Table of Isotopes CD- ROM Edition

(Version 1.0, March 1996)

The CD-ROM edition of the Table of Isotopes is an Adobe^{TM} ACROBAT document. On- line help for ACROBAT is provided. The CD-ROM may be navigated by activating bookmarks on the side bar with the mouse. The bookmarks access an extensive index to the book. The index has hypertext links to the main body of the book, and additional links, within the book, provide easy access to related material. All hypertext links are indicated by green text.

Bookmark and Index Summary

Chart of Nuclides — The chart is divided into 7 sections. Each section is comprised of separate parts for ground states and isomers. The isotope boxes on the chart have hypertext links to either an isomer, if an asterisk is present on the lower right of the box, or to the level table for that nucleus.

Summary Schemes — The 271 summary mass- chain decay schemes accessed by this index contain hyptertext links to the level table for each isotope. Additional links on the summary schemes access summary schemes for A ± 1 and A ± 4.

Reaction and Decay Daughter Index — Bookmarks are divided into groups of 10 mass chains with secondary bookmarks for every mass number. They access an index containing hypertext links to the summary schemes, level tables, decay scheme drawings, and nuclear band drawings for each mass chain.

Decay Parent Index — Bookmarks are divided into groups of 10 mass chains with secondary bookmarks for every mass number. They access an index containing hypertext links to the decay drawings and radiation tables for all radioactive parents.

Reference Index — Complete reference abstracts can be accessed by this index of hypertext links to first reference key number on each page of the references.

Appendix Index — The appendices to the Table of Isotopes are accessed through this index.

Other Hypertext Links

Level Tables — The isotope name at the beginning of the level table is linked to the corresponding decay drawing. References are linked to the complete reference abstracts.

Radiation Tables — The radiation table titles are linked to the corresponding decay scheme drawings.

Decay Drawings — The parent isotopes are linked to the corresponding radiation tables. Daughter isotopes are linked to the following band drawing, if one exists, or to the level tables.

Band Drawings — The isotope names are linked to the level tables.

Preface

It has been 60 years since Giorgio Fea published the first compilation of known radionuclides called the *Tabelle Riassuntive E Bibliografia delle Trasmutazioni Artificiali*[1] in Nuovo Cimento. Glenn Seaborg and colleagues published the *Table of Radionuclides*[2] in 1940, and later editions[3,4,5,6], renamed the *Table of Isotopes*, in 1944, 1948, 1953, and 1958. Remarkable historical events paralleled the publication of those editions as the *Table of Isotopes* helped pave our entry into the nuclear age. Some contents of the book were even deleted from publication for several years until the discovery of plutonium could be declassified. Data grew at a remarkable rate despite the prediction of an editor, in 1941, that “the rate at which such radioactivities are discovered may be reduced very considerably and the table would itself become stable.” It didn't stabilize and, when Mike Lederer took the helm for the 6th (1967) and 7th (1978) editions[7,8], data compilation was evolving into a specialized discipline. The enormous growth of nuclear data required the development of special expertise to sort through the information, evaluate it, and publish it in a convenient form. Mike Lederer pioneered the use of computers to facilitate the publication of the *Table of Isotopes*. He was one of the first to use word processing techniques, and the 7th edition of the *Table of Isotopes* was an early example of “desktop publishing.” However, Mike made one mistake in the last edition. He stated that “the 7th edition of the *Table of Isotopes* will be the last in the series.”

While the 7th edition of the *Table of Isotopes* was being prepared, Bruce Ewbank and his colleagues at Oak Ridge National Laboratory were developing the first comprehensive nuclear structure database, the Evaluated Nuclear Structure Data File (ENSDF), with supporting software for producing the *Nuclear Data Sheets*. The Berkeley and Oak Ridge efforts were joined together with groups at Idaho Falls and U. Pennsylvania, under the direction of the National Nuclear Data Center at Brookhaven National Laboratory, to form the U.S. Nuclear Data Network (USNDN). Brookhaven had led similar efforts to advance the compilation of neutron cross section data. Under Sol Pearlstein's direction an international network of nuclear data evaluators was established under the auspices of the IAEA. Nuclear structure and decay data continued expanding at an enormous rate, and it was a challenge even for the large data community to process this information into the ENSDF file and publish it in the

Nuclear Data Sheets. The editors, Murray Martin and Jagdish Tuli, deserve considerable credit for maintaining the quality of ENSDF and guiding the evaluators through the evaluation and review process. Few other scientific fields have developed such an extensive and efficient data program. In 1986, Edgardo Browne and I were able to use the ENSDF database to prepare the *Table of Radioactive Isotopes*[9], a new book emphasizing radioactive decay data. That effort merged the strengths of an international evaluation program with the publication tradition of the *Table of Isotopes*. In 1991 the National Academy of Sciences Panel on Basic Nuclear Data Compilations, chaired by Jolie Cizewski, requested that we prepare an 8th edition of the *Table of Isotopes.*

I owe an enormous debt of gratitude to my predecessors at Berkeley who began the *Table of Isotopes* and taught me the importance of quality in both the content and presentation of this book. In particular Virginia Shirley, my editor, represented the soul of this effort for over 25 years. Her editing standards were extremely high and accounted for the scarcity of mistakes in the 6th and 7th editions and in the *Table of Radioactive Isotopes.* Virginia passed away shortly before we completed this book and is sorely missed. I regret that she did not see the final product but, as I completed the final editing, I could sense that she was looking over my shoulder to make sure that we did it right.

Nearly 24,000 references are cited in this edition, and this book would not be possible without the research efforts of thousands of scientists. There have been over 100 nuclear data evaluators whose efforts have directly or indirectly contributed to the book. Some of them are listed on the summary mass chain decay schemes, but many more participated in numerous previous compilations over the past 60 years. Special thanks go to Mulki Bhat for rallying evaluators to update their mass chains in time for this edition. Georges Audi made a special effort to complete his mass evaluation in time for this book. Peter Ekström provided a great deal of advice and criticism throughout the project. Balraj Singh also contributed significantly to the development of this edition and evaluated most of the superdeformed band data. Darleane Hoffman, Glenn Seaborg, and Sigurd Hofmann helped to review and supply up-to-date heavy-element data. Peter Endt, Ron Tilley and Jean Blachot updated and reviewed much of the data for A<45. Dick Helmer provided prepublication data for the appendix on γ-ray energy and intensity standards. Many evaluators reviewed their contributions to this edition and provided us with additional, updated data.

This book would not be possible without the broad support of my colleagues at the Lawrence Berkeley Laboratory. James Symons, director of the Nuclear Science Division, provided advice, support, and encouragement. Jørgen Randrup helped develop and present the original proposals for the 8th edition, Darleane Hoffman continued those efforts, and Janis Dairiki saw to it that we were provided with the critical resources and support necessary to complete this project. Many LBNL scientists provided useful suggestions and reviewed various parts of the book. Special thanks go to the Information and Computer Science Division, under the direction of Stu Loken, for helping us solve many computer and software problems. Particular thanks go to Eric Beals, Marty Gelbaum, Cindy Hertzer, and Lam Wong who kept us up and running. Finally, I gratefully acknowledge the support and encouragement of the U.S. Department of Energy and, in particular, Stan Whetstone and Dick Meyer.

The 8th edition of the *Table of Isotopes* is not the end of this series, but instead the beginning of a new era. Our technology now allows us to update the book automatically from the underlying databases. We have developed this CD-ROM edition of the book to provide considerably more data in a compact format. With space for nearly 100,000 pages of information, we have solved the problem of an ever-expanding database. We look forward to publishing the *Table of Isotopes* in this CD-ROM format on a much more frequent schedule than was possible for the book. This time we can state that the 8th edition of the *Table of Isotopes* will *not* be the last in this series! We look forward with enthusiasm to preparing the next edition.

Richard B. Firestone

Berkeley, California
August, 1995

---

1. G. Fea, *Nuovo Cimento* **6**, 1 (1935).
2. J.J. Livingood and G.T. Seaborg, *Reviews of Modern Physics* **12**, 30 (1940).
3. G.T. Seaborg, *Reviews of Modern Physics* **16**, 1 (1944).

4. G.T. Seaborg and I. Perlman, *Reviews of Modern Physics* **20**, 585 (1948).
5. J.M. Hollander, I. Perlman, and G.T. Seaborg, *Reviews of Modern Physics* **25**, 469 (1953).
6. D. Strominger, J.M. Hollander, and G.T. Seaborg, *Reviews of Modern Physics* **30**, 585 (1958).
7. C.M. Lederer, J.M. Hollander, and I. Perlman, *Table of Isotopes*, John Wiley and Sons, New York (1967).
8. C.M. Lederer, V.S. Shirley, E. Browne, J.M. Dairiki, R.E. Doebler, A.A. Shihab-Eldin, L.J. Jardine, J.K. Tuli, and A.B. Buyrn, *Table of Isotopes*, 7th edition, John Wiley and Sons, New York (1978).
9. E. Browne, R.B. Firestone, and V.S. Shirley, *Table of Radioactive Isotopes*, John Wiley and Sons, New York (1986).

Introduction to the CD-ROM

I. General Information

The 8th edition of the *Table of Isotopes* contains nuclear structure and decay data for over 3100 isotopes and isomers with $1 \leq A \leq 272$. The information in this edition was based primarily on evaluation efforts by the members of the U.S. Nuclear Data Network and the International Atomic Energy Agency's Nuclear Structure and Decay Data Working Group. The detailed evaluations for light mass nuclei ($A \leq 44$) were published in *Nuclear Physics A*, and those for heavier nuclei ($45 \leq A \leq 266$) were published in *Nuclear Data Sheets*. These data are also available in the Evaluated Nuclear Structure Data File (ENSDF)[1], maintained by the National Nuclear Data Center at Brookhaven National Laboratory. We have used the ENSDF file as the starting point for this edition of the *Table of Isotopes*. In most instances, the most recently published evaluation was used but, for some mass chains, we used an updated, prepublication version. Some of the data have been selectively updated by the author from recent literature and/or extensively edited to provide uniform and concise presentation. For more detailed information, the reader is encouraged to consult the ENSDF file or the primary evaluation publications (referenced on the mass chain summary drawings), and the source references given in the tabular data.

In addition to the ENSDF file, data from several other compilations have been incorporated. Nuclear mass and Q-value data were taken from the Audi *et al.* 1993 mass table[2], neutron cross-section data are from Mughabghab *et al.*[3], most spontaneous fission probabilities are from Hoffman *et al.*[4] Nuclear moment data have been updated, when necessary, from Raghavan[5], and information on fission isomers and superdeformed nuclear band structure has been expanded to include information from Firestone and Singh[6]. The evaluations for $267 \leq A \leq 272$ were prepared by the author because, at this time, none existed in the ENSDF file.

This edition provides greater coverage of nuclear structure properties than previous editions. Adopted data for all known nuclear levels and their de-excitation modes are given. Complete decay data tables are also presented, as in the previous edition but, here, data evaluated from various literature sources have been combined in a single data set. The reaction level schemes of the 7th edition have been superseded by the more extensive level tables. In place of reaction level schemes, we have introduced high-spin nuclear band drawings, emphasizing information of particular importance in high-spin physics. The appendices from the 7th edition have been updated and expanded in this edition, and several new appendices have been added.

II. Organization of the 8th Edition CD-ROM

The 8th edition CD-ROM is an Adobe Acrobat document. The data are organized by mass number (A) and sub-ordered by atomic number (Z). For each mass chain there is an abbreviated summary decay scheme drawing (skeleton scheme) summarizing the ground state and isomeric state(s) half-lives, spin and parity assignments and ground state decay branchings, decay energies, and the proton and neutron separation energies for all known isotopes and isomers of that mass. The isotopes covered include those whose existence has been determined only in nuclear reactions, but whose decay is, as yet, unobserved. Isomers are defined as excited states with half-lives either greater than 1 ms, comparable to the ground-state half-life, or of particular historical interest (e.g., shape isomers).

The skeleton scheme is followed by the tabular listings for all isotopes, ordered by increasing atomic number (Z). The decay scheme and band structure drawings for each isotope, also ordered by increasing atomic number (Z), follow the tables. The tables contain general nuclear properties including natural isotopic abundance, mass excess, decay Q-values, proton and neutron separation energies, and neutron capture cross sections. These are followed by an alphabetically coded list of the decay modes and reactions known or expected to populate the isotope, with their associated 6-character reference codes from the Nuclear Science Reference file[7] (NSR). The table continues with an energy-ordered list of level data and γ-ray deexcitation information, adopted from decay and reaction measurements. Adopted level data include spin and parity, isospin, half-life, decay modes and branching intensities, dipole and quadrupole moments, and cross-indexing to the populating reactions and decays in which the level is observed. The data listed for the γ rays include energy, relative photon intensity normalized to 100 for the most intense photon branch from a given level, multipolarity, and mixing ratio. Radioactive decay data tables for the isotope and its isomers follow each adopted levels table. These provide tables of transition energies, relative intensities, multipolarities, mixing ratios, and absolute intensity normalizations for emitted γ rays, and tables of energies, relative intensities and absolute intensity normalizations for α, p, n, or other particles emitted in decay.

Decay scheme drawings are presented separtately for each decay mode feeding each daughter isotope. Such drawings show each parent's level energy, spin, parity, half-life, and decay energy. Beta or alpha decay feedings to daughter levels are shown with their associated reduced transition probabilities (log*ft* or HF). All γ rays from the levels populated by decay are shown with their energies, multipolarities, and relative branching intensities from the decay table. Additional γ rays deexciting the decay levels from the adopted levels table which were not observed in decay are shown in red on the drawings. Levels identified as having associated collective or high-spin structure are shown in nuclear band drawings. There, bands are drawn side by side and given a short band name if available. In-band γ rays, with their energies rounded to the nearest keV, and transitions to adjacent bands (arrow only) are shown. The existence of additional transition(s) that are not shown is indicated by an arrowhead on the level.

III. General Features of the 8th Edition

A. Uncertainties:

Uncertainties are indicated by smaller italic numbers following any value. They represent the uncertainty in the least significant digit(s). For example, 37.2 *22* stands for 37.2±2.2, 15.7^{17}_{5} for 15.7+1.7–0.5, and 4.3 *2* $\times10^{-4}$ for $(4.3\pm0.2)\times10^{-4}$. Some numbers are indicated as approximate (≈0.15) or as a limit (>10, < 0.06). Data from ENSDF for which limits were expressed as ≤ or ≥ have had those limits converted to < or >, respectively, except for quantized values such as spin. Values derived from systematics are indicated either in parentheses, e.g., (123), or as 123 *syst*; calculated values are shown, e.g., as 1.5 *calc*.

B. Energies:

All energies are given in keV. Level energies are shown in boldface type, and transition energies in boldface italic type. Level energies are quoted relative to a constant offset (**x, y, z, ..**) as **x** or **0+y, 1576.5+z,** etc., when their relationship to the ground state is unknown. Some γ-ray energies are given as ***X*** or ***>0*** when the transition is known to exist but its energy is not known. Systematic level energies are given in parentheses. Ground state energies are normally written as **0**, not **0.0**.

C. Reference Codes:

Standard reference codes from the Nuclear Science Reference file[7] (NSR), maintained by the National Nuclear Data Center at Brookhaven National Laboratory, are used. These codes follow the general form YYAu%% where the first two characters indicate the reference year, the second two characters are the first two letters of the first author's last name, and the last two characters are arbitrary sequence characters. If the last two characters are numeric, the reference is from a primary source (except for some pre-1969 publications) and, if they are alphabetic, the reference is from a secondary source such as a report, conference proceedings, or private communication. The reference codes are translated into short citations at the end of the main tables. In a few cases, reference codes were unavailable from NSR at the time of publication, so temporary alphabetic sequence numbers were assigned irrespective of whether the source was a primary or secondary one.

D. Masses:

Mass excesses, decay Q-values, and proton or neutron separation energies shown in the tables and figures are from the evaluation of Audi and Wapstra[2]. Values extrapolated from systematics are indicated by enclosing them in parentheses and rounding them based on the systematic uncertainty. Isotopes whose masses have not yet been tabulated are displayed on the summary mass chain schemes at their approximate masses estimated from the calculations of Möller, Myers, Swiatecki, and Treiner[8]. These values are presented on the decay scheme drawings in parentheses.

E. Data evaluation:

Data were generally taken directly from the ENSDF file with only minor adjustments to achieve uniform presentation. Updating was primarily limited to the addition of newly discovered isotopes, more complete nuclear band data, and the addition of missing or incomplete nuclear moments from the compilation of Raghavan[5]. Decay energies and proton/neutron separation energies were updated to values provided by Audi and Wapstra[2]. Log*ft* values were recalculated, rounded to the nearest 0.1 unit, and compared with the ENSDF file values for inconsistencies. Decay parent information was compared with relevant adopted daughter level information, and discrepancies were reconciled. Cross-indexing of levels to populating reactions and decays was taken from ENSDF, when available; otherwise, it was assigned on the basis of energy differences, level spins and parities, de-exciting transition energies and multipolarities, reaction ℓ-transfer values, and band assignments. Transition final level assignments are not generally available in ENSDF, so they were deduced from the transition energy with the requirement that transition multipolarity be consistent with initial and final level spin and parity values.

Adopted levels in the tabular data have been extended to include all levels in the decay scheme drawings whether or not the evaluator adopted them. Adopted γ-ray intensities have been renormalized, when necessary, to give 100 for the most intense photon branch from each level. Systematic multipolarities generally are not shown unless they have been used to infer the mixing ratio.

F. Mass-chain Reference:

The mass-chain evaluation citations are given in a box on the summary mass-chain decay scheme. The most recent primary reference and subsequent update (if any) are indicated. If a revision date is indicated, an unpublished evaluation which is either a continuous evaluation or a prepublication mass-chain evaluation has been used. The reader is encouraged to refer to the original *Nuclear Physics A* or *Nuclear Data Sheets* publication or the ENSDF file for more detailed information. The evaluator(s) of the most recent evaluation are indicated on the mass-chain skeleton scheme and may also be contacted for additional information. In many instances we have updated selected portions of the mass chains beyond the date indicated on the summary mass-chain decay scheme. This will be evident from the post-evaluation date references included in the tabular data.

IV. Detailed Description of the Tables and Drawings

A. Mass-chain Decay Schemes:

The ground-state of each nucleus is represented by a heavy line whose vertical position represents the mass of the nucleus relative to the lightest (most beta-stable) isobar. The square-root energy scale is plotted to the left of the scheme. Isomeric states are represented by heavy lines plotted above the ground state. The positions of these lines only approximate the actual energy to allow room for labels. Dashed lines represent probable isotopes or isomers. Proton or neutron separation energies are plotted as dashed lines near their actual energies. Beta-delayed particle emission is indicated by light lines if only a few discrete levels are populated by the beta decay, or by a cross-hatched band, plotted near the energy region of delayed particle emission, when many levels are populated. The mass, atomic number, and isotope symbol appear below each ground-state line.

Alpha-decay parents are shown at the top of the mass-chain decay scheme, directly above their respective daughters. Their vertical positions are unrelated to the energy scale. Half-lives are printed in large type next to the isotope or isomer lines. Spin and parity assignments are printed above the lines on the left side. Energies of isomeric states are printed above the right hand side of the line. Decay of an isotope is indicated by an arrow, labeled with the decay mode. When several decay processes compete, percentage branchings are given when known.

Q-values for β^-, EC (EC+β^+), α, p, and bb decay modes are given for each isotope; Q_a values are also given for α-decay parents. Q_{EC} is given for all EC+β^+ processes. All Q-values represent the actual mass difference (in units of keV) between neutral atoms, and they are taken from Audi and Wapstra[2]. They are derived from a least-squares fit to measured Q-values for decay and nuclear reactions and data on mass doublets. Systematic values are indicated in parentheses; they have been interpolated or extrapolated from the least-squares fit. The values are rounded, based on experimental or systematic uncertainties, to $<$ 25 units in the most significant digit(s). (Systematic uncertainties were also derived from the least-squares fit, but they are not shown here.)

B. Tabulated Data:

General Isotopic Information:

Each block of data for an isotope is headed by the isotope label. Immediately below the label are quantities of general interest described as follows.

%: *Natural isotopic abundance* (atom percent basis) for elements as they occur on earth. The values are those adopted by the International Union of Pure and Applied Chemistry[9].

Δ: *Mass excess* ($\equiv$ M–A) on the unified mass scale (Δ^{12}C$\equiv$0), in units of keV. All values refer to masses of neutral atoms. Systematic values are given in parentheses.

S_n: *Neutron separation energy* ($M_N - M_{N-1} - M_n$) in units of keV. Systematic values are given in parentheses.

S_p: *Proton separation energy* ($M_Z - M_{Z-1} - M_p$) in units of keV. Systematic values are given in parentheses.

Q_x: *Decay energy* for decay mode x = β^-, EC (EC+β^+), α, or p decay in units of keV. Systematic values are given in parentheses.

: *Neutron cross sections*: these include values for σ_γ ($\equiv\sigma$(n,γ), the neutron capture cross section), σ_α (n capture cross section for alpha particle emission), σ_p (n capture cross section for proton emission), σ_{abs}(“free” neutron scattering cross section) and σ_f (capture cross section for fission). Cross sections σ are those for thermal neutrons, σ^o for 2200 m/sec neutrons, and σ^r for reactor neutrons. Designation of “from” or “to” is followed by the energy of the capture or product nuclear state.

Populating reactions and decay modes:

A list of reactions and decay modes known to populate this isotope. The reaction list is obtained primarily from the compiled datasets, and the decay modes have been supplemented to include populating decays where explicit feeding of specific final levels is not known. A complete list of reference codes used by the evaluator follows each populating reaction or decay mode. Decay modes, sometimes without references, have been added here and the reader is referred to the parent isotope tables for references. When more than one level from a given parent may populate the isotope, the decay modes specify the identifying half-life; if those parent levels have identical half-lives, the decay modes are identified by the parent level energy or spin and parity values. Each entry on this list is preceded by a character which is used to cross-reference this entry to each level populated by the specified reaction or decay.

Adopted level data:
The following information about adopted levels is presented.

E: *Energy* in keV. If followed by +x, +y, +z, or some other alphabetic constant, the energy is relative to an unknown excitation energy. Levels whose energy is followed by (?) have questionable existence, and levels with energy in parentheses are systematic.

J^{π}: *Nuclear spin* (angular momentum) in units of $\hbar$ and *parity*. Isospin *T* or T_z may also be given. Multiple possible values may be indicated. Spins and/or parities in parentheses are based on less definite information. If the values are separated by “and”, then the level is presumed to be a doublet. In cases, where the spin is presented as J+*x* and *x* is a definite spin value, x is the increment in spin relative to some unknown spin value J.

$t_{1/2}$: *Level half-life* (mean-life × ln2). Conventional units are employed: y=year, d=day, h=hour, m=minute, s=second, ms=millisecond (10^{-3} s), μs=microsecond (10^{-6} s), ns=nanosecond (10^{-9} s), ps=picosecond (10^{-12} s), fs=femtosecond (10^{-15} s), and as=attosecond (10^{-18} s). In some instances level width Γ or partial width Γ_x (where x=n, p, γ, . . . is the partial decay mode) is given (in eV, keV, or MeV).

Cross-Reference codes:
Character list indexing the level to the reactions and decay modes which populate it.

Decay modes:
Percentage branchings are given for modes denoted by the following symbols:

β^-	negatron (electron) emission
β^+	positron emission
EC	orbital electron capture

α	alpha-particle emission
IT	isomeric transition (γ ray or conversion electron emission from an excited state)
SF	spontaneous fission
p	proton emission
n	neutron emission
$\beta^-\beta^-$	double negatron emission
ECEC	double orbital electron capture
ECx	electron capture delayed emission of x=p, α, SF(often denoted as ECDF), . . .
β^-x	negatron delayed emission of x=n, 2n, α, . . .
^{14}C	emission of ^{14}C nucleus
^{20}Ne	emission of ^{20}Ne nucleus

In general, decay modes are shown when they have been observed or inferred from experiment or when they are expected to be significant ($>$0.1 %) based on theory. If the percentage is given as "=?", this indicates that the percentage is unknown, and not that the decay mode is uncertain. If the percentage branching is from theory or systematics, the value is indicated as *syst.* When β^+ emission is energetically possible, it is always accompanied by EC decay. In these tables the undivided percentage branching for both modes %EC+%β^+ is given when both modes are possible.

Nuclear moments:

The magnetic dipole (μ) and electric quadrupole moment (Q) are taken from the compilation of Raghavan[5] unless the evaluator incorporated a newer value. If several values have been measured, the first value listed in Raghavan's table is the recommended value and that one is reported here. If the measurement led to two possible interpretations, both values are presented separated by the word "or". In cases where the spin is unknown, the "g-factor", *g,* may be shown instead; the magnetic dipole moment $\mu=gJ$.

Adopted γ-ray data:

The following information on adopted γ rays depopulating the level are presented.

E: *Energy* of the deexciting transition in keV, preceded by γ_{abc} where abc=energy of the level populated by that transition. Transitions with (?) following their energies have uncertain placements.

†$_{\gamma}$, †$_{e}$,†$_{e+\gamma}$: *Relative intensity* of photon, conversion electron, or total transition, respectively. Photon intensities are given whenever available, and electron intensities are typically given only for E0 transitions. The transition intensities are usually normalized to 100 for the most intense γ ray emitted from the level.

Multipolarity and mixing ratio (δ)**:** The transition multipolarities and mixing ratio are given when available. If the mixing ratio is inferred from systematic multipolarities, the multipolarities are given in square brackets. The multipolarities are shown as magnetic (Mλ) or electric (Eλ) 2^{λ}-multipole transitions, and as dipole (D, λ=1), quadrupole (Q, λ=2), and octupole (O, λ =3) transitions. Multipolarities in parentheses are determined from weaker evidence, and values reported as M1(+E2) generally infer that the contribution of the second multipolarity is minor. Multipolarities separated by commas represent the list of plausible values not excluded by experiment, and one or more values in the list may be negligible or nonexistent. In some cases, when more than one mixing ratio (δ) may be inferred from the data, multiple values are separated by the word "or". The sign of the mixing ratio (δ) is given explicitly when known, and follows the phase convention of Krane and Steffen[10]. For transitions of the general form $E(M)\lambda_1+M(E)\lambda_2$ ($\lambda_2=\lambda_1+1$), the ratio of the two multipolarity component intensities is $\delta^2=M(E)\lambda_2/E(M)\lambda_1$ The percentage of the second (λ_2) component, as expressed in earlier editions of the *Table of Isotopes*, is $\%E(M)\lambda_2=100\times\delta^2/(1+\delta^2)$.

Quantities for Superdeformation: The following quantities are provided for superdeformed band levels only:

Rotational Frequency

$$\hbar\omega = [E_{\gamma}((J+2)\rightarrow J)+E_{\gamma}(J\rightarrow(J-2))]/4 \text{ MeV}$$

Kinetic Moment of Inertia

$$I^{(1)}(J) = (2J-1)\hbar^2/[E_{\gamma}(J\rightarrow(J-2))] \text{ MeV}^{-1}$$

Dynamic Moment of Inertia

$$I^{(2)}(J) = 4\hbar^2/[E_{\gamma}((J+2)\rightarrow J)-E_{\gamma}(J\rightarrow(J-2))] \text{ MeV}^{-1}$$

Decay γ-ray data:

Tables of γ-ray energies and intensities from decay are headed by the generic title "γ *(daughter) from parent*($t_{1/2}$) *xx decay <for* I_γ*% multiply by yy>*" where *xx* is the mode of decay and *yy* is the factor required to normalize the γ-ray intensity to units of "per 100 decays of the parent". In some cases the decay is indicated as *from multiple parents* when the data are from a mixed source. The title is followed by an energy-ordered list of transitions, their intensities and their multipolarities and mixing ratios. See the discussion under adopted γ-ray data for a discussion of these quantities. Unplaced γ-ray transitions, not shown in the adopted γ-ray tables, are indicated by (u), following the energy. The γ-ray list typically includes measured values for transitions observed in decay experiments whose energies may vary from their adopted values in the level table. Additional transitions observed in reaction experiments and included in the adopted levels table are excluded from this list. A complete list of γ rays expected from decay can be inferred from the decay scheme drawings (see discussion below).

Decay particle data:

Tables of particle emission energies and intensities from decay are headed by the generic title "*x from parent*($t_{1/2}$) *x decay <for* I_X*% multiply by yy>*" where *x*= α*,p, n,….* is the emitted particle and *yy* is the normalization factor defined as for decay γ rays (see above). Particles are listed in energy order and preceded by x_{abc} where abc is the energy of the level populated in the daughter.

C. Decay-scheme drawings:

Nuclear levels populated by radioactive decay are shown on a detailed decay scheme drawing. A decay scheme for each parent decay mode summarizes the daughter level structure as observed in the decay of that parent isotope or isomeric state. All levels populated in radioactive decay, the adopted transitions from these levels, and additional adopted levels fed by the adopted transitions but not observed in decay, are shown on the decay scheme. If the decay scheme is sufficiently complex, it is drawn in several parts divided into regions of level excitation energy populated by the parent. In each part, the lower energy levels are omitted from the drawing unless they are fed from above. The following is a description of those properties shown on decay scheme drawings.

Levels are represented as horizontal lines and *transitions* by vertical arrows. Heavy lines denote ground states and isomeric states. Uncertain levels or transitions are indicated by dashed lines. The levels are plotted on a linear energy scale as close to their relative energies as possible; however, a minimum separation is imposed to facilitate legibility. The inner scale of the level drawing has a finer minimum level separation while the outer scale is coarser to allow room for labels. A group of unresolved levels, such as might be populated in delayed particle emission, may be presented as a broad band of lines.

Level energies (keV), in bold type, are located near the right end of a level. These energies are taken from the adopted levels tables.

Spins, parities, and isospin assignments*,* also in bold type, are located near the left end of a level. These values are from the adopted levels tables.

Half-lives, from the adopted levels tables, are located near the level at various positions as determined by layout considerations. Ground state and isomeric state half-lives are given in larger type than other half-lives.

Relative intensities of γ rays are located immediately above the transition arrow.

γ-ray energies (keV), in bold type, follow the intensities. An asterisk following the energy denotes a multiply placed γ ray.

Multipolarity of the γ ray follows the energy on the label. The intensity, energy, and multipolarity are from the adopted γ-ray tables.

Particle emission from excited states is indicated by a decay arrow on the left or right side of the level and labeled by the particle decay mode. When delayed particle emission is known to populate specific levels in the particle decay daughter, the relevant levels for that nucleus and the associated particle transitions to those levels are shown in greater detail. Particle decay branchings may be shown on the particle transition lines and final state feedings may be shown on horizontal feeding arrows pointing to the final states.

Parent isotopes are located in the upper corners of the decay scheme: β^- parents to the left, and α or EC+β^+ parents to the right. The parent half-life, energy, spin and parity assignment, decay mode, and decay Q-value are given. A vertical decay arrow points from the parent line to horizontal transition feeding lines (if any) pointing to levels populated in the daughter. If the parent is drawn to scale, a half-bullet on the parent decay arrow marks the energy (Q-value) of the parent on the same internal scale as the levels. Otherwise, a scale break (≈) is drawn through the decay arrow.

Level feedings from α or β decay are usually given on the transition feeding lines in transitions per 100 decays (%) of the parent. In some cases, relative intensities are given, and these are indicated by a † preceding the value. *Log ft values* for β decay are given in italics to the right of the intensity. For unique-forbidden transitions, the uniqueness order is given as a superscript to the *log ft.* α*-decay hindrance factors* are also given in italics following the α intensity; these values are typically the evaluator's values without revision following the incorporation of the 1993 mass table. In some cases, the transition feeding line is shown bracketed to more than one final level indicating the feeding is the sum to both levels. Dotted transition feeding lines indicate that the population of this level is uncertain.

D. Nuclear structure drawings:

Decay schemes for families of levels with common collective properties, high-spin structures, or structures of importance in high-spin physics have been drawn. For each nucleus the bands or structures are plotted side by side, with levels drawn at a position nearly proportional to the energy, and labeled by spin and parity on the left and energy on the right. In-band transition arrows are plotted in a compact semi-stack plot with energies, rounded to the nearest keV, drawn at the end of the arrow. Transitions between adjacent bands are indicated by diagonal arrows but are unlabeled. The existence of other transitions that could not be drawn is indicated by an arrowhead drawn to the right of the level near the energy. Due to layout considerations, some bands may be plotted at a false position relative to other bands. A band label is drawn beneath each band when that band has been given a definitive name in the literature. Among the common band names used here are:

GS band	The band built on the ground state

Yrast band	Sequence of levels corresponding to the lowest energy for each spin
β band	The band built on the first excited 0^+ state
γ band	The band built on the first excited 2^+ state
Octupole band	The band based on an octupole vibration
$K[Nn_Z\Lambda]$	Nilsson configuration
$\pi h_{11/2}$ or $\nu h_{11/2}$	Band based on configuration derived from the proton (π) or neutron (ν) shell model configuration $h_{11/2}$
SD band	Superdeformed band
α=+1/2, α=–1/2	Favored or unfavored signature band
3 QP	Three quasiparticle band

Sometimes the band label is a compound of more than one of the above forms indicating specific multiparticle configurations or core-particle excitations. Since band labels are somewhat subjective, and labeling has evolved over time, these labels should be considered only as rough descriptions of the more complex nuclear physics underlying their descriptions.

References

1) *Evaluated Nuclear Structure Data File* (ENSDF), an electronic data base containing evaluated nuclear structure and radioactive decay data. The file is maintained by the National Nuclear Data Center (NNDC), Brookhaven National Laboratory, on behalf of the International Network for Nuclear Structure and Decay Data Evaluation.
2) G. Audi and A.H. Wapstra, *Nucl. Phys.* **A565**, 1 (1993); private communication (1993).
3) *Neutron Cross Sections*, S.F. Mughabghab, M. Divadeenam, and N.E. Holden, Academic Press, New York (1981).
4) D.C. Hoffman, T.M. Hamilton, and M.R. Lane, *Spontaneous Fission*, LBL-33001 (1992).
5) P. Raghavan, *At. Data Nucl. Data Tables* **42**, 189 (1989).
6) R.B. Firestone and B. Singh, *Table of Superdeformed Nuclear Bands and Fission Isomers*, LBL-35916 (1994).

7) *Nuclear Science Reference File* (NSR), an electronic database containing nuclear structure references with keyword abstracts. The file is maintained by the National Nuclear Data Center (NNDC), Brookhaven National Laboratory, on behalf of the International Network for Nuclear Structure and Decay Data Evaluation.

8) P. Möller, W.D. Myers, W.J. Swiatecki, and J. Treiner, *At. Data Nucl. Data Tables* **39**, 225 (1988).

9) P. De Bièvre and P.D.P. Taylor, *Int. J. Mass Spectrom. Ion Phys.* **123**, 149 (1993).

10) K.S. Krane and R.M. Steffen, *Phys. Rev.* **C2**, 724 (1970).

Chart of Nuclides

Summary Scheme Index

Z=0-11	A=1
	A=2
	A=3
	A=4
	A=5
	A=6
	A=7
	A=8
	A=9
	A=10
	A=11
	A=12
	A=13
	A=14
	A=15
	A=16
	A=17
	A=18
	A=19
	A=20

Reaction and Decay Daughter Index

A=11 Summary Scheme

^{11}Li
- Level Table

^{11}Be
- Level Table
- ^{11}Li(8.5 ms) β^- Decay

^{11}B
- Level Table
- ^{11}Be(13.81 s) β^- Decay
- ^{11}C (20.39 m) EC Decay

^{11}C
- Level Table

^{11}N
- Level Table

A=12 Summary Scheme

^{12}Be
- Level Table

^{12}B
- Level Table
- ^{12}Be(23.6 ms) β^- Decay

^{12}C
- Level Table
- ^{12}B (20.20 ms) β^- Decay
- ^{12}N (11.000 ms) EC Decay

^{12}N
- Level Table

^{12}O
- Level Table

A=13 Summary Scheme

^{13}B
- Level Table

^{13}C
- Level Table
- ^{13}B (17.36 ms) β^- Decay
- ^{13}N (9.965 m) EC Decay

^{13}N
- Level Table
- ^{13}O (8.58 ms) EC Decay

^{13}O
- Level Table

A=14 Summary Scheme

^{14}Be
- Level Table

^{14}B
- Level Table
- ^{14}Be(4.35 ms) β^- Decay

^{14}C
- Level Table
- ^{14}B (13.8 ms) β^- Decay

^{14}N
- Level Table
- ^{14}C (5730 y) β^- Decay
- ^{14}O (70.606 s) EC Decay

^{14}O
- Level Table
- ^{15}F (1.0 mev) p Decay

A=15 Summary Scheme

^{15}B
- Level Table

^{15}C
- Level Table

^{15}N
- Level Table
- ^{15}C (2.449 s) β^- Decay
- ^{15}O (122.24 s) EC Decay

^{15}O
- Level Table
- ^{16}F (40 kev) p Decay

^{15}F
- Level Table

A=16 Summary Scheme

^{16}C
- Level Table

^{16}N
- Level Table
- ^{16}C (0.747 s) β^- Decay

^{16}O
- Level Table
- ^{16}N (7.13 s) β^- Decay

^{16}F
- Level Table

^{16}Ne
- Level Table

A=17 Summary Scheme

^{17}B
Level Table

^{17}C
Level Table

^{17}N
Level Table
^{17}C (193 ms) β^- Decay

^{17}O
Level Table
^{17}N (4.173 s) β^- Decay
^{17}F (64.49 s) EC Decay

^{17}F
Level Table
^{17}Ne(109.2 ms) EC Decay

^{17}Ne
Level Table

A=18 Summary Scheme

^{18}C
Level Table

^{18}N
Level Table

^{18}O
Level Table
^{18}N (624 ms) β^- Decay
^{18}F (109.77 m) EC Decay

^{18}F
Level Table
^{18}Ne(1672 ms) EC Decay

^{18}Ne
Level Table

A=19 Summary Scheme

^{19}B
Level Table

^{19}C
Level Table

^{19}N
Level Table

^{19}O
Level Table
^{19}N (0.27 s) β^- Decay

^{19}F
Level Table
^{19}O (26.91 s) β^- Decay
^{19}Ne(17.34 s) EC Decay

^{19}Ne
Level Table

^{19}Na
Level Table

A=20 Summary Scheme

^{20}C
Level Table

^{20}N
Level Table

^{20}O
Level Table
^{20}N (100 ms) β^- Decay

^{20}F
Level Table

^{20}Ne
Level Table
^{20}F (11.00 s) β^- Decay
^{20}Na(447.9 ms) EC Decay

^{20}Na
Level Table
^{20}Mg(95 ms) EC Decay

^{20}Mg
Level Table

Decay Parent Index

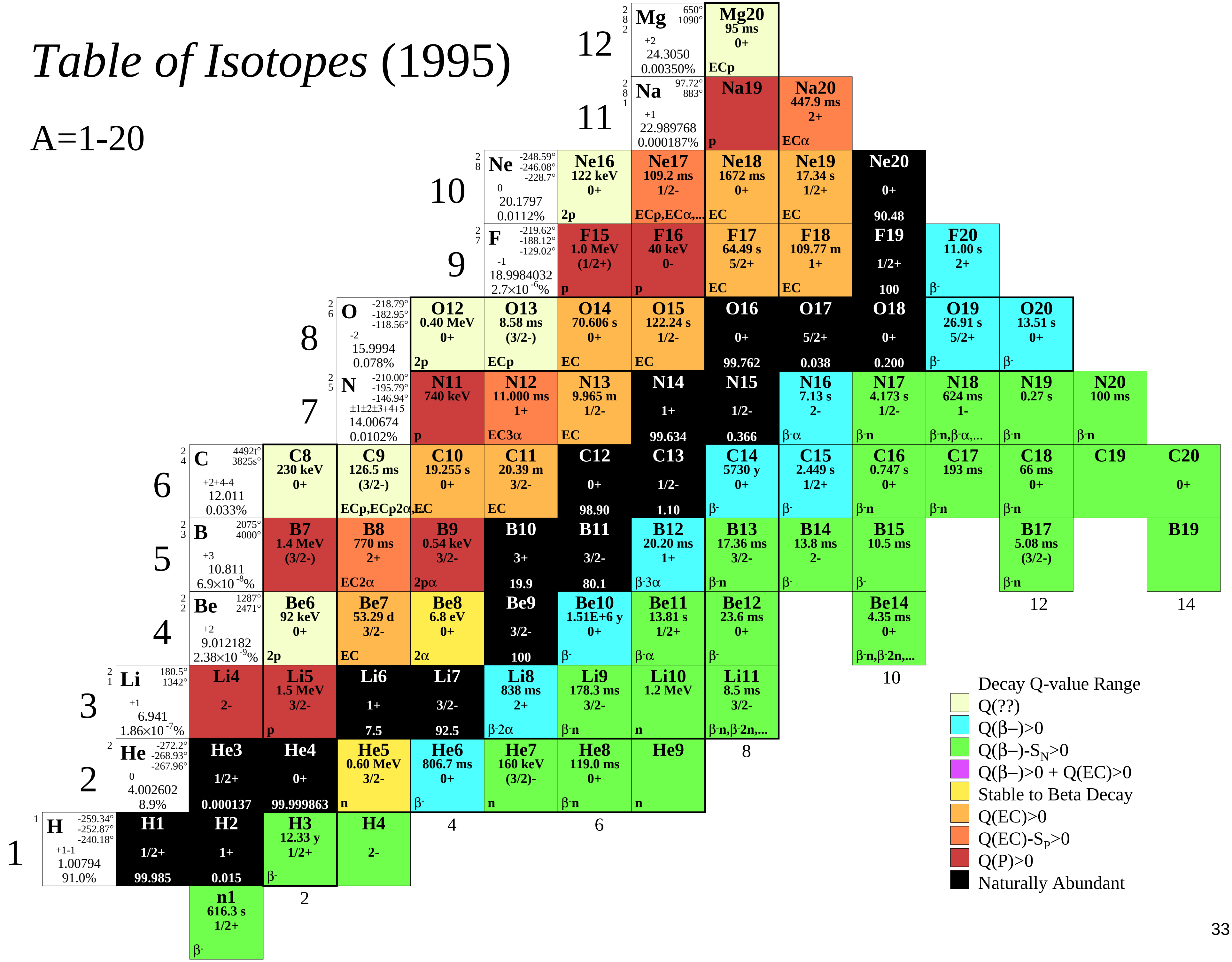
Decay Parent Index ^{17}C to ^{20}Mg

List of First Reference in Each Page

Appendix Index

Table of Isotopes (1995)

A=1-20



12									2 8 2 Mg 650° 1090° +2 24.3050 0.00350%	Mg20 95 ms 0+ ECp						
11									2 8 1 Na 97.72° 883° +1 22.989768 0.000187%	Na19 p	Na20 447.9 ms 2+ ECα					
10							2 8 Ne -248.59° -246.08° -228.7° 0 20.1797 0.0112%	Ne16 122 keV 0+ 2p	Ne17 109.2 ms 1/2- ECp,ECα,...	Ne18 1672 ms 0+ EC	Ne19 17.34 s 1/2+ EC	Ne20 0+ 90.48				
9							2 7 F -219.62° -188.12° -129.02° -1 18.9984032 2.7×10^{-6}%	F15 1.0 MeV (1/2+) p	F16 40 keV 0- p	F17 64.49 s 5/2+ EC	F18 109.77 m 1+ EC	F19 1/2+ 100	F20 11.00 s 2+ β^-			
8					2 6 O -218.79° -182.95° -118.56° -2 15.9994 0.078%	O12 0.40 MeV 0+ 2p	O13 8.58 ms (3/2-) ECp	O14 70.606 s 0+ EC	O15 122.24 s 1/2- EC	O16 0+ 99.762	O17 5/2+ 0.038	O18 0+ 0.200	O19 26.91 s 5/2+ β^-	O20 13.51 s 0+ β^-		
7					2 5 N -210.00° -195.79° -146.94° ±1±2±3+4+5 14.00674 0.0102%	N11 740 keV p	N12 11.000 ms 1+ EC3α	N13 9.965 m 1/2- EC	N14 1+ 99.634	N15 1/2- 0.366	N16 7.13 s 2- β^-α	N17 4.173 s 1/2- β^-n	N18 624 ms 1- β^-n,β^-α,...	N19 0.27 s β^-n	N20 100 ms β^-n	
6			2 4 C 4492t° 3825s° +2+4-4 12.011 0.033%	C8 230 keV 0+	C9 126.5 ms (3/2-) ECp,ECp2α,EC	C10 19.255 s 0+	C11 20.39 m 3/2- EC	C12 0+ 98.90	C13 1/2- 1.10	C14 5730 y 0+ β^-	C15 2.449 s 1/2+ β^-	C16 0.747 s 0+ β^-n	C17 193 ms β^-n	C18 66 ms 0+ β^-n	C19	C20 0+
5			2 3 B 2075° 4000° +3 10.811 6.9×10^{-8}%	B7 1.4 MeV (3/2-)	B8 770 ms 2+ EC2α	B9 0.54 keV 3/2- 2pα	B10 3+ 19.9	B11 3/2- 80.1	B12 20.20 ms 1+ β^-3α	B13 17.36 ms 3/2- β^-n	B14 13.8 ms 2- β^-	B15 10.5 ms β^-		B17 5.08 ms (3/2-) β^-n		B19
4			2 2 Be 1287° 2471° +2 9.012182 2.38×10^{-9}%	Be6 92 keV 0+ 2p	Be7 53.29 d 3/2- EC	Be8 6.8 eV 0+ 2α	Be9 3/2- 100	Be10 1.51E+6 y 0+ β^-	Be11 13.81 s 1/2+ β^-α	Be12 23.6 ms 0+ β^-		Be14 4.35 ms 0+ β^-n,β^-2n,...		12		14
3		2 1 Li 180.5° 1342° +1 6.941 1.86×10^{-7}%	Li4 2-	Li5 1.5 MeV 3/2- p	Li6 1+ 7.5	Li7 3/2- 92.5	Li8 838 ms 2+ β^-2α	Li9 178.3 ms 3/2- β^-n	Li10 1.2 MeV n	Li11 8.5 ms 3/2- β^-n,β^-2n,...		10				
2		2 He -272.2° -268.93° -267.96° 0 4.002602 8.9%	He3 1/2+ 0.000137	He4 0+ 99.999863	He5 0.60 MeV 3/2- n	He6 806.7 ms 0+ β^-	He7 160 keV (3/2)- n	He8 119.0 ms 0+ β^-n	He9 n	8						
1	1 H -259.34° -252.87° -240.18° +1-1 1.00794 91.0%	H1 1/2+ 99.985	H2 1+ 0.015	H3 12.33 y 1/2+ β^-	H4 2-	4		6								
			n1 616.3 s 1/2+ β^-	2												

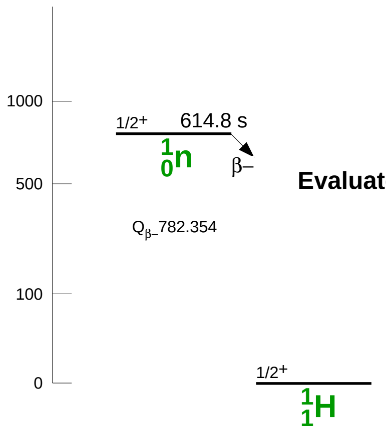
Decay Q-value Range

- 🟨 Q(??)
- 🟦 Q(β–)>0
- 🟩 Q(β–)-S_N>0
- 🟪 Q(β–)>0 + Q(EC)>0
- 🟨 Stable to Beta Decay
- 🟧 Q(EC)>0
- 🟧 Q(EC)-S_P>0
- 🟥 Q(P)>0
- ⬛ Naturally Abundant

A=1

PR D50, 1173(1994)

Evaluator: Particle Data Group



${}^{1}_{0}\mathrm{n}$

Δ: 8071.323 *20* **$Q_{\beta-}$:** 782.354 *20*

Levels:

0, $1/2^+$, 614.8 *14* s, $\%\beta^-=100$,
$\mu=-1.91304275$ *45*

${}^{1}_{1}\mathrm{H}$

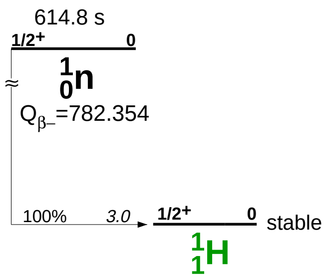
%: 99.985 *1*
Δ: 7288.969 *10*
σ_{γ}^{0}: 0.3326 *7* b

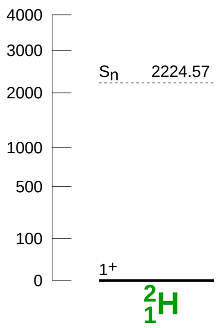
Populating Reactions and Decay Modes

n β^{-} decay (60Bu17, 60ClCC, 67GrCC, 69Ch05, 70Ch08, 70Er07, 70Er08, 70Er10, 74ErCC, 74St09, 75DoCC, 75KrCC, 76StCC, 78DoCC, 78ErCD, 79Er08, 86Bo04)

Levels:

0, $1/2^{+}$, stable, μ=+2.79284739 *7*


614.8 s
1/2+
0
$^{1}_{0}$n
$Q_{\beta-}$=782.354
100%
3.0
1/2+
0
stable
$^{1}_{1}$H



A=2

Evaluator: R.B. Firestone

$^{2}_{1}\mathrm{H}$

%: 0.015 *1*

Δ: 13135.720 *10* **S_n:** 2224.57 **S_p:** 2224.57

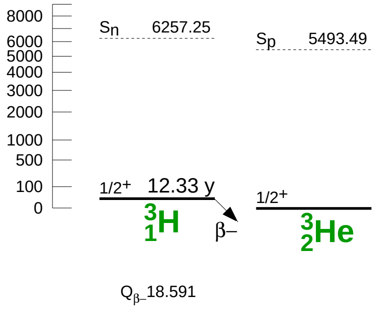
σ_γ: 0.519 *7* mb

Levels:

0, 1^+, stable, μ=+0.857438230 *24*,
Q=+0.002860 *15*

A=3

NP A474, 1(1987)



Evaluators: D.R. Tilley, H.R. Weller, and H. Hasan

$^{3}_{1}$H

Δ: 14949.794 *20* **S_n:** 6257.25 **$Q_{\beta-}$:** 18.591 *10*

σ_γ: <0.0060 mb

Populating Reactions and Decay Modes

^{6}Li(n,α) (47GoCC, 50Je60, 51Jo15, 55Jo20, 58Po64, 63EiCC, 67Jo09, 67Jo10, 71Al17, 73Pi01, 76Fu06, 77NeCC, 77RuCC, 79TiCC)

Levels:

0, 1/2^{+}, 12.33 *6* y, %β^{-}=100, μ=+2.97896248 *7*

$^{3}_{2}$He

%: 0.000137 *3*

Δ: 14931.203 *20* **S_p:** 5493.49

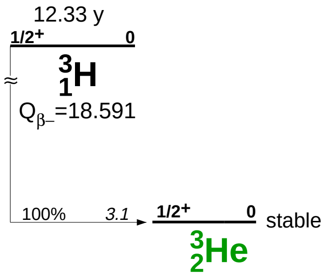
σ_γ: 0.031 *9* mb , **σ_p^0**: 5333 *7* b

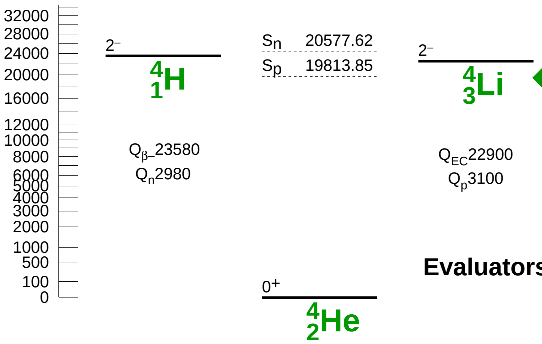
Populating Reactions and Decay Modes

^{3}H β^- decay (50Je60, 58Gr93, 58Po64, 61JoCC, 61Pi01, 69Da18, 69Sa21, 70Le15, 71Sc23, 72Be11, 73Pi01, 74Ro08, 75Sm02, 76Ba65, 76Tr07, 81Lu06, 81Sm02, 83De47, 83Ka33, 83Wi02, 84NiCC, 84St03, 85BoCC, 85Li02, 85Si07)

Levels:

0, $1/2^+$, stable, $\mu = -2.12762485$ *7*


12.33 y
1/2+
0
3 1 H
Qβ−=18.591
100%
3.1
1/2+
0
stable
3 2 He



A=4

NP A206, 1(1973)

NP A541, 1(1992)(U)

**Evaluators: D.R. Tilley, H.R. Weller,
and G.M. Hale**

${}^{4}_{1}\mathrm{H}$

Δ: 26000 *110* **Q_n:** 2980 *110* **$Q_{\beta-}$:** 23580 *110*

Populating Reactions and Decay Modes

A ^{4}He(π^-,x) (72Bl09, 73Fl04, 78Ka01, 81Ce01, 81Hi11, 81Or01, 82Gm02, 82Or06, 83Hi11, 86Ge08, 87Ge06, 88We01)

B ^{4}He(n,p) (73Fl04)

C 19 reactions

Levels:

0, 2^-, *[A]*, T=1, Γ_n=5.42 MeV

310, 1^-, *[AB]*, T=1, Γ_n=6.73 MeV

2080, 0^-, T=1, Γ_n=8.92 MeV

2830, 1^-, *[AB]*, T=1, Γ_n=12.99 MeV

$^{4}_{2}$He

%: 99.999863 *3*
Δ: 2424.911 *10* **S_n:** 20577.62 **S_p:** 19813.85

Populating Reactions and Decay Modes

34 reactions

Levels:

0, 0^+, stable, T=0

20210, 0^+, Γ=500 keV, T=0, Γ_p=500 keV

21010, 0^-, Γ=840 keV, T=0, Γ_p=640 keV, Γ_n=200 keV

21840, 2^-, Γ=2.01 MeV, T=0, Γ_p=1.26 MeV, Γ_n=750 keV

23330, 2^-, Γ=5.01 MeV, T=1, Γ_p=2.64 MeV, Γ_n=2.37 MeV

23640, 1^-, Γ=6.20 MeV, T=1, Γ_p=3.44 MeV, Γ_n=2.76 MeV

24250, 1^-, Γ=6.10 MeV, T=0, Γ_p=3.08 MeV, Γ_n=2.87 MeV, Γ_d=150 keV

25280, 0^-, Γ=7.97 MeV, T=1, Γ_p=4.12 MeV, Γ_n=3.85 MeV

25950, 1^-, Γ=12.66 MeV, T=1, Γ_p=6.52 MeV, Γ_n=6.14 MeV

27420, 2^+, Γ=8.69 MeV, T=0, Γ_p=250 keV, Γ_n=230 keV, Γ_d=8.21 MeV

28310, 1^+, Γ=9.89 MeV, T=0, Γ_p=4.72 MeV, Γ_n=4.66 MeV, Γ_d=510 keV

28370, 1^-, Γ=3.92 MeV, T=0, Γ_p=70 keV, Γ_n=80 keV, Γ_d=3.77 MeV

28390, 2^-, Γ=8.75 MeV, T=0, Γ_p=20 keV, Γ_n=20 keV, Γ_d=8.71 MeV

28640, 0^-, Γ=4.89 MeV, T=0, Γ_d=4.89 MeV

28670, 2^+, Γ=3.78 MeV, T=0, Γ_d=3.78 MeV

29890, 2^+, Γ=9.72 MeV, T=0, Γ_p=40 keV, Γ_n=40 keV, Γ_d=9.64 MeV

$^{4}_{3}$Li

Δ: 25320 *210* **Q_p:** 3100 *210* **Q_{EC}:** 22900 *210*

Populating Reactions and Decay Modes

^{3}He(p,p) (73Fi04)

Levels:

0, 2^{-}, T=1, Γ=6.03 MeV

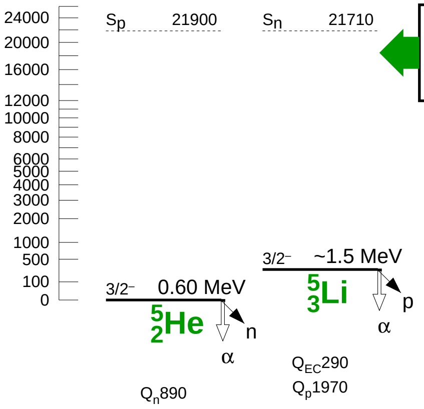
320, 1^{-}, T=1, Γ=7.35 MeV

2080, 0^{-}, T=1, Γ=9.35 MeV

2850, 1^{-}, T=1, Γ=13.51 MeV

A=5

NP A490, 1(1988)



Evaluator: F. Ajzenberg-Selove

${}^{5}_{2}\mathrm{He}$

Δ: 11390 *50* **S_p:** 21900 *120* **Q_n:** 890 *50*
Q_α: 890 *50*

Populating Reactions and Decay Modes

A ^{3}H(d,γ)
B ^{3}H(d,n), (d,2n), (d,pn)
C ^{3}H(d,d)
D ^{3}H(t,n)
E ^{3}He(t,p)
F ^{4}He(n,n)
G ^{4}He(d,p), (d,pn)
H ^{6}Li(γ,p), (e,ep), (π^{+},π^{+}p)
I ^{7}Li(p,^{3}He), (p,pd)
J ^{7}Li(d,α), (d,n)
K ^{7}Li(^{3}He,pα), (^{3}He,^{3}Hed)

Levels and γ-ray branchings:

0, $3/2^{-}$, Γ=0.60 *2* MeV, *[ADFGHIJK]*,
%n=100, T=1/2

4000 *1000*, $1/2^{-}$, Γ=4 *1* MeV, *[DFHIJ]*, T=1/2

16750 *50*, $3/2^{+}$, Γ=0.076 *12* MeV,
[ABEFGHIJK], T=1/2
γ_0*16720* E1

19800 *400*, $(3/2,5/2)^{+}$, Γ=2.5 *5* MeV,
[BCEGHIJK], T=1/2

≈**24500**, *[IJ]*

35700 *400* (?), Γ≈ 2 MeV, *[K]*

${}^{5}_{3}$Li

Δ: 11680 *50* **S_n:** 21710 *220* **Q_p:** 1970 *50*
Q_{EC}: 290 *70* **Q_α:** 1970 *50*

Populating Reactions and Decay Modes

A ^{3}He(d,γ)
B ^{3}He(d,p), (d,np), (d,2p), (d,2d)
C ^{3}He(d,d)
D ^{3}He(t,n)
E ^{4}He(p,p)
F ^{4}He(^{3}He,d), (^{3}He,pd)
G ^{4}He(^{7}Li,^{6}He)
H ^{6}Li(p,d), (p,pd), (p,pn)
I ^{6}Li(^{3}He,α), (^{3}He,pα)
J ^{6}Li(^{13}C,^{14}C)
K ^{7}Li(p,t), (p,nd)

Levels and γ-ray branchings:

0, 3/2$^-$, Γ≈ 1.5 MeV, *[ADEFGHIJK]*, T=1/2, %p=100

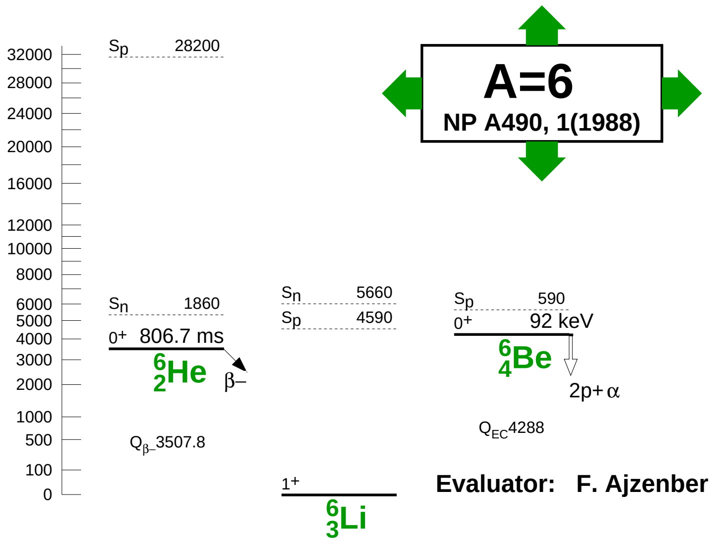
≈**7500**, 1/2$^-$, Γ=5 *2* MeV, *[AEFGHIJK]*, T=1/2

16660 *70*, 3/2$^+$, Γ≈ 0.3 MeV, *[ABCEHIK]*, T=1/2
γ_0*16630* E1

18000 *1000* (?), (1/2$^+$), *[ABH]*, T=1/2

20000 *500* (?), (3/2,5/2)$^+$, Γ≈ 5 MeV, *[ABCDEHI]*, T=1/2

34000 (?), Γ≈ 4 MeV, *[K]*



Evaluator: F. Ajzenberg-Selove

${}^{6}_{2}$He

Δ: 17594.1 *10* **S_n:** 1860 *50* **S_p:** 28200 *700*
$Q_{\beta-}$: 3507.8 *9*

Populating Reactions and Decay Modes

A ^{4}He(t,p)
B ^{6}Li(e,π^+)
C ^{6}Li(π^-,γ), (π^-,π^0)
D ^{6}Li(n,p)
E ^{6}Li(d,2p)
F ^{6}Li(t,^{3}He)
G ^{7}Li(γ,p), (e,ep)
H ^{7}Li(n,d)
I ^{7}Li(t,α)
J ^{7}Li(^{3}He,p^{3}He)
K ^{7}Li(^{6}Li,^{7}Be), (^{7}Li,^{8}Be)
L ^{7}He n decay

Levels:

0, 0^+, 806.7 *15* ms, *[ABCDEFGHIJK]*,
%β^-=100, T=1

1797 *25*, $(2)^+$, Γ=113 *20* keV, *[ABCEFGHIJK]*,
T=1

13600 *500* (?), (1^-,2^-), *[BHIK]*, T=1
15500 *500* (?), Γ=4 *2* MeV, *[CDGHJK]*
25000 *1000* (?), Γ=8 *2* MeV, *[D]*
32000 (?), Γ<2 MeV, *[J]*
36000 (?), Γ<2 MeV, *[J]*

$^{6}_{3}$Li

%: 7.5 *2*
Δ: 14086.3 *5* **S_n:** 5660 *50* **S_p:** 4590 *50*
σ_γ: 0.039 *3* b , **σ_α:** 940 *4* b

Populating Reactions and Decay Modes

A ^{6}He β^- decay
B ^{3}He(^{3}H,γ), (^{3}H,n), (^{3}H,d)
C ^{3}He(^{3}He,π^+)
D ^{4}He(d,d)
E ^{6}Li(γ,γ)
F ^{6}Li(e,e), (e,ep), (e,ed)
G ^{6}Li(π,π), (π^+,π^+p)
H ^{6}Li(p,p), (p,2p), (p,pd)
I ^{6}Li(d,d), (d,pn), (d,2d)
J ^{7}Li(^{3}He,α), (^{3}He,dα)
K ^{9}Be(p,α), (p,2α), (p,pt)

Levels and γ-ray branchings:

0, 1^+, stable, *[ABCEFGHIJK]*, T=0,
μ=+0.8220473 *6*, Q=−0.00083 *8*

2186 *2*, 3^+, Γ=24 *2* keV, *[BCDFGHIJK]*, T=0,
Γ_γ=4.40×10^{-4} *34* eV
γ_0***2186*** E2

3562.88 *10*, 0^+, Γ=8.2 *2* eV, *[BCEFGHIJK]*,
T=1
γ_0***3561.75*** M1

4310 *22*, 2^+, Γ=1.7 *2* MeV, *[BDFGHIK]*, T=0
γ_0***4308*** E2

5366 *15*, 2^+, Γ=540 *20* keV, *[BFHJK]*, T=1
γ_0***5363*** M1

5650 *50*, 1^+, Γ=1.5 *2* MeV, *[DHJK]*, T=0

15800 (?), 3^+, Γ=17.8 *8* MeV, *[D]*, T=0

21000, 2^-, *[B]*, T=1

21500, 0^-, *[B]*, T=1

23000 *2000* (?), 4^+, Γ=12 *2* MeV, *[BD]*, T=0

25000 *1000*, 4^-, Γ≈ 4 MeV, *[B]*, T=1

26600 *400*, 3^-, *[B]*, T=0

31000 (?), (3^+), *[B]*

$^{6}_{4}$Be

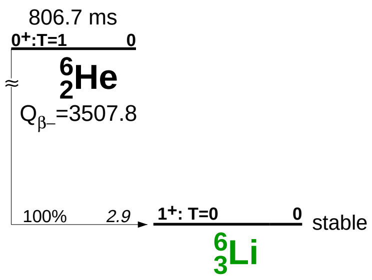
Δ: 18374 *5* **S$_p$:** 590 *50* **Q$_{EC}$:** 4288 *5*

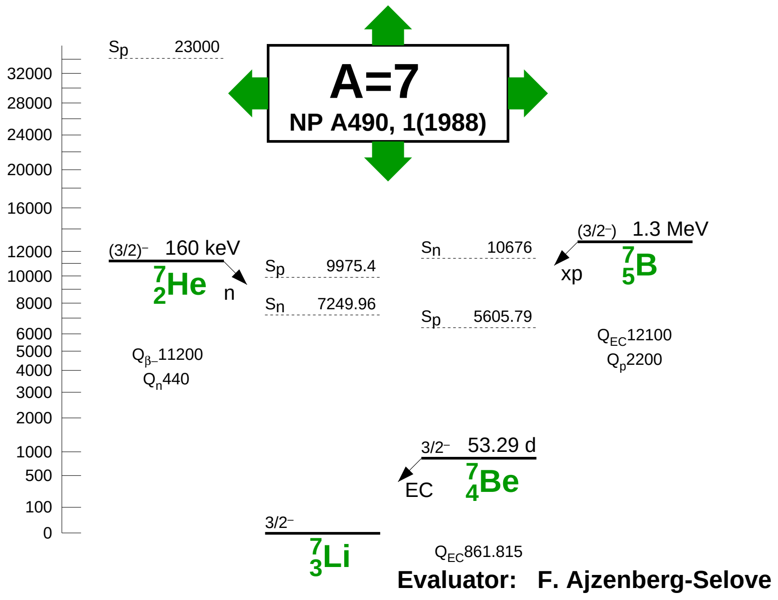
Populating Reactions and Decay Modes

A ^{3}He(^{3}He,γ), (^{3}He,p), (^{3}He,2p),
B ^{4}He(^{3}He,n)
C ^{6}Li(p,n), (p,pn)
D ^{6}Li(^{3}He,t)

Levels:

0, 0$^+$, Γ=92 *6* keV, *[BCD]*, %2pα=100, T=1
1670 *50*, (2)$^+$, Γ=1.16 *6* MeV, *[ABCD]*, T=1
23000, 4$^-$, *[AC]*
26000, 2$^-$, *[AC]*
27000, 3$^-$, *[A]*


806.7 ms
0+:T=1
0
6 2 He
Qβ−=3507.8
100%
2.9
1+: T=0
0
stable
6 3 Li


A=7
NP A490, 1(1988)
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
Sp 23000
(3/2)− 160 keV
7 2 He
n
Qβ− 11200
Qn 440
Sp 9975.4
Sn 7249.96
3/2−
7 3 Li
Sn 10676
Sp 5605.79
3/2− 53.29 d
EC
7 4 Be
QEC 861.815
(3/2−) 1.3 MeV
xp
7 5 B
QEC 12100
Qp 2200
Evaluator: F. Ajzenberg-Selove

$^{7}_{2}$He

Δ: 26110 *30* **S_p:** 23000 *300* **Q_n:** 440 *30*
$Q_{\beta-}$: 11200 *30*

Populating Reactions and Decay Modes

A ^{7}Li(π^-,γ)
B ^{7}Li(n,p)
C ^{7}Li(t,^{3}He)
D ^{7}Li(^{7}Li,^{7}Be), (^{11}B,^{11}C)

Levels:

0, (3/2)$^-$, Γ=160 *30* keV, *[ABCD]*, %n=100,
T=3/2

$^{7}_{3}$Li

%: 92.5 *2*
Δ: 14907.7 *5*   **S_n:** 7249.96 *9*   **S_p:** 9975.4 *9*
σ_γ: 0.045 *3* b

Populating Reactions and Decay Modes

A ^{7}Be EC decay (78He02, 83Ku03, 88Aj01)
B ^{3}H(α,n)
C ^{3}H(α,α)
D ^{4}He(^{3}He,π^+)
E ^{4}He(α,p)
F ^{6}Li(n,γ)
G ^{6}Li(n,n)
H ^{6}Li(p,π^+)
I ^{6}Li(d,p)
J ^{7}Li(γ,n), (γ,2n), (γ,p)
K ^{7}Li(e,e), (e,ep), (e,en)
L ^{8}He β^-n decay

Levels and γ-ray branchings:

0, $3/2^-$, stable, *[ABDEFHIJK]*, T=1/2,
μ=+3.2564268 *17*, Q= –0.0406

477.612 *3*, $1/2^-$, 73 *2* fs, *[ADEFHIK]*, T=1/2
γ_0 ***477.595*** (†$_\gamma$100) M1(+E2)

4630 *9*, $7/2^-$, Γ=93 *8* keV, *[CDHIK]*, T=1/2
γ_0 ***4628*** (†$_\gamma$100) E2

6680 *50*, $5/2^-$, Γ=0.88^{+20}_{-10} MeV, *[CIK]*, T=1/2

7459.5 *10*, $5/2^-$, Γ=89 *7* keV, *[BCGIK]*, T=1/2

9670 *100*, $7/2^-$, Γ≈ 400 keV, *[BCI]*, T=1/2

9850, $3/2^-$, Γ≈ 1200 keV, *[G]*, T=1/2

11240 *30*, $3/2^-$, Γ=260 *35* keV, *[G]*, T=3/2
13700, Γ≈ 500 keV, *[J]*
14700, Γ≈ 700 keV, *[J]*

$^{7}_{4}$Be

Δ: 15769.5 *5* **S_n:** 10676 *5* **S_p:** 5605.79 *9*

Q_{EC}: 861.815 *18*

σ_p: 48000 *9000* b , **σ_α:** <0.1 b

Populating Reactions and Decay Modes

A ^{4}He(^{3}He,γ)

B ^{4}He(^{3}He,^{3}He), (^{3}He,p)

C ^{4}He(α,n)

D ^{6}Li(p,γ)

E ^{6}Li(p,p), (p,2p), (p,pα)

F ^{6}Li(p,α)

G ^{6}Li(d,n)

H ^{6}Li(^{3}He,d)

I ^{7}Li(p,n)

J ^{7}Li(^{3}He,t)

K ^{9}Be(p,t)

Levels and γ-ray branchings:

0, 3/2^{-}, 53.29 *7* d, *[ACDGHIJK]*, T=1/2, %EC=100

429.08 *10*, 1/2^{-}, 133 *17* fs, *[ACDGHIJK]*, T=1/2

γ_0 ***429.07*** ($\dagger_\gamma$100) M1

4570 *50*, 7/2^{-}, Γ=175 *7* keV, *[BDHIJK]*, T=1/2

6730 *100*, 5/2^{-}, Γ=1.2 MeV, *[BFGIK]*, T=1/2

7210 *60*, 5/2^{-}, Γ<0.5 MeV, *[BEFGI]*, T=1/2

9270 *100*, 7/2^{-}, *[B]*, T=1/2

9900, 3/2^{-}, Γ≈ 1.8 MeV, *[BE]*, T=1/2

11010 *30*, 3/2^{-}, Γ=320 *30* keV, *[BEIK]*, T=3/2

17000, 1/2^{-}, Γ≈ 6.5 MeV, *[B]*, T=1/2

γ(*^{7}Li*) from ^{7}Be (53.29 d) EC decay **<** *for Iγ% multiply by 1.0* **>**

477.595 *2* ($\dagger_\gamma$10.52 *6*)

${}^{7}_{5}$B

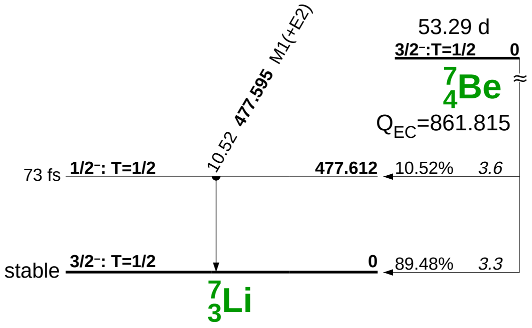
Δ: 27870 *70* **Q_p:** 2200 *70* **Q_{EC}:** 12100 *70*

Populating Reactions and Decay Modes

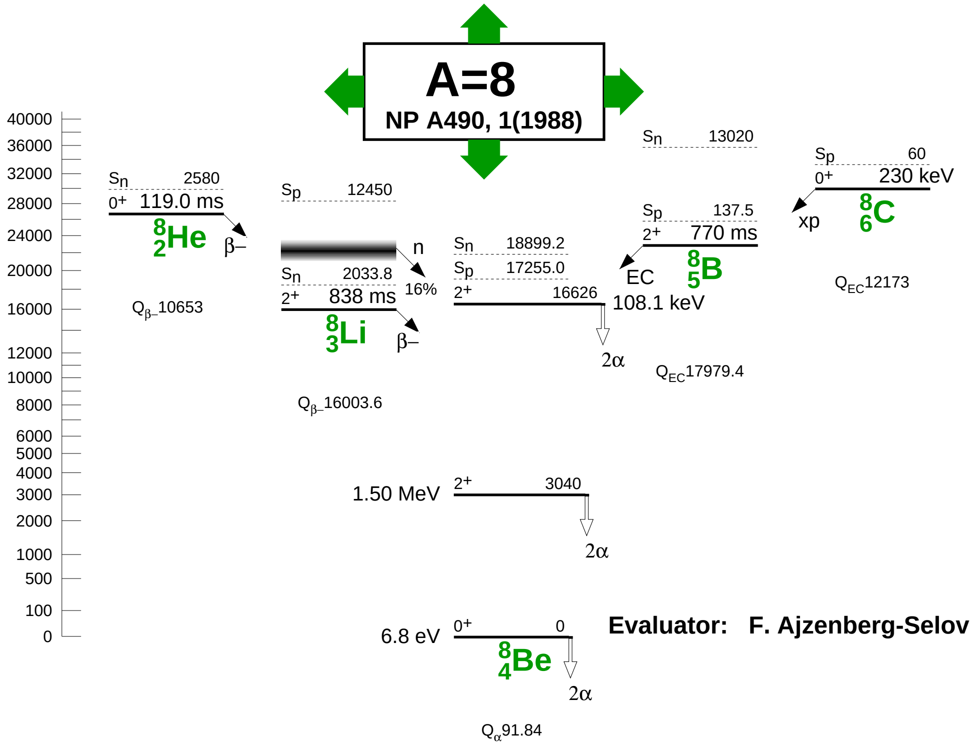
^{10}B(^{3}He,^{6}He) (74Aj01, 88Aj01)

Levels:

0, (3/2$^-$), Γ=1.4 *2* MeV, T=3/2, %2p,3p,4p?=100



53.29 d
3/2⁻:T=1/2
0
7 4 Be
≈
Q EC=861.815
10.52 477.595 M1(+E2)
73 fs
1/2⁻: T=1/2
477.612
10.52%
3.6
stable
3/2⁻: T=1/2
0
89.48%
3.3
7 3 Li



Evaluator: F. Ajzenberg-Selove

$^{8}_{2}$He

Δ: 31598 *7* **S$_{n}$:** 2580 *30* **Q$_{\beta-}$:** 10653 *7*

Populating Reactions and Decay Modes

A ^{9}Be(^{7}Li,^{8}B)

B ^{9}Be(^{9}Be,^{10}C), ^{11}B(^{7}Li,^{10}C)

C ^{9}He n decay

Levels:

0, 0^{+}, 119.0 *15* ms, *[AB]*, T=2, %β^{-}=100,
%β^{-}n=16 *1*

2800 *400*, (2^{+}), *[AB]*, T=2

γ*(^{8}Li)* from ^{8}He (119.0 ms) β^{-} decay **<** *for I*γ*%*
multiply by 1.0 **>**

980.7 (†$_{\gamma}$84 *1*)

$^{8}_{3}$Li

Δ: 20945.2 *6* **S_n:** 2033.8 *3* **S_p:** 12450 *30*

$Q_{\beta-}$: 16003.6 *6*

Populating Reactions and Decay Modes

A ^{8}He β^{-} decay
B ^{6}Li(t,p)
C ^{7}Li(n,γ)
D ^{7}Li(n,n)
E ^{7}Li(n,n’)
F ^{7}Li(p,π^{+})
G ^{9}Be(e,ep), (p,2p)
H ^{9}Be(d,^{3}He)
I ^{9}Be(t,α)
J ^{10}Be(p,^{3}He)
K ^{11}B(n,α)
L ^{11}B(^{7}Li,^{10}B)

Levels and γ-ray branchings:

0, 2^{+}, 838 *6* ms, *[BCFGHIKL]*, T=1,
%β^{-}=100, %$\beta^{-}2\alpha$=100,
μ=+1.653560 *18*, Q=0.0317 *4*

980.8 *1*, 1^{+}, 8 *3* fs, *[ABFGHIKL]*, T=1
γ_0 ***980.7*** ($\dagger_\gamma$100) M1

2255 *3*, 3^{+}, Γ=33 *6* keV, *[BCDFGHI]*, T=1
γ_0 ***2255*** ($\dagger_\gamma$100) M1

3210, 1^{+}, Γ≈ 1000 keV, *[AE]*, T=1

5400, $(0,1)^{+}$, Γ≈ 650 keV, *[AE]*, T=1

6100 *100*, (3), Γ≈ 1000 keV, *[D]*, T=1

6530 *20*, 4^{+}, Γ=35 *15* keV, *[BDFHI]*, T=1

7100 *100*, Γ≈ 400 keV, *[D]*

8000 (?), (1^{+}), Γ≈ 1000 keV, *[A]*

9000 (?), Γ≈ 6000 keV, *[G]*

10822.2 *55*, 0^{+}, Γ<12 keV, *[J]*, T=2

$^{8}_{4}$Be

Δ: 4941.66 *3* **S_n:** 18899.2 *5* **S_p:** 17255.0 *5*
Q_α: 91.84 *4*

Populating Reactions and Decay Modes

A ^{8}Li β^- decay
B ^{8}B β^+ decay
C ^{4}He(α,γ)
D ^{4}He(α,α)
E ^{6}Li(t,n)
F ^{6}Li(^{3}He,p), (^{3}He,2α)
G ^{6}Li(α,d), (α,2α)
H ^{6}Li(^{6}Li,α), (^{6}Li,2d)
I ^{7}Li(p,γ)
J ^{7}Li(p,n)
K ^{7}Li(p,p), (p,p')
L ^{9}Be(^{3}He,α),
M ^{6}Li(d,α), (d,αp)

Levels and γ-ray branchings:

0, 0^+, Γ=6.8 *17* eV, *[ABCDEFGHIL]*,
%2α=100, T=0

3040 *30*, 2^+, Γ=1.50 *2* MeV,
[ABCDEFGHIL], %2α=100, T=0

11400 *300*, 4^+, $\Gamma\approx$ 3.5 MeV, *[DGHL]*, T=0

16626 *3*, 2^+, Γ=108.1 *5* keV, *[BCDEFHIL]*,
%2α=100, T=0+1
γ_{3040}***13574*** ($\dagger_\gamma$100) M1

16922 *3*, 2^+, Γ=74.0 *4* keV, *[CDEFHIL]*,
T=0+1
γ_{3040}***13882*** ($\dagger_\gamma$100) M1+E2

17640 *10*, 1^+, Γ=10.7 *5* keV, *[FIK]*, T=1
γ_{16922}***718*** ($\dagger_\gamma$0.008 *2*) M1
γ_{16626}***1014*** ($\dagger_\gamma$0.019 *2*)
M1+E2: δ=−0.014 *13*
γ_{3040}***14586*** ($\dagger_\gamma$49.7 *4*) M1+E2: δ=0.21 *4*
γ_{0}***17619*** ($\dagger_\gamma$100) M1

18150 *4*, 1^+, Γ=138 *6* keV, *[FIK]*, T=0
γ_{16922}***1228*** ($\dagger_\gamma$1.6 *2*) M1
γ_{16626}***1524*** ($\dagger_\gamma$2.0 *5*) M1
γ_{3040}***15095*** ($\dagger_\gamma$100) M1
γ_{0}***18128*** ($\dagger_\gamma$79) M1

18910, 2^-, Γ=122 keV, *[FIJK]*
γ_{16922}***1988*** ($\dagger_\gamma$59) E1
γ_{16626}***2284*** ($\dagger_\gamma$100) E1

19070 *30*, 3^+, Γ=270 *20* keV, *[FIK]*, T=(1)
γ_{3040}***16013*** ($\dagger_\gamma$100) M1

19240 *25*, 3^+, Γ=230 *30* keV, *[JKL]*, T=(0)

19400, 1^-, $\Gamma\approx$ 650 keV, *[FJK]*

19860 *50*, 4^+, Γ=0.7 *1* MeV, *[DFL]*, T=0

20100, 2^+, $\Gamma\approx$ 1.1 MeV, *[DJK]*, T=0

20200, 0^+, Γ<1 MeV, *[D]*, T=0

20900, 4^-, Γ=1.6 *2* MeV, *[K]*

21500, 3($^+$), Γ=1 MeV, *[IJ]*

22000, 1^-, $\Gamma\approx$ 4 MeV, *[I]*, T=1
22050 *100*, Γ=270 *70* keV, *[L]*

22200, 2^+, $\Gamma\approx$ 0.8 MeV, *[DHJKM]*, T=0
22630 *100*, Γ=100 *50* keV, *[L]*
22980 *100*, Γ=230 *50* keV, *[L]*

24000, $(1,2)^-$, $\Gamma\approx$ 7 MeV, *[I]*, T=1

25200, 2^+, *[DM]*, T=0

25500, 4^+, *[M]*, T=0

27494.1 *18*, 0^+, Γ=5.5 *20* keV, *[M]*, T=2
γ_{17640}***9847.6*** ($\dagger_\gamma$100) M1
28600 (?), *[I]*

$^{8}_{5}$B

Δ: 22921.0 *11* **S_n:** 13020 *70* **S_p:** 137.5 *10*
Q_{EC}: 17979.4 *11*

Populating Reactions and Decay Modes

A ^{6}Li(d,π^-)
B ^{6}Li(^{3}He,n)
C ^{7}Li(p,π^-)
D ^{7}Li(^{7}Li,^{6}H)
E ^{7}Be(p,γ)
F ^{7}Be(d,n)
G ^{10}B(p,t)
H ^{11}B(^{3}He,^{6}He)

Levels and γ-ray branchings:

0, 2^+, 770 *3* ms, *[ABCDEFGH]*, T=1,
%EC+%β^+=100, %EC2α=100,
μ=1.0355 *3*

774 *6*, Γ=37 *5* keV, *[ABCEGH]*
γ_0*774* M1

2320 *30*, 3^+, Γ=350 *40* keV, *[CGH]*, T=1

10619 *9*, 0^+, Γ<60 keV, *[H]*, T=2

$^{8}_{6}\mathrm{C}$

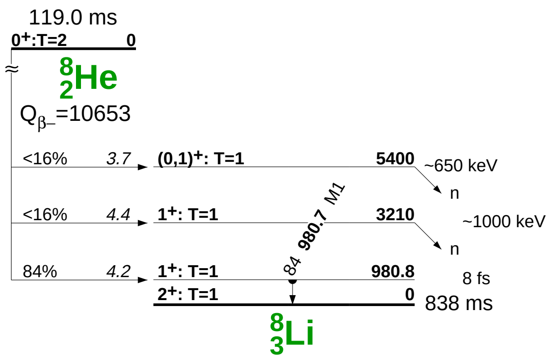
Δ: 35094 *23* **S_p:** 60 *70* **Q_{EC}:** 12173 *23*

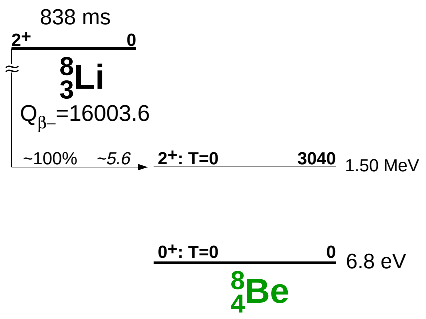
Populating Reactions and Decay Modes

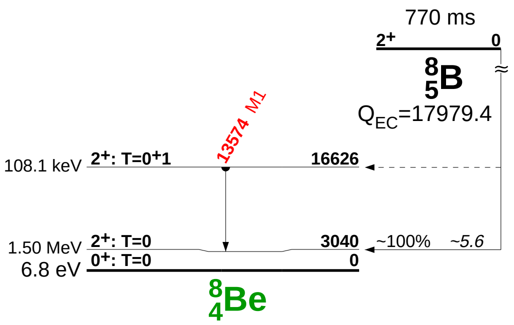
A ^{14}N(^{3}He,^{9}Li) (79Aj01, 88Aj01)
B ^{12}C(α,^{8}He)

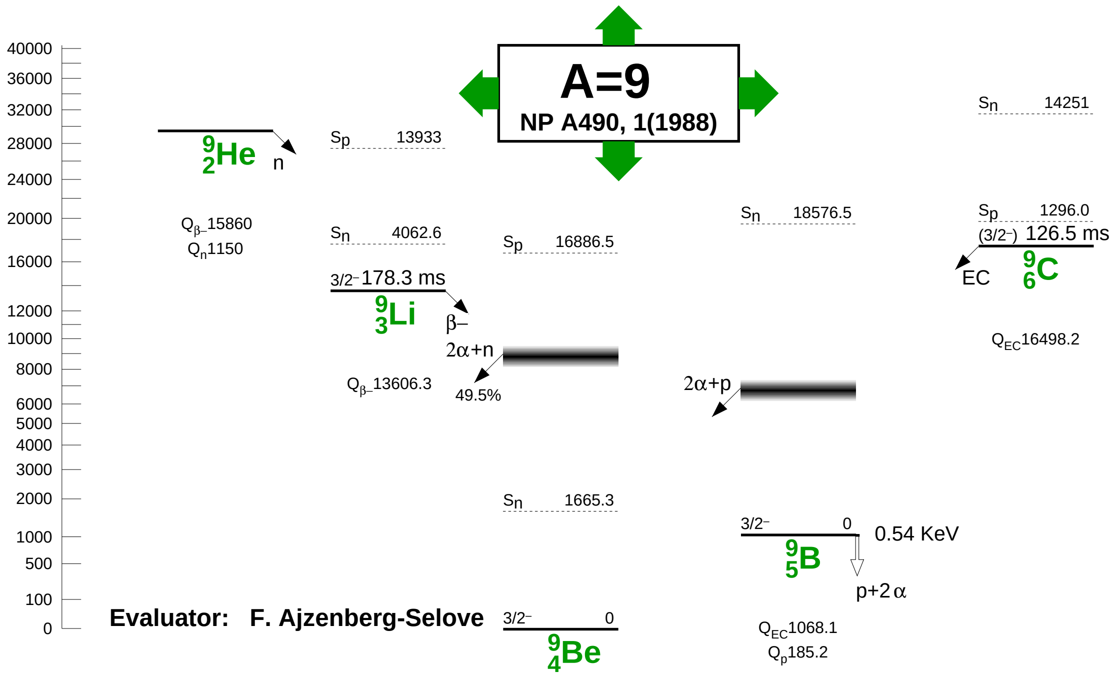
Levels:

0, 0^+, Γ=230 *50* keV, T=2, %2p,3p,4p?=100


119.0 ms
0+:T=2 0
8 2 He
Qβ−=10653
<16% 3.7 (0,1)+: T=1 5400
~650 keV
n
<16% 4.4 1+: T=1 3210
~1000 keV
n
84% 4.2 1+: T=1 980.8
8 fs
980.7 M1
84
2+: T=1 0
838 ms
8 3 Li


838 ms
2+
0
8 3 Li
Qβ−=16003.6
~100%
~5.6
2+: T=0
3040
1.50 MeV
0+: T=0
0
6.8 eV
8 4 Be


770 ms
2+
0
8 5 B
≈
QEC=17979.4
13574 M1
108.1 keV
2+: T=0+1
16626
1.50 MeV
2+: T=0
3040
~100%
~5.6
6.8 eV
0+: T=0
0
8 4 Be


A=9
NP A490, 1(1988)
40000
36000
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
9 2 He
n
Qβ– 15860
Qn 1150
Sp 13933
Sn 4062.6
3/2– 178.3 ms
9 3 Li
β–
2α+n
49.5%
Qβ– 13606.3
Sp 16886.5
Sn 1665.3
3/2– 0
9 4 Be
Sn 18576.5
2α+p
3/2– 0
9 5 B
0.54 KeV
p+2α
QEC 1068.1
Qp 185.2
Sn 14251
Sp 1296.0
(3/2–) 126.5 ms
9 6 C
EC
QEC 16498.2
Evaluator: F. Ajzenberg-Selove

${}^{9}_{2}$He

Δ: 40820 *60* **Q_n:** 1150 *60* **$Q_{\beta-}$:** 15860 *60*

Populating Reactions and Decay Modes

^{9}Be(^{14}C,^{14}O) (88Aj01)

Levels:

0, T=7/2, %n=100

$^{9}_{3}$Li

Δ: 24954.0 *19* **S_n:** 4062.6 *20* **S_p:** 13933 *7*
$Q_{\beta-}$: 13606.3 *19*

Populating Reactions and Decay Modes

A ^{7}Li(t,p)
B ^{9}Be(γ,π^+)
C ^{9}Be(π^-,γ)
D ^{9}Be(^{7}Li,^{7}Be)
E ^{11}B(^{6}Li,^{8}B)
F ^{10}Li n decay

Levels:

0, 3/2⁻, 178.3 *4* ms, *[ABCDE]*, T=3/2, %β^-=100, %β^-n2α=49.5 *5*, μ=3.4391 *6*, Q=0.0278 *8*

2691 *5*, (1/2⁻), *[ACE]*
4310 *20*, Γ=100 *30* keV, *[AE]*
5380 *60*, Γ=0.6 *1* MeV, *[A]*
6430 *15*, ≥9/2, Γ=40 *20* keV, *[AE]*

${}^{9}_{4}$Be

%: 100
Δ: 11347.7 *4*   **S_n:** 1665.3 *4*   **S_p:** 16886.5 *6*
σ_γ: 0.0076 *8* b

Populating Reactions and Decay Modes

A ^{9}Li β^{-} decay (79Aj01, 84Aj01, 88Aj01, 88Mi03)
B ^{7}Li(d,γ)
C ^{7}Li(^{3}He,p)
D ^{7}Li(α,d)
E ^{7}Li(^{6}Li,α)
F ^{9}Be(γ,n), (γ,α)
G ^{9}Be(e,e), (e,en), (e,ep), (e,eα)
H ^{9}Be(n,n), (n,2n)
I ^{9}Be(p,p)
J ^{9}Be(d,d)
K ^{9}Be(^{3}He,^{3}He), (^{3}He,2α)
L ^{10}B(t,α)
M ^{7}Li(d,p)
N ^{11}Li β^{-}2n decay

Levels and γ-ray branchings:

0, 3/2^{-}, stable, *[ABCDEFGHIJKL]*, T=1/2,
μ=−1.1778 *9*, Q=+0.053 *3*

1684 *7*, 1/2^{+}, Γ=217 *10* keV, *[BCDFGHIJKL]*
γ_0 ***1684*** ($\dagger_\gamma$100) E1

2429.4 *13*, 5/2^{-}, Γ=0.77 *15* keV, *[ABCDEGHIJKL]*
γ_0 ***2429.0*** ($\dagger_\gamma$100) M1+E2

2780 *120*, 1/2^{-}, Γ=1.08 *11* MeV, *[ABC]*

3049 *9*, 5/2^{+}, Γ=282 *11* keV, *[BCGHIJKL]*
γ_0 ***3048*** ($\dagger_\gamma$100) E1

4704 *25*, (3/2)$^{+}$, Γ=743 *55* keV, *[BCGJK]*

6760 *60*, 7/2^{-}, Γ=1.54 *20* MeV, *[CEGHIJK]*
γ_0 ***6757*** ($\dagger_\gamma$100) E2

7940 *80*, (1/2^{-}), Γ≈ 1000 keV, *[AI]*
11283 *24*, Γ=575 *50* keV, *[ACIL]*
11810 *20*, Γ=400 *30* keV, *[ACF]*, T=1/2
13790 *30*, Γ=590 *60* keV, *[CG]*, T=1/2

14392.2 *18*, 3/2^{-}, Γ=0.381 *33* keV, *[CGIKL]*, T=3/2
γ_{4704} ***9682*** ($\dagger_\gamma$11) E1
γ_{3049} ***11335*** ($\dagger_\gamma$17) E1
γ_{2429} ***11954*** ($\dagger_\gamma$88) M1
γ_0 ***14380*** ($\dagger_\gamma$100) M1

14400 *300*, Γ≈ 800 keV, *[L]*
15100 *50*, *[G]*
15970 *30*, Γ≈ 300 keV, *[G]*, T=1/2

16671 *8*, (5/2^{+}), Γ=41 *4* keV, *[CGIL]*

16975.2 *8*, 1/2^{-}, Γ=0.49 *5* keV, *[BGM]*, T=3/2
γ_{4704} ***12262*** ($\dagger_\gamma$13) E1
γ_{2780} ***14183*** ($\dagger_\gamma$13) M1
γ_{2429} ***14533*** ($\dagger_\gamma$3) E2
γ_{1684} ***15277*** ($\dagger_\gamma$12) E1
γ_0 ***16958*** ($\dagger_\gamma$100) M1

17298 *7*, (5/2)$^{-}$, Γ=200 keV, *[FGIM]*

17493 *7*, (7/2)$^{+}$, Γ=47 keV, *[GIM]*
18020 *50*, *[G]*
18580 *40*, *[GM]*
18600 *100* (?), Γ<300 keV, T=(3/2)
19200 *50*, Γ=310 *80* keV, *[M]*
19510 *50*, *[FG]*
19900 *200* (?), *[F]*
20470 *40* (?), *[F]*
20740 *30*, Γ≈ 1000 keV, *[FG]*
21400 *200* (?), *[F]*
22400 *200* (?), *[FI]*
23800 *200* (?), *[F]*
27000 *500*, *[F]*

$^{9}_{5}$B

Δ: 12415.8 *10*   **S_n:** 18576.5 *14*   **Q_p:** 185.2 *10*
Q_{EC}: 1068.1 *9*

Populating Reactions and Decay Modes

- *A* ^{9}C β^{+} decay
- *B* ^{6}Li(^{3}He,γ), (^{3}He,n), (^{3}He,p)
- *C* ^{6}Li(α,n)
- *D* ^{7}Li(^{3}He,n)
- *E* ^{7}Be(d,n), (d,p)
- *F* ^{9}Be(p,n), (p,pn)
- *G* ^{9}Be(^{3}He,t)
- *H* ^{9}Be(^{6}Li,^{6}He), (^{7}Li,^{7}Be)
- *I* ^{10}B(p,d), (p,pn)
- *J* ^{10}B(d,t)
- *K* ^{10}B(^{3}He,α), (^{3}He,αp), (^{3}He,2α)
- *L* ^{11}B(p,t)

Levels and γ-ray branchings:

0, $3/2^{-}$, Γ=0.54 *21* keV, *[ABCDFGHIJKL]*, T=1/2, %2αp=100

1600 (?), Γ≈ 700 keV, *[DGK]*

2361 *5*, $5/2^{-}$, Γ=81 *5* keV, *[ABCDFGHIJKL]*, T=1/2

2788 *30*, $(3/2,5/2)^{+}$, Γ=550 *40* keV, *[ADFIK]*, T=1/2

4800 *100*, Γ=1.2 *2* MeV, *[DGK]*

6970 *60*, $7/2^{-}$, Γ=2.0 *2* MeV, *[DFIL]*, T=1/2

11700 *70*, $(7/2)^{-}$, Γ=800 *50* keV, *[IK]*, T=1/2

12060 *60*, Γ=0.8 *2* MeV, *[ADL]*, T=1/2

14010 *70*, Γ=0.39 *11* MeV, *[DL]*, T=1/2

14655.0 *25*, $3/2^{-}$, Γ=0.395 *42* keV, *[DGL]*, T=3/2, %p=44

γ_{2788} ***11859***
γ_{2361} ***12285***
γ_{0} ***14642***

14700 *180*, $(5/2)^{-}$, Γ=1.35 *20* MeV, *[I]*, T=1/2

15290 *40*, *[L]*, T=1/2

15580 *40*, *[L]*, T=1/2

16024 *25*, Γ=180 *16* keV, *[DL]*, T=(1/2)

17076 *4*, Γ=22 *5* keV, *[BL]*, T=3/2

17190 *25*, Γ=120 *40* keV, *[DEL]*

17637 *10*, Γ=71 *8* keV, *[BDEL]*

18600 (?), Γ=1000 keV, *[BGI]*

${}^{9}_{6}$C

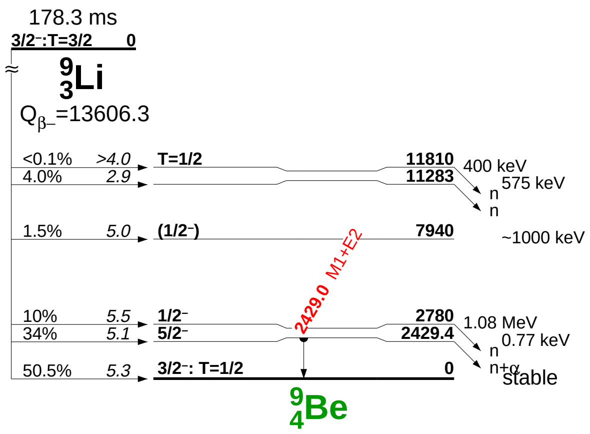
Δ: 28914.0 *21* **S_n:** 14251 *23* **S_p:** 1296.0 *23*
Q_{EC}: 16498.2 *23*

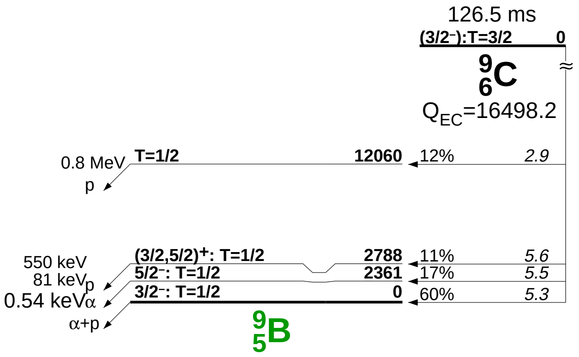
Populating Reactions and Decay Modes

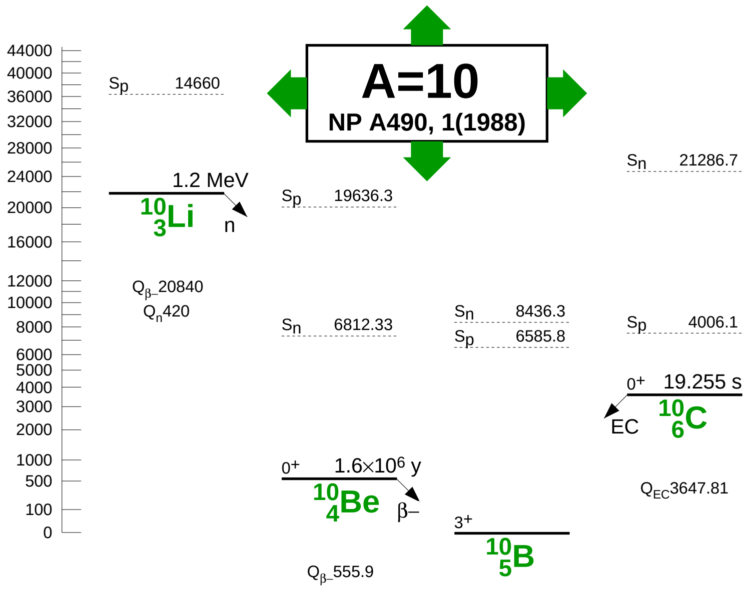
A ^{9}Be(π^+,π^-)
B ^{12}C(^{3}He,^{6}He)

Levels:

0, ($3/2^-$), 126.5 *9* ms, *[AB]*, T=3/2,
%EC+%β^+=100, %ECp2α=?
2218 *11*, Γ=100 *20* keV, *[AB]*


178.3 ms
3/2⁻:T=3/2 0
≈
9 3 Li
Qβ−=13606.3
<0.1% >4.0
4.0% 2.9
1.5% 5.0
10% 5.5
34% 5.1
50.5% 5.3
T=1/2
(1/2⁻)
1/2⁻
5/2⁻
3/2⁻: T=1/2
11810
11283
7940
2780
2429.4
0
400 keV
n
575 keV
n
~1000 keV
1.08 MeV
n
0.77 keV
n+α
stable
2429.0 M1+E2
9 4 Be


126.5 ms
(3/2⁻):T=3/2
0
$^{9}_{6}$C
≈
Q_{EC}=16498.2
0.8 MeV
p
T=1/2
12060
12%
2.9
550 keV
81 keV
p
0.54 keV
α
α+p
(3/2,5/2)⁺: T=1/2
2788
11%
5.6
5/2⁻: T=1/2
2361
17%
5.5
3/2⁻: T=1/2
0
60%
5.3
$^{9}_{5}$B



Evaluator: F. Ajzenberg-Selove

$^{10}_{3}$Li

Δ: 33440 *50* **S_p:** 14660 *80* **Q_n:** 420 *50*

$Q_{\beta-}$: 20840 *50*

Populating Reactions and Decay Modes

^{9}Be(^{9}Be,^{8}B) (79Aj01, 88Aj01)

Levels:

0 (?), Γ=1.2 *3* MeV, T=2, %n=100

$^{10}_{4}$Be

Δ: 12606.7 *4* **S_n:** 6812.33 *6* **S_p:** 19636.3 *19*
$Q_{\beta-}$: 555.9 *5*
σ_γ: <1 mb

Populating Reactions and Decay Modes

A ^{7}Li(t,γ), (t,n), (t,p), (t,t)
B ^{7}Li(α,p)
C ^{7}Li(^{7}Li,α)
D ^{9}Be(n,γ)
E ^{9}Be(n,n), (n,2n)
F ^{9}Be(p,π^{+})
G ^{9}Be(d,p)
H ^{9}Be(α,^{3}He)
I ^{10}B(n,p), (d,2p)
J ^{12}C(^{6}Li,^{8}B)
K ^{13}C(p,d2p)
L ^{11}Li β^{-}n decay

Levels and γ-ray branchings:

0, 0^{+}, 1.51×10^{6} *6* y, *[ABCDFGHIJ]*, T=1,
%β^{-}=100

3368.03 *3*, 2^{+}, 125 *12* fs, *[ABCDFGHIJ]*, T=1
γ_{0}***3367.4*** (†$_{\gamma}$100) E2

5958.39 *5*, 2^{+}, <55 fs, *[BDGHIJ]*, T=1
γ_{3368}***2592.6*** *4*
γ_{0}***5955.4*** *3* (†$_{\gamma}$100)

5959.9 *6*, 1^{-}, *[BGHIJ]*, T=1

6179.3 *7*, 0^{+}, 0.8^{+3}_{-2} ps, *[G]*, T=1
γ_{5960}***219.4*** (†$_{\gamma}$30) E1
γ_{3368}***2811*** (†$_{\gamma}$100) E2

6263.3 *50*, 2^{-}, *[GH]*, T=1

7371 *1*, 3^{-}, Γ=15.7 *5* keV, *[CEGH]*, T=1

7542 *1*, 2^{+}, Γ=6.3 *8* keV, *[BCEGHJ]*, T=1

9270, (4^{-}), Γ=150 *20* keV, *[CEGH]*, T=1

9400, $(2)^{+}$, Γ=291 *20* keV, *[CEGHIJ]*, T=1
10570 *30*, ≥1, *[BCEG]*, T=1
11760 *20*, Γ=121 *10* keV, *[BCGHJ]*

17790, Γ=110 *35* keV, *[ABC]*
18550, $\Gamma\approx$ 350 keV, *[ABC]*
21220 (?), (2^{-}), *[A]*, T=(2)
24000 (?), *[K]*

$^{10}_{5}$B

%: 19.9 *2*

Δ: 12050.8 *3* **S_n:** 8436.3 *10* **S_p:** 6585.8 *5*

σ_γ: 0.5 *2* b , **σ_{abs}:** 3837 *9* b

Populating Reactions and Decay Modes

A ^{10}Be β^- decay
B ^{10}C β^+ decay
C ^{6}Li(α,γ)
D ^{6}Li(α,α), (α,2α)
E ^{6}Li(^{6}Li,d)
F ^{7}Li(^{3}He,γ)
G ^{9}Be(p,γ)
H ^{9}Be(p,p), (p,pn), (p,pα)
I ^{9}Be(p,d), (p,α)
J ^{9}Be(d,n)
K ^{9}Be(^{3}He,d)
L ^{9}Be(α,t)
M ^{10}B(γ,n), (γ,p), (γ,pn)
N ^{10}Be(e,e), ^{10}B(e,en), (e,ep)
O ^{11}B(^{3}He,α), (^{3}He,2α)

Levels and γ-ray branchings:

0, 3^+, stable, *[ABCEFGJKLMNO]*,
μ=+1.8006448 *6*, Q=+0.08472 *56*, T=0

718.35 *4*, 1^+, 0.707 *3* ns, *[BCEFGJKLO]*,
μ=+0.63 *12*, T=0, Γ_γ=6.5×10^{-7} eV
γ_0***718.3*** ($\dagger_\gamma$100) E2

1740.15 *17*, 0^+, 5 *2* fs, *[BCEGJKLNO]*, T=1,
Γ_γ=0.09 *4* eV
γ_{718}***1021.7*** ($\dagger_\gamma$100) M1
γ_0***1740.0*** ($\dagger_\gamma$<0.2)

2154.3 *5*, 1^+, 1.48 *14* ps, *[CEGJKLO]*, T=0,
Γ_γ=3.1×10^{-4} *3* eV
γ_{1740}***414.1*** ($\dagger_\gamma$100 *3*) M1
γ_{718}***1435.8*** ($\dagger_\gamma$52.9 *17*) M1+E2: δ=0.22 *11*
γ_0***2154.1*** ($\dagger_\gamma$41 *3*) E2

3587.1 *5*, 2^+, 106 *8* fs, *[CEFGJKLO]*, T=0,
Γ_γ=4.31×10^{-3} *34* eV
γ_{2154}***1432.7*** ($\dagger_\gamma$21 *3*) M1
γ_{1740}***1846.7*** ($\dagger_\gamma$<0.45)
γ_{718}***2868.3*** ($\dagger_\gamma$100 *5*) M1
γ_0***3586.4*** ($\dagger_\gamma$28 *5*) M1

4774.0 *5*, 3^+, Γ=8.4 *18* eV, *[CEFJKLO]*, T=0,
Γ_γ=0.020 *4* eV
γ_{718}***4054.8*** ($\dagger_\gamma$>100) E2
γ_0***4772.8*** ($\dagger_\gamma$0.51 *10*) M1

5110.3 *6*, 2^-, Γ=0.98 *7* keV, *[CGJKO]*, T=0
γ_{1740}***3369.6*** ($\dagger_\gamma$8 *8*)
γ_{718}***4390.9*** ($\dagger_\gamma$48 *11*)
γ_0***5108.9*** ($\dagger_\gamma$100 *11*)

5163.9 *6*, 2^+, <4.2 fs, *[CGJKNO]*, T=1,
Γ_γ=1.5 *1* eV
γ_{3587}***1576.7*** ($\dagger_\gamma$11.9 *5*) M1
γ_{2154}***3009.1*** ($\dagger_\gamma$100.0 *14*) M1
γ_{1740}***3423.1*** ($\dagger_\gamma$1.1 *3*) M1
γ_{718}***4444.4*** ($\dagger_\gamma$34.6 *9*) M1
γ_0***5162.5*** ($\dagger_\gamma$6.8 *6*) M1

5180 *10*, 1^+, Γ=110 *10* keV, *[CDGJKO]*, T=0,
Γ_γ=0.06 *3* eV
γ_{1740}***3439.2*** ($\dagger_\gamma$100) M1

5919.5 *6*, 2^+, Γ=6 *1* keV, *[CDGJKLO]*, T=0,
Γ_γ=0.15 *4* eV
γ_{718}***5199.7*** ($\dagger_\gamma$22 *6*) M1
γ_0***5917.6*** ($\dagger_\gamma$100 *6*) M1

6025.0 *6*, 4^+, Γ=0.05 *3* keV, *[CDJKLNO]*,
Γ_γ=0.11 *2* eV
γ_0***6023.1*** ($\dagger_\gamma$100) M1

6127.2 *7*, 3^-, Γ=2.36 *3* keV, *[DJKLO]*,
Γ_γ≤21 eV

6560.0 *19*, $(4)^-$, Γ=25.1 *11* keV, *[DJKLO]*

6873 *5*, 1^-, Γ=120 *5* keV, *[CGHIJ]*, T=0+1
γ_{5920}***953.5*** ($\dagger_\gamma$7) E1
γ_{5164}***1708.9*** ($\dagger_\gamma$6) E1
γ_{5110}***1762.5*** ($\dagger_\gamma$7) M1
γ_{2154}***4717.5*** ($\dagger_\gamma$25) E1
γ_{1740}***5131.4*** ($\dagger_\gamma$100) E1
γ_{718}***6152.6*** ($\dagger_\gamma$38) E1

7002 *6*, $(1,2)^+$, Γ=100 *10* keV, *[DIJLO]*, T=(0)

7430 *10*, $2(^-)$, Γ=100 *10* keV, *[CGI]*, T=0+1

7467 *10*, 1^+, Γ=65 *10* keV, *[HO]*

7478 *2*, 2^+, Γ=74 *4* keV, *[GHNO]*, T=1

7559.9 *6*, 0^+, Γ=2.65 *18* keV, *[GHJO]*, T=1
γ_{5180}***2380*** ($\dagger_\gamma$15) M1
γ_{2154}***5404.0*** ($\dagger_\gamma$12) M1
γ_{718}***6839.1*** ($\dagger_\gamma$100) M1

7670 *30* (?), (1^+), Γ=250 *20* keV, *[HI]*, T=(0)

7819 *20*, 1^-, Γ=260 *30* keV, *[HJLO]*

8070, 2^+, Γ=0.8 *2* MeV, *[IJN]*

8700 (?), $(1^+,2^+)$, Γ≈ 200 keV, *[HI]*

8889 *6*, 3^-, Γ=84 *7* keV, *[HILN]*, T=1

8894 *2*, 2^+, Γ=40 *1* keV, *[GHILN]*, T=1
γ_0***8890*** ($\dagger_\gamma$100) E2

9700 (?), Γ≈ 700 keV, *[I]*, T=(1)

10840 *10*, $(2^+,3^+,4^+)$, Γ=0.3 *1* MeV, *[GHNO]*

11520 *35*, Γ=0.5 *1* MeV, *[NO]*

12560 *30*, $(0^+,1^+,2^+)$, Γ=100 *30* keV, *[GHNO]*

13490 *5*, $(0^+,1^+,2^+)$, Γ=300 *50* keV, *[GNO]*

14400 *100*, Γ=0.8 *2* MeV, *[DGO]*

18200 *200* (?), Γ=1.5 *3* MeV, *[O]*

18430, 2^-, Γ=340 keV, *[F]*, T=1

18800, 2^+, Γ<600 keV, *[F]*, T=1

19290, 2^-, Γ=190 *20* keV, *[F]*, T=1

20100 *100*, 1^-, *[FM]*, T=1

21100 (?), *[F]*

23100 *100*, *[M]*

$^{10}_{6}$C

Δ: 15698.6 *3* **S_n:** 21286.7 *21* **S_p:** 4006.1 *10*
Q_{EC}: 3647.81 *9*

Populating Reactions and Decay Modes

A ^{7}Li(^{3}He,π^-)
B ^{9}Be(p,π^-)
C ^{10}B(p,n)
D ^{10}B(^{3}He,t)
E ^{12}C(p,t)
F ^{13}C(^{3}He,^{6}He)
G ^{11}N p decay
H ^{12}O 2p decay

Levels:

0, 0^+, 19.255 *53* s, *[ABCDEF]*, T=1,
%EC+%β^+=100

3353.6 *7*, 2^+, 107 *17* fs, *[ABCDEF]*
γ_0 ***3353.0*** (†$_\gamma$100) E2

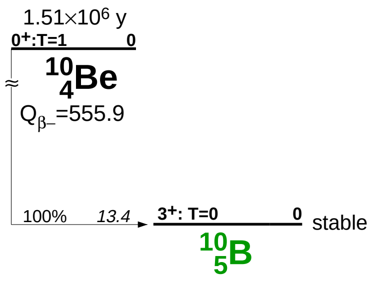
5220 *40*, Γ=225 *45* keV, *[BCDE]*

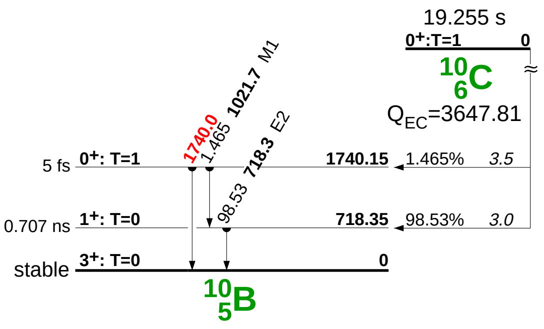
5380 *70*, Γ=300 *60* keV, *[BCDE]*

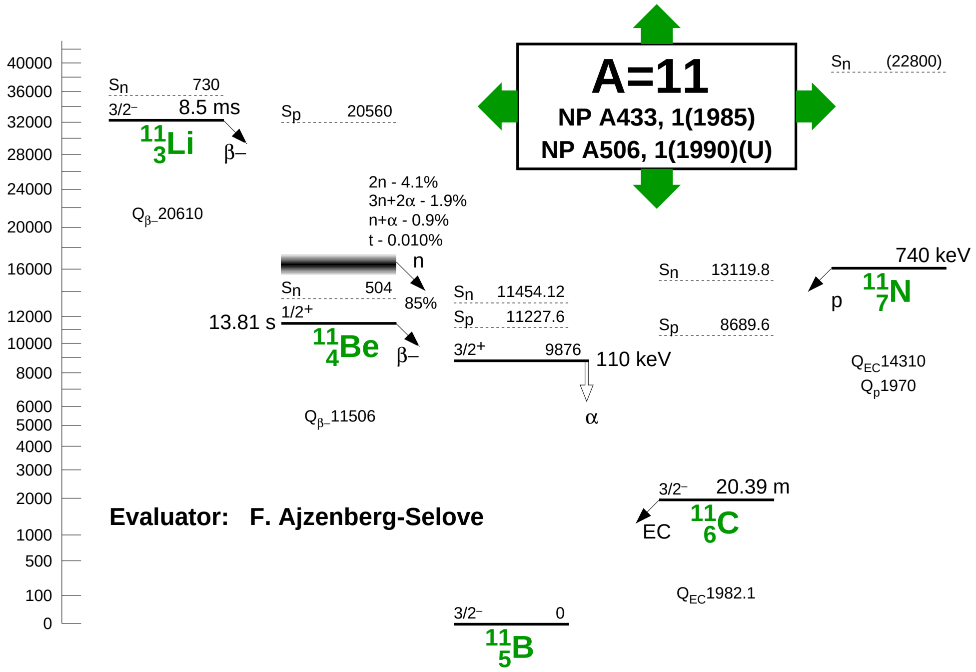
6580 *20*, (2^+), Γ=200 *40* keV, *[BDE]*

γ*(*^{10}*B)* from ^{10}C (19.255 s) β^+ decay **<** *for Iγ%*
*multiply by 1.0***>**

718.26 (†$_\gamma$98.53 *2*)
1021.72 (†$_\gamma$1.465 *14*)


1.51×10^6 y
0+:T=1
0
10 4 Be
Qβ−=555.9
100%
13.4
3+: T=0
0
stable
10 5 B


19.255 s
0+:T=1 0
10 6 C
≈
Q_{EC}=3647.81
1740.0
1.465
1021.7 M1
718.3 E2
98.53
5 fs
0+: T=1
1740.15
1.465%
3.5
0.707 ns
1+: T=0
718.35
98.53%
3.0
stable
3+: T=0
0
10 5 B


A=11
NP A433, 1(1985)
NP A506, 1(1990)(U)
Evaluator: F. Ajzenberg-Selove
40000
36000
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
Sn 730
3/2− 8.5 ms
11 3 Li
β−
Qβ− 20610
Sp 20560
2n - 4.1%
3n+2α - 1.9%
n+α - 0.9%
t - 0.010%
n
85%
Sn 504
1/2+
13.81 s
11 4 Be
β−
Qβ− 11506
Sn 11454.12
Sp 11227.6
3/2+ 9876
110 keV
α
11 5 B
3/2− 0
Sn 13119.8
Sp 8689.6
3/2− 20.39 m
11 6 C
EC
QEC 1982.1
Sn (22800)
740 keV
11 7 N
p
QEC 14310
Qp 1970

$^{11}_{3}$Li

Δ: 40790 *40* **S_n:** 730 *70* **$Q_{\beta-}$:** 20610 *40*

Populating Reactions and Decay Modes

Ir(p,x), U(p,x) (87Ar22, 90Aj01)

Levels:

0, 3/2$^-$, 8.5 *2* ms, %β^-=100, %β^-n=85 *1*,
%β^-2n=4.1 *4*, %β^-(3n+2α)=1.9 *2*,
%β^-(n+α)=0.9 *3*, %β^-t =0.010 *4*, T=5/2,
μ=3.6678 *25*

γ *(*^{11}*Be)* from ^{11}Li (8.5 ms) β^- decay **<** *for Iγ% multiply by 1.0* **>**

320.04 ($\dagger_{\gamma}$9.2 *7*) E1

α from ^{11}Li (8.5 ms) β^-3n+2α decay **<** *for Iα% multiply by 1.0* **>**

$\boldsymbol{\alpha_{3040}}$≈***1600*** (†0.9 *3*)
$\boldsymbol{\alpha_{0}}$***46.06*** *3* (†1.6 *2*)

γ *(* ^{10}*Be)* from ^{11}Li (8.5 ms) β^-n decay **<** *for Iγ% multiply by 1.0* **>**

218.8 ($\dagger_{\gamma}$1.6 *6*) E1
2592.6 *4*
2811.3 ($\dagger_{\gamma}$2.8 *12*) E2
3366.94 ($\dagger_{\gamma}$35 *3*) E2
5955.4 *3* ($\dagger_{\gamma}$≈0.39)

$^{11}_{4}$Be

Δ: 20174 *6*   **S_n:** 504 *6*   **S_p:** 20560 *50*

$Q_{\beta-}$: 11506 *6*

Populating Reactions and Decay Modes

^{11}Li β^- decay (81La11, 84La27, 85Aj01, 90Aj01)

Levels and γ-ray branchings:

0, $1/2^+$, 13.81 *8* s, T=3/2, %β^-=100,
%$\beta^-\alpha$=3.1 *4*

320.04 *10*, $1/2^-$, 115 *10* fs
γ_0***320.04*** (†$_\gamma$100) E1

1778 *12*, $(5/2,3/2)^+$, Γ=100 *20* keV

2690 *20*, $(1/2,3/2,5/2^+)$, Γ=200 *20* keV

3410 *20*, $(1/2,3/2,5/2^+)$, Γ=125 *20* keV

3887 *15*, $\geq 7/2$, Γ<10 keV

3956 *15*, $3/2^-$, Γ=15 *5* keV

5240 *21*, Γ=45 *10* keV

5860 (?), $\Gamma \approx$ 300 keV

6510 *50*, Γ=120 *50* keV

6705 *21*, Γ=40 *20* keV

7030 *50*, Γ=300 *100* keV

8816 *32*, Γ=200 *50* keV

10590 *50*, Γ=210 *40* keV

≈**18500** (?), $\Gamma \approx$ 500 keV

γ*(^{11}B)* from ^{11}Be (13.81 s) β^- decay **<** *for Iγ%*
multiply by 1.0 **>**

692.31 *10* (†$_\gamma$0.85 *4*)
2124.473 *27* (†$_\gamma$100)
2895.30 *40* (†$_\gamma$14.4 *6*)
4443.90 *50* (†$_\gamma$100)
4665.90 *40* (†$_\gamma$28.5 *11*)
5018.98 *40* (†$_\gamma$85.6 *6*)
5851.47 *42* (†$_\gamma$53.2 *12*)
6789.81 *50* (†$_\gamma$67.5 *11*)
7282.92 (†$_\gamma$87.0 *20*)
7974.73 (†$_\gamma$46.2 *11*)

α from ^{11}Be (13.81 s) $\beta^-\alpha$ decay **<** *for Iα%*
multiply by 0.031 4 **>**

α_0***771*** *8* (†87.4)
α_{478}***466*** *8* (†12.6)

$^{11}_{5}$B

%: 80.1 *2*

Δ: 8668.0 *4* **S_n:** 11454.12 *20* **S_p:** 11227.6 *5*

σ_γ: 0.006 *3* b

Populating Reactions and Decay Modes

- *A* ^{11}Be β^- decay (80Aj01, 81Al03, 82Mi08, 85Aj01, 90Aj01)
- *B* ^{11}C EC decay (80Aj01, 85Aj01, 90Aj01)
- *C* ^{6}Li(^{6}Li,p)
- *D* ^{7}Li(α,γ)
- *E* ^{7}Li(α,n)
- *F* ^{7}Li(α,α)
- *G* ^{7}Li(^{6}Li,d)
- *H* ^{9}Be(d,γ)
- *I* ^{9}Be(^{3}He,p)
- *J* ^{10}B(n,n)
- *K* ^{9}Be(d,p), (d,α), (d,t)
- *L* ^{11}B(γ,n), (γ,p), (γ,d), (γ,t)
- *M* ^{12}C(e,ep)

Levels and γ-ray branchings:

0, 3/2$^-$, stable, *[ABCDGHIL]*, T=1/2,
μ=+2.6886489 *10*, Q=+0.04065 *26*

2124.693 *27*, 1/2$^-$, 3.8 *3* fs, *[ACGHIM]*
γ_0 ***2124.473*** ($\dagger_\gamma$100) M1

4444.89 *50*, 5/2$^-$, Γ=1.18 *4* keV, *[ACDGHI]*
γ_0 ***4443.93*** ($\dagger_\gamma$100) M1+E2

5020.31 *30*, 3/2$^-$, Γ=0.34 *1* keV, *[ACGHIM]*
γ_{2125} ***2895.21*** ($\dagger_\gamma$17) M1+E2
γ_0 ***5019.08*** ($\dagger_\gamma$100) M1

6742.9 *18*, 7/2$^-$, Γ=22 *5* keV, *[CDGIM]*
γ_{4445} ***2297.75*** ($\dagger_\gamma$43) M1
γ_0 ***6740.7*** ($\dagger_\gamma$100) E2

6791.80 *30*, 1/2$^+$, Γ=1.7 *2* keV, *[ACDGIM]*
γ_{5020} ***1771.34*** ($\dagger_\gamma$6) E1
γ_{2125} ***4666.05*** ($\dagger_\gamma$42) E1
γ_0 ***6789.55*** ($\dagger_\gamma$100) E1

7285.51 *43*, 5/2$^+$, Γ=0.57 *4* keV, *[ACDGIM]*
γ_{5020} ***2264.9*** ($\dagger_\gamma$8) E1
γ_{4445} ***2840.23*** ($\dagger_\gamma$6) E1
γ_0 ***7282.92*** ($\dagger_\gamma$100) E1

7977.84 *42*, 3/2$^+$, Γ=0.57 *6* keV, *[ACDIM]*
γ_{7286} ***692.31*** ($\dagger_\gamma$16) M1
γ_{2125} ***5851.48*** ($\dagger_\gamma$100) E1
γ_0 ***7974.74*** ($\dagger_\gamma$87) E1

8560.3 *18*, (3/2$^-$), Γ=0.70 *7* keV, *[CIM]*
γ_{5020} ***3539.38*** ($\dagger_\gamma$16) M1
γ_{4445} ***4114.6*** ($\dagger_\gamma$9) M1
γ_{2125} ***6433.6*** ($\dagger_\gamma$53) M1
γ_0 ***8556.7*** ($\dagger_\gamma$100) M1

8920.2 *20*, 5/2$^-$, Γ=4.37 *2* eV, *[CDI]*
γ_{4445} ***4474.3*** ($\dagger_\gamma$5) M1
γ_0 ***8916.3*** ($\dagger_\gamma$100) M1+E2

9185.0 *20*, 7/2$^+$, $\Gamma=1.9^{+15}_{-11}$ eV, *[CDI]*
γ_{6743} ***2441.8*** ($\dagger_\gamma$15) E1
γ_{4445} ***4739.0*** ($\dagger_\gamma$100) E1
γ_0 ***9180.9*** ($\dagger_\gamma$1) M2

9274.4 *20*, 5/2$^+$, Γ=4 keV, *[CDI]*

9820 *25*, (1/2$^+$), *[M]*

9876 *8*, 3/2$^+$, Γ=110 *15* keV, *[AFI]*

10260 *15*, 3/2$^-$, Γ=150 *25* keV, *[DFI]*

10330 *11*, 5/2$^-$, Γ=110 *20* keV, *[DFI]*

10597 *9*, 7/2$^+$, Γ=100 *20* keV, *[DFIJ]*

10960 *50*, 5/2$^-$, Γ=4.5 MeV, *[F]*

11265 *17*, 9/2$^+$, Γ=110 *20* keV, *[FI]*

11444 *19*, Γ=103 *20* keV, *[FI]*

11600 *30*, 5/2$^+$, Γ=170 *30* keV, *[EFIJ]*

11886 *17*, 5/2$^-$, Γ=200 *20* keV, *[EFIJ]*

12000 *200*, 7/2$^+$, Γ≈ 1 MeV, *[FJ]*

12557 *16*, 1/2$^+$,(3/2$^+$), Γ=210 *20* keV, *[FI]*,
T=3/2

12916 *12*, 1/2$^-$, Γ=200 *25* keV, *[FI]*, T=3/2

13137 *40*, 9/2$^-$, Γ=426 *40* keV, *[EIJ]*

13160, 5/2$^+$,7/2$^+$, Γ=430 keV, *[J]*

14040 *100*, 11/2$^+$, Γ=0.5 *2* MeV, *[EJ]*

14340 *20*, 5/2$^+$, Γ=254 *18* keV, *[I]*, T=3/2

14565 *15*, Γ<30 keV, *[EIJ]*

15290 *25*, (3/2,5/2,7/2)$^+$, Γ=250 *50* keV, *[J]*,
T=(3/2)

16437 *20*, Γ<30 keV, *[IK]*, T=3/2

17330, Γ≈ 1 MeV, *[K]*

17430 *50*, Γ=100 *30* keV, *[EHIK]*, T=3/2

18000, Γ=0.87 *10* MeV, *[I]*, T=3/2

18370 *50*, (1/2,3/2,5/2)$^+$, Γ=260 *80* keV, *[H]*

19130 *30*, ($^+$), Γ=115 *25* keV, *[I]*, T=3/2

19700, (1/2$^+$), *[HL]*

21270 *50*, Γ=300 *30* keV, *[I]*, T=3/2

23700, (1/2,3/2,5/2)$^+$, *[H]*

26500, *[L]*

$^{11}_{6}$C

Δ: 10650.2 *9* **S_n:** 13119.8 *8* **S_p:** 8689.6 *8*
Q_{EC}: 1982.1 *8*

Populating Reactions and Decay Modes

A ^{6}Li(^{6}Li,n)
B ^{7}Be(α,γ)
C ^{9}Be(^{3}He,n)
D ^{10}B(p,γ)
E ^{10}B(p,n)
F ^{10}B(p,p)
G ^{10}B(p,p')
H ^{10}B(p,α)
I ^{10}B(d,n)
J ^{10}B(^{3}He,d)
K ^{12}C(p,d)
L ^{12}C(^{3}He,α), (^{3}He,tp)
M ^{12}C(π^{+},p)

Levels and γ-ray branchings:

0, $3/2^{-}$, 20.39 *2* m, *[ABDIJM]*, T=1/2,
%EC+%β^{+}=100, μ=–0.964 *1*,
Q=0.03426

2000.0 *5*, $1/2^{-}$, 7.1 *5* fs, *[ACDIJKLM]*
γ_{0}***1999.8*** ($\dagger_{\gamma}$100) M1

4318.8 *12*, $5/2^{-}$, <8.3 fs, *[ACDIJKLM]*
γ_{0}***4317.9*** ($\dagger_{\gamma}$100)

4804.2 *12*, $3/2^{-}$, <7.6 fs, *[ACIKLM]*
γ_{2000}***2803.8*** ($\dagger_{\gamma}$17.4 *16*)
γ_{0}***4803.1*** ($\dagger_{\gamma}$100.0 *16*)

6339.2 *14*, $1/2^{+}$, <76.2 fs, *[ACJL]*
γ_{2000}***4338.3*** ($\dagger_{\gamma}$50 *3*)
γ_{0}***6337.2*** ($\dagger_{\gamma}$100 *3*)

6478.2 *13*, $7/2^{-}$, <6 fs, *[ACDIJKLM]*
γ_{4319}***2159.0*** ($\dagger_{\gamma}$13.0 *16*)
γ_{0}***6476.1*** ($\dagger_{\gamma}$100.0 *16*)

6904.8 *14*, $5/2^{+}$, <48 fs, *[ACIJKL]*
γ_{4804}***2100.6*** ($\dagger_{\gamma}$4.9 *11*)
γ_{4319}***2585.5*** ($\dagger_{\gamma}$4.9 *11*)
γ_{0}***6902.5*** ($\dagger_{\gamma}$100.0 *22*)

7499.7 *15*, $3/2^{+}$, <63 fs, *[ACJKL]*
γ_{2000}***5498.2*** ($\dagger_{\gamma}$100 *3*)
γ_{0}***7496.9*** ($\dagger_{\gamma}$56 *3*)

8104.5 *17*, $3/2^{-}$, 0.04 *3* fs, *[BJKL]*
γ_{2000}***6102.7*** ($\dagger_{\gamma}$35 *7*)
γ_{0}***8101.3*** ($\dagger_{\gamma}$100 *16*) M1

8420 *2*, $5/2^{-}$, 0.030 *8* fs, *[ABCIJKL]*
γ_{0}***8417*** ($\dagger_{\gamma}$100) M1

8655 *8*, $7/2^{+}$, Γ<5 keV, *[IJK]*

8699 *10*, $5/2^{+}$, Γ=15 *1* keV, *[DIJ]*
γ_{6478}***2221*** ($\dagger_{\gamma}$32 *11*)
γ_{4804}***3894*** ($\dagger_{\gamma}$6 *4*)
γ_{4319}***4379*** ($\dagger_{\gamma}$100 *24*)
γ_{0}***8695*** ($\dagger_{\gamma}$100 *24*)

9200 *50*, $5/2^{+}$, Γ=500 *100* keV, *[D]*
γ_{6478}***2722*** ($\dagger_{\gamma}$27 *14*)
γ_{4319}***4880*** ($\dagger_{\gamma}$8 *7*)
γ_{0}***9196*** ($\dagger_{\gamma}$100 *24*)

9650 *50*, ($3/2^{-}$), Γ=210 *50* keV, *[DFHK]*
γ_{4804}***4845*** ($\dagger_{\gamma}$13 *7*)
γ_{4319}***5330*** ($\dagger_{\gamma}$53 *17*)
γ_{0}***9645*** ($\dagger_{\gamma}$100 *8*)

9780 *50*, ($5/2^{-}$), Γ=240 *60* keV, *[DFHK]*
γ_{6478}***3301*** ($\dagger_{\gamma}$16 *5*)
γ_{4804}***4975*** ($\dagger_{\gamma}$5 *3*)
γ_{4319}***5460*** ($\dagger_{\gamma}$11 *3*)
γ_{0}***9775*** ($\dagger_{\gamma}$100 *21*)

9970 *50*, ($7/2^{-}$), Γ=120 *20* keV, *[DK]*
γ_{6478}***3491*** ($\dagger_{\gamma}$11 *8*)
γ_{4319}***5649*** ($\dagger_{\gamma}$100 *11*)

10083 *5*, $7/2^{+}$, Γ≈ 230 keV, *[DFHJK]*
γ_{6478}***3604*** ($\dagger_{\gamma}$19 *9*)
γ_{4319}***5762*** ($\dagger_{\gamma}$100 *12*)

10679 *5*, $9/2^{+}$, Γ=200 *30* keV, *[DFHIK]*
γ_{0}***10673*** ($\dagger_{\gamma}$100)

11030 *30*, Γ=300 *60* keV, *[KL]*, T=1/2
11440 *10*, Γ=360 keV, *[HK]*
12160 *40*, Γ=270 *50* keV, *[CG]*, T=3/2
12400, $^{-}$, Γ=1-2 MeV, *[DL]*
12510 *30*, $1/2^{-}$, Γ=490 *40* keV, *[CGM]*, T=3/2
12650 *20*, ($7/2^{+}$), Γ=360 keV, *[DH]*
13010 (?), *[D]*
13330 *60*, Γ=270 *80* keV, *[M]*
13400, Γ=1100 *100* keV, *[HK]*
13900 *20*, Γ=200 *100* keV, *[DG]*, T=(3/2)
14070 *20*, Γ=135 *50* keV, *[E]*
14760 *40*, Γ≈ 450 keV, *[CEG]*
15350 *50*, $^{-}$, *[DEGL]*
15590 *50*, Γ≈ 450 keV, *[EG]*
16700, $^{-}$, Γ=800 *100* keV, *[D]*
18200 (?), *[D]*
23000 (?), *[L]*
28000 (?), *[L]*

$^{11}_{7}$N

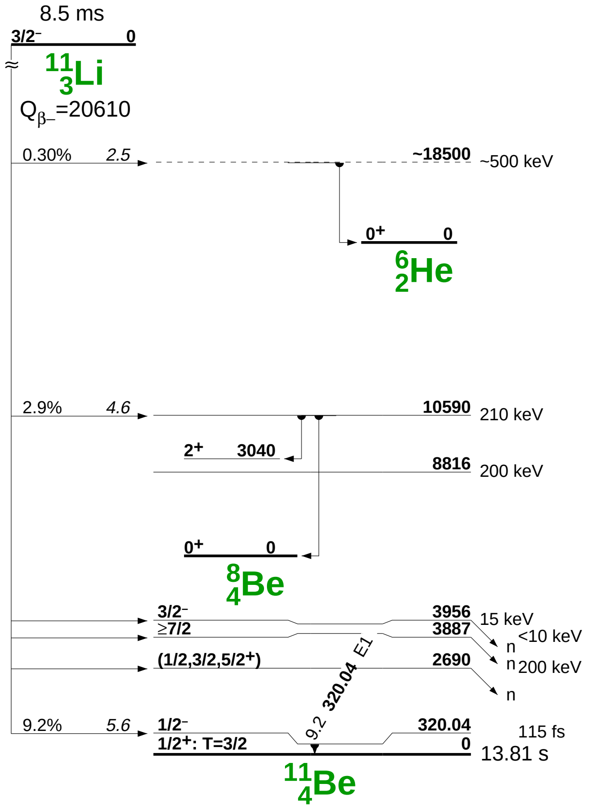
Δ: 24960 *180* **S_n:** (22800) **Q_p:** 1970 *180*
Q_{EC}: 14310 *180*

Populating Reactions and Decay Modes

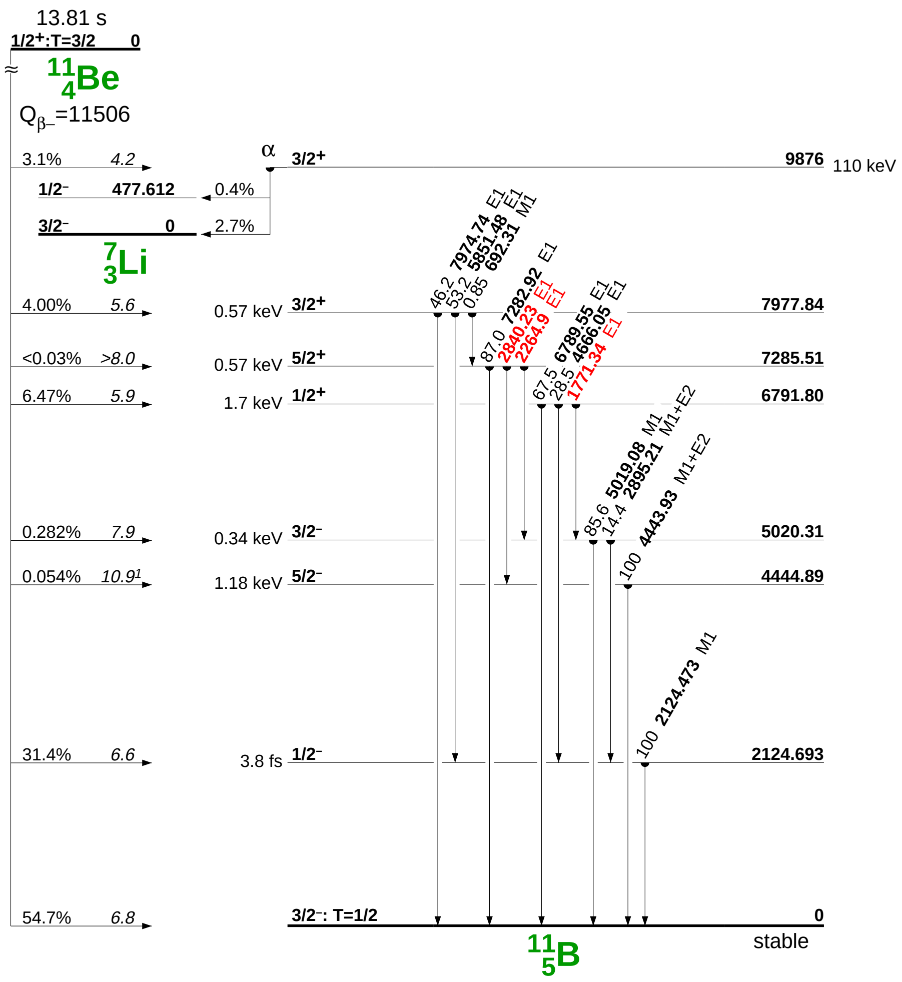
^{14}N(^{3}He,^{6}He) (74Be20, 85An28, 86An07, 88Wa18, 90Aj01)

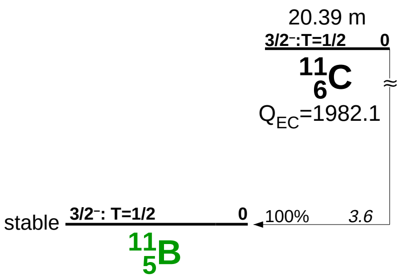
Levels:

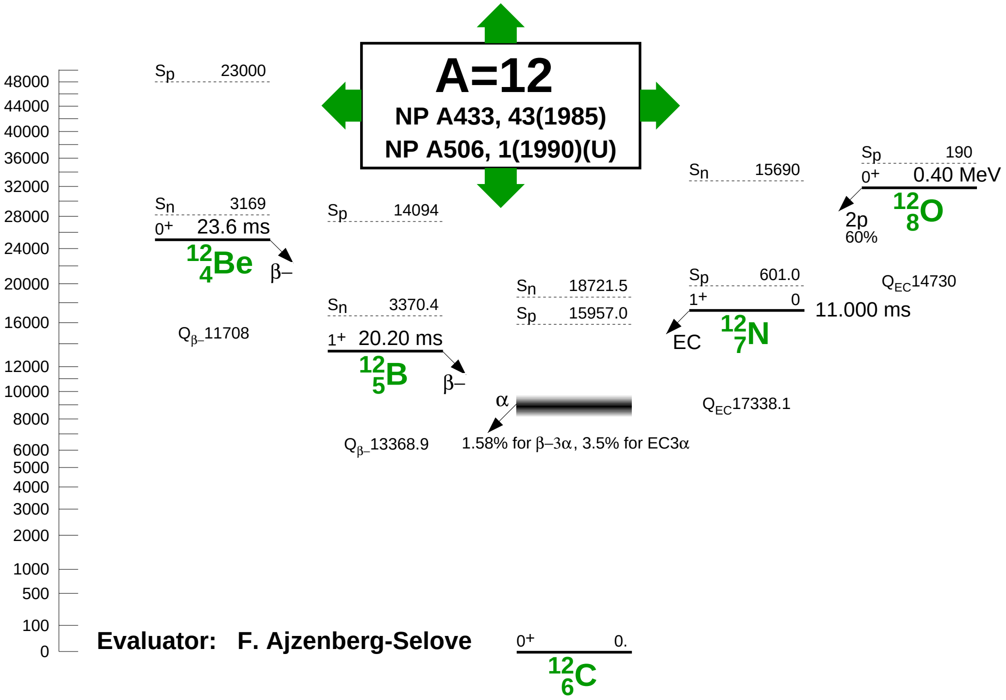
0 (?), Γ=740 *100* keV, T=3/2, %p=?



8.5 ms
3/2⁻ 0
11 3 Li
Qβ⁻=20610
0.30% 2.5
~18500 ~500 keV
0+ 0
6 2 He
2.9% 4.6
10590 210 keV
2+ 3040
8816 200 keV
0+ 0
8 4 Be
3/2⁻ 3956 15 keV
≥7/2 3887 <10 keV
n
(1/2,3/2,5/2+) 2690 200 keV
n
n
E1
320.04
9.2
9.2% 5.6
1/2⁻ 320.04 115 fs
1/2+: T=3/2 0 13.81 s
11 4 Be


13.81 s
1/2+:T=3/2 0
11 4 Be
Qβ−=11506
3.1% 4.2
4.00% 5.6
<0.03% >8.0
6.47% 5.9
0.282% 7.9
0.054% 10.91
31.4% 6.6
54.7% 6.8
α
1/2− 477.612
0.4%
3/2− 0
2.7%
7 3 Li
3/2+ 9876 110 keV
0.57 keV 3/2+ 7977.84
0.57 keV 5/2+ 7285.51
1.7 keV 1/2+ 6791.80
0.34 keV 3/2− 5020.31
1.18 keV 5/2− 4444.89
3.8 fs 1/2− 2124.693
3/2−: T=1/2 0
46.2 7974.74 E1
53.2 5851.48 E1
0.85 692.31 M1
87.0 7282.92 E1
2840.23 E1
2264.9 E1
67.5 6789.55 E1
28.5 4666.05 E1
1771.34 E1
85.6 5019.08 M1
14.4 2895.21 M1+E2
100 4443.93 M1+E2
100 2124.473 M1
11 5 B
stable


20.39 m
3/2⁻:T=1/2 0
11 6 C
≈
Q EC=1982.1
stable
3/2⁻: T=1/2 0
100%
3.6
11 5 B



Evaluator: F. Ajzenberg-Selove

$^{12}_{4}$Be

Δ: 25077 *15* **S_n:** 3169 *16* **S_p:** 23000 *50*
$Q_{\beta-}$: 11708 *15*

Populating Reactions and Decay Modes

A ^{10}Be(t,p) (78Al29, 82Be42, 90Aj01)
B ^{14}C(^{14}C,^{16}O)

Levels and γ-ray branchings:

0, 0^+, 23.6 *9* ms, *[AB]*, T=2, %β^-=100
2102 *12*, 2^+, *[AB]*, T=2
2702 *17*, *[AB]*
4560 *25*, *[A]*
5700 *25*, *[A]*

$^{12}_{5}$B

Δ: 13368.9 *14* **S_n:** 3370.4 *14* **S_p:** 14094 *7*
$Q_{\beta-}$: 13368.9 *14*

Populating Reactions and Decay Modes

A ^{12}Be β^- decay (78Al10, 84Du15, 90Aj01)
B ^{6}Li(^{7}Li,p), ^{7}Li(^{7}Li,d)
C ^{9}Be(^{6}Li,^{3}He)
D ^{9}Be(^{7}Li,α)
E ^{10}B(t,p)
F ^{11}B(n,n)
G ^{11}B(p,π^+)
H ^{11}B(d,p)
I ^{11}B(^{7}Li,^{6}Li)
J ^{12}C(^{7}Li,^{7}Be)
K ^{14}C(p,^{3}He)
L ^{12}C(^{13}C,^{13}N)
M ^{14}Be β^-2n decay

Levels and γ-ray branchings:

0, 1^+, 20.20 *2* ms, *[ABCDEGHIJKL]*, T=1,
%β^-=100, %$\beta^-3\alpha$=1.58 *30*,
μ=+1.00306 *15*, Q=0.0134 *14*

953.14 *60*, 2^+, 180 *28* fs, *[BCDEGHIJKL]*
γ_0 ***953.10*** ($\dagger_\gamma$100) M1

1673.65 *60*, 2^-, <35 fs, *[BCDEGHIJL]*
γ_{953} ***720.34*** ($\dagger_\gamma$3.3 *4*) E1
γ_0 ***1673.52*** ($\dagger_\gamma$100.0 *4*) E1

2620.8 *12*, 1^-, <49 fs, *[BDEGHIJL]*
γ_{1674} ***947.11*** ($\dagger_\gamma$18 *4*) M1
γ_{953} ***1667.54*** ($\dagger_\gamma$100 *4*) E1
γ_0 ***2620.5*** ($\dagger_\gamma$8 *1*) E1

2723 *11*, 0^+, *[BDEHIJ]*
γ_0 ***2722.7*** ($\dagger_\gamma$100)

3389.1 *15*, 3^-, Γ=3.1 *6* eV, *[BCDEFGHIL]*

3759 *6*, 2^+, Γ=40 *4* keV, *[CDEFGH]*

4301 *7*, 1^-, Γ=9 *4* keV, *[DEFG]*

4460, 2^-, *[FL]*

4518 *8*, 4^-, Γ=110 *20* keV, *[DEFGHIL]*

5000 *20*, 1^+, Γ=50 *15* keV, *[DEFG]*

5612 *8*, 3^+, Γ=110 *40* keV, *[DEFGIK]*

5726 *8*, 3^-, Γ=50 *20* keV, *[DEFI]*

6000, 1^-, *[F]*

6600, 1^+, Γ=140 keV, *[F]*

7060, 1^-, *[F]*

7545 *20*, Γ<14 keV, *[DEF]*

7670 (?), 2^-, Γ=45 keV, *[F]*

7700 *100*, 1^-, Γ=1.9 *1* MeV, *[L]*

7836 *20*, 1^-, Γ=60 *40* keV, *[DF]*

7937 *20*, (1^-), Γ=27 keV, *[D]*

8100 *100*, Γ=0.9 *2* MeV, *[D]*

8120 *20*, (3^-), *[DEF]*

8240 *30*, 3^-, Γ=65 keV, *[DF]*

8376 *20*, Γ=40 *20* keV, *[DE]*

8580 *30*, (3^-), Γ=75 keV, *[DEF]*

8707 *20*, (3^-), *[DF]*

9040 *20*, 1^-, Γ=95 *20* keV, *[DEF]*

9175 *20*, (2^-), *[DF]*

9430 *20*, Γ=85 *30* keV, *[DE]*

9585 *5*, 3^-, Γ=34 *5* keV, *[DEF]*

9758 *20*, *[D]*

9830 (?), *[D]*

10000 *40*, Γ=100 keV, *[DF]*

10110 *40*, *[D]*

10220 *20*, Γ<25 keV, *[DE]*

10435 *20*, Γ=75 *40* keV, *[D]*

10590 *20*, Γ<30 keV, *[DE]*

10900 *20*, Γ=30 *10* keV, *[DE]*

11080 (?), *[D]*

11310 *30*, Γ=130 *60* keV, *[D]*

11590 *20*, Γ=75 *25* keV, *[D]*

12345 *25*, Γ=100 *30* keV, *[DEF]*

12750 *50*, 0^+, Γ=85 *40* keV, *[DK]*, T=2

13330 *30*, Γ=50 *20* keV, *[D]*

13400 *100* (?), *[E]*

14820 *100*, (2^+), Γ<200 keV, *[K]*, T=(2)

15500, *[D]*

21800 *400* (?), (3^-), Γ=1.3 *4* MeV, *[J]*

23900 *1000* (?), (1^-), Γ=6 *1* MeV, *[J]*

γ(^{12}*C*) from ^{12}B (20.20 ms) β^- decay :

3214.83
4438.03

$^{12}_{6}$C

%: 98.90 *3*
Δ: 0.00 **S_n:** 18721.5 *9* **S_p:** 15957.0 *4*
σ_γ: 0.00353 *7* b

Populating Reactions and Decay Modes

A ^{12}B β^- decay (74Mc11, 78Al01, 80Aj01, 81Ka31, 90Aj01)
B ^{12}N EC decay (75Aj02, 78Al01, 80Aj01, 81Ka31, 90Aj01)
C ^{13}B β^-n decay
D ^{13}O ECp decay
E ^{16}N $\beta^-\alpha$ decay
F ^{9}Be(^{3}He,γ)
G ^{9}Be(^{3}He,n), (^{3}He,p), (^{3}He,d)
H ^{9}Be(α,n)
I ^{9}Be(^{6}Li,t)
J ^{9}Be(^{9}Be,^{6}He)
K ^{10}B(d,α)
L ^{10}B(^{3}He,p), (^{3}He,pα)
M ^{11}B(^{3}He,d)
N ^{12}C(e,e)
O ^{11}B(p,γ), (p,α), (p,3α)
P ^{11}B(p,n)
Q ^{11}B(p,p), (p,d)
R ^{10}Be(^{3}He,n)
S ^{14}C(p,t)

Levels and γ-ray branchings:

0, 0^+, stable, *[ABFHILMNORS]*, T=0

4438.91 *31*, 2^+, Γ=0.0108 *6* eV, *[ABFHIJLMNOR]*, T=0, Q=+0.06 *3*
γ_0 ***4438.03*** (†$_\gamma$100) E2

7654.20 *15*, 0^+, Γ=8.5 *10* eV, *[ABFHIJLMNOR]*, T=0
γ_{4439} ***3214.83*** (†$_\gamma$100) E2

9641 *5*, 3^-, Γ=34 *5* keV, *[HIJLMNO]*, T=0
γ_0 ***9637*** (†$_\gamma$100) E3

10300 *300*, (0^+), Γ=3.0 *7* MeV, *[ABH]*, T=0

10844 *16*, 1^-, Γ=315 *25* keV, *[HLM]*, T=0

11160 *50* (?), (2^+), Γ=430 *80* keV, *[M]*, T=0

11828 *16*, 2^-, Γ=260 *25* keV, *[ILMN]*, T=0

12710 *6*, 1^+, Γ=18.1 *28* eV, *[BILMN]*, T=0, Γ_α=17.7 *28* eV
γ_{4439} ***8268.03*** (†$_\gamma$14) M1
γ_0 ***12703*** (†$_\gamma$100) M1

13352 *17*, (2^-), Γ=375 *40* keV, *[LM]*, T=0

14083 *15*, 4^+, Γ=258 *15* keV, *[ILN]*, T=0

15110 *3*, 1^+, Γ=43.6 *13* eV, *[BLMN]*, T=1, Γ_α=1.8 *3* eV, Γ_γ=41.8 *12* eV
γ_{12710} ***2400*** (†$_\gamma$1.5) M1
γ_{7654} ***7453.3*** (†$_\gamma$28) M1
γ_{4439} ***10666.0*** (†$_\gamma$2.5) M1
γ_0 ***15100*** (†$_\gamma$100) M1

15440 *40*, (2^+), Γ=1.5 *2* MeV, *[N]*, T=(0)

16105.8 *7*, 2^+, Γ=5.3 *2* keV, *[LMNO]*, T=1
γ_{12710} ***3395.3*** (†$_\gamma$1.5) M1
γ_{9641} ***6463*** (†$_\gamma$2.4) E1
γ_{4439} ***11661*** (†$_\gamma$100) M1
γ_0 ***16094.2*** (†$_\gamma$4.6) E2

16570, 2^-, Γ=300 keV, *[LNOQ]*, T=1
γ_0 ***16558*** (†$_\gamma$100) M2

17230, 1^-, Γ=1.15 MeV, *[OQ]*, T=1

17760 *20*, 0^+, Γ=80 *20* keV, *[NOQR]*, T=1

18160 *70*, (1^+), Γ=240 *50* keV, *[O]*, T=(0)

18350 *50*, 3^-, Γ=220 *50* keV, *[MOQ]*, T=1

18350 *50*, 2^-, Γ=350 *50* keV, *[MNQ]*, T=0+1

18600 *100* (?), (3^-), Γ=300 keV, *[N]*

18710, Γ=100 keV, *[O]*, T=(1)

18800 *40*, 2^+, Γ=100 *10* keV, *[OPQ]*, T=1

19200, (1^-), Γ≈ 1.1 MeV, *[MOPQ]*, T=(1)

19400 *30*, (2^-), Γ=480 *40* keV, *[NO]*, T=(1)

19550 *50*, (4^-), Γ=490 *60* keV, *[MN]*, T=(1)

19690, 1^+, Γ=230 *35* keV, *[P]*

20000 *100*, (2^+), Γ≈ 250 keV, *[NPQ]*

20270 *50*, (1^+), Γ=140 *50* keV, *[PQ]*, T=(1)

20500 *100*, (3^+), Γ=300 *50* keV, *[LNO]*, T=(1)

20620 *60*, (3^-), Γ=200 *40* keV, *[MOPQ]*, T=(1)

20980, Γ=270 keV, *[P]*

21600 *100*, 3^-,2^+, Γ=1.20 *15* MeV, *[NOPQ]*, T=0

22000 *100*, 1^-, Γ=800 *100* keV, *[NPQ]*, T=1

22400 *40*, 1^-, Γ=275 *40* keV, *[MPQ]*, T=1

22650 *70*, 1^-, Γ=3.2 MeV, *[NOP]*, T=1

23040, (2^-), Γ=60 keV, *[P]*, T=(1)

23520 *30*, 1^-, Γ=230 *80* keV, *[NOPR]*, T=1

23920 *80*, (1^-), Γ=0.4 *1* MeV, *[NP]*, T=(1)

24430, Γ=0.1 MeV, *[P]*

24920, Γ=0.92 MeV, *[NP]*

25300 *150*, (1^-), Γ=0.51 *10* MeV, *[P]*, T=(1)

25400, 1^-, Γ≈ 2 MeV, *[NO]*, T=1

25950, Γ≈ 0.4 MeV, *[KP]*

26800, Γ=270 keV, *[KNP]*

27000 *300*, (1^-), Γ=1.4 *2* MeV, *[O]*, T=(1)

27595.0 *24*, 0^+, Γ<30 keV, *[RS]*, T=2

27900, Γ≈ 350 keV, *[GNO]*

28200, 1^-, Γ=1.6 MeV, *[F]*, T=1

28830 *40*, Γ=1.54 *9* MeV, *[FKO]*

29400 *300*, Γ=1.4 *2* MeV, *[GO]*

29630 *50*, Γ<200 keV, *[S]*, T=2

30290 *30*, Γ=1.96 *15* MeV, *[FN]*

31160 *30*, Γ=2.10 *15* MeV, *[F]*

32290 *40*, Γ=1.32 *23* MeV, *[FN]*

33470 *210*, Γ=1.93 *5* MeV, *[F]*

$^{12}_{7}$N

Δ: 17338.1 *10*   **S_n:** 15690 *180*   **S_p:** 601.0 *13*

Q_{EC}: 17338.1 *10*

Populating Reactions and Decay Modes

- *A* ^{10}B(^{3}He,n) (90Aj01)
- *B* ^{12}C(γ,π^-)
- *C* ^{12}C(p,n)
- *D* ^{12}C(^{3}He,t)
- *E* ^{12}C(^{6}Li,^{6}He)
- *F* ^{12}C(^{12}C,^{12}B)
- *G* ^{12}C(^{13}C,^{13}B)
- *H* ^{12}C(^{14}N,^{14}C)
- *I* ^{14}N(p,t)

Levels:

0, 1^+, 11.000 *16* ms, *[ABCDEFGH]*, T=1,
%EC+%β^+=100, %EC3α=3.5 *5*,
μ=+0.4573 *5*, Q=+0.026

960 *12*, 2^+, Γ<20 keV, *[ACDEGI]*

1191 *8*, 2^-, Γ=118 *14* keV, *[ACD]*

1800 *30*, 1^-, Γ=0.75 *25* MeV, *[D]*

2439 *9*, 0^+, Γ=68 *21* keV, *[ADI]*

3132 *8*, 2^+,3^-, Γ=220 *20* keV, *[AD]*

3558 *9*, $(1)^+$, Γ=220 *25* keV, *[ACD]*

4140 *10*, 2^- and 4^-, Γ=825 *25* keV, *[ACDG]*

5348 *13*, 3^-, Γ=180 *23* keV, *[ACD]*

5600 *11* (?), Γ=120 *50* keV, *[D]*

6400 *30*, (1^-), Γ=1200 *30* keV, *[D]*

7400 *50*, (1^-), Γ=1200 *30* keV, *[DG]*

7684 *21*, Γ=200 *32* keV, *[ACD]*

8446 *17*, Γ=90 *30* keV, *[A]*

9035 *12*, Γ<35 keV, *[A]*

9420 *100* (?), Γ≈ 200 keV, *[D]*

9800 *20*, Γ=0.45 *10* MeV, *[D]*

10300 *20*, Γ=0.45 *10* MeV, *[D]*

11000 *20*, Γ=0.35 *10* MeV, *[D]*

γ(*^{12}C*) from ^{12}N (11.000 ms) EC+β^+ decay :

3214.83 ($\dagger_\gamma$1.5 *3*)
4438.03 ($\dagger_\gamma$2.73 *30*)

$^{12}_{8}$O

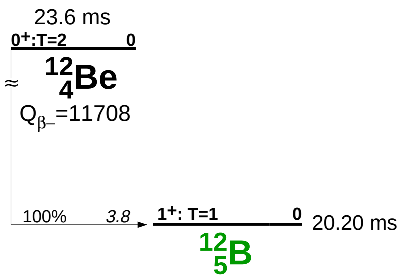
Δ: 32060 *40* **S$_p$:** 190 *190* **Q$_{EC}$:** 14730 *40*

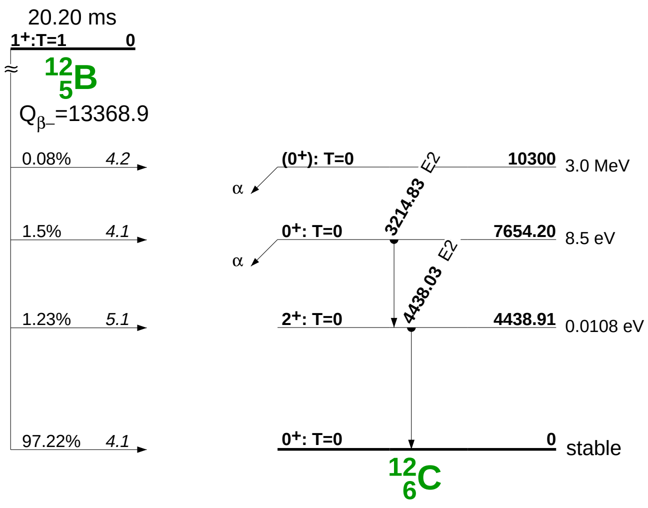
Populating Reactions and Decay Modes

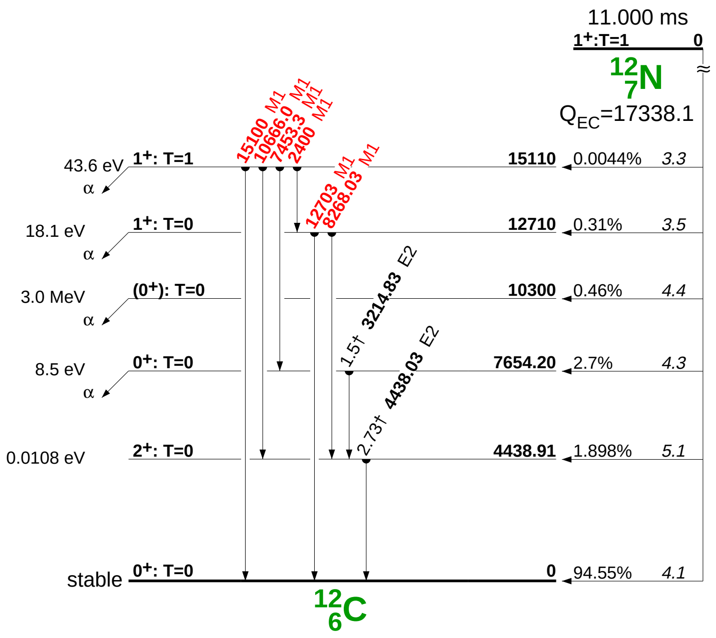
^{16}O(α,^{8}He), ^{12}C(π^{+},π^{-}) (78Ke06, 85Aj01, 85An28, 85Mo18, 86Ch39, 86Gi13, 87Bl18, 87Fa05, 87Sa15, 88Co15, 88Go21, 88Ma27, 88Wa18, 89Gr06, 90Aj01)

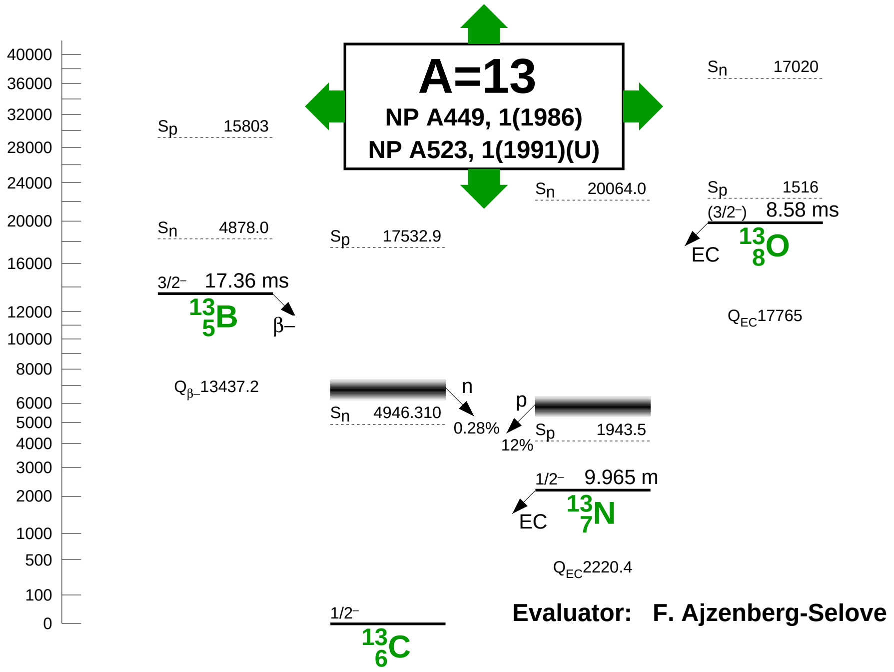
Levels:

0, 0^{+}, Γ=0.40 *25* MeV, %2p=60 *30*, T=2
1000 *100*


23.6 ms
0+:T=2
0
12 4 Be
Qβ−=11708
100%
3.8
1+: T=1
0
20.20 ms
12 5 B

20.20 ms
1+:T=1
0
≈
12 5 B
Qβ−=13368.9
0.08%
4.2
1.5%
4.1
1.23%
5.1
97.22%
4.1
α
α
(0+): T=0
10300
3.0 MeV
E2
3214.83
0+: T=0
7654.20
8.5 eV
E2
4438.03
2+: T=0
4438.91
0.0108 eV
0+: T=0
0
stable
12 6 C


11.000 ms
1+:T=1 0
12 7 N
QEC=17338.1
43.6 eV 1+: T=1 15110 0.0044% 3.3
18.1 eV 1+: T=0 12710 0.31% 3.5
3.0 MeV (0+): T=0 10300 0.46% 4.4
8.5 eV 0+: T=0 7654.20 2.7% 4.3
0.0108 eV 2+: T=0 4438.91 1.898% 5.1
stable 0+: T=0 0 94.55% 4.1
α
α
α
α
15100 M1
10666.0 M1
7453.3 M1
2400 M1
12703 M1
8268.03 M1
1.5† 3214.83 E2
2.73† 4438.03 E2
12 6 C


A=13
NP A449, 1(1986)
NP A523, 1(1991)(U)
40000
36000
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
Sp 15803
Sn 4878.0
3/2− 17.36 ms
13 5 B
β−
Qβ− 13437.2
Sp 17532.9
Sn 4946.310
n
0.28%
1/2−
13 6 C
Sn 20064.0
p
12%
Sp 1943.5
1/2− 9.965 m
EC
13 7 N
QEC 2220.4
Sn 17020
Sp 1516
(3/2−) 8.58 ms
EC
13 8 O
QEC 17765
Evaluator: F. Ajzenberg-Selove

$^{13}_{5}$B

Δ: 16562.3 *11* **S_n:** 4878.0 *18* **S_p:** 15803 *15*
$Q_{\beta-}$: 13437.2 *11*

Populating Reactions and Decay Modes

A ^{14}Be β^-n decay
B ^{7}Li(^{7}Li,p)
C ^{11}B(t,p)
D ^{12}C(^{13}C,^{12}N)
E ^{13}C(γ,π^+)
F ^{13}C(π^-,γ)
G ^{13}C(n,p)
H ^{13}C(d,2p)
I ^{13}C(^{7}Li,^{7}Be)
J ^{14}C(γ,p)
K ^{14}C(t,α)

Levels and γ-ray branchings:

0, 3/2$^-$, 17.36 *16* ms, *[BCDEFGHIK]*,
%β^-=100, %β^-n=0.28 *4*, μ=+3.1778 *5*,
Q=0.037 *4*, T=3/2

3483 *5*, *[C]*
γ_0*3482* *6* (†$_\gamma$100)

3535 *3*, >0.2 ps, *[BCEF]*

3681 *5*, *[CF]*

3713 *5*, <0.27 ps, *[BC]*
γ_{3535}*178* *6* (†$_\gamma$<10)
γ_0*3713* *5* (†$_\gamma$100)

4131 *6*, 0.043 *35* ps, *[BC]*
γ_{3713}*418* *8* (†$_\gamma$<14)
γ_{3535}*596* *8* (†$_\gamma$33 *14*)
γ_0*4131* *6* (†$_\gamma$100 *14*)

4829 *6*, *[BC]*

5024 *6*, *[BC]*

5106 *10*, Γ=60 *10* keV, *[C]*

5388 *6*, Γ=10 *10* keV, *[BC]*

5557 *7* (?), *[B]*

6167 *6*, *[BC]*

6425 *7*, Γ=36 *5* keV, *[BCEF]*

6934 *9*, Γ=55 *15* keV, *[BC]*

7516 *8* (?), *[BF]*

7859 *20* (?), *[BF]*

8133 *7*, Γ=100 *15* keV, *[BC]*

8683 *7*, Γ=89 *20* keV, *[BC]*

9440 *30*, Γ=81 *25* keV, *[C]*

9500 (?), *[I]*

10220 *20*, Γ=210 *20* keV, *[CF]*

10890 *20*, *[C]*

11800 (?), *[C]*

γ*(^{13}C)* from ^{13}B (17.36 ms) β^- decay **<** *for Iγ% multiply by 1.0***>**

169.300 *4* (†$_\gamma$<0.009)
595.013 *11* (†$_\gamma$0.057 *7*)
764.316 *10* (†$_\gamma$<0.3)
3089.049 *20* (†$_\gamma$<0.7)
3683.921 *23* (†$_\gamma$7.6 *8*) M1+E2: δ=+0.094 *9*
3853.170 *22* (†$_\gamma$<0.5) [M2+E3]: δ=–0.12 *3*
7545 *3* (†$_\gamma$0.094 *20*) [E2+M3]: δ=0.0093
8857 *20* (†$_\gamma$0.16 *3*)
9893 *5* (†$_\gamma$0.022 *7*) [M1+E2]: δ=0.139 *15*

n from ^{13}B (17.36 ms) β^-n decay **<** *for In% multiply by 1.0***>**

n_0*4570* *5* (†0.022 *7*)
n_0*3613* *20* (†0.16 *3*)
n_0*2401* *3* (†0.094 *20*)

$^{13}_{6}$C

%: 1.10 *3*
Δ: 3125.011 *5*   **S_n:** 4946.310 *10*   **S_p:** 17532.9 *14*
σ_γ: 0.00137 *4* b

Populating Reactions and Decay Modes

A ^{13}B β^- decay (91Aj01)
B ^{13}N β^+ decay (91Aj01)
C ^{9}Be(α,n), ^{9}Be(α,2n)
D ^{9}Be(^{6}Li,d)
E ^{10}B(^{6}Li,^{3}He)
F ^{11}B(d,n), (d,2n)
G ^{11}B(^{3}He,p)
H ^{12}C(n,n), (n,n'), (n,2n)
I ^{12}C(d,p)
J ^{12}C(t,d)
K ^{13}C(γ,n), (γ,2n)
L ^{13}C(γ,p), (γ,d)
M ^{13}C(e,e)
N ^{13}C(π,π)
O ^{13}C(p,p)
P ^{13}C(^{3}He,^{3}He)
Q ^{13}C(α,α)
R ^{14}C(p,d), (d,t), (^{3}He,α)
S ^{14}N(t,α)
T ^{15}N(p,^{3}He)
U 54 other reactions

Levels and γ-ray branchings:

0, 1/2$^-$, stable, *[ABDGIJKLMNOPQRST]*, T=1/2, μ=+0.7024118 *14*

3089.443 *20*, 1/2$^+$, 1.07 *10* fs, *[ADGIJMNOPQRST]*
γ_0***3089.049*** *20* ($\dagger_\gamma$100)

3684.507 *19*, 3/2$^-$, 1.10 *9* fs, *[ADGIJMNOPQRST]*
γ_{3089}***595.013*** *11* ($\dagger_\gamma$0.75 *3*)
γ_0***3683.921*** *23* ($\dagger_\gamma$100.00 *3*)
[M1+E2]: δ=+0.094 *9*

3853.807 *19*, 5/2$^+$, 8.60 *14* ps, *[ADGIJMNOPQRS]*, μ=1.40 *4*
γ_{3685}***169.300*** *4* ($\dagger_\gamma$58.1 *10*)
γ_{3089}***764.316*** *10* ($\dagger_\gamma$1.92 *7*)
γ_0***3853.170*** *22* ($\dagger_\gamma$100.0 *10*)
[M2+E3]: δ=−0.12 *3*

6864 *3*, 5/2$^+$, Γ=6 keV, *[DGHIJMOPQRST]*, Γ_γ=7×10^{-5} *4* eV, %IT=1.2×10^{-6}, %n=100
γ_0***6862*** *3* ($\dagger_\gamma$100)

7492 *10*, (7/2$^+$), Γ<5 keV, *[DEFIMPQS]*

7547 *3*, 5/2$^-$, Γ=1.2 *3* keV, *[ADEGHIMNOPQRST]*, Γ_γ=0.115 *7* eV, %IT=0.0096 *25*, %n=100
γ_0***7545*** *3* ($\dagger_\gamma$100) [E2+M3]: δ=0.0093

7686 *6*, 3/2$^+$, Γ=70 *5* keV, *[GIJKOPQRS]*, %IT=?, %n=?

8200 *100*, 3/2$^+$, Γ=1100 *300* keV, *[HIJOR]*, %IT=?, %n=?

8860 *20*, 1/2$^-$, Γ=150 *30* keV, *[AGHIMNOPQRST]*, Γ_γ=3.4 *5* eV, %IT=0.0023 *6*, %n=100
γ_0***8857*** *20* ($\dagger_\gamma$100)

9499.8 *1*, 9/2$^+$, Γ<5 keV, *[DEGHIJMNOPQRST]*, %IT=?, %n=?

9897 *5*, 3/2$^-$, Γ=26 *3* keV, *[ADEGHIKMOPRS]*, Γ_γ=0.33 *4* eV, %IT=0.00127 *21*, %n=100
γ_0***9893*** *5* ($\dagger_\gamma$100) [M1+E2]: δ=0.139 *15*

10460, Γ=200 keV, *[H]*, %n=100

10753 *4*, 7/2$^-$, Γ=55 *2* keV, *[DEGHIJMOPS]*, %IT=?, %n=?

10818 *5*, (5/2$^-$), Γ=24 *3* keV, *[DEGHIMOPS]*, %IT=?, %n=?

10996 *6*, 1/2$^+$, Γ=37 *4* keV, *[CGHIKORS]*, %IT=?, %n=?, %α=?

11080 *5*, 1/2$^-$, Γ<4 keV, *[CGHIMOPQRST]*, Γ_γ=1.02 *12* eV, %IT=?, %n=?, %α=?
γ_0***11075*** *5* ($\dagger_\gamma$100)

11748 *10*, 3/2$^-$, Γ=110 *15* keV, *[GHIORS]*, %n=100

11848 *4*, 7/2$^+$, Γ=68 *4* keV, *[DHIMNOPQT]*, %IT=?, %n=?

11950 *40*, 5/2$^+$, Γ=500 *80* keV, *[CHIMO]*, %n=?, %α=?

12106 *5*, 3/2$^+$, Γ=540 *70* keV, *[CHIKO]*, %IT=?, %n=?, %α=?

12130 *50*, 5/2$^-$, Γ=80 *30* keV, *[CDHS]*, %n=?, %α=?

12140 *70*, 1/2$^+$, Γ=430 *70* keV, *[CFO]*, %n=?, %α=?

12187 *10*, 3/2$^-$, Γ=150 *40* keV, *[CFM]*, %IT=?, %n=?, %α=?

12438 *12*, 7/2$^-$, Γ=140 *30* keV, *[CFMOT]*, %IT=?, %n=?, %α=?

13000 *1000*, *[K]*, %IT=?, %n=?

13280 (?), (3/2$^-$), Γ=340 keV, *[OR]*, %α=100

13410, (9/2$^-$), Γ=35 *3* keV, *[CDO]*, %n=?, %α=?

13570, 7/2$^-$, Γ=620 *50* keV, *[CHO]*, %n=?, %α=?

13760, (5/2,3/2)$^+$, Γ≈ 300 keV, *[CO]*, %n=?, %α=?

14130, 3/2$^-$, Γ≈ 150 keV, *[CDHO]*, %n=?, %α=?

14390 *15*, (1/2,5/2)$^-$, Γ=280 *70* keV, *[CMO]*, %IT=?, %n=?, %α=?

14582 *10*, (7/2$^+$,9/2$^+$), Γ=230 *40* keV, *[CMO]*, %IT=?, %n=?, %α=?

14983 *10*, (7/2$^-$), Γ=380 *60* keV, *[CHMO]*, %IT=?, %n=?, %α=?

15108.2 *12*, 3/2$^-$, Γ=5.49 *25* keV, *[CGHMOPRT]*, Γ_γ=45 *3* eV, %IT=0.82 *7*, %n=?, %α=?, T=3/2
γ_{3685}***11418.3*** *12* ($\dagger_\gamma$79 *11*)
γ_{3089}***12012.8*** *12* ($\dagger_\gamma$18 *3*)
γ_0***15098.8*** *12* ($\dagger_\gamma$100 *7*)
[M1+E2]: δ=0.164 *15*

15270, 9/2$^+$, *[H]*, %n=100

(continued on next page)

15526 *11*, $(3/2^-)$, Γ=150 *30* keV, *[CHMO]*, %IT=?, %n=?, %α=?

16080 *7*, $(7/2^+)$, Γ=150 *15* keV, *[CHMNOP]*, %IT=?, %n=?, %α=?

16150 *50*, $(5/2^-)$, Γ=230 keV, *[CO]*, %n=?, %α=?

16183 *28* (?), Γ=40 *20* keV, *[M]*, %IT=100

16950 *50*, Γ=330 keV, *[CO]*, %n=?, %α=?

17360 *100*, Γ=190 keV, *[CO]*, %n=?, %α=?

17533 *3*, Γ=17 *6* keV, *[H]*, %n=100, T=(3/2)

17699 *5*, (3/2,5/2), Γ=170 keV, *[CO]*, %n=?, %α=?

17920 *50* (?), *[N]*

18082 *3*, Γ=12 *7* keV, *[H]*, %n=100, T=(3/2)

18300 *50*, Γ=300 keV, *[CO]*, %n=?, %α=?

18497 *10* (?), Γ=91 *23* keV, *[M]*, %IT=100

18699 *5*, $(3/2^+,5/2^+)$, Γ=100 *15* keV, *[CLMO]*, %IT=?, %n=?, %p=?, %α=?

19510, $(5/2^-)$, Γ>500 keV, *[EHO]*, %n=?

19900, Γ≈ 600 keV, *[EO]*, %n=?, %p=?

20021 *13*, Γ=230 *30* keV, *[MO]*, %IT=100

20057 *4*, Γ=11 *8* keV, *[H]*, %n=100

20110 (?), $(1/2^-)$, Γ=1090 keV, *[H]*, %n=100

20110 (?), $(5/2^+)$, Γ=440 keV, *[H]*, %n=100

20200 *70*, $(7/2^+)$, Γ=560 *90* keV, *[FH]*, %IT=?, %n=?, %α=?

20300 (?), $(7/2^-)$, Γ=1560 keV, *[H]*, %n=100

20340 (?), $(9/2^+)$, Γ=320 keV, *[H]*, %n=100

20429 *8*, Γ=115 *25* keV, *[FMO]*, %IT=?, %n=?, %p=?

20520 *70*, Γ=510 *70* keV, *[FH]*, %IT=?, %n=?, %p=?

20600 *800*, Γ=5600 *400* keV, *[K]*, %IT=?, %n=?

20930 *100* (?), Γ=240 *100* keV, *[O]*

21280 *15*, Γ=159 *15* keV, *[FO]*, %n=?, %p=?

21466 *8*, $(7/2^+,9/2^+)$, Γ=270 *20* keV, *[MO]*, %IT=100

21703 *4*, Γ=18 *9* keV, *[H]*, %n=100, T=(3/2)

21810 *20*, (≥5/2), Γ=114 *21* keV, *[FO]*, %n=?

22200 *100*, (≤5/2), Γ=1100 *500* keV, *[FO]*, %n=?

23000, (≤5/2), Γ≈ 1000 keV, *[HO]*, %n=100

24000, Γ≈ 4000 keV, *[K]*, %IT=?, %n=?, %p=?

26000 (?), *[K]*, %IT=?, %p=?

26800, *[F]*, %n=?

27500, Γ≈ 1000 keV, *[F]*, %n=?, %p=?

30000, *[K]*, %IT=?, %n=?

$^{13}_{7}$N

Δ: 5345.5 *3* **S_n:** 20064.0 *10* **S_p:** 1943.5 *3*
Q_{EC}: 2220.4 *3*

Populating Reactions and Decay Modes

A ^{13}O β^+ decay (91Aj01)
B ^{17}Ne ECα decay
C ^{10}B(^{3}He,γ)
D ^{10}B(^{3}He,n), (^{3}He,p)
E ^{10}B(^{3}He,d), (^{3}He,^{3}He), (^{3}He,α)
F ^{10}B(^{6}Li,t), (^{9}Be,^{6}He)
G ^{11}B(^{3}He,n)
H ^{12}C(p,γ), (p,π^0)
I ^{12}C(p,p), (p,2p), (p,pα)
J ^{12}C(p,α)
K ^{12}C(^{3}He,d)
L ^{13}C(p,n), (p,pn)
M ^{13}C(^{3}He,t)
N ^{14}N(p,d)
O ^{14}N(d,t)
P ^{14}N(^{3}He,α), (^{3}He,pα)
Q ^{15}N(p,t)
R 20 other reactions

Levels and γ-ray branchings:

0, $1/2^-$, 9.965 *4* m, *[ACGHKLMNOPQ]*, T=1/2, %EC+%β^+=100, μ=0.3222 *4*

2364.9 *6*, $1/2^+$, Γ=31.7 *8* keV, *[GHIKLMNP]*, Γ_γ=0.50 *4* eV, %IT=0.00158 *13*, %p=100
γ_0***2364.7*** *6* ($\dagger_\gamma$100)

3502 *2*, $3/2^-$, Γ=62 *4* keV, *[ACGHIKLMNOPQ]*, Γ_γ=0.70 eV, %IT=0.0011, %p=100
γ_{2365}***1133*** *2* ($\dagger_\gamma$8.7 *11*)
γ_0***3502*** *2* ($\dagger_\gamma$100.0 *11*)

3547 *4*, $5/2^+$, Γ=47 *7* keV, *[CGIKLMNP]*, Γ_γ<0.002 eV, %IT<4.3×10^{-6}, %p=100
γ_0***3547*** *4* ($\dagger_\gamma$100)

6364 *9*, $5/2^+$, Γ=11 keV, *[FGIKMPQ]*, %p=100

6886 *8*, $3/2^+$, Γ=115 *5* keV, *[FGIKMP]*, %p=100

7155 *5*, $7/2^+$, Γ=9.0 *5* keV, *[FGIKMP]*, %p=100

7376 *9*, $5/2^-$, Γ=75 *5* keV, *[AFGIKMNOP]*, %p=100

7900, $3/2^+$, $\Gamma\approx$ 1500 keV, *[IK]*, %p=100

8918 *11*, $1/2^-$, Γ=230 keV, *[AGIKNOQ]*, %p=100

9000, $9/2^+$, Γ=280 *30* keV, *[FGLMO]*

9476 *8*, $3/2^-$, Γ=30 keV, *[AFGIKMO]*, %p=100

10250 *150*, $(1/2^+)$, $\Gamma\approx$ 280 keV, *[H]*, %IT=?, %p=?

10360, $5/2^-$, Γ=30 keV, *[AFGIKM]*, %p=100

10360, $7/2^-$, Γ=76 keV, *[FGIKM]*, %p=100

10833 *9*, $1/2^-$, *[FGKMQ]*

11530 *12*, $5/2^+$, Γ=430 *35* keV, *[FGI]*, %p=100

11700 *30*, $5/2^-$, Γ=115 *30* keV, *[I]*, %p=100

11740 *40*, $3/2^+$, Γ=240 *30* keV, *[HI]*, $\Gamma_\gamma\approx$4.2 eV, %IT=?, %p=?
γ_0***11734*** *40* ($\dagger_\gamma$100)

11740 *50*, $3/2^-$, Γ=530 *80* keV, *[GINOQ]*, %p=100

11860 *40*, $1/2^+$, Γ=380 *50* keV, *[IN]*, %p=100

12130 *50*, $7/2^-$, Γ=250 *30* keV, *[I]*, %p=100

12558 *23*, Γ>400 keV, *[G]*

12937 *24*, Γ>400 keV, *[G]*

13500 *200*, $3/2^+$, $\Gamma\approx$ 6500 keV, *[HI]*, $\Gamma\gamma_0$≥1000 eV, %IT=?, %p=100
γ_0***13500*** *200* ($\dagger_\gamma$100)

14050 *20*, $3/2^+$, Γ=165 *20* keV, *[HIJ]*, $\Gamma\gamma_0$=3.7 *10* eV, %IT=?, %p=?, %α=?, T=1/2
γ_0***14042*** *20* ($\dagger_\gamma$100)

15064.6 *4*, $3/2^-$, Γ=0.86 *12* keV, *[GHIJLMQ]*, Γ_γ=45.6 *25* eV, %IT=4.9 *3*, %p=?, %α=?, T=3/2
γ_{3502}***11557*** *2* ($\dagger_\gamma$80 *6*)
γ_{2365}***12688.5*** *4* ($\dagger_\gamma$<12)
γ_0***15055.2*** *4* ($\dagger_\gamma$100 *6*) [M1+E2]: δ=0.115 *22*

15300 *200*, $(3/2^+)$, Γ=350 *150* keV, *[H]*, Γ_γ≥0.5 eV, %IT=?, %p=100
γ_0***15300*** *200* ($\dagger_\gamma$100)

15990 *30*, $7/2^+$, Γ=135 *90* keV, *[IJM]*, %p=?, %α=?, T=1/2

16000, $\Gamma\approx$ 500 keV, *[I]*, %p=100

17500, *[HI]*, %IT=?, %p=?

18150 *30*, $3/2^+$, Γ=320 *80* keV, *[I]*, %p=100, T=1/2

18170 *20*, $1/2^-$, Γ=225 *50* keV, *[IJ]*, %p=?, %α=?, T=1/2

18406 *5*, $3/2^+$, Γ=66 *8* keV, *[GIJ]*, %p=?, %α=?, T=3/2

18961 *10*, $3/2^-$ or $7/2^+$, Γ=23 *5* keV, *[GIJ]*, %p=?, %α=?, T=3/2

19830, $5/2^-$, Γ=1000 keV, *[IJ]*, %p=?, %α=?, T=1/2

19880, $7/2^+$, Γ=750 keV, *[I]*, %p=100, T=1/2

20200, $5/2^-$, Γ=1000 keV, *[I]*, %p=100

20900 *300*, $1/2^+$, Γ=1200 keV, *[HI]*, %IT=?, %p=?

21400, $5/2^-$, Γ=750 keV, *[I]*, %p=100

21700, $3/2^+$, *[I]*, %p=100

22400 *500*, $1/2^+$, *[I]*, %p=100

23000, *[H]*, %IT=?, %p=?

23300, $(3/2^-)$, Γ=400 keV, *[DE]*, %p=?

23830 *50*, $(3/2^-)$, Γ=350 *50* keV, *[DE]*, %p=?

23900 (?), $(11/2^-)$, Γ=20 keV, *[E]*

24400 (?), Γ=700 keV, *[D]*, %p=?

24600 (?), Γ=120 keV, *[D]*, %p=?

25600 *100*, $(3/2)^-$, Γ=240 *80* keV, *[DI]*, %p=?

25900, Γ=1000 keV, *[DE]*, %n=?, %p=?, %α=?

(continued on next page)

$^{13}_{7}$N (continued)

26840, *[I]*, %p=100
28000, *[CDE]*, %IT=?, %p=?, %α=?
31000 (?), *[I]*, %p=100
32000, Γ≈ 2000 keV, *[CEH]*, %IT=?, %α=?

$^{13}_{8}\mathrm{O}$

Δ: 23111 *10*   **S_n:** 17020 *50*   **S_p:** 1516 *10*
Q_{EC}: 17765 *10*

Populating Reactions and Decay Modes

A ^{9}Be(^{13}C,^{9}He)
B ^{12}C(p,π^{-})
C ^{13}C(π^{+},π^{-})
D ^{16}O(^{3}He,^{6}He)

Levels:

0, (3/2^{-}), 8.58 *5* ms, *[ABCD]*, T=3/2,
%EC+%β^{+}=100, %ECp=12 *3*
2750 *40*, *[BC]*
4210, *[C]*
6020 *80*, Γ=1.2 MeV, *[C]*

γ*(*^{13}*N)* from ^{13}O (8.58 ms) β^{+} decay :

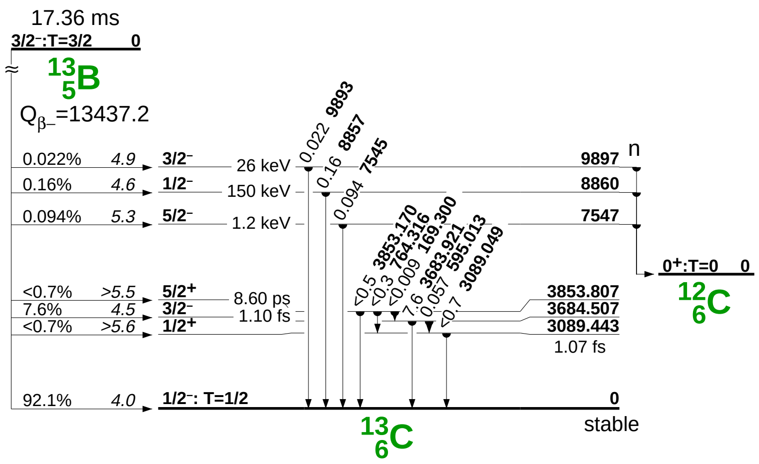
1133 *2*
2364.7 *6*
3502 *2*

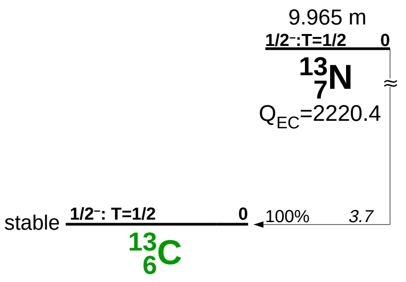
p from ^{13}O (8.58 ms) ECp decay **<** *for Ip% multiply by 1.0***>**

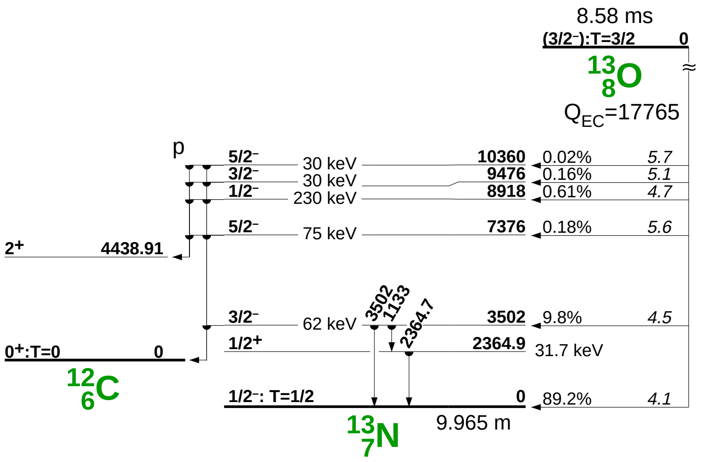
p_0***5480*** *50* (†0.02 *1*)
p_{4439}***3970*** *50* (†0.12 *8*)
p_{4439}***3120*** *50* (†0.06 *3*)
p_{4439}***2560*** *50* (†0.14 *4*)
p_{4439}***990*** (†0.16 *8*)

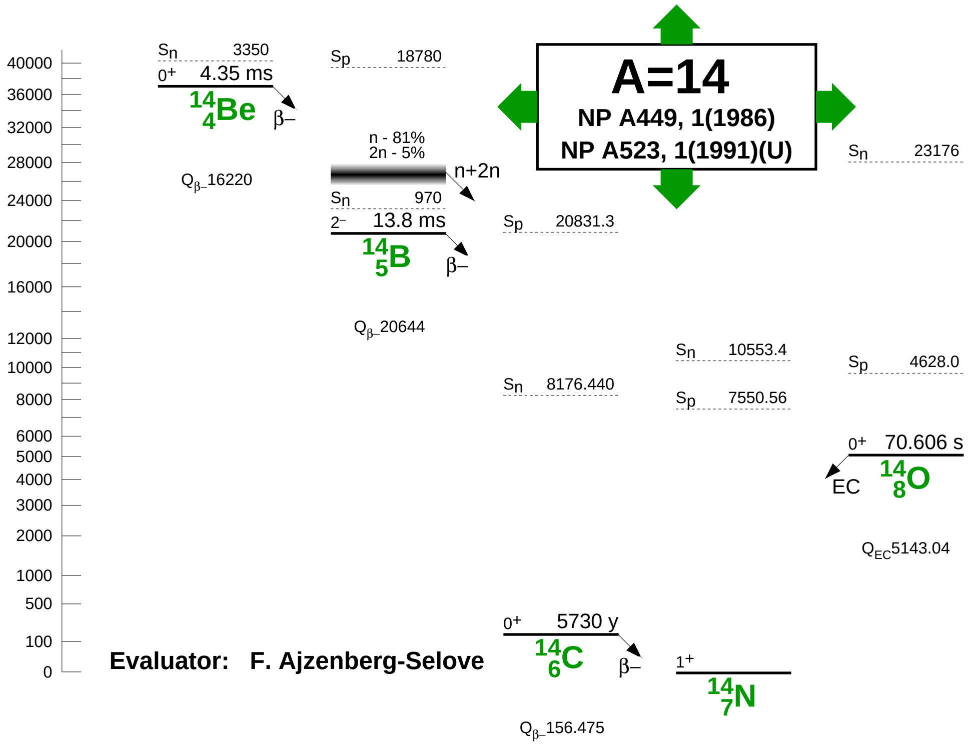
γ*(* ^{12}*C)* from ^{13}O (8.58 ms) ECp decay **<** *for I*γ*% multiply by 1.0***>**

4438.03 ($\dagger_{\gamma}$0.56) E2


17.36 ms
3/2−:T=3/2 0
13 5 B
Qβ−=13437.2
0.022% 4.9 3/2− 26 keV
0.16% 4.6 1/2− 150 keV
0.094% 5.3 5/2− 1.2 keV
<0.7% >5.5 5/2+ 8.60 ps
7.6% 4.5 3/2− 1.10 fs
<0.7% >5.6 1/2+
92.1% 4.0 1/2−: T=1/2
0.022 9893
0.16 8857
0.094 7545
<0.5 3853.170
<0.3 764.316
<0.009 169.300
7.6 3683.921
0.057 595.013
<0.7 3089.049
9897
8860
7547
3853.807
3684.507
3089.443
1.07 fs
0
stable
13 6 C
n
0+:T=0 0
12 6 C


9.965 m
1/2⁻:T=1/2 0
13 7 N
≈
Q_EC=2220.4
stable
1/2⁻: T=1/2 0
100% 3.7
13 6 C


8.58 ms
(3/2⁻):T=3/2 0
$^{13}_{8}$O
Q_{EC}=17765
p
5/2⁻ 30 keV 10360 0.02% 5.7
3/2⁻ 30 keV 9476 0.16% 5.1
1/2⁻ 230 keV 8918 0.61% 4.7
5/2⁻ 75 keV 7376 0.18% 5.6
2⁺ 4438.91
3/2⁻ 62 keV 3502 9.8% 4.5
3502
1133
2364.7
1/2⁺ 2364.9 31.7 keV
0⁺:T=0 0
$^{12}_{6}$C
1/2⁻: T=1/2 0 89.2% 4.1
$^{13}_{7}$N
9.965 m


A=14
NP A449, 1(1986)
NP A523, 1(1991)(U)
40000
36000
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
Sn 3350
0+ 4.35 ms
14 4 Be
β−
Qβ− 16220
Sp 18780
n - 81%
2n - 5%
n+2n
Sn 970
2− 13.8 ms
14 5 B
β−
Qβ− 20644
Sp 20831.3
Sn 8176.440
0+ 5730 y
14 6 C
β−
Qβ− 156.475
Sn 10553.4
Sp 7550.56
1+
14 7 N
Sn 23176
Sp 4628.0
0+ 70.606 s
14 8 O
EC
QEC 5143.04
Evaluator: F. Ajzenberg-Selove

${}^{14}_{4}$Be

Δ: 39880 *110*   **S_n:** 3350 *120*   **$Q_{\beta-}$:** 16220 *110*

Populating Reactions and Decay Modes

^{14}C(π^-,π^+) (91Aj01)

Levels:

0, 0^+, 4.35 *17* ms, %β^-=100, %β^-n=81 *4*,
%β^-2n=5 *2*

$^{14}_{5}\mathrm{B}$

Δ: 23664 *21*   **S_n:** 970 *21*   **S_p:** 18780 *50*
Q_{β^-}: 20644 *21*

Populating Reactions and Decay Modes

A ^{14}Be β^- decay
B ^{14}C(π^-,γ)
C ^{14}C(n,p)
D ^{14}C(^{7}Li,^{7}Be)
E ^{14}C(^{14}C,^{14}N)

Levels:

0, 2^-, 13.8 *10* ms, *[CDE]*, %β^-=100, T=2
740 *40*, (1^-), *[D]*, T=2
1380 *30*, (3^-), *[D]*, T=2
1860 *70*, 2^-, Γ=1.0 *5* MeV, *[BD]*, T=2
2080 *50*, (4^-), *[D]*, T=2
2320 *40* (?), *[D]*
2970 *40*, *[D]*

γ(*^{14}C*) from ^{14}B (13.8 ms) β^- decay **<** *for Iγ% multiply by 1.0* **>**

613 *3* ($\dagger_\gamma$<3.8)
634.4 *13* ($\dagger_\gamma$ 0.32 *14*)
1248 *3* ($\dagger_\gamma$<5.6)
6092.4 *2* ($\dagger_\gamma$ 86 *3*)
6726.5 *13* ($\dagger_\gamma$ 8.6 *16*)
7339 *3* ($\dagger_\gamma$<1.9)

$^{14}_{6}$C

Δ: 3019.894 *4* **S_n:** 8176.440 *10* **S_p:** 20831.3 *11*
Q_{β^-}: 156.475 *4*
σ_γ: <0.0010 mb

Populating Reactions and Decay Modes

A ^{14}B β^- decay (91Aj01)
B ^{18}N $\beta^-\alpha$ decay
C ^{9}Be(^{6}Li,p)
D ^{9}Be(Li,d)
E ^{11}B(α,p)
F ^{11}B(^{6}Li,^{3}He), (^{7}Li,α)
G ^{12}C(t,p)
H ^{12}C(α,2p)
I (n,γ)
J ^{13}C(n,n), (n,2n)
K ^{13}C(p,π^+)
L ^{13}C(d,p), (t,d)
M ^{14}C(e,e)
N ^{14}C(π,π)
O ^{14}C(α,α)
P ^{14}N(n,p)
Q ^{14}N(t,^{3}He)
R ^{15}N(d,^{3}He)

Levels and γ-ray branchings:

0, 0^+, 5730 *40* y, *[ACDEFGHIKLMNOPQR]*, %β^-=100, T=1

6093.8 *2*, 1^-, <7 fs, *[ACDEFGIKLMNOQR]*
γ_0 ***6092.4*** *2* ($\dagger_\gamma$100)

6589.4 *2*, 0^+, 3.0 *4* ps, *[CDEGIL]*
γ_{6094} ***495.35*** *10* ($\dagger_\gamma$100.0 *1*)
γ_0 ***6587.7*** *2* ($\dagger_e$1.1 *1*)

6728.2 *13*, 3^-, 66 *8* ps, *[ACDEFGHKLMNOQR]*, μ=0.816 *21*
γ_{6094} ***634.4*** *13* ($\dagger_\gamma$3.7 *13*)
γ_0 ***6726.5*** *13* ($\dagger_\gamma$100.1 *13*)

6902.6 *2*, 0^-, 25 *3* fs, *[CDFGILM]*
γ_{6094} ***808.8*** *3* ($\dagger_\gamma$100)

7012 *4*, 2^+, 9.0 *14* fs, *[CDEFGKLMNOR]*
γ_{6094} ***918*** *4* ($\dagger_\gamma$1.4 *7*)
γ_0 ***7010*** *4* ($\dagger_\gamma$100.0 *7*)

7341 *3*, 2^-, 111 *42* fs, *[ACDFGKLMOQR]*
γ_{6728} ***613*** *3* ($\dagger_\gamma$70 *7*)
γ_{6094} ***1248*** *3* ($\dagger_\gamma$100 *7*)
γ_0 ***7339*** *3* ($\dagger_\gamma$34 *7*)

8317.9 *8*, 2^+, Γ=3.4 *7* keV, *[CDEFGHIJKLMNOQ]*, %IT=?, %n=?

9746 *7*, 0^+, *[GR]*

9801 *6*, 3^-, Γ=45 *12* keV, *[CEFGJKLMOR]*, %IT=?, %n=?

10425 *5*, 2^+, *[CEGJKLMOR]*, %n=100

10449 *7*, ≥1, *[CEFGJKR]*, %n=100

10498 *4*, (3^-), Γ=26 *8* keV, *[CFGJKLN]*, %n=100

10736 *5*, 4^+, Γ=20 *7* keV, *[CEFGHKLO]*

11306 *15*, 1^+, Γ=46 *12* keV, *[CEJMOR]*, %IT=0.015 *5*, %n=99.985 *5*
γ_0 ***11301*** *15* ($\dagger_\gamma$100)

11395 *8*, 1^-, Γ=22 *7* keV, *[CEFGLO]*, %n=100

11500 (?), 1^- and 2^-, *[J]*, %n=100

11666 *10*, 4^-, Γ=20 *7* keV, *[CEFGHKLMNOR]*

11730 *9*, (5^-), *[CEFGHKN]*

11900 *300*, (1^-), Γ=950 *300* keV, *[JL]*, %n=100

12583 *10*, (2^-,3^-), Γ=95 *15* keV, *[CCFGJLNOR]*, %n=100

12863 *8*, Γ=30 *10* keV, *[CFGJKLM]*, %n=100

12963 *9*, (3^-), Γ=30 *10* keV, *[CFGJLO]*, %n=100

13500 *100* (?), Γ<200 keV, *[K]*

13700, 2^-, Γ≈ 1800 keV, *[J]*, %n=100

14050 *100* (?), Γ<200 keV, *[K]*

14667 *20*, (4^+), Γ=57 *15* keV, *[CEFJ]*, %n=100

14868 *20*, (6^+,5^-), *[CEFGHKR]*

15200 *23*, 4^-, *[CEFKMN]*

15370 *30* (?), *[C]*

15440 *40*, (3^-), *[CJ]*, %n=100

16020 *50* (?), (4^+), *[CJ]*, %n=100

16430 *16*, *[CEFG]*

16570 *40* (?), *[C]*

16715 *30*, (1^+), Γ≈ 200 keV, *[CEI]*, %IT=?, %n=?

17300 *30*, 4^-, *[CEFMN]*

17500 (?), (1^+), Γ≈ 200 keV, *[I]*, %IT=?, %n=?

17950 *40*, *[C]*

18100 *40*, *[C]*

18500, *[K]*

20400, *[P]*

21400 (?), *[E]*

22100 *100*, (2^-), *[M]*, T=(2)

23288 *15*, Γ≈ 50 keV, *[EK]*

24400 *100*, 4^-, Γ<300 keV, *[MN]*, T=(2)

24500, *[KN]*

$^{14}_{7}$N

%: 99.634 *9*
Δ: 2863.419 *20* **S_n:** 10553.4 *3* **S_p:** 7550.56
σ_γ: 0.075 *8* b , **σ_p:** 1.83 *3* b

Populating Reactions and Decay Modes

A ^{14}C β^- decay (91Aj01)
B ^{14}O β^+ decay (91Aj01)
C ^{10}B(α,n)
D ^{10}B(^{6}Li,d)
E ^{10}B(^{7}Li,t)
F ^{11}B(^{3}He,x)
G ^{11}B(^{6}Li,t)
H ^{12}C(d,n), (d,p), (d,2p)
I ^{12}C(d,d)
J ^{12}C(d,α)
K ^{12}C(He,p)
L ^{12}C(^{6}Li,α)
M ^{13}C(p,γ)
N ^{13}C(p,p)
O ^{13}C(p,n)
P ^{13}C(d,n)
Q ^{13}C(^{3}He,d)
R ^{14}N(e,e)
S ^{14}N(π,π)
T ^{14}N(p,p), (p,2p), (p,pd), (p,pα)
U ^{14}N(α,α)
V ^{15}N(p,d)
W ^{15}N(d,t)
X ^{15}N(^{3}He,α)

Levels and γ-ray branchings:

0, 1^+, stable, *[ABDEFKLMPQRSTUVWX]*,
T=0, μ=+0.40376100 *6*, Q=+0.0193 *8*

2312.798 *11*, 0^+, 68 *3* fs,
[BKLMPQRTVWX], T=1
γ_0***2312.593*** *11* ($\dagger_\gamma$100)

3948.10 *20*, 1^+, 4.8 *18* fs,
[BDEKLMPQSTUVWX], T=0
γ_{2313}***1635.20*** *20* ($\dagger_\gamma$100.0 *3*)
γ_0***3947.50*** *20* ($\dagger_\gamma$4.1 *2*) [M1+E2]: δ=+2.8 *3*

4915.1 *14*, 0^-, 5.3 *10* fs,
[DEKLPQSTUVWX], T=0
γ_{3948}***967.0*** *14* ($\dagger_\gamma$<0.5)
γ_{2313}***2602.0*** *14* ($\dagger_\gamma$<1)
γ_0***4914.2*** *14* ($\dagger_\gamma$100 *3*)

5105.89 *10*, 2^-, 4.35 *5* ps,
[DEKLPQSTUVWX], T=0, μ=1.32 *8*
γ_{3948}***1157.74*** *23* ($\dagger_\gamma$0.9 *5*)
γ_{2313}***2792.79*** *10* ($\dagger_\gamma$24.3 *15*)
γ_0***5104.89*** *10* ($\dagger_\gamma$100.0 *13*)

5691.44 *13*, 1^-, 11 *6* fs,
[DEKLMPQSTUVWX], T=0
γ_{2313}***3378.20*** *13* ($\dagger_\gamma$100.0 *19*)
γ_0***5690.20*** *13* ($\dagger_\gamma$56.5 *19*)

5834.25 *14*, 3^-, 8.30 *16* ps,
[DEGKLPQSTUVWX], T=0, μ>1.5,
μ<2.55
γ_{5106}***728.34*** *17* ($\dagger_\gamma$100.0 *17*)
[M1+E2]: δ=+0.044 *22*
γ_0***5832.94*** *14* ($\dagger_\gamma$27.1 *17*)
[M2+E3]: δ=−1.20 *22*

6203.5 *6*, 1^+, 111 *14* fs,
[DEKLMPQTUVWX], T=0
γ_{2313}***3890.1*** *6* ($\dagger_\gamma$100.0 *26*)
γ_0***6202.0*** *6* ($\dagger_\gamma$30.0 *26*) [M1+E2]: δ=−0.19 *4*

6446.17 *10*, 3^+, 430 *42* fs,
[DEKLMPQTUVWX], T=0
γ_{5834}***611.91*** *17* ($\dagger_\gamma$5.3 *9*)
γ_{5106}***1340.21*** *14* ($\dagger_\gamma$9.3 *9*)
γ_{3948}***2497.83*** *23* ($\dagger_\gamma$28.1 *14*)
γ_0***6444.58*** *10* ($\dagger_\gamma$100.0 *21*)

7029.12 *12*, 2^+, 3.7 *4* fs,
[DEKLMPPQSTUVWX], T=0
γ_{3948}***3080.7*** *23* ($\dagger_\gamma$0.91 *25*)
γ_{2313}***4715.47*** *12* ($\dagger_\gamma$0.5 *1*)
γ_0***7027.22*** *12* ($\dagger_\gamma$100.0 *3*)
[M1+E2]: δ=−0.74 *9*

7966.9 *5*, 2^-, Γ=2.5 *7* eV,
[DEKLMQTUVWX], Γ_γ=0.018 eV,
T=0, %IT=0.7 *2*, %p=99.3 *2*
γ_{3948}***4018.2*** *5* ($\dagger_\gamma$82 *6*)
γ_0***7964.5*** *5* ($\dagger_\gamma$100 *6*)

8062.0 *10*, 1^-, Γ=23 *1* keV, *[KMNPQTVX]*,
Γ_γ=12.3 *26* eV, T=1, %IT=0.053 *12*,
%p=99.947 *12*
γ_{5691}***2371*** *10* ($\dagger_\gamma$4.4 *5*)
γ_{5106}***2956*** *10* ($\dagger_\gamma$0.31 *18*)
γ_{4915}***3147*** *10* ($\dagger_\gamma$2.32 *18*)
γ_{3948}***4113*** *10* ($\dagger_\gamma$15.8 *5*)
γ_{2313}***5748*** *10* ($\dagger_\gamma$1.74 *18*)
γ_0***8060*** *10* ($\dagger_\gamma$100.0 *8*)

8490 *2*, 4^-, 13.2 *21* fs, *[DEKLMPQSTUW]*,
Γ_γ=0.0074 *25* eV, T=0, %IT=21 *8*,
%p=79 *8*
γ_{5834}***2656*** *2* ($\dagger_\gamma$20 *4*)
γ_{5106}***3384*** *2* ($\dagger_\gamma$100 *4*)

8618 *2*, 0^+, Γ=3.8 *3* keV, *[KMNPQTVX]*,
Γ_γ=5.25 eV, T=1, %IT=0.14,
%p=99.86
γ_{6204}***2414*** *2* ($\dagger_\gamma$100)
γ_{5691}***2927*** *2* ($\dagger_\gamma$32)
γ_{3948}***4670*** *2* ($\dagger_\gamma$60)
γ_0***8615*** *2* ($\dagger_\gamma$58)

8776 *7*, 0^-, Γ=410 *20* keV, *[MNQ]*,
Γ_γ=46 *12* eV, T=1, %IT=0.011 *3*,
%p=99.989 *3*
γ_0***8773*** *7* ($\dagger_\gamma$100)

8907 *3*, 3^-, Γ=16 *2* keV, *[KMNPQRTVX]*,
Γ_γ=0.38 *4* eV, T=1, %IT=0.0024 *4*,
%p=99.9977 *4*
γ_{7029}***1878*** *3* ($\dagger_\gamma$3.9 *6*)
γ_{6446}***2461*** *3* ($\dagger_\gamma$6.3 *7*)
γ_{5834}***3073*** *3* ($\dagger_\gamma$100.0 *11*)
γ_{5106}***3800*** *3* ($\dagger_\gamma$5.0 *6*)
γ_0***8904*** *3* ($\dagger_\gamma$3.4 *4*)

(continued on next page)

8964 *2*, 5^+, 73 *12* fs, *[EGKLMPQV]*, Γ_γ=0.0012 *2* eV, T=0, %IT=19 *5*, %p=81 *5*
γ_{6446} ***2518*** *2* ($\dagger_\gamma$100)
γ_0 ***8961*** *2* ($\dagger_\gamma$<1)

8980 *3*, 2^+, Γ=8 *2* keV, *[DEKMNPQV]*, %IT=?, %p=?, T=(0)

9129.0 *5*, 3^+, 9 *4* fs, *[DEKMPQU]*, Γ_γ=0.0103 *11* eV, T=0, %IT=20 *9*, %p=80 *9*
γ_{6446} ***2682.7*** *5* ($\dagger_\gamma$11 *4*)
γ_{5834} ***3294.4*** *5* ($\dagger_\gamma$11 *4*)
γ_0 ***9125.8*** *5* ($\dagger_\gamma$100 *4*)

9172.25 *12*, 2^+, Γ=122 *8* eV, *[KMPQRTVWX]*, Γ_γ=6.3 *3* eV, T=1, %IT=5.2 *4*, %p=94.8 *4*
γ_{7029} ***2142.95*** *17* ($\dagger_\gamma$3.7 *4*)
[M1+E2]: δ=+0.037 *15*
γ_{6446} ***2725.79*** *16* ($\dagger_\gamma$10.4 *10*)
[M1+E2]: δ=−0.031 *6*
γ_{5834} ***3337.59*** *19* ($\dagger_\gamma$0.72 *10*)
γ_{5691} ***3480.35*** *18* ($\dagger_\gamma$0.58 *12*)
γ_{2313} ***6857.65*** *12* ($\dagger_\gamma$1.00 *10*)
γ_0 ***9169.02*** *12* ($\dagger_\gamma$100.0 *12*)

9388 *3*, 2^-, Γ=13 *3* keV, *[DEKLMNPQTUVWX]*, %p=100, T=0

9509 *3*, 2^-, Γ=41 *2* keV, *[KMNPQTVWX]*, Γ_γ=4.0 *4* eV, T=1, %IT=0.0098 *11*, %p=99.9902 *11*
γ_{5834} ***3674*** *3* ($\dagger_\gamma$22.1 *20*)
γ_{5106} ***4402*** *3* ($\dagger_\gamma$100 *6*)
γ_{3948} ***5560*** *3* ($\dagger_\gamma$8.7 *7*)
γ_0 ***9506*** *3* ($\dagger_\gamma$0.79 *13*)

9703 *4*, 1^+, Γ=15 *3* keV, *[DKLMNPQTVWX]*, Γ_γ=0.061 *7* eV, T=0, %IT=0.00041 *10*, %p=99.99959 *10*
γ_{2313} ***7388*** *4* ($\dagger_\gamma$100 *12*)
γ_0 ***9699*** *4* ($\dagger_\gamma$43 *12*)

10079 *10*, (3^+), Γ<10 keV, *[DEGKLQ]*

10101 *15*, 2^+,1^+, Γ=12 *3* keV, *[KLMNQTVW]*, Γ_γ=0.21 *2* eV, T=0, %IT=0.0017 *5*, %p=99.9983 *5*
γ_0 ***10097*** *15* ($\dagger_\gamma$100)

10226 *8*, $1(^-)$, Γ=80 *15* keV, *[KLMNQV]*, Γ_γ=4.0 *13* eV, T=0, %IT=0.0050 *19*, %p=99.9950 *19*
γ_{2313} ***7910*** *8* ($\dagger_\gamma$100)

10432 *7*, 2^+, Γ=33 *3* keV, *[GKMNRVWX]*, Γ_γ=13.0 *6* eV, T=1, %IT=0.039 *4*, %p=99.961 *4*
γ_{7029} ***3401*** *7* ($\dagger_\gamma$7.8 *4*)
γ_{6446} ***3984*** *7* ($\dagger_\gamma$7.8 *4*)
γ_{5691} ***4739*** *7* ($\dagger_\gamma$1.9 *5*)
γ_{5106} ***5324*** *7* ($\dagger_\gamma$2.9 *3*)
γ_0 ***10427*** *7* ($\dagger_\gamma$100 *4*)

10534 *20*, (1^-), Γ=140 keV, *[KNQ]*, %p=100

10812 *15*, 5^+, Γ=0.39 *16* eV, *[DEGKLQU]*, Γ_γ=0.016 *7* eV, T=0, %IT=4.1 *8*, %p=95.9 *8*
γ_{6446} ***4365*** *15* ($\dagger_\gamma$100)

11000 *30*, Γ=165 *30* keV, *[M]*, %IT=?, %p=?

11050 *5*, 3^+, Γ=1.2 *4* keV, *[DEKLMMQVW]*, Γ_γ=0.21 *3* eV, %IT=0.018 *7*, %p=99.982 *7*
γ_{3948} ***7100*** *15* ($\dagger_\gamma$75 *17*)
γ_0 ***11045*** *15* ($\dagger_\gamma$100 *17*)

11070, 1^+, Γ=100 keV, *[HNO]*, %n=?, %p=?, T=0

11210 *30*, Γ=220 *30* keV, *[H]*, %IT=?, %p=?, T=1

11240 *15*, 3^-, Γ=11 keV, *[GKNOQRSTUV]*, %IT=?, %n=?, %p=?, T=0

11270 *15*, 2^-, Γ=180 keV, *[DHILNOQV]*, %n=?, %p=?, T=0

11357 *15*, 1^+, Γ=30 keV, *[HIKNOV]*, %n=?, %p=?, T=0

11513.5 *15*, 2^+,3^+, Γ=7.0 *5* keV, *[DEGHIKLQRVW]*, %p=?

11676 *18*, 1^-,2^-, Γ=150 *20* keV, *[HIOQV]*, %n=?, %p=?

11741 *6*, 1^-,2^-, Γ=40 *9* keV, *[H]*, %IT=?, %p=?

11761 *6*, 3^-,4^-, Γ=78 *6* keV, *[H]*, %IT=?, %p=?

11807 *7*, 2^-,(1^+), Γ=119 *9* keV, *[HI]*, %n=?, %p=?

11874 *6*, 2^-,(1^-), Γ=101 *9* keV, *[HO]*, %n=?, %p=?

12200 *19*, 1^-,2^-, Γ=300 *30* keV, *[HIOV]*, %n=?, %p=?

12408 *3*, (4^-), Γ=34 *3* keV, *[CHIL]*, %n=?, %p=?, %α=?

12418 *3*, 3^-,4^-, Γ=41 *4* keV, *[DGHK]*, %p=?

12495 *9*, (1^+), Γ=39 *5* keV, *[CHKMRVWX]*, %IT=?, %n=?, %p=?, %α=?, T=(1)

12594 *3*, 3^+, Γ=48 *2* keV, *[CHIKOUV]*, %n=?, %p=?, %α=?

12690 *5*, 3^-, Γ=18 *5* keV, *[CDEGHKLOU]*, %n=?, %p=?, %α=?

12708 *9*(?), Γ=43 *15* keV, *[H]*, %p=?

12789 *5*, 4^+, Γ=16 *3* keV, *[CEGHIKTUV]*, %n=?, %p=?, %α=?

12813 *4*, 4^-, Γ=5 *2* keV, *[CDEHIRSTUVW]*, %IT=?, %p=?, %α=?

12826 *6*, Γ=11 *3* keV, *[HI]*, %n=?, %p=?

12857 *6*, Γ=78 *10* keV, *[HLO]*, %n=?, %p=?

12883 *8*, Γ=134 *11* keV, *[H]*, %p=?

12922 *5*, 4^+, Γ=22 *4* keV, *[CGHI]*, %p=?, %α=?

13007 *17*, Γ=120 *30* keV, *[DEM]*, %IT=?, %p=?

13167 *5*, 1^+, Γ=15 *5* keV, *[CDKRV]*, %IT=?, %n=?, %p=?, %α=?

13192 *9*, 3^+, Γ=65 *10* keV, *[GV]*, %α=100

(continued on next page)

13243 *10*, 2^-, Γ=92 *5* keV, *[CORUV]*, %IT=?, %n=?, %p=?, %α=?

13300 *40*, (2^-), Γ=1000 *150* keV, *[M]*, %IT=?, %p=?, T=1

13656 *5*, (2^+,3^+), Γ≈ 90 keV, *[CHI]*, %n=?, %p=?, %α=?

13714 *5*, 2^-,3^+, Γ=105 *25* keV, *[CDG]*, %IT=?, %n=?, %p=?, %α=?

13740 *10*, 1^+, Γ=180 *20* keV, *[CHIMORVWX]*, %IT=?, %n=?, %p=?, %α=?, T=1

13770 *10*, (1^+), Γ=120 keV, *[C]*, %p=?, %α=?

14040 *30*, Γ=100 keV, *[CHIO]*, %n=?, %p=?, %α=?

14160 *30*, Γ=230 keV, *[CHI]*, %n=?, %p=?, %α=?

14250 *50*, 3^+, Γ=420 *100* keV, *[C]*, %p=?, %α=?

14300 *20*, Γ=150 keV, *[C]*, %p=?, %α=?

14560 *20*, Γ=100 keV, *[CG]*, %n=?, %p=?, %α=?

14590 *30*, Γ=50 keV, *[CG]*, %n=?, %p=?, %α=?

14660 *10*, 5^-, Γ=100 *20* keV, *[S]*, %α=100, T=0

14730 *25*, (2^-), Γ=125 keV, *[C]*, %IT=?, %n=?, %p=?, %α=?, T=(1)

14860 *30*, Γ=140 keV, *[CDGHIJLO]*, %n=?, %p=?, %α=?

14920 *30*, Γ=43 *8* keV, *[CGKO]*, %n=?, %p=?, %α=?

15020 *20*, 3^-,4^-, Γ≈ 60 keV, *[DORS]*, %IT=?, %n=?, %p=?, %α=?, T=1

15240 *20*, Γ=100 keV, *[CDEGHI]*, %p=?, %α=?

15430 *20*, Γ=100 keV, *[CHJL]*, %n=?, %p=?, %α=?

15700 *50*, Γ=350 keV, *[DHIJKLOR]*, %IT=?, %n=?, %p=?, %α=?

16210 *20*, Γ=125 keV, *[CLOW]*, %n=?, %p=?, %α=?

16400 *20*, Γ=150 keV, *[CJ]*, %p=?, %α=?

16650 *25*, 4^+, Γ=240 *25* keV, *[J]*, %α=?, T=0+1

16910 *20*, 5^-, Γ=170 *25* keV, *[GRS]*, T=1

16910 *30*, 4^+, Γ=290 *30* keV, *[J]*, %p=?, %α=?, T=0+1

16920 *20*, 2^+, Γ=830 *170* keV, *[J]*, %α=?, T=0+1

17030 *50*, 3^-, Γ=245 *50* keV, *[J]*, %α=?, T=0+1

17170 *30*, 1^-, Γ=300 *30* keV, *[GJLR]*, %IT=?, %p=?, %α=?, T=0+1

17310 *30*, 4^+, Γ=275 *30* keV, *[JX]*, %α=?, T=0+1

17400 *25*, 4^+, Γ=245 *25* keV, *[J]*, %α=?, T=0+1

17460, 5^-, *[S]*, T=0

17850 *50*, 4^+, Γ=475 *50* keV, *[J]*, %α=?, T=0+1

17850 *50*, 3^-, Γ=440 *50* keV, *[J]*, %α=?, T=0+1

17930 *70*, 2^+, Γ=340 *70* keV, *[J]*, %α=?, T=0+1

18020 *60*, 3^-, Γ=570 *60* keV, *[J]*, %α=?, T=0+1

18140 *50*, 4^+, Γ=480 *50* keV, *[J]*, %α=?, T=0+1

18350 *60*, 1^-, Γ=560 *60* keV, *[J]*, %α=?, T=0+1

18430 *65*, 4^+, Γ=315 *65* keV, *[J]*, %α=?, T=0+1

18500 *10*, 5^-, Γ=62 *10* keV, *[JR]*, %α=?, T=0+1

18530 *80*, 2^+, Γ=410 *80* keV, *[J]*, %α=?, T=0+1

18530 *60*, 3^-, Γ=310 *60* keV, *[J]*, %α=?, T=0+1

18640 *70*, 3^-, Γ=675 *70* keV, *[JS]*, %α=?, T=0+1

18780 *35*, 1^-, Γ=315 *35* keV, *[J]*, %α=?, T=0+1

18880 *50*, 4^+, Γ=475 *50* keV, *[J]*, %α=?, T=0+1

18930 *50*, 2^+,3^-, Γ=450 *50* keV, *[J]*, %α=?, T=0+1

19100 *90*, 3^-, Γ=870 *90* keV, *[J]*, %α=?, T=0+1

19900 *60*, 2^+, Γ=575 *60* keV, *[J]*, %α=?, T=0+1

19990 *50*, 1^-, Γ=510 *50* keV, *[J]*, %α=?, T=0+1

20110 *200* (?), 3^-,4^-, Γ=120 *20* keV, *[RS]*, T=0+1

20630 *110*, 4^+, Γ=1100 *110* keV, *[J]*, %α=?, T=0+1

20650 *60*, 5^-, Γ=610 *60* keV, *[J]*, %α=?, T=0+1

21240 *50*, 4^+, Γ=415 *50* keV, *[J]*, %α=?, T=0+1

21510 *25*, 3^-, Γ=235 *25* keV, *[J]*, %α=?, T=0+1

21530 *75*, 5^-, Γ=360 *75* keV, *[J]*, %α=?, T=0+1

21680 *40*, 4^+, Γ=360 *40* keV, *[J]*, %α=?, T=0+1

21800, 4^+, Γ=650 keV, *[F]*, %IT=?, T=0+1

22260 *15*, 4^+, Γ=65 *15* keV, *[J]*, %α=?, T=0+1

22310 *60*, 5^-, Γ=570 *60* keV, *[J]*, %α=?, T=0+1

22500, 2^-, *[M]*, %IT=?, %p=?, T=1

23000, 2^-, Γ≈ 3000 keV, *[M]*, %IT=?, %n=?, %p=?, T=1

(continued on next page)

$^{14}_{7}$N (continued)

23400 *70*, 5^-, Γ=640 *70* keV, *[J]*, %α=?, T=0+1

24000, $\Gamma\approx$ 1000 keV, *[F]*, %n=?, %α=?

$^{14}_{8}$O

Δ: 8006.46 *7* **S$_n$:** 23176 *10* **S$_p$:** 4628.0 *3*
Q$_{EC}$: 5143.04 *7*

Populating Reactions and Decay Modes

A ^{15}F p decay
B ^{16}Ne 2p decay
C ^{9}Be(^{13}C,^{8}He), (^{14}C,^{9}He)
D ^{12}C(^{3}He,n)
E ^{12}C(^{12}C,^{10}Be), (^{14}N,^{12}B)
F ^{13}C(p,π^-)
G ^{13}N(p,γ)
H ^{14}C(π^+,π^-)
I ^{14}N(p,n)
J ^{14}N(^{3}He,t)
K ^{16}O(p,t)

Levels:

0, 0^+, 70.606 *18* s, *[CDEFHIJK]*,
%EC+%β^+=100, T=1

5173 *10*, 1^-, Γ=38.1 *18* keV, *[DFGIJK]*, T=1

5920 *10*, 0^+, Γ<50 keV, *[DJK]*, %p=100, T=1

6272 *10*, 3^-, Γ=103 *6* keV, *[DEFJK]*, %p=100,
T=1

6590 *10*, 2^+, Γ<60 keV, *[DEFJK]*, %p=100, T=1

6790 *30* (?), $^-$, *[FJ]*

7768 *10*, 2^+, Γ=76 *10* keV, *[DFIJK]*, %p=100,
T=1

8720 *40* (?), *[JK]*

9715 *20*, (2^+), *[DFK]*, T=1

9915 *20*, 4^+, Γ=100 *50* keV, *[DEFJ]*, T=1

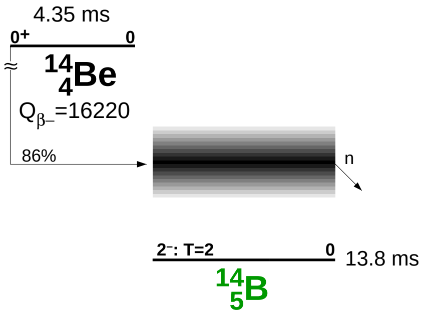
10890 *50*, *[FJ]*
11240 *50*, *[J]*
11970, *[FJ]*
12840 *50*, *[J]*
13010 *50*, *[J]*

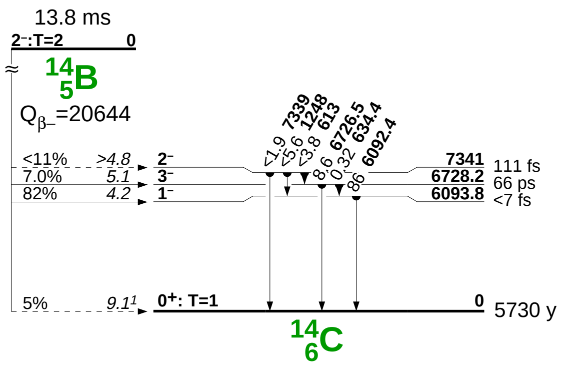
14150 *40*, (5^-), *[EFJ]*
14640 *60*, *[FJ]*

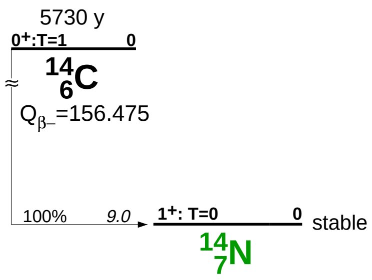
17400 *60*, *[FJ]*

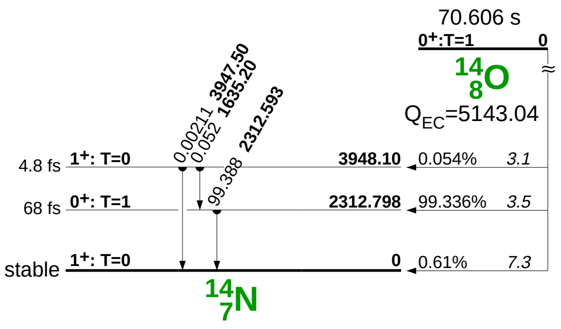
γ(*^{14}N*) from ^{14}O (70.606 s) β^+ decay **<** *for Iγ% multiply by 1.0* **>**

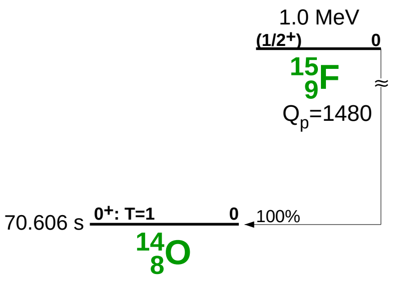
1635.20 *20* (†$_\gamma$0.052 *2*)
2312.593 *11* (†$_\gamma$99.388 *11*)
3947.50 *20* (†$_\gamma$0.00211 *13*)
[M1+E2]: δ=+2.8 *3*

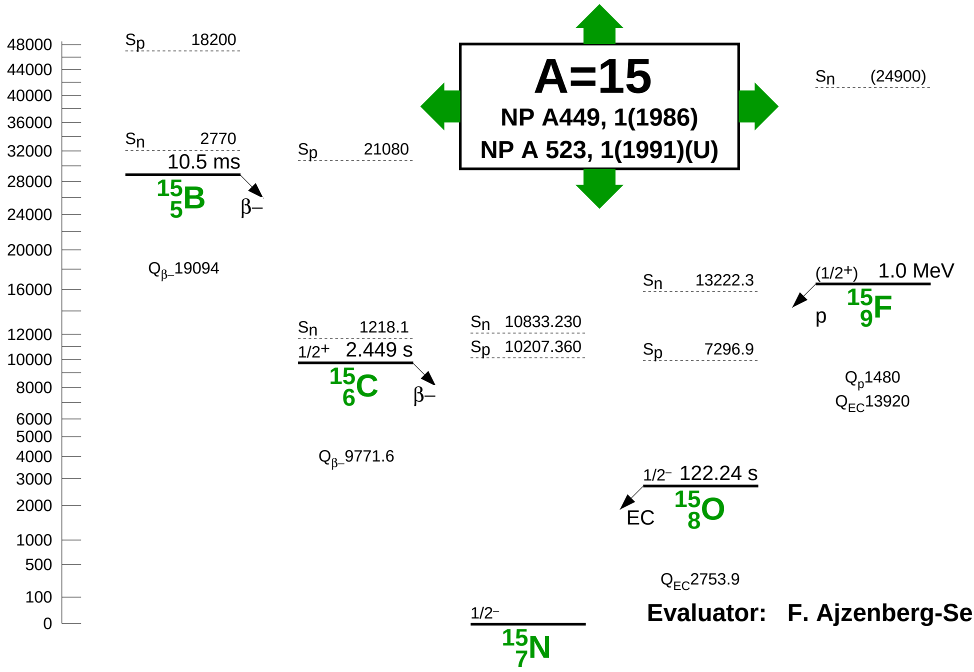

4.35 ms
0+
0
≈
$^{14}_{4}Be$
$Q_{\beta-}$=16220
86%
n
2⁻: T=2
0
13.8 ms
$^{14}_{5}B$


13.8 ms
2⁻:T=2
0
14 5 B
Qβ−=20644
<11%
>4.8
2⁻
7.0%
5.1
3⁻
82%
4.2
1⁻
5%
9.1¹
0⁺: T=1
<1.9 7339
<5.6 1248
<3.8 613
8.6 6726.5
0.32 634.4
86 6092.4
7341
111 fs
6728.2
66 ps
6093.8
<7 fs
0
5730 y
14 6 C


5730 y
0+:T=1
0
14 6 C
≈
Qβ−=156.475
100%
9.0
1+: T=0
0
stable
14 7 N


70.606 s
0+:T=1 0
14 8 O
QEC=5143.04
4.8 fs 1+: T=0 3948.10 0.054% 3.1
68 fs 0+: T=1 2312.798 99.336% 3.5
stable 1+: T=0 0 0.61% 7.3
0.00211 3947.50
0.052 1635.20
99.388 2312.593
14 7 N


1.0 MeV
(1/2+)
0
15 9 F
Qp=1480
≈
70.606 s
0+: T=1
0
100%
14 8 O



Evaluator: F. Ajzenberg-Selove

$^{15}_{5}$B

Δ: 28967 *22*   **S_n:** 2770 *30*   **S_p:** 18200 *110*
$Q_{\beta-}$: 19094 *22*

Populating Reactions and Decay Modes

^{48}Ca(^{18}O,^{51}V) (91Aj01)

Levels:

0, 10.5 *3* ms, %β^-=100

β^- decay :

740.0 *15* (†$_\gamma$100)

$^{15}_{6}$C

Δ: 9873.1 *8* **S_n:** 1218.1 *8* **S_p:** 21080 *21*
$Q_{\beta-}$: 9771.6 *8*

Populating Reactions and Decay Modes

A ^{15}B β^- decay
B ^{9}Be(^{7}Li,p)
C ^{13}C(t,p)
D ^{13}C(α,2p)
E ^{14}C(n,γ)
F ^{14}C(d,p)
G ^{14}C(^{13}C,^{12}C)
H ^{15}N(π^-,γ)
I ^{16}O(^{7}Li,^{8}B)

Levels and γ-ray branchings:

0, $1/2^+$, 2.449 *5* s, *[ABCDEFGI]*, %β^-=100, T=3/2, μ=1.32 *7*

740.0 *15*, $5/2^+$, 2.61 *7* ns, *[BCDGH]*, μ=–1.76 *3*
  γ_0 ***740.0*** *15* ($\dagger_\gamma$100)

3103 *4*, $1/2^-$, Γ<40 keV, *[BCI]*
4220 *3*, $5/2^-$, Γ<14 keV, *[BC]*
4657 *9*, $3/2^-$, *[BC]*
4780 *100*, $3/2^+$, Γ=1740 *400* keV, *[F]*
5833 *20*, ($3/2^+$), Γ=64 *8* keV, *[BF]*
5866 *8*, $1/2^-$, *[BC]*
6358 *6*, (5/2,$7/2^+$,$9/2^+$), Γ<20 keV, *[BC]*
6417 *6*, (3/2 to 7/2), Γ≈ 50 keV, *[BC]*
6449 *7*, ($9/2^-$,11/2), Γ<14 keV, *[BC]*
6536 *4*, Γ<14 keV, *[BC]*
6626 *8*, (3/2), Γ=20 *10* keV, *[BC]*
6841 *4*, Γ<14 keV, *[BC]*
6881 *4*, (9/2), Γ<20 keV, *[BC]*
7095 *4*, (3/2), Γ<15 keV, *[BC]*
7352 *6*, (9/2,11/2), Γ=20 *10* keV, *[BD]*
7414 *20*, *[B]*
7750 *30*, *[B]*
8010 *30*, *[B]*
8110 *10*, *[B]*
8470 *15*, (9/2 to 13/2), Γ=40 *15* keV, *[B]*
8559 *15*, (7/2 to 13/2), Γ=40 *15* keV, *[B]*
9000 *30*, *[B]*
9730 *30* (?), *[B]*
9789 *20*, (9/2 to 15/2), Γ=20 *15* keV, *[B]*
10248 *20*, (5/2 to 9/2), Γ=20 *15* keV, *[B]*
11015 *25*, *[B]*
11123 *25*, (11/2 to 19/2), Γ=30 *20* keV, *[B]*
11680 *30* (?), *[B]*
11825 *20*, ≥13/2, Γ=70 *30* keV, *[B]*

γ*(^{15}N)* from ^{15}C (2.449 s) β^- decay **<** *for Iγ% multiply by 1.0* **>**

977.02 *2* ($\dagger_\gamma$<2.4×10^{-5})
1011.75 *4* ($\dagger_\gamma$0.0018 *4*)
1157.52 *4* ($\dagger_\gamma$0.0005 *3*)
1416.28 *12* ($\dagger_\gamma$0.00047 *10*)
1748.77 *7* ($\dagger_\gamma$0.00041 *14*)
1884.77 *2* ($\dagger_\gamma$0.0010 *3*)
  [M1+E2]: δ=+0.014 $^{+15}_{-12}$
1988.70 *4* ($\dagger_\gamma$0.0018 *5*)
2001.86 *2* ($\dagger_\gamma$1.9×10^{-5} *10*)
2030.53 *2* ($\dagger_\gamma$5.8×10^{-5} *12*)
2247.44 *12* ($\dagger_\gamma$0.00018 *8*)
2725.66 *7* ($\dagger_\gamma$0.0015 *4*)
3013.47 *3* ($\dagger_\gamma$0.0041 *10*)
3042.13 *3* ($\dagger_\gamma$<0.0014)
3300.85 *12* ($\dagger_\gamma$0.0084 *14*)
  [M1+E2]: δ=+0.091 *7*
3779.04 *7* ($\dagger_\gamma$0.0012 *4*)
5269.161 *14* ($\dagger_\gamma$0.0037 *9*)
  [M2+E3]: δ=–0.131 *13*
5297.817 *14* ($\dagger_\gamma$63.2 *8*)
6322.35 *2* ($\dagger_\gamma$0.0055 *20*)
  [M1+E2]: δ=–0.132 *4*
7298.92 *2* ($\dagger_\gamma$0.0095 *10*)
  [E1+M2]: δ=–0.017 $^{+5}_{-8}$
8310.15 *3* ($\dagger_\gamma$0.032 *4*)
8568.77 *12* ($\dagger_\gamma$0.0043 *7*)
  [E1+M2]: δ=–0.085 $^{+5}_{-9}$
9046.78 *7* ($\dagger_\gamma$0.031 *3*)

$^{15}_{7}$N

%: 0.366 *9*
Δ: 101.508 *11* **S_n:** 10833.230 *10*
S_p: 10207.360 *10*
σ_γ: 0.024 *8* mb

Populating Reactions and Decay Modes

A ^{15}C β^- decay (91Aj01)
B ^{15}O β^+ decay (91Aj01)
C ^{16}C β^-n decay
D ^{10}B(^{7}Li,d)
E ^{11}B(α,γ)
F ^{11}B(α,n), (α,p)
G ^{11}B(α,α)
H ^{11}B(^{6}Li,d)
I ^{11}B(^{7}Li,t)
J ^{12}C(t,γ), (t,n), (t,p)
K ^{12}C(^{6}Li,^{3}He)
L ^{12}C(^{7}Li,α)
M ^{13}C(d,t), (d,^{3}He), (d,α)
N ^{13}C(^{3}He,p)
O ^{13}C(α,d)
P ^{14}C(p,γ)
Q ^{14}C(p,n)
R ^{14}C(n,n)
S ^{14}N(n,p), (n,d), (n,t), (n,α)
T ^{14}N(d,p)
U ^{12}C(α,p)
V ^{15}N(γ,x)

Levels and γ-ray branchings:

0, 1/2$^-$, stable, *[ABDEJKLNOPSTUV]*,
T=1/2, μ=−0.28318884 *5*

5270.155 *14*, 5/2$^+$, 1.79 *10* ps, *[ADKNOTU]*,
μ=+2.35 *18*
γ_0 ***5269.161*** *14* ($\dagger_\gamma$100)
[M2+E3]: δ=−0.131 *13*

5298.822 *14*, 1/2$^+$, 17 *5* fs, *[ADHILNOTU]*
γ_0 ***5297.817*** *14* ($\dagger_\gamma$100)

6323.78 *2*, 3/2$^-$, 0.146 *8* fs, *[ADHILNTU]*
γ_0 ***6322.35*** *2* ($\dagger_\gamma$100) [M1+E2]: δ=−0.132 *4*
γ_{5299} ***1024.92*** *2* ($\dagger_\gamma$<0.05)
γ_{5270} ***1053.58*** *2* ($\dagger_\gamma$<0.1)

7155.05 *2*, 5/2$^+$, 12 *6* fs, *[ADKLNOTU]*
γ_{6324} ***831.27*** *2* ($\dagger_\gamma$<0.5)
γ_{5299} ***1856.11*** *2* ($\dagger_\gamma$<4)
γ_{5270} ***1884.77*** *2* ($\dagger_\gamma$100.0 *4*)
[M1(+E2)]: δ=+0.014 $^{+15}_{-12}$
γ_0 ***7153.22*** *2* ($\dagger_\gamma$0.023 *3*)

7300.83 *2*, 3/2$^+$, 0.42 *4* fs, *[ADLNOTU]*
γ_{6324} ***977.02*** *2* ($\dagger_\gamma$<0.25)
γ_{5299} ***2001.86*** *2* ($\dagger_\gamma$0.2 *1*)
γ_{5270} ***2030.53*** *2* ($\dagger_\gamma$0.6 *1*)
γ_0 ***7298.92*** *2* ($\dagger_\gamma$100.0 *7*)
[E1+M2]: δ=−0.017 $^{+5}_{-8}$

7567.1 *10*, 7/2$^+$, 8$^{+8}_{-4}$ fs, *[DHIKLNOTU]*
γ_{6324} ***1243.2*** *10* ($\dagger_\gamma$<0.6)
γ_{5299} ***2268.1*** *10* ($\dagger_\gamma$<4)
γ_{5270} ***2296.8*** *10* ($\dagger_\gamma$100.0 *10*)
[M1+E2]: δ=+0.028 *12*
γ_0 ***7565.0*** *10* ($\dagger_\gamma$1.3 *6*)

8312.62 *3*, 1/2$^+$, 1.2 *8* fs, *[ADLNOT]*
γ_{7301} ***1011.75*** *4* ($\dagger_\gamma$5.6 *9*)
γ_{7155} ***1157.52*** *4* ($\dagger_\gamma$1.5 *8*)
γ_{6324} ***1988.70*** *4* ($\dagger_\gamma$5.6 *13*)
γ_{5299} ***3013.47*** *3* ($\dagger_\gamma$12.7 *26*)
γ_{5270} ***3042.13*** *3* ($\dagger_\gamma$<4)
γ_0 ***8310.15*** *3* ($\dagger_\gamma$100.0 *25*)

8571.40 *12*, 3/2$^+$, 0.5 *5* fs, *[ADHIKLNOTU]*
γ_{7301} ***1270.51*** *12* ($\dagger_\gamma$<1.1)
γ_{7155} ***1416.28*** *12* ($\dagger_\gamma$5.5 *8*)
γ_{6324} ***2247.44*** *12* ($\dagger_\gamma$2.2 *10*)
γ_{5299} ***3272.20*** *12* ($\dagger_\gamma$<19)
γ_{5270} ***3300.85*** *12* ($\dagger_\gamma$100 *5*)
[M1+E2]: δ=+0.091 *7*
γ_0 ***8568.77*** *12* ($\dagger_\gamma$51 *3*)
[E1+M2]: δ=−0.085 $^{+5}_{-9}$

9049.71 *7*, 1/2$^+$, 0.35 *6* fs, *[ADNOT]*
γ_{8313} ***737.09*** *7* ($\dagger_\gamma$<0.6)
γ_{7301} ***1748.77*** *7* ($\dagger_\gamma$1.3 *4*)
γ_{7155} ***1894.53*** *7* ($\dagger_\gamma$<11)
γ_{6324} ***2725.66*** *7* ($\dagger_\gamma$4.9 *11*)
γ_{5270} ***3779.04*** *7* ($\dagger_\gamma$3.8 *11*)
γ_0 ***9046.78*** *7* ($\dagger_\gamma$100 *3*)

9151.90 *12*, 3/2$^-$, 0.97 *25* fs, *[DHINOT]*
γ_0 ***9148.90*** *12* ($\dagger_\gamma$100)

9154.90 *3*, 5/2$^+$, 5$^{+4}_{-2}$ fs, *[DLNT]*
γ_{7155} ***1996.71*** *12* ($\dagger_\gamma$100 *6*)
γ_{6324} ***2827.83*** *12* ($\dagger_\gamma$39 *4*)
γ_{5299} ***3852.55*** *12* ($\dagger_\gamma$18 *2*)
γ_{5270} ***3881.20*** *12* ($\dagger_\gamma$19 *2*)
γ_0 ***9148.90*** *12* ($\dagger_\gamma$<4)

9222.1 *8*, 1/2$^-$, <90 fs, *[NT]*
γ_{8313} ***909.5*** *8* ($\dagger_\gamma$<12)
γ_{7567} ***1654.9*** *8* ($\dagger_\gamma$<48)
γ_{7301} ***1921.2*** *8* ($\dagger_\gamma$6.2 *17*)
γ_{7155} ***2066.9*** *8* ($\dagger_\gamma$<2.4)
γ_{6324} ***2898.0*** *8* ($\dagger_\gamma$83 *15*)
γ_{5299} ***3922.7*** *8* ($\dagger_\gamma$100 *19*)
γ_0 ***9219.1*** *8* ($\dagger_\gamma$52 *12*)

9760 *1*, 5/2$^-$, 1.8 *6* fs, *[NT]*
γ_{8571} ***1188.9*** *10* ($\dagger_\gamma$<2.5)
γ_{8313} ***1447.3*** *10* ($\dagger_\gamma$<1.3)
γ_{7567} ***2192.7*** *10* ($\dagger_\gamma$6.1 *8*)
γ_{7301} ***2459.0*** *10* ($\dagger_\gamma$<2.5)
γ_{7155} ***2604.8*** *10* ($\dagger_\gamma$2.8 *6*)
γ_{6324} ***3435.8*** *10* ($\dagger_\gamma$4.5 *10*)
γ_{5270} ***4475*** *15* ($\dagger_\gamma$9.2 *19*)
γ_0 ***9756.6*** *10* ($\dagger_\gamma$100 *4*)

9829 *3*, 7/2$^-$, 12 *5* fs, *[DHIKLNT]*
γ_{7567} ***2262*** *3* ($\dagger_\gamma$8.6 *12*)
γ_{7301} ***2528*** *3* ($\dagger_\gamma$4.4 *11*)
γ_{7155} ***2674*** *3* ($\dagger_\gamma$2.8 *13*)
γ_{6324} ***3505*** *3* ($\dagger_\gamma$2.6 *11*)
γ_{5299} ***4529*** *3* ($\dagger_\gamma$<18)
γ_{5270} ***4558*** *3* ($\dagger_\gamma$≈100)
γ_0 ***9826*** *3* ($\dagger_\gamma$<4.7)

(continued on next page)

9925.0 *2*, 3/2^{-}, 0.21 *4* fs, *[LNT]*

- γ_{8571} ***1353.5*** *2* ($\dagger_{\gamma}$<1.3)
- γ_{8313} ***1612.3*** *2* ($\dagger_{\gamma}$<1.3)
- γ_{7567} ***2357.7*** *2* ($\dagger_{\gamma}$<1.3)
- γ_{7301} ***2624.0*** *2* ($\dagger_{\gamma}$2.7 *11*)
- γ_{7155} ***2769.7*** *2* ($\dagger_{\gamma}$<1.3)
- γ_{6324} ***3600.7*** *2* ($\dagger_{\gamma}$6.3 *16*)
- γ_{5299} ***4639.5*** *14* ($\dagger_{\gamma}$19.8 *20*)
- γ_{0} ***9921.5*** *2* ($\dagger_{\gamma}$100.0 *25*)

10066.0 *2*, 3/2^{+}, 0.069 *4* fs, *[LT]*

- γ_{8571} ***1494.5*** *2* ($\dagger_{\gamma}$<3)
- γ_{8313} ***1753.3*** *2* ($\dagger_{\gamma}$<2)
- γ_{7567} ***2498.7*** *2* ($\dagger_{\gamma}$<2)
- γ_{7301} ***2764.9*** *2* ($\dagger_{\gamma}$<2)
- γ_{7155} ***2910.7*** *2* ($\dagger_{\gamma}$<2)
- γ_{6324} ***3741.7*** *2* ($\dagger_{\gamma}$<2)
- γ_{5299} ***4781.5*** *15* ($\dagger_{\gamma}$4.2 *7*)
- γ_{0} ***10062.4*** *2* ($\dagger_{\gamma}$100.0 *7*)

10449.7 *3*, 5/2^{-}, Γ<0.5 keV, *[DHINPT]*, Γ_{γ}>0.024 eV, %IT=?, %p=?

- γ_{9829} ***620.7*** *3* ($\dagger_{\gamma}$<0.2)
- γ_{9152} ***1297.7*** *3* ($\dagger_{\gamma}$8.5 *2*)
  [M1+E2]: $\delta=+0.32^{+10}_{-9}$
- γ_{8571} ***1878.2*** *3* ($\dagger_{\gamma}$6.9 *11*)
- γ_{7155} ***3294.3*** *3* ($\dagger_{\gamma}$9.5 *2*)
  [E1+M2]: $\delta=+0.13^{+3}_{-4}$
- γ_{6324} ***4125.3*** *3* ($\dagger_{\gamma}$57 *3*)
  [M1+E2]: δ=+0.59 *13*
- γ_{5299} ***5150.0*** *3* ($\dagger_{\gamma}$<3.6)
- γ_{5270} ***5178.5*** ($\dagger_{\gamma}$100.0 *15*)
- γ_{0} ***10445.8*** *3* ($\dagger_{\gamma}$<22)

10533.3 *5*, 5/2^{+}, *[DHILNOOPT]*, Γ_{γ}=0.035 *2* eV, %IT=?, %p=?

- γ_{9152} ***1381.3*** *5* ($\dagger_{\gamma}$0.78 *26*)
  [E1+M2]: $\delta=-0.20^{+3}_{-2}$
- γ_{8571} ***1961.8*** *5* ($\dagger_{\gamma}$6.20 *26*)
  [M1+E2]: $\delta=-0.012^{+5}_{-6}$
- γ_{7301} ***3232.1*** *5* ($\dagger_{\gamma}$81.1 *13*)
  [M1+E2]: δ=−0.066 *5*
- γ_{7155} ***3377.9*** *5* ($\dagger_{\gamma}$50.1 *5*)
- γ_{6324} ***4208.9*** *5* ($\dagger_{\gamma}$19.9 *3*)
  [E1+M2]: δ=−0.028 *4*
- γ_{5270} ***5262.1*** *5* ($\dagger_{\gamma}$100.0 *5*)
  [M1+E2]: δ=+0.27 *3*
- γ_{0} ***10529.3*** *5* ($\dagger_{\gamma}$<0.3)

10693.2 *3*, 9/2^{+}, 12 *6* fs, *[DIPU]*, Γ_{γ}>0.040 eV, %IT=?, %p=?

- γ_{7567} ***3125.8*** *10* ($\dagger_{\gamma}$58.9 *10*)
  [M1+E2]: δ=−0.118 *8*
- γ_{7155} ***3537.8*** *3* ($\dagger_{\gamma}$3.41 *16*)
- γ_{5270} ***5421.9*** *3* ($\dagger_{\gamma}$100.0 *5*)

10701.9 *3*, 3/2^{-}, Γ=0.2 keV, *[HIKLNP]*, Γ_{γ}=0.37 *7* eV, %IT=0.18, %p=99.82

- γ_{9222} ***1479.7*** *9* ($\dagger_{\gamma}$2.8 *2*)
  [M1+E2]: $\delta=-0.049^{+5}_{-6}$
- γ_{9152} ***1549.9*** *3* ($\dagger_{\gamma}$0.4 *2*) [M1+E2]: δ=+0.11 *3*
- γ_{9050} ***1652.1*** *3* ($\dagger_{\gamma}$0.4 *2*)
- γ_{8313} ***2389.1*** *3* ($\dagger_{\gamma}$1.5 *2*)
- γ_{7301} ***3400.7*** *3* ($\dagger_{\gamma}$4.4 *2*)
- γ_{7155} ***3546.4*** *3* ($\dagger_{\gamma}$0.8 *2*)
- γ_{6324} ***4377.4*** *3* ($\dagger_{\gamma}$7.2 *2*)
  [M1+E2]: δ=−0.135 *15*
- γ_{5299} ***5402.1*** *3* ($\dagger_{\gamma}$1.5 *2*)
  [E1+M2]: δ=−0.13 *7*
- γ_{5270} ***5430.6*** *3* ($\dagger_{\gamma}$71.1 *12*)
  [E1+M2]: $\delta=-0.24^{+4}_{-8}$
- γ_{0} ***10697.8*** *3* ($\dagger_{\gamma}$100.0 *16*)
  [M1+E2]: $\delta=-0.180^{+2}_{-6}$

10804 *2*, 3/2^{+}, Γ<0.001 keV, *[DHILNPT]*, %IT=?, %p=?

- γ_{9155} ***1649*** *3* ($\dagger_{\gamma}$8.16 *20*)
- γ_{9152} ***1652*** *3* ($\dagger_{\gamma}$1.75 *20*)
- γ_{9050} ***1754*** *3* ($\dagger_{\gamma}$0.58 *20*)
- γ_{8313} ***2491*** *3* ($\dagger_{\gamma}$6.99 *20*)
  [M1+E2]: δ=−0.12 *3*
- γ_{7301} ***3503*** *3* ($\dagger_{\gamma}$11.26 *20*)
  [M1+E2]: δ=+0.12 *2*
- γ_{7155} ***3649*** *3* ($\dagger_{\gamma}$15.14 *20*)
  [M1+E2]: δ=−0.14 *3*
- γ_{6324} ***4480*** *3* ($\dagger_{\gamma}$10.5 *4*) [E1+M2]: δ=−0.07 *5*
- γ_{5299} ***5505*** *3* ($\dagger_{\gamma}$30.1 *4*) [M1+E2]: δ=+0.55 *2*
- γ_{5270} ***5534*** *3* ($\dagger_{\gamma}$9.51 *20*)
  [M1+E2]: δ=+0.63 *4*
- γ_{0} ***10800*** *3* ($\dagger_{\gamma}$100.0 *8*) [E1+M2]: δ=−0.02 *1*

11235 *5*, ≥3/2, Γ=3.3 keV, *[RT]*, %n=100

11292.8 *7*, 1/2^{-}, Γ=8 *3* keV, *[LPQRSU]*, %IT=?, %n=?, %p=?

11437.6 *7*, 1/2^{+}, Γ=41.4 *11* keV, *[EFHILOPS]*, %IT=?, %n=?, %p=?, %α=?

11615 *4*, 1/2^{+}, Γ=405 *6* keV, *[P]*, Γ_{γ}=21.2 *7* eV, %IT=0.00523 *19*, %n=?, %p=?, T=3/2

- γ_{6324} ***5291*** *4* ($\dagger_{\gamma}$2.1 *17*)
- γ_{5299} ***6316*** *4* ($\dagger_{\gamma}$8.2 *17*)
- γ_{5270} ***6345*** *4* ($\dagger_{\gamma}$<1.1)
- γ_{0} ***11610*** *4* ($\dagger_{\gamma}$100 *4*)

11763 *3*, 3/2^{+}, Γ=40 keV, *[FQRS]*, %n=?, %p=?, %α=?

11876 *3*, 3/2^{-}, Γ=25 keV, *[FQRS]*, %IT=?, %n=?, %p=?, %α=?

11942 *6*, 9/2^{-}, Γ<3.0 keV, *[DKLORU]*, %n=?, %α=?

11965 *3*, 1/2^{-}, Γ=17 keV, *[DFHIQRS]*, %n=?, %p=?, %α=?

12095 *3*, 5/2^{+}, Γ=14 *5* keV, *[FOQRS]*, %n=?, %p=?, %α=?

(continued on next page)

12145 *3*, 3/2^{-}, Γ=41 *5* keV, *[FHIQRS]*, %n=?, %p=?, %α=?

12327 *4*, 5/2($^{+}$), Γ=22 keV, *[KLOQRS]*, %n=?, %p=?

12493 *4*, 5/2^{+}, Γ=40 *5* keV, *[FLOQRS]*, %n=?, %p=?, %α=?, T=1/2

12522 *8*, 5/2^{+}, Γ=58 *4* keV, *[P]*, Γ_{γ}=4.6 *6* eV, %IT=0.0079 *12*, %p=99.9921 *12*, T=3/2
γ_{6324} ***6197*** *10* (†$_{\gamma}$6.2 *7*)
γ_{5299} ***7221*** *10* (†$_{\gamma}$<1.1)
γ_{5270} ***7250*** *10* (†$_{\gamma}$100.0 *7*)
γ_{0} ***12516*** *10* (†$_{\gamma}$1.2 *5*)

12551 *10*, 9/2^{+}, *[DIKOU]*

12920 *4*, 3/2^{-}, Γ=56 *11* keV, *[FGLQRS]*, %n=?, %p=?, %α=?

12940 *10*, 5/2^{+}, Γ=81 keV, *[FGQ]*, %p=?, %α=?

13004 *10*, 11/2^{-}, *[DHILOU]*

13149 *10*, Γ=7 *3* keV, *[FS]*, %n=?, %p=?, %α=?

13174 *7*, (9/2), Γ=7 *3* keV, *[DFIKLQRSU]*, %n=?, %p=?, %α=?

13362 *8*, 3/2^{-}, Γ=16 *8* keV, *[FGQS]*, %n=?, %p=?, %α=?

13390 *10*, 3/2^{+}, Γ=56 keV, *[FGPQS]*, Γ_{γ}=3.0 *9* eV, %IT=0.0054, %n=?, %p=?, %α=?
γ_{7301} ***6089*** *10* (†$_{\gamma}$<5)
γ_{7155} ***6235*** *10* (†$_{\gamma}$<5)
γ_{6324} ***7066*** *10* (†$_{\gamma}$<5)
γ_{5299} ***8091*** *10* (†$_{\gamma}$<8)
γ_{5270} ***8120*** *10* (†$_{\gamma}$<8)
γ_{0} ***13384*** *10* (†$_{\gamma}$100)

13537 *10*, 3/2^{-}, Γ=85 *30* keV, *[FGQ]*, %n=?, %p=?, %α=?

13608 *7*, 5/2($^{+}$), Γ=18 *4* keV, *[FLRS]*, %n=?, %p=?, %α=?

13612 *10* (?), (1/2^{+}), Γ=90 keV, *[GQ]*, %n=?, %p=?, %α=?

13713 *10*, Γ=26 *8* keV, *[FQS]*, %n=?, %p=?, %α=?

13840 *30*, 3/2^{+}, Γ=75 keV, *[DFGIORS]*, %n=?, %p=?, %α=?

13900, 1/2^{+}, Γ=930 keV, *[PQ]*, %IT=?, %p=?

13990 *30*, 5/2^{+}, Γ=98 *10* keV, *[FIQ]*, %n=?, %p=?, %α=?

14090 *7*, (9/2^{+},7/2^{+}), Γ=22 *6* keV, *[DFHILORS]*, %n=?, %p=?, %α=?

14100 *30*, 3/2^{+}, Γ≈ 100 keV, *[DFG]*, %n=?, %α=?

14162 *10*, 3/2($^{+}$), Γ=27 *6* keV, *[DFRS]*, %n=?, %α=?

14240 *40*, 5/2^{+}, Γ=150 keV, *[GH]*, %α=100

14380 *40*, 7/2^{+}, Γ=100 keV, *[G]*, %α=100

14400, Γ≈ 1900 keV, *[RS]*, %n=?, %p=?, %α=?

14550 *20*, Γ=200 *50* keV, *[F]*, %n=?, %p=?, %α=?

14647 *10*, Γ=33 *6* keV, *[FRS]*, %n=?, %p=?, %α=?

14710, Γ=750 keV, *[P]*, %IT=?, %p=?

14720 *10*, 5/2^{-}, Γ=110 *50* keV, *[FHILRS]*, %IT=?, %n=?, %p=?, %α=?

14860 *20*, Γ=48 *11* keV, *[FGL]*, %n=?, %α=?

14920 *10*, Γ=12 *3* keV, *[FHS]*, %n=?, %α=?

15025 *10*, Γ=13 *3* keV, *[FL]*, %n=?, %α=?

15090 *20*, Γ=80 *25* keV, *[FG]*, %n=?, %α=?

15288 *10*, Γ=26 *6* keV, *[FG]*, %n=?, %α=?

15373 *10*, 13/2^{+}, *[DHIKLU]*

15380 *20*, Γ=75 *25* keV, *[FGJ]*, %n=?, %α=?

15430 *20*, Γ≈ 100 keV, *[FG]*, %n=?, %α=?

15450, Γ=750 keV, *[P]*, %IT=?, %p=?

15530 *20*, Γ≈ 35 keV, *[FHIS]*, %n=?, %α=?

15600 *20*, Γ=95 *25* keV, *[F]*, %n=?, %α=?

15782 *10*, *[FJL]*, %p=?, %α=?

15930 *20*, Γ=35 *5* keV, *[FJK]*, %n=?, %α=?

15944 *15*, Γ=21 *6* keV, *[FJ]*, %n=?, %α=?

16026 *10*, Γ=62 *12* keV, *[FGJLS]*, %n=?, %p=?, %α=?

16190 *10*, 3/2^{+}, Γ=450 *100* keV, *[HJL]*, %IT=?, %n=?, %p=?, %α=?

16260 *20*, 3/2^{+}, Γ=150 *28* keV, *[EFGJKL]*, %IT=?, %n=?, %α=?

16320 *20*, Γ≈ 30 keV, *[FJ]*, %n=?, %p=?, %α=?

16390 *20*, Γ=44 *11* keV, *[FJKL]*, %n=?, %p=?, %α=?

16460, Γ=560 keV, *[P]*, %IT=?, %p=?

16576 *15*, Γ=27 *15* keV, *[FS]*, %n=?, %α=?

16590 *25*, 3/2^{-}, Γ=490 keV, *[J]*, %IT=?, %n=?, %p=?, %α=?

16677 *15*, 1/2^{+}, Γ=80 *20* keV, *[EFJKLMPRSV]*, %IT=?, %n=?, %p=?, %α=?, T=1/2

16850 *30*, 5/2, Γ=110 *50* keV, *[J]*, %α=?

16910, Γ≈ 350 keV, *[JRS]*, %n=?, %p=?, %α=?

17050 (?), *[J]*, %p=?

17110, *[M]*, %α=?

17150 *50*, (1/2^{+},3/2^{+}), Γ=250 *60* keV, *[EJ]*, %IT=?, %α=?

17230 *40*, Γ≈ 175 keV, *[M]*, %α=?

17370 *40*, Γ≈ 250 keV, *[JMRS]*, %p=?, %α=?

17580 *40*, 3/2^{+}, Γ=450 *120* keV, *[JMS]*, %IT=?, %α=?

17670 *40*, 3/2^{+}, Γ=600 *80* keV, *[EM]*, %IT=?, %n=?, %α=?, T=1/2

17720 *10*, Γ=48 *10* keV, *[LMS]*, %n=?, %p=?, %α=?

17950 *20*, Γ=167 keV, *[L]*, %n=?, %α=?

18060 *10*, Γ=19 *4* keV, *[KM]*, %n=?, %α=?

18090 *20*, Γ≈ 40 keV, *[M]*, %n=?, %p=?

(continued on next page)

$^{15}_{7}$N (continued)

18220, Γ=158 keV, *[RS]*, %n=?, %α=?

18270 *20*, Γ=235 *60* keV, *[LMS]*, %n=?, %p=?, %α=?

18700 *20*, *[IL]*

18910 *150*, $3/2^+$ and $1/2^+$, Γ=750 *70* keV, *[E]*, %IT=?, %α=?

19200 *35*, ($1/2^+$), Γ≈ 130 keV, *[L]*, %n=?, T=(1/2)

19500, $3/2^+$, Γ≈ 400 keV, *[JPQ]*, %IT=?, %p=?, T=(3/2)

19720 *40*, *[IKL]*

20120 *50*, *[U]*, T=(3/2)

20500, $3/2^+$, Γ≈ 400 keV, *[P]*, %IT=?, %n=?, %p=?

20960 *65*, $3/2^+$ and $1/2^+$, Γ=1740 *150* keV, *[EL]*, %IT=?, %α=?

21820, Γ≈ 600 keV, *[PV]*, %IT=?, %p=?

23190 *60*, *[P]*, %IT=?, %p=?, T=(3/2)

23600, *[V]*, %IT=?, %n=?

24750 *150*, *[L]*

25500, $3/2^-$, *[PV]*, %IT=?, %n=?, %p=?, T=(3/2)

26800 (?), *[J]*

≈**37000**, *[P]*, %IT=?, %p=?

$^{15}_{8}$O

Δ: 2855.5 *5*   **S_n:** 13222.3 *5*   **S_p:** 7296.9 *5*
Q_{EC}: 2753.9 *5*

Populating Reactions and Decay Modes

A ^{16}F p decay
B ^{12}C(^{3}He,x)
C ^{12}C(α,n)
D ^{12}C(^{6}Li,t)
E ^{12}C(^{12}C,^{9}Be)
F ^{13}C(^{3}He,n)
G ^{14}N(p,γ)
H ^{14}N(p,n)
I ^{14}N(p,p)
J ^{14}N(p,α)
K ^{14}N(d,n)
L ^{14}N(^{3}He,d)
M ^{15}N(p,n)
N ^{15}N(^{3}He,t)
O ^{16}O(p,d)
P ^{16}O(^{3}He,α)
Q ^{17}O(p,t)

Levels and γ-ray branchings:

0, 1/2$^-$, 122.24 *16* s, *[BCDEFGKLMNOPQ]*,
%EC+%β$^+$=100, μ=0.7189 *8*, T=1/2

5183 *1*, 1/2$^+$, 5.7 *7* fs, *[DFGKLNOP]*
γ_0***5182*** *1* ($\dagger_\gamma$100)

5240.9 *3*, 5/2$^+$, 2.25 *21* ps,
[CDEFGKLMNOPQ], μ=+0.65 *7*
γ_0***5239.9*** *3* ($\dagger_\gamma$100) [M2+E3]: δ=–0.10 *4*

6176.3 *17*, 3/2$^-$, <1.74 fs, *[DFGKLMNOPQ]*
γ_0***6174.9*** *17* ($\dagger_\gamma$100) [M1+E2]: δ=+0.125 *7*

6793.1 *17*, 3/2$^+$, <20 fs, *[DFGKLNP]*
γ_0***6791.4*** *17* ($\dagger_\gamma$100) [E1(+M2)]: δ=+0.02 *2*

6859.4 *9*, 5/2$^+$, 11.1 *17* fs, *[CDFGKLNPQ]*
γ_{5241}***1618.4*** *10* ($\dagger_\gamma$100)
[M1(+E2)]: δ=+0.04 *3*

7275.9 *6*, 7/2$^+$, 0.49 *11* ps,
[CDEFKLMNOPQ]
γ_{5241}***2034.9*** *7* ($\dagger_\gamma$100.0 *12*)
γ_0***7274.0*** *6* ($\dagger_\gamma$4.0 *12*)

7556.5 *4*, 1/2$^+$, Γ=0.99 *10* keV,
[FGKLMNOP], Γ_γ=0.042 eV,
%IT=0.0042, %p=99.9958
γ_{6859}***697.1*** *10* ($\dagger_\gamma$<11)
γ_{6793}***763.4*** *17* ($\dagger_\gamma$40.3 *11*)
γ_{6176}***1380.1*** *17* ($\dagger_\gamma$100.0 *7*)
γ_{5183}***2373*** *1* ($\dagger_\gamma$27.5 *11*)
γ_0***7554.5*** *4* ($\dagger_\gamma$6.1 *9*)

8284.0 *5*, 3/2$^+$, Γ=3.6 *7* keV, *[DFGKLP]*,
Γ_γ=0.46 *6* eV, %IT=0.027, %p=99.973
γ_{6859}***1424.5*** *10* ($\dagger_\gamma$2.3 *6*)
γ_{6176}***2107.5*** *17* ($\dagger_\gamma$4.1 *12*)
γ_{5241}***3042.8*** *6* ($\dagger_\gamma$79.3 *10*)
γ_{5183}***3100.7*** *11* ($\dagger_\gamma$2.3 *2*)
γ_0***8281.5*** *5* ($\dagger_\gamma$100.0 *5*)

8743 *6*, 1/2$^+$, Γ=32 keV, *[FGP]*, %IT=0.0015,
%p=99.9985
γ_{6176}***2566*** *6* ($\dagger_\gamma$56 *5*)
γ_{5183}***3560*** *6* ($\dagger_\gamma$100 *5*)

8922 *2*, 5/2$^+$, Γ=3.3 *3* keV, *[CDFGOP]*,
%p=100
γ_{6859}***2063*** *2* ($\dagger_\gamma$72 *8*)
γ_{6176}***2746*** *3* ($\dagger_\gamma$62 *8*)
γ_{5183}***3738*** *2* ($\dagger_\gamma$100 *8*)
γ_0***8919*** *2* ($\dagger_\gamma$23 *11*)

8922 *2*, 1/2$^+$, Γ=7.5 keV, *[CFGOP]*, %p=100
γ_{6859}***2063*** *2* ($\dagger_\gamma$20 *20*)
γ_{6176}***2746*** *3* ($\dagger_\gamma$40 *20*)
γ_{5241}***2738*** *2* ($\dagger_\gamma$40 *20*)
γ_0***8919*** *2* ($\dagger_\gamma$100 *50*)

8982.1 *17*, (1/2)$^-$, Γ=3.9 *4* keV, *[DFGP]*,
%p=100
γ_{5183}***3799*** *1* ($\dagger_\gamma$6.4 *11*)
γ_0***8979.2*** *17* ($\dagger_\gamma$100.0 *11*)

9484 *8*, (3/2)$^+$, Γ≈ 200 keV, *[GP]*,
Γ_γ=9.1 *20* eV, %IT≈0.0046, %p=100
γ_0***9481*** *8* ($\dagger_\gamma$100)

9488 *3*, 5/2$^-$, Γ=10.1 *5* keV, *[DFGP]*,
Γ_γ=2.4 eV, %IT=0.024, %p=99.976
γ_{7276}***2212*** *3* ($\dagger_\gamma$5.9)
γ_{6859}***2628*** *3* ($\dagger_\gamma$4.0)
γ_{6176}***3311*** *3* ($\dagger_\gamma$0.8)
γ_{5241}***4246*** *3* ($\dagger_\gamma$7.6)
γ_0***9481*** *3* ($\dagger_\gamma$100)

9609 *2*, 3/2$^-$, Γ=8.8 *5* keV, *[CDFGP]*,
Γ_γ=5.0 eV, %IT=0.057, %p=99.943
γ_{6176}***3433*** *2* ($\dagger_\gamma$2.5)
γ_{5241}***4367*** *2* ($\dagger_\gamma$24)
γ_0***9606*** *2* ($\dagger_\gamma$100)

9662 *3*, (7/2,9/2)$^-$, Γ=2 *1* keV, *[CDFIP]*,
%p=100

10290, (5/2$^-$), Γ=3 *1* keV, *[DFIP]*, %p=100

10300, 5/2$^+$, Γ=11 *2* keV, *[DFIP]*, %p=100

10461 *5*, (9/2$^+$), Γ<2 keV, *[CDEFGP]*,
%IT=?, %p=?
γ_{7276}***3185*** *5* ($\dagger_\gamma$61 *10*)
γ_{6859}***3602*** *5* ($\dagger_\gamma$<6.5)
γ_{5241}***5219*** *5* ($\dagger_\gamma$100 *10*)

10480, (3/2$^-$), Γ=25 *5* keV, *[CFGI]*,
Γ_γ=0.35 *7* eV, %IT=0.0014 *4*, %p=100
γ_{6793}***3686*** ($\dagger_\gamma$<7)
γ_{6176}***4303*** ($\dagger_\gamma$<7)
γ_{5241}***5238*** ($\dagger_\gamma$67 *10*)
γ_0***10476*** ($\dagger_\gamma$100 *10*)

10506 (?), (3/2)$^+$, Γ=140 *40* keV, *[GI]*, %IT=?,
%p=100

10917 *12*, 7/2$^+$, Γ=90 keV, *[IP]*, %p=100

10938 *3*, 1/2$^+$, Γ=99 *5* keV, *[GIP]*,
Γ_γ=32 *5* eV, %IT=0.032 *6*, %p=100
γ_{6793}***4144*** *3* ($\dagger_\gamma$<18)
γ_{6176}***4761*** *3* ($\dagger_\gamma$50 *18*)
γ_{5183}***5754*** *3* ($\dagger_\gamma$77 *7*)
γ_0***10934*** *3* ($\dagger_\gamma$100 *18*)

11025 *3*, 1/2$^-$, Γ=25 *2* keV, *[GIP]*,
Γ_γ=1.4 *4* eV, %IT=0.0056 *16*, %p=100
γ_0***11021*** *3* ($\dagger_\gamma$100)

11151 *7*, Γ<10 keV, *[DIP]*, %p=100

(continued on next page)

$^{15}_{8}$O (continued)

11218 *3*, 3/2$^+$, Γ=40 *4* keV, *[GIP]*, Γ_γ=7.4 *6* eV, %IT=0.0185 *24*, %p=99.9815 *24*

γ_{6793} ***4424*** *3* ($\dagger_\gamma$<6)

γ_{5241} ***5975*** *3* ($\dagger_\gamma$16 *7*)

γ_{5183} ***6034*** *3* ($\dagger_\gamma$19 *7*)

γ_{0} ***11213*** *3* ($\dagger_\gamma$100 *7*)

11565 *15*, Γ<10 keV, *[DIP]*, %p=100

11569 *15*, 5/2$^-$, Γ=20 *15* keV, *[DGI]*, Γ_γ=1.9 *3* eV, %IT=0.010 *7*, %p=99.990 *7*

γ_{6793} ***4775*** *15* ($\dagger_\gamma$<5)

γ_{6176} ***5392*** *15* ($\dagger_\gamma$32 *15*)

γ_{5241} ***6326*** *15* ($\dagger_\gamma$100 *15*)

γ_{0} ***11564*** *15* ($\dagger_\gamma$29 *15*)

11616 *15*, (3/2,1/2)$^-$, Γ=80 *50* keV, *[GI]*, %IT=?, %p=100

11719 *8*, Γ<10 keV, *[CDIP]*, %p=100

11748 *3*, 5/2$^+$, Γ=99 *5* keV, *[GI]*, Γ_γ=10 *2* eV, %IT=0.010 *2*, %p=99.990 *2*

γ_{6176} ***5571*** *3* ($\dagger_\gamma$100 *13*)

γ_{5241} ***6505*** *3* ($\dagger_\gamma$89 *13*)

11846 *3*, 5/2$^-$, Γ=65 *3* keV, *[GI]*, Γ_γ=1.4 *6* eV, %IT=0.0022 *9*, %p=99.9978 *9*

γ_{5241} ***6603*** *3* ($\dagger_\gamma$100)

11980 *10*, 5/2$^-$, Γ=20 *5* keV, *[DIP]*, %p=100

12129 *15*, 5/2$^+$, Γ=200 *50* keV, *[I]*, %p=100

12222 *20*, Γ=100 *50* keV, *[I]*, %p=100

12255 *13*, 5/2$^+$, Γ=135 *15* keV, *[Q]*, %p=100, T=3/2

12295 *10*, *[D]*

12471 *3*, 5/2$^-$,(3/2$^-$), Γ=77 *4* keV, *[I]*, %p=100

12600 *10*, *[D]*

12800, Γ≈ 250 keV, *[G]*, %IT=?, %p=100

12835 *3*, Γ=16 *1* keV, *[CDEI]*, %p=100

13008 *3*, Γ=215 *3* keV, *[I]*, %p=100

13025 *3*, Γ=40 *30* keV, *[BI]*, %p=?

13450, (1/2,3/2)$^+$, Γ≈ 1000 keV, *[GIJ]*, %IT=?, %p=?, %α=?

13490 (?), (3/2$^+$), *[I]*, %p=?

13600, 5/2$^+$, *[J]*, %p=?, %α=?

13700, 3/2$^-$, *[I]*, %p=100

13790, 3/2$^-$, *[BIJ]*, %n=?, %p=?, %α=?

13870, Γ≈ 150 keV, *[G]*, %IT=?, %p=100

14030 *40*, (1/2$^-$,3/2$^-$), Γ=160 *20* keV, *[B]*, %n=?, %p=?

14170, 5/2$^-$, *[J]*, %p=?, %α=?

14270 *10*, 1/2$^+$, Γ=340 *30* keV, *[BCDHIJ]*, %n=?, %p=?, %α=?

14340, 5/2$^+$, Γ=240 keV, *[BJ]*, %p=?, %α=?

14465 *10*, 3/2$^+$,5/2$^+$, Γ=100 *10* keV, *[BHIJ]*, %n=?, %p=?, %α=?

14700 *40*, Γ=170 *35* keV, *[BH]*, %n=?, %p=?

14950 *40*, Γ=400 *25* keV, *[BHIJ]*, %n=?, %p=?, %α=?

15050 *10*, (13/2$^+$), *[CDE]*

15100, (1/2,3/2)$^+$, Γ≈ 1000 keV, *[G]*, %p=100

15450 *30*, Γ=70 *20* keV, *[B]*, %p=?, %α=?

15540 *10*, *[BD]*, %p=?, %α=?

15600 *10*, *[BD]*, %p=?, %α=?

15650 *10*, *[CD]*

15800 *10*, *[BD]*, %n=?

15900 *15*, 1/2$^-$,3/2$^-$, Γ=350 keV, *[B]*, %α=?

16050 *20*, Γ≈ 185 keV, *[BHIJ]*, %n=?, %p=?, %α=?

16100 *20*, *[B]*, %n=?, %α=?

16210 *20*, Γ≈ 140 keV, *[BIJ]*, %n=?, %p=?, %α=?

16430 *75*, 1/2$^+$, Γ=560 *100* keV, *[BH]*, %n=?, %α=?

16750 *50*, *[BP]*, %n=?

17050 *60*, (1/2,3/2)$^+$, Γ=700 *70* keV, *[BGIJ]*, %IT=?, %p=?, T=1/2

17460 *20*, *[D]*

17510 *20*, 1/2$^-$,3/2$^-$, Γ=640 *120* keV, *[BD]*, %IT=?, %n=?, %α=?

17990 *50*, 1/2$^-$,3/2$^-$, Γ=200 keV, *[B]*

18230 *50*, *[B]*, %n=?, %p=?

18670 *60*, (1/2,3/2)$^+$, Γ=520 *110* keV, *[BG]*, %IT=?, T=1/2

19030 *50*, Γ=1120 *300* keV, *[BO]*, %IT=?, %n=?

19570 *80*, (1/2,3/2)$^+$, Γ=780 *270* keV, *[B]*, %IT=?, T=1/2

19910 *50*, *[B]*, %n=?

20420 *70*, (3/2,1/2)$^+$, Γ=970 *240* keV, *[BG]*, %IT=?, %p=?, T=1/2

21560 *70*, (3/2,1/2)$^+$, Γ=730 *120* keV, *[BGO]*, %IT=?, %p=?, T=1/2

23800 *100*, Γ<500 keV, *[B]*, %IT=?

26000 (?), (13/2$^-$), Γ≈ 600 keV, *[B]*

28000 (?), (9/2$^-$,11/2$^-$), Γ≈ 2500 keV, *[B]*

29000 (?), Γ≈ 2500 keV, *[B]*

$^{15}_{9}$F

Δ: 16780 *130* **S_n:** (24900) **Q_p:** 1480 *130*

Q_{EC}: 13920 *130*

Populating Reactions and Decay Modes

A ^{12}C(^{3}He,π^-)

B ^{20}Ne(^{3}He,^{8}Li)

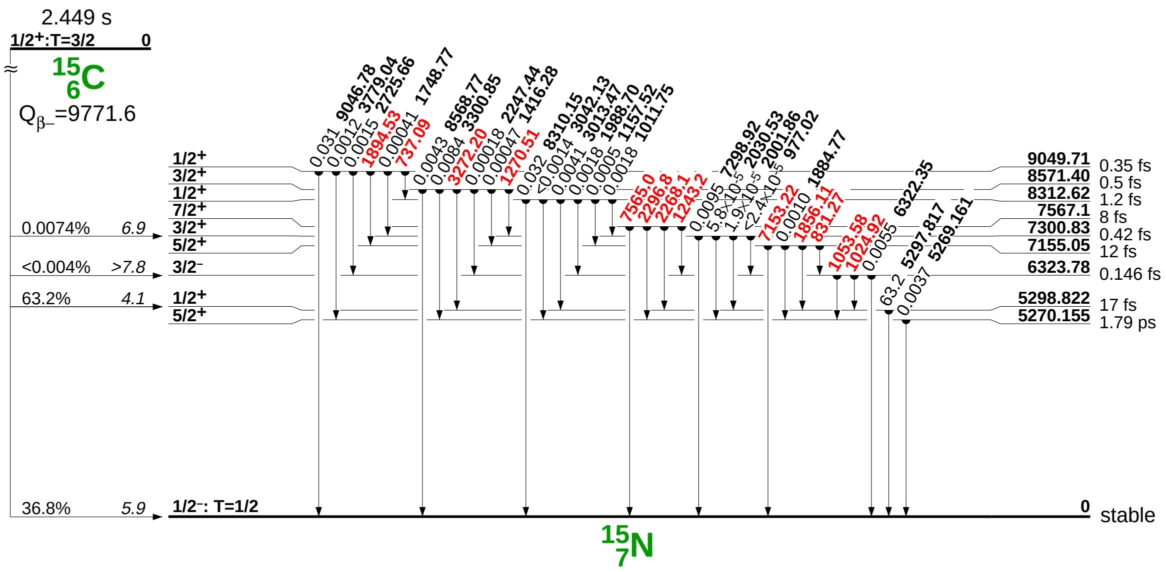
Levels:

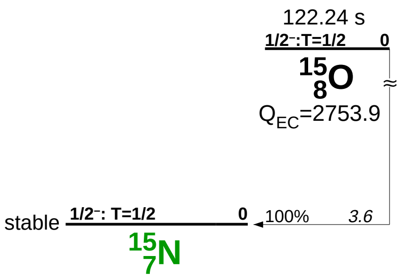
0, ($1/2^+$), Γ=1.0 *2* MeV, *[B]*, %p=100, T=3/2

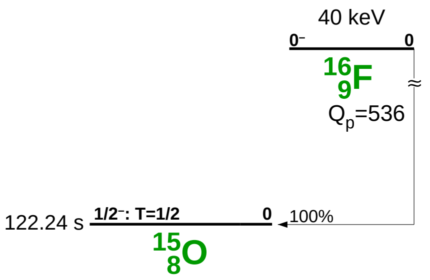
1300 *100*, ($5/2^+$), Γ=0.24 *3* MeV, *[B]*, %p=100, T=3/2

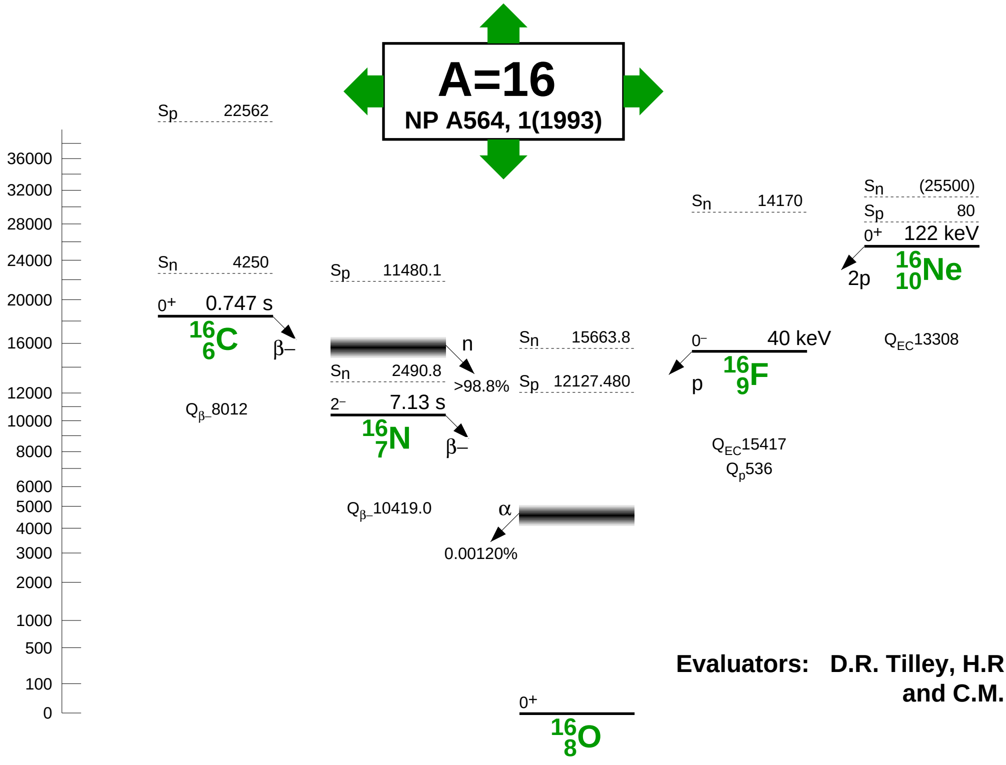
p from ^{15}F (1.0 MeV) p decay **<** *for Ip% multiply by 1.0* **>**

p_0 ***1370*** *120* (†100).


2.449 s
1/2+:T=3/2 0
15 6 C
Qβ−=9771.6
0.0074% 6.9
<0.004% >7.8
63.2% 4.1
36.8% 5.9
1/2+
3/2+
1/2+
7/2+
3/2+
5/2+
3/2−
1/2+
5/2+
1/2−: T=1/2
0.031 9046.78
0.0012 3779.04
0.0015 2725.66
1894.53
0.00041 1748.77
737.09
0.0043 8568.77
0.0084 3300.85
3272.20
0.00018 2247.44
0.00047 1416.28
1270.51
0.032 8310.15
<0.0014 3042.13
0.0041 3013.47
0.00018 1988.70
0.00005 1157.52
0.00018 1011.75
7565.0
2296.8
2268.1
1243.2
0.0095 7298.92
5.8×10-5 2030.53
1.9×10-5 2001.86
<2.4×10-5 977.02
7153.22
0.0010 1884.77
1856.11
831.27
1053.58
1024.92
0.0055 6322.35
63.2 5297.817
0.0037 5269.161
9049.71 0.35 fs
8571.40 0.5 fs
8312.62 1.2 fs
7567.1 8 fs
7300.83 0.42 fs
7155.05 12 fs
6323.78 0.146 fs
5298.822 17 fs
5270.155 1.79 ps
0 stable
15 7 N


122.24 s
1/2⁻:T=1/2
0
15 8 O
Q EC=2753.9
≈
stable
1/2⁻: T=1/2
0
100%
3.6
15 7 N


40 keV
0⁻
0
16 9 F
Qp=536
122.24 s
1/2⁻: T=1/2
0
100%
15 8 O



Evaluators: **D.R. Tilley, H.R. Weller,**
and C.M. Cheves

$^{16}_{6}$C

Δ: 13694 *4*   **S_n:** 4250 *4*   **S_p:** 22562 *23*

Q_{β^-}: 8012 *4*

Populating Reactions and Decay Modes

A ^{17}B β^-n decay

B ^{14}C(t,p)

Levels and γ-ray branchings:

0, 0^+, 0.747 *8* s, *[B]*, %β^-=100, %β^-n>98.8, T=2

1766 *10*, 2^+, *[B]*
  γ_0 ***1766*** *10* (†$_\gamma$100)

3027 *12*, (0^+), *[B]*

3986 *7*, 2, *[B]*
  γ_{1766} ***2220*** *12* (†$_\gamma$100) [D+Q]: δ=–0.18 *15*

4088 *7*, $3(^+)$, *[B]*
  γ_{1766} ***2322*** *12* (†$_\gamma$100) [M1+E2]: δ=–0.10 *9*

4142 *7*, 4^+, *[B]*
  γ_{1766} ***2376*** *12* (†$_\gamma$100)

6109 *15*, $(2^+,3^-,4^+)$, Γ<25 keV, *[B]*

γ(*^{16}N*) from ^{16}C (0.747 s) β^- decay **<** *for Iγ% multiply by 1.0* **>**

120.42 *12* (†$_\gamma$0.67 *10*)
276.85 *10* (†$_\gamma$<0.07)
298.22 *8* (†$_\gamma$<0.5)
397.27 *10* (†$_\gamma$<0.03)

n from ^{16}C (0.747 s) β^-n decay **<** *for In% multiply by 1.0* **>**

n_0*1714* *5* (†15.6 *17*)
n_0*810* *5* (†84.4 *17*)

$^{16}_{7}$N

Δ: 5682.0 *23* **S_n:** 2490.8 *23* **S_p:** 11480.1 *24*
$Q_{\beta-}$: 10419.0 *23*

Populating Reactions and Decay Modes

A ^{16}C β^- decay (93TiAA)
B ^{17}C β^-n decay
C ^{10}B(^{7}Li,p), ^{12}C(^{16}O,^{16}N)
D ^{13}C(α,p)
E ^{14}C(d,γ), (d,n), (d,p), (d,d)
F ^{14}C(^{3}He,p)
G ^{14}C(α,d)
H ^{14}N(t,p)
I ^{15}N(n,n), (n,p), (p,π^+)
J ^{15}N(d,p)
K ^{16}O(γ,π^+)
L ^{16}O(n,p)
M ^{16}O(t,^{3}He)
N ^{16}O(^{7}Li,^{7}Be), (γ,p), (π^+,2p)
O ^{17}O(d,^{3}He)
P ^{18}O(d,α)
Q ^{19}F(n,α)

Levels and γ-ray branchings:

0, 2$^-$, 7.13 *2* s, *[ACDFHKLMNOPQ]*,
%β^-=100, %β^-α=0.00120 *5*, T=1

120.42 *12*, 0$^-$, 5.25 *6* μs, *[ACDFHJKLMPQ]*
γ_0***120.42*** *12* ($\dagger_\gamma$100)

298.22 *8*, 3$^-$, 91.3 *13* ps,
[ACDFGHJKLMNOPQ], μ=1.60 *6*
γ_0***298.22*** *8* ($\dagger_\gamma$100)

397.27 *10*, 1$^-$, 3.90 *4* ps,
[ACDFHJKLMNOPQ], μ=−1.83 *13*
γ_{120}***276.85*** *10* ($\dagger_\gamma$100.0 *22*)
γ_0***397.27*** *10* ($\dagger_\gamma$36.2 *8*)

3353 *3*, (1$^+$), Γ=15 *5* keV, *[ACDFHIJNOP]*,
%n=100

3523 *3*, 2$^+$, Γ=3 keV, *[CDFHIJNOP]*,
%n=100

3963 *3*, 3$^+$, Γ<2 keV, *[CDFGHIJNOP]*,
%n=100

4320 *3*, 1$^+$, Γ=20 *5* keV, *[ACFHIJ]*, %n=100

4391 *3*, 1$^-$, Γ=82 *20* keV, *[CDFHIJ]*, %n=100

4760 *50*, 1$^-$, Γ=250 *50* keV, *[HIJ]*, %n=100

4783 *3*, 2$^+$, Γ=59 *8* keV, *[CDFHIJ]*, %n=100

5054 *3*, 2$^-$, Γ=19 *6* keV, *[CFHIJ]*, %n=100
5129 *7*, ≥2, Γ<11 keV, *[CDFHIJO]*, %n=100

5150 *7*, (3)$^-$, Γ<11 keV, *[CDFHIJO]*,
%n=100, T=1

5230 *3*, 3$^+$, Γ<4 keV, *[CFHIJP]*, %n=100

5250 *70*, 2$^-$, Γ=320 *80* keV, *[HJ]*, %n=100

5318 *3*, (0$^-$,1$^+$), Γ=260 keV, *[CI]*, %n=100

5521.6 *25*, 3$^+$, Γ<11 keV, *[CDFHIJNOP]*,
%n=100

5731.7 *25*, (5$^+$), Γ<11 keV, *[CDFGHIJNOP]*,
%n=100

6003 *3*, 1$^-$, Γ=270 *30* keV, *[CHIP]*, %n=100

6170.7 *24*, (4$^-$), Γ<11 keV, *[CDFHJLNOP]*,
%n=100, T=1

6374 *3*, (3$^-$), Γ=30 *6* keV, *[CDHIJOP]*,
%n=100, T=(1)

6426 *7*, Γ=300 *30* keV, *[HJ]*

6505 *3*, 1$^+$, Γ=34 *6* keV, *[CHIJOP]*, %n=100
6608 *3*, (4), Γ<11 keV, *[CDHJP]*
6840 (?), ≥2, Γ>140 keV, *[I]*, %n=100
6845 *4*, Γ<11 keV, *[DFHJP]*

7020 *20*, 1$^+$, Γ=22 *5* keV, *[HIJP]*, %n=100
7134 *7*, Γ<11 keV, *[FHJP]*
7250 *7*, ≥2, Γ=17 *5* keV, *[DHIJP]*, %n=100
7572 *4*, ≥3, Γ<11 keV, *[DFGHIJP]*, %n=100

7637 *4*, (3,4,5)$^+$, Γ<11 keV, *[DFGHJP]*
7674 *4*, Γ<11 keV, *[DFHIJOP]*, %n=100
7877 *9*, ≥4, Γ=100 *15* keV, *[DHIJLP]*,
%n=100
8048 *9*, Γ=85 *15* keV, *[HIP]*, %n=100

8199 *5*, (3,2)$^+$, Γ=28 *8* keV, *[FHP]*
8282 *8*, Γ=24 *8* keV, *[HP]*
8365 *8*, ≥1, Γ=18 *8* keV, *[DHIP]*, %n=100

8490 *30*, ≥1, Γ<50 keV, *[IP]*, %n=100
8720, ≥1, Γ=40 keV, *[I]*, %n=100
8819 *15*, Γ<50 keV, *[DIP]*, %n=100
9035 *15*, Γ<50 keV, *[P]*
9160 *30*, ≥2, Γ=100 keV, *[IP]*, %n=100
9340 *30*, Γ<50 keV, *[IP]*, %n=100
9459 *15*, ≥2, Γ=100 keV, *[DIOP]*, %n=100
9760 *10*, Γ=15 *8* keV, *[DFP]*, T=1
9813 *10*, *[F]*, T=1

9928 *7*, 0$^+$, Γ<12 keV, *[F]*, T=2
10055 *15*, ≥3, Γ=30 keV, *[DIQ]*, %n=100
10370 *40*, ≥2, Γ=165 keV, *[DI]*, %n=100
10710, ≥2, Γ=120 keV, *[I]*, %n=100
11160 *40*, *[D]*
11490, ≥3, *[I]*, %n=100
11610, ≥3, Γ=220 keV, *[EI]*, %n=?

11701 *7*, 2$^+$, Γ<12 keV, *[F]*, T=2
11750 *40*, Γ<50 keV, *[D]*
11920 (?), Γ=390 keV, *[E]*, %n=?
12090 (?), *[I]*, %n=100
12390 *60*, Γ=290 keV, *[DE]*, %n=?, %p=?
12570 *60*, Γ=180 keV, *[DE]*, %n=?, %p=?
12880, Γ=155 keV, *[EI]*, %n=?, %p=?
12970 (?), Γ=175 keV, *[E]*, %n=?
13110 *60*, *[DEI]*, %n=?
13830, *[I]*, %n=100

14100, (7$^+$), T=(2)

14360 *50*, (3)$^+$, Γ=180 keV, *[DE]*

γ*(*^{16}*O)* from ^{16}N (7.13 s) β^- decay **<** *for Iγ% multiply by 1.0***>**

787.2 *6* ($\dagger_\gamma$<3×10^{-6})
867.7 *1* ($\dagger_\gamma$0.000210 *2*)
986.93 *15* ($\dagger_\gamma$0.0034 *8*)
1067.5 *10* ($\dagger_\gamma$<3×10^{-5})
1754.9 *6* ($\dagger_\gamma$0.121 *10*) [M1+E2]: δ=2.1 *4*
1954.7 *8* ($\dagger_\gamma$0.038 *6*)
2741.5 *5* ($\dagger_\gamma$0.82 *6*) [M1+E2]: δ=2.9 *2*
2822.2 *12* ($\dagger_\gamma$0.13 *4*)

(continued on next page)

$^{16}_{7}$N (continued)

γ(^{16}O) from ^{16}N (7.13 s) β^- decay

< for Iγ% multiply by 1.0 >

6048.2 *10* (†$_e$0.14)
6128.63 *4* (†$_\gamma$67.0 *6*)
6915.5 *6* (†$_\gamma$0.038 *6*)
7115.15 *14* (†$_\gamma$4.9 *4*)
8869.3 *5* (†$_\gamma$0.076 *10*)

α from ^{16}N (7.13 s) $\beta^-\alpha$ decay *< for Iα% multiply by 1.0 >*

α_0***2014*** *3* (†6.5×10^{-7} *20*)
α_0***1852*** *21* (†0.0012 *5*)
α_0***1282.4*** *5* (†4.6×10^{-8} *8*)

$^{16}_{8}$O

%: 99.762 *15*
Δ: –4736.998 *20*   **S_n:** 15663.8 *5*
S_p: 12127.480 *10*
σ_γ: 0.190 *19* mb

Populating Reactions and Decay Modes

- *A* ^{16}N β^- decay (93TiAA)
- *B* ^{17}N β^-n decay
- *C* ^{17}Ne ECp decay
- *D* ^{20}Na ECα decay
- *E* ^{10}B(^{10}B,α)
- *F* ^{12}C(α,γ)
- *G* ^{12}C(α,n), (α,p), (α,d)
- *H* ^{12}C(α,α)
- *I* ^{12}C(^{6}Li,d)
- *J* ^{13}C(^{3}He,x)
- *K* ^{13}C(^{6}Li,t)
- *L* ^{14}N(d,α)
- *M* ^{14}N(^{3}He,p), (^{3}He,pα)
- *N* ^{15}N(p,γ)
- *O* ^{15}N(p,p), (p,α), (p,^{3}He)
- *P* ^{15}N(^{3}He,d)
- *Q* ^{16}O(e,e), (e,e’p)
- *R* ^{16}O(p,x)
- *S* ^{16}O(^{3}He,^{3}He)
- *T* ^{16}O(α,α), (α,αp), (α,2α)
- *U* ^{16}O(^{12}C,^{12}C), (^{12}C,α^{12}C)
- *V* ^{16}O(^{13}C,^{13}C), (^{14}C,^{14}C)
- *W* ^{17}O(d,t)
- *X* ^{17}O(^{3}He,α)
- *Y* ^{18}O(p,t)
- *Z* 55 other reactions

Levels and γ-ray branchings:

0, 0^+, stable,
[AEFIJKLMNPQRSTUVWXY], T=0

6049.4 *10*, 0^+, 67 *5* ps,
[AEFIJKMNPQRUVWY], T=0
γ_0 ***6048.2*** *10* (†$_e$100)

6129.89 *4*, 3^-, 18.4 *5* ps,
[AEFIJKMNQSUWXY], T=0,
μ=+1.668 *12*
γ_0 ***6128.63*** *4* (†$_\gamma$100)

6917.1 *6*, 2^+, 4.70 *13* fs,
[AEFIJKMNPQRSTUVWXY], T=0
γ_{6130} ***787.2*** *6* (†$_\gamma$<0.008)
γ_{6049} ***867.7*** *12* (†$_\gamma$0.027 *3*)
γ_0 ***6915.5*** *6* (†$_\gamma$100)

7116.85 *14*, 1^-, 8.3 *5* fs,
[AEFIJMNPQRTWXY], T=0
γ_{6130} ***986.93*** *15* (†$_\gamma$0.070 *14*)
γ_{6049} ***1067.5*** *10* (†$_\gamma$<0)
γ_0 ***7115.15*** *14* (†$_\gamma$100)

8871.9 *5*, 2^-, 125 *11* fs,
[AEFIKMPQRSTWX], T=0
γ_{7117} ***1754.9*** *6* (†$_\gamma$14.7 *7*) [M1+E2]: δ=2.1 *4*
γ_{6917} ***1954.7*** *8* (†$_\gamma$4.6 *7*)
γ_{6130} ***2741.5*** *5* (†$_\gamma$100 *21*) [M1+E2]: δ=2.9 *2*
γ_{6049} ***2822.2*** *12* (†$_\gamma$0.15 *5*)
γ_0 ***8869.3*** *5* (†$_\gamma$9.3 *10*)

9585 *11*, 1^-, Γ=420 *20* keV,
[AFHIMPRSTVW], Γ_γ=0.028 *4* eV,
%IT=6.7×10^{-6} *10*, %α=100, T=0
γ_{6917} ***2688*** *11* (†$_\gamma$12 *4*)
γ_0 ***9582*** *11* (†$_\gamma$100 *16*)

9844.5 *5*, 2^+, Γ=0.62 *10* keV,
[AEFHIKMPQRSTUVX],
Γ_γ=0.0098 *8* eV, %IT=0.0016 *3*,
%α=100, T=0
γ_{6917} ***2927.1*** *8* (†$_\gamma$34 *7*)
γ_{6049} ***3794.6*** *12* (†$_\gamma$30 *7*)
γ_0 ***9841.2*** *5* (†$_\gamma$100 *7*)

10356 *3*, 4^+, Γ=26 *3* keV,
[EFHIKMPQRSTUVX],
Γ_γ=0.062 *6* eV, %IT=2.4×10^{-4} *4*,
%α=100, T=0
γ_{6917} ***3439*** *3* (†$_\gamma$100 *10*)
γ_{6130} ***4225*** *3* (†$_\gamma$<1.6)
γ_0 ***10352*** *3* (†$_\gamma$9×10^{-5} *3*)

10957 *1*, 0^-, 5.5 *35* fs, *[EMPRX]*, T=0
γ_{7117} ***3839.6*** *10* (†$_\gamma$100)

11080 *3*, 3^+, Γ<12 keV, *[EMPX]*, T=0

11096.7 *16*, 4^+, Γ=0.28 *5* keV,
[EFHIKMQRSTUV],
Γ_γ=0.0056 *14* eV, %IT=0.0020 *6*,
%α=100, T=0
γ_{6917} ***4179.0*** *17* (†$_\gamma$81 *20*)
γ_{6130} ***4966.0*** *16* (†$_\gamma$100 *42*)

11260 (?), (0^+), Γ=2500 keV, *[HP]*, %α=100,
T=(0)

11520 *4*, 2^+, Γ=71 *3* keV,
[EFHKMQRSTUV], Γ_γ=0.67 *2* eV,
%IT=9.4×10^{-5} *3*, %α=100, T=0
γ_{7117} ***4402*** *4* (†$_\gamma$<0.9)
γ_{6917} ***4602*** *4* (†$_\gamma$4.4 *11*)
γ_{6049} ***5470*** *5* (†$_\gamma$4.6 *8*)
γ_0 ***11516*** *4* (†$_\gamma$100.0 *13*)

11600 *20*, 3^-, Γ=800 *100* keV, *[HUV]*,
%α=100, T=0

12049 *2*, 0^+, Γ=1.5 *5* keV, *[HKMQRSTUV]*,
%IT=?, %α=100, T=0
γ_0 ***12044.1*** *20* (†$_e$100)

12440 *2*, 1^-, Γ=91 *6* keV,
[FGHMNOPQTUV], Γ_γ=12 *2* eV,
%IT=0.0132 *24*, %p=0.9 *1*, %α=99.1 *1*,
T =0
γ_{6049} ***6389.2*** *23* (†$_\gamma$1.2 *4*)
γ_0 ***12434.8*** *20* (†$_\gamma$100)

(continued on next page)

$^{16}_{8}$O (continued)

12530 *1*, 2^-, Γ=0.111 *10* keV, *[FKMNOPQRTW]*, Γ_γ=3.5 *2* eV, %IT=3.2 *3*, %p=14 *7*, %α=83 *3*, T =0

γ_{8872}***3657.7*** *12* (†$_\gamma$67 *4*)

γ_{7117}***5412.1*** *10* (†$_\gamma$24.5 *14*)

γ_{6917}***5611.8*** *12* (†$_\gamma$<2)

γ_{6130}***6398.7*** *10* (†$_\gamma$100 *4*)

γ_{0}***12524.7*** *10* (†$_\gamma$12.2 *12*)

12796 *4*, 0^-, Γ=40 *4* keV, *[MOPR]*, Γ_γ=2.5 *2* eV, %IT=0.0062 *8*, %p=100, T=1

γ_{7117}***5678*** *4* (†$_\gamma$100)

12968.6 *4*, 2^-, Γ=1.34 *4* keV, *[KMNOPQWX]*, Γ_γ=3.7 *3* eV, %IT=0.28 *3*, %p=78 *4*, %α=22 *4*, T =1

γ_{8872}***4096.1*** *7* (†$_\gamma$84 *4*)

γ_{7117}***5850.7*** *5* (†$_\gamma$12 *2*)

γ_{6130}***6837.1*** *4* (†$_\gamma$100 *4*)

γ_{0}***12963.0*** *4* (†$_\gamma$4.2 *8*)

13020 *10*, 2^+, Γ=150 *10* keV, *[FHQRSTUV]*, %IT=?, %p=?, %α=?, T=0

γ_{0}***13014*** *10* (†$_\gamma$100)

13090 *8*, 1^-, Γ=130 *5* keV, *[FGHMPQX]*, Γ_γ=34 *5* eV, %IT=0.026 *4*, %p=71, %α=29, T=1

γ_{7117}***5972*** *8* (†$_\gamma$3.1 *8*)

γ_{6049}***7039*** *8* (†$_\gamma$0.58 *12*)

γ_{0}***13084*** *8* (†$_\gamma$100)

13129 *10*, 3^-, Γ=110 *30* keV, *[EFGHM]*, %IT=?, %p=1, %α=99, T=0

13259 *2*, 3^-, Γ=21 *1* keV, *[FGHMOPQRWXY]*, %IT=?, %p=?, %α=?, T=0

13664 *3*, 1^+, Γ=64 *3* keV, *[MNO]*, %IT<0.0015, %p=14, %α=86, T=0

13869 *2*, 4^+, Γ=89 *2* keV, *[EHMOQRSTUW]*, %IT=?, %p=0.6, %α=99.4, T=0

13980 *2*, 2^-, Γ=20 *2* keV, *[EMO]*, %p=?, %α=?

14032 *15*, 0^+, Γ=185 *35* keV, *[HQ]*, %IT=?, %α=100

14100 *100*, 3^-, Γ=750 *200* keV, *[H]*, %α=100

14302 *3*, $4^{(-)}$, Γ=34 *12* keV, *[KM]*

14399 *2*, 5^+, Γ=27 *5* keV, *[EKM]*

14620 *20*, $4^{(+)}$, Γ=490 *15* keV, *[HI]*, %α=100

14660 *20*, 5^-, Γ=670 *15* keV, *[HIUV]*, %α=100

14815.3 *16*, 6^+, Γ=70 *8* keV, *[EHIKMSTUV]*, %α=100, T=0

14926 *2*, 2^+, Γ=54 *5* keV, *[EMOQ]*, %p=?, %α=?

15097 *5*, 0^+, Γ=166 *30* keV, *[GHMO]*, %p=?, %α=?

15196 *3*, 2^-, Γ=63 *4* keV, *[MOQRSWX]*, %p=?, %α=?, T=0

15260 *50*, 2^+, Γ=300 *100* keV, *[OQRS]*, %p=?, %α=?, T=(0)

15408 *2*, 3^-, Γ=132 *7* keV, *[GHMOQRTUVWX]*, %p=?, %α=?, T=0

15785 *5*, 3^+, Γ=40 *10* keV, *[KM]*

15828 *30*, 3^-, Γ=700 *120* keV, *[HQ]*, %α=100

16200 *90*, 1^-, Γ=580 *60* keV, *[FMO]*, %IT=?, %p=?, %α=?, T=0

16209 *2*, 1^+, Γ=19 *3* keV, *[MNOQ]*, %IT=?, %n=?, %p=?, T=1

16275 *7*, 6^+, Γ=420 *20* keV, *[EHIV]*, %α=100

16352 *8*, (2^+), Γ=61 *8* keV, *[GHMORSTY]*, %p=?, %α=?

16442.3 *16*, 2^+, Γ=25 *2* keV, *[FGHMOQ]*, %IT=?, %n=?, %p=?, %α=?, T=1

16817 *2*, (3^+), Γ=28 *3* keV, *[KMNO]*, %IT=?, %p=?, %α=?, T=(1)

16844 *21*, 4^+, Γ=570 *60* keV, *[H]*, %α=100

16930 *50*, 2^+, Γ≈ 280 keV, *[H]*, %α=?

17090 *40*, 1^-, Γ=380 *40* keV, *[NO]*, %IT=?, %p=100, T=1

17129 *5*, 2^+, Γ=107 *14* keV, *[GH]*, %n=?, %p=?, %α=?

17140 *10*, 1^+, Γ=34 *3* keV, *[HNOQ]*, %IT=?, %n=?, %p=?, %α=?, T=1

17197 *17*, 2^+, Γ=160 *60* keV, *[EHPRST]*, %α=?

17282 *11*, 1^-, Γ=78 *5* keV, *[GNOQ]*, %IT=?, %n=?, %p=?, %α=?, T=1

17510 *26*, 1^-, Γ=180 *60* keV, *[H]*, %α=100

17555 *21*, (6^+), Γ=180 *70* keV, *[GH]*, %n=?, %α=?

17609 *7*, 2^+, Γ=114 *14* keV, *[GHO]*, %p=, %α=?, T=(1)

17720, $(0^+,2^+)$, Γ≈ 75 keV, *[H]*, %p=?, %α=?

17775 *11*, 4^-, Γ=45 *7* keV, *[KQRSTWX]*, %p=100, T=0

17784 *15*, 4^+, Γ=400 *40* keV, *[GHQUV]*, %n=?, %α=?

17877 *6*, $(2)^-$, Γ=24 *3* keV, *[NO]*, %IT=?, %p=?, %α=?, T=(1)

18016 *1*, 4^+, Γ=14 *2* keV, *[GHK]*, %n=?, %p=?, %α=?, T=(0)

18029 *5*, $3^{(-)}$, Γ=26 *4* keV, *[KNOQW]*, %IT=?, %n=?, %p=?, %α=?, T=1

18089 *25*, (0^+), Γ=288 *44* keV, *[FGHRT]*, %IT=?, %n=?, %p=?, %α=?

18202 *8*, 2^+, Γ=220 *50* keV, *[OQRT]*, %IT=?, %p=100

18290, Γ≈ 380 keV, *[FGH]*, %IT=?, %p=?, %α=?

18404 *12*, 5^-, Γ=550 *40* keV, *[H]*, %α=100

18430 *15*, 2^+, Γ=90 *40* keV, *[ORST]*, %p=100, T=0

18484 *6*, $(1^-,2^-)$, Γ=35 *6* keV, *[O]*, %p=100

(continued on next page)

$^{16}_{8}$O (continued)

18600, $(1^-,5^-)$, Γ≈ 150 keV, *[H]*, %α=100

18600, (4^+), Γ≈ 300 keV, *[H]*, %α=?

18640 *15*, (5^+), Γ=22 *7* keV, *[EKQ]*, %n=?, %p=?

18773 *22*, 1^-, Γ=215 *45* keV, *[GH]*, %p=?, %α=?

18785 *6*, 4^+, Γ=260 *20* keV, *[GH]*, %n=?, %p=?, %α=?

18790 *10*, 1^+, Γ=120 *20* keV, *[NOQ]*, %IT=?, %p=100, T=1

18977 *6*, 4^-, Γ=8 *4* keV, *[KNOQRSWX]*, %IT=?, %p=?, %α=?, T=1

19001 *24*, 2^-, Γ=420 *50* keV, *[NOQ]*, %IT=?, %p=100, T=1

19080 *30*, 2^+, Γ≈ 120 keV, *[GHNO]*, %IT=?, %n=?, %p=?, %α=?, T=(1)

19206 *12*, 3^-, Γ=68 *10* keV, *[QWX]*, T=1

19253 *30*, (5^-), Γ=50 *45* keV, *[GH]*, %n=?, %α=?

19257 *9*, 2^+, Γ=155 *25* keV, *[GHNO]*, %IT=?, %p=?, %α=?, T=(1)

19319 *14*, (6^+), Γ=65 *35* keV, *[GH]*, %p=?, %α=?

19375 *2*, 4^+, Γ=23 *4* keV, *[GH]*, %p=?, %α=?

19470 *30*, 1^-, Γ=200 *70* keV, *[NOQ]*, %IT=?, %p=100, T=1

19539 *19*, 2^+, Γ=255 *75* keV, *[EGHRT]*, %n=?, %α=?, T=0

19754 *16*, 2^+, Γ=290 *50* keV, *[GH]*, %p=?, %α=?

19808 *11*, 4^-, Γ=32 *4* keV, *[KRWX]*, T=0

19895 *7*, 3, Γ=42 *9* keV, *[ENO]*, %IT=?, %p=?, %α=?, T=1

20055 *13*, 2^+, Γ=400 *32* keV, *[FGHST]*, %IT=?, %n=?, %p=?, %α=?, T=0

20412 *17*, $(2^-,4^+)$, Γ=190 *20* keV, *[NOQWX]*, %IT=?, %n=?, %p=?, T=1

20510 *25*, (4^-), Γ=50 *30* keV, %IT=100, T=(1)

20541 *2*, 5^-, Γ=11 *2* keV, *[EGH]*, %p=?, %α=?, T=1

20560 *2*, Γ<5 keV, *[GH]*, %p=?, %α=?

20615 *3*, Γ<10 keV, *[H]*, %α=100

20800 (?), Γ≈ 60 keV, *[G]*, %n=?, %p=?, %α=?

20857 *14*, 7^-, Γ=900 *60* keV, *[HI]*, %α=100

20945 *20*, 1^-, Γ=300 *10* keV, *[NOQ]*, %IT=?, %n=?, %p=?, T=1

21050 *50*, (2^+), Γ=298 *43* keV, *[RT]*, T=(0)

21052 *6*, 6^+, Γ=205 *15* keV, *[H]*, %α=100

21175 *15*, *[E]*

21500, (1 to 4), Γ=120 keV, *[O]*, %p=100

21623 *11*, 7^-, Γ=60 *30* keV, *[GH]*, %n=?, %p=?, %α=?

21648 *3*, 6^+, Γ=115 *8* keV, *[GHI]*, %n=?, %α=?

21776 *9*, 3^-, Γ=43 *20* keV, *[EGH]*, %n=?, %p=?, %α=?

22040, 0^+, Γ=60 keV, *[G]*, %n=?, %α=?

22150 *10*, 1^-, Γ=680 *10* keV, *[LNO]*, %IT=?, %n=?, %p=?, %α=?, T=1

22350, 2^+, Γ=175 keV, *[L]*, %n=?, %α=?

22500 *100*, 3^-, Γ=400 *50* keV, *[LT]*, %p=?, %α=?

22650 *30*, Γ=60 keV, *[EG]*, %n=?, %α=?

22721 *3*, 0^+, Γ=12.5 *25* keV, *[GHLY]*, %n=?, %p=?, %α=?, T=2

22890 *10*, 1^-, Γ=300 *10* keV, *[NO]*, %IT=?, %p=?, T=1

23000 *100*, 6^+, Γ<500 keV, *[IL]*, %α=?

23100, Γ≈ 20 keV, *[HL]*, %n=?, %α=?

23235 *62*, (1^-), Γ=560 *150* keV, *[R]*, %n=?, %p=?, T=(1)

23510 *30*, (5^-), Γ=300 keV, *[EHLST]*, %p=?, %α=?

23879 *6*, 6^+, Γ=26 *4* keV, *[GHI]*, %p=?, %α=?

24070 *30*, 1^-, Γ=550 *40* keV, *[JNOR]*, %IT=?, %p=?, T=1

24360 *70*, $(2^+,3^-)$, Γ=424 *45* keV, *[T]*, %n=?, %p=?, T=0

24522 *11*, 2^+, Γ<50 keV, *[Y]*, T=2

24760 *50*, $(2,4)^+$, Γ=340 *60* keV, *[NO]*, %IT=?, %n=?, %p=?, T=1

25120 *50*, 1^-, Γ=3000 *300* keV, *[NOS]*, %IT=?, %p=?, %α=?, T=1

25500 *150*, 1^-, Γ=1300 *300* keV, *[QR]*, %IT=?, T=1

25600, (3^-), Γ=450 keV, *[HJ]*, %α=?, T=1

26000 *100*, 1^-, Γ=750 *250* keV, *[J]*, %IT=?, %α=?, T=(1)

26363 *62*, $(2,4)^+$, Γ=550 *70* keV, *[HNO]*, %IT=?, %n=?, %p=?, %α=?, T=1

27350 *100*, $(2,4)^+$, Γ=830 *110* keV, *[JNO]*, %IT=?, %p=?, %α=?, T=1

27500, (3^-), Γ≈ 2500 keV, *[J]*, %IT=?, T=(0)

28200, 7^-, Γ=1000 keV, *[HI]*, %α=100

28600 *200*, *[J]*, %IT=?

29000, 7^-, Γ=1000 keV, *[HI]*, %p=?, %α=?

29800 *100*, 9^- and 8^+, Γ=750 *250* keV, *[J]*, %α=?

31800 *600*, *[I]*, %IT=?, %α=?

34000, $10^+,(9^-)$, Γ=2300 keV, *[HI]*, %α=100

35000, *[I]*, %α=100

$^{16}_{9}$F

Δ: 10680 *8* **S_n:** 14170 *130* **Q_p:** 536 *8*
Q_{EC}: 15417 *8*

Populating Reactions and Decay Modes

A ^{14}N(^{3}He,n), (^{3}He,np),^{15}N(p,π^{-})
B ^{16}O(γ,π^{-})
C ^{16}O(p,n)
D ^{16}O(^{3}He,t)
E ^{16}O(^{6}Li,^{6}He), (^{7}Li,^{7}He)
F ^{19}F(^{3}He,^{6}He)

Levels:

0, 0^{-}, Γ=40 *20* keV, *[ABCDEF]*, %p=100, T=1
193 *6*, 1^{-}, Γ<40 keV, *[ACDF]*, %p=100
424 *5*, 2^{-}, Γ=40 *30* keV, *[ACDF]*, %p=100
721 *4*, 3^{-}, Γ<15 keV, *[ACDF]*, %p=100
3758 *6*, 1^{+}, Γ<40 keV, *[ACDF]*, %p=100
3870 *6*, 2^{+}, Γ<20 keV, *[ADF]*, %p=100
4372 *6*, 3^{+}, Γ=50 *20* keV, *[ACDF]*, %p=100
4654 *6*, 1^{+}, Γ=60 *20* keV, *[ACDF]*, %p=100
4710 *20* (?), *[F]*
4977 *8*, (2^{+}), Γ=60 *40* keV, *[ADF]*, %p=100
5272 *8*, (1^{-}), *[ACD]*, %p=100
5404 *10*, 4, *[ADF]*, %p=100
5449 *14*, *[A]*, %p=100
5524 *9*, $^{+}$, *[ADF]*, %p=100
5570 *20* (?), *[A]*, %p=100
5856 *10*, 2^{-}, *[CD]*, %p=100
6050 *20* (?), *[F]*
6224 *14*, *[AC]*
6372 *9*, 4^{-}, *[ACD]*
6559 *10*, *[D]*, %p=100
6679 *8*, Γ<45 keV, *[ADF]*
6930 *20* (?), *[F]*
7110 *20*, *[A]*
7500 *30*, 2^{-}, Γ=950 *100* keV, *[CD]*, %p=100
7900 *15*, Γ<100 keV, *[ACD]*
9500 *30*, 1^{-}(and 2^{-}), Γ=1050 *100* keV, *[CD]*, %p=100
9600 *20*, Γ=250 *50* keV, *[D]*
11500 *50*, 1^{-}(and 2^{-}), Γ=1900 *500* keV, *[CD]*, %p=100

p from ^{16}F (40 keV) p decay **<** *for Ip% multiply by 1.0* **>**

p_0 ***514*** *13* (†100).

$^{16}_{10}$Ne

Δ: 23989 *20*   **S_n:** (25500)   **S_p:** 80 *140*

Q_{EC}: 13308 *22*

Populating Reactions and Decay Modes

A ^{16}O(π^+,π^-)

B ^{20}Ne(α,^{8}He)

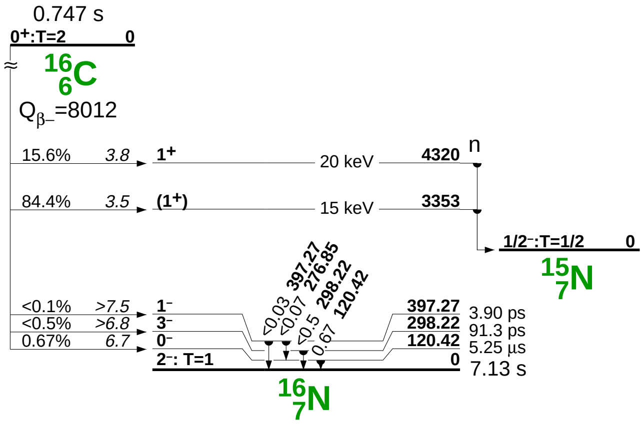
Levels:

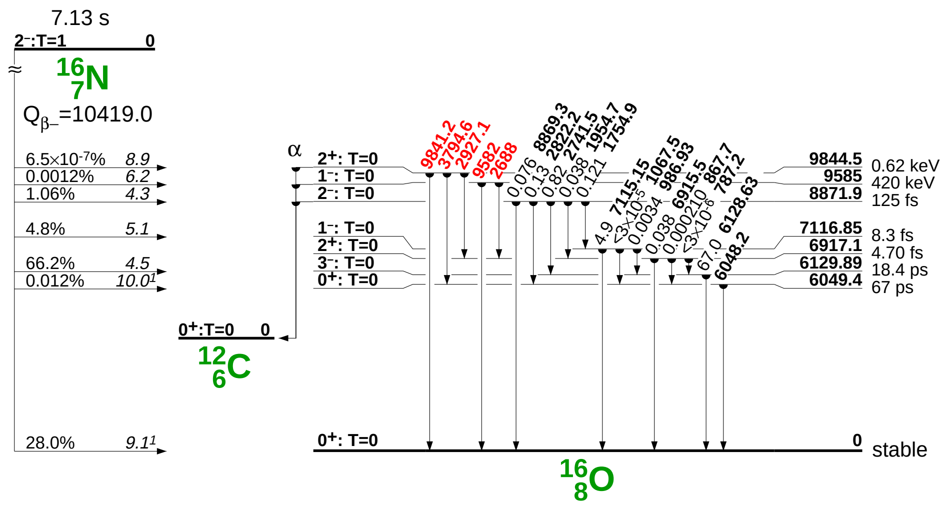
0, 0^+, Γ=122 *37* keV, *[AB]*, %2p=100, T=2

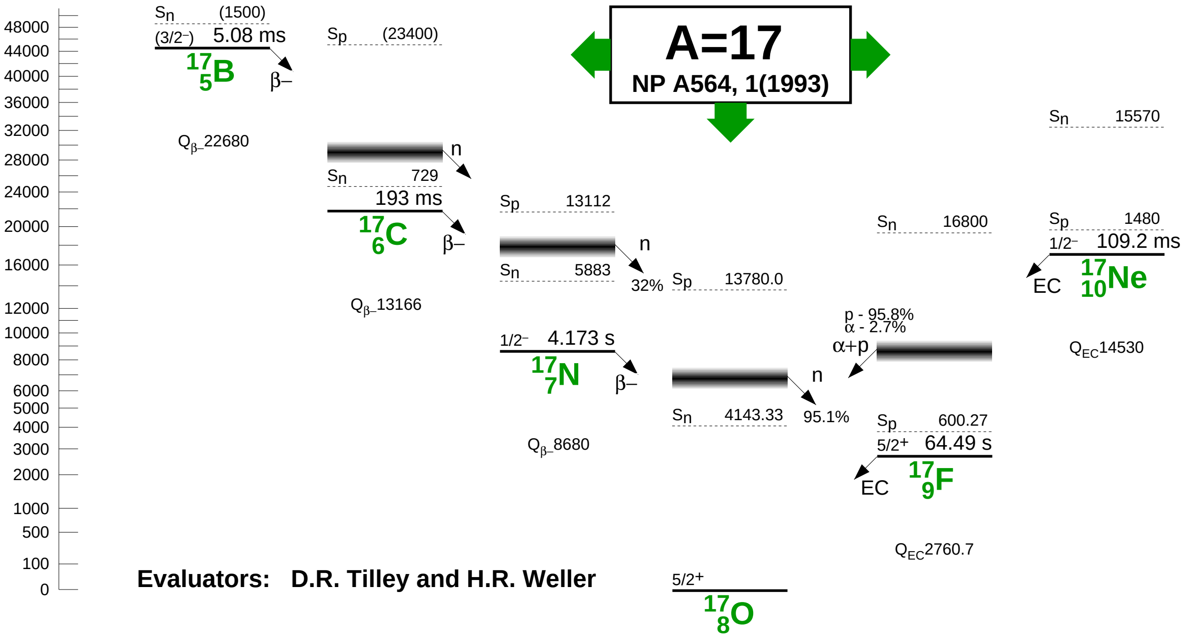
1690 *70*, (2^+), *[B]*, %p=100, T=2

p from ^{16}Ne (122 keV) 2p decay (summed energies) **<** *for Ip% multiply by 1.0* **>**

$2p_0$*1250* (†100).


0.747 s
0+:T=2 0
≈
16 6 C
Qβ−=8012
15.6% 3.8 1+
20 keV
4320
n
84.4% 3.5 (1+)
15 keV
3353
1/2−:T=1/2 0
15 7 N
397.27
276.85
298.22
120.42
<0.03
<0.07
<0.5
0.67
<0.1% >7.5 1−
<0.5% >6.8 3−
0.67% 6.7 0−
2−: T=1
397.27 3.90 ps
298.22 91.3 ps
120.42 5.25 μs
0 7.13 s
16 7 N


7.13 s
2⁻:T=1 0
16 7 N
Qβ−=10419.0
6.5×10-7% 8.9
0.0012% 6.2
1.06% 4.3
4.8% 5.1
66.2% 4.5
0.012% 10.01
28.0% 9.11
α
0+:T=0 0
12 6 C
2+: T=0
1−: T=0
2−: T=0
1−: T=0
2+: T=0
3−: T=0
0+: T=0
9841.2
3794.6
2927.1
9582
2688
0.076 8869.3
0.13 2822.2
0.82 2741.5
0.038 1954.7
0.121 1754.9
4.9 7115.15
<3×10-5 1067.5
0.0034 986.93
0.038 6915.5
0.000210 867.7
<3×10-6 787.2
67.0 6128.63
6048.2
9844.5 0.62 keV
9585 420 keV
8871.9 125 fs
7116.85 8.3 fs
6917.1 4.70 fs
6129.89 18.4 ps
6049.4 67 ps
0+: T=0 0 stable
16 8 O


A=17
NP A564, 1(1993)
48000
44000
40000
36000
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
Sn (1500)
(3/2−) 5.08 ms
17 5 B
β−
Qβ− 22680
Sp (23400)
n
Sn 729
193 ms
17 6 C
β−
Qβ− 13166
Sp 13112
n
Sn 5883
32%
1/2− 4.173 s
17 7 N
β−
Qβ− 8680
Sp 13780.0
n
Sn 4143.33
95.1%
5/2+
17 8 O
Sn 16800
p - 95.8%
α - 2.7%
α+p
Sp 600.27
5/2+ 64.49 s
EC
17 9 F
QEC 2760.7
Sn 15570
Sp 1480
1/2− 109.2 ms
EC
17 10 Ne
QEC 14530
Evaluators: D.R. Tilley and H.R. Weller

${}^{17}_{5}$B

Δ: 43720 *140* **S_n:** (1500) **$Q_{\beta-}$:** 22680 *140*

Populating Reactions and Decay Modes

U(p,x) (88Du09, 93TiAA)

Levels:

0, ($3/2^-$), 5.08 *5* ms, %β^-=100, %β^-n=?

$^{17}_{6}$C

Δ: 21037 *17* **S$_n$:** 729 *18* **S$_p$:** (23400)
Q$_{\beta-}$: 13166 *23*

Populating Reactions and Decay Modes

A ^{17}B β^- decay
B ^{48}Ca(^{18}O,x) (93TiAA)

Levels:

0, 193 *13* ms, *[B]*, %β^-=100, %β^-n=32 *3*
295 *10*, *[B]*

γ(*^{17}N*) from ^{17}C (193 ms) β^- decay :

475.7 *3* (†$_\gamma$3.4 *9*)
523.9 *3* (†$_\gamma$2.1 *17*)
612.2 *5* (†$_\gamma$5.3 *25*)
676.4 *5* (†$_\gamma$1.6 *8*)
1152.1 *5* (†$_\gamma$4.4 *21*)
1373.8 *3* (†$_\gamma$24 *8*)
1849.5 *3* (†$_\gamma$22 *5*)
1906.7 *3* (†$_\gamma$7 *5*)
2525.8 *5* (†$_\gamma$1.4 *7*)

$^{17}_{7}$N

Δ: 7871 *15*   **S_n:** 5883 *15*   **S_p:** 13112 *15*
Q_{β^-}: 8680 *15*

Populating Reactions and Decay Modes

A ^{17}C β^- decay (93TiAA)
B ^{18}C β^-n decay
C ^{9}Be(^{9}Be,p)
D ^{11}B(^{7}Li,p)
E ^{14}C(^{6}Li,^{3}He)
F ^{15}N(t,p)
G ^{18}O(γ,p)
H ^{18}O(d,^{3}He)
I ^{18}O(t,α)

Levels and γ-ray branchings:

0, 1/2$^-$, 4.173 *4* s, *[ADEFGHI]*, %β^-=100, %β^-n=95.1 *7*, T=3/2

1373.9 *3*, 3/2$^-$, 64 *24* fs, *[ADFGHI]*
γ_0***1373.8*** *3* ($\dagger_\gamma$100)

1849.6 *3*, 1/2$^+$, 28$^{+14}_{-6}$ ps, *[ADFGHI]*
γ_{1374}***475.7*** *3* ($\dagger_\gamma$16 *3*)
γ_0***1849.5*** *3* ($\dagger_\gamma$100 *3*)

1906.8 *3*, 5/2$^-$, 7.6 *14* ps, *[ADEFGHI]*
γ_{1374}***523.9*** *3* ($\dagger_\gamma$30 *3*)
γ_0***1906.7*** *3* ($\dagger_\gamma$100 *3*)

2526.0 *5*, 5/2$^+$, 22.9 *21* ps, *[ADEFHI]*
γ_{1907}***612.2*** *5* ($\dagger_\gamma$100 *6*)
γ_{1850}***676.4*** *5* ($\dagger_\gamma$29 *4*)
γ_{1374}***1152.1*** *5* ($\dagger_\gamma$83 *8*)
γ_0***2525.8*** *5* ($\dagger_\gamma$27 *3*)

3128.9 *5*, 7/2$^-$, 191 *56* ps, *[DFHI]*
γ_{2526}***602.9*** *7* ($\dagger_\gamma$<3)
γ_{1907}***1222.1*** *5* ($\dagger_\gamma$100)
γ_{1850}***1279.2*** *6* ($\dagger_\gamma$<2)
γ_{1374}***1754.9*** *6* ($\dagger_\gamma$<5)
γ_0***3128.6*** *5* ($\dagger_\gamma$<2)

3204.2 *9*, 3/2$^-$, <21 fs, *[DFHI]*
γ_{2526}***678.2*** *10* ($\dagger_\gamma$<3)
γ_{1907}***1297.3*** *9* ($\dagger_\gamma$14 *5*)
γ_{1850}***1354.5*** *10* ($\dagger_\gamma$<6)
γ_{1374}***1830.2*** *10* ($\dagger_\gamma$<5)
γ_0***3203.9*** *9* ($\dagger_\gamma$100 *5*)

3628.7 *7*, (7/2,9/2)$^-$, 8.3 *14* ps, *[DEF]*
γ_{3204}***424.5*** *12* ($\dagger_\gamma$<2)
γ_{3129}***499.8*** *7* ($\dagger_\gamma$100 *19*)
γ_{2526}***1102.7*** *9* ($\dagger_\gamma$<3)
γ_{1907}***1721.8*** *7* ($\dagger_\gamma$89 *19*)
γ_{1850}***1779.0*** *8* ($\dagger_\gamma$<7)
γ_{1374}***2254.6*** *8* ($\dagger_\gamma$<10)
γ_0***3628.3*** *8* ($\dagger_\gamma$<10)

3663 *4*, 1/2$^-$, <243 fs, *[DF]*
γ_{1850}***1813*** *4* ($\dagger_\gamma$100)

3906.0 *20*, (3/2,5/2)$^-$, 36 *15* fs, *[DF]*
γ_{1907}***1999.1*** *20* ($\dagger_\gamma$100)

4006.4 *20*, 3/2$^{(+)}$, <11 fs, *[DEFH]*
γ_{2526}***1480.3*** *20* ($\dagger_\gamma$100 *6*)
γ_{1850}***2156.7*** *20* ($\dagger_\gamma$<24)

4209 *3*, 5/2$^+$, <49 fs, *[DF]*
γ_{1374}***2835*** *3* ($\dagger_\gamma$100)

4415 *3*, (3/2,5/2)$^-$, <42 fs, *[DF]*
γ_{1907}***2508*** *3* ($\dagger_\gamma$100)

5170 *2*, (9/2$^+$), <42 fs, *[DEFH]*
γ_{3129}***2041*** *2* ($\dagger_\gamma$100 *11*)
γ_{2526}***2644*** *2* ($\dagger_\gamma$59 *11*)

5195 *3*, 3/2$^+$, <66 fs, *[DF]*
γ_{1907}***3288*** *3* ($\dagger_\gamma$≈100)
γ_{1850}***3345*** *3* ($\dagger_\gamma$≈72)

5515 *3*, 3/2$^-$, <70 fs, *[DFH]*
γ_{1374}***4141*** *3* ($\dagger_\gamma$≈100)
γ_0***5515*** *3* ($\dagger_\gamma$≈100)

5772 *3*, 1/2,3/2$^+$, <83 fs, *[DF]*
γ_{4006}***1766*** *3* (?) ($\dagger_\gamma$≈100)
γ_{1907}***3865*** *3* ($\dagger_\gamma$≈50)
γ_{1374}***4398*** *3* ($\dagger_\gamma$≈50)

6080 *30* (?), *[D]*

6233 *8*, *[DF]*
6449 *3*, *[DF]*
6615 *19*, *[DF]*
6938 *15*, *[F]*
6981 *20*, 3/2$^-$, *[DFH]*
7013 *22*, *[DFH]*
7170 *40*, *[D]*
7370 *40*, *[D]*
7630 *40*, *[D]*
7730 *40*, *[D]*
8000 *25*, *[D]*
8140 *40*, *[D]*
8550 *40*, *[D]*
8930 *40*, *[D]*
9260 *40*, *[D]*
9740 *40*, *[D]*
10140, (1/2,3/2)$^-$, *[H]*

γ(*^{17}O*) from ^{17}N (4.173 s) β^- decay **<** *for Iγ% multiply by 1.0* **>**

870.71 *12* ($\dagger_\gamma$3.3 *5*)
2184.48 *20* ($\dagger_\gamma$0.34 *6*)
3842.3 *4* ($\dagger_\gamma$<0.007)

n from ^{17}N (4.173 s) β^-n decay **<** *for In% multiply by 1.0* **>**

n_0***1700.3*** *17* (†6.9 *5*)
n_0***1170.9*** *8* (†50.1 *13*)
n_0***884*** *21* (†≈0.6)
n_0***382.8*** *9* (†38.0 *13*)

$^{17}_{8}\mathrm{O}$

%: 0.038 *3*

Δ: –809.00 *21*   **S_n:** 4143.33 *21*   **S_p:** 13780.0 *23*

σ_γ: 0.54 *7* mb , **σ_α:** 0.235 *10* b

Populating Reactions and Decay Modes

A ^{17}N β^- decay (93TiAA)
B ^{17}F β^+ decay (93TiAA)
C ^{18}N β^-n decay
D ^{12}C(^{6}Li,p)
E ^{12}C(^{7}Li,d)
F ^{13}C(α,n), (α,α)
G ^{13}C(^{6}Li,d)
H ^{13}C(^{7}Li,t), (^{9}Be,αn)
I ^{14}C(^{3}He,γ)
J ^{14}C(^{6}Li,t)
K ^{14}N(t,γ)
L ^{14}N(α,p), (α,αp)
M ^{15}N(d,α)
N ^{15}N(^{3}He,p)
O ^{16}O(n,n)
P ^{16}O(n,α)
Q ^{17}O(γ,n), (γ,2n), (γ,p)
R ^{17}O(e,e)
S ^{18}O(d,t)
T ^{19}F(d,α)
U 37 other reactions

Levels and γ-ray branchings:

0, $5/2^+$, stable, *[ABDEGHIJKLNQRST]*, T=1/2, μ=–1.89379 *9*, Q=–0.02578

870.73 *10*, $1/2^+$, 179.2 *18* ps, *[ABDEGHIJKLNRST]*
γ_0 ***870.71*** *12* (†$_\gamma$100)

3055.36 *16*, $1/2^-$, 0.08$^{+6}_{-4}$ ps, *[ADEGJLNRST]*
γ_{871} ***2184.48*** *20* (†$_\gamma$100)

3842.8 *4*, $5/2^-$, <18 fs, *[ADEGHJLNRST]*
γ_0 ***3842.3*** *4* (†$_\gamma$100)

4553.8 *16*, $3/2^-$, Γ=40 *5* keV, *[ADGHJLNOQRST]*, %IT=?, %n=100
γ_{871} ***3682.7*** *16*
γ_0 ***4553.1*** *16*

5084.8 *9*, $3/2^+$, Γ=96 *5* keV, *[AEGHLNORS]*, %IT=?, %n=100

5215.8 *5*, $9/2^-$, Γ<0.1 keV, *[EGHLNORT]*, %IT=?, %n=?

5379.2 *14*, $3/2^-$, Γ=28 *7* keV, *[ALNOQRST]*, %IT=?, %n=100

5697.3 *4*, $7/2^-$, Γ=3.4 *3* keV, *[EGHJLNOQRS]*, %IT=?, %n=100

5732.8 *5*, $(5/2^-)$, Γ<1 keV, *[ADEGHJLOT]*, %n=100

5869.1 *6*, $3/2^+$, Γ=6.6 *7* keV, *[AEGHLNOT]*, %n=100

5939 *4*, $1/2^-$, Γ=32 *3* keV, *[ADEGHLNORST]*, %IT=?, %n=100

6356 *8*, $1/2^+$, Γ=124 *12* keV, *[ADJLNOQR]*, %IT=?, %n=100

6862 *2*, $(5/2^+)$, Γ<1 keV, *[DEGHLNORST]*, %IT=?, %n=?

6972 *2*, $(7/2^-)$, Γ<1 keV, *[EGHLNORT]*, %IT=?, %n=?

7165.7 *8*, $5/2^-$, Γ=1.38 *5* keV, *[DEFGHLNOP]*, %n=?, %α=?

7202 *10*, $3/2^+$, Γ=280 *30* keV, *[GHLOP]*, %n=?, %α=?

7379.2 *10*, $5/2^+$, Γ=0.64 *23* keV, *[DEFGHNOPQRST]*, %IT=?, %n=?, %α=?

7382.2 *10*, $5/2^-$, Γ=0.96 *20* keV, *[DFGHLOPQRST]*, %IT=?, %n=?, %α=?

7559 *20*, $3/2^-$, Γ=500 *50* keV, *[OP]*, %n=?, %α=?

7576 *2*, $(7/2^-)$, Γ<0.1 keV, *[DEFGHLNOR]*, %IT=?, %n=?, %α=?

7688.2 *9*, $7/2^-$, Γ=14.4 *3* keV, *[DEFGHNOPQ]*, %IT=?, %n=?, %α=?

7757 *9*, $11/2^-$, *[JNR]*

7956 *6*, $1/2^+$, Γ=90 *9* keV, *[FNOP]*, %n=?, %α=?

7990 *50*, $1/2^-$, Γ=270 *30* keV, *[OP]*, %n=?, %α=?

8070 *10*, $3/2^+$, Γ=85 *9* keV, *[FNOP]*, %n=?, %α=?

8200 *7*, $3/2^-$, Γ=60 keV, *[FJNOPQS]*, %IT=?, %n=?, %α=?

8342.4 *9*, $1/2^+$, Γ=11.4 *5* keV, *[FNOPR]*, %IT=?, %n=?, %α=?

8402.3 *8*, $5/2^+$, Γ=6.17 *13* keV, *[EFGHNOPR]*, %IT=?, %n=?, %α=?

8466.0 *8*, $7/2^+$, Γ=2.13 *11* keV, *[EFGHNOPRS]*, %IT=?, %n=?, %α=?

8500.7 *8*, $5/2^-$, Γ=6.89 *22* keV, *[EFGHNOPQR]*, %IT=?, %n=?, %α=?

8687.0 *10*, $3/2^-$, Γ=55.3 *6* keV, *[FNOPQS]*, %IT=?, %n=?, %α=?

8885 *14*, $7/2^-$,$9/2^-$, Γ=6 keV, *[R]*

8897 *8*, $3/2^+$, Γ=101 *3* keV, *[EFGHNOPR]*, %n=?, %α=?

8967.2 *17*, $7/2^-$, Γ=26 *2* keV, *[EFGHNOPR]*, %IT=?, %n=?, %α=?

9147 *4*, $1/2^-$, Γ=4 *3* keV, *[EFGHS]*, %IT=?, %n=?, %α=?

9150 *20*, $9/2^-$, *[NO]*

9180, $7/2^-$, Γ=3 keV, *[FGH]*, %α=100

9193.9 *8*, $5/2^+$, Γ=3.53 *13* keV, *[FGHO]*, %n=?, %α=?

9420, $3/2^-$, Γ=120 keV, *[O]*, %n=100

9492 *4*, $5/2^-$, Γ=15 *1* keV, *[DFHNOS]*, %n=?, %α=?

9711.9 *9*, $7/2^+$, Γ=23.1 *3* keV, *[FHJNO]*, %n=?, %α=?

9783.3 *9*, $3/2^+$, Γ=11.7 *3* keV, *[FHO]*, %n=?, %α=?

(continued on next page)

$^{17}_{8}$O (continued)

9858.9 *9*, $(5/2^-)$, Γ=4.01 *23* keV, *[FHNO]*, %n=?, %α=?

9876.5 *13*, $(1/2^-)$, Γ=16.7 *17* keV, *[FHNO]*, %n=?, %α=?

9976 *20*, $5/2^+$, Γ≈ 80 keV, *[F]*, %n=?, %α=?

10045 *20*, Γ≈ 100 keV, *[F]*, %n=?, %α=?

10167.8 *10*, $7/2^-$, Γ=49.1 *8* keV, *[FO]*, %n=?, %α=?

10336 *15*, $5/2^+,7/2^-$, Γ=150 keV, *[FN]*, %n=?, %α=?

10423 *3*, Γ=14 *3* keV, *[FJ]*, %n=?, %α=?

10490, $5/2^+,7/2^-$, Γ=75 *30* keV, *[F]*, %n=?, %α=?

10559.1 *10*, $(7/2^-)$, Γ=42.5 *11* keV, *[FNO]*, %n=?, %α=?

10777 *3*, $1/2^+,7/2^-$, Γ=74 *3* keV, *[FHN]*, %n=?, %α=?

10913 *3*, $(5/2^+)$, Γ=41.7 *14* keV, *[FNO]*, %n=?, %α=?

11036 *3*, Γ=31 *3* keV, *[FN]*, %n=?, %α=?, T=1/2

11078.7 *9*, $1/2^-$, Γ=2.4 *3* keV, *[FOPRS]*, %IT=0.42 *14*, %n=?, %α=?, T=3/2, Γ_γ=10 *3* eV

γ_{871} ***10204.6*** *9* ($\dagger_\gamma$100)

11238, Γ=80 *3* keV, *[DFJ]*, %n=?, %α=?

11510, ≥3/2, Γ=190 keV, *[O]*, %n=100

11622, Γ=65 *2* keV, *[F]*, %n=?, %α=?

11750 *10*, Γ=40 *25* keV, *[FR]*, %IT=?, %n=?, %α=?

11815 *15*, Γ=12 *3* keV, *[FJ]*, %n=?, %α=?

12005 *15*, ≥3/2, Γ=270 keV, *[FJOR]*, %IT=?, %n=?, %α=?

12110 *20*, Γ=150 *50* keV, *[F]*, %n=?, %α=?

12220 *20*, Γ<20 keV, *[R]*

12274 *15*, Γ=100 *30* keV, *[FJ]*, %n=?, %α=?

12380 *20*, *[FO]*, %n=?, %α=?

12420 *15*, *[F]*, %n=?, %α=?

12466.0 *10*, $3/2^-$, Γ=6.9 *11* keV, *[FORS]*, %IT=?, %n=?, %α=?, T=3/2

12595 *15*, Γ=75 *30* keV, *[F]*, %n=?, %α=?

12669 *15*, Γ≈ 5 keV, *[FOR]*, %IT=?, %n=?, %α=?

12810 *25*, *[F]*, %n=?, %α=?

12930 *20*, Γ>150 keV, *[F]*, %n=?, %α=?

12944 *5*, $1/2^+$, Γ=6 *2* keV, *[FOS]*, %n=?, %α=?, T=3/2

12998.2 *10*, $5/2^-$, Γ=2.5 *10* keV, *[FOR]*, %IT=?, %n=?, %α=?, T=3/2

13076 *15*, Γ=16 *4* keV, *[F]*, %n=?, %α=?

13484 *15*, Γ≈ 120 keV, *[F]*, %n=?, %α=?

13580 *20*, $(11/2^-,13/2^-)$, Γ=68 *19* keV, *[GHR]*

13609 *15*, Γ=250 *100* keV, *[F]*, %n=?, %α=?

13635.3 *25*, $(5/2)^+$, Γ=9 *5* keV, *[OS]*, %n=?, %α=?, T=3/2

13670 (?), Γ=400 keV, *[O]*, %n=100

14150 *100*, $(9/2^+,11/2^+)$, Γ≈ 100 keV, *[G]*

14230.3 *17*, $7/2^-$, Γ=20.5 *16* keV, *[OR]*, %IT=?, %n=?, %α=?, T=3/2

14286 *3*, Γ=7.5 *4* keV, *[O]*, %n=?, %α=?, T=3/2

14451 *3*, Γ=40 *6* keV, *[O]*, %IT=?, %n=?, %α=?

14760 *100*, (≥3/2), Γ=340 keV, *[OR]*, %IT=?, %n=?

14791 *3*, $(1/2^-)$, Γ=36 *13* keV, *[OR]*, %IT=?, %n=?, %α=?, T=(3/2)

15000, Γ=180 keV, *[MO]*, %n=?, %α=?

15100 *100*, $(9/2^+,11/2^+)$, Γ≈ 500 keV, *[G]*

15199 *3*, Γ=52 *14* keV, *[JMOR]*, %IT=?, %n=?, %α=?, T=(3/2)

15368 *3*, $(5/2^+)$, Γ=40 *6* keV, *[O]*, %n=?, %α=?, T=(3/2)

15600 (?), Γ≈ 300 keV, *[M]*, %p=?, %α=?, T=1/2

15780 *20*, $(13/2^-)$, Γ<30 keV, *[R]*, T=(3/2)

15950 *150*, $(9/2^+,11/2^+)$, Γ≈ 700 keV, *[G]*

16243 *4*, $(9/2^+)$, Γ=21 *10* keV, *[O]*, %n=?, %p=?, %α=?, T=(3/2)

16580 *10*, $(1/2,3/2)^-$, Γ≈ 300 keV, *[RS]*, T=3/2

16600 *150*, $(11/2^-,13/2^-)$, *[G]*

17060 *20*, $11/2^-$, Γ<20 keV, *[GR]*, T=1/2

17436 *11*, Γ=66 *20* keV, *[O]*, %n=?, %α=?, T=(3/2)

17920 *20*, Γ=98 *16* keV, *[R]*

18110 *4*, $3/2^-$, Γ=46 *12* keV, *[OS]*, %n=?, %α=?, T=3/2

18720 *20*, Γ=87 *33* keV, *[R]*

19600 *150*, $(13/2^+,15/2^+)$, Γ≈ 250 keV, *[G]*

19820 *40*, 3/2, Γ=550 *50* keV, *[KR]*, %IT=?

20140 *20*, $11/2^-$, Γ=31 *5* keV, *[R]*, T=1/2

20200 *150*, $(13/2^+,15/2^+)$, Γ≈ 250 keV, *[G]*

20390 *50*, $5/2,7/2^-$, Γ=660 *70* keV, *[K]*, %IT=?

20580 *50*, 1/2, Γ=570 *80* keV, *[K]*, %IT=?

20700 *20*, $(9/2^-)$, Γ<20 keV, *[R]*, T=(3/2)

21050 *50*, 3/2, Γ=470 *60* keV, *[K]*, %IT=?

21200, $(13/2^+,15/2^+)$, *[G]*

21700 *100*, $5/2^+$, Γ≈ 750 keV, *[I]*, %IT=?, %α=?

22100 *100*, $7/2^-$, Γ≈ 750 keV, *[GI]*, %IT=?, %n=?, %α=?

22500 *200*, $3/2^{(-)}$, Γ≈ 1000 keV, *[I]*, %IT=?

23000, Γ≈ 6000 keV, *[QR]*, %IT=?, %n=?

23000, $1/2^+$, Γ≈ 400 keV, *[I]*, %IT=?

23500, *[I]*, %IT=?

24400, *[I]*, %IT=?

$^{17}_{9}$F

Δ: 1951.70 *25* **S_n:** 16800 *8* **S_p:** 600.27 *25*
Q_{EC}: 2760.7 *3*

Populating Reactions and Decay Modes

A ^{17}Ne EC decay (93TiAA)
B ^{12}C(^{14}N,^{9}Be)
C ^{14}N(^{3}He,γ), (α,p)
D ^{14}N(^{6}Li,t), (^{6}Li,tα)
E ^{15}N(^{3}He,n)
F ^{16}O(p,γ)
G ^{16}O(p,p), (p,2p), (p,pn), (p,pα)
H ^{16}O(p,n)
I ^{16}O(p,d)
J ^{16}O(p,t), (p,^{3}He)
K ^{16}O(p,α)
L ^{16}O(d,n)
M ^{16}O(^{3}He,d), (^{7}Li,^{6}He)
N ^{16}O(^{10}B,^{9}Be), (^{11}C,^{10}Be), ^{16}O(^{12}C,^{11}B), (^{13}C,^{12}B), ^{16}O(^{14}N,^{13}C), (^{16}O,^{15}N)
O ^{17}O(p,n)
P ^{19}F(p,t),^{20}Ne(p,α)

Levels and γ-ray branchings:

0, 5/2$^+$, 64.49 *16* s, *[ABCDEFLMNOP]*, %EC+%β$^+$=100, T=1/2, μ=+4.72130 *20*, Q=0.058 *4*

495.33 *10*, 1/2$^+$, 286 *6* ps, *[ABCDEFLMNOP]*
$γ_0$ ***495.32*** *10* (†$_γ$100)

3104 *3*, 1/2$^-$, Γ=19 *1* keV, *[ACDEFGLMP]*, %IT=6.3×10^{-5} *11*, %p=100, $Γ_γ$=0.012 *2* eV
$γ_{495}$ ***2609*** *3* (†$_γ$100)

3857 *4*, 5/2$^-$, Γ=1.5 *2* keV, *[CDEFGLMP]*, %IT=0.0073 *17*, %p=100, $Γ_γ$=0.11 *2* eV
$γ_0$ ***3857*** *4* (†$_γ$100)

4640 *20*, 3/2$^-$, Γ=225 keV, *[ADEGLO]*, %p=100

5000 *20*, 3/2$^+$, Γ=1530 keV, *[G]*, %p=100

5220 *10*, 9/2$^-$, *[DEN]*

5488 *11*, 3/2$^-$, Γ=68 keV, *[ADEG]*, %p=100

5672 *20*, 7/2$^-$, Γ=40 keV, *[DEG]*, %p=100

5682 *20*, (5/2$^-$), Γ<0.6 keV, *[DEG]*, %p=100

5820 *20*, 3/2$^+$, Γ=180 keV, *[DGO]*, %p=100

6037 *9*, 1/2$^-$, Γ=30 keV, *[ADEG]*, %p=100

6406 *30*, (1/2$^-$), %p=100, T=(3/2)

6560 *20*, 1/2$^+$, Γ=200 keV, *[G]*, %p=100

6697 *7*, 5/2$^+$, Γ<1.8 keV, *[DEG]*, %p=100

6774 *20*, (3/2$^+$), Γ=4.5 keV, *[G]*, %p=100

7027 *20*, 5/2$^-$, Γ=3.8 keV, *[EG]*, %p=100

7356 *20*, (3/2$^+$), Γ=10 *2* keV, *[EGK]*, %p=?, %α=?

7448 *20*, Γ<5 keV, *[G]*, %p=100

7454 *20*, Γ=7 *2* keV, *[GK]*, %p=?, %α=?

7471 *20*, Γ=5 *2* keV, *[G]*, %p=100

7479 *20*, 3/2$^+$, Γ=795 keV, *[G]*, %p=100

7546 *20*, 7/2$^-$, Γ=30 keV, *[G]*, %p=100

7750 *40*, (1/2$^+$), Γ=179 *30* keV, *[GKP]*, %p=?, %α=?

7950 *30*, Γ=10 *3* keV, *[G]*, %p=100

8010 *40*, Γ=50 *20* keV, *[GK]*, %p=?, %α=?

8070 *30*, 5/2($^+$), Γ=100 *20* keV, *[EGK]*, %p=?, %α=?

8075 *10*, (1/2,3/2)$^-$, *[AE]*, %p=100

8200, 3/2($^-$), Γ=700 *250* keV, *[AGK]*, %p=?, %α=?

8383 *10*, 5/2($^-$), Γ=11 *5* keV, *[GK]*, %p=?, %α=?

8416 *20*, (7/2$^+$), Γ=45 *10* keV, *[GK]*, %p=?, %α=?

8436 *10*, (1/2,3/2)$^-$, *[A]*, %p=100

8750 *60*, 5/2($^+$), Γ=170 *30* keV, *[GK]*, %p=?, %α=?

8760, 3/2$^+$, Γ=90 *20* keV, *[G]*, %p=100

8825 *25*, (1/2,3/2)$^-$, *[A]*, %p=100

8980 *20*, 7/2$^-$, Γ=165 *30* keV, *[GK]*, %p=?, %α=?

9170 *60*, 3/2($^+$), Γ=140 *30* keV, *[GKO]*, %p=?, %α=?

9450 *50*, Γ=200 *40* keV, *[A]*, %p=100

9920, 9/2$^+$, Γ=90 *30* keV, *[GK]*, %p=?, %α=?

10030 *60*, Γ=170 *40* keV, *[A]*, %p=100

10040 *40*, 7/2, Γ=280 *100* keV, *[G]*, %p=100

10220 *40*, Γ=250 *80* keV, *[K]*, %α=100

10400 *40*, 5/2($^+$), Γ=160 *40* keV, *[G]*, %p=100

10499 *30*, 7/2$^-$, Γ=165 *25* keV, *[GK]*, %p=?, %α=?

10660 *20*, Γ=90 *60* keV, *[A]*, %p=100

10790 *40*, Γ=120 *40* keV, *[GK]*, %p=?, %α=?

10910 *100*, 1/2$^-$, Γ=560 *100* keV, *[AG]*, %p=100

10950 *40*, Γ=190 *50* keV, *[GK]*, %p=?, %α=?

11192.9 *23*, 1/2$^-$, Γ=0.18 *3* keV, *[AEFGK]*, %IT=3.3 *15*, %p=?, %α=?, T=3/2, $Γ_γ$=6.0 *25* eV
$γ_{495}$ ***10694.0*** *23* (†$_γ$100)

11430 *40*, Γ=240 *50* keV, *[GK]*, %p=?, %α=?

11580 *50*, Γ=160 *30* keV, *[G]*, %p=100

12000 *40*, Γ=120 *40* keV, *[GK]*, %p=?, %α=?

12250 *40*, 3/2$^-$, Γ=300 *30* keV, *[AG]*, %p=100

12355 *20*, 1/2$^-$, Γ=190 *20* keV, *[G]*, %p=100

≈12500, 7/2$^-$, Γ≈ 600 keV, *[G]*, %p=100

12550.1 *9*, 3/2$^-$, Γ=2.83 *12* keV, *[EFGK]*, %IT=?, %p=?, %α=?, T=3/2

13061 *4*, 5/2$^-$, Γ=2 *1* keV, *[EFGK]*, %IT=?, %p=?, %α=?, T=3/2

13080 *4*, (1/2$^+$), Γ=2 *1* keV, *[GK]*, %p=?, %α=?, T=3/2

13130 *100*, 5/2$^-$, Γ=520 *50* keV, *[G]*, %p=100

13781 *4*, 5/2$^+$, Γ=12 *5* keV, *[GK]*, %p=?, %α=?, T=3/2

14000 *50*, 7/2$^-$, Γ=260 *30* keV, *[G]*, %p=100

(continued on next page)

14176 *6*, 3/2^{-}, Γ=30 *5* keV, *[FG]*, %IT=?, %p=?, T=3/2

14304 *3*, 7/2^{-}, Γ=19.3 *16* keV, *[FGK]*, %IT=?, %p=?, %α=?, T=3/2

14380 *50*, 5/2^{-}, Γ=610 *50* keV, *[GO]*, %p=100

14710 *100*, 1/2^{-}, Γ=470 *100* keV, *[G]*, %p=100

14809 *20*, 1/2^{+}, Γ=190 *25* keV, *[G]*, %p=100

15600, Γ≈ 550 keV, *[G]*, %p=100

17100, 5/2^{-}, Γ=1500 keV, *[G]*, %p=100

20100 *200*, Γ=1070 *60* keV, *[C]*, %IT=?

20400 *100*, Γ=700 *100* keV, *[C]*, %IT=?

20900, 9/2^{+}, Γ=600 keV, *[G]*, %p=100

21300 *100*, Γ=900 *100* keV, *[C]*, %IT=?

21800, (9/2^{+}), Γ=400 keV, *[G]*, %p=100

22700, 7/2^{+}, Γ=600 keV, *[G]*, %p=100

23800, 7/2^{+}, Γ=600 keV, *[G]*, %p=100

25400, 7/2^{-}, Γ=1500 keV, *[G]*, %p=100

27200, 5/2^{-}, Γ=1500 keV, *[G]*, %p=100

28900, 5/2^{+}, Γ=2000 keV, *[G]*, %p=100

$^{17}_{10}$Ne

Δ: 16490 *50* **S_n:** 15570 *50* **S_p:** 1480 *50*
Q_{EC}: 14530 *50*

Populating Reactions and Decay Modes

^{9}F(p,3n), ^{16}O(^{3}He,2n)

Levels:

0, 1/2^{-}, 109.2 *6* ms, %EC+%β^{+}=100,
%ECp=95.8 *9*, %ECα=2.7 *9*, T=3/2

γ(^{17}*F*) from ^{17}Ne (109.2 ms) EC+β^{+} decay
< *for Iγ% multiply by 1.0* **>**

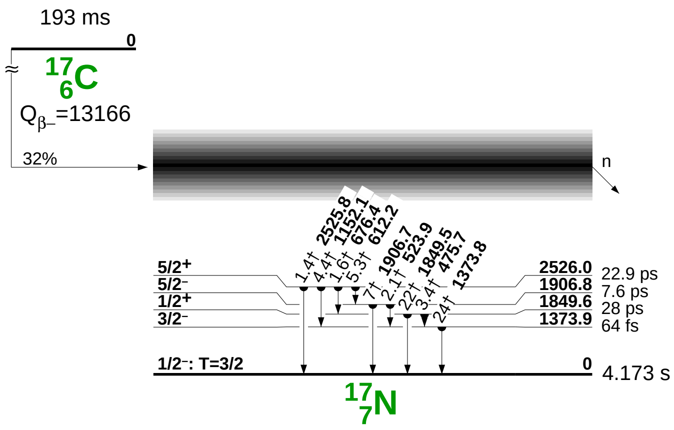
495.32 *10* (†$_{\gamma}$0.61 *10*)

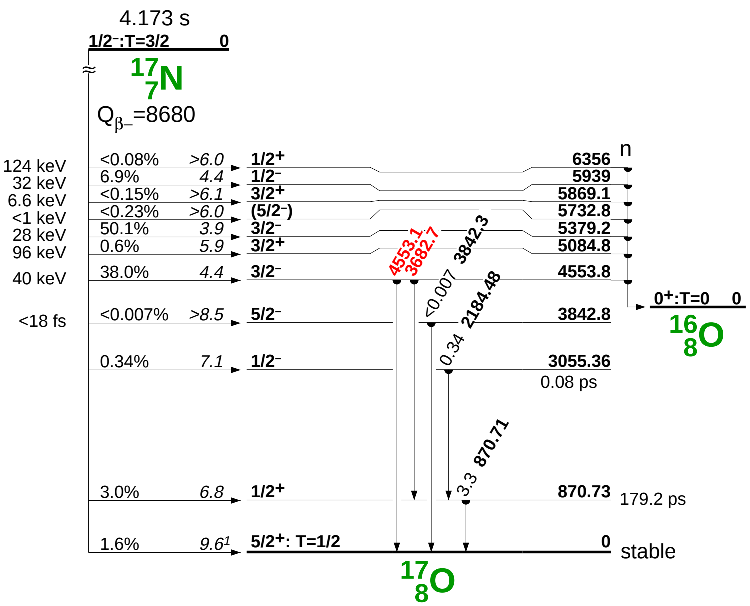
p from ^{17}Ne (109.2 ms) ECp decay **<** *for Ip%
multiply by 1.0* **>**

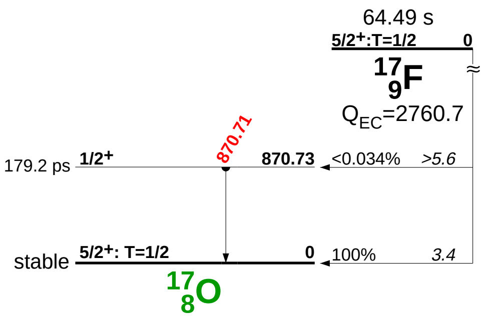
p_0***10880*** *40*
p_0***9957*** *4*
p_0***9720*** *20*
p_0***9460*** *20*
p_0***8820*** *40*
p_0***8360*** *40*
p_0***7370*** *5*
p_0≈***7070***
p_0***7021*** *5*
p_0***5115*** *4*
p_0***4593*** *4*
p_{6049}***4276*** *4*
p_{6130}***4192*** *4*
p_0***3763*** *4*
p_{7117}***3265*** *4*
p_{6049}***2568*** *20*
p_0***2339*** *8*
p_{7117}***2039*** *10*
p_{6049}***1312*** *10*
p_{6917}***844*** *10*

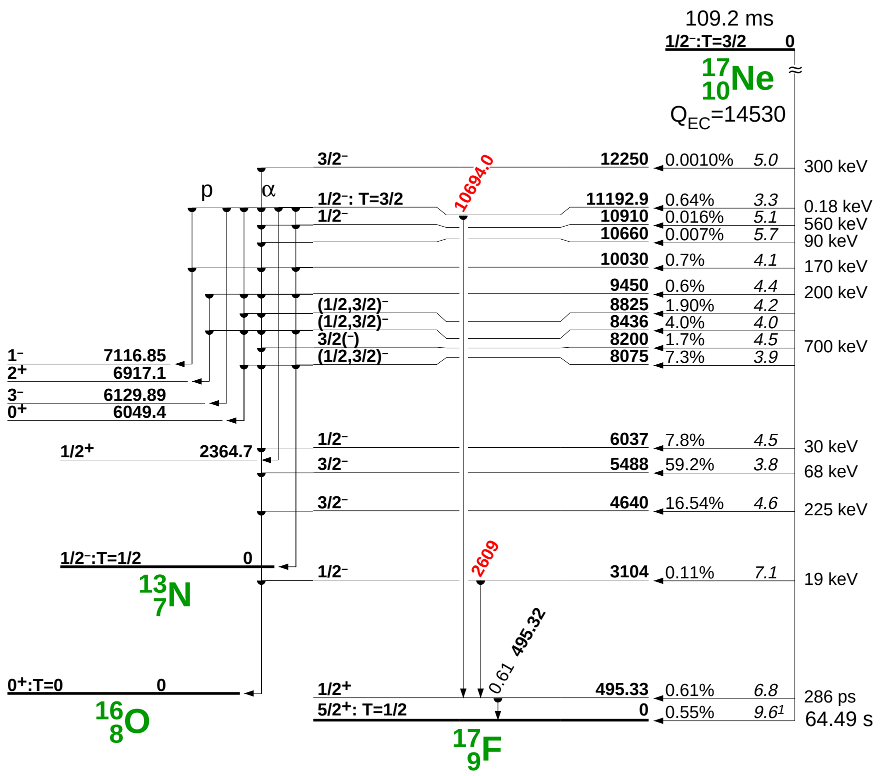
α from ^{17}Ne (109.2 ms) ECα decay **<** *for Iα%
multiply by 1.0* **>**

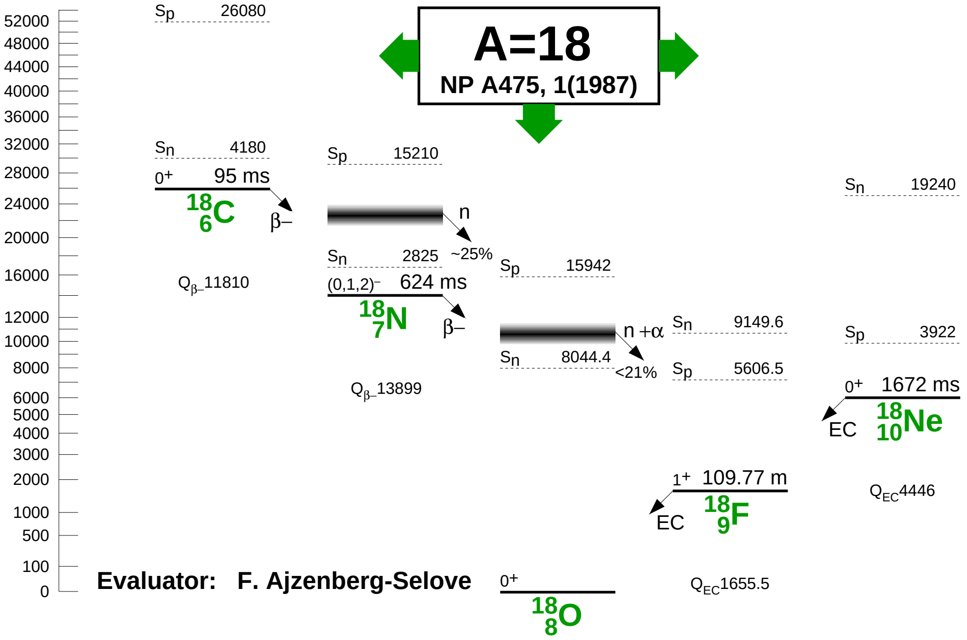
α_0***4092*** *20*
α_0***3920*** *40*
α_0***3255*** *40*
α_0***2740*** *40*
α_{2365}***2252*** *15*
α_0***1960*** *15*
α_0***1651*** *5*


193 ms
0
17/6 C
$Q_{\beta-}$=13166
32%
n
2525.8
1152.1
676.4
612.2
1906.7
523.9
1849.5
475.7
1373.8
1.4†
4.4†
1.6†
5.3†
7†
2.1†
22†
3.4†
24†
5/2+
5/2−
1/2+
3/2−
2526.0
1906.8
1849.6
1373.9
22.9 ps
7.6 ps
28 ps
64 fs
1/2−: T=3/2
0
4.173 s
17/7 N


4.173 s
1/2−:T=3/2 0
17 7 N
Qβ−=8680
124 keV <0.08% >6.0 1/2+ 6356
32 keV 6.9% 4.4 1/2− 5939
6.6 keV <0.15% >6.1 3/2+ 5869.1
<1 keV <0.23% >6.0 (5/2−) 5732.8
28 keV 50.1% 3.9 3/2− 5379.2
96 keV 0.6% 5.9 3/2+ 5084.8
40 keV 38.0% 4.4 3/2− 4553.8
<18 fs <0.007% >8.5 5/2− 3842.8
0.34% 7.1 1/2− 3055.36
0.08 ps
3.0% 6.8 1/2+ 870.73
179.2 ps
1.6% 9.6¹ 5/2+: T=1/2 0
stable
n
0+:T=0 0
16 8 O
17 8 O
4553.1
3682.7
3842.3
<0.007
2184.48
0.34
870.71
3.3


64.49 s
5/2+:T=1/2
0
17 9 F
Q_EC=2760.7
179.2 ps
1/2+
870.71
870.73
<0.034%
>5.6
stable
5/2+: T=1/2
0
100%
3.4
17 8 O


109.2 ms
1/2⁻:T=3/2 0
17 10 Ne
≈
QEC=14530
p
α
3/2⁻ 12250 0.0010% 5.0 300 keV
1/2⁻: T=3/2 11192.9 0.64% 3.3 0.18 keV
1/2⁻ 10910 0.016% 5.1 560 keV
10660 0.007% 5.7 90 keV
10030 0.7% 4.1 170 keV
9450 0.6% 4.4 200 keV
(1/2,3/2)⁻ 8825 1.90% 4.2
(1/2,3/2)⁻ 8436 4.0% 4.0
3/2(⁻) 8200 1.7% 4.5 700 keV
(1/2,3/2)⁻ 8075 7.3% 3.9
10694.0
1⁻ 7116.85
2⁺ 6917.1
3⁻ 6129.89
0⁺ 6049.4
1/2⁻ 6037 7.8% 4.5 30 keV
1/2⁺ 2364.7
3/2⁻ 5488 59.2% 3.8 68 keV
3/2⁻ 4640 16.54% 4.6 225 keV
1/2⁻:T=1/2 0
13 7 N
2609
1/2⁻ 3104 0.11% 7.1 19 keV
495.32
0.61
0⁺:T=0 0
16 8 O
1/2⁺ 495.33 0.61% 6.8 286 ps
5/2⁺: T=1/2 0 0.55% 9.6¹ 64.49 s
17 9 F


A=18
NP A475, 1(1987)
Evaluator: F. Ajzenberg-Selove
52000
48000
44000
40000
36000
32000
28000
24000
20000
16000
12000
10000
8000
6000
5000
4000
3000
2000
1000
500
100
0
Sp 26080
Sn 4180
0+ 95 ms
18 6 C
β–
Qβ– 11810
Sp 15210
n
~25%
Sn 2825
(0,1,2)– 624 ms
18 7 N
β–
Qβ– 13899
Sp 15942
n +α
<21%
Sn 8044.4
0+
18 8 O
Sn 9149.6
Sp 5606.5
1+ 109.77 m
EC
18 9 F
QEC 1655.5
Sn 19240
Sp 3922
0+ 1672 ms
EC
18 10 Ne
QEC 4446

$^{18}_{6}\mathrm{C}$

Δ: 24920 *30* **S_n:** 4180 *30* **S_p:** 26080 *140*
$Q_{\beta-}$: 11810 *40*

Populating Reactions and Decay Modes

A ^{18}O(π^-,π^+)
B ^{48}Ca(^{18}O,^{18}C)

Levels:

0, 0^+, 95 *10* ms, *[AB]*, %β^-=100, %β^-n≈25, T=3
1620 *20*, (2^+), *[AB]*, T=3

$^{18}_{7}$N

Δ: 13117 *20* **S$_n$:** 2825 *25* **S$_p$:** 15210 *30*

Q$_{\beta-}$: 13899 *20*

Populating Reactions and Decay Modes

A ^{18}C β^- decay
B ^{14}C(^{7}Li,^{3}He)
C ^{14}C(^{18}O,^{14}N)
D ^{18}O(π^-,π^0)
E ^{18}O(t,^{3}He)
F ^{18}O(^{7}Li,^{7}Be)
G ^{18}O(^{11}B,^{11}C)

Levels:

0, 1$^-$, 624 *12* ms, *[CDEF]*, %β^-=100, %β^-n<21, %$\beta^-\alpha$<21, T=2
121 *10*, 2$^-$, *[CDF]*
575 *25*, 2$^-$, *[CFG]*
747 *10*, 3$^-$, *[F]*
2210, *[F]*
2420, *[F]*

γ(*^{18}O*) from ^{18}N (624 ms) β^- decay **<** *for Iγ% multiply by 1.0* **>**

535.09 *18* ($\dagger_\gamma$1.8 *5*)
804.9 *12* ($\dagger_\gamma$0.00153 *3*)
821.76 *15* ($\dagger_\gamma$49.0 *11*)
861.8 *8* ($\dagger_\gamma$0.015 *5*)
880.9 *6* ($\dagger_\gamma$0.0060 *20*)
937.8 *13* ($\dagger_\gamma$0.050 *9*)
1074.7 *3* ($\dagger_\gamma$0.84 *13*)
1177.3 *6* ($\dagger_\gamma$0.363 *6*)
1339.9 *12* ($\dagger_\gamma$0.0044 *8*)
1542.8 *7* ($\dagger_\gamma$0.117 *23*)
1572.7 *5* ($\dagger_\gamma$0.43 *3*)
1609.7 *4* ($\dagger_\gamma$0.74 *12*)
1626.5 *12* ($\dagger_\gamma$0.0004 *3*)
1651.61 *15* ($\dagger_\gamma$48.9 *11*)
1705.5 *13* ($\dagger_\gamma$0.0006 *3*)
1742.6 *5* ($\dagger_\gamma$0.057 *9*)
1895.7 *6* ($\dagger_\gamma$0.26 *6*)
1938.26 *17* ($\dagger_\gamma$4.9 *6*)
1981.95 *9* ($\dagger_\gamma$83.2 *22*)
2424.7 *3* ($\dagger_\gamma$14.8 *8*)
2430.7 *7* ($\dagger_\gamma$1.21 *17*)
2473.29 *14* ($\dagger_\gamma$20.3 *9*)
2564.3 *5* ($\dagger_\gamma$0.035 *7*)
2673.1 *8* ($\dagger_\gamma$1.80 *24*)
3115.4 *6* ($\dagger_\gamma$1.54 *25*)
3278.0 *12* ($\dagger_\gamma$0.028 *5*) [M1+E2]: δ= –0.15 *4*
3315.2 *5* ($\dagger_\gamma$0.55 *12*)
3354.0 *6* ($\dagger_\gamma$0.0090 *30*)
3547.8 *3* ($\dagger_\gamma$1.52 *21*)
3633.37 *11* ($\dagger_e$0.15 *3*)
3919.98 *14* ($\dagger_\gamma$0.63 *8*)
4368.6 *6* ($\dagger_\gamma$0.26 *6*)
5259.6 *12* ($\dagger_\gamma$0.015 *3*)
5788.0 *5* ($\dagger_\gamma$2.6 *3*)
6197.1 *4* ($\dagger_\gamma$1.24 *18*)

$^{18}_{8}$O

%: 0.200 *12*
Δ: –782.1 *8*   **S_n:** 8044.4 *8*   **S_p:** 15942 *15*
σ_γ(to 0): 0.16 *1* mb

Populating Reactions and Decay Modes

A ^{18}N β^- decay (87Aj02)
B ^{18}F β^+ decay (87Aj02)
C ^{19}N β^-n decay
D ^{12}C(^{7}Li,p)
E ^{13}C(^{6}Li,p)
F ^{14}C(α,γ)
G ^{14}C(α,α), (α,n)
H ^{14}C(^{6}Li,d), (^{6}Li,dα)
I ^{14}C(^{7}Li,t)
J ^{16}O(t,p)
K ^{17}O(d,p)
L ^{18}O(γ,x)
M ^{18}O(e,e)
N ^{18}O(p,p)
O ^{18}O(α,α)
P ^{18}O(^{12}C,^{12}C), (^{13}C,^{13}C), ^{18}O(^{14}C,^{14}C), (^{12}C,α^{12}C)
Q ^{18}O(^{16}O,^{16}O)
R ^{18}O(^{17}O,^{17}O)
S ^{19}F(t,α)

Levels and γ-ray branchings:

0, 0^+, stable,
[ABCDEFGHIJKLMNOPQRS], T=1

1982.07 *9*, 2^+, 1.94 *5* ps,
[ADEFGHIJKMNOPQRS],
μ=–0.57 *3*, Q=–0.036 *9*
γ_0 ***1981.95*** *9* ($\dagger_\gamma$100)

3554.8 *4*, 4^+, 17.2 *9* ps,
[ADEFHIJKMNOPQRS], μ=2.5 *4*
γ_{1982} ***1572.7*** *5* ($\dagger_\gamma$100)

3633.76 *11*, 0^+, 0.96 *11* ps,
[ADEFHIJKMNOPQRS]
γ_{1982} ***1651.61*** *15* ($\dagger_\gamma$100.0 *6*)
γ_0 ***3633.37*** *11* ($\dagger_e$0.30 *6*)

3920.44 *14*, 2^+, 18.4 *20* fs,
[ADEFHIJKMNOQS]
γ_{1982} ***1938.26*** *17* ($\dagger_\gamma$100.0 *6*)
γ_0 ***3919.98*** *14* ($\dagger_\gamma$12.9 *6*)

4455.54 *10*, 1^-, 45 *11* fs,
[ADEFHIJKNOQRS]
γ_{3920} ***535.09*** *18* ($\dagger_\gamma$3.6 *9*)
γ_{3634} ***821.76*** *15* ($\dagger_\gamma$100 *1*)
γ_{1982} ***2473.29*** *14* ($\dagger_\gamma$41.5 *16*)

5097.8 *6*, 3^-, 43 *18* fs,
[ADEFHIJKMNOQRS]
γ_{3920} ***1177.3*** *6* ($\dagger_\gamma$23.5 *5*)
γ_{3555} ***1542.8*** *7* ($\dagger_\gamma$7.6 *8*)
γ_{1982} ***3115.4*** *6* ($\dagger_\gamma$100.0 *8*)

5260.4 *12*, 2^+, 7.0 *4* fs, *[ADEFHIJKMNOS]*
γ_{4456} ***804.9*** *12* ($\dagger_\gamma$5.4 *5*)
γ_{3920} ***1339.9*** *12* ($\dagger_\gamma$15.5 *7*)
γ_{3634} ***1626.5*** *12* ($\dagger_\gamma$1.6 *11*)
γ_{3555} ***1705.5*** *13* ($\dagger_\gamma$2.0 *11*)
γ_{1982} ***3278.0*** *12* ($\dagger_\gamma$100.0 *18*)
[M1+E2]: δ=–0.15 *4*
γ_0 ***5259.6*** *12* ($\dagger_\gamma$54.1 *16*)

5336.4 *6*, 0^+, 139 *28* fs, *[ADEHJKMOS]*
γ_{4456} ***880.9*** *6* ($\dagger_\gamma$67 *3*)
γ_{1982} ***3354.0*** *6* ($\dagger_\gamma$100 *3*)
γ_0 ***5335.6*** *6*

5377.8 *12*, 3^+, <21 fs, *[DEJKS]*
γ_{3920} ***1457.3*** *12* ($\dagger_\gamma$15.6 *25*)
γ_{1982} ***3395.4*** *12* ($\dagger_\gamma$100.0 *25*)

5530.2 *3*, 2^-, <18 fs, *[ADEJNOS]*
γ_{4456} ***1074.7*** *3* ($\dagger_\gamma$55 *4*)
γ_{3920} ***1609.7*** *4* ($\dagger_\gamma$49 *4*)
γ_{1982} ***3547.8*** *3* ($\dagger_\gamma$100 *4*)

6198.2 *4*, 1^-, 2.6 *4* fs, *[ADEHJKOS]*
γ_{5336} ***861.8*** *8* ($\dagger_\gamma$1.2 *3*)
γ_{5260} ***937.8*** *13* ($\dagger_\gamma$4.1 *5*)
γ_{4456} ***1742.6*** *5* ($\dagger_\gamma$4.6 *5*)
γ_{3634} ***2564.3*** *5* ($\dagger_\gamma$2.8 *3*)
γ_0 ***6197.1*** *4* ($\dagger_\gamma$100 *1*)

6351.3 *6*, (2^-), <25 fs, *[ADEJKOS]*
γ_{4456} ***1895.7*** *6* ($\dagger_\gamma$22 *4*)
γ_{3920} ***2430.7*** *7* ($\dagger_\gamma$100 *4*)
γ_{1982} ***4368.6*** *6* ($\dagger_\gamma$58 *4*)

6404.4 *12*, 3^-, 21 *10* fs, *[DEJOS]*
γ_{5260} ***1144.0*** *17* ($\dagger_\gamma$8.2 *13*)
γ_{5098} ***1306.5*** *14* ($\dagger_\gamma$14.4 *13*)
γ_{4456} ***1948.8*** *12* ($\dagger_\gamma$4.1 *15*)
γ_{3920} ***2483.8*** *12* ($\dagger_\gamma$9.3 *15*)
γ_{3555} ***2849.4*** *13* ($\dagger_\gamma$10.9 *18*)
γ_{1982} ***4421.7*** *12* ($\dagger_\gamma$100 *3*)

6880.4 *3*, 0^-, <18 fs, *[ADEJOS]*
γ_{4456} ***2424.7*** *3* ($\dagger_\gamma$100)

7116.9 *12*, 4^+, <18 fs,
[DEFHIJKMNOPQRS],
Γ_γ=0.095 *20* eV, %IT=?, %α=?
γ_{5098} ***2019.0*** *14* ($\dagger_\gamma$1.7 *4*)
γ_{3920} ***3196.2*** *12* ($\dagger_\gamma$2.6 *6*)
γ_{3555} ***3561.7*** *13* ($\dagger_\gamma$100 *9*)
γ_{1982} ***5134.0*** *12* ($\dagger_\gamma$38.6 *7*)
[E2+M3]: δ=+0.052 *35*

7619 *3*, 1^-, Γ<2.5 keV, *[DEFHJOPQRS]*,
Γ_γ=0.41 *8* eV
γ_{6198} ***1421*** *3* ($\dagger_\gamma$1.6 *16*)
γ_{5530} ***2089*** *3* ($\dagger_\gamma$<8)
γ_{5336} ***2283*** *3* ($\dagger_\gamma$9.7 *16*)
γ_{5260} ***2359*** *4* ($\dagger_\gamma$<4.8)
γ_{4456} ***3163*** *3* ($\dagger_\gamma$12.9 *16*)
[M1+E2]: δ=+0.21 *3*
γ_{3920} ***3699*** *3* ($\dagger_\gamma$<4.8)
γ_{3634} ***3985*** *3* ($\dagger_\gamma$<1.6)
γ_{1982} ***5636*** *3* ($\dagger_\gamma$100 *5*) [E1]: δ=–0.027 *8*
γ_0 ***7617*** *3* ($\dagger_\gamma$37 *3*)

(continued on next page)

7771.1 *5*, 2^{-}, *[ADEJS]*
γ_{5098}***2673.1*** *8* ($\dagger_{\gamma}$68 *6*)
γ_{4456}***3315.2*** *5* ($\dagger_{\gamma}$21 *4*)
γ_{1982}***5788.0*** *5* ($\dagger_{\gamma}$100 *6*)

7864 *5*, 5^{-}, *[DEFHIJKMOPQRS]*, Γ_{γ}=0.043 *9* eV
γ_{3555}***4308*** *5* ($\dagger_{\gamma}$100)

7977 *4*, $(3^{+},4^{-})$, *[DEJKS]*
γ_{5378}***2599*** *5* ($\dagger_{\gamma}$31 *3*)
γ_{5098}***2879*** *4* ($\dagger_{\gamma}$18 *3*)
γ_{3555}***4421*** *4* ($\dagger_{\gamma}$100 *3*)

8039 *2*, 1^{-}, Γ<2.5 keV, *[DEFGJPQRS]*, Γ_{γ}=1.07 *22* eV, %IT=?, %α=?
γ_{6198}***1840.7*** *21* ($\dagger_{\gamma}$<2.9)
γ_{5530}***2508.6*** *21* ($\dagger_{\gamma}$<2.9)
γ_{5336}***2702.4*** *21* ($\dagger_{\gamma}$<1.4)
γ_{5260}***2778.4*** *24* ($\dagger_{\gamma}$5.7 *14*)
γ_{5098}***2940.9*** *21* ($\dagger_{\gamma}$<1.4)
γ_{4456}***3583.1*** *20* ($\dagger_{\gamma}$<2.1)
γ_{3920}***4118.1*** *20* ($\dagger_{\gamma}$<1.4)
γ_{3634}***4404.6*** *20* ($\dagger_{\gamma}$14.3 *14*)
γ_{1982}***6055.8*** *20* ($\dagger_{\gamma}$100 *3*)
γ_{0}***8037.1*** *20* ($\dagger_{\gamma}$22.9 *14*)

8125 *2*, 5^{-}, *[DEFHIJS]*, Γ_{γ}=0.26 *5* eV, %IT=?, %α=?
γ_{7117}***1008.1*** *24* ($\dagger_{\gamma}$<2)
γ_{5098}***3026.9*** *21* ($\dagger_{\gamma}$1 *1*)
γ_{3555}***4569.6*** *21* ($\dagger_{\gamma}$100 *1*)

8213 *4*, 2^{+}, Γ=1.0 *8* keV, *[DEFGJNOPQRS]*, Γ_{γ}=0.41 *9* eV, %IT=0.04 *+16−2*, %n=?, %α=?
γ_{5260}***2953*** *5* ($\dagger_{\gamma}$<10)
γ_{5098}***3115*** *4* ($\dagger_{\gamma}$59 *3*)
γ_{4456}***3757*** *4* ($\dagger_{\gamma}$100 *10*)
γ_{3920}***4292*** *4* ($\dagger_{\gamma}$10 *3*)
γ_{3634}***4578*** *4* ($\dagger_{\gamma}$<10)
γ_{3555}***4657*** *4* ($\dagger_{\gamma}$10 *3*)
γ_{1982}***6230*** *4* ($\dagger_{\gamma}$100 *10*)
γ_{0}***8211*** *4* ($\dagger_{\gamma}$66 *14*)

8282 *3*, 3^{-}, Γ=8 *1* keV, *[DEFGHIJOS]*, Γ_{γ}=0.49 *13* eV, %IT=0.0061 *18*, %n=?, %α=?
γ_{5260}***3022*** *3* ($\dagger_{\gamma}$59 *5*)
γ_{4456}***3826*** *3* ($\dagger_{\gamma}$5 *5*)
γ_{3555}***4726*** *3* ($\dagger_{\gamma}$100 *5*)

8410 *8*, Γ=8 *6* keV, *[GJS]*, %n=?, %α=?

8521 *6*, *[JS]*

8660 *6*, *[JS]*

8817 *12*, (1^{+}), Γ=70 *12* keV, *[GNO]*, %n=?, %α=?

8955 *4*, Γ=43 *3* keV, *[GJO]*, %n=?, %α=?

9030, *[JKO]*

9100 (?), *[O]*

9361 *6*, (3^{-}), Γ=27 *15* keV, *[GIJMOPQR]*, %IT=?, %n=?, %α=?

9414 *18*, $\Gamma\approx$ 120 keV, *[GIJO]*, %n=?, %α=?

9480 *24*, $\Gamma\approx$ 65 keV, *[GJ]*, %n=?, %α=?

9672 *7*, (3^{-}), Γ=60 *30* keV, *[GJOPQR]*, %n=?, %α=?

9713 *7*, *[GJ]*

9890 *11*, $\Gamma\approx$ 150 keV, *[GJO]*, %n=?, %α=?

10000, *[A]*

10118 *10*, 3^{-}, Γ=16 *4* keV, *[GHJO]*, %n=?, %α=?

10295 *14*, 4^{+}, *[GHIOPQR]*, %n=?, %α=?

10396 *9*, 3^{-}, *[GJO]*, %n=?, %α=?

10595 *15*, *[GJ]*, %n=?, %α=?

10820 *20*, *[G]*, %n=?, %α=?

10910 *20*, *[GI]*, %n=?, %α=?

10990 *20*, *[G]*, %n=?, %α=?

11130 *20*, *[GI]*, %n=?, %α=?

11390 *20*, (2^{+}), *[GH]*, %n=?, %α=?

11410 *20*, (4^{+}), *[GH]*, %n=?, %α=?

11620 *20*, 5^{-}, Γ=76 *8* keV, *[GHIMOPQR]*, %IT=?, %n=?, %α=?

11690 *20*, 6^{+}, *[GHIO]*, %n=?, %α=?

11820 *20*, (3^{-}), *[G]*, %n=?, %α=?

12040 *20*, (2^{+}), Γ=28 *6* keV, *[GHM]*, %IT=?, %n=?, %α=?

12250 *20*, (1^{-}), *[GH]*, %n=?, %α=?

12330 *20*, 5^{-}, *[GHI]*, %n=?, %α=?

12500 *20*, 4^{+}, *[GPQR]*, %n=?, %α=?

12530 *20*, 6^{+}, *[GHIPQR]*, %n=?, %α=?

13100, 1^{-}, Γ=700 keV, *[L]*, %IT=?, %n=100

13800, 1^{-}, Γ=600 keV, *[L]*, %IT=?, %n=100

14700, 1^{-}, Γ=800 keV, *[L]*, %IT=?, %n=100

15800, 1^{-}, Γ=700 keV, *[L]*, %IT=?, %n=100

16210 *10*, $1(^{-})$, *[M]*

16315 *10*, $(3,2)^{-}$, *[M]*

16399 *5*, 2^{-}, Γ<20 keV, *[MN]*, T=2

16948 *10*, $(3,2)^{-}$, *[M]*

17025 *10*, ($\geq$3), Γ=20 *6* keV, *[M]*, T=2

17050, (7^{-}), $\Gamma\approx$ 350 keV, *[H]*

17398 *10*, 1^{-}, Γ=600 keV, *[LM]*, %IT=?, %n=?, %p=?, T=(2)

17450 *10*, $(2,1,3)^{-}$, *[M]*

17500, $\Gamma\approx$ 150 keV, *[M]*

17502 *10*, $(1,2,3)^{-}$, *[M]*

17600 *200* (?), (8^{+}), *[H]*

17635 *10*, *[M]*

(continued on next page)

$^{18}_{8}$O (continued)

18049 *10*, *[M]*

18200, $\Gamma\approx$ 150 keV, *[M]*

18500, $\Gamma\approx$ 4300 keV, *[M]*

18700 *20*, (4^-), Γ<20 keV, *[M]*, T=2

18871 *5*, 1^+, *[M]*, T=2

18927 *10*, (1,2^+), *[M]*

18950, (7^-), $\Gamma\approx$ 350 keV, *[H]*

19027 *10*, $(1,3)^-$, *[M]*

19150 *10*, (1^-,2^+,3^-), *[M]*

19240 *20*, ($\geq$3), Γ<20 keV, *[M]*, T=2

19400, 1^-, Γ=900 keV, *[L]*, %IT=?, %p=100, T=(2)

19700, $\Gamma\approx$ 200 keV, *[M]*

20200, $\Gamma\approx$ 180 keV, *[M]*

20360 *20*, (4^-), Γ<20 keV, *[M]*, T=2

21000, 1^-, $\Gamma\approx$ 150 keV, *[LM]*, %IT=?, %n=?, %p=?, T=(1)

22390 *40*, (4^-), Γ=74 *7* keV, *[M]*

22700, 1^-, *[L]*, %IT=?, %n=?, %p=?

23800, 1^-, $\Gamma\approx$ 1500 keV, *[LM]*, %IT=?, %n=?, %p=?, T=(1)

27000, 1^-, *[L]*, %IT=?, %n=?, %p=?, T=(2)

30000, *[L]*, %IT=?, %n=?

36000, *[L]*

$^{18}_{9}$F

Δ: 873.4 *6* **S$_n$:** 9149.6 *6* **S$_p$:** 5606.5 *6*
Q$_{EC}$: 1655.5 *6*

Populating Reactions and Decay Modes

A ^{18}Ne β$^+$ decay (87Aj02)
B ^{14}N(α,γ)
C ^{14}N(α,α), (α,2α), (α,^{6}Li)
D ^{14}N(^{6}Li,d), (^{6}Li,dα)
E ^{14}N(^{7}Li,t)
F ^{14}N(^{11}B,^{7}Li), (^{13}C,^{9}Be)
G ^{15}N(^{3}He,γ), (^{3}He,α)
H ^{16}O(d,α)
I ^{16}O(^{3}He,p)
J ^{16}O(^{6}Li,α)
K ^{17}O(p,γ)
L ^{17}O(p,p)
M ^{17}O(p,α)
N ^{18}O(^{3}He,t)
O ^{19}F(p,d)
P ^{19}F(^{3}He,α)
Q ^{20}Ne(d,α)
R 28 other reactions

Levels and γ-ray branchings:

0, 1$^+$, 109.77 *5* m, *[ABDEGIJLMNOPQ]*,
%EC+%β$^+$=100, T=0

937.20 *6*, 3$^+$, 46.9 *18* ps, *[BDEIJMNOPQ]*,
T=0, μ=+1.68 *15*
γ_0***937.17*** *6* ($\dagger_\gamma$100)

1041.55 *8*, 0$^+$, 1.8 *3* fs, *[ABDIKNOP]*, T=1
γ_0***1041.52*** *8* ($\dagger_\gamma$100)

1080.54 *12*, 0$^-$, 19.1 *13* fs,
[ABDEIJMNOPQ], T=0
γ_0***1080.51*** *12* ($\dagger_\gamma$100)

1121.36 *15*, 5$^+$, 162 *7* ns, *[BDEIKNOPQ]*,
T=0, μ=+2.86 *3*, Q=0.077 *5*
γ_{937}***184.16*** *17* ($\dagger_\gamma$100)

1700.81 *18*, 1$^+$, 662 *19* fs, *[ABEIKNOPQ]*,
T=0
γ_{1042}***659.25*** *20* ($\dagger_\gamma$100.0 *19*)
γ_0***1700.72*** *18* ($\dagger_\gamma$42.5 *19*)

2100.61 *10*, 2$^-$, 3.5 *4* ps, *[BEIJKNOPQ]*,
T=0
γ_{1081}***1020.04*** *16* ($\dagger_\gamma$82 *3*)
γ_{937}***1163.37*** *12* ($\dagger_\gamma$82 *3*)
γ_0***2100.48*** *10* ($\dagger_\gamma$100 *3*)

2523.35 *18*, 2$^+$, 409 *17* fs, *[BEIKOP]*, T=0
γ_{1701}***822.5*** *3* ($\dagger_\gamma$5.2 *8*) [M1+E2]: δ=–0.94 *4*
γ_{937}***1586.08*** *19* ($\dagger_\gamma$28.7 *16*)
[M1+E2]: δ=+1.5 *6*
γ_0***2523.16*** *18* ($\dagger_\gamma$100.0 *24*)
[M1+E2]: δ=–3.0 *10*

3061.84 *18*, 2$^+$, <0.9 fs, *[BIKOP]*, T=1
γ_{1042}***2020.17*** *20* ($\dagger_\gamma$0.14 *4*)
γ_{937}***2124.51*** *19* ($\dagger_\gamma$100 *1*)
γ_0***3061.56*** *18* ($\dagger_\gamma$30.2 *10*)

3133.87 *15*, 1$^-$, 0.270 *14* ps, *[BEIKOP]*, T=0
γ_{1701}***1433.00*** *24* ($\dagger_\gamma$5.1 *13*)
γ_{1081}***2053.20*** *20* ($\dagger_\gamma$64 *5*)
γ_{1042}***2092.19*** *17* ($\dagger_\gamma$87 *5*)
γ_0***3133.58*** *15* ($\dagger_\gamma$100 *5*)

3358.2 *10*, 3$^+$, 0.305 *21* ps, *[BEINOPQ]*, T=0
γ_{2523}***834.83*** *21* ($\dagger_\gamma$13 *7*)
γ_{2101}***1257.54*** *15* ($\dagger_\gamma$<7)
γ_{1701}***1657.31*** *21* ($\dagger_\gamma$89 *9*)
γ_{937}***2420.83*** *12* ($\dagger_\gamma$20 *7*)
γ_0***3357.86*** *10* ($\dagger_\gamma$100 *11*)

3724.19 *22*, 1$^+$, 1.9$^{+28}_{-19}$ fs, *[BEIJKNOPQ]*,
T=0
γ_{3062}***662.3*** *3* ($\dagger_\gamma$4.4 *22*)
γ_{1042}***2682.43*** *24* ($\dagger_\gamma$100.0 *22*)
γ_0***3723.78*** *22* ($\dagger_\gamma$5.5 *22*)

3791.49 *22*, 3$^-$, 1.32 *9* ps, *[EIJKNOPQ]*, T=0
γ_{3062}***729.6*** *3* ($\dagger_\gamma$44 *4*)
γ_{2523}***1268.1*** *3* ($\dagger_\gamma$3.2 *16*)
γ_{2101}***1690.8*** *25* ($\dagger_\gamma$100 *6*)
[M1+E2]: δ=+0.22 *6*

3839.17 *22*, 2$^+$, 13.2 *19* fs, *[BEIJKNOPQ]*,
T=0
γ_{3062}***777.3*** *3* ($\dagger_\gamma$100 *6*)
γ_{1701}***2138.3*** *3* ($\dagger_\gamma$6 *2*)
γ_{937}***2901.72*** *23* ($\dagger_\gamma$18 *3*)
γ_0***3838.73*** *22* ($\dagger_\gamma$76 *4*) [M1+E2]: δ=+1.8 *5*

4115.90 *25*, 3$^+$, 63 *15* fs, *[BEIJKNOPQ]*, T=0
γ_{3062}***1054.1*** *3* ($\dagger_\gamma$100 *3*)
γ_0***4115.4*** *3* ($\dagger_\gamma$5 *3*)

4225.8 *7*, 2$^-$, 76 *11* fs, *[BEIJNOPQ]*, T=0
γ_{3134}***1091.9*** *8* ($\dagger_\gamma$18 *12*)
γ_{2101}***2125.1*** *7* ($\dagger_\gamma$31 *10*)
γ_{1701}***2524.8*** *8* ($\dagger_\gamma$19.0 *24*)
γ_{1081}***3145.0*** *8* ($\dagger_\gamma$6.5 *20*)
γ_{937}***3288.3*** *7* ($\dagger_\gamma$100 *6*)
γ_0***4225.3*** *7* ($\dagger_\gamma$47 *4*)

4360.15 *26*, 1$^+$, 19 *7* fs, *[EIKNOPQ]*, T=0
γ_{3062}***1298.2*** *4* ($\dagger_\gamma$100)

4398.1 *7*, 4$^-$, 40 *8* fs, *[BEINOPQ]*, T=0
γ_{2101}***2297.3*** *7* ($\dagger_\gamma$45 *5*)
γ_{1121}***3276.4*** *8* ($\dagger_\gamma$100 *10*)
γ_{937}***3460.5*** *7* ($\dagger_\gamma$22 *7*)

4652 *2*, 4$^+$, <7 fs, *[BINOP]*, T=1
γ_{1121}***3530.2*** *20* ($\dagger_\gamma$100 *4*)
γ_{937}***3714.4*** *20* ($\dagger_\gamma$20 *4*)

4753 *3*, 0$^+$, *[INOPQ]*, T=1
γ_{1701}***3052*** *3* ($\dagger_\gamma$9 *4*)
γ_0***4752*** *3* ($\dagger_\gamma$100 *4*)

4848.3 *5*, 5$^-$, 3.6 *6* ps, *[J]*, T=0
γ_{3791}***1056.8*** *6* ($\dagger_\gamma$54 *6*)
γ_{1121}***3726.5*** *6* ($\dagger_\gamma$100 *6*)

4860 *2*, 1$^-$, 46 *13* fs, *[BIOPQ]*,
Γ_γ=0.009 *3* eV, %IT=90 *10*, %α≤20,
T=0
γ_{3134}***1726.0*** *20* ($\dagger_\gamma$6 *5*)
γ_{3062}***1798.1*** *20* ($\dagger_\gamma$35 *11*)
γ_{1081}***3779.1*** *20* ($\dagger_\gamma$12 *9*)
γ_{1042}***3818.0*** *20* ($\dagger_\gamma$100 *17*)

4963.6 *8*, 2$^+$, <3 fs, *[BIOP]*, T=1
γ_0***4962.9*** *8* ($\dagger_\gamma$100) [M1+E2]: δ=–1.2 *7*

(continued on next page)

5297.6 *15*, 4^+, 21 *4* fs, *[BDEFIOP]*, %IT=55 *18*, %α=45 *18*, T=0, Γ_γ=0.012 *4* eV
γ_{4652} ***645.6*** *25* (†$_\gamma$1.7 *4*)
γ_{3358} ***1939.3*** *15* (†$_\gamma$6.4 *13*) [M1+E2]: δ=−2.5 *8*
γ_{2523} ***2774.1*** *16* (†$_\gamma$100 *4*)
γ_{1121} ***4175.7*** *15* (†$_\gamma$9 *3*) [M1+E2]: δ=+1.1 *5*
γ_{937} ***4359.8*** *15* (†$_\gamma$12 *3*) [M1+E2]: δ=+0.3 *1*

5502 *2*, $3^{(-)}$, 44 *17* fs, *[BEIOP]*, %IT=21 *4*, %α=79 *4*, T=0, Γ_γ=0.0021 *7* eV
γ_{3062} ***2440.0*** *20* (†$_\gamma$100)

5603.4 *3*, 1^+, 10 *7* fs, *[BCKOPQ]*, Γ_γ=0.48 *5* eV
γ_{3062} ***2541.3*** *4* (†$_\gamma$100 *8*)
γ_{1042} ***4561.2*** *3* (†$_\gamma$4.8 *15*)
γ_{0} ***5602.5*** *3* (†$_\gamma$21 *3*)

5604.9 *3*, 1^-, Γ<1.2 keV, *[BCEIKOPQ]*, Γ_γ=0.87 *7* eV, %IT=?, %α=?, T=0+1
γ_{3134} ***2470.8*** *4* (†$_\gamma$60 *5*) [M1+E2]: δ=+0.05 *2*
γ_{3062} ***2542.8*** *4* (†$_\gamma$5 *3*)
γ_{1081} ***4523.7*** *3* (†$_\gamma$100 *6*)
γ_{1042} ***4562.7*** *3* (†$_\gamma$7.8 *15*)
γ_{0} ***5604.0*** *3* (†$_\gamma$12.4 *22*)

5673 *2*, 1^-, Γ<0.8 keV, *[BCEIKOPQ]*, Γ_γ=0.46 *6* eV, %IT=?, %α=?, T=0+1
γ_{3134} ***2538.9*** *20* (†$_\gamma$55 *4*) [M1+E2]: δ=−0.10 *3*
γ_{3062} ***2611.0*** *20* (†$_\gamma$7.7 *8*)
γ_{2101} ***3572.0*** *20* (†$_\gamma$0.8 *4*)
γ_{1701} ***3971.7*** *20* (†$_\gamma$1.5 *6*)
γ_{1081} ***4591.9*** *20* (†$_\gamma$100 *6*)
γ_{1042} ***4630.9*** *20* (†$_\gamma$15.6 *13*)
γ_{0} ***5672.0*** *20* (†$_\gamma$11.9 *8*)

5786.0 *24*, 2^-, 10 *7* fs, *[BIOPQ]*, Γ_γ=0.044 *21* eV, %IT=?, %α=?, T=0
γ_{1081} ***4704*** *24* (†$_\gamma$100 *13*)
γ_{937} ***4848*** *24* (†$_\gamma$67 *13*)

6096.4 *11*, 4^-, Γ=0.24 *3* keV, *[BEIKMOPQ]*, Γ_γ=0.051 *10* eV, %IT=0.021 *5*, %p=?, %α=?, T=0
γ_{4652} ***1444.3*** *23* (†$_\gamma$15.8 *13*)
γ_{4398} ***1698.2*** *13* (†$_\gamma$1.3 *6*)
γ_{4116} ***1980.4*** *12* (†$_\gamma$3.3 *6*)
γ_{3791} ***2304.7*** *12* (†$_\gamma$2.5 *6*)
γ_{2101} ***3995.3*** *11* (†$_\gamma$49 *4*)
γ_{1121} ***4974.3*** *12* (†$_\gamma$100 *6*)
γ_{937} ***5158.4*** *11* (†$_\gamma$8.9 *16*)

6108 *3*, (1^+), Γ=0.034 *3* keV, *[BCIJMPQ]*, %IT=?, %p=?, %α=?, T=0
γ_{3062} ***3046*** *3* (†$_\gamma$100 *11*)
γ_{2101} ***4007*** *3* (†$_\gamma$44 *13*)
γ_{937} ***5170*** *3* (†$_\gamma$24 *7*)
γ_{0} ***6107*** *3* (†$_\gamma$53 *7*)

6136.5 *4*, 0^+, Γ<1 keV, *[IKLPQ]*, Γ_γ>1.6 eV, %IT=?, %p=?, T=1
γ_{5603} ***533.1*** *5* (†$_\gamma$0.38 *4*)
γ_{4360} ***1776.2*** *5* (†$_\gamma$4.2 *8*)
γ_{3724} ***2412.1*** *4* (†$_\gamma$72 *6*)
γ_{1701} ***4435.1*** *4* (†$_\gamma$24 *4*)
γ_{0} ***6135.4*** *4* (†$_\gamma$100 *6*)

6163.2 *9*, 3^+, Γ=14.0 *5* keV, *[IKLMQ]*, Γ_γ=0.96 *26* eV, %IT=0.0069 *19*, %p=?, %α=?, T=1
γ_{4398} ***1765.1*** *7* (†$_\gamma$3.9 *4*)
γ_{4226} ***1937.4*** *7* (†$_\gamma$1.8 *6*)
γ_{4116} ***2047.3*** *3* (†$_\gamma$2.9 *6*)
γ_{3839} ***2323.99*** *24* (†$_\gamma$49 *3*)
γ_{3791} ***2371.66*** *24* (†$_\gamma$22.7 *25*)
γ_{3062} ***3101.19*** *21* (†$_\gamma$2.5 *6*)
γ_{2523} ***3639.58*** *21* (†$_\gamma$10.8 *8*)
γ_{1121} ***5041.20*** *18* (†$_\gamma$1.96 *20*)
γ_{937} ***5225.31*** *11* (†$_\gamma$100 *6*)
γ_{0} ***6162.19*** *9* (†$_\gamma$0.4 *4*)

6240.4 *8*, 3^-, Γ=0.19 *3* keV, *[BIKLMP]*, Γ_γ=0.80 *11* eV, %IT=0.42 *9*, %p=?, %α=?, T=0+1
γ_{4398} ***1842.2*** *11* (†$_\gamma$4.0 *4*)
γ_{4226} ***2014.5*** *11* (†$_\gamma$10.8 *6*)
γ_{4116} ***2124.4*** *9* (†$_\gamma$0.7 *3*)
γ_{3839} ***2401.0*** *9* (†$_\gamma$1.4 *3*)
γ_{3791} ***2448.7*** *9* (†$_\gamma$14.7 *7*)
γ_{3358} ***2882.0*** *8* (†$_\gamma$1.5 *6*)
γ_{2101} ***4139.3*** *8* (†$_\gamma$100 *4*)
γ_{937} ***5302.4*** *8* (†$_\gamma$6.4 *4*)

6242 *3*, 3^-, Γ=0.18 *4* keV, *[BCIKMP]*, Γ_γ=0.73 *11* eV, %IT=0.41 *11*, %p=?, %α=?, T=0+1
γ_{4398} ***1844*** *3* (†$_\gamma$3.0 *4*)
γ_{4226} ***2016*** *3* (†$_\gamma$11.5 *6*)
γ_{4116} ***2126*** *3* (†$_\gamma$1.5 *6*)
γ_{3839} ***2403*** *3* (†$_\gamma$1.3 *3*)
γ_{3791} ***2451*** *3* (†$_\gamma$16.3 *9*)
γ_{3358} ***2884*** *3* (†$_\gamma$1.1 *4*)
γ_{2101} ***4140*** *3* (†$_\gamma$100 *4*)
γ_{937} ***5304*** *3* (†$_\gamma$5.8 *4*)

6262.0 *25*, 1^+, Γ=0.60 *12* keV, *[BCEIMP]*, %IT=?, %p=?, %α=?, T=0
γ_{0} ***6260.8*** *25* (†$_\gamma$100)

(continued on next page)

6283.2 *9*, 2^+, Γ=10.0 *5* keV, *[IKLM]*,
Γ_γ=1.8 *5* eV, %IT=0.018 *5*, %p=?,
%α=?, T=1
γ_{4360}***1922.9*** *10* ($\dagger_\gamma$0.7 *6*)
γ_{4116}***2167.2*** *10* ($\dagger_\gamma$5.8 *3*)
γ_{3839}***2443.8*** *10* ($\dagger_\gamma$23.6 *21*)
γ_{3724}***2558.8*** *10* ($\dagger_\gamma$2.1 *8*)
γ_{3358}***2924.7*** *9* ($\dagger_\gamma$3.4 *5*)
γ_{3134}***3149.0*** *10* ($\dagger_\gamma$1.0 *5*)
γ_{2523}***3759.5*** *10* ($\dagger_\gamma$0.4 *3*)
γ_{2101}***4182.1*** *9* ($\dagger_\gamma$1.8 *5*)
γ_{1701}***4581.8*** *10* ($\dagger_\gamma$8.5 *9*)
γ_{1042}***5240.9*** *9* ($\dagger_\gamma$1.94 *15*)
γ_{937}***5345.1*** *9* ($\dagger_\gamma$100 *5*)
γ_{0}***6282.0*** *9* ($\dagger_\gamma$0.45 *15*)

6310.5 *8*, 3^+, Γ=0.95 *14* keV, *[BIKLMQ]*,
Γ_γ=0.17 *4* eV, %IT=0.018 *5*, %p=?,
%α=?, T=0
γ_{4964}***1346.8*** *12* ($\dagger_\gamma$23 *3*)
γ_{4116}***2194.5*** *9* ($\dagger_\gamma$4 *3*)
γ_{3839}***2471.1*** *9* ($\dagger_\gamma$8.1 *18*)
γ_{3724}***2586.1*** *9* ($\dagger_\gamma$2.5 *12*)
γ_{3062}***3248.4*** *9* ($\dagger_\gamma$100 *5*)
γ_{2523}***3786.7*** *9* ($\dagger_\gamma$7.0 *9*)
γ_{1701}***4609.1*** *9* ($\dagger_\gamma$5.3 *14*)
γ_{937}***5372.4*** *8* ($\dagger_\gamma$18.6 *18*)
γ_{0}***6309.3*** *8* ($\dagger_\gamma$7.0 *12*)

6385.5 *17*, 2^+, Γ=0.49 *9* keV, *[BIKMP]*,
Γ_γ=0.44 *18* eV, %IT=0.09 *4*, %p=?,
%α=?, T=0+1
γ_{4116}***2269.4*** *18* ($\dagger_\gamma$3.1 *7*)
γ_{3839}***2546.1*** *18* ($\dagger_\gamma$18.8 *21*)
γ_{1701}***4684.0*** *17* ($\dagger_\gamma$9.1 *23*)
γ_{937}***5447.4*** *17* ($\dagger_\gamma$100 *4*)
[M1+E2]: δ=+0.25 *10*
γ_{0}***6384.3*** *17* ($\dagger_\gamma$2.0 *7*)

6484.9 *15*, 3^+, Γ=0.40 *10* keV, *[BIKMPQ]*,
Γ_γ=0.074 *21* eV, %IT=0.018 *7*, %p=?,
%α=?, T=0
γ_{4964}***1521.2*** *17* ($\dagger_\gamma$6 *6*)
γ_{3839}***2645.5*** *16* ($\dagger_\gamma$27 *6*)
γ_{3791}***2693.2*** *16* ($\dagger_\gamma$12 *6*)
γ_{3062}***3422.8*** *16* ($\dagger_\gamma$64 *9*)
γ_{2523}***3961.0*** *16* ($\dagger_\gamma$12 *6*)
γ_{1701}***4783.4*** *16* ($\dagger_\gamma$12 *6*)
γ_{1121}***5362.6*** *15* ($\dagger_\gamma$30 *6*)
γ_{937}***5546.8*** *15* ($\dagger_\gamma$100 *6*)
γ_{0}***6483.6*** *15* ($\dagger_\gamma$39 *6*)

6567.0 *15*, 5^+, Γ=0.56 *13* keV, *[BCDEFIMP]*,
Γ_γ=0.026 *5* eV, %IT=0.0046 *14*, %p=?,
%α=?, T=0
γ_{5298}***1269.4*** *22* ($\dagger_\gamma$2.8 *7*)
γ_{3358}***3208.5*** *15* ($\dagger_\gamma$100 *4*)
γ_{937}***5628.9*** *15* ($\dagger_\gamma$18.3 *19*)

6633 *10*, 1, Γ=80 *2* keV, *[MP]*, %p=?, %α=?

6643.7 *8*, 2^-, Γ=0.60 *7* keV, *[BIKM]*,
Γ_γ=1.4 *4* eV, %IT=0.23 *7*, %p=?,
%α=?, T=1
γ_{5502}***1141.7*** *22* ($\dagger_\gamma$6.9 *5*)
γ_{4860}***1783.6*** *22* ($\dagger_\gamma$4.5 *3*)
γ_{4116}***2527.6*** *9* ($\dagger_\gamma$1.7 *5*)
γ_{3791}***2852.0*** *9* ($\dagger_\gamma$4.1 *3*)
γ_{3724}***2919.2*** *9* ($\dagger_\gamma$1.6 *3*)
γ_{3134}***3509.4*** *9* ($\dagger_\gamma$37.9 *22*)
γ_{2101}***4542.5*** *8* ($\dagger_\gamma$100 *5*)
γ_{937}***5705.5*** *8* ($\dagger_\gamma$15.3 *10*)

6647 *4*, 1^-, Γ=91 *4* keV, *[CEM]*, %p=?, %α=?

6777.0 *14*, 4^+, Γ=9.2 *10* keV, *[IKLMP]*,
Γ_γ=0.31 *8* eV, %IT=0.0034 *9*, %p=?,
%α=?, T=0
γ_{4652}***2125*** *15* ($\dagger_\gamma$100 *3*)
[M1+E2]: δ=−0.13 *13*
γ_{1121}***5655*** *14* ($\dagger_\gamma$40.6 *21*)
[M1+E2]: δ=+1.4 *11*
γ_{937}***5839*** *14* ($\dagger_\gamma$20.3 *15*)
[M1+E2]: δ=+0.35 *18*

6803.1 *15*, 1^+,2,3^+, Γ<2 keV, *[EIKLP]*,
%IT=?, %p=?, T=0
γ_{4964}***1839.4*** *17* ($\dagger_\gamma$14 *3*)
γ_{3839}***2963.6*** *16* ($\dagger_\gamma$6 *3*)
γ_{3062}***3740.9*** *16* ($\dagger_\gamma$100 *6*)
γ_{937}***5864.9*** *15* ($\dagger_\gamma$40 *4*)
γ_{0}***6801.7*** *15* ($\dagger_\gamma$40 *4*)

6809 *5*, 2^-, Γ=88 *2* keV, *[CM]*, %p=?, %α=?

6811, (2^+), Γ=3.0 *5* keV, *[M]*, %p=?, %α=?

6857 *10*, (3^-), Γ=5.0 *10* keV, *[MP]*, %p=?,
%α=?

6877.4 *17*, 3,4^-, Γ<2 keV, *[IKM]*, %IT=?,
%p=?, %α=?, T=0
γ_{4652}***2225*** *3* ($\dagger_\gamma$100.0 *22*)
γ_{2101}***4776.1*** *17* ($\dagger_\gamma$9.9 *22*)

7201 *2*, (4^+), Γ=6.5 keV, *[CMP]*, %p=?,
%α=?, T=0

7247 *2*, (1^+), Γ=46.5 keV, *[CM]*, %p=?,
%α=?, T=0

7291 *2*, 3^-, Γ=38 keV, *[CLM]*, %p=?, %α=?

7315 *4*, (3^-), Γ=52 keV, *[MP]*, %p=?, %α=?,
T=(0)

(continued on next page)

7336 *2*, 1^-, Γ=16 *2* keV, *[KL]*, %IT=?, %p=?, T=1

γ_{4226}***3109.9*** *22* (†$_\gamma$27.8 *11*)

γ_{3134}***4201.6*** *20* (†$_\gamma$14.8 *9*)

γ_{3062}***4273.7*** *20* (†$_\gamma$1.9 *9*)

γ_{2101}***5234.6*** *20* (†$_\gamma$33.3 *19*)

γ_{1081}***6254.3*** *20* (†$_\gamma$100 *4*)

γ_{0}***7334.4*** *20* (†$_\gamma$7.4 *9*)

7406 *2*, 1^+, Γ=14.6 *14* keV, *[L]*, %p=100

7447 *10*, Γ=140 keV, *[M]*, %p=?, %α=?

7454 *2*, 1^-, Γ=6 keV, *[L]*, %p=100

7478 *2*, (2), Γ=12 *3* keV, *[KLM]*, %IT=?, %p=?, %α=?

γ_{937}***6539.5*** *20* (†$_\gamma$100)

7485 *2*(?), (1^-), Γ=32 keV, *[L]*, %p=100

7506 *2*, 4^-, Γ=12 *2* keV, *[LM]*, %p=?, %α=?

7513 *2*, Γ<4 keV, *[K]*, %IT=?, %p=?

γ_{4398}***3114.6*** *22* (†$_\gamma$100 *13*)

γ_{3791}***3721.1*** *21* (†$_\gamma$60 *9*)

γ_{2101}***5411.5*** *20* (†$_\gamma$13 *9*)

γ_{937}***6574.5*** *20* (†$_\gamma$9 *7*)

7528 *2*, 2^-, Γ=16 *3* keV, *[KLM]*, %IT=?, %p=?, %α=?, T=1

γ_{3791}***3736.1*** *21* (†$_\gamma$52 *14*)

γ_{2101}***5426.5*** *20* (†$_\gamma$100 *18*)

γ_{937}***6589.5*** *20* (†$_\gamma$28 *12*)

γ_{0}***7526.3*** *20* (†$_\gamma$20 *6*)

7532 *5*, Γ=75 keV, *[LM]*, %p=?, %α=?

7555 *2*, (1^-), Γ=30 keV, *[L]*, %p=100

7584 *2*, Γ=9 *2* keV, *[KLM]*, %IT=?, %p=?, %α=?

γ_{4652}***2932*** *3* (†$_\gamma$100 *27*)

γ_{1121}***6461.4*** *20* (†$_\gamma$15 *12*)

γ_{937}***6645.5*** *20* (†$_\gamma$24 *20*)

γ_{0}***7582.3*** *20* (†$_\gamma$31 *12*)

7685 *2*, 3^+,4^+, Γ=36 *4* keV, *[LM]*, %p=?, %α=?

7729 *4*, ≥1, Γ=66 *5* keV, *[LM]*, %p=?, %α=?

7763 *4*, Γ=70 keV, *[L]*, %p=100

7878 *3*, ≥2, Γ=20 keV, *[LM]*, %p=?, %α=?

7899 *2*, (2^-), Γ=38 keV, *[CM]*, %p=?, %α=?

7941 *12*, (1^+), Γ=112 keV, *[CM]*, %p=?, %α=?

8064 *6*, ≥4, Γ=60 keV, *[LM]*, %p=?, %α=?

8115 *8*, Γ=96 keV, *[L]*, %p=100

8209 *2*, 2^-, Γ=52 keV, *[LM]*, %p=?, %α=?

8238 *2*, 4^+, Γ=20 keV, *[L]*, %p=100

9207 *15*, 3,4^-, *[H]*, %p=?, %α=?, T=0

9500, 2,3^+, *[H]*, %n=?, %α=?, T=0

9580 *20*, 6^+, *[DEF]*, %α=?

10580 *50*, *[F]*

11220 *30*, 7^+, *[DEF]*, %α=?

13830, 4^-,5^+, Γ=60 keV, *[H]*, %α=?

14020, 4^-,5^+, Γ=60 keV, *[H]*, %α=?

14100, 4^-,5^+, Γ=60 keV, *[H]*, %α=?

14180 *40*, (8^+), *[DEF]*, %α=?

15090, 4^-,5^+, *[H]*, %α=?

15340, 5^+,6^-, *[H]*, %α=?

15790 *100*, *[F]*

16070, 4^-,5^+, Γ=220 keV, *[H]*, %α=?

16720, 4^-,5^+, Γ=60 keV, *[H]*, %α=?

17430, 4^-,5^+,6^-, Γ=70 keV, *[H]*, %α=?

18620 *120*, *[F]*

19000 *150*(?), Γ=500 *150* keV, *[G]*, %IT=?

20100 *200*, (2^-), Γ=1600 *100* keV, *[G]*, %IT=?, T=(1)

22700 *200*, (2^-), Γ=1200 *100* keV, *[G]*, %IT=?, T=(1)

24100 *200*(?), Γ=1400 *300* keV, *[G]*, %IT=?

$^{18}_{10}$Ne

Δ: 5319 *5* **S$_n$:** 19240 *50* **S$_p$:** 3922 *5*
Q$_{EC}$: 4446 *5*

Populating Reactions and Decay Modes

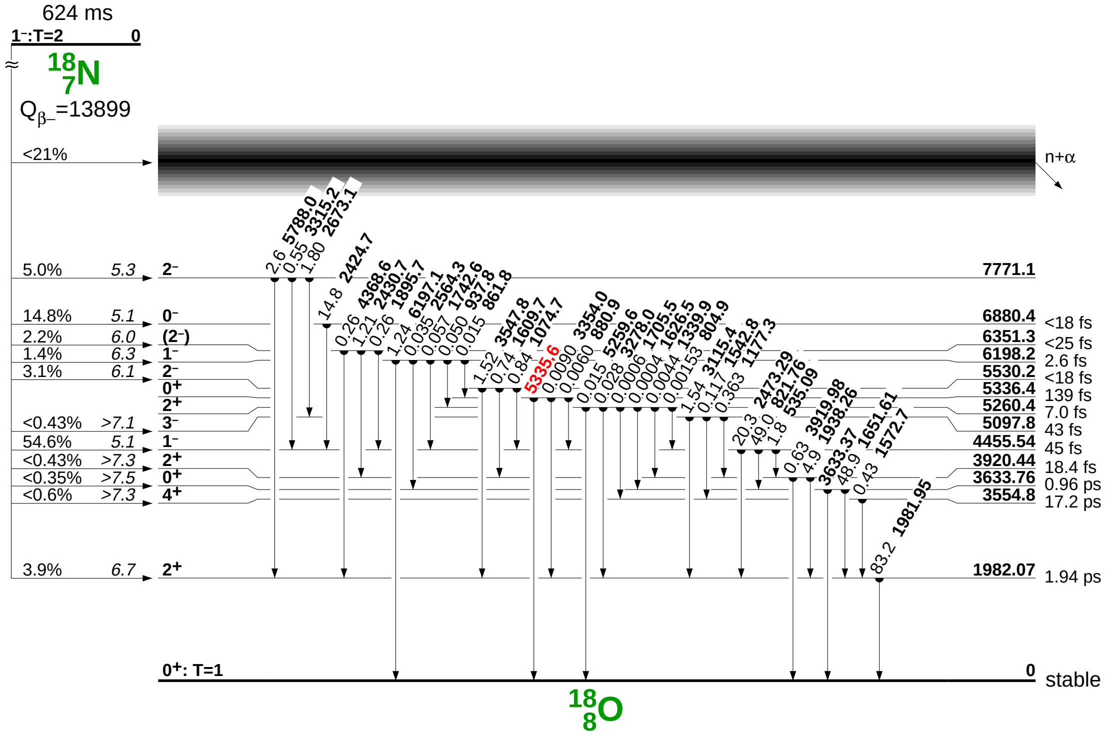
- *A* ^{19}Na p decay
- *B* ^{16}O(^{3}He,n)
- *C* ^{16}O(^{10}B,^{8}Li)
- *D* ^{18}O(π^{+},π^{-})
- *E* ^{20}Ne(p,t)

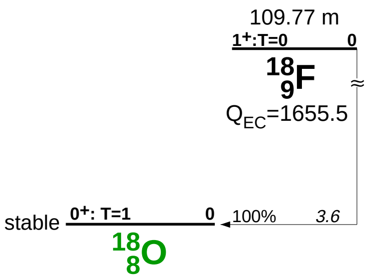
Levels:

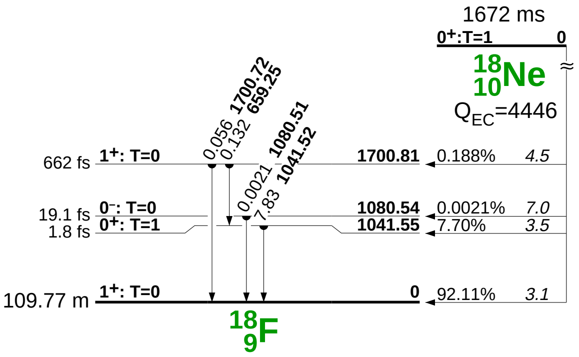
- **0**, 0^{+}, 1672 *8* ms, *[ABDE]*, %EC+%β^{+}=100, T=1
- **1887.3** *2*, 2^{+}, 0.46 *4* ps, *[BDE]*
- **3376.2** *4*, 4^{+}, 3.0 *4* ps, *[BCE]*
- **3576.3** *20*, 0^{+}, 2.8 *14* ps, *[BE]*
- **3616.4** *6*, 2^{+}, 44^{+21}_{-14} fs, *[BE]*
- **4519** *8*, 1^{-}, Γ<20 keV, *[BE]*
- **4590** *8*, 0^{+}, Γ<20 keV, *[BE]*
- **5090** *8*, (2^{+},3^{-}), Γ=40 *20* keV, *[BE]*
- **5146** *7*, (2^{+},3^{-}), Γ=25 *15* keV, *[BE]*
- **5453** *10*, Γ<50 keV, *[E]*
- **6297** *10*, (4^{+}), Γ<60 keV, *[BE]*
- **6353** *10*, Γ<60 keV, *[E]*
- **7059** *10*, (1^{-},2^{+}), Γ=180 *50* keV, *[B]*
- **7713** *10*, Γ<50 keV, *[BE]*
- **7910** *10*, (1^{-},2^{+}), Γ<50 keV, *[B]*
- **7950** *10*, Γ<60 keV, *[E]*
- **8086** *10*, Γ<50 keV, *[B]*
- **8500** *30*, Γ<120 keV, *[B]*
- **9201** *9*, Γ<50 keV, *[E]*

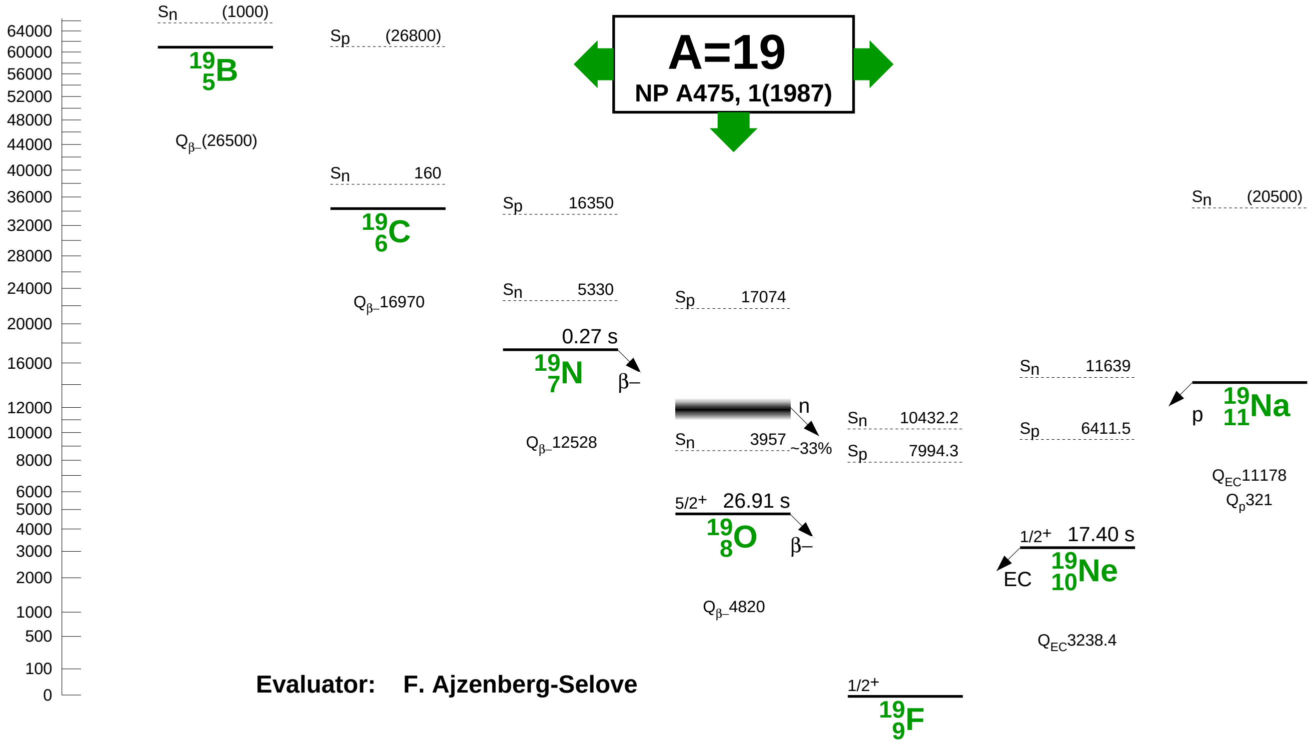
γ*(*^{18}*F)* from ^{18}Ne (1672 ms) β^{+} decay **<** *for Iγ% multiply by 1.0* **>**

- ***659.25*** *20* (†$_{\gamma}$0.132 *5*)
- ***1041.52*** *8* (†$_{\gamma}$7.83 *21*)
- ***1080.51*** *12* (†$_{\gamma}$0.0021 *3*)
- ***1700.72*** *18* (†$_{\gamma}$0.056 *3*)


624 ms
1⁻:T=2 0
18 7 N
Qβ−=13899
<21%
n+α
5.0% 5.3 2⁻
14.8% 5.1 0⁻
2.2% 6.0 (2⁻)
1.4% 6.3 1⁻
3.1% 6.1 2⁻
0⁺
2⁺
<0.43% >7.1 3⁻
54.6% 5.1 1⁻
<0.43% >7.3 2⁺
<0.35% >7.5 0⁺
<0.6% >7.3 4⁺
3.9% 6.7 2⁺
0⁺: T=1
2.6 5788.0
0.55 3315.2
1.80 2673.1
2424.7
14.8 4368.6
0.26 2430.7
1.21 1895.7
0.26 6197.1
1.24 2564.3
0.035 1742.6
0.057 937.8
0.050 861.8
0.015
1.52 3547.8
0.74 1609.7
0.84 1074.7
5335.6
0.0090 3354.0
0.0060 880.9
0.015 5259.6
0.028 3278.0
0.0006 1705.5
0.0004 1626.5
0.0044 1339.9
0.00153 804.9
1.54 3115.4
0.117 1542.8
0.363 1177.3
20.3 2473.29
49.0 821.76
1.8 535.09
0.63 3919.98
4.9 1938.26
3633.37
48.9 1651.61
0.43 1572.7
83.2 1981.95
7771.1
6880.4 <18 fs
6351.3 <25 fs
6198.2 2.6 fs
5530.2 <18 fs
5336.4 139 fs
5260.4 7.0 fs
5097.8 43 fs
4455.54 45 fs
3920.44 18.4 fs
3633.76 0.96 ps
3554.8 17.2 ps
1982.07 1.94 ps
0 stable
18 8 O


109.77 m
1+:T=0
0
18 9 F
≈
QEC=1655.5
stable
0+: T=1
0
100%
3.6
18 8 O


1672 ms
0+:T=1
0
18 10 Ne
≈
QEC=4446
0.056 1700.72
0.132 659.25
0.0021 1080.51
7.83 1041.52
662 fs
1+: T=0
1700.81
0.188%
4.5
19.1 fs
0−: T=0
1080.54
0.0021%
7.0
1.8 fs
0+: T=1
1041.55
7.70%
3.5
109.77 m
1+: T=0
0
92.11%
3.1
18 9 F



Evaluator: F. Ajzenberg-Selove

$^{19}_{5}\mathrm{B}$

Δ: (59400) **S_n:** (1000) **$Q_{\beta-}$:** (26500)

Populating Reactions and Decay Modes

^{9}Be(^{56}Fe,x) (87Aj02)

$^{19}_{6}\mathrm{C}$

Δ: 32830 *110* **S_n:** 160 *110* **S_p:** (26800)
$Q_{\beta-}$: 16970 *110*

Populating Reactions and Decay Modes

Th(p,x), Ar(p,x) (87Aj02)

${}^{19}_{7}$N

Δ: 15860 *16* **S_n:** 5330 *30* **S_p:** 16350 *30*
$Q_{\beta-}$: 12528 *17*

Populating Reactions and Decay Modes

^{48}Ca(^{18}O,x) (87Aj01, 87Aj02)

Levels:

0, 0.27 *6* s, %β^-=100, %β^-n≈33
1120 *40*
1590 *40*

γ(^{19}*O*) from ^{19}N (0.27 s) β^- decay :

96.0 *5* (†$_\gamma$100 *10*)
709.2 *8* (u) (†$_\gamma$63 *21*)
3137.8 *10* (u) (†$_\gamma$76 *21*)

$^{19}_{8}\mathrm{O}$

Δ: 3332 *3*   **S$_n$:** 3957 *3*   **S$_p$:** 17074 *20*
Q$_{\beta^-}$: 4820 *3*

Populating Reactions and Decay Modes

- *A* ^{19}N β^- decay
- *B* ^{20}N β^-n decay
- *C* ^{9}Be(^{18}O,^{8}Be)
- *D* ^{13}C(^{7}Li,p)
- *E* ^{17}O(t,p)
- *F* ^{18}O(n,γ), (n,n)
- *G* ^{18}O(n,α)
- *H* ^{18}O(d,p)
- *I* ^{19}N(π^-,γ)
- *J* ^{19}F(n,p)

Levels and γ-ray branchings:

0, 5/2$^+$, 26.91 *8* s, *[ACDEFGHI]*, %β^-=100, T=3/2

96.0 *5*, 3/2$^+$, 1.39 *5* ns, *[ADEHI]*, μ=–0.72 *9*
  γ_0 ***96.0*** *5* (†$_\gamma$100)

1471.7 *4*, 1/2$^+$, 0.88 *12* ps, *[DEH]*
  γ_{96} ***1375.6*** *7* (†$_\gamma$100 *2*)
  γ_0 ***1471.6*** *4* (†$_\gamma$2.0 *2*)

2371.5 *10*, 9/2$^+$, >2.4 ps, *[DEH]*
  γ_0 ***2371.3*** *10* (†$_\gamma$100)

2779.0 *9*, 7/2$^+$, 64 *13* fs, *[DEH]*
  γ_0 ***2778.8*** *9* (†$_\gamma$100) [M1+E2]: δ=–0.8 *5*

3067.4 *16*, 3/2$^+$, >0.69 ps, *[DEH]*
  γ_{1472} ***1595.6*** *17* (†$_\gamma$100)

3153.5 *17*, 5/2$^+$, >0.69 ps, *[DEH]*
  γ_{96} ***3057.2*** *18* (†$_\gamma$100 *4*)
  γ_0 ***3153.2*** *17* (†$_\gamma$9 *4*)

3231.6 *23*, 3/2$^+$, *[DEH]*

3944.9 *14*, 3/2$^-$, *[DEH]*
  γ_{1472} ***2473.0*** *15* (†$_\gamma$72 *10*)
  γ_{96} ***3848.5*** *15* (†$_\gamma$100 *8*)
  γ_0 ***3944.5*** *14* (†$_\gamma$85 *21*)

4109.3 *19*, 3/2$^+$, Γ<15 keV, *[DEH]*
4328.1 *24*, 3/2,5/2, Γ<15 keV, *[DEH]*
4402 *3*, 3/2 to 7/2, Γ<15 keV, *[DEH]*
4582 *5*, 3/2$^-$, Γ=52 *3* keV, *[DEFH]*, %n=100
4703 *3*, 5/2$^+$, Γ<15 keV, *[DEH]*
4968 *6*, 5/2,7/2, *[D]*
5007 *5*, 3/2,5/2, Γ<15 keV, *[DEH]*
5082 *6*, 1/2$^-$, Γ=49 *5* keV, *[DF]*, %n=100
5148 *3*, ≥5/2$^+$, Γ=3.4 *10* keV, *[DEFH]*, %n=100
5384 *3*, (9/2 to 13/2), *[D]*
5504 *3*, Γ<15 keV, *[DEH]*
5540, 3/2$^+$, Γ≈ 490 keV, *[F]*, %n=100
5705 *5*, 7/2$^-$,5/2, Γ=7.8 *14* keV, *[DEFH]*, %n=100
6120 *3*, 3/2$^+$, Γ≈ 110 keV, *[DF]*, %n=100
6192 *6*, *[D]*
6269 *3*, 7/2$^-$, Γ=19.2 *24* keV, *[DEFH]*, %n=100
6406 *3*, *[D]*
6466 *5*, (7/2 to 11/2), *[DFH]*, %n=100
6583 *6*, *[DH]*
6903 *8*, *[DH]*
6988 *9*, *[DH]*
7118 *10*, *[DH]*
7242 *8*, *[DH]*
7508 *10*, *[D]*
8048 *10*, *[D]*
8132 *20*, *[D]*
8247 *20*, *[D]*
8450 *20*, *[D]*
8561 *20*, *[D]*
8591 *20*, *[D]*
8916 *20*, *[D]*
8923 *20*, *[D]*
9022 *20*, *[D]*
9064 *20*, *[D]*
9253 *20*, *[D]*
9324 *20*, *[D]*
9430, *[D]*
9560, *[D]*
9600, 7/2$^-$, *[DF]*, %n=100
9900, 7/2$^-$, *[DF]*, %n=100
9930, *[D]*
9980, *[D]*
10210, 7/2$^-$, *[F]*, %n=100
10660, 7/2$^-$, *[F]*, %n=100
11250 *50*, Γ=240 keV, *[G]*, %n=?, %α=?
11580 *50*, Γ=330 keV, *[G]*, %n=?, %α=?

γ*(*^{19}*F)* from ^{19}O (26.91 s) β^- decay **<** *for Iγ% multiply by 1.0* **>**

109.894 *5* (†$_\gamma$2.71 *10*)
197.142 *4* (†$_\gamma$95.9 *19*)
1148.49 *13* (†$_\gamma$0.00054 *18*)
1235.74 *13* (†$_\gamma$0.016 *2*)
1356.843 *10* (†$_\gamma$50.4 *11*)
1444.085 *11* (†$_\gamma$2.64 *9*)
1553.970 *9* (†$_\gamma$1.39 *6*)
1597.78 *6* (†$_\gamma$0.0192 *12*)
2353.97 *20* (†$_\gamma$0.0017 *3*)
2582.52 *4* (†$_\gamma$0.0192 *12*)
3710.64 *20* (†$_\gamma$0.0011 *2*)
3797.87 *20* (†$_\gamma$0.0014 *2*)
3907.74 *20* (†$_\gamma$0.0039 *3*)
4180.07 *4* (†$_\gamma$0.079 *3*)

${}^{19}_{9}$F

%: 100
Δ: –1487.41 *7* **S_n:** 10432.2 *6* **S_p:** 7994.3 *8*
σ_γ: 0.0096 *5* b

Populating Reactions and Decay Modes

A ^{19}O β^- decay
B ^{19}Ne β^+ decay
C ^{12}C(^{11}B,α), (^{12}C,αp), (^{14}N,^{7}Be)
D ^{15}N(α,γ)
E ^{15}N(α,p), (α,α)
F ^{15}N(^{7}Li,t)
G ^{16}O(t,γ), (t,n), (t,p), (t,t), ^{16}O(t,α)
H ^{16}O(α,p)
I ^{16}O(^{6}Li,^{3}He)
J ^{16}O(^{7}Li,α)
K ^{17}O(^{3}He,p)
L ^{18}O(p,γ)
M ^{18}O(p,n)
N ^{18}O(p,p)
O ^{18}O(p,α)
P ^{18}O(d,n)
Q ^{18}O(^{3}He,d)
R ^{19}F(e,e)
S ^{19}F(p,p)
T ^{19}F(α,α)
U ^{20}Ne(t,α)
V 35 other reactions

Levels and γ-ray branchings:

0, 1/2$^+$, stable, *[ABDFGHIJKLPQRSTU]*, T=1/2, μ=+2.628868 *8*

109.894 *5*, 1/2$^-$, 0.591 *7* ns, *[ABDGIJKLQRTU]*
γ_0***109.894*** *5* ($\dagger_\gamma$100)

197.143 *4*, 5/2$^+$, 89.3 *10* ns, *[ABDFGHIJKLQRSTU]*, μ=+3.607 *8*, Q=–0.072 *4*
γ_{110}***87.249*** *7* ($\dagger_\gamma$<0.06)
γ_0***197.142*** *4* ($\dagger_\gamma$100)

1345.67 *13*, 5/2$^-$, 2.86 *4* ps, *[ADFHIJKLQRST]*, μ=0.67 *11*
γ_{197}***1148.49*** *13* ($\dagger_\gamma$3.3 *10*)
γ_{110}***1235.74*** *13* ($\dagger_\gamma$100 *1*)

1458.7 *3*, 3/2$^-$, 62 *14* fs, *[FIJKQRSTU]*
γ_{1346}***113.06*** *14* ($\dagger_\gamma$<0.29)
γ_{197}***1261.55*** *3* ($\dagger_\gamma$15.6 *7*)
γ_{110}***1348.79*** *3* ($\dagger_\gamma$100.0 *13*)
[M1+E2]: δ=–0.248 *20*
γ_0***1458.67*** *3* ($\dagger_\gamma$29.8 *10*) [E1]: δ=–0.01 *3*

1554.038 *9*, 3/2$^+$, 3.5 *21* fs, *[ABDHIJKLPQRSTU]*
γ_{1459}***95.31*** *4* ($\dagger_\gamma$<0.15)
γ_{1346}***208.37*** *13* ($\dagger_\gamma$<0.012)
γ_{197}***1356.843*** *10* ($\dagger_\gamma$100.00 *22*)
γ_{110}***1444.085*** *11* ($\dagger_\gamma$5.24 *13*)
γ_0***1553.970*** *9* ($\dagger_\gamma$2.75 *11*)

2779.85 *4*, 9/2$^+$, 194 *21* fs, *[ACDFHIJKPQRSTU]*
γ_{197}***2582.52*** *4* ($\dagger_\gamma$100)

3908.17 *20*, 3/2$^+$, 6 *4* fs, *[ADIJKLQRSTU]*
γ_{1554}***2353.97*** *20* ($\dagger_\gamma$44 *6*)
γ_{197}***3710.64*** *20* ($\dagger_\gamma$29 *4*)
γ_{110}***3797.87*** *20* ($\dagger_\gamma$35 *4*)
γ_0***3907.74*** *20* ($\dagger_\gamma$100 *4*)

3998.7 *7*, 7/2$^-$, 13 *5* fs, *[DIJKPQRSTU]*
γ_{1459}***2539.8*** *7* ($\dagger_\gamma$17 *9*)
γ_{1346}***2652.8*** *8* ($\dagger_\gamma$100 *6*)
γ_{197}***3801.2*** *7* ($\dagger_\gamma$26 *6*)

4032.5 *12*, 9/2$^-$, 46 *10* fs, *[DFHIJKPRSTU]*
γ_{1346}***2686.6*** *12* ($\dagger_\gamma$100)

4377.70 *4*, 7/2$^+$, <8 fs, *[ADHIJKLPQRSTU]*
γ_{2780}***1597.78*** *6* ($\dagger_\gamma$24.2 *12*)
[M1+E2]: δ=+0.16 *7*
γ_{197}***4180.07*** *5* ($\dagger_\gamma$100.0 *25*)
[M1+E2]: δ=–0.155 *22*
γ_{110}***4267.30*** *5* ($\dagger_\gamma$<2.5)
γ_0***4377.16*** *5* ($\dagger_\gamma$<6)

4549.9 *8*, 5/2$^+$, <35 fs, *[DIJKLRSTU]*
γ_{1554}***2995.6*** *8* ($\dagger_\gamma$26 *6*)
γ_{1459}***3090.9*** *8* ($\dagger_\gamma$12 *4*)
γ_{1346}***3203.9*** *9* ($\dagger_\gamma$7 *4*)
γ_{197}***4352.3*** *8* ($\dagger_\gamma$100 *10*)

4556.1 *5*, 3/2$^-$, 12^{+7}_{-6} fs, *[DIJLPQRSTU]*
γ_{1554}***3001.8*** *5* ($\dagger_\gamma$13 *7*)
γ_{1459}***3097.1*** *5* ($\dagger_\gamma$<9)
γ_{1346}***3210.1*** *6* ($\dagger_\gamma$9 *7*)
γ_{197}***4358.5*** *5* ($\dagger_\gamma$20 *7*)
γ_{110}***4445.6*** *5* ($\dagger_\gamma$100 *11*)
γ_0***4555.5*** *5* ($\dagger_\gamma$80 *9*)

4648 *1*, 13/2$^+$, 2.6 *3* ps, *[HIJKLRTU]*
γ_{2780}***1868.1*** *10* ($\dagger_\gamma$100)

4682.5 *7*, 5/2$^-$, 10.7 *21* fs, *[DIKLPQRSTU]*, %IT=4.4 *11*, %α=95.6 *11*
γ_{1459}***3223.5*** *7* ($\dagger_\gamma$50 *4*)
γ_{1346}***3336.5*** *8* ($\dagger_\gamma$100 *6*)
[M1+E2]: δ=-0.22^{+14}_{-24}
γ_{197}***4484.8*** *7* ($\dagger_\gamma$8.9 *14*)

5106.6 *9*, 5/2$^+$, <21 fs, *[DIJKLPQRSTU]*, %IT=?, %α=?
γ_{4378}***728.9*** *9* ($\dagger_\gamma$2.5 *6*)
γ_{3908}***1198.4*** *10* ($\dagger_\gamma$6.8 *11*)
γ_{2780}***2326.6*** *9* ($\dagger_\gamma$0.9 *8*)
γ_{1554}***3552.2*** *9* ($\dagger_\gamma$2.2 *22*)
γ_{1459}***3647.5*** *9* ($\dagger_\gamma$13 *3*)
γ_{1346}***3760.5*** *9* ($\dagger_\gamma$<2)
γ_{197}***4908.8*** *9* ($\dagger_\gamma$<100)
γ_{110}***4996.0*** *9* ($\dagger_\gamma$<100)
γ_0***5105.9*** *9* ($\dagger_\gamma$<100)

(continued on next page)

5337 *2*, 1/2($^+$), <0.07 fs, *[DIJKLQRSTU]*, %IT=?, %α=?, Γ_γ=1.63 *15* eV
γ_{1459}***3877.9*** *20* ($\dagger_\gamma$48 *5*)
γ_{110}***5226.3*** *20* ($\dagger_\gamma$100 *10*)
γ_{0}***5336.2*** *20* ($\dagger_\gamma$88 *10*)

5418 *1*, 7/2$^-$, Γ=2.6 *7* eV, *[CDIKLQRST]*, %IT=4, %α=96, Γ_γ=0.104 eV
γ_{4033}***1385.4*** *16* ($\dagger_\gamma$9)
γ_{3999}***1419.2*** *13* ($\dagger_\gamma$14)
γ_{1459}***3958.9*** *10* ($\dagger_\gamma$19)
γ_{1346}***4071.8*** *10* ($\dagger_\gamma$100)

5463.5 *15*, 7/2$^+$, <0.18 fs, *[DFHIJKLRST]*, %IT=?, %α=?
γ_{2780}***2683.5*** *15* ($\dagger_\gamma$100)
γ_{1554}***3909.1*** *15* ($\dagger_\gamma$8)
γ_{1346}***4117.3*** *15* ($\dagger_\gamma$54)
γ_{197}***5265.6*** *15* ($\dagger_\gamma$7)

5500.7 *17*, 3/2$^+$, Γ=4 *1* keV, *[DEJKLRST]*, Γ_γ=2.13 eV, %IT=0.053, %α=100
γ_{1554}***3946.3*** *17* ($\dagger_\gamma$22)
γ_{1346}***4154.5*** *17* ($\dagger_\gamma$33)
γ_{197}***5302.8*** *17* ($\dagger_\gamma$100)
γ_{110}***5390.0*** *17* ($\dagger_\gamma$51)

5535 *2*, 5/2$^+$, *[DKLRSTU]*, %IT=?, %α=?
γ_{1459}***4075.8*** *20* ($\dagger_\gamma$96)
γ_{197}***5337.1*** *20* ($\dagger_\gamma$100)
γ_{0}***5534.1*** *20* ($\dagger_\gamma$15)

5621 *1*, 5/2$^-$, <0.90 fs, *[DKLPQRSTU]*, %IT=?, %α=?
γ_{1346}***4274.8*** *10* ($\dagger_\gamma$100 *7*)
γ_{197}***5423.1*** *10* ($\dagger_\gamma$64 *7*)

5938 *1*, 1/2$^+$, *[DLPQRSTU]*, %IT=?, %α=?
γ_{3908}***2029.7*** *11* ($\dagger_\gamma$13 *5*)
[M1+E2]: δ=−0.28 *9*
γ_{1554}***4383.5*** *10* ($\dagger_\gamma$<3.2)
γ_{1459}***4478.7*** *10* ($\dagger_\gamma$100 *10*)
[E1+M2]: δ=−0.25 *2*
γ_{197}***5740.0*** *10* ($\dagger_\gamma$3.2 *16*)
γ_{110}***5827.1*** *10* ($\dagger_\gamma$32 *10*)
γ_{0}***5937.0*** *10* ($\dagger_\gamma$11 *6*)

6070 *1*, 7/2$^+$, Γ=1.2 keV, *[DKRS]*, Γ_γ=0.61 *11* eV, %IT=0.051, %α=100
γ_{4378}***1692.2*** *10* ($\dagger_\gamma$7.4 *19*)
γ_{2780}***3289.9*** *10* ($\dagger_\gamma$43 *6*)
γ_{1554}***4515.4*** *10* ($\dagger_\gamma$≈1.9)
γ_{1346}***4723.7*** *10* ($\dagger_\gamma$35 *4*)
γ_{197}***5871.9*** *10* ($\dagger_\gamma$100 *9*)
[M1+E2]: δ=+0.26 *2*

6088 *1*, 3/2$^-$, Γ=4 keV, *[DFIJKLRSU]*, Γ_γ=1.8 *4* eV, %IT=0.045, %α=100
γ_{197}***5889.9*** *10* ($\dagger_\gamma$23 *5*)
γ_{110}***5977.1*** *10* ($\dagger_\gamma$100 *8*)
[M1+E2]: δ=−0.045 *21*
γ_{0}***6087.0*** *10* ($\dagger_\gamma$41 *7*) [E1+M2]: δ=+0.021 *14*

6100 *2*, 9/2$^-$, *[LM]*

6160.6 *9*, 7/2$^-$, Γ=3.7 *10* eV, *[CDLRSU]*, %IT=21 *8*, %α=79 *8*, Γ_γ=0.77 *19* eV
γ_{4033}***2128.0*** *15* ($\dagger_\gamma$3.5 *5*)
γ_{3999}***2161.8*** *12* ($\dagger_\gamma$2.5 *9*)
γ_{1459}***4701.3*** *9* ($\dagger_\gamma$2.0 *9*)
γ_{1346}***4814.2*** *9* ($\dagger_\gamma$100 *6*)
[M1+E2]: δ=−0.077 *7*
γ_{197}***5962.5*** *9* ($\dagger_\gamma$48 *5*)
[E1+M2]: δ=+0.045 *25*

6255 *1*, 1/2$^+$, Γ=8 keV, *[ELMPQRSU]*, %α=100

6282 *2*, 5/2$^+$, Γ=2.4 keV, *[DEHKLPRS]*, %IT=0.013, %α=100, Γ_γ=0.31 *4* eV
γ_{1554}***4727.4*** *20* ($\dagger_\gamma$56 *6*)
[M1+E2]: δ=−0.11 *6*
γ_{1459}***4822.6*** *20* ($\dagger_\gamma$72 *6*)
γ_{1346}***4935.6*** *20* ($\dagger_\gamma$100 *6*)
γ_{197}***6083.9*** *20* ($\dagger_\gamma$12 *3*)
γ_{0}***6280.9*** *20* ($\dagger_\gamma$39 *6*)

6330 *2*, 7/2$^+$, Γ=2.4 keV, *[DEFKRS]*, %IT=0.008, %α=100, Γ_γ=0.192 *24* eV
γ_{4378}***1952.2*** *20* ($\dagger_\gamma$32 *4*)
γ_{1554}***4775.4*** *20* ($\dagger_\gamma$15 *3*)
γ_{1346}***4983.6*** *20* ($\dagger_\gamma$30 *4*)
γ_{197}***6131.8*** *20* ($\dagger_\gamma$100 *5*)
[M1+E2]: δ=+0.27 *24*

6429 *8*, 1/2$^-$, Γ=280 keV, *[ER]*, %α=100

6496.7 *14*, 3/2$^+$, *[DJKLQR]*, %IT=?, %α=?
γ_{1459}***5037.3*** *14* ($\dagger_\gamma$66 *5*)
γ_{1346}***5150.3*** *14* ($\dagger_\gamma$37 *5*) [M1,E2]: δ=+0.11 *9*
γ_{197}***6298.5*** *14* ($\dagger_\gamma$24 *5*)
γ_{110}***6385.6*** *14* ($\dagger_\gamma$37 *5*)
γ_{0}***6495.5*** *14* ($\dagger_\gamma$100 *5*)

6500.0 *9*, 11/2$^+$, *[DJLR]*, Γ_γ=0.38 eV, %IT=?, %α=?
γ_{4648}***1851.9*** *14* ($\dagger_\gamma$82)
γ_{2780}***3719.8*** *9* ($\dagger_\gamma$100)

6527.5 *14*, 3/2$^+$, Γ=4 keV, *[DHJKLR]*, %IT=?, %α=?
γ_{4550}***1977.5*** *17* ($\dagger_\gamma$20 *3*)
[E1+M2]: δ=+0.23 *13*
γ_{110}***6416.4*** *14* ($\dagger_\gamma$100 *5*)
γ_{0}***6526.3*** *14* ($\dagger_\gamma$49 *3*)

6554 *2*, 7/2($^+$), Γ=1.6 keV, *[DKR]*, %IT=?, %α=?
γ_{2780}***3773.8*** *20* ($\dagger_\gamma$47 *6*)
γ_{1346}***5207.5*** *20* ($\dagger_\gamma$100 *7*)
γ_{197}***6355.8*** *20* ($\dagger_\gamma$35 *4*)

(continued on next page)

6592 *2*, 9/2$^+$, Γ=7.6 *18* eV, *[CDHKLQR]*, Γ_{γ}=0.33 *6* eV, %IT=4.3 *13*, %α=95.7 *13*
- γ_{4378} ***2214.2*** *20* (†$_{\gamma}$38 *3*)
- γ_{2780} ***3811.8*** *20* (†$_{\gamma}$100 *5*)
- γ_{197} ***6393.7*** *20* (†$_{\gamma}$21 *3*)

6787 *2*, 3/2$^-$, Γ=6.9 *11* eV, *[DEKLQR]*, Γ_{γ}=5.5 *4* eV, %IT=80 *14*, %α=20 *14*
- γ_{3908} ***2878.6*** *20* (†$_{\gamma}$7 *3*)
- γ_{1459} ***5327.5*** *20* (†$_{\gamma}$64 *5*) [M1+E2]: δ=+0.13 *8*
- γ_{1346} ***5440.5*** *20* (†$_{\gamma}$13.6 *21*)
- γ_{197} ***6588.7*** *20* (†$_{\gamma}$33 *5*)
- γ_{110} ***6675.8*** *20* (†$_{\gamma}$100 *5*) [M1+E2]: δ=−0.11 *2*
- γ_{0} ***6785.7*** *20* (†$_{\gamma}$38 *5*) [M2+E1]: δ=+0.08 *3*

6838.4 *9*, 5/2$^+$, Γ=1.2 keV, *[DEKLR]*, %IT=?, %α=?
- γ_{1459} ***5378.9*** *9* (†$_{\gamma}$100 *18*)
- γ_{1346} ***5491.8*** *9* (†$_{\gamma}$22 *16*)
- γ_{197} ***6640.1*** *9* (†$_{\gamma}$60 *13*)
- γ_{110} ***6727.2*** *9* (†$_{\gamma}$20 *11*)
- γ_{0} ***6837.1*** *9* (†$_{\gamma}$20 *11*)

6891 *4*, 3/2$^-$, Γ=28 keV, *[DEKR]*, %IT=0.011 *2*, %α=100, Γ_{γ}=3.1 *5* eV
- γ_{1459} ***5431*** *4* (†$_{\gamma}$49 *8*) [M1+E2]: δ=−0.15 *12*
- γ_{1346} ***5544*** *4* (†$_{\gamma}$100 *8*)
- γ_{0} ***6890*** *4* (†$_{\gamma}$15 *3*)

6926.5 *17*, 7/2$^-$, Γ=2.4 keV, *[DEFHIKLQR]*, %IT=0.10, %α=100, Γ_{γ}=2.4 *3* eV
- γ_{4033} ***2893.8*** *21* (†$_{\gamma}$1.8 *7*)
- γ_{3999} ***2927.6*** *19* (†$_{\gamma}$1.8 *7*)
- γ_{2780} ***4146.2*** *17* (†$_{\gamma}$3.3 *7*)
- γ_{1346} ***5579.9*** *17* (†$_{\gamma}$30 *3*)
- γ_{197} ***6728.1*** *17* (†$_{\gamma}$100 *4*)

6989 *3*, 1/2$^-$, Γ=51 keV, *[ELR]*, %α=100

7114 *6*, 7/2$^+$, Γ=32 keV, *[EQR]*, %α=100

7166.2 *7*, 11/2$^-$, Γ=6.9 *11* eV, *[CDLM]*, %IT=2.4 *3*, %α=97.6 *3*, Γ_{γ}=0.17 *4* eV
- γ_{4648} ***2518.0*** *13* (†$_{\gamma}$3.9 *6*)
- γ_{4033} ***3133.4*** *14* (†$_{\gamma}$100.0 *9*)
- γ_{3999} ***3167.2*** *10* (†$_{\gamma}$6.2 *8*)

7262 *2*, 3/2$^+$, Γ<6 keV, *[EHIJLPQR]*, %α=100

7364 *4*, 1/2$^+$, *[JLPQR]*, %α=100

7539.6 *9*, 5/2$^+$, *[DEFHLQR]*, %IT≤4, %α≥96, Γ_{γ}=5.6 *7* eV, $\Gamma_{\alpha}0$=0.16 *5* keV, T=3/2
- γ_{5107} ***2432.8*** *13* (†$_{\gamma}$4.1 *10*)
- γ_{4378} ***3161.6*** *9* (†$_{\gamma}$66 *7*) [M1+E2]: δ=−0.042 *30*
- γ_{1554} ***5984.6*** *9* (†$_{\gamma}$100 *7*) [M1+E2]: δ=−0.017 *15*
- γ_{1346} ***6192.8*** *9* (†$_{\gamma}$2.9 *10*)
- γ_{197} ***7341.0*** *9* (†$_{\gamma}$71 *7*) [M1+E2]: δ=−0.09 *4*

7560 *10*, 7/2$^+$, Γ<90 keV, *[E]*, %α=100

7587, (5/2$^-$), *[R]*

7660.6 *9*, 3/2$^+$, *[DLQR]*, Γ_{γ}=1.81 *24* eV, %IT=?, %α=?, T=3/2
- γ_{5107} ***2553.8*** *13* (†$_{\gamma}$15.5 *13*)
- γ_{4550} ***3110.4*** *12* (†$_{\gamma}$13.4 *8*)
- γ_{3908} ***3752.0*** *10* (†$_{\gamma}$≈8)
- γ_{1554} ***6105.5*** *9* (†$_{\gamma}$95 *5*) [M1+E2]: δ=−0.06 *4*
- γ_{197} ***7461.9*** *9* (†$_{\gamma}$34 *5*)
- γ_{0} ***7658.9*** *9* (†$_{\gamma}$100 *11*)

7702 *5*, 1/2$^-$, Γ<30 keV, *[EHLQR]*, %α=100

7740 *40*, (5/2,7/2)$^-$, Γ<6 keV, *[R]*

7900 (?), Γ<200 keV, *[E]*, %α=100

7929 *3*, 7/2$^+$,9/2, *[DHJ]*, %IT=?, %α=?
- γ_{2780} ***5148*** *3* (†$_{\gamma}$100)
- γ_{197} ***7730*** *3* (†$_{\gamma}$4.2)

7937 *3*, 11/2$^+$, *[R]*, %IT=?, %α=?
- γ_{4648} ***3289*** *4* (†$_{\gamma}$100)
- γ_{2780} ***5156*** *3* (†$_{\gamma}$11)

8014.0 *10*, 5/2$^+$, *[Q]*, %p=100

8084 *3*, Γ<3 keV, *[EOQ]*, %p=?, %α=?

8137.7 *12*, 1/2$^+$, Γ<0.3 keV, *[ELOPQ]*, Γ_{γ}=1.3 eV, %IT=?, %p=?, %α=?
- γ_{6255} ***1883*** *1* (†$_{\gamma}$5.6 *19*)
- γ_{5938} ***2199.6*** *16* (†$_{\gamma}$18.5 *9*)
- γ_{3908} ***4229.0*** *13* (†$_{\gamma}$100 *4*)
- γ_{1554} ***6582.5*** *12* (†$_{\gamma}$3.7 *19*)
- γ_{197} ***7938.8*** *12* (†$_{\gamma}$14.8 *19*)
- γ_{110} ***8026.0*** *12* (†$_{\gamma}$44 *4*)
- γ_{0} ***8135.8*** *12* (†$_{\gamma}$14.8 *19*)

8160 (?), Γ<50 keV, *[E]*, %α=100

8199.0 *10*, (5/2$^+$), Γ<1 keV, *[ELOQ]*, %IT=?, %p=?, %α=?

8254.3 *26*, (5/2,7/2)$^-$, Γ<1.5 keV, *[LQ]*, %IT=?, %p=?
- γ_{3908} ***4345*** *3* (†$_{\gamma}$76 *24*)
- γ_{1459} ***6795*** *3* (†$_{\gamma}$73 *24*)
- γ_{1346} ***6908*** *3* (†$_{\gamma}$100 *30*)
- γ_{197} ***8055*** *3* (†$_{\gamma}$55 *21*)

8288 *2*, 13/2$^-$, Γ<1 keV, *[CDEFHI]*, Γ_{γ}=0.072 *8* eV, %IT=?, %α=?, $\Gamma_{\alpha}0$=0.90 *10* keV
- γ_{4648} ***3639.6*** *23* (†$_{\gamma}$8 *4*)
- γ_{4033} ***4255.0*** *24* (†$_{\gamma}$100 *4*)

8310.0 *12*, 5/2$^+$, Γ=0.047 *19* keV, *[DLOQ]*, Γ_{γ}=0.71 *17* eV, %IT=1.5 *7*, %p=?, %α=?
- γ_{4378} ***3931.9*** *12* (†$_{\gamma}$83 *4*) [M1+E2]: δ=+0.14 *7*
- γ_{1554} ***6754.7*** *12* (†$_{\gamma}$100 *4*)
- γ_{0} ***8308.0*** *12* (†$_{\gamma}$25.0 *21*)

8370 *4*, 7/2,5/2$^+$, Γ=7.5 *15* keV, *[D]*, %IT=?, %α=?
- γ_{3999} ***4370*** *4* (†$_{\gamma}$46 *8*)
- γ_{2780} ***5589*** *4* (†$_{\gamma}$77 *8*)
- γ_{1346} ***7023*** *4* (†$_{\gamma}$100 *8*)
- γ_{197} ***8171*** *4* (†$_{\gamma}$33 *5*)

(continued on next page)

$^{19}_{9}$F (continued)

8583.5 *16*, $5/2^+$, $\Gamma<0.5$ keV, *[DL]*, %IT=?, %p=?, %α=?
γ_{6927} ***1656.9*** *24* ($\dagger_\gamma$1.3 *8*)
γ_{6161} ***2422.7*** *19* ($\dagger_\gamma$6.6 *13*)
γ_{5938} ***2645.3*** *19* ($\dagger_\gamma$4.7 *13*)
γ_{5621} ***2962.3*** *19* ($\dagger_\gamma$5.8 *13*)
γ_{5464} ***3119.7*** *22* ($\dagger_\gamma$5.3 *13*)
γ_{5418} ***3165.2*** *19* ($\dagger_\gamma$11 *3*)
γ_{4556} ***4026.9*** *17* ($\dagger_\gamma$5.3 *18*)
γ_{3999} ***4584.2*** *18* ($\dagger_\gamma$11 *3*)
γ_{1554} ***7028.1*** *16* ($\dagger_\gamma$53 *8*)
γ_{1346} ***7236.3*** *16* ($\dagger_\gamma$61 *8*)
γ_{197} ***8384.4*** *16* ($\dagger_\gamma$100 *13*)
γ_{0} ***8581.4*** *16* ($\dagger_\gamma$11 *3*)

8591.9 *10*, $3/2^-$, Γ=2.0 *1* keV, *[DHLNOQ]*, %IT=0.042 *9*, %p=?, %α=?, Γ_γ=0.85 *17* eV
γ_{6787} ***1804.8*** *23* ($\dagger_\gamma$0.71 *24*)
γ_{6282} ***2309.7*** *23* ($\dagger_\gamma$1.4 *5*)
γ_{5501} ***3090.9*** *20* ($\dagger_\gamma$3.6 *12*)
γ_{5107} ***3485.0*** *14* ($\dagger_\gamma$2.4 *12*)
γ_{4550} ***4041.5*** *13* ($\dagger_\gamma$8.6 *14*)
γ_{3908} ***4683.1*** *11* ($\dagger_\gamma$19.0 *24*)
γ_{1554} ***7036.5*** *10* ($\dagger_\gamma$67 *7*)
γ_{1346} ***7244.7*** *10* ($\dagger_\gamma$16.7 *24*)
γ_{197} ***8392.8*** *10* ($\dagger_\gamma$100 *5*)
γ_{110} ***8480.0*** *10* ($\dagger_\gamma$7.1 *24*)
γ_{0} ***8589.8*** *10* ($\dagger_\gamma$12 *5*)

8629 *4*, $7/2^-$, $\Gamma<1$ keV, *[DE]*, %IT=?, %α=?, $\Gamma_\alpha 0$=66 *24* eV
γ_{4033} ***4596*** *5* ($\dagger_\gamma$8 *3*)
γ_{3999} ***4629*** *4* ($\dagger_\gamma$34 *3*)
γ_{2780} ***5848*** *4* ($\dagger_\gamma$100 *5*)
γ_{1459} ***7169*** *4* ($\dagger_\gamma$16 *3*)
γ_{1346} ***7282*** *4* ($\dagger_\gamma$16 *3*)
γ_{197} ***8430*** *4* ($\dagger_\gamma$89 *5*)

8650, $1/2^+$, $\Gamma\approx$ 300 keV, *[LNO]*, %IT=?, %p=?, %α=?
γ_{3908} ***4741.20*** *20* ($\dagger_\gamma$45 *11*)
γ_{1459} ***7189.81*** *3* ($\dagger_\gamma$43 *11*)
γ_{110} ***8538.046*** *5* ($\dagger_\gamma$100 *11*)

8793.2 *15*, $1/2^+$, Γ=46 *2* keV, *[LNOQ]*, %IT=?, %p=?, T=3/2
γ_{7661} ***1132.6*** *18* ($\dagger_\gamma$0.7 *3*)
γ_{7364} ***1429.2*** ($\dagger_\gamma$2.0 *3*)
γ_{7262} ***1531.2*** ($\dagger_\gamma$5.7 *7*)
γ_{6989} ***1804.2*** ($\dagger_\gamma$1.7 *3*)
γ_{6787} ***2006.1*** *25* ($\dagger_\gamma$4 *1*)
γ_{6528} ***2265.6*** *21* ($\dagger_\gamma$7.0 *7*)
γ_{6497} ***2296.4*** *21* ($\dagger_\gamma$20 *3*)
γ_{6255} ***2538.2*** ($\dagger_\gamma$0.7 *3*)
γ_{6088} ***2705.0*** *18* ($\dagger_\gamma$5.7 *7*)
γ_{5938} ***2855.0*** *18* ($\dagger_\gamma$6.0 *7*)
γ_{5337} ***3455.9*** *25* ($\dagger_\gamma$1.7 *3*)
γ_{3908} ***4884.3*** *16* ($\dagger_\gamma$73 *3*)
γ_{1554} ***7237.7*** *15* ($\dagger_\gamma$27 *3*)
γ_{1459} ***7333.0*** *15* ($\dagger_\gamma$73 *3*)
γ_{197} ***8594.0*** *15* ($\dagger_\gamma$1.0 *7*)
γ_{110} ***8681.2*** *15* ($\dagger_\gamma$100 *3*)
γ_{0} ***8791.0*** *15* ($\dagger_\gamma$4.0 *13*)

8864 *4*, $\leq$7/2, $\Gamma\approx$ 1 keV, *[D]*, %IT=?, %α=?
γ_{1346} ***7516*** *4* ($\dagger_\gamma$100)

8927 *3*, $3/2^-$, Γ=3.6 *2* keV, *[HILNO]*, %IT=?, %p=?, %α=?
γ_{3908} ***5018*** *3* ($\dagger_\gamma$52 *28*)
γ_{1554} ***7371*** *3* ($\dagger_\gamma$92 *28*) [E1+M2]: $\delta=-0.30$ *6*
γ_{1459} ***7466*** *3* ($\dagger_\gamma$100 *28*) [M1+E2]: $\delta=-3.0$ *25*
γ_{197} ***8728*** *3* ($\dagger_\gamma$96 *28*) [E1+M2]: $\delta=-1.0$ *8*
γ_{110} ***8815*** *3* ($\dagger_\gamma$40 *8*)
γ_{0} ***8925*** *3* ($\dagger_\gamma$20 *8*)

8953 *3*, $11/2^-$, $\Gamma\approx$ 1 keV, *[CDEF]*, %IT≈0.023, %α=100, Γ_γ=0.23 *3* eV, $\Gamma_\alpha 0$=3.57 *5* keV
γ_{5418} ***3535*** *4* ($\dagger_\gamma$10 *2*)
γ_{4648} ***4304*** *4* ($\dagger_\gamma$20 *4*)
γ_{4033} ***4920*** *4* ($\dagger_\gamma$18 *2*)
γ_{3999} ***4953*** *3* ($\dagger_\gamma$52 *4*)
γ_{2780} ***6172*** *3* ($\dagger_\gamma$100 *4*)

9030 *5*, 5/2,7/2, Γ=4.2 *10* keV, *[D]*, %IT=?, %α=?
γ_{6070} ***2960*** *5* ($\dagger_\gamma$59 *9*)
γ_{4378} ***4651*** *5* ($\dagger_\gamma$68 *11*)
γ_{197} ***8831*** *5* ($\dagger_\gamma$100 *11*)

9099.7 *7*, $7/2^-$, Γ=0.57 *3* keV, *[DLNO]*, %IT=?, %p=?, %α=?
γ_{6100} ***2999.4*** *22* ($\dagger_\gamma$25.5 *21*)
γ_{5621} ***3478.4*** *13* ($\dagger_\gamma$7.0 *6*)
γ_{5535} ***3564.3*** *22* ($\dagger_\gamma$2.8 *15*)
γ_{5418} ***3681.3*** *13* ($\dagger_\gamma$40 *4*)
γ_{5107} ***3992.6*** *12* ($\dagger_\gamma$2.6 *4*)
γ_{4683} ***4416.6*** *10* ($\dagger_\gamma$4.3 *6*)
γ_{4033} ***5066.5*** *14* ($\dagger_\gamma$14.9 *11*)
γ_{3999} ***5100.3*** *10* ($\dagger_\gamma$5.3 *6*)
γ_{2780} ***6318.8*** *7* ($\dagger_\gamma$100 *4*)
γ_{1346} ***7752.3*** *8* ($\dagger_\gamma$5.7 *6*)
γ_{197} ***8900.4*** *7* ($\dagger_\gamma$4.3 *6*)

9101 *4*, $7/2^+$,$9/2^+$, $\Gamma\approx$ 1 keV, *[DQ]*, %IT=?, %α=?
γ_{6330} ***2771*** *5* ($\dagger_\gamma$42 *8*)
γ_{6070} ***3031*** *5* ($\dagger_\gamma$63 *8*)
γ_{4378} ***4722*** *4* ($\dagger_\gamma$100 *8*)
γ_{3999} ***5101*** *4* ($\dagger_\gamma$100 *8*)
γ_{2780} ***6320*** *4* ($\dagger_\gamma$46 *8*)

9167 *14*, $1/2^+$, Γ=6.2 *5* keV, *[DNOQ]*, %IT=?, %p=?, %α=?
γ_{4556} ***4610*** *14* ($\dagger_\gamma$37 *4*)
γ_{1554} ***7611*** *14* ($\dagger_\gamma$59 *4*)
γ_{197} ***8968*** *14* ($\dagger_\gamma$100 *4*)

(continued on next page)

9204 *7*, 3/2, Γ=10.2 *15* keV, *[D]*, %IT=?, %α=?
γ_{1346}***7856*** *7* ($\dagger_\gamma$57 *7*)
γ_{197}***9005*** *7* ($\dagger_\gamma$22 *9*)
γ_{110}***9092*** *7* ($\dagger_\gamma$100 *7*)
γ_{0}***9202*** *7* ($\dagger_\gamma$39 *4*)

9267 *4*, 11/2$^+$,9/2$^+$, Γ=2 *1* keV, *[D]*, %IT=?, %α=?
γ_{4648}***4618*** *5* ($\dagger_\gamma$100 *6*)
γ_{4378}***4888*** *4* ($\dagger_\gamma$33 *4*)
γ_{2780}***6486*** *4* ($\dagger_\gamma$49 *4*)

9280 *5*, (7/2,9/2)$^+$, Γ<1.5 keV, *[D]*, %IT=?, %α=?
γ_{4033}***5247*** *6* ($\dagger_\gamma$72 *5*)
γ_{3999}***5280*** *5* ($\dagger_\gamma$100 *5*)

9318 *2*, 3/2$^+$, Γ=3.4 *7* keV, *[DHL]*, %IT=?, %p=?, %α=?
γ_{4683}***4634*** *2* ($\dagger_\gamma$22.7 *17*)
γ_{4556}***4761*** *2* ($\dagger_\gamma$10.7 *10*)
γ_{3908}***5409*** *2* ($\dagger_\gamma$10 *1*)
γ_{1554}***7762*** *2* ($\dagger_\gamma$57 *3*)
γ_{1459}***7857*** *2* ($\dagger_\gamma$93 *3*)
γ_{197}***9119*** *2* ($\dagger_\gamma$40 *3*)
γ_{0}***9316*** *2* ($\dagger_\gamma$100 *3*)

9321.0 *11*, 1/2$^+$, Γ=5.0 *2* keV, *[NO]*, %p=?, %α=?

9329 *4*, 1/2,3/2, Γ≈ 6 keV, *[D]*, %IT=?, %α=?
γ_{1554}***7773*** *4* ($\dagger_\gamma$100)

9509 *4*, 5/2$^+$,7/2$^+$, Γ<1 keV, *[DE]*, %IT=?, %α=?, Γ_α0=0.46 *5* keV
γ_{2780}***6728*** *4* ($\dagger_\gamma$100 *4*)
γ_{1554}***7953*** *4* ($\dagger_\gamma$19 *3*)
γ_{1346}***8161*** *4* ($\dagger_\gamma$19 *3*)

9527 *6*, (5/2), Γ=28 keV, *[NO]*, %p=?, %α=?

9536.4 *20*, 5/2$^+$, Γ=6.3 *15* keV, *[DL]*, %IT=?, %p=?, %α=?
γ_{8014}***1522.4*** *23* ($\dagger_\gamma$7 *3*)
γ_{7661}***1875.7*** *22* ($\dagger_\gamma$21 *3*)
γ_{7540}***1996.7*** *22* ($\dagger_\gamma$34 *3*) [M1+E2]: δ=–0.7 *3*
γ_{5107}***4429.2*** *22* ($\dagger_\gamma$100 *7*)
γ_{4683}***4853.2*** *22* ($\dagger_\gamma$41 *3*)
γ_{4556}***4979.6*** *21* ($\dagger_\gamma$52 *3*) [E1+M2]: δ=–0.7 *4*
γ_{1346}***8188.8*** *20* ($\dagger_\gamma$90 *7*)

9566 *3*, 3/2$^-$, Γ=26 *3* keV, *[L]*, %IT=?, %p=?
γ_{6255}***3311*** *4* ($\dagger_\gamma$30 *8*)
γ_{197}***9367*** *3* ($\dagger_\gamma$100 *13*)

9575 *4*, 3/2$^-$, Γ=67 *3* keV, *[LNO]*, %IT=?, %p=?, %α=?
γ_{7661}***1914*** *4* ($\dagger_\gamma$11 *3*)
γ_{7540}***2035*** *4* ($\dagger_\gamma$29 *5*)
γ_{6088}***3487*** *5* ($\dagger_\gamma$100 *5*) [M1+E2]: δ=–1.8 *10*
γ_{4550}***5024*** *4* ($\dagger_\gamma$45 *5*)
γ_{3908}***5666*** *4* ($\dagger_\gamma$11 *3*)
γ_{1459}***8114*** *4* ($\dagger_\gamma$68 *5*)

9586 *3*, 7/2, Γ=8.9 *12* keV, *[DLQ]*, %IT=?, %p=?, %α=?
γ_{4550}***5035*** *4* ($\dagger_\gamma$66 *6*)
γ_{3999}***5586*** *3* ($\dagger_\gamma$53 *6*)
γ_{2780}***6805*** *3* ($\dagger_\gamma$94 *6*)
γ_{1346}***8238*** *3* ($\dagger_\gamma$100 *13*)

9642 *6*, 3/2,5/2, Γ≈ 8 keV, *[D]*, %IT=?, %α=?
γ_{4550}***5091*** *6* ($\dagger_\gamma$43 *10*)
γ_{1346}***8294*** *6* ($\dagger_\gamma$100 *11*)
γ_{197}***9442*** *6* ($\dagger_\gamma$21 *5*)

9654 *6*, 3/2,5/2, Γ≈ 6 keV, *[D]*, %IT=?, %α=?
γ_{1554}***8098*** *6* ($\dagger_\gamma$100 *15*)
γ_{1346}***8306*** *6* ($\dagger_\gamma$69 *15*)

9667.5 *15*, 3/2$^+$, Γ=3.6 *4* keV, *[DLNOQ]*, %IT=?, %p=?, %α=?
γ_{7661}***2006.8*** *18* ($\dagger_\gamma$15.9 *14*) [M1+E2]: δ=–0.14 *4*
γ_{7540}***2127.8*** *18* ($\dagger_\gamma$18.2 *14*)
γ_{6838}***2828.9*** *18* ($\dagger_\gamma$4.5 *14*)
γ_{5337}***4330.0*** *25* ($\dagger_\gamma$4.5 *9*)
γ_{5107}***4560.3*** *18* ($\dagger_\gamma$6.8 *14*)
γ_{4550}***5116.9*** *17* ($\dagger_\gamma$36 *5*)
γ_{4378}***5289.0*** *15* ($\dagger_\gamma$2.3 *9*)
γ_{3908}***5758.4*** *16* ($\dagger_\gamma$25.0 *23*)
γ_{1554}***8111.6*** *15* ($\dagger_\gamma$45 *5*)
γ_{1459}***8206.9*** *15* ($\dagger_\gamma$23 *5*)
γ_{1346}***8319.8*** *15* ($\dagger_\gamma$41 *5*)
γ_{197}***9467.9*** *15* ($\dagger_\gamma$41 *5*)
γ_{110}***9555.0*** *15* ($\dagger_\gamma$91 *9*)
γ_{0}***9664.9*** *15* ($\dagger_\gamma$100 *9*)

9710 *4*, 9/2$^+$,11/2$^-$, Γ<1 keV, *[CDEH]*, %IT=?, %α=?, Γ_α0=0.12 *3* keV
γ_{4648}***5061*** *5* ($\dagger_\gamma$1.3 *13*)
γ_{4033}***5677*** *5* ($\dagger_\gamma$100 *5*)
γ_{2780}***6929*** *4* ($\dagger_\gamma$24 *4*)

9820.0 *10*, 5/2$^-$, Γ=0.30 *5* keV, *[DLNO]*, %IT=?, %p=?, %α=?
γ_{5621}***4199*** *10* ($\dagger_\gamma$1.7 *5*)
γ_{5535}***4284*** *11* ($\dagger_\gamma$1.5 *5*)
γ_{5418}***4401*** *10* ($\dagger_\gamma$24.4 *24*)
γ_{5107}***4712*** *10* ($\dagger_\gamma$0.7 *5*)
γ_{4683}***5137*** *10* ($\dagger_\gamma$11.7 *7*)
γ_{4556}***5263*** *10* ($\dagger_\gamma$1.22 *24*) [E1+M2]: δ=–0.30 *15*
γ_{3999}***5820*** *10* ($\dagger_\gamma$2.4 *5*)
γ_{1554}***8264*** *10* ($\dagger_\gamma$73 *5*)
γ_{1459}***8359*** *10* ($\dagger_\gamma$19.5 *24*)
γ_{1346}***8472*** *10* ($\dagger_\gamma$5.9 *12*) [M1+E2]: δ=0.6 *2*
γ_{197}***9620*** *10* ($\dagger_\gamma$100 *5*)
γ_{110}***9707*** *10* ($\dagger_\gamma$1.7 *5*)

(continued on next page)

9834 *3*, 11/2 to 15/2, Γ<1 keV, *[DE]*, %IT=?, %α=?, Γ_{α}0<0.2 keV

γ_{4648}***5185*** *4* ($\dagger_{\gamma}$100)

9874.0 *18*, $11/2^{-}$, Γ=0.0026 *6* keV, *[CDEHIL]*, %IT=42 *10*, %α=?, %p=?, Γ_{γ}=1.09 *10* eV

γ_{8288}***1586*** *3* ($\dagger_{\gamma}$1.6 *5*)

γ_{6500}***3373.7*** *21* ($\dagger_{\gamma}$3.0 *11*)

γ_{6100}***3774*** *3* ($\dagger_{\gamma}$6.0 *13*)

γ_{4648}***5225.2*** *21* ($\dagger_{\gamma}$3.3 *13*)

γ_{4033}***5840.5*** *22* ($\dagger_{\gamma}$38 *3*)

γ_{3999}***5874.3*** *20* ($\dagger_{\gamma}$6.7 *16*)

γ_{2780}***7092.8*** *18* ($\dagger_{\gamma}$100 *5*)

9887 *3*, $1/2^{+}$, Γ=25 *2* keV, *[LNO]*, %IT=?, %p=?, %α=?

γ_{7661}***2226*** *4* ($\dagger_{\gamma}$16 *3*)

γ_{6528}***3360*** *4* ($\dagger_{\gamma}$50 *6*)

γ_{6088}***3799*** *4* ($\dagger_{\gamma}$41 *9*)

γ_{5938}***3949*** *4* ($\dagger_{\gamma}$13 *3*)

γ_{3908}***5978*** *3* ($\dagger_{\gamma}$100 *6*)

γ_{1459}***8426*** *3* ($\dagger_{\gamma}$47 *16*)

γ_{197}***9687*** *3* ($\dagger_{\gamma}$47 *25*)

9926 *3*, $9/2^{+}$, $\Gamma\approx$ 1 keV, *[CDE]*, %IT=?, %α=?, Γ_{α}0=0.61 *9* keV

γ_{6500}***3426*** *4* ($\dagger_{\gamma}$100 *4*)

γ_{6330}***3596*** *4* ($\dagger_{\gamma}$14.8 *19*)

γ_{6070}***3856*** *4* ($\dagger_{\gamma}$13.0 *19*)

γ_{5464}***4462*** *4* ($\dagger_{\gamma}$18.5 *19*)

γ_{2780}***7145*** *3* ($\dagger_{\gamma}$35.2 *19*)

γ_{197}***9726*** *3* ($\dagger_{\gamma}$1.9 *19*)

10088 *5*, $5/2^{-}$,$7/2^{-}$, Γ<1.5 keV, *[DEF]*, %IT=?, %α=?, Γ_{α}0=1.15 *14* keV

γ_{6070}***4018*** *5* ($\dagger_{\gamma}$29 *3*)

γ_{5418}***4669*** *5* ($\dagger_{\gamma}$74 *6*)

γ_{3999}***6088*** *5* ($\dagger_{\gamma}$54 *6*)

γ_{1346}***8740*** *5* ($\dagger_{\gamma}$100 *6*)

γ_{197}***9888*** *5* ($\dagger_{\gamma}$29 *6*)

10137.0 *8*, $3/2^{-}$, Γ=4.3 *6* keV, *[DLO]*, %IT=?, %p=?, %α=?

γ_{1459}***8676*** *8* ($\dagger_{\gamma}$100 *6*)

γ_{1346}***8789*** *8* ($\dagger_{\gamma}$41 *6*)

10162 *3*, $1/2^{+}$, Γ=31 keV, *[NO]*, %p=?, %α=?

10232 *3*, $1/2^{+}$, Γ<1 keV, *[ENO]*, %p=?, %α=?

10254 *3*, $1/2^{+}$, Γ=22 keV, *[NO]*, %p=?, %α=?

10308 *4*, $3/2^{+}$, Γ=9.2 keV, *[EJNO]*, %p=?, %α=?

10365 *4*, 7/2 to 11/2, Γ=3.0 *15* keV, *[DQ]*, %IT=?, %α=?

γ_{4033}***6332*** *5* ($\dagger_{\gamma}$100)

10411 *3*, $13/2^{+}$, Γ<1.5 keV, *[CDEFHIJL]*, %IT=?, %α=?, Γ_{α}0=0.31 *11* keV

γ_{6500}***3911*** *4* ($\dagger_{\gamma}$10.2 *11*)

γ_{4683}***5728*** *3* ($\dagger_{\gamma}$100.0 *11*)

γ_{2780}***7629*** *3* ($\dagger_{\gamma}$3.4 *11*)

10469 *4*, Γ=11.0 *12* keV, *[E]*, %p=?, %α=?

10488 *4*, Γ=4.8 *8* keV, *[E]*, %p=?, %α=?

10496.3 *13*, $3/2^{+}$, Γ=5.7 *6* keV, *[EMNO]*, %n=?, %p=?, %α=?

10521 *4*, Γ=14 *2* keV, *[EQ]*, %p=?, %α=?

10542.3 *11*, Γ=2.5 *2* keV, *[EM]*, %n=?, %p=?, %α=?

10555 *3*, $3/2^{+}$, Γ=4.0 *12* keV, *[ENO]*, %p=?, %α=?, T=(3/2)

10564.7 *20*, Γ=4.6 *7* keV, *[EM]*, %n=?, %p=?, %α=?

10581 *4*, $(5/2^{+})$, Γ=22 *3* keV, *[NO]*, %p=?, %α=?

10614.3 *16*, $5/2^{+}$, Γ=4.7 *5* keV, *[MNO]*, %n=?, %p=?, %α=?, T=3/2

10763.3 *25*, $1/2^{-}$, Γ=6 *3* keV, *[HMNO]*, %n=?, %p=?, %α=?

10859.7 *19*, $5/2^{+}$, Γ=24.0 *15* keV, *[MNO]*, %n=?, %p=?, %α=?

10927 *8*, *[C]*

10975.0 *25*, $(3/2,5/2)^{+}$, Γ=14 *2* keV, *[MNO]*, %n=?, %p=?, %α=?

10989.0 *25*, Γ=7 *2* keV, *[M]*, %n=?, %p=?

11072 *3*, $1/2^{+}$, Γ=35 *4* keV, *[MNO]*, %n=?, %p=?, %α=?

11188 *4*, $(1/2^{-})$, Γ=17 *4* keV, *[MNO]*, %n=?, %p=?, %α=?

11273 *3*, Γ=7 *2* keV, *[M]*, %n=?, %p=?

11286 *7*, $5/2^{+}$, Γ=22 *5* keV, *[MNO]*, %n=?, %p=?, %α=?

11350 *25*, $1/2^{+}$, Γ=272 *31* keV, *[N]*, %p=100

11450 *4*, $1/2^{-}$, Γ=38 *7* keV, *[HMNO]*, %n=?, %p=?, %α=?

11478 *5*, Γ=7 *3* keV, *[M]*, %n=?, %p=?

11502 *5*, $(3/2^{-})$, Γ=4 *2* keV, *[MNO]*, %n=?, %p=?, %α=?

11540 *7*, $5/2^{+}$, Γ=22 *5* keV, *[MNO]*, %n=?, %p=?, %α=?

11569 *7*, Γ=15 *10* keV, *[M]*, %n=?, %p=?, T=(3/2)

11603 *12*, $3/2^{-}$, Γ=63 *7* keV, *[MN]*, %n=?, %p=?

11653 *4*, $3/2^{+}$, Γ=33 *6* keV, *[FHMNO]*, %n=?, %p=?, %α=?, T=(3/2)

11840 *10*, Γ<50 keV, *[M]*, %n=?, %p=?

11930 *10*, Γ=90 keV, *[M]*, %n=?, %p=?

12040 *20*, $1/2^{-}$, Γ=71 *24* keV, *[FNO]*, %p=?, %α=?

12136 *8*, $3/2^{-}$, Γ=105 *14* keV, *[MNO]*, %n=?, %p=?, %α=?, T=3/2

12222 *12*, $3/2^{+}$, Γ=74 *1* keV, *[MNO]*, %n=?, %p=?, %α=?

12522 *7*, $1/2^{-}$, Γ=15 *4* keV, *[N]*, %p=100

12577 *10*, $5/2^{+}$, Γ=48 *10* keV, *[NO]*, %p=?, %α=?

(continued on next page)

12580 *25*, $1/2^-$, Γ=285 *48* keV, *[N]*, %p=100, T=3/2

12780 *10*, $5/2^+$, Γ=95 *38* keV, *[HMNO]*, %n=?, %p=?, %α=?, T=3/2

12860 *30*, $3/2^+$, Γ=276 *38* keV, *[N]*, %p=100, T=3/2

12940 *25*, $5/2^+$, Γ=71 *24* keV, *[NO]*, %p=?, %α=?

12980 *50*, $1/2^-$, Γ=124 *38* keV, *[N]*, %p=100

13068 *4*, $1/2^+$, Γ<10 keV, *[GM]*, %n=?, %p=?

13090 *75*, $3/2^-$, Γ=285 *71* keV, *[N]*, %p=100

13170 *15*, Γ=70 keV, *[M]*, %n=?, %p=?

13245 *10*, $1/2^-$, Γ=7 keV, *[G]*

13270 *10*, $1/2^+$, Γ=4.5 keV, *[G]*

13317 *8*, $7/2^-$, Γ=28 *6* keV, *[MNO]*, %n=?, %p=?, %α=?, T=(3/2)

13360 *25*, $3/2^-$, Γ=38 *19* keV, *[N]*, %p=100

13532 *10*, $1/2^+$, Γ=22 keV, *[G]*

13732 *11*, $7/2^-$, Γ=52 *10* keV, *[IMNO]*, %n=?, %p=?, %α=?, T=3/2

13878 *15*, $1/2^+$, Γ=101 keV, *[G]*

14040 *20*, $5/2^+$, Γ=141 *28* keV, *[N]*, %p=100

14100 *21*, $3/2^-$, Γ=84 *28* keV, *[FIN]*, %p=100

14147 *20*, $1/2^+$, Γ=21 keV, *[G]*

14240 *15*, Γ=350 keV, *[M]*, %n=?, %p=?

14255 *15*, $3/2^+$, Γ=51 keV, *[G]*

14330 *20*, $3/2^-$, Γ=76 *28* keV, *[N]*, %p=100

14352 *10*, $1/2^+$, Γ=154 keV, *[G]*

14460 *25*, $3/2^+$, Γ=179 keV, *[G]*

14460 *25*, $5/2^+$, Γ=46 keV, *[G]*

14700 *20*, $3/2^-$, Γ=124 *38* keV, *[N]*, %p=100

14720 *70*, $1/2^-$, Γ=257 *67* keV, *[O]*, %α=100

14740 *50*, $1/2^+$, Γ=361 *67* keV, *[NO]*, %p=?, %α=?

14780 *20*, $5/2^+$, *[MN]*, %n=?, %p=?

14920 *30*, $7/2^-$, *[FIN]*, %p=100

15000 *20*, *[M]*, %n=?, %p=?

15360 *20*, $1/2^-$, *[N]*, %p=100

15400 *30*, $5/2^+$, *[N]*, %p=100

15560 *30*, *[I]*

15770 *21*, $3/2^-$, Γ=150 keV, *[M]*, %n=?, %p=?

16090 *50*, *[F]*

16200 *40*, $3/2^+$, *[N]*, %p=100

16230 *30*, $7/2^-$, *[N]*, %p=100

16280 *20*, $3/2^-$, Γ=200 keV, *[MN]*, %n=?, %p=?

16450 *50*, *[F]*

16800 *30*, *[M]*, %n=?, %p=?

17050 *40*, $3/2^-$, Γ=331 *67* keV, *[N]*, %p=100

17160 *40*, $7/2^-$, Γ=323 *67* keV, *[N]*, %p=100

17450 *30*, $3/2^-$, Γ=32 *19* keV, *[FN]*, %p=100

17650 *60*, $7/2^-$, Γ=95 *57* keV, *[N]*, %p=100

17930 *40*, $3/2^-$, Γ=255 *57* keV, *[N]*, %p=100

18030 *60*, $7/2^-$, Γ=365 *57* keV, *[FN]*, %p=100

18920 *30*, *[F]*

19070 *60*, $3/2^-$, Γ=555 *143* keV, *[N]*, %p=100

19830 *150*, $5/2^-$, Γ=369 *57* keV, *[N]*, %p=100

19890 *30*, $3/2^-$, Γ=473 *57* keV, *[FN]*, %p=100

20810 *50*, $1/2^-$, Γ=412 *57* keV, *[N]*, %p=100

20930 *50*, $3/2^-$, Γ=317 *48* keV, *[N]*, %p=100

21050 *40*, $7/2^-$, Γ=448 *29* keV, *[N]*, %p=100

$^{19}_{10}$Ne

Δ: 1751.0 *6* **S$_n$:** 11639 *5* **S$_p$:** 6411.5 *8*
Q$_{EC}$: 3238.4 *6*

Populating Reactions and Decay Modes

A ^{20}Mg ECp decay
B ^{15}O(α,γ)
C ^{16}O(^{3}He,x)
D ^{16}O(α,n)
E ^{16}O(^{6}Li,t)
F ^{16}O(^{10}B,^{7}Li)
G ^{17}O(^{3}He,n)
H ^{18}O(p,π^{-})
I ^{19}F(p,n)
J (^{19}F,t)
K ^{20}Ne(^{3}He,α)
L ^{21}Ne(p,t)

Levels and γ-ray branchings:

0, 1/2^{+}, 17.34 *9* s, *[CDEHIJKL]*,
%EC+%β^{+}=100, T=1/2, μ=−1.88542 *8*

238.27 *11*, 5/2^{+}, 18.0 *6* ns, *[DEIJKL]*,
μ=−0.740 *8*
γ_{0}***238.27*** *11* ($\dagger_{\gamma}$100)

275.09 *13*, 1/2^{-}, 42.6 *21* ps, *[DEIK]*
γ_{0}***275.09*** *13* ($\dagger_{\gamma}$100)

1507.6 *3*, 5/2^{-}, 1.0^{+4}_{-5} ps, *[DEIK]*
γ_{275}***1232.5*** *4* ($\dagger_{\gamma}$100 *3*)
γ_{238}***1269.3*** *4* ($\dagger_{\gamma}$14 *3*)

1536.0 *4*, 3/2^{+}, 19 *8* fs, *[DEIJK]*
γ_{275}***1260.9*** *5* ($\dagger_{\gamma}$5 *3*)
γ_{238}***1297.7*** *5* ($\dagger_{\gamma}$100 *3*)

1615.6 *5*, 3/2^{-}, 99 *21* fs, *[DEIK]*
γ_{275}***1340.4*** *6* ($\dagger_{\gamma}$100 *6*)
γ_{238}***1377.2*** *6* ($\dagger_{\gamma}$14 *4*)
γ_{0}***1615.5*** *5* ($\dagger_{\gamma}$29 *4*)

2794.7 *6*, 9/2^{+}, 97 *24* fs, *[DEFHIJKL]*
γ_{238}***2556.2*** *7* ($\dagger_{\gamma}$100)

4032.9 *24*, 3/2^{+}, <35 fs, *[EGKL]*
γ_{1536}***2496.7*** *25* ($\dagger_{\gamma}$19 *6*)
γ_{275}***3757.4*** *24* ($\dagger_{\gamma}$6 *6*)
γ_{0}***4032.4*** *24* ($\dagger_{\gamma}$100 *19*)

4140 *4*, (9/2)$^{-}$, <0.21 ps, *[EGK]*
γ_{1508}***2632*** *4* ($\dagger_{\gamma}$100)

4197.1 *24*, (7/2)$^{-}$, <0.25 ps, *[DEGK]*
γ_{1508}***2689.3*** *25* ($\dagger_{\gamma}$100 *6*)
γ_{238}***3958.4*** *24* ($\dagger_{\gamma}$25 *6*)

4379.1 *22*, 7/2^{+}, <0.083 ps, *[EGK]*
γ_{2795}***1584.3*** *23* ($\dagger_{\gamma}$18 *5*)
γ_{238}***4140.3*** *22* ($\dagger_{\gamma}$100 *5*)

4549 *4*, (1/2,3/2)$^{-}$, <56 fs, *[EGK]*
γ_{275}***4273*** *4* ($\dagger_{\gamma}$100 *38*)
γ_{0}***4548*** *4* ($\dagger_{\gamma}$54 *38*)

4600 *4*, (5/2^{+}), <0.11 ps, *[EG]*
γ_{1536}***3064*** *4* ($\dagger_{\gamma}$11 *6*)
γ_{238}***4361*** *4* ($\dagger_{\gamma}$100 *6*)

4635 *4*, 13/2^{+}, >0.69 ps, *[DEFGHK]*
γ_{2795}***1840*** *4* ($\dagger_{\gamma}$100)

4712 *10*, (5/2^{-}), *[E]*
4783 *20*, *[K]*
5092 *6*, 5/2^{+}, *[EGKL]*
5351 *10*, 1/2^{+}, *[K]*
5424 *7*, (7/2^{+}), *[DEK]*
5463 *20*, *[K]*
5539 *9*, *[K]*
5832 *9*, *[K]*
6013 *7*, (3/2,1/2)$^{-}$, *[K]*
6092 *8*, *[EK]*
6149 *20*, *[L]*
6288 *7*, *[EL]*
6437 *9*, *[K]*
6742 *7*, (3/2,1/2)$^{-}$, *[K]*
6861 *7*, *[EK]*
7067 *9*, *[K]*
7210 *20*, *[EK]*
7253 *10*, *[K]*
7326 *15* (?), *[K]*
7531 *15* (?), *[K]*
7616 *16*, 3/2^{+}, *[DKL]*, T=3/2
7700 *10*, *[K]*
7788 *10* (?), *[K]*
7994 *15*, *[K]*
8069 *12*, *[EK]*
8236 *10*, *[K]*
8442 *9*, *[DEK]*
8523 *10*, *[K]*
8810 *25* (?), *[K]*
8920 *9*, *[DEFK]*
9013 *10*, *[K]*
9100 *20*, *[K]*
9240 *20*, *[DK]*
9489 *25*, *[K]*
9810 *20*, *[DEFGK]*
10010 *20*, *[E]*
10407 *30*, 3/2^{+}, Γ=45 keV, *[CDK]*, %p=?,
%α=?
10460, 1/2^{+}, Γ=355 keV, *[C]*, %p=?, %α=?
10613 *20*, *[K]*
11080 *20*, *[DEF]*
11240 *20*, *[E]*
11400 *20*, *[E]*
11510 *50*, 3/2^{-},(1/2^{-}), Γ=25 keV, *[D]*, %α=?
12230 *50*, 5/2^{+}, Γ=200 *25* keV, *[DF]*, %α=?
12400 *50*, 7/2^{+}, Γ=180 *25* keV, *[C]*, %α=?
12560 *20*, *[E]*
12690 *50*, 1/2^{+}, Γ=180 *40* keV, *[C]*, %p=?
13100 *30*, *[E]*
13220 *30*, *[E]*
13800 *250*, Γ=670 *250* keV, *[C]*, %IT=?
14180 *30*, *[EF]*
14440 *30*, *[E]*
14780 *30*, Γ=620 *130* keV, *[CE]*, %IT=?
16230 *130*, Γ=400 *130* keV, *[C]*, %IT=?,
%n=?
18400 *500*, Γ=4400 *500* keV, *[C]*, %IT=?

(continued on next page)

$^{19}_{10}$Ne (continued)

γ(*^{19}F*) from ^{19}Ne (17.34 s) β^+ decay **<** *for Iγ% multiply by 1.0* **>**

109.894 *5* (†$_\gamma$0.012 *2*)
197.142 *4* (†$_\gamma$0.00206 *20*)
1356.843 *10* (†$_\gamma$0.00206 *20*)
1444.085 *10* (†$_\gamma$0.000108 *11*)
1553.970 *9* (†$_\gamma$0.000057 *6*)

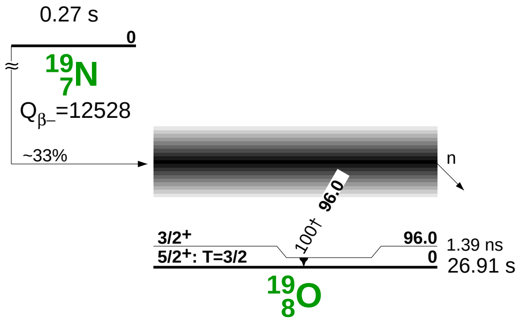
$^{19}_{11}$Na

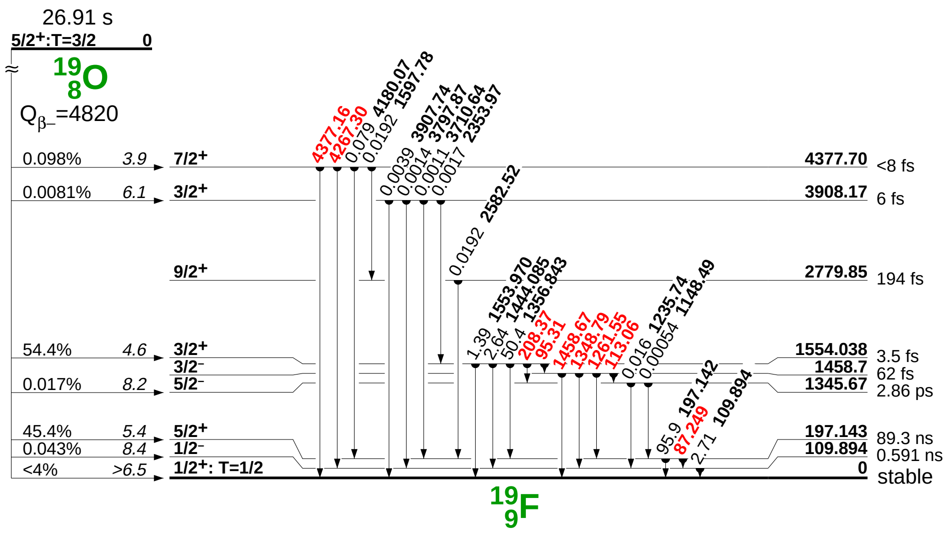
Δ: 12929 *12*   **S_n:** (20500)   **Q_p:** 321 *13*
Q_{EC}: 11178 *12*

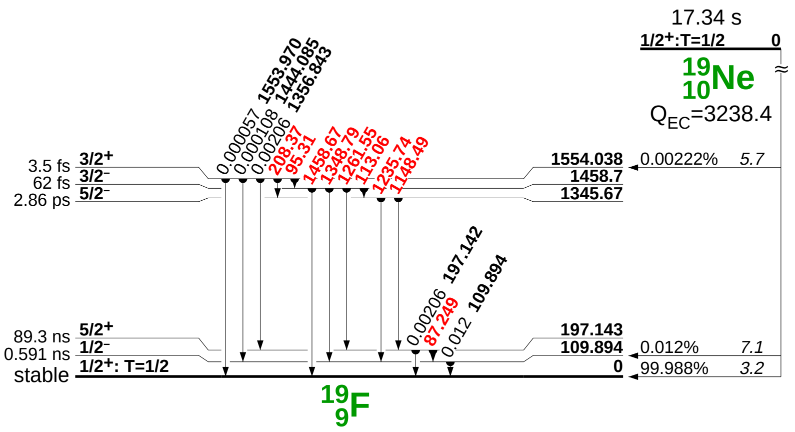
Populating Reactions and Decay Modes

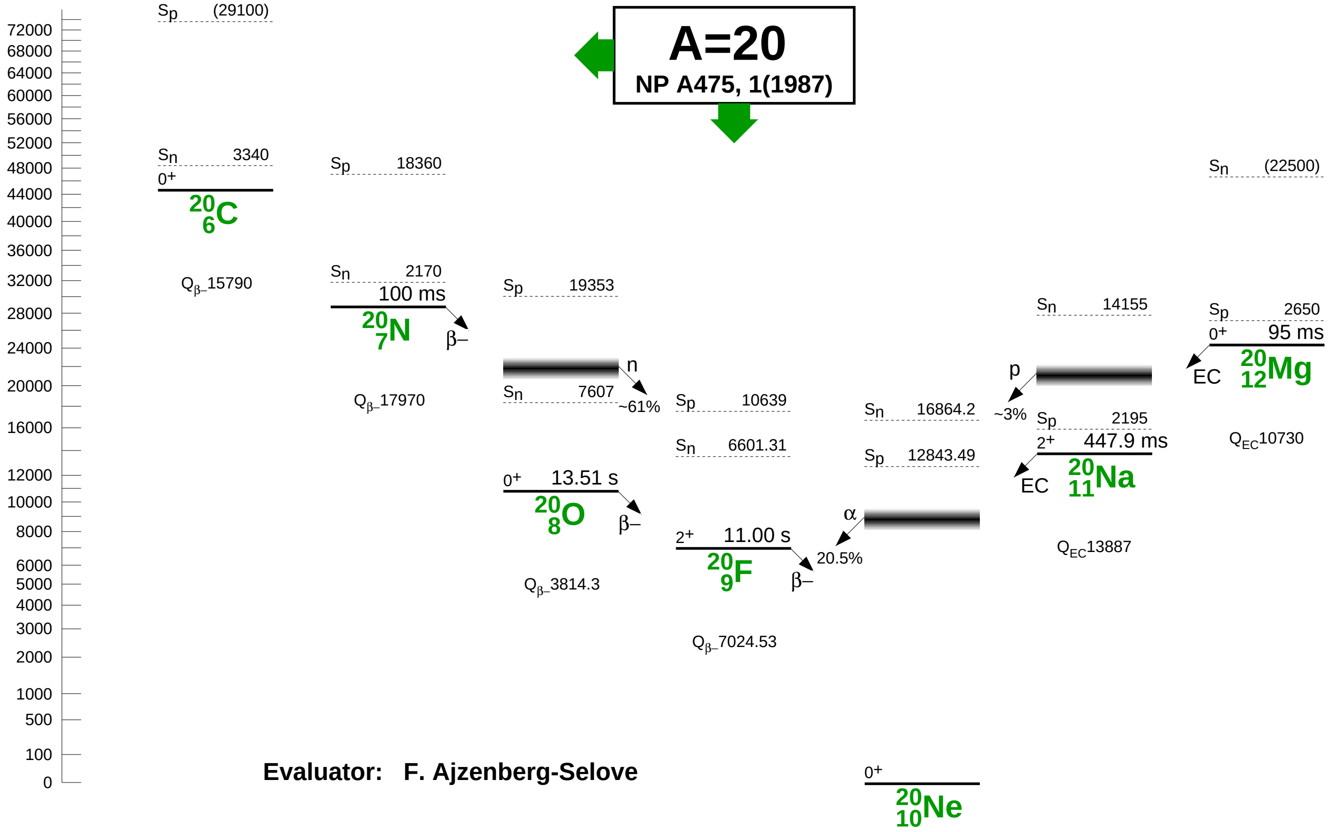
^{24}Mg(^{3}He,^{8}Li) (87Aj02)

Levels:
0, %p=?
120 *10*


0.27 s
0
$^{19}_{7}$N
$Q_{\beta-}$=12528
~33%
n
96.0
100†
3/2+
5/2+: T=3/2
96.0
0
1.39 ns
26.91 s
$^{19}_{8}$O


26.91 s
5/2+:T=3/2 0
19 8 O
Qβ−=4820
0.098% 3.9 7/2+
0.0081% 6.1 3/2+
9/2+
54.4% 4.6 3/2+
3/2−
0.017% 8.2 5/2−
45.4% 5.4 5/2+
0.043% 8.4 1/2−
<4% >6.5 1/2+: T=1/2
4377.16
4267.30
0.079 4180.07
0.0192 1597.78
0.0039 3907.74
0.0014 3797.87
0.0011 3710.64
0.0017 2353.97
0.0192 2582.52
1.39 1553.970
2.64 1444.085
50.4 1356.843
208.37
95.31
1458.67
1348.79
1261.55
113.06
0.016 1235.74
0.00054 1148.49
95.9 197.142
87.249
2.71 109.894
4377.70 <8 fs
3908.17 6 fs
2779.85 194 fs
1554.038 3.5 fs
1458.7 62 fs
1345.67 2.86 ps
197.143 89.3 ns
109.894 0.591 ns
0 stable
19 9 F


17.34 s
1/2+:T=1/2
0
$^{19}_{10}$Ne
Q_{EC}=3238.4
0.00222% 5.7
0.012% 7.1
99.988% 3.2
3.5 fs 3/2+
62 fs 3/2−
2.86 ps 5/2−
89.3 ns 5/2+
0.591 ns 1/2−
stable 1/2+: T=1/2
1554.038
1458.7
1345.67
197.143
109.894
0
0.000057 1553.970
0.000108 1444.085
0.00206 1356.843
208.37
95.31
1458.67
1348.79
1261.55
113.06
1235.74
1148.49
0.00206 197.142
87.249
0.012 109.894
$^{19}_{9}$F



Evaluator: F. Ajzenberg-Selove

$^{20}_{6}$C

Δ: 37560 *200* **S_n:** 3340 *230* **S_p:** (29100)

$Q_{\beta-}$: 15790 *210*

Populating Reactions and Decay Modes

Ar+x fragmentation

Levels:

0, 0^+

$^{20}_{7}N$

Δ: 21770 *50* **S_n:** 2170 *60* **S_p:** 18360 *120*
$Q_{\beta-}$: 17970 *50*

Populating Reactions and Decay Modes

Th(p,x), Ta(^{40}Ar,x)

Levels:

0, 100^{+30}_{-20} ms, %β^-=100, %β^-n≈61

$^{20}_{8}$O

Δ: 3796.9 *12* **S_n:** 7607 *3* **S_p:** 19353 *16*

$Q_{\beta-}$: 3814.3 *12*

Populating Reactions and Decay Modes

A ^{20}N β^- decay

B ^{21}N β^-n decay

C ^{18}O(t,p)

D ^{18}O(α,2p)

E ^{18}O(^{18}O,^{16}O)

Levels:

0, 0^+, 13.51 *5* s, *[ACDE]*, %β^-=100, T=2

1637.68 *15*, 2^+, 7.3 *3* ps, *[CDE]*, μ=–0.70 *3*

3570 *7*, 4^+, *[CDE]*

4072 *4*, 2^+, *[CE]*

4456 *5*, 0^+, *[CE]*

4850 *15*, 4^+, *[C]*

5002 *6*, *[C]*

5234 *5*, 2^+, *[C]*

5304 *6*, 2^+, *[C]*

5387 *6*, 0^+, *[C]*

5614 *3*, (3^-), *[C]*

6555 *8*, (2), *[C]*

7252 *8*, 5^-, *[C]*

7622 *7*, 3^- and 4^+, *[C]*

7754 *5*, 4^+, *[CD]*

7855 *6*, (5^-), *[CD]*

8554 *8*, 4^+, *[C]*

8804 *9*, 3^-, *[CD]*

8962 *21*, (0^+), *[C]*

9770 *8*, 0^+, *[C]*

10125 *11*, 2^+, *[CD]*

γ(*^{20}F*) from ^{20}O (13.51 s) β^- decay **<** *for Iγ% multiply by 1.0* **>**

1056.818 *4* (†$_\gamma$99.979 *2*)

1309.29 *5* (†$_\gamma$0.0022 *6*)

1644.45 *10* (†$_\gamma$0.0019 *6*)

1843.88 *8* (†$_\gamma$0.0019 *6*)

2179.02 *8* (†$_\gamma$0.0022 *6*)

2431.48 *6* (†$_\gamma$0.0059 *13*)

3488.16 *6* (†$_\gamma$0.017 *2*)

$^{20}_{9}$F

Δ: –17.40 *8* **S_n:** 6601.31 *5* **S_p:** 10639 *3*
Q_{β^-}: 7024.53 *8*

Populating Reactions and Decay Modes

A ^{20}O β^- decay (87Aj02)
B ^{12}C(^{9}Be,p)
C ^{13}C(^{9}Be,d)
D ^{13}C(^{11}B,α)
E ^{14}N(^{7}Li,p)
F ^{16}O(^{7}Li,^{3}He)
G ^{18}O(^{3}He,p)
H ^{18}O(α,d)
I ^{19}F(n,γ)
J ^{19}F(n,n), (n,n’), (n,2n)
K ^{19}F(n,α)
L ^{19}F(d,p)
M ^{20}Ne(π^-,γ)
N ^{21}Ne(d,^{3}He)
O ^{22}Ne(p,^{3}He)
P ^{22}Ne(d,α)
Q ^{27}Al(^{20}Ne,^{27}Si)
R 4 other reactions

Levels and γ-ray branchings:

0, 2^+, 11.00 *2* s, *[ABCEFGHILMNPQ]*,
%β^-=100, T=1, μ=+2.0935 *9*,
Q=0.042 *3*

656.00 *4*, 3^+, 0.270 *21* ps, *[EFGHILP]*
γ_0***655.99*** *4* ($\dagger_\gamma$100) [M1+E2]: δ=–0.10 *5*

822.68 *8*, 4^+, 55 *4* ps, *[DEFGHILNP]*
γ_{656}***166.68*** *9* ($\dagger_\gamma$100 *5*)
γ_0***822.66*** *8* ($\dagger_\gamma$56 *5*)

983.71 *5*, 1^-, 1.39 *14* ps, *[EFGILNP]*
γ_0***983.68*** *5* ($\dagger_\gamma$100)

1056.848 *4*, 1^+, 31 *9* fs, *[AEFGILNP]*
γ_0***1056.818*** *4* ($\dagger_\gamma$100)

1309.34 *5*, 2^-, 1.11 *21* ps, *[AEFGILMNP]*
γ_0***1309.29*** *5* ($\dagger_\gamma$100)

1824.4 *12*, 5^+, <45 fs, *[BEGHLP]*
γ_{823}***1001.7*** *12* ($\dagger_\gamma$100)

1843.97 *8*, 2^-, 21 *14* fs, *[ABFGILN]*
γ_0***1843.88*** *8* ($\dagger_\gamma$100)

1970.80 *7*, (3^-), *[BDEFGILP]*
γ_{1309}***661.45*** *9* ($\dagger_\gamma$53 *6*)
γ_{823}***1148.08*** *11* ($\dagger_\gamma$100 *6*)
γ_0***1970.70*** *7* ($\dagger_\gamma$29 *7*)

2044.05 *6*, 2^+, 26 *11* fs, *[BEFGILNP]*
γ_{656}***1388.00*** *8* ($\dagger_\gamma$100.0 *21*)
γ_0***2043.94*** *6* ($\dagger_\gamma$8.8 *21*)

2194.36 *8*, (3^+), <8.3 fs, *[BEFGILNP]*
γ_{823}***1371.63*** *12* ($\dagger_\gamma$86 *4*)
γ_0***2194.23*** *8* ($\dagger_\gamma$100 *4*)

2864.9 *15*, (3^-), *[EFGLP]*
γ_0***2864.7*** *15* ($\dagger_\gamma$100)

2966.16 *8*, 3^+, 42 *28* fs, *[EFGILP]*
γ_{823}***2143.36*** *12* ($\dagger_\gamma$100 *5*)
γ_{656}***2310.02*** *9* ($\dagger_\gamma$38 *5*)
γ_0***2965.92*** *8* ($\dagger_\gamma$41 *5*)

2968.0 *15*, (4^-), *[DEFP]*
γ_{1971}***997.2*** *15* ($\dagger_\gamma$100 *7*)
γ_{823}***2145.2*** *15* ($\dagger_\gamma$64 *7*)

3172.6 *4*, (1^+), *[EFGILP]*
γ_{984}***2188.8*** *5* ($\dagger_\gamma$100)

3488.49 *6*, 1^+, 30 *8* fs, *[AEFGILP]*
γ_{1844}***1644.45*** *10* ($\dagger_\gamma$11 *3*)
γ_{1309}***2179.02*** *8* ($\dagger_\gamma$13 *3*)
γ_{1057}***2431.48*** *6* ($\dagger_\gamma$35 *6*)
γ_0***3488.16*** *6* ($\dagger_\gamma$100 *6*)

3526.28 *7*, 0^+, 21 *10* fs, *[GIL]*
γ_{1057}***2469.30*** *7* ($\dagger_\gamma$100)

3586.56 *9*, $(1,2)^+$, <42 fs, *[EFGILP]*
γ_{2194}***1392.15*** *12* ($\dagger_\gamma$14 *6*)
γ_{2044}***1542.45*** *11* ($\dagger_\gamma$100 *6*)
γ_{984}***2602.67*** *11* ($\dagger_\gamma$7 *2*)
γ_{656}***2930.33*** *10* ($\dagger_\gamma$19.6 *24*)
γ_0***3586.22*** *9* ($\dagger_\gamma$61 *5*)

3680.13 *6*, 1,2, *[EFGILP]*
γ_{1057}***2623.13*** *6* ($\dagger_\gamma$52 *6*)
γ_0***3679.77*** *6* ($\dagger_\gamma$100 *6*)

3761.1 *19*, (2^-,3^+), *[EFGLP]*

3965.19 *16*, 1^+, *[EFGILP]*
γ_{1309}***2655.66*** *17* ($\dagger_\gamma$100 *8*)
γ_{984}***2981.24*** *17* ($\dagger_\gamma$32 *8*)

4082.08 *11*, $(1)^+$, *[EFGILP]*
γ_{1057}***3025.01*** *11* ($\dagger_\gamma$100 *5*)
γ_0***4081.63*** *11* ($\dagger_\gamma$52 *5*)

4199 *3*, *[EL]*

4207.7 *26*, *[FLP]*

4277.22 *14*, $(1,2)^+$, *[EFILP]*
γ_{1057}***3220.12*** *14* ($\dagger_\gamma$100)

4315.4 *20*, $(0,1)^+$, *[L]*

4371.38 *12*, (2^+), *[EFILP]*
γ_{2968}***1403.3*** *15* ($\dagger_\gamma$100 *9*)
γ_{984}***3387.36*** *13* ($\dagger_\gamma$58 *9*)
γ_{823}***3548.36*** *15* ($\dagger_\gamma$12 *5*)

4508.7 *4*, 1^+,(2), *[EFILP]*
γ_{656}***3852.3*** *4* ($\dagger_\gamma$100)

4580.8 *18*, *[EFL]*

4592 *3*, *[LP]*

4731.0 *20*, (3^-,4,5^+), *[EFLP]*

4765.6 *20*, *[EFLP]*

4892 *3*, *[ELP]*

4898 *3*, *[FL]*

5047 *4*, $(2)^-$, *[ELP]*

5068 *3*, (1^-,2,3^+), *[EL]*

5131.0 *25*, (2^-,3,4^+), *[ELP]*

5223.9 *23*, $(1,2)^-$, *[EFLP]*

5281.9 *25*, *[ELP]*

(continued on next page)

$^{20}_{9}$F (continued)

- **5318.87** *17*, 0,1,2, *[EILP]*
  - γ_{984}***4334.66*** *18* (†$_{\gamma}$100 *11*)
  - γ_{0}***5318.11*** *17* (†$_{\gamma}$52 *11*)
- **5349.0** *4*, $(3)^{+}$, *[EL]*
- **5413.1** *6*, *[EFLP]*
- **5450** *4*, *[LP]*
- **5455** *3*, *[L]*
- **5463** *3*, $(1,2,3)^{+}$, *[L]*
- **5555.34** *13*, $1,2^{+}$, *[FILP]*
  - γ_{3526}***2028.95*** *15* (†$_{\gamma}$92 *19*)
  - γ_{1309}***4245.52*** *14* (†$_{\gamma}$100 *14*)
  - γ_{0}***5554.51*** *13* (†$_{\gamma}$78 *11*)
- **5588.1** *15*, *[L]*
- **5620** *3*, *[FLP]*
- **5713** *2*, *[ELP]*
- **5764.0** *25*, $(3)^{+}$, *[ELP]*
- **5810.4** *25*, (1^{+}), *[ELP]*
- **5936.09** *5*, 2^{-}, *[ILP]*
  - γ_{3965}***1970.80*** *17* (†$_{\gamma}$11 *4*)
  - γ_{3680}***2255.82*** *8* (†$_{\gamma}$30 *3*)
  - γ_{3587}***2349.38*** *11* (†$_{\gamma}$32 *7*)
  - γ_{3488}***2447.44*** *8* (†$_{\gamma}$38 *5*)
  - γ_{2968}***2967.9*** *15* (†$_{\gamma}$10 *3*)
  - γ_{2194}***3741.35*** *10* (†$_{\gamma}$16.9 *25*)
  - γ_{2044}***3891.63*** *8* (†$_{\gamma}$10.3 *21*)
  - γ_{1971}***3964.87*** *9* (†$_{\gamma}$100 *6*)
  - γ_{984}***4951.72*** *7* (†$_{\gamma}$45 *12*)
  - γ_{656}***5279.34*** *7* (†$_{\gamma}$94 *6*)
  - γ_{0}***5935.14*** *5* (†$_{\gamma}$26.4 *17*)
- **6017.77** *3*, 2^{-}, *[IL]*
  - γ_{4082}***1935.59*** *12* (†$_{\gamma}$10.7 *16*)
  - γ_{3587}***2431.05*** *10* (†$_{\gamma}$56 *10*)
  - γ_{3488}***2529.11*** *7* (†$_{\gamma}$86 *5*)
  - γ_{2968}***3049.6*** *15* (†$_{\gamma}$36.6 *21*)
  - γ_{2194}***3823.02*** *9* (†$_{\gamma}$15.6 *16*)
  - γ_{2044}***3973.30*** *7* (†$_{\gamma}$2.8 *6*)
  - γ_{1971}***4046.53*** *8* (†$_{\gamma}$4.3 *10*)
  - γ_{1844}***4173.33*** *9* (†$_{\gamma}$21.8 *16*)
  - γ_{1309}***4707.83*** *6* (†$_{\gamma}$3.4 *9*)
  - γ_{984}***5033.38*** *6* (†$_{\gamma}$62 *3*)
  - γ_{656}***5361.00*** *5* (†$_{\gamma}$12.6 *7*)
  - γ_{0}***6016.80*** *3* (†$_{\gamma}$100 *5*)
- **6044.98** *8*, 0,1,2, *[ILP]*
  - γ_{3526}***2518.53*** *11* (†$_{\gamma}$78 *8*)
  - γ_{3488}***2556.31*** *10* (†$_{\gamma}$42 *14*)
  - γ_{1844}***4200.54*** *12* (†$_{\gamma}$100 *8*)
  - γ_{1309}***4735.04*** *10* (†$_{\gamma}$58 *6*)
- **6090** *7*, (0^{-}), *[E]*
- **6161** *4*, $(2,3^{+})$, *[EP]*
- **6200** *4*, $(2^{-},3,4^{+})$, *[EP]*
- **6240** *7*, *[P]*
- **6299** *4*, *[EP]*
- **6339** *4*, *[EP]*
- **6375** *4*, *[EP]*
- **6416** *4*, *[EP]*
- **6441** *9*, *[P]*
- **6474** *3*, *[EP]*
- **6519** *3*, 0^{+}, *[GO]*, T=2
- **6588** *5*, *[P]*
- **6601.33** *4*, $0^{+},1^{+}$, *[I]*
  - γ_{6045}***556.34*** *8* (†$_{\gamma}$12.0 *13*)
  - γ_{6018}***583.55*** *5* (†$_{\gamma}$100 *8*)
  - γ_{5936}***665.23*** *6* (†$_{\gamma}$38 *4*)
  - γ_{5555}***1045.96*** *14* (†$_{\gamma}$6 *1*)
  - γ_{5319}***1282.42*** *17* (†$_{\gamma}$3.8 *13*)
  - γ_{4509}***2092.54*** *4* (†$_{\gamma}$1.3 *4*)
  - γ_{4371}***2229.82*** *13* (†$_{\gamma}$2.1 *4*)
  - γ_{4277}***2323.97*** *15* (†$_{\gamma}$3.5 *5*)
  - γ_{4082}***2519.08*** *12* (†$_{\gamma}$2.3 *3*)
  - γ_{3965}***2635.95*** *17* (†$_{\gamma}$2.0 *3*)
  - γ_{3680}***2920.97*** *7* (†$_{\gamma}$2.5 *5*)
  - γ_{3587}***3014.53*** *10* (†$_{\gamma}$11.7 *8*)
  - γ_{3526}***3074.80*** *8* (†$_{\gamma}$5.1 *5*)
  - γ_{3488}***3112.58*** *7* (†$_{\gamma}$5.8 *5*)
  - γ_{2044}***4556.72*** *7* (†$_{\gamma}$12.3 *8*)
  - γ_{1844}***4756.75*** *9* (†$_{\gamma}$4.1 *3*)
  - γ_{1309}***5291.24*** *7* (†$_{\gamma}$5.5 *3*)
  - γ_{1057}***5543.66*** *4* (†$_{\gamma}$8.5 *8*)
  - γ_{984}***5616.77*** *7* (†$_{\gamma}$3.22 *25*)
  - γ_{0}***6600.16*** *4* (†$_{\gamma}$21.3 *15*)
- **6627.0** *3*, 2^{-}, Γ=0.31 *2* keV, *[IJ]*, %IT=0.45 *10*, %n=99.55 *10*, Γ_{γ}=1.4 *3* eV
  - γ_{4082}***2544.7*** *3* (†$_{\gamma}$4.57 *22*)
  - γ_{3526}***3100.5*** *3* (†$_{\gamma}$17.4 *22*)
  - γ_{3488}***3138.2*** *3* (†$_{\gamma}$6.5 *22*)
  - γ_{2044}***4582.4*** *3* (†$_{\gamma}$3.26 *22*)
  - γ_{1971}***4656.8*** *3* (†$_{\gamma}$100 *9*)
  - γ_{1309}***5182.3*** *3* (†$_{\gamma}$17 *4*)
  - γ_{1057}***5316.9*** *3* (†$_{\gamma}$67 *4*)
  - γ_{656}***5970.0*** *3* (†$_{\gamma}$13.0 *22*)
  - γ_{0}***6625.8*** *3* (†$_{\gamma}$4.3 *11*)
- **6642.6** *3*, (3,4), Γ<0.08 keV, *[I]*, %IT=?, %n=?
  - γ_{2966}***3676.1*** *3* (†$_{\gamma}$83 *21*)
  - γ_{823}***5819.0*** *3* (†$_{\gamma}$55 *17*)
  - γ_{656}***5985.6*** *3* (†$_{\gamma}$100 *17*)

(continued on next page)

$^{20}_{9}$F (continued)

6647.5 *4*, 1^-, Γ=1.59 *10* keV, *[IJ]*, %IT=0.101 *20*, %n=99.899 *20*, Γ_γ=1.6 *3* eV

γ_{3488} ***3158.7*** *4* ($\dagger_\gamma$24 *9*)

γ_{2044} ***4602.9*** *4* ($\dagger_\gamma$100 *10*)

γ_{1057} ***5589.8*** *4* ($\dagger_\gamma$15 *7*)

γ_{984} ***5662.9*** *4* ($\dagger_\gamma$31 *7*)

6693.4 *6*, 1^-, Γ=13.8 *8* keV, *[EIJ]*, %IT=?, %n=100

6766.1 *9*, (2^-,3,4^+), Γ<0.6 keV, *[EIP]*, %IT=?, %n=?

6825 *5*, *[EJP]*, %n=100

6856.7 *10*, 2, Γ=10 *2* keV, *[I]*, %IT=0.035 *11*, %n=99.965 *11*, Γ_γ=3.5 *8* eV

6905 *8*, *[P]*

6936 *4*, *[E]*

6967.8 *10*, 1^-, Γ=5 *1* keV, *[EIJ]*, %IT=0.048 *19*, %n=99.952 *19*, Γ_γ=2.4 *8* eV

7067.0 *12* (?), 0^-, Γ=2.4 *6* keV, *[IJ]*, %IT=?, %n=?

7080, (1^+), Γ=24 keV, *[EJ]*, %n=100

7166 *2*, 2($^+$), Γ=8 *1* keV, *[EIJK]*, %IT=0.079 *18*, %n=99.921 *18*, Γ_γ=6.3 *12* eV

7232 *7*, *[E]*

7283 *4*, *[E]*

7319 *8*, (1), Γ=33 keV, *[EIJ]*, %IT=0.009, %n=100, Γ_γ=2.9 eV

7370 *20*, (1), Γ=19 keV, *[EJ]*, %n=100

7420 *20*, (2^+), Γ=10 keV, *[EIJ]*, %IT=?, %n=100

7495 *5*, (2), Γ=80 keV, *[EIJ]*, %IT=0.0035, %n=100, Γ_γ=2.8 eV

7655 *5*, (2^+), Γ=65 keV, *[EIJ]*, %IT=0.0060, %n=100, Γ_γ=3.9 eV

7734 *6*, Γ=140 keV, *[EJ]*, %n=100

7843 *11*, 1^-, Γ=50 *10* keV, *[EI]*, %IT=?, %n=100

7985 *4*, 1, Γ=14 *2* keV, *[EI]*, %IT=?, %n=100

8050 *100*, 2^+, *[O]*, T=2

8062 *8*, *[E]*

8113 *4*, Γ=195 keV, *[EIJ]*, %IT=0.006, %n=100, Γ_γ=11 *3* eV

8147 *6*, Γ=15 keV, *[EI]*, %n=100

8268 *12*, *[E]*

8349 *4*, *[E]*

8421, Γ=27 keV, *[J]*, %n=100

8500, Γ=140 keV, *[J]*, %n=100

8720, Γ<30 keV, *[EJ]*, %n=100

8770, Γ=76 keV, *[EJ]*, %n=100

8940, Γ=73 keV, *[EJ]*, %n=100

9010, *[E]*

9200, *[HJ]*, %n=100

9520, Γ=110 keV, *[J]*, %n=100

9650, Γ=100 keV, *[J]*, %n=100

9830, Γ=33 keV, *[J]*, %n=100

9850, Γ=120 keV, *[J]*, %n=100

9886 *10* (?), *[J]*, %n=100

9900, Γ<30 keV, *[J]*, %n=100

9929 *10* (?), *[J]*, %n=100

9981 *10* (?), *[J]*, %n=100

10024 *10*, Γ=150 keV, *[JK]*, %n=?, %α=?

10100 *50*, *[K]*, %n=?, %α=?

10228 *10*, 0^-,1, $\Gamma\approx$ 200 keV, *[JK]*, %n=?, %α=?

10480 *10*, $\Gamma\approx$ 10 keV, *[JK]*, %n=?, %α=?

10641 *10*, 1,2, Γ=70 keV, *[J]*, %n=100

10807 *10*, 0^-,1, $\Gamma\approx$ 310 keV, *[JK]*, %n=?, %α=?

10990, Γ=190 keV, *[J]*, %n=100

11045 *10* (?), $\Gamma\approx$ 30 keV, *[J]*, %n=100

11130 *10* (?), Γ<25 keV, *[J]*, %n=100

11244 *10* (?), Γ<25 keV, *[J]*, %n=100

11287 *10* (?), *[J]*, %n=100

11490 *50*, *[K]*, %n=?, %α=?

12000, *[K]*, %n=?, %α=?

12200 *100*, *[K]*, %n=?, %α=?

12400, *[K]*, %n=?, %α=?

12700, *[K]*, %n=?, %α=?

13200, *[K]*, %n=?, %α=?

13700, *[JK]*, %n=?, %α=?

14000, *[K]*, %n=?, %α=?

γ(*^{20}Ne*) from ^{20}F (11.00 s) β^- decay *<for Iγ% multiply by 1.0>*

1633.602 *15* ($\dagger_\gamma$100)

3332.54 *20* ($\dagger_\gamma$0.0082 *6*)

4965.85 *20* ($\dagger_\gamma$0.00005 *2*)

$^{20}_{10}$Ne

%: 90.48 *3*

Δ: –7041.929 *3* **S_n:** 16864.2 *6* **S_p:** 12843.49 *7*

σ_γ: 0.037 *4* b

Populating Reactions and Decay Modes

A ^{20}F β^- decay (87Aj02)
B ^{20}Na EC decay (87Aj02)
C ^{21}Mg ECp decay (78En02)
D ^{22}Al EC2p decay
E ^{24}Al ECα decay
F ^{10}B(^{14}N,α)
G ^{12}C(^{10}B,d), (^{11}B,t)
H ^{12}C(^{12}C,α)
I ^{12}C(^{14}N,^{6}Li)
J ^{16}O(α,γ)
K ^{16}O(α,α), (α,2α)
L ^{16}O(^{6}Li,d)
M ^{16}O(^{7}Li,t)
N ^{16}O(^{12}C,^{8}Be), (^{12}C,2α), ^{16}O(^{12}C,α^{12}C)
O ^{19}F(p,γ)
P ^{19}F(p,p), (p,p'), (p,d)
Q ^{19}F(p,n)
R ^{19}F(p,α)
S ^{19}F(d,n)
T ^{19}F(^{3}He,d)
U ^{20}Ne(γ,n), (γ,2n), (γ,α)
V ^{21}Ne(d,t)
W (^{24}Mg,^{6}Li)
X 46 other reactions

Levels and γ-ray branchings:

0, 0^+, stable, *[ABCFHIJLMNOSTUW]*, T=0

1633.674 *15*, 2^+, 0.73 *4* ps, *[ABCFHIJLMNOSTVW]*, μ=+1.08 *8*, Q=–0.23 *3*, T=0
γ_0***1633.602*** *15* ($\dagger_\gamma$100)

4247.7 *11*, 4^+, 64 *6* fs, *[BCFHIJLMNSTW]*, μ=+0.5 *6*, T=0
γ_{1634}***2613.8*** *11* ($\dagger_\gamma$100)

4966.51 *20*, 2^-, 3.3 *4* ps, *[ABCFHIJLOSW]*, T=0
γ_{1634}***3332.54*** *20* ($\dagger_\gamma$100)
γ_0***4965.85*** *20* ($\dagger_\gamma$0.6 *2*)

5621.4 *17*, 3^-, 139 *35* fs, *[BFHIJLSTW]*, %IT=7 *3*, %α=93 *3*, Γ_γ=2.4×10^{-4} *6* eV, T=0
γ_{4967}***654.9*** *18* ($\dagger_\gamma$5.5 *18*)
γ_{1634}***3987.3*** *17* ($\dagger_\gamma$100.0 *11*)
γ_0***5620.6*** *17* ($\dagger_\gamma$8.7 *11*)

5787.7 *26*, 1^-, Γ=0.028 *3* keV, *[FHIJKLMNTVW]*, %IT=0.016 *3*, %α=100, Γ_γ=4.6×10^{-3} *8* eV, T=0
γ_{1634}***4154*** *3* ($\dagger_\gamma$100 *6*)
γ_0***5787*** *3* ($\dagger_\gamma$22 *6*)

6725 *5*, 0^+, Γ=19.0 *9* keV, *[IJKLSTW]*, %IT=1.7×10^{-4}, %α=100, Γ_γ=0.033 eV, T=0
γ_{1634}***5090*** *5* ($\dagger_\gamma$100)
γ_0***6724*** *5*

7004 *4*, 4^-, 305 *62* fs, *[FHILTW]*, T=0
γ_{5621}***1383*** *4* ($\dagger_\gamma$39)
γ_{4967}***2037*** *4* ($\dagger_\gamma$17)
γ_{4248}***2756*** *4* ($\dagger_\gamma$100)
γ_{1634}***5369*** *4* ($\dagger_\gamma$0.8 *3*)

7156.3 *5*, 3^-, Γ=8.2 *3* keV, *[FHIJKLMNST]*, Γ_γ=16.1×10^{-4} *15* eV, %IT=2.0×10^{-5} *2*, %α=100, T =0
γ_{5788}***1369*** *3* ($\dagger_\gamma$67 *8*)
γ_{4248}***2908.4*** *12* ($\dagger_\gamma$100 *8*)

7191 *3*, 0^+, Γ=3.4 *2* keV, *[GHJKW]*, Γ_γ=4.4×10^{-3} *8* eV, %IT=1.29×10^{-4} *25*, %α=100, T=0
γ_{1634}***5556*** *3* ($\dagger_\gamma$100)
γ_0***7190*** *3*

7421.9 *12*, 2^+, Γ=15.1 *7* keV, *[BFGHJKLSTVW]*, %IT=1.9×10^{-4} *3*, %α=100, Γ_γ=0.029 *4* eV, T=0
γ_{4248}***3173.9*** *17* ($\dagger_\gamma$<9)
γ_{1634}***5787.3*** *12* ($\dagger_\gamma$100)
[M1+E2]: $\delta=+8.4^{+15}_{-10}$
γ_0***7420.4*** *12* ($\dagger_\gamma$<12)

7829.0 *24*, 2^+, Γ=2 keV, *[BFGHJKTVW]*, %IT=3.4×10^{-3}, %α=100, Γ_γ=0.069 *7* eV, T=0
γ_{4248}***3581*** *3* ($\dagger_\gamma$<3.6)
γ_{1634}***6194.3*** *24* ($\dagger_\gamma$20.5 *12*)
γ_0***7827.4*** *24* ($\dagger_\gamma$100.0 *12*)

8453 *4*, 5^-, Γ=0.013 *4* keV, *[FGHJKLTW]*, %IT=0.10 *4*, %α=99.90 *4*, Γ_γ=0.013 *3* eV, T=0
γ_{5621}***2832*** *5* ($\dagger_\gamma$100)

≈**8700**, 0^+, Γ>800 keV, *[K]*, %α=100, T=0

8708 *7*, 1^-, Γ=2.1 *8* keV, *[HJKTW]*, %IT=3.3×10^{-3} *15*, %α=100, Γ_γ=0.070 *17* eV, T=0
γ_{1634}***7073*** *7* ($\dagger_\gamma$15 *9*)
γ_0***8706*** *7* ($\dagger_\gamma$100 *9*)

8777.6 *22*, 6^+, Γ=0.11 *2* keV, *[FGHJKLMNTW]*, %IT=0.091 *21*, %α=100, Γ_γ=0.100 *15* eV, T=0
γ_{4248}***4529.3*** *25* ($\dagger_\gamma$100)

≈**8800**, 2^+, Γ>800 keV, *[BKT]*, %α=100, T=0

8820, (5^-), Γ<1 keV, *[K]*, %α=100, T=0

8854 *5*, 1^-, Γ=19 keV, *[HKV]*, %α=100, T=0

9031 *7*, 4^+, Γ=3 keV, *[FGHJKTW]*, %IT=0.011, %α=100, Γ_γ=0.34 *4* eV, T=0
γ_{4248}***4782*** *7* ($\dagger_\gamma$<2)
γ_{1634}***7396*** *7* ($\dagger_\gamma$100)

(continued on next page)

$^{20}_{10}$Ne (continued)

9116 *3*, 3^-, Γ=3.2 keV, *[FHJKSTW]*, %IT=8×10^{-4}, %α=100, Γ_γ=0.026 *3* eV, T=0
γ_{5621}***3495*** *4* ($\dagger_\gamma$34 *8*)
γ_{4967}***4149*** *3* ($\dagger_\gamma$66 *10*)
γ_{1634}***7480*** *3* ($\dagger_\gamma$100 *10*)

9318 *2*, (2^-), *[HJTW]*, T=0
γ_{1634}***7682.7*** *20* ($\dagger_\gamma$100)

9487 *5*, 2^+, Γ=29 *15* keV, *[BJKW]*, Γ_γ=0.26 *10* eV, %IT=9×10^{-4} *6*, %α=100, T=0
γ_{1634}***7851*** *5* ($\dagger_\gamma$100)
γ_{0}***9485*** *5*

9873 *4*, 3^+, *[BHT]*, T=0
γ_{7422}***2451*** *5* ($\dagger_\gamma$≈3.8)
γ_{5621}***4252*** *5* ($\dagger_\gamma$≈9)
γ_{4967}***4905*** *4* ($\dagger_\gamma$<6)
γ_{4248}***5624*** *5* ($\dagger_\gamma$15 *4*)
γ_{1634}***8237*** *4* ($\dagger_\gamma$100)
γ_{0}***9870*** *4* ($\dagger_\gamma$<0.6)

9935 *12*, (1^+), <24.3 fs, *[HTW]*, T=0
γ_{4967}***4967*** *12* ($\dagger_\gamma$28 *6*)
γ_{1634}***8299*** *12* ($\dagger_\gamma$100 *6*)

9990 *8*, 4^+, Γ=155 *30* keV, *[FHJKSTW]*, Γ_γ=0.9 *4* eV, %IT=6×10^{-4} *3*, %α=100, T=0
γ_{1634}***8354*** *8* ($\dagger_\gamma$100)
γ_{0}***9987*** *8*

10262 *5*, 5^-, Γ=145 *40* keV, *[FHKLMNT]*, %α=100, T=0

10274 *3*, 2^+, Γ<0.3 keV, *[BJKV]*, Γ_γ=4.6 *5* eV, %IT=?, %α=?, T=1
γ_{7829}***2445*** *4* ($\dagger_\gamma$0.25 *7*)
γ_{7422}***2852*** *4* ($\dagger_\gamma$7.8 *5*)
γ_{5621}***4652*** *4* ($\dagger_\gamma$2.36 *22*)
γ_{4967}***5306*** *3* ($\dagger_\gamma$1.46 *11*)
γ_{1634}***8638*** *3* ($\dagger_\gamma$100.0 *6*)
γ_{0}***10271*** *3* ($\dagger_\gamma$0.73 *16*)

10406 *5*, 3^-, Γ=80 keV, *[HKTW]*, %α=100, T=0

10553 *5*, 4^+, Γ=16 keV, *[HKT]*, %α=100, T=0

10584 *5*, 2^+, Γ=24 keV, *[BKTW]*, %α=100, T=0

10609 *6*, 6^-, 16 *5* fs, *[FGH]*, T=0
γ_{8453}***2156*** *8* ($\dagger_\gamma$4.7 *13*)
γ_{7004}***3605*** *8* ($\dagger_\gamma$100.0 *13*)

10694 *6*, 4^-,3^+, *[GH]*, T=0
γ_{4967}***5726*** *6* ($\dagger_\gamma$100 *5*)
γ_{4248}***6445*** *6* ($\dagger_\gamma$33 *5*)

10800 *75*, 4^+, Γ=350 keV, *[KLT]*, %α=100, T=0

10840 *6*, 3^-, Γ=45 keV, *[HK]*, %IT=?, %α=?, T=0

10843 *4*, 2^+, Γ=13 keV, *[BKW]*, %α=100, T=0

10884 *3*, 3^+, <21 fs, *[BV]*, T=1
γ_{4248}***6635*** *4* ($\dagger_\gamma$30 *7*)
γ_{1634}***9248*** *3* ($\dagger_\gamma$100 *7*)

10917 *6*, 3^+, *[H]*, T=0

10970 *120*, 0^+, Γ=580 keV, *[K]*, %α=100, T=0

11020 *8*, 4^+, Γ=24 keV, *[GHKW]*, %α=100, T=0

11090 *3*, 4^+, Γ<0.5 keV, *[JKT]*, Γ_γ=0.34 *4* eV, %IT=?, %α=?, T=1
γ_{4248}***6841*** *4* ($\dagger_\gamma$100.00 *25*)
γ_{1634}***9454*** *3* ($\dagger_\gamma$0.50 *25*)

11240 *23*, 1^-, Γ=175 keV, *[KT]*, %α=100, T=0

11262.3 *19*, 1^+, *[BJ]*, T=1
γ_{1634}***9626.1*** *19* ($\dagger_\gamma$19 *6*)
γ_{0}***11258.9*** *19* ($\dagger_\gamma$100 *6*)

11270 *5*, 1^-, Γ<0.3 keV, *[JK]*, Γ_γ=0.71 *6* eV, %IT=?, %α=?, T=1
γ_{9318}***1952*** *6* ($\dagger_\gamma$16.4 *18*)
γ_{8854}***2416*** *7* ($\dagger_\gamma$49 *3*)
γ_{4967}***6302*** *5* ($\dagger_\gamma$11.8 *18*)
γ_{1634}***9634*** *5* ($\dagger_\gamma$4.5 *18*)
γ_{0}***11267*** *5* ($\dagger_\gamma$100 *4*)

11320 *9*, 2^+, Γ=40 *10* keV, *[BK]*, %α=100, T=0

11528 *6*, 3^+,4^-, <21 fs, *[H]*, T=0
γ_{7004}***4523*** *7*
γ_{4967}***6560*** *6* ($\dagger_\gamma$100 *4*)
γ_{4248}***7279*** *6* ($\dagger_\gamma$43 *4*)

11555 *6*, (3^+), *[H]*, T=0
γ_{7004}***4550*** *7*
γ_{1634}***9918*** *6*

11558 *4*, 0^+, Γ=1.1 *4* keV, *[JK]*, T=0
γ_{4248}***7309*** *5* ($\dagger_\gamma$<8)
γ_{1634}***9921*** *4* ($\dagger_\gamma$100)

11601 *10*, 2^-, *[V]*, T=1

11653 *5*, (3^+), *[GH]*, T=0
γ_{4248}***7404*** *6* ($\dagger_\gamma$100 *4*)
γ_{1634}***10016*** *5* ($\dagger_\gamma$16 *4*)

11885 *7*, 2^+, Γ=46 keV, *[BHKTVW]*, %IT=?, %α=?, T=0

11928 *4*, 4^+, Γ=0.44 *15* keV, *[JKW]*, Γ_γ=0.026 *6* eV, %IT=6×10^{-3} *3*, %α=100, T=0
γ_{4248}***7678*** *5* ($\dagger_\gamma$100 *14*)
γ_{1634}***10291*** *4* ($\dagger_\gamma$27 *14*)

(continued on next page)

11951 *4*, 8^+, Γ=0.035 *10* keV, *[GHIJKLMNT]*, Γ_γ=7.7×10^{-3} *11* eV, %IT=0.022 *7*, %α=100, T=0

γ_{8778}***3173*** *5* (†$_\gamma$100)

11985 *16*, 1^-, Γ=30 *5* keV, *[HJK]*, %IT=?, %α=?, T=0

12098 *6*, 2^-, *[HTV]*, T=1

12137 *5*, 6^+, *[GHIKL]*, %α=100, T=0

12221 *4*, 2^+, Γ<1 keV, *[HJ]*, %IT=?, %α=?, T=1

γ_{1634}***10584*** *4* (†$_\gamma$100)

12253 *10*, 4^+, Γ=155 *15* keV, *[K]*, %α=100, T=0

12256 *3*, 3^-, Γ<1 keV, *[JK]*, %IT=?, %α=?, T=1

γ_{5621}***6634*** *4* (†$_\gamma$58.7 *24*)

γ_{1634}***10619*** *3* (†$_\gamma$100.0 *24*)

12327 *10*, 2^+, Γ=390 *50* keV, *[K]*, %α=100, T=0

12401 *5*, 3^-, Γ=37.3 *9* keV, *[GHJKSW]*, Γ_γ=0.2 eV, %IT=5×10^{-4}, %α=100, T=(1)

γ_{4248}***8151*** *6* (†$_\gamma$≈100)

γ_{1634}***10764*** *5* (†$_\gamma$≈41)

γ_{0}***12397*** *5* (†$_\gamma$≈1.4)

12433 *5*, 0^+, Γ=24.4 *5* keV, *[HJK]*, Γ_γ=0.17 *5* eV, %IT=7.0×10^{-4} *21*, %α=100, T=0

γ_{1634}***10796*** *5* (†$_\gamma$100)

12472 *10*, (2^+), Γ=124 *6* keV, *[K]*, %α=100, T=0

12585 *5*, 6^+, Γ=72 *9* keV, *[GHKLMN]*, %α=100, T=0

12592 *15*, (2^+), Γ=145 *25* keV, *[K]*, %α=100, T=0

12713 *5*, 5^-, Γ=84 *8* keV, *[GHK]*, %α=100, T=0

12743 *10*, (2^+), Γ=61 *12* keV, *[GHK]*, %α=100, T=0

12836 *5*, 1^-, Γ=30 *5* keV, *[HK]*, %α=100, T=0

12957 *5*, 2^+, Γ=38 *4* keV, *[HKW]*, %α=100, T=0

13048 *5*, 4^+, Γ=18 *3* keV, *[GHK]*, %α=100, T=0

13060.7 *21*, 2^-, Γ=1.0 keV, *[R]*, %p=?, %α=?

13099 *10*, (0^+), Γ=53 *24* keV, *[K]*, %α=100, T=0

13105 *5*, 6^+, Γ=102 *5* keV, *[K]*, %α=100, T=0

13137 *5*, 3^-, Γ=48 *4* keV, *[K]*, %α=100, T=0

13171.3 *21*, 1^+, Γ=2.3 *2* keV, *[OPRS]*, %IT=?, %p=?, %α=?, T=(1)

13222 *10*, 0^+, Γ=40 *13* keV, *[HKR]*, %α=100, T=0

13224 *15*, 1^-, Γ=80 keV, *[KR]*, %p=?, %α=?, T=0

13226 *5*, 3^-, Γ=53 *4* keV, *[K]*, %α=100, T=0

13307.5 *21*, 1^+, Γ=0.9 *1* keV, *[OPR]*, %IT=?, %p=?, %α=?

13338 *5*, 7^-, Γ=0.08 *3* keV, *[GHIK]*, %α=100, T=0

13341 *5*, 4^+, Γ=26 *3* keV, *[K]*, %α=100, T=0

13414 *2*, 3^-, Γ=24 *3* keV, *[KLPR]*, %α=100, T=0

13426 *5*, (5^-), Γ=49 *7* keV, *[K]*, %α=100, T=0

13461 *10*, 1^-, Γ=195 *25* keV, *[KR]*, %p=?, %α=?

13484 *2*, 1^+, Γ=6.4 *3* keV, *[OPR]*, %IT=?, %p=?, %α=?, T=1

γ_{4967}***8515.6*** *20* (†$_\gamma$5)

γ_{1634}***11846.5*** *20* (†$_\gamma$100)

13507 *5*, 1^-, Γ=24 *8* keV, *[KPR]*, %p=?, %α=?, T=0

13529 *5*, 2^+, Γ=61 *8* keV, *[K]*, %α=100, T=0

13530 *15*, (0^+), Γ=76 *32* keV, *[K]*, %α=100, T=0

13573 *5*, 2^+, Γ=12 *5* keV, *[HKR]*, %α=100, T=0

13586 *3*, 2^+, Γ=9 *1* keV, *[PR]*, %p=?, %α=?

13642 *3*, 0^+, Γ=17 *1* keV, *[HPRS]*, %p=?, %α=?, T=1

13676.0 *23*, (2^-), Γ=4.5 *2* keV, *[OPR]*, %IT=?, %p=?, %α=?

13677 *5*, 5^-, Γ=11 *2* keV, *[GK]*, %α=100, T=0

13692 *10*, 7^-, Γ=310 *30* keV, *[K]*, %α=100, T=0

13736.0 *25*, 1^+, Γ=7.7 *5* keV, *[OPR]*, %IT=?, %p=?, %α=?

13744 *20*, 0^+, Γ≈ 80 keV, *[K]*, %α=100, T=0

13827 *10*, 3^-, Γ=136 *15* keV, *[HK]*, %α=100, T=0

13866 *30*, 1^-, Γ≈ 175 keV, *[HKR]*, %p=?, %α=?, T=0

13881.0 *23*, 2^+, Γ=0.14 *5* keV, *[HIOPRS]*, %IT=?, %p=?, %α=?, T=1

γ_{4967}***8912*** *23* (†$_\gamma$100)

γ_{1634}***12243*** *23* (†$_\gamma$25)

13908 *5*, 2^+, Γ=74 *10* keV, *[KR]*, %α=100, T=0

13926.0 *23*, (0^+), Γ=3.5 *4* keV, *[R]*, %p=?, %α=?

13928 *5*, 6^+, Γ=65 *3* keV, *[KLM]*, %α=100, T=0

13948 *10*, 0^+, Γ=79 *15* keV, *[K]*, %α=100, T=0

13965 *5*, 4^+, Γ=8.1 *10* keV, *[K]*, %α=100, T=0

14020, 1^-, Γ≈ 70 keV, *[R]*, %p=?, %α=?

14063.0 *23*, 2^+, Γ≈ 140 keV, *[PR]*, %p=?, %α=?

14115 *5*, 2^+, Γ=42 *6* keV, *[K]*, %α=100, T=0

14128 *2*, 2^-, Γ=4.7 *7* keV, *[OPR]*, %IT=?, %p=?, %α=?

(continued on next page)

14150.0 *23*, 2^{-}, Γ=11.8 *10* keV, *[OPR]*, %IT=?, %p=?, %α=?

14200, 1^{+}, Γ=14 *1* keV, *[OP]*, %IT=?, %p=?

14270 *10*, 4^{+}, Γ=92 *9* keV, *[K]*, %α=100, T=0

14304 *10*, (6^{+}), Γ=60 *13* keV, *[GHK]*, %α=100, T=0

14311 *5*, 6^{+}, Γ=117 *8* keV, *[GHKLMN]*, %α=100, T=0

14313 *15*, (3^{-}), Γ≈ 45 keV, *[K]*, %α=100, T=0

14370 *3*, Γ≈ 5 keV, *[PR]*, %p=?, %α=?

14454 *5*, 5^{-}, Γ≈ 15 keV, *[N]*, %α=100, T=0

14455 *3*, $(0^{+},2^{+})$, Γ=33 *3* keV, *[KPR]*, %p=?, %α=?, T=0

14475 *6*, 0^{+}, Γ=68 *2* keV, *[PR]*, %p=?, %α=?

14593 *10*, 4^{+}, Γ=260 *25* keV, *[K]*, %α=100, T=0

14597 *7*, 1^{-}, Γ=116 *5* keV, *[KR]*, %p=?, %α=?, T=0

14653 *10*, (0^{+}), Γ=25 keV, *[PR]*, %p=?, %α=?

14699 *4*, (1^{+}), Γ=36 *10* keV, *[KPR]*, %p=?, %α=?

14731 *10*, (4^{+}), Γ=60 *25* keV, *[K]*, %α=100, T=0

14761 *5*, 6^{+}, Γ=7.3 *48* keV, *[K]*, %α=100, T=0

14776 *4*, (1^{-}), Γ=110 *20* keV, *[PR]*, %p=?, %α=?

14807 *5*, 6^{+}, Γ=86 *7* keV, *[GKR]*, %α=100, T=0

14816 *5*, 5^{-}, Γ=117 *13* keV, *[GK]*, %α=100, T=0

14839 *10*, (4^{+}), Γ=79 *15* keV, *[K]*, %α=100, T=0

14888 *10*, 2^{+}, Γ=100 *30* keV, *[KR]*, %p=?, %α=?, T=0

15047 *10*, 2^{+}, Γ=66 *20* keV, *[HKR]*, %p=?, %α=?, T=0

15073 *10*, 5^{-}, Γ=160 *25* keV, *[K]*, %α=100, T=0

15142 *15*, (2^{+}), Γ≈ 60 keV, *[K]*, %α=100, T=0

15174 *10*, 5^{-}, Γ=230 *25* keV, *[GK]*, %α=100, T=0

15230, Γ=28 keV, *[R]*, %p=?, %α=?

15270, (1^{-}), Γ=285 keV, *[R]*, %p=?, %α=?

15319 *25*, 7^{-}, Γ=280 *40* keV, *[GHKLMN]*, %α=100, T=0

15330 *5*, 4^{+}, Γ=34 *10* keV, *[GHK]*, %α=100, T=0

15366 *5*, 7^{-}, Γ=110 *10* keV, *[KLMN]*, %α=100, T=0

15436 *15*, (3^{-}), Γ=90 *20* keV, *[HKR]*, %p=?, %α=?, T=0

15500, Γ=55 keV, *[KR]*, %p=?, %α=?

15700 *15*, (8^{-}), *[GHK]*, %α=100, T=0

15874 *9*, 8^{+}, Γ=100 *15* keV, *[GHLN]*, %α=100

15970, (6^{+}), *[K]*, %α=100, T=0

16010 *25*, (2^{+}), Γ=100 keV, *[R]*, %p=?, %α=?, T=(1)

16139 *15*, Γ=38 keV, *[GHKR]*, %α=100

16250, *[GK]*, %α=100

16329 *11*, 4^{+}, Γ=45 keV, *[KR]*, %p=?, %α=?, T=0

16437 *11*, $(0,2,4)^{+}$, Γ=35 keV, *[K]*, %α=100, T=0

16505 *15*, 6^{+}, Γ=24 *4* keV, *[GK]*, %α=100, T=0

16559 *15*, 5^{-}, Γ=90 *30* keV, *[K]*, %α=100, T=0

16581 *15*, 7^{-}, Γ=92 *8* keV, *[HK]*, %α=100, T=0

16628 *20*, 3^{-}, Γ=80 *25* keV, *[K]*, %α=100, T=0

16630 *20*, (7^{-}), *[LMN]*, %α=100

16667 *15*, 4^{+}, Γ=100 *25* keV, *[K]*, %α=100, T=0

16717 *15*, 5^{-}, Γ≈ 25 keV, *[GHK]*, %α=100, T=0

16732 *5*, 0^{+}, Γ=2.0 *5* keV, *[OPR]*, %IT=?, %p=?, %α=?, T=2

γ_{11262} ***5469*** *6* (†$_{\gamma}$100)

γ_{5788} ***10941*** *6*

γ_{1634} ***15092*** *5*

16746 *25*, 8^{+}, Γ=160 *50* keV, *[K]*, %α=100, T=0

16847 *15*, 5^{-}, Γ=16 *8* keV, *[K]*, %α=100, T=0

16871 *20*, 6^{+}, Γ=350 *50* keV, *[K]*, %α=100, T=0

17072 *20*, 4^{+}, Γ=180 *30* keV, *[K]*, %α=100, T=0

17155 *15*, 5^{-}, Γ=26 *5* keV, *[K]*, %α=100, T=0

17213 *15*, 4^{+}, Γ=225 *30* keV, *[K]*, %α=100, T=0

17284 *15*, 3^{-}, Γ=86 *25* keV, *[K]*, %α=100, T=0

17295 *15*, 8^{+}, Γ=200 *25* keV, *[KLMN]*, %α=100, T=0

17390 *15*, Γ<10 keV, *[K]*, %α=100

17430 *15*, 9^{-}, Γ=220 *25* keV, *[GHIK]*, %α=100, T=0

17541 *15*, 6^{+}, Γ=86 *9* keV, *[K]*, %α=100, T=0

17550 *10*, (2^{+}), Γ=19 keV, *[QR]*, %n=?, %p=?, %α=?, T=(1)

17606 *15*, 5^{-}, Γ=140 *20* keV, *[K]*, %α=100, T=0

17769 *20*, 4^{+}, Γ≈ 125 keV, *[KR]*, %p=?, %α=?, T=0

17851 *15*, 5^{-}, Γ=200 *30* keV, *[K]*, %α=100, T=0

17910 *20*, (0^{+}), *[Q]*, %n=?, %p=?

18005 *15*, 7^{-}, Γ<10 keV, *[K]*, %α=100, T=0

18024 *5*, 5^{-}, Γ=34 *7* keV, *[K]*, %α=100, T=0

18083 *25*, 4^{+}, Γ=140 *60* keV, *[K]*, %α=100, T=0

(continued on next page)

18125 *5*, 7^-, Γ=29 *6* keV, *[GHIK]*, %α=100, T=0

18286 *10*, 6^+, Γ=190 *30* keV, *[GK]*, %α=100, T=0

18430 *7*, 2^+, Γ=9.5 *30* keV, *[OPQR]*, Γ_γ=0.3 eV, %IT=3×10^{-3}, %n=?, %p=?, %α=?, T=2

γ_{12221} ***6208*** *21* (†$_\gamma$100)

18430 *20*, 7^-, Γ=185 *40* keV, *[K]*, %α=100, T=0

18494 *20*, 5^-, Γ=130 *30* keV, *[K]*, %α=100, T=0

18621 *20*, 8^+, Γ=185 *30* keV, *[K]*, %α=100, T=0

18745 *25*, 6^+, Γ=140 *50* keV, *[K]*, T=0

18768 *20*, 7^-, Γ=140 *35* keV, *[KL]*, %α=100, T=0

18960 *25*, 8^+, Γ=200 *60* keV, *[K]*, %α=100, T=0

19051 *15*, 5^-, Γ≈ 90 keV, *[K]*, %α=100, T=0

19150 *20*, 6^+, Γ=200 *50* keV, *[IK]*, %α=100, T=0

19284 *15*, 6^+, Γ=140 *25* keV, *[K]*, %α=100, T=0

19298 *25*, 7^-, Γ=430 *60* keV, *[KL]*, %α=100, T=0

19443 *10*, 6^+, Γ=130 *15* keV, *[K]*, %α=100, T=0

19536 *25*, 6^+, Γ=250 *60* keV, *[K]*, %α=100, T=0

19655 *20*, 6^+, Γ=140 *35* keV, *[K]*, %α=100, T=0

19731 *20*, 8^+, Γ=330 *60* keV, *[K]*, %α=100, T=0

19845 *40*, 6^+, Γ=360 *120* keV, *[K]*, %α=100, T=0

19859 *10*, 5^-, Γ=170 *25* keV, *[K]*, %α=100, T=0

19884 *40*, 7^-, Γ≈ 120 keV, *[KL]*, %α=100, T=0

19991 *30*, 4^+, Γ=130 *100* keV, *[K]*, %α=100, T=0

20027 *15*, 6^+, Γ=80 *35* keV, *[K]*, %α=100, T=0

20106 *25*, 7^-, Γ=190 *35* keV, *[K]*, %α=100, T=0

20150 *150*, *[U]*, %IT=?, %n=?

20168 *35*, 6^+, Γ=285 *100* keV, *[K]*, %α=100, T=0

20296 *15*, 7^-, Γ=255 *40* keV, *[K]*, %α=100, T=0

20341 *20*, 5^-, Γ=190 *40* keV, *[K]*, %α=100, T=0

20344 *15*, 7^-, Γ=135 *35* keV, *[K]*, %α=100, T=0

20419 *30*, 6^+, Γ=215 *90* keV, *[K]*, %α=100, T=0

20445 *25*, 6^+, Γ=370 *55* keV, *[K]*, %α=100, T=0

20468 *30*, 5^-, Γ=280 *70* keV, *[K]*, %α=100, T=0

20686 *6*, 9^-, Γ=78 *11* keV, *[HKM]*, %α=100, T=0

20760 *30*, 7^-, Γ=240 *50* keV, *[KL]*, %α=100, T=0

20800 *25*, 5^-, Γ=170 *60* keV, *[K]*, %α=100, T=0

20950 *40*, 7^-, Γ=300 *50* keV, *[K]*, %α=100, T=0

21062 *6*, 9^-, Γ=60 *6* keV, *[HKMN]*, %α=100, T=0

21300 *100*, 7^-, Γ=300 keV, *[KL]*, %α=100, T=0

21800 *100*, 7^-, Γ=300 keV, *[HKL]*, %α=100, T=0

22300 *100*, 7^-, Γ=500 keV, *[HKL]*, %α=100, T=0

22600 *300*, *[U]*, %IT=?, %n=?

22800 *60*, 9^-, Γ=500 keV, *[HK]*, %α=100, T=0

22870 *40*, 9^-, Γ=225 *40* keV, *[HKMN]*, %α=100, T=0

23400 *200*, 8^+, Γ=500 keV, *[K]*, %α=100, T=0

23700 *30*, (9^-), Γ<200 keV, *[LM]*, %α=100

24210 *25*, 8^+, Γ=350 keV, *[KM]*, %α=100, T=0

24900 *500*, *[U]*, %IT=?, %n=?

25100 *50*, 8^+, Γ≈ 200 keV, *[KM]*, %α=100, T=0

25670 *50*, Γ≈ 400 keV, *[KM]*, %α=100

27100 *100*, (9^-), Γ=700 keV, *[KLN]*, %α=100

27500, *[U]*, %IT=?, %n=?

28000, 8^+, Γ=1600 keV, *[K]*, %α=100, T=0

28200 *300*, Γ=700 keV, *[K]*, %α=100

$^{20}_{11}$Na

Δ: 6845 *7* **S_n:** 14155 *14* **S_p:** 2195 *7*
Q_{EC}: 13887 *7*

Populating Reactions and Decay Modes

A ^{20}Mg β^+ decay (87Aj02)
B ^{19}F(p,π^-)
C ^{19}Ne(p,γ)
D ^{20}Ne(p,n)
E ^{20}Ne(^{3}He,t)
G ^{27}Al(^{20}Ne,^{27}Mg)

Levels:

0, 2^+, 447.9 *23* ms, *[ADE]*, %EC+%β^+=100, %ECα=20.5 *16*, T=1, μ=+0.3694 *2*
591 *12*, *[DE]*
768 *8*, *[BDE]*
850 *50* (?), *[E]*
958 *8*, *[DE]*
1010 *14* (?), *[D]*
1310 *10*, *[DE]*
1820 *20*, *[E]*
1910 *20*, *[BE]*
1980 *20*, *[E]*
2570 *20*, *[E]*
2660 *20*, *[E]*
2880 *40*, *[BE]*
2960 *40*, *[E]*
3060 *40*, *[E]*
3160 *40*, *[E]*
4330 *100*, *[BE]*
6570 *50*, 0^+, *[AF]*, T=2

γ(*^{20}Ne*) from ^{20}Na (447.9 ms) EC+β^+ decay
< *for Iγ% multiply by 1.0* **>**

654.9 *18* (†$_\gamma$0.0030 *11*)
1633.602 *15* (†$_\gamma$79.3 *11*)
2445 *4* (†$_\gamma$<0.0081)
2451 *5* (†$_\gamma$≈0.0007)
2613.8 *11* (†$_\gamma$0.0026 *18*)
2852 *4* (†$_\gamma$<0.210)
3332.54 *20* (†$_\gamma$0.037 *3*)
3987.3 *17* (†$_\gamma$0.0543 *6*)
4252 *5* (†$_\gamma$≈0.0015)
4652 *4* (†$_\gamma$<0.066)
4905 *4* (†$_\gamma$<0.001)
4965.85 *20* (†$_\gamma$0.00022 *8*)
5306 *3* (†$_\gamma$<0.040)
5620.6 *17* (†$_\gamma$0.0047 *8*)
5624 *5* (†$_\gamma$0.0026 *18*)
6635 *4* (†$_\gamma$<0.004)
8237 *4* (†$_\gamma$0.017 *11*)
8638 *3* (†$_\gamma$<2.59)
9248 *3* (†$_\gamma$<0.013)
9626.1 *19* (†$_\gamma$0.032 *11*)
9870 *4* (†$_\gamma$<0.0001)
10271 *3* (†$_\gamma$<0.023)
11258.9 *19* (†$_\gamma$0.171 *24*)

α from ^{20}Na (447.9 ms) ECα decay **<** *for Iα% multiply by 1.0* **>**

α_0***5701*** *20* (†0.0016 *4*)
α_0***5272*** *15* (†0.036 *4*)
α_0***4894*** *7* (†0.193 *15*)
α_0***4683*** *7* (†0.087 *9*)
α_0***4438*** *5* (†2.94 *22*)
α_0***3801*** *7* (†0.25 *2*)
α_0***3210*** *70* (†0.034 *7*)
α_0***2148*** *5* (†16.4 *13*)

${}^{20}_{12}$Mg

Δ: 17570 *30* **S_n:** (22500) **S_p:** 2650 *30*
Q_{EC}: 10730 *30*

Populating Reactions and Decay Modes

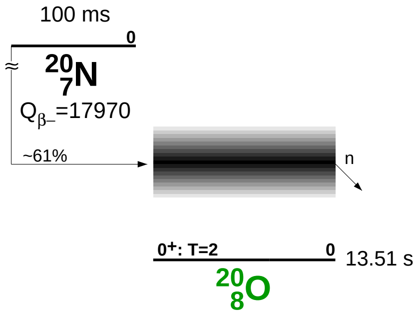
^{24}Mg(α,^{8}He), ^{20}Ne(^{3}He,3n)

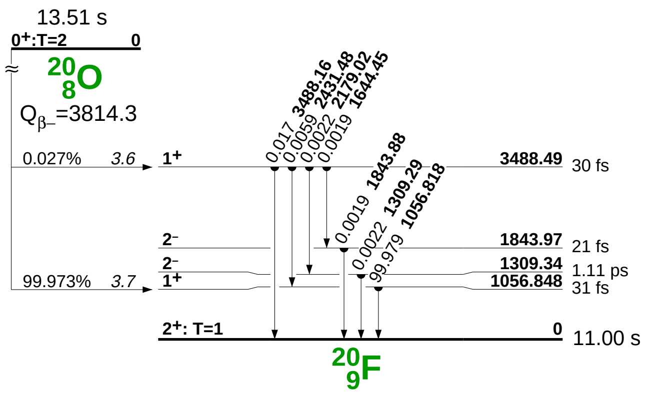
Levels:

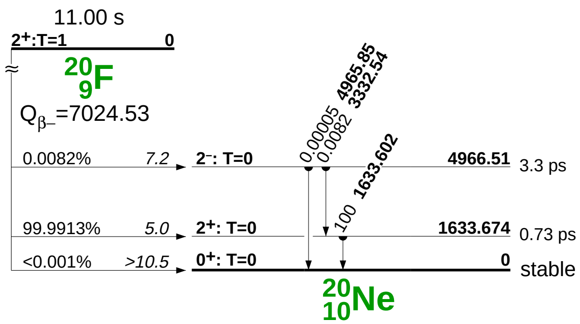
0, 0^+, 95^{+80}_{-50} ms, %EC+%β^+=100, %ECp≈3

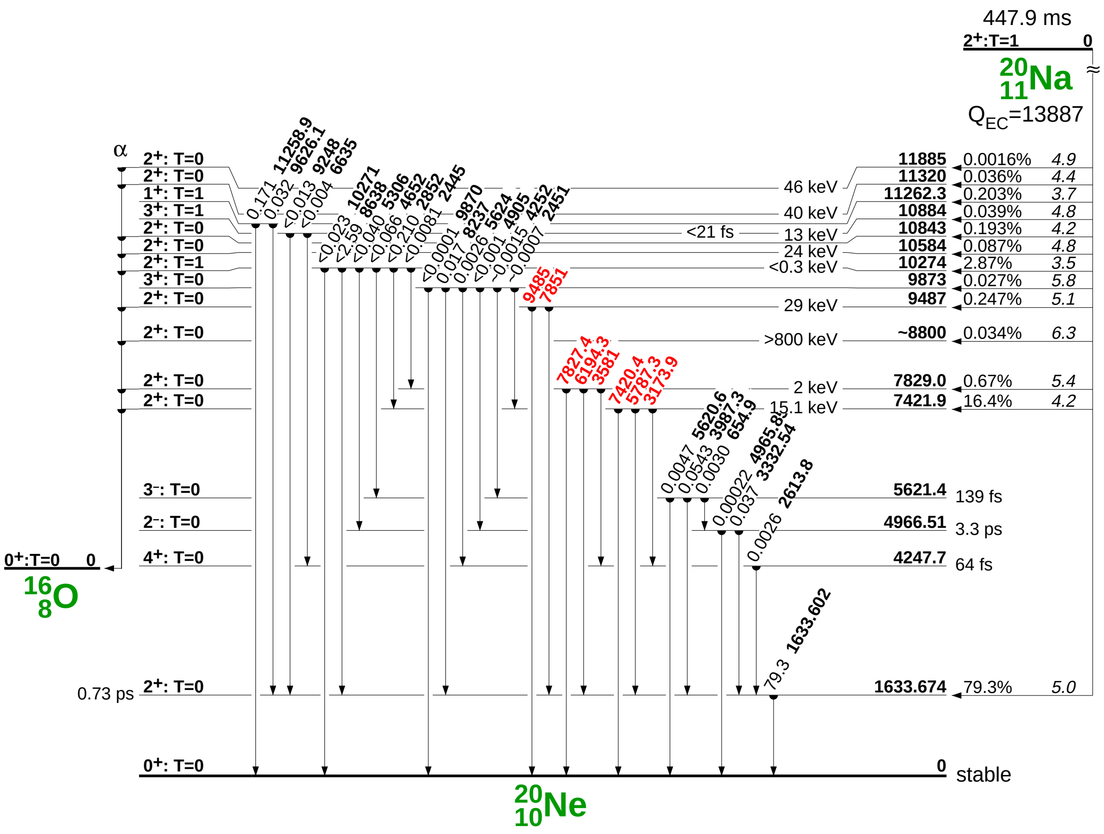
p from ^{20}Mg (95 ms) ECp decay **<** *for Ip% multiply by 1.0* **>**

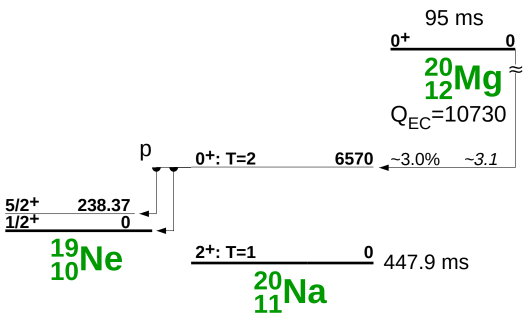
p_0 ***4160*** *50* (†≈1)
p_{238} ***3950*** *60* (†≈2)


100 ms
0
≈
$^{20}_{7}$N
$Q_{\beta-}$=17970
~61%
n
0+: T=2
0
13.51 s
$^{20}_{8}$O


13.51 s
0+:T=2
0
$^{20}_{8}$O
$Q_{\beta-}$=3814.3
0.027%
3.6
99.973%
3.7
1+
2−
2−
1+
2+: T=1
0.017 3488.16
0.0059 2431.48
0.0022 2179.02
0.0019 1644.45
0.0019 1843.88
0.0022 1309.29
99.979 1056.818
3488.49
30 fs
1843.97
21 fs
1309.34
1.11 ps
1056.848
31 fs
0
11.00 s
$^{20}_{9}$F


11.00 s
2+:T=1
0
20
9
F
Qβ−=7024.53
0.0082%
7.2
2−: T=0
4966.51
3.3 ps
99.9913%
5.0
2+: T=0
1633.674
0.73 ps
<0.001%
>10.5
0+: T=0
0
stable
0.00005
4965.85
0.0082
3332.54
100
1633.602
20
10
Ne


447.9 ms
2+:T=1 0
20 11 Na
QEC=13887
α
2+: T=0
2+: T=0
1+: T=1
3+: T=1
2+: T=0
2+: T=0
2+: T=1
3+: T=0
2+: T=0
2+: T=0
2+: T=0
2+: T=0
3−: T=0
2−: T=0
4+: T=0
2+: T=0
0+: T=0
0+:T=0 0
16 8 O
0.73 ps
11258.9
9626.1
9248
6635
0.171
0.032
<0.013
<0.004
10271
8638
5306
4652
2852
2445
<0.023
<2.59
<0.040
<0.066
<0.210
<0.0081
9870
8237
5624
4905
4252
2451
<0.0001
0.017
0.0026
<0.001
~0.0015
~0.0007
9485
7851
7827.4
6194.3
3581
7420.4
5787.3
3173.9
5620.6
3987.3
654.9
0.0047
0.0543
0.0030
4965.85
3332.54
0.00022
0.037
2613.8
0.0026
1633.602
79.3
46 keV
40 keV
<21 fs
13 keV
24 keV
<0.3 keV
29 keV
>800 keV
2 keV
15.1 keV
11885 0.0016% 4.9
11320 0.036% 4.4
11262.3 0.203% 3.7
10884 0.039% 4.8
10843 0.193% 4.2
10584 0.087% 4.8
10274 2.87% 3.5
9873 0.027% 5.8
9487 0.247% 5.1
~8800 0.034% 6.3
7829.0 0.67% 5.4
7421.9 16.4% 4.2
5621.4 139 fs
4966.51 3.3 ps
4247.7 64 fs
1633.674 79.3% 5.0
0 stable
20 10 Ne


95 ms
0+
0
20 12 Mg
≈
Q_EC=10730
p
0+: T=2
6570
~3.0%
~3.1
5/2+
238.37
1/2+
0
19 10 Ne
2+: T=1
0
447.9 ms
20 11 Na

Reference Codes

The six-character reference codes in the tabular level data are taken almost exclusively from the Nuclear Structure Reference (NSR) file, maintained at the National Nuclear Data Center, Brookhaven National Laboratory. The first two characters indicate the publication year, the second two characters are the first two letters in the first author's last name, and the last two characters are an arbitrary sequence code. The references not taken from the NSR file are followed by an asterisk; these are unavailable in NSR at present.

47GoCC

Phys. Rev. 72, 972 (1947) (not abstracted).

50Je60 *A Precise Determination of the Half-Life and Average Energy of Tritium Decay*

G. H. Jenks, F. H. Sweeton, J. A. Ghormley, Phys. Rev. 80, 990 (1950).

51Jo15 *The Half-Life of Tritium by Absolute Counting*

W. M. Jones, Phys. Rev. 83, 537(1951).

55Jo20 *Half-Life of Tritium*

W. M. Jones, Phys. Rev. 100, 124(1955).

58Gr93

D. P. Gregory, D. A. Landsman, Phys. Rev. 109, 2091 (1958).

58Po64 *The Average β-Particle Energy and Decay Constant of Tritium*

M. M. Popov, Yu. V. Gagarinskii, M. D. Senin, T. P. Mikhalenko, Yu. M. Morozov, Atomnaya Energ. 4, 296(1958); J. Nuclear Energy 9, 190(1959).

60Bu17

F. Bumiller, M. Croissiaux, R. Hofstadter, Phys. Rev. Letters 5, 261 (1961).

Nuclear Structure: ^{1}H; measured not abstracted; deduced nuclear properties.

60ClCC

Can. J. Phys. 38, 693 (1960) (not abstracted)

61JoCC

Reference unavailable.

61Pi01

W. L. Pillinger, J. J. Hentges, J. A. Blair, Phys. Rev. 121, 232 (1961).

Nuclear Structure: ^{3}H; measured not abstracted; deduced nuclear properties.

63EiCC

Reference unavailable.

67GrCC

Yad. Fiz. 6, 329 (1967) (not abstracted).

67Jo09 *Half-Life of Tritium*

K. C. Jordan, B. C. Blanke, W. A. Dudley, J. Inorg. Nucl. Chem. 29, 2129(1967).

Nuclear Structure: ^{3}H; measured not abstracted; deduced nuclear properties.

67Jo10 *The Half Life of Tritium*

P. M. S. Jones, J. Nucl. Mater. 21, 239(1967).

Nuclear Structure: ^{3}H; measured not abstracted; deduced nuclear properties.

69Ch05 *Measurement of A and B Coefficients in the Decay of Polarized Neutrons*

C. J. Christensen, V. E. Krohn, G. R. Ringo, Phys. Letters 28B, 411(1969).

Radioactivity: ^{1}n; measured $\beta(\theta)$ from polarized neutrons; deduced beta-decay coupling constants.

69Da18 *Beta Decay of Tritium*

R. Daris, C. St-Pierre, Nucl. Phys. A138, 545 (1969).

Radioactivity: ^{3}H; measured Eβ; deduced Qβ, ν rest mass, ft. Enriched target.

69Sa21 *Re-Determination of the β-Energy of Tritium and its Relation to the Neutrino Rest Mass and the Gamow-Teller Matrix Element*

R. C. Salgo, H. H. Staub, Nucl. Phys. A138, 417 (1969).

Radioactivity: ^{3}H; measured Eβ; deduced ν rest mass, Gamow-Teller matrix element.

70Ch08 *Measurement of Angular Correlations in the Decay of Polarized Neutrons*

C. J. Christensen, V. E. Krohn, G. R. Ringo, Phys. Rev. C1, 1693 (1970).

Radioactivity: ^{1}n(polarized); measured β momentum-n spin, antineutrino momentum-n spin angular correlations.

70Er07 *Measurement of the Angular Correlation between the Neutron Spin and the Antineutrino Momentum in the Decay of Polarized Neutrons*

V. G. Erozolimskii, L. N. Bondarenko, Y. A. Mostovoi, V. A. Obinyakov, V. A. Titov, V. P. Zakharova, A. I. Frank, Yad. Fiz. 12, 323 (1970); Sov. J. Nucl. Phys. 12, 178 (1971).

Radioactivity: ^{1}n(polarized); measured (neutron spin)(antineutrino momentum) correlation.

70Er08 *Search for Three-Vector Correlation in the Decay of Polarized Neutrons*

B. G. Erozolimskii, L. N. Bondarenko, Y. A. Mostovoi, B. A. Obinyakov, V. P. Zakharova, V. A. Titov, Yad. Fiz. 11, 1049 (1970); Sov. J. Nucl. Phys. 11, 583 (1970).

Radioactivity: ^{1}n(polarized); measured (neutron spin)(electron momentum)(antineutrino momentum) triple correlation.

70Er10 *Angular Correlation between the Neutron Spin and the Antineutrino Momentum in the Neutron Decay*

B. G. Erozolimsky, L. N. Bondarenko, Y. A. Mostovoy, B. A. Obinyakov, V. A. Titov, V. P. Zakharova, A. I. Frank, Phys. Lett. 34B, 351 (1970).

Radioactivity: ^{1}n(polarized); measured (neutron spin) (antineutrino momentum) (θ).

70Le15 *Beta Decay of Tritium*

V. E. Lewis, Nucl. Phys. A151, 120 (1970).

Radioactivity: ^{3}H; measured Eβ; deduced ft.

71Al17 *Influence of the Chemical Environment on β-Decays*

K. Alder, G. Baur, U. Raff, Helv. Phys. Acta 44, 514 (1971).

Radioactivity: ^{3}H, ^{23}Na, ^{35}S, ^{131}I; calculated chemical effects on $T_{1/2}$.

71Sc23 *The Effect of Atomic Excitation on the Shape of the ^{3}H Beta Spectrum Near the End Point*

R. D. Scott, J. Phys. (London) A4, L105 (1971).

Radioactivity: ^{3}H; calculated atomic excitation effects on β-spectrum.

72Be11 *A High-Luminosity, High-Resolution Study of the End-Point Behaviour of The Tritium β-Spectrum (II). The End-Point Energy of the Spectrum. Comparison of the Experimental Axial-Vector Matrix Element with Predictions Based on PCAC*

K. -E. Bergkvist, Nucl. Phys. B39, 371 (1972).

Radioactivity: ^{3}H; analyzed Eβ; deduced Q, ft-value, axial-vector matrix element.

72Bl09 *Limits on Angular Momentum in Heavy-Ion Compound-Nucleus Reactions*

M. Blann, F. Plasil, Phys. Rev. Lett. 29, 303 (1972).

73Fi04 *Energy Levels of Light Nuclei A = 4*

S. Fiarman, W. E. Meyerhof, Nucl. Phys. A206, 1 (1973).

Nuclear Structure: ^{4}H, ^{4}He, ^{4}Li; compiled levels, reaction Q-values, J, π, T.

73Fl04 *Study of the (p,t) Reaction on the Even Gadolinium Nuclei*

D. G. Fleming, C. Gunther, G. Hagemann, B. Herskind, P. O. Tjom, Phys. Rev. C8, 806 (1973).

Nuclear Reactions: ^{152}, ^{154}, ^{156}, ^{158}, ^{160}Gd(p, t), E=18 MeV; measured σ(Et,θ). ^{150}, ^{152}, ^{154}, ^{156}, ^{158}Gd deduced levels, J, π.

73Pi01 *The β-Decay of Tritium*

W. F. Piel, Jr., Nucl. Phys. A203, 369 (1973).

Radioactivity: ^{3}H, ^{195}Au; measured Eβ; deduced end-point energy, log ft, Q, upper limit for rest mass of electron antineutrino, for Fermi energy of neutrino sea.

74Aj01 *Energy Levels of Light Nuclei A = 5-10*

F. Ajzenberg-Selove, T. Lauritsen, Nucl. Phys. A227, 1 (1974).

Compilation: A=5-10; compiled energy levels.

74Be20 *T = 3/2 States in Mass-11 Nuclei*

W. Benenson, E. Kashy, D. H. Kong-A-Siou, A. Moalem, H. Nann, Phys. Rev. C9, 2130 (1974).

Nuclear Reactions: ^{14}N(^{3}He,^{6}He), E=70 MeV; ^{13}C(p, t), E=46.7 MeV; ^{13}C(p,^{3}He), E=40 MeV; measured σ(E(^{6}He),Et,E(^{3}He)). ^{11}N, ^{11}C, ^{11}B deduced levels.

74ErCC

Pisma ZETFA 20, 745 (1974) (not abstracted).

74Mc11 β *Decay of ^{12}B and ^{12}N*

R. E. McDonald, J. A. Becker, R. A. Chalmers, D. H. Wilkinson, Phys. Rev. C10, 333 (1974).

Radioactivity: ^{12}N, ^{12}B; measured Eβ, Iβ, βγ-coin; deduced log ft.

74Ro08 *Messung des ^{3}H-Betaspektrums und Bestimmung der Obergrenze fur die Ruhemasse des elektronischen Antineutrinos*

B. Rode, Z. Naturforsch. 29a, 261 (1974).

Radioactivity: ^{3}H; measured Eβ.

74St09 *New Experimental Limit on T Invariance in Polarized-Neutron* β *Decay*

R. I. Steinberg, P. Liaud, B. Vignon, V. W. Hughes, Phys. Rev. Lett. 33, 41 (1974).

Radioactivity: ^{1}n; measured pβ-coin from decay of polarized neutrons; deduced T-invariance.

75Aj02 *Energy Levels of Light Nuclei A = 11-12*

F. Ajzenberg-Selove, Nucl. Phys. A248, 1 (1975).

Compilation: A=11-12; compiled, evaluated structure data.

75DoCC

Phys. Rev. D11, 510 (1975) (not abstracted).

75KrCC

Phys. Lett. 55B, 175 (1975) (not abstracted).

75Sm02 *Masses of Isotopes of H, He, C, N, O, and F*

L. G. Smith, A. H. Wapstra, Phys. Rev. C11, 1392 (1975).

Atomic Physics: 3}H, ^{3}He, ^{13}, ^{14}C, ^{14}, ^{15}N, ^{16}O, ^{19}F; measured atomic mass.

Nuclear Reactions: ^{2}H, ^{3}He, ^{12}, ^{13}C, ^{14}N(n, γ); calculated quadrupole moment.

76Ba65 *On the* β*-Decay to Bound States*

I. S. Batkin, Izv. Akad. Nauk SSSR, Ser. Fiz. 40, 1279 (1976); Bull. Acad. Sci. USSR, Phys. Ser. 40, No. 6, 149 (1976).

Radioactivity: ^{3}H, ^{63}Ni, ^{93}Zr, ^{106}Ru, ^{151}Sm, ^{171}Tm, ^{187}Re, ^{210}Rn, ^{228}Ra, ^{227}Ac, ^{241}Pu; calculated β decay parameters.

76Fu06 *Nuclear Spins and Moments*

G. H. Fuller, J. Phys. Chem. Ref. Data 5, 835 (1976).

Compilation: A=1-253; compiled μ, quadrupole moment, I.

76StCC

Phys. Rev. D13, 2469 (1976) (not abstracted).

76Tr07 *Measurements of the β-Spectrum of Tritium for the Purpose of Refining the Upper Limit for the Antineutrino Rest Mass*

E. F. Tretyakov, N. F. Myasoedov, A. M. Apalikov, V. F. Konyaev, V. A. Lyubimov, E. G. Novikov, Izv. Akad. Nauk SSSR, Ser. Fiz. 40, 2026 (1976); Bull. Acad. Sci. USSR, Phys. Ser. 40, No. 10, 1 (1976).

Radioactivity: ^{3}H; measured Eβ.

77NeCC

Reference unavailable.

77RuCC

Reference unavailable.

78Al01 *Beta-Ray Branching and Half-Lives of ^{12}B and ^{12}N*

D. E. Alburger, A. M. Nathan, Phys. Rev. C17, 280 (1978).

Radioactivity: ^{12}B, ^{12}N; measured Eβ, Iβ, βγ-coin, $T_{1/2}$; deduced β-branching, mirror asymmetries, ft.

78Al10 *Core Excited T = 2 Levels in A = 12 from Studies of ^{12}Be*

D. E. Alburger, D. P. Balamuth, J. M. Lind, L. Mulligan, K. C. Young, Jr., R. W. Zurmuhle, R. Middleton, Phys. Rev. C17, 1525 (1978).

Radioactivity: ^{12}Be [from ^{10}Be(t,p)]; measured $T_{1/\ 2}$, delayed neutrons; deduced upper limit delayed neutron branch.

Nuclear Reactions: ^{10}Be(t,pγ), E=12 MeV; measured σ(Ep,Eγ, θ). ^{12}Be deduced levels, J, π. Enriched target.

78Al29 *Mass and Excited States of ^{12}Be*

D. E. Alburger, S. Mordechai, H. T. Fortune, R. Middleton, Phys. Rev. C18, 2727 (1978).

Nuclear Reactions: ^{10}Be(t,p), E=17 MeV; measured Q; deduced coefficients of isobaric mass multiplet equation. ^{12}Be deduced mass excess, levels.

78DoCC

Phys. Rev. D18, 3970 (1978) (not abstracted).

78En02 *Energy Levels of A = 21-44*

P. M. Endt, C. van der Leun, Nucl. Phys. A310, 1 (1978).

Compilation: A=21-44; compiled, evaluated structure data.

78ErCD

Yad. Fiz. 28, 98 (1978) (not abstracted).

78He02 *Observation of Characteristic γ Radiation from the (K^-,$\pi^-\gamma$) Reaction on Light Nuclei*

J. C. Herrera, J. J. Kolata, H. W. Kraner, C. L. Wang, R. Allen, D. Gockley, M. A. Hasan, A. Kanofsky, G. Lazo, Phys. Rev. Lett. 40, 158 (1978).

Nuclear Reactions: ^{7}Li(K^-,$\pi^-\gamma$), E=1.7 GeV/c; measured γ-spectra; deduced hypernuclear transitions. Be, B, C, O(K^-,$\pi^-\gamma$), E=1.7 GeV/c; measured γ-spectra.

78Ka01 *Reactions ^{3}He(π^-,n)^{2}H and ^{4}He(π^-, n)^{3}H at Pion Energies of 100, 200, and 290 MeV*

J. Kallne, H. A. Thiessen, C. L. Morris, S. L. Verbeck, G. R. Burleson, M. J. Devereaux, J. S. McCarthy, J. E. Bolger, C. F. Moore, C. A. Goulding, Phys. Rev. Lett. 40, 378 (1978).

Nuclear Reactions: ^{4}, ^{3}He(π^-,n), E=100, 200, 290 MeV; measured σ(θ).

78Ke06 *Masses of the Unbound Nuclei ^{16}Ne, ^{15}F, and ^{12}O*

G. J. KeKelis, M. S. Zisman, D. K. Scott, R. Jahn, D. J. Vieira, J. Cerny, F. Ajzenberg-Selove, Phys. Rev. C17, 1929 (1978).

Nuclear Reactions: ^{16}O, ^{20}Ne(α,^{8}He), E=117 MeV; ^{20}Ne(^{3}He,^{8}Li), E=75, 88 MeV; measured σ(θ); deduced Q. ^{12}O, ^{15}F, ^{16}Ne deduced mass excess, Γ(cm), diproton decay.

79Aj01 *Energy Levels of Light Nuclei A = 5-10*

F. Ajzenberg-Selove, Nucl. Phys. A320, 1 (1979).

Compilation: A=5-10; compiled, calculated available structure data.

79Er08 *Measurement of the Spin-Electron Correlation Coefficient in the Decay Of Polarized Neutrons and Determination of the g(A)/g(V) Ratio*

B. G. Erozolimskii, A. I. Frank, Y. A. Mostovoi, S. S. Arzumanov, L. R. Voitzik, Yad. Fiz. 30, 692 (1979); Sov. J. Nucl. Phys. 30, 356 (1979).

Radioactivity: ^{1}n; measured neutron spin-electron momentum correlation; deduced ratio of axial-vector to vector coupling. polarized neutrons.

79TiCC

Reference unavailable.

80Aj01 *Energy Levels of Light Nuclei A = 11-12*

F. Ajzenberg-Selove, C. L. Busch, Nucl. Phys. A336, 1 (1980).

Compilation: ^{11}, ^{12}Li, ^{11}, ^{12}Be, ^{11}, ^{12}B, ^{11}, ^{12}C, ^{11}, ^{12}N, ^{12}O; compiled, evaluated structure data.

81Al03 *Delayed Particles from the β-decay of ^{11}Be*

D. E. Alburger, D. J. Millener, D. H. Wilkinson, Phys. Rev. C23, 473 (1981).

Radioactivity: ^{11}Be [from ^{9}Be(t,p), E=3.4 MeV]; measured β-delayed Eα, β-delayed E(^{7}Li), $\alpha\gamma$-, ^{7}Liγ-coin; deduced log ft, β-branching. ^{11}B level deduced α-branching. Helium jet system, Si, Na(Tl) detectors.

81Ce01 *Energy Spectra of Single Neutrons and Charged Particles Emitted Following the Absorption of Stopped Negative Pions in ^{4}He*

C. Cernigoi, I. Gabrielli, N. Grion, G. Pauli, B. Saitta, R. A. Ricci, P. Boccaccio, G. Viesti, Nucl. Phys. A352, 343 (1981).

Nuclear Reactions: ^{4}He(π^{-},n), (π^{-},p), (π^{-}, d), E at rest; measured neutron, proton, deuteron energy spectra. Liquid target.

81Hi11

Reference unavailable.

81Ka31 *Beta Decay of ^{12}B and ^{12}N to the First Excited State of ^{12}C (4.44 MeV)*

W. Kaina, V. Soergel, W. Trost, G. Zinser, Z. Phys. A301, 183 (1981).

Radioactivity: ^{12}B [from ^{11}B(d,p), E=1.5 MeV]; ^{12}N [from ^{10}B(^{3}He,n), E=5 MeV]; measured $\beta\gamma$-coin, $\beta\gamma$(t); deduced Iβ, log ft.

81La11 *β-Delayed Charged Particles from ^{9}Li and ^{11}Li*

M. Langevin, C. Detraz, D. Guillemaud, F. Naulin, M. Epherre, R. Klapisch, S. K. T. Mark, M. De Saint Simon, C. Thibault, F. Touchard, Nucl. Phys. A366, 449 (1981).

Radioactivity: ^{9}, ^{11}Li; measured β-delayed Eα, $\beta\alpha$-coin. ^{11}Li; measured β-delayed E(^{6}He), β(^{6}He)-coin; deduced log ft. ^{9}Li deduced single neutron emission probability, β-delayed I(n). ^{11}Li deduced three neutron emission probability, β-delayed I(n). ^{9}, ^{11}Be levels deduced anti-analog character.

81Lu06 *Search for Production of Superheavy Elements via ' Fusion after Instantaneous Fission ' in the Reaction ^{238}U + ^{208}Pb*

T. Lund, D. Hirdes, H. Jungclas, D. Molzahn, P. Vater, R. Brandt, P. Lemmertz, R. Fass, H. Wollnik, H. Gaggeler, Z. Phys. A303, 115 (1981).

Radioactivity: Fission ^{254}Cf(SF), ^{240}, ^{242m}, ^{244m}Am(SF) [from ^{238}U(^{208}Pb,X), E=8 MeV/nucleon]; measured fragment distribution. Gas jet, fission track counting techniques.

Nuclear Reactions: Fission ^{238}U(^{208}Pb,X), E=8 MeV/nucleon; measured Eα, Iα, SF fragment distribution, α(fragment)-coin; deduced production yields for ^{240}, ^{242}, ^{244}Cm, ^{254}Cf, superheavy production σ. Radiochemical, gas jet, rotating wheel techniques, natural target.

81Or01 *Pion Absorption in ^{3}, ^{4}He and πN Resonances*

L. Orphanos, J. Kallne, R. Altemus, P. C. Gugelot, J. S. McCarthy, R. C. Minehart, P. A. M. Gram, B. Hoistad, C. L. Morris, E. A. Wadlinger, C. Perdrisat, Phys. Rev. Lett. 46, 1562 (1981).

Nuclear Reactions: ^{3}, ^{4}He(π^{-},n), E=285, 428, 525, 575 MeV; measured $\sigma(\theta$,E); deduced off-shell effects in pion absorption.

81Sm02 *The Mass-Difference ^{3}T - ^{3}He and the Neutrino Mass*

L. G. Smith, E. Koets, A. H. Wapstra, Phys. Lett. 102B, 114 (1981).

Atomic Physics: +3}H, ^{3}He; measured mass difference. Discussed neutrino mass implications.

82Be42 *^{12}Be Levels Studied with the ^{14}C(^{14}C, ^{12}Be)^{16}O Reaction*

M. Bernas, J. C. Peng, N. Stein, Phys. Lett. 116B, 7 (1982).

Nuclear Reactions: ^{14}C(^{14}C,^{12}Be), E=50-63 MeV; measured $\sigma(\theta)$ vs E, σ(E(^{12}Be)); deduced multi-step process, entrance channel effects. ^{12}Be deduced level. DWBA analysis.

82Gm02 *Basic Mechanisms of Radiative Capture of Pions*

M. Gmitro, H. -R. Kissener, P. Truol, R. A. Eramzhyan, Fiz. Elem. Chastits At. Yadra 13, 1230 (1982); Sov. J. Part. Nucl. 13, 513 (1982).

Atomic Physics: esic-Atoms ^{6}, ^{7}Li, ^{9}Be, ^{10}, ^{11}B, ^{12}, ^{13}C, ^{14}N, ^{16}, ^{18}O, ^{19}F, ^{20}, ^{22}Ne, ^{23}Na; compiled pion width data.

Nuclear Reactions: ^{1}, ^{2}, ^{3}H, ^{3}, ^{4}He, ^{6}, ^{7}Li, ^{9}Be, ^{10}, ^{11}B, ^{12}, ^{13}, ^{14}C, ^{14}N, ^{16}, ^{18}O, ^{19}F, ^{20}Ne, Mg, ^{32}S, ^{40}Ca, ^{48}Ti, ^{63}Cu, ^{90}Zr, Pb, ^{209}Bi(π^{-}, γ), E at rest; compiled γ yield data; deduced reaction mechanism, other processes correlation.

82Mi08 *Decay Scheme of ^{11}Be*

D. J. Millener, D. E. Alburger, E. K. Warburton, D. H. Wilkinson, Phys. Rev. C26, 1167 (1982).

Radioactivity: ^{11}Be [from ^{9}Be(t,p)]; measured Eγ, Iγ, γγ-coin; deduced log ft. ^{11}B levels deduced β-, γ-branching, B(λ). Shell model.

82Or06 *^{3}, ^{4}He(π^-,n)^{2}, ^{3}H and ^{3}He(π^-,π^0)^{3}H at 285-575 MeV*

L. Orphanos, J. S. McCarthy, R. C. Minehart, P. A. M. Gram, B. Hoistad, C. F. Perdrisat, J. Kallne, Phys. Rev. C26, 2111 (1982).

Nuclear Reactions: ^{3}, ^{4}He(π^-,n), E=285-575 MeV; ^{3}He(π^-,π^0), E=285-525 MeV; measured σ(θ); deduced reaction mechanism, form factor role. Optical, Glauber models.

83De47 *Measurement of the β Spectrum of Tritium Introduced into Silicon-Lithium Detector*

A. V. Derbin, L. A. Popeko, Yad. Fiz. 38, 1105 (1983).

Radioactivity: ^{3}H(β^-); measured β-spectra; deduced β-endpoint energy, antineutrino mass upper limit. Source in Si-Li detector.

83Hi11 *The ^{4}He(π^-,n)^{3}H Reaction in a Δ-Hole Model*

M. Hirata, K. Masutani, A. Matsuyama, K. Yazaki, Phys. Lett. 128B, 15 (1983).

Nuclear Reactions: ^{4}He(π^-,n), E=100, 150, 200 MeV; calculated σ(θ). ^{2}H(π^+,p), E=142 MeV; calculated σ(θ), polarization vs θ; deduced isobar-nucleon to nucleon-nucleon transition interaction parameters.

83Ka33 *Effect of Molecular Structure on the β Spectrum and the Problem of Determining the Rest Mass of the Neutrino*

I. G. Kaplan, V. N. Smutnyi, G. V. Smelov, Zh. Eksp. Teor. Fiz. 84, 833 (1983); Sov. Phys. JETP 57, 483 (1983).

Radioactivity: ^{3}H(β^-); calculated β-spectrum molecular dependence; deduced effects on neutrino mass estimates.

83Ku03 *Precision Measurement of Gamma-Ray Energies in the Range 450-600 keV*

H. Kumahora, H. Inoue, Y. Yoshizawa, Nucl. Instrum. Methods 206, 489 (1983).

Radioactivity: ^{7}Be(EC); ^{106}Ru(β^-); ^{85}Sr(EC); ^{147}Nd(β^-); ^{207}Bi(EC), (β^+); measured Eγ, Iγ, pair spectra. ^{7}Li, ^{106}Rh, ^{85}Rb, ^{147}Pm transition deduced Eγ. High precision, ^{198}Au, ^{192}Ir standards, Ge(Li) spectrometer.

83Wi02 *Atomic Final-State Interactions in Tritium Decay*

R. D. Williams, S. E. Koonin, Phys. Rev. C27, 1815 (1983).

Radioactivity: $^{3}H(\beta^{-})$; calculated atomic final state effect on β-decay; deduced residual ion excited state probability changes.

84Aj01 *Energy Levels of Light Nuclei A = 5-10*

F. Ajzenberg-Selove, Nucl. Phys. A413, 1 (1984).

Compilation: ^{5}, ^{6}, ^{8}, ^{9}n, ^{5}, ^{6}, ^{7}H, ^{5}, ^{6}, ^{7}, ^{8}, ^{9}, ^{10}He, ^{5}, ^{6}, ^{7}, ^{8}, ^{9}, ^{10}Li, ^{5}, ^{6}, ^{7}, ^{8}, ^{9}, ^{10}Be, ^{6}, ^{8}, ^{9}, ^{10}C, ^{7}, ^{8}, ^{9}, ^{10}B, ^{9}, ^{10}N, ^{10}O, ^{10}F, ^{10}Ne; compiled, evaluated structure data.

84Du15 *Beta-Delayed Neutron Radioactivity of ^{15}B*

J. P. Dufour, S. Beraud-Sudreau, R. Del Moral, H. Emmermann, A. Fleury, F. Hubert, C. Poinot, M. Pravikoff, J. Frehaut, M. Beau, A. Bertin, G. Giraudet, A. Huck, G. Klotz, C. Miehe, C. Richard-Serre, H. Delagrange, Z. Phys. A319, 237 (1984).

Radioactivity: $^{15}B(\beta^{-}n)$ [from $^{12}C(^{18}O, X)$, E=84 MeV/nucleon]; measured $T_{1/2}$, zero-, two-neutron emission probability limits. $^{12}Be(\beta^{-})$ [from $^{12}C(^{18}O,X)$, E=84 MeV/nucleon]; measured $T_{1/2}$.

Nuclear Reactions: $^{12}C(^{18}O,X)^{15}B/^{12}Be$, E=84 MeV/ nucleon; measured residual production rate. Activation technique.

84La27 *Observation of β-Delayed Triton Emission*

M. Langevin, C. Detraz, M. Epherre, D. Guillemaud-Mueller, B. Jonson, C. Thibault, and the ISOLDE Collaboration, Phys. Lett. 146B, 176 (1984).

Radioactivity: $^{7}Li(\beta^{-})$ [from U(p,X), E=600 MeV]; measured charge particle spectra following β-decay; deduced evidence for β-delayed triton emission. ^{11}B levels deduced β-branching ratios. ^{6}He levels deduced α-branching ratios. ^{8}Li deduced triton branching ratios.

84NiCC

Reference unavailable.

84St03 *Long Range Dipole Correlations and Electron Scattering Sum Rules*

S. Stringari, Phys. Rev. C29, 1482 (1984).

Nuclear Structure: ^{12}C, ^{40}Ca; calculated longitudinal, transverse sum rule strength vs momentum transfer. RPA, Schematic model.

Nuclear Reactions: $^{12}C(e,e')$, E not given; calculated total σ(inelastic) vs momentum transfer; deduced dipole correlations role. RPA, schematic model.

85Aj01 *Energy Levels of Light Nuclei A = 11-12*

F. Ajzenberg-Selove, Nucl. Phys. A433, 1 (1985); Erratum Nucl. Phys. A449, 155 (1986).

Compilation: ^{11}Li, ^{11}Be, ^{11}B, ^{11}C, ^{11}N, ^{12}Be, ^{12}B, ^{12}C, ^{12}N, ^{12}O; compiled, evaluated structure data.

85An28 *Isobaric Mass Equation for A = 1-45 and Systematics of Coulomb Displacement Energies*

M. S. Antony, J. Britz, J. B. Bueb, A. Pape, At. Data Nucl. Data Tables 33, 447 (1985).

Compilation: A=1-45; compiled T=1/2, 1, 3/2, 2 multiplet members mass excesses; deduced isobaric multiplet mass equation coefficients, Coulomb displacement energy systematics.

85BoCC

Reference unavailable.

85Li02 *Precise ^{3}H-^{3}He Mass Difference for Neutrino Mass Determination*

E. Lippmaa, R. Pikver, E. Suurmaa, J. Past, J. Puskar, I. Koppel, A. Tammik, Phys. Rev. Lett. 54, 285 (1985).

Atomic Physics: 3}H, ^{3}He; measured mass difference; deduced nonzero ν(bar)(e) mass evidence.

85Mo18 *Systematics of Continuum Pion Double Charge Exchange on T = 0 Nuclei*

S. Mordechai, P. A. Seidl, C. F. Moore, L. C. Bland, R. Gilman, K. S. Dhuga, H. T. Fortune, C. L. Morris, S. J. Greene, Phys. Rev. C32, 999 (1985).

Nuclear Reactions: ^{12}C, ^{24}Mg, ^{28}Si, ^{32}S, ^{40}Ca(π^+, π^-), E=120-210 MeV; measured $\sigma(\theta,E(\pi))$. ^{12}C, ^{40}Ca(π^+,π^-), E=164 MeV; measured $\sigma(\theta)$; deduced target mass, E(π), excitation energy dependences. ^{12}O, ^{40}Ti deduced nonanalog transition excitation.

85Si07 *End-Point Energy of ^{3}H Beta Decay*

J. J. Simpson, W. R. Dixon, R. S. Storey, Phys. Rev. C31, 1891 (1985).

Radioactivity: ^{3}H(β^-); measured Eβ, endpoint energy; deduced Q. Tritium implanted Si(Li) detector.

86An07 *Predicted Masses and Excitation Energies in Higher Isospin Multiplets for $9 \le A \le 60$*

M. S. Antony, J. Britz, A. Pape, At. Data Nucl. Data Tables 34, 279 (1986).

Compilation: A=9-60; compiled mass excesses, T≤6 isospin mutiplet level energies.

86Bo04 *Beta-Decay Asymmetry of the Neutron and g(A)/g(V)*

P. Bopp, D. Dubbers, L. Hornig, E. Klemt, J. Last, H. Schutze, S. J. Freedman, O. Scharpf, Phys. Rev. Lett. 56, 919 (1986); Erratum Phys. Rev. 57, 1192 (1986).

Radioactivity: ^{1}n; measured β-asymmetry, Eβ, Iβ; deduced (g(A)/g(V)). Polarized neutron beam, long solenoidal β-spectrometer.

86Ch39 *A Comparison of πΔ Interaction Mechanism with the Double Charge Exchange Experimental Data on Self-Conjugate Nuclei*

C. R. Ching, T. E. O. Ericson, T. H. Ho, W. Q. Zhao, Nucl. Phys. A459, 488 (1986).

Nuclear Reactions: ^{12}C, ^{40}Ca(π^+,π^-), E=164 MeV; ^{16}O(π^+,π^-), E=120, 164, 200 MeV; calculated σ(θ). ^{12}C, ^{16}O, ^{24}Mg, ^{28}Si, ^{32}S, ^{40}Ca(π^+, π^-), E=100-220 MeV; ^{16}O(π^+, π^-), E 100-300 MeV; calculated σ(θ) vs E; deduced Δ-π interaction role, mass dependence.

86Ge08 *Fast Deuteron Production following Pion Absorption in ^{4}He*

J. -F. Germond, C. Wilkin, Helv. Phys. Acta 59, 1194 (1986).

Nuclear Reactions: ^{4}He(π^-,2n), E at rest; calculated fast deuteron production σ. Cluster model.

86Gi13 *Nuclear-Structure Aspects of Nonanalog Pion Double Charge Exchange*

R. Gilman, H. T. Fortune, M. B. Johnson, E. R. Siciliano, H. Toki, A. Wirzba, B. A. Brown, Phys. Rev. C34, 1895 (1986).

Nuclear Reactions: ^{12}C, ^{16}O, ^{24}Mg, ^{28}Si, ^{32}S, ^{40}, ^{44}Ca, ^{56}Fe(π^+,π^-), E=100-300 MeV; calculated σ(θ) vs E. Nonanalog double charge exchange.

87Aj01 *Anomalous Behavior of the Proton-Induced Fision Cross Sections of ^{235}U and ^{238}U at Extreme Sub-Barrier Energies*

N. N. Ajitanand, K. N. Iyengar, R. P. Anand, D. M. Nadkarni, A. K. Mohanty, Phys. Rev. Lett. 58, 1520 (1987).

Nuclear Reactions: ICPND ^{235}, ^{238}U(p,F), E=0.5-4.3 MeV; measured fission σ(E). Enriched ^{235}U, natural Uranium targets, solid state track detectors.

87Aj02 *Energy Levels of Light Nuclei A = 18-20*

F. Ajzenberg-Selove, Nucl. Phys. A475, 1 (1987).

Compilation: A=18-20; compiled, evaluated structure data.

87Ar22 *Nuclear Spin and Magnetic Moment of ^{11}Li*

E. Arnold, J. Bonn, R. Gegenwarth, W. Neu, R. Neugart, E. -W. Otten, G. Ulm, K. Wendt, and ISOLDE Collaboration, Phys. Lett. 197B, 311 (1987).

Radioactivity: ^{9}, ^{8}, ^{11}Li(β^{-}) [from Ta(p, X), E=600 MeV]; measured β-asymmetry, NMR, hfs. ^{9}, ^{8}Li deduced μ. ^{11}Li deduced level J, μ. Fast atomic beam, optical pumping.

87Bl18 *Excited States of Light N = Z Nuclei with a Specific Spin-Isospin Order*

R. Blumel, K. Dietrich, Nucl. Phys. A471, 453 (1987).

Nuclear Structure: ^{4}, ^{6}, ^{8}, ^{10}He, ^{8}, ^{10}, ^{12}, ^{14}Be, ^{8}, ^{10}, ^{12}, ^{14}, ^{16}, ^{18}, ^{20}, ^{22}, ^{24}C, ^{10}, ^{12}, ^{14}, ^{16}, ^{18}, ^{20}, ^{22}, ^{24}, ^{26}O, ^{20}, ^{22}, ^{24}, ^{26}, ^{28}, ^{30}, ^{32}Ne, ^{24}, ^{26}, ^{28}, ^{30}, ^{32}, ^{34}, ^{36}, ^{38}Mg, ^{32}S; calculated levels, quadrupole moments. Hartree-Fock method, specific spin-isospin latice, energy effective interactions.

87Fa05 *Pion Double Charge Exchange on ^{12}C at Low Energies*

J. A. Faucett, M. W. Rawool, K. S. Dhuga, J. D. Zumbro, R. Gilman, H. T. Fortune, C. L. Morris, M. A. Plum, Phys. Rev. C35, 1570 (1987).

Nuclear Reactions: ^{12}C(π^{+},π^{-}), E=50-120 MeV; measured σ(θ), σ(θ) vs E, σ(E(π^{-})); deduced σ energy dependence.

87Ge06 *On Measuring the D State of ^{4}He*

J. -F. Germond, C. Wilkin, J. Phys. (London) G13, L259 (1987).

Nuclear Reactions: ^{4}He(π^{-},2n), E at rest; calculated pion capture kinematics suitable for D- state estimate. ^{1}H(α,pd), E not given; calculated spectator deuteron tensor polarization role in α- D state.

87Sa15 *Hartree-Fock Calculations of Light Neutron-Rich Nuclei*

H. Sagawa, H. Toki, J. Phys. (London) G13, 453 (1987).

Nuclear Structure: ^{8}, ^{9}, ^{10}, ^{11}, ^{12}, ^{13}, ^{14}, ^{15}, ^{16}, ^{17}, ^{18}, ^{19}, ^{20}, ^{21}, ^{22}, ^{23}, ^{24}C, ^{40}, ^{42}, ^{44}, ^{48}Ca, ^{4}, ^{6}, ^{8}, ^{10}He, ^{7}, ^{8}, ^{9}, ^{10}, ^{11}, ^{12}, ^{13}, ^{14}, ^{15}, ^{16}Be, ^{11}, ^{12}, ^{13}, ^{14}, ^{15}, ^{16}, ^{17}, ^{18}, ^{19}, ^{20}, ^{21}, ^{22}, ^{23}, ^{24}, ^{25}, ^{26}O; calculated binding energies. ^{3}, ^{4}, ^{6}, ^{8}He; calculated mass radii. ^{4}, ^{8}He; calculated p, n density distributions. Skyrme interactions.

88Aj01 *Energy Levels of Light Nuclei A = 5-10*

F. Ajzenberg-Selove, Nucl. Phys. A490, 1 (1988).

Compilation: A=5-10; compiled, evaluated structure data.

88Co15 *The Thomas-Ehrman Shift across the Proton Dripline*

E. Comay, I. Kelson, A. Zidon, Phys. Lett. 210B, 31 (1988).

Nuclear Structure: ^{4}Li, ^{6}, ^{7}Be, ^{7}B, ^{8}C, ^{11}N, ^{12}O, ^{15}, ^{16}F, ^{16}Ne, ^{19}Na, ^{39}Sc; calculated masses. Charge symmetric mass relationships.

Atomic Physics: 4}Li, ^{6}, ^{7}Be, ^{7}B, ^{8}C, ^{11}N, ^{12}O, ^{15}, ^{16}F, ^{16}Ne, ^{19}Na, ^{39}Sc; calculated masses. Charge symmetric mass relationships.

88Du09 *Beta Delayed Multi-Neutron Radioactivity of ^{17}B, ^{14}Be, ^{19}C*

J. P. Dufour, R. Del Moral, F. Hubert, D. Jean, M. S. Pravikoff, A. Fleury, A. C. Mueller, K. -H. Schmidt, K. Summerer, E. Hanelt, J. Frehaut, M. Beau, G. Giraudet, Phys. Lett. 206B, 195 (1988).

Radioactivity: ^{17}B, ^{14}Be, ^{19}C(β^{-}n); [from Ta, C(^{22}Ne,X), E=60 MeV/nucleon]; measured β-delayed neutron spectra; deduced $T_{1/2}$, multi-neutron branching ratios.

88Go21 *Neutron-Excessive Nuclei and Two-Proton Radioactivity*

V. I. Goldanskii, Phys. Lett. 212B, 11 (1988).

Radioactivity: ^{22}Si, ^{31}Ar, ^{39}Ti, ^{42}Cr; calculated 2p-decay $T_{1/2}$, Q, Eβ. Neutron excess nuclei data input.

88Ma27 *The Non-Analog Double Charge Exchange Transition: $^{16}O(\pi^{+},\pi^{-})^{16}N(e)(gs)$ and $^{12}C(\pi^{+},\pi^{-})^{12}O(gs)$*

W. -H. Ma, G. -Y. Zhang, S. -W. Wang, C. -K. Chen, Nucl. Phys. A481, 793 (1988).

Nuclear Reactions: ^{16}O(π^{+},π^{-}), E=120-200 MeV; ^{12}C(π^{+},π^{-}), E=164 MeV; calculated σ(θ). ^{16}O(π^{+},π^{-}), E=120-280 MeV; calculated σ(θ) vs E. Two-delta excitation mechanisms.

88Mi03 *Branching Ratios of ^{9}C to Low Lying States in ^{9}B*

D. Mikolas, B. A. Brown, W. Benenson, L. H. Harwood, E. Kashy, J. A. Nolen, Jr. , B. Sherrill, J. Stevenson, J. S. Winfield, Z. Q. Xie, R. Sherr, Phys. Rev. C37, 766 (1988).

Radioactivity: ^{9}C(β^{+}) [from Ni(^{12}C,X), E=35 MeV/nucleon]; measured β-delayed Ep, Ip, β-delayed Eα, Iα, βαp-coin; deduced log ft. ^{9}B levels deduced Iβ, Gamow-Teller transition strengths, comparison with other data.

Nuclear Structure: ^{9}B, ^{9}Be, ^{9}C; calculated levels, Gamow-Teller transition strengths, particle decay spectroscopic factors, particle decay reduced widths. Input from ^{9}Be(p,n) reaction.

88Wa18 *Atomic Masses from (Mainly) Experimental Data*

A. H. Wapstra, G. Audi, R. Hoekstra, At. Data Nucl. Data Tables 39, 281 (1988).

Nuclear Structure: A=72-212; analyzed data; deduced masses.

Atomic Physics: 72-212; analyzed data; deduced masses.

88We01 *Total Radiative Capture Rates for Three- and Four-Nucleon Pionic Atoms*

C. Werntz, H. S. Valk, Phys. Rev. C37, 724 (1988).

Nuclear Reactions: ^{3}H, ^{3}, ^{4}He(π^{-},γ), E at rest; calculated radiative capture reduced rates; deduced pion absorption mechanism.

Atomic Physics: esic-Atoms ^{3}H; calculated pionic level width. Radiative capture rate input.

89Gr06 *Dependence of the Cross Section for Inclusive Pion Double Charge Exchange on Nuclear Mass and Charge*

P. A. M. Gram, S. A. Wood, E. R. Kinney, S. Hoibraten, P. Mansky, J. L. Matthews, T. Soos, G. A. Rebka, Jr., D. A. Roberts, Phys. Rev. Lett. 62, 1837 (1989).

Nuclear Reactions: ^{4}He, ^{6}, ^{7}Li, ^{9}Be, ^{12}C, ^{16}O, ^{40}Ca, ^{103}Rh, ^{208}Pb(π^{+}, π^{-}), (π^{-},π^{+}), E=180, 240 MeV; measured total reaction σ. Phenomenological model.

90Aj01 *Energy Levels of Light Nuclei A = 11-12*

F. Ajzenberg-Selove, Nucl. Phys. A506, 1 (1990).

Compilation: A=11; A=12; compiled, evaluated structure data.

91Aj01 *Energy Levels of Light Nuclei A = 13-15*

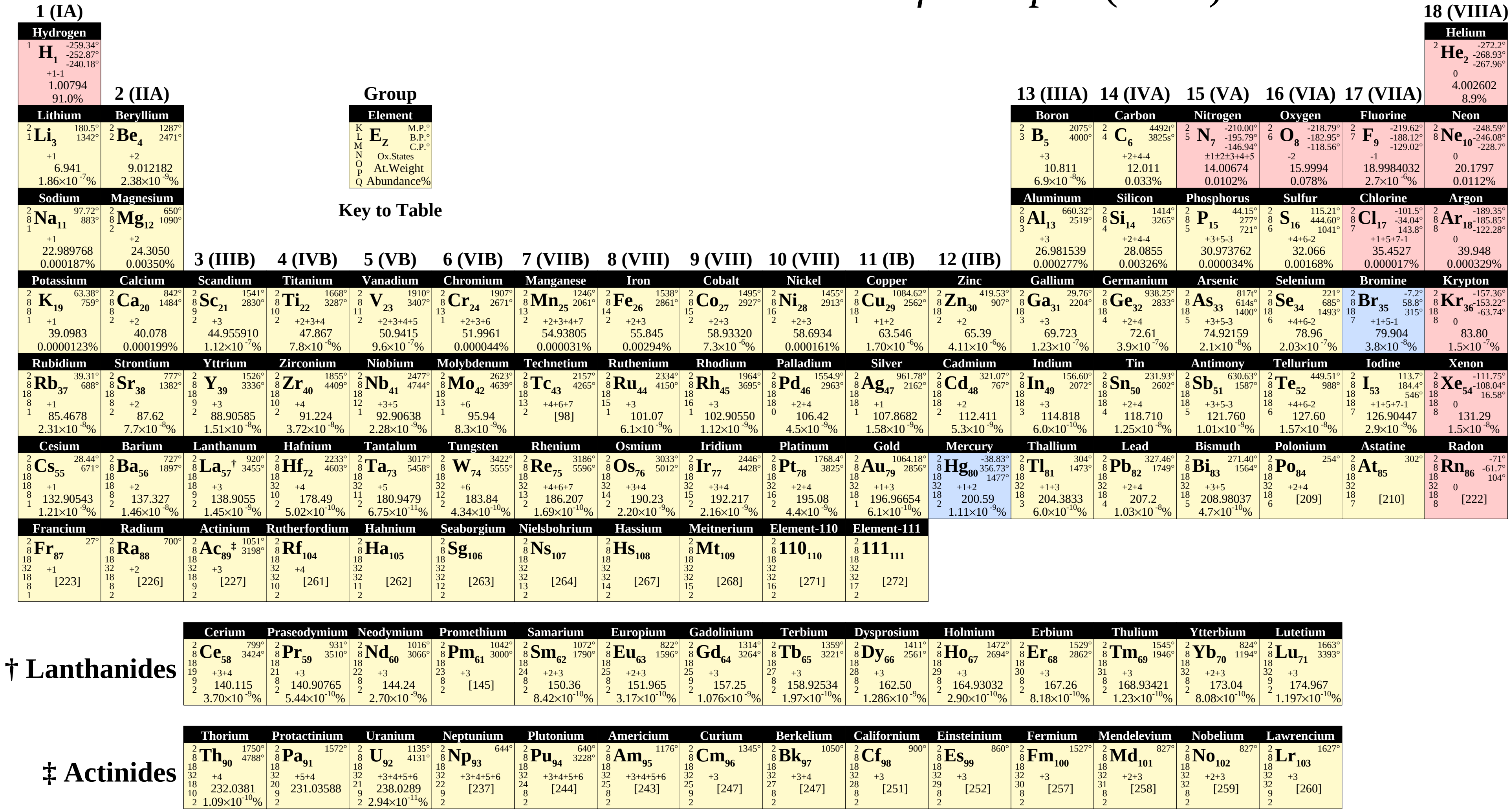
F. Ajzenberg-Selove, Nucl. Phys. A523, 1 (1991).

Compilation: A=13-15; compiled, evaluated structure data.

93TiAA

see 93Ti07 (1993) (not abstracted).

Periodic Table for the *Table of Isotopes* (1995)



Group

Element
K L M N O P Q
E_Z
M.P.° B.P.° C.P.°
Ox.States
At.Weight
Abundance%

Key to Table

1 (IA)	2 (IIA)	3 (IIIB)	4 (IVB)	5 (VB)	6 (VIB)	7 (VIIB)	8 (VIII)	9 (VIII)	10 (VIII)	11 (IB)	12 (IIB)	13 (IIIA)	14 (IVA)	15 (VA)	16 (VIA)	17 (VIIA)	18 (VIIIA)
Hydrogen H_1 1 -259.34° -252.87° -240.18° +1-1 1.00794 91.0%																	**Helium** He_2 2 -272.2° -268.93° -267.96° 0 4.002602 8.9%
Lithium Li_3 2 1 180.5° 1342° +1 6.941 1.86×10^{-7}%	**Beryllium** Be_4 2 2 1287° 2471° +2 9.012182 2.38×10^{-9}%											**Boron** B_5 2 3 2075° 4000° +3 10.811 6.9×10^{-8}%	**Carbon** C_6 2 4 4492t° 3825s° +2+4-4 12.011 0.033%	**Nitrogen** N_7 2 5 -210.00° -195.79° -146.94° ±1±2±3+4+5 14.00674 0.0102%	**Oxygen** O_8 2 6 -218.79° -182.95° -118.56° -2 15.9994 0.078%	**Fluorine** F_9 2 7 -219.62° -188.12° -129.02° -1 18.9984032 2.7×10^{-6}%	**Neon** Ne_{10} 2 8 -248.59° -246.08° -228.7° 0 20.1797 0.0112%
Sodium Na_{11} 2 8 1 97.72° 883° +1 22.989768 0.000187%	**Magnesium** Mg_{12} 2 8 2 650° 1090° +2 24.3050 0.00350%											**Aluminum** Al_{13} 2 8 3 660.32° 2519° +3 26.981539 0.000277%	**Silicon** Si_{14} 2 8 4 1414° 3265° +2+4-4 28.0855 0.00326%	**Phosphorus** P_{15} 2 8 5 44.15° 277° 721° +3+5-3 30.973762 0.000034%	**Sulfur** S_{16} 2 8 6 115.21° 444.60° 1041° +4+6-2 32.066 0.00168%	**Chlorine** Cl_{17} 2 8 7 -101.5° -34.04° 143.8° +1+5+7-1 35.4527 0.000017%	**Argon** Ar_{18} 2 8 8 -189.35° -185.85° -122.28° 0 39.948 0.000329%
Potassium K_{19} 2 8 8 1 63.38° 759° +1 39.0983 0.0000123%	**Calcium** Ca_{20} 2 8 8 2 842° 1484° +2 40.078 0.000199%	**Scandium** Sc_{21} 2 8 9 2 1541° 2830° +3 44.955910 1.12×10^{-7}%	**Titanium** Ti_{22} 2 8 10 2 1668° 3287° +2+3+4 47.867 7.8×10^{-6}%	**Vanadium** V_{23} 2 8 11 2 1910° 3407° +2+3+4+5 50.9415 9.6×10^{-7}%	**Chromium** Cr_{24} 2 8 13 1 1907° 2671° +2+3+6 51.9961 0.000044%	**Manganese** Mn_{25} 2 8 13 2 1246° 2061° +2+3+4+7 54.93805 0.000031%	**Iron** Fe_{26} 2 8 14 2 1538° 2861° +2+3 55.845 0.00294%	**Cobalt** Co_{27} 2 8 15 2 1495° 2927° +2+3 58.93320 7.3×10^{-6}%	**Nickel** Ni_{28} 2 8 16 2 1455° 2913° +2+3 58.6934 0.000161%	**Copper** Cu_{29} 2 8 18 1 1084.62° 2562° +1+2 63.546 1.70×10^{-6}%	**Zinc** Zn_{30} 2 8 18 2 419.53° 907° +2 65.39 4.11×10^{-6}%	**Gallium** Ga_{31} 2 8 18 3 29.76° 2204° +3 69.723 1.23×10^{-7}%	**Germanium** Ge_{32} 2 8 18 4 938.25° 2833° +2+4 72.61 3.9×10^{-7}%	**Arsenic** As_{33} 2 8 18 5 817t° 614s° 1400° +3+5-3 74.92159 2.1×10^{-8}%	**Selenium** Se_{34} 2 8 18 6 221° 685° 1493° +4+6-2 78.96 2.03×10^{-7}%	**Bromine** Br_{35} 2 8 18 7 -7.2° 58.8° 315° +1+5-1 79.904 3.8×10^{-8}%	**Krypton** Kr_{36} 2 8 18 8 -157.36° -153.22° -63.74° 0 83.80 1.5×10^{-7}%
Rubidium Rb_{37} 2 8 18 8 1 39.31° 688° +1 85.4678 2.31×10^{-8}%	**Strontium** Sr_{38} 2 8 18 8 2 777° 1382° +2 87.62 7.7×10^{-8}%	**Yttrium** Y_{39} 2 8 18 9 2 1526° 3336° +3 88.90585 1.51×10^{-8}%	**Zirconium** Zr_{40} 2 8 18 10 2 1855° 4409° +4 91.224 3.72×10^{-8}%	**Niobium** Nb_{41} 2 8 18 12 1 2477° 4744° +3+5 92.90638 2.28×10^{-9}%	**Molybdenum** Mo_{42} 2 8 18 13 1 2623° 4639° +6 95.94 8.3×10^{-9}%	**Technetium** Tc_{43} 2 8 18 13 2 2157° 4265° +4+6+7 [98]	**Ruthenium** Ru_{44} 2 8 18 15 1 2334° 4150° +3 101.07 6.1×10^{-9}%	**Rhodium** Rh_{45} 2 8 18 16 1 1964° 3695° +3 102.90550 1.12×10^{-9}%	**Palladium** Pd_{46} 2 8 18 18 0 1554.9° 2963° +2+4 106.42 4.5×10^{-9}%	**Silver** Ag_{47} 2 8 18 18 1 961.78° 2162° +1 107.8682 1.58×10^{-9}%	**Cadmium** Cd_{48} 2 8 18 18 2 321.07° 767° +2 112.411 5.3×10^{-9}%	**Indium** In_{49} 2 8 18 18 3 156.60° 2072° +3 114.818 6.0×10^{-10}%	**Tin** Sn_{50} 2 8 18 18 4 231.93° 2602° +2+4 118.710 1.25×10^{-8}%	**Antimony** Sb_{51} 2 8 18 18 5 630.63° 1587° +3+5-3 121.760 1.01×10^{-9}%	**Tellurium** Te_{52} 2 8 18 18 6 449.51° 988° +4+6-2 127.60 1.57×10^{-8}%	**Iodine** I_{53} 2 8 18 18 7 113.7° 184.4° 546° +1+5+7-1 126.90447 2.9×10^{-9}%	**Xenon** Xe_{54} 2 8 18 18 8 -111.75° -108.04° 16.58° 0 131.29 1.5×10^{-8}%
Cesium Cs_{55} 2 8 18 18 8 1 28.44° 671° +1 132.90543 1.21×10^{-9}%	**Barium** Ba_{56} 2 8 18 18 8 2 727° 1897° +2 137.327 1.46×10^{-8}%	**Lanthanum** $La_{57}^{\dagger}$ 2 8 18 18 9 2 920° 3455° +3 138.9055 1.45×10^{-9}%	**Hafnium** Hf_{72} 2 8 18 32 10 2 2233° 4603° +4 178.49 5.02×10^{-10}%	**Tantalum** Ta_{73} 2 8 18 32 11 2 3017° 5458° +5 180.9479 6.75×10^{-11}%	**Tungsten** W_{74} 2 8 18 32 12 2 3422° 5555° +6 183.84 4.34×10^{-10}%	**Rhenium** Re_{75} 2 8 18 32 13 2 3186° 5596° +4+6+7 186.207 1.69×10^{-10}%	**Osmium** Os_{76} 2 8 18 32 14 2 3033° 5012° +3+4 190.23 2.20×10^{-9}%	**Iridium** Ir_{77} 2 8 18 32 15 2 2446° 4428° +3+4 192.217 2.16×10^{-9}%	**Platinum** Pt_{78} 2 8 18 32 16 2 1768.4° 3825° +2+4 195.08 4.4×10^{-9}%	**Gold** Au_{79} 2 8 18 32 18 1 1064.18° 2856° +1+3 196.96654 6.1×10^{-10}%	**Mercury** Hg_{80} 2 8 18 32 18 2 -38.83° 356.73° 1477° +1+2 200.59 1.11×10^{-9}%	**Thallium** Tl_{81} 2 8 18 32 18 3 304° 1473° +1+3 204.3833 6.0×10^{-10}%	**Lead** Pb_{82} 2 8 18 32 18 4 327.46° 1749° +2+4 207.2 1.03×10^{-8}%	**Bismuth** Bi_{83} 2 8 18 32 18 5 271.40° 1564° +3+5 208.98037 4.7×10^{-10}%	**Polonium** Po_{84} 2 8 18 32 18 6 254° +2+4 [209]	**Astatine** At_{85} 2 8 18 32 18 7 302° [210]	**Radon** Rn_{86} 2 8 18 32 18 8 -71° -61.7° 104° 0 [222]
Francium Fr_{87} 2 8 18 32 18 8 1 27° +1 [223]	**Radium** Ra_{88} 2 8 18 32 18 8 2 700° +2 [226]	**Actinium** $Ac_{89}^{\ddagger}$ 2 8 18 32 18 9 2 1051° 3198° +3 [227]	**Rutherfordium** Rf_{104} 2 8 18 32 32 10 2 +4 [261]	**Hahnium** Ha_{105} 2 8 18 32 32 11 2 [262]	**Seaborgium** Sg_{106} 2 8 18 32 32 12 2 [263]	**Nielsbohrium** Ns_{107} 2 8 18 32 32 13 2 [264]	**Hassium** Hs_{108} 2 8 18 32 32 14 2 [267]	**Meitnerium** Mt_{109} 2 8 18 32 32 15 2 [268]	**Element-110** 110_{110} 2 8 18 32 32 16 2 [271]	**Element-111** 111_{111} 2 8 18 32 32 17 2 [272]							

† Lanthanides	**Cerium** Ce_{58} 2 8 18 19 9 2 799° 3424° +3+4 140.115 3.70×10^{-9}%	**Praseodymium** Pr_{59} 2 8 18 21 8 2 931° 3510° +3 140.90765 5.44×10^{-10}%	**Neodymium** Nd_{60} 2 8 18 22 8 2 1016° 3066° +3 144.24 2.70×10^{-9}%	**Promethium** Pm_{61} 2 8 18 23 8 2 1042° 3000° +3 [145]	**Samarium** Sm_{62} 2 8 18 24 8 2 1072° 1790° +2+3 150.36 8.42×10^{-10}%	**Europium** Eu_{63} 2 8 18 25 8 2 822° 1596° +2+3 151.965 3.17×10^{-10}%	**Gadolinium** Gd_{64} 2 8 18 25 9 2 1314° 3264° +3 157.25 1.076×10^{-9}%	**Terbium** Tb_{65} 2 8 18 27 8 2 1359° 3221° +3 158.92534 1.97×10^{-10}%	**Dysprosium** Dy_{66} 2 8 18 28 8 2 1411° 2561° +3 162.50 1.286×10^{-9}%	**Holmium** Ho_{67} 2 8 18 29 8 2 1472° 2694° +3 164.93032 2.90×10^{-10}%	**Erbium** Er_{68} 2 8 18 30 8 2 1529° 2862° +3 167.26 8.18×10^{-10}%	**Thulium** Tm_{69} 2 8 18 31 8 2 1545° 1946° +3 168.93421 1.23×10^{-10}%	**Ytterbium** Yb_{70} 2 8 18 32 8 2 824° 1194° +2+3 173.04 8.08×10^{-10}%	**Lutetium** Lu_{71} 2 8 18 32 9 2 1663° 3393° +3 174.967 1.197×10^{-10}%
‡ Actinides	**Thorium** Th_{90} 2 8 18 32 18 10 2 1750° 4788° +4 232.0381 1.09×10^{-10}%	**Protactinium** Pa_{91} 2 8 18 32 20 9 2 1572° +5+4 231.03588	**Uranium** U_{92} 2 8 18 32 21 9 2 1135° 4131° +3+4+5+6 238.0289 2.94×10^{-11}%	**Neptunium** Np_{93} 2 8 18 32 22 9 2 644° +3+4+5+6 [237]	**Plutonium** Pu_{94} 2 8 18 32 24 8 2 640° 3228° +3+4+5+6 [244]	**Americium** Am_{95} 2 8 18 32 25 8 2 1176° +3+4+5+6 [243]	**Curium** Cm_{96} 2 8 18 32 25 9 2 1345° +3 [247]	**Berkelium** Bk_{97} 2 8 18 32 27 8 2 1050° +3+4 [247]	**Californium** Cf_{98} 2 8 18 32 28 8 2 900° +3 [251]	**Einsteinium** Es_{99} 2 8 18 32 29 8 2 860° +3 [252]	**Fermium** Fm_{100} 2 8 18 32 30 8 2 1527° +3 [257]	**Mendelevium** Md_{101} 2 8 18 32 31 8 2 827° +2+3 [258]	**Nobelium** No_{102} 2 8 18 32 32 8 2 827° +2+3 [259]	**Lawrencium** Lr_{103} 2 8 18 32 32 9 2 1627° +3 [260]

The new IUPAC Group format numbers the groups from 1 to 18. The numbering system used by the Chemical Abstracts Service (CAS) is given in parentheses. For elements that are not naturally abundant, the mass number of the longest-lived isotope is given in brackets. The abundances are based on meteorite and solar wind data. The melting point (M.P.), boiling point (B.P.), and critical point temperatures are given in °Celsius. Sublimation and critical temperatures are indicated by s and t.

REFERENCES

1. D.R. Lide, Editor, *Handbook of Chemistry and Physics*, 75th edition, CRC Press, (1995).
2. G.J. Leigh, *Nomenclature of Inorganic Chemistry*, Blackwells Scientific Publications, Oxford, (1990).
3. *Chemical and Engineering News*, **63**(5), 27(1985).
4. E. Anders and N. Grevesse, *Abundances of the Elements: Meteoritic and Solar*, Geochimica et Cosmochimica Acta **53**, 197 (1989).

APPENDIX A. PROPERTIES OF THE ELEMENTS

Table 1 lists atomic weights, densities, melting and boiling points, critical points, ionization potentials, specific heats. Data were taken from the 75th edition of the *CRC Handbook of Chemistry and Physics*[1]. Atomic weights apply to elements as they exist naturally on earth, or, in the cases of thorium and protactinium, to the isotopes which have the longest half-lives. Values in parentheses are the mass numbers for the longest lived isotopes of some of the radioactive elements. Specific heats are given for the elements at 25°C. Densities for solids and liquids are given at 25°C, unless otherwise indicated by a superscript temperature (in °C); densities for the gaseous elements are for the liquids at their boiling points.

The solar system elemental abundances (atomic %) in Table 2 are from the compilation of Anders and Grevesse[2], and are based on meteorite and solar wind data. The elemental abundances in the earth's crust and in the sea represent the median values of reported measurements.[1,3,4,5] The concentrations of the less abundant elements may vary with location by several orders of magnitude.

Table 1. Chemical Properties

Z	El	Name	Atomic Weight (a.m.u.)	Density (g/cm^3)	Melting point (°C)	Boiling point (°C)	Critical point (°C)	Ionization potential (eV)	Specific heat (J/g K)
1	H	Hydrogen	1.00794 *7*	0.0708	-259.34	-252.87	-240.18	13.598	14.304
2	He	Helium	4.002602 *2*	0.124901	-272.2	-268.93	-267.96	24.587	5.193
3	Li	Lithium	6.941 *2*	0.534	180.5	1342		5.392	3.582
4	Be	Beryllium	9.012182 *3*	1.85	1287	2471		9.323	1.825
5	B	Boron	10.811 *5*	2.37	2075	4000		8.298	$1.026^{\text{amorphous}}$
6	C	Carbon	12.011 *1*	2.2670^{15°	4492^{t}	3825^{s}		11.260	0.709^{graphite}
7	N	Nitrogen	14.00674 *7*	0.807	-210.00	-195.79	-146.94	14.534	1.040
8	O	Oxygen	15.9994 *3*	1.141	-218.79	-182.95	-118.56	13.618	0.918
9	F	Fluorine	18.9984032 *9*	1.50	-219.62	-188.12	-129.02	17.423	0.824
10	Ne	Neon	20.1797 *6*	1.204	-248.59	-246.08	-228.7	21.565	1.030
11	Na	Sodium	22.989768 *6*	0.97	97.72	883		5.139	1.228
12	Mg	Magnesium	24.3050 *6*	1.74	650	1090		7.646	1.023
13	Al	Aluminum	26.981539 *5*	2.70	660.32	2519		5.986	0.897
14	Si	Silicon	28.0855 *3*	2.3296	1414	3265		8.152	0.705
15	P	Phosphorus	30.973762 *4*	1.82	44.15	277	721	10.487	0.769^{white}
16	S	Sulfur	32.066 *6*	2.067	115.21	444.60	1041	10.360	$0.710^{\text{orthorhombic}}$
17	Cl	Chlorine	35.4527 *9*	1.56	-101.5	-34.04	143.8	12.968	0.479
18	Ar	Argon	39.948 *1*	1.396	-189.35	-185.85	-122.28	15.760	0.520
19	K	Potassium	39.0983 *1*	0.89	63.38	759		4.341	0.757
20	Ca	Calcium	40.078 *4*	1.54	842	1484		6.113	0.647
21	Sc	Scandium	44.955910 *9*	2.99	1541	2830		6.561	0.568
22	Ti	Titanium	47.867 *1*	4.5	1668	3287		6.828	0.523
23	V	Vanadium	50.9415 *1*	6.0	1910	3407		6.746	0.489
24	Cr	Chromium	51.9961 *6*	7.15	1907	2671		6.767	0.449
25	Mn	Manganese	54.93805 *1*	7.3	1246	2061		7.434	0.479
26	Fe	Iron	55.845 *2*	7.875	1538	2861		7.902	0.449
27	Co	Cobalt	58.93320 *1*	8.86	1495	2927		7.881	0.421
28	Ni	Nickel	58.6934 *2*	8.912	1455	2913		7.640	0.444
29	Cu	Copper	63.546 *3*	8.933	1084.62	2562		7.726	0.385

---

[1] *Handbook of Chemistry and Physics*, 75th edition, D.R. Lide, editor, CRC Press, Boca Raton, FL (1995).

[2] E. Anders and N. Grevesse, *Geochimica et Cosmochimica Acta* **53**, 197 (1989).

[3] *CRC Practical Handbook of Physical Properties of Rocks and Minerals*, R.S. Carmichael, editor, CRC Press, Boca Raton, FL (1989).

[4] I. Bodek *et al*, *Environmental Inorganic Chemistry*, Pergamon Press, New York (1988).

[5] A.B. Ronov and A.A. Yaroshevsky, "Earth's Crust Geochemistry", in the *Encyclopedia of Geochemistry and Environmental Sciences*, R.W. Fairbridge, editor, Van Nostrand, New York (1969).

A-3

Z	El	Name	Atomic Weight (a.m.u.)	Density (g/cm^3)	Melting point (°C)	Boiling point (°C)	Critical point (°C)	Ionization potential (eV)	Specific heat (J/g K)
30	Zn	Zinc	65.39 *2*	7.134	419.53	907		9.394	0.388
31	Ga	Gallium	69.723 *1*	5.91	29.76	2204		5.999	0.371
32	Ge	Germanium	72.61 *2*	5.323	938.25	2833		7.900	0.320
33	As	Arsenic	74.92159 *2*	$5.776^{26°}$	817^{t}	614^{s}	1400	9.815	0.329
34	Se	Selenium	78.96 *3*	$4.809^{26°}$	221	685	1493	9.752	0.321
35	Br	Bromine	79.904 *1*	3.11	-7.2	58.8	315	11.814	0.226
36	Kr	Krypton	83.80 *1*	2.418	-157.36	-153.22	-63.74	14.000	0.248
37	Rb	Rubidium	85.4678 *3*	1.53	39.31	688		4.177	0.363
38	Sr	Strontium	87.62 *1*	2.64	777	1382		5.695	0.301
39	Y	Yttrium	88.90585 *2*	4.47	1526	3336		6.217	0.298
40	Zr	Zirconium	91.224 *2*	6.52	1855	4409		6.634	0.278
41	Nb	Niobium	92.90638 *2*	8.57	2477	4744		6.759	0.265
42	Mo	Molybdenum	95.94 *1*	10.2	2623	4639		7.092	0.251
43	Tc	Technetium	[98]	11	2157	4265		7.28	
44	Ru	Ruthenium	101.07 *2*	12.1	2334	4150		7.361	0.238
45	Rh	Rhodium	102.90550 *3*	12.4	1964	3695		7.459	0.243
46	Pd	Palladium	106.42 *1*	12.0	1554.9	2963		8.337	0.244
47	Ag	Silver	107.8682 *2*	10.501	961.78	2162		7.576	0.235
48	Cd	Cadmium	112.411 *8*	8.69	321.07	767		8.994	0.232
49	In	Indium	114.818 *3*	7.31	156.60	2072		5.786	0.233
50	Sn	Tin	118.710 *7*	$7.287^{26°}$	231.93	2602		7.344	0.228^{white}
51	Sb	Antimony	121.760 *1*	$6.685^{26°}$	630.63	1587		8.64	0.207
52	Te	Tellurium	127.60 *3*	6.232	449.51	988		9.010	0.202
53	I	Iodine	126.90447 *3*	$4.93^{20°}$	113.7	184.4	546	10.451	0.145
54	Xe	Xenon	131.29 *2*	2.953	-111.75	-108.04	16.58	12.130	0.158
55	Cs	Cesium	132.90543 *5*	1.93	28.44	671		3.894	0.242
56	Ba	Barium	137.327 *7*	3.62	727	1897		5.212	0.204
57	La	Lanthanum	138.9055 *2*	6.15	920	3455		5.577	0.195
58	Ce	Cerium	140.115 *4*	8.16	799	3424		5.539	0.192
59	Pr	Praseodymium	140.90765 *3*	6.77	931	3510		5.464	0.193
60	Nd	Neodymium	144.24 *3*	7.01	1016	3066		5.525	0.190
61	Pm	Promethium	[145]	7.26	1042	3000		5.55	
62	Sm	Samarium	150.36 *3*	7.52	1072	1790		5.644	0.197
63	Eu	Europium	151.965 *9*	5.24	822	1596		5.670	0.182
64	Gd	Gadolinium	157.25 *3*	7.90	1314	3264		6.150	0.236
65	Tb	Terbium	158.92534 *3*	8.23	1359	3221		5.864	0.182
66	Dy	Dysprosium	162.50 *3*	8.55	1411	2561		5.939	0.173
67	Ho	Holmium	164.93032 *3*	8.80	1472	2694		6.022	0.165
68	Er	Erbium	167.26 *3*	9.07	1529	2862		6.108	0.168
69	Tm	Thulium	168.93421 *3*	9.32	1545	1946		6.184	0.160
70	Yb	Ytterbium	173.04 *3*	6.90	824	1194		6.254	0.155
71	Lu	Lutetium	174.967 *1*	9.84	1663	3393		5.426	0.154
72	Hf	Hafnium	178.49 *2*	13.3	2233	4603		6.825	0.144
73	Ta	Tantalum	180.9479 *1*	16.4	3017	5458		7.89	0.140
74	W	Tungsten	183.84 *1*	19.3	3422	5555		7.98	0.132
75	Re	Rhenium	186.207 *1*	20.8	3186	5596		7.88	0.137
76	Os	Osmium	190.23 *3*	22.5	3033	5012		8.7	0.130
77	Ir	Iridium	192.217 *3*	22.5	2446	4428		9.1	0.131
78	Pt	Platinum	195.08 *3*	21.46	1768.4	3825		9.0	0.133
79	Au	Gold	196.96654 *3*	19.282	1064.18	2856		9.226	0.129
80	Hg	Mercury	200.59 *2*	13.5336	-38.83	356.73	1477	10.438	0.140
81	Tl	Thallium	204.3833 *2*	11.8	304	1473		6.108	0.129
82	Pb	Lead	207.2 *1*	11.342	327.46	1749		7.417	0.129
83	Bi	Bismuth	208.98037 *3*	9.807	271.40	1564		7.289	0.122
84	Po	Polonium	[209]	9.32	254			8.417	
85	At	Astatine	[210]		302				

A-4

Z	El	Name	Atomic Weight (a.m.u.)	Density (g/cm^3)	Melting point (°C)	Boiling point (°C)	Critical point (°C)	Ionization potential (eV)	Specific heat (J/g K)
86	Rn	Radon	[222]	4.4	-71	-61.7	104	10.749	0.094
87	Fr	Francium	[223]		27				
88	Ra	Radium	[226]	5	700			5.279	
89	Ac	Actinium	[227]	10.07^a	1051	3198		5.17	
90	Th	Thorium	232.0381 *1*	11.72	1750	4788		6.08	0.113
91	Pa	Protactinium	231.03588 *2*	15.37^a	1572			5.89	
92	U	Uranium	238.0289 *1*	≈18.95	1135	4131		6.194	0.116
93	Np	Neptunium	[237]	20.25^{20°	644			6.266	
94	Pu	Plutonium	[244]	19.84	640	3228		6.06	
95	Am	Americium	[243]	13.69^{20°	1176			5.993	
96	Cm	Curium	[247]	13.51^a	1345			6.02	
97	Bk	Berkelium	[247]	14^b	1050			6.23	
98	Cf	Californium	[251]		900			6.30	
99	Es	Einsteinium	[252]		860			6.42	
100	Fm	Fermium	[257]		1527			6.50	
101	Md	Mendelevium	[258]		827			6.58	
102	No	Nobelium	[259]		827			6.65	
103	Lr	Lawrencium	[260]		1627				
104	Rf	Rutherfordium	[261]						
105	Ha	Hahnium	[262]						
106	Sg	Seaborgium	[263]						
107	Ns	Nielsbohrium	[264]						
108	Hs	Hassium	[267]						
109	Mt	Meitnerium	[268]						
110	??	Element-110	[271]						
111	??	Element-111	[272]						

^{a}Calculated ^{b}Estimated ^{t}Critical temperature ^{s}Sublimation temperature

Table 2. Elemental Abundances

Z	El	Solar System (%)	Abundance in the Earth's	
			Crust (mg/kg)	Sea (mg/L)
1	H	91.0 *23*	1400	1.08×10^{5}
2	He	8.9 *5*	0.008	7×10^{-6}
3	Li	1.86×10^{-7} *17*	20	0.18
4	Be	2.38×10^{-9} *23*	2.8	5.6×10^{-6}
5	B	6.9×10^{-8} *7*	10	4.44
6	C	0.033	200	28
7	N	0.0102	19	0.5
8	O	0.078 *8*	4.61×10^{5}	8.57×10^{5}
9	F	2.7×10^{-6} *4*	585	1.3
10	Ne	0.0112 *16*	0.005	1.2×10^{-4}
11	Na	0.000187 *13*	2.36×10^{4}	1.08×10^{4}
12	Mg	0.00350 *13*	2.33×10^{4}	1290
13	Al	0.000277 *10*	8.23×10^{4}	0.002
14	Si	0.00326 *14*	2.82×10^{5}	2.2
15	P	3.4×10^{-5} *3*	1050	0.06
16	S	0.00168 *22*	350	905
17	Cl	1.7×10^{-5} *3*	145	1.94×10^{4}
18	Ar	0.000329 *20*	3.5	0.45
19	K	1.23×10^{-5} *9*	2.09×10^{4}	399
20	Ca	0.000199 *14*	4.15×10^{4}	412
21	Sc	1.12×10^{-7} *10*	22	6×10^{-7}
22	Ti	7.8×10^{-6} *4*	5650	0.001
23	V	9.6×10^{-7} *5*	120	0.0025
24	Cr	4.4×10^{-5} *3*	102	3×10^{-4}
25	Mn	3.1×10^{-5} *3*	950	2×10^{-4}
26	Fe	0.00294 *8*	5.63×10^{4}	0.002
27	Co	7.3×10^{-6} *5*	25	2×10^{-5}
28	Ni	0.000161 *8*	84	5.6×10^{-4}
29	Cu	1.70×10^{-6} *19*	60	2.5×10^{-4}
30	Zn	4.11×10^{-6} *18*	70	0.0049
31	Ga	1.23×10^{-7} *8*	19	3×10^{-5}
32	Ge	3.9×10^{-7} *4*	1.5	5×10^{-5}
33	As	2.1×10^{-8} *3*	1.8	0.0037
34	Se	2.03×10^{-7} *13*	0.05	2×10^{-4}
35	Br	3.8×10^{-8} *7*	2.4	67.3
36	Kr	1.5×10^{-7} *3*	1×10^{-4}	2.1×10^{-4}
37	Rb	2.31×10^{-8} *15*	90	0.12
38	Sr	7.7×10^{-8} *6*	370	7.9
39	Y	1.51×10^{-8} *9*	33	1.3×10^{-5}
40	Zr	3.72×10^{-8} *24*	165	3×10^{-5}
41	Nb	2.28×10^{-9} *3*	20	1×10^{-5}
42	Mo	8.3×10^{-9} *5*	1.2	0.01
43	Tc			
44	Ru	6.1×10^{-9} *3*	0.001	7×10^{-7}
45	Rh	1.12×10^{-9} *9*	0.001	
46	Pd	4.5×10^{-9} *3*	0.015	
47	Ag	1.58×10^{-9} *5*	0.075	4×10^{-5}
48	Cd	5.3×10^{-9} *3*	0.15	1.1×10^{-4}
49	In	6.0×10^{-10} *4*	0.25	0.02
50	Sn	1.25×10^{-8} *12*	2.3	4×10^{-6}
51	Sb	1.01×10^{-9} *18*	0.2	2.4×10^{-4}
52	Te	1.57×10^{-8} *16*	0.001	
53	I	2.9×10^{-9} *6*	0.45	0.06
54	Xe	1.5×10^{-8} *3*	3×10^{-5}	5×10^{-5}
55	Cs	1.21×10^{-9} *7*	3	3×10^{-4}
56	Ba	1.46×10^{-8} *9*	425	0.013
57	La	1.45×10^{-9} *3*	39	3.4×10^{-6}
58	Ce	3.70×10^{-9} *6*	66.5	1.2×10^{-6}
59	Pr	5.44×10^{-10} *13*	9.2	6.4×10^{-7}
60	Nd	2.70×10^{-9} *4*	41.5	2.8×10^{-6}
61	Pm			
62	Sm	8.42×10^{-10} *11*	7.05	4.5×10^{-7}
63	Eu	3.17×10^{-10} *5*	2.0	1.3×10^{-7}
64	Gd	1.076×10^{-9} *15*	6.2	7×10^{-7}
65	Tb	1.97×10^{-10} *4*	1.2	1.4×10^{-7}
66	Dy	1.286×10^{-9} *18*	5.2	9.1×10^{-7}
67	Ho	2.90×10^{-10} *7*	1.3	2.2×10^{-7}
68	Er	8.18×10^{-10} *11*	3.5	8.7×10^{-7}
69	Tm	1.23×10^{-10} *3*	0.52	1.7×10^{-7}
70	Yb	8.08×10^{-10} *13*	3.2	8.2×10^{-7}
71	Lu	1.197×10^{-10} *16*	0.8	1.5×10^{-7}
72	Hf	5.02×10^{-10} *10*	3.0	7×10^{-6}
73	Ta	6.75×10^{-11} *12*	2.0	2×10^{-6}
74	W	4.34×10^{-10} *22*	1.25	1×10^{-4}
75	Re	1.69×10^{-10} *16*	7×10^{-4}	4×10^{-6}
76	Os	2.20×10^{-9} *14*	0.0015	
77	Ir	2.16×10^{-9} *13*	0.001	
78	Pt	4.4×10^{-9} *3*	0.005	
79	Au	6.1×10^{-10} *9*	0.004	4×10^{-6}
80	Hg	1.11×10^{-9} *13*	0.085	3×10^{-5}
81	Tl	6.0×10^{-10} *6*	0.85	1.9×10^{-5}
82	Pb	1.03×10^{-8} *8*	14	3×10^{-5}
83	Bi	4.7×10^{-10} *4*	0.0085	2×10^{-5}
84	Po		2×10^{-10}	1.5×10^{-14}
85	At			
86	Rn		4×10^{-13}	6×10^{-16}
87	Fr			
88	Ra		9×10^{-7}	8.9×10^{-11}
89	Ac		5.5×10^{-10}	
90	Th	1.09×10^{-10} *6*	9.6	1×10^{-6}
91	Pa		1.4×10^{-6}	5×10^{-11}
92	U	2.94×10^{-11} *25*	2.7	0.0032

APPENDIX B. PHYSICAL CONSTANTS[1,2,3]

Quantity	Symbol, equation	Value	Uncert. (ppm)
speed of light in vacuum[4]	c	2.997 924 58$\times10^{10}$ cm s^{-1}	0
Planck constant	h	6.626 075 5(40)$\times10^{-27}$ erg s	0.60
Planck constant, reduced	$\hbar = h/2\pi$	1.054 572 66(63)$\times10^{-27}$ erg s	0.60
		= 6.582 122 0(20)$\times10^{-22}$ MeV s	0.30
electron charge magnitude	e	4.803 206 8(15)$\times10^{-10}$ esu	0.30
		= 1.602 177 33(49)$\times10^{-19}$ coulomb	0.30
conversion constant	$\hbar c$	197.327 053(59) MeV fm	0.30
conversion constant	$(\hbar c)^2$	0.389 379 66(23) GeV^2 mbarn	0.59
electron mass	m_e	0.510 999 06(15) MeV/c^2 = 9.109 389 7(54)$\times10^{-28}$ g	0.30, 0.59
proton mass	m_p	938.272 31(28) MeV/c^2 = 1.672 623 1(10)$\times10^{-24}$ g	0.30, 0.59
neutron mass	m_n	939.565 63(28) MeV/c^2 = 1.674 928 6(10)$\times10^{-24}$ g	0.30, 0.59
		= 1.008 664 904(14) amu	0.014
deuteron mass	m_d	1875.613 39(57) MeV/c^2	0.30
atomic mass unit (amu)	(mass C^{12} atom)/12 = (1 g)/N_A	931.494 32(28) MeV/c^2 = 1.660 540 2(10)$\times10^{-24}$ g	0.30, 0.59
electron charge to mass ratio	e/m_e	5.272 808 6(16)$\times10^{17}$ esu g^{-1}	0.30
		= 1.758 819 62(53)$\times10^{8}$ coulomb g^{-1}	0.30
quantum of magnetic flux	h/e	4.135 669 2(12)$\times10^{-15}$ joule s coulomb^{-1}	0.30
Josephson frequency-voltage ratio	$2e/h$	4.835 976 7(14)$\times10^{14}$ cycles s^{-1} v^{-1}	0.30
Faraday constant	F	9.648 530 9(29)$\times10^{4}$ coulomb mol^{-1}	0.30
fine-structure constant	$\alpha = e^2/\hbar c$	1/137.035 989 5(61)	0.045
classical electron radius	$r_e = e^2/m_e c^2$	2.817 940 92(38) fm	0.13
electron Compton wavelength	$\lambda_e = \hbar/m_e c = r_e\,\alpha^{-1}$	3.861 593 23(35)$\times10^{-11}$ cm	0.089
proton Compton wavelength	$\lambda_p = \hbar/m_p c$	2.103 089 37(19)$\times10^{-14}$ cm	0.089
neutron Compton wavelength	$\lambda_n = \hbar/m_n c$	2.100 194 45(19)$\times10^{-14}$ cm	0.089
Bohr radius ($m_{nucleus} = \infty$)	$\alpha_\infty = \hbar^2/m_e e^2 = r_e\,\alpha^{-2}$	0.529 177 249(24)$\times10^{-8}$ cm	0.045
Rydberg energy	$hcR_\infty = m_e e^4/2\hbar^2 = m_e c^2\alpha^2/2$	13.605 698 1(40) eV	0.30
Thomson cross section	$\sigma_T = 8\pi r_e^2/3$	0.665 246 16(18) barn	0.27
Bohr magneton	$\mu_B = e\hbar/2m_e c$	5.788 382 63(52)$\times10^{-15}$ MeV gauss^{-1}	0.089
nuclear magneton	$\mu_N = e\hbar/2m_p c$	3.152 451 66(28)$\times10^{-18}$ MeV gauss^{-1}	0.089
electron cyclotron frequency/field	$\omega^{e}_{cycl}/B = e/m_e c$	1.758 819 62(53)$\times10^{7}$ radian s^{-1} gauss^{-1}	0.30
proton cyclotron frequency/field	$\omega^{p}_{cycl}/B = e/m_p c$	9.578 830 9(29)$\times10^{3}$ radian s^{-1} gauss^{-1}	0.30
gravitational constant	G_N	6.672 59(85)$\times10^{-8}$ cm^{3}g^{-1} s^{-2}	128
grav. acceleration, sea level, 45° lat.	g	980.665 cm s^{-2}	0
Fermi coupling constant	$G_F/(\hbar c)^3$	1.166 39(2)$\times10^{-5}$ GeV^{-2}	20
Avogadro number	N_A	6.022 136 7(36)$\times10^{23}$ mol^{-1}	0.59
molar gas constant, ideal gas at STP	R	8.314 510(70)$\times10^{7}$ erg mol^{-1} K^{-1}	8.4
Boltzmann constant	k	1.380 658(12)$\times10^{-16}$ erg K^{-1}	8.5
		= 8.617 385(73)$\times10^{-5}$ eV K^{-1}	8.4
molar volume, ideal gas at STP	$N_A k$(273.15 K)/(atmosphere)	22 414.10(19) cm^3 mol^{-1}	8.4
Stefan-Boltzmann constant	$\sigma = \pi^2 k^4/60\hbar^3 c^2$	5.670 51(19)$\times10^{-5}$ erg s^{-1} cm^{-2} K^{-4}	34
first radiation constant	$2\pi hc^2$	3.741 774 9(22)$\times10^{-5}$ erg cm^2 s^{-1}	0.60
second radiation constant	hc/k	1.438 769(12) cm K	8.4

---

[1] E.R. Cohen and B.N. Taylor, *Rev. Mod. Phys.* **59**, 1121 (1987).

[2] B.N. Taylor and E.R. Cohen, *J. Res. Natl. Inst. Stand. Technol.* **95**, 497 (1990).

[3] E.R. Cohen and B.N. Taylor, *Phys. Today*, **46**(8) Part 2, BG9 (1993).

[4] Defined at the Conférence Générale des Poids et Mesures, October, 1983.

Physical Constants (continued)

Useful constants and conversion factors

π= 3.141 592 653 589 793 238

e = 2.718 281 828 459 045 235

γ = 0.577 215 664 901 532 861

1 in = 2.54 cm

1 Å = 10^{-8} cm

1 fm = 10^{-13} cm

1 barn = 10^{-24} cm^2

1 newton = 10^5 dyne

1 joule = 10^7 erg

1 eV = 1.602 177 33(49)$\times10^{-12}$ erg

1 eV/c^2 = 1.782 662 70(54)$\times10^{-33}$ g

1 cal = 4.184 joule

1 coulomb = 2.997 924 58$\times10^9$ esu

1 tesla = 10^4 gauss

1 atm. = 1.013 25$\times10^6$ dyne/cm^2

0° C = 273.15 K

1 sidereal year = 3.155 814 98$\times10^7$ s

1 tropical year 3.155 692 52$\times10^7$ s

1 light year = 9.460 528$\times10^{17}$ cm

1 parsec = 3.261 633 light year

1 astro. unit = 1.495 978 706 6(2)$\times10^{13}$ cm

1 curie = 3.7$\times10^{10}$ disintegration /s

1 rad = 100 erg/ g of tissue

1 roentgen = 1 esu/ 0.001293 g of air

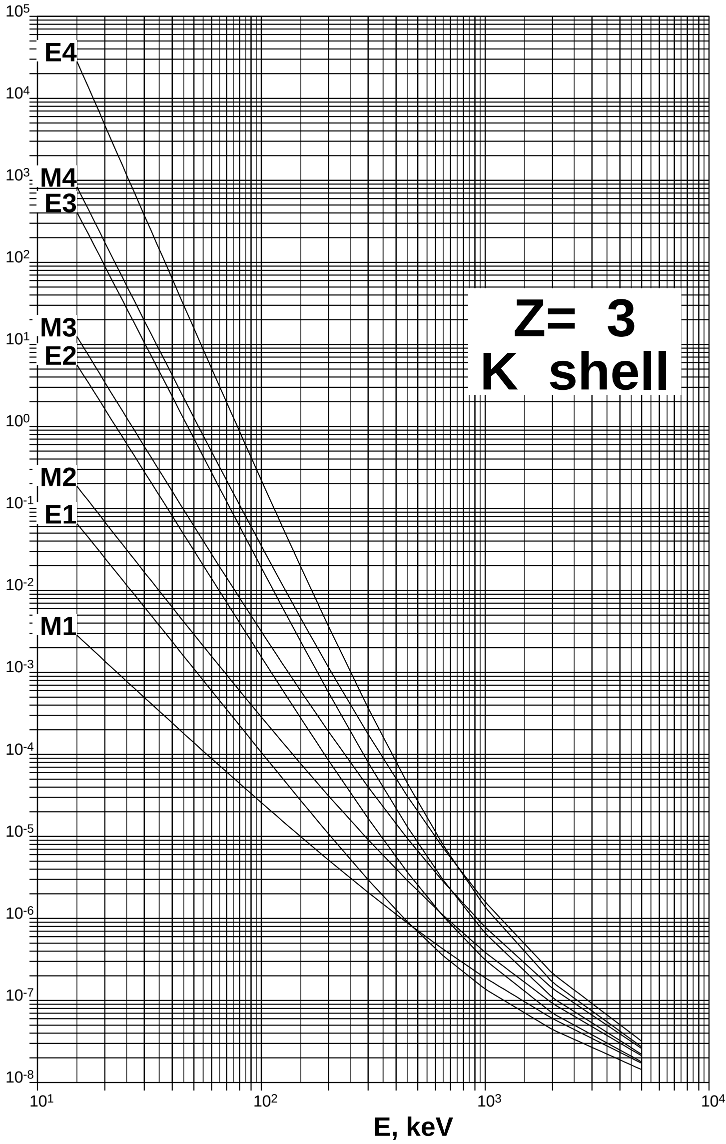
APPENDIX F. ATOMIC DATA

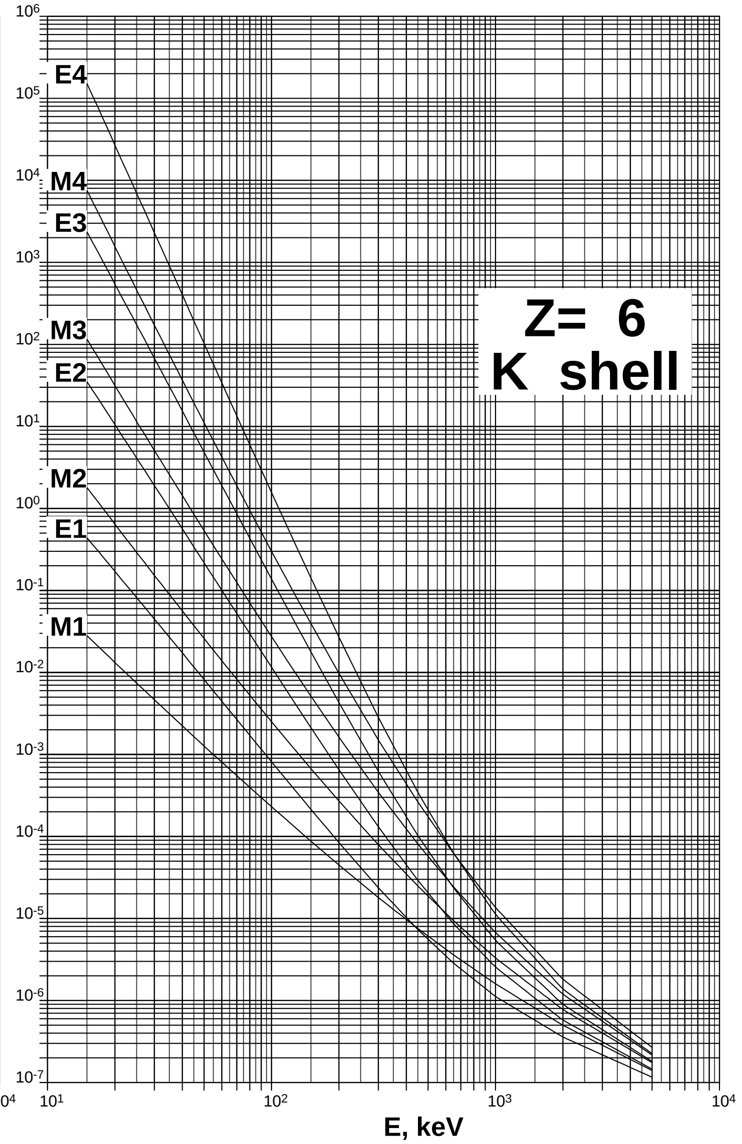
1. Theoretical Internal Conversion Coefficients

The following graphs provide selected theoretical conversion coefficients for *M*1, *M*2, *M*3, *M*4, *E*1, *E*2, *E*3, and *E*4 transitions to an accuracy of 3% to 5%. For atomic numbers *Z*=3, 6, 10, and 20, the graphs show *K*-shell and *L*-subshell conversion coefficients from Band *et al.*[1] For Z=30 through Z=100, they show *K*-shell, *L*- subshell, and total conversion coefficients from calculations by Rösel *et al.*[2]

Smooth curves have been drawn through the calculated data points by using a cubic spline fit to the logarithms of both energy and conversion coefficient. Discontinuities in the plots of total conversion coefficients occur at the binding energies of the *K* atomic shells, and the graphs at these energies indicate only the change in the conversion coefficient due to the presence of the *K*-shell edge. One should be aware that the cubic spline fit may not adequately represent this region and interpolation near the *K*-shell edge may be unreliable.

The *K* binding energies used by Rösel *et al* [2] for calculating conversion coefficients are from Bearden and Burr.[3] The newer and generally more precise *K* binding energies of Porter and Freedman[4] are somewhat different and, for some elements with *Z*≥84,[5] differ by more than 2 *keV*. One should be aware that these differences may significantly affect conversion coefficients near the *K* binding energy.





---

[1] I.M. Band, M.B. Trzhaskovskaya, and M.A. Listengarten, *At. Data and Nucl. Data Tables* **18**, 433 (1976).

[2] F. Rösel, H.M. Fries, K. Alder, and H.C. Pauli, *At. Data and Nucl. Data Tables* **21**, 91 (1978); **21**, 291 (1978).

[3] J.A. Bearden and A.F. Burr, *Rev. Mod. Phys.* **39**, 125 (1967).

[4] F.T. Porter and M.S. Freedman, *J. Phys. Chem. Ref. Data.* **7**, 1267 (1978).

[5] M.R. Schmorak, private communication (1982).

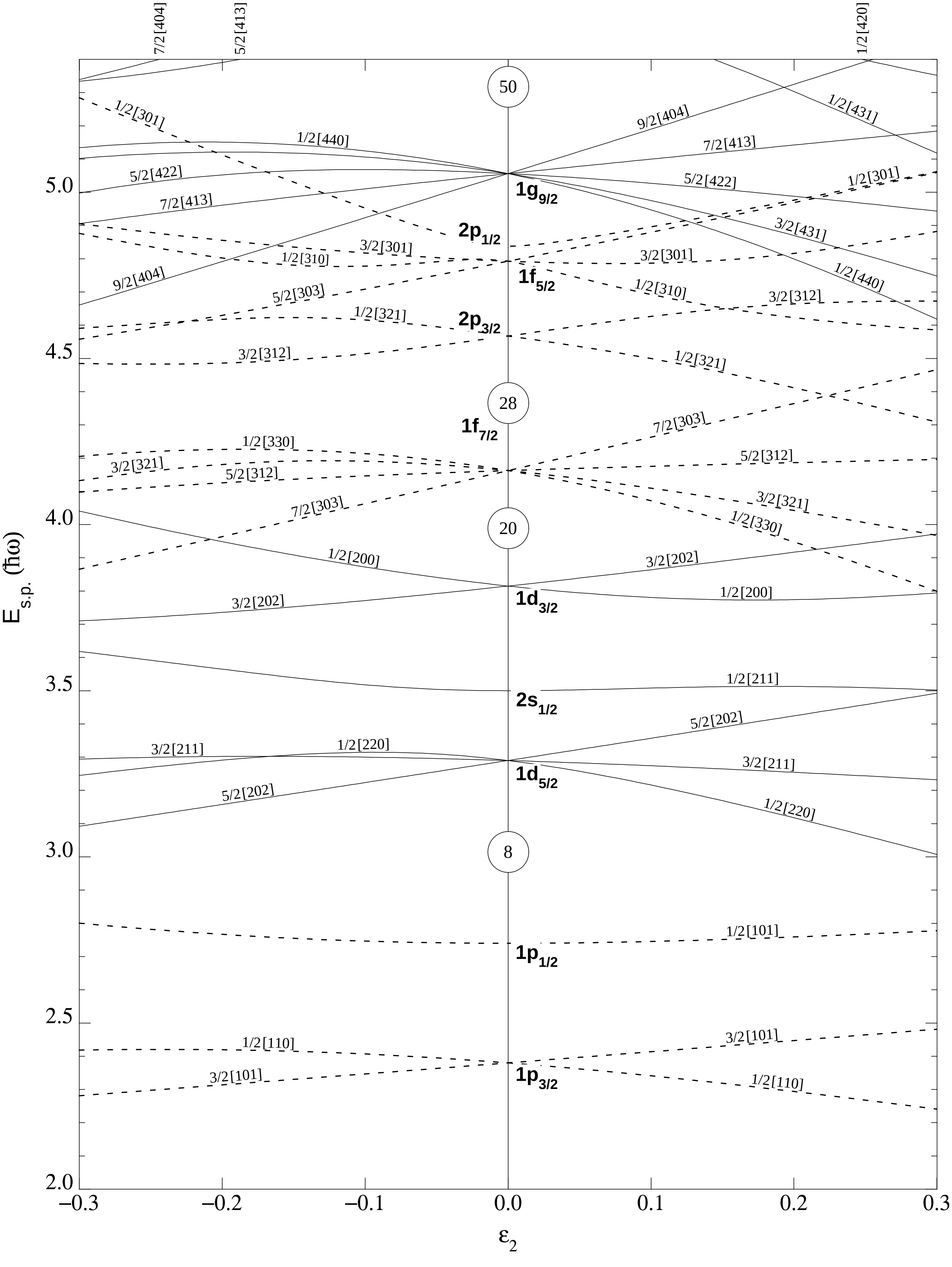


Figure 4. Nilsson diagram for protons or neutrons, Z or N ≤ 50 (ε_4 = 0).