Monographie BIPM-5

Table of Radionuclides
(Vol. 8 – A = 41 to 198)

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Preface

This monograph is one of several published in a series by the Bureau International des Poids et Mesures (BIPM) on behalf of the Consultative Committee for Ionizing Radiation (*Comité Consultatif des Rayonnements Ionisants,* CCRI[1]). The aim of this series of publications is to review topics that are of importance for the measurement of ionizing radiation and especially of radioactivity, in particular those techniques normally used by participants in international comparisons. It is expected that these publications will prove to be useful reference volumes both for those who are already engaged in this field and for those who are approaching such measurements for the first time.

The purpose of this monograph, number 5 in the series, is to present the recommended values of nuclear and decay data for a wide range of radionuclides. Activity measurements for more than sixty-seven of these radionuclides have already been the subject of comparisons under the auspices of Section II (dedicated to the Measurement of radionuclides) of the CCRI. The material for this monograph is now covered in eight volumes. The first two volumes contain the primary recommended data relating to half-lives, decay modes, x-rays, gamma-rays, electron emissions; alpha- and beta-particle transitions and emissions, and their uncertainties for a set of sixty-eight radionuclides, Volume 1 for mass numbers up to and including 150 and Volume 2 for mass numbers over 150. Volume 3 contains the equivalent data for twenty-six additional radionuclides and re-evaluations for ^{125}Sb and ^{153}Sm. Volume 4 contains the data for a further thirty-one radionuclides with a re-evaluation for ^{226}Ra. Volume 5 includes seventeen new radionuclide evaluations and eight re-evaluations. Volume 6 contains twenty-one new radionuclide evaluations and four re-evaluations. Volume 7 contains twenty-four new radionuclide evaluations and five re-evaluations. The present Volume 8 contains twenty-three new radionuclide evaluations and nine re-evaluations for ^{88}Y, ^{93m}Nb, ^{109}Cd, ^{131}I, ^{131m}Xe, ^{133}Ba, ^{140}Ba, ^{140}La and ^{198}Au. The data have been collated and evaluated by an international working group (Decay Data Evaluation Project, DDEP) led by the Laboratoire National de Métrologie et d'Essais – Laboratoire National Henri Becquerel (LNE-LNHB).

The evaluators have agreed on the methodologies to be used and their comments for each radionuclide in addition to the data tables in the present monograph can now both be found on the BIPM website at http://www.bipm.org/en/publications/scientific-output/monographies-ri.html. Consequently, the CD-ROM that accompanied previous issues is no longer deemed necessary and has been discontinued.

The work involved in evaluating nuclear data is ongoing and the recommended values are kept up to date on the LNE-LNHB website at http://www.nucleide.org/DDEP_WG/DDEPdata.htm.

The BIPM and the DDEP are most grateful to the International Atomic Energy Agency (IAEA) for their assistance and financial support to some evaluators in the production of data for Volumes 1 to 3 through their Coordinated Research Project ″Update of X Ray and Gamma Ray Decay Data Standards for Detector Calibration and Other Applications″, for Volumes 4 to 7 through their Coordinated Research Project ″Updated Decay Data Library for Actinides″ and for Volume 8 through their Coordinated Research Projects ″Testing and Improving the International Reactor Dosimetry and Fusion File (IRDFF)″ and ″Nuclear Data for Charged-particle Monitor Reactions and Medical Isotope Production″. The BIPM and the DDEP are indebted also to some other evaluators who participate in the United States Nuclear Data Program (USNDP) for their support to these publications. The publication of further volumes of Monographie 5 is envisaged when necessary to add new radionuclide data or re-evaluations in this more permanent format that can be referenced easily.

Although other data sets may still be used when evaluating radionuclide activity, the CCRI encourages the use of this common, recommended data set that should help to reduce the uncertainties in activity evaluations and lead to more coherent results for comparisons (2009, CCRI Report of 21st meeting, section 17.2).

W. Louw	M.J.T. Milton
President of the CCRI	Director of the BIPM

[1] previously known as the *Comité Consultatif pour les Étalons de Mesure des Rayonnements Ionisants* (CCEMRI)

Monographie BIPM-5 – Table of Radionuclides, Volume 8

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"TABLE DE RADIONUCLÉIDES"

Sommaire - Ce volume regroupe l'évaluation des radionucléides suivants :

^{41}Ca, ^{47}Sc, ^{52}Fe, ^{58}Co, ^{61}Cu, ^{63}Zn, ^{73}Se, ^{82}Rb, ^{82}Sr, ^{88}Y, ^{89}Zr, ^{93}Zr, ^{93m}Nb, ^{94m}Tc, ^{106}Ru, ^{106}Rh, ^{109}Cd, ^{127}Xe, ^{131}I, ^{131m}Xe, ^{133}Ba, ^{138}La, ^{140}Ba, ^{140}La, ^{144}Ce, ^{144}Pr, ^{144m}Pr, ^{148}Pm, ^{148m}Pm, ^{151}Sm, ^{169}Er, ^{198}Au.

Les valeurs recommandées et les incertitudes associées comprennent : la période radioactive, les modes de décroissance, les émissions α, β, γ, X et électroniques ainsi que les caractéristiques des transitions correspondantes.

"TABLE OF RADIONUCLIDES"

Summary - This volume includes the evaluation of the following radionuclides:

^{41}Ca, ^{47}Sc, ^{52}Fe, ^{58}Co, ^{61}Cu, ^{63}Zn, ^{73}Se, ^{82}Rb, ^{82}Sr, ^{88}Y, ^{89}Zr, ^{93}Zr, ^{93m}Nb, ^{94m}Tc, ^{106}Ru, ^{106}Rh, ^{109}Cd, ^{127}Xe, ^{131}I, ^{131m}Xe, ^{133}Ba, ^{138}La, ^{140}Ba, ^{140}La, ^{144}Ce, ^{144}Pr, ^{144m}Pr, ^{148}Pm, ^{148m}Pm, ^{151}Sm, ^{169}Er, ^{198}Au.

Primary recommended data comprise half-lives, decay modes, X-rays, gamma-rays, electron emissions, alpha- and beta-particle transitions and emissions, and their uncertainties.

"TABELLE DER RADIONUKLIDE"

Zusammenfassung – Dieser Band umfaßt die Evaluation der folgenden Radionuklide:

^{41}Ca, ^{47}Sc, ^{52}Fe, ^{58}Co, ^{61}Cu, ^{63}Zn, ^{73}Se, ^{82}Rb, ^{82}Sr, ^{88}Y, ^{89}Zr, ^{93}Zr, ^{93m}Nb, ^{94m}Tc, ^{106}Ru, ^{106}Rh, ^{109}Cd, ^{127}Xe, ^{131}I, ^{131m}Xe, ^{133}Ba, ^{138}La, ^{140}Ba, ^{140}La, ^{144}Ce, ^{144}Pr, ^{144m}Pr, ^{148}Pm, ^{148m}Pm, ^{151}Sm, ^{169}Er, ^{198}Au.

In diesem Bericht sind evaluierte Werte der Halbwertszeiten, Übergangswahrscheinlichkeiten und Übergangsenergien von α, $β^-$-, $β^+$-, EC- und Gammaübergängen, Konversionskoeffizienten von Gammaübergängen sowie der Emissionswahrscheinlichkeiten von Röntgen- und Gammaquanten, Auger- und Konversionselektronen und deren Unsicherheiten zusammengefaßt.

"ТАБЛИЦА РАДИОНУКЛИДОВ"

Резюме. Этот том включает оценки характеристик распада для следующих нуклидов:

^{41}Ca, ^{47}Sc, ^{52}Fe, ^{58}Co, ^{61}Cu, ^{63}Zn, ^{73}Se, ^{82}Rb, ^{82}Sr, ^{88}Y, ^{89}Zr, ^{93}Zr, ^{93m}Nb, ^{94m}Tc, ^{106}Ru, ^{106}Rh, ^{109}Cd, ^{127}Xe, ^{131}I, ^{131m}Xe, ^{133}Ba, ^{138}La, ^{140}Ba, ^{140}La, ^{144}Ce, ^{144}Pr, ^{144m}Pr, ^{148}Pm, ^{148m}Pm, ^{151}Sm, ^{169}Er, ^{198}Au.

Основные рекомендуемые данные включают периоды полураспада, виды распада, X-излучение, гамма-излучение, электронное излучение, альфа- и бета- переходы и излучения, а также погрешности рассмотренных величин.

"TABLA DE RADIONUCLEIDOS"

Contenido – Este volúmen agrupa la evaluación de los radionucleidos siguientes:

^{41}Ca, ^{47}Sc, ^{52}Fe, ^{58}Co, ^{61}Cu, ^{63}Zn, ^{73}Se, ^{82}Rb, ^{82}Sr, ^{88}Y, ^{89}Zr, ^{93}Zr, ^{93m}Nb, ^{94m}Tc, ^{106}Ru, ^{106}Rh, ^{109}Cd, ^{127}Xe, ^{131}I, ^{131m}Xe, ^{133}Ba, ^{138}La, ^{140}Ba, ^{140}La, ^{144}Ce, ^{144}Pr, ^{144m}Pr, ^{148}Pm, ^{148m}Pm, ^{151}Sm, ^{169}Er, ^{198}Au.

Los valores recomendados y las incertidumbres asociadas comprenden: el período de semidesintegración radiactiva, los modos de desintegración, las emisiones α, β, γ, X y electrónicas incluyendo las características de las transiciones correspondientes.

TABLE DE RADIONUCLÉIDES

TABLE OF RADIONUCLIDES

TABELLE DER RADIONUKLIDE

ТАБЛИЦА РАДИОНУКЛИДОВ

TABLA DE RADIONUCLEIDOS

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TABLE DE RADIONUCLÉIDES

INTRODUCTION

Le Laboratoire National Henri Becquerel (LNHB) a commencé l'étude des données nucléaires et atomiques qui caractérisent la décroissance des radionucléides en 1974. Ces évaluations ont fait l'objet de la publication des quatre volumes de la Table de Radionucléides [87Ta, 99Be] et de sept volumes de la *Monographie* BIPM-5 [04Be, 06Be, 08Be, 10Be, 11Be, 13Be]. Ce nouveau volume s'inscrit dans la continuation du travail précédent.

D'autre part, pour des raisons évidentes, telles la facilité de mise à jour des données ou la commodité de consultation pour les utilisateurs, le LNHB a créé une base de données informatisée. Le logiciel NUCLEIDE est la forme informatisée de cette table, il permet un accès aisé aux différentes informations à l'aide de menus déroulants atteints par un simple « clic » sur un « bouton ».

Le propos de la Table est d'étudier un nombre limité de radionucléides utiles dans le domaine de la métrologie ou dans des domaines variés d'applications (médecine nucléaire, environnement, cycle du combustible, etc.) et d'en présenter une étude complète.

Les données recommandées comprennent : la période radioactive, les modes de décroissance, les émissions α, β, γ, X et électroniques ainsi que les caractéristiques des transitions associées.

Dans le but de mettre à jour et d'ajouter de nouvelles évaluations plus rapidement Le Laboratoire National Henri Becquerel (LNHB, France) et le Physikalisch - Technische Bundesanstalt (PTB, Germany) ont établi un accord de coopération. Ils ont ensuite été rejoints par Idaho National Engineering & Environmental Laboratory (INEEL, USA), Lawrence Berkeley National Laboratory (LBNL, USA) et Khlopin Radium Institute (KRI, Russia). Le premier travail de cette collaboration internationale a été d'établir une méthode et des règles communes d'évaluation. Les évaluations proposent des valeurs recommandées et leurs incertitudes. Ces valeurs ont été évaluées à partir des données expérimentales disponibles. A défaut, elles sont issues de calculs théoriques. Toutes les références utilisées pour l'évaluation d'un radionucléide sont listées à la fin de chaque chapitre.

Ce volume est le huitième de la *Monographie* 5 publiée sous l'égide du BIPM.

VALEURS RECOMMANDÉES ET INCERTITUDES

Les principales étapes pour l'évaluation des données et leurs incertitudes sont :
- une analyse critique de toutes les publications disponibles afin de retenir ou non une valeur et son incertitude, ramenée à l'incertitude-type composée ;
- la détermination d'une valeur recommandée qui est, selon les cas, une moyenne simple ou pondérée des valeurs issues des publications, ceci est décidé après examen du chi carré réduit. Dans le cas d'une moyenne pondérée, le poids relatif de chaque valeur est limité à 50 %. L'incertitude, notée u_c, est la plus grande des valeurs des incertitudes interne ou externe ; dans le cas de valeurs incompatibles elle peut être étendue pour recouvrir la valeur la plus précise.

Pour certaines applications il est nécessaire de définir une incertitude élargie, notée U, telle que :
$U(y) = k \times u_c(y)$ où k est le facteur d'élargissement.
La valeur de k retenue pour cette publication est : $k = 1$.

Les valeurs d'incertitude indiquées portent sur les derniers chiffres significatifs, ainsi :
9,230 (11) signifie 9,230 ± 0,011 et
9,2 (11) 9,2 ± 1,1

Si une valeur est donnée sans incertitude, cela signifie qu'elle est considérée comme douteuse. Elle est indiquée à titre indicatif et souvent a été estimée en fonction du schéma de désintégration comme étant « de l'ordre de ».

Des précisions concernant les techniques d'évaluation peuvent être obtenues dans les références [85Zi], [96He], [99In] (voir rubrique Références) ou directement auprès des auteurs.
La description physique des données évaluées est disponible dans la référence [99In].

NUMÉROTAGE

Les niveaux d'un noyau sont numérotés, arbitrairement, de 0 pour le niveau fondamental à *n* pour le énième niveau excité. Les diverses transitions sont ainsi repérées par leur niveau de départ et leur niveau d'arrivée. Dans le cas de transition de faible probabilité qu'il n'est pas possible de situer sur le schéma de désintégration, les niveaux de départ et d'arrivée sont notés (-1, *n*).
Dans le cas de l'émission gamma de 511 keV qui suit une désintégration bêta plus, la notation adoptée est : (-1, -1).

UNITÉS

Les valeurs recommandées sont exprimées :
- pour les périodes :

	Symbole
. en secondes pour $T_{1/2}$ <= 60 secondes	s
. en minutes pour $T_{1/2}$ > 60 secondes	min
. en heures pour $T_{1/2}$ > 60 minutes	h
. en jours pour $T_{1/2}$ > 24 heures	d
. en années pour $T_{1/2}$ > 365 jours	a

1 année = 365,242 198 jours = 31 556 926 secondes ;

- pour les probabilités de transition et nombre de particules émises, les valeurs sont données pour 100 désintégrations ;

- les énergies sont exprimées en keV.

Remarque : Si une valeur plus précise de la période est nécessaire, par exemple en jours plutôt qu'en années, le lecteur se référera aux commentaires de l'évaluation inclus sur le CD-Rom ou sur les sites web du LNE-LNHB ou du BIPM. Ceci évitera l'introduction d'erreurs d'arrondi supplémentaires en cas de conversion d'unités.

AVERTISSEMENT

Ce document a été imprimé en 2016, pour toutes les nouvelles évaluations et mises à jour ultérieures, le lecteur se référera aux documents accessibles sur :
http://www.nucleide.org/NucData.htm
http://www.bipm.org/fr/publications/monographie-ri-5.html

TABLE OF RADIONUCLIDES

INTRODUCTION

The evaluation of decay data for the “Table de Radionucléides” by the Bureau National de Métrologie – Laboratoire National Henri Becquerel/Commissariat à L'Énergie Atomique (BNM – LNHB/CEA) began in 1974, continued to 1987 and four volumes were published [87Ta, 99Be]. This work has been pursued and seven volumes of evaluations have already been published as *Monographie* BIPM-5 [04Be, 06Be, 08Be, 10Be, 11Be, 13Be].
Moreover, LNHB developed a database and related software (NUCLÉIDE) with the objectives of making it easier to update and add data and, obviously, to offer easy access to the nuclear and atomic decay data to the user by “click on the button” facilities.
The aim of this Table is to provide recommended data for nuclides of special interest for metrology or practical applications like nuclear medicine, monitoring and reactor shielding, etc.
Primary recommended data comprise half-lives, decay modes, X-rays, gamma-rays, electron emissions, alpha- and beta-particle transitions and emissions, and their uncertainties. All the references used for the evaluations are given.
In order to update the data of the nuclides already present and to add new evaluations, the Laboratoire National Henri Becquerel (LNHB, France) and the Physikalisch-Technische Bundesanstalt (PTB, Germany) established a cooperative agreement; they were then joined by the Idaho National Engineering & Environmental Laboratory (INEEL, USA), the Lawrence Berkeley National Laboratory (LBNL, USA) and the Khlopin Radium Institute (KRI, Russia). This international collaboration is based on an informal agreement; the initial work of this group was to discuss and to agree on a methodology to be used in these evaluations. The data and associated uncertainties were evaluated from all available experiments and taking into account theoretical considerations.

This volume is the eighth in the series of the *Monographie* 5 published under the auspices of the BIPM.

RECOMMENDED VALUES AND UNCERTAINTIES

The main steps for the evaluation of the data and their uncertainties are:
- a critical analysis of all available original publications in order to accept or not each value and its uncertainty reduced to the combined standard uncertainty;
- the determination of the best value which is either the weighted or the unweighted average of the retained values, this is decided after examination of the reduced χ^2 value. For a weighted average of discrepant data, each weight is limited to 50 %, and the uncertainty, designated u_c, is the larger of the internal or external uncertainty values, which may be expanded to cover the most precise input value.

For some applications it may be necessary to define an expanded uncertainty, designated U, as:
$U(y) = k \times u_c(y)$ where k is the coverage factor.
In this publication, standard uncertainties are quoted (i.e. $k = 1$).

The value of the uncertainty, in parentheses, applies to the least significant digits, i.e.:
9.230 (11) means 9.230 ± 0.011 and
9.2 (11) 9.2 ± 1.1

A value given without an uncertainty is considered questionable. It is provided for information and often its order of magnitude is estimated from the decay scheme.

Information on evaluation methods may be obtained from references [85Zi, 96He, 99In] or directly from the authors.
Information on the meaning of physical data may be obtained from reference [99In].

NUMBERING

Nuclear levels are arbitrarily numbered from 0 (for the ground state level) to *n* (for the *n*th excited level).
All transitions are designated by their initial and final levels.
For transitions with weak emission probabilities that are not shown by an arrow in the decay scheme, the initial and final levels are noted (-1, *n*).
For a 511 keV gamma emission, which follows a beta plus disintegration, the adopted numbering is (-1, -1).

UNITS

The recommended values are given:
- for half-lives:

	Symbol
. in seconds for $T_{1/2}$ <= 60 seconds	s
. in minutes for $T_{1/2}$ > 60 seconds	min
. in hours for $T_{1/2}$ > 60 minutes	h
. in days for $T_{1/2}$ > 24 hours	d
. in years for $T_{1/2}$ > 365 days	a

1 year = 1 a = 365.242 198 d = 31 556 926 s

- for transition probabilities and number of emitted particles, the values are given for 100 disintegrations of the parent nuclide.

- for energies, the values are expressed in keV.

Remark: When a more precise evaluation of a half life is required, for example in days instead of years, the reader is referred to the commented evaluation included on the CD ROM or on the websites of the LNE-LNHB or the BIPM. This will avoid the introduction of rounding errors.

NOTICE

This report was printed in 2016. New evaluations and updated issues will be available on:
http://www.nucleide.org/NucData.htm
http://www.bipm.org/en/publications/monographie-ri-5.html

TABELLE DER RADIONUKLIDE

EINLEITUNG

Die Evaluation der Zerfallsdaten für die „Table de Radionucléides“ durch das Laboratoire National Henri Becquerel (BNM-LNHB/CEA) begann im Jahre 1974, diese Arbeit wurde bis 1987 fortgesetzt, und es wurden vier Bände veröffentlicht [87Ta, 99Be]. Seitdem sind des weiteren sieben Bände der *Monographie* BIPM-5 [04Be, 06Be, 08Be, 10Be, 11Be, 13Be] erschienen. Der vorliegende neue Band stellt die Fortsetzung der vorhergehenden Arbeit dar.
Darüber hinaus wurde im LNHB eine computerbasierte Datenbank entwickelt. Die Software NUCLEIDE erleichtert die Aktualisierung und die Einbeziehung weiterer Daten und ermöglicht den Zugang zu den Kern- und Atomdaten für den Anwender „auf Tastendruck“.
Der Zweck dieser Tabelle ist es, empfohlene Daten einer begrenzten Anzahl von Radionukliden für metrologische und praktische Anwendungen wie etwa in der Nuklearmedizin, der Umweltüberwachung, dem Brennstoffkreislauf, der Reaktorabschirmung usw. zur Verfügung zu stellen.
Die empfohlenen Daten betreffen die Halbwertszeit, die Art des Zerfalls und die Charakteristika der α-, β-, γ-, Röntgen- und Elektronenemissionen und der entsprechenden Übergänge.
Um die bereits vorliegenden Daten zu aktualisieren und neue Evaluationen schneller einbeziehen zu können, vereinbarten das Laboratoire National Henri Becquerel (LNHB, Frankreich) und die Physikalisch-Technische Bundesanstalt (PTB, Deutschland) eine Übereinkunft zur Zusammenarbeit. Es schlossen sich das Idaho National Engineering and Environmental Laboratory (INEEL, USA), das Lawrence Berkeley National Laboratory (LBNL, USA) und das Khlopin Radium Institute (KRI, Rußland) an. Eine der ersten Arbeiten dieser Gruppe war es, die in diesen Evaluationen benutzte Methodologie zu diskutieren und festzulegen. Die Datenbank umfaßt empfohlene Daten und ihre Unsicherheiten, die aus den verfügbaren experimentellen Daten oder theoretischen Berechnungen gewonnen wurden. Alle für die Evaluation benutzten Referenzen werden angegeben.
Dieser Band ist die achte Ausgabe der *Monographie* BIPM-5.

EMPFOHLENE WERTE UND UNSICHERHEITEN

Die Hauptschritte für die Evaluation der Daten und Unsicherheiten sind:
- Eine kritische Analyse aller verfügbaren Veröffentlichungen, um einen jeweils veröffentlichten Wert und seine Unsicherheit - auf die kombinierte Standardunsicherheit zurückgeführt - zu berücksichtigen oder auszuschließen.
- Die Bestimmung eines empfohlenen Wertes, der entweder das gewichtete oder das ungewichtete Mittel der veröffentlichten Werte ist. Die Entscheidung wird nach der Prüfung des reduzierten Chi-Quadrat-Werts getroffen. Im Falle des gewichteten Mittels wird das Gewicht jedes Einzelwerts auf 50 % begrenzt. Die Unsicherheit, als u_c bezeichnet, ist der größere Wert der inneren oder äußeren Unsicherheit. Für einen diskrepanten Datensatz kann sie so vergrößert werden, daß der genaueste Einzelwert in der Unsicherheit mit eingeschlossen ist.

Für einige Anwendungen ist es notwendig, eine vergrößerte Unsicherheit, als U bezeichnet, wie folgt zu definieren:
$U(y) = k \times u_c(y)$ wo k der Erweiterungsfaktor ist.
Für die vorliegende Veröffentlichung ist die erweitere Unsicherheit mit $k = 1$ berechnet.

Die Werte der Unsicherheit beziehen sich auf die letzten Stellen, d. h.:
9,230(11) bedeutet 9,230 ± 0,011 und
9,2(11) bedeutet 9,2 ± 1,1

Wenn ein Wert ohne Unsicherheit angegeben ist, bedeutet das, daß dieser Wert als fragwürdig zu betrachten ist. Er wird zur Information mitgeteilt und ist oft abgeschätzt aus dem Zerfallsschema im Sinne „in der Größenordnung von“.
Informationen über die Evaluationsprozedur können aus den Referenzen [85Zi, 96He, 99In] oder direkt von den Autoren bezogen werden.

Die Bedeutung der evaluierten Daten kann aus Ref. [99In] entnommen werden.

NUMERIERUNG

Die Kernniveaus werden willkürlich numeriert von 0 für den Grundzustand bis zu *n* für das n-te angeregte Niveau. Alle Übergänge werden durch ihr Ausgangs- und Endniveau gekennzeichnet. Für Übergänge mit geringen Wahrscheinlichkeiten, die nicht im Zerfallsschema gezeigt werden können, werden als Ausgangs- und Endniveau (-1, *n*) angegeben.

Für die 511 keV-Gamma-Emission, die dem Beta Plus-Zerfall folgt, ist die angenommene Numerierung (-1, -1).

EINHEITEN

Die empfohlenen Werte sind ausgedrückt:
- für Halbwertszeiten:

. in Sekunden für $T_{1/2} \leq 60$ Sekunden	s
. in Minuten für $T_{1/2} > 60$ Sekunden	min
. in Stunden für $T_{1/2} > 60$ Minuten	h
. in Tagen für $T_{1/2} > 24$ Stunden	d
. in Jahren für $T_{1/2} > 365$ Tage	a

1 a = 365,242 198 d = 31 556 926 s

- für Übergangswahrscheinlichkeiten und die Anzahl der emittierten Teilchen werden Werte angegeben, die sich auf 100 Zerfälle beziehen.

- die Werte der Energien sind in keV ausgedrückt.

HINWEIS

Dieses Dokument wurde im Jahre 2016 erstellt. Alle späteren Fassungen oder neueren Evaluationen können vom Leser unter
http://www.nucleide.org/NucData.htm
http://www.bipm.org/en/publications/monographie-ri-5.html
abgerufen werden.

ТАБЛИЦА РАДИОНУКЛИДОВ

ВВЕДЕНИЕ

Оценка данных распада для Table de Radionucléides, BNM – LNHB/CEA, была начата в 1974 г. и продолжалась до 1987 г. К тому времени были опубликованы четыре тома [87Ta] и затем, в 1999 г., был опубликован пятый том, содержащий ревизованные оценки для 30 выбранных радионуклидов [99Be]. Эта работа была продолжена, и семь тома были опубликованы как *Monographie* BIPM-5 [04Be, 06Be, 08Be, 10Be, 11Be, 13Be].
В дополнение в LNHB была развита компьютерная форма Table de Radionucléides (программа NUCLEIDE) с тем, чтобы обеспечить более простое обновление и дополнение данных и, очевидно, также с целью предложить пользователю более легкий доступ к ядерным и атомным данным распада путем "нажатия кнопки".
Цель настоящего издания - дать рекомендованные данные для нуклидов, представляющих специфический интерес для метрологии или практических приложений, таких как ядерная медицина, мониторинг, реакторная защита и др.
Первичные рекомендованные данные включают периоды полураспада, виды распада, характеристики X- и гамма-излучений, электронных излучений, альфа- и бета-переходов и излучений и погрешности величин этих характеристик. В книге дан полный список литературы, использованной для оценок.
Для того чтобы обновить данные по нуклидам, уже имеющимся в Table de Radionucléides, и добавить новые оценки, Национальная лаборатория им. Анри Беккереля (LNHB, Франция) и Физико-Технический Институт (PTB, Германия) заключили кооперативное соглашение. К ним затем присоединились Национальная лаборатория прикладных и экологических исследований Айдахо (INEEL, США), Лоуренсовская Национальная Лаборатория Беркли (LBNL, США) и Радиевый институт им. В.Г. Хлопина (KRI, Россия). Это международное сотрудничество основано на неформальном соглашении. Первоначальная работа состояла в обсуждении и принятии согласованной методологии, которая должна быть использована в этих оценках. Данные и связанные с ними погрешности были оценены с использованием всех имеющихся в распоряжении результатов экспериментов и с учетом теоретических рассмотрений.

Настоящий том представляет собой восьмой выпуск *Monographie* BIPM-5.

РЕКОМЕНДОВАННЫЕ ЗНАЧЕНИЯ И ПОГРЕШНОСТИ

Основные шаги для оценки данных и их погрешностей следующие:

- критический анализ всех имеющихся оригинальных публикаций, чтобы принять или отвергнуть данное значение и его погрешность, приведенную к комбинированному стандартному отклонению;

- определение лучшего значения, которое является взвешенным или невзвешенным средним сохраненных величин; выбор взвешенного или невзвешенного среднего определяется анализом величины χ^2. В случае среднего взвешенного вес каждого оригинального результата ограничивается 50 %. В качестве итоговой погрешности (u_c) принимается большая из двух погрешностей среднего взвешенного: внутренней и внешней. Для расходящегося набора данных она может быть расширена, чтобы перекрыть самое точное входное значение.

Для некоторых применений может оказаться необходимым расширенная погрешность (U), выраженная как: $U(y) = k \times u_c(y)$, где k - коэффициент перекрытия. Для этой публикации принято $k = 1$.

Значение погрешности, в скобках, приводится в единицах последней значащей цифры, т.е.:

9,230 (11) означает	9,230 ± 0,011	и
9,2 (11)	9,2 ± 1,1	

Если значение величины дается без погрешности, она считается сомнительной и приводится для информации. Такие величины часто оценивались из схемы распада под рубрикой "порядка".

Информацию о процедурах оценки можно получить из публикаций [85Zi, 96He, 99In] или непосредственно от авторов.
Информация о смысле физических величин может быть получена из [99In].

НУМЕРАЦИЯ

Ядерные уровни произвольно пронумерованы от 0 для основного состояния до *n* для n-ого возбужденного уровня. Все переходы обозначаются по их начальному и конечному уровням.
Для слабых переходов, не показанных стрелкой в схеме распада, начальный и конечный уровни обозначаются как (-1, *n*).
Для гамма-излучения с энергией 511 кэВ, которое следует за бета-плюс распадом, принято обозначение (-1, -1).

ЕДИНИЦЫ

Рекомендованные значения выражены:

- для периодов полураспада:

. в секундах для $T_{1/2} \leq 60$ секунд	s
. в минутах для $T_{1/2} > 60$ секунд	min
. в часах для $T_{1/2} > 60$ минут	h
. в сутках для $T_{1/2} > 24$ часов	d
. в годах для $T_{1/2} > 365$ суток	a

1 год = 365,242198 суток = 31 556 926 секунд

- для вероятностей переходов и числа испускаемых частиц значения даны на 100 распадов;

- для энергий значения выражены в килоэлектронвольтах (keV).

ПРИМЕЧАНИЕ

Этот выпуск подготовлен в 2016 г. Новые оценки и обновленные результаты можно найти на сайте:
http://www.nucleide.org/NucData.htm
http://www.bipm.org/en/publications/monographie-ri-5.html

TABLA DE RADIONUCLEIDOS

INTRODUCCION

El Laboratorio Nacional Henri Becquerel (LNHB) inició en 1974 el estudio de datos nucleares y atómicos que caracterizan la desintegración de radionucleidos. Esas evaluaciones han permitido la publicación de cuatro volúmenes de la Tabla de Radionucleidos [87Ta, 99Be]. Este nuevo volumen es el siguiente en la continuación del estudio precedente *Monographie* BIPM-5 [04Be, 06Be, 08Be, 10Be, 11Be, 13Be].

Para facilitar la corrección de nueva información y mejorar la comodidad de consulta a los lectores, el LNHB a creado una base de datos informatizada. El programa NUCLEIDE permite el acceso a la Tabla de Radionucleidos con la ayuda de menues en cascada disponibles con un simple « clic ».

El objetivo de la Tabla de Radionucleidos es el de proporcionar información sobre un número limitado de radionucleidos utilizados en el campo de la metrología o en otras disciplinas (medicina nuclear, medio ambiente, ciclo del combustible,etc.)

Los datos recomendados incluyen : el período de semidesintegración, los modos de desintegración, las emisiones α, β, γ, X y de electrones atómicos asociados a las mismas.

Con el propósito de actualizar y agregar nuevas evaluaciones rapidamente el *Laboratoire National Henri Becquerel* (LNHB, Francia) y el *Physikalisch-Technische Bundesanstalt* (PTB , Alemania) establecieron un acuerdo de colaboración. Posteriormente se unieron el *Idaho National Engineering & Environmental Laboratory* (INEEL, USA), *Lawrence Berkeley National Laboratory* LBNL, USA) y *Khlopin Radium Institute* (KRI, Rusia). El primer trabajo de esta colaboración internacional fue el de establecer el método y las reglas comunes de evaluación. Las evaluaciones proponen valores recomendados e incertidumbres asociadas. Éstos valores han sido evaluados a partir de datos experimentales. En su ausencia, los valores se obtienen por cálculos teóricos. Todas las referencias utilizadas para la evaluación de un radionucleido se citan al final de cada capítulo.

VALORES RECOMENDADOS E INCERTIDUMBRES

Las principales etapas para evaluar datos con sus incertidumbres son:

- Un análisis crítico de todas las publicaciones disponibles con el fin de obtener un valor con su incertidumbre, considerada como incertidumbre típica combinada.
- La determinación de un valor recomendado que es, según el caso, una media simple o ponderada de valores obtenidos de publicaciones. Ésto se decide tras el chi-cuadrado reducido. En el caso de una media ponderada para conjuntos de valores discrepantes, el peso estadístico relativo de cada valor es limitado al 50 %. La incertidumbre, $\boldsymbol{u_c}$, es el mayor de los valores de las incertidumbres interna o externa. En el caso de conjuntos de valores discrepantes, este valor puede ser extendido con el fin de incluir el valor experimental más preciso.

Para ciertas aplicaciones, es necesario definir una incertidumbre expandida, llamada $\boldsymbol{U}$:
$\boldsymbol{U}(y) = k \times \boldsymbol{u_c}(y)$ donde k es el factor de cobertura.
El valor de k utilizado en esta publicación es: $k = 1$.

Los valores de incertidumbres indicados entre paréntesis corresponden a las últimas cifras significativas, por ejemplo:
9,230 (11) significa 9,230 ± 0,011 y
9,2 (11) significa 9,2 ± 1,1

Valores dados sin incertidumbres se consideran dudosos (usualmente se presentan como valores aproximados, y a menudo estimados a partir de los esquemas de desintegración).
Para más información sobre las técnicas de evaluación consultar [85Zi], [96He], [99In] o directamente con el autor.

NUMERACION

Los niveles de un núcleo están arbitrariamente numerados desde “0” (para el nivel fundamental), hasta “*n*” para el enésimo nivel excitado. Las transiciones se representan por sus niveles inicial y final.
En el caso de una transición débil e imposible de situar en el esquema de desintegración, el nivel inicial y el final están designados con la siguiente notación: (-1, *n*).
En el caso de una emisión γ de 511 keV que sigue a una desintegración β^+, la notación adoptada es: (-1, -1).

UNIDADES

Los valores recomendados se dan:
- para los períodos de semidesintegración:

	Símbolo
. en segundos para $T_{1/2} \leq 60$ segundos	s
. en minutos para $T_{1/2} > 60$ segundos	min
. en horas para $T_{1/2} > 60$ minutos	h
. en días para $T_{1/2} > 24$ horas	d
. en años para $T_{1/2} > 365$ días	a

1 año = 365,242 198 días = 31 556 926 segundos;

- para las probabilidades de transición y número de partículas emitidas, los valores se dan por 100 desintegraciones;
- para las energías, los valores se expresan en keV.

ADVERTENCIA

Este documento ha sido imprimido en el 2016. Para obtener todas las nuevas evaluaciones actualizadas ulteriormente, el lector deberá referirse a los documentos disponibles en:
http://www.nucleide.org/NucData.htm
http://www.bipm.org/en/publications/monographie-ri-5.html

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[11Be] **Marie-Martine BÉ, Vanessa CHISTÉ, Christophe DULIEU, Xavier MOUGEOT, Valery CHECHEV, Nikolay KUZMENKO, Filip G. KONDEV, Aurelian LUCA, Mónica GALÁN, Arzu ARINC, Xiaolong HUANG, B. WANG, Alan NICHOLS.** Table of Radionuclides, Monographie BIPM-5, vol.6, ISBN 13 978-92-822-2242-3 (Vol. 6) et 13 978-92-822-2243-0 (CD-Rom), CEA/LNE-LNHB, 91191 Gif-sur-Yvette, France and BIPM, Pavillon de Breteuil, 92312 Sèvres, France.
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[13Be] **Marie-Martine BÉ, Vanessa CHISTÉ, Christophe DULIEU, Xavier MOUGEOT, Valery CHECHEV, Filip G. KONDEV, Alan L. NICHOLS, Xiaolong HUANG, Baosong WANG.** Table of Radionuclides, Monographie BIPM-5, vol.7, ISBN 13 978-92-822-2248-5 (Vol. 7) et 13 978-92-822-2249-2 (CD-Rom), CEA/LNE-LNHB, 91191 Gif-sur-Yvette, France and BIPM, Pavillon de Breteuil, 92312 Sèvres, France.
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Toutes demandes de renseignements concernant les données recommandées et la façon dont elles ont été établies doivent être adressées directement aux auteurs des évaluations.

Information on the data and the evaluation methods is available from the authors listed below.

Informationen über die Daten und Evaluationsprozeduren können bei den im folgenden zusammengestellten Autoren angefordert werden:

Todos los pedidos de información relativos a datos recomendados y la manera de establecerlos deben dirigirse directamente a los autores de las evaluaciones.

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* : updated evaluations

Volume 3 - A = 3 to 244

* : updated evaluations

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* : updated evaluations

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(Volumes 1 to 8 – All nuclides sorted by alphabetical order)

* : updated evaluations

$^{41}_{20}$Ca $_{21}$

1 Decay Scheme

^{41}Ca disintegrates by 100% electron-capture transition to the ground state of the stable nuclide ^{41}K.

Le calcium 41 se désintègre exclusivement par capture électronique vers le niveau fondamental du potassium 41.

2 Nuclear Data

$T_{1/2}$(^{41}Ca)	:	1,002	(17)	10^5 a
Q^+(^{41}Ca)	:	421,63	(14)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_{M+}
$\epsilon_{0,0}$	421,63 (14)	100	Unique 1st forbidden	10,53	0,894 (9)	0,0916 (9)	0,01482 (15)

3 Atomic Data

3.1 K

ω_K	:	0,143	(4)
$\bar{\omega}_L$	:	0,00181	(36)
n_{KL}	:	1,654	(6)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	3,3111	50,55
	$K\alpha_1$	3,3138	100
	$K\beta_1$	3,5896	} 18,44
	$K\beta_5''$	3,6028	}
X_L			
	$L\ell$	0,2604	
	$L\eta$	0,263	
	$L\beta$	0,29654 - 0,3618	
	$L\gamma$	0,29917 - 0,29917	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	2,615 - 2,985	100
KLX	3,183 - 3,296	24,5
KXY	3,540 - 3,572	1,5
Auger L	0,226 - 0,342	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(K)	0,226 - 0,342	9,16 (9)
e_{AK}	(K)		} 76,6 (9)
	KLL	2,615 - 2,985	}
	KLX	3,183 - 3,296	}
	KXY	3,540 - 3,572	}

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(K)	0,2604 - 0,3618	0,017 (4)	
XKα_2	(K)	3,3111	3,82 (12)	} Kα
XKα_1	(K)	3,3138	7,56 (23)	}
XKβ_1	(K)	3,5896 }	1,40 (5)	K$'\beta_1$
XKβ_5''	(K)	3,6028 }		

6 Main Production Modes

$^{40}Ca(n,\gamma)^{41}Ca$ σ : 0,41 (2) barns

Possible impurities : $^{44}Ca(n,\gamma)^{45}Ca$ σ : 0,88 (5) barns

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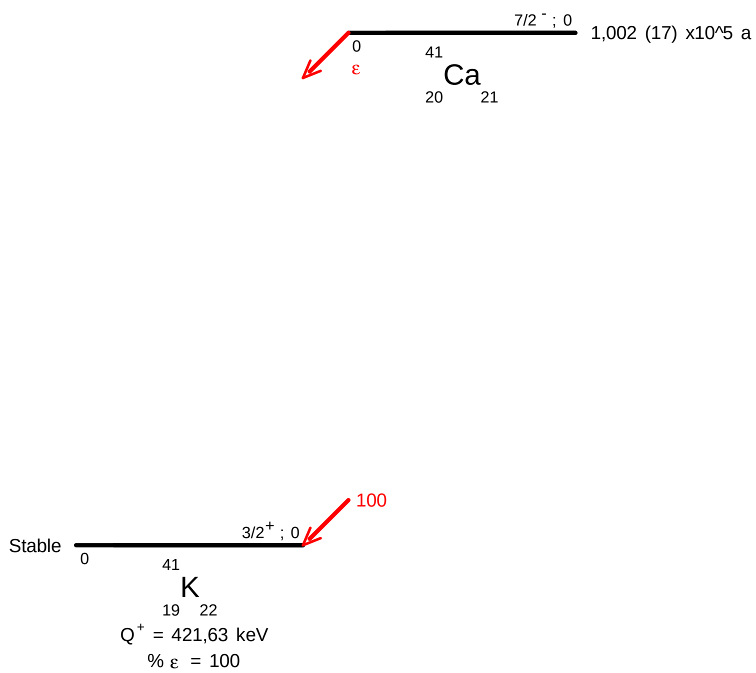
7/2 ⁻ ; 0
1,002 (17) x10^5 a
0
ε
41
Ca
20
21
100
Stable
3/2+ ; 0
0
41
K
19
22
Q+ = 421,63 keV
% ε = 100

$^{47}_{21}$Sc $_{26}$

1 Decay Scheme

Le scandium 47 se désintègre par émission bêta moins vers le niveau excité de 159 keV et le niveau fondamental du titane 47.

Sc-47 decays by beta minus emission to the 159 keV excited level and the ground state of Ti-47.

2 Nuclear Data

$T_{1/2}$(^{47}Sc)	:	3,3485	(9)	d
Q^-(^{47}Sc)	:	600,8	(19)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,1}$	441,4 (19)	68,5 (5)	Allowed	5,3
$\beta^-_{0,0}$	600,8 (19)	31,5 (5)	Allowed	6,1

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-5})	α_T (10^{-3})
$\gamma_{1,0}$(Ti)	159,373 (12)	68,5 (5)	M1+0,97(17)%E2	5,60 (12)	5,12 (11)	6,54 (14)	6,18 (13)

3 Atomic Data

3.1 Ti

ω_K	:	0,226	(5)
$\bar{\omega}_L$	:	0,00321	(64)
n_{KL}	:	1,566	(5)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	4,50491	50,76
	$K\alpha_1$	4,5109	100
	$K\beta_1$	4,93186	} 19,98
	$K\beta_5''$	4,9623	}

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	3,79 - 4,01	100
KLX	4,33 - 4,48	18,9
KXY	4,83 - 4,90	1,35
Auger L	0,3 - 0,5	

4 Electron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Ti)	0,3 - 0,5		0,0349 (8)
e_{AK}	(Ti)			
	KLL	3,79 - 4,01		}
	KLX	4,33 - 4,48		} 0,295 (7)
	KXY	4,83 - 4,90		}
$ec_{1,0\ K}$	(Ti)	154,407	(12)	0,381 (9)
$ec_{1,0\ L}$	(Ti)	158,809 - 158,918		0,0349 (8)
$\beta^-_{0,1}$	max:	441,4	(19)	} 68,5 (5)
	avg:	142,8	(7)	}
$\beta^-_{0,0}$	max:	600,8	(19)	} 31,5 (5)
	avg:	204,2	(8)	}

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
$XK\alpha_2$	(Ti)	4,50491	0,0256 (9)	} $K\alpha$
$XK\alpha_1$	(Ti)	4,5109	0,0505 (16)	}
$XK\beta_1$	(Ti)	4,93186 }	0,0101 (4)	$K'\beta_1$
$XK\beta''_5$	(Ti)	4,9623 }		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Ti)	159,373 (12)	68,1 (5)

6 Main Production Modes

{ Ti – 47(n,p)Sc – 47 σ : 0,23 (4) barns
  Possible impurities: Sc – 46, Sc – 48, Ca – 45

{ Ca – 48(p,2n)Sc – 47
  Possible impurities: Sc – 46, Sc – 48

{ Ti – 49(d,α)Sc – 47
  Possible impurities: Ca – 45

Ca – 44(α,p)Sc – 47

Ca – 46(d,n)Sc – 47

Ca – 46(p,γ)Sc – 47

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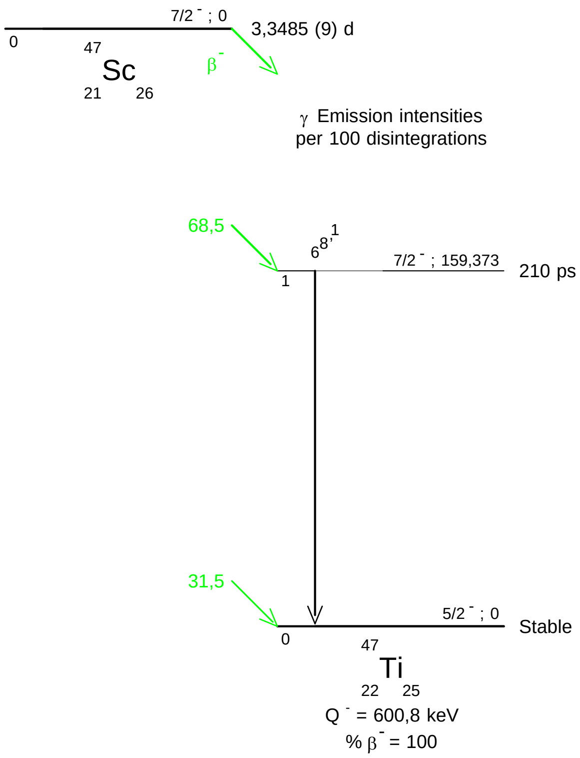
7/2 - ; 0
3,3485 (9) d
0
47
Sc
21
26
β-
γ Emission intensities
per 100 disintegrations
68,5
68,1
7/2 - ; 159,373
210 ps
1
31,5
5/2 - ; 0
Stable
0
47
Ti
22
25
Q - = 600,8 keV
% β- = 100

$$^{52}_{26}\mathrm{Fe}_{26}$$

1 Decay Scheme

Fe-52 disintegrates 100% by electron capture and positron decay to excited levels in Mn-52.
Le fer 52 se désintègre par capture électronique et émissions bêta plus sur des niveaux excités de manganèse 52.

2 Nuclear Data

$T_{1/2}(^{52}\mathrm{Fe})$	:	8,273	(8)	h
$T_{1/2}(^{52}\mathrm{Mn})$	:	5,591	(3)	d
$T_{1/2}(^{52m}\mathrm{Mn})$	:	21,1	(2)	min
$Q^+(^{52}\mathrm{Fe})$	:	2375	(6)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,3}$	957 (6)	0,095 (4)		5,8	0,8892 (16)	0,0950 (13)	0,0151 (5)
$\epsilon_{0,2}$	1829 (6)	43,8 (13)	Allowed	4,7	0,8898 (16)	0,0946 (13)	0,0150 (5)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,2}$	807 (6)	56,1 (7)	Allowed	4,7

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{2,1}$(Mn)	168,689 (8)	99,9 (15)	M1	0,00705 (10)	0,000679 (10)	0,0000922 (13)	0,00783 (11)
$\gamma_{1,0}$(Mn)	377,749 (5)	1,705 (42)	E4	0,0356 (5)	0,00382 (6)	0,000515 (8)	0,0399 (6)
$\gamma_{3,1}$(Mn)	1039,939 (19)	0,095 (4)	M1+E2	0,000130 (15)	0,0000122 (14)	0,00000165 (19)	0,000143 (16)

3 Atomic Data

3.1 Mn

ω_K	:	0,321	(5)
$\bar{\omega}_L$	:	0,0047	(7)
n_{KL}	:	1,478	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	5,88772	50,99
	$K\alpha_1$	5,89881	100
	$K\beta_1$	6,49051	} 20,52
	$K\beta_5''$	6,5354	}
X_L			
	$L\ell$	0,5576	
	$L\alpha$	0,6394 - 0,6404	
	$L\eta$	0,5695	
	$L\beta$	0,64636 - 0,7694	
	$L\gamma$	0,65826 - 0,65826	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	4,953 - 5,210	100
KLX	5,671 - 5,895	27,2
KXY	6,370 - 6,532	1,85
Auger L	0,4725 - 0,7653	

4 Electron and Positron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Mn)	0,4725 - 0,7653	57,1 (15)
e_{AK}	(Mn)		
	KLL	4,953 - 5,210	} 26,3 (11)
	KLX	5,671 - 5,895	}
	KXY	6,370 - 6,532	}
$ec_{2,1\ T}$	(Mn)	162,150 - 168,689	0,777 (24)
$ec_{2,1\ K}$	(Mn)	162,150 (8)	0,699 (21)
$ec_{2,1\ L}$	(Mn)	167,920 - 168,049	0,0674 (21)
$ec_{1,0\ K}$	(Mn)	371,210 (5)	0,0585 (15)
$\beta^+_{0,2}$	max:	807 (6)	} 56,1 (7)
	avg:		}

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Mn)	0,5576 - 0,7694	0,213 (10)	
XKα_2	(Mn)	5,88772	3,70 (17)	} Kα
XKα_1	(Mn)	5,89881	7,3 (4)	}
XKβ_1	(Mn)	6,49051	} 1,49 (7)	K$'\beta_1$
XKβ''_5	(Mn)	6,5354	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{2,1}$(Mn)	168,689 (8)	99,1 (15)
$\gamma_{1,0}$(Mn)	377,749 (5)	1,64 (4)
$\gamma^{\pm}$	511	112,2 (14)
$\gamma_{3,1}$(Mn)	1039,939 (19)	0,095 (4)

6 Main Production Modes

Cr – 50(α,2n)Fe – 52

Mn – 55(p,4n)Fe – 52

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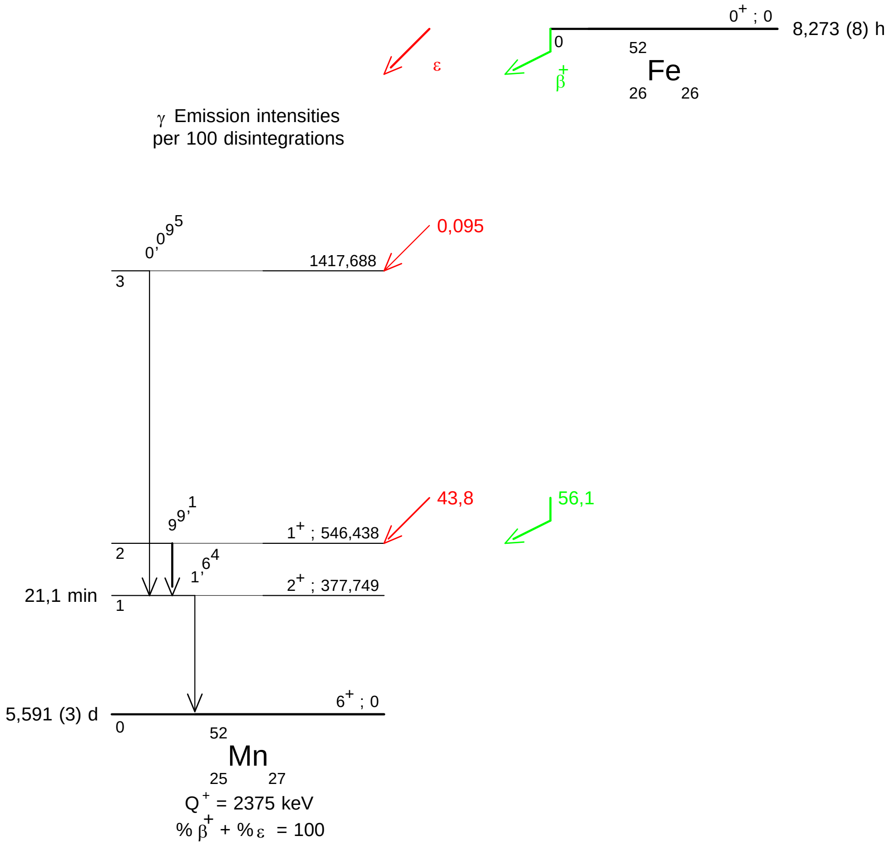
  (Q)


0+ ; 0
8,273 (8) h
0
52
Fe
26
26
ε
β+
γ Emission intensities
per 100 disintegrations
0,095
1417,688
3
0,095
43,8
56,1
1+ ; 546,438
2
99,1
1,64
2+ ; 377,749
21,1 min
1
6+ ; 0
5,591 (3) d
0
52
Mn
25
27
Q+ = 2375 keV
% β+ + % ε = 100

$^{58}_{27}Co_{31}$

1 Decay Scheme

Co-58 decays 100% by electron capture and beta plus disintegrations to the two first excited levels in Fe-58.

Le cobalt 58 se désintègre à 100 % par capture électronique et transitions bêta plus vers les deux premiers niveaux excités du fer 58.

2 Nuclear Data

$T_{1/2}(^{58}Co)$	:	70,85	(3)	d
$Q^{+}(^{58}Co)$	:	2307,9	(11)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_{M+}
$\epsilon_{0,2}$	633,2 (11)	1,228 (35)	Allowed	7,7	0,8873 (16)	0,0965 (13)	0,0155 (5)
$\epsilon_{0,1}$	1497,1 (11)	83,83 (16)	Allowed	6,6	0,8885 (16)	0,0955 (13)	0,0153 (5)

2.2 β^{+} Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^{+}_{0,1}$	475,1 (11)	14,94 (16)	Allowed	6,6
$\beta^{+}_{0,0}$	1285,9 (11)	0,0008 (7)	2nd Forbidden	12,8

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_T	α_π
$\gamma_{1,0}$(Fe)	810,7662 (20)	99,473 (20)	E2	0,000299 (5)	0,0000287 (4)	0,000332 (5)	
$\gamma_{2,1}$(Fe)	863,965 (6)	0,700 (22)	M1+E2	0,000208 (4)	0,0000199 (4)	0,000231 (4)	
$\gamma_{2,0}$(Fe)	1674,731 (6)	0,528 (13)	E2	0,0000577 (8)	0,00000547 (8)	0,000225 (4)	0,0001606 (23)

3 Atomic Data

3.1 Fe

ω_K	:	0,355	(4)
$\bar{\omega}_L$	:	0,0060	(6)
n_{KL}	:	1,447	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	6,39091	51,07
	$K\alpha_1$	6,40391	100
	$K\beta_1$	7,0581	} 20,67
	$K\beta_5''$	7,1083	}
X_L			
	$L\ell$	0,617	
	$L\alpha$	0,7075 - 0,7084	
	$L\eta$	0,6306	
	$L\beta$	0,7148 - 0,8454	
	$L\gamma$	0,7284 - 0,7284	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	5,37 - 5,65	100
KLX	6,16 - 6,40	27,4
KXY	6,93 - 7,11	1,87
Auger L	0,52 - 0,84	

4 Electron and Positron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Fe)	0,52 - 0,84		116,9 (7)
e_{AK}	(Fe)			48,8 (4)
	KLL	5,37 - 5,65		
	KLX	6,16 - 6,40		
	KXY	6,93 - 7,11		
$ec_{1,0\ K}$	(Fe)	803,654	(2)	0,0297 (5)
$\beta^+_{0,1}$	max:	475,1	(11)	14,94 (16)
	avg:	201,3	(5)	
$\beta^+_{0,0}$	max:	1285,9	(11)	0,0008 (7)
	avg:			

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Fe)	0,617 - 0,8454	0,609 (18)	
XKα_2	(Fe)	6,39091	7,98 (11)	Kα
XKα_1	(Fe)	6,40391	15,63 (19)	
XKβ_1	(Fe)	7,0581	3,23 (5)	K$'\beta_1$
XKβ_5''	(Fe)	7,1083		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma^{\pm}$	511	29,88 (32)
$\gamma_{1,0}$(Fe)	810,7602 (20)	99,44 (2)
$\gamma_{2,1}$(Fe)	863,958 (6)	0,700 (22)
$\gamma_{2,0}$(Fe)	1674,705 (6)	0,528 (13)

6 Main Production Modes

$\begin{cases} \text{Ni} - 58(\text{n,p})\text{Co} - 58 \\ \text{Possible impurities : Ni} - 63\text{, Co} - 57\text{, Co} - 58\text{m, Co} - 60 \end{cases}$

$\begin{cases} \text{Mn} - 55(\alpha\text{,n})\text{Co} - 58 \\ \text{Possible impurities : none} \end{cases}$

$\begin{cases} \text{Co} - 59(\text{n,2n})\text{Co} - 58 \\ \text{Possible impurities : Fe} - 59\text{, Co} - 58\text{m, Co} - 60 \end{cases}$

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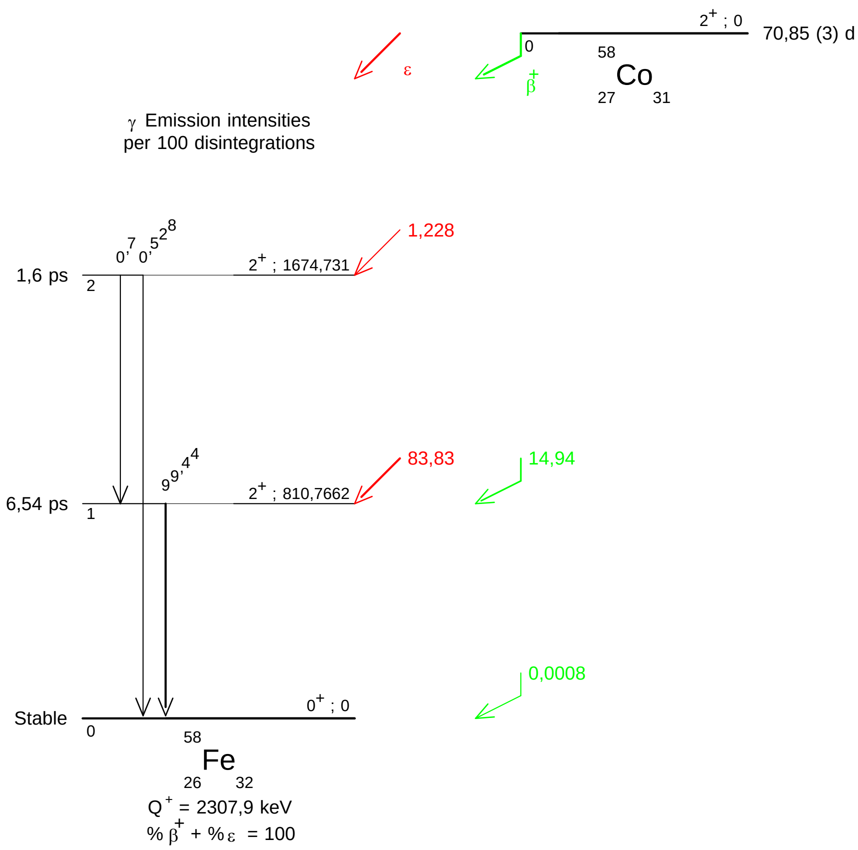
  (Q)


2+ ; 0
70,85 (3) d
0
58
Co
27
31
ε
β+
γ Emission intensities
per 100 disintegrations
1,228
0,7
0,528
2+ ; 1674,731
1,6 ps
2
83,83
14,94
99,44
2+ ; 810,7662
6,54 ps
1
0,0008
0+ ; 0
Stable
0
58
Fe
26
32
Q+ = 2307,9 keV
% β+ + % ε = 100

$^{61}_{29}$Cu $_{32}$

1 Decay Scheme

Cu-61 decays 100% by electron capture and beta plus disintegrations to various excited levels and to the ground state of Ni-61.

Le cuivre 61 se désintègre par capture électronique et émissions bêta plus vers le niveau fondamental et des niveaux excités du nickel 61.

2 Nuclear Data

$T_{1/2}$(^{61}Cu)	:	3,366	(33)	h
Q^+(^{61}Cu)	:	2237,5	(10)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,12}$	113,5 (10)	0,040 (5)	Allowed	5	0,8729 (22)	0,1083 (18)	0,0178 (6)
$\epsilon_{0,11}$	239,8 (10)	0,0043 (14)	Allowed	6,7	0,8808 (17)	0,1016 (14)	0,0166 (5)
$\epsilon_{0,10}$	508 (1)	0,228 (18)	Allowed	5,7	0,8843 (16)	0,0987 (13)	0,0160 (5)
$\epsilon_{0,9}$	627,9 (10)	0,063 (7)	Allowed	6,5	0,8849 (16)	0,0982 (13)	0,0160 (5)
$\epsilon_{0,8}$	1052,3 (10)	4,1 (5)	Allowed	5	0,8859 (16)	0,0974 (13)	0,0158 (5)
$\epsilon_{0,7}$	1105,2 (10)	0,154 (17)	Allowed	6,5	0,8860 (16)	0,0973 (13)	0,0158 (5)
$\epsilon_{0,6}$	1137,9 (10)	0,64 (6)	Allowed	5,9	0,8860 (16)	0,0973 (13)	0,0158 (5)
$\epsilon_{0,5}$	1222,7 (10)	0,006 (6)	2nd Forbidden	7,8	0,8861 (16)	0,0972 (13)	0,0158 (5)
$\epsilon_{0,4}$	1328,9 (10)	1,32 (15)	Allowed	5,7	0,8862 (16)	0,0971 (13)	0,0158 (5)
$\epsilon_{0,3}$	1581,5 (10)	10,7 (12)	Allowed	4,9	0,8864 (16)	0,0970 (13)	0,0157 (5)
$\epsilon_{0,2}$	1954,5 (10)	4,0 (7)	Allowed	5,5	0,8866 (16)	0,0968 (13)	0,0157 (5)
$\epsilon_{0,1}$	2170,1 (10)	0,79 (20)	Allowed	6,3	0,8866 (16)	0,0968 (13)	0,0157 (5)
$\epsilon_{0,0}$	2237,5 (10)	16,3 (8)	Allowed	5	0,8867 (16)	0,0967 (13)	0,0157 (5)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,5}$	200,7 (10)	0,000032 (32)	2nd Forbidden	7,8
$\beta^+_{0,4}$	306,9 (10)	0,0347 (40)	Allowed	5,7
$\beta^+_{0,3}$	559,5 (10)	2,52 (27)	Allowed	4,9
$\beta^+_{0,2}$	932,5 (10)	5,4 (9)	Allowed	5,5
$\beta^+_{0,1}$	1148,1 (10)	2,1 (5)	Allowed	6,3
$\beta^+_{0,0}$	1215,5 (10)	51,6 (25)	Allowed	5

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Ni)	67,412 (3)	4,5 (7)	(M1)	0,1224 (18)	0,01261 (18)	0,001776 (25)	0,1368 (20)
$\gamma_{7,5}$(Ni)	117,5	0,010 (6)					
$\gamma_{2,1}$(Ni)	215,545 (4)	0,013 (7)					
$\gamma_{2,0}$(Ni)	282,9568 (19)	12,0 (17)	(M1)	0,00295 (5)	0,000293 (5)	0,0000413 (6)	0,00329 (5)
$\gamma_{3,2}$(Ni)	373,0552 (36)	2,09 (30)	[M1]	0,00153 (2)	0,000151 (2)	0,0000213 (3)	0,00170 (2)
$\gamma_{8,3}$(Ni)	529,224 (11)	0,38 (5)					
$\gamma_{10,8}$(Ni)	544,8	0,006 (4)					
$\gamma_{3,1}$(Ni)	588,600 (4)	1,15 (16)	[E2]				
$\gamma_{4,2}$(Ni)	625,663 (11)	0,044 (7)	[E2]				
$\gamma_{3,0}$(Ni)	656,012 (3)	10,4 (15)	(M1+E2)				
$\gamma_{9,4}$(Ni)	701,019 (24)	0,0108 (28)					
$\gamma_{6,2}$(Ni)	816,665 (10)	0,32 (5)	M1+5,0(15)%E2				
$\gamma_{10,4}$(Ni)	820,851 (15)	0,0216 (39)					
$\gamma_{4,1}$(Ni)	841,208 (11)	0,224 (34)	M1+77(8)%E2				
$\gamma_{8,2}$(Ni)	902,279 (11)	0,084 (12)					
$\gamma_{4,0}$(Ni)	908,620 (11)	1,12 (16)	M1+3,2(9)%E2				
$\gamma_{5,1}$(Ni)	947,39 (40)	0,0060 (19)	M1+86(5)%E2				
$\gamma_{5,0}$(Ni)	1014,8 (4)	0,0103 (39)	E2+0,09(9)%M3	0,0002 (6)	0,00002 (6)	0,000003 (8)	0,0002 (6)
$\gamma_{6,1}$(Ni)	1032,21 (1)	0,053 (10)					
$\gamma_{7,1}$(Ni)	1064,920 (17)	0,052 (9)	M1+1,9(16)%E2				
$\gamma_{10,3}$(Ni)	1073,459 (10)	0,042 (11)					
$\gamma_{11,4}$(Ni)	1089,1 (9)	0,00060 (8)					
$\gamma_{6,0}$(Ni)	1099,622 (10)	0,257 (39)					
$\gamma_{8,1}$(Ni)	1117,824 (11)	0,039 (9)					
$\gamma_{7,0}$(Ni)	1132,332 (17)	0,092 (13)	M1+18,1(35)%E2				
$\gamma_{8,0}$(Ni)	1185,236 (11)	3,6 (5)	(M1+E2)				
$\gamma_{10,2}$(Ni)	1446,514 (10)	0,046 (7)					
$\gamma_{9,1}$(Ni)	1542,227 (21)	0,029 (5)	M1+0,49(35)%E2				
$\gamma_{9,0}$(Ni)	1609,639 (21)	0,0236 (43)	M1+9,8(42)%E2				
$\gamma_{10,1}$(Ni)	1662,059 (10)	0,051 (8)					
$\gamma_{10,0}$(Ni)	1729,471 (10)	0,065 (14)					
$\gamma_{11,0}$(Ni)	1997,7 (9)	0,0037 (13)	M1+6,8(15)%E2				
$\gamma_{12,0}$(Ni)	2124 (1)	0,040 (6)					

3 Atomic Data

3.1 Ni

ω_K	:	0,421	(4)
$\bar{\omega}_L$	:	0,0084	(4)
n_{KL}	:	1,388	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	7,46097	51,24
	$K\alpha_1$	7,47824	100
	$K\beta_1$	8,26475	} 20,84
	$K\beta_5''$	8,3287	}
X_L			
	$L\ell$	0,7445	
	$L\alpha$	0,8532 - 0,8539	
	$L\eta$	0,7622	
	$L\beta$	0,86123 - 1,0083	
	$L\gamma$	0,87898 - 0,87898	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	6,262 - 6,567	100
KLX	7,196 - 7,475	27,6
KXY	8,109 - 8,326	1,9
Auger L	0,632 - 1,010	

4 Electron and Positron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Ni)	0,632 - 1,010	51,2 (9)
e_{AK}	(Ni)		20,0 (9)
	KLL	6,262 - 6,567	
	KLX	7,196 - 7,475	
	KXY	8,109 - 8,326	
$ec_{1,0\ T}$	(Ni)	59,079 - 67,412	0,55 (8)
$ec_{1,0\ K}$	(Ni)	59,079 (3)	0,49 (7)
$ec_{1,0\ L}$	(Ni)	66,404 - 66,557	0,050 (8)
$ec_{2,0\ K}$	(Ni)	274,6240 (19)	0,035 (5)
$\beta^+_{0,0}$	max:	1215,5 (10)	51,6 (25)
	avg:	523,8 (5)	
$\beta^+_{0,1}$	max:	1148,1 (10)	2,1 (5)
	avg:	493,8 (5)	
$\beta^+_{0,2}$	max:	932,5 (10)	5,4 (9)
	avg:	398,9 (5)	
$\beta^+_{0,3}$	max:	559,5 (10)	2,52 (27)
	avg:	238,5 (4)	
$\beta^+_{0,4}$	max:	306,9 (10)	0,0347 (40)
	avg:	132,8 (4)	
$\beta^+_{0,5}$	max:	200,7 (10)	0,000032 (32)
	avg:	88,7 (4)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Ni)	0,7445 - 1,0083	0,437 (14)	
$XK\alpha_2$	(Ni)	7,46097	4,33 (20)	$K\alpha$
$XK\alpha_1$	(Ni)	7,47824	8,4 (4)	
$XK\beta_1$	(Ni)	8,26475	1,76 (9)	$K'\beta_1$
$XK\beta''_5$	(Ni)	8,3287		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Ni)	67,412 (3)	4,0 (6)
$\gamma_{7,5}$(Ni)	117,5	0,010 (6)
$\gamma_{2,1}$(Ni)	215,55 (18)	0,013 (7)
$\gamma_{2,0}$(Ni)	282,956 (2)	12,0 (17)
$\gamma_{3,2}$(Ni)	373,050 (5)	2,09 (30)
$\gamma^{\pm}$	511	123 (5)
$\gamma_{8,3}$(Ni)	529,169 (22)	0,38 (5)
$\gamma_{10,8}$(Ni)	544,8	0,006 (4)
$\gamma_{3,1}$(Ni)	588,605 (9)	1,15 (16)
$\gamma_{4,2}$(Ni)	625,605 (24)	0,044 (7)
$\gamma_{3,0}$(Ni)	656,008 (4)	10,4 (15)
$\gamma_{9,4}$(Ni)	701,1 (3)	0,0108 (28)
$\gamma_{6,2}$(Ni)	816,692 (13)	0,32 (5)
$\gamma_{10,4}$(Ni)	820,89 (17)	0,0216 (39)
$\gamma_{4,1}$(Ni)	841,211 (17)	0,224 (34)
$\gamma_{8,2}$(Ni)	902,294 (20)	0,084 (12)
$\gamma_{4,0}$(Ni)	908,631 (17)	1,12 (16)
$\gamma_{5,1}$(Ni)	947,4 (4)	0,0060 (19)
$\gamma_{5,0}$(Ni)	1014,8 (4)	0,0103 (39)
$\gamma_{6,1}$(Ni)	1032,162 (10)	0,053 (10)
$\gamma_{7,1}$(Ni)	1064,896 (20)	0,052 (9)
$\gamma_{10,3}$(Ni)	1073,465 (25)	0,042 (11)
$\gamma_{11,4}$(Ni)	1089,11	0,00060 (8)
$\gamma_{6,0}$(Ni)	1099,560 (19)	0,257 (39)
$\gamma_{8,1}$(Ni)	1117,822 (43)	0,039 (9)
$\gamma_{7,0}$(Ni)	1132,35 (3)	0,092 (13)
$\gamma_{8,0}$(Ni)	1185,234 (15)	3,6 (5)
$\gamma_{10,2}$(Ni)	1446,492 (19)	0,046 (7)
$\gamma_{9,1}$(Ni)	1542,204 (23)	0,029 (5)
$\gamma_{9,0}$(Ni)	1609,625 (48)	0,0236 (43)
$\gamma_{10,1}$(Ni)	1662,000 (19)	0,051 (8)
$\gamma_{10,0}$(Ni)	1729,473 (18)	0,065 (14)
$\gamma_{11,0}$(Ni)	1997,7 (9)	0,0037 (13)
$\gamma_{12,0}$(Ni)	2124 (1)	0,040 (6)

6 Main Production Modes

Ni – 61(p,n)Cu – 61

Zn – 64(p,α)Cu – 61

Cu – 63(γ,2n)Cu – 61

7 References

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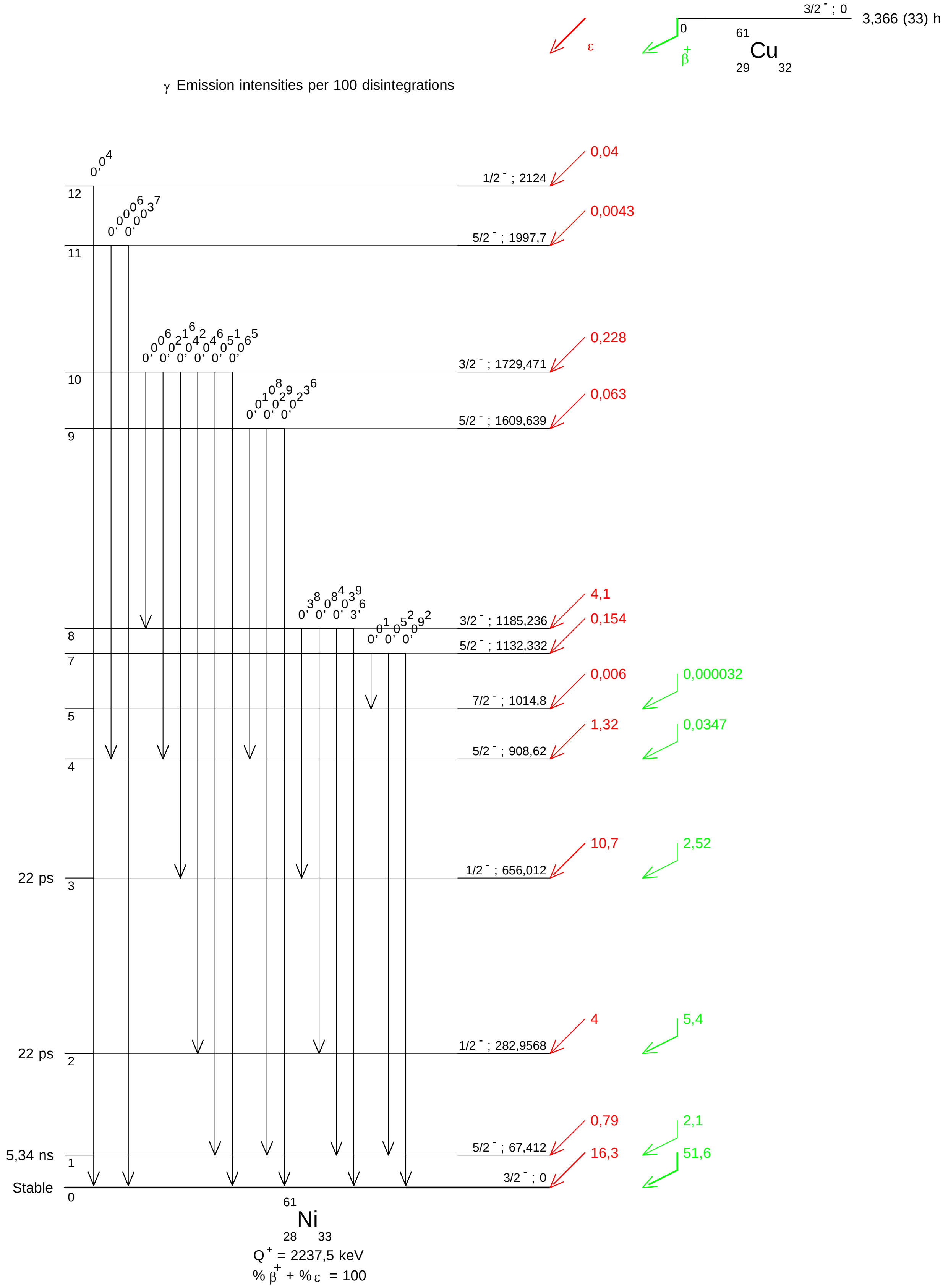
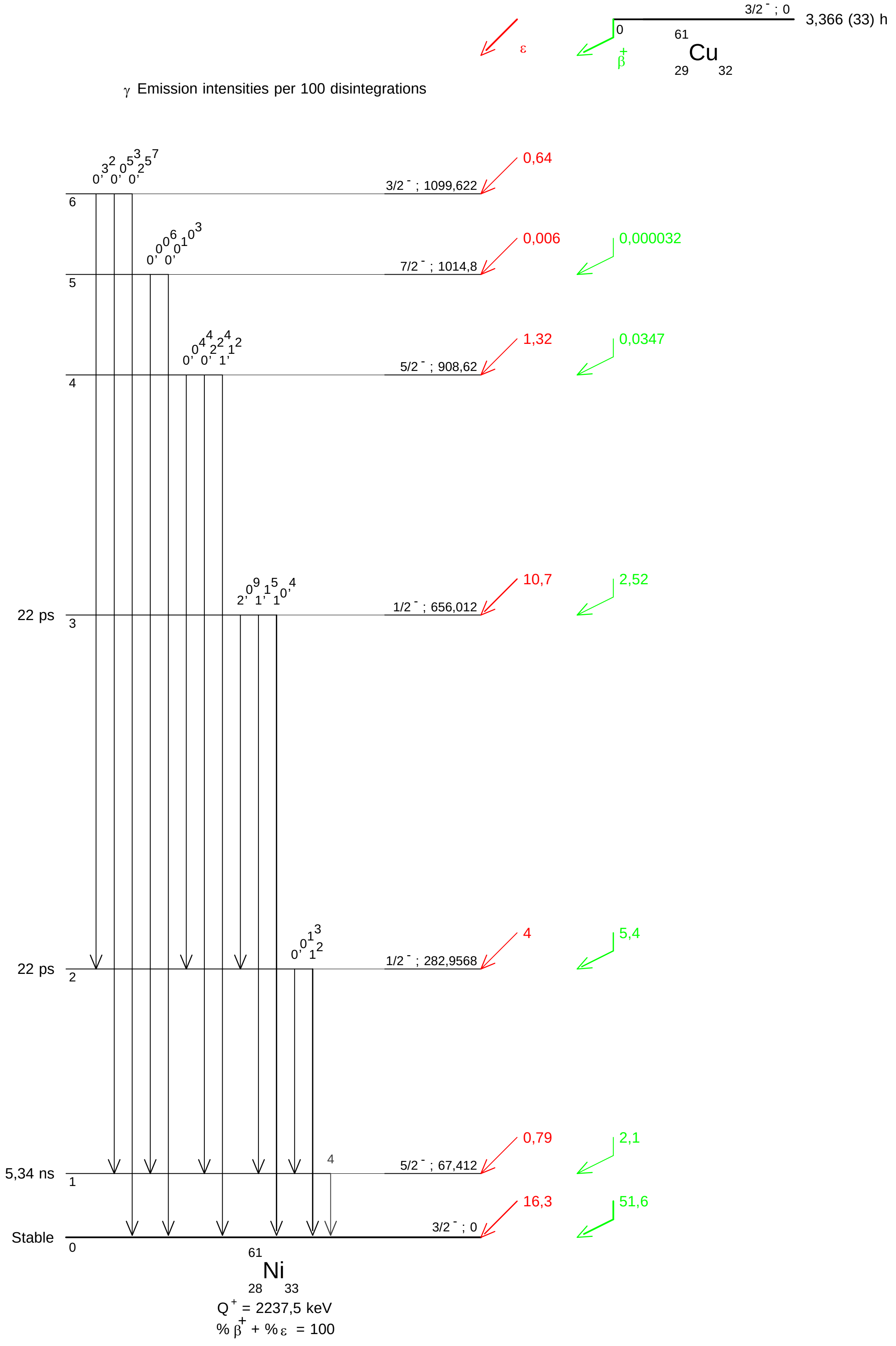


3/2 - ; 0
3,366 (33) h
61 Cu 29 32
ε
β+
γ Emission intensities per 100 disintegrations
1/2 - ; 2124
5/2 - ; 1997,7
3/2 - ; 1729,471
5/2 - ; 1609,639
3/2 - ; 1185,236
5/2 - ; 1132,332
7/2 - ; 1014,8
5/2 - ; 908,62
1/2 - ; 656,012
1/2 - ; 282,9568
5/2 - ; 67,412
3/2 - ; 0
0,04
0,0043
0,228
0,063
4,1
0,154
0,006
0,000032
1,32
0,0347
10,7
2,52
4
5,4
0,79
2,1
16,3
51,6
22 ps
22 ps
5,34 ns
Stable
61 Ni 28 33
Q+ = 2237,5 keV
% β+ + % ε = 100


3/2 - ; 0
3,366 (33) h
ε
β+
61 Cu 29 32
γ Emission intensities per 100 disintegrations
3/2 - ; 1099,622
0,64
7/2 - ; 1014,8
0,006
0,000032
5/2 - ; 908,62
1,32
0,0347
22 ps
1/2 - ; 656,012
10,7
2,52
22 ps
1/2 - ; 282,9568
4
5,4
5,34 ns
5/2 - ; 67,412
0,79
2,1
Stable
3/2 - ; 0
16,3
51,6
61 Ni 28 33
Q+ = 2237,5 keV
% β+ + % ε = 100

$^{63}_{30}$Zn $_{33}$

1 Decay Scheme

Zn-63 (half-life of 38.33 min) decays by 100% electron capture/beta plus to various excited levels and the ground state of Cu-63 (stable).

Le zinc 63 (38,33 min) se désintègre à 100 % par capture électronique/émission bêta plus vers plusieurs niveaux excités et le niveau fondamental du cuivre 63 (stable).

2 Nuclear Data

$T_{1/2}$(^{63}Zn)	:	38,33	(10)	min
Q^{+}(^{63}Zn)	:	3366,2	(15)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_{M+}
$\epsilon_{0,22}$	264,8 (16)	0,0007 (2)	allowed	6,89	0,8802 (16)	0,1020 (13)	0,0168 (5)
$\epsilon_{0,21}$	323,6 (15)	0,0048 (8)	(allowed)	6,24	0,8814 (16)	0,1010 (13)	0,0166 (5)
$\epsilon_{0,20}$	477,3 (16)	0,0104 (14)	allowed	6,24	0,8831 (16)	0,0996 (13)	0,0163 (5)
$\epsilon_{0,19}$	508,3 (15)	0,0069 (12)	(allowed)	6,48	0,8833 (16)	0,0994 (13)	0,0163 (5)
$\epsilon_{0,18}$	558,1 (15)	0,0052 (10)	allowed	6,68	0,8836 (16)	0,0992 (13)	0,0162 (5)
$\epsilon_{0,17}$	586,0 (15)	0,0298 (21)	(allowed)	5,97	0,8837 (16)	0,0991 (13)	0,0162 (5)
$\epsilon_{0,16}$	649,7 (15)	0,082 (7)	allowed	5,62	0,8840 (16)	0,0988 (13)	0,0162 (5)
$\epsilon_{0,15}$	669,5 (15)	0,122 (6)	allowed	5,47	0,8841 (16)	0,0988 (13)	0,0161 (5)
$\epsilon_{0,14}$	830,4 (15)	0,261 (14)	(allowed)	5,33	0,8846 (16)	0,0984 (13)	0,0161 (5)
$\epsilon_{0,13}$	855,1 (15)	0,011 (2)	[allowed]	6,73	0,8846 (16)	0,0983 (13)	0,0161 (5)
$\epsilon_{0,12}$	869,0 (15)	0,0247 (20)	(allowed)	6,40	0,8846 (16)	0,0983 (13)	0,0161 (5)
$\epsilon_{0,11}$	1029,7 (15)	0,141 (9)	allowed	5,79	0,8849 (16)	0,0980 (13)	0,0160 (5)
$\epsilon_{0,9}$	1284,9 (15)	0,035 (7)	(allowed)	6,59	0,8853 (16)	0,0978 (13)	0,0160 (5)
$\epsilon_{0,8}$	1303,8 (15)	0,153 (13)	(allowed)	5,96	0,8853 (16)	0,0978 (13)	0,0160 (5)
$\epsilon_{0,7}$	1353,3 (15)	0,0130 (3)	allowed	7,06	0,8853 (16)	0,0977 (13)	0,0160 (5)
$\epsilon_{0,5}$	1819,2 (15)	0,060 (7)	allowed	6,65	0,8856 (16)	0,0975 (13)	0,0159 (5)
$\epsilon_{0,4}$	1954,0 (15)	0,42 (2)	allowed	5,87	0,8857 (16)	0,0974 (13)	0,0159 (5)

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_{M+}
$\epsilon_{0,2}$	2404,2 (15)	1,19 (3)	allowed	5,60	0,8858 (16)	0,0973 (13)	0,0159 (5)
$\epsilon_{0,1}$	2696,3 (15)	0,92 (1)	allowed	5,81	0,8859 (16)	0,0972 (13)	0,0159 (5)
$\epsilon_{0,0}$	3366,2 (15)	3,75 (5)	allowed	5,40	0,8860 (16)	0,0971 (13)	0,0158 (5)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,9}$	262,9 (15)	0,00043 (9)	(allowed)	6,59
$\beta^+_{0,8}$	281,8 (15)	0,0025 (2)	(allowed)	5,96
$\beta^+_{0,7}$	331,3 (15)	0,00039 (2)	allowed	7,06
$\beta^+_{0,5}$	797,2 (15)	0,042 (4)	allowed	6,65
$\beta^+_{0,4}$	932,0 (15)	0,49 (2)	allowed	5,87
$\beta^+_{0,2}$	1382,2 (15)	4,96 (13)	allowed	5,60
$\beta^+_{0,1}$	1674,3 (15)	7,00 (2)	allowed	5,81
$\beta^+_{0,0}$	2344,2 (15)	80,3 (6)	allowed	5,40

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_T
$\gamma_{17,14}$(Cu)	244,40 (22)	0,0054 (8)	(E2)	0,0190 (3)	0,00198 (3)	0,0213 (3)
$\gamma_{3,2}$(Cu)	364,74 (6)	0,0115 (25)	M1+0,36%E2	0,00184 (3)	0,000184 (3)	0,00205 (3)
$\gamma_{14,10}$(Cu)	443,70 (12)	0,013 (4)	(M1+50%E2)	0,00177 (14)	0,000179 (14)	0,00198 (16)
$\gamma_{4,2}$(Cu)	450,14 (5)	0,229 (16)	M1+1,3%E2	0,00114 (4)	0,000113 (5)	0,00127 (5)
$\gamma_{11,6}$(Cu)	475,91 (13)	0,006 (3)	M1+E2			
$\gamma_{8,5}$(Cu)	515,45 (9)	0,021 (8)	(M1+E2)			
$\gamma_{9,5}$(Cu)	534,32 (23)	0,005 (2)	(M1+E2)			
$\gamma_{5,2}$(Cu)	584,98 (6)	0,033 (4)	M1+E2			
$\gamma_{16,10}$(Cu)	624,34 (13)	0,011 (4)	(E2)			
$\gamma_{1,0}$(Cu)	669,93 (4)	8,19 (32)	M1+1,2%E2	0,000466 (7)	0,0000462 (7)	0,000519 (8)
$\gamma_{14,6}$(Cu)	675,20 (9)	0,015 (3)	(M1+E2)			
$\gamma_{15,7}$(Cu)	683,74 (17)	0,004 (2)	M1+E2			
$\gamma_{4,1}$(Cu)	742,23 (6)	0,067 (8)	E2	0,000512 (8)	0,0000511 (8)	0,000571 (8)
$\gamma_{9,3}$(Cu)	754,56 (23)	0,016 (6)	M1+E2			
$\gamma_{10,3}$(Cu)	765,37 (11)	0,007 (3)	M1+E2			
$\gamma_{5,1}$(Cu)	877,07 (6)	0,003 (2)	M1+E2			
$\gamma_{6,2}$(Cu)	898,61 (7)	0,009 (3)	M1+E2			
$\gamma_{11,4}$(Cu)	924,38 (13)	0,0099 (20)	M1+E2			
$\gamma_{2,0}$(Cu)	962,02 (3)	6,50 (16)	M1+18,7%E2	0,000226 (4)	0,0000223 (4)	0,000251 (4)
$\gamma_{14,5}$(Cu)	988,83 (9)	0,0038 (11)	(M1+E2)			
$\gamma_{7,2}$(Cu)	1050,90 (11)	0,0044 (11)	M1+E2			
$\gamma_{14,4}$(Cu)	1123,67 (8)	0,112 (11)	M1+50%E2	0,000171 (4)	0,0000169 (4)	0,000192 (4)
$\gamma_{10,2}$(Cu)	1130,11 (10)	0,013 (2)	M1+E2			
$\gamma_{15,5}$(Cu)	1149,66 (14)	0,019 (2)	M1+E2			
$\gamma_{16,5}$(Cu)	1169,47 (10)	0,0077 (16)	M1+E2			
$\gamma_{14,3}$(Cu)	1209,07 (9)	0,014 (3)	(M1+E2)			
$\gamma_{17,5}$(Cu)	1233,23 (22)	0,0025 (8)	M1+E2			

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_T
$\gamma_{3,0}$(Cu)	1326,76 (5)	0,069 (4)	E2	0,0001268 (18)	0,00001251 (18)	0,0001757 (25)
$\gamma_{7,1}$(Cu)	1342,99 (12)	0,0025 (8)	M1+E2			
$\gamma_{11,2}$(Cu)	1374,52 (12)	0,034 (2)	M1+E2			
$\gamma_{16,3}$(Cu)	1389,71 (10)	0,043 (6)	(E2)			
$\gamma_{8,1}$(Cu)	1392,52 (9)	0,10 (1)	(M1+50%E2)	0,0001098 (19)	0,00001080 (19)	0,000167 (4)
$\gamma_{4,0}$(Cu)	1412,16 (4)	0,74 (3)	M1+36,6%E2	0,0001055 (16)	0,00001038 (15)	0,000166 (3)
$\gamma_{19,4}$(Cu)	1445,7 (3)	0,0025 (8)	(E2)			
$\gamma_{18,3}$(Cu)	1481,34 (9)	0,0016 (8)	E2			
$\gamma_{5,0}$(Cu)	1547,00 (5)	0,124 (5)	M1+13,2%E2	0,0000870 (13)	0,00000854 (13)	0,000181 (3)
$\gamma_{14,2}$(Cu)	1573,81 (8)	0,016 (2)	(M1+E2)			
$\gamma_{11,1}$(Cu)	1666,61 (13)	0,0014 (6)	E2			
$\gamma_{(-1,1)}$(Cu)	1696,6 (10)	0,002 (1)				
$\gamma_{16,2}$(Cu)	1754,45 (9)	0,0043 (11)	M1+E2			
$\gamma_{12,1}$(Cu)	1827,26 (10)	0,0042 (11)	(M1+E2)			
$\gamma_{6,0}$(Cu)	1860,63 (6)	0,011 (3)	E2	0,0000646 (9)	0,00000635 (9)	0,000316 (5)
$\gamma_{14,1}$(Cu)	1865,90 (8)	0,0200 (21)	(E2)	0,0000643 (9)	0,00000631 (9)	0,000319 (5)
$\gamma_{20,2}$(Cu)	1926,9 (4)	0,0053 (11)	(E2)			
$\gamma_{7,0}$(Cu)	2012,92 (11)	0,011 (2)	M1+E2			
$\gamma_{15,1}$(Cu)	2026,73 (14)	0,060 (4)	M1+E2			
$\gamma_{16,1}$(Cu)	2046,54 (10)	0,0035 (11)	M1+E2			
$\gamma_{8,0}$(Cu)	2062,45 (8)	0,034 (3)	(M1+E2)			
$\gamma_{9,0}$(Cu)	2081,32 (22)	0,015 (2)	(M1+E2)			
$\gamma_{10,0}$(Cu)	2092,13 (10)	0,005 (3)	E2			
$\gamma_{17,1}$(Cu)	2110,30 (21)	0,0065 (13)	M1+E2			
$\gamma_{(-1,2)}$(Cu)	2181,8 (7)	0.0013 (8)				
$\gamma_{19,1}$(Cu)	2188,0 (3)	0,0016 (8)	M1+E2			
$\gamma_{20,1}$(Cu)	2219,0 (4)	0,0029 (8)	M1+E2			
$\gamma_{11,0}$(Cu)	2336,54 (12)	0,077 (5)	M1+E2			
$\gamma_{12,0}$(Cu)	2497,19 (9)	0,020 (2)	(M1+E2)			
$\gamma_{13,0}$(Cu)	2511,06 (6)	0,011 (2)	[M1+E2]			
$\gamma_{14,0}$(Cu)	2535,83 (7)	0,067 (3)	(M1+E2)			
$\gamma_{15,0}$(Cu)	2696,66 (13)	0,039 (3)	M1+E2			
$\gamma_{16,0}$(Cu)	2716,47 (9)	0,012 (1)	M1+E2			
$\gamma_{17,0}$(Cu)	2780,23 (21)	0,0154 (12)	M1+E2			
$\gamma_{18,0}$(Cu)	2808,10 (8)	0,0036 (6)	M1+E2			
$\gamma_{19,0}$(Cu)	2857,9 (3)	0,0028 (5)	M1+E2			
$\gamma_{20,0}$(Cu)	2888,9 (4)	0,0021 (2)	M1+E2			
$\gamma_{21,0}$(Cu)	3042,59 (8)	0,0048 (8)	M1+E2			
$\gamma_{22,0}$(Cu)	3101,4 (4)	0,0007 (2)	M1+E2			

3 Atomic Data

3.1 Cu

ω_K	:	0,454	(4)
$\bar{\omega}_L$	:	0,0097	(4)
n_{KL}	:	1,357	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	8,02792	51,3
	$K\alpha_1$	8,04787	100
	$K\beta_3$	8,90541	} 21,1
	$K\beta_1$	8,90539	}
	$K\beta_5''$	8,9771	}
X_L			
	$L\ell$	0,811	
	$L\alpha$	0,929 - 0,93	
	$L\eta$	0,831	
	$L\beta$	0,949 - 1,022	
	$L\gamma$	0,952	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	6,731 - 7,059	100
KLX	7,746 - 8,064	27,8
KXY	8,739 - 8,982	1,93
Auger L	0,68 - 0,80	346

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Cu)	0,68 - 0,80	9,30 (9)
e_{AK}	(Cu)		3,50 (5)
	KLL	6,731 - 7,059	}
	KLX	7,746 - 8,064	}
	KXY	8,739 - 8,982	}
$\beta^+_{0,0}$	max:	2344,2 (15)	} 80,3 (6)
	avg:	1041,9 (7)	}
$\beta^+_{0,1}$	max:	1674,3 (15)	} 7,00 (2)
	avg:	732,0 (7)	}

		Energy (keV)		Electrons (per 100 disint.)
$\beta^+_{0,2}$	max:	1382,2	(15)	4,96 (13)
	avg:	599,5	(7)	
$\beta^+_{0,4}$	max:	932,0	(15)	0,49 (2)
	avg:	399,7	(7)	
$\beta^+_{0,5}$	max:	797,2	(15)	0,042 (4)
	avg:	341,0	(7)	
$\beta^+_{0,7}$	max:	331,3	(15)	0,00039 (2)
	avg:	143,6	(6)	
$\beta^+_{0,8}$	max:	281,8	(15)	0,0025 (2)
	avg:	123,0	(6)	
$\beta^+_{0,9}$	max:	262,9	(15)	0,00043 (9)
	avg:	115,1	(6)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Cu)	0,811 - 1,022	0,0958 (16)	
XKα_2	(Cu)	8,02792	0,865 (12)	Kα
XKα_1	(Cu)	8,04787	1,686 (22)	
XKβ_3	(Cu)	8,90541	0,355 (6)	K$'\beta_1$
XKβ_1	(Cu)	8,90539		
XKβ_5''	(Cu)	8,9771		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{17,14}$(Cu)	244,40 (22)	0,0053 (8)
$\gamma_{3,2}$(Cu)	364,74 (6)	0,0115 (25)
$\gamma_{14,10}$(Cu)	443,70 (12)	0,013 (4)
$\gamma_{4,2}$(Cu)	450,14 (5)	0,229 (16)
$\gamma_{11,6}$(Cu)	475,91 (13)	0,006 (3)
$\gamma^{\pm}$	511	185,6 (9)
$\gamma_{8,5}$(Cu)	515,45 (9)	0,021 (8)
$\gamma_{9,5}$(Cu)	534,32 (23)	0,005 (2)
$\gamma_{5,2}$(Cu)	584,98 (6)	0,033 (4)
$\gamma_{16,10}$(Cu)	624,34 (13)	0,011 (4)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Cu)	669,93 (4)	8,19 (32)
$\gamma_{14,6}$(Cu)	675,20 (9)	0,015 (3)
$\gamma_{15,7}$(Cu)	683,74 (17)	0,004 (2)
$\gamma_{4,1}$(Cu)	742,23 (6)	0,067 (8)
$\gamma_{9,3}$(Cu)	754,56 (23)	0,016 (6)
$\gamma_{10,3}$(Cu)	765,37 (11)	0,007 (3)
$\gamma_{5,1}$(Cu)	877,06 (6)	0,003 (2)
$\gamma_{6,2}$(Cu)	898,60 (7)	0,009 (3)
$\gamma_{11,4}$(Cu)	924,37 (13)	0,0099 (20)
$\gamma_{2,0}$(Cu)	962,01 (3)	6,50 (16)
$\gamma_{14,5}$(Cu)	988,82 (9)	0,0038 (11)
$\gamma_{7,2}$(Cu)	1050,89 (11)	0,0044 (11)
$\gamma_{14,4}$(Cu)	1123,66 (8)	0,112 (11)
$\gamma_{10,2}$(Cu)	1130,10 (10)	0,013 (2)
$\gamma_{15,5}$(Cu)	1149,65 (14)	0,019 (2)
$\gamma_{16,5}$(Cu)	1169,46 (10)	0,0077 (16)
$\gamma_{14,3}$(Cu)	1209,06 (9)	0,014 (3)
$\gamma_{17,5}$(Cu)	1233,22 (22)	0,0025 (8)
$\gamma_{3,0}$(Cu)	1326,75 (5)	0,069 (4)
$\gamma_{7,1}$(Cu)	1342,97 (12)	0,0025 (8)
$\gamma_{11,2}$(Cu)	1374,50 (12)	0,034 (2)
$\gamma_{16,3}$(Cu)	1389,69 (10)	0,043 (6)
$\gamma_{8,1}$(Cu)	1392,50 (9)	0,10 (1)
$\gamma_{4,0}$(Cu)	1412,14 (4)	0,74 (3)
$\gamma_{19,4}$(Cu)	1445,7 (3)	0,0025 (8)
$\gamma_{18,3}$(Cu)	1481,32 (9)	0,0016 (8)
$\gamma_{5,0}$(Cu)	1546,98 (5)	0,124 (5)
$\gamma_{14,2}$(Cu)	1573,79 (8)	0,016 (2)
$\gamma_{11,1}$(Cu)	1666,59 (13)	0,0014 (6)
$\gamma_{(-1,1)}$(Cu)	1696,6 (10)	0,002 (1)
$\gamma_{16,2}$(Cu)	1754,42 (9)	0,0043 (11)
$\gamma_{12,1}$(Cu)	1827,23 (10)	0,0042 (11)
$\gamma_{6,0}$(Cu)	1860,60 (6)	0,011 (3)
$\gamma_{14,1}$(Cu)	1865,87 (8)	0,0200 (21)
$\gamma_{20,2}$(Cu)	1926,9 (4)	0,0053 (11)
$\gamma_{7,0}$(Cu)	2012,89 (11)	0,011 (2)
$\gamma_{15,1}$(Cu)	2026,70 (14)	0,060 (4)
$\gamma_{16,1}$(Cu)	2046,50 (10)	0,0035 (11)
$\gamma_{8,0}$(Cu)	2062,41 (8)	0,034 (3)
$\gamma_{9,0}$(Cu)	2081,28 (22)	0,015 (2)
$\gamma_{10,0}$(Cu)	2092,09 (10)	0,005 (3)
$\gamma_{17,1}$(Cu)	2110,26 (21)	0,0065 (13)
$\gamma_{(-1,2)}$(Cu)	2181,8 (7)	0,0013 (8)
$\gamma_{19,1}$(Cu)	2188,0 (3)	0,0016 (8)
$\gamma_{20,1}$(Cu)	2219,0 (4)	0,0029 (8)
$\gamma_{11,0}$(Cu)	2336,49 (12)	0,077 (5)
$\gamma_{12,0}$(Cu)	2497,14 (9)	0,020 (2)
$\gamma_{13,0}$(Cu)	2511,01 (6)	0,011 (2)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{14,0}$(Cu)	2535,78 (7)	0,067 (3)
$\gamma_{15,0}$(Cu)	2696,60 (13)	0,039 (3)
$\gamma_{16,0}$(Cu)	2716,41 (9)	0,012 (1)
$\gamma_{17,0}$(Cu)	2780,16 (21)	0,0154 (12)
$\gamma_{18,0}$(Cu)	2808,03 (8)	0,0036 (6)
$\gamma_{19,0}$(Cu)	2857,8 (3)	0,0028 (5)
$\gamma_{20,0}$(Cu)	2888,8 (4)	0,0021 (2)
$\gamma_{21,0}$(Cu)	3042,51 (8)	0,0048 (8)
$\gamma_{22,0}$(Cu)	3101,3 (4)	0,0007 (2)

6 Main Production Modes

^{64}Zn(n,2n)^{63}Zn

^{63}Cu(p,n)^{63}Zn

^{63}Cu(d,2n)^{63}Zn

^{64}Zn(γ,n)^{63}Zn

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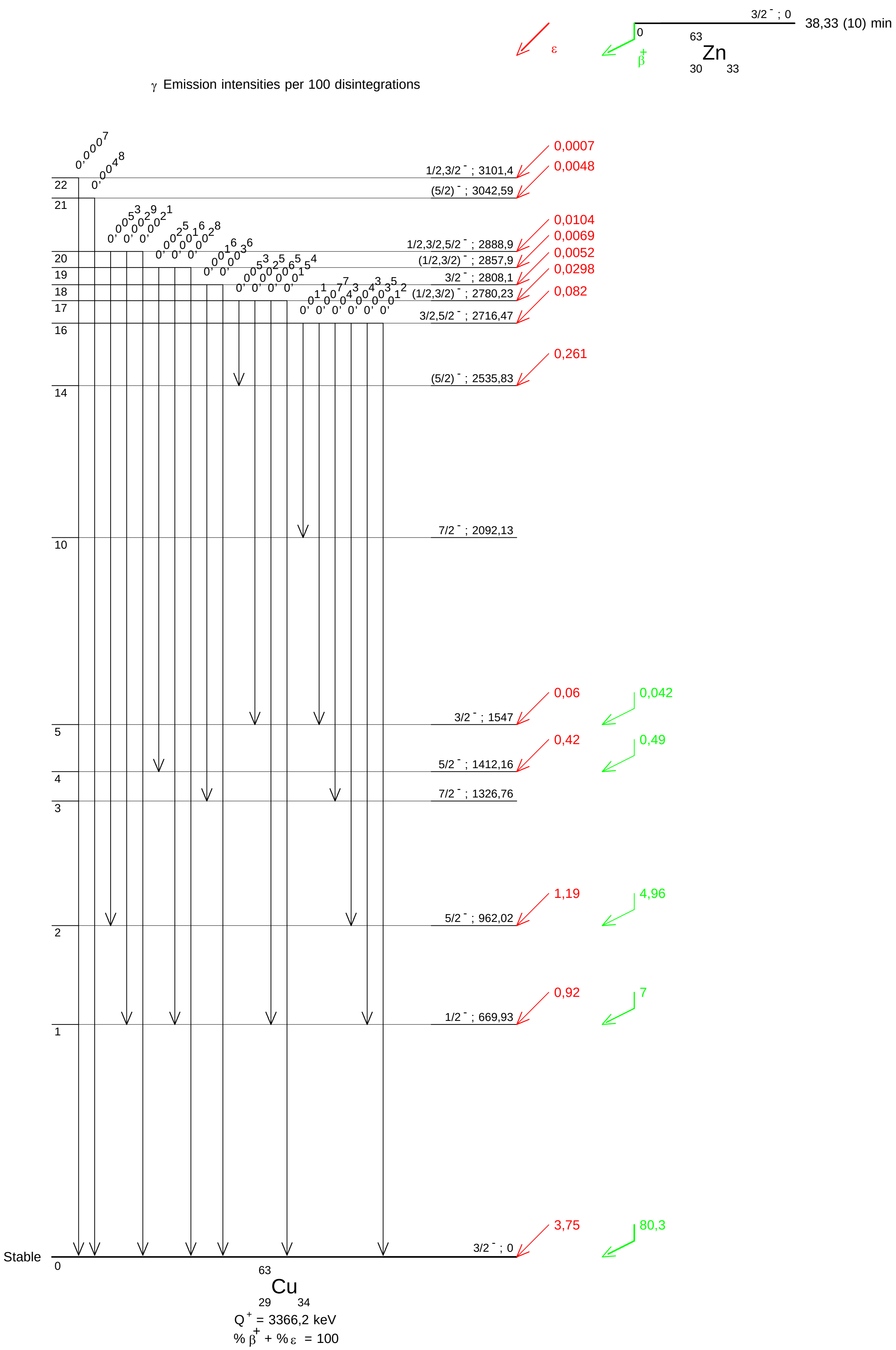
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38,33 (10) min
ε
β+
63 Zn 30 33
γ Emission intensities per 100 disintegrations
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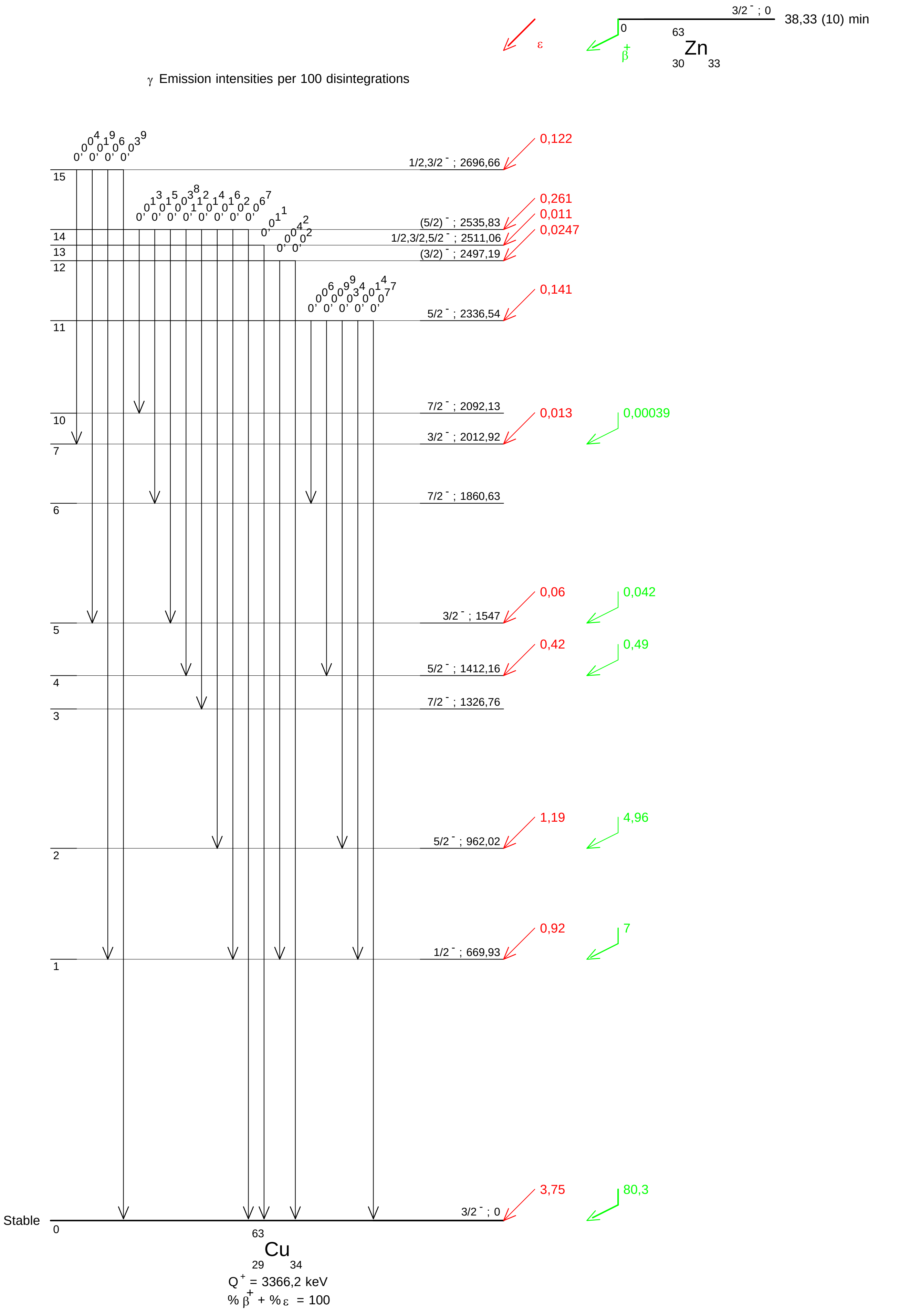
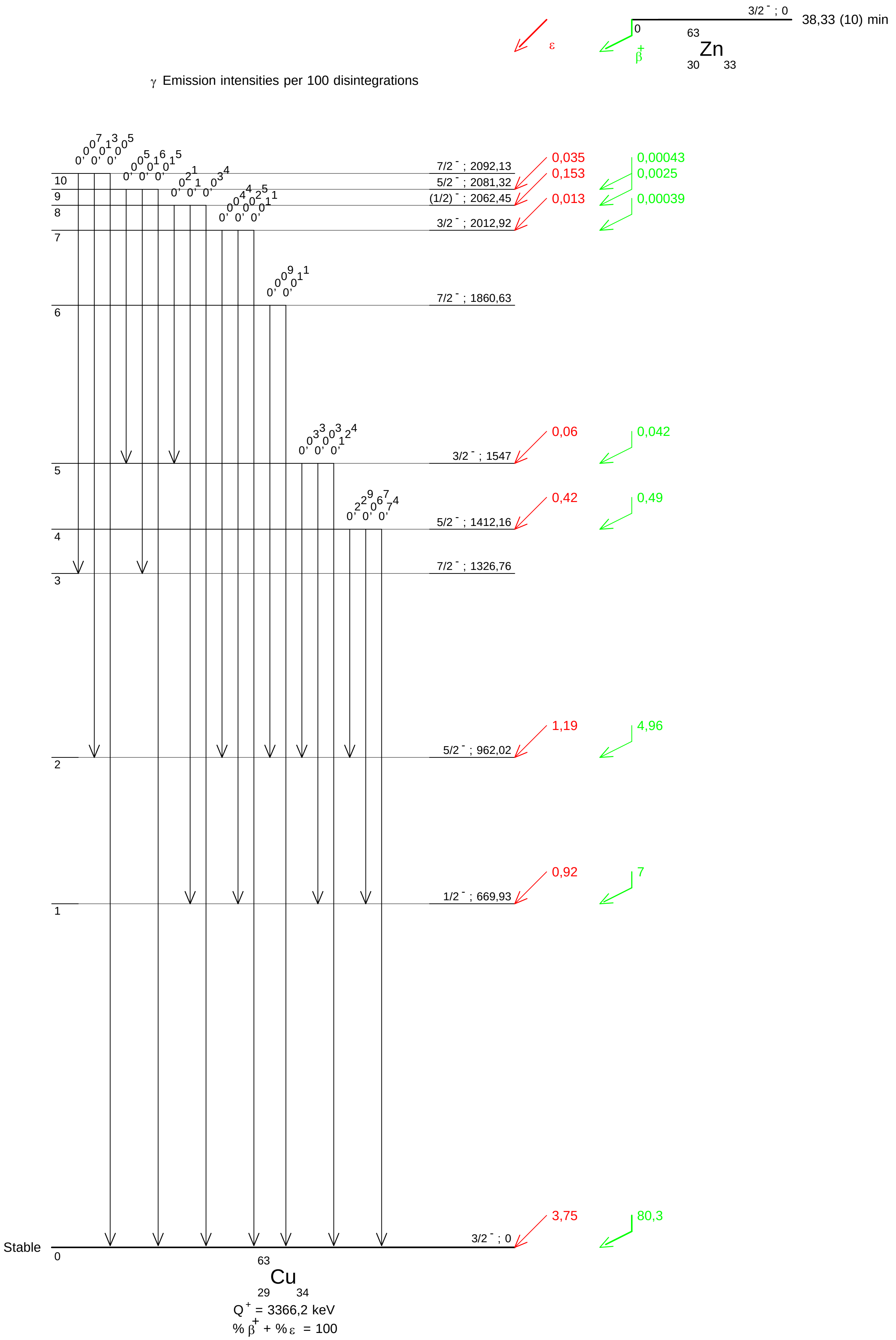
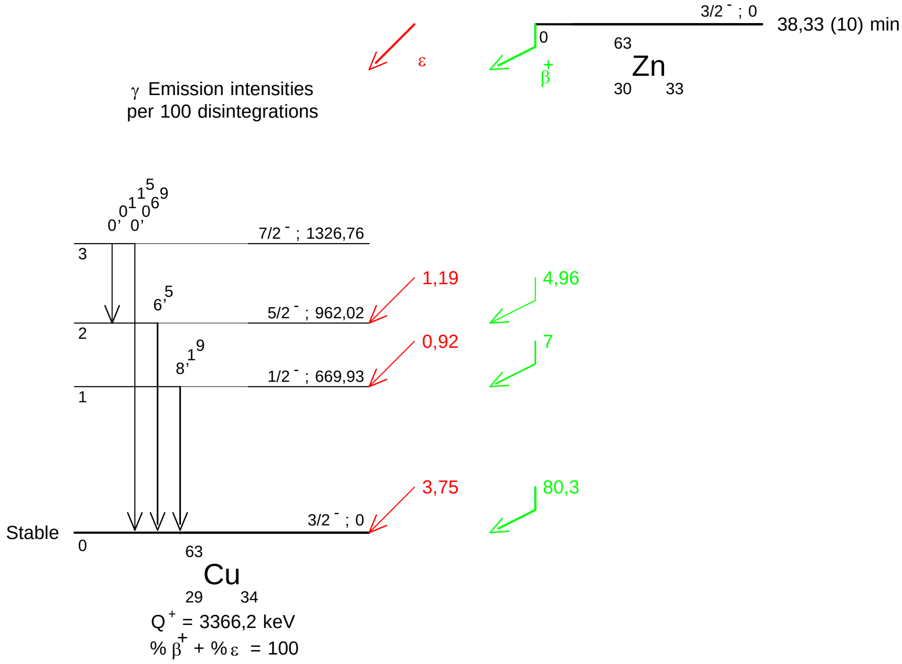
1/2,3/2,5/2 - ; 2888,9
(1/2,3/2) - ; 2857,9
3/2 - ; 2808,1
(1/2,3/2) - ; 2780,23
3/2,5/2 - ; 2716,47
(5/2) - ; 2535,83
7/2 - ; 2092,13
3/2 - ; 1547
5/2 - ; 1412,16
7/2 - ; 1326,76
5/2 - ; 962,02
1/2 - ; 669,93
3/2 - ; 0
0,0007
0,0048
0,0104
0,0069
0,0052
0,0298
0,082
0,261
0,06
0,042
0,42
0,49
1,19
4,96
0,92
7
3,75
80,3
Stable
63 Cu 29 34
Q+ = 3366,2 keV
% β+ + % ε = 100


3/2 - ; 0
38,33 (10) min
ε
β+
63
Zn
30 33
γ Emission intensities per 100 disintegrations
1/2,3/2 - ; 2696,66
(5/2) - ; 2535,83
1/2,3/2,5/2 - ; 2511,06
(3/2) - ; 2497,19
5/2 - ; 2336,54
7/2 - ; 2092,13
3/2 - ; 2012,92
7/2 - ; 1860,63
3/2 - ; 1547
5/2 - ; 1412,16
7/2 - ; 1326,76
5/2 - ; 962,02
1/2 - ; 669,93
3/2 - ; 0
0,122
0,261
0,011
0,0247
0,141
0,013
0,00039
0,06
0,042
0,42
0,49
1,19
4,96
0,92
7
3,75
80,3
15
14
13
12
11
10
7
6
5
4
3
2
1
0
Stable
63
Cu
29 34
Q+ = 3366,2 keV
% β+ + % ε = 100


3/2 - ; 0
38,33 (10) min
ε
β+
0
63
Zn
30 33
γ Emission intensities per 100 disintegrations
7/2 - ; 2092,13
5/2 - ; 2081,32
(1/2) - ; 2062,45
3/2 - ; 2012,92
7/2 - ; 1860,63
3/2 - ; 1547
5/2 - ; 1412,16
7/2 - ; 1326,76
5/2 - ; 962,02
1/2 - ; 669,93
3/2 - ; 0
0,035
0,153
0,013
0,06
0,42
1,19
0,92
3,75
0,00043
0,0025
0,00039
0,042
0,49
4,96
7
80,3
10
9
8
7
6
5
4
3
2
1
0
Stable
63
Cu
29 34
Q + = 3366,2 keV
% β+ + % ε = 100


3/2 - ; 0
38,33 (10) min
0
63 Zn 30 33
ε
β+
γ Emission intensities
per 100 disintegrations
7/2 - ; 1326,76
5/2 - ; 962,02
1/2 - ; 669,93
3/2 - ; 0
3
2
1
0
1,19
0,92
3,75
4,96
7
80,3
Stable
63 Cu 29 34
Q+ = 3366,2 keV
% β+ + % ε = 100

$^{73}_{34}Se_{39}$

1 Decay Scheme

Se-73 (half-life of 7.10 h) decays by 100% electron capture/beta plus to various excited levels of As-73 that populate the ground state of As-73 (half-life of 80.30 d).

Le selenium 73 (7,10 h) se désintègre à 100% par capture électronique et transitions bêta plus vers plusieurs niveaux excités de l'arsenic 73.

2 Nuclear Data

$T_{1/2}(^{73}Se)$	:	7,10	(9)	h
$T_{1/2}(^{73}As)$	:	80,30	(6)	d
$Q^+(^{73}Se)$	:	2725	(7)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,20}$	141 (7)	0,0155 (20)	(non-unique 1st forbidden)	6,2	0,8646 (19)	0,1136 (16)	0,0199 (5)
$\epsilon_{0,19}$	242 (7)	0,0087 (20)	(allowed)	7	0,8723 (16)	0,1072 (13)	0,0186 (4)
$\epsilon_{0,18}$	249 (7)	0,0029 (10)	(allowed)	7,5	0,8726 (16)	0,1070 (13)	0,0186 (4)
$\epsilon_{0,17}$	291 (7)	0,0048 (19)	(non-unique 2nd forbidden)	7,4	0,8740 (16)	0,1058 (13)	0,0184 (4)
$\epsilon_{0,16}$	413 (7)	0,157 (6)	(allowed)	6,2	0,8764 (16)	0,1038 (13)	0,0180 (4)
$\epsilon_{0,15}$	544 (7)	0,030 (8)	(allowed)	7,1	0,8778 (15)	0,1027 (13)	0,0178 (4)
$\epsilon_{0,14}$	750 (7)	0,094 (3)	(allowed)	6,9	0,8789 (15)	0,1018 (13)	0,0176 (4)
$\epsilon_{0,13}$	763 (7)	0,017 (5)	(allowed)	7,7	0,8790 (15)	0,1017 (13)	0,0176 (4)
$\epsilon_{0,12}$	815 (7)	0,060 (7)	(allowed)	7,2	0,8792 (15)	0,1016 (13)	0,0175 (4)
$\epsilon_{0,11}$	874 (7)	0,433 (11)	(allowed)	6,4	0,8794 (15)	0,1014 (12)	0,0175 (4)
$\epsilon_{0,10}$	1396 (7)	0,129 (3)	(allowed)	7,3	0,8804 (15)	0,1006 (12)	0,0173 (4)
$\epsilon_{0,8}$	1432 (7)	0,435 (19)	(allowed)	6,8	0,8804 (15)	0,1006 (12)	0,0173 (4)
$\epsilon_{0,7}$	1450 (7)	0,0057 (19)	(allowed)	8,7	0,8804 (15)	0,1006 (12)	0,0173 (4)
$\epsilon_{0,6}$	1547 (7)	0,178 (2)	(non-unique 1st forbidden)	7,3	0,8805 (15)	0,1005 (12)	0,0173 (4)
$\epsilon_{0,2}$	2297 (7)	33,3 (5)	allowed	5,36	0,8810 (15)	0,1001 (12)	0,0172 (4)
$\epsilon_{0,1}$	2658 (7)	0,51 (9)	unique 1st forbidden	8,7	0,8811 (15)	0,1000 (12)	0,0172 (4)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,10}$	374 (7)	0,0034 (2)	(allowed)	7,3
$\beta^+_{0,8}$	410 (7)	0,017 (2)	(allowed)	6,8
$\beta^+_{0,7}$	428 (7)	0,0003 (1)	(allowed)	8,7
$\beta^+_{0,6}$	525 (7)	0,017 (1)	(non-unique 1st forbidden)	7,3
$\beta^+_{0,2}$	1275 (7)	63,9 (5)	allowed	5,36
$\beta^+_{0,1}$	1636 (7)	0,69 (11)	unique 1st forbidden	8,7

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-5})	α_L (10^{-6})	α_M (10^{-6})	α_T (10^{-4})	α_π (10^{-5})
$\gamma_{1,0}$(As)	67,039 (8)	90 (9)	100%M1	24100 (400)	26400 (400)	4040 (60)	2720 (40)	
$\gamma_{2,1}$(As)	360,867 (23)	98,18 (20)	M2+0.12%E3	1165 (17)	1286 (18)	197 (3)	131,5 (19)	
$\gamma_{2,0}$(As)	427,906 (21)	0,079 (14)	E3	1195 (17)	1397 (20)	213 (3)	135,7 (19)	
$\gamma_{3,1}$(As)	443,016 (19)	0,050 (3)	(E1)	92,6 (13)	95,5 (14)	14,54 (21)	10,37 (15)	
$\gamma_{3,0}$(As)	510,055 (17)	0,26 (3)	(E1)	65,0 (10)	67,0 (10)	10,20 (15)	7,28 (11)	
$\gamma_{11,8}$(As)	557,50 (11)	0,052 (2)	(M1+E2)					
$\gamma_{11,7}$(As)	575,45 (9)	0,146 (7)	(M1+E2)					
$\gamma_{(-1,1)}$(As)	600,3 (3)	0,020 (3)						
$\gamma_{5,2}$(As)	609,22 (4)	0,049 (4)	(E2)	125,8 (18)	132,7 (19)	20,2 (3)	14,12 (20)	
$\gamma_{14,9}$(As)	682,04 (11)	0,019 (2)	(E1)	33,0 (5)	33,8 (5)	5,15 (8)	3,69 (6)	
$\gamma_{14,7}$(As)	700,27 (13)	0,044 (2)	(M1+E2)					
$\gamma_{7,3}$(As)	765,09 (7)	0,127 (2)	(M1+E2)					
$\gamma_{9,3}$(As)	783,32 (4)	0,058 (2)	(M1+E2)					
$\gamma_{(-1,2)}$(As)	793,0 (5)	0,064 (2)						
$\gamma_{11,5}$(As)	813,46 (6)	0,009 (1)	(E2)	57,3 (8)	59,7 (9)	9,10 (13)	6,42 (9)	
$\gamma_{10,3}$(As)	818,84 (5)	0,036 (2)	(M1+E2)					
$\gamma_{7,2}$(As)	847,23 (7)	0,078 (6)	(M1+E2)					
$\gamma_{11,4}$(As)	856,82 (5)	0,023 (6)	(E1)	20,3 (3)	20,7 (3)	3,16 (5)	2,27 (4)	
$\gamma_{8,2}$(As)	865,18 (10)	0,50 (2)	(M1+E2)					
$\gamma_{9,2}$(As)	865,46 (3)	0,02 (1)	(M1+E2)					
$\gamma_{12,5}$(As)	873,00 (12)	0,038 (7)	(E2)	47,9 (7)	49,9 (7)	7,60 (11)	5,37 (8)	
$\gamma_{15,9}$(As)	887,29 (10)	0,011 (8)	(M1+E2)					
$\gamma_{10,2}$(As)	900,98 (5)	0,135 (2)	(M1+E2)					
$\gamma_{4,1}$(As)	926,727 (14)	0,004 (1)	(M1+E2)					
$\gamma_{(-1,3)}$(As)	930,09 (15)	0,005 (1)						
$\gamma_{13,4}$(As)	968,0 (2)	0,012 (5)						
$\gamma_{16,10}$(As)	982,74 (8)	0,034 (1)	(M1+E2)					
$\gamma_{4,0}$(As)	993,766 (12)	0,005 (1)	(E2)	35,0 (5)	36,3 (5)	5,52 (8)	3,92 (6)	
$\gamma_{15,6}$(As)	1002,61 (10)	0,004 (1)	(E1)	14,84 (21)	15,17 (22)	2,31 (4)	1,660 (24)	
$\gamma_{16,9}$(As)	1018,26 (7)	0,053 (2)	(M1+E2)					
$\gamma_{16,7}$(As)	1036,49 (9)	0,015 (1)	(M1+E2)					
$\gamma_{6,1}$(As)	1111,013 (23)	0,201 (2)	(M1+E2)					
$\gamma_{19,10}$(As)	1153,98 (24)	0,005 (1)	(M1+E2)					
$\gamma_{17,7}$(As)	1159,0 (4)	0,003 (1)						
$\gamma_{7,1}$(As)	1208,10 (7)	0,004 (1)	(E1)	10,50 (15)	10,72 (15)	1,632 (23)	1,700 (24)	5,25 (8)
$\gamma_{(-1,4)}$(As)	1215,4 (8)	0,063 (10)						
$\gamma_{9,1}$(As)	1226,33 (3)	0,003 (2)	(E1)	10,23 (15)	10,43 (15)	1,589 (23)	1,79 (3)	6,43 (9)
$\gamma_{(-1,5)}$(As)	1249,9 (2)	0,004 (1)						
$\gamma_{7,0}$(As)	1275,14 (7)	0,007 (1)	(M2)	39,4 (6)	40,8 (6)	6,23 (9)	4,46 (7)	0,416 (6)
$\gamma_{20,7}$(As)	1308,95 (13)	0,004 (1)	(E1)	9,12 (13)	9,30 (13)	1,417 (20)	2,22 (4)	12,03 (17)

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-5})	α_L (10^{-6})	α_M (10^{-6})	α_T (10^{-4})	α_π (10^{-5})
$\gamma_{16,4}$(As)	1317,86 (6)	0,006 (1)	(E1)	9,02 (13)	9,19 (13)	1,40 (2)	2,27 (4)	12,61 (18)
$\gamma_{(-1,6)}$(As)	1323,81 (20)	0,007 (1)						
$\gamma_{11,3}$(As)	1340,54 (5)	0,069 (2)	(E2)	18,0 (3)	18,5 (3)	2,82 (4)	2,39 (4)	3,76 (6)
$\gamma_{20,6}$(As)	1406,04 (11)	0,002 (1)	(M1+E2)					
$\gamma_{11,2}$(As)	1422,68 (6)	0,135 (5)	(M1+E2)					
$\gamma_{18,5}$(As)	1439,0 (2)	0,002 (1)						
$\gamma_{13,3}$(As)	1451,7 (2)	0,006 (2)						
$\gamma_{12,2}$(As)	1482,22 (6)	0,022 (1)	(M1+E2)					
$\gamma_{14,2}$(As)	1547,50 (11)	0,031 (1)	(M1+E2)					
$\gamma_{15,3}$(As)	1670,61 (10)	0,005 (1)	(M1+E2)					
$\gamma_{(-1,7)}$(As)	1738,4 (5)	0,002 (1)						
$\gamma_{15,2}$(As)	1752,75 (10)	0,011 (1)	(M1+E2)					
$\gamma_{16,3}$(As)	1801,58 (6)	0,019 (5)	(M1+E2)					
$\gamma_{(-1,8)}$(As)	1847,8 (3)	0,008 (1)						
$\gamma_{16,2}$(As)	1883,72 (6)	0,030 (2)	(M1+E2)					
$\gamma_{(-1,9)}$(As)	1889,57 (20)	0,003 (1)						
$\gamma_{19,3}$(As)	1972,82 (23)	0,001 (1)	(M1+E2)					
$\gamma_{17,2}$(As)	2006,2 (4)	0,002 (1)						
$\gamma_{(-1,10)}$(As)	2023,9 (3)	0,002 (1)						
$\gamma_{18,2}$(As)	2048,2 (2)	0,001 (1)						
$\gamma_{19,2}$(As)	2054,96 (23)	0,003 (1)	(M1+E2)					
$\gamma_{20,2}$(As)	2156,18 (11)	0,005 (1)	(E1)	4,13 (6)	4,19 (6)	0,638 (9)	7,85 (11)	73,9 (11)
$\gamma_{(-1,11)}$(As)	2170,5 (3)	0,002 (1)						
$\gamma_{20,1}$(As)	2517,05 (11)	0,005 (1)	(M1+E2)					

3 Atomic Data

3.1 As

ω_K	:	0,575	(4)
$\bar{\omega}_L$	:	0,0155	(5)
n_{KL}	:	1,232	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	10,50814	51,2
	$K\alpha_1$	10,5438	100
	$K\beta_3$	11,7204	}
	$K\beta_1$	11,7263	} 22,8
	$K\beta_5''$	11,821	}
	$K\beta_2$	11,8643	0,86
X_L			
	$L\ell$	1,12	
	$L\alpha$	1,282	
	$L\eta$	1,155	
	$L\beta$	1,317 - 1,388	
	$L\gamma$	1,524	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	8,746 - 9,149	100
KLX	10,114 - 10,541	31,3
KXY	11,460 - 11,862	2,45
Auger L	0,90 - 1,23	416

4 Electron and Positron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(As)	0,90 - 1,23	65,3 (15)
e_{AK}	(As)		21,0 (8)
	KLL	8,746 - 9,149	
	KLX	10,114 - 10,541	
	KXY	11,460 - 11,862	
$ec_{1,0\ T}$	(As)	55,172 - 67,037	19 (11)
$ec_{1,0\ K}$	(As)	55,172 (8)	17 (10)
$ec_{1,0\ L}$	(As)	65,513 - 65,716	1,8 (10)
$ec_{1,0\ M+}$	(As)	66,836 - 67,037	0,32 (18)
$ec_{2,1\ T}$	(As)	349,00 - 360,86	1,27 (30)
$ec_{2,1\ K}$	(As)	349,00 (3)	1,13 (25)
$ec_{2,1\ L}$	(As)	359,34 - 359,54	0,12 (3)
$ec_{2,1\ M+}$	(As)	360,66 - 360,86	0,021 (5)
$\beta^+_{0,1}$	max:	1636 (7)	0,69 (11)
	avg:	745 (3)	
$\beta^+_{0,2}$	max:	1275 (7)	63,9 (5)
	avg:	555 (3)	
$\beta^+_{0,6}$	max:	525 (7)	0,017 (1)
	avg:	228 (3)	
$\beta^+_{0,7}$	max:	428 (7)	0,0003 (1)
	avg:	187 (3)	
$\beta^+_{0,8}$	max:	410 (7)	0,017 (2)
	avg:	179 (3)	
$\beta^+_{0,10}$	max:	374 (7)	0,0034 (2)
	avg:	164 (3)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(As)	1,12 - 1,524	1,05 (3)	
$XK\alpha_2$	(As)	10,50814	8,3 (3)	$K\alpha$
$XK\alpha_1$	(As)	10,5438	16,2 (6)	
$XK\beta_3$	(As)	11,7204		
$XK\beta_1$	(As)	11,7263	3,70 (14)	$K'\beta_1$
$XK\beta_5''$	(As)	11,821		
$XK\beta_2$	(As)	11,8643	0,140 (7)	$K'\beta_2$

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(As)	67,039 (8)	70,7 (70)
$\gamma_{2,1}$(As)	360,866 (23)	96,91 (20)
$\gamma_{2,0}$(As)	427,905 (21)	0,078 (14)
$\gamma_{3,1}$(As)	443,015 (19)	0,050 (3)
$\gamma_{3,0}$(As)	510,053 (17)	0,26 (3)
$\gamma^{\pm}$	511	129 (8)
$\gamma_{11,8}$(As)	557,50 (11)	0,052 (2)
$\gamma_{11,7}$(As)	575,45 (9)	0,146 (7)
$\gamma_{(-1,1)}$(As)	600,3 (3)	0,020 (3)
$\gamma_{5,2}$(As)	609,22 (4)	0,049 (4)
$\gamma_{14,9}$(As)	682,04 (11)	0,019 (2)
$\gamma_{14,7}$(As)	700,27 (13)	0,044 (2)
$\gamma_{7,3}$(As)	765,09 (7)	0,127 (2)
$\gamma_{9,3}$(As)	783,32 (4)	0,058 (2)
$\gamma_{(-1,2)}$(As)	793,0 (5)	0,064 (2)
$\gamma_{11,5}$(As)	813,46 (6)	0,009 (1)
$\gamma_{10,3}$(As)	818,84 (5)	0,036 (2)
$\gamma_{7,2}$(As)	847,22 (7)	0,078 (6)
$\gamma_{11,4}$(As)	856,81 (5)	0,023 (6)
$\gamma_{8,2}$(As)	865,17 (10)	0,50 (2)
$\gamma_{9,2}$(As)	865,45 (3)	0,02 (1)
$\gamma_{12,5}$(As)	872,99 (12)	0,038 (7)
$\gamma_{15,9}$(As)	887,28 (10)	0,011 (8)
$\gamma_{10,2}$(As)	900,97 (5)	0,135 (2)
$\gamma_{4,1}$(As)	926,721 (14)	0,004 (1)
$\gamma_{(-1,3)}$(As)	930,09 (15)	0,005 (1)
$\gamma_{13,4}$(As)	968,0 (2)	0,012 (5)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{16,10}$(As)	982,73 (8)	0,034 (1)
$\gamma_{4,0}$(As)	993,759 (12)	0,005 (1)
$\gamma_{15,6}$(As)	1002,60 (10)	0,004 (1)
$\gamma_{16,9}$(As)	1018,25 (7)	0,053 (2)
$\gamma_{16,7}$(As)	1036,48 (9)	0,015 (1)
$\gamma_{6,1}$(As)	1111,004 (23)	0,201 (2)
$\gamma_{19,10}$(As)	1153,97 (24)	0,005 (1)
$\gamma_{17,7}$(As)	1159,0 (4)	0,003 (1)
$\gamma_{7,1}$(As)	1208,09 (7)	0,004 (1)
$\gamma_{(-1,4)}$(As)	1215,4 (8)	0,063 (10)
$\gamma_{9,1}$(As)	1226,32 (3)	0,003 (2)
$\gamma_{(-1,5)}$(As)	1249,9 (2)	0,004 (1)
$\gamma_{7,0}$(As)	1275,13 (7)	0,007 (1)
$\gamma_{20,7}$(As)	1308,94 (13)	0,004 (1)
$\gamma_{16,4}$(As)	1317,85 (6)	0,006 (1)
$\gamma_{(-1,6)}$(As)	1323,81 (20)	0,007 (1)
$\gamma_{11,3}$(As)	1340,53 (5)	0,069 (2)
$\gamma_{20,6}$(As)	1406,03 (11)	0,002 (1)
$\gamma_{11,2}$(As)	1422,67 (6)	0,135 (5)
$\gamma_{18,5}$(As)	1439,0 (2)	0,002 (1)
$\gamma_{13,3}$(As)	1451,7 (2)	0,006 (2)
$\gamma_{12,2}$(As)	1482,20 (6)	0,022 (1)
$\gamma_{14,2}$(As)	1547,48 (11)	0,031 (1)
$\gamma_{15,3}$(As)	1670,59 (10)	0,005 (1)
$\gamma_{(-1,7)}$(As)	1738,4 (5)	0,002 (1)
$\gamma_{15,2}$(As)	1752,73 (10)	0,011 (1)
$\gamma_{16,3}$(As)	1801,56 (6)	0,019 (5)
$\gamma_{(-1,8)}$(As)	1847,8 (3)	0,008 (1)
$\gamma_{16,2}$(As)	1883,69 (6)	0,030 (2)
$\gamma_{(-1,9)}$(As)	1889,57 (20)	0,003 (1)
$\gamma_{19,3}$(As)	1972,79 (23)	0,001 (1)
$\gamma_{17,2}$(As)	2006,2 (4)	0,002 (1)
$\gamma_{(-1,10)}$(As)	2023,9 (3)	0,002 (1)
$\gamma_{18,2}$(As)	2048,2 (2)	0,001 (1)
$\gamma_{19,2}$(As)	2054,93 (23)	0,003 (1)
$\gamma_{20,2}$(As)	2156,15 (11)	0,005 (1)
$\gamma_{(-1,11)}$(As)	2170,5 (3)	0,002 (1)
$\gamma_{20,1}$(As)	2517,00 (11)	0,005 (1)

6 Main Production Modes

$\begin{cases} \text{Ge} - 70(\alpha,\text{n})\text{Se} - 73 \\ \text{Possible impurities : As} - 72, \text{Se} - 72, \text{Se} - 73\text{m} \end{cases}$

$\begin{cases} \text{Se} - 74(\text{n,2n})\text{Se} - 73 \\ \text{Possible impurities : As} - 74, \text{Se} - 73\text{m} \end{cases}$

$\begin{cases} \text{Se} - 74(\gamma,\text{n})\text{Se} - 73 \\ \text{Possible impurities : Se} - 73\text{m} \end{cases}$

$\left\{\begin{array}{l} As-75(p,3n)Se-73 \\ \text{Possible impurities : } As-74,\ Se-73m \end{array}\right.$

$\left\{\begin{array}{l} Ge-72(He-3,d)Se-73 \\ \text{Possible impurities : } Se-73m \end{array}\right.$

$\left\{\begin{array}{l} Ni-60(O-16,p2n)Se-73 \\ \text{Possible impurities : } Se-73m \end{array}\right.$

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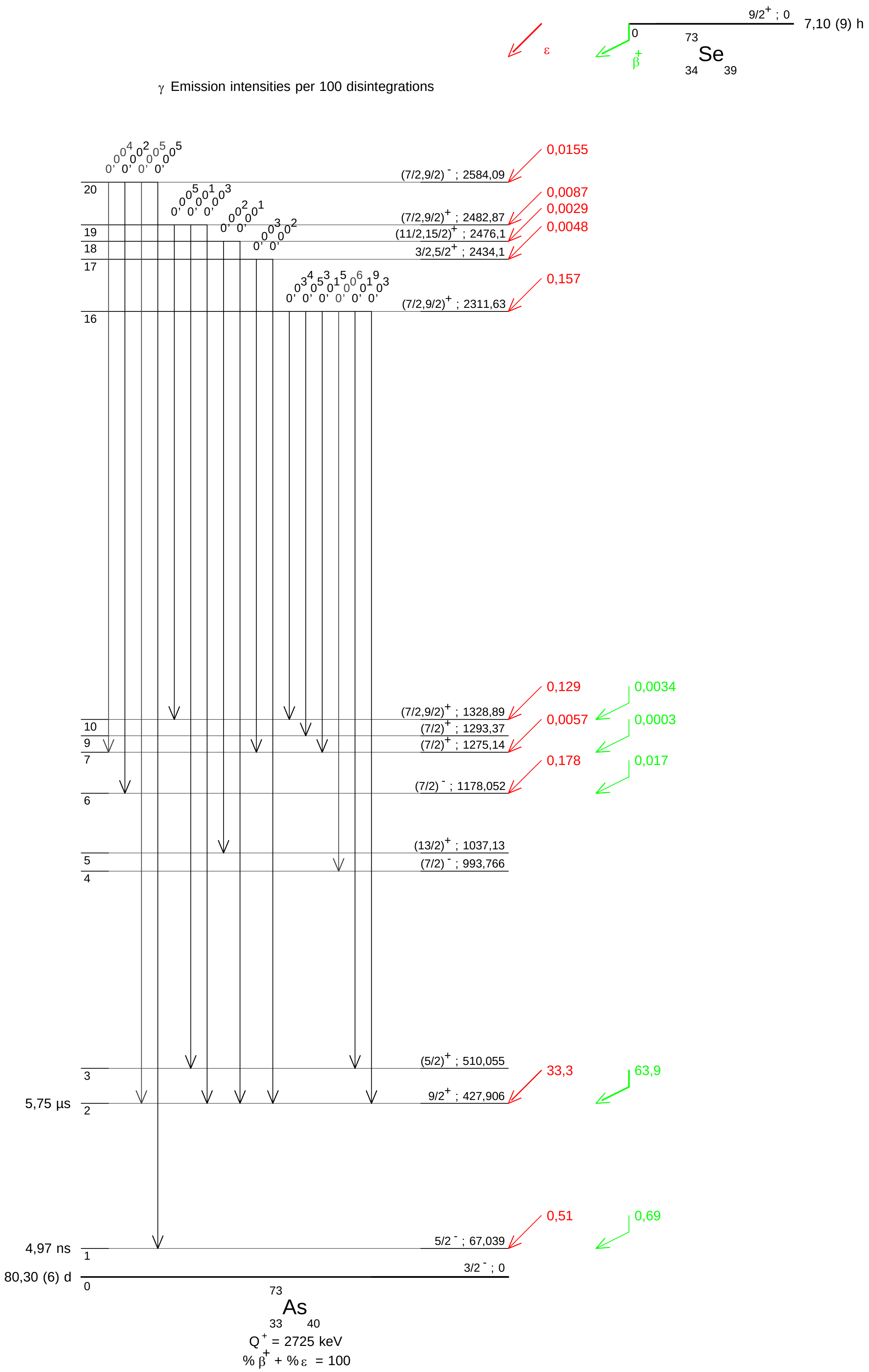
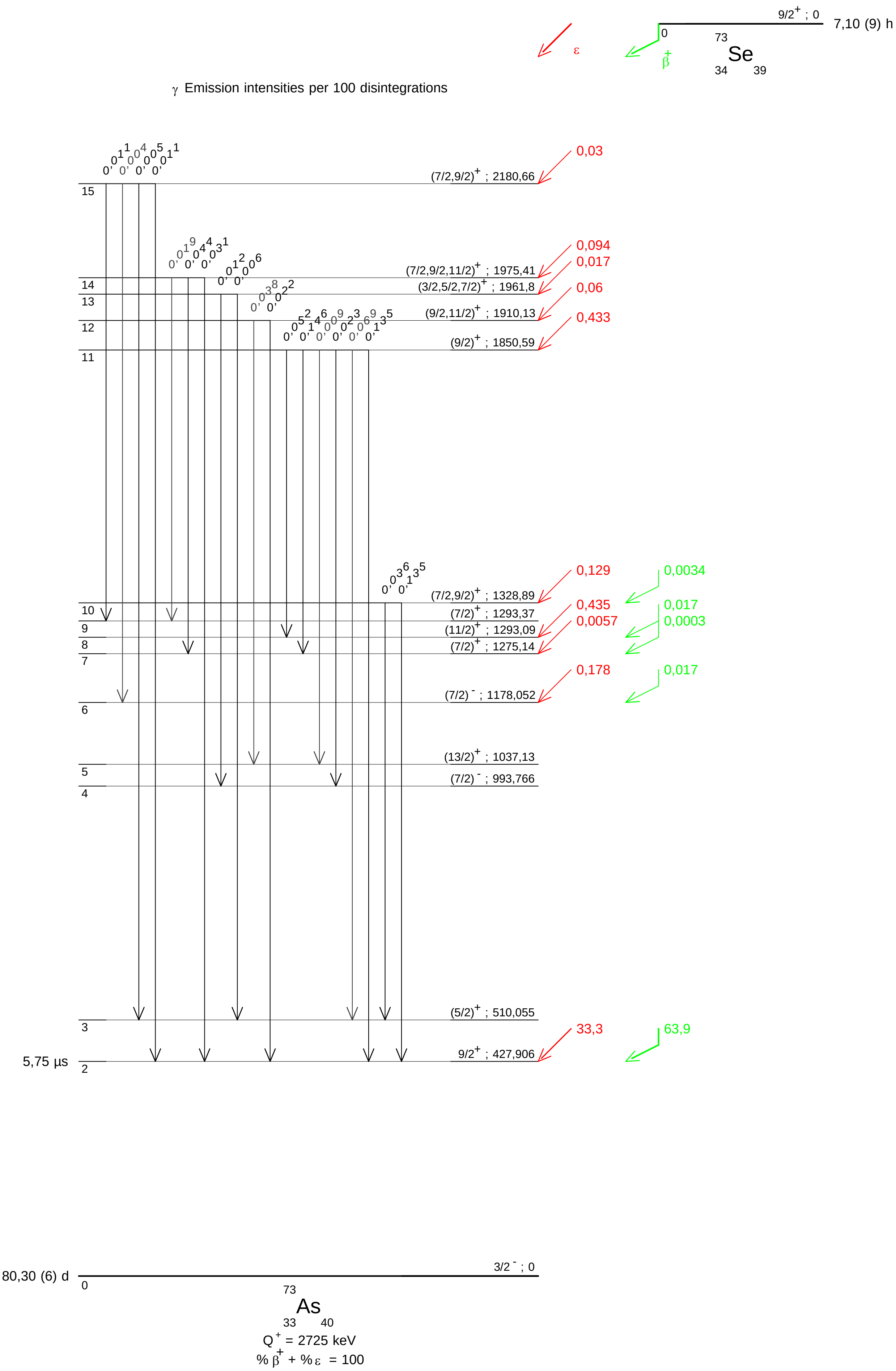
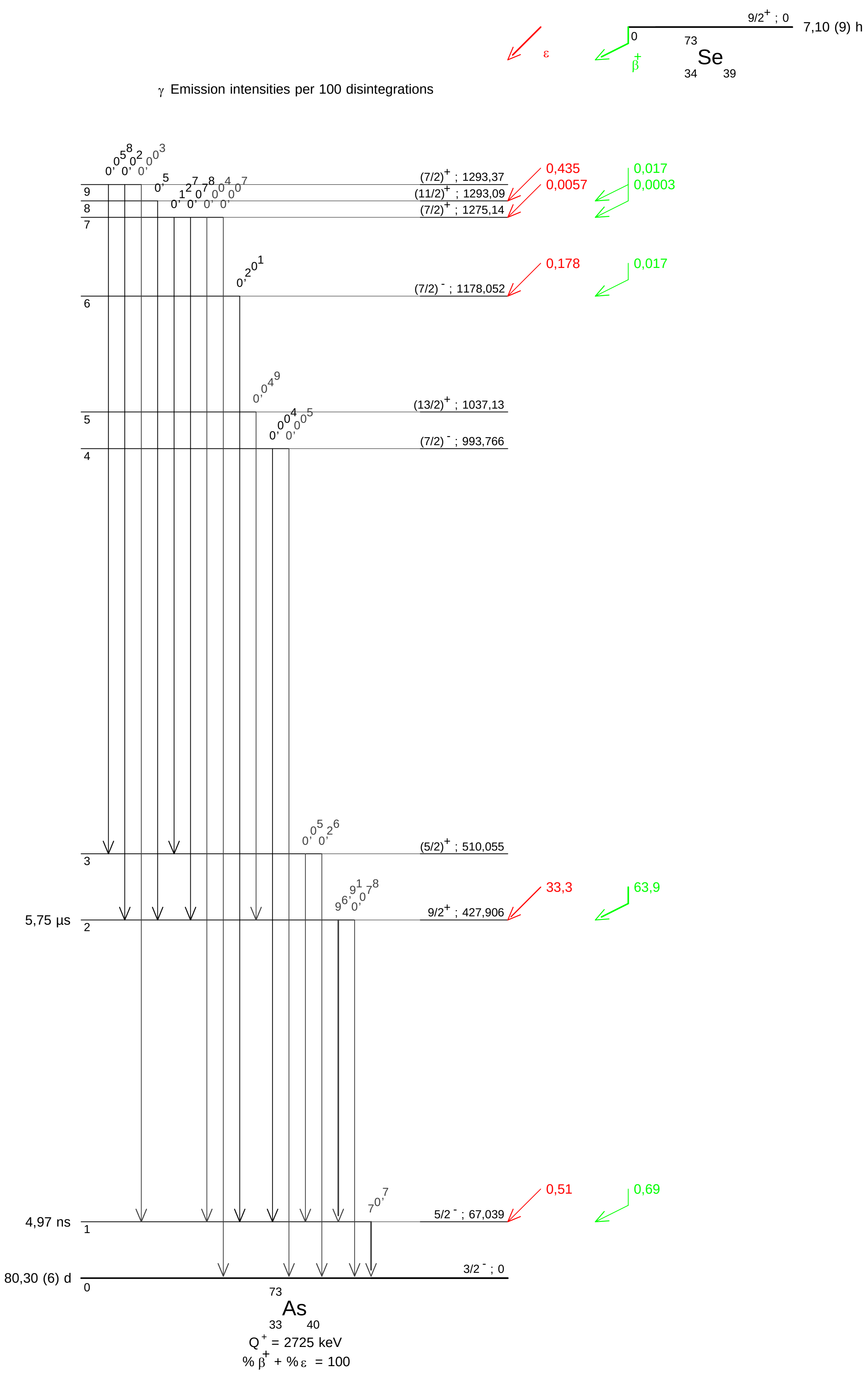

9/2+ ; 0
7,10 (9) h
73
Se
34 39
ε
β+
γ Emission intensities per 100 disintegrations
(7/2,9/2)- ; 2584,09
0,0155
(7/2,9/2)+ ; 2482,87
0,0087
(11/2,15/2)+ ; 2476,1
0,0029
3/2,5/2+ ; 2434,1
0,0048
(7/2,9/2)+ ; 2311,63
0,157
(7/2,9/2)+ ; 1328,89
0,129
0,0034
(7/2)+ ; 1293,37
(7/2)+ ; 1275,14
0,0057
0,0003
(7/2)- ; 1178,052
0,178
0,017
(13/2)+ ; 1037,13
(7/2)- ; 993,766
(5/2)+ ; 510,055
9/2+ ; 427,906
33,3
63,9
5,75 µs
5/2- ; 67,039
0,51
0,69
4,97 ns
3/2- ; 0
80,30 (6) d
73
As
33 40
Q+ = 2725 keV
% β+ + % ε = 100


9/2+ ; 0
7,10 (9) h
ε
β+
73
Se
34 39
γ Emission intensities per 100 disintegrations
(7/2,9/2)+ ; 2180,66
0,03
(7/2,9/2,11/2)+ ; 1975,41
0,094
(3/2,5/2,7/2)+ ; 1961,8
0,017
(9/2,11/2)+ ; 1910,13
0,06
(9/2)+ ; 1850,59
0,433
(7/2,9/2)+ ; 1328,89
0,129
0,0034
(7/2)+ ; 1293,37
0,435
0,017
(11/2)+ ; 1293,09
0,0057
0,0003
(7/2)+ ; 1275,14
(7/2)- ; 1178,052
0,178
0,017
(13/2)+ ; 1037,13
(7/2)- ; 993,766
(5/2)+ ; 510,055
9/2+ ; 427,906
33,3
63,9
5,75 µs
80,30 (6) d
3/2- ; 0
73
As
33 40
Q+ = 2725 keV
% β+ + % ε = 100


9/2+ ; 0
7,10 (9) h
ε
β+
73 Se 34 39
γ Emission intensities per 100 disintegrations
(7/2)+ ; 1293,37
(11/2)+ ; 1293,09
(7/2)+ ; 1275,14
0,435
0,0057
0,017
0,0003
(7/2) - ; 1178,052
0,178
0,017
(13/2)+ ; 1037,13
(7/2) - ; 993,766
(5/2)+ ; 510,055
9/2+ ; 427,906
33,3
63,9
5,75 µs
5/2 - ; 67,039
0,51
0,69
4,97 ns
3/2 - ; 0
80,30 (6) d
73 As 33 40
Q+ = 2725 keV
% β+ + % ε = 100

$^{82}_{37}$Rb $_{45}$

1 Decay Scheme

Le rubidium 82 se désintègre par capture électronique vers des niveaux excités et le niveau fondamental du krypton 82.

Rb-82 decays by electron capture to excited levels and to the ground state of Kr-82.

2 Nuclear Data

$T_{1/2}$(^{82}Rb) : 1,2652 (45) min
Q^{+}(^{82}Rb) : 4403 (3) keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,24}$	446,9 (30)	0,00009 (2)		7,1	0,8722 (15)	0,1061 (12)	0,0192 (4)
$\epsilon_{0,23}$	491,9 (30)	0,00010 (2)		7,1			
$\epsilon_{0,22}$	521,9 (30)	0,00024 (5)		6,8			
$\epsilon_{0,21}$	567,2 (30)	0,00089 (5)		6,3			
$\epsilon_{0,20}$	587,9 (30)	0,0019 (8)		5,6			
$\epsilon_{0,19}$	661 (3)	0,0036 (6)		5,9			
$\epsilon_{0,18}$	686,2 (30)	0,008 (3)		5,8			
$\epsilon_{0,17}$	838,4 (30)	0,0034 (31)		6			
$\epsilon_{0,16}$	945,5 (30)	0,000111 (23)		7,7			
$\epsilon_{0,15}$	1047,7 (30)	0,00134 (13)		6,7			
$\epsilon_{0,14}$	1216,2 (30)	0,0265 (15)		5,5	0,8763 (15)	0,1028 (12)	0,0185 (4)
$\epsilon_{0,13}$	1458,9 (30)	0,0500 (19)		5,4	0,8766 (15)	0,1025 (12)	0,0185 (4)
$\epsilon_{0,12}$	1747,2 (30)	0,0142 (17)		6,1	0,8770 (14)	0,1022 (12)	0,0184 (4)
$\epsilon_{0,11}$	1841,3 (30)	0,0011 (6)		7,3			
$\epsilon_{0,10}$	1846,7 (30)	0,00023 (11)		10			
$\epsilon_{0,9}$	1894 (3)	0,0011 (6)		7,4			
$\epsilon_{0,8}$	1923,3 (30)	0,0682 (14)		5,5	0,8771 (14)	0,1021 (12)	0,0184 (4)
$\epsilon_{0,7}$	1952,9 (30)	0,0105 (8)		6,3	0,8771 (14)	0,1021 (12)	0,0184 (4)
$\epsilon_{0,6}$	2231,3 (30)	0,283 (5)	Allowed	5	0,8773 (14)	0,1019 (12)	0,0184 (4)
$\epsilon_{0,5}$	2446,2 (30)	0,0047 (8)		6,7			
$\epsilon_{0,4}$	2582,4 (30)	0,00003 (3)	Unique 2nd Forbidden	11,5			
$\epsilon_{0,3}$	2915,4 (30)	0,0096 (9)	Allowed	6,7			

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,2}$	2928,1 (30)	0,0284 (14)	Allowed	6,3	0,8776 (14)	0,1017 (12)	0,0183 (4)
$\epsilon_{0,1}$	3626,5 (30)	1,06 (2)	Allowed	4,8	0,8778 (14)	0,1016 (12)	0,0183 (4)
$\epsilon_{0,0}$	4403 (3)	3,01 (3)	Allowed	4,6	0,8779 (14)	0,1014 (12)	0,0183 (4)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,12}$	725,2 (30)	0,00284 (34)		6,1
$\beta^+_{0,11}$	819,3 (30)	0,00033 (19)		7,3
$\beta^+_{0,10}$	824,7 (30)	0,00007 (4)		10
$\beta^+_{0,9}$	872 (3)	0,00041 (25)		7,4
$\beta^+_{0,8}$	901,3 (30)	0,0288 (7)		5,5
$\beta^+_{0,7}$	930,9 (30)	0,0050 (4)		6,3
$\beta^+_{0,6}$	1209,3 (30)	0,317 (6)	Allowed	5
$\beta^+_{0,5}$	1424,2 (30)	0,00890 (14)		6,7
$\beta^+_{0,4}$	1560,4 (30)	0,00007 (7)	Unique 2nd Forbidden	11,5
$\beta^+_{0,3}$	1893,4 (30)	0,0444 (41)	Allowed	6,7
$\beta^+_{0,2}$	1906,1 (30)	0,135 (7)	Allowed	6,3
$\beta^+_{0,1}$	2604,5 (30)	13,10 (19)	Allowed	4,8
$\beta^+_{0,0}$	3381 (3)	81,81 (24)	Allowed	4,6

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-4})	α_L (10^{-5})	α_M (10^{-6})	α_T (10^{-4})
$\gamma_{8,5}$(Kr)	522,923 (36)	0,0045 (15)					
$\gamma_{6,2}$(Kr)	696,786 (32)	0,071 (6)					
$\gamma_{2,1}$(Kr)	698,372 (14)	0,159 (11)					
$\gamma_{3,1}$(Kr)	711,10 (7)	0,060 (4)					
$\gamma_{1,0}$(Kr)	776,522 (10)	15,03 (19)	E2	8,19 (12)	8,84 (13)	14,3 (2)	9,23 (13)
$\gamma_{20,13}$(Kr)	871 (1)	0,0014 (8)					
$\gamma_{7,2}$(Kr)	975,20 (9)	0,0084 (11)					
$\gamma_{8,3}$(Kr)	992,10 (8)	0,0018 (8)					
$\gamma_{9,3}$(Kr)	1021,4 (5)	0,0015 (9)					
$\gamma_{4,1}$(Kr)	1044,08 (40)	0,0009 (6)					
$\gamma_{10,2}$(Kr)	1081,4 (7)	0,00030 (15)					
$\gamma_{11,2}$(Kr)	1086,8 (5)	0,0014 (8)					
$\gamma_{13,4}$(Kr)	1123,54 (40)	0,0008 (6)					
$\gamma_{12,3}$(Kr)	1168,20 (12)	0,0014 (6)					
$\gamma_{5,1}$(Kr)	1180,275 (22)	0,0165 (15)					
$\gamma_{12,2}$(Kr)	1180,93 (10)	0,0030 (15)					
$\gamma_{6,1}$(Kr)	1395,158 (32)	0,529 (8)	E2	2,12 (3)	2,24 (4)	3,63 (5)	2,90 (4)
$\gamma_{2,0}$(Kr)	1474,894 (10)	0,0904 (24)	E2	1,90 (3)	2,00 (3)	3,24 (5)	2,89 (4)
$\gamma_{17,5}$(Kr)	1607,8 (3)	0,00225 (30)					
$\gamma_{7,1}$(Kr)	1673,57 (9)	0,0071 (5)					
$\gamma_{14,3}$(Kr)	1699,20 (9)	0,0015 (8)					
$\gamma_{8,1}$(Kr)	1703,198 (32)	0,0505 (11)					

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-4})	α_L (10^{-5})	α_M (10^{-6})	α_T (10^{-4})
$\gamma_{14,2}$(Kr)	1711,93 (5)	0,00165 (30)					
$\gamma_{19,5}$(Kr)	1785,16 (8)	0,0030 (6)					
$\gamma_{12,1}$(Kr)	1879,3 (1)	0,0101 (6)					
$\gamma_{5,0}$(Kr)	1956,797 (20)	0,0068 (6)					
$\gamma_{13,1}$(Kr)	2167,618 (41)	0,0431 (6)					
$\gamma_{18,2}$(Kr)	2241,94 (15)	0,0009 (8)					
$\gamma_{14,1}$(Kr)	2410,30 (5)	0,0233 (12)					
$\gamma_{8,0}$(Kr)	2479,72 (3)	0,0401 (16)					
$\gamma_{15,1}$(Kr)	2578,80 (19)	0,00105 (11)					
$\gamma_{12,0}$(Kr)	2655,82 (10)	0,0026 (6)					
$\gamma_{17,1}$(Kr)	2788,08 (30)	0,00114 (8)					
$\gamma_{18,1}$(Kr)	2940,31 (15)	0,0071 (29)					
$\gamma_{13,0}$(Kr)	2944,14 (4)	0,0075 (15)					
$\gamma_{19,1}$(Kr)	2965,44 (8)	0,00060 (5)					
$\gamma_{21,1}$(Kr)	3059,3 (5)	0,00068 (5)					
$\gamma_{22,1}$(Kr)	3104,6 (5)	0,00015 (5)					
$\gamma_{15,0}$(Kr)	3355,32 (19)	0,000285 (30)					
$\gamma_{16,0}$(Kr)	3457,5 (7)	0,000111 (23)					
$\gamma_{20,0}$(Kr)	3815,1 (10)	0,000451 (31)					
$\gamma_{21,0}$(Kr)	3835,8 (5)	0,000219 (23)					
$\gamma_{22,0}$(Kr)	3881,1 (5)	0,000087 (21)					
$\gamma_{23,0}$(Kr)	3911,1 (10)	0,000105 (15)					
$\gamma_{24,0}$(Kr)	3956,1 (10)	0,000090 (15)					

3 Atomic Data

3.1 Kr

ω_K	:	0,652	(4)
$\bar{\omega}_L$	:	0,0215	(6)
n_{KL}	:	1,149	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	12,599	51,86
	$K\alpha_1$	12,65	100
	$K\beta_3$	14,105	} 23,96
	$K\beta_1$	14,113	}
	$K\beta_5''$	14,238	}
	$K\beta_2$	14,315	} 2,42
	$K\beta_4$	14,328	}
X_L			
	$L\ell$	1,387	
	$L\alpha$	1,585 - 1,586	
	$L\eta$	1,439	
	$L\beta$	1,637 - 1,831	
	$L\gamma$	1,706 - 1,911	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	10,398 - 10,885	100
KLX	12,077 - 12,637	34,7
KXY	13,741 - 14,298	3,02
Auger L	1,09 - 1,91	

4 Electron and Positron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Kr)	1,09 - 1,91		4,961 (25)
e_{AK}	(Kr)			
	KLL	10,398 - 10,885		1,394 (20)
	KLX	12,077 - 12,637		
	KXY	13,741 - 14,298		
$\beta^+_{0,0}$	max:	3381	(3)	81,81 (24)
	avg:	1535,6	(15)	
$\beta^+_{0,1}$	max:	2604,5	(30)	13,10 (19)
	avg:	1168,5	(15)	
$\beta^+_{0,2}$	max:	1906,1	(30)	0,135 (7)
	avg:	844,1	(14)	
$\beta^+_{0,3}$	max:	1893,4	(30)	0,0444 (41)
	avg:	838,3	(14)	
$\beta^+_{0,4}$	max:	1560,4	(30)	0,00007 (7)
	avg:	735,6	(15)	
$\beta^+_{0,5}$	max:	1424,2	(30)	0,00890 (14)
	avg:	624,8	(14)	
$\beta^+_{0,6}$	max:	1209,3	(30)	0,317 (6)
	avg:	528,6	(14)	
$\beta^+_{0,7}$	max:	930,9	(30)	0,0050 (4)
	avg:	405,7	(14)	
$\beta^+_{0,8}$	max:	901,3	(30)	0,0288 (7)
	avg:	392,7	(14)	
$\beta^+_{0,9}$	max:	872	(3)	0,00041 (25)
	avg:	380,0	(14)	
$\beta^+_{0,10}$	max:	824,7	(30)	0,00007 (4)
	avg:	359,4	(14)	
$\beta^+_{0,11}$	max:	819,3	(30)	0,00033 (19)
	avg:	357,0	(14)	

		Energy (keV)	Electrons (per 100 disint.)
$\beta^+_{0,12}$	max:	725,2 (30)	0,00284 (34)
	avg:	316,2 (13)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Kr)	1,387 - 1,911	0,1066 (18)	
XKα_2	(Kr)	12,599	0,760 (9)	Kα
XKα_1	(Kr)	12,65	1,466 (16)	
XKβ_3	(Kr)	14,105	0,351 (5)	K$'\beta_1$
XKβ_1	(Kr)	14,113		
XKβ_5''	(Kr)	14,238		
XKβ_2	(Kr)	14,315	0,0354 (12)	K$'\beta_2$
XKβ_4	(Kr)	14,328		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma^{\pm}$	511	190,9 (6)
$\gamma_{8,5}$(Kr)	522,8 (5)	0,0045 (15)
$\gamma_{6,2}$(Kr)	696,86 (15)	0,071 (6)
$\gamma_{2,1}$(Kr)	698,37 (5)	0,159 (11)
$\gamma_{3,1}$(Kr)	711,2 (1)	0,060 (4)
$\gamma_{1,0}$(Kr)	776,52 (1)	15,02 (19)
$\gamma_{20,13}$(Kr)	869,3 (4)	0,0014 (8)
$\gamma_{7,2}$(Kr)	975,2 (1)	0,0084 (11)
$\gamma_{8,3}$(Kr)	992,2 (1)	0,0018 (8)
$\gamma_{9,3}$(Kr)	1021,4 (5)	0,0015 (9)
$\gamma_{4,1}$(Kr)	1044,1 (5)	0,0009 (6)
$\gamma_{10,2}$(Kr)	1081,4 (7)	0,00030 (15)
$\gamma_{11,2}$(Kr)	1086,8 (5)	0,0014 (8)
$\gamma_{13,4}$(Kr)	1123,6 (7)	0,0008 (6)
$\gamma_{12,3}$(Kr)	1168,2 (2)	0,0014 (6)
$\gamma_{5,1}$(Kr)	1180,27 (2)	0,0165 (15)
$\gamma_{12,2}$(Kr)	1181,3	0,0030 (15)
$\gamma_{6,1}$(Kr)	1395,14 (3)	0,529 (8)
$\gamma_{2,0}$(Kr)	1474,88 (1)	0,0904 (24)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{17,5}$(Kr)	1607,7 (3)	0,00225 (30)
$\gamma_{7,1}$(Kr)	1673,55 (9)	0,0071 (5)
$\gamma_{14,3}$(Kr)	1698,7 (3)	0,0015 (8)
$\gamma_{8,1}$(Kr)	1703,19 (4)	0,0505 (11)
$\gamma_{14,2}$(Kr)	1711,9 (4)	0,00165 (30)
$\gamma_{19,5}$(Kr)	1785,13 (7)	0,0030 (6)
$\gamma_{12,1}$(Kr)	1879,18 (15)	0,0101 (6)
$\gamma_{5,0}$(Kr)	1956,75 (4)	0,0068 (6)
$\gamma_{13,1}$(Kr)	2167,59 (4)	0,0431 (6)
$\gamma_{18,2}$(Kr)	2241,98 (17)	0,0009 (8)
$\gamma_{14,1}$(Kr)	2410,26 (5)	0,0233 (12)
$\gamma_{8,0}$(Kr)	2479,65 (4)	0,0401 (16)
$\gamma_{15,1}$(Kr)	2578,7 (2)	0,00105 (11)
$\gamma_{12,0}$(Kr)	2655,85 (15)	0,0026 (6)
$\gamma_{17,1}$(Kr)	2788,4 (5)	0,00114 (8)
$\gamma_{18,1}$(Kr)	2940,0 (3)	0,0071 (29)
$\gamma_{13,0}$(Kr)	2944,0 (2)	0,0075 (15)
$\gamma_{19,1}$(Kr)	2966,3 (7)	0,00060 (5)
$\gamma_{21,1}$(Kr)	3059,2 (5)	0,00068 (5)
$\gamma_{22,1}$(Kr)	3104,5 (5)	0,00015 (5)
$\gamma_{15,0}$(Kr)	3355,6 (5)	0,000285 (30)
$\gamma_{16,0}$(Kr)	3457,4 (7)	0,000111 (23)
$\gamma_{20,0}$(Kr)	3815 (1)	0,000451 (31)
$\gamma_{21,0}$(Kr)	3836 (1)	0,000219 (23)
$\gamma_{22,0}$(Kr)	3881 (1)	0,000087 (21)
$\gamma_{23,0}$(Kr)	3911 (1)	0,000105 (15)
$\gamma_{24,0}$(Kr)	3956 (1)	0,000090 (15)

6 Main Production Modes

$$\begin{cases} Rb-nat(p,xn)Sr-82 \\ \text{Possible impurities: } Sr-85 \end{cases}$$

$$\begin{cases} Rb-85(p,4n)Sr-82 \\ \text{Possible impurities: } Sr-85 \end{cases}$$

Sr – 82(E.C.)Rb – 82

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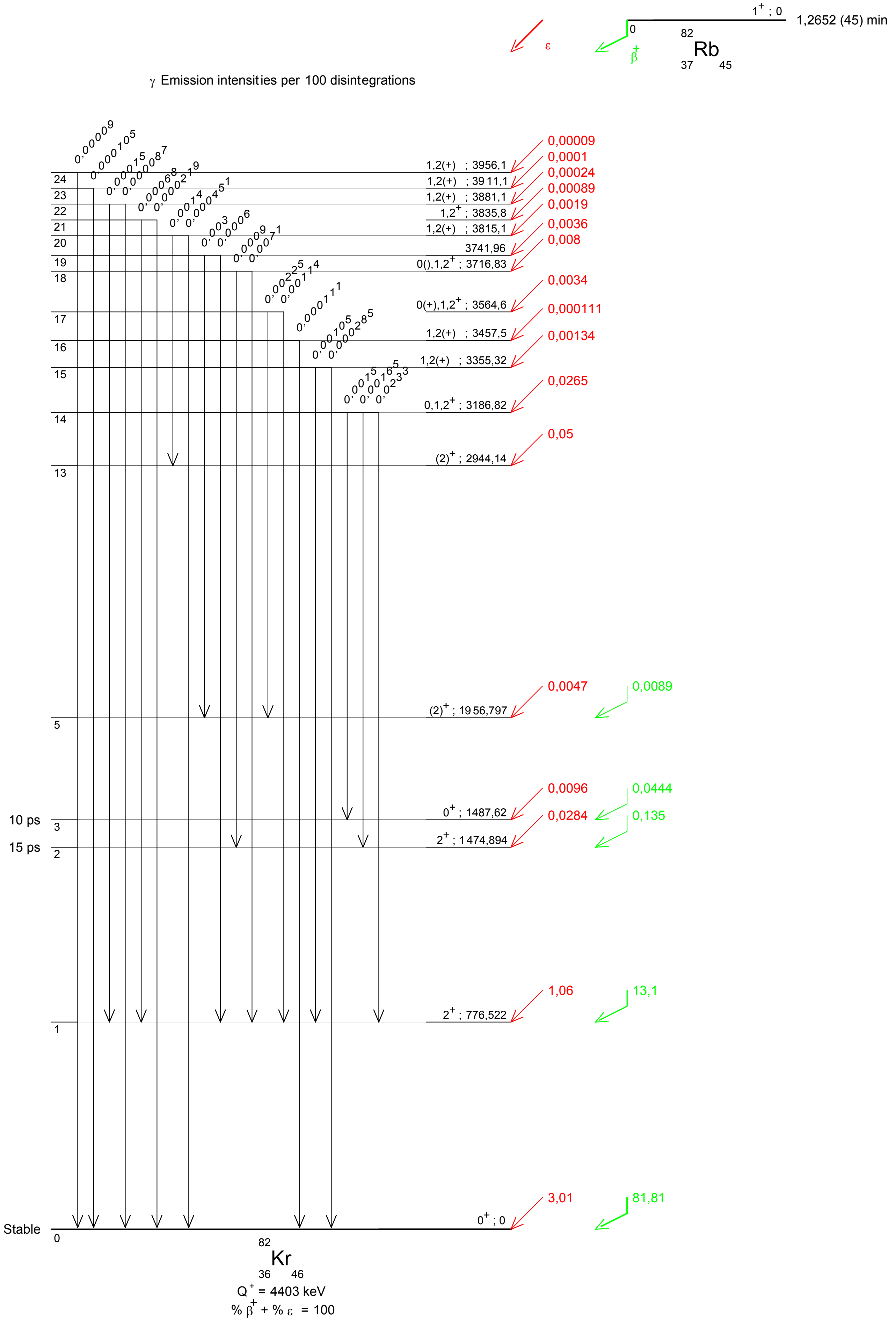
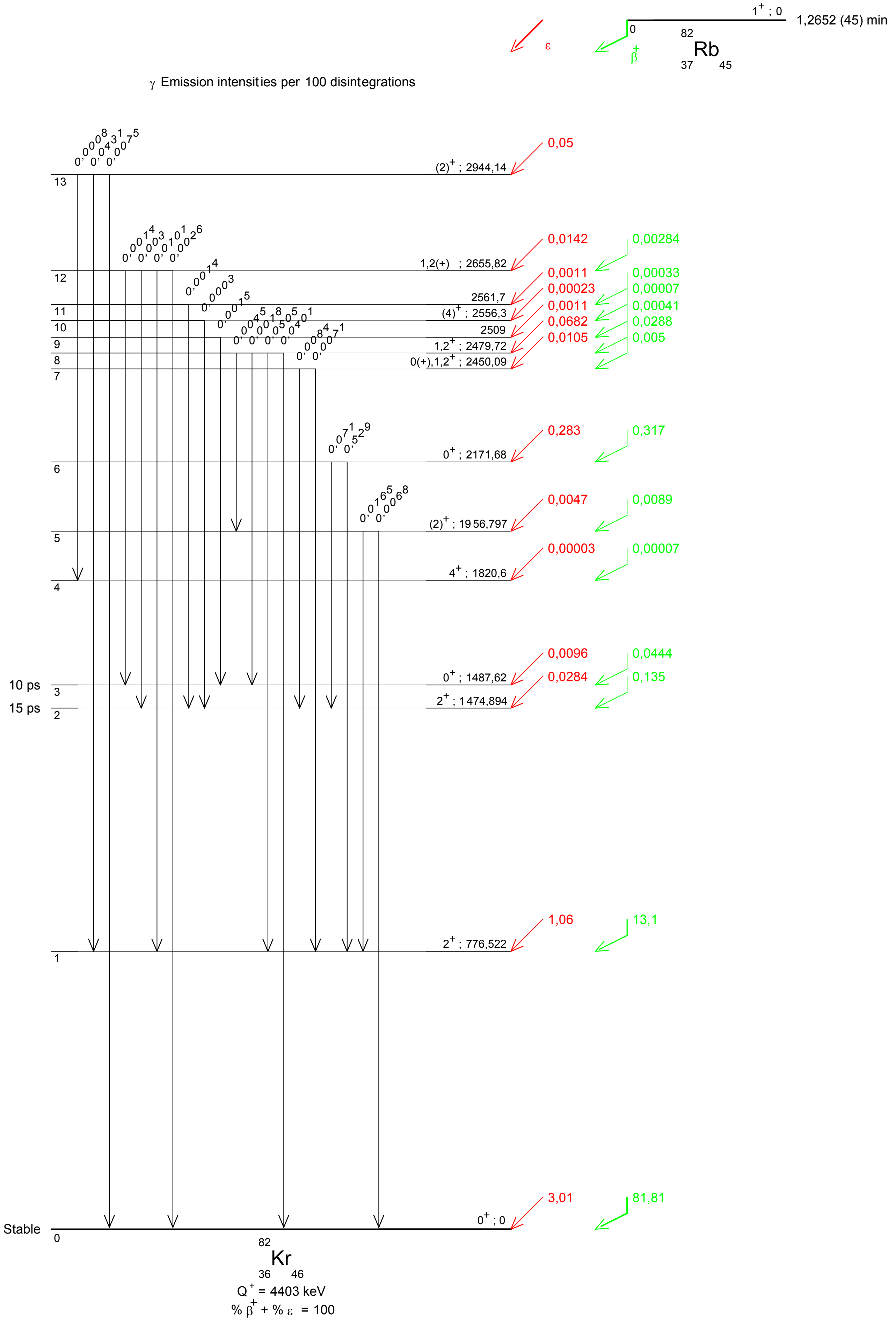
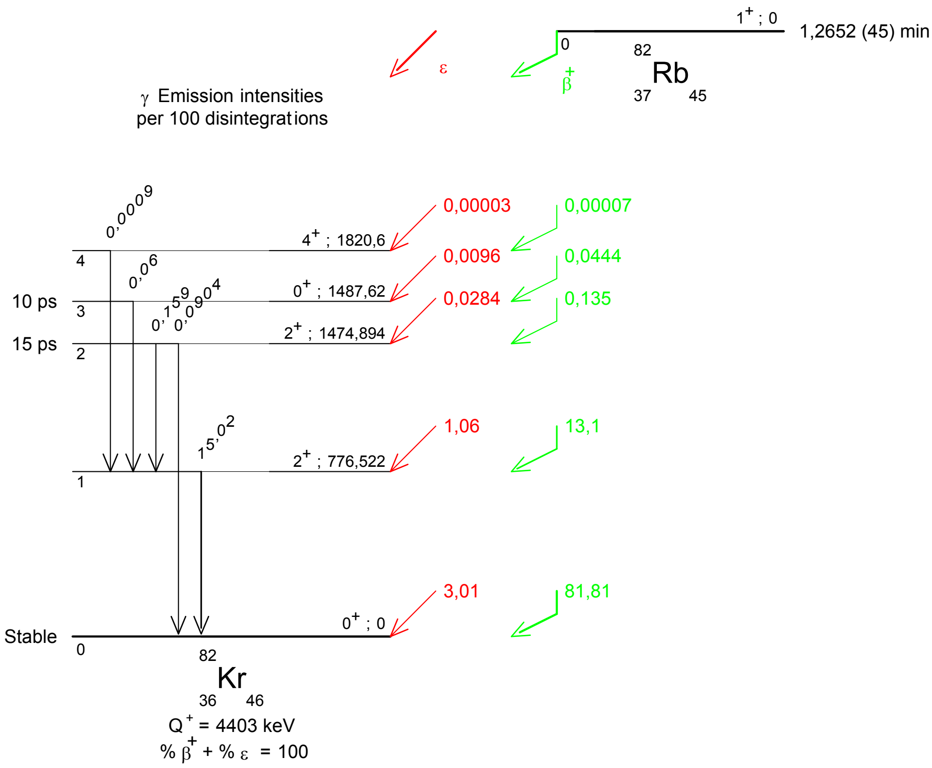


1+ ; 0
1,2652 (45) min
82 Rb 37 45
ε
β+
γ Emission intensities per 100 disintegrations
1,2(+) ; 3956,1
1,2(+) ; 3911,1
1,2(+) ; 3881,1
1,2+ ; 3835,8
1,2(+) ; 3815,1
3741,96
0(),1,2+ ; 3716,83
0(+),1,2+ ; 3564,6
1,2(+) ; 3457,5
1,2(+) ; 3355,32
0,1,2+ ; 3186,82
(2)+ ; 2944,14
(2)+ ; 1956,797
0+ ; 1487,62
2+ ; 1474,894
2+ ; 776,522
0+ ; 0
0,00009
0,0001
0,00024
0,00089
0,0019
0,0036
0,008
0,0034
0,000111
0,00134
0,0265
0,05
0,0047
0,0089
0,0096
0,0444
0,0284
0,135
1,06
13,1
3,01
81,81
10 ps
15 ps
Stable
82 Kr 36 46
Q+ = 4403 keV
% β+ + % ε = 100



1+ ; 0
1,2652 (45) min
ε
β+
82 Rb 37 45
γ Emission intensities per 100 disintegrations
(2)+ ; 2944,14
0,05
1,2(+) ; 2655,82
0,0142
0,00284
2561,7
0,0011
0,00033
(4)+ ; 2556,3
0,00023
0,00007
2509
0,0011
0,00041
1,2+ ; 2479,72
0,0682
0,0288
0(+),1,2+ ; 2450,09
0,0105
0,005
0+ ; 2171,68
0,283
0,317
(2)+ ; 1956,797
0,0047
0,0089
4+ ; 1820,6
0,00003
0,00007
0+ ; 1487,62
0,0096
0,0444
2+ ; 1474,894
0,0284
0,135
10 ps
15 ps
2+ ; 776,522
1,06
13,1
Stable
0+ ; 0
3,01
81,81
82 Kr 36 46
Q+ = 4403 keV
% β+ + % ε = 100


1+ ; 0
1,2652 (45) min
0
82 Rb 37 45
ε
β+
γ Emission intensities
per 100 disintegrations
0,00009
0,06
0,0904
0,159
0,1
1502
4+ ; 1820,6
0+ ; 1487,62
2+ ; 1474,894
2+ ; 776,522
0+ ; 0
0,00003
0,0096
0,0284
1,06
3,01
0,00007
0,0444
0,135
13,1
81,81
10 ps
15 ps
Stable
4
3
2
1
0
82 Kr 36 46
Q+ = 4403 keV
% β+ + % ε = 100

$^{82}_{38}$Sr$_{44}$

1 Decay Scheme

Sr-82 decays by electron capture to the ground state of Rb-82 ($T_{1/2}$ = 1,2652 (45) min). There is no decay to the excited level of Rb-82m ($T_{1/2}$ = 6,47 h).

Le strontium 82 se désintègre par capture électronique vers le niveau fondamental du rubidium 82 ($T_{1/2}$=1,2652 (45) min), le niveau excité de période 6,47 h n'est pas atteint.

2 Nuclear Data

$T_{1/2}$(^{82}Sr)	:	25,347	(17)	d
$T_{1/2}$(^{82}Rb)	:	1,2652	(45)	min
Q^+(^{82}Sr)	:	178	(7)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,0}$	178 (7)	100	Allowed	4,7	0,859 (2)	0,116 (2)	0,022 (1)

3 Atomic Data

3.1 Rb

ω_K	:	0,674	(4)
$\bar{\omega}_L$	:	0,0237	(6)
n_{KL}	:	1,125	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	13,3359	51,95
	$K\alpha_1$	13,3955	100
	$K\beta_3$	14,9519	} 24,34
	$K\beta_1$	14,9614	}
	$K\beta_5''$	15,085	}
	$K\beta_2$	15,1856	} 2,82
	$K\beta_4$	15,205	}
X_L			
	$L\ell$	1,484	
	$L\alpha$	1,693 - 1,695	
	$L\eta$	1,543	
	$L\beta$	1,752 - 1,954	
	$L\gamma$	1,831 - 2,051	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	10,987 - 11,503	100
KLX	12,782 - 13,381	35,8
KXY	14,556 - 15,172	3,2
Auger L	1,16 - 2,05	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Rb)	1,16 - 2,05	105,7 (5)
e_{AK}	(Rb)		
	KLL	10,987 - 11,503	} 28,0 (4)
	KLX	12,782 - 13,381	}
	KXY	14,556 - 15,172	}

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Rb)	1,484 - 2,051	2,52 (5)	
XKα_2	(Rb)	13,3359	16,79 (14)	Kα
XKα_1	(Rb)	13,3955	32,32 (22)	
XKβ_3	(Rb)	14,9519		
XKβ_1	(Rb)	14,9614	7,87 (9)	K$'\beta_1$
XKβ_5''	(Rb)	15,085		
XKβ_2	(Rb)	15,1856	0,91 (4)	K$'\beta_2$
XKβ_4	(Rb)	15,205		

6 Main Production Modes

Rb – nat(p,xn)Sr – 82
Possible impurities: Sr – 85

Rb – 85(p,4n)Sr – 82
Possible impurities: Sr – 85

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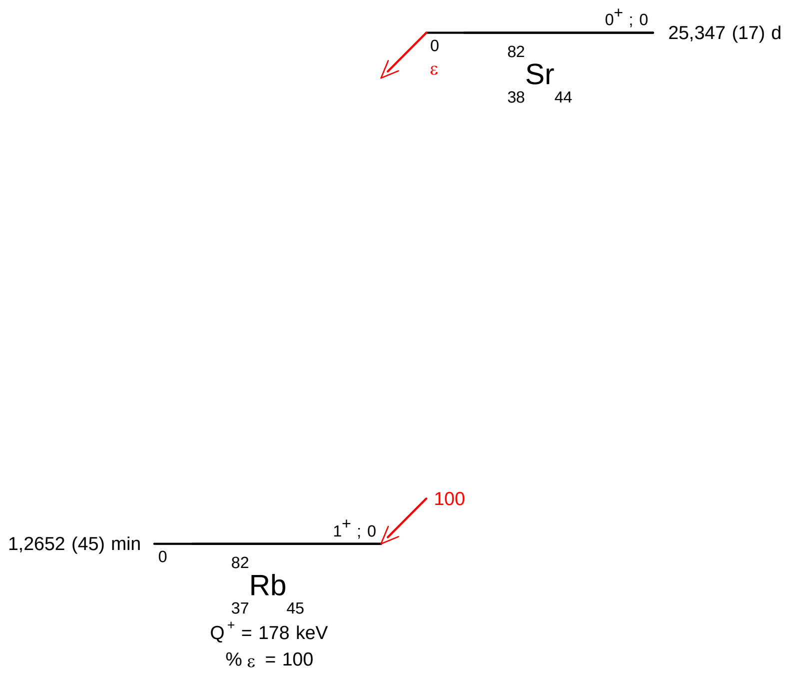
  (Q)


0+ ; 0
25,347 (17) d
0
ε
82
Sr
38 44
100
1,2652 (45) min
1+ ; 0
0
82
Rb
37 45
Q+ = 178 keV
% ε = 100

$^{88}_{39}Y_{49}$

1 Decay Scheme

L'yttrium 88 se désintègre par capture électronique et émission bêta plus vers les niveaux excités du strontium 88. Aucune transition (EC/β^+) vers le niveau fondamental du strontium 88 n'a été mise en évidence.

Y-88 decays by electron capture and β^+ emission to excited levels of Sr-88. No (EC/β^+) transition to the ground state of Sr-88 was found.

2 Nuclear Data

$T_{1/2}$(^{88}Y)	:	106,63	(5)	d
Q^+(^{88}Y)	:	3622,6	(15)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,4}$	37,8 (15)	0,048 (18)	Allowed	7	0,721 (12)	0,225 (10)	0,0542 (25)
$\epsilon_{0,3}$	404,1 (15)	0,023 (4)	Unique 1st Forbidden	9,5	0,8521 (2)	0,1209 (1)	0,02701 (3)
$\epsilon_{0,2}$	888,5 (15)	94,3 (3)	Allowed	6,9	0,8726 (15)	0,1046 (14)	0,0229 (6)
$\epsilon_{0,1}$	1786,5 (15)	5,7 (3)	Unique 1st Forbidden	9,8	0,8393 (3)	0,100085 (4)	0,02206 (8)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,1}$	764,5 (15)	0,21 (1)	Unique 1st Forbidden	9,8

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-5})	α_N (10^{-6})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{3,2}$(Sr)	484,352 (23)	0,0009 (9)	[E1]	1,079 (16)	1,165 (17)	1,95 (3)	2,45 (4)	1,217 (17)	
$\gamma_{4,2}$(Sr)	850,647 (21)	0,048 (18)	E2	0,754 (11)	0,828 (12)	1,39 (2)	1,739 (25)	0,853 (12)	
$\gamma_{2,1}$(Sr)	898,047 (11)	93,7 (3)	E1(+M2)	0,273 (4)	0,292 (4)	0,489 (7)	0,614 (9)	0,307 (5)	
$\gamma_{3,1}$(Sr)	1382,399 (23)	0,016 (3)	M1+E2	0,255 (4)	0,273 (4)	0,458 (7)	0,577 (8)	0,288 (4)	0,378 (6)
$\gamma_{1,0}$(Sr)	1836,090 (8)	99,385 (25)	E2	0,1449 (21)	0,1550 (22)	0,260 (4)	0,327 (5)	0,163 (2)	2,30 (4)
$\gamma_{2,0}$(Sr)	2734,137 (8)	0,608 (25)	(E3)	0,1098 (16)	0,1176 (17)	0,197 (3)	0,248 (4)	0,124 (2)	4,40 (7)
$\gamma_{3,0}$(Sr)	3218,489 (22)	0,0071 (20)	E2	0,0545 (8)	0,0577 (8)	0,0967 (14)	0,1219 (17)	0,0613 (8)	8,69 (13)

3 Atomic Data

3.1 Sr

ω_K : 0,696 (4)
$\bar{\omega}_L$: 0,0262 (7)
n_{KL} : 1,102 (4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	Kα_2	14,098	52,05
	Kα_1	14,1652	100
	Kβ_3	15,8252	} 24,69131
	Kβ_1	15,8359	}
	Kβ_5''	15,969	}
	Kβ_2	16,0847	} 3,20987
	Kβ_4	16,104	}
X_L			
	Lℓ	1,5833	
	Lα	1,8054 - 1,8071	
	Lη	1,6501	
	Lβ	1,8722 - 1,9466	
	Lγ	1,9707 - 2,1971	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	11,587 - 12,134	100
KLX	13,498 - 14,145	36,7
KXY	15,390 - 16,065	3,37
Auger L	1,2246 - 2,1944	

4 Electron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Sr)	1,2246 - 2,1944		103,8 (5)
e_{AK}	(Sr)			
	KLL	11,587 - 12,134	}	26,5 (4)
	KLX	13,498 - 14,145	}	
	KXY	15,390 - 16,065	}	
$ec^{\pm}_{1,0}$	(Sr)	814,072 (8)		0,02285 (40)
$ec_{2,1\ T}$	(Sr)	881,942 - 898,045		0,02877 (48)
$ec^{\pm}_{2,0}$	(Sr)	1712,094 (8)		0,000268 (12)
$ec_{1,0\ T}$	(Sr)	1819,99 - 1836,09		0,0162 (2)
$\beta^+_{0,1}$	max:	764,5 (15)	}	0,21 (1)
	avg:	359,5 (7)	}	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)		Photons (per 100 disint.)		
XL	(Sr)	1,5833 - 2,1971		2,76 (5)		
$XK\alpha_2$	(Sr)	14,098		17,55 (16)	}	$K\alpha$
$XK\alpha_1$	(Sr)	14,1652		33,71 (26)	}	
$XK\beta_3$	(Sr)	15,8252	}	8,32 (10)		$K'\beta_1$
$XK\beta_1$	(Sr)	15,8359	}			
$XK\beta''_5$	(Sr)	15,969	}			
$XK\beta_2$	(Sr)	16,0847	}	1,08 (4)		$K'\beta_2$
$XK\beta_4$	(Sr)	16,104	}			

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{3,2}$(Sr)	484,352 (23)	0,0009 (9)
$\gamma^{\pm}$	511	0,46 (3)
$\gamma_{4,2}$(Sr)	850,643 (21)	0,048 (18)
$\gamma_{2,1}$(Sr)	898,042 (11)	93,7 (3)
$\gamma_{3,1}$(Sr)	1382,387 (23)	0,016 (3)
$\gamma_{1,0}$(Sr)	1836,070 (8)	99,346 (25)
$\gamma_{2,0}$(Sr)	2734,092 (8)	0,608 (25)
$\gamma_{3,0}$(Sr)	3218,426 (22)	0,0071 (20)

6 Main Production Modes

Sr – 88(p,n)Y – 88
Possible impurities: Y – 84, Y – 85, Y – 86, Y – 87, Rb – 83, Rb – 84, Rb – 86

Sr – 88(d,2n)Y – 88
Possible impurities: Y – 84, Y – 87, Sr – 89

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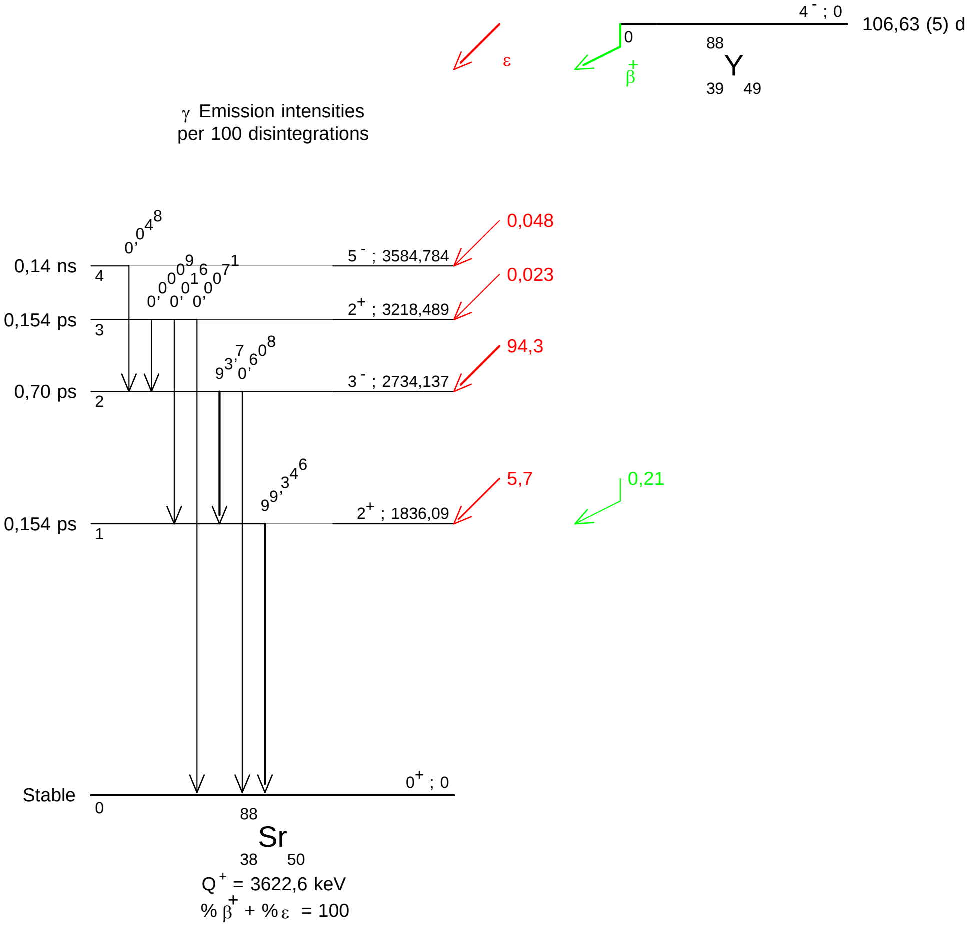
4 - ; 0
106,63 (5) d
0
88
Y
39 49
ε
β+
γ Emission intensities
per 100 disintegrations
0,048
0,023
94,3
5,7
0,21
0,14 ns
0,154 ps
0,70 ps
0,154 ps
Stable
5 - ; 3584,784
2+ ; 3218,489
3 - ; 2734,137
2+ ; 1836,09
0+ ; 0
88
Sr
38 50
Q+ = 3622,6 keV
% β+ + % ε = 100

$^{89}_{40}$Zr $_{49}$

1 Decay Scheme

Zr-89 (half-life of 78.42 h) undergoes 100% EC/positron decay (Q_{EC} of 2832.8(28) keV) to various nuclear levels, including the metastable and ground states of Y-89.

Le zirconium 89 se désintègre par capture électronique et/ou transitions bêta plus vers plusieurs niveaux de l'yttrium 89, y compris le niveau isomérique et le niveau fondamental.

2 Nuclear Data

$T_{1/2}(^{89}Zr)$	:	78,42	(13)	h
$T_{1/2}(^{89m}Y)$	:	15,84	(18)	s
$Q^+(^{89}Zr)$	:	2832,8	(28)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,5}$	211 (3)	0,745 (10)	allowed	6,18	0,8575 (17)	0,1165 (13)	0,0223 (5)
$\epsilon_{0,4}$	266 (3)	0,106 (5)	allowed	7,25	0,8615 (16)	0,1134 (13)	0,0216 (5)
$\epsilon_{0,3}$	303 (3)	0,074 (5)	allowed	7,52	0,8632 (16)	0,1120 (13)	0,0213 (4)
$\epsilon_{0,2}$	1088 (3)	0,123 (4)	unique 1st forbidden	9,09	0,8677 (15)	0,1082 (12)	0,0208 (4)
$\epsilon_{0,1}$	1924 (3)	76,2 (3)	allowed	6,152	0,8731 (15)	0,1041 (12)	0,0196 (4)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,1}$	902 (3)	22,8 (3)	allowed	6,152

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-4})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{1,0}$(Y)	908,97 (3)	99,873 (23)	M4	7,43 (11)	9,06 (13)	1,561 (22)	8,51 (12)	
$\gamma_{3,1}$(Y)	1620,83 (20)	0,074 (5)	M1+E2					
$\gamma_{4,1}$(Y)	1657,58 (15)	0,106 (5)	M1+E2					
$\gamma_{5,1}$(Y)	1713,1 (3)	0,745 (10)	M1+E2					
$\gamma_{2,0}$(Y)	1744,74 (18)	0,1231 (40)	E2	0,1722 (25)	0,186 (3)	0,0317 (5)	0,382 (6)	1,88 (3)

3 Atomic Data

3.1 Y

ω_K	:	0,716	(4)
$\bar{\omega}_L$	:	0,0289	(7)
n_{KL}	:	1,081	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	14,8829	52,1
	$K\alpha_1$	14,9585	100
	$K\beta_3$	16,7259	} 25,1
	$K\beta_1$	16,7381	
	$K\beta_5''$	16,88	
	$K\beta_2$	17,0156	} 3,48
	$K\beta_4$	17,0362	
X_L			
	$L\ell$	1,686	
	$L\alpha$	1,92 - 1,923	
	$L\eta$	1,762	
	$L\beta$	1,996 - 2,078	
	$L\gamma$	2,153 - 2,347	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	12,205 - 12,784	100
KLX	14,238 - 14,956	37,6
KXY	16,251 - 17,034	3,53
Auger L	1,27 - 1,89	579

4 Electron and Positron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Y)	1,27 - 1,89	79,5 (7)
e_{AK}	(Y)		
	KLL	12,205 - 12,784	} 19,4 (3)
	KLX	14,238 - 14,956	}
	KXY	16,251 - 17,034	}
$ec_{1,0\ T}$	(Y)	891,93 - 908,97	0,84 (3)
$ec_{1,0\ K}$	(Y)	891,93 (3)	0,73 (3)
$ec_{1,0\ L}$	(Y)	906,60 - 906,89	0,089 (3)
$ec_{1,0\ M+}$	(Y)	908,58 - 908,97	0,017 (1)
$\beta^+_{0,1}$	max:	902 (3)	} 22,8 (3)
	avg:	395,7 (14)	}

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Y)	1,686 - 2,347	2,36 (5)	
$XK\alpha_2$	(Y)	14,8829	14,08 (13)	} $K\alpha$
$XK\alpha_1$	(Y)	14,9585	27,01 (20)	}
$XK\beta_3$	(Y)	16,7259	} 6,78 (8)	$K'\beta_1$
$XK\beta_1$	(Y)	16,7381	}	
$XK\beta_5''$	(Y)	16,88	}	
$XK\beta_2$	(Y)	17,0156	} 0,94 (4)	$K'\beta_2$
$XK\beta_4$	(Y)	17,0362	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma^{\pm}$	511	45,6 (6)
$\gamma_{1,0}$(Y)	908,97 (3)	99,03 (2)
$\gamma_{3,1}$(Y)	1620,81 (20)	0,074 (5)
$\gamma_{4,1}$(Y)	1657,56 (15)	0,106 (5)
$\gamma_{5,1}$(Y)	1713,1 (3)	0,745 (10)
$\gamma_{2,0}$(Y)	1744,72 (18)	0,123 (4)

6 Main Production Modes

{ Y – 89(p,n)Zr – 89
Possible impurities: Zr – 88(EC)Y – 88, Zr – 89m

Y – 89(d,2n)Zr – 89

Y – 89(α,p3n)Zr – 89

{ Zr – 90(n,2n)Zr – 89
Possible impurities: Zr – 89m

Zr – 90(p,2n)Nb – 89(EC)Zr – 89

Zr – 90(p,pn)Zr – 89

Zr – 90(γ,n)Zr – 89

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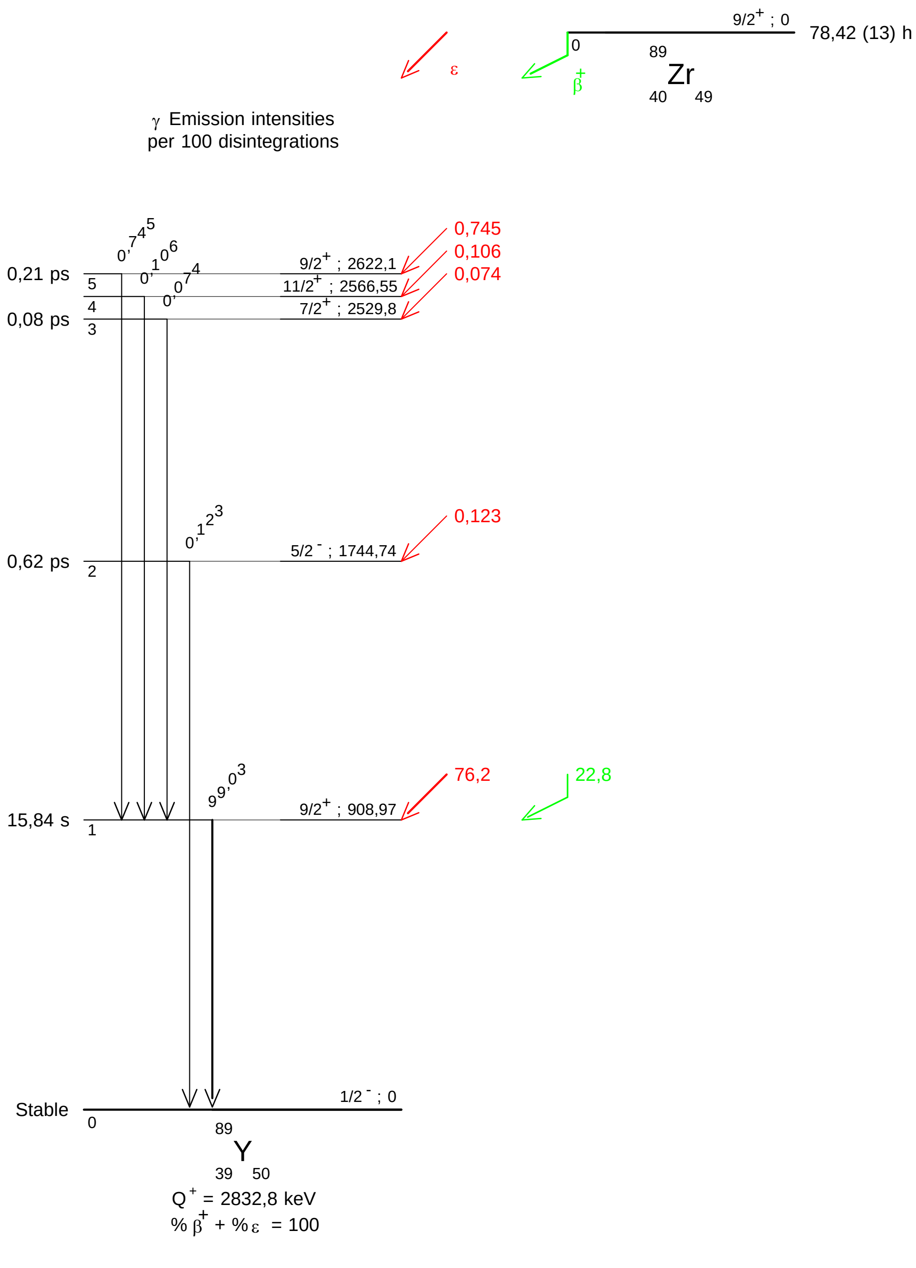
9/2+ ; 0
78,42 (13) h
0
89
Zr
40 49
ε
β+
γ Emission intensities
per 100 disintegrations
0,745
0,106
0,074
0,123
76,2
22,8
0,745
0,106
0,074
0,123
99,03
0,21 ps
0,08 ps
0,62 ps
15,84 s
Stable
9/2+ ; 2622,1
11/2+ ; 2566,55
7/2+ ; 2529,8
5/2- ; 1744,74
9/2+ ; 908,97
1/2- ; 0
5
4
3
2
1
0
89
Y
39 50
Q+ = 2832,8 keV
% β+ + % ε = 100

$^{93}_{40}$Zr $_{53}$

1 Decay Scheme

Zr-93 decays via two beta minus transitions, 73(5)% to Nb-93m and 27(5)% to Nb-93.

Le zirconium-93 se désintègre 100 % par émission bêta vers le niveau isomerique (73 (5) %) et le niveau fondamental (27 (5) %) du niobium 93.

2 Nuclear Data

$T_{1/2}(^{93}$Zr)	:	1,61	(6)	10^6 a
$Q^-(^{93}$Zr)	:	90,3	(15)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,1}$	59,5 (15)	73 (5)	Unique 1st Forbidden	10,16
$\beta^-_{0,0}$	90,3 (15)	27 (5)	2nd Forbidden	12,09

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^5)	α_L (10^5)	α_M (10^5)	α_T (10^5)
$\gamma_{1,0}$(Nb)	30,77 (2)	73 (5)	M4	0,260 (4)	1,151 (17)	0,249 (4)	1,693 (25)

3 Atomic Data

3.1 Nb

ω_K	:	0,751	(4)
$\bar{\omega}_L$	:	0,0347	(9)
n_{KL}	:	1,045	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	16,5213	52,36
	$K\alpha_1$	16,6152	100
	$K\beta_3$	18,607	}
	$K\beta_1$	18,623	} 25,87
	$K\beta_5''$	18,78	}
	$K\beta_2$	18,953	} 3,88
	$K\beta_4$	18,981	}
X_L			
	$L\ell$	1,9	
	$L\alpha$	2,16 - 2,17	
	$L\eta$	2	
	$L\beta$	2,26 - 2,49	
	$L\gamma$	2,41 - 2,67	

3.1.2 Auger Electrons

		Energy (keV)	Relative probability
Auger K			
	KLL	13,49 - 14,14	100
	KLX	15,78 - 16,61	39,1
	KXY	18,05 - 18,98	3,81
Auger L		1,4 - 2,7	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Nb)	1,4 - 2,7	59,1 (4)
e_{AK}	(Nb)		2,78 (21)
	KLL	13,49 - 14,14	
	KLX	15,78 - 16,61	
	KXY	18,05 - 18,98	
$ec_{1,0\ T}$	(Nb)	11,78 - 30,77	73 (5)
$ec_{1,0\ K}$	(Nb)	11,78 (2)	11,2 (8)
$ec_{1,0\ L}$	(Nb)	28,07 - 28,40	49,5 (35)
$ec_{1,0\ M}$	(Nb)	30,30 - 30,57	10,7 (8)
$ec_{1,0\ N}$	(Nb)	30,71 - 30,77	1,39 (10)
$\beta^-_{0,1}$	max:	59,5 (15)	73 (5)
	avg:	18,75 (54)	
$\beta^-_{0,0}$	max:	90,3 (15)	27 (5)
	avg:	23,64 (42)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Nb)	1,9 - 2,67	2,1 (1)	
XKα_2	(Nb)	16,5213	2,41 (18)	Kα
XKα_1	(Nb)	16,6152	4,6 (4)	
XKβ_3	(Nb)	18,607	1,19 (9)	K$'\beta_1$
XKβ_1	(Nb)	18,623		
XKβ''_5	(Nb)	18,78		
XKβ_2	(Nb)	18,953	0,179 (15)	K$'\beta_2$
XKβ_4	(Nb)	18,981		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Nb)	30,77 (2)	0,00043 (3)

6 Main Production Modes

$\begin{cases} U - 235(n,f)Zr - 93 \\ \text{Possible impurities :} \; Fe - 55, Mo - 93, Nb - 93m \end{cases}$

$\begin{cases} Zr - 92(n,\gamma)Zr - 93 \\ \text{Possible impurities :} \; Nb - 93m \end{cases}$

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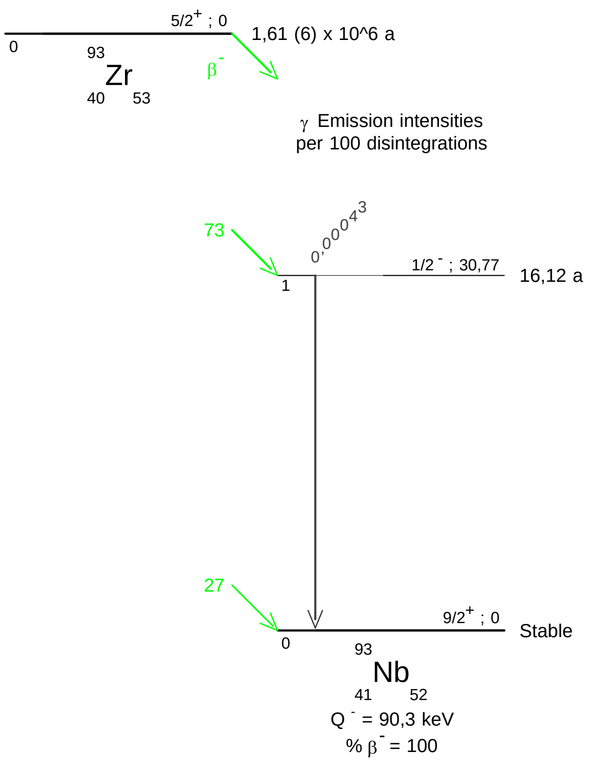
(Q)


5/2+ ; 0
1,61 (6) x 10^6 a
0
93
Zr
40 53
β-
γ Emission intensities
per 100 disintegrations
73
0,00043
1/2- ; 30,77
16,12 a
1
27
9/2+ ; 0
Stable
0
93
Nb
41 52
Q- = 90,3 keV
% β- = 100

$^{93m}_{41}\mathrm{Nb}_{52}$

1 Decay Scheme

Nb-93m disintegrates by 100% gamma transition to the ground state of the stable nuclide Nb-93.
Le niobium 93m se désexcite à 100 % par transition gamma vers le noyau stable de niobium 93.

2 Nuclear Data

$T_{1/2}(^{93m}\mathrm{Nb})$	:	16,12	(15)	a
$Q^{IT}(^{93m}\mathrm{Nb})$	:	30,77	(2)	keV

2.1 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^5)	α_L (10^5)	α_M (10^5)	α_T (10^5)
$\gamma_{1,0}$(Nb)	30,77 (2)	100	M4	0,260 (4)	1,151 (17)	0,249 (4)	1,693 (25)

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CEA/LNE-LNHB / M.A. Kellett

3 Atomic Data

3.1 Nb

ω_K	:	0,751	(4)
$\bar{\omega}_L$	:	0,0347	(9)
n_{KL}	:	1,045	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	16,5213	52,36
	$K\alpha_1$	16,6152	100
	$K\beta_3$	18,607	}
	$K\beta_1$	18,623	} 25,8
	$K\beta_5''$	18,78	}
	$K\beta_2$	18,952	} 3,86
	$K\beta_4$	18,982	}
X_L			
	$L\ell$	1,9	
	$L\alpha$	2,16 - 2,17	
	$L\eta$	2	
	$L\beta$	2,26 - 2,37	
	$L\gamma$	2,41 - 2,67	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	13,49 - 14,14	100
KLX	15,79 - 16,58	39,1
KXY	18,02 - 18,91	3,81
Auger L	1,4 - 2,6	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Nb)	1,4 - 2,6	81,25 (28)
e_{AK}	(Nb)		3,83 (11)
	KLL	13,49 - 14,14	
	KLX	15,79 - 16,58	
	KXY	18,02 - 18,91	
$ec_{1,0\ T}$	(Nb)	11,78 - 30,77	99,999409 (9)
$ec_{1,0\ K}$	(Nb)	11,78 (2)	15,37 (33)
$ec_{1,0\ L}$	(Nb)	28,07 - 28,40	68,0 (14)
$ec_{1,0\ M}$	(Nb)	30,30 - 30,57	14,72 (33)
$ec_{1,0\ N}$	(Nb)	30,71 - 30,77	1,91 (4)

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Nb)	1,9 - 2,67	2,88 (6)	
$XK\alpha_2$	(Nb)	16,5213	3,32 (8)	$K\alpha$
$XK\alpha_1$	(Nb)	16,6152	6,34 (15)	
$XK\beta_3$	(Nb)	18,607	1,64 (4)	$K'\beta_1$
$XK\beta_1$	(Nb)	18,623		
$XK\beta_5''$	(Nb)	18,78		
$XK\beta_2$	(Nb)	18,952	0,246 (11)	$K'\beta_2$
$XK\beta_4$	(Nb)	18,982		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Nb)	30,77 (2)	0,000591 (9)

6 Main Production Modes

$\left\{ \begin{array}{l} \text{Nb} - 93(\text{n,n}')\text{Nb} - 93\text{m} \\ \text{Possible impurities : Nb} - 92\text{m, Nb} - 94\text{, Nb} - 95 \end{array} \right.$

Mo – 92(n,γ)Mo – 93

$\left\{ \begin{array}{l} \text{Separation from Zr} - 93 + \text{Nb} - 93\text{m (Fission products)} \\ \text{Possible impurities : Nb} - 94 \end{array} \right.$

Mo – 93(EC)Nb – 93m

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  (Theoretical ICCs)


γ Emission intensities
per 100 disintegrations
0,000591
1/2⁻ ; 30,77
16,12 a
1
9/2⁺ ; 0
Stable
0
93
Nb
41
52
Q^IT = 30,77 keV
% IT = 100

$^{94m}_{43}$Tc $_{51}$

1 Decay Scheme

Tc-94m (half-life of 51.9 (10) min) undergoes 100% EC/positron decay (Q(EC) of 4332(5) keV) to various excited nuclear levels and the ground state of Mo-94.

Le technétium 94 métastable se désintègre à 100 % par capture électronique et bêta plus vers des niveaux excités et le niveau fondamental du molybdène 94.

2 Nuclear Data

$T_{1/2}$(^{94m}Tc)	:	51,9	(10)	min
Q^{+}(^{94m}Tc)	:	4332	(5)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,27}$	440 (5)	0,212 (13)	(allowed)	5,6	0,8620 (15)	0,1121 (12)	0,0220 (4)
$\epsilon_{0,26}$	539 (5)	0,169 (20)	(allowed)	5,9	0,8639 (15)	0,1106 (11)	0,0216 (4)
$\epsilon_{0,25}$	798 (5)	0,106 (3)	(allowed)	6,4	0,8664 (15)	0,1086 (11)	0,0212 (4)
$\epsilon_{0,24}$	820 (5)	0,121 (10)	(allowed)	6,4	0,8666 (15)	0,1085 (11)	0,0212 (4)
$\epsilon_{0,23}$	884 (5)	0,118 (19)	(allowed)	6,4	0,8669 (14)	0,1082 (11)	0,0211 (4)
$\epsilon_{0,22}$	931 (5)	0,36 (4)	(allowed)	6	0,8672 (14)	0,1080 (11)	0,0211 (4)
$\epsilon_{0,20}$	1000 (5)	0,234 (20)	(allowed)	6,3	0,8675 (14)	0,1078 (11)	0,0210 (4)
$\epsilon_{0,18}$	1169 (5)	0,058 (17)	(allowed)	7	0,8681 (14)	0,1073 (11)	0,0209 (4)
$\epsilon_{0,17}$	1203 (5)	1,63 (9)	(allowed)	5,57	0,8682 (14)	0,1072 (11)	0,0209 (4)
$\epsilon_{0,16}$	1367 (5)	0,093 (14)	(allowed)	6,9	0,8686 (14)	0,1069 (11)	0,0208 (4)
$\epsilon_{0,13}$	1462 (5)	0,15 (3)	(allowed)	6,8	0,8688 (14)	0,1067 (11)	0,0208 (4)
$\epsilon_{0,11}$	1592 (5)	10,1 (4)	(allowed)	5,03	0,8690 (14)	0,1066 (11)	0,0207 (4)
$\epsilon_{0,7}$	1939 (5)	4,0 (2)	(allowed)	5,6	0,8694 (14)	0,1062 (11)	0,0207 (4)
$\epsilon_{0,5}$	2265 (5)	0,34 (5)	(allowed)	6,8	0,8697 (14)	0,1060 (11)	0,0206 (4)
$\epsilon_{0,4}$	2468 (5)	0,39 (9)	(allowed)	6,82	0,8699 (14)	0,1059 (11)	0,0206 (4)
$\epsilon_{0,1}$	3461 (5)	12,8 (1)	(allowed)	5,61	0,8704 (14)	0,1055 (11)	0,0205 (4)

2.2 β^+ Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^+_{0,16}$	345 (5)	0,00058 (9)	(allowed)	6,9
$\beta^+_{0,13}$	440 (5)	0,0024 (5)	(allowed)	6,8
$\beta^+_{0,11}$	570 (5)	0,427 (21)	(allowed)	5,03
$\beta^+_{0,7}$	917 (5)	0,91 (6)	(allowed)	5,6
$\beta^+_{0,5}$	1243 (5)	0,22 (3)	(allowed)	6,8
$\beta^+_{0,4}$	1446 (5)	0,41 (10)	(allowed)	6,82
$\beta^+_{0,1}$	2439 (5)	67,2 (4)	(allowed)	5,61

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-2})	α_L (10^{-3})	α_M (10^{-4})	α_T (10^{-2})	α_π (10^{-6})
$\gamma_{7,5}$(Mo)	325,67 (9)	0,027 (2)	M1+50%E2	1,28 (8)	1,56 (11)	2,80 (19)	1,47 (9)	
$\gamma_{18,12}$(Mo)	358,3 (3)	0,0084 (7)	M1+10,9%E2	0,80 (4)	0,93 (5)	1,67 (8)	0,92 (4)	
$\gamma_{7,4}$(Mo)	528,71 (8)	0,032 (2)	M1+50%E2	0,325 (8)	0,378 (11)	0,676 (19)	0,371 (9)	
$\gamma_{11,5}$(Mo)	672,56 (9)	0,17 (3)	M1+50%E2	0,176 (3)	0,201 (4)	0,359 (7)	0,200 (3)	
$\gamma_{2,1}$(Mo)	702,66 (4)	0,18 (2)	E2	0,1608 (23)	0,187 (3)	0,334 (5)	0,183 (3)	
$\gamma_{13,5}$(Mo)	802,55 (10)	0,0246 (14)	M1+50%E2	0,1146 (16)	0,1301 (19)	0,232 (4)	0,1303 (19)	
$\gamma_{3,1}$(Mo)	870,55 (22)	0,26 (3)	E2	0,0940 (14)	0,1075 (15)	0,192 (3)	0,1070 (15)	
$\gamma_{1,0}$(Mo)	871,098 (16)	94,04 (21)	E2	0,0939 (14)	0,1073 (15)	0,192 (3)	0,1068 (15)	
$\gamma_{11,4}$(Mo)	875,60 (9)	1,0 (3)	M1+1,0%E2	0,0945 (14)	0,1056 (15)	0,189 (3)	0,1072 (15)	
$\gamma_{16,5}$(Mo)	898,06 (9)	0,0098 (5)	M1+80%E2	0,0877 (13)	0,0996 (14)	0,1778 (25)	0,0997 (15)	
$\gamma_{4,1}$(Mo)	993,21 (5)	2,21 (18)	M1+80%E2	0,0696 (13)	0,0786 (13)	0,1403 (22)	0,0791 (15)	
$\gamma_{11,3}$(Mo)	998,26 (17)	0,24 (2)	M1	0,071 (1)	0,0792 (11)	0,1413 (20)	0,0806 (12)	
$\gamma_{13,4}$(Mo)	1005,59 (9)	0,09 (3)	M1+0,25%E2	0,0699 (10)	0,0779 (11)	0,139 (2)	0,0793 (12)	
$\gamma_{17,5}$(Mo)	1061,31 (9)	0,016 (2)	M1+24,5%E2	0,0616 (10)	0,0688 (10)	0,1227 (18)	0,0699 (11)	
$\gamma_{16,4}$(Mo)	1101,10 (8)	0,042 (14)	M1+0,80%E2	0,0576 (8)	0,0640 (9)	0,1142 (16)	0,0653 (10)	0,492 (8)
$\gamma_{5,1}$(Mo)	1196,25 (6)	0,71 (7)	M1+2,20%E2	0,0483 (7)	0,0536 (8)	0,0957 (14)	0,0553 (8)	5,77 (9)
$\gamma_{17,4}$(Mo)	1264,35 (9)	0,22 (2)	M1+0,64%E2	0,0431 (6)	0,0478 (7)	0,0852 (12)	0,0503 (7)	15,16 (22)
$\gamma_{16,2}$(Mo)	1391,65 (7)	0,0267 (10)	M1+0,64%E2	0,0353 (5)	0,0391 (6)	0,0698 (10)	0,0441 (7)	40,4 (6)
$\gamma_{26,7}$(Mo)	1399,85 (16)	0,041 (3)	M1+E2					
$\gamma_{20,4}$(Mo)	1467,43 (18)	0,072 (5)	M1+8,3%E2	0,0316 (15)	0,0350 (15)	0,062 (3)	0,0419 (9)	61 (10)
$\gamma_{27,7}$(Mo)	1499,14 (9)	0,067 (11)	M1+E2					
$\gamma_{7,1}$(Mo)	1521,92 (6)	4,48 (28)	M1+1,42%E2	0,0295 (5)	0,0326 (5)	0,0581 (9)	0,0411 (6)	77,6 (11)
$\gamma_{22,4}$(Mo)	1536,52 (18)	0,014 (3)						
$\gamma_{25,4}$(Mo)	1670,01 (10)	0,037 (2)	M1+2,20%E2	0,0245 (4)	0,0270 (4)	0,0481 (7)	0,0410 (6)	132 (3)
$\gamma_{20,2}$(Mo)	1757,98 (17)	0,15 (2)	M1+1,0%E2	0,0221 (3)	0,0244 (4)	0,0435 (6)	0,0418 (6)	167,7 (24)
$\gamma_{24,3}$(Mo)	1770,21 (21)	0,025 (6)	(M1+E2)					
$\gamma_{27,5}$(Mo)	1824,81 (9)	0,023 (1)	(M1+E2)					
$\gamma_{4,0}$(Mo)	1864,31 (5)	0,23 (3)	E2	0,0189 (3)	0,0209 (3)	0,0372 (6)	0,0455 (7)	241 (4)
$\gamma_{11,1}$(Mo)	1868,81 (7)	5,49 (28)	M1+1,42%E2	0,0196 (3)	0,0216 (3)	0,0385 (6)	0,0438 (7)	215 (3)
$\gamma_{26,4}$(Mo)	1928,56 (16)	0,075 (19)	M1+E2					
$\gamma_{13,1}$(Mo)	1998,80 (8)	0,0123 (6)	M1+62,8%E2	0,0168 (3)	0,0186 (3)	0,0331 (6)	0,0484 (10)	293 (9)
$\gamma_{27,4}$(Mo)	2027,85 (9)	0,021 (4)	(M1+E2)					
$\gamma_{5,0}$(Mo)	2067,35 (6)	0,11 (1)	E2	0,01562 (22)	0,01722 (25)	0,0307 (5)	0,0515 (8)	338 (5)
$\gamma_{16,1}$(Mo)	2094,31 (6)	0,0156 (6)	M1+54,8%E2	0,0155 (3)	0,0171 (4)	0,0304 (6)	0,0512 (14)	336 (15)
$\gamma_{17,1}$(Mo)	2257,56 (7)	0,057 (5)	M1+35,4%E2	0,01356 (20)	0,01491 (22)	0,0266 (4)	0,0561 (9)	407 (8)
$\gamma_{18,1}$(Mo)	2292,19 (19)	0,050 (17)	M1+2,8%E2	0,01330 (19)	0,01461 (21)	0,0260 (4)	0,0562 (8)	411 (6)
$\gamma_{7,0}$(Mo)	2393,02 (6)	0,50 (4)	E2	0,01203 (17)	0,01322 (19)	0,0235 (4)	0,0633 (9)	496 (7)
$\gamma_{20,1}$(Mo)	2460,64 (17)	0,011 (2)	(M1+E2)					
$\gamma_{22,1}$(Mo)	2529,73 (17)	0,34 (4)						

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-2})	α_L (10^{-3})	α_M (10^{-4})	α_T (10^{-2})	α_π (10^{-6})
$\gamma_{23,1}$(Mo)	2576,5 (4)	0,11 (2)	M1+78,3%E2	0,01061 (15)	0,01164 (17)	0,0207 (3)	0,0694 (12)	574 (11)
$\gamma_{24,1}$(Mo)	2640,76 (14)	0,033 (4)	(M1+E2)					
$\gamma_{25,1}$(Mo)	2663,22 (9)	0,066 (2)	M1+8,3%E2	0,01009 (15)	0,01106 (16)	0,0197 (3)	0,0699 (11)	585 (10)
$\gamma_{11,0}$(Mo)	2739,91 (7)	3,53 (20)	M1	0,00959 (14)	0,01051 (15)	0,0187 (3)	0,0725 (11)	616 (9)
$\gamma_{13,0}$(Mo)	2869,90 (8)	0,016 (2)	E2	0,00881 (13)	0,00964 (14)	0,01717 (24)	0,0816 (12)	717 (10)
$\gamma_{27,1}$(Mo)	3021,06 (7)	0,087 (14)	(M1+E2)					
$\gamma_{17,0}$(Mo)	3128,66 (7)	1,34 (9)	M1	0,00758 (11)	0,00829 (12)	0,01476 (21)	0,0871 (13)	785 (11)
$\gamma_{22,0}$(Mo)	3400,83 (17)	0,005 (2)						
$\gamma_{23,0}$(Mo)	3447,6 (4)	0,006 (1)						
$\gamma_{24,0}$(Mo)	3511,86 (14)	0,063 (7)	(M1+E2)					
$\gamma_{25,0}$(Mo)	3534,32 (9)	0,0034 (4)	E2	0,00625 (9)	0,00682 (10)	0,01215 (17)	0,1065 (15)	994 (14)
$\gamma_{26,0}$(Mo)	3792,87 (15)	0,052 (5)	E2	0,00559 (8)	0,00609 (9)	0,01084 (16)	0,1149 (16)	1086 (16)
$\gamma_{27,0}$(Mo)	3892,16 (7)	0,014 (2)						

3 Atomic Data

3.1 Mo

ω_K	:	0,767	(4)
$\bar{\omega}_L$	:	0,0381	(9)
n_{KL}	:	1,029	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	17,3745	52,4
	$K\alpha_1$	17,47954	100
	$K\beta_3$	19,5904	} 26,3
	$K\beta_1$	19,6085	}
	$K\beta_5''$	19,774	}
	$K\beta_2$	19,9653	} 4,04
	$K\beta_4$	19,998	}
X_L			
	$L\ell$	2,016	
	$L\alpha$	2,29 - 2,293	
	$L\eta$	2,12	
	$L\beta$	2,395 - 2,518	
	$L\gamma$	2,623 - 2,831	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	14,172 - 14,855	100
KLX	16,592 - 17,478	39,8
KXY	18,990 - 19,996	3,94
Auger L	1,48 - 2,25	682

4 Electron and Positron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Mo)	1,48 - 2,25		29,8 (4)
e_{AK}	(Mo)			
	KLL	14,172 - 14,855		6,28 (15)
	KLX	16,592 - 17,478		
	KXY	18,990 - 19,996		
$\beta^+_{0,1}$	max:	2439	(5)	67,2 (4)
	avg:	1094,4	(24)	
$\beta^+_{0,4}$	max:	1446	(5)	0,41 (10)
	avg:	639,6	(23)	
$\beta^+_{0,5}$	max:	1243	(5)	0,22 (3)
	avg:	548,7	(23)	
$\beta^+_{0,7}$	max:	917	(5)	0,91 (6)
	avg:	404,8	(22)	
$\beta^+_{0,11}$	max:	570	(5)	0,427 (21)
	avg:	254,3	(22)	
$\beta^+_{0,13}$	max:	440	(5)	0,0024 (5)
	avg:	198,5	(22)	
$\beta^+_{0,16}$	max:	345	(5)	0,00058 (9)
	avg:	157,5	(22)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Mo)	2,016 - 2,831	1,198 (22)	
$XK\alpha_2$	(Mo)	17,3745	5,93 (11)	$K\alpha$
$XK\alpha_1$	(Mo)	17,47954	11,31 (19)	
$XK\beta_3$	(Mo)	19,5904	2,97 (6)	$K'\beta_1$
$XK\beta_1$	(Mo)	19,6085		
$XK\beta_5''$	(Mo)	19,774		
$XK\beta_2$	(Mo)	19,9653	0,457 (18)	$K'\beta_2$
$XK\beta_4$	(Mo)	19,998		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{7,5}$(Mo)	325,67 (9)	0,027 (2)
$\gamma_{18,12}$(Mo)	358,3 (3)	0,0084 (7)
$\gamma^{\pm}$	511	138 (1)
$\gamma_{7,4}$(Mo)	528,71 (8)	0,032 (2)
$\gamma_{11,5}$(Mo)	672,56 (9)	0,17 (3)
$\gamma_{2,1}$(Mo)	702,66 (4)	0,18 (2)
$\gamma_{13,5}$(Mo)	802,55 (10)	0,0246 (14)
$\gamma_{3,1}$(Mo)	870,55 (22)	0,26 (3)
$\gamma_{1,0}$(Mo)	871,094 (16)	94,04 (21)
$\gamma_{11,4}$(Mo)	875,60 (9)	1,0 (3)
$\gamma_{16,5}$(Mo)	898,06 (9)	0,0098 (5)
$\gamma_{4,1}$(Mo)	993,20 (5)	2,21 (18)
$\gamma_{11,3}$(Mo)	998,25 (17)	0,24 (2)
$\gamma_{13,4}$(Mo)	1005,58 (9)	0,09 (3)
$\gamma_{(-1,-2)}$(Mo)	1022	0,027 (14)
$\gamma_{(-1,1)}$(Mo)	1037,2 (3)	0,044 (14)
$\gamma_{17,5}$(Mo)	1061,30 (9)	0,016 (2)
$\gamma_{16,4}$(Mo)	1101,09 (8)	0,042 (14)
$\gamma_{5,1}$(Mo)	1196,24 (6)	0,71 (7)
$\gamma_{17,4}$(Mo)	1264,34 (9)	0,22 (2)
$\gamma_{(-1,2)}$(Mo)	1357,4 (15)	0,19 (8)
$\gamma_{16,2}$(Mo)	1391,64 (7)	0,0267 (10)
$\gamma_{26,7}$(Mo)	1399,84 (16)	0,041 (3)
$\gamma_{20,4}$(Mo)	1467,42 (18)	0,072 (5)
$\gamma_{27,7}$(Mo)	1499,13 (9)	0,067 (11)
$\gamma_{7,1}$(Mo)	1521,91 (6)	4,48 (28)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{22,4}$(Mo)	1536,51 (18)	0,014 (3)
$\gamma_{25,4}$(Mo)	1669,99 (10)	0,037 (2)
$\gamma_{20,2}$(Mo)	1757,96 (17)	0,15 (2)
$\gamma_{24,3}$(Mo)	1770,19 (21)	0,025 (6)
$\gamma_{27,5}$(Mo)	1824,79 (9)	0,023 (1)
$\gamma_{4,0}$(Mo)	1864,29 (5)	0,23 (3)
$\gamma_{11,1}$(Mo)	1868,79 (7)	5,49 (28)
$\gamma_{26,4}$(Mo)	1928,54 (16)	0,075 (19)
$\gamma_{13,1}$(Mo)	1998,78 (8)	0,0123 (6)
$\gamma_{27,4}$(Mo)	2027,83 (9)	0,021 (4)
$\gamma_{5,0}$(Mo)	2067,33 (6)	0,11 (1)
$\gamma_{16,1}$(Mo)	2094,28 (6)	0,0156 (6)
$\gamma_{17,1}$(Mo)	2257,53 (7)	0,057 (5)
$\gamma_{18,1}$(Mo)	2292,16 (19)	0,050 (17)
$\gamma_{7,0}$(Mo)	2392,99 (6)	0,50 (4)
$\gamma_{20,1}$(Mo)	2460,61 (17)	0,011 (2)
$\gamma_{22,1}$(Mo)	2529,69 (17)	0,34 (4)
$\gamma_{23,1}$(Mo)	2576,5 (4)	0,11 (2)
$\gamma_{24,1}$(Mo)	2640,72 (14)	0,033 (4)
$\gamma_{25,1}$(Mo)	2663,18 (9)	0,066 (2)
$\gamma_{11,0}$(Mo)	2739,87 (7)	3,53 (20)
$\gamma_{13,0}$(Mo)	2869,85 (8)	0,016 (2)
$\gamma_{27,1}$(Mo)	3021,01 (7)	0,087 (14)
$\gamma_{(-1,3)}$(Mo)	3065,6 (3)	0,011 (4)
$\gamma_{(-1,4)}$(Mo)	3085,8 (3)	0,016 (4)
$\gamma_{17,0}$(Mo)	3128,60 (7)	1,34 (9)
$\gamma_{22,0}$(Mo)	3400,76 (17)	0,005 (2)
$\gamma_{23,0}$(Mo)	3447,5 (4)	0,006 (1)
$\gamma_{24,0}$(Mo)	3511,79 (14)	0,063 (7)
$\gamma_{25,0}$(Mo)	3534,25 (9)	0,0034 (4)
$\gamma_{(-1,5)}$(Mo)	3640,6 (3)	0,007 (2)
$\gamma_{26,0}$(Mo)	3792,79 (15)	0,052 (5)
$\gamma_{27,0}$(Mo)	3892,07 (7)	0,014 (2)
$\gamma_{(-1,6)}$(Mo)	4136,2 (3)	0,007 (1)

6 Main Production Modes

Mo – 94(p,n)Tc – 94m
Possible impurities: Tc – 94 ground state.

Mo – 94(d,2n)Tc – 94m
Possible impurities: Tc – 94 ground state.

Mo – 92(α,2n)Ru – 94(EC)Tc – 94m

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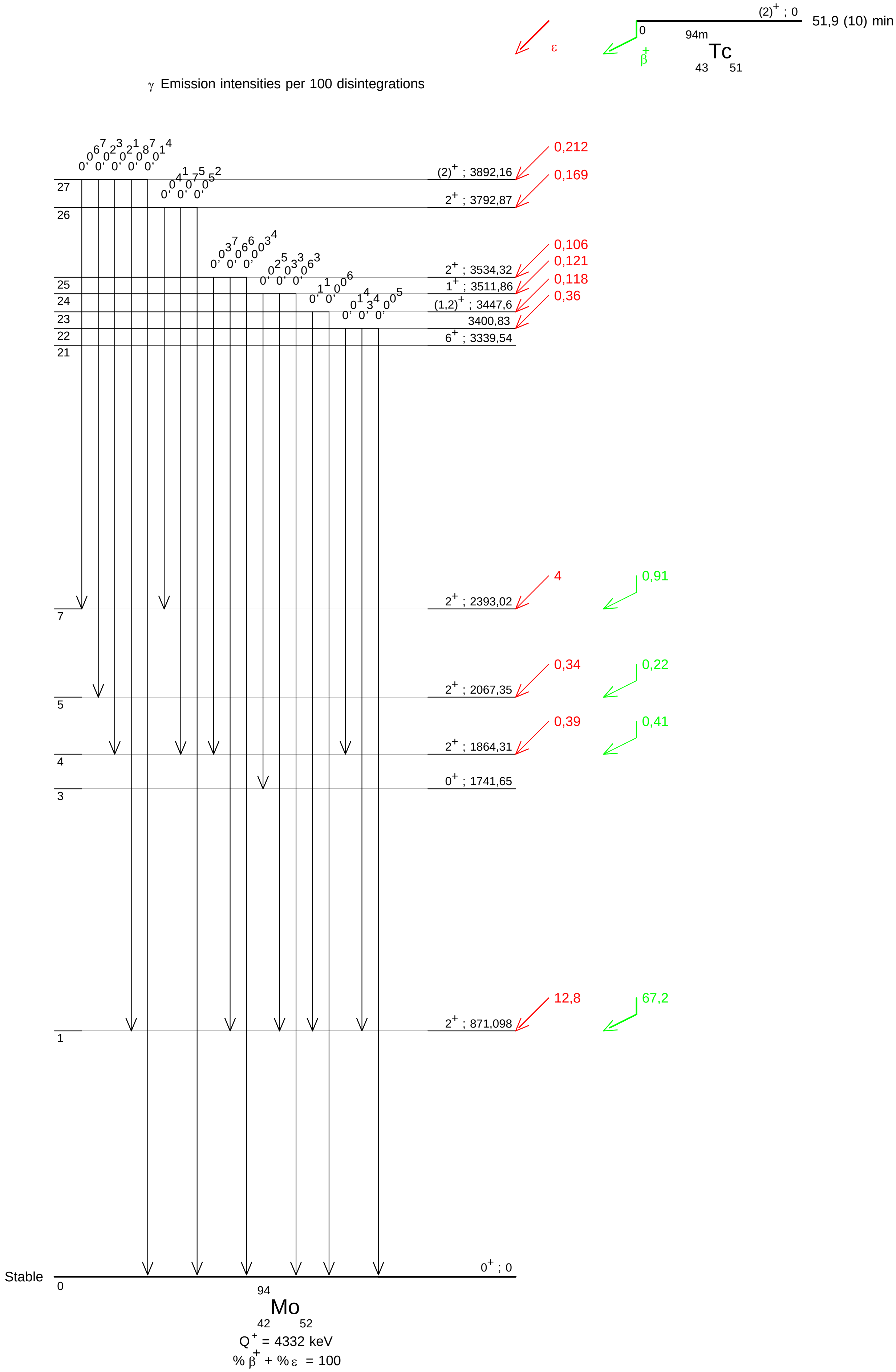
(2)+ ; 0
51,9 (10) min
94m Tc 43 51
ε
β+
γ Emission intensities per 100 disintegrations
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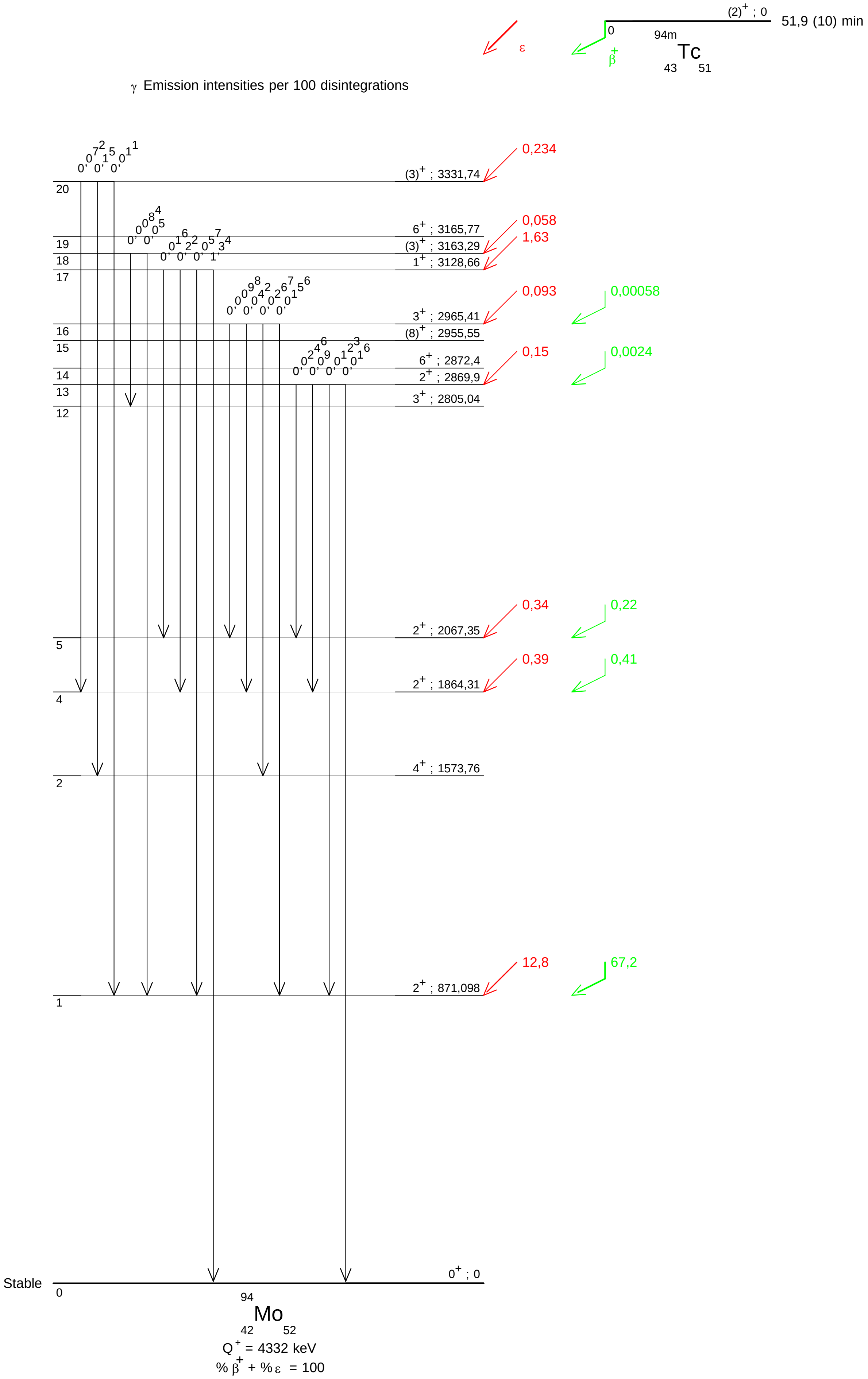
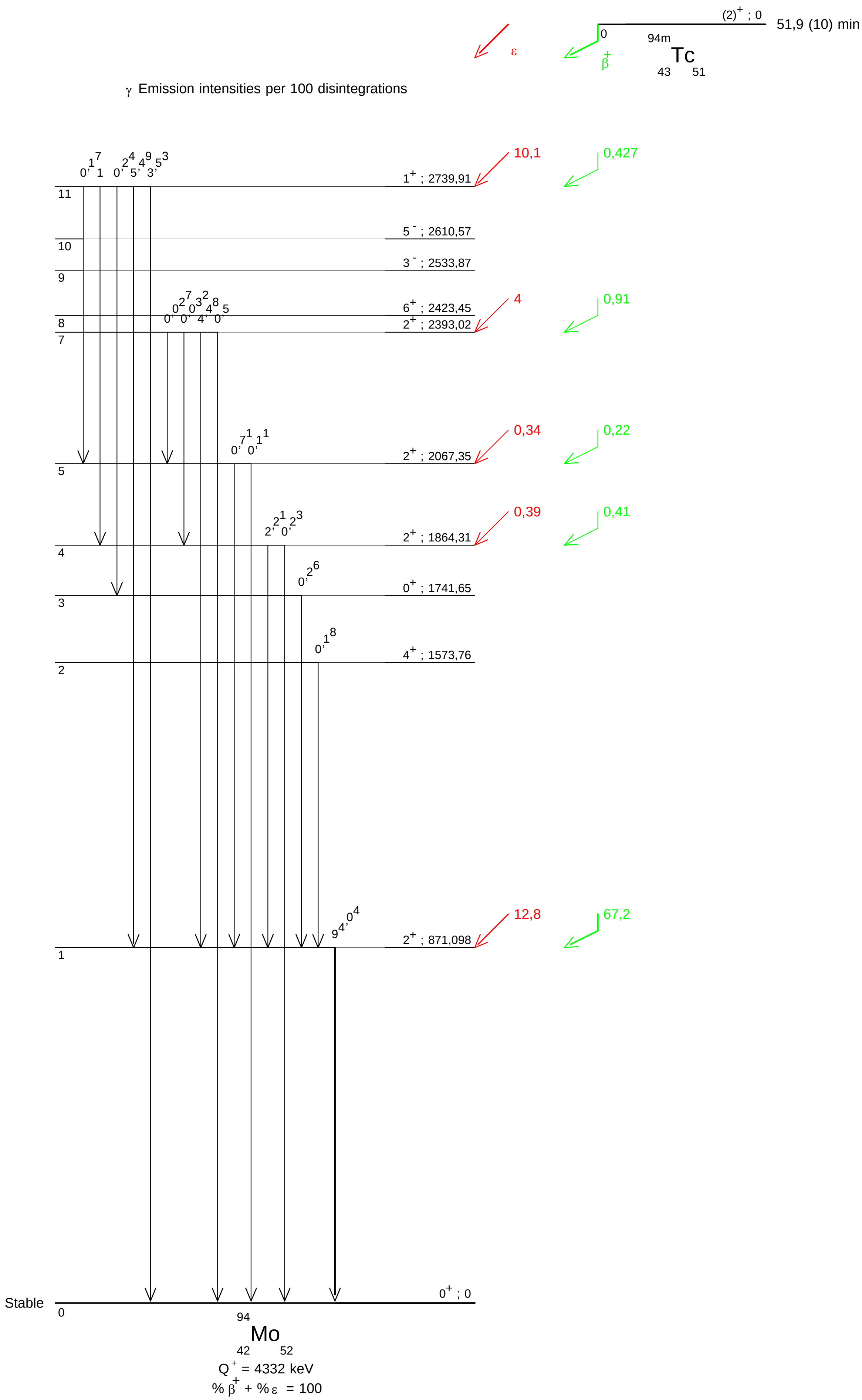
2+ ; 3792,87
2+ ; 3534,32
1+ ; 3511,86
(1,2)+ ; 3447,6
3400,83
6+ ; 3339,54
2+ ; 2393,02
2+ ; 2067,35
2+ ; 1864,31
0+ ; 1741,65
2+ ; 871,098
0+ ; 0
0,212
0,169
0,106
0,121
0,118
0,36
4
0,91
0,34
0,22
0,39
0,41
12,8
67,2
Stable
94 Mo 42 52
Q+ = 4332 keV
% β+ + % ε = 100


(2)+ ; 0
51,9 (10) min
0
94m Tc 43 51
ε
β+
γ Emission intensities per 100 disintegrations
(3)+ ; 3331,74
0,234
6+ ; 3165,77
0,058
(3)+ ; 3163,29
1,63
1+ ; 3128,66
3+ ; 2965,41
0,093
0,00058
(8)+ ; 2955,55
6+ ; 2872,4
0,15
0,0024
2+ ; 2869,9
3+ ; 2805,04
2+ ; 2067,35
0,34
0,22
2+ ; 1864,31
0,39
0,41
4+ ; 1573,76
2+ ; 871,098
12,8
67,2
Stable
0+ ; 0
94 Mo 42 52
Q+ = 4332 keV
% β+ + % ε = 100


(2)+ ; 0
51,9 (10) min
94m Tc 43 51
ε
β+
γ Emission intensities per 100 disintegrations
1+ ; 2739,91
10,1
0,427
5- ; 2610,57
3- ; 2533,87
6+ ; 2423,45
2+ ; 2393,02
4
0,91
2+ ; 2067,35
0,34
0,22
2+ ; 1864,31
0,39
0,41
0+ ; 1741,65
4+ ; 1573,76
2+ ; 871,098
12,8
67,2
Stable
0+ ; 0
94 Mo 42 52
Q+ = 4332 keV
% β+ + % ε = 100

$^{106}_{44}$Ru $_{62}$

1 Decay Scheme

Ru-106 desintegrates by beta minus emission to the ground state of Rh-106.
Le ruthénium 106 se désintègre 100% par émission bêta vers le niveau fondamental du rhodium 106.

2 Nuclear Data

$T_{1/2}$(^{106}Ru)	:	371,5	(21)	d
$T_{1/2}$(^{106}Rh)	:	30,1	(3)	s
Q^-(^{106}Ru)	:	39,40	(21)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,0}$	39,40 (21)	100	Allowed	4,31

3 Atomic Data

3.1 Rh

ω_K	:	0,809	(4)
$\bar{\omega}_L$	:	0,0494	(12)
n_{KL}	:	0,987	(4)

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
$\beta^-_{0,0}$	max:	39,40 (21)	100
	avg:	10,03 (6)	

5 Main Production Modes

$^{235}U(n,f)^{106}Ru$

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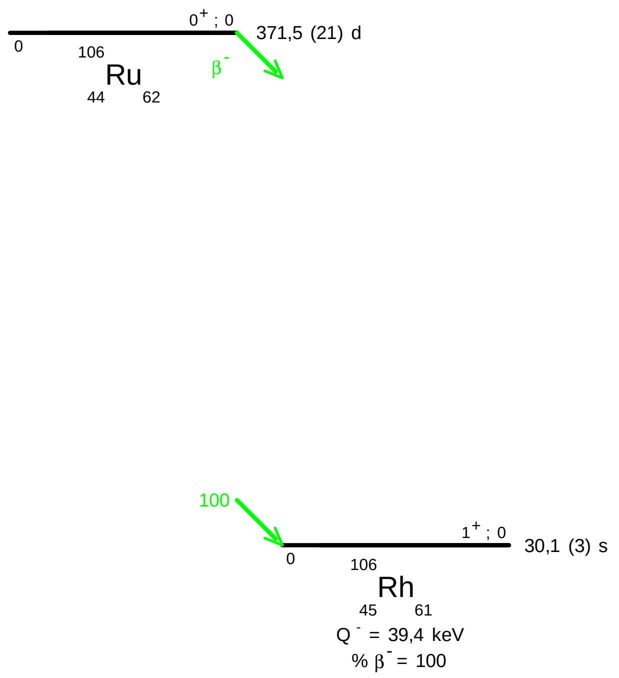
  (Q value)


0+ ; 0
371,5 (21) d
0
106
Ru
44
62
β-
100
1+ ; 0
30,1 (3) s
0
106
Rh
45
61
Q - = 39,4 keV
% β- = 100

$^{106}_{45}$Rh $_{61}$

1 Decay Scheme

Rh-106 disintegrates by beta minus emission to the ground state and excited levels of Pd-106.

Le rhodium 106 se désintègre par émission bêta principalement vers le niveau fondamental et les niveaux excités du palladium 106.

2 Nuclear Data

$T_{1/2}$(^{106}Rh)	:	30,1	(3)	s
Q^-(^{106}Rh)	:	3546	(5)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,37}$	144 (5)	0,0000125 (19)		
$\beta^-_{0,36}$	169 (5)	0,000025 (9)		
$\beta^-_{0,35}$	226 (5)	0,00087 (8)	Allowed	5,71
$\beta^-_{0,34}$	247 (5)	0,000082 (21)		
$\beta^-_{0,33}$	272 (5)	0,000049 (14)		
$\beta^-_{0,32}$	294 (5)	0,00021 (4)	Allowed	6,7
$\beta^-_{0,31}$	296 (5)	0,000086 (16)	Allowed	7,09
$\beta^-_{0,30}$	325 (5)	0,00402 (13)	Allowed	5,56
$\beta^-_{0,29}$	382 (5)	0,00070 (5)	(Allowed)	6,55
$\beta^-_{0,28}$	462 (5)	0,00278 (13)		
$\beta^-_{0,27}$	491 (5)	0,0101 (5)	Allowed	5,76
$\beta^-_{0,26}$	509 (5)	0,0022 (3)		
$\beta^-_{0,25}$	577 (5)	0,00022 (4)	Unique 1st Forbidden	7,82
$\beta^-_{0,24}$	628 (5)	0,0183 (7)	Allowed	5,87
$\beta^-_{0,23}$	644 (5)	0,00760 (18)	Allowed	6,29
$\beta^-_{0,22}$	668 (5)	0,0262 (9)	Allowed	5,81
$\beta^-_{0,21}$	718 (5)	0,00731 (19)	Allowed	6,47
$\beta^-_{0,20}$	725 (5)	0,0090 (3)	Allowed	6,4

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,19}$	762 (5)	0,00117 (8)	Allowed	7,36
$\beta^-_{0,18}$	828 (5)	0,00023 (12)		
$\beta^-_{0,17}$	841 (5)	0,0106 (4)	(Allowed)	6,56
$\beta^-_{0,16}$	922 (5)	0,090 (3)	Allowed	5,78
$\beta^-_{0,15}$	1046 (5)	0,0284 (6)	1st Forbidden	6,48
$\beta^-_{0,14}$	1061 (5)	0,00093 (15)	(1st Forbidden)	7,99
$\beta^-_{0,13}$	1107 (5)	0,0208 (5)	Allowed	6,71
$\beta^-_{0,12}$	1237 (5)	0,0430 (7)	Allowed	6,57
$\beta^-_{0,11}$	1268 (5)	0,043 (5)	Allowed	6,62
$\beta^-_{0,10}$	1304 (5)	0,0372 (8)	Allowed	6,72
$\beta^-_{0,9}$	1545 (5)	0,448 (9)	Allowed	5,93
$\beta^-_{0,8}$	1637 (5)	0,00277 (21)	(Allowed)	8,24
$\beta^-_{0,7}$	1840 (5)	0,0664 (10)	Allowed	7,06
$\beta^-_{0,6}$	1984 (5)	1,67 (3)	Allowed	5,79
$\beta^-_{0,4}$	2317 (5)	0,0051 (5)	Unique 2nd Forbidden	11
$\beta^-_{0,3}$	2412 (5)	9,82 (15)	Allowed	5,37
$\beta^-_{0,2}$	2418 (5)	0,608 (21)	Allowed	6,58
$\beta^-_{0,1}$	3034 (5)	8,2 (3)	Allowed	5,87
$\beta^-_{0,0}$	3546 (5)	78,80 (24)	Allowed	5,18

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-5})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{6,3}$(Pd)	428,49 (5)	0,0711 (24)	E2	8,17 (12)	10,63 (15)	20,0 (3)	9,47 (14)	
$\gamma_{6,2}$(Pd)	434,23 (4)	0,020 (4)	E2	7,85 (11)	10,19 (15)	19,2 (3)	9,09 (13)	
$\gamma_{9,6}$(Pd)	439,23 (6)	0,0111 (16)						
$\gamma_{1,0}$(Pd)	511,8547 (23)	20,63 (23)	E2	4,84 (7)	6,12 (9)	11,53 (17)	5,59 (8)	
$\gamma_{7,2}$(Pd)	578,42 (6)	0,0090 (6)	E2	3,43 (5)	4,27 (6)	8,04 (12)	3,95 (6)	
$\gamma_{2,1}$(Pd)	616,17 (3)	0,733 (17)	M1+98%E2	2,89 (4)	3,57 (5)	6,71 (10)	3,33 (5)	
$\gamma_{3,1}$(Pd)	621,91 (4)	9,90 (15)	E2	2,82 (4)	3,48 (5)	6,54 (10)	3,24 (5)	
$\gamma_{10,6}$(Pd)	680,23 (6)	0,0103 (6)	E1+14%M2	2,34 (4)	2,74 (4)	5,15 (8)	2,68 (4)	
$\gamma_{10,5}$(Pd)	684,80 (6)	0,00552 (21)						
$\gamma_{17,9}$(Pd)	702,8 (10)	0,00029 (18)						
$\gamma_{11,6}$(Pd)	715,86 (9)	0,0099 (4)						
$\gamma_{4,1}$(Pd)	717,45 (4)	0,0067 (4)	E2	1,94 (3)	2,36 (4)	4,43 (7)	2,23 (4)	
$\gamma_{12,5}$(Pd)	751,26 (20)	0,00121 (23)						
$\gamma_{9,2}$(Pd)	873,46 (6)	0,436 (8)	E2	1,201 (17)	1,432 (20)	2,69 (4)	1,375 (20)	
$\gamma_{15,5}$(Pd)	942,63 (9)	0,00060 (18)						
$\gamma_{5,1}$(Pd)	1045,83 (4)	0,0131 (16)	M1+94%E2	0,803 (12)	0,942 (14)	1,766 (25)	0,918 (13)	
$\gamma_{6,1}$(Pd)	1050,40 (3)	1,492 (25)	M1+5,4%E2	0,883 (13)	1,018 (15)	1,91 (3)	1,007 (15)	
$\gamma_{16,6}$(Pd)	1062,15 (6)	0,0304 (19)						
$\gamma_{10,3}$(Pd)	1108,72 (6)	0,0056 (3)						
$\gamma_{10,2}$(Pd)	1114,46 (6)	0,0117 (3)	M1+69%E2	0,720 (12)	0,838 (14)	1,570 (25)	0,823 (14)	0,00830 (17)
$\gamma_{2,0}$(Pd)	1128,02 (3)	0,398 (8)	E2	0,675 (10)	0,790 (11)	1,479 (21)	0,773 (11)	0,01341 (19)
$\gamma_{3,0}$(Pd)	1133,76 (4)		E0					
$\gamma_{11,2}$(Pd)	1150,09 (9)	0,00287 (17)	E2	0,648 (9)	0,757 (11)	1,417 (20)	0,742 (11)	0,0248 (4)
$\gamma_{18,5}$(Pd)	1159,91 (21)	0,00023 (12)						
$\gamma_{12,2}$(Pd)	1180,80 (6)	0,0144 (3)	M1+0,4%E2	0,689 (10)	0,792 (12)	1,482 (22)	0,790 (12)	0,0421 (7)
$\gamma_{7,1}$(Pd)	1194,59 (5)	0,0573 (8)	E2	0,597 (9)	0,696 (10)	1,304 (19)	0,689 (10)	0,0664 (10)
$\gamma_{13,4}$(Pd)	1209,80 (8)	0,00039 (8)						
$\gamma_{20,6}$(Pd)	1258,72 (9)	0,00066 (8)						

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-5})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{21,6}$(Pd)	1266,04 (9)	0,00109 (10)						
$\gamma_{13,3}$(Pd)	1305,34 (8)	0,00109 (12)						
$\gamma_{22,6}$(Pd)	1315,67 (8)	0,0030 (5)	E2	0,489 (7)	0,567 (8)	1,061 (15)	0,586 (9)	0,280 (4)
$\gamma_{24,6}$(Pd)	1355,61 (9)	0,00060 (25)						
$\gamma_{24,5}$(Pd)	1360,18 (9)	0,0018 (4)						
$\gamma_{15,2}$(Pd)	1372,29 (9)	0,00199 (15)						
$\gamma_{8,1}$(Pd)	1397,52 (16)	0,00277 (21)						
$\gamma_{9,1}$(Pd)	1489,63 (5)	0,0018 (3)						
$\gamma_{16,2}$(Pd)	1496,38 (6)	0,0240 (17)						
$\gamma_{27,5}$(Pd)	1498,74 (16)	0,0068 (4)						
$\gamma_{6,0}$(Pd)	1562,25 (3)	0,156 (8)						
$\gamma_{17,3}$(Pd)	1572,48 (20)	0,00185 (19)						
$\gamma_{17,2}$(Pd)	1577,28 (9)	0,00105 (16)						
$\gamma_{20,3}$(Pd)	1687,21 (10)	0,00055 (16)						
$\gamma_{20,2}$(Pd)	1693,2 (3)	0,00082 (14)						
$\gamma_{10,1}$(Pd)	1730,46 (20)	0,00209 (13)						
$\gamma_{11,1}$(Pd)	1766,26 (9)	0,030 (5)	E2	0,274 (4)	0,314 (5)	0,586 (9)	0,506 (7)	1,93 (3)
$\gamma_{23,2}$(Pd)	1774,46 (10)	0,00094 (8)						
$\gamma_{24,3}$(Pd)	1784,10 (9)	0,00043 (12)						
$\gamma_{12,1}$(Pd)	1796,97 (5)	0,0274 (5)	M1+5,9%E2	0,287 (4)	0,327 (5)	0,611 (9)	0,516 (8)	1,89 (3)
$\gamma_{28,4}$(Pd)	1854,91 (20)	0,00125 (10)						
$\gamma_{26,2}$(Pd)	1909,30 (17)	0,00107 (25)						
$\gamma_{13,1}$(Pd)	1927,25 (7)	0,0147 (4)	M1+0,5%E2	0,250 (4)	0,285 (4)	0,533 (8)	0,532 (8)	2,47 (4)
$\gamma_{28,2}$(Pd)	1954,9 (4)	0,00020 (4)						
$\gamma_{14,1}$(Pd)	1973,4 (8)	0,00017 (4)						
$\gamma_{15,1}$(Pd)	1988,46 (8)	0,0258 (5)	E1+0,25%M2	0,1173 (22)	0,1318 (25)	0,246 (5)	0,735 (11)	6,02 (9)
$\gamma_{30,2}$(Pd)	2093,35 (25)	0,00029 (6)	E2	0,200 (3)	0,228 (4)	0,426 (6)	0,576 (8)	3,48 (5)
$\gamma_{16,1}$(Pd)	2112,55 (5)	0,0351 (7)	E2	0,197 (3)	0,224 (4)	0,419 (6)	0,581 (9)	3,57 (5)
$\gamma_{35,3}$(Pd)	2185,7 (5)	0,00025 (6)						
$\gamma_{17,1}$(Pd)	2193,19 (10)	0,00495 (21)	M1+2,8%E2	0,194 (3)	0,220 (3)	0,412 (6)	0,594 (9)	3,73 (6)
$\gamma_{10,0}$(Pd)	2242,48 (5)	0,00195 (8)						
$\gamma_{19,1}$(Pd)	2271,89 (21)	0,00117 (8)						
$\gamma_{20,1}$(Pd)	2309,12 (9)	0,00575 (16)						
$\gamma_{21,1}$(Pd)	2316,44 (9)	0,00622 (16)	E2	0,1670 (24)	0,189 (3)	0,354 (5)	0,646 (9)	4,56 (7)
$\gamma_{22,1}$(Pd)	2366,07 (7)	0,0232 (7)	E2	0,1608 (23)	0,182 (3)	0,341 (5)	0,663 (10)	4,80 (7)
$\gamma_{23,1}$(Pd)	2390,63 (10)	0,00660 (16)	M1+1,0%E2	0,1645 (24)	0,186 (3)	0,349 (5)	0,654 (10)	4,67 (7)
$\gamma_{24,1}$(Pd)	2406,01 (8)	0,0145 (4)	M1+0,25%E2	0,1626 (23)	0,184 (3)	0,344 (5)	0,659 (10)	4,74 (7)
$\gamma_{13,0}$(Pd)	2439,10 (7)	0,00464 (13)	E2	0,1525 (22)	0,1727 (25)	0,323 (5)	0,689 (10)	5,15 (8)
$\gamma_{25,1}$(Pd)	2456,83 (21)	0,00022 (4)						
$\gamma_{14,0}$(Pd)	2484,66 (20)	0,00076 (14)						
$\gamma_{26,1}$(Pd)	2525,47 (17)	0,00011 (3)						
$\gamma_{27,1}$(Pd)	2542,82 (10)	0,00289 (9)	M1+0,5%E2	0,1464 (21)	0,1657 (24)	0,310 (5)	0,705 (10)	5,39 (8)
$\gamma_{28,1}$(Pd)	2571,19 (20)	0,00133 (6)						
$\gamma_{29,1}$(Pd)	2651,43 (20)	0,00068 (4)						
$\gamma_{17,0}$(Pd)	2705,30 (8)	0,00248 (13)						
$\gamma_{30,1}$(Pd)	2709,52 (25)	0,00373 (11)	E2	0,1271 (18)	0,1436 (21)	0,268 (4)	0,785 (11)	6,41 (9)
$\gamma_{32,1}$(Pd)	2740,2 (4)	0,00021 (4)						
$\gamma_{34,1}$(Pd)	2788,2 (5)	0,000082 (21)						
$\gamma_{35,1}$(Pd)	2809,1 (3)	0,00062 (4)	E2	0,1195 (17)	0,1349 (19)	0,252 (4)	0,822 (12)	6,86 (10)
$\gamma_{20,0}$(Pd)	2821,2 (3)	0,00120 (4)						
$\gamma_{36,1}$(Pd)	2865 (1)	0,000014 (8)						
$\gamma_{23,0}$(Pd)	2902,6 (5)	0,000066 (21)						
$\gamma_{24,0}$(Pd)	2917,6 (3)	0,00094 (4)						
$\gamma_{26,0}$(Pd)	3037,4 (3)	0,00105 (4)						
$\gamma_{27,0}$(Pd)	3055,1 (3)	0,00036 (4)						
$\gamma_{29,0}$(Pd)	3164,7 (10)	0,000023 (12)						
$\gamma_{31,0}$(Pd)	3249,9 (5)	0,000086 (16)						
$\gamma_{33,0}$(Pd)	3273,5 (7)	0,000049 (14)						
$\gamma_{36,0}$(Pd)	3376,0 (14)	0,0000113 (21)						
$\gamma_{37,0}$(Pd)	3401,9 (9)	0,0000125 (19)						

3 Atomic Data

3.1 Pd

ω_K	:	0,820	(4)
$\bar{\omega}_L$	:	0,0536	(13)
n_{KL}	:	0,975	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	21,0203	52,93
	$K\alpha_1$	21,1774	100
	$K\beta_3$	23,7914	}
	$K\beta_1$	23,819	} 27,44
	$K\beta_5''$	24,013	}
	$K\beta_2$	24,2994	} 4,66
	$K\beta_4$	24,344	}
X_L			
	$L\ell$	2,5045	
	$L\alpha$	2,8337 - 2,839	
	$L\eta$	2,6611	
	$L\beta$	2,9904 - 3,1715	
	$L\gamma$	3,2464 - 3,5545	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	17,032 - 17,884	100
KLX	20,032 - 21,176	42
KXY	23,011 - 24,347	4,4
Auger L	1,83 - 3,60	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Pd)	1,83 - 3,60	0,1377 (8)
e_{AK}	(Pd)		0,0238 (7)
	KLL	17,032 - 17,884	
	KLX	20,032 - 21,176	
	KXY	23,011 - 24,347	
$\beta^-_{0,37}$	max:	144 (5)	0,0000125 (19)
	avg:		
$\beta^-_{0,36}$	max:	169 (5)	0,000025 (9)
	avg:		
$\beta^-_{0,35}$	max:	226 (5)	0,00087 (8)
	avg:	62,9 (16)	
$\beta^-_{0,34}$	max:	247 (5)	0,000082 (21)
	avg:		
$\beta^-_{0,33}$	max:	272 (5)	0,000049 (14)
	avg:		
$\beta^-_{0,32}$	max:	294 (5)	0,00021 (4)
	avg:	84,5 (17)	
$\beta^-_{0,31}$	max:	296 (5)	0,000086 (16)
	avg:	85,2 (17)	
$\beta^-_{0,30}$	max:	325 (5)	0,00402 (13)
	avg:	94,5 (17)	
$\beta^-_{0,29}$	max:	382 (5)	0,00070 (5)
	avg:	113,8 (17)	
$\beta^-_{0,28}$	max:	462 (5)	0,00278 (13)
	avg:		
$\beta^-_{0,27}$	max:	491 (5)	0,0101 (5)
	avg:	151,8 (18)	
$\beta^-_{0,26}$	max:	509 (5)	0,0022 (3)
	avg:		
$\beta^-_{0,25}$	max:	577 (5)	0,00022 (4)
	avg:	202,8 (19)	
$\beta^-_{0,24}$	max:	628 (5)	0,0183 (7)
	avg:	202,3 (19)	
$\beta^-_{0,23}$	max:	644 (5)	0,00760 (18)
	avg:	208,1 (19)	
$\beta^-_{0,22}$	max:	668 (5)	0,0262 (9)
	avg:	217,5 (20)	
$\beta^-_{0,21}$	max:	718 (5)	0,00731 (19)
	avg:	236,6 (20)	
$\beta^-_{0,20}$	max:	725 (5)	0,0090 (3)
	avg:	239,4 (20)	

		Energy (keV)		Electrons (per 100 disint.)
$\beta^-_{0,19}$	max:	762	(5)	0,00117 (8)
	avg:	254	(2)	
$\beta^-_{0,18}$	max:	828	(5)	0,00023 (12)
	avg:			
$\beta^-_{0,17}$	max:	841	(5)	0,0106 (4)
	avg:	285,1	(20)	
$\beta^-_{0,16}$	max:	922	(5)	0,090 (3)
	avg:	317,8	(21)	
$\beta^-_{0,15}$	max:	1046	(5)	0,0284 (6)
	avg:	369,0	(21)	
$\beta^-_{0,14}$	max:	1061	(5)	0,00093 (15)
	avg:	375,6	(21)	
$\beta^-_{0,13}$	max:	1107	(5)	0,0208 (5)
	avg:	394,7	(21)	
$\beta^-_{0,12}$	max:	1237	(5)	0,0430 (7)
	avg:	450,1	(22)	
$\beta^-_{0,11}$	max:	1268	(5)	0,043 (5)
	avg:	463,3	(22)	
$\beta^-_{0,10}$	max:	1304	(5)	0,0372 (8)
	avg:	478,7	(22)	
$\beta^-_{0,9}$	max:	1545	(5)	0,448 (9)
	avg:	584,3	(23)	
$\beta^-_{0,8}$	max:	1637	(5)	0,00277 (21)
	avg:	625,2	(23)	
$\beta^-_{0,7}$	max:	1840	(5)	0,0664 (10)
	avg:	716,4	(23)	
$\beta^-_{0,6}$	max:	1984	(5)	1,67 (3)
	avg:	781,9	(23)	
$\beta^-_{0,4}$	max:	2317	(5)	0,0051 (5)
	avg:	951,8	(23)	
$\beta^-_{0,3}$	max:	2412	(5)	9,82 (15)
	avg:	978,9	(24)	
$\beta^-_{0,2}$	max:	2418	(5)	0,608 (21)
	avg:	981,6	(24)	
$\beta^-_{0,1}$	max:	3034	(5)	8,2 (3)
	avg:	1269,5	(24)	
$\beta^-_{0,0}$	max:	3546	(5)	78,80 (24)
	avg:	1511,1	(24)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Pd)	2,5045 - 3,5545	0,00785 (14)	
XKα_2	(Pd)	21,0203	0,0310 (5)	} Kα
XKα_1	(Pd)	21,1774	0,0586 (9)	}
XKβ_3	(Pd)	23,7914	}	
XKβ_1	(Pd)	23,819	} 0,01608 (29)	K$'\beta_1$
XKβ_5''	(Pd)	24,013	}	
XKβ_2	(Pd)	24,2994	} 0,00273 (10)	K$'\beta_2$
XKβ_4	(Pd)	24,344	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{6,3}$(Pd)	428,49 (5)	0,0704 (24)
$\gamma_{6,2}$(Pd)	434,23 (4)	0,020 (4)
$\gamma_{9,6}$(Pd)	439,23 (6)	0,0111 (16)
$\gamma_{1,0}$(Pd)	511,8534 (23)	20,52 (23)
$\gamma_{7,2}$(Pd)	578,42 (6)	0,0090 (6)
$\gamma_{2,1}$(Pd)	616,16 (3)	0,731 (17)
$\gamma_{3,1}$(Pd)	621,90 (4)	9,87 (15)
$\gamma_{10,6}$(Pd)	680,23 (6)	0,0103 (6)
$\gamma_{10,5}$(Pd)	684,80 (6)	0,00552 (21)
$\gamma_{17,9}$(Pd)	702,8 (10)	0,00029 (18)
$\gamma_{11,6}$(Pd)	715,86 (9)	0,0099 (4)
$\gamma_{4,1}$(Pd)	717,44 (4)	0,0067 (4)
$\gamma_{12,5}$(Pd)	751,26 (20)	0,00121 (23)
$\gamma_{9,2}$(Pd)	873,46 (6)	0,435 (8)
$\gamma_{15,5}$(Pd)	942,63 (9)	0,00060 (18)
$\gamma_{5,1}$(Pd)	1045,82 (4)	0,0131 (16)
$\gamma_{6,1}$(Pd)	1050,39 (3)	1,490 (25)
$\gamma_{16,6}$(Pd)	1062,14 (6)	0,0304 (19)
$\gamma_{10,3}$(Pd)	1108,71 (6)	0,0056 (3)
$\gamma_{10,2}$(Pd)	1114,45 (6)	0,0117 (3)
$\gamma_{2,0}$(Pd)	1128,01 (3)	0,398 (8)
$\gamma_{11,2}$(Pd)	1150,08 (9)	0,00287 (17)
$\gamma_{18,5}$(Pd)	1159,90 (21)	0,00023 (12)
$\gamma_{12,2}$(Pd)	1180,79 (6)	0,0144 (3)
$\gamma_{7,1}$(Pd)	1194,58 (5)	0,0573 (8)
$\gamma_{13,4}$(Pd)	1209,79 (8)	0,00039 (8)
$\gamma_{20,6}$(Pd)	1258,71 (9)	0,00066 (8)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{21,6}$(Pd)	1266,03 (9)	0,00109 (10)
$\gamma_{13,3}$(Pd)	1305,33 (8)	0,00109 (12)
$\gamma_{22,6}$(Pd)	1315,66 (8)	0,0030 (5)
$\gamma_{24,6}$(Pd)	1355,60 (9)	0,00060 (25)
$\gamma_{24,5}$(Pd)	1360,17 (9)	0,0018 (4)
$\gamma_{15,2}$(Pd)	1372,28 (9)	0,00199 (15)
$\gamma_{8,1}$(Pd)	1397,51 (16)	0,00277 (21)
$\gamma_{9,1}$(Pd)	1489,61 (5)	0,0018 (3)
$\gamma_{16,2}$(Pd)	1496,37 (6)	0,0240 (17)
$\gamma_{27,5}$(Pd)	1498,73 (16)	0,0068 (4)
$\gamma_{6,0}$(Pd)	1562,24 (3)	0,156 (8)
$\gamma_{17,3}$(Pd)	1572,47 (20)	0,00185 (19)
$\gamma_{17,2}$(Pd)	1577,27 (9)	0,00105 (16)
$\gamma_{20,3}$(Pd)	1687,2 (1)	0,00055 (16)
$\gamma_{20,2}$(Pd)	1693,2 (3)	0,00082 (14)
$\gamma_{10,1}$(Pd)	1730,44 (20)	0,00209 (13)
$\gamma_{11,1}$(Pd)	1766,24 (9)	0,030 (5)
$\gamma_{23,2}$(Pd)	1774,44 (10)	0,00094 (8)
$\gamma_{24,3}$(Pd)	1784,08 (9)	0,00043 (12)
$\gamma_{12,1}$(Pd)	1796,95 (5)	0,0274 (5)
$\gamma_{28,4}$(Pd)	1854,89 (20)	0,00125 (10)
$\gamma_{26,2}$(Pd)	1909,28 (17)	0,00107 (25)
$\gamma_{13,1}$(Pd)	1927,23 (7)	0,0147 (4)
$\gamma_{28,2}$(Pd)	1954,9 (4)	0,00020 (4)
$\gamma_{14,1}$(Pd)	1973,4 (8)	0,00017 (4)
$\gamma_{15,1}$(Pd)	1988,44 (8)	0,0258 (5)
$\gamma_{30,2}$(Pd)	2093,33 (25)	0,00029 (6)
$\gamma_{16,1}$(Pd)	2112,52 (5)	0,0351 (7)
$\gamma_{35,3}$(Pd)	2185,7 (5)	0,00025 (6)
$\gamma_{17,1}$(Pd)	2193,17 (10)	0,00495 (21)
$\gamma_{10,0}$(Pd)	2242,45 (5)	0,00195 (8)
$\gamma_{19,1}$(Pd)	2271,86 (21)	0,00117 (8)
$\gamma_{20,1}$(Pd)	2309,09 (9)	0,00575 (16)
$\gamma_{21,1}$(Pd)	2316,41 (9)	0,00622 (16)
$\gamma_{22,1}$(Pd)	2366,04 (7)	0,0232 (7)
$\gamma_{23,1}$(Pd)	2390,6 (1)	0,00659 (16)
$\gamma_{24,1}$(Pd)	2405,98 (8)	0,0145 (4)
$\gamma_{13,0}$(Pd)	2439,07 (7)	0,00464 (13)
$\gamma_{25,1}$(Pd)	2456,79 (21)	0,00022 (4)
$\gamma_{14,0}$(Pd)	2484,63 (20)	0,00076 (14)
$\gamma_{26,1}$(Pd)	2525,43 (17)	0,00011 (3)
$\gamma_{27,1}$(Pd)	2542,79 (10)	0,00289 (9)
$\gamma_{28,1}$(Pd)	2571,16 (20)	0,00133 (6)
$\gamma_{29,1}$(Pd)	2651,39 (20)	0,00068 (4)
$\gamma_{17,0}$(Pd)	2705,26 (8)	0,00248 (13)
$\gamma_{30,1}$(Pd)	2709,48 (25)	0,00373 (11)
$\gamma_{32,1}$(Pd)	2740,1 (4)	0,00021 (4)
$\gamma_{34,1}$(Pd)	2788,2 (5)	0,000082 (21)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{35,1}$(Pd)	2809,1 (3)	0,00062 (4)
$\gamma_{20,0}$(Pd)	2821,2 (3)	0,00120 (4)
$\gamma_{36,1}$(Pd)	2865 (1)	0,000014 (8)
$\gamma_{23,0}$(Pd)	2902,6 (5)	0,000066 (21)
$\gamma_{24,0}$(Pd)	2917,6 (3)	0,00094 (4)
$\gamma_{26,0}$(Pd)	3037,3 (3)	0,00105 (4)
$\gamma_{27,0}$(Pd)	3055,0 (3)	0,00036 (4)
$\gamma_{29,0}$(Pd)	3164,6 (10)	0,000023 (12)
$\gamma_{31,0}$(Pd)	3249,8 (5)	0,000086 (16)
$\gamma_{33,0}$(Pd)	3273,4 (7)	0,000049 (14)
$\gamma_{36,0}$(Pd)	3375,9 (14)	0,0000113 (21)
$\gamma_{37,0}$(Pd)	3401,8 (9)	0,0000125 (19)

6 Main Production Modes

$^{235}U(n,f)^{106}Ru$

$^{106}Ru(\beta^-)^{106}Rh$

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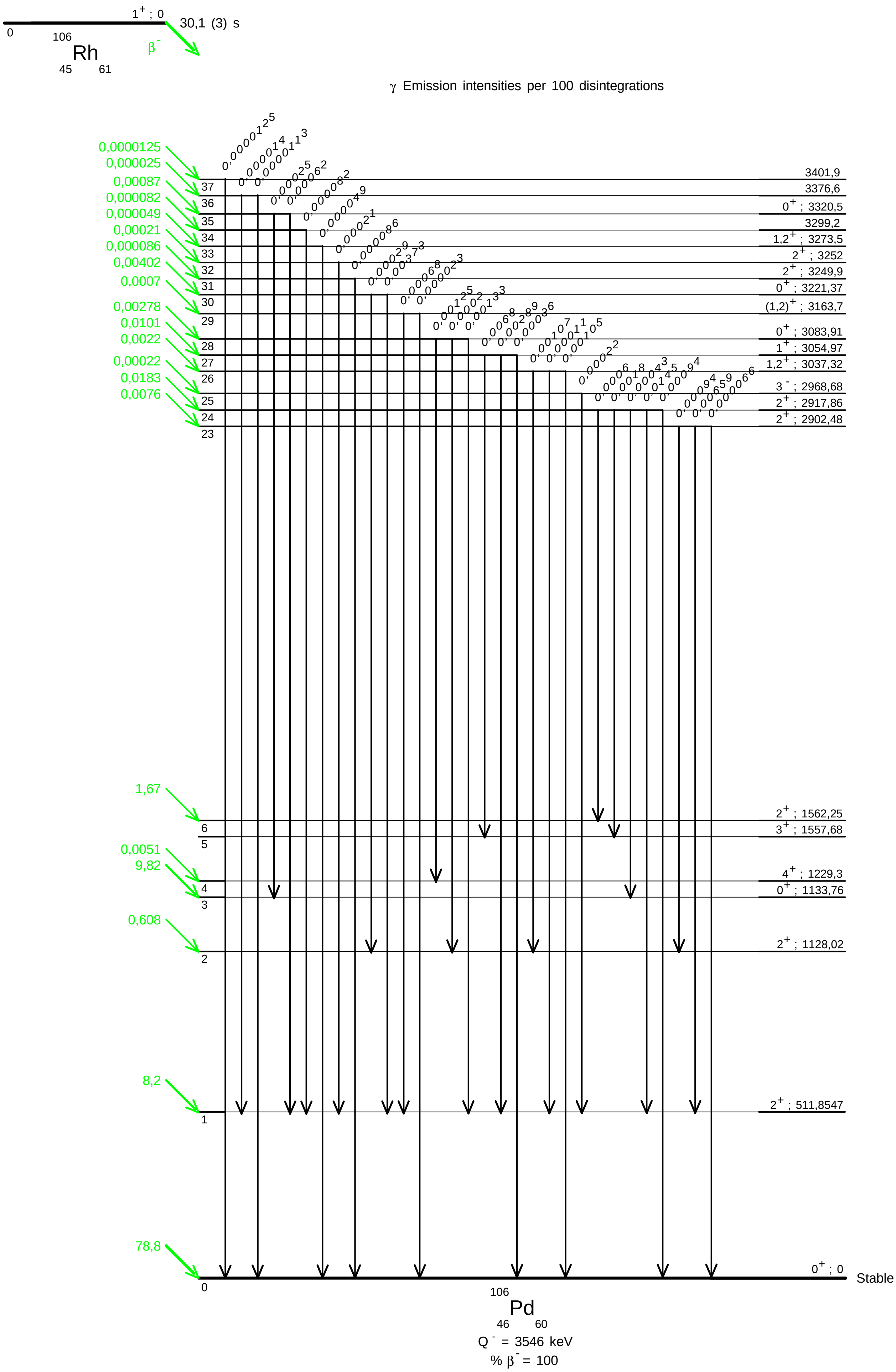
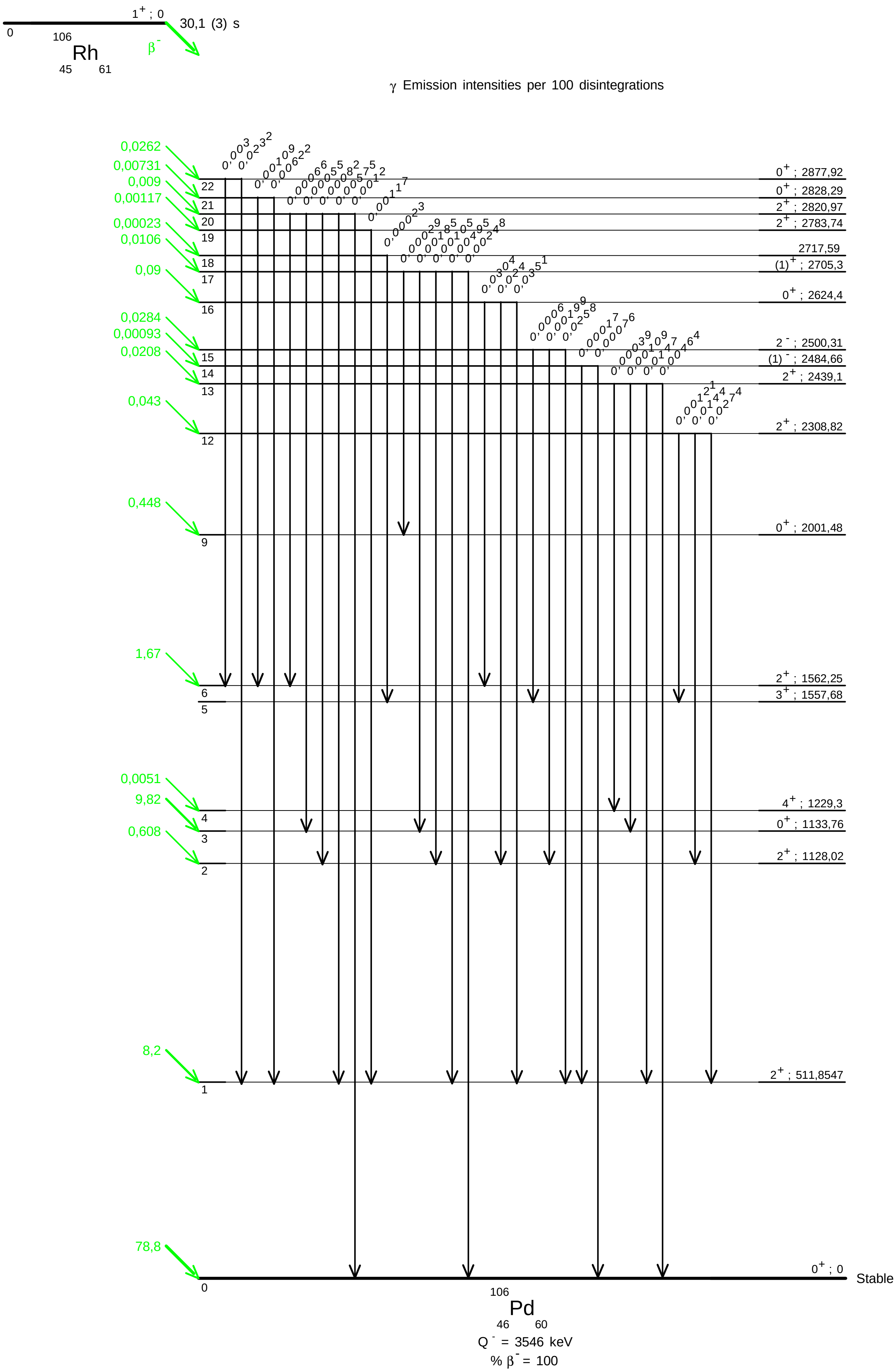
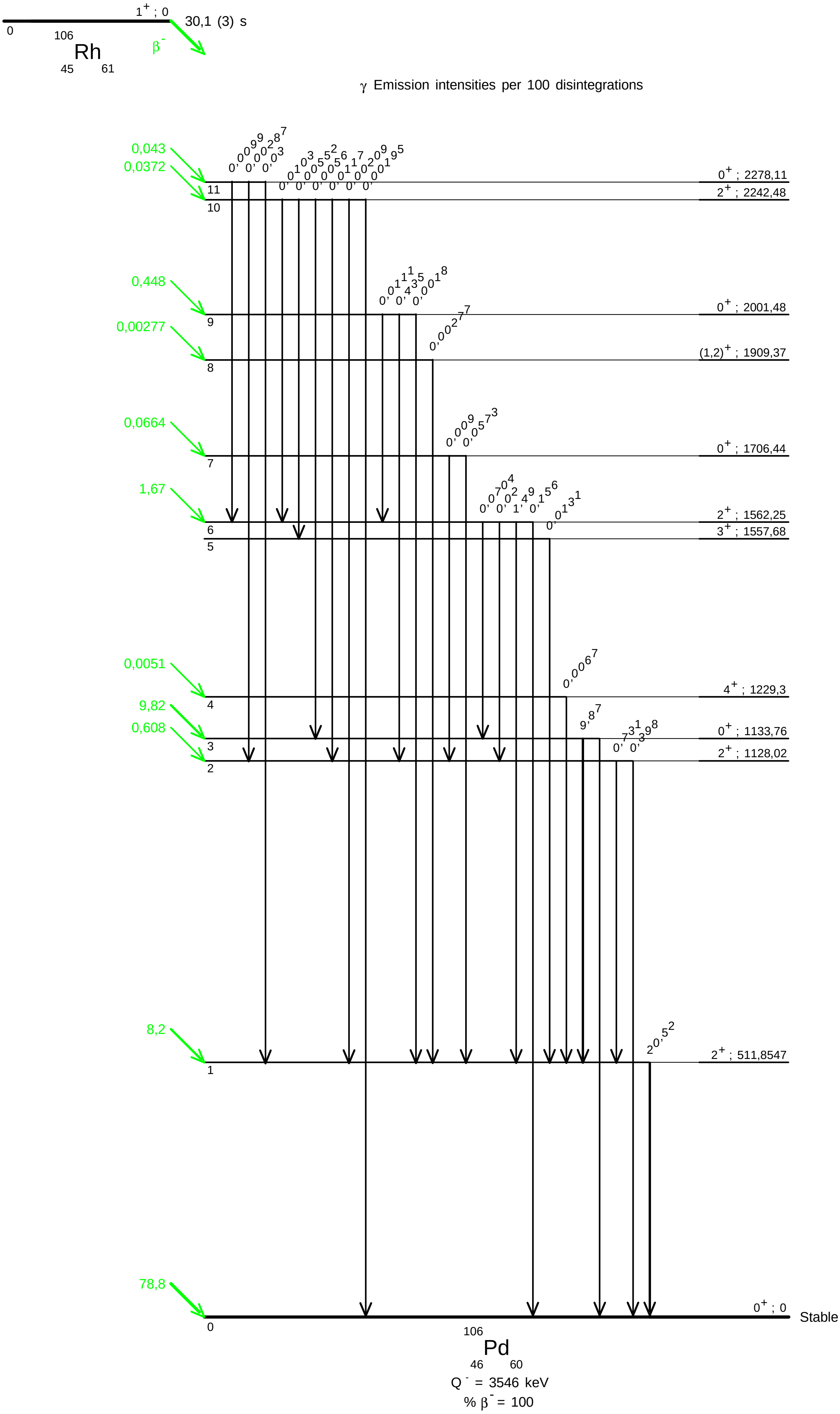

1+ ; 0
30,1 (3) s
0
106 Rh 45 61
β-
γ Emission intensities per 100 disintegrations
0,0000125
0,000025
0,00087
0,000082
0,000049
0,00021
0,000086
0,00402
0,0007
0,00278
0,0101
0,0022
0,00022
0,0183
0,0076
1,67
0,0051
9,82
0,608
8,2
78,8
3401,9
3376,6
0+ ; 3320,5
3299,2
1,2+ ; 3273,5
2+ ; 3252
2+ ; 3249,9
0+ ; 3221,37
(1,2)+ ; 3163,7
0+ ; 3083,91
1+ ; 3054,97
1,2+ ; 3037,32
3 - ; 2968,68
2+ ; 2917,86
2+ ; 2902,48
2+ ; 1562,25
3+ ; 1557,68
4+ ; 1229,3
0+ ; 1133,76
2+ ; 1128,02
2+ ; 511,8547
0+ ; 0
Stable
106 Pd 46 60
Q - = 3546 keV
% β- = 100


1+ ; 0
30,1 (3) s
106 Rh 45 61
β-
γ Emission intensities per 100 disintegrations
0+ ; 2877,92
0+ ; 2828,29
2+ ; 2820,97
2+ ; 2783,74
2717,59
(1)+ ; 2705,3
0+ ; 2624,4
2- ; 2500,31
(1)- ; 2484,66
2+ ; 2439,1
2+ ; 2308,82
0+ ; 2001,48
2+ ; 1562,25
3+ ; 1557,68
4+ ; 1229,3
0+ ; 1133,76
2+ ; 1128,02
2+ ; 511,8547
0+ ; 0
Stable
106 Pd 46 60
Q- = 3546 keV
% β- = 100


1+ ; 0
0
106 Rh 45 61
30,1 (3) s
β-
γ Emission intensities per 100 disintegrations
0,043
0,0372
0,448
0,00277
0,0664
1,67
0,0051
9,82
0,608
8,2
78,8
0+ ; 2278,11
2+ ; 2242,48
0+ ; 2001,48
(1,2)+ ; 1909,37
0+ ; 1706,44
2+ ; 1562,25
3+ ; 1557,68
4+ ; 1229,3
0+ ; 1133,76
2+ ; 1128,02
2+ ; 511,8547
0+ ; 0
Stable
106 Pd 46 60
Q- = 3546 keV
% β- = 100

$^{109}_{48}$Cd $_{61}$

1 Decay Scheme

Cd-109 decays by electron capture to the isomeric state (88 keV) of Ag-109.
Le cadmium 109 se désintègre uniquement par capture électronique vers l'état isomérique de l'argent 109 (88 keV).

2 Nuclear Data

$T_{1/2}(^{109}$Cd) : 461,9 (4) d
$Q^{+}(^{109}$Cd) : 215,5 (18) keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,1}$	127,5 (18)	100	Allowed	6	0,812 (3)	0,150 (3)	0,0321 (9)

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Ag)	88,0341 (10)	100	E3	11,41 (16)	12,06 (17)	2,47 (4)	26,3 (4)

3 Atomic Data

3.1 Ag

ω_K : 0,831 (4)
$\bar{\omega}_L$: 0,0583 (14)
n_{KL} : 0,964 (4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	21,9906	53,05
	$K\alpha_1$	22,16317	100
	$K\beta_3$	24,9118	}
	$K\beta_1$	24,9427	} 27,7
	$K\beta_5''$	25,146	}
	$K\beta_2$	25,4567	} 4,82
	$K\beta_4$	25,512	}
X_L			
	$L\ell$	2,634	
	$L\alpha$	2,977 - 2,985	
	$L\eta$	2,807	
	$L\beta$	3,151 - 3,438	
	$L\gamma$	3,431 - 3,748	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	17,79 - 18,69	100
KLX	20,945 - 22,160	42,5
KXY	24,079 - 25,507	4,51
Auger L	1,8 - 3,8	1194

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Ag)	1,8 - 3,8	167,3 (8)
e_{AK}	(Ag)		
	KLL	17,79 - 18,69	}
	KLX	20,945 - 22,160	} 20,8 (6)
	KXY	24,079 - 25,507	}
$ec_{1,0\ K}$	(Ag)	62,520 (1)	41,8 (8)
$ec_{1,0\ L}$	(Ag)	84,2279 - 84,6826	44,1 (9)
$ec_{1,0\ M}$	(Ag)	87,3162 - 87,6670	9,04 (19)
$ec_{1,0\ N}$	(Ag)	87,9385 - 88,0304	1,413 (29)

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Ag)	2,634 - 3,748	10,37 (27)	
XKα_2	(Ag)	21,9906	29,21 (30)	} Kα
XKα_1	(Ag)	22,16317	55,1 (5)	}
XKβ_3	(Ag)	24,9118	}	
XKβ_1	(Ag)	24,9427	} 15,25 (20)	K$'\beta_1$
XKβ_5''	(Ag)	25,146	}	
XKβ_2	(Ag)	25,4567	} 2,65 (10)	K$'\beta_2$
XKβ_4	(Ag)	25,512	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Ag)	88,0336 (10)	3,66 (5)

6 Main Production Modes

{ Cd – 108(n,γ)Cd – 109 σ : 1,1 (3) barns
Possible impurities: Ag – 110m

{ Ag – 109(p,n)Cd – 109
Possible impurities: none

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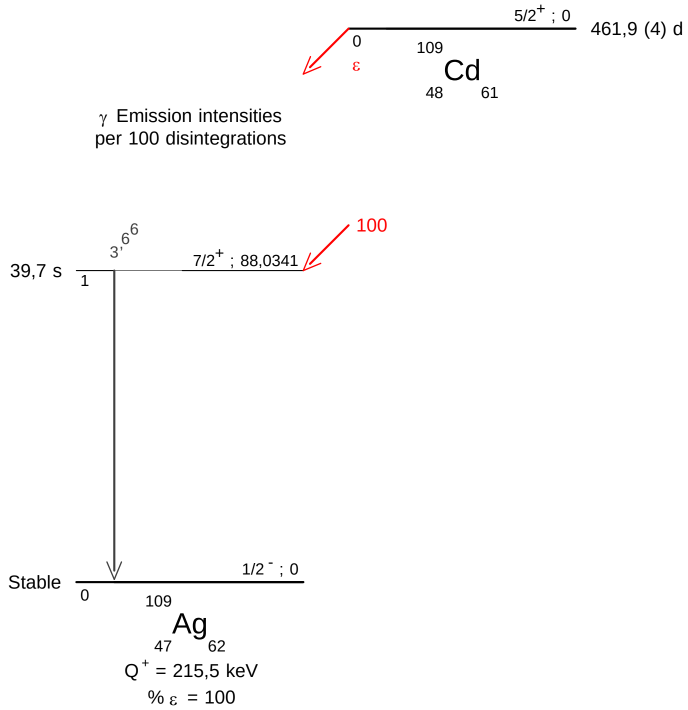
5/2+ ; 0
461,9 (4) d
0
ε
109
Cd
48
61
γ Emission intensities
per 100 disintegrations
100
3,66
7/2+ ; 88,0341
39,7 s
1
Stable
1/2 - ; 0
0
109
Ag
47
62
Q+ = 215,5 keV
% ε = 100

$^{127}_{54}\mathrm{Xe}_{73}$

1 Decay Scheme

Xe-127 decays by electron capture to excited levels in I-127.
Le Xe-127 se désintègre par capture électronique vers des niveaux excités de I-127.

2 Nuclear Data

$T_{1/2}(^{127}\mathrm{Xe})$	:	36,358	(31)	d
$Q^{+}(^{127}\mathrm{Xe})$	:	662,3	(20)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,4}$	43,9 (21)	0,0142 (9)	Allowed	7,42	0,31 (6)	0,523 (44)	0,137 (12)
$\epsilon_{0,3}$	287,3 (20)	47,3 (7)	Allowed	6,21	0,830 (8)	0,134 (1)	0,0294 (6)
$\epsilon_{0,2}$	459,4 (20)	52,7 (14)	Allowed	6,61	0,842 (8)	0,125 (1)	0,0272 (5)

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(I)	57,609 (11)	6,00 (18)	M1 + 0,68 (8) % E2	3,16 (5)	0,449 (8)	0,0910 (16)	3,72 (6)
$\gamma_{2,1}$(I)	145,251 (14)	6,22 (11)	E2	0,357 (5)	0,0906 (13)	0,0189 (3)	0,471 (7)
$\gamma_{3,2}$(I)	172,132 (12)	29,74 (45)	M1 + 0,72 (10) % E2	0,1419 (20)	0,0185 (3)	0,00373 (6)	0,1649 (24)
$\gamma_{2,0}$(I)	202,860 (8)	76,3 (5)	M1 + 21,1 (17) % E2	0,0964 (15)	0,0142 (3)	0,00289 (6)	0,1142 (18)
$\gamma_{3,0}$(I)	374,992 (9)	17,60 (28)	E2	0,01671 (24)	0,00257 (4)	0,000524 (8)	0,0199 (3)
$\gamma_{4,0}$(I)	618,4 (3)	0,0142 (9)	M1 + 0,65 (29) % E2	0,00528 (8)	0,000656 (10)	0,0001316 (19)	0,00609 (9)

3 Atomic Data

3.1 I

ω_K	:	0,8842	(40)
$\bar{\omega}_L$	:	0,092	(4)
n_{KL}	:	0,909	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	28,3175	53,84
	$K\alpha_1$	28,6123	100
	$K\beta_3$	32,2397	}
	$K\beta_1$	32,2951	} 28,81
	$K\beta_5''$	32,544	}
	$K\beta_2$	33,042	}
	$K\beta_4$	33,12	} 6,51
	$KO_{2,3}$	33,166	}
X_L			
	$L\ell$	3,4848	
	$L\alpha$	3,9269 - 3,9382	
	$L\eta$	3,7791	
	$L\beta$	4,2212 - 4,5678	
	$L\gamma$	4,6668 - 5,0595	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	22,66 - 23,91	100
KLX	26,85 - 28,56	45,8
KXY	30,99 - 33,07	6,2
Auger L	2,4 - 5,1	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(I)	2,4 - 5,1	96,4 (6)
e_{AK}	(I)		11,8 (5)
	KLL	22,66 - 23,91	
	KLX	26,85 - 28,56	
	KXY	30,99 - 33,07	
$ec_{1,0\ T}$	(I)	24,440 - 57,606	4,73 (15)
$ec_{1,0\ K}$	(I)	24,440 (11)	4,02 (13)
$ec_{1,0\ L}$	(I)	52,421 - 53,052	0,571 (19)
$ec_{1,0\ M}$	(I)	56,537 - 56,990	0,1158 (38)
$ec_{1,0\ N}$	(I)	57,423 - 57,559	0,0233 (8)
$ec_{2,1\ T}$	(I)	112,082 - 145,248	1,992 (44)
$ec_{2,1\ K}$	(I)	112,082 (14)	1,510 (33)
$ec_{3,2\ K}$	(I)	138,963 (12)	3,62 (7)
$ec_{3,2\ T}$	(I)	138,963 - 172,129	4,21 (9)
$ec_{2,1\ L}$	(I)	140,063 - 140,694	0,383 (8)
$ec_{2,1\ M}$	(I)	144,179 - 144,632	0,0799 (18)
$ec_{2,1\ N}$	(I)	145,065 - 145,201	0,01561 (36)
$ec_{3,2\ L}$	(I)	166,944 - 167,575	0,472 (10)
$ec_{2,0\ T}$	(I)	169,69 - 202,86	7,82 (13)
$ec_{2,0\ K}$	(I)	169,691 (8)	6,60 (11)
$ec_{3,2\ M}$	(I)	171,060 - 171,513	0,0952 (21)
$ec_{3,2\ N}$	(I)	171,946 - 172,082	0,01925 (40)
$ec_{2,0\ L}$	(I)	197,67 - 198,30	0,972 (22)
$ec_{2,0\ M}$	(I)	201,79 - 202,24	0,1978 (43)
$ec_{2,0\ N}$	(I)	202,67 - 202,81	0,0396 (9)
$ec_{3,0\ K}$	(I)	341,823 (9)	0,288 (6)
$ec_{3,0\ L}$	(I)	369,804 - 370,435	0,0444 (10)

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(I)	3,4848 - 5,0595	9,60 (19)	
$XK\alpha_2$	(I)	28,3175	25,0 (4)	} $K\alpha$
$XK\alpha_1$	(I)	28,6123	46,5 (8)	
$XK\beta_3$	(I)	32,2397	}	
$XK\beta_1$	(I)	32,2951	13,39 (25)	$K'\beta_1$
$XK\beta_5''$	(I)	32,544	}	
$XK\beta_2$	(I)	33,042	}	
$XK\beta_4$	(I)	33,12	3,03 (9)	$K'\beta_2$
$XKO_{2,3}$	(I)	33,166	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(I)	57,61 (2)	1,272 (35)
$\gamma_{2,1}$(I)	145,252 (10)	4,23 (7)
$\gamma_{3,2}$(I)	172,132 (10)	25,53 (38)
$\gamma_{2,0}$(I)	202,86 (1)	68,45 (45)
$\gamma_{3,0}$(I)	374,991 (12)	17,26 (27)
$\gamma_{4,0}$(I)	618,41 (14)	0,0141 (9)

6 Main Production Modes

{ Xe – 126(n,γ)Xe – 127 σ : 3,5 (8) barns
Possible impurities : Xe – 129m, Xe – 131m

{ I – 127(p,n)Xe – 127m
Possible impurities : Xe – 122, Xe – 125

{ I – 127(d,2n)Xe – 127m
Possible impurities : I – 126

Xe – 126(n,γ)Xe – 127m

Xe – 127m(I.T.)Xe – 127 $T_{1/2}$: 69 s

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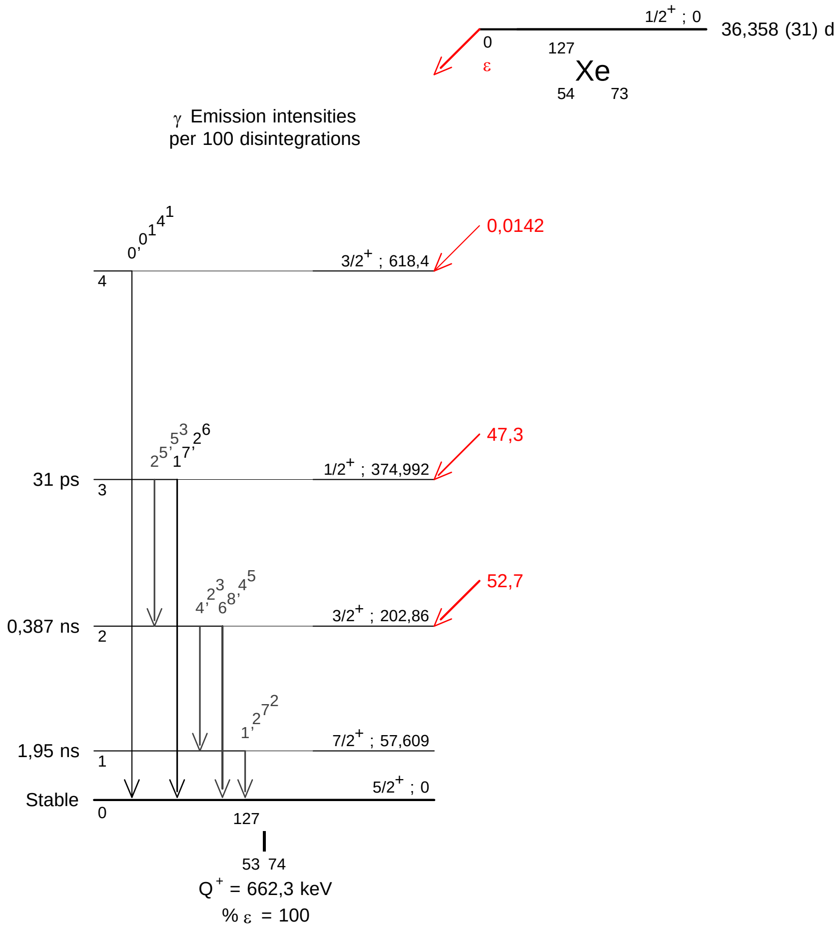
1/2+ ; 0
36,358 (31) d
0
ε
127
Xe
54 73
γ Emission intensities
per 100 disintegrations
0,0142
3/2+ ; 618,4
47,3
1/2+ ; 374,992
52,7
3/2+ ; 202,86
7/2+ ; 57,609
5/2+ ; 0
31 ps
0,387 ns
1,95 ns
Stable
4
3
2
1
0
127
I
53 74
Q+ = 662,3 keV
% ε = 100

$^{131}_{53}I_{78}$

1 Decay Scheme

L'iode 131 se désintègre par émission bêta moins vers les niveaux excités de xénon 131, incluant l'isomère xénon 131m de 11,962 (20) jours de période. L'état d'équilibre idéal, c'est à dire l'activité de l'iode 131 étant égale à l'activité de xénon 131m, est obtenue uniquement à tm = 14,04 (9) jours.

I-131 disintegrates through beta minus emissions to excited levels of Xe-131, including the isomeric state Xe-131m. The radioactive equilibrium, i.e. when the activity of I-131 is equal to the activity of Xe-131m, is valid only at tm = 14.04 (9) days.

Pour cette évaluation, l'intensité de la raie gamma de 163,9 keV est donnée, et est valable seulement, au temps t = tm.

For this evaluation, the intensity of the 163.9 keV gamma ray given is only valid at t = tm.

2 Nuclear Data

$T_{1/2}(^{131}I)$	:	8,0233	(19)	d
$Q^{-}(^{131}I)$	:	970,8	(6)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,8}$	247,9 (6)	2,130 (21)	Allowed	6,98
$\beta^-_{0,7}$	303,9 (6)	0,643 (27)	1st Forbidden	7,79
$\beta^-_{0,6}$	333,8 (6)	7,20 (7)	Allowed	6,86
$\beta^-_{0,4}$	606,3 (6)	89,4 (8)	Allowed	6,64
$\beta^-_{0,3}$	629,7 (6)	0,060 (12)	1st Forbidden	9,8
$\beta^-_{0,2}$	806,9 (6)	0,386 (23)	Unique 1st Forbidden	10,03

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Xe)	80,1854 (19)	6,63 (15)	M1	1,32 (4)	0,175 (5)	0,036 (1)	1,544 (46)
$\gamma_{8,6}$(Xe)	85,919 (8)	0,0163 (23)	[M1, E2]	1,50 (6)	0,56 (2)		2,2 (1)
$\gamma_{2,0}$(Xe)	163,930 (8)	1,087 (21)	M4	31,6 (5)	14,75 (21)	3,38 (5)	50,5 (7)
$\gamma_{3,2}$(Xe)	177,214 (12)	0,344 (9)	M1+94,9(9)%E2	0,187 (6)	0,0427 (13)	0,00901 (27)	0,241 (7)
$\gamma_{6,5}$(Xe)	232,175 (8)	0,0025 (10)	[E2]	0,0782 (22)	0,0151 (5)	0,0031 (1)	0,097 (2)
$\gamma_{6,4}$(Xe)	272,500 (8)	0,0612 (16)	M1+12,6(6)%E2	0,0453 (7)	0,0061 (3)	0,00125 (6)	0,0530 (9)
$\gamma_{4,1}$(Xe)	284,305 (5)	6,45 (6)	E2	0,0408 (6)	0,00714 (10)	0,001479 (21)	0,0497 (7)
$\gamma_{6,3}$(Xe)	295,846 (13)	0,0012 (6)	[E1]	0,0093 (2)	0,00117 (3)	0,00024 (4)	0,0108 (3)
$\gamma_{7,4}$(Xe)	302,444 (13)	0,0046 (7)	[E1]	0,0088 (2)	0,00111 (1)	0,00022 (1)	0,0102 (2)
$\gamma_{8,5}$(Xe)	318,094 (8)	0,0835 (21)	M1+1,2(9)%E2	0,0301 (5)	0,00388 (6)	0,000786 (12)	0,0350 (5)
$\gamma_{5,1}$(Xe)	324,630 (6)	0,0252 (26)	M1+E2	0,0278 (10)	0,0041 (4)	0,00083 (9)	0,0329 (6)
$\gamma_{7,3}$(Xe)	325,790 (18)	0,283 (8)	M1+39(34)%E2	0,0288 (9)	0,00376 (11)	0,000765 (23)	0,0335 (10)
$\gamma_{8,4}$(Xe)	358,419 (8)	0,017 (8)	[M1,E2]	0,0210 (12)	0,00301 (18)	0,00061 (5)	0,0248 (10)
$\gamma_{4,0}$(Xe)	364,490 (4)	83,1 (5)	M1+95,4(23)%E2	0,0190 (3)	0,00300 (5)	0,000616 (9)	0,0228 (4)
$\gamma_{5,0}$(Xe)	404,815 (4)	0,0562 (17)	M1+50%E2	0,0151 (13)	0,00210 (4)	0,000429 (11)	0,0177 (12)
$\gamma_{7,2}$(Xe)	503,004 (17)	0,3571 (46)	E2	0,00748 (11)	0,001083 (16)	0,000221 (3)	0,00883 (13)
$\gamma_{6,0}$(Xe)	636,990 (4)	7,15 (7)	E2	0,00401 (6)	0,000551 (8)	0,0001123 (16)	0,00470 (7)
$\gamma_{8,1}$(Xe)	642,724 (6)	0,2193 (26)	[E2]	0,0039 (1)	0,00054 (1)	0,00011 (2)	0,0046 (1)
$\gamma_{8,0}$(Xe)	722,909 (4)	1,794 (19)	M1+4,1(1)%E2	0,00390 (6)	0,000488 (7)	0,0000987 (14)	0,00451 (7)

3 Atomic Data

3.1 Xe

ω_K : 0,888 (5)
$\bar{\omega}_L$: 0,097 (5)
n_{KL} : 0,902 (4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	29,459	53,98
	$K\alpha_1$	29,779	100
	$K\beta_3$	33,562	} 28,99
	$K\beta_1$	33,625	}
	$K\beta_5''$	33,881	}
	$K\beta_2$	34,415	} 6,84
	$K\beta_4$	34,496	}
	$KO_{2,3}$	34,552	}
X_L			
	$L\ell$	3,64	
	$L\alpha$	4,1 - 4,11	
	$L\eta$	3,96	
	$L\beta$	4,42 - 4,78	
	$L\gamma$	4,89 - 5,3	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	23,512 - 24,842	100
KLX	27,897 - 29,770	46,5
KXY	32,27 - 34,54	5,41
Auger L	2,50 - 5,43	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Xe)	2,50 - 5,43	5,87 (4)
e_{AK}	(Xe)		0,67 (4)
	KLL	23,512 - 24,842	
	KLX	27,897 - 29,770	
	KXY	32,27 - 34,54	
$ec_{1,0\ T}$	(Xe)	45,6209 - 80,1732	4,03 (13)
$ec_{1,0\ K}$	(Xe)	45,6209 (19)	3,44 (11)
$ec_{1,0\ L}$	(Xe)	74,7325 - 75,4031	0,456 (14)
$ec_{1,0\ M}$	(Xe)	79,0366 - 79,5086	0,0939 (29)
$ec_{1,0\ N}$	(Xe)	79,9720 - 80,1178	0,01921 (39)
$ec_{2,0\ T}$	(Xe)	129,366 - 163,917	1,066 (47)
$ec_{2,0\ K}$	(Xe)	129,366 (8)	0,662 (29)
$ec_{2,0\ L}$	(Xe)	158,477 - 159,148	0,315 (14)
$ec_{2,0\ M}$	(Xe)	162,781 - 163,253	0,0727 (32)
$ec_{2,0\ N}$	(Xe)	163,717 - 163,862	0,0148 (7)
$ec_{4,1\ K}$	(Xe)	249,741 (5)	0,2505 (44)
$ec_{4,1\ L}$	(Xe)	278,852 - 279,523	0,0438 (7)
$ec_{4,0\ K}$	(Xe)	329,926 (4)	1,543 (26)
$ec_{4,0\ T}$	(Xe)	329,93 - 364,48	1,851 (34)
$ec_{4,0\ L}$	(Xe)	359,04 - 359,71	0,2436 (43)
$ec_{4,0\ M}$	(Xe)	363,34 - 363,81	0,0500 (8)
$ec_{4,0\ N}$	(Xe)	364,28 - 364,42	0,01020 (16)
$ec_{6,0\ K}$	(Xe)	602,426 (4)	0,0286 (5)
$\beta^-_{0,8}$	max:	247,9 (6)	2,130 (21)
	avg:	69,35 (19)	
$\beta^-_{0,7}$	max:	303,9 (6)	0,643 (27)
	avg:	86,94 (19)	
$\beta^-_{0,6}$	max:	333,8 (6)	7,20 (7)
	avg:	96,61 (19)	
$\beta^-_{0,4}$	max:	606,3 (6)	89,4 (8)
	avg:	191,59 (22)	

		Energy (keV)		Electrons (per 100 disint.)
$\beta^-_{0,3}$	max:	629,7	(6)	0,060 (12)
	avg:	200,23	(22)	
$\beta^-_{0,2}$	max:	806,9	(6)	0,386 (23)
	avg:	267,91	(23)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Xe)	3,64 - 5,3	0,631 (13)	
$XK\alpha_2$	(Xe)	29,459	1,52 (4)	$K\alpha$
$XK\alpha_1$	(Xe)	29,779	2,81 (6)	
$XK\beta_3$	(Xe)	33,562	0,816 (19)	$K'\beta_1$
$XK\beta_1$	(Xe)	33,625		
$XK\beta''_5$	(Xe)	33,881		
$XK\beta_2$	(Xe)	34,415	0,193 (6)	$K'\beta_2$
$XK\beta_4$	(Xe)	34,496		
$XKO_{2,3}$	(Xe)	34,552		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Xe)	80,185 (2)	2,607 (35)
$\gamma_{8,6}$(Xe)	85,9 (2)	0,0051 (7)
$\gamma_{2,0}$(Xe)	163,930 (8)	0,0211 (3)
$\gamma_{3,2}$(Xe)	177,214 (20)	0,277 (7)
$\gamma_{6,5}$(Xe)	232,18 (15)	0,0023 (9)
$\gamma_{6,4}$(Xe)	272,498 (17)	0,0581 (15)
$\gamma_{4,1}$(Xe)	284,305 (5)	6,14 (6)
$\gamma_{6,3}$(Xe)	295,8 (2)	0,0012 (6)
$\gamma_{7,4}$(Xe)	302,4 (2)	0,0046 (7)
$\gamma_{8,5}$(Xe)	318,088 (16)	0,0807 (20)
$\gamma_{5,1}$(Xe)	324,651 (25)	0,0244 (25)
$\gamma_{7,3}$(Xe)	325,789 (4)	0,274 (8)
$\gamma_{8,4}$(Xe)	358,4 (2)	0,017 (8)
$\gamma_{4,0}$(Xe)	364,489 (5)	81,2 (5)
$\gamma_{5,0}$(Xe)	404,814 (4)	0,0552 (17)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{7,2}$(Xe)	503,004 (4)	0,3540 (46)
$\gamma_{6,0}$(Xe)	636,989 (4)	7,12 (7)
$\gamma_{8,1}$(Xe)	642,719 (5)	0,2183 (26)
$\gamma_{8,0}$(Xe)	722,911 (5)	1,786 (19)

6 Main Production Modes

Fission product

$\left\{\begin{array}{l} \mathrm{Te-130(n,\gamma)Te-131} \quad \sigma : 0{,}27\ (6)\ \text{barns} \\ \text{Possible impurities: Te} - 121\text{m, Te} - 121\text{, Te} - 123\text{m, Te} - 125\text{m, Te} - 127\text{, Te} - 129\text{m} \end{array}\right.$

Te – 131(β^-)I – 131 $T_{1/2}$: 25 min

$\left\{\begin{array}{l} \mathrm{Te-130(n,\gamma)Te-131m} \quad \sigma : 0{,}02\ (1)\ \text{barns} \\ \text{Possible impurities: Te} - 121\text{m, Te} - 121\text{, Te} - 123\text{m, Te} - 125\text{m, Te} - 127\text{, Te} - 129\text{m} \end{array}\right.$

Te – 131m(β^-)I – 131 $T_{1/2}$: 30 h

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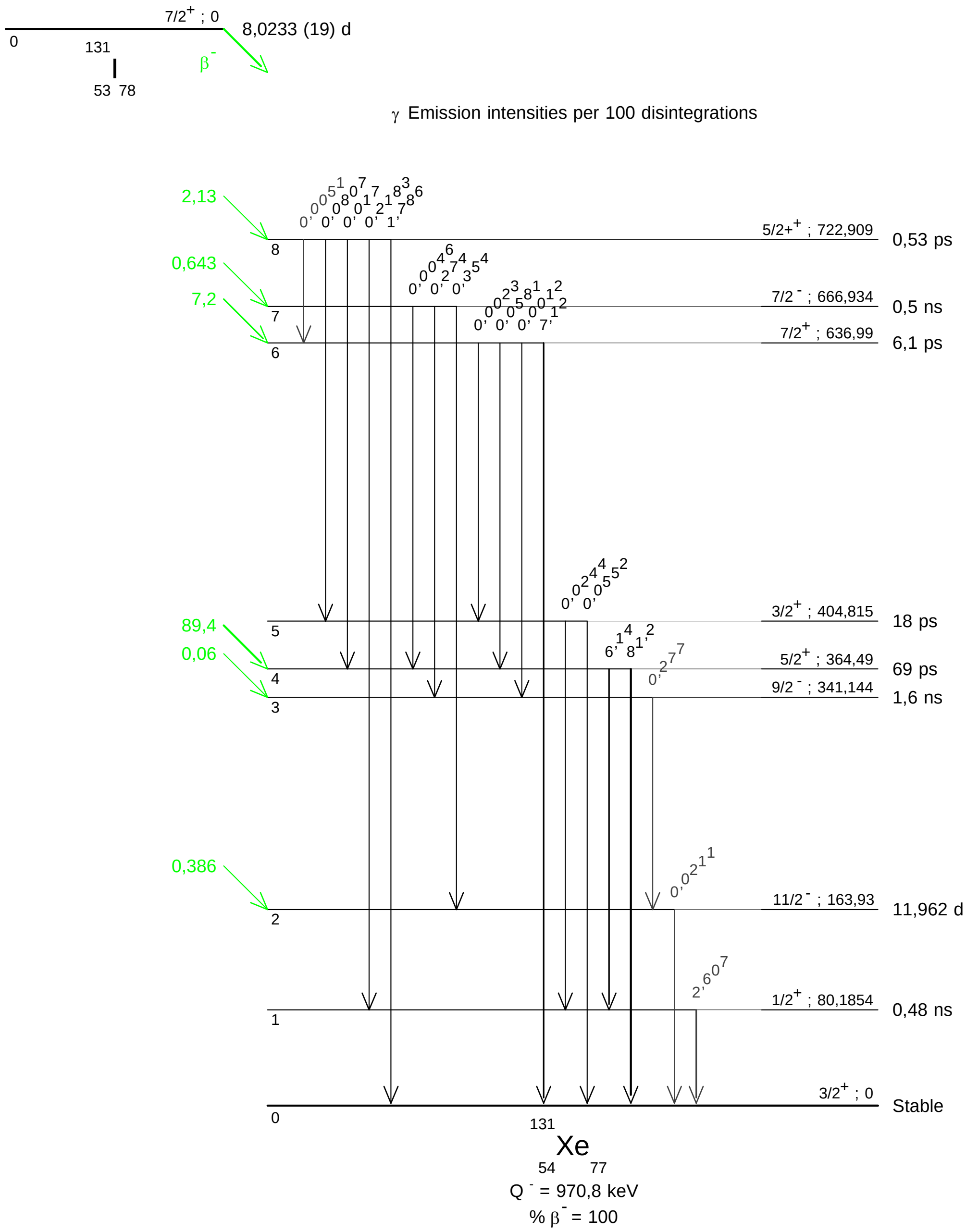
7/2+ ; 0
8,0233 (19) d
0
131
53 78
β-
γ Emission intensities per 100 disintegrations
2,13
0,643
7,2
89,4
0,06
0,386
5/2++ ; 722,909
0,53 ps
7/2 - ; 666,934
0,5 ns
7/2+ ; 636,99
6,1 ps
3/2+ ; 404,815
18 ps
5/2+ ; 364,49
69 ps
9/2 - ; 341,144
1,6 ns
11/2 - ; 163,93
11,962 d
1/2+ ; 80,1854
0,48 ns
3/2+ ; 0
Stable
131
Xe
54 77
Q - = 970,8 keV
% β- = 100

$^{131m}_{54}Xe_{77}$

1 Decay Scheme

Le xénon 131 métastable se désexcite par une transition gamma (163,930 keV) fortement convertie.
Xe-131m decays by a strongly converted gamma transition.

2 Nuclear Data

$T_{1/2}(^{131m}Xe)$	:	11,962	(20)	d
$Q^{IT}(^{131m}Xe)$	:	163,930	(8)	keV

2.1 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Xe)	163,930 (8)	100	M4	31,6 (5)	14,75 (21)	3,38 (5)	50,5 (7)

3 Atomic Data

3.1 Xe

ω_K	:	0,888	(5)
$\bar{\omega}_L$	:	0,097	(5)
n_{KL}	:	0,902	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	29,459	53,98
	$K\alpha_1$	29,779	100

		Energy (keV)	Relative probability
	$K\beta_3$	33,562	28,99
	$K\beta_1$	33,625	
	$K\beta_5''$	33,881	
	$K\beta_2$	34,415	6,84
	$K\beta_4$	34,496	
	$KO_{2,3}$	34,552	
X_L			
	$L\ell$	3,64	
	$L\alpha$	4,1 - 4,11	
	$L\eta$	3,96	
	$L\beta$	4,42 - 4,78	
	$L\gamma$	4,89 - 5,3	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	23,512 - 24,842	100
KLX	27,897 - 29,770	46,5
KXY	32,27 - 34,54	5,41
Auger L	2,50 - 5,43	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Xe)	2,50 - 5,43	75,8 (5)
e_{AK}	(Xe)		6,9 (4)
	KLL	23,512 - 24,842	
	KLX	27,897 - 29,770	
	KXY	32,27 - 34,54	
$ec_{1,0\ K}$	(Xe)	129,366 (8)	61,4 (13)
$ec_{1,0\ L}$	(Xe)	158,48 - 159,15	28,6 (6)
$ec_{1,0\ M}$	(Xe)	162,78 - 163,25	6,56 (13)
$ec_{1,0\ N}$	(Xe)	163,72 - 163,86	1,342 (26)

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Xe)	3,64 - 5,3	8,12 (16)	
$XK\alpha_2$	(Xe)	29,459	15,5 (4)	$K\alpha$
$XK\alpha_1$	(Xe)	29,779	28,7 (7)	
$XK\beta_3$	(Xe)	33,562		
$XK\beta_1$	(Xe)	33,625	8,31 (22)	$K'\beta_1$
$XK\beta_5''$	(Xe)	33,881		
$XK\beta_2$	(Xe)	34,415		
$XK\beta_4$	(Xe)	34,496	1,96 (7)	$K'\beta_2$
$XKO_{2,3}$	(Xe)	34,552		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Xe)	163,930 (8)	1,942 (26)

6 Main Production Modes

Fission product
Possible impurities: Xe – 127, Xe – 129m, Xe – 133, Xe – 133m, Xe – 135

Xe – 130(n,γ)Xe – 131m σ : 0,45 (10) barns
Possible impurities: Xe – 129m

I – 131(β^-)Xe – 131m

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  (Half-life)


γ Emission intensities
per 100 disintegrations
1
0
11/2⁻ ; 163,93
11,962 d
3/2⁺ ; 0
Stable
131
Xe
54
77
Q^IT = 163,93 keV
% IT = 100

$^{133}_{56}$Ba $_{77}$

1 Decay Scheme

^{133}Ba disintegrates by electron capture mainly to two ^{133}Cs excited levels of 437 keV (85.4%) and of 383 keV (14.5%) with three very minor branches to the 160 keV, 81 keV excited levels and the ground state.

Le baryum 133 se désintègre par capture électronique principalement vers deux niveaux excités de 437 keV et 383 keV du césium 133.

2 Nuclear Data

$T_{1/2}$(^{133}Ba)	:	10,539	(6)	a
Q^+(^{133}Ba)	:	517,3	(10)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,4}$	80,3 (10)	85,41 (53)	Allowed	6,63	0,671 (5)	0,251 (4)	0,0777 (11)
$\epsilon_{0,3}$	133,5 (10)	14,46 (51)	Allowed	8,03	0,7727 (9)	0,1755 (7)	0,05174 (23)
$\epsilon_{0,2}$	356,7 (10)	<0,3	2nd Forbidden	>10,6	0,83	0,13	0,037
$\epsilon_{0,1}$	436,3 (10)	<0,7	2nd Forbidden	>10,9	0,84	0,13	0,037
$\epsilon_{0,0}$	517,3 (10)	<0,0005	Unique 2nd Forbidden	>13,9	0,77	0,18	0,05

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{4,3}$(Cs)	53,1622 (18)	14,25 (46)	M1+E2	4,78 (7)	0,70 (5)	0,144 (12)	5,66 (11)
$\gamma_{2,1}$(Cs)	79,6142 (19)	7,3 (5)	M1+E2	1,495 (22)	0,217 (6)	0,0447 (13)	1,77 (3)
$\gamma_{1,0}$(Cs)	80,9979 (11)	90,05 (6)	M1+E2	1,431 (20)	0,216 (4)	0,0447 (8)	1,703 (24)
$\gamma_{2,0}$(Cs)	160,6121 (16)	0,826 (9)	M1+E2	0,234 (4)	0,0471 (13)	0,0099 (3)	0,294 (6)
$\gamma_{3,2}$(Cs)	223,237 (2)	0,494 (6)	M1+E2	0,0836 (12)	0,01103 (16)	0,00226 (4)	0,0975 (14)
$\gamma_{4,2}$(Cs)	276,3992 (21)	7,53 (6)	E2	0,0460 (7)	0,00842 (12)	0,001763 (25)	0,0566 (8)
$\gamma_{3,1}$(Cs)	302,8512 (16)	19,10 (12)	M1+E2	0,0373 (6)	0,00484 (7)	0,000988 (14)	0,0434 (6)
$\gamma_{4,1}$(Cs)	356,0134 (17)	63,63 (20)	E2	0,0211 (3)	0,00346 (5)	0,000721 (10)	0,0254 (4)
$\gamma_{3,0}$(Cs)	383,8491 (12)	9,12 (6)	E2	0,01684 (24)	0,00270 (4)	0,000560 (8)	0,0202 (3)

3 Atomic Data

3.1 Cs

ω_K	:	0,894	(4)
$\bar{\omega}_L$	:	0,104	(5)
n_{KL}	:	0,895	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	30,6254	54,13
	$K\alpha_1$	30,9731	100
	$K\beta_3$	34,9197	}
	$K\beta_1$	34,9873	} 29,21532
	$K\beta_5''$	35,252	}
	$K\beta_2$	35,822	}
	$K\beta_4$	35,907	} 7,12854
	$KO_{2,3}$	35,972	}
X_L			
	$L\ell$	3,7946	
	$L\alpha$	4,2729 - 4,2866	
	$L\eta$	4,1418	
	$L\beta$	4,62 - 4,9333	
	$L\gamma$	5,1308 - 5,5525	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	24,411 - 25,804	100
KLX	28,991 - 30,961	47,2
KXY	33,55 - 35,96	5,56
Auger L	2,5777 - 5,5590	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Cs)	2,5777 - 5,5590	136,8 (8)
e_{AK}	(Cs)		
	KLL	24,411 - 25,804	14,1 (6)
	KLX	28,991 - 30,961	
	KXY	33,55 - 35,96	
$ec_{4,3\ T}$	(Cs)	17,1776 - 53,1508	12,11 (41)
$ec_{4,3\ K}$	(Cs)	17,1776 (18)	10,23 (32)
$ec_{2,1\ T}$	(Cs)	43,6296 - 79,6028	4,66 (35)
$ec_{2,1\ K}$	(Cs)	43,6296 (19)	3,93 (29)
$ec_{1,0\ K}$	(Cs)	45,0133 (11)	47,7 (8)
$ec_{1,0\ T}$	(Cs)	45,0133 - 80,9865	56,7 (9)
$ec_{4,3\ L}$	(Cs)	47,4479 - 48,1503	1,50 (11)
$ec_{4,3\ M}$	(Cs)	51,9451 - 52,4367	0,308 (27)
$ec_{4,3\ N}$	(Cs)	52,9314 - 53,0857	0,065 (5)
$ec_{2,1\ L}$	(Cs)	73,8999 - 74,6023	0,571 (44)
$ec_{1,0\ L}$	(Cs)	75,2836 - 75,9860	7,19 (15)
$ec_{2,1\ M}$	(Cs)	78,3971 - 78,8887	0,118 (9)
$ec_{2,1\ N}$	(Cs)	79,3834 - 79,5377	0,0247 (19)
$ec_{1,0\ M}$	(Cs)	79,7808 - 80,2724	1,489 (30)
$ec_{1,0\ N}$	(Cs)	80,7671 - 80,9214	0,313 (6)
$ec_{2,0\ K}$	(Cs)	124,6275 (16)	0,1493 (29)
$ec_{2,0\ L}$	(Cs)	154,8978 - 155,6002	0,0300 (9)
$ec_{3,2\ K}$	(Cs)	187,252 (2)	0,0376 (7)
$ec_{4,2\ K}$	(Cs)	240,4146 (21)	0,328 (6)
$ec_{3,1\ T}$	(Cs)	266,8666 - 302,8398	0,795 (12)
$ec_{3,1\ K}$	(Cs)	266,8666 (16)	0,683 (12)
$ec_{4,2\ L}$	(Cs)	270,6849 - 271,3873	0,060 (1)
$ec_{4,2\ M}$	(Cs)	275,1821 - 275,6737	0,01257 (21)
$ec_{3,1\ L}$	(Cs)	297,1369 - 297,8393	0,0886 (14)
$ec_{3,1\ M}$	(Cs)	301,6341 - 302,1257	0,01809 (28)
$ec_{4,1\ T}$	(Cs)	320,0288 - 356,0020	1,576 (25)

		Energy (keV)	Electrons (per 100 disint.)
$ec_{4,1\ K}$	(Cs)	320,0288 (17)	1,309 (19)
$ec_{3,0\ K}$	(Cs)	347,8645 (12)	0,1505 (24)
$ec_{4,1\ L}$	(Cs)	350,2991 - 351,0015	0,2147 (32)
$ec_{4,1\ M}$	(Cs)	354,7963 - 355,2879	0,0447 (6)
$ec_{3,0\ L}$	(Cs)	378,1348 - 378,8372	0,02414 (39)

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Cs)	3,7946 - 5,5525	15,87 (26)	
$XK\alpha_2$	(Cs)	30,6254	33,8 (4)	$K\alpha$
$XK\alpha_1$	(Cs)	30,9731	62,4 (7)	
$XK\beta_3$	(Cs)	34,9197	18,24 (29)	$K'\beta_1$
$XK\beta_1$	(Cs)	34,9873		
$XK\beta_5''$	(Cs)	35,252		
$XK\beta_2$	(Cs)	35,822	4,45 (12)	$K'\beta_2$
$XK\beta_4$	(Cs)	35,907		
$XKO_{2,3}$	(Cs)	35,972		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{4,3}$(Cs)	53,1622 (18)	2,14 (6)
$\gamma_{2,1}$(Cs)	79,6142 (19)	2,63 (19)
$\gamma_{1,0}$(Cs)	80,9979 (11)	33,31 (30)
$\gamma_{2,0}$(Cs)	160,6121 (16)	0,638 (6)
$\gamma_{3,2}$(Cs)	223,2368 (13)	0,450 (5)
$\gamma_{4,2}$(Cs)	276,3989 (12)	7,13 (6)
$\gamma_{3,1}$(Cs)	302,8508 (5)	18,31 (11)
$\gamma_{4,1}$(Cs)	356,0129 (7)	62,05 (19)
$\gamma_{3,0}$(Cs)	383,8485 (12)	8,94 (6)

6 Main Production Modes

$\begin{cases} \text{Ba} - 132(\text{n},\gamma)\text{Ba} - 133 \quad \sigma : 6{,}5\ (8)\ \text{barns} \\ \text{Possible impurities: Ba} - 131,\ \text{Ba} - 140 \end{cases}$

$\text{Ba} - 132(\text{n},\gamma)\text{Ba} - 133\text{m} \quad \sigma : 0{,}5\ \text{barns}$

$\begin{cases} \text{Ca} - 133(\text{p},\text{n})\text{Ba} - 133 \\ \text{Possible impurities: Cs} - 132 \end{cases}$

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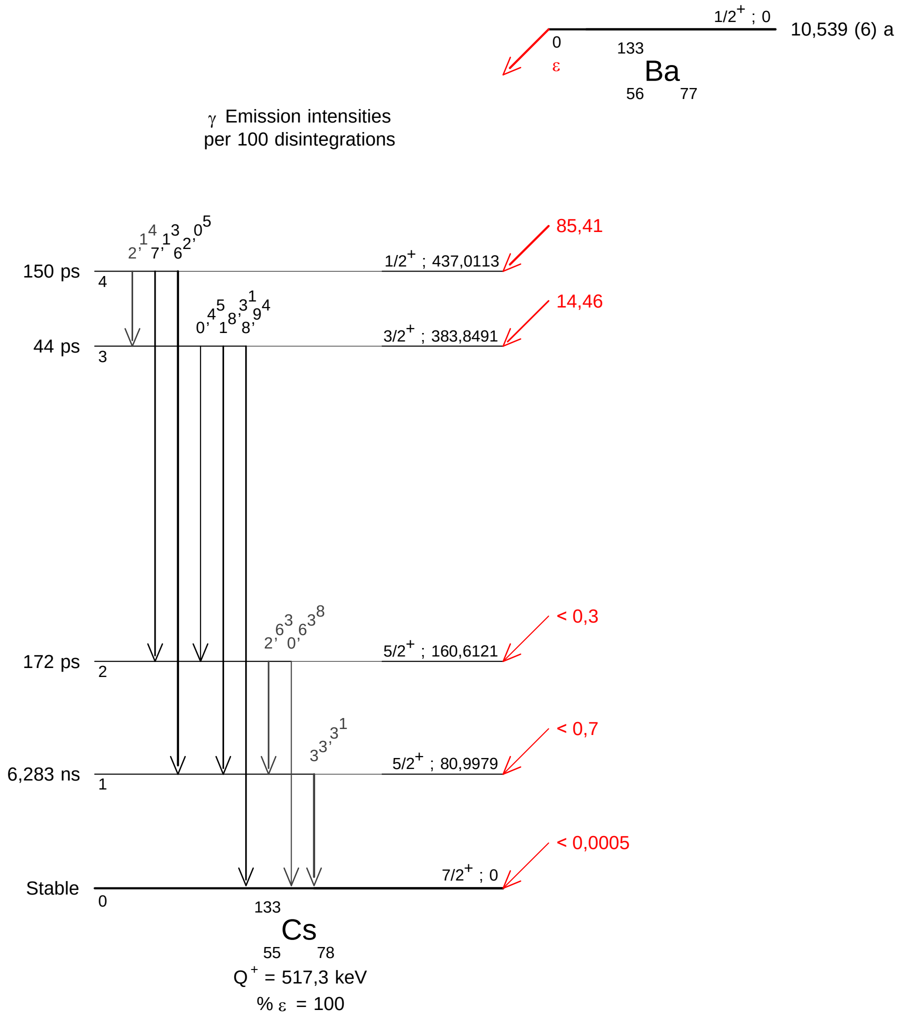
1/2+ ; 0
10,539 (6) a
0
ε
133
Ba
56
77
γ Emission intensities
per 100 disintegrations
85,41
14,46
< 0,3
< 0,7
< 0,0005
150 ps
44 ps
172 ps
6,283 ns
Stable
1/2+ ; 437,0113
3/2+ ; 383,8491
5/2+ ; 160,6121
5/2+ ; 80,9979
7/2+ ; 0
133
Cs
55
78
Q+ = 517,3 keV
% ε = 100

$^{138}_{57}$La $_{81}$

1 Decay Scheme

La-138 decays by an electron capture transition and a β^- decay to the first excited levels of Ba-138 and of Ce-138 respectively.

Le lanthane 138 se désintègre par une transition capture électronique et un bêta moins vers les premiers niveaux excités, respectivement, du baryum 138 et du cérium 138.

2 Nuclear Data

$T_{1/2}$(^{138}La)	:	103,6	(20)	10^9 a
Q^+(^{138}La)	:	1740,0	(34)	keV
Q^-(^{138}La)	:	1051,7	(40)	keV

2.1 Electron Capture Transitions

	Energy (keV)	Probability (%)	Nature	lg ft	P_K	P_L	P_M
$\epsilon_{0,1}$	304,2 (34)	65,2 (6)	Unique 2nd Forbidden	17,2	0,637 (5)	0,275 (3)	0,0880 (11)

2.2 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,1}$	263 (4)	34,8 (6)	Unique 2nd Forbidden	18,7

2.3 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-4})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{1,0}$(Ce)	788,744 (8)	34,8 (6)	E2	2,91 (4)	4,06 (6)	0,852 (12)	3,42 (5)	
$\gamma_{1,0}$(Ba)	1435,816 (10)	65,2 (6)	E2	0,742 (11)	0,937 (14)	0,192 (3)	0,917 (13)	0,572 (8)

3 Atomic Data

3.1 Ba

ω_K	:	0,900	(4)
$\bar{\omega}_L$	:	0,110	(5)
n_{KL}	:	0,888	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	Kα_2	31,8174	54,28
	Kα_1	32,1939	100
	Kβ_3	36,3045	}
	Kβ_1	36,3786	} 29,41
	Kβ_5''	36,654	}
	Kβ_2	37,258	}
	Kβ_4	37,312	} 7,41
	KO$_{2,3}$	37,425	}
X_L			
	Lℓ	3,9544	
	Lα	4,4515 - 4,4666	
	Lη	4,3307	
	Lβ	4,8278 - 5,207	
	Lγ	5,3715 - 5,8104	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	25,314 - 26,786	100
KLX	30,095 - 32,179	47,7
KXY	34,86 - 37,41	5,7
Auger L	2,66 - 5,81	

3.2 Ce

ω_K	:	0,910	(4)
$\bar{\omega}_L$	:	0,125	(5)
n_{KL}	:	0,876	(4)

3.2.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	34,2793	54,6
	$K\alpha_1$	34,72	100
	$K\beta_3$	39,1705	}
	$K\beta_1$	39,2578	} 30,1
	$K\beta_5''$	39,549	}
	$K\beta_2$	40,233	}
	$K\beta_4$	40,337	} 7,7
	$KO_{2,3}$	40,423	}
X_L			
	$L\ell$	4,2868	
	$L\alpha$	4,822 - 4,8411	
	$L\eta$	4,7274	
	$L\beta$	5,2625 - 5,665	
	$L\gamma$	5,8755 - 6,3412	

3.2.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	27,190 - 28,828	100
KLX	32,392 - 34,700	48,9
KXY	37,57 - 40,40	5,97
Auger L	2,85 - 6,51	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Ba)	2,66 - 5,81	48,8 (4)
e_{AK}	(Ba)		4,16 (18)
	KLL	25,314 - 26,786	}
	KLX	30,095 - 32,179	}
	KXY	34,86 - 37,41	}
e_{AL}	(Ce)	2,85 - 6,51	0,0895 (7)
e_{AK}	(Ce)		0,0091 (5)
	KLL	27,190 - 28,828	}
	KLX	32,392 - 34,700	}
	KXY	37,57 - 40,40	}

		Energy (keV)	Electrons (per 100 disint.)
$ec_{1,0\ K}$	(Ce)	748,301 (8)	0,1010 (22)
$ec_{1,0\ L}$	(Ce)	782,195 - 783,021	0,01409 (32)
$ec_{1,0\ K}$	(Ba)	1398,38 (1)	0,0483 (8)
$\beta^-_{0,1}$	max:	263 (4)	34,8 (6)
	avg:	91,1 (21)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Ba)	3,9544 - 5,8104	6,03 (10)	
XKα_2	(Ba)	31,8174	10,63 (15)	Kα
XKα_1	(Ba)	32,1939	19,58 (26)	
XKβ_3	(Ba)	36,3045		
XKβ_1	(Ba)	36,3786	5,76 (10)	K$'\beta_1$
XKβ_5''	(Ba)	36,654		
XKβ_2	(Ba)	37,258		
XKβ_4	(Ba)	37,312	1,45 (4)	K$'\beta_2$
XKO$_{2,3}$	(Ba)	37,425		
XL	(Ce)	4,2868 - 6,3412	0,01301 (29)	
XKα_2	(Ce)	34,2793	0,0261 (6)	Kα
XKα_1	(Ce)	34,72	0,0478 (11)	
XKβ_3	(Ce)	39,1705		
XKβ_1	(Ce)	39,2578	0,0144 (4)	K$'\beta_1$
XKβ_5''	(Ce)	39,549		
XKβ_2	(Ce)	40,233		
XKβ_4	(Ce)	40,337	0,00365 (12)	K$'\beta_2$
XKO$_{2,3}$	(Ce)	40,423		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Ce)	788,742 (8)	34,7 (6)
$\gamma_{1,0}$(Ba)	1435,795 (10)	65,1 (6)

6 Main Production Modes

{ Naturally occurring
Possible impurities: Ac – 227

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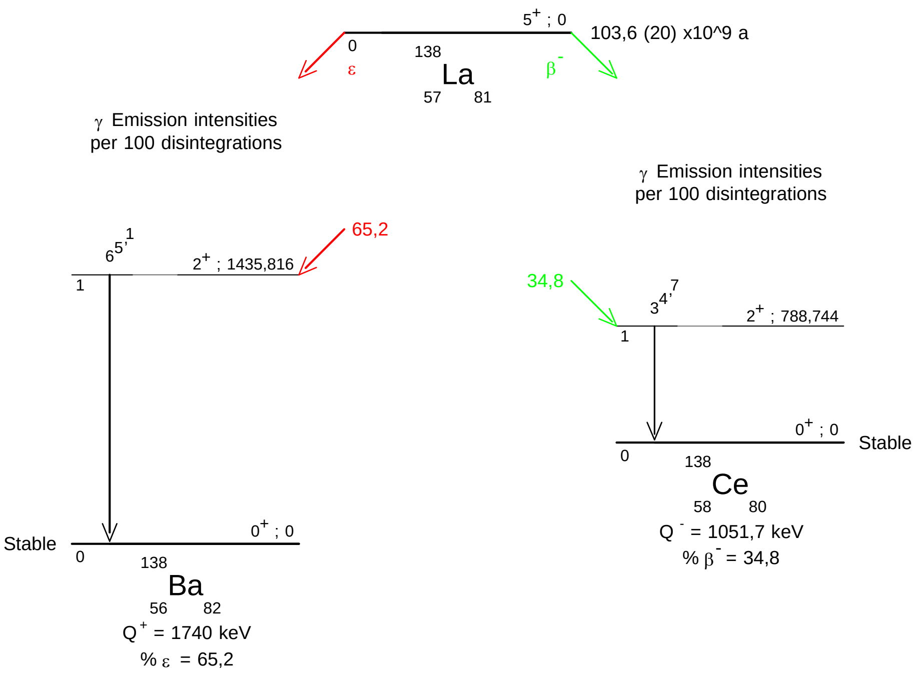
5+ ; 0
103,6 (20) x10^9 a
0
ε
138
La
57 81
β-
γ Emission intensities
per 100 disintegrations
γ Emission intensities
per 100 disintegrations
65,2
65,1
2+ ; 1435,816
1
Stable
0+ ; 0
0
138
Ba
56 82
Q+ = 1740 keV
% ε = 65,2
34,8
34,7
2+ ; 788,744
1
0+ ; 0
Stable
0
138
Ce
58 80
Q- = 1051,7 keV
% β- = 34,8

$^{140}_{56}$Ba $_{84}$

1 Decay Scheme

Ba-140 decays by beta minus emission to various excited levels of La-140.
The activity ratio La-140/Ba-140 at time t (for initially pure Ba-140) is given by:

$$\frac{T_1}{T_1 - T_2}(1 - e^{-t \times ln(2) \times \frac{T_1 - T_2}{T_1 \times T_2}}).$$

where T_1 is the half-life of Ba-140 and T_2 is the half-life of La-140.
At equilibrium (t $\geq$ 19 d) the activity ratio is simply: $T_1/(T_1 - T_2) = 1.1516 \pm 0.0005$.

Le baryum 140 se désintègre par émission bêta moins vers des niveaux excités de lanthane 140.
Le rapport au temps t des activités La-140/Ba-140 dans le Ba-140 initialement pur s'écrit :

$$\frac{T_1}{T_1 - T_2}(1 - e^{-t \times ln(2) \times \frac{T_1 - T_2}{T_1 \times T_2}}).$$

T_1 et T_2 étant respectivement les périodes de Ba-140 et La-140.
À l'équilibre (t $\geq$ 19 jours) ce rapport est égal à : $T_1/(T_1 - T_2)$ = 1,1516 ± 0,0005.

2 Nuclear Data

$T_{1/2}$(^{140}Ba)	:	12,753	(5)	d
$T_{1/2}$(^{140}La)	:	1,67858	(21)	d
Q^-(^{140}Ba)	:	1048	(8)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,6}$	467 (8)	24,94 (50)	1st Forbidden	7,1
$\beta^-_{0,5}$	580 (8)	9,71 (12)	1st Forbidden	7,8
$\beta^-_{0,4}$	885 (8)	4,14 (31)	Unique 1st Forbidden	9,3
$\beta^-_{0,2}$	1004 (8)	35,6 (31)	1st Forbidden	8
$\beta^-_{0,1}$	1018 (8)	25,6 (42)	Unique 1st Forbidden	8,7

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{2,1}$(La)	13,880 (18)	63,8 (31)	M1+E2		42,8 (15)	8,9 (4)	54,0 (19)
$\gamma_{1,0}$(La)	29,9641 (6)	91,7 (29)	M1(+E2)		4,26 (6)	0,885 (13)	5,37 (8)
$\gamma_{3,0}$(La)	63,1790 (7)	0,00015 (8)	M1	3,45 (5)	0,472 (7)	0,0983 (14)	4,05 (6)
$\gamma_{4,3}$(La)	99,4801 (20)	0,00006 (4)	[E2]	1,235 (18)	0,620 (9)	0,1371 (20)	2,03 (3)
$\gamma_{6,5}$(La)	113,48 (4)	0,0302 (23)	M1	0,645 (9)	0,0872 (13)	0,0181 (3)	0,755 (11)
$\gamma_{4,2}$(La)	118,815 (18)	0,101 (4)	M1	0,566 (8)	0,0765 (11)	0,01591 (23)	0,663 (10)
$\gamma_{4,1}$(La)	132,695 (2)	0,300 (9)	M1	0,415 (6)	0,0560 (8)	0,01163 (17)	0,485 (7)
$\gamma_{4,0}$(La)	162,6591 (19)	8,3 (3)	M1(+E2)	0,235 (4)	0,0317 (5)	0,00659 (11)	0,275 (4)
$\gamma_{5,4}$(La)	304,971 (30)	4,55 (9)	M1(+E2)	0,0434 (6)	0,00573 (8)	0,001189 (17)	0,0506 (7)
$\gamma_{5,2}$(La)	423,786 (35)	3,20 (6)	M1	0,0186 (3)	0,00243 (4)	0,000503 (7)	0,0217 (3)
$\gamma_{5,1}$(La)	437,666 (30)	1,98 (4)	M1	0,01716 (24)	0,00224 (4)	0,000464 (7)	0,0200 (3)
$\gamma_{6,2}$(La)	537,262 (25)	24,9 (5)	M1	0,01029 (15)	0,001332 (19)	0,000276 (4)	0,01197 (17)
$\gamma_{6,1}$(La)	551,142 (18)	0,0049 (20)	[E2]	0,00666 (10)	0,000997 (14)	0,000209 (3)	0,00792 (11)

3 Atomic Data

3.1

ω_K : 0,905 (4)
$\bar{\omega}_L$: 0,117 (5)
n_{KL} : 0,882 (4)
$\bar{n}_{LM}$: 1,61 (3)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	Kα_2	33,0344	54,44
	Kα_1	33,4421	100
	Kβ_3	37,7206	} 29,8
	Kβ_1	37,8015	}
	Kβ_5''	38,075	}
	Kβ_5'	39,095	}
	Kβ_2	38,7303	} 7,5
	Kβ_4	38,828	}
	KO$_{2,3}$	39,91	}
X_L			
	Lℓ	4,1174	
	Lα	4,6338 - 4,6504	
	Lη	4,5248	
	Lβ	5,0412 - 5,3814	
	Lγ	5,6198 - 6,0724	

3.1.2 Auger Electrons

		Energy (keV)	Relative probability
Auger K			
	KLL	26,240 - 27,795	100
	KLX	31,231 - 33,428	47,8
	KXY	36,2 - 38,9	6,65
Auger L		2,7 - 6,2	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(La)	2,7 - 6,2	99,5 (19)
e_{AK}	(La)		
	KLL	26,240 - 27,795	0,208 (11)
	KLX	31,231 - 33,428	
	KXY	36,2 - 38,9	
$ec_{2,1\ L}$	(La)	7,61 - 8,40	49,6 (24)
$ec_{2,1\ M}$	(La)	12,52 - 13,05	10,3 (6)
$ec_{2,1\ N}$	(La)	13,61 - 13,78	2,26 (11)
$ec_{1,0\ L}$	(La)	23,6978 - 24,4814	61,3 (19)
$ec_{1,0\ M}$	(La)	28,6028 - 29,1324	12,74 (40)
$ec_{1,0\ N}$	(La)	29,6937 - 29,8652	2,79 (9)
$ec_{6,5\ K}$	(La)	74,56 (4)	0,0111 (9)
$ec_{4,2\ K}$	(La)	79,890 (18)	0,0346 (13)
$ec_{4,1\ K}$	(La)	93,770 (2)	0,0838 (28)
$ec_{4,0\ T}$	(La)	123,7345 - 162,6447	1,78 (8)
$ec_{4,0\ K}$	(La)	123,7345 (19)	1,53 (7)
$ec_{4,1\ L}$	(La)	126,429 - 127,212	0,01131 (37)
$ec_{4,0\ L}$	(La)	156,3928 - 157,1764	0,206 (9)
$ec_{4,0\ M}$	(La)	161,2978 - 161,8274	0,0428 (19)
$ec_{5,4\ K}$	(La)	266,05 (3)	0,1884 (47)
$ec_{5,4\ L}$	(La)	298,705 - 299,488	0,0249 (6)
$ec_{5,2\ K}$	(La)	384,861 (35)	0,0582 (15)
$ec_{5,1\ K}$	(La)	398,74 (3)	0,0333 (8)
$ec_{6,2\ K}$	(La)	498,337 (25)	0,253 (6)
$ec_{6,2\ L}$	(La)	530,996 - 531,779	0,0328 (8)
$\beta^-_{0,6}$	max:	467 (8)	24,94 (50)
	avg:	141 (3)	
$\beta^-_{0,5}$	max:	580 (8)	9,71 (12)
	avg:	181 (3)	
$\beta^-_{0,4}$	max:	885 (8)	4,14 (31)
	avg:	311 (3)	

		Energy (keV)		Electrons (per 100 disint.)
$\beta^-_{0,2}$	max:	1004	(8)	35,6 (31)
	avg:	345	(3)	
$\beta^-_{0,1}$	max:	1018	(8)	25,6 (42)
	avg:	362	(3)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(La)	4,1174 - 6,0724	13,7 (4)	
XKα_2	(La)	33,0344	0,562 (19)	Kα
XKα_1	(La)	33,4421	1,03 (4)	
XKβ_3	(La)	37,7206	0,307 (11)	K$'\beta_1$
XKβ_1	(La)	37,8015		
XKβ''_5	(La)	38,075		
XKβ'_5	(La)	39,095		
XKβ_2	(La)	38,7303	0,078 (3)	K$'\beta_2$
XKβ_4	(La)	38,828		
XKO$_{2,3}$	(La)	39,91		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{2,1}$(La)	13,880 (18)	1,16 (4)
$\gamma_{1,0}$(La)	29,9641 (6)	14,4 (4)
$\gamma_{3,0}$(La)	63,1790 (7)	0,000030 (15)
$\gamma_{4,3}$(La)	99,4801 (20)	0,000020 (12)
$\gamma_{6,5}$(La)	113,48 (4)	0,0172 (13)
$\gamma_{4,2}$(La)	118,815 (18)	0,0610 (21)
$\gamma_{4,1}$(La)	132,695 (2)	0,202 (6)
$\gamma_{4,0}$(La)	162,6591 (19)	6,49 (27)
$\gamma_{5,4}$(La)	304,971 (30)	4,33 (9)
$\gamma_{5,2}$(La)	423,786 (35)	3,13 (6)
$\gamma_{5,1}$(La)	437,666 (30)	1,94 (4)
$\gamma_{6,2}$(La)	537,261 (25)	24,6 (5)
$\gamma_{6,1}$(La)	551,141 (18)	0,0049 (20)

6 Main Production Modes

Fission product
Possible impurities: none

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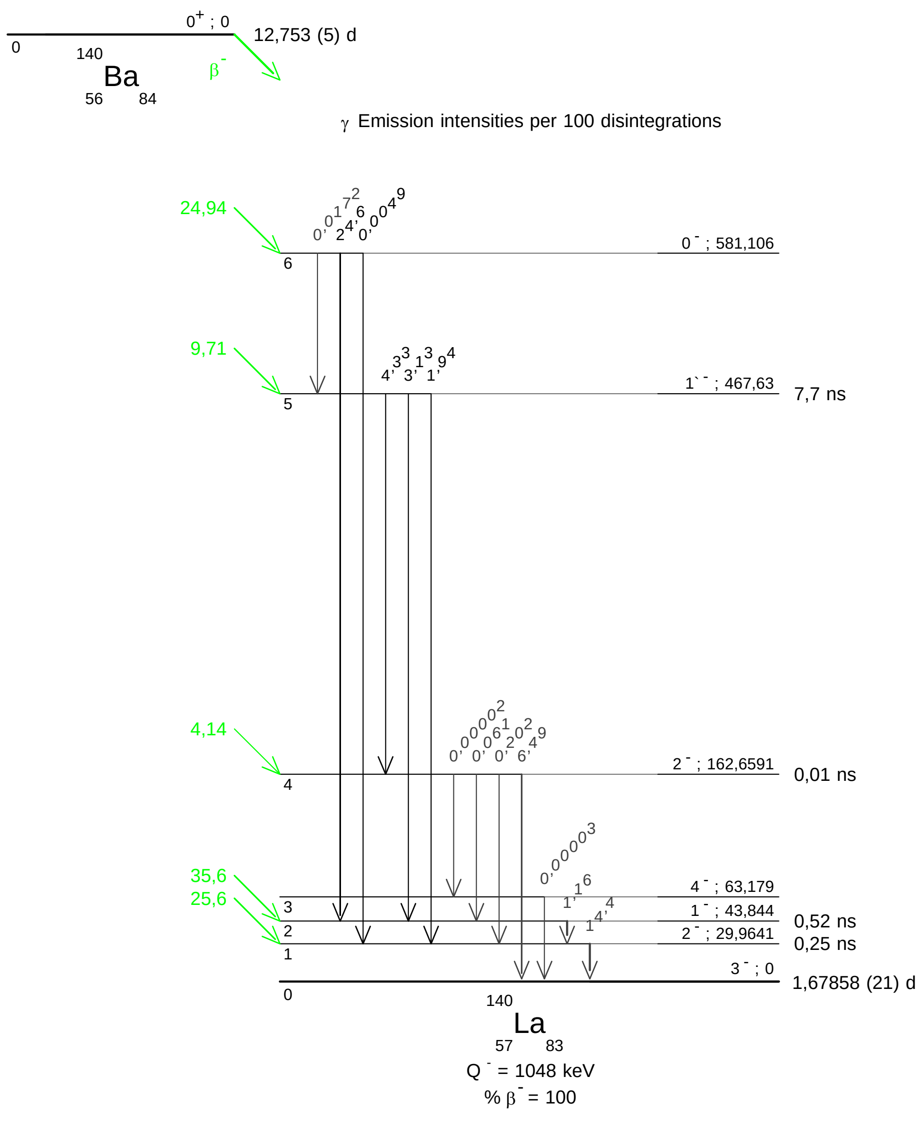
0+ ; 0
12,753 (5) d
0
140
Ba
56 84
β-
γ Emission intensities per 100 disintegrations
24,94
9,71
4,14
35,6
25,6
6
5
4
3
2
1
0
0- ; 581,106
1`- ; 467,63
7,7 ns
2- ; 162,6591
0,01 ns
4- ; 63,179
1- ; 43,844
0,52 ns
2- ; 29,9641
0,25 ns
3- ; 0
1,67858 (21) d
140
La
57 83
Q- = 1048 keV
% β- = 100

$^{140}_{57}$La $_{83}$

1 Decay Scheme

Le lanthane 140 se désintègre par émission bêta moins vers les niveaux excités du cérium 140.
La-140 decays by beta minus emission to the Ce-140 excited levels.

2 Nuclear Data

$T_{1/2}(^{140}$La)	:	1,67858	(21)	d
$Q^-(^{140}$La)	:	3760,9	(18)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,19}$	240,1 (18)	0,011 (3)	1st Forbidden	8,6
$\beta^-_{0,18}$	287,4 (18)	0,052 (7)	Allowed	8,2
$\beta^-_{0,17}$	366,1 (18)	0,020 (4)	Allowed	9
$\beta^-_{0,16}$	441,3 (18)	0,0039 (3)	1st Forbidden	9,9
$\beta^-_{0,15}$	642,5 (18)	0,027 (1)	1st Forbidden	9,6
$\beta^-_{0,14}$	760,0 (18)	0,085 (9)	1st Forbidden	9,4
$\beta^-_{0,13}$	861,2 (18)	0,112 (6)	1st Forbidden	9,5
$\beta^-_{0,12}$	1213,7 (18)	0,636 (7)	Unique 1st Forbidden	10
$\beta^-_{0,11}$	1239,5 (18)	11,11 (9)	1st Forbidden	8,1
$\beta^-_{0,10}$	1245,2 (18)	5,80 (4)	1st Forbidden	8,4
$\beta^-_{0,9}$	1280,0 (18)	1,14 (2)	1st Forbidden	9,1
$\beta^-_{0,8}$	1296,8 (18)	5,60 (7)	Allowed	8,44
$\beta^-_{0,7}$	1348,9 (18)	44,8 (4)	1st Forbidden	7,6
$\beta^-_{0,6}$	1411,1 (18)	0,262 (22)	Unique 1st Forbidden	10,7
$\beta^-_{0,5}$	1413,0 (18)	5,03 (12)	1st Forbidden	8,6
$\beta^-_{0,3}$	1677,7 (18)	20,8 (6)	1st Forbidden	8,3
$\beta^-_{0,1}$	2164,7 (18)	4,5 (6)	1st Forbidden	9,4

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-2})	α_M (10^{-2})	α_N (10^{-3})	α_T (10^{-2})	α_π (10^{-5})
$\gamma_{4,3}$(Ce)	24,594 (4)	0,480 (11)	E2		54500 (800)	12200 (180)	25900 (400)	69600 (1000)	
$\gamma_{7,5}$(Ce)	64,129 (4)	0,073 (11)	M1	3610 (50)	49,9 (7)	10,46 (15)	23,2 (4)	424 (6)	
$\gamma_{9,7}$(Ce)	68,923 (5)	0,342 (10)	M1	2930 (50)	40,5 (6)	8,48 (12)	18,8 (3)	344 (5)	
$\gamma_{11,7}$(Ce)	109,417 (4)	0,423 (12)	M1+E2	787 (12)	12,8 (4)	2,71 (8)	5,97 (18)	94,9 (15)	
$\gamma_{9,6}$(Ce)	131,121 (4)	0,729 (16)	M1+E2	468 (7)	6,60 (22)	1,39 (5)	3,07 (11)	55,2 (9)	
$\gamma_{11,5}$(Ce)	173,546 (5)	0,158 (6)	M1	214 (3)	2,91 (4)	0,609 (9)	1,350 (19)	25,1 (4)	
$\gamma_{6,4}$(Ce)	241,959 (6)	0,480 (11)	M1+E2	84 (3)	1,30 (11)	0,275 (25)	0,61 (6)	10,05 (18)	
$\gamma_{6,3}$(Ce)	266,554 (5)	0,531 (10)	M1+E2	67,1 (11)	0,906 (17)	0,190 (4)	0,420 (9)	7,85 (12)	
$\gamma_{2,1}$(Ce)	307,08 (4)	0,023 (5)	E2	36,2 (6)	0,695 (10)	0,1495 (21)	0,326 (5)	4,50 (7)	
$\gamma_{7,3}$(Ce)	328,761 (4)	21,7 (3)	M1+E2	38,8 (6)	0,516 (8)	0,1078 (15)	0,239 (4)	4,53 (7)	
$\gamma_{9,3}$(Ce)	397,674 (6)	0,0765 (31)	(E2)	16,89 (24)	0,288 (4)	0,0615 (9)	0,1347 (19)	2,05 (3)	
$\gamma_{10,3}$(Ce)	432,513 (8)	3,063 (31)	M1+E2	17,9 (4)	0,245 (4)	0,0514 (8)	0,1138 (17)	2,10 (4)	
$\gamma_{11,3}$(Ce)	438,178 (6)	0,017 (10)	M1	18,6 (3)	0,244 (4)	0,0510 (8)	0,1132 (16)	2,17 (3)	
$\gamma_{5,2}$(Ce)	444,57 (4)	0,003 (1)	[E2]	12,34 (18)	0,202 (3)	0,0429 (6)	0,0942 (14)	1,490 (21)	
$\gamma_{3,1}$(Ce)	487,022 (6)	46,6 (5)	E2	9,63 (14)	0,1526 (22)	0,0324 (5)	0,0711 (10)	1,156 (17)	
$\gamma_{11,2}$(Ce)	618,12 (4)	0,041 (3)	[E2]	5,20 (8)	0,0768 (11)	0,01619 (23)	0,0357 (5)	0,617 (9)	
$\gamma_{5,1}$(Ce)	751,655 (7)	4,41 (5)	M1+E2	4,71 (8)	0,0613 (10)	0,01277 (20)	0,0283 (5)	0,548 (9)	
$\gamma_{7,1}$(Ce)	815,784 (6)	23,83 (20)	M1+E2	4,05 (6)	0,0521 (8)	0,01085 (16)	0,0241 (4)	0,471 (7)	
$\gamma_{8,1}$(Ce)	867,842 (16)	5,59 (7)	E1+M2	0,977 (22)	0,0122 (3)	0,00253 (7)	0,00561 (14)	0,113 (3)	
$\gamma_{10,1}$(Ce)	919,536 (10)	2,74 (3)	M1+E2	2,19 (6)	0,0295 (7)	0,00616 (13)	0,0136 (3)	0,257 (6)	
$\gamma_{11,1}$(Ce)	925,201 (7)	7,06 (7)	M1+E2	2,96 (5)	0,0381 (6)	0,00792 (12)	0,0176 (3)	0,344 (6)	
$\gamma_{12,1}$(Ce)	950,991 (20)	0,533 (7)	M1+E2	2,82 (4)	0,0361 (5)	0,00752 (11)	0,01669 (24)	0,328 (5)	
$\gamma_{18,9}$(Ce)	992,64 (18)	0,010 (3)	[E1]	0,743 (11)	0,00924 (13)	0,00191 (3)	0,00423 (6)	0,0860 (12)	
$\gamma_{17,6}$(Ce)	1045,02 (9)	0,020 (4)	[E1]	0,675 (10)	0,00837 (12)	0,001733 (25)	0,00384 (6)	0,0781 (11)	
$\gamma_{14,2}$(Ce)	1097,58 (9)	0,023 (5)	[E2]	1,42 (2)	0,0188 (3)	0,00392 (6)	0,00868 (13)	0,1658 (24)	
$\gamma_{13,1}$(Ce)	1303,35 (7)	0,045 (6)	[M1+E2+E0]	1,2 (2)	0,015 (2)	0,0032 (5)		0,14 (2)	
$\gamma_{14,1}$(Ce)	1404,67 (9)	0,062 (8)	[M1+E2]	1,01 (15)	0,0129 (18)	0,0027 (4)	0,0059 (8)	0,117 (15)	4,73 (8)
$\gamma_{1,0}$(Ce)	1596,213 (13)	95,49 (5)	E2	0,676 (10)	0,00863 (12)	0,00179 (3)	0,00397 (6)	0,0787 (13)	11,28 (16)
$\gamma_{18,1}$(Ce)	1877,34 (18)	0,041 (6)	[E1]	0,245 (4)	0,00300 (5)	0,000621 (9)	0,001377 (20)	0,0284 (4)	49,9 (7)
$\gamma_{2,0}$(Ce)	1903,29 (4)	0,0146 (15)	E0						
$\gamma_{19,1}$(Ce)	1924,5 (2)	0,011 (3)	[E2]	0,478 (7)	0,00601 (9)	0,001247 (18)	0,00276 (4)	0,0554 (8)	25,7 (4)
$\gamma_{3,0}$(Ce)	2083,236 (14)	0,036 (7)	E4	1,162 (17)	0,01598 (23)	0,00335 (5)	0,00743 (11)	0,1364 (19)	
$\gamma_{5,0}$(Ce)	2347,868 (14)	0,846 (16)	E2	0,333 (5)	0,00415 (6)	0,000860 (12)	0,00191 (3)	0,0386 (5)	46,0 (7)
$\gamma_{8,0}$(Ce)	2464,054 (20)	0,0097 (13)	[E3]	0,515 (8)	0,00661 (10)	0,001375 (20)	0,00305 (5)	0,0598 (8)	33,1 (5)
$\gamma_{11,0}$(Ce)	2521,410 (14)	3,41 (5)	E2	0,294 (5)	0,00365 (6)	0,000756 (11)	0,001676 (24)	0,0340 (5)	54,2 (8)
$\gamma_{12,0}$(Ce)	2547,200 (23)	0,1021 (20)	M1	0,320 (5)	0,00398 (6)	0,000824 (12)	0,00183 (3)	0,0370 (5)	59,3 (9)
$\gamma_{13,0}$(Ce)	2899,56 (7)	0,0661 (10)	E2	0,231 (4)	0,00284 (4)	0,000588 (9)	0,001306 (19)	0,0266 (4)	71,4 (10)
$\gamma_{15,0}$(Ce)	3118,53 (10)	0,026 (1)	(E2)	0,204 (3)	0,00250 (4)	0,000518 (8)	0,001149 (16)	0,0234 (3)	80,8 (12)
$\gamma_{16,0}$(Ce)	3319,56 (24)	0,0039 (3)	E2	0,183 (3)	0,00225 (4)	0,000464 (7)	0,001031 (15)	0,0211 (3)	89,2 (13)

3 Atomic Data

3.1 Ce

ω_K	:	0,910	(4)
$\bar{\omega}_L$	:	0,125	(5)
n_{KL}	:	0,876	(4)
$\bar{n}_{LM}$	:	1,57	(3)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	34,2793	54,6
	$K\alpha_1$	34,72	100
	$K\beta_3$	39,1705	} 30,31
	$K\beta_1$	39,2578	}
	$K\beta_5''$	39,549	}
	$K\beta_2$	40,233	} 9,8
	$K\beta_4$	40,337	}
X_L			
	$L\ell$	4,2868	
	$L\alpha$	4,822 - 4,8411	
	$L\eta$	4,7274	
	$L\beta$	5,2625 - 5,6103	
	$L\gamma$	5,8755 - 6,3412	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	27,190 - 28,828	100
KLX	32,392 - 34,700	48,3
KXY	37,57 - 40,40	6,77
Auger L	2,8 - 6,5	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Ce)	2,8 - 6,5	2,360 (13)
e_{AK}	(Ce)		0,206 (10)
	KLL	27,190 - 28,828	
	KLX	32,392 - 34,700	
	KXY	37,57 - 40,40	
$ec_{4,3\ L}$	(Ce)	18,045 - 18,871	0,376 (12)
$ec_{4,3\ M}$	(Ce)	23,159 - 23,711	0,0841 (26)
$ec_{7,5\ K}$	(Ce)	23,686 (4)	0,051 (7)
$ec_{4,3\ N}$	(Ce)	24,304 - 24,594	0,0178 (6)
$ec_{9,7\ K}$	(Ce)	28,480 (5)	0,226 (7)
$ec_{9,7\ L}$	(Ce)	62,374 - 63,200	0,0312 (9)
$ec_{11,7\ K}$	(Ce)	68,974 (4)	0,171 (5)
$ec_{9,6\ K}$	(Ce)	90,678 (4)	0,220 (6)
$ec_{11,7\ L}$	(Ce)	102,868 - 103,694	0,0278 (12)
$ec_{9,6\ L}$	(Ce)	124,572 - 125,398	0,0310 (12)
$ec_{11,5\ K}$	(Ce)	133,103 (5)	0,0270 (11)
$ec_{6,4\ K}$	(Ce)	201,516 (6)	0,0366 (16)
$ec_{6,3\ K}$	(Ce)	226,111 (5)	0,0330 (8)
$ec_{7,3\ T}$	(Ce)	288,318 - 328,741	0,942 (20)
$ec_{7,3\ K}$	(Ce)	288,318 (4)	0,807 (17)
$ec_{7,3\ L}$	(Ce)	322,212 - 323,038	0,1073 (23)
$ec_{7,3\ M}$	(Ce)	327,326 - 327,878	0,02242 (45)
$ec_{10,3\ K}$	(Ce)	392,070 (8)	0,0537 (13)
$ec_{3,1\ T}$	(Ce)	446,579 - 487,002	0,533 (10)
$ec_{3,1\ K}$	(Ce)	446,579 (6)	0,444 (8)
$ec_{3,1\ L}$	(Ce)	480,473 - 481,299	0,0703 (13)
$ec_{3,1\ M}$	(Ce)	485,587 - 486,139	0,01494 (28)
$ec_{5,1\ K}$	(Ce)	711,212 (7)	0,02068 (42)
$ec_{7,1\ K}$	(Ce)	775,341 (6)	0,0961 (16)
$ec_{7,1\ L}$	(Ce)	809,235 - 810,061	0,01236 (22)
$ec_{11,1\ K}$	(Ce)	884,758 (7)	0,02084 (41)
$ec_{1,0\ K}$	(Ce)	1555,770 (13)	0,0645 (10)
$\beta^-_{0,19}$	max:	240,1 (18)	0,011 (3)
	avg:	66,7 (6)	
$\beta^-_{0,18}$	max:	287,4 (18)	0,052 (7)
	avg:	81,4 (6)	
$\beta^-_{0,17}$	max:	366,1 (18)	0,020 (4)
	avg:	106,7 (6)	
$\beta^-_{0,16}$	max:	441,3 (18)	0,0039 (3)
	avg:	132,0 (6)	
$\beta^-_{0,15}$	max:	642,5 (18)	0,027 (1)
	avg:	203,7 (7)	
$\beta^-_{0,14}$	max:	760,0 (18)	0,085 (9)
	avg:	248,0 (7)	

		Energy (keV)		Electrons (per 100 disint.)
$\beta^-_{0,13}$	max:	861,2	(18)	0,112 (6)
	avg:	287,3	(7)	
$\beta^-_{0,12}$	max:	1213,7	(18)	0,636 (7)
	avg:	438,4	(7)	
$\beta^-_{0,11}$	max:	1239,5	(18)	11,11 (9)
	avg:	441,4	(8)	
$\beta^-_{0,10}$	max:	1245,2	(18)	5,80 (4)
	avg:	443,8	(8)	
$\beta^-_{0,9}$	max:	1280,0	(18)	1,14 (2)
	avg:	458,4	(8)	
$\beta^-_{0,8}$	max:	1296,8	(18)	5,60 (7)
	avg:	465,6	(8)	
$\beta^-_{0,7}$	max:	1348,9	(18)	44,8 (4)
	avg:	487,6	(8)	
$\beta^-_{0,6}$	max:	1411,1	(18)	0,262 (22)
	avg:	518,8	(8)	
$\beta^-_{0,5}$	max:	1413,0	(18)	5,03 (12)
	avg:	515,0	(8)	
$\beta^-_{0,3}$	max:	1677,7	(18)	20,8 (6)
	avg:	629,7	(8)	
$\beta^-_{0,1}$	max:	2164,7	(18)	4,5 (6)
	avg:	846,4	(8)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Ce)	4,2868 - 6,3412	0,343 (7)	
XKα_2	(Ce)	34,2793	0,591 (8)	Kα
XKα_1	(Ce)	34,72	1,082 (13)	
XKβ_3	(Ce)	39,1705	0,326 (6)	K$'\beta_1$
XKβ_1	(Ce)	39,2578		
XKβ_5''	(Ce)	39,549		
XKβ_2	(Ce)	40,233	0,0828 (21)	K$'\beta_2$
XKβ_4	(Ce)	40,337		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{4,3}$(Ce)	24,595 (4)	0,000689 (19)
$\gamma_{7,5}$(Ce)	64,129 (4)	0,014 (2)
$\gamma_{9,7}$(Ce)	68,923 (5)	0,077 (2)
$\gamma_{11,7}$(Ce)	109,417 (4)	0,217 (6)
$\gamma_{9,6}$(Ce)	131,121 (4)	0,47 (1)
$\gamma_{11,5}$(Ce)	173,546 (5)	0,126 (5)
$\gamma_{6,4}$(Ce)	241,959 (6)	0,436 (10)
$\gamma_{6,3}$(Ce)	266,554 (5)	0,492 (9)
$\gamma_{2,1}$(Ce)	307,08 (4)	0,022 (5)
$\gamma_{7,3}$(Ce)	328,761 (4)	20,8 (3)
$\gamma_{9,3}$(Ce)	397,674 (6)	0,075 (3)
$\gamma_{10,3}$(Ce)	432,513 (8)	3,00 (3)
$\gamma_{11,3}$(Ce)	438,178 (6)	0,017 (10)
$\gamma_{5,2}$(Ce)	444,57 (4)	0,003 (1)
$\gamma_{3,1}$(Ce)	487,022 (6)	46,1 (5)
$\gamma_{11,2}$(Ce)	618,12 (4)	0,041 (3)
$\gamma_{5,1}$(Ce)	751,653 (7)	4,39 (5)
$\gamma_{7,1}$(Ce)	815,784 (6)	23,72 (20)
$\gamma_{8,1}$(Ce)	867,839 (16)	5,58 (7)
$\gamma_{10,1}$(Ce)	919,533 (10)	2,73 (3)
$\gamma_{11,1}$(Ce)	925,198 (7)	7,04 (7)
$\gamma_{12,1}$(Ce)	950,988 (20)	0,531 (7)
$\gamma_{18,9}$(Ce)	992,64 (18)	0,010 (3)
$\gamma_{17,6}$(Ce)	1045,02 (9)	0,020 (4)
$\gamma_{14,2}$(Ce)	1097,58 (9)	0,023 (5)
$\gamma_{13,1}$(Ce)	1303,34 (7)	0,045 (6)
$\gamma_{14,1}$(Ce)	1404,66 (9)	0,062 (8)
$\gamma_{1,0}$(Ce)	1596,203 (13)	95,40 (5)
$\gamma_{18,1}$(Ce)	1877,33 (18)	0,041 (6)
$\gamma_{19,1}$(Ce)	1924,5 (2)	0,011 (3)
$\gamma_{3,0}$(Ce)	2083,219 (14)	0,036 (7)
$\gamma_{5,0}$(Ce)	2347,847 (14)	0,845 (16)
$\gamma_{8,0}$(Ce)	2464,031 (20)	0,0097 (13)
$\gamma_{11,0}$(Ce)	2521,390 (14)	3,41 (5)
$\gamma_{12,0}$(Ce)	2547,180 (23)	0,102 (2)
$\gamma_{13,0}$(Ce)	2899,53 (7)	0,066 (1)
$\gamma_{15,0}$(Ce)	3118,49 (10)	0,026 (1)
$\gamma_{16,0}$(Ce)	3319,52 (24)	0,0039 (3)

6 Main Production Modes

{ Separation from Ba – 140 & La – 140
Possible impurities: Ba – 140

{ La – 139(n,γ)La – 140 σ : 8,93 (4) barns
Possible impurities: La – 141

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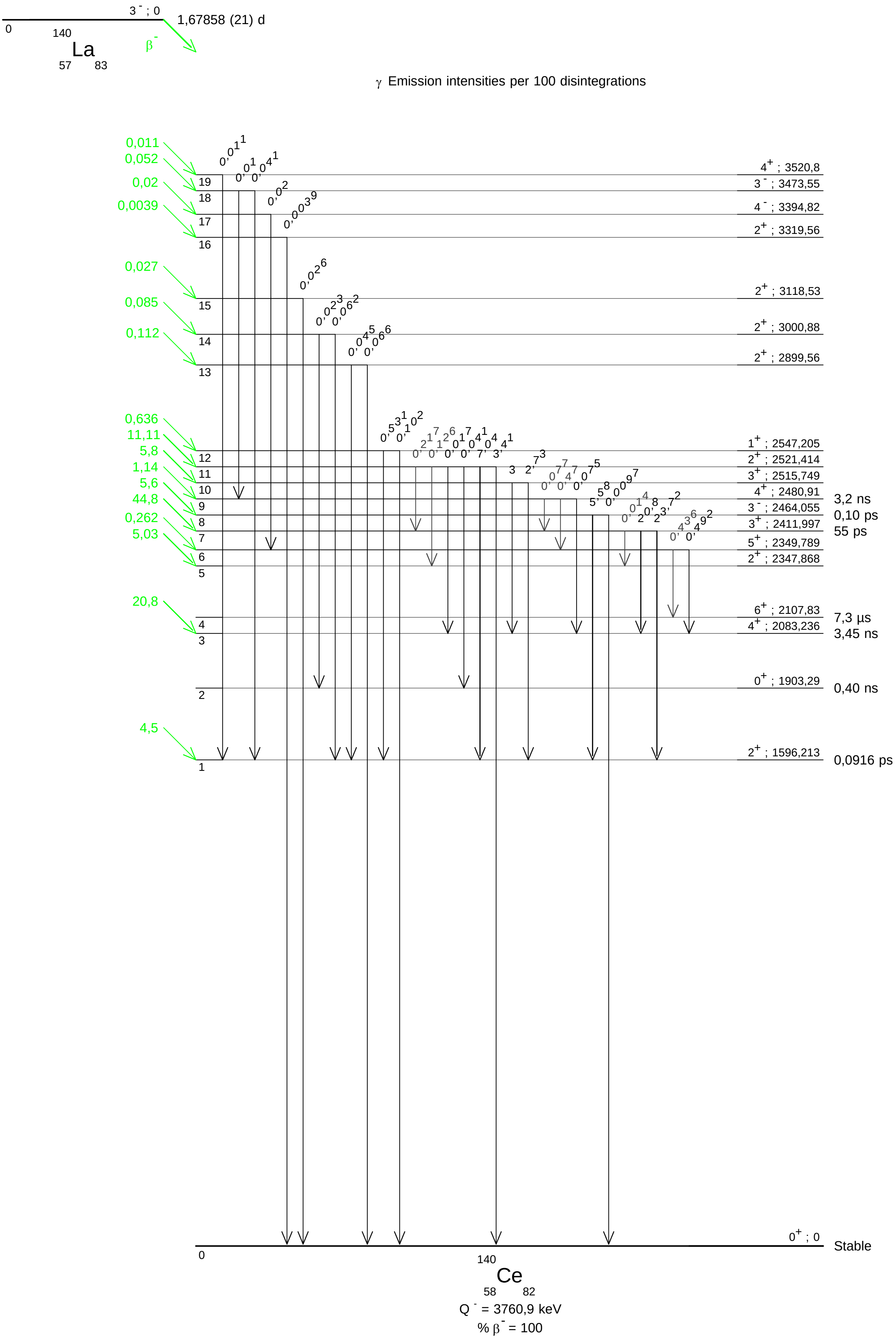
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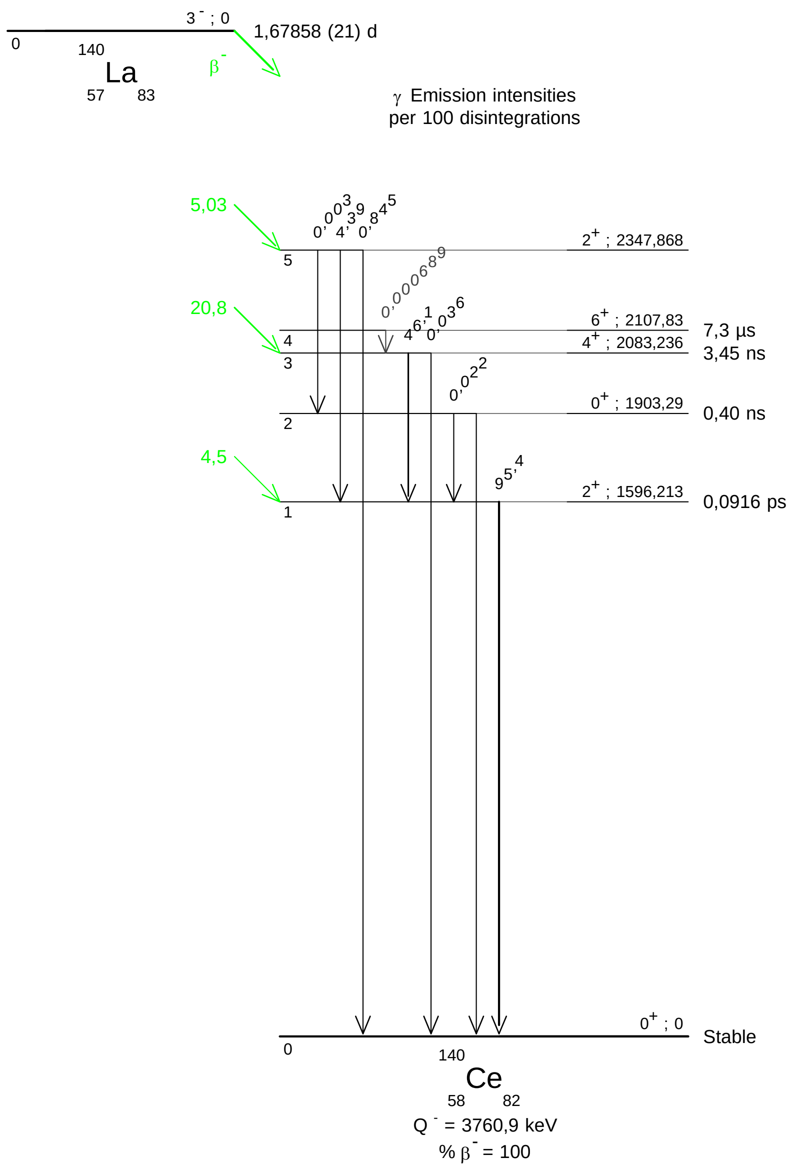
140 La 57 83
β-
1,67858 (21) d
γ Emission intensities per 100 disintegrations
0,011
0,052
0,02
0,0039
0,027
0,085
0,112
0,636
11,11
5,8
1,14
5,6
44,8
0,262
5,03
20,8
4,5
4+ ; 3520,8
3 - ; 3473,55
4 - ; 3394,82
2+ ; 3319,56
2+ ; 3118,53
2+ ; 3000,88
2+ ; 2899,56
1+ ; 2547,205
2+ ; 2521,414
3+ ; 2515,749
4+ ; 2480,91
3 - ; 2464,055
3+ ; 2411,997
5+ ; 2349,789
2+ ; 2347,868
6+ ; 2107,83
4+ ; 2083,236
0+ ; 1903,29
2+ ; 1596,213
0+ ; 0
3,2 ns
0,10 ps
55 ps
7,3 µs
3,45 ns
0,40 ns
0,0916 ps
Stable
140 Ce 58 82
Q - = 3760,9 keV
% β- = 100


3 - ; 0
1,67858 (21) d
0
140
La
57 83
β-
γ Emission intensities
per 100 disintegrations
5,03
20,8
4,5
2+ ; 2347,868
6+ ; 2107,83
4+ ; 2083,236
0+ ; 1903,29
2+ ; 1596,213
0+ ; 0
7,3 µs
3,45 ns
0,40 ns
0,0916 ps
Stable
140
Ce
58 82
Q - = 3760,9 keV
% β- = 100

$^{\mathbf{144}}_{58}\mathrm{Ce}_{86}$

1 Decay Scheme

Ce-144 (half-life 284.89 d) undergoes 100% beta minus decay to Pr-144m (half-life of 7.2 min) with a branching fraction of 0.0115, and Pr-144 (half-life of 17.29 min) with a branching fraction of 0.9885.

Le cérium 144 (284,89 d) se désintègre par émission bêta moins, pour 1,15 % vers le praséodyme 144m (7,2 min) et pour 98,85 % vers le praséodyme 144 (17,29 min).

2 Nuclear Data

$T_{1/2}(^{144}\mathrm{Ce})$	:	284,89	(6)	d
$T_{1/2}(^{144}\mathrm{Pr})$	:	17,29	(4)	min
$Q^-(^{144}\mathrm{Ce})$	:	318,6	(8)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,4}$	185,1 (8)	19,2 (1)	1st forbidden non-unique	7,27
$\beta^-_{0,2}$	238,5 (8)	3,9 (2)	1st forbidden non-unique	8,33
$\beta^-_{0,0}$	318,6 (8)	76,9 (3)	1st forbidden non-unique	7,42

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{4,3}$(Pr)	33,563 (9)	1,28 (6)	M1		3,70 (6)	0,780 (11)	4,69 (7)
$\gamma_{3,1}$(Pr)	40,92 (3)	1,16 (18)	M1		2,06 (3)	0,434 (7)	2,61 (4)
$\gamma_{4,2}$(Pr)	53,395 (5)	0,90 (4)	M1	6,75 (10)	0,942 (14)	0,199 (3)	7,94 (12)
$\gamma_{1,0}$(Pr)	59,03 (3)	1,15 (23)	M3	408 (6)	618 (9)	155,0 (23)	1221 (18)
$\gamma_{2,0}$(Pr)	80,120 (4)	4,83 (17)	M1	2,08 (3)	0,288 (4)	0,0608 (9)	2,45 (4)
$\gamma_{3,0}$(Pr)	99,952 (9)	0,128 (6)	E2	1,214 (17)	0,71 (1)	0,1599 (23)	2,12 (3)
$\gamma_{4,0}$(Pr)	133,5152 (20)	17,01 (19)	M1	0,486 (7)	0,0668 (10)	0,01408 (20)	0,571 (8)

3 Atomic Data

3.1 Pr

ω_K	:	0,914	(4)
$\bar{\omega}_L$	:	0,132	(5)
n_{KL}	:	0,871	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	35,5506	54,8
	$K\alpha_1$	36,0267	100
	$K\beta_3$	40,6533	}
	$K\beta_1$	40,7487	} 30,5
	$K\beta_5''$	41,05	}
	$K\beta_2$	41,774	}
	$K\beta_4$	41,877	} 7,8
	$KO_{2,3}$	41,968	}
X_L			
	$L\ell$	4,453	
	$L\alpha$	5,013 - 5,033	
	$L\eta$	4,929	
	$L\beta$	5,489 - 5,851	
	$L\gamma$	6,327 - 6,617	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	28,162 - 29,890	100
KLX	33,576 - 36,004	49,4
KXY	38,97 - 41,95	6,1
Auger L	2,90 - 4,91	1922

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Pr)	2,90 - 4,91	9,88 (10)
e_{AK}	(Pr)		0,80 (4)
	KLL	28,162 - 29,890	
	KLX	33,576 - 36,004	
	KXY	38,97 - 41,95	
$ec_{4,2\ T}$	(Pr)	11,404 - 53,373	0,802 (42)
$ec_{4,2\ K}$	(Pr)	11,404 (5)	0,682 (35)
$ec_{1,0\ T}$	(Pr)	17,04 - 59,01	1,15 (23)
$ec_{1,0\ K}$	(Pr)	17,04 (3)	0,38 (8)
$ec_{4,3\ T}$	(Pr)	26,728 - 33,563	1,05 (6)
$ec_{4,3\ L}$	(Pr)	26,728 - 27,599	0,83 (5)
$ec_{4,3\ M}$	(Pr)	32,052 - 32,632	0,175 (10)
$ec_{4,3\ N}$	(Pr)	33,259 - 33,561	0,039 (2)
$ec_{3,1\ T}$	(Pr)	34,09 - 40,90	0,84 (13)
$ec_{3,1\ L}$	(Pr)	34,09 - 34,96	0,66 (10)
$ec_{2,0\ T}$	(Pr)	38,129 - 80,120	3,43 (18)
$ec_{2,0\ K}$	(Pr)	38,129 (4)	2,91 (15)
$ec_{3,1\ M}$	(Pr)	39,41 - 39,99	0,139 (22)
$ec_{3,1\ N}$	(Pr)	40,62 - 40,92	0,0311 (49)
$ec_{4,2\ L}$	(Pr)	46,560 - 47,431	0,0951 (49)
$ec_{4,2\ M}$	(Pr)	51,884 - 52,464	0,0201 (10)
$ec_{4,2\ N}$	(Pr)	53,091 - 53,393	0,00448 (23)
$ec_{1,0\ L}$	(Pr)	52,20 - 53,07	0,58 (12)
$ec_{1,0\ M}$	(Pr)	57,52 - 58,10	0,146 (30)
$ec_{1,0\ N}$	(Pr)	58,73 - 59,03	0,033 (7)
$ec_{2,0\ L}$	(Pr)	73,285 - 74,156	0,403 (21)
$ec_{2,0\ M}$	(Pr)	78,609 - 79,189	0,085 (4)
$ec_{2,0\ N}$	(Pr)	79,816 - 80,118	0,019 (1)
$ec_{4,0\ T}$	(Pr)	91,524 - 133,515	6,18 (22)
$ec_{4,0\ K}$	(Pr)	91,524 (2)	5,26 (19)
$ec_{4,0\ L}$	(Pr)	126,680 - 127,551	0,723 (25)
$ec_{4,0\ M}$	(Pr)	132,004 - 132,584	0,152 (5)
$ec_{4,0\ N}$	(Pr)	133,211 - 133,513	0,0341 (12)
$\beta^-_{0,4}$	max:	185,1 (8)	19,2 (1)
	avg:	50,29 (24)	
$\beta^-_{0,2}$	max:	238,5 (8)	3,9 (2)
	avg:	66,24 (25)	
$\beta^-_{0,0}$	max:	318,6 (8)	76,9 (3)
	avg:	91,3 (3)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Pr)	4,453 - 6,617	1,54 (4)	
$XK\alpha_2$	(Pr)	35,5506	2,41 (5)	} $K\alpha$
$XK\alpha_1$	(Pr)	36,0267	4,40 (9)	}
$XK\beta_3$	(Pr)	40,6533	}	
$XK\beta_1$	(Pr)	40,7487	} 1,34 (3)	$K'\beta_1$
$XK\beta_5''$	(Pr)	41,05	}	
$XK\beta_2$	(Pr)	41,774	}	
$XK\beta_4$	(Pr)	41,877	} 0,343 (10)	$K'\beta_2$
$XKO_{2,3}$	(Pr)	41,968	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{4,3}$(Pr)	33,563 (9)	0,225 (11)
$\gamma_{3,1}$(Pr)	40,92 (3)	0,32 (5)
$\gamma_{4,2}$(Pr)	53,395 (5)	0,101 (5)
$\gamma_{1,0}$(Pr)	59,03 (3)	0,00094 (19)
$\gamma_{2,0}$(Pr)	80,120 (4)	1,40 (5)
$\gamma_{3,0}$(Pr)	99,952 (9)	0,041 (2)
$\gamma_{4,0}$(Pr)	133,5152 (20)	10,83 (12)

6 Main Production Modes

U – 235(n,f)Ce – 144

U – 238(n,f)Ce – 144

Pu – 239(n,f)Ce – 144

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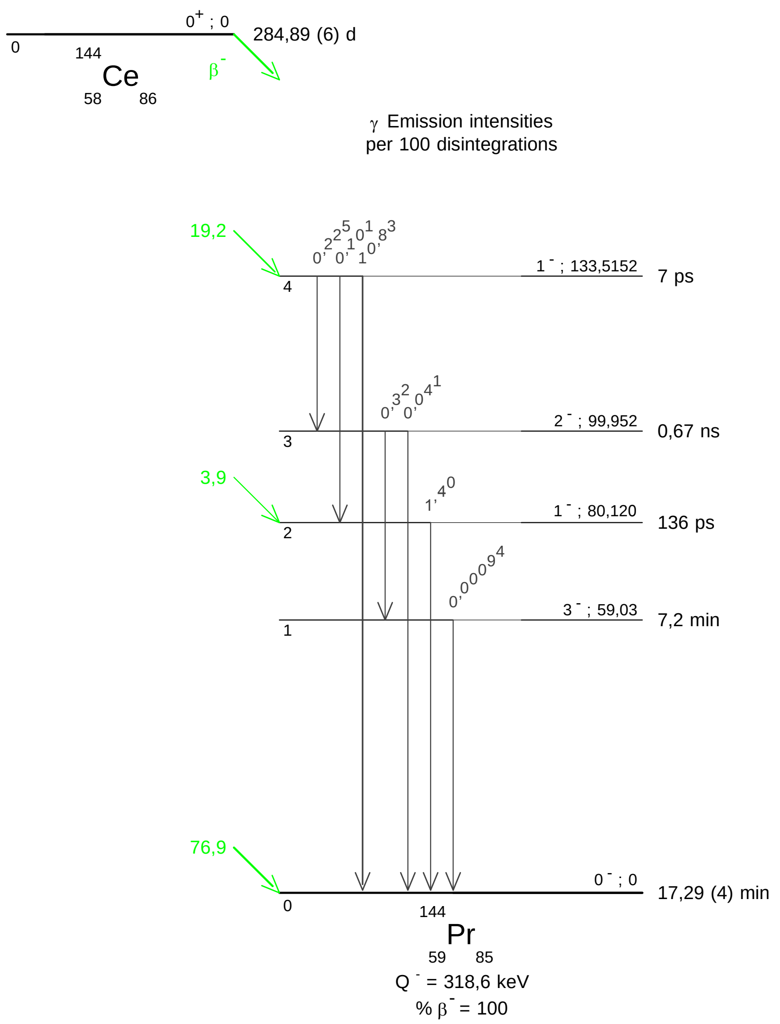
0+ ; 0
284,89 (6) d
0
144
Ce
58
86
β-
γ Emission intensities
per 100 disintegrations
19,2
0,22
0,15
1,01
0,83
1- ; 133,5152
7 ps
4
0,32
0,41
2- ; 99,952
0,67 ns
3
3,9
1,40
1- ; 80,120
136 ps
2
0,00094
3- ; 59,03
7,2 min
1
76,9
0- ; 0
17,29 (4) min
0
144
Pr
59
85
Q- = 318,6 keV
% β- = 100

$^{144}_{59}$Pr $_{85}$

1 Decay Scheme

Pr-144 (half-life of 17.29 min) undergoes 100% beta minus decay to various excited levels and predominantly to the ground state of Nd-144.

Le praséodyme 144 (17,29 min) se désintègre à 100 % par émission bêta moins vers les niveaux excités et le niveau fondamental du néodyme 144.

2 Nuclear Data

$T_{1/2}(^{144}$Pr)	:	17,29	(4)	min
$T_{1/2}(^{144}$Nd)	:	2,3	(3)	10^{15} a
$Q^{-}(^{144}$Pr)	:	2997,4	(24)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,12}$	254,4 (24)	0,00035 (6)	1st forbidden non-unique	8,1
$\beta^-_{0,11}$	321,8 (24)	0,00096 (8)	1st forbidden non-unique	8
$\beta^-_{0,10}$	341,9 (24)	0,00018 (3)	1st forbidden non-unique	8,8
$\beta^-_{0,8}$	628,6 (24)	0,00027 (6)	1st forbidden unique	9,7
$\beta^-_{0,7}$	811,7 (24)	1,021 (10)	allowed	6,32
$\beta^-_{0,6}$	912,7 (24)	0,00708 (6)	1st forbidden non-unique	8,7
$\beta^-_{0,5}$	924,5 (24)	0,00065 (6)	1st forbidden unique	10,2
$\beta^-_{0,4}$	1436,5 (24)	0,0017 (3)	1st forbidden unique	10,8
$\beta^-_{0,1}$	2300,8 (24)	1,116 (3)	1st forbidden unique	9,17
$\beta^-_{0,0}$	2997,4 (24)	97,852 (10)	1st forbidden non-unique	6,53

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-4})	α_T (10^{-3})	α_π (10^{-4})
$\gamma_{7,4}$(Nd)	624,83 (3)	0,00118 (3)	E1	2,07 (3)	2,67 (4)	0,561 (8)	2,41 (4)	
$\gamma_{7,3}$(Nd)	674,88 (4)	0,00301 (14)	E2	4,60 (7)	6,86 (10)	1,465 (21)	5,47 (8)	
$\gamma_{1,0}$(Nd)	696,507 (4)	1,42 (7)	E2	4,27 (6)	6,31 (9)	1,348 (19)	5,07 (7)	
$\gamma_{3,1}$(Nd)	814,310 (23)	0,00331 (14)	E1	1,198 (17)	1,528 (22)	0,321 (5)	1,391 (20)	
$\gamma_{4,1}$(Nd)	864,359 (16)	0,00270 (14)	M1+48,5%E2	3,38 (14)	4,56 (16)	0,96 (4)	3,96 (16)	
$\gamma_{12,4}$(Nd)	1182,07 (7)	0,00006 (3)	E2	1,353 (19)	1,82 (3)	0,384 (6)	1,587 (23)	0,0410 (6)
$\gamma_{5,1}$(Nd)	1376,35 (3)	0,00041 (4)	M1+10,4%E2	1,35 (3)	1,75 (4)	0,368 (8)	1,61 (4)	0,398 (6)
$\gamma_{6,1}$(Nd)	1388,12 (4)	0,00707 (6)	E2	0,984 (14)	1,297 (19)	0,274 (4)	1,190 (17)	0,416 (6)
$\gamma_{7,1}$(Nd)	1489,156 (3)	0,286 (3)	E1	0,397 (6)	0,495 (7)	0,1038 (15)	0,663 (10)	2,04 (3)
$\gamma_{4,0}$(Nd)	1560,920 (13)	0,00021 (3)	E2	0,786 (11)	1,024 (15)	0,216 (3)	1,014 (15)	0,981 (14)
$\gamma_{8,1}$(Nd)	1672,26 (4)	0,00021 (6)	M1+2,5%E2	0,892 (14)	1,146 (18)	0,241 (4)	1,189 (18)	1,519 (22)
$\gamma_{11,1}$(Nd)	1979,05 (8)	0,00096 (8)	E2	0,505 (7)	0,647 (9)	0,1360 (19)	0,868 (13)	2,81 (4)
$\gamma_{12,1}$(Nd)	2046,43 (7)	0,00030 (6)	E2	0,475 (7)	0,607 (9)	0,1277 (18)	0,865 (13)	3,13 (5)
$\gamma_{5,0}$(Nd)	2072,91 (3)	0,00024 (3)	E2	0,465 (7)	0,593 (9)	0,1246 (18)	0,865 (13)	3,26 (5)
$\gamma_{7,0}$(Nd)	2185,663 (5)	0,731 (10)	E1	0,213 (3)	0,264 (4)	0,0552 (8)	0,959 (14)	7,12 (10)
$\gamma_{8,0}$(Nd)	2368,82 (4)	0,000051 (14)	E2	0,365 (6)	0,463 (7)	0,0973 (14)	0,891 (13)	4,67 (7)
$\gamma_{10,0}$(Nd)	2655,54 (3)	0,00018 (3)	M1+E2					

3 Atomic Data

3.1 Nd

ω_K	:	0,918	(4)
$\bar{\omega}_L$	:	0,140	(6)
n_{KL}	:	0,866	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	36,8478	55
	$K\alpha_1$	37,3614	100
	$K\beta_3$	42,167	} 30,7
	$K\beta_1$	42,2717	
	$K\beta_5''$	42,58	
	$K\beta_2$	43,335	} 7,9
	$K\beta_4$	43,451	
	$KO_{2,3}$	43,548	
X_L			
	$L\ell$	4,633	
	$L\alpha$	5,208 - 5,23	
	$L\eta$	5,146	
	$L\beta$	5,722 - 6,09	
	$L\gamma$	6,604 - 6,901	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	29,154 - 30,978	100
KLX	34,798 - 37,340	50
KXY	40,42 - 43,53	6,2
Auger L	3,01 - 5,10	1655

4 Electron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Nd)	3,01 - 5,10		0,00551 (18)
e_{AK}	(Nd)			0,00052 (4)
	KLL	29,154 - 30,978		
	KLX	34,798 - 37,340		
	KXY	40,42 - 43,53		
$\beta^-_{0,12}$	max:	254,4	(24)	0,00035 (6)
	avg:	71,05	(8)	
$\beta^-_{0,11}$	max:	321,8	(24)	0,00096 (8)
	avg:	92,21	(8)	
$\beta^-_{0,10}$	max:	341,9	(24)	0,00018 (3)
	avg:	98,68	(8)	
$\beta^-_{0,8}$	max:	628,6	(24)	0,00027 (6)
	avg:	213,04	(9)	
$\beta^-_{0,7}$	max:	811,7	(24)	1,021 (10)
	avg:	267,12	(9)	
$\beta^-_{0,6}$	max:	912,7	(24)	0,00708 (6)
	avg:	306,67	(10)	
$\beta^-_{0,5}$	max:	924,5	(24)	0,00065 (6)
	avg:	322,77	(9)	
$\beta^-_{0,4}$	max:	1436,5	(24)	0,0017 (3)
	avg:	526,25	(10)	
$\beta^-_{0,1}$	max:	2300,8	(24)	1,116 (3)
	avg:	894,90	(11)	
$\beta^-_{0,0}$	max:	2997,4	(24)	97,852 (10)
	avg:	1221,990	(1)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Nd)	4,633 - 6,901	0,00092 (3)	
XKα_2	(Nd)	36,8478	0,00165 (9)	} Kα
XKα_1	(Nd)	37,3614	0,00300 (15)	}
XKβ_3	(Nd)	42,167	}	
XKβ_1	(Nd)	42,2717	} 0,00092 (5)	K$'\beta_1$
XKβ_5''	(Nd)	42,58	}	
XKβ_2	(Nd)	43,335	}	
XKβ_4	(Nd)	43,451	} 0,000237 (13)	K$'\beta_2$
XKO$_{2,3}$	(Nd)	43,548	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{7,4}$(Nd)	624,83 (3)	0,00118 (3)
$\gamma_{7,3}$(Nd)	674,88 (4)	0,00299 (14)
$\gamma_{1,0}$(Nd)	696,505 (4)	1,41 (7)
$\gamma_{3,1}$(Nd)	814,308 (23)	0,00331 (14)
$\gamma_{4,1}$(Nd)	864,356 (16)	0,00269 (14)
$\gamma_{12,4}$(Nd)	1182,06 (7)	0,00006 (3)
$\gamma_{5,1}$(Nd)	1376,34 (3)	0,00041 (4)
$\gamma_{6,1}$(Nd)	1388,11 (4)	0,00706 (6)
$\gamma_{7,1}$(Nd)	1489,148 (3)	0,286 (3)
$\gamma_{4,0}$(Nd)	1560,911 (13)	0,00021 (3)
$\gamma_{8,1}$(Nd)	1672,25 (4)	0,00021 (6)
$\gamma_{11,1}$(Nd)	1979,04 (8)	0,00096 (8)
$\gamma_{12,1}$(Nd)	2046,41 (7)	0,00030 (6)
$\gamma_{5,0}$(Nd)	2072,89 (3)	0,00024 (3)
$\gamma_{7,0}$(Nd)	2185,645 (5)	0,73 (1)
$\gamma_{8,0}$(Nd)	2368,80 (4)	0,000051 (14)
$\gamma_{10,0}$(Nd)	2655,51 (3)	0,00018 (3)

6 Main Production Modes

U – 235(n,f)Pr – 144

U – 238(n,f)Pr – 144

Pu – 239(n,f)Pr – 144

Ce – 144(β^-)Pr – 144

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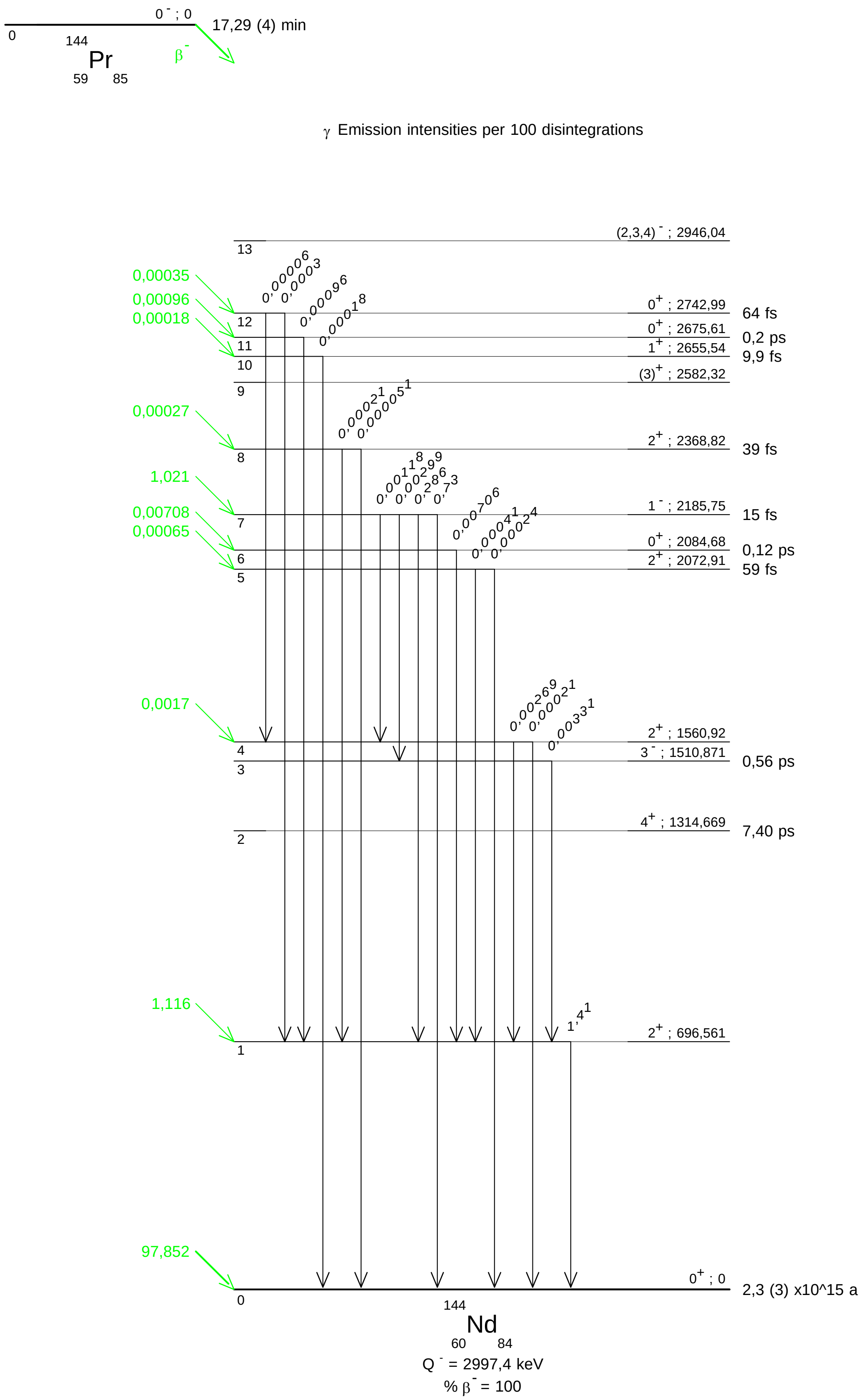
0 - ; 0
17,29 (4) min
0
144
Pr
59 85
β-
γ Emission intensities per 100 disintegrations
(2,3,4) - ; 2946,04
0+ ; 2742,99 64 fs
0+ ; 2675,61 0,2 ps
1+ ; 2655,54 9,9 fs
(3)+ ; 2582,32
2+ ; 2368,82 39 fs
1 - ; 2185,75 15 fs
0+ ; 2084,68 0,12 ps
2+ ; 2072,91 59 fs
2+ ; 1560,92
3 - ; 1510,871 0,56 ps
4+ ; 1314,669 7,40 ps
2+ ; 696,561
0+ ; 0 2,3 (3) x10^15 a
0,00035
0,00096
0,00018
0,00027
1,021
0,00708
0,00065
0,0017
1,116
97,852
144
Nd
60 84
Q - = 2997,4 keV
% β- = 100

$^{144m}_{59}Pr_{85}$

1 Decay Scheme

Pr-144m (half-life of 7.2 min) decays 99.94(2)% by an isomeric transition to Pr-144 and 0.06(2)% by beta minus emission to various excited levels of Nd-144.

Le praséodyme 144m (7,2 min) se désintègre à 99,94 % par transition isomérique vers le praséodyme 144 et par émission bêta moins vers trois niveaux excités du néodyme 144.

2 Nuclear Data

$T_{1/2}(^{144m}Pr)$	:	7,2	(2)	min
$T_{1/2}(^{144}Nd)$	:	2,3	(3)	10^{15} a
$T_{1/2}(^{144}Pr)$	:	17,29	(4)	min
$Q^{IT}(^{144m}Pr)$	:	59,03	(3)	keV
$Q^{-}(^{144m}Pr)$	:	3056,4	(24)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,13}$	110,4 (24)	0,030 (3)	(allowed)	4,65
$\beta^-_{0,9}$	474,1 (24)	0,010 (3)	(1st forbidden non-unique)	7,15
$\beta^-_{0,3}$	1545,5 (24)	0,02 (1)	allowed	8,7

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T	α_π
$\gamma_{1,0}$(Pr)	59,03 (3)	99,94 (2)	M3	408 (6)	618 (9)	155,0 (23)	1221 (18)	
$\gamma_{2,1}$(Nd)	618,108 (16)	0,030 (3)	E2	0,00568 (8)	0,000869 (13)	0,000186 (3)	0,00679 (10)	
$\gamma_{1,0}$(Nd)	696,507 (4)	0,06 (2)	E2	0,00427 (6)	0,000631 (9)	0,0001348 (19)	0,00507 (7)	
$\gamma_{3,1}$(Nd)	814,310 (23)	0,02 (1)	E1	0,001198 (17)	0,0001528 (22)	0,0000321 (5)	0,001391 (20)	
$\gamma_{13,2}$(Nd)	1631,37 (10)	0,030 (3)						
$\gamma_{9,1}$(Nd)	1885,76 (6)	0,010 (3)	M1+1,7%E2	0,000686 (10)	0,0000878 (13)	0,0000185 (3)	0,001052 (15)	0,000255 (4)

3 Atomic Data

3.1 Nd

ω_K	:	0,918	(4)
$\bar{\omega}_L$	:	0,140	(6)
n_{KL}	:	0,866	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	36,8478	54,1
	$K\alpha_1$	37,3614	100
	$K\beta_3$	42,167	}
	$K\beta_1$	42,2717	} 30,5
	$K\beta_5''$	42,58	}
	$K\beta_2$	43,335	}
	$K\beta_4$	43,451	} 7,73
	$KO_{2,3}$	43,548	}

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	29,154 - 30,978	100
KLX	34,798 - 37,340	50
KXY	40,42 - 43,53	6,25
Auger L	3,01 - 5,10	1667

3.2 Pr

ω_K	:	0,914	(4)
$\bar{\omega}_L$	:	0,132	(5)
n_{KL}	:	0,871	(4)

3.2.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	33,5506	54,8
	$K\alpha_1$	36,0267	100
	$K\beta_3$	40,6533	}
	$K\beta_1$	40,7487	} 30,4
	$K\beta_5''$	41,05	}
	$K\beta_2$	41,774	}
	$K\beta_4$	41,877	} 7,78
	$KO_{2,3}$	41,968	}
X_L			
	$L\ell$	4,453	
	$L\alpha$	5,013 - 5,033	
	$L\eta$	4,929	
	$L\beta$	5,489 - 5,851	
	$L\gamma$	6,327	

3.2.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	28,162 - 29,890	100
KLX	33,576 - 36,004	49,2
KXY	38,97 - 41,95	6,11
Auger L	2,90 - 4,91	3730

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Nd)	3,01 - 5,10	0,00040 (5)
e_{AK}	(Nd)		0,000038 (8)
	KLL	29,154 - 30,978	
	KLX	34,798 - 37,340	
	KXY	40,42 - 43,53	
e_{AL}	(Pr)	2,90 - 4,91	69 (10)
e_{AK}	(Pr)		2,87 (15)
	KLL	28,162 - 29,890	
	KLX	33,576 - 36,004	
	KXY	38,97 - 41,95	
$ec_{1,0\ T}$	(Pr)	17,04 - 59,01	99,9 (21)
$ec_{1,0\ K}$	(Pr)	17,04 (3)	33,4 (7)
$ec_{1,0\ L}$	(Pr)	52,20 - 53,07	50,6 (10)
$ec_{1,0\ M}$	(Pr)	57,52 - 58,10	12,68 (26)
$ec_{1,0\ N}$	(Pr)	58,73 - 59,03	2,84 (6)
$ec_{1,0\ O}$	(Pr)	58,99 - 59,01	0,411 (9)
$\beta^-_{0,13}$	max:	110,4 (24)	0,030 (3)
	avg:	29,0 (7)	
$\beta^-_{0,9}$	max:	474,1 (24)	0,010 (3)
	avg:	143,0 (8)	
$\beta^-_{0,3}$	max:	1545,5 (24)	0,02 (1)
	avg:	570,0 (11)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
$XK\alpha_2$	(Nd)	36,8478	0,000119 (23)	$K\alpha$
$XK\alpha_1$	(Nd)	37,3614	0,00022 (5)	
$XK\beta_3$	(Nd)	42,167	0,000067 (13)	$K'\beta_1$
$XK\beta_1$	(Nd)	42,2717		
$XK\beta''_5$	(Nd)	42,58		
$XK\beta_2$	(Nd)	43,335	0,000017 (4)	$K'\beta_2$
$XK\beta_4$	(Nd)	43,451		
$XKO_{2,3}$	(Nd)	43,548		

		Energy (keV)	Photons (per 100 disint.)	
XL	(Pr)	4,453 - 6,617	10,5 (5)	
$XK\alpha_2$	(Pr)	33,5506	8,66 (19)	} $K\alpha$
$XK\alpha_1$	(Pr)	36,0267	15,8 (4)	
$XK\beta_3$	(Pr)	40,6533 }		
$XK\beta_1$	(Pr)	40,7487 }	4,81 (12)	$K'\beta_1$
$XK\beta_5''$	(Pr)	41,05 }		
$XK\beta_2$	(Pr)	41,774 }		
$XK\beta_4$	(Pr)	41,877 }	1,23 (4)	$K'\beta_2$
$XKO_{2,3}$	(Pr)	41,968 }		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Pr)	59,03 (3)	0,0818 (12)
$\gamma_{2,1}$(Nd)	618,107 (16)	0,030 (3)
$\gamma_{1,0}$(Nd)	696,505 (4)	0,06 (2)
$\gamma_{3,1}$(Nd)	814,308 (23)	0,02 (1)
$\gamma_{13,2}$(Nd)	1631,36 (10)	0,030 (3)
$\gamma_{9,1}$(Nd)	1885,75 (6)	0,010 (3)

6 Main Production Modes

U – 235(n,f)Pr – 144m

U – 238(n,f)Pr – 144m

Pu – 239(n,f)Pr – 144m

Ce – 144(β^-)Pr – 144m

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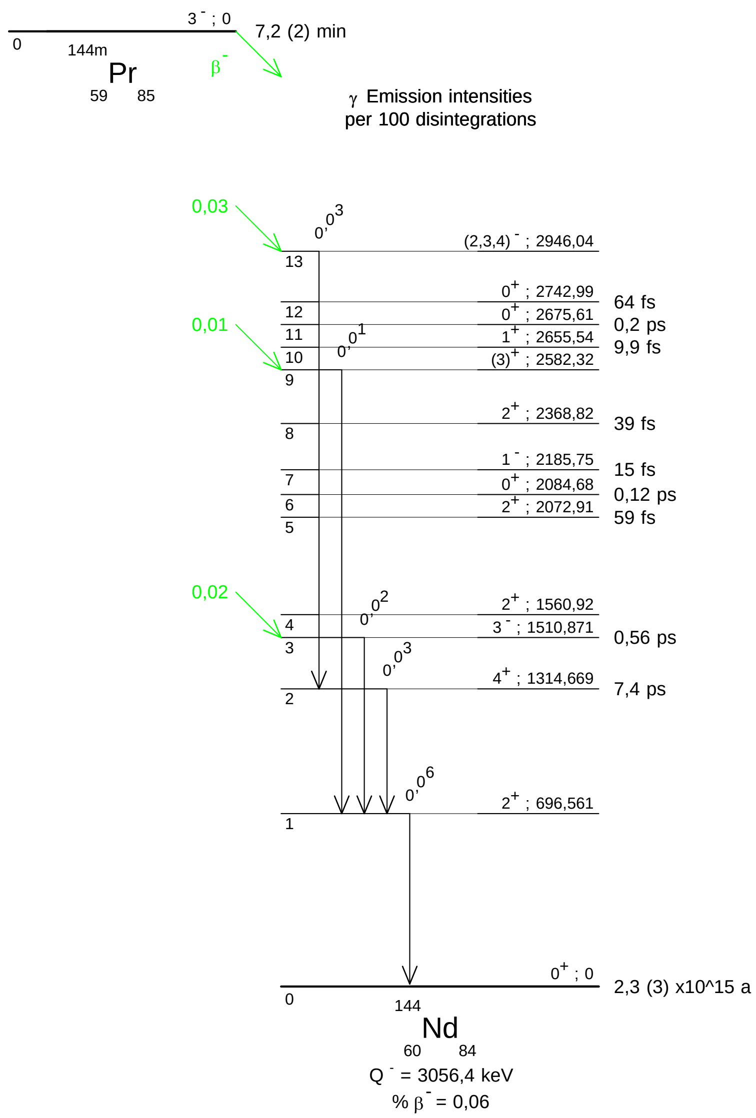
γ Emission intensities
per 100 disintegrations
0,0818
3 - ; 59,03
7,2 min
1
0 - ; 0
17,29 (4) min
0
144
Pr
59 85
Q^IT = 59,03 keV
% IT = 99,94


3 - ; 0
7,2 (2) min
0
144m
Pr
59 85
β -
γ Emission intensities
per 100 disintegrations
0,03
0,01
0,02
(2,3,4) - ; 2946,04
0+ ; 2742,99
0+ ; 2675,61
1+ ; 2655,54
(3)+ ; 2582,32
2+ ; 2368,82
1 - ; 2185,75
0+ ; 2084,68
2+ ; 2072,91
2+ ; 1560,92
3 - ; 1510,871
4+ ; 1314,669
2+ ; 696,561
0+ ; 0
64 fs
0,2 ps
9,9 fs
39 fs
15 fs
0,12 ps
59 fs
0,56 ps
7,4 ps
2,3 (3) x10^15 a
0,03
0,01
0,02
0,03
0,06
144
Nd
60 84
Q - = 3056,4 keV
% β - = 0,06

$^{148}_{61}$Pm $_{87}$

1 Decay Scheme

Pm-148 decays via beta minus transitions to nine excited levels and the ground state of Sm-148.
Le prométhéum 148 se désintègre 100 % par émission bêta vers neuf niveaux excités et le niveau fondamental du samarium 148.

2 Nuclear Data

$T_{1/2}$(^{148}Pm)	:	5,370	(15)	d
Q^-(^{148}Pm)	:	2471	(6)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,10}$	157 (6)	0,0091 (15)	1st Forbidden	8,7
$\beta^-_{0,9}$	187 (6)	0,0965 (34)	Super Allowed Or Allowed	7,9
$\beta^-_{0,8}$	413 (6)	1,360 (22)	Allowed	7,9
$\beta^-_{0,7}$	549 (6)	0,0138 (14)	1st Forbidden	10,3
$\beta^-_{0,6}$	807 (6)	0,018 (3)	1st Forbidden	10,8
$\beta^-_{0,5}$	1006 (6)	33,3 (6)	Super Allowed Or Allowed	7,8
$\beta^-_{0,4}$	1017 (6)	0,093 (3)	1st Forbidden	10,4
$\beta^-_{0,3}$	1047 (6)	0,236 (9)	1st Forbidden	10,1
$\beta^-_{0,1}$	1921 (6)	9,3 (6)	1st Forbidden	9,5
$\beta^-_{0,0}$	2471 (6)	55,5 (7)	1st Forbidden	9,1

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K (10^{-3})	α_L (10^{-4})	α_M (10^{-5})	α_T (10^{-3})	α_π (10^{-5})
$\gamma_{5,2}$(Sm)	303,592 (31)	0,0397 (47)	E2	42,3 (6)	93,1 (13)	207 (3)	54,2 (8)	
$\gamma_{8,6}$(Sm)	393,801 (30)	0,0155 (22)	E1	6,43 (9)	8,62 (12)	18,4 (3)	7,52 (11)	
$\gamma_{1,0}$(Sm)	550,274 (17)	22,7 (6)	E2	8,25 (12)	13,60 (19)	29,6 (5)	9,98 (14)	
$\gamma_{8,5}$(Sm)	592,832 (29)	0,355 (10)	M1	11,98 (17)	16,21 (23)	34,7 (5)	14,04 (20)	
$\gamma_{2,1}$(Sm)	611,263 (29)	1,043 (40)	E1+0,07%M2	2,39 (5)	3,15 (6)	6,70 (13)	2,79 (5)	
$\gamma_{9,5}$(Sm)	819,276 (28)	0,0134 (22)	M1	5,42 (8)	7,26 (11)	15,51 (22)	6,35 (9)	
$\gamma_{3,1}$(Sm)	874,186 (43)	0,241 (10)	E2	2,80 (4)	4,06 (6)	8,74 (13)	3,32 (5)	
$\gamma_{8,2}$(Sm)	896,424 (33)	0,984 (20)	M1+64%E2	3,28 (8)	4,56 (10)	9,77 (20)	3,86 (9)	
$\gamma_{4,1}$(Sm)	903,943 (29)	0,0422 (20)	M1+84%E2	2,87 (5)	4,06 (7)	8,72 (14)	3,39 (6)	
$\gamma_{5,1}$(Sm)	914,855 (25)	12,0 (5)	E1	1,050 (15)	1,354 (19)	2,88 (4)	1,221 (17)	
$\gamma_{6,1}$(Sm)	1113,886 (27)	0,0223 (23)	M1+24%E2	2,39 (4)	3,19 (5)	6,81 (10)	2,79 (5)	0,0565 (8)
$\gamma_{10,2}$(Sm)	1152,47 (15)	0,0029 (13)	E1+1%M2	0,73 (13)	0,95 (18)	2,0 (4)	0,86 (15)	0,98 (3)
$\gamma_{7,1}$(Sm)	1371,31 (20)	0,0138 (14)	E2	1,119 (16)	1,507 (22)	3,22 (5)	1,347 (19)	3,64 (6)
$\gamma_{4,0}$(Sm)	1454,217 (23)	0,0512 (25)	E2	1,000 (14)	1,338 (19)	2,86 (4)	1,230 (18)	6,03 (9)
$\gamma_{5,0}$(Sm)	1465,129 (19)	22,2 (5)	E1	0,449 (7)	0,570 (8)	1,208 (17)	0,704 (10)	18,3 (3)
$\gamma_{8,1}$(Sm)	1507,687 (28)	0,0056 (9)	E1	0,428 (6)	0,542 (8)	1,150 (17)	0,711 (10)	21,4 (3)
$\gamma_{6,0}$(Sm)	1664,160 (21)	0,0113 (11)	E2	0,775 (11)	1,024 (15)	2,18 (3)	1,042 (15)	13,75 (20)
$\gamma_{9,1}$(Sm)	1734,131 (27)	0,0386 (11)	E1	0,339 (5)	0,428 (6)	0,907 (13)	0,777 (11)	38,3 (6)
$\gamma_{10,1}$(Sm)	1763,74 (15)	0,0062 (7)	M1+83%E2	0,732 (22)	0,96 (3)	2,05 (6)	1,04 (3)	18,3 (3)
$\gamma_{9,0}$(Sm)	2284,405 (21)	0,0445 (24)	E1	0,219 (3)	0,274 (4)	0,581 (9)	1,027 (15)	77,4 (11)

3 Atomic Data

3.1 Sm

ω_K	:	0,926	(4)
$\bar{\omega}_L$	:	0,158	(6)
n_{KL}	:	0,857	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	39,5229	55,25
	$K\alpha_1$	40,1186	100
	$K\beta_3$	45,289	}
	$K\beta_1$	45,413	} 31,26
	$K\beta_5''$	45,731	}
	$K\beta_2$	46,575	}
	$K\beta_4$	46,705	} 8,07
	$KO_{2,3}$	46,813	}
X_L			
	$L\ell$	4,9909	
	$L\alpha$	5,6088 - 5,6376	
	$L\eta$	5,586	
	$L\beta$	6,1928 - 6,6557	
	$L\gamma$	6,9644 - 7,4871	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	31,190 - 33,218	100
KLX	37,302 - 40,097	50,7
KXY	43,39 - 46,79	6,42
Auger L	3,27 - 7,69	

4 Electron Emissions

		Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Sm)	3,27 - 7,69		0,1883 (16)
e_{AK}	(Sm)			0,0163 (10)
	KLL	31,190 - 33,218		
	KLX	37,302 - 40,097		
	KXY	43,39 - 46,79		
$ec_{1,0\ K}$	(Sm)	503,440	(17)	0,186 (6)
$ec_{1,0\ L}$	(Sm)	542,537 - 543,558		0,0306 (9)
$ec_{5,1\ K}$	(Sm)	868,021	(25)	0,0126 (6)
$\beta^-_{0,10}$	max:	157	(6)	0,0091 (15)
	avg:	42,1	(18)	
$\beta^-_{0,9}$	max:	187	(6)	0,0965 (34)
	avg:	50,7	(18)	
$\beta^-_{0,8}$	max:	413	(6)	1,360 (22)
	avg:	121,9	(21)	
$\beta^-_{0,7}$	max:	549	(6)	0,0138 (14)
	avg:	169,0	(22)	
$\beta^-_{0,6}$	max:	807	(6)	0,018 (3)
	avg:	264,4	(23)	
$\beta^-_{0,5}$	max:	1006	(6)	33,3 (6)
	avg:	342,7	(24)	
$\beta^-_{0,4}$	max:	1017	(6)	0,093 (3)
	avg:	347,1	(25)	
$\beta^-_{0,3}$	max:	1047	(6)	0,236 (9)
	avg:	359,1	(25)	
$\beta^-_{0,1}$	max:	1921	(6)	9,3 (6)
	avg:	731,6	(27)	
$\beta^-_{0,0}$	max:	2471	(6)	55,5 (7)
	avg:	977,7	(28)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Sm)	4,9909 - 7,4871	0,0363 (8)	
XKα_2	(Sm)	39,5229	0,0581 (16)	Kα
XKα_1	(Sm)	40,1186	0,1051 (28)	Kα
XKβ_3	(Sm)	45,289		
XKβ_1	(Sm)	45,413	0,0328 (10)	K$'\beta_1$
XKβ_5''	(Sm)	45,731		
XKβ_2	(Sm)	46,575		
XKβ_4	(Sm)	46,705	0,00847 (30)	K$'\beta_2$
XKO$_{2,3}$	(Sm)	46,813		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{5,2}$(Sm)	303,59 (3)	0,0377 (45)
$\gamma_{8,6}$(Sm)	393,80 (3)	0,0155 (22)
$\gamma_{1,0}$(Sm)	550,27 (3)	22,5 (6)
$\gamma_{8,5}$(Sm)	592,83 (3)	0,35 (1)
$\gamma_{2,1}$(Sm)	611,26 (3)	1,04 (4)
$\gamma_{9,5}$(Sm)	819,27 (3)	0,0133 (22)
$\gamma_{3,1}$(Sm)	874,18 (3)	0,24 (1)
$\gamma_{8,2}$(Sm)	896,42 (3)	0,98 (2)
$\gamma_{4,1}$(Sm)	903,94 (3)	0,042 (2)
$\gamma_{5,1}$(Sm)	914,85 (3)	12,0 (5)
$\gamma_{6,1}$(Sm)	1113,88 (3)	0,0222 (23)
$\gamma_{10,2}$(Sm)	1152,5 (2)	0,0029 (13)
$\gamma_{7,1}$(Sm)	1371,3 (2)	0,0138 (14)
$\gamma_{4,0}$(Sm)	1454,21 (3)	0,0511 (25)
$\gamma_{5,0}$(Sm)	1465,12 (3)	22,2 (5)
$\gamma_{8,1}$(Sm)	1507,68 (3)	0,0056 (9)
$\gamma_{6,0}$(Sm)	1664,15 (3)	0,0113 (11)
$\gamma_{9,1}$(Sm)	1734,12 (3)	0,0386 (11)
$\gamma_{10,1}$(Sm)	1763,7 (2)	0,0062 (7)
$\gamma_{9,0}$(Sm)	2284,39 (3)	0,0444 (24)

6 Main Production Modes

^{148}Nd(p,n)^{148}Pm
Possible impurities : ^{148m}Pm

^{148}Nd(d,2n)^{148}Pm
Possible impurities : ^{148m}Pm

^{147}Pm(n,γ)^{148}Pm σ : 80 barns
Possible impurities : ^{148m}Pm (70 barns); ^{149,150}Pm from ^{148,149}Pm(n,γ)

^{238}U(p,f)^{148}Pm
Possible impurities : ^{148m}Pm

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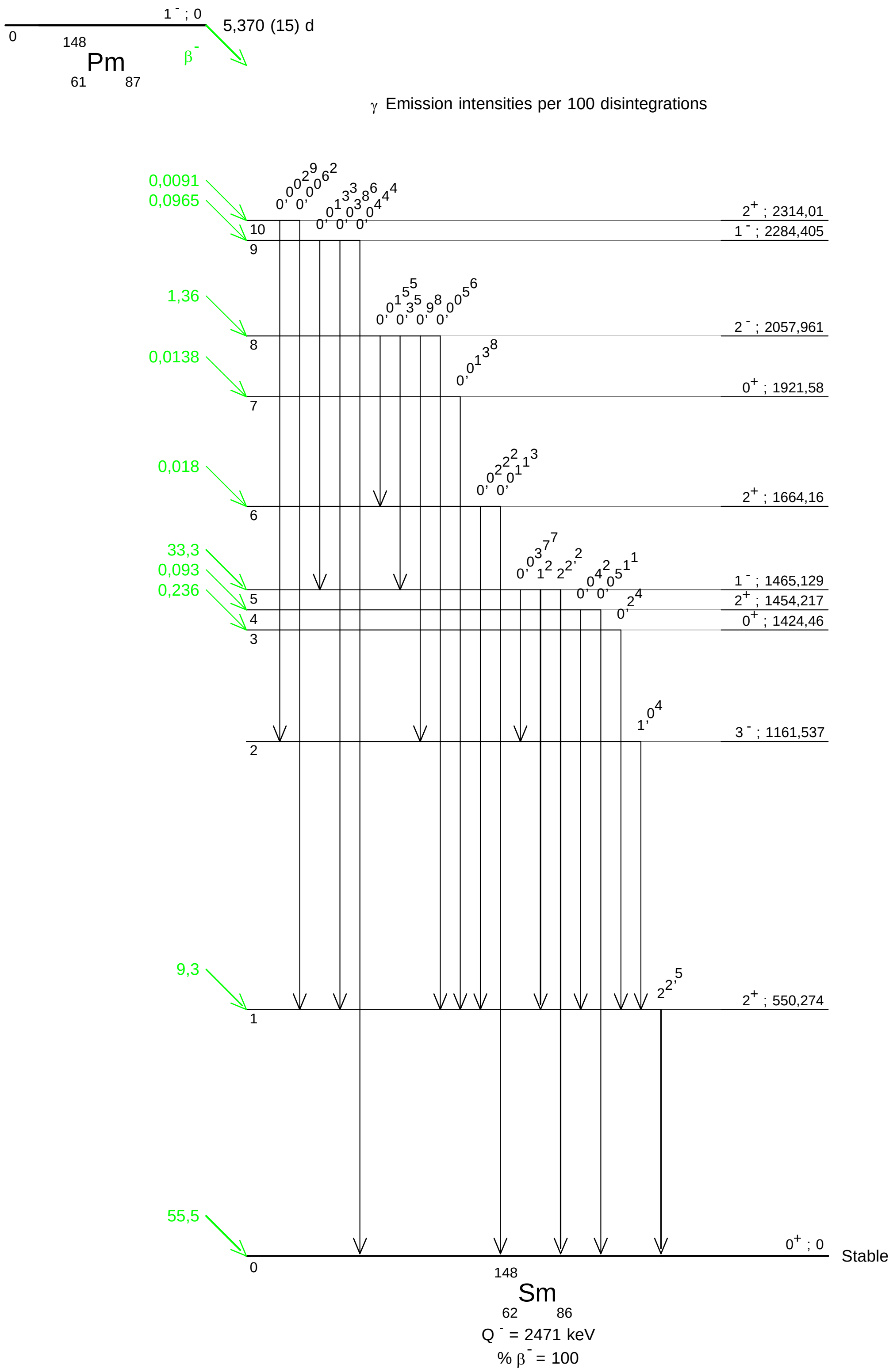
1 - ; 0
5,370 (15) d
0
148
Pm
61 87
β-
γ Emission intensities per 100 disintegrations
0,0091
0,0965
1,36
0,0138
0,018
33,3
0,093
0,236
9,3
55,5
2+ ; 2314,01
1 - ; 2284,405
2 - ; 2057,961
0+ ; 1921,58
2+ ; 1664,16
1 - ; 1465,129
2+ ; 1454,217
0+ ; 1424,46
3 - ; 1161,537
2+ ; 550,274
0+ ; 0
Stable
148
Sm
62 86
Q - = 2471 keV
% β- = 100

148m Pm
61 Pm 87

1 Decay Scheme

Pm-148m decays 94.4 (5) % via beta minus emission to four excited levels of Sm-148, and via an isomeric transition of 5.6 (5) %.

Le prométhéum 148m se désintègre 94,4 (5) % par émission bêta vers quatre niveaux excités du samarium 148 et 5,6 (5) % par transition isomerique.

2 Nuclear Data

$T_{1/2}(^{148m}\text{Pm})$	:	41,29	(13)	d
$T_{1/2}(^{148}\text{Pm})$	:	5,370	(15)	d
$Q^{-}(^{148m}\text{Pm})$	:	2608	(6)	keV
$Q^{IT}(^{148m}\text{Pm})$	:	137	(3)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,9}$	414 (6)	54,0 (9)	1st Forbidden	7,18
$\beta^-_{0,8}$	513 (6)	18,1 (9)	1st Forbidden	7,96
$\beta^-_{0,7}$	702 (6)	21,8 (7)	1st Forbidden	8,35
$\beta^-_{0,4}$	1014 (6)	0,93 (45)	Allowed	10,29

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{2,1}$(Pm)	61,30 (5)	5,6 (5)	E4	30 (5)	10000 (4000)	2900 (1200)	14000 (6000)
$\gamma_{1,0}$(Pm)	75,8 (1)	5,6 (5)	M1	2,9 (4)	0,41 (6)	0,088 (11)	3,4 (5)
$\gamma_{9,8}$(Sm)	98,48 (6)	8,1 (7)	M1+3%E2	1,488 (21)	0,236 (4)	0,0511 (8)	1,79 (3)
$\gamma_{8,7}$(Sm)	189,63 (6)	1,44 (8)	E2	0,1769 (25)	0,0565 (8)	0,01284 (18)	0,249 (4)

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{9,7}$(Sm)	288,11 (6)	13,1 (4)	M1+0,8%E2	0,0763 (11)	0,01062 (15)	0,00228 (4)	0,0898 (13)
$\gamma_{9,6}$(Sm)	299,12 (13)	0,14 (4)	E2	0,0442 (7)	0,00982 (14)	0,00219 (3)	0,0567 (8)
$\gamma_{7,4}$(Sm)	311,63 (6)	3,82 (11)	E1	0,01141 (16)	0,001546 (22)	0,000330 (5)	0,01337 (19)
$\gamma_{8,5}$(Sm)	362,09 (6)	0,176 (13)	E2	0,0253 (4)	0,00504 (7)	0,001114 (16)	0,0318 (5)
$\gamma_{4,3}$(Sm)	414,07 (6)	18,47 (33)	E1+0,017%M2	0,00572 (9)	0,000766 (13)	0,000163 (3)	0,00670 (11)
$\gamma_{4,2}$(Sm)	432,78 (6)	5,29 (13)	E2	0,01544 (22)	0,00281 (4)	0,000617 (9)	0,0190 (3)
$\gamma_{9,5}$(Sm)	460,57 (6)	0,41 (1)	E2	0,01306 (19)	0,00231 (4)	0,000507 (7)	0,01601 (23)
$\gamma_{8,4}$(Sm)	501,26 (6)	6,62 (11)	E1+0,029%M2	0,00369 (7)	0,000489 (9)	0,0001042 (20)	0,00431 (8)
$\gamma_{1,0}$(Sm)	550,27 (3)	94,4 (5)	E2	0,00825 (12)	0,001360 (19)	0,000296 (5)	0,00998 (14)
$\gamma_{5,3}$(Sm)	553,24 (6)	0,35 (4)	M1+73%E2	0,0098 (4)	0,00150 (4)	0,000324 (8)	0,0117 (4)
$\gamma_{5,2}$(Sm)	571,95 (6)	0,212 (7)	E1	0,00274 (4)	0,000361 (5)	0,0000768 (11)	0,00320 (5)
$\gamma_{9,4}$(Sm)	599,74 (6)	12,39 (22)	E1+0,04%M2	0,00249 (4)	0,000327 (6)	0,0000696 (12)	0,00290 (5)
$\gamma_{2,1}$(Sm)	611,26 (5)	5,6 (2)	E1	0,00237 (4)	0,000312 (5)	0,0000663 (10)	0,00277 (4)
$\gamma_{3,1}$(Sm)	629,97 (5)	88,4 (19)	E2	0,00591 (9)	0,000932 (13)	0,000202 (3)	0,0071 (1)
$\gamma_{6,3}$(Sm)	714,69 (13)	0,045 (5)	M1+E2	0,0060 (16)	0,00084 (18)	0,00018 (4)	0,0070 (18)
$\gamma_{7,3}$(Sm)	725,70 (6)	32,5 (6)	E2	0,00424 (6)	0,000642 (9)	0,0001389 (20)	0,00506 (7)
$\gamma_{8,3}$(Sm)	915,33 (6)	18,0 (5)	E2	0,00254 (4)	0,000364 (6)	0,0000783 (11)	0,00300 (5)
$\gamma_{9,3}$(Sm)	1013,81 (6)	19,9 (4)	E2+0,06%M3	0,00206 (4)	0,000290 (5)	0,0000622 (10)	0,00243 (4)
$\gamma_{6,1}$(Sm)	1344,66 (12)	0,057 (5)	E2	0,001162 (17)	0,0001570 (22)	0,0000335 (5)	0,001392 (20)

3 Atomic Data

3.1 Sm

ω_K	:	0,926	(4)
$\bar{\omega}_L$	:	0,158	(6)
n_{KL}	:	0,857	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	39,5229	55,25
	$K\alpha_1$	40,1186	100
	$K\beta_3$	45,289	} 31,26
	$K\beta_1$	45,413	}
	$K\beta_5''$	45,731	}
	$K\beta_2$	46,575	} 8,07
	$K\beta_4$	46,705	}
	$KO_{2,3}$	46,813	}
X_L			
	$L\ell$	4,9909	
	$L\alpha$	5,6088 - 5,6376	
	$L\eta$	5,586	
	$L\beta$	6,1928 - 6,6557	
	$L\gamma$	6,9644 - 7,4871	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	31,190 - 33,218	100
KLX	37,302 - 40,097	50,7
KXY	43,39 - 46,79	6,42
Auger L	3,27 - 7,69	

3.2 Pm

ω_K	:	0,922	(4)
$\bar{\omega}_L$	:	0,148	(6)
n_{KL}	:	0,861	(4)

3.2.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	38,1716	55,08
	$K\alpha_1$	38,7251	100
	$K\beta_3$	43,713	}
	$K\beta_1$	43,826	} 31
	$K\beta_5''$	44,145	}
	$K\beta_2$	44,937	}
	$K\beta_4$	45,064	} 7,97
	$KO_{2,3}$	45,162	}
X_L			
	$L\ell$	4,81	
	$L\alpha$	5,4061 - 5,4325	
	$L\eta$	5,363	
	$L\beta$	5,9552 - 6,3985	
	$L\gamma$	6,6814 - 7,1893	

3.2.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	30,162 - 32,086	100
KLX	36,035 - 38,703	50,3
KXY	41,88 - 45,14	6,32
Auger L	3,16 - 7,38	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Sm)	3,27 - 7,69	6,23 (10)
e_{AK}	(Sm)		0,54 (5)
	KLL	31,190 - 33,218	
	KLX	37,302 - 40,097	
	KXY	43,39 - 46,79	
e_{AL}	(Pm)	3,16 - 7,38	6,59 (10)
e_{AK}	(Pm)		0,287 (23)
	KLL	30,162 - 32,086	
	KLX	36,035 - 38,703	
	KXY	41,88 - 45,14	
$ec_{2,1\ T}$	(Pm)	16,1 - 61,3	5,6 (34)
$ec_{2,1\ K}$	(Pm)	16,12 (5)	0,012 (5)
$ec_{1,0\ T}$	(Pm)	30,6 - 75,8	4,3 (9)
$ec_{1,0\ K}$	(Pm)	30,6 (1)	3,7 (8)
$ec_{9,8\ K}$	(Sm)	51,65 (6)	4,37 (39)
$ec_{9,8\ T}$	(Sm)	51,65 - 98,46	5,26 (47)
$ec_{2,1\ L}$	(Pm)	53,9 - 54,8	4,0 (23)
$ec_{2,1\ M}$	(Pm)	59,6 - 60,3	1,2 (7)
$ec_{2,1\ N}$	(Pm)	61,0 - 61,3	0,24 (16)
$ec_{1,0\ L}$	(Pm)	68,4 - 69,3	0,52 (11)
$ec_{1,0\ M}$	(Pm)	74,1 - 74,8	0,112 (22)
$ec_{1,0\ N}$	(Pm)	75,5 - 75,8	0,025 (5)
$ec_{9,8\ L}$	(Sm)	90,74 - 91,76	0,69 (6)
$ec_{9,8\ M}$	(Sm)	96,76 - 97,40	0,150 (13)
$ec_{9,8\ N}$	(Sm)	98,13 - 98,47	0,0339 (30)
$ec_{8,7\ K}$	(Sm)	142,80 (6)	0,205 (11)
$ec_{8,7\ L}$	(Sm)	181,89 - 182,91	0,0655 (35)
$ec_{8,7\ M}$	(Sm)	187,91 - 188,55	0,0149 (8)
$ec_{9,7\ K}$	(Sm)	241,28 (6)	0,925 (31)
$ec_{9,7\ T}$	(Sm)	241,28 - 288,09	1,088 (37)

		Energy (keV)		Electrons (per 100 disint.)
$ec_{7,4\ K}$	(Sm)	264,80 (6)		0,0432 (14)
$ec_{9,7\ L}$	(Sm)	280,37 - 281,39		0,1287 (43)
$ec_{9,7\ M}$	(Sm)	286,39 - 287,03		0,0276 (10)
$ec_{4,3\ K}$	(Sm)	367,24 (6)		0,1054 (22)
$ec_{4,2\ K}$	(Sm)	385,95 (6)		0,0806 (22)
$ec_{4,3\ L}$	(Sm)	406,33 - 407,35		0,01408 (29)
$ec_{4,2\ L}$	(Sm)	425,04 - 426,06		0,01467 (40)
$ec_{8,4\ K}$	(Sm)	454,43 (6)		0,0243 (5)
$ec_{1,0\ T}$	(Sm)	503,44 - 550,25		0,933 (19)
$ec_{1,0\ K}$	(Sm)	503,44 (3)		0,776 (16)
$ec_{1,0\ L}$	(Sm)	542,53 - 543,55		0,1280 (26)
$ec_{1,0\ M}$	(Sm)	548,55 - 549,19		0,0279 (6)
$ec_{9,4\ K}$	(Sm)	552,91 (6)		0,0310 (7)
$ec_{2,1\ K}$	(Sm)	564,43 (5)		0,0134 (5)
$ec_{3,1\ K}$	(Sm)	583,14 (5)		0,522 (10)
$ec_{3,1\ T}$	(Sm)	583,14 - 629,95		0,627 (12)
$ec_{3,1\ L}$	(Sm)	622,23 - 623,25		0,0823 (16)
$ec_{3,1\ M}$	(Sm)	628,25 - 628,89		0,01784 (35)
$ec_{7,3\ K}$	(Sm)	678,87 (6)		0,1378 (28)
$ec_{7,3\ L}$	(Sm)	718 - 719		0,02086 (42)
$ec_{8,3\ K}$	(Sm)	868,50 (6)		0,0457 (15)
$ec_{9,3\ K}$	(Sm)	966,98 (6)		0,0411 (10)
$\beta^-_{0,9}$	max:	414 (6)	}	54,0 (9)
	avg:	122,3 (26)		
$\beta^-_{0,8}$	max:	513 (6)	}	18,1 (9)
	avg:	156,0 (27)		
$\beta^-_{0,7}$	max:	702 (6)	}	21,8 (7)
	avg:	224,7 (29)		
$\beta^-_{0,4}$	max:	1014 (6)	}	0,93 (45)
	avg:	345,9 (31)		

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Sm)	4,9909 - 7,4871	1,20 (4)	
XKα_2	(Sm)	39,5229	1,92 (11)	Kα
XKα_1	(Sm)	40,1186	3,47 (19)	
XKβ_3	(Sm)	45,289		
XKβ_1	(Sm)	45,413	1,09 (6)	K$'\beta_1$
XKβ_5''	(Sm)	45,731		
XKβ_2	(Sm)	46,575		
XKβ_4	(Sm)	46,705	0,280 (17)	K$'\beta_2$
XKO$_{2,3}$	(Sm)	46,813		
XL	(Pm)	4,81 - 7,1893	1,20 (4)	
XKα_2	(Pm)	38,1716	0,96 (6)	Kα
XKα_1	(Pm)	38,7251	1,75 (11)	
XKβ_3	(Pm)	43,713		
XKβ_1	(Pm)	43,826	0,54 (4)	K$'\beta_1$
XKβ_5''	(Pm)	44,145		
XKβ_2	(Pm)	44,937		
XKβ_4	(Pm)	45,064	0,139 (9)	K$'\beta_2$
XKO$_{2,3}$	(Pm)	45,162		

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{2,1}$(Pm)	61,30 (5)	0,00040 (17)
$\gamma_{1,0}$(Pm)	75,8 (1)	1,27 (20)
$\gamma_{9,8}$(Sm)	98,48 (3)	2,92 (26)
$\gamma_{8,7}$(Sm)	189,63 (3)	1,15 (6)
$\gamma_{9,7}$(Sm)	288,11 (3)	12,0 (4)
$\gamma_{9,6}$(Sm)	299,1 (2)	0,13 (4)
$\gamma_{7,4}$(Sm)	311,63 (3)	3,77 (11)
$\gamma_{8,5}$(Sm)	362,09 (3)	0,171 (13)
$\gamma_{4,3}$(Sm)	414,07 (3)	18,35 (33)
$\gamma_{4,2}$(Sm)	432,78 (3)	5,19 (13)
$\gamma_{9,5}$(Sm)	460,57 (3)	0,40 (1)
$\gamma_{8,4}$(Sm)	501,26 (3)	6,59 (11)
$\gamma_{1,0}$(Sm)	550,27 (3)	93,5 (14)

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{5,3}$(Sm)	553,24 (3)	0,35 (4)
$\gamma_{5,2}$(Sm)	571,95 (3)	0,211 (7)
$\gamma_{9,4}$(Sm)	599,74 (3)	12,35 (22)
$\gamma_{2,1}$(Sm)	611,26 (3)	5,6 (2)
$\gamma_{3,1}$(Sm)	629,97 (3)	87,8 (14)
$\gamma_{6,3}$(Sm)	714,7 (2)	0,045 (5)
$\gamma_{7,3}$(Sm)	725,70 (3)	32,3 (6)
$\gamma_{8,3}$(Sm)	915,33 (3)	17,9 (5)
$\gamma_{9,3}$(Sm)	1013,81 (3)	19,8 (4)
$\gamma_{6,1}$(Sm)	1344,6 (2)	0,057 (5)

6 Main Production Modes

^{148}Nd(p,n)^{148m}Pm
Possible impurities : ^{148}Pm

^{148}Nd(d,2n)^{148m}Pm
Possible impurities : ^{148}Pm

^{147}Pm(n,γ)^{148m}Pm σ : 70 barns
Possible impurities : ^{148}Pm (80 barns); ^{149,150}Pm from ^{148,149}Pm(n,γ)

^{238}U(p,f)^{148m}Pm
Possible impurities : ^{148}Pm

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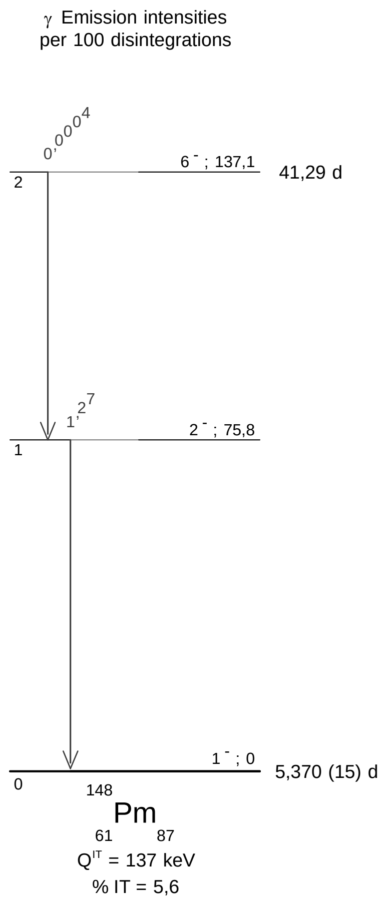
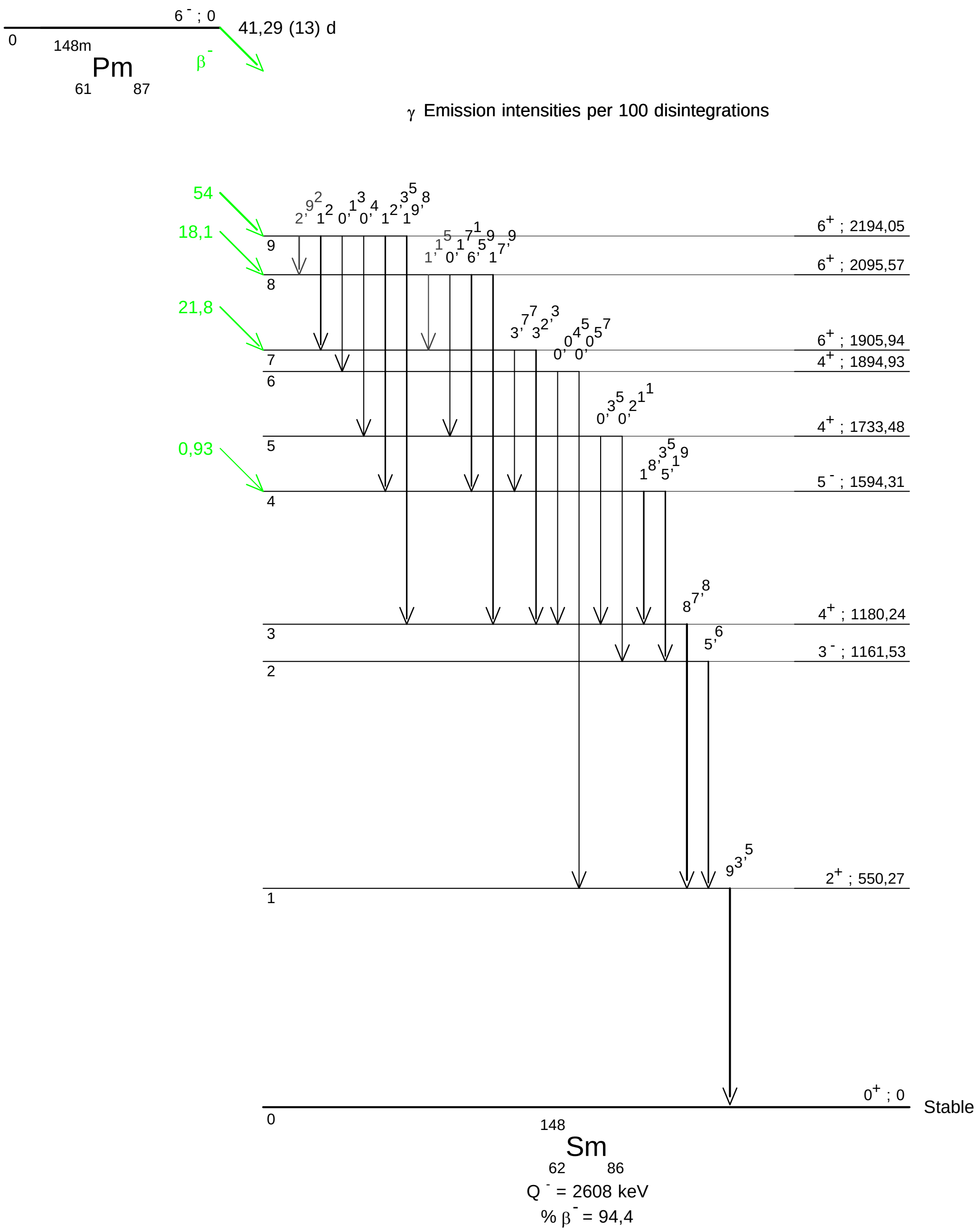
(Q)


γ Emission intensities
per 100 disintegrations
0,0004
6 ⁻ ; 137,1
41,29 d
2
1,27
2 ⁻ ; 75,8
1
1 ⁻ ; 0
5,370 (15) d
0
148
Pm
61
87
Q^IT = 137 keV
% IT = 5,6


6 - ; 0
41,29 (13) d
0
148m
Pm
61 87
β-
γ Emission intensities per 100 disintegrations
54
18,1
21,8
0,93
6+ ; 2194,05
6+ ; 2095,57
6+ ; 1905,94
4+ ; 1894,93
4+ ; 1733,48
5 - ; 1594,31
4+ ; 1180,24
3 - ; 1161,53
2+ ; 550,27
0+ ; 0
Stable
148
Sm
62 86
Q - = 2608 keV
% β- = 94,4

$^{151}_{62}$Sm $_{89}$

1 Decay Scheme

Le samarium 151 se désintègre par émission bêta moins principalement vers le niveau fondamental de l'europium 151.
Sm-151 decays by beta minus emission mainly to the Eu-151 ground state.

Probabilité d'ionisation interne dans la couche K, lors la désintégration bêta moins de Sm-151:
Internal ionisation probability in the K shell following beta minus decay:
Pk : 2,0 (2) E-4 %

et probabilité d'ionisation interne dans la couche L:
and internal ionisation probability in the L shell:
PL : 31 (3) E-2 %

2 Nuclear Data

$T_{1/2}$(^{151}Sm)	:	94,7	(6)	a
Q^-(^{151}Sm)	:	76,4	(5)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,1}$	54,9 (5)	0,93 (4)	1st Forbidden	7,5
$\beta^-_{0,0}$	76,4 (5)	99,07 (4)	1st Forbidden	9

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_L	α_M	α_N	α_T
$\gamma_{1,0}$(Eu)	21,541 (3)	0,93 (4)	M1+0,085(5)%E2	21,7 (4)	4,71 (8)	0,168 (3)	27,6 (5)

3 Atomic Data

3.1 Eu

ω_K	:	0,929	(4)
$\bar{\omega}_L$	:	0,168	(7)
n_{KL}	:	0,853	(4)

3.1.1 X Radiations

		Energy (keV)
X_L		
	$L\ell$	5,175
	$L\alpha$	5,815 - 5,846
	$L\eta$	5,815
	$L\beta$	6,436 - 6,839
	$L\gamma$	7,254 - 7,791

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger L	3,377 - 7,786	100

4 Electron Emissions

			Energy (keV)		Electrons (per 100 disint.)
e_{AL}	(Eu)		3,377 - 7,786		0,581 (19)
$ec_{1,0\ L}$	(Eu)		13,489 - 14,564		0,703 (31)
$ec_{1,0\ M}$	(Eu)		19,70 - 20,41		0,153 (7)
$ec_{1,0\ N}$	(Eu)		21,181 - 21,408		0,0348 (15)
$\beta^-_{0,1}$	max:		54,9	(5)	0,93 (4)
	avg:		14,0	(2)	
$\beta^-_{0,0}$	max:		76,4	(5)	99,07 (4)
	avg:		19,7	(2)	

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)
XL	(Eu)	5,175 - 7,791	0,121 (4)

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Eu)	21,541 (3)	0,0324 (13)

6 Main Production Modes

Fission product
Possible impurities: Sm – 153

Sm – 149(n,γ)Sm – 151 σ : 104 (5) barns
Possible impurities: Sm – 153

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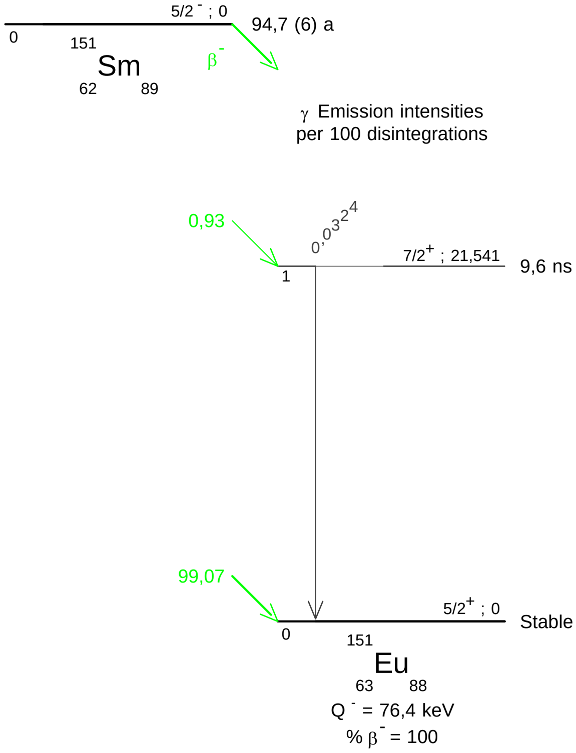
5/2 - ; 0
94,7 (6) a
0
151
Sm
62
89
β-
γ Emission intensities
per 100 disintegrations
0,93
0,0324
7/2+ ; 21,541
9,6 ns
1
99,07
5/2+ ; 0
Stable
0
151
Eu
63
88
Q - = 76,4 keV
% β- = 100

169 Er
68 Er 101

1 Decay Scheme

L'erbium 169 se désintègre par émission bêta moins vers les niveaux excités ou le niveau fondamental de thulium 169.

Er-169 disintegrates by beta minus emissions to Tm-169.

2 Nuclear Data

$T_{1/2}$(^{169}Er)	:	9,38	(2)	d
Q^-(^{169}Er)	:	353,0	(12)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,2}$	234,8 (12)	~ 0,016	Unique 1st Forbidden	9,5
$\beta^-_{0,1}$	344,6 (12)	44 (5)	1st Forbidden	6,5
$\beta^-_{0,0}$	353,0 (12)	56 (5)	1st Forbidden	6,3

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_N	α_O	α_T
$\gamma_{1,0}$(Tm)	8,4102 (1)	44 (6)	M1+0,094%(E2)			199 (8)	45,8 (18)	6,1 (2)	251 (10)
$\gamma_{2,1}$(Tm)	109,77930 (14)	0,0152 (30)	M1+2,17%E2	1,96 (3)	0,316 (5)	0,0710 (12)	0,017 (1)	0,0024 (1)	2,37 (4)
$\gamma_{2,0}$(Tm)	118,1895 (1)	0,0013	E2	0,70 (1)	0,721 (10)	0,1759 (25)	0,040 (1)	0,0047 (1)	1,642 (23)

3 Atomic Data

3.1 Tm

ω_K	:	0,945	(4)
$\bar{\omega}_L$	:	0,227	(9)
$\bar{\omega}_M$	:	0,0127	(12)
n_{KL}	:	0,835	(4)

3.1.1 Auger Electrons

	Mean Energy (keV)	Relative probability
Auger MNO		
M	0,70	36,69
N	0,10	57,11
O	0,02	6,20
Auger total	0,32	100

4 Electron Emissions

		Energy (keV)			Electrons (per 100 disint.)
e_{ATotal}	(Tm)				
	avg M	0,70			203,3
	avg N	0,10			
	avg O	0,02			
$ec_{1,0\ M}$	(Tm)	6,1034	-	6,9425	34,8 (44)
$ec_{1,0\ N}$	(Tm)	7,9385	-	8,4049	8 (1)
$ec_{1,0\ O}$	(Tm)	8,3570	-	8,3779	1,07 (13)
$ec_{2,1\ T}$	(Tm)	50,3897	-	109,7470	0,0107 (21)
$\beta^-_{0,2}$	max:	234,8	(12)		0,016
	avg:	73,0	(5)		
$\beta^-_{0,1}$	max:	344,6	(12)		44 (5)
	avg:	96,5	(5)		
$\beta^-_{0,0}$	max:	353,0	(12)		56 (5)
	avg:	99,1	(5)		

5 Photon Emissions

5.1 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Tm)	8,4102 (1)	0,174 (21)
$\gamma_{2,1}$(Tm)	109,77930 (14)	0,0045 (9)
$\gamma_{2,0}$(Tm)	118,1895 (1)	0,0005

6 Main Production Modes

Er − 168(d,p)Er − 169
Possible impurities: Er − 165, Er − 171

Er − 170(n,2n)Er − 169
Possible impurities: Ho − 167

Er − 168(n,γ)Er − 169 σ : 2,0 (1) barns
Possible impurities: Er − 165, Er − 171

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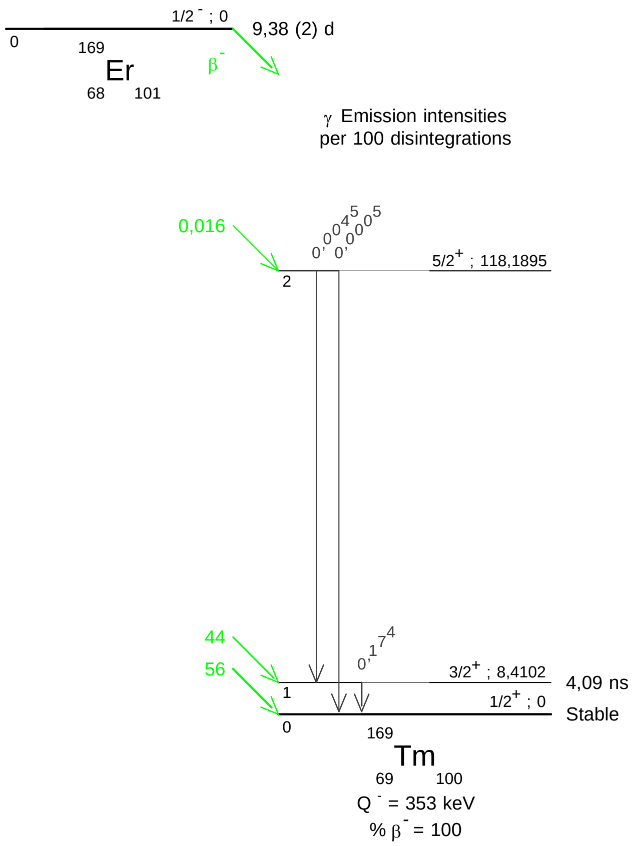
1/2 - ; 0
9,38 (2) d
0
169
Er
68 101
β-
γ Emission intensities
per 100 disintegrations
0,016
0,0045
0,0005
5/2+ ; 118,1895
2
44
56
0,174
3/2+ ; 8,4102
4,09 ns
1
1/2+ ; 0
Stable
0
169
Tm
69 100
Q - = 353 keV
% β- = 100

198		
79	Au	119

1 Decay Scheme

Au-198 decays via beta minus transitions to two excited levels and the ground state of Hg-198.
L'or 198 se désintègre 100 % par émission bêta vers deux niveaux excités et le niveau fondamental du mercure 198.

2 Nuclear Data

$T_{1/2}$(^{198}Au)	:	2,6943	(3)	d
Q^-(^{198}Au)	:	1372,8	(5)	keV

2.1 β^- Transitions

	Energy (keV)	Probability (%)	Nature	lg ft
$\beta^-_{0,2}$	285,1 (5)	0,985 (5)	1st Forbidden	7,6
$\beta^-_{0,1}$	961,0 (5)	98,99 (6)	1st Forbidden	7,37
$\beta^-_{0,0}$	1372,8 (5)	0,025 (5)	Unique 1st Forbidden	12,4

2.2 Gamma Transitions and Internal Conversion Coefficients

	Energy (keV)	$P_{\gamma+ce}$ (%)	Multipolarity	α_K	α_L	α_M	α_T
$\gamma_{1,0}$(Hg)	411,80250 (17)	99,82 (9)	E2	0,0300 (5)	0,01055 (15)	0,00263 (4)	0,0439 (7)
$\gamma_{2,1}$(Hg)	675,8849 (5)	0,825 (5)	M1+E2	0,0216 (17)	0,00389 (24)	0,00091 (6)	0,0267 (20)
$\gamma_{2,0}$(Hg)	1087,6874 (5)	0,1599 (21)	E2	0,00414 (6)	0,000751 (11)	0,0001766 (25)	0,00512 (8)

3 Atomic Data

3.1 Hg

ω_K	:	0,962	(4)
$\bar{\omega}_L$	:	0,355	(14)
n_{KL}	:	0,813	(4)

3.1.1 X Radiations

		Energy (keV)	Relative probability
X_K			
	$K\alpha_2$	68,895	58,99
	$K\alpha_1$	70,82	100
	$K\beta_3$	79,823	}
	$K\beta_1$	80,254	} 33,94
	$K\beta_5''$	80,762	}
	$K\beta_2$	82,435	}
	$K\beta_4$	82,776	} 9,94
	$KO_{2,3}$	83,028	}
X_L			
	$L\ell$	8,7226	
	$L\alpha$	9,8981 - 9,9886	
	$L\eta$	10,6473	
	$L\beta$	11,4835 - 12,5471	
	$L\gamma$	13,4081 - 14,2672	

3.1.2 Auger Electrons

	Energy (keV)	Relative probability
Auger K		
KLL	53,178 - 58,277	100
KLX	64,594 - 70,811	55,2
KXY	75,98 - 83,09	7,62
Auger L	5,16 - 14,82	

4 Electron Emissions

		Energy (keV)	Electrons (per 100 disint.)
e_{AL}	(Hg)	5,161 - 14,822	2,156 (24)
e_{AK}	(Hg)		
	KLL	53,178 - 58,277	} 0,110 (12)
	KLX	64,594 - 70,811	}
	KXY	75,98 - 83,09	}
$ec_{1,0\ T}$	(Hg)	328,7002 - 411,7947	4,20 (7)
$ec_{1,0\ K}$	(Hg)	328,70020 (17)	2,869 (48)
$ec_{1,0\ L}$	(Hg)	396,9632 - 399,5186	1,009 (14)
$ec_{1,0\ M}$	(Hg)	408,2409 - 409,5076	0,2515 (38)
$ec_{1,0\ N}$	(Hg)	411,0000 - 411,7026	0,0626 (10)
$ec_{2,1\ K}$	(Hg)	592,7826 (5)	0,0174 (14)
$\beta^-_{0,2}$	max:	285,1 (5)	} 0,985 (5)
	avg:	79,5 (2)	}
$\beta^-_{0,1}$	max:	961,0 (5)	} 98,99 (6)
	avg:	314,7 (2)	}
$\beta^-_{0,0}$	max:	1372,8 (5)	} 0,025 (5)
	avg:	467,3 (2)	}

5 Photon Emissions

5.1 X-Ray Emissions

		Energy (keV)	Photons (per 100 disint.)	
XL	(Hg)	8,7226 - 14,2672	1,203 (22)	
$XK\alpha_2$	(Hg)	68,895	0,807 (15)	} $K\alpha$
$XK\alpha_1$	(Hg)	70,82	1,369 (24)	}
$XK\beta_3$	(Hg)	79,823	} 0,465 (11)	$K'\beta_1$
$XK\beta_1$	(Hg)	80,254	}	
$XK\beta_5''$	(Hg)	80,762	}	
$XK\beta_2$	(Hg)	82,435	} 0,136 (4)	$K'\beta_2$
$XK\beta_4$	(Hg)	82,776	}	
$XKO_{2,3}$	(Hg)	83,028	}	

5.2 Gamma Emissions

	Energy (keV)	Photons (per 100 disint.)
$\gamma_{1,0}$(Hg)	411,80205 (17)	95,62 (6)
$\gamma_{2,1}$(Hg)	675,8836 (7)	0,804 (5)
$\gamma_{2,0}$(Hg)	1087,6842 (7)	0,1591 (21)

6 Main Production Modes

Au – 197(n,γ)Au – 198
Possible impurities: Au – 199

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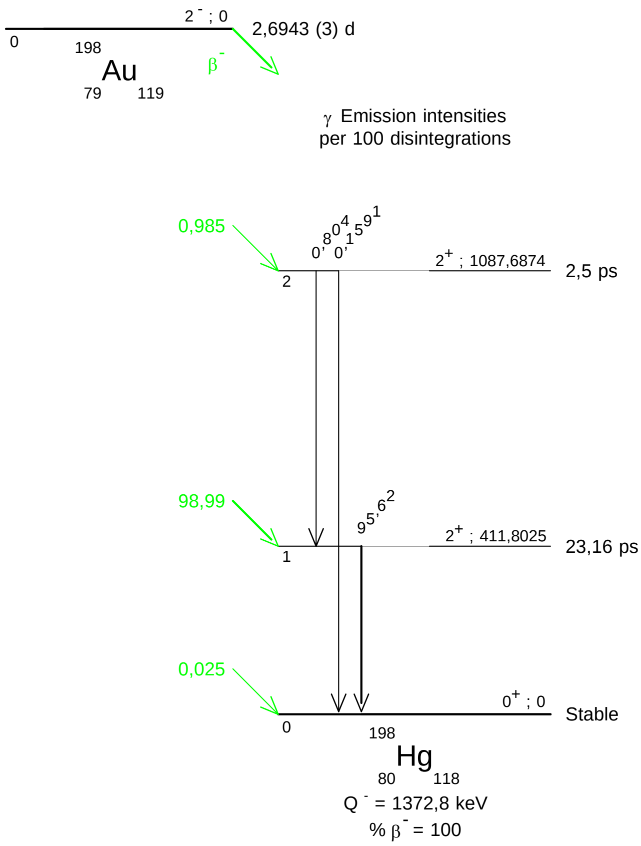
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