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TABLE OF NUCLEAR ELECTRIC QUADRUPOLE MOMENTS

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ABSTRACT

This Table is a compilation of experimental measurements of static electric quadrupole moments of ground states and excited states of atomic nuclei throughout the periodic table. To aid identification of the states, their excitation energy, half-life, spin and parity are given, along with a brief indication of the method and any reference standard used in the particular measurement. Experimental data from all quadrupole moment measurements actually provide a value of the product of the moment and the electric field gradient [EFG] acting at the nucleus. Knowledge of the EFG is thus necessary to extract the quadrupole moment. A single recommended value of the moment is given for each state, based, for each element, wherever possible, upon a standard reference moment for a nuclear state of that element studied in a situation in which the electric field gradient has been well calculated. For several elements one or more subsidiary reference EFG/moment references are required and their use is specified.

The literature search covers the period to mid-2013.

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INTRODUCTION AND MOTIVATION

The electric quadrupole moment is a feature of atomic nuclei which finds relevance in a wide range of fields of research and more general measurement. Although the quadrupole moment is most obviously of value in the study of nuclei themselves, being a measure of the deviation of the nuclear charge distribution from a spherical shape, measurement of nuclear quadrupole interactions form a vital investigatory tool in many areas of condensed matter physics and, aiding into the elucidation of structures of complex molecules and their functions, extending into many areas of chemical, biological and medical science.

Establishing accepted values of the quadrupole moment of any nucleus faces a fundamental problem. The difficulty lies in the fact that what can actually be measured is the interaction energy of the quadrupole moment, eQ, with its surroundings, usually written as $h\nu_Q = e^2qQ$. This interaction involves the product of the moment with the electric field gradient [EFG], eq, acting at the nucleus. The situation can be contrasted to the challenge of measuring the nuclear magnetic dipole moment, μ, which similarly involves its product with the magnetic field B acting at the nucleus, $h\nu_M = \mu B$. In the latter case it is a relatively simple matter to apply a known magnetic field, generated by a suitable arrangement of coils carrying a precisely measured current, which can be varied at the will of the experimenter. The nuclear magnetic moment, can be extracted from this product, and hence measured, by a wide range of methods.

However it is not possible to generate EFGs in the laboratory which are sufficiently large to produce measurable energy differences. Given the small scale of nuclear quadrupole moments, of order I barn [100 fm^2], to provide an energy splitting between levels of order 10 MHz requires an EFG of order 10^{17} Vcm^{-2}. However, such large gradients are to be found at nuclei when in atoms, ions or molecules and also in a wide range of non-cubic solids. This does not solve the problem of extracting the quadrupole moment since difficulty in calculation of the EFG from first principles has been a serious barrier to separation of the nuclear quadrupole moment from the measured product.

This is not the place to enter into a history of multi-electron electric field distribution theory, however until the advent of more powerful computers only the simplest atoms or ions, with few electrons, were open to accurate calculation. For this reason the study of quadrupole hyperfine interactions in muonic atoms, in which the muon wavefunction [and hence charge distribution and EFG] at the nucleus can be accurately predicted, was early seen as a fruitful way to establish reliable values of quadrupole moments, especially in heavier elements where the interaction can be readily resolved. For multi-electron atoms and ions, many delicate features of the calculation were beyond the power of computation until the past two decades or so. Prior to this, the best EFG estimates involved approximations and corrections related to the distortion of inner closed electron shells, collectively associated with the name Sternheimer shielding [or anti-shielding] factors, which could be uncertain to 10% or more. Thus, although experimentally the nuclear quadrupole interaction could be measured to very much better precision, the nuclear quadrupole moments extracted from the measurements were hard to pin down.

In recent years multi-electron computation has advanced to the extent that it is now possible to make calculations of EFGs in most atoms and ions and also in many molecules. The results show admirable self-consistency and are proving reliable to a degree comparable to that of the best muonic atom results. First in 1992 and again in 2001 and 2008 Pyykko, one of the pioneers in such calculations, published a listing of recommended values of the quadrupole moments of selected, usually stable, nuclear states in the majority of elements, including those most commonly used in applications beyond the realm of nuclear structure physics. Adopting such a set of standard values allows measurements using the standard isotope to be used to calibrate EFGs in other environments and, by extension, to allow moments of other isotopes, and excited states in all isotopes, to be related to the single reference moment. The modern calculations include all effects previously grouped under the name of shielding.

There exist in the literature many excellent experimental results giving rise to values of nuclear quadrupole moments. Each measurement required the authors to specify the EFG at the nucleus in their particular experimental system. The published Q values depend upon the individual choice of EFG and can thus be difficult to compare consistently without considerable effort. This is especially true if the experiments were made many years apart, during which the reference value(s) adopted may have changed. Existing tabulations do not always specify adopted standards and where they do, the standard values can change over the years. Only recently has it been possible, with the aid of much improved EFG calculations, to prepare a tabulation in which the adopted standards are likely to prove stable over at least the medium term, trustworthy in many cases to a few percent or better.

This Table presents a listing of measured quadrupole moments normalized, as far as possible, to a set of identified reference moments, one or more for each element, which have been derived from measurement in a situation in which the EFG has been calculated either by a modern computation or in a simpler system such as a muonic atom. There are still some 17 elements, He, Si, P, Ar, Ag, Cd, Te, Ce, Tm, W, Pt, Tl, Po, At, Cm, Bk and Cf in the sequence to Einsteinium at Z = 99 for which no such basic reference standard has been adopted. For the majority of the remaining elements the reference values chosen by Pyykko in his most recent listing (2008Py02 Mol. Phys. 106 1965 (2008)) have been adopted. The few exceptions are noted in the Table.

Nevertheless it is frequently not possible to normalize all measurements to the adopted reference for an element. This arises most often in connection with excited state measurements when an equivalent measurement on the reference (usually stable) isotope in the same conditions is not possible. In such cases a secondary standard EFG has often been adopted. These are briefly specified in the Table in the heading for each element.

In contrast to the forgoing discussion there do exist methods of measurement of the quadrupole moment which are free of uncertainty of estimation of an associated EFG. These involve calculation of field gradients provided by free electric charges and thus nothing more than Coulomb's law. They include electron scattering [ES] and re-orientation of the angular distribution during coulomb excitation [CER] both of which have been extensively used in the study of short lived excited nuclear states. Calculation of the electromagnetic interaction of the charged projectile with the nucleus is straightforward in principle and the quadrupole moment can be readily extracted, although the experiments have limited accuracy. Results based on these methods are therefore not directly related to, or dependent upon, the value of the adopted standard quadrupole moment for that element.

The most recent entries in this tabulation were published in mid-2013.

POLICIES

Signs

Signs are given when the sign can be determined from experimental data. Where the sign is not given by the measurement, no sign is given in the Table, although it can sometimes be inferred either from systematics or from the magnitude of the result.

Results and Uncertainties

Experimental values and their associated errors are as given by the authors subject to a policy of limiting significant figures. Numerical errors with digits above 15 have, in most cases, been rounded to 2 and errors with first digit 2 or greater rounded down if the second digit is 4 or lower, otherwise rounded up. Results have also been rounded to give no more significant figures than the rounded error would allow. Thus a published value 0.953(65) has been rounded to 0.95(7) and 0.25(16) rounded to 0.3(2).

Electric Quadrupole Moments

These are listed in units of barns (1 b = 10^{-28} m^2). As explained in the introduction, with modern computations of the EFG, corrections relating shielding caused by polarization of atomic electrons, known as Sternheimer Corrections, are no longer needed. Where there is more than one reference isotope this is possible without causing any confusion since moment ratios are frequently determined to far greater precision than their individual values. References to original publication is given, both in the form of the Nuclear Structure Reference listing maintained at the National Nuclear Data Centre, Brookhaven National Laboratory, and the journal reference. A listing of journal abbreviations is given below.

Reference moments and EFGs.

Justification of the reference values should be sought in the reference(s) given, usually Pyykko [2], or, for the secondary standards, the measurements in which they have been used.

Recommended Values

The Table gives, for each listed state, identified by energy [in keV], half-life and spin, a single value for the quadrupole moment. The method involved in its measurement is identified by one of the abbreviations listed below. Entries have been normalized to the given value of the reference isotope moment wherever possible, so values will in general differ from those in the original publications. Where several experimental results exist for the same state, attempts to make valid weighted averages have been avoided since frequently there exist non-statistical differences between experiments which cannot be properly taken into account. Most often one of the more recent results, with a relatively small estimated uncertainty, has been chosen. Readers who require a more extended listing of all results on a given state should consult the extended Table [3].

ACKNOWLEDGEMENTS

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REFERENCES FOR THE INTRODUCTION

1. P. Pyykko, Molecular Physics 106 (2008) 1965 and Molecular Physics 99, 1617 (2001).
2. N.J. Stone, At. Data Nucl. Data Tables 90 (2005) 75.
3. N.J. Stone, INDC(NDS) -0594, IAEA, April 2011

EXPLANATION OF THE TABLE

The Table gives information as follows:

Element	Identifies the element for the following isotopes and specifies the reference isotope(s) for that element. Also, in the first row for each element, the system in which the EFG which has been calculated to obtain the reference moment(s) is given briefly. Secondary standards are listed in subsequent rows and identified by Letters A,B,C …. For more detail on the EFG calculations see [1] above.
Nucleus	Identifies the nucleus by mass number *A* and atomic number *Z*, with its chemical symbol. This is given once for each nucleus. Nuclei are grouped by element in increasing sequence of atomic number and by increasing mass number for each element.
E(level)	Gives the energy of the state on which the measurement is made, rounded to the nearest kilovolt, 0 being the ground state. Where placement of the level with respect to the ground state is unknown, this is denoted by addition of an offset *x* or *y*.
$T_{1/2}$	Gives the half-life $T_{1/2}$ of the state: Units y = years, d = days, h = hours, m = minutes, s = seconds, ms = milliseconds (10^{-3} s), μs = microseconds (10^{-6} s), ns = nanoseconds (10^{-9} s), ps = picoseconds (10^{-12} s) and fs = femtoseconds (10^{-15} s).
I^{π}	Gives the spin (*I*) and parity (π) of the state. Uncertain values are given in brackets. Where the measurement was made on unresolved states, the average spin is given as I_{av}
Q(b)	Gives the measured nuclear electric quadrupole moment *Q* in units of the barn (1 barn = 10^{-28} m^2). No sign is given if it was not determined by the experiment. The uncertainty in the result is given in brackets, subject to the policy declared in the introduction. Thus +1.27(10) means a value of +1.27 barns with uncertainty 0.10 barns.
Ref. Std.	In this column the reference standard upon which the listed result depends is given. There is no entry when the method used does not depend upon an adopted standard (i.e. a Coulomb Excitation Reorientation (CER) measurement).
Method	The method used in the measurement is briefly identified here. A list of abbreviations used is given below. In view of the great proliferation of specialized methods, this method description is limited and for detailed information reference should be made to the original publication. Re-evaluation of the published result, where it involves re-normalization to the adopted value of the reference standard by the tabulator, is not indicated specifically.

References 1. The NSR keyword reference is given. These can be further identified by reference to the Brookhaven National Nuclear Data Centre website www.nndc.bnl.gov.

2. The original journal or other publication reference is given wherever possible.

Experimental Method Abbreviations

AB	Atomic beam magnetic resonance
AB/MS	Atomic beam and molecular spectroscopy
ABLDF	Atomic beam with laser double resonance detection
ABLFS	Atomic beam with laser fluorescence spectroscopy
ABLS	Atomic beam laser spectroscopy
β-NMR	NMR of in-beam polarized nuclei with beta asymmetry detection
β-NQR	Nuclear quadrupole resonance with beta detection
β-RadOP	Beta-ray detection of optical pumping
B(E2)	Value based on measured E2 transition probability
CER	Coulomb excitation reorientation
CERP	Precession of coulomb excitation reorientation
CFBLS	Collinear fast beam laser spectroscopy
CFBLS/ β-NMR	Collinear fast beam laser spectroscopy: NMR with beta detection
CLS	Resonance cell laser spectroscopy
EPR	Electron paramagnetic resonance
ES	Electron scattering
IPAC	Integral perturbed angular correlation
LEMS	Level mixing spectroscopy
LRFS	Laser resonance fluorescence spectroscopy
LRIS	Laser resonance ionization spectroscopy
LS	Laser spectroscopy
MA	Microwave absorption in gases
MAPON	Modulated adiabatic passage NMR on oriented nuclei
MB	Molecular beam magnetic resonance
ME	Mossbauer effect
MS	Molecular spectroscopy
Mu-X	Muonic X-ray hyperfine structure
NMR/ON	Nuclear magnetic resonance on oriented nuclei

NO/ME	Mossbauer effect on oriented nuclei
NO/S	Static nuclear orientation with gamma detection
NQR	Nuclear quadrupole resonance
NSLR	Nuclear spin-lattice relaxation
O	Optical spectroscopy
OD	Optical double resonance
OP/RD	Optical pumping with radiative detection
PAC	Perturbed angular correlation
Pi-X	Pionic X-ray Hyperfine Structure
Q	Quadrupole resonance
QI-NMR/ON	Quadrupole interaction resolved NMR on oriented nuclei
QIR	Quadrupole Interaction deduced from Relaxation Time
R	Re-evaluated data, or (for revised reference standard) adjusted by tabulator
RIMS/LS	Resonant ionization mass spectrometry/laser spectroscopy
TDPAC	Time-dependent perturbed angular correlation
TDPAD	Time-dependent perturbed angular distribution
TF	Transient field
TFLD	Tilted foil time-differential perturbed gamma angular distribution
TLS	Trap laser spectroscopy

Journal Abbreviations

ADNDT	Atomic data and Nuclear Data Tables
AECL	Atomic Energy Commission, Chalk River Laboratories, Report
ARHMI	Annual Report, Hahn-Meitner Institute, Berlin
AuJP	Australian Journal of Physics
BAPS	Bulletin of the American Physical Society
Bk88 NFFS	Nuclei Far From Stability, AIP Conference 164, Rosseau Lake, Ont. Canada 1988
CERN EP	CERN EP Division Report
CPL	Chemical Physics Letters
CzJP	Czech Journal of Physics
Eur Phys J	European Physics Journal
HP Ac	Helvetia Physica Acta
HFI	Hyperfine Interactions

IoP Conf	Institute of Physics Conference Series
IAN	Izv. Akad. Nauk. SSSR Ser Fiz (trans. Bull. Acad. Sci. USSR, Phys. Ser.)
J Phys	Journal of Physics (London)
J Phys Radium	Journal de Physique et el Radium (Paris)
JCP	Journal of Chemical Physics
JINC	Journal of Inorganic and Nuclear Chemistry
JPCR	Journal of Physical and Chemical Reference Data
JPJS	Journal of the Physical Society of Japan
JPPa	Journal de Physique (Paris)
LNPP	Leningrad Nuclear Physics Institute preprint
Mol Phys	Molecular Physics
NIM	Nuclear Instruments and Methods
NIMPR	Nuclear Instruments and Methods in Physics Research
NP	Nuclear Physics
ORNL	Oak Ridge National Laboratory Report
Ospk	Opt. Spektrosk. (trans Optics and Spectroscopy (USSR))
PCNeugart	R. Neugart, private communication
Phca	Physica
PhMg	Philosophical Magazine
PL	Physics Letters
PR	Physical Review
PRep	Physics Reports
PRL	Physical Review Letters
PS	Physica Scripta
RIKEN	Report of RIKEN Laboratory, Japan
Sol St Comm	Solid State Communications
STMP	Springer Texts in Modern Physics
Th 68 Cass.	B. R. Casserberg, Thesis, Princeton, (1968)
UCRL	University of California Lawrence Berkeley Report
UkrF	Ukraine Fiz. Zh.
YadF	Yadern Fys. (trans Soviet Journal of Nuclear Physics)
ZNat	Zeitschrift fur Naturforschung
ZP	Zeitschrift fur Physik

Element	*Nucleus*	*E(level)*	$T_{1/2}$	I^p	*Q(b)*	*Ref. Std.*	*Method*	*NSR Keynumber*	*Journal Reference*
Hydrogen	*Efg at the deuterium nucleus calculated for HD and D2*								
Reference isotope	1 H 2	0	stable	1+	+0.00286(2)		MB,R	1979Bi14	PR A20 381 (1979)
Lithium	*Efg at the 7Li nucleus calculated for the LiH molecule*								
	3 Li 6	0	stable	1+	-0.000806(6)	[7Li]	MB	2005Bo45/1998Ce04	PR C72 044309 (2005)/PR A57 2539 (1998
Reference isotope	3 Li 7	0	stable	3/2-	-0.0400(3)		MB	2008Py02	Mol Phys 106 1965 (2008)/PR A57 2539 (1998)
	3 Li 8	0	842 ms	2+	+0.0314(2)	[7Li]	β-NMR	2005Bo45	PR C72 044309 (2005)
	3 Li 9	0	178 ms	3/2-	-0.0304(2)	[7Li]	β-NMR	2011AV08	J Phys G 38 075102 (2011)
	3 Li 11	0	8.5 ms	3/2-	(-)0.0333(5)	[7Li]	β-NMR	2008Ne11	PRL 101 132502 (2008)
Berylium	*Calculation of the quadrupole coupling constant for the 3P2 state of the 9Be atom*								
Reference isotope	4 Be 9	0	stable	3/2-	+0.0529(4)		AB	1991Su05	CPL 177 91 (1991)
Boron	*Calculation of the quadrupole coupling constant of the 2P3/2 ground state of the 11B atom*								
	5 B 8	0	0.77s	2+	+0.0643(14)	[11B]	β-NQR	2006Su13	PR C74 024327 (2006)
	5 B 10	0	stable	3+	+0.0845(2)	[11B]	AB	2008Py02/1970Ne21	Mol Phys 106 1965 (2008)/PR A2 1208 (1970)
Reference isotope	5 B 11	0	stable	3/2-	+0.04059(10)		AB	2008Py02/1970Ne21	Mol Phys 106 1965 (2008)/PR A2 1208 (1970)
	5 B 12	0	20.4 ms	1+	0.0132(3)	[11B]	β-NMR	1992Mi18	PRL 69 2058 (1992)
	5 B 13	0	17.4 ms	3/2-	(+)0.0365(8)	[11B]	β-NMR	2004Na38	NP A746 509c (2004)
	5 B 14	0	13.8 ms	2-	0.0297(8)	[11B]	β-NMR	1996Iz01	PL B366 51 (1996)
	5 B 15	0	10.3 ms	3/2-	0.0379(11)	[11B]	β-NMR	1996Iz01	PL B366 51 (1996)
	5 B 17	0	5.1 ms	(3/2-)	0.0385(15)	[11B]	β-NMR	2003Og03	PR C67 064308 (2003)
Carbon	*Calculation of the quadrupole coupling constant of the 3P2 state of the 11C atom*								
Reference isotope	6 C 11	0	20.4 m	3/2-	0.0333(2)		AB	2008Py02/1969Sc34	PR 181 137 (1969)
	6 C 12	4438	45 fs	2+	+0.06(3)	[12C]	CER	1983Ve01	PL B122 23 (1983)
Nitrogen	*Calculation of the quadrupole coupling constant of the 1P1 state of the 14N+ ion*								
	7 N 12	0	11.0 ms	1+	+0.100(9)	[14N]	β-NMR	1998Mi10	PL B420 31 (1998)
Reference isotope	7 N 14	0	stable	1+	+0.02044(3)		AB/MS	2008Py02/1997To06	Mol Phys 106 1965 (2008)/CPL 265 60 (1997)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	7 N 16	0	7.13 s	2-	(-)0.018(2)	[14N]	β-NMR	2001Ma42	PRL 86 3735 (2001)
	7 N 18	0	624 ms	1-	+0.027(4)	[14N]	LMR	1999Ne01	PRL 82 497 (1999) Q for this state is an unresolvec
					(+)0.0123(12)	[14N]	β-NMR	1999Og03	PL B451 11 (1999) probler
Oxygen	*Calculation of the quadrupole coupling constant of the 3P2 state of the 17O atom*								
	8 O 13	0	8..6 ms	3/2-	0.0111(8)	[17O]	β-NQR	1999Ma46	PL B459 81 (1999)
Reference isotope	8 O 17	0	stable	5/2+	-0.0256(2)		R/EPR	2008Py02/1969Sc34	Mol Phys 106 1965 (2008)/PR 181 137 (1969)
	8 O 18	1982	2.07 ps	2+	-0.036(9)	[17O]	CER	1983Gr28	NP A411 329 (1983)
	8 O 19	0	27 s	5/2+	0.00362(13)	[17O]	β-NMR	1999Mi16	PL B457 9 (1999)
Fluorine	*Calculation of the quadrupole coupling constant of the F2 molecule*								
	9 F 17	0	64.5 s	5/2+	0.076(4)	[19F 197keV]	β-NMR	1974Mi21	NP A236 415 (1974)
	9 F 18	1121	153 ns	5+	0.071(6)	[19F 197keV]	β-NMR	1974Mi21	NP A236 415 (1974)
Reference isomer	9 F 19	197	88.5 ns	5/2+	-0.0942(9)		PAC	2008Py02	Mol Phys 106 1965 (2008)
	9 F 20	0	11 s	2+	0.056(4)	[19F 197keV]	β-NMR	1974Mi21	NP A236 415 (1974)
	9 F 21	0	4.16 s	5/2+	0.011(2)	[19F 197keV]	β-NMR	1999Mb13	HFI 120/121 673 (1999)
	9 F 22	0	4.2 s	4+	0.003(2)	[19F 197keV]	β-NMR	2010Mi13	NP A834 75c (2010)
Neon	*Calculation of the quadrupole coupling constant of the 3P2 state of the 21Ne atom*								
	10 Ne 20	1634	0.7 ps	2+	-0.23(3)	[21Ne]	CER	1981Sp07	PRep 73 369 (1981)
Reference isotope	10 Ne 21	0	stable	3/2+	+0.102(8)		O/AB	2008Py02/1972Du06	Mol Phys 106 1965 (2008)/PR A5 1036(1972)
	10 Ne 22	1275	3.6 ps	2+	-0.19(4)	[21Ne]	CER	1981Sp07	PRep 73 369 (1981)
	10 Ne 23	0	37.6 s	5/2+	0.145(13)	[21Ne]	CFBLS	2005Ge06	PR C71 064319 (2005)
Sodium	*Muonic atom HFS measurements*								
	11 Na 20	0	0.446 s	2+	+0.101(8)	[23Na]	β-NMR	2009Mi04	PL B672 120 (2009)
	11 Na 21	0	22.5 s	3/2+	0.138(11)	[23Na]	β-NMR	2009Mi04	PL B672 120 (2009)
	11 Na 22	0	2.60 y	3+	+0.180(11)	[23Na]	ABLS	1998Ga44	Eur Phys J A3 313 (1998)
Reference isotope	11 Na 23	0	stable	3/2+	+0.104(1)		O	2008Py02/2006Da14	Mol Phys 106 1965 (2008)/J Phys B 39 3111 (2006

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	11 Na 25	0	60 s	5/2+	0.0015(3)	[23Na]	β-NMR	2004Og13	HFI 159 235 (2004)
	11 Na 26	0	1.07 s	3+	-0.0053(2)	[23Na]	CFBLS/β-NMR	2000Ke09	Eur Phys J A8 31 (2000)
	11 Na 27	0	0.29 s	5/2+	-0.0071(3)	[23Na]	CFBLS/β-NMR	2000Ke09	Eur Phys J A8 31 (2000)
	11 Na 28	0	30.5 ms	1+	+0.389(11)	[23Na]	CFBLS/β-NMR	2000Ke09	Eur Phys J A8 31 (2000)
	11 Na 29	0	43 ms	3/2+	+0.085(3)	[23Na]	CFBLS/β-NMR	2000Ke09	Eur Phys J A8 31 (2000)
Magnesium	*Calculation of the quadrupole coupling constant of the 3P1 state of the 25Mg atom*								
	12 Mg 23	0	11.3 s	3/2+	0.114(3)	[25Mg]	β-NMR	1999Mb13	HFI 120/121 673 (1999)
	12 Mg 24	1369	1.45 ps	2+	-0.29(3)		CER	1990Gr11	PR C42 R471 (1990)
Reference isotope	12 Mg 25	0	stable	5/2+	+0.199(2)		AB	2008Py02	Mol Phys 106 1965 (2008)
	12 Mg 26	1809	476 fs	2+	-0.21(2)		CER	1991He09	PR C43 2546
Aluminium	*Calculation of the quadrupole coupling constant of the 3P3/2 state of the 27Al atom*								
	13 Al 25	0	7.18 s	5/2+	0.24(2)	[27Al]	β-NQR	2007Ma94	
	13 Al 26	0	7x10*5 y	5+	+0.26(3)	[27Al]	ABLS	1997Le19	JPhys G23 1145 (1997)
Reference isotope	13 Al 27	0	stable	5/2+	+0.1466(10)		AB	2008Py02/1968Ma23	Mol Phys 106 1965 (2008)/PRS A305 139 (1968
	13 Al 28	0	2.24 m	3+	0.172(12)	[27Al]	β-NMR	1978St31	HFI 4 170 (1978)
	13 Al 31	0	644 ms	(5/2+)	0.134(2)	[27Al]	β-NQR	2009De25	PL B678 344 (2009)
	13 Al 32	0	33 ms	1+	0.025(2)	[27Al]	β-NQR	2007Ka68	HFI 180 61 (2007)
	13 Al 33	0	44 ms	(5/2+)	0.132(16)	[27Al]	β-NMR	2012Sh22	PL B714 246 (2012)
Silicon	*There is no adopted reference efg for Si.*								
	A. Efg at Si in Al2O3 estimated from band structure calculations								
	14 Si 27	0	4.1 s	5/2+	0.063(14)	A	β-NQR	1999Mb13	HFI 120/121 673 (1999)
	14 Si 28	1779	0.49 ps	2+	+0.16(3)		CER	1981Sp07	PRep 73 369 (1981)
	14 Si 30	2235	0.25 ps	2+	-0.05(6)		CER	1981Sp07	PRep 73 369 (1981)
Phosphorus	*There is no adopted reference efg for P.*								
	A. Calculated efg at P site in α-Al2O3								
	15 P 28	0	270 ms	3+	0.137(14)	A	β-NQR	2012Zh36	Chin Phys Lett 29 092102 (2012)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Sulphur	*Calculation of the quadrupole coupling constant of the 33S- ion*								
	A. Efg at S site in FeS2								
	16 S 32	2230	0.16 ps	2+	-0.16(2)		CER	1982Ve09	NP A389 185 (1982)
Reference isotope	16 S 33	0	stable	3/2+	-0.0678(13)		MA	2008Py02	Mol Phys 106 1965 (2008)
	16 S 34	2128	0.32 ps	2+	+0.04(3)		CER	1981Sp07	PRep 73 369 (1981)
Reference isotope	16 S 35	0	87.4 d	3/2+	+0.0471(9)		MA	2008Py02	Mol Phys 106 1965 (2008)
	16 S 43	320	415 ns	7/2-	0.23(3)	A	TDPAD	2012Ch16	PRL 108 162501 (2012)
Chlorine	*Calculation of the quadrupole interaction at Cl in the HCl molecule*								
Reference isotope	17 Cl 35	0	stable	3/2+	-0.0817(8)		AB	2008Py02	Mol Phys 106 1965 (2008)
	17 Cl 36	0	$3.0x10^5$ y	2+	-0.178(4)	[35Cl]	MA	1972St38	PR A6 1702 (1972)
Reference isotope	17 Cl 37	0	stable	3/2+	-0.0644(6)		AB	2008Py02	Mol Phys 106 1965 (2008)
Argon	*Calculation of the quadrupole coupling constant in the Ar atom*								
	18 Ar 35	0	1.78s	3/2+	-0.084(15)	[37Ar]	CFBLS/β-NMR	1996Kl04	NP A607 1 (1996)
	18 Ar 36	1970	0.28 ps	2+	+0.11(6)		CER	1971Na06	PL 34B 389 (1971)
	18 Ar 37	0	35.0 d	3/2+	+0.076(9)	calc B value	CFBLS/β-NMR	1996Kl04	NP A607 1 (1996)
	18 Ar 39	0	269 y	7/2-	-0.12(3)	[37Ar]	CFBLS	2008Bl01	NP A799 30 (2008)
	18 Ar 40	1461	1.12 ps	2+	+0.01(4)		CER	1971Na05	PRL 24 903 (1970)
	18 Ar 41	0	1.82 h	7/2-	-0.042(4)	[37Ar]	CFBLS	2008Bl01	NP A799 30 (2008)
	18 Ar 43	0	5.37 m	5/2-	+0.142(14)	[37Ar]	CFBLS	2008Bl01	NP A799 30 (2008)
Potassium	*Calculation of the quadrupole coupling constant of the 4F9/2 state of the 39K atom*								
	19 K 37	0	1.22 s	3/2+	+0.106(4)	[39K]	β-NQR	2008Mi07	PL B662 389 (2008)
Reference isotope	19 K 39	0	stable	3/2+	+0.0585(6)		AB	2008Py02/1998Ke05	Mol Phys 106 1965 (2008)/CPL 292 403 (1998
Reference isotope	19 K 40	0	1.3x10*9y	4-	-0.073(1)		AB	2008Py02/1998Ke05	Mol Phys 106 1965 (2008)/CPL 292 403 (1998
Reference isotope	19 K 41	0	stable	3/2+	+0.0711(7)		AB	2008Py02/1998Ke05	Mol Phys 106 1965 (2008)/CPL 292 403 (1998
Calcium	*Calculation of the quadrupole coupling constant of the 1D2 state of the Ca atom*								

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	20 Ca 39	0	0.86 s	3/2+	0.036(7)	calc efg	β-NMR	1999MaZI	RIKEN 32 79 (1999)
Reference isotope	20 Ca 41	0	$1.0x10^5$ y	7/2-	-0.0665(18)		AB	2008Py02	Mol Phys 106 1965 (2008)
	20 Ca 42	1525	1.1 ps	2+	-0.19(8)		CER	1973To07	NP A204 574 (1973)
Reference isotope	20 Ca 43	0	stable	7/2-	-0.0408(8)		AB	2008Py02	Mol Phys 106 1965 (2008)
	20 Ca 44	1157	3.0 ps	2+	-0.14(7)		CER	1973To07	NP A204 574 (1973)
	20 Ca 45	0	165 d	7/2-	+0.038(12)	[41Ca]	ABLFS	1983Ar25	ZP A314 303 (1983)
Scandium	*Calculation of the quadrupole coupling constants in ScF, ScCl and ScBr molecules*								
	21 Sc 41	0	0.59 s	7/2-	-0.145(3)	[45Sc]	β-NQR	2002Mi37	ZNat 57a 595 (2002)
	21 Sc 43	0	3.89 h	7/2-	-0.27(5)	[45Sc]	CLS	2011Av01	J Phys G38 025104 (2011)
		3123	473 ns	19/2-	0.199(14)	[45Sc]	TDPAD	1981Da06	PR C23 1612 (1981)
	21 Sc 44	0	3.89 h	2+	+0.10(5)	[45Sc]	CLS	2011Av01	J Phys G38 025104 (2011)
		68	153 ns	1-	0.21(2)	[45Sc]	TDPAC	1973Ha61	JCP 58 3339 (1973)
		271	58.6 h	6+	-0.19(2)	[45Sc]	CLS	2011Av01	J Phys G38 025104 (2011)
Reference isotope	21 Sc 45	0	stable	7/2-	-0.220(2)		MS	2008Py02	Mol Phys 106 1965 (2008)
		12.4	318 ms	3/2+	+0.28(5)	[45Sc]	CLS	2011Av01	J Phys G38 025104 (2011)
	21 Sc 46	0	83.81 d	4+	+0.119(6)	[45Sc]	AB	1962Pe21	PR 128 1740 (1962)
	21 Sc 47	0	3.42 d	7/2-	-0.22(3)	[45Sc]	AB	1966Co13	PR 141 1106 (1966)
Titanium	*Calculation of the quadrupole coupling constants in states of the Ti+ ion*								
	22 Ti 43	3066	560 ns	19/2-	0.33(8)	[47Ti]	TDPAD	1981Da06	PR C23 1612 (1981)
	22 Ti 45	0	3.09 h	7/2-	0.015(15)	[47Ti][49Ti]	AB	1966Co19	PR 148 1157 (1966)
	22 Ti 46	889	5.36 ps	2+	-0.21(6)		CER	1975To06	NP A250 381 (1975)
Reference isotope	22 Ti 47	0	stable	5/2-	+0.302(10)		AB	2008Py02	Mol Phys 106 1965 (2008)
	22 Ti 48	984	4.29 ps	2+	-0.177(8)		ES	1972Li12	PL B38 475 (1972)
Reference isotope	22 Ti 49	0	stable	7/2-	+0.247(11)		AB	2008Py02	Mol Phys 106 1965 (2008)
	22 Ti 50	1554	1.12 ps	2+	+0.08(16)		CER	1975To06	NP A250 381 (1975)
Vanadium	*Calculation of the quadrupole coupling constants in states of the V atom*								
	A. Calculated efg in 3d/4s excited states of the V atom								

Element	*Nucleus*	*E(level)*	*$T_{1/2}$*	*I^p*	*Q(b)*	*Ref. Std.*	*Method*	*NSR Keynumber*	*Journal Reference*
Reference isotope	23 V 50	0	$1.5x10^{17}$ y	6+	+0.21(4)		ABLDF	2008Py02/1979Er04	Mol Phys 106 1965 (2008)/PL B85 319 (1979)
	23 V 51	0	stable	7/2-	-0.043(5)	A	LRFS	1989Un01	ZP D11 259 (1989)
Chromium	*Calculation of the quadrupole coupling constants in states of the Cr atom*								
	24 Cr 50	783	9.2 ps	2+	-0.36(7)		CER	1975To06	NP A250 381 (1975)
	24 Cr 52	1434	0.707 ps	2+	-0.08(2)		ES	1989Ra17	JPJS 34 387 (1973)
Reference isotope	24 Cr 53	0	stable	3/2-	-0.15(5)		AB	2008Py02	Mol Phys 106 1965 (2008)
	24 Cr 54	835	8.0 ps	2+	-0.21(8)		CER	1975To06	NP A250 381 (1975)
Manganese	*Calculation of the quadrupole coupling constant for the 6D states of the Mn atom*								
	25 Mn 50	229	1.75 m	5+	+0.83(12)	[Mn55]	TLS	2010Ch15	PL B690 346 (2010)
	25 Mn 51	0	stable	5/2-	0.41(8)	[Mn55]	AB	1971Jo10	NP A166 306 (1971)
	25 Mn 52	0	5.80 d	6+	+0.50(7)	[Mn55]	NMR/ON	1970Ni11	Phca 50 259 (1970)
	25 Mn 53	0	$3.7x10^{6}$ y	7/2-	+0.17(3)	[Mn55]	TLS	2010Ch15	PL B690 346 (2010)
	25 Mn 54	0	312 d	3+	+0.37(3)	[Mn55]	TLS	2010Ch15	PL B690 346 (2010)
Reference isotope	25 Mn 55	0	stable	5/2-	+0.330(10)		AB	2008Py02	Mol Phys 106 1965 (2008)
	25 Mn 56	0	2.58 h	3+	+0.48(15)	[Mn55]	TLS	2010Ch15	PL B690 346 (2010)
Iron	*Efg calculations in many Fe compounds*								
	26 Fe 54	1408	0.80 ps	2+	-0.05(14)		CER	1981Le02	PR C23 244 (1981)
		6527	367 ns	10+	+0.30(4)	[57Fe 14 keV]	TDPAD/TF	1984Ha07	NP A414 316 (1984)
	26 Fe 56	847	6.9 ps	2+	-0.23(3)		CER	1971Th14	PR C4 1699 (1971)
Reference isotope	26 Fe 57	14	98 ns	3/2-	+0.160(8)		ME	2008Py02/1995Du17	Mol Phys 106 1965 (2008)/PRL 75 3545 (1995)
	26 Fe 58	811	6.7 ps	2+	-0.27(5)		CER	1981Le02	PR C23 244 (1981)
	26 Fe 61	861	245 ns	(9/2+)	0.44(6)	[57Fe 14 keV]	TDPAD	2007Ve05	PR C75 051302 (2007)
Cobalt	*Calculation of the quadrupole coupling constants in states of the Co atom*								
	27 Co 56	0	78.8 d	4+	+0.25(9)	[59Co]	MAPON	1988Ba87	PR B37 4911 (1988)
	27 Co 57	0	271 d	7/2-	+0.54(10)	[59Co]	NMR/ON	1972Ni01	Phca 57 1 (1972)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	27 Co 58	0	70.8 d	2+	+0.23(3)	[59Co]	NMR/ON	1972Ni01	Phca 57 1 (1972)
Reference isotope	27 Co 59	0	stable	7/2-	+0.42(3)		AB	2008Py02	Mol Phys 106 1965 (2008)
	27 Co 60	0	5.271 y	5+	+0.46(6)	[59Co]	NMR/ON	1972Ni01	Phca 57 1 (1972)
Nickel	*Calculation of the quadrupole coupling constants in states of the Ni atom*								
	28 Ni 58	1454	0.644 ps	2+	-0.10(6)		CER	1974Le13	NP A223 563 (1974)
	28 Ni 60	1332	0.713 ps	2+	-0.10(2)		ES	1972Li12	PL 38B 475 (1972)
Reference isotope	28 Ni 61	0	stable	3/2-	+0.162(15)		AB	2008Py02/1968Ch10	Mol Phys 106 1965 (2008)/PR 170 136 (1968)
		67	5.34 ns	5/2-	-0.20(3)	[61Ni]	ME	1971Go31	ZNat 26a 1931 (1971)
	28 Ni 62	1173	1.43 ps	2+	+0.05(12)		CER	1974Le13	NP A223 563 (1974)
	28 Ni 64	1346	0.85 ps	2+	+0.4(2)		CER	1971ChZK	BAPS 16 625 (1971)
Copper	*Muonic atom X-ray hyperfine structure*								
	29 Cu 58	0	3.2 s	1+	-0.16(3)	[65Cu]	CLS	2011Vi03	PL B703 34 (2011)
	29 Cu 59	0	81.5 s	3/2-	-0.20(2)	[65Cu]	CLS	2011Vi03	PL B703 34 (2011)
	29 Cu 60	0	23.4 m	2+	+0.121(13)	[65Cu]	CLS	2011Vi03	PL B703 34 (2011)
	29 Cu 61	0	3.41 h	3/2-	-0.221(10)	[65Cu]	CLS	2011Vi03	PL B703 34 (2011)
	29 Cu 62	0	9.73 m	1+	-0.022(4)	[65Cu]	CLS	2011Vi03	PL B703 34 (2011)
Reference isotope	29 Cu 63	0	stable	3/2-	-0.220(15)		Mu-X	2008Py02/1982Ef01	Mol Phys 106 1965 (2008)/ZP A309 77 (1982)
	29 Cu 64	0	12.7 h	1+	+0.075(9)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
Reference isotope	29 Cu 65	0	stable	3/2-	-0.204(14)		Mu-X	2008Py02/1982Ef01	Mol Phys 106 1965 (2008)/ZP A309 77 (1982)
	29 Cu 66	0	5.1 m	1+	+0.059(14)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
		1154	0.60 ms	6-	(+)0.195(13)	[63Cu,65Cu]	TDPAD	2011Lo01	PL B694 316 (2011)
	29 Cu 67	0	61.83 h	3/2-	-0.182(8)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 68	0	31.1 s	1+	-0.086(14)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
		637	3.75 m	6-	-0.46(2)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 69	0	2.85 m	3/2-	-0.154(17)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 70	0	44.5 s	6-	-0.298(15)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
		101	33 s	3-	-0.14(4)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
		242	6.6 s	1+	-0.12(3)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 71	0	19.5 s	3/2-	-0.200(17)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 72	0	6.62 s	2-	+0.08(2)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 73	0	4.2 s	3/2-	-0.210(10)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 74	0	1.63 s	2-	+0.27(3)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
	29 Cu 75	0	1.22 s	5/2-	-0.281(17)	[65Cu]	CLS	2010Vi07	PR C82 064311 (2010)
Zinc	*Calculation of the quadrupole coupling constants in states of the Zn atom*								
	30 Zn 63	0	38.1 m	3/2-	+0.29(3)	[67Zn]	OD	1969La05	PR 177 1606 (1969)
	30 Zn 64	992	1.85 ps	2+	-0.14(2)		ES	1981Ko06/1976Ne06	JPhys G7 L63 (1981)/NP A263 249 (1976)
	30 Zn 65	0	244.1 d	5/2-	-0.023(2)	[67Zn]	OD	1964By01	PR 134 A47 (1964)
	30 Zn 66	1039	1.56 ps	2+	-0.081(13)		ES	1981Ko06/1976Ne06	JPhys G7 L63 (1981)/NP A263 249 (1976)
Reference isotope	30 Zn 67	0	stable	5/2-	+0.150(15)		AB	2008Py02/1969La05	Mol Phys 106 1965 (2008)/PR 177 1606 (1969)
		604	333 ns	9/2+	+0.54(5)	[67Zn]	NQR	1976Ch37/1979Ka44	ZP B24 177 (1976)/Sol St Comm 29 375 (1979)
	30 Zn 68	1077	1.61 ps	2+	-0.106(16)		ES	1981Ko06/1976Ne06	JPhys G7 L63 (1981)/NP A263 249 (1976)
	30 Zn 69	439	13.72 h	9/2+	-0.45(7)	[67Zn]	NO/S	1983Oe01	ZP A310 233 (1983)
	30 Zn 70	885	3.2 ps	2+	-0.24(3)		ES	1981Ko06/1976Ne06	JPhys G7 L63 (1981)/NP A263 249 (1976)
Gallium	*Calculation of the quadrupole coupling constants in GaF, GaCl and GaBr molecules*								
	31 Ga 63	0	32.4 s	3/2-	+0.212(4)	[69Ga]	CLS	2012Pr11	PR C85 034334 (2012)
	31 Ga 66	1464	57 ns	7-	+0.78(4)	[69Ga][71Ga]	TDPAD	1985Ra33	HFI 26 855 (1985)/BAPS 24 632 (1979)
	31 Ga 67	0	78.3 h	3/2-	+0.197(2)	[69Ga][71Ga]	AB	1968Eh02/2001Py02	PR 176 25 (1968)/Mol Phys 99 1617 (2001)
	31 Ga 68	0	68.1 m	1+	-0.0277(14)	[69Ga][71Ga]	AB	1972St38	PR A6 1702 (1972)
		1230	64 ns	7-	+0.72(2)	[69Ga][71Ga]	TDPAD	1985Ra33	HFI 26 855 (1985)/BAPS 24 632 (1979)
Reference isotope	31 Ga 69	0	stable	3/2-	+0.171(2)		MS	2008Py02	Mol Phys 106 1965 (2008)
	31 Ga 70	0	21.1 m	1+	+0.105(7)	[69Ga]	CLS	2012Pr11	PR C85 034334 (2012)
Reference isotope	31 Ga 71	0	stable	3/2-	+0.107(1)		MS	2008Py02	Mol Phys 106 1965 (2008)
	31 Ga 72	0	14.1 h	3-	+0.530(6)	[69Ga][71Ga]	AB	1968Eh02/2001Py02	PR 176 25 (1968)/Mol Phys 99 1617 (2001)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	31 Ga 73	0	4.86 h	3/2-	+0.209(2)	[71Ga]	CLS	2010Ch16	PRL 104 252502 (2010)
	31 Ga 74	0	8.12 m	3- or 4-	+0.55(4) or +0.60(4)	[71Ga]	LRS	2011Ma45	PR C84 024303 (2011)
	31 Ga 75	0	126 s	3/2-	-0.285(17)	[71Ga]	CLS	2010Ch16	PRL 104 252502 (2010)
	31 Ga 76	0	32.6 s	(2+)	+0.33(2)	[71Ga]	LRS	2011Ma45	PR C84 024303 (2011)
	31 Ga 77	0	13.2 s	3/2-	-0.208(13)	[71Ga]	CLS	2010Ch16	PRL 104 252502 (2010)
	31 Ga 78	0	5.1 s	(2+)	+0.33(2)	[71Ga]	LRS	2011Ma45	PR C84 024303 (2011)
	31 Ga 79	0	2.85 s	3/2-	+0.158(10)	[71Ga]	CLS	2010Ch16	PRL 104 252502 (2010)
	31 Ga 80	0?	0.2 - 1.7 s	(3-)	+0.38(2)	[71Ga]	CLS	2010Ch50	PR C82 051302(R) (2010)
		0?	0.2 - 1.7 s	(6-)	+0.48(3)	[71Ga]	CLS	2010Ch50	PR C82 051302(R) (2010)
	31 Ga 81	0	1.22 s	5/2-	-0.048(8)	[71Ga]	CLS	2010Ch16	PRL 104 252502 (2010)
Germanium	*Calculation of the quadrupole coupling constants in GeO, GeS molecules*								
	A. Efg of Ge in Zn single crystal								
	32 Ge 67	752	146 ns	9/2+	0.92(9)	[73Ge]	TDPAD	1993Co17/1981Vi05	HFI 80 1321 (1993)/HFI 10 1243 (1981
	32 Ge 69	0	39.0 h	5/2-	+0.027(5)	[73Ge]	AB	1970Ol02	PR C2 228 (1970)
		398	2.8 ms	9/2+	0.75(8)	[73Ge]	TDPAD	1993Co17/1981Vi05	HFI 80 1321 (1993)/HFI 10 1243 (1981
	32 Ge 70	1039	1.32 ps	2+	+0.03(6)		CER	1980Le16/2000To12	PR C22 1530 (1980)/Eur Phys J A9 353 (2000
	32 Ge 71	175	84 ns	5/2+	0.18(4)	A	TDPAD	1993Co17/1981Vi05	HFI 80 1321 (1993)/HFI 10 1243 (1981
		199	20.2 ms	9/2+	0.34(5)		QIR	1975Ri03/1976Br41	PS 11 228 (1975)/HFI 2 265 (1976
	32 Ge 72	834	3.29 ps	2+	-0.13(6)		CER	1980Le16/2000To12	PR C22 1530 (1980)/Eur Phys J A9 353 (2000
Reference isotope	32 Ge 73	0	stable	9/2+	-0.196(1)		MS	2008Py02/1999Ke17	Mol Phys 106 1965 (2008)/Mol Phys 96 275 (1999
		13	2.86 ms	5/2+	0.70(8)	A	TDPAC	1993Co17/1981Vi05	HFI 80 1321 (1993)/HFI 10 1243 (1981
	32 Ge 74	596	12.5 ps	2+	-0.19(2)		CER	2000To12	Eur Phys J A9 353 (2000)
		1204	4.9 ps	2+	-0.26(6)		CER	2000To12	Eur Phys J A9 353 (2000)
	32 Ge 76	563	18.6 ps	2+	-0.19(6)		CER	1980Le16/2000To12	PR C22 1530 (1980)/Eur Phys J A9 353 (2000
Arsenic	*Muonic atom X-ray hyperfine structure*								
	33 As 70	0	53 m	4+	+0.09(2)	[75As]	AB	1980Ho02	ZP A294 1 (1980)
	33 As 71	0	65.3 h	5/2-	-0.021(6)	[75As]	NO/S	1988Wh03	HFI 43 205 (1988)
	33 As 72	0	26 h	2-	-0.08(2)	[75As]	AB	1980Ho02	ZP A294 1 (1980)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	33 As 73	66	5.0 ns	5/2-	+0.356(12)	[75As]	TDPAC	1992Sc21	ZP A343 279 (1992)
Reference isotope	33 As 75	0	stable	3/2-	+0.314(6)		Mu-X	2008Py02/1982Ef01	Mol Phys 106 1965 (2008)/ZP A309 77 (1982)
Selenium	*Calculation of the quadrupole coupling constant in Se metal*								
	34 Se 74	635	7.08 ps	2+	-0.36(7)		CER	1978Le22	PR C18 2801 (1978)
	34 Se 75	0	118.5 d	5/2+	1.1(2)	[77Se]	MA	1955Aa06	PR 98 1224 (1955)
	34 Se 76	559	12.3 ps	2+	-0.34(7)		CER	1977Le11	NP A284 123 (1977)
Reference isotope	34 Se 77	250	9.56 ns	5/2-	+0.76(5)		TDPAC	2008Py02/1983Un02	Mol Phys 106 1965 (2008)/HFI 14 119 (1983)
	34 Se 78	614	8.6 ps	2+	-0.26(9)		CER	1977Le11	NP A284 123 (1977)
	34 Se 79	0	<6.5x10^4 y	7/2+	+0.8(2)	[77Se]	MA	1989Ra17	ADNDT 42 189 (1989)/OSpk 12 163 (1962)
	34 Se 80	666	8.0 ps	2+	-0.31(7)		CER	1977Le11	NP A284 123 (1977)
	34 Se 82	654	11.3 ps	2+	-0.22(7)		CER	1977Le11	NP A284 123 (1977)
Bromine	*Calculation of the quadrupole coupling constants in states of the Br atom and in HBr*								
	35 Br 76	0	16.1 h	1-	+0.255(4)	[79Br]	AB	1960Li11	PR 119 1053 (1960)
	35 Br 77	0	57 h	3/2-	+0.51(2)	m	MAPON	1998Se09	PRL 80 5289 (1998)
Reference isotope	35 Br 79	0	stable	3/2-	+0.313(3)		AB/MS	2008Py02/2001Bi17	Mol Phys 106 1965 (2008)/PR A64 052507 (2001
	35 Br 80	0	17.6 m	1+	+0.185(3)	[79Br]	AB	1964Wh05	PR 136 B584 (1964)
		37	7.4 ns	2-	0.164(6)	[79Br]	AB	1978Ta24	HP Ac 51 755 (1978)
		86	4.42 h	5-	+0.710(10)	[79Br]	AB	1964Wh05	PR 136 B584 (1964)
Reference isotope	35 Br 81	0	stable	3/2-	+0.262(3)	[79Br]	AB/MS	2008Py02/2001Bi17	Mol Phys 106 1965 (2008)/PR A64 052507 (2001
	35 Br 82	0	35.3 h	5-	+0.707(10)	[79Br]	AB	1959Ga12	PR 116 393 (1959)
Krypton	*Calculation of the quadrupole coupling constants in KrH+*								
	36 Kr 75	0	4.3 m	5/2+	+1.137(13)	[83Kr]	CFBLS	1995Ke04	NP A586 219 (1995)
	36 Kr 77	0	74.4 m	5/2+	+0.948(10)	[83Kr]	CFBLS	1995Ke04	NP A586 219 (1995)
	36 Kr 79	130	50 s	7/2+	+0.404(5)	[83Kr]	CFBLS	1995Ke04	NP A586 219 (1995)
		147	77.7 ns	5/2-	+0.45(3)	[83Kr]	TDPAD	1978HaXP	ARHMI 50 (1977)
	36 Kr 81	0	2.3 x 10*5 y	7/2+	+0.644(4)	[83Kr]	LRFS	1993Ca41	PR A47 1148 (1993)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Reference isotope	36 Kr 83	0	stable	9/2+	+0.259(1)		MS	2008Py02	Mol Phys 106 1965 (2008)
		9	147 ns	7/2+	+0.507(3)	[83Kr]	ME	1977Ho33	JCP 66 2627 (1977)
	36 Kr 84	3236	1.84 ms	8+	+0.36(4)	[83Kr]	LEMS	2006Sc22	PR C74 034309 (2006)
	36 Kr 85	0	10.76 y	9/2+	+0.443(3)	[83Kr]	LRFS	1993Ca41	PR A47 1148 (1993)
	36 Kr 87	0	76.3 m	5/2+	-0.300(3)	[83Kr]	CFBLS	1995Ke04	NP A586 219 (1995)
	36 Kr 89	0	3.15 m	3/2+	+0.166(2)	[83Kr]	CFBLS	1995Ke04	NP A586 219 (1995)
	36 Kr 91	0	8.57 s	5/2+	+0.303(6)	[83Kr]	CFBLS	1995Ke04	NP A586 219 (1995)
	36 Kr 94	666	8.7 ps	2+	-0.5(3)		CER	2012 Al03	PRL 108 062701 (2012)
Rubidium	*Calculation of the quadrupole coupling constants in RbF*								
	37 Rb 76	0	39 s	1(-)	+0.46(20)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 77	0	3.8 m	3/2-	+0.84(17)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 78	103	6.3 m	4-	+0.99(20)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 79	0	23 m	5/2+	-0.12(4)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 80	0	30 s	1+	+0.42(8)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 81	0	4.58 h	3/2-	+0.48(10)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
		86	32 m	9/2+	-0.90(19)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 82	0	1.25 m	1+	+0.23(10)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
		~100	6.47 h	5-	+1.22(27)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 83	0	86.2 d	5/2-	+0.24(5)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 84	0	33 d	2-	-0.02(4)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
		465	20.4 m	6-	+0.70(36)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
Reference isotope	37 Rb 85	0	stable	5/2-	+0.276(1)		MS	2008Py02	Mol Phys 106 1965 (2008)
		514	1.02 ms	9/2+	-0.9(3)	[85Rb]	OPD	1991Ma21	PRL 66 1681 (1991)
	37 Rb 86	0	18.65 d	2-	+0.23(6)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
		556	1.02 m	(6-)	+0.45(14)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
Reference isotope	37 Rb 87	0	4.9 10*10y	3/2-	+0.1335(5)		MS	2008Py02	Mol Phys 106 1965 (2008)
	37 Rb 88	0	17.7 m	2-	-0.01(11)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 89	0	15.2 m	3/2-	+0.17(3)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	37 Rb 90	107	4.26 m	3-	+0.25(7)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 91	0	58 s	3/2(-)	+0.19(5)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 93	0	5.85 s	5/2-	+0.21(6)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 94	0	2.73 s	3(-)	+0.20(7)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 95	0	0.38 s	5/2-	+0.26(9)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 96	0	0.20 s	2+	+0.30(9)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
	37 Rb 97	0	0.17 s	3/2-	+0.70)15)	[85Rb]	ABLS	1981Th04	PR C23 2720 (1981)
Strontium	*Calculation of the quadrupole coupling constants in the 4d 2D5/2 and 5P3/2 states of the Sr+ ion*								
	38 Sr 77	0	9 s	5/2+	+1.27(5)	[87Sr]	CFBLS	1992Li11	PR C46 797 (1992
	38 Sr 79	0	2.25 m	(3/2-)	+0.661(6)	[87Sr]	CFBLS	1990Bu12	PR C41 2883 (1990)
	38 Sr 83	0	32.4 h	7/2+	+0.708(11)	[87Sr]	CFBLS	1990Bu12	PR C41 2883 (1990)
	38 Sr 85	0	64.8 d	9/2+	+0.263(14)	[87Sr]	CFBLS	1990Bu12	PR C41 2883 (1990)
Reference isotope	38 Sr 87	0	stable	9/2+	+0.305(2)		AB	2008Py02/2006Sa21	Mol Phys 106 1965 (2008)/PR A73 062501 (2006
	38 Sr 89	0	50.5 d	5/2+	-0.253(8)	[87Sr]	CFBLS	1990Bu12	PR C41 2883 (1990)
	38 Sr 91	0	9.5 h	5/2+	+0.042(10)	[87Sr]	CFBLS	1990Bu12	PR C41 2883 (1990)
	38 Sr 93	0	7.4 m	5/2+	+0.240(10)	[87Sr]	CFBLS	1990Bu12	PR C41 2883 (1990)
	38 Sr 99	0	0.269 s	3/2+	+0.76(4)	[87Sr]	CFBLS	1991Li05	PL B256 141 (1991)
Yttrium	*Calculation of the quadrupole coupling constants in the 4d5s2 2D states of the Y atom*								
	39 Y 87	381	13.4 h	9/2+	-0.50(6)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
	39 Y 88	0	106 d	4-	+0.16(3)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
		675	14 ms	8+	+0.06(6)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
	39 Y 89	909	16.1 s	9/2+	-0.43(6)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
Reference isotope	39 Y 90	0	64.1 h	2-	-0.125(11)		AB	2008Py02/1998Bi20	Mol Phys 106 1965 (2008)/PR A58 4401 (1998
		682	3.19 h	7+	-0.65(8)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
	39 Y 92	0	3.54 h	2-	0.00(2)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
	39 Y 93	758	0.82 s	9/2+	-0.64(8)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	39 Y 94	0	18.7 m	2-	-0.03(3)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
	39 Y 96	1140	9.6 s	8+	-0.98(11)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
	39 Y 97	668	1.17 s	9/2+	-0.76(8)	[90Y]	CLS	2007Ch07	PL B645 133 (2007)
		3522	142 ms	(27/2)	-1.21(14)	[90Y]	CLS	2007Bi14	PL B645 330 (2007)
	39 Y 98	410	2.0 s	4 or 5	+1.7(2) or +1.8(2)	[90Y]	CLS	2007Bi14	PL B645 330 (2007)
	39 Y 99	0	1.47 s	5/2+	+1.55(17)	[90Y]	CLS	2007Bi14	PL B645 330 (2007)
	39 Y 100	(143)	0.94 s	4	+1.85(20)	[90Y]	CLS	2007Bi14/2010Ba31	PL B645 330 (2007)/J Phys G37 105103 (2010
	39 Y 101	0	0.45 s	5/2+	+1.53(17)	[90Y]	CLS	2007Bi14	PL B645 330 (2007)
	39 Y 102	0 + x	0.3 s	2 or 3	+1.17(13) or +1.36(16)	[90Y]	CLS	2007Bi14	PL B645 330 (2007)
Zirconium	*Calculation of the quadrupole coupling constants in the ZrO and ZrS molecules*								
	40 Zr 87	0	1.68 h	9/2+	+0.42(5)	[91Zr]	CLS	2003Th03	J Phys G29 2247 (2003)
	40 Zr 88	2889	1.32 ms	8+	+0.44(3)	[91Zr]	TDPAD/TFLD	1985Ra09/1986Be06	PRL 54 2592 (1985)/PR C33 1517 (1986
	40 Zr 89	0	78.4 h	9/2+	+0.28(10)	[91Zr]	CLS	2003Th03	J Phys G29 2247 (2003)
	40 Zr 90	3589	134 ns	8+	-0.44(3)	[91Zr]	TDPAD/TFLD	1985Ra09/1986Be06	PRL 54 2592 (1985)/PR C33 1517 (1986
Reference isotope	40 Zr 91	0	stable	5/2+	-0.176(3)		MS	2008Py02/2000Ke03	Mol Phys 106 1965 (2008)/CPL 318 222 (2000
		3167	3.6 ms	21/2+	0.71(4)	[91Zr]	TDPAD	1985Ra09	PRL 54 2592 (1985)
	40 Zr 95	0	64.0 d	5/2+	+0.22(2)	[5- 90mZr calc]	MAPON	1998Se01	PRL 80 924 (1998)
	40 Zr 101	0	2.4s	3/2+	+0.81(6)	[91Zr]	CLS	2002Ca37	PRL 89 082501 (2002)
Niobium	*Muonic atom X-ray hyperfine structure*								
	41 Nb 90	0	14.6 h	8+	+0.01(4)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)
		125	18.8 s	4-	-0.26(4)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)
	41 Nb 91	0	680 y	9/2+	-0.25(3)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)
	41 Nb 92	0	3.5×10^7 y	7+	-0.35(3)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)
Reference isotope	41 Nb 93	0	stable	9/2+	-0.32(2)		Mu-X	2008Py02/1973Po15	Mol Phys 106 1965 (2008)/NP A217 573 (1973
	41 Nb 99	0	15 s	9/2+	-0.41(14)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)
	41 Nb 101	0	7.1 s	5/2+	+1.05(7)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)

Element	*Nucleus*	*E(level)*	$T_{1/2}$	I^p	*Q(b)*	*Ref. Std.*	*Method*	*NSR Keynumber*	*Journal Reference*
	41 Nb 103	0	1.5 s	5/2+	+1.08(9)	[93Nb]	CLS	2009Ch25	PRL 102 222501 (2009)
Molybdenum	*Estimation of the quadrupole coupling constant in states of the Mo atom*								
	A. Normalised to Q of 92Mo 2760 keV state estimated from B(E2)								
	42 Mo 90	2875	1.1 ms	8+	0.61(3)	A	TDPAD	1985Ra09	PRL 54 2592 (1985)
	42 Mo 92	2760	190 ns	8+	(-)0.36		not measured	1991Ha04	PR C43 2140 (1991)
	42 Mo 94	871	2.9 ps	2+	-0.13(8) or +0.01(8)		CER	1976Pa13	PR C14 835 (1976)
		2956	98 ns	8+	0.50(1)	A	TDPAD	1985Ra09	PRL 54 2592 (1985)
Reference isotope	42 Mo 95	0	stable	5/2+	-0.022(1))		AB	2008Py02/1982BuZE	Mol Phys 106 1965 (2008)/STMP vol 96
	42 Mo 96	778	3.7 ps	2+	-0.20(8) or +0.04(8)		CER	1976Pa13	PR C14 835 (1976)
Reference isotope	42 Mo 97	0	stable	5/2+	+0.255(13)		AB	2008Py02/1982BuZE	Mol Phys 106 1965 (2008)/STMP vol 96
	42 Mo 98	787	3.5 ps	2+	-0.26(9)		CER	1979Pa11	PR C20 1201 (1979)
	42 Mo 100	536	10.3 ps	2+	-0.25(7)		CER	2011Wr01	Acta Phys Pol B42 803 (2011)
Technetium	*Estimation of the quadrupole coupling constant in states of the Tc atom*								
Reference isotope	43 Tc 99	0	2.1x10*5y	9/2+	-0.129(6)		AB	2008Py02/1982BuZE	Mol Phys 106 1965 (2008)/STMP vol 96
Ruthenium	*Calculated hyperfine structure in the 5F multiplet of the Ru atom*								
	44 Ru 93	2082	2.4 ms	21/2+	+0.04(1)	[99Ru]	TDPAD	1991Ha04	PR C43 2140 (1991)
	44 Ru 96	833	2.7 ps	2+	-0.15(8)		CER	1998Hi01	PR C57 (1998)
	44 Ru 98	653	5.9 ps	2+	-0.21(8) or -0.01(9)		CER	1998Hi01	PR C57 (1998)
Reference isotope	44 Ru 99	0	stable	5/2+	+0.079(4)		AB	2008Py02/1982BuZE	Mol Phys 106 1965 (2008)/STMP vol 96
		90	20.5 ns	3/2+	+0.231(13)	[99Ru]	ME	1976Ki02	PR C13 1132 (1976)
	44 Ru 100	540	12 ps	2+	-0.44(4) or -0.27(7)		CER	1998Hi01	PR C57 (1998)
Reference isotope	44 Ru 101	0	stable	5/2+	+0.46(2)		AB	2008Py02/1982BuZE	Mol Phys 106 1965 (2008)/STMP vol 96
	44 Ru 102	475	18 ps	2+	-0.63(4) or -0.34(3)		CER	1998Hi01	PR C57 (1998)
	44 Ru 103	0	39.4 d	3/2+	+0.62(2)	[99Ru 90 keV]	NO/S	1986Gr26	HFI 30 355 (1986)
	44 Ru 104	358	58 ps	2+	-0.78(7) or -0.20(12)		CER	1998Hi01	PR C57 (1998)
Rhodium	*Calculation of the quadrupole coupling constants in Rh intermettalic compounds*								

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Reference isotope	45 Rh 100	74	214 ns	(2)+	0.153 (18)		PAC	2008Py02/1996Bl15	Mol Phys 106 1965 (2008)/HFI 97/98 3 (1996)
	45 Rh 103	295	6.7 ps	3/2-	-0.3(2)		CERP	1976Ge19	Z Phys A 279 183 (1976)
		357	73 ps	5/2-	-0.4(2)		CERP	1976Ge19	Z Phys A 279 183 (1976)
Palladium	*Muonic atom X-ray hyperfine structure*								
	46 Pd 102	556	11.3 ps	2+	-0.20(15)		CERP	1977Fa11	NIM 146 329 (1977)
	46 Pd 104	556	9.7 ps	2+	-0.46(11)		CERP	1977Fa11	NIM 146 329 (1977)
Reference isotope	46 Pd 105	0	stable	5/2+	+0.660(11)		Mu-X	2008Py02/1978Vu01	Mol Phys 106 1965 (2008)/NP A294 273 (1978)
	46 Pd 106	512	12 ps	2+	-0.51(7)		ES	1973Ho05	PRL 30 388 (1973)
	46 Pd 108	434	23 ps	2+	-0.58(4)		ES	1978Ar07	J Phys G4 961 (1978)
	46 Pd 110	374	46 ps	2+	-0.47(3)		ES	1976Li19	PR C14 952 (1976)
Silver	*Calculation of the quadrupole coupling constant in the Ag atom*								
	47 Ag 101	0	11.4 m	9/2+	+0.35(5)	[110Ag 118 keV]	CLS	1989Di12	NP A503 331 (1989)
	47 Ag 103	0	1.10 h	7/2+	+0.84(9)	[110Ag 118 keV]	CLS	1989Di12	NP A503 331 (1989)
	47 Ag 104	0	69 m	5+	+1.06(11)	[110Ag 118 keV]	CLS	1989Di12	NP A503 331 (1989)
	47 Ag 105	25	7.2 m	7/2+	+0.85(11)	[110Ag 118 keV]	CLS	1989Di12	NP A503 331 (1989)
	47 Ag 106	90	8.5 d	6+	1.11(11)	[110Ag 118 keV]	CLS	1989Di12	NP A503 331 (1989)
	47 Ag 107	93	44.3 s	7/2+	0.98(11)	[110Ag 118 keV]	LMR	1986Be01/1984Be53	PR C33 390 (1986)/PR C30 2028 (1984)
	47 Ag 108	110	418 y	6+	+1.32(7)	[110Ag 118 keV]	O	1984Be53	PR C30 2028 (1984)
	47 Ag 109	88	39.8 s	7/2+	(+)1.02(12)	[110Ag 118 keV]	LMR	1986Be01/1984Be53	PR C33 390 (1986)/PR C30 2028 (1984)
		311	5.9 ps	3/2-	-0.7(3)		CER	1972Th16	PL 41B 585 (1972)
		415	35 ps	5/2-	-0.3(3)		CER	1972Th16	PL 41B 585 (1972)
	47 Ag 110	0	24.4 s	1+	0.24(12)		QIR	1981Do17	HFI 10 727 (1981)
Reference isomer		118	252 d	6+	+1.44(10)		O	1984Be53	PR C30 2028 (1984)
Cadmium	*There is no adopted reference efg for Cd.*								
	A. Efg in 2P5/2 state of the Cd ion								(PRL 110 192501 (2013)
	B. For the efg used to obtain Q(109Cd)/Q(109Cd 463 keV) see 1969La06/1978Sp09								PR 177 1615 (1969)/HFI 4 229 (1978)
	48 Cd 102	2718	56 ns	8+	0.76(9)	[efg Cd in Cd]	TDPAD	1992Al17	Z Phys A344 1 (1992)
	48 Cd 103	0	7.3 m	5/2+	-0.7(6)	A	CLS	1987Bu01	NP A462 305 (1987)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	48 Cd 105	0	56 m	5/2+	+0.37(4)	A	OD	1969La06	PR 177 1615 (1969)
		2517	4.5 ms	21/2+	+1.02(10)	B	TDPAC	1978Sp09	HFI 4 229 (1978)
	48 Cd 106	633	7.3 ps	2+	-0.28(8)		CER	1976Es02	NP A274 237 (1977)
	48 Cd 107	0	6.50 h	5/2+	+0.60(2)	A	CLS	2013Yo02	PRL 110 192501 (2013)
		846	70 ns	11/2-	-0.94(10)	B	TDPAC	1978Sp09	HFI 4 229 (1978)
		2679	56 ns	21/2+	+1.05(11)	B	TDPAC	1978Sp09	HFI 4 229 (1978)
	48 Cd 108	633	6.8 ps	2+	-0.45(8)		CER	1976Es02	NP A274 237 (1977)
	48 Cd 109	0	453 d	5/2+	+0.60(3)	A	CLS	2013Yo02	PRL 110 192501 (2013)
		463	10.9 ms	11/2-	[-0.92(9)]	systematic	not measured	1978Sp09	HFI 4 229 (1978)
						extrapolation			
	48 Cd 110	658	5.0 ps	2+	-0.40(4)		ES	1977Gi13	J Phys G3 L169 (1977)
	48 Cd 111	245	84 ns	5/2+	+0.74(7)	B	TDPAC	1978Sp09	HFI 4 229 (1978)
		396	48.6 m	11/2-	-0.75(3)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 112	617	6.2 ps	2+	-0.37(4)		ES	1977Gi13	J Phys G3 L169 (1977)
	48 Cd 113	264	14 y	11/2-	-0.61(3)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 114	558	9.0 ps	2+	-0.348(12)		ES	1981Ko06	J Phys G7 L63 (1981)
	48 Cd 115	173	44.8 d	11/2-	-0.48(2)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 116	514	15 ps	2+	-0.42(4)		ES	1977Gi13	J Phys G3 L169 (1977)
	48 Cd 117	136	3.36 h	11/2-	-0.320(13)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 119	147	2.20 m	11/2-	-0.135(6)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 121	215	8.3 s	11/2-	+0.009(6)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 123	317	1.82 s	11/2-	+0.135(7)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 125	0	0.68 s	3/2+	+0.209(10)	A	CLS	2013Yo02	PRL 110 192501 (2013)
		x	0.48 s	11/2-	+0.269(13)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 127	0	0.37 s	3/2+	+0.239(11)	A	CLS	2013Yo02	PRL 110 192501 (2013)
		x	-	11/2-	+0.34(2)	A	CLS	2013Yo02	PRL 110 192501 (2013)
	48 Cd 129	0	0.27 s	3/2+	+0.132(9)	A	CLS	2013Yo02	PRL 110 192501 (2013)
		x	-	11/2-	+0.57(3)	A	CLS	2013Yo02	PRL 110 192501 (2013)
Indium	*Calculated electric quadrupole interactions in indium halides*								
	49 In 104	0	1.7 m	5+	+0.63(10)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	49 In 105	0	5.07 m	9/2+	+0.79(5)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 106	0	6.2 m	7+	+0.92(6)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 107	0	32.4 min	9/2+	+0.77(5)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 108	0	58 m	7+	+0.955(7)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		29	40 m	2+	'+0.444(13)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 109	0	4.2 h	9/2+	+0.80(3)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 110	0*	69.1 m	2+	+0.32(2)	[113In]	AB	1968CaZX	Th 68 Cass.
		0*	4.9 h	7+	+0.95(2)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 111	0	2.83 d	9/2+	+0.76(2)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 112	0*	14.4 m	1+	+0.082(5)	[113In]	AB	1968CaZX	Th 68 Cass.
		157	20.9 m	4+	+0.679(10)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		351	0.69 ms	7+	1.00(3)	[117In 660 keV]	TDPAD	1993Io02	HFI 77 111 (1993)
		614	2.82 ms	8-	0.092(3)	[117In 660 keV]	TDPAD	1993Io02	HFI 77 111 (1993)
Reference isotope	49 In 113	0	stable	9/2+	0.759(8)		AB/MS	2008Py02	Mol Phys 106 1965 (2008)
	49 In 114	190	49.5 d	5+	+0.703(11)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
Reference isotope	49 In 115	0	4.4x10*14 y	9/2+	0.770(8)		AB/MS	2008Py02	Mol Phys 106 1965 (2008)
		829	5.78 ns	3/2+	-0.59(4)	[117In 660 keV]	TDPAC	1973Ha61	JCP 58 3339 (1973)
	49 In 116	0	14.1 s	1+	0.11(1)	[115In]	NSLR	1982Gr17	NP A386 56 (1982)
		127	54.2 m	5+	+0.762(11)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		290	2.18 s	8-	+0.295(9)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 117	0	42 m	9/2+	+0.788(10)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		660	53.6 ns	3/2+	-0.57(4)	[115In]	TDPAC	1972Ra27	PRL 28 54 (1972)
	49 In 118	~60	4.45 m	5+	+0.757(8)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		~200	8.5 s	8-	+0.419(7)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 119	0	2.4 m	9/2+	+0.812(7)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		654	130 ns	3/2+	0.59(4)	[115In]	TDPAC	1980HaYW	ARHMI 1979 75 (1979)
	49 In 120	(0)	44.4 s	5+	+0.770(16)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		(0)	47.3 s	8-	+0.504(10)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 121	0	23.1 s	9/2+	+0.774(10)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 122	0+x	9.2 s	5+	+0.77(2)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		~220	10.5s	8-	+0.56(2)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	49 In 123	0	6.68 s	9/2+	+0.720(9)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 124	0	3.09 s	3+	+0.58(7)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		190	3.7 s	8-	+0.631(9)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 125	0	2.50 s	9/2+	+0.68(3)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 126	(0)	1.60 s	3+	+0.47(5)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
		(0)	1.64 s	8-	+0.649(11)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
	49 In 127	0	1.22 s	9/2+	+0.56(3)	[115In]	CFBLS	1987Eb02	NP A464 9 (1987)
Tin	*There is no adopted reference efg for Sn.*								
	A - relative to 119Sn 24 keV - calculation of the quadrupole coupling constants in many molecular tin compounds.								
	B - relative to 117Sn 315 keV - calculation of quadrupole interaction in the 5p6s;3P1 state of the tin atom. At present this calculation is accurate only to, at best, +/- 10-20%.								
	C-relative to 116Sn 3548 keV 10+ moment estimated from theory. Accuracy estimated at 10%.								
	D- relative to 118Sn 3106 keV 10+ moment estimated from theory. Accuracy estimated at 10%.								
	50 Sn 109	0	18.0 m	5/2+	+0.33(11)	B	ABLFS	1987Eb01	ZP A326 121 (1987)
	50 Sn 110	2480	5.6 ns	6+	0.30(4)	D	TDPAD	1989Vo17	IAN Ser Fiz 53 2188 (1989)
	50 Sn 111	0	35 m	7/2+	+0.20(10)	B	ABLFS	1987Eb01	ZP A326 121 (1987)
	50 Sn 112	1257	0.35 ps	2+	-0.09(10)		CER	1975Gr30	PR C12 1462 (1975)
		2550	13.7 ns	6+	(-)0.25(5)	C	TDPAD	1975Vi03	NP A243 29 (1973)
	50 Sn 113	739	82 ns	11/2-	(-)0.41(4)	C	TDPAD	1975Di02	PL B55 293 (1975)
	50 Sn 114	3088	765 ns	7-	(-)0.32(3)	C	TDPAD	1975Di02	PL B55 293 (1975)
	50 Sn 115	613	3.26 ps	7/2+	(-)0.26(3)	D	TDPAD	1976Be59	HFI 2 326 (1976)
		714	159 μs	11/2-	0.38(6)		QIR	1975Ri03	Phys Scr 11 228 (1975)
	50 Sn 116	1294	0.36 ps	2+	-0.17(4)		ES	1976Li19	PR C14 952 (1976)
		2366	370 ns	5-	(-)0.26(3)	C	TDPAD	1975Di02	PL B55 293 (1975)
		3548	904 ns	10+	[(-)0.41(4)]	C	not measured	1975Di02	PL B55 293 (1975)
	50 Sn 117	315	13.6 d	11/2-	-0.42(5)	B	ABLFS	1986An24	PR C34 1052 (1986)
	50 Sn 118	1230	0.46 ps	2+	-0.14(10)		CER	1975Gr30	PR C12 1462 (1975)
		2321	21.7 ns	5-	(-)0.22(3)	C	TDPAD	1975Di02	PL B55 293 (1975)
		2575	217 ns	7-	0.32(3)	D	TDPAD	1976Be59	HFI 2 326 (1976)
		3106	2.65 ms	10+	[0.41(4)]	D	not measured	1976Be59	HFI 2 326 (1976)
Reference Isotope	50 Sn 119	24	17.8 ns	3/2+	-0.132(1)		ME	2008Py02/2008Ba56	Mol Phys 106 1965 (2008)/JPC A112 1666 (2008
		90	293.1 d	11/2-	-0.29(3)	A	ME	1972Be79	PL B42 349 (1972)
	50 Sn 120	1171	0.64 ps	2+	+0.02(7)		CER	1975Gr30	PR C12 1462 (1975)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
		2285	5.53 ns	5-	0.046(2)	A	TDPAC	1970Wo02	ZP 232 256 (1970)
	50 Sn 121	0	27.1 h	3/2+	-0.02(2)	B	ABLFS	1986An24	PR C34 1052 (1986)
		6.3	55 y	11/2-	-0.14(3)	B	ABLFS	1986An24	PR C34 1052 (1986)
	50 Sn 122	1140	0.76 ps	2+	-0.13(10)		CER	1975Gr30	PR C12 1462 (1975)
	50 Sn 123	0	129 d	11/2-	+0.03(4)	B	ABLFS	1986An24	PR C34 1052 (1986)
	50 Sn 124	1132	0.97 ps	2+	+0.03(13)		CER	1975Gr30	PR C12 1462 (1975)
	50 Sn 125	0	9.62 d	11/2-	+0.2(2)	B	ABLFS	2005Le34	PR C72 034305
		28	9.5 m	3/2+	+0.86(8)	B	ABLFS	2004Le13	NP A734 437 (2004)
	50 Sn 126	1141	1.0 ps	2+	0.0(2)		CER	2011Al35	PR C84 1303 (2011)
	50 Sn 127	0	2.1 h	11/2-	+0.32(14)	B	ABLFS	2005Le34	PR C72 034305
		5	4.13 m	3/2+	+0.65(7)	B	ABLFS	2004Le13	NP A734 437 (2004)
	50 Sn 128	2492	2.7 μs	10+	-0.1(3)		CER	2011Al35	PR C84 1303 (2011)
	50 Sn 129	0	2.23 m	3/2+	+0.05(12)	B	ABLFS	2004Le13	NP A734 437 (2004)
		35	6.9 m	11/2-	-0.20(19)	B	ABLFS	2005Le34	PR C72 034305
	50 Sn 130	1947	1.7 m	7-	-0.39(12)	B	ABLFS	2005Le34	PR C72 034305
	50 Sn 131	0	56 s	3/2+	-0.04(9)	B	ABLFS	2004Le13	NP A734 437 (2004)
		242	58.4 s	11/2-	0.0(2)	B	ABLFS	2005Le34	PR C72 034305
Antimony	*Calculated efg's in SbN, SbP, SbF and SbCl molecues*							2008Py02	Mol Phys 106 1965 (2008)
	51 Sb 112	796	536 ns	8-	1.06(2)	[121Sb]	TDPAD	1982Ma29	PR C26 493 (1982)
	51 Sb 114	496	219 ms	8-	1.02(16)	[121Sb]	QIR,R	1982Ma29	PR C26 493 (1982)
	51 Sb 115	2796	152 ns	19/2-	0.79(4)	[121Sb]	TDPAD	1983Se04	ZP A309 349 (1983)
	51 Sb 116	1844	11.9 ns	7+	2.5(6)	[121Sb]	TDPAD(ampl)	1992Io01	ZP A343 21 (1992)
	51 Sb 117	0	2.80 h	5/2+	0.2(12)	[121Sb]	AB	1974Ek01	NP A226 219 (1974)
		3131	340 ms	(25/2)+	1.14(5)	[121Sb]	QIR,R	1982Ma29	PR C26 493 (1982)/JPhys G3 713 (1977
		3231	290 ns	23/2-	3.7(4)	[121Sb]	TDPAD	1988Io01	PL B 200 259 (1988)
	51 Sb 118	51	20.6 ms	(3)+	0.9(2)	[121Sb]	TDPAD	1982Ma29	PR C26 493 (1982)
		270	13.4 ns	3-	0.39(8)	[121Sb]	TDPAD(ampl)	1985Di07	ZP A320 613 (1985)
		927	22.8 ns	7+	2.6(5)	[121Sb]	TDPAD(ampl)	1988Io01	PL B 200 259 (1988)
	51 Sb 119	2554	128 ns	19/2-	3.18(13)	[121Sb]	TDPAD	1991Io02	NP A531 112 (1991)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	51 Sb 120	78	247 ns	3+	0.63(2)	[121Sb]	TDPAD	1982Ma29	PR C26 493 (1982)
Reference Isotope	51 Sb 121	0	stable	5/2+	-0.543(11)		O	2008Py02/1978Bu24	Mol Phys 106 1965 (2008)/JPC A112 1666 (2008
		37	3.5 ns	7/2+	-0.727(16)	[121Sb]	ME	1970St13	PL A32 91 (1970)
	51 Sb 122	0	2.68 d	2-	+1.28(8)	[121Sb]	O	1960Fe08	PhMg 5 1309 (1960)
		61	1.86 ms	3+	0.63(2)	[121Sb]	TDPAD	1982Ma29	PR C26 493 (1982)
Reference Isotope	51 Sb 123	0	stable	7/2+	-0.692(14)		O	2008Py02/1978Bu24	Mol Phys 106 1965 (2008)/JPC A112 1666 (2008
	51 Sb 124	0	60.2 d	3-	+2.8(2)	[121Sb]	NO/S	1985He16	ZP A322 281 (1985)
Tellurium	*There is no adopted reference efg for Te.*								
	A. Efg in the lased state of the Te atom calculated by semi-empirical methods								
	52 Te 122	564	7.52 ps	2+	-0.57(5)		CER	1976Bo12	NP A261 498 A261
	52 Te 124	603	6.25 ps	2+	-0.45(5)		CER	1976Bo12	NP A261 498 A261
	52 Te 125	36	1.48 ns	3/2+	-0.31(2)	[129I]	ME	1977La03	PR B15 2504
		145	58 d	11/2-	0.0(2)	A	CLS	2006Si40	HFI 171 173 (2006)
		321	695 ps	9/2-	0.12(+5,-9)	[125Te 36 keV]	IPAC	1976Va28	HFI 2 321 (1976)
	52 Te 126	666	4.41 ps	2+	-0.23(5)		CER	1976Bo12	NP A261 498 A261
	52 Te 127	88	109 d	11/2-	0.17(12)	A	CLS	2006Si40	HFI 171 173 (2006)
	52 Te 128	743	3.2 ps	2+	-0.22(5)		CER	1976Bo12	NP A261 498 A261
	52 Te 129	0	69.5 m	3/2+	0.055(13)	[129I]	NO/ME	1987Be36	HFI 35 1023 (1987)
		106	33.5 d	11/2-	0.40(3)	A	CLS	2006Si40	HFI 171 173 (2006)
	52 Te 130	840	2.3 ps	2+	-0.12(5)		CER	1976Bo12	NP A261 498 A261
	52 Te 131	182	30 h	11/2-	0.25(14)	A	CLS	2006Si40	HFI 171 173 (2006)
	52 Te 133	0	12.5 m	3/2+	0.23(9)	A	CLS	2006Si40	HFI 171 173 (2006)
		334	55.4 m	11/2-	0.28(14)	A	CLS	2006Si40	HFI 171 173 (2006)
	52 Te 135	0	19 s	7/2-	0.29(9)	A	CLS	2006Si40	HFI 171 173 (2006)
Iodine	*Calculated efg's in atomic I and HI*							2008Py02	Mol Phys 106 1965 (2008)
	53 I 125	0	60.2 d	5/2+	-0.761(17)	[127I]	MA	1958Fl39	PR 110 536 (1958)
Reference isotope	53 I 127	0	stable	5/2+	-0.696(12)		AB	1976Fu06	JPCR 5 835 (1976)
		58	1.95 ns	7/2+	-0.624(11)	[127I]	ME	1964Pe15	PL 13 198 (1964)
	53 I 129	0	1.6x10*7 y	7/2+	-0.488(8)	[127I]	Q,MA	1953Li16	PR 90 609 (1953)
		28	16.8 ns	5/2+	-0.604(10)	[127I]	ME	1972Ro41	NIM 105 509 (1972)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	53 I 131	0	8.04 d	7/2+	-0.34(2)	[127I]	AB	1960Li13	PR 119 2022 (1960)
		1797	5.9 ns	(15/2)-	0.66(6)	[129I 28 keV]	TDPAC	1973Ha61	JCP 58 3339 (1973)
	53 I 132	0	2.28 h	4+	0.08(1)	[127I]	AB	1960Wh06	BAPS 5 504 (1960)
		50	1.12 ns	3+	0.20(6)	[129I]	IPAC	1979Oo01	NP A321 180 (1979)
		278	1.42 ns	1+	-0.150(5)	[129I]	TDPAC	1979Oo01	NP A321 180 (1979)
	53 I 133	0	20.9 h	7/2+	-0.23(1)	[127I]	AB	1961Al20	UCRL 9850 (1960)
Xenon	*Calculated efg in XeH+ and XeD+* except for *(a) estimated Q of this state giving efg at Xe in Cd metal*								
	A - Q estimated from B(E2)								
	B - Efg estimated from systematics in Te metal								
	54 Xe 117	0	1.02 m	5/2+	+1.14((4)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 119	0	5.8 m	5/2+	+1.29(5)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 121	0	39 m	5/2+	+1.31(5)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 123	180+x	5.2 ms	7/2(-)	1.4(3)	[125Xe 296 keV]	TDPAD	1982Ze05	ZP A308 227 (1982)
		201 + x	17 ns	9/2-	1.1(6)	[125Xe 296 keV]	TDPAD(ampl)	1982Ze05	ZP A308 227 (1982)
	54 Xe 125	253	57 s	9/2-	+0.417(15)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
		296	140 ns	7/2+	1.40(15) (a)	A	not measured	1982Ze05	ZP A308 227 (1982)
	54 Xe 127	297	1.15 m	9/2-	+0.68(2)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 129	40	0.98 ns	3/2+	-0.393(10)	[131Xe]	ME	1964Pe06	PR 135B 1102 (1964)
		236	8.89 d	11/2-	+0.63(2)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
Reference isotope	54 Xe 131	0	stable	3/2+	-0.114(1)		CLS	1989Bo03	PL B216 7 (1989)
		164	11.8 d	11/2-	+0.72(3)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 132	2214	90 ns	7-	0.010(5)	B	TDPAD	1987Le31	UkrF 32 1636 (1987)
	54 Xe 133	0	5.24 d	3/2+	+0.140(5)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
		233	2.19 d	11/2-	+0.76(5)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 135	0	9.10 h	3/2+	+0.210(7)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
		527	15.3 m	11/2-	+0.61(2)	[131Xe]	CLS	1990NeZY	PC Neugart (1990)
	54 Xe 137	0	3.82 m	7/2-	-0.47(2)	[131Xe]	CLS	1989Bo03	PL B216 7 (1989)
	54 Xe 139	0	39.7 s	3/2-	+0.39(2)	[131Xe]	CLS	1989Bo03	PL B216 7 (1989)
	54 Xe 141	0	1.73 s	5/2+	-0.57(2)	[131Xe]	CLS	1989Bo03	PL B216 7 (1989)
	54 Xe 143	0	0.30 s	5/2-	+0.91(3)	[131Xe]	CLS	1989Bo03	PL B216 7 (1989)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Caesium	*Calculated efg in CsF molecule.*							2008Py02	Mol Phys 106 1965 (2008)
	A - estimated efg at Cs in Ga metal								
	55 Cs 118	(0)	14 s	2	+1.31(17)	[133Cs]	ABLS	1987Co19	NP A468 1 (1987)
	55 Cs 119	(0)	36 s	9/2+	+2.65(17)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
		(0)	28 s	3/2+	+0.85(12)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 120	0	64 s	2+	+1.36(7)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 121	0	2.27 m	3/2+	+0.79(4)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
		~36	2.02 m	9/2+	+2.53(13)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 122	(0)	21 s	1+	-0.179(10)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
		(0)	4.2 m	8-	+3.09(8)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 124	0	30.8 s	1+	-0.69(4)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 126	0	1.64 m	1+	-0.64(3)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 127	66	24.9 ns	5/2(+)	0.58(12)	A	TDPAC	1999Co22	NIM B152 357 (1999)
	55 Cs 128	0	3.62 m	1+	-0.54(3)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 130	0	29.9 m	1+	-0.056(6)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
		0+x	3.7 m	5(-)	+1.36(8)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 131	0	9.69 d	5/2+	+0.59(2)	[133Cs]	ABLS	1975Ac01	NP A248 157 (1975)
		134	8.7 ns	5/2+	0.20(2)	[133Cs 81 keV]	TDPAC	2000De13	Eur Phys J A7 177 (2000)
	55 Cs 132	0	6.47 d	2(-)	+0.48(2)	[133Cs]	ABLS	1975Ac01	NP A248 157 (1975)
Reference isotope	55 Cs 133	0	stable	7/2+	-0.00343(10)		MB	1998Pe18	JCP 47 3896 (1967)/JCP 108 6739 (1998
		81	6.31 ns	5/2+	0.30(2)	[133Cs]	ME	1977Ca30	PR B15 3318 (1977)
	55 Cs 134	0	2.06 y	4+	+0.37(2)	[133Cs]	ABLS	1975Ac01	NP A248 157 (1975)
		139	2.90 h	8-	+0.92(8)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 135	0	3x10*6 y	7/2+	+0.048(3)	[133Cs]	ABLS	1975Ac01	NP A248 157 (1975)
		1633	53 m	19/2-	+0.83(7)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 136	0	13.2 d	5+	+0.213(15)	[133Cs]	ABLS	1975Ac01	NP A248 157 (1975)
		0+x	19 s	8-	+0.70(3)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 137	0	30.17 y	7/2+	+0.048(2)	[133Cs]	ABLS	1975Ac01	NP A248 157 (1975)
	55 Cs 138	0	32.2 m	3-	+0.112(17)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
		80	2.9 m	6-	-0.37(5)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	55 Cs 139	0	9.4 m	7/2+	-0.063(14)	[133Cs]	ABLS	1979Bo01	ZP A289 227 (1979)
	55 Cs 140	0	65 s	1-	-0.094(15)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 141	0	25.1 s	7/2+	-0.42(7)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 143	0	1.78 s	3/2+	+0.44(3)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 144	0	1.00 s	1	+0.29(2)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 145	0	0.59 s	3/2+	+0.58(6)	[133Cs]	ABLS	1981Th06	NP A367 1 (1981)
	55 Cs 146	0	0.34 s	1	+0.21(3)	[133Cs]	ABLS	1987Co19	NP A468 1 (1987)
Barium	*Efg calculations in the 6p 2P3/2 state of the Ba II spectrum*							2008Py02	Mol Phys 106 1965 (2008)
	56 Ba 121	0	30 s	5/2(+)	+1.96(13)	[135Ba]	CLS	1988We14	PL B211 272 (1988)
	56 Ba 123	0	2.7 m	5/2+	+1.63(13)	[135Ba]	CLS	1988We14	PL B211 272 (1988)
	56 Ba 127	80	1.9 s	7/2(-)	+1.78(14)	[135Ba]	CLS	1992Da06	J Phys G 17 L67 (1992)
	56 Ba 129	8.4	2.16h	7/2+	+1.75(14)	[135Ba]	CLS	1979Be25	ZP A291 219 (1979)
	56 Ba 130	357	37 ps	2+	-1.02(15) or -0.09(15)		CER	1989Bu07	NP A494 102 (1989)
		2476	9.54 ms	8-	+2.40(6)	[135Ba]	CLS	2002Mo31	PL B547 200 (2002)
	56 Ba 131	188	14.6 m	9/2-	+1.60(14)	[135Ba]	CLS	1983Mu12	NP A403 234 (1983)
	56 Ba 133	288	38.9 h	11/2-	+0.96(6)	[135Ba]	CLS	1979Be25	ZP A291 219 (1979)
	56 Ba 134	605	5.1 ps	2+	-0.26(12) or +0.15(12)		CER	1989Bu07	NP A494 102 (1989)
Reference isotope	56 Ba 135	0	stable	3/2+	+0.160(3)		CFBLS	1984We15	ZP A318 125 (1984)
		268	28.7 h	11/2-	+1.03(15)	[135Ba]	CLS	1979Be25	ZP A291 219 (1979)
	56 Ba 136	819	1.93 ps	2+	-0.19(6) or +0.07(7)		CER	1986Ro15	PR C34 732 (1986)
Reference isotope	56 Ba 137	0	stable	3/2+	+0.245(4)		CFBLS	1984We15	ZP A318 125 (1984)
		662	2.55 m	11/2-	+0.85(10)	[135Ba]	CLS	1983Mu12	NP A403 234 (1983)
	56 Ba 138	1436	0.206 ps	2+	-0.14(6) or +0.08(6)		CER	1989Bu07	NP A494 102 (1989)
	56 Ba 139	0	84.6 m	7/2-	-0.573(13)	[135Ba]	CFBLS	1988We07	ZP A329 407 (1988)
	56 Ba 140	602	7.2 ps	2+	-0.5(3)		CER	2012Ba40	PR C86 034310 (2012)
	56 Ba 141	0	18.7 m	3/2-	+0.454(10)	[135Ba]	CFBLS	1988We07	ZP A329 407 (1988)
	56 Ba 143	0	14.5 s	5/2(+)	-0.88(2)	[135Ba]	CFBLS	1988We07	ZP A329 407 (1988)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	56 Ba 145	0	4.31 s	5/2(-)	+1.22(2)	[135Ba]	CFBLS	1988We07	ZP A329 407 (1988)
Lanthanum	*Calculated efg's in La halides*							2008Py02	Mol Phys 106 1965 (2008)
	57 La 135	0	19.5 h	5/2+	-0.4(4)	[139La]	CLS	2003Ii03	PR C68 054328 (2003)
	57 La 137	0	6 x 10*4 y	7/2+	+0.21(4)	[139La]	CLS	2003Ii03	PR C68 054328 (2003)
	57 La 138	0	1.1x10*11 y	5+	+0.39(3)	[139La]	CLS	2003Ii03	PR C68 054328 (2003)
Reference isotope	57 La 139	0	stable	7/2+	+0.200(6)		MB	2007Ja16	JCP 127 204303 (2007)
	57 La 140	0	40.3 h	3-	+0.084(13)	[139La]	NO/S	1966Bl05	PR 143 911 (1966)
Cerium	*There is no adopted efg calculation for cerium.*								
	A. Normalised to nuclear model estimate of Q 138Cs 3538 keV.								
	58 Ce 129	108	60 ns	9/2-	1.32(13)	A	TDPAD	1998Io01	NP A633 459 (1998)
	58 Ce 130	2454	109 ns	7-	1.8(2)	A	TDPAD	1999Io02	PR C60 024316 (1999)
	58 Ce 131	162	88 ns	9/2-	0.92(10)	A	TDPAD	1998Io01	NP A633 459 (1998)
	58 Ce 134	3209	308 ns	10+	+1.32(12)	A	TDPAD	1983Da29	HFI 15/16 101 (1983)
	58 Ce 136	3095	2.2 ms	10+	+1.11(11)	A	TDPAD	1983Da29	HFI 15/16 101 (1983)
	58 Ce 138	3538	82 ns	10+	estimated +0.77 eb		not measured	1983Da29	HFI 15/16 101 (1983)
	58 Ce 140	2084	3.4 ns	4+	0.35(7)	[139La]	TDPAC	1973KlZV	JPJS 34 265 (1973)
	58 Ce 142	641	5.7 ps	2+	-0.16(5) or -0.37(5)		CER	1988Ve08/1989Sp07	PR C38 2982 (1988)/AuJP 42 345 (1989)
Praseodymium	*Efg calculated in the Pr ion with estimated Sternheimer correction (1994Il01)*						N.B. Deviation from standard adopted by Pyykko (2008Py02) who gives Q ^{141}Pr -0.059(4) b.		
Reference isotope	59 Pr 141	0	stable	5/2+	-0.077(6)		CLS	1994Ii01	PR C50 661 (1994)
	59 Pr 142	0	19.2 h	2-	0.039(17)	[141Pr]	AB	1962Ca10	PR 126 1004 (1962)
	59 Pr 143	0	13.57 d	7/2+	+0.77(16)	[141Pr]	CLS	1994Ii01	PR C50 661 (1994)
Neodymium	*Efg calculated in the Nd ion with estimated Sternheimer correction*						N.B. Deviation from standard adopted by Pyykko (2008Py02) who gives Q ^{143}Nd -0.63(6) b.		
	60 Nd 135	0	12.4 m	9/2-	+1.9(5)	[143Nd]	CLS	1992Le09	JPhys G18 1177 (1992)
	60 Nd 139	0	30 m	3/2+	+0.28(9)	[143Nd]	CLS	1992Le09	JPhys G18 1177 (1992)
	60 Nd 141	0	2.49 h	3/2+	+0.32(13)	[143Nd]	CLS	1992Le09	JPhys G18 1177 (1992)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Reference isotope	60 Nd 143	0	stable	7/2-	-0.61(2)		AB	1992Au04	ZP D23 19 (1992)
	60 Nd 144	697	4.51 ps	2+	-0.15(6) or -0.28(6)		CER	1989Sp07	AuJP 42 345 (1989)
	60 Nd 145	0	stable	7/2-	-0.314(12)	[143Nd]	AB	1992Au04	ZP D23 19 (1992)
	60 Nd 146	454	27.5 ps	2+	-0.78(9)		CER	1970Ge08	NP A151 252 (1970)
	60 Nd 147	0	11.0 d	5/2-	+0.9(3)	[143Nd]	AB	1970PiZR	BAPS 15 769 (1970)
	60 Nd 148	302	78 ps	2+	-1.46(13)		CER	1970Ge08	NP A151 252 (1970)
	60 Nd 149	0	1.73 h	5/2-	+1.3(3)	[143Nd]	AB	1970PiZR	BAPS 15 769 (1970)
	60 Nd 150	130	2142 ps	2+	-2.0(5)		CER	1970Ge08	NP A151 252 (1970)
Promethium	*Empirical efg estimate in Pm atom*								
	61 Pm 145	0	17.7 y	5/2+	+0.23(8)	[147Pm]	CLS	1992Al03	JP B25 571 (1992)
Reference isotope	61 Pm 147	0	2.623 y	7/2+	+0.74(20)		O	1966Re04	PR 141 1123 (1966)
	61 Pm 148	0	5.37 d	1-	+0.2(2)	[147Pm]	AB	1963Bu14	PR 132 723 (1963)
	61 Pm 151	0	28.4 h	5/2 +	2.2(9)	[147Pm]	AB	1963Bu14	PR 132 723 (1963)
Samarium	*Muonic atom X-ray hyperfine structure*								
	62 Sm 140	3172	19.4 ns	10+	1.7(5)	[154Sm 82]	TDPAD	1985Be23	ZP A321 403 (1985)
	62 Sm 141	176	22.6 m	11/2-	+1.6(5)	[147Sm]	CLS	1992Le09	JPhys G18 1177 (1992)
	62 Sm 142	2372	170 ns	7-	+1.1(3)	[154Sm 82]	TDPAD	1985Be23/1986Da22	ZP A321 403 (1985)/PL B181 21 (1986
	62 Sm 143	0	8.83 m	3/2+	+0.4(2)	[147Sm]	CLS	1992Le09	JPhys G18 1177 (1992)
	62 Sm 145	0	340 d	7/2-	-0.60(7)	[147Sm]	LRFS	1990En01	JPhys G16 105 (1990)
Reference isotope	62 Sm 147	0	1.1x10*11y	7/2-	-0.26(3)		Mu-X	2008Py02/1981Ba28	Mol Phys 106 1965 (2008)/NP A364 446 (1981
		121	0.78 ns	5/2-	-0.5(2)	[147Sm]	ME	1971Pa04	PR C3 841 (1971)
	62 Sm 148	550	7.3 ps	2+	-1.0(3)		CER	1989Ra17	JPJS 34 443 (1973)
	62 Sm 149	0	> 2x10*15 y	7/2-	+0.078(8)	[147Sm]	AB	1972Ch55/1992Le09	PR A6 2011 (1972)/JPhys G18 1177 (1992
		23	7.6 ns	5/2-	+1.01(9)	[147Sm]	Mu-X	1981Ba28	NP A364 446 (1981)
	62 Sm 150	334	49 ps	2+	-1.3(2)		CER	1973Gr06	PRL 30 453 (1973)
	62 Sm 151	0	90 y	5/2-	+0.71(7)	[147Sm]	LRFS	1990En01	JPhys G16 105 (1990)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Reference isotope	62 Sm 152	122	1.40 ns	2+	-1.666(16)		Mu-X	1979Po05	NP A316 295 (1979)
	62 Sm 153	0	46.8 h	3/2+	+1.30(12)	[147Sm]	LRFS	1990En01	JPhys G16 105 (1990)
Reference isotope	62 Sm 154	82	3.01 ns	2+	-1.87(4)		Mu-X	1979Po05	NP A316 295 (1979)
	62 Sm 155	0	22.4 m	3/2-	1.13(13)	[147Sm]	AB	1976Fu06	JPCR 5 835 (1976)
Europium	*Muonic atom X-ray hyperfine structure*								
	63 Eu 140	0 + x	1.54 s	1(+)	+0.31(4)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 141	0	40 s	5/2+	+0.85(4)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 142	0	2.4 s	1+	+0.12(5)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
		180	73 s	8-	+1.41(6)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 143	0	2.6 m	5/2+	+0.51(3)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 144	0	10 s	1+	+0.10(3)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 145	0	5.93 d	5/2+	+0.29(2)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 146	0	4.59 d	4-	-0.18(6)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 147	0	24.1 d	5/2+	+0.55(3)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 148	0	54.5 d	5-	+0.35(6)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 149	0	93.1 d	5/2+	+0.75(2)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 150	0	35.8 y	5(-)	+1.13(5)	[153Eu]	CLS	1985Ah02	ZP A321 35 (1985)
	63 Eu 151	0	stable	5/2+	+0.903(10)	[153Eu]	Mu-X	1984Ta04	PR C29 1830 (1984)
		22	9.5 ns	7/2+	+1.28(2)		Mu-X	1984Ta05	PR C29 1897 (1984)
	63 Eu 152	0	13.54 y	3-	+2.72(3)	[153Eu]	CLS	1986Al33	YadF 44 1134 (1986)
Reference isotope	63 Eu 153	0	stable	5/2+	+2.41(2)		Mu-X	1984Ta04	PR C29 1830 (1984)
		83	0.80 ns	7/2+	+0.44(2)		Mu-X	1984Ta05	PR C29 1897 (1984)
		103	3.9 ns	3/2+	+1.253(12)	[153Eu]	ME	1973Ar19	PL A44 279 (1973)
	63 Eu 154	0	8.6 y	3-	+2.85(10)	[153Eu]	CLS	1986Al33	YadF 44 1134 (1986)
	63 Eu 155	0	4.68 y	5/2+	+2.5(3)	[153Eu]	CLS	1990Al34	ZP A337 257 (1990)
	63 Eu 157	0	15.2 h	5/2+	+2.6(3)	[153Eu]	CLS	1990Al34	ZP A337 257 (1990)
	63 Eu 158	0	45.9 m	1(-)	+0.66(14)	[153Eu]	CLS	1990Al34	ZP A337 257 (1990)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	63 Eu 159	0	18.1 m	5/2+	+2.7(3)	[153Eu]	CLS	1990Al34	ZP A337 257 (1990)
Gadolinium	*Muonic atom X-ray hyperfine structure*								
	64 Gd 144	3433	130 ns	10+	-1.40(6)	[155Gd]	TDPAD	1982Ha20/1985Da20	NP A379 287 (1982)/NP A443 135 (1985
	64 Gd 147	997	22.2 ns	13/2+	-0.70(8)	[155Gd]	TDPAD	1982Ha20/1985Da20	NP A379 287 (1982)/NP A443 135 (1985
		3582	27 ns	27/2-	-1.21(9)	[155Gd]	TDPAD	1982Ha20/1985Da20	NP A379 287 (1982)/NP A443 135 (1985
		8587	510 ns	49/2+	-3.00(18)	[155Gd]	TDPAD	1982Ha20/1985Da20	NP A379 287 (1982)/NP A443 135 (1985
	64 Gd 148	2695	16.5 ns	9-	0.96(5)	[155Gd]	TDPAD	1982Ha20	NP A379 287 (1982)
	64 Gd 154	123	1.17 ns	2+	-1.82(4)		Mu-X	1983La08	PR C27 1772 (1983)
Reference isotope	64 Gd 155	0	stable	3/2-	+1.27(3)		Mu-X	1983La08	PR C27 1772 (1983)
		87	6.35 ns	5/2+	+0.110(8)	[155Gd]	ME	1974Ar23	NP A233 385 (1974)
		105	1.18 ns	3/2+	+1.27(5)	[155Gd]	ME	1974Ar23	NP A233 385 (1974)
	64 Gd 156	89	2.21 ns	2+	-1.93(4)		Mu-X	1983La08	PR C27 1772 (1983)
Reference isotope	64 Gd 157	0	stable	3/2-	+1.35(3)		Mu-X	1983La08	PR C27 1772 (1983)
		64	0.46 ms	5/2+	+2.43(7)	[157Gd]	ME	1974Ar23	NP A233 385 (74)
	64 Gd 158	80	2.52 ns	2+	-2.01(4)		Mu-X	1983La08	PR C27 1772 (1983)
	64 Gd 160	75	2.70 ns	2+	-2.08(4)		Mu-X	1983La08	PR C27 1772 (1983)
Terbium	*Muonic atom X-ray hyperfine structure*								
	A. Efg estimate at Tb in yttrium ethylsuphate								
	65 Tb 148	0	60 m	2-	-0.3(2)	[159Tb]	CLS	1990Al36	ZP A337 367 (1990)
	65 Tb 150	0 + x	3.48 h	2(-)	0.00(13)	[159Tb]	CLS	1990Al36	ZP A337 367 (1990)
	65 Tb 152	0	17.5 h	2-	+0.34(13)	[159Tb]	CLS	1990Al36	ZP A337 367 (1990)
	65 Tb 153	0	2.34 d	5/2+	+1.08(14)	[159Tb]	CLS	1990Al36	ZP A337 367 (1990)
	65 Tb 154	0 + x	9.4 h	3-	+2.4(13)	[159Tb]	NO/S	1983Be03	JPhys G9 213 (1983)
	65 Tb 155	0	5.32 d	3/2+	+1.41(6)	[159Tb]	CLS	1990Al36	ZP A337 367 (1990)
	65 Tb 156	0	5.35 d	3-	+2.3(8)	[159Tb]	NO/S	1979Ri17/1983Be03	CzJP B29 620 (1979)/JPhys G9 213 (1983
	65 Tb 157	0	99 y	3/2+	+1.40(8)	[159Tb]	CLS	1990Al36	ZP A337 367 (1990)
	65 Tb 158	0	150 y	3-	+2.7(5)	A	EPR/NO/S	1968Ea04	PR 170 1083 (1968)
Reference isotope	65 Tb 159	0	stable	3/2+	+1.432(8)		Mu-X	1984Ta04	PR C29 1830 (1984)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	65 Tb 160	0	72.1 d	3-	+3.85(5)	[159Tb]	NMR/ON	1987Ma42	PRL 59 1764 (1987)
	65 Tb 161	0	6.9 d	3/2+	+1.3(6)	[159Tb]	NO/S	1983Ri15	HFI 15 83 (1(83)
Dysprosium	*Muonic atom X-ray hyperfine structure*								
	A. Unpublished results from Neugart, PC to Raghavan (1987). No information on interaction analysis.								
	B. Analysis of perturbation of TDPAC in liquid sources								
	66 Dy 147	751	59 s	(11/2-)	+0.67(10)	A	CLS	1989Ra17	ADNDT 42 189 (1989)
	66 Dy 149	0	4.23 m	7/2-	-0.62(5)	A	CLS	1989Ra17	ADNDT 42 189 (1989)
	66 Dy 151	0	17 m	7/2-	-0.30(5)	A	CLS	1989Ra17	ADNDT 42 189 (1989)
	66 Dy 153	0	6.3 h	7/2-	-0.15(9)	[163Dy]	AB	1973Ek01	PS 7 31 (1973)
	66 Dy 155	0	10.0 h	3/2-	+0.96(2)	[163Dy]	AB	1973Ek01	PS 7 31 (1973)
	66 Dy 157	0	8.1 h	3/2-	+1.29(2)	[163Dy]	AB	1973Ek01	PS 7 31 (1973)
	66 Dy 159	0	144 d	3/2-	+1.37(2)	A	CLS	1989Ra17	ADNDT 42 189 (1989)
	66 Dy 160	87	1.96 ns	2+	1.8(4)	B	TDPAC	1970Wa25	ZP A238 35 (1970)
	66 Dy 161	0	stable	5/2+	+2.51(2)	[163Dy]	AB	1974Fe05	PL A49 287 (1974)
		26	29 ns	5/2-	+2.51(2)	[161Dy]	ME	1973St23	JPCR 5 1093 (1973)
		44	0.78 ns	7/2+	+0.53(13)	[161Dy]	ME	1973Sy01	PR C7 2056 (1973)
		75	3.2 ns	3/2-	+1.45(6)	[161Dy]	ME	1973St23	JPCR 5 1093 (1973)
Reference isotope	66 Dy 163	0	stable	5/2-	+2.65(2)		Mu-X	1984Ta04	PR C29 1830 (1984)
	66 Dy 164	73	2.39 ns	2+	-2.08(15)	[161Dy]	ME	1968Mu01	ZP A208 184 (1968)
	66 Dy 165	0	2.33 h	7/2+	+3.48(7)	[161Dy]	AB	1968 Ra03	PR 165 1360 (1968)
Holmium	*Pionic atom X-ray hyperfine structure*				n				
	67 Ho 152	0	161.8 s	2-	+0.1(2)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
		160	49.5 s	9+	-1.3(8)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 153	0	2.0 m	11/2-	-1.1(5)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 154	0	11.76 m	2-	+0.19(10)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
		320	3.10 m	8+	-1.0(5)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 155	0	48 m	5/2+	+1.56(12)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 156	0	56 m	4(+)	+2.40(18)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	67 Ho 157	0	12.6 m	7/2-	+3.05(13)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 158	0	11.3 m	5+	+4.2(4)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
		67.2	28 m	2-	+1.66(17)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 159	0	35.05 m	7/2-	+3.27(13)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 160	0	25.6 m	5+	+4.0(2)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
		60	5.02 h	2-	+1.83(17)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 161	0	2.48 h	7/2-	+3.30(11)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 162	106	67 m	6-	+4.0(7)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
	67 Ho 163	0	4570 y	7/2-	+3.7(6)	[165Ho]	LRIS	1989Al27	NP A504 549 (1989)
Reference isotope	67 Ho 165	0	stable	7/2-	+3.58(2)		Pi-X	1983Ol03	NP A403 572 (1983)
		95	22 ps	9/2-	+3.52(4)	[165Ho]	Mu-X	1976Po05	NP A262 493 (1976)
Erbium	*Muonic atom X-ray hyperfine structure*								
	A - Estimated efg in Er metal.								
	68 Er 153	0	37.1 s	(7/2-)	-0.42(2)	[167Er]	CLS	1987OtZW	CERN EP 87/51 (1987)
	68 Er 155	0	5.3 m	7/2-	-0.27(2)	[167Er]	CLS	1987OtZW	CERN EP 87/51 (1987)
	68 Er 157	0	25 m	3/2-	+0.92(1)	[167Er]	CLS	1987OtZW	CERN EP 87/51 (1987)
	68 Er 159	0	36 m	3/2-	+1.17(1)	[167Er]	CLS	1987OtZW	CERN EP 87/51 (1987)
	68 Er 161	0	3.21 h	3/2-	+1.363(8)	[167Er]	AB	1972Ek03	NP A194 237 (1972)
	68 Er 162	102	1.3 ns	2+	<0		CER	1981Hu02	PR C23 240 (1981)
		901	1.24 ps	2+	1.8(6)		CER	1983Hu01	PR C27 550 (1983)
	68 Er 163	0	75.1 m	5/2-	+2.56(2)	[167Er]	CLS	1987OtZW	CERN EP 87/51 (1987)
	68 Er 164	92	1.48 ns	2+	<0		CER	1981Hu02	PR C23 240 (1981)
		860	1.9 ps	2+	2.4(3)		CER	1983Hu01	PR C27 550 (1983)
	68 Er 165	0	10.36 h	5/2-	+2.71(3)	[167Er]	CLS	1987OtZW	CERN EP 87/51 (1987)
	68 Er 166	81	1.85 ns	2+	-1.9(4)	A	ME	1965Hu01	ZP 182 499 (1965)
		265	118 ps	4+	-2.7(9)		CER	1970McZQ	ORNL 4513 56 (1970)
		786	4.6 ps	2+	2.2(3)		CER	1983Hu01	PR C27 550 (1983)
Reference isotope	68 Er 167	0	stable	7/2+	+3.57(3)		Mu-X	1984Ta04	PR C29 1830 (1984)
	68 Er 168	264	121 ps	4+	-2.2(10)		CER	1970McZQ	ORNL 4513 56 (1970)
		821	2.9 ps	2+	2.3(2)		CER	1983Hu01	PR C27 550 (1983)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	68 Er 170	79	1.90 ns	2+	-1.9(2)		CER	1973Lu02	PR C8 391 (1973)
		260	~135 ps	4+	-2.2(10)		CER	1970McZQ	ORNL 4513 56 (1970)
		932		2+	2.0(3)		CER	1983Hu01	PR C27 550 (1983)
	68 Er 171	0	7.52 h	5/2-	2.86(9)	[167Er]	AB	1964Bu09	PR 135 B1281 (1964)
Thulium	*There is no adopted reference efg for Tm.*								
	A. For details of the efg used see 1973Ek01/1988Al04								
	B. Includes estimated Sternheimer correction								
	69 Tm 153	0	1.48 s	(11/2-)	+0.5(10)	[169Tm]	LRIS	2000Ba16	PR C61 034304 (2000)
	69 Tm 154	0	8.1 s	(2-)	+0.4(9)	A	LRIS	2000Ba16	PR C61 034304 (2000)
		0 + x	3.30 s	(9+)	-0.2(4)	A	LRIS	2000Ba16	PR C61 034304 (2000)
	69 Tm 156	0	1.3 m	2-	-0.48(11)	A	LRIS	1987AlZb	LIYAF 1309 (1987)
	69 Tm 158	0	4.3 m	2-	+0.74(11)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 159	0	9.0 m	5/2+	+1.93(7)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 160	0	9.4 m	1-	+0.58(4)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 161	0	38 m	7/2+	+2.90(7)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 162	0	21 m	1-	+0.69(3)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 164	0	2.0 m	1+	+0.71(5)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 166	0	7.7 h	2+	+2.14(3)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 168	0	85 d	3+	+3.23(7)	A	LRIS	1988Al04	NP A477 37 (1988)
	69 Tm 169	8	3.9 ns	3/2+	-1.2(1)	B	ME	1964Co08	PR 134 A94 (1964)
	69 Tm 170	0	128.6 d	1+	+0.74(2)	A	LRIS	1988Al04	NP A477 37 (1988)
Ytterbium	*Muonic atom X-ray hyperfine structure*								
	A. Assumes relation Q(spectroscopic) = 2Q(intrinsic)/7 and Q(intrinsic) 2+ (84 keV) 170Yb = 7.63(9) b.								
	70 Yb 155	0	1.59 s	(7/2-)	-0.5(3)	[173Yb]	LRIS	2000Ba16	PR C61 034304 (2000)
	70 Yb 159	0	1.58 m	5/2(-)	-0.22(2)	[173Yb]	CLS	1983Ne13	HFI 15 181 (1983)
	70 Yb 161	0	4.2 m	3/2-	+1.03(2)	[173Yb]	CLS	1983Ne13	HFI 15 181 (1983)
	70 Yb 163	0	11.0 m	3/2-	+1.24(2)	[173Yb]	CLS	1983Ne13	HFI 15 181 (1983)
	70 Yb 165	0	9.9 m	5/2-	+2.48(4)	[173Yb]	CLS	1983Ne13	HFI 15 181 (1983)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	70 Yb 167	0	17.5 m	5/2-	+2.70(4)	[173Yb]	CLS	1983Ne13	HFI 15 181 (1983)
	70 Yb 169	0	32.0 d	7/2+	+3.54(6)	[173Yb]	CLS	1983Ne13	HFI 15 181 (1983)
	70 Yb 170	84	1.57 ns	2+	-2.18(3)	A		2001Ra27	ADNDT 78 1 (2001)
	70 Yb 171	67	0.81 ns	3/2-	-2.34(7)	[170Yb 84 keV]	ME	1971Pl03	NP A165 97 (1971)
		76	1.64 ns	5/2-	-2.22(7)	[170Yb 84 keV]	ME	1971Pl03	NP A165 97 (1971)
	70 Yb 172	79	1.6 ns	2+	-2.22(4)	[170Yb 84 keV]	ME	1971Pl03	NP A165 97 (1971)
		260	0.122 ns	4+	-2.3(12)		CER	1970McZQ	ORNL-4513 56 (1970)
		1172	7.8 ns	3+	-2.9(3)	[170Yb 84 keV]	TDPAC	1970Wa25	ZP A238 35 (1970)
		1757	-	(1-)	-3.44(10)		Mu-X	1979Ho23	PR C20 1934 (1979)
		1822	-	(3-)	+1.97(10)		Mu-X	1979Ho23	PR C20 1934 (1979)
Reference isotope	70 Yb 173	0	stable	5/2-	+2.80(4)		Mu-X	1975Ze04	NP A254 315 (1975(
	70 Yb 174	77	1.79 ns	2+	-2.18(5)	[170Yb 84 keV]	ME	1971Pl03	NP A165 97 (1971)
		253	144 ps	4+	-1.8(12)		CER	1970McZQ	ORNL-4513 56 (1970)
	70 Yb 175	0	4.19 d	7/2-	+3.52(5)	[173Yb]	CLS	2012Fl05	JPhys G39 125101 (2012)
	70 Yb 176	82	1.8 ns	2+	-2.28(6)	[170Yb 84 keV]	ME	1967Ec01	PR 156 246 (1967)
		272	0.11 ns	4+	-0.9(12)		CER	1970McZQ	ORNL-4513 56 (1970)
		1050	11.4 s	8-	+5.30(8)	[173Yb]	CLS	2007Bi14	PL B645 330 (2007)
	70 Yb 177	0	1.91 h	9/2+	+4.03(6)	[173Yb]	CLS	2012Fl05	JPhys G39 125101 (2012)
Lutetium	*Muonic atom X-ray hyperfine structure*								
	71 Lu 162	0	1.37 m	1-	+0.519(8)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 164	0	3.14 m	1-	+0.608(7)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 166	0	2.65 m	6-	+4.33(4)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
		34	1.41 m	3-	+2.72(2)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 167	0	51.5 m	7/2+	+3.28(2)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 168	0	5.5 m	6-	+4.77(6)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
		220	6.7 m	3+	+2.43(2)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 169	0	34.1 h	7/2+	+3.48(3)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 171	0	8.24 d	7/2+	+3.53(3)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 172	0	6.70 d	4-	+3.80(4)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
		42	3.7 m	1-	+0.76(3)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	71 Lu 173	0	1.37 y	7/2+	+3.53(2)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 174	0	3.3 y	1-	+0.773(7)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
		171	142 d	6-	+4.80(5)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
Reference isotope	71 Lu 175	0	stable	7/2+	+3.49(2)		Mu-X	1979De29	NP A326 418 (1979)
	71 Lu 176	0	3.6x10*10 y	7-	+4.92(3)	[175Lu]	A	1985Br09	NP A440 407 (1985)
		127	3.68 h	1-	-1.450(12)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 177	0	6.71 d	7/2+	+3.39(3)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
		970	160 d	23/2	+5.71(5)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 178	0	28.4 m	1+	+0.708(10)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
		120	23.1 m	9-	+5.39(10)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
	71 Lu 179	0	4.59 h	7/2+	+3.32(3)	[175Lu]	CLS	1998Ge13	Eur Phys J A3 225 (1998)
Hafnium	*Muonic atom X-ray hyperfine structure*								
	72 Hf 171	0	12.1 h	7/2+	+3.46(3)	[177Hf]	CLS	2000Ye02	J Phys G26 839 (2000)
	72 Hf 175	0	70 d	5/2-	+2.72(2)	[177Hf]	CLS	2002Ni12	PRL 88 094801 (2002)
	72 Hf 176	88	1.47 ns	2+	-2.10(2)	[177Hf]	Mu-X	1984Ta10	PR C30 350 (1984)
Reference isotope	72 Hf 177	0	stable	7/2-	+3.37(3)		Mu-X	1984Ta04	PR C29 1830 (1984)
			490 ps	9/2-	+1.30(2)	[177Hf]	Mu-X	1984Ta10	PR C30 350 (1984)
	72 Hf 178	93	1.47 ns	2+	-2.02(2)	[177Hf]	Mu-X	1984Ta10	PR C30 350 (1984)
		1147	4 s	23/2-	+4.99(4)	[177Hf]	CLS	2007Bi14	PL B645 330 (2007)
		2446	31 y	16+	+6.00(7)	[177Hf]	CLS	1994Bo15	PRL 72 2689 (1994)
Reference isotope	72 Hf 179	0	stable	9/2+	+3.79(3)		Mu-X	1984Ta04	PR C29 1830 (1984)
		123	37 ps	11/2+	+1.88(3)	[177Hf]	Mu-X	1984Ta10	PR C30 350 (1984)
	72 Hf 180	93	1.53 ns	2+	-2.00(2)	[177Hf]	Mu-X	1984Ta10	PR C30 350 (1984)
		1142	5.5 h	8-	+4.6(3)	[177Hf]	NO/S	1973Ka31	PL B46 62 (1973)
Tantalum	*Pionic atom X-ray hyperfine structure*								
	73 Ta 171	184	45 ns	9/2-	(+)3.1(2)	[181Ta]	TDPAD	1995Do32	HFI 96 223 (1995)
	73 Ta 173	0	3.14 h	5/2-	-1.8(2)	[181Ta]	NO/S	1983Ed01	PL B133 44 (1983)
	73 Ta 175	0	10.5 h	7/2+	+3.5(3)	[181Ta]	NO/S	1983Ed01	PL B133 44 (1983)
	73 Ta 178	0 + x	9.3 m	1+	+0.63(6)	[181Ta]	NO/S	1983Ha49	HFI 15 105 (1983)
	73 Ta 179	0	1.82 y	7/2+	+3.27(4)	[181Ta]	CLS	1996Wa02	PR C53 611 (1996)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	73 Ta 180	75	>1.2x10*15y	9-	+4.80(3)	[181Ta]	CLS	1994Wa34	PR C50 4639 (1994)
Reference isotope	73 Ta 181	0	stable	7/2+	+3.17(2)		Pi-X	1983Ol03	NP A 403 572 (1983)
		6	6.05 ms	9/2-	+3.59(2)	[181Ta]	ME	1983Ei02	PL A93 259 (1983)
		482	10.8 ns	5/2+	+2.28(2)	[181Ta]	ME	1983Bu11	PL A97 217 (1983)
	73 Ta 182	0	115 d	3-	+2.6(3)	[181Ta]	NO/S	1991Fa12	PL A159 421 (1991)
Tungsten	*There is no adopted reference efg for W*								
	A. Efg calculation in Tl metal								
	74 W 176	3746	41 ns	14+	6.0(8)	A	TDPAD	2002Io01	PL B541 219 (2002)
	74 W 179	3348	750 ns	35/2-	+3.9(10)	A	LEMS	2001Ba04	PRL 86 604 (2001)
	74 W 180	104	1.22 ns	2+	-2.1(4)	[182W 100 keV]	ME	1973Zi02	ZP 262 413 (1973)
	74 W 182	100	1.37 ns	2+	-2.1(4)		CER	1977RuZV	BAPS 22 1032 (1977)
	74 W 183	47	184 ps	3/2-	-1.8(4)	[182W 100 keV]	ME	1966Sh07	JPSJ 21 829 (1966)
		99	0.71 ns	5/2-	-2.0(3)	[182W 100 keV]	ME	1967Ag02/1974Ge17	PR 155 1342 (1967)/ZP 267 61 (1974
	74 W 184	111	1.25 ns	2+	-1.9(2)	[182W 100 keV]	CER	1974Ge17/1977RuZV	ZP 267 61 (1974)/BAPS 22 1032 (1977
		904	1.73 ps	2+	+0.1(4)		CER	1977Ob02	NP A291 510 (1977)
	74 W 186	123	1.05 ns	2+	-1.6(3)	[182W 100 keV]	CER	1977RuZV	BAPS 22 1032 (1977)
		396	36 ps	4+	-2.6(13)		CER	1970McZQ	ORNL-4513 56 (1970)
		737	4.4 ps	2+	1.3(3)		CER	1977Ob02	NP A291 510 (1977)
Rhenium	*Pionic atom X-ray hyperfine structure*								
	75 Re 182	0	64.0 h	7+	+4.1(3)	[185,187Re]	NO/S	1983Ha49	HFI 215 105 (1983)
		0 + x	12.7 h	2+	+1.8(2)	[185,187Re]	NO/S	1985Ha41/1981Er01	HFI 22 19 (1985)/PR C23 1739 (1981
	75 Re 183	0	70.0 d	5/2+	+2.3(2)	[185,187Re]	NO/S	1983Ha49	HFI 215 105 (1983)
		497	7 ns	9/2-	(+)3.7(4)	[185,187Re]	TDPAC	1978Ne14	HFI 4 211 (1978)
	75 Re 184	0	38.0 d	3-	+2.8(2)	[185,187Re]	NO/S	1983Ha49	HFI 215 105 (1983)
Reference isotope	75 Re 185	0	stable	5/2+	+2.18(2)		Pi-X	1981Ko11	NP A360 187 (1981)
	75 Re 186	0	90.6 h	1-	+0.618(6)	[185,187Re]	AB	1981Bu13	ZP A302 290 (1981)
Reference isotope	75 Re 187	0	4 x 10*10 y	5/2+	+2.07(2)		Pi-X	1981Ko11	NP A360 187 (1981)
		206	555 ns	9/2-	+3.04(5)	[187Re]	TDPAC	1973Ha61	JCP 58 3339 (1973)
	75 Re 188	0	16.9 h	1-	+0.572(6)	[185,187Re]	AB	1981Bu13	ZP A302 290 (1981)
Osmium	*Muonic atom X-ray hyperfine structure*								

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	76 Os 182	7049	150 ns	25+	4.2(2)	[188Os 155keV]	TDPAD	1991Br25	PL B264 17 (1991)
	76 Os 183	0	13.0 h	9/2+	+3.1(3)	[188Os 155keV]	NO/S	1985Ha41	HFI 22 19 (1985)
	76 Os 184	120	1.18 ns	2+	-2.7(12)	[188Os 155keV]	CER	1972La16	PR C6 613 (1972)
	76 Os 186	137	830 ps	2+	-1.63(4)		Mu-X	1981Ho22	PR C24 1667 (1981)
Reference isotope	76 Os 188	155	710 ps	2+	-1.46(4)		Mu-X	1981Ho22	PR C24 1667 (1981)
		633	6.3 ps	2+	+1.0(3)	[188Os 155keV]	CER	1980Ba42	PR C22 2383 (1980)
		2121	-	(3-)	+1.69(9)		Mu-X	1979Ho23	PR C20 1934 (1979)
	76 Os 189	0	stable	3/2-	+0.86(3)	[188Os 155keV]	ME	1972Wa24	ZP A254 112 (1972)
		70	1.63 ns	5/2-	-0.63(2)	[188Os 155keV]	ME	1972Wa24	ZP A254 112 (1972)
	76 Os 190	187	366 ps	2+	-1.18(3)		Mu-X	1981Ho22	PR C24 1667 (1981)
		558	12.5 ps	2+	+0.8(5)	[188Os 155keV]	CER	1980Ba42	PR C22 2383 (1980)
	76 Os 191	0	15.4 d	9/2-	+2.53(16)	[188Os 155keV]	NO/S	1979Er09	NP A332 41 (1979)
	76 Os 192	206	289 ps	2+	-0.96(3)		Mu-X	1981Ho22	PR C24 1667 (1981)
		489	30.1 ps	2+	-0.7(3)	[188Os 155keV]	CER	1980Ba42	PR C22 2383 (1980)
	76 Os 193	0	30.5 h	3/2-	+0.48(6)	[188Os 155keV]	NO/S,R	1985Be03/1979Er09	JPhys G11 287 (1985)/NP A332 41 (1979
Iridium	*Muonic atom X-ray hyperfine structure*								
	A. Estimated efg at Ir in hcp Co metal crystal								
	B. Estimated efg at Ir in Os metal polycrystal								
	77 Ir 182	0	15 m	3+	-1.7(6)	[191Ir]	RIMS/LS	2006Ve10	Eur Phys J A30 489 (2006)
	77 Ir 183	0	55 m	5/2-	-1.8(7)	[191Ir]	RIMS/LS	2006Ve10	Eur Phys J A30 489 (2006)
	77 Ir 184	0	3.14 h	5-	+2.41(3)	A	QI-NMR/ON	1996Se15	PRL 77 5016 (1996)
	77 Ir 185	0	14.4 h	5/2-	-1.84(12)	A	NMR/ON R	1988Oh02	J Phys G 14 365 (1988)
	77 Ir 186	0	16.64 h	5+	-2.55(3)	A	QI-NMR/ON	1996Se15	PRL 77 5016 (1996)
		x		2(-)	+1.456(17)	A	QI-NMR/ON	1996Se15	PRL 77 5016 (1996)
	77 Ir 187	0	10.5 h	3/2+	+0.941(11)	A	QI-NMR/ON	1996Se15	PRL 77 5016 (1996)
		434	152 ns	11/2-	2.33(14)	[193Ir]	TDPAC	1978HaXO	ARHMI 52 1977
	77 Ir 188	0	40.5 h	1(-)	+0.484(6)	A	QI-NMR/ON	1996Se15	PRL 77 5016 (1996)
	77 Ir 189	0	13.1 d	3/2+	+0.82(8)	[191Ir]	RIMS/LS	2006Ve10	Eur Phys J A30 489 (2006)
					['+0.878(10)]		Estimated	1996Se15	PRL 77 5016 (1996)
	77 Ir 190	0	11.8 d	(4)+	+2.87(16)	A	NO/S	1980Mu07	HFI 7 481 (1980)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Reference isotope	77 Ir 191	0	stable	3/2+	+0.816(9)		Mu-X	1984Ta04	PR C29 1830 (1984)
	77 Ir 192	0	74.2 d	4-	+2.15(6)	A	QI-NMR/ON	1996Se15	PRL 77 5016 (1996)
	77 Ir 193	0	stable	3/2+	+0.751(9)		Mu-X	1984Ta04	PR C29 1830 (1984)
	77 Ir 194	0	19.4 h	1-	+0.339(12)	[191Ir]	NMR/ON	1985Ed02	PR C32 582 (1985)
Platinum	*There is no adopted reference efg for Pt.*								
	A. For details of the efg used see 1992Hi07								
	B. Estimated efg at Pt in osmium metal								
	78 Pt 183	35	43 s	7/2-	+3.4(3)	A	LS	1999Le52/1992Hi07	PR C60 054310 (1999)/ZP A342 1 (1992
	78 Pt 185	0	70.9 m	9/2+	+3.73(17)	A	LS	1999Le52/1992Hi07	PR C60 054310 (1999)/ZP A342 1 (1992
	78 Pt 187	0	2.35 h	3/2-	-1.02(4)	A	RIMS/LS	1992Hi07/1989Du01	ZP A342 1 (1992)/PL B217 401 (1989
	78 Pt 189	0	10.9 h	3/2-	-0.95(4)	A	RIMS/LS	1992Hi07/1989Du01	ZP A342 1 (1992)/PL B217 401 (1989
	78 Pt 191	0	2.9 d	3/2-	-0.87(4)	A	RIMS/LS	1992Hi07/1989Du01	ZP A342 1 (1992)/PL B217 401 (1989
	78 Pt 192	317	43.7 ps	2+	+0.6(2)		CER	1987Gy01	NP A470 415 (1987)
	78 Pt 194	328	41.8 ps	2+	+0.48(14)		CER	1986Gy04	NP A458 165 (1986)
	78 Pt 195	259	4.02 d	13/2+	+1.4(6)	B	NO/S	1985Ed05	PL B158 371 (1985)
	78 Pt 196	356	34 ps	2+	+0.62(8)		CER	1992Li14	NP A548 308 (1992)
		689	36.8 ps	2+	-0.39(16)		CER	1992Li14	NP A548 308 (1992)
		877	3.6 ps	4+	+1.03(12)		CER	1992Li14	NP A548 308 (1992)
		1526	0.98 ps	6+	-0.2(3)		CER	1992Li14	NP A548 308 (1992)
	78 Pt 198	407	22.3 ps	2+	+0.42(12)		CER	1986Gy04	NP A458 165 (1986)
Gold	*Muonic atom X-ray hyperfine structure*								
	79 Au 184	0	21 s	5	+4.7(3)	[197Au]	CLS	1997Le22	PRL 79 2213 (1997)
			49 s	2	+1.90(16)	[197Au]	CLS	1997Le22	PRL 79 2213 (1997)
	79 Au 185	0	4.2 m	5/2-	-1.10(10)	[186Au, 197Au]	CLS	1992Ki30/1994Pa37	NIMPR B70 537 (1992)/NP A580 173 (1994
	79 Au 186	0	10.7 m	3-	+3.10(6)	[186Au, 197Au]	CLS	1992Ki30/1994Pa37	NIMPR B70 537 (1992)/NP A580 173 (1994
	79 Au 191	0	3.18 h	3/2+	+0.72(2)	[197Au]	CLS	1994Pa37	NP A580 173 (1994)
	79 Au 192	0	5.0 h	1-	-0.228(8)	[197Au]	CLS	1994Pa37	NP A580 173 (1994)
	79 Au 193	0	17.65 h	3/2+	+0.66(2)	[197Au]	CLS	1994Pa37	NP A580 173 (1994)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
		290	3.9 s	11/2-	+1.98(6)	[197Au]	MAPON	1996Se06	NP A602 41 (1996)
	79 Au 194	0	39.5 h	1-	-0.240(9)	[197Au]	CLS	1994Pa37	NP A580 173 (1994)
	79 Au 195	0	183 d	3/2+	+0.607(18)	[197Au]	QI-NMR/ON	1993Hi10	NP A562 205 (1993)
		319	30.6 s	11/2-	+1.87(6)	[197Au]	MAPON	1996Se06	NP A602 41 (1996)
	79 Au 196	0	6.18 d	2-	+0.81(7)	[197Au]	NMR/ON	1987Oh11	PR C36 2072 (1987)
Reference isotope	79 Au 197	0	stable	3/2+	+0.547(16)		Mu-X	1974Po02	NP A230 413 (1974)
		409	7.8 s	11/2-	+1.68(5)	[197Au]	MAPON	1996Se06	NP A602 41 (1996)
	79 Au 198	0	2.696 d	2-	+0.640(19)	[197Au]	NMR/ON	1993Hi10	NP A562 205 (1993)
	79 Au 199	0	3.14 d	3/2+	+0.510(16)	[197Au]	NMR/ON	1993Hi10	NP A562 205 (1993)
Mercury	*Efg calculations in the 3P1 state of neutral Hg*								
	80 Hg 185	99.3	27 s	13/2+	+0.2(3)	[201Hg]	β-RADOP	1979Da06	PL B82 199 (1979)
	80 Hg 187	0	2.4 m	13/2+	+0.5(3)	[201Hg]	β-RADOP	1979Da06	PL B82 199 (1979)
		134	1.9 m	3/2-	-0.75(18)	[201Hg]	β-RADOP	1986Ul02/1979Da06	ZP A325 247(1986)/PL B82 199 (1979)
	80 Hg 188	2724	135 ns	12+	0.91(11)	[199Hg 158 keV]	TDPAD	1984Dr09	PL B149 311 (1984)
	80 Hg 189	0	7.6 m	3/2-	-0.8(3)	[201Hg]	β-RADOP	1986Ul02/1979Da06	ZP A325 247(1986)/PL B82 199 (1979)
		0 + x	8.6 m	13/2+	+0.66(19)	[201Hg]	β-RADOP	1979Da06	PL B82 199 (1979)
	80 Hg 190	2621	21 ns	12+	1.17(14)	[199Hg 158 keV]	TDPAD	1984Dr09	PL B149 311 (1984)
	80 Hg 191	0	49 m	3/2-	-0.80(13)	[201Hg]	β-RADOP	1986Ul02/1979Da06	ZP A325 247(1986)/PL B82 199 (1979)
		140	50.8 m	13/2+	+0.6(2)	[201Hg]	β-RADOP	1979Da06	PL B82 199 (1979)
	80 Hg 193	0	3.80 h	3/2-	-0.7(3)	[201Hg]	O	1974Fu06/1966Da07	PR A9 593 (1974)/PR 147 861 (1966)
		141	11.8 h	13/2+	+0.92(2)	[201Hg]	O	1974Re05	PR A9 1776 (1974)
	80 Hg 195	176	41.6 h	13/2+	+1.08(2)	[201Hg]	O	1965Sm01	PR A137 330 (1965)
	80 Hg 197	134	8.1 ns	5/2-	+0.081(6)	[199Hg 158 keV]	TDPAC	1980He05	NP A337 261 (1980)
		299	23.8 h	13/2+	+1.25(3)	[201Hg]	O	1961Br17	J Phys Radium 22 412 (1961)
	80 Hg 198	412	23 ps	2+	+0.68(12) or +0.84(12)		CER	1979Bo16/1984Fe08	ZP A291 245 (1979)/NP A425 373 (1984
	80 Hg 199	158	2.45 ns	5/2-	+0.95(7)		Mu-X	1979Ha08	NP A314 361 (1979)
		208	69 ps	3/2-	+0.62(15)		Mu-X	1979Ha08	NP A314 361 (1979)
		532	42.6 m	13/2+	+1.2(3)	[201Hg]	β-RADOP	1979Da06	PL B82 199 (1979)
	80 Hg 200	368	46.6 ps	2+	+0.96(11) or +1.11(11)		CER	1979Bo16	ZP A291 245 (1979)
Reference isotope	80 Hg 201	0	stable	3/2-	+0.387(6)			2005Bi03/1961Ko05	PR A71 012502 (2005)/PR 121 1104 (1961

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
	80 Hg 202	440	27.3 ps	2+	+0.87(13) or +1.01(13)		CER	1980Sp05	NP A345 252 (1980)
	80 Hg 203	0	46.8 d	5/2-	+0.344(7)	[201Hg]	O	1970Re14	PR A2 1135 (1970)
	80 Hg 204	437	40.2 ps	2+	+0.4(2)		CER	1981Es03	NP A362 227 (1981)
	80 Hg 206	2102	2.15 ms	5-	0.74(15)	[199Hg 158 keV]	TDPAD	1984Ma43	PR C30 1702 (1984)
Thallium	*There is no adopted reference efg for Th.*								
	A. For reference to the efg used in CLS studies see 1987Bo44 (PR C36 2560 (1987)								
	B. Estimated efg in In metal								
	81 Tl 187	335	15.6 s	(9/2-)	-2.43(5)	A	CLS	1993ScZW	IoP Conf 132 221 (1993)
	81 Tl 188	0 + x	71 s	7+	+0.129(4)	A	CLS	1992Me07	ZP A341 475 (1992)
	81 Tl 189	281	1.4 m	9/2-	-2.29(4)	A	CLS	1987Bo44	PR C36 2560 (1987)
	81 Tl 190	0 + x	2.6 m	2-	-0.329(9)	A	CLS	1992Me07	ZP A341 475 (1992)
		0 + y	3.7 m	7+	+0.285(14)	A	CLS	1992Me07	ZP A341 475 (1992)
	81 Tl 191	299	5.2 m	9/2-	-2.23(2)	A	CLS	1992Me07	ZP A341 475 (1992)
	81 Tl 192	0 + x	9.6 m	2-	-0.328(11)	A	CLS	1992Me07	ZP A341 475 (1992)
		0 + y	10.8 m	7+	+0.46(2)	A	CLS	1992Me07	ZP A341 475 (1992)
		251 + x	296 ns	8-	0.44(7)	B	TDPAD	1982Sc27	
	81 Tl 193	365	2.11m	9/2-	-2.20(2)	A	CLS	1987Bo44	PR C36 2560 (1987)
	81 Tl 194	0	34 m	2-	-0.282(7)	A	CLS	1992Me07	ZP A341 475 (1992)
		0 + y	32.8 m	7+	+0.607(16)	A	CLS	1992Me07	ZP A341 475 (1992)
	81 Tl 196	0	1.84 h	2-	-0.178(14)	A	CLS	1992Me07	ZP A341 475 (1992)
		394	1.41 h	7+	+0.76(2)	A	CLS	1992Me07	ZP A341 475 (1992)
	81 Tl 205	204	1.5 ns	3/2+	+0.74(15)		Mu-X	1972Ch07	NP A181 25 (1972)
		2623	short	(5/2)-	-0.5(2)		Mu-X	1972Ch07	NP A181 25 (1972)
Lead	*Efg in 3P1 state of neutral Pb*								
	A. Efg in 1D2 state in neutral Pb								
	B. Normalised to estimated Q of 206Pb 4027 keV								
	C. Obtained from theory of relaxation in Hg metal								
	82 Pb 191	138	2.18 m	13/2+	+0.085(5)	A	CLS	1991Du07	ZP A341 39 (1991)
	82 Pb 192	2581+d	1.07 ms	12+	0.32(4)	B	TDPAD	2007Io03	PL B650 141 (2007)
		2743	756 ns	11-	2.9(3)	B	TDPAD	2007Io03	PL B650 141 (2007)
	82 Pb 193	100	5.8 m	13/2+	+0.195(10)	A	CLS	1991Du07	ZP A341 39 (1991)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
		1586 + x	22 ns	(21/2-)	0.22(2)	B	TDPAD	2004Ba31	Eur Phys J A20 191 (2004)
		2585 + x	9.4 ns	(27/2-)	2.6(3)	B	TDPAD	2011Ba02	
				(29/2-)	2.8(3)	B	TDPAD	2004Ba31	Eur Phys J A20 191 (2004)
		2613 + x	135 ns	(33/2+)	0.45(4)	B	TDPAD	2004Ba31	Eur Phys J A20 191 (2004)
	82 Pb 194	2628	350 ns	12+	0.49(3)	B	TDPAD	1985St16	ZP A322 83 (1985)
		2933	122 ns	11-	3.6(4)	B	TDPAD	2007Io03	PL B650 141 (2007)
	82 Pb 195	203	15.0 m	13/2+	+0.306(15)	A	CLS	1991Du07	ZP A341 39 (1991)
	82 Pb 196	2694	269 ns	12+	0.65(5)	B	TDPAD	1981Zy02	HFI 9 109 (1981)
		3191	85 ns	11-	(-)3.4(7)	B	LEMS	2002Vy01	PRL 88 102502 (2002)
	82 Pb 197	0	8 m	3/2-	-0.08(17)		CLS	1986An06	ZP A451 471 (1986)
		319	43 m	13/2+	+0.378(19)	A	CLS	1991Du07	ZP A341 39 (1991)
	82 Pb 198	2820	212 ns	12+	0.75(5)	B	TDPAD	1981Zy02	HFI 9 109 (1981)
	82 Pb 199	0	1.5 h	3/2-	'+0.08(9)		CLS	1986An06	ZP A451 471 (1986)
	82 Pb 200	2154	44 ns	7-	0.32(2)	B	TDPAD	*********	AECL-6680 27 (1979)
		2183	480 ns	9-	0.40(2)	B	TDPAD	********	AECL-6680 27 (1979)
		3006	152 ns	12+	0.79(3)	B	TDPAD	1979Ma37	PL B88 48 (1979)
	82 Pb 201	0	9.33 h	5/2-	0.01(4)		CLS	1986An06	ZP A451 471 (1986)
		2719	63 ns	25/2-	0.46(2)	B	TDPAD	*********etc	AECL-6680 27 (1979)
	82 Pb 202	2170	3.62 h	9-	+0.58(9)		CLS	1986An06	ZP A451 471 (1986)
		2208	65 ns	7-	0.28(2)	B	TDPAD	*********etc	AECL-6680 27 (1979)
	82 Pb 203	0	51.9 h	5/2-	+0.10(5)		CLS	1986An06	ZP A451 471 (1986)
		1921	56 ns	21/2+	0.85(3)	B	TDPAD	*********etc	AECL-6680 27 (1979)
	82 Pb 204	899	2.94 ps	2+	+0.23(9)		CER	1978Jo04	PL B72 307 (1978)
		1274	280 ns	4+	0.44(2)	B	TDPAD	*********etc	AECL-6680 27 (1979)
	82 Pb 205	0	1.5x10*7y	5/2-	+0.23(4)		CLS	1986An06	ZP A451 471 (1986)
		1014	5.55 ms	13/2+	0.30(5)	C	QIR	1974Ri03	PS 11 228 (1975)
		3196	217 ns	25/2-	0.63(3)	B	TDPAD	*********etc	AECL-6680 27 (1979)
	82 Pb 206	803	8.4 ps	2+	+0.05(9)		CER	1978Jo04	PL B72 307 (1978)
		2200	123 ms	7-	0.33(5)	C	QIR	1974Ri03	PS 11 228 (1975)
		4027	185 ns	12+	estimated 0.51(2)		from B(E2)	1979Ma37	PL B88 48 (1979)
	82 Pb 208	2615	15 ps	3-	-0.34(15)		CER	1984Ve07	AuJP 37 123 (1984)
		4086	0.74 fs	2+	-0.7(3)		CER	1984Ve07	AuJP 37 123 (1984)
Reference isotope	82 Pb 209	0	3.25 h	9/2+	-0.27(17)		CLS	1986An06	ZP A451 471 (1986)
	82 Pb 211	0	36.1 m	9/2+	+0.09(6)		CLS	1986An06	ZP A451 471 (1986)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Bismuth	*Efg calculations in the 4P3/2 state of neutral Bi*							2001Bi23	PRL 87 133003 (2001)
	83 Bi 202	0	1.72 h	[5+]	-1.00(9)	[209Bi]	LFRS	1996Ca02/2001Bi23	NP A598 61 (1996)/PRL 87 133003 (2001
				[6+]	-1.21(9)	[209Bi]	LFRS	1996Ca02/2001Bi23	NP A598 61 (1996)/PRL 87 133003 (2001
		615	3.04 ms	10-	0.14(2)	[209Bi]	TDPAD	1987Ma65	HFI 34 47 (1987)
		2607	310 ns	17+	0.45(2)	[209Bi]	TDPAD	1987Ma65	HFI 34 47 (1987)
	83 Bi 203	0	11.8 h	9/2-	-0.93(7)	[209Bi]	LFRS	1996Ca02/2001Bi23	NP A598 61 (1996)/PRL 87 133003 (2001
	83 Bi 204	0	11.22 h	6+	-0.68(20)	[209Bi]	LFRS	1996Ca02/2001Bi23	NP A598 61 (1996)/PRL 87 133003 (2001
		806	13.0 ms	10-	0.074(2)	[209Bi]	LEMS	1991Sc14	PR C43 2560 (1991)
	83 Bi 205	0	15.3 d	9/2-	-0.81(3)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
	83 Bi 206	0	6.243 d	6+	-0.54(4)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
		1045	0.89 ms	(10-)	0.057(11)	[209Bi]	LEMS	1991Sc14	PR C43 2560 (1991)
	83 Bi 207	0	32.2 y	9/2-	-0.76(2)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
		2101	182 ms	21/2+	0.051(9)	[209Bi]	LEMS	1991Sc14	PR C43 2560 (1991)
	83 Bi 208	0	3.7x10*5 y	5+	-0.70(8)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
Reference isotope	83 Bi 209	0	stable	9/2-	-0.516(15)		AB	1970Hu05/2001Bi23	PR A1 685 (1970)/PRL 87 133003 (2001)
		2563	14 fs	(9/2)+	+0.15(7)	[209Bi]	Mu-X	1972Le07	NP A180 14 (1972)
		2741	12 ps	15/2+	0.0(5)	[209Bi]	Mu-X	1972Le07	NP A180 14 (1972)
	83 Bi 210	0	5.01 d	1-	+0.190(6)	[209Bi]	AB	1962Al02/2001Bi23	PR 125 256 (1962)/PRL 87 133003 (2001)
		271	3.0x10*6 y	9-	-0.66(7)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
	83 Bi 212	0	60.6 m	1(-)	+0.1(4)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
	83 Bi 213	0	45.6 m	9/2-	-0.83(5)	[209Bi]	LRFS	2000Pe30/2001Bi23	J Phys G26 1829(2000)/PRL 87 133003 (2001
Polonium	*There is no adopted reference efg for Po.*								
	A. The moments quoted are based on a calculated value for the 1557 keV, 8+, state in 210Po [1991Be03, NPA522 483 (1991)].								
	84 Po 200	1774	61 ns	8+	(-)1.38(7)	A	TDPAD	1987Ma65	HFI 34 47 (1987)
	84 Po 202	1712	110 ns	8+	(-)1.21(16)	A	LEMS	1997Ne06	NP A625 668 (1997)
	84 Po 204	1639	158 ns	8+	(-)1.14(5)	A	TDPAD	1987Ma65	HFI 34 47 (1987)
	84 Po 206	1586	212 ns	8+	(-)1.02(4)	A	TDPAD	1987Ma65	HFI 34 47 (1987)
	84 Po 208	1528	380 ns	8+	(-)0.90(4)	A	TDPAD	1987Ma65	HFI 34 47 (1987)
	84 Po 209	1473	98.1 ns	(17/2-)	(-)0.39(8)	A	TDPAD	1983Da01	NP A394 245 (1983)
	84 Po 210	1557	96 ns	8+	-0.55(2)	calculation	from B(E2)	1991Be03	NP A522 483 (1991)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
		2849	20.1 ns	11-	(-)0.86(11)	A	TDPAD	1991Be03	NP A522 483 (1991)
		4372	51 ns	13-	(-)0.90(7)	A	TDPAD	1991Be03	NP A522 483 (1991)
		5058	265 ns	16+	(-)1.30(2)	A	TDPAD	1991Be03	NP A522 483 (1991)
Astitine	*There is no adopted reference efg for As.*								
	A. The moments quoted are based on a calculated value for the 1417 keV, 21/2-, state in 211At [1995Ba66 NP A591 104 (1995)].								
	85 At 208	1090	48 ns	10-	(-)1.67(18)	A	LEMS	1991Sc15	PR C43 2566 (1991)
	85 At 209	1428	26 ns	21/2-	(-)0.78(6)	A	TDPAD	1983Ma08	PL B122 27 (1983)
		2429	890 ns	29/2+	(-)1.49(9)	A	TDPAD	1983Ma08	PL B122 27 (1983)
	85 At 210	1363	28.4 ns	11+	(-)0.64(5)	A	TDPAD	1983Ma08	PL B122 27 (1983)
		2550	480 ns	15-	(-)1.21(7)	A	TDPAD	1983Ma08	PL B122 27 (1983)
		4028	5.9 ms	19+	(-)2.16(18)	A	LEMS	1991Sc15	PR C43 2566 (1991)
	85 At 211	1417	35.1 ns	21/2-	(-)0.524(10)	calculation	from B(E2)	1995Ba66	NP A591 104 (1996)
		2641	50.8 ns	29/2+	(-)1.01(7)	A	TDPAD	1983Ma08	PL B122 27 (1983)
		4816	4.2 ms	39/2-	(-)1.88(19)	A	LEMS	1991Sc15	PR C43 2566 (1991)
Radon	*There is no adopted reference efg for Ra.*								
	A. Estimated efg in Rn atom [CERN EP/87 51 (1987)].								
	B. Normalised to Q of 1694 keV, 8+ state in 212Rn estimated from B(E2).								
	86 Rn 203	361	28 s	(13/2+)	+1.28(13)	209Rn	CLS	1987OtZW	CERN EP/87 51 (1987)
	86 Rn 205	0	2.83 m	5/2-	+0.062(6)	209Rn	CLS	1987OtZW	CERN EP/87 51 (1987)
	86 Rn 207	0	9.3 m	5/2-	+0.22(2)	209Rn	CLS	1987OtZW	CERN EP/87 51 (1987)
	86 Rn 208	1826	490 ns	8+	0.41(5)	B	TDPAD	1986Be40	PL B182 11 (1986)
n	86 Rn 209	0	29 m	5/2-	+0.31(3)	A	CLS	1987OtZW	CERN EP/87 51 (1987)
	86 Rn 210	1665+x	644 ns	(8+)	0.32(4)	B	TDPAD	1986Be40	PL B182 11 (1986)
		3812+x	1.05 ms	(17)-	0.89(10)	B	TDPAD	1986Be40	PL B182 11 (1986)
	86 Rn 211	1578+x	596 ns	17/2-	0.19(2)	B	TDPAD	1985Da14	PRL 55 1269 (1985)
c		8855+y	201 ns	63/2-	1.6(2)	B	TDPAD	1985Da14	PRL 55 1269 (1985)
	86 Rn 212	1502	8.8 ns	4+					
		1694	0.91 ms	8+	-0.18(2)	from B(E2)	not measured	1985Da13	NP A441 501 (1985)
	86 Rn 219	0	3.96 s	5/2+	+1.15(12)	209Rn	CLS	1987OtZW	CERN EP/87 51 (1987)
	86 Rn 221	0	25 m	7/2+	-0.47(5)	209Rn	CLS	1987OtZW	CERN EP/87 51 (1987)
	86 Rn 223	0	23.2 m	7/2	+0.80(8)	209Rn	CLS	1988NeZZ	Bk88 NFFS 126 (1988)
	86 Rn 225	0	4.5 m	7/2-	+0.84(8)	209Rn	CLS	1988NeZZ	Bk88 NFFS 126 (1988)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Francium	*Efg calculated in the 2P3/2 state of the Fr atom (PR A27 3332 (1983) revised (PL B163 (1985)).*								
	A. Normalised to calculated Q of the 2538 keV 29/2+ state in 211Fr.								
	87 Fr 207	0	14.8 s	9/2-	-0.16(5)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 208	0	58.6 s	7+	0.00(4)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 209	0	50 s	9/2-	-0.24(2)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 210	0	3.2 m	6+	+0.19(2)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 211	0	3.1 m	9/2-	-0.19(3)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
		2423	146 ns	29/2+	(-)1.07(18)	A	LEMS	1991Ha02	PR C43 514 (1991)
		4657	123 ns	45/2-	(-)2.0(6)	A	LEMS	1991Ha02	PR C43 514 (1991)
	87 Fr 212	0	19.3 m	5+	-0.10(1)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
		2492	604 ns	(15-)	(-)0.84(13)	A	TDPAD	1990By03	NP A516 145 (1990)
		5854	312 ns	(27-)	(-)1.7(3)	A	TDPAD	1990By03	NP A516 145 (1990)
	87 Fr 213	0	34.7 s	9/2-	-0.14(2)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
		2538	243 ns	29/2+	[-0.70(7)]	calculated	not measured	1990By03	NP A516 145 (1990)
		8095	3.1 ms	65/2-	(-)2.2(5)	A	LEMS	1991Ha02	PR C43 514 (1991)
	87 Fr 214	640	103 ns	11+	0.8(2)	A	LEMS	1995Ne06	PR C51 3483 (1995)
		6477+D'	108 ns	32+ or 33+	2.2(5)	A	LEMS	1995Ne06	PR C51 3483 (1995)
	87 Fr 220	0	27.4 s	1+	+0.47(3)	223Fr	ABLS	1985Co24/1987Co19	PL B163 66 (1985)/NP A468 1 (1987)
	87 Fr 221	0	4.8 m	5/2-	-0.98(6)	223Fr	ABLS	1985Co24/1987Co19	PL B163 66 (1985)/NP A468 1 (1987)
	87 Fr 222	0	14.2 m	2-	+0.51(4)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
Reference isotope	87 Fr 223	0	21.8 m	3/2(-)	+1.17(1)		ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 224	0	3.3 m	1(-)	+0.517(4)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 225	0	3.9 m	3/2-	"+1.32(5)	223Fr	ABLS	1985Co24/1987Co19	PL B163 66 (1985)/NP A468 1 (1987)
	87 Fr 226	0	48 s	1	-1.35(2)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
	87 Fr 228	0	39 s	2-	+2.38(5)	223Fr	ABLS	1985Co24	PL B163 66 (1985)
Radium	*Efg calculated in 7s7p states of the Ra atom*								
	88 Ra 209	0	4.7 s	5/2-	+0.39(4)	223Ra	CLS	1989Ne03	ZP D11 105 (1989)
	88 Ra 211	0	13s	5/2-	+0.46(4)	223Ra	CLS	1989Ne03	ZP D11 105 (1989)
	88 Ra 221	0	30 s	5/2-	+1.92(6)	223Ra	CLS	1989Ne03	ZP D11 105 (1989)

Element	Nucleus	E(level)	$T_{1/2}$	I^p	Q(b)	Ref. Std.	Method	NSR Keynumber	Journal Reference
Reference isotope	88 Ra 223	0	11.44 d	3/2+	+1.21(3)		CLS	2008Py02/1989Ne03	Mol Phys 106 1965 (2008)/ZP D11 105 (1989
	88 Ra 227	0	42.2 m	3/2+	+1.53(6)	223Ra	CLS	1989Ne03	ZP D11 105 (1989)
	88 Ra 229	0	4.0 m	5/2(+)	+2.99(12)	223Ra	CLS	1989Ne03	ZP D11 105 (1989)
Actinium	*There is no adopted reference efg for Ac.*								
	The quoted value and its error are both quite uncertain.								
	89 Ac 227	0	21.77 y	3/2-	-1.7(2)		O	1955Fr26	PR 98 1514 (1955)
Thorium	*There is no adopted reference efg for Th.*								
	A. Based on estimated efg in the Th atom								
	90 Th 229	0	7340 y	5/2+	+4.3(9)	A	O	1974Ge06	JPPa 35 483 (1974)
Protoactinium	*There is no adopted reference efg for Pa.*								
	A. Estimated from B(E2) value.								
	B. Based on estimated efg in the Pr atom								
	91 Pa 231	0	3.3x10*4 y	3/2-	[-1.72(5)]	A		1978Fr28	PL A69 225 (1975)
		84.2	41 ns	5/2+	+0.7(2)	231Pa	ME	1978Fr28	PL A69 225 (1975)
	91 Pa 233	0	27.0 d	3/2-	-3.0(4)	B	AB	1961Ma42	NP 23 90 (1961)
Uranium	*Muonic atom X-ray hyperfine structure*								
Reference isotope	92 U 233	0	1.6x10*5 y	5/2+	+3.663(8)		Mu-X	1984Zu02	PRL 53 1888 (1984)
		40	50 ps	7/2+	+0.64(3)		Mu-X	1984Zu02	PRL 53 1888 (1984)
Reference isotope	92 U 235	0	7.0x10*8 y	7/2-	+4.936(6)		Mu-X	1984Zu02	PRL 53 1888 (1984)
		46	< 60 ps	9/2-	+1.87(3)		Mu-X	1984Zu02	PRL 53 1888 (1984)
Neptunium	*Muonic atom X-ray hyperfine structure*								
Reference isotope	93 Np 237	0	2.1x10*6 y	5/2+	+3.886(6)		Mu-X	1987De10	PL B189 7 (1987)
		60	68 ns	5/2-	+3.85(4)	237Np	ME	1968Pi01/1968St03	BAPS 13 28 (1968)/PR 165 1319 (1968
Plutonium	*Muonic atom X-ray hyperfine structure*								
	A. Calculated efg of the 8F3/2 state of Pu II								
Reference isotope	94 Pu 239	8	36 ps	3/2+	-2.319(7)		Mu-X	1986Zu01	PL B167 383 (1986)
		57	101 ps	5/2+	-3.345(13)		Mu-X	1986Zu01	PL B167 383 (1986)
		76	83 ps	7/2+	-3.83(3)		Mu-X	1986Zu01	PL B167 383 (1986)
	94 Pu 241	0	14.4 y	5/2+	+6(2)	A	O	1964Ch12	JPPa 25 825 (1964)
Americium	*Muonic atom X-ray hyperfine structure*								

Element	*Nucleus*	*E(level)*	$T_{1/2}$	I^p	*Q(b)*	*Ref. Std.*	*Method*	*NSR Keynumber*	*Journal Reference*
Reference isotope	95 Am 241	0	432.7 y	5/2-	+4.34(5)		Mu-X	1985Jo04	PL B161 75 (1985)
	95 Am 242	0	16.0 h	1-	-2.44((3)	241Am	AB	1966Ar04	PR 144 994 (1966)
		49	152 y	5-	+6.7(4)	241Am	ABLS	1988Be30	ZP A330 235 (1988)
	95 Am 243	0	7370 y	5/2-	+4.32(6)		Mu-X	1985Jo04	PL B161 75 (1985)
		84	2.3 ns	5/2+	+4.2(2)	241Am	ME	1976Bo13	JINC 38 1291 (1976)
Einsteinium	*Efg calculated in the Es atom*								
Reference isotope	99 Es 253	0	20.4 d	7/2+	+6.7(8)		AB	1975Go05	PR A11 499 (1975)
Reference isotope	99 Es 254	78	39.3 h	2+	+3.7(5)		AB	1975Go05	PR A11 499 (1975)

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