$^{123}Te^{m}$ - Comments on evaluation of decay data by M. M. Bé and V. Chisté

This evaluation was completed in October 1993 and has been updated in September 2002.
Several measurements of the gamma emission intensity and of the total internal conversion coefficient of the 159-keV line were carried out. The decay scheme has been constructed mainly from these measurements.

Nuclear Data

- Spins and parities are from the LPRI "Table de Radionucléides" [1]-

- The half-life value is the weighted average of : 119,7(3) (Emery 1970 – 1970EmZY) and 119,2(1) (Coursey 1992 – 1992Co11) ; its uncertainty is the internal uncertainty.

Gamma Transitions

- 88-keV gamma transition

For this M4 transition, the various theoretical conversion coefficients differ by about 5%. They are compared with measured values in the following table :

	Th. value Band 2002 – (2002Ba85)	Th. Value Rösel 1978 – (1978Ro22)	Exp. Value Kalinausskas 1969 – (1968Ka20)	Exp. Value Raman 1973 – (1973Ra32)	Exp. value Chu 1964 – (1964Ch18)
α_T	1099	1151	1000 (70)	1080 (40)	
α_K	463	483			455 (9)
α_L	493	517			482 (14)
α_M	118	124			

Values interpolated from the new Band *et al.* tables (2002Ba85), have been adopted following the recommendations of Gorozhankin (2002) [3].
The transition probability has been deduced from the decay scheme balance at the 159-keV level.

- 247-keV gamma transition

The conversion coefficients, for this E5 transition, were calculated using the new tables of Band *et al.* (2002Ba85) as suggested by Gorozhankin [2, 3]. The theoretical α_T (7,75 (30)) agrees with the measured value (8,1(4)) given by Raman (1973Ra32).
The transition probability has been deduced using this theoretical value for α_T and the gamma emission intensity (see below).

- 159-keV gamma transition

For the 159-keV gamma transition, the following values of the mixing ratio squared δ^2 have been found in the literature :

Reference	d^2	a_T
Goldberg *et al.* – (1955Go25)	0,013(1)	$1,919\ 10^{-1}$
Fagg *et al.* – (1955Fa40)	0,0034(20)	$1,905\ 10^{-1}$
Chu *et al.* – (1964Ch08)	0,0067(11)	$1,909\ 10^{-1}$
Gupta *et al.* – (1966Gu02	0,011(8)	$1,916\ 10^{-1}$
Alkhazov *et al.* – (1964Al28)	0,004(5)	$1,906\ 10^{-1}$
Törnkvist *et al.* – (1969To02)	0,0119(9)	$1,917\ 10^{-1}$
Krane – (1977Kr13)	0,01232 (47) (adopted value)	$1,918\ 10^{-1}$

The internal conversion coefficients were calculated by ICC Computer Code [2] by interpolation of the Rösel tables (1978Ro22).

Elsewhere, the following measurements of the α_T coefficients were carried out :

Chu1964 (1964ch08)	0,1964 (74)
Hatch1966 (1966Ha03)	0,1979 (54)
Janssen1992 (1999Ja15)	0,1932 (46)
Janssen1992 (1999Ja15)	0,1895 (13)

The weighted mean of the above values is 0,1904 with a reduced-χ^2 of 1,14 ; the internal uncertainty is 0,0012; the external uncertainty 0,0013. This value is in good agreement with the theoretical adopted α_T (0,1918(19)).
The transition probability was deduced from the evaluated value (see below) of the emission intensity, using the adopted α_T .

Gamma Ray Emissions

- 159-keV gamma ray emission intensity is the weighted mean of :

83,65	0,50	(Chu – 1964Ch08)
83,48	0,38	(Hatch – 1966Ha03)
83,2	0,5	(Schötzig 1991 – [5])
83,9	0,6	(Coursey – 1992Co11)
83,81	0,32	(Janssen – 1992Ja15)
84,07	0,09	(Janssen – 1992Ja15)

The adopted value 83,99 is the weighted mean with an internal uncertainty of 0,08, and a reduced-χ^2 of 1,18.

[From the decay scheme and the α_T = 0,1918(19), the expected value is 83,90(14).]

- From α_T = 1099(33) and the decay scheme, the 88-keV gamma ray emission intensity is 0,0909(27). This value agrees with $I_\gamma(88)$ = 0,0927(34), deduced from the ratio $I_\gamma(159)/I_\gamma(88)$ = 906(33) measured by Raman (1972Ra07), using $I_\gamma(159)$ = 83,99(8).

- The 247-keV gamma ray emission intensity of 0,000344(34) has been deduced from the ratio $I_\gamma(247)/I_\gamma(159) = 4,1(4)\ 10^{-6}$ measured by Raman (1973Ra32).

Conversion electrons

The conversion electron emission intensities have been calculated using conversion coefficients and gamma-ray emission intensities.

Atomic Data

The ω_K value is from Bambynek (1984) [6].
The ϖ_L value is from Schönfeld (1996Sc06).
The X-ray and Auger electron emission intensities have been calculated by using the program EMISSION (version 3.01) [4]

References

[1] F. Lagoutine, N. Coursol, J. Legrand.
Table de Radionucléides, CEA/DIMRI, F-91191 Gif-sur-Yvette cedex, ISBN 2 7272 0078 1

[2] V. M. Gorozhankin, N. Coursol, E. A. Yakushev. ICC99v3a: A computer program for interpolating internal conversion coefficients from Hager and Seltzer, Rosel et al., and from Band et al. (1999), BNM-CEA/LNHB

[3] V. M. Gorozhankin, N. Coursol, E. A. Yakushev.
Appl. Rad. Isot. **56**, 189 (2002)

[4] E. Schönfeld, H. Janssen. The program EMISSION Computer Code, PTB
Appl. Radiat. Isot. **52**, 595 (2000).

[5] U. Schötzig, H. Schrader, K. Debertin. Proc. Int. Conf. Nuclear Data Sci. Techn., Jülich, 13-17 May (1991)

[6] W. Bambynek. X-84 Proc. X-Ray and Inner-Shell Processes in Atoms, Molecules and Solids, A. Meisel Ed., Leipzig Aug. 20-23 (1984)

1955Fa40 – L. W. Fagg, E. A. Woliki, R. O. Bondelid, K. L. Dunning, S. Snyder.
Phys. Rev. **100**, 1299 (1955).
1955Go21 – N. Goldberg, S. Frankel.
Phys. Rev. **100**, 1350 (1955).
1964Al28 – D. G. Alkhazov, V. D. Vasilev, G. M. Gusinskii, I. K. Lemberg, V. A. Nabichvrishvili.
Bull. Acad. Sci. USSR, Phys. Ser. **28**, 1575 (1965).
1964Ch18 – Y. Y. Chu, M.L. Perlman.
Phys. Rev. **135**, B319 (1964).
1964Ch08 – Y. Y. Chu, O. C. Kistner, A. C. Li, S. Monaro, M. L. Perlman.
Phys. Rev. **133**, B1361 (1964).
1966Gu02 – S. L. Gupta, M. M. Bajaj, N. K. Saha.
Nucl. Phys. **80**, 471 (1966).
1966Ha03 – E. N. Hatch, G. W. Eakins, G. C. Nelson, R. E. McAdams.
Proc. Intern. Conf. Internal Conversion Process, Nashville, Tenn. (1965), J.H. Hamilton, Ed., Academic Press, Inc., New York, p. 183 (1966).
1968Ka20 - R. A. Kalinauskas, K. V. Makaryunas, E. K. Makaryunene, R. I. Davidonis.
. Bull. Acad. Sci. USSR, Phys. Ser. **32**, 187 (1969).
1969To02 – S. Tornkvist, S. Strom, L. Hasselgren.
Nucl. Phys. **A130**, 604 (1969).
1970EmZY – J. F. Emery, S. A. Reynolds, E. I. Wyatt.
ORNL-4466, p. 75 (1970).

1972Ra07 – S. Raman
Nucl. Instrum. Methods **103** (1972) 407
1973Ra32 – S. Raman, R. L. Auble, W. T. Milner.
Phys. Lett. **47B**, 19 (1973).
1974RaZO – S. Raman, R. L. Auble, W. T. Milner, T. A. Walkiewickz, R. Gunnink, B. Martin.
Report ORNL-4937, p. 144 (1974).
1977Kr13 – K. S. Krane.
At. Data Nucl. Data Tables **19**, 363 (1977).
1978Ro22 – F. Rosel, H. M. Fries, K. Alder, H. C. Pauli.
At. Data Nucl. Data Tables **21**, 92 (1978).
1992Ja15 – H. Janssen, E. Schönfeld, R. Klein.
Appl. Radiat. Isot. **43**, 1309 (1992).
1992Co11 – B. M. Coursey, D. B. Golas, D. H. Gray, D. D. Hoppes, F. J. Schima.
Nucl. Instrum. Methods Phys. Res. **A312**, 121 (1992).
1996Sc06 – E. Schönfeld, H. Janssen.
Nucl. Instrum. Methods Phys. Res. **A369**, 527 (1996).
2002Ba85 – I. M. Band, M. B. Trzhaskovskaya, C. W. Nestor, Jr., P. O. Tikkanen, S. Raman.
At. Data Nucl. Data Tables **81**, 1 (2002).