

**²¹³Po - Comments on evaluation of the decay data
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This evaluation was completed in 2007. Literature available by December 2007 was included.

1 Decay Scheme

²¹³Po disintegrates 100 % by α emissions to levels in ²⁰⁹Pb. ²¹³Po ground state has $J^\pi = 9/2^+$ (2007Ba19).

2 Nuclear Data

The Q value is from the 2003Au03 evaluation.

The level energies, spin and parities are from 2007Ba19.

The measured and evaluated ²¹³Po half-life values are listed in Table 1.

Table 1 - Measured half-life values of ²¹³Po and evaluated value, in μ s.

$T_{1/2}$ (μ s)	References	measurement method
4.2 (8)	1948Je05	
3.74 (2)	1995WaZQ	Superseded by 1998Wa25
3.70 (3)	1997VaZV	Superseded by 1998Wa25
3.75 (4)	1997Wa27	Si(Au), delayed β - α coincidences
3.65 (4)	1998Wa25	Three-dimensional single-crystal scintillation time spectrometer
3.65	2002Mo46	HPGe and 4π autocorrelation single-crystal scintillation time spectrometer. No uncertainty given
3.70 (5)		Unweighted mean of 1997Wa27 and 1998Wa25
3.70 (5)		Weighted mean of 1997Wa27 and 1998Wa25, $\chi^2=3.1$
3.70 (5)	Recommended value	

Values given by 1995WaZQ, 1997VaZV, 1997Wa27, and 1998Wa25 have authors in common, thus, they may not be independent of each other. A recommended value of 3.70 (5) μ s has been estimated by the evaluator.

2.1 g Transitions

The γ -ray transition probability is calculated using the γ -ray emission intensity and the relevant internal conversion coefficient.

Multipolarity of 778.8 keV γ -ray is from level scheme (not measured).

The internal conversion coefficient (ICC) and their associated uncertainties for γ -ray transitions have been obtained using the BRICC computer program, which uses the "Frozen Orbital" approximation (2002Ba85).

2.2 a Transitions

Measured and recommended alpha particles energies are listed in table 2. The recommended values are from 1964Va20 and 1991Ry01.

Table 2 - Measured and recommended value of α -particle energy from ²¹³Po decay

1964Va20	1982Bo04 ^a	1991Ry01 ^b	Recommended value
7614 (10)			7614 (10)
8377 (5)	8376 (3)	8375.9 (25)	8375.9 (25)

^a: Original energies of 1982Bo04 have been increased by 2 keV due to changes in calibration energies (1991Ry01).

^b: evaluation.

The measured and recommended alpha particle emission probabilities are listed in table 3. The recommended alpha particle emission probabilities have been deduced from γ -ray transition intensity balance.

Table 3 - Measured and recommended α -particle emission probabilities from ²¹³Po decay

E_α (keV)	P_α			
	1964Va20	1969LeZW	1997Ch53	Recommended
7614 (10)	0.003 (1)	0.006 (2)	0.0031 (2)	0.0050 (5)
8375.9 (25)	100	100	99.997 (31)	99.9950 (5)

$P_\alpha = 0.0031$ (2) % in 1997Ch53 is from an α -particle spectrum. This very weak peak is at the low-energy tail of the intense 8376-keV α -particle group. Thus, the evaluator has considered its reported intensity to be quite inaccurate, despite the value reported in 1997Ch53.

3. Photon Emissions

There is only one γ -ray emitted from ²¹³Po α decay. Only 1989Ko26 measured the γ -ray energy: 778.8 (3) keV. The present recommended γ -ray energy has been taken from this measurement.

The recommended absolute γ -ray emission probability has been obtained as follows: 1989Ko26 measured the ratio: $I_\gamma(779 \text{ keV}) / I_\gamma(440 \text{ keV})$ (in ²¹³Bi β^- decay) = 0.000181 (18). Using $P_\gamma(440 \text{ keV}) = 26.1$ (3) % and $\% \beta^- = 0.9791$ (3) (2007HuXX) then $P_\gamma(778 \text{ keV}) = 0.0048$ (5) %.

4. References

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Comments on evaluation

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