

^{189}Ta IT decay (0.58 μs) 2011St21,2009A130

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson, Balraj Singh		NDS 142, 1 (2017)	15-Apr-2017

Parent: ^{189}Ta : $E=0+x$; $T_{1/2}=0.58 \mu\text{s}$ 22; %IT decay=100.0

^{189}Ta -%IT decay: Assumed 100% decay through isomeric transitions.

2011St21: ^{189}Ta nuclide formed by in-flight fragmentation of ^{208}Pb beam at 1 GeV/nucleon from the GSI UNILAC and SIS-18 accelerator complex. Fragments identified in flight by the FRS fragment separator operated in achromatic mode based on time of flight, $B\rho$ and energy loss. Transmitted ions slowed in Al degraders and stopped in a plastic catcher. The stopper was surrounded by the RISING γ -ray spectrometer. Measured E_γ , I_γ , delayed γ rays, isomer half-life. Beam was fully-stripped or mixture of H- or He-like nuclei.

2009A130: projectile fragmentation of ^{208}Pb beam at 1 GeV/nucleon with a ^9Be target at GSI facility. Fragment Recoil separator (FRS) used to identify ^{189}Ta nuclide. The secondary ions were implanted into RISING active stopper consisting of double-sided silicon strip detectors. Measured E_γ , I_γ , $\gamma\gamma$, $\gamma\gamma(t)$, correlations, and isomer half-lives using RISING array of 15 seven-element Ge cluster detectors for γ rays, two multi-wire proportional counters for position measurements, two scintillation detectors providing time-of-flight and position information, and two scintillators and an ionization chamber (MUSIC) for energy loss measurements.

 ^{189}Ta Levels

E(level)	$T_{1/2}$	Comments
0+x	0.58 μs 22	E(level): x=1600 400 suggested in 2017Au03 from systematics. According to 2011St21 , there may be another μs isomer, possibly with $T_{1/2}=1.6 \mu\text{s}$ 2, as reported by 2009A130 . $T_{1/2}$: from $\gamma(t)$ (2011St21). Other: 1.6 μs 2 (2009A130 , $\gamma(t)$). It is suggested by 2011St21 that there may be two isomeric levels here. 153.9 γ , 283.7 γ , 342.5 γ , 388.7 γ , and 481.6-keV γ rays deexcite this isomer, but the decay scheme is unknown.

 $\gamma(^{189}\text{Ta})$

E_γ	I_γ	$E_i(\text{level})$	Comments
$^x57^\ddagger$			
$^x83^\ddagger$			
$^x99^\#$			
$^x134^\ddagger$			
$^x153.9^\dagger$ 5	100 † 19		Additional information 1.
$^x199^\ddagger$			
$^x246^\ddagger$			
$^x283.7^\dagger$ 5	73 † 17		Additional information 2.
$^x342.5^\dagger$ 5	47 † 13		
$^x388.7^\dagger$ 5	80 † 19		Additional information 3.
$^x481.6^\dagger$ 5	97 † 21		Additional information 4.

† From [2011St21](#). Uncertainty of 0.5 keV is assigned in consultation with Zs. Podolyak. This γ is associated with the deexcitation of a 0.58- μs isomer, but the level scheme is unknown. However, the authors state that all the five γ transitions reported are in mutual coincidence. It is also suggested by [2011St21](#) that there may be two isomers in ^{189}Ta , one of 0.58 μs half-life in their work, and the other of 1.6 μs reported in their earlier study [2009A130](#). Four of these gamma rays were also observed in [2009A130](#), assigned to the decay of a 1.6- μs isomer, however no energy uncertainties or intensities were reported in that work.

‡ From [2009A130](#) where they are shown in a spectrum associated with the isomeric decay in Figure 4. [2011St21](#) stated that these lines were only weakly observed in their spectrum and that they considered these as tentative, or possibly associated with another

Continued on next page (footnotes at end of table)

^{189}Ta IT decay (0.58 μs) [2011St21,2009A130](#) (continued)

$\gamma(^{189}\text{Ta})$ (continued)

isomer in ^{189}Ta . The evaluators note that in the spectrum shown in Fig. 4 of [2009A130](#), these lines are weak relative to the other γ lines as well.

Questionable γ ray from [2011St21](#).

^x γ ray not placed in level scheme.