

<sup>239</sup>Pu(n,Fγ):isomer 2010Si03

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Full Evaluation	N. Nica	NDS 160, 1 (2019)	21-Oct-2019

Compiled for the XUNDL database by B. Singh (McMaster) and by K. Zuber (IFJ, PAN, Krakow).

**2010Si03:** masses 155, 153, and 151 fission fragments were observed using the Lohengrin mass spectrometer at the high-flux reactor of the Institute Laue-Langevin, Grenoble. <sup>155</sup>Sm and other mass 155 nuclei were produced by thermal-neutron induced fission of a 0.32 mg/cm<sup>2</sup>, 7×0.5 cm<sup>2</sup> <sup>239</sup>Pu target and mass spectrometer selecting recoiling fragments. Measured Eγ, Iγ, γγ, γγ(t) using two Clover Ge detectors. Conversion electrons were detected by two Si(Li) detectors. Theoretical calculations done with the quasiparticle rotor model (QPRM).

Level scheme based on the γγ and γγ-delayed γ ray coinc. data.

Two new isomeric states were measured and placed in <sup>155</sup>Sm level scheme (see table below). A 29.7-keV γ ray measured in a delayed coin spectrum with A=155 ions gives a half-life of 1.3 μs for a third isomer in <sup>155</sup>Sm, or in <sup>155</sup>Pm or <sup>155</sup>Nd.

<sup>155</sup>Sm Levels

E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	T <sub>1/2</sub>	Comments
0.0	3/2 <sup>-</sup>		E(level): 3/2[521], dominant configuration from QPRM calculations.
16.5 <sup>#</sup> 10	5/2 <sup>+</sup>	2.8 μs 5	T <sub>1/2</sub> : from fitting an exponential function to the time spectra of delayed 16.5 keV transition ( <b>2010Si03</b> ).
76.4 <sup>#</sup> 11	7/2 <sup>+</sup>		
152.7 <sup>#</sup> 11	9/2 <sup>+</sup>		
251.0 <sup>#</sup> 11	11/2 <sup>+</sup>		
359.2 <sup>#</sup> 11	13/2 <sup>+</sup>		
538.4 11	(11/2 <sup>-</sup> )	1.00 μs 8	J <sup>π</sup> : ≥11/2 from level scheme arguments; (11/2 <sup>-</sup> ) based on QPRM calculations ( <b>2010Si03</b> ). T <sub>1/2</sub> : from fitting an exponential decay function to the time spectra, sum of 385.6+287.5+76.5+60.0 γ rays +Kα+Kβ x rays in the delayed cascade from the 538.6 keV isomer ( <b>2010Si03</b> ). E(level): dominant configuration=11/2[505].

<sup>†</sup> From least-squares fit to Eγ's.

<sup>‡</sup> Unless noted otherwise, from Adopted Levels, Gammas dataset.

<sup>#</sup> Band(A): 5/2[642] band (dominant configuration from QPRM calculations).

γ(<sup>155</sup>Sm)

Based on their measured relative γ-ray intensities and internal conversion coefficients, **2010Si03** calculated total transition intensities and deduced experimental branching ratios that were compared with those calculated by the quasiparticle rotor model (QPRM).

E <sub>γ</sub> <sup>†</sup>	I <sub>γ</sub> <sup>‡</sup>	E <sub>i</sub> (level)	J <sub>i</sub> <sup>π</sup>	E <sub>f</sub>	J <sub>f</sub> <sup>π</sup>	Mult.	Comments
16.5		16.5	5/2 <sup>+</sup>	0.0	3/2 <sup>-</sup>	E1	α(M)exp=1.1 3 ( <b>2010Si03</b> ) α(M)=1.17 5 Mult.: from α(M)exp.
60.0 2	11 1	76.4	7/2 <sup>+</sup>	16.5	5/2 <sup>+</sup>		
76.5 2	18 2	152.7	9/2 <sup>+</sup>	76.4	7/2 <sup>+</sup>		
98.3 <sup>#</sup> 2	7 1	251.0	11/2 <sup>+</sup>	152.7	9/2 <sup>+</sup>		
108.0 <sup>#</sup> 2	1 1	359.2	13/2 <sup>+</sup>	251.0	11/2 <sup>+</sup>		
136.1 <sup>#</sup> 2	6 3	152.7	9/2 <sup>+</sup>	16.5	5/2 <sup>+</sup>		
179.2 2	6 3	538.4	(11/2 <sup>-</sup> )	359.2	13/2 <sup>+</sup>	[E1]	

Continued on next page (footnotes at end of table)

$^{239}\text{Pu}(n,\text{F}\gamma)\text{:isomer}$  2010Si03 (continued) $\gamma(^{155}\text{Sm})$  (continued)

<u><math>E_\gamma</math></u> <sup>†</sup>	<u><math>I_\gamma</math></u> <sup>‡</sup>	<u><math>E_i(\text{level})</math></u>	<u><math>J_i^\pi</math></u>	<u><math>E_f</math></u>	<u><math>J_f^\pi</math></u>	<u>Mult.</u>
206.5 <sup>#</sup> 2	4 1	359.2	13/2 <sup>+</sup>	152.7	9/2 <sup>+</sup>	
287.5 2	11 3	538.4	(11/2 <sup>-</sup> )	251.0	11/2 <sup>+</sup>	[E1]
385.6 2	75 7	538.4	(11/2 <sup>-</sup> )	152.7	9/2 <sup>+</sup>	[E1]

<sup>†</sup> Typical uncertainty is stated as 0.2 keV in 2010Si03.

<sup>‡</sup> Intensities relative to 100 for total intensity of 76.5 $\gamma$  according to 2010Si03. The placement of most of the weak transitions is uncertain.

<sup>#</sup> Placement of transition in the level scheme is uncertain.

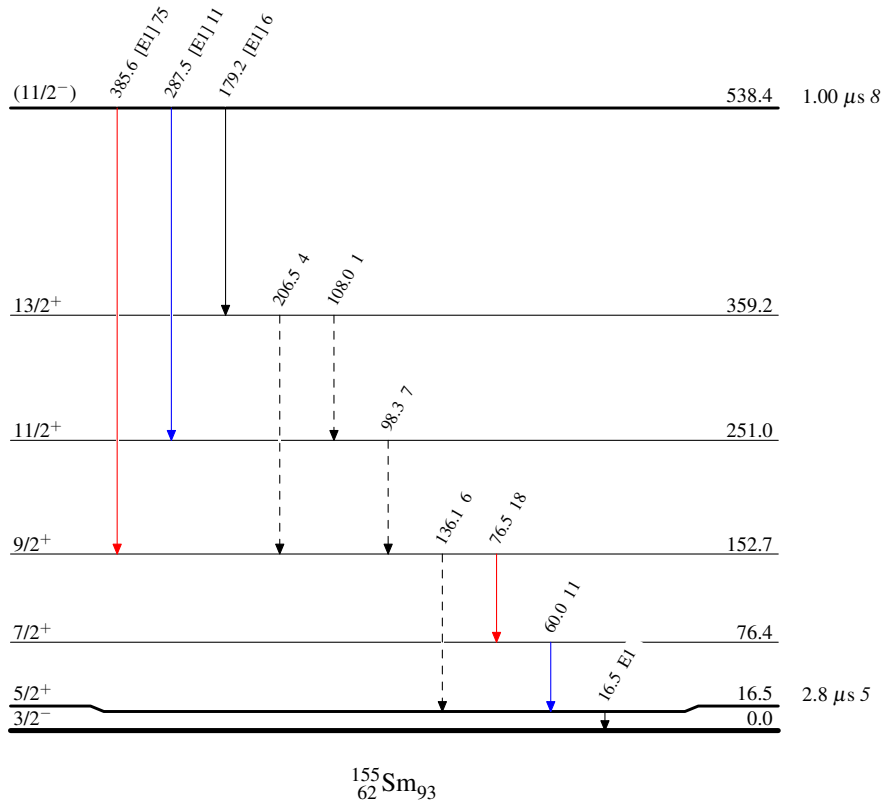
$^{239}\text{Pu}(n,\text{F}\gamma)\text{:isomer}$  2010Si03

Legend

## Level Scheme

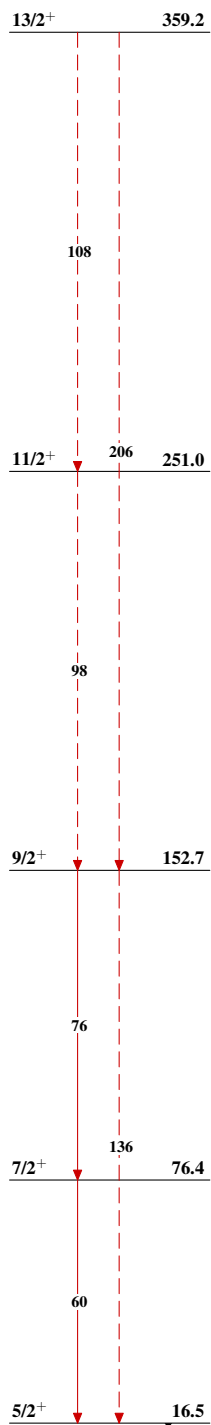
Intensities: Relative  $I_\gamma$ 

- ▶  $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- ▶  $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- ▶  $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
- - - - -▶  $\gamma$  Decay (Uncertain)



$^{239}\text{Pu}(n,F\gamma)$ :isomer 2010Si03

Band(A): 5/2[642] band  
(dominant configuration  
from QPRM calculations)

 $^{155}_{62}\text{Sm}_{93}$