

**$^{123}\text{Ag}$  IT decay (202 ns) 2013La11,2009St28**

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Parent:  $^{123}\text{Ag}$ :  $E=1426.1+y$ ;  $T_{1/2}=202$  ns 20; %IT decay=100.0

**2013La11**: neutron-rich Ag nuclei were produced in two experiments performed at GSI, using the fragmentation of a  $^{136}\text{Xe}$  beam and the fission of a  $^{238}\text{U}$  beam, both with  $E=750$  MeV/nucleon from the SIS-18 synchrotron, on Be targets of 1 and 4 g/cm<sup>2</sup> thickness, respectively. Fragments were analyzed and separated by the GSI Fragment Separator (FRS) and implanted into a copper or plastic stopper. Delayed  $\gamma$  rays were detected with the RISING array consisting of 105 HPGe detectors mounted as 15 clusters. Measured  $E_\gamma$ ,  $I_\gamma$ ,  $\gamma\gamma$ -coin,  $\gamma(t)$ . Deduced levels,  $J$ ,  $\pi$ ,  $T_{1/2}$ . Comparisons with shell-model calculations.

**2009St28** (also **2007To23**, **2006ToZW**, **2005WaZY**): neutron-rich Ag nuclei were produced via fragmentation of  $E=120$  MeV/nucleon  $^{136}\text{Xe}$  beam from the cyclotron at NSCL on a 188 mg/cm<sup>2</sup> Be target. Fragments were separated by the A1900 separator and implanted into the NSCL Beta Counting System (BCS) consisting of three Si PIN detectors, a double-sided and six single-sided Si detectors for particle identification.  $\gamma$  rays were detected with 12 segmented Ge detectors from the NSCL SeGA array. Measured  $E_\gamma$ ,  $I_\gamma$ , fragment- $\gamma$ -coin,  $\gamma\gamma$ -coin,  $\gamma(t)$ . Deduced levels,  $J$ ,  $\pi$ ,  $T_{1/2}$ . Systematics of neighboring Ag isotopes.

The placements of  $\gamma$  transitions (level scheme) follows that of **2019Ch24** in  $^{123}\text{Pd}$   $\beta^-$  decay, which is much more complete than that of **2013La11** and has identified the unknown level at  $E(\text{level})=x$  fed by the  $390\gamma$ - $382\gamma$ - $592\gamma$  sequence in **2013La11** to be the  $1/2^-$  isomer with  $E(\text{level})=59.5$ . The order of  $382\gamma$ - $593\gamma$  cascade in **2013La11** is inverted in **2019Ch24**.

Due to unobserved transition(s), the decay scheme is probably incomplete.

 $^{123}\text{Ag}$  Levels

$E(\text{level})^\dagger$	$J^\ddagger$	$T_{1/2}$	Comments
59.5	(1/2 <sup>-</sup> )		<a href="#">Additional information 1.</a> E(level): 0+x in <b>2013La11</b> .
442.6 7 1035.9 9 1426.1 11 1426.1+y	(3/2 <sup>-</sup> ,5/2 <sup>-</sup> )	202 ns 20	E(level): this isomer feeds the 1426.1 level directly or indirectly ( <b>2013La11</b> ), but the feeding transition has not been observed. $T_{1/2}$ : from $\gamma(t)$ of $382\gamma+592\gamma+390\gamma$ ( <b>2013La11</b> ).

<sup>†</sup> From a least-squares fit to  $\gamma$ -ray energies.

<sup>‡</sup> From Adopted Levels.

 $\gamma(^{123}\text{Ag})$ 

$E_\gamma^\dagger$	$I_\gamma^\#$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
x <sup>@</sup>		1426.1+y				$E_\gamma$ : de-exciting transition directly from this isomer is not observed ( <b>2013La11</b> ). Such transition could feed directly the 1426.1 level or possible unobserved intermediate levels that feed the 1426.1 level.
383.1 <sup>‡</sup> 7	5.5 7	442.6	(3/2 <sup>-</sup> ,5/2 <sup>-</sup> )	59.5	(1/2 <sup>-</sup> )	$E_\gamma$ : unweighted average of 382.4 5 ( <b>2013La11</b> ) and 383.8 3 ( <b>2006ToZW</b> ). Others: 385.3 2 (unplaced in <b>2009St28</b> ), 383.1 ( <b>2019Ch24</b> ). $I_\gamma$ : weighted average of 5.5 7 ( <b>2013La11</b> ), 4 1 ( <b>2009St28</b> ), and 6 2 ( <b>2006ToZW</b> ).
390.2 7	5.3 18	1426.1		1035.9		$E_\gamma$ : unweighted average of 389.5 5 ( <b>2013La11</b> ) and 390.8 3 ( <b>2006ToZW</b> ). Others: 391.2 3 (unplaced in <b>2009St28</b> ), 390.1 ( <b>2019Ch24</b> ). $I_\gamma$ : unweighted average of 8.8 9 ( <b>2013La11</b> ), 4 1 ( <b>2009St28</b> ), and 3 3 ( <b>2006ToZW</b> ). In the level scheme of <b>2019Ch24</b> , this $\gamma$ is indicated much weaker than both 593 $\gamma$ and 383 $\gamma$ .

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$^{123}\text{Ag}$  IT decay (202 ns) 2013La11,2009St28 (continued)

 $\gamma(^{123}\text{Ag})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^\#$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
593.3 $\ddagger$ 5	6.6 8	1035.9		442.6	(3/2 <sup>-</sup> , 5/2 <sup>-</sup> )	$E_\gamma$ : from 2013La11. Others: 597.6 6 (unplaced in 2009St28), 594.0 (2019Ch24). This $\gamma$ is not reported in 2006ToZW but an unlabelled peak around this energy is seen in the $\gamma$ spectrum in Fig 4.33. $I_\gamma$ : weighted average of 6.5 8 (2013La11) and 7 2 (2009St28).

† Values in 2009St28 seem systematically higher than those in 2019Ch24, 2013La11 and 2006ToZW by  $\approx 2$ -4 keV and are not considered in average.

‡ The order of 593 $\gamma$ -382 $\gamma$  is inverted in 2013La11.

# Relative to  $I_\gamma=100$  for 713 $\gamma$  seen in  $^{123}\text{Ag}$  IT decay (393 ns).

@ Placement of transition in the level scheme is uncertain.

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