

**$^{225}\text{Ra}$   $\beta^-$  decay (14.9 d) [1986He06](#),[1985Is03](#),[1955St04](#)**

| Type            | History      |          | Literature Cutoff Date |
|-----------------|--------------|----------|------------------------|
|                 | Author       | Citation |                        |
| Full Evaluation | Balraj Singh | ENSDF    | 25-Oct-2019            |

Parent:  $^{225}\text{Ra}$ :  $E=0.0$ ;  $J^\pi=1/2^+$ ;  $T_{1/2}=14.9$  d 3;  $Q(\beta^-)=356$  5;  $\%\beta^-$  decay=100.0

$^{225}\text{Ra}$ - $J^\pi$ : From  $^{225}\text{Ra}$  Adopted Levels in the ENSDF database (as of Dec 2008), with configuration= $\nu 1/2[631]$ .

$^{225}\text{Ra}$ - $T_{1/2}$ : Unweighted average of 15.02 d 56 ([1987Mi10](#)) and 14.8 d 2 ([1950Ha52](#)). Other: 14 d ([1947En03](#)).

$^{225}\text{Ra}$ - $Q(\beta^-)$ : From [2017Wa10](#).

$^{225}\text{Ra}$ - $\%\beta^-$  decay:  $\%\beta^-$ =100 for  $^{225}\text{Ra}$  decay.

[1986He06](#): measured  $I_\gamma$ (absolute) for 40.09 $\gamma$ .

[1985Is03](#): measured half-life of 40.09 level by  $\beta(\text{ce})(t)$ .

[1984Ah01](#): measured  $E\beta$ ,  $I\beta$ .

[1955St04](#): measured  $E\beta$ ,  $E\gamma$ .

[1960As02](#): measured L-subshell ratios, deduced mult(40.09 $\gamma$ ).

Evaluation by the DDEP group: [2010BeZQ](#) (as of May 2007).

 $^{225}\text{Ac}$  Levels

| E(level) | $J^\pi^\dagger$ | $T_{1/2}$ | Comments                                                                                                                                                                                    |
|----------|-----------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.0      | ( $3/2^-$ )     | 9.920 d 3 | $T_{1/2}$ : from the Adopted Levels.<br>Configuration= $\pi 3/2[532]$ .                                                                                                                     |
| 40.09 5  | ( $3/2^+$ )     | 0.72 ns 3 | Configuration= $\pi 3/2[651]$ .<br>$T_{1/2}$ : $\beta(\text{ce of } 40.0\gamma)(t)$ ( <a href="#">1985Is03</a> ). Other measurements: <a href="#">1955Pe24</a> , <a href="#">1955St88</a> . |
| 120.8?   | ( $5/2^-$ )     |           |                                                                                                                                                                                             |
| 155.6?   | ( $5/2^+$ )     |           |                                                                                                                                                                                             |

$^\dagger$  from the Adopted Levels.

 $\beta^-$  radiations

| E(decay)             | E(level) | $I\beta^-^\ddagger$ | Log $ft$            | Comments                                                                                                                                                                               |
|----------------------|----------|---------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (200 <sup>#</sup> 5) | 155.6?   | <0.01 <sup>†</sup>  | >10.2               |                                                                                                                                                                                        |
| (235 <sup>#</sup> 5) | 120.8?   | <0.01 <sup>†</sup>  | >10.4 <sup>1u</sup> |                                                                                                                                                                                        |
| (316 5)              | 40.09    | 68.8 17             | 6.97 1              | av $E\beta=93$ 4<br>$E(\text{decay})$ : measured values from $\beta\gamma$ -coin: 320 10 ( <a href="#">1955Ma61</a> ); 320 30 ( <a href="#">1955Pe24</a> , <a href="#">1955St04</a> ). |
| (356 5)              | 0.0      | 31.2 17             | 7.46 1              | $I\beta^-$ : from transition intensity of 40.09/100 decays of $^{225}\text{Ac}$ .<br>av $E\beta=105$ 4<br>$I\beta^-$ : 100- $\beta$ feeding to 40.09 level.                            |

$^\dagger$  From upper limit on the actinium K x-ray intensity,  $\beta^-$  decay to the 120.8- and 155.7-keV levels in  $^{225}\text{Ac}$  were estimated by [1984Ah01](#) to be <0.01%.

$^\ddagger$  Absolute intensity per 100 decays.

<sup>#</sup> Existence of this branch is questionable.

$^{225}\text{Ra}$   $\beta^-$  decay (14.9 d) 1986He06,1985Is03,1955St04 (continued) $\gamma(^{225}\text{Ac})$ 

I $\gamma$  normalization: Absolute photon intensity of 40.0 $\gamma$  was measured by 1986He06 to be 30.0% 7, using a  $^{229}\text{Th}$  source in equilibrium with its daughters. Other measured values: 39.3% 12 (1981Di14), 29% (1955St04), 33% (1955Ma61).

| $E_\gamma$ | $I_\gamma^\dagger$ | $E_i(\text{level})$ | $J_i^\pi$           | $E_f$ | $J_f^\pi$           | Mult. | $\alpha^\ddagger$ | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------|--------------------|---------------------|---------------------|-------|---------------------|-------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 40.09 5    | 100                | 40.09               | (3/2 <sup>+</sup> ) | 0.0   | (3/2 <sup>-</sup> ) | E1    | 1.293             | $\alpha(\text{L})=0.974$ 14; $\alpha(\text{M})=0.241$ 4<br>$\alpha(\text{N})=0.0624$ 9; $\alpha(\text{O})=0.01336$ 20; $\alpha(\text{P})=0.00203$ 3;<br>$\alpha(\text{Q})=7.96\times 10^{-5}$ 12<br>$\alpha(\text{L})_{\text{exp}}=1.1$ 3 (1955St04)<br>Measured I $\gamma$ (absolute)=30.0% 7 (1986He06), 39.3% 12 (1981Di14), 33% (1955Ma61), 29% (1955St04).<br>Mult.: from measured L1:L2:L3=0.55 14:0.64 16:1.00 (1960As02).<br>$E_\gamma$ : From 1987Ah05 in $^{229}\text{Pa}$ $\alpha$ decay. Others: 40.12 5 (1981Di14), 40.0 10 (1955St04), 41 2 (1955Ma61). |

<sup>†</sup> For absolute intensity per 100 decays, multiply by 0.300 7.

<sup>‡</sup> Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on  $\gamma$ -ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

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