RDDS Lifetime Measurement on 140Sm using the Eagle Spectrometer in Warsaw

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Beyond mean field calculations predict a shape transition from $^{\rm 140}{\rm Sm}$ to $^{\rm 142}{\rm Gd}$



$^{20}Ne + ^{124}Te \rightarrow ^{140}Sm + 4n$

Entry states for channel 4n0p0a d^2(sigma)/(dE dI) [mb/(MeV*hbar)]

COMPA: entry-state distribution significant population of low-spin states \Rightarrow decay path bypassing 10⁺ isomers

CERN-ISOLDE ¹⁴⁰Sm Coulomb excitation experiment - July 2012

30

0

60

90

 θ_{CM} (deg)

120

150 180

Total projection of γ - γ matrix (forward detectors)

Gated in the shifted peak of the $4^+ \rightarrow 2^+$ transition

Total projection of γ - γ matrix (forward detectors)

Channel

Total projection of $\gamma\text{-}\gamma$ matrix (forward detectors)

50 µm

Channel

$$\tau(x) = \frac{\{B_s, A_u\}(x)}{\frac{d}{dx}\{B_s, A_s\}(x)} \cdot \frac{1}{v}$$

A. Dewald et al. PPNP 67 (2012)

 $T(E2) = 1.22 \times 10^9 E_{\gamma}^5 B(E2)$

$$B(E2;2^+_1 \rightarrow 0^+) = 2090 \pm 112 e^2 fm^4$$

M.Girod, J.-P.Delaroche CEA Bruyères-le-Châtel

I_i	I_f	$M(E2; I_i \to I_f)(eb)$	$B(E2; I_i \to I_f)(eb)$
2_{1}^{+}	0^+_1	$1.117^{+0.05}_{-0.05}$	$0.250^{+0.02}_{-0.02}$
2_{1}^{+}	2_{1}^{+}	$-0.18^{+0.43}_{-0.29}$	-
4_{1}^{+}	2_{1}^{+}	$1.639^{+0.05}_{-0.05}$	$0.299^{+0.02}_{-0.02}$
0^+_2	2_{1}^{+}	$1.010^{+0.07}_{-0.07}$	$1.02^{+0.15}_{-0.15}$

with 2⁺ lifetime as additional constraint

I_i	I_f	$M(E2; I_i \to I_f)(eb)$	$B(E2; I_i \to I_f)(eb)$
2_{1}^{+}	0^+_1	$1.025_{-0.02}^{+0.02}$	$0.210^{+0.01}_{-0.01}$
2_{1}^{+}	2^{+}_{1}	$-0.36^{+0.29}_{-0.23}$	-
4_{1}^{+}	2^{+}_{1}	$1.625_{-0.05}^{+0.05}$	$0.293^{+0.02}_{-0.02}$
0^{+}_{2}	2_{1}^{+}	$0.995^{+0.07}_{-0.07}$	$0.991^{+0.15}_{-0.14}$

$I_i I_f M(I)$	$E2; I_i \to I_f)(eb) \ \mathcal{B}(E)$	$22; I_i \to I_f)(eb)$		
$2^+_1 \ 0^+_1$	$1.117^{+0.05}_{-0.05}$	$0.250^{+0.02}_{-0.02}$		
$2^+_1 2^+_1$	$-0.18^{+0.43}_{-0.29}$	-		
$4_1^+ 2_1^+$	$1.639^{+0.05}_{-0.05}$	$0.299^{+0.02}_{-0.02}$		-
$0^+_2 2^+_1$	$1.010^{+0.07}_{-0.07}$	$1.02^{+0.15}_{-0.15}$	(0+)?	

with 2⁺ lifetime as additional constraint

4+

 $2^+_I \rightarrow 0^+$

516.5

520.9

456.8

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Thanks

Distance