# RDDS Lifetime Measurement on I40Sm using the Eagle Spectrometer in Warsaw 

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







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

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


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

## CERN-ISOLDE ${ }^{140} \mathrm{Sm}$ Coulomb excitation

experiment - July 2012

M. Klintefjord


## HIL-Warsaw ${ }^{140}$ Sm Lifetime measurement

 experiment - June 2013





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



Gated in the shifted peak of the $4^{+}->2^{+}$transition

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Distance ( $\mu \mathrm{m}$ )


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$$
\begin{gathered}
T(E 2)=1.22 \times 10^{9} E_{\gamma}^{5} B(E 2) \\
\mathbf{B}\left(\mathbf{E} 2 ; \mathbf{2}^{+} \rightarrow \mathbf{0}^{+}\right)=2090 \pm \mathbf{I} \mathbf{I} \mathbf{2} \mathrm{e}^{2} \mathrm{fm}^{4}
\end{gathered}
$$

| $I_{i}$ | $I_{f}$ | $\mathrm{M}\left(E 2 ; I_{i} \rightarrow I_{f}\right)(e b) \mathrm{B}\left(E 2 ; I_{i} \rightarrow I_{f}\right)(e b)$ |  |
| :--- | ---: | ---: | ---: |
| $2_{1}^{+}$ | $0_{1}^{+}$ | $1.117_{-0.05}^{+0.05}$ | $0.250_{-0.02}^{+0.02}$ |
| $2_{1}^{+}$ | $2_{1}^{+}$ | $-0.18_{-0.29}^{+0.43}$ |  |
| $4_{1}^{+}$ | $2_{1}^{+}$ | $1.639_{-0.05}^{+0.05}$ | $0.299_{-0.02}^{+0.02}$ |
| $0_{2}^{+}$ | $2_{1}^{+}$ | $1.010_{-0.07}^{+0.07}$ | $1.02_{-0.15}^{+0.15}$ |

with $2^{+}$lifetime as additional constraint

| $I_{i}$ | $I_{f}$ | $\mathrm{M}\left(E 2 ; I_{i} \rightarrow I_{f}\right)(e b)$ | $\mathrm{B}\left(E 2 ; I_{i} \rightarrow I_{f}\right)(e b)$ |
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| $2_{1}^{+}$ | $2_{1}^{+}$ | $-0.36_{-0.23}^{+0.29}$ | - |
| $4_{1}^{+}$ | $2_{1}^{+}$ | $1.625_{-0.05}^{+0.05}$ | $0.293_{-0.02}^{+0.02}$ |
| $0_{2}^{+}$ | $2_{1}^{+}$ | $0.995_{-0.07}^{+0.87}$ | $0.991_{-0.14}^{+0.15}$ |


M. Klintefjord

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| with 2+ lifetime as additional constraint |  |  |  |
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HIL-Warsaw ${ }^{140}$ Sm
Angular correlation
experiment - May 2014

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## IFIN-Bucharest ${ }^{138} \mathrm{Nd}$ Lifetime



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## Thanks



Distance


Distance
$\tau(x)=\frac{\left\{B_{s}, A_{u}\right\}(x)}{\frac{d}{d x}\left\{B_{s}, A_{s}\right\}(x)} \cdot \frac{1}{v}$
A. Dewald et al.

PPNP 67 (2012)


Distance

