

Probing the stability of superheavy nuclei

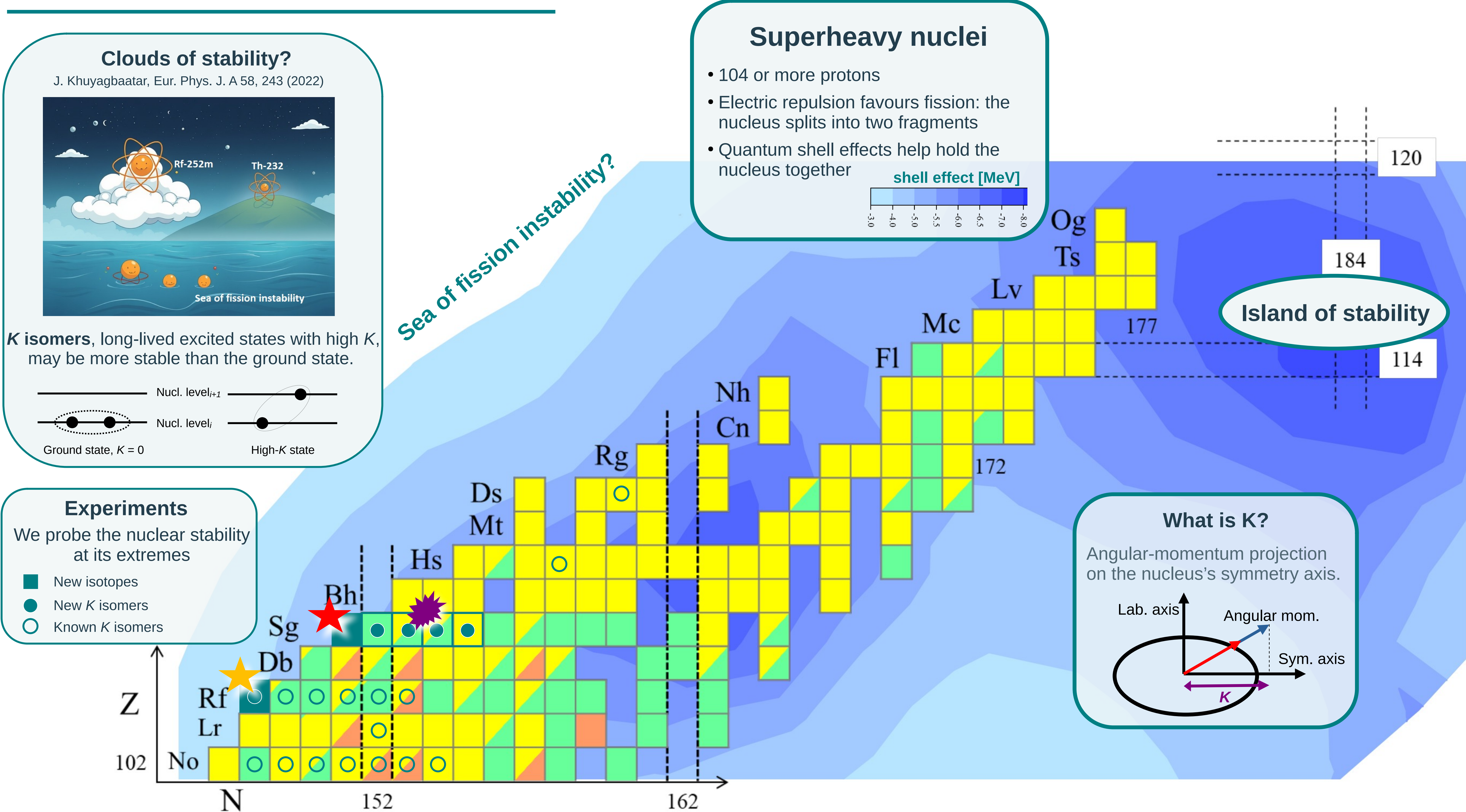
Searching for the clouds of stability above the sea of instability

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Too short-lived?
Get excited.



New isotope discovered

²⁵²Rf: Stepping into the Sea of Instability

J. Khuyagbaatar, P. Mosat et al.,
Physical Review Letters 134, 022501 (2025)

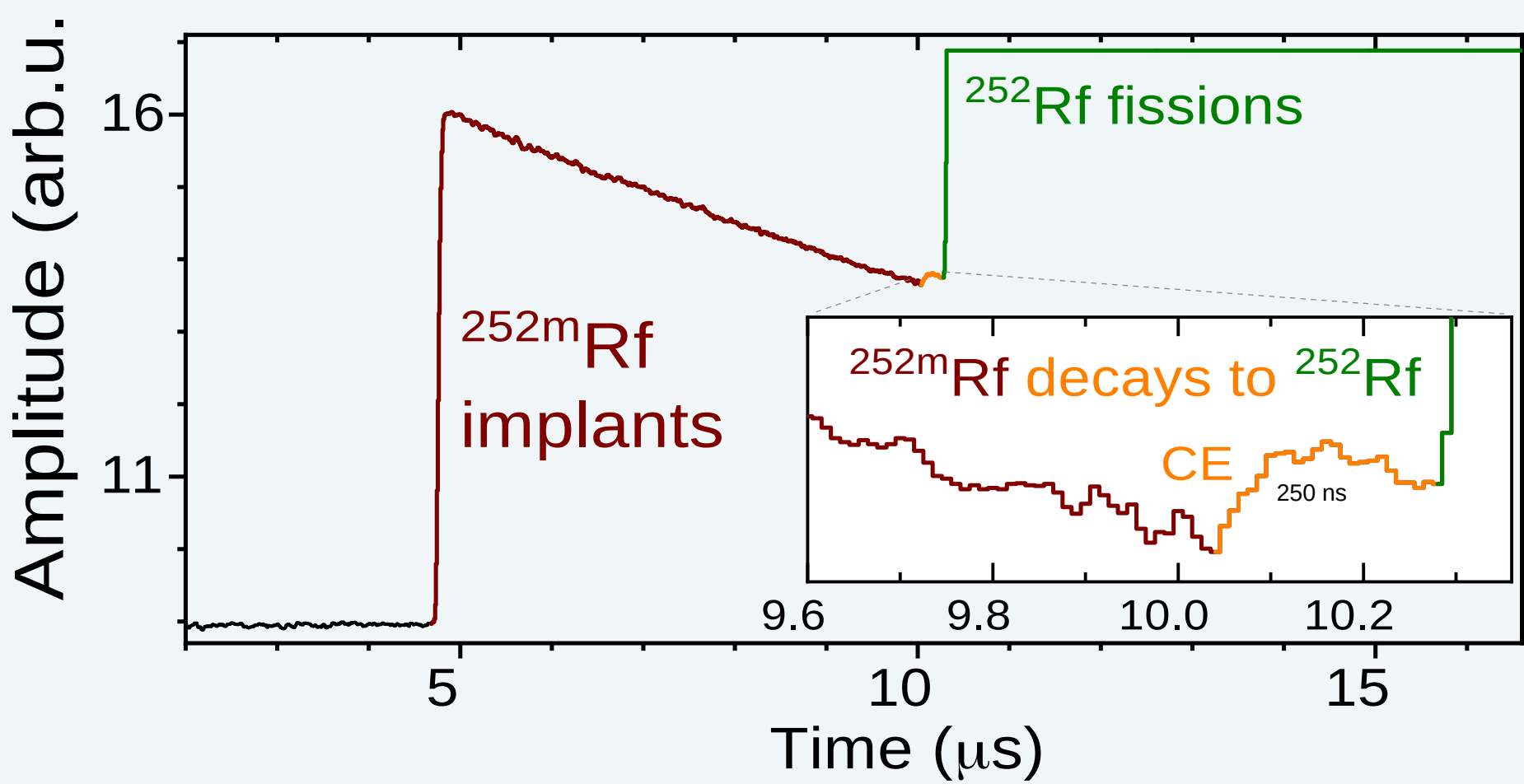
PRL Editors' Suggestion • Featured in Physics

The shortest-lived superheavy nucleus ever observed!

...identified via its longer-lived K isomer.

@ TASCA

²⁵² Rf
13 μs
60 ns

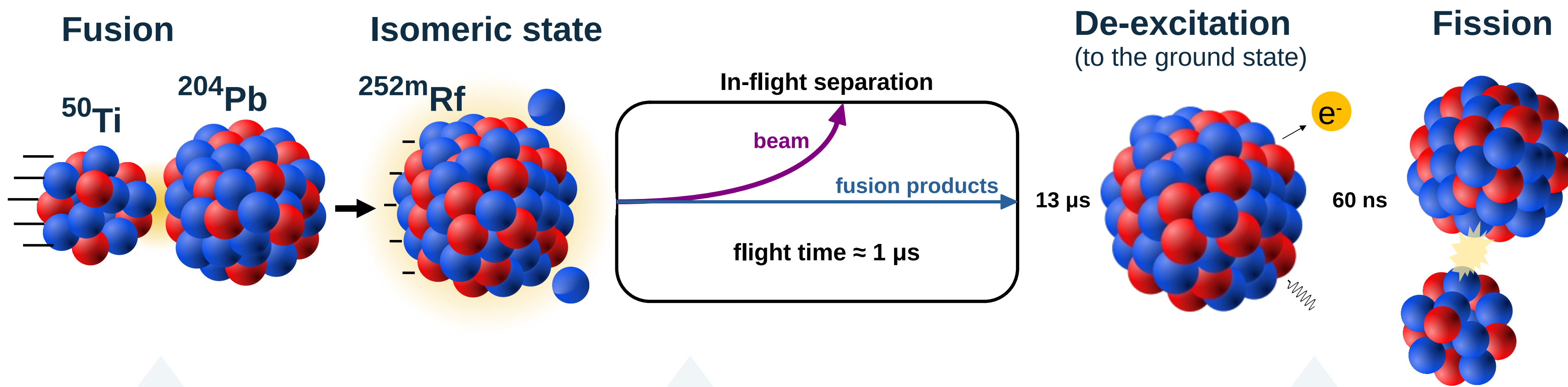


Three signals reveal the nucleus's story.

Clouds of stability confirmed!

The ground state may not survive – a K isomer can!

How to catch a nucleus



I. Synthesis

Two nuclei fuse.

Nucleus may become trapped in an isomeric state.

II. Transport & separation

Electromagnetic fields separate the new nuclei from the beam.

III. Detection

A detector records three signals:

- implantation
- conversion electrons
- fission

New isotope discovered

²⁵⁷Sg: Probing the Shell Effects on Fission

P. Mosat, J. Khuyagbaatar et al.,
Physical Review Letters 134, 232501 (2025)

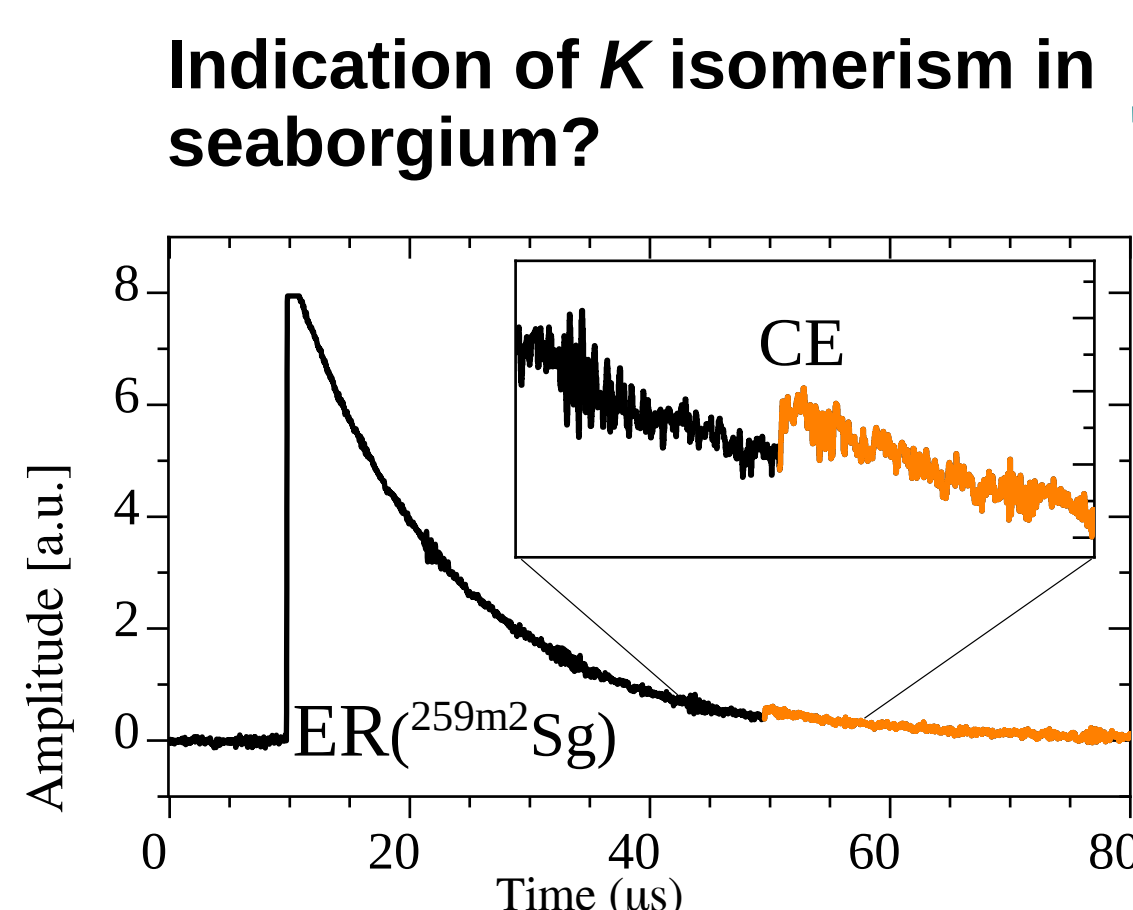
PRL Editors' Suggestion • Collection of the Year 2025

@ TASCA

²⁵⁷ Sg
12.6 ms

@ TASCA

²⁵⁹ Sg
??

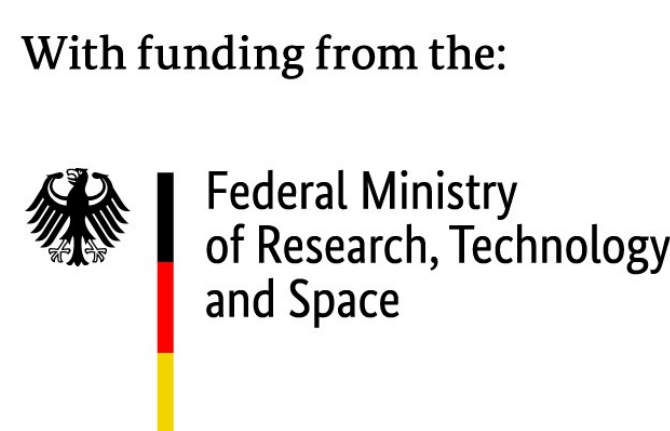


Discovery of K isomers in seaborgium

P. Mořat', B. Andel, J. Khuyagbaatar et al.,
Physical Review C 114, 034321 (2026)

K-isomeric states observed across four Sg isotopes.

@ SHIP	@ SHIP	@ SHIP	@ SHIP
²⁵⁸ Sg	²⁵⁹ Sg	²⁶⁰ Sg	²⁶¹ Sg
120 μs	85 μs	8.5 μs	12.6 μs



The results presented here are based on experiments U328 and G-22-00034, performed at the X8/TASCA beamline at GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany, within FAIR Phase-0, and on SHIP runs R212, R228, R231, R239 and R273. We thank GSI's ion-source and UNILAC staff, the Experiment Electronics department and the Target Laboratory for their support. This work was supported by the German BMBF (Grant No. 05P21UMFN2), the Slovak Research and Development Agency (Contract No. APVV-22-0282) and the Slovak grant agency VEGA (Contract No. 1/0019/25).