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## Recoil-alpha-fission and Recoil-alpha-alpha-fission Chains Stemming from Element 115

Rudolph, Dirk; Forsberg, Ulrika; Düllmann, C. E.; Golubev, Pavel; Heßberger, F.P.; Khuyagbaatar, J.; Kratz, J. V.; Sarmiento, Luis; Yakushev, A.; Ackermann, D.; Andersson, L.; Block, M.; Brand, H.; Cox, D.; Derx, X.; Di Nitto, A.; Eberhardt, K.; Even, J.; Fahlander, Claes; Gates, J. M.; Gerl, J.; Gregorich, E. K.; Gross, C. J.; Herzberg, R.-D.; Jäger, E.; Kindler, B.; Krier, J.; Kojouharov, I.; Kurz, N.; Lommel, B.; Mistry, A.; Mokry, C.; Nitsche, H.; Omtvedt, J. P.; Papadakis, P.; Runke, J.; Rykaczewski, K.; Schädel, M.; Schaffner, H.; Schausten, B.; Thörle-Pospiech, P.; Torres, T.; Traut, T.; Trautmann, N.; Türler, A.; Ward, A.; Wiehl, N.

Published in:  
GSI Report

DOI:  
[10.15120/GR-2015-1-MU-NUSTAR-SHE-C-02](https://doi.org/10.15120/GR-2015-1-MU-NUSTAR-SHE-C-02)

2015

[Link to publication](#)

*Citation for published version (APA):*

Rudolph, D., Forsberg, U., Düllmann, C. E., Golubev, P., Heßberger, F. P., Khuyagbaatar, J., Kratz, J. V., Sarmiento, L., Yakushev, A., Ackermann, D., Andersson, L., Block, M., Brand, H., Cox, D., Derx, X., Di Nitto, A., Eberhardt, K., Even, J., Fahlander, C., ... Wiehl, N. (2015). Recoil-alpha-fission and Recoil-alpha-alpha-fission Chains Stemming from Element 115. In *GSI Report* (Vol. 2015-1, pp. 180). GSI Helmholtzzentrum für Schwerionenforschung. <https://doi.org/10.15120/GR-2015-1-MU-NUSTAR-SHE-C-02>

Total number of authors:  
47

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Download date: 17. May. 2025

LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

## Recoil- $\alpha$ -fission and recoil- $\alpha$ - $\alpha$ -fission chains stemming from element 115

D. Rudolph<sup>1</sup>, U. Forsberg<sup>1</sup>, Ch.E. Düllmann<sup>2,3,4</sup>, P. Golubev<sup>1</sup>, F.P. Heßberger<sup>2,3</sup>, J. Khuyagbaatar<sup>2,3</sup>, J.V. Kratz<sup>4</sup>, L.G. Sarmiento<sup>1</sup>, A. Yakushev<sup>2</sup>, D. Ackermann<sup>2</sup>, L.-L. Andersson<sup>3</sup>, M. Block<sup>2</sup>, H. Brand<sup>2</sup>, D. Cox<sup>5</sup>, X. Derks<sup>3,4</sup>, A. Di Nitto<sup>4</sup>, K. Eberhardt<sup>3,4</sup>, J. Even<sup>3</sup>, C. Fahlander<sup>1</sup>, J.M. Gates<sup>6</sup>, J. Gerl<sup>2</sup>, K.E. Gregorich<sup>6</sup>, C.J. Gross<sup>7</sup>, R.-D. Herzberg<sup>5</sup>, E. Jäger<sup>2</sup>, B. Kindler<sup>2</sup>, J. Krier<sup>2</sup>, I. Kojouharov<sup>2</sup>, N. Kurz<sup>2</sup>, B. Lommel<sup>2</sup>, A. Mistry<sup>5</sup>, C. Mokry<sup>3,4</sup>, H. Nitsche<sup>6</sup>, J.P. Omtvedt<sup>8</sup>, P. Papadakis<sup>5</sup>, J. Runke<sup>2</sup>, K. Rykaczewski<sup>7</sup>, M. Schädel<sup>2,9</sup>, H. Schaffner<sup>2</sup>, B. Schausten<sup>2</sup>, P. Thörle-Pospiech<sup>3,4</sup>, T. Torres<sup>2</sup>, Traut<sup>4</sup>, N. Trautmann<sup>4</sup>, A. Türler<sup>10</sup>, A. Ward<sup>5</sup>, and N. Wiehl<sup>3,4</sup>

<sup>1</sup>Lund University, Lund, Sweden; <sup>2</sup>GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany; <sup>3</sup>Helmholtz Institute Mainz, Mainz, Germany; <sup>4</sup>Johannes Gutenberg-Universität Mainz, Mainz, Germany; <sup>5</sup>University of Liverpool, Liverpool, United Kingdom; <sup>6</sup>Lawrence Berkeley National Laboratory, Berkeley, USA; <sup>7</sup>Oak Ridge National Laboratory, Oak Ridge, USA; <sup>8</sup>University of Oslo, Oslo, Norway; <sup>9</sup>Advanced Science Research Center, Japan Atomic Energy Agency, Tokai, Japan; <sup>10</sup>Paul Scherrer Institute and University of Bern, Villigen, Switzerland

Products of the <sup>48</sup>Ca+<sup>243</sup>Am fusion-evaporation reaction were studied with the TASI Spec set-up [1, 2] behind TASCA [3-5]. Thirty correlated  $\alpha$ -decay chains originating from different isotopes of E115 were observed [6, 7], produced with an overall production cross section of  $\approx 10$  pb. There are 1+22=23 five- $\alpha$ -long chains linked to the production of <sup>287,288</sup>115 [6], in agreement with 2+31=33 chains reported earlier [8]. The combined 22+31=53 chains associated with <sup>288</sup>115 yield a statistically solid reference.

Besides these 'long chains', two recoil- $\alpha$ -fission and five recoil- $\alpha$ - $\alpha$ -fission chains are present in the TASI Spec data [7]. Interestingly, the interpretation and thus the assignment of these 'short chains' to a certain isotope of E115 turns out to be non-trivial. The issue is discussed with the help of Fig. 1: Panel (a) shows the relevant beginning of the long <sup>288</sup>115 reference chain. The average values of the 2+5=7 new short chains in panel (b) are consistent with the numbers in panel (a). This indicates at first sight  $\sim 5$ -15% fission or electron-capture branches of <sup>284</sup>113 and <sup>280</sup>Rg. However, this view is at variance with the interpretation of 3+1=4 short chains previously observed at Dubna [8] [panel (c)]. There, one chain, denoted 'D3', is significantly different from all the other E115 chains. However, only including this particular chain in the 3+1=4 averaging procedure generated a seemingly consistent link between E115 and E117 [8, 9] [panel (d)]. Panel (e) provides a refined interpretation of all published E117 data [9, 10]. The rightmost sequence averaged

over twelve E117 chains opens for a connection to E115 via 'D3', while the other ten E117 chains would be consistent with (a subset of) other E115 chains [11].

More high-quality spectroscopic data is obviously required. This is necessary to provide the foundation for a relevant nuclear-structure based interpretation of links between decay chains of these two odd- $Z$  elements [7, 11].

The authors thank the ion-source and accelerator staff at GSI. This work is supported by the European Community FP7 – Capacities ENSAR No. 262010, the Royal Physiographic Society in Lund, the Euroball Owners Committee, the Swedish Research Council, the German BMBF, the Office of Nuclear Physics, U.S. Department of Energy, and the UK Science and Technology Facilities Council.

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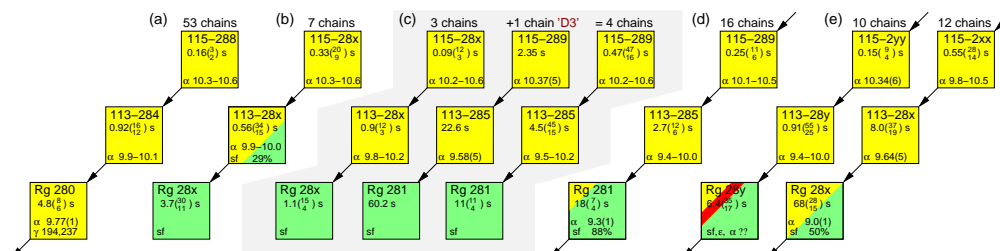


Figure 1: Average values from selections of decay chains of isotopes of E115 to E113 into Rg ( $Z = 111$ ). (a) 53 <sup>288</sup>115 reference chains [6, 8]. (b) Seven recoil- $\alpha$ - $\alpha$ -fission chains observed with TASI Spec [7]. (c) Data from all four recoil- $\alpha$ - $\alpha$ -fission 'Dubna chains' listed in Table III of Ref. [8]. (d) Sixteen chains associated with the decay of <sup>293</sup>117, i.e. interpreted to populate the isotope <sup>289</sup>115 [9]. (e) Possible re-interpretation [11] of all existing E117 decay data [9, 10].

