



BETA-DELAYED FISSION STUDIES OF THE NEUTRON-DEFICIENT TL, FR AND AT NUCLEI



- Fission properties are known only near the β -stability line
- Theoretical models have been tuned by using these data
- Large discrepancies between models for n-def. and n-rich nuclei
- Fission properties can be studied via β -delayed fission



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β **Delayed Fission**



- Low-energy fission! (E*<=Q_{EC},E* ~3-12MeV)
- Relatively low angular momentum of the state;
- 12 cases known before our work (neutron-deficient Uranium region)

Probability $P_{\beta DF} = \frac{N_{\beta DF}}{N_{\beta}}$ • Q_{EC} of the Parent • B_f of the Daughter

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EXPERIMENTAL SETUP



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RESULTS:



Figura: Part of the alpha spectrum recorded in the silicon detectors for ¹⁸⁰TI

βDF OF 178, 180 TL

β**DF** OF ¹⁸⁰**TL** - **A.ANDREYEV** PRL 105 252502 (2010)



Figura: Energy distribution of the fission fragments of 180 Hg after β DF of 180 Tl, coincidence events (top) and singles (bottom)

βDF OF 178, 180 TL

β DF of ¹⁸⁰TL - A.ANDREYEV prl 105 252502 (2010)





Figura: Mass distribution of the fission fragments of 180 Hg after β DF of 180 Tl.



Asymmetric mass split! Most probable masses M_L =80, M_H =100

βDF OF 178, 180 TL

β **DF of** ¹⁷⁸**TL @ISOLDE -V.Liberati** *et al.* **draft ready**



Fission Fragments Energy in Si detector [MeV]

Figura: Energy distribution of the fission fragments of ¹⁷⁸ Hg after β DF of ¹⁷⁸ Π , singles (top), compared with the energy distribution of the fission fragments of ¹⁸⁰ Hg after β DF of ¹⁸⁰ Π

At this level of statistics: also asymmetric fission of ¹⁷⁸Hg, with mass split similar to ¹⁸⁰Hg

 β DF of 202 Fr

$\beta \mathbf{DF} \ \mathbf{OF} \ ^{202}\mathbf{Fr}$



βDF of ¹⁹⁶At

β DF of ¹⁹⁶At: 9-14 May 2012



- Very preliminary, online spectra
- plot (a): 252 singles fission fragments (ff) recorded in two silicon detectors
- rate = \sim 7 ff/h
- plot (b): 62 coincidence events

CONCLUSIONS

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- The β DF process has been investigated in the neutron-deficient Pb region at the ISOLDE mass separator.
- ¹⁸⁰**TI** : asymmetric mass split of the fission fragments of ¹⁸⁰Hg in masses M_L =80 and M_H =100.
- ¹⁷⁸**TI** : presently suggested an asymmetric mass split for ¹⁷⁸Hg within the available statistics.
- ²⁰² Fr : at the moment no conclusion can be drawn for the mass distribution of ²⁰² Rn. Need to clarify which isomer is responsible for ADE

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COLLABORATION

V. Liberati¹, A.N. Andreyev^{1,2}, S. Antalic³, D. Ackermann⁴, A. Barzakh⁵, N. Bree², T.E. Cocolios², V. F. Comas⁴, J. Diriken², J. Elseviers², S. Franchoo⁶, D. Fedorov⁵, V. Fedoseyev⁷, S. Heinz⁴, J.A. Heredia⁴, F P Heßberger⁴, S Hofmann^{4,8}, M. Huyse², O. Ivanov², J Khuyagbaatar⁴, B Kindler⁴, I Kojouharov⁴, U. Koster⁹, J. Lane¹, B Lommel⁴, R Mann⁴, B. Marsh⁷, K. Nishio¹⁰, R.D. Page¹¹, N. Patronis², S Rinta-Antila¹¹, P J Sapple¹¹, M. Seliverstov^{1,7}, I. Tsekhanovich¹², P. Van den Bergh², J. Van De Walle⁷, P. Van Duppen², M. Venhart², S. Vermote¹³, M. Veselsky¹⁴, C. Wagemans¹³ and H V Watkins¹¹

¹School of Engineering and Science, University of the West of Scotland, Paisley, PA1 2BE, UK

²Instituut voor Kern- en Stralingsfysica, KU. Leuven, University of Leuven, B-3001 Leuven, Belgium

³Department of Nuclear Physics and Biophysics, Comenius University, Bratislava, SK-84248, Slovakia

⁴GSI Helmholtzzentrum fur Schwerionenforschung GmbH, 64291 Darmstadt, Germany

⁵PNPI, Gatchina, Russia

⁶IPN Orsay, F-91406 Orsay Cedex France

⁷ISOLDE, CERN

⁸J.W. Goethe-Universitat, Dâ60054 Frankfurt, Germany

⁹ILL, Grenoble, France

¹⁰Advanced Science Research Center, Japan Atomic Energy Agency (JAEA), Tokai-mura, Naka-gun, Ibaraki, 319-1195, Japan

¹¹Department of Physics, Oliver Lodge Laboratory, University of Liverpool, Liverpool L69 7ZE, UK

¹²Manchester University, UK

¹³University of Gent, Belgium

14 Slovak Academy of Science, Bratislava, Slovakia