

LISA ITN

Academic “fun” day

Work Package 5 – Exploring the limits of nuclear existence

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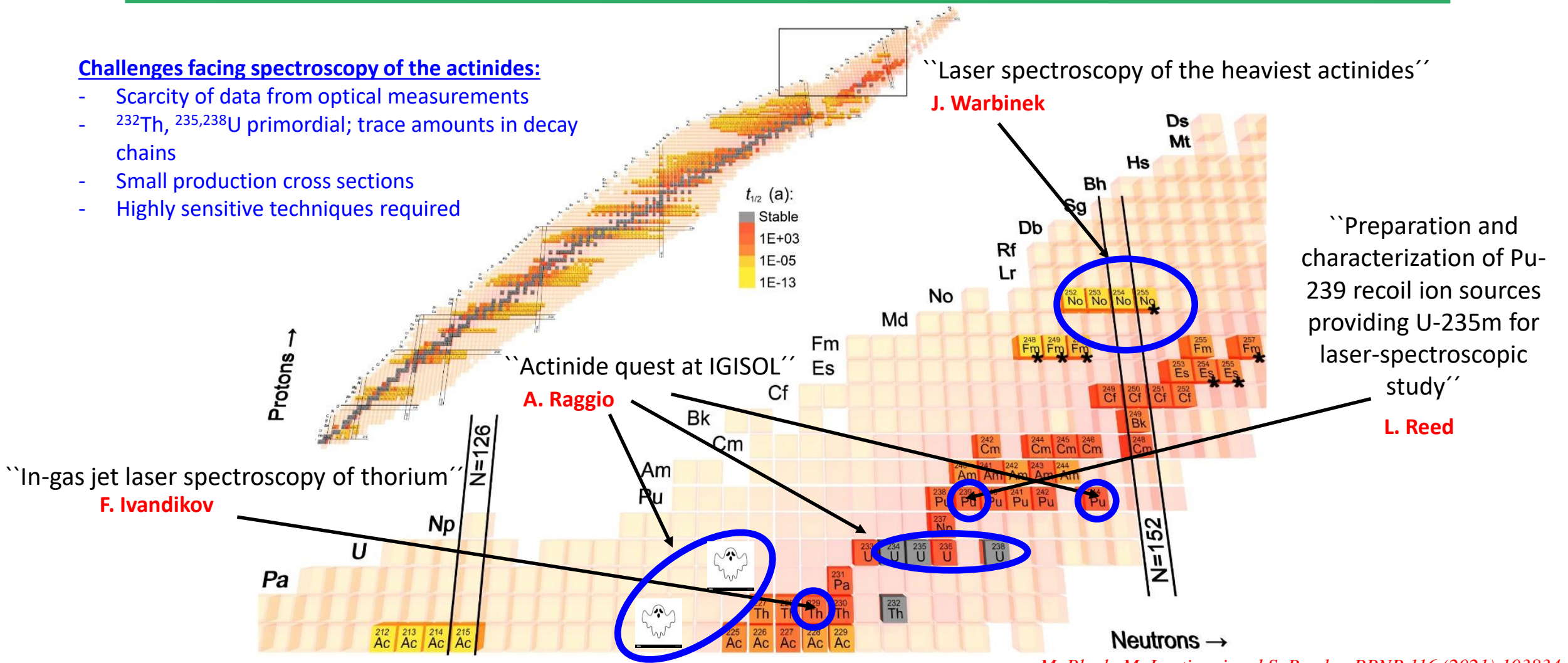
Content

- Research objectives
- Current status of milestones & deliverables
- WP-5 ESRs

Optical spectroscopy of the heaviest elements

Challenges facing spectroscopy of the actinides:

- Scarcity of data from optical measurements
- ^{232}Th , $^{235},^{238}\text{U}$ primordial; trace amounts in decay chains
- Small production cross sections
- Highly sensitive techniques required



“Laser spectroscopy of the heaviest actinides”
J. Warbinek

“Preparation and characterization of Pu-239 recoil ion sources providing U-235m for laser-spectroscopic study”
L. Reed

“In-gas jet laser spectroscopy of thorium”
F. Ivandikov

“Actinide quest at IGISOL”
A. Raggio

M. Block, M. Laatiaoui and S. Raeder, PPNP 116 (2021) 103834

Objectives of Work Package 5

- Optimize actinide sample preparation and characterization techniques for the LISA network. **Lauren Reed (ESR11)**.
- Perform laser spectroscopy using highly sensitive techniques on isotopes of both actinide and trans-actinide elements with the goal of probing fundamental atomic and nuclear properties and to benchmark state-of-the-art atomic and nuclear theoretical calculations. **Jessica Warbinek (ESR10) & Andrea Raggio (ESR4)**.
- Characterize and optimize the novel in-gas-jet spectroscopy technique for final implementation at GANIL-S3. **Fedor Ivandikov (ESR7)**.

Milestones & schedule



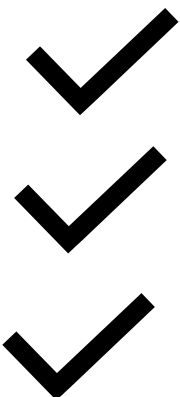
MS21	Optimum filament setup for efficient Lr evaporation	GSI	M12	LISA technical design report
MS22	Pu targets for JYU	JGU	M15	Target delivered and verified with γ -ray spectroscopy
MS23	Offline study of atomic transitions in U: dye and Ti:sa	JYU	M18	Laser spectroscopy results on $^{234,235,238}\text{U}$
*MS24	Identification of atomic states in Lr	GSI	M24	LISA scientific report
**MS25	Picoliter injection system	JGU	M24	LISA technical design report
MS26	Setup for high-resolution in gas-jet spectroscopy	GSI	M36	LISA technical design report
MS27	First high-res online LS at GANIL-S3	KUL	M42	Resonance peak linewidth <300 MHz online

31 Oct.
2022

*MS24: Part of the beamtime completed – recommend moving by one year to 31 Oct. 2022.

**MS25: Expected delivery date 30 April 2022 (coordinating with Hannover)

Deliverables



Deliverable	Deliverable title	Lead beneficiary	Due date
D5.1	Optimized geometry of the gas cell nozzle	KUL	24
*D5.2	Laser ablation source	JYU	24
D5.3	Off-line U studies	JYU	30
D5.4	Preparation of characterization of samples for LISA	JGU	36
D5.5	Precise data of atomic and nuclear properties of Lr	GSI	42
D5.6	Exotic U studies (off- and on-line production)	JYU	48

31 Oct. 2022

Deliverables primarily produced as reports. D5.5 and D5.6 are "other".

*Note that the technical design report for the laser ablation source is still listed as "Pending" although it has been submitted.

Work Package 5: ESRs



Andrea Raggio (JYU) – ESR 4



Fedor Ivandikov (KUL) – ESR 7

*Started PhD position at end of January 2022.

KU LEUVEN



Jessica Warbinek (GSI) – ESR 10



Lauren Reed (JGU) – ESR 11

