Spectroscopy of neutron-rich fission fragments produced in the ^{238}U(n,f) reaction

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Universitas Varsoviensis

IFIC Institut de Física Corpuscular

IPHC Institut Pluridisciplinaire Hubert Curien Strasbourg

Scientific workshop on Nuball2 2024

04 July 2024

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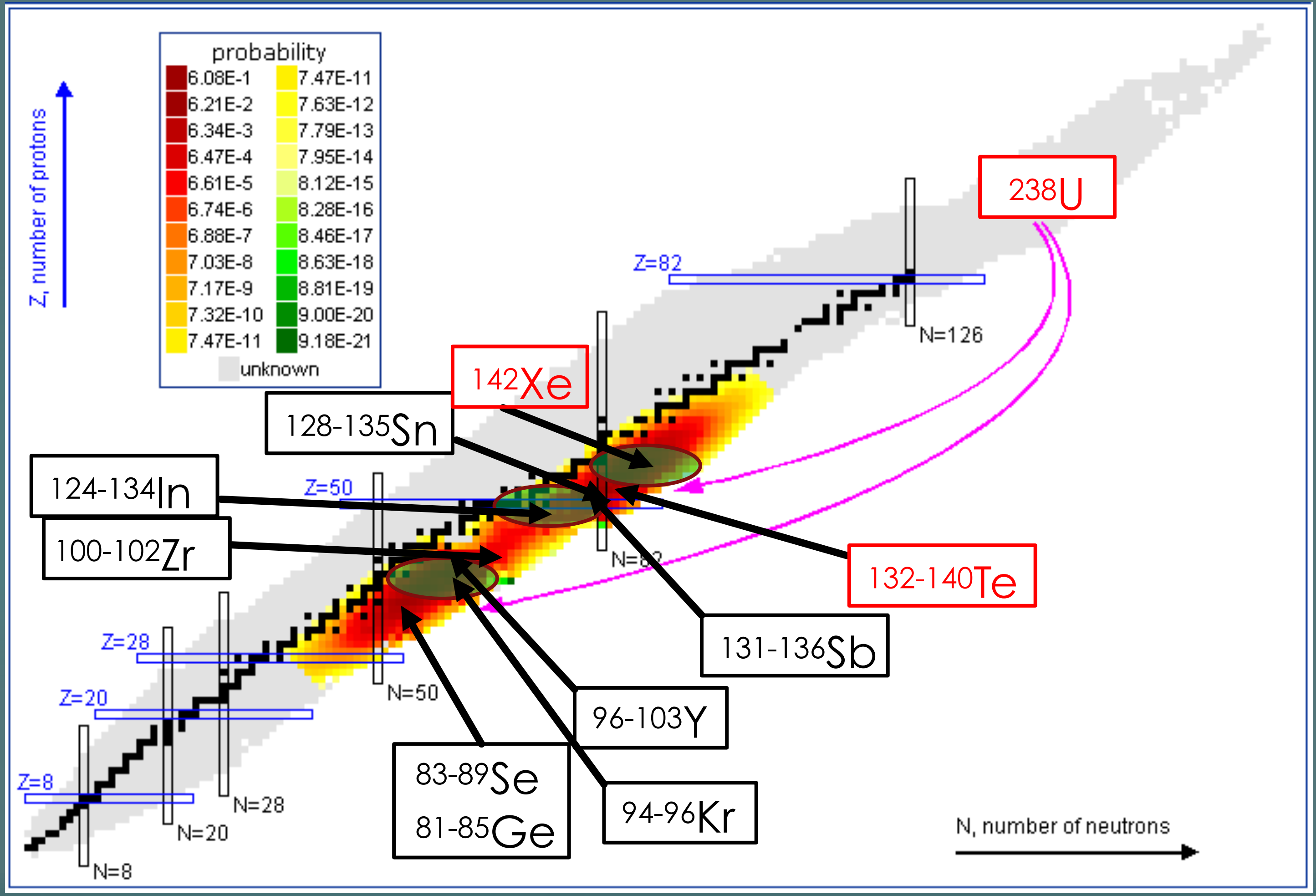

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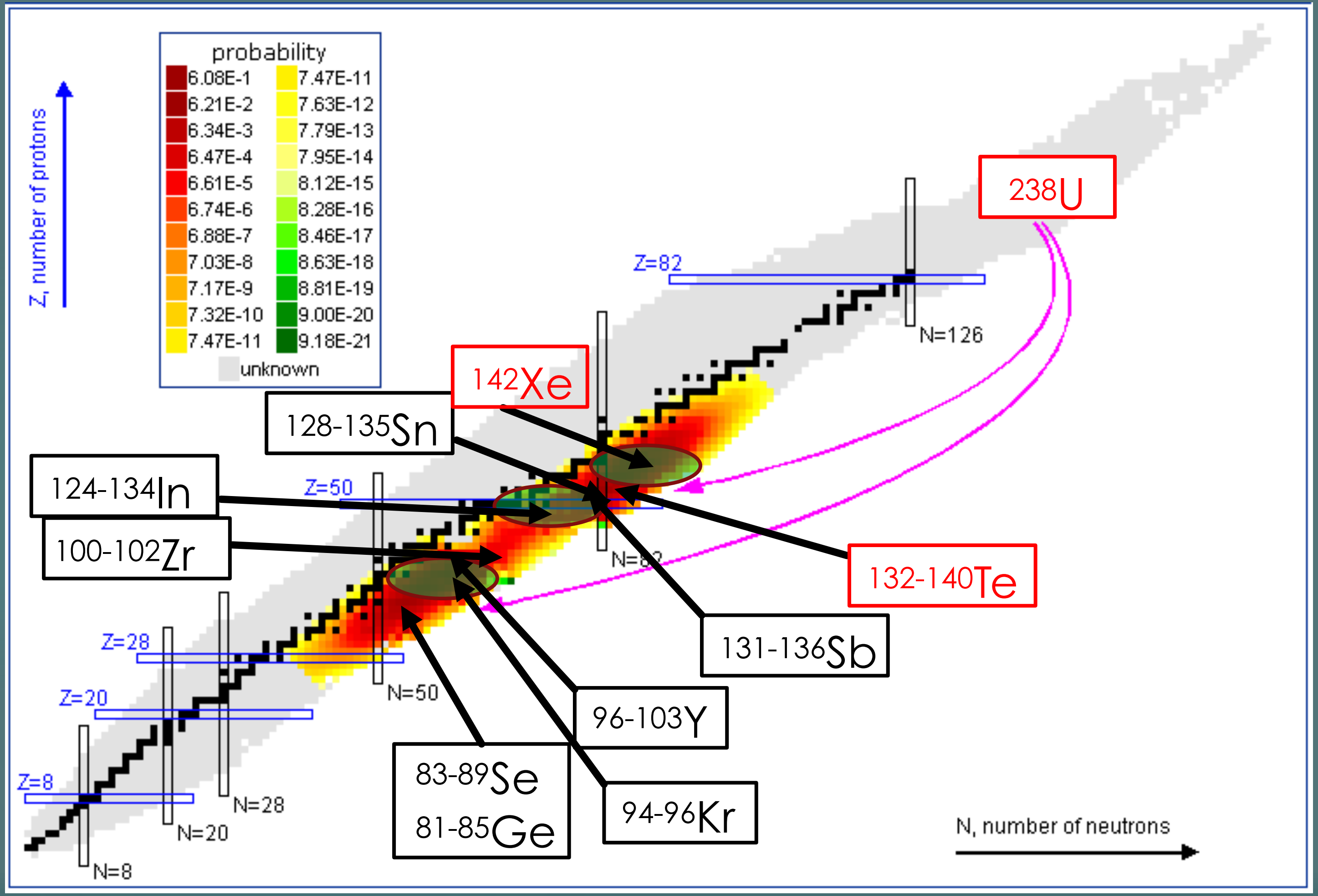

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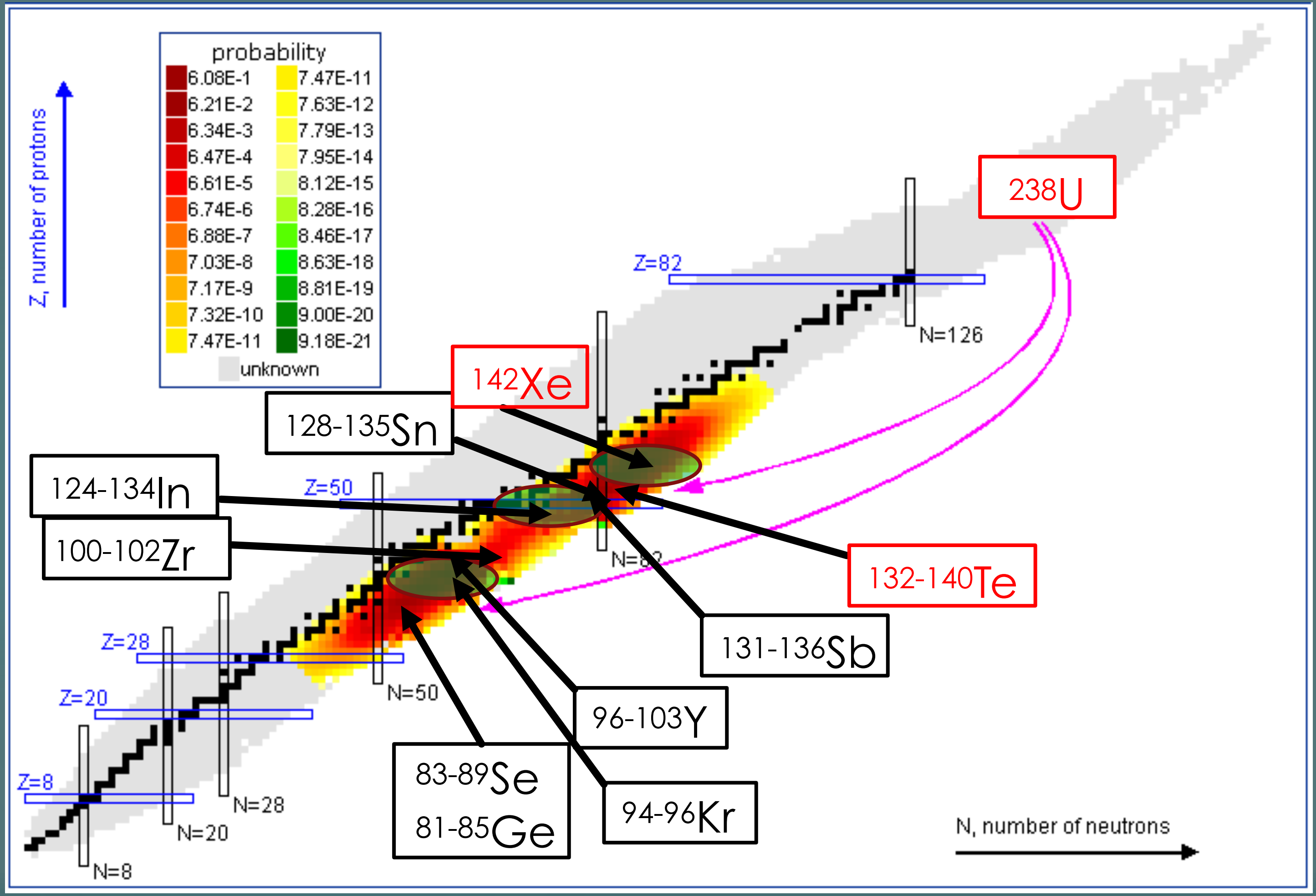

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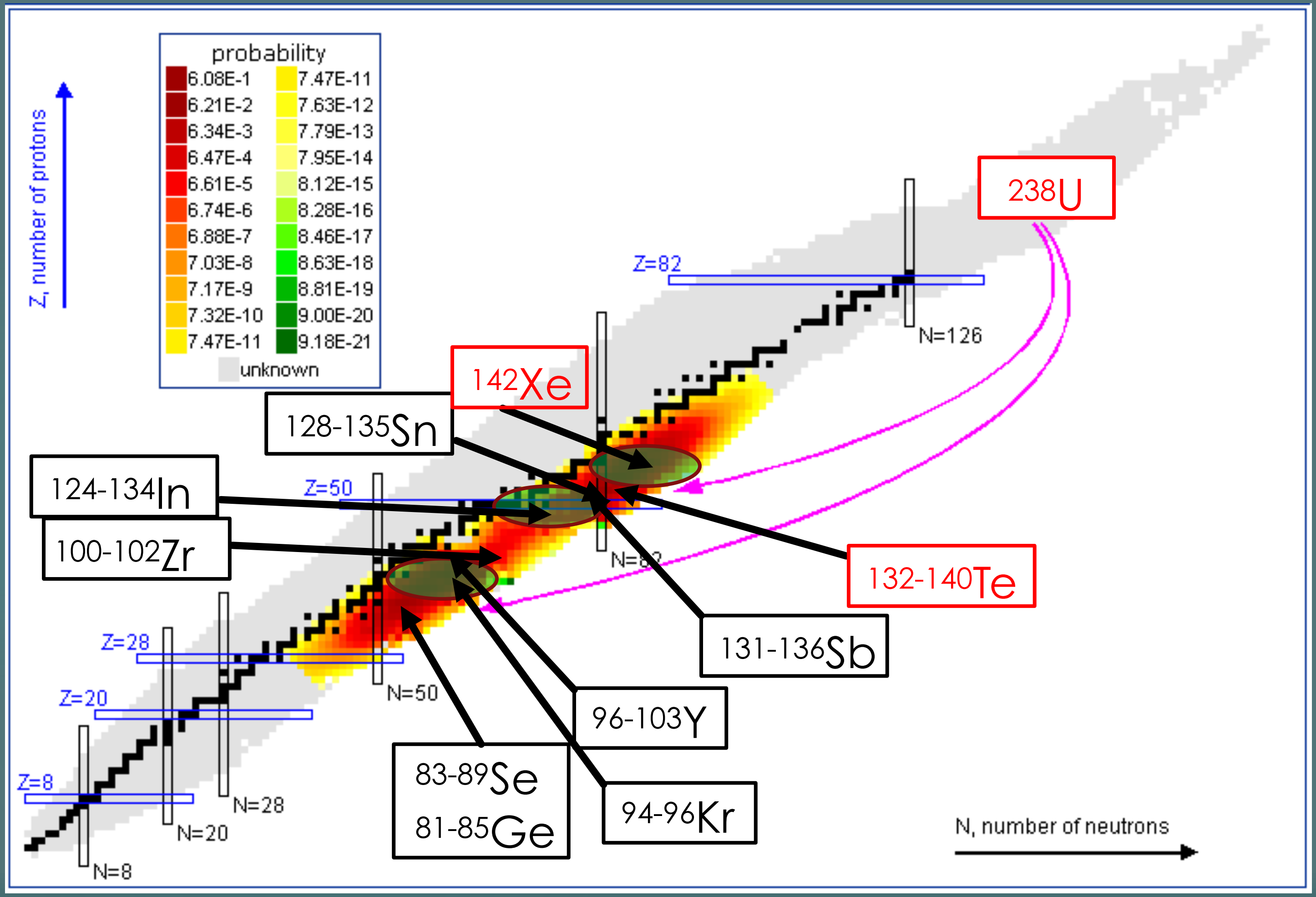

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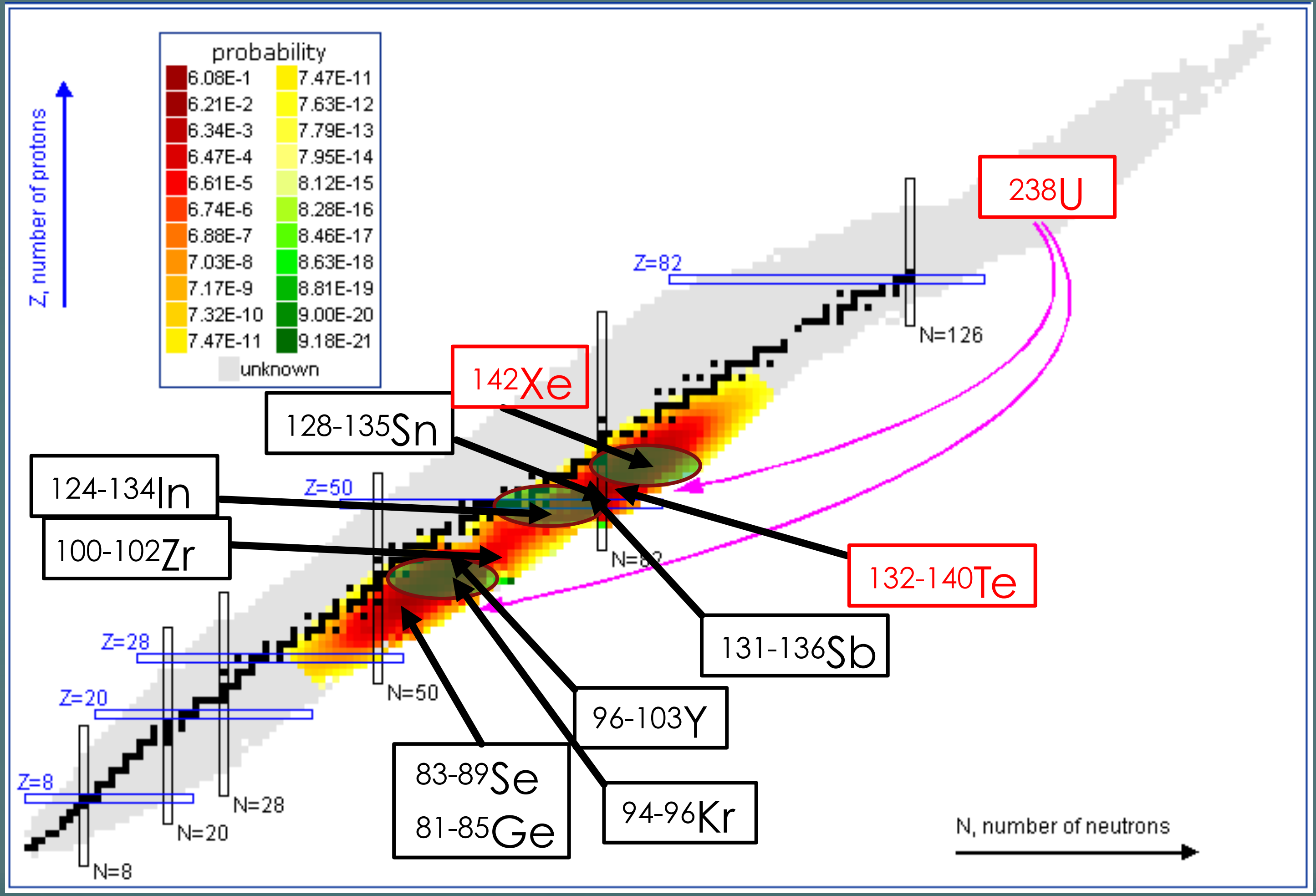

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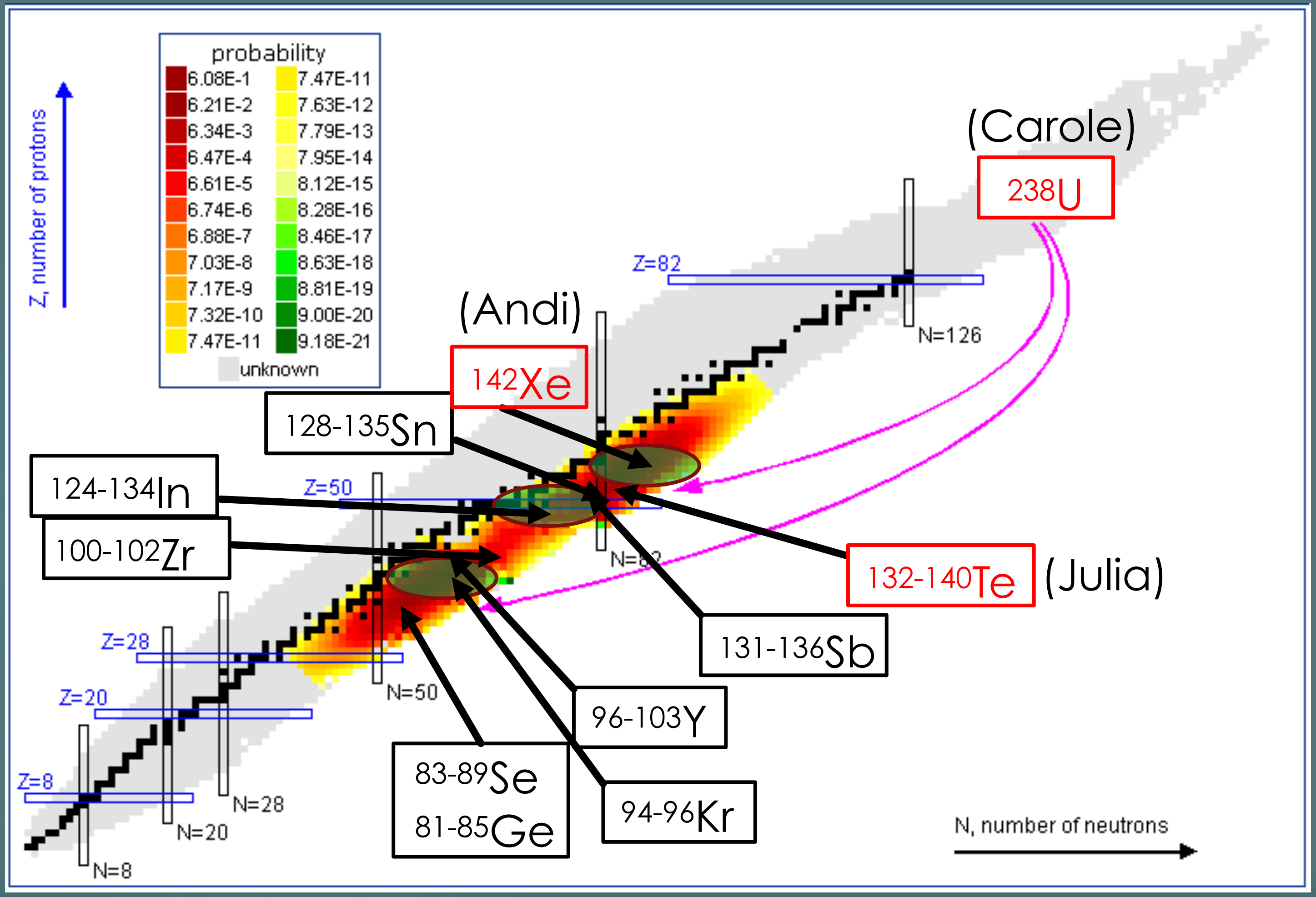

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2 data taking runs:

- 5 days in July (33% of events)

- 9 days in October 2022 (67% of events)

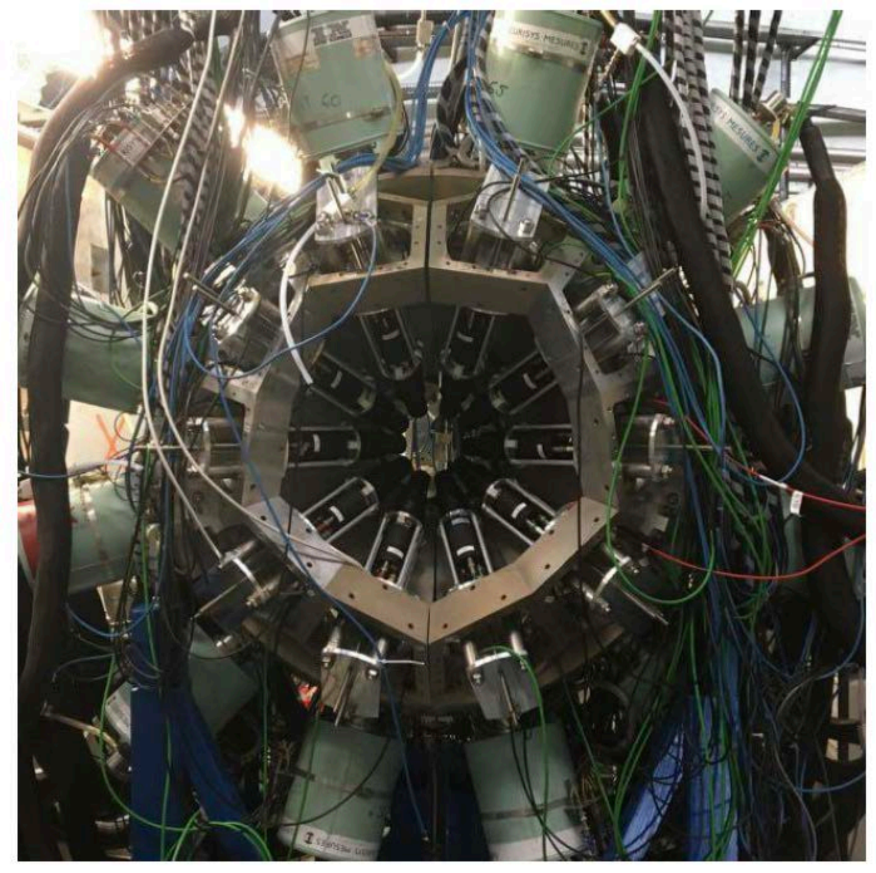
Total: (14 days)

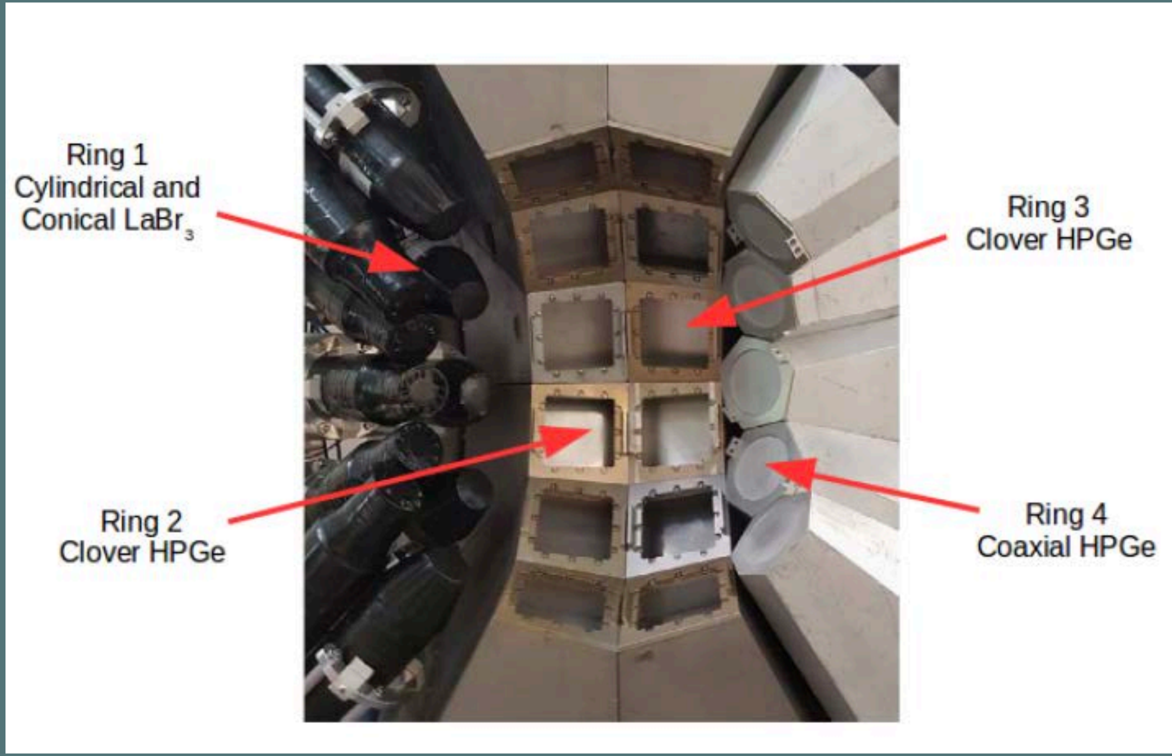
Raw data: 42 TB → **1.1 TB processed data**

Optimised setup for fast-timing:

- $LaBr_3$ positions
- Changed stopper and collimator
- Increased beam intensity
- Increased gas pressure

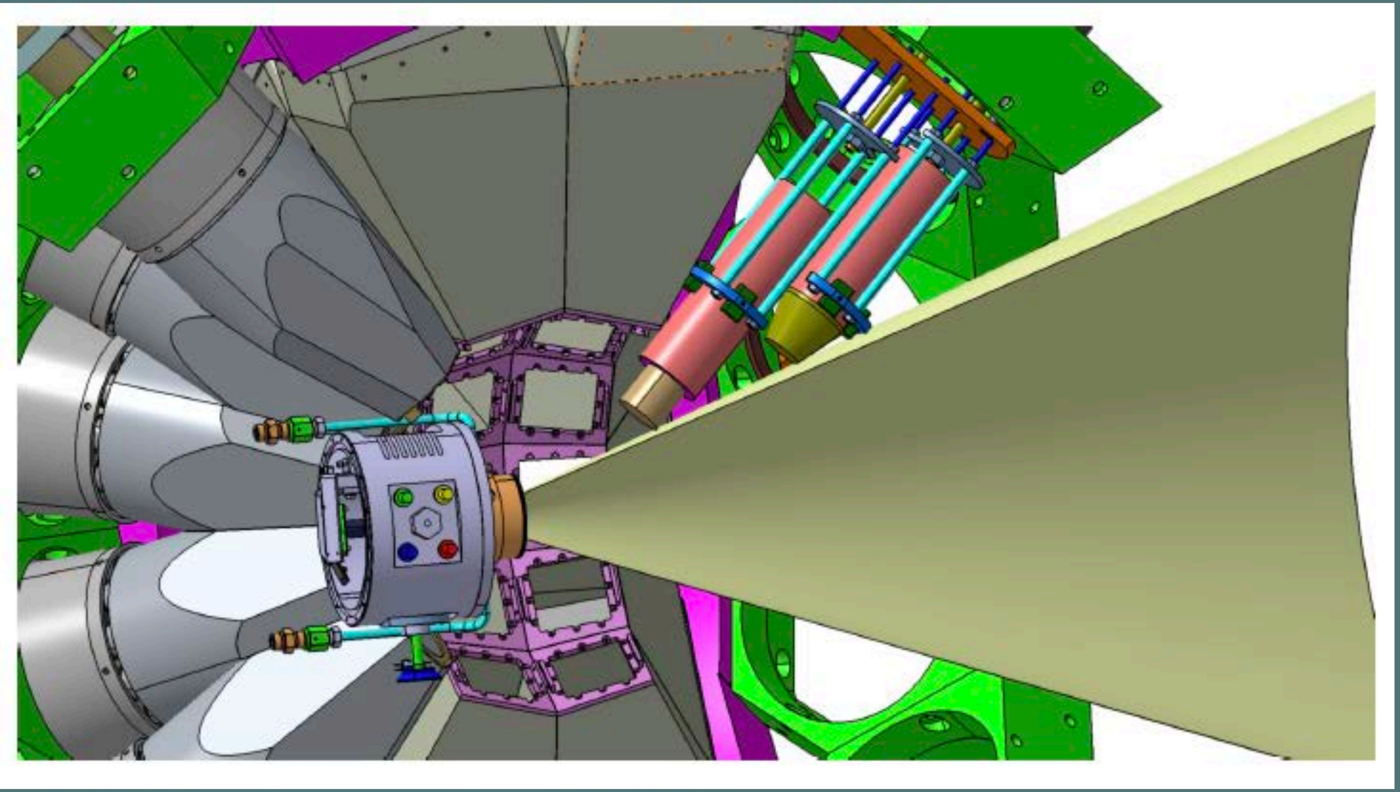
ν-ball1 array



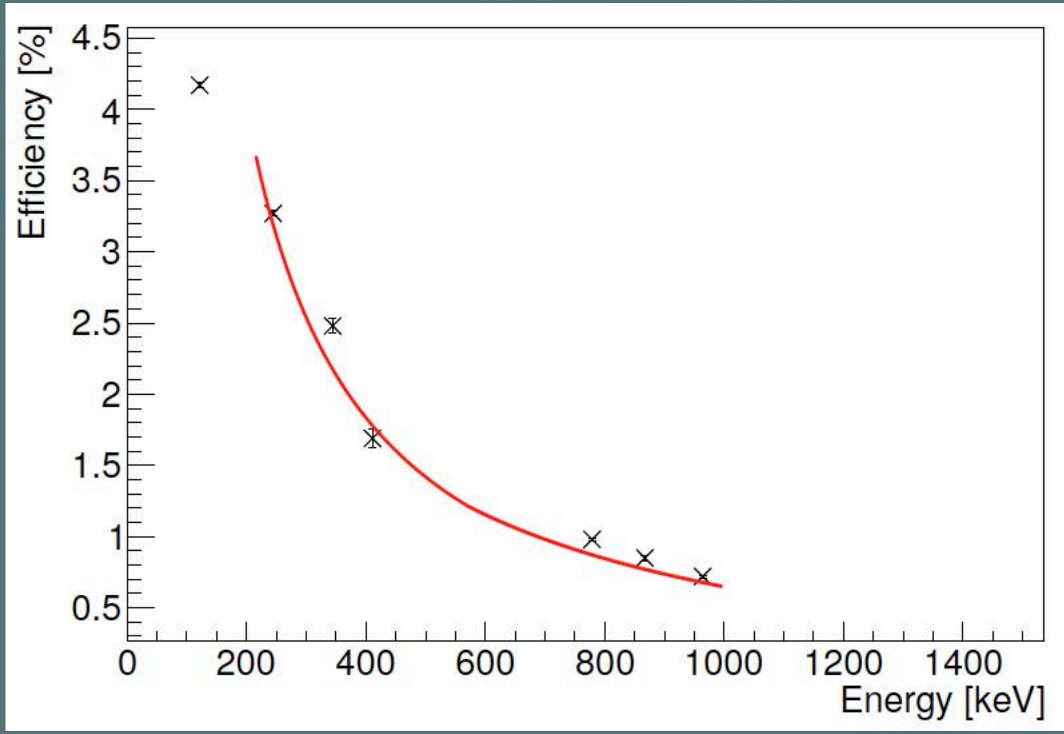


ν-ball1 array

Neutron cone



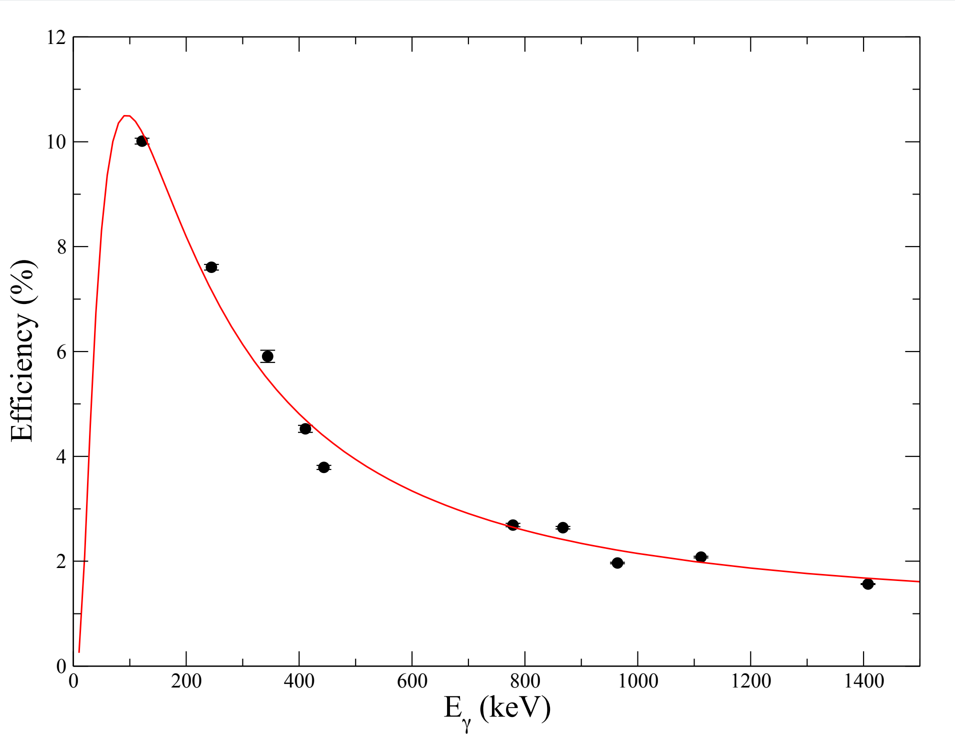
$LaBr_3$ efficiency curve



R. Canavan PhD thesis

ν-Ball2 array

LaBr$_3$ efficiency curve



Energy resolution: 34 keV @ 1408 keV (2.4%)
Time resolution: ~350 ps @ 1173-1332 keV

ν-ball1 vs ν-ball2

ν-ball1		ν-ball2
• Fast neutron source (LICORNE)	Clean spectra ↔	Fast neutron source (Improved LICORNE): Au stopper, W collimator
• ^{7}Li beam: ~ 10 nA pulsed beam pulsed beam	x 10 ↔	High intensity ^{7}Li beam: ~ 100 nA
• H gas cell: 1.3 atm	x 25% ↔	H gas cell: 1.6 atm
• 24 clovers + 10 Coax HPGe + + 20 $LaBr_3$ detectors (2 types)	↔	24 clovers + 20 UK FATIMA detectors (1.5''x2'' cylindrical crystals)
• Eff($LaBr_3$)~0.7% @ 1 MeV	x 3 ↔	Eff($LaBr_3$)~2.1% @ 1 MeV

Ge-Ge: x8

Ge-$LaBr_3$-$LaBr_3$: >70

Conclusions

- Successful fast-neutron induced fission experiment
- ν-Ball2: 24 clover HPGe + 20 $LaBr_3$(Ce)
- Improved statistics
- Preliminary/advanced analysis

Thanks to all the collaborators

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