

Beta-Delayed Two-Neutron Emission from U Fission Fragments

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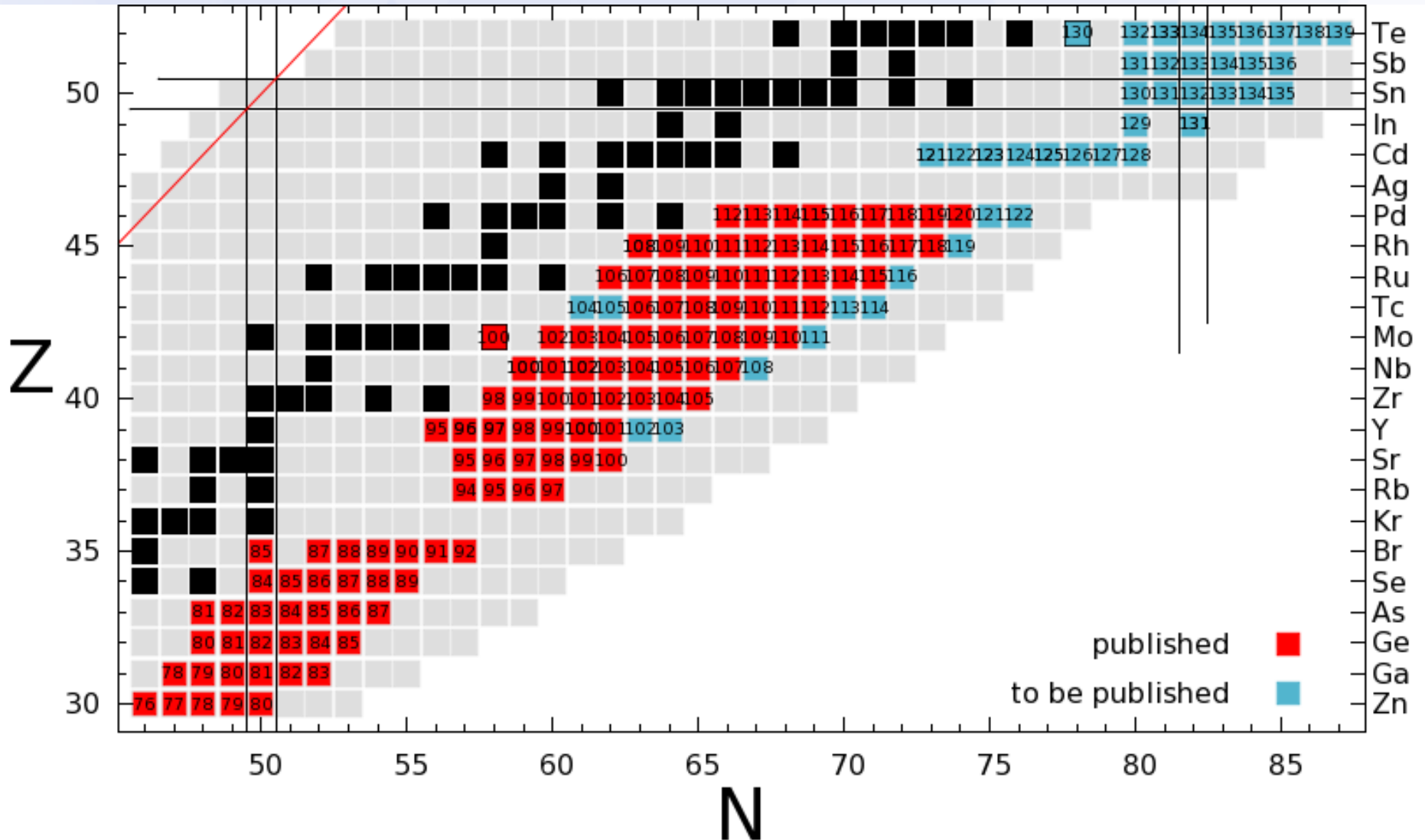


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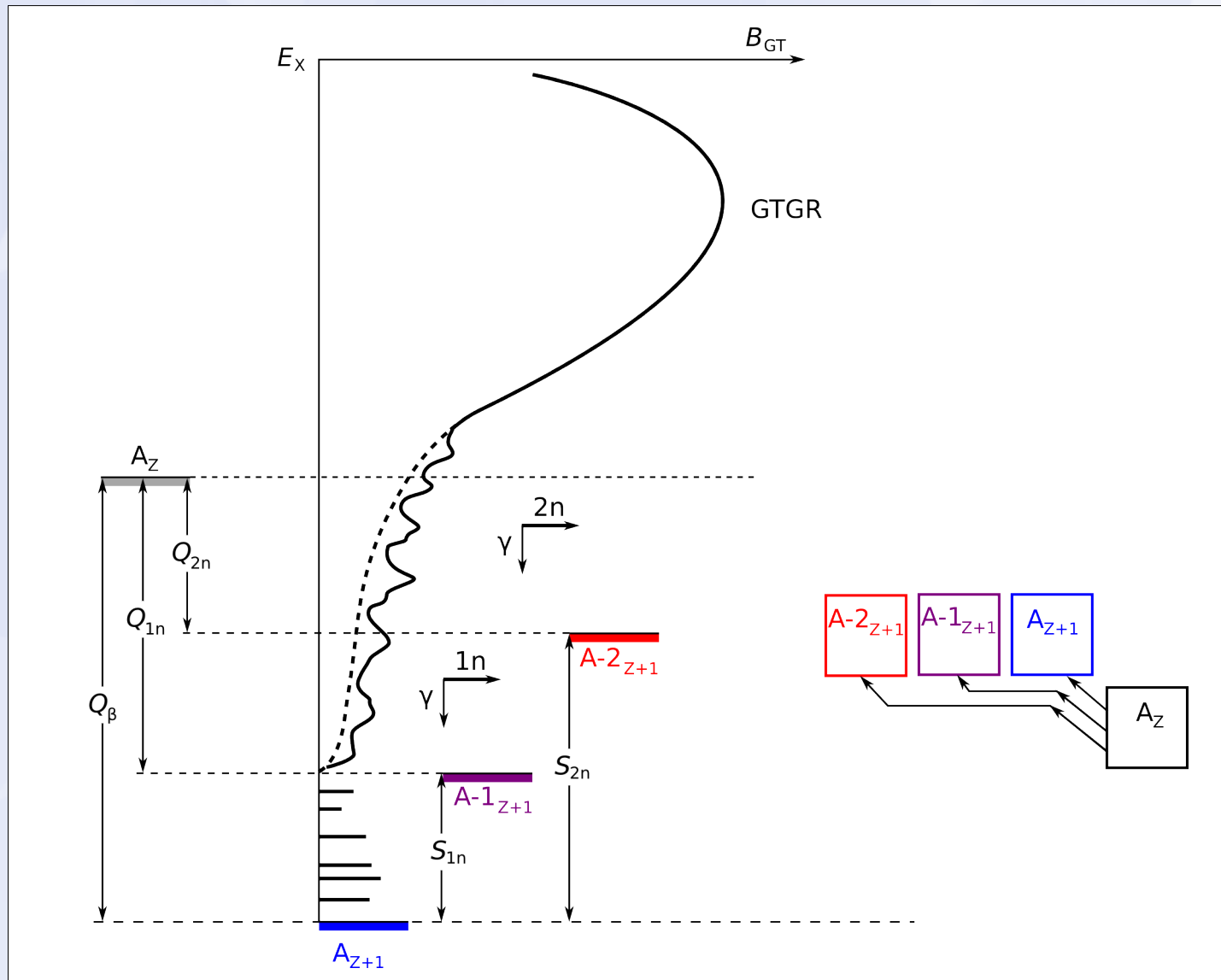
New mass data from JYFLTRAP

- Masses of ~200 fission fragments measured since 2005
- Typical accuracy <10keV
- Can derive S_{2n} and Q_{β} values
- Extrapolation from these measured solid values is more reliable

JYFLTRAP Masses

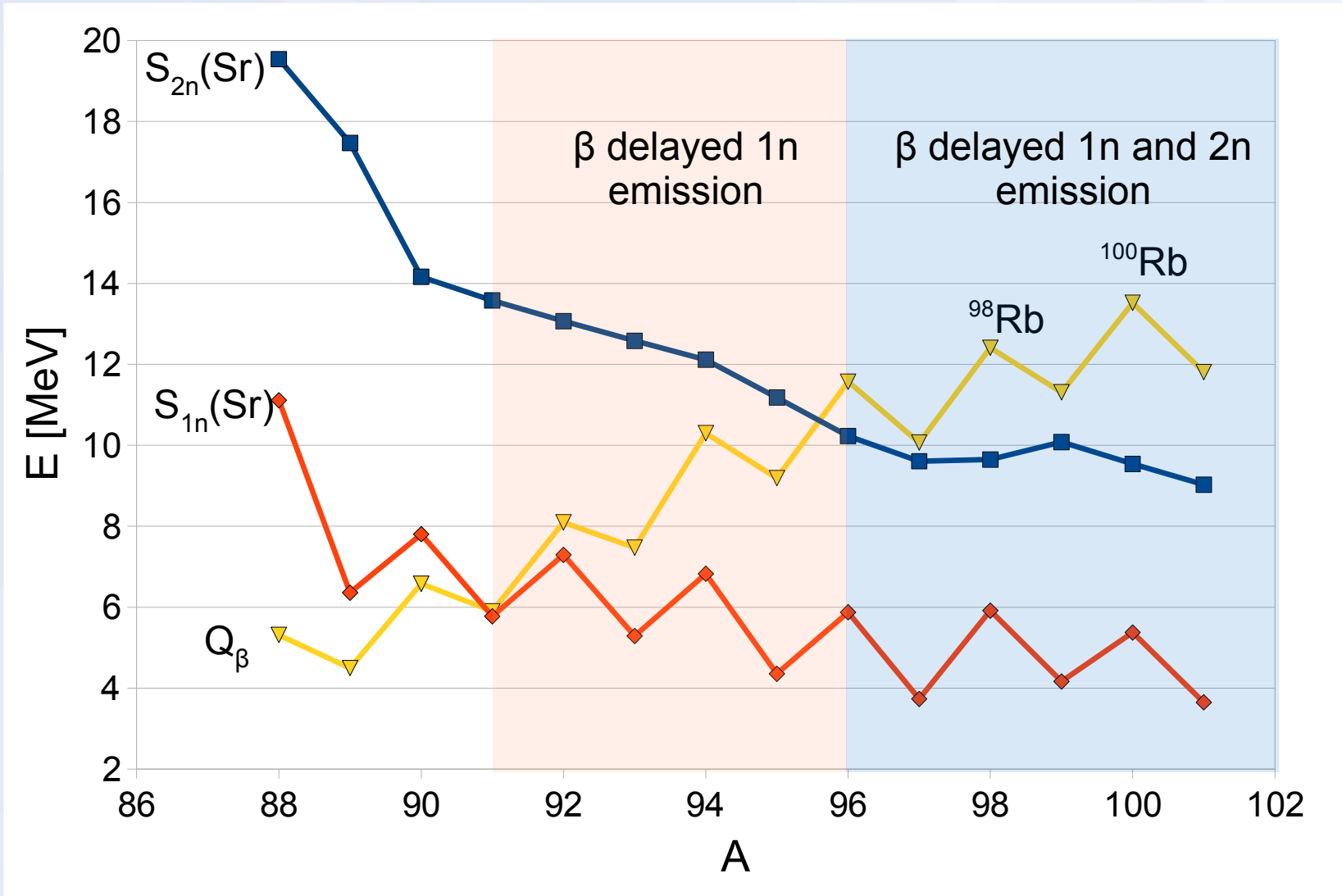


β delayed 1n and 2n emission scheme



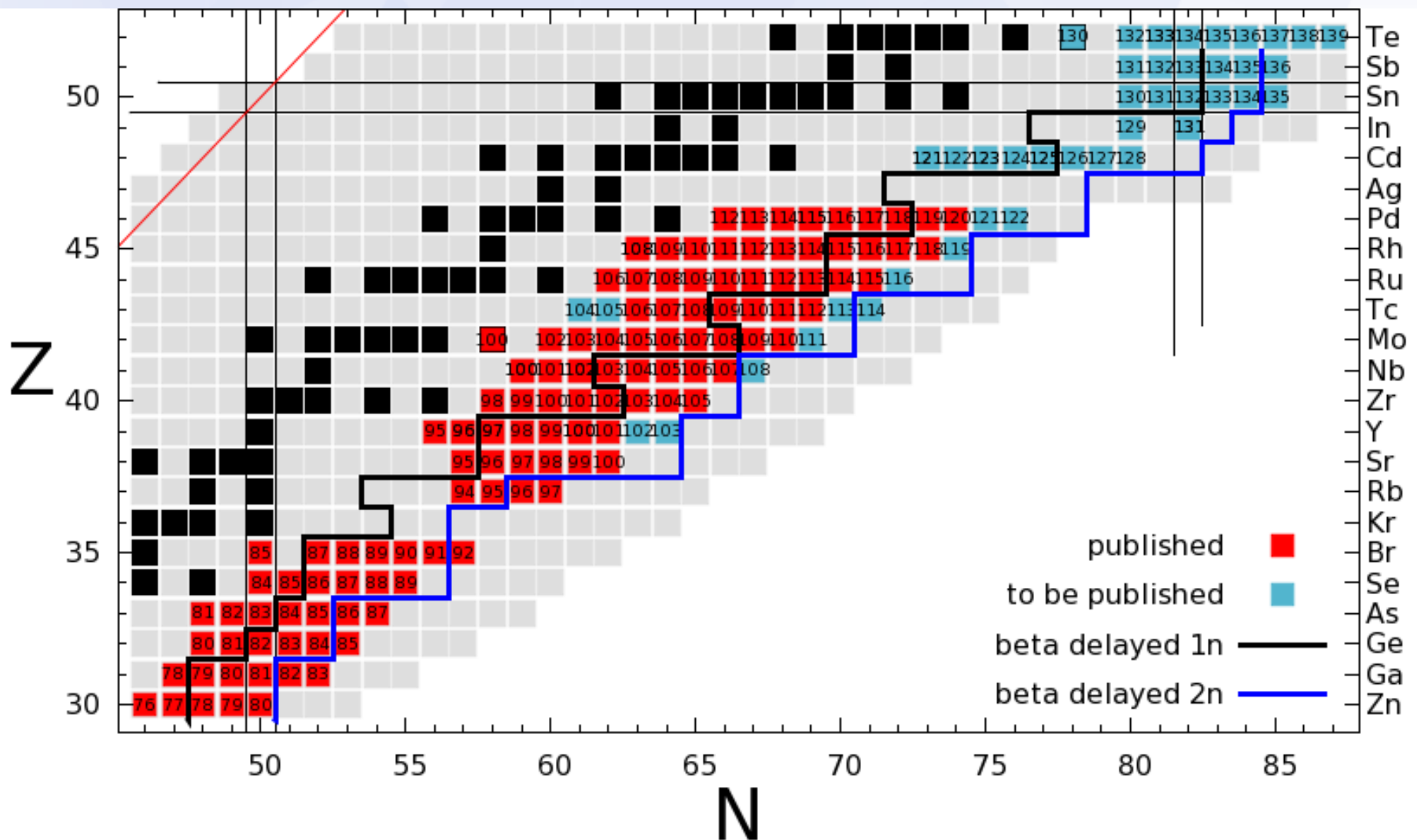
Yu.S.Lyutostansky, I.V. Panov, Z. Phys. A **313** 235 (1983).

Rb isotope chain



P.L.Reeder *et al.* Phys. Rev. Lett. **47** 483 (1981)
 B.Jonson *et al.* Proc.Int.Conf.Nuclei Far from Stability,
 Helsingor, Denmark, Vol.1, p.265 (1981)

Energy window for β delayed 1n and 2n emission



Detection of β -delayed 2n event

- Beta detector (AIDA) + neutron counter (BELEN)
- Beta-neutron-neutron triple coincidence \rightarrow clean
- No neutron scattering events
- Neutron residence time \rightarrow correlation time
- Random coincidences \rightarrow rate limitation
- Neutron detection efficiency?
- Beta threshold/recoil beta correlation?
- Source cleanliness (FRS performance)?

Earlier work on β delayed 2n emission from heavy nuclei

^{98}Rb , $p_{2n} = 0.060\%$

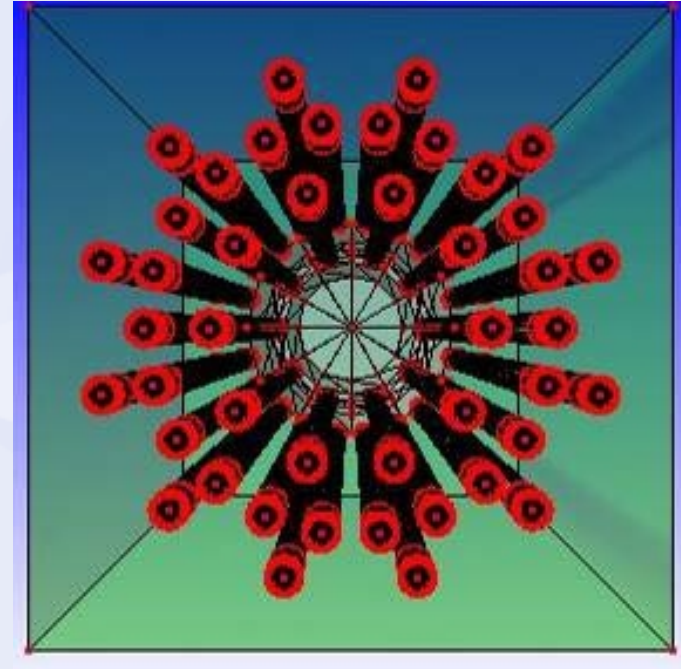
- P.L.Reeder *et al.* Phys. Rev. Lett. 47 483 (1981).
- TRISTAN @ Brookhaven, thermal neutron fission of ^{235}U
- The SOLAR Neutron Counter
 - 40 ^3He tubes in a Polyethylene moderator
 - Eff: 59% for neutrons with average energy of 500keV

^{100}Rb , $p_{2n} = 0.14\%$

- B.Jonson *et al.* Proc.Int.Conf.Nuclei Far from Stability, Helsingor, Denmark, Vol.1, p.265 (1981)
- ISOLDE, CERN
- 12 ^3He tubes in a paraffin-wax moderator
- Eff: 20%

BELEN Neutron Counter

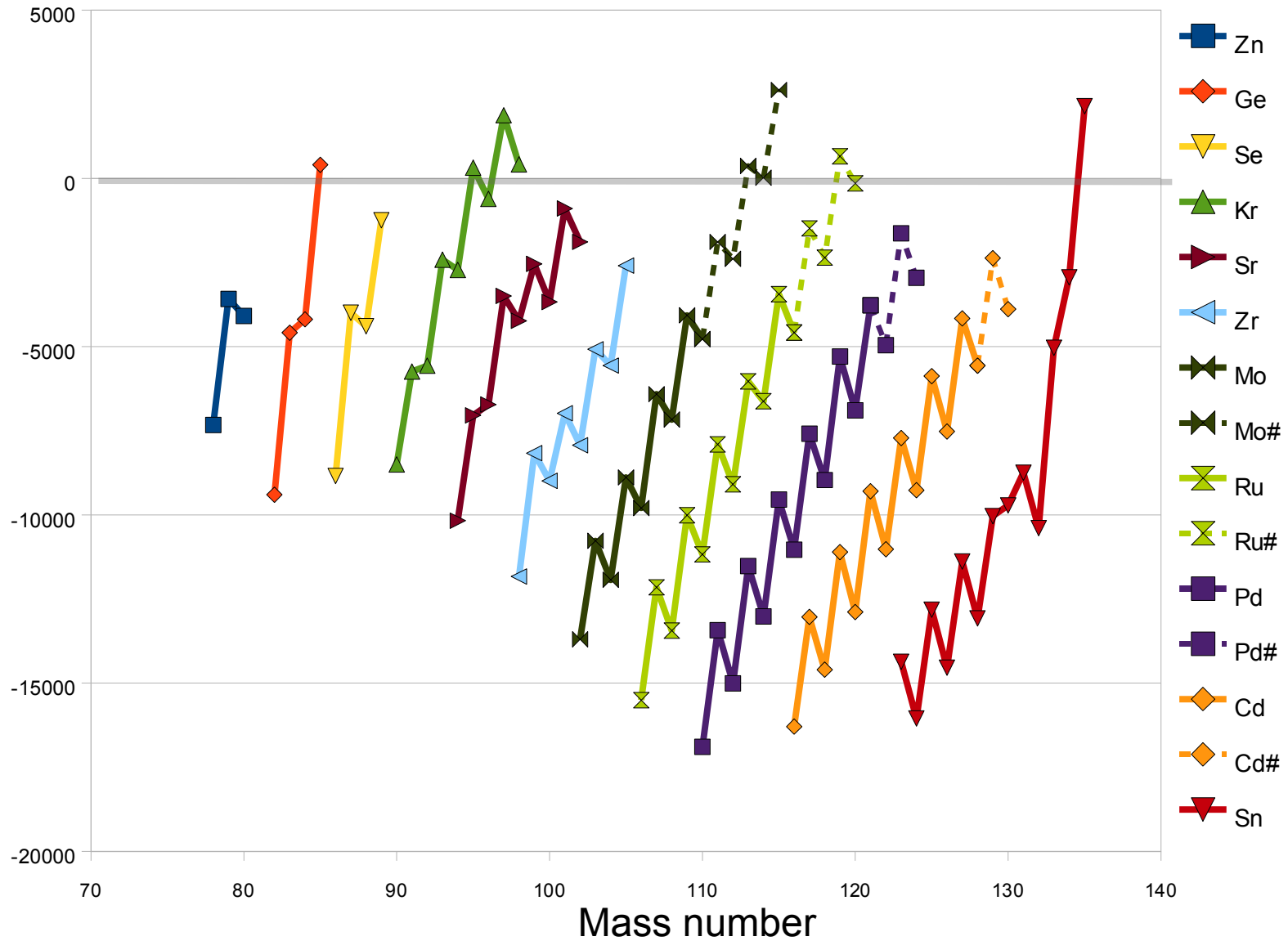
- 44 ^3He tubes in 3 crowns
- PE moderator matrix
- Eff: 58%
- See Belen's talk



Other detectors/labs

- HRIBF neutron detector ^3He , ORNL
 - 74 ^3He tubes, 4 crowns
 - HDPE moderator $\sim 60 \times 60 \times 70 \text{cm}^3$, bore 9cm
 - $\epsilon = 75\%$
- NERO @NSCL, MSU
 - 16 ^3He tubes in inner crown, 20 and 24 BF_3 tubes in two outer crowns
 - PE moderator $60 \times 60 \times 80 \text{cm}^3$, bore 22.8cm
 - $\epsilon = 45\%$

Beta delayed 2n window, even Z



Beta delayed 2n window, odd Z precursor

