Physics cases for 2GeV proton beam at ISOLDE : Benefits for the mass measurement program

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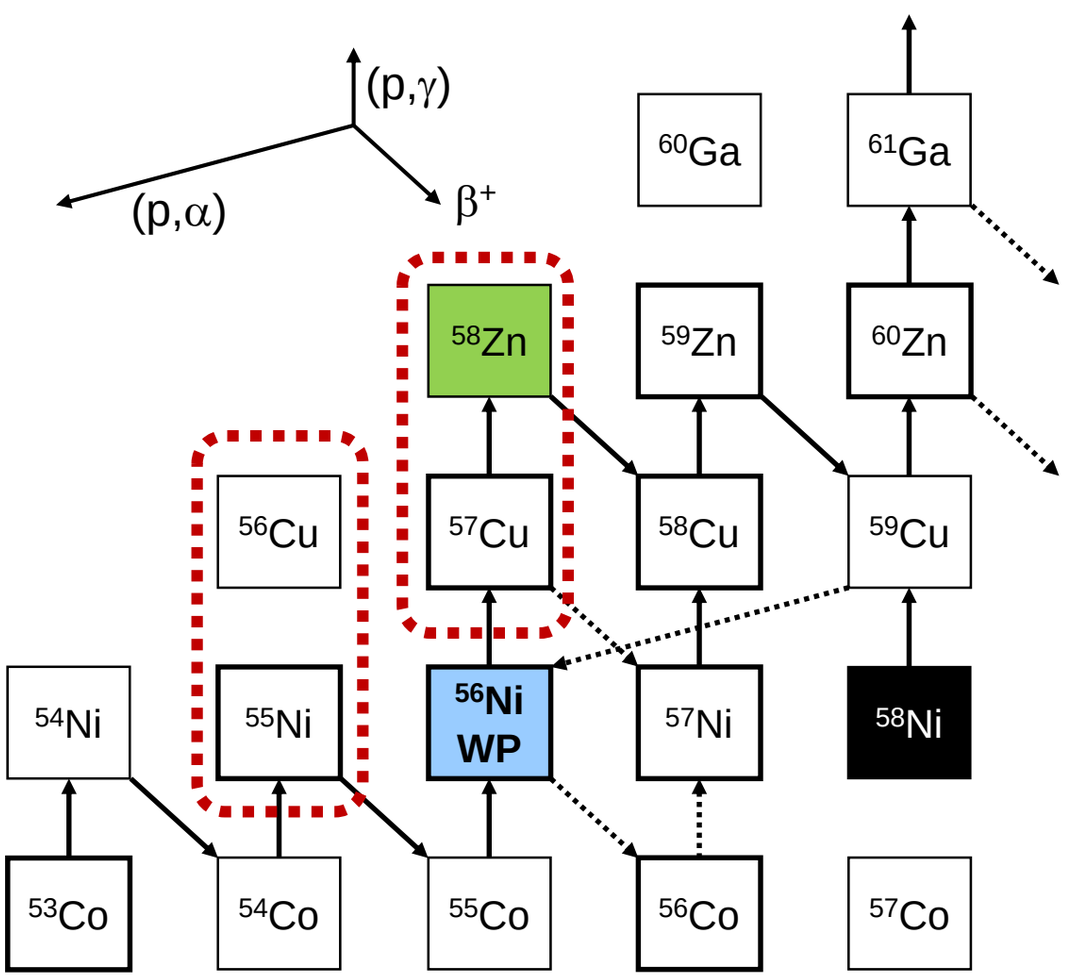
Masses of neutron deficient rp-process nuclei

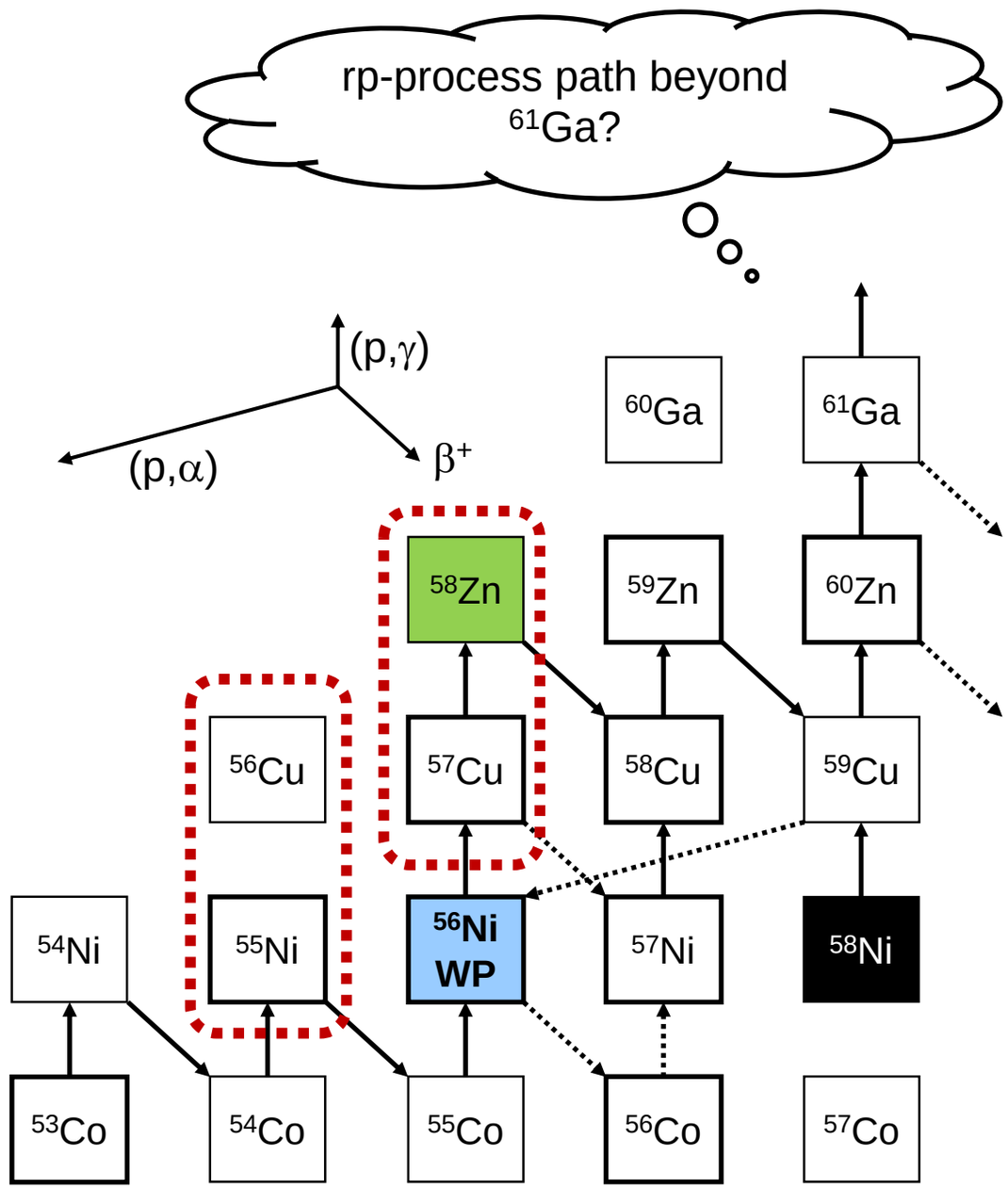
rp-process studies at ISOLTRAP



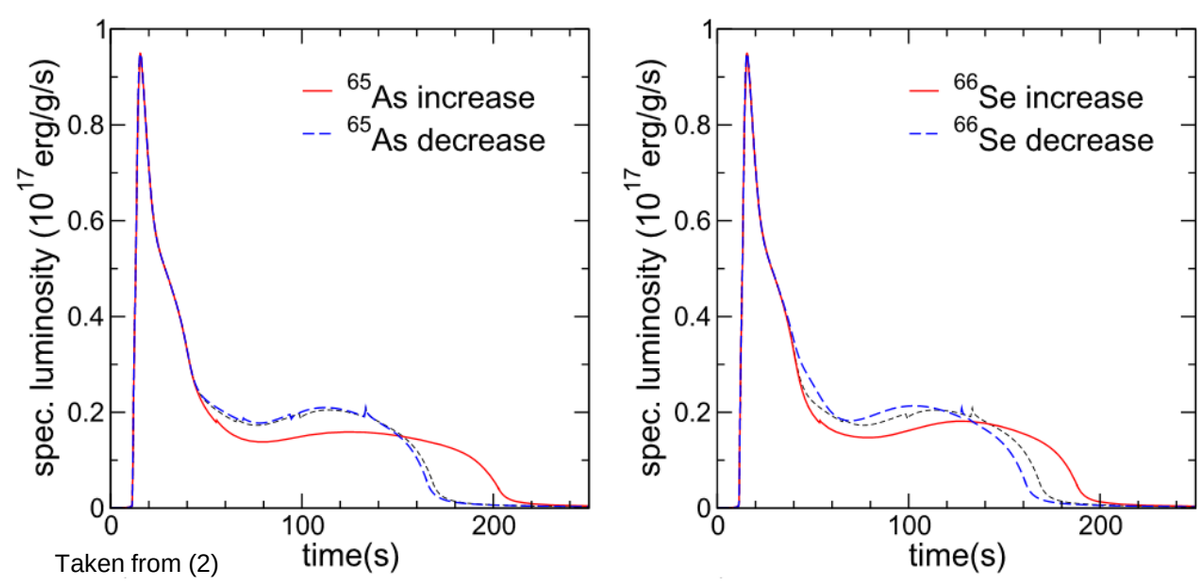
- $Q(p,\gamma)$ = m(Z,A)+m_p-m(Z+1,A+1)
- Ratio of (γ,p) reaction rate to the reverse $\propto e^{-Q(p,\gamma)}$
- $^{56}Cu^{*}$ and ^{58}Zn accepted by the INTC → IS625

*Measured at LEBIT : A.A Valverde *et al.,* Phys. Rev. Lett. **120**, 032701
**Impact study : H. Schatz *et al.,* The Astrophysical Journal, 884:139 (11pp)

rp-process studies at ISOLTRAP



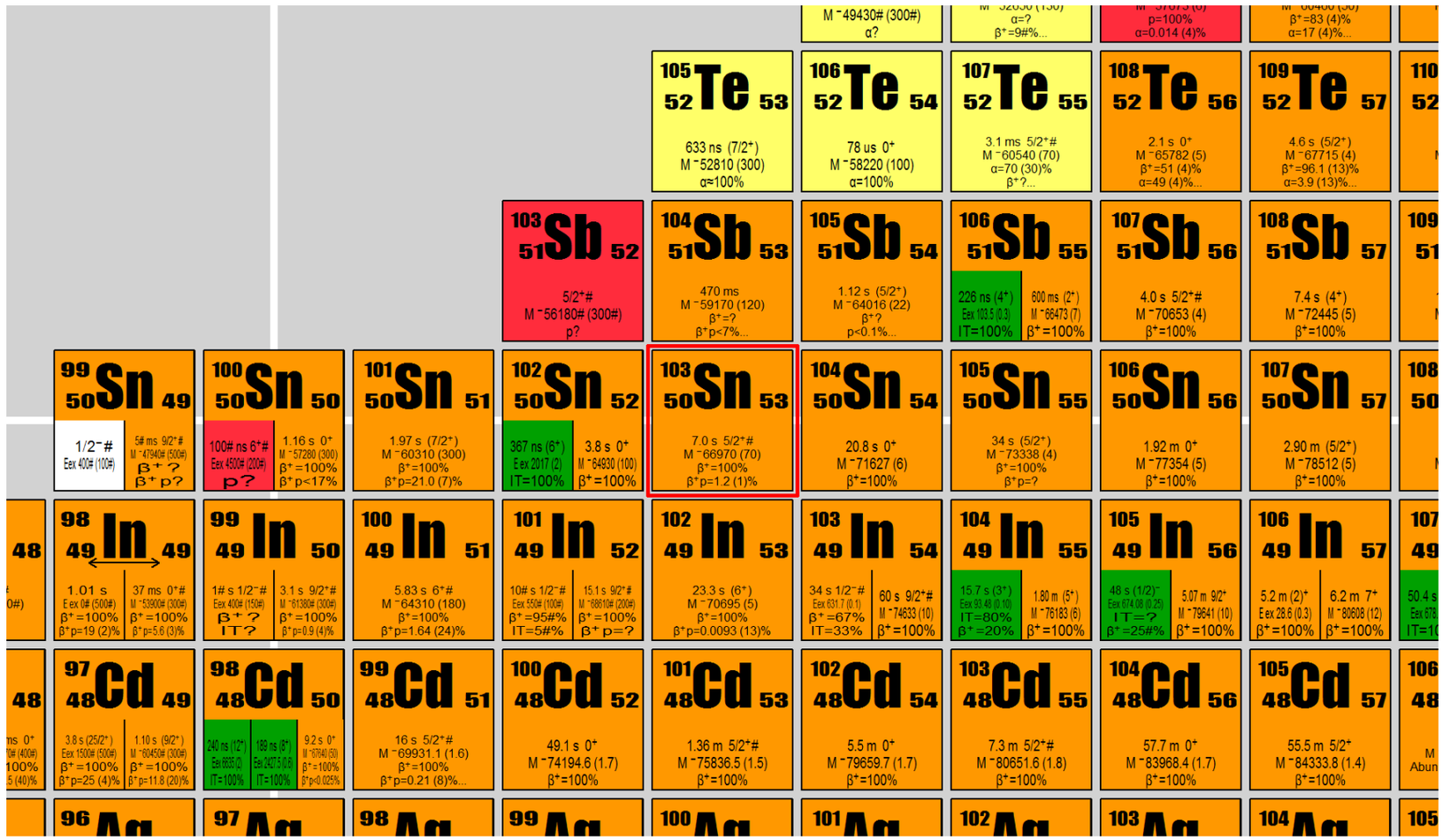
- $Q(p,\gamma)$ = m(Z,A)+m_p-m(Z+1,A+1)
- Ratio of (γ,p) reaction rate to the reverse $\propto e^{-Q(p,\gamma)}$
- ^{56}Cu(1) and ^{58}Zn accepted by the INTC → IS625
- Other key waiting point ^{64}Ge
- Nuclei which strongly impact astrophysical observables(2) : ^{58}Zn,^{61}Ga,^{62}Ge,^{65}As,^{66}Se
- Benefit from a factor 2 increase with ZrO_2 target



Taken from (2)

(1)Measured at LEBIT : A.A Valverde *et al.,* Phys. Rev. Lett. **120**, 032701
(2)Impact study : H. Schatz *et al.,* The Astrophysical Journal, 884:139 (11pp)

rp-process studies at ISOLTRAP



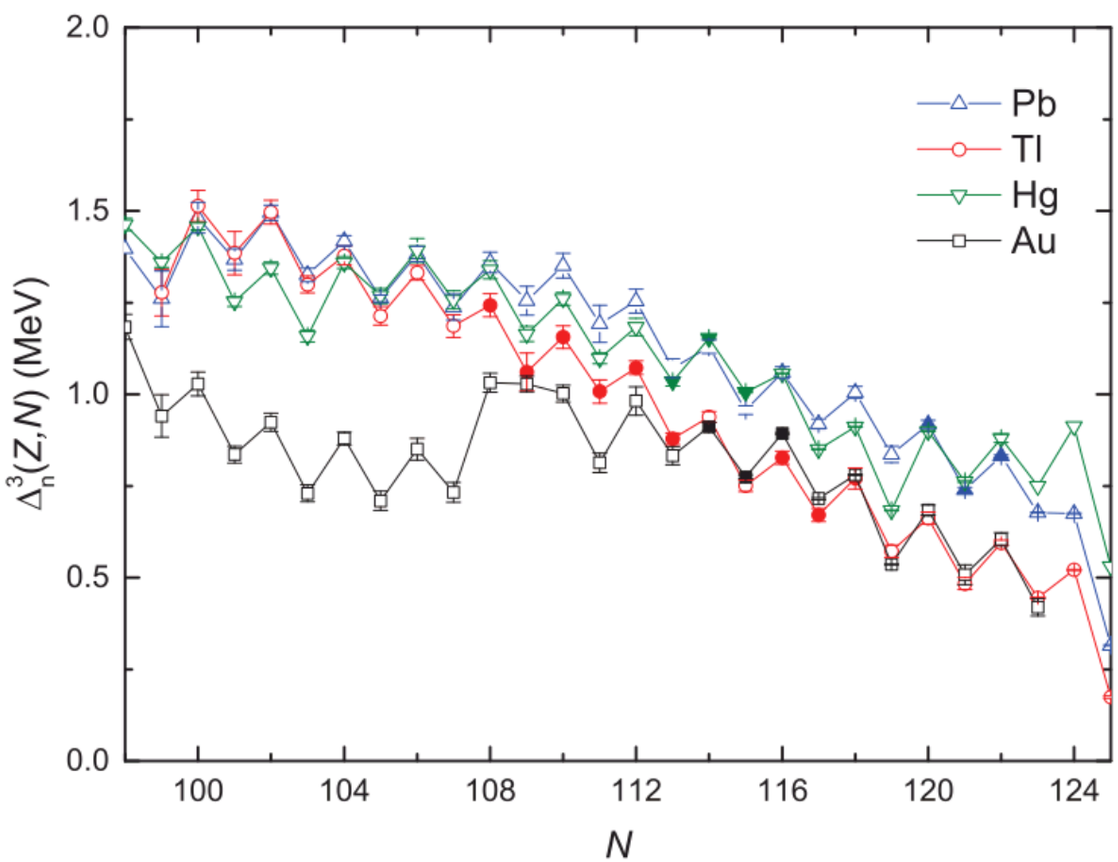
- Nuclear Astrophysics : rp-process studies towards the Sn-Sb-Te cycle
  → ^{98}Cd, $^{99\text{-}101}$In impact the X-ray burst ashes composition strongly(2)
- Nuclear structure : Probing the region around doubly-magic ^{100}Sn(3) → $^{99\text{-}101}$In (even ^{98}In?)
- Benefit from a factor 2-3 on LaC_2 target

(2)Impact study : H. Schatz *et al.*, The Astrophysical Journal, 884:139 (11pp)
(3)Link between direct link between ^{100}Sn and ^{100}In masses :

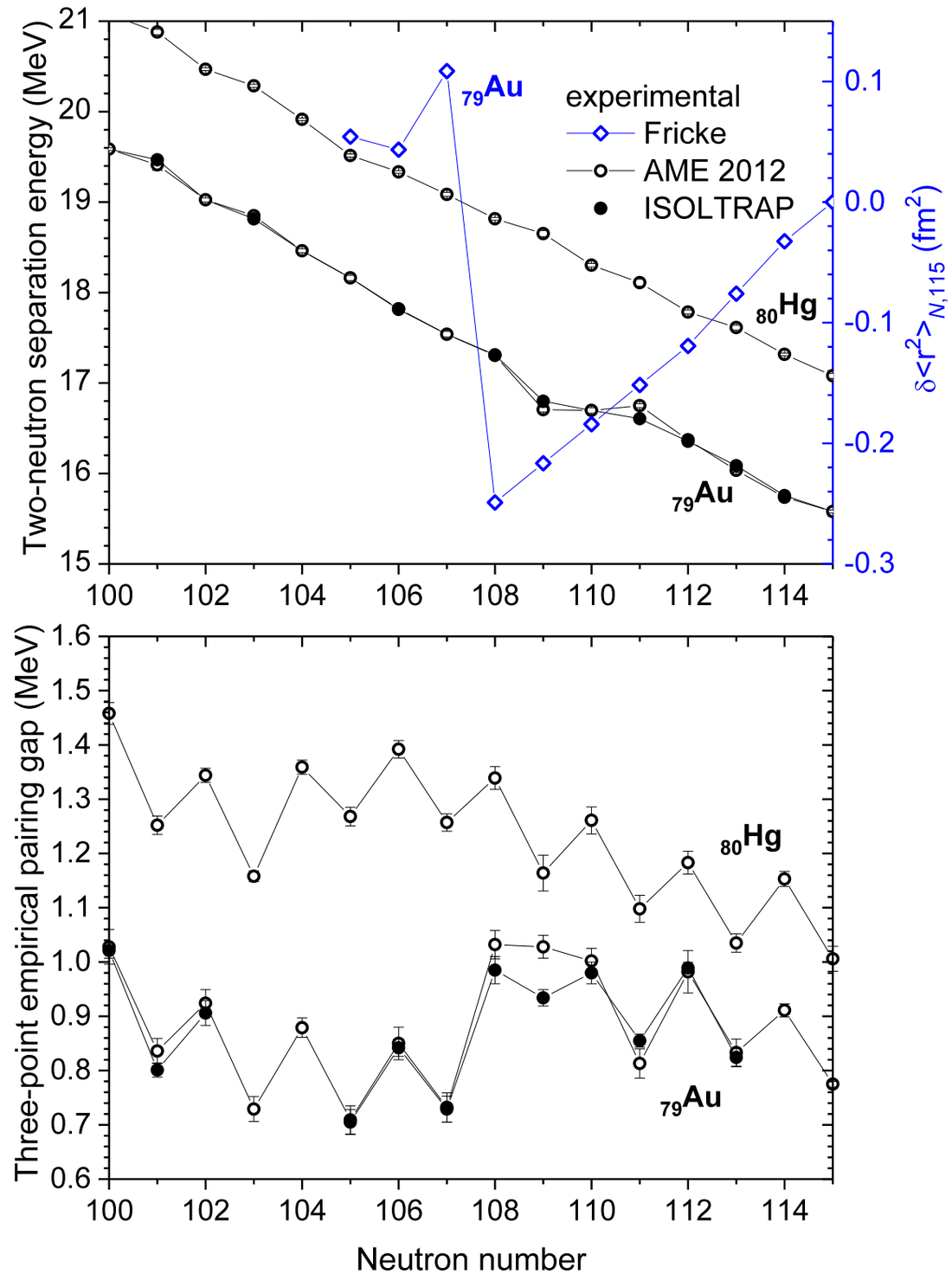
Mass measurements in the neutron-deficient Pb region

Mass measurements in the lead region

- Strong nuclear structure effects are observed by spectroscopy in particular on the neutron-deficient side from Z = 77 to Z = 84 around mid-shell *N* = 104.
- Similar effects with smaller magnitude were observed in the gold and mercury isotopes.



C. Weber et al. Nucl. Phys. A 803 (2008) 1–29;
Ch. Boehm et *al*. PHYS. REV. 90, 044307, (2014)



V. Manea et *al*. PHYS. REV. C 95, 054322 (2017)

Mass measurements in the lead region

Enhancement factor of 3-5 with UC_x target will allow extending the studies In this region very close to the proton-drip line