Opportunities with MINOS+MINIBALL at RIBF

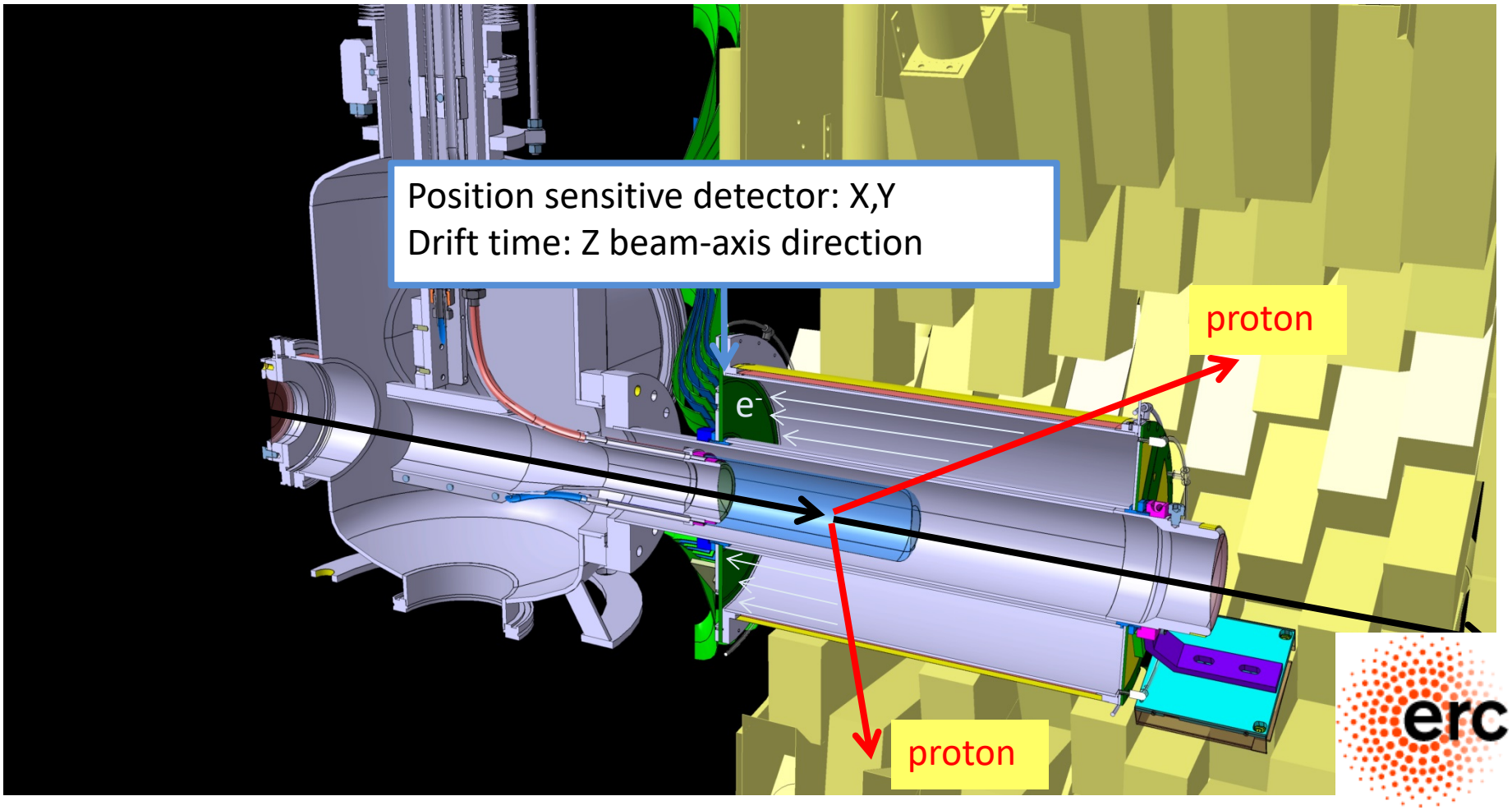
A.Corsi, CEA/IRFU/DPhN

High Resolution Gamma Spectroscopy at RIBF, Darmstadt, 10th-12th April 2019

Acknowledgments: D. Leboeuf, V.Panin (CEA), B.D.Linh (Vinatom)

MINOS : Magic Numbers Off Stability

Thick target (5-15 cm) + vertex reconstruction for **Doppler and energy loss correction**



Efficiency: 95% in (p,2p) & resolution on vertex: 5 mm (FWHM)

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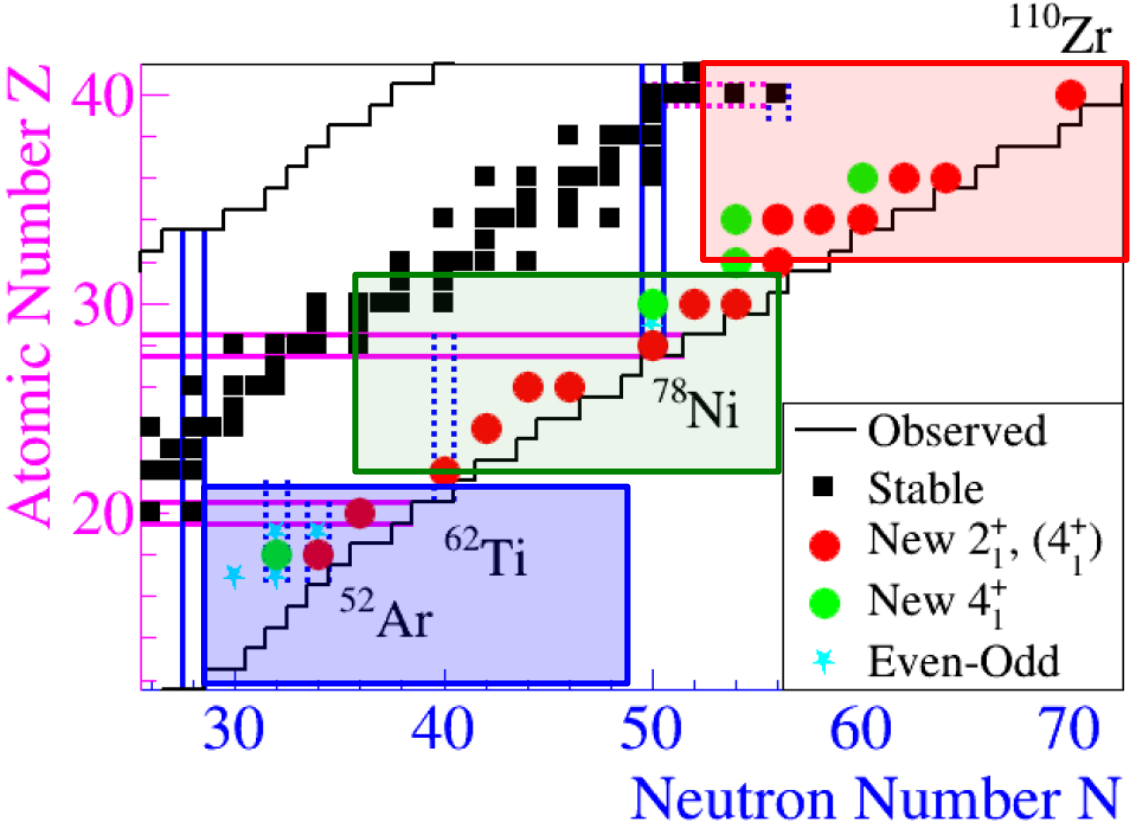
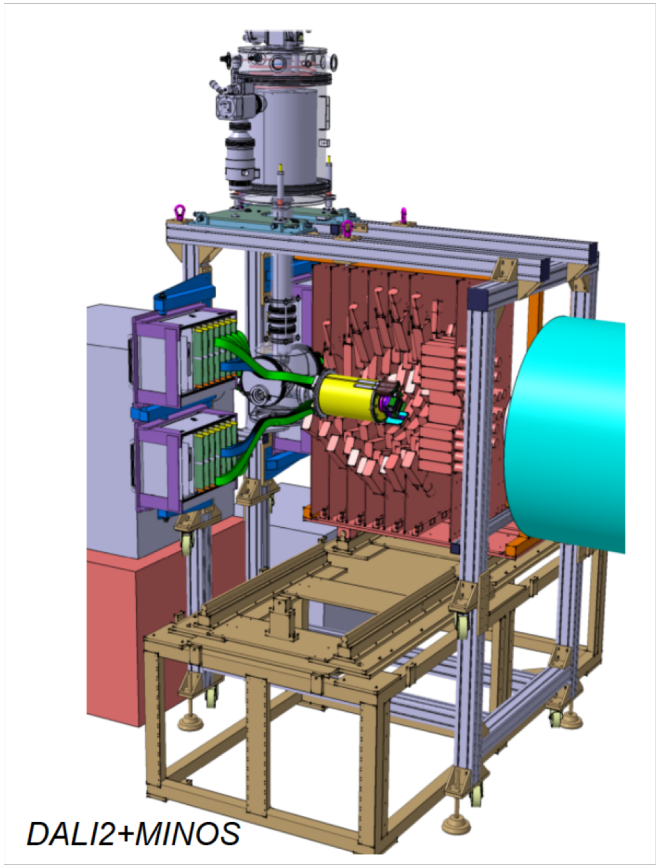
Gamma spectroscopy of very neutron rich nuclei

- May 2014 SEASTAR1
- May 2015 SEASTAR2
- May 2017 SEASTAR3



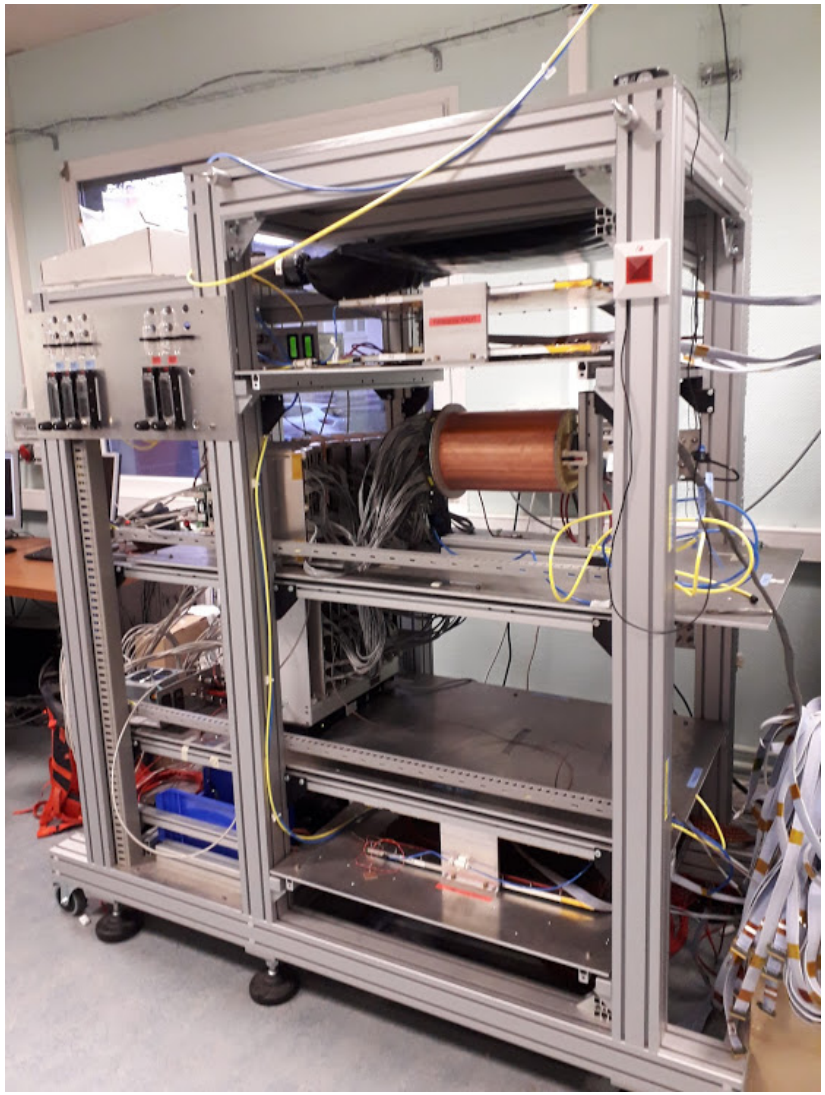


Spokespersons: P. Doornenbal (RIKEN), A. Obertelli (CEA, TU Darmstadt)

Status of MINOS device

Plans / ongoing

- Refurbishment of slow control system (hardware and software) ongoing a Saclay
- Test of cryogenic system in RIKEN this summer
- Reparation of TPC damaged before SEASTAR3
- Test of TPC in the cosmic bench at Saclay
- Support from EXPAND grant (N.Orr)
- MoU CEA-RIKEN under renewal until 2022



Coupling MINOS and MINIBALL

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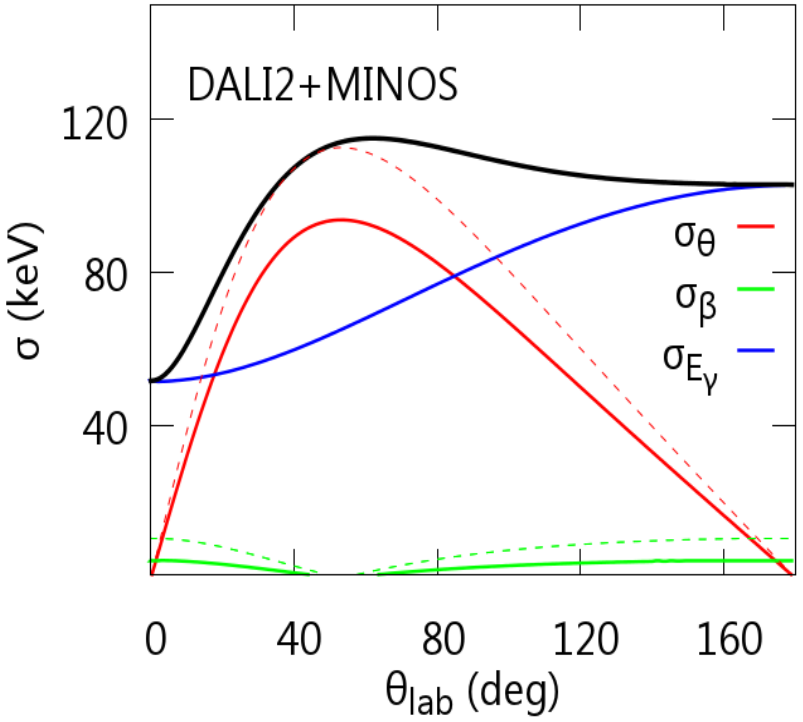
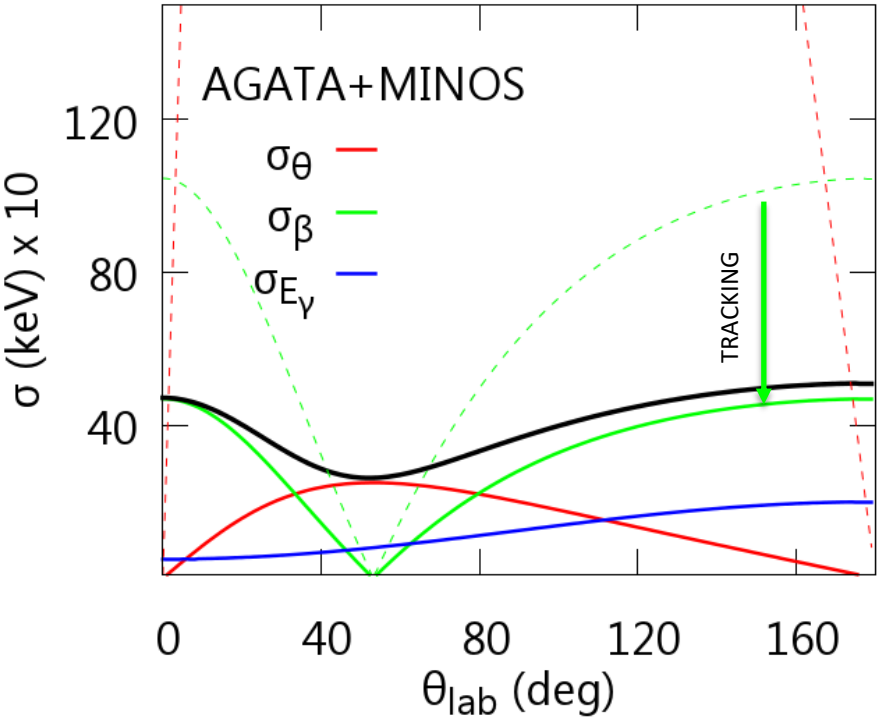
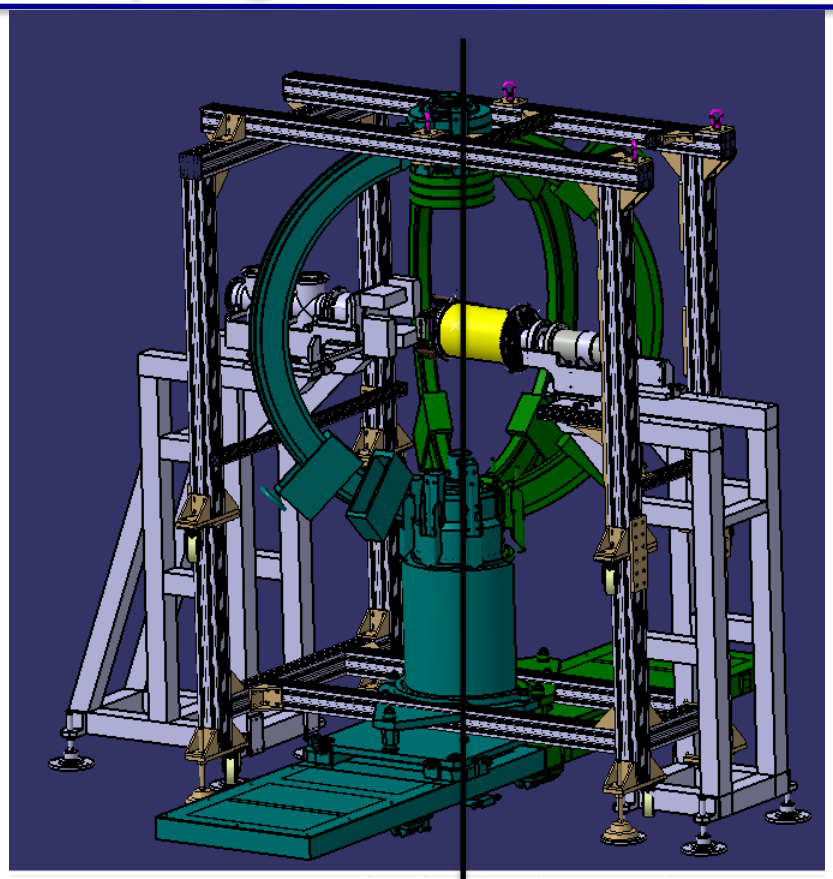
Eγ=1 MeV, β=0.6, 15 cm LH2 target

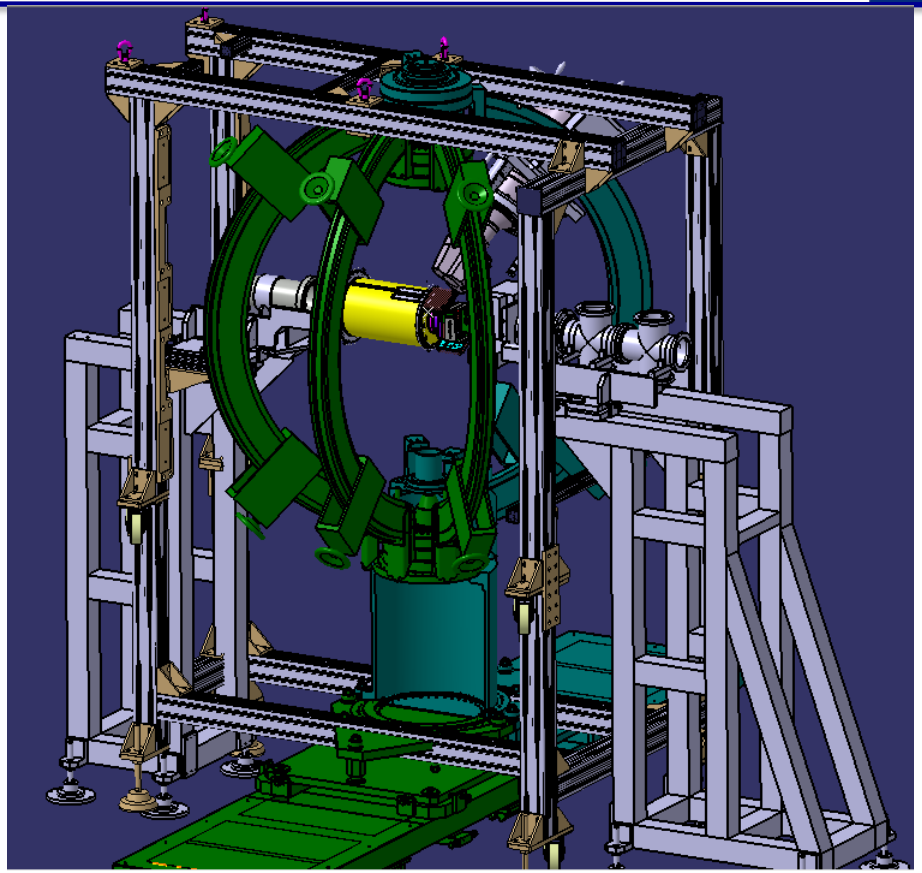


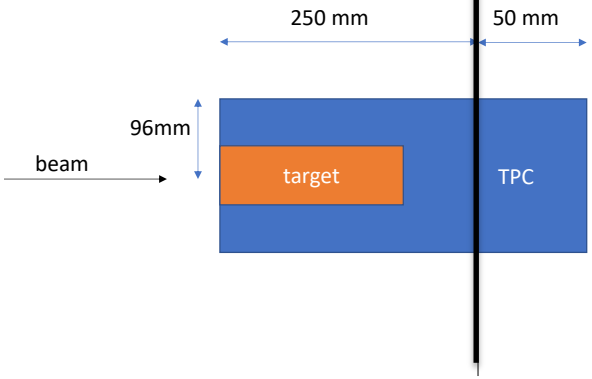


- Gamma energy and interaction point, and vertex resolution needed for good resolution!
- Efficiency?
- See Kathrin's talk

Coupling MINOS and MINIBALL







- Few (minor) conflicts
- Simulations needed…

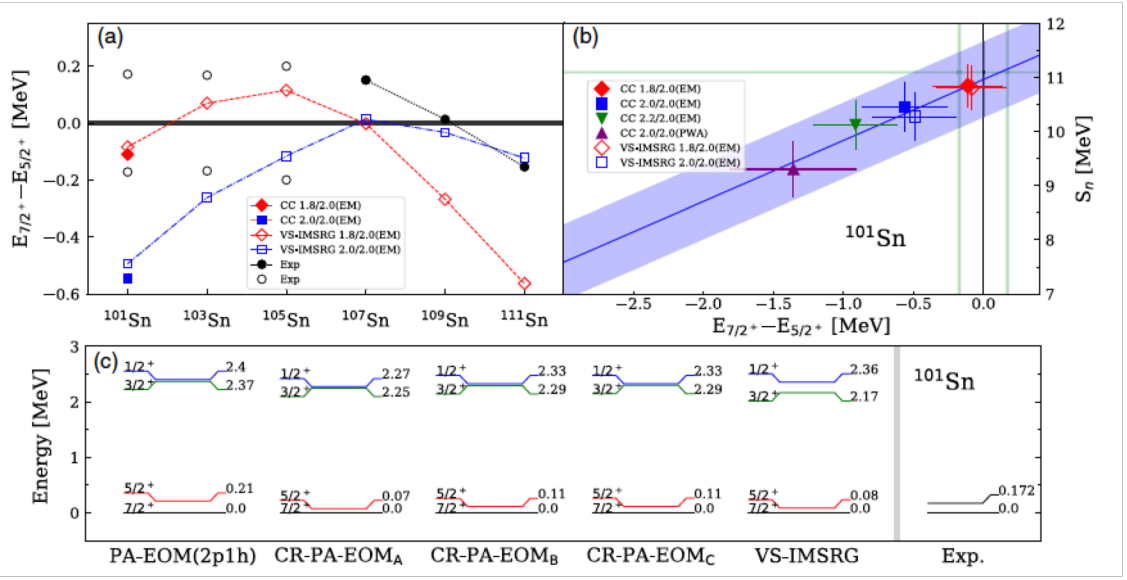
101Sn: ordering of d5/2 and g7/2

STATE OF THE ART

- First excited state at 172 keV, no spin assignement
- Theory not (yet) enough precise

PROPOSAL

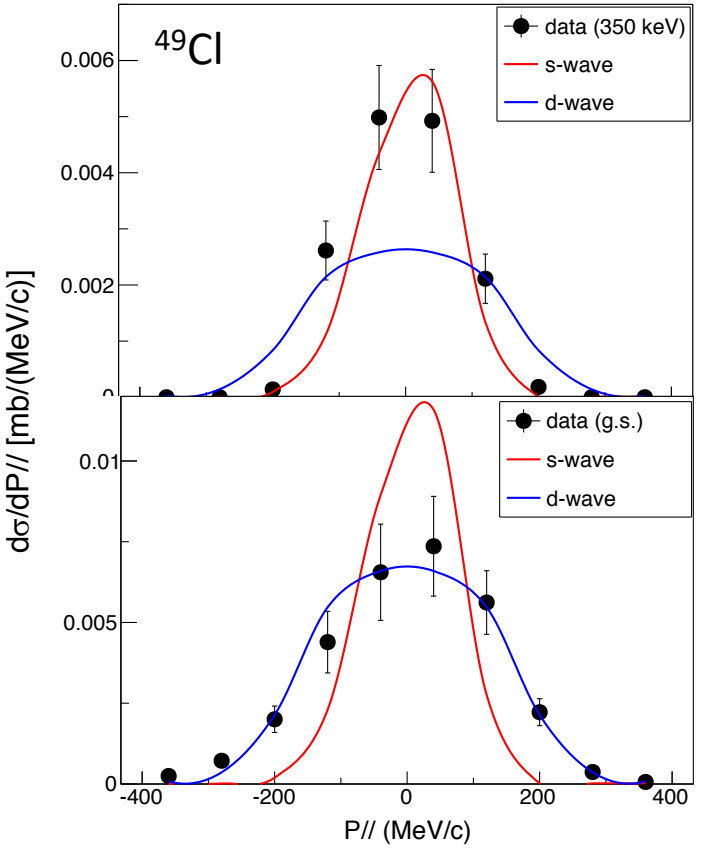
- l=2 and l=4 from parallel momentum after **102Sn(p,pn)101Sn**
- **Need to identify final state (MINIBALL) and measure $p_{//}$ (MINOS)**
- To be simulated: $p_{//}$ resolution for Z=50 and 5 cm LH2, γ efficiency



Morris et al. PRL 120, 152503 (2018)

SEASTAR3

σ=44 MeV/c with Ar and 15 cm LH2 target



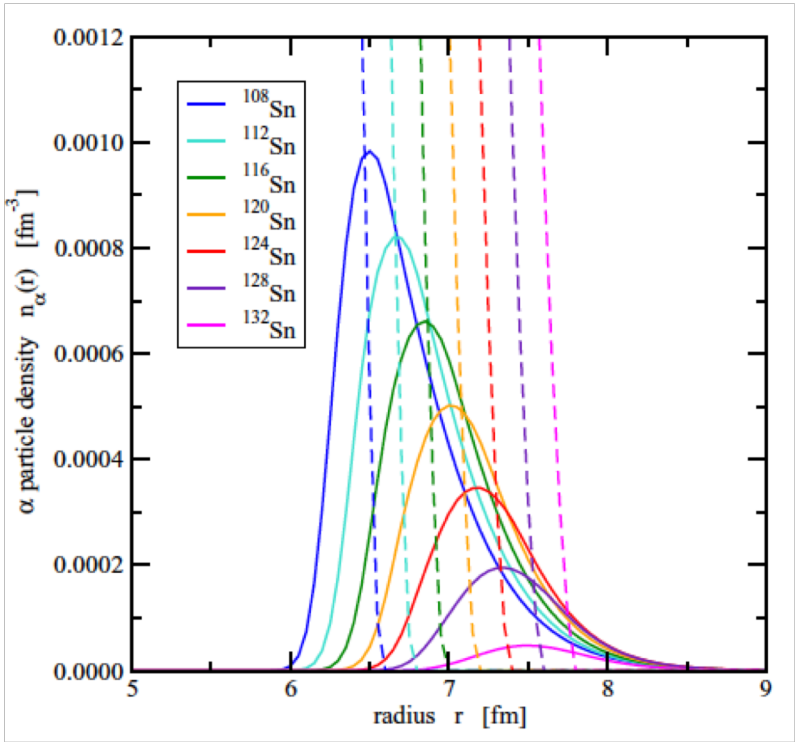
Courtesy B.D.Linh, Calculations: A.Moro

Spectroscopy of 100Sn, J.Lee, K.Wimmer, A.Corsi
3 days approved for cross section measurement, scheduled in May

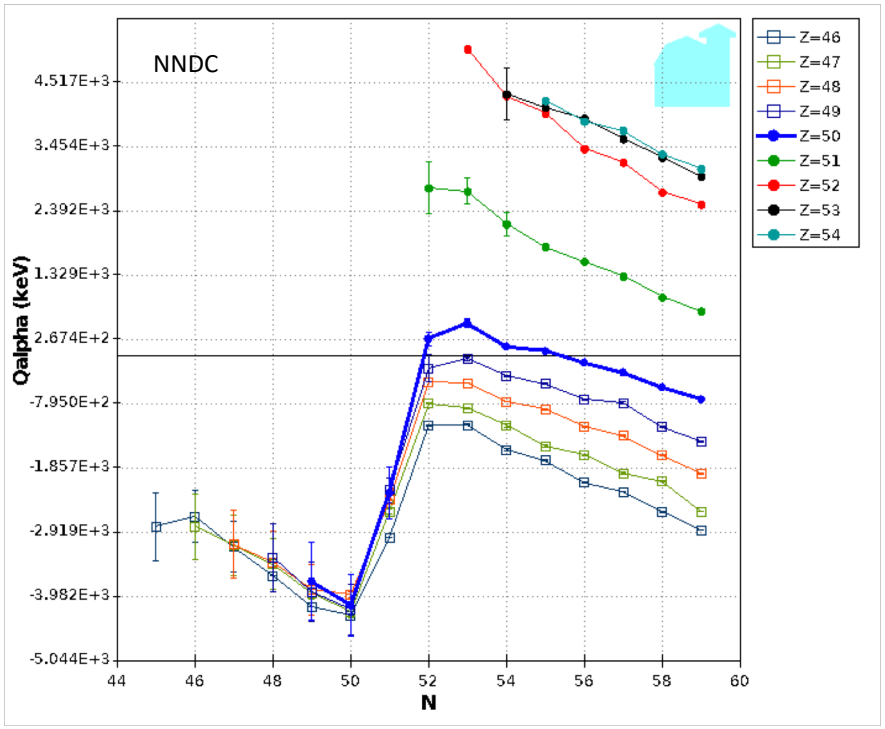
Clustering in light Tin isotopes

STATE OF THE ART

- Clustering at the surface predicted to decrease when neutron skin develops
- Recent results from (p,pα) at RCNP (112-124Sn) submitted to Nature
- Resolution on the final state crytical, expecially in inverse kinematics



S.Typel et al., PRC 89, 064321 (2014)



α separation energy sensitive to shell closure!

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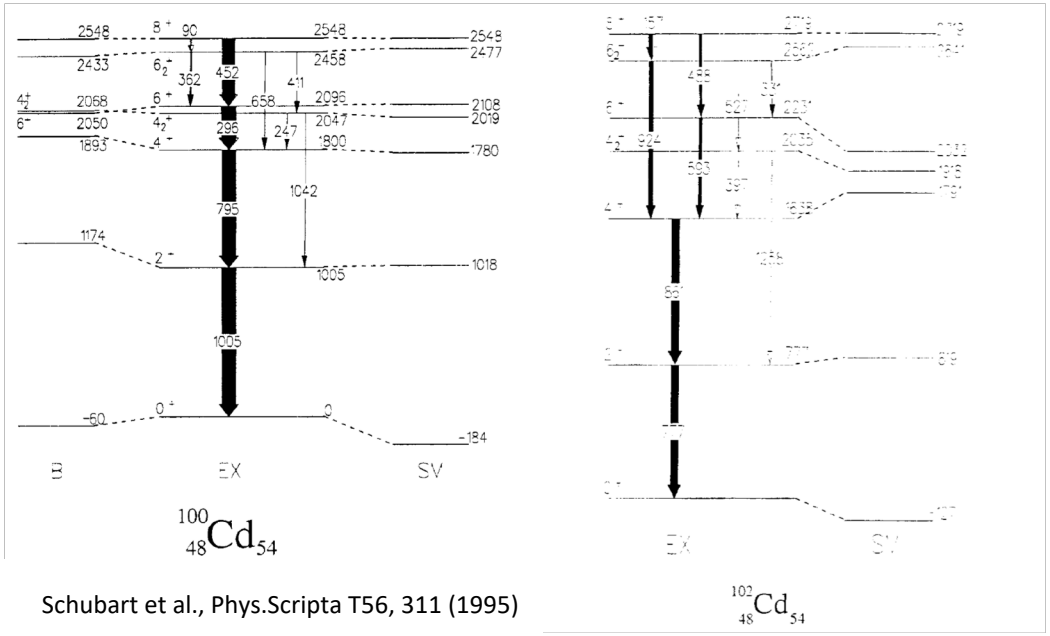
Clustering in light Tin isotopes

PROPOSAL:

- Explore clustering for neutron deficient/rich Tin
- **^{A}Sn(p,pα)$^{A-4}$Cd**
- projectile and A-4 have almost same magnetic rigidity (ZDS ok)

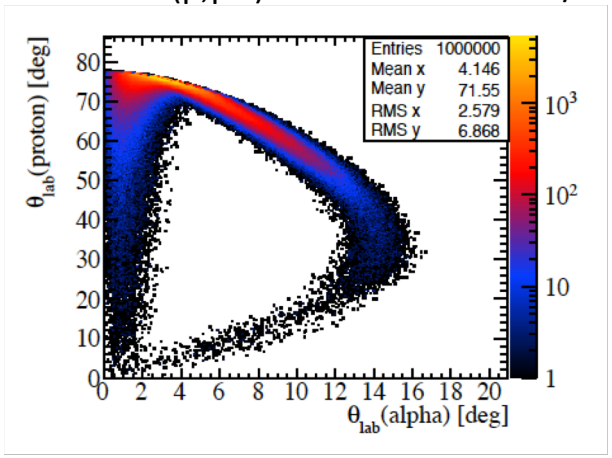
REQUIREMENTS

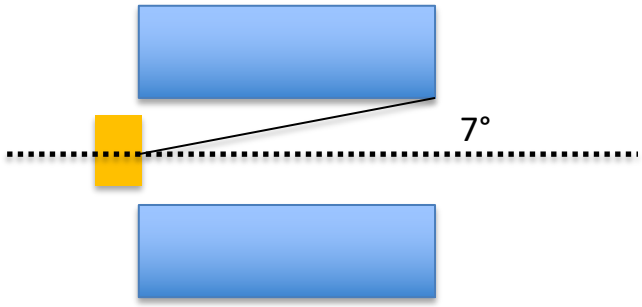
- energy resolution for the final state
- measure scattering angles down to few degrees (α)



Schubart et al., Phys.Scripta T56, 311 (1995)

104Sn(p,pα)100Cd at ~150 MeV/u





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