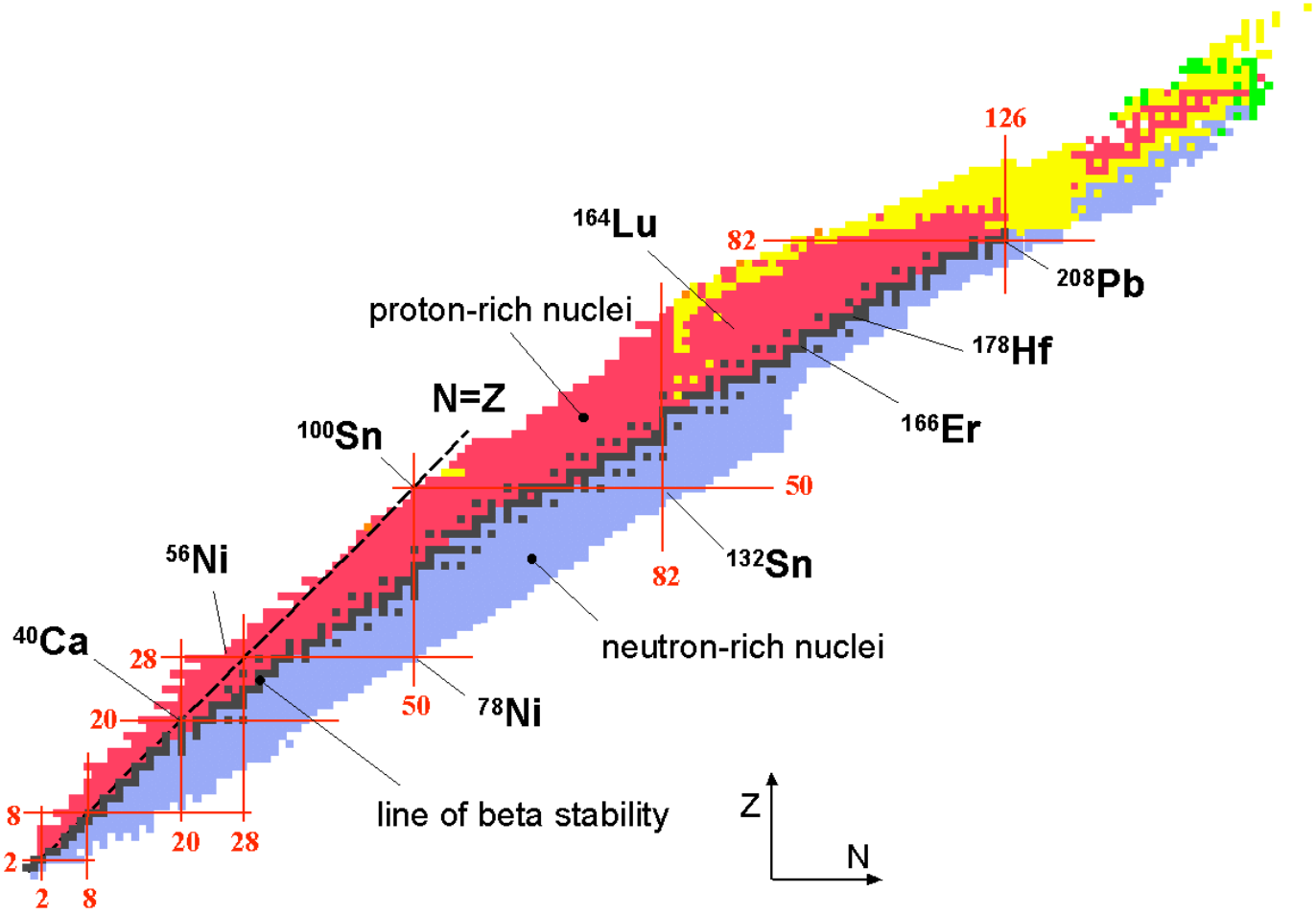
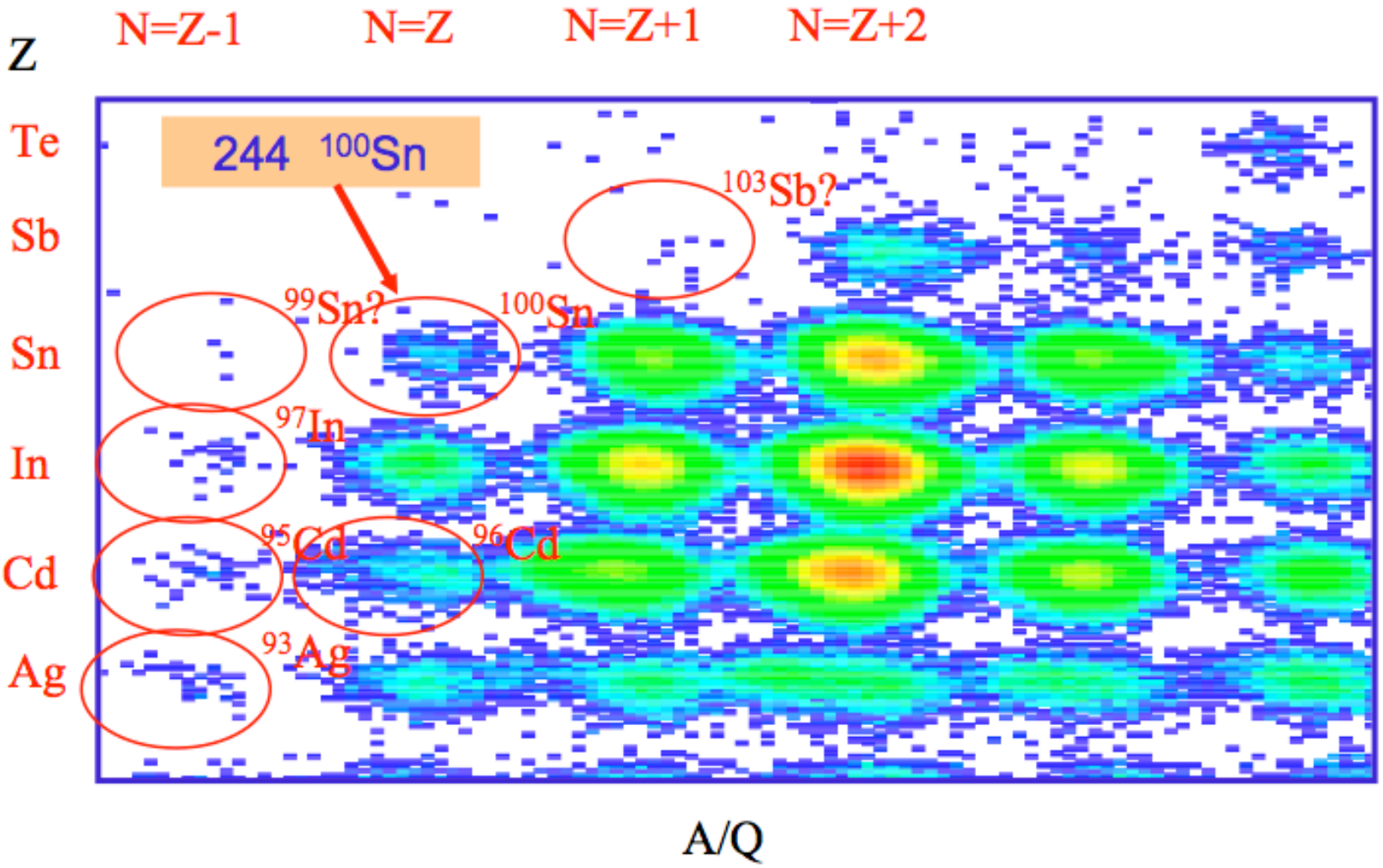
Quadrupole Transition Strengths in the Vicinity of ^{100}Sn

C. Fahlander Queenstown NZ 2008

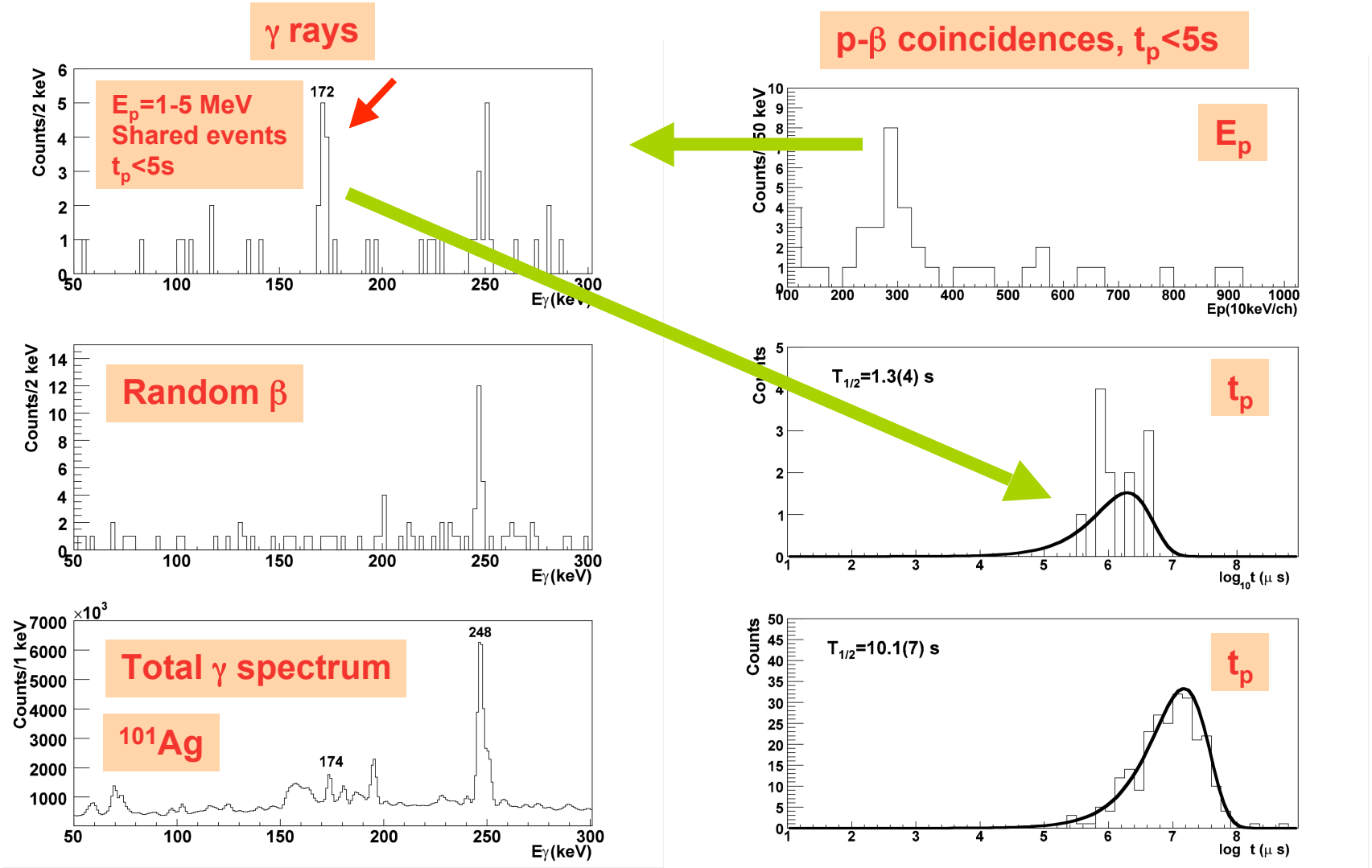


^{100}Sn setting (full statistics)



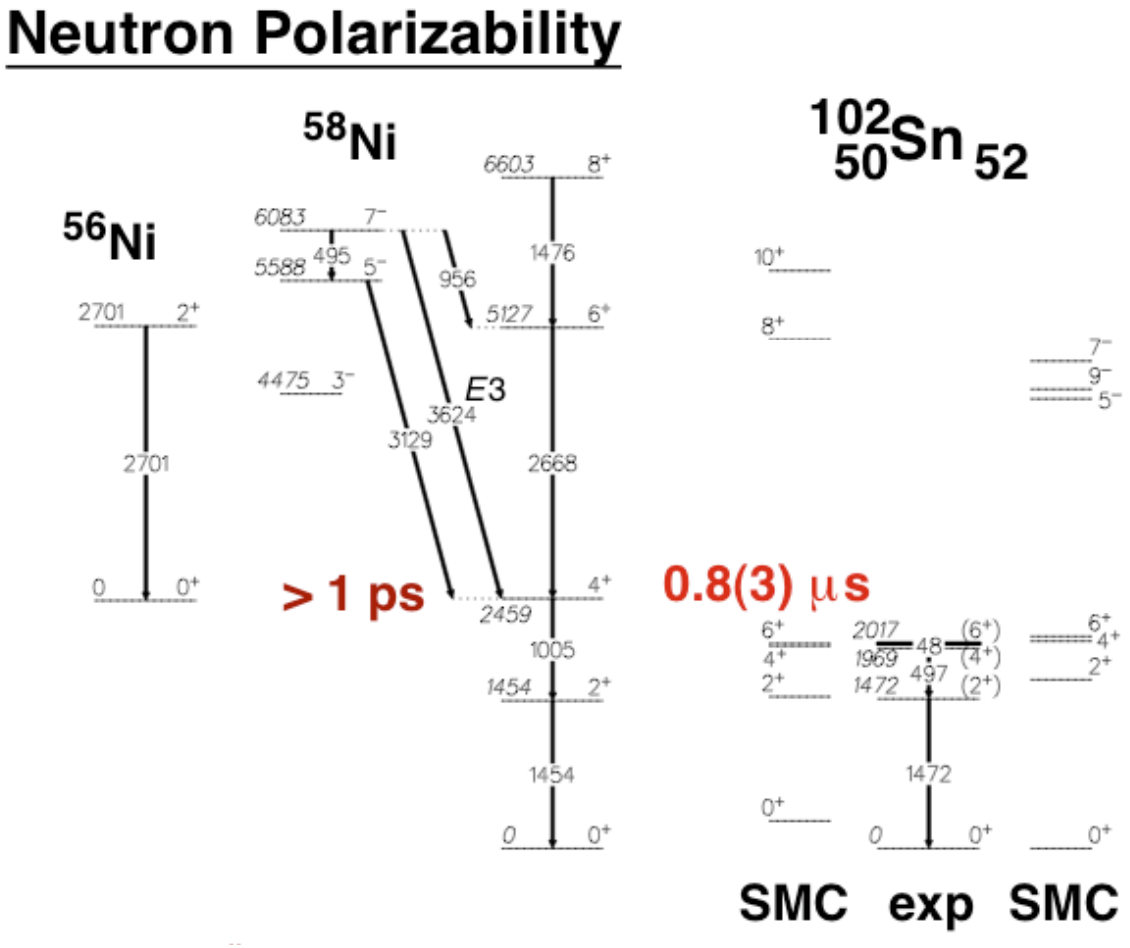
From T. Faestermann, ENAM08, for the S330 and RISING collaborations

^{101}Sn prompt γ rays



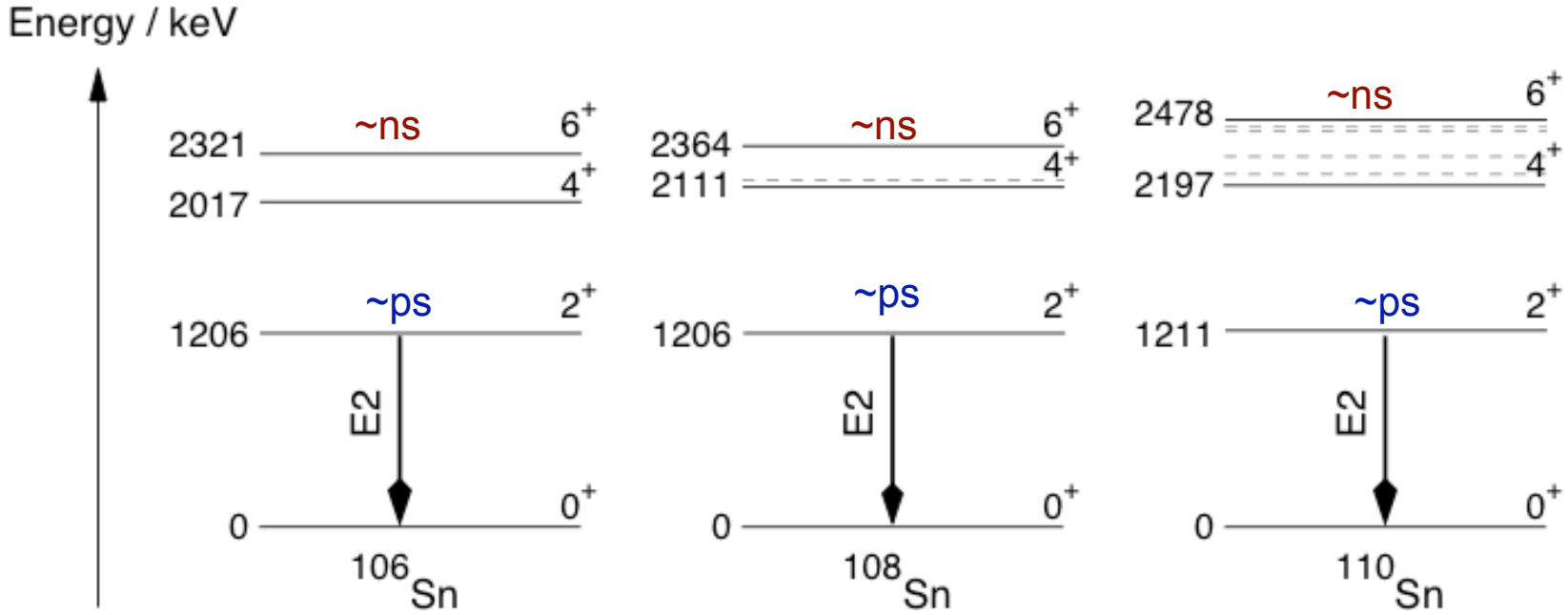
D. Seweryniak et al., Phys. Rev. Lett. 99, 022504 (2007)

Isomeric 6^+ state in ^{102}Sn

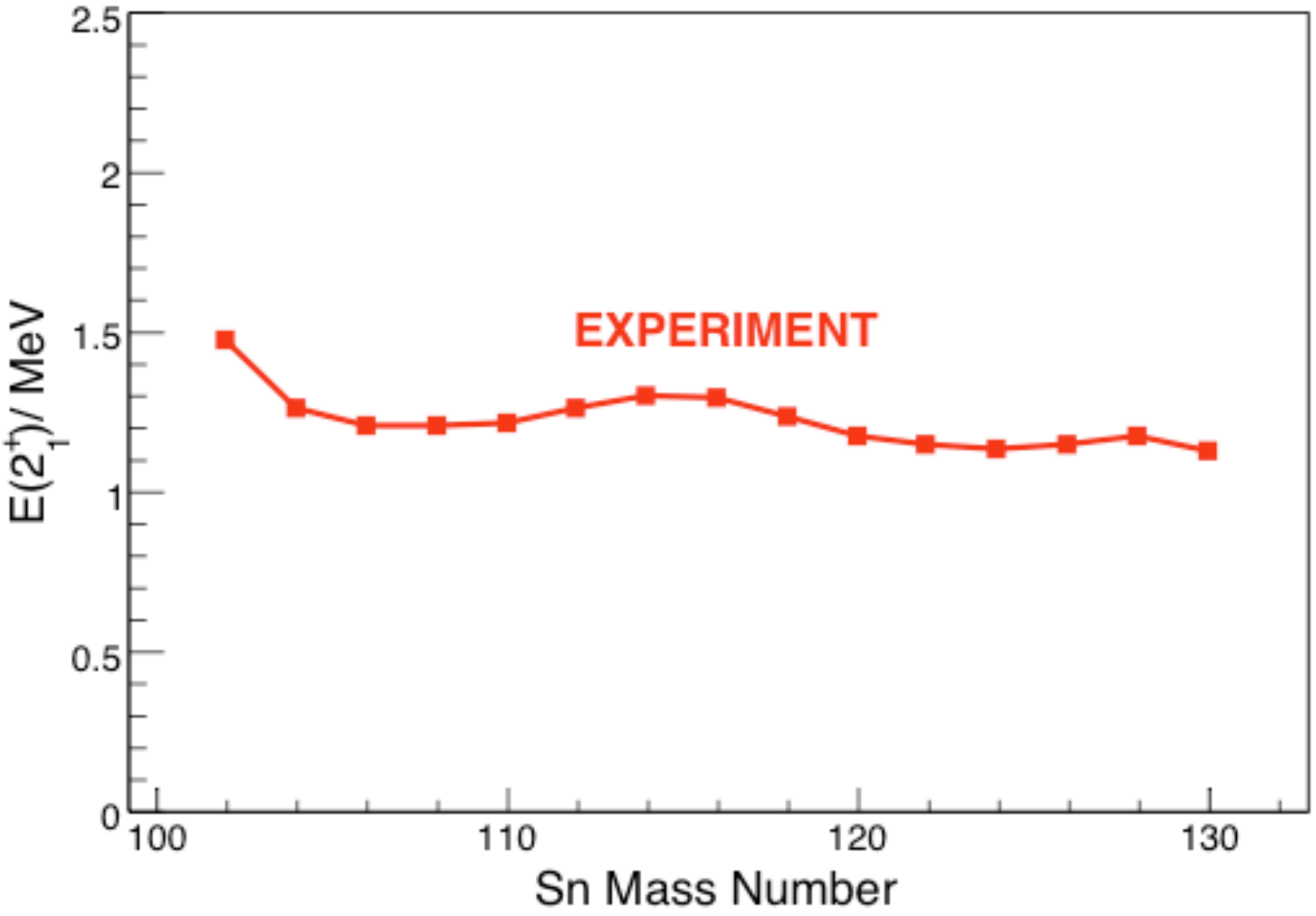


M. Lipoglavsek et al., ZPA356, 239 (1996); PLB440, 246 (1998)

Partial level structures of ^{106,108,110}Sn



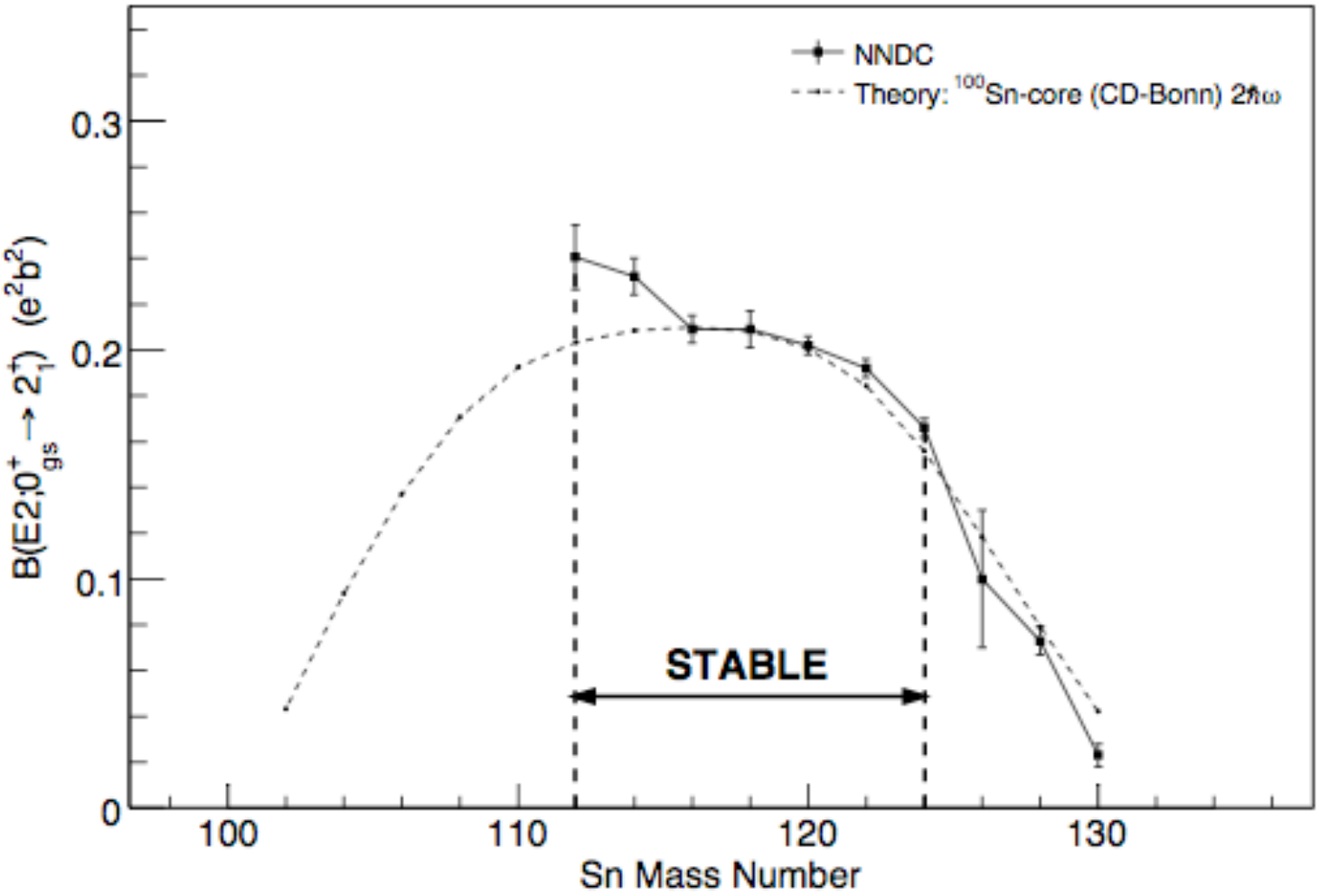
$E(2^+)$ in even Sn isotopes



G. Racha, Phys. Rev. 62, 438 (1942) & Phys. Rev 63, 367 (1943)

I. Talmi, Nucl. Phys. A172, 1 (1971)

B(E2; $0^+ \rightarrow 2^+$) in even Sn isotopes



ENSDF, http://www.nndc.bnl.gov

D.C. Radford et al., Nucl. Phys. A746, 83c (2004)

Recent experiments on ^{106,108,110,112,114}Sn

^{114}Sn: UNILAC @ GSI
Subbarrier Coulomb excitation; normalized to B(E2) in ^{116}Sn
P. Doornenbal et al., Phys. Rev. C78, 031303 (R) (2008)

^{112}Sn: @ University of Kentucky
The (n,n'γ) reaction; Doppler-shift attenuation method
J.N. Orce et al., Phys. Rev. C76, 021302 (R) (2007)

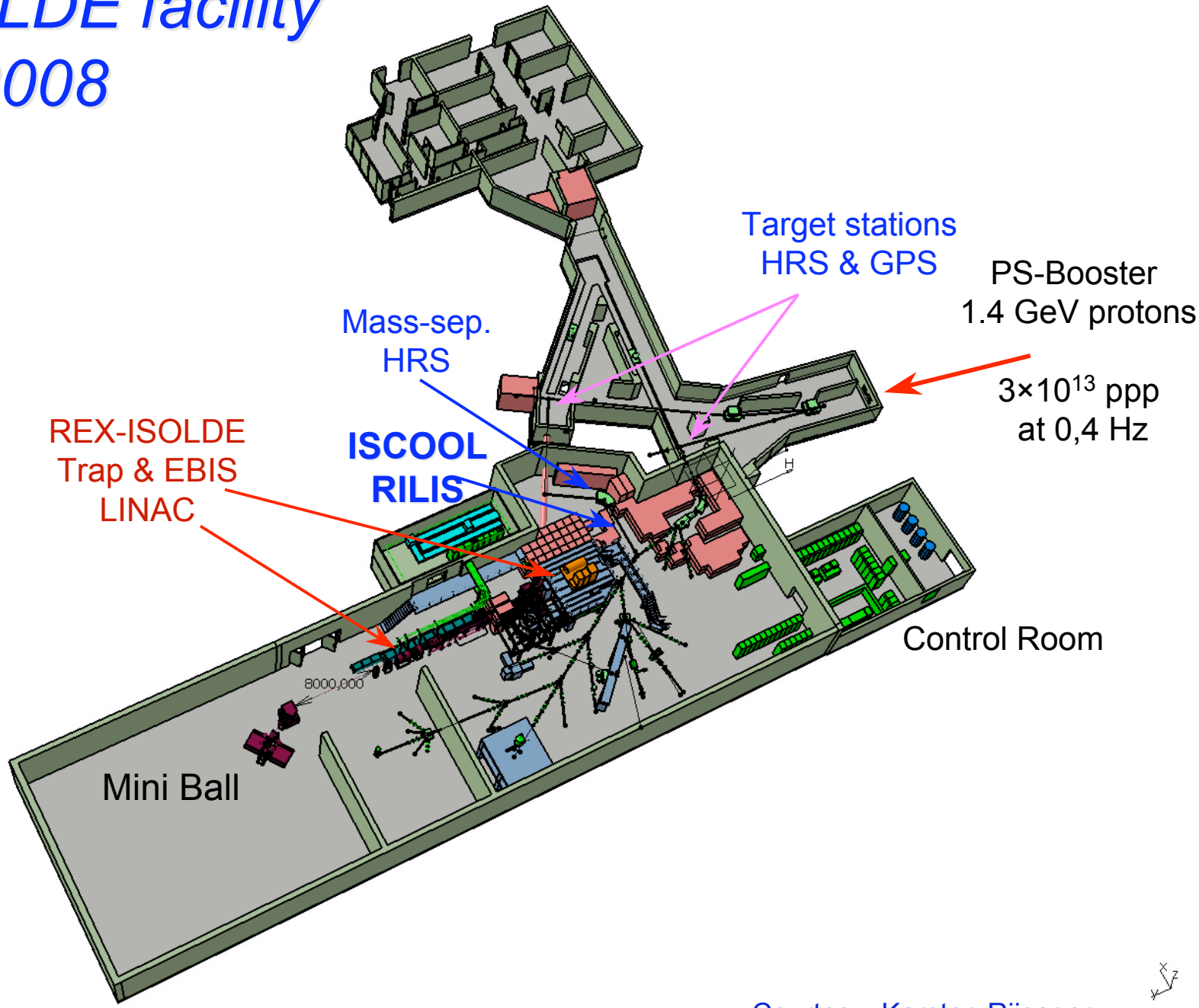
^{108}Sn: RISING @ GSI
Intermediate Coulomb excitation; normalized to B(E2) in ^{112}Sn
A. Banu et al., Phys. Rev. C72, 061305(R) (2005)

^{110}Sn: MINIBALL @ REX-ISOLDE
Subbarrier Coulomb excitation; normalized to B(E2) in ^{58}Ni
J. Cederkäll et al., Phys. Rev. Lett. 98, 172501 (2007)

^{106,108,110,112}Sn: @ MSU
Intermediate Coulomb excitation; normalized to B(E2) in ^{197}Au
C. Vaman et al., Phys. Rev. Lett. 99, 162501 (2007)

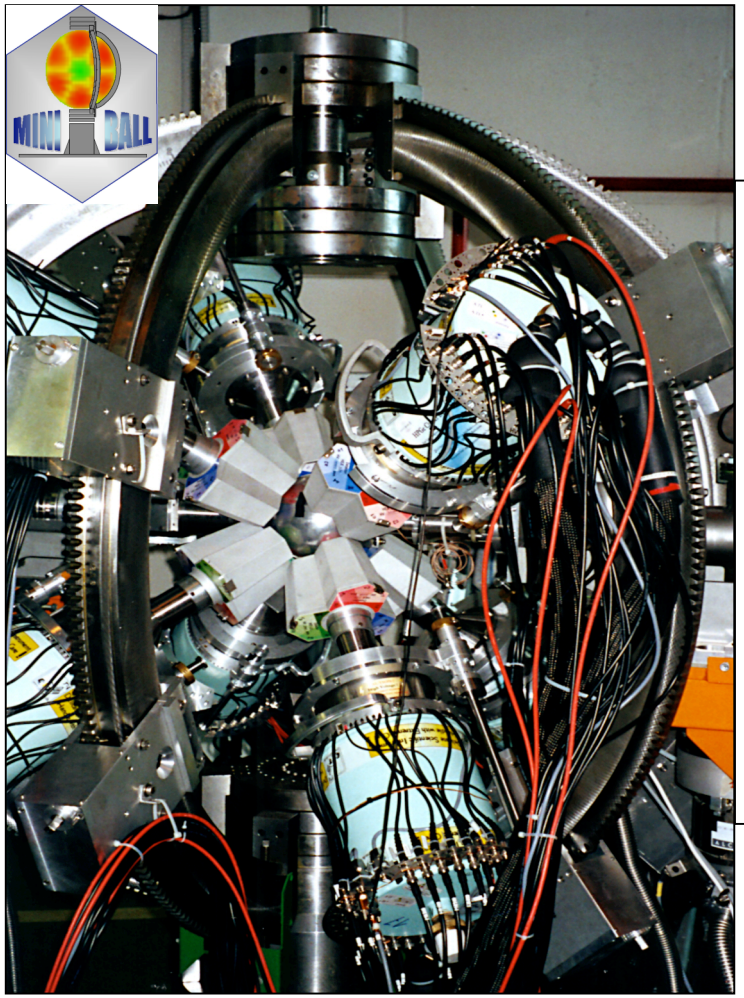
^{106,108}Sn: MINIBALL @ REX-ISOLDE
Subbarrier Coulomb excitation; normalized to B(E2) in ^{58}Ni
A. Ekström et al., Phys. Rev. Lett. 101, 012502 (2008)

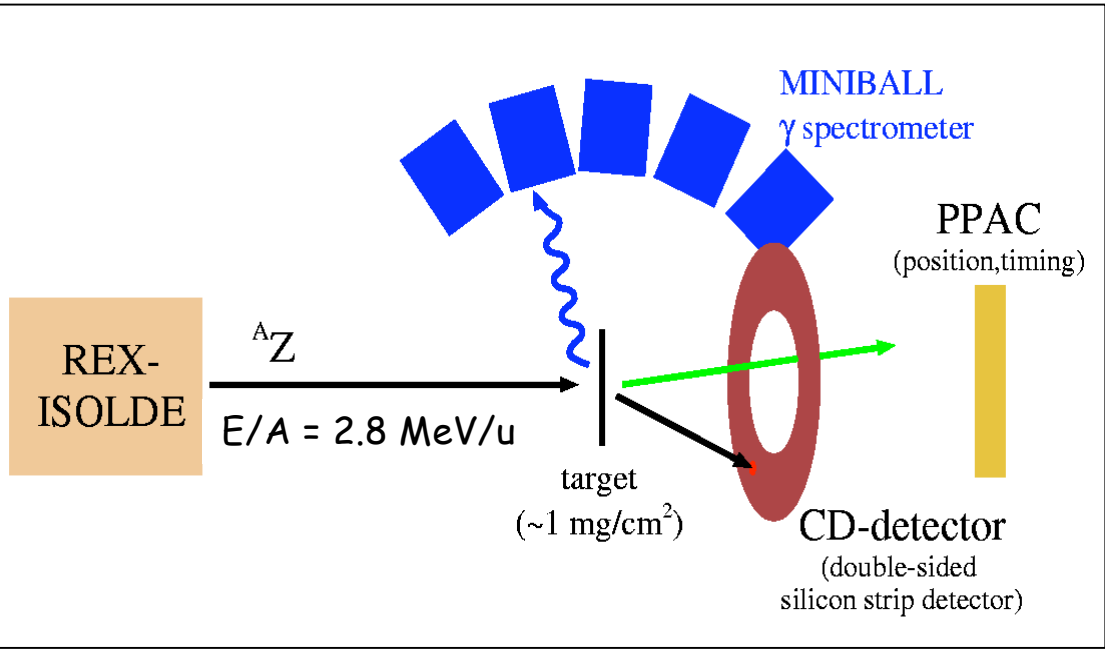
The ISOLDE facility 2008



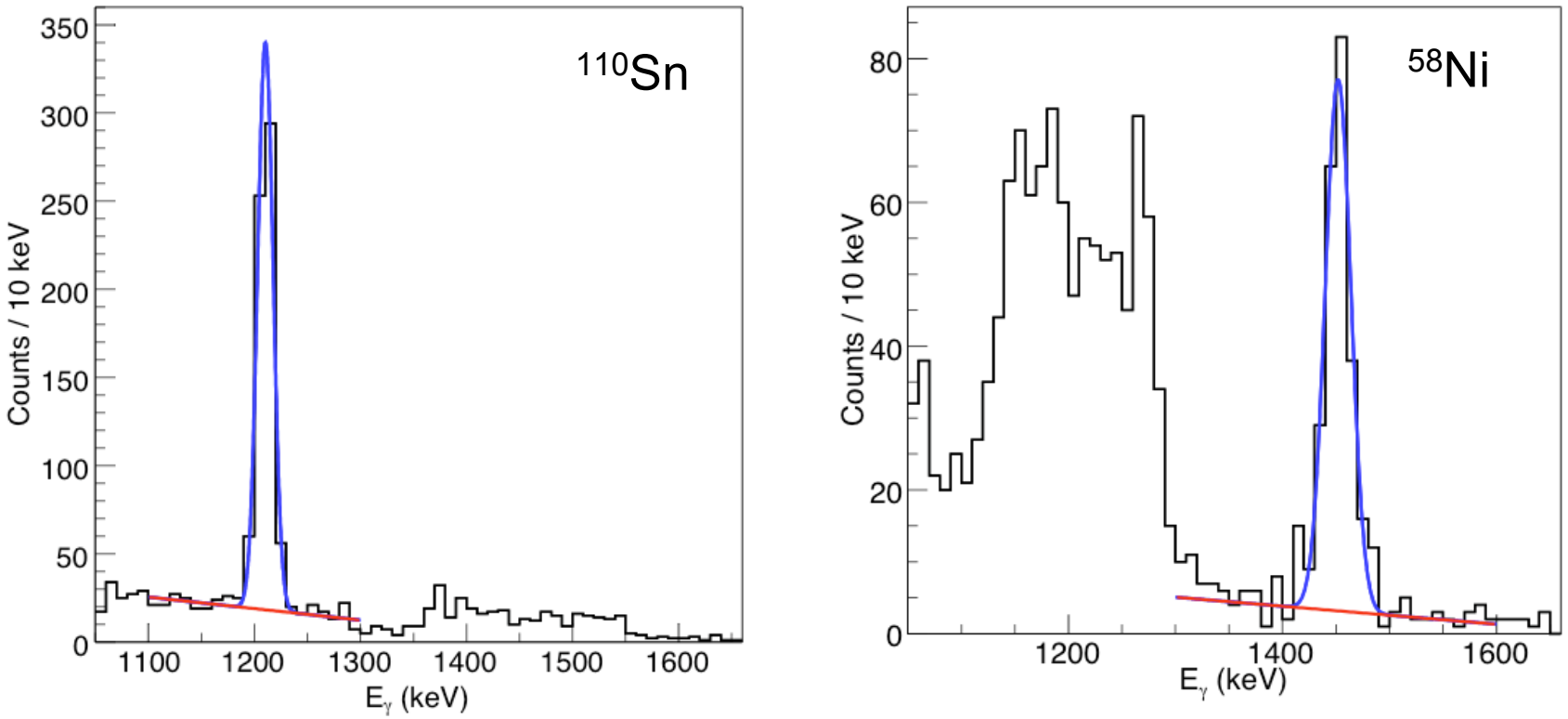
Courtesy: Karsten Riisager

Safe Coulomb Excitation
Particle - γ correlations



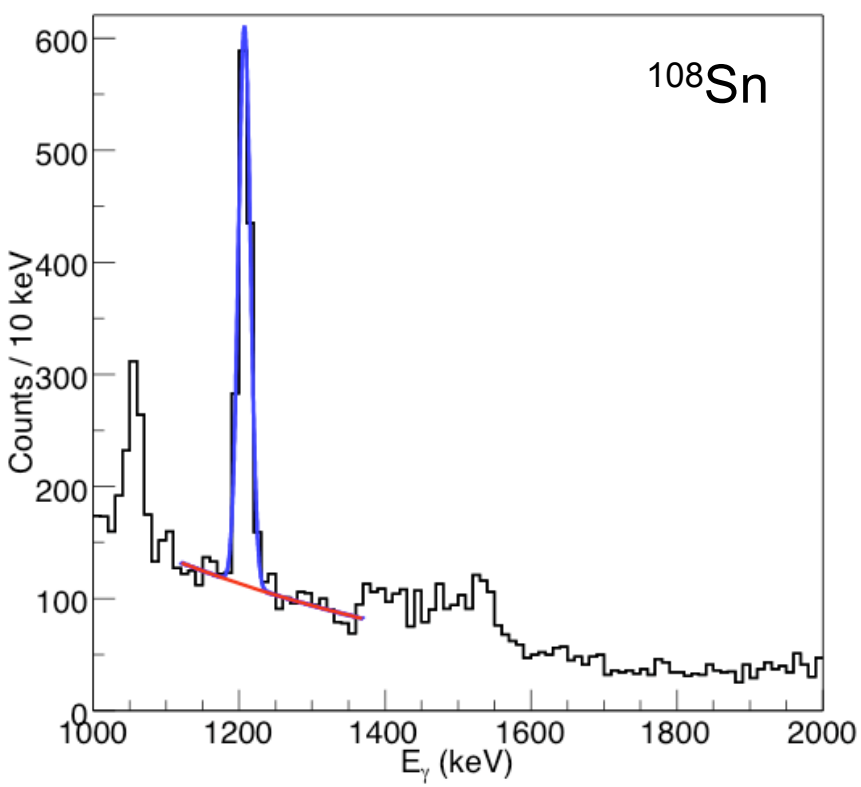


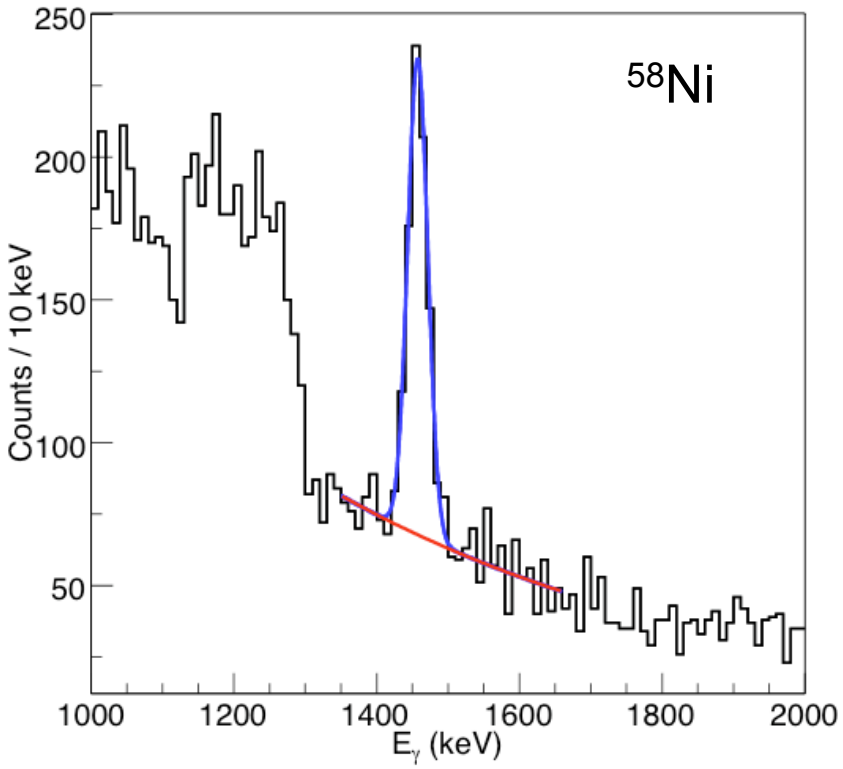
^{110}Sn γ rays from REX-ISOLDE



J. Cederkäll et al., Phys. Rev. Lett. 98, 172501 (2007)

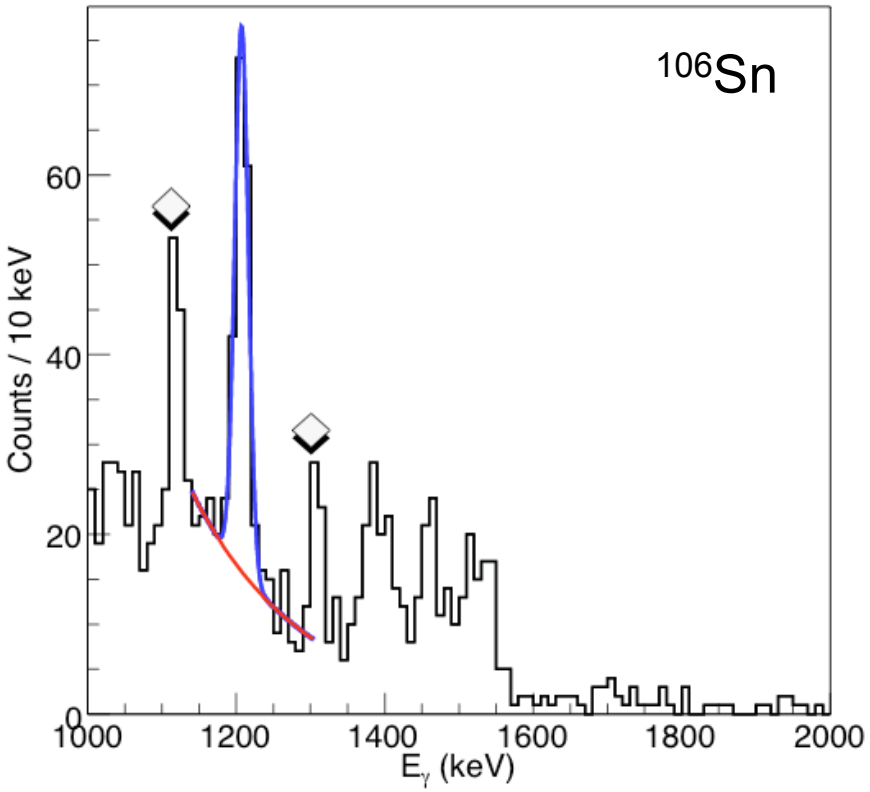
^{108}Sn γ rays from REX-ISOLDE

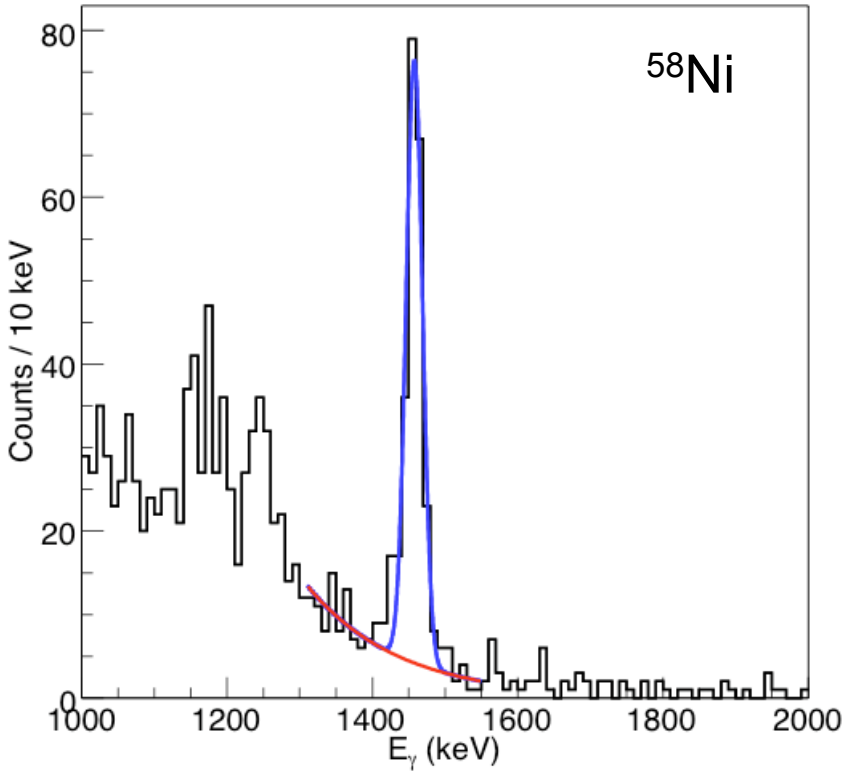




A. Ekström et al., Phys. Rev. Lett. 101, 012502 (2008)

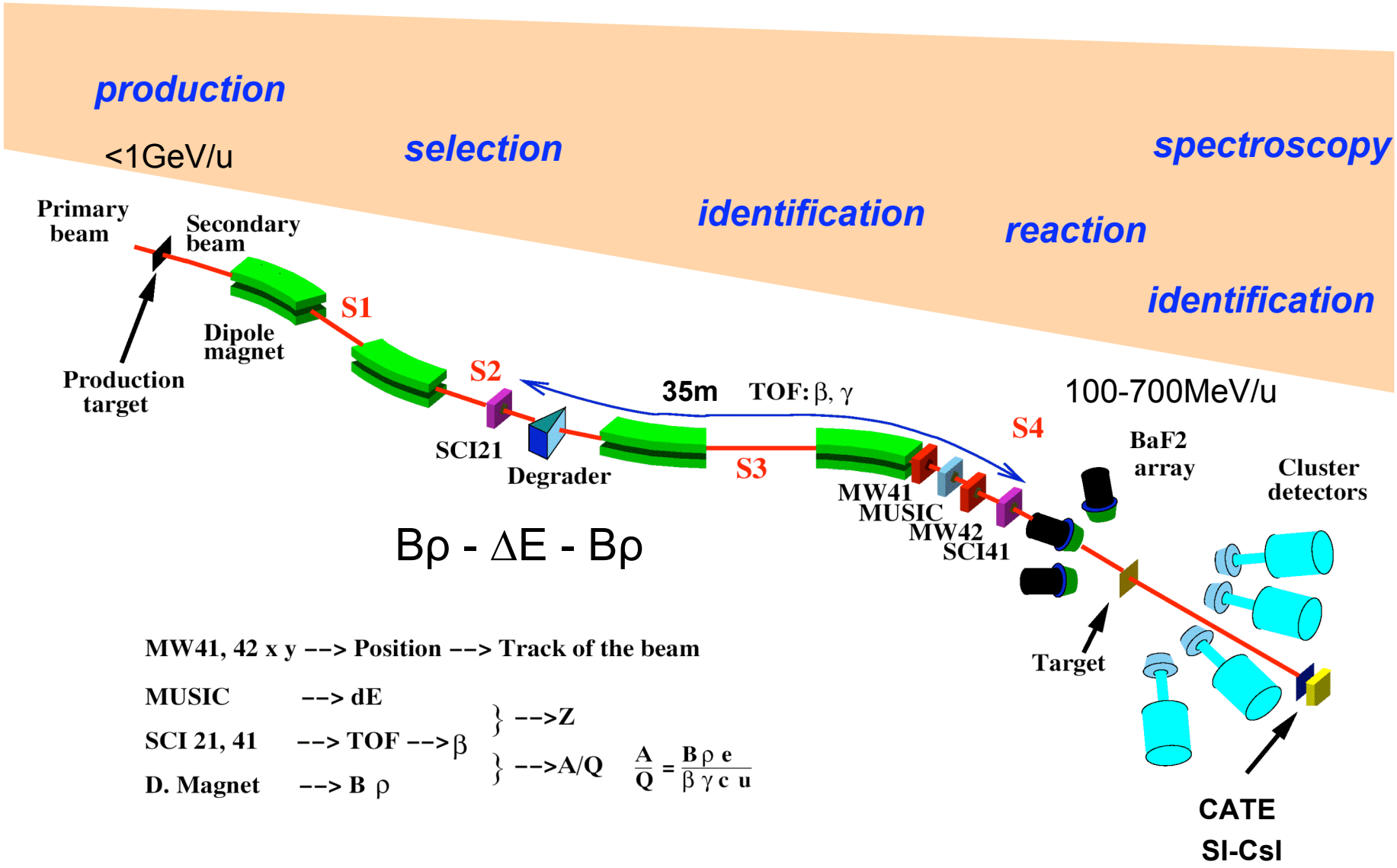
^{106}Sn γ rays from REX-ISOLDE



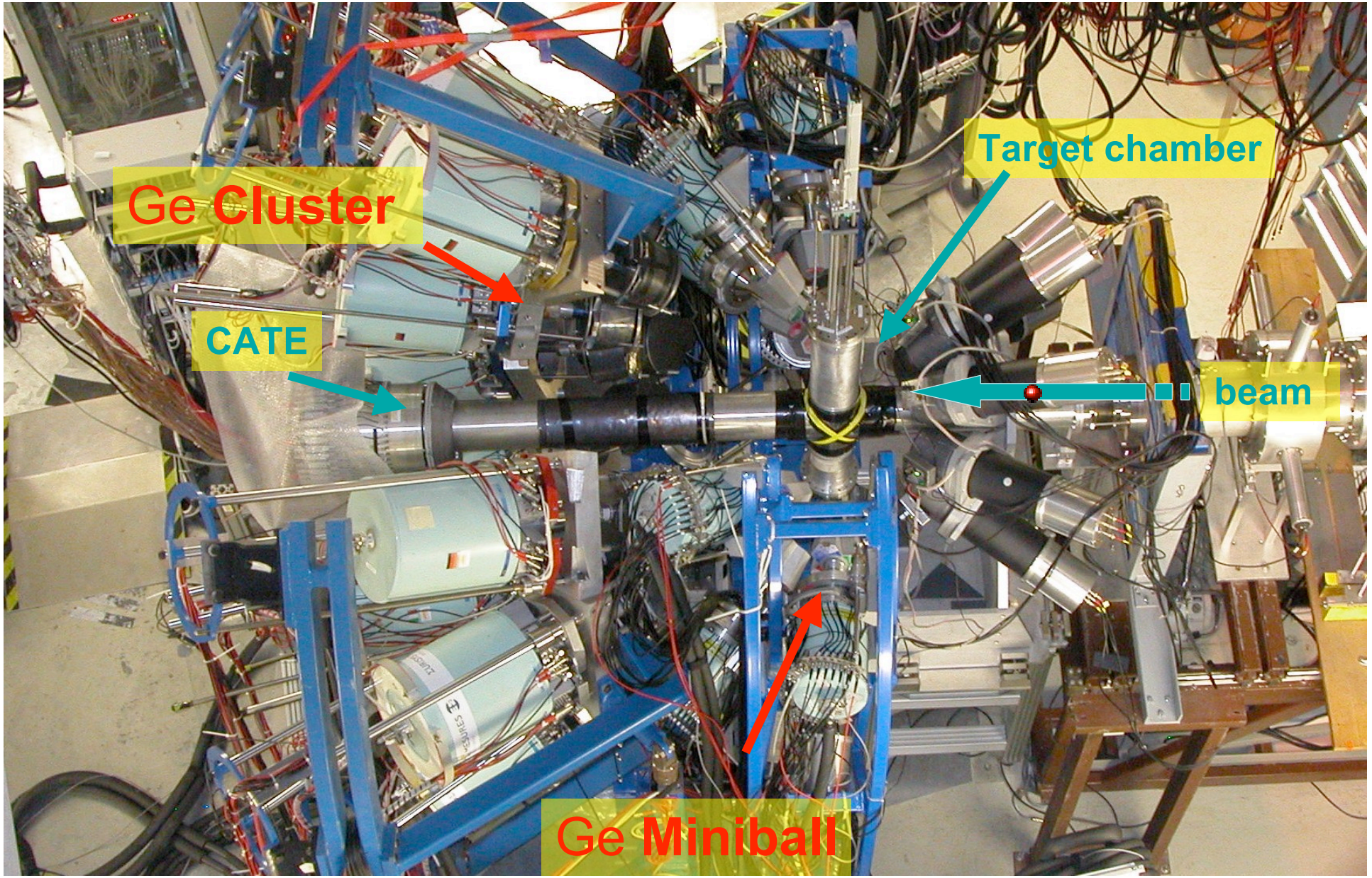


A. Ekström et al., Phys. Rev. Lett. 101, 012502 (2008)

Experiments with fast beams



RISING γ-array for fast beams

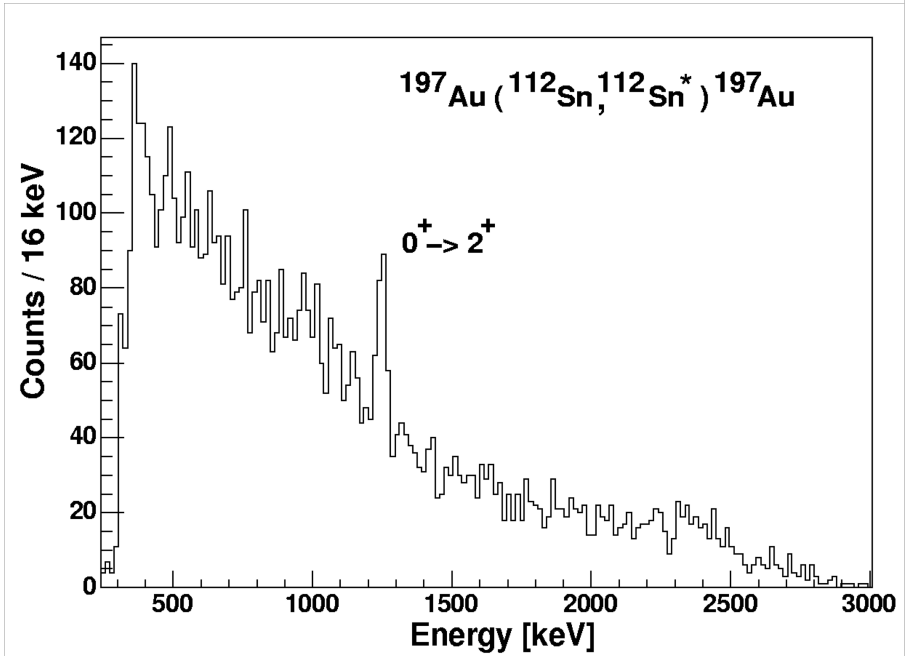


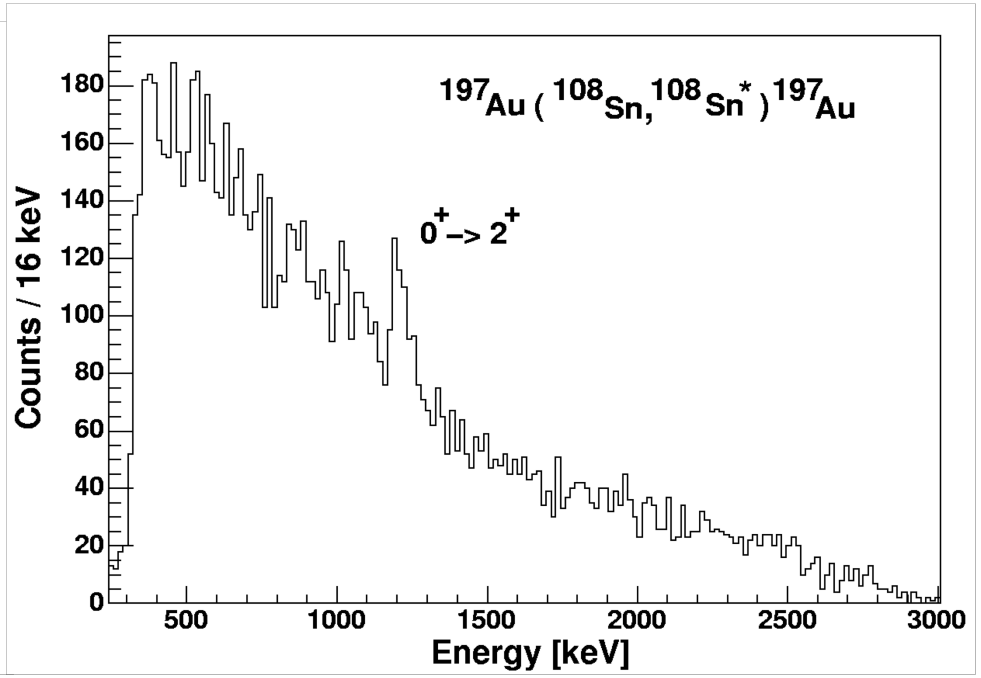
Relativistic Coulomb excitation of nuclei towards ^{100}Sn

2003

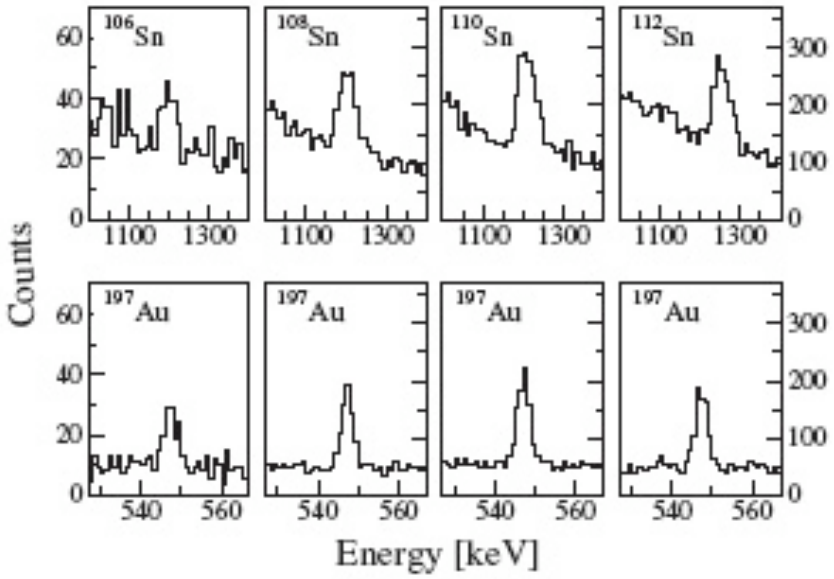
- ^{112,108}Sn secondary beam with ~150MeV/u
- Au – Coulex target

A. Banu et al., PR C72, 061305(R) (2005)



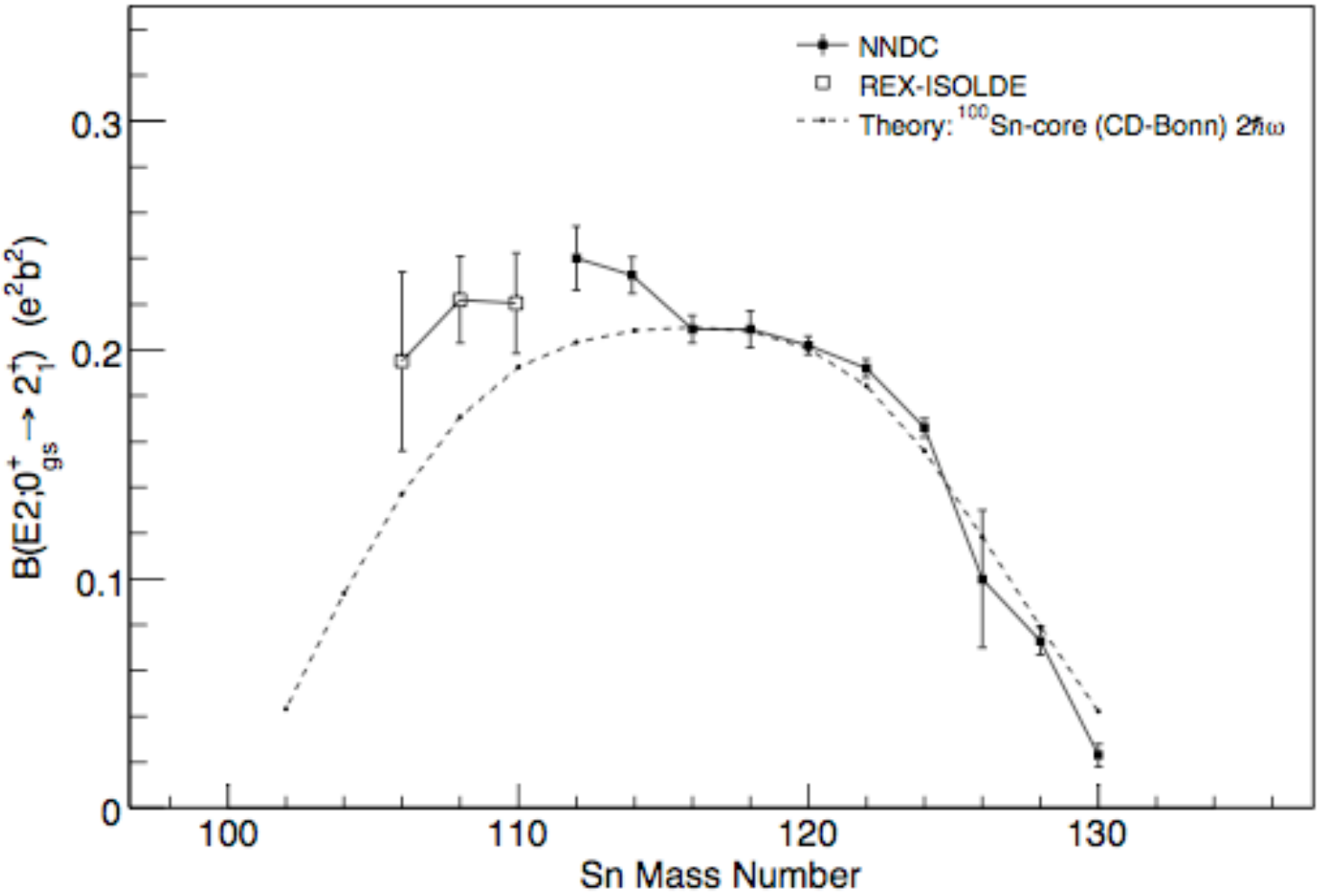


^{106,108,110,112}Sn γ rays from MSU

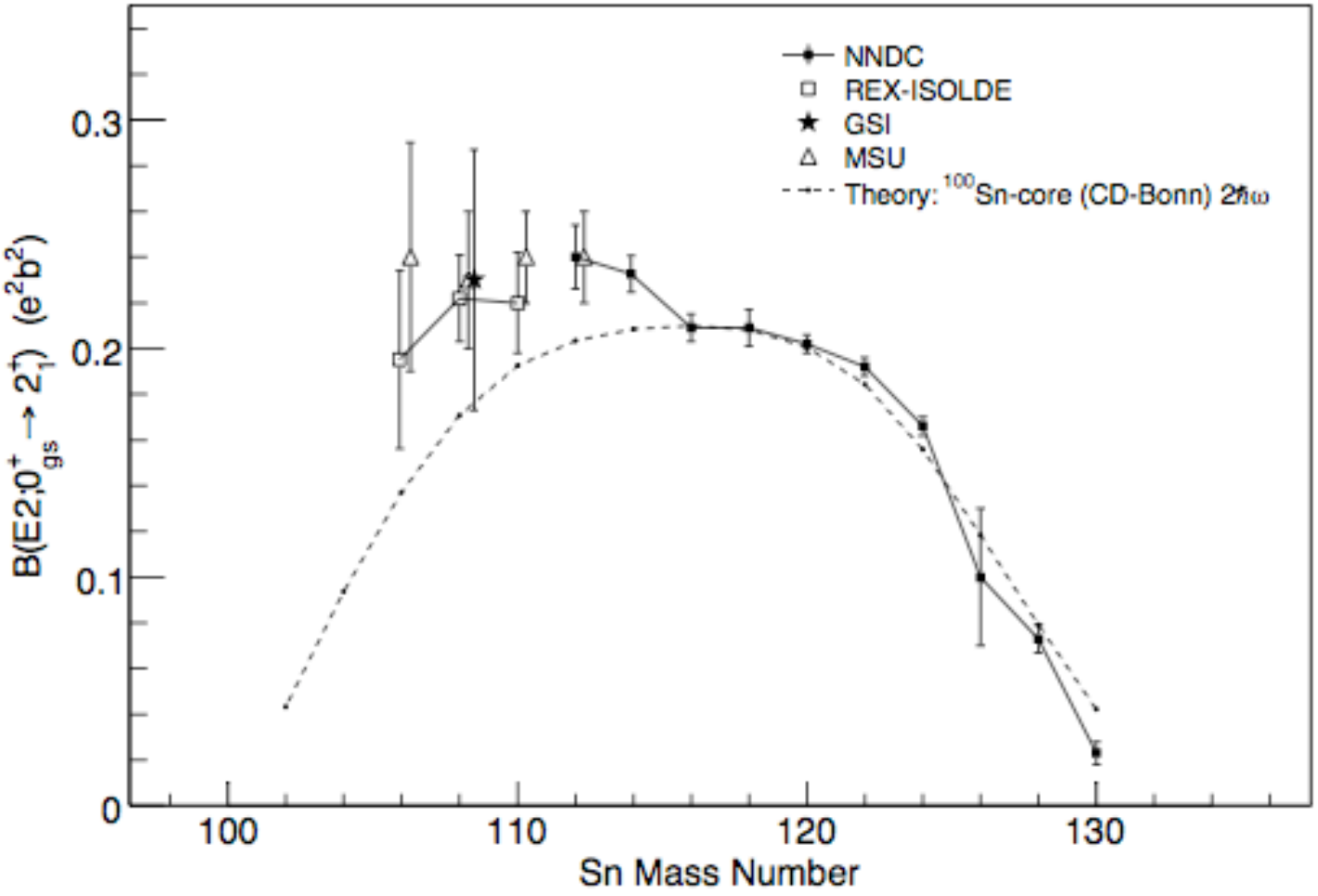


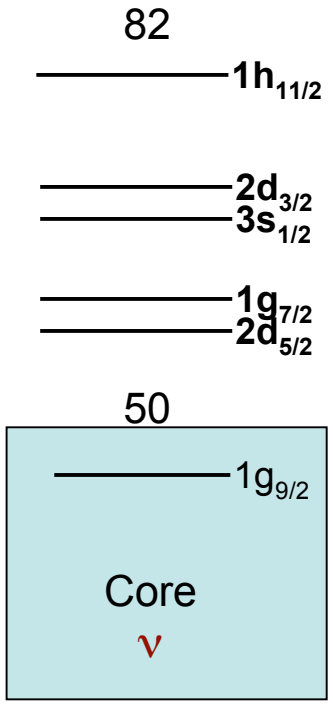
C. Vaman et al., Phys. Rev. Lett. 99, 162501 (2007)

B(E2; $0^+ \rightarrow 2^+$) in even Sn isotopes

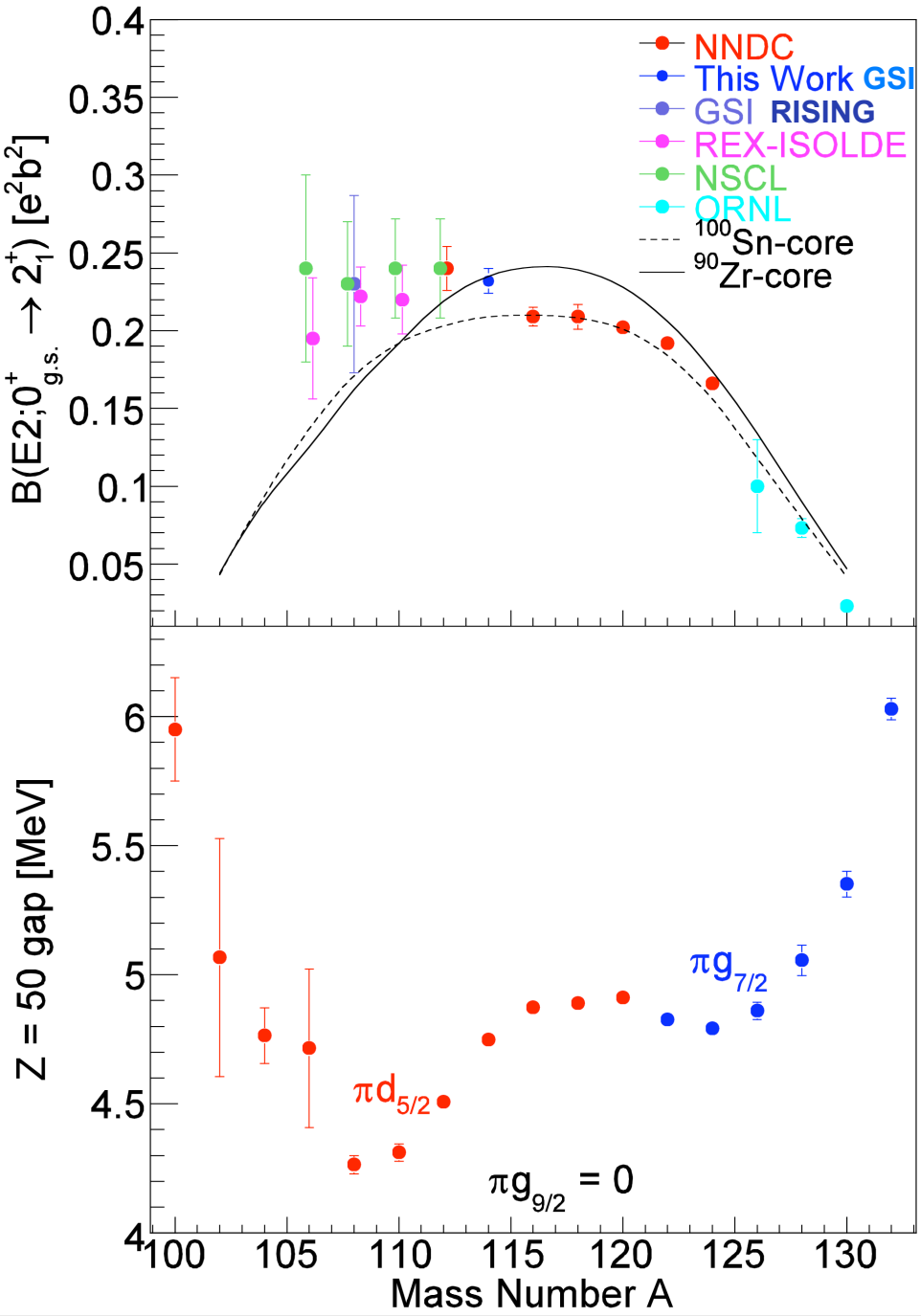


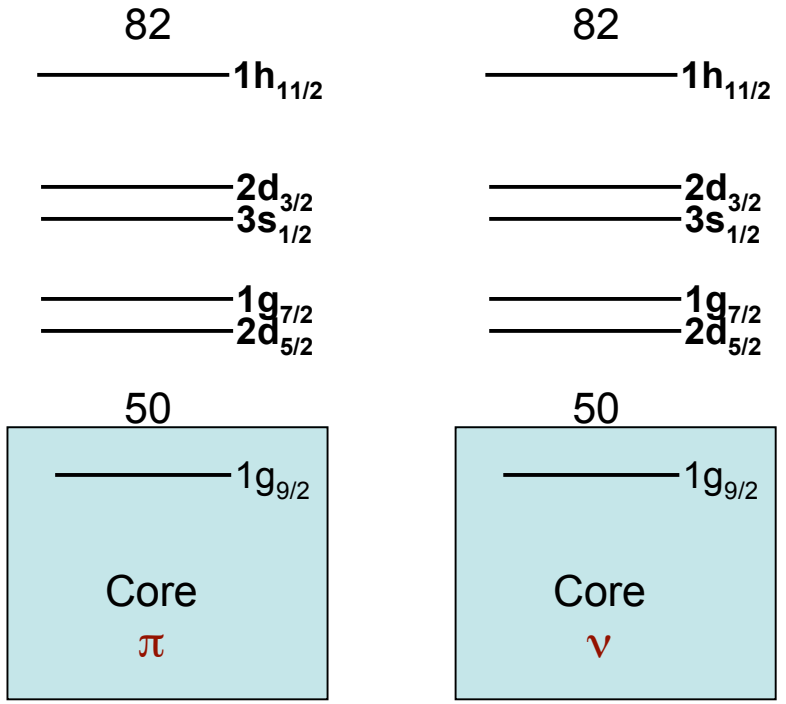
B(E2; $0^+ \rightarrow 2^+$) in even Sn isotopes





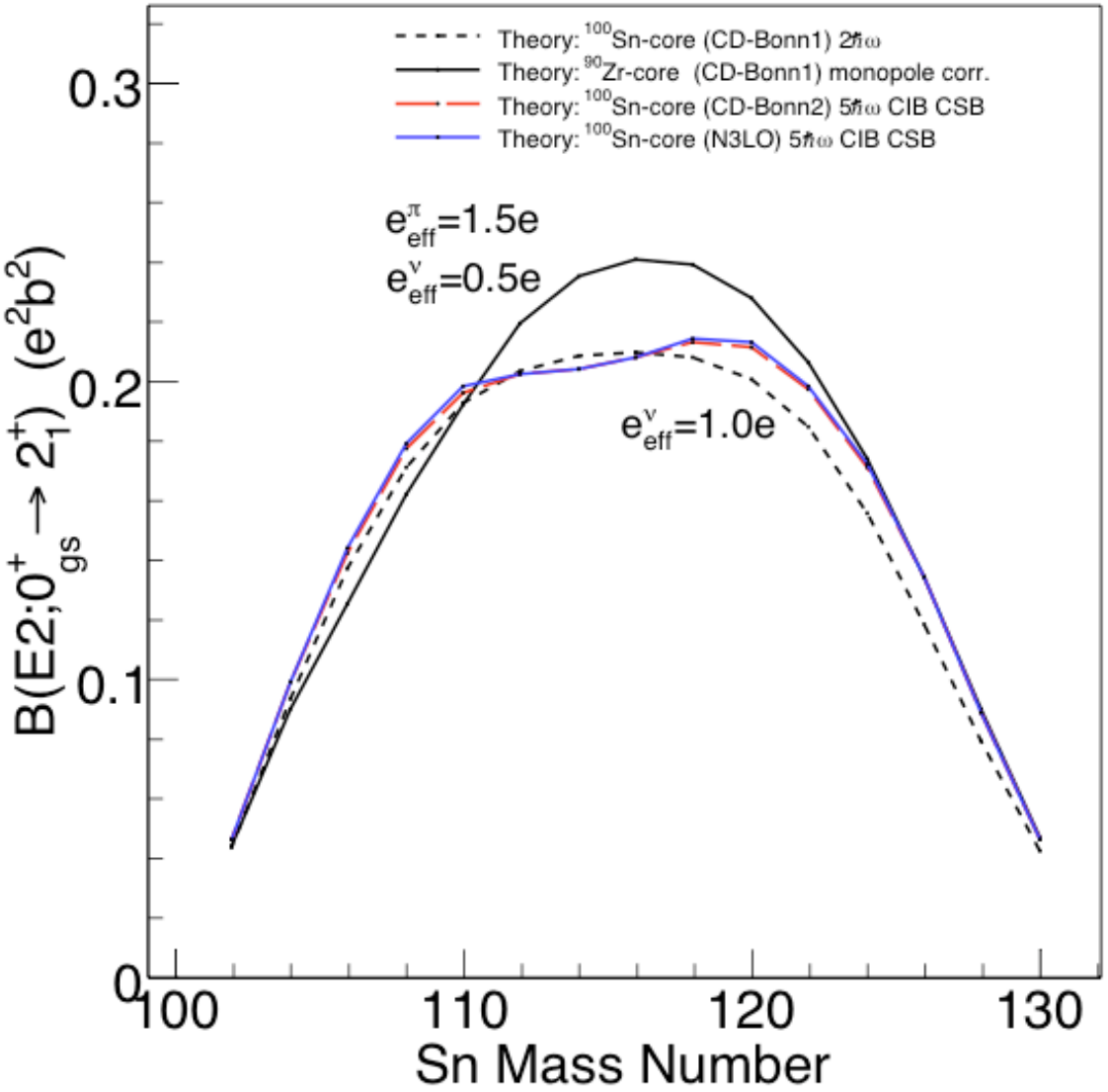
Enhanced B(E2) values towards ^{100}Sn

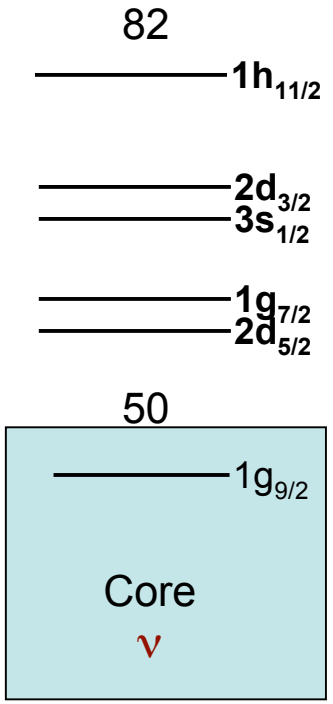




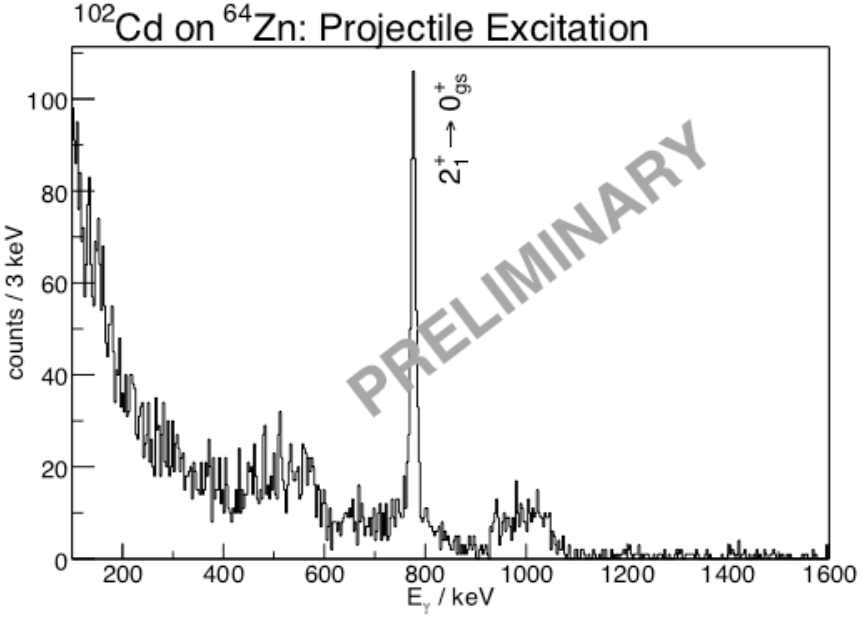
Courtesy: Magda Gorska

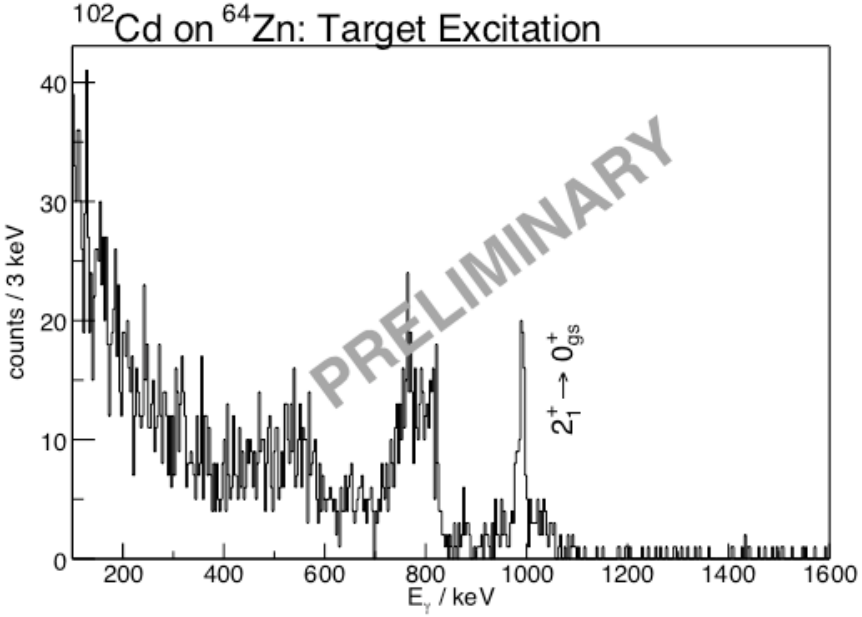
B(E2; $0^+ \rightarrow 2^+$) in even Sn isotopes





A. Ekström, Lund University and M. Hjort-Jensen, Oslo University


^{102}Cd on ^{64}Zn: Projectile Excitation
counts / 3 keV
E_γ / keV
$2_1^+ \rightarrow 0_{gs}^+$
PRELIMINARY


^{102}Cd on ^{64}Zn: Target Excitation
counts / 3 keV
E_γ / keV
$2_1^+ \rightarrow 0_{gs}^+$
PRELIMINARY

Conclusions

- B(E2;0^+-->2^+) have been measured in 110,108,106Sn.
- Experiment do not agree with state-of-the-art large-scale shell-model calculations.

Theory:

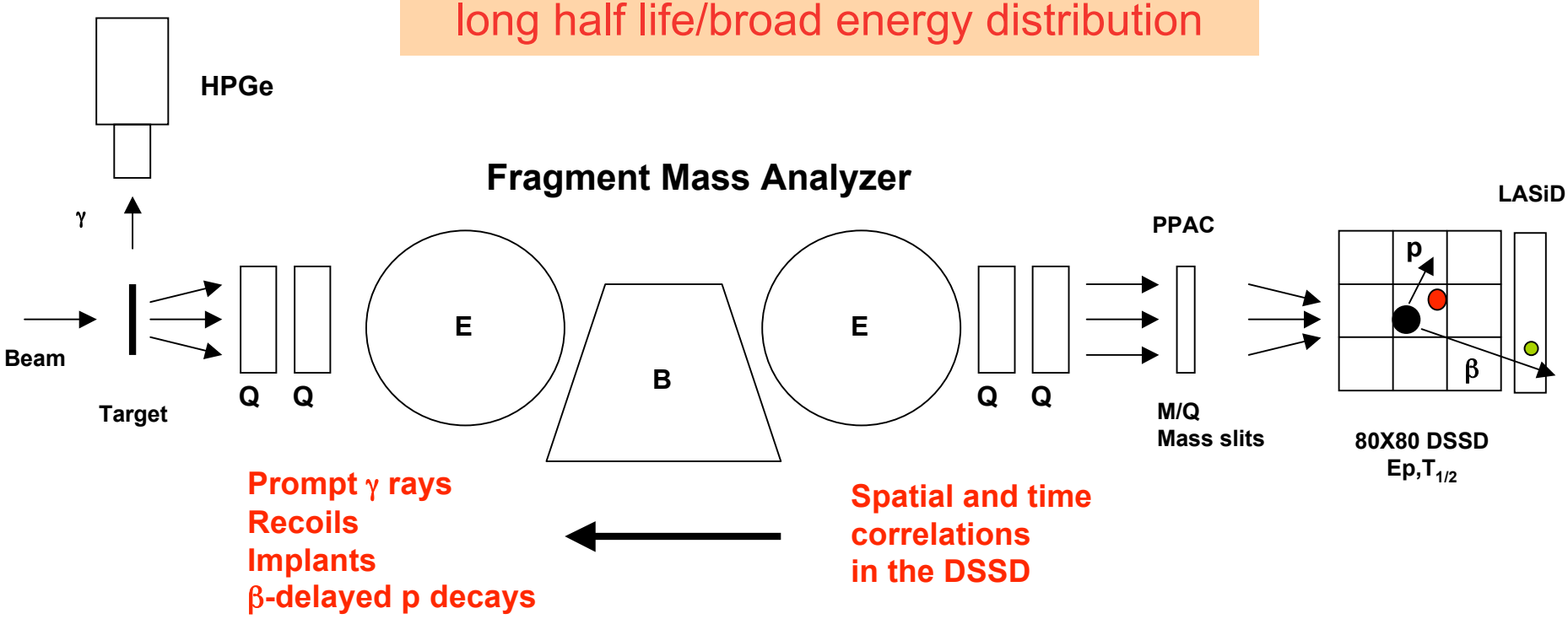
- Extended shell-model calculations
  - New interactions
  - Inclusion of proton core excitations

Experiments:

- Even cadmium isotopes ongoing @ REX-ISOLDE
- Odd tin isotopes ongoing @ REX-ISOLDE
- ^{104}Sn proposed for PRESPEC @ GSI
- ^{102}Sn possibly for HISPEC @ FAIR

Recoil-Decay Tagging

$^{46}Ti(^{58}Ni,3n)^{101}Sn$ reaction
~50nb of out of ~100mb
long half life/broad energy distribution



D. Seweryniak et al., Phys. Rev. Lett. 99, 022504 (2007)