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Ideas for spectroscopy experiments on TASCA

By Johnny Come Lately

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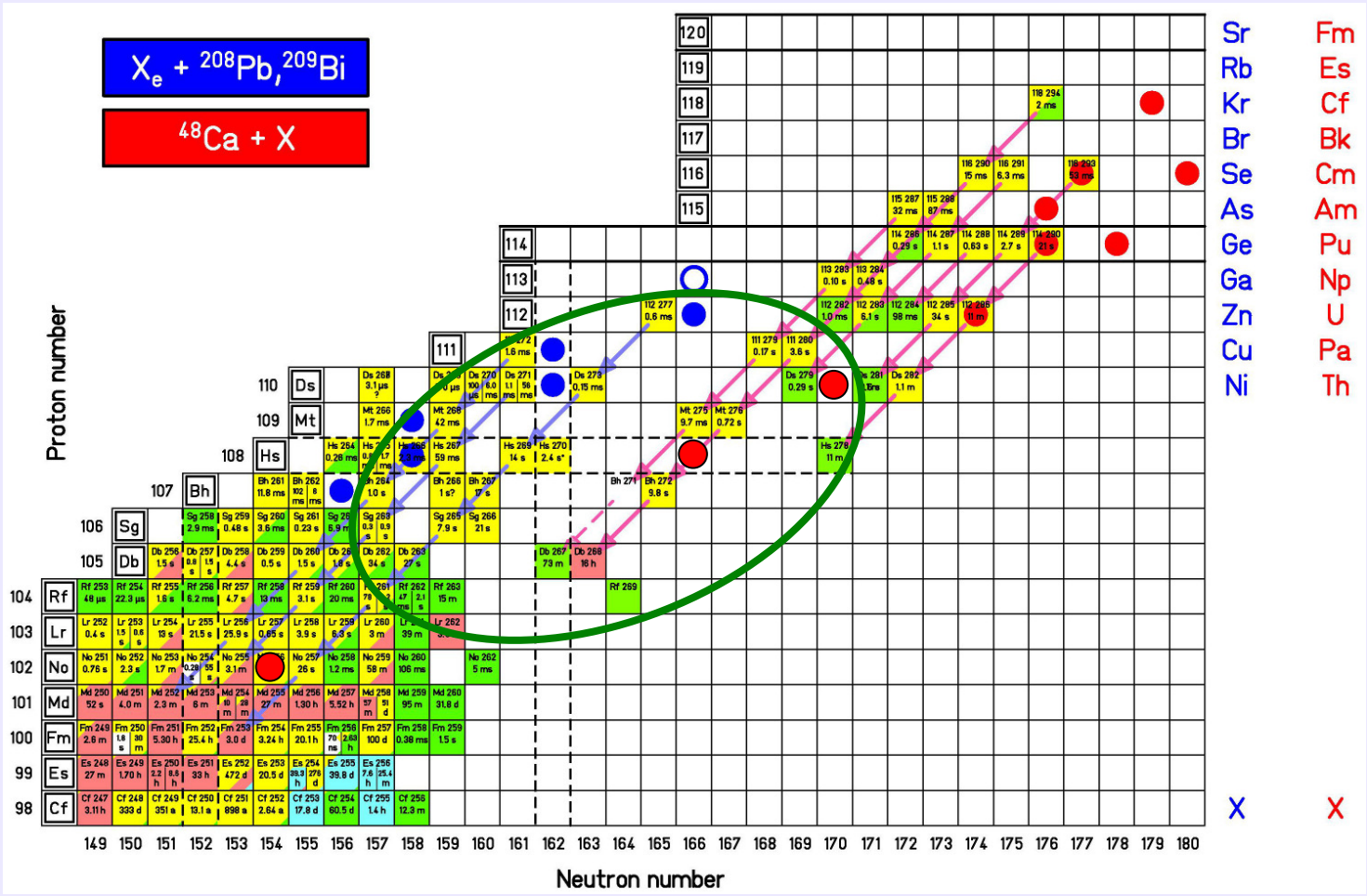
Different reactions



Picture from S. Hofmann

R-D Herzberg

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Outline

- Example 1: α-γ-e spectroscopy in SHE
- Example 2: Isomer spectroscopy
- ShERN status and way forward

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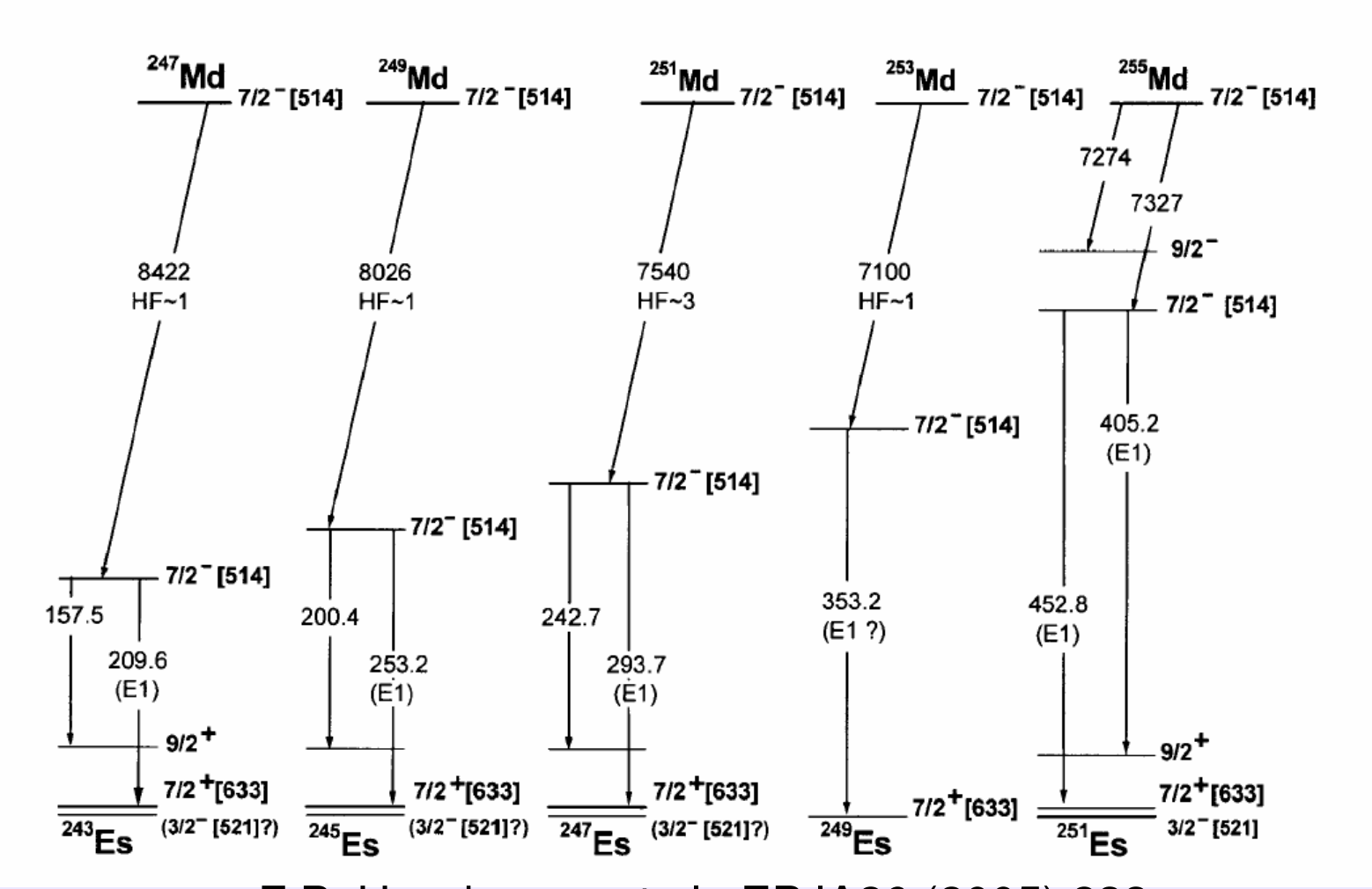
Alpha decay Md -> Es



F.P. Hessberger et al., EPJA26 (2005) 233.

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Decay Spectroscopy

Any odd-mass nucleus, preferrably odd Z.
Needs: Alpha decay branch, ~100 pb

- E.g. Db Spectroscopy:
- $^{209}Bi + {}^{50}Ti \rightarrow {}^{259}Db^{*}$ $^{257}Db \rightarrow {}^{253}Lr \rightarrow {}^{249}Md$
- $^{238}U + {}^{27}Al \rightarrow {}^{265}Db^{*}$ $^{261}Db \rightarrow {}^{257}Lr \rightarrow {}^{253}Md$
- $^{243}Am + {}^{22}Ne \rightarrow {}^{265}Db^{*}$ dito
- Cross section in $^{209}Bi + {}^{48}Ti$: ~100 pb

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Problems

- Implanted Alpha decays sum with electrons
- Fast alphas (<20 us) see Preamplifier recovery from recoil implant or previous decay
- Conversion electrons have to go through material before leaving the detector

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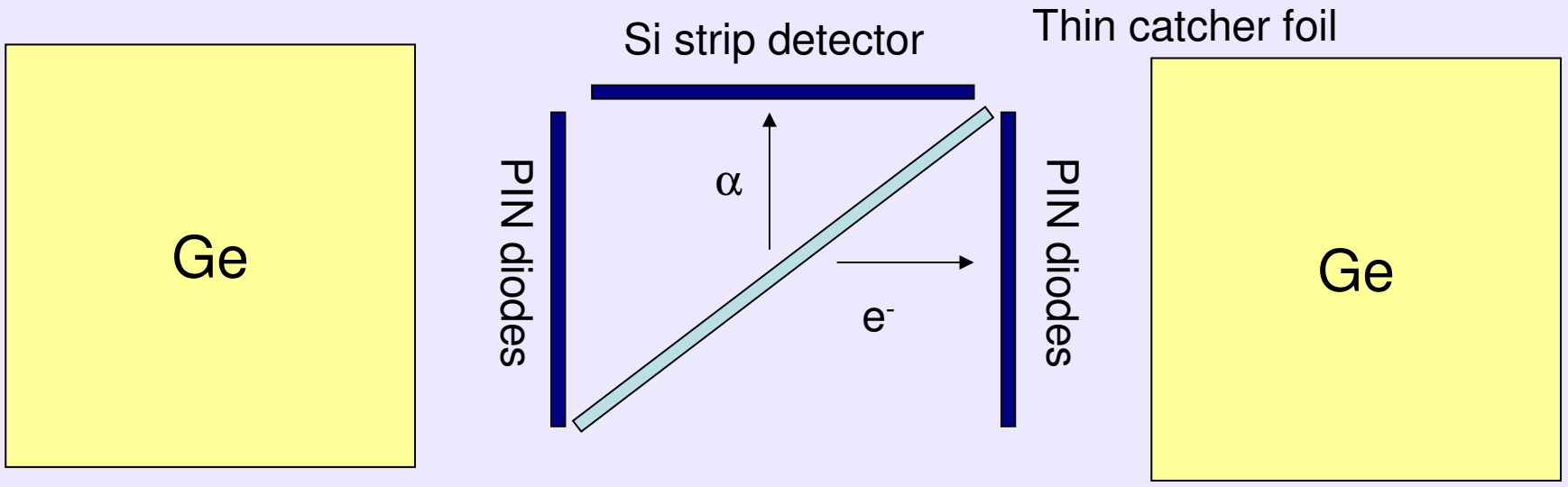
Easy solution



See M. Asai!

Catcher could also be active,
i.e. very thin monolithic Si with resistive position readout

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Example 2 Isomers

- 1) Realistic: $^{238}U + ^{18}O \rightarrow ^{252}Fm + 4n$

  Attempted: W. Meczinski, RFD+EUROBALL IV (failed)

Check the N=152 systematics:

expect two proton K=8 isomer

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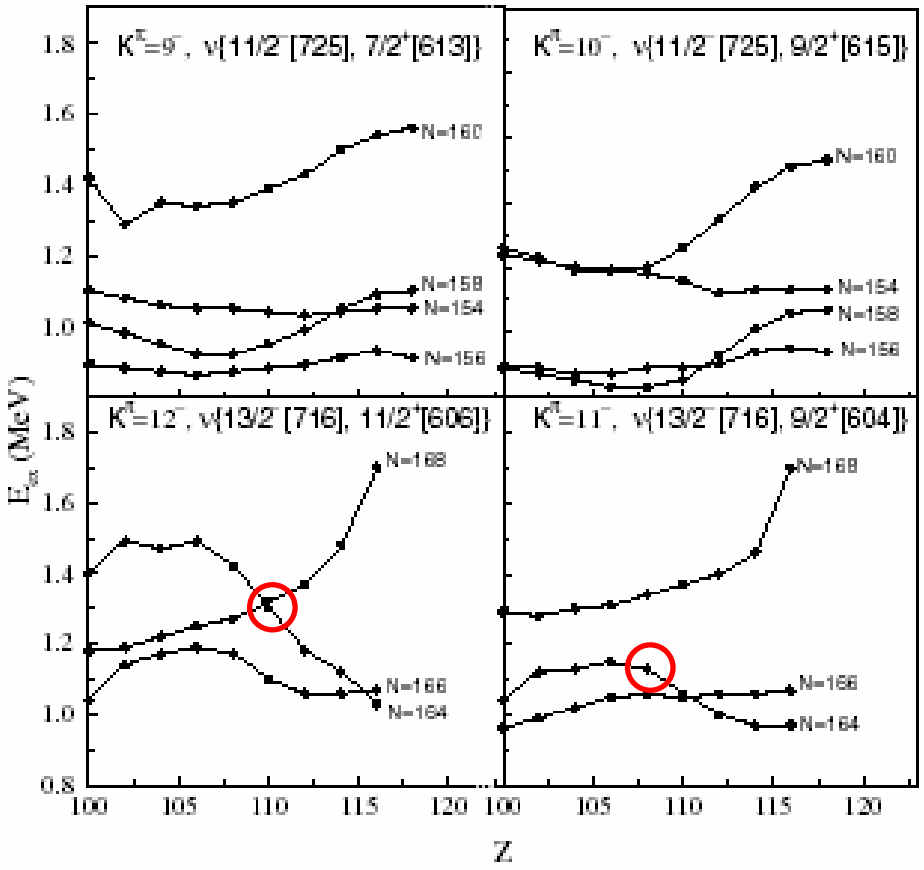
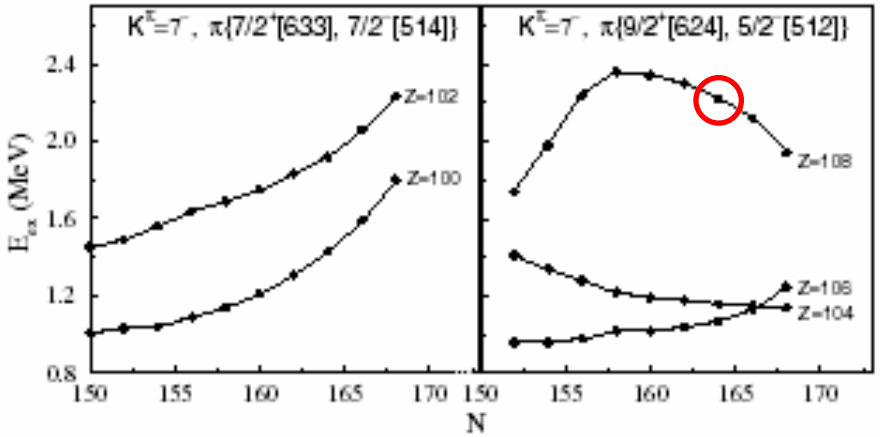
Isomers 2): ambitious

F.R. Xu et al., PRL 92 (04) 252501





Look at the neutron rich side:

Here $K=12^-$ and $K=11^-$ states are Predicted at 1.3 and 1.1 MeV These will certainly be isomeric

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TASCA Cases

- E.g. $^{226}Ra(^{48}Ca,2n)\,^{272}Hs$
- E.g. $^{226}Ra(^{48}Ca,4n)\,^{270}Hs$

Cross sections?

- These Isomers can
  - Fission
  - Alpha decay
  - Gamma decay
  - Undergo internal conversion

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Summary

- Both realistic and ambitious experiments available at an early stage.
- Each case is different and needs detailled proposal.
- I have a ^{231}Pa target

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ShERN

- LoI was presented in Helsinki

  (PT Greenlees)

- Synergies were found with 2 networks:
  - Theory Mihai Mirea (One participant…)
  - Actinide Targets Uli Koester

- I propose to be open to merge with both