

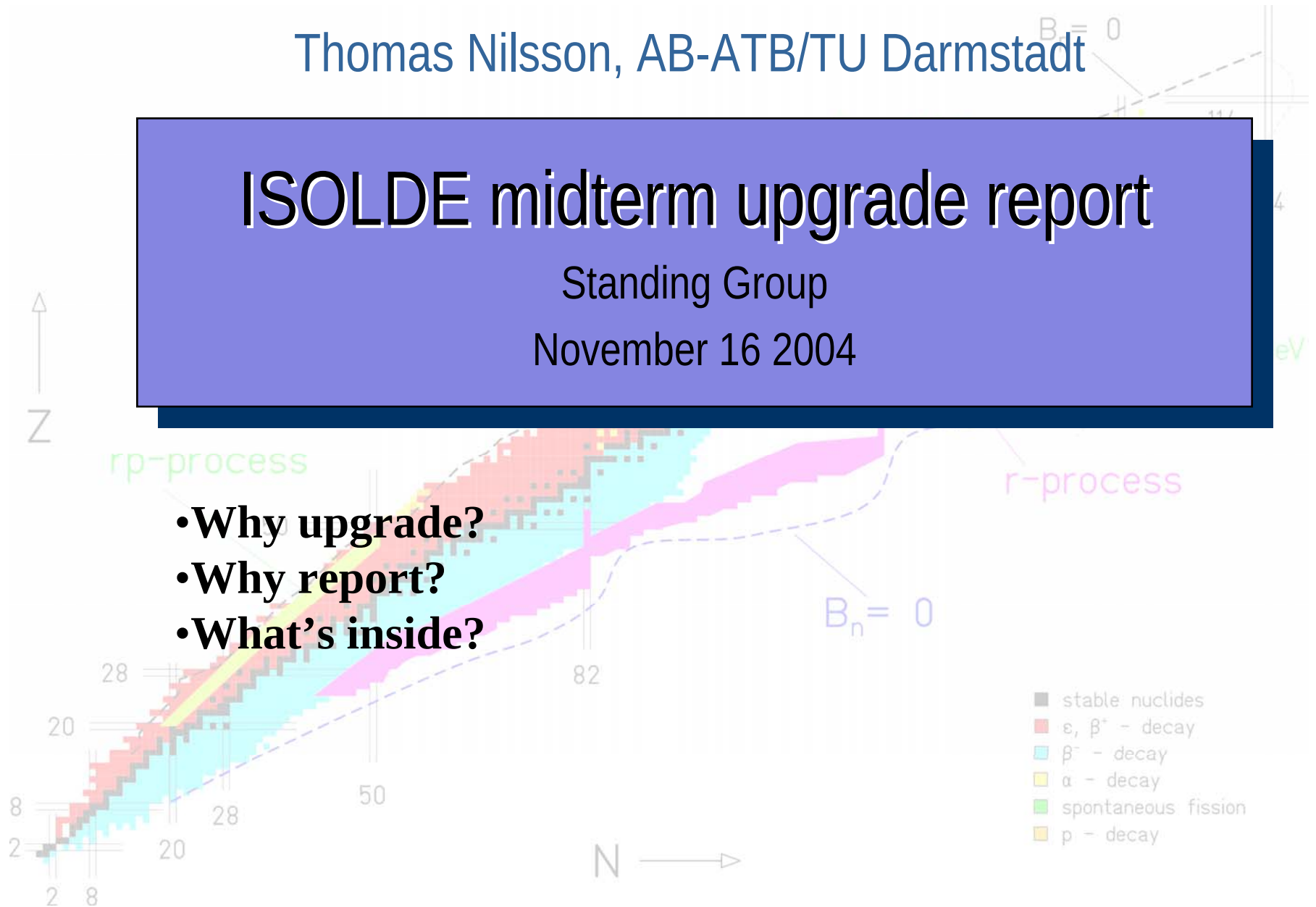
Thomas Nilsson, AB-ATB/TU Darmstadt

ISOLDE midterm upgrade report

Standing Group

November 16 2004

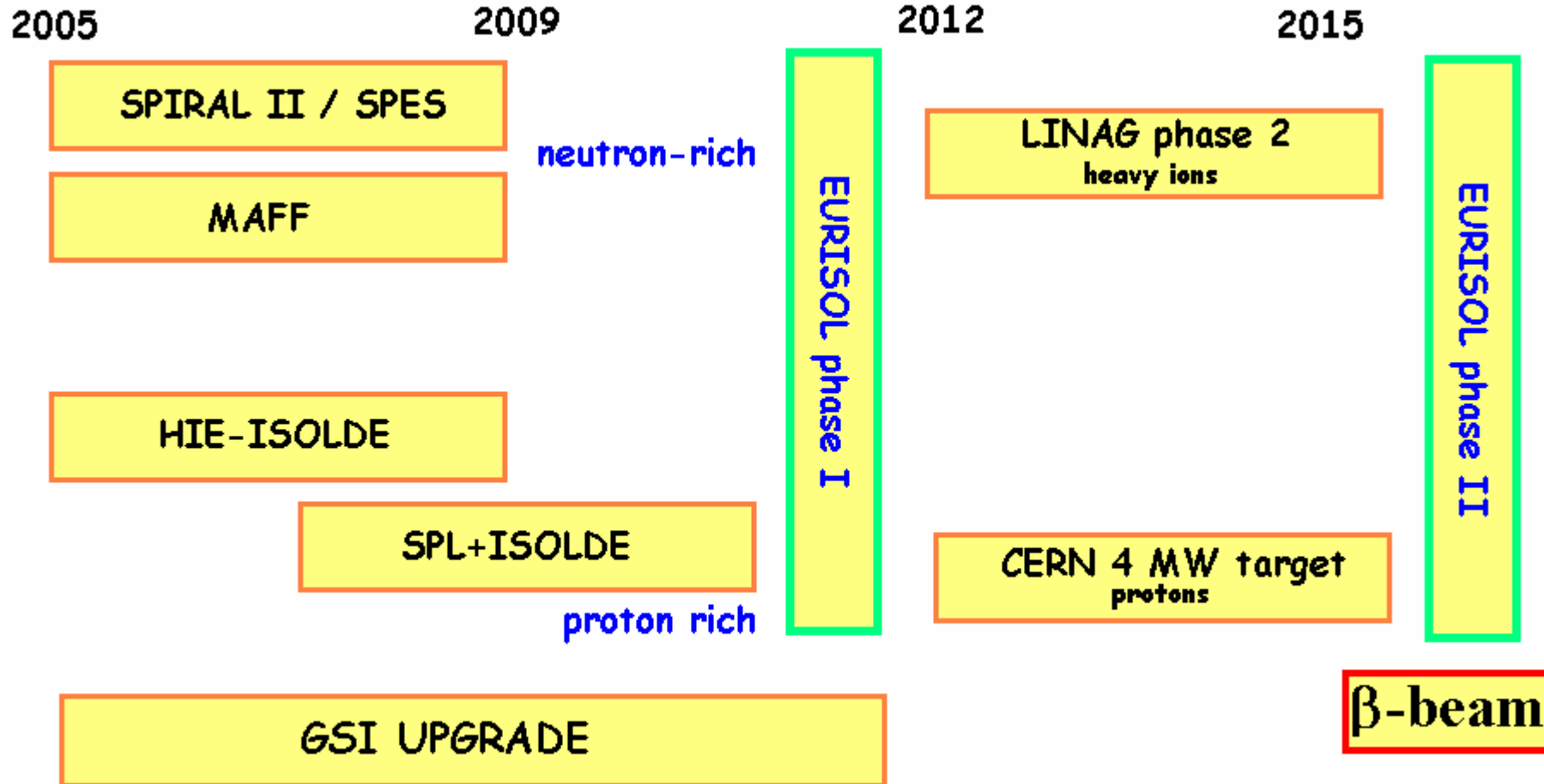
- Why upgrade?
- Why report?
- What's inside?



Why upgrading ISOLDE?

- User-demand driven developments have historically been THE key to the success story of ISOLDE
 - More beam(s)
 - Higher intensity
 - New isotopes/elements
 - Better beams
 - Purity
 - Emittance
 - Time structure
 - Charge state
 - Higher/lower energy
- Developments towards EURISOL

Europe RIB physics roadmap



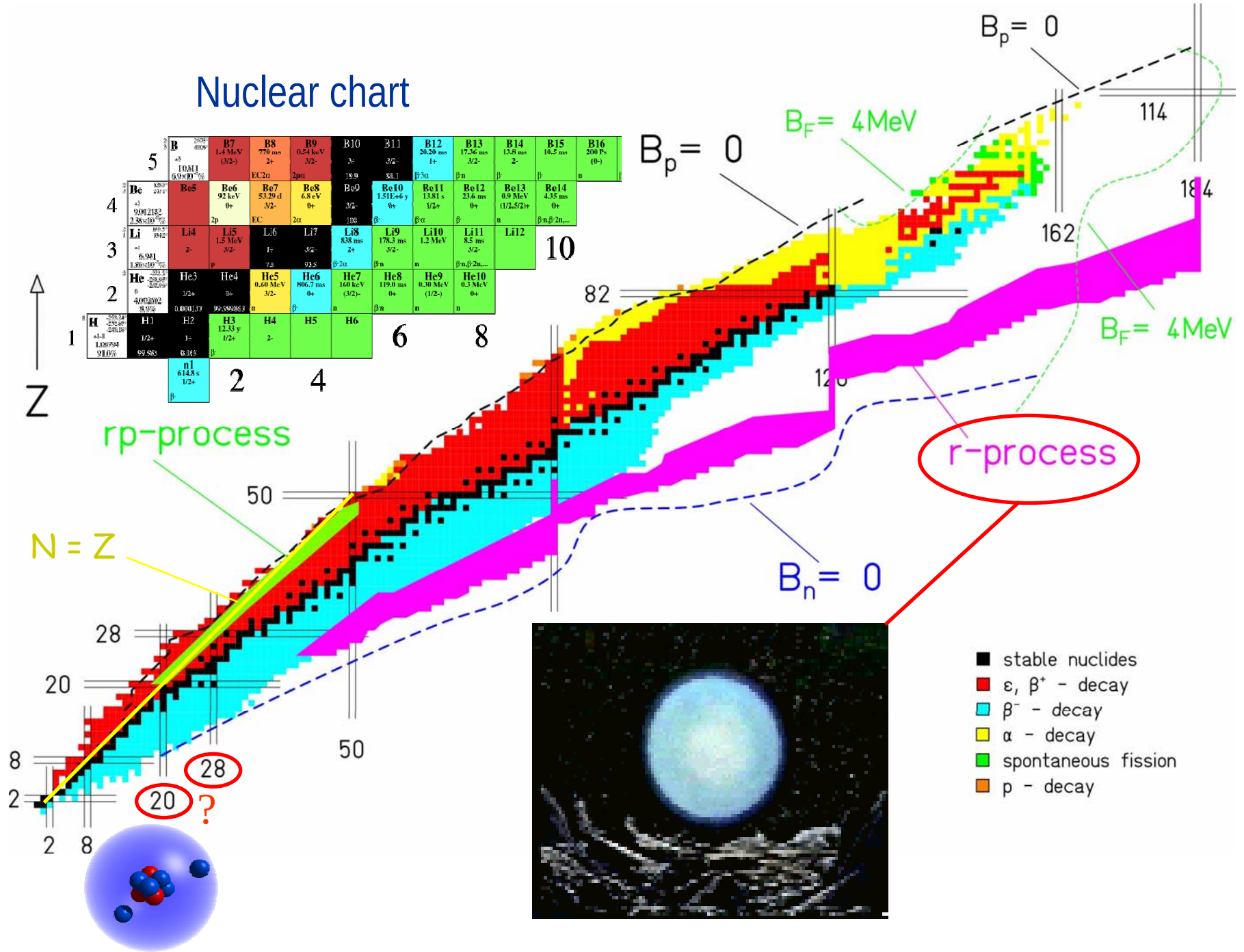
The standing Group for the Upgrade of ISOLDE

- Mandate from directors of research and accelerators to study the short and long term future of the CERN ISOLDE facility
- “... upgrade committee should coordinate the editing of a Technical Design Report (TDR) in the form of a CERN yellow report for the upgrade of the ISOLDE facility”
- Editor’s reflection: different parts will rather be a mixture of TDR and CDR

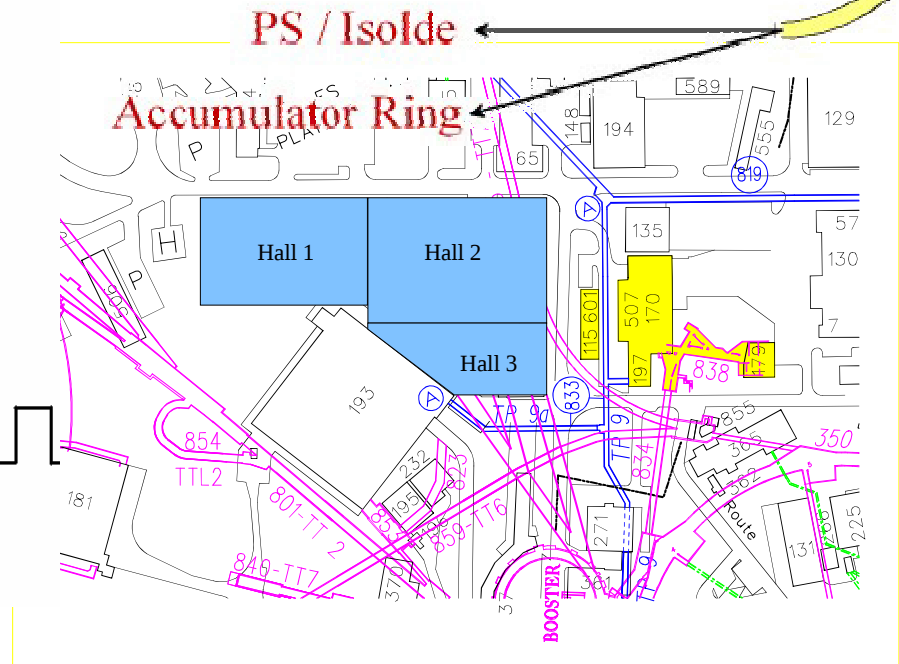
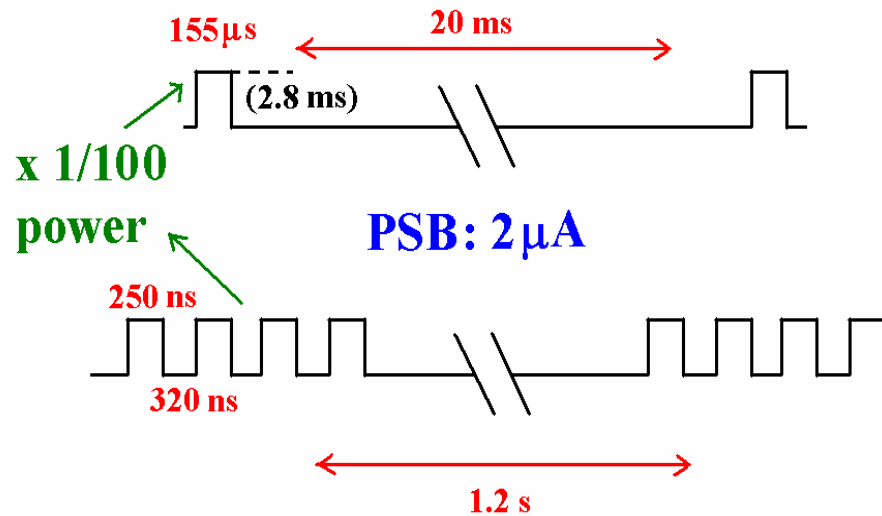
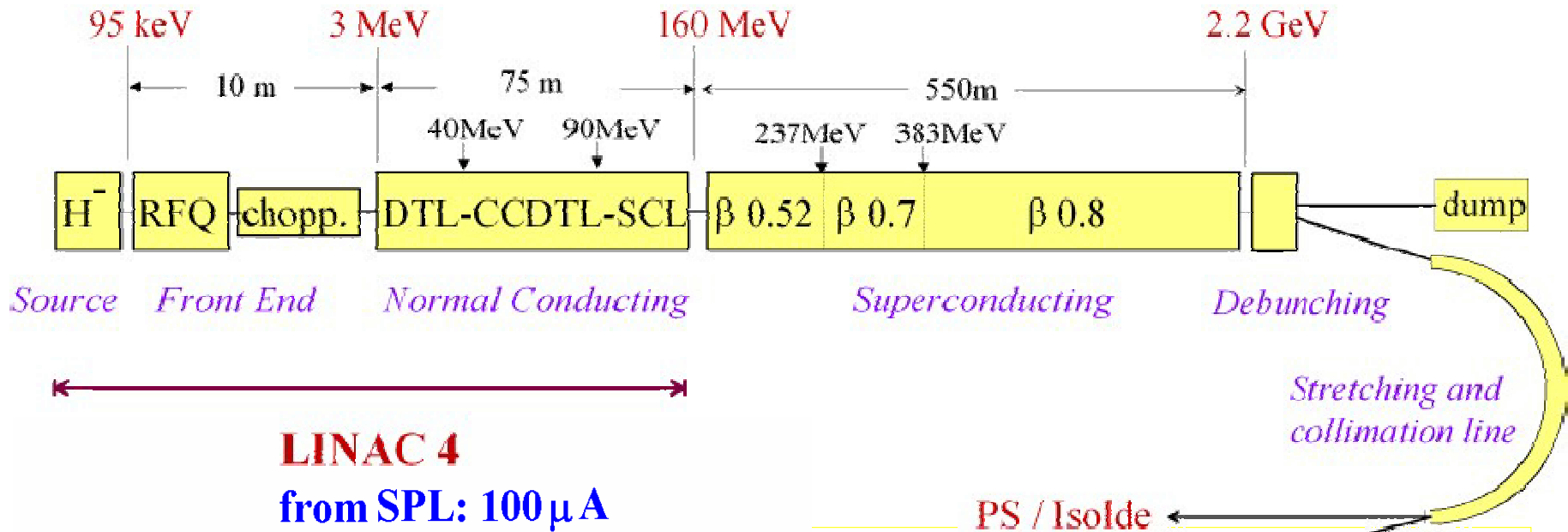
ISOLDE Upgrades – Yellow Report TOC

- Introduction – T.N. et al.
- The scientific case for RIB Physics@CERN
- Increasing RIB intensities and range of ions accessible
 - Increasing the proton current on target – PSB upgrades (0.9 s) and future perspectives (LINAC4, SPL) - HIP
 - CERN-AB-2004-021 HIGH-INTENSITY PROTON BEAMS AT CERN AND THE SPL STUDY
 - Target and ion source development – J. Lettry , U. Köster
 - Radioprotection issues – T. Otto

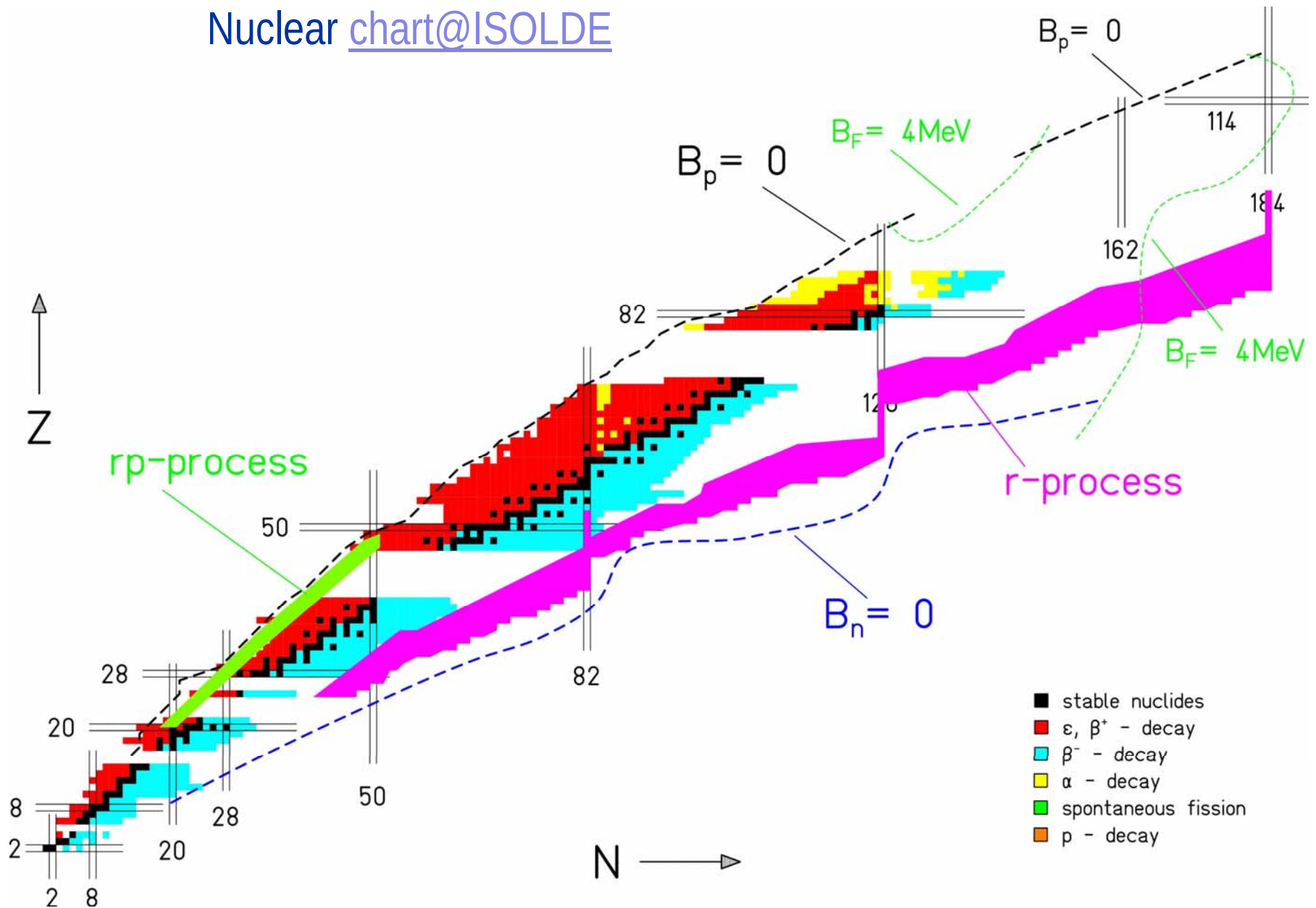
Nuclear chart



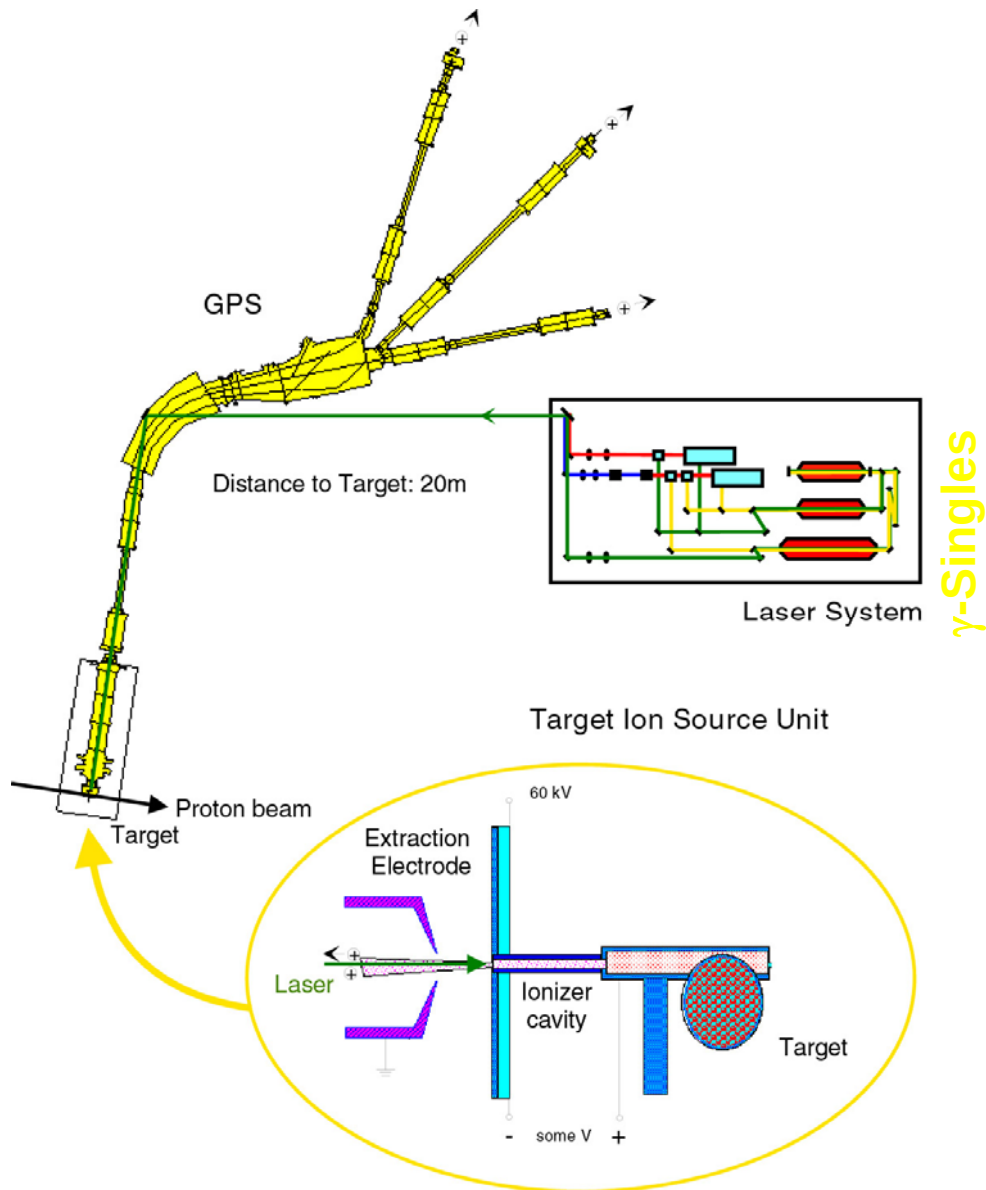
Future protons at CERN?



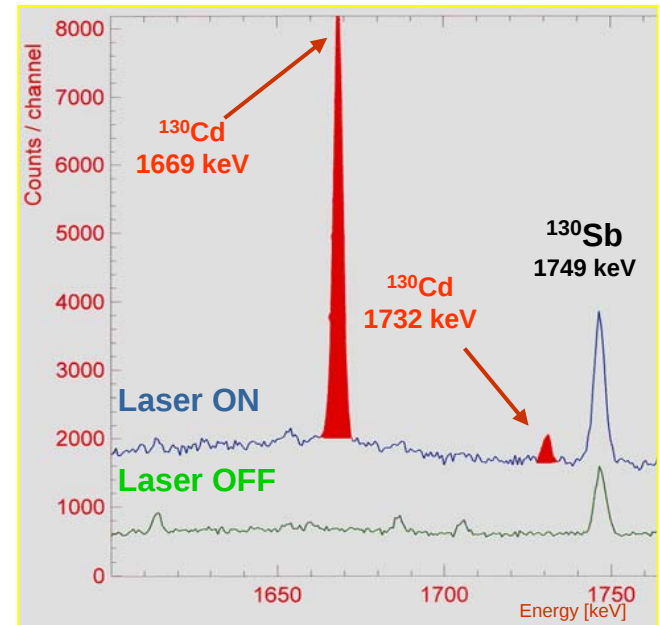
Nuclear chart@ISOLDE



Resonant LASER Ion Source



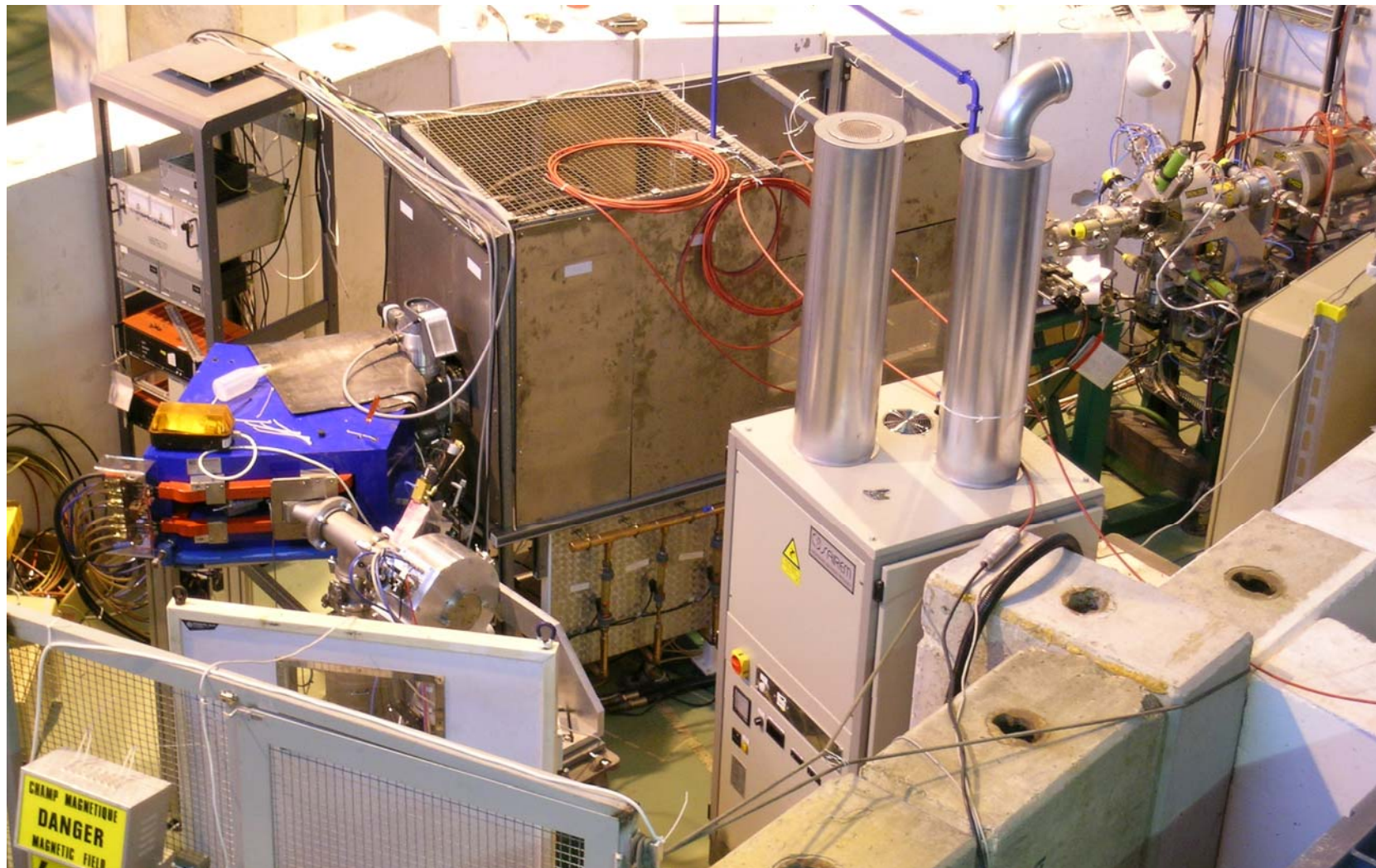
γ -Singles



TOC cont.

- New and developed experiments with low-energy beams
 - Highly charged ions for low-energy reactions and Condensed Matter Physics – T. Agne, M. Hass
 - Highly charged ions for ultra-precise mass measurements – K. Blaum
 - Improvements in the beam-line layout – T. Giles, U. Köster
 - New possibilities with cooled radioactive beams – I. Podadera

Low energy RIB



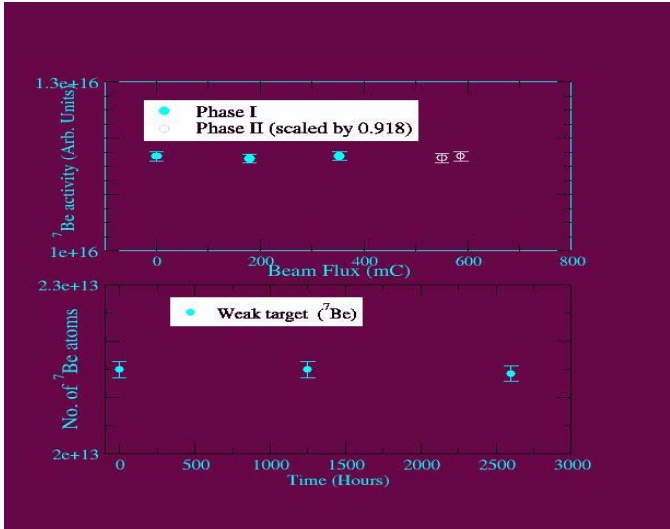
A Precision Measurement of the Proton Capture Rate on ^7Be and the $S_{17}(0)$ Factor

L. T. Baby, C. Bordeanu, G. Goldring, M. Hass, L. Weissman, V.N. Fedoseyev, U. Koester, Y. Nir-El, G. Haquin, H.W. Gaggeler, R. Weinreich
 Weizmann Institute of Science, Israel, NSCL, Michigan State University, USA
 ISOLDE, CERN, Soreq Research Centre, Yavne, Israel, Paul Scherrer Institute, Villigen, Switzerland

L. T. Baby *et al.* Phys. Rev. Lett. 90, 022501 (2003)



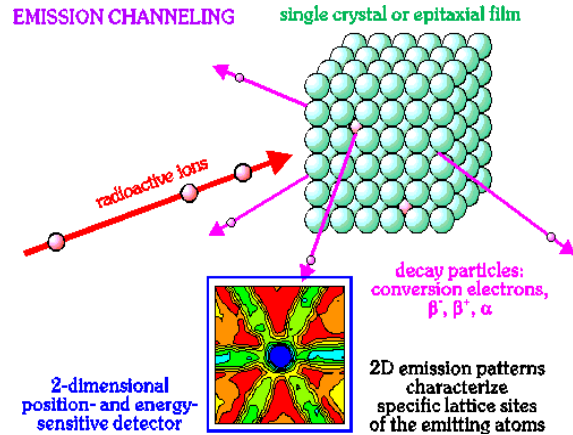
Implanted Target from ISOLDE



Offline implantation of 60 keV ^7Be beam – Laser Ion source
 ^7Be source from PSI

Produced Strong and Weak targets, enabling precise determination of ^7Be atom number

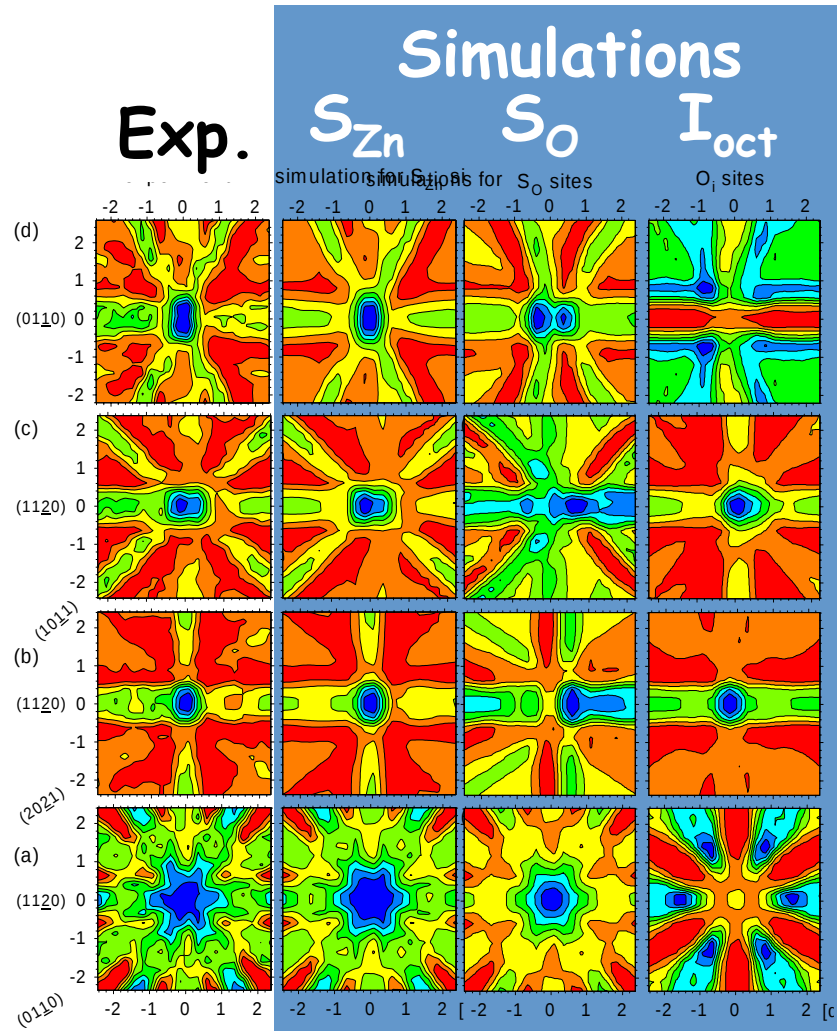
IS368 -Where sits Er in ZnO ?

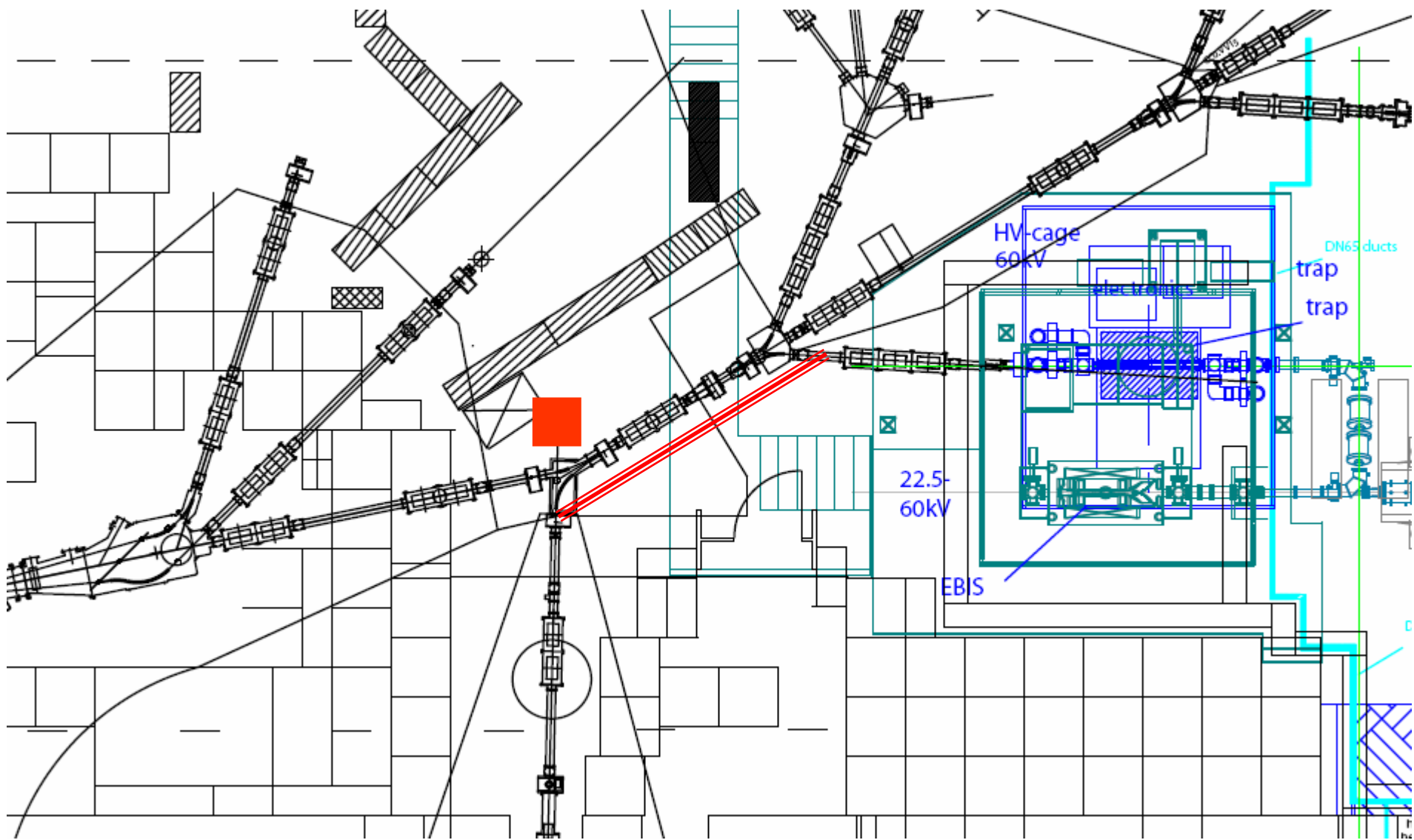


Conv. Elec. from ^{167m}Er

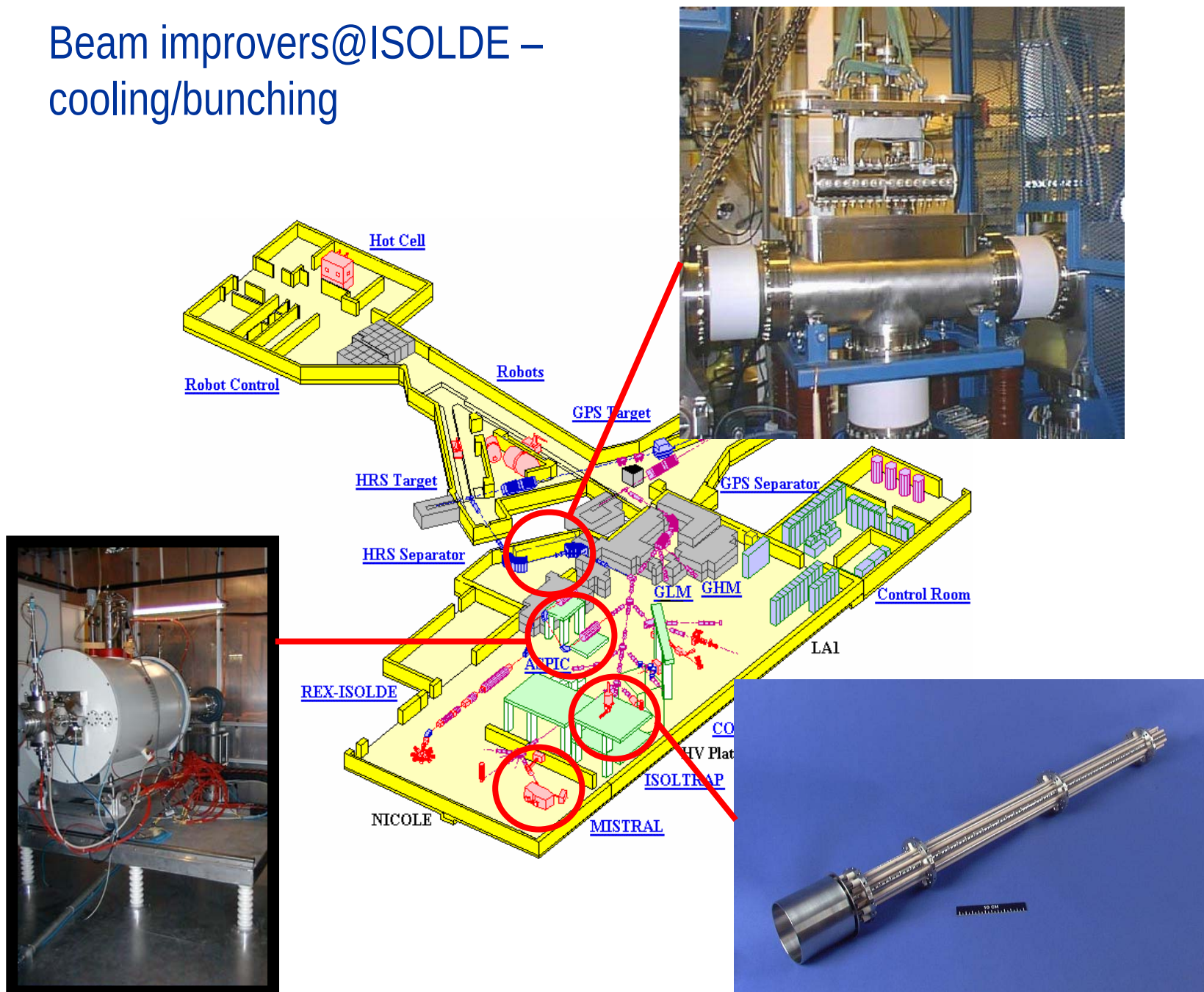
Er is substitutional at
the Zn Site

(accepted by
Applied Physics Letters)

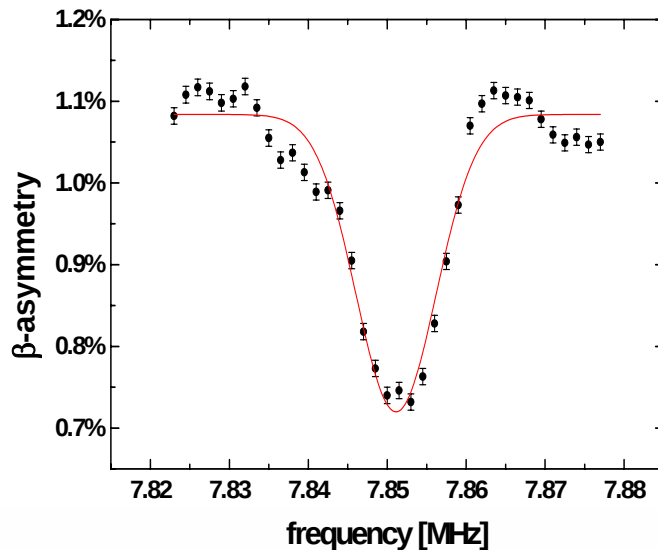




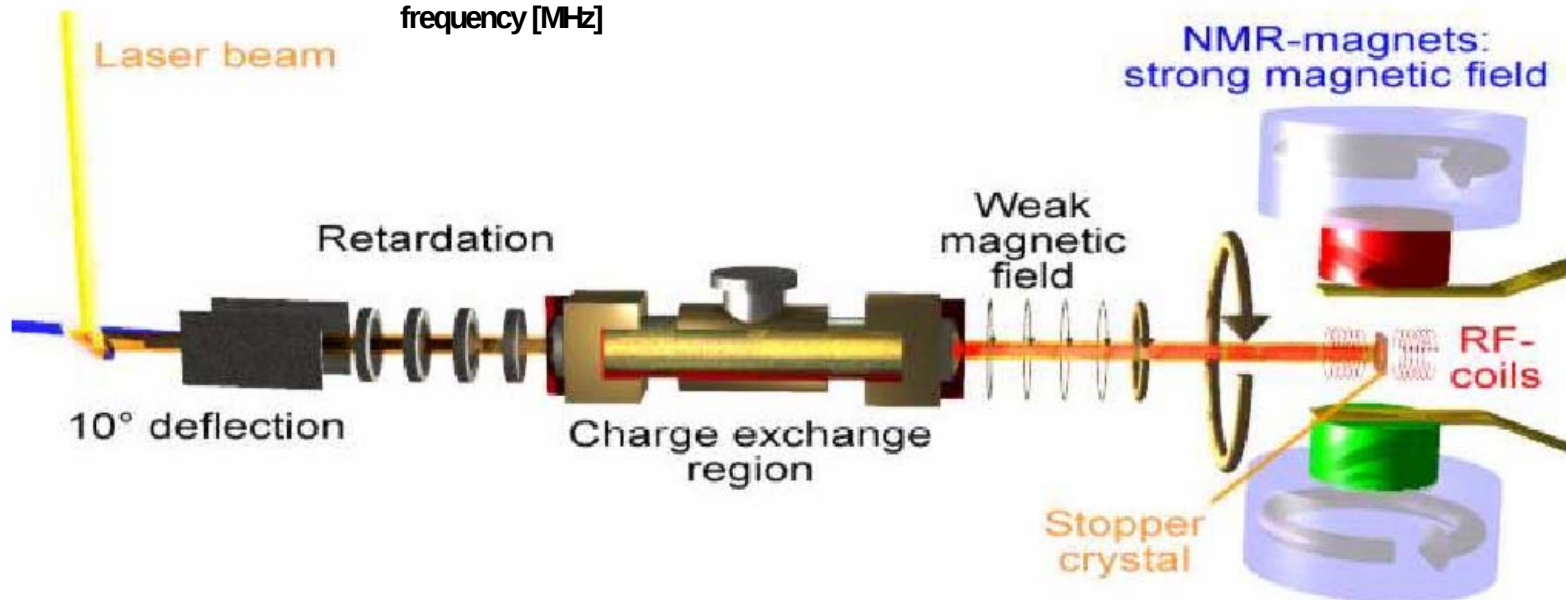
Beam improvers@ISOLDE – cooling/bunching



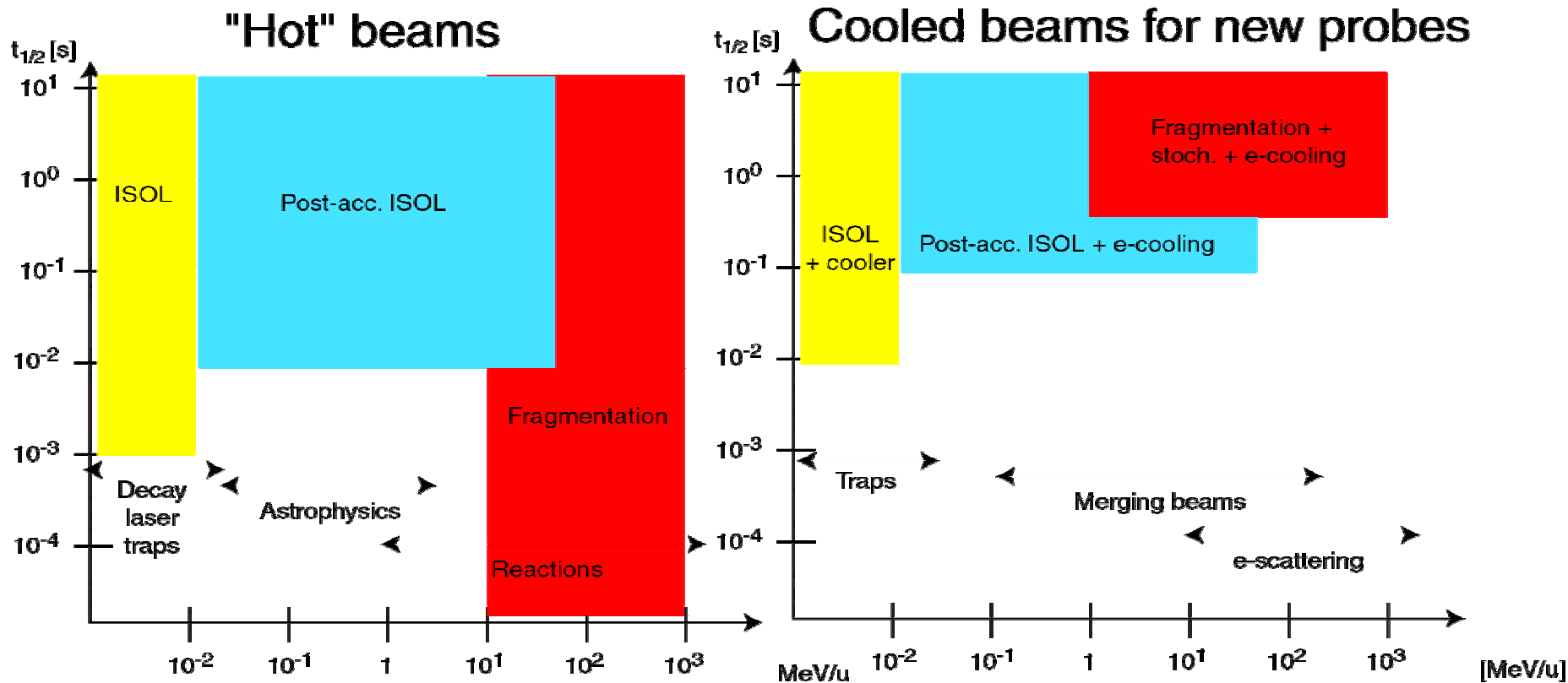
COLLAPS – polarized RIBs - β -NMR



$$\mu_l(^{11}\text{Be}) = -1.682(3) \mu_N$$



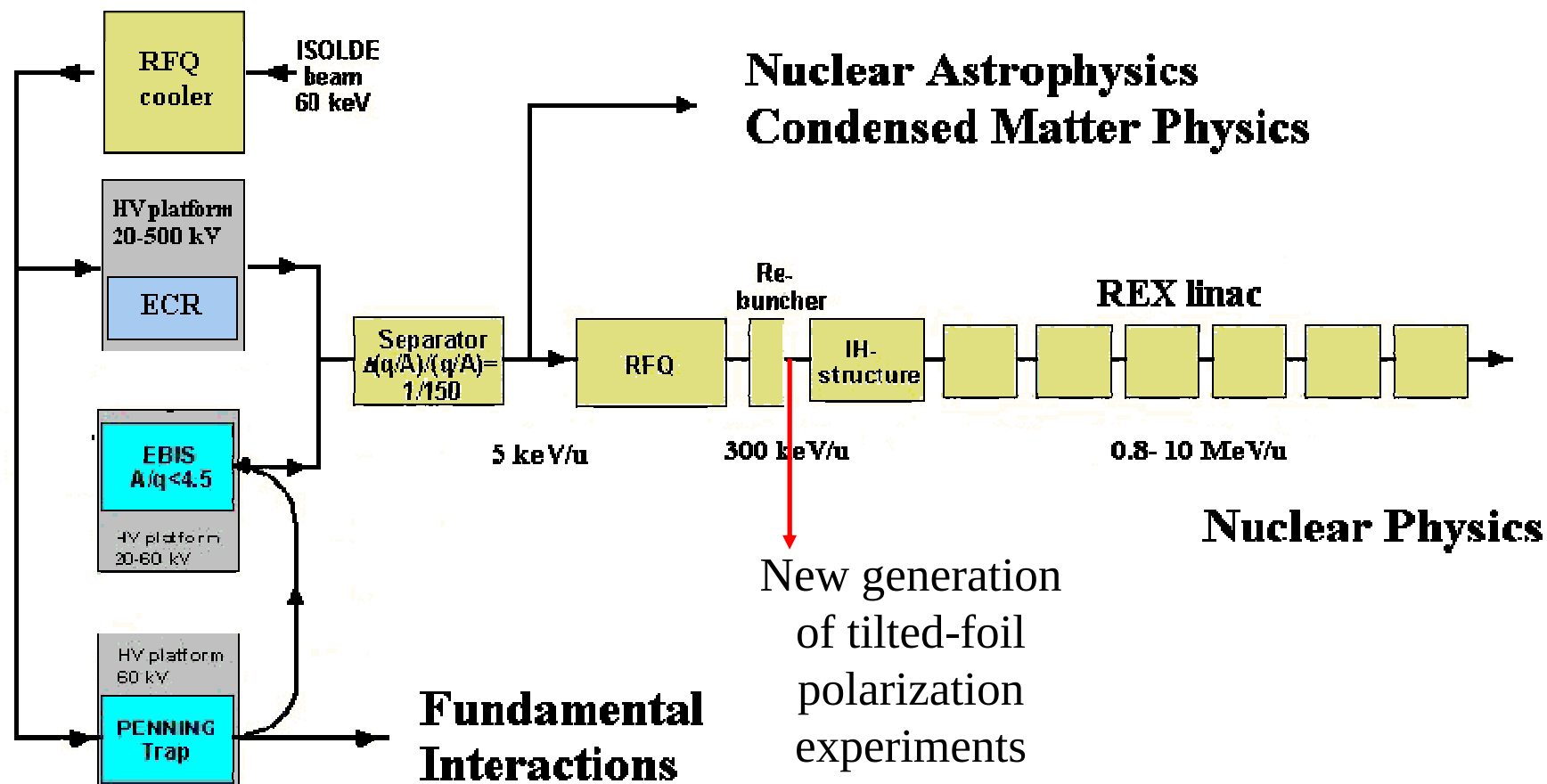
Complementarity



TOC cont.

- Increasing Energy, intensity and range of post-accelerated ions
 - Beam preparation improvements, cooling and charge-breeding of higher intensities - [F. Wenander](#)
 - Beam purity developments, molecular ions, stripping – [P. Delahaye](#)
 - Energy upgrades beyond 3.1 MeV/u, beam quality issues – [T. Sieber](#)
 - Development of instrumentation, gamma ray, charged particle detection and ion identification – [PH-IS et al](#)
 - Recoil mass spectrometer – [C.J. Barton](#)

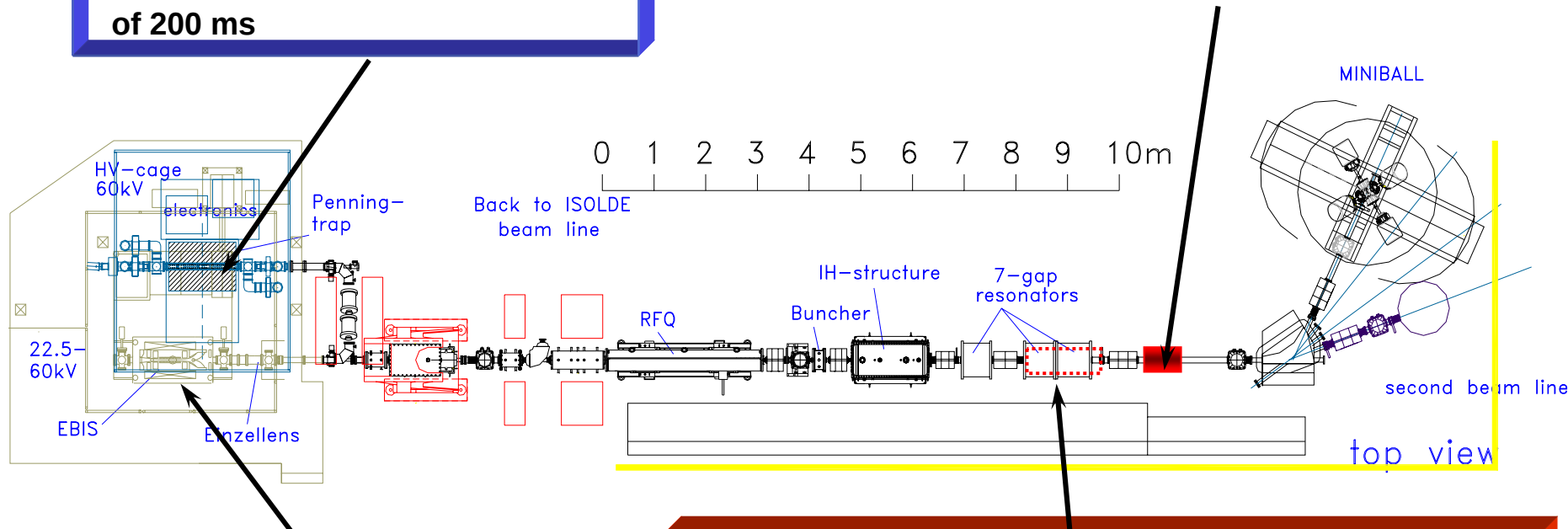
REX ISOLDE → HIE ISOLDE



REX upgrades

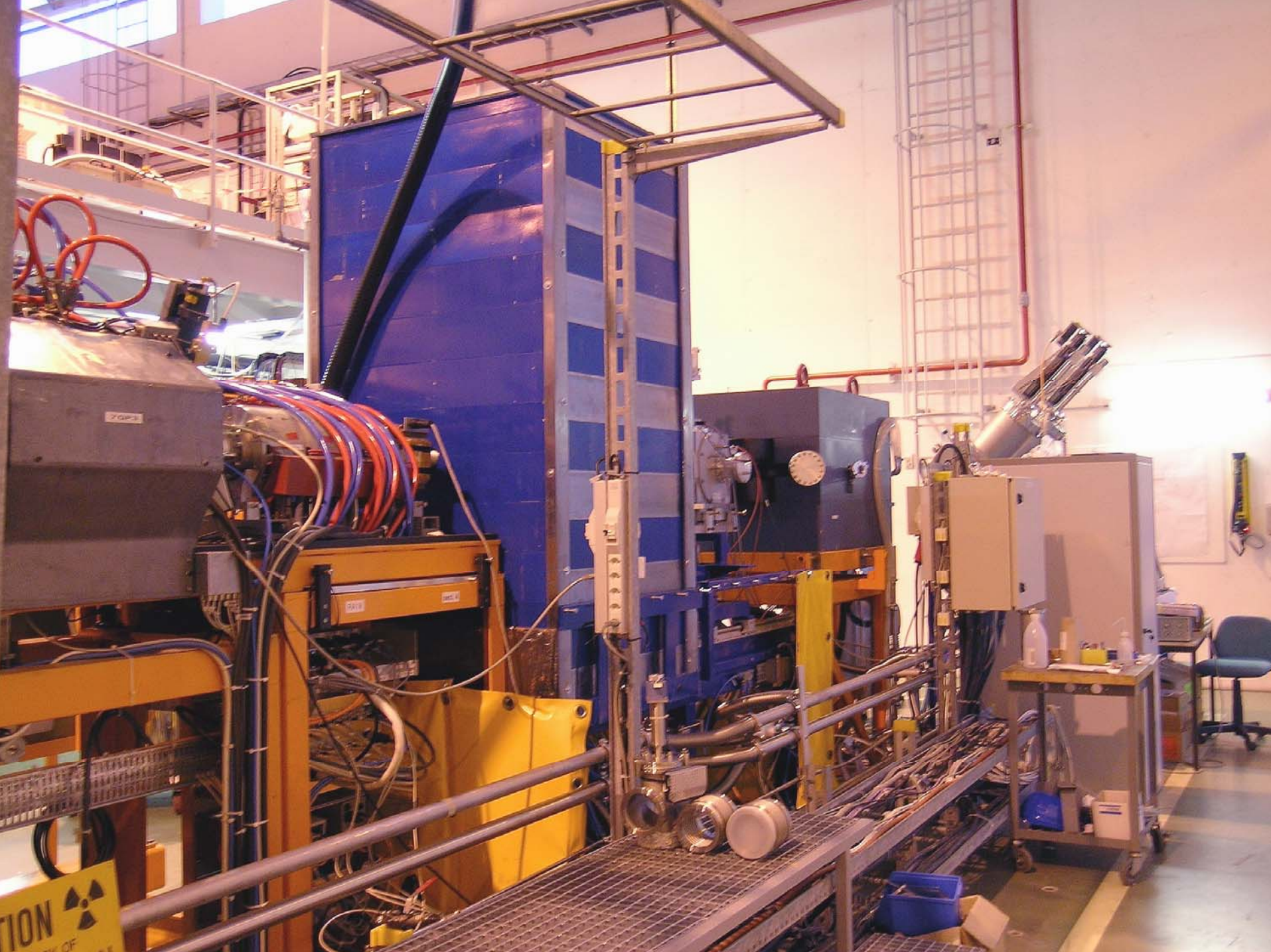
- higher beam intensities ($10^9/s$) by using new cooling technique (rotating wall)
- test of accumulation period of 200 ms

- energy upgrade to 3.1 MeV/u in 2003 (MLL)
→ adding one 9-gap IH resonator

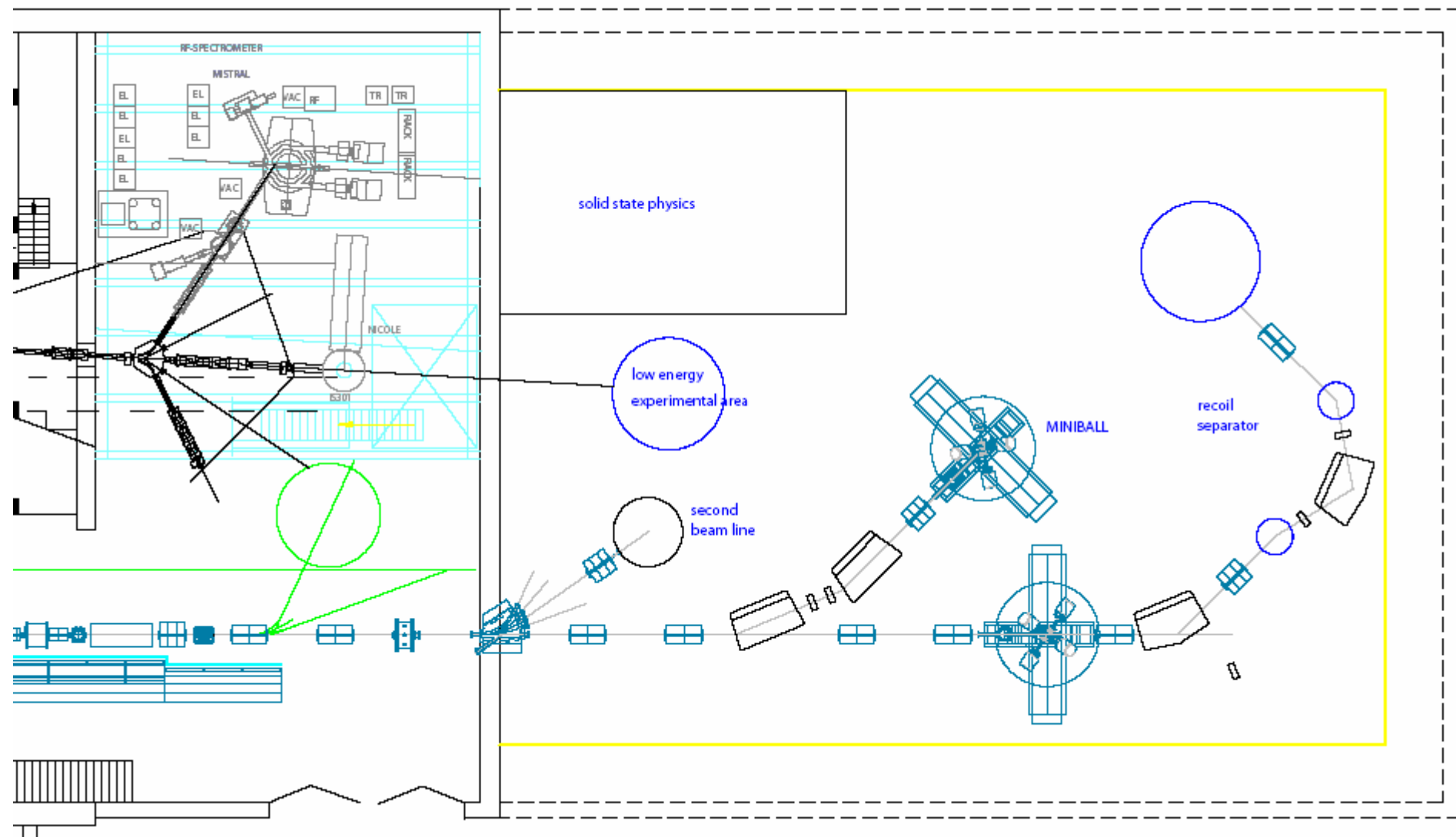


- Breeding of heavier masses
→ breeding time up to 200 ms
- increase of electron beam current density to 500 A/cm^2

- energy upgrade to 4.3 MeV/u in 2006/2007
→ replacement two 7-gap spiral resonators by one 26 gap IH-resonator



Hall extension



Conclusions

- Excellent scientific case and technical opportunities for a mid-term upgrade programme
- Influx of ideas and resources from external groups existing, but more always welcome
- Report:
 - Contributions by Dec. 1st
 - First draft by Xmas