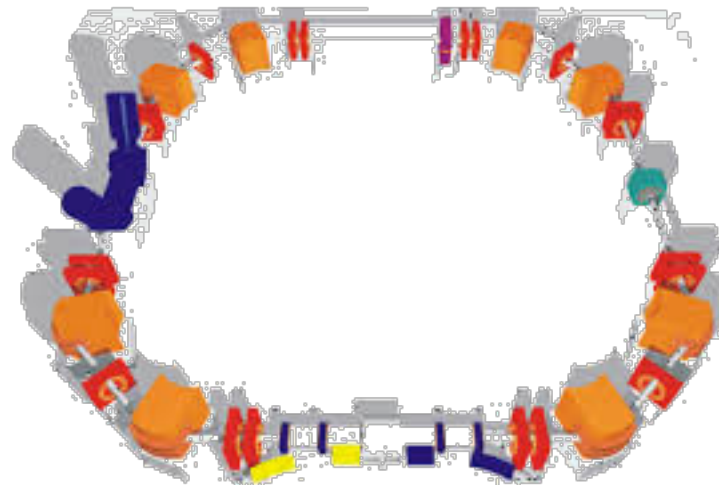


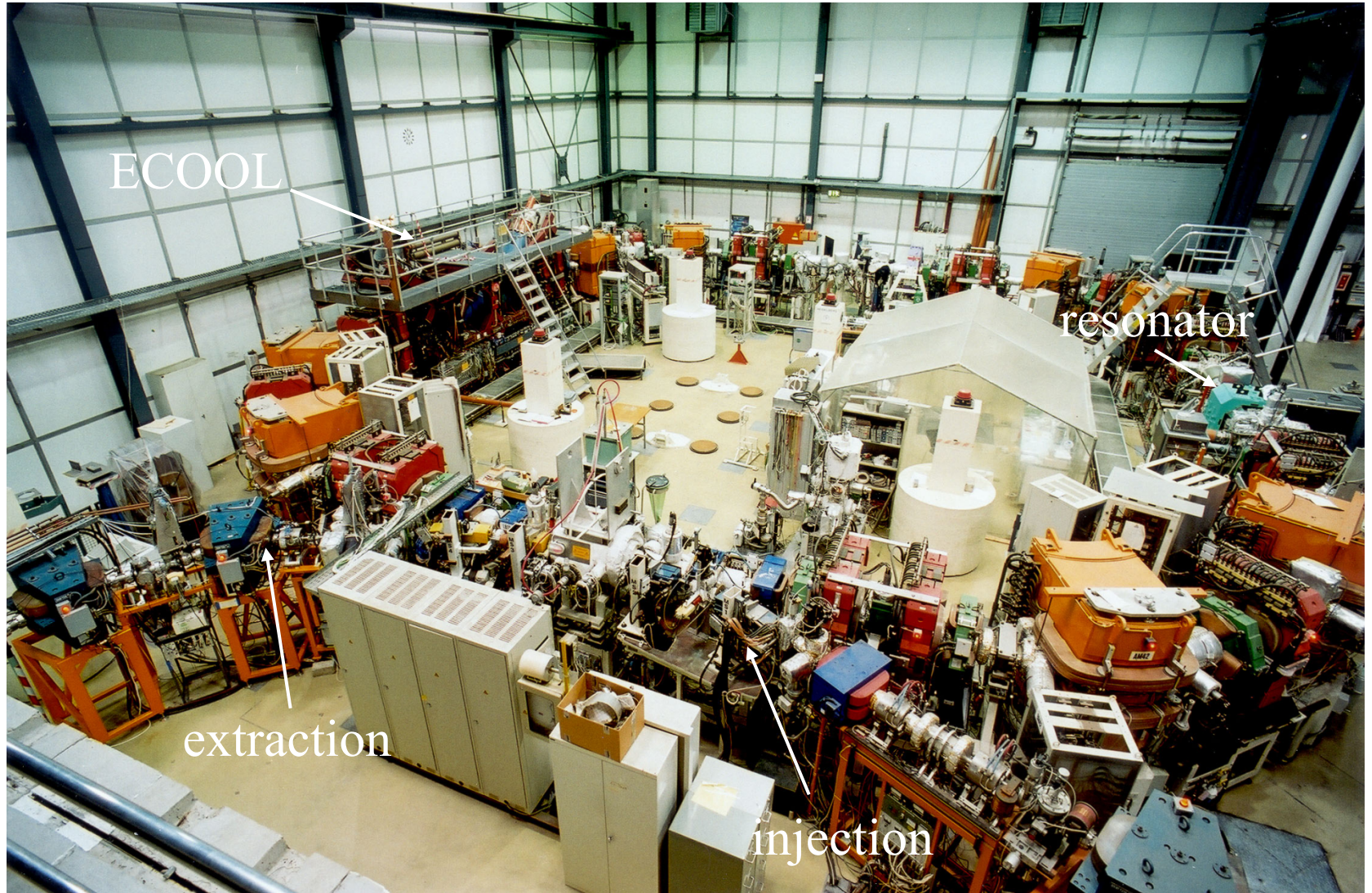
ISOL-SRS project



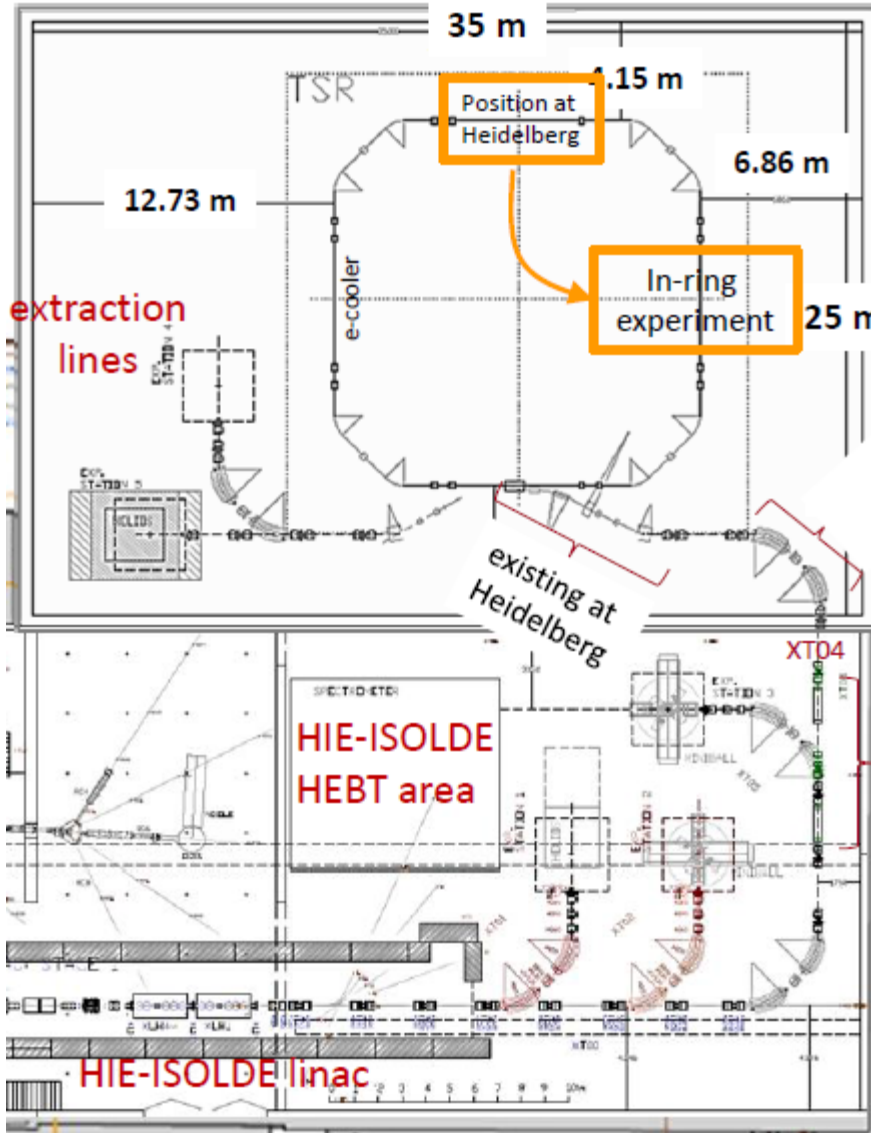
TSR  **ISOLDE**

The heavy ion storage ring (TSR)

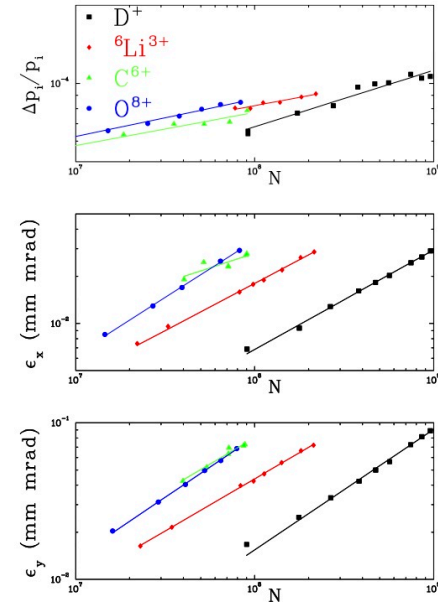
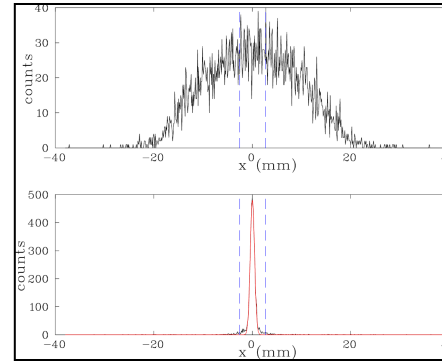
Circumference: 55m



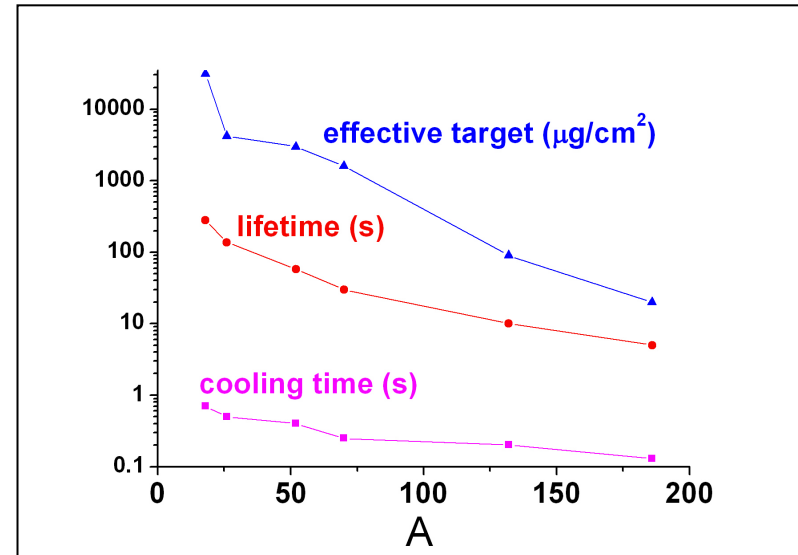
Storage ring at ISOLDE: **why?**



Beam quality



Luminosity



International Collaboration



- **MPI-K Heidelberg:** TSR, technical input to install and commission.
- **CERN:** New TSR building and infrastructure (15 MCHF). Research Board approved installation and included on CERN-MTP.
- **UK:** Detector array for internal spectrometer. External (HELIOS-like) spectrometer. Development of in-ring laser spectroscopy
- **Universities of Aarhus and Lund:** In-ring gas-jet target.

U.K. PARTICIPANTS

U.K. lead participants
ISOL-SRS

Peter Butler
Wilton Catford
Thomas Cocolios
Thomas Davinson
Kieran Flanagan
Sean Freeman
Dave Jenkins
Ben Kay (now at ANL)
Ian Lazarus
Gavin Lotay
Robert Page
John Simpson
Phil Woods

+ 19 others

UK lead roles in TSR Collaboration

Peter Butler
Kieran Flanagan
Sean Freeman
Phil Walker
Phil Woods

In-ring DSSD System

For in-ring (d,p), (p,d) and (^3He ,d) transfer studies of astrophysical resonances

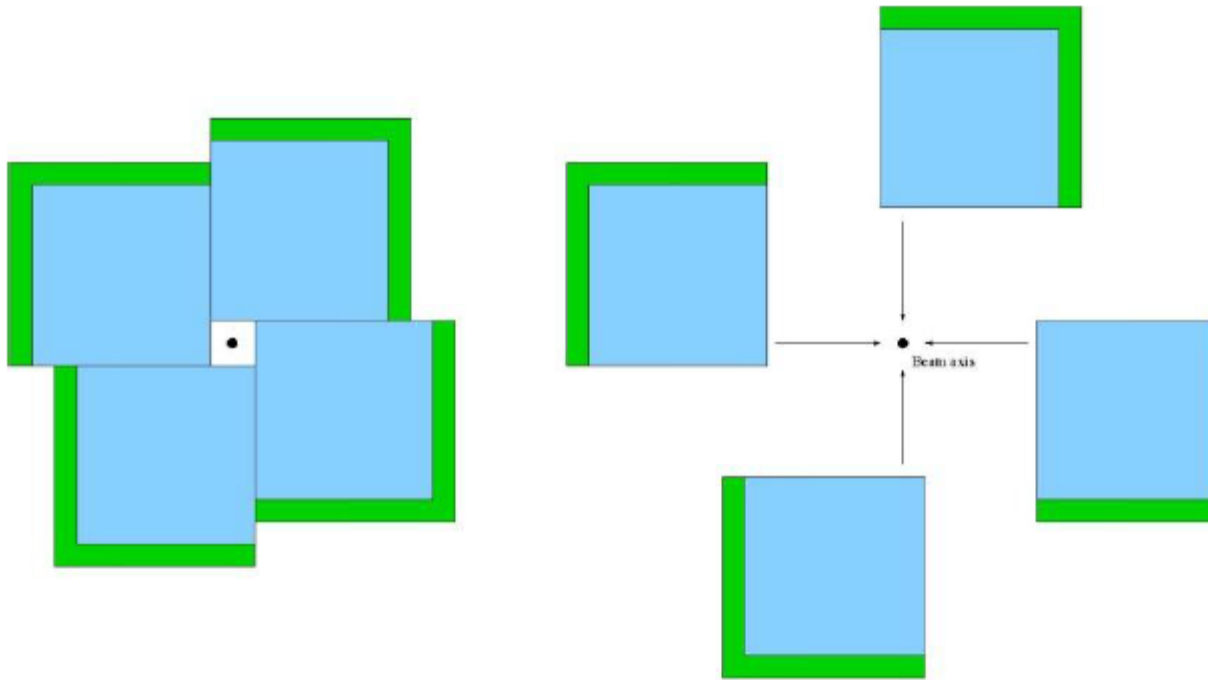


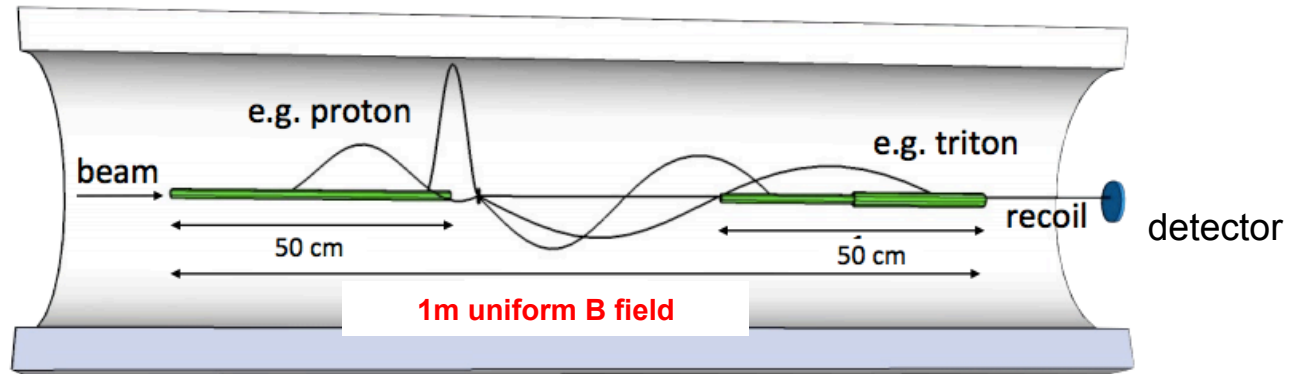
Illustration of upstream or downstream assembly of 4 DSSDs about beam axis

UHV mounting; 100 x 100 mm; 0.25 – 1mm strips; AIDA-type readout

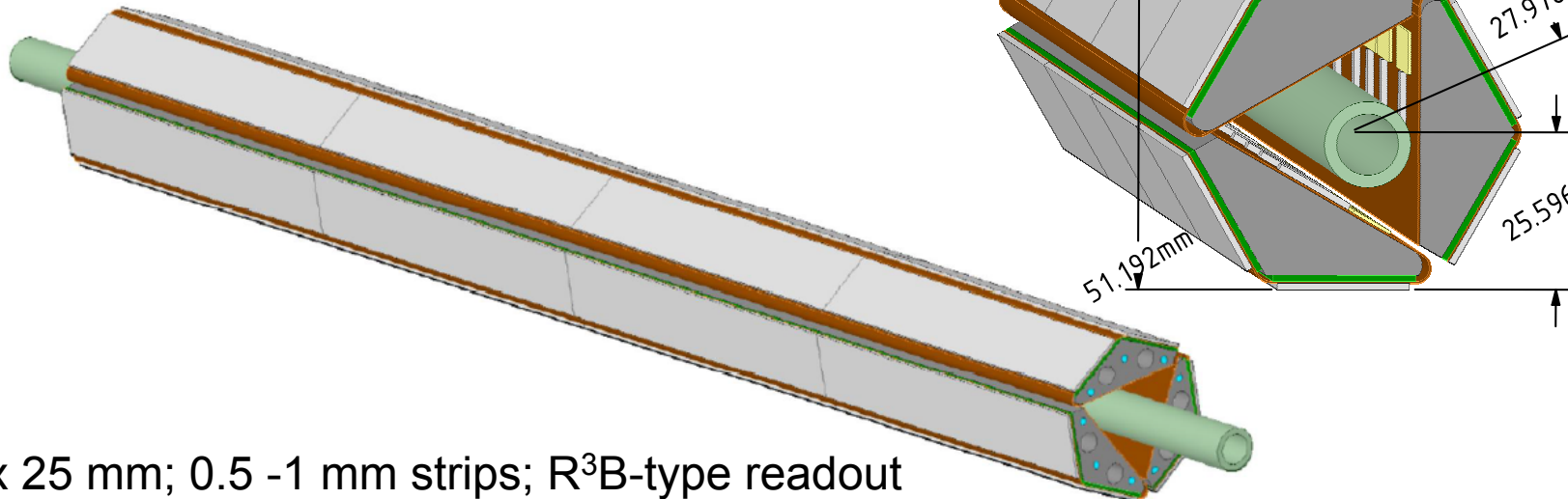
External spectrometer

for high resolution studies of nuclear reactions on heavier nuclei outside the ring

HELIOS concept

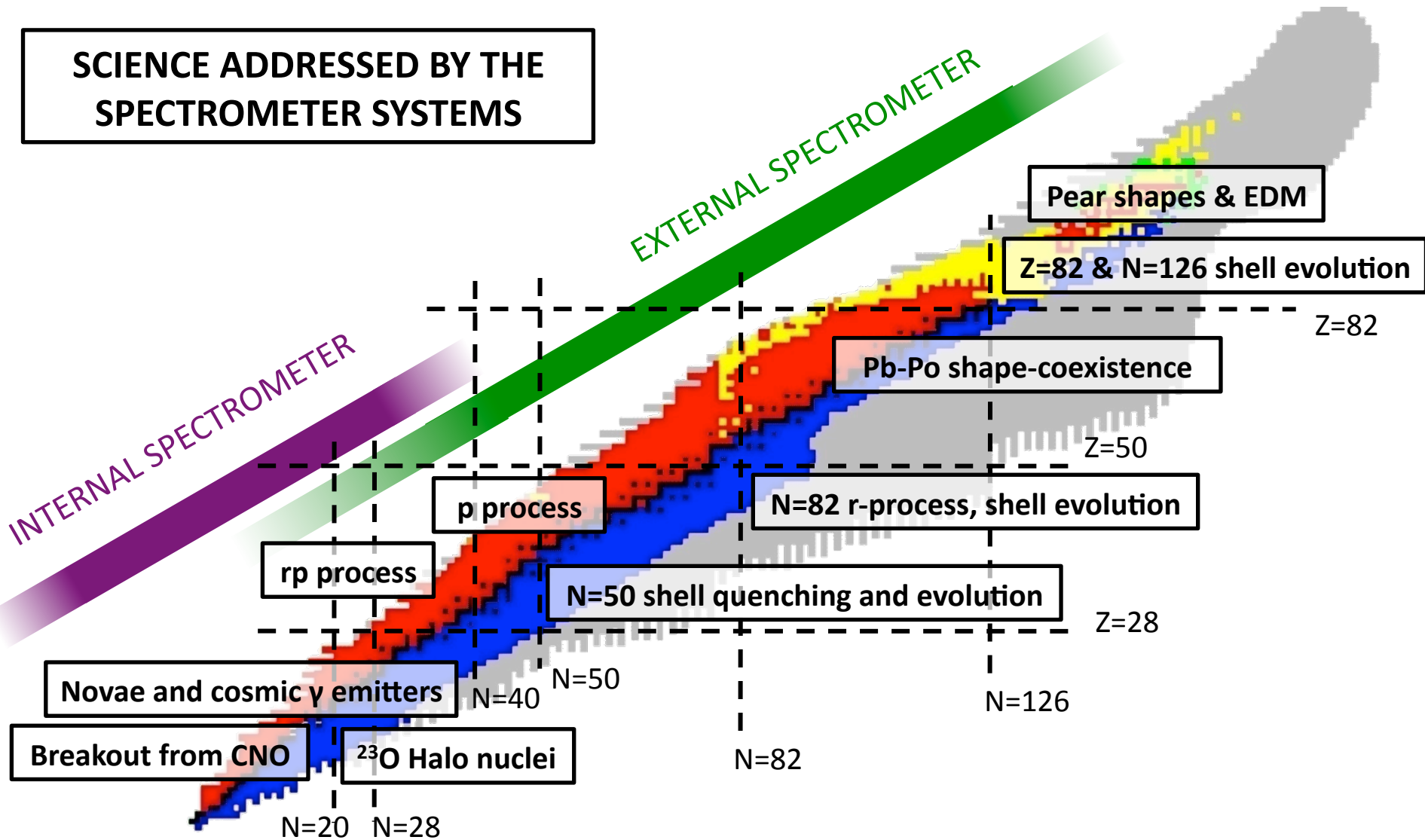


e.g. $Q\text{-value} = 1.01 E_{\text{lab}} (\text{MeV}) - 9.92 - 0.21 z (\text{cm})$
for $10 \text{ MeV/u } ^{132}\text{Sn}(d,p)$



4 x 125 x 25 mm; 0.5 - 1 mm strips; R³B-type readout

SCIENCE ADDRESSED BY THE SPECTROMETER SYSTEMS

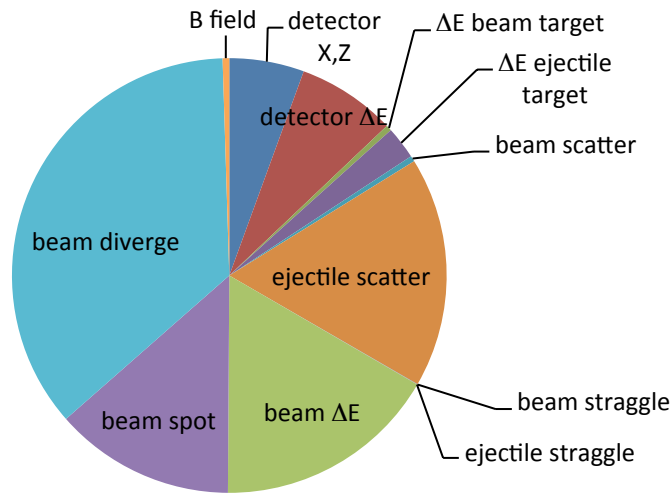


KEY PRIORITY of ISOL-SRS is to develop spectrometer systems for the TSR storage ring to fully exploit the range of radioactive beams from HIE-ISOLDE.

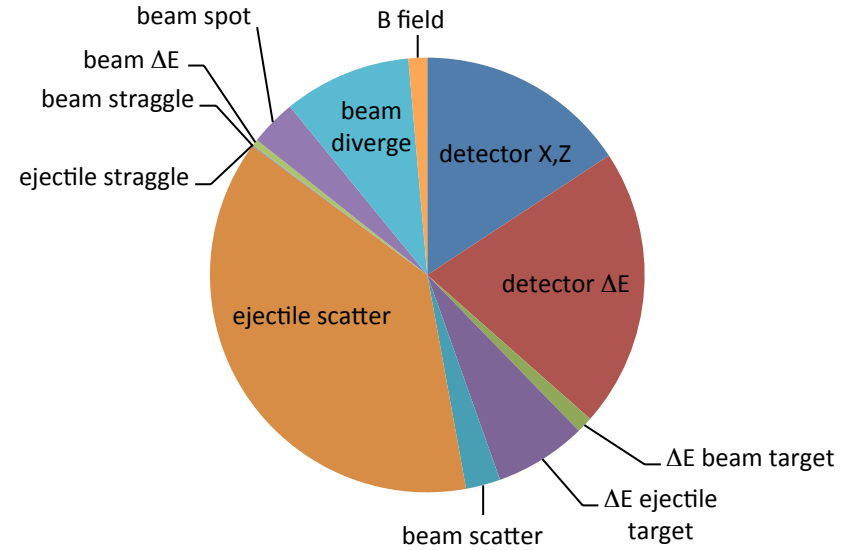
Q-VALUE RESOLUTION

EXTERNAL SPECTROMETER: $d(^{24}\text{Ne},p)^{25}\text{Ne}$ @ 10 MeV/u

With HIE-ISOLDE beam: 38 keV

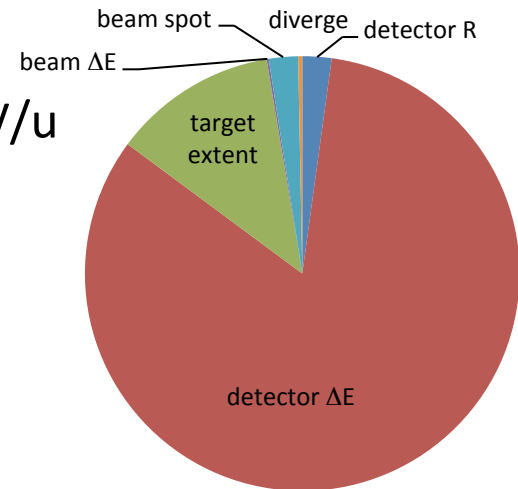


With cooled TSR beam: 22 keV

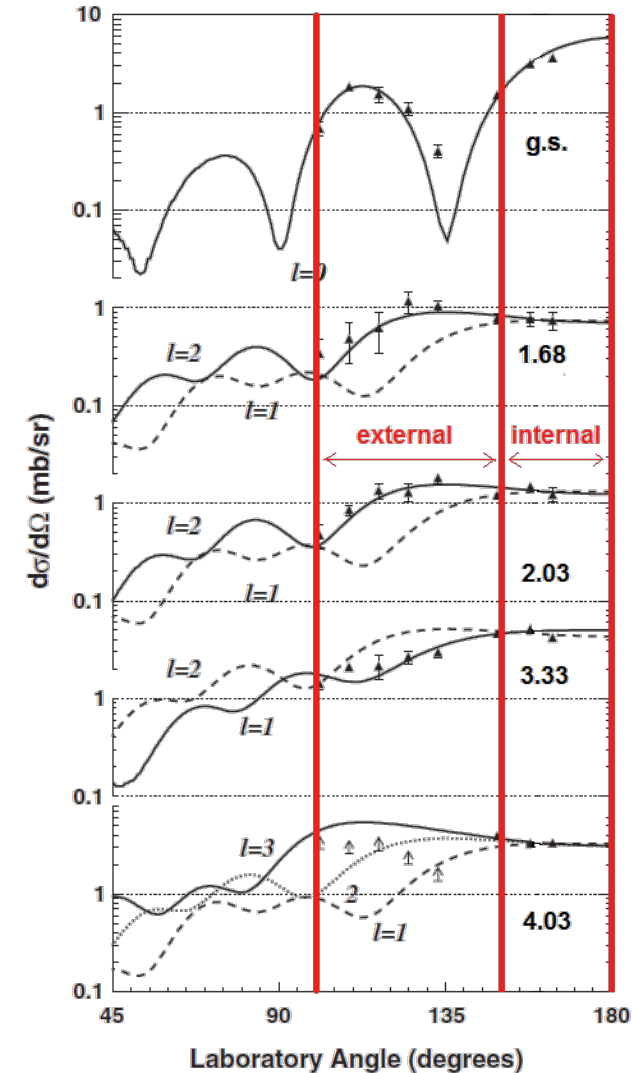
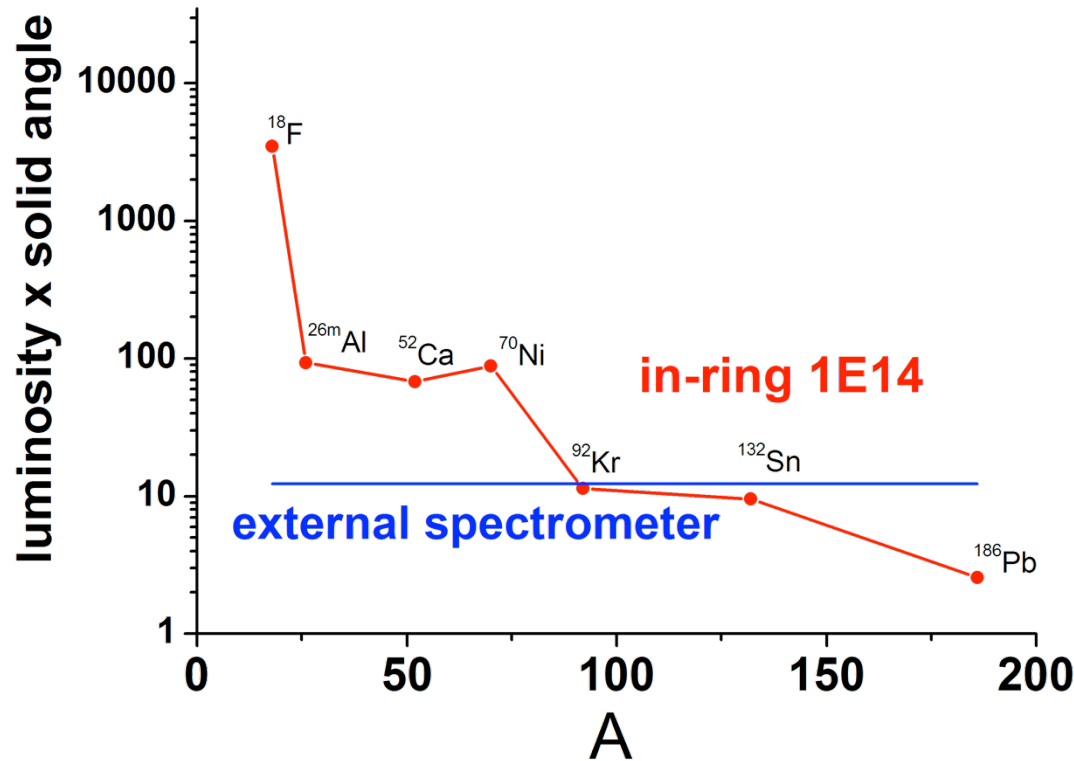


INTERNAL SPECTROMETER: $d(^{26}\text{Al},p)^{27}\text{Al}$ @ 10 MeV/u

Cooled TSR beam: 29 keV



Luminosity and acceptance

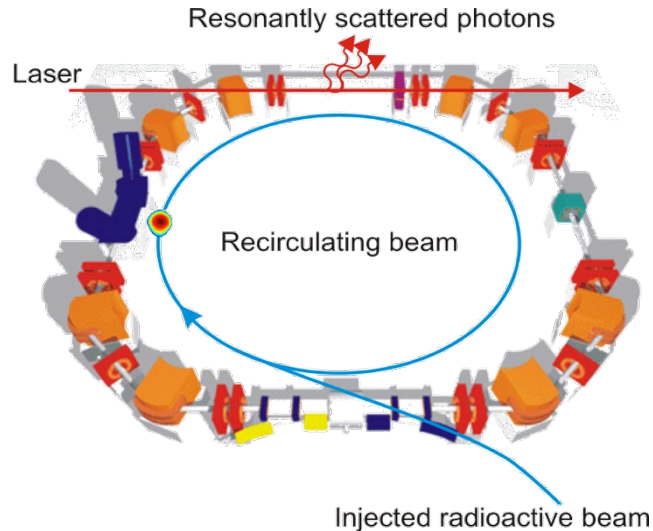
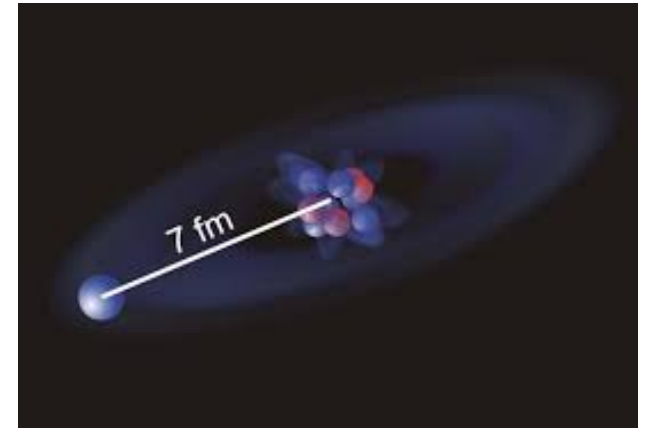


- **Internal:** Recirculation advantage for light species; any pure light gas, e.g. helium-3, can be used as target.
- **External:** Generally larger coverage in scattering angle, important for establishing angular distributions.

Laser spectroscopy

LASER SPECTROSCOPY:

Measure charge radii and moments of previously inaccessible unstable light nuclei. Use interaction of lasers with ions recirculating in the ring to induce fluorescent emission and study hyperfine structure.

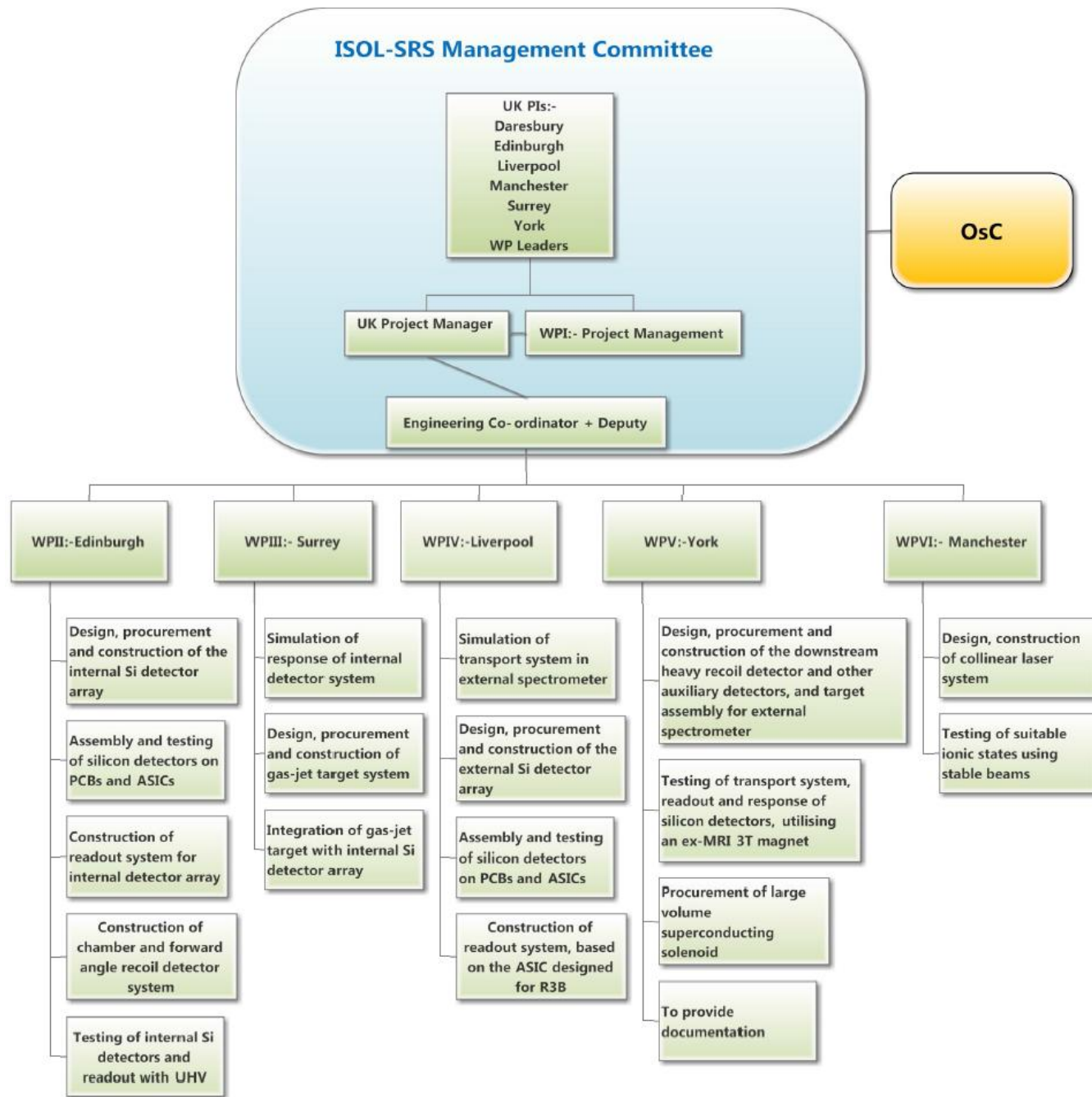


Produce He-like ions in EBIS of HIE-ISOLDE
(allows high precision in use of atomic models for calibration)

Inaccessible transition energies Doppler-shifted

Recirculation of the beam

Polarisation & purification possible



STFC Funding Story

Feb 2011 PPAN discusses balance of programme within STFC

Nov 2011 community meeting : HELIOS and HISRI merged to make ISOL-SRS

March 2012 Sol submitted

May 2012 – Sept 2013 STFC programmatic review

Nov 2013 ad-hoc Science Board panel: gas-jet WP removed

Jan 2014 Full PPRP proposal with £3M cap new money (actual bid £3.4M, total £6.1M)

April –June 2014 PPRP and Visiting Panel

August 2014 resubmit new figure of £4.3M new money because of shortfall in CG posts

Nov 2014 response from Science Board: £3.2M new money (£4.8M total)

Detectors and read-out for internal and external spectrometers funded but no magnet!!!

Jan 2015 project starts (announcement delayed)

Issues and plans

Silicon systems ready by end of 2018 according to project plan

External spectrometer could be deployed in ISOLDE hall but both magnet and funding for it needs to be found (possibility of capital funding in UK). 3rd beam line is supported from CERN.

Gas-jet target needs to be picked up by someone – possible role of Scandinavian groups

Internal spectrometer experiments matching timescale of the TSR – 2020s

Laser spectroscopy aspects to be pursued through consolidated grants

Others welcome to join – bring ancillary detectors etc.

FINIS