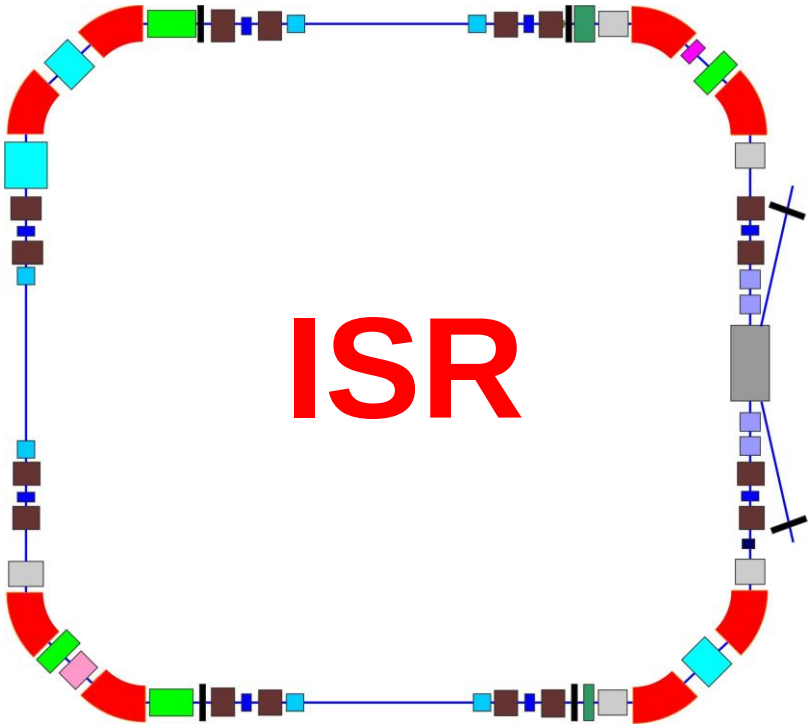
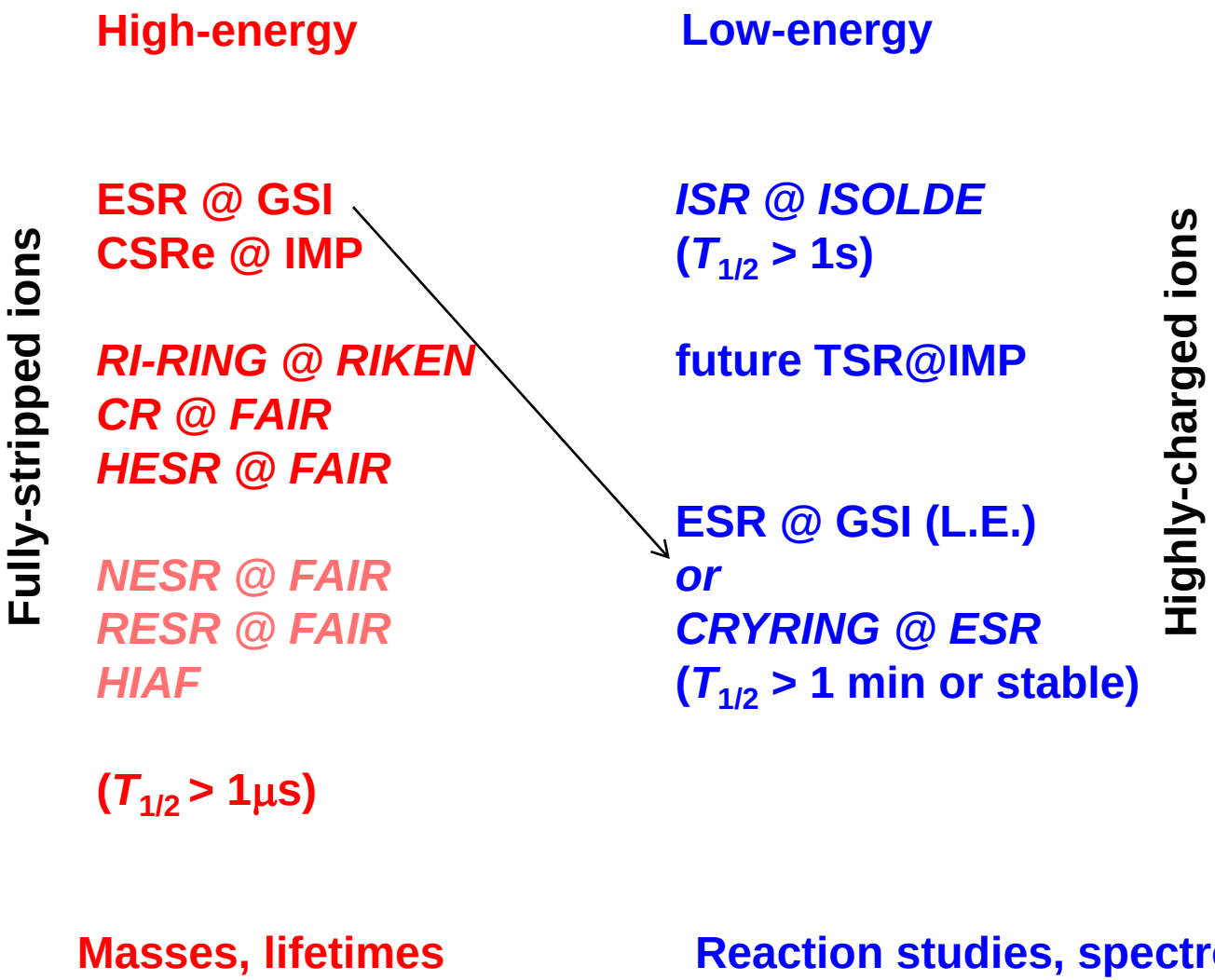
A new storage ring at ISOLDE (ISR): reminder on the physics cases



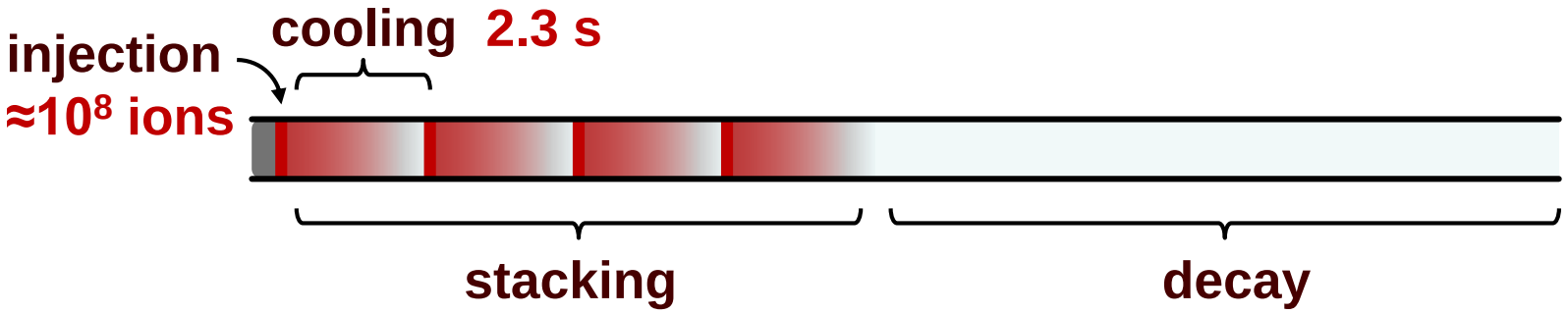
KLAUS BLAUM Max-Planck-Institute for Nuclear Physics, Heidelberg, Germany

World-wide storage rings

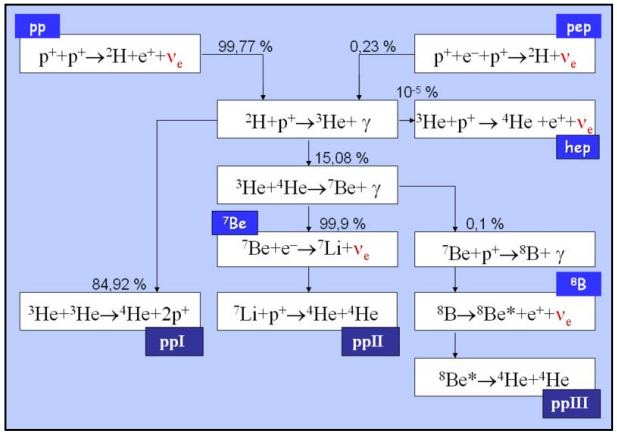


ISOLDE would become a unique facility with the world-only ISOL storage ring.
(different radionuclides, $T_{1/2}$ > 5 ms)

In-ring measurements



Beam is stored in REXTRAP ~ 1-2 s
Charge bred in REXEBIS 100 ms – 1 s
Injected into ISR within 35 μs
Stacking possible ≈$T_{1/2}$

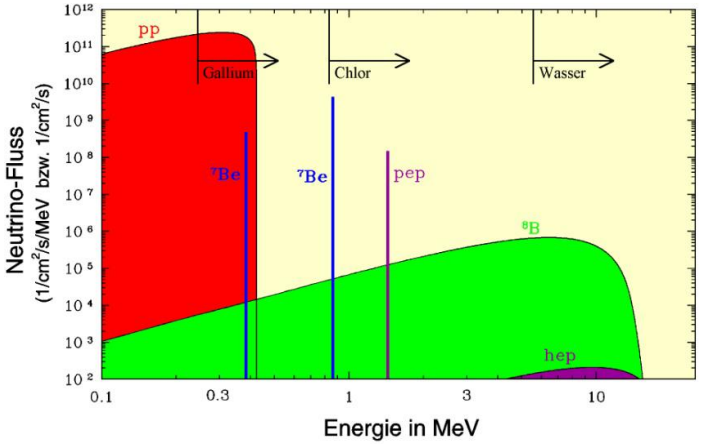


Half-life of H-like ^{7}Be in the Sun

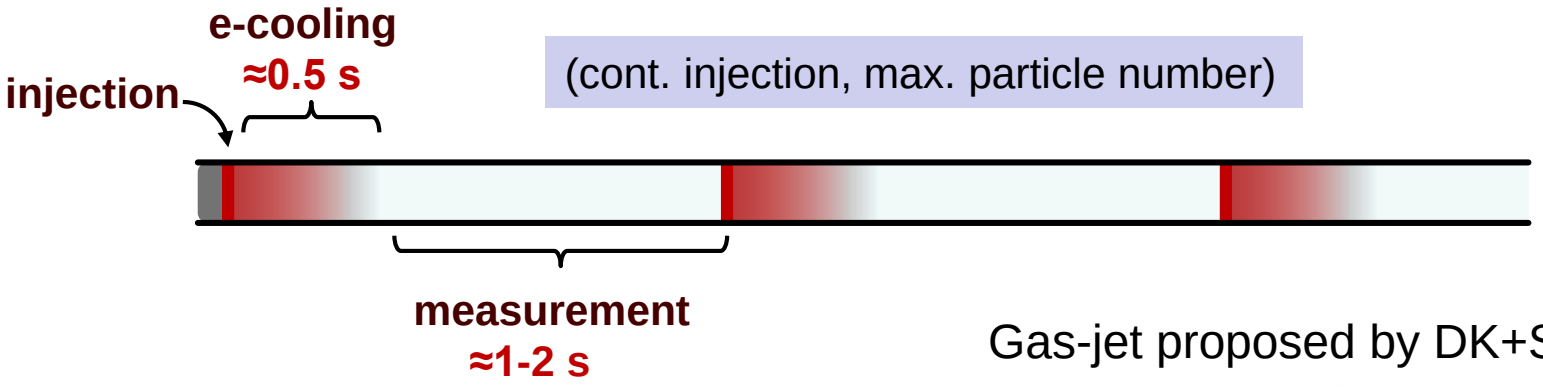
the missing gamma emitter ^{34m}Cl in Novae explosions

β-delayed proton emission of ^{11}Be

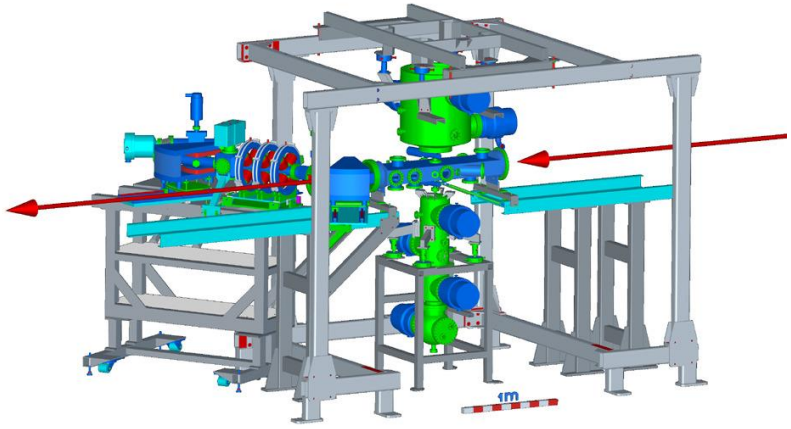
laser spectroscopy



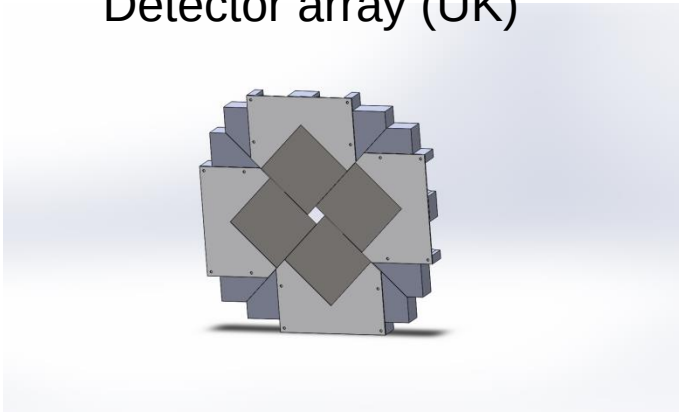
Measurements using internal target



Gas-jet proposed by DK+S

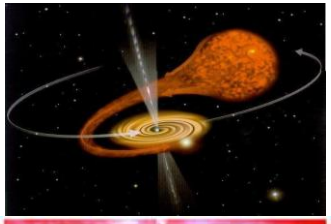


Detector array (UK)



p-capture

Direct measurement of (p,γ) or (α,γ) rates
(^{3}He,d) as surrogate of (p,γ)



X-ray bursts (rp-process)

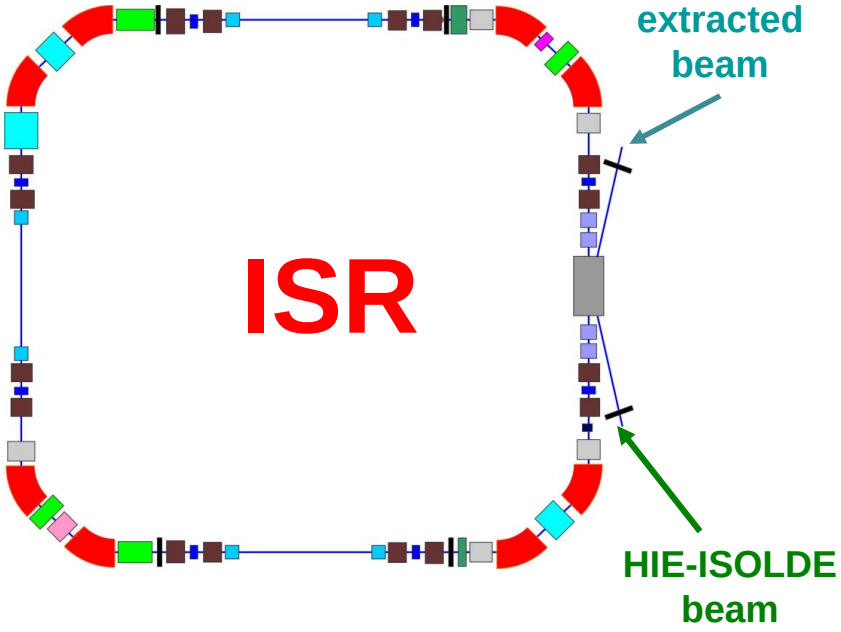
Galactic abundance of γ-ray emitter ^{26}Al

Measure ^{26m}Al(d,p)^{27}Al transfer reaction

Supernovae (r-process)

External target: beam extraction

- Extraction times
  can be reduced to ~ 1s
- Efficiency (cooled beam) ≈70%
- Properties similar to those
  of the cooled beam



probe tensor interaction:

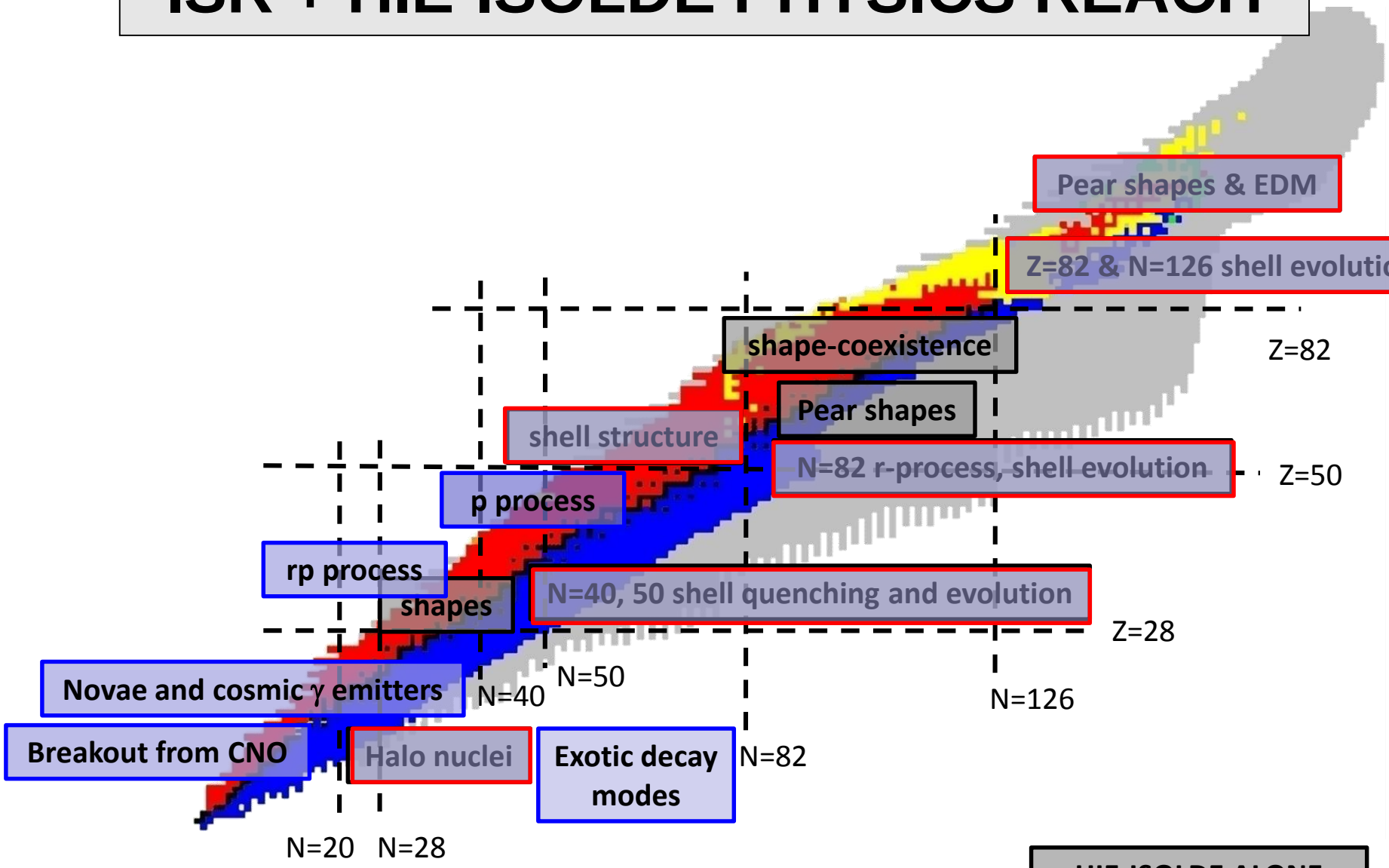
N=82 using ^{146}Gd, ^{148}Dy, ^{150}Er (d,p)

N=126 using ^{206}Hg, ^{212}Rn, ^{214}Ra (d,p)

pear-shaped nuclei for EDM

^{225}Ra(d,d')

ISR + HIE-ISOLDE PHYSICS REACH



Opens a number of new fields of research, including atomic physics with radionuclides!

HIE-ISOLDE ALONE

IMPROVE WITH ISR

NEW WITH ISR

Summary

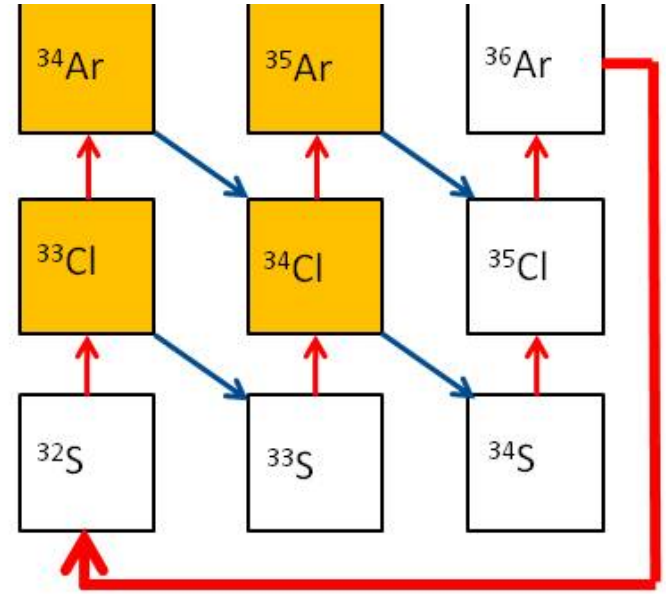
Several HIE-ISOLDE research areas will strongly benefit from the ISR.

New opportunities, particularly nuclear astrophysics, will come from the ISR.

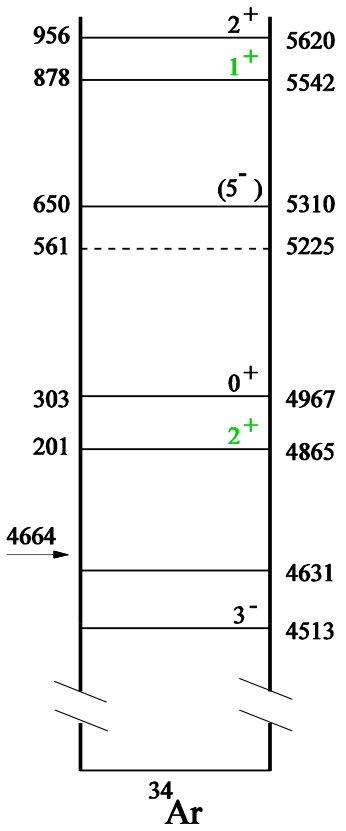
ISR can be (almost) integrated in the existing building (see talk by Manfred Grieser).

Spare slide

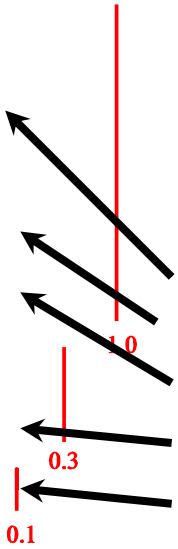
Example: $^{33}Cl(p,\gamma)^{34}Ar$ by-pass of ^{34m}Cl γ-ray emitting isomer
Novae physics
Production of $^{34m,g}Cl$



S. Bishop et al.



resonance strengths



assuming 10^6 stored ^{33}Cl we can expect:

1200 count/hr
1 count/s
2 counts/s
10 counts/day
1 count/s