Experiment S323:
β-Decay of very neutron-rich Rh, Pd, Ag nuclei including the r-process waiting point ^{128}Pd

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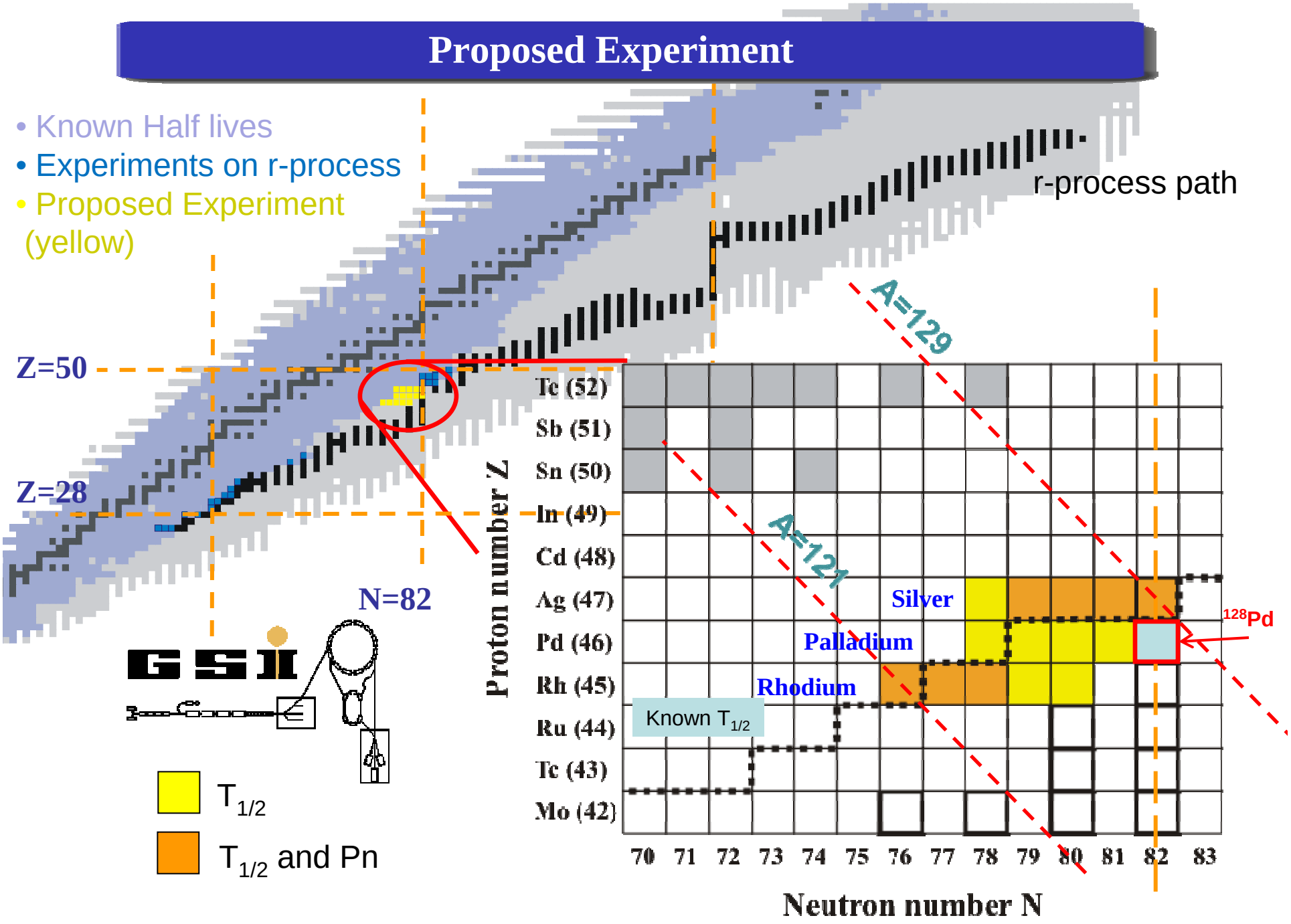
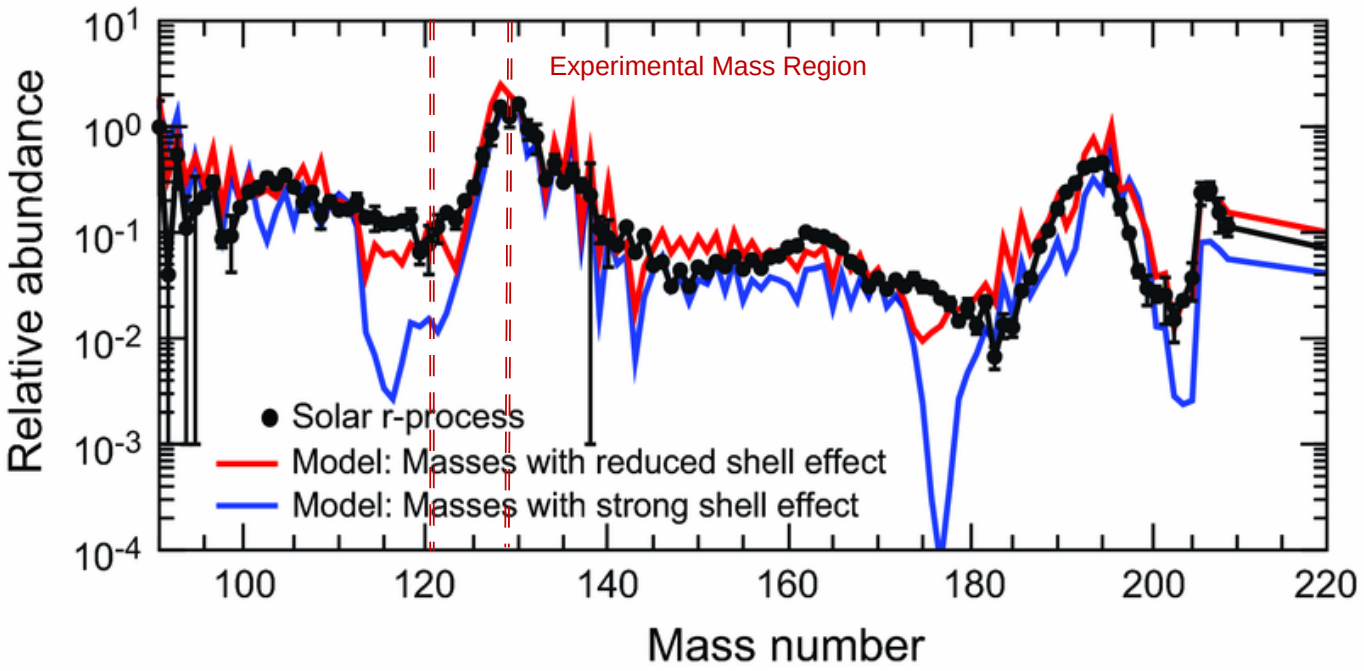
Approved April 2006

Proposed Experiment

- Known Half lives
- Experiments on r-process
- Proposed Experiment (yellow)

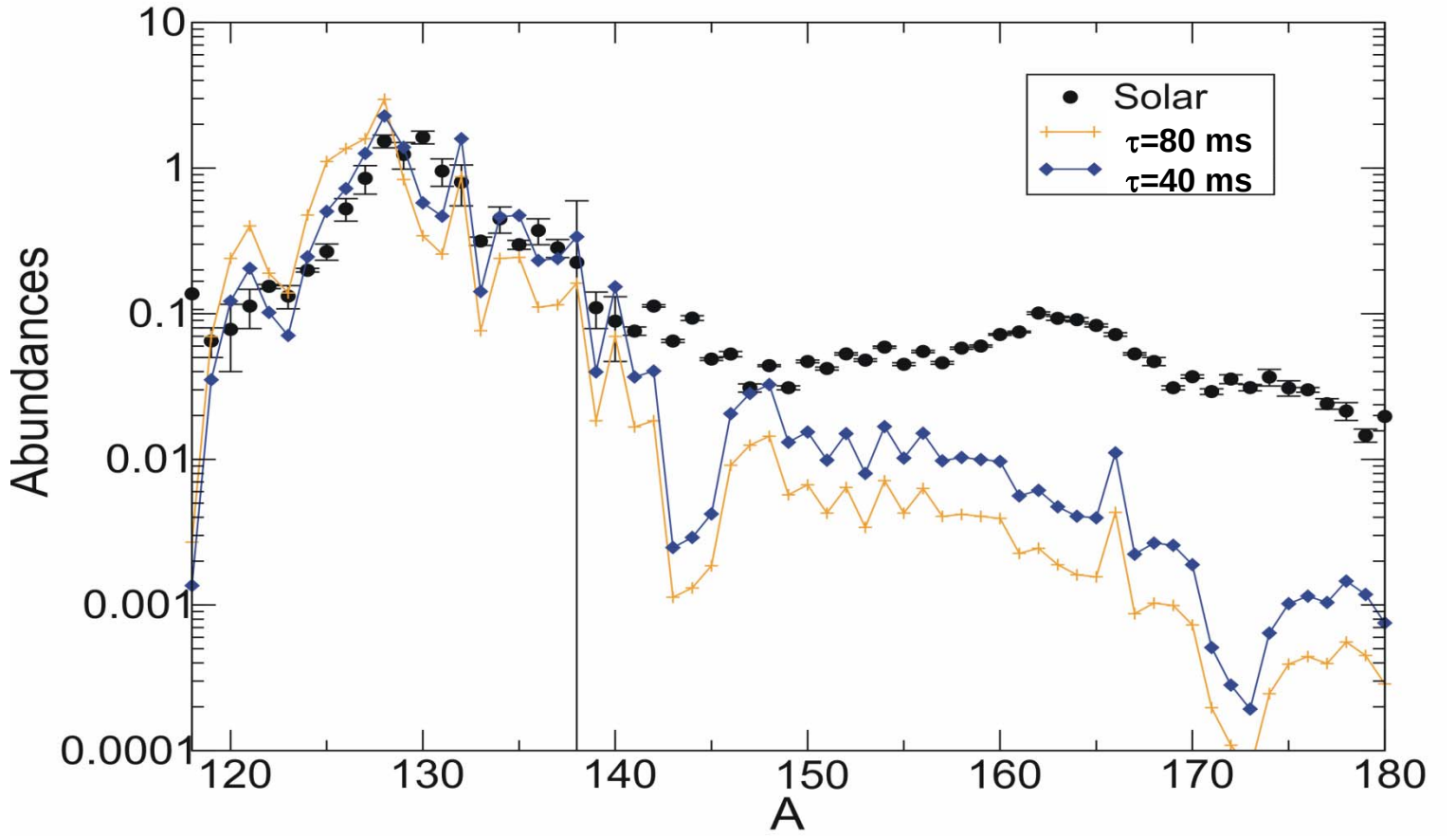


Motivation



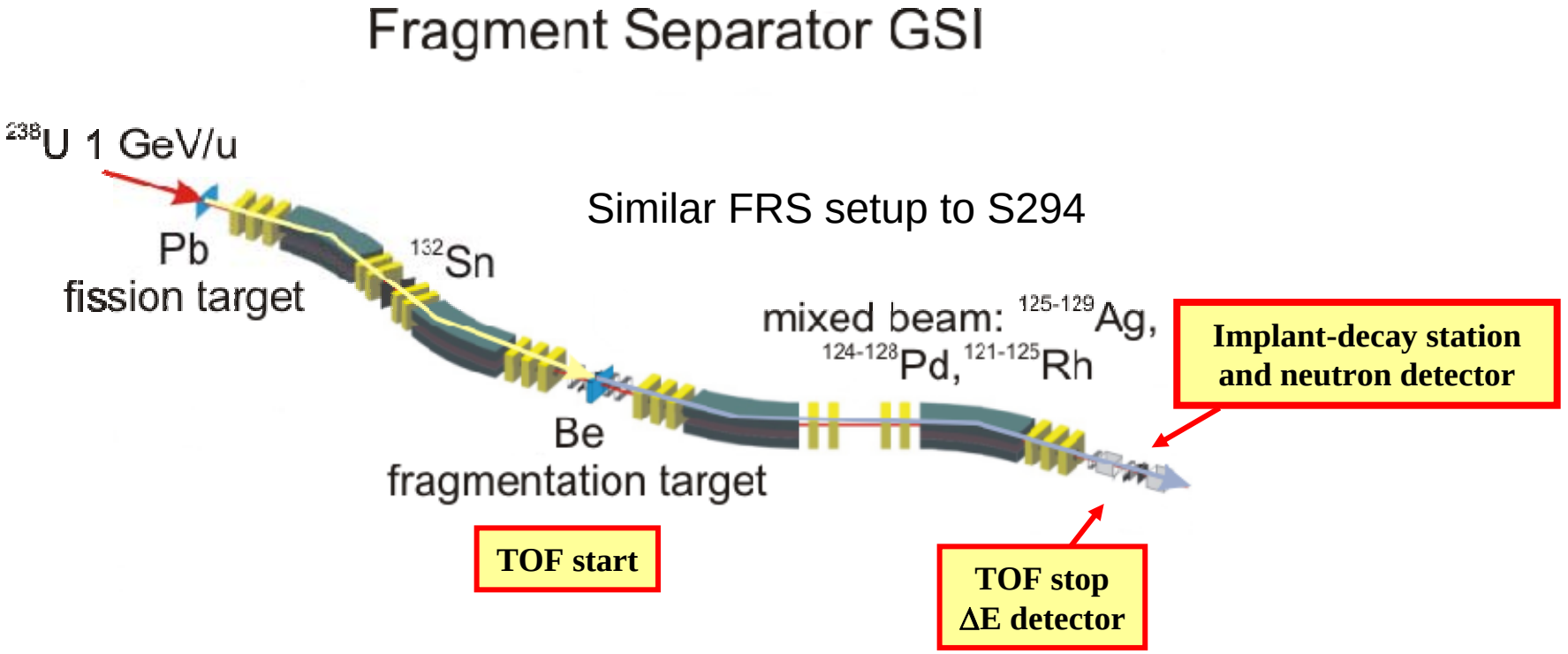
1. β-delayed neutron emission probabilities (Pn) are direct inputs in r-process calculations: set abundances in the important A=115-125 region
2. ^{128}Pd is first bottleneck isotope of the N=82 abundance peak (sets timescale for following nucleosynthesis)
   - Astrophysics and Nuclear Physics underlying the r-process
   - N=82,126 shell closure give rise to abundance peaks around A=130,195
   - Discrepancy between classical r-process models with differing masses

Motivation



3. ^{128}Pd half-life affects predictions of Th, U cosmochronometers in ultra-metal poor stars
4. Both half-lives and Pn values are rough indicators of nuclear structure (reliable extrapolations to more exotic nuclei)

Experimental setup

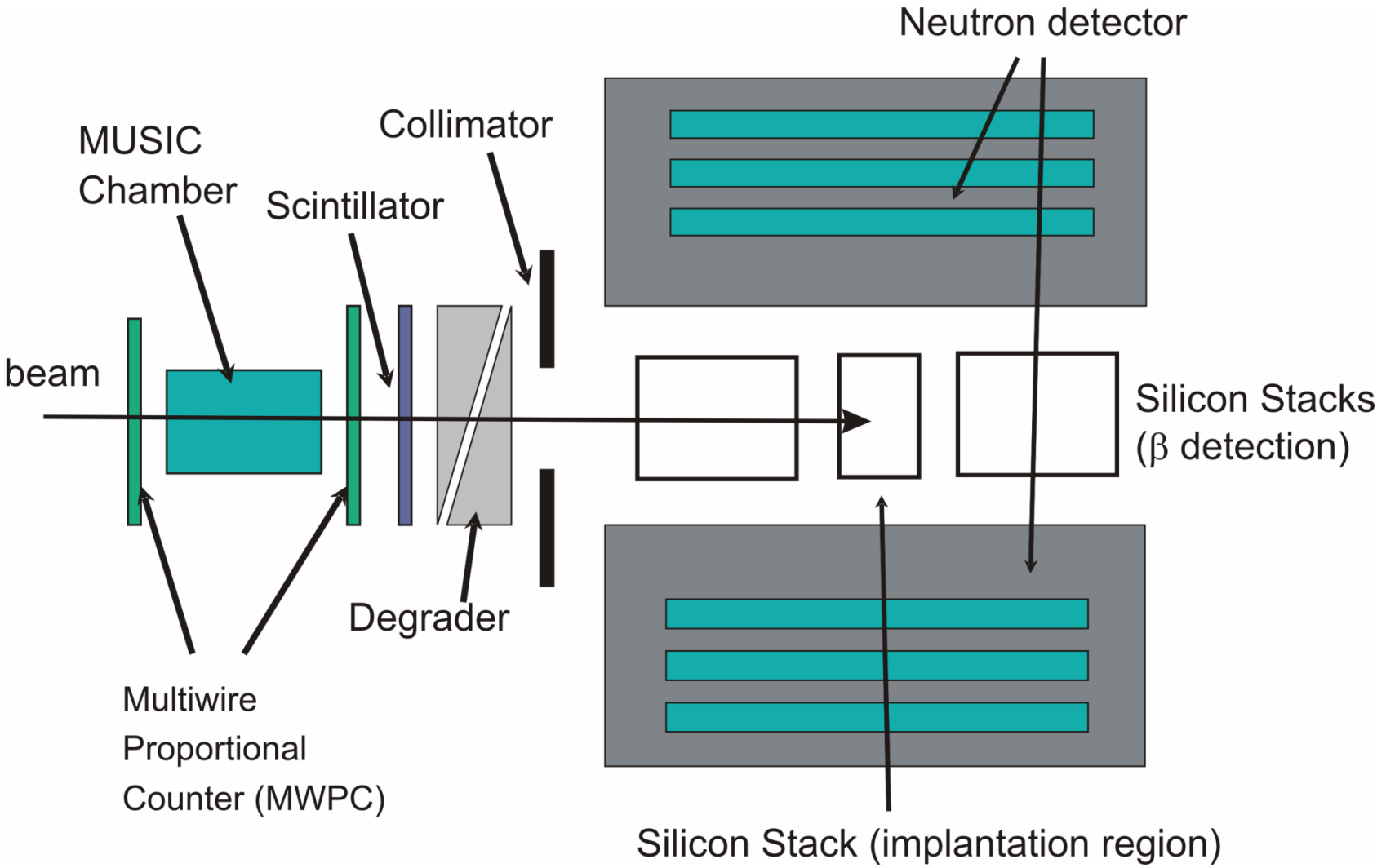


Assuming an incident intensity of $2*10^9$ particles/spill

Transmission to F2 ~ 8% 10^4 ions/spill ^{132}Sn

Transmission F2-F4 ~ 40% total implantation rate ~10 /s

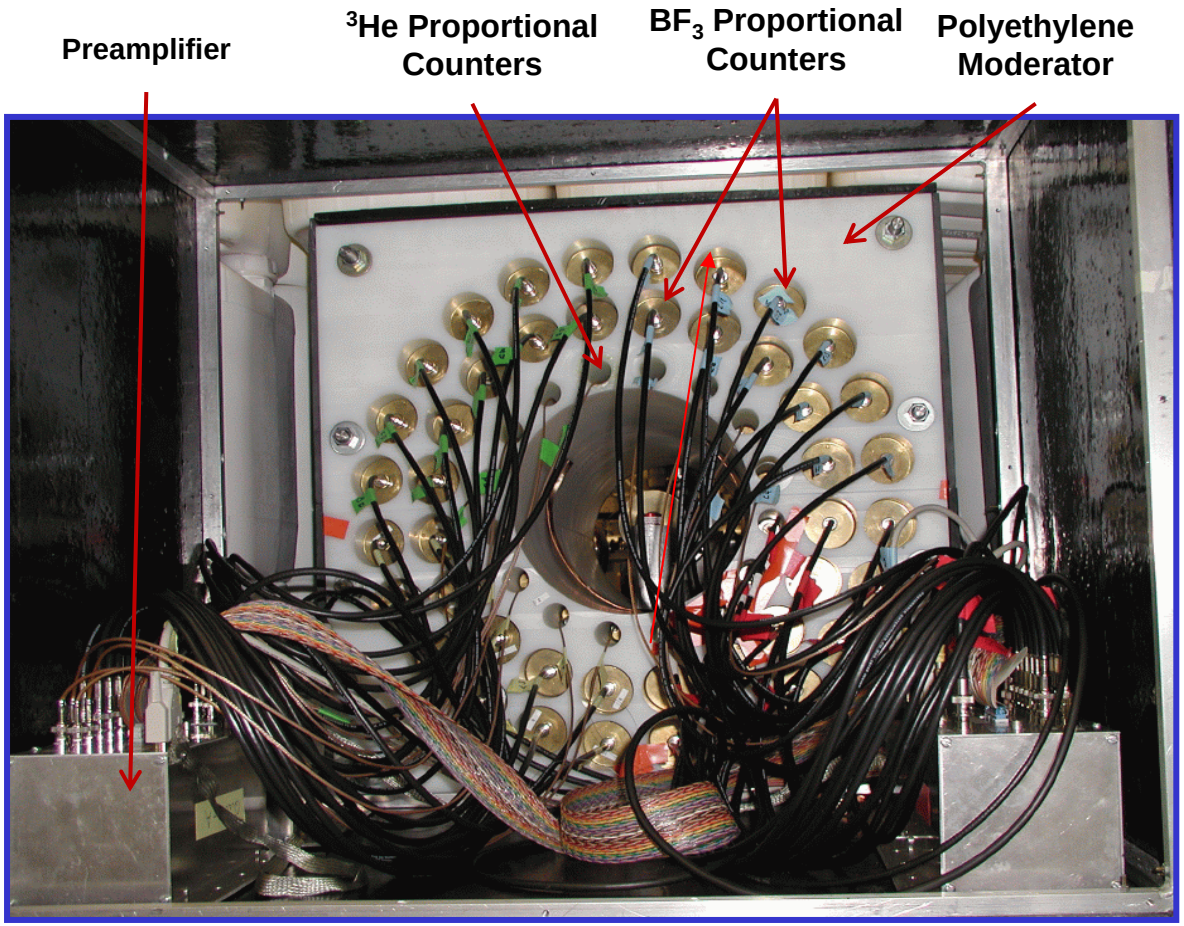
Implant-decay station and neutron detector



Equipment Need at F2:
Be target, Collimator, and Scintillator

Equipment Need at F4:
MUSIC, Scintillator, Degrader, and Collimator

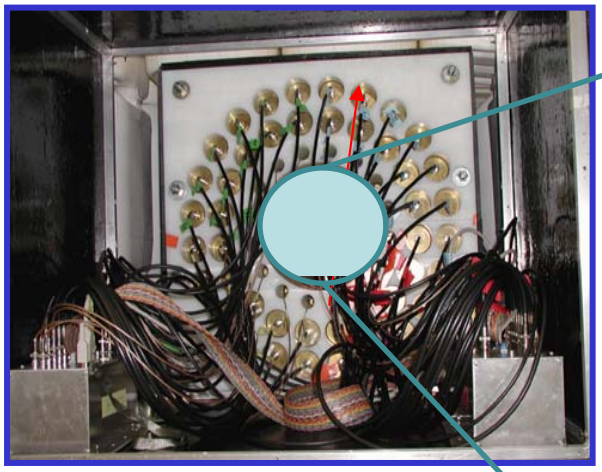
Neutron & Beta Detectors



Neutron Emission Ratio Observer (NERO)

- Currently undergoing final testing at NSCL
- Exploring Cosmic Ray Shield
- Can be at GSI by April 1

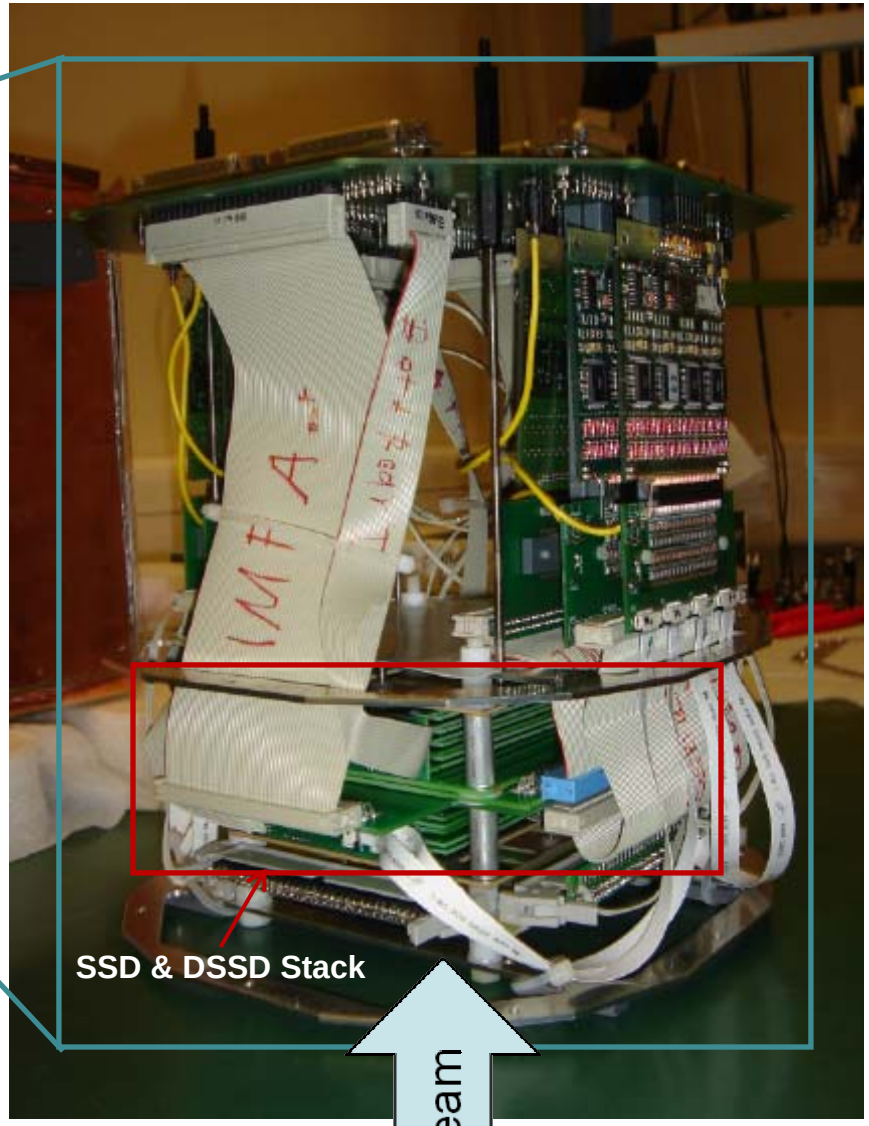
Neutron & Beta Detectors



NERO

Silicon Implantation Detector and Beta Absorber (SIMBA)

- **Currently at Munich**
- **Can Be at GSI by April 1st**



Beam time request

Parasitic beam time	
projectile	beamtime
^{136}Xe(1AGeV)	2days

Main beam time			
projectile	1st FRS section	2nd FRS section	beamtime
^{238}U(1AGeV)	FRS calibrations		1day
^{238}U(1AGeV)	^{132}Sn	cocktailbeam	5days

Total approved beam time	
main beam time ^{238}U	6days
parasitic beam time ^{136}Xe	2days

Equipment ready at beginning of May
We request beamtime any time in May, or after July 2009