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

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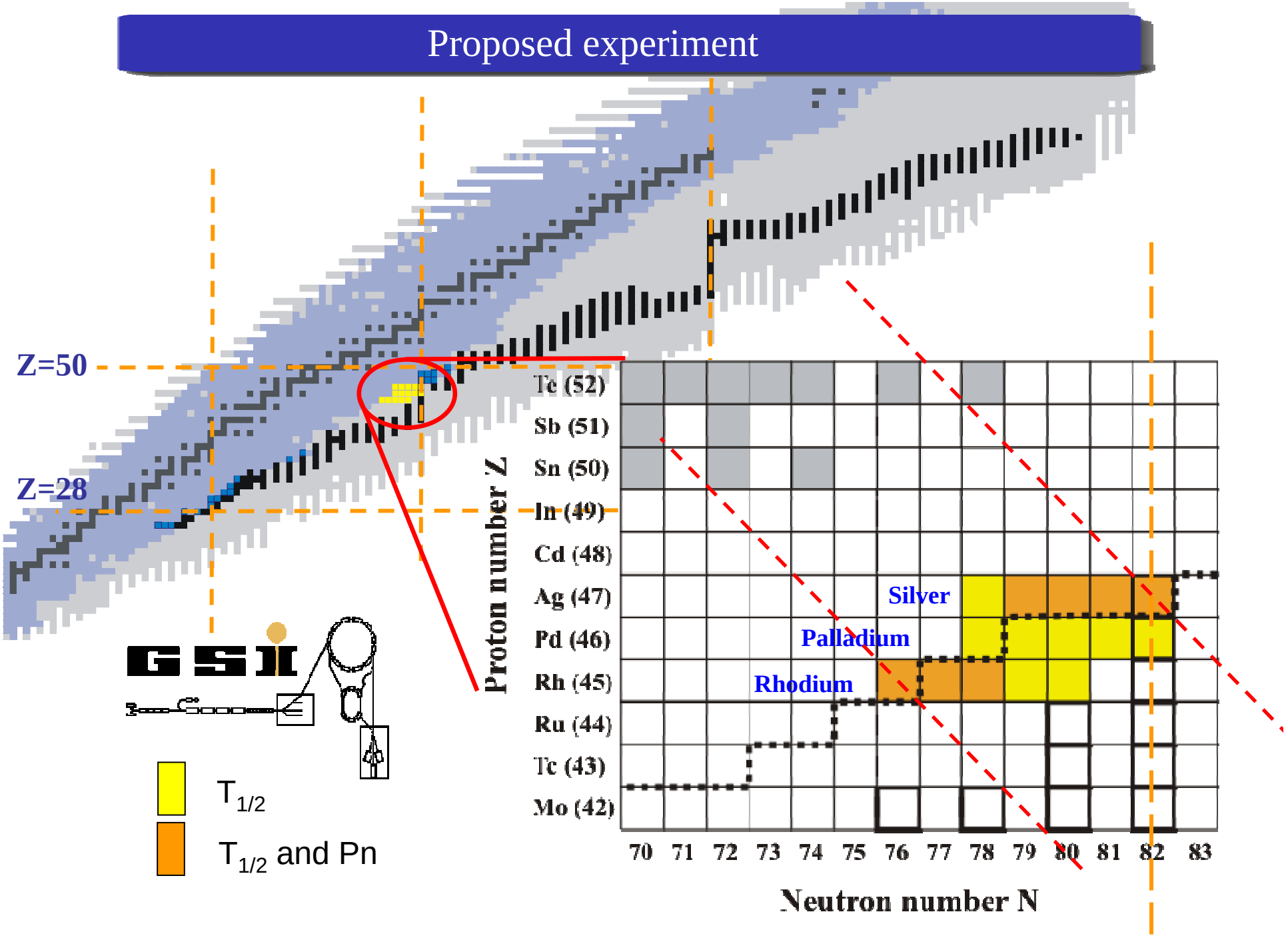
Approved April 2006

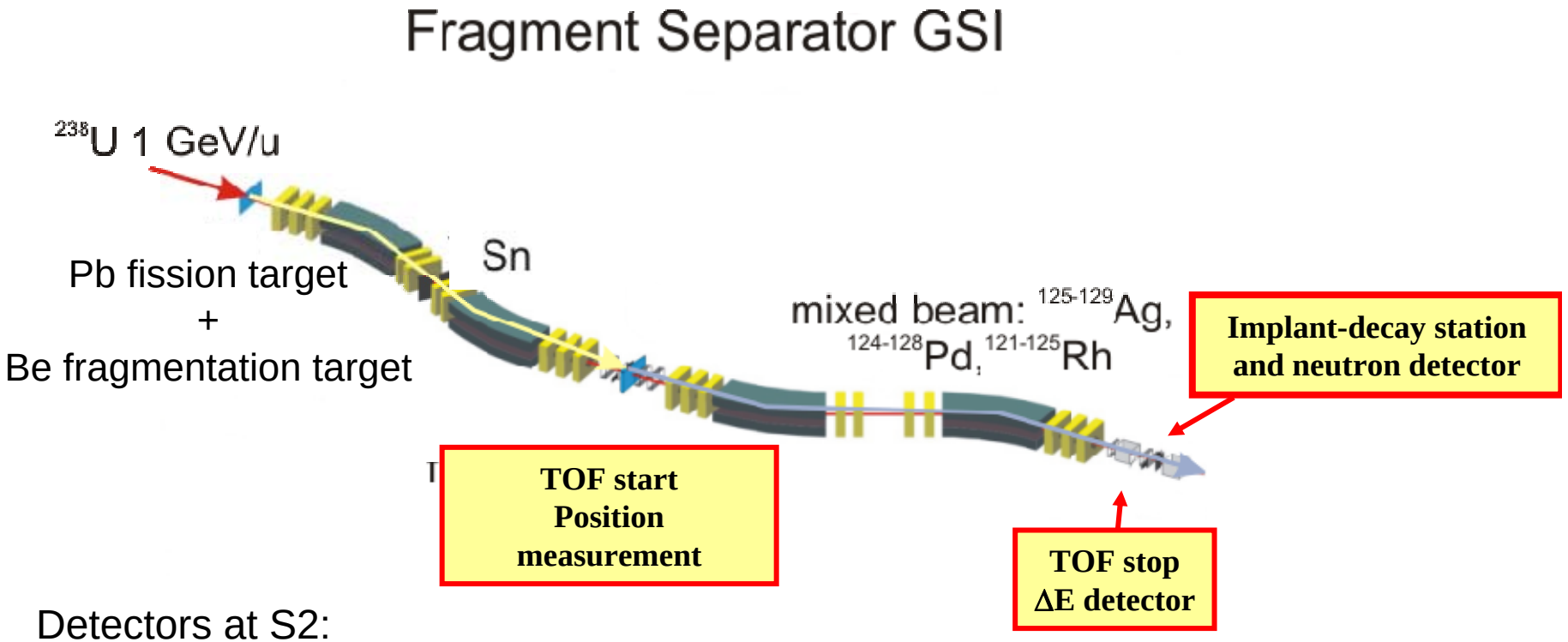
Proposed experiment



Motivation

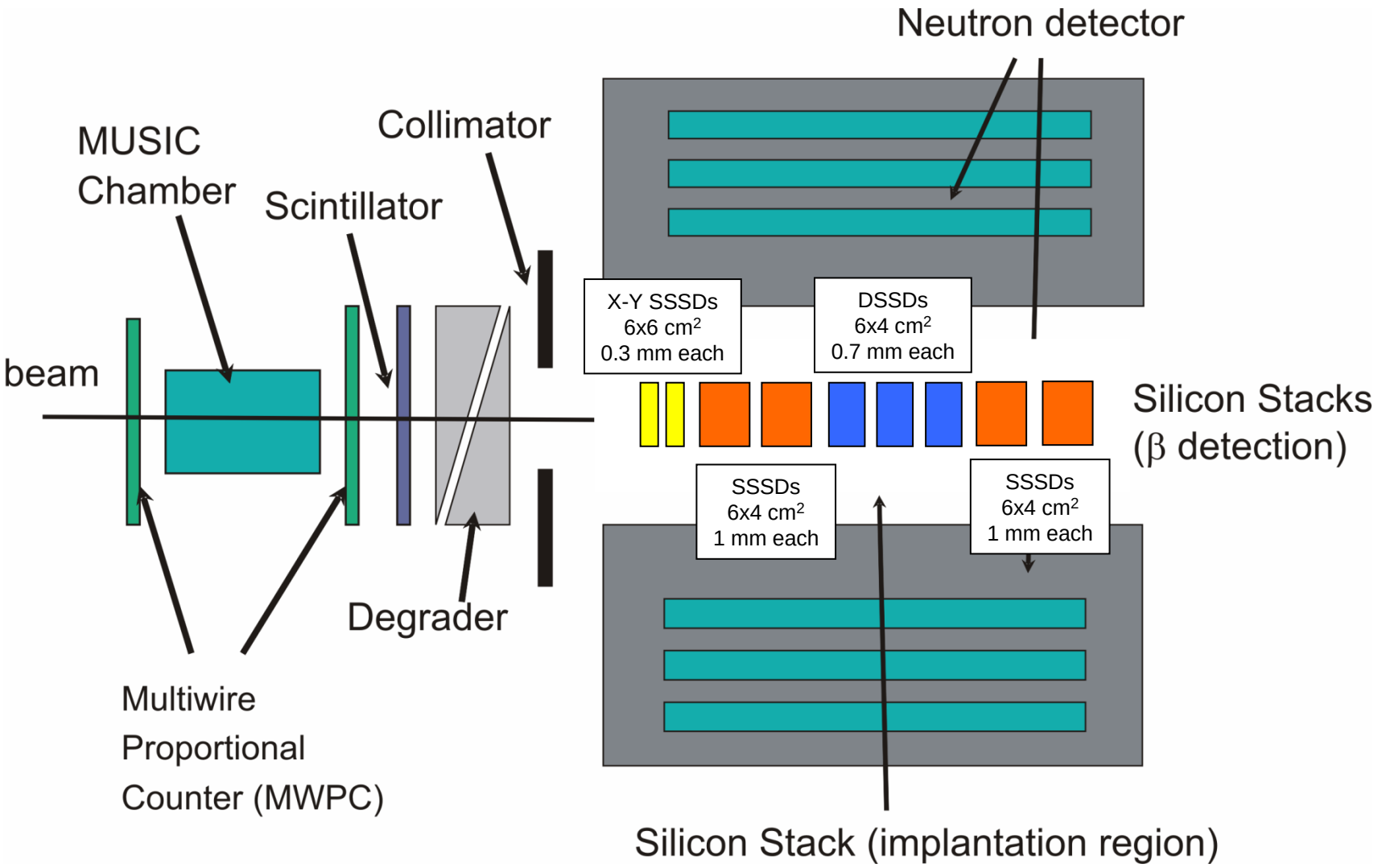
1. **β-delayed neutron emission probabilites (Pn) are direct inputs in r-process calculations: set abundances in the important A=115-125 region**
2. **^{128}Pd is first bottleneck isotope of the N=82 abundance peak (sets timescale for following nucleosynthesis)**
3. **^{128}Pd half-life affects predictions 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



Detectors at S2:
TPC1 + TPC2 + Scintillator

Implant-decay station and neutron detector



Beam estimates

- Fission Pb target 1000 mg/cm2
- Fragmentation Be target 4000 mg/cm2
- Beta efficiency 90%
- Neutron detector efficiency 35%

experimental
COFRA estimates
unknown T1/2

	Cross Section [mb]	Transmission [%]	Intensity [pp spil]	Intensity/10 [pps]	Pn (%)	detected beta/day	beta-n/day
Ag129	5.42E-03	3.60%	7.91E-02	7.91E-03	13.1	615.24	28.21
Ag128	3.00E-02	2.30%	2.80E-01	2.80E-02	4.9	2174.65	37.30
Ag127	1.50E-01	1.60%	9.73E-01	9.73E-02	4.6	7563.98	121.78
Pd128	6.77E-05	5.37%	1.47E-03	1.47E-04	7.6	11.46	0.30
Pd127	3.61E-04	5.23%	7.65E-03	7.65E-04	3.9	59.50	0.81
Pd126	2.88E-03	3.64%	4.25E-02	4.25E-03	2.9	330.39	3.35
Pd125	7.23E-03	1.76%	5.16E-02	5.16E-03	1.5	401.04	2.11
Pd124	4.00E-02	0.46%	7.46E-02	7.46E-03	0.4	579.91	0.81
Rh124	7.49E-05	4.61%	1.40E-03	1.40E-04	11.2	10.88	0.43
Rh123	3.99E-04	3.53%	5.72E-03	5.72E-04	12.5	44.44	1.94
Rh122	3.19E-03	1.47%	1.90E-02	1.90E-03	10.5	147.64	5.43
Rh121	8.00E-03	0.31%	1.01E-02	1.01E-03	6.6	78.16	1.81

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 requested beam time

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

We request beamtime in 2010 (2nd half preferred)

(PhD Karl Smith, collaboration with Helmholtz Nachwuchsgruppe Dillmann)