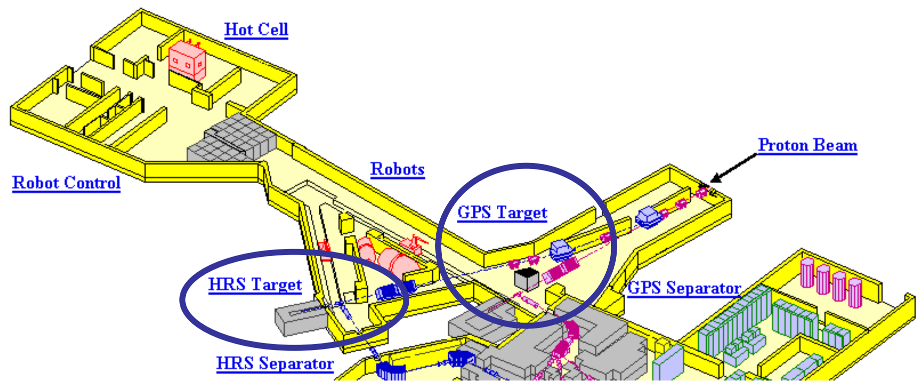
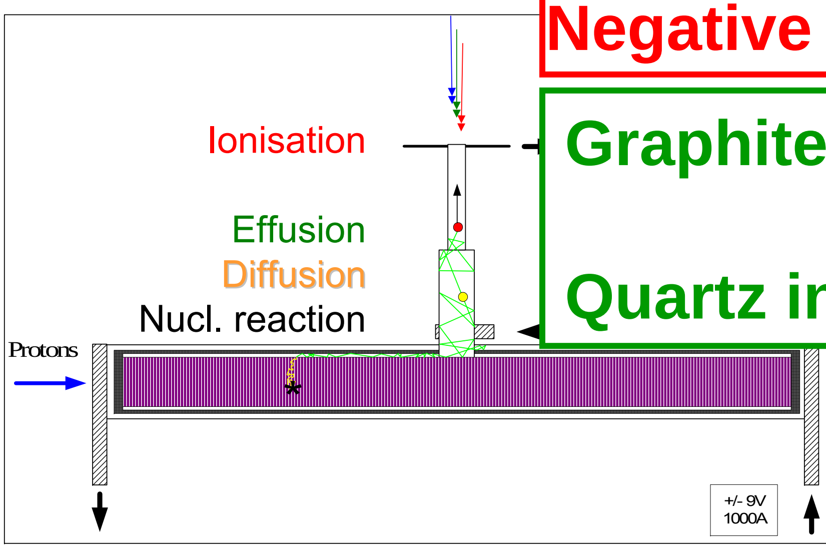
Target and Ion Source Development in 2005

EURISOL Design Study 100kW targets



Pre-Separation, Separation, Extraction, beam optics



Negative surface ion source

Graphite transfer line

Quartz insert

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M. Eller (fellow doct)
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E. Bouquerel (USAS Marie Curie)
M. Menna (Fellow Marie Curie)
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PH-IS

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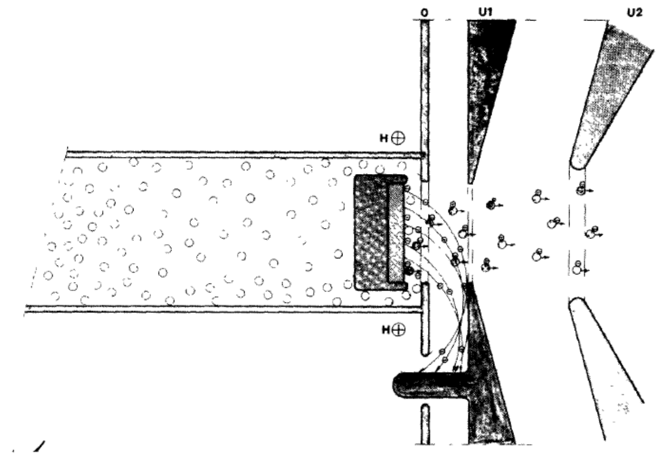
M. Turrión Targisol
S. Fernandes

Negative Surface Ion Source LaB_6

(UCx – 263)

- Work function 2.7 eV (2.4-3.3)
- Used in 1980's at ISOLDE (1^{st} publi in 70)
- Operates at 1300°C
- 50% max efficiency (geometry)
- Elements with high e^- affinity (F, Cl, Br, I, At 2.8 eV, ~ Au)

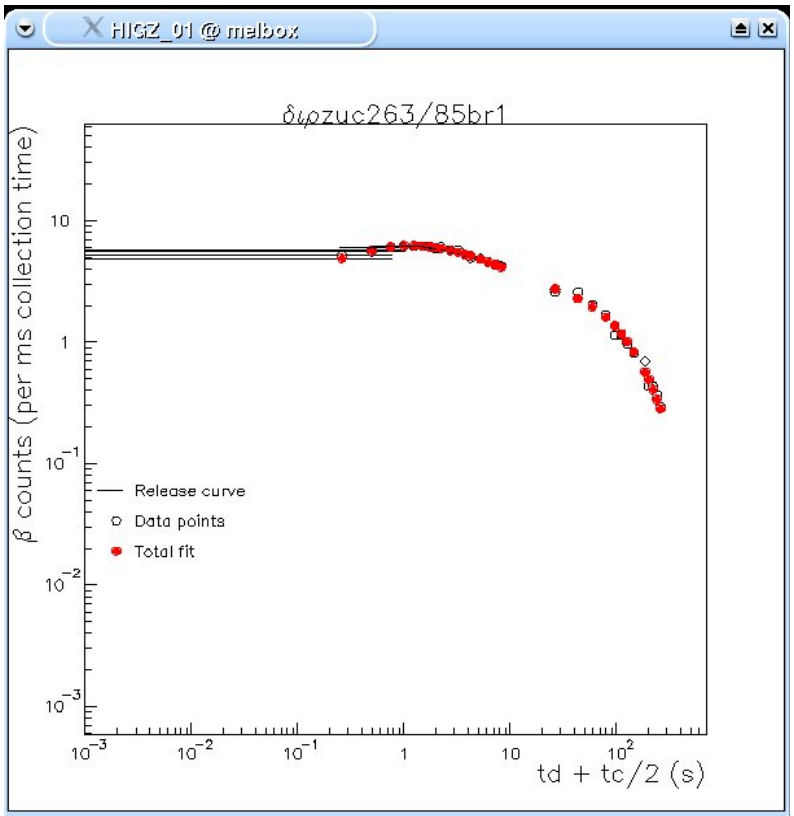


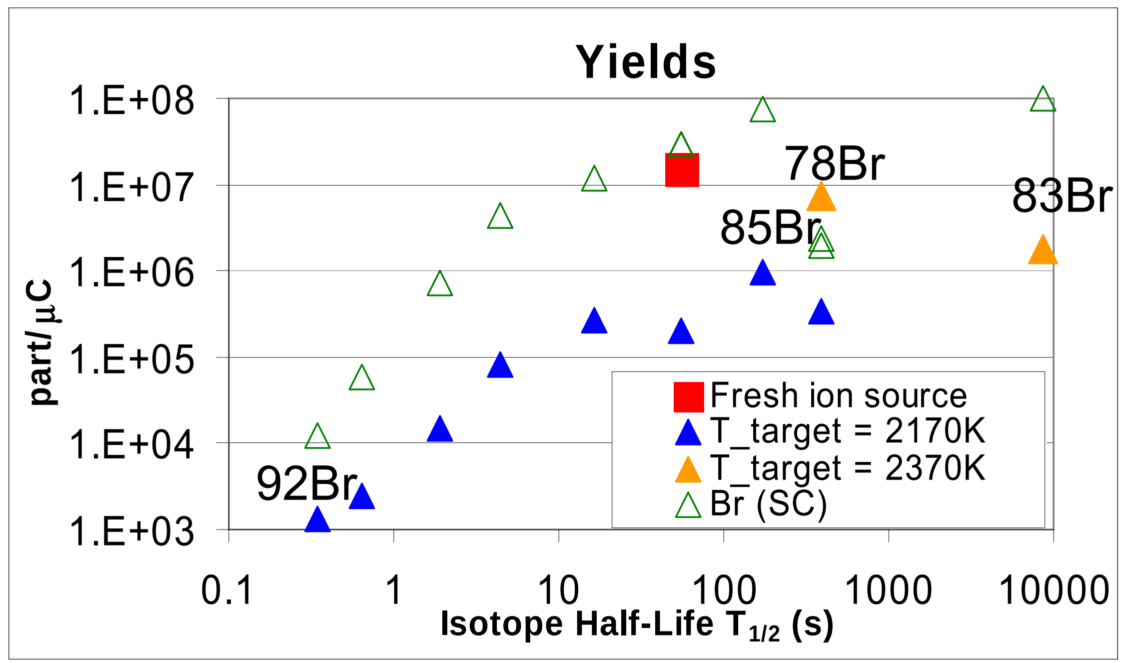
$$\alpha = \frac{g_-}{g_0} \exp\left(\frac{A - \phi_0 + f(E) - c\theta}{kT}\right)$$

Nucl Instr Methods 186 (1981), 307 and 275

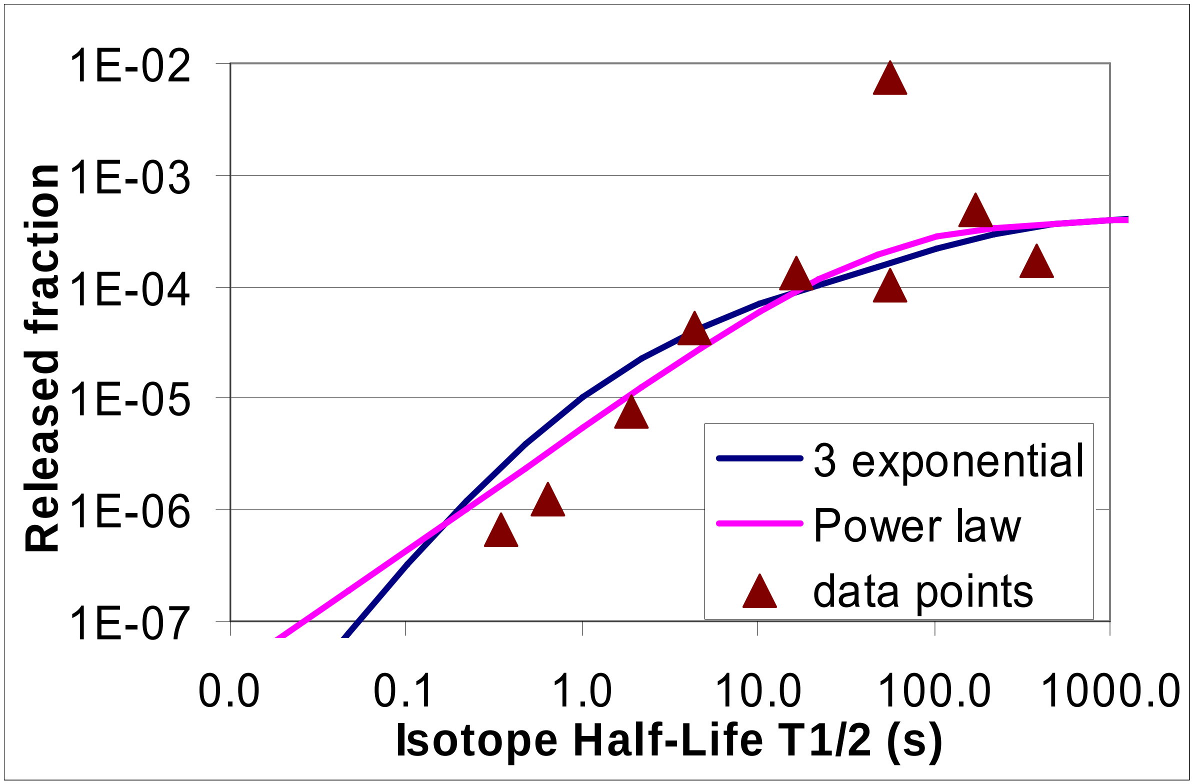
Release and Yields of Bromine

Neutron rich Bromine: 83Br – 92Br and 78Br





Comparative study of released fraction



S. Lukić,
K.H Schmidt et al.,
GSI

$$p(t) = \left(1 - \exp\left(-\frac{\ln 2t}{t_r}\right)\right)\left(\alpha \exp\left(-\frac{\ln 2t}{t_f}\right) + (1-\alpha)\exp\left(-\frac{\ln 2t}{t_s}\right)\right)$$

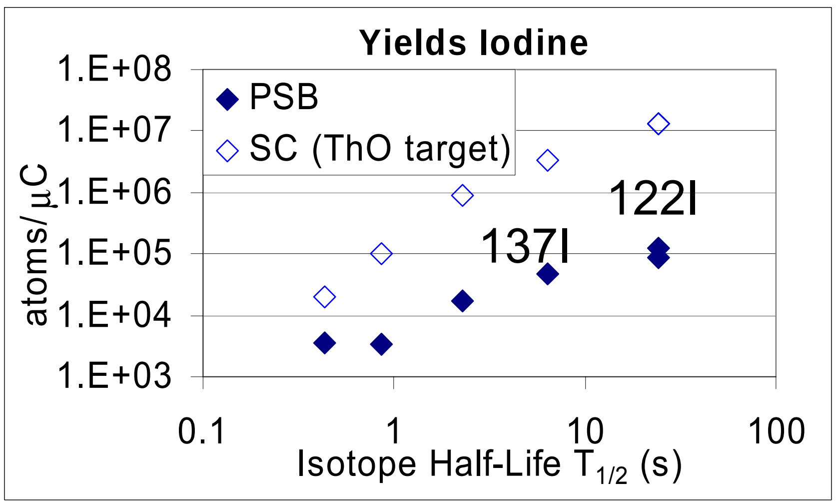
t_r = 0.31 s
t_f = 3.9 s
t_s = 120 s
α = 0.87

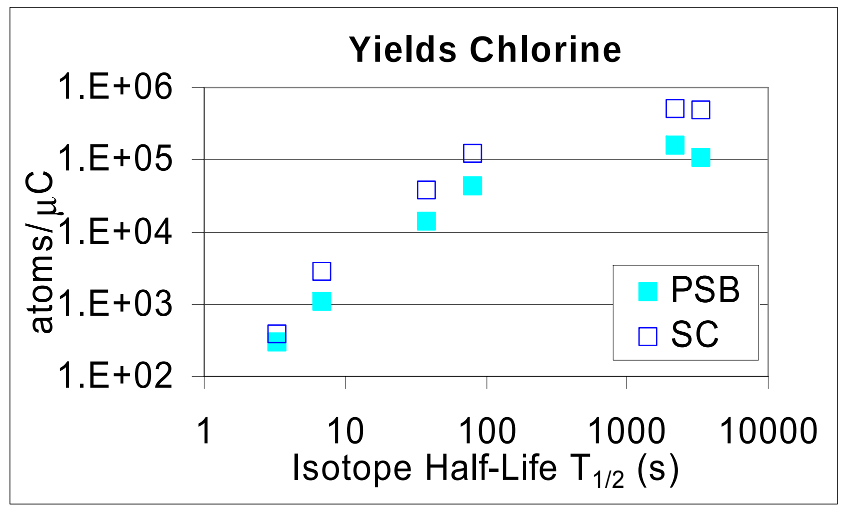
ε_0 = 0.04%
t_0 = 50 s
α = 1.1

$$\varepsilon(T_{1/2}) = \frac{\varepsilon_0}{1 + \left(T_{1/2}/t_0\right)^{-\alpha}}$$

Halogen Yields

Neutron rich Iodine 137 – 141 I   and 122 I
Neutron rich Chlorine 38 – 43 Cl

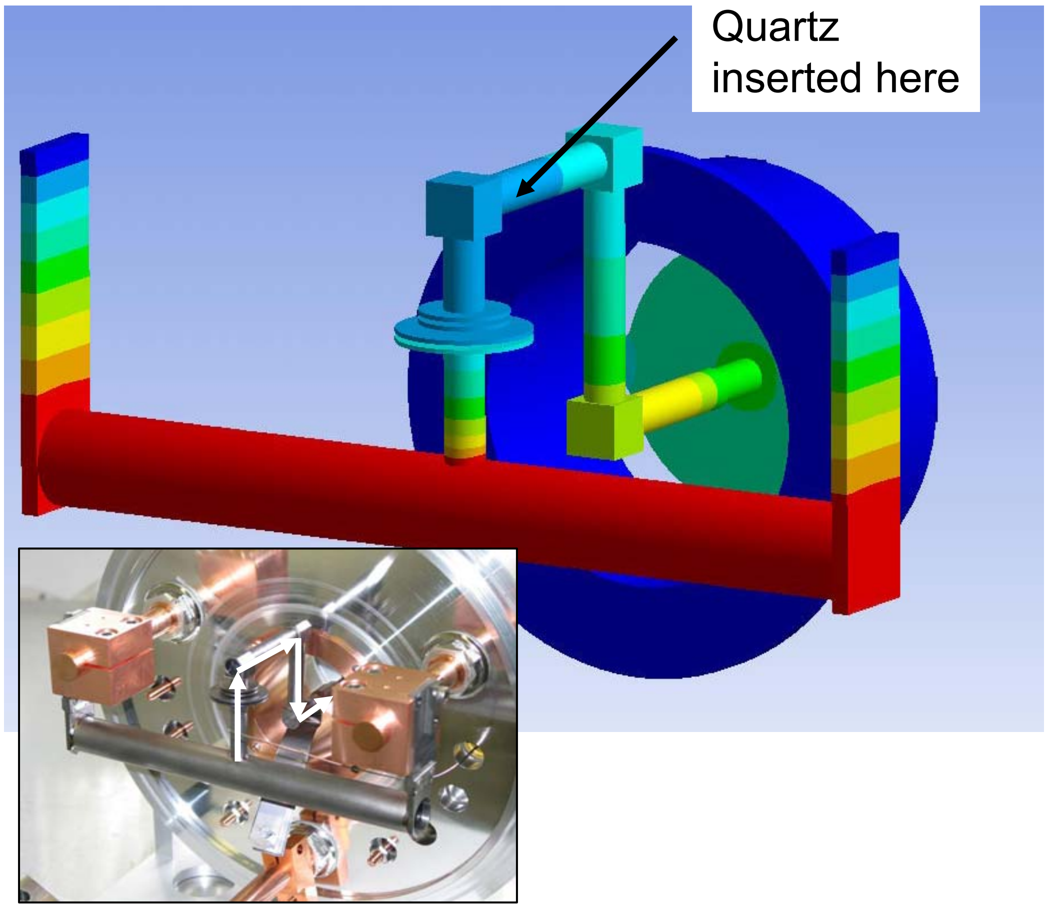


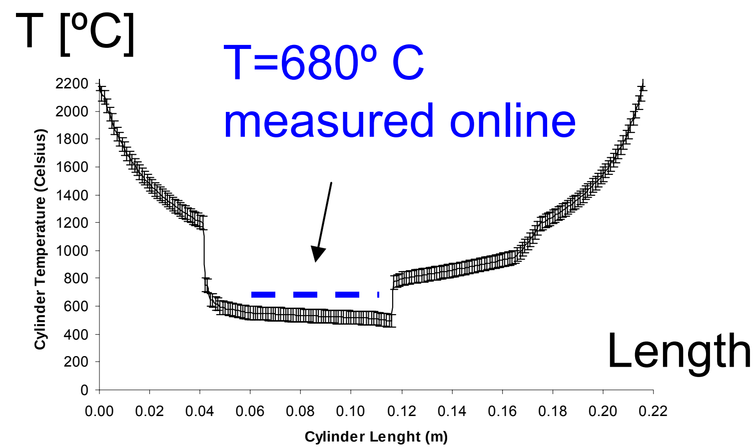


M. Menna has detected Astatine

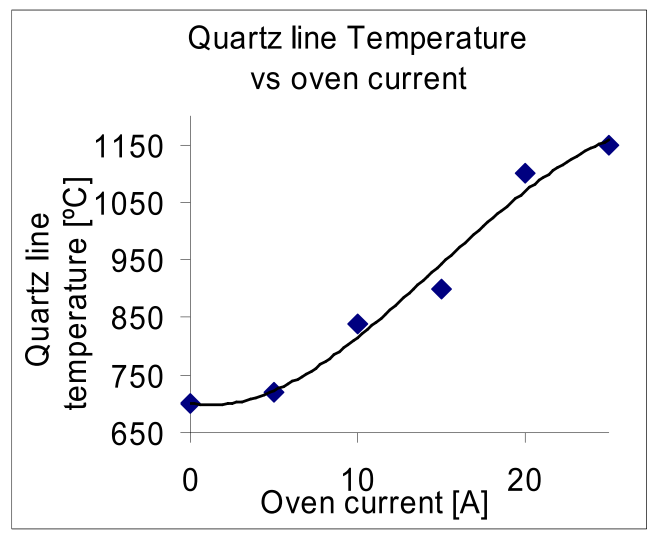
UCx – 314 (Quartz Insert)

ΔT=200-1400ºC to suppress Alkalis (Cs, Rb) for pure beams of Cd, Zn

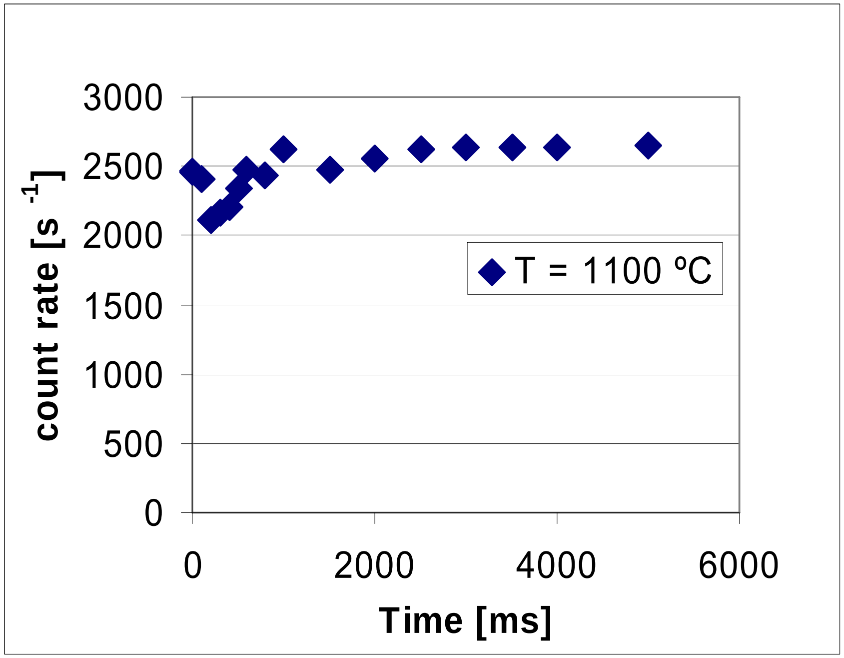




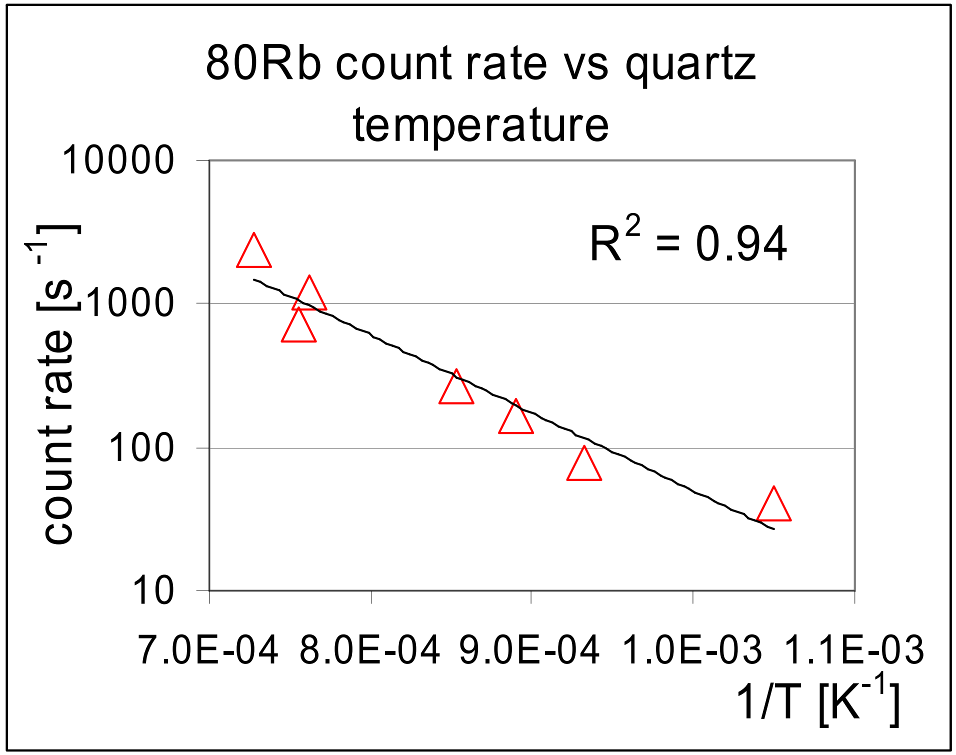
Numerical simulation of temperature profile along the transfer line



Quartz temperature - Rb



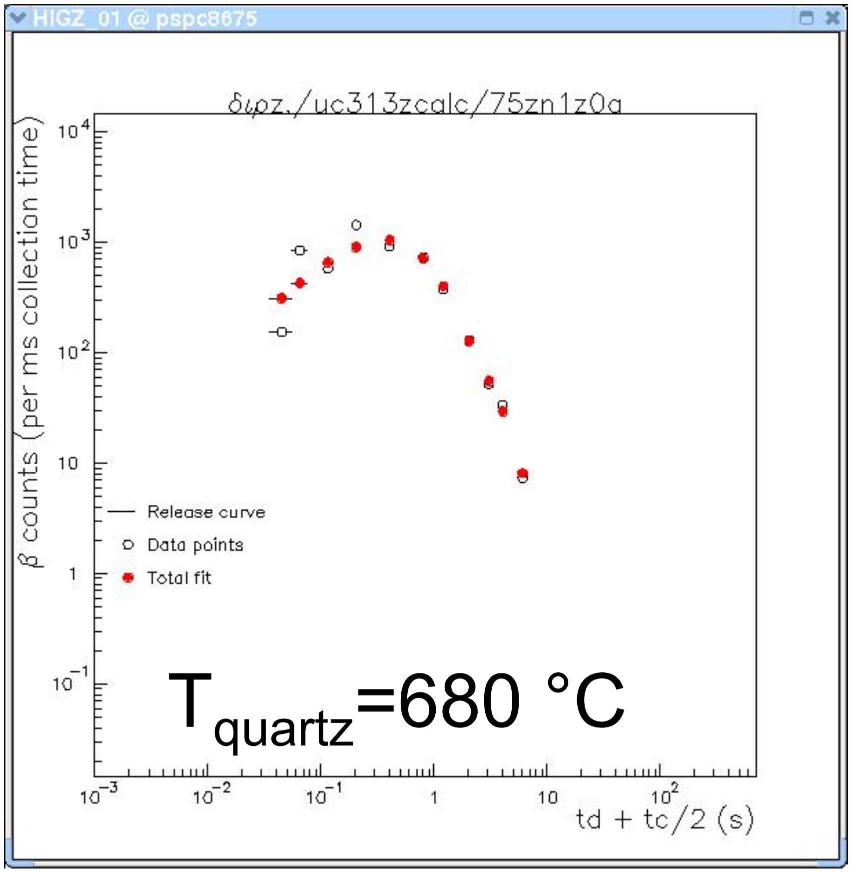
Long time structure

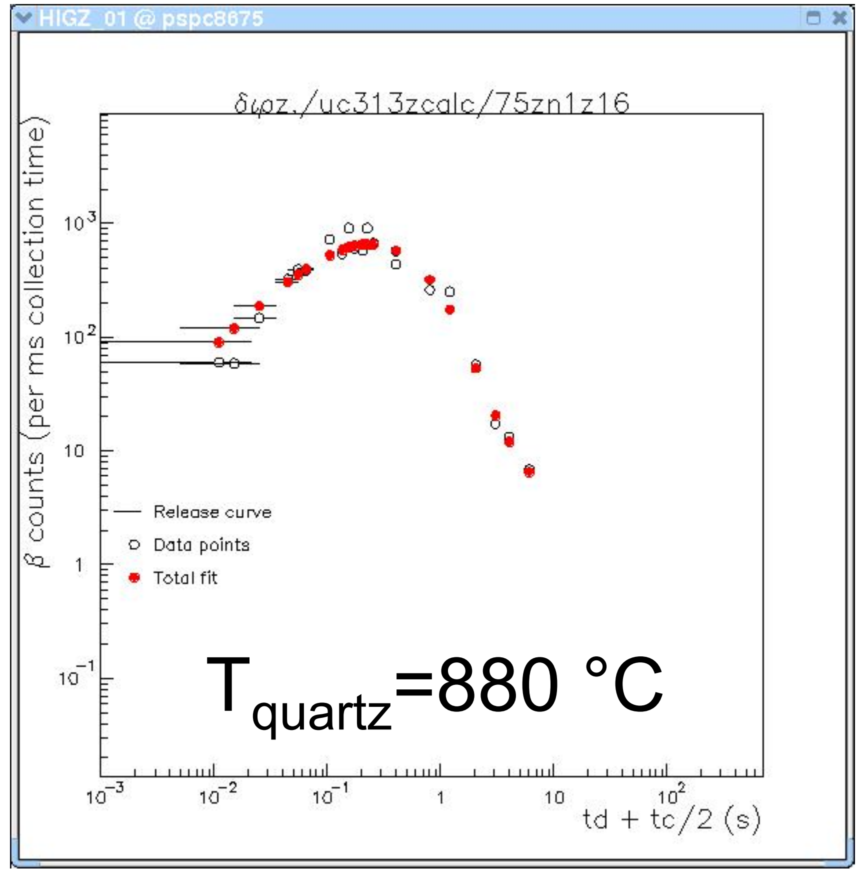


1200 ºC

680 ºC

Zinc release





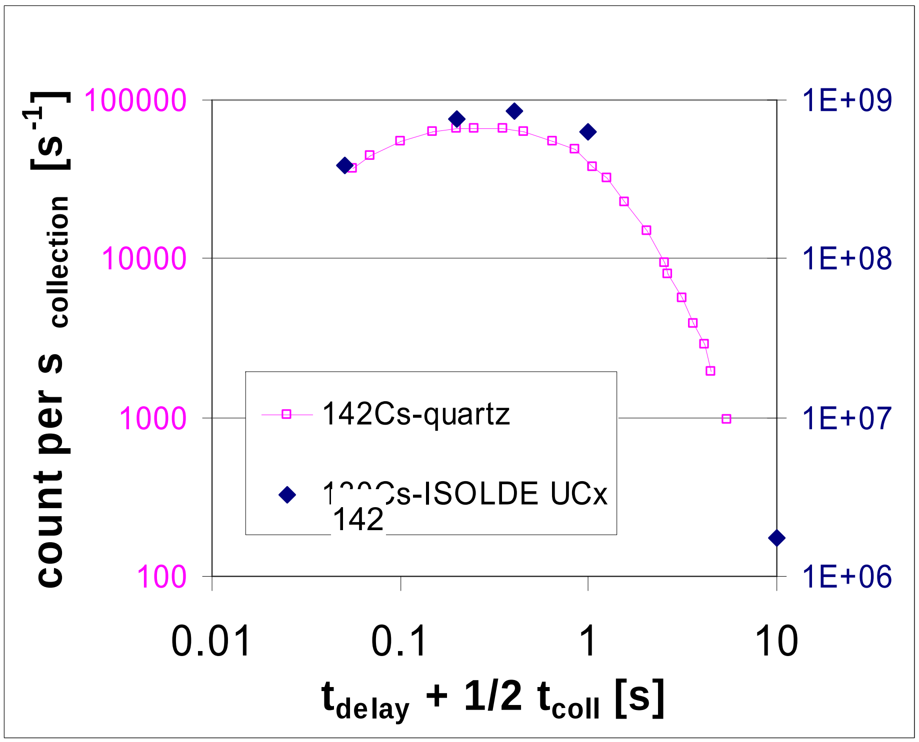
t_r = 100 ms α = 0.97

t_f = 425 ms   Yld = 4-7 10^6 ions/μC

t_s = 3700 ms

Cesium

10^4 suppression factor

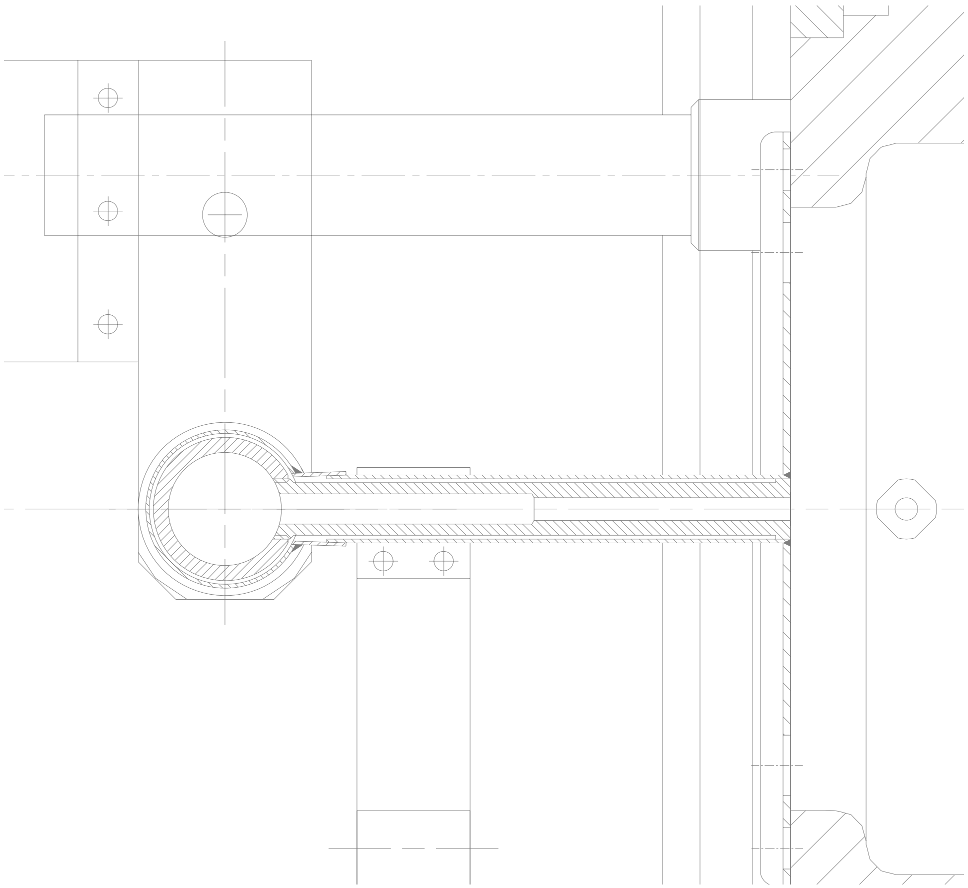


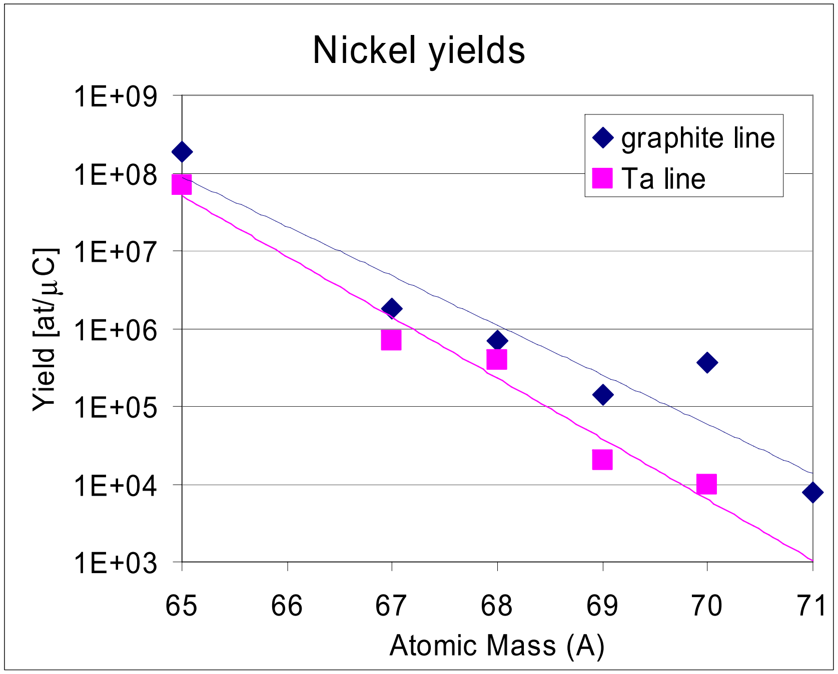
t_r = 74 ms
t_f = 1152 ms
t_s = 25737 ms
α = 0.92

^{142}Cs for standard ISOLDE Target:
Yield = 8 10^8 ions/μC

For prototype: 1.6 10^5 ions/μC

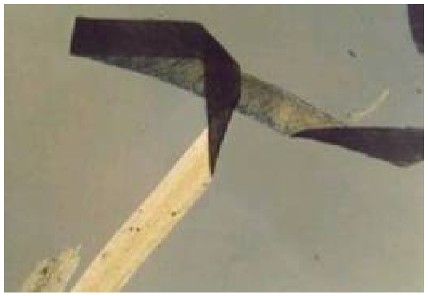
UCx-302 Graphite Line



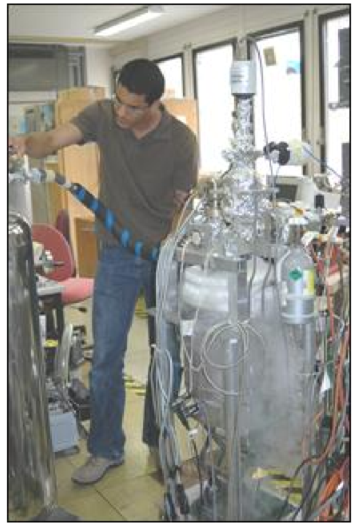


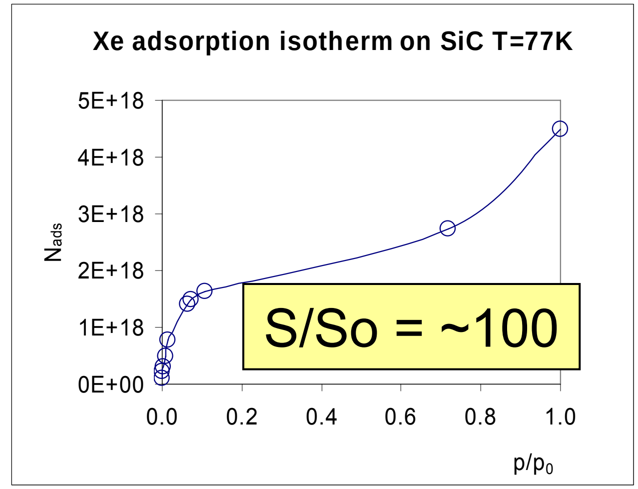
RILIS ionization

100kW target stations



New materials





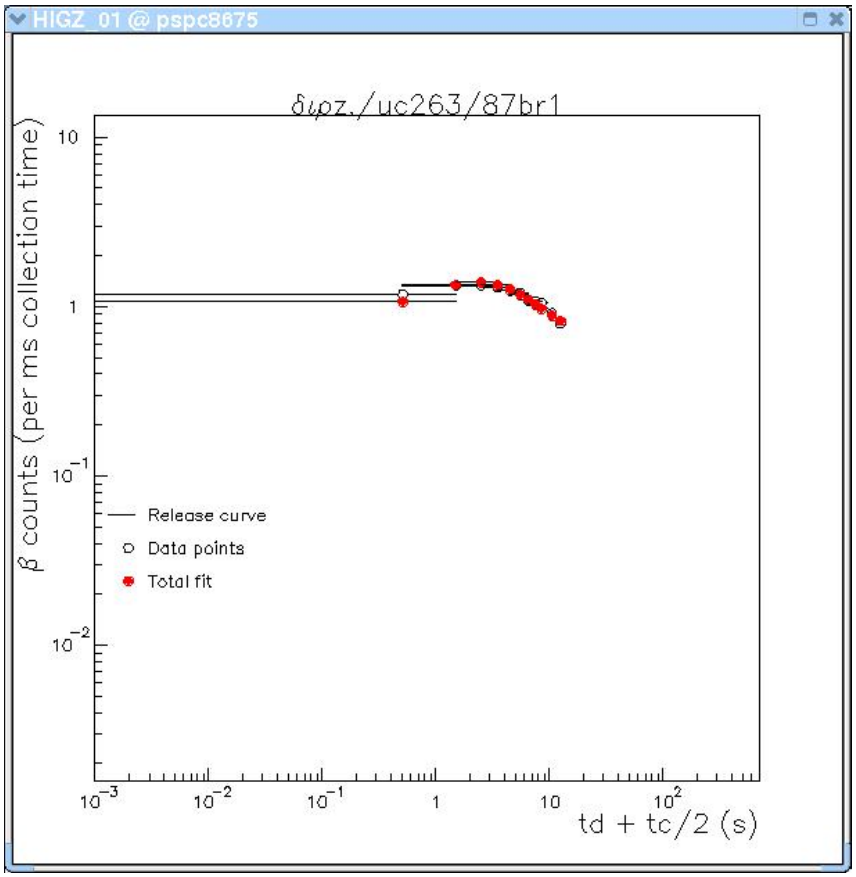
Heat conductivity

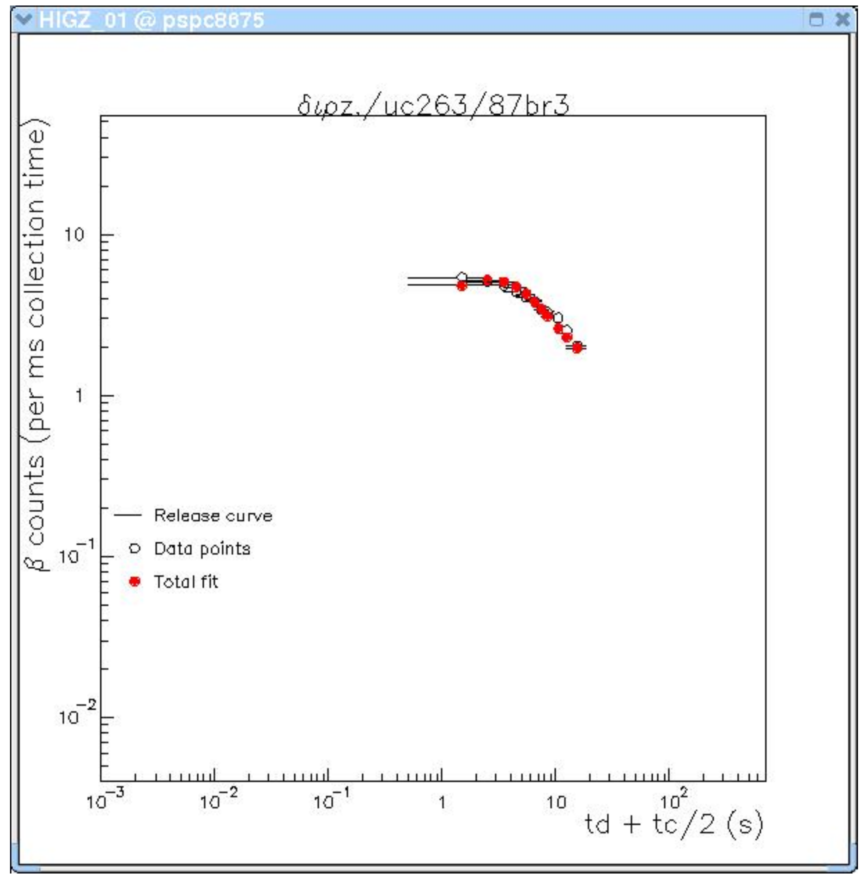
Target specific surfaces (BET)

Sintering

Outlook for 2006-2007…

- Prototypes (new and v2.0)
- Halogen beams (Negative Ion Sources)
- 100 kW EURISOL Design Study
- In-target effusion – target sintering
- New target materials


HIGZ_01 @ pspc8675
διρz./uc263/87br1
β counts (per ms collection time)
Release curve
Data points
Total fit
td + tc/2 (s)


HIGZ_01 @ pspc8675
διρz./uc263/87br3
β counts (per ms collection time)
Release curve
Data points
Total fit
td + tc/2 (s)