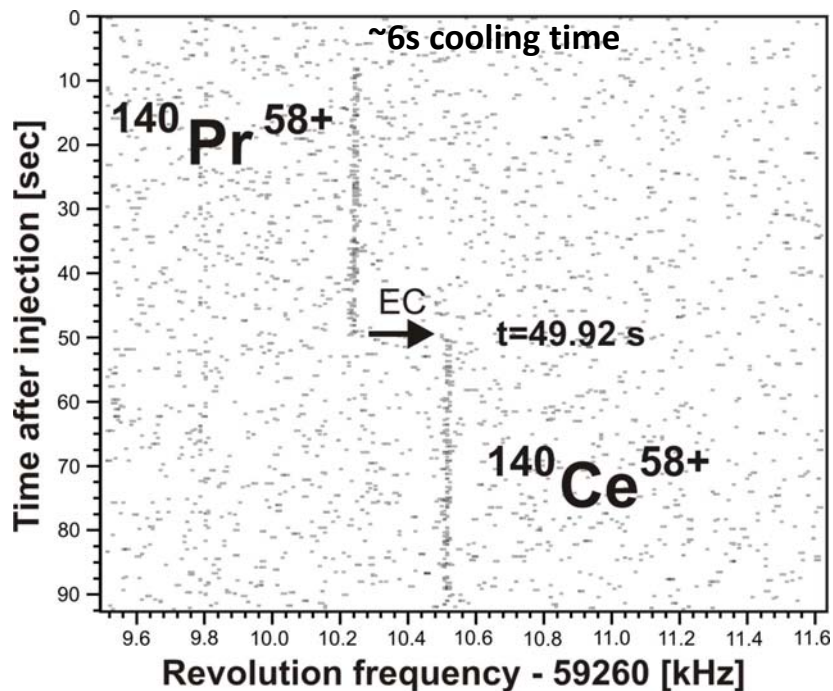


Non-Exponential Orbital Electron Capture Decays of Hydrogen-Like Ions

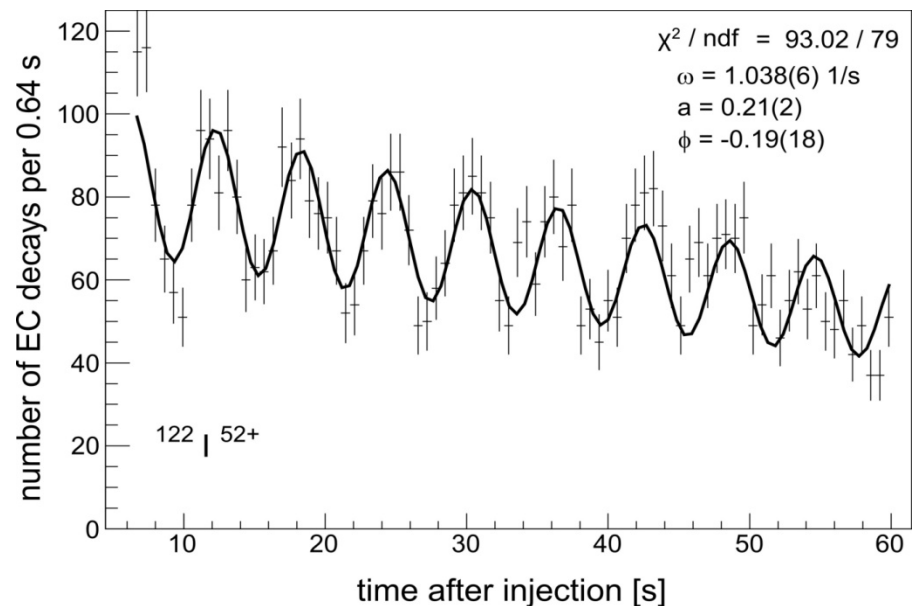
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Schottky Mass Spectrometry signal



Fit by: $dN_{EC}/dt = N_0 \lambda_{EC} \exp(-\lambda t) [1 + a \cos(\omega t + \phi)]$



Summary of ESR-GSI results :

Isotope	T_{lab} (s)	a
^{142}Pr	7.10(22)	0.23(4)
^{140}Pm	7.06(8)	0.18(3)
^{122}I	6.05(4)	0.21(2)

(not observed in 'normal' EC decays or in β^+ decays)

One suggested interpretation:

beats due to neutrino mixing

→ expect $T_{\text{lab}} = h \gamma 2 M / \Delta^2 m_{12}$:

- observed mass dependence

$$- (\Delta^2 m_{12})_{\text{exp}} \cong 2.5 (\Delta^2 m_{12})_{\text{Kamland}}$$

Still to be checked :

- E_{ion} dependence
- He like ions
- different B-settings
- ...
- verify at other/different setups (Lhazou, ISOLDE)

Verify oscillations at ISOLDE using :

REX-EBIS → produce hydrogenlike ions
&
WITCH → store in Penning ion trap

Requirements :

1. well defined $t = 0$ (production)
2. $O(10^{-10}$ mbar) vacuum (NEG pumps)
3. non-disturbing cooling method (evaporative cooling)
4. beam line from REX-ISOLDE to WITCH (design ongoing)
5. results for ongoing WITCH project secured

Candidate isotopes :

	$T_{1/2}$ [s]	EC/ β^+ [%]	yield (CaO ; cold line)
^{19}Ne	17.25	0.100	$\sim 5\text{E}6 / \mu\text{C}$
^{35}Ar	1.775	0.073	$\sim 5\text{E}7 / \mu\text{C}$