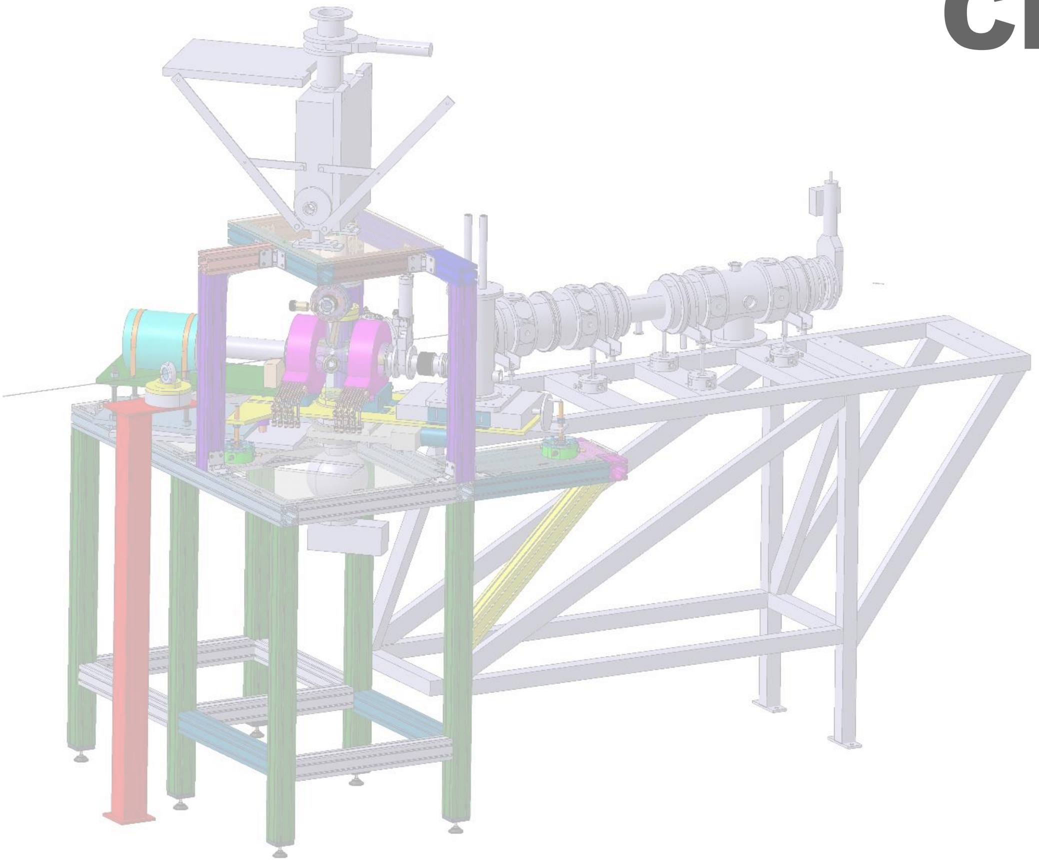
COnversion electrons Chasing at Orsay

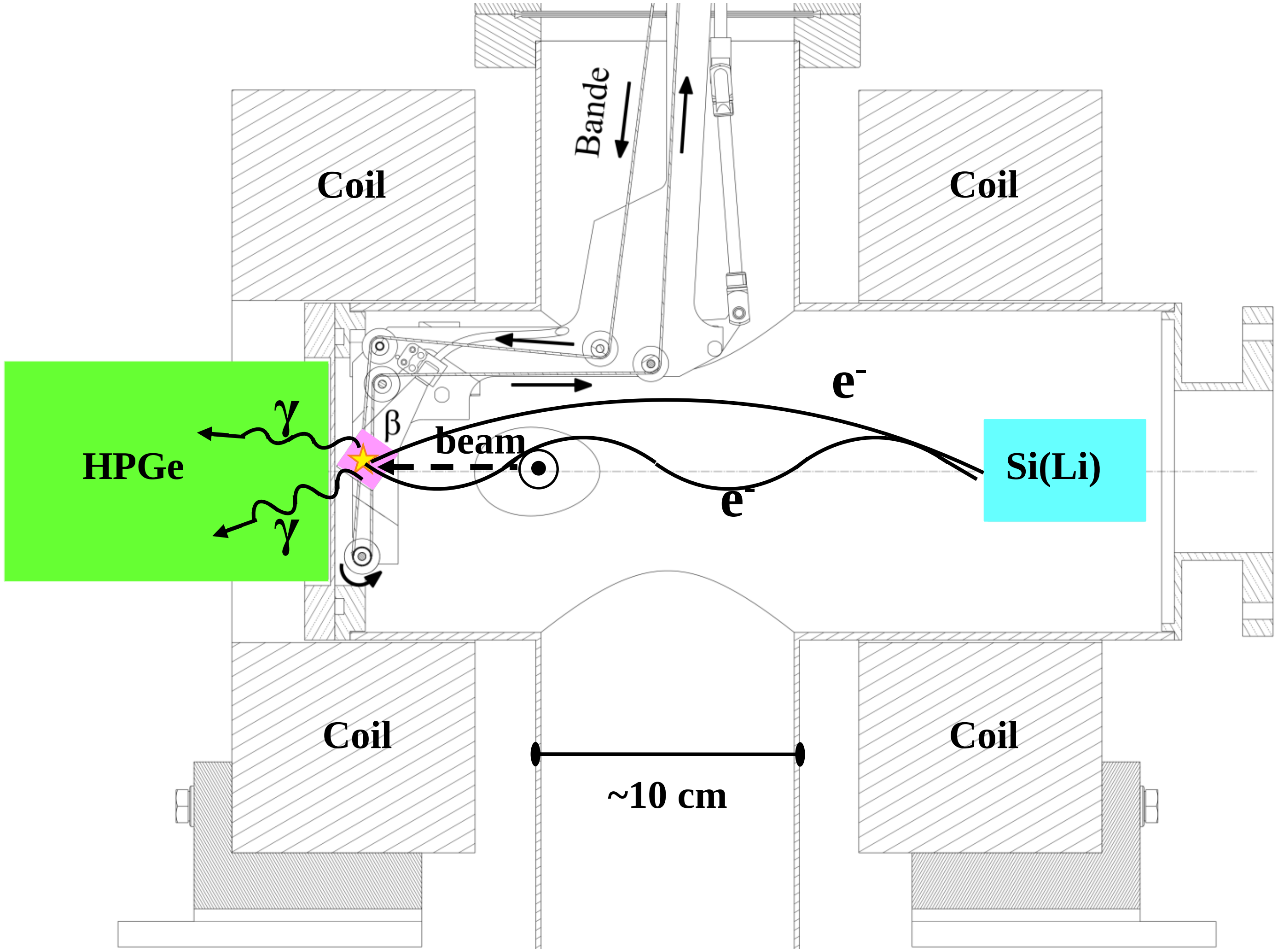


1. The decay setup COeCO
2. Last year’s timeline and plans
3. On-line commissioning of COeCO
4. New half-life measurement of first excited 0^+ in ^{98}Zr

COnversion electrons Chasing at Orsay

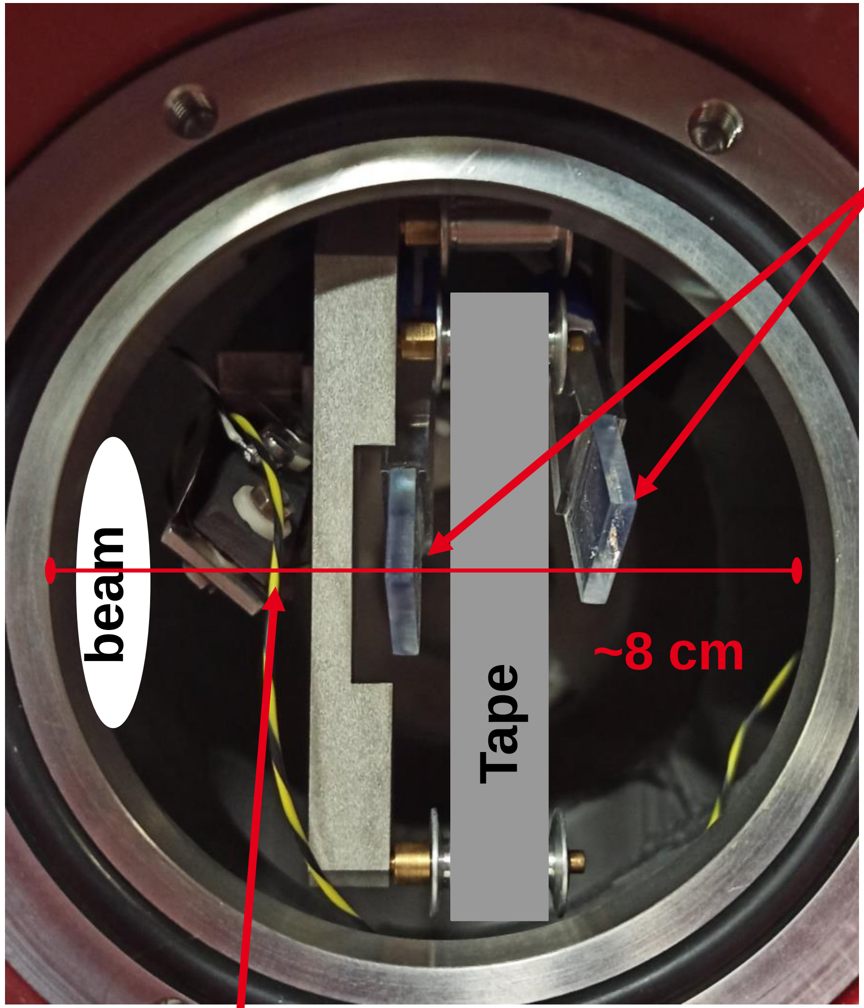
Magnetic transporter (Helmholtz configuration)

- Beam collected on tape
- Plastic scintillator for β-tagging
- Conversion electrons guided inside the chamber to compensate the loss of solid angle
- Tape unwinded to remove the source

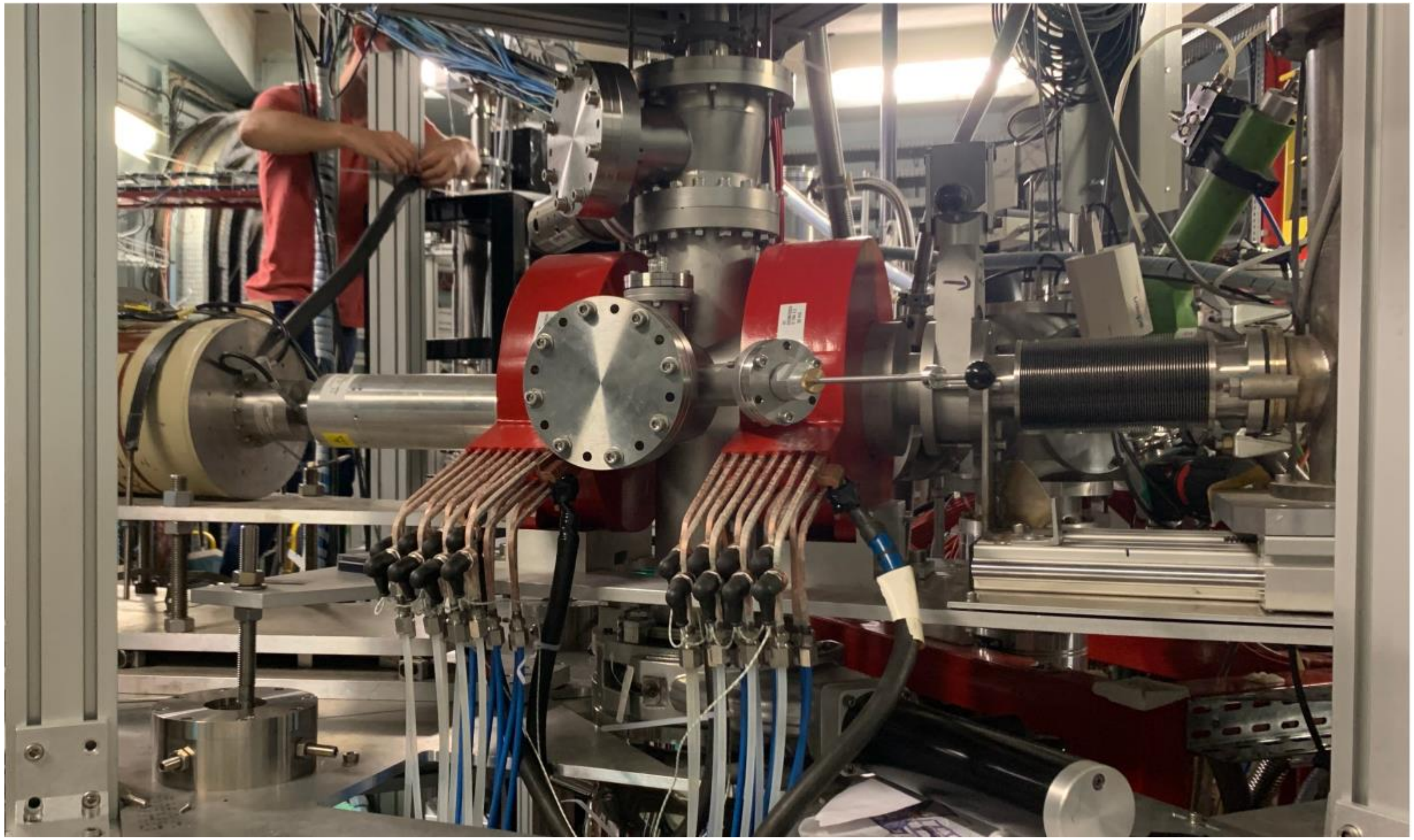


COnversion electrons Chasing at Orsay

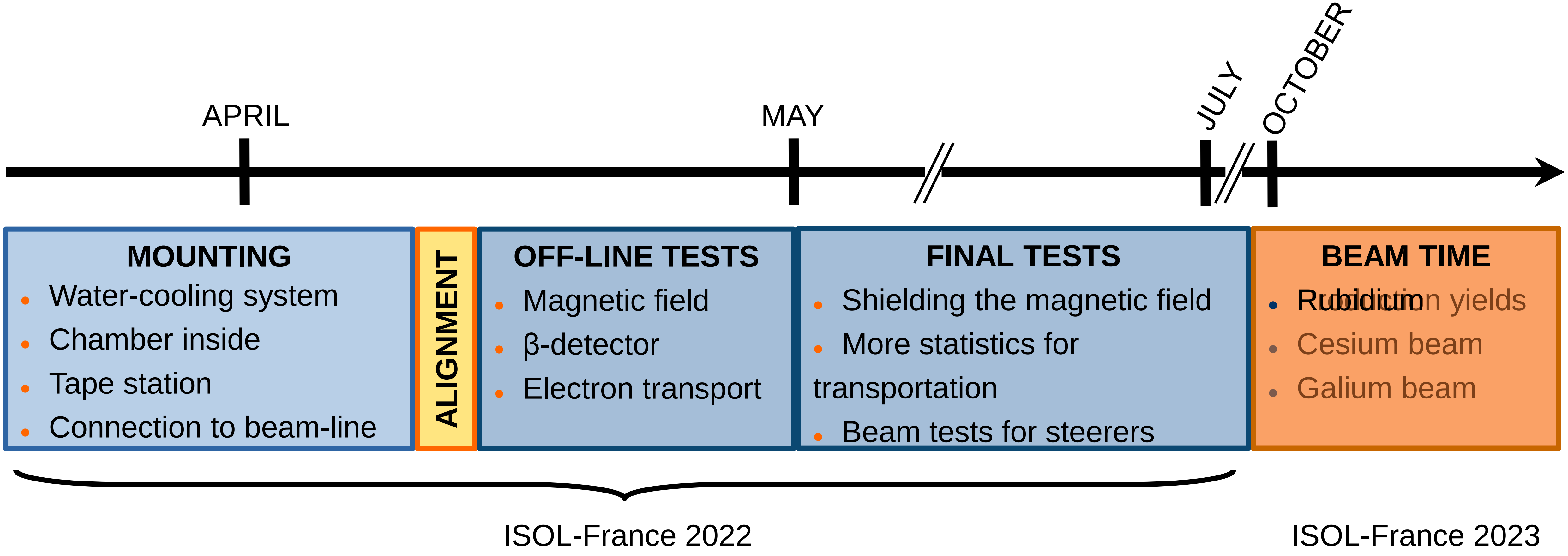
Plastic scintillator



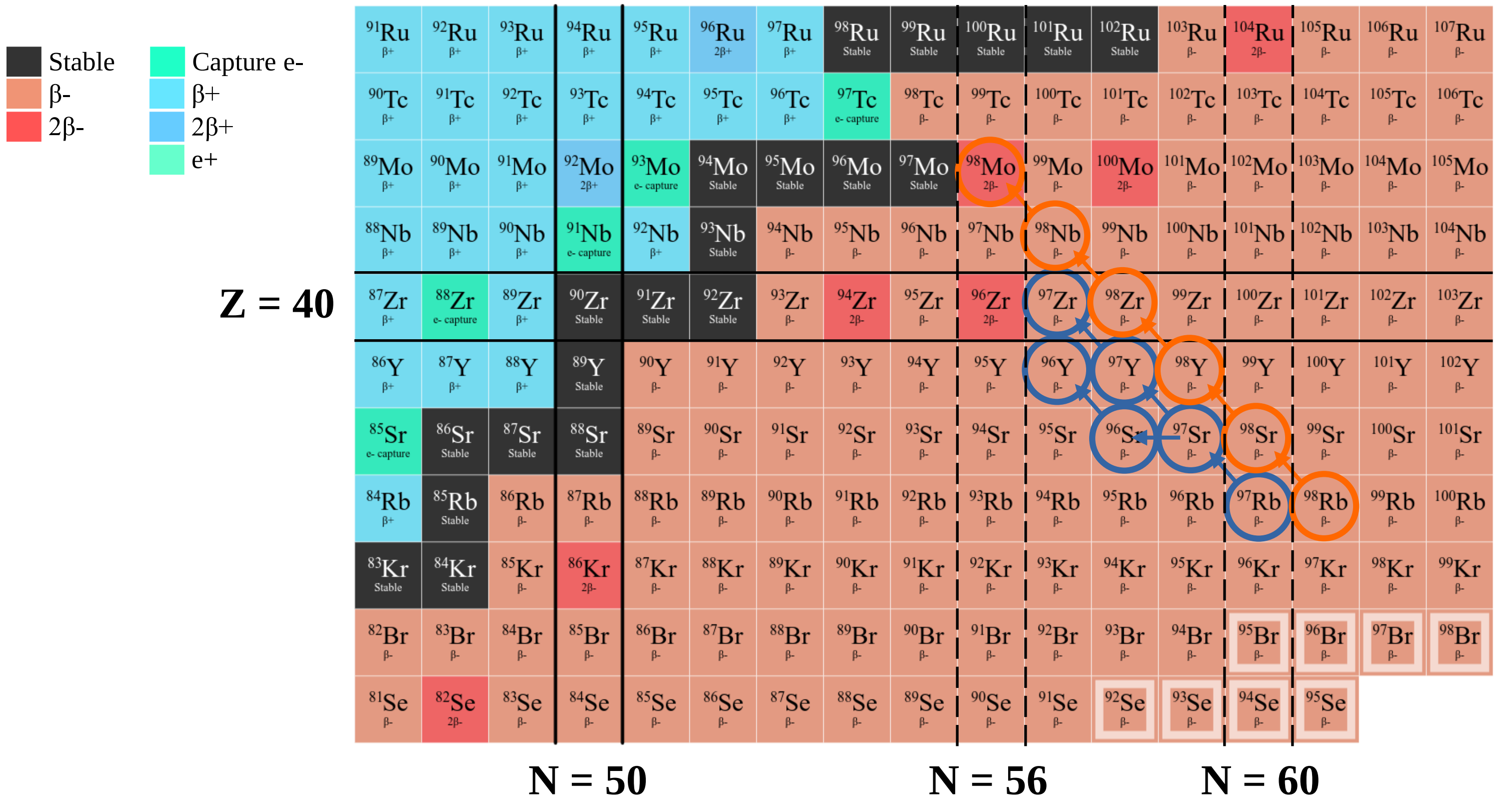
Faraday cup



COeCO year 0 (2022)

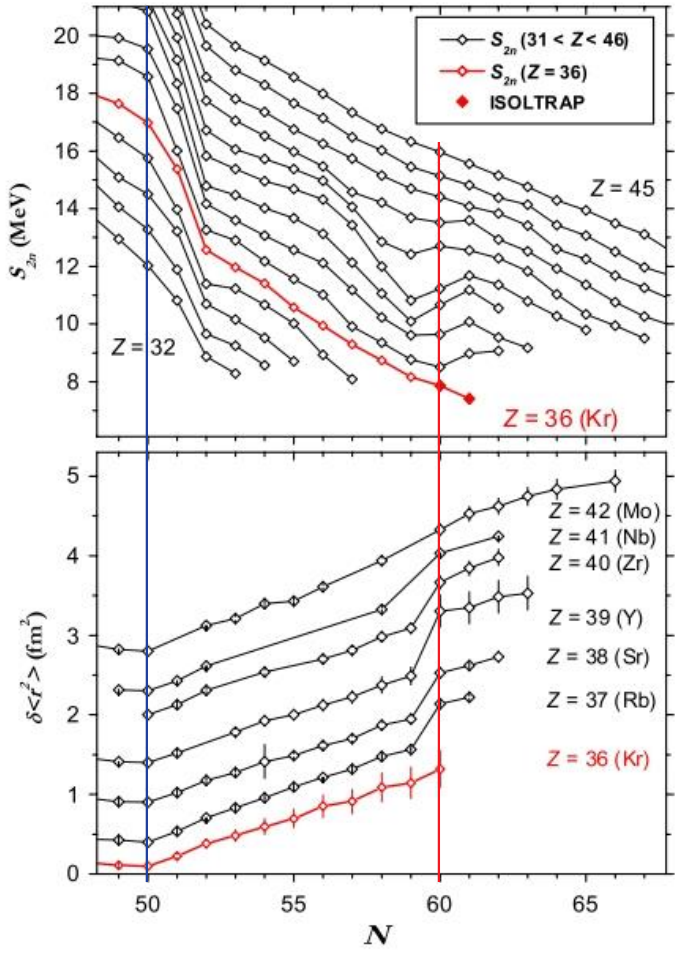


Physics motivation : shape transition around N=60



- Some data on conversion electrons to calibrate the setup (conversion coefficients)
- Region of known shape coexistence, with E0 to measure

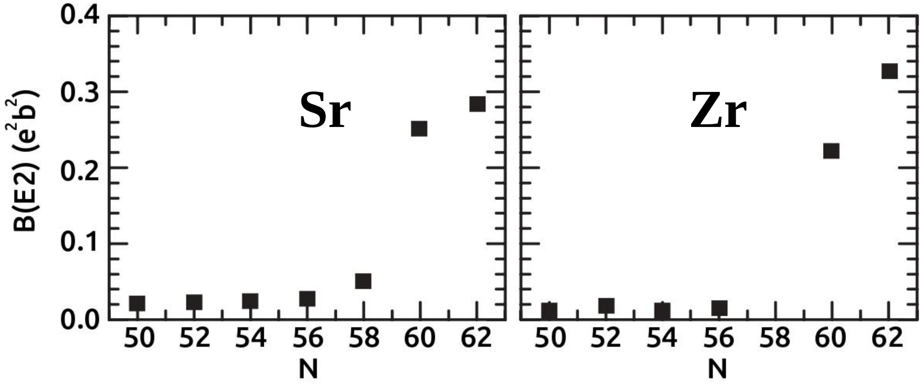
Physics motivation : shape transition around N=60



S. Naimi *et al*. Phys. Rev. Lett. 105 032502, 2010

Masses

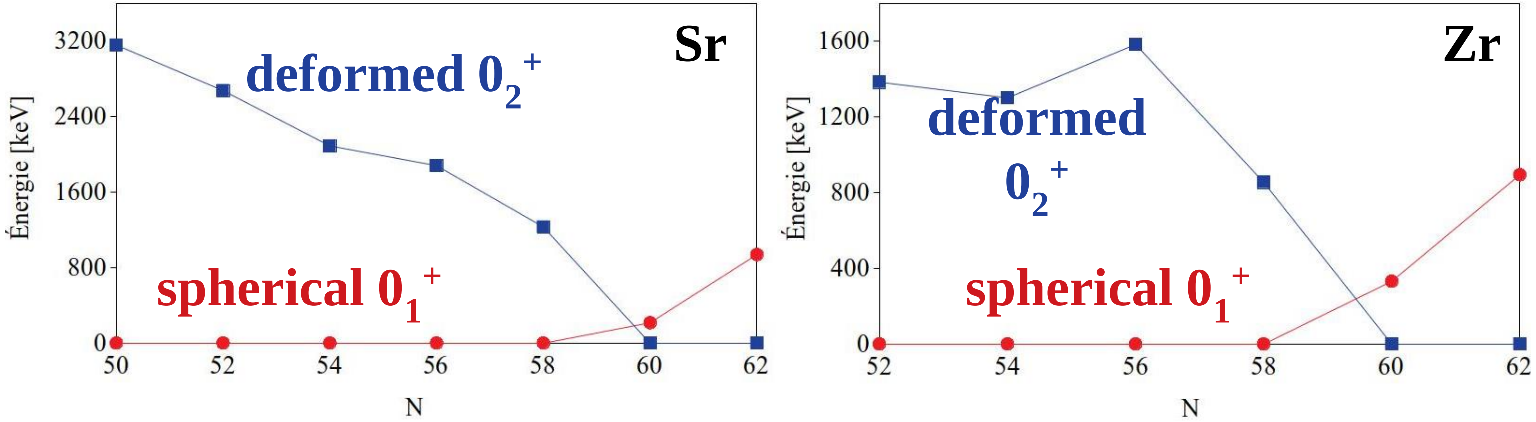
Radius



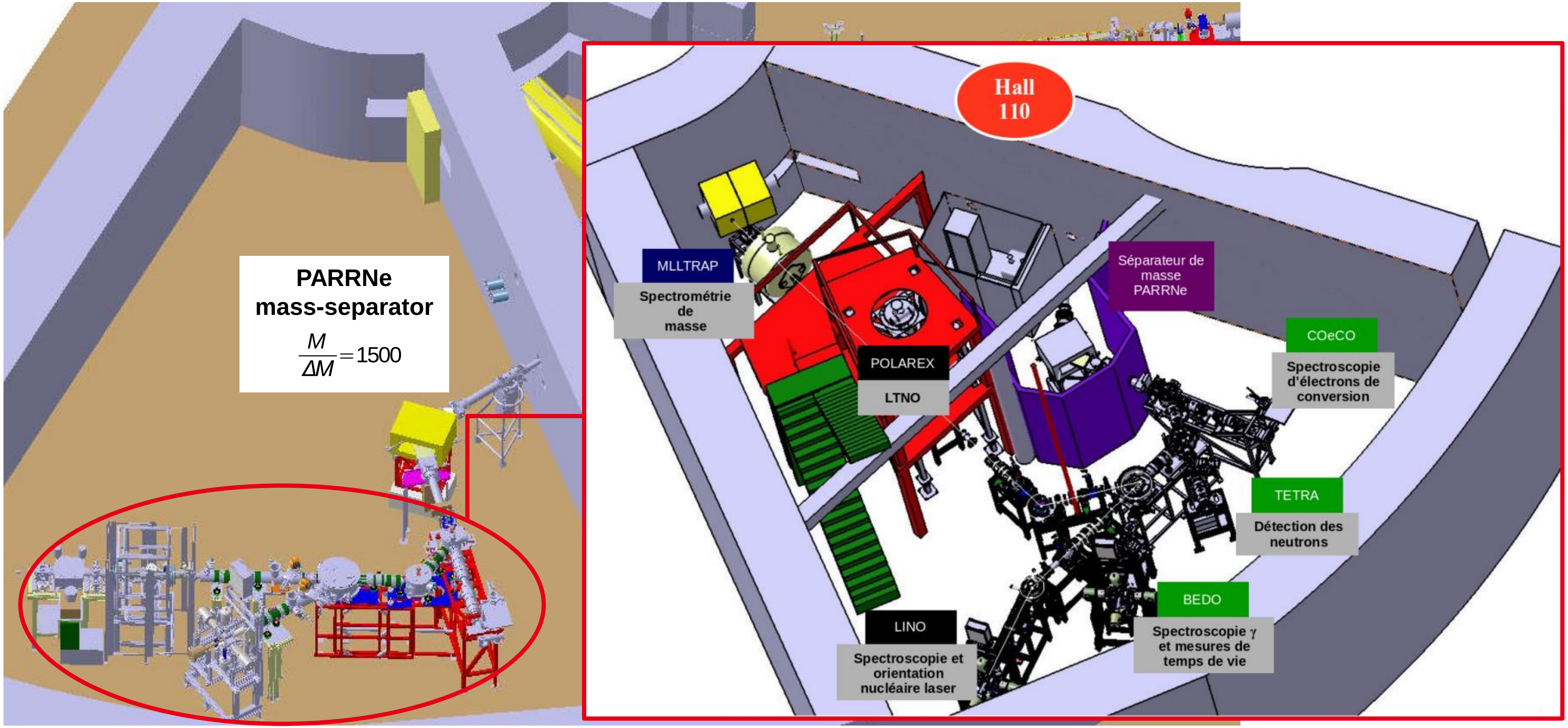
From H. Mei *et al*. Phys. Rev. C 85 034321, 2012

Reduced transition probabilities

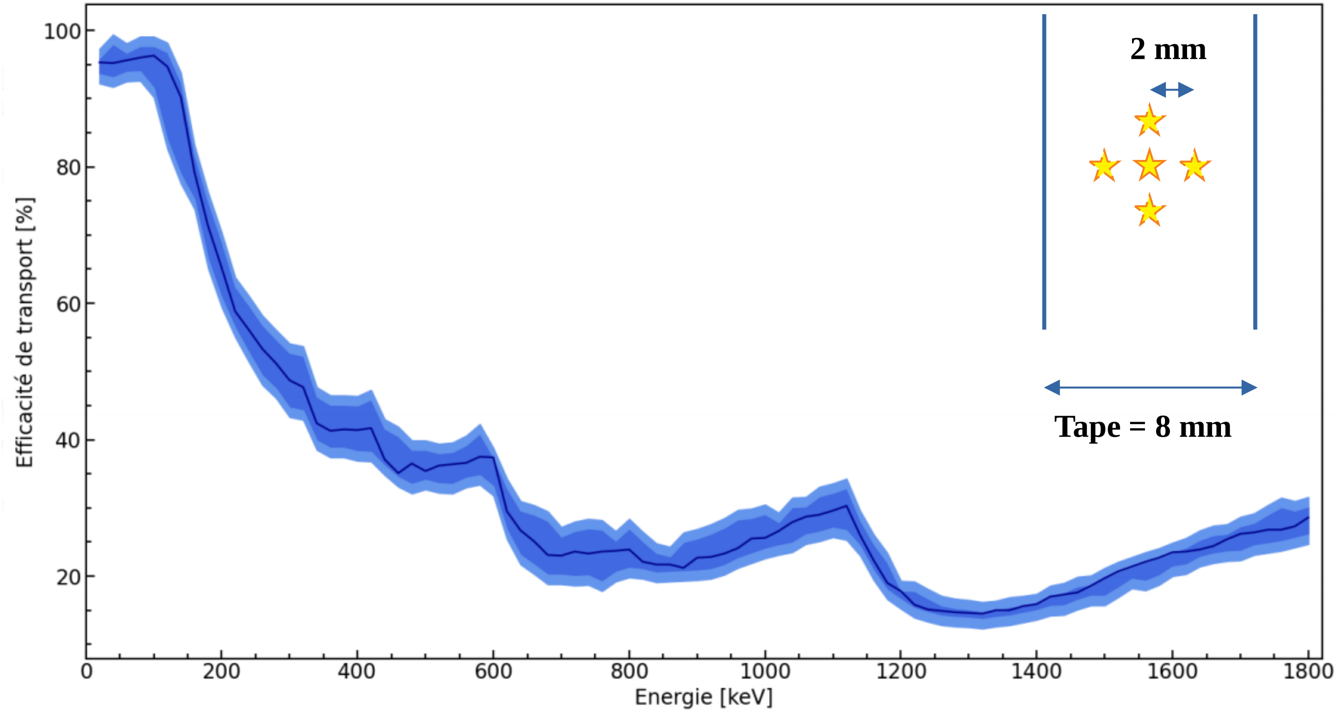
E0 transitions

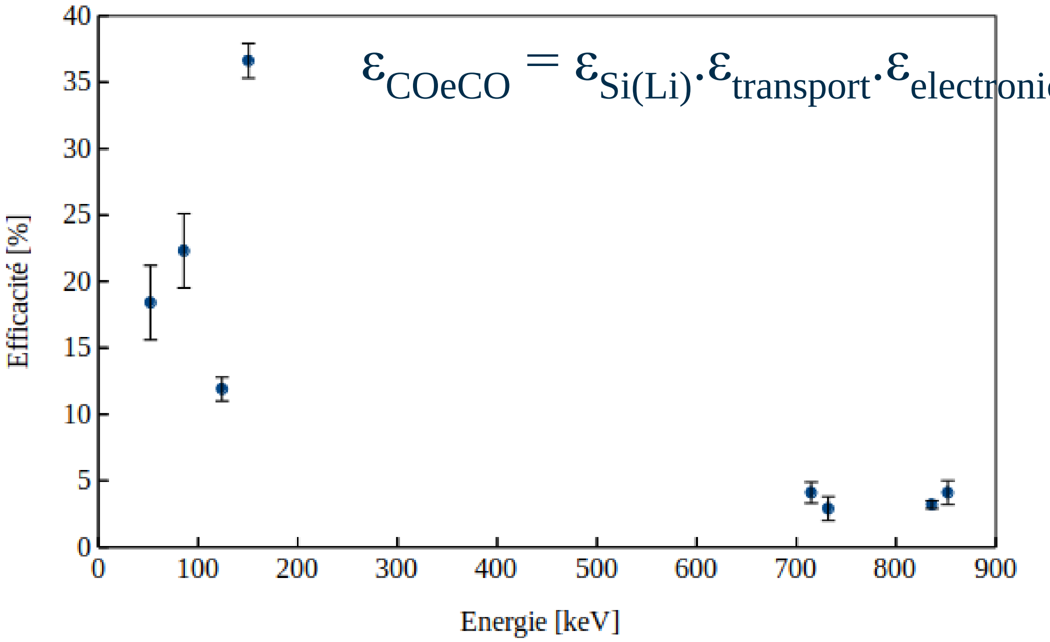


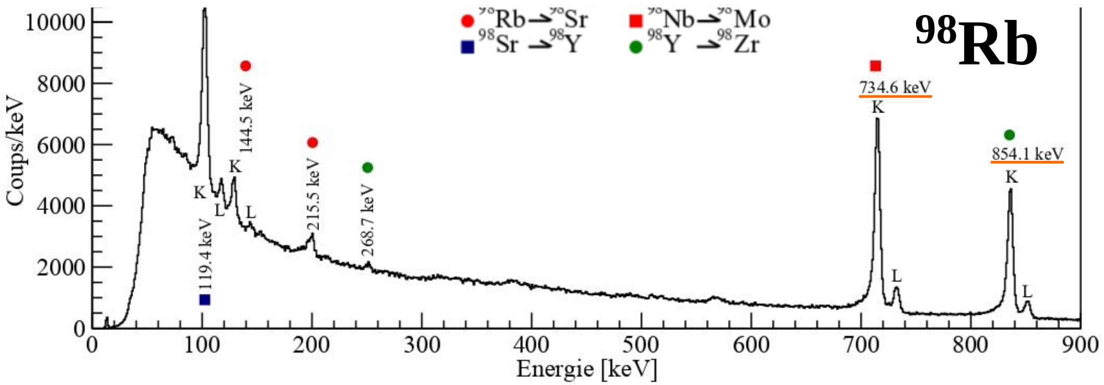
ALTO radioactive beams



On-line commissioning of COeCO



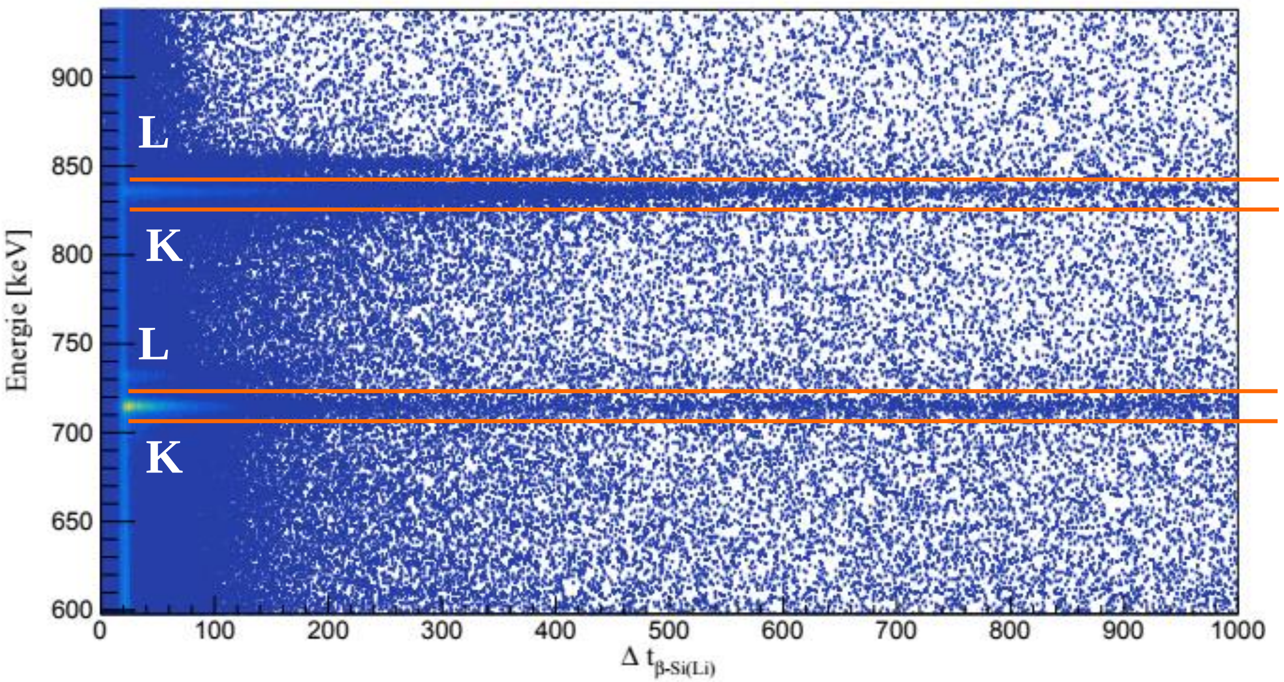


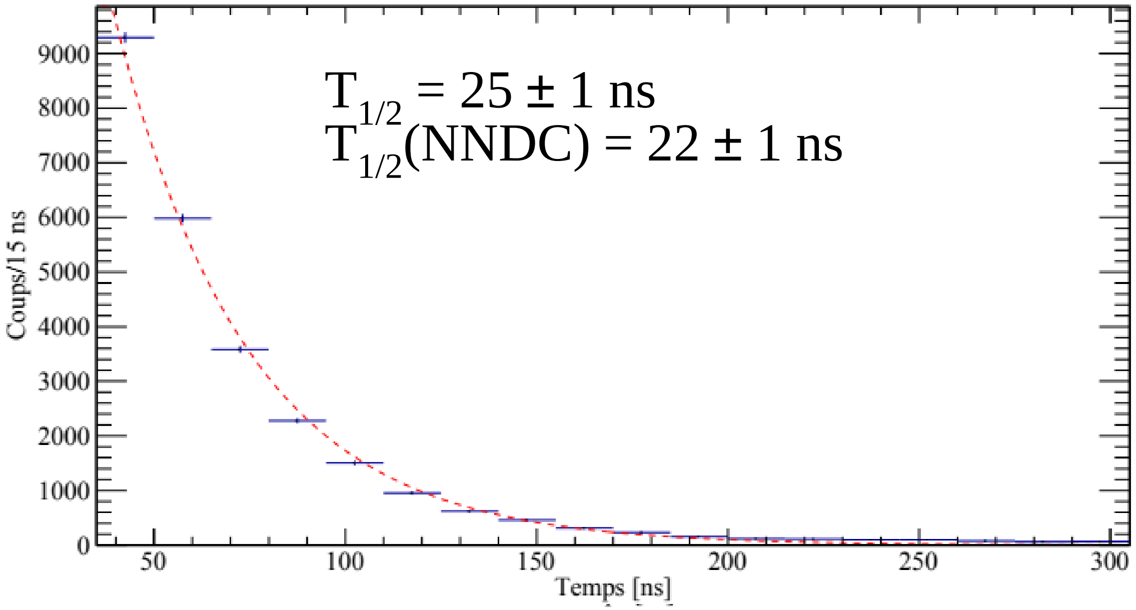


$$\epsilon_{COeCO} = \frac{N_e}{AtI}$$

- Need more points, especially in the medium energy range
- De-focused beam could explain the lack of consistency with simulations

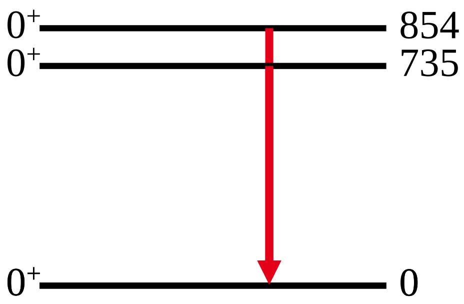
Half-life measurements of E0 transitions





- Time difference between an event in the plastic scintillator (β) and an event in the Si(Li) (CE)

- Compute strength of the transition, $\rho^2 = \frac{\ln(2)}{T_{1/2}\Omega_K}$



- Time behaviour of the E0 transition at 854keV in ^{98}Zr ^{98}Mo

  $\rho^2 = 9{,}6.10^{-3}$

Two-states mixing mode

States resulting from the mixing of two deformed states 1 and 2 with mixing angle θ :

$$\begin{cases} \left|0_i^+\right\rangle = \cos\theta \left|0_1^+\right\rangle + \sin\theta \left|0_2^+\right\rangle \\ \left|0_f^+\right\rangle = -\sin\theta \left|0_1^+\right\rangle + \cos\theta \left|0_2^+\right\rangle \end{cases}$$

Transition strength given by :

$$\rho^2(E0) = \left| \frac{\langle \Phi_f | \hat{T}(E0) | \Phi_i \rangle}{eR^2} \right|^2$$

If the surface of both states shape can be described by a sum of spherical harmonics :

$$\rho^2(E0) = \frac{Z^2}{R_0^2} \cos^2\theta \sin^2\theta \left[\Delta \langle r^2 \rangle \right]^2$$

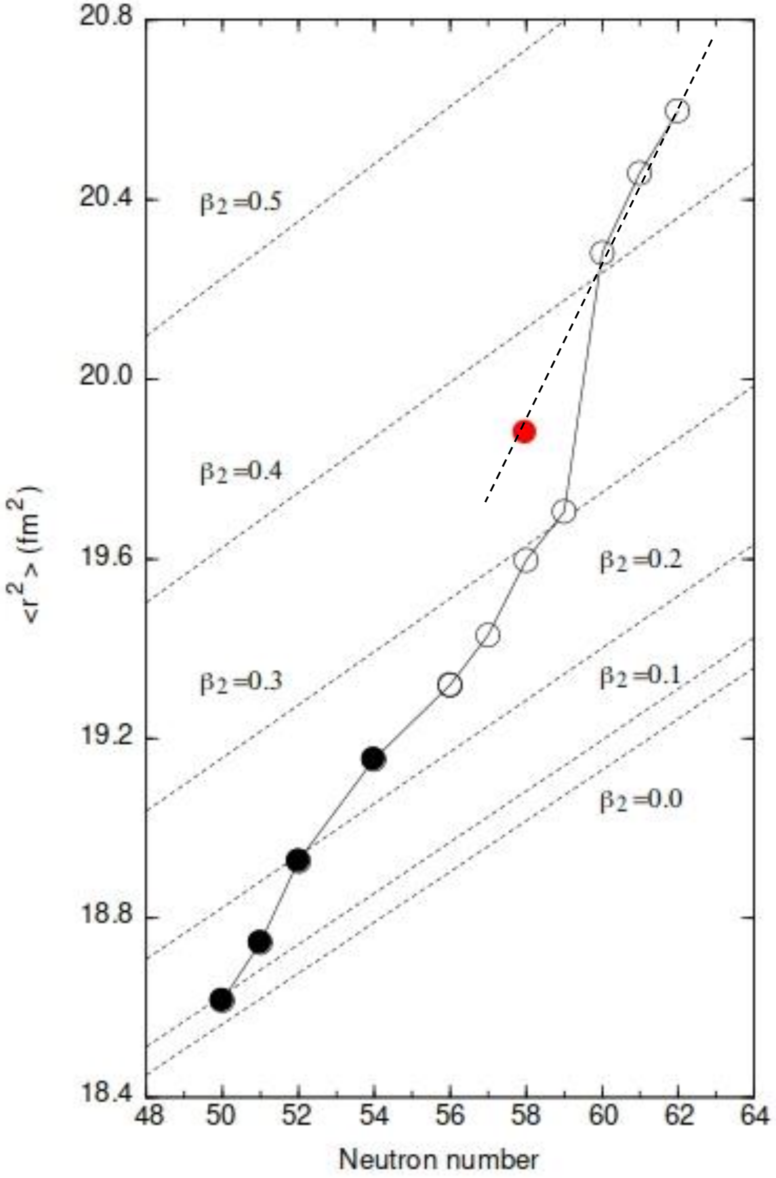


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Figure from Campbell et al., PRL 89(8), 2002, 10.1103/PhysRevLett.89.082501

Conclusion

- On-line commissioning of the COeCO setup with neutron-rich Rb beam
- All subsections were characterized (β, coils, Si(Li), etc.) as well as the setup as a whole
- Half-life of first excited 0^+ state in ^{98}Zr measured to be $T_{1/2} = 82 \pm 2$ ns
- New value of ρ^2 and δr^2 adds to our understanding of shape transition in the region
- Campaign to study neutron-rich silver in april