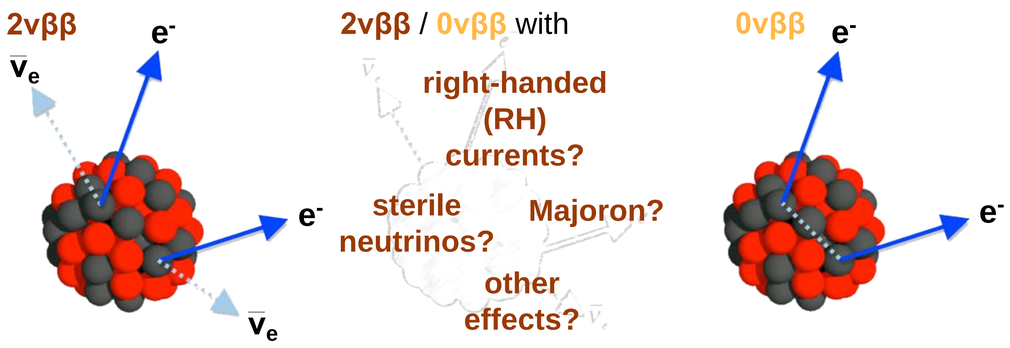
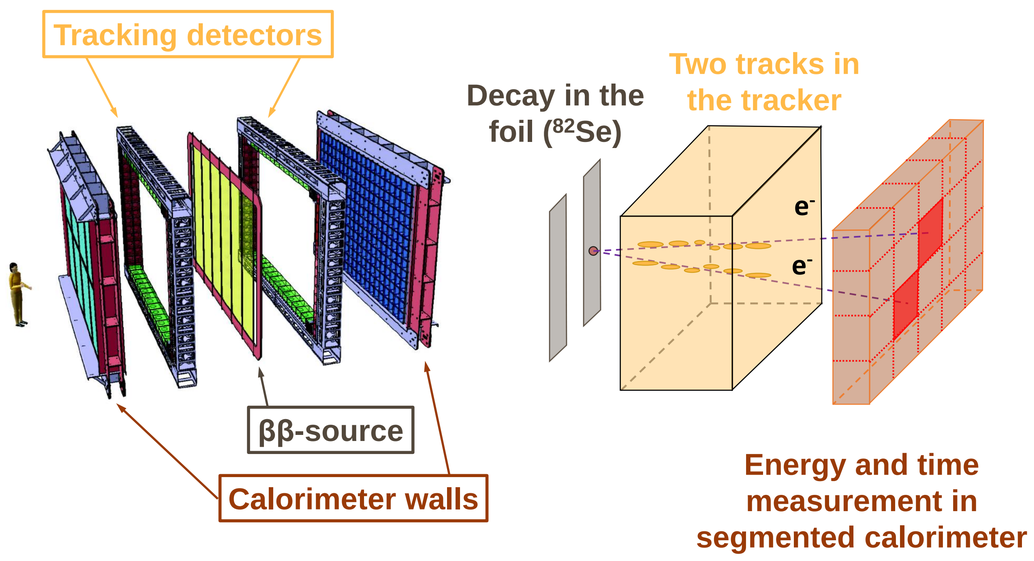
The SuperNEMO Demonstrator: a unique technology for high-precision measurements of ββ-decay modes

SuperNEMO in nutshell

- **SuperNEMO is a great tool for ββ precision physics**



- **Source:** ^{82}Se (6.11 kg), $Q_{\beta\beta}$ = 2.99 MeV
- **Tracker:** 2034 drift cells working in Geiger mode
- **Calorimeter:** 712 plastic scintillators
- **^{207}Bi energy calibration system:** see poster **#382**

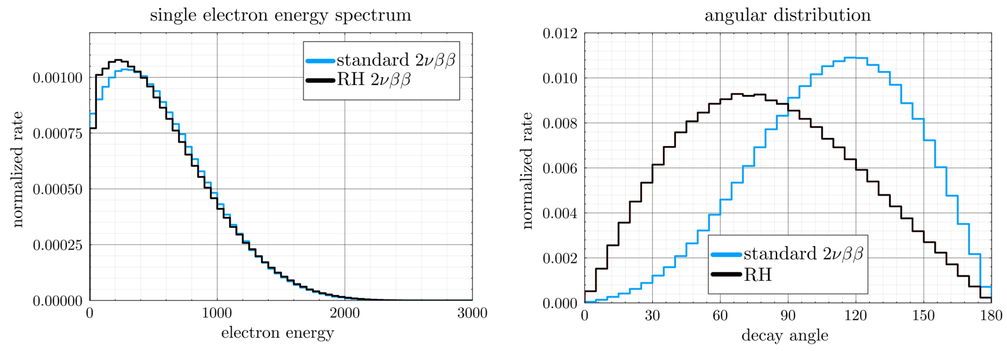


Energy and time measurement in segmented calorimeter

Tracking: SuperNEMO´s SuperPOWER!

- **3D track reconstruction**
- **Legendre transformation-based** tracking algorithm
- Capable to extract **decay angle**

- **How to distinguish between standard and exotic ββ-physics – example: 2νββ with RH currents**



Plots inspired by inputs form: Frank F. Deppisch et al., Phys.Rev.Lett. 125 (2020) 171801

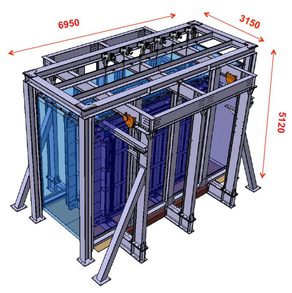
- **Possibility to study g_A^{eff} as a function of $M^{2\nu}_{GT-3}$:**

$$\frac{1}{T^{2\nu}_{1/2}} = \left(g_A^{eff}\right)^4 \left|M^{2\nu}_{GT-3}\right|^2 \frac{(G_0^{2\nu} + \xi_{31} G_2^{2\nu})}{|\xi_{31}|^2}$$

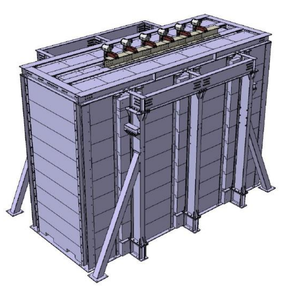
Current phase: shielding installation

SuperNEMO shielding was designed to suppress:

- **Radon:** anti-radon tent (see poster **#41**)
- **Gammas:** iron shielding
- **Neutrons:** water + polyethylene



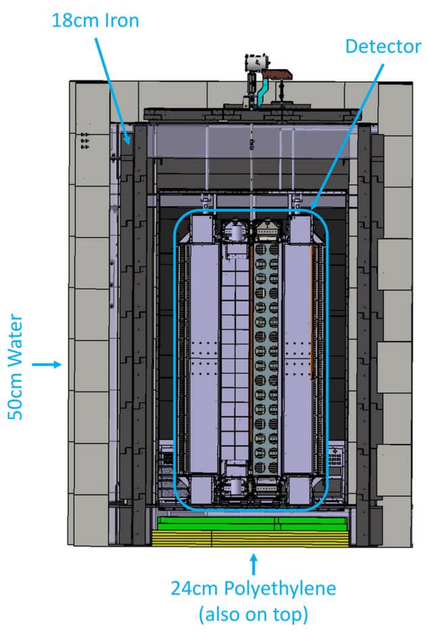
Anti-radon tent + radon free air



Iron shielding

H_2O + Polyethylene

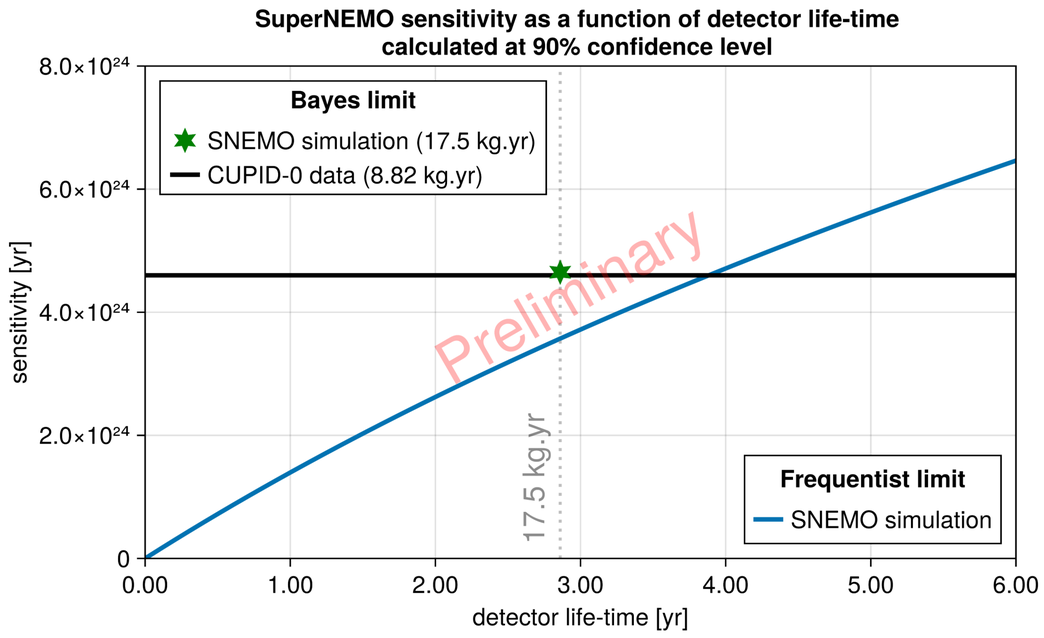
Current status



Quo vadis SuperNEMO?

- **Since 2022:** commissioning data
- **Currently:** shielding installation (iron)
- **From Sept. 2024:** physics data taking
- **Expected duration:** 3 years

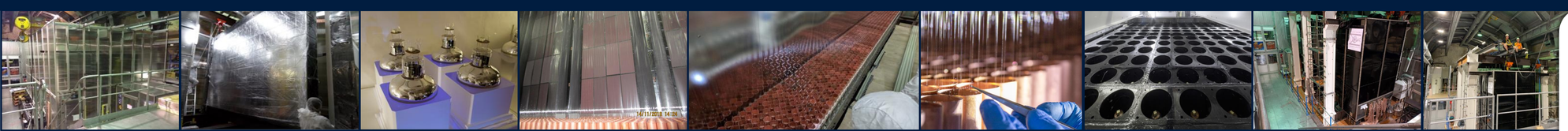
- **Estimated number of 2νββ events:** ~ 10^4 - 10^5
- **Expected bkg. in 0νββ ROI:** 10^{-4} keV.kg.yr **(**see poster **#397)**
- **Expected sensitivity to 0νββ:** 4.6×10^{24} yr (Bayes, at 90%)



CUPID-0 result taken from: O. Azzolini et al.,Phys. Rev. Lett. 129, 111801

Miroslav Macko, on behalf of the SuperNEMO collaboration

#451



CTU CZECH TECHNICAL UNIVERSITY IN PRAGUE