Measurement of the γ background in Modane Underground Laboratory with SuperNEMO, and estimation of SuperNEMO's overall background - Poster #397

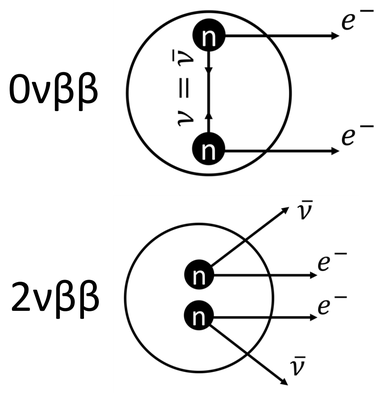
Summary

SuperNEMO is a 0νββ experiment located in the it to study the mechanism behind Modane Underground laboratory (LSM). Its unique tracker-calorimeter technology would allow the 0νββ and the 2νββ. SuperNEMO use ^{82}Se ($Q_{\beta\beta}$ = 3 MeV) as its source foil.

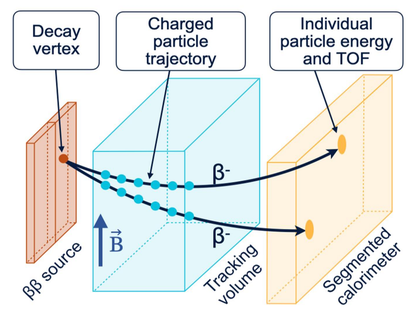
Ultra low background is necessary for these decay searches, and a dedicated measurement using SuperNEMO was conducted to evaluate the ambient γ background. A simulation of the total background is also shown.

SuperNEMO demonstrator

Decay signature (two electrons)



Measurement principle



SuperNEMO status

- Shielding installation **summer 2024**
- Anti-Radon system **summer 2024**
- Data-taking **Sep 2024-2027**
- For more information, **poster #451**

Shielding

Iron **γ** shielding

Neutron shield

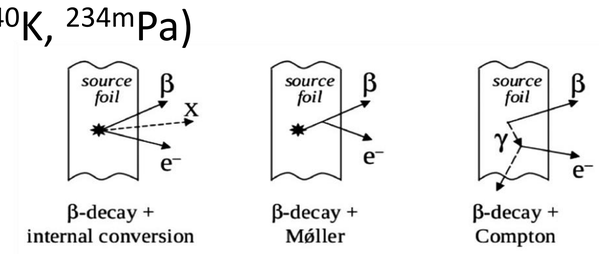
Modane Underground laboratory

Background in SuperNEMO

Internal background

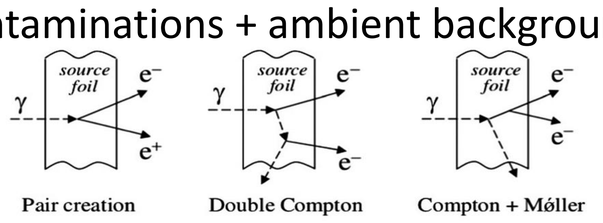
2νββ and Source foil contamination

(^{208}Tl, ^{214}Bi, ^{40}K, ^{234m}Pa)



External background

Detector contaminations + ambient background



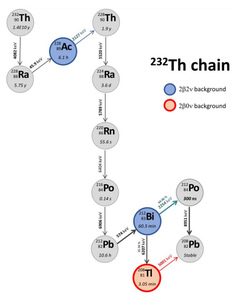
Radon

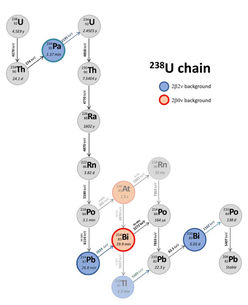
See poster #41

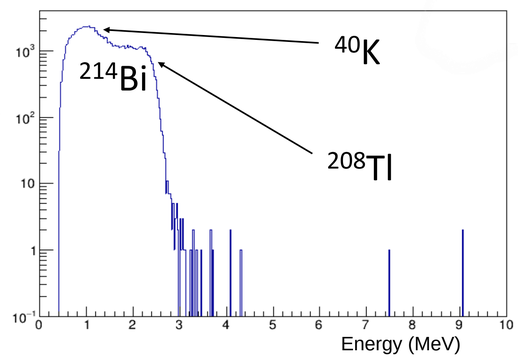
Ambient gamma spectrum

Main background without shielding

Emitted from lab's rock walls





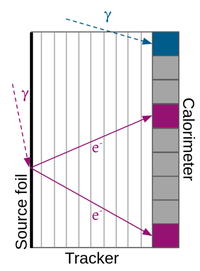


Two-electron-like event spectrum in the main calorimeter (50 hours of data)

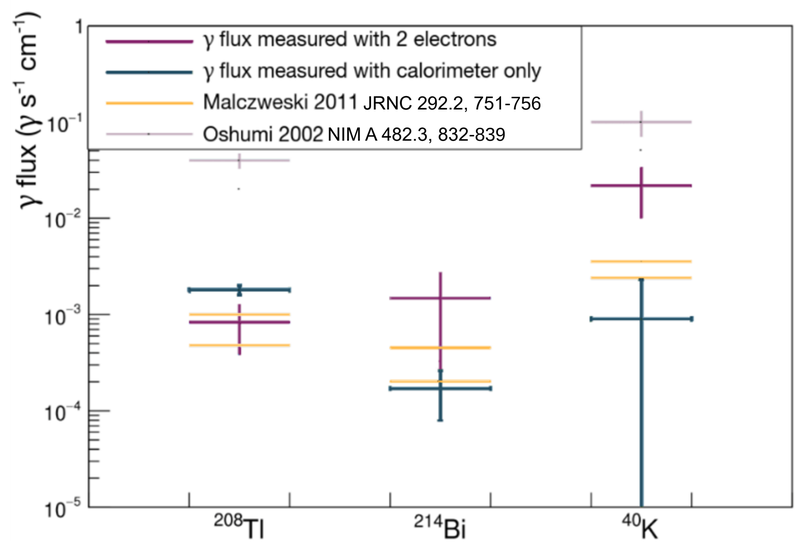
Measured gamma flux

Two background channel analyses:

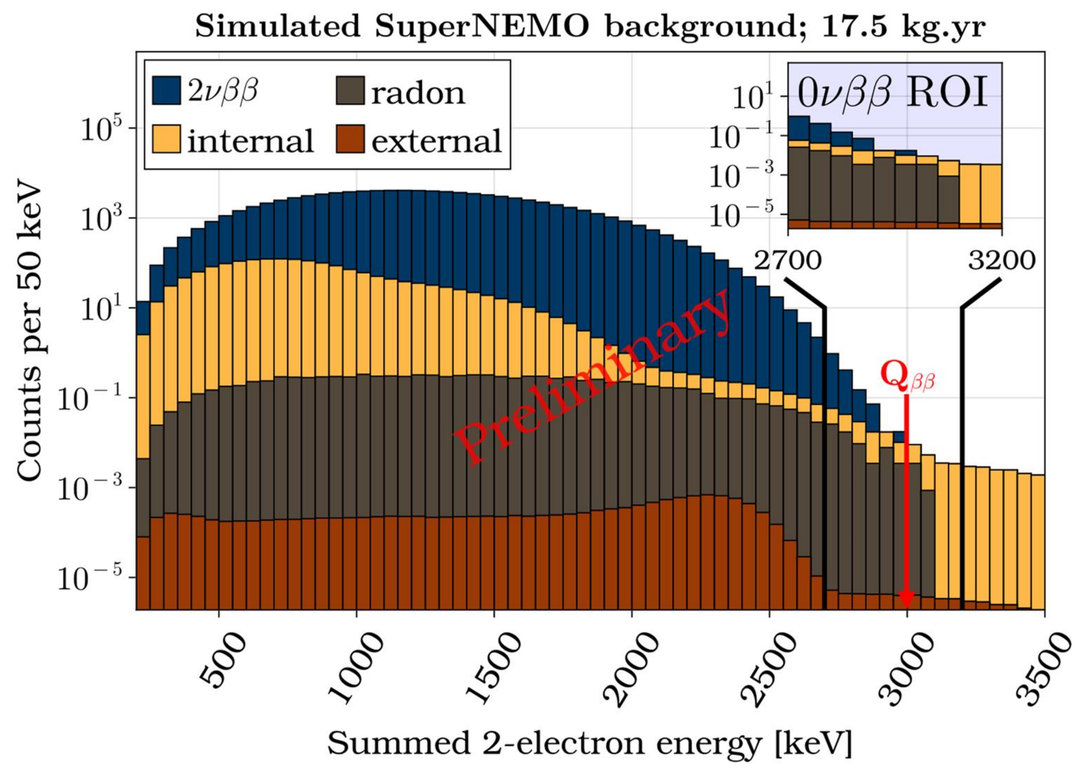
- Direct calorimetric measurement
- Two-electron-like event measurement



Comparison with earlier measurements of LSM ambient gamma flux



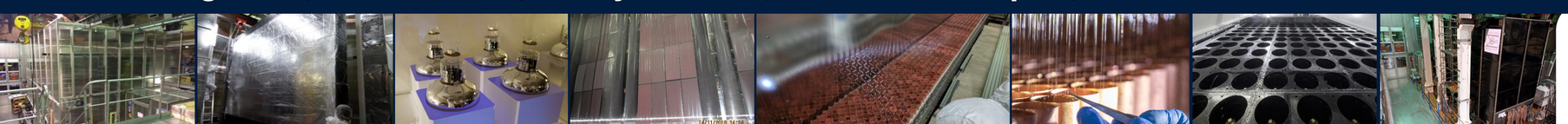
Expected total background



Expected background rate in ROI:
< 10^{-4} events per keV.kg.yr

Grant support: No. 24-10180S.

Xalbat Aguerre, Maros Petro, Cheryl Patrick, Christine Marquet, Emmanuel Chauveau on behalf of the SuperNEMO collaboration



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