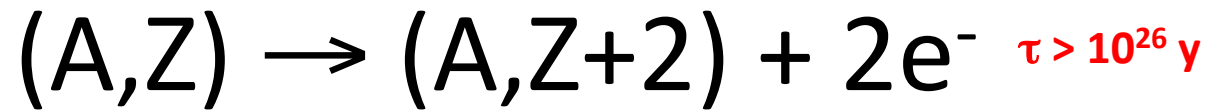


**BINGO** is an ERC project (started on Oct 1<sup>st</sup>, 2020) aiming at developing innovative technological solutions for a future large-scale neutrinoless double beta decay experiment capable of reaching the meV scale for the effective Majorana mass (NO).

Claudia Nones

Reunion des experiences, Jan. 14 2022

# Break the Standard Model observing an ultra-rare nuclear decay: $0\nu 2\beta$

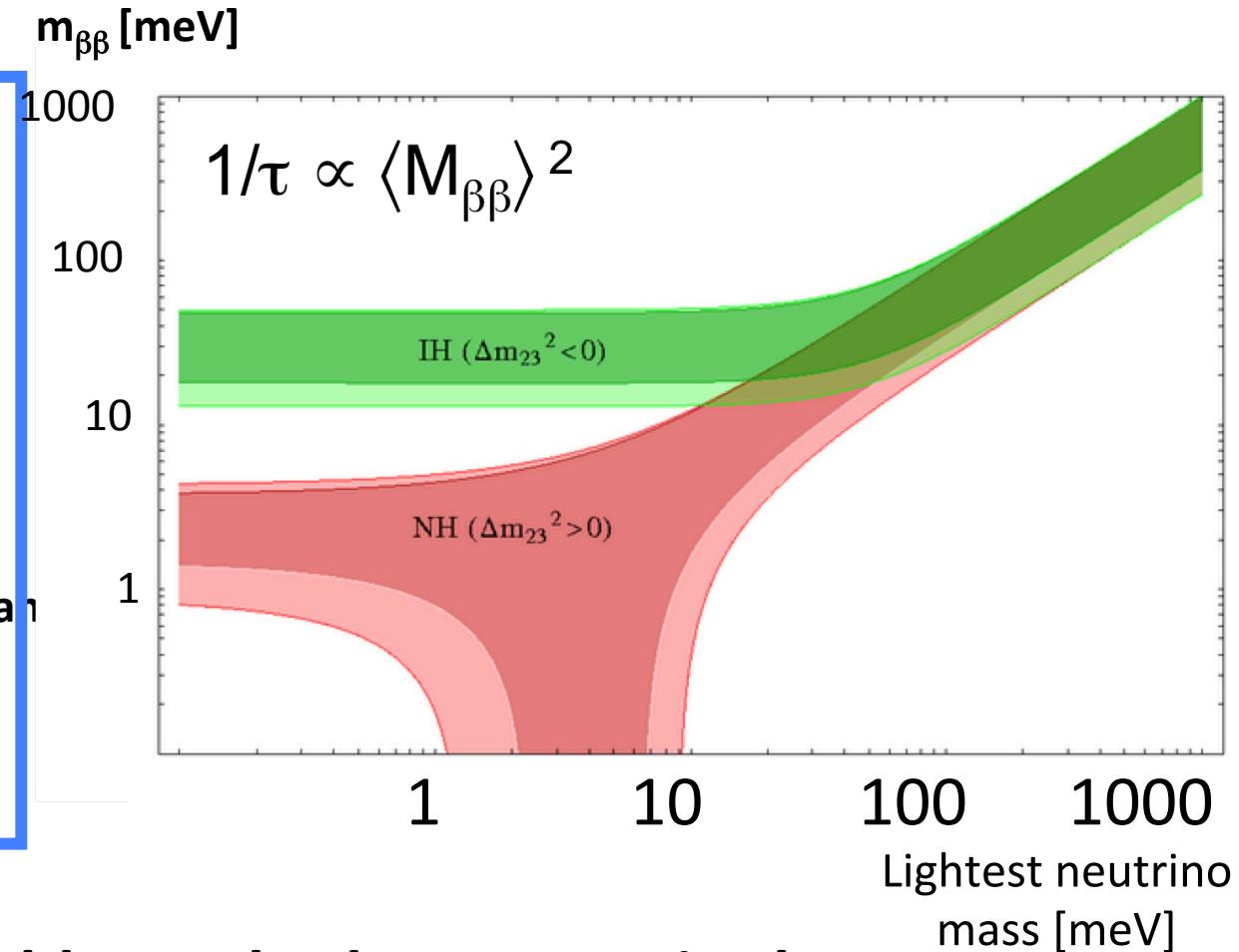


Creation of matter without antimatter partners

**Never observed.**

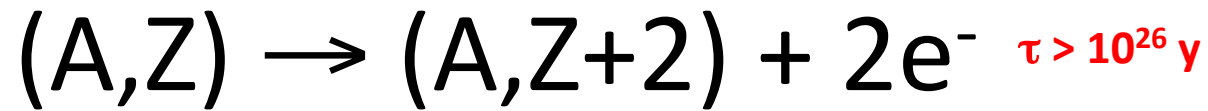
Its detection would:

- establish that neutrino is a **Majorana** particle
- fix the **neutrino mass scale**, provided by the **effective Majorana neutrino mass**  $m_{\beta\beta}$
- prove **Lepton Number Violation**



The only experimentally viable method to ascertain the  
**Majorana nature of neutrino**

# Break the Standard Model observing an ultra-rare nuclear decay: $0\nu 2\beta$

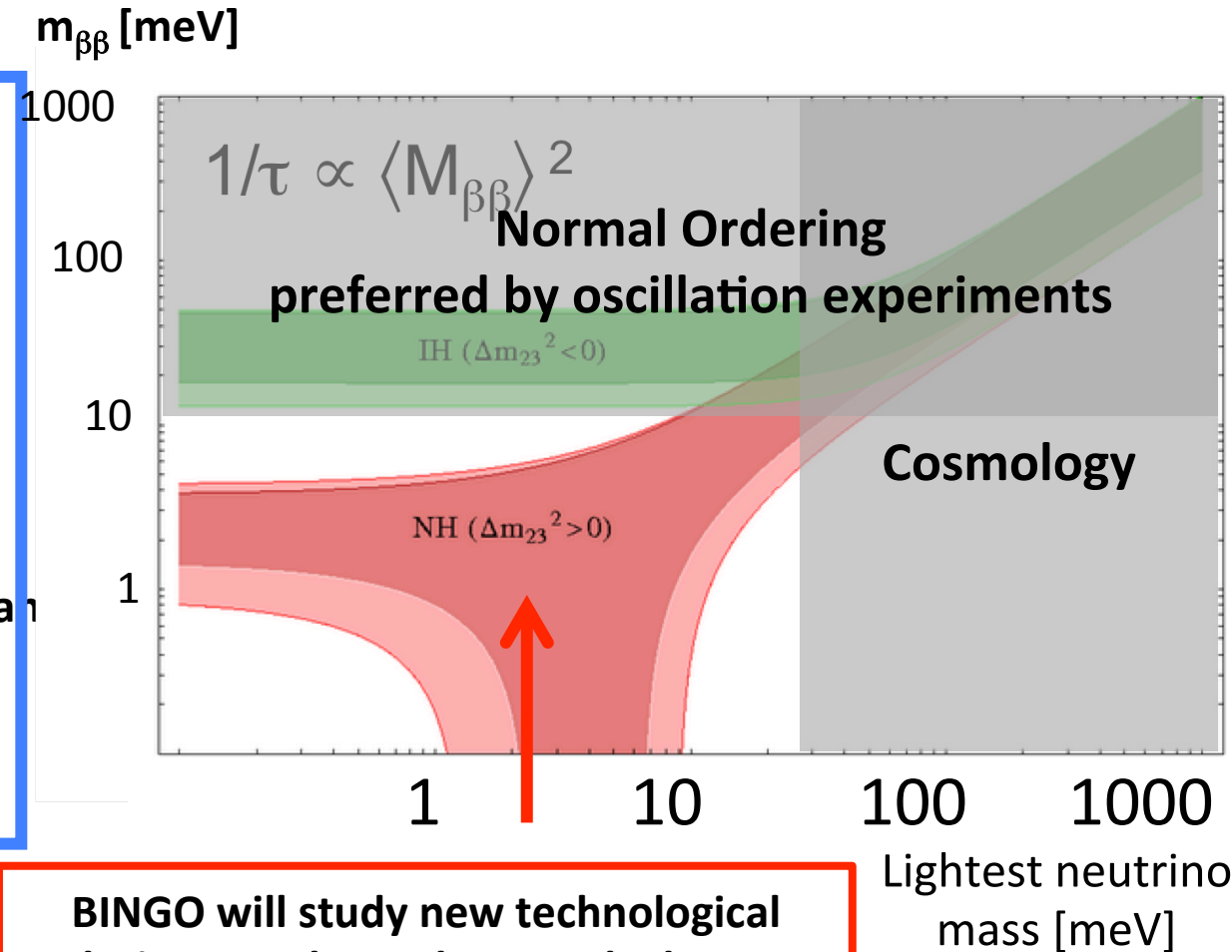


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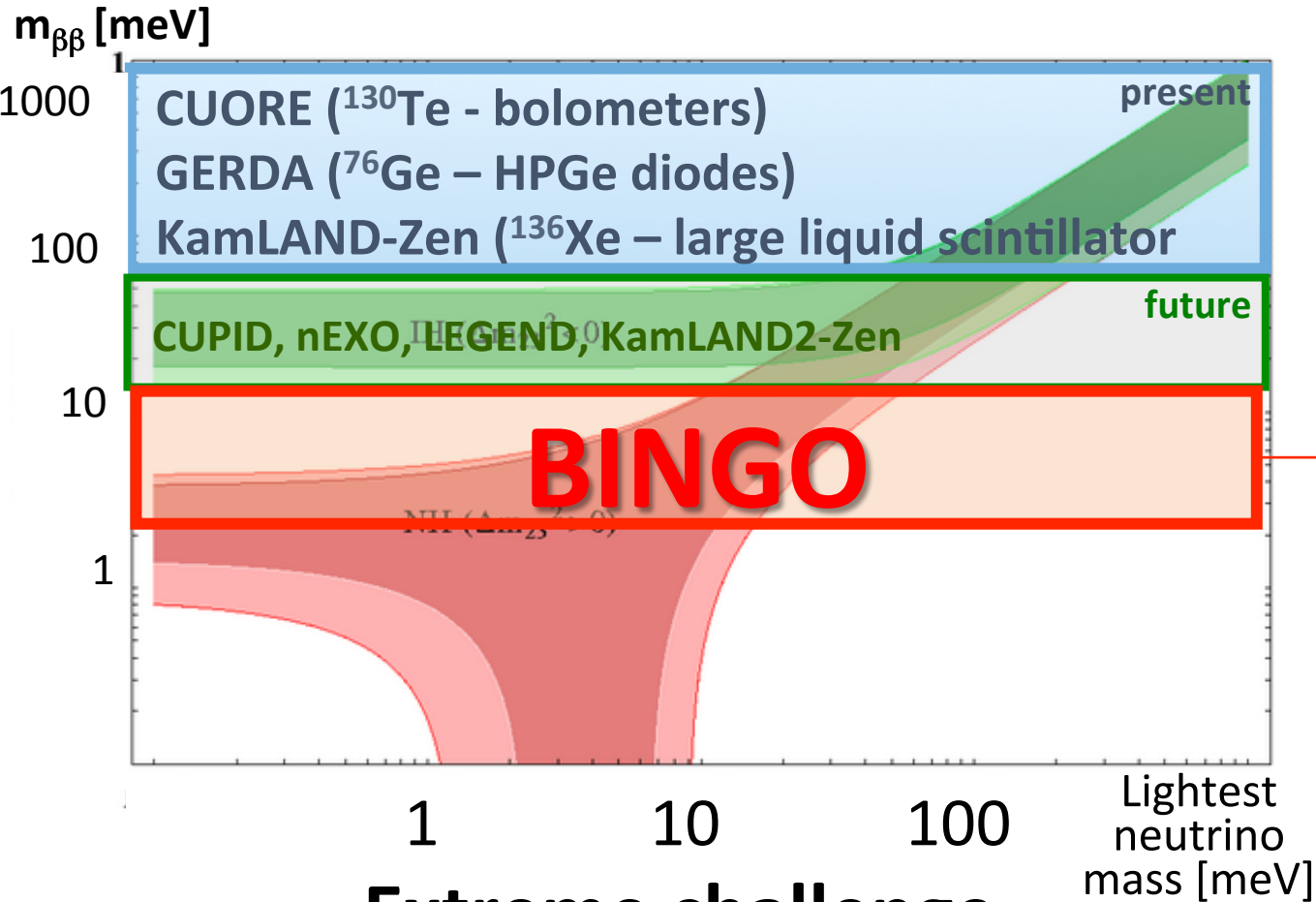
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**BINGO will study new technological solutions on the path towards the meV scale**

# BINGO: the leap towards meV level



**Extreme challenge**

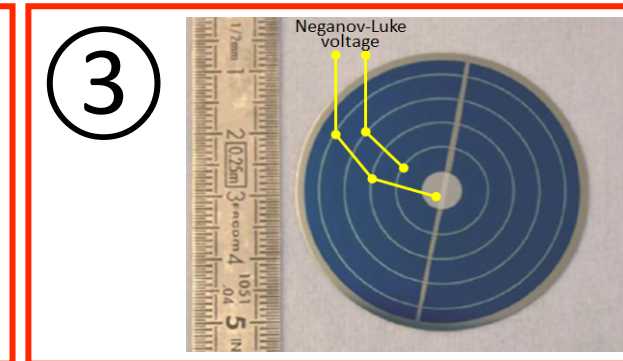
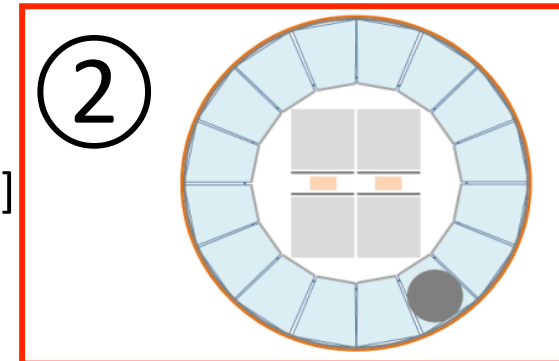
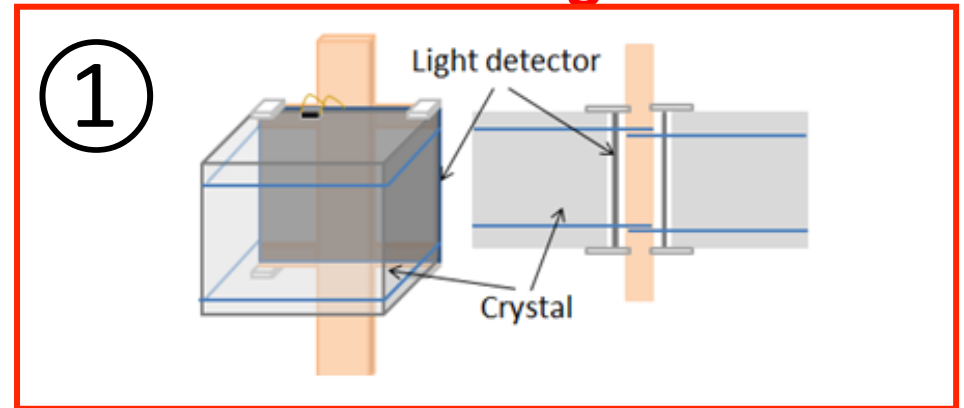
Only embryonal ideas in the  $0\nu 2\beta$  community

**BINGO is a breakthrough**

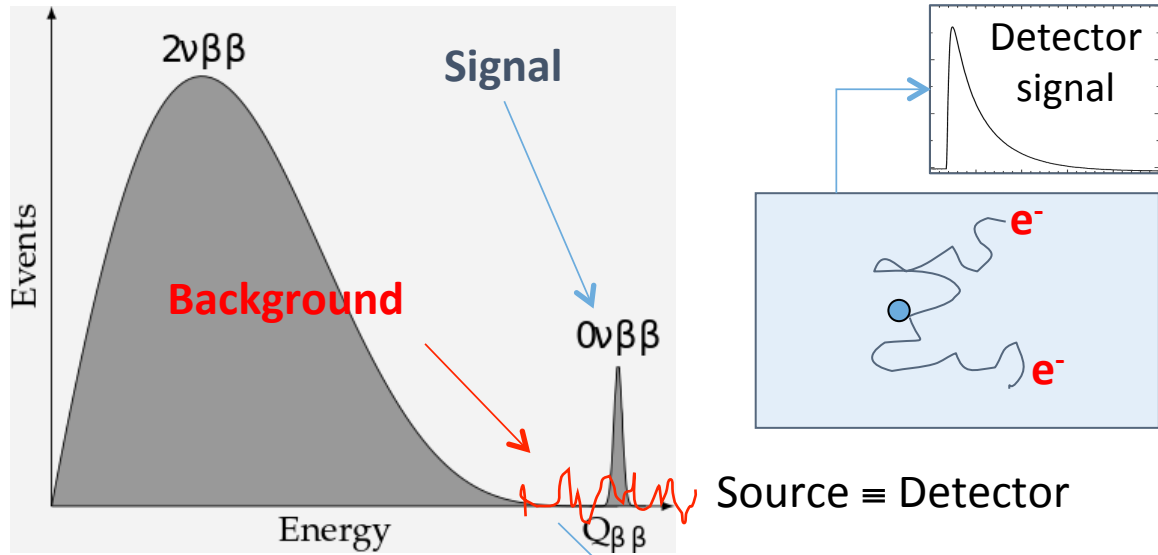
Scintillating bolometers

+

New technologies to explore the NH region



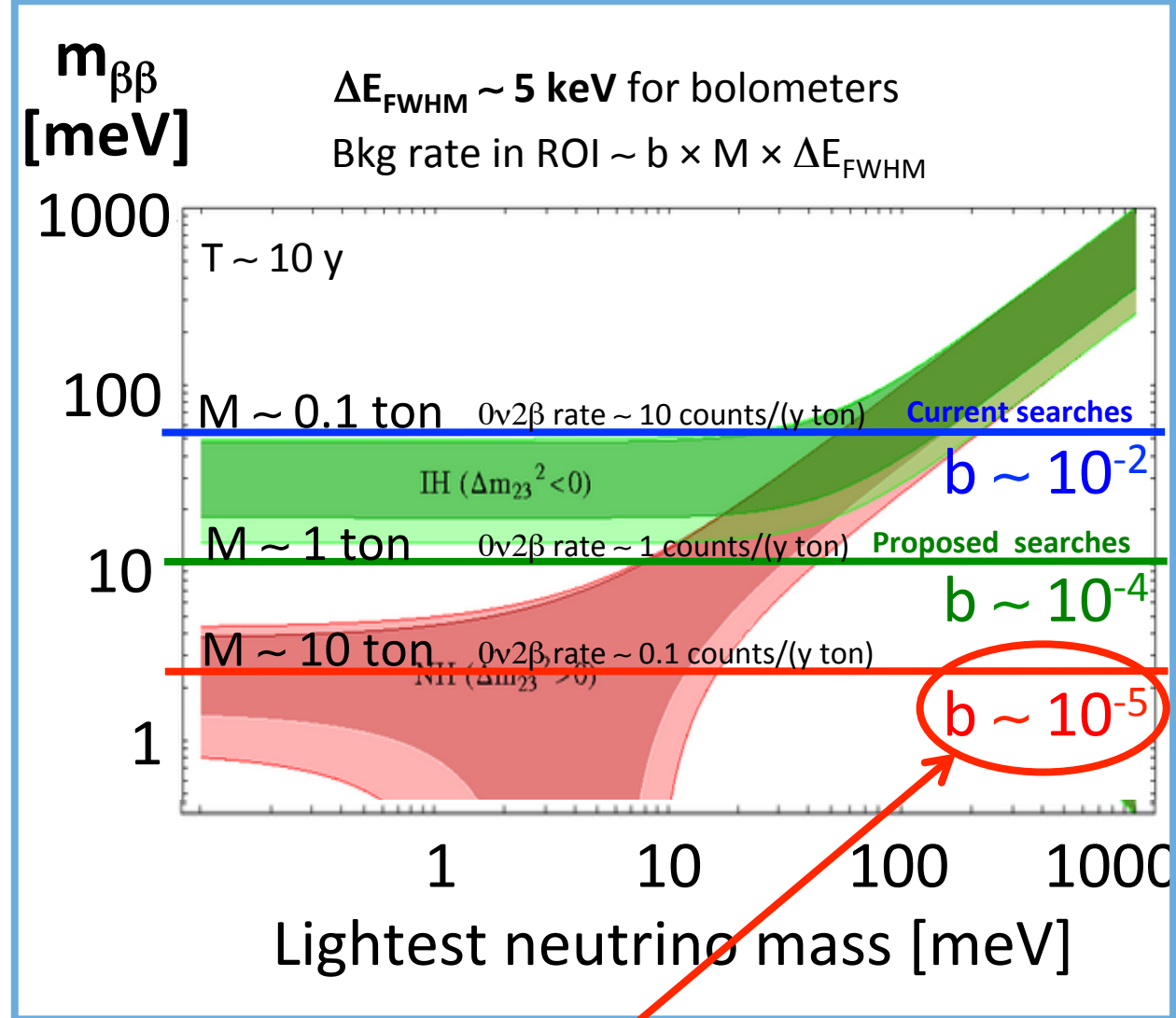
# A key parameter: the background index



## Background index

$$b = \frac{\text{Background counts}}{M \times \Delta E \times T} \quad [\text{counts}/(\text{keV kg y})]$$

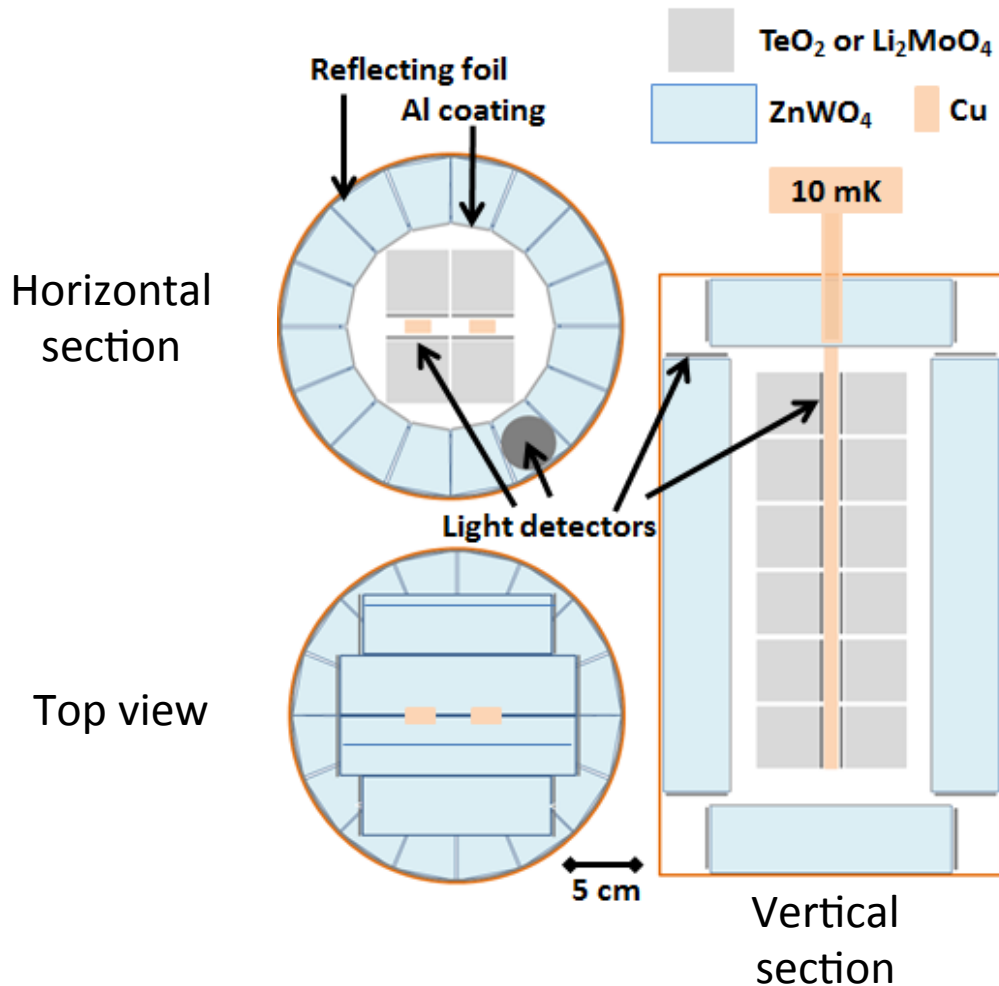
$M$ : Detector/source mass  
 $\Delta E$ : Energy interval  
 $T$ : Measurement time



**BINGO objective**

# MINI-BINGO underground

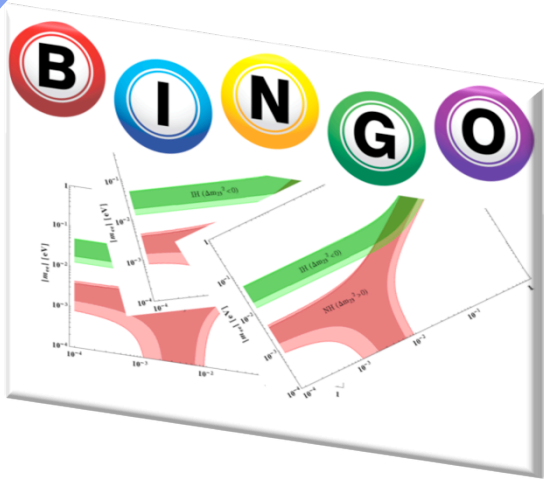
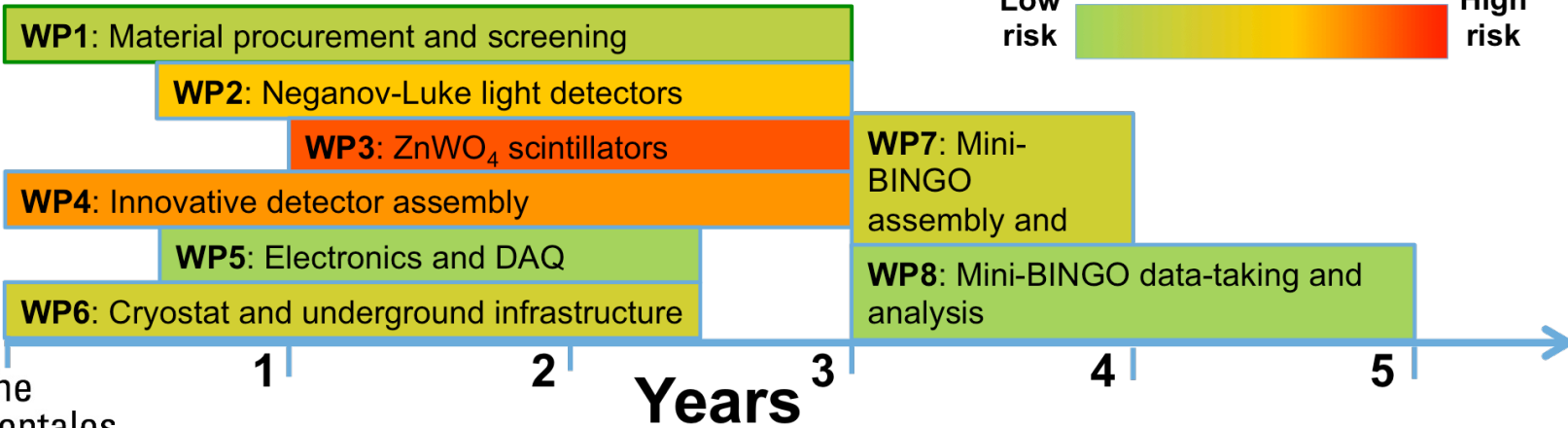
**MINI-BINGO** is the **demonstrator** of the BINGO technology in a dedicated **underground cryostat** at **LSM**



## Small-scale validation of all the BINGO elements

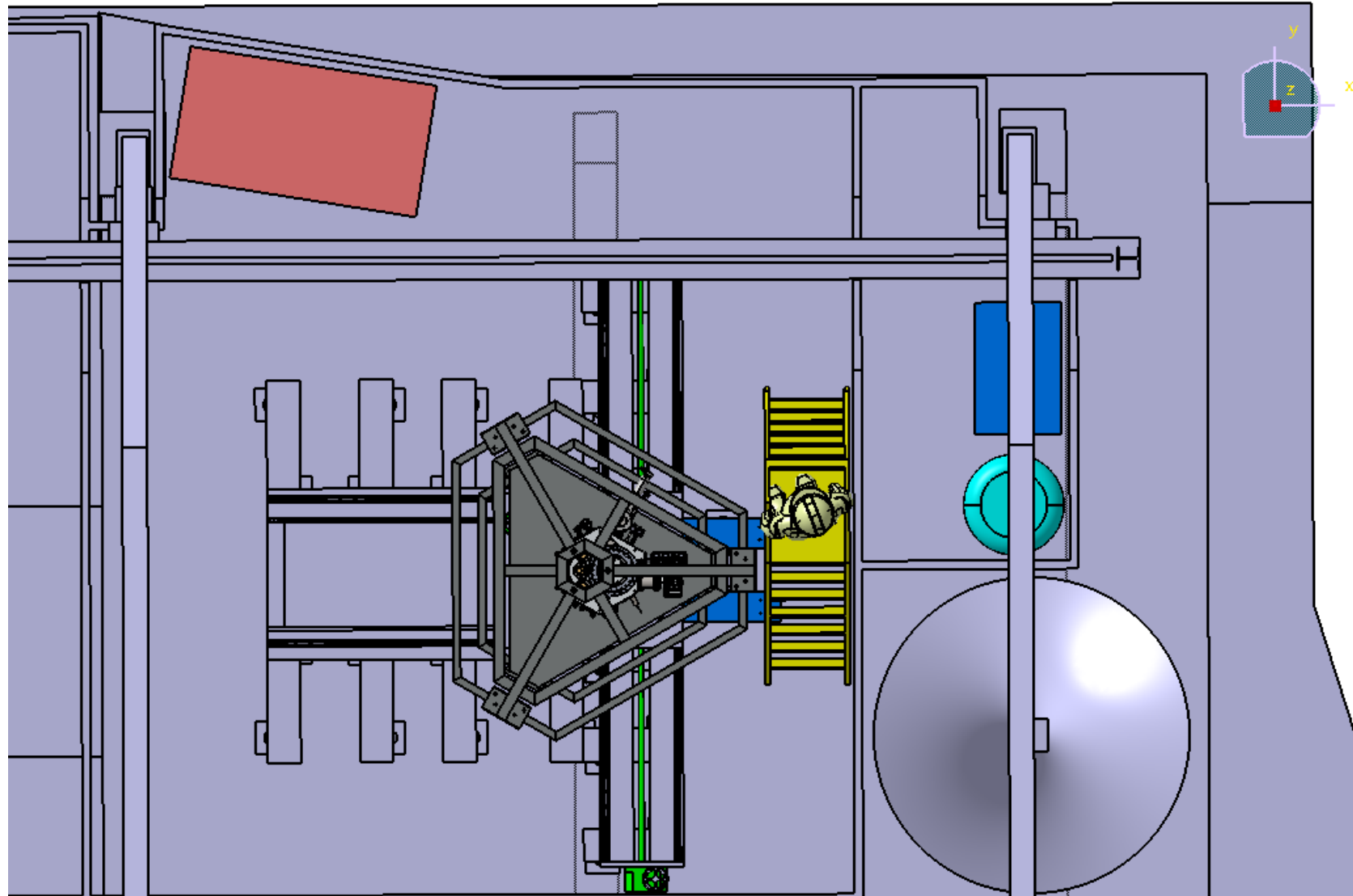
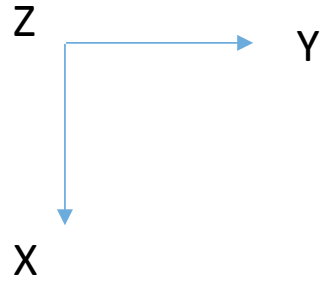
- 2 isotopes: <sup>100</sup>Mo and <sup>130</sup>Te
- 2 towers of 12 crystals each
- Crystals will see nothing else that is not active
- ZnWO<sub>4</sub> crystals as active shields
- Innovative light detectors
- Synergies with EDELWEISS and CRYOSEL

Scale high enough to demonstrate  
 **$b \leq 10^{-4}$**  in **1 y data taking**  
Pave the way to **BINGO**



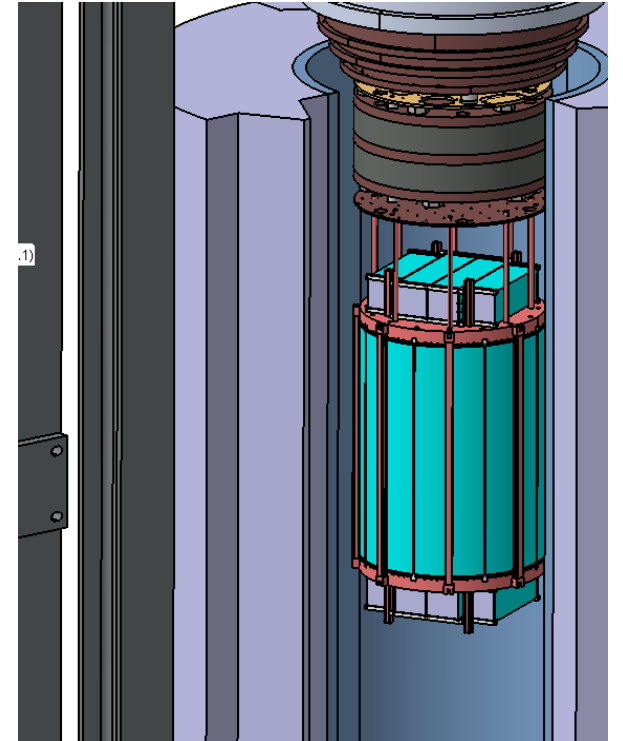
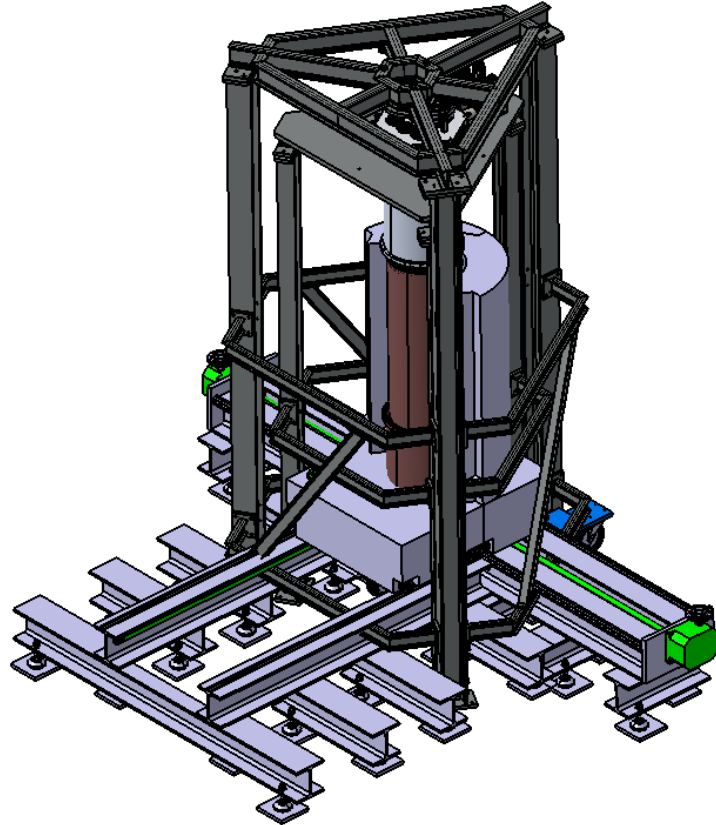
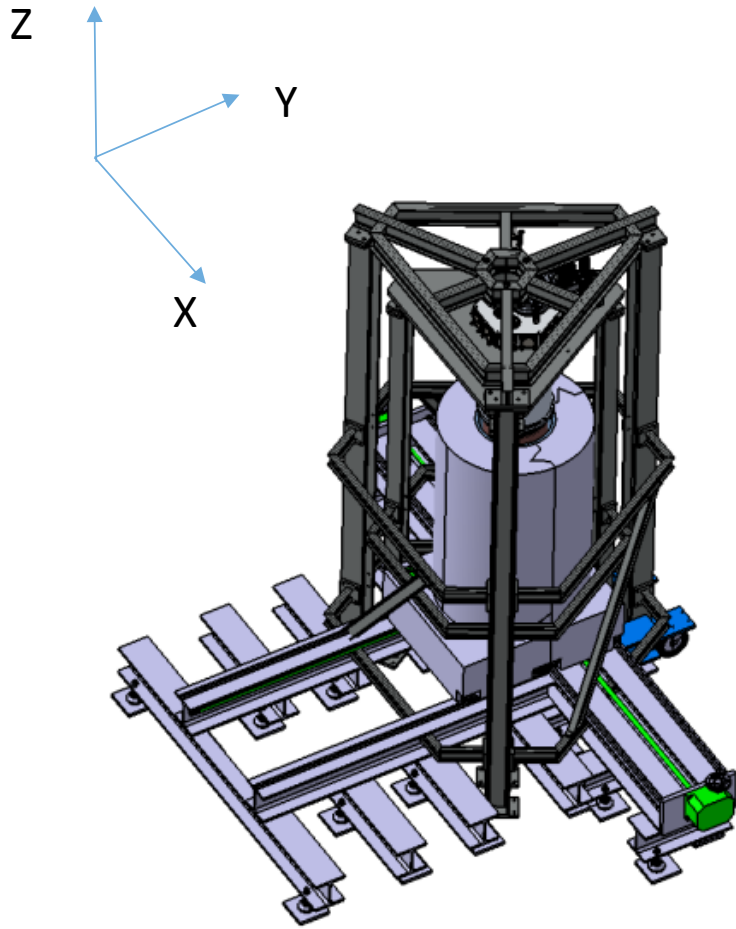
# Work-packages and Timeline

# Installation at LSM





# Some details of the cryostat installation



# Calendar for LSM activities

- 2021: several missions (vibrations, space location, clean room needs, visit for cryostat tender suppliers, ...), low radioactivity screening
- Tender for clean room: asap (need definition on-going)
- Preparation of the space for BINGO
- Oct 2022: installation of the clean room (no roof + no frontal wall)
- Nov-Dec 2022: cryostat installation at LSM
- Jan 2023: first detectors to be installed
- Jan 2023 – mid 2024: possibility to run both Cryosel/BINGO detectors together
- End 2024: 1Y of data-taking of Mini-BINGO

# Conclusions

- BINGO, a new double-beta decay experiment at LSM
- 2022: an intense year for the preparation and installation of the cryogenic infrastructure
- Physics run expected at the beginning of 2023
- Synergies with EDELWEISS
- Thanks to Aurelien, Guillaume, Thierry for their help in the conception phase and beyond
- Looking for new collaborators

