

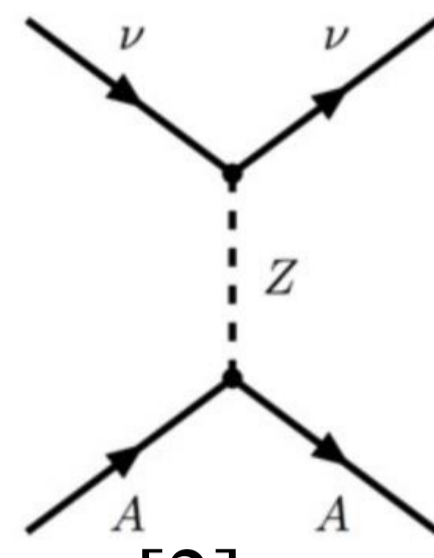
# First Performance of the RICOCHET Experiment at ILL

Valentina Novati, on behalf of the RICOCHET collaboration

valentina.novati@lpsc.in2p3.fr

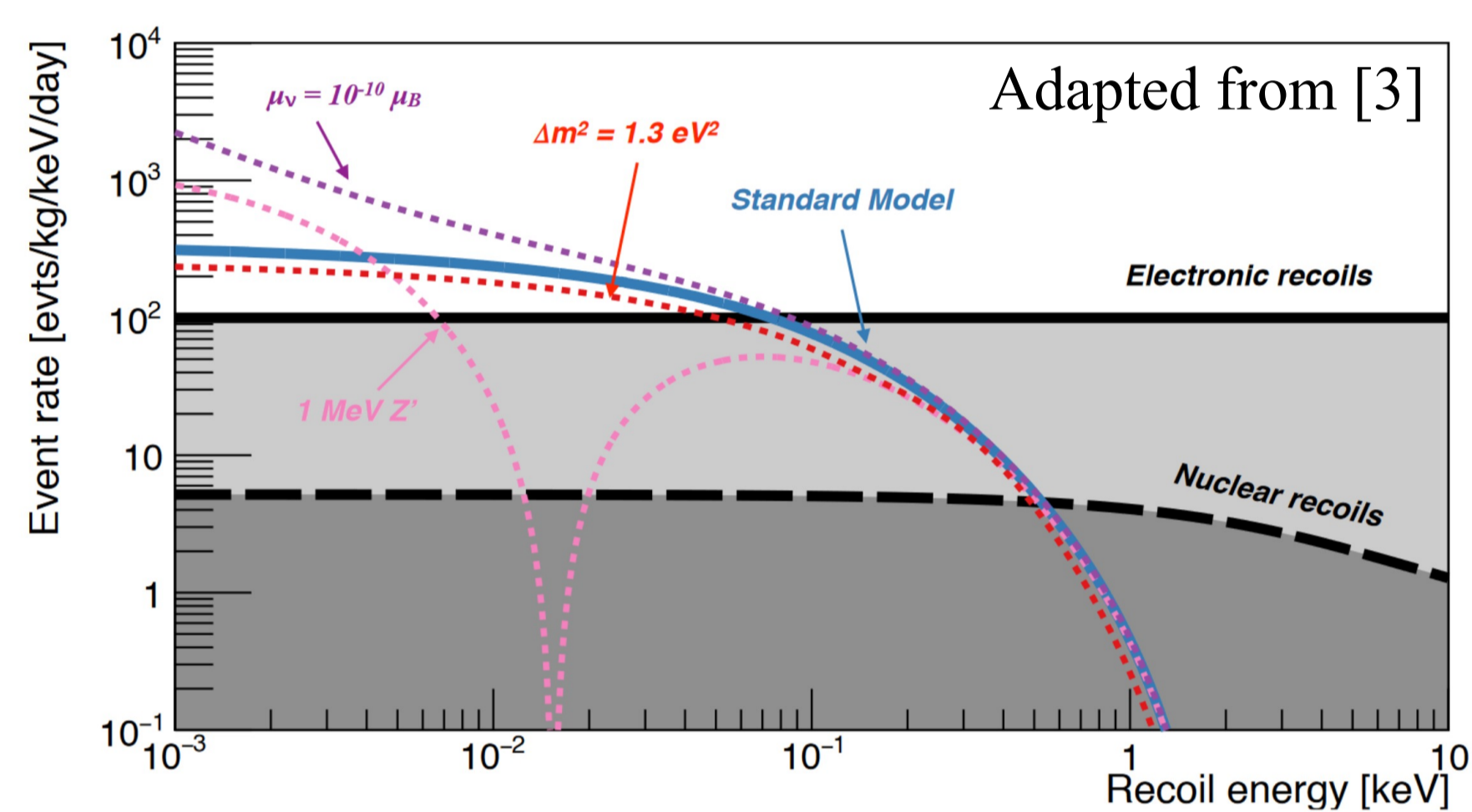
## Coherent Elastic Neutrino-Nucleus Scattering (CEvNS)

The CEvNS process was predicted in 1974 by Freedman [1] and first observed in 2017 with O(10 MeV) neutrinos at the Spallation Neutron Source [2].



CEvNS is a probe for new physics beyond the Standard Model [3]:

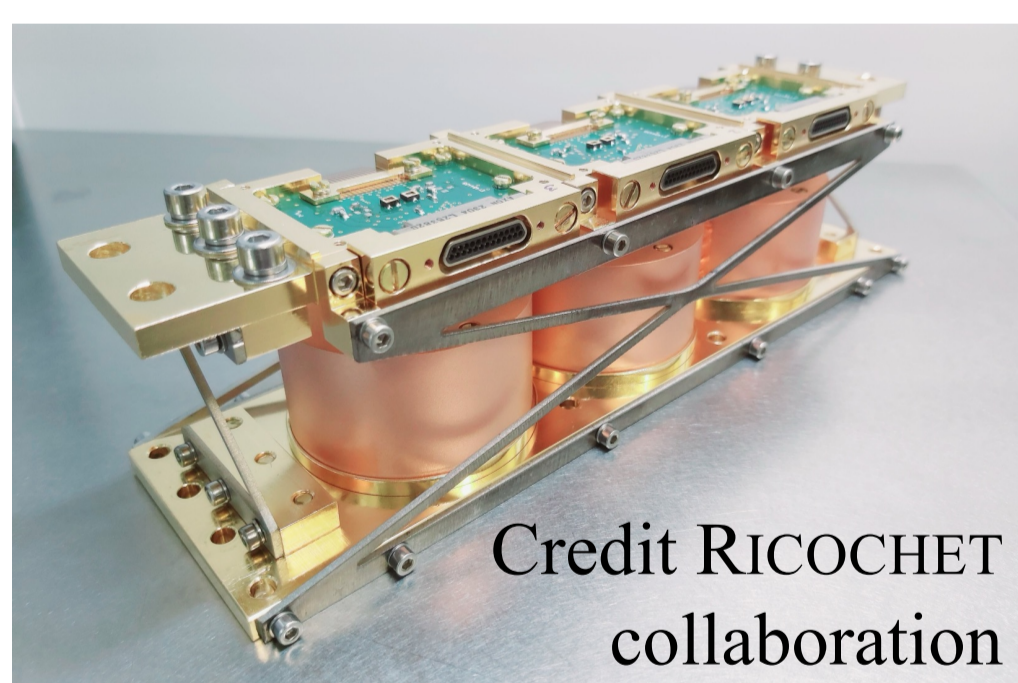
- Non-standard interactions of neutrinos and quarks
- Neutrino magnetic moment
- Sterile neutrino
- Neutrino couplings to new mediators



## The RICOCHET experiment

The RICOCHET experiment [4] searches for the CEvNS at a research reactor hosted at the Institut Laue Langevin (ILL) in Grenoble, FR. Two detector technologies based on cryogenic calorimeters are envisaged:

- **CryoCube** [5] – which is using 18 germanium targets equipped with germanium-Neutron-Transmutation-Doped thermistors and aluminum electrodes for the ionization readout
- **Q-Array** [6] – which will leverage 9 superconducting targets (as zinc, aluminum, tin) with a Transition-Edge Sensor read-out

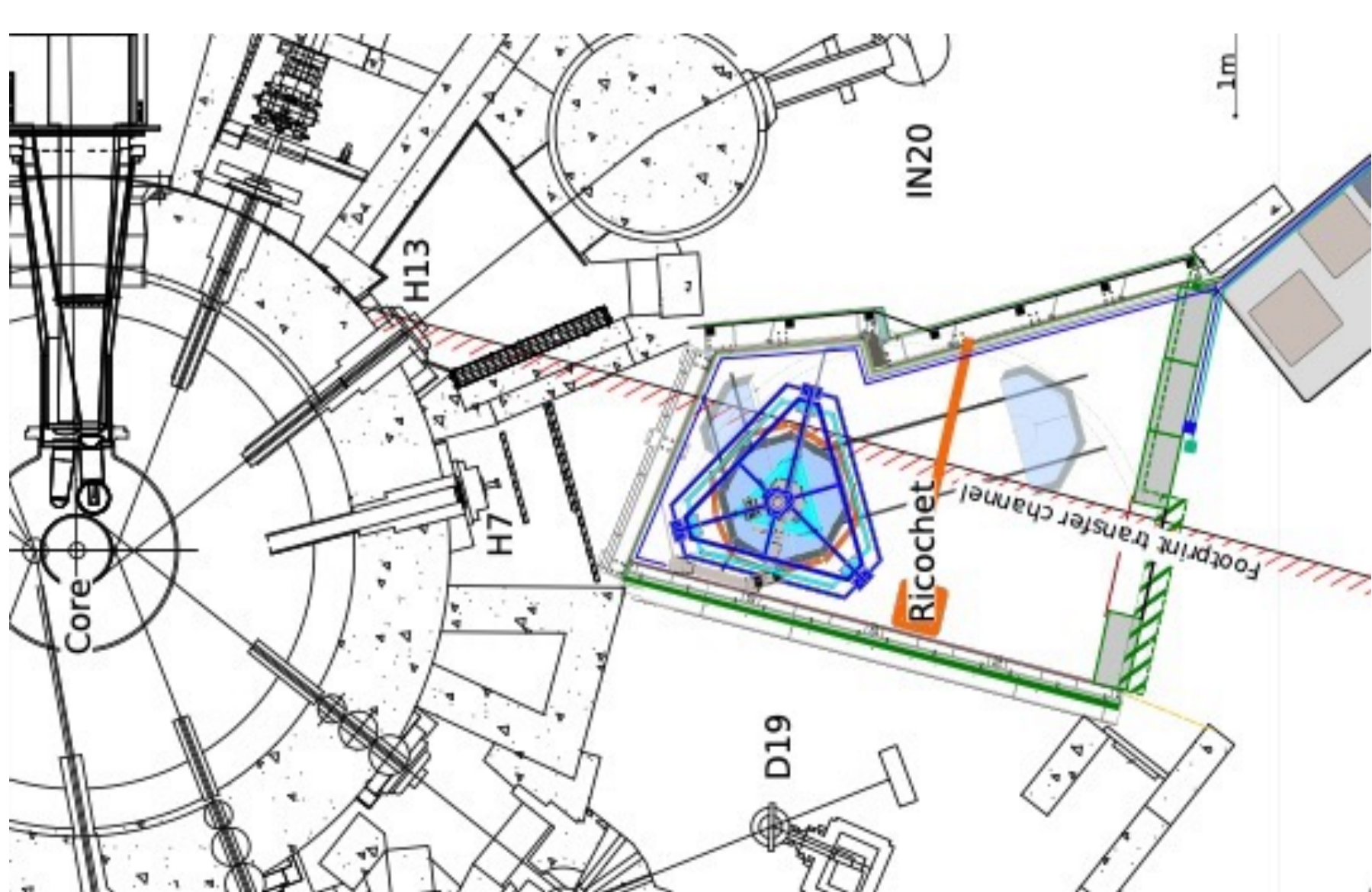


Mini-CryoCube

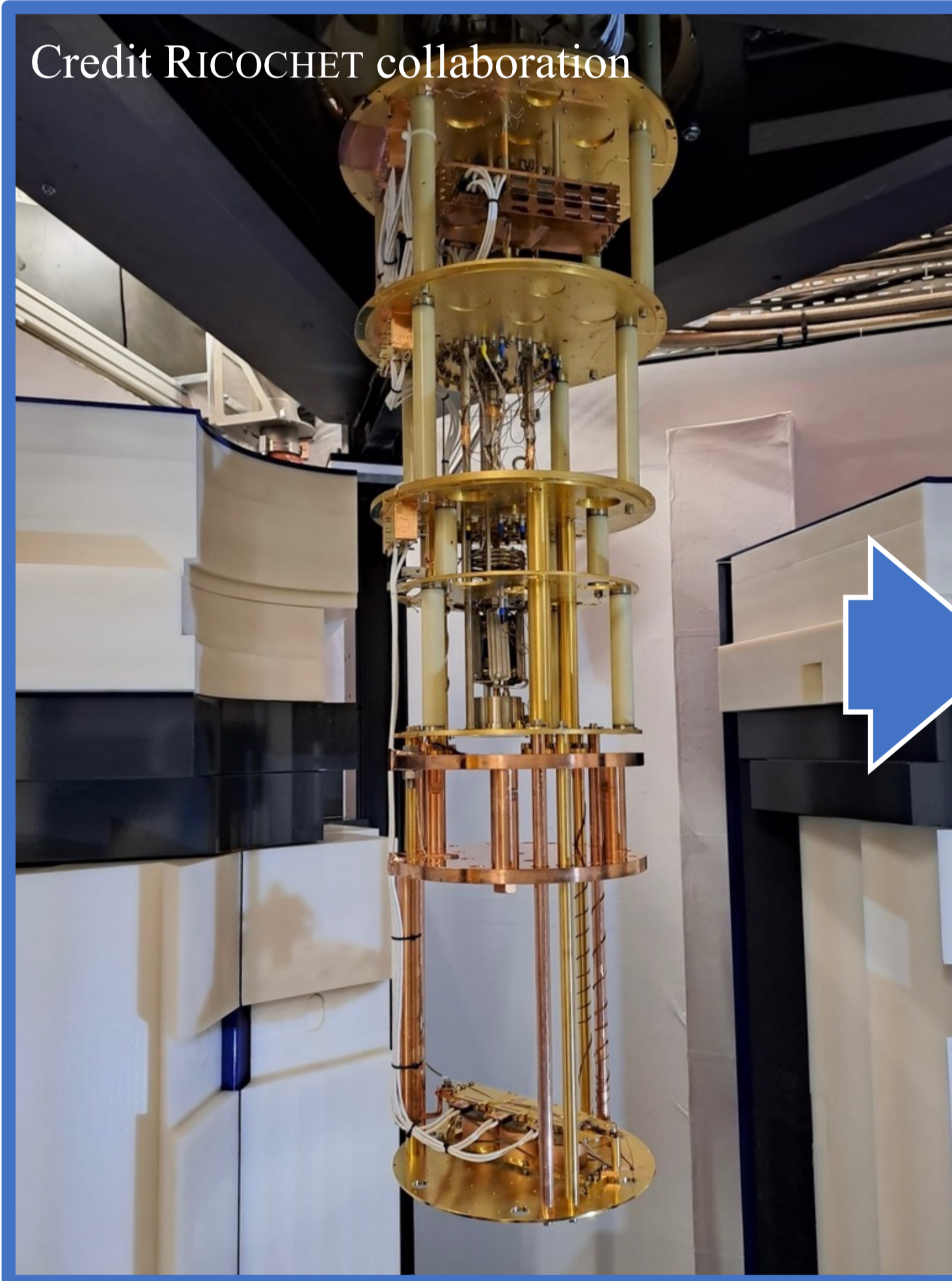
Credit RICOCHET collaboration

## The RICOCHET integration at ILL

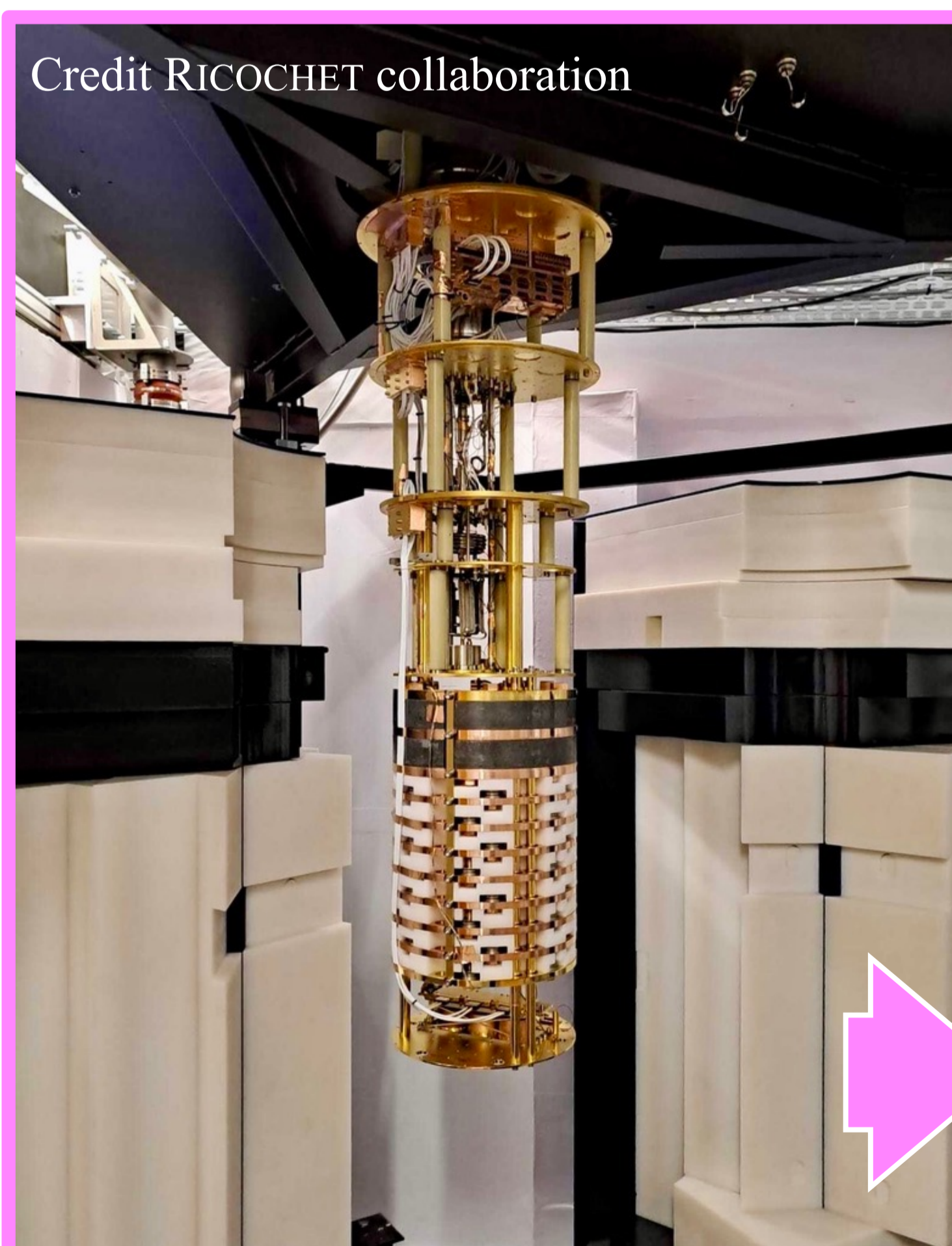
The RICOCHET experiment is installed at the ILL-H7 site, at a distance of 8.8 m from the reactor core with a power of 58 MW, leading to an expected flux of  $1.2 \cdot 10^{12}$  neutrinos / (s·cm<sup>2</sup>) at the RICOCHET detectors



The RICOCHET cryostat during the cryogenic run



The RICOCHET cryostat with the Mini-CryoCube installed



The RICOCHET cryostat with the internal shield and the Mini-CryoCube installed

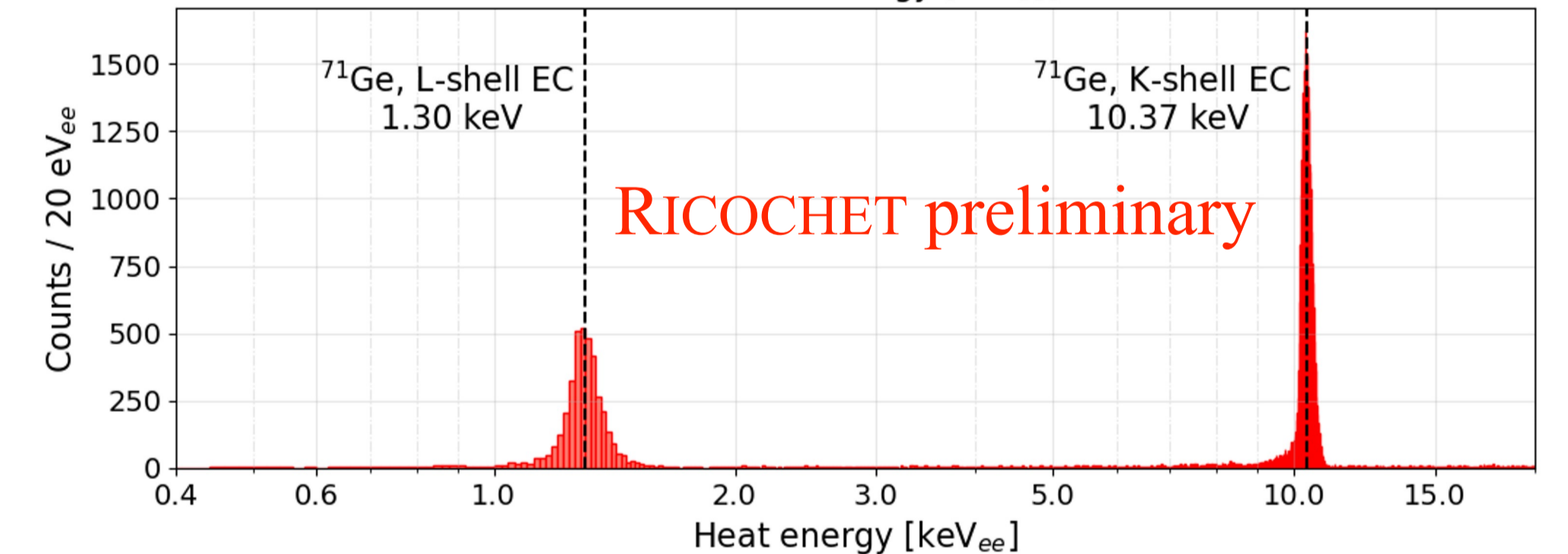
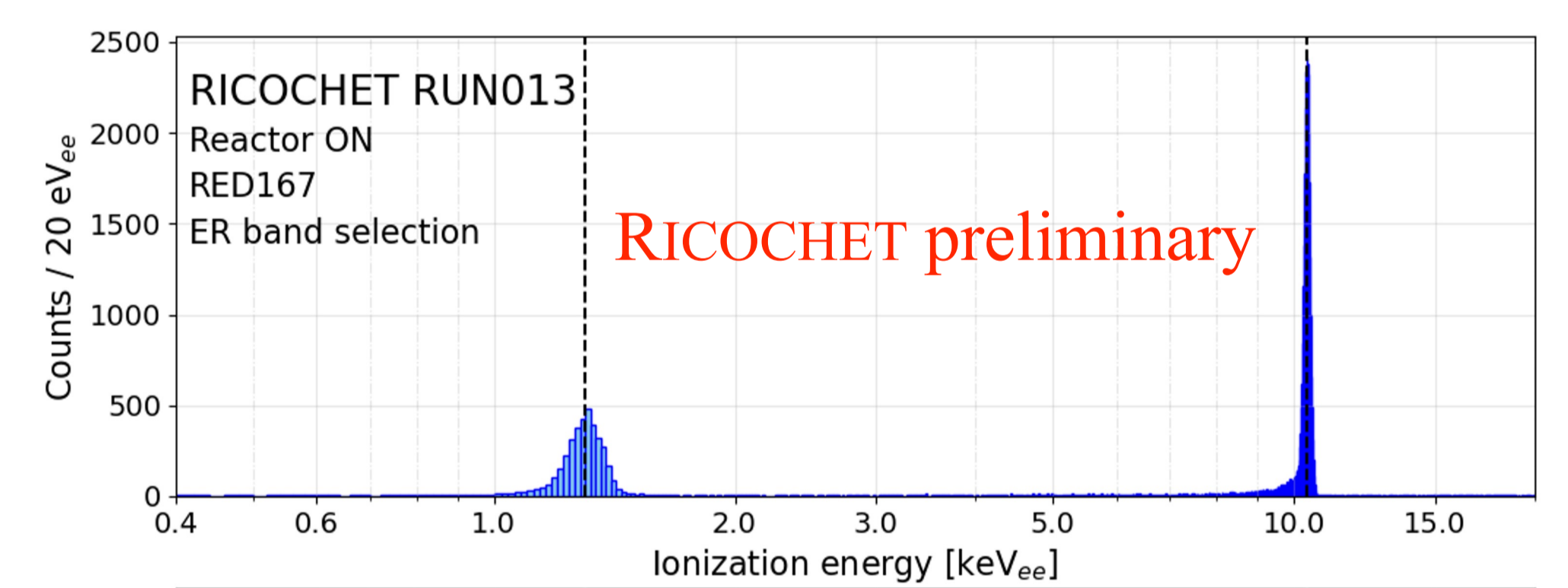
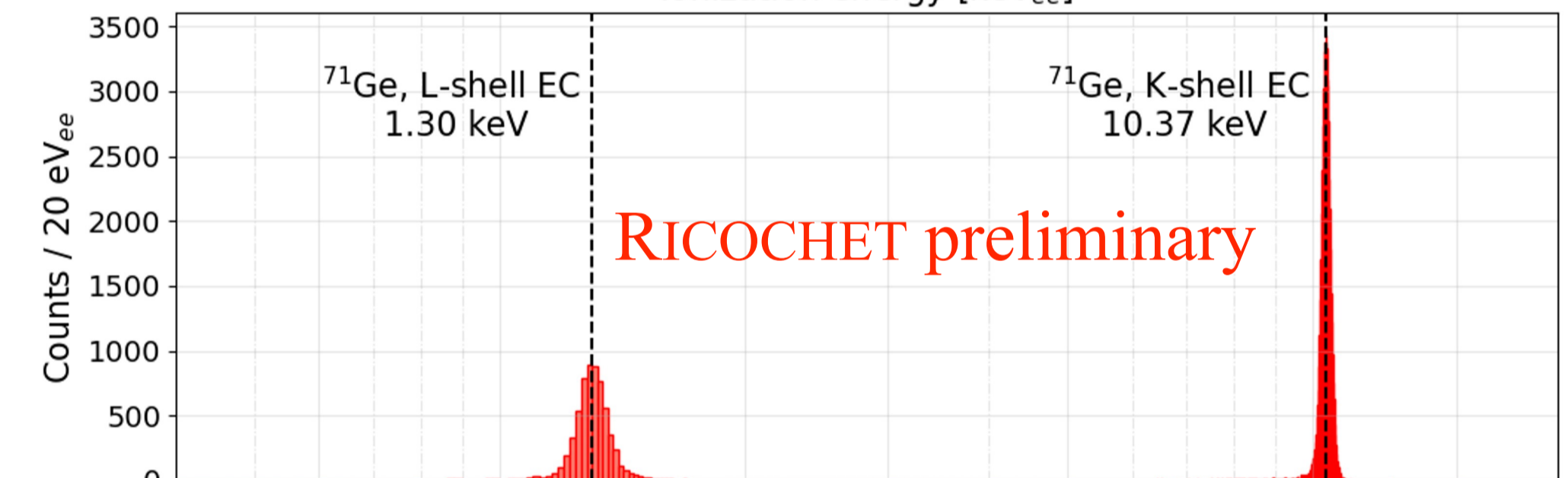
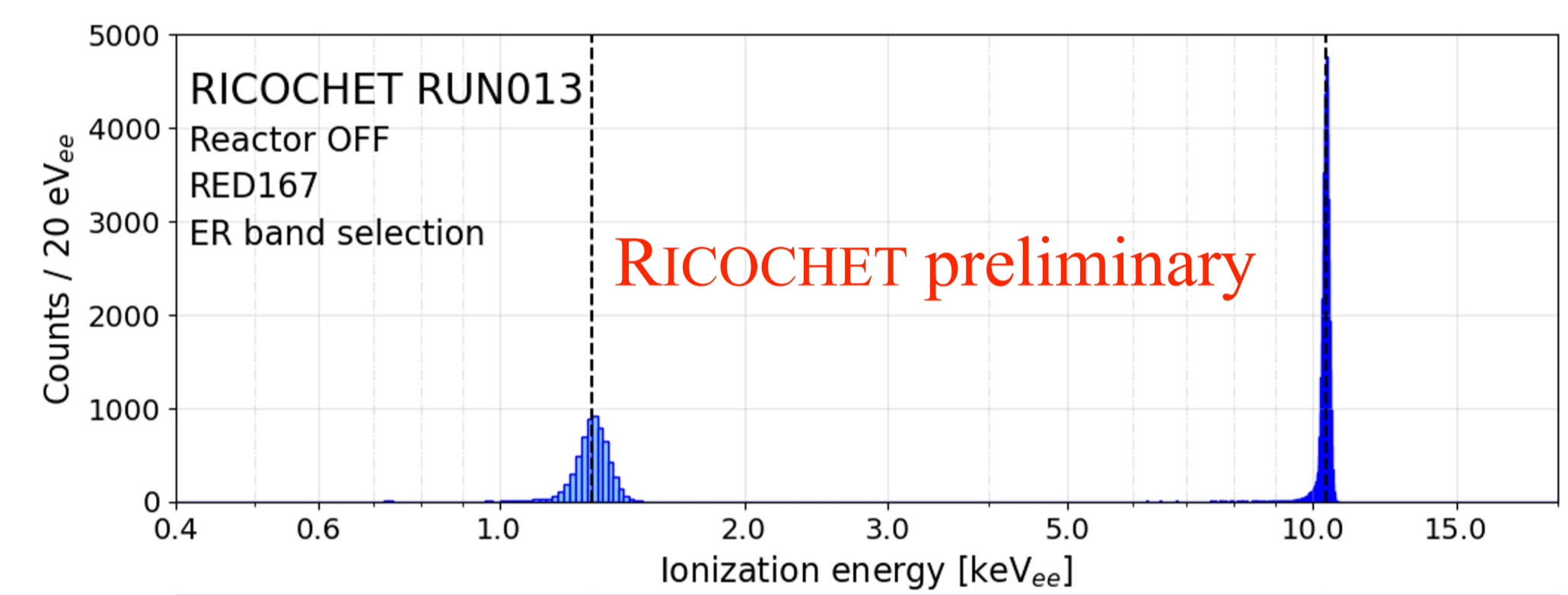
## First cryogenic run at ILL

- The RICOCHET cryostat was relocated from the IP2I (Lyon, FR) to the ILL in November 2023
- The cryostat was installed in its external shielding, which is made of polyethylene, lead, and soft iron.

A base temperature of 8.6 mK was attained, the anticipated cryogenics performance was achieved at ILL

## First detector run at ILL

- A Mini-CryoCube consisting of three RICOCHET detectors was installed and operated at the ILL
- Both reactor ON and OFF data were acquired to establish detector performance



The first RICOCHET data were acquired at ILL with a Mini-CryoCube. The detector performance with reactor ON/OFF are comparable.

## Background validation run

- The inner lead and polyethylene shield was installed
- The laser calibration system for three detectors was deployed
- The top muon veto was installed

The run is ongoing, stay tuned for new results!

## Outlook

- In-situ commissioning (background levels, vibration mitigation, full muon veto operations) until end-2024
- First science data with the full CryoCube payload in Spring 2025

## References

- [1] D. Z. Freedman, PRD 9, 1389, (1974) [2] J. Billard et al, JCAP 11,016, (2018) [4] C. Augier et al., EPJC 84, 186, (2024)  
[2] D. Akimov, Science 357, 1123 (2017) [3] C. Augier et al., EPJC 83, 20, (2023) [5] C. Augier et al., NIMA 1057, 168765, (2023)