Contribution ID: **77** Type: **Poster**

Exploring the impact of the Mediterranean Sea activity on the performance of CUORE mK-calorimetric experiment

Tuesday, 18 June 2024 17:30 (2 hours)

CUORE is a ton-scale experiment designed for the search of the neutrinoless double beta ($0\nu\beta\beta$) decay of ^{130}Te. Hosted in Italy at the Gran Sasso National Laboratory (LNGS), CUORE consists in an array of 988 cryogenic calorimeters operated below $\simeq$15 mK.

Experiments working at the millikelvin-scale are usually characterized by very good energy resolution. However, they have to handle and suppress many sources of noise, including electronic, vibrational and seismic noise.
The activity of seas and oceans is an additional, not yet extensively studied, source of noise, inducing microseismic waves in the sub-Hz domain.

This contribution will report a novel multi-detector analysis based on data from Copernicus Marine Environment Monitoring System (CMEMS), from high-sensitivity seismometers at LNGS, and from CUORE calorimeters.
We assess a strong correlation between variations in the Mediterranean Sea activity, in the microseismic noise at LNGS, and in the performance of all CUORE calorimeters. This correlation emphasizes the impact of microseismic noise generated by the Mediterranean Sea activity on the energy resolution of CUORE.

Since the energy resolution is a crucial parameter in defining the experimental sensitivity to $0\nu\beta\beta$ decay, the mitigation of such low-frequency environmental noise can benefit both CUORE and CUPID, the next-generation experiment for $0\nu\beta\beta$ decay searches with mK-calorimeters.
This analysis opens the possibility to improve noise-reduction algorithms, as well as to upgrade the seismic insulation system of the CUORE cryostat, which will also host the CUPID experiment.

Poster prize

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Session Classification: Poster session and reception 1

Track Classification: Neutrinoless Double Beta Decay