Contribution ID: **356** Type: **Oral**

First cryogenic SiPM readout of a NaI(Tl)-based dark matter detector with the ASTAROTH project

Wednesday 27 August 2025 17:00 (20 minutes)

One of the most exciting quests in fundamental physics is the search for dark matter, which continues to see growing worldwide efforts across several theories and experimental techniques. Among these, NaI(Tl) scintillating crystals stand out, as they are used to observe the direct interaction of dark matter particles via nuclear recoils of a few keV. A long-lasting, but so far unconfirmed, positive result obtained at the Gran Sasso National Laboratory calls for further investigation. The ASTAROTH project in Milan is developing a cryogenic NaI(Tl)-based detector, where light is read for the first time using large-area SiPM matrices. The ASTAROTH innovative detector design has the potential to surpass the limitations of current-generation experiments, enabling the exploration of sub-keV energy recoils where a significant fraction of the dark matter signal may be waiting to be uncovered. The first phase of the project concluded in 2024 with the first successful data taking campaign. We report about the results and performance of the detector as well as the developments planned within the second phase of the project for the next three years.

Collaboration you are representing

ASTAROTH

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Session Classification: Dark Matter and Its Detection

Track Classification: Dark Matter and Its Detection