



Contribution ID: 104

Type: Oral

COSINUS- A cryogenic NaI dark matter detector using the novel “remoTES” design.

Tuesday, 27 June 2023 16:40 (20 minutes)

Over the past twenty-five years, the DAMA/LIBRA experiment has observed an annual modulation signal that is consistent with a dark matter explanation. Unfortunately, in a standard halo scenario, this observation is contradicted by the null-results of numerous experiments utilizing different target materials. In order to perform a true, model-independent investigation of the DAMA/LIBRA result, a study with the same target material is required. The COSINUS (Cryogenic Observatory for Signatures seen in Next-generation Underground Searches) experiment, located at the Gran Sasso underground laboratory, will use NaI crystals operated as cryogenic scintillating calorimeters to cross-check the DAMA/LIBRA result. These detectors will be cooled to milli-Kelvin temperatures and provide a measurement of both the phonon and scintillation light signals via transition edge sensors (TES). This is the first cryogenic measurement of NaI detectors for a dark matter search and the dual channel capability will allow particle discrimination between electron and nuclear recoils on an event-by-event basis. However, attaching a TES directly to the surface of NaI is difficult due to the soft and hydroscopic nature of the crystal. This issue was overcome with the novel “remoTES”(Figure 1) design where the TES is attached to an external wafer crystal and connected to the crystal through a gold bond wire. In this talk we will detail the recent results and implications of the new “remoTES” detector system and present the current status of the experiment.

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Session Classification: Applications

Track Classification: Applications