

# COSINUS and NaI-based Dark Matter Experiments

*Tuesday 9 August 2022 10:20 (20 minutes)*

COSINUS (Cryogenic Observatory for Signatures seen in Next-generation Underground Searches) is a dark matter direct detection experiments investigating the nature of the annual modulation signal detected by the DAMA/LIBRA collaboration. A two-channel readout differentiates COSINUS from the other dark matter experiments using NaI-crystals: in addition to the scintillation light (measured with silicon light detectors), COSINUS can measure the heat released in the target after a particle interaction. The NaI-crystals are operated as cryogenic calorimeters and both the crystals and the silicon light detectors are equipped with Transition Edge Sensors (TES). The ratio between the amount of light and heat measured in the two channels is used to discriminate  $e^-/\gamma$ -events from nuclear recoils on an event-by-event basis, thus it can provide further information on the nature of the DAMA/LIBRA signal. COSINUS has overcome the challenge of a low-melting-point and hygroscopic crystal by developing and successfully operating a new TES coupling named remoTES. It consists of a TES fabricated on a separated wafer and coupled to the NaI-absorber through a gold bonding wire and a gold foil glued on the NaI-surface. The required performance to cross-check the DAMA/LIBRA's results is now within COSINUS's reach. The construction of the facility hosting the new cryogenic observatory at the Gran Sasso National Laboratory (Italy) is progressing fast and planned to be complete by the end of 2023. In this talk, we provide a short overview of the state-of-the-art of the searches for the dark-matter-rate-annual-modulation and we describe the COSINUS detector design and optimisation, the current status of the facility and future plans.

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**Session Classification:** Contributed talks