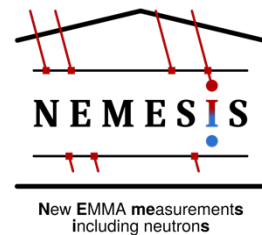


Executive summary

Poster #394



New NEMESIS results*

**Reporting DM-like anomalies*

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on behalf of the NEMESIS Collaboration

- A new experiment collects data at a depth of 210 m.w.e. in the Callio Lab in the Pyhasalmi mine in Finland. The setup, called NEMESIS (New Emma MEasurements Including neutrons), incorporates infrastructure from the EMMA experiment with neutron and large-area plastic scintillator detectors of the MAZE project.
- The primary aim is to measure precision yields, multiplicities, and lateral distributions of high-multiplicity neutron events induced by cosmic muons in various materials. The data are relevant for background evaluation of the deep-underground searches for Dark Matter, neutrino-less double beta decay, etc.
- The setup is also a feasibility demonstrator for the NEMESIS Dark Matter experiment intended to search for WIMP annihilation signals in neutron multiplicity spectra. This paper presents the preliminary results of a one-year measurement with a 565 kg Pb target, 14 He-3 counters, two large-area scintillators, and a 5-layer muon tracker.
- The neutron multiplicity spectrum, recorded under the muon veto requirement, yielded the most intriguing outcome. The spectrum is well represented by a power-law, except at high multiplicities, where excess events were detected at a 1.5 – 3.6 σ level.
- Similar excess events at matching multiplicities were reported in an earlier experiment. The nature of these anomalies remains unclear, but, in principle, they may be a signature of self-annihilation of a WIMP with a mass close to 10 GeV/c². For SD interactions, the expected cross-section would be around 10⁻⁴² cm²; for SI, 10⁻⁴⁶ cm².
- An improved NEMESIS Dark Matter setup would verify the validity of the suspected anomalies at over the 5 σ significance level. The minimal upgrade requires quadrupling the target mass, doubling the neutron counters, better scintillator coverage, and tracking. We seek your support for that project.
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