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New results from NEMESIS experiment

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A new experiment collects data at a depth of 210 m.w.e. in the Callio Lab [1] at the Pyhasalmi mine [2] in Finland. The setup, called NEMESIS (New Emma MEasurement with neutronS In cosmic Showers), incorporates infrastructure from the EMMA experiment [3] with neutron and large-area plastic scintillator detectors of the MAZE system [4]. The experiment's primary aim is to combine muon tracking with position-sensitive neutron detection 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 consists of 4 layers of position-sensitive muon counters, two large-area, amplitude-sensitive scintillators, and 14 He-3 proportional counters in polyethylene casting for neutron detection. The detectors surround a removable target. The results of a 300-day run with a 565 kg Pb target and preliminary simulations will be presented. A significant upgrade of the setup is being prepared to improve the performance and increase the detection efficiency by one order of magnitude. The upgraded experiment would be well suited for searching for Dark Matter WIMP inelastic scattering events associated with the emission of an energetic charged lepton [5].

1. Callio, https://callio.info
2. W.H. Trzaska et al., (2018), https://arxiv.org/abs/1810.00909
3. P. Kuusiniemi et al., AP 102(2018)67 https://www.sciencedirect.com/science/article/abs/pii/S092765051730333X M. Kasztelan et al., (2006) Proc. the 20th ECRS, Lisbon https://www.lip.pt/events/2006/ecrs/proc/ecrs06-s0-92.pdf
4. T.E. Ward et al., APS April Meeting 2019, https://meetings.aps.org/Meeting/APR19/Session/G17.1

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Collaboration

other (fill field below)

other Collaboration

NEMESIS

Subcategory

Experimental Results

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