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Exploring the lifetime frontier with the proposed MATHUSLA experiment

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Observation of neutral long-lived particle (LLP) can be the first sign for physics beyond the Standard Model at the LHC. These particles are invisible until they decay into detectable Standard Model particles some macroscopic distance away from the collision. Their existence is theoretically well motivated and can provide explanations to known unexplained phenomena such as Dark Matter, the Baryon Asymmetry of the universe, neutrino masses, and the Hierarchy Problem. The current LHC search programs focus mostly on energetic final states produced promptly within subatomic distances of the proton collision. These searches are largely insensitive to neutral LLPs. An LLP surface detector may be the only way of discovering new physics and, by that, solving fundamental puzzles of the incomplete Standard Model. These considerations prompt the MATHUSLA experiment (MAssive Timing Hodoscope for Ultra-Stable neutraL pArticles), which opens a new avenue for discovery of Physics Beyond the Standard Model at the LHC. The large-volume detector will be placed above the CMS experiment with O(100) m of rock separation from the LHC interaction point. It is instrumented with a tracking system to observe LLP decays inside its empty volume. The experiment is composed of a modular array of detectors covering together (100 × 100) mˆ2 × 25 m high. It is planned in time for the high luminosity LHC runs. MATHUSLA, with a large detection area and good granularity tracking system, is also an efficient cosmic-ray Extended Air Shower detector.
We will describe the basic detector concept and layout, the current status of the project, the on-going cosmic ray studies, as well as the future plans. Moreover, we will report on the background studies and the results obtained with the test stand installed on the surface above the ATLAS detector in 2018.

I read the instructions

Secondary track (number)

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