

MATHUSLA: From the subatomic world to the stars

Abstract

The MATHUSLA detector will be a unique instrument that will extend and complement the searches for physics beyond the Standard Model at the LHC. The detector will consist of a large-volume tracking detector (horizontal surface of $200 \times 200 m^2$ and high of $20 m$) that will allow to search for the decay of exotic, neutral, long-lived particles which might be produced in TeV proton-proton collisions at the High-Luminosity LHC. The detector will be located at a horizontal distance of $100 m$ from one of the main underground detectors, ATLAS or CMS, along the central beam line and at ground level. Given its experimental design and location, MATHUSLA will become also an exceptional extensive air shower (EAS) detector, as it will allow to measure with an unprecedented precision the temporal and spatial structure of very high-energy EAS induced in collisions of energetic particles from outer space with the atmosphere. That will make of MATHUSLA also an astroparticle telescope for PeV cosmic rays and might be also for neutrinos or gamma rays. In this contribution, the MATHUSLA telescope and its particle physics objectives will be introduced. Then the new possibilities that MATHUSLA might offer for the astroparticle physics community and as a laboratory to test high-energy hadron interaction models will be presented.

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