

## The MATHUSLA Cosmic-Ray project

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### Abstract

In the quest for particle dark matter and physics beyond the Standard Model, the possibility of the existence of neutral long-lived particles (LLPs) has been proposed. The MATHUSLA project is designed as a surface experiment to detect possible LLPs produced in collisions at the CERN High-Luminosity Large Hadron Collider (HL-LHC). The MATHUSLA detector will cover a  $10^4$  m<sup>2</sup> surface and will have 9 layers of scintillating-detector planes, with a 25 m high LLP decay volume. The detector will be installed above the CMS interaction region of the LHC before the beginning of the Phase-2 high-luminosity operation. By adding a full-coverage layer of Resistive Plate Chambers (RPCs), the MATHUSLA experiment can extend its initial goal and give contributions to several unresolved issues in cosmic-ray physics: the unique spatial and temporal resolution in the detection of extensive air showers provided by this extended set-up will give detailed information for studying the energy spectrum and composition of cosmic rays, as well as their arrival directions. This information will be crucial in the study of hadronic-interaction models and investigating the origin and propagation of primary cosmic rays. The potentialities of MATHUSLA in LLP searches and cosmic-ray physics will be presented.

### Comments

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