

# Constraints on UHE tau neutrino, tau, and tau-like particles generated from BSM scenarios with the Pierre Auger Observatory

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The Fluorescence Detector (FD) of the Pierre Auger Observatory has a large exposure for the detection of ultra-high-energy (UHE) upward-going showers (UGS) like the ones reported by ANITA.

Recently, strong limits on UGS were obtained using 14 years of FD data, which are in tension with the observations made by ANITA-I and III.

Furthermore, ANITA-IV has reported new UGS candidates.

Both of these observations motivate the exploration of Beyond Standard Model (BSM) scenarios.

In this work, we explore the parameter space to test three classes of BSM models.

These unknown BSM particles can interact inside the Earth and produce  $\nu_\tau$ ,  $\tau$ , and  $\tau$ -like particles, which can further interact or decay.

Subsequently, some of the final products may escape the Earth and induce a UGS in the atmosphere.

Due to the non-observation of the UGS by the FD, the upper flux limits of these UHE BSM particles are obtained as a function of their possible cross-sections with matter.

In addition, stronger constraints are achieved by combining the Surface Detector and FD data of the Pierre Auger Observatory.

## Poster prize

Yes

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