

A tau scenario application to a search for upward-going showers with the Fluorescence Detector of the Pierre Auger Observatory

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The Pierre Auger Observatory has a large exposure to search for upward propagating shower-like events, and we have used 14 years of its Fluorescence Detector (FD) data to perform a generic search for such events. Recent observations of two coherent radio pulses with the ANITA detector are consistent with steeply upward-going cosmic-ray showers with energies of few tenths of an EeV and remain unexplained. We have performed a general search for up-going air-showers of any type and here it is recast in terms of a general tau lepton model. For maximal flexibility, only the propagation, decay and interactions of tau leptons are treated in this analysis, meaning that the results are independent of the tau production scenario. This treatment allows for a straightforward application of these results to the wide range of neutrino models which currently aim to describe the “anomalous” ANITA events. The goal is accomplished by generating tau leptons within the Earth and its atmosphere with an intensity dependent on the media density. The zenith angle, location and calorimetric energy of any resulting tau-induced air showers are then used to calculate the exposure.

Above 0.2 EeV, preliminary results indicate the FD has an exposure which exceeds the estimates of ANITA's exposure

to up-going tau primaries with elevation angles greater than 20° from the horizon. Results for different neutrino-agnostic models of tau leptons interacting in the sensitive volume will be presented. Full exposure and sensitivity information for a range of zenith angles is provided, facilitating the flexible application of these results for the community.

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Primary authors: CARACAS, Ioana Alexandra (Bergische University Wuppertal); FOR THE PIERRE AUGER COLLABORATION

Presenter: CARACAS, Ioana Alexandra (Bergische University Wuppertal)

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