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Recent Ultra High Energy neutrino bounds and multimessenger observations with the Pierre Auger Observatory

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The overall picture of the highest energy particles produced in the Universe is changing because of measurements made with the Pierre Auger Observatory. Composition studies point towards an unexpected mixed composition of intermediate mass nuclei, more isotropic than anticipated, which is reshaping the future of the field and underlining the priority to understand composition at the highest energies.
The Observatory is competitive in the search for neutrinos of all flavours above about 100 PeV by looking for very inclined showers produced deep in the atmosphere by neutrinos interacting either in the atmosphere or in the Earth's crust and covering a declination field of view between -65° and 60° in equatorial coordinates.
Neutrinos are produced in ultra high energy cosmic ray interactions and they provide valuable complementary information, their fluxes being sensitive to the primary cosmic ray masses and their directions reflecting the source positions. We report the results of the neutrino search providing competitive bounds to neutrino production and strong constraints to a number of production models including cosmogenic neutrinos due to ultra high energy protons. We also report on two recent contributions of the Observatory to multimessenger studies. The correlations of the directions of the highest energy astrophysical neutrinos discovered with IceCube and the highest energy cosmic rays detected with the Auger Observatory and the Telescope Array, and the targeted search for neutrinos correlated with the discovery of the gravitational-wave events GW150914 and GW151226 discovered with advanced LIGO.

Primary author: Prof. ZAS, Enrique (IGFAE - University of Santiago)

Presenter: Prof. ZAS, Enrique (IGFAE - University of Santiago)

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