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Search for tau neutrinos with the MAGIC telescopes: the quest continues

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MAGIC, a system of two Cherenkov telescopes located at the Roque de los Muchachos Observatory (2200 a.s.l.) in the Canary Island of La Palma, has lately been engaged in an unconventional task: the search for a signature of particle showers induced by earth-skimming cosmic tau neutrinos arising from the ocean, in the PeV to EeV energy range.
When pointing at the Sea, the MAGIC telescopes can collect data in a range of about 5 deg in zenith and 80 deg in azimuth: the analysis of the shower images from 30 hours of data, together with the simulations of upward-going tau neutrino showers, shows that the air showers induced by tau neutrinos can be discriminated from the hadronic background coming from a similar direction. We have calculated the point source acceptance and the expected event rates, assuming an incoming tau neutrino flux consistent with IceCube measurements, and for a sample of generic neutrino fluxes from photo-hadronic interactions in AGNs and GRBs. A 90% C.L. upper limit on the tau-neutrino point source flux of 2.0x10^-4 GeV cm^-2 s^-1 has been obtained. The presented results can also be important for future Cherenkov experiments such as the Cherenkov Telescope Array. This next generation ground-based observatory can have a much better possibility to detect tau neutrinos, given its larger FOV and much larger effective area.

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