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Impact of coherent scattering on relic neutrinos boosted by cosmic rays

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Ultra-high-energy cosmic rays (UHECR) scattering off the cosmic relic neutrino background have recently gained renewed interest in the literature. Current data suggest that UHECR are predominantly made of heavy nuclei. Since the energy of relic neutrinos can reach ~O(10) MeV in the rest frame of the UHECR, the cross section of heavy nuclei scattering off relic neutrinos can be coherently enhanced, which is similar to the coherent elastic neutrino-nucleus scattering (CEνNS) observed at low-energy neutrino experiments. We calculate the diffuse flux of relic neutrinos boosted by UHECR by taking into account the contributions from both the coherent and incoherent scatterings. Using current data from the IceCube Neutrino Observatory and the Pierre Auger Observatory, we place constraints on the overdensity of relic neutrinos down to 10^7. Since the flux of boosted relic neutrinos peaks at an energy of ~O(100)PeV, we also entertain the possibility to explain the recently observed KM3NeT event with boosted relic neutrinos from UHECR.

Collaboration you are representing

Author: LIAO, Jiajun (Sun Yat-sen University)

Presenter: LIAO, Jiajun (Sun Yat-sen University)

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