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Relic Neutrino Background from Cosmic-Ray Reservoirs

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The relic ν background (RνB) is the 'holy grail' of neutrino physics and it is also the only known Dark Matter subcomponent. Yet, it has so far escaped detection attempts, mainly due to the very low energies and very weak cross-sections involved in the detection channels. In this talk, I will describe the mechanism by which ultra-high energy (UHE) cosmic rays, stored in cosmic reservoirs for $\sim$ Gyr timescales, can upscatter the RνB to ultra-high energies. For sufficiently high overdensities of the RνB in the location of the source, which may potentially be induced by BSM effects, the up-scattered neutrino flux is within the reach of future UHE neutrino detection experiments (e.g. IceCube-Gen2 and GRAND) and distinguishable from other neutrino signals via its unique features such as its spectral shape and flavour composition. The non-detection of this flux at current UHE neutrino experiments sets the current most stringent bound on neutrino overdensities on the scales of galaxy clusters.

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