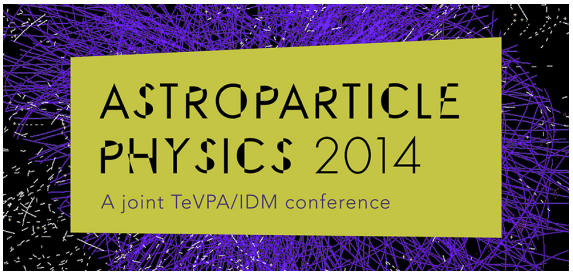

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Synchrotron pair halo and echo emission from blazars in the cosmic web: application to extreme TeV blazars

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High frequency peaked, high redshift blazars, are extreme in the sense that their spectrum is particularly hard and peaks at TeV energies. Standard leptonic scenarios often require peculiar source parameters and/or a special setup in order to account for these observations. Electromagnetic cascades seeded by ultra-high energy cosmic rays (UHECRs) in the intergalactic medium have also been invoked, assuming a very low intergalactic magnetic field (IGMF). I will present an alternative explanation for the observed spectra of such extreme blazars in which the observed TeV emission is the synchrotron emission of UHECR secondaries produced in blazars located in magnetised environments, and demonstrate that it is a viable explanation for the observed spectra of extreme TeV blazars, focusing on three sources: 1ES 0229+200, RGB J0710+591, and 1ES 1218+304. I will show that this synchrotron pair halo/echo flux at the peak energy is not sensitive to variations in the overall IGMF strength, which is appealing in view of the large uncertainties on the IGMF in voids of large scale structure. I will also discuss the observed variability of the gamma-ray emission of these sources and show that it can be accommodated by the synchrotron emission of secondary products of ultra-high energy neutral beams if these are emitted by UHECR accelerators inside magnetised regions.

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