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The axion challenge in gamma-rays: a blueprint of the best search strategy

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Axion Like Particles (ALPs) are predicted to couple with photons in the presence of magnetic fields. This may lead to a significant change in the observed spectra of gamma-ray sources such as AGNs. Here we simultaneously consider both the photon/ALP mixing that takes place in the gamma-ray source itself and the one expected to occur in the intergalactic magnetic fields. We show that photon/ALP mixing might explain recent puzzles regarding the observed spectra of distant gamma-ray sources (e.g. the pile-up problem at the highest energies). We summarize the different ALP signatures expected in VHE spectra and discuss the best search strategy to be followed by the Fermi satellite and current Imaging Atmospheric Cherenkov telescopes (IACTs). We finally test this scenario making use of recent measurements of blazars spectra obtained by IACTs above 100 GeV.

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