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Probing Gamma-Ray Propagation at Very-High Energies with H.E.S.S. Observations of M87

The radio galaxy Messier 87 (M87) has an active galactic nucleus which enables us to observe it at very high energy gamma rays. Photons from M87 have been observed at up to a few 10s of TeV using the H.E.S.S. telescope array. During monitoring campaigns and target of opportunity observations, several high flux states could be identified, which allow us to probe the Extragalactic Background Light (EBL). Interaction with the EBL causes the attenuation of very high energy photons, leading to an observed cut-off in the spectra of very high energy sources. Hence, observations of M87 can be utilized to make measurements of the local EBL, specifically in the far infrared. Furthermore, M87 is located at the heart of the Virgo cluster, a cluster that has been well observed and studied. Its magnetic field in particular is fairly well modeled and measured. This allows us the opportunity to search for Axion Like Particles, or ALPs. These dark matter candidates are predicted to exhibit an "oscillation"effect in the presence of magnetic fields, oscillating between photon and ALP states. This would produce measurable "wiggles" in the source's spectra. We compare an ALP based model and a non-ALP model to ask the question: do we see a preference for an ALP based model when considering the observed spectra of M87?

Collaboration / Activity

H.E.S.S. Collaboration

Primary author: CECIL, Rahul Joseph (UNI/EXP (Uni Hamburg, Institut fur Experimentalphysik))

Co-authors: BARBOSA MARTINS, Victor (Z_CTA (Cherenkov Telescope Array)); Dr MEYER, Manuel (University of South Denmark); Dr LYPOVA, Iryna (University of Heidelberg)

Presenter: CECIL, Rahul Joseph (UNI/EXP (Uni Hamburg, Institut fur Experimentalphysik))

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