Contribution ID: **362** Type: **Contributed talk**

The gamma-ray morphology of M87 and the cosmic-ray pressure in the Virgo Cluster with H.E.S.S.

Wednesday 6 July 2022 15:45 (15 minutes)

The Active Galactic Nucleus feedback is a potential heating mechanism, which solves the Cooling Flow (CF) Problem in Cool Core (CC) clusters. The cosmic-ray from the jet interact with the Intra-Cluster Medium (ICM) producing neutral pions, which decay to gamma rays, originating a steady and spatially extended gamma-ray signal. However, no gamma-ray observations could yet be associated with cluster diffuse emission.

The High Energy Stereoscopic System (H.E.S.S.) is an array of five Imaging Atmospheric Cherenkov Telescopes (IACTs) located in Namibia. The H.E.S.S. telescopes are sensitive to Very-High-Energy (VHE) gamma rays between ~30 GeV and ~100 TeV and have being observing M87 since 2004. M87 is one of the closest radio-galaxies, at $\sim$16.5 Mpc from Earth, at the center of the CC Virgo Cluster.

In this work, we analyze H.E.S.S. observations of M87 and classify the source emission into low, intermediate and high states. No significant gamma-ray extension was detected in the low state, leading to a 99.7% confidence level (c.l.) upper limit on the σ extension of $0.016^\circ \approx 4.6$ kpc. The volume-averaged cosmic-ray pressure ratio <XCR> is constrained to $\leq$20% within the inner 20 kpc at 99.7% c.l., considering two different approaches and a hard proton spectral index.

A cluster emission could not be detected, although it can not be ruled out. The Cherenkov Telescope Array Observatory (CTAO) will be the next generation of IACTs. With a better sensitivity and angular resolution, it has the potential to unravel M87 extended emission and help solve the CF problem.

Authors: BARBOSA MARTINS, Victor (DESY, D-15738 Zeuthen, Germany); ARCARO, Cornelia (Centre for Space Research, North-West University, Potchefst, South Africa); ZYWUCKA, Natalia (Centre for Space Research, Potchefst, North-West University, South Africa); OHM, Stefan (DESY, D-15738 Zeuthen, Germany); DE NAUROIS, Mathieu (Laboratoire Leprince-Ringuet, École Polytechnique, CNRS, Institut Polytechnique de Paris, F-91128 Palaiseau, France); TAYLOR, Andrew (DESY, D-15738 Zeuthen, Germany)

Presenter: BARBOSA MARTINS, Victor (DESY, D-15738 Zeuthen, Germany)

Session Classification: Contributed Talks