Lepto-hadronic jet-disc model for the multi-wavelength SED of M87

Margot Boughelilba, Anita Reimer

Institute for Astro- and Particle Physics, Technikerstrasse 25, 6020 Innsbruck, Austria

margot.boughelilba@uibk.ac.at

The low-luminosity Active Galactic Nuclei M87, archetype of Fanaroff-Riley I radio-galaxies, was observed in a historically quiet state in 2017. While one-zone leptonic jet models cannot explain the radio-to-gamma-ray spectrum, we explore a hybrid jet-disc scenario. In this work, we model the overall spectral energy distribution of M87's core with a dominating one-zone lepto-hadronic jet numerical emission model, coupled with the contribution from an advection-dominated accretion flow. We find sets of parameter values for which the jet component fits the radio-to-optical data as well as the gamma-ray band. These imply that a mildly relativistic $\delta_{\rm jet} = 2.3$ compact emission region of $\sim 5\, r_g$ is suitable to model the contribution of the jet. Given the jet component that we found, we are able to model the remaining X-ray observations with the accretion flow described by a set of parameters that we explored thoroughly. The crucial observational difference between purely leptonic models and lepto-hadronic ones such as ours is the production of neutrinos associated with photo-meson interaction. Thus we also calculate the predicted neutrino flux produced by such scenarios, although it remains below the current instruments sensitivity.