

Investigating jet physics via the joint modelling of Event Horizon Telescope images and multi-wavelength observations

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A key characteristic of some active galactic nuclei (AGN), such as radio galaxies, is that they possess powerful jets that can extend through or beyond their host galaxy. However, the exact mechanisms of their launch and their internal properties are still not well understood. In this talk, I will focus on Event Horizon Telescope (EHT) and multi-wavelength image and spectral observations of our neighbouring AGN, M87. In particular, I investigate what processes are responsible for the particle acceleration physics by calculating the electron distribution function (eDF), as well as interpreting the resultant images and spectrum, to explore the origins of the observed jet power. Once a certain eDF choice is made, it is important that the observed emission is interpreted thoroughly because the process in which these simulated images are created has consequences for the overall spectrum. There is a degeneracy in the simulation process because we do not calculate the eDFs from first principles but rather explore preset parameterised eDFs based on particle-in-cell (PIC) simulations that consist of more accurate plasma physics simulations. In this talk, I will present an optimisation and fitting pipeline for simulating images of M87 and simultaneously compare them to 2017 multi-wavelength data published by the EHT multi-wavelength group. This pipeline will be used in future EHT and multi-wavelength studies.

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