Contribution ID: **231** Type: **Poster**

Long term multi-wavelength analysis of the flat spectrum radio quasar OP 313

The flat spectrum radio quasar OP 313 showed extremely intense γ-ray activity from November 2023 to March 2024, as observed by the Large Area Telescope on board the Fermi Gamma-ray Space Telescope. This initiated a large number of follow-up campaigns at all wavelengths, resulting in a confirmation of the increase of the source activity from the radio to very high energy (VHE) bands. Remarkably, it also led to the first detection of the VHE emission from OP 313 by the Large-Sized Telescope (LST-1) of the Cherennkov Telescope Array Observatory at La Palma and it is also the most distant Active Galactic Nuclei detected at these energies.

We present a multi-wavelength analysis covering 15 years of Fermi-LAT observations, from August 2008 to March 2024. From the Fermi-LAT study of the 15-year light curve, we can identify different periods of activity states of the source: one quiescent and one flaring state that can be compared with the data available from other instruments. In our study, we include X-ray, optical, and radio data collected by Swift, the Nordic Optical Telescope, and the Medicina radio telescope, respectively. Then, we aim to model the multi-wavelength Spectral Energy Distribution of OP 313 in the flaring states with different theoretical leptonic and hadronic models to explain the source's behavior, understand the mechanisms involved in particle acceleration inside the jet, and how radiation in different wavelengths is connected.

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