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The Most Distant VHE Quasar: Probing OP 313's power with LST-1 and MAGIC

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Flat Spectrum Radio Quasars (FSRQs) are rarely detected at very-high-energy (VHE, E > 100 GeV) gamma rays due to their distance, soft spectra, and strong absorption from the Extragalactic Background Light (EBL). In December 2023, the Large-Sized Telescope prototype (LST-1) of the Cherenkov Telescope Array Observatory (CTAO) and the Major Atmospheric Gamma-ray Imaging Cherenkov (MAGIC) simultaneously detected for the first time VHE emission from the FSRQ OP 313 during an exceptionally bright emission phase, which is still echoing today. With a redshift of z = 0.997, OP 313 is the most distant blazar ever detected in this energy band, and among the most luminous persistent sources ever detected in the gamma-ray band. The detection marks a milestone for LST-1 and offers a unique opportunity to study both the extreme physics of FSRQs and the opacity of the Universe to gamma rays due to interaction with low energy EBL photons.

OP 313 triggered one of the most extensive and productive multi-wavelength campaigns ever carried out on a flaring FSRQ, resulting in an exceptional dataset spanning from radio to VHE gamma rays. In this contribution, we present the first in a series of multi-wavelength studies of OP 313 extending to the VHE regime, combining data from LST-1, MAGIC, Fermi-LAT, Swift-XRT, and complementary optical and IR observations. We model the broadband emission using two leptonic scenarios and investigate the contribution of various external photon fields to the gamma-ray output. The unprecedented brightness of the flare and the high redshift of the source also allow us to place new constraints on the EBL intensity in the optical-to-near-IR range. This detection highlights the scientific potential of CTAO to probe the distant Universe and capture the most extreme blazar outbursts.

Primary author(s) : NIEVAS ROSILLO, Mireia (Instituto de Astrofisica de Canarias (IAC)); Dr. HECKMANN, Lea (Université Paris Cité, CNRS, Astroparticule et Cosmologie, Paris, France; Max-Planck-Institut für Physik, Garching, Germany); Dr. TAKEISHI, Ryuji (Institute for Cosmic Ray Research, University of Tokyo, Kashiwa, Japan); BAKSHI, Chitranshi (Saha Institute of Nuclear Physics (SINP)); OTERO SANTOS, Jorge (INFN--Padova); ARBET-ENGELS, Axel (ETH Zürich); MORCUENDE, Daniel (CTAO); DANCHEZ, David (Laboratoire d'Annecy de Physique des Particules); Sr. BAXTER, Joshua (Institute for Cosmic Ray Research, University of Tokyo, Kashiwa, Japan)

Presenter(s) : NIEVAS ROSILLO, Mireia (Instituto de Astrofisica de Canarias (IAC))

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