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Exploring the high energy spectral cut-off in intermediate and high-redshift FSRQs using CTAO

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A power-law distribution with a high energy cut-off can typically describe the gamma-ray energy spectrum for Active Galactic Nuclei (AGNs). The Fermi Large Area Telescope (LAT) can probe many of these objects for which this cut-off sits in the GeV domain. However, measurement of the spectral energy cutoff requires large photon statistics, which are not always available because of Fermi-LAT's limited sensitivity above 100 GeV. The Cherenkov Telescope Observatory (CTAO) will provide a wider energy range, larger effective area, and better angular resolution and flux sensitivity in comparison to any existing gamma-ray detector. An energy threshold as low as 20 GeV will allow CTAO to study more distant AGNs, which are not seen by the other ground-based gamma-ray facilities.
In our study, we chose five flat-spectrum radio quasars (FSRQs) located at intermediate and high-redshift (z=0.3 - 1) observed by Fermi-LAT and with different Cherenkov telescopes during flaring periods.
We combined Fermi-LAT data and CTAO simulated observations between 0.1 GeV and 10 TeV, and obtained constraints on the cutoff energy parameter under the assumption that a power law with an exponential cutoff describes the spectral energy distribution of the sources in this energy range.
We compared the joint Fermi-LAT and simulated CTAO dataset for different CTAO configurations: 4 Large-Sized Telescopes (LSTs), 4 LSTs and 9 Middle-Sized Telescopes (MSTs) for Northern hemisphere FSRQs, and 14 MSTs for Southern hemisphere sources. We also consider the additional 11 Schwarzschild-Couder Telescopes (SCTs) in a scenario beyond the Alpha configuration in the southern hemisphere.
We fitted each dataset with different physically motivated models, employing the Akaike Information Criterion (AIC) and the maximum likelihood ratio test, to assess the effectiveness of the various CTAO configurations for spectral studies.

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