X-ray emission study of extreme Blazars using AstroSat

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A new class of high energy peaked blazars have been detected by Cherenkov telescopes at very high energy (VHE) gamma-rays. These sources are widely known as extreme HBLs (EHBLs) for their ambiguous spectral properties in high energy emission. Their X-ray and VHE emission is characterized by a hard intrinsic spectrum. As for the SED peaks, either of the synchrotron/inverse Compton (IC) peaks or both located at very high energy, may reach up to tens of keV in synchrotron and a few TeV in IC component. These extreme sources are, ideally, expected to represent the low end of the blazar sequence owing to the famous synchrotron peak frequency-luminosity trend seen in the blazar sequence. Given their unique spectral properties, these sources hold great interest in recent studies. These offer an ideal tool to probe for constraining important cosmological quantities, the extragalactic background light (EBL) and the intergalactic magnetic field (IGMF). In this context, it is very important to have constraints on the SED peak energies, which in turn, allow us to have better constraints in the source parameters associated with the intrinsic particle spectrum. Due to the limited observational range in X-rays and VHE gamma-rays, there remains large uncertainty in locating their peak positions, apparently requiring a wide range of simultaneous data in these energy bands.

A number of these sources that are relatively unexplored in X-rays have been detected by *AstroSat* over the last five years. In this contribution, we report the preliminary spectral analysis results of extreme HBL 1ES1741+196 and HBL 1ES2322-409 utilizing first-measured *AstroSat* data (from our proposed observations) in a wide X-ray band. *AstroSat* observed the source 1ES1741+196 during 2019 for 3-occasions (March, July & August), and 1ES2322-409 during 2020 for a single occasion. The different flux state spectra are well fitted by a log-parabola model, and in contrast to the previous studies, our spectral analysis using SXT and LAXPC data reveals the curved X-ray spectral nature of these sources. Especially for source 1ES1741+196, the synchrotron peak energies of different flux states spectra are well confined at energies 1-2 keV, within the observation range. The study herein, therefore, reports *the first well-constrained determination of the synchrotron peak energy of the EHBL source 1ES1741+196*. Nevertheless, there is no indication of significant short term variability in X-rays during the observation period as evident from their average flux (2-10 keV) and spectral index values. We further include the spectral analysis results of a few more EHBL sources, RGBJ0710+591, 1ES1101-232 & 1ES0120+340 using available *AstroSat* archival data.