

Investigating Spectral Width Evolution in Gamma-Ray Bursts

Thursday 18 September 2025 15:10 (20 minutes)

The spectral width (W) is proposed as a new measure to address the complexities in the GRB prompt phase spectral studies. We carried out a detailed procedure to redefine the Band function with W as one of the parameters, to study the GRB spectra. This model was convolved with the XSPEC, and the temporal evolution of W , for the case of GRB 220426A and GRB 230812B using the Fermi/ GBM data, was investigated. The increasing trend of W was observed for both the bursts; however, it was more prominent in the case of GRB 230812B, with the W ranging from 0.84 to 1.64, compared to GRB 220426A, with the maximum difference in W being 0.15. The W evolution for fundamental emission processes, such as photospheric emission from the expanding fireball and synchrotron emission from the relativistic electron distribution, was studied. Under each scenario, the spectrum tends to get narrower with time, which is in contrast to the observation where it broadens with time. This study portrays the emission process as being more entangled and complex for the prompt phase.

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Session Classification: Poster Session

Track Classification: GRBs, FRBs and other Transients