Title:	Exploring Multi-pulse Gamma-Ray Burst Prompt Emission Via A Novel Pulse Shape Model
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Abstract:	The light curves of the prompt phase of the gamma-ray bursts are highly complex and diverse. There is no complete model of the physical origins explaining this temporal vari- ability in the pulses. Recent studies on multi-pulsed bursts show that the hardness of spec- tral slope decreases with pulse number, suggesting a change in emission mechanism. Here, we attempt to correlate pulse asymmetry and spectral parameters similarly. We perform a time-resolved spectral analysis on the sample of 42 pulses in 14 GRBs detected by the Fermi Gamma-ray Burst Monitor. We apply a maximum likelihood analysis to all spectra that have at least two bins with statistical significance S ≥ 20 within each pulse and fit it to the Band model. We quantify a pulse's asymmetry as the ratio of the slopes of rise and decay phases using a novel fitting function. Surprisingly, we find that the initial pulses in a multi-pulsed burst are the most non-FRED Fast Rise Exponential Decay) like and as the pulse number increases, the asymmetry parameter increases. Further, we get a positive Spearman correlation index of 0.575 between asymmetry and low energy spectral index α max . We also find that the α max of 62.8% of the GRB pulses are between the bounds of the slow cooling synchrotron and non-dissipative photospheric emission models, suggesting a model for overlapping emission mechanisms.
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