Short GRBs and MGF pulse fitting and spectral analysis

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Short gamma-ray bursts (SGRBs) are energetic impulses with emissions that last for less than 2 s and have a hard spectra [1]. They are cosmological entities and they originate from compact binary mergers like binary systems [2, 3]. Moreover, there is evidence that they are also tied to gravitational wave events after the detection of GRB170817A . However, these properties are not unique to them. There are other short gamma-ray transients that posses similar properties called magnetar giant flares (MGFs). They however, originate from magnetars in our galaxy or in nearby star-forming galaxies. When MGFs are observed at great distances only their prominent peaks are observed hence can be confused with the cosmological SGRBs. Typically, their spectra has a prominent peak which is then followed by prolonged fading pulses [4]. Without the detection of the oscillating fading phase, the distinction between SGRBs and MGFs is hindered if the redshift is unknown. MGFs typically have isotropic energy in the range $10^{44} - 10^{47}$ erg whilst SGRBs are highly energetic with isotropic energy around 10^{52} erg [5]. In this work, both transients with prominent peaks were fit with the Norris function [6] to get their pulse rising times at varying energy ranges and the goodness of the pulse fit was measured with the χ^2 value. Their pulse rising times are utilised to make a distinction between the two transients. MGFs posses pulse rising times that last for hundreds of ms whilst for SGRBs its a few ms. Moreover, spectral analysis was performed in the energy range 10 kev - 40 MeV and data fitting was achieved with the Comptonized and Band model for the brightest detector for each SGRB. The significance of these fits was determined with the Cash Castor-statistics. The bursts utilised in the spectral analysis have known redshift and were detected by the *Fermi*-GBM instrument.

References

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