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GRB 980923, A BURST WITH A HARD SPECTRUM IN ENERGIES FROM KEV TO MEV

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A detailed joint analysis of BATSE-LAD, BATSE-SD and EGRET-TASC of GRB980923 was performed. The analysis yielded to the discovery of an anomalous short keV to MeV component in the spectra of the burst.

GRB941017 was the first burst that had an observed high-energy (multi-MeV) spectral component distinct from the observed lower-energy γ-ray component (González et al 2003). FERMI had observed another 3 bursts that presented a distinct component (Granot 2010), which extends up to GeV and evolves temporal-independent to the emission in keV.

GRB980923 was observed by BATSE at 20:10:52 for 33.02 s in the galactic coordinates $l = 293.08°$ and $b = -30.89°$. The burst direction was 124.4° with respect to the pointing-axis direction of CGRO, placing the burst outside the ∼1 sr field of view of COMPTEL and the EGRET spark chamber. GRB980923 is the third burst with the highest fluence of 4.5×10^{-4} erg cm^{-2} in the BATSE catalog (Preece et al. 2000). Joint BATSE-LAD and EGRET-TASC data was previously analyzed for GRB980923 by González et al. (2005) & Kaneko et al. (2008), noticing that a single function (Band or similar) was not enough to describe the prompt emission from 20 keV to 200 MeV. An excess over the predicted by a single function is observed. Moreover González (2005) postulates GRB980923 as a candidate to have an extra high energy component described by a power law in the second episode of the burst.

We extend the spectral analysis of the burst, using joint data from BATSE-LAD, BATSE-SD7, BATSE-SD3, and EGRET-TASC, gaining time resolution and energy coverage. The lightcurves of GRB980923 (see right panel of Figure 1) as observed by BATSE-SD7 has two episodes. The first episode lasts about ∼14 seconds, then the counts drop drastically to start the second episode with a duration of ∼20 seconds. GRB980923 also has a long (400s) and smooth tail reported previously by Giblin et al.

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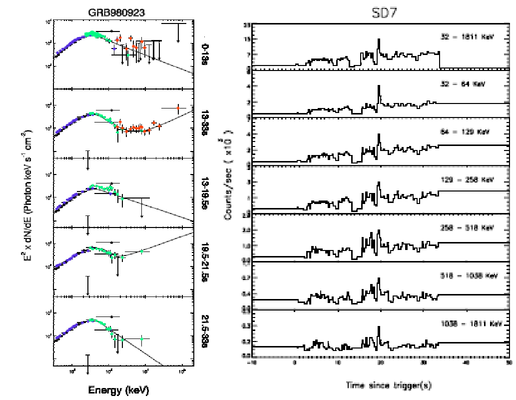

Fig. 1. Left panel: Energy spectrum at different times, time intervals in s. From top to bottom: 0–13, 13–33, 13–19.5, 19.5–21.5 & 21.5–33. Right panel: Evolution in energy of the lightcurves, the top one is the total lightcurve. Then from top to bottom in keV: 32–64, 64–129, 129–258, 258–518, 518–1038 & 1038–1811.

(1999). In the lightcurves as function of energy is notorious the presence of a 2 s peak, at 20 s, that evolves different from the entire lightcurve. This peak is present at low and high energies. The spectral adjustment was made for four episodes (see left panel of Figure 1) . It can be observed that just for the interval between 19–21 s an anomalous component is needed to describe the spectrum. The values obtained for Ftest with a PL component included is $\sim 10^{-13}$. GRB980923 clearly shows 3 spectral components: the main given by a Band function, the tail described by a power Law that lasts ∼400 s and the high energy component that extends from keV to MeV with a duration of ∼2 s at $t = 20$ s. This result is in contrast with the components reported by González (2003) and FERMI that are long and last more than the bust itself.

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