

## *Fermi*/GBM Observations of SGR J0501+4516 Bursts

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### ABSTRACT

We present our temporal and spectral analyses of 29 bursts from SGR J0501+4516, detected with the Gamma-ray Burst Monitor onboard the *Fermi* Gamma-ray Space Telescope during the 13 days of the source activation in 2008 (August 22 to September 3). We find that the  $T_{90}$  durations of the bursts can be fit with a log-normal distribution with a mean value of  $\sim 123$  ms. We also estimate for the first time event durations of Soft Gamma Repeater (SGR) bursts in photon space (i.e., using their deconvolved spectra) and find that these are very similar to the  $T_{90}$ s estimated in count space (following a log-normal distribution with a mean value of  $\sim 124$  ms). We fit the time-integrated spectra for each burst and the time-resolved spectra of the five brightest bursts with several models. We find that a single power law with an exponential cutoff model fits all 29 bursts well, while 18 of the events can also be fit with two black body functions. We expand on the physical interpretation of these two models and we compare their parameters and discuss their evolution. We show that the time-integrated and time-resolved spectra reveal that  $E_{\text{peak}}$  decreases with energy flux (and fluence) to a minimum of  $\sim 30$  keV at  $F = 8.7 \times 10^{-6}$  erg cm<sup>-2</sup> s<sup>-1</sup>, increasing steadily afterwards. Two more sources exhibit a similar trend: SGRs J1550 – 5418 and 1806 – 20. The isotropic luminosity,  $L_{\text{iso}}$ , corresponding to these flux values is roughly similar for all sources ( $0.4 - 1.5 \times 10^{40}$  erg s<sup>-1</sup>).

*Subject headings:* soft gamma repeater: general — soft gamma repeater: individual(SGR J0501+4516)

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