Galaxy Clusters in the Swift/BAT Era

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Abstract

We report about the detection of 10 clusters of galaxies in the ongoing Swift/BAT all-sky survey. This sample, which comprises mostly merging clusters, was serendipitously detected in the 15–55 keV band. We use the BAT sample to investigate the presence of non-thermal emissions. The BAT clusters do not show significant (e.g. ≥2σ) high-energy non-thermal emission. The only exceptions are represented by Perseus and Abell 0754 whose high-energy emissions are likely due to two point-like X-ray sources. Using XMM-Newton, Swift/XRT, Chandra and BAT data, we are able to produce upper limits on the Inverse Compton (IC) mechanism which are in disagreement with most of the previously claimed non-thermal components.

Observations and data reduction

BAT survey data from January 2005 to November 2007 were used to image the hard X-ray sky (15–55 keV). The mean exposure is 3 Ms, being 1.5 Ms and 5 Ms the minimum and maximum exposure times respectively. Above the 5σ threshold we detected 10 Galaxy Clusters. This is so far the largest complete sample detected above the 10 keV threshold. The details of the clusters are reported in Table 1.

Accuracy of the BAT spectra

For each galaxy cluster we extracted a 15–195 keV spectrum with the method described in Ajello et al. (2008b). Here we recall the main steps: the details can be found in the aforementioned paper. For a given source, we extract a spectrum from each observation where the source is in the field of view. These spectra are corrected for residual background contamination and for vignetting; the per-pointing spectra are then (weighted) averaged to produce the final source spectrum. Thus, the final spectrum represents the average source emission over the time-span considered here (2.5 years). Moreover, the analysis of 160 source-free regions shows that the background subtraction is efficient and accurate in the whole energy range and that BAT spectra are extremely sensitive.

Results

Comparison with previous results. The comparison with previously published results show that the BAT upper limits are usually lower than the claimed non-thermal component.