

Selection effects in Gamma-ray bursts standard candles

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It was previously found that the total energy released in gamma-ray bursts (GRB) could be a good standard candle. It was also found that the total energy, either isotropic E_{iso} or beamed-corrected E_{γ} , has a very good correlation with the source frame peak energy E_{peak} , which makes it possible for GRBs to be used in the study of cosmology. Similar correlation was found between the peak photon-energy luminosity L_{en} and E_{peak} . In this paper, the GRB data from BATSE, *BeppoSAX*, *HETE-2* and Swift are analyzed in order to examine possible selection effects in those potential standard candles. It is found that those standard candles cannot be undoubtedly extended to the whole GRB sample detected so far, because they are affected by several selection effects: GRBs with measured redshift are those with larger detection significance at high redshift, and with smaller beaming angles and larger E_{peak} at high redshift. These selection effects may come from the detection requirements and limits of GRBs and their afterglows. We also find that the peak photon-number luminosity L_{ph} is independent of E_{peak} , based on which the above-mentioned correlations between GRB energy/luminosity with E_{peak} can be explained.