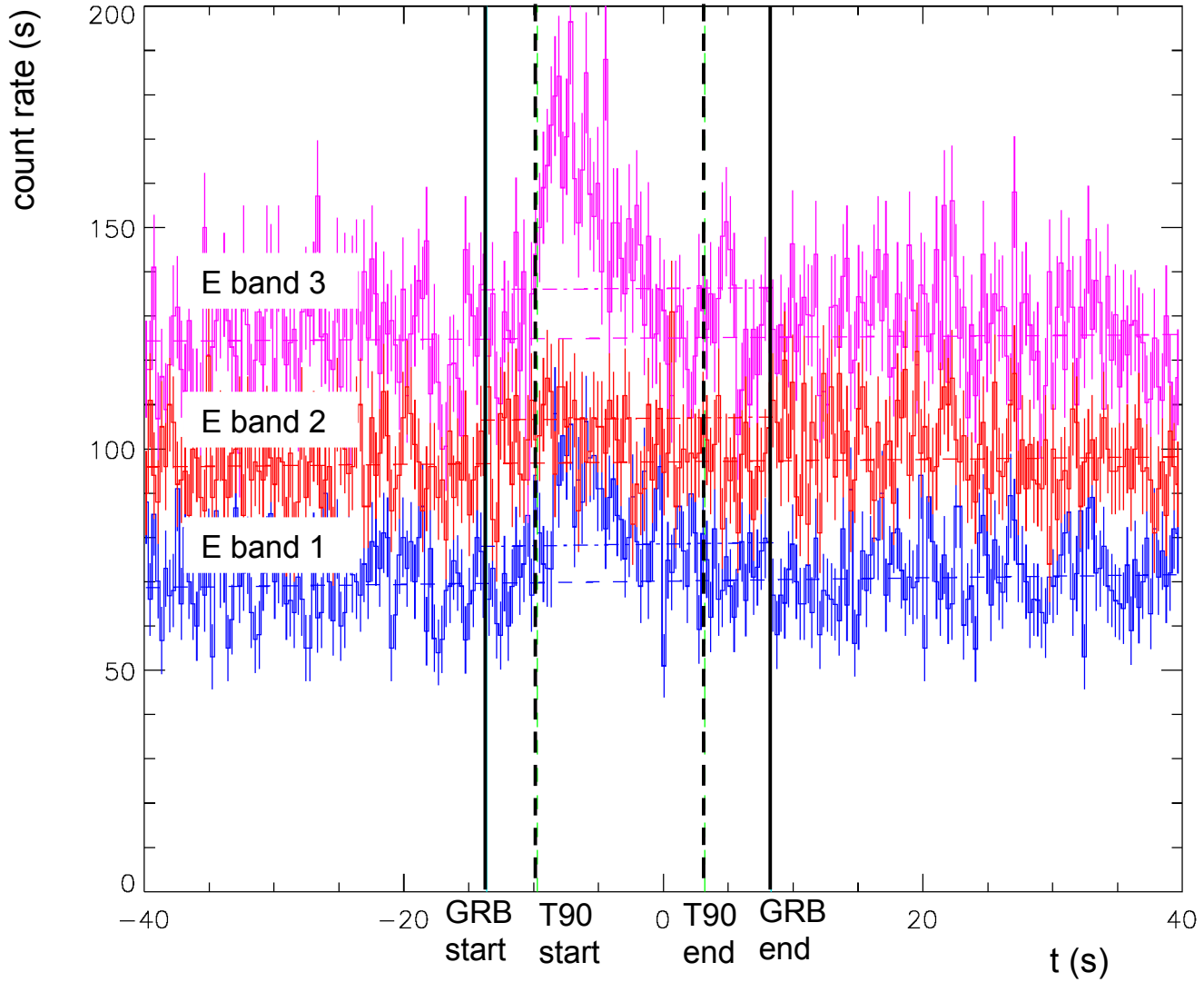
Homework

Hint


count rate (s)
200
150
100
50
0
E band 3
E band 2
E band 1
−40
−20
GRB start
T90 start
0
T90 end
GRB end
20
40
t (s)
background fit 3
background fit 2
background fit 1

Homework

- Data file grb_data_homework.dat will be uploaded to the course's website and it contains a count rate curve of a detected GRB at three energy bands.

grb_data_homework.dat

'time s'	'counts 10-30 keV'	'counts 30-50 keV'	'counts 50-300 keV'
-99.8500	376.685	320.315	250.000
-99.5500	344.685	268.238	226.154
-99.2500	371.614	299.000	212.000
-98.9500	296.000	296.000	230.000
-98.6500	340.000	284.000	240.000
-98.3500	316.000	280.000	280.000
-98.0500	364.000	309.773	238.454
-97.7500	335.102	335.000	278.000
-97.4500	360.000	326.000	220.000
-97.1500	368.000	311.000	260.000
-96.8500	368.000	292.000	206.000
-96.5500	324.000	363.000	256.000

- In one figure plot count rate curves (cnt/s) for each energy band.
- Do linear least-squares fit to the background using the pre-burst data (beginning to -40.15 s) and post-burst data (60.05 s to end) together. Do fitting for the three bands separately.
- Subtract fitted background models from the data (again separately for three bands).
- Calculate the start time and end time of T_{90} duration using added count curves of three bands together (10-300 keV), calculate also the T_{90} duration itself and use background-subtracted count rate curves.
- Plot background-subtracted count rate curves (cnt/s) for three bands separately and mark T_{90} start and end.
- Calculate peak count-rates *F* (cnt/s) using the background-subtracted count rate curves for each energy band separately.
- Calculate total number of counts *S* (analogy to fluence) during T_{90} using the background-subtracted count rate curves for each energy band separately.
- Calculate hardness ratio *H = S(50-300 keV) / S(10-30 keV).*
- Compare *H* for this burst with other bursts shown on the figure *H* vs T_{90} of Fermi/GBM GRBs in this presentation and decide, based on duration and spectral hardness, if this GRB is most likely produced by a merger of compact objects or by a collapse of a massive star.