

GBM Sensitivity for BATSE-type Sky Survey

***James C. Ling/JPL
&
Charles Meegan/MSFC***

Presented at the GLAST User Committee Meeting at Stanford on June 6-7 2005

Outline

- BATSE - GBM Comparison
- GBM Sensitivity
- GBM Sensitivity vs Gamma-Ray Transient Sources Observed by BATSE (Lightcurves)
- GBM Sensitivity vs. 9-year Average Fluxes of Gamma-Ray Sources Observed by BATSE
- Summary

BATSE/GBM Comparison		
	BATSE -LAD	GBM
Material	Nal	Nal
Number of Detectors	8	12
Thickness of Detector	1.27 cm ²	1.27cm ²
Area per detector	2025 cm ²	126 cm ²
Total Projected Area to source	(2-4) LADs with the cosine of the angle between the look-axis for each LAD and the source is >0.4	215 cm ²
Energy Range	25 keV to 1.8 MeV	8 keV to 1 MeV
3? Sensitivity (mCrab) in the 25-50 keV band		
1 day	150	748
2 weeks	46	200
1 year	7	38
3? Sensitivity (mCrab) in the 50-300 keV band		
1 day	103	213
2 weeks	28	55
1 year	5	12

GBM Sensitivity

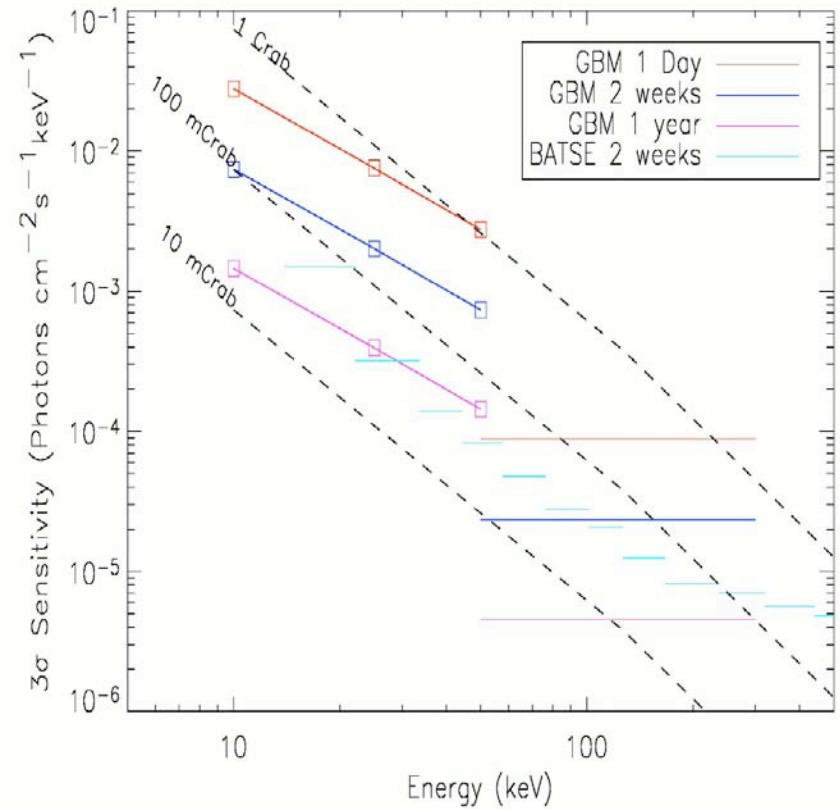
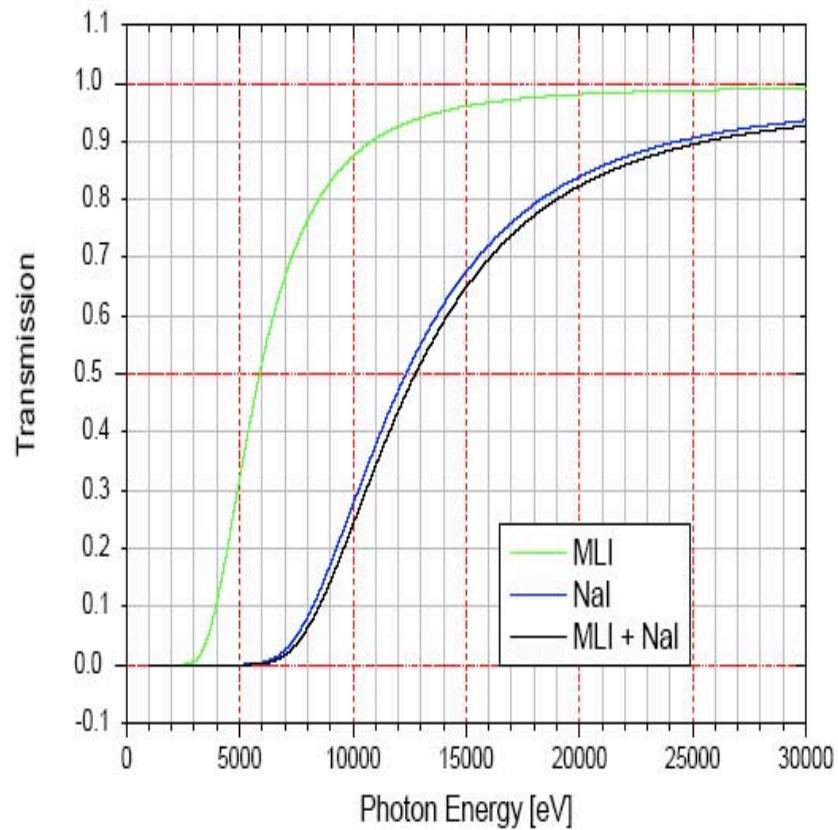
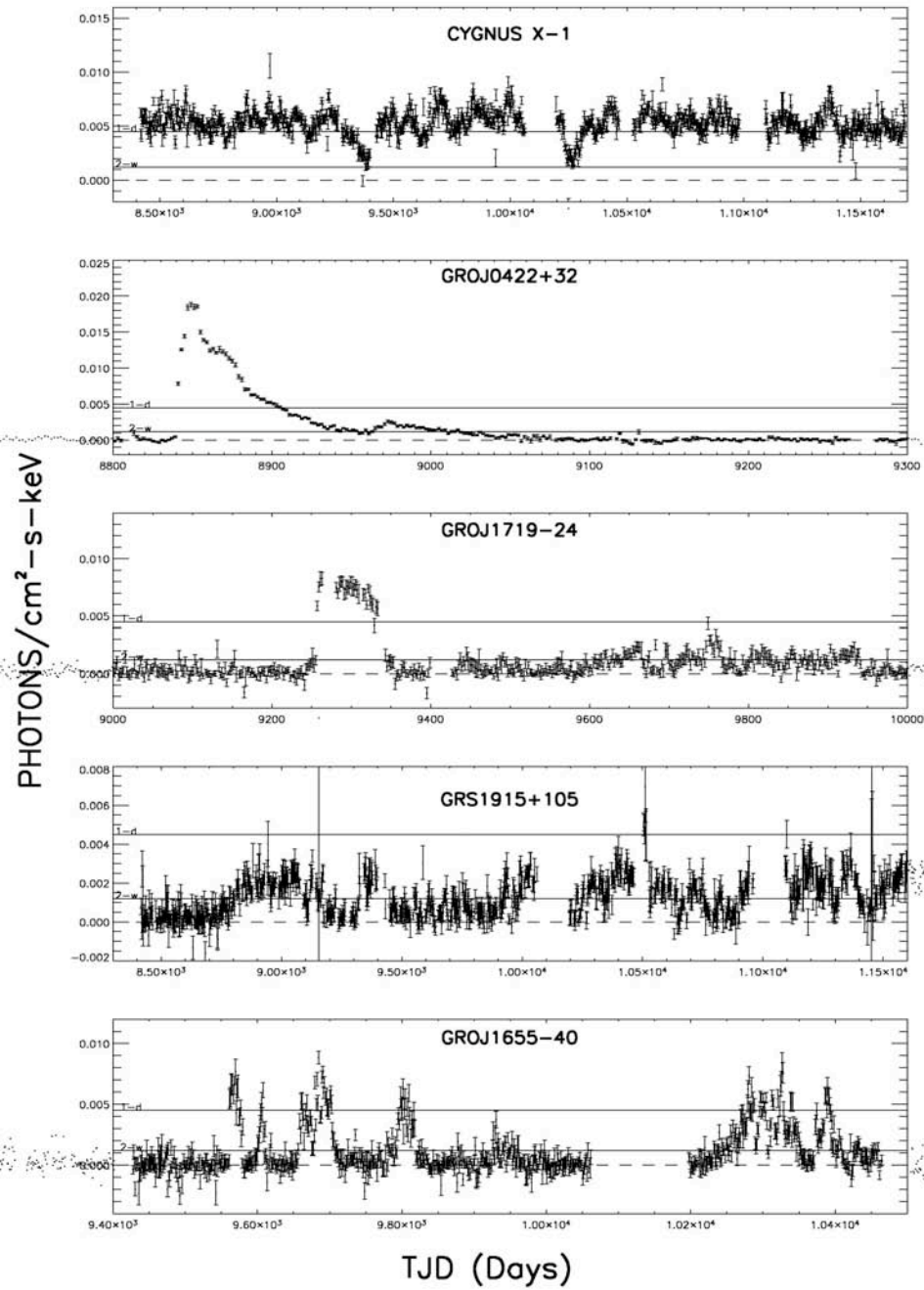
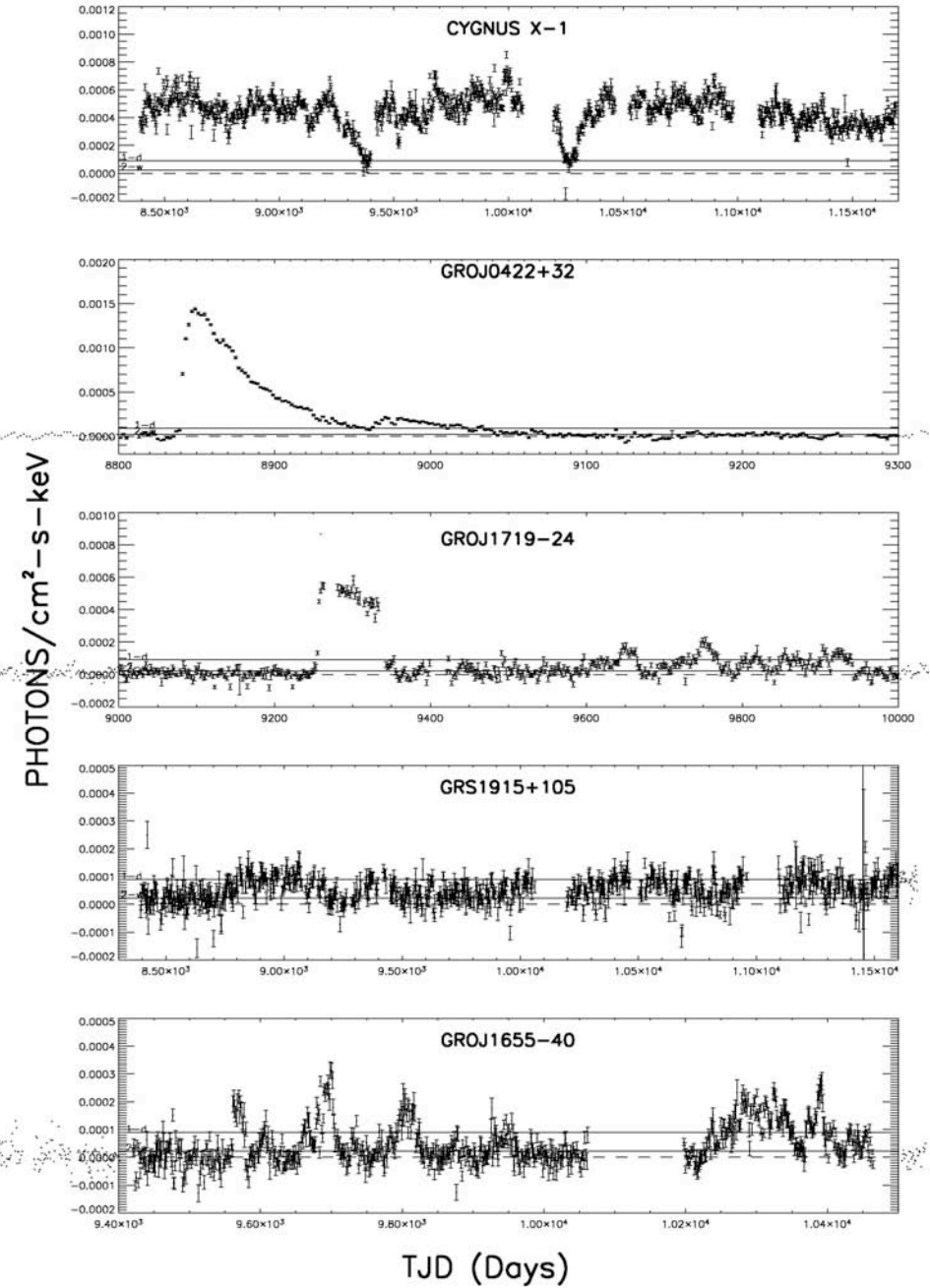


Fig. 5: X-ray transmission of MLI and NaI detector (individual and as sum).

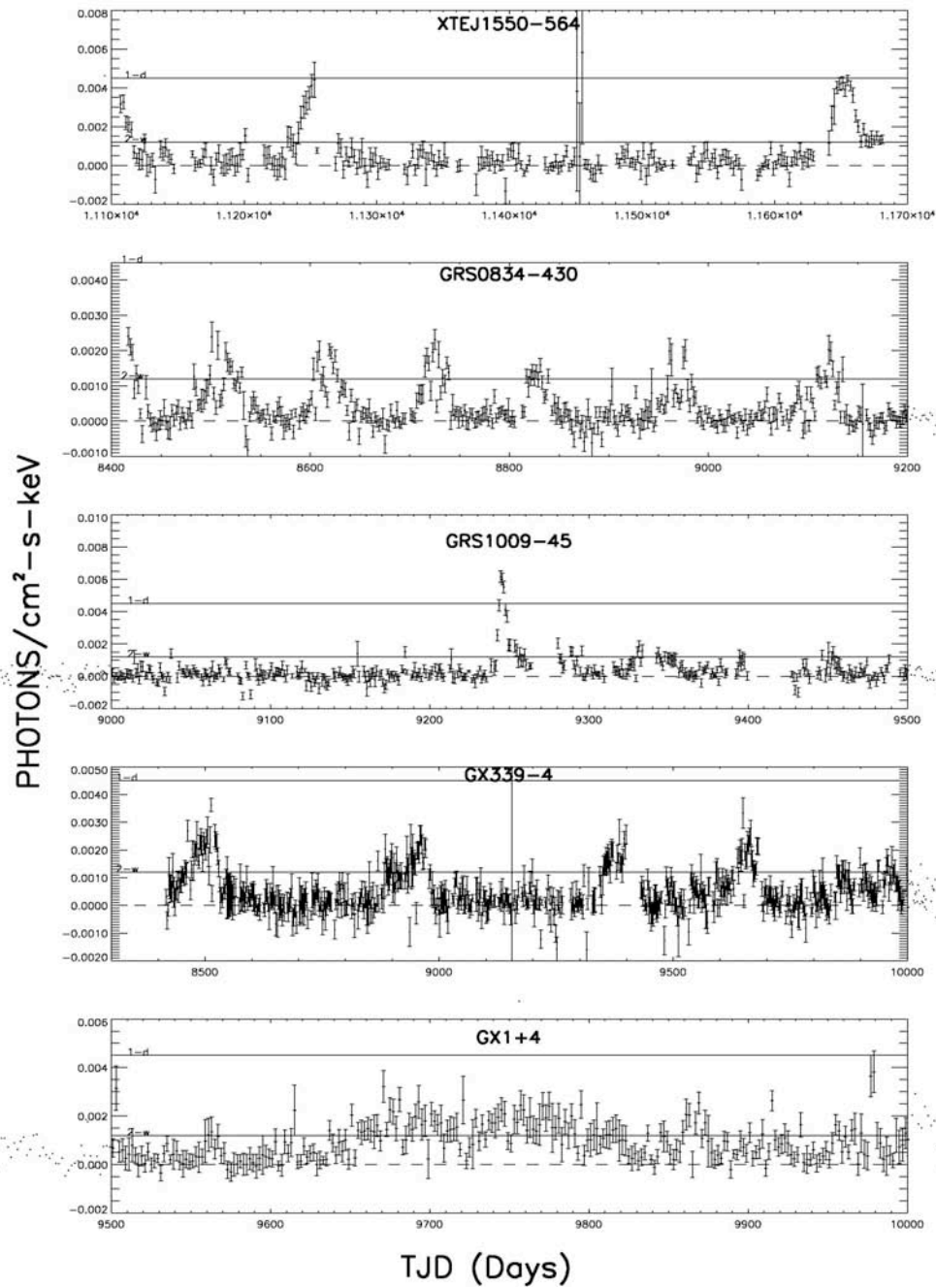
BATSE 25–50 keV LIGHTCURVES



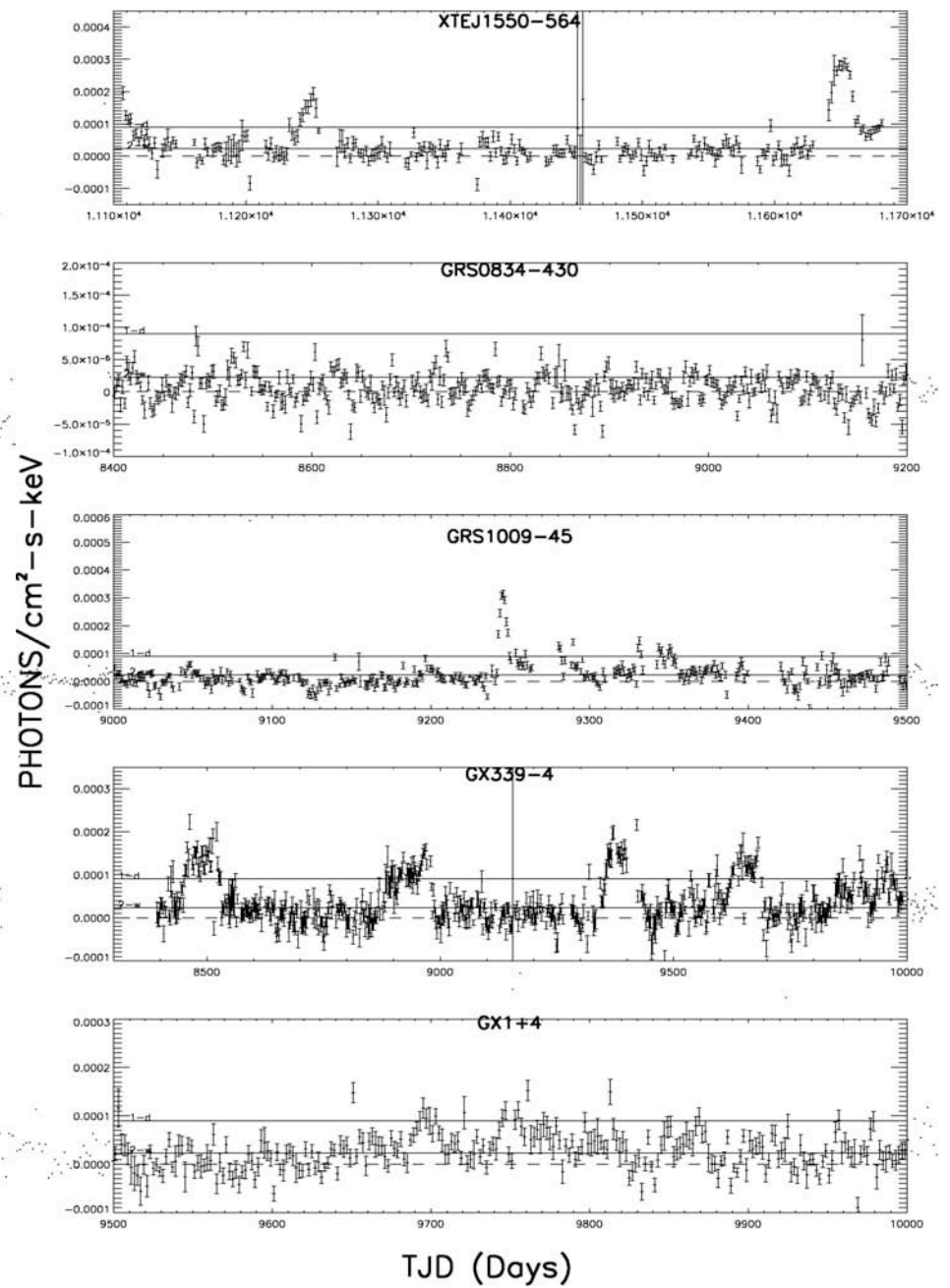
BATSE 50–300 keV LIGHTCURVES



BATSE 25–50 keV LIGHTCURVES



BATSE 50–300 keV LIGHTCURVES



BATSE/EBOP Nine-Year Average Source Fluxes >20 mCrab (Preliminary)

Source Name	25-50 keV (mCrab Flux)	Flux (photon*cm ² - s-keV)	50-300 keV (mCrab Flux)	Flux (photon*cm ² - s-keV)	GBM Sensitivity (3 [?]) in mCrab units
1e1740-29	80	4.80E-04	121	5.12E-05	25-50 keV
3c273	21	1.26E-04	27	1.16E-05	1 day = 748 mCrab
4u1543-45	20	1.23E-04	30	1.27E-05	2 weeks = 200 mCrab
4u1608-522	35	2.11E-04	50	2.11E-05	1 year = 38 mCrab
4u1630-47	57	3.44E-04	40	1.69E-05	
4u1700-37	184	1.11E-03	85	3.58E-05	50-300 keV
aquila_x-1	49	2.94E-04	46	1.96E-05	1 day = 213 mCrab
cen_a	57	0.000342117	89	3.76E-05	2 weeks = 55 mCrab
cen_x-3	30	0.000182058	14	6.01E-06	1 year = 12 mCrab
cen_x-3	30	0.000182058	14	6.01E-06	
crab	1000	6.02E-03	1000	0.000422	
cyg_x-1	874	5.26E-03	1045	0.000440895	
cyg_x-3	101	0.000606963	32	1.35E-05	
exo1846-31	69	0.00041418	65	2.75E-05	
groj0422+32	35	0.000209726	59	2.47E-05	
groj1655-40	43	0.000259256	33	1.38E-05	
groj1719-24	49	0.00029287	41	1.72E-05	
groj1744-28	33	0.000195761	10	4.34E-06	
groj1944+26	20	0.000119248	23	9.59E-06	
grs0834-430	18	0.000111246	12	5.23E-06	

BATSE/EBOP Nine-Year Average Source Fluxes >20 mCrab (Preliminary)

Source Name	25-50 keV (mCrab Flux)	Flux (photon*cm ² - s-keV)	50-300 keV (mCrab Flux)	Flux (photon*cm ² - s-keV)	GBM Sensitivity (3 [?]) in mCrab units
grs1009-45	21	0.000125643	33	1.40E-05	25-50 keV
grs1758-258	95	0.000574685	70	2.96E-05	1 day = 748 mCrab
grs1915+105	179	0.001076789	118	4.98E-05	2 weeks = 200 mCrab
gs1826-238	62	0.000372585	53	2.26E-05	1 year = 38 mCrab
gx1+4	82	0.000494265	39	1.65E-05	
gx17+2	73	0.000438101	35	1.48E-05	50-300 keV
gx301-2	103	0.000617953	11	4.70E-06	1 day = 213 mCrab
gx312-1	32	0.000189723	36	1.53E-05	2 weeks = 55 mCrab
gx339-4	62	0.000372507	83	3.52E-05	1 year = 12 mCrab
gx354+0	71	0.000428025	50	2.12E-05	
her_x-1	29	0.000172964	14	5.81E-06	
ngc4151	39	0.000234431	41	1.75E-05	
oao1657-415	66	0.000398368	35	1.46E-05	
psr1259-63	21	1.24E-04	22	9.19E-06	
psr1509-58	17	9.96E-05	36	1.50E-05	
sco_x-1	269	0.001617457	12	4.93E-06	
sctx-1	37	0.000223285	34	1.42E-05	
vela_x-1	174	0.001049755	29	1.23E-05	
xtej1550-564	26	0.000159346	43	1.81E-05	
xtej1748-288	53	3.21E-04	35	1.49E-05	

Summary

- GBM All Sky Survey enables discovery of new sources
- It provides targets of opportunity for multi-wavelength observations
- Continuous monitoring of sources provides a broader overview of source behavior to complement pointed observations
- Detailed monitoring of spectral changes in point sources could reveal important information on possible changes in the system configuration and physical processes associated with the state transitions of gamma-ray sources.
- Effort for converting BATSE earth-occultation analysis tools for GBM application is estimated to be ~ 1 person-year.