



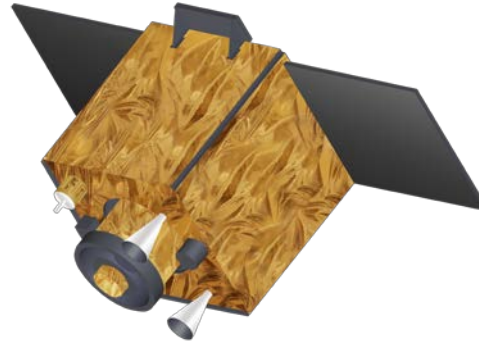
第十屆

海峽兩岸天文望遠鏡與觀測前沿技術研討會 -

The Gamma-ray Transients Monitor (GTM) on board Formosat-8B

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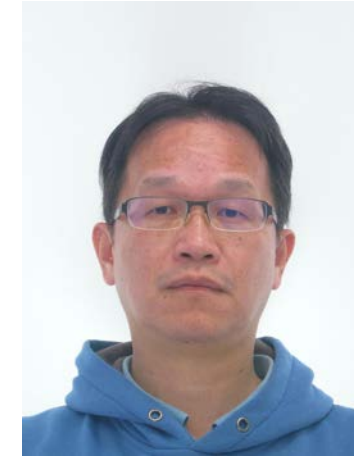


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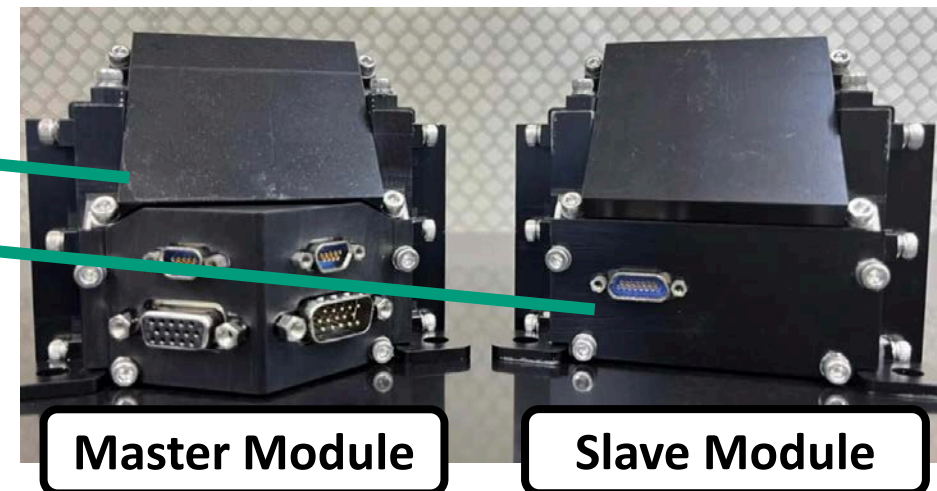
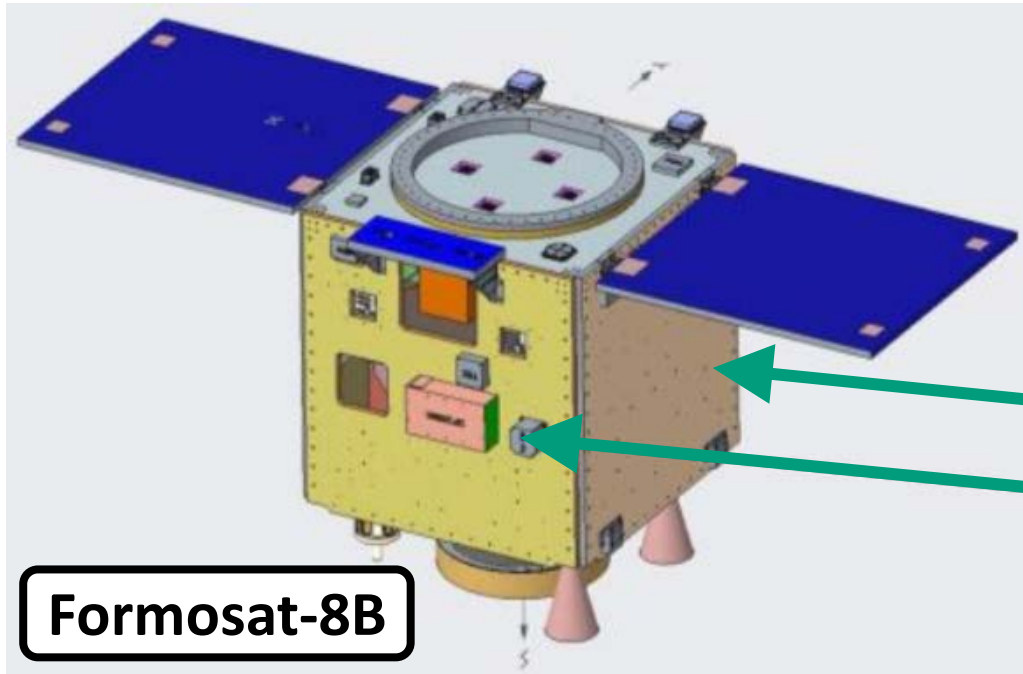
Concept of GTM on board Formosat-8B

- **Science Goal**

To monitor Gamma-Ray Bursts (GRBs) and bright gamma-ray transients from other sources in 30 keV – 2 MeV.

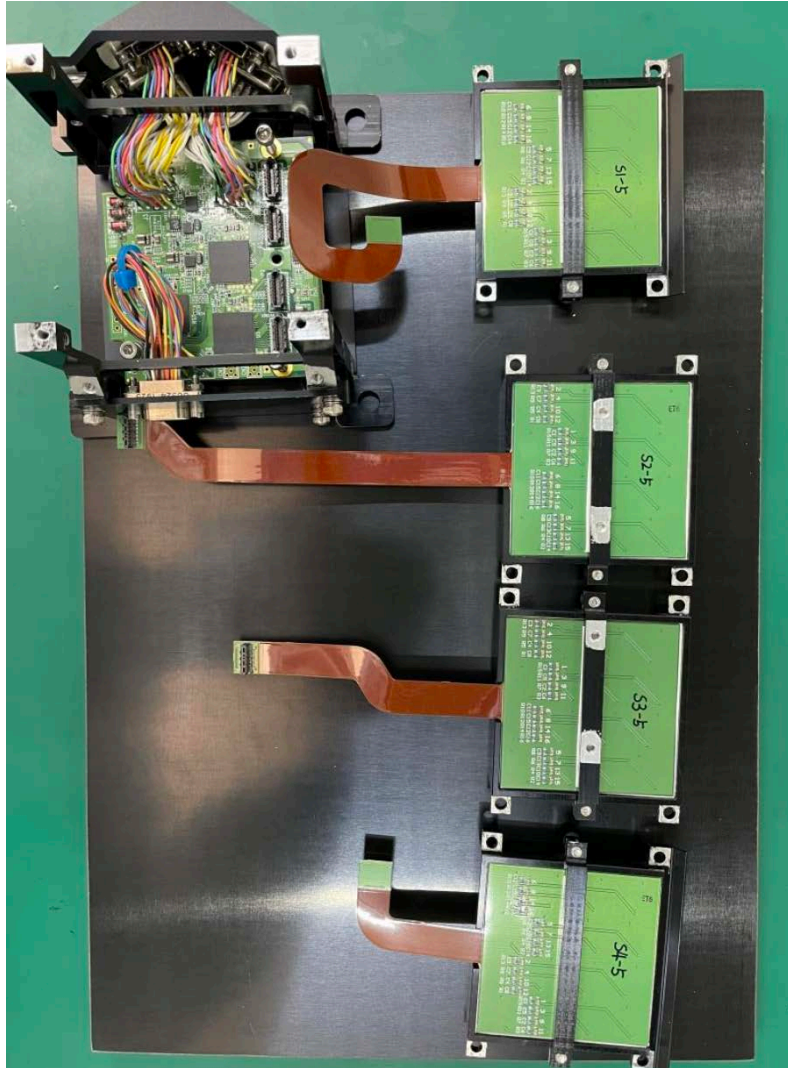
- **Instrument Design**

Two identical modules located on two opposite sides of FS-8B. Each module has four sensor units facing different directions to cover the whole sky.

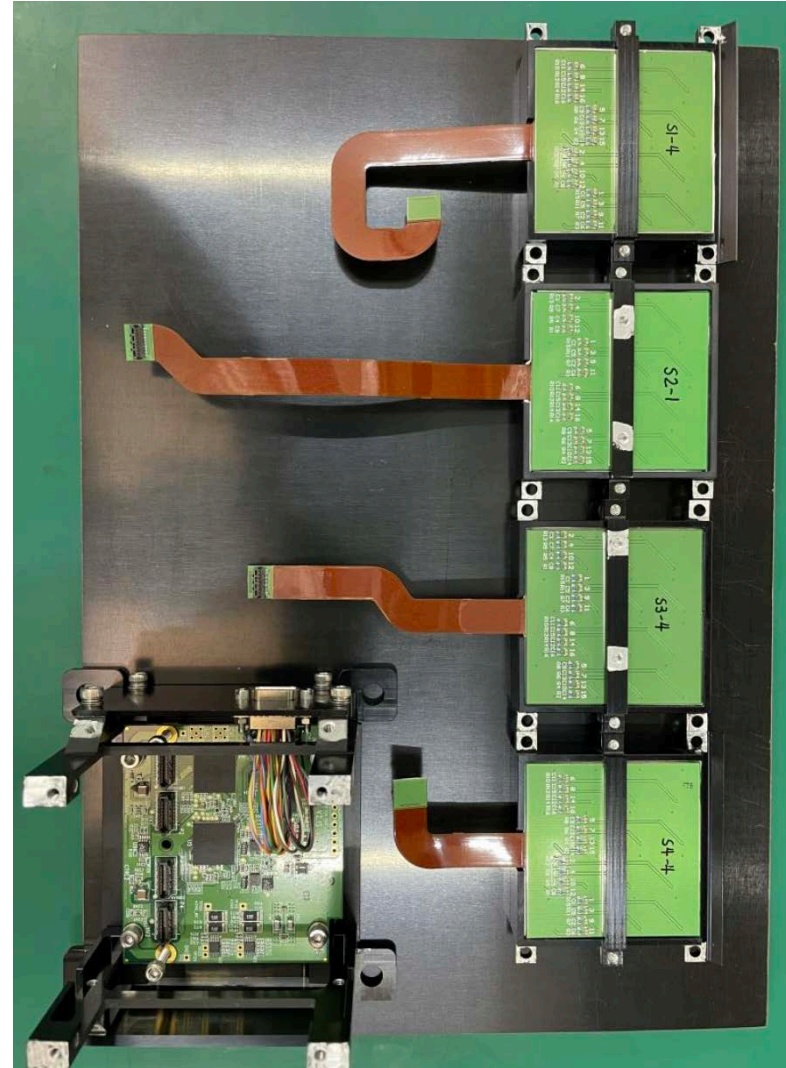


Details in Module

Master

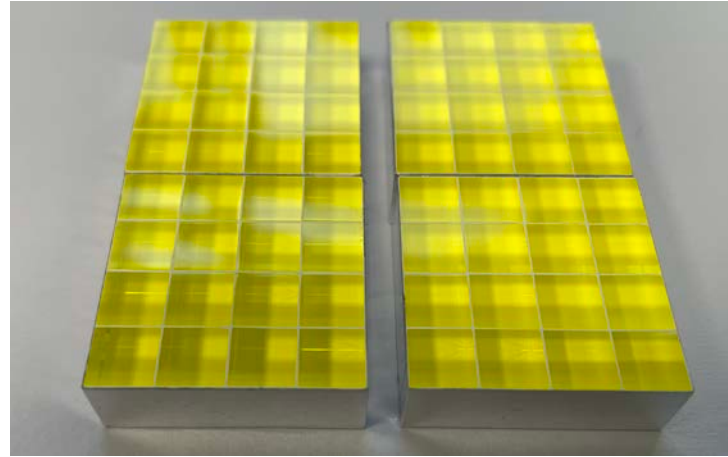


Slave



Details in Sensor Unit

GAGG Scintillator
(51 mm x 51 mm x 8 mm)

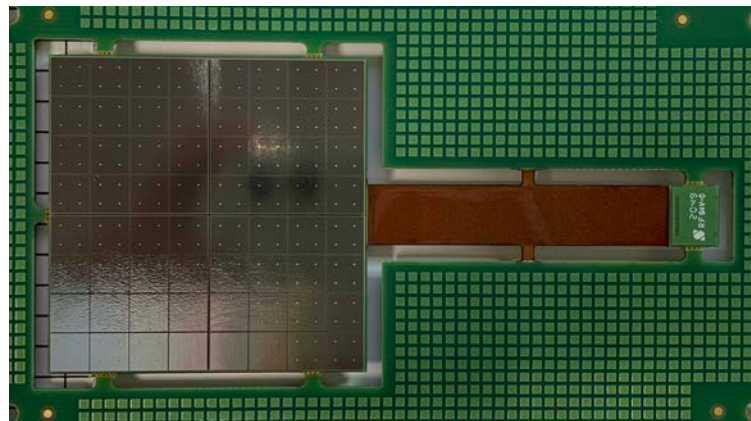
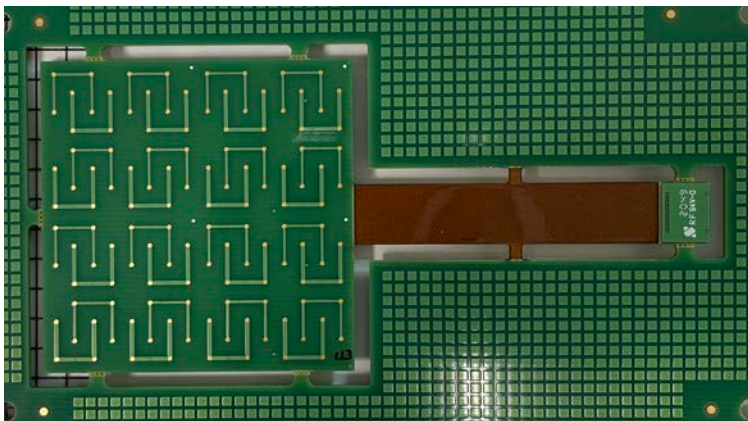
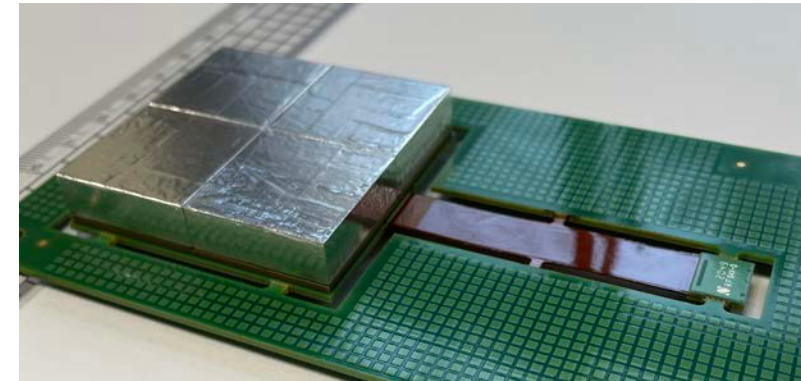


+



PCB with 16 pixel-channels

PCB + SiPM chips



Scintillation Mechanisms

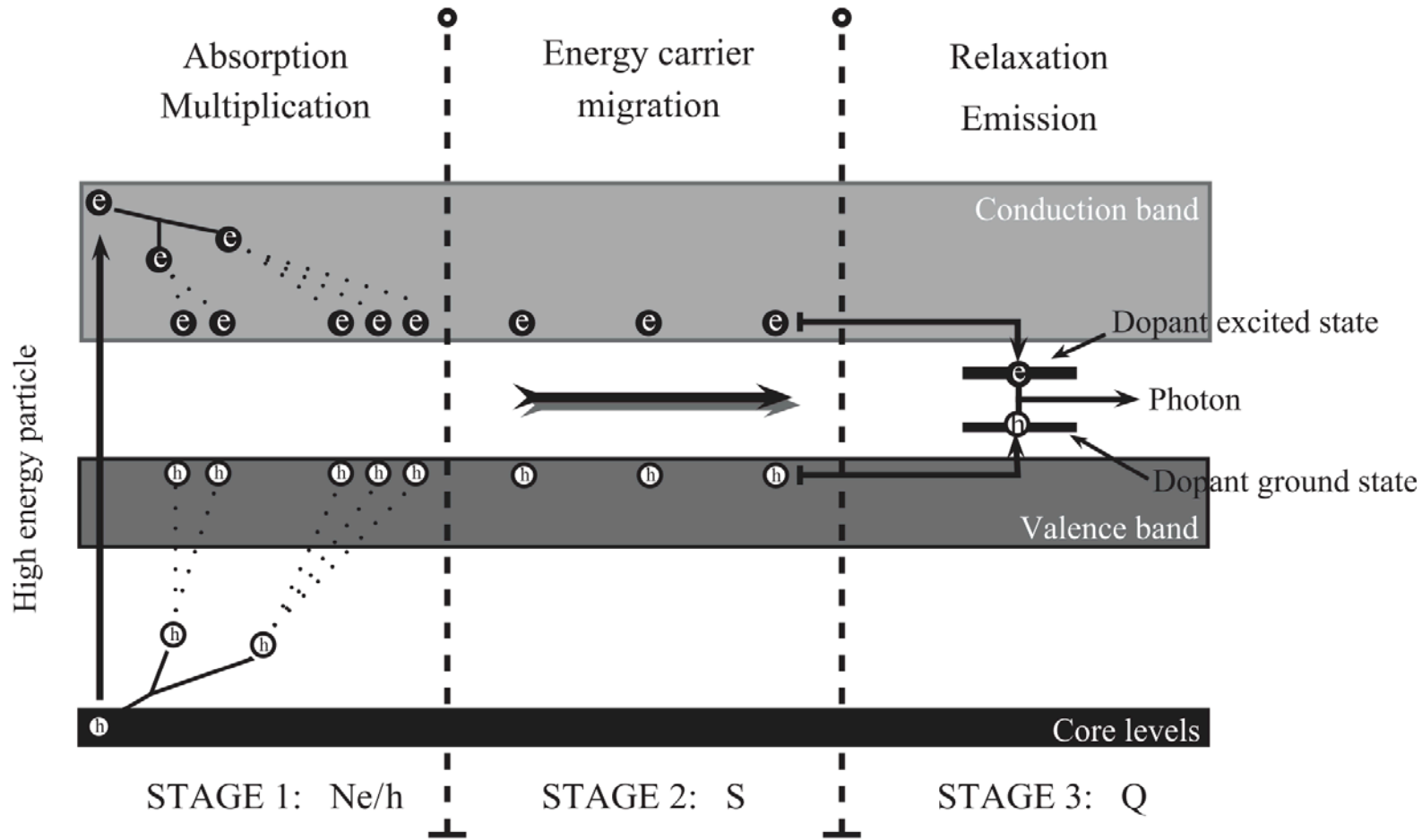
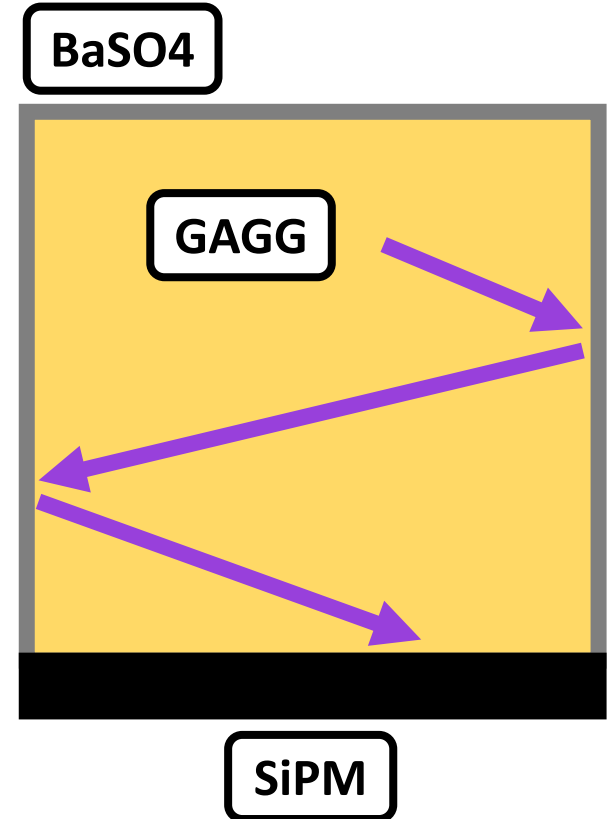


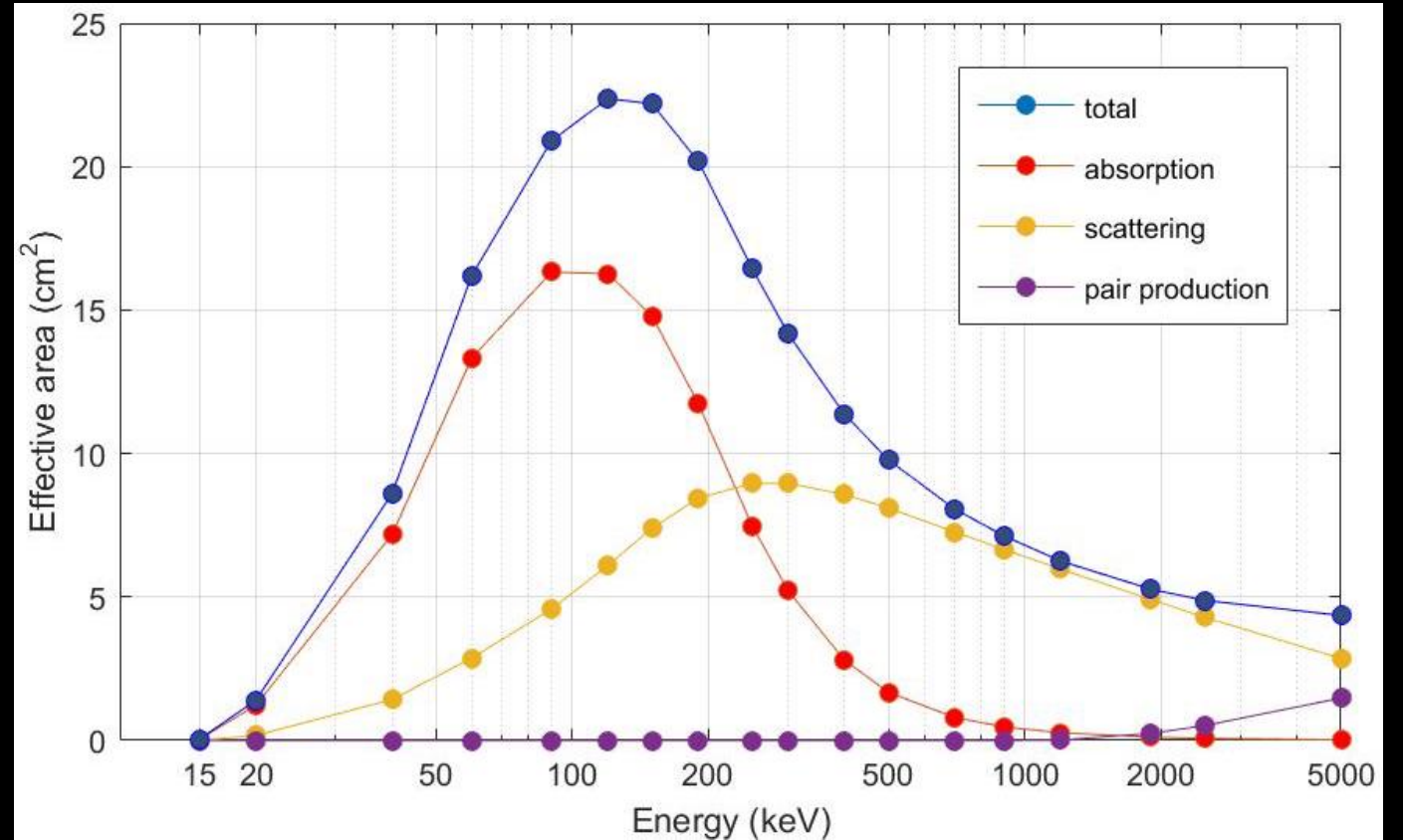
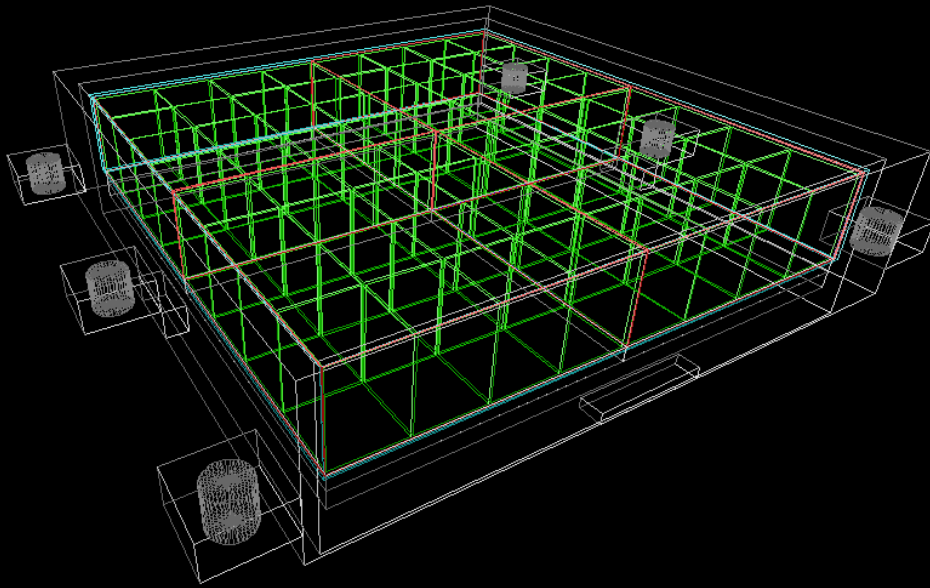
Fig. 1. Basic scheme of various stages involved in scintillation. (G. Bizarri, 2010)



Simulation – Effective Area



MEGALib (Zoglauer et al. 2008)



Simulation – Detection Efficiency



MEGALib (Zoglauer et al. 2008)

Source

- Spectrum model:

$$f_{\text{CPL}} \propto E^\alpha \cdot e^{-\frac{E(2+\alpha)}{E_p}}$$

- Short GRBs:

$$\alpha = -0.5, E_p = 500 \text{ keV}, T = 0.5 \text{ s}$$

- Long GRBs:

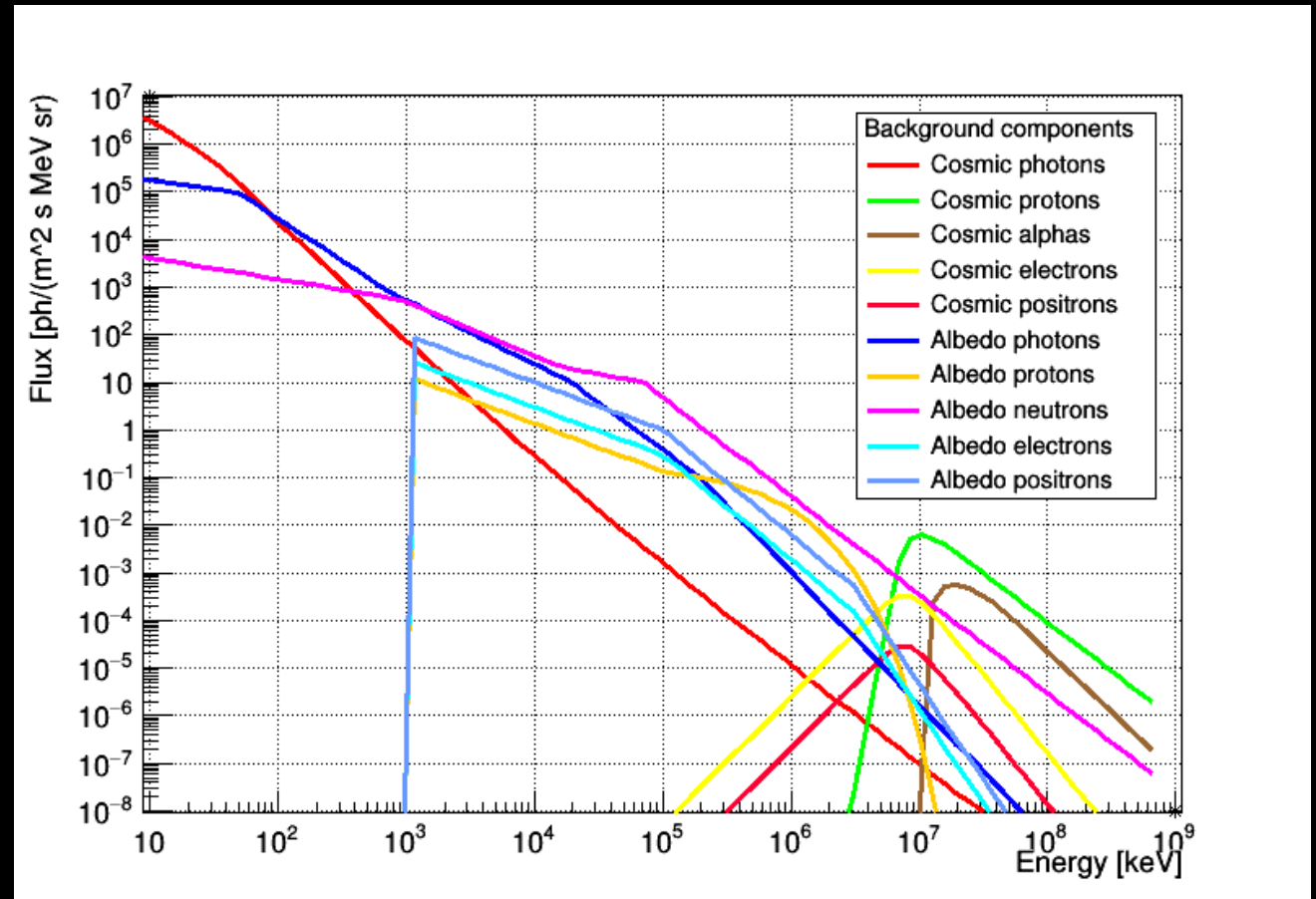
$$\alpha = -1.0, E_p = 300 \text{ keV}, T = 10 \text{ s}$$



First GTM Paper:
Chang et al., 2022, ASR, 69, 1249

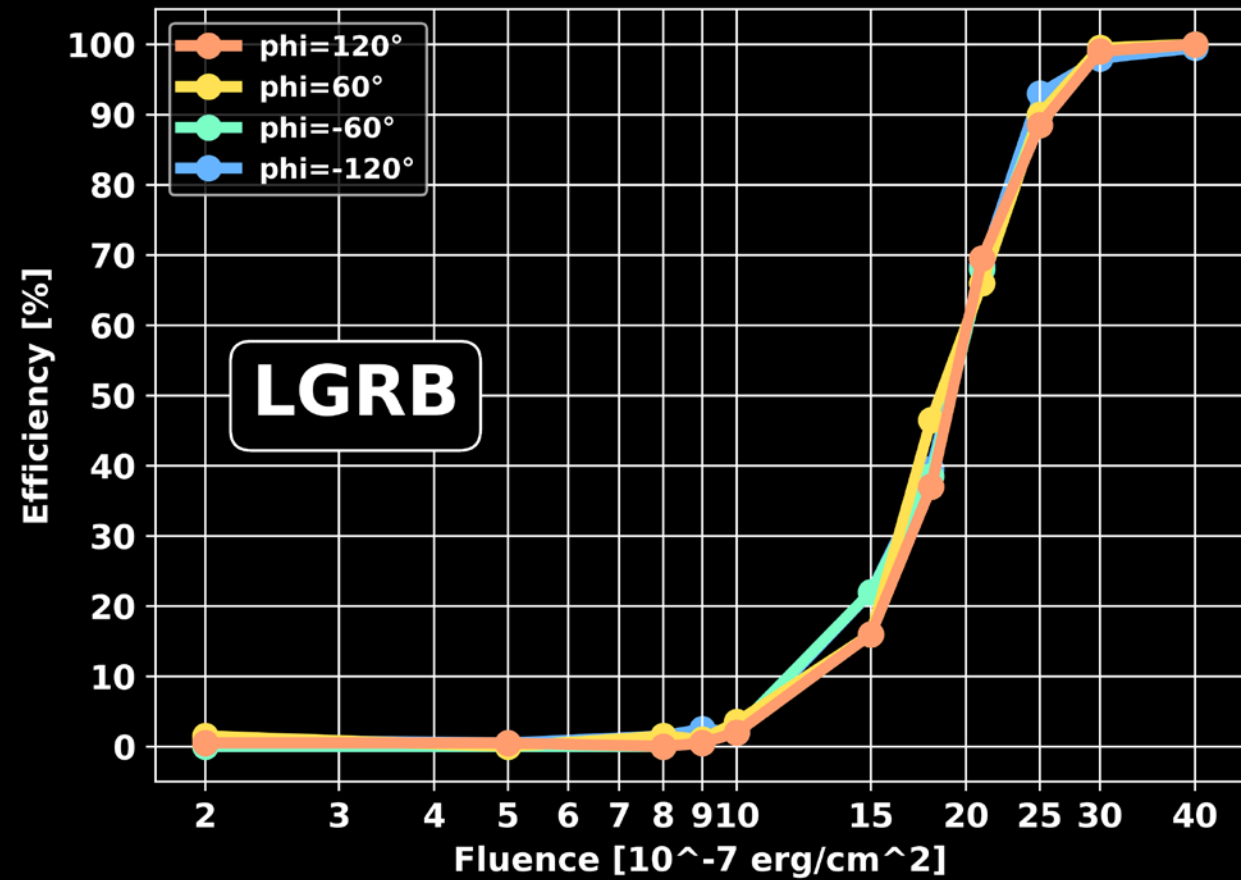
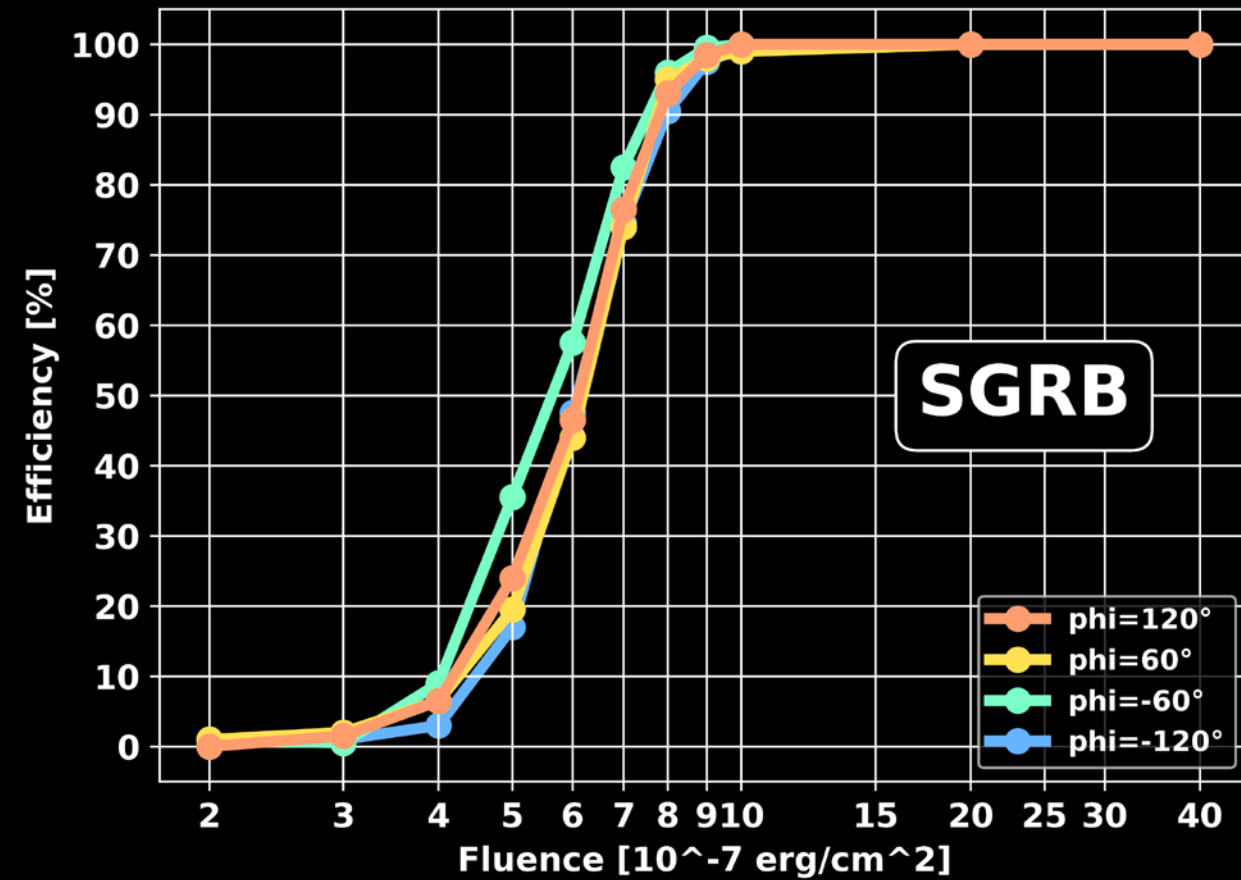
Background

- Altitude: 561 km
- Inclination: 97 deg

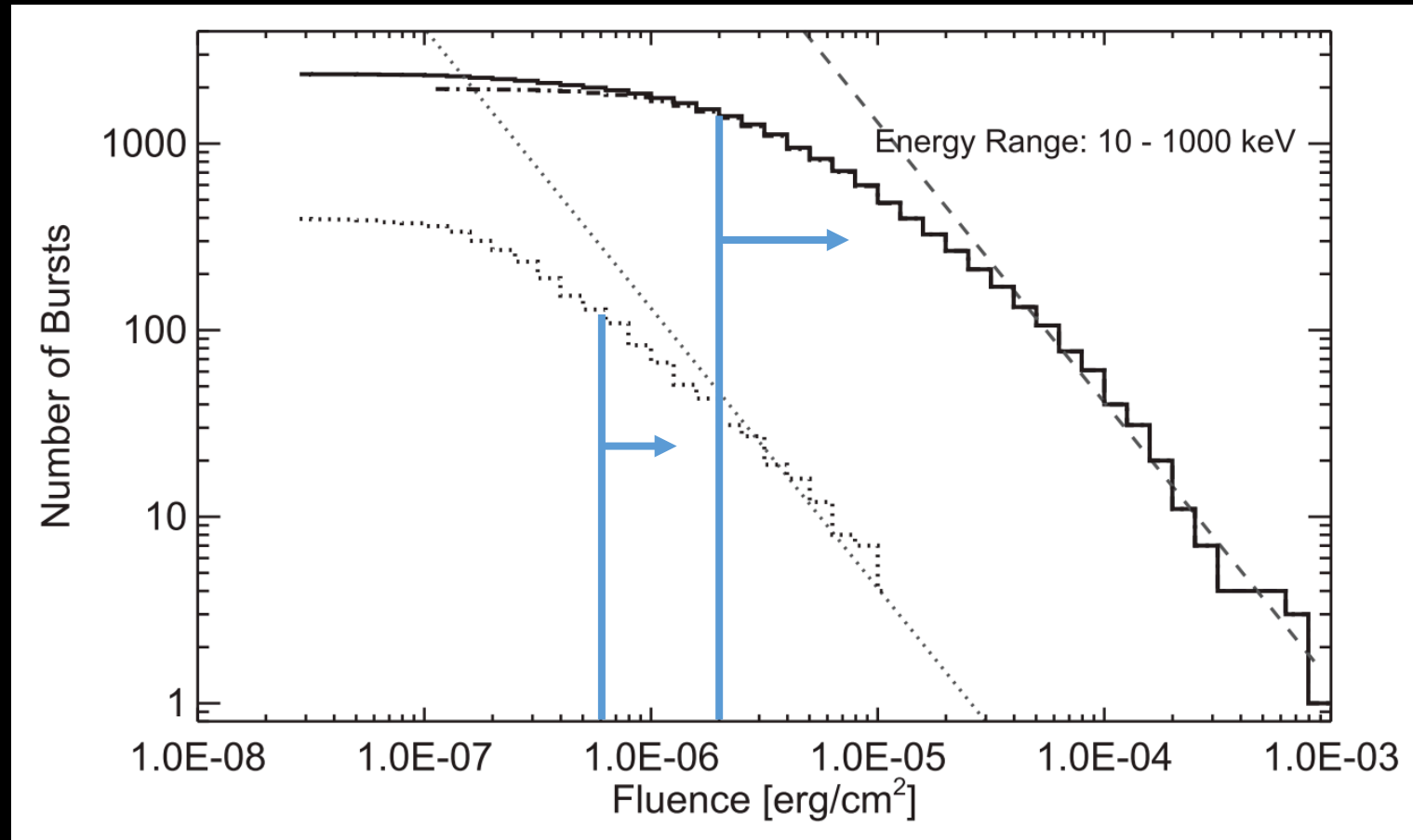




Simulation – Detection Efficiency



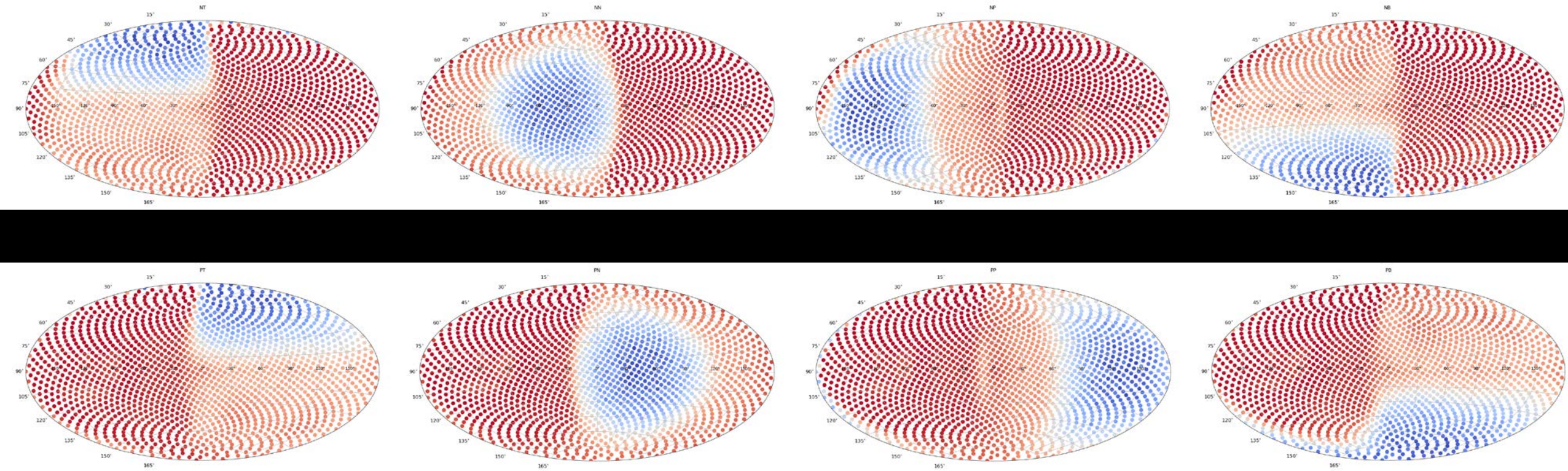
Simulation – Detection Efficiency



Fermi/GBM 10-year GRB fluence distribution (von Kienlin et al. 2020)

Assuming a 36% duty cycle, **FS8B/GTM will detect about 50 GRBs per year.**

Simulation – Detector Response

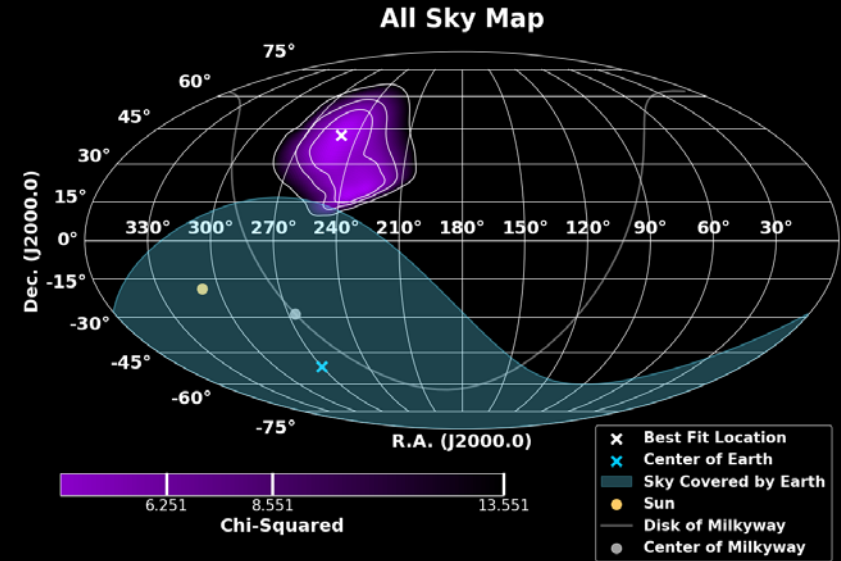
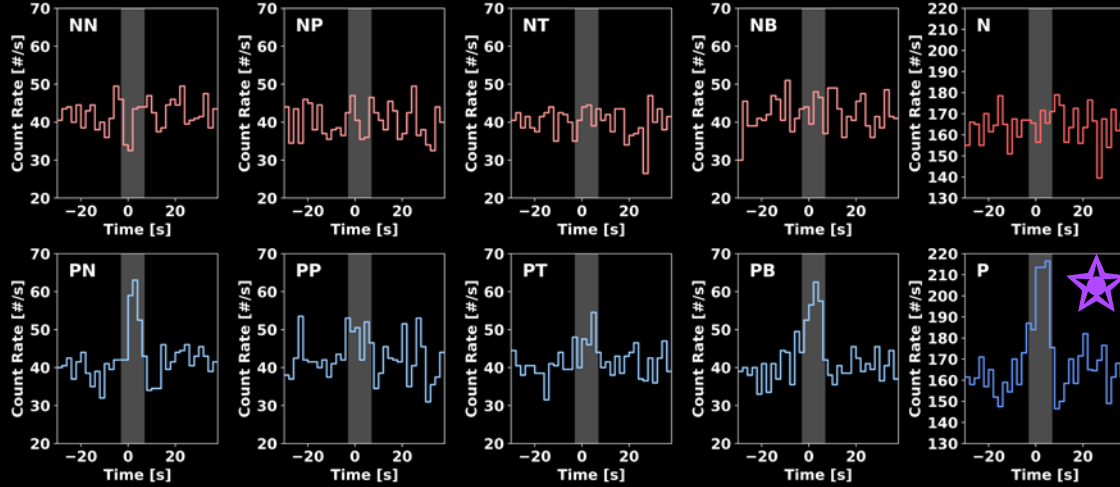




Simulation – Localization Capability

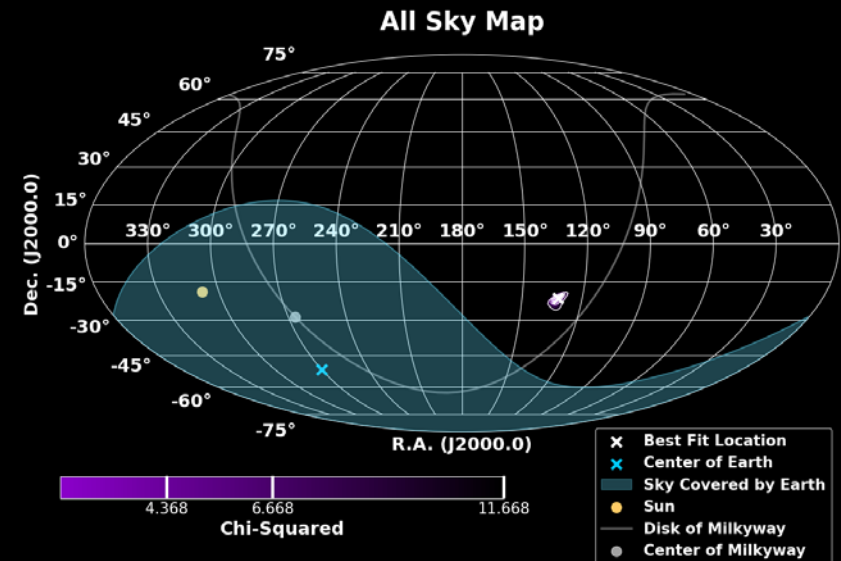
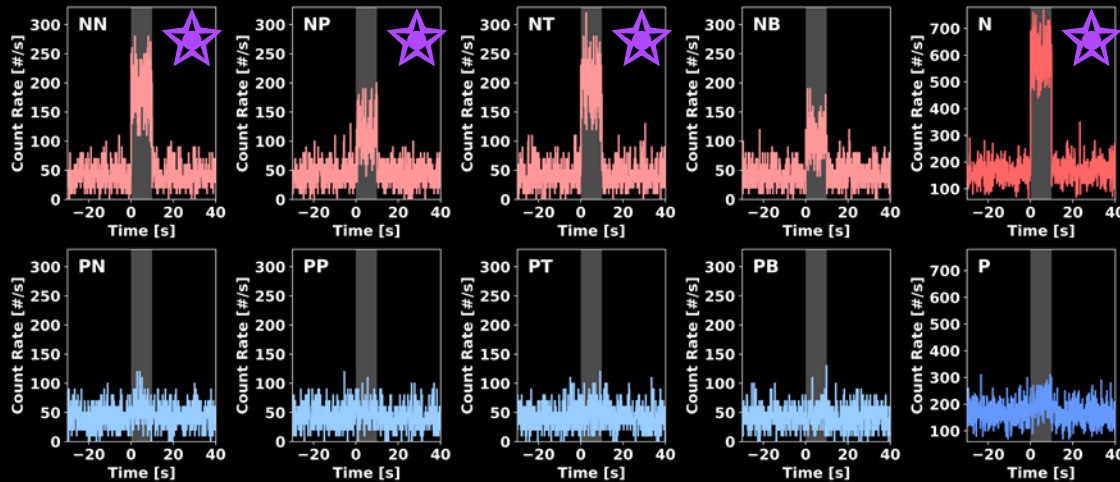
Lightcurve with Min Time Bin = 2.0 s
GRB: Theta ~ 144.28°, Phi ~ 52.43°, Fluence = 4.0×10^{-6} erg/cm²

Input GRB Duration

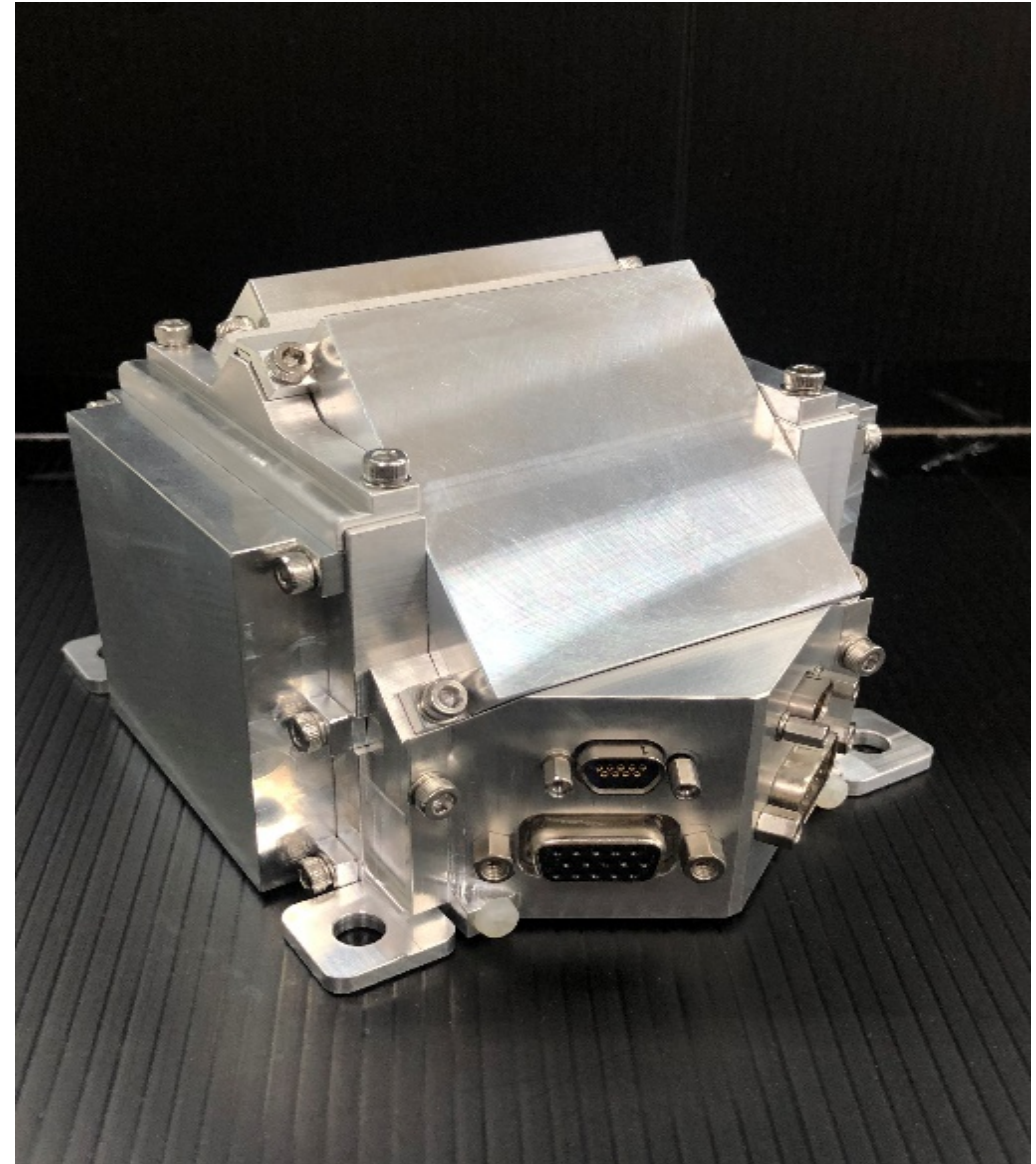
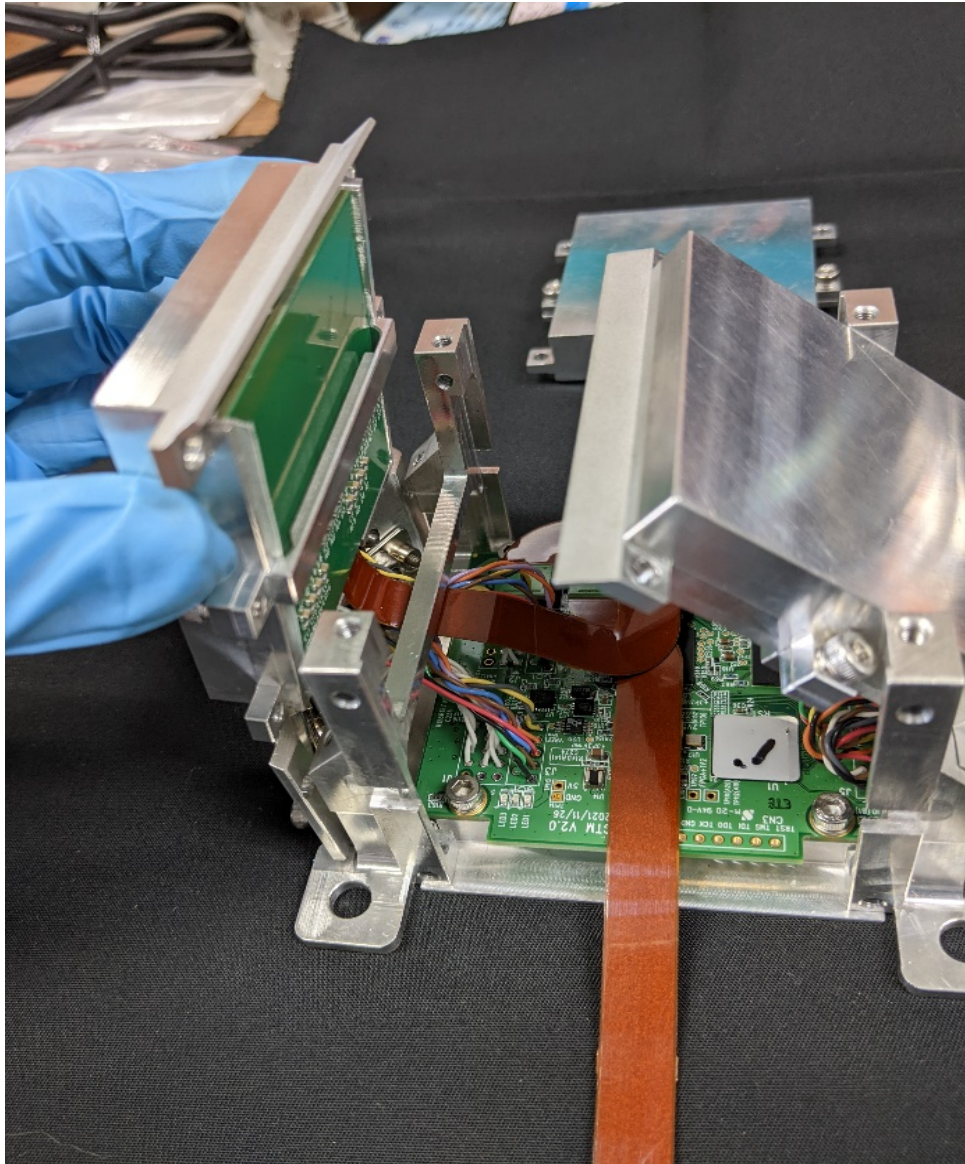


Lightcurve with Time Bin = 0.1 s
GRB: Theta ~ 45.67°, Phi ~ -31.49°, Fluence = 4.0×10^{-5} erg/cm²

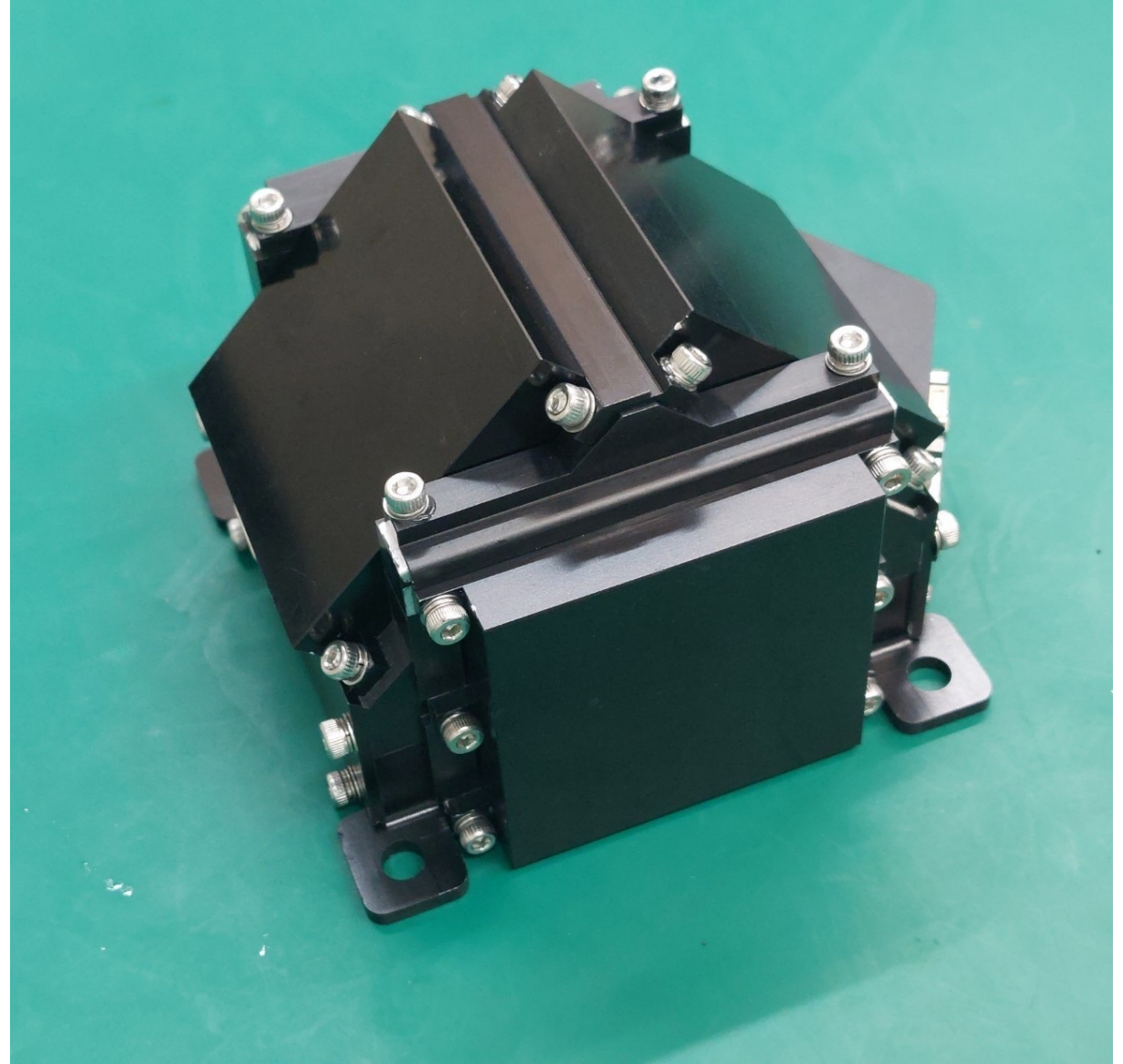
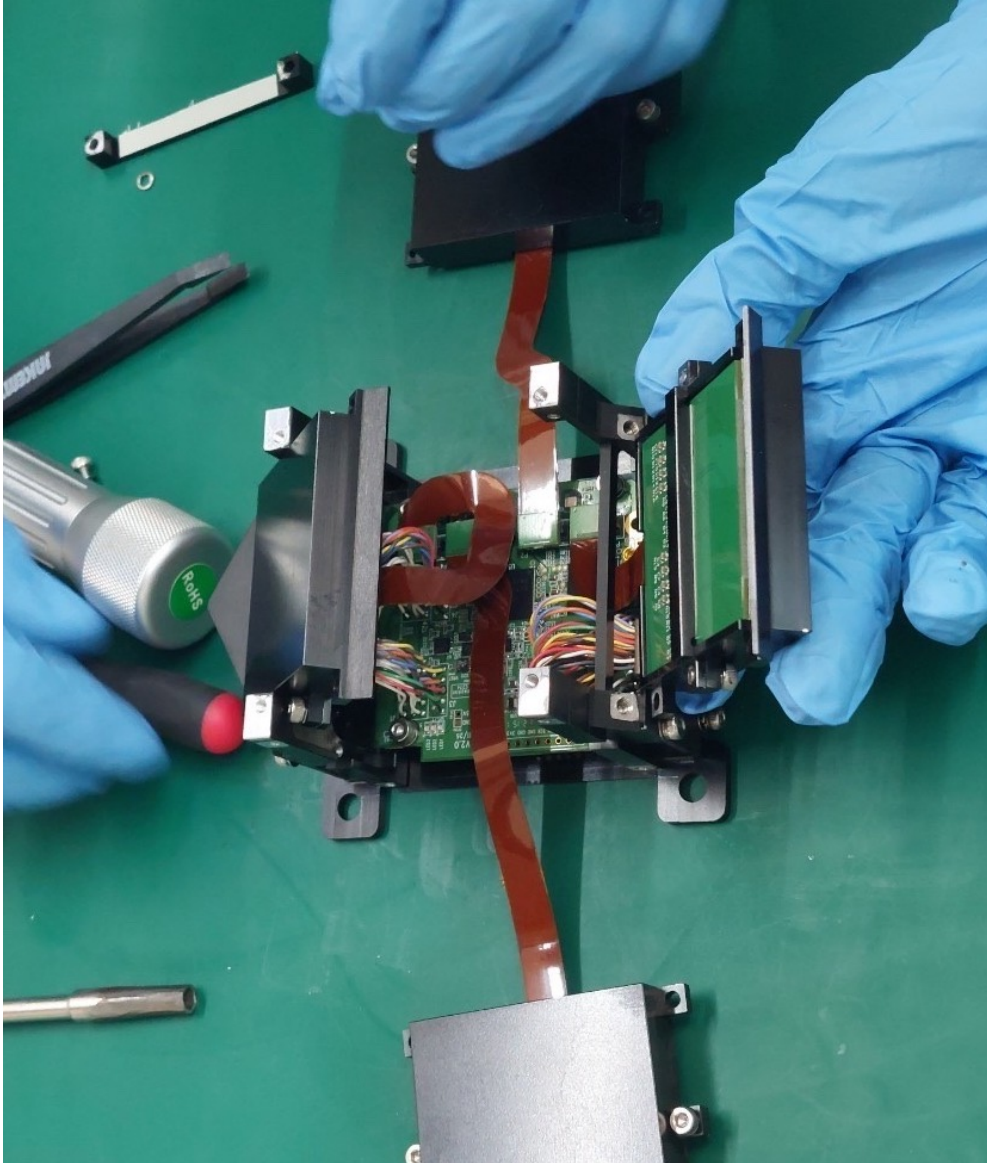
Input GRB Duration



Engineering Model (EM)



Engineering Qualification Model (EQM)



Assembly



Tests

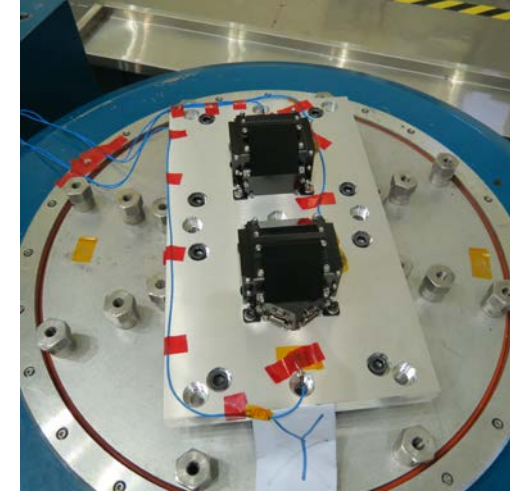
Functional Test



Termal Cycle Test



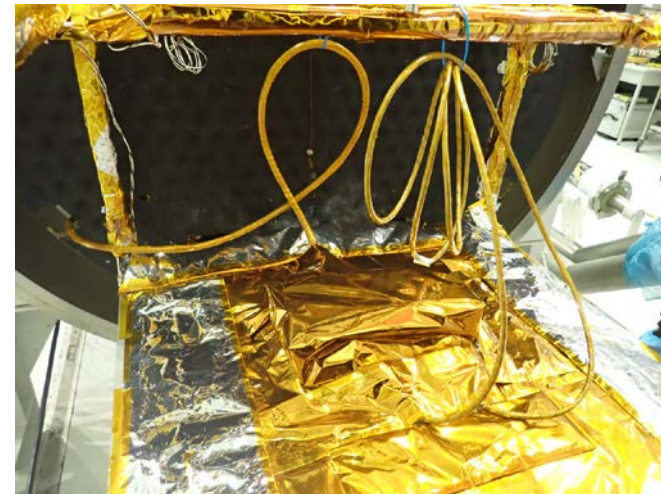
Vibration Test



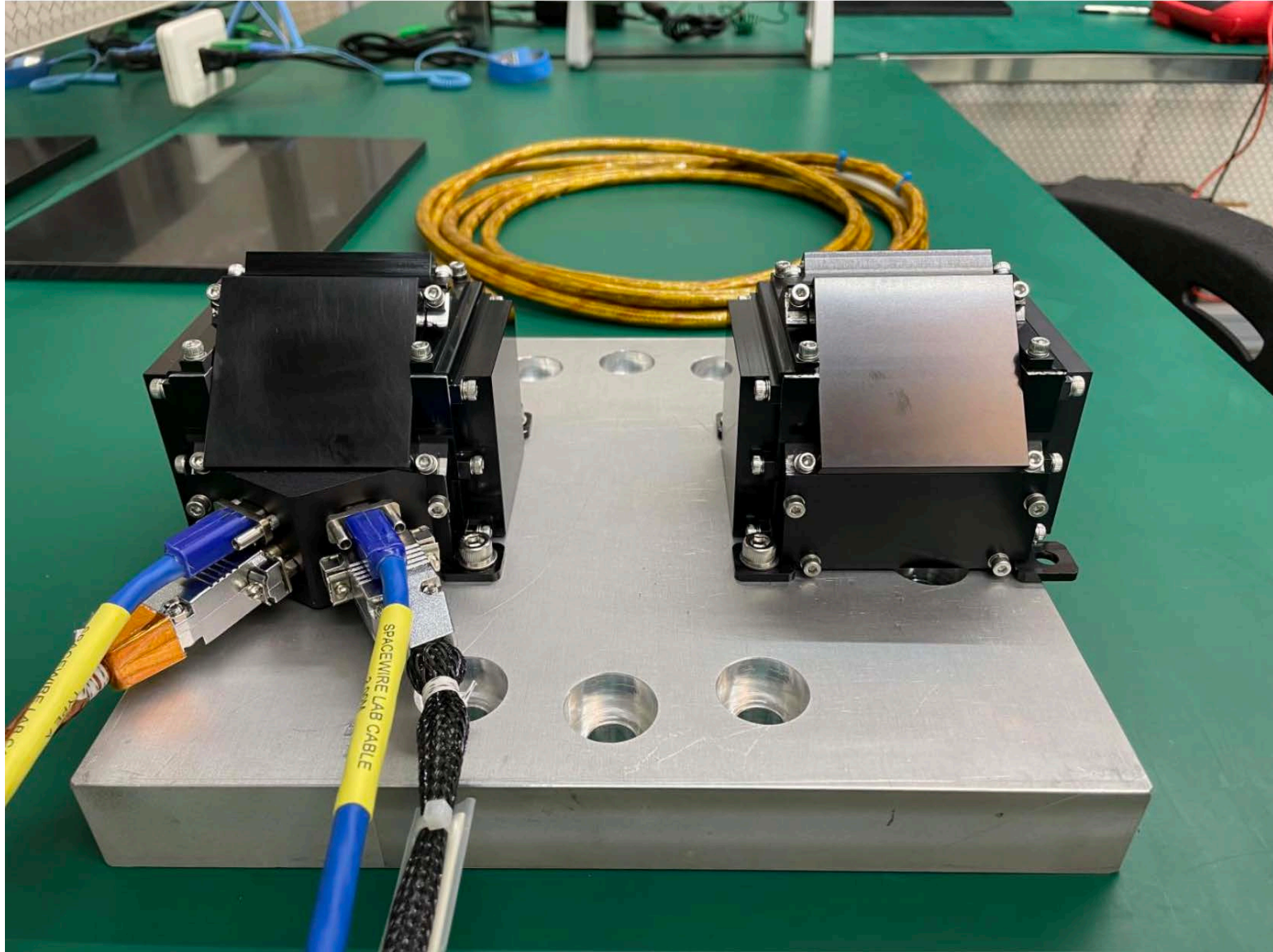
EMC/EMI Test



Termal Vacuum Test



Flight Model (FM)

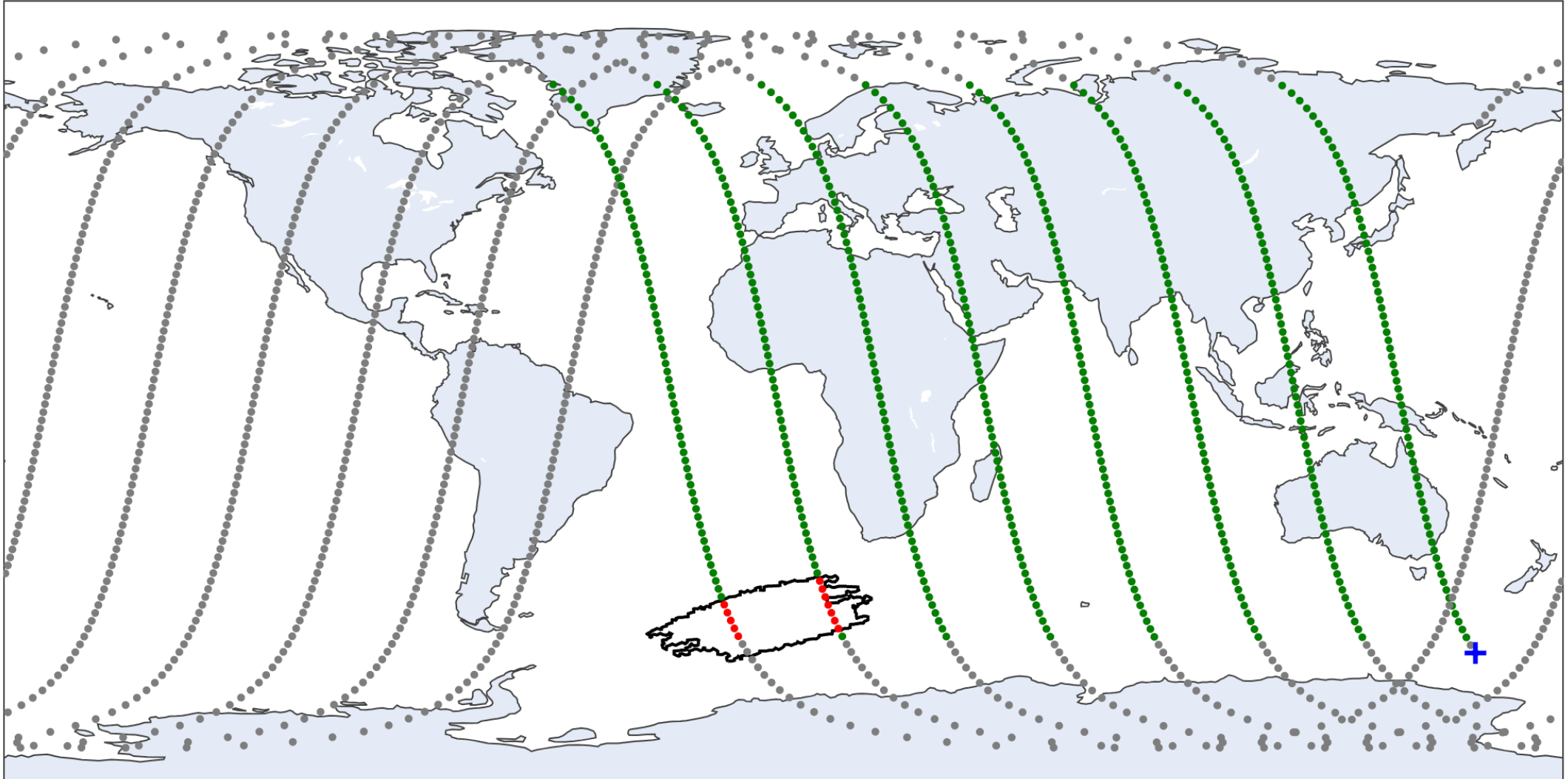


Science Data Center (SDC)

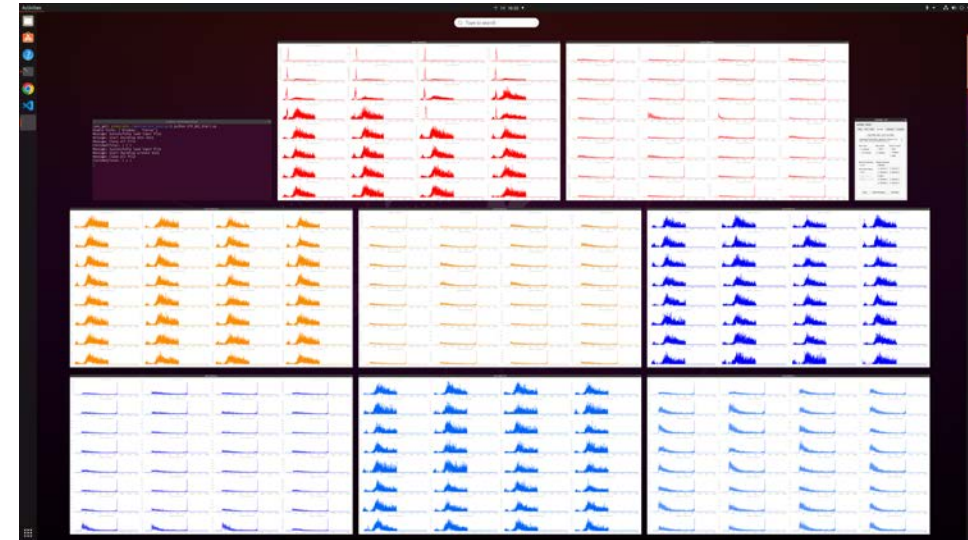
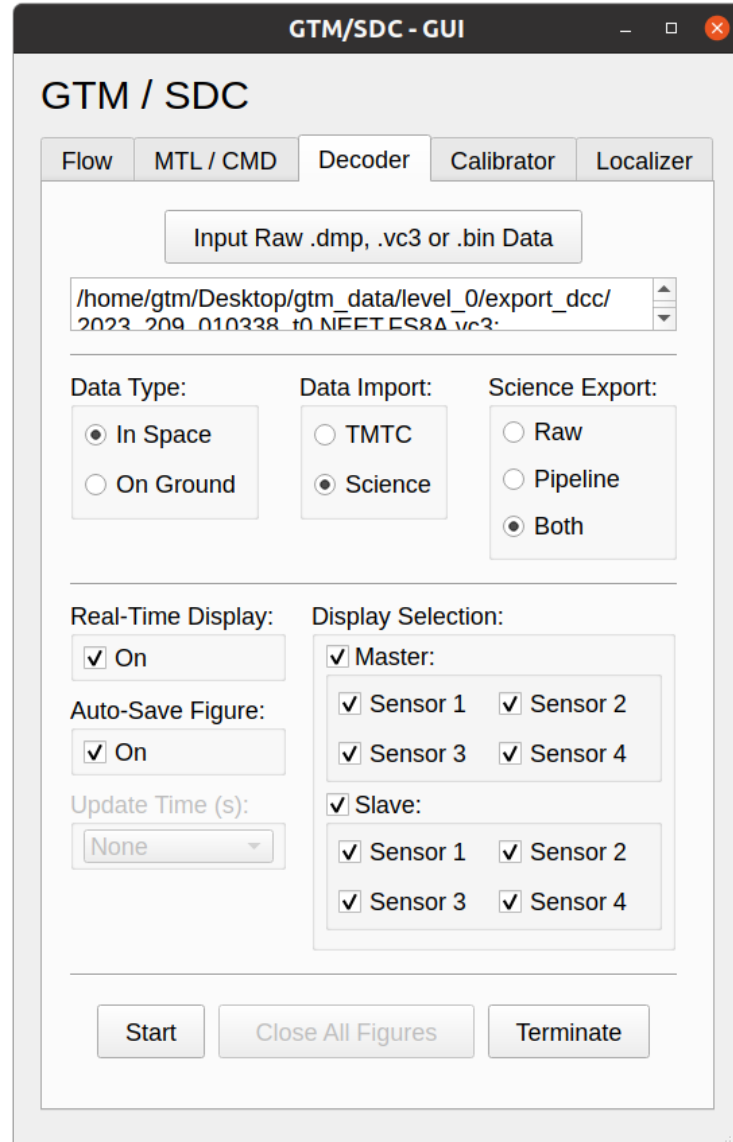
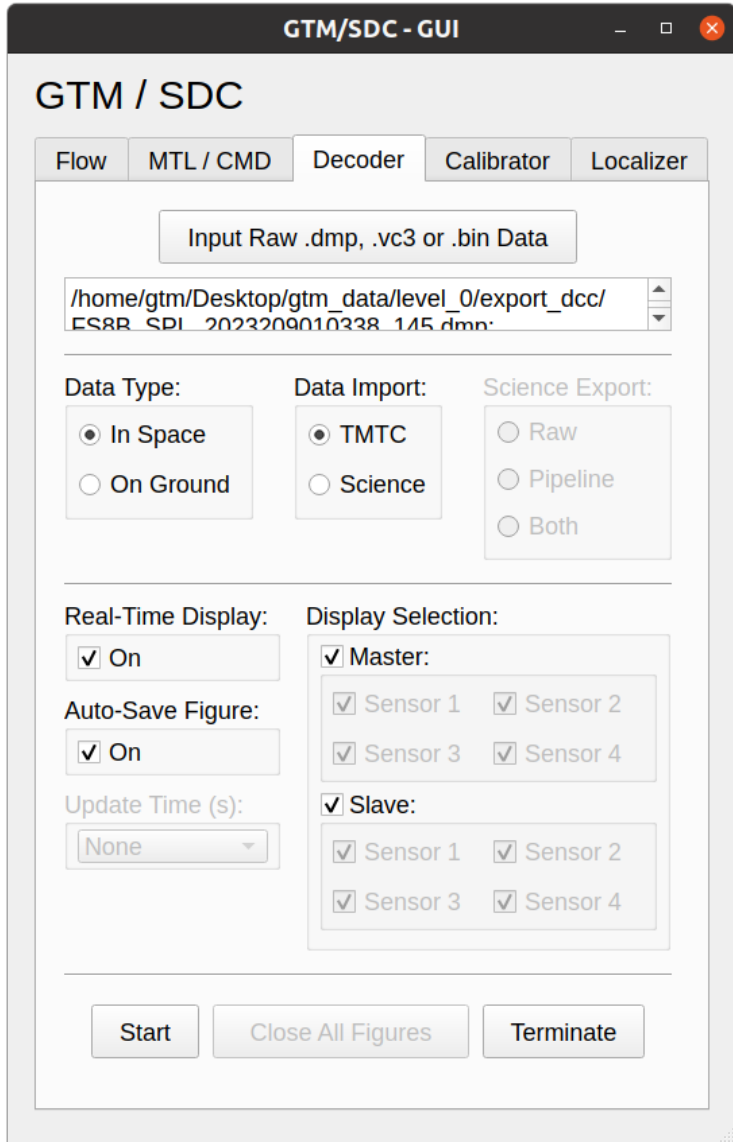




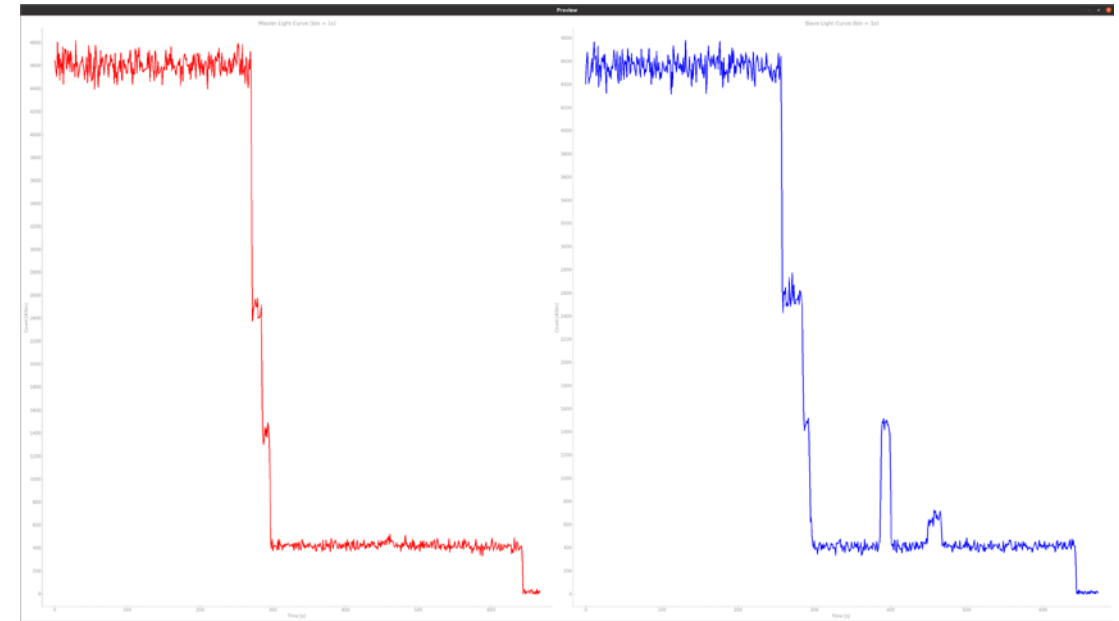
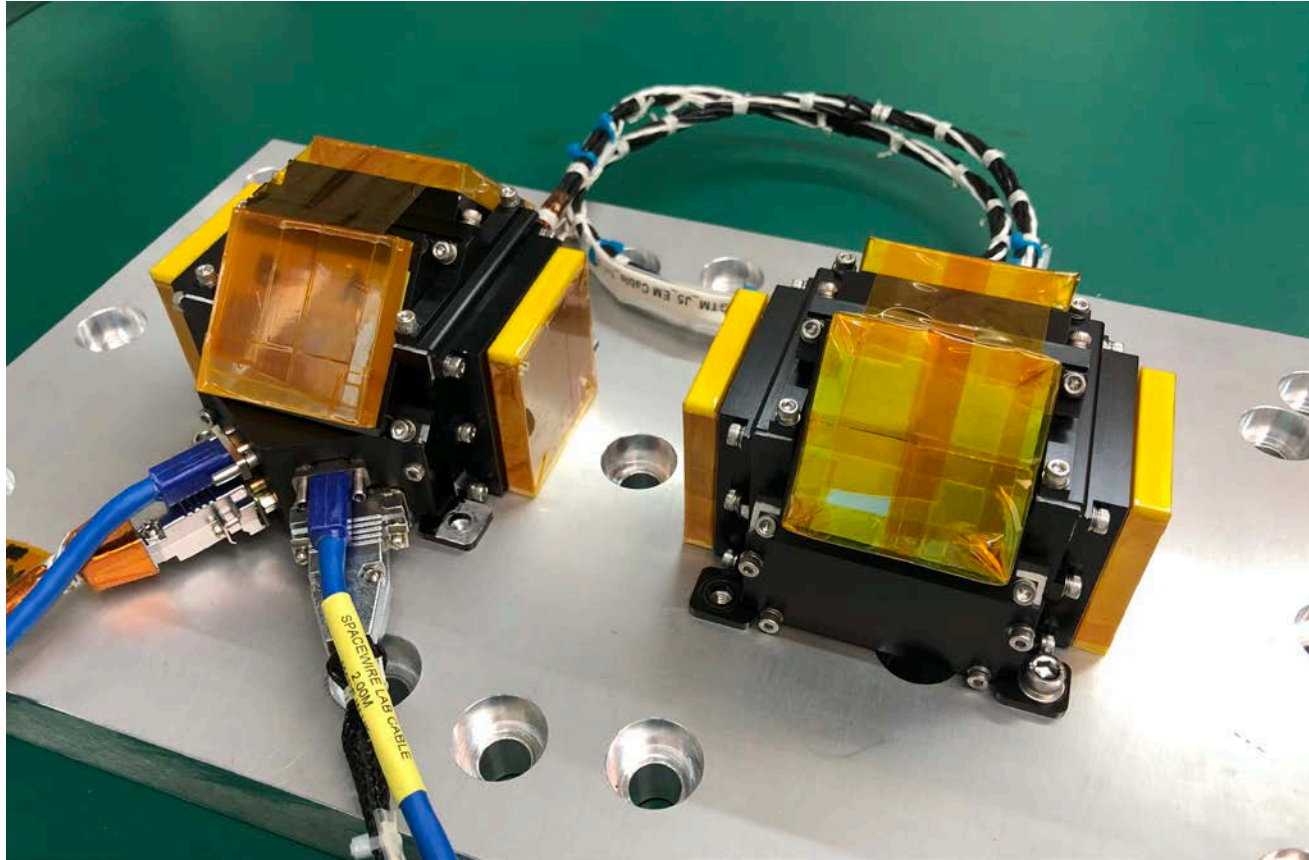
SDC – Mission Timeline



SDC – Decode Data

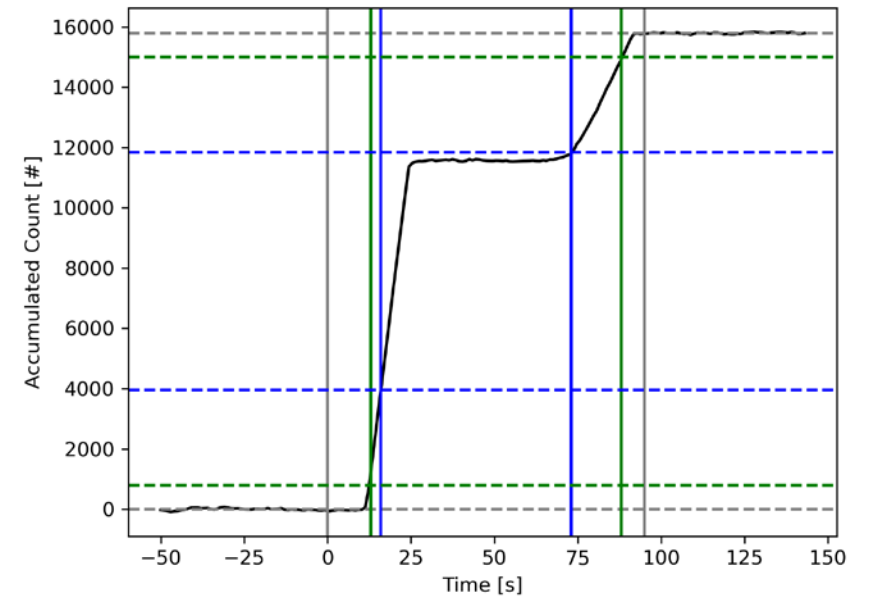
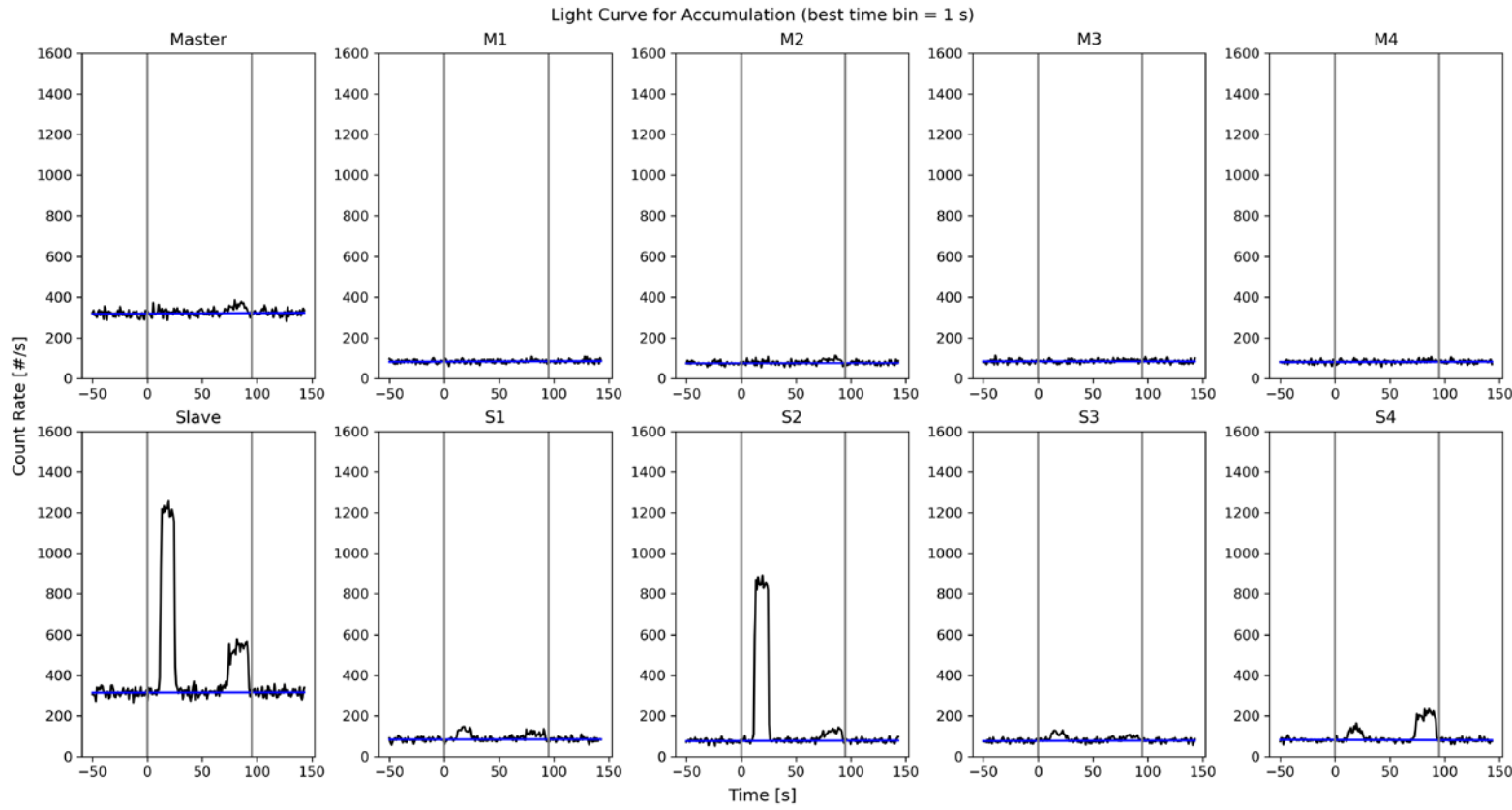


SDC – Generate Artificial GRB



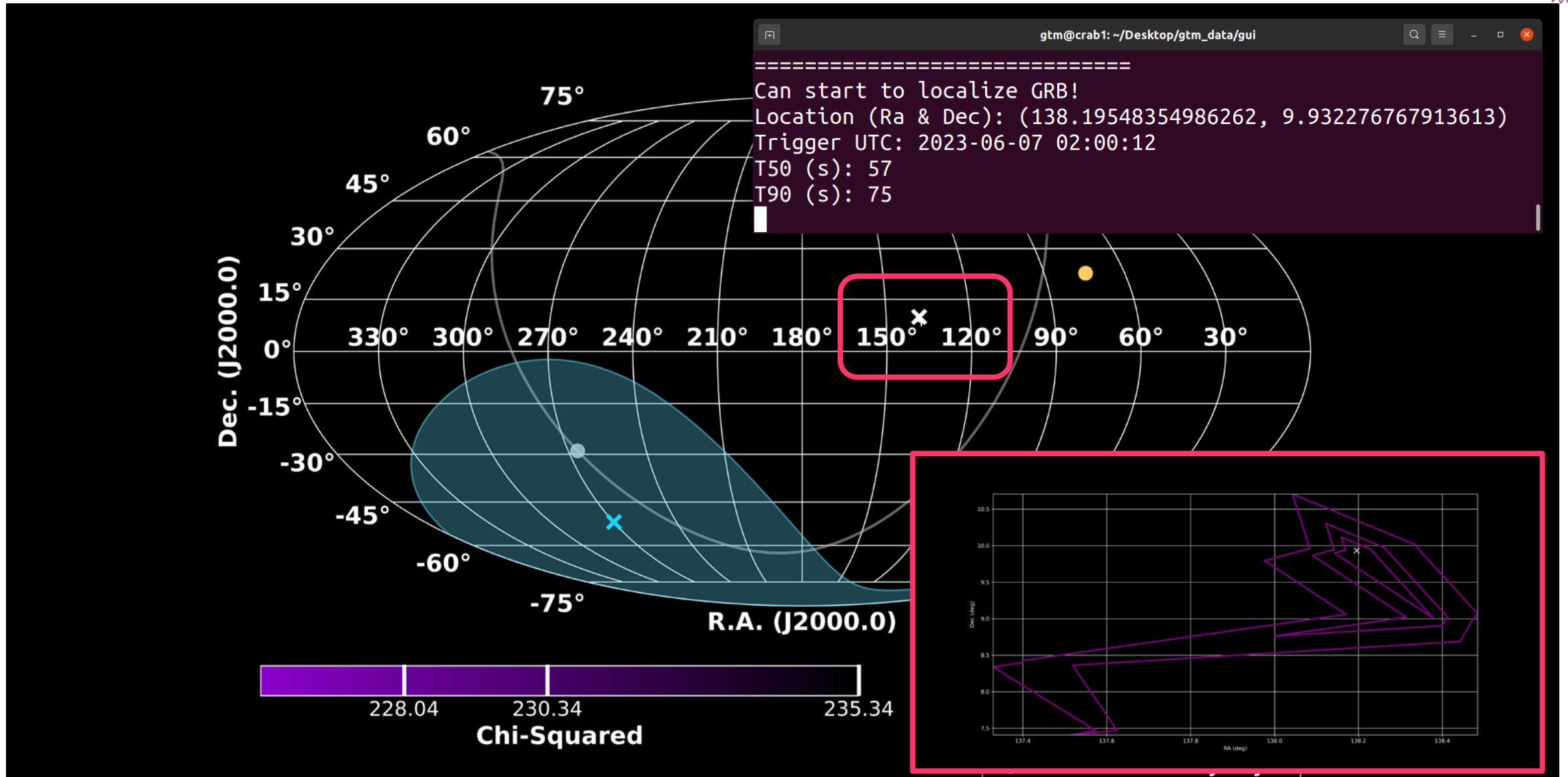


SDC – Find Artificial GRB





SDC – Report Location



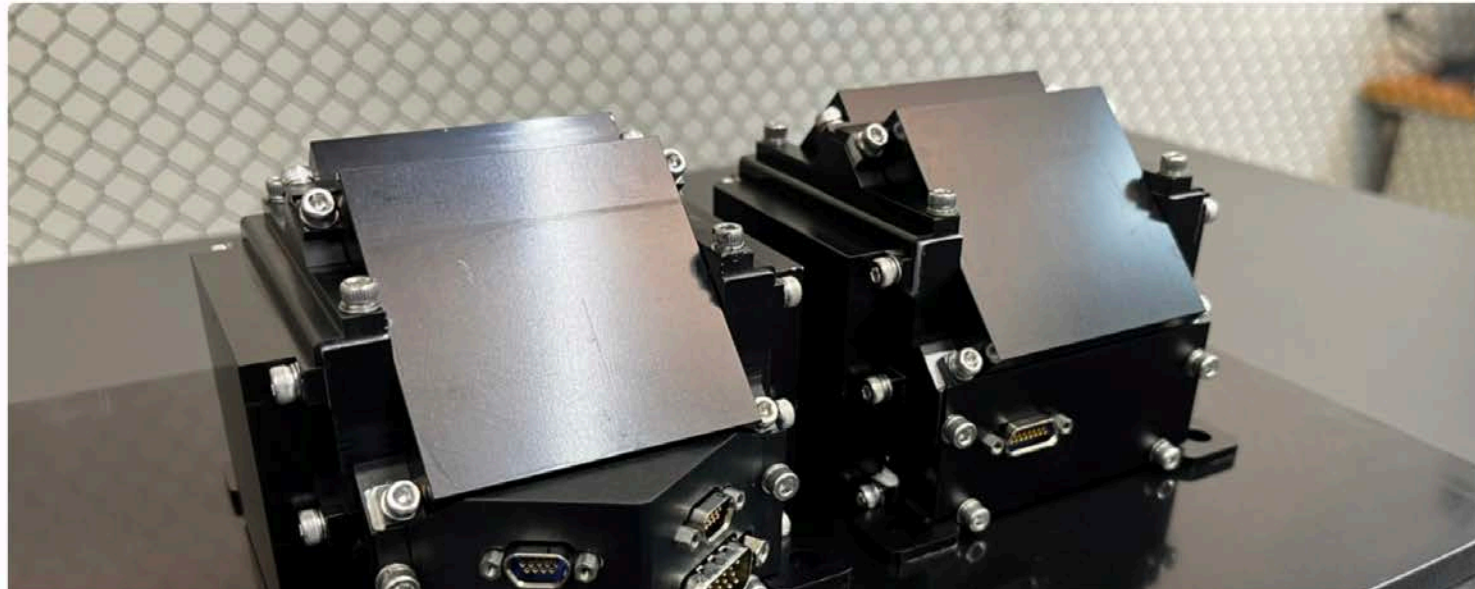


Gamma-ray Transients Monitor

The first space astronomical telescope of Taiwan on board Formosat-8B

[Visit TASA](#)

[View GitHub](#)





SDC – Database

- Copy
- CSV
- Excel
- PDF
- Print

Search:

name	position_ra_deg	position_dec_deg	time_trigger_utc	time_t50_s	time_t90_s	note
GRB230607A	138.2	9.9	02:00:12	57	75	Artificial GRB detected by GTM for SMRR demo.
Fermi/GBM GRB080803A	300.1	82.8	18:31:22.0407	11.072	26.240	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080802A	154.3	40.7	09:15:10.5274	0.576	0.448	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080730B	246.6	28.7	18:51:38.1813	4.096	13.312	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080730A	245.4	4.6	12:29:15.4032	4.096	17.408	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080725B	354.8	8.9	12:59:23.7624	0.316	0.960	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080724A	358.3	32.9	09:37:40.6034	348.421	379.397	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080723D	105.3	71.1	23:37:42.7083	25.280	42.816	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080723C	113.3	-19.7	21:55:23.0583	0.064	0.192	Copy from 4th Fermi/GBM GRB Catalog
Fermi/GBM GRB080719A	153.2	-61.3	12:41:40.9578	8.448	16.128	Copy from 4th Fermi/GBM GRB Catalog

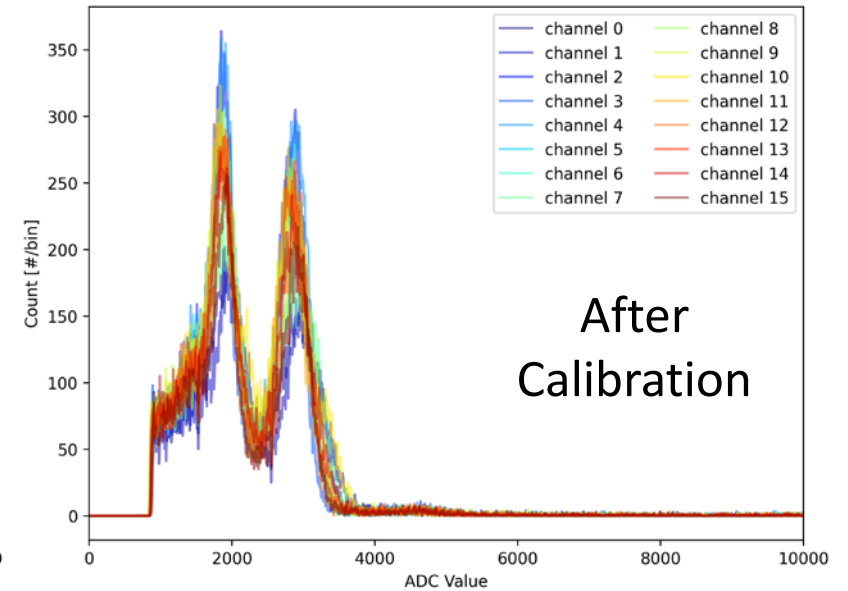
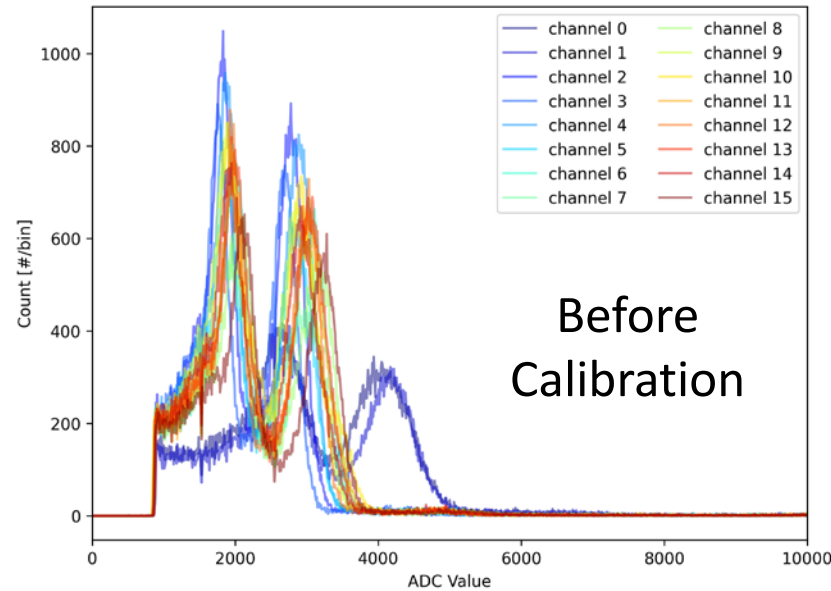
Showing 1 to 10 of 14 entries

Previous 1 2 Next

GTM Current Status

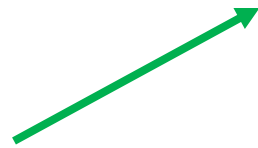
Finished

- ✓ EM Assembly
- ✓ EQM Assembly
- ✓ EQM Tests
- ✓ FM Assembly
- ✓ FM Tests
- ✓ FM Delivery
- ✓ SDC Ready



On Going

- FM Calibration



- ❖ **FS-8B will be launched in 2026.**
(The first space astronomical telescope of Taiwan!)

GTM Team

