

Fermi

Gamma-ray Space Telescope

# GRB/BA activity

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## Burst Advocate Responsibilities

- **TASK 1: alert the team** of a detection or probable detection in the LAT.
  - In the instance of a detection, others will **help** with the analysis.
  - The BA should always be listed as the "**point of contact**" on the GCN circular whether they were awake at the time of writing or not.
    - The author list of the circular **should include the BA** as well as anyone who contributed to the analysis, with the author order reflecting those contributions.
- **TASK 2:** submit or make sure someone else is **submitting a Swift ToO request**, if the localization is accurate enough to warrant it.
  - **This responsibility is a higher priority than putting out the circular.**
    - This is a vital step to getting a redshift and detecting the afterglow of the GRB
  - This step is now **AUTOMATIC** with the LAT OFFLINE position submission



- **Prerequisites**

1. Join the **#grb (now shared with GBM!!)**, **#ligofup** and **#transients** channels on **slack**
2. Join the BAlist mailing list
  - <https://www-glast.stanford.edu/cgi-prot/subscribe>
3. Sign up for **GCN circulars**, so that you can submit them yourself
4. Familiarize yourself with the important pages where automatic analysis of GBM, Swift, Integral, etc, triggers is performed:
  - **LAT Transient Factory (LTF)** <http://fermigrb.stanford.edu/>
  - **BA Tool** <https://glast-ground.slac.stanford.edu/LATBA/>
5. Familiarize yourself with the software tools
  - **Local computer/laptop:**
    - Download and install the conda version of Fermitools
  - **Remotely:**
    - Run Fermitools in your own space at SLAC
  - **Main GRB analysis tools**
    - Gtburst (tutorial?)
      - » Be sure of updating gtburst to the latest version **INSIDE** the graphic interface at the first run
    - GRBAnalysis (tutorial?)
      1. Be sure that SW tools are always **UPDATED TO THE LATEST VERSION.**
      2. If in doubt about anything, email [GRBslist@glast2.stanford.edu](mailto:GRBslist@glast2.stanford.edu)



- **Signup for shifts**

- 1 shift = **1 week long, 24 hours a day**
  - Shifts are from Monday 0:00 UT to Sunday 23:59 UT.
- The current signup lists 2 shifts
  - **BA shift**
  - **Deputy BA shift;**
- Shifts are divided into **3 times zones**
  - Europe, US and Japan
  - BA and deputy BA should always be **from two different time zones** at any time.
- Since 2015, shifts are organized on a **6-months basis**.



- LAT shift contacts
  - **European** BA shifts contact: **Betta** [elisabetta.bissaldi@ba.infn.it](mailto:elisabetta.bissaldi@ba.infn.it)
  - **US** BA shift contact: **Nicola** [nicola.omodei@stanford.edu](mailto:nicola.omodei@stanford.edu)
  - **Japanese** BA shift contact: **Magnus** [magnusa@astro.su.se](mailto:magnusa@astro.su.se)
- Confluence page with **shifts agenda** (compiled every 6 months)
  - <https://confluence.slac.stanford.edu/display/SCIGRPS/BA+shift+schedule>
- **Sign-up** page:
  - <https://glast-ground.slac.stanford.edu/ShiftSchedule/weeklyShiftSchedule.jsp>



- **Current pool of BAs**

- Europe, including South Africa and Israel (**Shift contact:** Betta): 10 people

Name	Affiliation	e-mail for GCN
Alessandra	University & INFN Perugia	alessandra.berretta@pg.infn.it
Betta	Politecnico & INFN Bari	elisabetta.bissaldi@ba.infn.it
Elena	IFAE, Barcelona	moretti@ifae.es
Feraol	Univ. of Johannesburg	fdirisa@uj.ac.za
Franz	University and INFN, Trieste	francesco.longo@ts.infn.it
Fred	CNRS/IN2P3/LUPM	piron@in2p3.fr
Lorenzo	CNRS/IN2P3/LUPM	lorenzo.scotton@lupm.in2p3.fr
Michele		
Milos	INFN Perugia	milos.kovacevic@pg.infn.it
Sara	INFN Perugia	sara.cutini@pg.infn.it

- US (**Shift contact:** Nicola): 7 people

Name	Affiliation	e-mail for GCN
Alyson		
Dan		
Donggeun	UMD & NASA/GSFC	donggeun.tak@gmail.com
Judy		
Mike		
Milena	Univ. of Maryland & NASA/GSFC	mcrnogor@astro.umd.edu
Nicola	Stanford University	nicola.omodei@stanford.edu

- Japan (**Shift contact:** Magnus): 4 people


Name	Affiliation	e-mail for GCN
Helen Poon	Hiroshima University	
Magnus Axelsson	KTH & Stockholm Univ.	magaxe@kth.se
Makoto Arimoto	Kanazawa Univ.	arimoto@se.kanazawa-u.ac.jp
Masanori Ohno	Hiroshima University	



- **Constantly monitor** GBM wiki pages
  - <https://gamma-wiki.mpe.mpg.de/GBM/GRBs>
- **In case of bright GBM trigger**
  - **Run dedicated analysis**
- **In case of LAT detection by BA Tool or LTF**
  - Run dedicated analysis to **cross-check the position**
    - **SUBMIT** offline position GCN
  - Create **confluence** page
    - **Draft GCN Circular**
      - Obtain info about flux, HE photon, etc
    - **Post all other analysis results to keep track**
  - Update **LAT GRB list**
    - <https://confluence.slac.stanford.edu/display/SCIGRPS/GRB+list>
  - **Report** at **GRB Group meeting** and **WAM**




- **After a LVC alert**

- Monitor analysis pipelines: GWFUP + BA GW Tool
- Create **confluence** page 
- **Draft GCN Circular** using numbers from pipelines
- Update **LAT internal table** of GW follow-ups
- **Report** at GRB Group meeting and WAM

- Each alert requires **>1 hour of work**  
The GCN is usually submitted within 1 day

→ The GW alerts now **outnumber** the GRBs

GLAST LAT Science Groups / ... / Rapid Response to GW alerts  
ermi  
S190901ap

 Created by Magnus Axelsson, last modified by Francesco Longo on Sep 02, 2019

**LAT BA Checklist for GW follow-up search**

- Populate GCN template with numbers from pipelines (step-by-step guide)
- Submit GCN Circular
- Add a new GCN or ATEL using the relative button at the top of this page
- Check that your GCN or ATEL's entry is listed correctly if not, contact Giovanna Senatore
- Add entry to Table of GW follow-ups
- Report at GRB Group meeting and WAM

**GCNs**

- LIGO (GCN 25606)
- All GCNs
- graceDB
- submitted

**Links**

- BA GW Tool (v2)
- GWFUP pipeline tool





- **3 Templates:**

1. **No counterpart candidates with Fermi NOT in SAA**

2. **No counterpart candidates with Fermi in SAA**

3. **Detection!**

- **More info at:**

<https://confluence.slac.stanford.edu/display/SCIGRPS/LAT+GCN+Circular+Instructions>

#### LIGO/Virgo GXXXXXX: No counterpart candidates in Fermi-LAT observations

A. Author (Afil), A. Author (Afil), and A. Author (Afil)  
report on behalf of the Fermi-LAT Collaboration:

We have searched data collected by the Fermi Large Area Telescope (LAT) on MONTH DAY, YEAR, for possible high-energy ( $E > 100$  MeV) gamma-ray emission in spatial/temporal coincidence with the LIGO/Virgo trigger SXXXXXX (GCN XXXXX).

We define "instantaneous coverage" as the integral over the region of the LIGO probability map that is within the LAT field of view at a given time, and "cumulative coverage" as the integral of the instantaneous coverage over time. Fermi-LAT had an instantaneous coverage of  $\sim XX\%$  of the LIGO probability at the time of the trigger ( $T_0 = 20XX-XX-XX XX:XX:XX.XXX$  UTC), and reached 100% cumulative coverage after  $\sim X$  ks. [OR, and reached  $\sim XX\%$  cumulative coverage after  $\sim X$  ks. The remaining area was not observed within 10 ks following the trigger time of the event.]

We performed a search for a transient counterpart within the observed region of the 90% contour of LIGO map in a fixed time window from  $T_0$  to  $T_0 + XX$  ks. No significant new sources are found.

We also performed a search which adapted the time interval of the analysis to the exposure of each region of the sky, and no additional excesses were found.

Energy flux upper bounds for the fixed time interval between 100 MeV and 1 GeV for this search vary between  $Xe-XX$  and  $Xe-XX$  [erg/cm<sup>2</sup>/s].

The Fermi-LAT point of contact for this event is  
XXXXX XXXXX (xxxx@xxx.xxx).

The Fermi-LAT is a pair conversion telescope designed to cover the energy band from 20 MeV to greater than 300 GeV. It is the product of an international collaboration between NASA and DOE in the U.S. and many scientific institutions across France, Italy, Japan and Sweden.



<https://confluence.slac.stanford.edu/display/SCIGRPS/Internal+table+of+follow-up+results+for+GW+events>

GLAST LAT Science Groups / ... / Rapid Response to GW alerts

Internal table of follow-up results for GW events

Created by Magnus Axelsson, last modified by Lorenzo - Scotton on Sep 05, 2019

Please fill out the table for each GW event, adding the latest at the top.

- BA tool for GW events
- GWFUP pipeline

GW event (with link to graceDB)	Confluence page	LIGO GCN	Type of event	Instant coverage	Time to max coverage	In SAA?	Lowest UL	Highest UL	New source detected?	Comments
<a href="#">S190901ap</a>	<a href="#">S190901ap</a>	GCN 25606	BNS	37%	5 ks (98%)	No	5e-8	3e-7	No	Analysis performed on the <a href="#">updated sky map</a>
<a href="#">S190828l</a>	<a href="#">S190828l</a>	GCN 25503	BBH	22%	5.1 ks	No	1.2e-10	6.7e-10	No	
<a href="#">S190828j</a>	<a href="#">S190828j</a>	GCN 25497	BBH	0%	10 ks (52%)	No	4.3e-10	8.5e-8	No	
<a href="#">S190814bv</a>	<a href="#">S190814bv</a>	GCN 25324	NSBH	100%	-	No	3.1e-10	8.5e-10	No	Analysis performed on the <a href="#">updated sky map</a>
<a href="#">S190728q</a>	<a href="#">S190728q</a>	GCN 25187	MassGap (52%) BBH (34%)	58%	5.8 ks (95%)	No	2.3E-10	2.7E-8	No	Updated sky map released after this analysis. Reached >99% of max coverage at about 2.1 ks.
<a href="#">S190727h</a>	<a href="#">S190727h</a>	GCN 25164	BBH	61%	2.1 ks (100%)	No	1.6E-10	1.3E-09	No	GCN sent on July 27. Current analysis corresponds to Ligo/Virgo map updated on August 1.
<a href="#">S190720a</a>	<a href="#">S190720a</a>	GCN 25115	BBH	45%	4 ks (100%)	No	1.4E-10	3.9E-09	No	
<a href="#">S190718y</a>	<a href="#">S190718y</a>	GCN 25087	Terrestrial (BNS 2%)	30%	4 ks (98%)	No	9.8E-11	1.1E-07	No	LVC performed additional analysis, and maintained the status as a binary merger candidate.
<a href="#">S190707q</a>	<a href="#">S190707q</a>	GCN 25012	BBH	35%	6.6 ks (100%)	No	2.3E-10	6.8E-09	No	Updated sky map released after this analysis.
<a href="#">S190706ai</a>	<a href="#">S190706ai</a>	GCN 24998	BBH	45%	1 ks	No	2E-10	5E-10	No	Updated sky map released after this analysis.



- BAs perform an important duty for the team!
- Pipelines make things much easier for the BA, but human checking is needed!
- A few people carry more than their share of the burden...
  - We are always looking for **more people** to help

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