



Fermi

Gamma-ray Space Telescope

# Automatic search for GW counterparts with *Fermi*-LAT

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On behalf of the  
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# Follow-up of GW events

- Fixed Time Interval analysis (FTI):
  - Compute likelihood for each pixel of the LIGO probability map (with  $P > 0.9$ ), including all the LAT sources as well as the Galactic and isotropic diffuse templates and providing a TS map, an UL flux map and a Bayesian UL for the entire map.
- Adaptive Time Interval analysis (ATI):
  - Similar to the FTI analysis but the likelihood is calculated only for the interval of time when the pixel is in the LAT field of view (for each pixel).
- LAT Low Energy events (LLE):
  - Extract LLE data ( $E < 100$  MeV) around the time of the trigger for each pixel of the map (downgraded to NSIDE=32) producing light curve and estimating the significance.

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As happened during O1 and O2 runs, every time we received a LIGO/Virgo alert:

- Two independent analysis pipelines are automatically triggered (good for cross-checks and redundancy);
- Within few hours, a GCN is sent with computed UL and TS for a possible gamma counterpart;
  - Flux ULs (0.1–1 GeV)  $\sim 1\text{--}5 \times 10^{-10}$  erg cm<sup>-2</sup> s<sup>-1</sup>.

Reference paper (Vianello, Omodei, Chiang, Digel): [10.3847/2041-8213/aa7262](https://arxiv.org/abs/10.3847/2041-8213/aa7262)