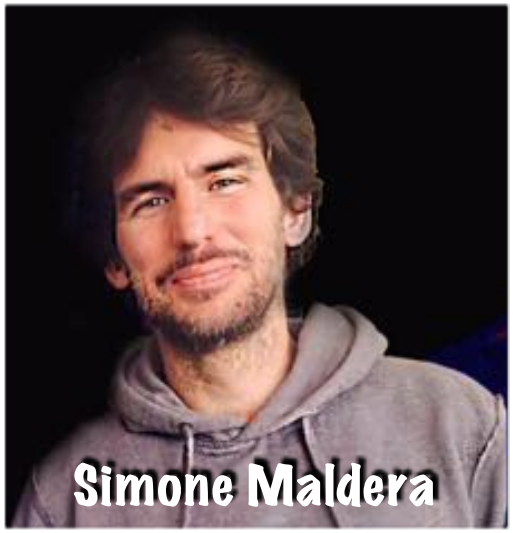
Attività Fermi-LAT a Torino

Who we are


Raffaella Bonino


Francesco de Palma

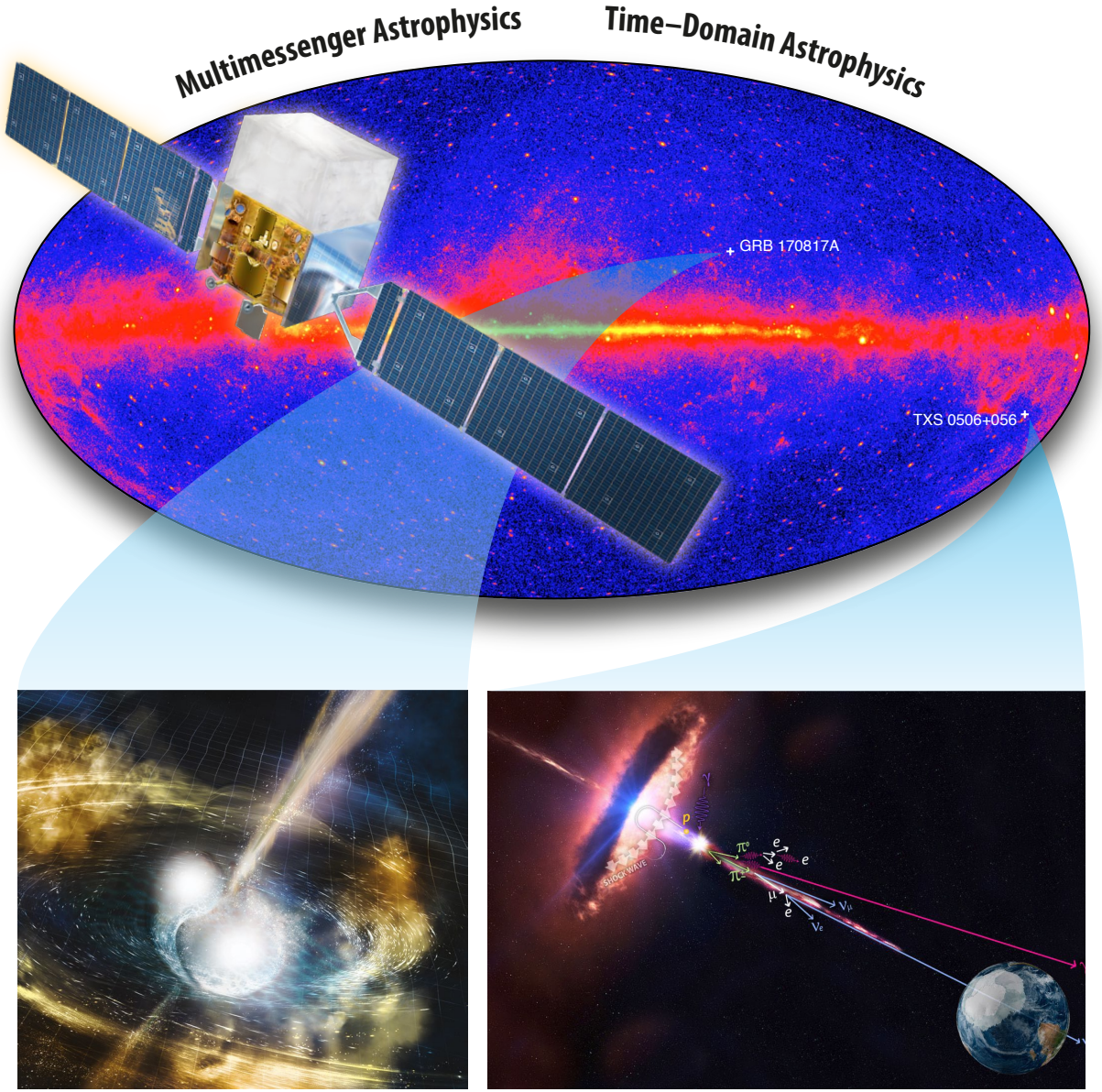

Luca Latronico


Simone Maldera

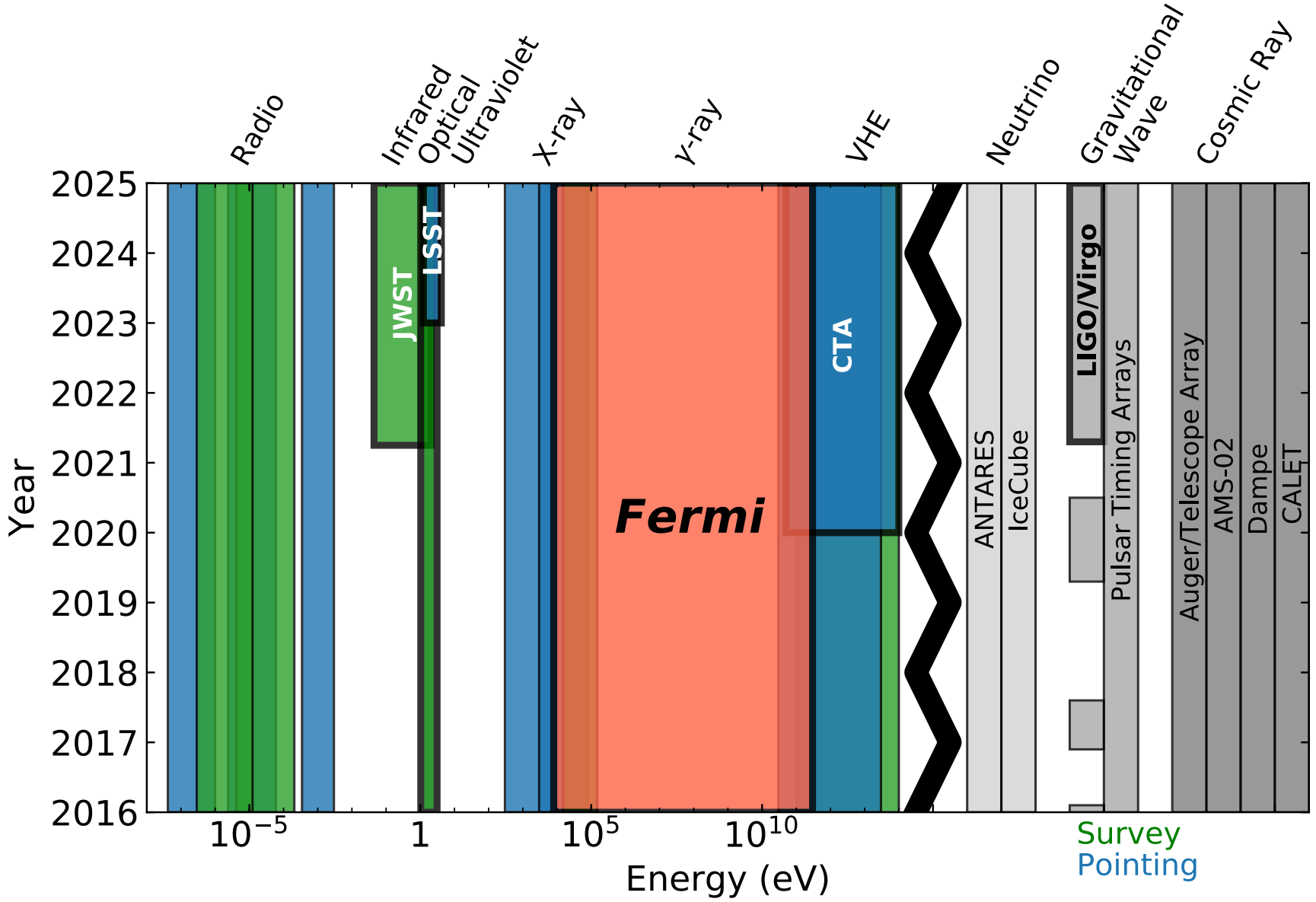

PETZL
Boris
Francesco Massaro


Michela Negro

Multimessenger astrophysics



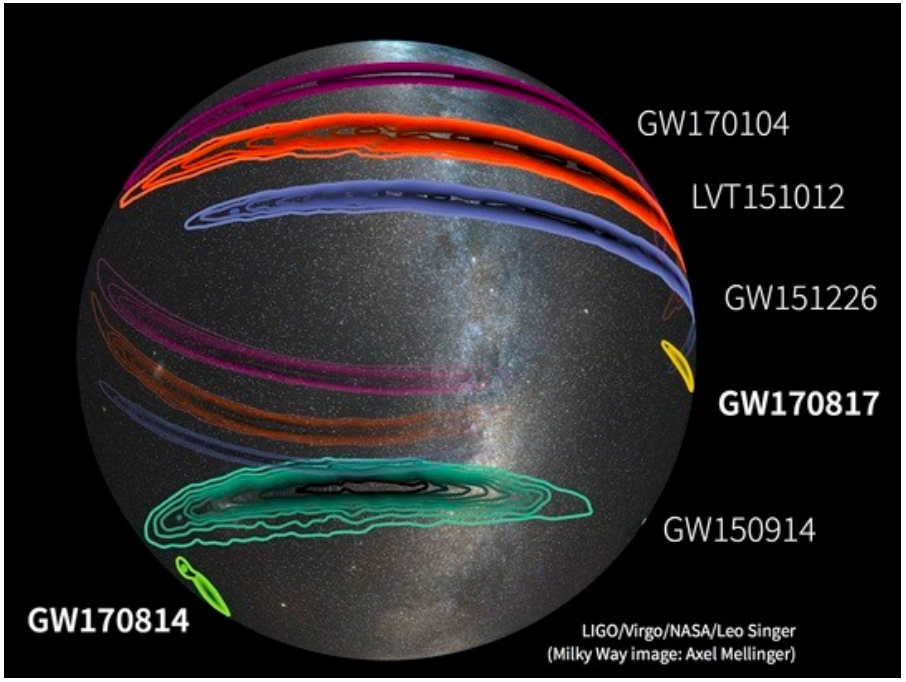
Fermi in the MW and MM era



Search for GW counterpart

- In the first 2 runs (O1&O2) of LIGO/ VIRGO **11 GW events** announced:
  - **10 BBH** (e.g. GW150914)
  - **1 BNS** (GW170817) → electromagn. counterpart detected!!!

- Now O3 is running (1 year from April 1st 2019), **14 candidates** found:
  - **12 BBH, 1 BNS, 1 NSBH** → no electromagn. counterpart found

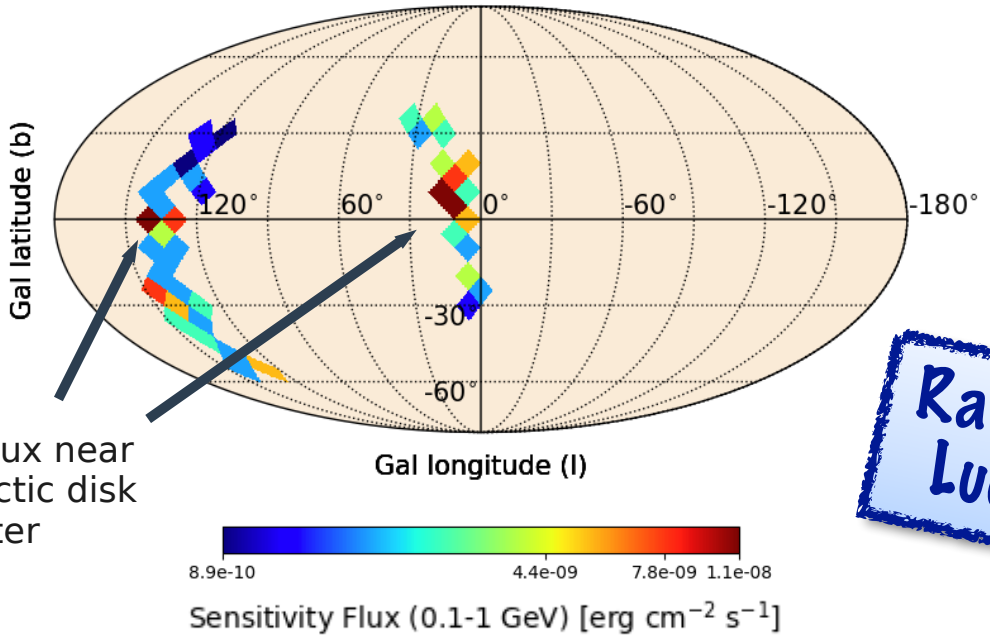


- **Strategy for Fermi-LAT** searches of the em counterpart:
  - Automated full sky searches of transients
  - Specific searches in the LIGO contours
  - Pipelines to quick alert the community

→ Burst Advocate shifts

LAT sensitivity estimation

- Automated Fermi **pipeline** searches for high-energy gamma emission:
  - Run an independent likelihood analysis for each pixel of the LV contour, testing for the presence of a **new source** at the center of the pixel
  - In case of non-detection, compute a global Bayesian **upper bound** for the flux
- LAT **sensitivity estimation** *(with 1 master + 2 bachelor students)*:
  - Starting from the real Fermi's position and orientation in the time interval around the GW event, estimate the flux threshold corresponding to a GRB detection @ ~5 sigma (**TS=25**)



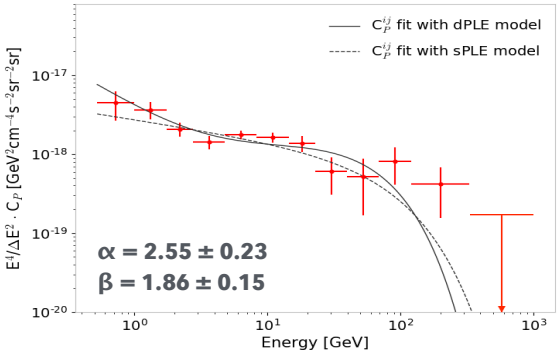
Higher flux near the galactic disk and center

Raffaella Bonino
Luca Latronico

UGRB/EGB: new projects

- Interpretation of the **anisotropy energy spectrum**:
  - Hints about the presence of two classes of sources
    → GOAL: understand the nature of the two populations
    (w/ M.Regis, N.Fornengo, Ando)
  - Energy cutoff: constrain the redshift distribution of unresolved BL-Lacs (w/ M.Regis, N.Fornengo, A.Paggi, F.Massaro)

sPLE is excluded at 99.8% CL
(estimation from $\Delta\chi^2$ distribution evaluated with MC)



- **Dipole in the EGB** (Extragalactic Gamma-ray Background)
  - MOTIVATION: anomalous dipole term in radio, not consistent with expectations
  - Measure the amplitude and direction of the dipole term in the EGB and compare it to the prediction (w/ S.Maldera, R.Bonino, M.Regis, M.Ajello)

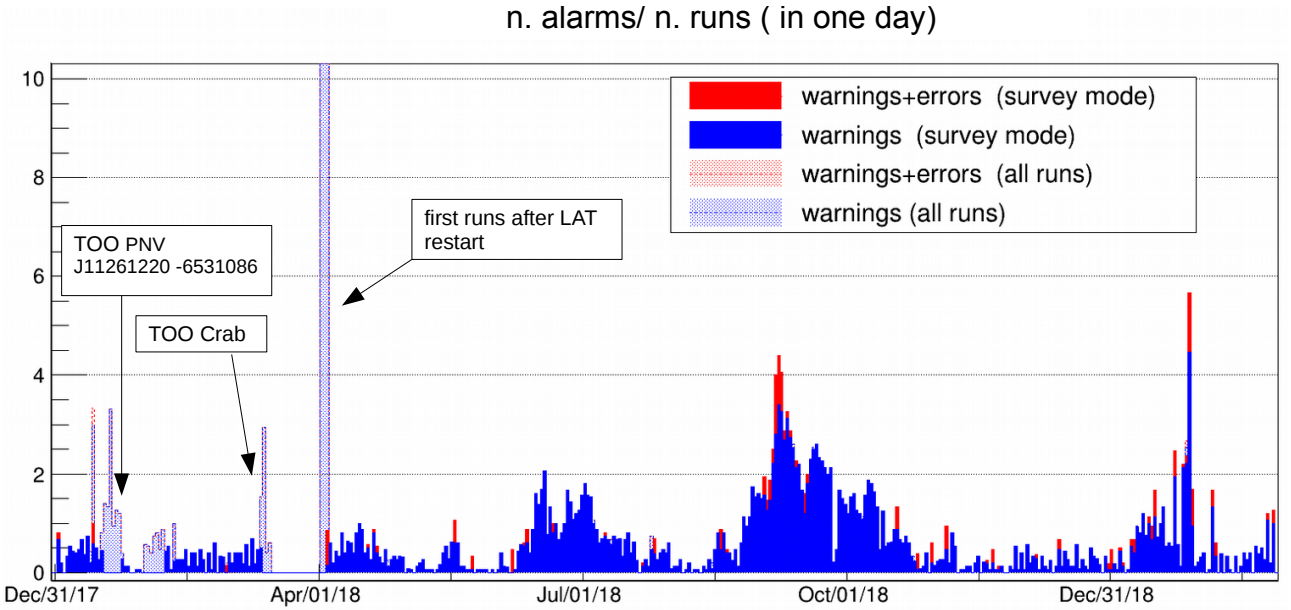
- PWN low diffusion haloes (w/ M. Di Mauro)

- Auto-correlation of simulated catalogs (w/ M.Ajello)

Michela Negro

DQM and data processing

- Supervision of **DQM activity** and DQM shifts



- Support to **data handling and processing**

- Production of the **Instrument Response Functions**

Simone Maldera

Other projects

Galactic γ-ray sources:

- **SuperNova Remnant** analysis:
  - **J1912**: joint Fermi-MAGIC analysis almost completed
  - **J1534** and **J1614**: ongoing analysis
- Image deconvolution for the analysis of **extended sources** to map the emission in different wavelengths

Francesco De Palma

Unidentified/unassociated γ-ray sources

(in 4FGL catalog ~5100 sources: 1525 are unassociated):

- **optical spectroscopic campaign** of blazar candidate, potential counterparts of unidentified/unassociated γ-ray sources (285/300 classified as blazars)
- during one of these campaign the **optical counterpart of GW170817 has been observed**!!!

Francesco Massaro + PhD students

Outreach


Alternanza scuola-lavoro


Masterclass


10th Fermi Anniversary

Outreach: “Segnali dal cosmo”