



Detection of new gamma-ray transient sources in the extra-galactic sky with Fermi LAT (1FLT Catalog)

**Isabella Mereu, Gino Tosti, Sara Cutini,
Elisabetta Cavazzuti**

on behalf of the Fermi-LAT collaboration

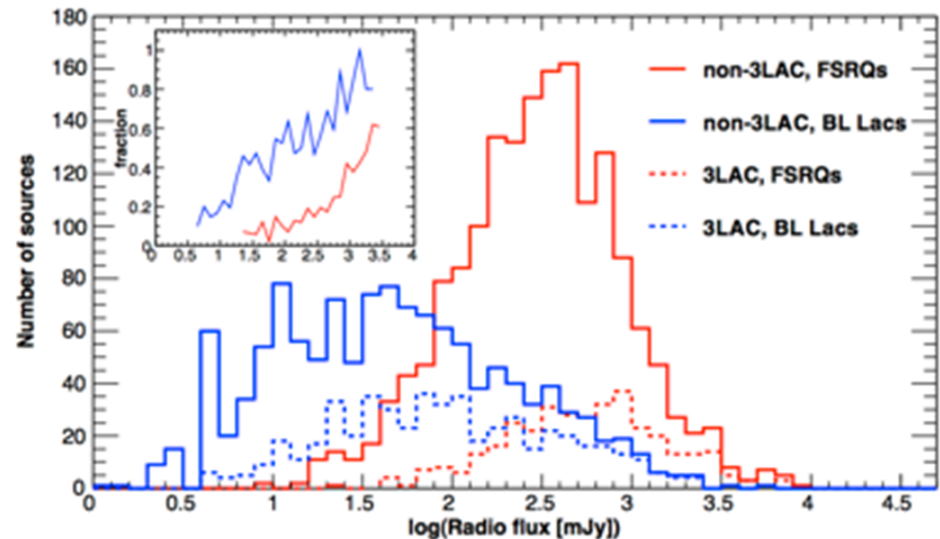


We search for transient sources missed from the LAT catalogs. The expected candidates are gamma-ray emitters which showed faint and fast time variability (typical of FSRQs). These sources flare only once or twice but not enough to reach the Fermi-LAT gamma-ray source catalog selection threshold.

We have chosen 1-month time bin of integration because it is a reasonable time interval for gamma-ray transients to be detected with good confidence.

FROM 3LAC:

Radio flux density at 1.4 GHz for 3LAC (dashed) and non-3LAC (solid) BZCAT sources. The inset displays the fraction of 3LAC sources relative to the total. Red: FSRQs; blue: BL Lacs.

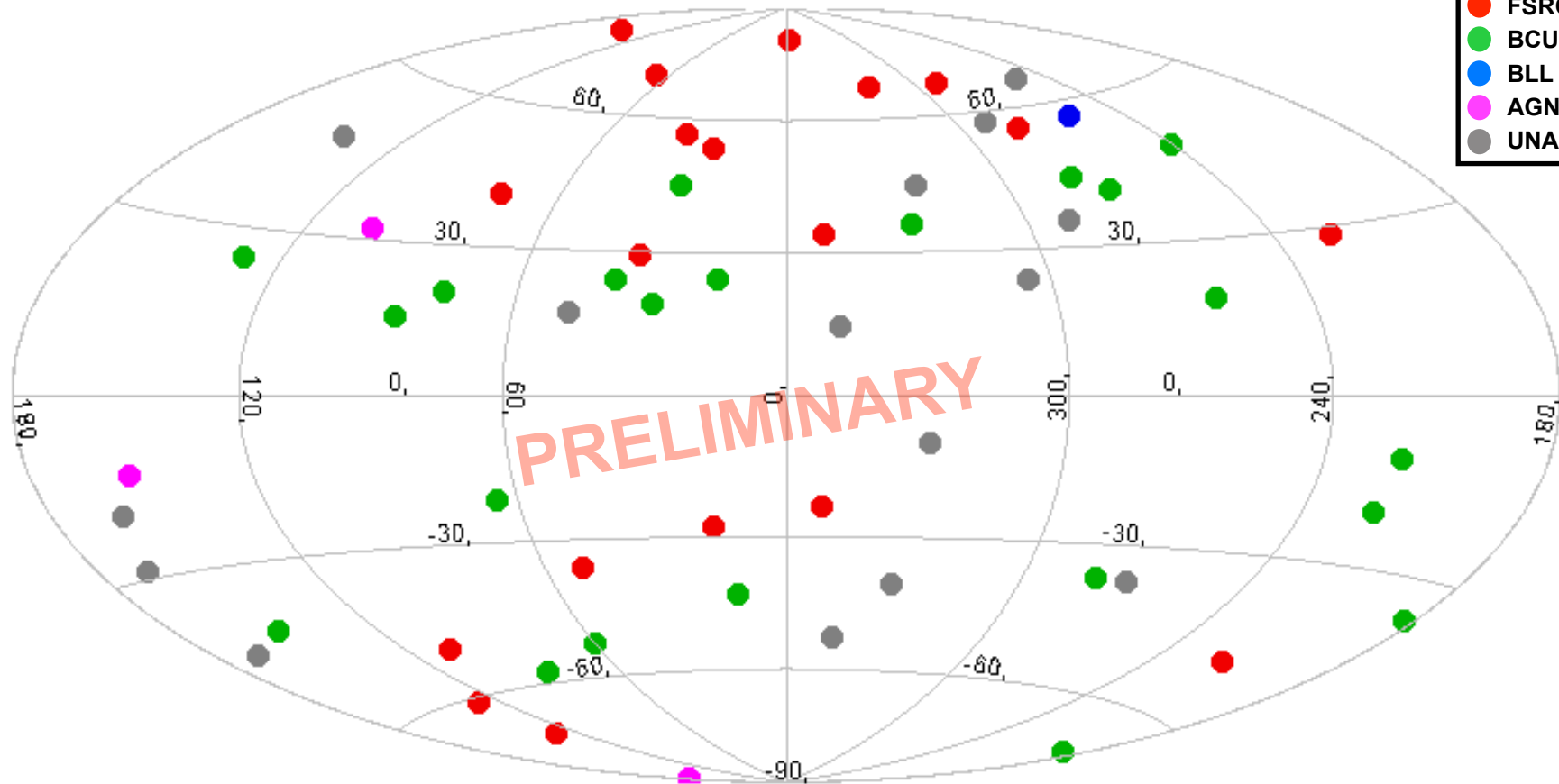




- 8 years of LAT data
- 0.1 - 300 GeV
- Pass8, P8R2
- Galactic diffuse: `gll_iem_v06.fits`
- $|b| > 10$ deg
- zenith angles less than 100°
- 96 months + 96 15-day shifted months: 192 different skies
(from 4 August 2008 to 2 August 2016 / from 17 August 2008 to 17 August 2016)
- PGWave to perform the seed search
- `fermipy` to perform the ML and define gamma-ray parameters
- 1FLT sources are > 1 deg apart from 0,1,2,3,4 FGL

We have obtained a sample of 60 sources with $TS > 25$.

Sky map



All transient sources with $TS > 25$ outside gamma-ray catalogs



We look for possible counterparts with sources in other wavelengths.

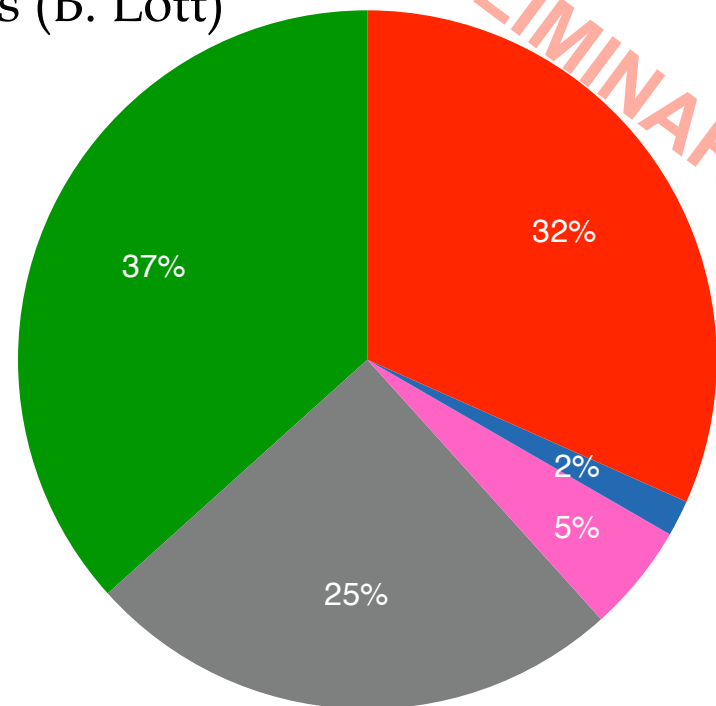
● Fsrq ● Bll ● Agn ● Unassoc ● Bcu

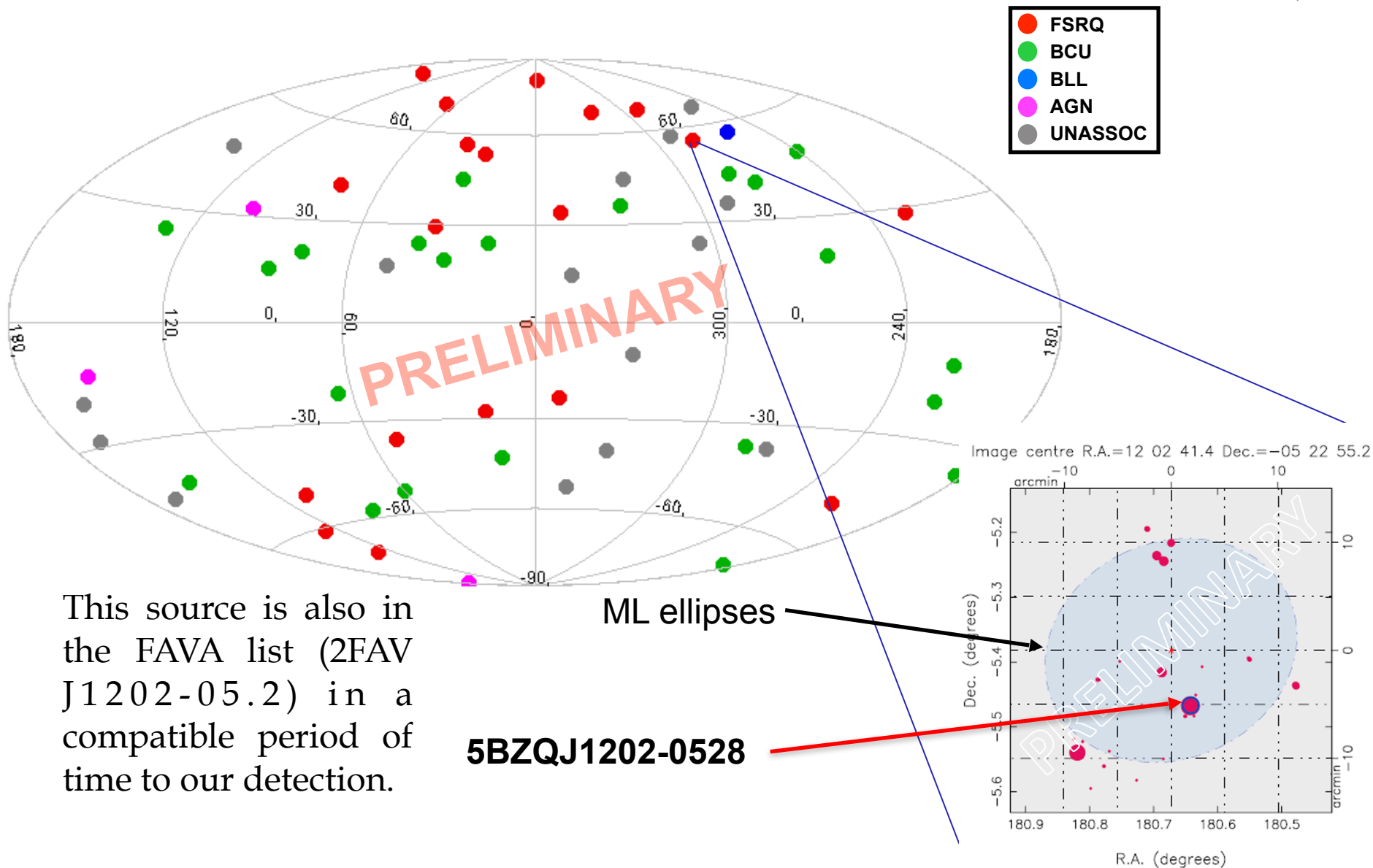
Bayesian association: as in FGL catalogs (B. Lott)

Positional association: SSDC

Tools (<https://tools.ssdsc.asi.it/>)
and VOU-Blazar Tool (by Chang
Y-L., Giommi P. & Brandt C.

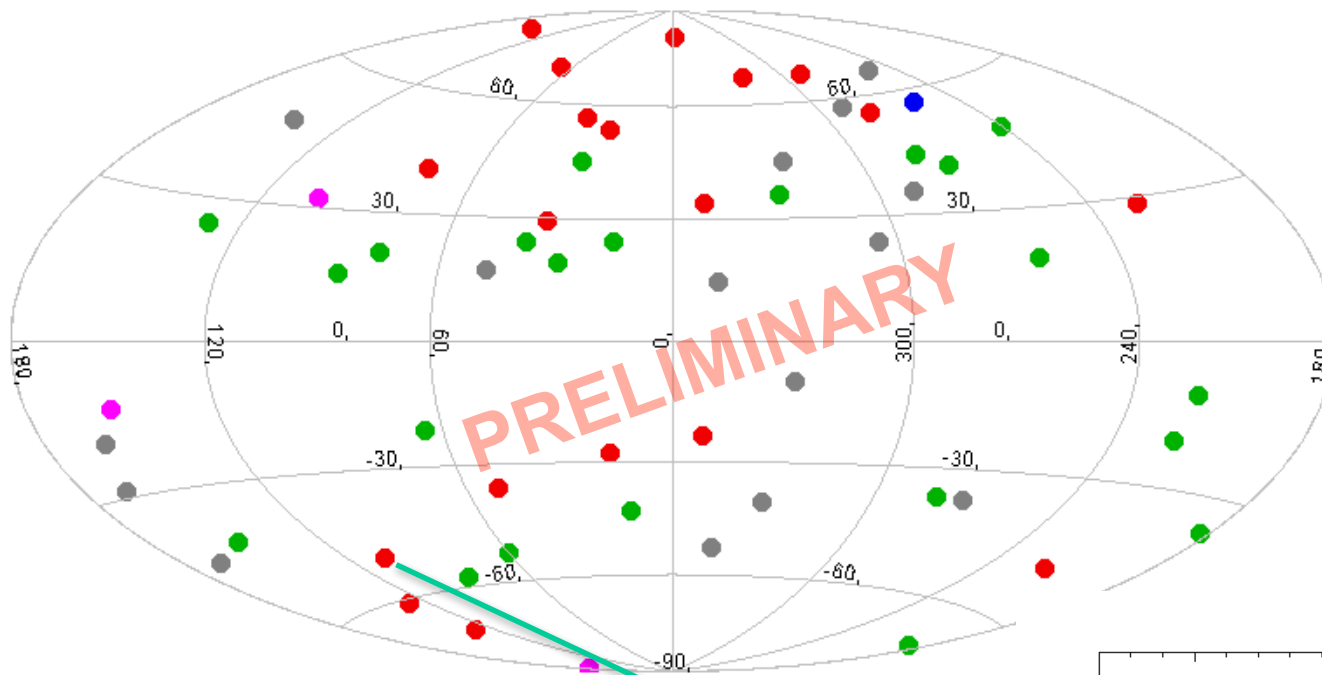
[http://
www.openuniverse.asi.it/](http://www.openuniverse.asi.it/)).





This source is also in the FAVA list (2FAV J1202-05.2) in a compatible period of time to our detection.

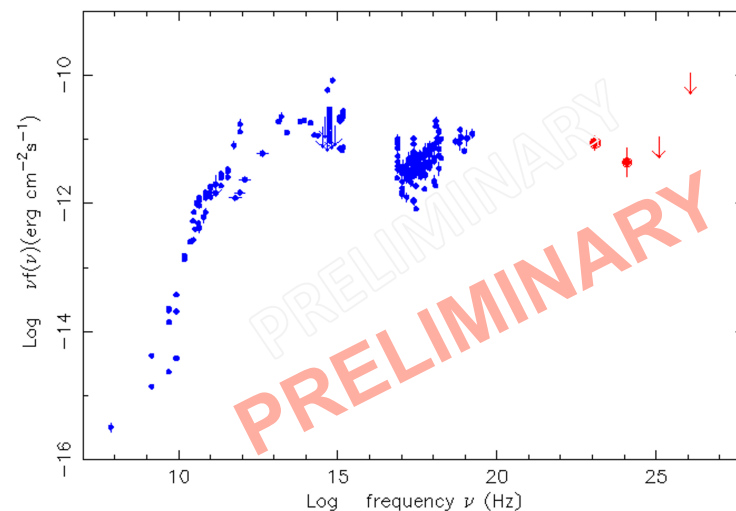
1FLT J0009+1047 TBIN_21 shifted



- FSRQ
- BCU
- BLL
- AGN
- UNASSOC

Positional
associated with
Mrk 1501

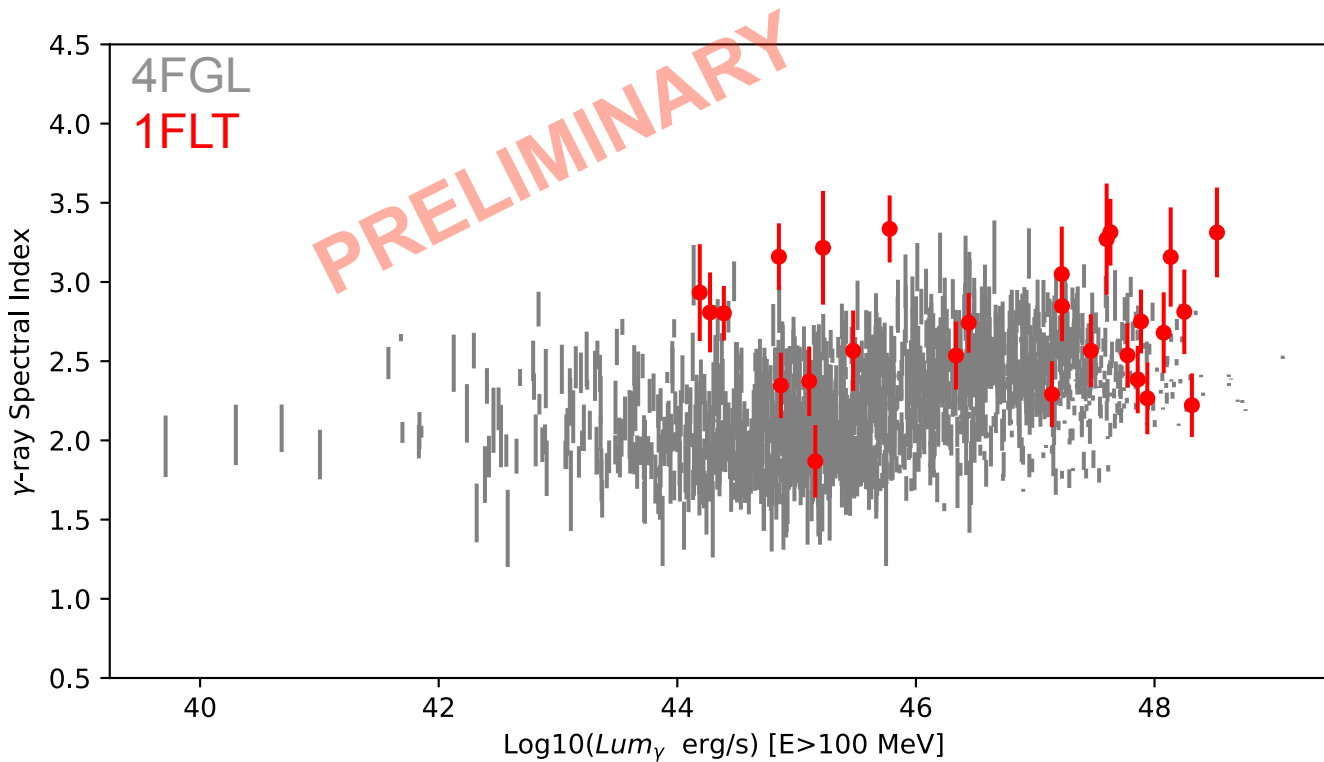
Mrk 1501 SED. In blue the archival data (available from [SSDC SED builder tool](https://tools.ssdc.asi.it/SED/)) and in red the flaring state data points from our analysis. We point out that the two data sets are not simultaneous.



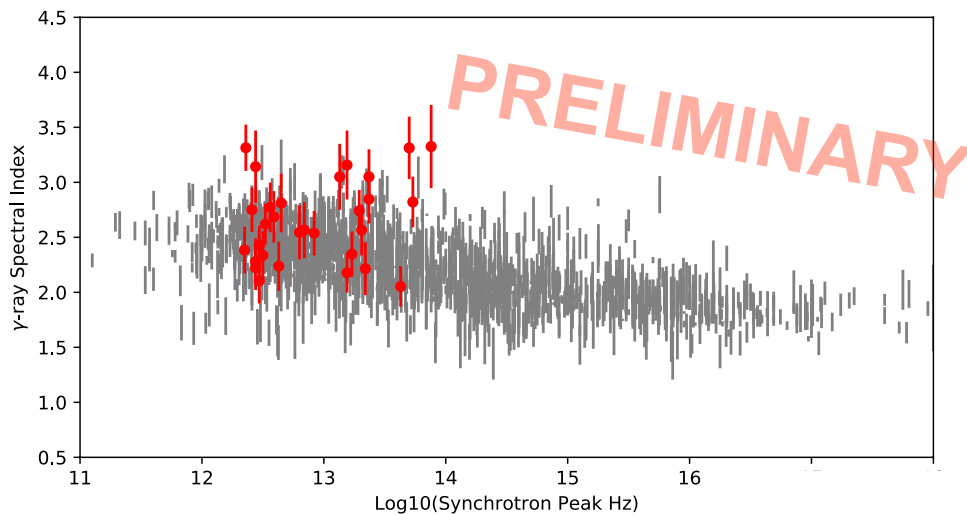
1FLT source properties



AGN-like monthly transients reach high gamma-ray luminosity

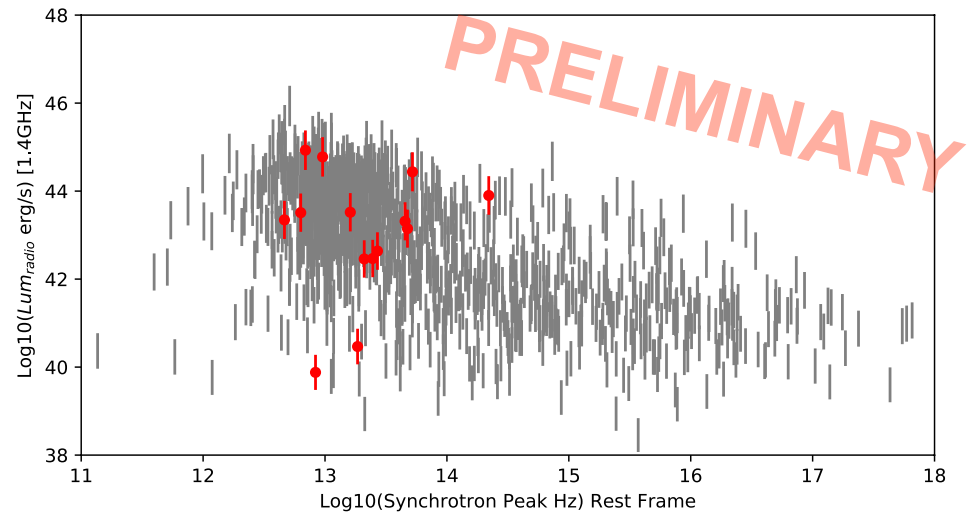


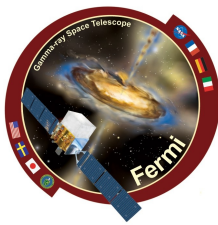
1FLT source properties



4FGL
1FLT

AGN-like monthly transients
show very soft spectral indexes
and they are principally Low
Synchrotron Peaked Blazars.





- * 1FLT sources are LSP and with very soft spectral index
- * 1FLT includes soft gamma-ray sources otherwise otherwise hard to detect in longer integrations
- * 1FLT unassociated sources are valuable targets for Multi-Wavelength follow-up and Multi-Messenger physics