A quick look at Blazar PKS 2155-304 with *easyFermi*

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The *Fermi*-LAT

The *Fermi* spacecraft has been observing the y-ray sky since april 2008

It's instruments are the Large Area Telescope (LAT) and the Gamma-ray Burst Monitor (GBM)

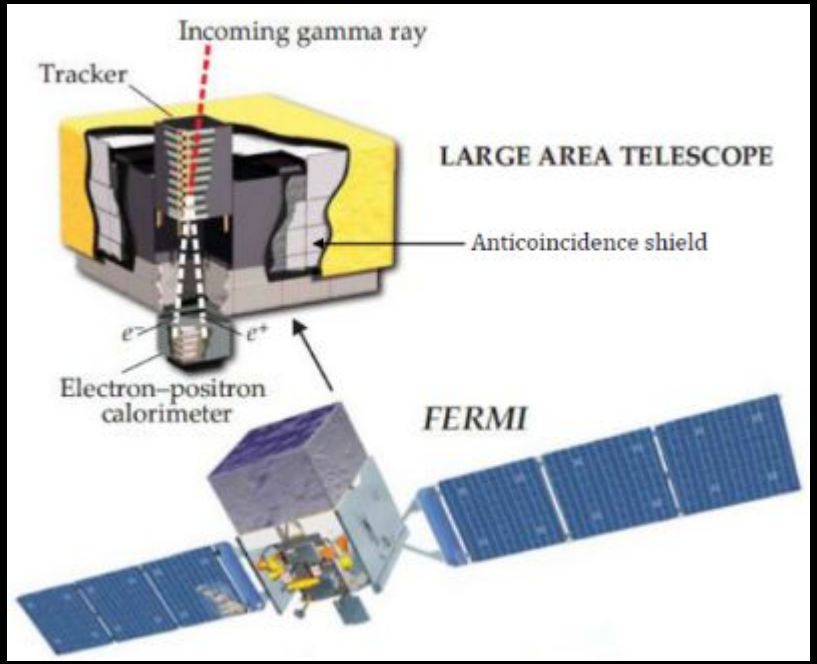


Figure adapted from *Thompson et al. (2012)*

Fermi data is public, let's use it!

0 - Setup easyFermi

1 - Choose a target and observation period

2 - Query the photon and spacecraft files on

https://fermi.gsfc.nasa.gov/cgi-bin/ssc/LAT/LATDataQuery.cgi

3 - Make sure you have everything

4 - Analysis and profit!

0 - Setup easyFermi

Find support on
https://github.com/ranieremenezes/easyFermi

Have Anaconda 3 or Miniconda installed

To install *Fermitools* in the terminal with conda, do:

```
$ conda create --name fermi -c conda-forge -c fermi python=3.9
"fermitools>=2.2.0" healpy gammapy
```

Then activate the fermi environment:

```
$ conda activate fermi
```

And simply install *Fermipy* and *easyFermi* with pip:

```
$ pip install fermipy ipython easyFermi
```

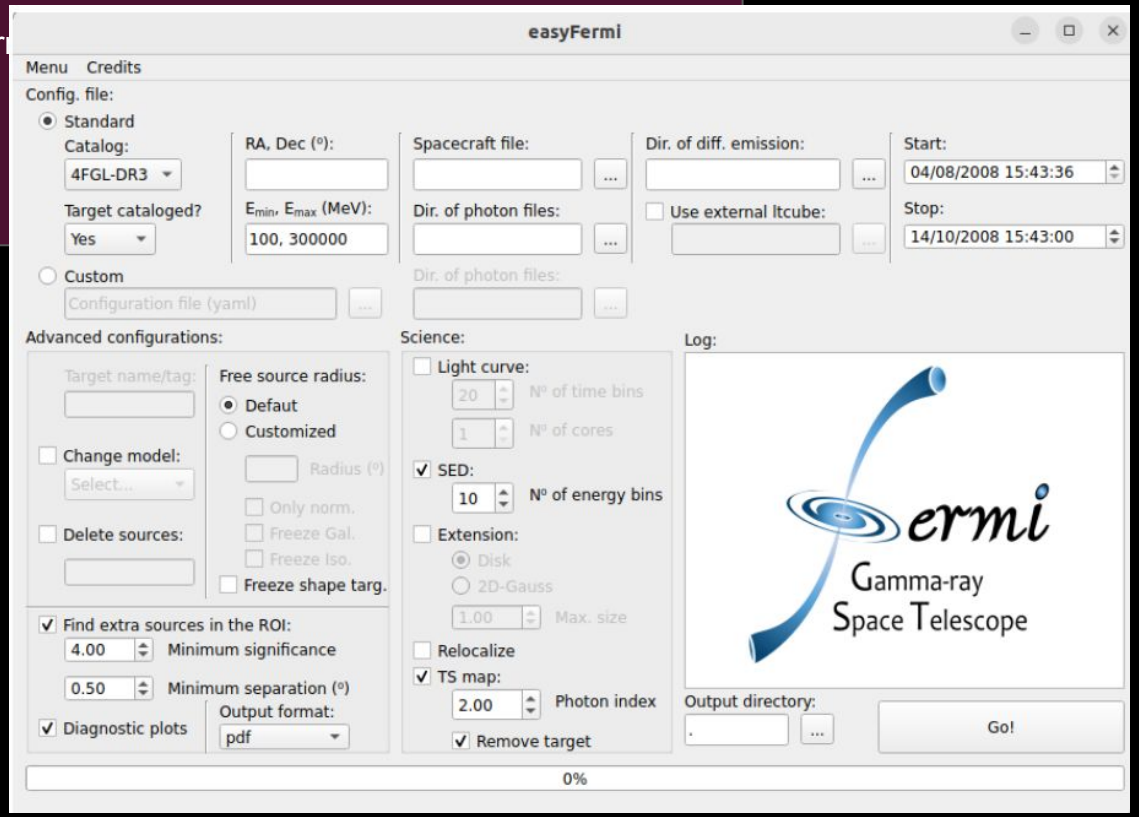
0 - Setup easyFermi

Find support on
https://github.com/ranieremenezes/easyFermi

To launch easyFermi, type while on the fer

```
$ ipython

>>> import easyFermi
```

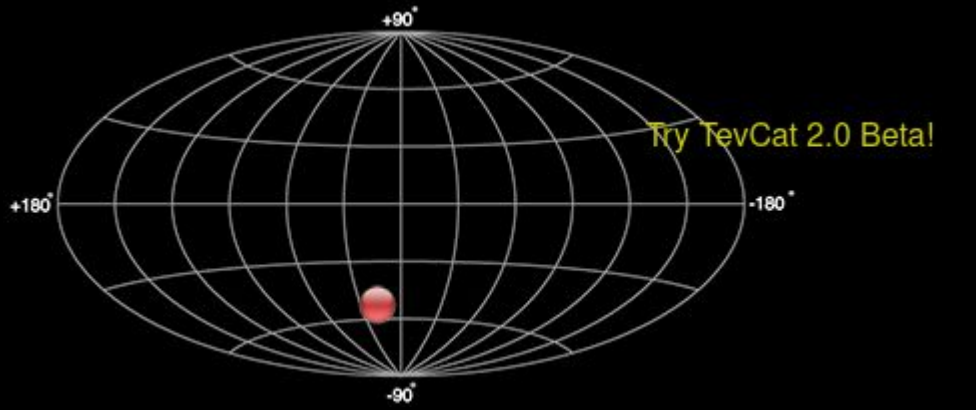


1 - Choose a target and observation period

Let's look at PKS 2155-304, (ra, dec) = (329.71694, -30.22559)

This is a High Synchrotron Peak

BL Lac (HSB) at z=0.116



during 21/02/2020 to 31/05/2020

check out the catalogue of TeV emmiters: http://tevcat.uchicago.edu/

1 - Choose a target and observation period

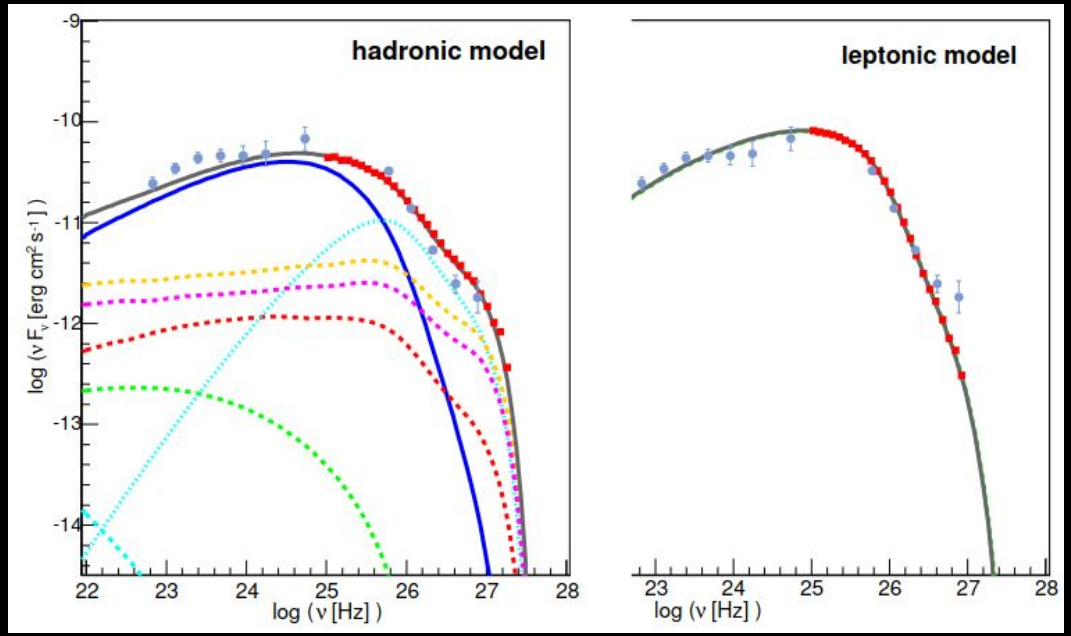
Expected signatures from hadronic emission processes in the TeV spectra of BL Lacertae objects

A. Zech[1], M. Cerruti[2], and D. Mazin[3]

Zech et al. (2017)

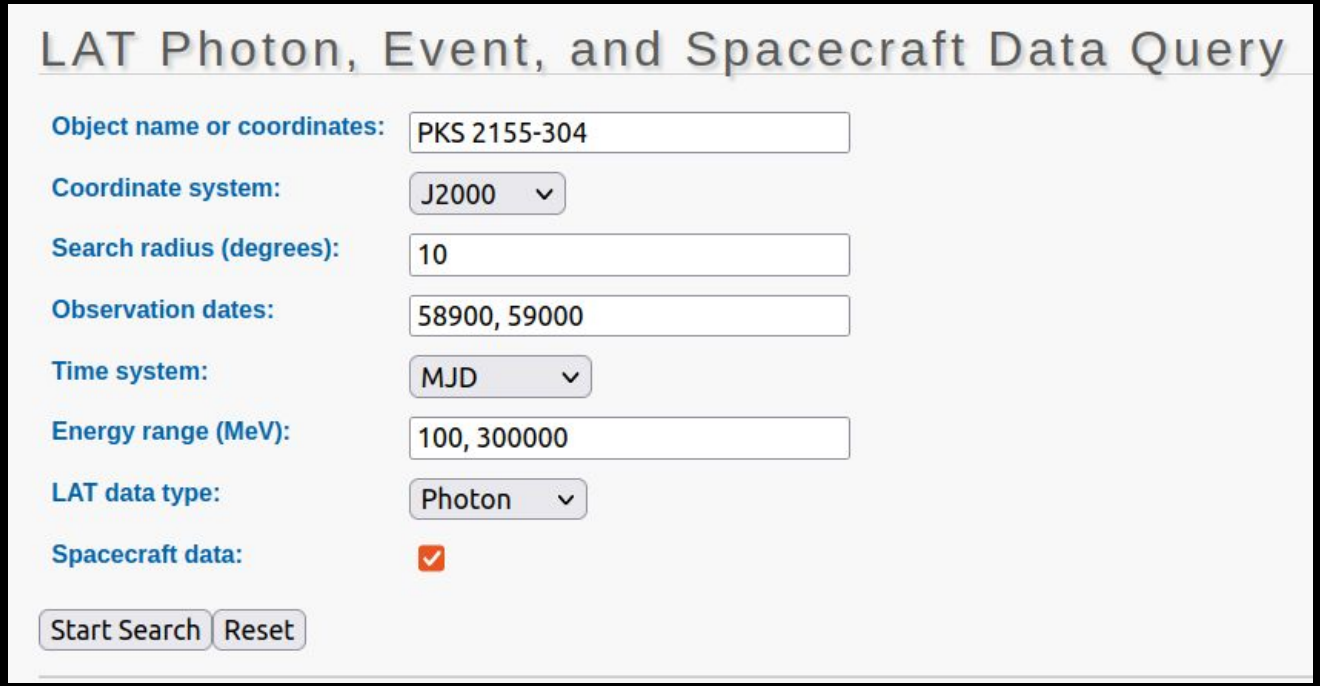
VHE emitters are prime targets for the exploration of particle acceleration and possible neutrino sources!

The SED of PKS 2155-304 has a peak at ~ 100 GeV



2 - Query the photon and spacecraft files

Go to https://fermi.gsfc.nasa.gov/cgi-bin/ssc/LAT/LATDataQuery.cgi and perform the query



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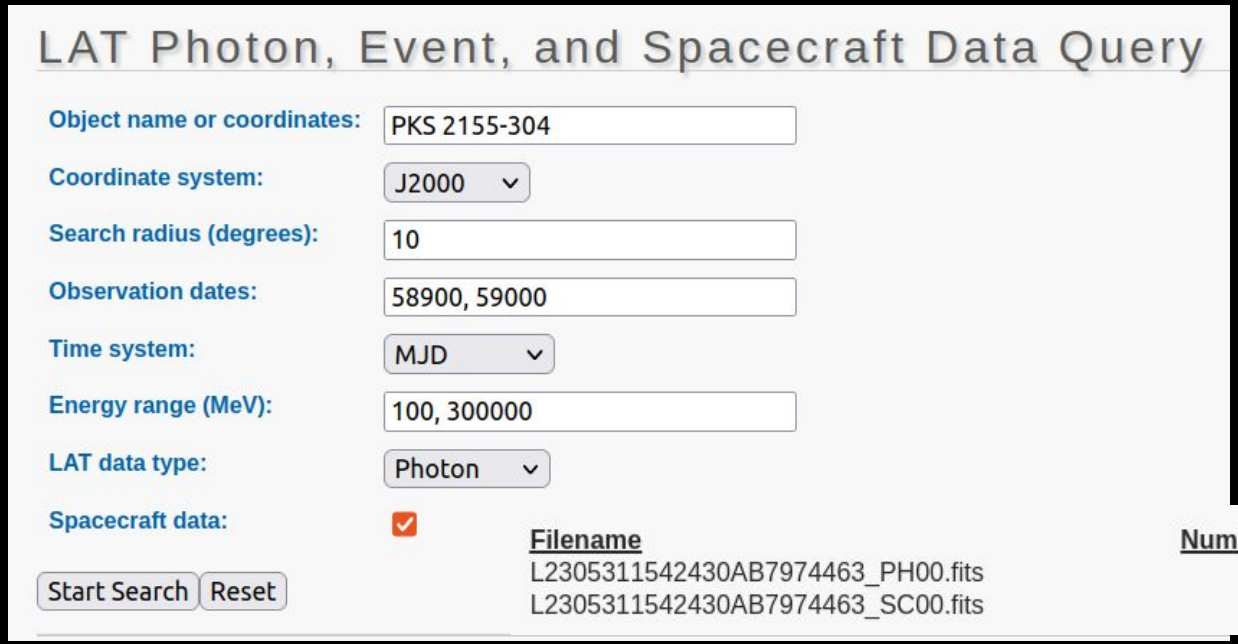


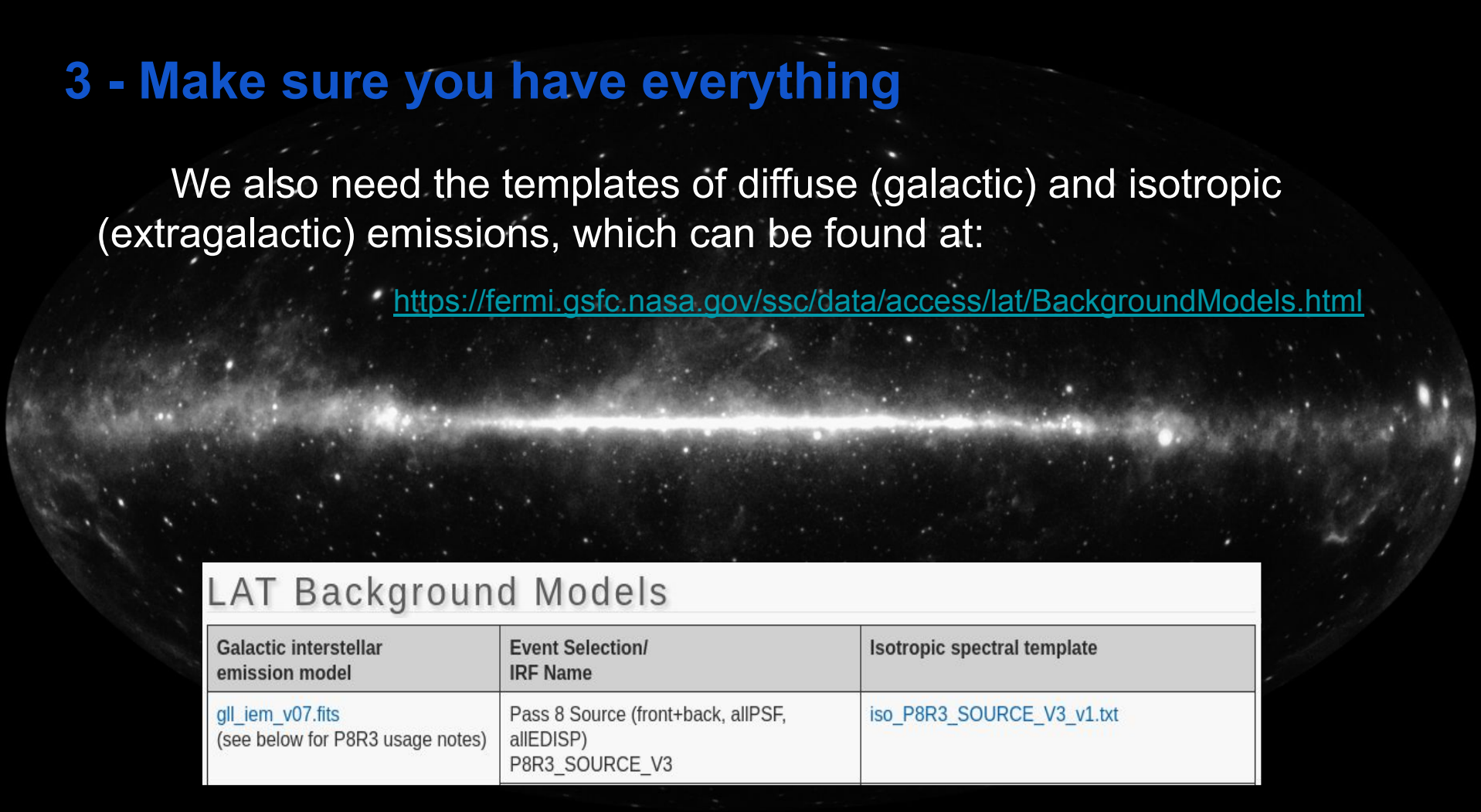
Then download all files that show up!

Filename	Number of Entries	Size (MB)	Status
L2305311542430AB7974463_PH00.fits	183427	17.19	Available
L2305311542430AB7974463_SC00.fits	243571	38.11	Available

3 - Make sure you have everything

We also need the templates of diffuse (galactic) and isotropic (extragalactic) emissions, which can be found at:

https://fermi.gsfc.nasa.gov/ssc/data/access/lat/BackgroundModels.html

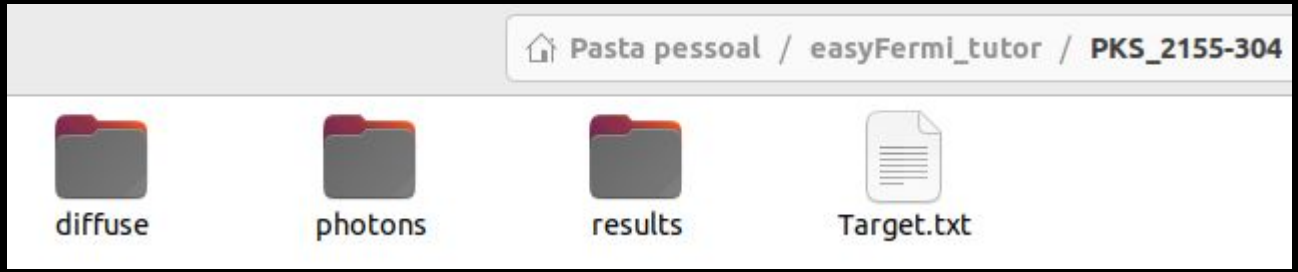


LAT Background Models

Galactic interstellar emission model	Event Selection/ IRF Name	Isotropic spectral template
gll_iem_v07.fits (see below for P8R3 usage notes)	Pass 8 Source (front+back, allPSF, allEDISP) P8R3_SOURCE_V3	iso_P8R3_SOURCE_V3_v1.txt

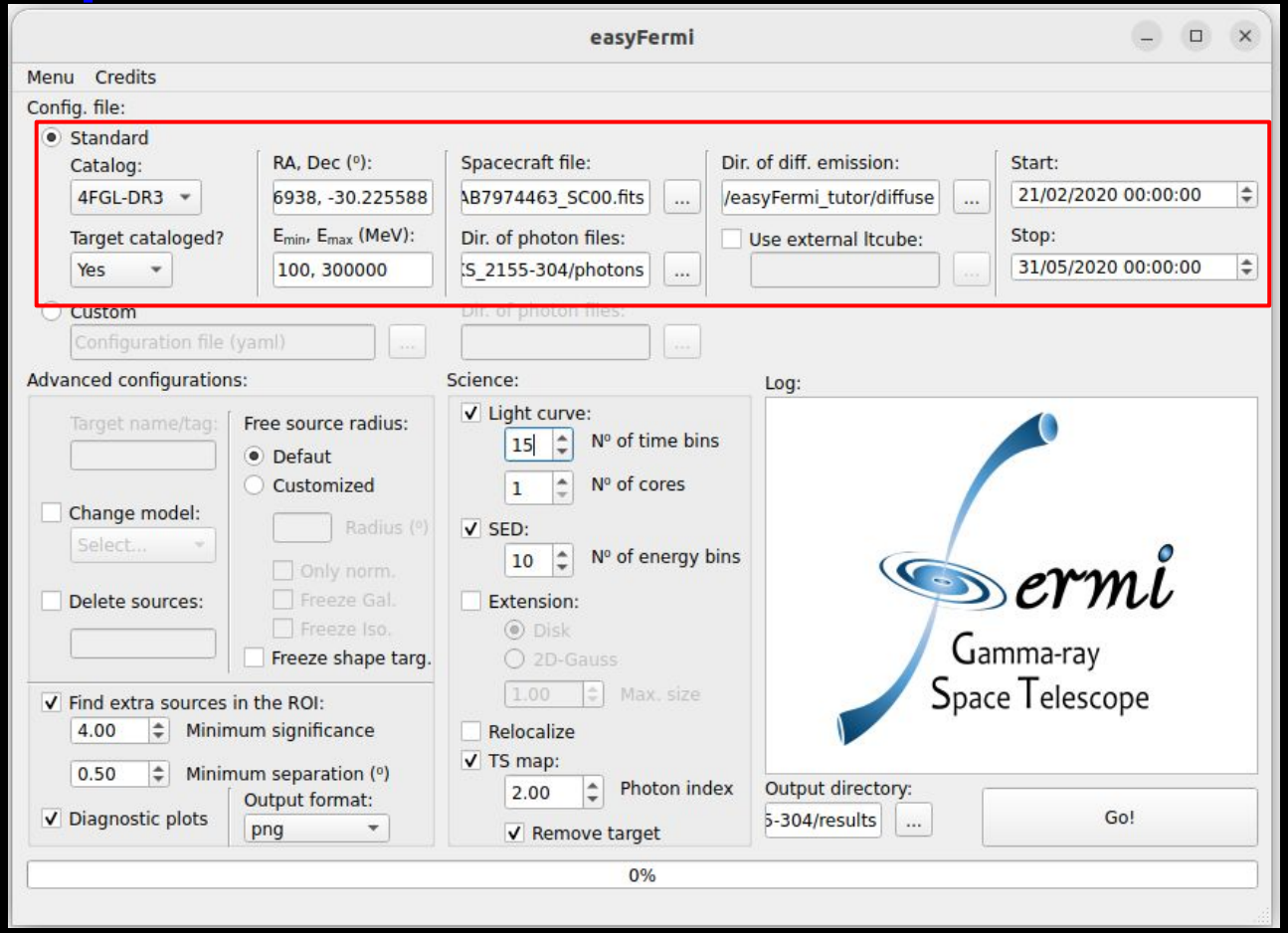
3 - Make sure you have everything

- Let’s have a data directory for the photon and spacecraft files
- Another one for the diffuse templates
- And one more just to hold the results of our analysis



Being well organised pays off!

4 - Analysis and profit!



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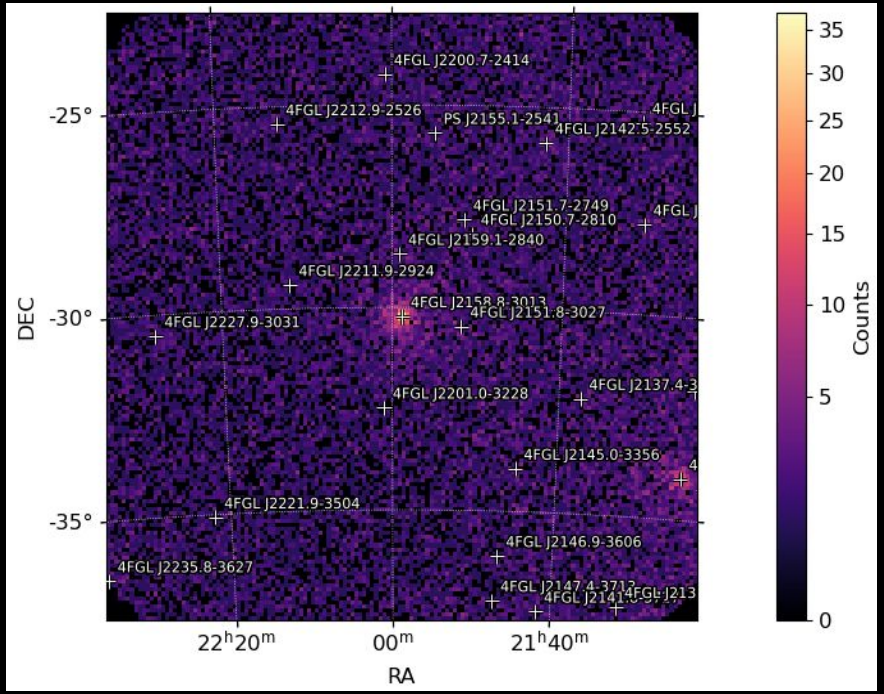

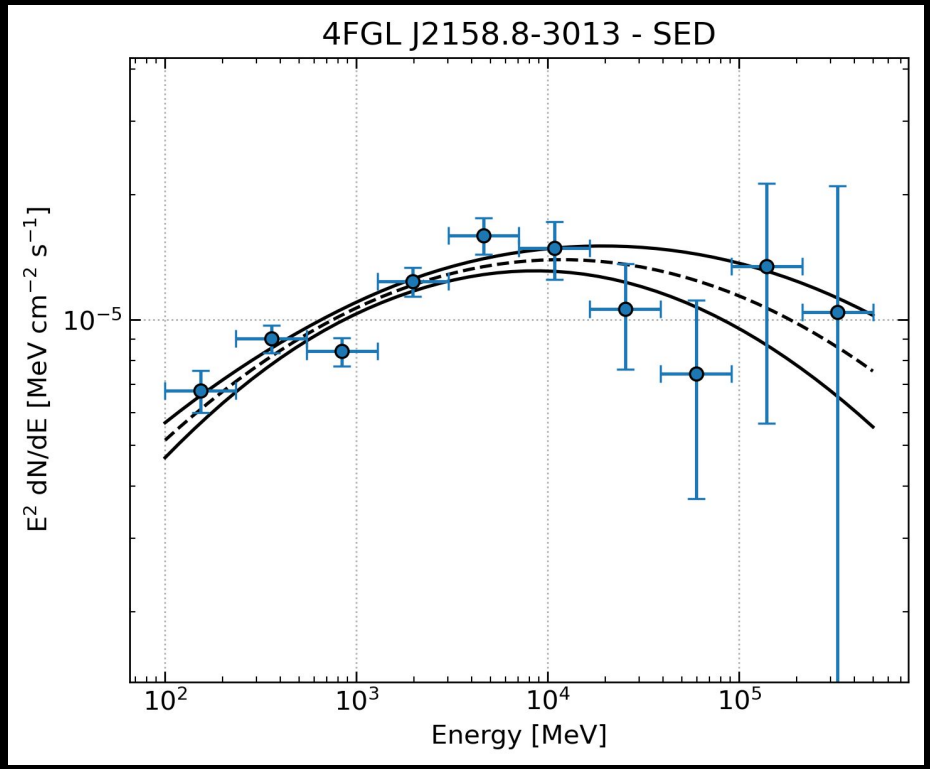

4FGL J2158.8-3013 is
the name of PKS 2155-304 in the Fermi's source catalogue