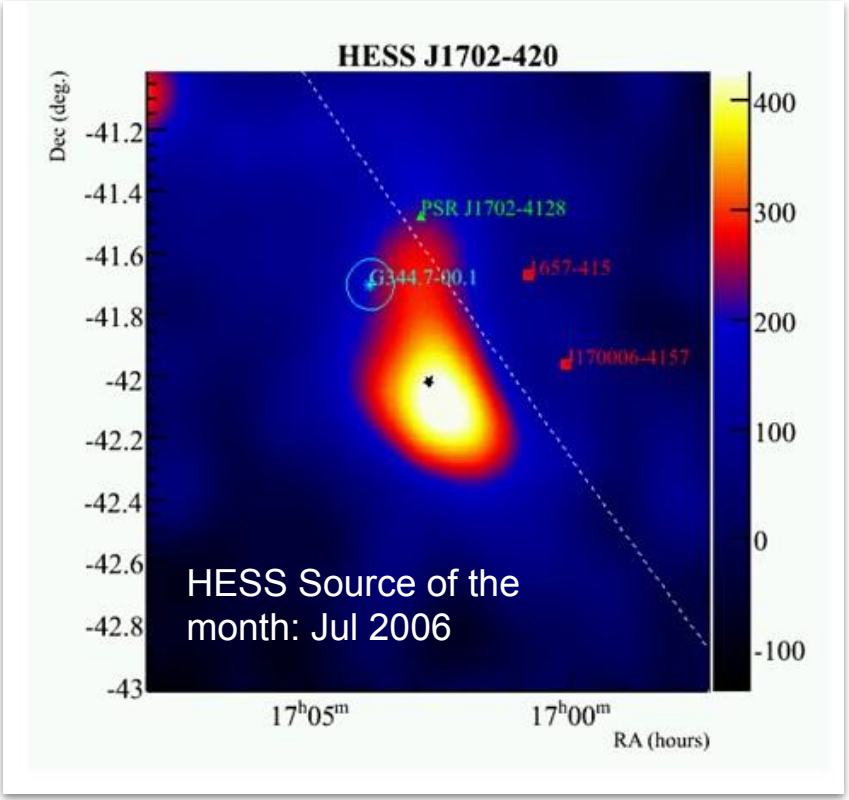
The PeVatron candidate HESS J1702-420

Status of the analysis and perspectives

History and observations

- **First discovery**: 2006 (Aharonian+ 2006)
- Tagged as a:
  - **Dark source** (Aharonian+ 2008)
  - **PeVatron candidate**
- **HGPS**:
  - 14.5 h of livetime (HESS1), 15 σ
  - Extension: 0.2 deg
  - Within R_{ON}=0.32 deg: 0.2 Crab units
  - Spectral index: 2.09 +- 0.07
- 2017: Proposal for follow-up observations: 37 hrs accumulated using HESS1U

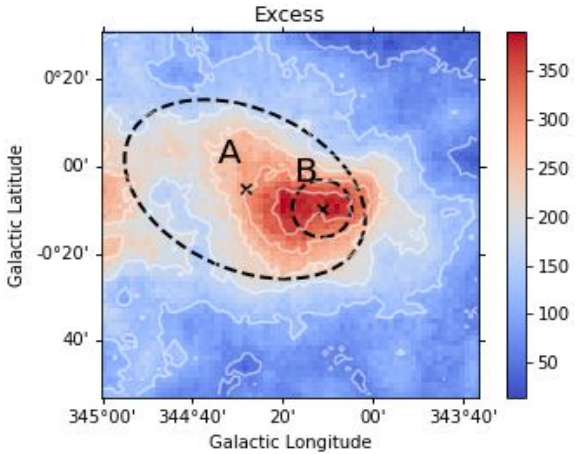


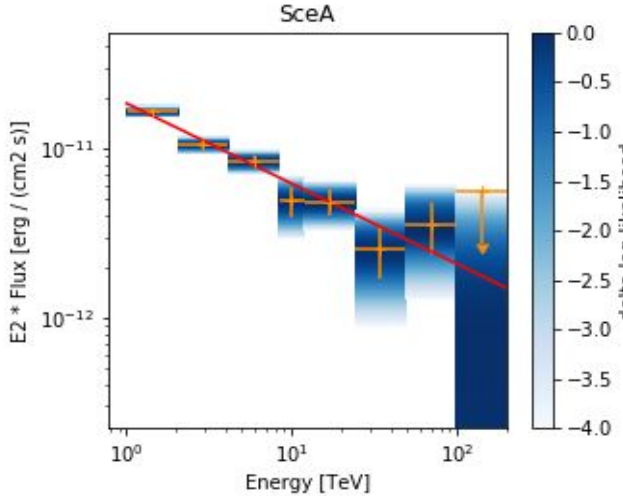
Reminder from Annecy

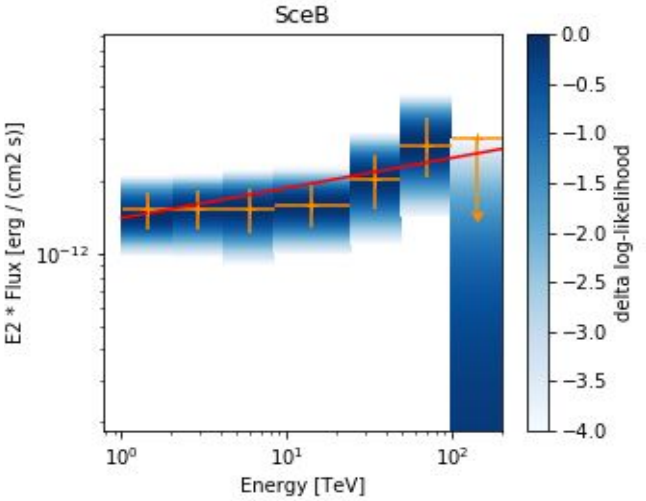
- Preliminary DL3 data analysis with **gammapy**
- **Dataset:** HAP-fr, HE configuration (Stereo, CT1-4)
- **Runs:** 327

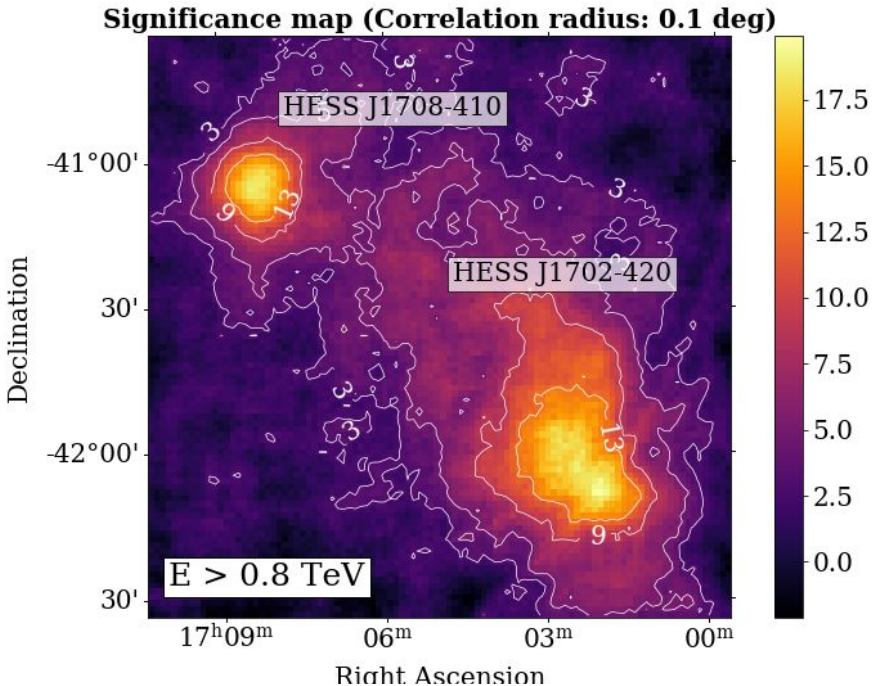
Summary:

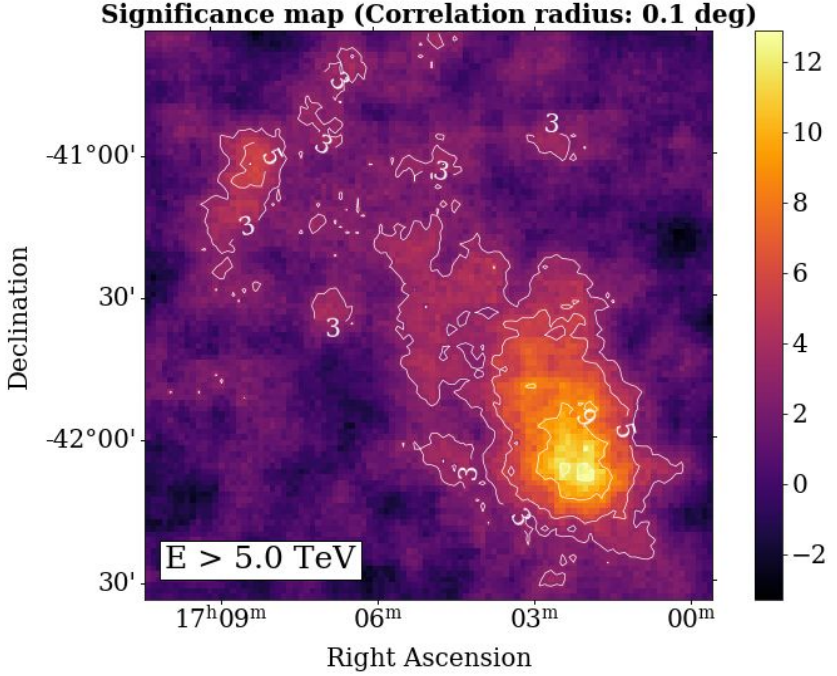
- **Very hard** emission towards the TeV peak
- A model with **2 components** provides a good description of the TeV excess
- We identified a component with very hard spectral index (~1.8), that shows **no indication of a cutoff** and is well described by an **hadronic PL spectrum**

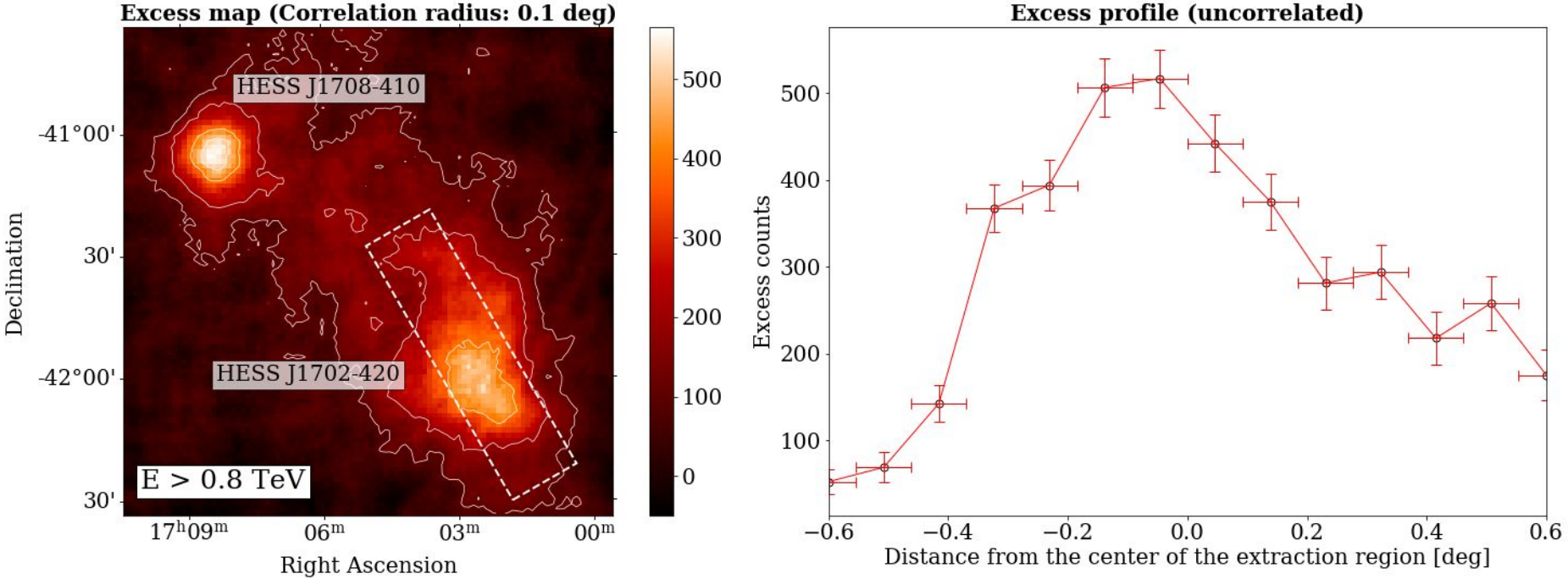


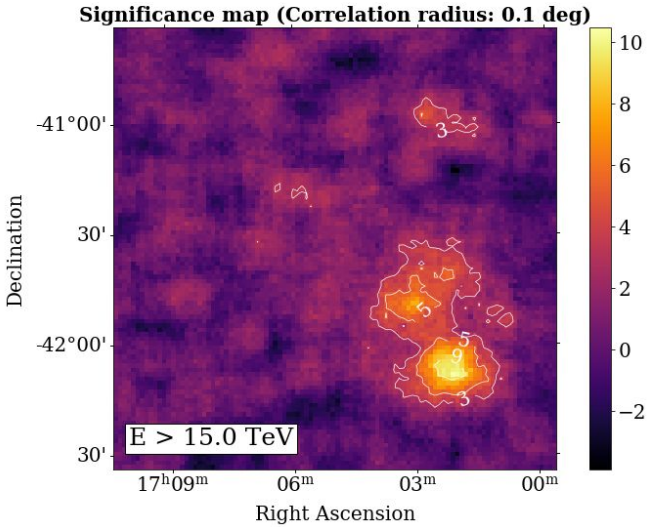


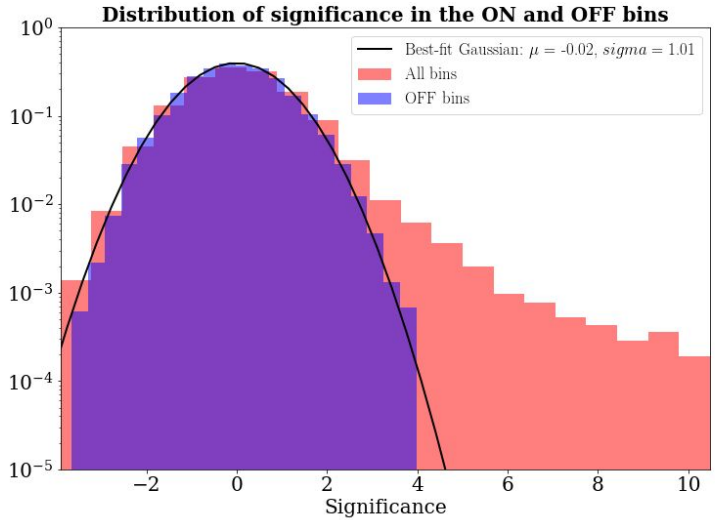


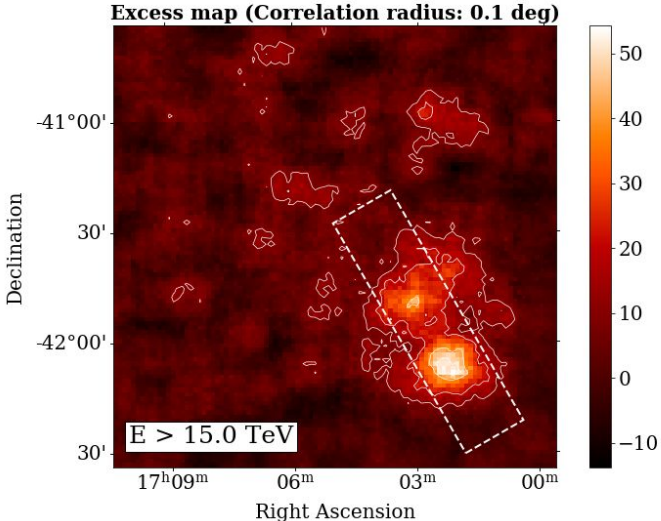

Significance map (Correlation radius: 0.1 deg)
HESS J1708-410
HESS J1702-420
E > 0.8 TeV
Declination
-41°00'
30'
-42°00'
30'
17h09m
06m
03m
00m
Right Ascension
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0

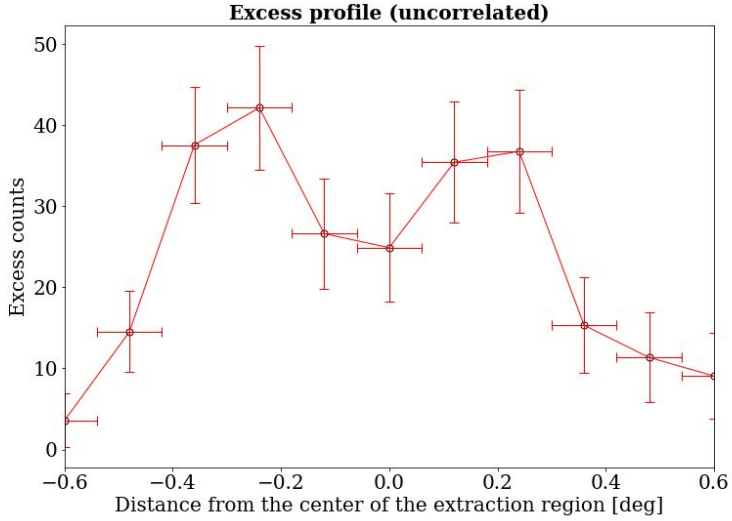

Significance map (Correlation radius: 0.1 deg)
E > 5.0 TeV
Declination
-41°00'
30'
-42°00'
30'
17h09m
06m
03m
00m
Right Ascension
12
10
8
6
4
2
0
−2

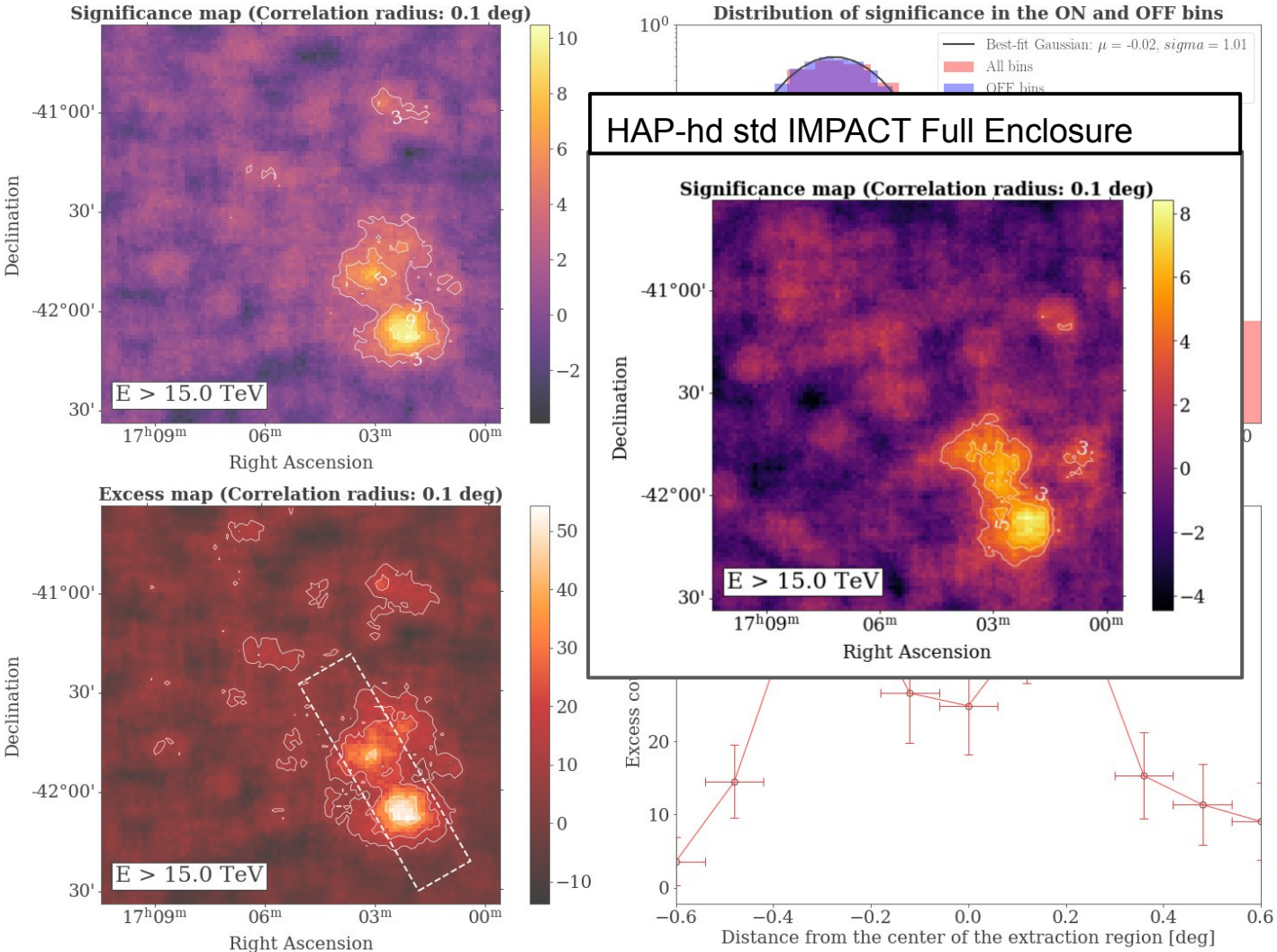

Excess map (Correlation radius: 0.1 deg)
HESS J1708-410
HESS J1702-420
E > 0.8 TeV
-41°00'
30'
-42°00'
30'
Declination
17h09m
06m
03m
00m
Right Ascension
500
400
300
200
100
0
Excess profile (uncorrelated)
Excess counts
500
400
300
200
100
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6
Distance from the center of the extraction region [deg]


Significance map (Correlation radius: 0.1 deg)
E > 15.0 TeV
Declination
Right Ascension
-41°00'
30'
-42°00'
30'
17h09m
06m
03m
00m
3
5
5
9
3
10
8
6
4
2
0
−2


Distribution of significance in the ON and OFF bins
Best-fit Gaussian: μ = -0.02, $sigma$ = 1.01
All bins
OFF bins
Significance
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
−2
0
2
4
6
8
10


Excess map (Correlation radius: 0.1 deg)
E > 15.0 TeV
Declination
Right Ascension
-41°00'
30'
-42°00'
30'
17h09m
06m
03m
00m
50
40
30
20
10
0
−10


Excess profile (uncorrelated)
Excess counts
Distance from the center of the extraction region [deg]
50
40
30
20
10
0
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6


Significance map (Correlation radius: 0.1 deg)
Distribution of significance in the ON and OFF bins
Best-fit Gaussian: μ = -0.02, $sigma$ = 1.01
All bins
OFF bins
HAP-hd std IMPACT Full Enclosure
Significance map (Correlation radius: 0.1 deg)
E > 15.0 TeV
Declination
Right Ascension
Excess map (Correlation radius: 0.1 deg)
E > 15.0 TeV
Declination
Right Ascension
Distance from the center of the extraction region [deg]

Prospects

- Refinement of the 3D analysis:
  - Need to model the **residual diffuse emission** in the region
  - Finalize the production of a more solid **background model**
- Attempt standard spectral analysis (aperture photometry) for the hard source at the TeV peak
- Hopefully these things should be in for the Obergurgl Collaboration Meeting
- Plan to present this at Gamma2020