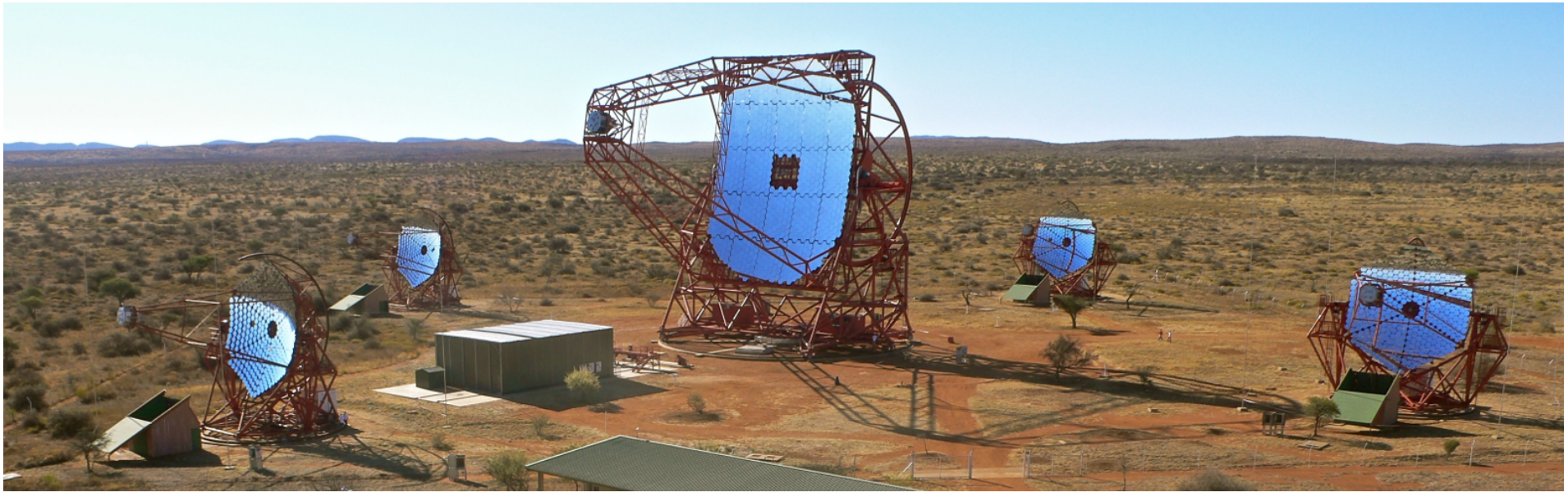
Recent H.E.S.S. highlights in light of MWL observations.



D. Kostunin for the H.E.S.S. collaboration

HEAconf 2019, Moscow

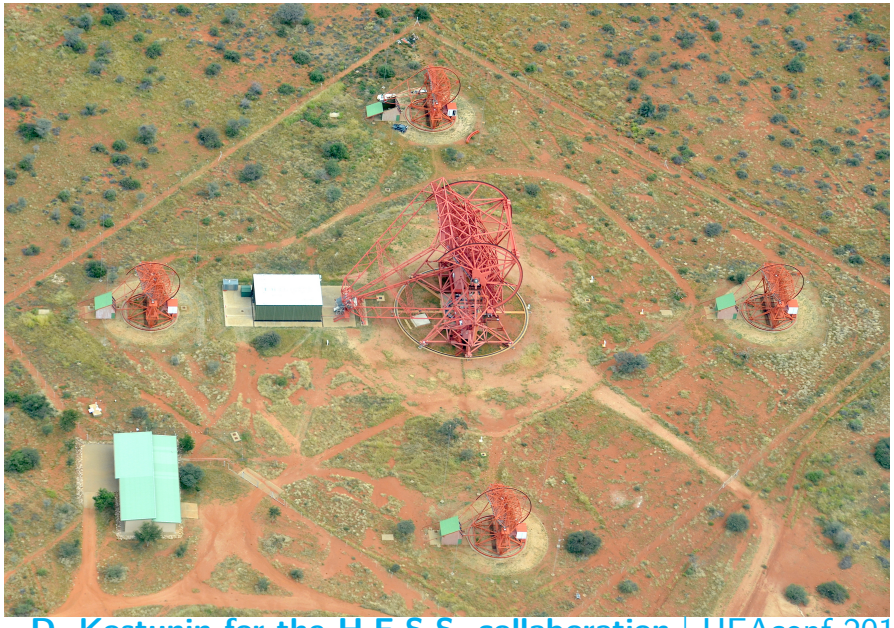
HELMHOLTZ GEMEINSCHAFT

DESY.

High Energy Stereoscopic System

Namibia, 23°16'17"S 16°30'00"E, 1800 m a.s.l.

- Energy range 30 GeV – 100 TeV
- Enery resolution ∼15%
- Angular resolution ∼5'
- Source position ∼ 10"
- Observations ∼1000 h/year



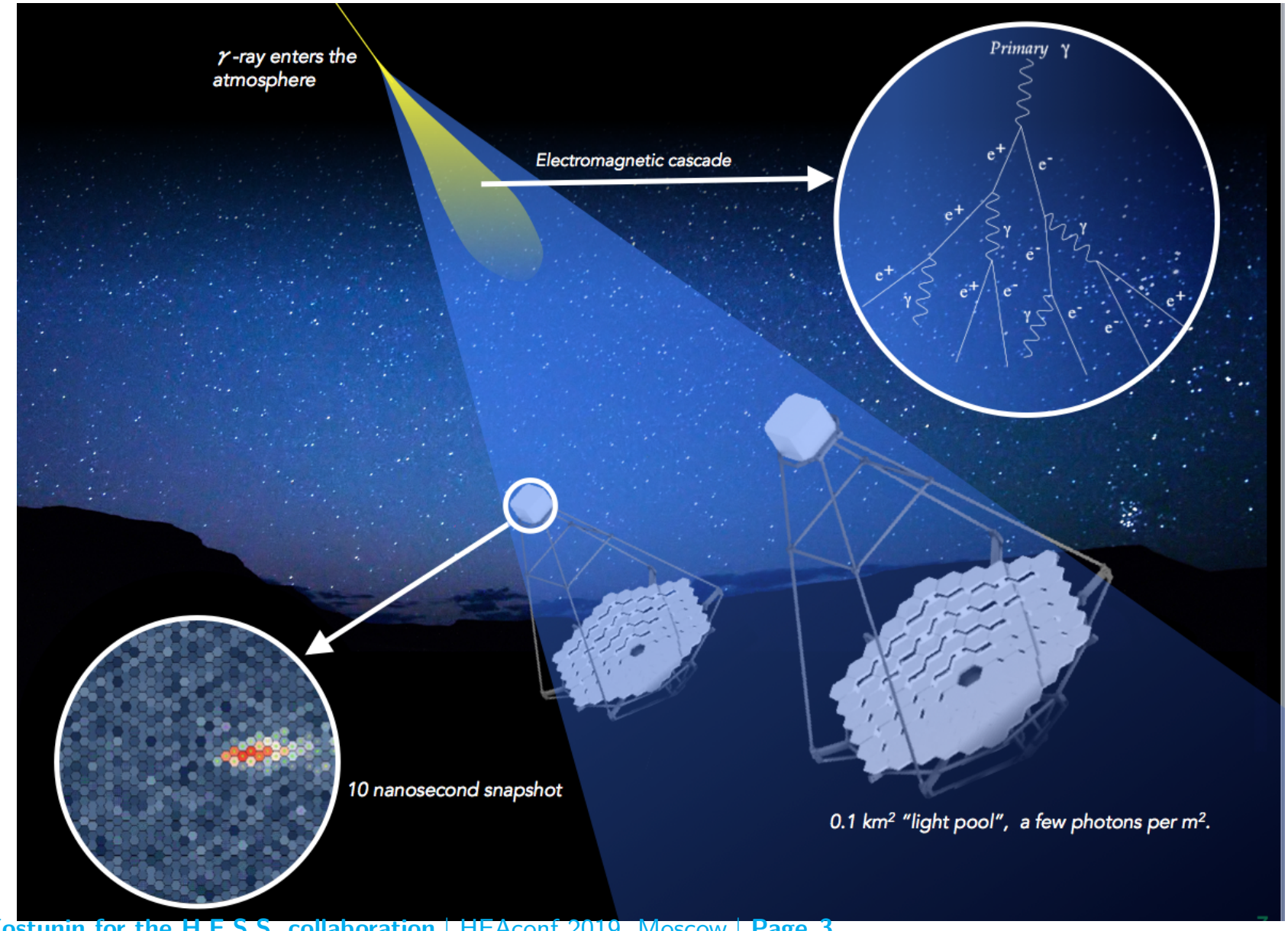
H.E.S.S. phase I (Sep. 2002)

- 4 telescopes: ⌀12 m, 107 m^2
- Stereoscopic reconstruction
- 960 PMTs/camera, FoV 5°

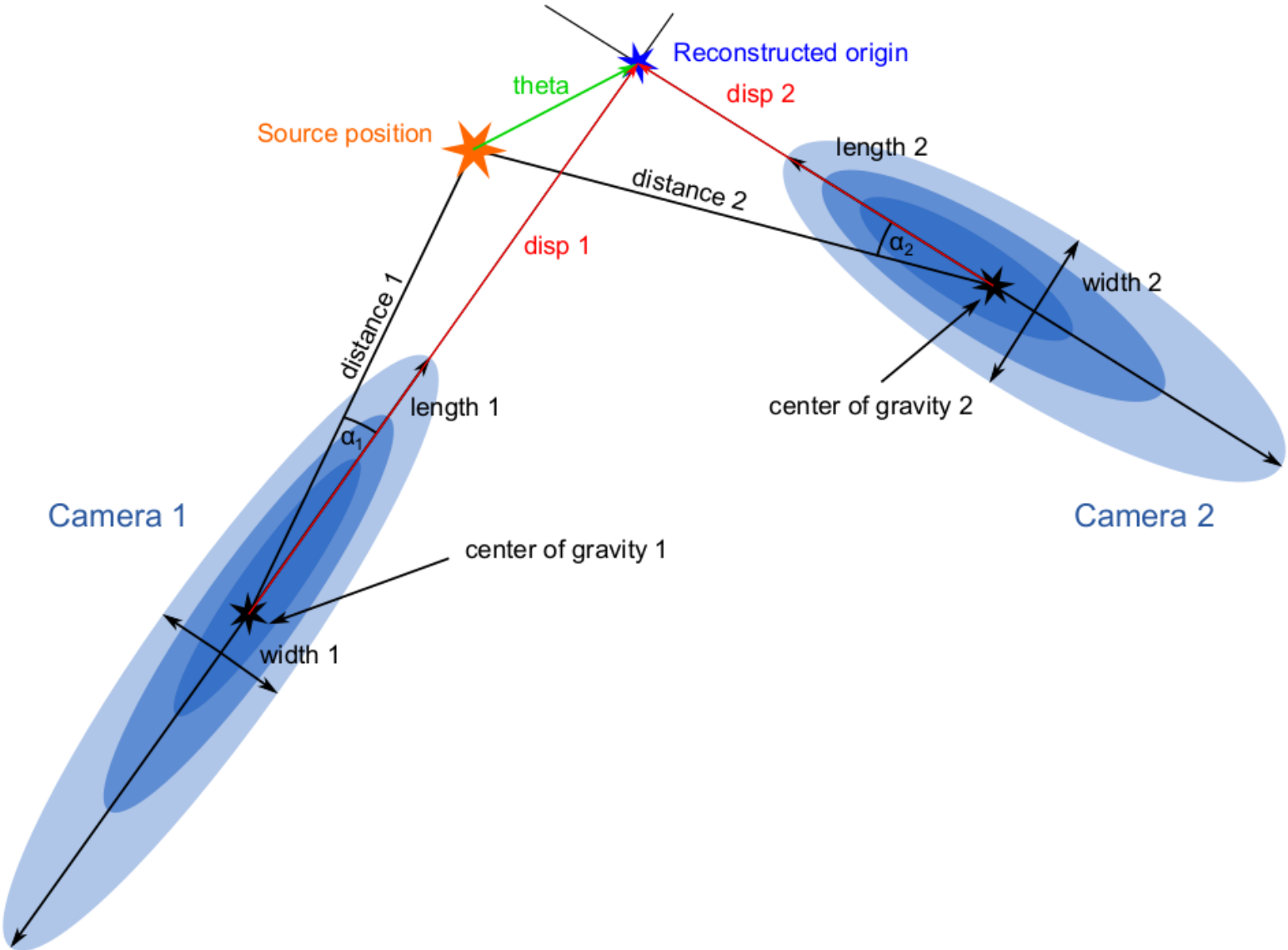
H.E.S.S. phase II (Sep. 2012)

- 5th telescope: ⌀28 m, 600 m^2 (largest IACT in the world)
- 2048 (until Oct. 2019) / 1758 (now) PMTs, FoV 3.5°
- Energy threshold ∼30 GeV
- Fast response of CT5: >90% of targets in 60 s

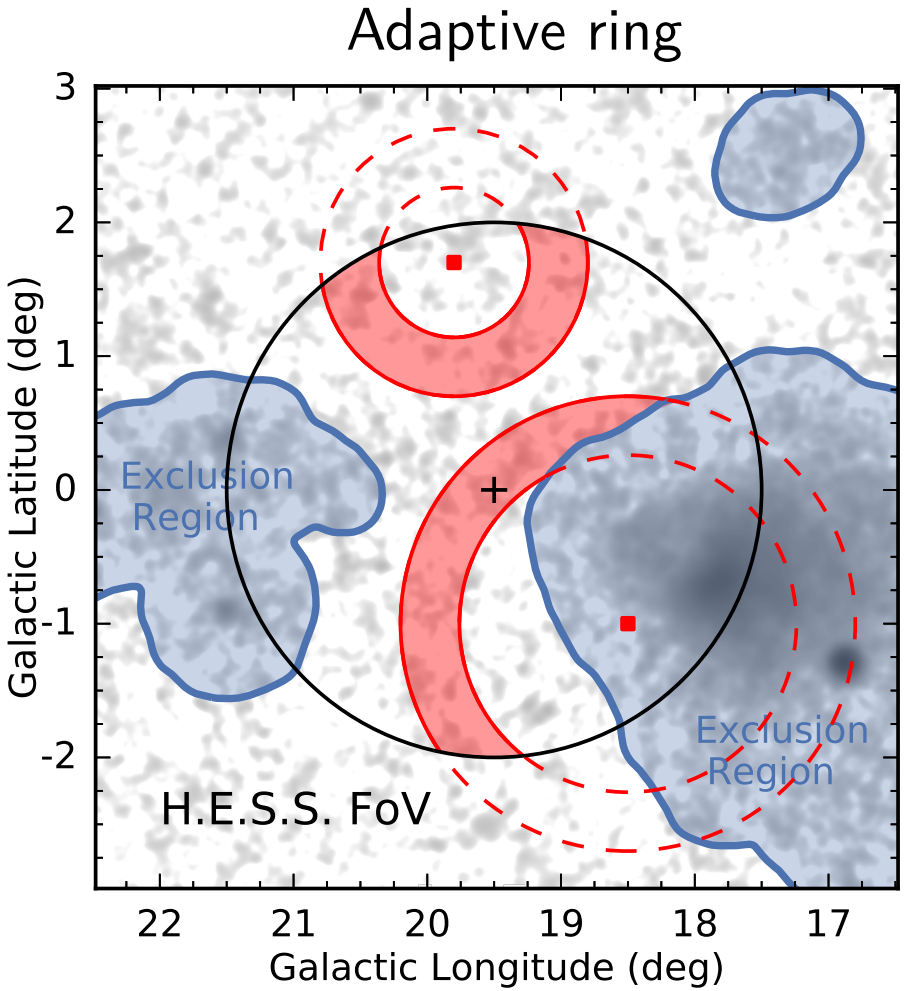
Principle of IACT detection

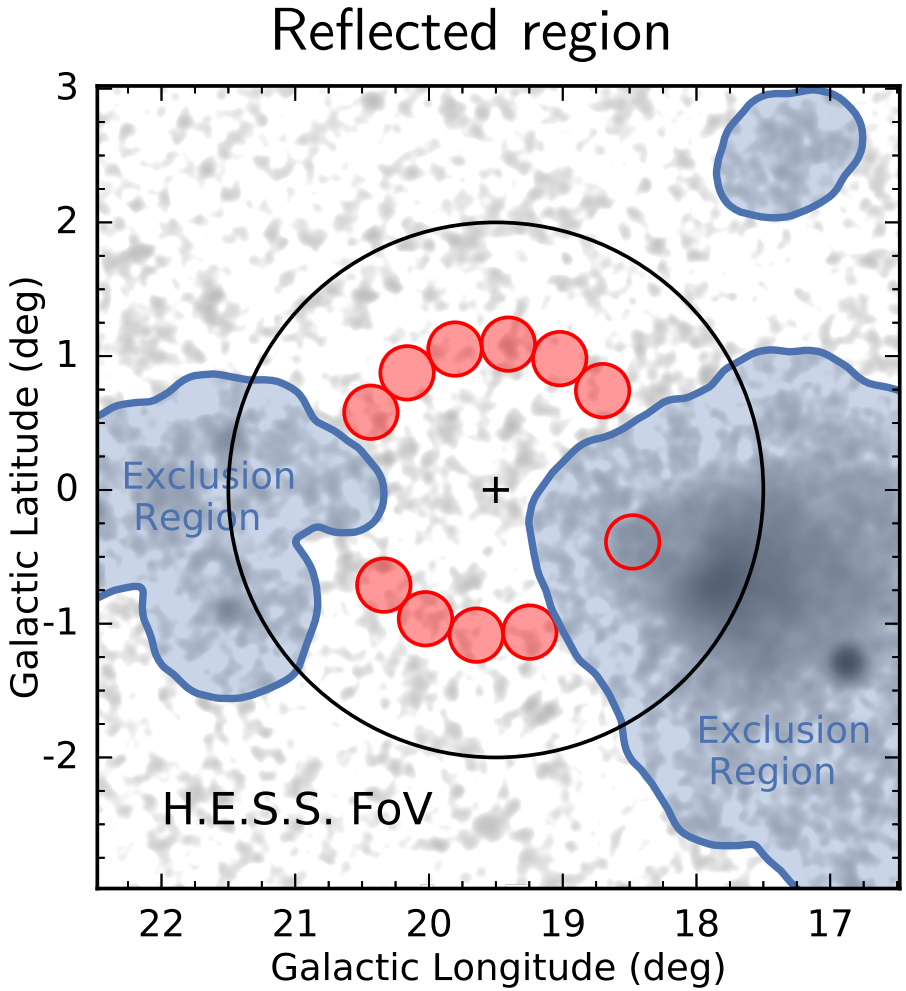


Direction reconstruction

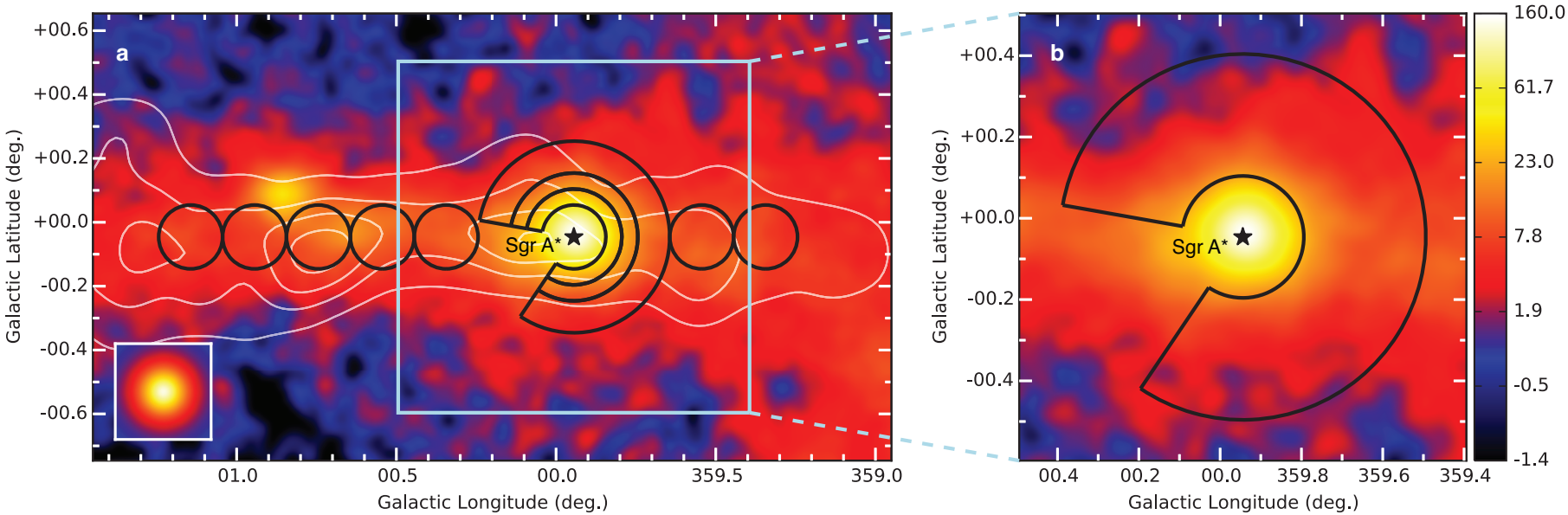


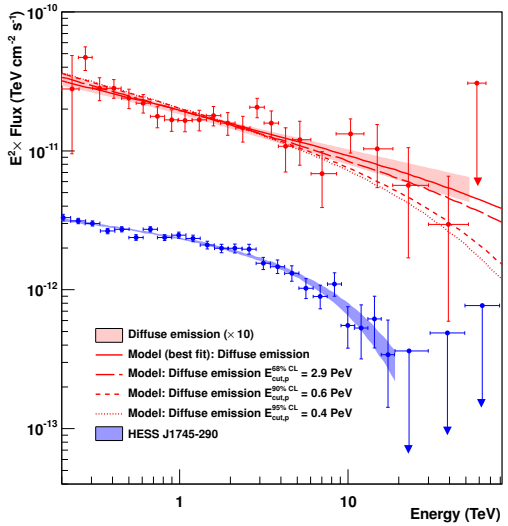
Background estimation

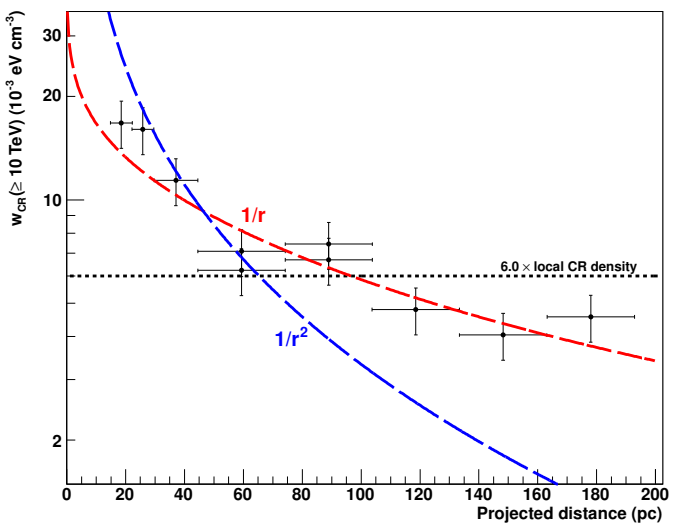




PeVatron at Galactic Centre

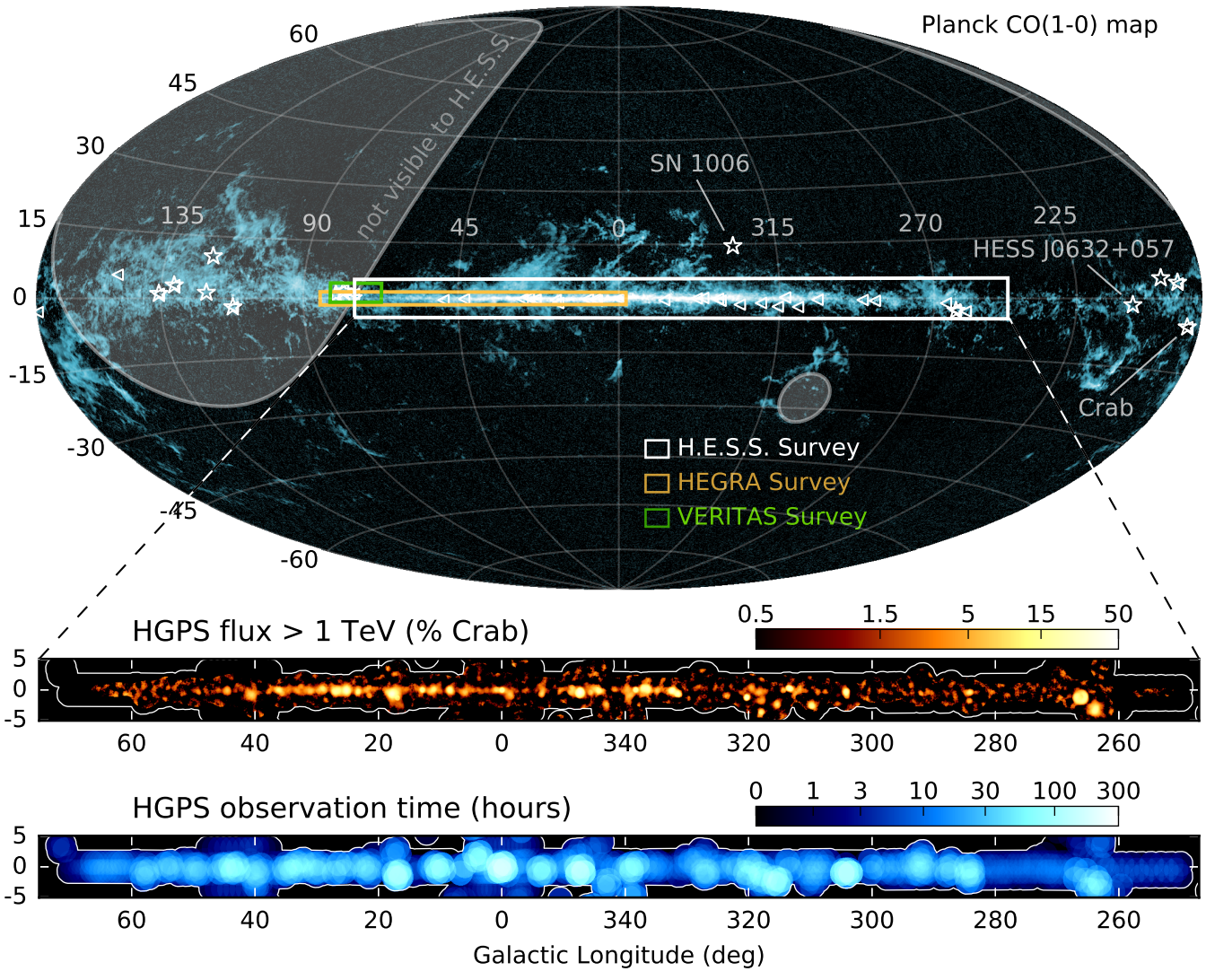






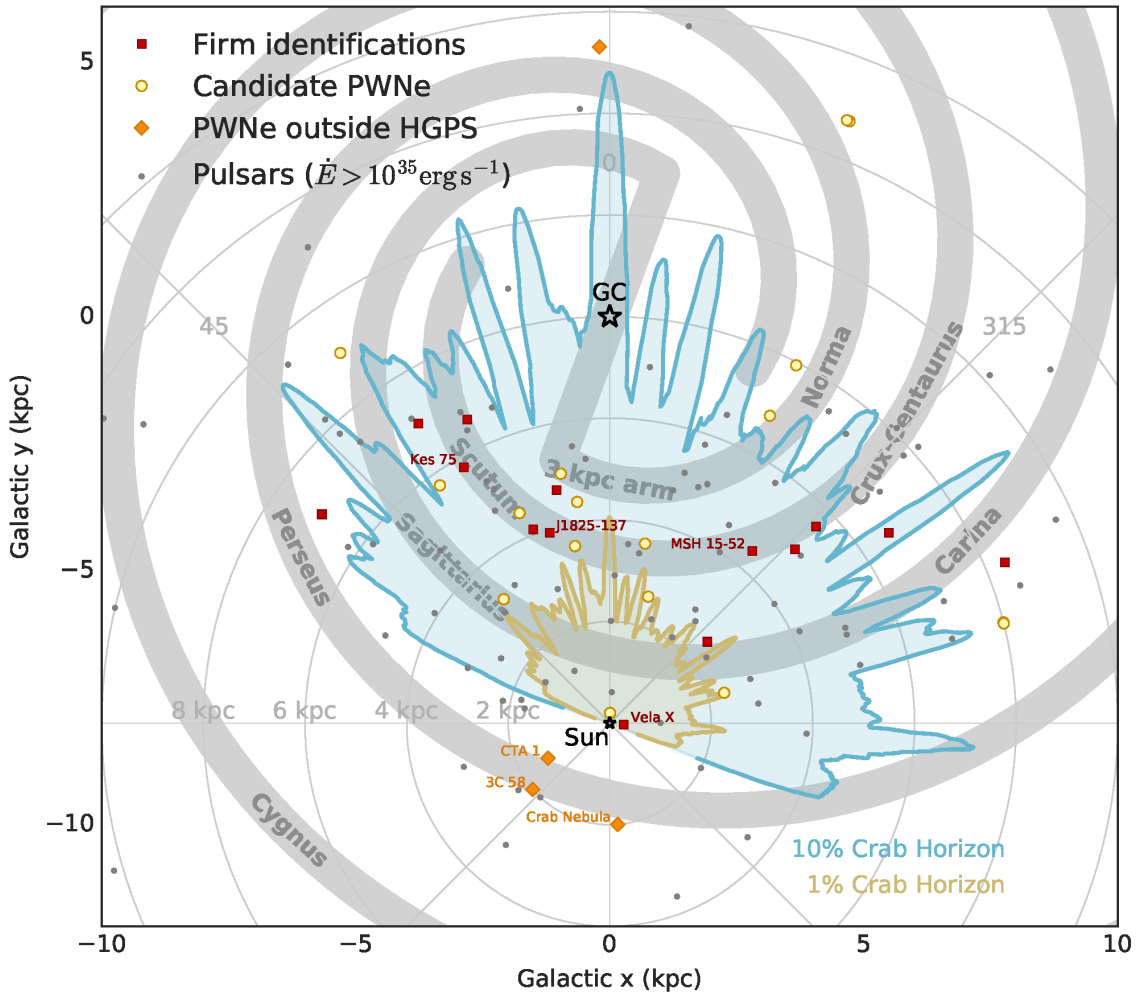
Nature 531 (2016) 476

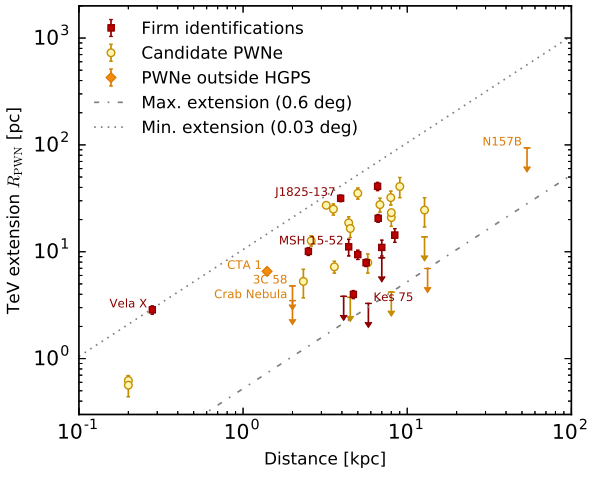
H.E.S.S. Galactic Plane Survey (HGPS)

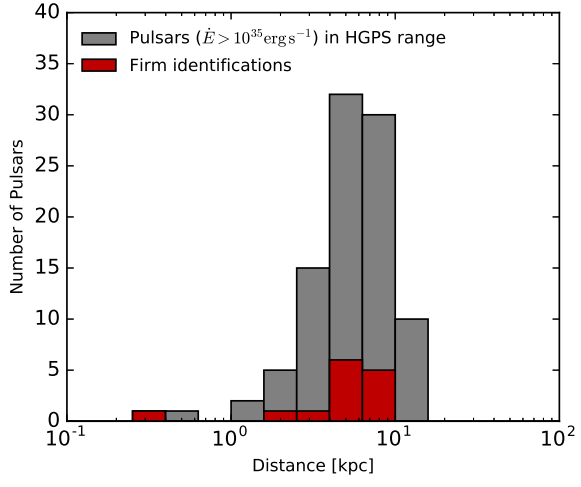


https://www.mpi-hd.mpg.de/hfm/HESS/hgps/

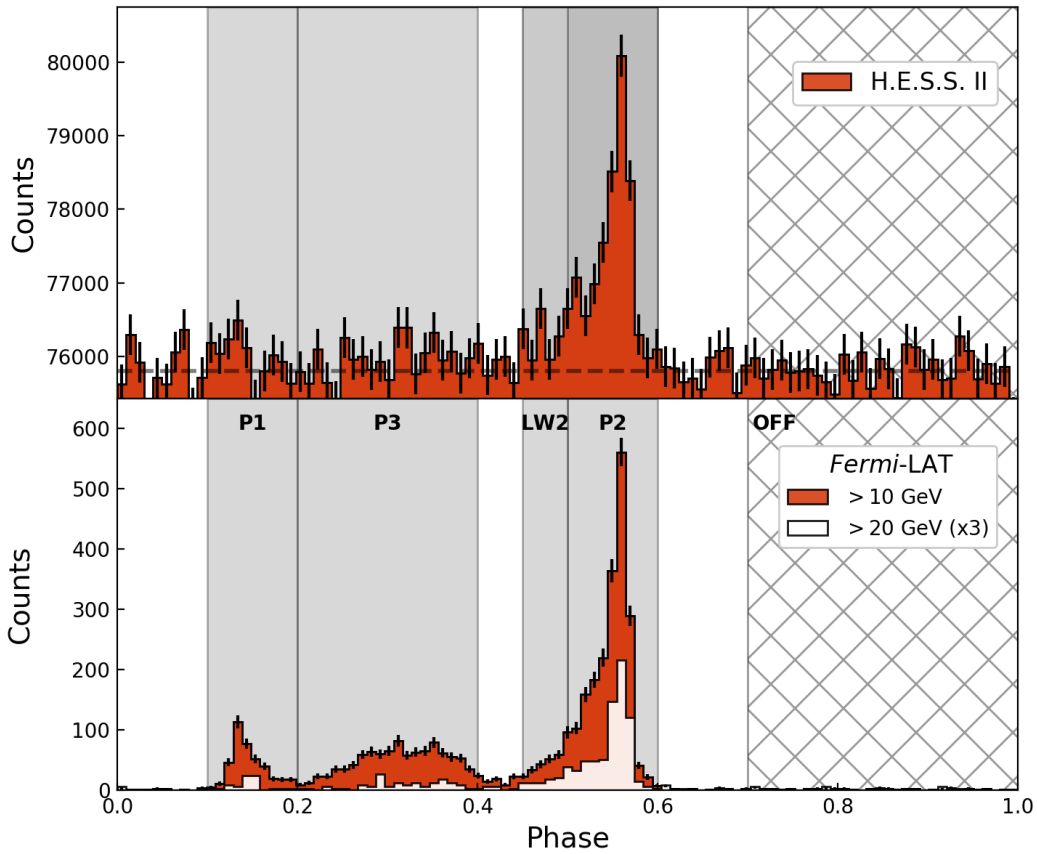
HGPS sensitivity & identified PWN

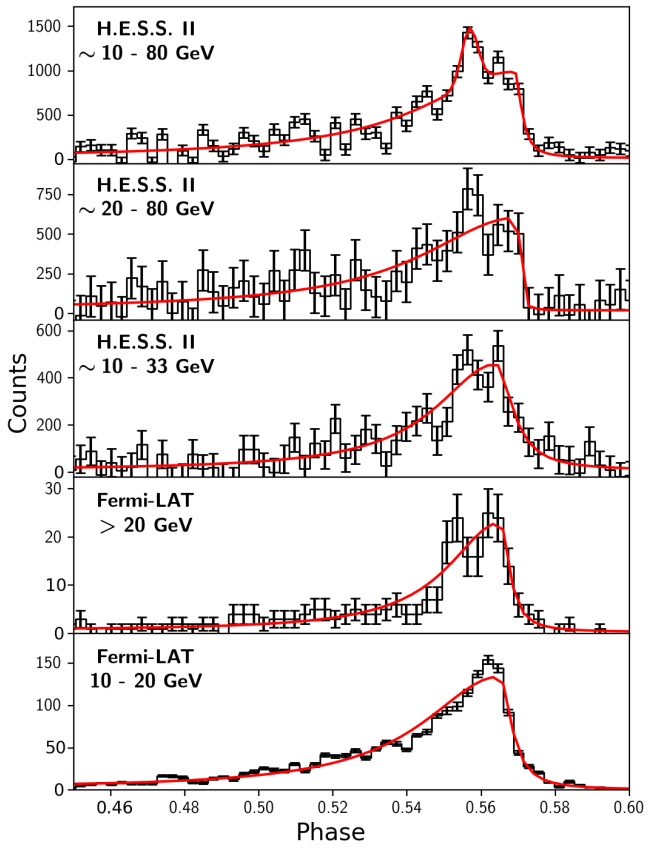






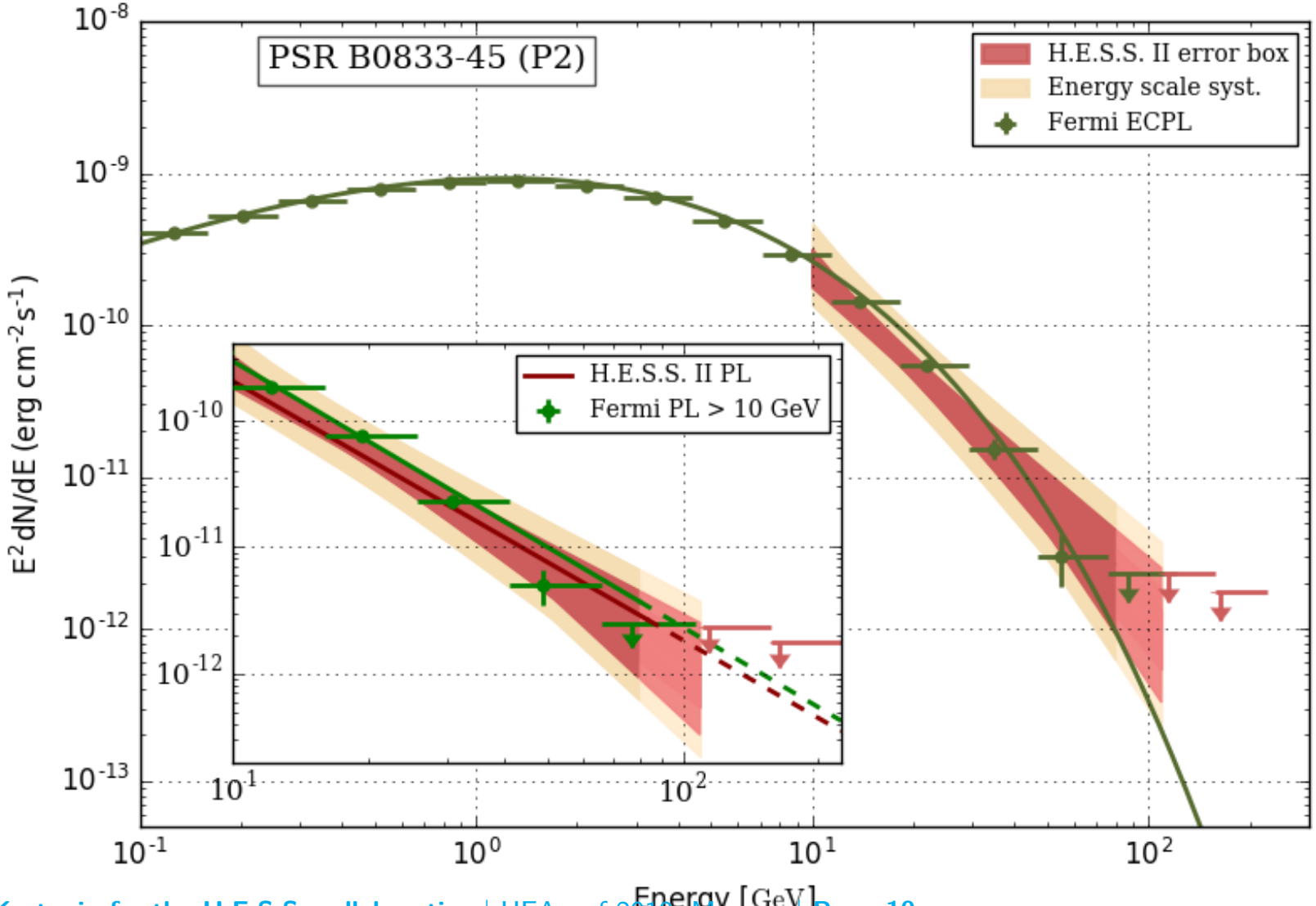
Vela pulsation with H.E.S.S



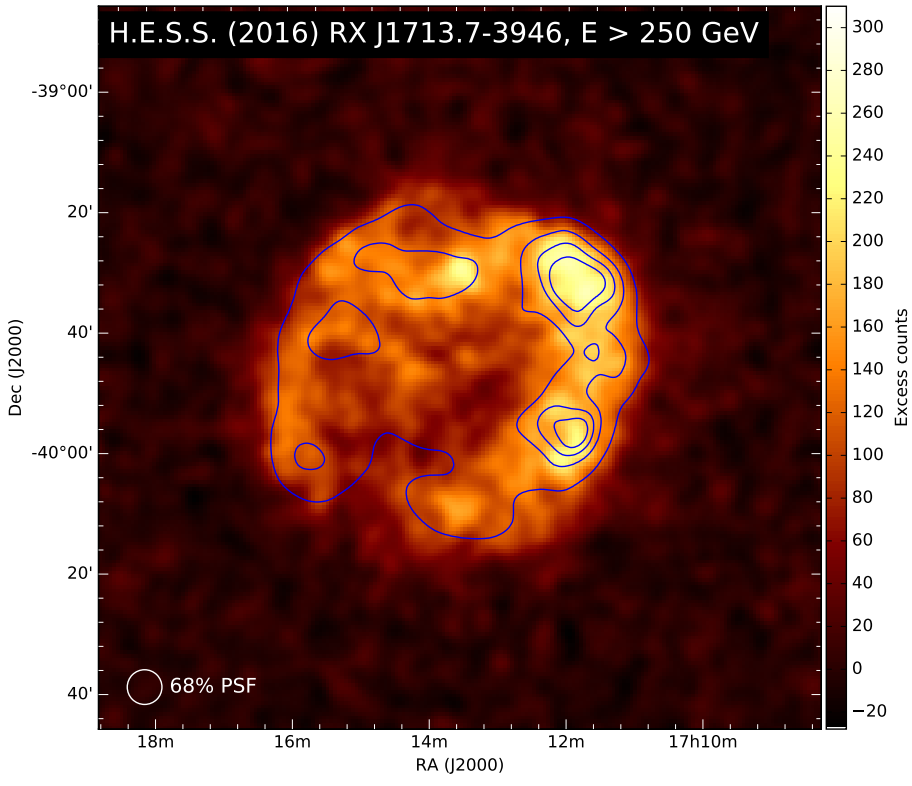


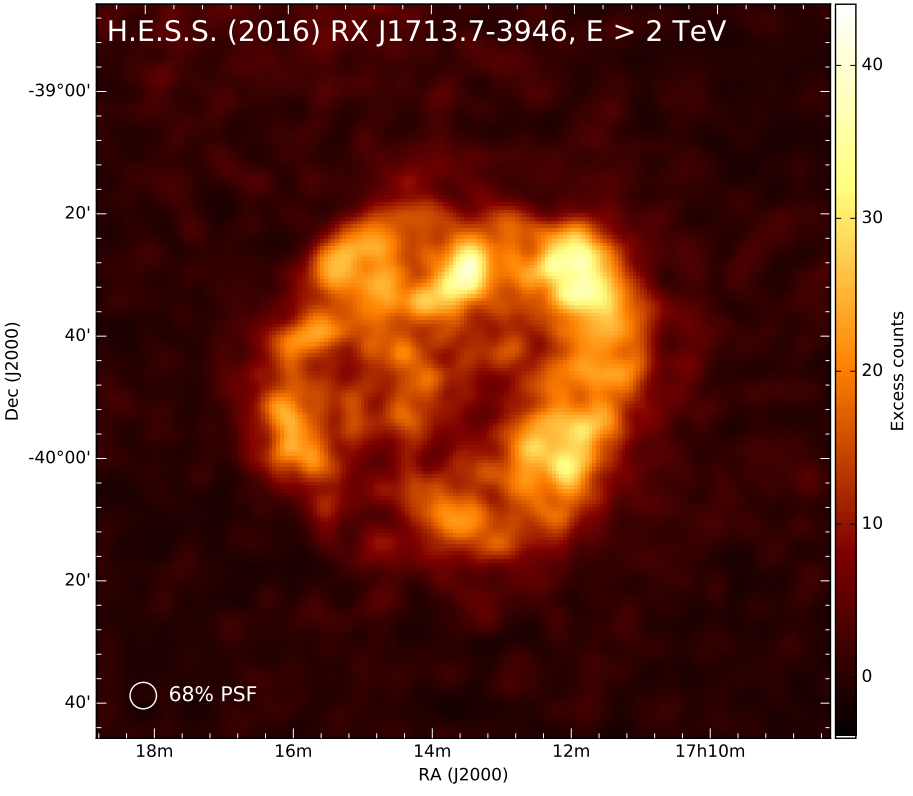
Astron. Astrophys. 620 (2018) A66

Vela pulsation with H.E.S.S



Observation of RX J1713.7-3946

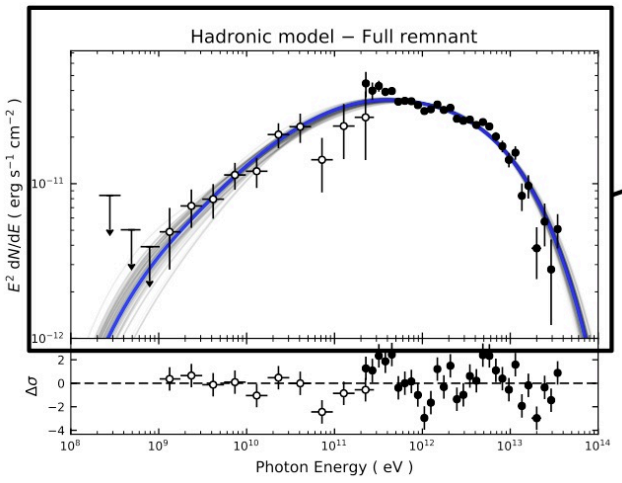


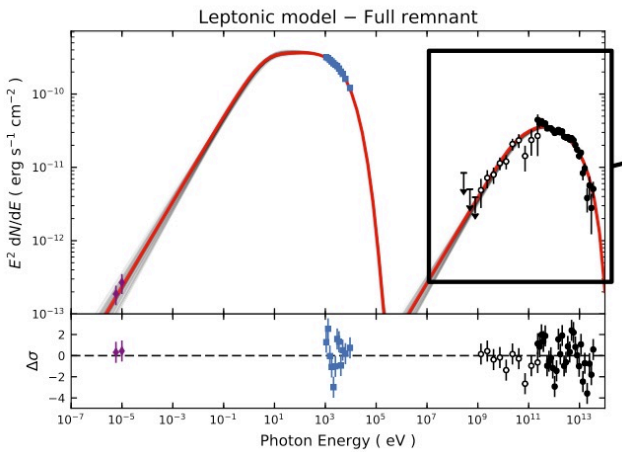


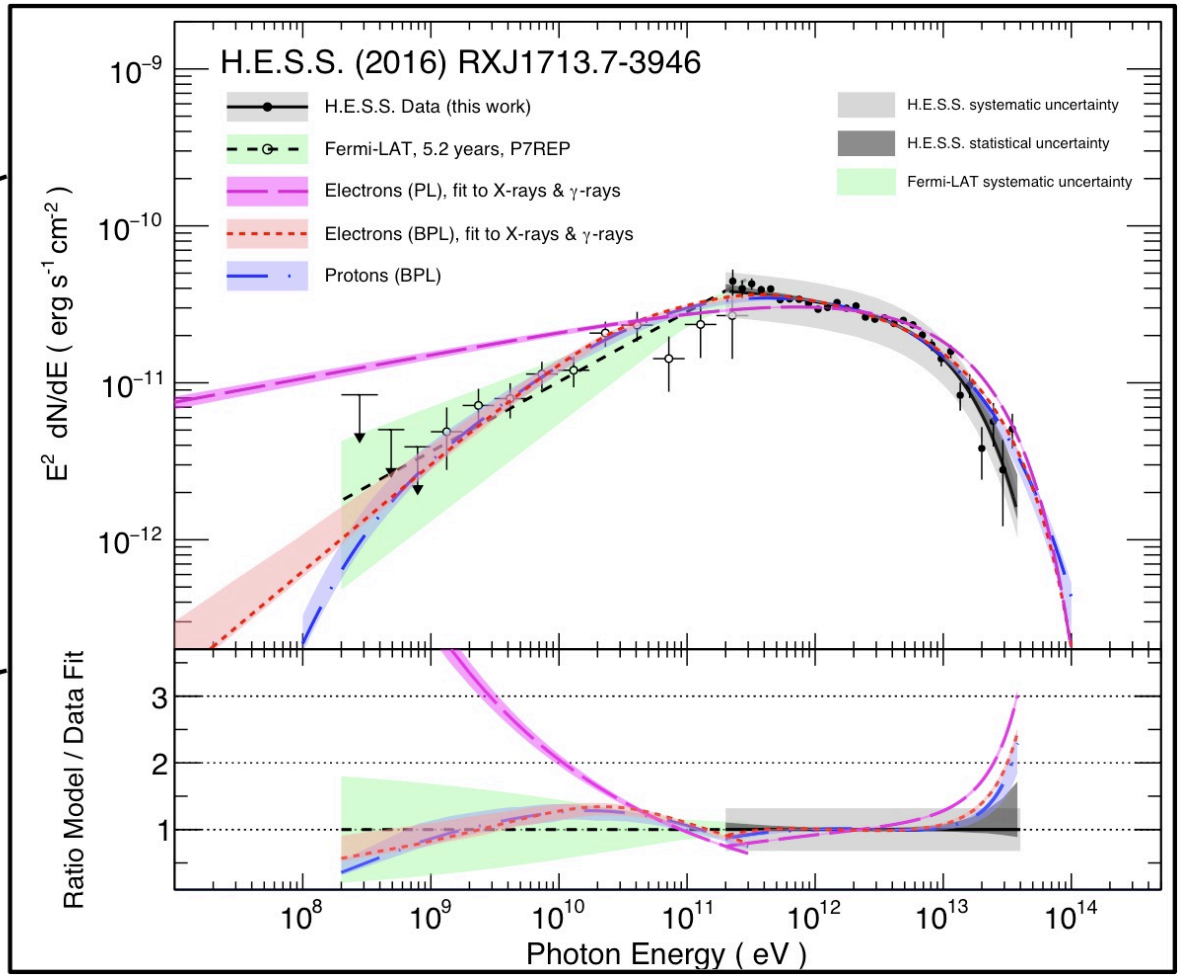
Agular resolution of $0.048°$ $(2.9')$ and $0.036°$ $(2.2')$ for $E > 2$ TeV

A&A 612, A6 (2018)

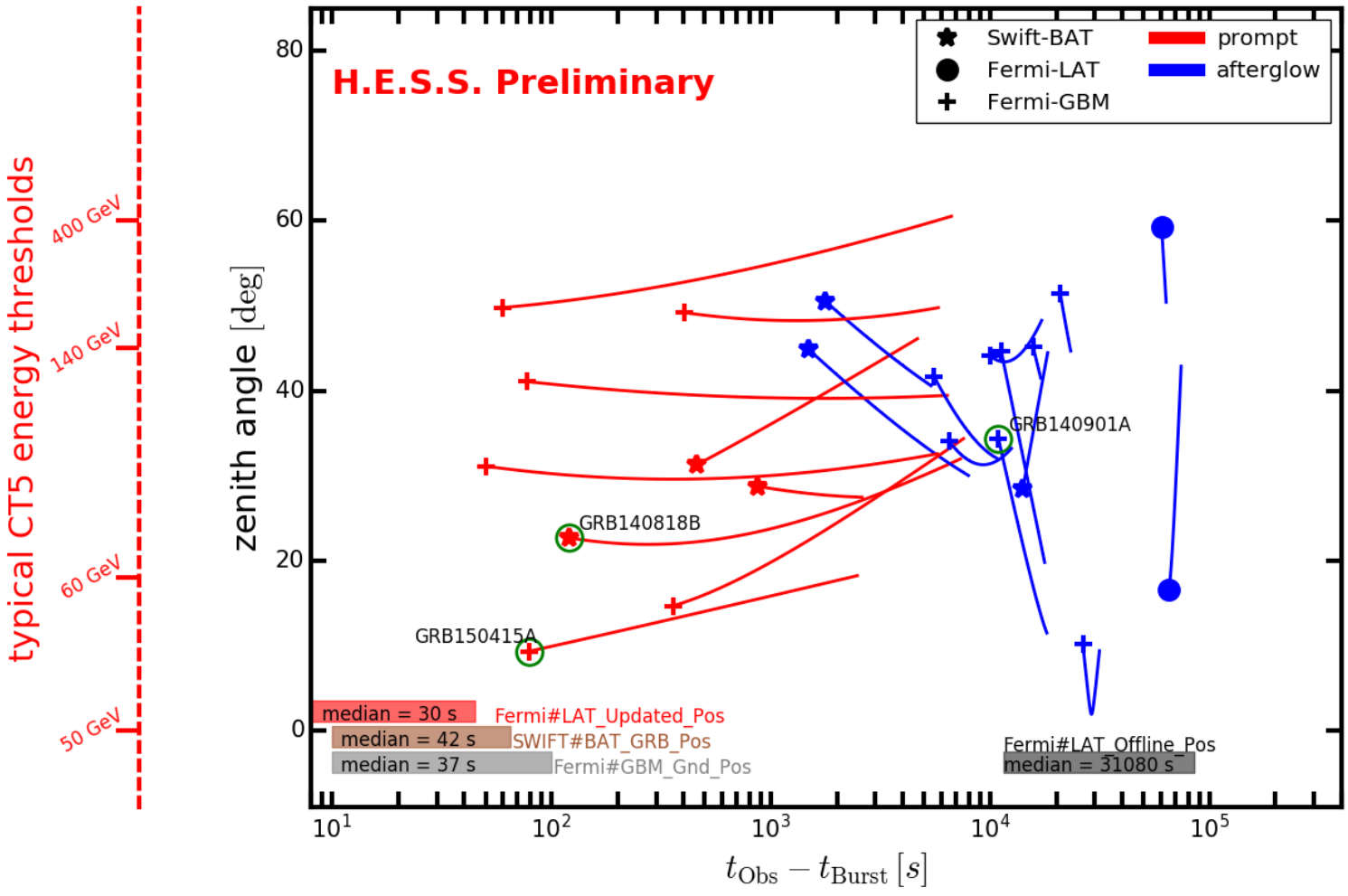
Observation of RX J1713.7-3946





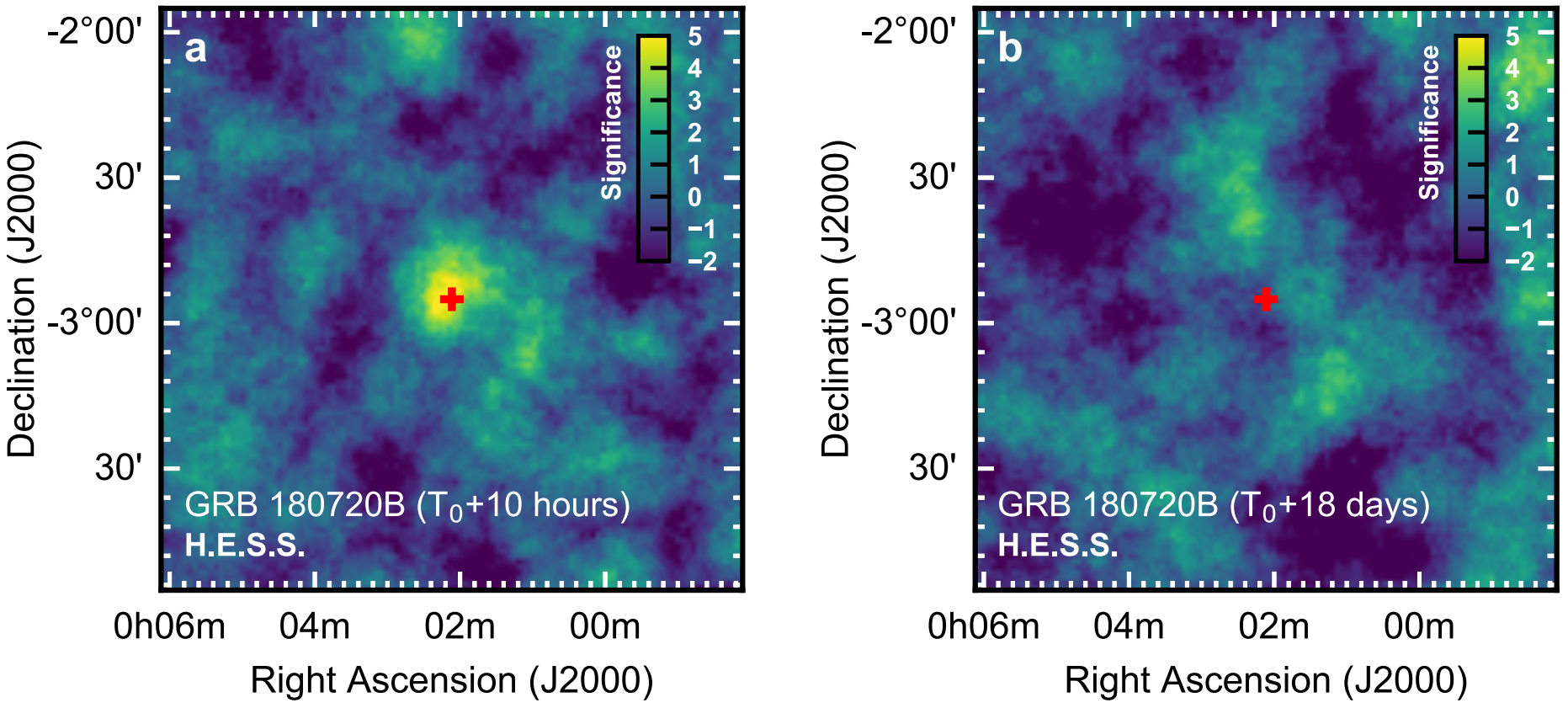


H.E.S.S. II GRB program



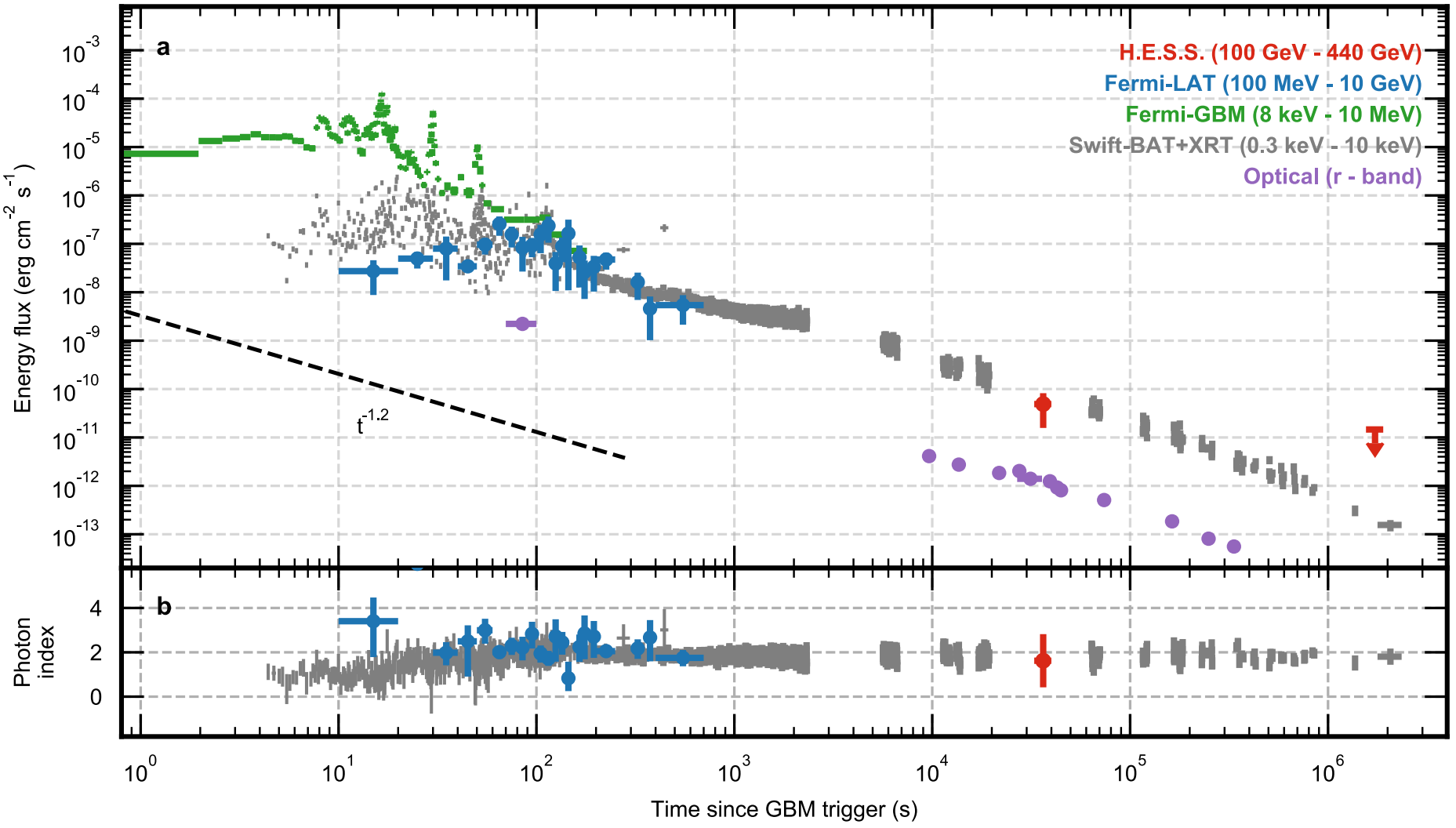
arXiv:1708.01088

Detection of GRB 180720B afterglow



Nature 575 (2019) no.7783, 464-467

Detection of GRB 180720B afterglow



Nature 575 (2019) no.7783, 464-467

Detection of GRB 190829A afterglow

GRB190829A: Detection of VHE gamma-ray emission with H.E.S.S.

ATel #13052; ***M. de Naurois (H. E.S. S. Collaboration)***
*on **30 Aug 2019; 07:12 UT***
Credential Certification: Fabian SchÃÂ¼ssler (fabian.schussler@cea.fr)

Subjects: Gamma Ray, >GeV, TeV, VHE, Gamma-Ray Burst

Tweet

The H.E.S.S. array of imaging atmospheric Cherenkov telescopes was used to carry out follow-up observations of the afterglow of GRB 190829A (Dichiara et al., GCN 25552). At a redshift of z = 0.0785 +/- 0.005 (A.F. Valeev et al., GCN 25565) this is one of the nearest GRBs detected to date. H.E.S.S. Observations started July 30 at 00:16 UTC (i.e. T0 + 4h20), lasted until 3h50 UTC and were taken under good conditions. A preliminary onsite analysis of the obtained data shows a >5sigma gamma-ray excess compatible with the direction of GRB190829A. Further analyses of the data are on-going and further H.E.S.S. observations are planned. We strongly encourage follow-up at all wavelengths. H.E.S.S. is an array of five imaging atmospheric Cherenkov telescopes for the detection of very-high-energy gamma-ray sources and is located in the Khomas Highlands in Namibia. It was constructed and is operated by researchers from Armenia, Australia, Austria, France, Germany, Ireland, Japan, the Netherlands, Poland, South Africa, Sweden, UK, and the host country, Namibia. For more details see https://www.mpi-hd.mpg.de/hfm/HESS/

publication in progress

Summary

A number of key results in TeV science

- Discovery of PeVatron in the center of Milky Way
- Detailed scan of Galactic plane
- Resolving extending sources: morphology studies, particle propagation, strength of magnetic fields, etc

Current H.E.S.S. multiwavelength activity

- Growing Target-of-Opportunity (ToO) program
- Following MWL/MM alerts and optical transients
- **Detection of GRB 180720B afterglow**
- Participation in DWF and EHT (M87) campaigns
- Common H.E.S.S. and XMM-Newton program on Galactic Center and SN1987A
- Growing number of MoUs with different experiments and observatories (e.g. HAWC)