HESS J1857+026

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Suggestion of this work : Simon Johnston Parkes Observatory.

Outline

- Analysis Overview
- Region Of Interest (ROI)
- Search for Pulsed Emission (by Marie-Hélène Grondin).
- Morphology (E > 10 GeV)
- Spectral Analysis (E > 1 GeV)
- SED Modelling (by Adam Van Etten)
- Next ?

Analysis

- Data Set : Aug 04 2008 - Feb 16 2011 (MET : 239557417 – 319532843)
- Position Center :

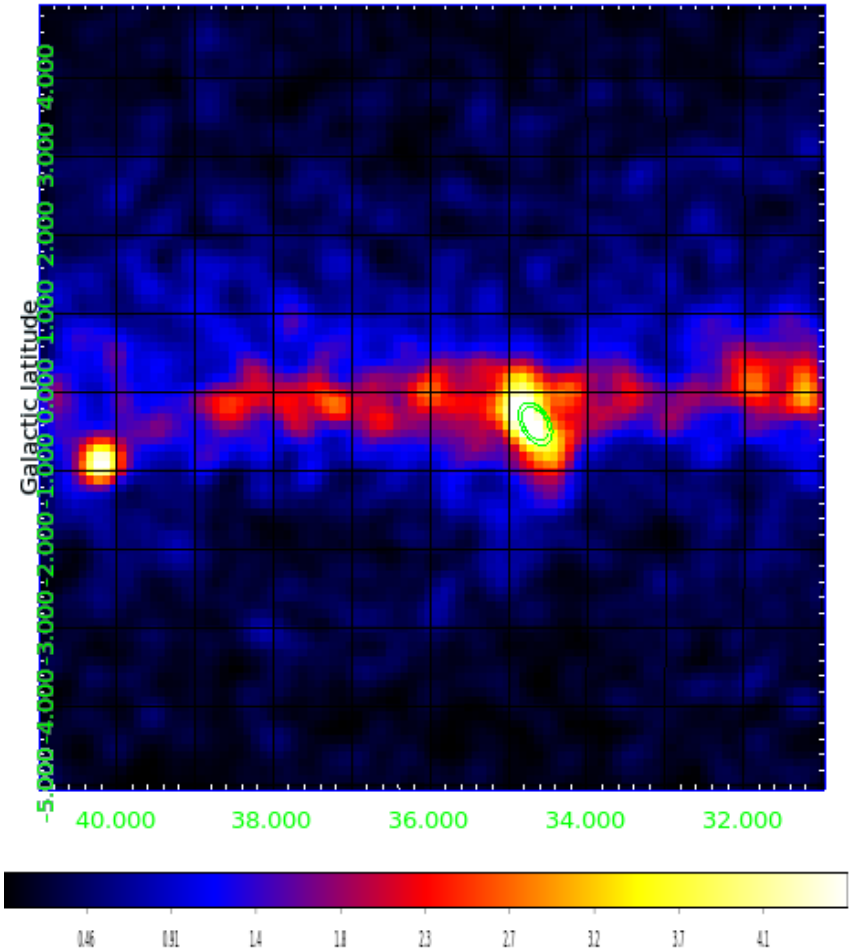
  (J2000) RA=284.30°, DEC=2.68°,

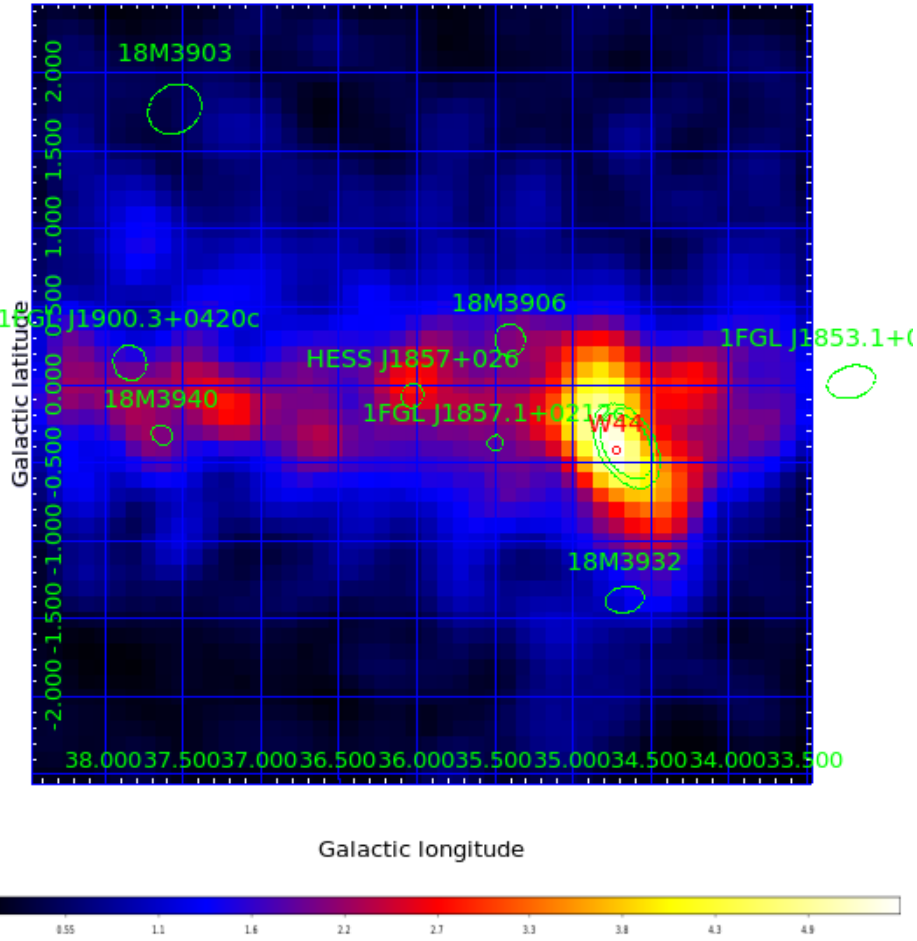
  (GAL) L=35.972°, B=- 0.056°

- Roi : 10 X 10° (gtlike) , (R=10°, gtlike)

- Science Tools : V09r21p0 + Pointlike
- Event Class : 3 – 4
- Energy range : 1GeV - 100GeV
- Z < 100°
- P6_V11_Diffuse, P6_V3_Diffuse
- 11 and 18 M catalog

Counts Map E > 6 GeV





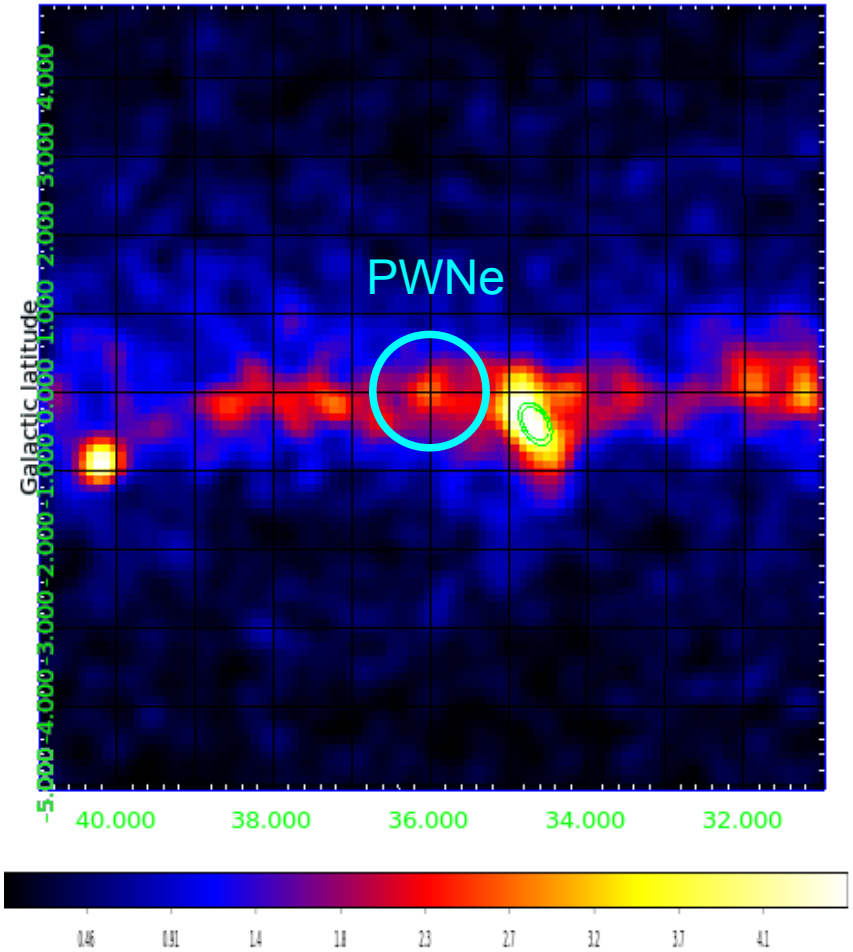
10° X 10°

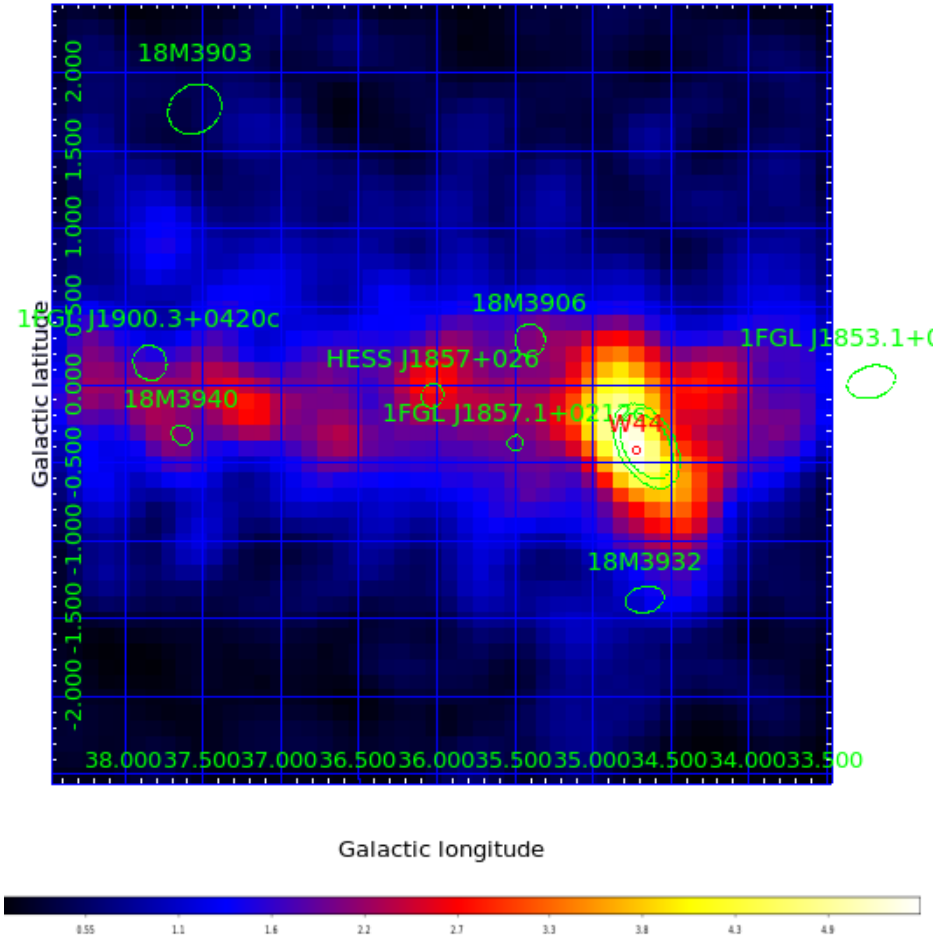
5° X 5°

Counts Map smoothed by a gaussian

W44 : Abdo, Science, 327, 1103, 2010

Counts Map E > 6 GeV





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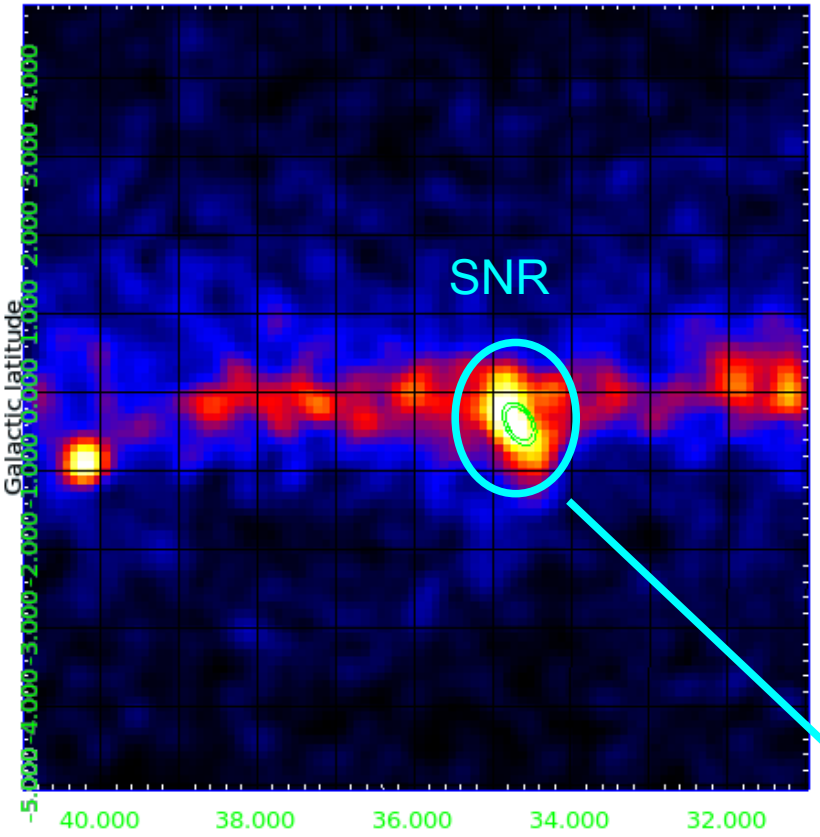
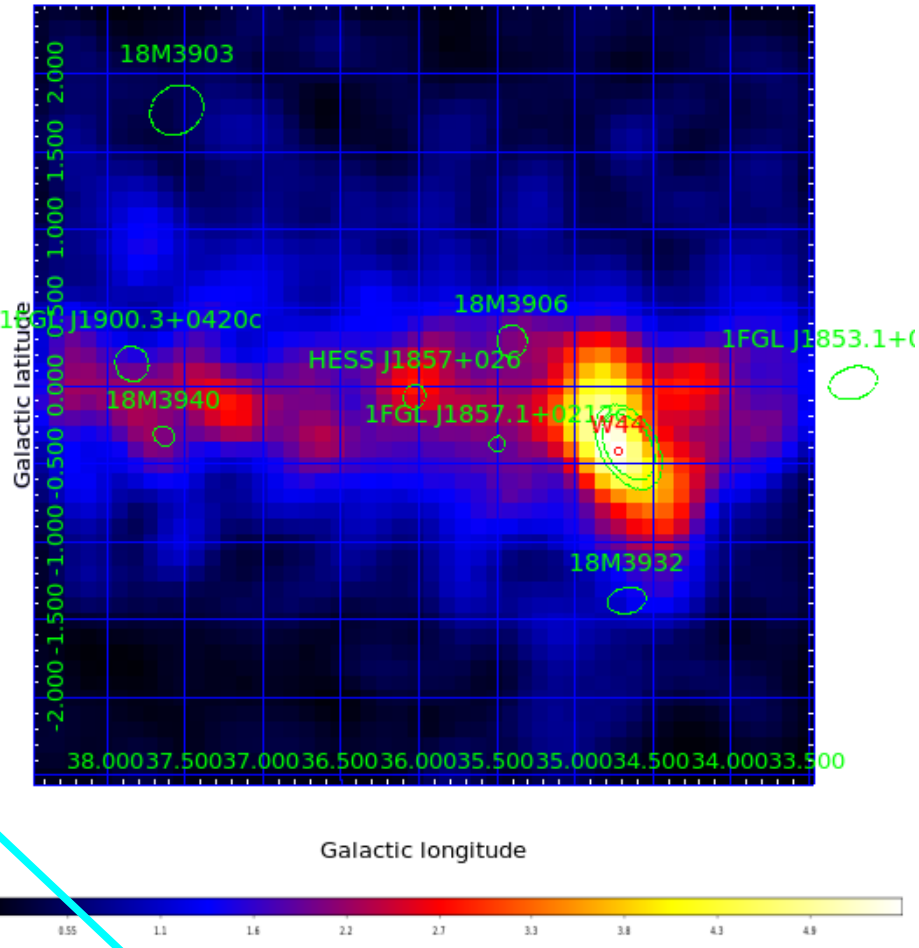




10° X 10°

5° X 5°

Counts Map smoothed by a gaussian

W44 : Abdo, Science, 327, 1103, 2010

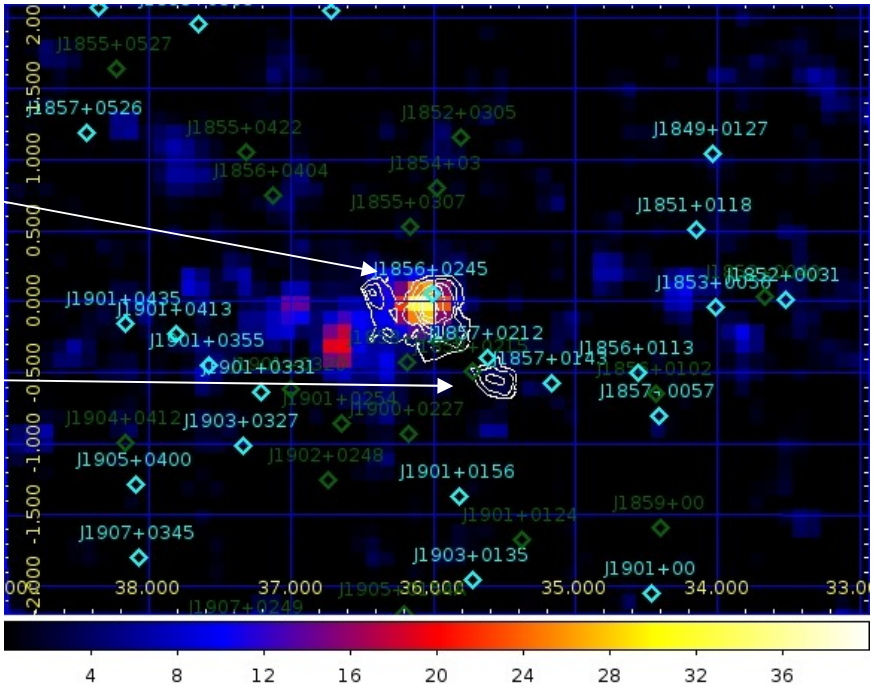
Searches for pulsed emission (I)

43 pulsars in a 3° ROI around HESS J1857+026 from which 24 pulsars monitored by radio-telescopes

- **Temporal analyses were performed for each pulsar (using TEMPO2 and ephemerides kindly provided by the Pulsar Consortium) on diffuse events only to estimate if the detected emission may suffer from any contamination by these pulsars**

HESS J1857+026

HESS J1858+020



TS Map above 10 GeV

Cyan : Pulsars monitored by radio-telescopes

Green : Other pulsars (from the ATNF database)

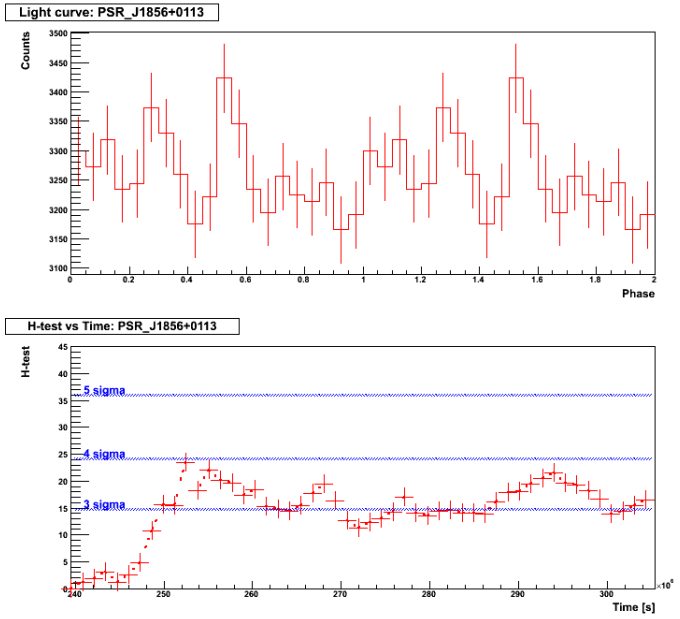
Searches for pulsed emission (II)

1 good candidate as gamma-ray pulsar found above 3 sigma (H-test):

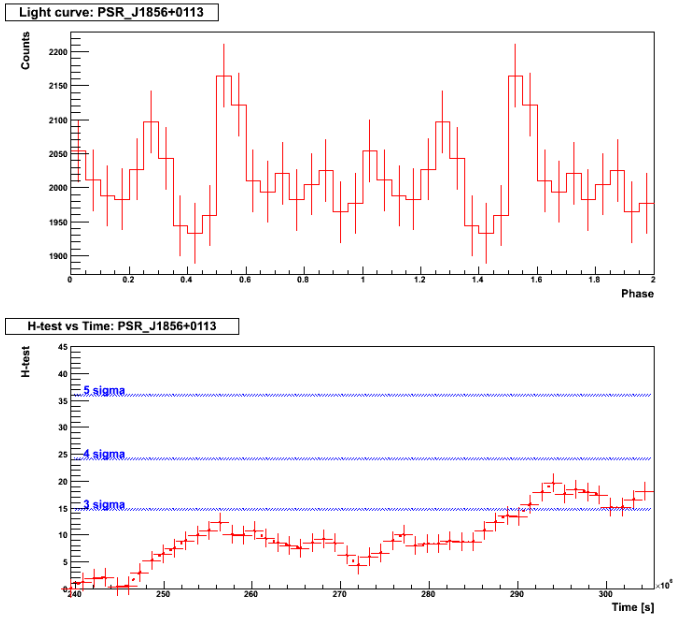
- **PSR J1856+0113 = PSR B1853+01 above 50 MeV, 300 MeV, ROI = 1.0°)**
  - **Monitored by Jodrell & Nançay**
  - **P = 0.267 s, dP/dt = 2.08e-13 s/s,**
  - **dE/dt = 4.3e35 erg/s**

Dist = 3.3 kpc
Age = 20.3 kyr

Above 50 MeV



Above 300 MeV



Searches for pulsed emission (III)

1 good candidate as gamma-ray pulsar found above 3 sigma (H-test):

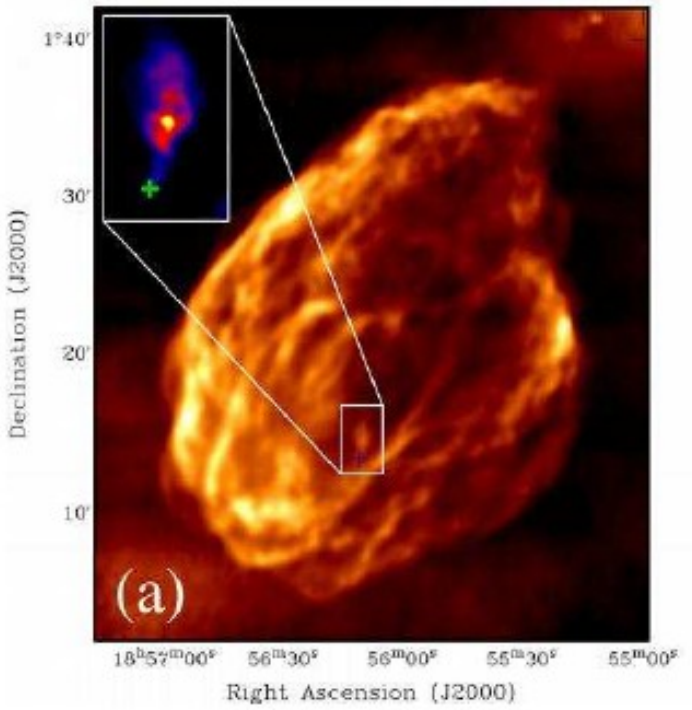
- **PSR J1856+0113 = PSR B1853+01 above 50 MeV, 300 MeV, ROI = 1.0°)**
  - **Monitored by Jodrell & Nançay**
  - **P = 0.267 s, dP/dt = 2.08e-13 s/s,**
  - **dE/dt = 4.3e35 erg/s**

Dist = 3.3 kpc
Age = 20.3 kyr

Main panel : Radio image of W44 (VLA, 1.4 GHz)

Inset: Radio image of the region surrounding the pulsar PSR B1851+01 (PSR J1856+0113, marked with a green cross, VLA, 8.4 GHz)

(Gaensler & Slane, 2006)

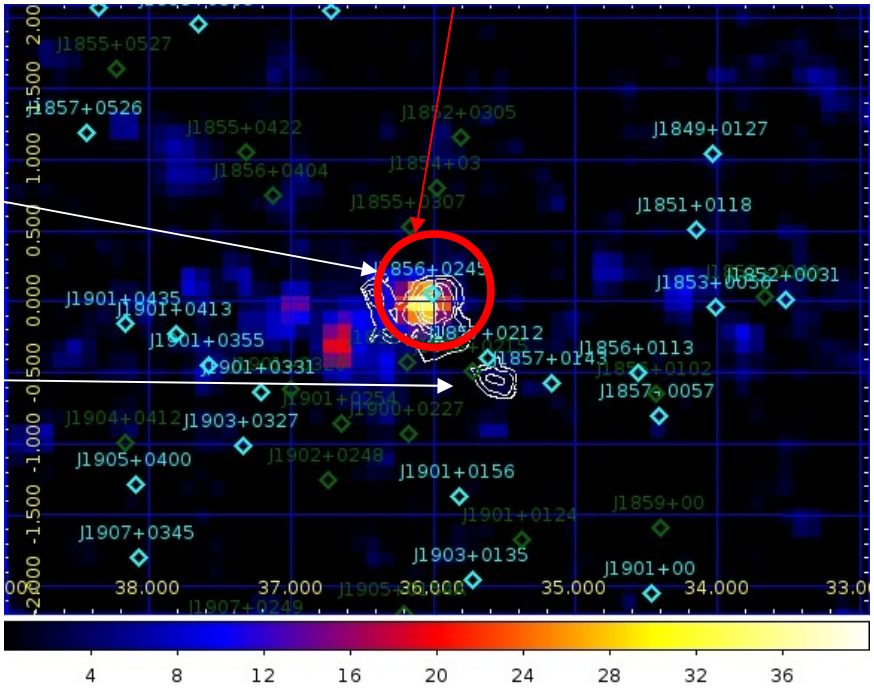


Searches for pulsed emission (IV)

No detection of the pulsar J1856+0245 which creates the PWNe

HESS J1857+026

HESS J1858+020



TS Map above 10 GeV

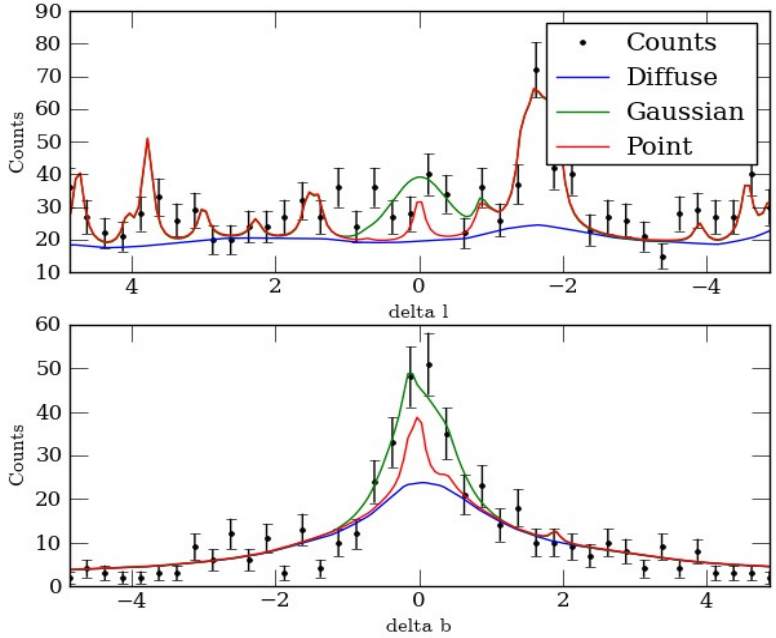
Cyan : Pulsars monitored by radio-telescopes

Green : Other pulsars (from the ATNF database)

Morphology (E > 10GeV)

Estimated with Pointlike

Type	TS	Extension (°)	gal
Point	29.9	-	1.02
Disk	57.7	0.541 (+0.082 -0.071)	1.04
Gaussian	59.02	0.374 (+0.107 - 0.083)	1.03

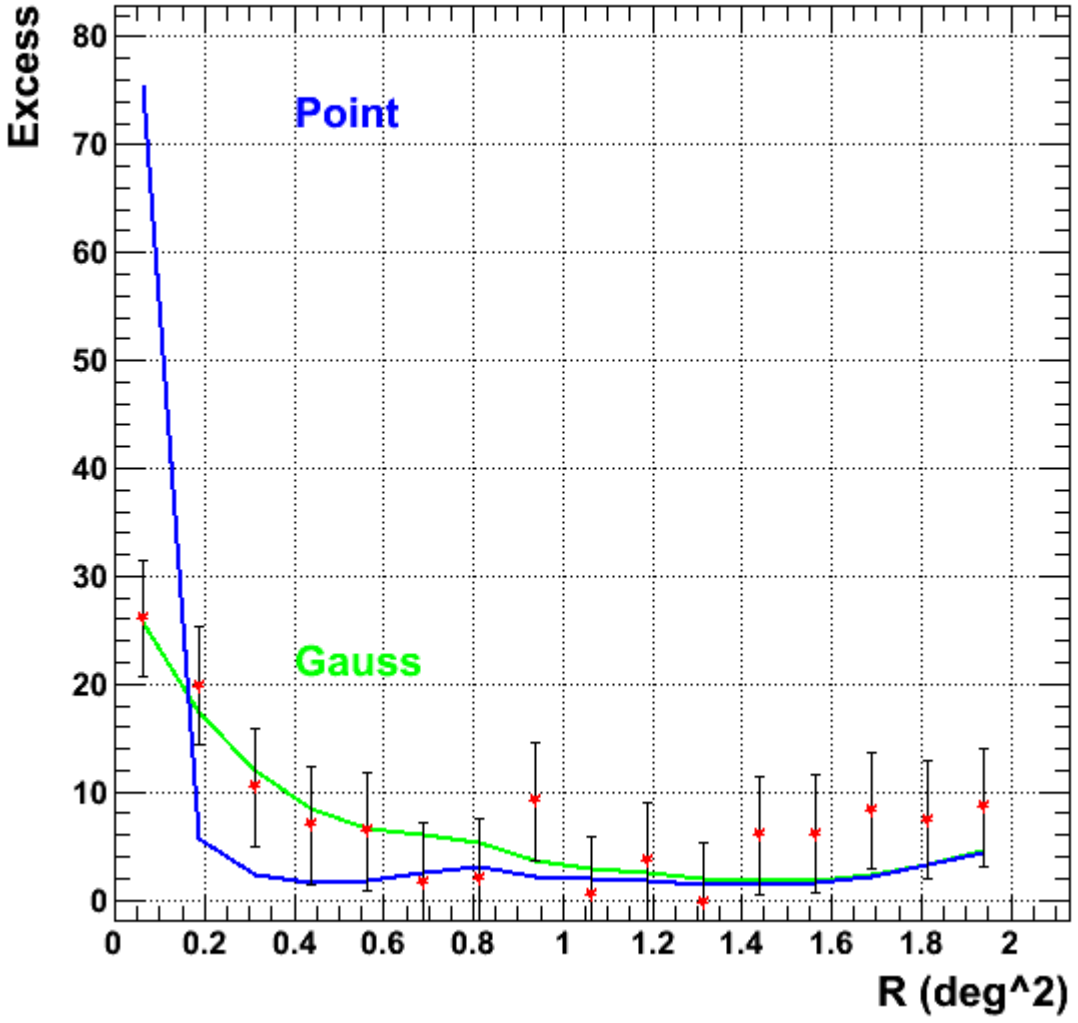


Statistical error only

Significative extension

ΔTS = 29.12 > 25

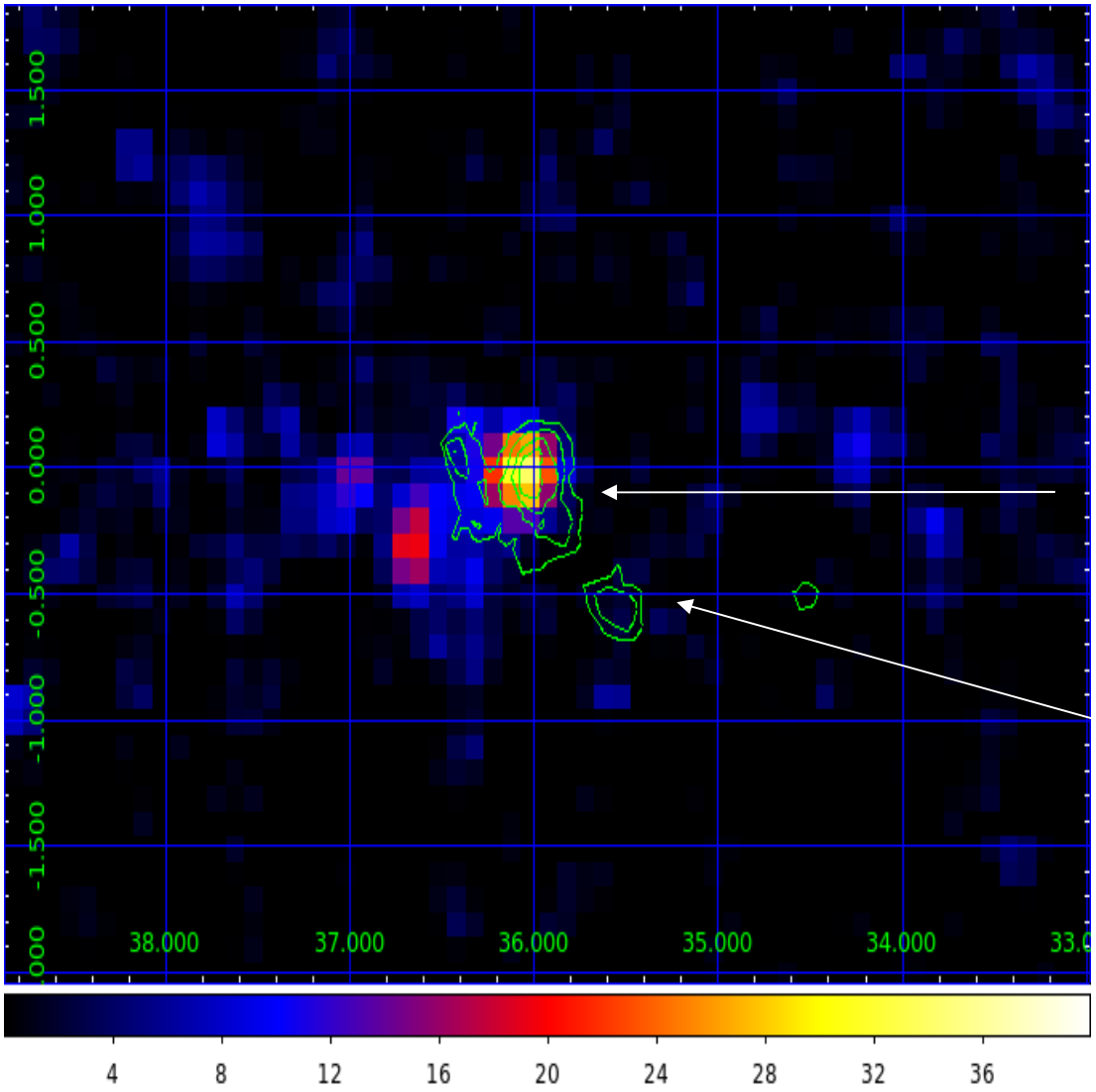
Morphology (E > 10GeV)



Radial profile excess
(counts – Diffuse)

Point Source located at the center of the gaussian and renomalized to have the same Number of counts between 0 and 0.5°²

Morphology (E > 10GeV)



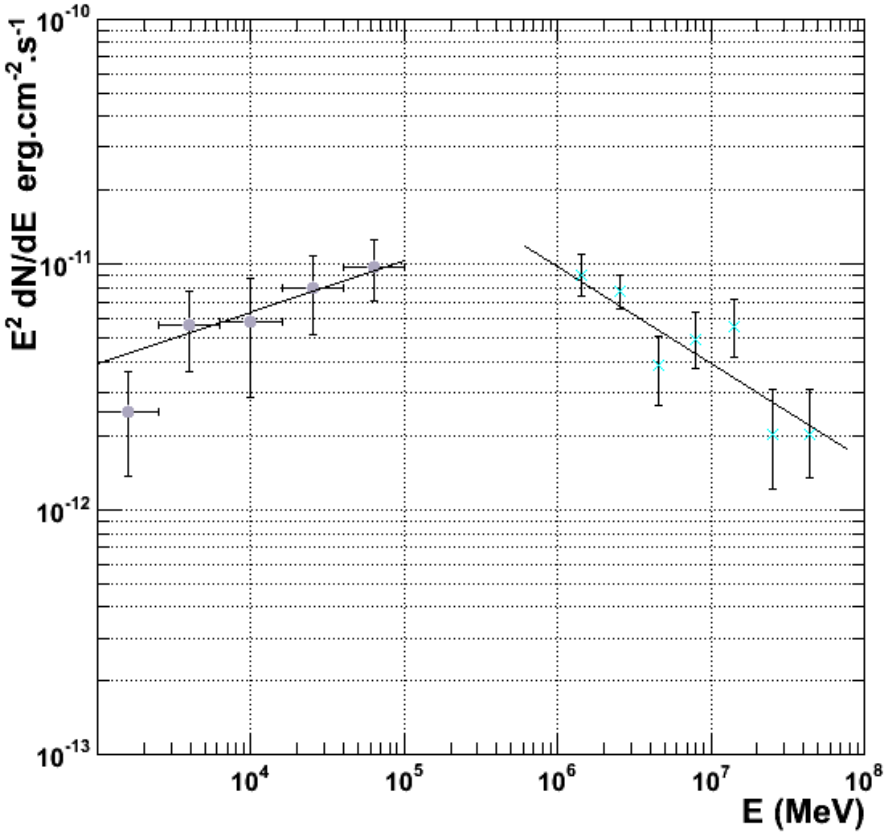
Residual TS Map obtained with pointlike by fitting all 1FGL and the diffuse backgrounds in the ROI

In Green HESS contours

HESS J1857+026

HESS J1858+020

SED



Obtain with gtlike with statistical Error bar only, using the best fitted Gaussian using pointlike (slide 8)

Pointlike : E > 100 MeV

RA(°)	DEC(°)	Ext(°)	TS	Int. Flux (ph/cm²/s)	Index	gal
284.5	3.042	0.38	138	$1.92*10^{-8}$ (+0.65 -0.59)	1.79 (+0.27 -0.23)	1.05

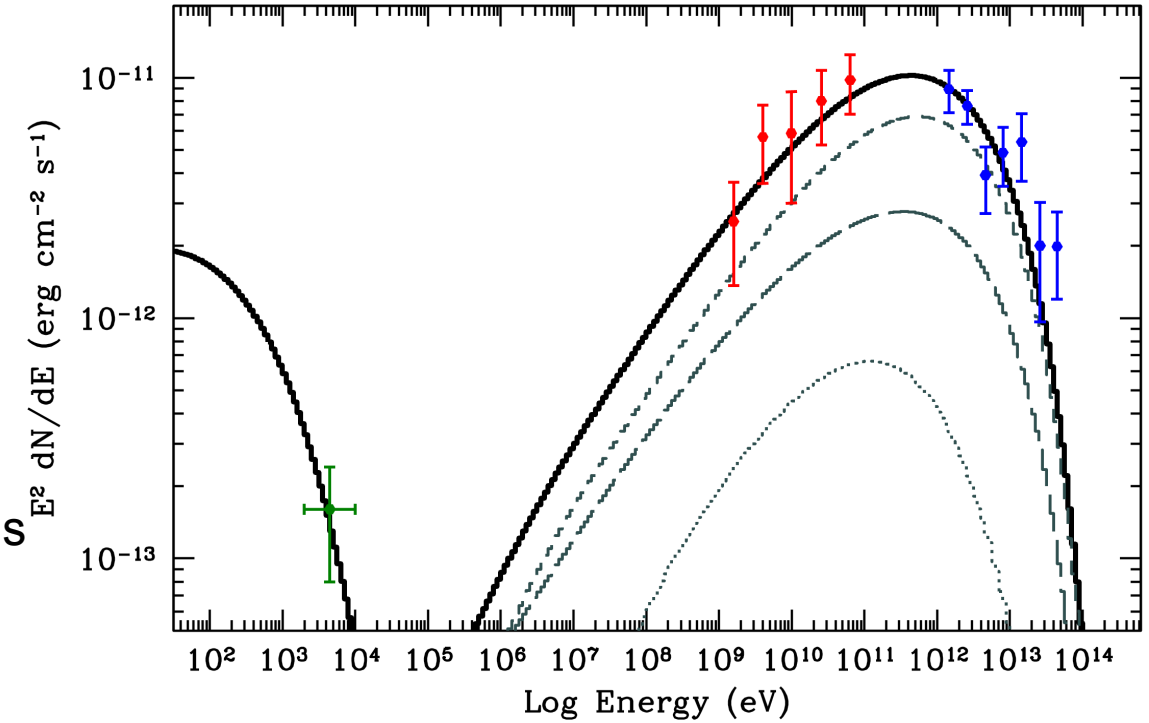
SED Modelling

- **LAT and H.E.S.S. data mesh nicely, and well constrain PWN properties**
- **We construct a time-dependent one-zone SED model with constant expansion velocity, $B \propto t^{-3/2}$, and assume a distance of 9 kpc***

- Preliminary fit:

  $\chi^2/dof = 12.2/8$

  - Final B = 2.7 μG
  - Electron slope = 2.0
  - Electron cutoff = 44 TeV
  - Initial spin period = 9.6 ms
  - Braking index = 2.4
- These parameters predict an age of 31 kyr



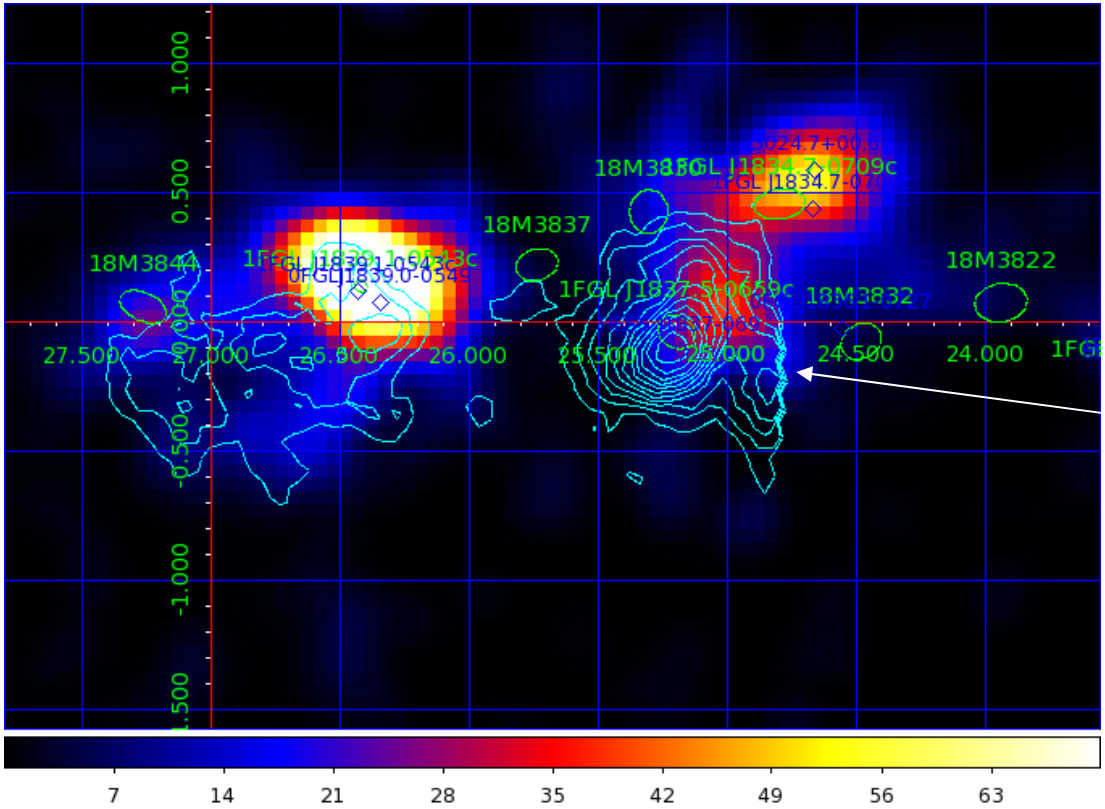
Green = ASCA X-ray, Red = LAT, Blue = H.E.S.S.

IC components : stellar (dot), IR (medium-dashed) and scattering on CMB (long-dashed)

* : Hessels, 2008

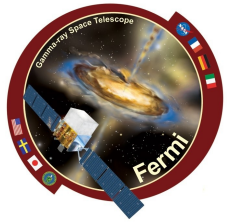
Next ?

- **Systematics, Modelling**
- **Write a letter (ApJ) with A. Van Etten (draft ~ 2month)**
- **HESS J1837-069**



Limit of the region publicly available


ermi
Gamma-ray
Space Telescope


Gamma-ray Space Telescope
Fermi

Thank you !