

The VelaX pulsar wind nebula in the TeV regime

ecap

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PHYSICS

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for the H.E.S.S. Collaboration
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Outline

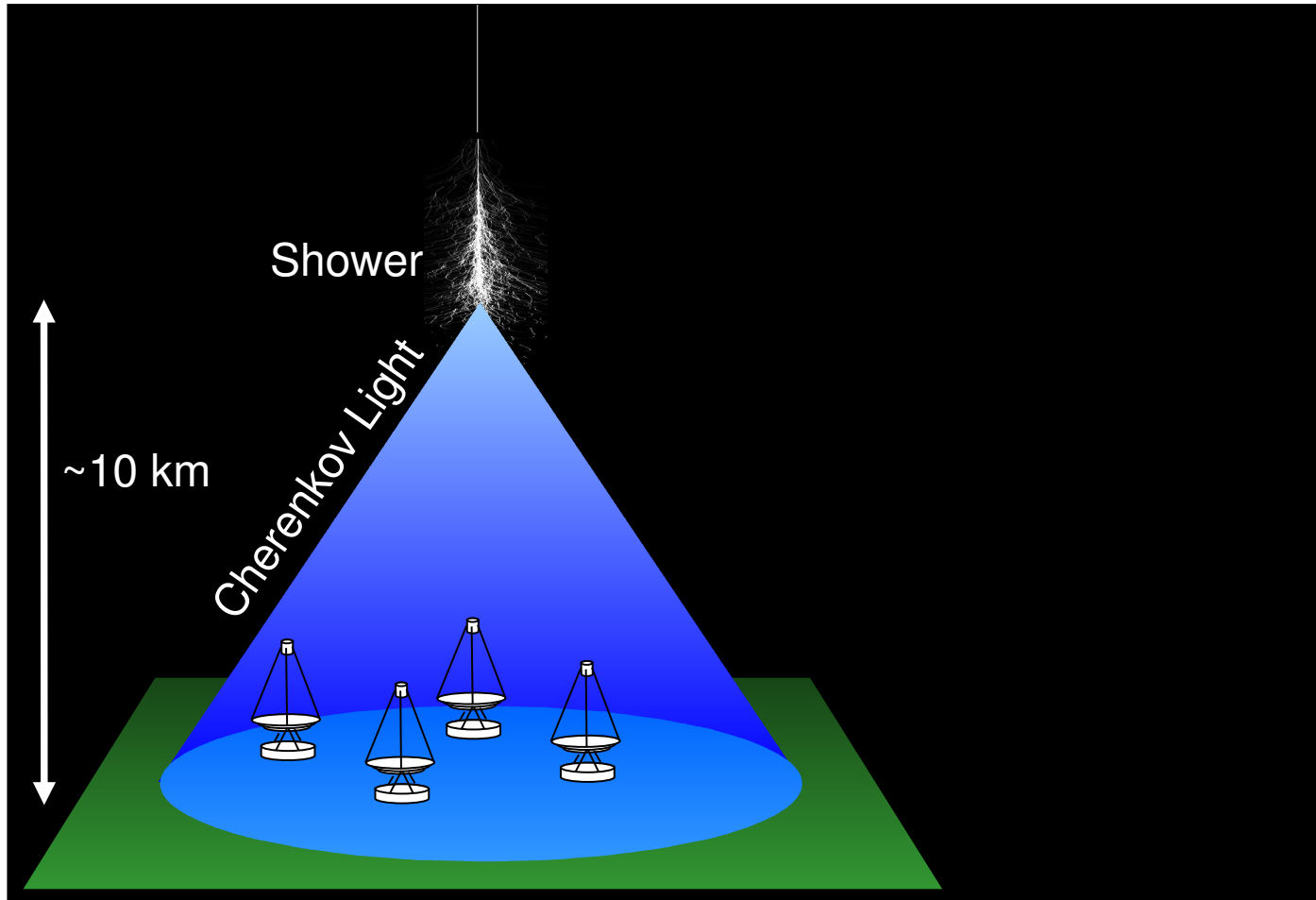
- The H.E.S.S. Experiment
- Results for PWN VelaX from observation 2004 to 2006
- Follow up observations and first results

The High Energy Stereoscopic System (H.E.S.S.)

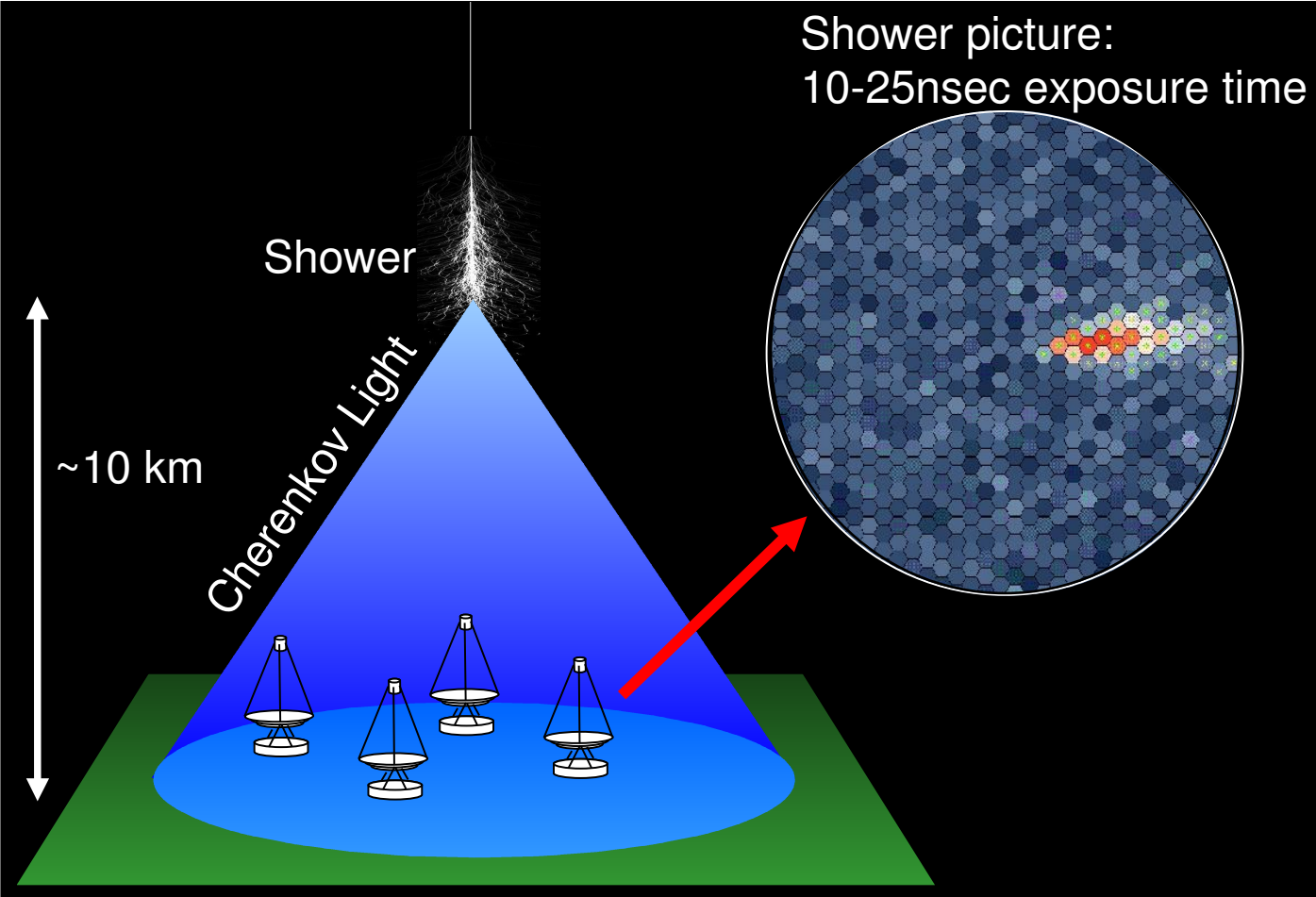


- Field of view: 5deg, no flat acceptance
- Energy threshold: ~ 100 GeV
- Angular resolution: $< 0.1^\circ$
- Flux sensitivity: 5σ in 25 h for 1% Crab
- System trigger rate ~ 200 Hz (mostly background)

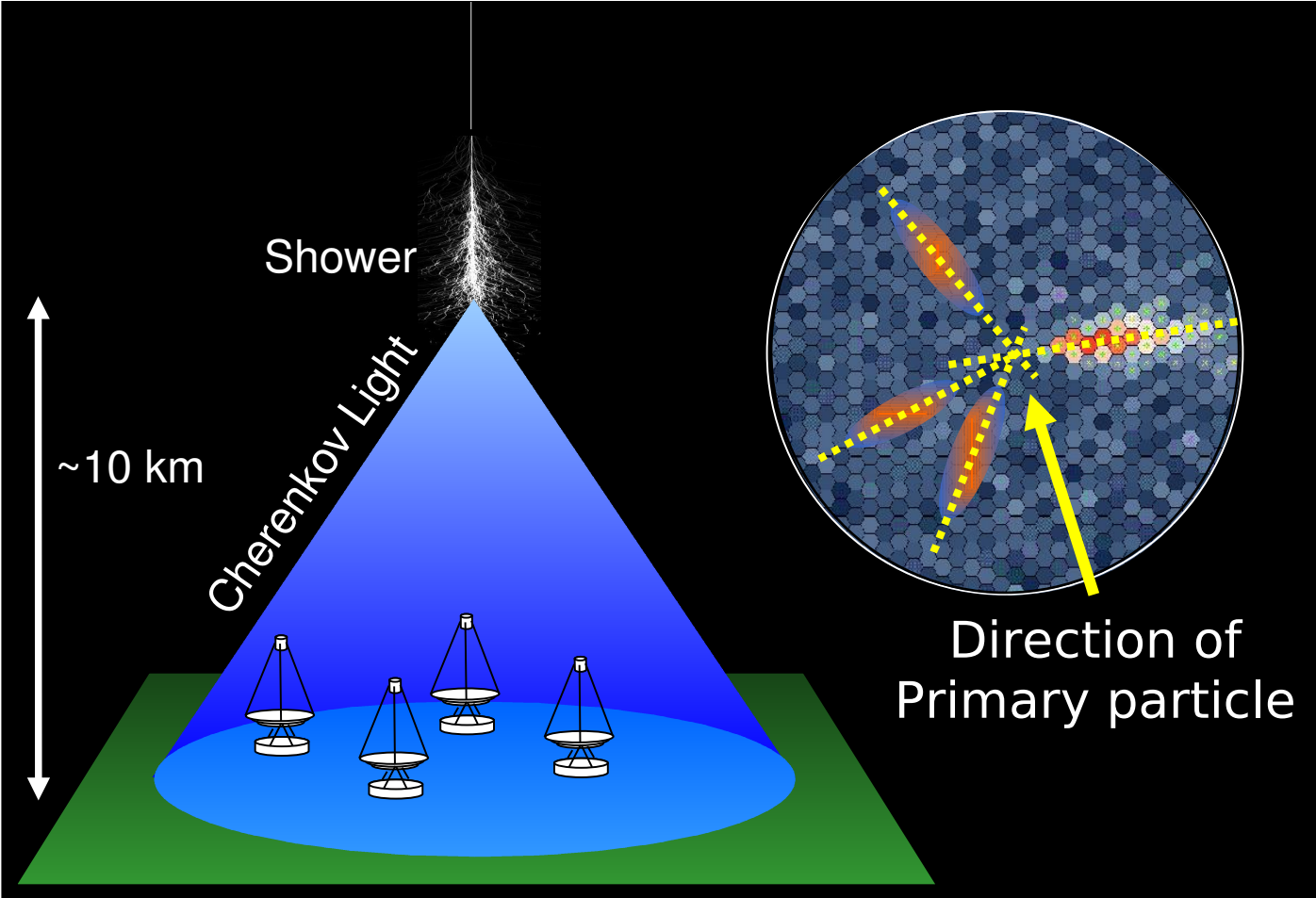
Detection of VHE Gamma Rays



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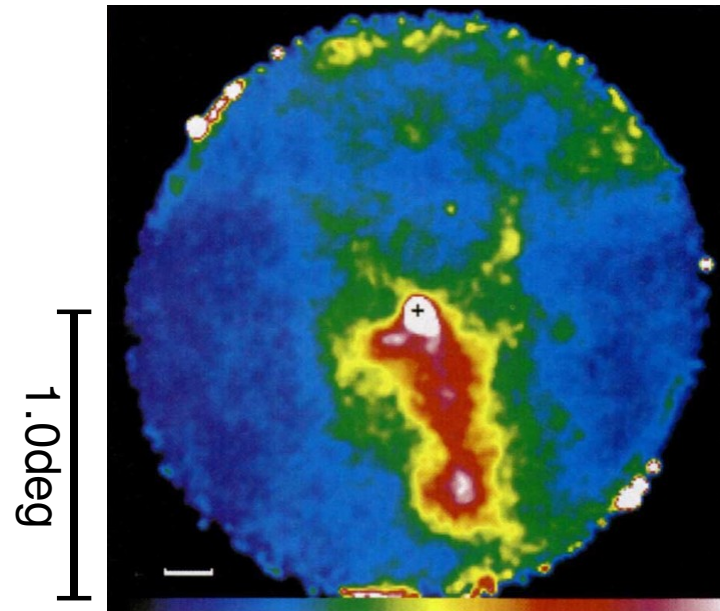
The VelaX

The pulsar PSR B0833-45:

- RA = 08h35m20
Dec = $-45^{\circ} 10' 34.8751''$
- Period: 89.3 ms
- Characteristic Age:
 $11.3 \cdot 10^3$ years
[ATNF Pulsar Catalogue]
- Distance: 287 pc
[Dodson et al, ApJ 596, 1137]

The extended pulsar wind nebula
("cocoon"):

- ROSAT centered on pulsar
- Energy range: 0.9-2.0 keV
[Markwardt, Ögelmann, 1995]

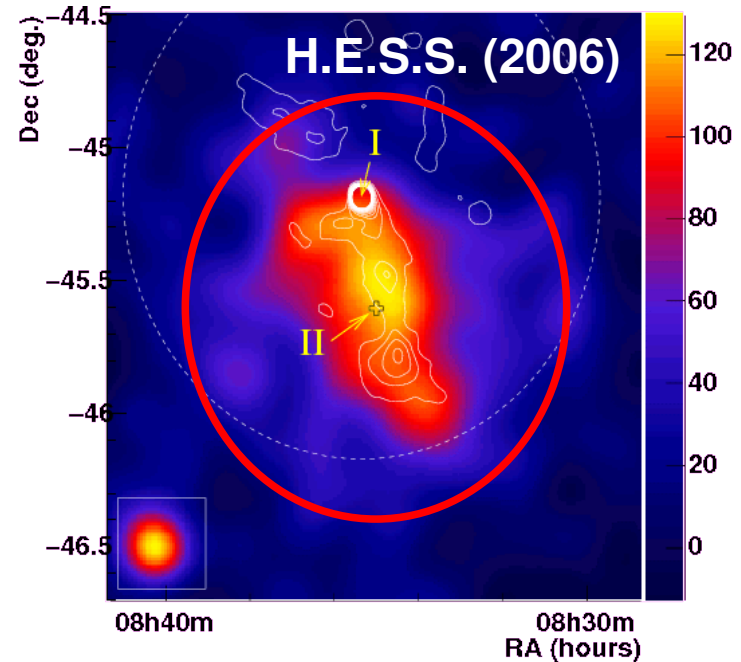
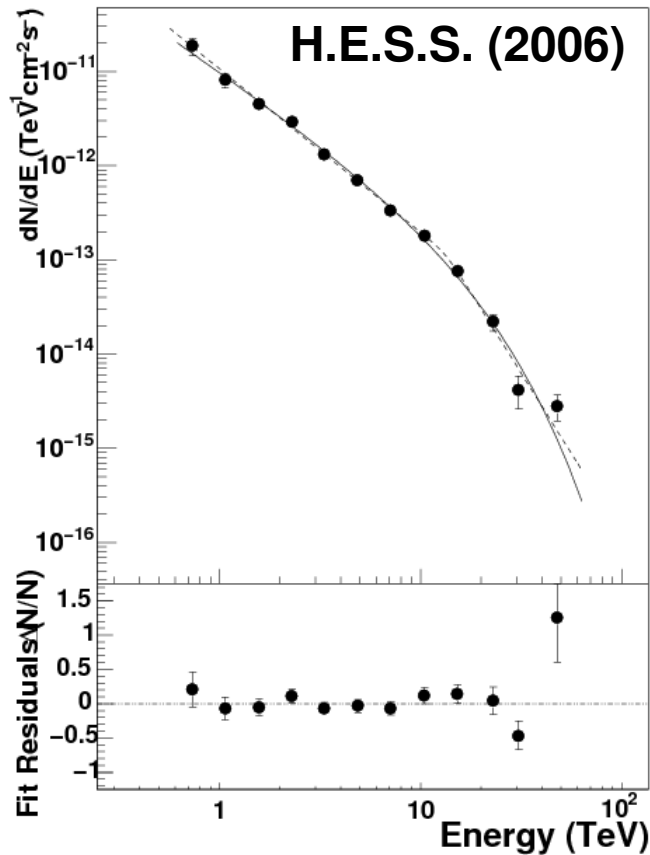


H.E.S.S. VelaX Observation 2004 to 2006

- 16.4h data taken in 2004 to 2006
- Backsubtraction: OnOff
The background is estimated from separate runs under comparable observation conditions (e.g. zenith angle).
- extended TeV source to the south of the pulsar
width along major axis 0.48deg (2dim Gaussian model, intrinsic)
- Within an integration radius of 0.8deg:
1.9k excess events, 16.7σ , S/B ~ 0.22
- spectrum power law with exponential cutoff
cutoff at $13.8 \pm 2.3_{\text{stat}} \pm 4.1_{\text{sys}}$ TeV, spectral index 1.45 ± 0.1

[Aharonian, F. et al, 2006, A&A, 448, L43, astro-ph/0601575]

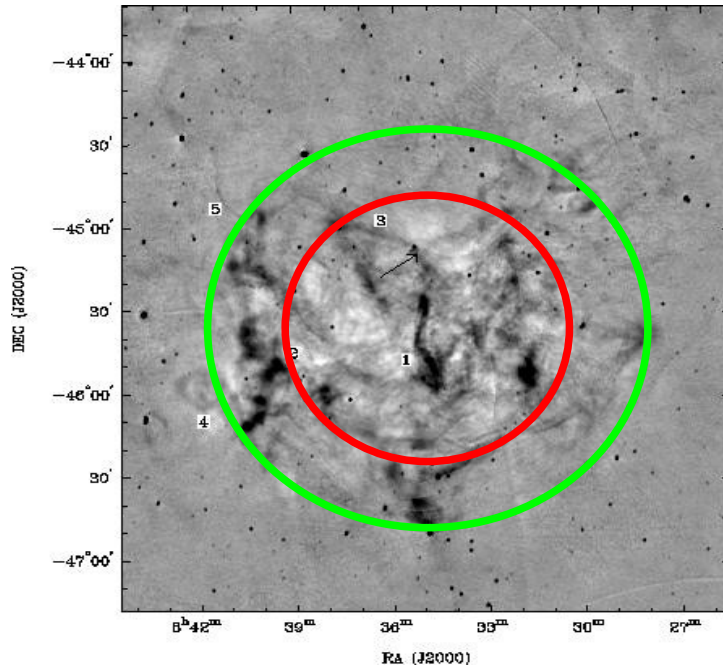
H.E.S.S. VelaX Observation 2004 to 2006



- I. Vela Pulsar
- II. integration radius **0.8deg**
- III. white lines: ROSAT

[Aharonian, F. et al, 2006, A&A, 448, L43, astro-ph/0601575]

Extended radio emission in the VelaX region



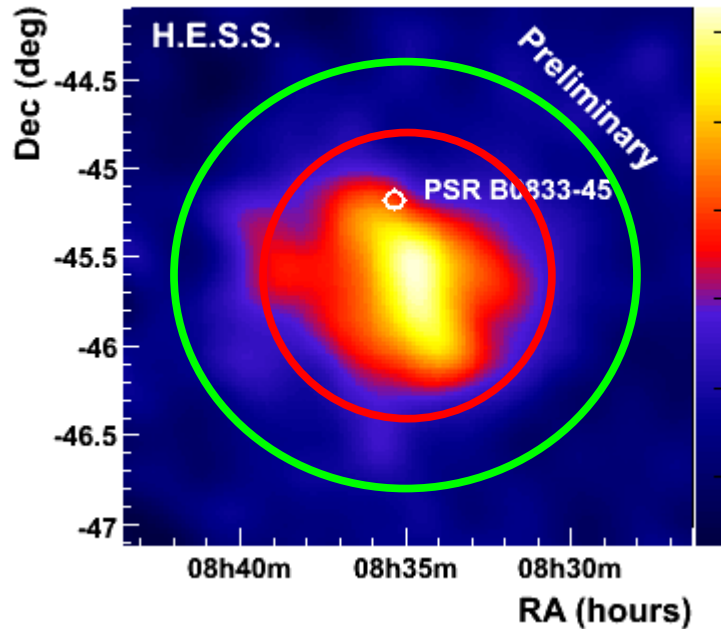
- 0.8deg integration radius for TeV emission
- Radio emission within a radius of ~1.2deg

→ Follow up observation with H.E.S.S. until 2009

High resolution radio survey at 843 MHz, Molonglo Observatory Synthesis Telescope

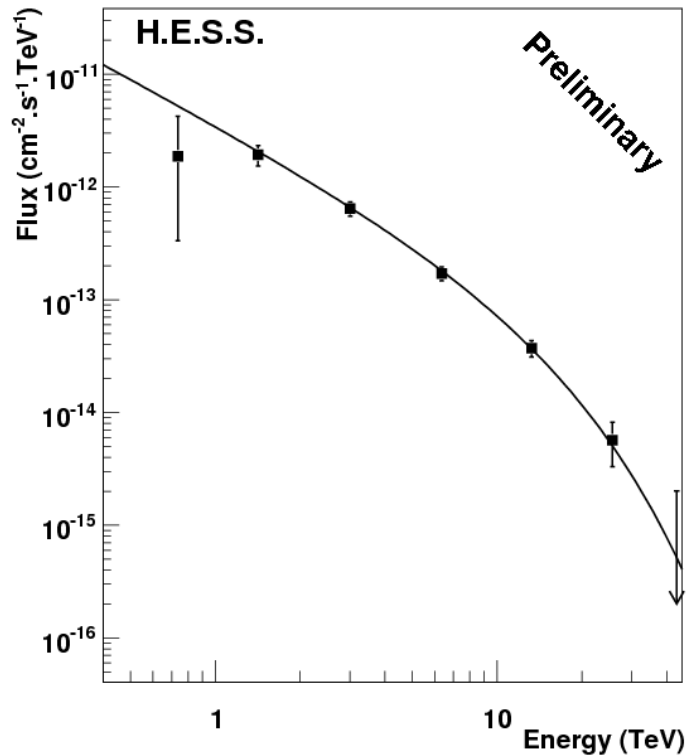
[Bock et al., 1998]

Follow up observations with H.E.S.S.



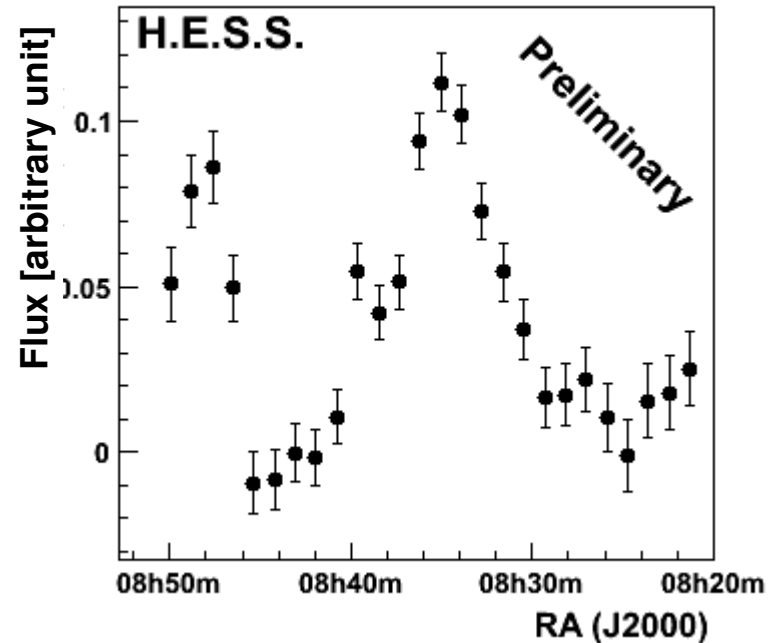
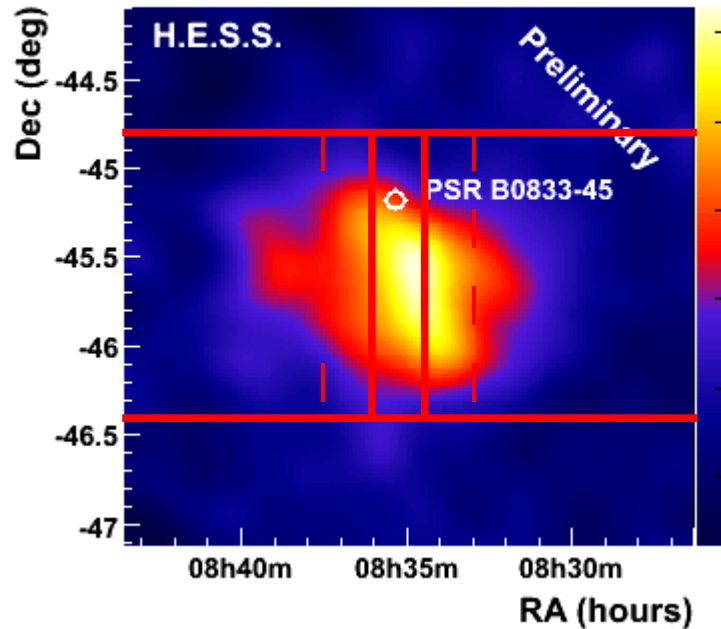
- Additional 42h of new data (after quality selection)
- In all 58h of data between 2004 and 2009
- 7.6k excess events detected within a radius of **1.2deg**, 28.4σ , $S/B \sim 0.24$
- Thereof 2.1k events between 0.8-1.2deg, 11.0σ

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- Preliminary TeV spectrum of the ring extension (0.8-1.2deg) has shape compatible with that of whole PWN

Follow up observations with H.E.S.S.



- Profile along right ascension direction
- Box width 1.6 deg
- Beside VelaX, northern parts of Vela Junior SNR are included

Summary

- Large extended TeV has been detected from the VelaX pulsar wind nebulae. New data allows to obtain new exciting results.
- There will be an ICRC proceeding on arxiv in a few days.
- Detailed paper, coming soon ...

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