TeV Shells in the
H.E.S.S. Galactic Plane Survey

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on behalf of the H.E.S.S. Collaboration

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Montpellier, France
The TeV Galactic plane from Namibia
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The 5-tel hybrid Cherenkov telescope array

4 12-m IACTs w/ recoated mirrors + 1 28-m IACT
(camera electronics upgrade in progress)

CT5: 2048 PMTs  614 m²  3.2° FoV  $E_{\text{min}} \sim 0.02$ TeV  $f = 38$ m

vs. 5.0° FoV (CT1-4)
TeV Horizon
1% & 10% Crab Sensitivity
$\gamma$-ray significance

$E_\gamma > 1 \text{ TeV}$
γ-ray significance

H.E.S.S. (2015) Preliminary

E_γ > 1 TeV

See poster **Sushch+ (H.E.S.S.) (S1.21) – Vela Jr SNR**

*Deep H.E.S.S. Observations of the SNR RX J0852.0-4622*
$\gamma$-ray significance

$E_\gamma > 1$ TeV

See poster Puehlhofer+ (H.E.S.S.) (S1.17) – RX J1713 SNR
New constraints on the TeV SNR shells RX J1713.7-3946 & HESS J1731-347
Significance

\( \gamma \)-ray significance

See poster Puehlhofer+ (S1.17) – HESS J1731 SNR

New constraints on the TeV SNR shells RX J1713.7-3946 & HESS J1731-347

\( E_\gamma > 1 \text{ TeV} \)
γ-ray significance (zoom-in)

Full-detail TeV sky images, catalog, & MWL associations

See paper Abramowski+ (H.E.S.S.) 2016 – RCW 86 SNR

Detailed spectral & morphological analysis of the shell type SNR RCW 86
HGPS firm identifications

MWL counterparts:
- **Pulsars** (ATNF), **PWN** (SNRcat), **SNRs** (SNRcat), **HE sources** (1FHL, 3FGL)

* doesn't include SN 1006 (outside HGPS)

N.B. associations (spatial coincidences) vs. identifications

77 H.E.S.S. preliminary

- **PWN**: 12
- **SNRs**: 8
- **COMP**: 7
- **Binary**: 3
- **Not firmly identified**: 47
HGPS firmly identified SNRs

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5 / 8 firm IDs → shell-like in TeV gamma-rays
HGPS firmly identified SNRs

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5 / 8 firm IDs → shell-like in TeV gamma-rays
HESS J1534-571

Discovered during a systematic search for shell-like TeV morphologies in the HGPS

Target morphology:
Azimuthally-symmetric, homogeneous, projected 3D shell

Null hypothesis:
2D symmetric Gaussian

$p = 6.4 \times 10^{-3}$
HESS J1534-571

Discovered during a systematic search for shell-like TeV morphologies in the HGPS

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Azimuthally-symmetric, homogeneous, projected 3D shell

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VHE data
57 h live-time
9.3 \( \sigma \) significance
outer radius \( \sim 0.40^\circ \)

(spectrum will be provided in paper in preparation)
New radio SNR candidate discovered during MGPS-2

843 MHz
51 x 38 arcmin
“extremely faint oval region”
6 mJy/beam
no obvious match w/ MIR
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X-ray dark

No ROSAT counterpart
(E < ~2.4 keV)

Follow-up Suzaku observations (PI: Bamba)
4 x 40 ks
Excludes non-thermal X-ray emission
at current X-ray satellite sensitivity level
Previously discovered (2009) but suspected to be PWN

Azimuthally-symmetric, homogeneous, projected 3D shell

\[ P = 1.7 \times 10^{-6} \text{ (vs Gaussian)} \]

VHE data

122 h (6x previous dataset)

17 \sigma significance

outer radius \( \sim 0.49^\circ \)

(spectrum will be provided in paper in preparation)
Previously discovered (2009) but suspected to be PWN

Azimuthally-symmetric, homogeneous, projected 3D shell

\[ P = 1.7 \times 10^{-6} \] (vs Gaussian)

**VHE data**

122 h (6x previous dataset)

17 \( \sigma \) significance

outer radius \( \sim 0.48^\circ \)

(spectrum will be provided in paper in preparation)

*No radio counterpart*

(e.g. not covered by MGPS-2, FIRST)

*Energetic PSR also complicates firm ID*

(e.g. but not known PWN either)

*X-rays uncertain*
HESS J1614-518

Previously discovered (2006) very bright unID source

Azimuthally-symmetric, homogeneous, projected 3D shell
P = 3.1 \times 10^{-6} (vs Gaussian)

VHE data
34 \sigma significance
outer radius \sim 0.42^\circ

(spectrum will be provided in paper in preparation)

GeV emission
Lower E counterpart
3FGL & 2FHL extended GeV source
(Acero+15) Fermi/LAT
Summary

Decade-long H.E.S.S. I Galactic Plane Survey completed
  Legacy paper in preparation, close to submission
  Final catalog, high-level FITS data release ready, incl. spectra
  16 new source discoveries & a few new source candidates
  MWL associations & firm IDs, incl. shell SNRs
  Coupled w/ population studies (SNRs, PWNe) & new TeV shells

H.E.S.S. still discovering new shell-type SNRs via TeV $\gamma$-rays
  HESS J1534-571
  $\rightarrow$ matching radio counterpart G323.7-1.0
  $\rightarrow$ no non-thermal X-rays: suggests emission dominantly hadronic

  HESS J1912+101
  $\rightarrow$ new SNR candidate

  HESS J1614-518
  $\rightarrow$ new SNR candidate
  $\rightarrow$ promising GeV counterpart