

Observation of burst activity from SGR1935+2154 associated to first galactic FRB with H.E.S.S.

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SGR and FRB

Soft Gamma-ray Repeaters (**SGR**) and Anomalous X-ray Pulsars (**AXPs**) are associated with highly magnetized neutron stars or magnetars.

Fast radio bursts (**FRBs**) are powerful radio pulses with a duration of several milliseconds with high brightness temperatures suggesting a coherent emission mechanism

SGR1935+2154 burst activity

Discovered in 2014, most active SGR, dozens of bursts in past few years.

Active period in 2020:

gamma-ray:

Fermi-GBM, INTEGRAL, HXMT, AGILE, Swift-BAT, NuSTAR, NICER/XTI, Konus-Wind radio CHIME, STARE2, FAST

upper limits:

optical (BOOTES, MeerLicht)
very-high-energy gamma (H.E.S.S.)

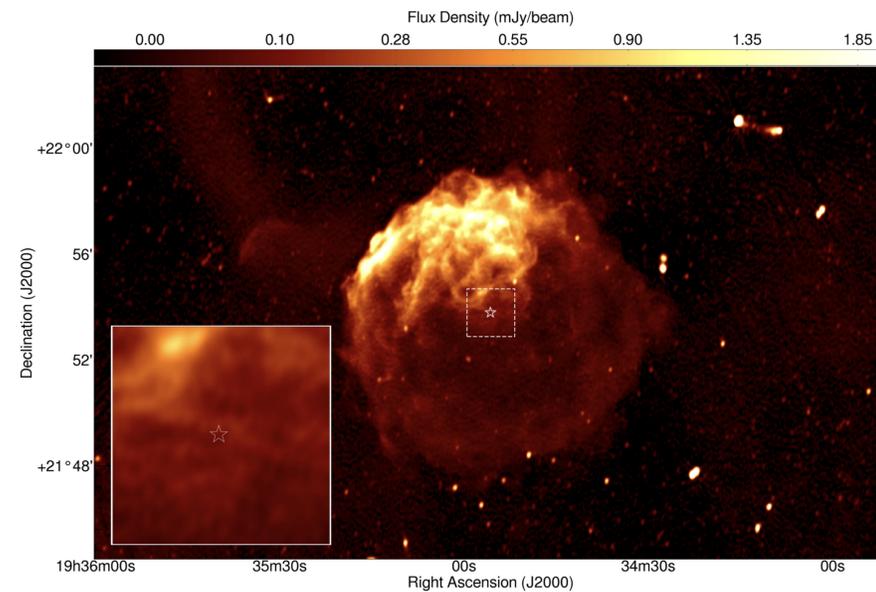
High Energy Stereoscopic System

System of four imaging atmospheric Cherenkov telescopes (IACTs) with 12-m reflectors (CT1-4) + 28-m reflector telescope (CT5) Namibia, 23°16'17"S 16°30'00"E, 1800 m a.s.l.

H.E.S.S. observations of SGR1935+2154

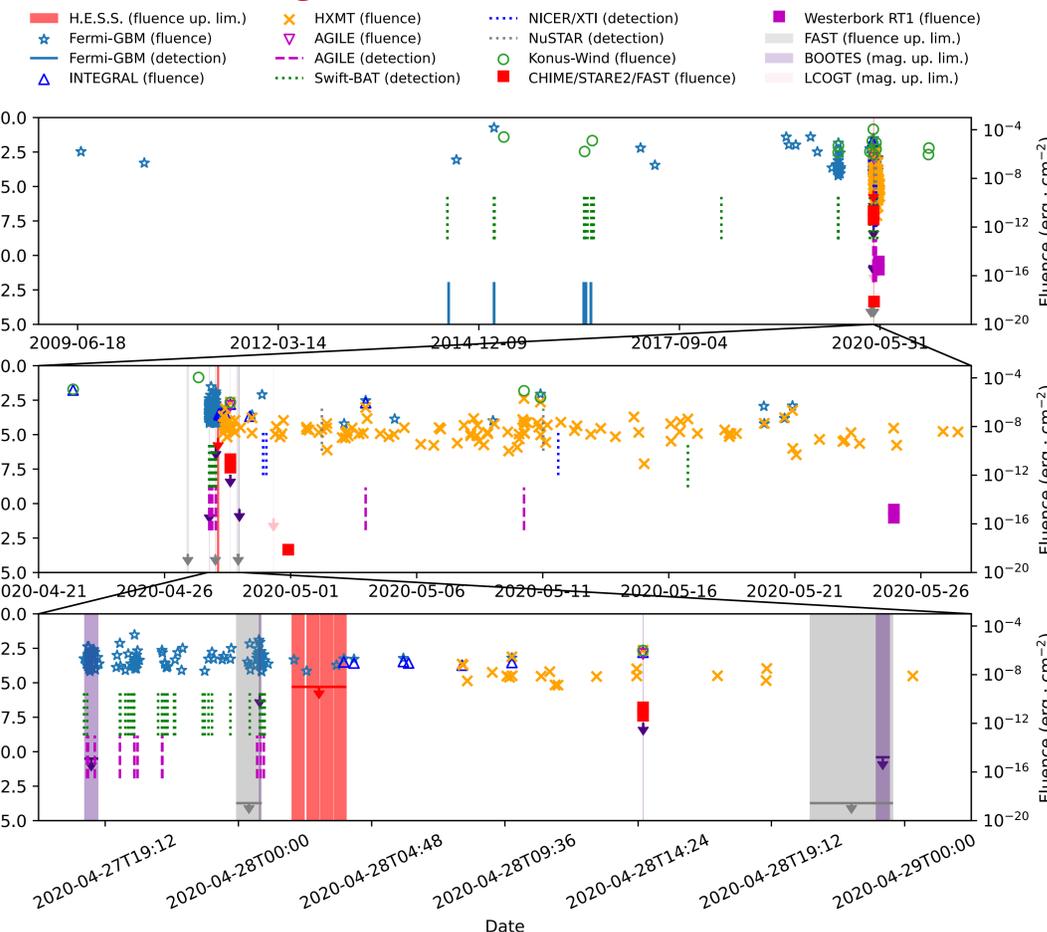
Start time (UTC)	Duration	Average zenith angle
2020-04-28 01:55:00	28 min	55.0 deg
2020-04-28 02:26:55	28 min	51.0 deg
2020-04-28 02:56:08	28 min	48.1 deg
2020-04-28 03:25:24	28 min	46.2 deg

Table: Summary of the H.E.S.S. observations of SGR 1935+2154. The observations overlapped with magnetar bursts detected by INTEGRAL and *Fermi*-GBM.

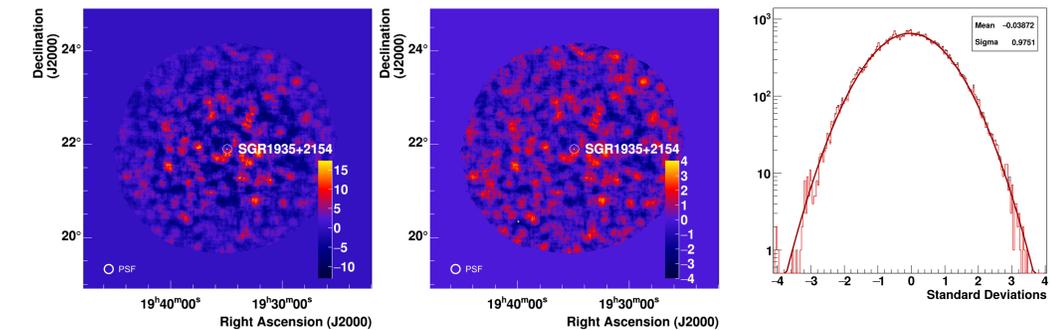


MeerKAT observations of SGR J1935+2154 marked with a star, embedded in the emission from SNR G57.2+00.8
Credit: M. Bailes et al. Multi-frequency observations of SGR J1935+2154 Mon.Not.Roy.Astron.Soc. 503 (2021) 4, 5367-5384m

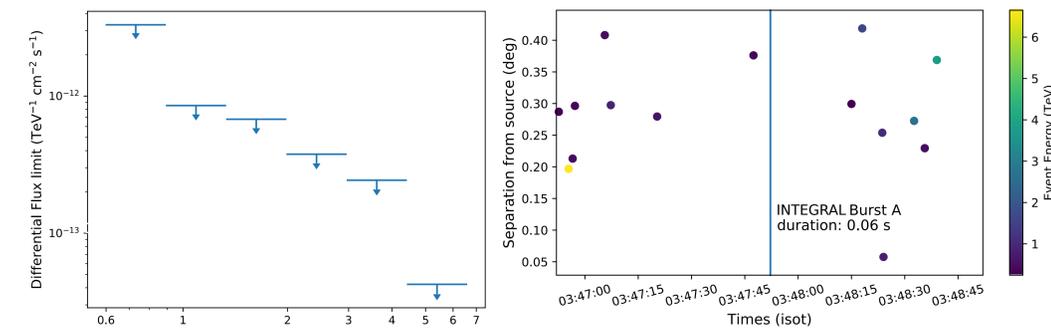
Multiwavelength observations of SGR1935+2154



H.E.S.S. has observed SGR1935+2154 during its bursting activity, no total excess detected. The transient search for short-scale excess or gamma-ray candidates coincident with INTEGRAL and Fermi-GBM detects no emission.



Excess (left) and significance (center) maps for SGR1935+2154 reconstructed by H.E.S.S. One-dimensional significance distribution (right) shows no detection



Left: Differential 95% C.L. upper limits derived from the H.E.S.S. observational data taken on SGR1935+2154. Right: VHE gamma candidates detected by H.E.S.S. from SGR1935+2154 at the time of the X-ray burst A detected by INTEGRAL.

Summary

- First VHE observations of a magnetar in an active state
- No significant emission detected
- Obtained upper limits on the VHE emission in agreement with existing SGR models
- Prompt follow-up observations of magnetar bursts as novel way to study FRBs
- H.E.S.S. sensitivity well suited to study gamma-ray counterparts to FRB and restrict/confirm several models

Acknowledgments:

<https://www.mpi-hd.mpg.de/hfm/HESS/pages/publications/auxiliary/HESS-Acknowledgements-2021.html>

