Localising the H.E.S.S. Galactic Centre point source

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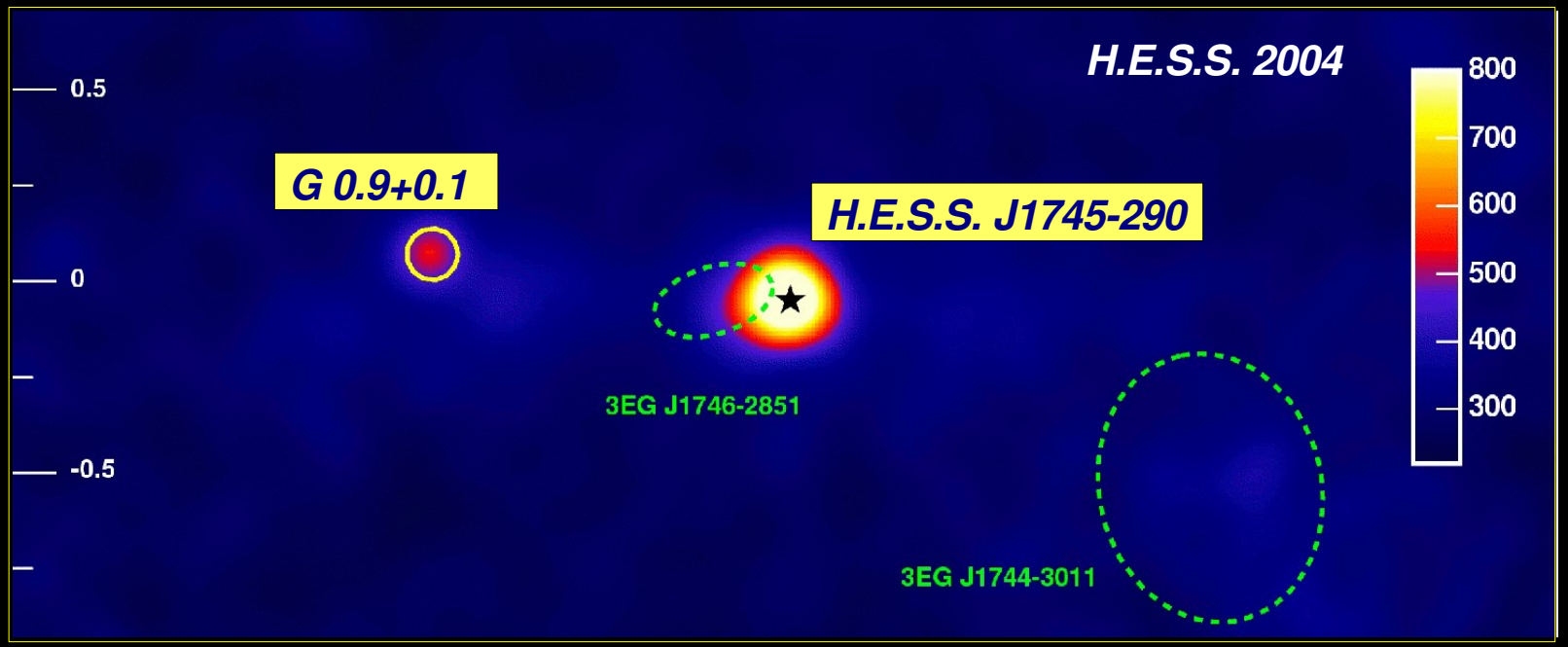
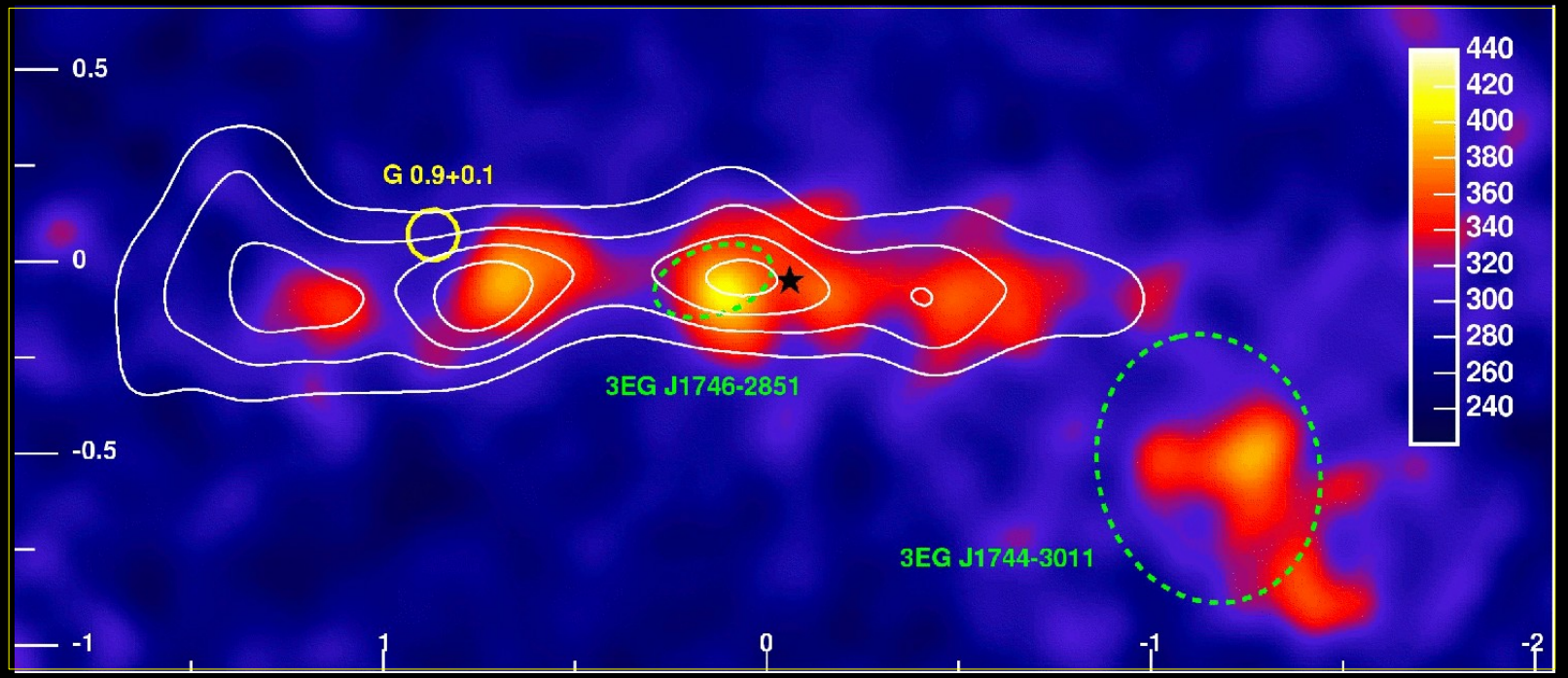
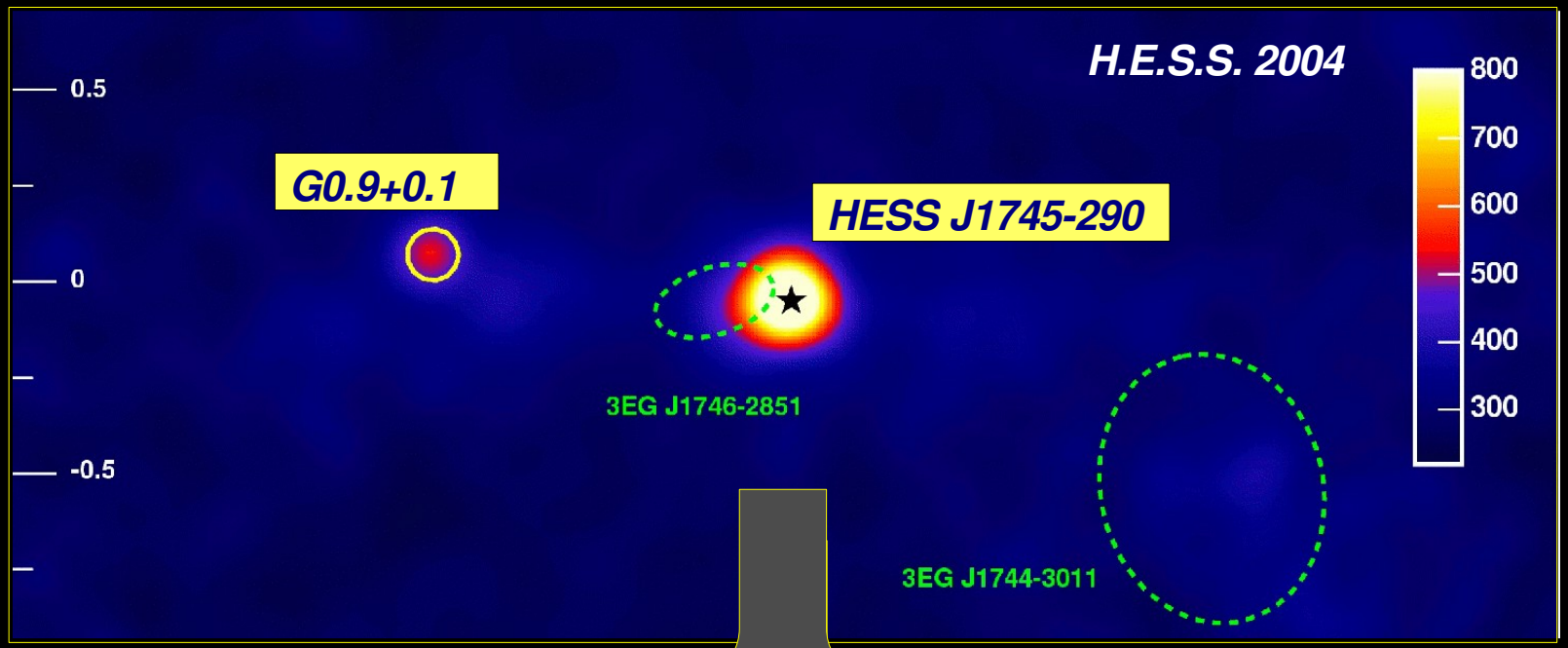
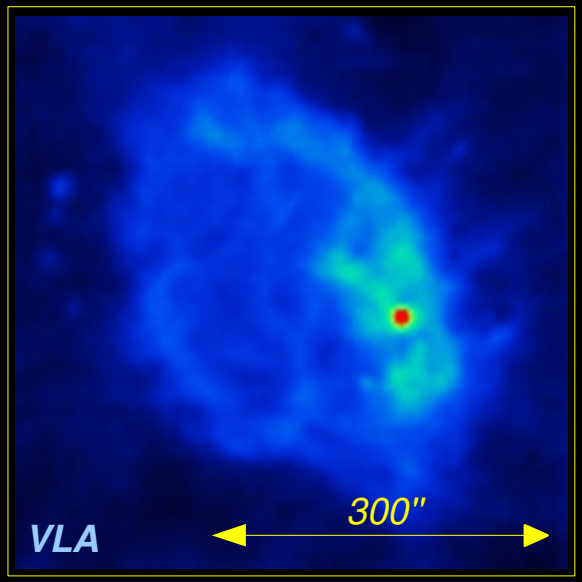
Astro-Teilchenphysik

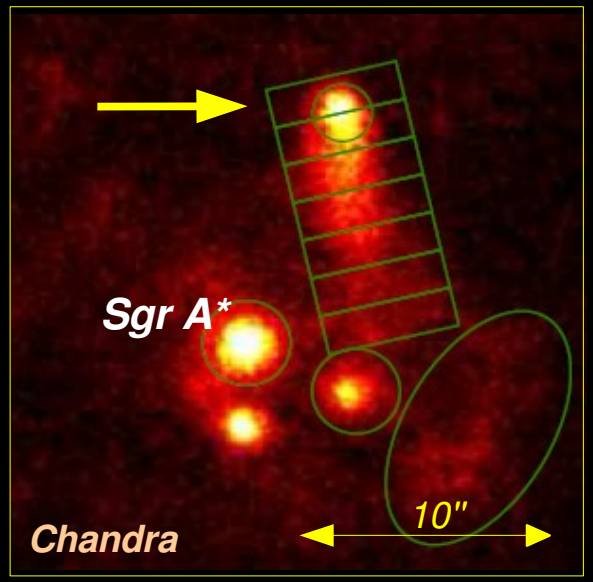
Großgeräte der physikalischen Grundlagenforschung


H.E.S.S. 2004
G 0.9+0.1
H.E.S.S. J1745-290
3EG J1746-2851
3EG J1744-3011
0.5
0
-0.5
800
700
600
500
400
300


G 0.9+0.1
3EG J1746-2851
3EG J1744-3011
0.5
0
-0.5
-1
1
0
-1
-2
440
420
400
380
360
340
320
300
280
260
240





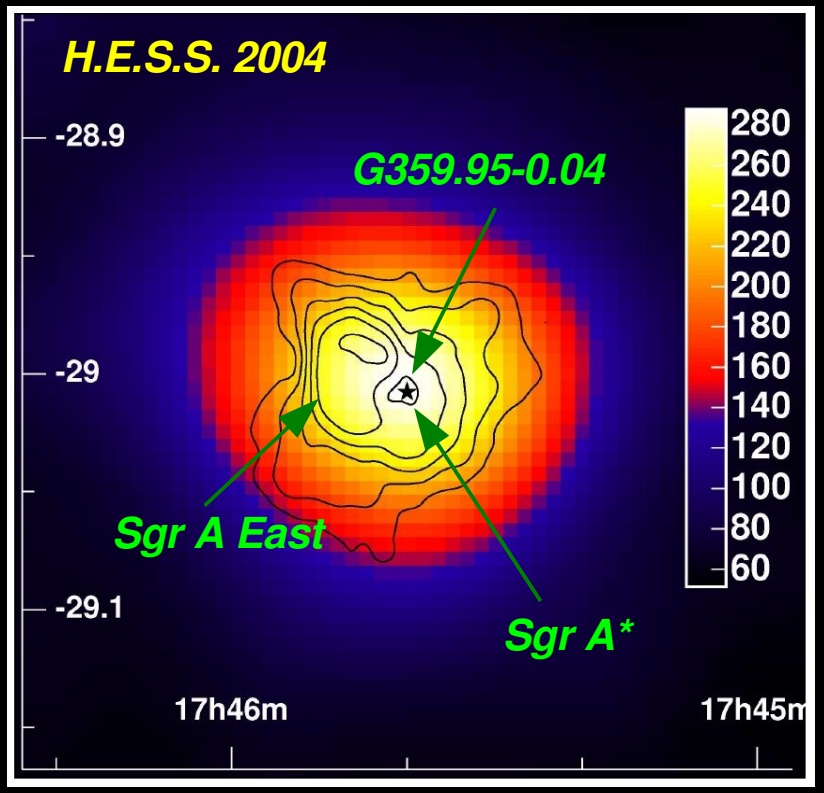


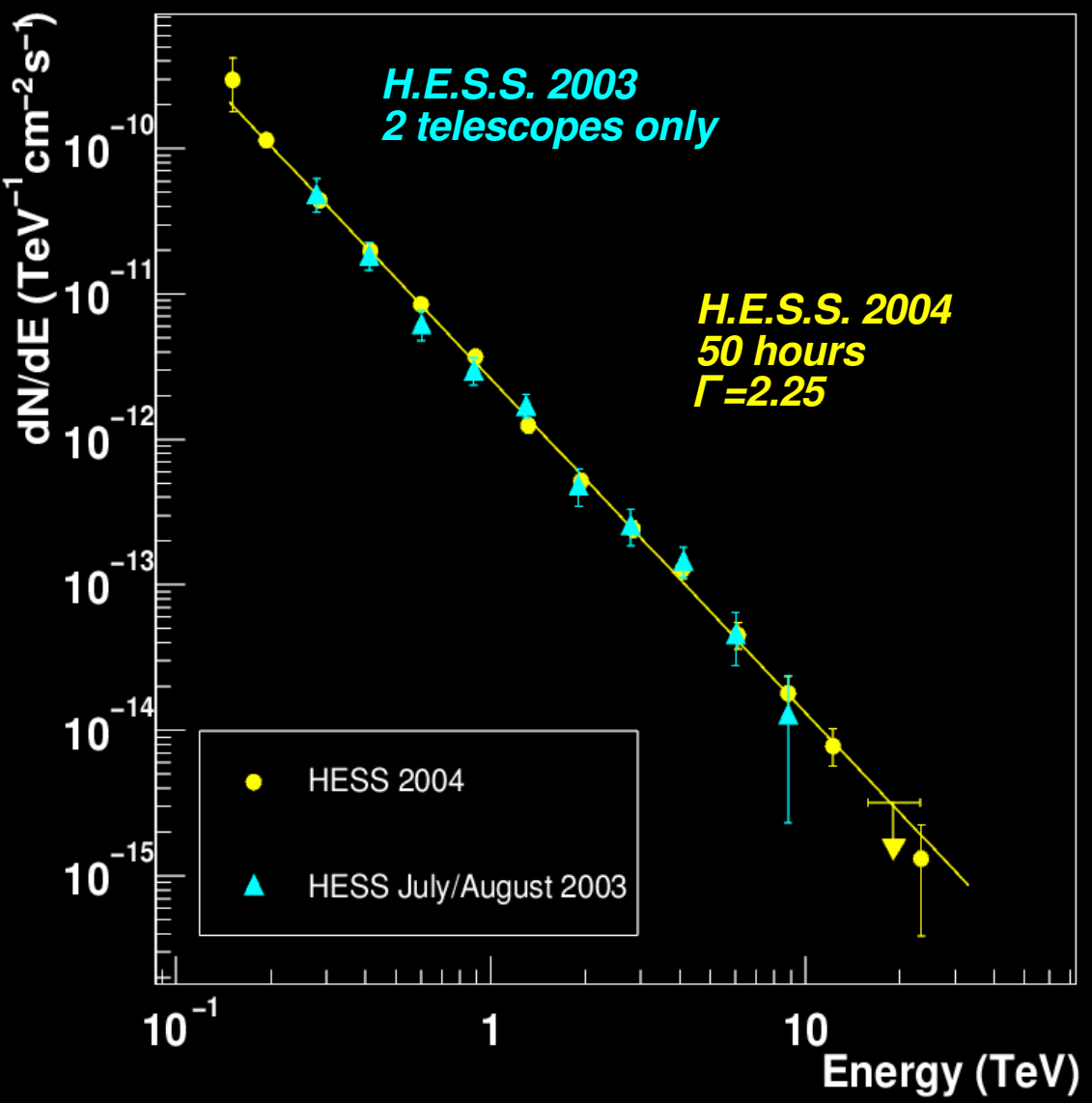
SNR Sgr A East?

SMBH Sgr A* ?

PWN G359.95-0.04?

Galactic Centre source HESS J1745-290





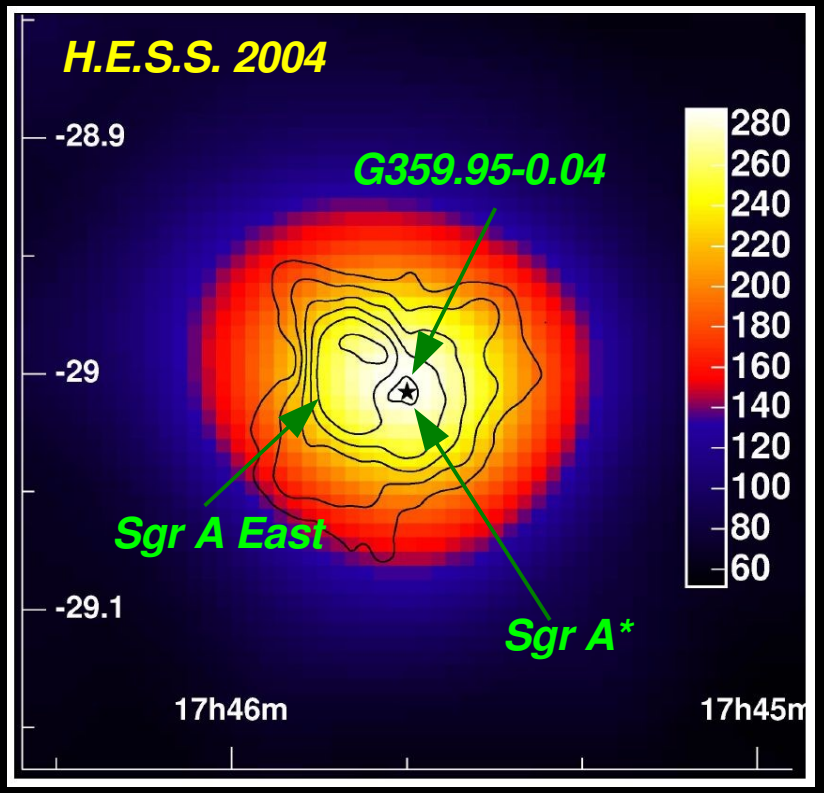
- *hard spectrum (Γ=2.25)*
- *pure power-law*

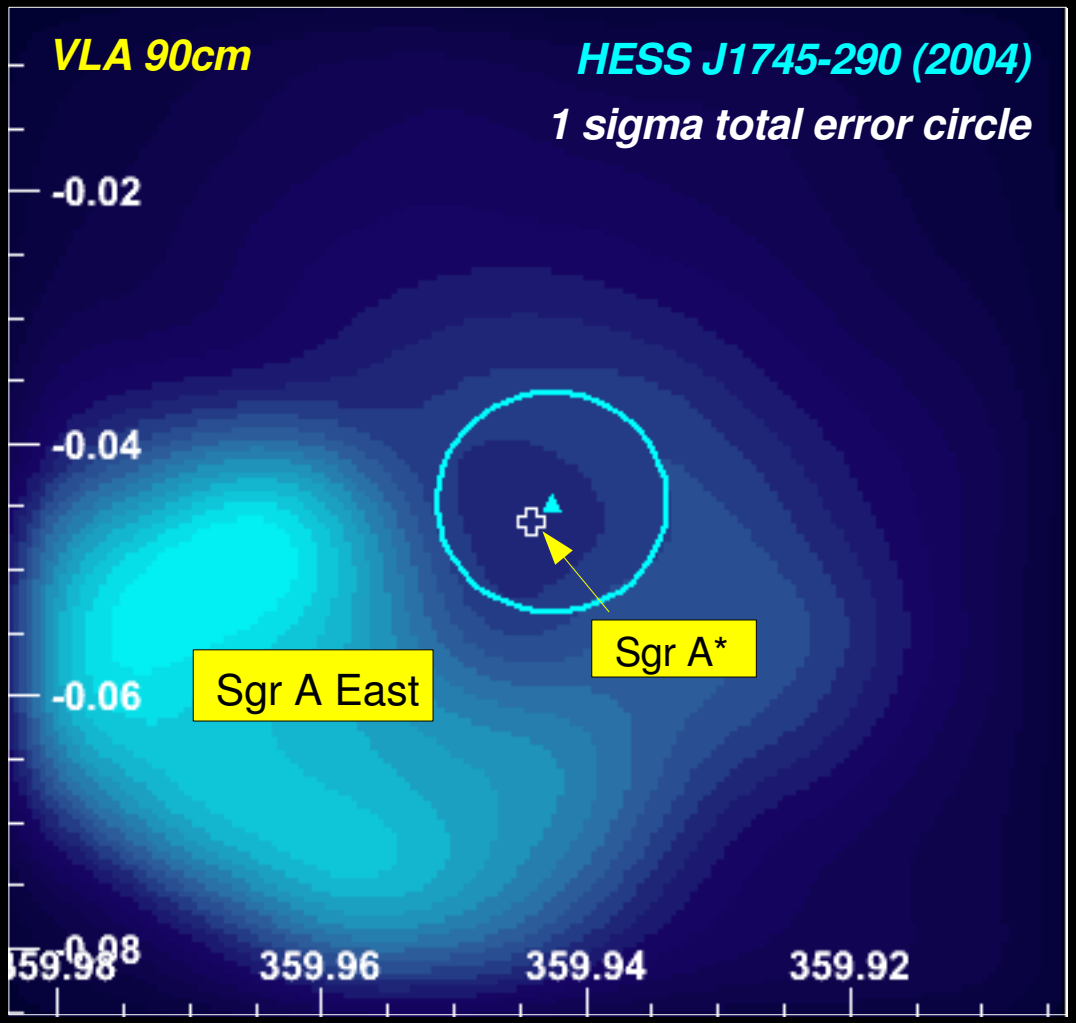
- *extension?*

  point-like for H.E.S.S.
- *variability?*

  not on time scales of years, months, days, hours, minutes
- *position? some separation potential on statistical basis!*

Position of HESS J1745-290



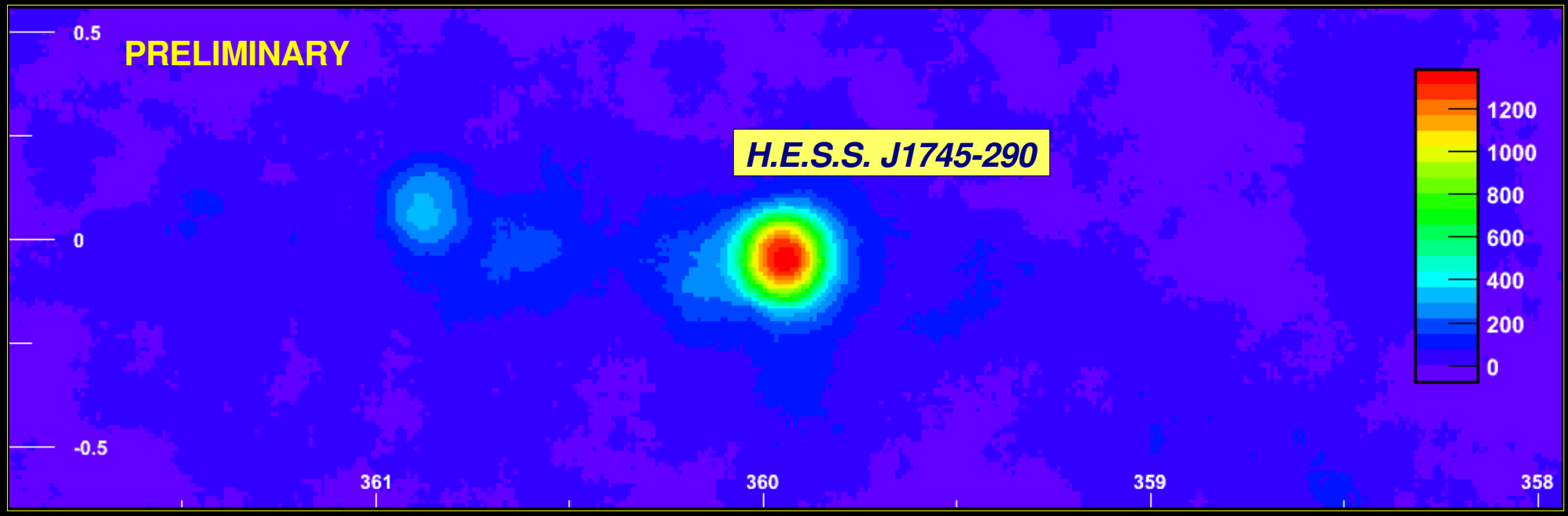


- *position coincident with Sgr A**
- *error dominated by systematic pointing uncertainty (28")*

- *Sgr A East seems disfavoured, but no strong conclusion possible*

HESS J1745-290 in 2005/2006

- *73.2 h live time, 44 sigma significance*
- *mean angular resolution: 0.07 deg per event*
- *spectral energy range: 160 GeV – 30 TeV*



- ***precise pointing:***

  guiding telescopes for identification of stars

  systematic error reduced to 9'' (2004: 28'')

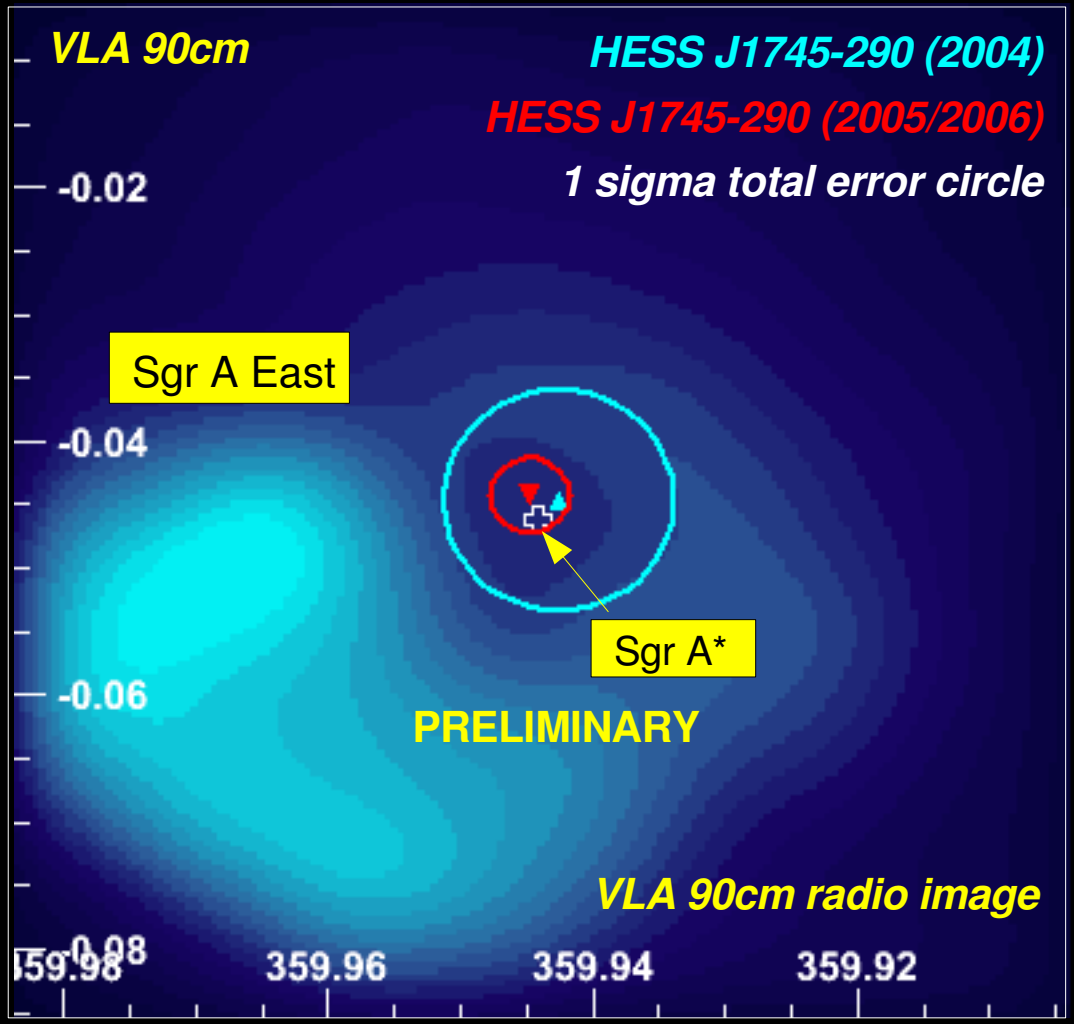
  - major effort: 2 years of work with several people involved
- *subtraction of diffuse emission component*
- ***position fit:** 2-dim multi-gauss representing H.E.S.S. PSF*

Position of HESS J1745-290 cont'd

- best fit position:

> l = 359d56'41.1" +/- 6.4" +/- 6"
> b = -0d2'39.2" +/- 5.9" +/- 6"
>
> *preliminary statistical + systematic errors*

- point-like after subtraction of diffuse emission
- position no longer dominated by pointing systematics



Position of HESS J1745-290 cont'd

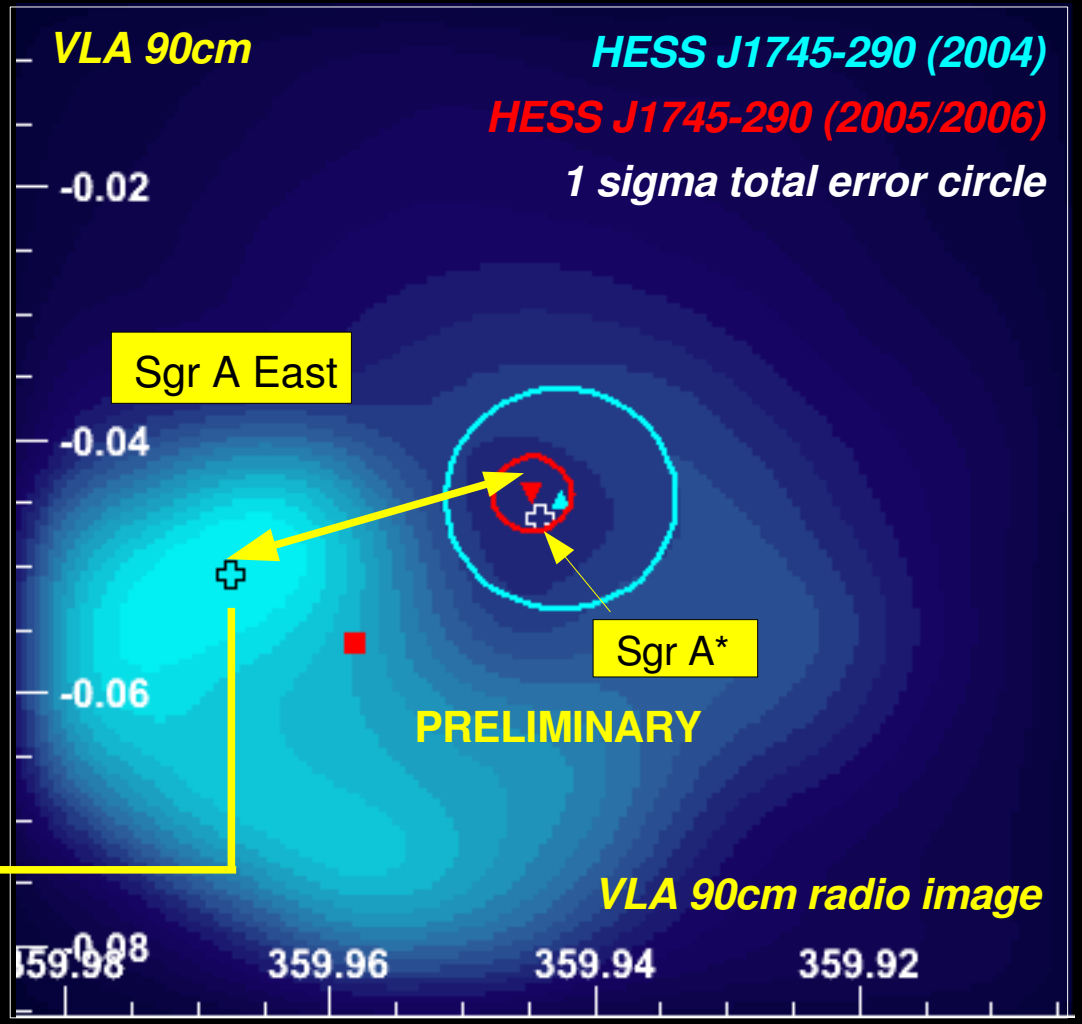
- best fit position:

l = 359d56'41.1" +/- 6.4" +/- 6"
b = -0d2'39.2" +/- 5.9" +/- 6"

preliminary statistical + systematic errors

- point-like after subtraction of diffuse emission
- position no longer dominated by pointing systematics
- VHE emission from Sgr A East radio maximum?

-> excluded at 7 sigma level



Position of HESS J1745-290 cont'd

- best fit position:

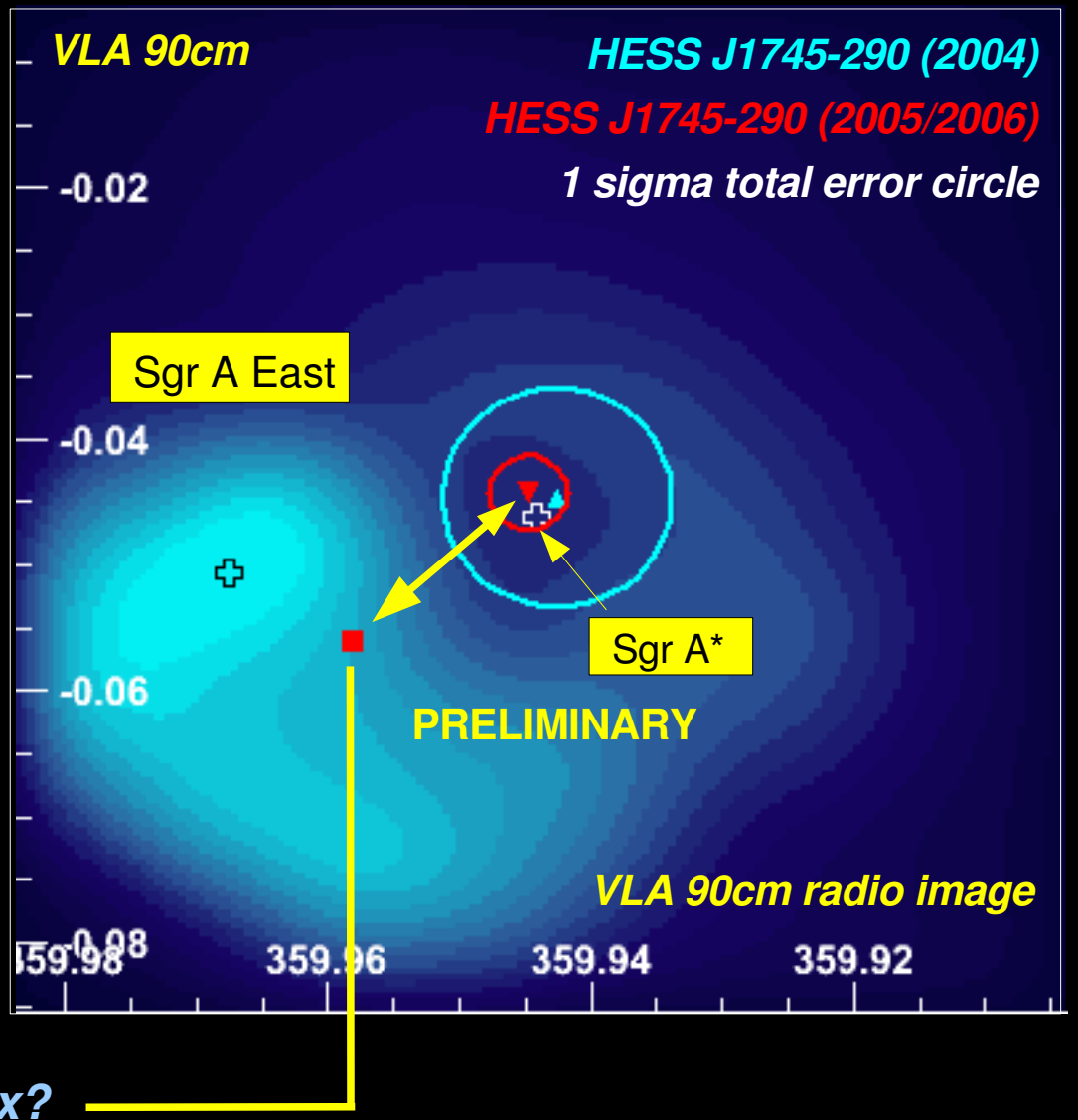
> l = 359d56'41.1" +/- 6.4" +/- 6"
> b = -0d2'39.2" +/- 5.9" +/- 6"
>
> *preliminary statistical + systematic errors*

- point-like after subtraction of diffuse emission
- position no longer dominated by pointing systematics
- VHE emission from Sgr A East radio maximum?

  -> excluded at 7 sigma level

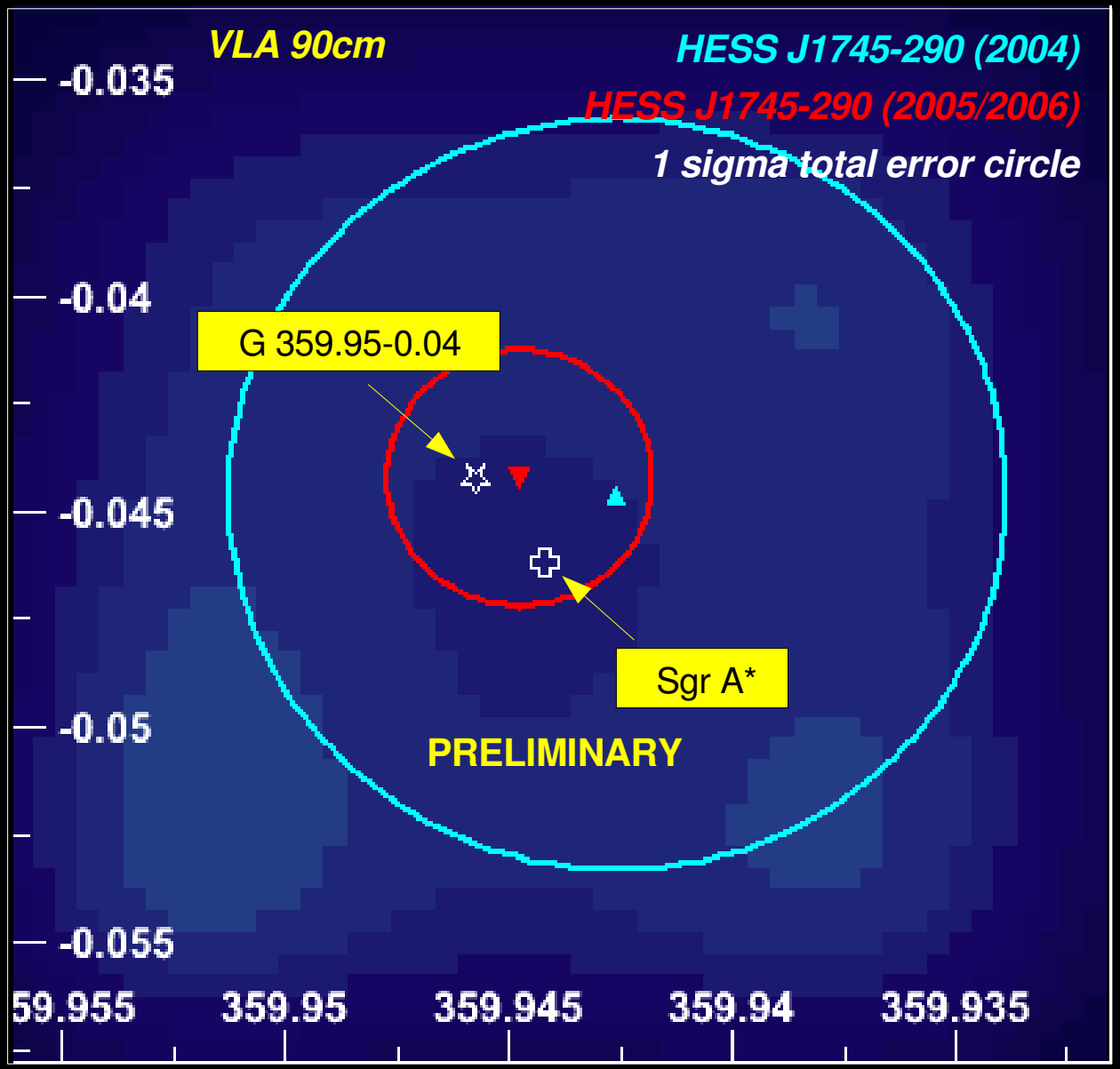
- does VHE emission follow radio flux?

> -> excluded at 5.3 sigma level



bulk of VHE emission not from Sgr A East!

Black hole or pulsar wind nebula?



position unresolvable: both SMBH and PWN are good candidates

Summary

The H.E.S.S. view of the Galactic Centre source:

- 3 prime candidate sources for the HESS GC point source:
- Sgr A East
  can be excluded due to excellent pointing accuracy
- SMBH Sgr A* + PWN G395.95-0.04
  positionally unresolvable for H.E.S.S.
  both viable candidates in terms of energetics and SED
- detection of simultaneous VHE-X-ray flares would
  strongly argue in favour of Sgr A*

-> see next talk