



# AGN observations with $< 100$ GeV threshold with H.E.S.S. II

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



# Outline



- H.E.S.S. and H.E.S.S. II
- AGNs at  $\sim 100$  GeV threshold
- Implications for EBL studies
- Conclusions



# H.E.S.S. in phase II



- 4+1 telescopes:
  - 12 m +28 m diameter
- Energy threshold down to ~30 GeV (for pulsar studies)
- Different analysis mode:
  - MONO, STEREO, COMBINED

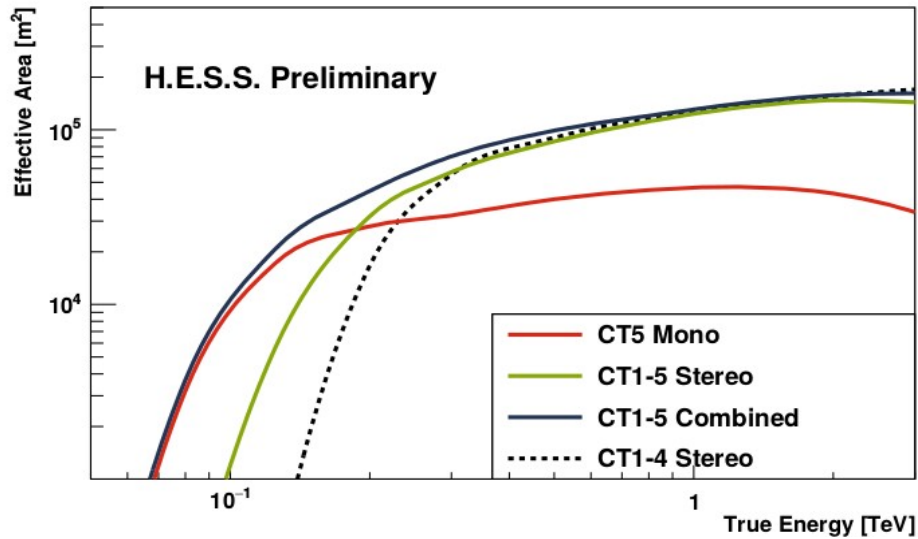


## MONO:

- Low energy threshold
- Limited angular resolution and sensitivity
- BEST SUITABLE for bright object at high redshift (AGNs or GRBs)

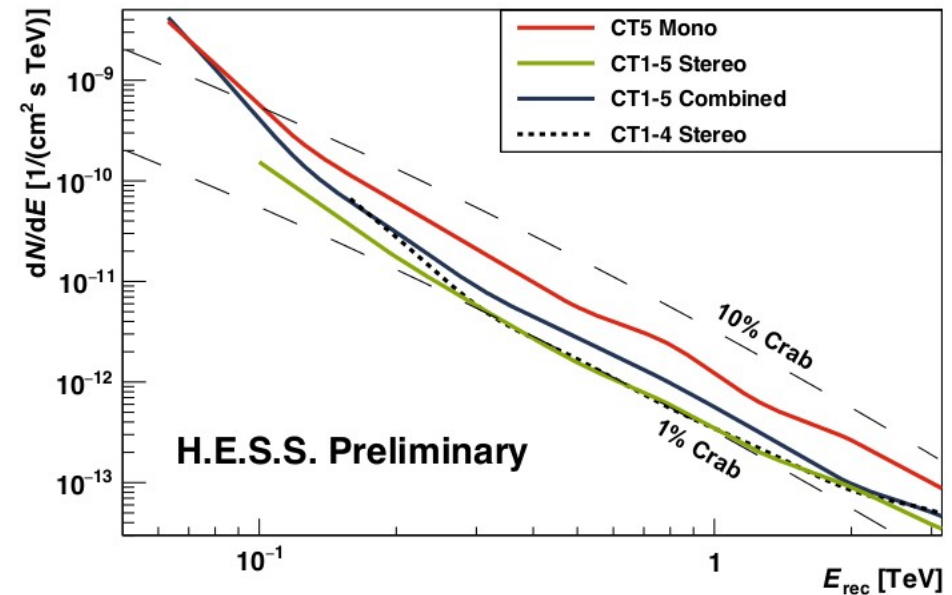
## STEREO:

- Higher energy threshold
- High angular resolution and good sensitivity
- BEST SUITABLE for fainter sources and morphology study

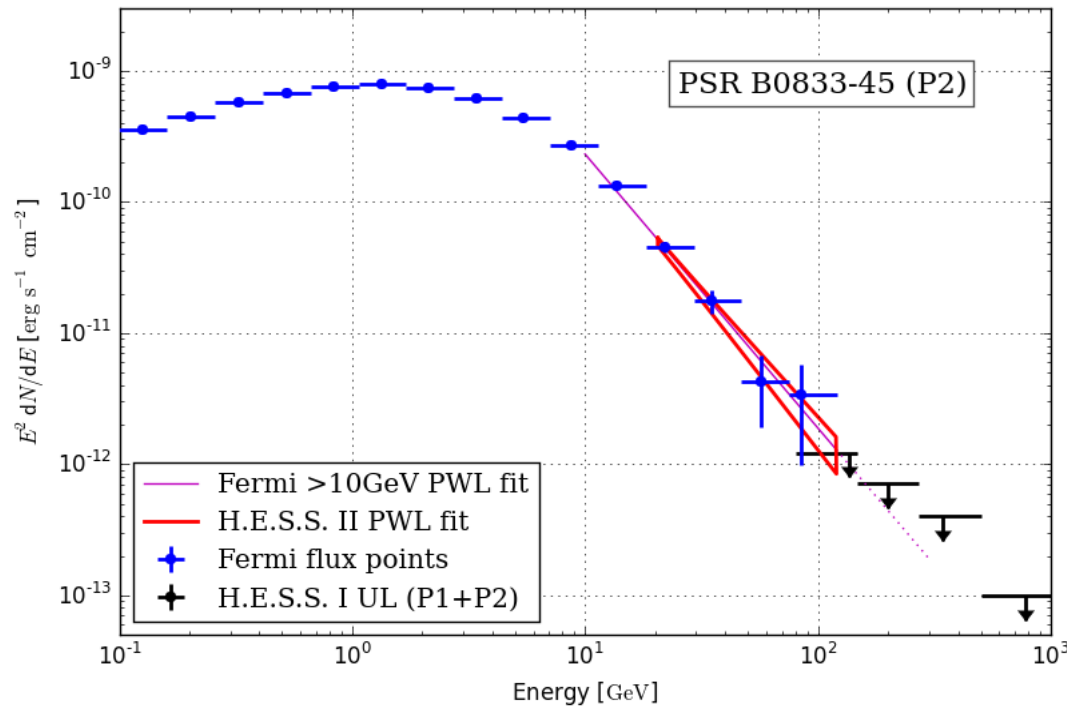


Effective Area for different subarrays

Sensitivity curve after 50 hrs for a 5 sigma detection



- Some recent results from H.E.S.S.
  - Vela pulsar down to 30 GeV



Thanks to the phase II

From Gajdus  
ICRC2015



# Lowering the threshold below 100 GeV



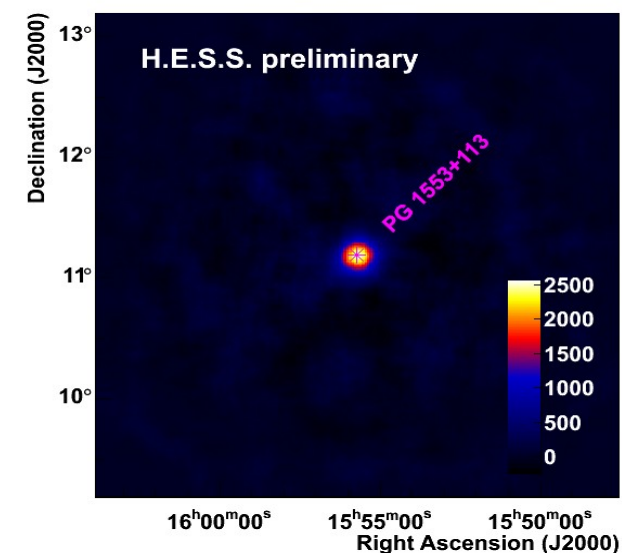
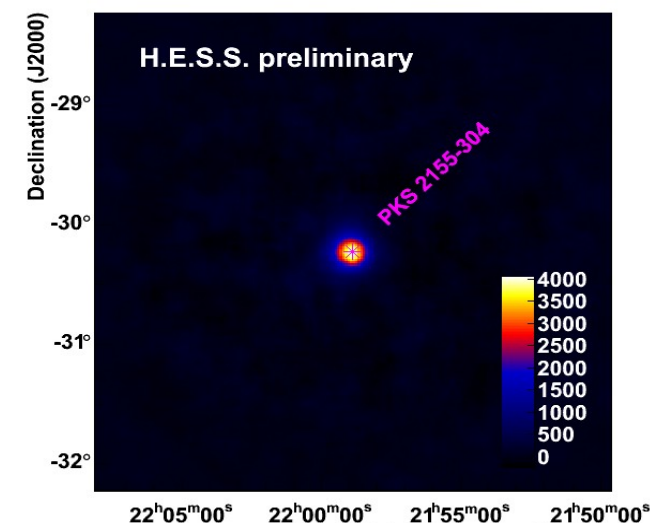
- Better overlap with *Fermi*-LAT
- Opening the field to observe more distant sources (MAGIC and VERITAS examples)
  - Dealing with the EBL



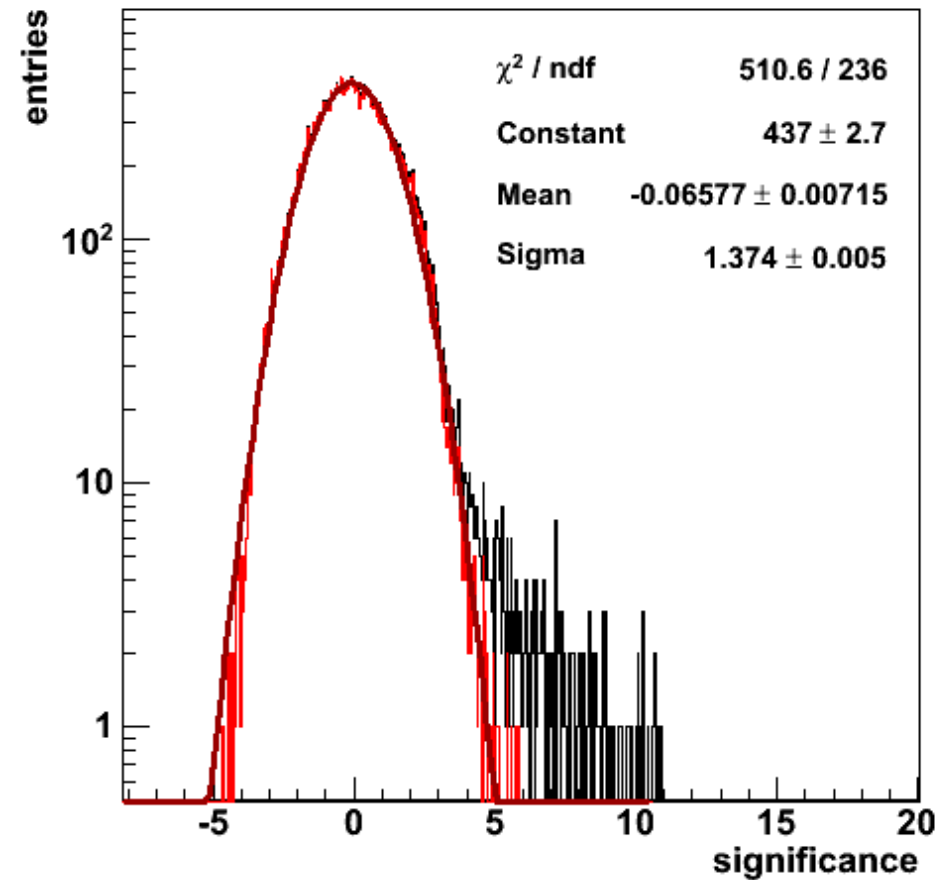
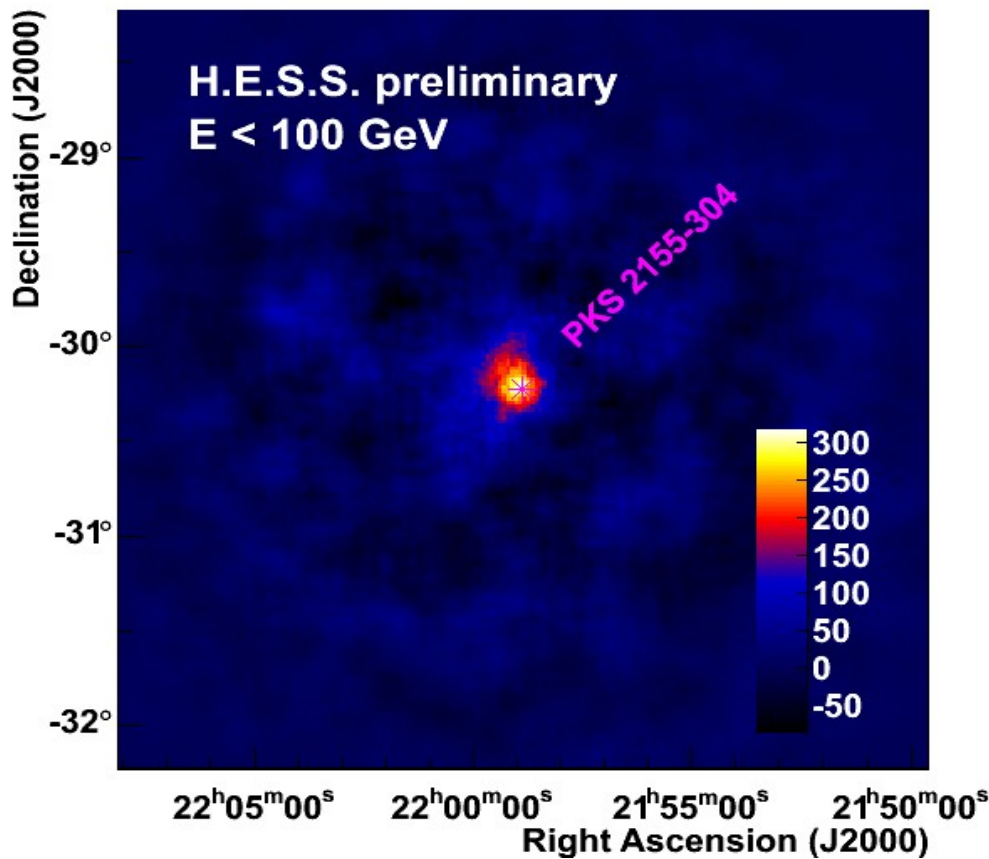
# First HESS results ~100 GeV



- Analysis using MONO (CT5 only) data
  - PKS 2155-304 ( $z = 0.116$ )
    - Favourable zenith angle
    - Widely studied with H.E.S.S.
    - 56 hours between 2013 and 2014
  - PG 1553+113 ( $0.43 < z < 0.58$ )
    - Bright distant blazar
    - Steep spectrum
    - 16.8 hours taken in 2013

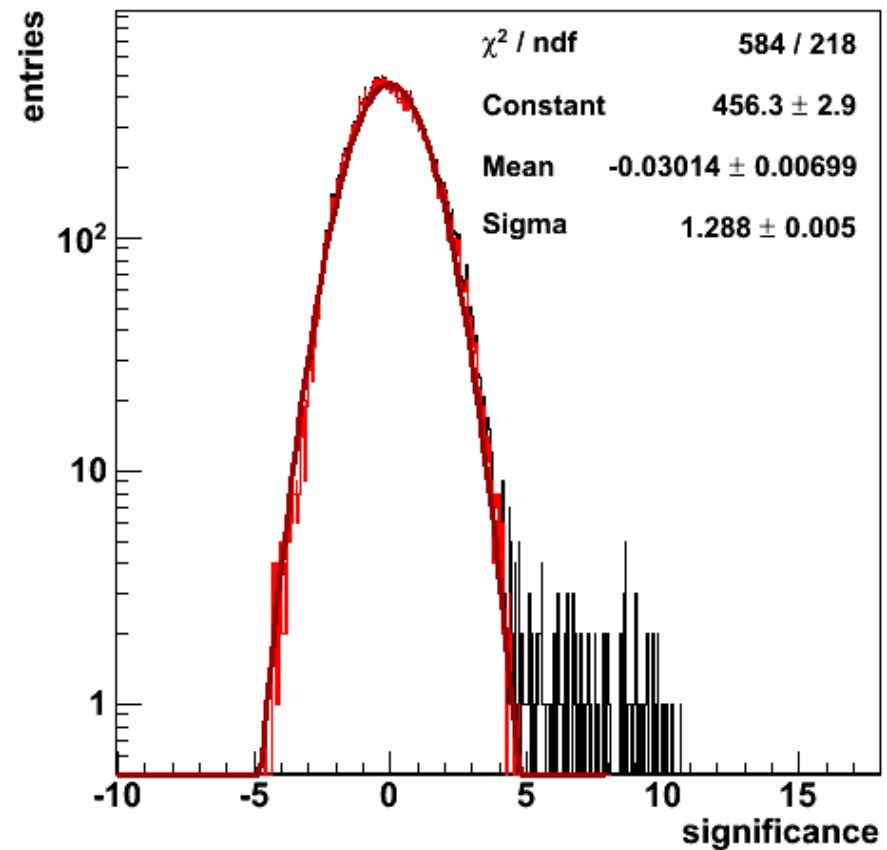
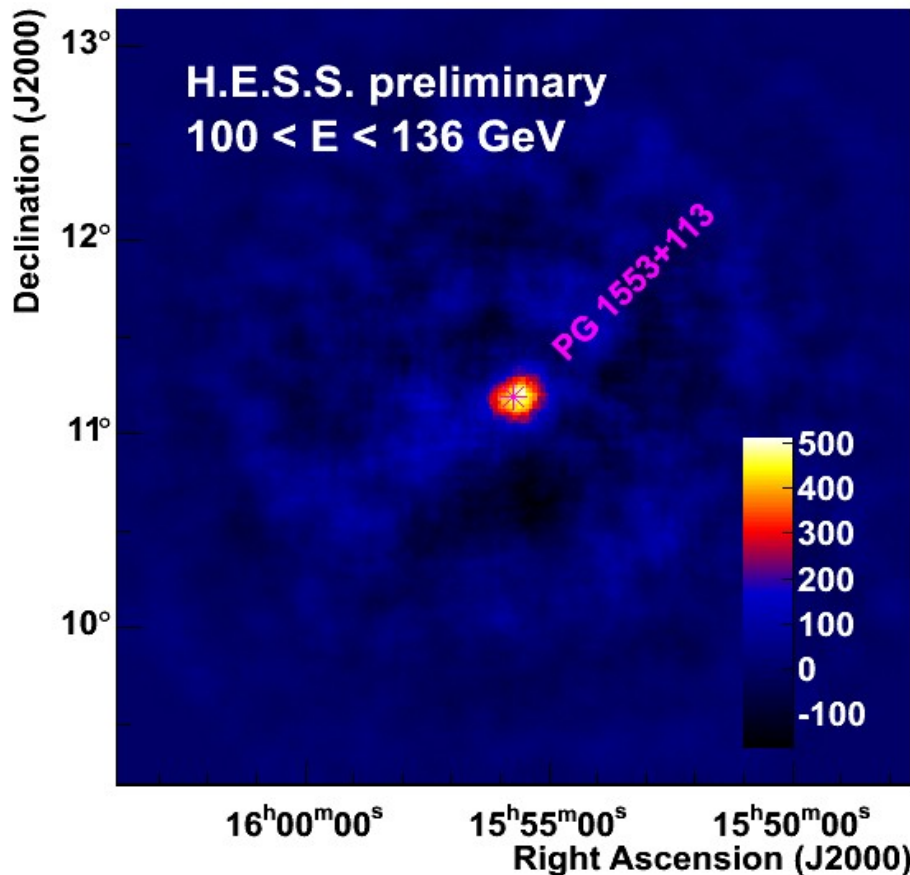


- At the threshold ( $\sim 85$  GeV)

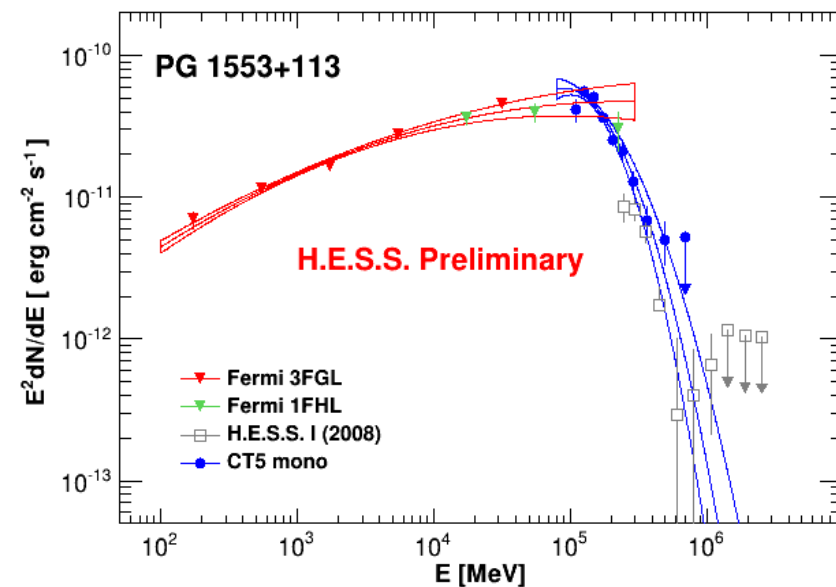
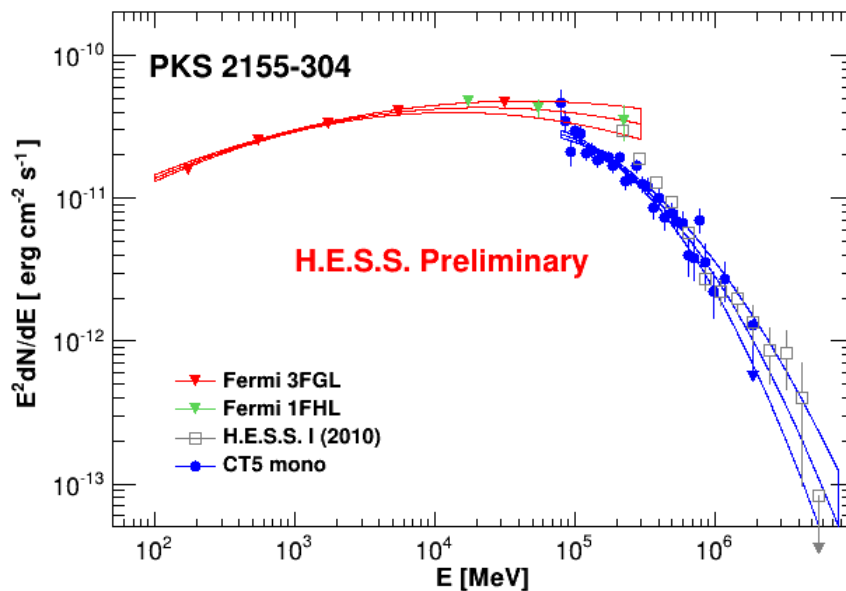




- At the threshold ( $\sim 100$  GeV)



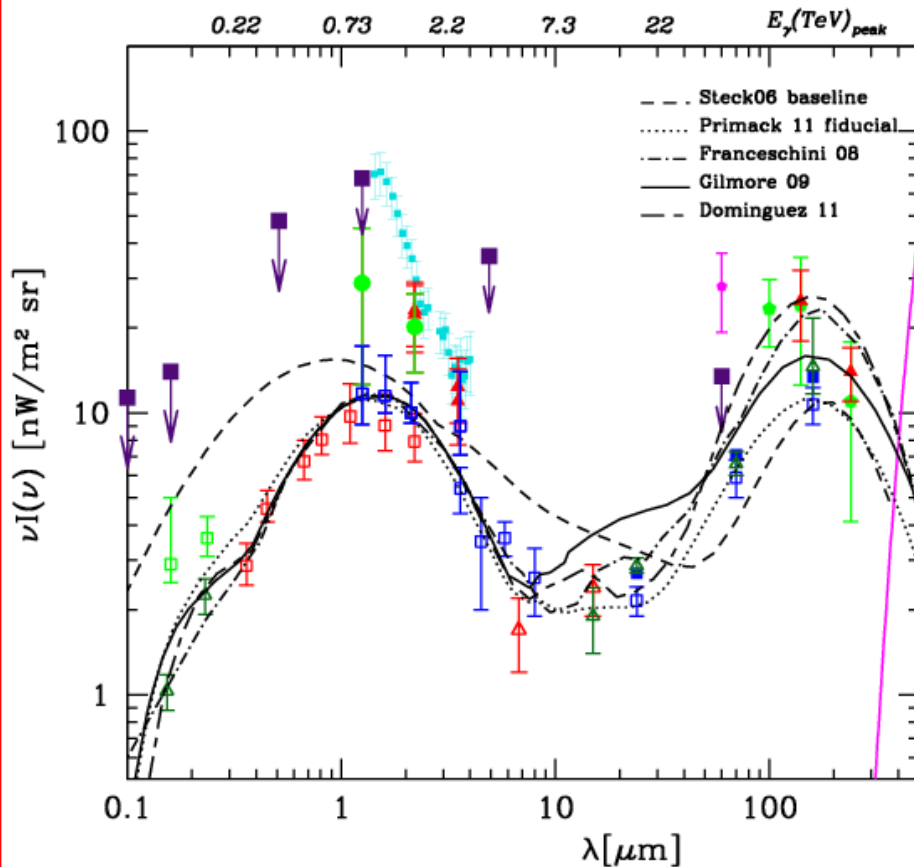
- Use of the MONO analysis:
  - Clear curvature in the spectrum
  - EBL-induced cutoff at the transition between the instruments



# The Extragalactic Background Light

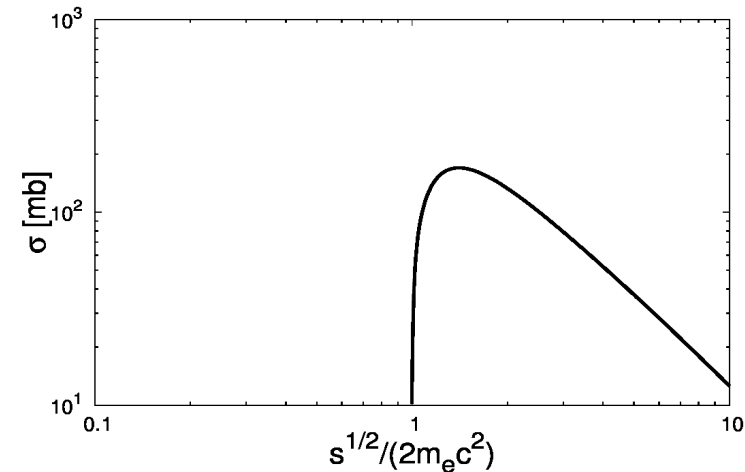


## EBL shape



Costamante, 2013  $1 \mu\text{m} \sim 1 \text{ eV}$

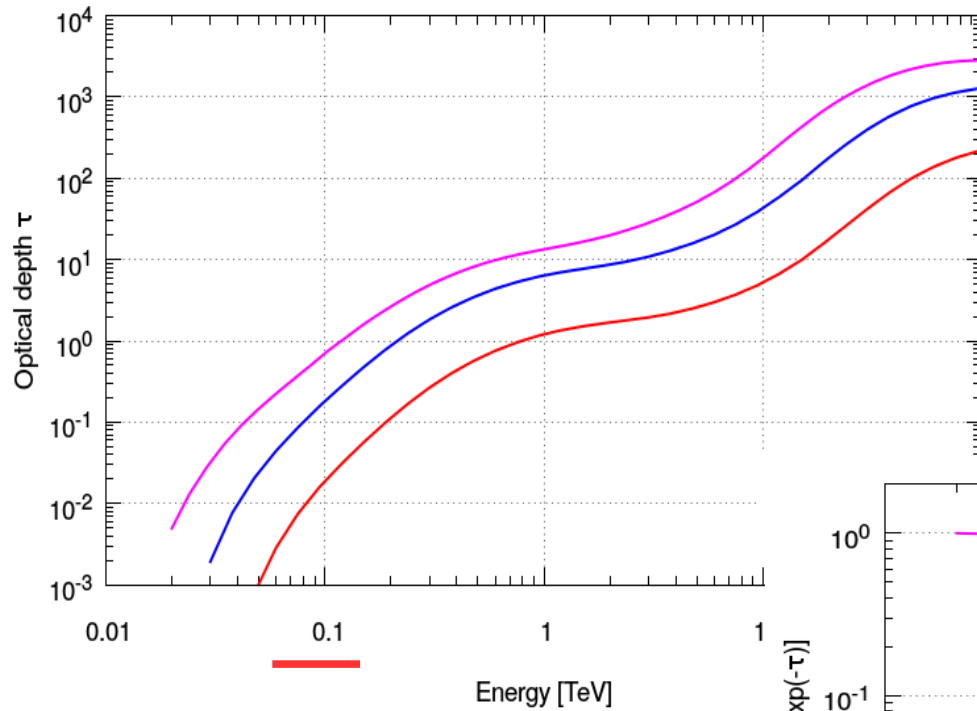
## $\gamma$ - $\gamma$ cross section



Attenuation of high energy gamma ray photons due to the optical-near infrared photons

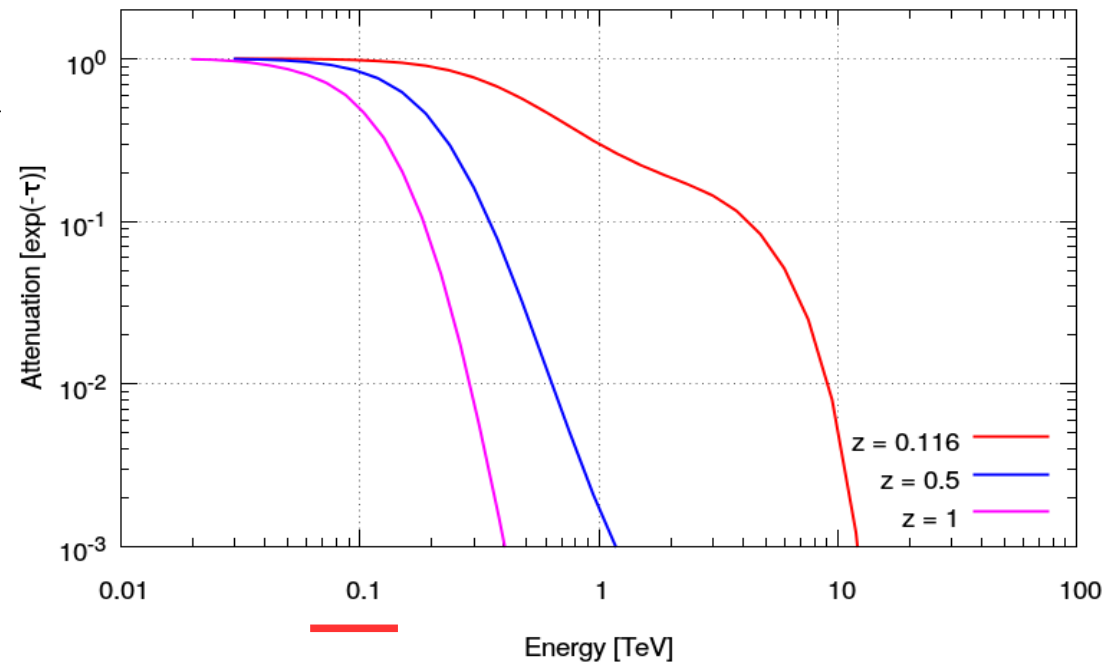
$$E_{\gamma}^{\text{TeV}} E_{\gamma}^{\text{eV}} \approx 1$$

# EBL attenuation



Using the Franceschini's model (2008)

Lower energy  $\rightarrow$  Higher distance

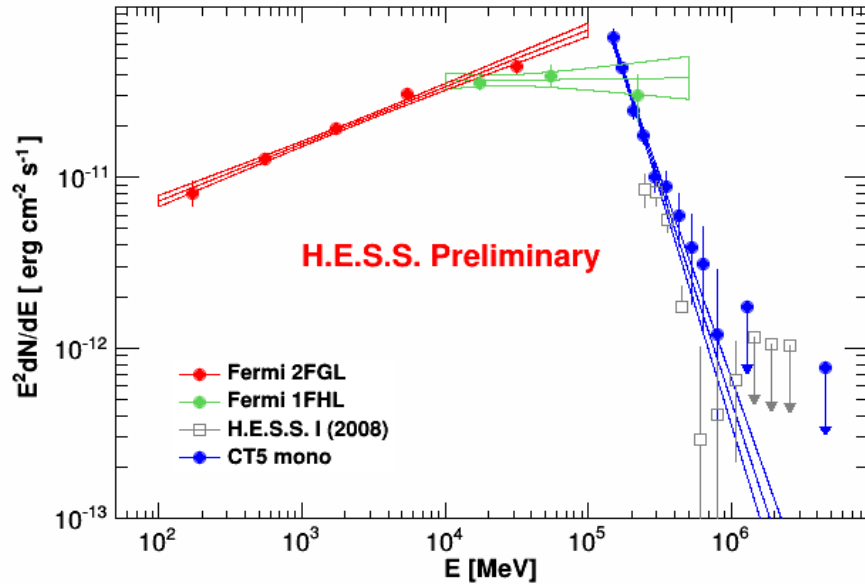




# Conclusions



- Robust results to show the ability of H.E.S.S. II to lower the threshold below the 100 GeV limit
- Possibility to probe the EBL at higher redshifts
- Good overlap with the Fermi-LAT
- Still room for improvement!



PG 1553+113

**THANK YOU!**

