



Unusual Radio & Gamma-ray Properties of the Quasar 4C+55.17

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On Behalf of the Fermi LAT Collaboration

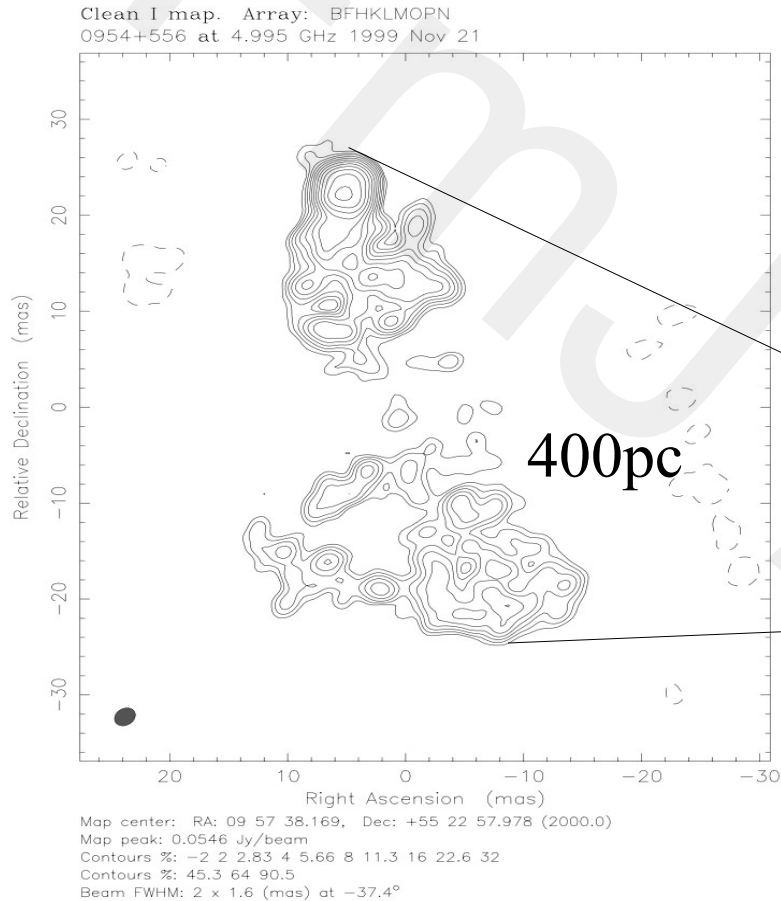
**Fermi Meets Jansky Conference, Bonn
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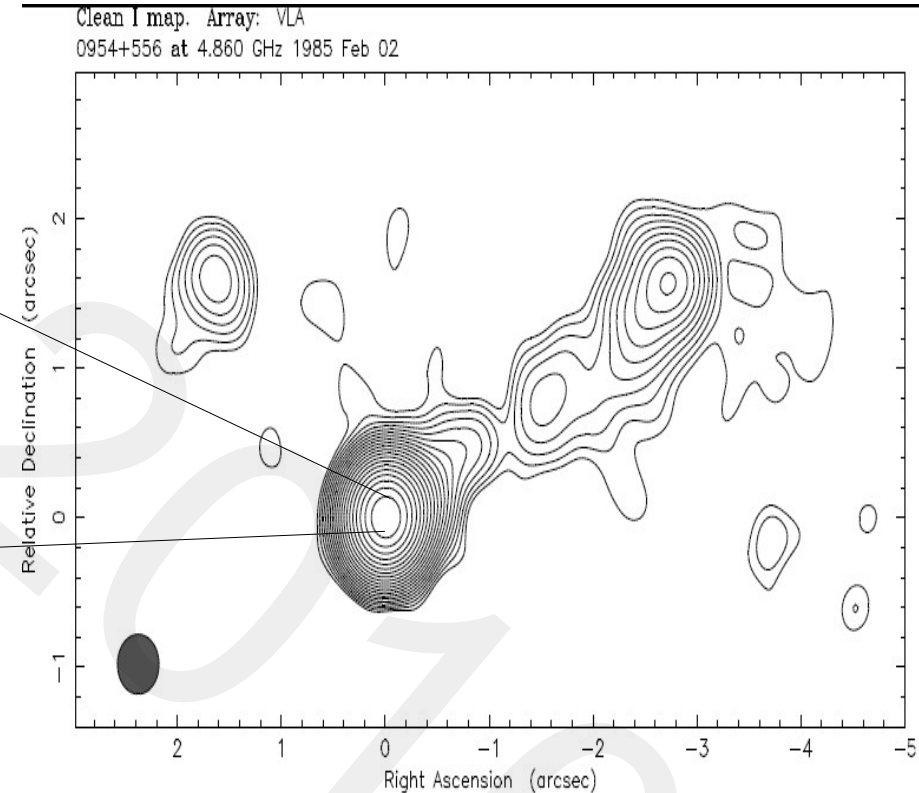
Introduction

- FSRQ 4C+55.17 ($z=0.896$) first appeared as a gamma-ray source during the EGRET era: 2EG J0957+5515, 3EG J0952+5501, & EGR J0957+5513
 - Tentative association due to poor EGRET localization (~ 0.5 deg)
 - Radio morphology uncharacteristic of EGRET blazars: Marscher et al. (2002) deemed it a “spurious association”
 - Association now confirmed in Fermi Bright Source List and 1st year catalog (r95% \sim few arcmin)
- Exhibits characteristics of both blazar and medium symmetric object (MSO)
- No clear evidence ruling out either scenario

4C+55.17 Radio Morphology



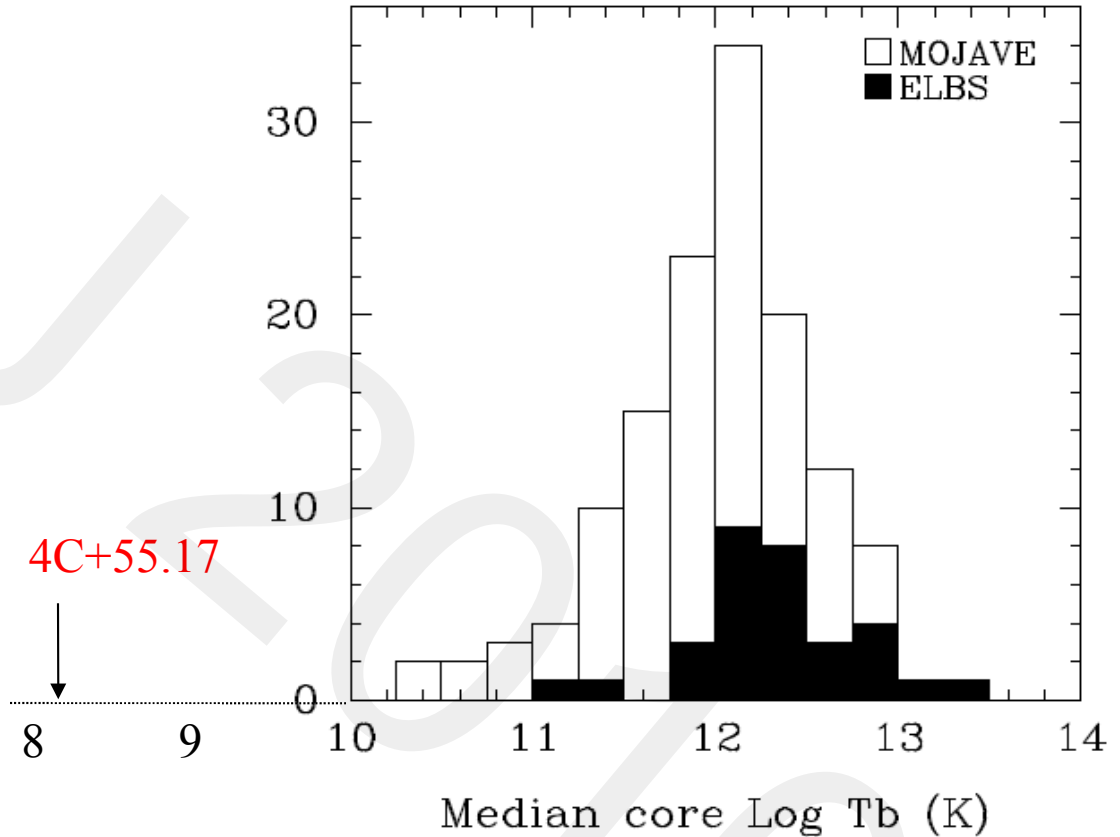
5 GHz VLBA



5GHz VLA

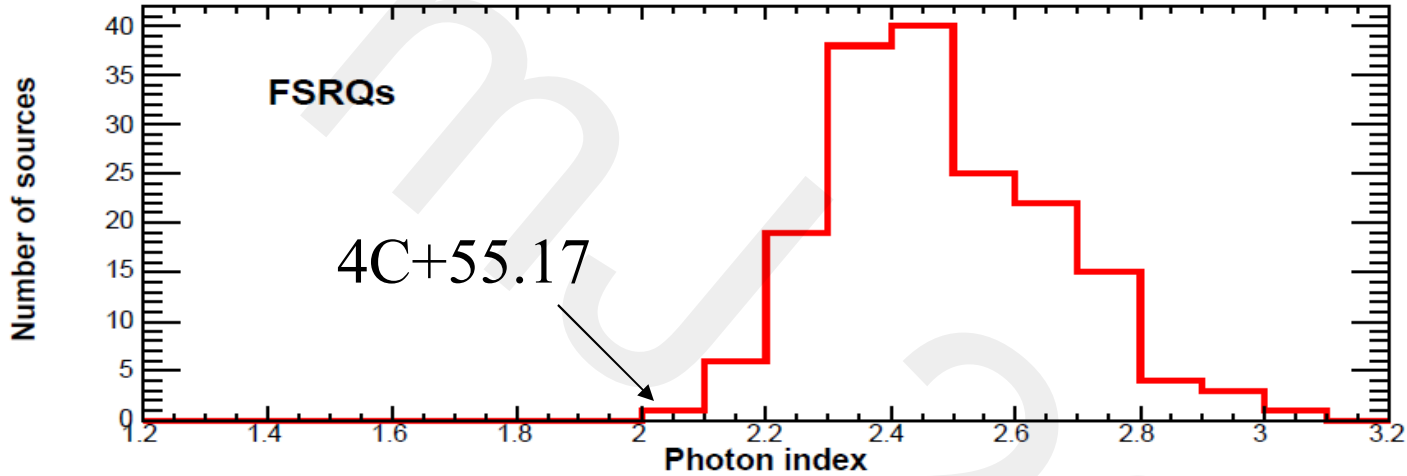
4C+55.17: Radio to Gamma-Rays

- No clear evidence of relativistic beaming:
 - No variability in radio, x-rays, or gamma-rays
 - Brightest VLBI feature
 $T_b \sim 10^8$ K
 - Resolved & extended radio morphology (~ 400 pc)
- Radio polarization ~ 3 to 4 percent (Aller et al. 2003, Jackson et al. 2007)



Core brightness temperatures, 15GHz VLBI MOJAVE sample (Kovalev et al. 2009)

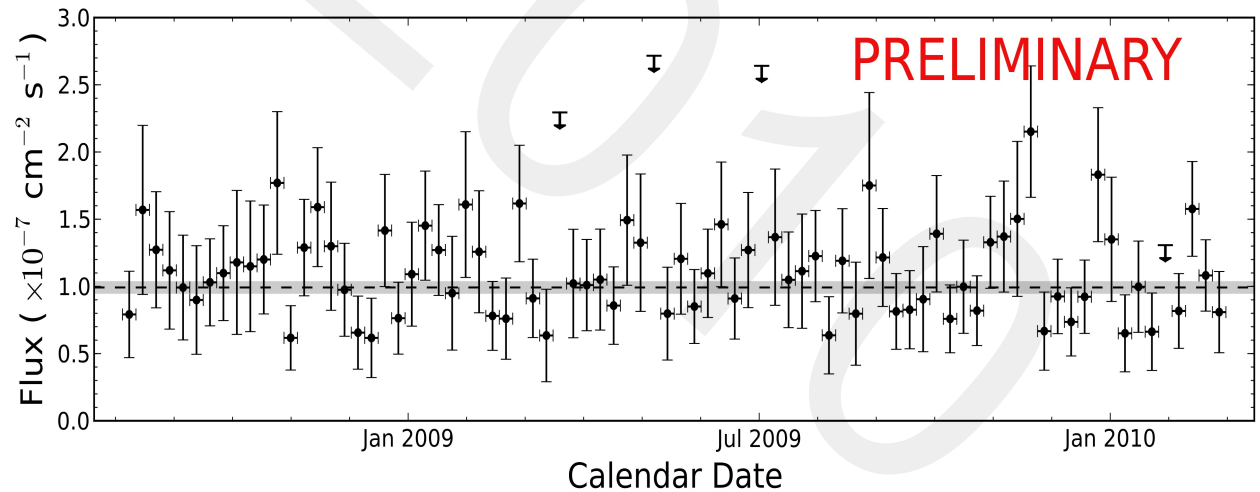
4C+55.17: Gamma-Rays



Photon index for FSRQ's in the 1LAC flux-limited sample (Abdo et al. 2010)

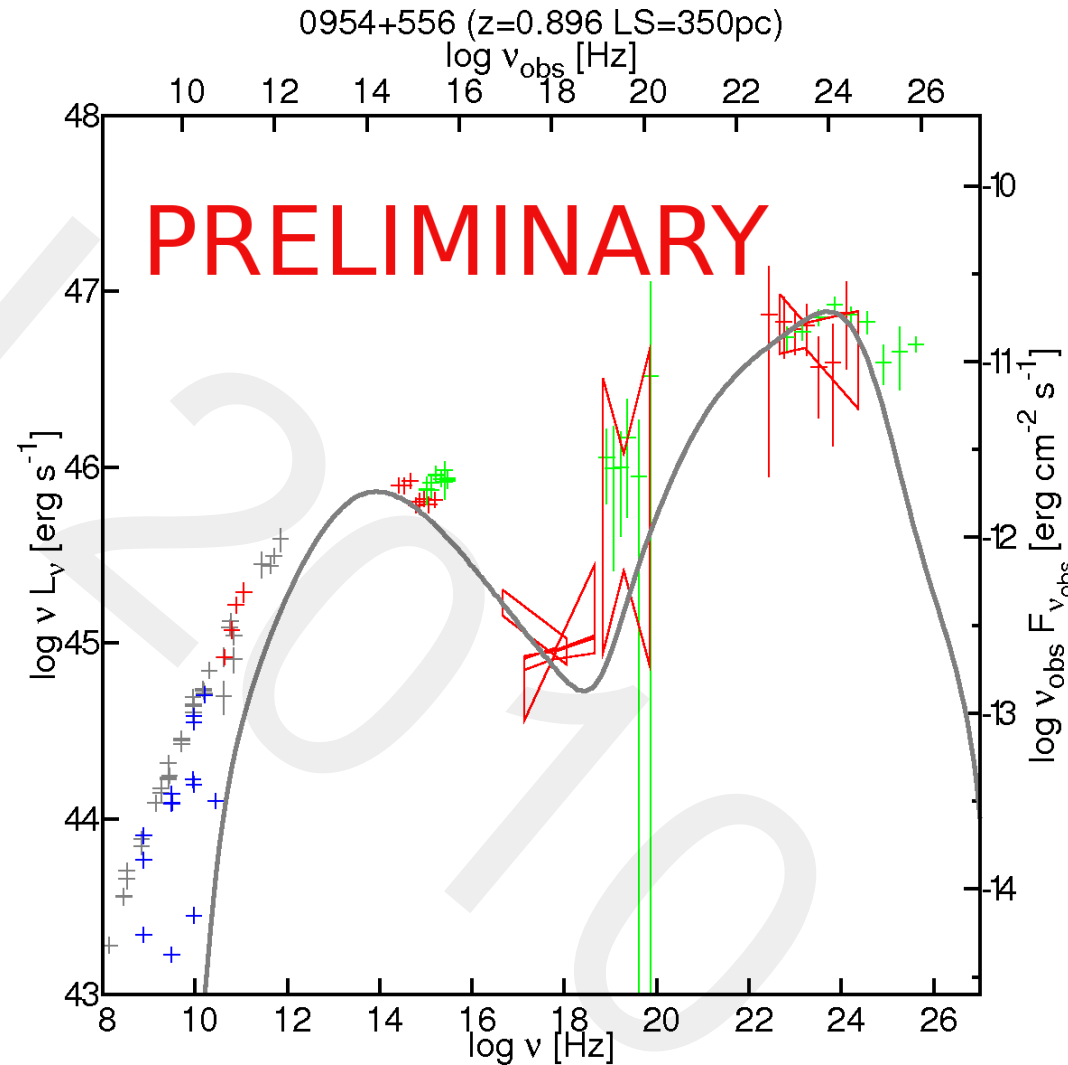
19 month gamma-ray light curve (7 day bins), with weighted average.

Compare to EGRET average value:
 $(9.28 \pm 0.82) \times 10^{-8}$ ph/cm²/s
 (Hartman et al. 1999)



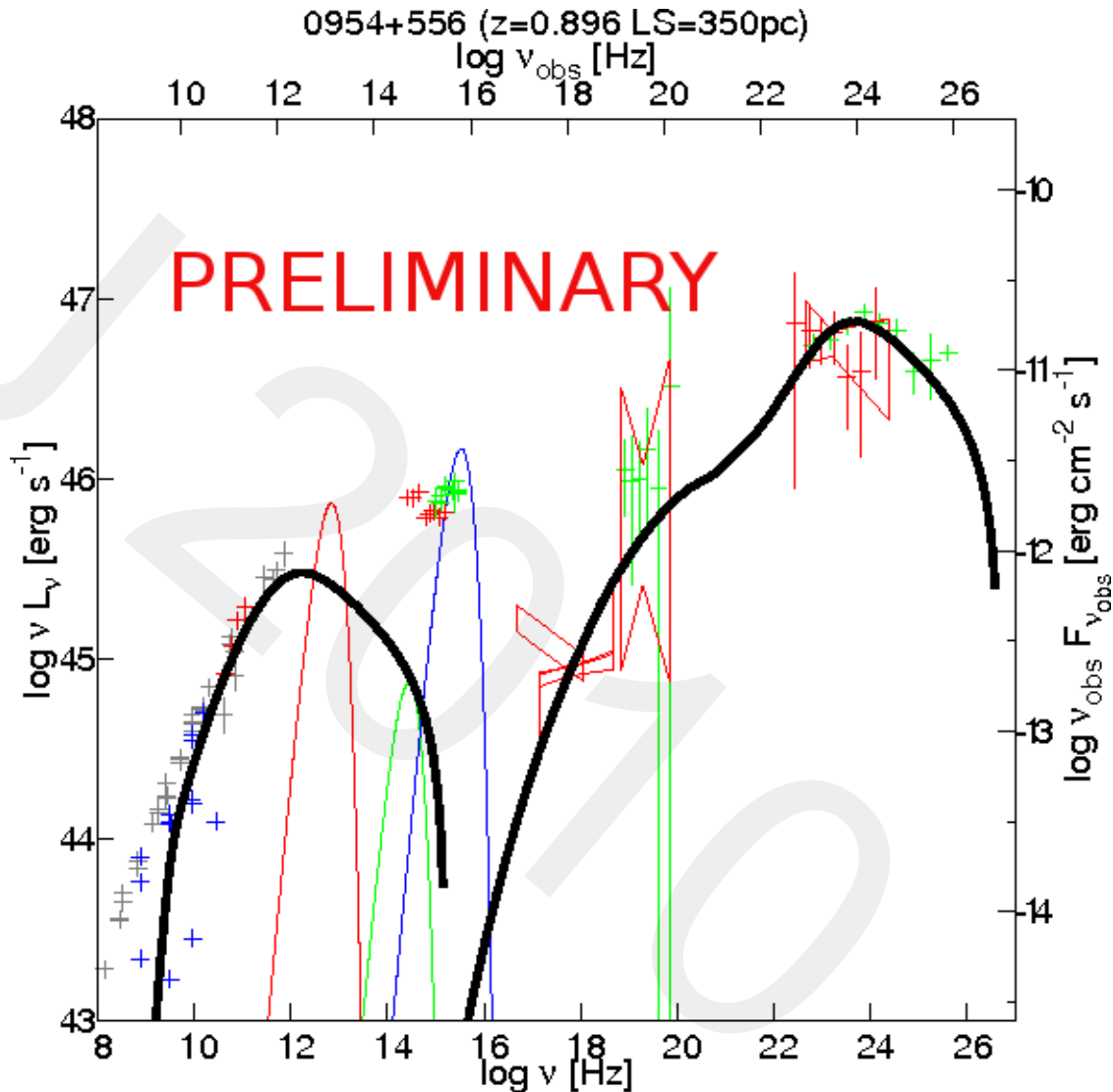
4C+55.17: “Unusual” Blazar?

- Consider standard “blazar” hypothesis using BLAZAR model by Moderski et al. (2003)
 - Size of γ -emitting region < 1 pc
 - High Doppler factor ($\delta = 9.85$)
- Parameters of fit values are plausible compared to standard blazars
- But.... is this really consistent with the observations?



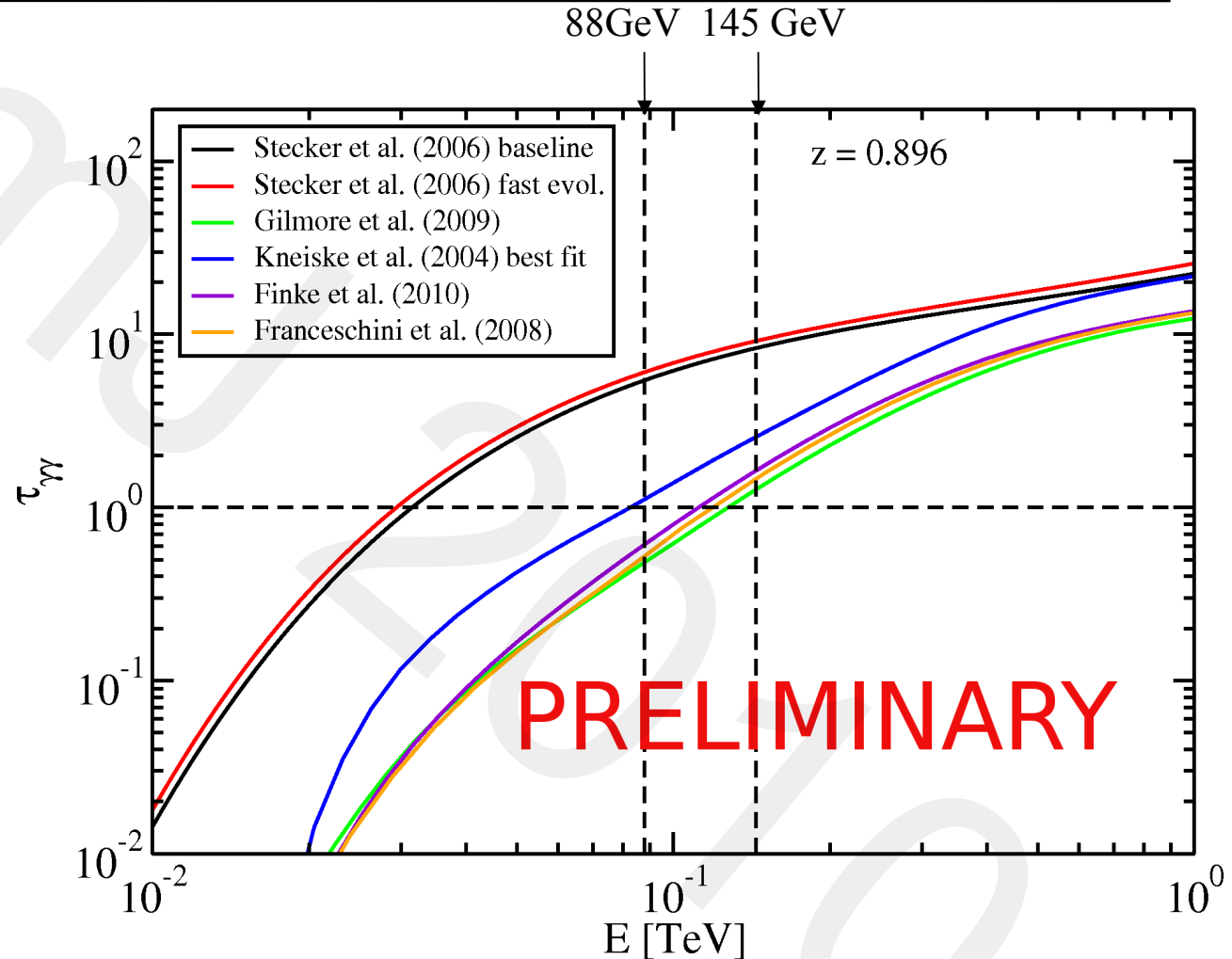
4C+55.17: Candidate MSO?

- SSC + IC (host, UV disk, re-scattered UV) emission of a CSO/MSO following Stawarz et al. (2008)
- Consistent with model parameters of confirmed X-ray detected CSO's (Ostorero et al. 2010)
- Fits the gamma emission without resorting to relativistic beaming effects.



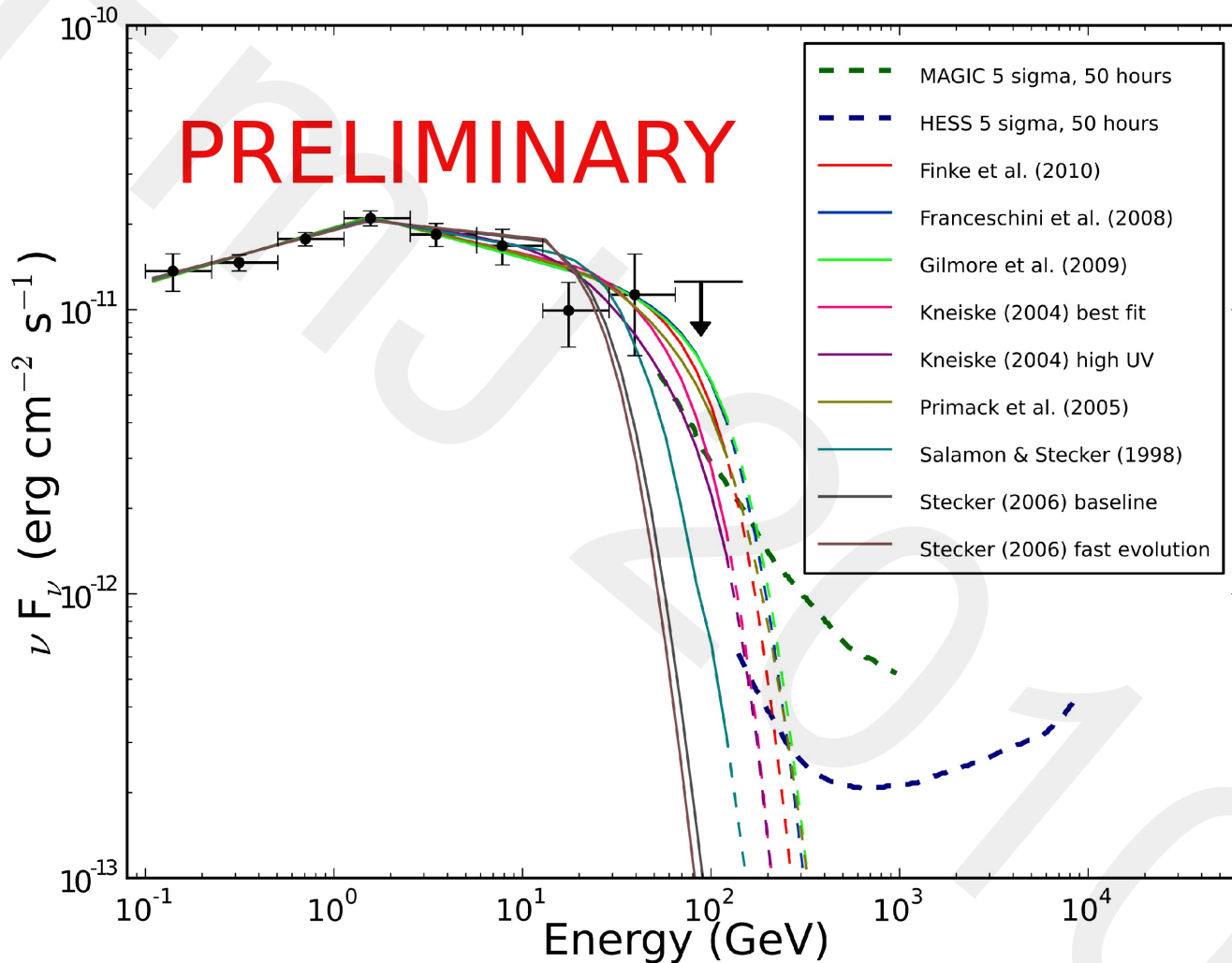
4C+55.17 and the Extragalactic Background Light

- At $z=0.896$, offers a promising candidate for EBL studies
- In 19 months of data detected at VHE ($>100\text{GeV}$)
- Observable by a ground-based Cherenkov telescope?



Gamma-gamma opacity for various EBL models, compared to two highest energy photons of 4C+55.17. Figure courtesy of J. Finke.

4C+55.17 Gamma-Ray Spectrum



4C+55.17 Gamma-ray spectrum with attenuation from several EBL models. MAGIC and H.E.S.S differential flux sensitivities taken from Funk et al. (2008)

Conclusions

- **4C+55.17 is an interesting case study:**
 - **Highly unusual properties for gamma-ray FSRQ**
 - **No clear evidence of relativistic beaming**
 - **MSO model parameters compare reasonably to other x-ray detected CSO sources**
- **Gamma-ray spectrum makes it a good candidate for EBL studies**
- **Non-variability and hard spectrum make it a viable candidate for future ground-based VHE observations**