MWL characterization of the blazar S50716+714

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On behalf of
MAGIC and
Fermi-LAT
collaborations

MAGIC team *:
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Fermi-LAT: D. Bastieri, D. Gasparrini, B. Rani

Other MWL collaborators: G. Borman, T. Hovatta, S. Jorstad,
V. M. Larionov, A. Lähteenmäki, I. Troitsky

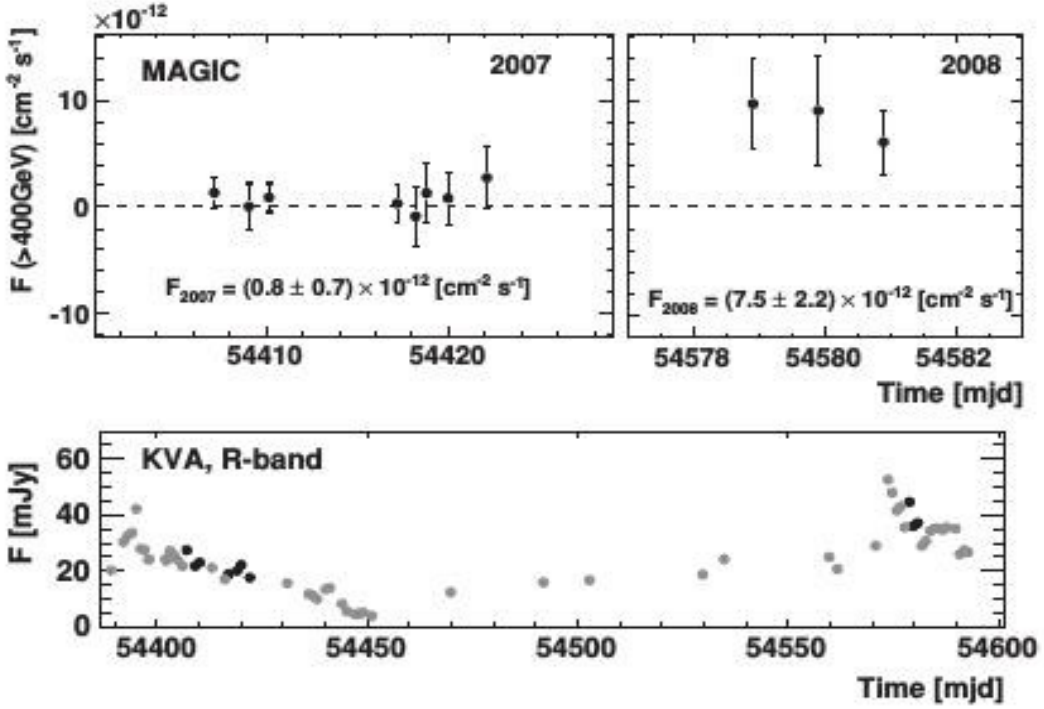
*(same of S4 0954+65 team, see G. Pedaletti talk later)

-- 28th Texas Symposium, 13-18 Dec 2015, Geneva --

S50716+714: an old MAGIC friend

- Discovered by MAGIC in 2008* (mono configuration!)
- Redshift z~0.12 ** (debated)

  (by imaging and not spectroscopically derived)
- Flare up to 9% CU



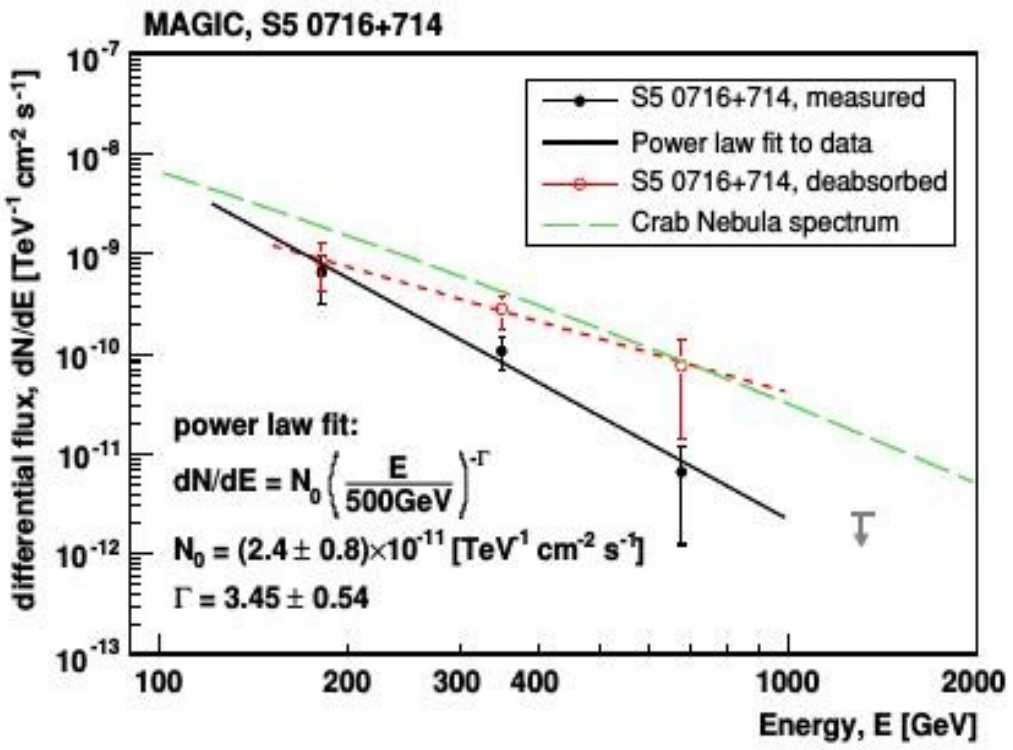
- Threshold of 400 GeV
- Triggered by an high optical state

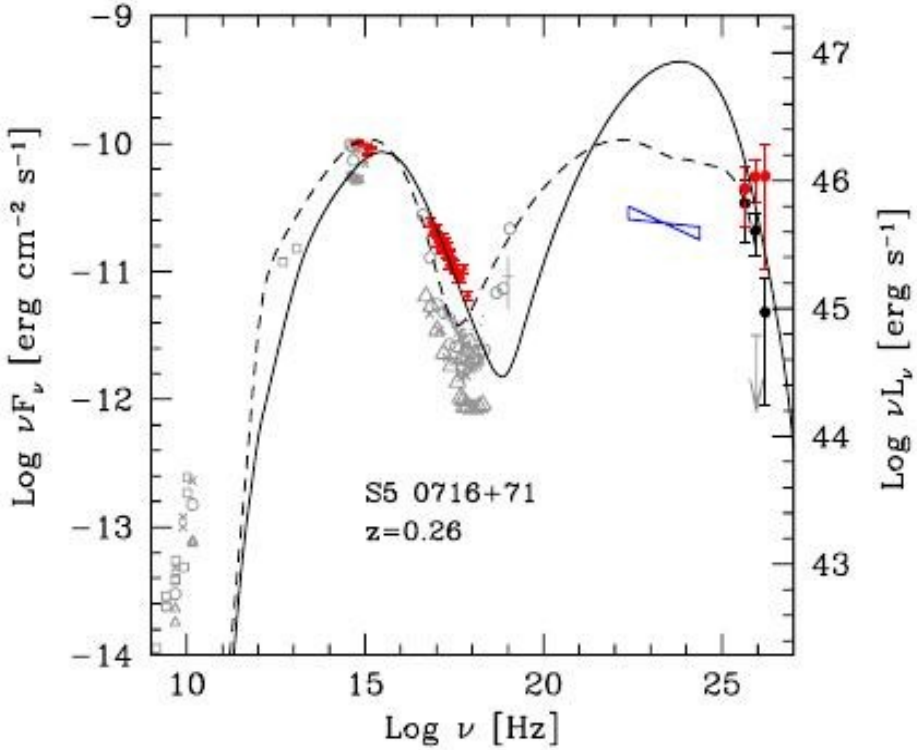
*D. Mazin et al., (2008) 31st ICRC proc.
H. Anderhub et al., (2009) ApJ

** Stadnik and Romani (2014) arXiv:1402.5464

S50716+714: an old MAGIC friend

- The spectrum: observed and deabsorbed
- Broadband modelling with a 1 zone SSC





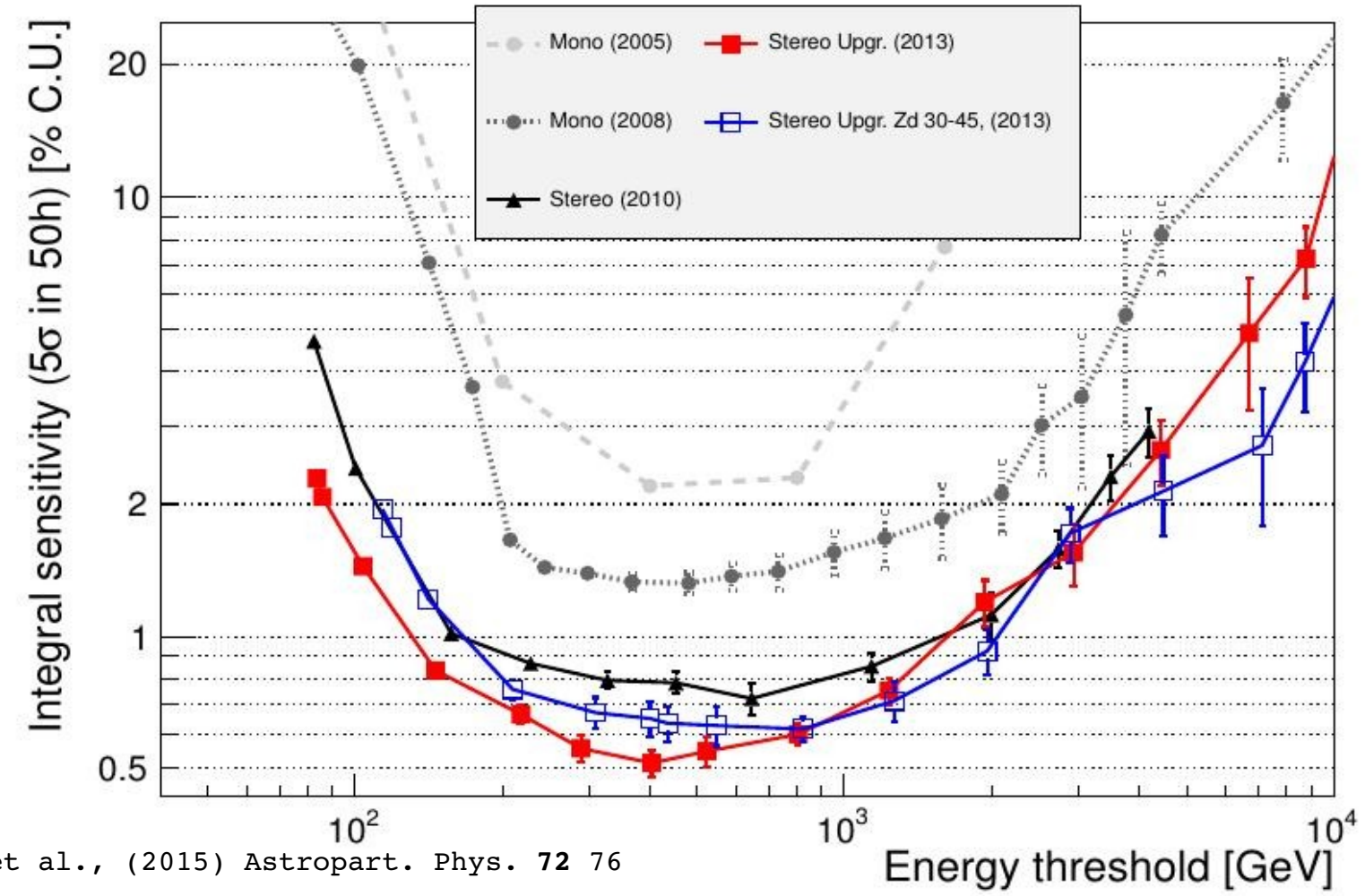
H. Anderhub et al., (2009) ApJ

The MAGIC telescopes: exploring the VHE sky

- Two 17m diameter Cherenkov telescopes
- Stereo configuration from 2009
- Energy range between 50 GeV and 10 TeV
- Angular resolution: 0.16 @ 100GeV
- During 2011 and 2012 full upgrade of the electronics for the readout system and camera of the first telescope replaced
- Devoted to the investigation of particle acceleration in the most violent cosmic environments and to the study of fundamental questions of Physics: the origin of Galactic cosmic rays and the nature of dark matter, the measure and the evolution of the extra-galactic background radiation...
- And lately: new sources discovered at the Gamma ray horizon limit! (see Josepha Becerra contribution later)

The MAGIC telescopes: exploring the VHE sky

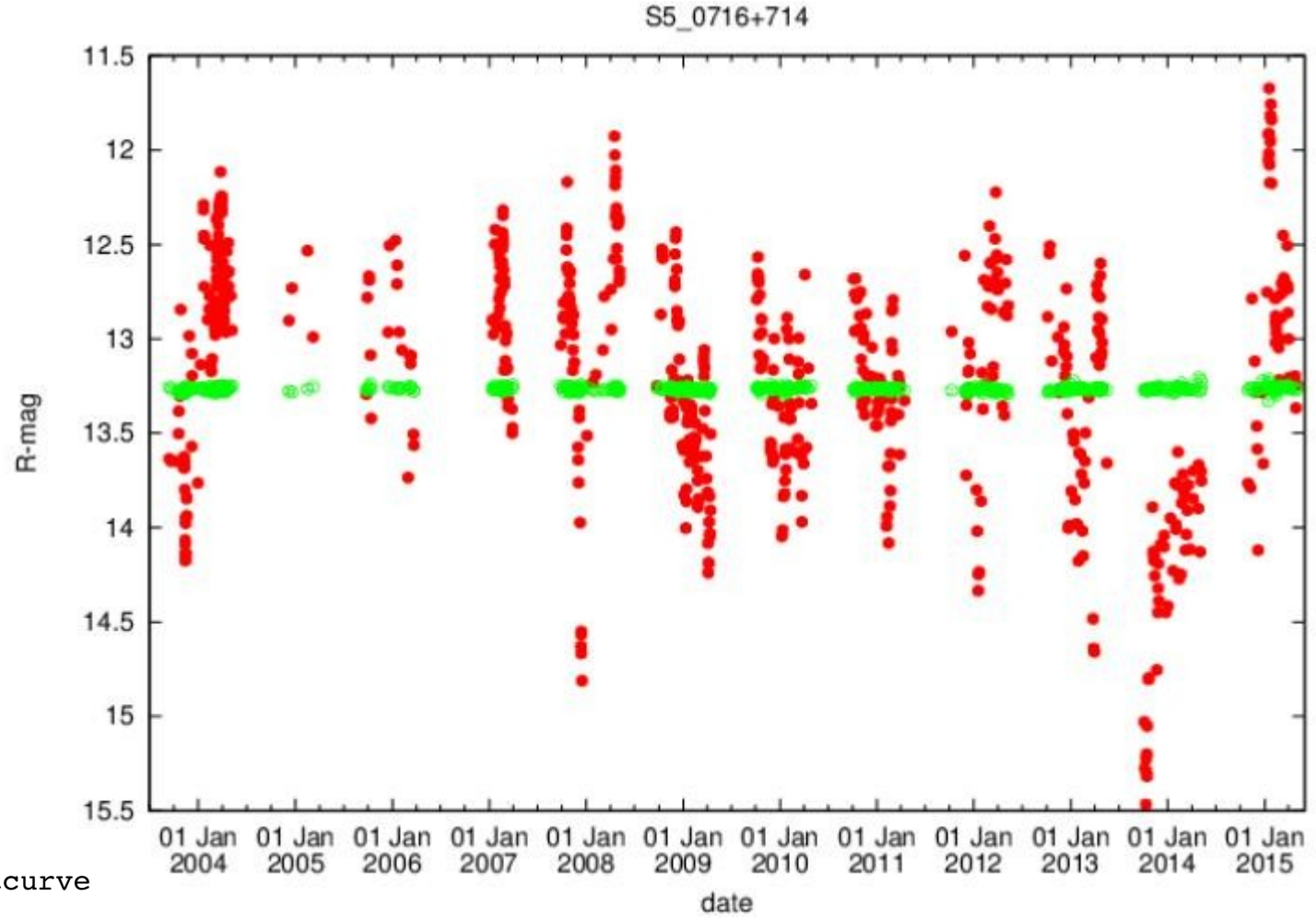
- Sensitivity after the upgrade



Aleksic et al., (2015) Astropart. Phys. **72** 76

S50716: the 2015 flare

- Triggered by an exceptionally high flare in the optical range



KVA Lightcurve

S50716: MAGIC observations

- Fermi-LAT trigger: Jan 18
- MAGIC follow-up: Jan 19
- Detection: Jan 22
- ATel#6999: Jan 27

Date	Teff [h]	Sign. LE
2015-01-19	1.71	1.89
2015-01-22	2.7	6.60
2015-01-23	1.89	6.45
2015-01-24	1.95	6.86
2015-01-25	1.96	8.76
2015-01-26	1.93	13.43
2015-01-27	0.24	1.14
2015-01-28	1.10	2.87
2015-02-13	1.39	4.81
2015-02-14	0.91	4.03
2015-02-15	2.91	10.47
2015-02-16	0.65	0.90
total	19.33	21.89

Outside
GCN
IAUCs

Other
ATel on Twitter and Facebook
ATELstream
ATel Community Site
MacOS: Dashboard Widget

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4 Dec 2015; 14:38 UT

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MAGIC detects Very High Energy gamma-rays from S5 0716+714

ATel #6999; *Razmik Mirzoyan on behalf of the MAGIC collaboration*
on 27 Jan 2015; 20:02 UT
Credential Certification: Razmik Mirzoyan (Razmik.Mirzoyan@mpp.mpg.de)

Subjects: Optical, X-ray, Gamma Ray, >GeV, TeV, VHE, AGN

Referred to by ATel #: 7026, 7268

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The blazar S5 0716+714 was recently reported to be at exceptionally high optical state (ATel#6902, ATel#6942, ATel#6944, ATel#6953, ATel#6957), which triggered MAGIC observations of the source in very high energy gamma rays (VHE, E>100 GeV). The preliminary analysis of the MAGIC data taken between 2015/01/22 and 2015/01/26 indicates potentially variable VHE flux in the range from 4x10^-11 cm^-2 s^-1 to 7x10^-11 cm^-2 s^-1 above 150GeV. S5 0716+714 is a blazar with z~0.31 (Nilsson et al. 2008, A&A...487L..29N), which was reported as VHE emitter in 2008 (Anderhub et al. 2009, ApJ, 704, 129). The measured integral flux above 400 GeV was (7.5 +- 2.2) * 10^-12 cm^-2 s^-1. The 2008 detection is the only significant detection of VHE gamma-ray emission prior to observations reported here. Notably, the 2008 MAGIC detection of the source took place during a high optical state, too. The MAGIC observations were accompanied with simultaneous optical observations with the KVA telescope. The R-band magnitude on 2015/01/26 was 11.84, the lightcurve is available at: http://users.utu.fi/kani/1m/S5_0716+714.html MAGIC observations on S5 0716+714 will continue for one more night and multiwavelength observations are encouraged. The MAGIC contact persons for these observations are R. Mirzoyan (Razmik.Mirzoyan@mpp.mpg.de) and E. Lindfors (elilin@utu.fi). MAGIC is a system of two 17m-diameter Imaging Atmospheric Cherenkov Telescopes located at the Canary island of La Palma, Spain, and designed to perform gamma-ray astronomy in the energy range from 50 GeV to greater than 50 TeV.

Related

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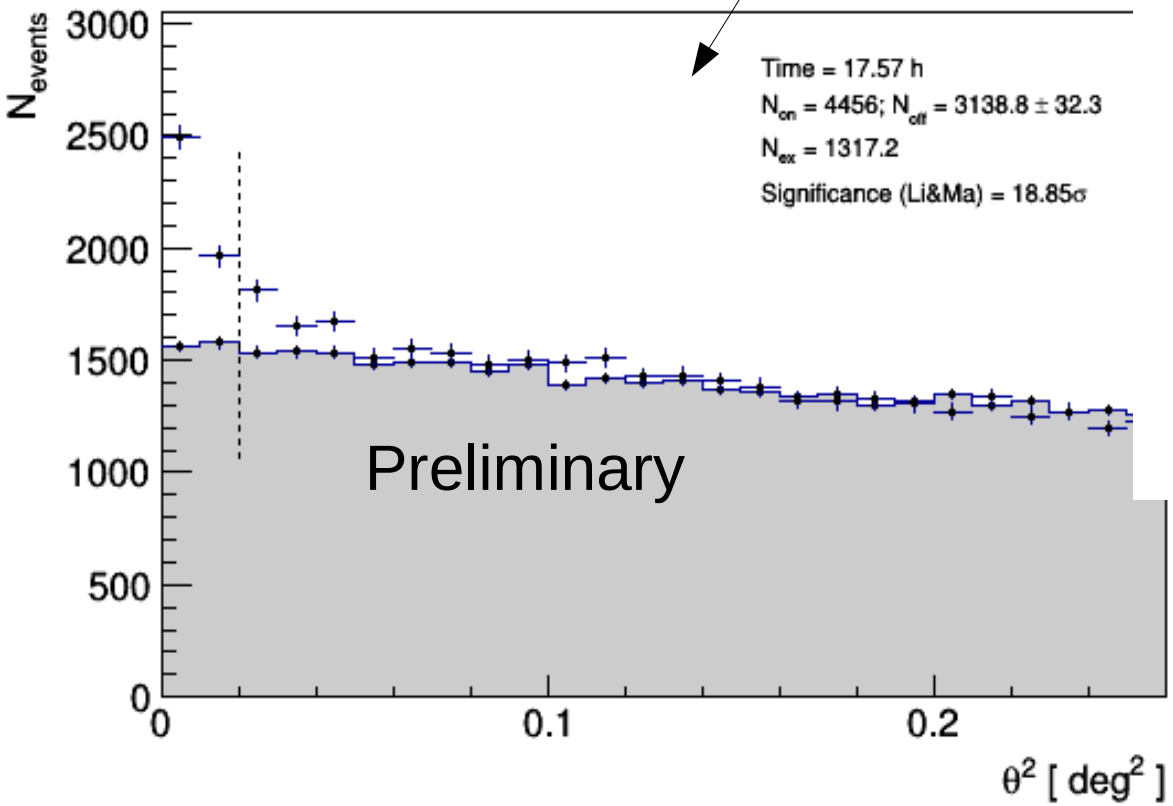
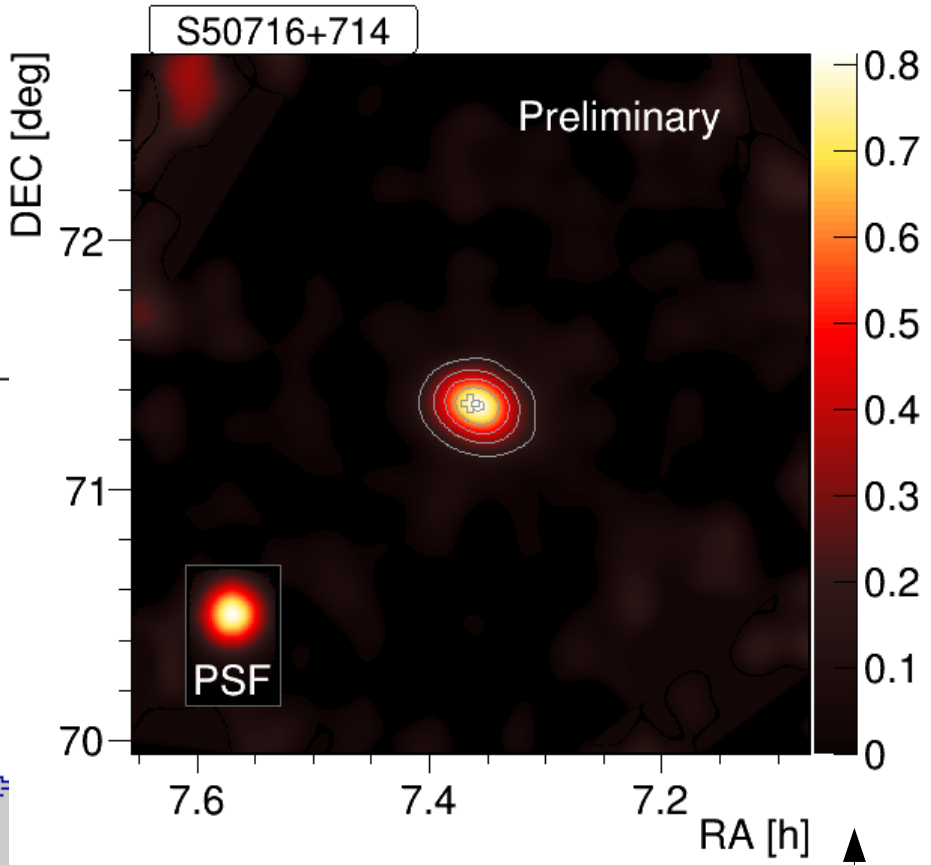
S50716+714: detection by MAGIC

Distribution of the squared angular distance θ2 between the reconstructed source position and the nominal source position (points) or the background estimation position (shaded area)





Flux Map. Z axis = Excess/OFF.

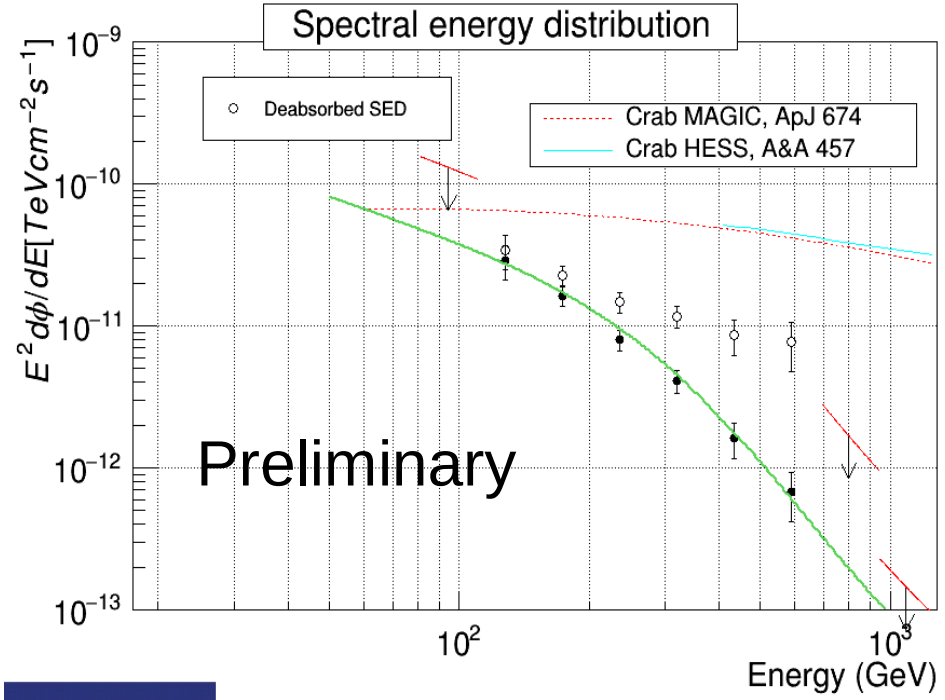
Countours at 5, 10, 15 ... σ

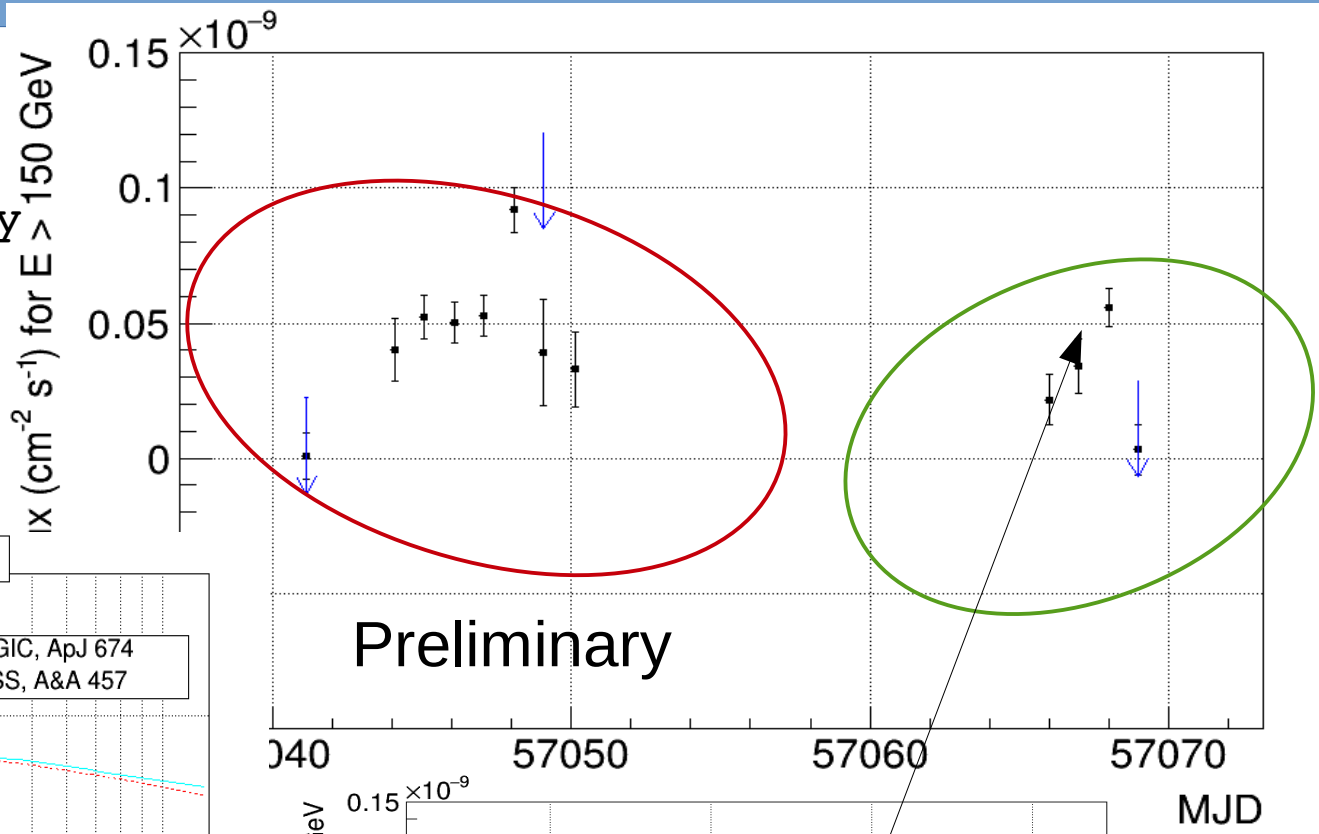
S50716+714: MAGIC Light Curve and SED

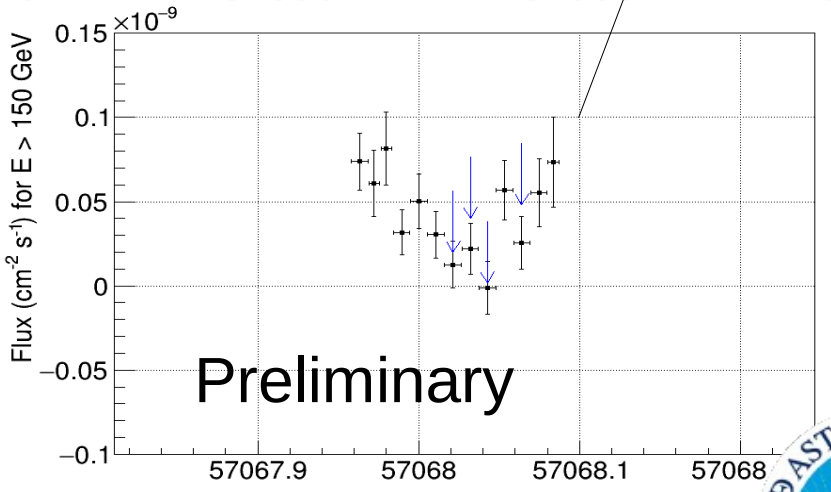
- 2 sub-flares
- Interesting variability

$\alpha = 4.2$ observed

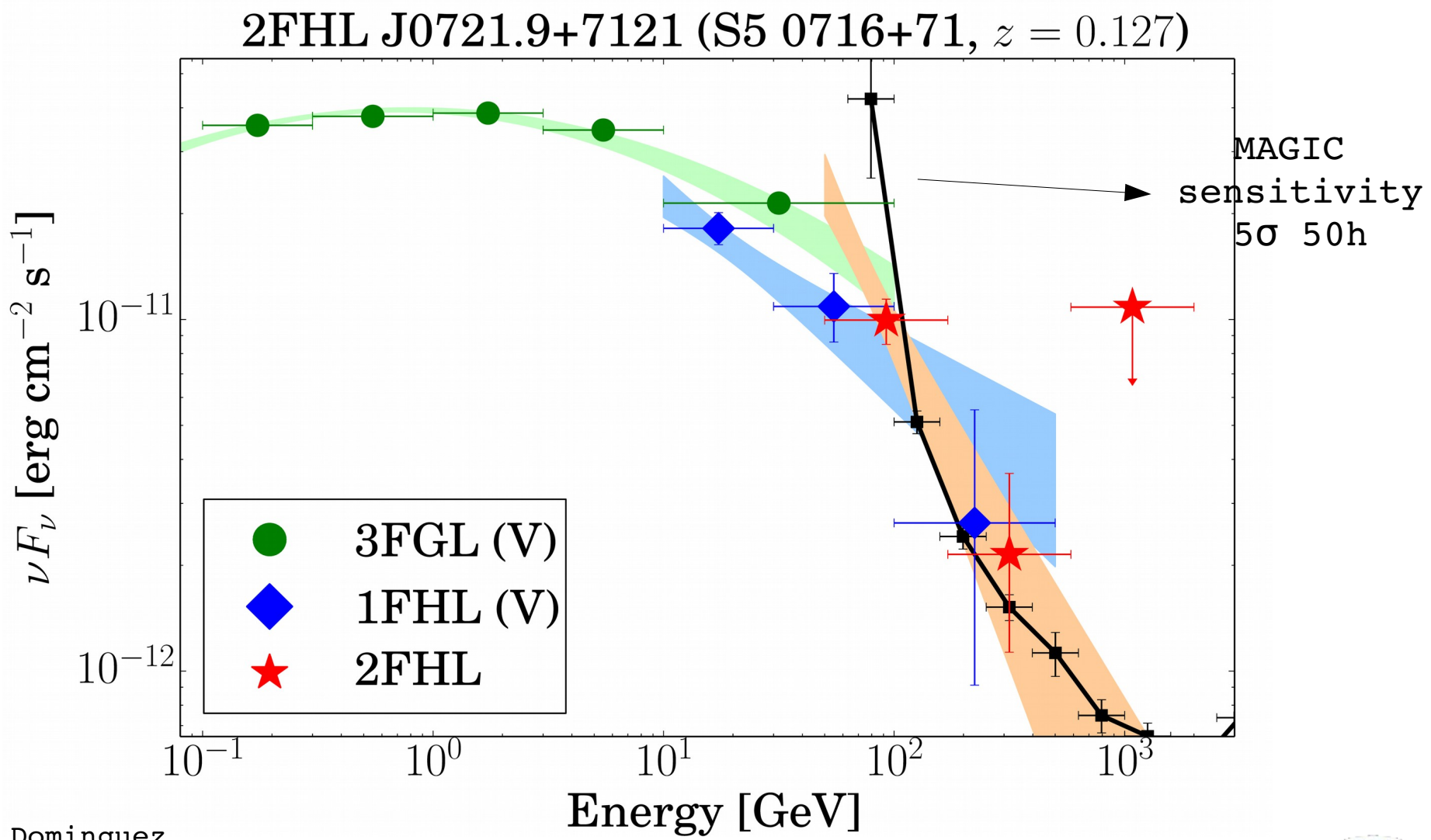
$\alpha = 3.1$ EBL deabsorbed







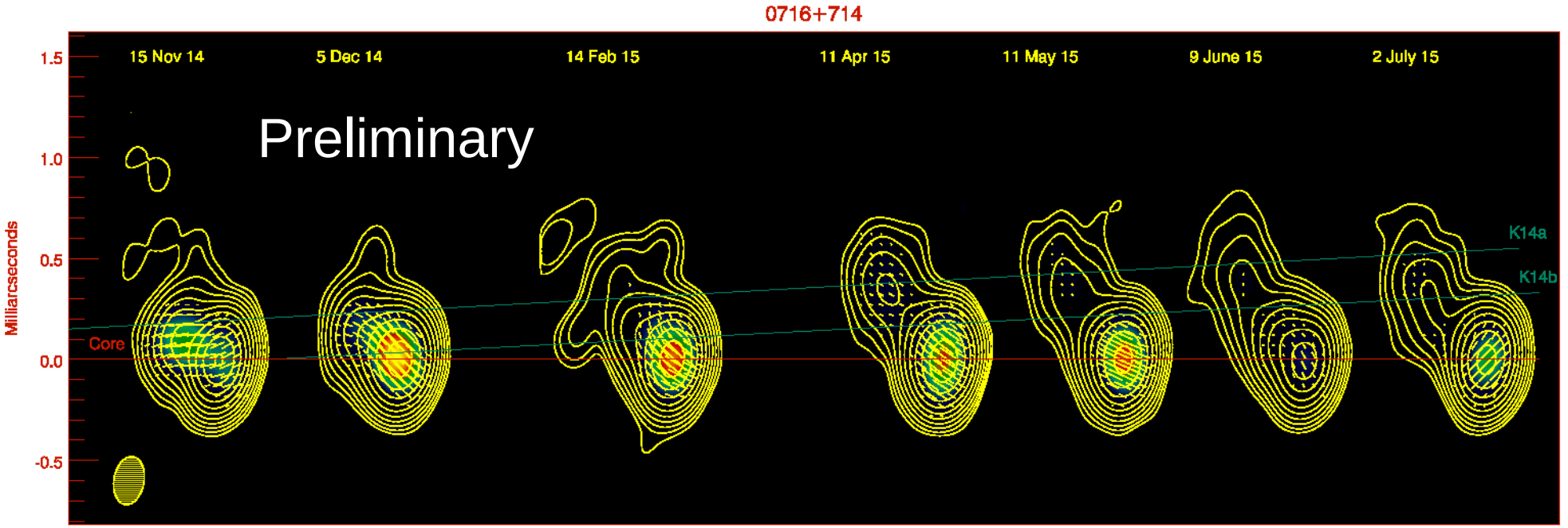
S50716+714: Fermi catalogs spectrum



A. Dominguez

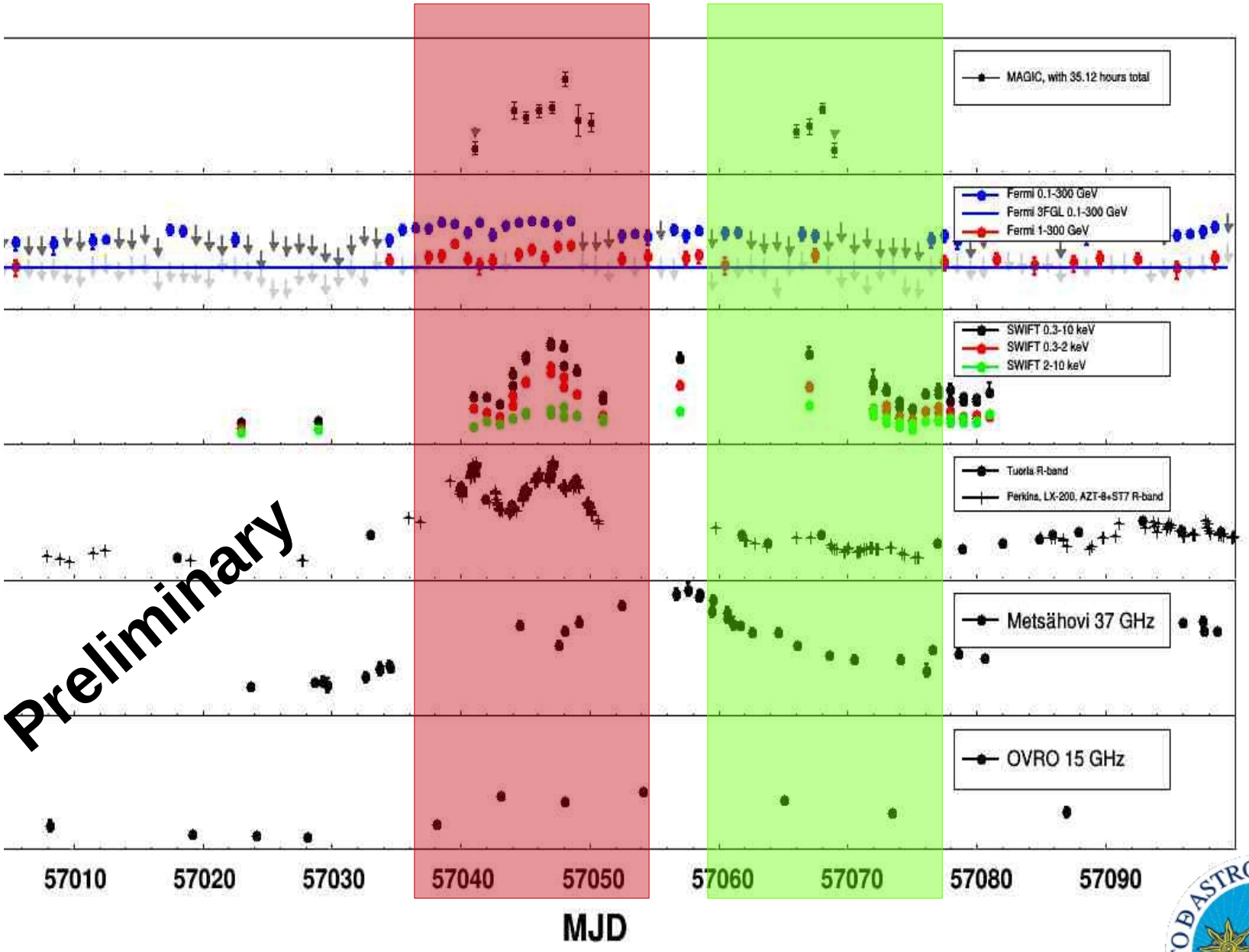
S50716+714: VLBA jet analysis

- No knots ejected in 2015
- Interesting jet behaviour
- Stationary feature near the core

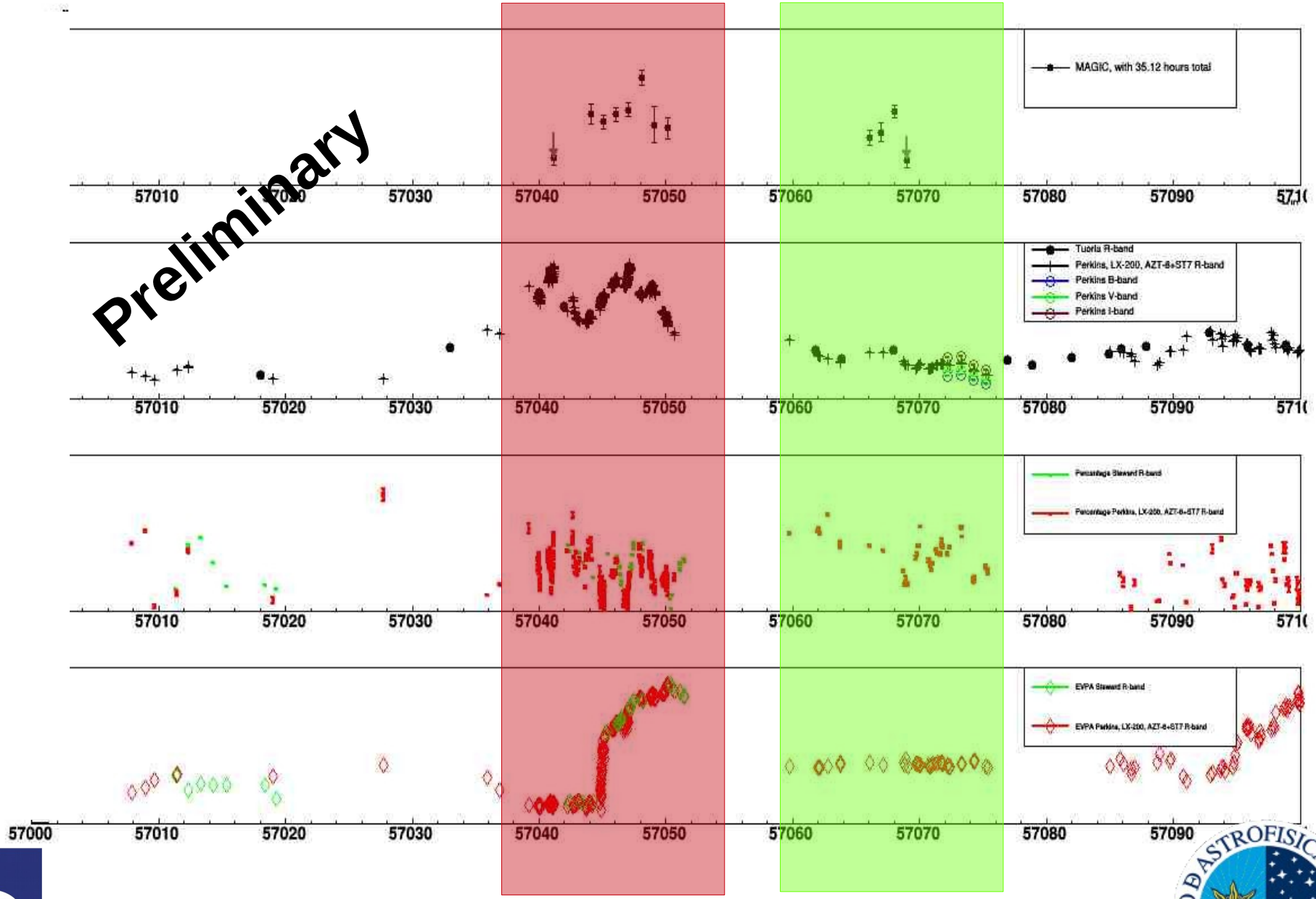


VLBA-BU-BLAZAR data, results provided by S. Jorstad

MWL LightCurve I



MWL LightCurve (optical) II



Conclusions

- MAGIC detected S50716+714 in VHE during its brightest ever optical state
- The Spectral Energy distribution was studied using current EBL models (Dominguez 11)
- MAGIC and Fermi data have been used to determine the redshift of the source
- The variability and the Discrete Correlation Function are under investigation
- An extended collection of MWL data (from Fermi-LAT, SWIFT-XRT,Tuorla, Perkins, Steward,SWIFT-UVOT, Metsahövi, OVRO and more) makes possible a comprehensive study of the emission mechanism (work in progress!)

- All the preliminary plots and results are part of of a joint MAGIC-Fermi-LAT paper in preparation

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