



MAX-PLANCK-GESELLSCHAFT

Status of the MAGIC Telescope Project

*Presented by Razmick Mirzoyan
On behalf of the MAGIC Collaboration*

Max-Planck-Institute for Physics
(Werner-Heisenberg-Institute)
Munich, Germany

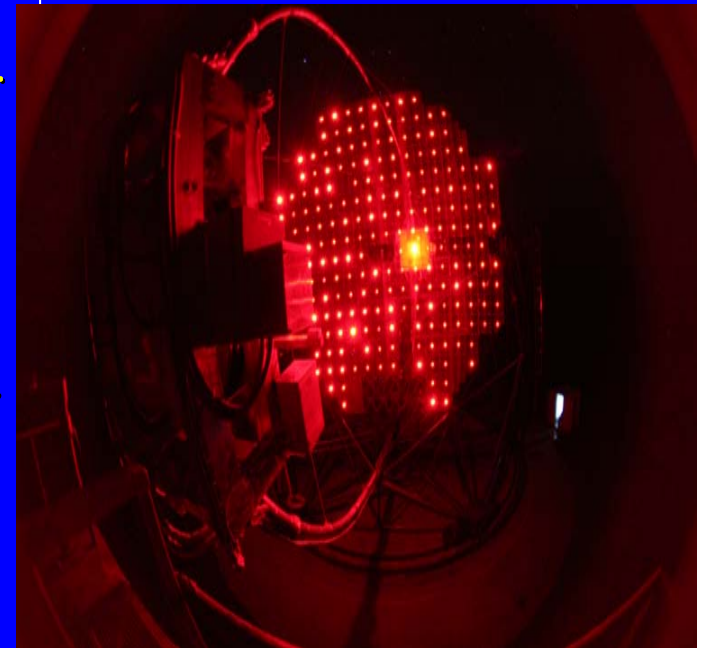
The MAGIC Collaboration

Major Atmospheric Gamma-Ray Imaging Cherenkov Telescope

Barcelona IFAE, Barcelona UAB, Crimean Observatory, U.C. Davis, U. Lodz, UCM Madrid, MPI Munich, INFN/ U. Padua, INFN/ U. Siena U. Humboldt Berlin, Tuorla Observatory, Yerevan Phys. Institute, INFN/U. Udine, U. Würzburg, ETH Zürich, INR Sofia, Univ. Dortmund

- MAGIC is an international collaboration of ~ **150 physicists** operating a **17 m Cherenkov Telescope** for observation of **HE cosmic γ -rays**.
- Main aim: to detect **γ -ray sources** in the unexplored energy range: **30 (10)-> 250 GeV**
- MAGIC is a challenging design to lower the **energy threshold**, by 1) **increased mirror size** 2) using of improved optics, light sensors and electronics 3) **using of advanced trigger**, 4) **ultra-fast readout**

MAGIC aims for the lowest possible threshold for a Cherenkov telescope !



Chronology of the project

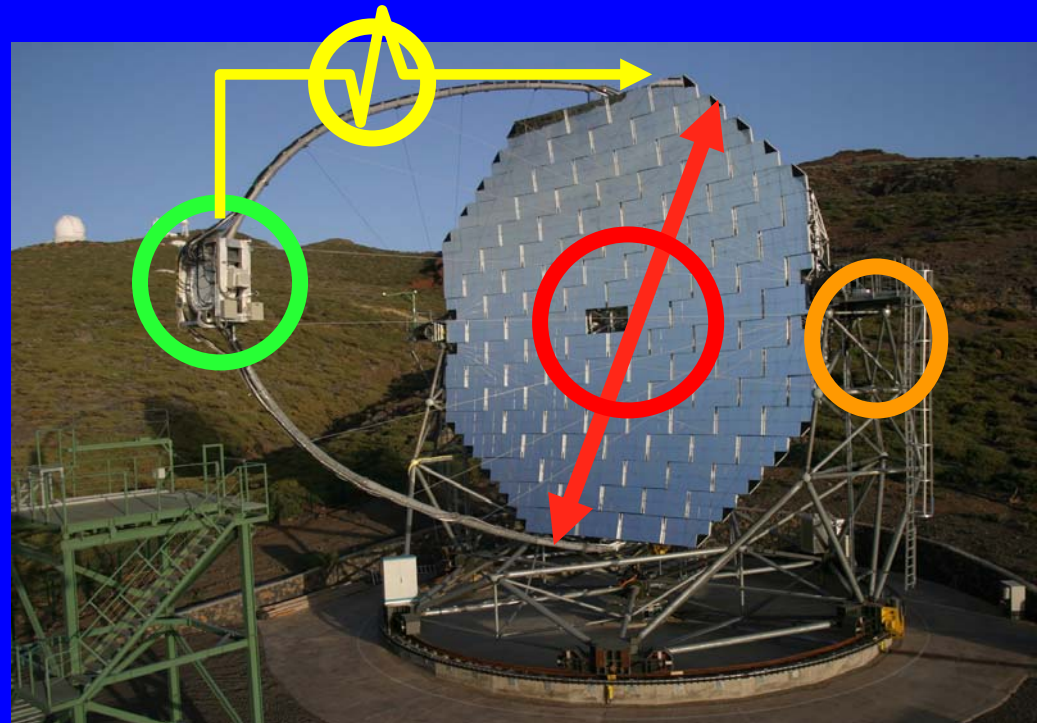
- First presentations in 1995, for example, 25th ICRC, Rome, (*Bradbury et al*)
- Design study: spring 1998
- Approval of funding only late 2000
- Start of construction in 2001
- Inauguration October 10th 2003
- Commissioning until late summer 2004
- Regular observations: early fall 2004



MAGIC: a pioneering telescope setting new threshold & technology standards

The key elements of the MAGIC telescope:

- 17 m diameter reflecting surface (236 m²)
- Light weight carbon fibre frame
- Active mirror control
- 577 pixels enhanced QE, ~3.5° FOV camera + advanced calibration system
- Analogue optical signal transport via 162m long fibres
- 3-level advanced trigger system

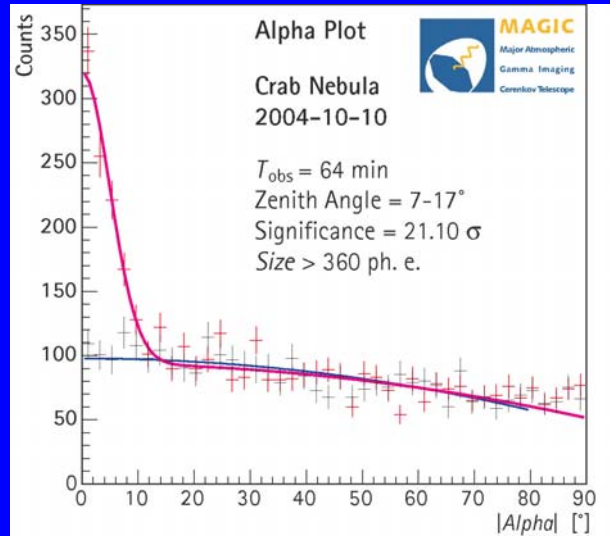


Observed Sources

1ES1959	26.1 hours
2E-1415+2557	19.9
	10
Arp-220	17.9
GC	10.6
Sgr A	11.3
Mkn 501	14.6
HESS 1813-178	15.2
1ES1426+428	15.3
1553+11	9.1
M 87	13.4
W Comae	8.6
1H1722+119	5.7
3EG1605+15	9.5
Crab Nebula	83.1
IC 443	8.8
Mkn 421	36.9

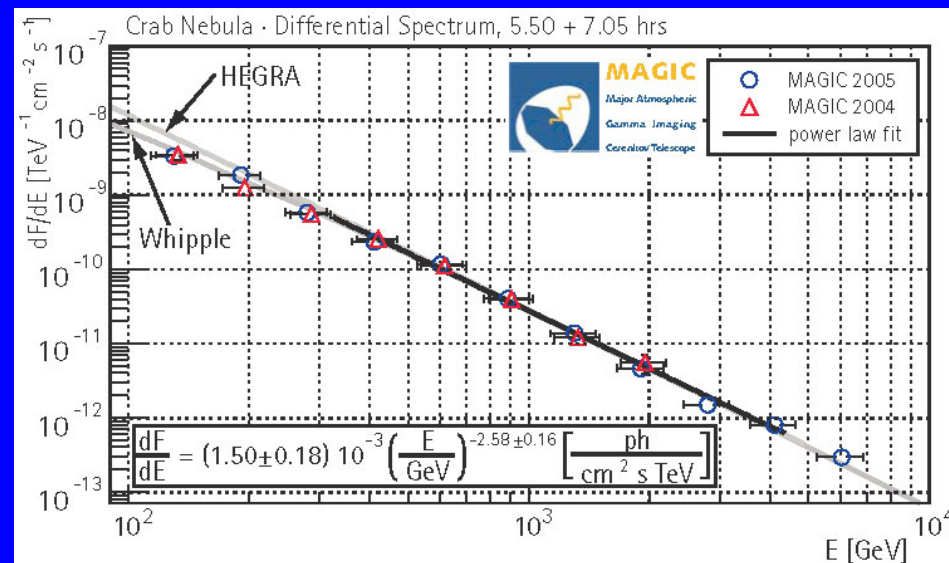
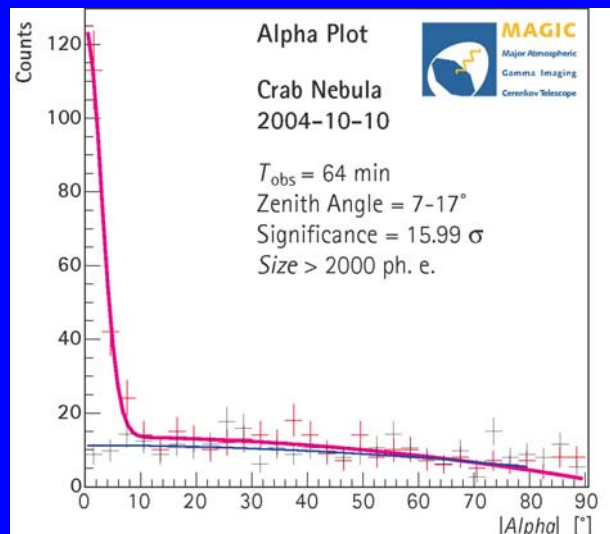
TeV-L3+C	6.7
1ES1218+304	10.5
1ES1440+122	2.1
SGR 1806-20	1.3
3EG0520+2626	7.8
3EG0853	+19
0317+18	14
0323+02	4
0735+17	1.7
3C66A	22.9
4C15.05	7.5
PSRB1957+20	7.5
PSRB1951+32	10.3
3EG2033+41	13.6
3EG1727+04	3.6
BL Lac	0.6

Source Measurements: Crab Nebula

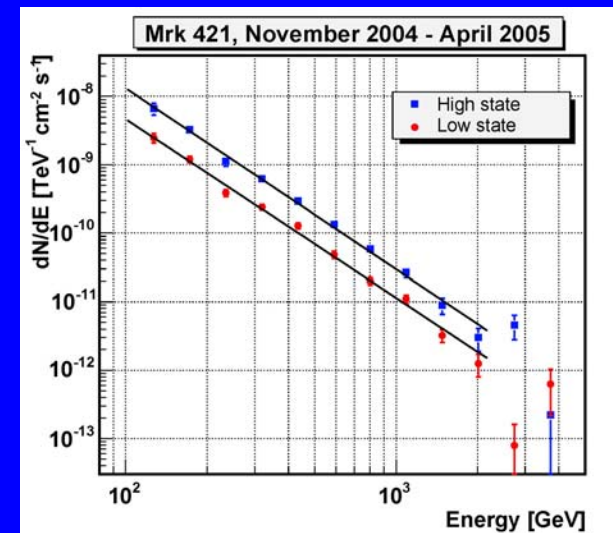
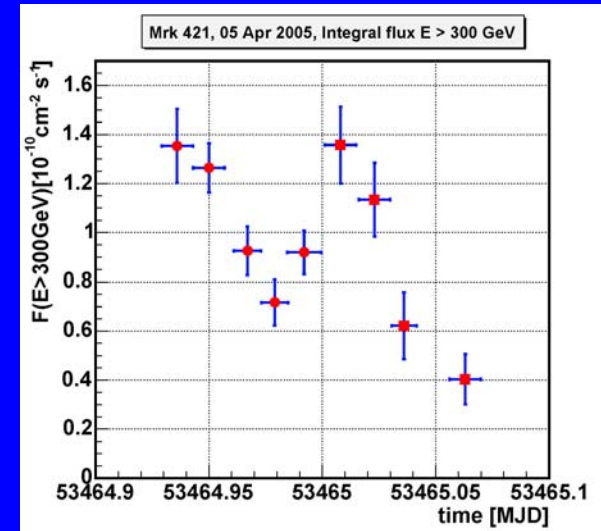
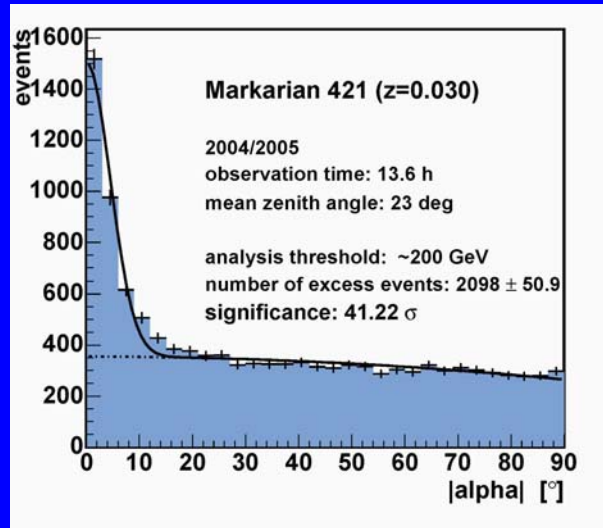


Measurements of Crab Nebula allowed us to understand the sensitivity of MAGIC, at least for energies > 100 GeV.

In 50h we can measure with 5σ a source with ~ 30 mCrab intensity

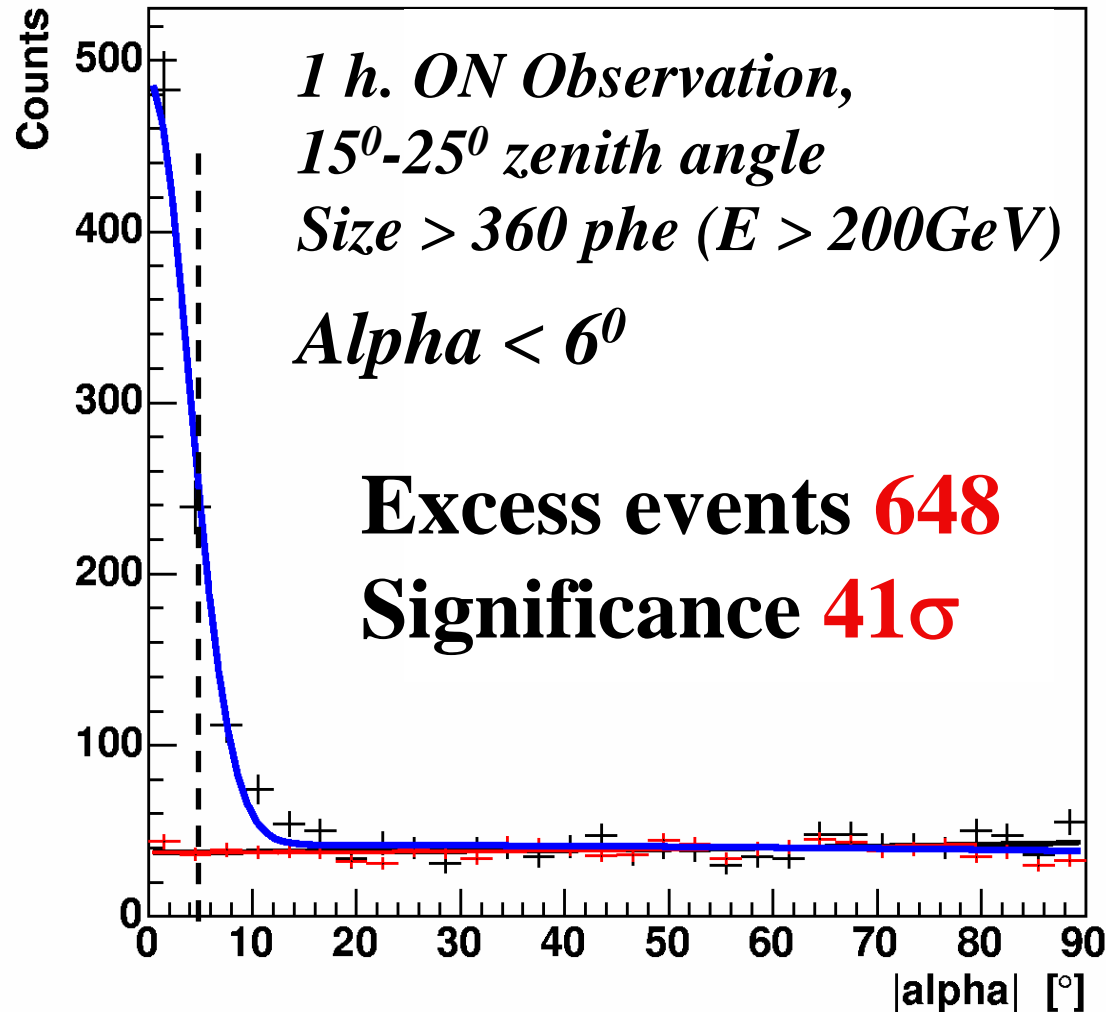


Source Measurements: Mkn 421

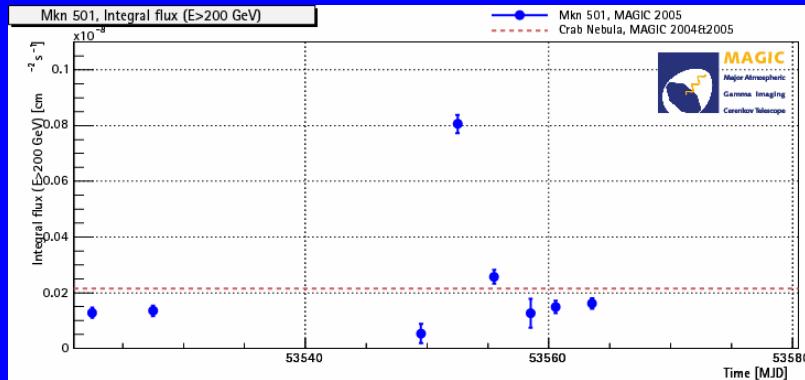


Source Measurements: Mkn 501

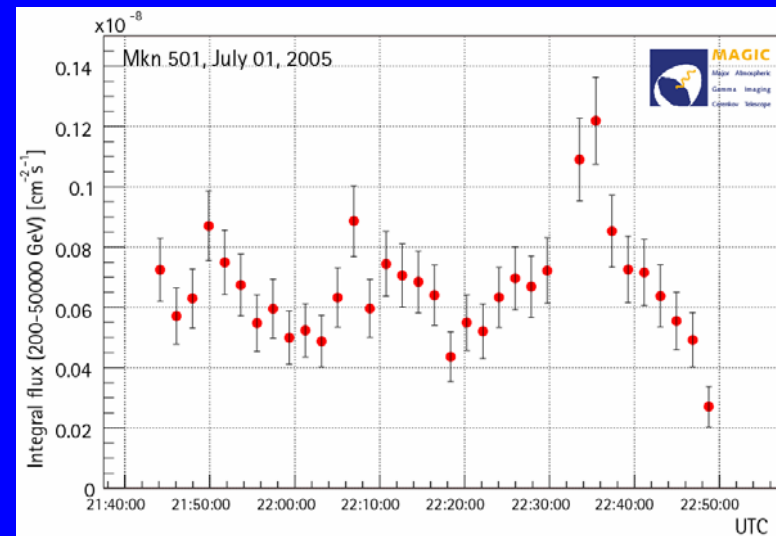
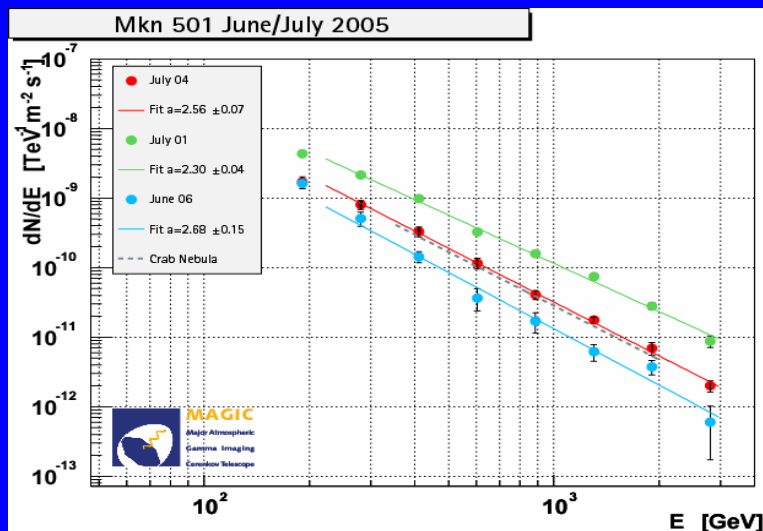
Alpha plot for data taken on July 1st



Source Measurements: Mkn 501

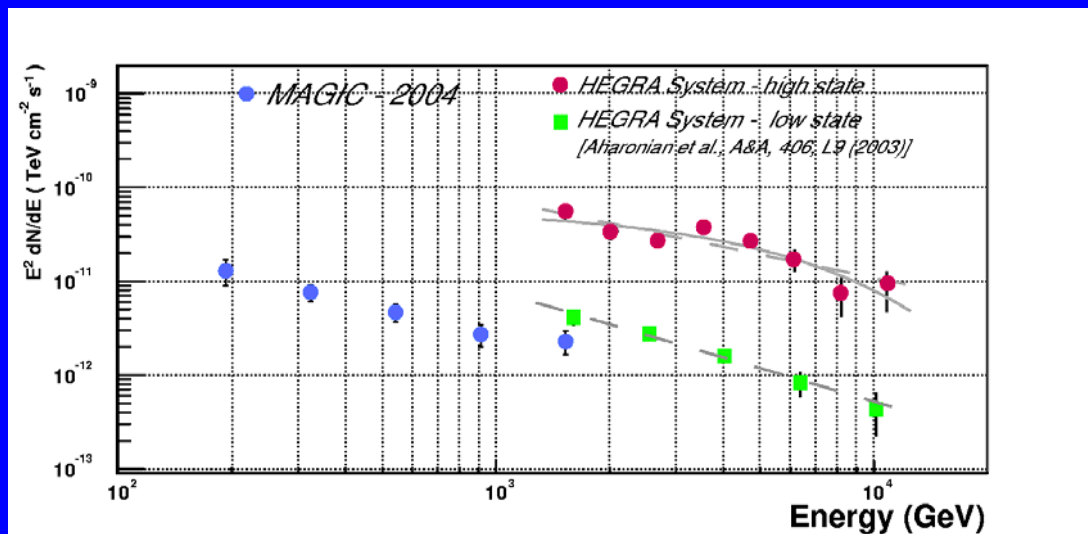
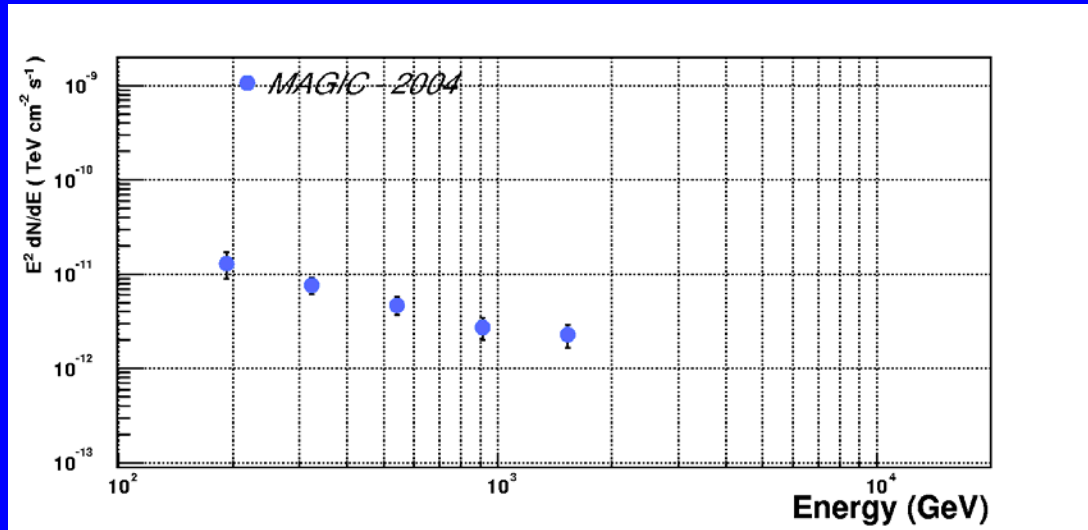
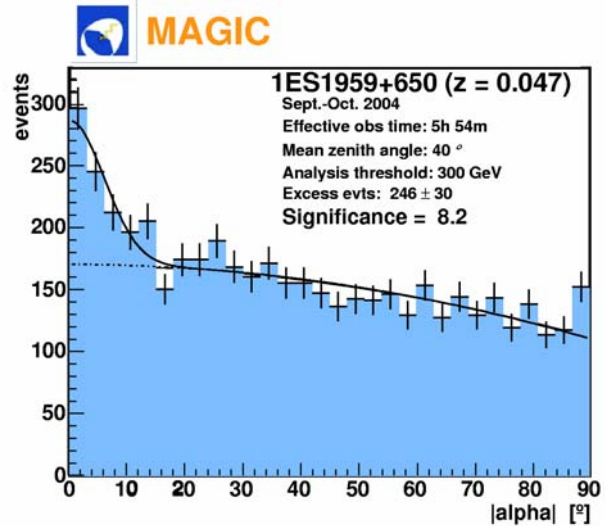


Recently there was a huge outburst from Mkn 501 on July 1st, the intensity of the source was ~ 4 Crab. Because of the very strong detection we could follow the intensity variations in bins of 2 min.



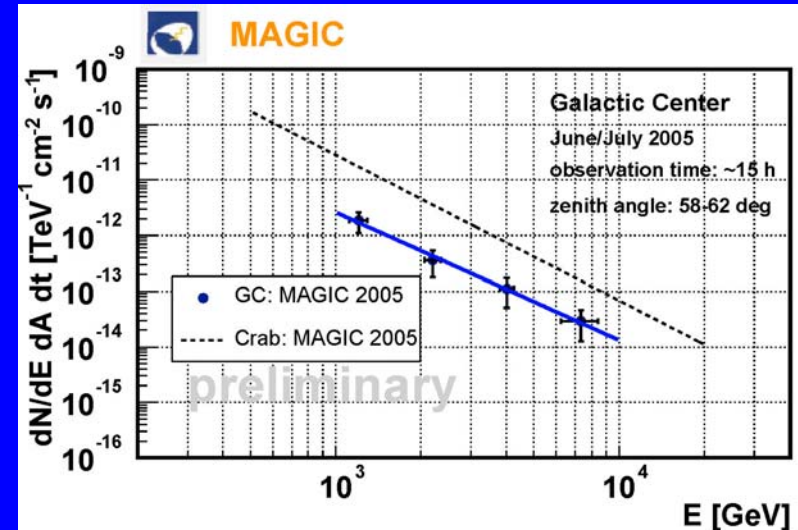
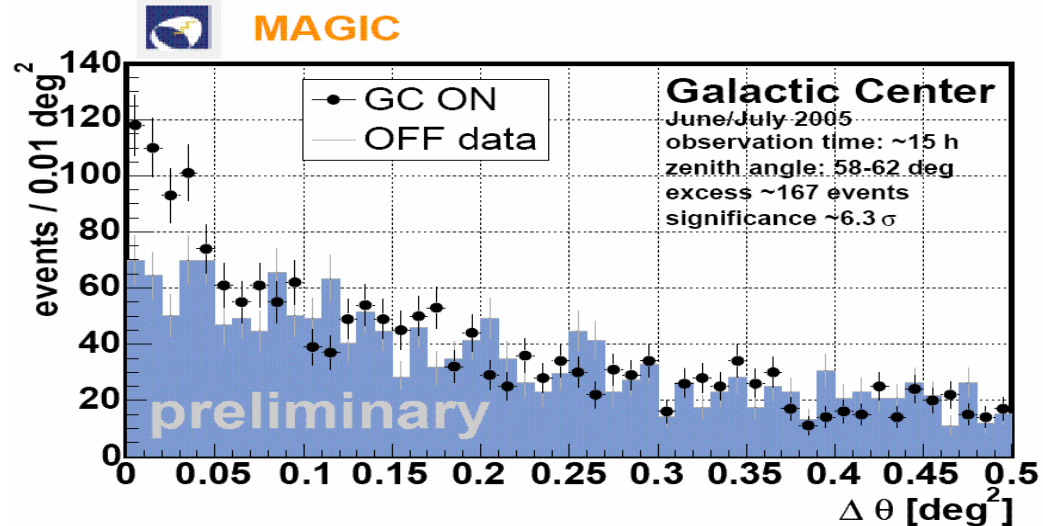
Source Measurements: 1ES-1959

(see Tonello, et al.,)



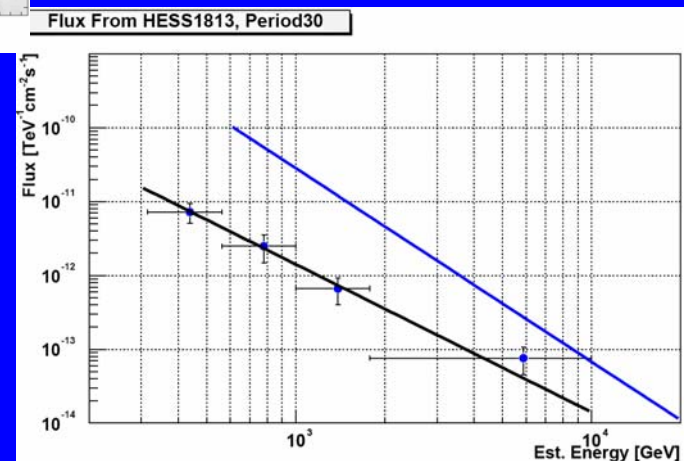
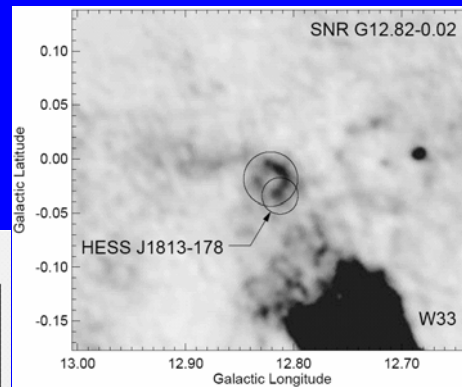
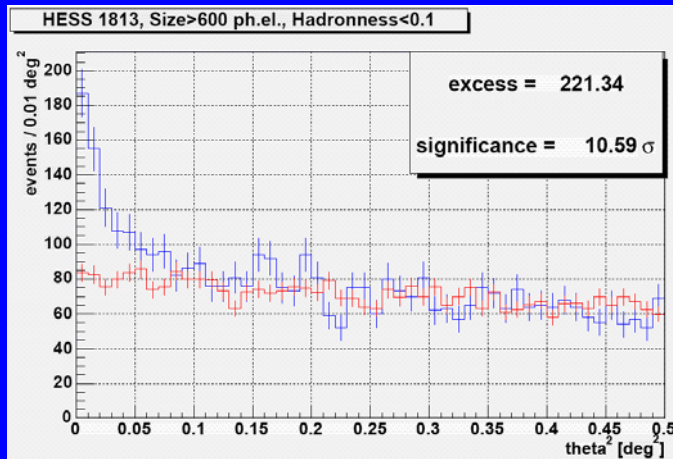
Source Measurements: Galactic Center

- ~6 sigma significance, ~167 excess events
- SIZE > 600 ph.el., threshold ~1.4 TeV
- GC ON/OFF data (15h+8h, June+July 2005)
(see Bartko, etal.,)



Source Measurements: HESS J1813

This source has been measured very recently, in June and July. In ~ 25 h wobble mode we have obtained $\sim 10.6 \sigma$ signal. Above ~ 1 TeV: 10% Crab flux, relatively hard spectrum with the diff. index of ~ 2.2 . To our knowledge it is the first time that the spectrum of this source is shown (see Bartko, et al.,)

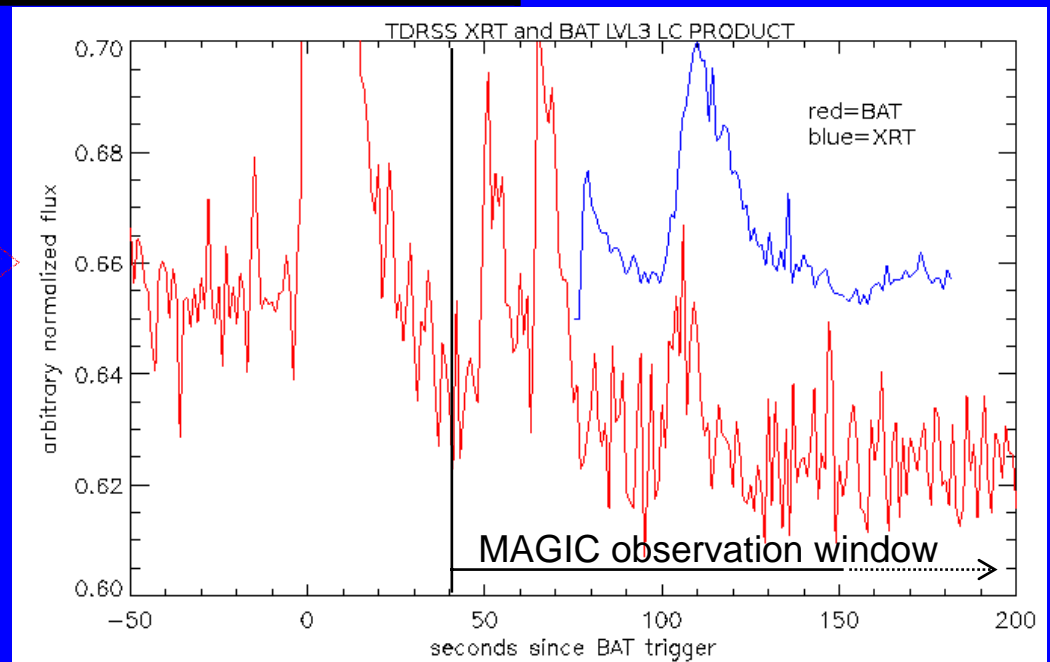


Source Measurements: GRBs

Nr	GRB Event	Satellite	GRB onset [UTC]	Δt alert [sec]	Δt observation [sec]	Zenith distance	Redshift
1.	GRB050408	HETE	16:22:50	14	3138	48°	1.2357
2.	GRB050421	SWIFT	04:11:52	58	112	52°	
3.	GRB050502	SWIFT	02:14:18	18	990	33°	3.793
4.	GRB050505	SWIFT	23:22:21	540	793	50°	4.27
5.	GRB050509A	SWIFT	01:46:29	16	115	57°	
6.	GRB050509B	SWIFT	04:00:19	15	368	69°	0.226
7.	GRB050528	SWIFT	04:06:45	43	77	52°	
8.	GRB050713A	SWIFT	04:29:02	13	40	49°	

GRB050713A

On July 13th we started to measure the GRB050713A just after 40 sec. After the burst was detected.



Second Phase of the project: MAGIC-II

The second telescope, MAGIC-II, is already under the construction in La Palma, on 85m distance from the MAGIC-I. It is essentially a clone telescope with some improvements on the camera part. MAGIC-II is scheduled to be completed in spring 2007 (see Teshima, et al.)



Conclusions

- Regular data taking since early fall 2004 with MAGIC-I
- Strong γ ray signals from a number of sources have been measured and evaluated
- Sensitivity of the telescope: a source with ~ 22 mCrab intensity can be measured with 5σ in 50h.
- MAGIC-II is currently under construction. Shall be ready sometime in spring 2007.
- Coincident operation of the two telescopes will provide the double sensitivity and a lower threshold setting.