



VERITAS Observations of Mrk 501 in 2009

Alexander Konopelko (Pittsburg State University),
for the VERITAS collaboration



The spectral and variability measurements of Mrk 501 with VERITAS during 2009 observational campaign.

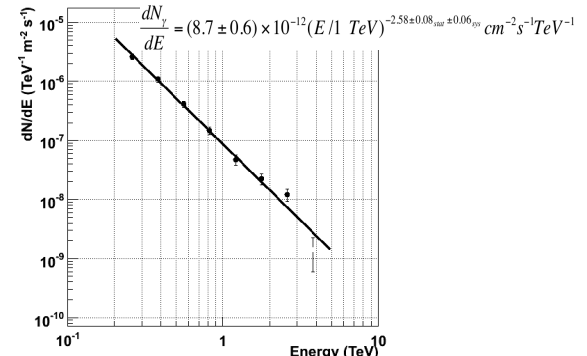
VERITAS (*Very Energetic Radiation Imaging Telescope Array System*) is an array of four imaging atmospheric Cherenkov telescopes located in southern Arizona at an altitude of 1.3 km. The telescopes are almost identical in their technical parameters. The 12 m optical reflector is a tessellated structure consisting of 357 identical spherical mirror facets, which are hexagonal in shape. The arrangement of the mirror facets constitutes a Davies-Cotton design, providing a total reflecting area of 110 m². The optical point-spread function of a VERITAS telescope has a FWHM of about 4' on-axis. A high-resolution imaging camera placed at the focus of the reflector consists of 499 photomultiplier tubes (PMTs) in a close-packed hexagonal arrangement and has a field of view of 3.5°. Each camera PMT views a circle of diameter 0.15° on the sky.



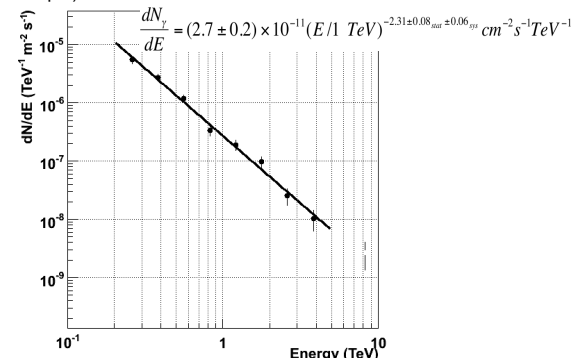
Summary of Data: Mrk 501 was observed with VERITAS for 8.3 hours between March 17 and June 22 of 2009. The observations were made with the full four-telescope array, as well as with the sub-arrays of three and two telescopes. During the nights of April 30 and May 1, two telescopes were disabled due to hardware issues leaving two operational telescopes from the full four telescope array. For the data in late May and during June, three telescopes were operational due to the move of T1 (see the poster by Perkins et al. at this Symposium).

Setup:	Period:	Exposure [min]:	Gamma-ray rate [γ's min ⁻¹]:	Significance [σ]
4 telescopes	March 17 - 25, 2009	184	2.17 +/- 0.17	14.3
2 telescopes	April 30 - May 1, 2009	146	2.89 +/- 0.18	23.0
3 telescopes	May 29 - June 22, 2009	166	2.09 +/- 0.17	14.4

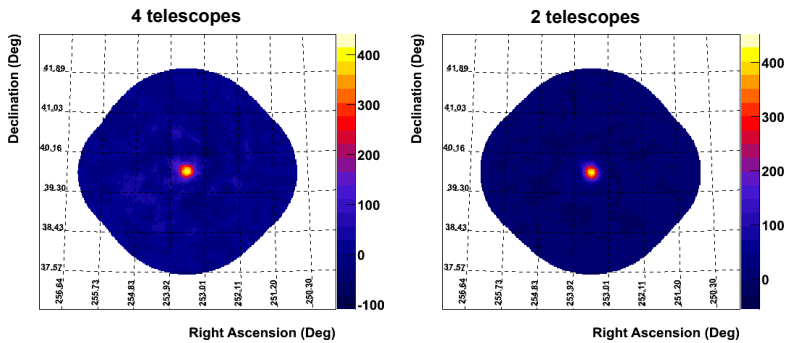
Differential energy spectrum of TeV γ rays from Mrk 501, measured with VERITAS.



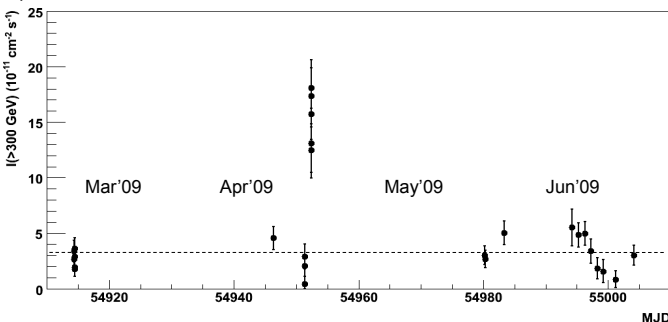
The baseline emission spectrum (combined 3 & 4 telescopes data sample).



The high-flux spectrum (2 telescopes data sample).



Smoothed sky map of excess counts from the region centered at Mrk 501 observed with VERITAS for 3 hours with 4 telescopes (left panel) and for 2.4 hrs with 2 telescopes (right panel). The color bar represents the excess event counts.



Run by run light curve of Mrk 501. The dashed line shows the fit to a constant integrated flux of the lightcurve excluding the nights of April 30 and May 1.

Acknowledgements. This research was supported by grants from the U.S. Department of Energy, the U.S. National Science Foundation and the Smithsonian Institution, by NSERC in Canada, by Science Foundation Ireland and by STFC in the UK. The VERITAS collaboration acknowledges the hard work and dedication of the FLWO support staff in making the relocation of Telescope 1 possible. The VERITAS collaboration acknowledges the NASA support on the Fermi GST LAT Grant #NNX08AV62G.

Summary: Analysis of the Mrk 501 data, taken with the VERITAS array during 2009 observing season, revealed significant variations of the flux and noticeable variation of the spectral slope at energies above 250 GeV depending on the emission state. The *correlated analysis* of the *Fermi*-LAT and VERITAS data taken during 2009 observational season is currently ongoing. The results reported in this poster are consistent with the previous observations of Mrk 501 at TeV energies made with VERITAS and the other ground-based experiments. Observations of blazar Mrk 501 at GeV and TeV energies allow to profile the spectral shape of the high-energy component of its emission. *Simultaneous broadband observation* of Mrk 501 in a *flaring state* provides excellent test of emission models.

Multi-wavelength observations of Mrk 501 in the quiescent-state (Mar'09) are presented at this Symposium in the poster by Gall et al.