

# Study of the Performance of a Single Stand-Alone H.E.S.S. Telescope: Monte Carlo Simulations & Data

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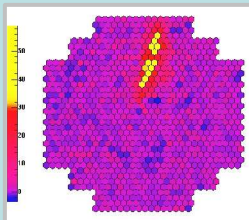
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The High Energy Stereoscopic System (H.E.S.S.), a system of four 12 m imaging Cherenkov telescopes is currently under construction in the Khomas Highland of Namibia (Hofmann et al. OG 2.5). The first telescope has been taking data since June 2002. An extended sample of recorded cosmic ray images, as well as a sample of gamma-rays from the Crab Nebula, along with simulated data, give an opportunity to study the telescope performance.

## Simulations:

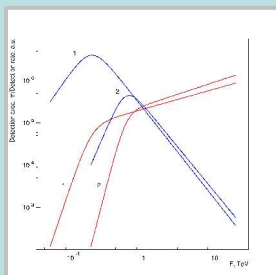
MC codes: ALTAI, CORSIKA, KASCADE, MOCCA  
 Energy range: from 10 GeV to 30 TeV  
 Elevation range: from 30 degree up to the Zenith  
 Solid angle of incidence of CR showers has a half opening angle of 5 degree  
 Maximum impact radius was typically 1000 m  
 Dedicated detector simulation procedure

## Shower Image:



Camera Performance:  
 Vincent et al. OG 2.5

## Detection Areas & Rates:

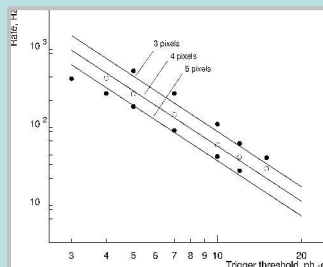


The Crab Nebula spectrum as measured by HEGRA (Aharonian et al. 2000 ApJ, 539:317) was used

Energy threshold for gamma-rays is about 150 GeV and 550 GeV at elevation of 80 and 45 degree, respectively

Legend: 1 – elevation of 80 deg; 2 – elevation of 45 deg

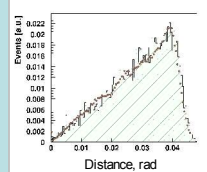
## Event Rate:



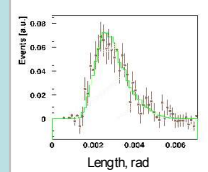
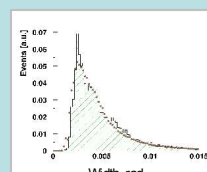
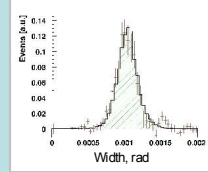
Default trigger setup: 4-fold pixel coincidence with a pixel signal above 5 ph.-e.  
 Event counting rate at an elevation of 80 degree: about 255 Hz (dead-time unfolded)  
 The Monte Carlo predicted rate:  
 $253 \pm 18 (stat) \pm 53 (syst)$  Hz  
 Air showers from cosmic ray nuclei: about 27%

## Image Parameters:

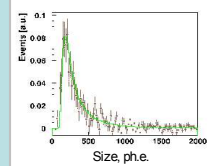
### Cosmic Rays



### Gamma-rays



Data: filled circles;  
 MC: histogram.



## Performance:

The gamma-ray rate from the Crab Nebula after analysis cuts (Masterson, C. OG 2.2) is of about  $3.57 \pm 0.18 \text{ min}^{-1}$   
 The MC predicted rate:  $2.9 \pm 0.18 (stat) \pm 0.9 (syst) \text{ min}^{-1}$   
 The background data rate:  $2.5 \pm 0.5 \text{ min}^{-1}$   
 corresponding MC rate:  $2.3 \pm 0.1 (stat) \pm 0.6 (syst)$

The single H.E.S.S. telescope can see the signal from the Crab Nebula at the level of 9 after one hour of observations