



Outline

- Brief Introduction
- Upgrade
- Benefits
- conclusions



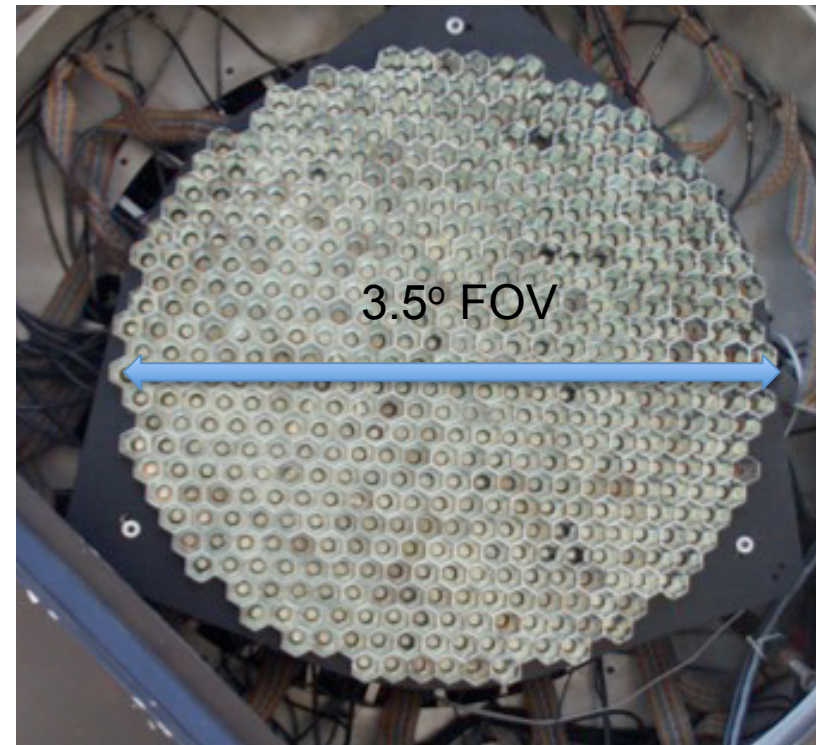
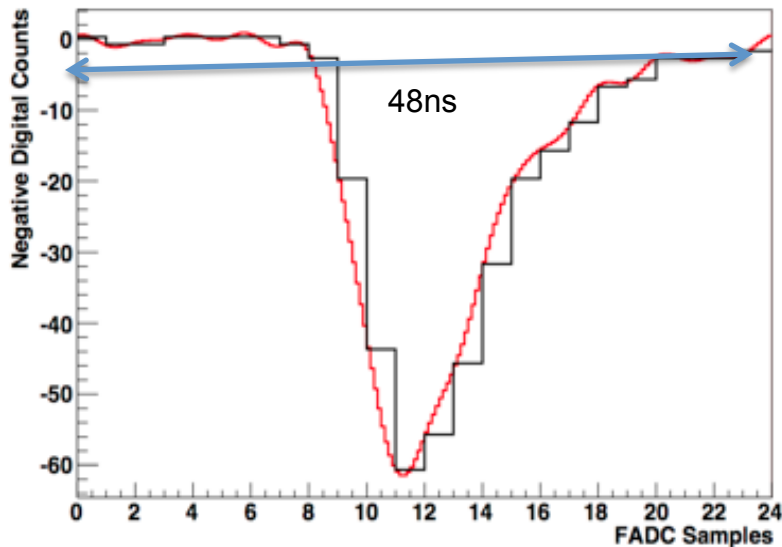
The Very Energetic Radiation Imaging Telescope Array System



- VERITAS is a Ground based observatory
- It comprises an array of four 12m optical reflectors

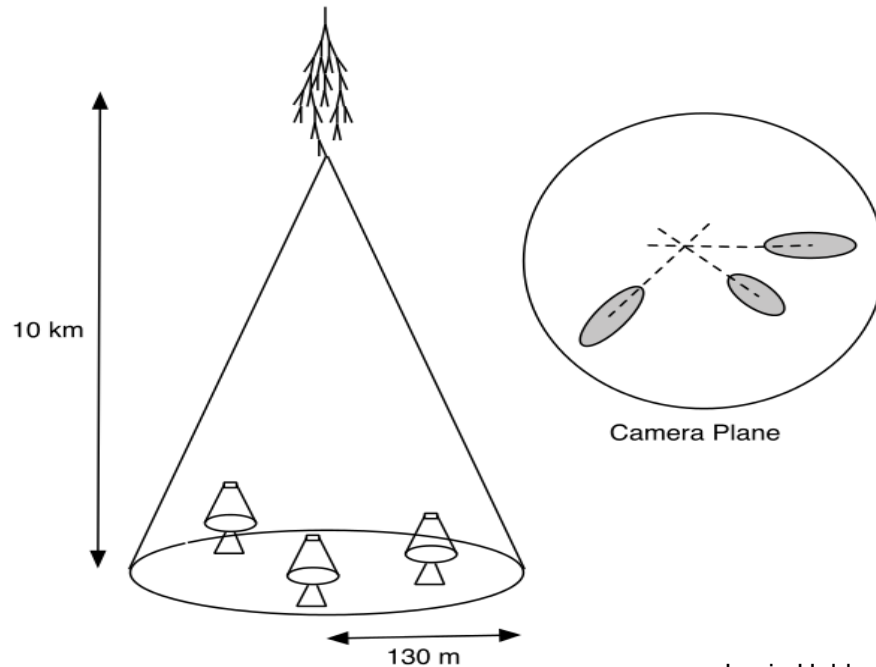
VERITAS continued.....

- 499 PMTs (Photonis XP 2970/02)
- 3.5° field of view
- 500 MSample/s flash ADC (2 ns)
- Energy range is 100 GeV - 50 TeV



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Cherenkov Imaging technique

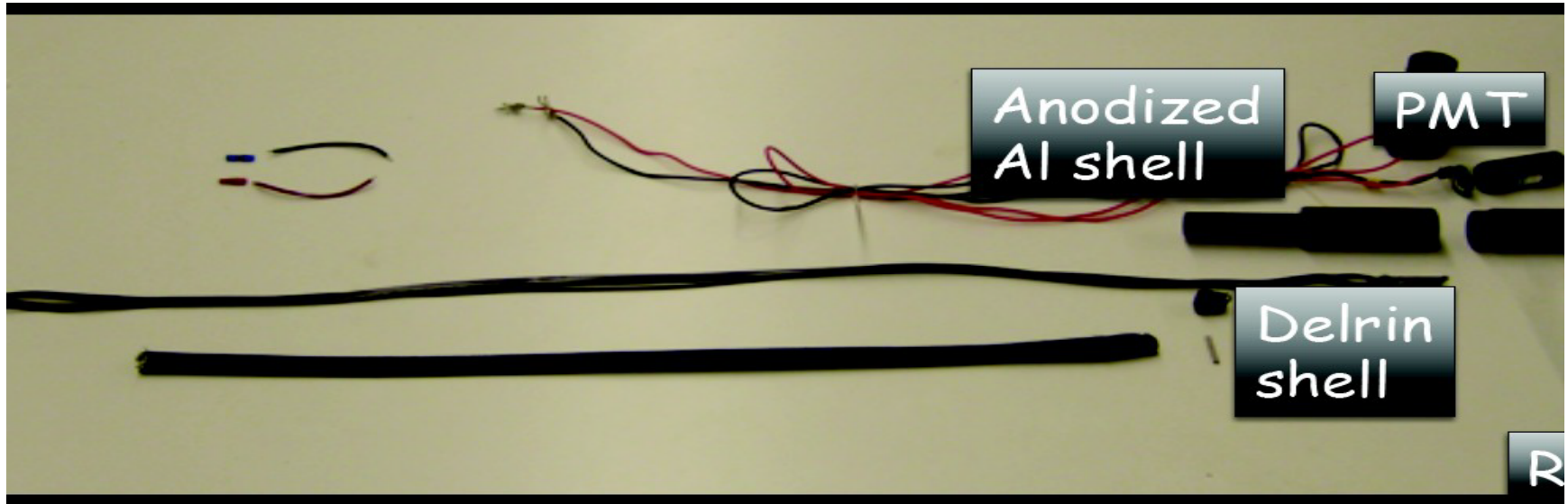


Jamie Holder

Array of photomultipliers in the focal plane of optical reflector record the image of air shower.



Looking Ahead

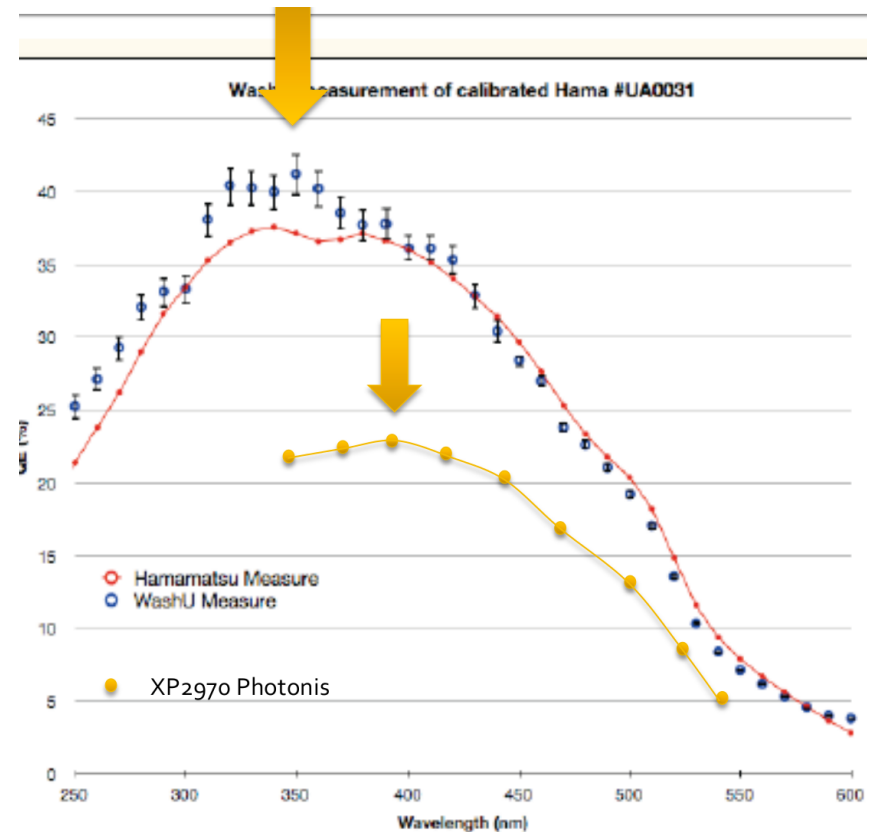


- Current Photonis PMT XP2970 ~18-22% peak Quantum efficiency(QE)
- New Hamamatsu PMT R10560 ~34-40% peak QE



Quantum efficiency

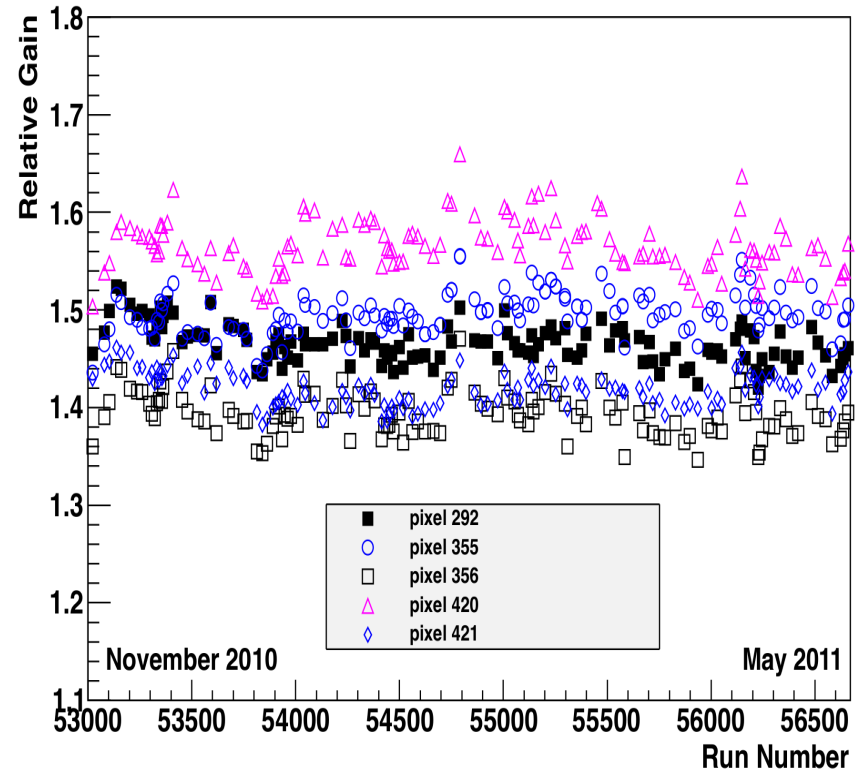
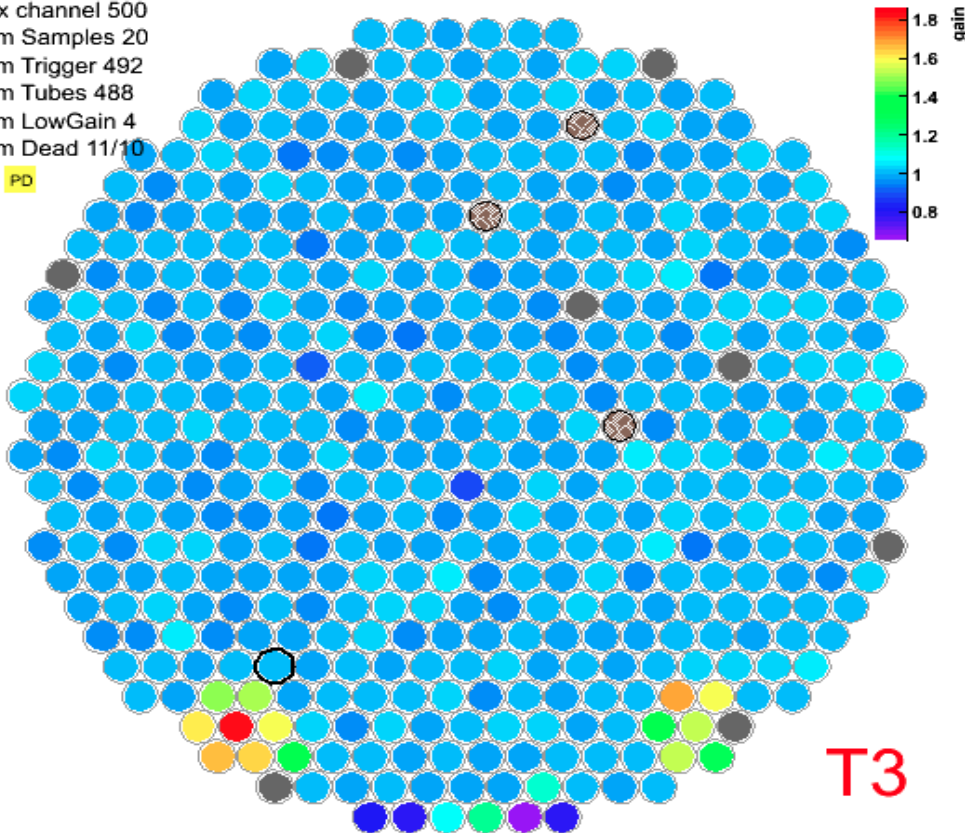
It is defined as the ratio of number of photoelectrons emitted to the number of photons incident upon the photocathode.





Gain stability of pixels

Run: 52604 Event: 18 Type: 1 (0) GPS: 2010 290 : 10 : 25 : 2.46653
 Max channel 500
 Num Samples 20
 Num Trigger 492
 Num Tubes 488
 Num LowGain 4
 Num Dead 11/10



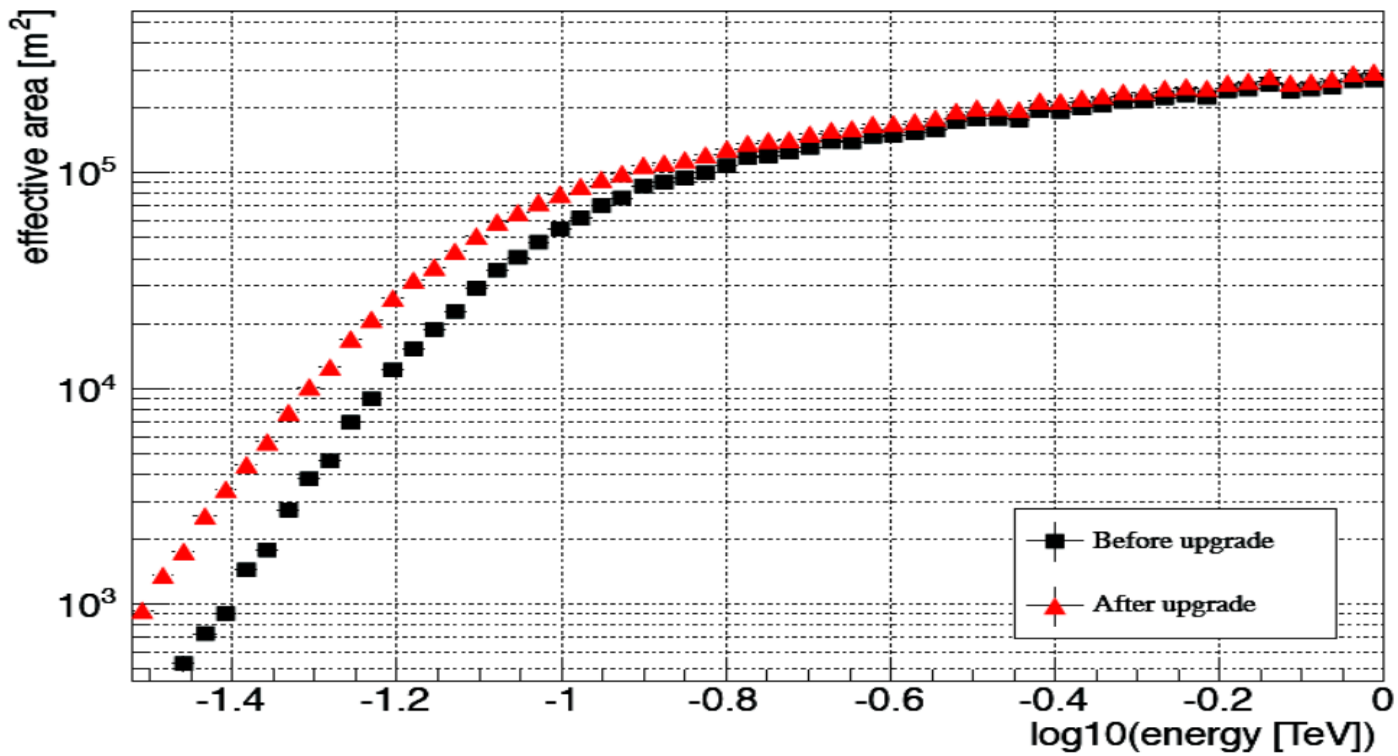


Benefits of replacement

- Better collection efficiency leads to Increase in the effective area at lower energy
- Pulse shape results in Better discrimination of cherenkov signal against the background photons

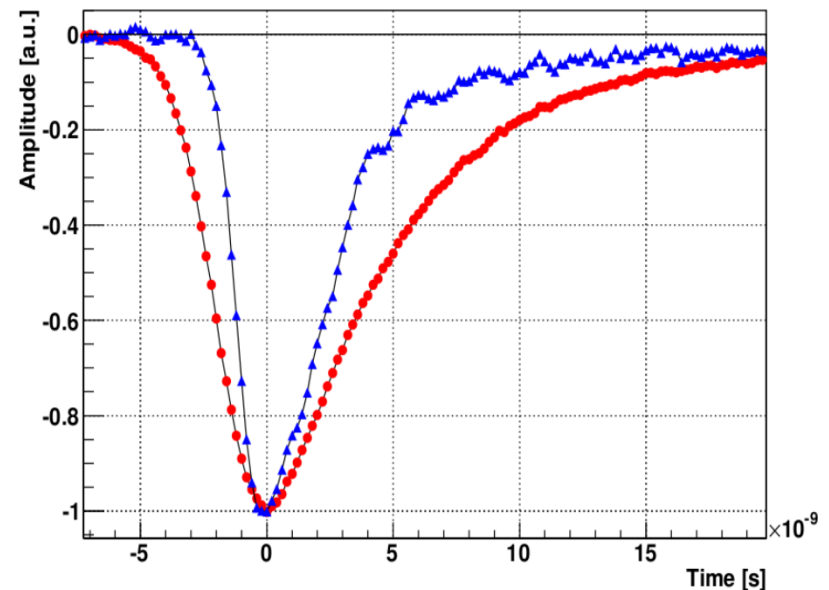


Effective area



Pulse shape

- R10560 has a full width at half maximum (FWHM) of 4.2 nanoseconds
- 40% narrower than the pulse shape of the Photonis XP2970 (6.8 nanoseconds).



Blue triangles: pulse shape of the R10560. Red solid dots: Pulse shape of the XP2970.



Conclusions

- We are spending almost 6 weeks this summer in upgrading the telescopes
- Get the data with the new hardware and with better efficiency