Astronomers using the VERITAS telescopes to detect some of the highest-energy photons in the Universe need your help! These photons are gamma-rays that originate in astrophysical environments like the expanding blast waves thrown out by supernova explosions, or from powerful streams of material that flow from the cores of active galaxies at speeds close to that of light. Muons (a particle like an electron, only heavier) are a prominent background contaminant when observing very-high-energy gamma rays on earth. They leave a distinctive ring-like shape making them obvious to the human eye, but incomplete or truncated rings can appear very gamma-ray-like to automatic analysis algorithms. We need your help to identify camera images that contain muon rings so we can teach computers to better identify such images and efficiently filter out those pesky muons that are masquerading as gamma rays.

Find out more at  Muon Hunters
VERITAS Video

Videos on youtube can be found [here](https://www.youtube.com).

Media

Here are copies of the new (2011) signs posted outside the FLWO Visitors Center close to the T1 telescope (click on the figures for full-size versions):
Observing Gamma Rays

Miles overhead, very-high-energy gamma rays enter the atmosphere and collide with air molecules. These collisions produce a shower of secondary particles that move towards the ground at nearly the speed of light. The VERITAS gamma-ray image the faint blue/whitish glow emitted by these “air showers”. This pulsed Cherenkov light lasts only a few nanoseconds of a second.

The telescope in front of you is one of four in an array. Using these telescopes rather than just one enables the direction and energy of each gamma ray to be determined more accurately and to reject numerous charged particles that act like noise in the observation.

Each telescope views the air shower from a different perspective and the resulting images have different orientations. The position is that of a gamma-ray source can be determined from the intersections of lines drawn through such images.

The complete spectrum of visible and invisible light extends far out on both sides of visible light, from radio waves to gamma rays. VERITAS studies invisible, very-high-energy gamma rays with energies of trillions of times higher than visible light.

Gamma-ray astronomy has opened a new window on the universe. Thanks to gamma-ray telescopes such as VERITAS, astronomers can study these very-high-energy invisible light produced in the most extreme environments in the Universe, such as black holes, supernovae, and starburst galaxies.

The Crab Nebula is a supernova remnant produced by a stellar explosion seen in 1054 AD. Inside its core is a pulsar, a superdense remnant composed of neutrons from which streams a highly energetic wind of charged particles. The particles are ionized and the synchrotron reaction generates gamma rays. The Crab Nebula is a source of gamma rays at night and it is used to calibrate the VERITAS instruments.

Young stars, whose atmosphere emits visible, ultraviolet, and x-ray light, produce ionized and energized ions of elements such as carbon and nitrogen. The collision between these winds and the surrounding gas may produce gamma rays.

Starburst galaxies, the M82, have such ionized winds that may produce gamma rays from collisions of ionized charged particles with atomic nuclei. These charged particles can produce gamma rays that can be detected here on Earth.

The gamma-ray signal at very-long wavelengths such as those of the MeV, from energetic gamma rays, indicates the presence of material in the Crab Nebula that is emitting a very black but fainter, lower-energy emission in these regions. It is an artifact of the very-long wavelengths of gamma rays detected by VERITAS.
An on-site observing team controls and monitors the telescope array, from inside the main building through computer links to each telescope. The huge data sets produced by the observing teams each night are replicated and cleaned off-line. VERA's collaboration scientists carefully process the mountain of data to determine whether any gamma-ray sources may have been detected. They also search known gamma-ray sources to understand more about these unusual and often variable objects.

VERITAS operates by more than 100 scientists from more than 20 different institutions in the United States, Ireland, England and Canada. VERITAS is funded by the U.S. Department of Energy, the U.S. National Science Foundation, the Smithsonian Institution, the Natural Sciences and Engineering Research Council of Canada, Enterprise Ireland, and the Particle Physics and Astronomy Research Council of the U.K.

From Data to Discovery

Links

If you have any questions on astronomy or astrophysics in general please follow one of these links

- NASA - Ask an astrophysicist
- Ask an astrophysicist - specialising in cosmic-ray, gamma-ray and X-ray astrophysics
- Ask an astronomer
- McDonald's Observatory ask an astronomer
- Curious about astronomy ask an astronomer
- Cool cosmos ask an astronomer
- Ask an astronomer @ UCBerkely
- Lick Observatory ask an astronomer
- NRAO ask an astronomer
- Harvard CfA resources for amateur astronomers
- Phil Plait's Bad Astronomy page