Description of the Program

The combination of very high energy (VHE; E > 100 GeV) and high energy (MeV to GeV) gamma-ray observations is a powerful method with which to view the universe. Towards this end, the Fermi and VERITAS projects have established a pilot program to support collaborative efforts to observe Fermi sources which will be awarded on a competitive basis. The programs that will be supported are those that are enhanced by the combination of Fermi observations with VHE observations made by VERITAS. The philosophy of the approach, in keeping with the missions of both Fermi and VERITAS, will be that of maximum scientific return for the entire scientific community.

Specifically, investigators applying to this program will be awarded observing time on VERITAS in collaboration with the VERITAS team provided that the observations proposed do not conflict with the existing VERITAS long-term science plan and that they are technically feasible. In turn, the Fermi guest investigator (GI) program will award funding to successful U.S.-based investigators requesting a collaboration with VERITAS through the GI process. These proposals would include VERITAS observations that are directly relevant to the proposed Fermi Guest Investigation, the latter being subject only to the constraints imposed by the Fermi Cycle-8 NRA and having a clearly identified Fermi related component. The GI peer-review proposal-evaluation process will identify programs with sufficient science justification to be allocated funding by Fermi, and those that fall within the agreed-on range of VERITAS observing time will be allocated VERITAS observations barring unforeseen circumstances such as weather or technical difficulties. Note that VERITAS is a PI-lead instrument so these observations will be done in collaboration with the VERITAS team and will be subject to the VERITAS publication policy.

Proposals for VERITAS observing time submitted through the Fermi GI program are likely to be successful only if they make use of the unique capabilities available by combining VERITAS
and intending to request a collaboration with VERITAS are strongly encouraged to submit a notice of intent (NOI) via the Fermi SSC web site two months prior to the proposal submission deadline. This NOI will be confidentially shared with a VERITAS technical review board who will determine the technical feasibility of your study and suggest several scientists within the VERITAS team to collaborate with. You may submit a Fermi GI proposal without submitting an NOI but you will not benefit from the expertise of the VERITAS team in advance of preparing your submission.

It is expected that there will be some overlap between proposals and ongoing VERITAS programs. To this end, the proposal will be placed in one of three categories: projects that are off-limits to GI proposers (Category A), ongoing VERITAS projects that are eligible for collaboration (Category B, confidentially known to to the FSSC manager and the VERITAS spokesperson) and projects not in conflict with any existing VERITAS program (Category C). Any proposals falling into Category A will be identified as ineligible to request VERITAS observations and will be graded solely on their Fermi related content. Proposals in Category B will be invited to collaborate with the VERITAS team (but project leadership by the proposer is not guaranteed). PIs of proposals falling into Category C will be expected to lead the collaborative effort. This categorization will occur at the NOI stage or post-submission technical review stage depending on whether or not an NOI was submitted.

Each proposer is required to append a brief technical justification, comprising one-page or less of text, to their regular 4-page scientific justification text. This technical justification should describe the VERITAS observing mode requested, the VERITAS time requested, the minimum elevation requested, and the observing conditions required (see the VERITAS technical guidelines section). The proposer should also indicate that they are willing to abide by the VERITAS publication guidelines listed below. It is strongly encouraged that the proposer contact the VERITAS team via the NOI procedure outlined above prior to proposal submission and work with one of the suggested VERITAS collaborators during proposal preparation.

The actual amount of VERITAS observing time allocated via this program will depend on the amount of proposal pressure and the deemed scientific merit of the proposals. VERITAS has allocated a maximum of 120 hours of total time, approximately 15% of the VERITAS observing season. The total allocated time of all successful proposals in Cycle-8 will not exceed this upper limit. The 2015-2016 VERITAS observing season begins in September 2015 and ends in July 2016. The observatory does not operate during July and August due to local weather conditions.
In order to spread the observations supported under this program evenly throughout the year, there are additional constraints on the observing time available within any one-hour wide RA band. The total requested observing time of all successful proposals in any individual RA band is not to exceed 25% of the historical VERITAS observing time (approximately 20 hours) within that RA band. See More details on the exact amount of time available in individual RA bands is to be determined. The sensitivity of VERITAS is well understood for sources with angular diameters less than 0.5 degrees. Thus, proposers should only request analysis of regions smaller than 0.5 degrees within the field of view of the VERITAS observations.

Proposals received via the GI program will then be evaluated for technical feasibility before peer review which will provide guidance to the Fermi GI review panel. The Fermi GI review panel will then rank the proposal alongside all other submitted proposals. Successful proposals will then be allocated time by the VERITAS TAC. The observations requested will be taken barring any adverse weather or technical difficulties.

Successful PI’s will then work with the VERITAS team (most likely interfacing with one of the suggested VERITAS scientists) to complete the final scientific product. If there are no outstanding technical problems, the VERITAS team will process the data. Note that the reduction of VERITAS data is not immediate and the final data product will not be available to the proposer until the VERITAS team is satisfied with the quality of the resulting product.

Since VERITAS is a PI-lead instrument and does not (nor is required to) have a public data release policy there are no public tools available to analyze VERITAS data. Thus, the acquisition and analysis of VERITAS data takes skills and knowledge not available to the general scientific community. These tools as well as the experiment itself have been developed by the whole VERITAS collaboration and it is reasonable and necessary to expect their input in publications using VERITAS data. Any publications using previously unpublished VERITAS data must include the full VERITAS membership as authors. The proposer(s) can be listed separately above this list depending on the source category. In general, Category B publications will list the VERITAS collaboration first and Category C publications will list the proposer(s) first. Additionally, any publication of VERITAS data must pass an internal review by the VERITAS collaboration. This is a two round process involving a paper committee and an additional two week period for comments from any VERITAS member.

VERITAS Technical Guidelines and Observer’s Tools
VERITAS is an array of four 12 m Imaging atmospheric Cherenkov telescopes that operate in southern Arizona at an altitude of 1268 m a.s.l. The VERITAS team is developing tools for proposers which will be helpful in preparing your proposal. A summary of the VERITAS specifications are included here:

- energy range: 85 GeV to > 30 TeV (spectral reconstruction starts at 100 GeV)

- energy resolution: 17% at 1 TeV

- peak effective area: 100,000 m$^2$ at 1 TeV

- angular resolution: 0.08 deg at 1 TeV, 0.13 deg at 200 GeV (68% containment radius)

- source location accuracy: <50 arc-seconds

- point source sensitivity: 1% Crab Nebula in < 25 h, 10% Crab Nebula in < 25 min

VERITAS observes only under clear, dark skies. Proposers should indicate if less than ideal weather conditions are acceptable for their proposal. Poor weather conditions will decrease the sensitivity of the array but might be required to allow for simultaneous multiwavelength studies. Observations can be made under moonlight, when the moon is less than half full. VERITAS does not observe for ~5 days every month around full moon. Proposers should indicate if moonlight observations are acceptable for their proposal. Moonlight observations increase the sky background level effectively reducing the sensitivity and increasing the energy threshold of the array by up to ~25%.

VERITAS works best for sources at high elevation angles. For observations made below 50 degree elevation, Cherenkov telescopes have reduced sensitivity and higher energy threshold.
This limits most VERITAS targets to declinations 0 deg to +60 deg; exceptions can be made for particularly interesting targets slightly outside of this region (-10 deg to +70 deg). A useful source visibility tool is available at TeVCat. Proposers should indicate the minimum acceptable elevation angle for their proposed observations.

VERITAS nominally operates in ‘wobble’ mode; where the pointing direction of the telescopes is offset by 0.5 degrees from the source position to allow for a simultaneous measurement of the background. The proposer should indicate if the standard 0.5 degree offset is acceptable or if a larger offset is needed. Larger offsets are sometimes used to expand the field-of-view, encompass a large extended source or account for systematic effects. Note that the sensitivity of VERITAS decreases as the offset is increased beyond 0.75 degrees.

The VERITAS Specifications Webpage.