Abstract Submitted
for the MAS16 Meeting of
The American Physical Society

**A detailed study of the Cas A and IC 443 supernova remnants in $\gamma$-rays with VERITAS.**[1] SAJAN KUMAR, University of Delaware, VERITAS COLLABORATION — The origin of cosmic rays has been unresolved ever since their discovery over one hundred years ago. The shock front created when the blast wave from a supernova explosion moves through the interstellar medium has been widely accepted as one possible acceleration site for cosmic rays. This connection between supernova remnant (SNR) shocks and cosmic rays is substantiated by the detection of high energy (HE; 100 MeV to 100 GeV) and very high energy (VHE; 100 GeV to 100 TeV) gamma rays from young and middle-aged SNRs. Gamma-rays can be produced both by electrons, through non-thermal Bremsstrahlung and inverse Compton scattering, and by protons, through proton-proton collisions and subsequent neutral pion decay. Therefore, the interpretation of the gamma-ray observations is not unique. To disentangle and quantify the contributions of electrons and protons to the gamma-ray flux, it is necessary to measure precisely the spectra and morphology of SNRs over a broad range of gamma-ray energies. Two well-known SNRs, Cassiopeia A (a young and bright SNR) and IC 443 (a middle-aged SNR interacting with molecular cloud), are well studied in the gamma-ray regime. Here, we will present the detailed spectral and morphological results from these two SNRs using observations by the VERITAS telescope array.

[1]This research is supported by grants from the U.S. Department of Energy Office of Science, the U.S. National Science Foundation and the Smithsonian Institution, and by NSERC in Canada.

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Date submitted: 15 Sep 2016 Electronic form version 1.4