PROJECT SUMMARY

Operation & Return of the Pre-HEAT Telescope on Dome A

We propose to continue operation of the Pre-HEAT telescope, the submillimeter component of the Plateau Observatory (PLATO) successfully deployed by an international collaboration to Dome Argus in 2008 as part of the AstroPoles and PANDA IPY projects.

Funded by an NSF SGER grant (ANT-0735854) in May 2007, Pre-HEAT is a 20 cm aperture telescope with a one-axis drive system, coupled to an ambient temperature Schottky diode heterodyne receiver operating at 450 microns wavelength (661 GHz). The receiver output is directed to an IF processor and FFT spectrometer for simultaneous measurement of the submillimeter sky opacity and spectra of ^{13}CO J=6-5, a key spectral diagnostic of star formation.

PLATO and Pre-HEAT took 204 consecutive days of data in the 2008 season, **setting a new record** for high powered, completely autonomous operation on the high plateau. Even in the first year of observations, Pre-HEAT has demonstrated that Dome A is the finest site on the planet for submillimeter and terahertz astronomy.

What is the intellectual merit of the proposed activity?

`Pre-HEAT` and its successor, `HEAT` (the High Elevation Antarctic Terahertz Telescope) forge entirely new capabilities for ground based infrared and submillimeter astronomy which otherwise would be unachievable except via expensive airborne or space-based platforms. `Pre-HEAT` represents a new generation of polar instrumentation that permits the excellent conditions available from remote sites like Dome A to be harnessed without the costs and hazards associated with manned operations. In addition to quantifying the transmission characteristics of the atmosphere over Dome A, `Pre-HEAT` is constructing the first large-scale submillimeter map of the Galactic Plane in ^{13}CO J=6-5 which will help answer timely and fundamental questions about the evolution of the interstellar medium and star formation. It significantly enhances the interpretation of previous millimeter wave surveys of comparable quality, and will complement the exciting terahertz-frequency surveys to be later performed by `HEAT`.

What are the broader impacts of the proposed activity?

`Pre-HEAT` is a pioneering mission which is paving the way for future far-infrared astronomical investigations from Dome A. It is mapping the Southern Galactic Plane in the spectral light of ^{13}CO J=6-5, a key measure of the warm, dense gas that participates in star formation and stellar-interstellar feedback. Definitive and comprehensive science products from the survey and its many synergistic collaborations are being made available to the astronomical community via the Web. These products will enhance the value of numerous contemporary surveys. Beneficiaries include the GLIMPSE Legacy program from the Spitzer Space Telescope, IRAS, the CfA/Columbia CO J=1-0 surveys of the Galactic Plane, the recent HI and CO surveys of the Galactic Plane, and the 2MASS infrared sky survey. `Pre-HEAT` will serve both as a scientific and technological pathfinder for future suborbital and space-based missions.