

**02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS**

Submit only ONE copy of this form for each PI/PD and co-PI/PD identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.B. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. **DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.**

PI/PD Name: Christopher K Walker

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
(Select one or more)
 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
 Other
 None

Citizenship: (Choose one) U.S. Citizen Permanent Resident Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name):

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project

Ethnicity Definition:

Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.

Race Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information received from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational opportunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

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PI/PD Name: Craig A Kulesa

Gender: Male Female
Ethnicity: (Choose one response) Hispanic or Latino Not Hispanic or Latino

Race:
(Select one or more)
 American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

Disability Status:
(Select one or more)
 Hearing Impairment
 Visual Impairment
 Mobility/Orthopedic Impairment
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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/If not in response to a program announcement/solicitation enter NSF 04-23 NSF 07-549					FOR NSF USE ONLY	
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.) ANT - ANTARCTIC AERONOMY & ASTROPHYS					NSF PROPOSAL NUMBER	
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
				806345617		
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN) 866004791		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE University of Arizona			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE 888 N Euclid Ave TUCSON, AZ 85721-0001			
AWARDEE ORGANIZATION CODE (IF KNOWN) 0010835000						
NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		<input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> MINORITY BUSINESS <input type="checkbox"/> WOMAN-OWNED BUSINESS		<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Pre-HEAT: First Submillimeter Site Testing and Astronomical Spectra from Dome A						
REQUESTED AMOUNT \$ 43,385	PROPOSED DURATION (1-60 MONTHS) 8 months		REQUESTED STARTING DATE 05/01/07		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE	
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.A) <input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C) <input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.1.d) <input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j) <input checked="" type="checkbox"/> SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1) <input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.5) IACUC App. Date _____						
<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.6) Exemption Subsection _____ or IRB App. Date _____ <input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j) _____ <input type="checkbox"/> HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)						
PI/PD DEPARTMENT Department of Astronomy			PI/PD POSTAL ADDRESS Steward Observatory 933 N. Cherry Avenue Tucson, AZ 85721 United States			
PI/PD FAX NUMBER 520-621-1532						
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
Christopher K Walker	PhD	1988	520-621-8783	cwalker@as.arizona.edu		
CO-PI/PD Craig A Kulesa	PhD	2002	520-621-6540	ckulesa@as.arizona.edu		
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 04-23. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Appendix C of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes

No

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Appendix D of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME			
TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER	

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

PROJECT SUMMARY

Pre-HEAT: First Submillimeter Site Testing & Astronomical Spectra from Dome A

We propose to construct *Pre-HEAT*, a 450 μm tipping radiometer and digital FFT spectrometer to be installed at Dome A, the summit of the Antarctic ice plateau. Dome A is receiving international acclaim as the best site for ground based THz astronomy in the world, on the basis of the exceptionally cold, dry and stable conditions which prevail there.

An exciting and timely opportunity has arisen that allows us to perform important, pathfinding research *immediately* at Dome A. Our Chinese and Australian partners will be installing the first base Plateau Observatory (PLATO) on Dome A this coming Austral summer (2007-8). They have given us the opportunity to field a submillimeter radiometer as part of this expedition. This instrument, *Pre-HEAT*, is a 450 μm (660 GHz) tipping radiometer coupled with a digital FFT spectrometer. The goals of *Pre-HEAT* are to (1) Measure the submillimeter sky opacity as a quantitative demonstration of the exceptional conditions of Dome A, (2) Perform strip maps of the Galactic Plane in the ^{13}CO J=6-5 line at 661 GHz, constituting the first astrophysical measurements from Dome A, and (3) Field-test many of the key technologies for a successor mission, entitled *HEAT*, the High Elevation Antarctic (Terahertz) Telescope, to be deployed in 2008-9 pending funding from NSF/MRI. *Pre-HEAT* will pioneer new capabilities for ground-based astronomy and is an opportunity for the US to play a major role in a landmark International Polar Year (IPY) project.

What is the intellectual merit of the proposed activity?

Pre-HEAT and its successor, *HEAT* (the High Elevation Antarctic Terahertz Telescope) will 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* will establish 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 will significantly enhance the interpretation of previous millimeter wave surveys of comparable quality, and will complement the THz surveys to be later performed by *HEAT*. If *HEAT* is deployed, *Pre-HEAT* will continue to operate as a tipping radiometer to provide simultaneous cross-calibration of *HEAT*'s Terahertz spectrometers.

What are the broader impacts of the proposed activity?

Pre-HEAT is a pioneering mission which will pave the way for all future far-infrared astronomical investigations from Dome A. It will map 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 will be made available to the astronomical community via the Web in a timely manner. 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 most 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. Finally, the design and fabrication of *Pre-HEAT* will be an interdisciplinary team effort involving students from astronomy and optical sciences. Astronomical instrumentation is becoming ever more complex, requiring the talents of many individuals to bring them to fruition. Providing students with both technical training and team-work experience increases their probability of success not only within astronomy, but society as a whole.

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Table of Contents	1	_____
Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	4	_____
References Cited	1	_____
Biographical Sketches (Not to exceed 2 pages each)	2	_____
Budget (Plus up to 3 pages of budget justification)	4	_____
Current and Pending Support	3	_____
Facilities, Equipment and Other Resources	1	_____
Special Information/Supplementary Documentation	1	_____
Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____
Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

Pre-HEAT: First Submillimeter Site Testing & Astronomical Spectra from Dome A

A Unique Mission of Opportunity for the International Polar Year

At the summit of the Antarctic ice plateau, Dome A is receiving international acclaim as the best site for ground based THz astronomy in the world (Lawrence et al. 2004). While at optical & near-infrared wavelengths the atmospheric image quality at Dome A is not yet demonstrated, at submillimeter and far-infrared wavelengths the measured extreme cold and dryness **already** sets Dome A apart from all other sites on the planet. Over the past 3 years our team has been pursuing the concept of a small (0.5 m), automated THz observatory for Dome A. This work has culminated in an NSF-funded design study of HEAT: the High Elevation Antarctic Terahertz Telescope. A MRI proposal to build HEAT for deployment to Dome A in the 2008-9 timescale is currently under consideration at NSF. The HEAT project (through the AstroPoles program, M. Burton-PI, UNSW) has been endorsed by the IPY Joint Committee (see attached letter).

An exciting and timely opportunity has arisen that allows us to perform important, pathfinding research *this year*, in advance of HEAT. Our Chinese and Australian partners in HEAT will be installing the first base Plateau Observatory (PLATO) on Dome A this coming Austral summer (2007-8). They have given us the opportunity to field a submillimeter radiometer as part of this expedition. This instrument, entitled Pre-HEAT, is a 450 μm (660 GHz) tipping radiometer coupled with a FFT spectrometer. Many of the key components for Pre-HEAT already exist in our lab. The goals of Pre-HEAT are to (1) Measure the submillimeter sky opacity as a quantitative demonstration of the exceptional conditions of Dome A, (2) Perform strip maps of the Galactic Plane in the ^{13}CO J=6-5 line at 661 GHz, constituting the first astrophysical measurements from Dome A, and (3) Field-test many of HEAT's key technologies. Pre-HEAT will pioneer new capabilities for ground-based astronomy and is an opportunity for the US to play a major role in a landmark International Polar Year (IPY) project.

1 The Scientific Importance of Dome A

The far-infrared (Terahertz) portion of the electromagnetic spectrum contains answers to fundamental questions concerning the origin and evolution of the Universe, galaxies, stars, and planets. For example, far-infrared spectroscopy will fill glaring gaps in our understanding of the life cycle of interstellar clouds (Figure 1), the "nurseries" from which all stars, planets and life are born. *It is astonishing that the formation and destruction of these clouds remains unobserved given their importance to our own cosmic origins!* All far-infrared spectroscopy has come from limited operation of airborne and space observatories. Less than 0.01% of the Galaxy has been surveyed with high spectral resolution in the pivotal 158 μm line of ionized carbon [CII], the brightest spectral line in the Galaxy.

Exciting new developments offer promise that such observations can be performed from the ground. A 2005 Chinese expedition to "Dome A", the summit of the Antarctic ice plateau, installed an Australian Automated Weather Station (AWS) that still operates today. A plot of the atmospheric transmission based on this data shows that entirely new windows onto the Universe are opened in the skies above Dome A, including one providing access to

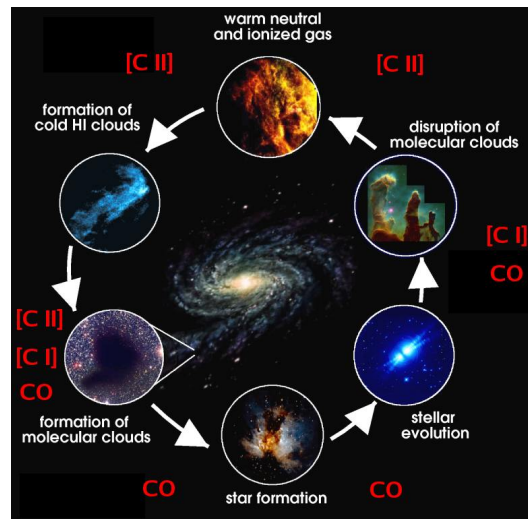


Figure 1: HEAT, with its forerunner Pre-HEAT, will be the first dedicated instruments to study the entire life cycle of interstellar clouds from which stars and planets are formed.

the [CII] line. Such observations are impossible from more established submillimeter sites such as Mauna Kea and the high Atacama desert in northern Chile (Figure 2). The extreme cold (-100F), high elevation (14,000 ft), and dryness of Dome A are what make it unique.

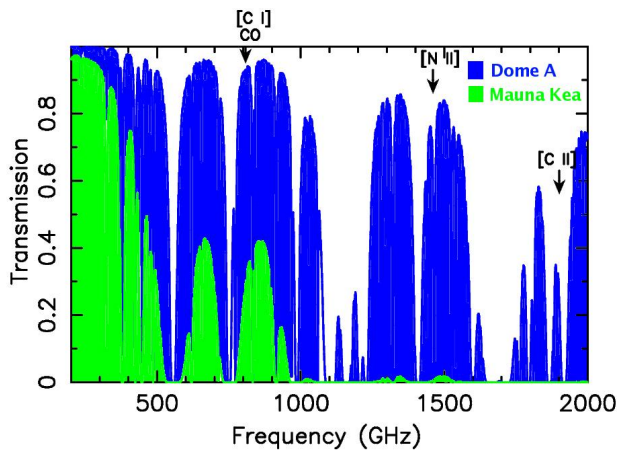


Figure 2: The atmospheric transmission from Mauna Kea allows efficient operation at frequencies below 1 THz, but the extraordinary conditions at Dome A open up entirely new atmospheric windows of crucial importance.

A small, dedicated survey telescope at Dome A would benefit astronomy enormously; its large-scale coverage of the Galaxy would provide a timely study of the ecology of the Milky Way and how the evolution of interstellar gas relates to the evolution of stars. It could witness for the first time the formation of interstellar clouds from which all stars and planets are created. By revealing the full life cycle of interstellar clouds, a meaningful template of the Milky Way can be constructed – a “Rosetta Stone” which can be used to translate future observations of distant galaxies into reliable indicators of their respective histories (Figure 1). Finally, these surveys would be “finder charts” that would enable productive focused studies with future submillimeter and Terahertz observatories like ALMA, Herschel, and SOFIA.

In this SGER proposal, we are requesting funds to construct the forerunner of such a dedicated survey telescope. Since the survey telescope is named “HEAT” (the High Elevation Antarctic Terahertz Telescope), this forerunner will be referred to as “Pre-HEAT”.

2 Pre-HEAT: A Unique Mission of Opportunity for NSF-SGER

Pre-HEAT will provide the first direct submillimeter observations of the atmospheric opacity from Dome A and the first astronomical spectra from this unique site. A block diagram and 3-D CAD rendering of Pre-HEAT is provided in Figure 3 and

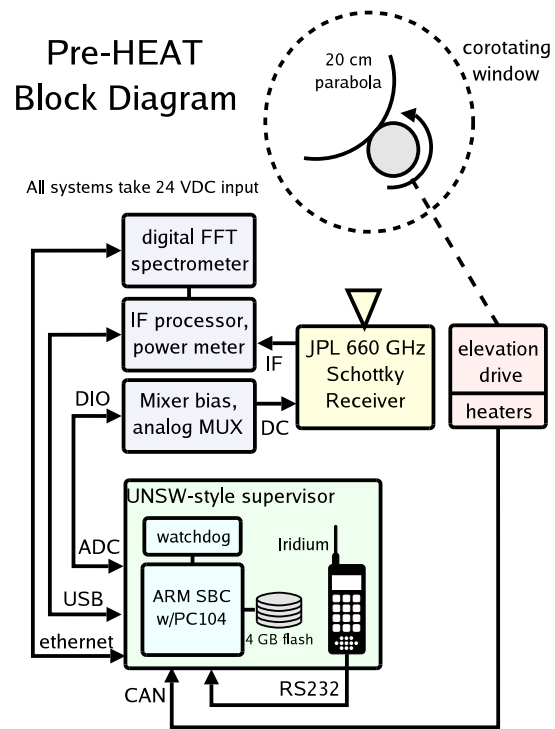


Figure 3: Block Diagram of the Pre-HEAT installation.

Figure 4. A rotating 20×28cm parabolic primary mirror illuminates an ambient temperature Schottky mixer receiver at 661 GHz (454 μm). The Schottky receiver (Siegel et al. 1998) has been graciously provided to the project from Peter Siegel’s team at the Jet Propulsion Laboratory (JPL). The total power in the downconverted (4-12 GHz) Intermediate Frequency (IF) signal produced by the receiver at a series of elevation angles will be used to compute the atmospheric transmission. With 180 degrees of elevation travel and a simple fixed-azimuth mount, Pre-HEAT will also be able to observe the Galactic

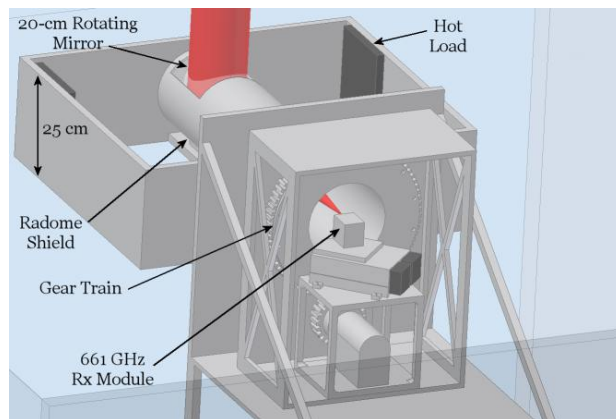


Figure 4: 3D mechanical diagram of Pre-HEAT.

Component	Readiness Level	Estd. Cost
660 GHz Schottky RX	Works in lab, requires mount	\$1000
IF processor	(From Supercam) Works in lab; needs packaging	\$500
Digital FFT spectrometer	(From Supercam) Works in lab; needs packaging	\$500
Analog (mixer) Bias Box	(From Supercam) Works in lab, needs packaging	\$500
20x28 cm mirror	Identified; need to purchase	\$1500
External Telescope Mount	Designed; need to fabricate	\$7000
Worm gear/Drive system	Parts identified; need to purchase	\$2000
Thermal Sensors/Heaters	System designed; need to fabricate	\$500
Single Board Computer	Prototype works in lab w/ partial software	\$500
Supervisor Module	UNSW design; need to fabricate and test	\$1000
Iridium Communication	Purchase sat. phone, integrate into Supervisor	\$1000

Table 1: Deployment Readiness of *Pre-HEAT* components. Total direct cost of fabrication and labor for telescope construction is approximately \$16,000.

Plane for 4 hours per day. During this time, spectral strip maps through the Galaxy at the pretuned frequency of the 661 GHz ^{13}CO J=6-5 line will be performed. These maps will be constructed by the technique of drift scanning (i.e. On-the-Fly mapping) as the Earth rotates. The IF signal is passed through a Fast Fourier Transform (FFT) Spectrometer which accumulates a power spectrum of the ^{13}CO J=6-5 line every 5-10 seconds. Over time, the S/N of the Galactic Plane strip maps will rival the sensitivity and angular resolution of the landmark CfA/Columbia CO J=1-0 maps of the sky (Dame et al. 1987, 2001). A total of 100 square degrees of the southern Galactic Plane will be observed in 2008. **Such a survey at submillimeter wavelengths has never before been performed.** The data set will complement the THz observations that will be performed by HEAT and be of immediate use to the larger astronomical community.

The site testing data and ^{13}CO J=6-5 survey results will be provided to the scientific community through the HEAT web site at the University of Arizona, in accordance with the spirit of the International Polar Year (IPY).

3 Pre-HEAT Instrument Implementation and Schedule

The PI's team has a decade-long experience building submillimeter instruments for the AST/RO telescope at the South Pole. Several of these instruments were built through collaborations with multi-institutional (including international) partners. The culmination of this collaborative expertise will be

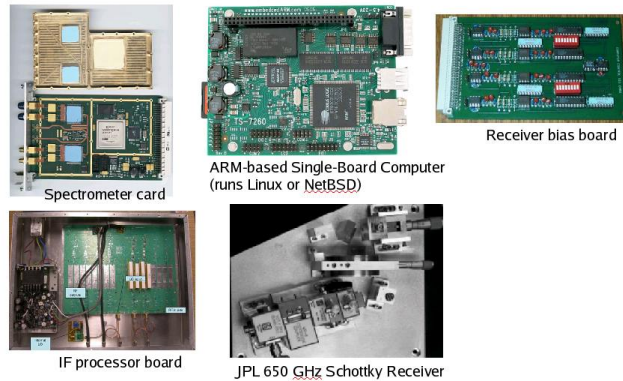


Figure 5: Major components of *Pre-HEAT* that are already fully tested and are now in the PI's lab.

brought to bear on both HEAT and *Pre-HEAT*.

The aggressive schedule in which *Pre-HEAT* must be completed is set by the deployment dates of the Chinese 2007-8 traverse to Dome A: *Pre-HEAT* should be integrated into the PLATO module at UNSW by the end of August, 2007. Meeting this schedule within tight budgetary constraints is made possible by the technological foundation laid by the PI's NSF-funded *SuperCam* 64-beam heterodyne array (2004-7) and the NSF-funded design study for the HEAT telescope (2006-7). The Deployment Readiness of *Pre-HEAT* components is described in Table 1, and pictures of assembled components are shown in Figure 5. All components of the receiver system exist in the PI's lab. Only the integration of these components into the scanning mirror assembly is needed. The remaining items to be procured have been identified and can be assembled rapidly.

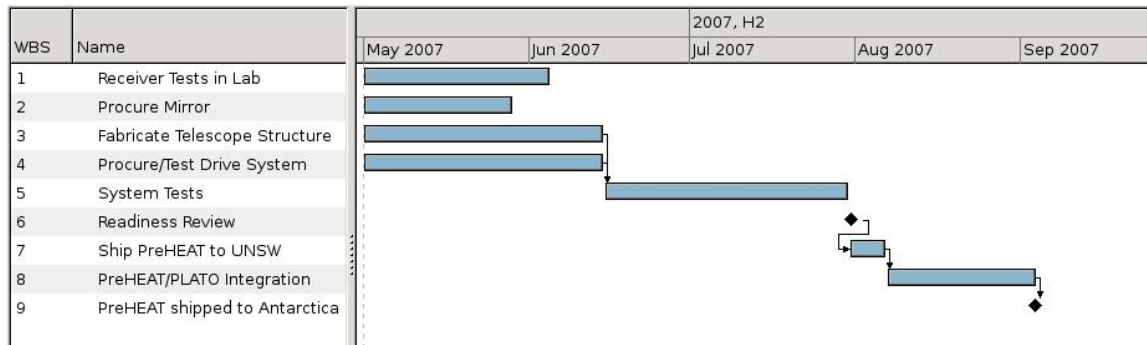


Figure 6: A working schedule for Pre-HEAT predicated on funding beginning May 1, 2007.

A schedule for Pre-HEAT integration and deployment is highlighted in Figure 6. A detailed budget and budget justification is provided on the pages that follow.

4 Next mission: the HEAT Observatory

With Pre-HEAT deployed, all systems will be in place to prepare for the deployment of the full HEAT telescope in 2008-9, pending funding from NSF/MRI. HEAT will be a 0.5-meter telescope with three sets of Schottky receivers that will simultaneously observe in [C II](158 μm), [N II](205 μm), and CO J=7 \rightarrow 6/[C I] (370 μm) – a combination that probes every stage of an interstellar cloud’s life cycle. The plan is for Pre-HEAT to remain in operation after the deployment of HEAT, extending the baseline of site testing data and providing valuable atmospheric calibration for the HEAT observations.

References

- Lawrence, J. S., 2004, "Infrared and submillimetre atmospheric characteristics of high Antarctic plateau sites", *PASP*, 116, 482.
- Siegel, P.H., Mehdi, I., Dengler, R.J., Lee, T.H., Hunphrey, D.A., Pease, A., Zimmermann, R., & Zimmermann, P., 1998, "A 640 GHz planar-diode fundamental mixer/receiver", *Microwave Symposium Digest, 1998 IEEE MTT-S International*, 2, 407.

Christopher K. Walker

Steward Observatory, University of Arizona, Tucson, AZ 85721

Education

Ph.D.: Astronomy, University of Arizona, 1988

Advisor: Charles J. Lada

Thesis: "Observational Studies of Star Forming Regions"

M.S.: Electrical Engineering, Ohio State University, 1981

Advisor: John D. Kraus

Thesis: "Upgrading the Ohio State Radio Observatory"

B.S.: Electrical Engineering, Clemson University, 1980

Graduated with Honors

Experience

- Professor of Astronomy, Associate Professor of Optical Sciences, and Electrical Engineering, University of Arizona, 2003-
- Associate Professor of Astronomy, Optical Sciences, and Electrical Engineering, University of Arizona, 2002-2003
- Associate Professor of Astronomy & Optical Sciences, University of Arizona, 2000-2002
- Associate Professor, Steward Observatory, University of Arizona, 1997-2000
- Assistant Professor, Steward Observatory, University of Arizona, 1991-1997
- Millikan Research Fellow in Physics, Caltech, 1988-1991
- Graduate Research Assistant, Steward Observatory, 1983-1991
- Research and Development Engineer, Jet Propulsion Laboratory, 1983
- Electrical Engineer, TRW Aerospace Division, 1981-1983

Honors and Awards

- Antarctic Service Medal of the USA (1999)
- NSF Young Investigator (1994-1999)
- Millikan Fellow in Physics at Caltech (1988-1991)
- Graduated Cum Laude B.S.E.E.
- Tau Beta Pi, General Engineering Honors Society
- Eta Kappa Nu, Electrical Engineering Honors Society

Professional Societies

- American Astronomical Society
- International Society of Optical Engineers

Recent Publications

Hedden, A. S., Walker, C. K., Groppi, C. E., and Butner, H. A., 2006, *Star Formation in the Northern Cloud Complex of NGC 2264*, *Ap. J.*, in press.

Narayanan, D., Cox, T., Robertson, B., Dave, R., Matteo, T., Kulesa, C., Hernquist, L., and Walker, C. K., 2006, *Molecular Outflows in Galaxy Merger Simulations with Embedded HCN*. *Ap. J.*, in press.

Narayanan, D., Groppi, C., Kulesa, C., and Walker, C., 2005, *Warm, Dense Molecular Gas in the ISM of Starbursts, LIRGs, and ULIRGs*, *Ap. J.*, **630**, 269.

Kulesa, C., Hungerford, a., Walker, C., Zhang, X., and Lane, A., 2005, *Large-Scale CO and [CI] Emission in the Rho Ophiuchi Molecular Cloud*, *Ap. J.*, **625**, 194.

Craig A. Kulesa

Steward Observatory
University of Arizona
Tucson, AZ 85721

Telephone: (520) 621-6540
FAX: (520) 621-1532
Email: ckulesa@as.arizona.edu

Professional Preparation

Ph.D., Astronomy	December 2002	The University of Arizona
B.S., Physics	June 1993	Miami University (Ohio)

Appointments	2006-	Assistant Astronomer University of Arizona
	2003-2006	Assistant Staff Scientist Steward Observatory University of Arizona
	1998-2002	Research Assistant (Science and Instrumentation) University of Arizona
	1994-1996	Research Assistant (Science) University of Arizona

Selected Papers Relevant to This Study

1. "Large Scale CO and [CI] Emission in the Rho Ophiuchi Molecular Cloud", Kulesa, C.A., Hungerford, A.L., Walker, C.K., Zhang X., & Lane, A., ApJ, 625, 194
2. "Millimeter and Submillimeter Survey of the R Coronae Australis Region", Groppi, C. E., Kulesa, C., Walker, C., & Martin, C. L. 2004, ApJ, 612, 946
3. "CO Emission from Disks around AB Aurigae and HD 141569: Implications for Disk Structure and Planet Formation Timescales", Brittain, S. D., Rettig, T. W., Simon, T., Kulesa, C., DiSanti, M. A., & Dello Russo, N. 2003, ApJ, 588, 535
4. "Abundances of H₂, H₃⁺ & CO in Molecular Clouds and Pre-planetary Disks", Kulesa, C. A. & Black, J. H. 2002, Chemistry as a Diagnostic of Star Formation, 60
5. "DesertSTAR: a 7 pixel 345 GHz heterodyne array receiver for the Heinrich Hertz Telescope", Groppi, C., Walker, C., Kulesa, C., Golish, D., Hedden, A., Gensheimer, P., Narayanan, G., Lichtenberger, A., Graf, U., Heyminck, S., 2003, SPIE, 4855 : 330

Synergistic Activities:

- Development of new techniques for molecular cloud modeling of physical structure, chemistry, radiative transfer and dynamics.
- Dissemination of research results to the wider public by lectures and presentations, e.g. through Steward Observatory programs, student organizations, and primary/secondary schools.

SUMMARY PROPOSAL BUDGET YEAR 1

ORGANIZATION University of Arizona				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Christopher K Walker				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Christopher K Walker - Professor	0.00	0.00	0.00	\$ 0	\$	
2.	Craig A Kulesa - Assistant Astronomer	1.00	0.00	0.00	4,682		
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(2) TOTAL SENIOR PERSONNEL (1 - 6)	1.00	0.00	0.00	4,682		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0		
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0		
3.	(0) GRADUATE STUDENTS				0		
4.	(0) UNDERGRADUATE STUDENTS				0		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					4,682		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					1,250		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					5,932		
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT					0		
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)					0		
2. FOREIGN					6,800		
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____	0					
2.	TRAVEL _____	0					
3.	SUBSISTENCE _____	0					
4.	OTHER _____	0					
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS					0		
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES					0		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0		
3. CONSULTANT SERVICES					0		
4. COMPUTER SERVICES					0		
5. SUBAWARDS					0		
6. OTHER					16,000		
TOTAL OTHER DIRECT COSTS					16,000		
H. TOTAL DIRECT COSTS (A THROUGH G)					28,732		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
University overhead on Direct Costs (Rate: 51.0000, Base: 28732)							
TOTAL INDIRECT COSTS (F&A)					14,653		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					43,385		
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				\$	43,385	\$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Christopher K Walker				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Arizona				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Christopher K Walker				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Christopher K Walker - Professor				0.00	0.00	0.00	\$ 0
2. Craig A Kulesa - Assistant Astronomer				1.00	0.00	0.00	4,682
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (2) TOTAL SENIOR PERSONNEL (1 - 6)				1.00	0.00	0.00	4,682
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							4,682
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							1,250
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							5,932
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							6,800
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____				0			
2. TRAVEL _____				0			
3. SUBSISTENCE _____				0			
4. OTHER _____				0			
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							16,000
TOTAL OTHER DIRECT COSTS							16,000
H. TOTAL DIRECT COSTS (A THROUGH G)							28,732
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							14,653
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							43,385
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 43,385
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Christopher K Walker				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

A & B. Personnel Costs: Co-PI Kulesa will lead the integration and testing efforts for Pre-HEAT, as he has already commissioned such prototypes for the PI's SuperCam project.

C. Fringe benefits rate for A (Senior Personnel) is 26.7% of salaries, effective July 1, 2007. No salary will be drawn before that date.

D. No major capital equipment will be purchased during this proposal period. All major equipment will be fabricated.

E. Travel:

Travel support for Walker & Kulesa to the University of New South Wales (Sydney, AU) in August 2007 is needed to integrate the Pre-HEAT instrument into the PLATO module. The completion of systems tests must be performed before the entire PLATO module is issued to a Chinese freighter for the Zhongshan-to-Dome-A traverse at the end of the year. The estimated cost is based on \$2000 USD/person for air travel and \$100 USD/day/person for all other costs (food/lodging).

G. Other Direct Costs (Fabrication costs total to \$16,000)

1. Drive system purchase consists of a 12" fine-toothed gear with a 5" cleared hub and ring bearing. Matching worm gear is mated to a motor+resolver from Empire Magnetics[TM]. (\$2,000)
2. Telescope mirror is 20x28 cm of approximately f/5 focal ratio, machined from aluminum. To be fabricated by SuperFinishers II, Inc. (\$1,500)
3. Receiver Electronics Repackaging: All receiver electronics in the PI's lab operate from 120VAC and are in separate nonstandard enclosures. This line item covers the total cost of consolidating these components into 1 or 2 rack-mounted enclosures with DC-to-DC converters to scale the PLATO's 24VDC power to the 1.8, 3.3, 5, and 12V needed by the different components. (\$1,500)
4. Fabrication of telescope and receiver mount: This item covers the materials and labor needed to fabricate the interior receiver mount, external mirror mount, cylindrical housing, and surrounding rectangular mount. (\$8,000)
5. Supervisor Electronics Module: The UNSW will provide us with the design for their Supervisor module; these costs cover the fabrication of a supervisor board (plus a spare) and the cost of stuffing the boards with their electronic components. (\$1,000)
6. Thermal Sensing and Heater Network: Pre-HEAT's components which have not been tested below -40°C will have active heaters that are available to keep them within safe thermal ranges. This cost item covers the installation of the heaters and the computer-controlled switching network. (\$500)
7. Iridium Communications: A single Iridium phone will be purchased for remote telemetry and data return. This item covers the cost of the satellite phone/service and integration into the Supervisor module. (\$1,000)
8. Instrument Control Computer: An ARM-based Single Board Computer from

Technologic Systems will be purchased for overall systems control. One such board is available for testing now but is consigned for SuperCam. We cover here the cost of a duplicate board for Pre-HEAT. (\$500)

I. Indirect costs

This project will be charged at the rate of 51%. The only exceptions are graduate student fringe benefits, of which 11.2% is overhead bearing and 27.4% is overhead exempt (tuition remission). Neither is applicable to this proposal.

Current and Pending Research Support
Investigator: Christopher K. Walker

CURRENT SUPPORT:

Project title: Development of a Submillimeter-wave Superheterodyne Camera (SuperCam) for the Heinrich Hertz Telescope

Source of Support: NSF MRI Program AST-0421499

POC: Andrew Clegg, aclegg@nsf.gov, (703) 292-4892

Total Award Amount: \$1,742,356 Total Award Period Covered: 09/01/04 - 08/31/07

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 1.0

Project title: A High Elevation Antarctic TeraHertz Telescope -HEAT-

Source of Support: NSF- OPP Antarctic Aeronomy & Astrophysics

POC: Bernhardt Lettau, blettau@nsf.gov, (703) 292-8033

Total Award Amount: \$79,695 Total Award Period Covered: 07/15/06 - 06/30/07

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 1.0

Project title: Computing a Universe of Galaxies (Co-I)

Source of Support: NSF 05-627 DMS Infrastructure Program

POC: Dean M. Evasius, devasius@nsf.gov, (703) 292-8132

Total Award Amount: \$99,681 Total Award Period Covered: 08/01/06 - 07/31/07

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 0

Project title: Hazal: A Portable System for Detecting Hazardous Materials Using Terahertz Absorption Line Spectroscopy

Source of Support: Teravision, Inc.

POC: Christian Drouet D'Aubigny, cdaubigny@as.arizona.edu, (520) 621-6540

Total Award Amount: \$323,253 Total Award Period Covered: 11/26/06 - 12/31/07

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 1.69

Project title: Hazal: Identification of hazardous Materials Using High Resolution Spectroscopy Between 0.14 and 0.9 THz

Source of Support: Air Force Office of Scientific Research - DURIP

POC:

Total Award Amount: \$235,000 Total Award Period Covered: 04/01/07 - 03/31/08

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: 0.36 Sumr:

PENDING SUPPORT:

Project title: HEAT: the High Elevation Antarctic TeraHertz Telescope

Source of Support: NSF- 07-510 - ANT - MRI

POC: Dean M. Evasius, devasius@nsf.gov, (703) 292-8132

Total Award Amount: \$1,985,459 Total Award Period Covered: 09/01/07 - 08/31/09

Location of Project: The University of Arizona

Current and Pending Research Support
Investigator: Christopher K. Walker

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 1.0

Project title: A 1.45 THz Receiver for Dome A, Antarctica: A Dress Rehearsal for
Future Space Science & Manned Mars Missions

Source of Support: JPL - DRDF

POC: Anders Skalare, anders.skalare@jpl.nasa.gov, (818) 354-9383

Total Award Amount: \$99,800 Total Award Period Covered: 07/01/07 - 06/30/08

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 0.56

Project title: A Strategic Research Group for the Development and Commercialization
of TeraHertz Technology

Source of Support: Science Foundation Arizona

POC: Patrick L. Jones, pljones@ott.arizona.edu, (520) 621-5000

Total Award Amount: \$1,422,690 Total Award Period Covered: 06/15/07 - 06/14/09

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 2.0

Project title: Development of a Submillimeter-wave Superheterodyne Camera (SuperCam)
for the Heinrich Hertz Telescope (Supplement)

Source of Support: NSF

POC: Andrew Clegg, aclegg@nsf.gov, (703) 292-4892

Total Award Amount: \$395,125 Total Award Period Covered: 03/01/07 - 12/31/07

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: 1.0 Sumr:

Project title: Stratospheric TeraHerz Observatory

Source of Support: NASA

POC:

Total Award Amount: \$1,740,605 Total Award Period Covered: 01/01/08 - 12/31/10

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 1.0

Project title: Pre-HEAT: First Submillimeter Site Testing and Astronomical Spectra From Dome A

Source of Support: NSF (THIS PROPOSAL)

POC:

Total Award Amount: \$43,385 Total Award Period Covered: 05/01/07 – 12/31/07

Location of Project: The University of Arizona

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr:

Craig Kulesa

Current & Pending Support

<i>Title Program Name</i>	<i>Agency</i>	<i>Performance Period Budget</i>	<i>Total Commitment</i> (calendar months)
Development of a Submillimeter-wave Superheterodyne Camera (SuperCam) for the Heinrich Hertz Telescope	NSF/MRI	09/2004 - 08/2007 \$1,742,356	6
HEAT: The High Elevation Antarctic Terahertz Telescope	NSF/OPP	07/2006 – 06/2007 \$79,695	5
PENDING: Mapping the connections between molecular clouds, star formation, and stellar feedback	NSF/AST	07/2007 – 6/2010 \$282,553	1
PENDING: Identifying molecular cloud formation in the Galaxy	NSF/AST	7/2007 – 6/2010 \$224,175	5
PENDING: HEAT: The High Elevation Antarctic Terahertz Telescope	NSF/OPP	09/2007 – 08/2009 \$1,985,536	18
PENDING: Pre-HEAT: First Submillimeter Site Testing and Astronomical Spectra from Dome A	NSF/OPP (SGER)	05/2007—12/2007 \$43,385	1

Facilities and Equipment

University of Arizona, Steward Observatory

Steward Observatory has a large technical staff with many years of experience in the design and construction of state-of-the-art telescopes and instrumentation for use from optical (e.g. MMT, Magellan, and Large Binocular Telescope (LBT)) to millimeter/submillimeter wavelengths (e.g. Heinrich Hertz Telescope (HHT)). This expertise will be augmented by Instrument Team members with Polar experience and utilized during the development of Pre-HEAT.

In 1992 the PI established a laboratory (the Steward Observatory Radio Astronomy Laboratory, SORAL) for the development of state-of-the-art submillimeter-wave receiver systems. SORAL possess all the equipment (spectrum analyzers, network analyzer's, vacuum pumps, cryogenic support facilities, etc.) needed for the development of receivers. We also have ^4He , ^3He , and closed-cycle cryostats, a full receiver testbed, local oscillator sources (including a Coherent/DEOS FIR laser), and an antenna test range which allow us to characterize a wide range of receiver systems. SORAL has licenses for Hewlett Packard's High Frequency Structure Simulator (HFSS) and Advanced Design System (ADS) software packages, as well as Agilent HFSS and CST Microwave Studio. These programs are used to accurately model and optimize mixers and other crucial receiver components. In addition, we have licenses for optical and mechanical design packages such as Zemax, Code V, and Inventor which we have already used to design the Pre-HEAT instrument.

Using these facilities, SORAL has designed and built a number of receiver systems; including single pixel 230, 490, and 810 GHz receivers and the world's first 345 and 810 GHz arrays. SORAL has been the primary facility instrument builder for both the 10m Heinrich Hertz Telescope on Mt. Graham, Arizona and the AST/RO telescope at the South Pole. Based upon the success of these instruments, the PI was awarded a NSF Major Research Instrumentation (MRI) grant to design and construct the world's largest submillimeter wave heterodyne instrument; a 64 pixel, 345 GHz array receiver. The instrument (known as *SuperCam*, short for Superheterodyne Camera) is a multi-institutional project, much like Pre-HEAT. The Pre-HEAT instrument package will leverage greatly from SuperCam. Pre-HEAT will utilize the Supercam prototype IF processor and FFT spectrometer and as well as the same multi-pixel heterodyne array bias and control systems. The timing of the Pre-HEAT award would dovetail into the last year of the SuperCam effort.



30 November 2005

Dear Associate Professor Michael Burton

On behalf of the ICSU/WMO Joint Committee for the International Polar Year 2007-2008 we wish to thank you for submitting a proposal entitled 'Astronomy from the Polar Plateaus' for consideration as an IPY activity. Success of the IPY depends fundamentally on excellent research and support and on a high level of international coordination, derived from the talents and energy of groups such as yours.

At its November meeting in Geneva the Joint Committee completed evaluations of all proposals received up to 30 September 2005 for scientific or educational significance, for consistency with the IPY themes, regions and time frames, for evidence of international collaboration, and for development of effective management plans covering communications, operations, data, and education and outreach. In addition, the Joint Committee examined each proposal for evidence of involvement by scientists from non-polar nations, for indications of interdisciplinarity within the proposal and of linkages to other IPY activities, and for evidence that activities proposed would contribute to an IPY legacy. The Joint Committee evaluated more than 200 coordination proposals and expects to evaluate one additional set of coordination proposals submitted by 31 January 2006.

The Joint Committee considers that your proposal as submitted includes very strong scientific, education and outreach components and demonstrates a high level of adherence to IPY themes and goals. The Joint Committee therefore endorses your proposal as a prominent and valued part of the IPY program. The Joint Committee intends that these endorsements will provide assistance as IPY participants seek funding for the work proposed.

The IPY International Programme Office will shortly provide additional guidance for project coordinators and steering groups, including description of initial IPY information management processes. As part of that information exchange, we will expect project coordinators to keep the IPO informed about funding status of their projects and about substantial changes from the projects as proposed. In all cases, we wish you enormous success with your component of the IPY.

Yours sincerely

Co-chairs of Joint Committee

Ian Allison

Michel Béland

cc: Dr Lucio Piccirillo

c/o British Antarctic Survey, High Cross, Madingley Road, Cambridge
CB3 0ET, United Kingdom

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