



University of Massachusetts
Department of Electrical and Computer Engineering
Microwave Remote Sensing Laboratory
Amherst, MA 01003

October 17th, 2003

Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Application for Experimental Licensing

Exhibit 4 (3 pages)

Government Project Description

This application is for experimental frequency license to operate our polarimetric, X-band Doppler radar system that will enable us to conduct necessary research for future development of NETRAD – a dense network of solid-state radars installed on towers and rooftops and used to peer into thunderstorms with the resolution needed to find tornadoes, microbursts, and other small-scale hazardous structures. NETRAD represents a cornerstone of Distributed Collaborative Adaptive Sensing System (DCAS), a project for which University of Massachusetts has received the NSF grant, which copy is provided below.

NSF Award - #0313747

AWSFL008-DS3

Center for Collaborative Adaptive Sensing of the Atmosphere (CASA)

NSF Org EEC

Latest Amendment Date September 24, 2003

Award Number 0313747

Award Instrument Cooperative Agreement

Program Manager Lynn Preston

EEC DIV OF ENGINEERING EDUCATION AND CENTERS
ENG DIRECTORATE FOR ENGINEERING

Start Date September 1, 2003

Expires August 31, 2008 (Estimated)

Expected Total Amount \$17000000 (Estimated)

Investigator David J. McLaughlin dmclaugh@mirsl.ecs.umass.edu (Principal Investigator current)

James F. Kurose (Co-Principal Investigator current)

Sandra Cruz-Pol (Co-Principal Investigator current)

V. Chandrasekar (Co-Principal Investigator current)

Kelvin K. Droegemeier (Co-Principal Investigator current)

Sponsor U of Massachusetts Amherst

408 Goodell Building

Amherst, MA 010033285 413/545-0698

NSF Program 1480 ENGINEERING RESEARCH CENTERS

Field Application

Program Reference Code 0000,4444,7234,7238,OTHR,

Abstract

Our ability to monitor, anticipate, and respond to changing circumstances and events is increasingly important, particularly with regard to our physical surroundings. Nowhere is this capability more vital to society, or the challenges associated with its practical implementation greater, than in the context of the atmosphere, where hazardous local weather, such as thunderstorms, tornadoes, microbursts, snow storms, and floods as well as lofted radiological, chemical and biological agents can, in a matter of minutes or hours, destroy or contaminate life and property over vast areas. Yet, the portion of the

atmosphere that contains the bulk of both natural and man-made hazards the lower troposphere and particularly the atmospheric boundary layer is grossly undersampled by today's sensing technologies. Our ERC proposes a revolutionary new paradigm in which transforming systems of distributed, collaborative, and adaptive sensing (DCAS) networks are deployed to overcome fundamental limitations of current approaches. Here, distributed refers to the use of large numbers of appropriately spaced sensors capable of high spatial and temporal resolution throughout the entire troposphere. These systems will operate collaboratively within a dynamic information technology infrastructure, adapting to changing conditions in a manner that meets competing end user needs. These systems will achieve breakthrough improvements in sensitivity and resolution leading to significant reductions in tornado false alarms, vastly improved precipitation estimates for flood prediction, fine scale wind field imaging and thermodynamic state estimation for use in airborne hazard dispersion prediction and other applications. Successful implementation of DCAS systems will require fundamental breakthroughs consistent with the NSF Technical Merit Review Criteria. Among these breakthroughs will be integration and sharing of knowledge across disciplines; design and fabrication of low cost, multi beam, solid state radars; creation of a systems based architecture to organize sensing, computing, and communications resources; development of twoway end user interfaces that dynamically target system resources; deployment of integrative test beds to validate assumptions and understand emergent system behavior; implementation of cross linked hierarchical data storage and processing; and improved understanding of small scale atmospheric processes. To achieve these breakthroughs, we have assembled leading engineering and computer science experts from the University of Massachusetts, Amherst. They will work in partnership with scientists and engineers from the University of Oklahoma, Colorado State University and the University of Puerto Rico, Mayaguez, and corporate partners including Raytheon, IBM, Vaisala, and federal and state government agencies to create the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA). We will create scalable prototype test beds to demonstrate the potential for DCAS to revolutionize our understanding, detection, and prediction of hazardous atmospheric phenomena with end users involved from the outset. CASA meets the NSF Broader Impacts Review Criteria through: comprehensive education and outreach programs that introduce systems based engineering to K-12 students via the mandated engineering/technology curriculum in Massachusetts, and serves as the mechanism for expanding participation by under represented groups in engineering and scientific endeavors at all levels. Further, it will engage first responders and other end users through the provision of both technology and training. CASA will address the observation, prediction and response of weather, an issue that affects between 10 percent and 30 percent of the U.S. gross national product. Our management structure has the flexibility to take advantage of our broad partnership. For example, CASA will collaborate with industry partners, who, in turn, will create new product lines and services based on our new paradigm for sensing, analyzing, predicting and responding to atmospheric hazards in the troposphere.
