



# ***Puerto Rico Student Test Bed IP-3***

By  
Manuel A. Vega-Cartagena  
Carlos A. Rodríguez-Rivera  
CASA SLC Members  
UPRM Graduate Students



CASA is primarily supported by the Engineering Research Centers Program of the National Science Foundation under NSF award number 0313747.



# Overview

- Magnetron Radar
  - Radar Specifications
  - Calibration Channel
  - Corner Reflector
  - Logarithmic Detector (Video)



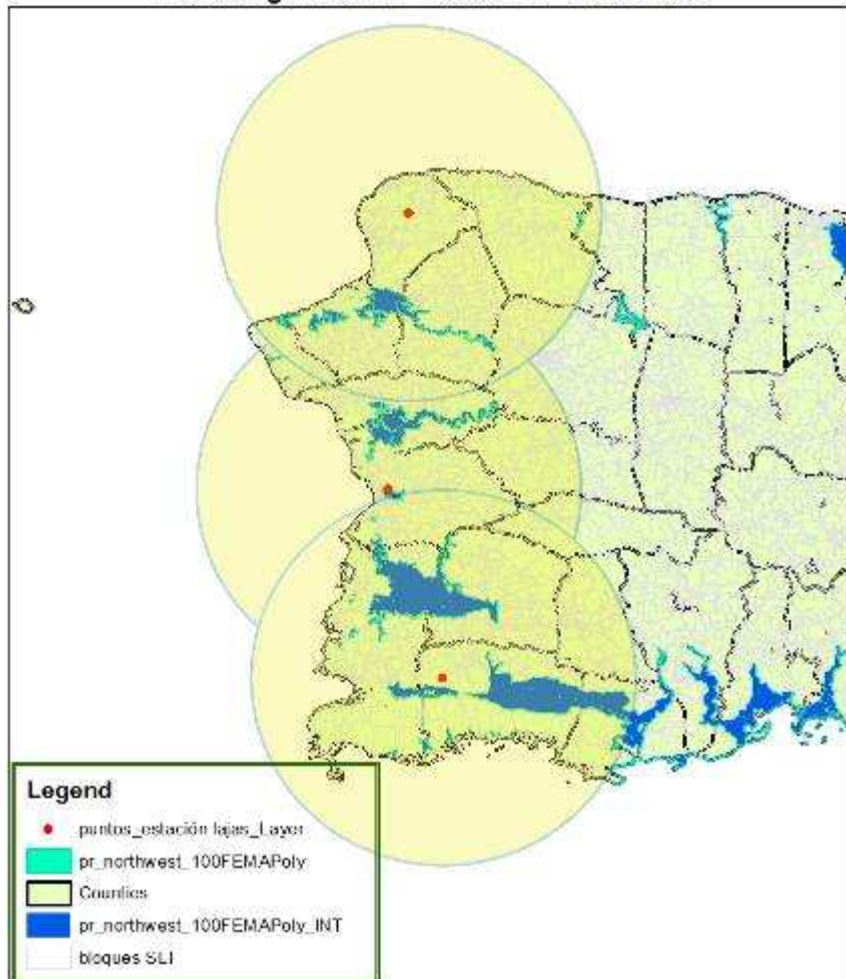
# *Student Test Bed*

- Objective
  - To establish a QPE sensing network starting in the western end of the island taking into consideration coverage gaps from NEXRAD.
- Radar Sites
  - Three sites were selected based on geographical data and sociological impact. These are located in Mayagüez, Aguadilla.

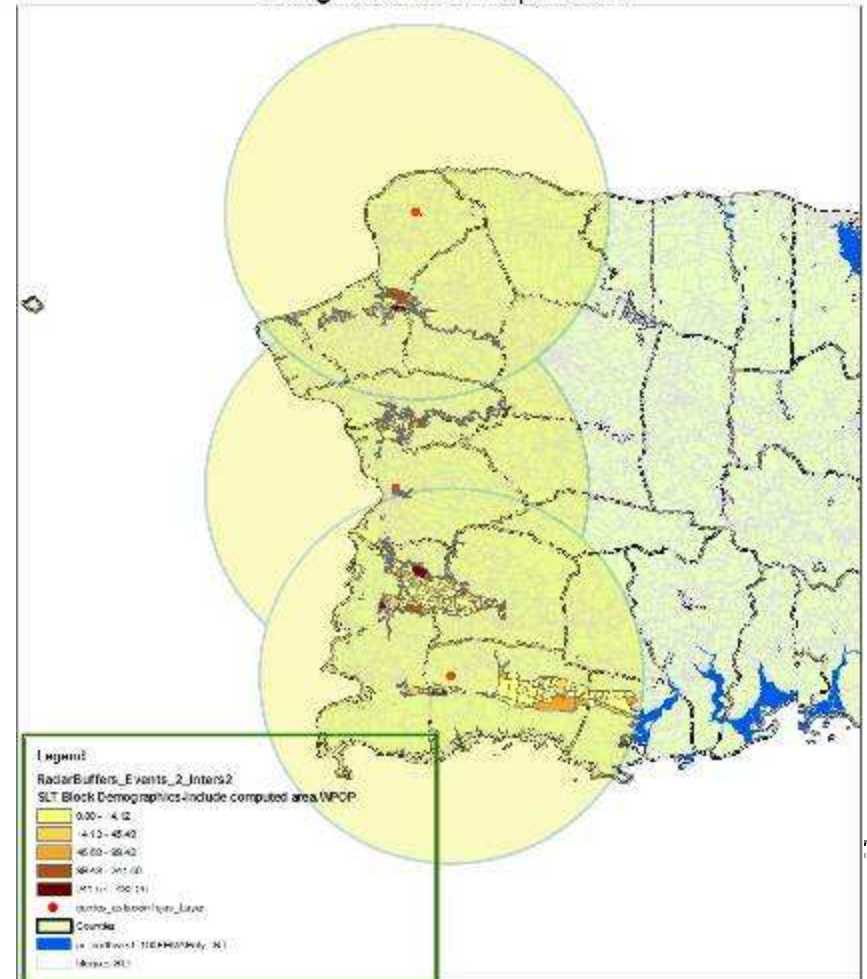


# Student Test Bed

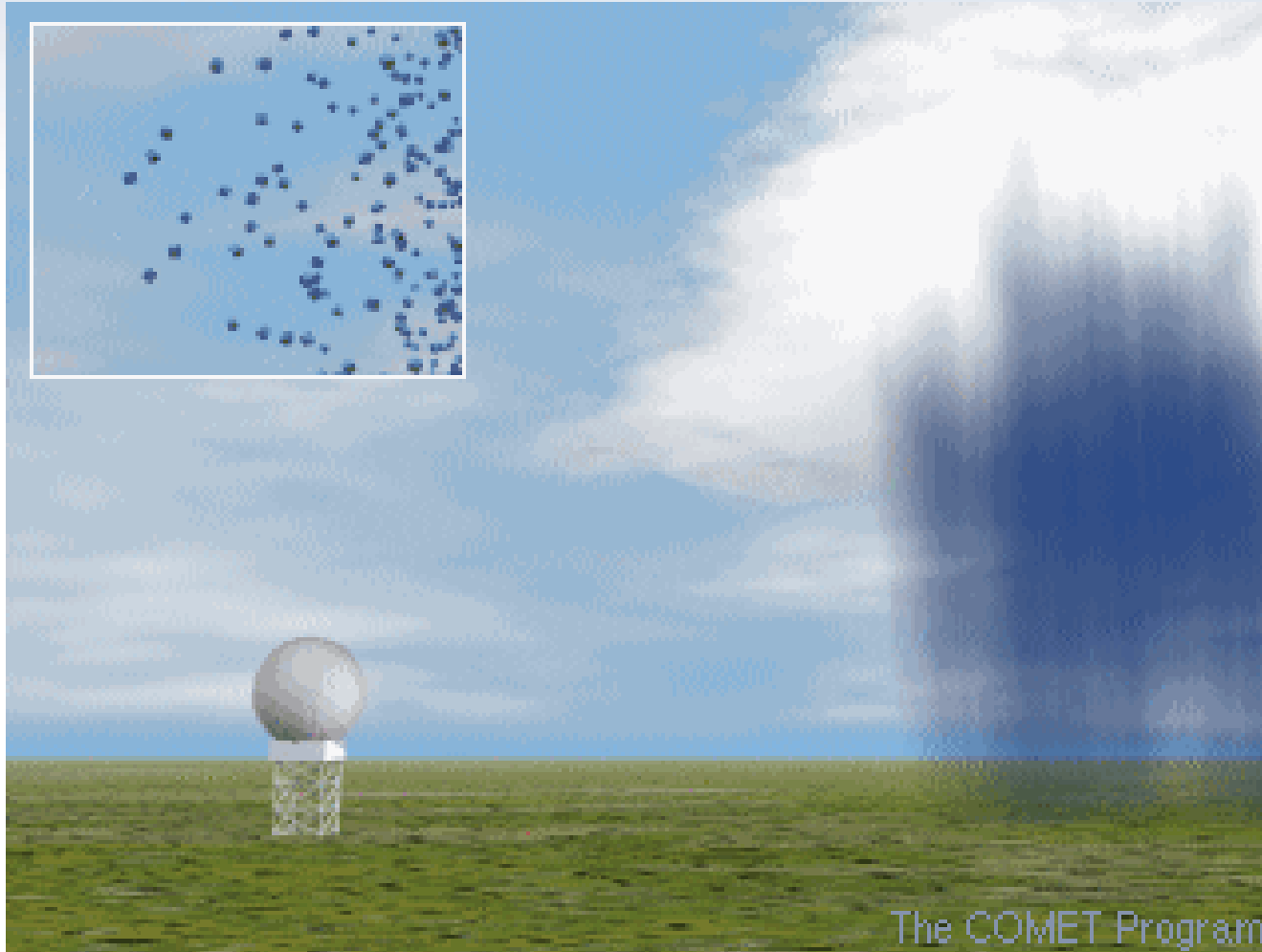
SLT Area  
Flooding Areas in Western Puerto Rico



SLT Area  
Weighted Total Population



# ***RADAR***



# *Radar Specifications*

- Raytheon Marine X-Band Radar
- Single Polarization
  - Magnetron
    - $F = 9.41 \text{ GHz}$
    - $P_{\text{peak}} = 25 \text{ kW}$
    - $\text{Duty Cycle}_{\text{max}} = 0.001$



# *Radar Specifications*

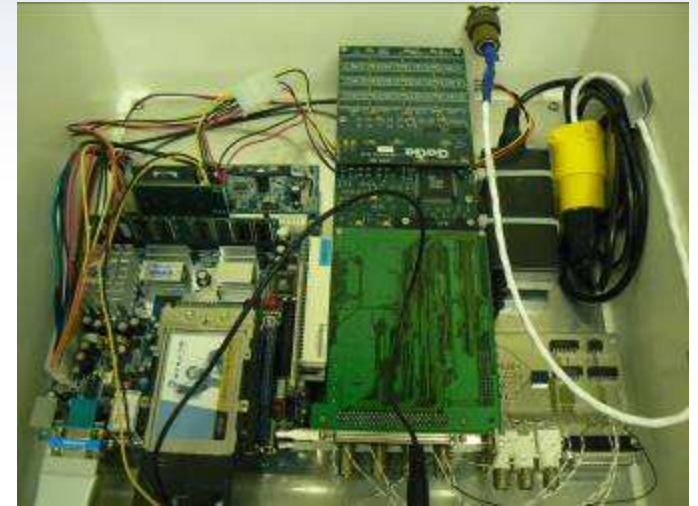
- Modifications
  - Antenna
    - 1.22m Parabolic Dish
    - $G = 38$  dB
    - $2.0^\circ$  HPBeamwidth
  - Spinner
    - Originally 25 RPM
    - Lowered to 3 RPM





# *Radar Specifications*

- Modifications
  - Data System
    - Linux based Mini-ITX embedded system
    - 12 Bit ADC for sampling video signal
    - 802.11b data transport to data archive server
  - Control
    - FPGA on PCI bus for timing signals and antenna position encoder data





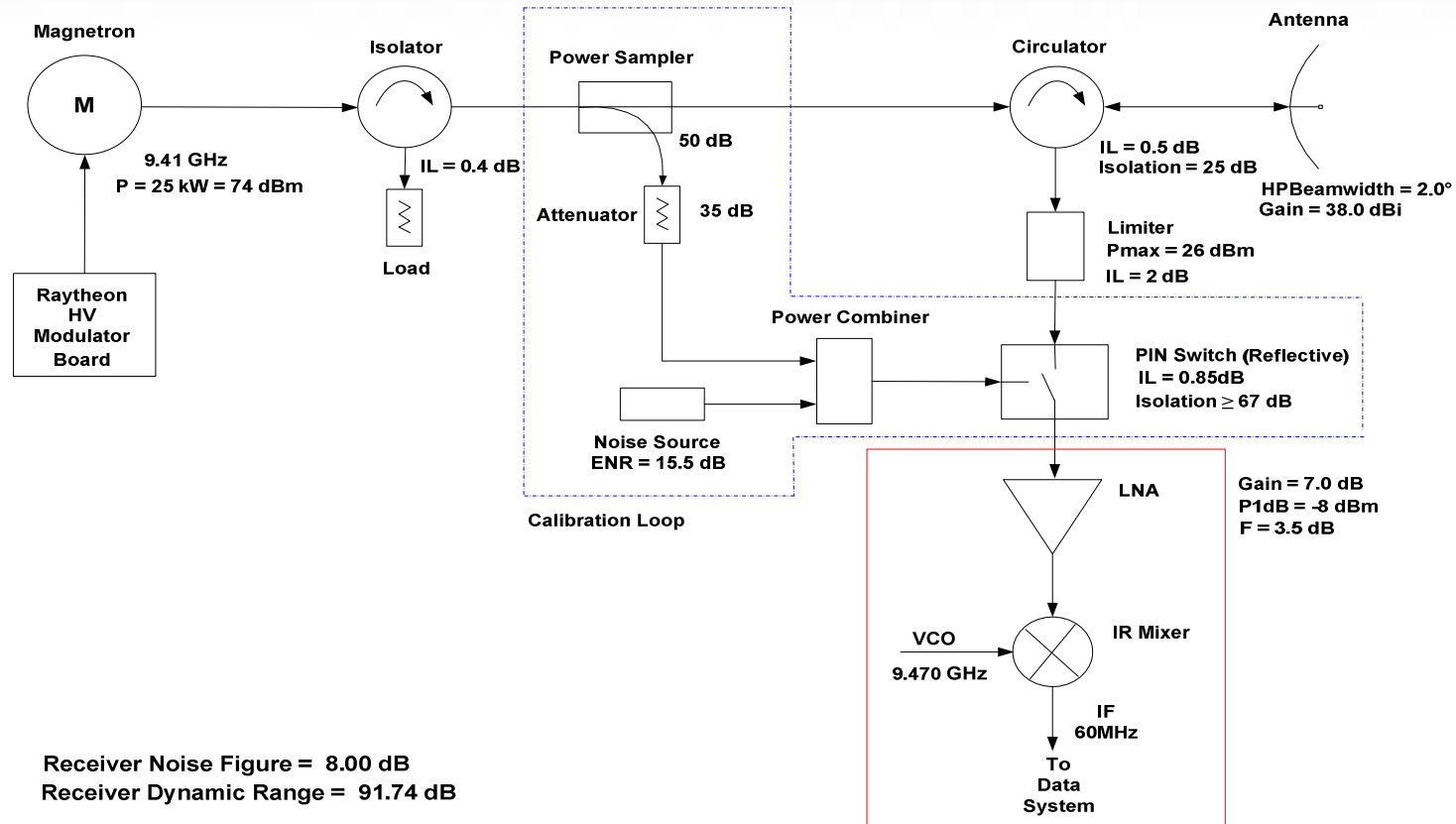
# *Radars Specifications*

- Location
  - Roof of electrical engineering building at UPRM
  - Waveguides already installed



# Radar Specifications

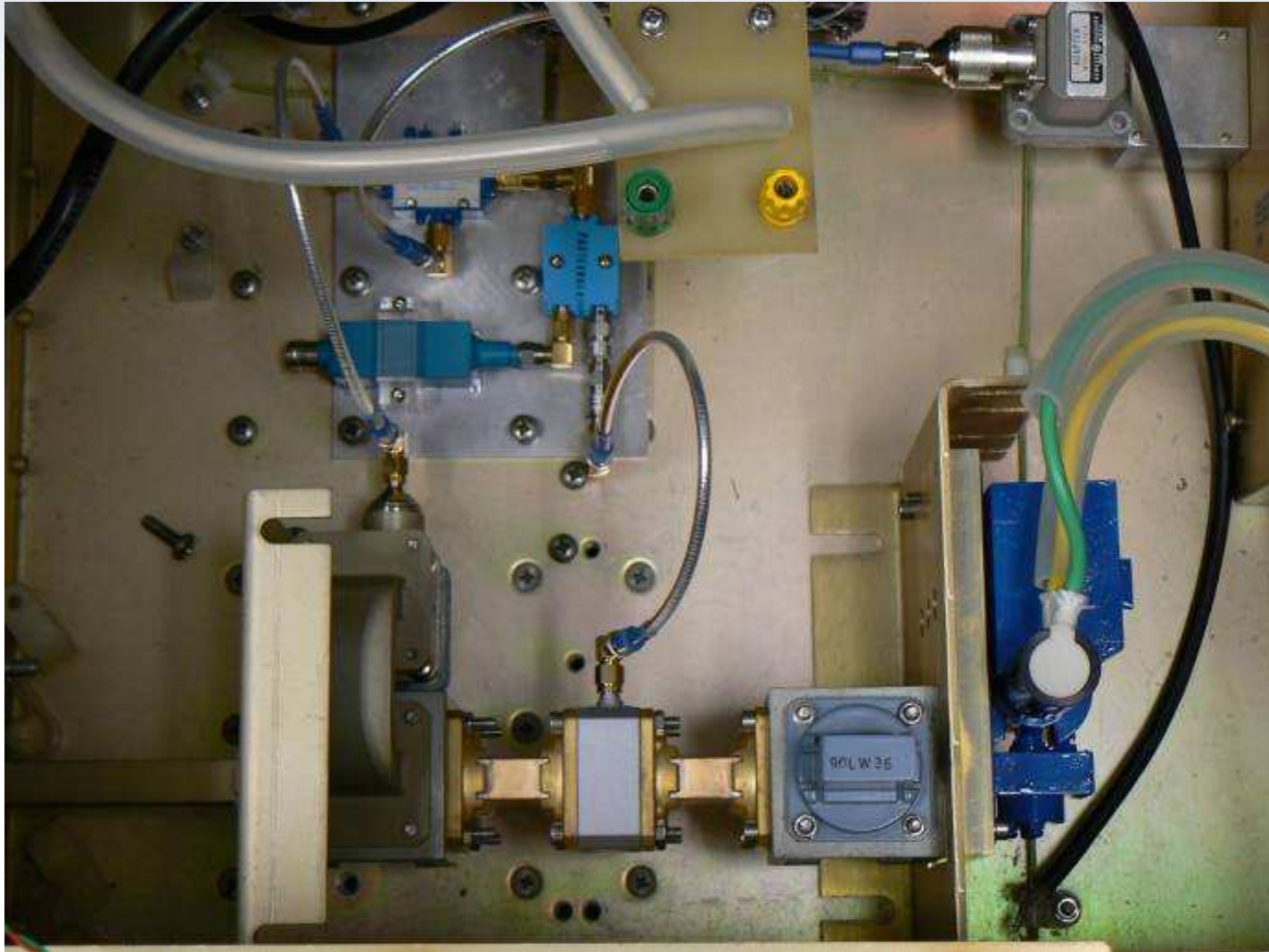
Raytheon X-Band Radar  
Modified Front End  
Diagram



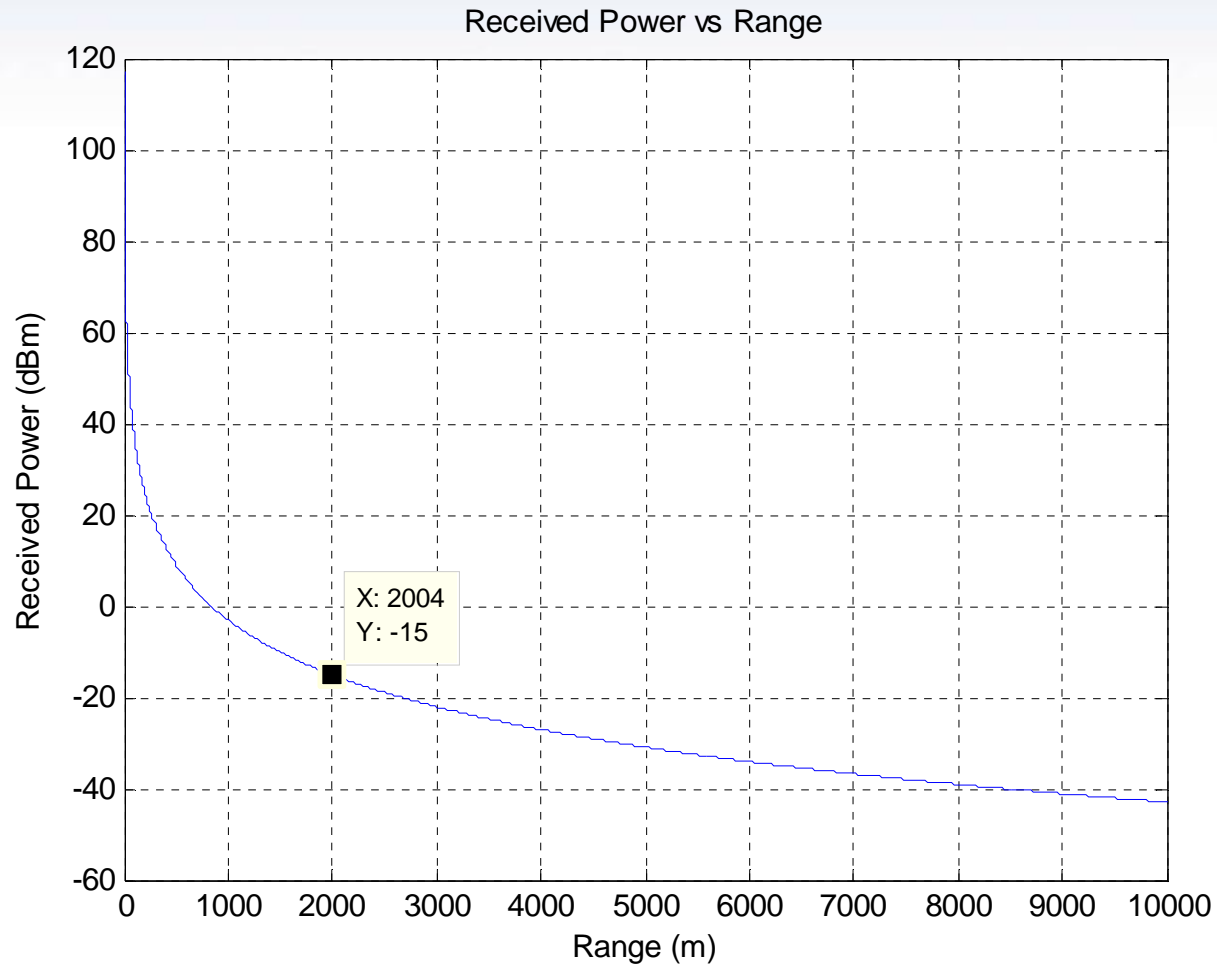
Receiver Noise Figure = 8.00 dB  
Receiver Dynamic Range = 91.74 dB



# *Radar Specifications*



# Corner Reflector





# *Corner Reflector*

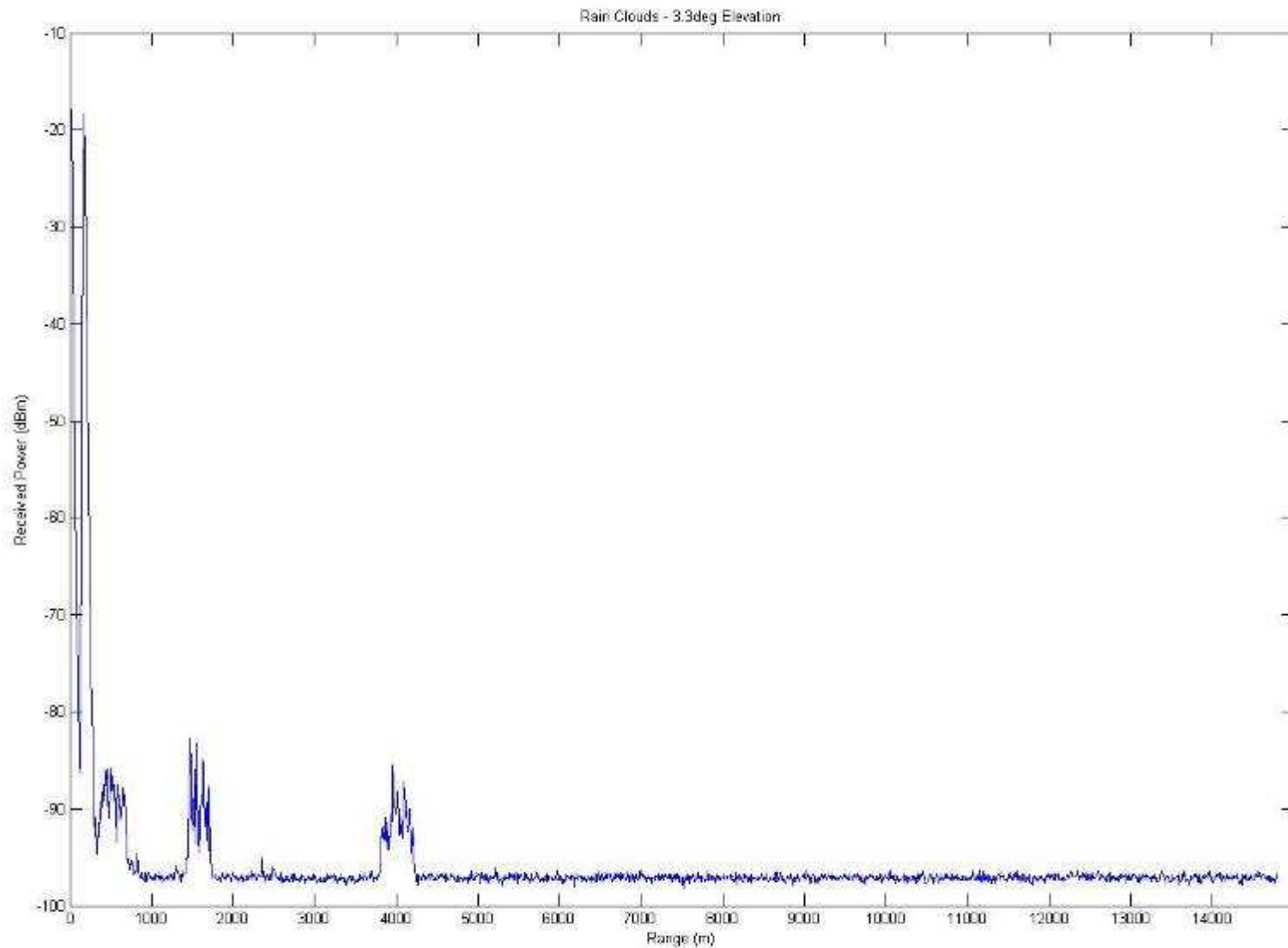


# *Corner Reflector*



**casa**

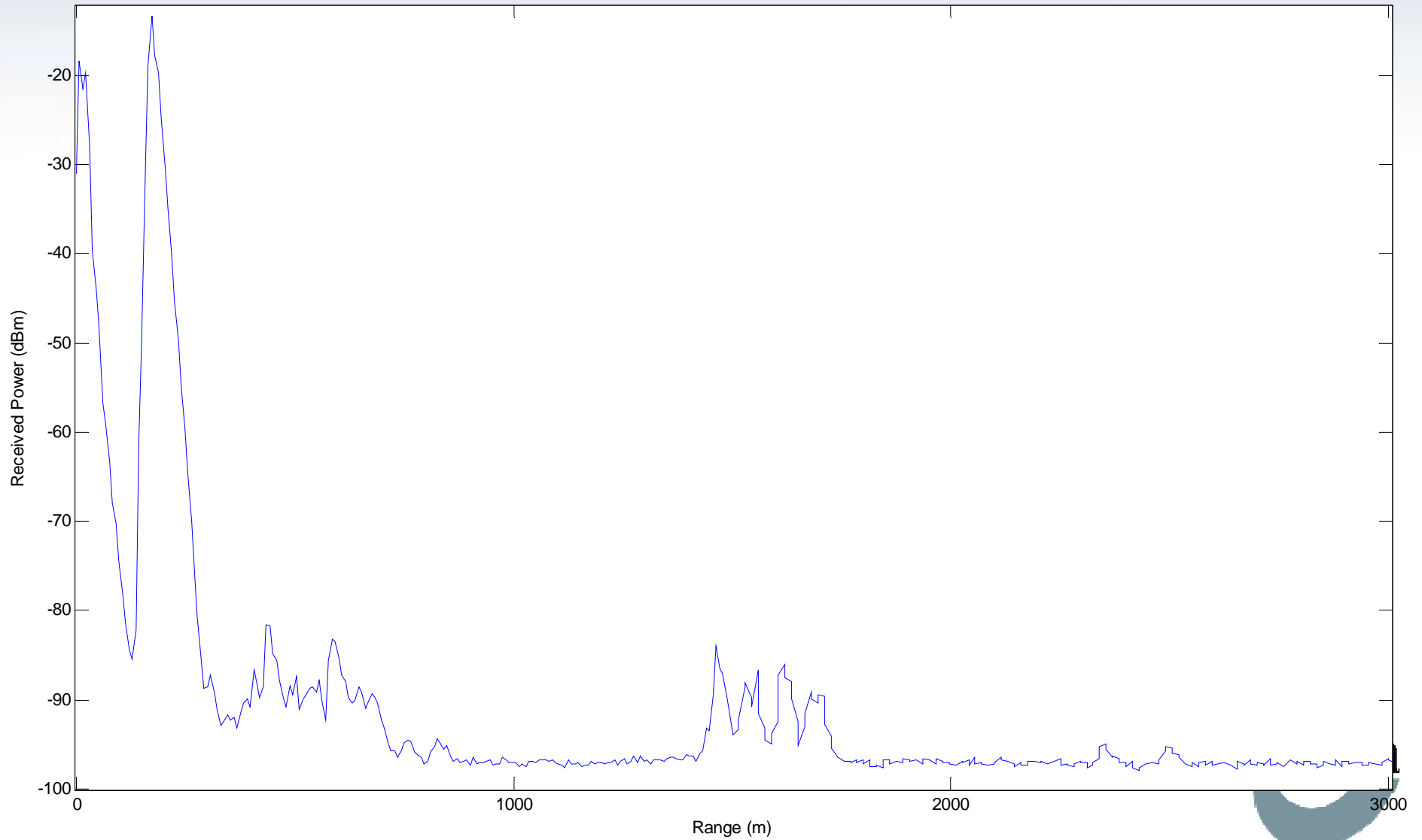
# *Latest Achievements*





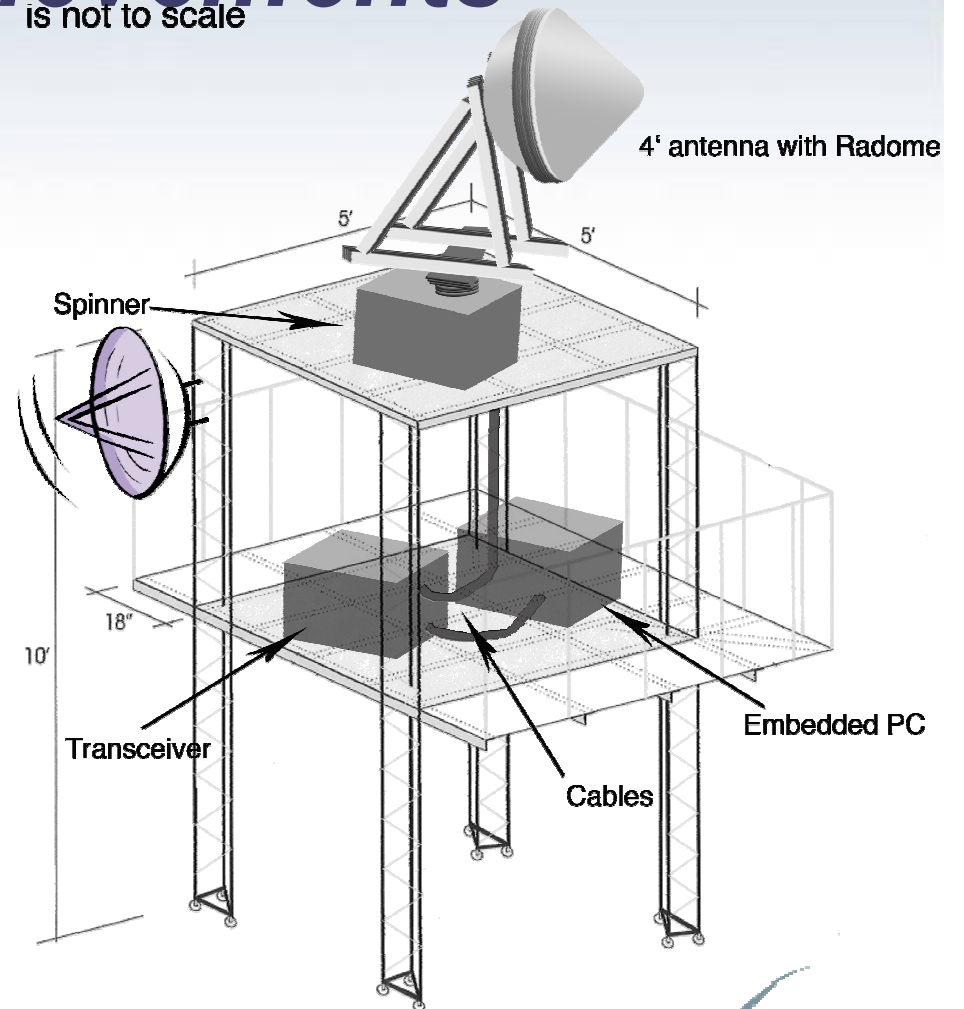
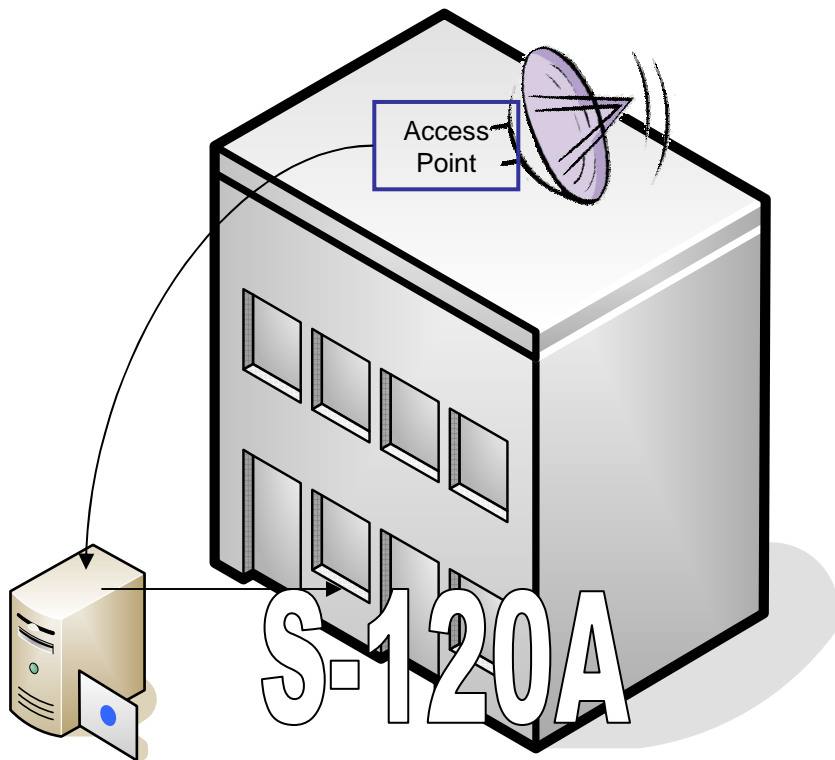
# Latest Achievements

Nubes de Lluvia



# Latest Achievements

is not to scale



# Latest Achievements



Puerto Rico STB | DCAS Network | PDC LAB | Documentation

## Welcome to STB-Portal

### Puerto Rico Student Test Bed

#### Students to design and build weather-sensing radar system

The Student Test Bed, an innovative **CASA** education project, is being developed and implemented at the western area of Puerto Rico. The STB project is led and managed entirely by students and serves as a fundamental component of their education. The multi-disciplinary, multi-level, multi-campus team is composed of students from University of Massachusetts, University of Puerto Rico, University of Oklahoma and Colorado State University.

The primary mission of the Puerto Rico STB is to validate the DCAS approach in variable terrain. The test bed will follow parallel research paths using off-the-shelf hardware to construct the network while developing a new type of low power radar. The test bed will focus on constructing a network of radars to provide detailed QPE information to the people of Puerto Rico while educating students and advancing radar technology.

#### Project Goals

- Establishing a QPE sensing network starting at the western end of the island
- Filling in NEXRAD coverage gaps.
- Improve precipitation estimates for western Puerto Rico
- Developing a DCAS strategy for tropical QPE.
- Exploring the plausibility of an 'off the grid' radar.
- Exploring the capabilities of short range, high beamwidth, and limited node computation radar network.

## Latest News

- 22 May 2006** HP Grid & Utility Computing Workshop.
- 22 April 2006** CASA site visit 4/25-4/27
- 30 March 2006** The Portal demo is available.
- 27 March 2006** Magnetron based Radar: [history](#)
- 23 March 2006** The PDC meeting is cancelled.
- 3 February 2006** Diego's birthday.



University of Massachusetts  
Amherst (UMASS)



University of Oklahoma  
(OU)



University of Puerto Rico  
at Mayaguez campus (UPRM)



Colorado State  
University (CSU)



Engineer Research center for  
Collaborative Adaptive Sensing  
of the Atmosphere (CASA)



Parallel and Distributed  
Computing Laboratory  
(PDC Lab)

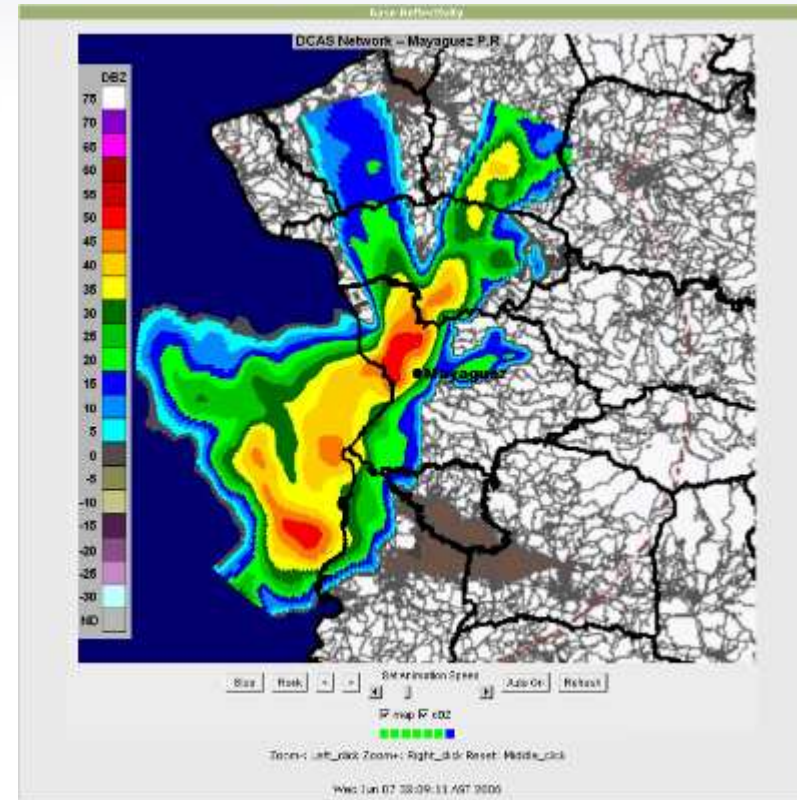
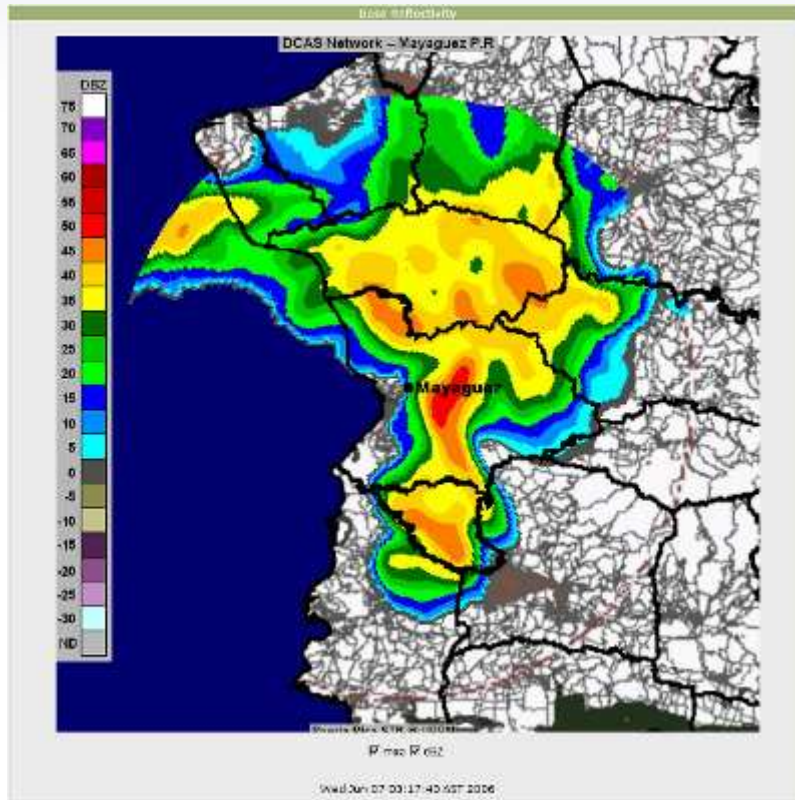


National Science  
Foundation (NSF)

© 2005 Puerto Rico Student Test Bed - University of Puerto Rico at Mayaguez.  
This page is maintained by PDC Lab - Grid Computing Team.

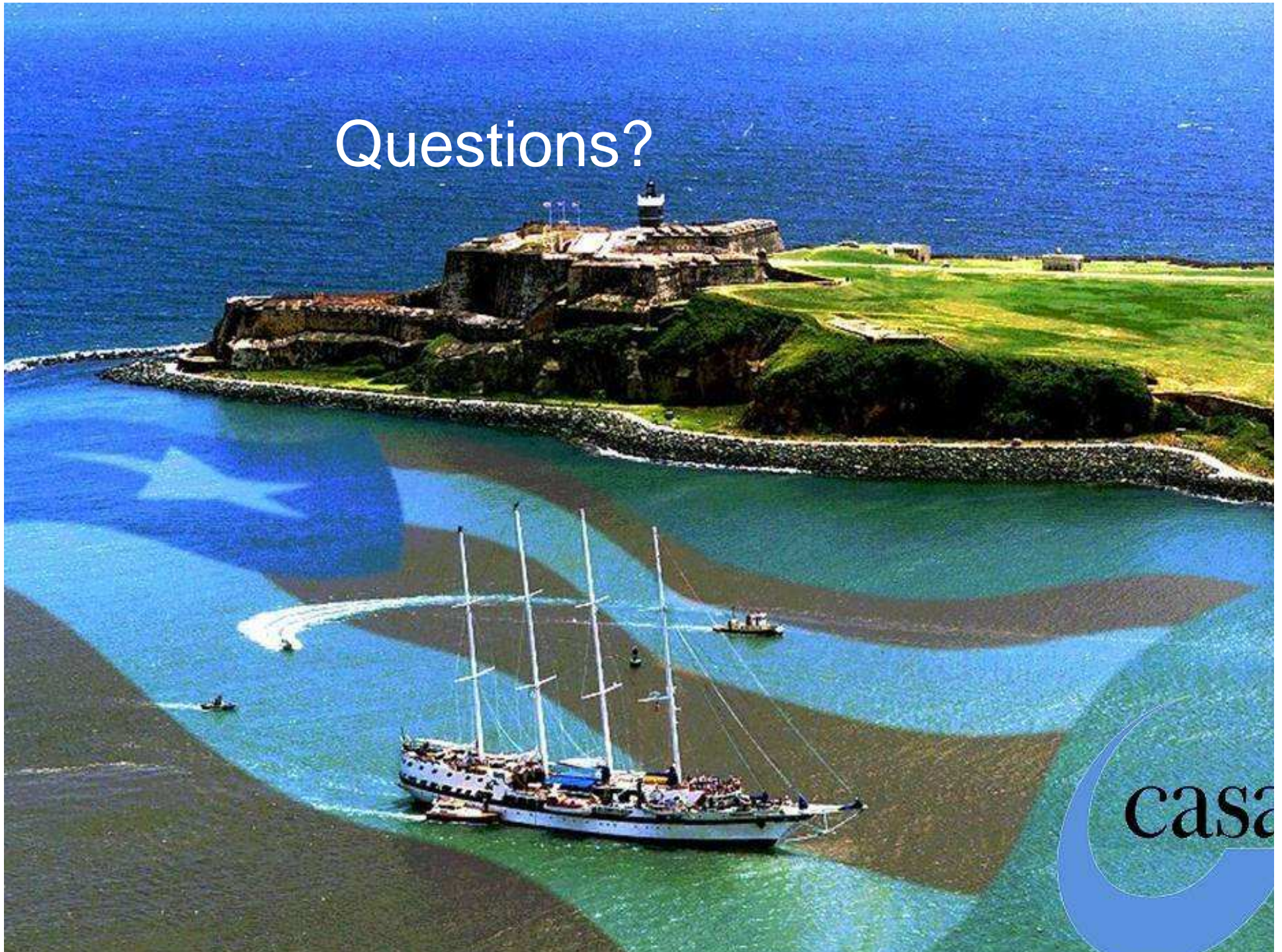
Contact [diego.anao@ece.uprm.edu](mailto:diego.anao@ece.uprm.edu) with comments regarding this page - Last updated at March 30, 2006

# Latest Achievements





Questions?



casa