5.21 THE NATIONAL WEATHER RADAR TESTBED (PHASED-ARRAY)

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1. Introduction

The WSR-88D has been in the field now for over 12 years and it is time to look at what additional technology might be applied to improving this important forecast and warning tool. A unique phased array Weather Radar Testbed is being built in Norman, Oklahoma to study and develop faster and more accurate warning and forecast techniques. This site is under development by a government/industry team consisting of the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory (NSSL) and Radar Operations Center, the United States Navy's Office of Naval Research, Lockheed Martin Corporation, the University of Oklahoma's Electrical Engineering Department and School of Meteorology, the Oklahoma State Regents for Higher Education, and the Federal Aviation Administration's Technical Center. The total cost is approximately $25 million. This system will be used as a radar meteorological research testbed serving the needs of the atmospheric research community.

Currently, the National Weather Radar Testbed (NWRT) is being built and integrated by Lockheed Martin and will be delivered to Norman, Oklahoma in the fall of 2002 and available for use in the spring of 2003. In this paper we will describe our progress along with our plans to manage and encourage access to this National Facility.

2. System Components

The National Weather Radar Testbed (NWRT) (See Figure 1) will include a SPY-1A antenna and beamsteering controller and a WSR-88D (NEXRAD) transmitter provided by the National Weather Service. A COTS based Environmental Processor (EP) for the NWRT is being designed and built by Lockheed Martin under a contract with the University of Oklahoma. The rest of the system and integration, installation and testing is being accomplished by Lockheed Martin under a separate contract with the Navy. The facility to house the NWRT is being furnished by NSSL with partial funding from the Navy and the FAA. The components that comprise the NWRT include:

NAVY:
★AN/SPY-1A Antenna
★AN/SPY-1A Beam Programmer

NOAA/NWS:
★WSR-88D Transmitter

University of Oklahoma:
★Environmental Processor (EP)

Lockheed Martin:
★Receiver/Exciter
★PAR Testbed Controller
★Enclosure, Pedestal & Radome

NOAA/NSSL:
★Infrastructure support for the Architectural Facility (Enclosure, Pedestal & Radome)
★User Facility

3. System Description

The antenna, pedestal, transmitter and system components for analog signal generation and processing are located in the pedestal building/Architectural Facility. The antenna system will have a capability to rotate ± 225 degrees allowing for 360 degree coverage with the antenna. The transmitter is an NSSL modified WSR-88D transmitter with a new Klystron tube that will transmit at 3.2 Giga-Hertz. The digital receiver performs the A/D conversion and the digital data is sent via fiber optic link to the control building/User Facility. The control building houses most of the EP that includes the digital signal processor (DSP), weather data

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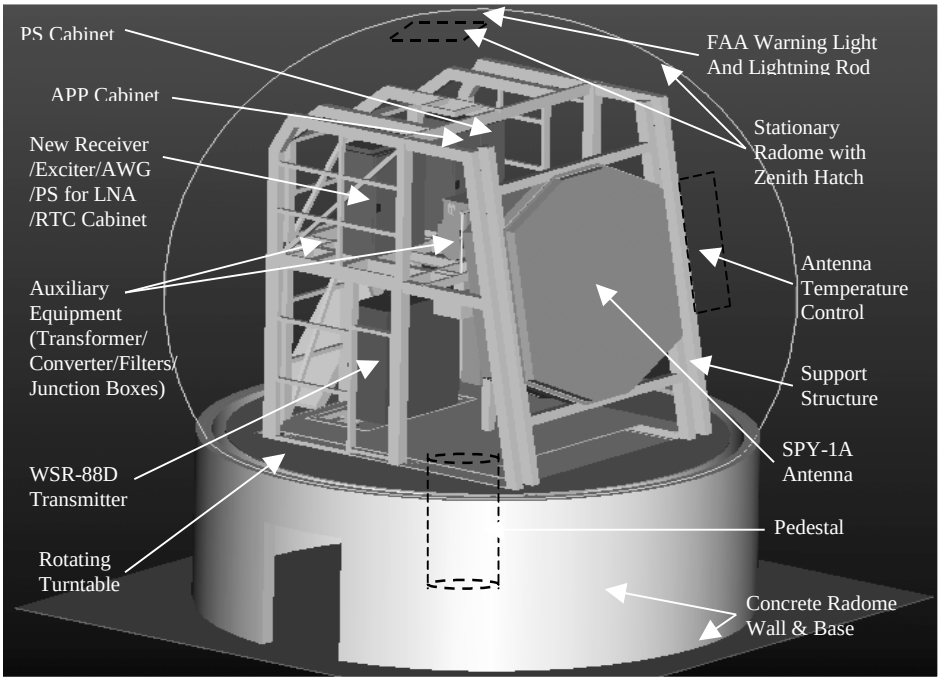

Figure 1. National Weather Radar Testbed (NWRT). Pedestal Building/Architectural Facility. Solid-Model Front View

processor (WDP), and the data recording and archive devices. The system will be capable of storing 1 hour of I&Q data at 10 mega-samples per second and up to 50 hours of Universal Format data. The user interface software, radar control display, and the radar scheduler are also housed in the control building located a maximum of 300 meters from the pedestal building. The EP operating modes includes real-time processing, off-line processing and data capture and record only modes. Both the real-time and off-line processing modes include an ability to provide pulse-pair, pulse Doppler (16- and 32-point FFT) and single pulse (reflectivity) data. Both modes include an ability to apply matched filters and operator selectable clutter filters. The ability to distribute the data over a LAN will also exist.

4. Progress and Schedule

During the last year, we have made substantial progress. The antenna system has been tested and delivered to Lockheed Martin. Lockheed Martin has completed their System Design Review's for both the NWRT and EP. The transmitter was obtained from the NWS and installed for testing at the NSSL. Two new Klystron tubes have been received to operate at 3.2 Giga-Hertz. An A/E firm has been put under contract for the Architectural facility and siting of the facility has been accomplished. The User facility has been leased and furniture ordered.

The current schedule will result in the system being built this fall with integration and testing occurring next spring and summer at the Lockheed Martin facility in Moorestown, New Jersey. The system will then be installed on the north campus of the University of Oklahoma near the NSSL in Norman, Oklahoma during the fall 2002. The NWRT will then be tested and ready for operations during the spring 2003.

5. Facility Management

At this time, the day-to-day use of the facility will be managed by NSSL. Within two years after initial test and operations (now Spring 2005), a management panel will be established for reviewing proposals and scheduling access to the NWRT making this national resource available to the broader research community. Members of the panel will be from NSSL, ONR, OU, FAA and the research community.

Acknowledgments

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