2.8 BUILDING THE NATIONAL WEATHER RADAR TESTBED (PHASED-ARRAY)

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1. INTRODUCTION

A unique phased array National Weather Radar Testbed (NWRT) is being built in Norman, Oklahoma to study and develop faster and more accurate warning, analysis and forecast techniques for severe and hazardous weather. As reported at the last Interactive Information Processing Systems (IIPS) conference, Forsyth (2002), this site is under development by a government/university/industry team consisting of the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory 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 William J. Hughes Technical Center. The total cost is approximately $25 million. This converted Navy SPY-1 phased array system will be used as a radar meteorological research testbed serving the needs of the atmospheric research community.

In this paper we will describe our progress and current schedule along with our plans for upgrading the system.

2. PROGRESS

The components of the National Weather Radar Testbed (NWRT) are shown in a block diagram (See Figure 1) and include the SPY-1A antenna and beam programmer, Enclosure, Pedestal and Radome, a WSR-88D transmitter modified to transmit at 3.2 GHz, an Environmental Processor (EP) (Digital Receiver/Signal Processor), and Real-Time Controller (RTC).

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The architectural facility (Radar Facility) will house all of the above equipment except the EP that is located in the User Facility or Testbed Control Center (TCC). The Architectural and Engineering (A&E) Design was completed by Burns and McDonnell, Kansas City, MO. and the general contractor (The Ross Group, Tulsa, OK.) has been selected to build the Radar Facility. The site work began on September 18, 2002. Lockheed Martin is finishing their Integration and Testing (I&T) in Moorestown, NJ. The EP has been built and software and documentation received. The EP has completed integration and test and various timing problems have been solved through the optimization of the run-time code. The initial sparing for the system has been identified and maintenance and training concepts and plans are being developed.

3. SCHEDULE

As of this writing, the Radar Facility is due to be completed by December 15, 2002. On January 6, 2003, Lockheed Martin plans to start the installation of equipment with system checkout due to follow. Several critical path construction items have driven the scheduled start of system checkout to mid April but if all goes smoothly, we may still be able to collect some excellent data on severe storms during the months of May and June. The scheduled completion of the system including training and documentation is the end of July, 2003. See Figure 2.

4. PLANNED UPGRADES

As a result of funding from the FAA and cost savings in the program, several upgrades to the system have been planned. A backup generator will be added to support all equipment in the Radar Facility along with an additional generator and UPS to support the critical equipment in the TCC. This will provide an improved ability to collect data when thunderstorms are in the Norman area. In addition, the limited rotation capability, Forsyth (2002), will be replaced with a continuous rotation capability with rotation

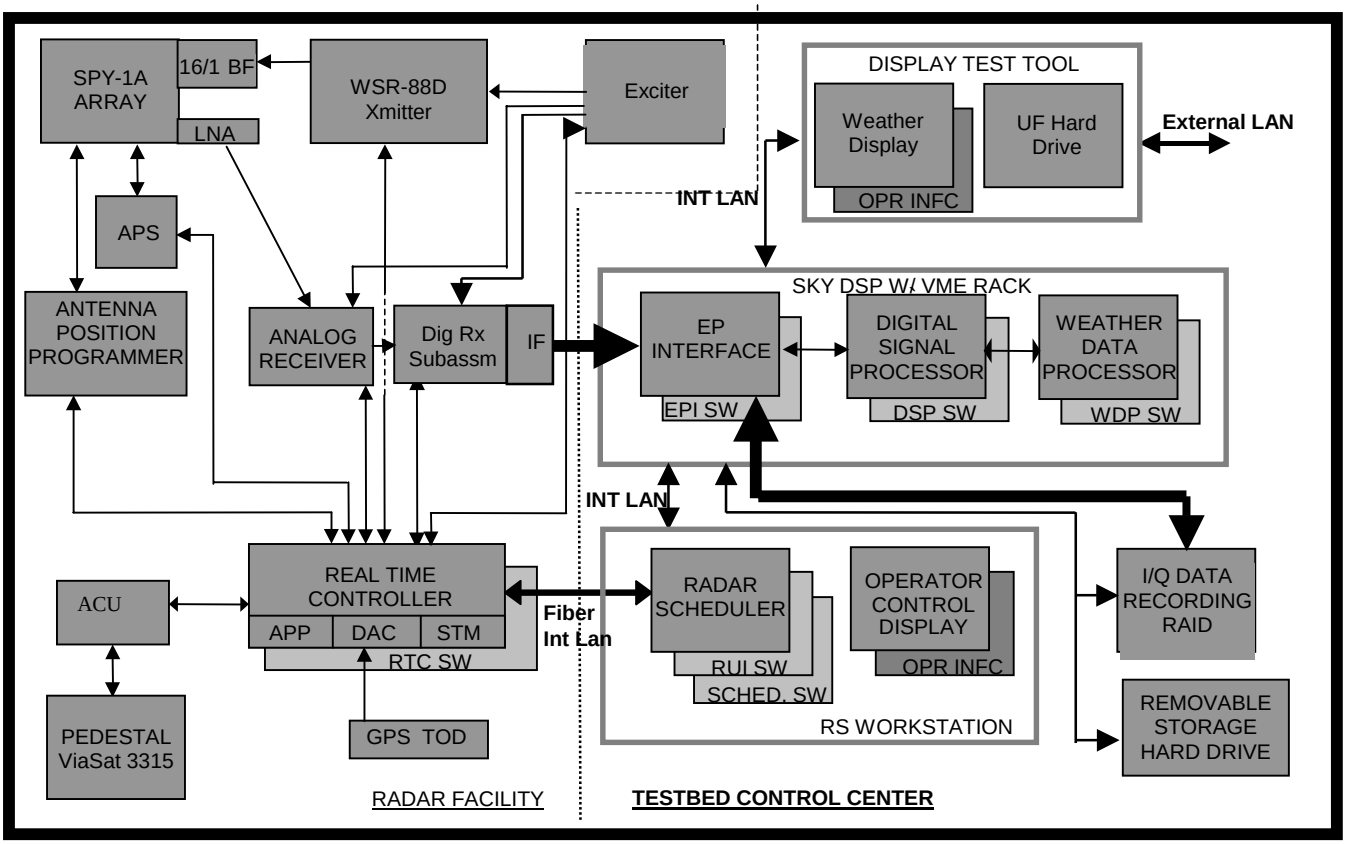

Figure 1. System Block Diagram. Location of equipment is either the Radar Facility or Testbed Control Center separated by the dotted line. (Courtesy of Lockheed Martin)

speeds of up to 18 degrees per second. This will allow the radar to complete a full 360-degree rotation in 20 seconds (e.g., 1 volume scan of 14 levels in less than 60 seconds). The rotary joint will replace the umbilical cord and installation and checkout are planned for September 2003. A scheduling tool to automate the creation of beam multiplexing strategies will be developed and available for researchers. Our plans are to convert the display system to use our Warning Decision Support System-II (WDSS-II), Hondl (2002) and to start an upgrade path to make the NWRT a virtual radar similar to the capability implemented on the CHILL Radar at Colorado State University, Chandrasekar (2001).

We are studying a number of modifications to enhance the capability of the radar. Future plans include an adaptive scan capability where the radar algorithms will modify the volume scan strategy in real-time to more frequently revisit areas of highest interest, such as a rapidly developing storm formation. In addition, we are looking at adding a transmitter capable of providing dual frequency coded waveforms. Other multi-use applications of the system for wind profiling, aircraft tracking and chemical/biological profiling are being explored. Dual polarization capability is another upgrade that will be pursued.

ID	Task Name
1	Architectual Facility
2	Install & Test Phased Array
3	Collect and Evaluate Initial Data Sets
4	Install & Test Continous Rotation
5	Collect Initial Data - Severe Weather Season

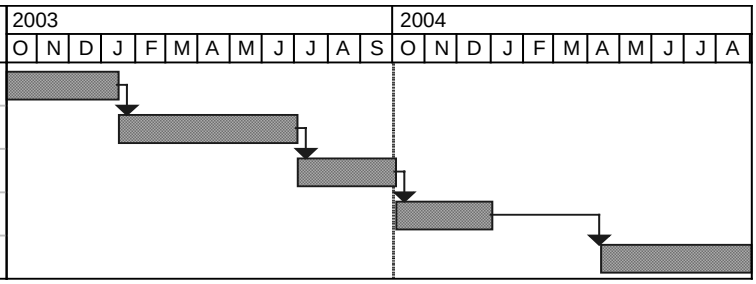

Figure 2. Schedule

5. Acknowledgments

We acknowledge the support of our various organizations in funding and helping to implement this national facility.

6. References

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