Radar Wind Profiler

1. Introduction and Overview

The ARM program currently has seven radar wind profilers (RWPs) in operation world-wide with four sites in at the Southern Great Plains (SGP), one at the North Slope of Alaska (NSA) and two with the ARM Mobile Facilities (AMF1, AMF2). This network provides a continuous depiction of atmospheric profiles of wind speed and direction to 3-6 km or more in clear air conditions and profiles of water/particle fall speed to as high as 14 km during precipitation. These data can also be used to estimate the height of the mixed layer within the planetary boundary layer as well as stratified stable layers. Six of the current systems are limited to 5 pre-defined pointing positions, from which the horizontal wind profile is calculated based on the geometry of those beams. The seventh, located with AMF2, is capable of beam steering for ship deployments.

The ARM program is currently developing two new sites that require wind profilers. One site is at Oliktok Point in Alaska, where a 915 MHz system similar to those presently located at Barrow, AK and SGP is envisaged. However the program will also entertain proposals using other frequencies such as 449 MHz, if they can provide near-surface coverage similar to that presently achievable with 915 MHz systems. The second site is in the Azores, thus a 1290 MHz system similar to that presently located with the AMF1, is requested so as to avoid frequency restrictions.

2. Operational Specification

Multi-beam radar wind profiler with following specifications:

- Capable of at least 4 tilted and 1 vertical pointing direction
- Capable of switching between beams in less than 0.5 sec.
- Operating frequency of 1290 MHz (Azores) or 915 MHz or equivalent (Oliktok)
- Nominal peak transmit power 1 kW approximate
- Beam width 10 deg or less
- Multiple transmit pulse lengths (.400 – 2.800 μs)
- Variable, selectable coherent integration times
- Selectable spectral size and averaging

- Nominal 4 km range in normal clear air atmospheric conditions with 1.400 μs pulse length
- Capable of arbitrary combinations of transmit power, range gates, spectral averaging and pointing directions

3. Software and Data Specifications

- Data content similar in content (but need not be identical) to current Vaisala (now Scintec) LAP-3000 profilers
- Data reported at user-selected ranges and averaging intervals
- Data to include spectral data and spectral moments from chosen pointing directions
- Data to include calculation of wind profiles and velocity along selected pointing directions averaged over user-defined time periods with quality control (% acceptable signals, e g.) indicator
- Data to include signal amplitude/power in snr or Cn^2 or equivalent
- Support wireless data transfer
- The computer system, with the instrument application shall provide the necessary functionality to perform instrument control and to deliver instrument measurements to the ARM data system
- The instrument computer shall generate hourly files of data and metadata (i.e., logs, hardware metadata, etc). Provide an explanation in the proposal if this condition cannot be met.
- The instrument computer shall have an FTP server
- Files to be delivered by the instrument computer to the ARM data system shall be placed in a directory readable and writable by the data system user using the ftp server
- The files placed in the collection directory by the instrument control process shall follow a file naming convention which ensures unique names for an arbitrarily long time series of files. The vendor shall provide scripting or other mechanism to allow ARM instrument administrators to define the file name syntax
- The data system collection process shall validate that the instrument PC is synchronized with local NTP server. This requires that the instrument computer OS shall run a Network Time Protocol (NTP) compatible time synchronization mechanism. It recommended that MS Windows based systems use Dimension 4, Version 5.0 or later. Each ARM measurement facility includes a GPS based NTP time reference
- The instrument application shall execute under an operating system (OS) that has operating system vendor provided support for security patches and OS

updates for at least a 3 year period after system delivery to ARM.
- Additional software and data requirements are described in the attachment, "InstrumentComputerSpec.pdf".

4. Documentation

- Comprehensive users manual
- Trouble shooting guide
- Spare parts list
- Selected maintenance procedures

5. Mechanical Specifications

- Supporting electronics 19" rack mountable
- Instrument computer 50GB or greater hard drive
- Antenna hardened against vibration, salt water environment
- Antenna supplied with adequate tie-downs to survive 100 mph winds

6. Environmental Specifications

- Electronics at least -30 – 40 C operating range
- Antenna capable of operating during precipitation
- Antenna capable of operating between –40C and 45C.

7. Electrical Requirements

120/240 VAC, 50/60 Hz electrical supply

8. Safety

RF radiation levels outside of clutter fence less than 3.0 mW/cm^2

9. Site Installation

- Capable of straightforward/easy dismantling and installation within a few hours
- Appropriate tie-downs for installation and leveling of antenna`

10. Instrument Support

- Include plan for phone real-time support

- Site visits as necessary
- Maintenance support option

11. Deliverables

- Electronics, cables, antenna, clutter fence
- Manuals, supporting documentation as above
- Acceptance test
- Progress reports