

# RAL

## DESIGN & DISCOVERY

### Open Days July 1990

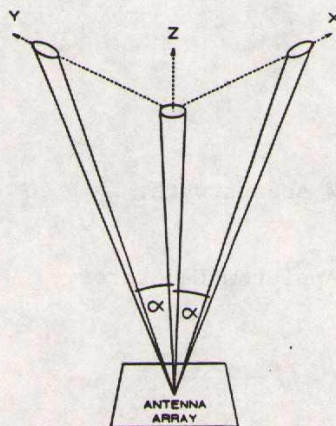
**RUTHERFORD APPLETON LABORATORY**  
SCIENCE AND ENGINEERING RESEARCH COUNCIL

#### THE SERC MST RADAR FACILITY

The development of the SERC MST radar facility, due to become operational in the Autumn of 1990, is a joint project between Rutherford Appleton Laboratory and the Physics Department of the University College of Wales, Aberystwyth. The radar is located at Capel Dewi, five miles from Aberystwyth, and is for use by the UK Geophysics Community. It provides measurements of horizontal/vertical wind velocities in the Mesosphere (75-85km), Stratosphere (12-25km) and Troposphere (2-12km) at 150m height intervals, and enables information to be obtained on:-

- \* The turbulent structure and wind field of the atmosphere.
- \* The jet stream and weather fronts.
- \* Gravity waves.
- \* The role of waves and mean flow in the transport of atmospheric constituents, such as ozone for example.

The radar uses a 20 by 20 array of yagi antennas for transmitting and receiving radar signals from different heights of the atmosphere. By changing the phasing of the antenna array, ie. by changing the lengths of the cables connecting the yagis, the direction of the radar beam can be swung off-vertical to enable the radar to detect the horizontal component of the wind velocity. By measuring the Doppler frequency shifts of the radar echoes received "looking" vertically and along two off-vertical directions at right angles to each other (see figure below), it is possible to determine the vertical and horizontal wind profiles.

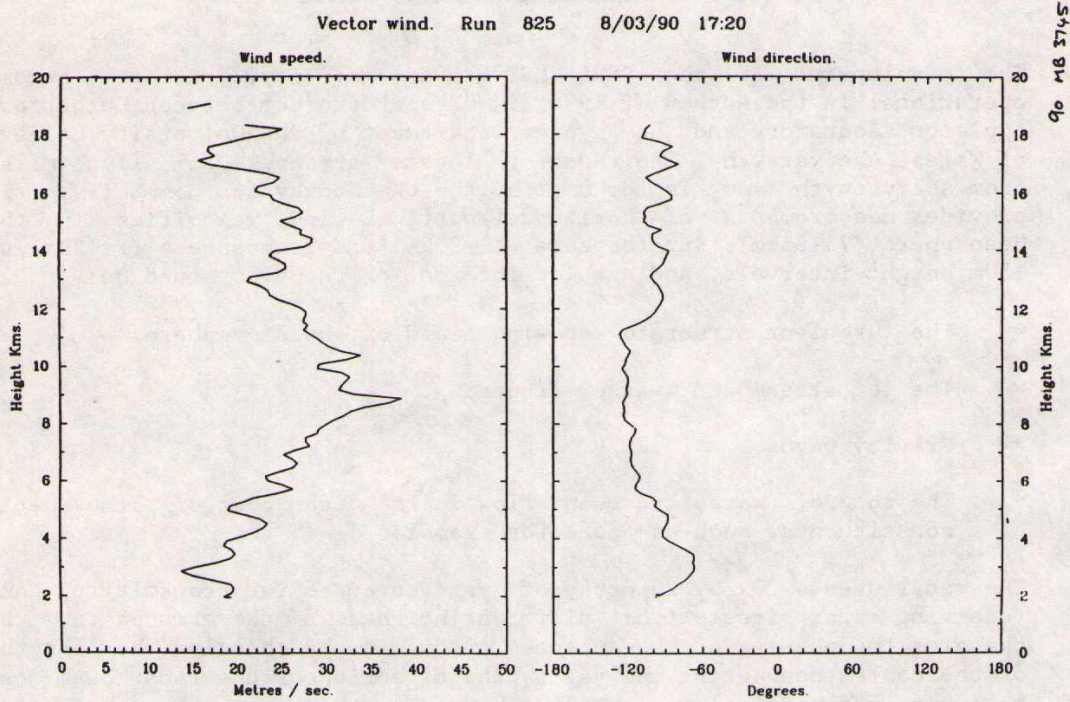


PRINCIPLE OF DOPPLER BEAM SWINGING

#### Radar Parameters

Frequency: 46.5MHz  
Peak Power: 250kW  
Mean Power: 12.5kW  
Pulse Lengths: 1, 2, 4us  
Prf (approx): 1.5, 3, 6, 12KHz  
Pulse Coding: 4, 8, 16, 32 bits  
Antenna Size: 104m x 104m square  
Beam Width: 3 degrees  
Beam Directions: Vertical,  
4 degrees N, E, S, W,  
6 degrees NE, SE, SW, NW,  
8 degrees, N, E, S, W,  
12 degrees, NE, SE, NW.

The radar is computer controlled and processes all the radar signals received from the different height regions in real-time. When operational it will automatically cycle round the three selected beam directions to produce wind profiles, like the example shown below, every 2 minutes for periods lasting up to 24 hours. It is planned (a) to connect the system to JANET so that users can gain remote access to the facility, and, (b) to maintain an archive of the MST radar data on the Geophysical Data Facility (GDF).



Example of a horizontal wind profile

Further information can be obtained from:-

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