18969 NJ 920 944

7.2.1 LOW-ALTITUDE COVERAGE OF ST RADARS

W. L. Ecklund

Aeronomy Laboratory
NOAA
Boulder, CO 80303

Clear-air ST radars are now widely used for atmospheric research and wind profiling. Most attention to date has been directed toward extending the altitude coverage of these radars as high as possible. It is also desirable to extend the coverage as low as possible, but low altitude coverage has not received much attention (probably because it is not very glamorous). Any improvement in the low altitude coverage of existing wind profiling radars would be useful. In this note, we list the approximate lower limits of some existing ST radars, and then briefly speculate on what establishes these limits.

Table 1 lists the low altitude coverage (height above ground) of a number of different radars. The values for the WPL (NOAA-Wave Propagation Lab) radars were obtained from STRAUCH (private communication). The table shows that the 915-MHz radar has the best low altitude performance. The 50-MHz radars show a fairly wide range of low altitude coverage depending on antenna size, pulse width and transmitter configuration. The 800-meter coverage in France was obtained by using the driver stage of the transmitter (peak power about 3 kW) instead of the final stage (peak power about 40 kW). Tests in France showed that the minimum system range was about 500 meters when transmitting into a dummy load. The receiver in the Liberal, Kansas, 50-MHz radar was saturated out to a range of about 2000 meters when transmitting 40 kW peak power pulses into the antenna.

The results from France suggest that decreasing the peak power might improve low altitude performance. It is clear that system recovery time is increased when the transmitter is switched from a dummy load to the antenna. This may be due to internal reflections in the antenna or to intense nearby ground clutter. It is suspected that internal reflections may be the problem, since the low altitude coverage of the Liberal, Kansas, radar (100 by 100 meter antenna) is poorer than the coverage of the Colorado network radars (50 by 50 meter antennas). System recovery time has also been observed to be limited by significant amounts of nearly coherent energy leaking from the transmitter into the receiver after the main transmitter pulse is turned off. This problem might be solved by using a better TR/ATR switch or by using a transmitter with a significantly wider bandwidth.

Table 1

Radar location (organization)	Freq. (MHz)	Antenna (m^2)	Pulse width (microsec.)	Low alt. (always)	Coverage (m) (sometimes)
Denver, CO (WPL)	915	100	1	300	200
Liberal, KS (AL)	50	10,000	2,4	-	2100
Colorado (WPL)	50	2500	3	1700	1400
France (LSEET)	48	2500	1	-	800