

PERFORMANCE OF AN L-BAND ANTENNA FOR RADIOMETRIC MEASUREMENTS

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The objective of this paper is to discuss the performance of a new L-Band, truck-mounted radiometer antenna. This new low loss antenna has been designed to increase the calibration stability of the ComRAD radiometer system. ComRAD is a dual polarized combined radar radiometer system operating as a radar at 1.3 GHz and as a radiometer at 1.413 GHz. It utilizes the same antenna for both frequencies. ComRAD is used to develop algorithms for the sensing of soil moisture in the presence of vegetation. The system is presently being employed to monitor agricultural crops over the growing cycle in preparation for the upcoming SMAP (Soil Moisture Active Passive) satellite mission.

The new antenna is of a Cassegrain type so that the antenna ports will be close to the radiometer inputs. It is not a classic Cassegrain design, however because of the low L band frequency of operation. The subreflector, which is supported by a rexolite dielectric cone, is only a wavelength from the main dish. The design of the antenna has been aided by FEKO simulation software. A complete set of antenna radiation patterns have been performed in the NASA Goddard Space Flight Center anechoic chamber. The measured results in the chamber are quite close to the simulated results by FEKO.

This paper will discuss the performance of the antenna under actual operating conditions. Assuming that the radiometer has been calibrated, the actual measured antenna patterns will be used to calculate the horizontal and vertical brightness temperatures when the antenna is pointed at a flat ground (dielectric half space) at specified angle of incidence. A plot of these brightness temperatures versus angle of incidence will be made. These curves will be compared to the curves produced by an ideal antenna. Using this comparison the effects of antenna side lobes and cross polarization coupling can be assessed. The results will also be compared to ComRad data taken of a flat agricultural field whose crop has recently been harvested.