Pod-Mounted Conformal Ultra-Wideband Omnidirectional Traveling-Wave Antenna

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Bandwidth enhancement and size reduction are critical design problems for a wide range of wireless systems, from cell phone to aircraft, on which the mounting space for antenna is scarce and at a premium. For airborne applications, antennas at frequencies VHF or lower are physically large and aerodynamically problematic. A general solution is to use a conformal antenna, and to have it contained in an instrument pod which is attached to aircraft via a pylon. In previous papers the present authors reported scale-model development of a pod-mounted traveling-wave (TW) antenna to enhance the bandwidth, and reduce the size, of the antenna (J. Wang and D. Triplett, *IEEE APS Symp*. and *URSI*, 2008) beyond the classical Chu limitation (L. J. Chu, *J. Appl. Phys*., Vol. 19, 1948). This paper presents key results in full-scale model development.

Fig. 1 shows the full-scale TW antenna, approximately a semi-circular cylinder in shape, 70-in long and 10-in high. Fig. 2 shows the pod with the antenna installed inside and thus not visible. The performance of the antenna/pod assembly was tested in WEO's anechoic chamber and later on a government antenna range.

Fig. 1. Antenna on partially assembled pod.

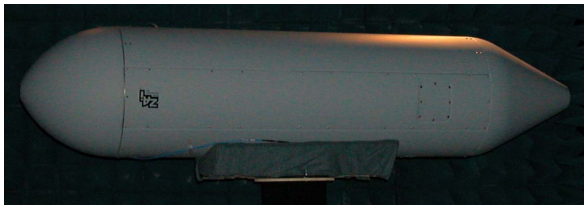
Fig. 2. Pod with antenna installed inside.

Fig. 3 shows measured SWR over 88 to 880 MHz, a 10:1 octaval bandwidth. Measured gain patterns, with the axis of the cylinder parallel to the ground, exhibit omnidirectional coverage with vertical polarization similar to that of a vertical monopole or an annular slot at the bottom of the pod. Ripples in azimuth patterns arise with increasing frequency, due to the elongated shape of the antenna.

The gain of the antenna/pod assembly is fairly good, but some degradation is observed at low frequencies due to the low conductivity of the pod.

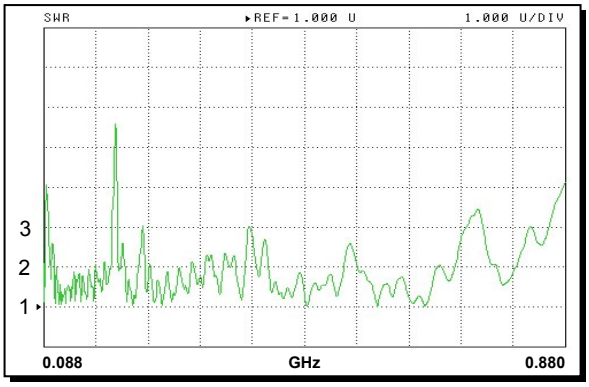

Fig. 3. Measured SWR over 88-880 MHz.