An Omnidirectional and Low-VSWR Ultra Wideband Antenna for a Frequency Band of 6 to 40 GHz

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We have proposed an omnidirectional-in-azimuth, low voltage-standing-wave-ratio (VSWR), and easy-to-construct antenna for ultra-wideband (UWB) systems (T. Taniguchi, and T. Kobayashi, IEEE AP-S 2003, vol. 3, 460-463). Omnidirectional and low-VSWR requirements are essential for applications such as UWB channel sounding. The proposed antenna consists of a circular ground plane and a teardrop that is defined as a combination of a finite cone and a sphere to be inscribed inside the cone at the cone's base. This antenna can be considered either as a rounded finite monocone antenna or as a simplified volcano smoke antenna. Assuming 50-Ω excitation, the optimum half-cone angle is 48º which gives the lowest maximum VSWR. Following a prototype in the frequency band of 3 to 20 GHz, we constructed the 6 - 40 GHz version, as shown in Figs. 1 and 2. The teardrop was 12.5 mm high (the quarter wavelength at 6 GHz) and ground plane was 50 mm in diameter (sufficiently larger than any quarter wavelength in the designated bandwidth for 6 - 40 GHz). The teardrop is connected to the inner conductor of the coaxial cable that penetrates the ground plane. The tip of the inner conductor of a K connector was inserted into the apex of the teardrop.

The measured VSWRs are shown in Fig. 3. The new prototype antenna demonstrated VSWR < 1.35 and group delay < 0.2 ns between 6 and 40 GHz, while the former one's VSRWR < 1.3 and group delay < 0.2 ns between 3 and 20 GHz.

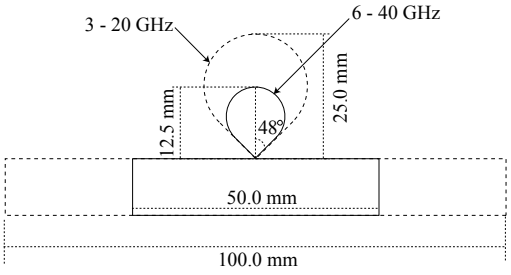

Fig. 1. Cross section of the proposed antennas.

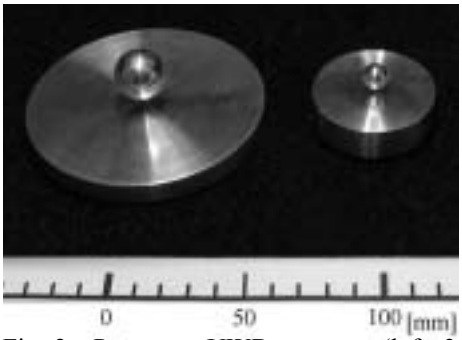

Fig. 2. Prototype UWB antennas (left: 3 - 20 GHz, right: 6 - 40 GHz).

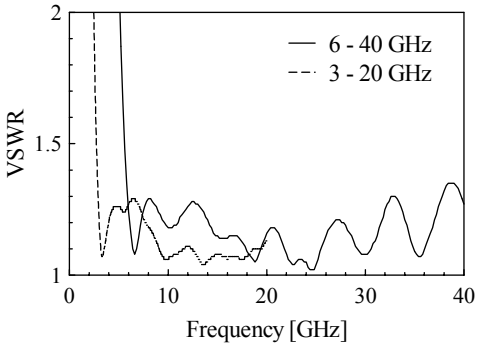

Fig. 3. VSWR of the proposed antennas.