Abstracts

A Dielectric-Free Superconducting Coaxial Cable

C. Rose and M.J. Gans. "A Dielectric-Free Superconducting Coaxial Cable." 1990 Transactions on Microwave Theory and Techniques 38.2 (Feb. 1990 [T-MTT]): 166-177.

We have investigated the theoretical properties of a dielectric free superconducting coaxial cable with a magnetically levitated inner conductor. We found that at 100 GHz the intrinsic attenuation along such a cable is on the order of a 0.1 dB per kilometer. Furthermore, for a given cable, the loss is proportional to the square of the frequency. Thus, at 10 GHz, one could expect losses on the order of 10/sup -3/ dB/km. This low loss, coupled with a generous signal to noise ratio (/spl ap/80 dB at 100 GHz bandwidth), helps provide bit rates of 100 Gbit/s over 600 km. At 10 Gbit/s the distance increases to over 60000 kilometers: about 1.5 times the earth's circumference. Such a high-bandwidth, extremely low loss electronic transmission medium might be of interest for very long distance repeaterless communications. In addition, since efficient means of tapping coaxial media already exist, local area network applications with in excess of 10/sup 4/ users could be supported. The two properties of superconductors central to this application are (1) very low intrinsic loss and (2) expulsion of magnetic flux. Low loss allows high-bandwidth dispersionless transmission. Magnetic flux expulsion permits magnetic support of the inner conductor, thereby avoiding the large dielectric losses associated with any support material.

❑ Return to main document.