NRAO Electronics Division Technical Note No. 191

Simple-Stepped Circular-to-Square Mode Transducers

06-09-96

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June 09, 1996

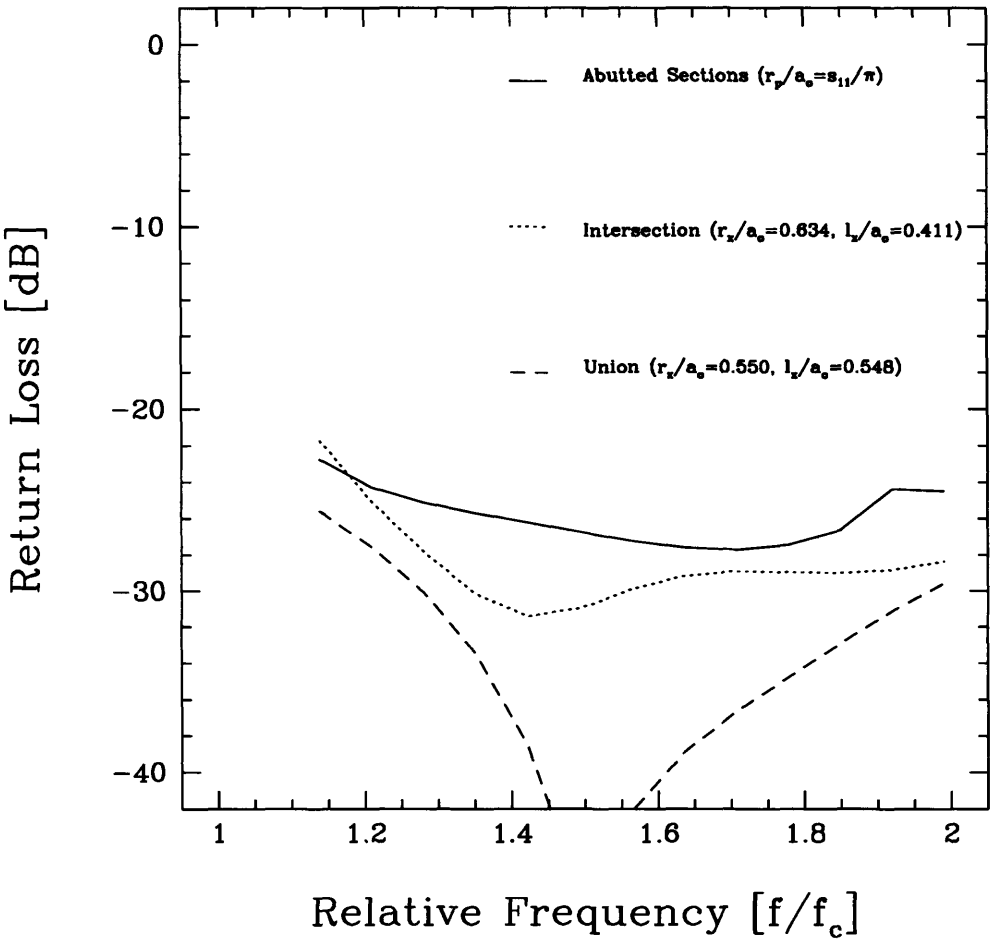

Figure 1. The modeled return loss for simple-stepped circular-to-square transducers. In all three structures, the radius and the guide broadwall are related by the Pyle condition, $r_p = a_o s_{11}/\pi$. The curve labeled 'Intersection' is formed by the intersection of a rectangular and cylindrical section whose length, l_x, results in a phase shift of $\sim \pi/2$ (the natural geometry for an electro-formed mode transducer). The curve labeled 'Union' is defined by the union of a quarter-wave cylindrical and a rectangular guide section (the natural geometry for split-block mode transducer). In both cases, the design with the best, wide-band response is plotted. The risk of moding is greater in the 'Intersection' verses the 'Union' design due to the greater mismatch in cutoff wavelength, λ_c. Note the evidence of moding at the high end of the band in the 'Abutted' design. In all three cases, the critical fabrication parameter is maintaining the four-fold symmetry of the junction (*i.e.*, preventing the excitation of $TE^{\square}_{11}$, $TM^{\square}_{11}$, TM°_{01}, and TE°_{21}).