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Simple-Stepped Circular-to-Square Mode Transducers

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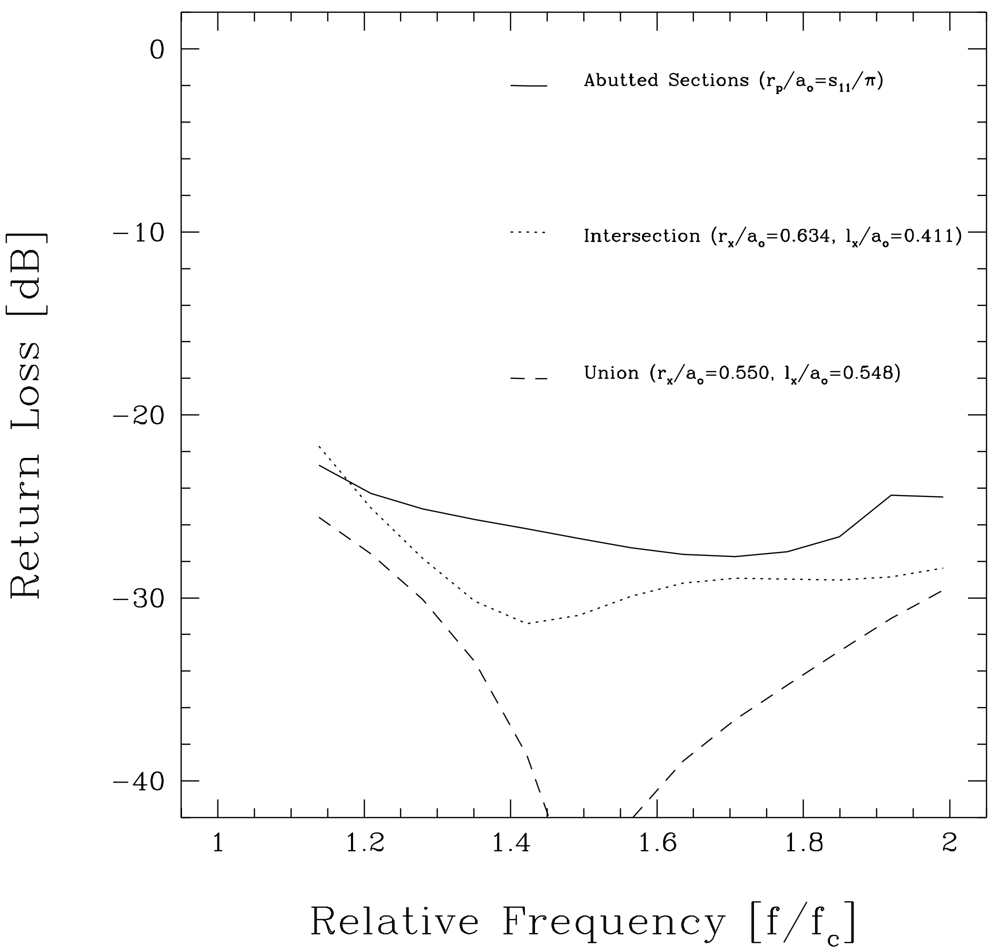

Figure 1. The modeled return loss for simple-stepped circular-to-square transducers. In all three structures, the radius and the guide broadwall are related by the Pyle condition, $r_{\mathrm{p}} = a_o s_{11}/\pi$. The curve labeled 'Intersection' is formed by the intersection of a rectangular and cylindrical 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 $\mathrm{TE}_{11}^{\square}$, $\mathrm{TM}_{11}^{\square}$, TM_{01}°, and TE_{21}°).