Abstracts

Coupling Holes Between Resonant Cavities or Wave-Guides Evaluated in Terms of Volume Ratios

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A hole in a common wall is used to provide coupling between two resonant cavities (k=coefficient of coupling) or between two waveguides (x or b=normalized reactance or susceptance) or between cavity and waveguide (p=loading power factor of cavity). Referring to either side of a thin common wall, the field intensity in the center of a small hole is ½ what it would have been at that location on the wall. Between two equal regions, the coupling (k, x or b) by magnetic or electric field is expressed as ¼ the ratio of the effective volume of the hole over the effective volume of each region, by duality (Booker's principle), the effective volume (related to the polarizability) of an aperture in a thin wall is identified with that of an analogous thin body in a uniform field. For a resonant cavity loaded by coupling to a waveguide, the loading power factor is p=kx; this theorem is proved by reference to an equivalent network. Various cases of coupling by two-dimensional and three-dimensional fields are formulated in terms of area or volume ratios, especially between pillbox resonators (rectangular, circular, or coaxial-circular) and between rectangular waveguides with common side walls or top and bottom walls. The effective area or volume of a small hole in a thin conducting wall is given for various symmetrical shapes, in a magnetic or electric field.

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