Abstracts

Radiation Losses of Planar Circuit Resonators and the R/Q Parameter (Short Papers)

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The resonator parameter R/Q, the ratio of a shunt resistance to the unloaded Q, which might be termed a "mode-geometry" parameter, is a natural parameter for characterizing oscillation modes of planar-circuit resonators which are open circuited at the edges. These resonators are often excited by connection at the edge to a microstrip transmission line, and the appropriate shunt resistance is the equivalent resistance at resonance at these terminals for that mode. Losses in planar-circuit resonators include the ohmic (skin-effect and dielectric) losses of enclosed resonators plus a radiation-loss component. For a variety of planar resonators, the ohmic losses are easily calculated, but the radiation-loss determination is a difficult boundary-value problem. More specifically, the determination of either the unloaded Q or the radiation component of the unloaded Q is often readily accessible only through measurement. The knowledge of the R/Q parameter allows one, in effect, to replace the Q measurement with a shunt-resistance measurement, which is often more expedient to perform. Two simple planar-resonator configurations, the circular disk, and the square plate are studied. The radiation component of the Q is evaluated by using the measured shunt resistance and the R/Q parameter to calculate the total unloaded Q and thence the radiation component of the unloaded Q. A comparison is made between these results and those obtained from direct Q measurements.

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