Abstracts

Microwave-Induced Auditory Effect in a Dielectric Sphere

N.K. Uzunoglu and S.I. Polychronopoulos. "Microwave-Induced Auditory Effect in a Dielectric Sphere." 1988 Transactions on Microwave Theory and Techniques 36.10 (Oct. 1988 [T-MTT]): 1418-1425.

The acoustic pressure wave generation inside an electromagnetically lossy dielectric sphere from an incident microwave pulse is analyzed rigorously. The pressure wave equation, derived by using the first-order approximation of a thorough formulation on microwave-induced thermoacoustic effect in dielectrics, is employed. The inhomogeneous hyperbolic type pressure wave differential equation is solved by employing a Green's function theory approach. The inhomogeneous term of this equation is proportional to the time derivative of the absorbed power (P) per unit volume inside the sphere. The boundary conditions on the dielectric sphere-air interface are taken into account. The power P is computed by applying the exact Mie theory solution for the dielectric sphere. Two types of acoustic waves are derived inside the sphere: a) a transient burst type pressure wave, corresponding to the free-space contribution of Green's function, and b) an infinite set of damped oscillations related to the normal acoustic modes of the spherical resonator. Numerical results are computed and presented for several cases.

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