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Time-Domain Analysis of Higher Order Mode Properties in an Open Cavity Retaining Axial Symmetry S. Y. LIN, Fairview High School, M. C. LIN, Hanyang University — Theoretical and computational research to accurately and efficiently determine higher order mode properties of an axially symmetrical open cavity has been pursued. Open cavities have been widely employed in gyrotrons for the generation of high-power millimeter, submillimeter, and THz waves. A standing wave forms in the main body of the cavity, and the open end allows the extraction of power generated by the electron beam wave interaction. On the other hand, microresonators, such as microspheres that have small effective volume of their whispering gallery modes (WGMs), high quality factors, and quasi insensitivity to conducting material boundaries can also be considered as open cavities since the WGMs are natural electromagnetic eigenmodes that are activated by external coherent signals. For these cavities, axial symmetry is usually retained. The CAVITY program developed by Professor K. R. Chu using Fortran allows the users to accurately and efficiently determine the resonant frequency, the quality factor, and the field profile for the TE modes of an open cavity. In this work, an extension of the CAVITY program using Mathematica, CAVITY-M, to perform time-domain analysis of higher order modes in open cavities retaining axial symmetry for wider applications such as those mentioned above has been carried out. The new CAVITY-M program developed using Mathematica is able to effectively analyze the higher order mode characteristics of a general open cavity with an axial symmetry, in addition to the traditional modes in a gyrotron cavity.

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