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Analytical Time Domain Analysis of an Acoustic Waveguide

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A new analytical time domain Normal Mode solution for one layer acoustic channel in two dimensional Cartesian coordinates is presented in this paper. The method is based on the separation of variables technique for the time domain wave equation. Dirichlet boundary condition is applied on the upper and lower boundaries of the channel. Klein-Gordon equation is obtained and solved by using the Green function. The fundamental advantage of this new technique is not necessary to use the Fourier Transformation to obtain time domain response of arbitrary acoustical source signal in the waveguide. In order to validate the obtained results, first of all, the Fast Fourier Transform is applied to the time domain analytical data, then, the comparisons are given between KRAKEN program and a new analytical time domain Normal Mode solution in the sense of Transmission Loss relating to ranges. The excellent agreement is obtained between the results.