

Resonance Phenomena for a Class of Partial Differential Equations of Higher Order in Cylindrical Waveguides

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Abstract.

We consider a domain Ω in \mathbb{R}^n of the form $\Omega = \mathbb{R}^l \times \Omega'$ with bounded $\Omega' \subset \mathbb{R}^{n-l}$. In Ω we study the Dirichlet initial and boundary value problem for the equation $\partial_t^2 u + [(-\partial_1^2 - \dots - \partial_l^2)^m + (-\partial_{l+1}^2 - \dots - \partial_n^2)^m] u = f e^{-i\omega t}$. We show that resonances can occur if $2m \geq l$. In particular, the amplitude of u may increase like t^α (α rational, $0 < \alpha < 1$) or like $\ln t$ as $t \rightarrow \infty$. Furthermore, we prove that the limiting amplitude principle holds in the remaining cases.

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