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Revisiting the limiting amplitude principle

The limiting amplitude principle is a well-known result connecting the solution of the Helmholtz equation with the long-time behavior of time-dependent wave equations with a periodic source term. We extend the classical formulation of the principle to treat the wave equation with non-constant coefficients. Motivated by numerical analysis of time-domain methods for the Helmholtz equation, we quantify the convergence of the time-dependent wave equation towards the stationary solution under appropriate assumptions. We also generalize the formulation of the limiting amplitude principle to the one-dimensional setting where the classical statement of the principle is generally violated. Our proof of the limiting amplitude principle (and its quantification) is due to reduction towards several results concerning temporal decay for wave equations with sufficiently localized initial data or a source term. The talk is based on recent results of a joint work with A. Arnold, S. Geever and I. Perugia.