
Waves over a periodic progressive modulation

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Abstract

Reciprocity is a principle of the if-you-can-hear-me-then-I-can-hear-you category that governs wave propagation in linear media. Reciprocity is robust as it holds in the presence of inhomogeneities or linear losses. However, it fails when the properties of the medium are modulated in function of time. Here, we report on some aspects of non-reciprocity in time-dependent media when the modulation is periodic and progressive. Such modulations create a bias whereby the waves traveling with and against the modulation do not behave in the same fashion. In some cases, waves will only be able to travel one way. We investigate how this bias manifests itself in the dispersion diagram as well as in the effective homogeneous behavior for low enough frequencies. We finally comment on some issues involving numerical simulations as well as on a number of experimental demonstrations.

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