

Negative diffraction pattern dynamics in nonlinear cavities with left-handed materials

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(Submitted on 2 Mar 2010 (v1), last revised 2 Mar 2010 (this version, v2))

We study a ring cavity filled with a slab of a right-handed material and a slab of a left-handed material. Both layers are assumed to be nonlinear Kerr media. First, we derive a model for the propagation of light in a left-handed material. By constructing a mean-field model, we show that the sign of diffraction can be made either positive or negative in this resonator, depending on the thicknesses of the layers. Subsequently, we demonstrate that the dynamical behavior of the modulation instability is strongly affected by the sign of the diffraction coefficient. Finally, we study the dissipative structures in this resonator and reveal the predominance of a two-dimensional up-switching process over the formation of spatially periodic structures, leading to the truncation of the homogeneous hysteresis cycle.

Comments: 8 pages, 5 figures

Subjects: **Pattern Formation and Solitons (nlin.PS)**; Optics (physics.optics)

Journal reference: Phys. Rev. A 74, 033822 (2006)

DOI: [10.1103/PhysRevA.74.033822](https://doi.org/10.1103/PhysRevA.74.033822)

Cite as: [arXiv:1003.0584v2](https://arxiv.org/abs/1003.0584v2) [nlin.PS]

Submission history

From: Philippe Tassin [[view email](#)]

[v1] Tue, 2 Mar 2010 20:25:46 GMT (332kb)

[v2] Tue, 2 Mar 2010 21:06:58 GMT (322kb)

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