

Abstract Submitted
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Backward-wave optical parametric amplification and mirrorless oscillations in negative-index materials¹ ALEXANDER POPOV, University of Wisconsin-Stevens Point, SERGEY MYSLIVETS, Institute of Physics of Russian Academy of Sciences, VLADIMIR SHALAEV, Purdue University — Extraordinary properties of mirrorless backward-wave OPO in nanostructured crystal have been recently demonstrated in [1]. Phase matching of backward waves is inherent to negative-index materials (NIMs). Extraordinary, distributed-feedback, properties of OPA and possibility of OPO in NIMs were predicted in [2,3]. Herewith, we show the feasibilities and explore the features of the mirrorless OPO and of the generation of counterpropagating left-handed signal and right-handed idler photons in NIMs. Two different options are investigated. One is OPO based on intrinsic quadratic nonlinearity of the NIM. Another option is four-wave mixing OPO based on separately engineered strong cubic nonlinearity through resonant nonlinear impurities. It is shown that in the latter case the OPO properties can be tailored by quantum control. [1] C. Canalias and V. Pasiskevicius, *Nat. Photonics* **1**, 459 (2007) [2] A. K. Popov and V. M. Shalaev, *Opt. Lett.* **31**, 2169 (2006). [3] A. K. Popov, S. A. Myslivets, T. F. George and V. M. Shalaev, *Opt. Lett.* **32**, 3044 (2007)

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