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**Optically controllable photonic structures with zero absorption**<sup>1</sup> CHRISTOPHER O'BRIEN, Texas A&M University and University of Kaiserslautern, OLGA KOCHAROVSKAYA, Texas A&M University — We show the possibility to periodically modulate the refractive index in a homogeneous resonant atomic medium in space or/and time while simultaneously maintaining vanishing absorption/gain.<sup>2</sup> Such modulation is based on periodic resonant enhancement of the refractive index via the matching of an effective absorption resonance to an effective gain resonance, controlled by external optical fields, and opens the way to produce coherently controllable photonic structures. We suggest the possible implementation of the proposed scheme in rare-earth doped crystals with excited state absorption. Providing a particular example of how the refractive index can be periodically changed along the optical axis of an Er3+:YAG crystal to optically produce in a homogenous media, a distributed Bragg reflector with a very high reflectivity and very narrow bandwidth.

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