

Abstract Submitted
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Optical-reciprocity-induced symmetry in photonic heterostructures and its manifestation in scattering \mathcal{PT} -symmetry breaking¹ LI GE, College of Staten Island/Graduate Center, CUNY, LIANG FENG, SUNY Buffalo — The scattering matrix S obeys the symmetry property $\mathcal{PT}S\mathcal{PT} = S^{-1}$ in a Parity-Time (\mathcal{PT}) symmetric system and the unitary relation $S^\dagger S = 1$ in the absence of gain and loss. Here we report a different symmetry relation of S in a one-dimensional heterostructure, which is given by the amplitude ratio of the incident waves in the scattering eigenstates. It originates from the optical reciprocity and holds independent of the presence of gain and loss in the system. Guided by this symmetry relation, we probe the reminiscence of the spontaneous symmetry breaking of a \mathcal{PT} -symmetric S matrix, when the system does not have exact \mathcal{PT} symmetry due to unbalanced gain and loss and even in the absence of gain. We show that the additional symmetry relation provides a clear evidence of a quasi-transition, even when all previously found signatures of the \mathcal{PT} symmetry breaking of S are completely erased.

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