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Anti-parity-time-symmetry optics in an atomic vapor PENG PENG, WANXIA CAO, Fudan Univ, JIANMING WEN, LIANG JIANG, Yale University, YANHONG XIAO, Fudan Univ — Recently, there has been growing interest to create optical systems with parity-time (PT) symmetry for manipulation of light. A new addition to this line of research is the study of anti-PT-symmetry optics. Unlike a PT symmetry system which requires balanced gain and loss and equal refractive index, the anti-PT symmetry system requires balanced positive and negative refractive index but with the same gain or loss. As in PT-symmetry systems, anti-PT symmetry systems can also display spontaneous phase transition. We have experimentally demonstrated an anti-PT symmetry optical system using a warm atomic vapor cell containing 87Rb. Coupling of two optical modes under Electromagnetically-induced-transparency (EIT) is realized by coherent diffusion of atomic coherence. Our theory predicts that, in a PT-symmetry system, coupling of the two optical channels would increase the gap between their initially separated EIT peaks, but in an anti-PT symmetry system, it would do the opposite. Especially, when the coupling is large enough, the gap vanishes, which indicates that the system is under phase transition. We will report experiment observation of these predictions.

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