Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Probing non-Hermitian physics with flying atoms JIANMING WEN, yale university, YANHONG XIAO, PENG PENG, WANXIA CAO, CE SHEN, WEIZHI QU, Fudan University, LIANG JIANG, Yale University — Non-Hermtian optical systems with parity-time (PT) symmetry provide new means for light manipulation and control. To date, most of experimental demonstrations on PT symmetry rely on advanced nanotechnologies and sophisticated fabrication techniques to manmade solid-state materials. Here, we report the first experimental realization of optical anti-PT symmetry [1], a counterpart of conventional PT symmetry [2], in a warm atomic-vapor cell. By exploiting rapid coherence transport via flying atoms, we observe essential features of anti-PT symmetry with an unprecedented precision on phase-transition threshold. Moreover, our system allows nonlocal interference of two spatially-separated fields as well as anti-PT assisted four-wave mixing. Besides, another intriguing feature offered by the system is refractionless (or unit-refraction) light propagation. Our results thus represent a significant advance in non-Hermitian physics by bridging a firm connection with the AMO field, where novel phenomena and applications in quantum and nonlinear optics aided by (anti-)PT symmetry can be anticipated. [1] P. Peng, W. Cao, C. Shen, W. Qu, J. Wen, L. Jiang, and Y. Xiao, arXiv: 1509.07736 (2015). [2] L. Chang, X. Jiang, S. Hua, C. Yang, J. Wen, L. Jiang, G. Li, G. Wang, and M. Xiao, Nature Photonics **8**, 524-529 (2014).

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Date submitted: 31 Jan 2016 Electronic form version 1.4