

Colloquium Series

Exploiting wave transport in classical and quantum open systems

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Abstract: Technological advancement, which have provided many new possibilities for better living for humankind, they also indicate that our needs have extended to new dimensions. This shift has encouraged us to find innovative approaches and utilize every possible degree of freedom to propose elegant mechanisms that bring us full control over wave transport in linear, and nonlinear classical and quantum system.

In this talk, I specifically focus on symmetries that require the system to be open or symmetries that can be implemented using asymmetric channels. The existence of such symmetries drives us to investigate non-Hermitian Hamiltonians. Non-Hermitian Hamiltonians are achievable by means of synthesizing wave-matter-interaction and can be implemented in non-Hermitian electronic, acoustic and optical systems. I will show how exploiting symmetries like parity and time symmetry and the resulting intrinsic topological properties of such symmetric systems reveal exquisite and unprecedented functionalities that are not observed in nature. Specifically, I will discuss the effects that have gotten the most attention in the field of non-Hermitian systems and significantly affect the growth of the field. In particular, I show how tailoring “meta-potentials” can lead to nonlinear-assisted asymmetric light propagation [1], unidirectional invisibility [2], unidirectional lasing [3], nonreciprocal localization of photons [4], tunable flat bands [5] and ultra-fast low-cost quantum state transfer [6].

[1] H. Ramezani, T. Kottos, R. El-Ganainy, D. Christodoulides, PRA, 82 (4), 043803 (2010), N. Shitrit, J. Kim, D. Barth, H. Ramezani, Y. Wang, X. Zhang, PRL, 121 (4), 046101(2018)

[2] Z. Lin, H. Ramezani, T. Eichelkraut, T. Kottos, H. Cao, D. Christodoulides, PRL 106 (21), 213901 (2011)

[3] H. Ramezani, H. K. Li, Y. Wang, X. Zhang, PRL 113 (26), 263905 (2014), H. Ramezani, S. Kalish, I. Vitebskiy, T. Kottos PRL, 112 (4), 043904 (2014)

[4] H. Ramezani, P. Jha, Y. Wang, X. Zhang, PRL, 120 (4), 043901(2018)

[5] H. Ramezani, 96 (1), 011802 (2017)

[6] F. Mostafavi, L. Yuan, H. Ramezani, PRL, 122, 050404 (2019)

About the speaker: Dr. Hamidreza Ramezani Hamidreza Ramezani is an assistant professor at the University of Texas Rio Grande Valley (UTRGV), Department of Physics and Astronomy. Before joining UTRGV, Dr. Ramezani was a postdoctoral research assistant at the University of California, Berkeley. He got his Ph.D. from Wesleyan University in 2013. Dr. Ramezani is the recipient of STAR award, Biruni award, and MSI travel award. He has more than 50 publications and gave numerous invited talks in international conferences. Dr. Ramezani is among the pioneers in the field of non-Hermitian optics, non-Hermitian photonics, and non-Hermitian acoustics and has several noticeable contributions in the topics, including the first proposal on isolation in nonlinear PT-symmetric systems (featured in Nature Physics News and Views), the first proposal on unidirectional invisibility using PT symmetry (selected as breakthrough in 2011 photonics by IEEE), and the first proposal on unidirectional lasing. His proposal on the unidirectional localization of photon has been selected as Editors’ Suggestion in Phys. Rev. Lett. in 2018 and has been featured in Inside Science by IOP.

Friday, March 1st, 2019

TIME:

4:00pm-5:00pm

PLACE:

Brownsville: BLHSB 1.312

and will streamed to Edinburg: ESCNE 1.603

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