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Title: A summary of some of our results on non-Hermitian quantum mechanics and PT-Symmetry in Optics.

Abstract: This talk will present a summary of a few our results on non-Hermitian quantum mechanics and PT-Symmetry in Optics. Additional results are available in the papers available here: <https://dml.riken.jp/pub/non-hermitian/> and also below, with the URLs of the respective works.

1. B. Peng, S.K. Ozdemir, W. Chen, F. Nori, L. Yang
What is and what is not electromagnetically induced transparency in whispering-gallery microcavities
Nature Communications **5**, 5082 (2014). [[PDF](#)][[Link](#)][[arXiv](#)]. The supplementary material is here [[PDF](#)][[Link](#)].
2. B. Peng, S.K. Ozdemir, S. Rotter, H. Yilmaz, M. Liertzer, F. Monifi, C. M. Bender, F. Nori, et al.
Loss-induced suppression and revival of lasing, Science **346**, 328-332 (2014). [[PDF](#)][[Link](#)][[arXiv](#)]
The supplementary material is here [[PDF](#)][[Link](#)]. "Perspective": Science 346, 304-305 (2014) [[PDF](#)][[Link](#)].
3. B. Peng, S.K. Ozdemir, F. Lei, F. Monifi, M. Gianfreda, G. L. Long, S. Fan, F. Nori, C. M. Bender, et al.
Parity-time-symmetric whispering-gallery microcavities, Nature Physics **10**, 394-398 (2014). [[PDF](#)][[Link](#)][[arXiv](#)]
The supplementary material is here [[PDF](#)][[Link](#)] Featured in a Nature Physics "News & Views" [[PDF](#)][[Link](#)]
4. H. Jing, S.K. Ozdemir, X.Y. Lu, J. Zhang, L. Yang, F. Nori, *PT-Symmetric Phonon Laser*
Phys. Rev. Lett. **113**, 053604 (2014). [[PDF](#)][[Link](#)][[arXiv](#)]. The supplementary material is here [[PDF](#)][[Link](#)]
5. H. Jing, S.K. Ozdemir, Z. Geng, J. Zhang, X.Y. Lu, B. Peng, L. Yang, F. Nori
Optomechanically-Induced Transparency in parity-time-symmetric microresonators
Scientific Reports **5**, 9663 (2015). [[PDF](#)][[Link](#)][[arXiv](#)]
6. J. Zhang, B. Peng, S.K. Ozdemir, Y.X. Liu, H. Jing, X.Y. Lu, Y.L. Liu, L. Yang, F. Nori
Giant nonlinearity via breaking parity-time symmetry: A route to low-threshold phonon diodes
Phys. Rev. B **92**, 115407 (2015). [[PDF](#)][[Link](#)][[arXiv](#)]
7. T. Gao, E. Estrecho, K.Y. Bliokh, T.C.H. Liew, M.D. Fraser, S. Brodbeck, M. Kamp, C. Schneider, S. Höfling, Y. Yamamoto, F. Nori, Y.S. Kivshar, A. Truscott, R. Dall, E.A. Ostrovskaya, *Observation of non-Hermitian degeneracies in a chaotic exciton-polariton billiard*, Nature **526**, 15522 (2015). [[PDF](#)][[Link](#)][[arXiv](#)]
8. F. Monifi, J. Zhang, S.K. Ozdemir, B. Peng, Y.X. Liu, F. Bo, F. Nori, et al., *Optomechanically induced stochastic resonance and chaos transfer between optical fields*, Nature Photonics **10**, 399–405 (2016). [[PDF](#)][[Link](#)][[Suppl. Info.](#)] Nature Photonics Cover [[PNG](#)]. "News and Views": Nature Photonics **10**, 366–368 (2016). [[PDF](#)][[Link](#)]
9. Z.P. Liu, J. Zhang, S.K. Ozdemir, B. Peng, H. Jing, X.Y. Lu, C.W. Li, L. Yang, F. Nori, Y.X. Liu
Metrology with PT-Symmetric Cavities: Enhanced Sensitivity near the PT-Phase Transition
Phys. Rev. Lett. **117**, 110802 (2016). [[PDF](#)][[Link](#)][[arXiv](#)][[Suppl. Info.](#)]
10. M. Asano, K.Y. Bliokh, et al., S.K. Ozdemir, F. Nori
Anomalous time delays and quantum weak measurements in optical micro-resonators
Nature Communications **7**, 13488 (2016). [[PDF](#)][[Link](#)][[arXiv](#)][[Suppl. Info.](#)][[Reviewers' Comments](#)]
11. D. Leykam, K.Y. Bliokh, C. Huang, Y.D. Chong, F. Nori
Edge Modes, Degeneracies, and Topological Numbers in Non-Hermitian Systems
Phys. Rev. Lett. **118**, 040401 (2017). [[PDF](#)][[Link](#)][[arXiv](#)][[Suppl. Info.](#)]
12. Y.L. Liu, R. Wu, J. Zhang, S.K. Ozdemir, L. Yang, F. Nori, Y.X. Liu
Controllable optical response by modifying the gain and loss of a mechanical resonator and cavity mode in an optomechanical system, Phys. Rev. A **95**, 013843 (2017). [[PDF](#)][[Link](#)][[arXiv](#)]

13. H. Jing, S.K. Ozdemir, H. Lu, F. Nori, *High-order exceptional points in optomechanics*, Scientific Reports **7**, 3386 (2017).
14. H. Lu, S.K. Ozdemir, L.M. Kuang, F. Nori, H. Jing, *Exceptional Points in Random-Defect Phonon Lasers*, Phys. Rev. Applied **8**, 044020 (2017). [[PDF](#)][[Link](#)][[arXiv](#)]
15. F. Quijandría, U. Naether, S.K. Ozdemir, F. Nori, D. Zueco, *PT-symmetric circuit QED*, Phys. Rev. A **97**, 053846 (2018). [[PDF](#)][[Link](#)][[arXiv](#)]. *Featured in Physics, Editors' Suggestion*
16. J. Zhang, B. Peng, S.K. Ozdemir, K. Pichler, D.O. Krimer, G. Zhao, F. Nori, Y.X. Liu, S. Rotter, et al., *A phonon laser operating at an exceptional point*, Nature Photonics **12**, pp. 479–484 (2018). [[PDF](#)][[Link](#)][[Suppl. Info.](#)]
17. K.Y. Bliokh, D. Leykam, M. Lein, F. Nori, *Topological non-Hermitian origin of surface Maxwell waves* Nature Communications **10**, 580 (2019). [[PDF](#)][[Link_1](#)][[Link_2](#)][[arXiv](#)][[Suppl. Info.](#)]
18. T. Liu, Y.R. Zhang, Q. Ai, Z. Gong, K. Kawabata, M. Ueda, F. Nori *Second-Order Topological Phases in Non-Hermitian Systems* Phys. Rev. Lett. **122**, 076801 (2019). [[PDF](#)][[Link](#)][[arXiv](#)][[Suppl. Info.](#)]
19. S.K. Ozdemir, S. Rotter, F. Nori, L. Yang, *Parity–time symmetry and exceptional points in photonics*, Nature Materials **18**, pp. 783–798 (2019). [[PDF](#)][[Link_1](#)][[Link_2](#)]
20. I.I. Arkhipov, A. Miranowicz, O. Di Stefano, R. Stassi, S. Savasta, F. Nori, S.K. Ozdemir *Scully-Lamb quantum laser model for parity-time-symmetric whispering-gallery microcavities: Gain and nonreciprocity* Phys. Rev. A **99**, 053806 (2019). [[PDF](#)][[Link](#)][[arXiv](#)]
21. Z.Y. Ge, Y.R. Zhang, T. Liu, S.W. Li, H. Fan, F. Nori *Topological band theory for non-Hermitian systems from the Dirac equation* Phys. Rev. B **100**, 054105 (2019). [[PDF](#)][[Link](#)][[arXiv](#)]
22. C.Y. Ju, A. Miranowicz, G.Y. Chen, F. Nori *Non-Hermitian Hamiltonians and no-go theorems in quantum information*, Phys. Rev. A **100**, 062118 (2019). [[PDF](#)][[Link](#)][[arXiv](#)]
23. F. Minganti, A. Miranowicz, R.W. Chhajlany, F. Nori *Quantum exceptional points of non-Hermitian Hamiltonians and Liouvillians: The effects of quantum jumps* Phys. Rev. A **100**, 062131 (2019). [[PDF](#)][[Link](#)][[arXiv](#)]
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25. D. Huybrechts, F. Minganti, F. Nori, M. Wouters, N. Shammah *Validity of MF theory in a dissipative critical system: PT-symmetric antigap, and permutational symmetry in the XYZ model*, Phys. Rev. B **101**, 214302 (2020). [[PDF](#)][[Link](#)][[arXiv](#)]
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27. I.I. Arkhipov, A. Miranowicz, F. Minganti, F. Nori *Liouvillian exceptional points of any order in dissipative linear bosonic systems: Coherence functions and switching between PT and anti-PT symmetries*, Phys. Rev. A **102**, 033715 (2020). [[PDF](#)][[Link](#)][[arXiv](#)]
28. T. Liu, J.J. He, T. Yoshida, Z.L. Xiang, F. Nori *Non-Hermitian topological Mott insulators in one-dimensional fermionic superlattices* Phys. Rev. B **102**, 235151 (2020). [[PDF](#)][[Link](#)][[arXiv](#)]. *Editors' Suggestion*