Optomechanically induced stochastic resonance and chaos transfer between optical fields

Objective

To study optomechanically induced stochastic resonance and chaos transfer between optical fields.

Summary of Research Activities

- Chaos involves hypersensitivity to the initial conditions of a system and introduces unpredictability into its output. Thus, it is often unwanted. Interestingly, the very same features make chaos a powerful tool to suppress decoherence, achieve secure communication and replace background noise in stochastic resonance—a counterintuitive concept that a system's ability to transfer information can be coherently amplified by adding noise.

- We reported the first demonstration of chaos-induced stochastic resonance in an opto-mechanical system, and the opto-mechanically mediated chaos transfer between two optical fields such that they follow the same route to chaos.

- These results will contribute to the understanding of nonlinear phenomena and chaos in opto-mechanical systems, and may find applications in the chaotic transfer of information and for improving the detection of otherwise undetectable signals in opto-mechanical systems.

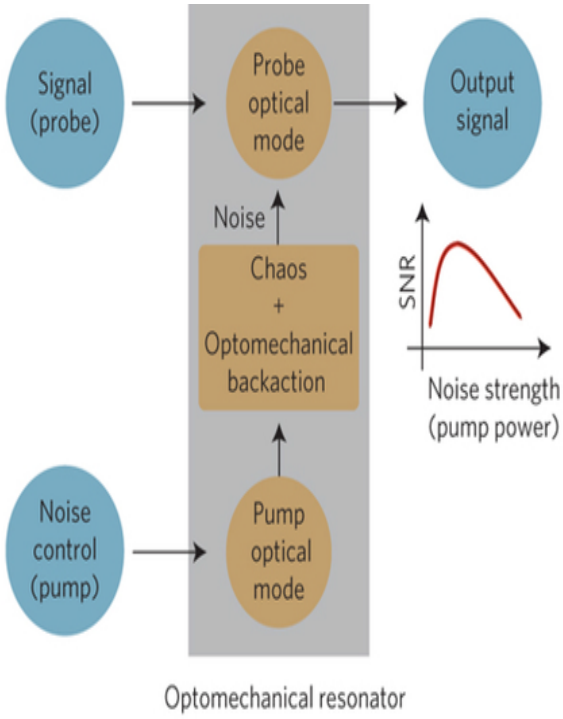

Fig. 1 Optomechanically-induced stochastic resonance and chaos transfer between optical fields.

Publications

F. Monifi, J. Zhang, Ş.K. Özdemir, B. Peng, Y.X. Liu, F. Bo, F. Nori, L. Yang,
Optomechanically induced stochastic resonance and chaos transfer between optical fields
Nature Photonics **10**, 399–405 (2016). Nature Photonics Cover. Featured in a "News and Views": Optomechanics: Vibrations copying optical chaos, Nature Photonics **10**, 366–368 (2016).