

PCS NEWSLETTER

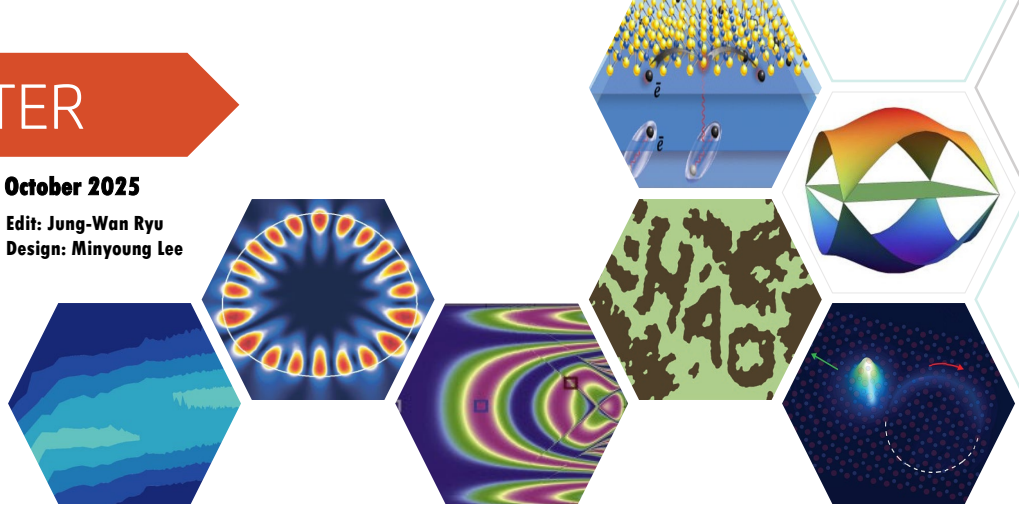


QR to PCS Webpage

October 2025

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Design: Minyoung Lee



PCS Workshops and Meetings

PCS will co-host [the Workshop Novel Perspectives in Non-Hermitian Physics: From Condensed Matter to Optical and Beyond](#) on October 29 – 31, 2025

PCS IBS Seminars

[“Dual holography from a non-perturbative generalization of the Wilsonian RG framework”](#)

by Ki Seok Kim, POSTECH, Korea (September 11), IBS Physics Colloquium @ Daejeon

[“Nanomechanical cat-states in NEM-based quantum signal processing”](#)

by Danko Radić, University of Zagreb, Croatia (September 23)

[“Exceptional Physics in topological systems”](#)

by Debashree Chowdhury, Centre for Nanotechnology, India (September 25)

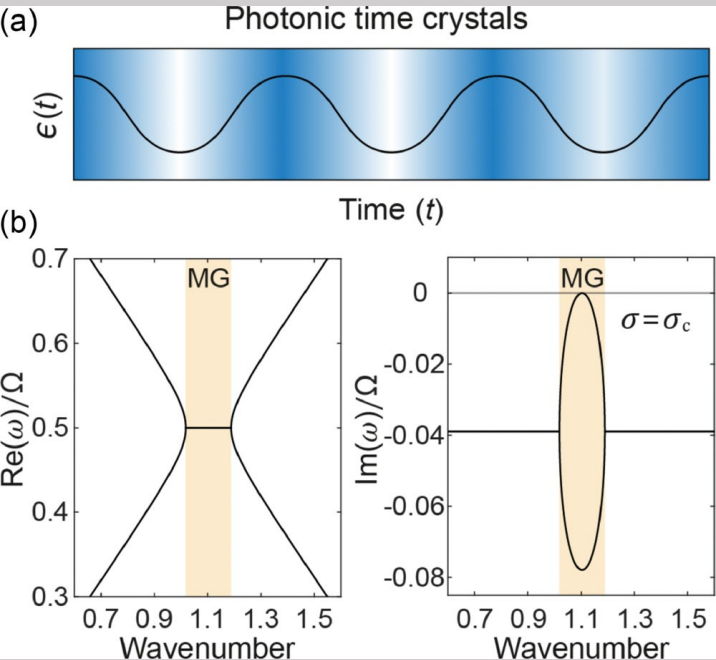
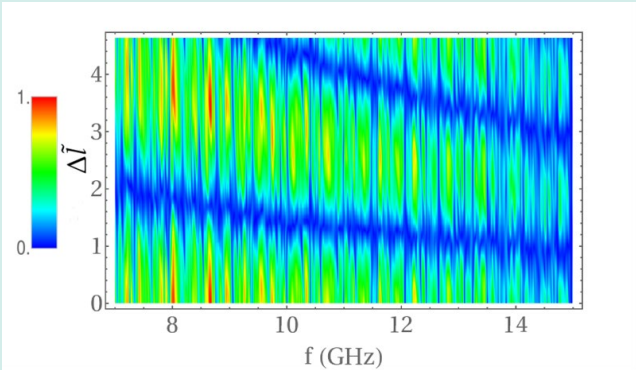
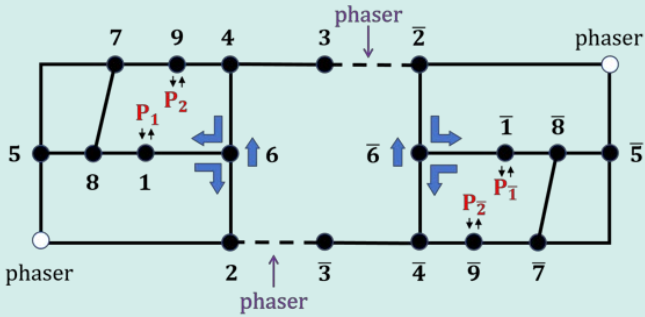
One can find more seminars on [this page](#).

Experimental study of the distributions of off-diagonal scattering-matrix elements of quantum graphs with symplectic symmetry

Jiongning Che, Nils Gluth, Simon Köhnes, Thomas Guhr, and Barbara Dietz

[Phys. Rev. E 112, 034208 \(2025\)](#)

The authors report on experimental studies of the distribution of the off-diagonal elements of the scattering (S) matrix of open microwave networks with symplectic symmetry and chaotic wave dynamics. These consist of two geometrically identical subgraphs with unitary symmetry described by complex conjugate Hamiltonians that are coupled by a pair of bonds. The results are compared to random-matrix theory (RMT) predictions obtained on the basis of the Heidelberg approach for the S matrix of open quantum-chaotic systems, employing random matrices from the Gaussian symplectic ensemble. It is demonstrated that deviations observed in the distributions of the off-diagonal S-matrix elements may be attributed to the fact that the subgraphs are not fully connected, and a RMT model is proposed, which takes this into account and indeed confirms the experimental results.



Spontaneous Emission Decay and Excitation in Photonic Time Crystals

Jagang Park, Kyungmin Lee, Ruo-Yang Zhang, Hee-Chul Park, Jung-Wan Ryu, Gil Young Cho, Min Yeul Lee, Zhaoqing Zhang, Namkyoo Park

[Phys. Rev. Lett. 135, 133801 \(2025\)](#)

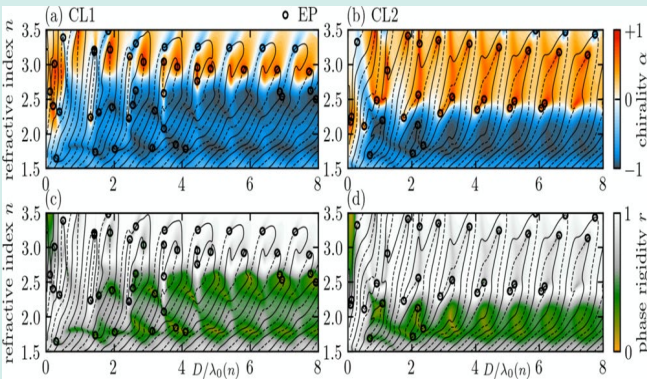
Over the last few decades, the predominant strategies for controlling spontaneous emission have involved tailoring the spatial surroundings of quantum emitters or atoms to create resonant or spatially periodic photonic structures. However, the rise of time-varying photonics has prompted a reevaluation of spontaneous emission in dynamically changing environments, especially within photonic time crystals, where optical properties undergo time-periodic modulation. The authors apply classical light-matter interaction theory together with Floquet analysis to reveal a substantial enhancement of the spontaneous emission decay rate at the momentum gap frequency in photonic time crystals. Moreover, the findings suggest that photonic time crystals enable a nonequilibrium light-matter interaction process: the spontaneous excitation of an atom from its ground state to an excited state, accompanied by the concurrent emission of a photon, referred to as spontaneous emission excitation.

Robust exceptional point chains and chirality switch in a vast optical parameter space

Chang-Hwan Yi, Jung-Wan Ryu, Tom Simon Rodemund, and Martina Hentschel

[Phys. Rev. A 112, L031501 \(2025\)](#)

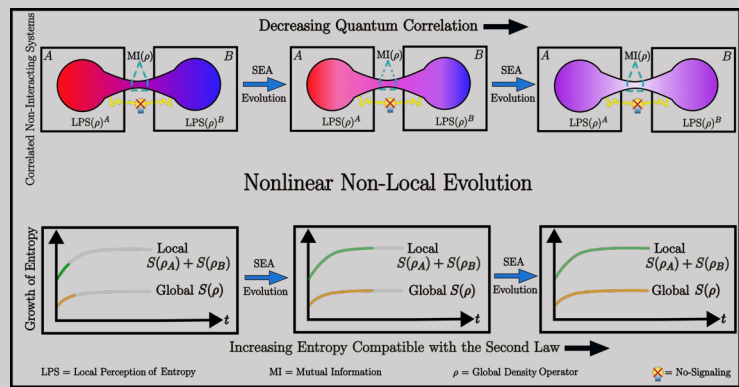
While the special properties of exceptional points (EPs) may improve application relevant features such as hypersensing, often their realization requires a precise fine-tuning of parameters. The authors report the robust formation of EP chains in coupled optical microcavities over intercavity distances D on the order of the cavity size. They find that coupling, or more generally, the availability of an outer (coupling) channel, is sufficient to induce EPs in the parameter space spanned by the refractive index n along with D . This occurs even at D of several wavelengths, yielding a network of EPs in parameter space with a periodicity of the order of the wavelength in the D direction. Upon the increase of n , the authors observe a sharp transition in the sign of the chirality measured in one of the cavities that further structures the system properties.



No-Signaling in Steepest Entropy Ascent: A Nonlinear, Non-Local, Non-Equilibrium Quantum Dynamics of Composite Systems Strongly Compatible with the Second Law

Rohit Kishan Ray and Gian Paolo Beretta

[Entropy, 27\(10\), 1018 \(2025\)](#)



Usually nonlinear theories of quantum evolution (different from GP equation type nonlinearity) can support faster than light communication, or can be used to establish a telephone line between two branches of the wavefunction, or solve NP Hard problems in polynomial time (and many other exotic phenomena). On the other hand, SEA is a theory that tries to combine quantum mechanics and thermodynamics into a single framework that is useful in studying dissipation and open system dynamics but is nonlinear by design. It becomes important therefore, to show that SEA does not contain these exotic non-physical possibilities in its formalism. In this work, the authors prove that SEA is safe from these effects.

Puzzle of the Month

September puzzle solution: T/N!

The correct solution was sent in by Mohamad Mirzakhani and Victor Kagalovsky. Congratulations!

Puzzle of the month:

$$8809 = 6$$

$$7111 = 0$$

$$6666 = 4$$

$$7652 = 1$$

$$3368 = 3$$

$$9313 = 1$$

$$1008 = 4$$

$$9887 = 5$$

$$1155 = 0$$

$$2021 = ?$$

Send your solution to myleel@ibs.re.kr

The winner will be announced in the next issue.