PCS NEWSLETTER

QR to PCS Webpage

November 2025
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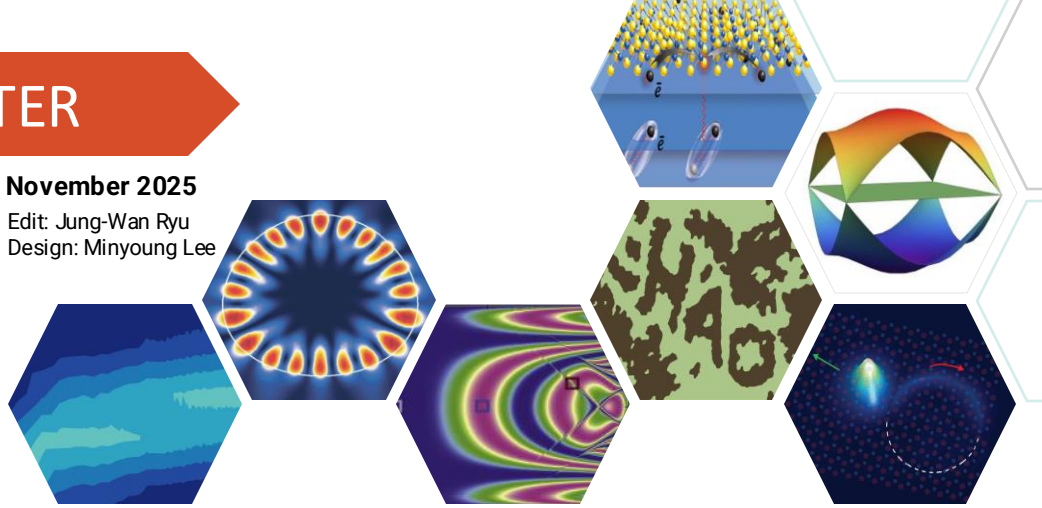
Design: Minyoung Lee



PCS Workshops and Meetings

PCS will co-host the Asian Network School and Workshop on Complex Condensed Matter Systems on November 10 – 14, 2025

PCS IBS Seminars

"Non-Abelian Thouless pumping in lattices" by Carlo Danieli, Sapienza University of Rome, Italy (October 21)

"Scaling Theory of the Anderson Localization Revisited" by Boris Altshuler, Columbia University, USA (October 28)

"Quo Vadis European Particle Physics?" by Tadeusz Lesiak, Institute of Nuclear Physics PAN, Poland (October 31), IBS Physics Colloquium @ Daejeon

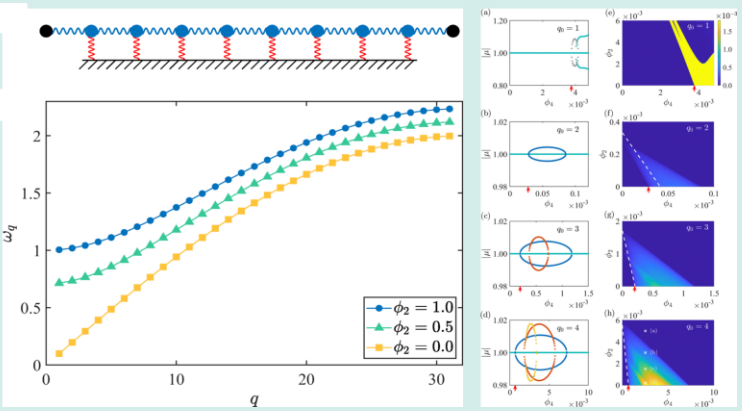
One can find more seminars on this page.

New Research Results

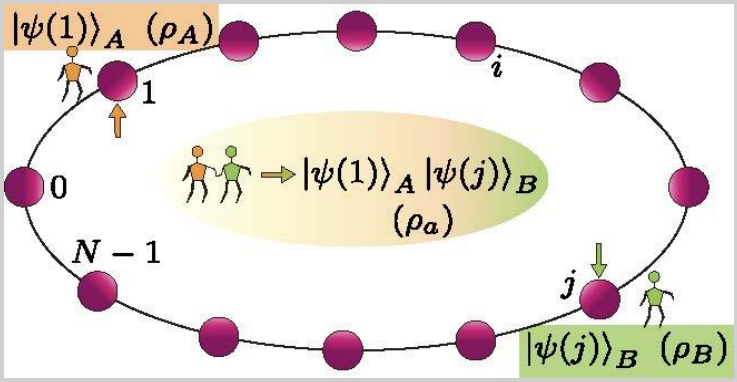
Impact of on-site potentials on q breathers in nonlinear chains

Lin Deng, Chengguan Fang, Hang Yu, Yisen Wang, Zhigang Zhu, Weicheng Fu, Sergej Flach and Liang Huang

Phys. Rev. E 112, 044202 (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.



Dissipation in fermionic two-body continuous-time quantum walk under the steepest entropy ascent formalism

Rohit Kishan Ray, R. Srikanth, and Sonjoy Majumder

Phys. Rev. E 112, 044120 (2025)

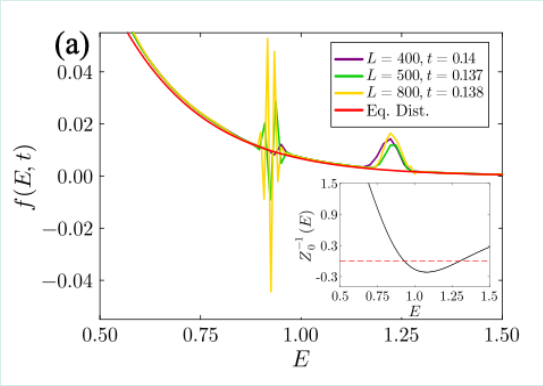
The authors study dissipative two-body continuous-time quantum work for fermionic system using steepest entropy ascent (SEA) type dissipation. They have studied Hubbard and extended Hubbard type interactions on a 1D tight-binding lattice with periodic boundary conditions. They show how the average thermalization (defined by the saturation of mutual information) can depend on interaction strength and interaction type. Using lack of Markovian approximation in SEA formalism, the authors produce the smearing of probabilities, and enhance the mean-squared displacement of the walk under various interaction regimes (four considered in total).

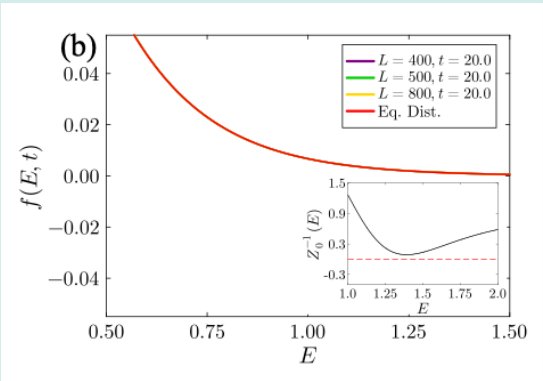
Instability of Metals with Respect to Strong Electron-Phonon Interaction

Emil A. Yuzbashyan, Boris L. Altshuler, and Aniket Patra

Phys. Rev. Lett. 135, 026503 (2025)

Hydrogen has long been a candidate for high-Tc superconductivity: metallic hydrogen was predicted under extreme pressure, and hydrogen-rich hydrides have realized very high Tc at megabar scales. Within the phonon-mediated framework, Migdal-Eliashberg theory allows Tc to rise with increasing electron-phonon coupling λ, but it does not set an intrinsic upper bound. Their analysis identifies a kinetic instability that emerges when λ is pushed too far: perturbations no longer relax, the quasiparticle weight becomes negative over an energy window, and the electronic specific heat may change sign. This provides a practical ceiling on the physical coupling λ -- and hence on Tc -- which can still lie above room temperature under high pressure but remains finite. The result clarifies recent hydride observations and delineates realistic targets for future materials.





Puzzle of the Month

October puzzle solution: 1 (the number of circles or loops (or their slight deformations) in the left hand part).

The correct solutions was sent in by Jayendra N Bandyopadhyay, Oleg Utesov and Mohammad Mirzakhani. Congratulations!

Puzzle of the month:

Find the smallest natural number written in decimal representation such that the digits are either 1 or 0 (e.g. 1100110) which is divisible by 36.

Send your solution to mylee1@ibs.re.kr
The winner will be announced in the next issue.