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Degeneracy and Defectiveness in Non-Hermitian Systems with Open Boundary

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Abstract : We study the band degeneracy, defectiveness, as well as exceptional points of non-Hermitian systems and materials analytically. We elaborate on the energy bands, the band degeneracy, and the defectiveness of eigenstates under open boundary conditions based on developing a general theory of one-dimensional (1D) non-Hermitian systems. We research the presence of the exceptional points in a generalized non-Hermitian Su-Schrieffer-Heeger model under open boundary conditions. Beyond our general theory, there exist infernal points in 1D non-Hermitian systems, where the energy spectra under open boundary conditions converge on some discrete energy values. We study two 1D non-Hermitian models with the existence of infernal points. We generalize the infernal points to the infernal knots in four-dimensional non-Hermitian systems.

Keywords : non-hermitian, degeneracy, defectiveness, exceptional points, infernal points
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