

Mathematical Physics

Resolutions of Identity for Some Non-Hermitian Hamiltonians. I. Exceptional Point in Continuous Spectrum

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Resolutions of identity for certain non-Hermitian Hamiltonians constructed from biorthogonal sets of their eigen- and associated functions are given for the spectral problem defined on entire axis. Non-Hermitian Hamiltonians under consideration possess the continuous spectrum and the following peculiarities are investigated: (1) the case when there is an exceptional point of arbitrary multiplicity situated on a boundary of continuous spectrum; (2) the case when there is an exceptional point situated inside of continuous spectrum. The reductions of the derived resolutions of identity under narrowing of the classes of employed test functions are revealed. It is shown that in the case (1) some of associated functions included into the resolution of identity are normalizable and some of them may be not and in the case (2) the bounded associated function corresponding to the exceptional point does not belong to the physical state space. Spectral properties of a SUSY partner Hamiltonian for the Hamiltonian with an exceptional point are examined.

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