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Reviewer: Znojil, Miloslav

Reviewer number: 13388

Address:
NPI Rez,
250 68 Czech Republic
znojil@ujf.cas.cz

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Review text:

This paper (the sixth continuation of the series [1] - [5]) is a certain final step of development motivated, i.a., by C. M. Bender and A. V. Turbiner (Phys. Lett. A 173 (1993) 442) who noticed that an analytic potential V(r) may give different binding energies depending on the choice of the Schroedinger integration contours in the complex plane of the coordinate r. Five years later, C. M. Bender and S. Boettcher (Phys. Rev. Lett. 24 (1998) 5243) narrowed this freedom by the postulate of the so called PT symmetry of the "admissible" contours which guarantees the (phenomenologically desirable) reality of spectra in many non-Hermitian models. In the year 2000, A. V. Turbiner conjectured, in private, that there should exist an equivalence mapping between each PT symmetric Hamiltonian H and another, standard and Hermitian, H'. I disagreed, knowing that only the PT symmetric models seem capable to admit the so called unavoided level crossings in one dimension (M. Znojil, Phys. Lett. A 259 (1999) 220). Nevertheless, during my visit to Turkey in 2001, the Turbiner's hypothesis was also supported by A. Mostafazadeh who, later, confirmed the existence of the Hermitian "partners" H' in papers [1] - [5] where he assumed that the PT symmetric Hamiltonians H (or rather all the pseudo-Hermitian Hamiltonians as their most elementary and natural generalizations which may only possess energies real or in complex conjugate pairs) were diagonalizable. This forced me to repeat my visit to Turkey and re-open the discussions with A. Mostafazadeh in 2002. Our continuing debate inspired and contributed to his present study where he finally accepted the necessity of working with the weaker block-diagonalizability assumption. In the light of his present, innovated Theorems accompanied by a two-by-two matrix illustration and by an elementary realistic solvable Wheeler-de Witt PDE model, his final conclusion is acceptable for me at last: Due to the admitted presence of the so called Jordan blocks, the partner H' may only be "Hermitian" with respect to a semi-definite inner product.