This is a review text file submitted electronically to MR.

Reviewer: Znojil, Miloslav

Reviewer number:

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

Author: Giri, Pulak Ranjan

Short title: Lower bound of minimal time evolution in quantum mechanics.

MR Number: 2442889

Primary classification: 81S99

Secondary classification(s): 46C50 47B50 81Q10 81P15 81V80

Review text:

Just another straightforward textbook-based critique of the thought-provoking ref. [37] ("Faster than Hermitian Quantum Mechanics", arXiv:quant-ph/0609032), the message of which has already been shown misleading in ref. [46] (arXiv:0706.3844) or, slightly later, by Geyer, Heiss and Scholtz in Can. J. Phys. 86 (2008) 1195-1201, arXiv:0710.5593. And just another confirmation that within the framework of the textbook quantum mechanics of stable systems it is clearly impossible to achieve faster than unitary evolution using PT-symmetric or other non-Hermitian Hamiltonians.

Still, all this does not mean that the case of the "Faster than Hermitian Quantum Mechanics" is lost. On a purely experimental level, a PT-symmetric setup has very recently been proposed within the realm of optics. Makris et al, Phys. Rev. Lett. 100, 103904 (2008), Musslimani et al, Phys. Rev. Lett. 100, 030402 (2008), El-Ganainy et al, Opt. Lett. 32, 20637 (2007) combined an even optical index with an odd gain/loss profile and revealed the existence of phenomena like double refraction, non-reciprocity, power oscillations and band merging. In a topical dedicated international conference in India (in January 2009, cf. http://gemma.ujf.cas.cz/the first observation of the typically nonhermitian exceptional-point related passive phase transition has also been announced by the same authors. In parallel, Frydryszak et al. (Phys. Rev. A 77, 014103 (2008)) considered a spin-1 system in a magnetic field in similar context.

Apparently, an ultimate reconciliation of the theory with experiment has been achieved by Guenther and Samsonov who clarified that many manifestly non-hermitian PT-symmetric Hamiltonians can be interpreted as representing a subsystem of a standard quantum system. This has been published in Phys. Rev.

Lett. 101, 230404 (2008), arXiv:0807.3643 (and, partially, also in Phys. Rev. A 78, 042115 (2008), arXiv:0709.0483) and reported in another international conference in Spain (in July 2008, cf. http://gemma.ujf.cas.cz/This opened a way towards another direct experimental implementation of the theory describing an ultra-fast brachistochrone regime of an entangled two-spin system. Still, even the latter synthesis evoked certain critical comments (cf. arXiv:0709.1756) arguing, e.g., that the the underlying quantum theory suffers from a dynamical inconsistency and that the whole argument is by no means sufficient for abandoning the standard theory of measurement and/or for its various ad hoc generalizations.