

# On the pseudo-Hermitian invariant method for the time-dependent Non-Hermitian Hamiltonians

Boubekeur Khantoul<sup>1</sup>, Abdelhafid Bounames<sup>1</sup>, Mustapha Maamache<sup>2</sup>

*Department of Physics, University of Jijel, Algeria.*<sup>1</sup>,

*Department of Physics, University of Setif 1, Algeria.*<sup>2</sup>

a.bounames@gmail.com<sup>1</sup>, bounames@univ-jijel.dz<sup>1</sup>

A consistent pseudo-Hermitian invariant operator theory of quantum mechanics can be built on a complex time-dependent non-Hermitian Hamiltonian. We use the pseudo-Hermitian invariant operator in order to study the general time-dependent problems in non-Hermitian quantum mechanics, e.g., those with a time-dependent non Hermitian Hamiltonian and with a time-dependent metric. The pseudo-Hermitian invariant has positive real eigenvalues and implies that the dynamics is governed by unitary time evolution. As a consequence, the phase associated with the non-Hermitian evolution is real. This work is not in contradiction with conventional pseudo quantum mechanics studied recently but is rather a complex generalization of it. The harmonic oscillator with a time-dependent frequency under the action of a complex time-dependent linear potential is considered as an illustrative example.