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GENERALIZED WEYL QUANTIZATION AND TIME

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Abstract. This work presents quantization of time of arrival functions using generalized Stratonovich-Weyl quantization. We take into account the ordering problems involved, mainly the Born-Jordan and the symmetric ordering schemes. We call attention to the combination of the group theoretic methods usually employed in Weyl quantization with the implementation of different ordering schemes via integral kernel factors. It is possible to, and we do, apply the Pegg-Barnett method to the quantization of time to address physical issues such as boundedness and self-adjointness.

MSC: 81S30, 20E35, 22E70
Keywords: Born-Jordan ordering, phase space, symmetric ordering

1. Introduction

The Weyl quantization rule or Weyl transform is easy to comprehend because of its simplicity, as it is simply the operator version of the (symplectic) Fourier inversion formula. It has very important covariance properties, corresponding to the canonical transformations in classical mechanics. It is also intimately related to the Wigner transform, which is an important object of the phase space representation of quantum mechanics, mainly, but not restricted to, classical like computation of quantum expectation values and transition probabilities [13]. The composition of two Weyl transform leads to the so-called star-product of phase space functions, allowing for an autonomous formulation of quantum mechanics in phase space, that is, quantum mechanics without operators. This has led to the vast topic of deformation quantization which has been extremely useful in solving deep mathematical problems [2, 7, 13]. However, it has been pointed out in [6] that an inconsistency