Quantum Localisation on the Circle

Rodrigo Fresneda

CMCC/UFABC, São Paulo, Brasil
E-mail: rodrigo.fresneda@ufabc.edu.br

ABSTRACT

Covariant integral quantisation using coherent states for semi-direct product groups is implemented for the motion of a particle on the circle. In this case the phase space is the cylinder, which is viewed as a left coset of the Euclidean group $E(2)$. Coherent states issued from fiducial vectors are labelled by points in the cylinder and depend also on extra parameters. We carry out the corresponding quantisations of the basic classical observables, particularly the angular momentum, and the 2π-periodic discontinuous angle function. We compute their corresponding lower symbols. The quantum localisation on the circle is examined through the properties of the angle operator yielded by our procedure, its spectrum and lower symbol, its commutator with the quantum angular momentum, and the resulting Heisenberg inequality. Comparison with other approaches to the long-standing question of the quantum angle is discussed.