

S. Gudder: Real-valued observables and quantum uncertainty

Referee report

The paper reviews a generalization of the Robertson-Schrödinger uncertainty principle for mixed states, obtained from a definition of correlation of self-adjoint operators with respect to a state as an inner product. The uncertainty principle is then applied to real valued observables and real valued coarse grainings, using their stochastic operators and sharp versions. Other concepts are also studied in this setting, such as (in)compatibility of observables, conjugate observables, as well as a sequential product and conditioning defined via an instrument measuring one of the observables. The results are illustrated in a number of examples.

Some small remarks:

1. page 5, displayed equation just above Lemma 2.3: in the second expression, Δ_ρ should be D_ρ
2. page 6, a typo in Eq.(2.5)
3. page 8, last paragraph – page 9, line 9: Ω_a should be Ω_A (three times)
4. page 9, definition of $\hat{A} = \{P_i : i = 1, 2, \dots, n\}$ here an information on λ_i is missing. To keep with the previous notations, one should have $\Omega_{\hat{A}} = \{\lambda_i : i = 1, 2, \dots, n\}$ and $\hat{A} = \{P_{\lambda_i} = P_i : i = 1, 2, \dots, n\}$.