Priyabrata Bag, Azad Rohilla, Harsh Trivedi: Quantum U-channels on S-space

Referee report

An S-space is a Hilbert space equipped with a sesquilinear form given by a unitary operator U. Positivity of operators with respect to this form is called U-positivity. This paper studies related notions of positive, completely positive maps and channels, and proves some representations and properties similar to those of usual channels.

Overall evaluation

No motivation for studying the topic of the paper is given. The authors list some previous works, but no applications of the U-channels to quantum information or elsewhere are described. Moreover, the U-channels (U-states, U-CP maps, etc..) have an obvious relation to the usual quantum channels (states, CP-maps, etc...), and all the results can be straightforwardly obtained from the well known results by this relation. I do not see any "added value" in this paper, so I cannot recommend its publication.

A further remark: According to Def. 5.1, a (U_A, U_B)-channel ψ is (U_A, U_B)-CP and trace preserving. But this is not in agreement with the rest of the paper, where it is actually assumed that the related map $\phi(X) = U_B^* \psi(U_A X)$ is a channel (CP and trace preserving). This is a quite different condition.