Secure tripartite quantum state sharing in the continuous-variable domain

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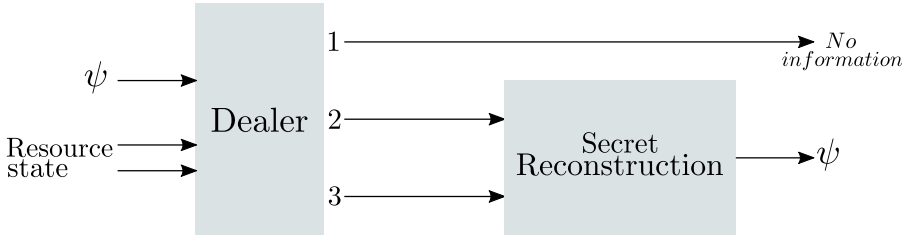

Quantum state sharing (QSS) is a cryptographic technique which splits the information describing a single quantum state across a number of modes, each distributed to a single potentially-dishonest player as shown above. Importantly, the original state is then inaccessible to any individual player acting alone. Only by collaborating can a subset of the players reconstruct the original state. The information is then guarded against dishonest individuals without hindering access when not all players are available [1, 2].

We present a quantum state sharing (QSS) protocol suitable for the sharing of any Gaussian state between three players and certify its security for any *pure* Gaussian state. Our protocol is a generalisation of one previously discussed by Tyc & Sanders [3] and Lance *et al.* [4] which allows the use of a wider variety of resource states.

We show that the tripartite quantum state sharing of coherent states can be achieved securely with the use of any two-mode Gaussian resource exhibiting any degree of EPR-steering [5]. We also show that displaced squeezed states can also be shared securely with an increase in the entanglement requirement dependent on the degree of squeezing allowed in the input states.

References

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