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Certification of quantum network functionality based on multi-round teleportation¹ VICTORIA LIPINSKA, LE PHUC THINH, STEPHANIE WEHNER, Delft Univ of Tech — Quantum communication is a core element of quantum information science. The most general communication scenario involves separated nodes exchanging quantum information at a large distance, which can define a quantum network. It has been shown that various operational stages of network functionality can be tested. In particular, it is known that in certain networks nodes can certify storage of a quantum system for a given time. On the other hand, in some networks a local control over the system can be maintained. Here we focus on a quantum network which combines the two functionalities. We propose a simple test which we call lifetime and control test, that provides an explicit certification of attainment of both tasks. Specifically, we present a protocol based on multi-round teleportation whose successful realization guarantees the desired functionality of the network. We demonstrate its performance and adapt the protocol to experimentally feasible scenarios employing imperfect memory. We also provide explicit parameters for estimation of the quality of a memory in the presence of local control, based on the probability of successful performance of the protocol.

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