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Quantum communication complexity and the reality of the wavefunction ALBERTO MONTINA, STEFAN WOLF, Università della Svizzera Italiana — The communication complexity of a quantum channel is the minimal amount of classical communication required for classically simulating the process of preparation, transmission through the channel, and subsequent measurement of a quantum state. At present, only little is known about this quantity. We have recently presented a procedure for systematically evaluating the communication complexity of channels in any general probabilistic theory, in particular quantum theory [A. Montina, M. Pfaffhauser, S. Wolf, Phys. Rev. Lett. 111, 160502 (2013)]. The procedure is particularly important in quantum foundations, as classical simulations of quantum channels employing a finite amount of communication are essentially equivalent to a special class of hidden variable theories where quantum states represent statistical knowledge about the classical state and not an element of reality [A. Montina, Phys. Rev. Lett. 109, 110501 (2012)]. This special class of theories, called psi-epistemic, has attracted strong interest very recently. With our procedure, we are able to build up a psi-epistemic theory that is also the most efficient one in terms of employed communication resources.

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