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(G*) Channel capacity of relativistic quantum communication with rapid interaction

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We study nonperturbatively the transmission of classical and quantum information in globally hyperbolic spacetimes, where the communication channel is between two qubit detectors interacting with a quantized massless scalar field via delta-coupling interaction. This interaction approximates very rapid detector-field interaction, effectively occurring at a single instant in time for each detector. We show that when both detectors interact via delta-coupling, one can arrange and tune the detectors so that the channel capacity is (at least) as good as the quantum channel constructed nonperturbatively using gapless detectors. Furthermore, we prove that this channel capacity is in fact optimal, i.e., both nonperturbative methods give essentially the same channel capacity, thus there is a sense in which the two methods can be regarded as equivalent as far as relativistic quantum communication is concerned.

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