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Privacy, Acceleration and the Unruh Effect

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Abstract

In a relativistic theory of quantum information, the possible presence of horizons is a complicating feature that places restrictions on the transmission and retrieval of information. In talk, I will quantify the importance of this feature by calculating how effectively the Unruh effect can be exploited for the purpose of achieving private communication, both classical and quantum mechanical. More specifically, I'll discuss a scenario in which two inertial participants communicate via a noiseless dual-rail qubit channel in the presence of a uniformly accelerated eavesdropper. Due to the Unruh effect, the eavesdropper's view of the encoded information is noisy, a feature the two inertial participants can exploit to achieve perfectly secure communication at a rate depending on the eavesdroppper's acceleration. Exploiting the symmetries of the problem make it possible to calculate the associated private classical capacity as a function of this acceleration. I'll also introduce a new quantity called the private quantum capacity, which had not previously been studied because its interpretation is problematic in the absence of horizons. Curiously, the private quantum capacity is exactly zero for all accelerations.

This is joint work with Kamil Bradler and Prakash Panangaden.