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Measurements and communication through quantum fields

We will discuss the little oddities and joys of doing quantum information when relativity is 'switched on' and we operate with quantum fields. Relativity has its peculiar way of either helping or hindering quantum and classical information processing and the transmission of quantum information. We will discuss the quantum channel consisting of two localized quantum systems that communicate through a local coupling to a quantum field, and show how relativistic causality and covariance play a role in these tasks. We will revisit about the measurement problem when relativity comes to play with quantum theory. Then we will discuss how suitable communication protocols for this type of quantum channel require the careful navigation of several constraints, such as the no-cloning principle, the strong Huygens principle and the tendency of short field-matter couplings to be entanglement breaking. Time and decoherence permitting, we will also discuss how entanglement contained in quantum fields (even in spacelike separated regions) can be harvested and utilized (or not!) to assist communication.