

Abstract Submitted  
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**Foundational aspects of energy-time entanglement** JAN-ÅKE LARSSON, Linköping University — This presentation will discuss whether energy-time entanglement is a properly Quantum Information representation, by considering its relation to Einstein-Podolsky-Rosen (EPR) elements of reality. The interferometric experiment proposed by J. D. Franson in 1989 provides the background, and the main issue here is whether a Local Realist model can give the Quantum-Mechanical predictions for this setup. The Franson interferometer gives the same interference pattern as the usual Bell experiment (modulo postselection). Even so, depending on the precise requirements made on the Local Realist model, this can imply a) no violation, b) smaller violation than usual, or c) full violation of the appropriate statistical bound. The discussion will include the nature of the requirements, the motivation for making them, and their effect. The alternatives include using a) only the measurement outcomes as EPR elements of reality, b) the emission time as EPR element of reality, and c) path realism. These subtle requirements need to be taken into account when designing and setting up future experiments of this kind, intended to test Local Realism, or indeed to do Quantum Information Processing.

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