

# Uncertainty relations and flow of time in inertial and non-inertial quantum reference frames

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Uncertainty relations play a crucial role in quantum mechanics [1]. On the one hand, we have shown that the locality of generalized uncertainty relations gives rise to both known and hitherto unknown bounds on quantum correlations [2-4]. On the other hand, in a recent work [5] we have emphasized the relational aspects of position uncertainties, clock uncertainties and their influence on each other within the framework of quantum reference frames. In this talk I will address both local and relational aspects of uncertainty relations trying to reconcile them via a properly defined covariance matrix structure. As constructive examples of this approach I will discuss novel time-energy uncertainty relations [6], the appearance of non-unitarity from the perspective of non-inertial quantum clocks [7] and general consequences regarding entanglement and the relational flow of time.

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