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Quantum uncertainty relations, originally due to Heisenberg, Kennard and Schrödinger, which provide fundamental bounds for variance of outcomes of two quantum measurements, belong to the cornerstones of the quantum theory. During recent years several new generalizations and improvements of these classical results were obtained. In particular, uncertainty relations were formulated in terms of the entropies, which characterize outcomes of quantum measurements.

Quantum mechanics is a linear theory and it admits existence of superposition of quantum states. In the case of quantum systems composed of several subsystems there exists so called entangled states, which display non-classical correlations between the subsystems. Such peculiar quantum states, already constructed in laboratories, are crucial for realization of quantum cryptography, quantum teleportation and several other tasks of quantum information processing.

Proposed research project concerns theoretical physics and foundations of quantum theory. It aims to establish and elucidate closer links between uncertainty relations and quantum entanglement. Entropic uncertainty relations, generalized for the cases of several arbitrary quantum measurements, will provide new methods to detect quantum entanglement and to and characterize this effect. A complementary aim of the project consists in deriving generalized uncertainty relations for the cases of composed systems, in which effects of quantum entanglement play an important role.