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Beyond standard Heisenberg limit through many-body correlated tunneling LUSHUAI CAO, XIAOCHUN DUAN, XING DENG, SHOULONG CHEN, Huazhong University of Science Technology — It is well known that the uncertainty of classical measurement scales as 1/\sqrt{N}, where N refers to the total number of the copies of the probes. And in quantum measurement, the uncertainty can achieve an improved scaling of 1/N, using entangled or squeezed states as the probe. Recently, it has been experimentally proved that the scaling of the uncertainty could even reach 1/N^{k}, by engineering a k-body interaction. In this talk, we propose that, instead of the k-body interaction, the k-body correlated tunneling could also give rise to a new scaling of 1/J^k, where J is the strength of the effective k-body tunneling. Moreover, we will introduce detailed measurement schemes based on the realizable k-body correlated tunnelings of ultracold atoms. These schemes are also analyzed by the calculation of the quantum and classical Fisher information, which confirms the new scaling in these setups.

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