

Atomtronics: from many-body physics to quantum technologies

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Atomtronics is the emerging quantum technology of matter-wave circuits which coherently guide propagating ultra-cold atoms. The field benefits from the remarkable progress recently achieved in micro optics, allowing to control the coherent matter with enhanced flexibility on the micro-meter spatial scale. This way, both fundamental studies in quantum science and technological applications can be carried out. I will sketch recent progress in matter-wave circuitry and atomtronics-based quantum technology. In particular, I will discuss specific examples showing how the persistent current of correlated matter-wave confined in ring-shape circuits can provide a diagnostic tool for pinpointing the nature of correlations in many-body systems. At the same time, the specific features of the current put the basis for interferometers with enhanced performances.

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