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Young Plenary Lecture

Metric graphs: a mathematical model for quantum technologies

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Abstract

As problems related to the physical limits of silicon-based devices increase, the scientific community has begun to search for alternative technologies, possibly not founded on electron transport. One of the approaches suggested by the physics literature in the last years concerns the development of quantum-based technological frameworks, which exploit either fine quantum properties of new materials (such as, for instance, graphene) or completely new ways to transfer information. This also drove the rise of the new research field of Atomtronics, which aims at the construction of devices in which currents are generated by matter waves, instead of electrons, supplied by Bose–Einstein Condensates (BEC). One of the mathematical models proposed to study the features of circuits designed in this perspective is the NonLinear Schrödinger (NLS) equation on networks, or more precisely on *metric graphs*. The talk will provide an overview on some of the most relevant achievements on this model, obtained in the last decade, and a hint on future developments, possibly toward multidimensional structures known as *hybrids*.