





Meetings of the Belgian Quantum Physics Initiative Colloquium



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Two-particle quantum interferences with atoms

The demonstration of non-classical interference effects has been a crucial enterprise in the history of quantum physics. This has played a role in stimulating quantum information theories, but has also provided benchmarking experiments for quantum information protocols. Two examples are the observation of the Hong–Ou–Mandel effect and the violation of Bell's inequalities using photons. Thanks to recent progress, similar experiments have become possible using massive particles (e.g. atoms or electrons).

In this colloquium, I will present our two most recent experiments using metastable Helium-4 atoms. The first closely resembles the Hong–Ou–Mandel experiment and directly reveals the indiscernible nature of the atoms [1]. The second is inspired by the Rarity–Tapster Bell inequality violation experiment and yields first indications that the atom pairs are entangled [2]. Both experiments bring rare demonstrations of two-particle interferences for massive particles and open the way to a genuine test of a Bell inequality using the momentum degree of freedom.

R. Lopes et al., "Atomic Hong-Ou-Mandel experiment", Nature 520, 66 (2015).
P. Dussarrat et al., "Two-atom, four mode interferometer", arXiv:1707.01279.

Thursday 9 NOVEMBER 2017 AT 2.00 P.M.

COFFEE AND TEA WILL BE SERVED AT 3.00 P.M.

Followed by

4pm: Hadrien Kurkjian (Antwerp Univ.)

«Elementary excitations in strongly interacting Fermi superfluids»

4:30pm: Levon Chakhmakhchyan (QuIC, ULB)

« Quantum-inspired algorithm for estimating the permanent of positive semidefinite matrices»

PRIGOGINE ROOM

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