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Coherent Backscattering of Ultracold Atoms FRED JENDRZEJEWSKI, LCFIO/JQI, KILIAN MUELLER, LCFIO, THOMAS PLISSON, LCFIO/LHPS, JEREMIE RICHARD, LCFIO, PHILIPPE BOUYER, LP2N, ALAIN ASPECT, VINCENT JOSSE, LCFIO — Quantum inference effects play a fundamental role in our understanding of quantum transport through disordered media, as it can lead to the suppression of transport, i.e. Anderson Localization. Convincing as recent observations of Anderson Localization with ultracold atoms are, none of these experiments includes a direct evidence of the role of coherence. For weak disorder, a first order manifestation of quantum interference is the phenomenon of coherent backscattering (CBS), i.e. the enhancement of the scattering probability in the backward direction, due to a quantum interference of amplitudes associated with two opposite multiple scattering paths. In this talk, I present our work on the direct observation of such a CBS peak. A cloud of non-interacting ultra-cold atoms was launched with a narrow velocity distribution in an elongated laser speckle disordered potential. Time of ?ight imaging, after propagation time t in the disorder, directly yield the momentum distribution. The most remarkable feature is the large visibility peak, which builds up in the backward direction. The height and width of that peak, and their evolution with time, are an indisputable signature of CBS, intimately linked to the role of coherence.

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