Transverse Momentum Distribution of Atoms in an Interferometer

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From the stationary solution of Schrödinger's equation in an interferometer we derive the wave functions of the longitudinal and the transverse motion. The former function is a plane wave. The wave function of the transverse motion is a one dimensional wave packet representing a superposition of components with various values of the particles transverse momentum. The particles transverse momentum distribution in an interferometer is time independent and is determined by the aperture wave function. Consequently, it is independent of the distance from the slits. As such, it is a very important characteristic of the quantum state. Experimental determination of the momentum distribution would support the particle *and* wave interpretation of quantum interference in a new manner.

Key words: Atomic Interference; Transfer Momentum Distribution; Wave-particle Duality.