Analysis of the loss of coherence in interferometry with macromolecules

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abstract We provide a self-contained quantum description of the interference produced by macromolecules diffracted by a grating, with particular reference to fullerene interferometry experiments arnzei99,JMO2000. We analyze the processes inducing loss of coherence consisting in beam preparation (collimation setup and thermal spread of the wavelengths of the macromolecules) and in environmental disturbances. The results show a good agreement with experimental data and highlight the analogy with optics. Our analysis gives some hints for planning future experiments.