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**Momentum-conserving decoherence suited for three dimensions**

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The decoherence rate of a quantum particle can be much higher than the rate of momentum change. An example is a free particle moving with a constant velocity in a dephasing environment. Such a particle is described by a wavepacket whose half-width is determined by the dephasing rate. In the single-particle Green's function, dephasing is described by a non-hermitian part of the self-energy. However in the standard Green's function theory, it is not clear how to obtain the actual time evolution of a quantum particle. We present a scheme to describe the time evolution of a quantum particle in real space under the influence of momentum-conserving dephasing. In contrast to earlier approaches, as [1], the scheme is suited for problems in two and three dimensions. The description of a free dephasing particle as a moving wavepacket is discussed as an example. [1]I. Knittel, F. Gagel, M. Schreiber; Quantum transport and momentum conserving dephasing *Phy. Rev B* 60, 916 (1999)

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