

Decoherence and the size of a wave packet

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Off diagonal elements of the one particle density matrix do not go to zero, but rather (for the ideal gas) go to the thermal wavelength. This density matrix nevertheless is consistent with plane waves for wave functions. A contrary view, one natural to kinetic theory is of particles. Using this view, and taking account the spreading of gaussian wave packets during non-scattering periods, we conclude that wave packet size should be a constant times the square root of [the thermal wavelength times the mean free path]. The constant is order unity, but larger than one.