Hunting the nedm by random walks

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The behavior of a spin undergoing Larmor precession in the presence of
fluctuating fields is of interest to workers in many fields. Particles making random walks in inhomogeneous fields see time fluctuating fields which cause frequency shifts and relaxation which are related to their power spectrum, which can be determined by taking the Fourier transform of the auto-correlation functions of the field fluctuations. Recently we have shown how to calculate these correlation functions for
all values of mean free path (ballistic to diffusive motion) in finite bounded regions, using the model of persistent continuous time random walks (CTRW) for particles subject to scattering by fixed (frozen) scattering centers so that the speed of the moving particles is not changed by the collisions. Here we show how scattering with energy exchange from an ensemble of scatterers in thermal equilibrium can be
incorporated into the CTRW. . Our
results for the velocity autocorrelation function show a long time tail
which we also obtain from conventional di usion theory, with the same power, independent of dimensionality. Our results are valid for any Markovian scattering kernel as well as any kernel based
on a scattering cross section ~1/v.

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