Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

External dc bias field effects in the nonlinear ac stationary response of permanent dipoles in a uniaxial potential NIJUN WEI, WILLIAM T. COFFEY, Department of Electronic and Electrical Engineering, Trinity College, Dublin 2, Ireland, PIRRE-MICHEL DJARDIN, YURI P. KALMYKOV, LAMPS (EA 4217), Universit de Perpignan Via Domitia, France — External dc bias field effects on the nonlinear dielectric relaxation and dynamic Kerr effect of a system of permanent dipoles in a uniaxial mean field potential are studied via the rotational Brownian motion model. Postulated in terms of the infinite hierarchy of differential-recurrence equations for the statistical moments (the expectation value of the Legendre polynomials), the dielectric and Kerr effect ac stationary responses may be evaluated for arbitrary dc bias field strength via perturbation theory in the ac field. We have given two complementary approaches for treating the nonlinear effects. The first is based on perturbation theory allowing one to calculate the nonlinear ac stationary responses using powerful matrix methods. The second approach based on the accurate two-mode approximation [D.A. Garanin, Phys. Rev. E. **54**, 3250 (1996)] effectively generalizes the existing results for dipolar systems in superimposed ac and dc fields to a mean field potential. The results apply both to nonlinear dielectric relaxation and dynamic Kerr effect of nematics and to magnetic birefringence relaxation of ferrofluids. Furthermore, the given methods of the solution of infinite hierarchies of *multi-term* recurrence relations are quite general and can be applied to analogous nonlinear response problems.

Yuri Kalmykov
LAMPS (EA 4217), Universit de Perpignan Via Domitia

Date submitted: 05 Nov 2015 Electronic form version 1.4