Unavoidable Asymmetries in Distributions of Electric Field Gradients
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WILLIAM E. EVENSON¹, Retired — Evenson, et. al. [1] have addressed topologically appropriate coordinates for probability distribution functions (PDFs) used to describe electric field gradients (EFGs) in solid materials. In many situations of interest, such as Perturbed Angular Correlation (PAC) studies, the distribution of material defects that give rise to EFGs are nearly amorphous. Czjzek, et al. [2] provided a theoretical foundation for such a distribution of EFGs in an amorphous solid. However, most applications of his work seem to ignore the inherent asymmetry of the PDF that must arise from nearest neighbor defects in real materials, whether or not that material is amorphous. Such asymmetries may make it difficult or impossible to remove correlations between EFG components, thwarting attempts to find separable, independent PDFs such as are used to explore hyperfine phenomena. We use Evenson’s parameterization of the EFG coordinates to study the asymmetries introduced into the PDFs of cubic materials, looking to see how strongly these asymmetries affect attempts to find separable PDFs for use in characterizing PAC spectra.


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