

Two-Dimensional Nutation NQR Broad-Line Spectra in Oriented Samples

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The NQR nutation method to determine the electric field gradient asymmetry parameter η in systems, where the resonance line is so broad that the radio frequency field can excite only a portion of the nuclear spins, is presented. In this situation, the recently developed spectroscopic methods are not applicable. Two-dimensional nutation NQR spectra of oriented powders are calculated and used to determine η at particular frequencies along a broad NQR line. The proposed method is useful for single crystals, oriented powders, glasses, and disordered systems even for small values of the asymmetry parameter. Therefore it can be used to evaluate fluctuations in η and the quadrupole coupling constant e^2qQ due to inhomogeneities. We demonstrate the application of this method to oriented chalcogenide semiconducting glasses.

Key words: Nuclear Quadrupole Resonance; 2D Nutation Spectroscopy; Electric Field Gradient Tensor.