

Awschalom *et al.* Reply: As stated in our paper [1], the agreement between the experimentally measured dependence of resonant frequency on applied field, B , and the theoretical estimate based on two-level systems is only qualitative. Garg [2] points out that there is a noticeable difference between theoretical expectations and experimental results for $\nu_{\text{res}}(B)$ at the largest fields, though the maximum discrepancy is much closer to a factor of 5 than the factor of 10 that he claims. Indeed, our paper makes clear that almost all the theoretical estimates agree with the data only semiquantitatively. It is worth emphasizing, however, that it has so far proven impossible to achieve even qualitative agreement between *all* of the observed phenomena and any description other than a quantum tunneling one. (Earlier experiments [3] used such comparisons to *eliminate* quantum tunneling as a viable explanation for nonlinear dynamics observed in small ferromagnetic systems.) Hopefully further experiments will help us refine this understanding and clarify the role of dissipation, which is neglected in the simplest quantum-tunneling description to which we have compared the data.

Garg's estimate for the effect on the resonant peak height and width of the external field is approximately correct, though not quite right in detail. More careful treatment of the two-level system shows, for example, that the peak maximum occurs near $\nu_{\text{res}}(B)$, rather than between $\nu_{\text{res}}(0)$ and $2\nu_{\text{res}}(0)$ as his estimate suggests. Figure 1 shows data for the peak height and width [4] from the same experimental runs that were reported in our original paper [1]. The simple two-level-system model does in fact correctly predict the general trends of this data. The peak height of the observed resonance decreases sharply as a function of field, falling by a factor of about 5 by the time B reaches 2.5 mG. The width increases with field, broadening by roughly 20% at $B \sim 2.5$ mG. Both these results are in the predicted direction, though neither is quite as rapid as predicted by two-level systems. While we do not have a definitive explanation for this quantitative discrepancy, we mention one possibility: Any particle-substrate interactions which tend to orient the moments of the different particles along a particular axis would reduce the expected broadening and height reduction of the peak with increasing field. Since interactions between different particles are negligible in

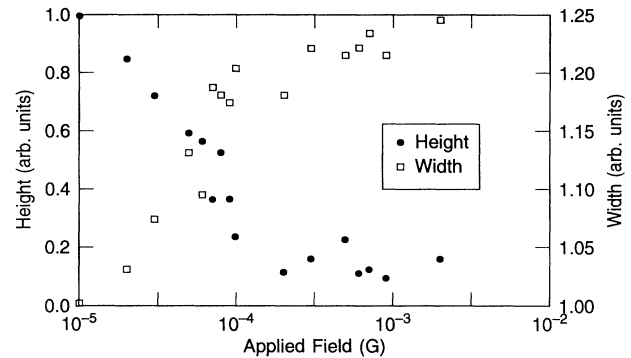


FIG. 1. The behavior of the resonance height and width as a function of applied magnetic field at $T = 29.7$ mK. Both height and width values are normalized to 1.0 at near zero-field conditions ($B < 10^{-5}$ G).

the samples where resonant behavior is observed, such a correlation between the orientation of moments would not strongly affect any of the other estimates upon which our analysis of the data is based.

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