

**Li and Rau Reply:** Bode *et al.*, in a Comment [1] on our Letter [2], claim that the vortex ( $V$ ) core width  $d_{vc}$  in magnetic nanodisks (NDs) is on the order of 10 nm and essentially independent of the ND diameter  $d$ . We are presenting published data (see also Fig. 1) that clearly show that this claim is incorrect. For instance, a recent transmission electron microscopy experiment on  $d = 6 \mu\text{m}$  Co elements gives  $d_{vc} = 80 \text{ nm}$  [3]. Their claim rests in a formula [Eq. (1) in Ref. [1]] published by Feldtkeller and Thomas [4] for the Bloch line radius of thin films ( $d = \infty$ ) with zero thickness  $D = 0$  and zero distance  $\rho$  from the Bloch line center using Lilley's definition for the wall thickness [5]. We [6] and others [7] have already experimentally shown that the  $V$  wall thickness depends *strongly* on  $\rho$  in patterned Co NDs. Equation (1) in Ref. [1] does not exhibit any dependence on  $d$  and  $D$  and should not be used for *finite*  $D$  and  $d$ . Usov and Peschany [8], Komineas [9], as well as Jubert and Allenspach [10] show that  $d_{vc}$  depends on  $d$  and  $D$ . Data taken from Refs. [10,11] show that  $d_{vc}$  changes at least by a factor of 4 with changing  $D$  (see Fig. 1). Buda *et al.* [11] remark that, increasing  $D$ , the out-of-plane demagnetization field decreases, and hence the exchange energy widens the  $V$  core. The failure of their claim can be more directly seen from Fig. 1, which gives  $d_{vc}$  versus different  $d$  values obtained from recent publications [2–19] together with a

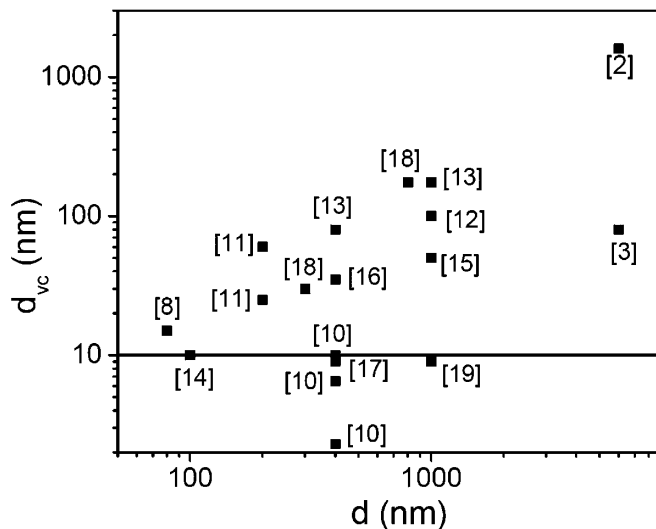


FIG. 1.  $d_{vc}$  values—together with the corresponding literature reference numbers—plotted versus  $d$ .

horizontal black line that corresponds to a  $d_{vc}$  value of 10 nm as proposed in Ref. [1]. The clear deviation of most of the presented data from this line unambiguously shows that  $d_{vc}$  is not “on the order of 10 nm” and not “essentially independent of  $d$ ” as claimed in Ref. [1]. Quite recently, Komineas showed for  $V$ -antivortex (AV) pairs that in the presence of an easy-plane anisotropy,  $d_{vc}$  scales with the reduced anisotropy constant  $Q = K_r/K_d$  [2]:  $d_{vc} \sim 1/Q^{0.5}$  [20]. For our Co NDs,  $Q = 8.4 \times 10^{-4}$  is obtained [2]. For this value, compared to a medium anisotropy  $Q \approx 1$  ( $d_{vc} = 10 \text{ nm}$  [1]) and including a thickness factor of 4, we obtain for  $d_{vc}$  a value of  $1.38 \mu\text{m}$ , which is close to our experimental values for single  $V$ s as well as for  $V$ s and AVs in AV pairs in  $D = 30 \text{ nm}$  Co elements (see Figs. 2 and 3 in Ref. [2]).

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