D'Anna *et al.* Reply: In the preceding Comment [1], Ikeda contests the idea that the vortex-lattice melting line might originate from a microscopic electronic process, as it occurs, for example, at the mean-field transition line $H_{c2}(T)$.

In our Letter [2] we have implicitly suggested that a microscopic process occurs at the melting transition, since we observed a sharp change in the Hall conductivity at the vortex-lattice melting temperature. According to the most consistent part of the theoretical literature on the Hall effect in the vortex state, the Hall behavior is explained in terms of microscopic electronic processes which affect the single vortex trajectory [3]. In these models the Hall conductivity is a direct microscopic probe of the Hall force coefficient in the single vortex equation of motion, thus the contested suggestion of a possible microscopic origin for the vortex-lattice melting transition.

We would like to underline that this proposal is not new. It has been proposed, for example, from the observation that critical amplitude fluctuations persist almost down to the vortex-lattice melting transition [4]. Other authors [5–7] have suggested this idea, arguing that part of the latent heat observed at the first-order vortex-lattice melting transition comes from changes in the entropy at microscopic length scales, or have advanced the same idea on general theoretical grounds [8]. The problem is to decide whether our observations suffice to conclude in this direction. Ikeda suggests that a vortex glass scaling theory [9,10] explains our observations. In the model, the Hall resistivity is a power of the longitudinal resistivity, $\rho_{xy} \propto \rho_{xx}^{\beta}$, the exponent being universal and $\ll 2$ in the three-dimensional regime. As a consequence, the strong nonlinearity of $\rho_{xx}(j)$ in the glassy solid phase implies a nonlinear Hall conductivity, diverging at small currents. We have obtained new data showing that the Hall conductivity is indeed current dependent in the vortex solid, confirming the conjecture of Ikeda. With these new data at hand, we also concur with the idea that we cannot conclude that the vortex-lattice melting is of microscopic origin (*but the eventuality is not excluded*). Certainly, pinning effects have to be considered and the Hall conductivity does not seem to be a microscopic probe. Nevertheless, a detailed study of the scaling law in the different vortex phases [11] shows that β is disorder-type dependent.

G. D'Anna,[1] V. Berseth,[1] L. Forró,[1] A. Erb,[2] and E. Walker[2]
[1]IGA DP, Ecole Polytechnique Fédérale de Lausanne
CH-1015 Lausanne, Switzerland
[2]DPMC, Université de Genève
CH-1211 Genève, Switzerland

Received 10 December 1998 [S0031-9007(99)08978-4]
PACS numbers: 74.25.Fy, 74.60.Ge, 74.72.Bk

[1] R. Ikeda, preceding Comment, Phys. Rev. Lett. **82**, 3378 (1999).
[2] G. D'Anna *et al.*, Phys. Rev. Lett. **81**, 2530 (1998).
[3] See, for example, M. V. Feigel'man *et al.* JETP Lett. **62**, 834 (1995); A. van Otterlo *et al.*, Phys. Rev. Lett. **75**, 3736 (1995).
[4] J. R. Cooper *et al.*, Phys. Rev. Lett. **79**, 1730 (1997).
[5] G. E. Volovik, JETP Lett. **65**, 491 (1997).
[6] M. J. W. Dodgson, V. Geshkenbein, H. Nordborg, and G. Blatter, Phys. Rev. Lett. **80**, 837 (1998).
[7] S. W. Pierson and O. T. Valls, Phys. Rev. B **57**, R8143 (1998).
[8] A. V. Nikulov, D. Y. Remisov, and V. A. Oboznov, Phys. Rev. Lett. **75**, 2586 (1995); A. V. Nikulov, Czech. J. Phys. **46**, 1779 (1996).
[9] A. T. Dorsey and M. P. A. Fisher, Phys. Rev. Lett. **68**, 694 (1992).
[10] R. Ikeda, J. Phys. Soc. Jpn. **65**, 3998 (1996).
[11] G. D'Anna *et al.*, cond-mat/9811106.

0031-9007/99/82(16)/3379(1)$15.00