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Unusual Hall effect due to carrier delocalization. XIAOHANG ZHANG, S. VON MOLNAR, P. XIONG, Florida State University, Z. FISK, University of California at Irvine — Recently, an unusual Hall effect (HE) in antiferromagnetic $YbRh_2Si_2$ was reported.[1] Here, we describe the observation of a similar HE in ferromagnetic EuB_6. The unusual HE is characterized by two distinct slopes in the Hall resistivity as a function of applied magnetic field: a small slope in the ferromagnetic state and a large slope at high temperatures. In the paramagnetic state just above the Curie-Weiss temperature θ (intermediate temperatures), the Hall resistivity switches from the large slope at low fields to the small slope at high fields. The phenomenon cannot be attributed to the anomalous HE since the change in the Hall slope is not accompanied by saturation of magnetization. Moreover, the switching field was found to depend linearly on temperature and vanish right at θ. We show that the switching occurs at a certain magnetization at which carriers are delocalized due to the overlapping of magnetic polarons. A quantitative fit to the HE data has been obtained based on this model of carrier delocalization. The model and analysis were successfully applied to the published HE data on $YbRh_2Si_2$, which suggests a possible relation between carrier delocalization and quantum criticality. This work was supported by a FSU Research Foundation PEG, NSF DMR 0710492 and 0503360 grants. [1]S. Paschen et al., Nature **432**, 881 (2004).

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