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Evolution of antiferromagnetic order in rare-earth nickelates probed by muon spin relaxation BENJAMIN FRANDSEN, LIAN LIU, SKY CHEUNG, YASUTOMO J. UEMURA, Columbia University, TIMOTHY MUNSIE, MURRAY WILSON, ALANNAH HALLAS, GREAME M. LUKE, McMaster University, BIJUAN CHEN, CHANGQING JIN, Institute of Physics, Beijing, CUI DING, FANLONG NING, Zhejiang University, JOSE ALONSO, Instituto de Ciencia de Materiales de Madrid (ICMM) — The rare-earth nickelates with structural formula $R\mathrm{NiO}_3$ comprise a well-known family of Mott insulators that exhibits a gradual suppression of the metal-insulator transition and antiferromagnetic (AF) order with increasing rare-earth ionic size, resulting in a zero-temperature quantum phase transition at a rare-earth ionic radius of $\sim$1.17 Å. We present detailed muon spin relaxation (μSR) measurements of $R\mathrm{NiO}_3$ (R=Sm,Nd,Pr,La) to investigate the evolution of the antiferromagnetic order across the phase diagram. In the compounds with lower ordering temperatures near the quantum phase transition, we observe a "stretched" Mott transition with phase separation between magnetic and paramagnetic regions over a wide temperature interval. We also find that the suppression of the magnetic order at the quantum phase transition occurs in a first-order manner, with the ordered volume fraction decreasing to zero while the moment size remains large and constant. We compare these observations to other Mott insulator systems and discuss generic behavior.

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