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Element Specific Magnetic Ordering in $Nd_{0.75}Dy_{0.25}Fe_3(BO_3)_4$ C.S. NELSON, National Synchrotron Light Source, Brookhaven National Laboratory, L.N. BEZMATERNYKH, I.A. GUDIM, Kirensky Institute of Physics, Siberian Division, Russian Academy of Sciences — Interest in $RFe_3(BO_3)_4$ has been motivated by the magnetoelectric properties of R = Gd and Nd, in which field-induced polarization phases are induced at modest (<1 T) magnetic fields. Spontaneous polarization has more recently been observed in the substituted ferroborate with R = $Nd_{0.75}Dy_{0.25}$.[1] Using rare earth L edge resonant x-ray scattering and nonresonant x-ray scattering, we have investigated the element specific magnetic ordering in $Nd_{0.75}Dy_{0.25}Fe_3(BO_3)_4$ in an effort to shed light on the origin of its multiferroic behavior. Unlike in the R = Gd and Nd materials, the magnetic structure of $Nd_{0.75}Dy_{0.25}Fe_3(BO_3)_4$ is observed to be strictly commensurate below T_N. In addition, a spin reorienation from easy axis toward easy plane is observed in the Nd and Fe subsystems with increasing temperature, and there is a decoupling between the two rare earth subsystems. The effects on the magnetic ordering of a magnetic field applied along the a-axis will also be discussed. Use of the National Synchrotron Light Source, Brookhaven National Laboratory, was supported by the U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences, under Contract No. DE-AC02-98CH10886. [1] Y.F. Popov et al., JETP Lett. 8, 345 (2009).

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