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**X-ray Magnetic Circular Dichroism Investigation of Fe Valence Ordering in Multiferroic  $\text{LuFe}_2\text{O}_4$**  VEMURU KRISHNAMURTHY, Oak Ridge National Laboratory, JONATHAN LANG, DANIEL HASKEL, GEORGE SRAJER, Argonne National Laboratory, BRIAN SALES, Oak Ridge National Laboratory, MAS SUBRAMANIAN, Oregon State University, DAVID SINGH, LEE ROBERTSON, MANUEL ANGST, DAVID MANDRUS, Oak Ridge National Laboratory — A new mechanism of ferroelectricity that is based on the iron valence ordering in a charge frustrated lattice has been reported for  $\text{LuFe}_2\text{O}_4$ . In this compound, a ferroelectric transition occurs at 330 K and ferrimagnetic order develops below 250 K. The ferroelectric polarization shows a sharp increase at the ferrimagnetic ordering temperature suggesting that the two order parameters are coupled. X-ray magnetic circular dichroism (XMCD) at the Fe K edge and at Lu  $L_{2,3}$  edges has been measured in  $\text{LuFe}_2\text{O}_4$  using 4-ID-D beamline at Advanced Photon Source. Two clear peaks are seen in the Fe K-edge XMCD suggesting that the magnetism of Fe is associated with two types of Fe sites. Fe K edge XMCD probes the 4p shell, thus it is sensitive to different charge states and gives an indirect measure of the Fe magnetism through 3d-4p hybridization. The observed double peak structure in the XMCD is an indication of charge ordering of  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  in the ferrimagnetic state. XMCD is also observed at Lu  $L_{2,3}$  edges suggesting a small induced Lu 5d moment. Funded by US Dept. of Energy.

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