

Abstract Submitted  
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**Optical Properties and Magnetic Field-Induced Phase Transitions in the Ferroelectric State of  $\text{Ni}_3\text{V}_2\text{O}_8$** <sup>1</sup> R.C. RAI, J. CAO, S. BROWN, J.L. MUSFELDT, University of Tennessee, D. KASHINATHAN, UC Davis, D.J. SINGH, ORNL, G. LAWES, Wayne State University, N. ROGADO, DuPont, R.J. CAVA, Princeton University, X. WEI, NHMFL — We present a combination of optical spectra, first principles calculations, and magneto-optical measurements to elucidate the electronic structure and to study the phase diagram of  $\text{Ni}_3\text{V}_2\text{O}_8$ . We find a remarkable interplay of magnetic field and optical properties that reveals additional high magnetic field phases and an unexpected electronic structure which we associate with the strong magneto-dielectric couplings in this material over a wide energy range. Specifically, we observed several prominent magneto-dielectric effects that derive from changes in crystal field environment around Ni spine and cross-tie centers. This effect is consistent with a field-induced modification of local structure. We find  $\text{Ni}_3\text{V}_2\text{O}_8$  to be an intermediate gap, local moment band insulator. This electronic structure is particularly favorable for magneto-dielectric couplings, because the material is not subject to the spin charge separation characteristic of strongly correlated large gap Mott insulators, while at the same time remaining a magnetic insulator independent of the particular spin order and temperature.

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