Abstract Submitted
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A concentration dependence of the low temperature fluorescence of Neodymium (III) doped Gadolinium Gallium Garnet[1] CHRISTOPHER FERRI, JACKY WAN, MICHAEL TENNENBAUM, SAYANTANI GHOSH, Department of Physics, University of California, Merced — We perform temperature and concentration dependent studies on the ${}^4F_{3/2} \rightarrow {}^4 I_{9/2}$ transition of Neodymium dopant in Gadolinium Gallium Garnet. Optical spectra are taken at a range of temperatures between 5K and 300K for all three concentrations: 0.1 at.%, 0.5 at.% and 1 at.%. The transitions centered at 11000 $cm^{-1}(R_n \rightarrow Z_5)$ are fit with Voigt profiles. Subsequently, we analyze each of the profile parameters as a function of temperature. We find that the linewidth of the dominant transition ($R_1 \rightarrow Z_5$) experiences broadening below 50K that can not be explained using phonon-ion theory. We posit this low temperature broadening is due to the approaching paramagnetic to spin liquid phase transition. We also find that the inhomogeneous broadening of all of the transitions has a temperature dependence suggesting that thermal expansion of the crystal is an important effect, but the energy shifts of the transitions are adequately explained without including a crystal expansion term in the analysis.

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