Crystal Field Excitations Across High Tc Phase Diagram in $La_{1.6-x}Nd_{0.4}Sr_xCuO_4$. QIANLI MA, DALINI MAHARAJ, CONNOR BUHARI-WALLA, McMaster Univ, ALEXANDER KOLESNIKOV, MATTHEW STONE, Oak Ridge National Laboratory, BRUCE GAULIN, McMaster Univ — The family of high Tc superconductors (SC) $La_{1.6-x}Nd_{0.4}Sr_xCuO_4$ (Nd-LSCO) has been studied as it displays a complex picture of the canonical hole-doped high Tc phase diagram. It displays static charge and spin stripe order over a range of Sr doping, which are optimized around $x=0.125$. Nd-LSCO evolves from an AFM insulating phase at $x=0$, to a region ($0.05<x<0.17$) where static charge and spin stripe order co-exist with superconductivity at low temperatures, to an optimally-doped SC ($x=0.19$) with $T_c=20K$, and to what is believed to be a conventional non-superconducting Fermi liquid for $x>0.25$. Here I present time-of-flight inelastic neutron scattering data of the Nd$^{3+}$ crystalline electric field (CEF) levels on polycrystalline samples of Nd-LSCO over a range of compositions up to $x=0.4$. The experiments were performed on the SEQUOIA chopper spectrometer at the Spallation Neutron Source, and observe the evolution of the splitting of the $J=9/2$ multiplet appropriate to Nd$^{3+}$ as a function of Sr concentrations ($x=0.04, 0.12, 0.2, 0.24$ and $0.4$) and (4K, 35K and 200K) temperature. We observe sharp CEF transitions near 21 meV and 27 meV at low $x$, evolve to a single transition near 24meV near $x=0.1$, in agreement with the onset of a superconducting ground state.

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