Unidirectional Order and 3D Stacking of Stripes in Orthorhombic Pr$_{1.67}$Sr$_{0.33}$NiO$_4$ and Nd$_{1.67}$Sr$_{0.33}$NiO$_4$. MARKUS HÜCKER, JOHN M. TRANQUADA, GEN D. GU, Brookhaven National Laboratory, MARTIN V. ZIMMERMANN, HASYLAB at DESY, Hamburg, Germany, BERND K. BÜCHNER, IFW Leibniz-Institute, Dresden, Germany — The crystal structure and charge stripe order in Pr$_{1.67}$Sr$_{0.33}$NiO$_4$ and Nd$_{1.67}$Sr$_{0.33}$NiO$_4$ was studied by means of single crystal x-ray diffraction in zero and high electric fields. In contrast to tetragonal La$_{1.67}$Sr$_{0.33}$NiO$_4$, these crystals are orthorhombic at room temperature. We find that the distortion of the NiO$_2$ planes associated with the orthorhombic strain dictates the direction of the charge stripes. The critical temperature for charge stripe order is the same as in La$_{1.67}$Sr$_{0.33}$NiO$_4$ ($T_{CO} \sim 245$ K), i.e., it does not depend on the crystal symmetry. A second structural transition observed only in Nd$_{1.67}$Sr$_{0.33}$NiO$_4$ at temperatures $T \sim 100$ K has no noticeable influence on the stripe order. In crystals with a hole content very close to 1/3 we observe a tripling of the charge stripe unit cell along the c-axis for temperatures $T < 225$ K, which indicates a strong tendency towards a well defined three dimensional order. A high electric field applied to Nd$_{1.67}$Sr$_{0.33}$NiO$_4$ had no noticeable impact on the charge stripe order, i.e., a sliding of stripes was not observed. The work at Brookhaven was supported by the Office of Science, U.S. Department of Energy under Contract No. DE-AC02-98CH10886.

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Date submitted: 30 Nov 2005