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Medium-range Structure of $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ ($0.0 < x < 0.3$) by Pulsed Neutron PDF Analysis JIN NAKAMURA, University of Tennessee, THOMAS PROFFEN, Los Alamos National Laboratory, TAKESHI EGAMI, University of Tennessee and Oak Ridge National Laboratory — We studied the local and medium-range atomic structure in high- temperature superconductor (HTSC) $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ ($0.0 < x < 0.3$) by the pulsed neutron pair-density function (PDF) analyses. The measurement was made with the NPDF of LANSCE, LANL. Because of the high Q -resolution of the NPDF the PDF was determined up to 20 nm . The measured PDF was compared with that calculated for the average structure determined by the Rietveld analysis of the same data. We found that the measured PDF deviates from the calculated PDF in two different ways. For $x = 0.16 - 0.3$ deviations were seen up to about 3 nm , strongly related to the oxygen in the CuO_2 plane displaced along the c -axis. These deviations reflect local fluctuations between the orthorhombic and tetragonal phases. A more interesting deviations were seen for $x = 0.04 - 0.16$ up to 2 nm for all compositions. The lengthscale of this local fluctuation corresponds to the in-plane coherence length, suggesting that the structure that supports HTSC may be different from the average structure, and the size of the local domains is not limited by the dopant concentration. Further implications are discussed.

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