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Near-Equilibrium Structural Dynamics on the 20ps Time Scale
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— We observed near-equilibrium optically-induced structural dynamics at the Stanford Synchrotron Radiation Lightsource (SSRL). Hard x-ray diffraction experiments were performed in a typically unavailable regime: low optical pump fluence (20-250 μJ/cm^2) and short x ray pulses (15-60ps). We studied several different thin films ($BiFeO_3$ (BFO), Pb(Zr)TiO_3 (PZT), and Bi), pumping above bandgap using 343nm (BFO, PZT) or 1030nm (Bi) laser light at a 1.28MHz repetition rate in a special low alpha (short pulse) mode of the synchrotron. The corresponding small diffraction pattern changes (including fractional changes in lattice constant on order 10^{-6} were made much more apparent because of the ability of the experimental apparatus to make use of the high repetition rate of the x rays; it is precisely this rapid data acquisition process that allows such small changes to be measured.

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