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Time resolved 2nd harmonic generation at LaAlO₃/SrTiO₃ Interfaces SANJAY ADHIKARI, West Virginia University, CHANG-BEOM EOM, SANGWOO RYU, University of Wisconsin, Madison, CHENG CEN, West Virginia University — Ultrafast spectroscopy can produce information of carrier/lattice dynamics, which is especially valuable for understanding phase transitions at LaAlO₃/SrTiO₃ interfaces. LaAlO₃ (LAO) and SrTiO₃ (STO) are both associated with wide band gap, which allows deep penetration of commonly used laser wavelengths and therefore usually leads to overwhelming bulk signal background. Here we report a time resolved study of a 2nd harmonic generation (SHG) signal resulting from impulsive below-the-band-gap optical pumping. The nonlinear nature of the signal enables us to probe the interface directly. Output of a home built Ti:Sapphire laser and BBO crystal were used to generate 30fs pulses of two colors (405nm and 810nm). The 405nm pulse was used to pump the LAO/STO interfaces, while 2nd harmonics of the 810nm pulse generated at the interfaces was probed as a function of the time delay. Signals from samples with varying LAO thicknesses clearly correlates to the metal-insulator transition. Distinct time dependent signals were observed at LAO/STO interfaces grown on different substrates. Experiments performed at different optical polarization geometries, interface electric fields and temperatures allow us to paint a clearer picture of the novel oxide heterostructures under investigation.

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