

Terahertz probe of hidden superconducting coherence in the stripe phase of high- T_c cuprate superconductors

Ryo Shimano^{1,2}

¹*Cryogenic Research Center, The University of Tokyo*

²*Department of Physics, The University of Tokyo*

We report on two-dimensional terahertz (2D-THz) spectroscopy performed on the La-based high- T_c cuprate superconductors $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ (LSCO) and $\text{La}_{1.6-x}\text{Nd}_{0.4}\text{Sr}_x\text{CuO}_4$ (LNSCO) to investigate the interplay between superconductivity and stripe order, where charges and spins spontaneously organize into a stripe structure within the CuO_2 plane. Nonlinear THz signals were clearly observed in the superconducting phase of both systems. In LSCO, nonlinear signals originating from the c-axis Josephson plasmon emerged below the superconducting transition temperature T_c , indicating the development of c-axis superconducting coherence. In contrast, for LNSCO-which exhibits static charge and spin stripe order-nonlinear THz signals were observed even above T_c , suggesting the presence of superconducting coherence within the stripe phase. These experimental results are well reproduced by a model assuming pair density wave (PDW) order in the stripe phase. In this presentation, we will discuss the details of the 2D-THz spectroscopy measurements and present an analysis of the nonlinear Josephson current based on PDW order.