

## Terahertz time-domain spectroscopy on the stripe-ordered $\text{La}_{1.84-y}\text{Eu}_y\text{Sr}_{0.16}\text{CuO}_4$

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Recently, a state of two-dimensional fluctuating superconductivity has been reported in stripe-ordered  $\text{La}_{2-x}\text{Ba}_x\text{CuO}_4$  with  $x = 1/8$ <sup>1</sup>. This is consistent with the results of  $c$ -axis ( $\mathbf{E}||c$ ) infrared optical studies for  $\text{La}_{2-x}\text{Ba}_x\text{CuO}_4$  and  $\text{La}_{2-x-y}\text{Nd}_y\text{Sr}_x\text{CuO}_4$ , that the Josephson plasma resonance originating from Josephson coupling of the  $\text{CuO}_2$  planes disappears in the stripe phase<sup>2</sup>.

To clarify the universality of this phenomena, we performed terahertz time-domain reflection spectroscopy measurement, in which one can obtain lower frequency information than the conventional Fourier transform type spectrometer, on stripe-ordered  $\text{La}_{1.84-y}\text{Eu}_y\text{Sr}_{0.16}\text{CuO}_4$  ( $y = 0, 0.1, 0.2$ ). We observed the systematic shift of the Josephson plasma resonance with  $y$  and we could observe the Josephson plasma resonance even for  $y = 0.2$ . This is the first observation of the Josephson plasma resonance in such low  $T_c$  sample ( $T_c = 13$  K) and low frequency region. Detail of the Josephson plasma resonance will be discussed.

<sup>1</sup>Q. Li, M. Hucker, G.D. Gu, A.M. Tsvelik, and J.M. Tranquada, Phys. Rev. Lett. **99**, 067001 (2007).

<sup>2</sup>A.A. Schafgans, C.C. Homes, G. D. Gu, Seiki Komiya, Yoichi Ando, and D.N. Basov, Phys. Rev. B **82**, 100505(R) (2010).