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Towards two-dimensional superconductivity in $La_{2-x}Sr_xCuO_4$ in a moderate magnetic field[1]

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We report a novel aspect of the competition and coexistence between antiferromagnetism and superconductivity in the prototypical high-Tc cuprate $La_{2-x}Sr_xCuO_4$ (La214). With a modest magnetic field applied $H \parallel c$-axis, we monitored the infrared signature of pair tunneling between the CuO_2 planes and discovered the complete suppression of interlayer coupling in a series of La214 single crystals. We find that the in-plane superconducting properties remain largely intact, in spite of increased antiferromagnetism in the planes. Thus, our experiments show that an isolated CuO_2 plane is capable of maintaining high-Tc superconductivity. The theoretical framework for antiferromagnetic-driven interlayer decoupling is identified in the work of Berg, *et. al.* [E. Berg, *et. al.*, Phys. Rev. Lett. **99**, 127003 (2007) and Cond-mat arXiv:0810.1564].

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