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Fourier Transform Inelastic Tunneling Spectroscopy of $Bi_2Sr_2CaCu_2O_{8+x}$

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Inelastic electron tunneling spectroscopy (IETS) played a central role in determining that phonons were responsible for conventional superconductivity[1]. Since STM-based IETS can reveal local vibrational modes[2], and STM-based Fourier transform scanning tunneling spectroscopy (FT-STS) [3] can reveal momentum-space structure of elastic scattering processes[4], a combination of these techniques might be used to elucidate the momentum-space structure of electron-boson inelastic processes in cuprates[5]. Here we introduce this new STM technique, FT-IETS, in which we map the derivative of the differential conductance, d^2I/dV^2, with atomic resolution in the high-T_c superconductor $Bi_2Sr_2CaCu_2O_{8+\delta g}$. Fourier analysis is then used to search for the momentum-space structure of electron-boson interactions in this system [6]. 1. J.R. Schrieffer, D.J. Scalapino & J. Wilkins, ***Phys. Rev. Lett*** . **10**, 336 (1963); W.L. McMillan & J.M. Rowell ***Phys. Rev. Lett.*** **14**, 108 (1965). 2. B.C. Stipe *et al* ***Science*** **280**, 1732 (1998) 3. J.E. Hoffman *et al* ***Science 266***, 455 (2002) ; J.E. Hoffman *et al* ***Science*** **297,** 1148 (2002). 4. K. McElroy *et al* ***Nature 422***,520 (2003). 5. J.-X. Zhu, J. Sun, Q. Si, and A. V. Balatsky ***Phys. Rev. Lett.*** **92**, 017002 (2004) 6. Jinho Lee *et al*, Submitted.

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