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On infrared and terahertz imaging of surface plasmons in high-Tc superconductors H.T. STINSON, Z. FEI, University of California - San Diego, A.S. RODIN, Boston University, A.S. MCLEOD, M.M. FOGLER, D.N. BASOV, University of California - San Diego — Recent scattering-mode scanning near-field optical microscopy (s-SNOM) experiments have imaged surface plasmons in graphene at infrared frequencies.[1] The scanning probe launches surface plasmons and detects their standing-wave interference pattern upon reflection from the sample edge. The surface plasmon dispersion relation directly relates the standing wave fringe separation and amplitude decay to the optical constants of the sample. We have modeled surface plasmon s-SNOM imaging for high-Tc superconductor (HTSC) thin films. Our results indicate that surface plasmons can be imaged in HTSCs at frequencies near or below the superconducting gap. This would allow for a direct measurement of HTSC optical constants below the gap. For known HTSCs such as YBCO, this is in the far-IR or terahertz range. Our simulations show that this method can also distinguish between superconducting and normal states at the nanoscale.

[1]Z. Fei et al., Nature, **487**, 82 (2012).

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