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Optical Study of Optimally Doped and Overdoped YBCO[1] MINGHAN CHEN, D.B. TANNER, Department of Physics, University of Florida, Gainesville FL 32611-8440, USA, G. HAMMERL, J. MANNHART, Center for Electronic Correlation and Magnetism, Institute of Physics, Augsburg University, Augsburg 86135, Germany — Thin films of the optimally-doped and overdoped high temperature superconductor ($YBa_2Cu_3O_{7-\delta}$ and $Y_{0.7}Ca_{0.3}Ba_2Cu_3O_{7-\delta}$ with T_c= 90 K and 79 K, respectively) have been investigated by optical spectroscopy in the ab-plane. In the normal state, with increasing the carrier concentration in the CuO_2 planes, spectral weight is lost in the high-frequency charge-transfer band and transferred to lower frequencies. With increased doping, the free-carrier (Drude-like component) plasma frequency increases, consistent with a charge density increase. However, the superfluid density decreases in this regime (overdoped region) and a substantial normal-fluid component still exists in the low frequency part of the optical conductivity well below T_c.

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