Intraband Optical Spectral Weight in the presence of a van Hove singularity: application to $\mathbf{Bi_2Sr_2CaCu_2O_{8+\delta}}$[1] FRANK MARSIGLIO, University of Alberta, FABRIZIO CARBONE, ALEXEY KUZMENKO, DIRK VAN DER MAREL, Universite de Geneve — While the Kubo sum rule is often applied to the entire optical spectral weight to learn about the bare plasma frequency, the so-called "Kubo single band sum rule" is used to determine the optical spectral weight corresponding to intraband transitions in the valence band. We use a tight binding band with further than nearest neighbour hopping to explore the range of superconductivity-induced changes that are possible. We find that changes of both signs can occur within a conventional BCS framework. Using a band structure determined for $Bi_2Sr_2CaCu_2O_{8+\delta}$, we find that a straightforward BCS calculation of the optical spectral weight cannot account for the experimental observations. Including a scattering rate collapse phenomenologically, however, gives a very good description of the change in optical spectral weight at T_c as a function of doping.

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Date submitted: 05 Dec 2006   Electronic form version 1.4