

Abstract Submitted  
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**Theory of Raman Scattering from Leggett's Collective Mode in a Multiple Band Superconductor: Application to MgB<sub>2</sub>** MILES KLEIN, University of Illinois at Urbana-Champaign — Using an extension of BCS theory to a two-band superconductor, Leggett showed that if the relevant parameters obeyed certain conditions a collective mode would exist corresponding to the counter flow of the two condensates.<sup>1</sup> I have extended earlier work on electronic Raman in superconductors<sup>2</sup> to the multiple band case in order to incorporate Leggett's theory. The following effects have been included: (a) Vertex correction in the particle/hole channel where the Raman vertex acts. (b) Realistic parameters that apply to MgB<sub>2</sub> yielding a counter flow mode that decays into the pair-breaking continuum associated with the lower gap  $\pi$  band. (c) Large finite wave-vector effects due to the relatively large Fermi velocity of the  $\pi$  band. (d) Integration over the wave-vector in part (c) necessitated by the exponential decay of the photon fields traveling into and out of the metallic sample. A comparison to the results of Blumberg<sup>3</sup> will be given. <sup>1</sup>A.J. Leggett, *Progr. Theor. Phys.* **36**, 901 (1966). <sup>2</sup>M.V. Klein and S.B. Dierker, *Phys. Rev. B***29**, 4976 (1984). <sup>3</sup>G. Blumberg et al., *Phys. Rev. Lett.* **99**, (2007); arXiv:0710.2803.

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