Calculation of the magneto-optical response of Kane fermions in HgCdTe

JOHN MALCOLM, ELISABETH NICOL, University of Guelph — The concentration \( x = x_c \approx 0.17 \) in \( \text{Hg}_x\text{Cd}_{1-x}\text{Te} \) describes a critical value in the phase transition between semimetal \((x < x_c)\) and semiconductor \((x > x_c)\). At this critical value, the low-energy quasiparticle dispersion exhibits a node at the intersection of two doubly degenerate linear cones and an equally degenerate flat band; quasi-particles that have been dubbed Kane fermions [1]. We present our results for the calculation of the magneto-optical spectra of these Kane fermions in the three-dimensional material, which can be compared to experiment, and also for those confined to only two-dimensions. The latter allows for a direct comparison to the analogous theoretical Dirac-Weyl system in two dimensions with pseudospin one [2].