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**Ferromagnetism and infrared electrodynamics of GaMnAs** B.C. CHAPLER, University of California San Diego, S. MACK, University of California Santa Barbara, R.C. MYERS, The Ohio State University, K.S. BURCH, University of Toronto, N. SAMARTH, The Pennsylvania State University, D.D. AWSCHALOM, University of California Santa Barbara, D.N. BASOV, University of California San Diego — In this work we experimentally address both the magnetic and the electronic properties of the prototype dilute magnetic semiconductor $Ga_{1-x}Mn_xAs$ using infrared (IR) spectroscopy. We first examine the relationship between the carrier density, determined through a sum-rule analysis of our data and additional IR data available in the literature, and the ferromagnetic transition temperature $T_C$. Our analysis supports the conclusion that the Fermi level resides within a Mn-induced IB, and that the location of the Fermi level within the band plays a key role in controlling $T_C$. Additionally, we perform a detailed examination of the spectral features observed in the IR data of our $Ga_{1-x}Mn_xAs$ films, and show that these features are also consistent only with a Mn-induced IB scenario. In this latter vein, we will discuss and resolve controversies in the literature related to the peak in a broad mid-IR resonance observed in $Ga_{1-x}Mn_xAs$ IR spectra.

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