Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Compensation, interstitial defects and ferromagnetism in III-V semiconductors TIMOTHY ZIMAN, Institut Laue Langevin, GEORGES BOUZERAR, Laboratoire Louis Neel, CNRS, Grenoble, JOSEF KUDRNOVSKÝ, Institute of Physics, Academy of Sciences of the Czech Republic — In diluted magnetic semi-conductors, e.g. Ga(Mn)As, Ga(Mn)N and In(Mn)As, the observed magnetism depends strongly on methods of preparation and sample history, with correlation between the Curie temperature T_c and the conductivity for the same concentration of magnetic ions. The transport measurements show that the simple picture of substitution of Mn^{2+} ions for Ga sites is insufficient and effects of defects, e.g. Mn interstitials and As anti-sites, must be included. We present a quantitative theory, using magnetic exchange interactions from carrier- and impurity- concentration dependent *ab initio* estimates, and a recently developed semi-analytic theory[1,2]. Spin fluctuations are treated in a locally self-consistent RPA approach, and disorder exactly, by sampling. Very good agreement, without ajustable parameters, is obtained for the T_c of different samples. We predict T_c as a function of hole concentration for $Mn_xGa_{1-x}As$ and $In_xGa_{1-x}As$. For fixed x, T_c is non-monotonic in carrier concentration for a restricted region of carrier density and vanishes outside. [1]G. Bouzerar, T. Ziman, J.Kudrnovský, cond-mat/0405322 [2]G. Bouzerar, T. Ziman, J.Kudrnovský, Appl. Phys. Lett. (scheduled Nov. 29 2004), cond-mat/0407101

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Date submitted: 08 Dec 2004 Electronic form version 1.4