Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Epitaxial engineering of ferromagnetism in (GaAs)/(Ga,Mn)As digital superlattices.[1] M.J. WILSON, G. XIANG, B.L. SHEU, P. SCHIFFER, N. SAMARTH, Penn State University — Recent theory predicts novel pathways for the epitaxial engineering of ferromagnetism in GaAs/MnAs digital superlattices grown along different crystalline directions [Franceschetti et al, PRL 97, 047202 (2006)]. This has motivated us to systematically study GaAs/(Ga,Mn)As digital superlattices grown along the [001], [110], [201] and [311] directions. We have characterized these samples using SQUID magnetometry, magnetotransport,TEM and SIMS. We observe clear trends in the Curie temperature that are correlated with the epitaxy direction and the GaAs spacer layer thickness. Our results suggest that – for a given Mn concentration – the Curie temperature of (Ga,Mn)As may depend on the geometrical arrangement of the Mn ions. We also explore alternative explanations, such as an orientation dependence of the Mn incorporation rate and defect formation energies.

[1]Work supported by the DARPA PROM program

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Date submitted: 27 Nov 2007 Electronic form version 1.4