Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Experimental methods for fabricating ultra-shallow undoped 2DEGs in GaAs-AlGaAs heterostructures K DAS GUPTA, W. Y. MAK, H. E. BEERE, I. FARRER , D. A. RITCHIE, Cavendish Laboratory, University of Cambridge , SEMICONDUCTOR PHYSICS GROUP TEAM — The 2-dimensional electron gas (2DEG) at a GaAs-AlGaAs heterointerface forms the starting point for several experiments with 1-dimensional channels, quantum dots and mesoscopic rings. Usually for these experiments, the despth of the 2DEG from the wafer surface is about 100 nm. In structures where modulation doping or delta doping is used this distance is dictated by the need to have a large enough spacer layer to reduce scattering and switching noise from remote ionsied dopants. Very shallow high mobility 2DEGs would be useful in defining smaller lithographic features that conveniently approach the single electron limit. These would also enable several experiments with laterally coupled 1-dimensional channels and rings. In this talk we present an experimental method of making fully undoped and shallow ($<$ 30nm) 2DEGs. We have developed a method of making very low resistance (less than 50 Ω) contacts to these structures and systematically studied the evloution of the mobility as a function of the depth of the 2DEG (from 300nm to 30nm). We also demonstrate a way of extracting quantitative information about the surface states from the data.

K Das Gupta
Cavendish Laboratory, University of Cambridge

Date submitted: 19 Nov 2009 Electronic form version 1.4