Abstract Submitted
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Computation of the influence of scanning probe microscope (SPM) on quantum dot eigenstates and 2DEG potential MICHAEL STOPA, Harvard University — We calculate the electronic structure of GaAs-AlGaAs two-dimensional electron gas (2DEG) devices, such as quantum dots and quantum point contacts (QPCs) in the presence of a tip of a scanning probe microscope at some distance above the surface. The calculation employs standard density functional theory with exchange and correlation treated in the local density approximation. The position and voltage on the tip are varied and the conditions for depletion of the 2DEG are shown to compare favorably to experiment [1]. We show that the size of the depletion region created (by a negative tip voltage) is unexpectedly small due to focusing of the potential lines by the higher dielectric. We study the interaction of the tip with an isolated quantum dot that contains one or two electrons. The raster pattern of the *difference* between single particle energies reveals that the tip distorts the shape of the confining potential and suggests that excited state properties, if they can be measured experimentally, can contribute to the resolution of spatial information. [1] M.A. Topinka, R.M. Westervelt, E.J. Heller, "http://meso.deas.harvard.edu/papers/Topinka, PT 56 12 (2003)" (Imaging Electron Flow), Physics Today **56**, 12 (2003).

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