Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Localised magnetic fields in arbitrary directions using patterned nanomagnets ROBERT MCNEIL, R.J. SCHNEBLE, M. KATAOKA, T. KASAMA, R.E. DUNIN-BORKOWSKI, J.M. FEINBERG, R.J. HARRISON, C.J.B. FORD, C.H.W. BARNES, D.H.Y. TSE, T. TRYPINIOTIS, J.A.C. BLAND, D. ANDERSON, G.A.C. JONES, M. PEPPER, University of Cambridge — Controllable local electric fields on nanometer length scales have revolutionised quantum electronics, but local magnetic fields are less well developed. Nanometer-scale magnets may be engineered to give qualitatively different behaviour from that seen in larger similar shapes. We present designs of patterned magnetic elements that can produce remnant fields of 50 mT (potentially 200 mT) confined to chosen, submicron regions, in directions perpendicular to an external initializing field. We have fabricated an example to confirm the modeling, and have imaged the resulting magnetic field using electron holography. A wide variety of magnetic-field profiles on nanometer scales can be produced and the ability to apply electric fields, for example to move a quantum dot between regions of differing magnetic-field strength or direction, makes this a powerful technique.

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Date submitted: 14 Dec 2009 Electronic form version 1.4