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Microwave guiding of electrons in a planar quadrupole guide ROMAN FRÖHLICH, JOHANNES HOFFROGGE, Max Planck Institute of Quantum Optics, Garching, Germany, MARK A. KASEVICH, Department of Physics, Stanford University, Stanford, CA, PETER HOMMELHOFF, Max Planck Institute of Quantum Optics, Garching, Germany — We present the first experimental realization of electron guiding in a linear Paul trap.[1] The guiding potential is generated by a microfabricated electrode layout on a planar substrate, similar to surface-electrode ion traps. In comparison to ion traps much higher driving frequencies are necessary. To obtain stable trajectories, we drive the structure at 1 GHz leading to a guiding potential with transverse frequencies of about 150 MHz. The feasibility of electron guiding is demonstrated by forcing a low energy electron beam traveling 500 μm above the chip's surface on a curved path. For electron energies between 1 eV and 5 eV we present the influence of trap stability and depth on the electron signal over a wide range of driving frequencies and voltages. Furthermore we characterize second generation substrates fabricated by thick film lithography that minimize charging effects and discuss realizing more complex guiding potentials like e.g. beam splitters. The future prospects of combining these electron guiding structures with coherent electron emitters like single atom tips will be discussed as well.

[1]J. Hoffrogge, R. Fröhlich, M. A. Kasevich and P. Hommelhoff - submitted (2010) arXiv:1012.2376v1

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