Fabrication of High Quality Electronic Fabry-Perot Interferometer in the Quantum Hall Regime

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We report on study of electronic Fabry-Perot interferometer fabricated from an ultra-high mobility GaAs/AlGaAs quantum well. The interferometer features a pair of narrow constrictions through which a circular droplet of electrons is connected to the rest of the bulk two-dimensional electron system. The Fabry-Perot interferometer was defined using electron-beam lithography. Trenches for the side gates were dry etched to the depth of the two-dimensional electron gas and metalized with TiAu via a lift-off process. The width of the constrictions was defined to be 400 nm, with the overall diameter of the interferometer 1.2μm. Magnetotransport in the quantum Hall regime reveals a set of prominent, periodic oscillations reminiscent of Aharonov-Bohm effect. From the flux period scaling, the effective area of the interferometer can be self-consistently determined. Our findings are mostly in agreement with the predictions of the interacting model of quantum Hall Fabry-Perot interferometers.

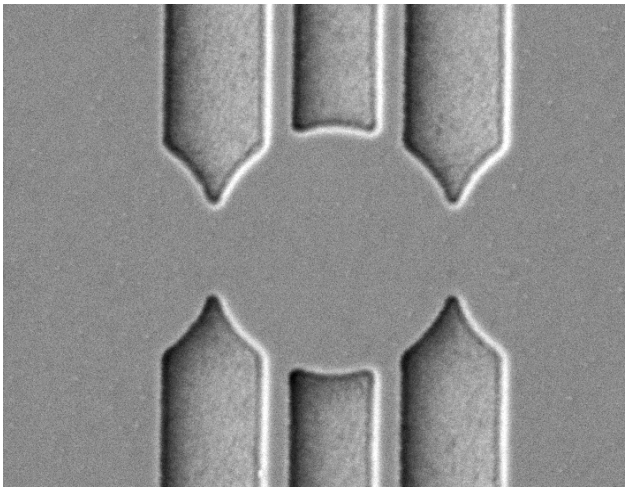

Figure 1: The Electronic Fabry-Perot Interferometer: The micrograph shows an electronic Fabry-Perot interferometer made from GaAs/AlGaAs quantum well via e-beam lithography. The trenches for the metallic gates were dry etched to the depth of the two-dimensional electron gas and metalized with TiAu. The width of the constrictions was defined to be 400 nm, with the overall diameter of the interferometer 1.2μm.