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Ballistic tranport at finite frequencies in 2DEGs and quantum point contacts SUNGMU KANG, PETER BURKE, U.C. Irvine, L.N. PFEIFFER, K. WEST, Lucent Technologies — In this talk, we present our work on ballistic transport in both the spatial limit and temporal limit. In the temporal limit, we have characterized[1] the ac impedance of 2DEGs contacted with ohmic contacts at frequencies above and below the momentum scattering frequency, which is of order GHz for high mobility 2DEGs. The crossover from omega tau < 1 to omega tau > 1 is clearly observed. Additional non-linear effects due to plasma wave rectification in gated geometries are also under investigation, which will lead to new modes of HEMT operation not limited by transit-time effects. In order to investigate this we have fabricated devices with asymmetric ac bias conditions on the source/drain. Using an integrated, on-chip high impedance transmission line to connect the source, and a low-impedance contact to a generator on the drain, we are able to quantitatively test the dc and ac behavior of HEMT devices in the resonant limit, where standing-waves of 2d plasmons are generated in the finite length gated region (the channel). Finally, we will present data on the ac impedance of quantum point contact devices, which are ballistic in both senses: device size $<$ mean free path, and frequency $>$ momentum scattering frequency. [1] Sungmu Kang, Peter J. Burke, L. N. Pfeiffer, and K. W. West, Solid State Electronics 48, 2013-2017 (2004).

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[X] Prefer Oral Session
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