



Physical Sciences Seminar

Quantum point contacts and transparent submicron ohmic islands in InAs, towards quantum simulation of non-Fermi liquid p.

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Hybrid metal-semiconductor two-dimensional systems are an attractive platform for exploring correlated electron-electron interactions. Flexible nanopatterning allows design of structures to emulate particular Hamiltonians with electrostatically tunable parameters. Frdric Pierre recently demonstrated a quantum phase transition based on a multichannel charge Kondo effect[1,2] in a GaAs heterostructure with an annealed metal island. With the goal of scaling up towards simulating coherent Kondo lattice interactions, a two-site charge Kondo circuit in GaAs was developed in our group, realizing a unique inter-island interaction and new quantum phase transition[3]. InAs may offer significant advantages: pinning of the surface Fermi level in the conduction band allows for direct ohmic contact to surface metals. Small metallic islands with large charging energies will enable building on earlier charge Kondo work without requiring as low electron temperatures. Working towards developing an InAs-based quantum simulation platform of non-Fermi liquid phases, we have been building on progress made in the growth of high-mobility InAs quantum well heterostructures[4]. I will talk about our recent work on gate-defined quantum point contacts (QPCs) with large g-factor anisotropy and subband spacings, and highly transparent interfaces between submicron metallic islands and quantum Hall edge states[5]. References 1.Z. Iftikhar, et al., Nature 526, 233236 (2015) 2.Z. Iftikhar, et al., Science 360, 13151320 (2018)3.W. Pouse, et al. arXiv:2108.12691 (2021) 4.A. T. Hatke, et al., Applied Physics Letters 111, 142106 (2017) 5.C.L. Hsueh, P. Sriram, et al. (under preparation)

Thursday, October 21, 2021 02:45pm - 03:45pm

Foyer seminar room Ground floor / Office Bldg West (I21.EG.128)



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