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Sub-harmonic gap structure and Magneto-transport in suspended graphene –Superconductor ballistic junctions PIRANAVAN KUMARAVADIVEL, XU DU, Stonybrook University — Inducing superconductivity in graphene via the proximity effect enables to study the rich transport of the massless Dirac fermions at the Superconductor(S) - Graphene (G) interface. Some of the predictions are pseudo diffusive transport in Ballistic SGS junctions at low carrier densities and the unique specular and retro Andreev reflections in graphene. One of the challenges in observing these experimentally is to fabricate highly transparent ballistic SGS junctions that can be probed at low carrier densities near the Dirac point. In this talk we will present our recent results on suspended graphene- Niobium Josephson weak links. Our devices exhibit a mobility of ~ 350000 $cm^2V^{-1}s^{-1}$ with a carrier density as low as 10^9 cm^{-2}. Below the Superconducting transition temperature (T_c) $\sim$ 9K, the devices show supercurrent and sub-harmonic gap structure due to Multiple Andreev reflections. In the vicinity of the Dirac point, the sub-harmonic gap structure becomes more pronounced, which as predicated, is indicative of pseudo-diffusive transport. With a fine scanning of gate voltage close to Dirac point we see emergence of some unusual sub- gap structures. We also report on our study of these samples below the upper critical field of Nb ($\sim$ 3.5T), where superconducting proximity effect coexists with Quantum Hall effect.

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