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Role of the charge inhomogeneity on the breakdown of the quantum Hall effect in narrow single layer graphene devices[1] CENK YANIK, ISMET KAYA, Sabanci University, QUANTUM TRANSPORT AND NANOELECTRONICS LABORATORY TEAM — The breakdown of the quantum Hall effect, which is observed as an abrupt escalation in the longitudinal resistance with an associated loss in the quantization of Hall voltage is the major obstacle against improving the resistance standard which is currently based on this effect. Graphene is inherently a 2D material and has an unusual band structure that allows the quantization of the Hall resistance even at room temperature. These unique properties of graphene make it a good candidate as a high precision metrological characterization tool for the quantum Hall resistance. The uncertainty in the quantum Hall resistance in graphene has been rapidly improving recently and graphene samples have already been shown to reach the precision of the current best 2DEG samples. In this talk, experimental results on the breakdown of the quantum Hall effect in graphene on SiOx is presented. In narrow graphene samples of 1 micrometer width, the charge inhomogeneity is quite prominent and strongly affects the nondissipative transport in the quantum Hall regime. It is observed that in such samples the quantization of the Hall resistance can retain at high current densities in the excess of 1 A/m even in the presence of dissipative potential along the longitudinal probes.

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