# Electronic inhomogeneities in Gr-FETs: An STM/S study

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**Abstract**

Graphene based field electronic transistor (FET) devices have been explored for various applications despite the absence of an energy gap in single layer graphene. The easy proliferation of electron inhomogeneities is another drawback of graphene which eventually prevents one from accessing the Dirac point. In a Gr-FET one rather gets electron and hole puddles due to charge disorder, arising from interface states, traps and adsorbates, even in perfectly charge neutral graphene. This prevents one from accessing the fascinating physics that may actually exist at the Dirac point. We have studied the electronic inhomogeneities in single layer Gr-FETs using STM/S. We probe this inhomogeneity in two ways: 1) spatially resolved tunneling spectra (and their variation with gate voltage) showing the tip gating effects, which eventually helps us in finding the variation in local Fermi energy and 2) STS conductance maps which show the evolution of electronic inhomogeneity with back gate. The length scale of the inhomogeneity grows as one approaches the Dirac point due to the poor screening in graphene near Dirac point. Moreover the local spectra in some places show gate screening due to interface or trap states and the fraction of such places is found to grow with sample aging indicating increase in states at the interface with ageing.