# In-situ Study of the Impact of Aberration-Corrected Electron-Beam Lithography on the Electronic Transport of Suspended Graphene Devices

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The implementation of aberration-corrected electron beam lithography (AC-EBL) in a 200 keV scanning transmission electron microscope (STEM) is a novel technique that could be used for the fabrication of quantum devices based on 2D atomic crystals with single nanometer critical dimensions, allowing to observe more robust quantum effects. In this work we study electron-beam sculpturing of nanostructures on suspended graphene field effect transistors using AC-EBL, focusing on the in-situ characterization of the impact of electron beam exposure on device electronic transport quality. When AC-EBL is performed on a graphene channel (local exposure) or on the outside vicinity of a graphene channel (non-local exposure), the charge transport characteristics of graphene can be significantly affected due to charge doping and scattering. While the detrimental effect of non-local exposure can be largely removed by vigorous annealing, local-exposure induced damage is irreversible and cannot be fixed by annealing. We discuss the possible causes of the observed exposure effects. Our results provide guidance to the future development of high-energy electron-beam lithography for nanomaterial device fabrication.