Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Vertical Graphene-base transistor on GaN substrate AHMAD ZUBAIR, OMAIR SAADAT, YI SONG, JING KONG, MILDRED DRESSELHAUS, TOMAS PALACIOS, Massachusetts Instiute of Technology — The high carrier mobility, saturation velocity and thermal conductivity make graphene an attractive candidate for RF electronics. In addition to conventional lateral transistors, several alternative vertical device structures like hot electron transistors have been demonstrated to be promising for RF applications. The unique combination of sub-nanometer thickness and high conductivity makes graphene an excellent base material for hot electron transistors by lowering the base transit time in these vertical devices. The demonstrated graphene-base hot electron transistor performance is limited by low current density and low common-base current gain. In this work, we fabricated a graphene-base transistor on GaN/AlGaN heterostructure. We studied the tunneling from GaN/AlGaN heterojunction to graphene and compared with other demonstrated vertical graphene-base devices. We also investigated the effect of AlGaN thickness and different filtering barriers on both room temperature and low temperature transport characteristics of the fabricated devices. With careful design and optimization of the structure, graphene-base transistors on GaN substrate can be a potential candidate for future graphene RF electronics.

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Date submitted: 15 Nov 2013 Electronic form version 1.4