Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Theory of near-field response of graphene-graphene plasmonic heterostructures: Symmetry breaking in rotationally disordered bilayer graphene DAN YOU, Lehigh University, Department of Physics, LE WANG, MICHAEL E. GOODRICH, XIAOJI G. XU, Lehigh University, Department of Chemistry, SLAVA V. ROTKIN, Lehigh University, Department of Physics, Department of Materials Science and Engineering — High field confinement one of the important goals in nanophotonics devices - has been already demonstrated in graphene plasmonics. Confined (vs. propagating) plasmons, that give even stronger field localization, were observed in graphene with metallic resonators/antennas and in nanostructured graphene. However hybridization of plasmons with the resonances of the substrate which happens frequently in ordinary devices impeded studies of intrinsic wavefunctions of plasmons so far. With the help of the mid-infrared scattering-type Scanning Near-field Optical Microscopy direct mapping of angular distribution of plasmon wave functions is demonstrated here in graphene-graphene heterostructure made of a nano-disk covered by a monolayer graphene. Using excitation frequencies well above SiO2 substrate resonances a clean quantized plasmonic signal was obtained. This talk will further present the model of plasmon hybridization which allows to explain experimental angular patterns of confined plasmonic modes. In particular, mixing of angular momentum is induced by the rotational disorder in bilayer disk lattices. Moire pattern of the rotationally displaced graphene lattice is shown to produce confined modes of the mixed symmetry, not expected in the ordinary 2DEG plasmonics.

Dan You
Lehigh University, Department of Physics

Date submitted: 11 Nov 2016 Electronic form version 1.4