Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Three-dimensional topological insulator based nanospaser HARI PAUDEL, VADYM APALKOV, MARK STOCKMAN, Georgia State Univ — After the discovery of spaser, now it has been possible to deliver optical energy beyond the diffraction limit and generate an intense source of optical field. Spaser is a nanoplasmonic counter part of laser. One of the major advantages of spaser is the size: spaser is truly a nanoscopic device whose size can be made smaller than skin depth of the material to a size as small as the nonlocality radius. Recently, an electrically pumped graphene based nanospaser has been prosposed that operates in the mid-infrared frequency (Apalkov & Stockman). Here we propose an optically pumped nanospaser based on 3-dimensional topological insulator (3D TI) materials such as Bi2Se3 that operates at an energy equal to the bulk bandgap energy and uses the surface as a source for plasmons and its bulk as a gain medium. The population inversion is obtained in the bulk and radiative energy of exciton recombination is transferred to surface plasmons of the same material to stimulate spasing action. As this spaser operates in the mid-infrared spectral region, it can be a useful devices for number of applications such as nanoscopy, nanolithography, nanospectroscopy, and semi-classical information processing.

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Date submitted: 27 Oct 2015 Electronic form version 1.4