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The back – gated AlGaN/GaN HEMT structure for observation of twisted plasmonic states in terahertz frequency range.

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The Inverse Faraday Effect (IFE) is the appearance of stationary magnetic moments magnetization caused by circulary polarized ligh. Up to this moment, IFE has been mostly studied in the magnetic materials. In recent years, the IFE was predicted in the periodic lattice of metallic disks or spheres placed in the vicinity of two-dimensional electron liquid and under illumination of the external circularly polarized light. The radiation causes the DC current loops in the electron liquid, thus leading to appearance of static magnetic moments. As a result, the interaction between metal disks and two-dimensional electron liquid, the "twisted" plasmonic modes are excited what leads to the appearance of DC circulating current due to rectification. In this work, we present the basic idea of IFE. The mechanism of the effect is described and the theoretical predictions are presented. We propose GaN/AlGaN as a basic system for the experimental realization of the IFE. We present GaN/AlGaN HEMT like structure with 2-dimensional electron gas as a channel, that was made in order to observe the twisted plasmonic modes experimentally. On top of the structure, the periodic lattice of metal disks was fabricated with use of electron beam lithography. We present the theoretical predictions and the technological realization of the structure as well as its basic characterization. The frequency of the twisted plasmonic modes is expected to be in range of 0.6 - 1.2 THz thus leading to potential applications in terahertz physics and technology.

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