Edge magnetoplasmons in strongly non-uniform magnetic field

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We have theoretically studied two-dimensional electron gas (2DEG) placed in a strong laterally non-uniform magnetic field, which appears due to ferromagnetic film, see Fig 1. We have found, that in this case 2DEG experiences static charge redistribution that strongly depends on presence and configuration of the gates on the surface of a heterostructure [1].

Also, it is shown that lateral inhomogeneity of a strong magnetic field allows itself "magnetic gradient" or "magnetic-edge" magnetoplasmons due to complex lateral structure of magnetic field gradient. This mechanism is different from usual "density gradient" edge magnetoplasmons [2, 3]. We have investigated two families of different-chirality modes localized near the edge of the magnetic film. They are characterized by different direction of magnetoplasmon propagation that is determined by the sign of the gradient of magnetic field in the region where pertinent family of the modes is mainly localized.

Spectrum of plasmons is sensitive to preparation of a heterostructure surface. We have analyzed in detail influence of the electrostatic boundary conditions near the edge of metal gate in particular, due to ferromagnetic film. We have found, that gate always screens out long range Coulomb interaction and kernel of the integral equation that determine dispersion of magnetoplasmons remains finite. Therefore, contrary to the previous findings [2,3] none of the fundamental state has logarithmically large phase velocity at small wave vectors.

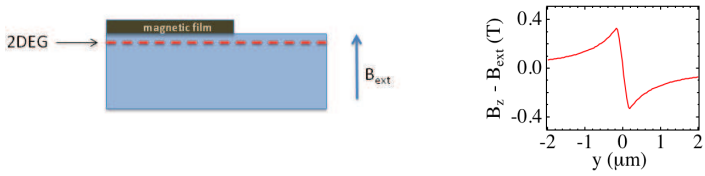

Fig. 1 Heterostructure layout and profile of the magnetic induction at the edge of the ferromagnetic film in perpendicular external field.

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[3] O. G. Balev and P. Vasilopoulos, *Phys. Rev. Lett.* **81**, 1481 (1998)