Diploma thesis abstract

Plasmonic resonances of nanogratings for optical radiation control

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Using diffraction gratings of nanometer thickness, process of generation of surface plasmon polaritons is studied. The gratings with constant spacing and the gratings with exponentially deformed spacing are compared. Using semi-analytical numerical methods such as the method of rigorous coupled waves and the scattering matrix method, the frequency and angular spectra of the reflection and transmission coefficients in the different diffraction orders are calculated, as well as the phase of the complex coefficient of mirror reflection depending on the angle of incidence. It is shown that the deformation of grating's period leads to the presence of regions with positive second derivative in the complex coefficient of mirror reflection dependence. This effect allows one to restore the profile of the diffractively broadened beam after the reflection from such a nanograting. To achieve the desired characteristics of phase of coefficient of mirror reflection and estimate the parameters of grating's deformation the analytical expression for the mirror reflected electric field is obtained using two-wave approximation and the slowly varying envelope approximation. The obtained results can help to plan and to interpret experiments with diffraction nano gratings.