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SNOM investigation of the electromagnetic field intensity and polarization distribution in the vicinity of nanostructures DMITRIY MUZYCHENKO, MIHAIL BASHEVOY, ALEXANDR EJOV, SERGEY MAGNITSKIY, DMITRIY MALAKHOV, VLADIMIR PANOV, JARKIN TOURSINOV, Moscow State University M.V.Lomonosov, MOSCOW STATE UNIVERSITY M.V.LOMONOSOV TEAM — Experimental and calculated results of the investigation of the electromagnetic field distribution including its polarization characteristics in the vicinity of the surface submicro- and nanostructures are presented. Experimental investigation was realized by aperture type scanning near-field optical microscopes (SNOM), which provided both high spatial resolution and large scanning range. Shear-force detection was used for the control of aperture to surface gap. Normal resolution better than 0.1 nm was demonstrated for this gap control system. Collection mode was used for electromagnetic field distribution observation. Theoretical computation was realized by finite-difference time-domain (FDTD) method. Experimental 3D maps of intensity and polarization distribution as result of diffraction of light at sub-wavelength aperture in metal screen, dielectric and metallized nanocylinders were obtained. The qualitative difference between the orthogonal polarized components distribution near sub-wavelength aperture in aluminium screen was experimentally shown. The electromagnetic field concentration in the proximity of the dielectric nanocylinders was observed. This observation gives good fit with the results of FDTD computations. Spiral type electromagnetic field distribution pattern was experimentally observed in the proximity of metallized nanocylinders, which is unexpected from both experimental and theoretical points of view.

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