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Nonlinear Laser Lithography implementation for both "normal" and "anomalous" laser induced periodic structuring. IHOR PAVLOV, ONUR TOKEL, OZGUN YAVUZ, GHAITH MAKEY, OMER ILDAY, Bilkent University, OMER ILDAY TEAM — Laser Induced Periodic Surface Structuring (LIPSS) is one of the most prominent directions in laser-material interaction due to both practical and theoretical importance, especially after the discovery of Nonlinear Laser Lithography (NLL) [1], which opens new area for industrial application of LIPSS as an effective tool for controllable, highly ordered large area nanostructuring. LIPSS appear on the surface under laser beam in the form of periodical lines. The LIPSS, that appear perpendicular to laser polarization are called "normal", in contrast to "anomalous" LIPSS appearing parallel to the polarization. Although, NLL technique was already demonstrated for "normal" and "anomalous" LIPSS separately, up to now, there is no clear understanding of switching mechanism between these two modes. In presented paper we have shown that the mechanism relies on interplay between two feedbacks: long range, low intensity dipole-like scattering of light along the surface, and short range, high intensity plasmon-polariton wave. For the first time, we are able to create both types of LIPSS on the same surface by controlling these two feedbacks, obtaining highly-ordered large-area structured patterns in both modes. [1] Oktem et al. Nature Photonics 7, 897, (2013)

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