Analysis On The Stability Of A Waveguide Nanoplasma And The Intensity Variation Observed By Enhanced EUV Fluorescence Using Few-Femtosecond Low-Energy Laser Pulses

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In this paper we present the study of nanostructure-enhanced formation of confined plasma within a gas filled plasmonic waveguide. Few-femtosecond low-energy laser pulses are used for the analysis. The physics of highly nonlinear optical excitation of noble gases in tapered hollow waveguides is also studied. It is found that the threshold behaviour of this nanoplasma is pronounced. This nanoplasma also exhibits bistability of the fluorescent EUV emission that depends on the gas species as well as on pressure. This bistability indicates that there are cascaded excitation processes. During the analysis it has also been observed that the incident laser polarization affects the intensity of the EUV emission. The generation of a nanometric plasma is induced by the local plasmonic field enhancement that results in incoherent extreme-ultraviolet fluorescence from optical transitions of neutral and ionized argon. Although sufficient local intensities are achieved then also such tapered plasmonic waveguides are not suitable for efficient nanostructure enhanced HHG. This research work may lead to applications in the areas of EUV near-field imaging, spectroscopy and lithography techniques.

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