



Contribution ID: 6

Type: **Poster**

## Modeling controlled sub-wavelength plasma formation in dielectrics

*Thursday 18 September 2025 17:05 (1 minute)*

Laser induced damage in dielectrics due to short pulse excitation plays a major role in a variety of scientific and industrial applications, such as the preparation of 3D structured evanescently coupled wave-guides [1] or nano-gratings [2]. The corresponding irreversible material modifications predominantly originate from higher order nonlinearities like strong field ionization and plasma formation, which makes their consistent description imperative for any kind of theoretical modelling aiming at improving user control over these modifications. In particular the associated feedback effects on the field propagation can have drastic implications.

We developed and utilized a numerical model, that combines a local description of the plasma dynamics in terms of corresponding rate equations for ionization, collisions and heating with a fully electromagnetic field propagation via the Finite-Difference-Time-Domain method, adding self-consistent feedback effects like the sudden buildup of plasma mirrors. Here we present recent numerical results regarding the creation and control of sub-wavelength gratings formed at the rear side of pure and gold-coated fused silica films.

[1] L. Englert et al, Opt. Express 15, 17855-17862 (2007)

[2] M. Alameer et al, Opt. Lett. 43, 5757-5760 (2018)

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**Session Classification:** Poster session

**Track Classification:** Micro-/Nanophysics