



1. Title:	Optimization of 13.5 nm Conversion Efficiencies for LPP and DPP EUVL Radiation Sources
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3. Abstract body:

Laser-produced plasmas (LPPs) and discharge-produced plasmas (DPPs) are attractive candidates as 13.5 nm radiation sources for extreme ultraviolet lithography (EUVL). Accurate simulation of the dynamics and spectral properties of plasmas in EUVL experiments plays a crucial role in optimizing the 13.5 nm efficiency. We have developed a suite of plasma radiation and atomic physics codes that are used to simulate in detail the radiative properties of EUVL plasmas.

We perform numerical simulations of the dynamic evolution of LPPs and DPPs using the HELIOS-CR 1-D radiation-magnetohydrodynamics code. HELIOS-CR includes an in-line collisional-radiative (C-R) model for computing the non-LTE atomic kinetics of plasmas at each time step in the simulation. Two-dimensional radiation-hydrodynamics calculations are performed to study the angular distribution of radiation flux onto the EUVL collector optics. We use SPECT3D to generate images and spectra, based on radiation-hydrodynamics simulation output, that can be directly compared with experimental measurements. Atomic, equation of state, and opacity data for Li-, Sn-, and Xe-based systems are generated using the ATBASE and PROPACEOS codes.

Comparisons of simulations of Li and Sn LPP plasmas with experimental measurements have shown good agreement. We will discuss the major features of these simulation tools and present comparisons with experiments.