

Spectroscopic modeling of Ti K- α emission from planar targets irradiated at laser intensities relevant for shock-ignition

R. Florido¹, J. M. Martín-González¹, M. A. Gigosos², G. Cristoforetti³, L. Antonelli⁴, F. Baffigi³,
F. Barbato⁵, D. Batani⁶, L. A. Gizzi³, Ph. Nicolai⁶, O. Renner^{7,8}, V. Tikhonchuk⁶

¹ *iUNAT - Departamento de Física, Universidad de Las Palmas de Gran Canaria, Spain*

² *Departamento de Física Teórica, Atómica y Óptica, Univ. de Valladolid, Valladolid, Spain*

³ *Intense Laser Irradiation Laboratory, INO-CNR, Pisa, Italy*

⁴ *Department of Physics, University of York, York, United Kingdom*

⁵ *Empa Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland*

⁶ *Centre Lasers Intenses et Applications, Université de Bordeaux-CNRS-CEA, Talence, France*

⁷ *Institute of Physics & ELI-Beamlines, Czech Academy of Sciences, Prague, Czech Republic*

⁸ *Institute of Plasma Physics & PALS Facility, Prague, Czech Republic*

Shock-ignition (SI) is a promising ICF scheme relying on the assembly of a deuterium-tritium mixture, and its ignition by a strong shock launched just before the end of the compression stage. One of SI major issues is the interaction of the laser pulse with a long-scale-length plasma formed by the CH ablator, and the impact of generated hot electrons on shock formation and propagation in the compressed shell. In planar-geometry experiments performed at the Prague Asterix Laser System facility at SI-relevant laser intensities –i.e. $I \sim 1 - 3 \times 10^{16}$ W/cm²–, characterization of hot electrons production and its connection with the development of parametric instabilities is being investigated by application of X-ray spectroscopy [1, 2]. Here, we focus on the collisional-radiative [3] study of Ti layer located at the rear side of irradiated plastic targets and spectroscopic modeling of K- α emission produced after inner-shell ionization caused by hot electrons. Sensitivity of spectral features to total amount and energy of hot electrons is assessed. Also, for interpretation of observed spectra, we discuss synthetic spectra obtained from post-processing of hydrodynamics simulations of reported experiments.

Acknowledgements

This work is supported by Research Grant No. ENE2015-67561-R from Spanish Ministry of Economy and Competitiveness and EUROfusion Project No. AWP17-ENR-IFE-CEA-01.

References

- [1] O. Renner *et al.*, 10th IFSA International Conference, St. Malo (France), September 11-15 (2017).
- [2] G. Cristoforetti *et al.*, Phys. Plasmas **25**, 012702 (2018).
- [3] R. Florido *et al.*, Phys. Rev. E **80**, 056402 (2009).