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Improving the current understanding of TNSA experiments at the Laser Light Ion beam-Line via high-fidelity Particle-In-Cell simulations PABLO BILBAO SANTIAGO, Lancaster University - Physics Department, Lancaster University, Lancaster, UK GoLP / Instituto de Plasmas e Fuso Nuclear, Instituto Superior Tcnico, ELISABETTA BOELLA, Lancaster University - Physics Department, Lancaster University, Lancaster, UK, LEONIDA GIZZI, Intense Laser Irradiation Laboratory, INO-CNR, Pisa, Italy, on behalf of the L3IA collaboration, DARIO GIOVE, INFN-LASA, Segrate, Italy, on behalf of the L3IA collaboration — Despite Target Normal Sheath acceleration being the most robust ion acceleration scheme proposed so far, promising practical applications are limited by the stability of the acceleration parameters and the lack of control of the spectral and angular properties of TNSA accelerated beams. We report on detailed numerical modelling of Target Normal Sheath Acceleration under the same experimental conditions of the Laser Light Ion beam-Line (CNR, INFN, Italy) [1]. Realistic one-to-one multidimensional Particle-In-Cell simulations performed with the code OSIRIS [2] are used to gain deeper insight into the physics of laser energy deposition into the plasma and subsequent ion acceleration. The role played by different parameters with low experimental control, such as target ionization and contaminant layer, is also explored with the aim of better understanding their impact on the maximum ion energy. [1] Gizzi L.A., et al., Nucl. Instrum. Methods A909, 160 (2018). [2] Fonseca et al., Lect. Notes Comput. Sci. 2331, 342 (2002).

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