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Numerical study of the target geometry on the proton-boron fusion yield under direct laser illumination

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The α-particle sources present many applications and may be produced through nuclear reactions thanks to laser-driven protons [V. S. Belyaev, A. P. Matafonov, V. I. Vinogradov, V. P. Krainov, V. S. Lisitsa, A. S. Roussetski, G. N. Ignatyev, and V. P. Andrianov, Phys. Rev. E 72, 026406 (2005)]. In this numerical study, the effect of the target geometry, planar or spherical, is investigated and the different particle acceleration processes, responsible for the source of α-particles, analyzed. Thanks to the implementation of nuclear reactions in the particle in cell code SMILEI [J. Derouillat, A.Beck, F. Perez, T. Vinci, M. Chiaramello, A. Grassi, M. Fle, G. Bouchard, I. Plotnikov, N. Aunai, J. Dargent, C. Riconda and M. Grech, Comput. Phys. Comm. 222, 351 (2018)], the spatial and temporal locations of the α-particle sources are presented and highlight the benefit of using a spherical target. Specifically, effects of electric and magnetic fields on ion acceleration are analyzed and show, in spherical geometry, succession of two different acceleration processes leading to an increase of nuclear reactions

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