Sub-micrometer spheres for laser driven ion acceleration

D. Margarone[a], I.J. Kim[c], J. Psikal[a,b], J. Prokupek[a,b], O. Klimo[a,b], T.M. Jeong[c], J. Kaufman[a,b], L. Stolcova[b], J. Proska[b], J. Limpouch[a,b], T . Mocek[a], G. Korn[a]

[a]*Institute of Physics of the ASCR, ELI-Beamlines Project, Prague, Czech Republic;*
[b]*Czech Technical University in Prague, Prague, Czech Republic;*
[c]*APRI/CoReLS, IBS, GIST-campus, Gwangju, Republic of Korea*

The Enhanced-Target Normal Sheath Acceleration (ETNSA [1, 2]) mechanism has been demonstrated in three different experimental campaigns performed at APRI-CoReLS ultraintense femtosecond laser facility. Sub-micrometer polystyrene spheres have been placed at the target front-side in order to enhance the laser absorption and, as a consequence, the number and temperature of the accelerated hot electrons. Such increased laser conversion mechanism at the foil front-side resulted in an increase of maximum energy and total number of the accelerated protons emerging from the target rear-side. Presented results have been obtained by using laser intensities ranging from $5x10^{19}$ W/cm^2 up to $5x10^{20}$ W/cm^2 and plastic targets with an effective thickness of about 1 μm. Experimental results and comparison with particle-in-cell numerical simulations are presented and discussed.

[1] O. Klimo et al., New J. Phys. 13(2011) 053028
[2] D. Margarone et al., Phys. Rev. Lett. 109 (2012) 234801