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Laser Ion Acceleration at ELI-ALPS

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Laser acceleration of ions from both solid and gaseous target attracts a great attention because of its potential medical applications including the hadron therapy. The recent development of ELI facility which will host the laser system capable of generating ultra-short pulses in the multiterawatt or even petawatt power range at high repetition rate, which is crucial for the investigation of new regimes of laser-matter interactions, especially laser proton acceleration. The most stable and well understood mechanism is the TNSA (Target Normal Sheath Acceleration), which usually requires long pulse duration in order to reach high cut-off energy. Since at ELI-ALPS the short pulses are in the center of interest, we have to consider different mechanisms, where the RPDA (Radiation Pressure Dominant Acceleration) is the driving process. The schemes of interest are the collision-less Shock Wave Acceleration and Magnetic Vortex Ion Acceleration, which is more efficient in near-critical density plasma.

Primary author: Dr SHARMA, Ashutosh (ELI-ALPS, Szeged, Hungary)

Presenter: Dr SHARMA, Ashutosh (ELI-ALPS, Szeged, Hungary)

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