Near-term experiments and long-term goals at INURA pulsed ion accelerator in Nazarbayev University

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Nazarbayev University works on establishing a research program on inertial confinement fusion, high energy physics and critical states of matter. Long term plans include building a new multi-MV, ~10 to several hundred GW/cm2 ion accelerator facility which will be used in studies of material properties at extreme conditions. Two design options are being considered. The first option is a 1.2 MV induction linac similar to the NDCX-II at LBNL, but with modifications, capable of heating a 1 mm spot size thin targets to a few eV temperature. The second option is a 2 - 3 MV, ~200 kA, single-gap-diode proton accelerator powered by an inductive voltage adder, to obtain power densities of several hundred GW/cm2 at ~1 cm spot size. In both cases to achieve high beam intensity on target we plan to use plasma neutralization to focus the beam both spatially and temporarily.

Our first beam-physics experiments will be started on currently constructed ion accelerator test-stand (INURA), to be commissioned on December 2016. INURA ion accelerator will have an accelerating voltage of 400 kV, pulse duration of 80 ns, and total beam current of 10 kA. Initially the diode system of the INURA will be based on Br-applied focusing ion diode with an active anode plasma source. Plasma on the anode surface will be generated by an additional high-voltage pulse followed by the primary one. The composition of an ion beam will range from light ions (H^+) to heavy ions (W^+) as determined by the material of the potential electrode. Near-term experiments on INURA ion accelerator will include studies on formation of ablation plasma on the surface of materials, material modification by high intensity pulsed ion beams, ion beam neutralized transport and longitudinal and transverse compression, and research on suitable ion diode concepts.