# NURA - NAZARBAYEV UNIVERSITY RESEARCH ACCELERATOR: A NEW LINAC FOR WDM, HEDP AND HIF

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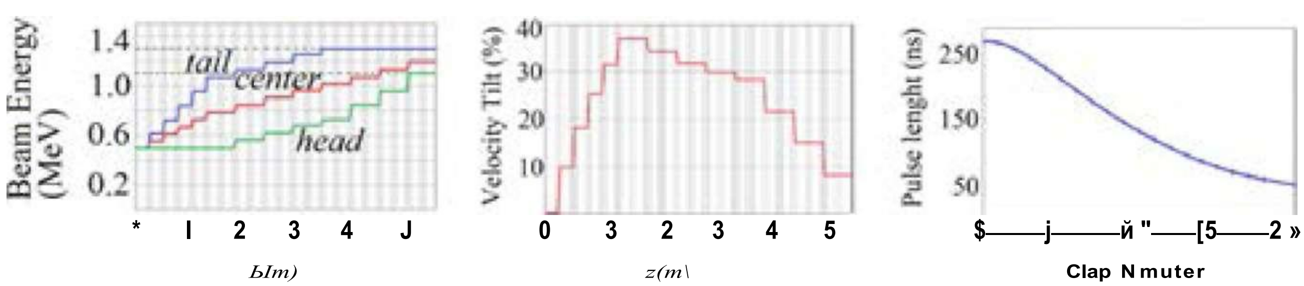
**Introduction.** A project called NURA [1] which is a new linear accelerator (Linac) for Warm Dense Matter (WDM), High Energy Dense Plasma (HEDP) and Heavy Ion Fusion (HIF) is described. The NURA will be similar to the NDCX-II at Lawrence Berkeley National Laboratory featuring an induction linac [2]. Furthermore, the facility will be designed to allow the flexibility of additional laser heating and diagnostic beam in combination with the ion beam.

**Methodology and results.**

**1) Beam quality:** The ion beam pulse delivered by the NURA accelerator is adequate to heat a micrometer-thick solid target to a final temperature of 1eV (11604.5 °K). We have calculated that a 1.2 MeV helium ion bunch will produce a rather uniform energy deposition in gold within the first 1 micrometer (|im) penetration heating it up to 1 eV. In order to minimized the beam spot size, an beam will start with a transverse normalized emittance of ~ 1 pi-mm-mr from the source and limiting to an increase of a factor of two as the beam is transported.. For longitudinal emittance, the initial beam pulse length is a few hundred ns at the ion source to provide 30-50 nC ion charge and will be compressed during acceleration and neutralized drift compression [3].

**2) Calculations and numerical simulations of ion beam:** Our goal is to produce a 1.2 MeV helium beam, then compress it to 0.5 ns, and focus it to a spot radius of 0.5 mm. Preliminary calculation shows that this can be done with 12 induction cells. The first 5 pulsers will deliver voltage ramps (0-->Vmax) where Vmax=110, 112, 114,116, and 118 kV. The next 4 pulsers will deliver flat-top constant voltages of V= 60, 60, 60, and 50 kV. Then the 3 remaining pulsers will deliver reverse ramps (Vmax-->0) where Vmax=110, 120 and 140 kV. This accelerating schedule will accelerate the ion beam from 0.5 MeV (which is injector's output voltage) to 1.25-1.5 MeV and to compress it from 280 ns to 56 ns before reaching the Final Focus Section.




**References.**

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