Production of a High Brightness Beam from a Large Surface Source *

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In today's HIF experiments, e.g. the HCX, the typical K^+ ion current density at the alumino-silicate ion source is about 7 mA/cm^2. This corresponds to an ion source diameter of 10 cm in order to produce 500 mA of beam current. Previous HCX data have indicated that spherical aberrations could degrade the emittance, so an experiment was set up on a 500-kV test stand to study the beam optics and to find ways for improvement. One of the experiments that we plan to do is to aperture the high current beam to enhance its brightness.

Beam diagnostics measurements from Faraday cup, emittance scanner, kapton and optical imaging will be compared with the 3-D WARP simulation in order to benchmark the computer code and confirm the beam optics.

We have also used the large diode to study the physics of controlling beam pulse rise time. Fast rise time is desirable because many potential near-term HIF experiments will require short beam pulses, and this can only be realized if the beam has a fast rise-time. According to a one-dimensional model, the beam head can propagate through the extraction diode with a sharp front edge by applying a special voltage waveform to the diode. Our simulation results showed that a proper waveform can be constructed to produce a 50-ns beam rise time for a real 3-D diode.

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