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A high current, low emittance Li$^+$ alumino-silicate ion source and injector

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We will present the design of a Li$^+$ ion source and injector for the Neutralized Drift Compression Experiment-II (NDCX-II) for warm dense matter experiments. The injector has been designed to use a large diameter ($\approx 11$ cm) Li$^+$-doped alumino-silicate source with an injected ion kinetic energy of 100 keV, pulse duration of 0.5$\mu$s, and beam current of 100mA. Using small prototype emitters, at a temperature of approximately 1275° C, the space charge limited Li$^+$ beam current density of $J \approx 1$ mA/cm$^2$ was obtained for a 0.64 cm diameter emitting area. The lifetime of the ion source is $\geq 50$ hours while pulsing the extraction voltage at 2 to 3 times per minute (a rate expected in NDCX-II). We are designing and fabricating a larger diameter source, in parallel with continuing R & D effort to increase the life time of the ion source.

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