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Development of a Very Compact High-Current Cyclotron Injector System for Future Neutrino Physics and Medical Applications DANIEL KOSER, DANIEL WINKLEHNER, LOYD HOYT WAITES, JOSEPH SMOLSKY, JANET CONRAD, Massachusetts Institute of Technology MIT — For the IsoDAR experiment, which aims to perform a definitive search for sterile neutrinos, a high-current, 60 MeV driver cyclotron is being developed which, besides particle physics, might also enable advances in other high-current beam applications such as the production of medical isotopes. To cope with the high space-charge forces at injection into the cyclotron, a novel scheme for pre-bunching is applied that includes a compact radio-frequency quadrupole (RFQ) of the split-coaxial type. This choice of RF structure enables a small transverse RFQ diameter at the comparatively low operating frequency of 32.8 MHz, which is crucial for the integration of the RFQ into the cyclotron yoke. Beam is injected into the cyclotron central region axially through the RFQ and an electrostatic spiral inflector. The scheme of the compact high-current injector system is described with an emphasis on the technical and beam dynamics design of the newly developed split-coaxial RFQ. At a nominal beam current of up to 10 mA this will constitute a significant advancement for compact high-current pre-accelerator and bunching systems, also in view of other types of hadron accelerators.

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