The CANadian Rare-isotope laboratory with Electron Beam ion source (CANREB) project at TRIUMF [1] produces a large variety of rare radioactive and stable isotope beams for fundamental research. Essential to CANREB is a new radiofrequency quadrupole (RFQ) cooler-buncher [2] operating in grade 5.0 helium gas at 3 MHz, 1.2 kV\(_{pp}\) (q \(\sim 0.2\)) with 60-70 W input RF power. The RFQ is designed to (A) accept beams with <100 pA currents at <60 keV energies, and (B) deliver cooled and bunched beams <10\(^6\) ions/bunch at 100 Hz with >90\% efficiency, <10 eV energy spread, and short <1 us time-spread. Commissioning tests with picoamp beams of 30 keV \(^{133}\)Cs\(^{+1}\) (r \(\sim 5\) mm, angular spread \(\sim 10\) mrad) in \(\sim 5\) mtorr helium yield >90\% transmission through the RFQ with >80\% bunching efficiency. Simulations agree with \(^{133}\)Cs\(^{+1}\) performance characteristics. Here we discuss simulation of beam properties in the RFQ obtained with SIMION to actual performance for \(^{133}\)Cs\(^{+1}\), \(^{85}\)Rb\(^{+1}\) and other isotopes of interest, over a range of energies. Preliminary results indicate q-values for RFQ operation with >90\% transmission occur for 60 keV: \(^{133}\)Cs\(^{+1}\) = 0.10-0.25, \(^{85}\)Rb\(^{+1}\) = 0.09, and \(^{133}\)Cs\(^{+1}\) (18.5 keV) = 0.14-0.30, \(^{85}\)Rb\(^{+1}\) (29 keV) = 0.12-0.16.

References:


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