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Improvement of the MHB quality factor and engineering design

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The linear accelerator RAON, a component of the Rare Isotope Science Project, was developed to accelerate heavy ions from elements ranging from helium to uranium. The injector line consists of an Electron Cyclotron Resonance Ion Source, a Low Energy Beam Transport line, a Medium Energy Beam Transport line, and a Radio Frequency Quadrupole (RFQ). To improve beam quality, a multi-harmonic buncher (MHB) was proposed for inclusion before the RFQ. The MHB is needed to efficiently utilize two beams with different mass-to-charge (A/q) ratios. The MHB resonator operates at three frequencies (40.625 MHz, 81.25 MHz, 121.875 MHz), the fundamental frequency is half the frequency of the RFQ. Electric field simulations of the MHB were conducted using the CST Micro Wave Studio. The electrodes were designed as cone-type electrodes so that the electric field can be concentrated between the electrodes through which the beam passes. The electric field was optimized to account for structural changes such as gap length between electrodes, resonator position and other design details. The model optimized in the simulation tool is drawn through the 3D Inventor program.

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