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Development of Permanent-Magnet-Type ECR Ion Source and Double-Einzel Lens Type LEBT for Compact Neutron Source RANSIII

At RIKEN, a transportable accelerator compact neutron source (RANS-III) is under development for non-destructive inspection of the degradation of old concrete and reinforcing steel on site. RANS-III is applied to bridges and other structures. The 500 MHz radio frequency quadrupole (RFQ) linear accelerator (linac) used as a RANS-III accelerator. As a proton ion source for RANS-III, we developed a permanent-magnet electron-cyclotron-resonance (ECR) ion source and a double Einzel lens. The ECR ion source consists of a 2.45 GHz magnetron, a ridge tuner, plasma chamber, neodymium magnet, and reeler grids. We fabricated a permanent-magnet ECR ion source and double Einzel lens. Subsequently, we conducted a beam property test of the ECR ion source and Einzel lens with a beamline consisting of a Faraday cup and a bending magnet. We measured the effect of the hydrogen-gas flow rate on the beam current and proton fraction and evaluated the ion source conditions for injection into the RFQ linac.

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