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Development of a Laser Ion Source for a Four-Beam Interdigital-H type Radio Frequency Quadruple Linac

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The multi-beam acceleration method is an acceleration technique for low-energy high-intensity heavy ion beams, which involves accelerating multiple beams to decrease space charge effects, and then integrating these beams by a beam funneling system. At the Tokyo Institute of Technology, in order to demonstrate that a four-beam Interdigital-H type Radio Frequency Quadruple (IH-RFQ) linear accelerator is suitable for high-intensity heavy ion beam acceleration, we have been developing a four-beam IH-RFQ linac prototype. As an injection system for a four-beam IH-RFQ linac, we developed a laser ion source using a direct plasma injection scheme (DPIS). The laser ion source is directly connected to the RFQ cavity without a low energy beam transport system, and generates four-ablation plasmas by irradiating a graphite target with four split laser. The plasmas expand through plasma transport pipes and go directly into each RFQ channel. We measured the carbon ion beam properties of the laser ion source such as the output beam current and the charge state spectrum. The details of the laser ion source test bench and the experimental results of the carbon ion beam properties will be presented

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