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P03 - Improvement of compact ion microbeam focusing with the hundreds-keV three-stage acceleration lens system by optimizing the divergence angle of an incident beam

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A several hundred keV compact ion microbeam system with a three-stage acceleration lens system is under development at Japan Atomic Energy Agency. This system consists of a duoplasmatron-type ion source and the three-stage acceleration lenses. The microbeam system was designed to form a hundred nanometer sized ion beam with an energy of 300 keV. In the previous studies, we had shown that the three-stage acceleration lens system worked as a focusing lens as we designed. A proton beam with an energy of 143 keV could be focused down to 17 μm in diameter in the performance test [1,2]. The next goal is to improve the demagnification of the lens system by forming an ion beam with several micro-meters in diameter using 150 keV energy proton beam. Because the microbeam system is placed in the open air at this stage, lower energy operation is required to prevent the lens system form occurring electric discharge. The beam size measurements were carried out by changing the divergence angle of an incident ion beam from the extraction of the ion source to the first acceleration lens. As a result, the demagnification of the lens system was improved by optimizing the incident beam divergence angle. We will report the experimental setup and the result of beam formation test in this paper.

[1] T. Ohkubo, Y. Ishii, Y. Miyake; T. Kamiya, AIP Conference Proceedings, Volume 1525, pp. 370-374 (2013).
[2] Y Ishii, T. Ohkubo, T. Kamiya, Nucl. Instr. Meth. B. in printing.

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