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Development of a 100 mA-class CW microwave ion source for industrial accelerators

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Industrial accelerators are currently employed in a multitude of fields, including semiconductor manufacturing and medicine. In recent years, there has been a growing demand to enhance the irradiation throughput of industrial accelerators, which necessitates the development of high-current ion sources. In this study, we developed a 2.45 GHz off-resonance 100 mA-class CW microwave ion source that can be integrated into industrial accelerators. The design was optimized for proton beam generation. The plasma chamber and the matching section, which is responsible for matching the impedance of the waveguide and the plasma chamber, were designed using a combination of an analytical approach and finite element electromagnetic field analysis. The electromagnets for generating the off-resonance magnetic field to increase the plasma density were designed using finite element magnetostatic field calculations. The design of the single-hole, three-electrode beam extraction system, which operates in acceleration-deceleration mode, was performed using beam orbit calculations that take into account space-charge effects. The design and fabrication have been completed, and beam tests are now underway. In the presentation, in addition to the design of the ion source, we will also report on the preliminary results that were obtained in the beam test.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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