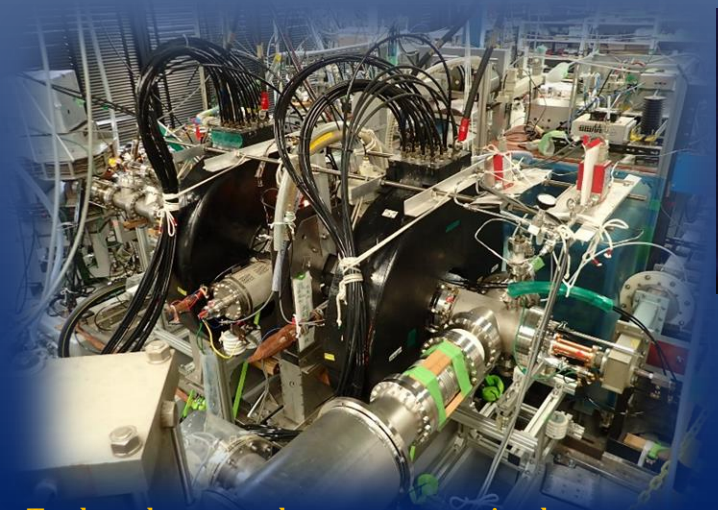
Advanced Beam Systems Engineering, Advanced Electromagnetic Energy Engineering, Division of Electrical, Electronic and Infocommunications Engineering, Graduate School of Engineering

One of the cutting-edge technologies that will support human welfare and society in the future is various beam utilization technologies. Beams with precisely controlled energy, time, and space will not only be used in the field of nuclear physics, but will also open up a world of new applications and the creation of new products such as cancer treatment, space propulsion, and even new functional materials. In the "*Advanced Beam Systems Engineering*" area, we are working on the efficient generation of multiply charged ions used in accelerators, molecular ions that are expected to be useful, the generation of new synthetic molecular ion beams, and their applied research. Normally, an ion beam source is required for each ion type, but we aim to create an universal beam source that can generate beams for a wide range of ion types with a single device, and to establish a next-generation beam system.



Tandem electron cyclotron resonance ion beam source experimental device: An ion beam device that aims to become an universal source with a tandem configuration of the first stage with a cylindrical comb-shaped permanent magnet and the second stage with a magnetic field configuration that combines an octupole permanent magnet with a mirror magnetic field generated by an electromagnet.

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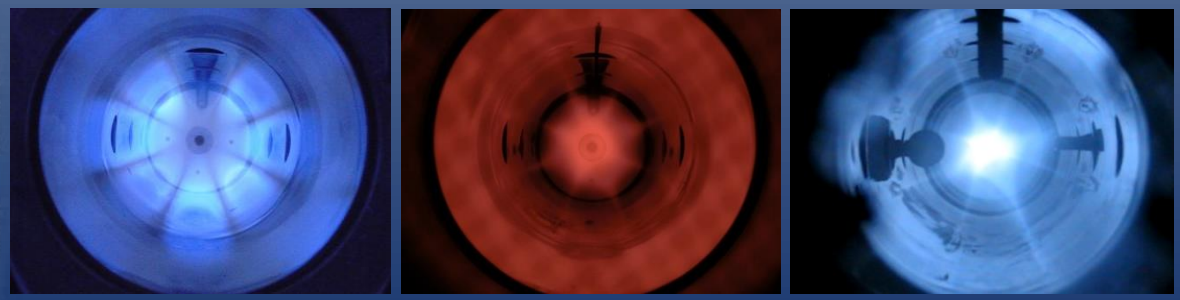
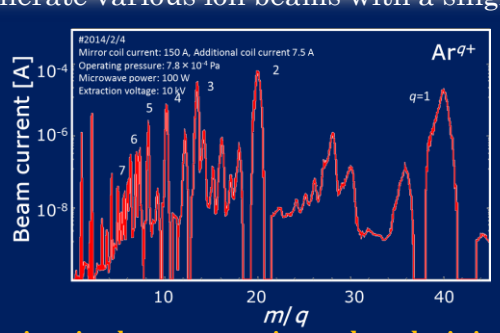
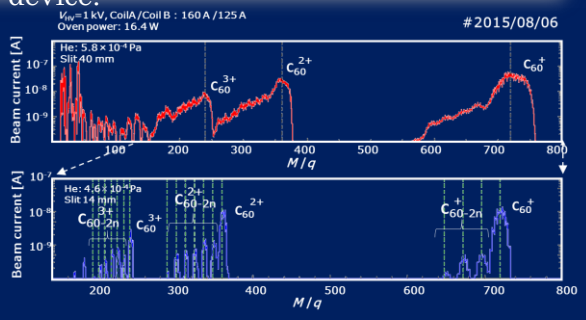


Electron cyclotron resonance (ECR) ion source plasma:
Due to its high yield of multiply charged ions, it is used in high-energy accelerators, *etc*. It is widely used in physical fields such as nuclear physics, biological and medical fields such as heavy ion beam cancer therapy, and engineering fields such as ion implantation, space propulsion, and bio/nanomaterials.

Development of a universal ion beam source that can generate various ion beams with a single device.





Various ion beam generation and synthetic ion beam generation:
We generate ion beams and synthetic ion beams from multiply charged ions with a mass/charge ratio of less than 10 to tens, hundreds, or thousands of ions. We are also developing an unique metal ion beam source for high melting point materials used in gas phase synthesis.