Development of High Intensity Neutron Source and Advanced Fusion System by Innovative Acceleration Technology

Project manager

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Summary of the project

Taking new accelerator technology into the field of nuclear fusion, we will make a paradigm shift in fusion energy development by achieving high intensity and compact innovative accelerator technology.

To achieve high intensity beam, we will establish innovative accelerator technology for ampere-class beams, generating number of neutrons that surpass the nuclear fusion material irradiation facility (IFMIF) and accelerating the development of nuclear fusion reactor materials.

To realize compactness, we will verify the feasibility of a small beam-driven fusion reactor by injecting and heating ions directly into the plasma using an automatic cyclotron resonance accelerator.

By realizing these research and development projects, we aim for a future society with "self-sufficient fuel without relying on imports," "a society that does not increase high-level radioactive waste," "a society that can coexist with fusion reactors," and "an energy source that supports activities in uncharted territories of humanity (such as deep-sea or interplanetary travel)."

Milestone by year 2034

【 Development of Ampere-Class Beam Accelerator Technology 】
To achieve an accelerator that brings a paradigm shift to fusion energy, we will complete the overall design of the innovative accelerator.

【 Development of Automatic Cyclotron Resonance Accelerator 】
To realize the diversity of fusion systems, we will complete the basic design of a beam-driven fusion system.

Milestone by year 2029

Before conducting full-scale research and development, we will carry out a feasibility study on the following matters and use them as decision-making criteria to launch full-scale development research.

By collaborating with researchers in the fields of nuclear fusion and beam technology, we will determine appropriate target parameters, timelines, and achievement goals to ensure that the accelerator makes a significant contribution towards the early realization of fusion energy.

For ampere-class beam acceleration, we will verify feasibility through integrated numerical simulations. For the automatic cyclotron resonance accelerator, we will numerically simulate to demonstrate efficient injection into the plasma.

Once these verifications confirm effectiveness, we will formally begin the development of ampere-class beam accelerator technology and the automatic cyclotron resonance accelerator.

Project structure

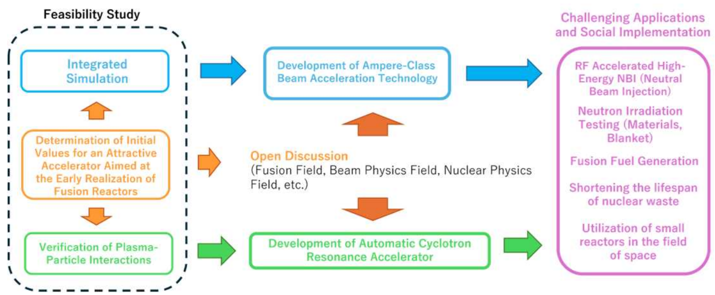

Fig. 1 Approach to Research and Development