1-4. LHD Project Research Collaboration

The LHD Project Research Collaboration program has been contributed to develop basic research activities of the fusion technology and the plasma physics in Japanese universities in a long-term schedule.

The aim of the LHD Project Research Collaboration, being reported here, is to research and develop both technology and the scientific foundations that are useful for both the LHD group and the universities, and then, to apply these results to LHD experiments for the improvement of LHD. The characteristic of this collaboration program is that some R&D's are performed in each domestic university or institute, instead of in NIFS as conventional research collaborations. The advantage of this type collaboration over conventional one is that co-workers can devote themselves to R&D's more efficiently and enthusiastically by spending much more time.

From eight years before, the LHD Project Research Collaboration started to invited public participation from universities and institutes in Japan. Three committees and one advisory council participate in selection process of collaboration subjects. At the beginning, the committees of the Fusion Network in Japan select and recommend some proposed plans to the committee of the LHD Project Research Collaboration in NIFS. NIFS has partnerships with Fusion Network linking three major research fields in Japan: fusion engineering, fusion science and plasma science. Although these fields have been developed independently, intimate collaboration between them is essential for further progress of fusion research. NIFS, as a Center of Excellence (COE) should develop a network of fusion research activities of universities and government institutions, including information exchange, planning, collaboration with foreign institutions and education of graduate course students. An important point to choose a subject of collaboration is a new attempt, which is useful for the LHD project and is not planned in NIFS.

From 2007, LHD team proposed three subjects for supporting research in universities to drive forward the deuterium experiment scheduled to start in a few years effectively.

As the fusion-plasma science program, following subjects were approved last year and reported in this book.

1. Development of Doppler-free spectroscopy for plasma diagnostics
2. Wall Plasma Interaction Using Ablated Plasma Plumes Induced with Laser and Ion Beams
3. Statistical Characteristics of Dynamics and Field Structure on Magnetized Plasmas
4. Effect of outboard helical field on toroidal plasmas
5. Suppression of Carbon Dust Growth and Hydrogen Isotope Retention in the Low Temperature Reactive Plasmas with Nitrogen
6. Development of a compact 14 GHz ECR plasma production unit for a negative hydrogen ion source
7. Physics study on 3-D helical equilibrium plasmas with 2-D imaging diagnostics
8. Two frequency wave excitation experiments
9. Development of the multi-pass Thomson scattering system in the GAMMA 10 tandem mirror
10. Positional stabilization of torus plasma with simple helical coils
11. Development of Cesium-free Hydrogen Negative-ion Source Based on Plasma-assisted Catalytic Ionization
12. Laser-induced Fluorescence Spectroscopy with Femtosecond Laser Pulses
13. Development of the Electron Energy Distribution Function Measurement from Time-derivatives of the Electrostatic Probe Characteristics
14. Static and Dynamical Spectroscopy on Neutral Hydrogen Transport in a Fusion Plasma
15. Development of Neutron Measurement Systems for Study of High-Energy Particle Physics
16. Measurements of Charge Exchange Cross Sections for highly charged tungsten ions with hydrogen atoms
17. Development of Energy Resolved X-ray Video Camera

As the fusion-engineering program, following subjects were also approved last year and reported here.

1. Heat Removal Demo-research for Flibe Blanket Development
2. W-coating on Low Activation Structural Materials
3. Investigation on Environmental Behavior of Organically Bound Tritium
4. Study on biological effects of tritium at animal level
5. Thermal Strain Exerted on Superconductive Filaments in Practical Nb_3Sn and Nb_3Al Strands
6. Development of More Sophisticated Tritium Recovery System of Fusion Power Plant
7. Fabrication of REBCO coil and Application for Fusion Plasma Experimental Device Mini-RT
8. Cool-down and excitation tests of the REBCO coil for the torus plasma experimental device Mini-RT
9. Development of the tungsten materials for high heat flux components application to neutron irradiation conditions in fusion reactor
10. Analysis of tritium transfer dynamics for helical prototype nuclear reactor system design
11. R&D of Joining Technology between Dissimilar Materials for Metallic Components in Blanket
12. A proposal of in-situ diagnostics methods for PFMs under multiple irradiation
13. Study on Mechanisms of Superconductivity Change by Neutron Irradiation
14. Study of selective exhaust of particles on LHD closed divertor
15. Fundamental Engineering of Divertor Element as Heat and Particle Load Convertor for Helical Reactor

These subjects are planned basically as the three years program. Therefore, the reports presented here represent one portion of the total subjects.

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