1-5. LHD Project Research Collaboration

Both fusion technology and the plasma physics are important subjects and must be developed in a long-term program. This program requires collaborations with scientists and researchers from universities and institutes in Japan and also from all over the world.

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 five 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 future deuterium experiment in LHD effectively. Another important point is whether that program can contribute to stimulate university researches and LHD programs.

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

1. Production Mechanism of Impurity Hydrocarbons and their Transportation in LHD plasma
2. Development of Two Dimensional Thomson Scattering Measurement System
3. Experiment of Helical Magnetic Field Configuration Optimization
4. Neutral Flow Field Measurement Using a Single-mode Tunable Diode Laser
5. Study on Electron Bernstein Wave Heating and Current Drive in High Density Plasmas
6. Study of wave physics in high beta plasmas Research of plasma turbulence, turbulent transport and experimental methods
7. Development of Magnetic Island Detector by Magnetics Measurement
8. Characteristics of rf-based hydrogen negative ion source with Cs additive
9. Role of plasma fluctuation for EBW current ramp-up at the electron cyclotron harmonics
10. Control of Rotational Transform by Electron Cyclotron Current Drive in Helical Systems
11. Study of the physics of IDB plasma and the density limit in helical devices
12. Development of a simultaneous measurement system of high-resolution spectra of hydrogen emissions for the study of LHD edge plasma
13. Study of optimum conditions and atomic and molecular reactions on LHD closed divertor

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

1. Experimental study on liquid lithium flow for IFMIF target
2. a) Nitrogen Removal from Liquid Lithium and Improvement of Hydrogen Monitor for Liquid Lithium
   b) Integrated Experimental Process Study for Removal of Tritium and Impurities from Liquid Lithium, II
3. Optimized Thermo-mechanical Design of High Intensity Neutron Source Test Cell for Material Irradiation
4. In situ measurement of surface modification of plasma-facing material during the long duration discharge
5. Evaluation of Advanced Tungsten Materials as Plasma Facing Materials
6. Dynamic Behavior of Tritium Release from Stainless Steel for LHD
7. Compatibility and Mass Transfer Study for Liquid Breeder Blanket System
8. Change in properties of superconducting magnet materials by fission neutron irradiation
9. Feasibility Study of LiPb-He-SiC High Temperature Blanket Concept
10. Development of advanced superconducting conductors for fusion devices
11. Basic studies for reduction of tritium retention, and for recovering and recycling of H, D and T under LHD-DD operations
12. Hydrogen isotope retention behavior on the surface of metal-carbon mixture layer under carbon, hydrogen isotopes and helium simultaneous irradiation circumstance
13. Study on behavior of environmental tritium and assessment of influence on environment
14. Assessment study on biological effects of low-dose radiation
15. Observation of Hydrogen Permeation in LHD and Evaluation of Wall Leakage for DD Experiments
16. Investigation on Deuterium Retention and Desorption in Plasma Facing Wall Toward Deuterium Discharge in LHD
17. Development of High Heat Plasma Generator with Ion Beam Analysis and In-situ Measurement of Hydrogen Isotope Retention
18. Development of Neutron Diagnostic Systems for LHD Deuterium Experiment

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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