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 six 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. Study of wave physics in high beta plasmas
3. Development of a real time control system for MHD Instabilities
4. Radial correlation structure of fluctuation in electron ITB plasmas of LHD
5. Development of magnetic island detector by magnetic measurement
6. Characteristics of RF-based hydrogen negative ion source with Cs additive
7. Role of plasma fluctuation for EBW current ramp-up at the electron cyclotron harmonics
8. Control of rotational transform by electron cyclotron current drive in helical systems
9. Study of the physics of IDB plasma and the density limit in helical devices
10. Development of simultaneous measurement system of high-resolution spectra of hydrogen emissions for the study of LHD edge plasma
11. Study of optimum conditions and atomic and molecular reactions on LHD closed divertor
12. Development of Doppler-free spectroscopy for plasma diagnostics
13. Spectroscopy of highly charged tungsten ions using electron beam ion traps
14. Formation of minimum-B torus by ECH
15. Development of electron Bernstein wave emission diagnostics for electron temperature measurement in high beta plasma

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

1. Evaluation of Advanced Tungsten Materials as Plasma Facing Materials
2. Dynamic Behavior of Tritium Release from Stainless Steel for LHD
3. Removal of Metal Impurities from Flibe by Electrolytic Separation
4. Change in properties of superconducting magnet materials by neutron irradiation
5. Feasibility Study of LiPb-He-SiC High Temperature Blanket Concept
6. Development of advanced superconducting conductors for fusion devices
7. Basic studies for reduction of tritium retention, and for recovering and recycling of H, D and T under LHD-DD operations
8. Hydrogen isotope retention behavior on the surface of metal-carbon mixture layer under carbon, hydrogen isotopes and helium simultaneous irradiation circumstance
9. Study on behavior of environmental tritium and assessment of influence on environment
10. Assessment study on biological effects of low-dose tritium radiation
11. Observation of Hydrogen Permeation in LHD and Evaluation of Wall Leakage for DD Experiments
12. Wall Conditionings for DD Discharge Phase in LHD by Inert Gas Glow Discharges
13. Development of High Heat Plasma Generator with Ion Beam Analysis and In-situ Measurement of Hydrogen Isotope Retention
14. Development of Neutron Diagnostic Systems for LHD Deuterium Experiment
15. Heat Removal Demo-research for Flibe Blanket Development
16. R&D of W-coat processing on Low Activation Structural Materials

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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