# 4. Coordination Research Project

## 1. Coordination Research Project

The coordination research project aims at a smooth accomplishment of a wide range of coordinated research activities in NIFS. It plans, establishes and supports the framework of coordinated research and opens coordinated research products for the effective use of them.

In order to accomplish the above-mentioned purpose, the coordination research committee with the sectional meetings as shown in Fig. 1 was set up and corresponds to a variety of coordinated researches.

#### 2. Achievements of Coordination Research

#### 2.1 NINS cooperation

NIFS promotes interdisciplinary research to explore new scientific horizon as a constituting institute of the National Institutes of Natural Sciences (NINS). The major program is "research of turbulence, magnetic island and magnetic field lines in magnetically confined plasmas" which forms part of the project "formation of international academic base in research of natural sciences" conducted by NINS. This program is closely related to Imaging Science which is emphasized in the Center of Novel Science Initiatives, NINS. NIFS is also leading research on hierarchy and holism in natural sciences in NINS. Bottomup interdisciplinary approaches by young scientists are promoted by NINS and 4 subjects in NIFS; nano-material, large-scale particle simulation, turbulence in solar plasma and magnetic reconnection have been supported by NINS. Cooperation on fusion laboratory and solar plasmas is organized with a sister institute, National Astronomical Observatory of Japan in NINS and LHD makes a significant contribution to solar plasma research through comparative study with HINODE which is the observational satellite of the sun.

#### 2.2 ITER/BA cooperation

The main activity of ITER/BA collaboration is to cooperate with all interested parties to make steady progress in ITER and BA projects. The participation and presentation to ITPA (International Tokamak Physics Activity) topical meetings from NIFS are one of the important tasks and six presentations were performed in this year. Our group members cooperated with JAEA members to make a big event reporting the results of ITER/BA activities. These activities are summarized in the report of ITER/BA collaboration.

## 2.3 JAEA cooperation

"JAEA cooperation" promotes coordinated research activities with the Japan Atomic Energy Research Institute (JAEA) according to individual contracts. The evaluation of superconducting conductors of JT-60SA has been carried out.

## 2.4 Laser cooperation

Laser coordinate research group has been collaborating with Institute of Laser Engineering, Osaka University to promote Fast Ignition Realization EXperiment (FIREX) project. As divergence angle of generated fast electrons is large (~90 degree) and it results in low coupling efficiency, we are going to use well-collimated fast ion beams to assist the core heating and ion beam characteristics were investigated by 2D PIC simulations and core heating properties were evaluated by integrated simulations. About fuel layering, a final goal is to create a solid DT or  $D_2$  fuel layer with  $\sim 20 \ \mu m$  in thickness on the inner surface of the plastic shell and it was succeeded to create a thin H<sub>2</sub> ice layer on the inner surface of a 2 mm Polystyrene shell. In FIREX experiments with various designed targets, spectra of fast electrons, whose energy range is from 2 MeV to 110 MeV, were observed by the electron spectrometer with the permanent magnet and each result was compared to understand physical mechanisms. Additionally, the temperature dependence of thermo-optic effects in cryogenically cooled Yb:YAG ceramics was evaluated between 70 and 300 K, and significant improvements at low temperature were found.

### 2.5 Academic-industrial cooperation

In the academic-industrial coordination, a report was submitted in relation to the liquid dielectric properties in the microwave frequency to obtain the basic data for the microwave chemical reaction technology. In the sutdy, the complex permittivities of water and 0.5M-KCl aqueous solution were measured by coaxial cable probe method using a network analizer, and the attenuation characteristics was compared.



Fig. 1. Composition of coordination research committee. (Mito, T.)