## §4. Consideration on History of Compact Helical System Based on Historical Documents

## Matsuoka, K., Iguchi, H.

We have been making an effort to write a booklet of the history of Compact Helical System (CHS). Toward accomplishing this, compilation of chronology and writing the draft are in progress. In the course of this work, one question arose, "What was the reason why the CHS was remotely related to the Scientific Committee and the Steering Committee of the Institute of Plasma Physics, Nagoya University (hereafter, IPP) at the initial phase of CHS."

The CHS project had been planned since 1985 and the machine was constructed in the fiscal year 1987. The experiment started in 1988. However, not only in designing and constructing phase of the machine but also after the start of experiment, Review & Check that was usually implemented by the Scientific Committee was not conducted.

IPP was founded in 1961 and ended in 1989 being reorganized into National Institute for Fusion Science as one of its constituting bodies. Because IPP was the institute for collaborative research belonging to Nagoya University its research projects were planned, approved and watched by the two Committees. The members of the Scientific Committee were typical experts in their research fields. More than half of the members of the Committees were from outside of IPP, which means that IPP was managed not only IPP but also by the plasma-fusion community.

To answer the above-mentioned question we have to look back at the history of IPP for about 15 years from mid-1970 to 1989, because CHS is closely related to the third research future plan of IPP. The discussion of the third plan started at around 1975. The main project of the third plan was the reacting plasma project, the so-called "R-project." There, deuterium (D) and tritium (T) are introduced in the R-tokamak and the effect of  $\alpha$  heating on the plasma confinement is the main topic to be investigated. The reason why DT burning was adopted, of course, was that the burning physics was an inevitable experimental subject for fusion, but the choice of the subject for the future plan of IPP was rather limited at that time. This is because in the late 1970's a variety of research centers belonging to universities were established: Plasma Physics Laboratory at Kyoto University, Plasma Research Center at Tsukuba University, Laser Fusion Center at Osaka University, etc. Japan Atomic Energy Research Institute (JAERI) was advancing tokamak research constructing JT-60 that was one of the three big tokamaks in the world. This means that prospective type of fusion machine was not left for IPP's future plan. We think this situation was a part of the reason why IPP picked up DT burning as the future plan, although there were a lot of subjects related to toroidal plasma confinement based on detailed plasma profile measurements using hydrogen plasma.

R-project was intensively promoted, however, we think that realizing the burning plasma experiment was a huge burden for IPP. In the meanwhile Satio Hayakawa, chairman of Fusion Panel under the Council for Science and Technology, organized the working group in 1982 to discuss the research trend of fusion in Japan. The working group members were of rank of a president of university. In 1984 Hayakawa organized another working group to discuss what research should be conducted for fusion in Japan. Acting researchers such as associate professors were called from universities and JAERI as the members. One of the authors (K.M.) was the member. The working group summarized the status of fusion research at that time in Japan and, after intense discussion on what should be done for next 10-20 years, finally proposed in 1985 that the toroidal plasma confinement study should be conducted using a large helical plasma complementary to tokamak at JAERI. This new large helical plasma project became latterly LHD. In parallel to the design work of LHD the organization of the new institute (later NIFS) was discussed under the MoE. The new institute was thought to have a top-down character in determining research strategy and so on, which was contrary to IPP of which decision-making process was bottom-up.

In 1985 the leader of the R-project declared its demise, which meant that IPP was in trouble to make own future plan. Soon after the working group's conclusion of the new large helical device, voluntary based activities to make a small helical machine at IPP emerged in 1985. In 1986, the director of IPP set up a new office to correspond to the large helical device project and designated the small helical project (later CHS) as the main project of IPP. In the end of calendar year of 1986 the budget to construct CHS was approved by the MoE. Finally after establishment of NIFS CHS was designated as the supporting experiment of LHD. But at the initial phase of CHS the relation between CHS and LHD was sparse. After looking back at the history the following remarks are obtained as a summary of this research.

1. In the Scientific Committee the number of researchers who were familiar with helical plasma was only 10 percent of the members.

2. The situation of helical plasma in the world was that ATF and W7-AS that opened a new era of helical plasma research would soon be operational. It was necessary to start quickly the new helical plasma project in Japan, too. IPP might not be able to wait the discussion at the Scientific Committee and the Steering Committee.

3. The top-down character of coming new institute did not seem to affect what the members of the Scientific Committee said.

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