

§1. Archival Study on Development of Heliotron Devices

Mizuuchi, T. (IAE, Kyoto Univ.), Iguchi, H.

"Fusion Science Archives" of National Institute for Fusion Science (NIFS) has promoted archival activities about the scientific studies in the field of nuclear fusion that have been performed at universities in Japan.

This archival study is focused on the fusion oriented high temperature plasma experimental devices developed and constructed in the universities, especially on the series of Heliotron devices, which have been originally proposed and developed in Kyoto University by the late professor emeritus of Kyoto University, UO Koji [1].

After the proof-of-principle experiment in Heliotron E (Kyoto University), the Helical-Heliotron concept is now in its parameter expansion phase and a lot of remarkable results have been obtained through the LHD project in NIFS. On the other hand, in Kyoto University, a new generation of the heliotron concept, Helical-Axis Heliotron configuration [2], was proposed by the Kyoto Univ. group and has been experimentally examined its basic idea through the Heliotron J project [3] in Laboratory for Complex Energy Processes, Institute of Advanced Energy (IAE), Kyoto University under the auspices of the NIFS Collaborative Research Program.

The aim of this archival study is to make comprehensive and systematic collection of the research materials on each heliotron device. The materials about technical notes in the R&D phase of machine construction and of control sequences are also the targets. By the collaboration with "Fusion Science Archives" since 2007, collection of scientific materials about heliotron devices is in progress. By 2008, a present situation of a series of heliotron devices has been investigated, and some documents of each device were confirmed. The minutes of technical meetings with the manufacturer in each device and the records of the malfunction in operation and countermeasure have been also added in the archive. Here, we have started to make a microfilm collection of large size drawings for the plasma devices and their relating equipment. During these archival activities, we have found accidentally some documents in the unexpected places, like a pipe space in the Heliotron building. Those documents have been under investigation to identify their origins. Some videotapes were also discovered, which are probably taken on the occasion of test assembling of the Heliotron E device in a factory (Hitachi, Ltd.). The

image video records in very early phase of the Heliotron E experiment are also discovered. In addition to making a digital library of photographic slides of experimental devices and presentations in Heliotron E era, we have started to re-store the raw data of Heliotron E experiment (including some program files for data analyses) into a set of HD. The original data were recorded in reel-to-reel type 1/2-inch magnetic tapes (about 1200 reels of MT). It is necessary to keep a lot of space to store these reels and, more importantly, it is not easy to maintain or ensure the tape reader system workable with a present-day computer system. Therefore, under the initiative of Laboratory for Complex Energy Processes, IAE, the data were converted to a set of HD from the MTs.

In 2012, since a big-scale reconstruction of the building of the former Plasma Physics Laboratory (Heliotron Fusion Research Center) was carried out to improve its earthquake-resistance, the storage space for the archives was also temporarily moved to other buildings (Fig. 1). Thanks to kind understanding of residents in those temporarily used buildings, almost all the materials could be moved safely. During this reconstruction work, it was found several new materials relating to previous devices/projects carried out by Heliotron group (some films for presentations in academic meetings, test-samples of conductor for helical-coils, technical reports, etc.). The materials will be set back to new spaces in the reformed building by summer in 2013.

These situations of the Heliotron archives were briefly reported in the general meeting of Fusion Science Archives held at National Institute for Fusion Science on December 4, 2012. (NIFS11KVXP008)

- [1] K. Uo, in Kakuyugo-Kondankai (May, 1958).
- [2] M. Wakatani, et al., 17th IAEA Fusion Energy Conf. (Yokohama, 1998) IAEA-CN-69/EX2/5. M. YOKOYAMA, et al., Nucl. Fusion 40, 261 (2000).
- [3] F. Sano, et al., J. Plasma Fusion Res. SERIES 3, 26 (2000). T. Obiki, et al., Nucl. Fusion 41, 833 (2001).



Fig. 1 A stack of cartons for tentative storage of materials