

## §1. Archival Study on Development of Heliotron Devices

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"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 our country.

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 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 heliotrons 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. In 2009, the minutes of technical meetings with the manufacturer in each device and the records of the malfunction in operation and countermeasure are also added in the archive. We have started to make a microfilm collection of large size drawings for the Heliotron E device and its relating equipment since 2009. In 2010, some documents were discovered in the unexpected places, like a pipe space in the Heliotron building. Those documents are 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. The image video records in very early phase of the Heliotron E experiment are also discovered. Because the condition of these tapes is not so good, their digital copies were made through this collaboration activity in 2010.

In 2011, the raw data of Heliotron E experiment (including some program files for data analyses) are re-stored in 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. We are planning to make copy of them in DVD to secure storage of these data in near future. In addition, we have started make digital library of photographic slides of experimental devices and presentations in Heliotron-E era.

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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. A part of the stored MT reels for Heliotron-E experimental data (top) and a set of a MT reader and PC for media conversion of the data (bottom)