§4. Archival Studies on Devices of Fusion Science

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The research for the peaceful use of thermonuclear energy is of scientific research and is technical development itself, and there are a number of scientific and great technical problems to be solved. Then the challenging programs of scientific research and development have been undertaken. It has been progressed through an iterative process including the experimental evidence of physics principle and the improvement of experimental apparatus. To analyze and investigate the progress process of the research and development on the basis of evolution of the experimental devices for fusion research gives useful knowledge and suggestions for a course of research and development on future big scientific projects such as nuclear fusion. The studies of experimental devices, including the idea with their evolution, will help us to find the way to resolve technical difficulties and scientific problems on the research.

Objective of research

The main objective of the research is to collect and arrange the documents/materials on the devices of fusion research, which were built and used from the early stage in the fusion research to the recent fruitful stage. Another objective is to provide the collection as materials available to researchers who are interested in the history of science as well as the fusion research.

Method of research

We will collect the materials for experimental apparatus of plasma physics and nuclear fusion research in some universities and institutes. The devices in foreign countries should be investigated, however for a while the collection will be focused on the devices in Japan.

During this fiscal year, we have discussed what kind of devices and documents should be collected. As a result of discussions, we concluded to collect materials on the following guideline: 1. To give priority to original and innovative devices and the devices which played an important role in the course of progress of fusion research. 2. To pay attention to much of unpublished materials. On the other hand, in order to collect materials systematically, we have historically reviewed the fusion research in the dawn stage. The discussion on the use of nuclear energy of fusion began at the end of World War II. Theoretical aspects were mainly discussed and the experimental studies were carried out in universities and institutes in several countries, such as U.S.A, UK and USSR, independently. But the results of their experimental studies were classified. Since the second International Conference on the Peaceful Uses of Atomic Energy, many researches for fusion have been unclassified and actively discussed in the conferences thereafter. According to published reports such as Project Sherwood, the confinement of high temperature plasma was the most important subject. Therefore the experimental program was planned for various approaches based on the confinement of plasma. Consequently, the experimental devices on the early stage had been designed for different methods of plasma confinement, that is, 1. Pinch concept, 2. Stellerator concept, 3. Mirror concept. As the result of these surveys, we have concluded that we should start to collect the materials of the devices that were designed for the above three confinement concepts. As the worldwide activity and progress in fusion research also have been accompanied by similar advances both in the development of the diagnostic technologies of high temperature plasma and the research of plasma physics for nuclear fusion, we will also collect the materials for the experimental apparatus of basic plasma physics research and diagnostic development.

Present status and future plan

Until last fiscal year, the documents on some devices of IPPJ and JAERI had been arranged under NIFS collaborative research carried out by Dr. Kitsunezaki et al. In this fiscal year, some documents of the mirror machine in University of Tsukuba, GAMMA, have been collected in the collaboration with University of Tsukuba

We are going to discuss about the database format for arrangement of device materials and after the decision of the format we will arrange the documents.

We are also considering the collaborative work on the standardization of the format with some universities and institutes.

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