

(2) Safety Management Research

The Radiation safety managements of experimental devices, such as LHD, plasma heating devices like NBI, ECH and ICRH, and an accelerator for the Heavy Ion Beam Probe, are the major issues in the LHD research. For safety operation of LHD and related devices, radiation management system and access-control system were well integrated. Radiation monitoring by the Radiation Monitoring System Applicable to Fusion Experiments (RMSAFE) has been working successfully. The other radiation safety issues are a plan of the safety management system and development of precise radiation monitors considering the deuterium (D) plasma experiments in LHD, especially neutron protection and tritium treatment. Topics of these activities on the safety management research during FY 2013 are summarized as follows:

(i) Radiation management and monitoring

For the occupational workers in radiation control area, educational training and registration system have been established. The radiation management in NIFS had been performed by radiation safety control office in the Division for health and safety promotion. It is required that the annual exposure dose caused by operation of some radiation emission devices should not exceed 50 μ Sv in a year on the site boundary. To ensure this limit, a monitoring system RMSAFE works to detect burst X-ray and to discriminate the radiation caused by plasma experiment from the natural radiation and to accumulate the exposure dose. To get the background data of atmospheric condition, atmospheric concentration and deposition flux of radionuclides, ground-water and rain-water, natural radiation distribution, and soil were investigated. To investigate the geochemical characteristics, precipitation and inland water at Okinawa Island were measured.

(ii) Studies of tritium treatment system and safety

Tritium is one of key issues from view point of radiation safety for the D experiment in LHD and for a future nuclear fusion facility. The specific technologies are extremely low level tritium monitoring and removing or recovering of tritium from the vacuum pumping gas or exhausting air from the vacuum vessel. It is also important to grasp tendency of the environmental radioactivity before D experiments in LHD. The topics of research and developments are evaluation of high-sensitivity tritium gas monitoring system, new-type plastic scintillator tritium monitor, exhaust detritiation system and tritium monitor, and gas-flow in the exhaust pipe lines.

(iii) Non-ionizing radiation monitoring and management

Leakage of static magnetic field and variable frequencies of electromagnetic fields are concerned in a magnetic fusion plasma experimental facility. The visualization technique of the leakage electromagnetic field with a positional sensing system using the IR camera was

applied to measure the field distribution around the RF oscillator in LHD.

(iv) Education

After the severe accident at Fukushima, the handling of radioactive materials has come under close scrutiny. For the safety handling, enhancement of the radiation education in schools is getting to be important. Practical methods according to the three principles for radiation protection are proposed.

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List of Reports

1. "Atmospheric concentration and deposition flux of radionuclides at NIFS site", Akata, N. (NIFS)
2. "Groundwater and rain water monitoring around Tono area", Ueda, A. (Univ. of Toyama)
3. "Investigation of natural radiation and radioactivity at Tono area in Gifu Prefecture, Japan", Hosoda, M. (Hiroshima Univ.)
4. "Distribution of Background Radiation in Soil around NIFS Facilities", Yokoyama, S. (Fujita Health Univ.)
5. "Geochemical characteristics of precipitation and inland water at Okinawa Island", Furukawa, M. (Univ. Ryukyus)
6. "Performance Evaluation of High-Sensitivity Tritium Gas Monitoring System Developed by Employing Two-Parameter Spectrometer (Effect of Rise Time Analysis)", Kawano, T. (NIFS)
7. "Development of a new tritium monitor by using a plastic scintillator with surface treatment", Furuta E. (Ochanomizu Univ.)
8. "Design and Construction of the Exhaust Detritiation System for Large Fusion Test Device", Tanaka, M. (NIFS)
9. "Design Consideration of the Gaseous Tritium Sampling System in the Exhaust Detritiation System", Tanaka, M. (NIFS)
10. "Performance of Simplified Active Sampler for Tritium Monitoring in a Fusion Test Facility", Tanaka, M. (NIFS)
11. "Observation of the Gas Stream in the Vacuum Exhaust Pipe Line for the Design of Exhaust Detritiation System", Tanaka, M. (NIFS)
12. "Visualization and Spectrum Analysis of Leakage EM Field in Magnetic Confinement Fusion Test Facilities", Kamimura, Y. (Grad. School of Engin., Utsunomiya Univ.)
13. "Practical Research on Radiation Education (2)", Fukutoku, Y. (Nat. Sci. Cntr. Res. Educ. Kagoshima Univ.)