## SAFETY CONCEPT OF THE IFMIF/EVEDA LITHIUM TEST LOOP

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In order to obtain the engineering data on the lithium target system, which is the neutron source of the International Fusion Material Irradiation Facility (IFMIF), the design and fabrication of the IFMIF/EVEDA Lithium Test Loop are being carried out under the Engineering Validation and Engineering Design Activity (EVEDA). The detail design was started from the early FY 2009, and the construction was started on November, 2009 at O-arai Research and Development Center, JAEA.

The loop will hold 2.5 tons  $(5m^3)$  of lithium. Since lithium is specified by Japanese law as a dangerous substance as well as sodium which is the coolant of fast reactors, countermeasures which assumed a lithium leak incident and various abnormal issues are indispensable. This paper describes about the safety principles and measures for lithium leaks of the IFMIF/EVEDA lithium test loop decided under the detailed design process.

The leak-related safety measures for the liquid lithium test loop system are based on the basic concepts applied to the existing sodium test loop system. The basic concepts against lithium leaks are (a) leak prevention, (b) early detection, (c) leak reduction and (d) prevention of fire expansion, and the various countermeasures shown in Table 1 are applied for the loop.

The volume of lithium leaks was estimated from various viewpoints. The fireextinguishing performance of the candidate fire extinguishant was also estimated, and the deposition amounts were determined.

The completion of the loop will be planned at the end of February, 2011, and the demonstration tests of the lithium target system will be done for approximately two years from May, 2011.

Leak prevention	Housing of the target assembly in an airtight steel container to provide a two-fold boundary
	structure.
	Periodical ultrasonic tests on the target assembly to measure the decrease in the wall thickness.
Early detection	Installation of lithium leak detectors for all lithium components and pipes.
	Installation of smoke sensors for each floor and air cooling duct.
	Monitoring by multiple surveillance cameras.
	The control room to manage the alarm and warning signals.
	Enhancement of the surveillance using different types of liquid level meters (for the Li tanks).
Leak reduction	Use of multi-layered drain piping
	Remote-controlled drain operation
	Optimization of draining process depending on the leak point by preparation of several emergency
	drain routes.
Prevention of fire expansion	Compartmentalization by installing steel floor liners and barriers.
	Recovery of spills by installing communicating tubes on the places where large lithium leaks are
	anticipated.

Table 1 Measures against liquid lithium leaks