

Profile LFR-55

ADSMIF

JAPAN

GENERAL INFORMATION

NAME OF THE FACILITY	ADS Material Irradiation Facility in J-PARC
ACRONYM	Click here to enter text.
COOLANT(S) OF THE FACILITY	LBE
LOCATION (address):	2-4, Oaza-Shirakata, Tokai, Naka, Ibaraki, Japan
OPERATOR	Japan Atomic Energy Agency
CONTACT PERSON	Toshinobu SASA
(name, address, institute, function, telephone, email):	2-4, Oaza-Shirakata, Tokai, Naka, Ibaraki, Japan J-PARC, JAEA, +81-29-282-5364, sasa.toshinobu@jaea.go.jp

STATUS OF THE FACILITY	Under Design
Start of operation (date):	Choose an item.

MAIN RESEARCH FIELD(S)	<input type="checkbox"/> Zero power facility for V&V and licensing purposes
	<input type="checkbox"/> Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
	<input checked="" type="checkbox"/> Thermal-hydraulics
	<input checked="" type="checkbox"/> Coolant chemistry
	<input checked="" type="checkbox"/> Materials
	<input checked="" type="checkbox"/> Systems and components
	<input checked="" type="checkbox"/> Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

Within the framework of the J-PARC project, JAEA plans to construct an Experimental Facility to study Minor actinides (MA) transmutation by accelerator-driven systems (ADS)^[1]. The facility is located at the end of the LINAC, which is also an important component to be developed for future ADS, and shares the proton beam with other experimental facilities in J-PARC.

The facility^[2] is planned as a material irradiation facility which can accept a maximum 400 MeV-250 kW proton beam on a LBE spallation target. It also has the possibility of being used for various research purposes such as measurement of the reaction cross sections of MA and structural materials, basic science studies and so on.

The main purpose is to obtain the data to evaluate the actual lifetime of the beam window. Facility mainly consists of a LBE spallation target, a LBE cooling circuit, and hot cells to handle the spent target and irradiation test pieces.

A high power spallation target will be installed in facility, which will be used for the irradiation of candidate materials for both a beam window and structural materials of full-scale ADS. In the reference operation case of the target for irradiation, the peak proton beam current density of $20 \mu\text{A}/\text{cm}^2$, which equals the maximum beam current density of the JAEA-proposed 800MW_{th} ADS, can be adopted. The material of the irradiation target would be a type 316 stainless steel for temperatures below 450°C and T91 steel for higher operation temperatures above 450°C . The irradiation performance of the reference case was evaluated at around 8 DPA/year by 400MeV - 250kW proton beam injection, which corresponds to 40% of the DPA considered in the beam window of the JAEA-proposed ADS^[4].

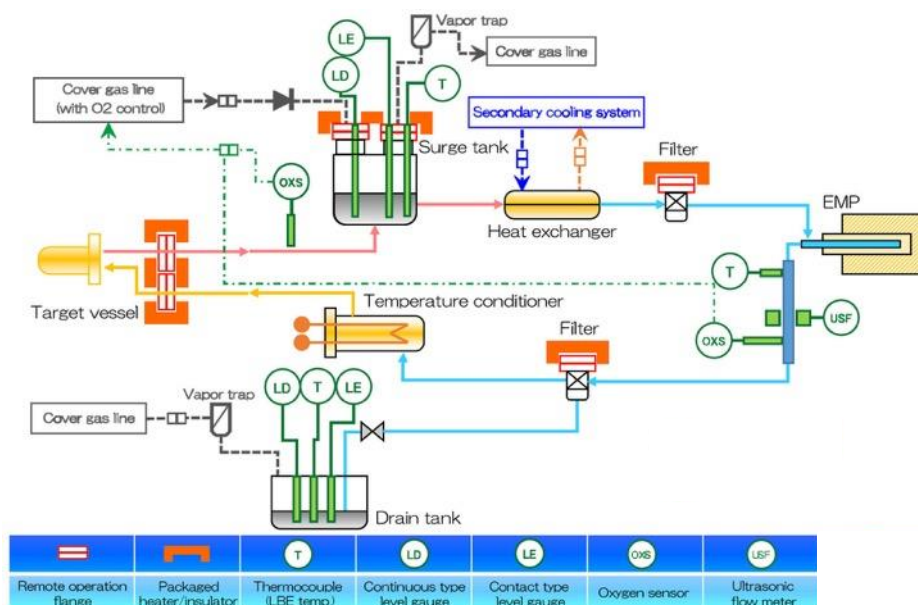
After the preparation of material irradiation database, the functional tests of future ADS beam window by simulating the shape and coolant flow condition will be also performed to confirm the evaluated life time of beam window.

Acceptance of radioactive material

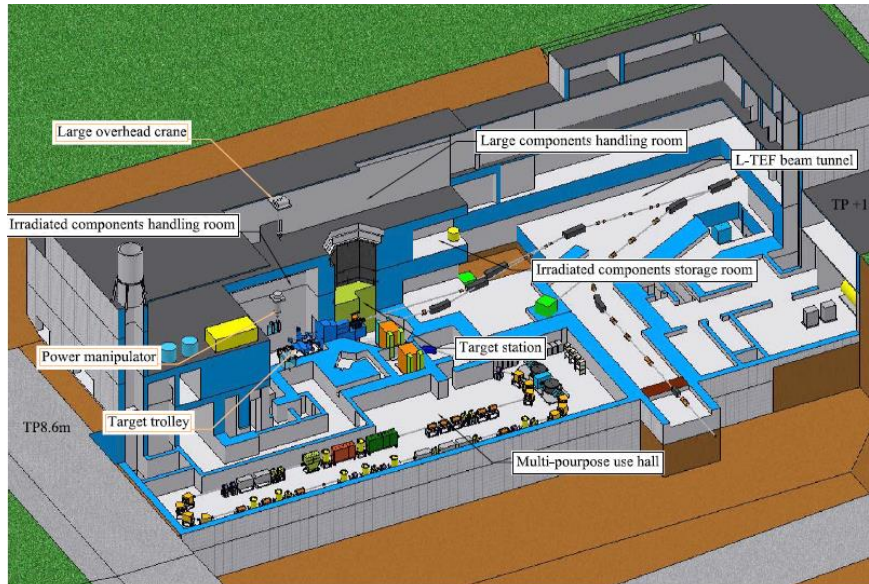
Yes

Scheme/diagram

Draft design of the primary LBE loop which includes the spallation target is illustrated as follows.



3D drawing/photo



Parameters table

Coolant inventory	3000 kg (Tentative Value)
Power	250kW (400MeV Proton)
Test sections	
TS #1	<u>Characteristic dimensions</u> Effective Target Size:15cm Diameter, 60cm Length
	<u>Static/dynamic experiment</u> Dynamic Experiment
	<u>Temperature range in the test section (Delta T)</u> 200-500°C (100°C)
	<u>Operating pressure and design pressure</u> 0.1 MPa _{max} in operation and 0.5 MPa in design
	<u>Flow range (mass, velocity, etc.)</u> 0-120 liter/min, Maximum velocity in the target head of about 2 m/s
Coolant chemistry measurement and control (active or not, measured parameters)	Oxygen potential will be controlled to prevent material corrosion. Equipment to remove reaction products from flowing LBE
Instrumentation	Thermocouples, Gas pressure gauge, Ultrasonic flow meter, Pressurized water-cooled heat exchanger, Continuous level gauge, Temperature conditioner. Oxygen control unit(planning), Liquid pressure gauge(planning)

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

None

PLANNED EXPERIMENTS (including time schedule)

Functional Test for LBE target (2025-)

TRAINING ACTIVITIES

None

REFERENCES (*specification of availability and language*)

- [1] T. Sasa and H. Oigawa, "Studies on accelerator-driven system in JAEA", Plasma and Fusion Research, 9, 4401113 (2014).
- [2] T. Sasa, et al., "Conceptual Study of a Transmutation Experimental Facility (2) Study on an ADS Target Test Facility" (in Japanese), JAERI-Tech 2005-021 (2005).
- [3] H. Oigawa, et al., "Conceptual Design of a Transmutation Experimental Facility", Proc. Global2001, Paris, France (CD-ROM, 2001).
- [4] T. Sasa, "Design of J-PARC Transmutation Experimental Facility", Progress in Nuclear Energy, in press (2014).
- [5] Nuclear Transmutation Division, "Technical Design Report on J-PARC Transmutation Experimental Facility -ADS Target Test Facility (TEF-T)-", JAEA-Technology 2017-003 (in Japanese, 2017).