Profile SFR-57

RIGADYN

LATVIA

GENERAL INFORMATION

NAME OF THE FACILITY	Riga MHD Dynamo test facility
ACRONYM	RIGADYN
COOLANT(S) OF THE FACILITY	Na
LOCATION (address):	LV-2169 Salaspils Miera str.32 Latvia
OPERATOR	Institute of Physics University of Latvia (IPUL)
CONTACT PERSON (name, address, institute, function, telephone, email):	Agris Gailitis LV-2169 Salaspils Miera str.32 Latvia Institute of Physics University of Latvia, Head of Lab. Tel: +371-228878453 gailitis@sal.lv

STATUS OF THE FACILITY	Under upgrading up to 30.06.2015
Start of operation (date):	11.11.1999

MAIN RESEARCH FIELD(S)

- ☐ Zero power facility for V&V and licensing purposes
- x Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- x Thermal-hydraulics
- ☐ Coolant chemistry
- ☐ Materials
- x Systems and components
- ☐ Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The Riga dynamo experiment is a laboratory model of the natural process that is responsible for all environmental magnetic fields which are generated without human interference. This applies to the field of the Earth, the Sun, stars and even galaxies which are produced by intense motions of large volumes of good electro-conducting fluids. For our experiment we use molten sodium - the best liquid electro-conductor available in the laboratory. Approximately 2 m^3 of molten sodium are filled into a prolonged cylinder, at the top of

which rotates a propeller powered by 200 kW from two motors. By thin inner walls the cylinder is divided into three coaxial parts. In the inner tube the propeller moves the sodium flow helically downward, in the middle one the sodium flows vertically upward. The outer part contains liquid sodium at rest. When the propeller speed exceeds a critical value (depending on temperature: around 1800 rpm, corresponding to a sodium flow of 0.6 m^3/s) then a magnetic field is spontaneously excited. The field pattern slowly rotates around the vertical axis.

Our facility is purposely build to study dynamo phenomenon as such. To enable self-excitation, the sodium flow had been carefully optimized. The relation to nuclear technology is indirect. - The phenomenon occurs at flowrates typical for sodium cooling systems. The measured field exceeds 0.1T. Unintended field of such magnitude in nuclear plants can be potentially dangerous.

Acceptance of radioactive material

No.

Scheme/diagram

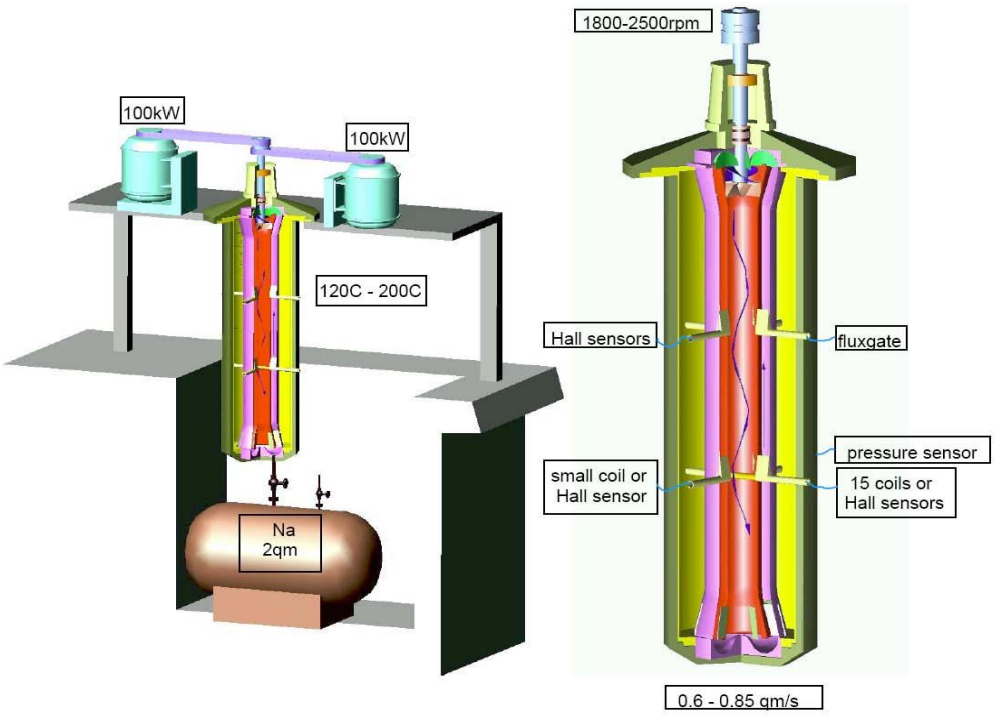

FIG. 1. Scheme of the RIGADYN facility

3D drawing/photo

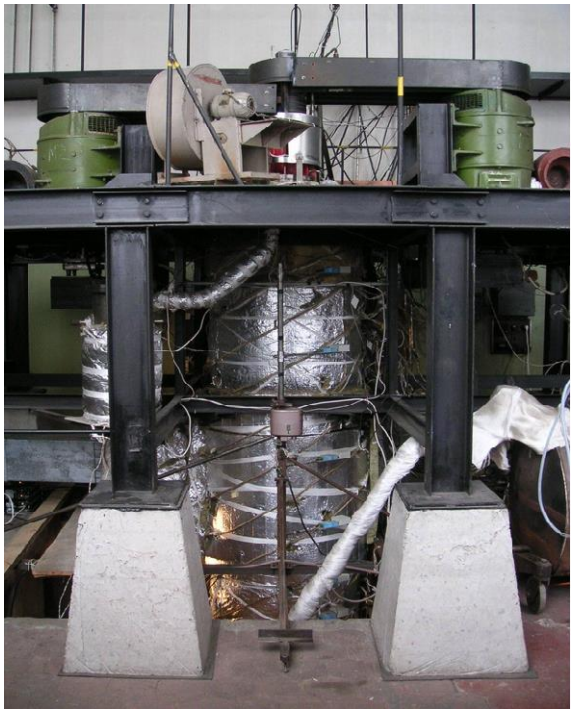

FIG. 2. View of the RIGADYN facility

Parameters table

Coolant inventory	Na $2m^3$
Power	200 kW
Test sections	
TS #1	*Characteristic dimensions* L=3m, D=0.8m
	Static/dynamic experiment dynamic
	Temperature range in the test section (Delta T) Operating 120^o-200^oC, at preparation 300^oC
	Operating pressure and design pressure Operating 2.5 bar, design 5 bar
	Flow range (mass, velocity, etc.) 0.6m/s at 1800 rpm, max=2500rpm
Coolant chemistry measurement and control (active or not, measured parameters)	No.
Instrumentation	Thermocouples, pressure transducers, magnetic field sensors: coils, Fluxgates and Hall probes.

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

Worlds over first laboratory MHD dynamo phenomenon detection 11.11.1999

Detailed Dynamo study at 2000,2002,2005,2010

PLANNED EXPERIMENTS (including time schedule)

Magnetic field back-reaction onto flow –Summer 2015

TRAINING ACTIVITIES

Training activities can be agreed with IPUL under supervision of IPUL staff.

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