MHD-PbLi facility for experiments under real blanket relevant thermo-hydraulic conditions

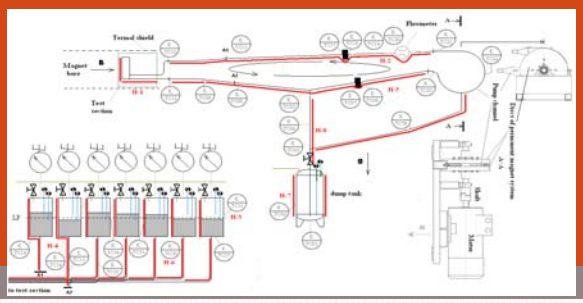
E. Platacis, S. Ivanov , A. Shishko, I. Bucenieks

University of Latvia Institute of Physics

Eutectic alloy lead–lithium PbLi has been proposed as a tritium breeder and coolant fluid in several **liquid metal blanket** concepts for future **fusion power plants**, including self-cooled lead–lithium (SCLL), dual-coolant lead–lithium (DCLL), helium-cooled lead–lithium (HCLL), and water-cooled lead–lithium (WCLL) blankets, Lead-Lithium Ceramic Breeder (LLCB).

The MHD facilities at IPUL is intended for the experimental study of some aspects of **PbLi flows and associated heat and mass transfer phenomena** with a magnetic field.

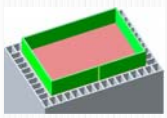
The MHD facilities at IPUL: the loop; the magnet; the pump and the flowmeter; pressure gauges; a system for measuring pressure drops in the channel; probes to register electric potential variations on the channel walls; loop heating and insulation; heat shielding of the magnet; a system of thermal stabilization; a system of melting and oxide removal; the procedure of the loop filling and pouring out; data acquisition system; supplement devices – a system of vacuuming, inert gas supply and pressure release.



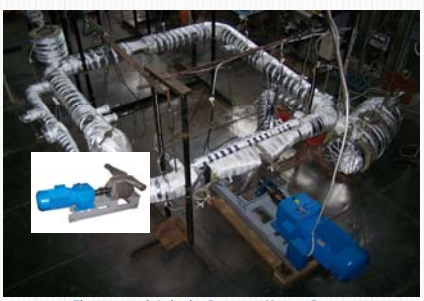
Li thin film on the stainless steel matrix

Some loop modifications were used in experiments with models of LLCB channel units (blanket concepts for DEMO of India) performed with Indian colleagues from the Institute of Plasma Research, Bhabha Atomic Research Center, Veermata Jijabai Technological Institute.

A key element in DCLL TBM is the SiC-composite FCI.



IPUL has a work experience with the high-temperature LM-loops; **experience of designing, development and production** of high-temperature pumps and LM-loops; **the necessary equipment**: vacuum chambers for high-temperature LM-loops, magnet.



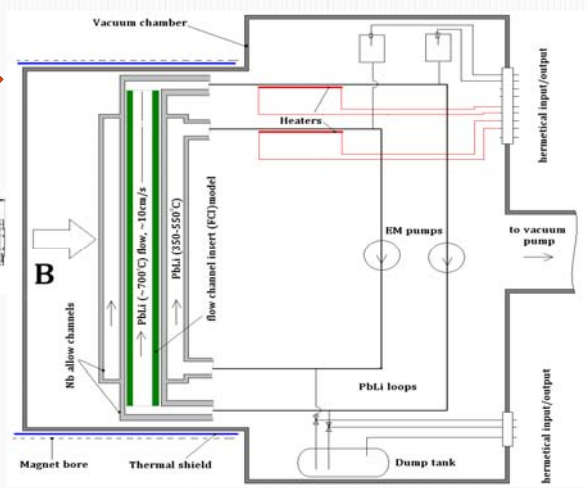
Electromagnetic Induction Permanent Magnets Pumps

Power supply for pump drive using standard AC motor and frequency converter for adjusting pump productivity

Pump productivity for Heavy Liquid Metals (mercury, pure lead and lead based eutectic Pb/Bi, Pb/Li): Output discharge pressure heads up to 10 bars, provided flow rate up to 100 L/s.

Pump efficiency in the range from 10% up to 20%.

IPUL plans the experiment: Checking the continuous operation of the mock-ups of FCI under blanket (DCLL TBM) relevant thermo-hydraulic conditions



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