Introduction of Large Research Infrastructure CICRR

CORE-2025

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CVŘ Research Centre Řež

UJV Group PEOPLE I INNOVATION I TECHNOLOGY

Large research infrastructure

Large infrastructure for research, development and innovation means a **unique research facility**, which is necessary for comprehensive research and development activity with high financial and technological demands, and which **is approved by the government** and established by one research organization for also used by other research organizations

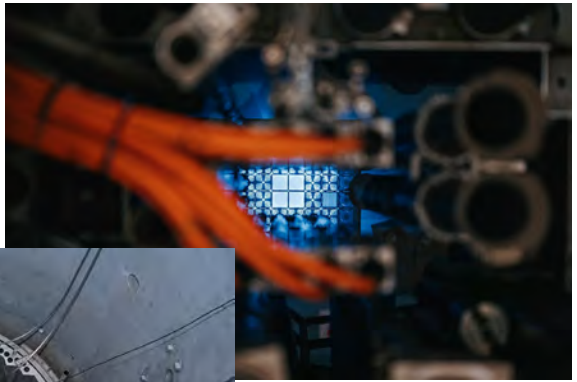
LARGE RESEARCH INFRASTRUCTURES

LRI in Czech republic

Infrastructure map is on the website of the Ministry of Education, Youth and Sports

https://www.vyzkumne-infrastruktury.cz/cestovni-mapa-velkych-vyzkumnych-infrastruktur-cr/

The CVR company historically had 3 infrastructures (Reactors Rez, JHR CZ and SUSEN), currently merged into one named CICRR – Czech International Centre of Research Reactors.



LRI CICRR

Merged LRI Czech International Centre of Research Reactors (CICRR) consists of two existing large research infrastructures from the Czech roadmap – **Reactors LVR-15 and LR-0 and JHR-CZ**. The system of the supporting laboratories, hot cells, experimental loops and other analytical and research facilities created within the SUSEN project is also included in the CICRR LRI.

https://www.cicrr.cz/

CICRR
Czech International Centre
of Research Reactors

Technologies

CVR based infrastructure

LVR-15 Reactor

LR-0 Reactor

Supporting infrastructures:

- Experimental Loops
- Hot Cells
- Microstructural laboratories
- Neutron laboratory
- Qualification laboratories
- Chemical laboratories

JHR based infrastructure

Up to 3% of Access Rights to JHR

Access to CICRR infrastructure

One of the basic conditions for the operation and support of infrastructures is the offering and use of capacities in **Open Access** mode.

A **list of infrastructures**, a basic application form and a contact address are defined on the CICRR website.

The main part of the offered open access is focused on the **use of experimental technologies**, but it is also about **student topics** and **implementation support, partial analyses/measurements, visits and internships** etc.

Open Access

Access in the Open Access mode to the research infrastructure is allowed to **all interested parties** meeting the definition of a user who are able to demonstrate:

- scientific excellence,
- originality,
- quality,
- technical and ethical feasibility of the application

evaluated through a review by experts (CVR's Scientific board) and acceptance of the contractual conditions of open access.

Users

Users of CVR’s LRI CICRR can be **individuals, teams or institutions** from the academic sphere, business, **industry or public services** of the European research area, as well as **researchers, doctoral students, technical workers or students** participating in research as part of their studies at universities.

Infrastructure CICRR

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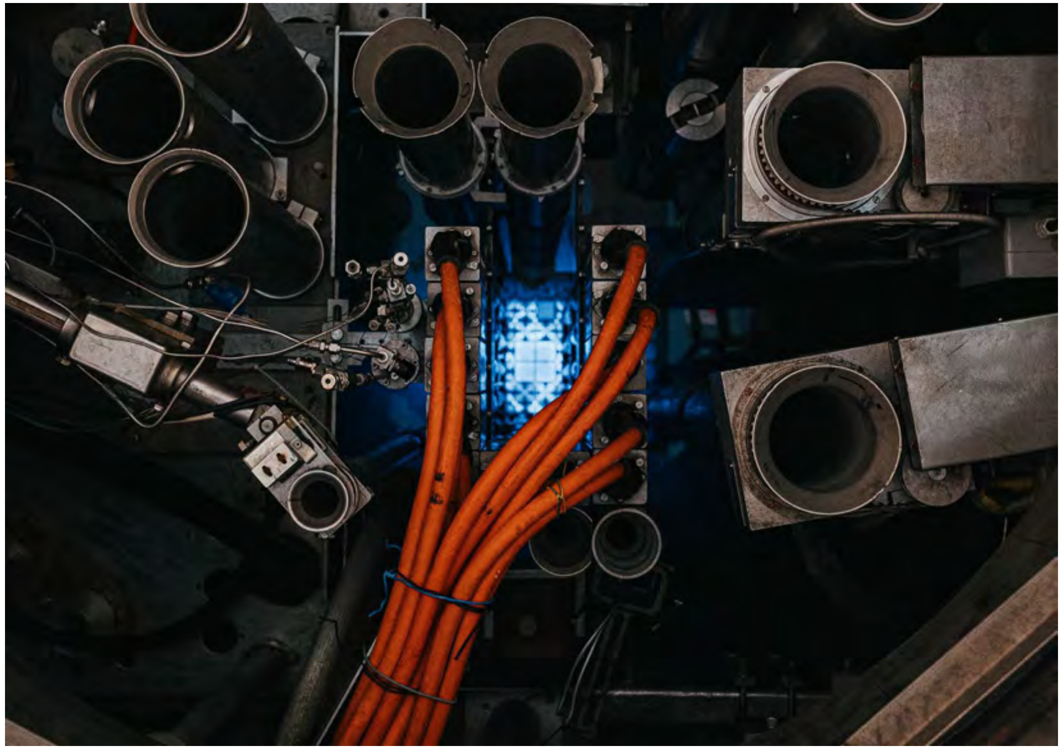
LVR-15



10 MWt multipurpose reactor

Material research, *no fuel irradiation*

- Irradiation rigs: standardized, special purpose rigs
- Past experience with in-pile water loops: BWR, PWR
- Currently in operation out-of-pile loops: SCWL, HTHL (designed for future in-pile operation)

Isotope production (medical, industrial)

Neutron Transmutation Doping

- Rotating probes for Si crystal ingots

Neutron beams channels

LR-0

The light water zero power reactor

Reactor with versatile core arrangements

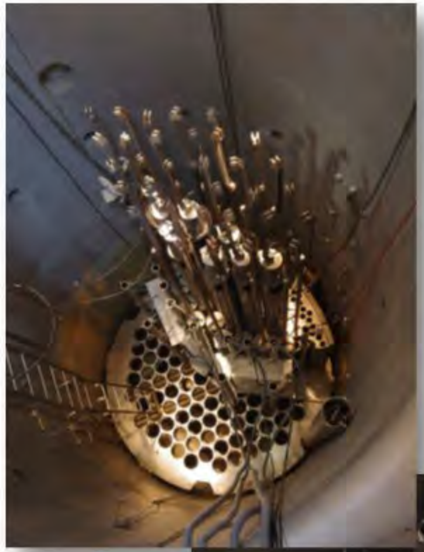
For determination of neutron-physical characteristics of various types of reactor lattices, kinetics experiments

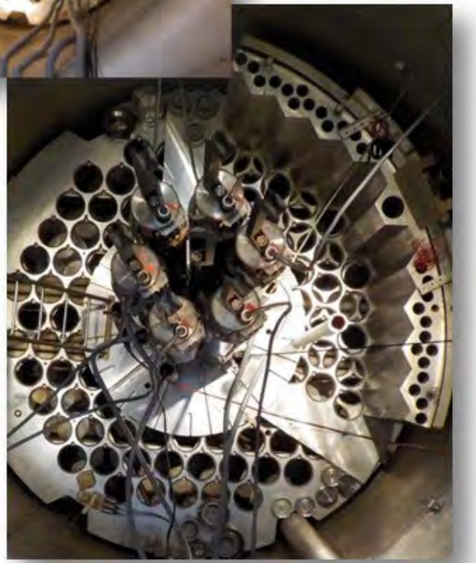
Reactor ionization chambers and other I&C equipment testing

Experiments with various insertion zone types (graphite, fluorine salts)

Experimental verification of criticality and subcriticality i relation to core parameters

Verification of computation codes





Experimental loops

Experimental loops for modelling of conditions in the reactor core and connected reactor cooling circuits

Mechanical, thermal-hydraulic, material, corrosion and further research under operational conditions of various reactor concepts

Currently only out-of-pile loops in operation

Main experimental loops

HTHL 1 loops – high-temperature helium up to 850 °C

S-Allegro

sCO_2 loop – supercritical carbon dioxide – heat transfer through sCO_2

Metal liquid loops – Pb, PbBi

FLiBe loop – LiF-BeF_2 and nickel-based alloy (< 760°C)

SCWR loop – water of supercritical parameters (550 °C, 25 MPa)

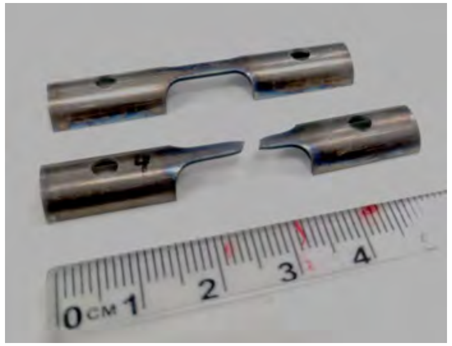
UCW Loop – UltraCritical Water loop (374°C, 22.1 Mpa)

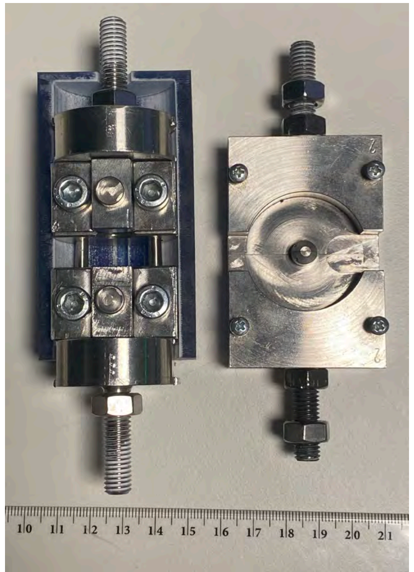
Hot cell laboratory

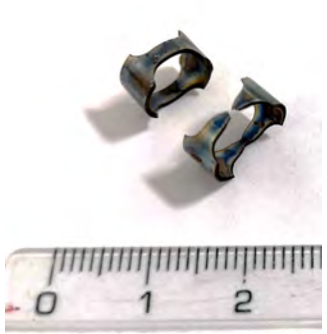
8 gamma hot cells, 2 alpha hot cells, 1 semi hot cell and dry pool

Study of nuclear reactors materials degradation and mechanical properties

- Specimen preparation
- Mechanical testing
- Microstructural studies







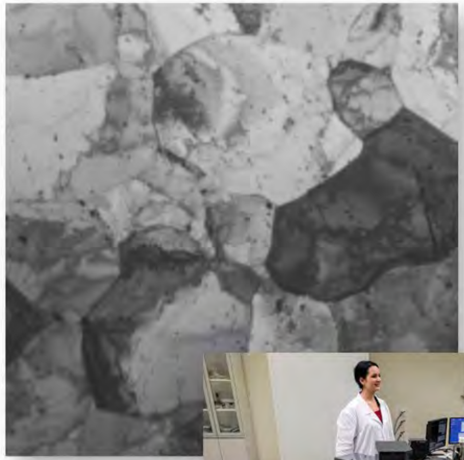
Microstructural and microchemical labs

Microstructural and microchemical analysis of various types of metal and nonmetallic materials

Study of radiation damage of structural materials for nuclear reactors

Development of new methods of the detection of very low activity in very small samples

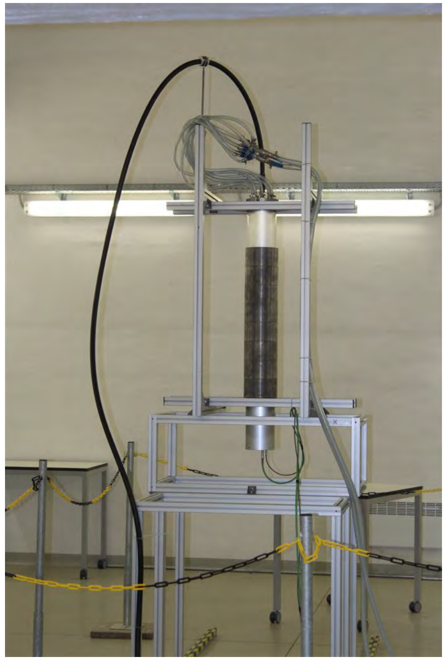
- Light Optical Microscope (LOM)
- Scanning Electron Microscope (SEM)
- Transmission Electron Microscope (TEM)
- Secondary Ion Mass Spectroscopy (SIMS)
- Nanoindenter



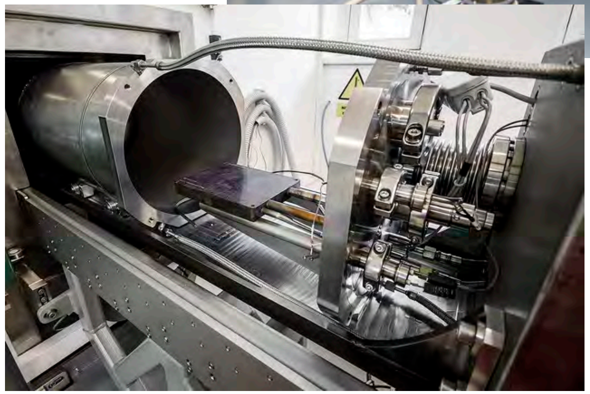
HPGe Spektrometry

Benchmark assemblies of pure material, Fe spheres diameter 20, 30, 50 and 100 cm, Ni sphere diameter 50 cm, H_2O sphere diameter 30 cm, D_2O (+Cd) sphere diameter 30 cm (dosimetry neutron standard of moderated spectrum) , PE, Fe and D_2O slabs, cylindrical assemblies, paraffine barrel for producing thermal neutron field.

- Neutron and gamma spectra measurement using different neutron sources (Cf-252 and AmBe)
- Spectrometry equipment for neutron and gamma, access to the LR-0 reactor core N-spectrometer En = 0.1–20 MeV, G-spectrometer Eg = 0.4–15 MeV



Qualification laboratories



LOCA laboratory

- Testing of cables, instrumentations, devices under LOCA conditions
- Qualification for NPP

VN testing laboratory

- Testing of electrical equipment by high voltage
- HV insulation test, Insulation resistivity test and Core resistivity test

Gamma irradiation laboratory

- ^{60}Co isotopic source
- Temperature and gamma ageing
- Possibility to irradiate at cryogenic temperatures

Chemical laboratory

Equipped by

- Electromembrane device – Electrodialysis
- ETA AAS – ContrAA 700
- TOC analyzer
- HPLC-IC Anions
- FT-IT Spectroscopy
- Raman Microscopy

These instruments support a wide range of chemical analyses for research and development applications within the CICRR.

Julles Horowitz Reactor / JHR-CZ

JHR is a highly powerful nuclear reactor for research in the field of materials and nuclear fuel with the capacity of 100 MW, currently under construction. The JHR Project is a part of both, the ESFRI Roadmap and the ČR Travel Map, covering large infrastructures for research, experimental development, and innovations.

Large number of organizations from France, Belgium, Finland, Spain, Sweden, Japan, India, and the Czech Republic form international consortium.

ÚJV Řež, a. s., is a guarantor and coordinator for the Czech part of the contract, with CVR, being responsible for realization of hot cell construction.

- Up to 3% of Access Rights belongs to Czech republic
- First criticality is expected in 2032

https://www.cicrr.cz/jhr
https://jhrreactor.com/en/home/

Thank you for your attention