



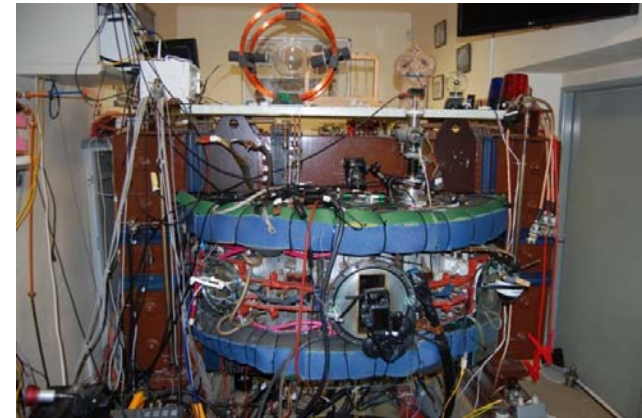
**Faculty of Nuclear Sciences and
Physical Engineering
CTU in Prague**

Lenka Thinova, Katerina Cubova, Jan Rataj

Czech Technical University in Prague
Faculty of Nuclear Sciences and Physical Engineering
Department of Dosimetry, Nuclear Chemistry and Nuclear Reactors

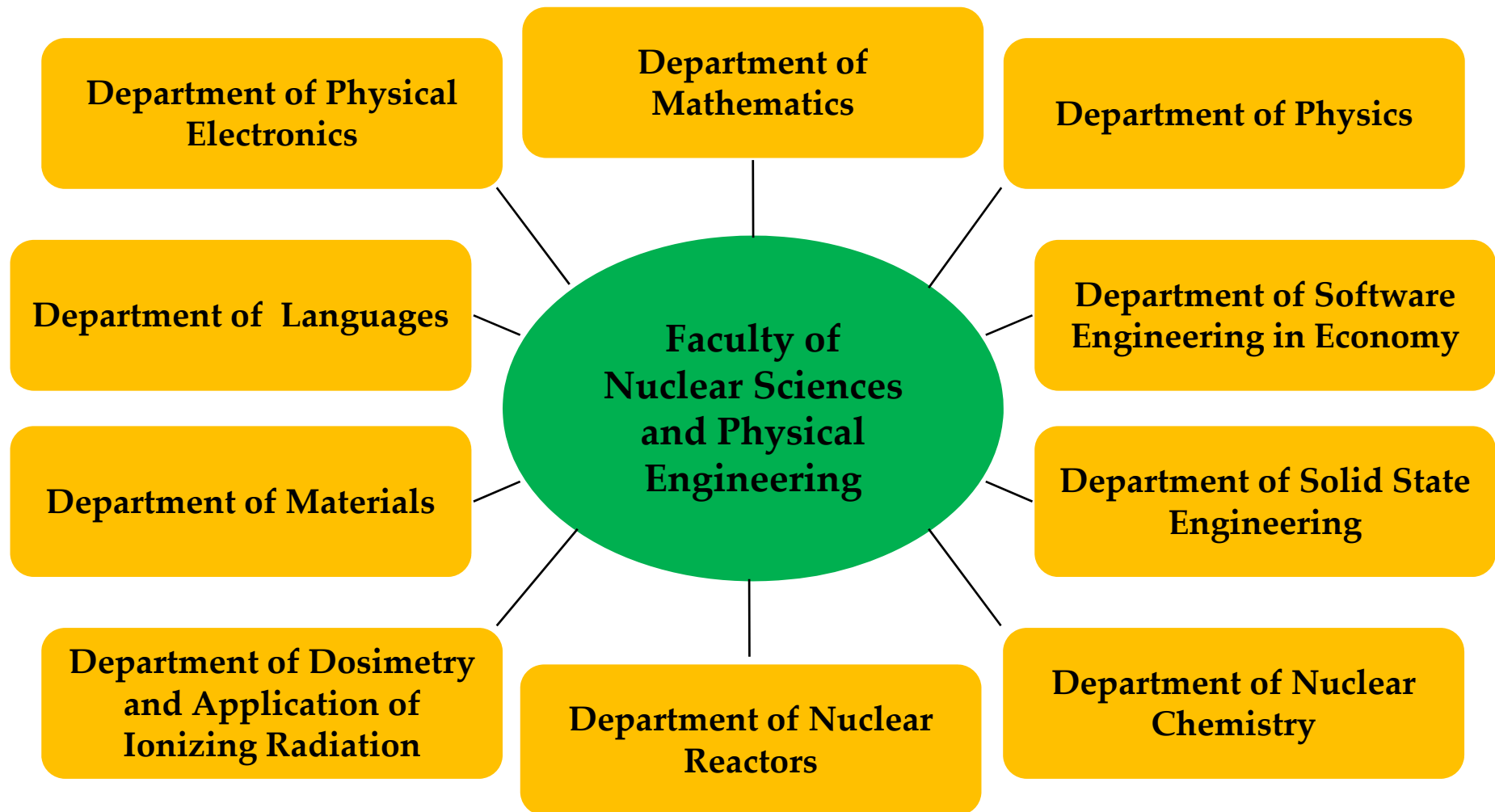
Faculty of Nuclear Sciences and Physical Engineering

- The Faculty was founded in 1955 as part of the Charles University
- In 1959 the faculty became a new special faculty of the Czech Technical University in Prague
- Education of experts for Czech nuclear research and industry.
- www.fjfi.cvut.cz



Small-class tokamak GOLEM



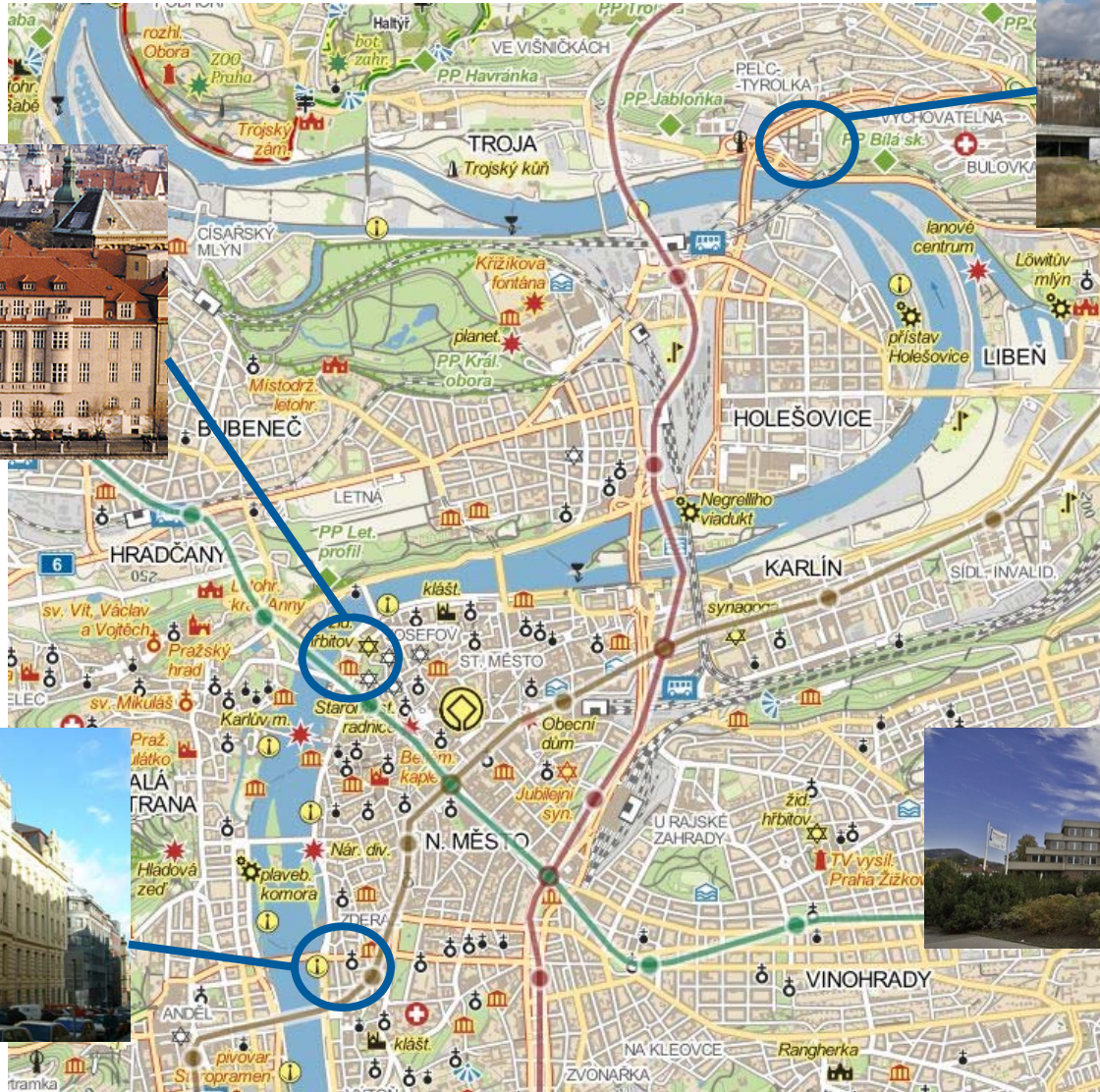


- Students: 1 500
- Staff: 230





Brehova



Trojanova



V Holesovickach



Děčín



Agenda

- Faculty of Nuclear Sciences and Physical Engineering
 - ◆ Department of Dosimetry and Application of Ionizing Radiation
 - ◆ Department of Materials
 - ◆ Department of Nuclear Chemistry
- Department of Nuclear Reactors
- Potential areas of co-operation



New study title: Decommissioning

Departments:

- Dosimetry and ppl. of IR
- Nuclear chemistry
- Nuclear reactors
- Materials
- Matematics
- Physics
- Languages

Collaborating institutes/companies:

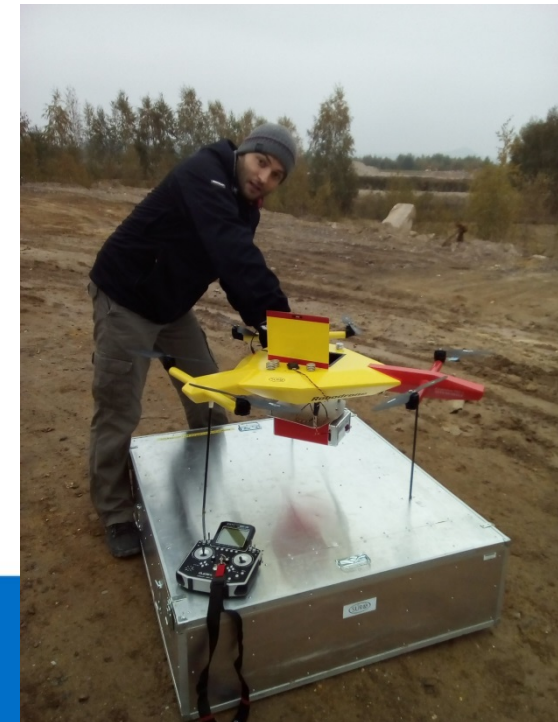
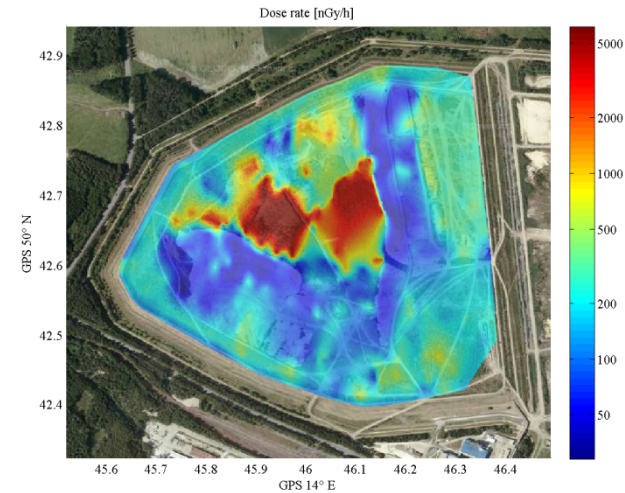
- SUJB
- ČEZ, a.s.
- NUVIA a.s.
- SUJCHBO v.v.i.
- SURO v.v.i.
- DIAMO s.p.



Study structure

5 years – the best of ☺

- Mathematics
- Physics
- Nuclear chemistry
- Science of materials
- Dosimetry and AIR
- Languages
- Practical exercises – basic physics
- Highly specialized laboratory
- Seminars with experts
- Students' individual projects
- Excursions, practical works
- Foreign – external – fellowships
- Field measurements in cooperation with companies



Supposed skills

- Excelent knowledge
 - Fuel cycle
 - Chemistry of radionuclides
 - Dozimetry (interaction IZ, detection, monitoring, metrology of IR)
 - Math and statistics
 - Behaviour of materials in the field (beam) of IR
 - Waste management
 - Legislation, risk analysis, metodology, EU legislation
- Skillfulness – measurement technique
- Analytic skills, indipendence in decision making



Lessons

	matematika	fyzika	chemie	dozimetrie	materiály	ŽP+odpady	reaktory	IT+ programování	praktická cvičení	právo+ legislativa	sam. práce
1. ročník	12	12	7	7	0	4	4	4	3	0	0
	6	2	10	0	0	0	0	4	0	4	0
2. ročník	12	6	8	16	0	0	0	0	3	0	0
	0	2	5	0	0	0	0	0	0	4	0
3. ročník	7	0	8	2	4	0	6	0	2	0	15
	0	0	2	2	0	0	0	0	0	0	0
4. ročník	0	0	12	4	3	8	6	0	6	4	14
	0	0	2	4	0	0	0	4	0	0	0
5. ročník	0	0	0	5	3	0	4	3	6	2	30
	0	0	2	4	0	0	0	2	0	0	0
1. ročník	216	168	108	84	0	48	48	96	36	48	0
2. ročník	144	96	156	192	0	0	0	0	36	48	0
3. ročník	84	0	120	48	48	0	72	0	24	0	180
4. ročník	0	0	168	96	36	96	72	48	72	48	168
5. ročník	0	0	24	48	36	0	48	60	72	24	360
celkem	444	264	576	468	120	144	240	204	240	168	708



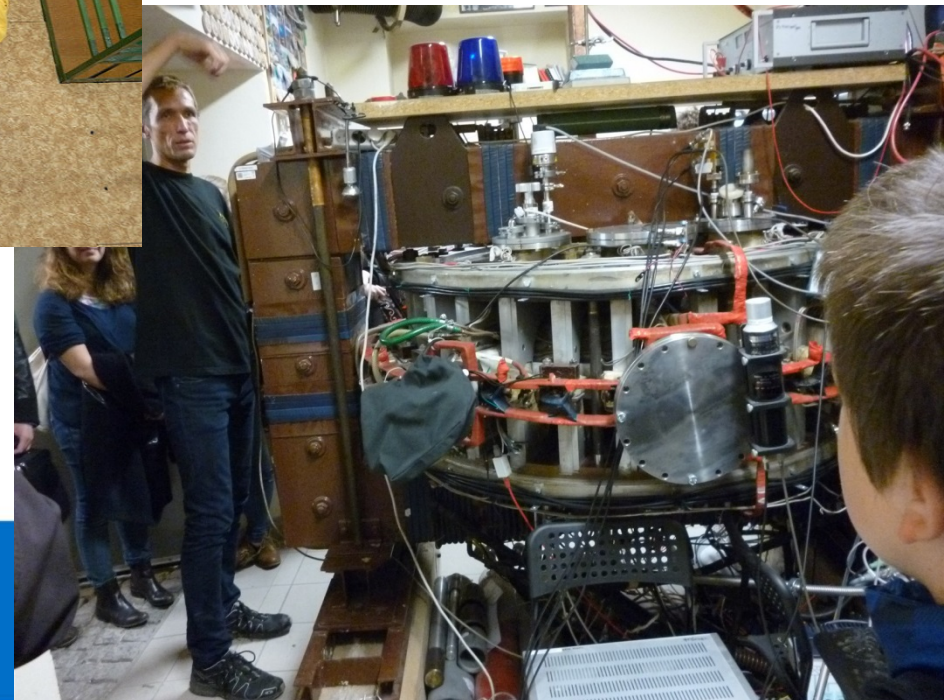
Experimental equipments



Training reactor
„Vrabc“

Tokamak „Golem“

Irradiation hall (^{137}Cs , ^{252}Cf ,
Gammacell)



Department of Dosimetry and Application of Ionizing Radiation

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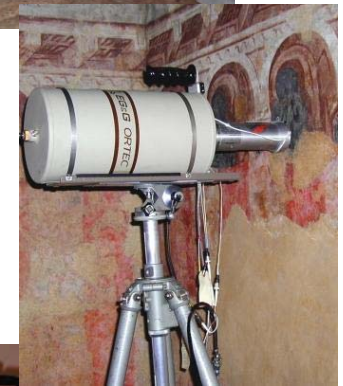


Nuclear fallout measurement

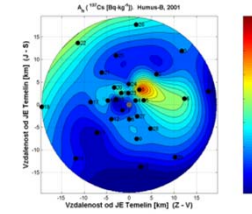


Research Activities

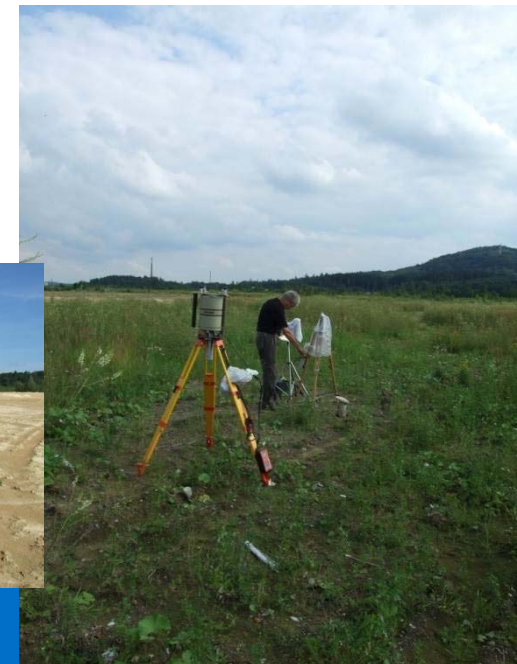
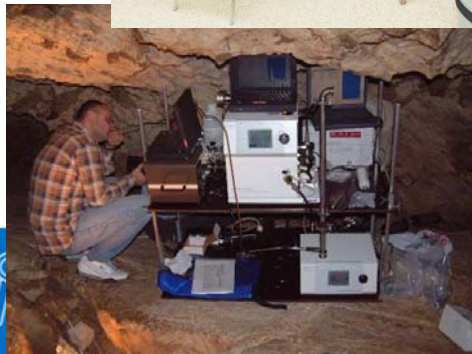
- Environmental bio-monitoring
- Radiation protection and monitoring
- X-ray fluorescence analysis
- Verification of Leksell gamma knife planning system
- Gel dosimetry
- Mathematical modeling of ionizing radiation transport using MC code



Research activities



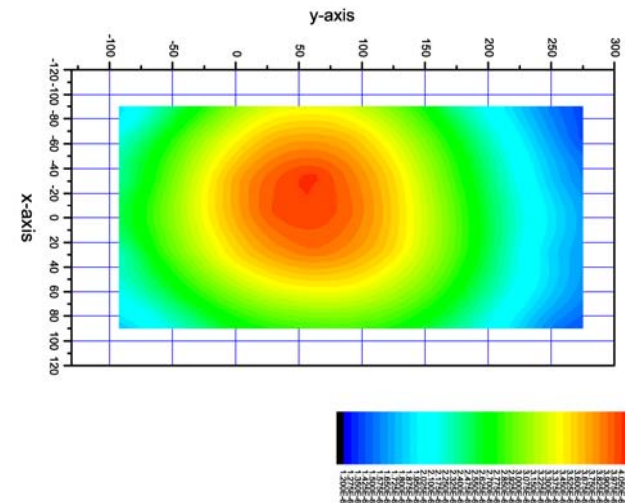
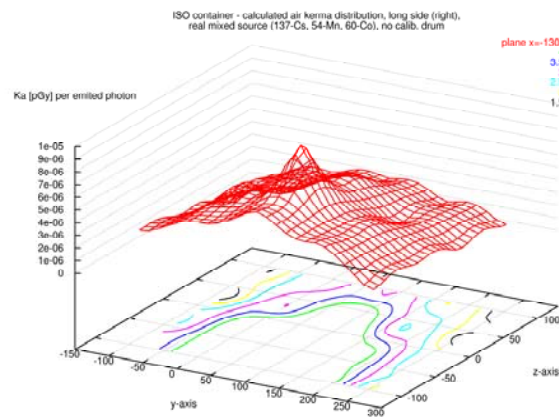
- Monitoring of the environment (in situ and laboratory gamma spektrometry, termoluminiscent analysis, surface contamination, calculations and Monte Carlo simulations...)
- Radiation protection at workplaces



Nuclear safety

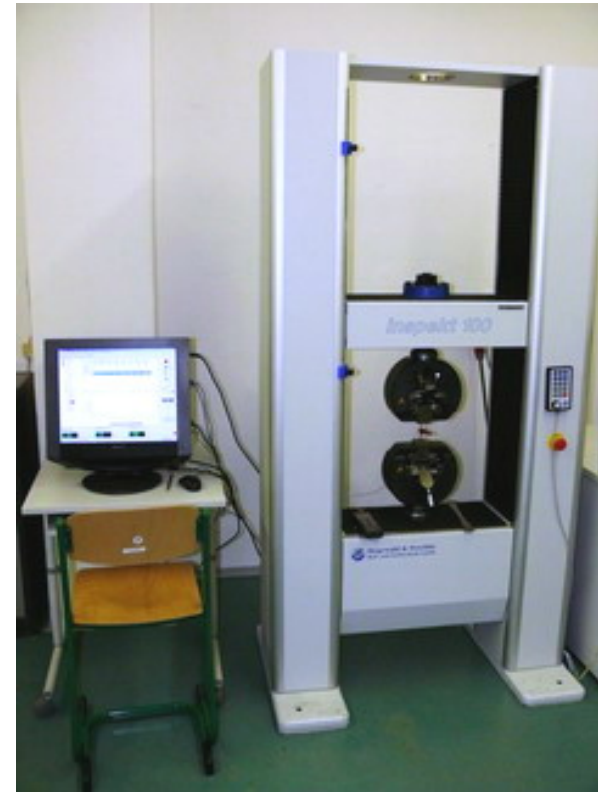
- Mathematical modelling of transportation of IR (MCNPX, MicroShield, SuperMC, Fluka, Geant; Frame02...)
- Tomograph, TIMEPIX

ISO contejner



Department of Materials

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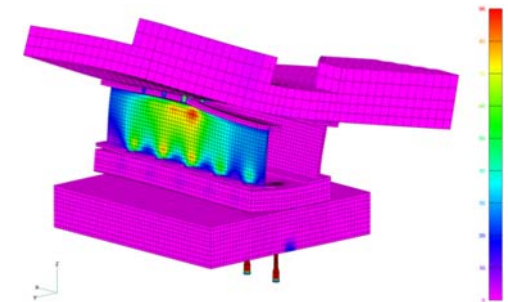


Universal testing machine



Research Activities

- Study of fatigue properties and fracture micro-mechanisms of Al-alloy 7010
- Development and application of fractographic methods of reconstitution of fatigue, crack growth history in aircraft structure parts
- Mathematical modeling of stress and strain field around the crack tip, simulation of fatigue crack growth in structure parts etc.

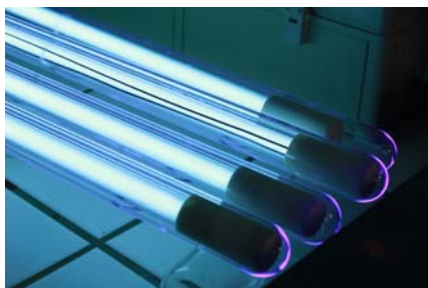


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Radiochemical laboratory



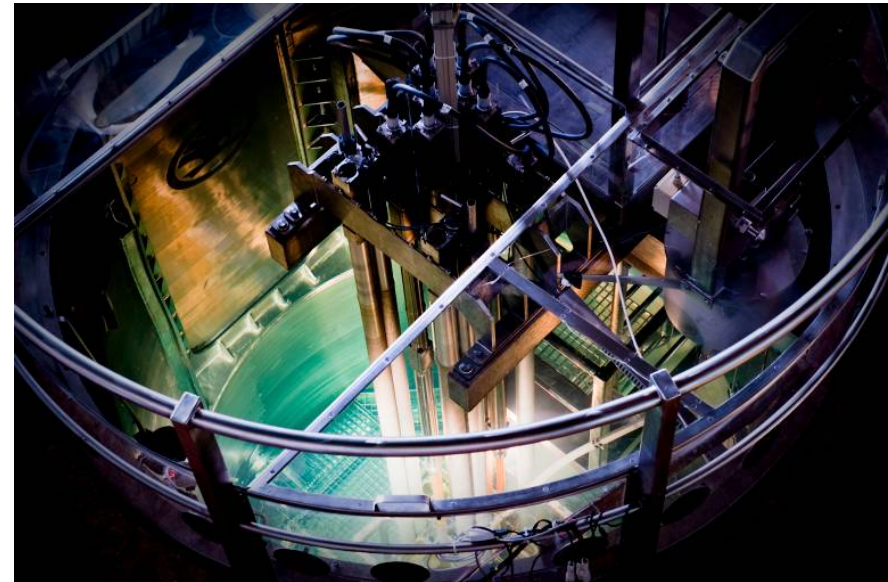
Research Activities

- Behavior and speciation of radionuclides in the environment, including HLW repository related studies
- New separation principles and methods for the treatment of liquid radioactive waste (including partitioning) and/or radioanalytical applications
- Ionizing radiation influencing of the matter, including material syntheses, radiation chemical environmental technologies or HLW repository related study



Department of Nuclear Reactors

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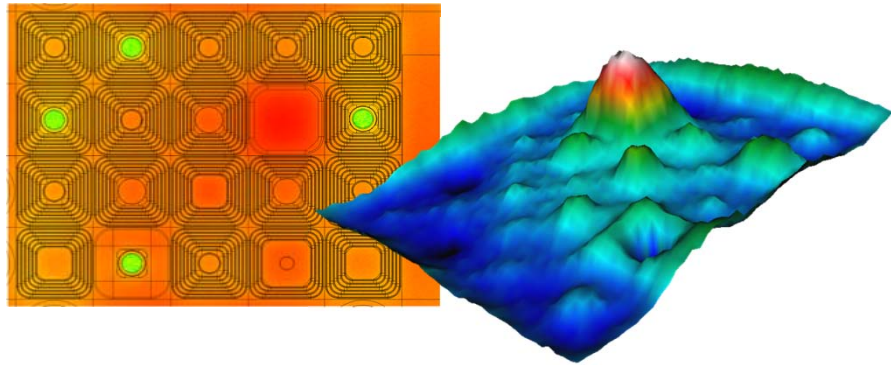


VR-1 reactor - reactor vessel



Education – Theory & Practice

- Theory & practice:
 - Nuclear Reactor Physics
 - Reactor Dynamics
 - Nuclear Fuel Cycle
 - Nuclear Safety
 - Experimental neutron physics
 - Experimental Reactor Physics
 - Operator Course at VR-1
 - Pre-diploma Practice



Neutron flux distribution in
VR-1 reactor core (MCNP)



Students' practical work with
manganese bath



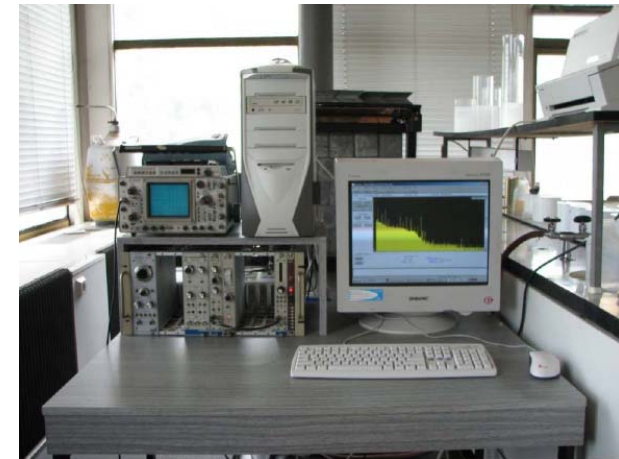
Research Activities

- Criticality and shielding calculation
- Fuel cycle & inventory calculation
- Feasibility study on implementation of new reactor systems in Czech Republic
- Validation of computational codes
- Development and testing of equipment for research reactor
- Development and testing of advanced detection systems for neutron & ionizing radiation



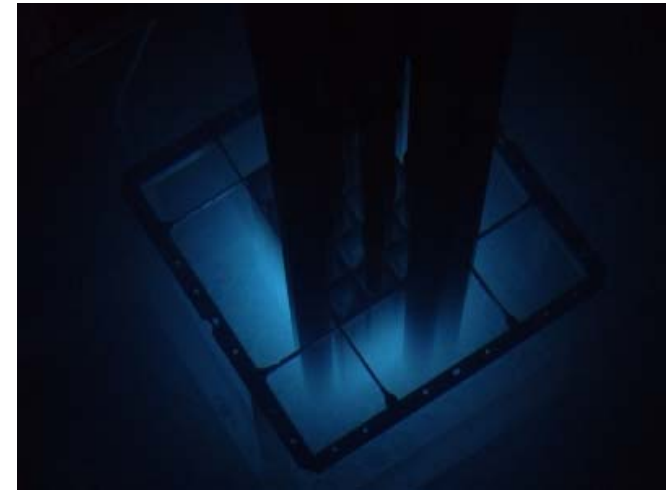
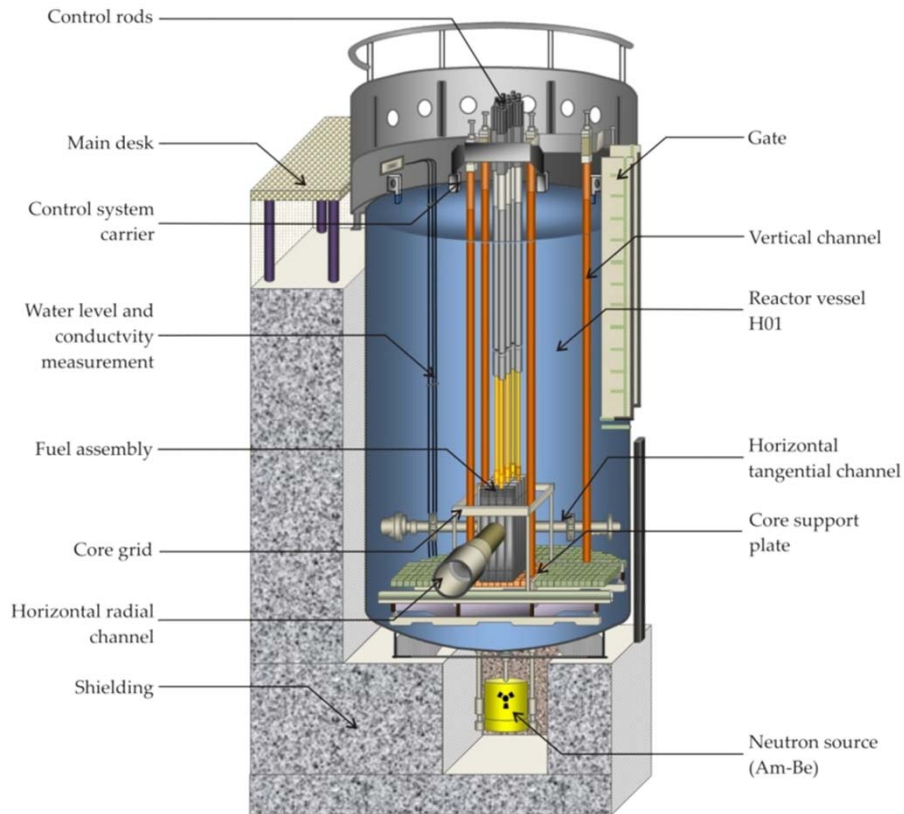
Laboratories

- Training Reactor VR-1
- Neutron Laboratory
- Spectrometry Laboratory
- Electronic Laboratory



Reactor VR-1

www.ReactorVR1.eu



Cherenkov effect at VR-1 reactor



Work inside the reactor vessel



Reactor VR-1 – Utilization

- Education & training
 - Students from Czech universities : 150 students / year
 - International courses for abroad universities: 50 – 70 students / year
 - International course for developing countries
- Training of nuclear power plants staff
 - reactor operators & control physicist
 - Czech & Slovak NPPs
 - ~ 4 courses / year
- Information and promotional activities
 - ~ 1000 high school students / year
- R&D with respect to reactor parameters



One Week Training Course at VR-1 Reactor

- **Monday**
 - *Morning:* Welcome meeting & Visit of the VR-1 Reactor
 - *Afternoon:* Neutron detection
- **Tuesday**
 - *Morning:* Delayed neutrons detection
 - *Afternoon:* Reactivity measurement
- **Wednesday**
 - *Morning:* Study of the reactor dynamics I
 - *Afternoon:* Study of the reactor dynamics II
- **Thursday**
 - *Morning:* Control rod calibration
 - *Afternoon:* Critical experiment – approaching critical state
- **Friday**
 - *Morning:* Digital control and safety systems of the VR-1 reactor
 - *Afternoon:* Discussion & evaluation



Potential Areas of Co-operation

■ Education and training:

- Student exchange
- Lecturer exchange
- Utilization of VR-1 reactor



■ R&D

- Development and validation of calculation codes
- Development of detection systems
- Neutron application (e.g. NAA, neutron imaging methods, radioisotopes production...)
- Possible implementation new reactor systems in Czech Republic





SUJCHBO v.v.i.



Radon-aerosol chamber:
Aerosol environment
preparation and
measurement,
contamination using short
lived radionuclides

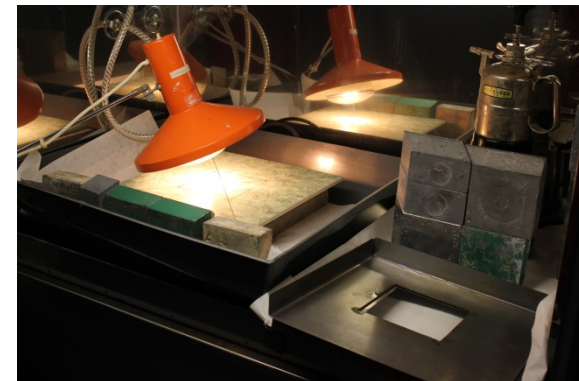




Decontamination practice

Radionuclides and simulation of radionuclide contamination:

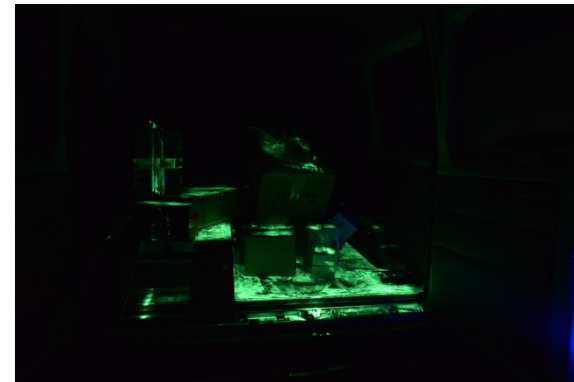
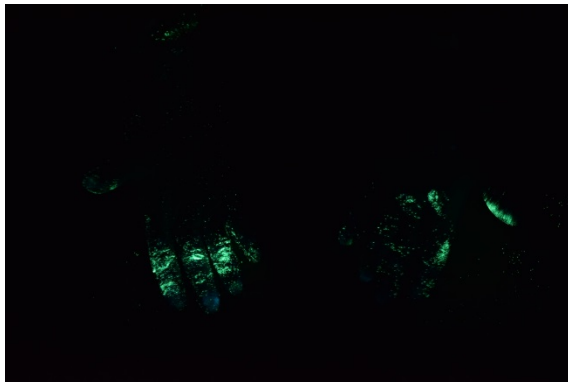
- Mechanical decontamination
- Chemical decontamination
- Decontamination using removable paints





Personal protective-shielding suits

- Practice in utilization
- Practice in radionuclides searching and PSS against IZ testing





Státní ústav radiační ochrany, v. v. i.
National Radiation Protection Institute

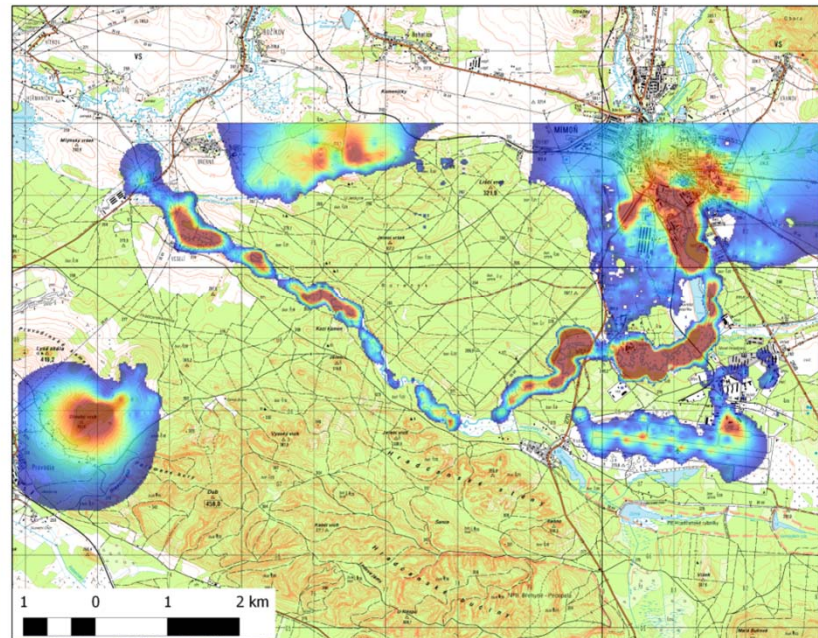


Mobile group:

- Field exploration
- Reference laboratories

Modelling, calculations,
stadard spread model
utilization

Letecká skupina SÚRO - 27.4. 2011 - Ploučnice



interpolace v open-source programu SAGA GIS, mapa vytvořena v programu Quantum GIS



DIAMO s.p.



- Field measurement
- Radionuclides movement in the environment modelling
- Remedial practical measurements
- Monitoring of the surface contamination
- Real decommissioning (uranium mining workplace)
- Excursions, seminars with experts.....





**8th International Conference
on Protection against Radon at Home and at Work**

**13th International Workshop
on the Geological Aspects of Radon Risk Mapping**

www.radon2016.cz
radon@radon2016.cz
September 12-16, 2016, Prague



You are welcome to the Radon2016 and GARRM2016 conference

To avoid topical overlaps and to better fit the time possibilities of you – participants - we have jointly decided to organize two respected international radon conferences, Radon conference and GARRM one after another to fit in one week and at the same venue.



Thank you for your attention

- SARA 2016 course date???
- September? October?

