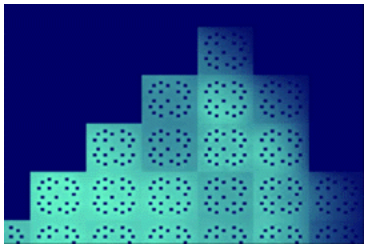
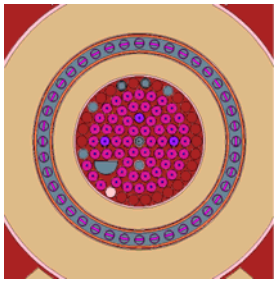
Our research in the domain of **reactor physics** is directed mostly towards development of new calculational methods for research and power reactors. Our work is focused on neutron, photon and electron Monte Carlo transport, nuclear data evaluation, sensitivity methods, advanced nodal methods, pin cell and fuel element homogenization and on methods aimed at precise power distribution reconstruction. Several program packages for reactor calculations both for our TRIGA research reactor and Krško nuclear power plant were developed at our department. We also study advanced fourth generation reactors, advanced neutron sources and data and materials for fusion technology.

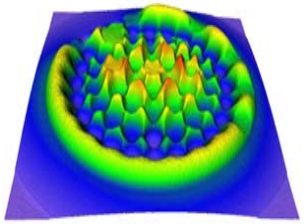


CORD-2 calculation of a PWR reactor.

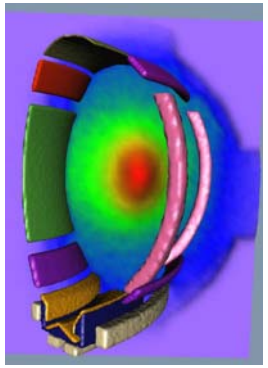
Members of our department during Physics Start-up Tests at Krško NPP.

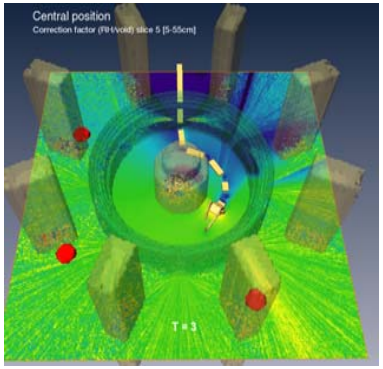
We perform neutron and photon transport calculations for the currently largest fusion reactor JET (Great Britain) and for the future fusion reactor ITER (France).





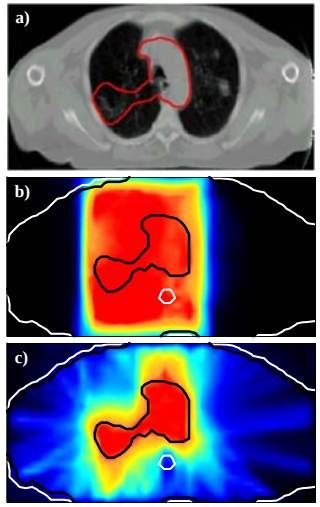
Computer model of the TRIGA reactor and sample thermal flux calculation.





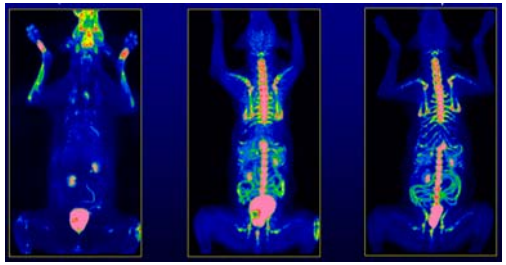
Neutron flux distribution and influence of the mascot robot inside the JET tokamak.

Our research in **medical physics** is now mostly oriented into image guided therapy. Our intention is to use advanced methods for medical imaging for a further advance in radiotherapy.



Comparison of inverse (c) and classical (b) planning of radiotherapy on sample tumor marked on picture (a).

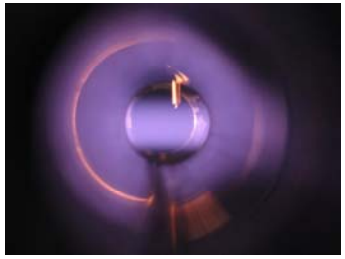
Within this general field we are focused mainly into quantitative PET imaging. Quantification is based on kinetic analysis of radiopharmaceutical tissue uptake. Kinetic analysis is done on voxel level allowing for parametric image generation and following of a spatial distribution of the progress of the disease and the response to therapy.



Picture of the radiation damage after radiotherapy.

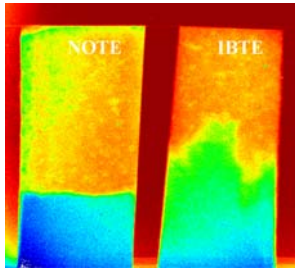
In the area of **physics of semiconductors** we used the ionized cluster beam technique in order to perform admittance spectroscopy of metal–semiconductor interfaces.

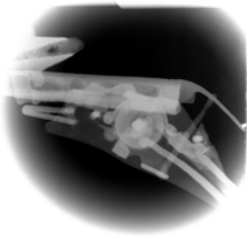
In the **Plasma Physics** Laboratory phenomena in magnetized plasmas are studied. Experimental research work has been in recent years focused on electronic double layer in a weakly magnetized plasma produced by a DC discharge with a hot cathode, and the development of microcomputer supported plasma diagnostic equipment. Theoretical research is focused on the interaction of laser light with plasmas.



Plasma in our experimental device.

In the area **of neutron dosimetry, spectrometry, radiography** we are working on material non-destructive testing and examination.





Sample neutron radiography images: water in concrete and archaeology specimen.

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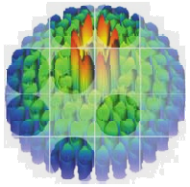

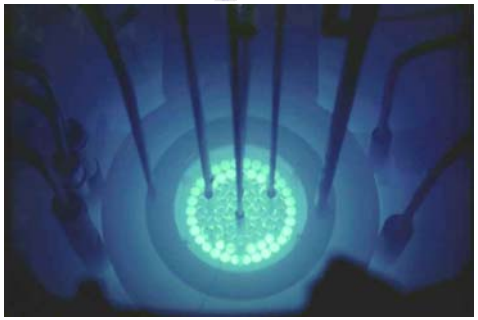

TRIGA Research reactor at "Jožef Stefan" Institute during pulse experiment.

"Jožef Stefan" Institute
Ljubljana, Slovenia

Reactor Physics Department F8

Research Areas:

- Reactor Physics
- Plasma Physics
- Neutron dosimetry, spectrometry, radiography and tomography, gamma dosimetry
- Medical Physics
- Physics of Semiconductors