Spectral Imaging

RECOOP HST Research Activity Inventory		
Please complete the template for each selected project your organization would like to share with the partners of the RECOOP HST Consortium and would like to invite other organizations to write FP7 or NIH proposals.		
Organization	Actin Cytoskeleton Research Unit (CRC) Department of Biophysics Medical School, University of Pécs	
Area of the Research	Protein, actin, conformation, dynamics, cytoskeleton, fluorescence, spectroscopy, fast kinetics	
Title of the Research Activity	Spectral imaging	
Department (complete address)		**Principal Investigator or Head of the Research Group**
Department of Biophysics Medical School, University of Pécs H-7624 Pécs, Szigeti út 12., Hungary		Name: Dr. NYITRAI, Miklós
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Abstract Maximum 500 characters

Research area

The purpose of the research is to describe and understand the molecular mechanisms playing a part in the regulation and operation of actine cytoskeleton. Fluorescent spectroscopic procedures are used to investigate the changes in the conformational and dynamic features of various proteins in selected model systems. We study the interrelationship between actin and actin binding proteins. Fast-kinetic procedures are used to investigate the kinetic features of the related protein-protein and protein-ligand relationship.

Human resources

researchers (9) (of them 3 degree holders and 4 PhD students) and laboratory assistants (3)

Special instruments

- steady-state fluorescence and spectrofluorimeters applicable for measuring the lifetime of fluorescence
- system measuring pikosecond 1-foton counting (TCSPC) fluorescence lifetime
- confocal microscope
- fast-kinetic (‘stopped-flow’) system
- fluorescence microsccope
- the development of an ultra fast spectroscopy laboratory as part of a National Research and Development Project is under way in the Institute. The result of the development is a femtosecond fluorescenct spectroscopic measuring instrument.
- as part of GVOP development, a 2-foton microscope is available for the Institute, while the result of further development is fluorescence lifetime imaging microscope (FLIM) and a fluorescence correlation spectroscopic measuring instrument (FCS).

- the research team also has access to further measuring instruments of the Department of Biophysics.
- DSC calorymeter (in cooperation with Dr. LŐRINCZY, Dénes).
- EPR spectroscope (in cooperation with Prof. BELÁGYI, József).
- flow cytometer and cell sorter (in cooperation with Dr. LUSTYIK, György).

Products and services
spectroscopic and fast kinetic investigations, fluorescence microscopic measurements, DCS and EPR measurements, cell analytic measurements

Methods used	Maximum 300 characters

Related references (max 3)	Indicate the impact factor of the cited reference

Related Inventions Disclosures and Patents	

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Please complete the template for each selected project your organization would like to share with the partners of the RECOOP HST Consortium and would like to invite other organizations to write FP7 or NIH proposals.		
Organization	Department of Experimental Physics, Faculty of Sciences, University of Pécs	
Area of the Research	Nonlinear optics, terahertz-spectroscopy, crystal-optics, fluorescence-spectroscopy, waveguide-optics, plasma physics, X-ray-spectroscopy	
Title of the Research Activity	Medical Device	
Department (complete address)		**Principal Investigator or Head of the Research Group**
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Abstract	Maximum 500 characters	

Research are:

1 Generation and application of ultra-short (fs) pulses
2 Generation of far infrared (THz) light pulses
3 Study of linear and non-linear optical properties of oxide crystals
4 Study of periodically poled lithium-niobate (PPLN) crystal
5 Energy transfer in proteins, dipolar relaxation
6 Propagation of ultra-short pulses in waveguides
7 Capillary X-ray optics.

Human resources:
professor (1), associate professors (4), assistant professor (1), PhD students (3)

Special instruments:
Argon-ion laser, diode pumped frequency doubled Nd-Yag laser, Q-switched Nd-Yag laser, with frequency doubler and tripler units.

Products and services:
Currently a measurement set-up makes it possible to determine the non-linear properties (refraction, absorption and photorefraction) of different non-linear materials. The domestic production of the periodically poled lithium-niobate (PPLN) will be started in the near future. Shortly, a terahertz laboratory will operate in our department. With our fluorescence-spectroscopic method it is possible to determine the uranium content of impure water. The method was developed in cooperation with the Physical Chemistry Department of the University of Pécs, and was applied successfully to examine the waters of Paks NPP.

Research in our department is oriented towards lasers, and their applications. It includes build up and development of different optical amplifying and laser systems, spectroscopic applications of

lasers, examination of different laser-material interactions. In previous years surpassing result was born in the field of nonlinear optics. This is connected to the efficient generation of terahertz (THz) pulses. We achieved a special velocity matching set-up, in which the front of the pump pulse is tilted relative to its wave front. According to the Huygens principle, the THz radiation propagates perpendicularly to this tilted wave front. Velocity matching can be adjusted with the variation of the tilting angle. The advantage of the set-up is that it makes possible the application of extended pump beams and the generation of THz pulses with large energy. Our aim is to establish the first Hungarian THz laboratory in Pécs. THz pulses make possible the identification of different materials either inside an envelope or inside a package, since THz radiation can transmit through the paper. Another project is the fabrication of periodically poled lithium-niobate crystals, which will also be unique in Hungary. Currently a measurement set-up makes it possible to determine the non-linear properties (refraction, absorption and photorefraction) of different non-linear materials. Relying on findings of the theoretical examination of waveguides, we elaborated a new model, which can be applied for multi-mode waveguides. In the past few years we have started a new project, which is focused on the build up of X-ray laser excited by capillary discharge. Research in the field of fluorescence spectroscopy involves the study of solvent dynamics in macromolecules and dipolar relaxation. We examined the emission wave length dependence of fluorescence decay and rotation anisotropy in humanserium-albumin (HSA) and acrylodan. As applied research in the field of fluorescence-spectroscopy, we elaborated a method in order to determine quantitatively the uranium content of natural waters. These methods have regional importance, especially relating to the uranium-mines in the surroundings of Pécs.

Methods used	Maximum 300 characters

Related references (max 3)	Indicate the impact factor of the cited reference

Related Inventions Disclosures and Patents	