

ICPS 2015 LAB TOURS

Dear colleagues,

please below find the info on lab tour groups and labs you will be visiting on August 13 and 14. There's some pretty exciting stuff to be seen here!

During the check-in, you will be given an opportunity to choose which group you will join (the number of participants for each group is limited). The groups are labeled B1 – B9 (Thursday) and A1 – A7 (Friday).

Meeting point and time is given in the tables below. Look for your tour guide – they will hold a sign with your group number on it and will lead you to the institutes. You will go with trams and can buy tram tickets in any tobacco or newspaper shop (TISAK and iNovine) which is suggested to buy some time before. One way ticket is 10 kuna or you can buy a daily ticket for 30 kuna.

Please note that it is necessary to have your ID to enter the Ruđer Bošković Institute!

Thursday, August 13

Groups B1, B2, B3, B4, B5, B6, B7, B8, B9

Important: Meeting with your tour guide is at **16:15** in front of the Faculty.

B1	Visit to the Institute of Physics and some of its labs focusing on research in the fields of: <ul style="list-style-type: none">• Femtosecond spectroscopy & Cold atoms,• Plasma physics• Surface physics• Biophysics
B2	
B3	
B4	
B5	Laboratory for Low-level Radioactivities (Ruđer Bošković Institute) Laboratory for ac susceptibility (Institute of Physics) Lecture: Non-perturbative approach to phase transitions with disorder (Ivan Balog, Institute of Physics)
B6	Laboratory for Low-level Radioactivities (Ruđer Bošković Institute) Molecular Physics Laboratory (Ruđer Bošković Institute) Lecture: Non-perturbative approach to phase transitions with disorder (Ivan Balog, Institute of Physics)
B7	Laboratory for ion beam interactions (Ruđer Bošković Institute) Laboratory for Low-level Radioactivities (Ruđer Bošković Institute) Lecture: When electrons are made to cooperate: Collective phases in molecular conductors (Tomislav Ivek, Institute of physics)
B8	Molecular Physics Laboratory (Ruđer Bošković Institute) Laboratory for ion beam interactions (Ruđer Bošković Institute) Lecture: When electrons are made to cooperate: Collective phases in molecular conductors (Tomislav Ivek, Institute of physics)
B9	The Technical Museum Laboratory for ion beam interactions (Ruđer Bošković Institute)

Friday, August 14

Groups A1, A2, A3, A4, A5, A6, A7

Important: Meeting with your tour guide is at **16:30** in front of the Faculty.

A1	
A2	Visit to the Institute of Physics and some of its labs focusing on research in the fields of: <ul style="list-style-type: none">• Femtosecond spectroscopy & Cold atoms,• Plasma physics• Surface physics• Biophysics
A3	
A4	
A5	
A6	Laboratory for Astroparticle Physics (Ruđer Bošković Institute) Laboratory for Intermediate and High Energies (Department of Physics, Faculty of Science) Metroteka
A7	

Thursday, August 13: Groups B1, B2, B3, B4

Friday, August 14: Groups A1, A2, A3, A4

Institute of Physics, Zagreb

Visit to the Institute of Physics (www.ifs.hr) will bring you the insight into research activities in theoretical and in particular experimental physics which are devoted to solid state physics, surface physics, statistical physics, biological physics, atomic and molecular physics, optical physics and plasma physics. Institute of Physics employs 35 scientists at permanent positions, 17 PhD students and 26 technical and administrative staff. Besides Institute's permanent goal to acquire as high level of research quality as possible, the important component of our activities is education, dominantly through the supervision of graduate and PhD theses and through teaching at undergraduate and graduate level on Croatian universities. The third important component is the mission and efforts to ensure that the research leads to technology transfer to the industry standards through spin-off activities.

In this visit you will get an insight to the Institute of physics and recent research highlights (intro lecture) and afterwards you will be able to see the following research labs:



Femtosecond spectroscopy & Cold atoms

Keywords: Study of alkali vapours and high-pressure light sources with alkali vapours by means of fs-lasers, construction of components for fs-systems, amplification stages and other control units for shaping of fs-pulses, applications in biophysics and dentistry; Development of new and efficient methods for cooling atoms and molecules by means of c.w. and fs-lasers, magneto-optical trapping for the formation of ultracold Rb, spectroscopy of ultracold matter singlet and triplet states, fs-pulse shaping of ultracold alkali molecules in lowest ro-vibrational states.



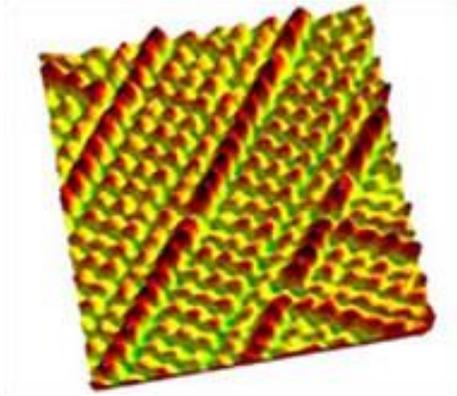
Presenters: Nataša Vujičić & Neven Šantić



Plasma physics

Keywords: High pressure hot plasmas as potential light sources, diagnostics and modelling of processes within the laser produced plasma (ns- and fs- modes) in vacuum, background gases and in liquids, diagnostics and modelling of processes within low-pressure inductively coupled RF plasma, application of plasma for material processing and formation of nanostructures, plasma for spectroscopic elemental analysis, transient phenomena and striations in plasma, atmospheric pressure plasma jets for soft ionization, applications in biomedicine, food and textile technologies, for synthesis of novel materials.

Presenter: Dean Popović



Surface physics

Keywords: Structural and electronic properties of clean surfaces, ultra-thin films and nanostructures, electronic confinement in nano-particles and low dimension systems, quantum well states, stepped (vicinal) surfaces and nanostructures built on them, novel 2D materials (graphene, dichalcogenides, hBN, topological insulators).

Presenter: Marko Kralj



Biophysics

Keywords: Experimental investigations of characteristic space scales in water solutions of DNA and other (bio)polyelectrolytes, dielectric spectroscopy, complexes of RecA proteins and DNA molecules of characteristic helicoidal symmetry, protein-DNA and protein-RNA interactions, theoretical investigations of complexation of proteins and DNA molecules, RNA viruses as systems with spontaneous self-construction, condensed phases of DNA molecules within the viruses, protein-protein interactions based on electrostatics of charges on proteins in solutions, dependence on pH and salinity of solution.

Presenter: Tomislav Vuletić

Thursday, August 13: Groups B5, B6, B7

Laboratory for Low-level Radioactivities (Ruđer Bošković Institute)

Laboratory for Low-level Radioactivities (^{14}C and ^3H Laboratory) at the Rudjer Bošković Institute, is a part of the Division for Experimental Physics of the Institute. The group studies radioactive (^{14}C , ^3H) and stable (^2H , ^{13}C , ^{18}O) isotopes in nature and their application in archaeology, geology, hydrology, paleoclimatology, ecology and geochemistry, with the emphasis to the processes in karst regions. Collaborators of the Laboratory are also involved in development of techniques for tritium (^3H) and radiocarbon (^{14}C) measurements. Recently, the Laboratory introduced the chemical technique for graphite preparation of milligram-sized samples to be measured by accelerator mass spectrometry (AMS).

Presenters: Nada Horvatinčić, Andreja Sironić

Thursday, August 13: Group B5

Laboratory for ac susceptibility (Institute of Physics)

Laboratory for ac susceptibility at the Institute of Physics conducts research on magnetic materials using a very sensitive home-made inductive coil method. Materials studied span a wide range from soft- and hard-ferromagnets to quantum magnets and superconductors. Alongside the collaboration with several groups at the Institute of Physics and nearby Department of Physics, we collaborate with several international research centers in Switzerland, Germany, Canada and Spain.

Presenter: Vinko Šurija

Thursday, August 13: Groups B6, B8

Molecular Physics Laboratory (Ruđer Bošković Institute)

The laboratory has traditionally focused on studying on optical, structural and vibrational properties of nanostructural materials and molecules by vibrational spectroscopies (Raman and infrared). The laboratory capital instrument JobinYvon Horiba T64000 Raman spectrometer is used to analyze the laser light scattered on a very small amount of sample. Based on the observed energy transfer one can draw conclusions about the states of the system and particle interactions in the crystal, glass, liquid, etc.. In recent years, research focus shifted to the nanostructures.

Research and development of new functional materials and nanostructures in Molecular Physics Laboratory has been undertaken in the framework of several research topics:

1. silicon nanostructures for advanced applications
2. new ceramics and multiferroics
3. molecular systems and vibrational analysis
4. laser interactions and selforganizational processes
5. new methods for Raman spectroscopy
6. titanium nanostructures

Presenter: Vedran Đerek

Thursday, August 13: Groups B7, B8, B9

Laboratory for ion beam interactions (Ruđer Bošković Institute)

The group operates the accelerator center consisting of two tandem accelerators and associated experimental beam lines, this being the largest and most complex experimental facility in Croatia. It performs basic and interdisciplinary research concerning interactions of ion beams with matter, and develops methods to characterize and modify properties of matter, with emphasis on nanostructure research. Part of the activities are connected to applications of analysis methods in biomedicine, environment as well as on research of cultural heritage objects.

Presenter: Milko Jakšić

Thursday, August 13: Groups B5, B6

Non-perturbative approach to phase transitions with disorder

Presenter: Ivan Balog (Institute of Physics)

Phenomena resulting from collective behavior, have confused and delighted researchers for decades. The reason for this are difficulties in understanding phenomena emerging exclusively from correlations and which do not exist in one-particle picture, as well as necessity for constant development of novel theoretical concepts, necessary for explaining them.

Currently the most modern approach to such problems is nonperturbative renormalization group (NPRG) [1], which is strongly developing recently. The reason for interest in this approach is in its generality, which enables us to use it on numerous very different problems such as: classical or quantum phase transitions to nonequilibrium phenomena. The advantage of NPRG is, besides giving deep insight, the possibility to explain effects which have been unsolved puzzles in theoretical sense. Such effects are often resulting from rare but important events, spatial inhomogeneities etc.

After a short introduction to NPRG, I am going to present some illustrative examples which I have worked on [2,3,4]. We shed light on some fundamental questions related to the random field Ising model, which represents a paradigm of phase transitions in the presence of disorder, because it describes the phenomenology of many experimental systems.

[1] J. Berges, N. Tetradis, and C. Wetterich, Phys. Rep. 363, 223 (2002).

[2] I. Balog, M. Tisser and G. Tarjus, Phys. Rev. B 89, 104201 (2014)

[3] I. Balog and G. Tarjus, Phys. Rev. B 91, 214201 (2015)

[4] I. Balog, M. Tisser and G. Tarjus, J. Stat. Mech P10017 (2014)

Thursday, August 13: Groups B7, B8

When electrons are made to cooperate: Collective phases in molecular conductors

Presenter: Tomislav Ivek (Institute of physics)

Modern physics of condensed matter is in large part the study of strongly-correlated electron systems. In the presence of strong interactions electrons simply cannot be thought of as "free" particles embedded in a static sea of others. They push each other around, are constrained by their neighbors, and ultimately bring about a whole zoo of novel cooperative states: different unconventional superconductivities, purely electronic ferroelectricity, charge and spin orders, multiferroicity, colossal magnetoresistance to name only a few. These phenomena are crucial to our understanding of fundamental forces at play, and serve to drive recent advances in high technology.

In this lecture we will focus on some of the quasi-2D conducting organic salts with surprisingly rich phase diagrams linked to ordering of electronic charge. How do we detect all these different phases? How do they come about? The state-of-the-art theories and experimental observations are incomplete but constantly improving, which makes this promising area of research all the more exciting.

Friday, August 14: Groups A5, A6, A7

Laboratory for astroparticle physics (Ruđer Bošković Institute)

The group is a member of the MAGIC telescope in the Canary Islands and participates in data analysis, in particular in photon-hadron signal separation. The theoretical work of the group members consists of investigation of dark energy models (RG-running cosmologies, holographic dark energy models, neutrino dark energy models), neutrino astroparticle physics, black holes and noncommutative quantum field theories.

Presenter: Dario Hrupec

Friday, August 14: Groups A5, A6, A7

Laboratory for Intermediate and High Energies (Department of Physics, Faculty of Science)

Research in experimental particle physics at high energies focuses on the investigation of quark-gluon plasma at the Relativistic Heavy Ion Collider (RHIC) and Large Hadron Collider (LHC), as well as the nucleon spin structure at the RHIC. During this visit you will see the group's clean room and experimental setup.

Presenter: Nikola Poljak



Friday, August 14: Groups A5, A6, A7

Metroteka

Presenter: Siniša Prugovečki, CEO

I graduated in physics in 2001 (a year after participating in organization of ICPS 2000) and tried a few things (most of them quite unsuccessfully) before starting my own metrology company Metroteka in 2008. Since then, we've grown into one of the most diverse accredited calibration laboratories in Europe, had a quick romance with Caravaggio's \$60.000.000 painting, cared for baby bats and other creatures, jumped onto the big data 4th industrial revolution train, started USA collaboration with business teachers of Steve Jobs and as the latest high point - managed to get on the ICPS 2015 Costume Party jury.

In 20 minutes, I will try to give you a quick glimpse of metrology and entrepreneurial alternative to academic research, teaching or jobs in industry and finance.

