

7 Training and career development, Public Information

The Eleventh International Workshop and Fusion Summer School in Kudowa-Zdrój

The 11th Kudowa Summer School "Towards Fusion Energy" was held this year in Kudowa Zdrój, Poland, in June 11-15, 2012, on the initiative of the the Institute of Plasma Physics and Laser Microfusion (IPPLM), the Association EURATOM-IPPLM and International Centre for Dense Magnetised Plasmas (ICDMP). It is a scientific event that takes place annually in Kudowa Zdrój and aims at young scientists (PhD and Master students) from different countries, and provides courses on various aspects of a fusion energy, plasma experiments and technology. Participating students were encouraged this year to present short (10-15 min.) presentations about their research activities and provide 2-4 pages contribution based on given presentation. There was a competition for the best presentation at the end of the school.

The topics of the lectures were as follows:

- Magnetic Confinement Fusion (MCF),
- Inertial Confinement Fusion (ICF),
- Fusion Technology,
- Plasma Diagnostic Techniques.

18 distinguished lecturers presented lectures during the school. Among others, the group included J. Ongena (Director of the School), D. Batani, P. Kubes, G. Maddaluno, L. Torrioni, U. Woźnicka. The topics ranged from warm dense matter and high energy density physics to exciting times ahead in Fusion research. Around 35 persons (mainly Doctors and PhD students) from Ukraine, Italy, Czech Republic, Bulgaria, Russian Federation, Germany, Estonia and Poland met in Kudowa in 2012.

Participating in the XVI Science Festival in Warsaw, 22-30 September, 2012

The idea of the Science Festival originated in September of 1996. Originally, 72 meetings were held within 2 days at 44 research institutes and organizations. In the subsequent years, the project has developed significantly. Over 100 research institutes propose festival activities. Some events during the Festival remain invariable from year to year: clubs and discussions, weekend meetings such as laboratory presentations for a limited number of participants (they are delivered in the form of presentation and can be accompanied by lecture) and festival lessons on weekdays mainly for primary or secondary school students.

Lectures on the IPPLM side referred to nuclear fusion as a solution for energy problems in the world, laser-plasma interaction as a source of fast particles, satellite plasma thrusters, Sun on Earth, laser acceleration of particles and others. After lectures delivered by physicians with doctor degrees, participants had a chance to visit laser laboratories and PF-1000 device, as well as take part in hands-on experiments in relation to radiation.

In total, five junior and high schools (one class from each) participated in the festival lessons on weekdays and around 100 persons of various age joined IPPLM during weekends.

Visits of students

Around 30 persons from Maria Skłodowska-Curie University (Institute of Physics) visited IPPLM in March. Lectures included such topics as thermonuclear fusion in the context of the energy crisis,

magnetic and inertial confinement, fusion technology and plasma thrusters. Participants had a chance to see the PF-100 device and laser laboratory.

Around 50 persons (two classes) from LXIII High School named after L. Kossuth visited IPPLM in April. M. Scholz conducted a lecture on thermonuclear fusion and tokamaks, W. Stępniewski described the functioning of PF-1000 device, S. Jednoróg focused on spectrometry, and young scientists proposed a tour of the laser laboratory.

Press release, web page publications, distribution of materials, organising informative meetings, public lectures

Article 'Modern technologies in Mazovia province' on www.mazovia.pl on the visit of Mr Adam Struzik, Marshal of the Mazovia province, in IPPLM who got to know the Institute's activity and scientific staff. March 2012

TV spot 'Age of Inventions' on TVP Info Channel on the future of nuclear and thermonuclear energy in Poland presenting PF-1000 device. September 2012

Video spot 'Foresight for thermonuclear energy' on www.dotacjenasukces.pl (of the National Center for Research and Development) on the project aimed at developing procedures for engaging Polish science and industry in works devoted to thermonuclear energy. October 2012

Article 'The Polish Hall thruster – crypton plasma thruster for space probes' in *Urządzenia dla Energetyki* on the efforts of Dr. J. Kurzyna and his team to implement noble gas krypton to be used in plasma thrusters as opposed to expensive xenon which is difficult to obtain. October 2012

Catalogue of technologies developed by Polish Research Institutes, Section: Physics and Astronomy, developed by the Ministry of Foreign Affairs. The structure of IPPLM, its scope of activity and offer for potential partners for cooperation. November 2012

Article of the Director of IPPLM Andrzej Gałkowski 'Thermonuclear energy' in *Przegląd Techniczny* issue 25 and 26) on the methods of plasma heating, JET tokamak as well as ITER and DEMO reactors. December 2012

Video spot on the website of the Mazovian Unit of EU Programmes Implementation devoted among others to the modernization of the High Power Laser Laboratory and IPPLM's efforts to reconstruct solar fusion in terrestrial conditions.

Collaboration with Teatr GO

Workshops called The Art Of Science have been organised for two years by Teatr GO, and their popularity is still growing. In 2012, 500 participants attended the cycle of ten meetings. Children as well as junior and high school students, when taken aback by the new technology, want to understand the phenomena in nature. That is why they have visited IPPLM, talked to scientists, invented scenarios for their plays about atoms, played jokes with scientific themes. One of the main IPPLM facility, Plasma Focus 1000, was utilised to make science more familiar to different age groups to which the lecture/explanations were provided. Thanks to the workshops, participants have built their trust in science. Plans of joint efforts of Teatr Go and IPPLM for 2013 include among others workshops with the Budapest youth which will lead to the artistic performance

PhD studies in the area of plasma physics and controlled fusion research

PhD studies in the area of plasma physics and controlled fusion research are carried out at the National Centre for Nuclear Studies (NCBJ) in Otwock-Swierk, Poland, as regular courses for candidates with MSc or MSc EE degrees. It is assumed that the PhD degree can be obtained in 3-4 years. These studies embrace:

1. Individual studies on plasma physics, including:
 - Basic notions, examples of plasma appearance and its applications
 - Definitions of high-temperature plasma and thermonuclear reactions
 - Description of charged particles motions in plasma
 - Kinetic theory of plasma
 - Macroscopic, probe and corpuscular methods of plasma diagnostics
 - Magneto-hydrodynamic theory of a plasma
 - Microwave methods of plasma diagnostics
 - Thermodynamic description of a plasma
 - Optical methods of plasma diagnostics
 - Classification of plasma research facilities
 - Methods of the high-temperature plasma generation
 - Confinement of a high-temperature plasma and design of a fusion reactor
2. Active participation in plasma experiments at NCBJ and collaborating laboratories, including:
 - Assistance at various plasma experiments
 - Elaboration of experimental results
 - Preparation of scientific papers
3. Active participation in plasma seminars at NCBJ and other research centres, including:
 - Presentation of chosen problems
 - Presentation of results obtained during own experimental or theoretical studies
4. Individual studies of selected topics of philosophy
5. Individual studies of the English language

The PhD courses described above are supervised by Prof. Marek J. Sadowski, FInstP (UK). In 2012 at the NCBJ there were three PhD students studying plasma physics and controlled fusion research.

PhD studies in the area of nuclear fusion related topics at INP in Krakow

Two students are preparing doctor thesis in the field of plasma diagnostics at the IFJ PAN. One of them will be finished in 2013.