1 Preface

In 2013, IPPLM Euratom Association continued its involvement in fusion science and technology programme with the aim to contribute strongly to the fusion development in general and in particular to the success of the ITER project. Our programme is focused on the EFDA priorities and we have been strongly involved in the EFDA activities to accomplish milestones defined in our work programme. IPPLM is willing to continue its strong participation in the European Fusion Programme and to reinforce its commitment to the DEMO design activities and the ITER project.

The physics programme has been carried out including projects coordinated by the EFDA Task Forces and Topical Groups and our participation in the JET experiments and developments.

The Polish Team contributed to JET experimental program in 2013 taking part in C31-C32 JET Experimental Campaigns. The main tasks performed during campaigns and notification work were oriented on the upgrading of high-resolution X-ray crystal spectrometer (KX1) and first measurements of radiation emitted by Ni26+ and W46+ ions. A part of the JET activities was dedicated to calibration of the JET VUV spectroscopy diagnostics (KT1, KT2, KT7). Moreover, numerical analyses of plasma discharges in JET ITER-like Wall configuration were performed with the help of the COREDIV code. The achievements of the IPPLM Association in the JET activities were also related to neutron activation measurements and calculations of neutron streaming through JET Torus hall ducts. The limits of the W coatings deposited on CFC tiles for the ITER-like wall at JET using FIB and SEM/TEM techniques were investigated. Sensitivity study of the Edge LIDAR systems for the LIBS application were performed.

It is worth emphasizing that the involvement of our scientists in the JET programme provides a very important platform for the integration of the Polish fusion community.

In 2013, the involvement of association teams in EFDA activities increased significantly. We participated in a number of EFDA tasks covering activities in the ITER Physics area and in the Power Plant Physics and Technology (PPPT) programme. In particular, the Polish Association has contributed to work related to Plasma-Wall Interaction (PWI). There were 10 tasks in areas of dust, fuel removal, material erosion and transport. The aim of these tasks was to optimize in laboratory experiments the removal process with the use of Yb:fiber and Nd:YAG lasers, investigate a dust formation and describe material mixing and plasma-induced damages of the analysed samples by different surface analysis methods. The tungsten impurity release during Ion Cyclotron Resonance Heating (ICRF) operation was also investigated in the ASDEX Upgrade (AUG) tokamak.

The IPPLM Association activities in the thematic area of Emerging Technologies were implemented through three sub-projects namely: development of material science and advanced materials for DEMO, materials modelling and development of HT superconductors for DEMO. The tasks were carried out by three universities – members of the Association Research Unit, that is Warsaw University of Technology, AGH University of Technology and West Pomeranian University of Technology. The implemented tasks were devoted to structural material for low temperature cooling concept, divertor shield materials, joining technology for W-SiC structural joints, modelling of structure and properties of iron and iron alloys, nuclear data studies/experiments in support of TBM activities and studies in the field of cooling techniques for HTS fusion windings.

The activity of IPPLM Euratom Association in theory and modelling covers a very broad list of subject. The works are focused on development of tools for numerical analyses of present tokamak experiments and future projects like ITER and DEMO. The IPPLM Association is involved in a number of tasks related to the Integrated Tokamak Modelling Task Force activities. In the frame of IMP3 project, we are involved in the works devoted to the development of physical models for impurities and neutrals, implementation of the models into numerical codes and the development of numerical methods to solve the transport problem as well as implementation of modules on the Kepler platform. The Poznan Supercomputing and

Networking Center (PSNC) has continued its involvement in the ITM TF activities by supporting the workflow orchestration system (KEPLER) for fusion modelling and by providing direct support to the ITM users through the work of the Core Programming Team (CPT) and activities in the High Level Support Team (HLST). Association teams are strongly involved in the DEMO modelling activities by participation in a number of the EFDA PPPT projects related to studies of the DEMO scenarios, novel divertor concepts and power exhaust physics.

The Polish contribution to Wendelstein 7-X programme is considered to play a very important role in the integration of all Polish parties that form our Association. The Polish involvement in W7-X programme is quite extended, ranging from the cooperation on the development of NBI system through development of several diagnostics (X-ray PHA, C/O monitor).

Wroclaw University of Technology (WrUT) has been continuing the studies concerning the risk analysis of the ITER cryogenic. The performed risk analysis, together with the numerical investigation of the helium outflows to the confinements of cryogenic nodes, allows identifying the most credible incidents and corresponding mitigation schemes. IPPLM and IFJ PAN have started activities in the frame of the F4E contract on the design of the Radial Neutron Camera and Radial Gamma-Ray Spectrometer for ITER.

IPPLM is also continuing the physics and technology research on inertial fusion in the frame of the keep in touch activities within the Euratom programme. Concerning the shock ignition relevant experiment, the inhibiting influence of pre-plasma on energy transfer from the laser beam to the shock was found in the case of first harmonic. Concerning the laser-driven ion acceleration for fast ignition, it was confirmed that the Laser Induced Cavity Pressure Acceleration scheme indeed ensures enhanced laser-to-ion energy conversion efficiency both at ultra-high laser intensities and at moderately relativistic laser intensities.

With reference to the Public Information, we have continued a wide range of activities. Articles and brochures on fusion for the general public are translated into Polish language and posted on our website. We continue our cooperation with small, professional theatre GO and organize visits of young students and pupils from junior and high schools to the IPPLM facilities. In 2013, two international conferences were organized jointly by IPPLM and the Polish Physical Society. The international conference PLASMA-2013 was organized in Warsaw with more than 130 participants from various countries. The conference has been considered an important international scientific event of exceptional importance for scientific communities in Eastern and Western Europe. It facilitates the meetings of young scientists with experienced researchers from renowned centers in Poland and abroad. The 14th International Workshop on Plasma Edge Theory in Fusion Devices was organized in Cracow gathering 59 researches from 12 countries. Like all the preceding workshops, the subject of this year conference was plasma theory of the edge region in magnetic confinement fusion devices.

Finally, I would like to thank all those who contributed to the Polish Association Work Programme and helped the Association to find its place in the European and worldwide fusion programme.

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