

EXECUTIVE SUMMARY

1. Introduction

The national frame for the fusion research activities is the National Programme for International Collaboration "CORINT" of the National Plan for Research Development and Innovation of the Ministry of Education and Research (MEdC) for the period 2000-2006.

All the fusion research activities carried out in Romania in the frame of the European Fusion Programme is mainly financed by MEdC and partly by EURATOM.

The Association EURATOM/MEdC was established in 25 December 1999 when the Contract of Association between EURATOM and MEdC was signed. The following contracts between Euratom and MEdC are extended to the end of 2006: the Contract of Association, the European Fusion Development Agreement, the JET Implementing Agreement and the Staff Mobility Agreement.

The Fusion Research Unit is the Institute of Atomic Physics with research groups in the National Institutes for Physics and the Universities participating in the European Fusion Programme as follows: National Institute for Laser, Plasma and Radiation Physics (NILPRP), Magurele-Bucharest, "Horia Hulubei" National Institute of R&D for Physics and Nuclear Engineering (IFIN-HH), Magurele-Bucharest, National Institute of R&D for Cryogenics and Isotope Technologies (ICIT), Ramnicu Valcea, University of Craiova (UCv), Craiova, Technical University of Cluj-Napoca (TUCN), Cluj-Napoca and "Al. I. Cuza" University (UAIC), Iasi.

The research activities of the Association are directed by the Steering Committee, that comprises the following members in 2005:

Chairman: Yvan.Capouet, EU Commission, Research DG

Members: Walter van Hattum, EU Commission, Research DG

Barry Green, EU Commission, Research DG

Dan Popescu, Nuclear Agency

Gheorghe Mateescu, "Horia Hulubei" National Institute of R&D for
Nuclear Physics and Engineering

Voicu Lupei, National Institute for Laser, Plasma and Radiation Physics

Head of Research Unit: Theodor Ionescu Bujor, Institute of Atomic Physics

The Steering Committee had one meeting in 2005 on 29 September.

The Romanian Members in the EU Fusion Committees:

Consultative Committee for the Euratom Specific Research and Training Programme in the Field of Nuclear Energy-Fusion (CCE-FU):

T. Ionescu Bujor - Institute of Atomic Physics

M. Chis - Ministry of Education and Research

Elena Toma - Ministry of European Integration

EFDA Steering Committee:

Olivia Comsa - Ministry of European Integration

M. Chis - Ministry of Education and Research

T. Ionescu Bujor - Institute of Atomic Physics

Science and Technology Advisory Committee (STAC):

Calin Vlad Atanasiu – National Institute for Laser, Plasma and Radiation Physics

Florin Spineanu – National Institute for Laser, Plasma and Radiation Physics

Dan Sporea - National Institute for Laser, Plasma and Radiation Physics

2. Research activity in 2005

The 2005 Annual Report of the Association EURATOM/MEdC presents our main results obtained in the frame of the European Fusion Programme in a number of 23 tasks as follows: Fusion Plasma Physics (8), Underlying Technology (2) and Technology Tasks (13).

In the framework of the Fusion Plasma Physics our Association contributes to:

- theoretical and numerical studies of MHD stability and plasma control (Resistive Wall Modes);
- the modeling of edge plasma turbulence with applications to the study of the ELM's and particle transport;
- the analysis of transport phenomena in the scrape off layer (SOL) , Internal Transport Barriers and transport phenomena in presence of radio-frequency heating.;
- the quantitative description of large scale coherent flows and structures and of their influence on transport. Also on the characterization of the topological structure of the transiently stochastic magnetic regions and the effects on the reconnection rate and tearing mode saturation;
- the modeling and data analysis in support of the JET experimental campaigns;
- the development of nuclear techniques for fusion plasma diagnostics, in particular neutron and gamma-ray diagnostics. The Association Euratom-MEdC is the leading Association for the JET EP2 diagnostics project "Upgrade of Gamma-Ray Cameras –Neutron Attenuators" started in 2005.

In the framework of the EFDA technology workprogramme our contributions are related to:

- the study of irradiation (gamma-rays, neutrons, protons, electron beams) induced effects on optoelectronic devices, optical fibers in the UV spectral range, and optical components. The experimental data on irradiated laser diodes and optical fibers could provide an input to the database of the ITPA Topical Group on Diagnostics;
- the development of chemical deposition methods for the fabrication of YBCO high temperature superconducting coated conductors for high-field applications;
- manufacturing and characterization of silver free braze materials;

- calculation of cross-sections of interest for the first-wall of fusion reactors, and IFMIF X-ray microtomography for inspections of the structural integrity of IFMIF complete assemblies before, during and after irradiation campaigns;
- the design of the Water Detritiation Systems for JET and ITER.

In 2005 our participation to the EFDA JET Workprogramme has been improved by using our expertise related to W and Be coatings in the ITER-like Wall Project at JET. New technologies developed in our Association are used for W-coating of CFC tiles from JET at industrial scale and for Be coating of Inconel, W, CFC and graphite tiles. Also, based on our expertise related to atmospheric plasma sources we started a new task with the goal to realize a movable small size Ar plasma torch for detritiation and removal of co-deposited layers at JET.

A part of the 2005 results are already published in the main scientific journals:

Phys.Rev.Letters (1), Physics of Plasmas (4), Nuclear Fusion (1), Plasma Physics and Controlled Fusion (6), Fusion Engineering and Design (1), Nuclear Physics A (1).

3. Scientific visits

In the framework of the Mobility Agreement 23 scientists were seconded to the EURATOM partners: JET (9), Université Libre de Bruxelles (5), CEA-DRFC, Cadarache (2), IPP CZ (2), FZK (1), ENEA Frascati (2), CIEMAT Madrid (1), Technische Universitaet Wien (1).

In 2005 the following scientists visited our Association:

Dr Paul Coad - JET, UKAEA and Dr.Marek Rubel - Association Euratom-VR, Sweden (15-16 June 2005);

Dr. Raphael Mitteau, Dr. Xavier Courtois- Association Euratom-CEA, DRFC, Cadarache (27-28 July 2005);

Prof. Radu Balescu, Dr. Daniele Carati and Dr. Boris Weyssow - Association Euratom – Etat Belge, Université Libre de Bruxelles, Belgium (29 August – September 2, 2005)

Dr. Olgierd Dumbrajs, Association Euratom-Institute of Solid State Physics, University of Latvia, Latvia (29 August – September 2, 2005);

Dr. Vincenzo Pericoli- Association Euratom-ENEA, Frascati (22-29 October 2005);

Prof.. Siegbert Kuhn- Association Euratom-OAW, University of Innsbruck, Austria (22-29 October 2005);

Dr. Christian Grisolia – JET (12-13 December 2005);

Dr. Silvia Annibaldi- Association Euratom-ENEA, Frascati (4-17 December 2005).

Besides the common works with our researchers they have presented invited talks, visited our laboratories involved in Fusion Programme as well as laboratories which have enough experience to be involved in the next future in this Programme and new possibilities of collaboration have been identified.

4. The 2nd Days of the Association EURATOM/MEdC

In this year the Days of Association EURATOM/MEdC took place in Iasi on 27-28 October at the “Alexandru Ioan Cuza” University at the same time as the “Fusion Expo”. Both events were organized in Iasi with the aim to stimulate students and teachers to get involved in the fusion research programme. At this meeting participated with invited talks: Prof. Siegbert Kuhn, University of Innsbruck and Dr. Vincenzo Pericoli, ENEA, Frascati.

This two days meeting was devoted to thirteen oral presentations of Romanian research groups involved in the European Fusion Programme. They reported on the last results obtained during 2005 in the fields: Physics, Underlying Technology and Technology Tasks. The session was a very good opportunity to bring again together representatives and research teams of all National Institutes and Universities involved in ongoing and near future projects, representatives of research groups and laboratories that have experience and expertise of interest to the fusion field, senior scientists and engineers, as well as young researchers.

5. “Fusion Expo” in Romania

Fusion Expo, the successful itinerant exhibition produced by the European Fusion Development Agreement (EFDA) of the European Commission, was hosted for the first time in Romania in Bucharest (5-15 October) and Iasi (19-28 October). Organized by the European Commission and the Romanian Ministry of Education and Research - National Authority for Scientific Research, “Fusion Expo” was one of the major scientific events of the “Research Days” that took place in Romania in the period September-October 2005. The exhibition was prepared and set up with a large contribution of the representatives of the Consorzio RFX in Padova: Mrs. Maria Teresa Orlando, Mr. Ugo Paccagnella, Mr. Moreno Maniero and Mr. Modesto Moressa. We would like to thank them once more for the friendly collaboration. The “Fusion Expo-Guide Course” of Dr. G. Mazzitelli of Association Euratom/ENEA was very useful to instruct the guides and we would like to thank him very much for his help. The visitors considered timely the organization of “Fusion Expo” in Romania, remark the excellent qualitative level of the exhibition and give a high appreciation to the clear, attractive and accessible way of the presentation of the exhibits and of the remarkable results obtained in the field of nuclear fusion in Europe. In our opinion the housing of the exhibition in Bucharest and Iasi allowed large and useful information of both the scientific community and the young students from Romania on the extremely good perspectives offered on medium and long term by the European Fusion Programme

6. The expenditure and the staff of Association

We present in the following figures the evolution of the expenditure and the staff of the Association in the period 2000 - 2005. The total expenditure for the whole period is also shown.

The gradually increase of the budget for research activities determined a gradually more extensive involvement of our Association in new tasks.

The new technological tasks at JET started at JET in 2005 have involved new research teams and an increasing of the number of professionals and non-professionals.

