IPPLM Association Council Meeting
Cracow, 15 March 2013

News from the Research Unit Association Euratom-IPPLM

Roman Zagórski

Zachodniopomorski Uniwersytet Technologiczny w Szczecinie

AGH University of Science and Technology

NATIONAL CENTRE for NUCLEAR RESEARCH Świerk

WARSAW UNIVERSITY OF TECHNOLOGY

Wrocław University of Technology

INTiBS PAN WROCŁAW

News from the Association

- **IPPLM Association 2012/2013**
  - composition
  - budget 2013 and expenditure 2012
  - staff
- **Work programme 2013**
  - ITER
  - EFDA JET
  - EFDA Garching
  - Accompanying program
- **Miscelanea**
  - Meetings and conferences

Composition of the Association

- Research Unit

1. **IPPLM** Institute of Plasma Physics and Laser Microfusion, Warsaw
2. **WUT** Warsaw University of Technology, Warsaw
    a) Faculty of Materials Engineering
    b) Institute of Electronic Systems (Faculty of Electronics and Information Technology)
3. **IFJ PAN** Institute of Nuclear Physics, Krakow
4. **NCBJ** National Centre for Nuclear Research Otwock-Świerk
5. **AGH** University of Science and Technology, Krakow
6. **OU** Opole University
7. **WPUT** West Pomerania University of Technology, Szczecin
8. **MUS** Maritime University of Szczecin
9. **PSNC** Institute of Bioorganic Chemistry PAS - Poznan Supercomputing and Networking Center
10. **NCU** Nicolaus Copernicus University, Toruń
    a) Institute of Sociology
    b) Faculty of Chemistry
11. **WrUT** Wrocław University of Technology

- Other institutions involved

12. **ILTSR** Institute of Low Temperature and Structure Research, Wroclaw

Association management

Association Steering Committee

- European Commission, DG Research and Innovation

Simon Webster,	Head of Unit K6 (Fusion Association Agreements)	
Vito Marchese,	Scientific Officer,	Unit K6
Marc Pipeleers,	Financial Officer,	Unit K7

- Poland

  Andrzej Gałkowski, IPPLM

  Paulina Styczeń, MSHE

  Łukasz Ciupiński, WUT

Head of Research Unit Roman Zagórski, IPPLM

Association Council

1. P. Berczyński, Consortium of Szczecin Universities, Poland
2. M. Chatelier, CEA Cadarache, France
3. M. Chorowski, Wroclaw Technical University, Poland
4. A. Gałkowski, Institute of Plasma Physics and Laser Microfusion, Poland
5. T. Klinger, Max-Planck-Institut für Plasmaphysik, Germany
6. J. Musielok, Opole University, Poland
7. J. Pamela, Agency ITER France
8. F. Romanelli, EFDA Leader
9. M. Rubel, Royal Institute of Technology, Sweden, Chairman
10. M.J. Sadowski, National Centre for Nuclear Research, Poland
11. S.Taczanowski, AGH University of Science and Technology, Poland
12. M. Watkins, EFDA CSU Culham
13. H.W. Weber, Vienna University of Technology, Austria
14. U. Woźnicka, IFJ PAN Institute of Nuclear Physics, Poland
15. A. Zaleski, PAS Institute of Low Temperature and Structure Research, Poland

Participation in the Fusion Programme Committees

• CCE-FU	P. Styczeń A. Gałkowski R. Zagórski (v-ce chair)
• F4E Governing Board	Ł. Ciupiński P. Styczeń
• F4E Executive Committee	K.J. Kurzydłowski M. Chorowski
• F4E Industry Liaison Officer	S. Wójtowicz
• EFDA SC	R. Zagórski R. Miklaszewski
• EFDA PPPT Board	M. Lewandowska
• Board of HPC	S. Potemski

Officers and CP

EFDA CSU

• SERF Responsible Officer	M. Gadomska

EFDA contact persons

• JET	A. Czarnecka
• TF PWI	M. Kubkowska
• TF ITM	R. Stankiewicz
• TG Fusion materials	E. Fortuna-Zaleśna
• TG MHD / CEG Fusion	R. Miklaszewski
• TG Diagnostics	M. Scholz
• Public information	P. Nadrowski
• Remote Participation UG	S. Małek

CP in the PPPT Task Areas

• SYS & PEX	R. Zagórski
• DTM	M. Chorowski
• DAS	M. Scholz
• MAT	Ł. Ciupiński

IFE WG J. Wołowski

Collaboration

- **IPP Garching/Greifswald**
- **CEA Cadarache**
- **ENEA Frascati**
- **IPP.CR Prague**
- IPP Juelich
- VR Sweden (KTH, Chalmers University)
- CCFE Culham
- EPFL CRPP Lausanne
- **KIT (Karlsruhe Institute of Technology)**
- IST Lisbon
- OAW Vienna

Collaboration

Our strategic partners – bilateral agreements:

Signed or agreed

- **IPP – 28.10.2009**
- **ENEA – 23.03.2012**

  ENEA – IPPLM Meeting in Warsaw in 9-10 May 2012
- **CEA – ready to be signed**

Under discussion

- KIT

  KIT-IPPLM Meeting in Karlsruhe on 25th May 2012
- IPP.CR

Expenditures 2012

- Total **2140k€** (2435k€ in 2011)

Including:

- BS (20%) 1533 k€ (1540 k€ in 2011)
- PS (+20%) 210 k€ (102 k€ in 2011)
- PS (40%) 98 k€ (20 k€ in 2011)
- PS (50%) 135 k€ (0 k€ in 2011)
- Art.7 (100%) 140 k€ (0k€ in 2011)
- Mobility 180 k€ (127 k€ in 2011)
- JET (Art.6.3) 30 k€ (250 k€ in 2011)
- ITER IO 0 k€ (396 k€ in 2011)
- F4E 20 k€ (0 k€ in 2011)

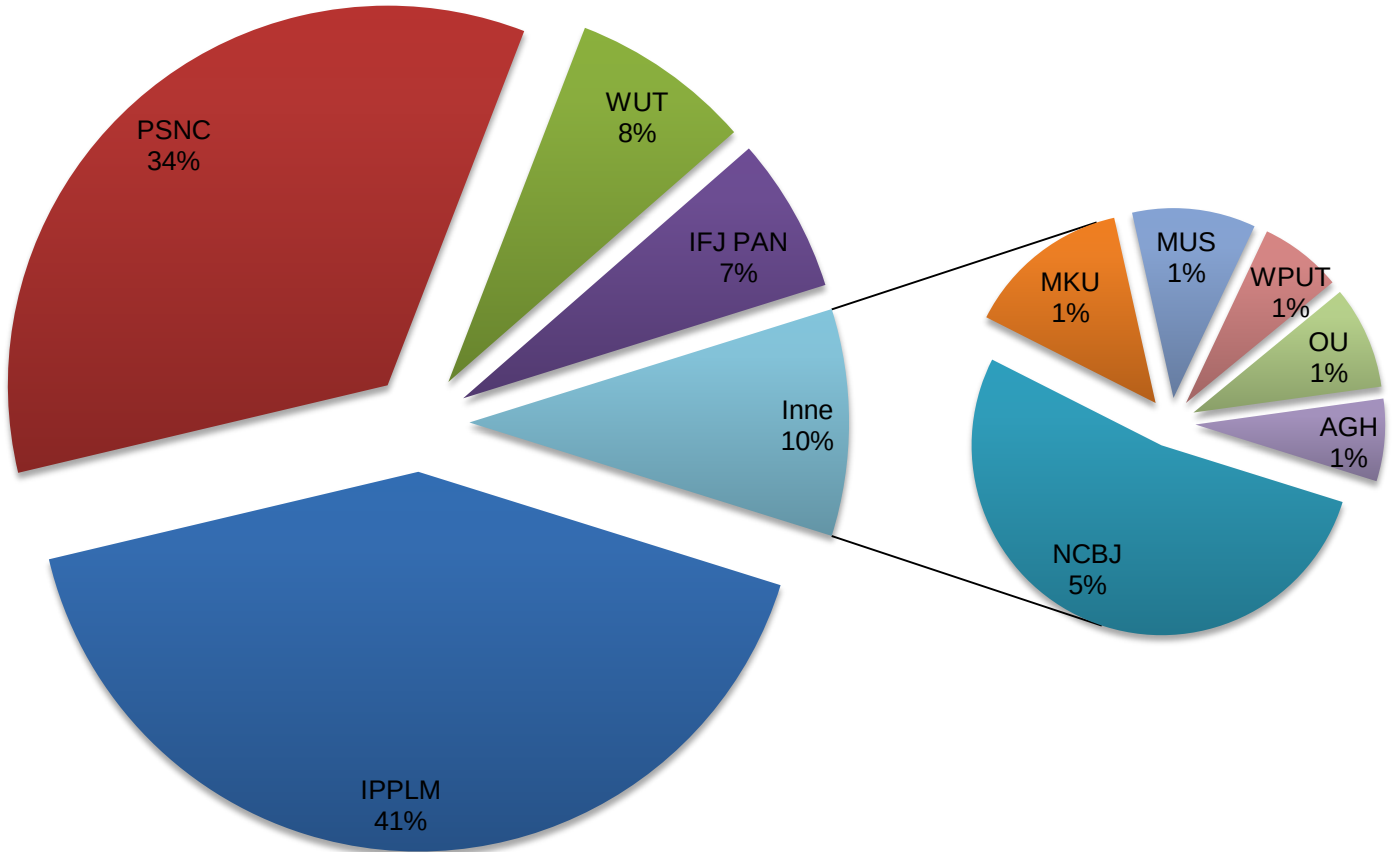
Budget 2013

- Total **2550k€** (2140 k€ in 2012)

  Including:

- BS (20%) **1807 k€** (1533 k€ in 2012)
- PS (+20%) 220 k€ (210 k€ in 2012)
- PS (40%) 42 k€ (98 k€ in 2012)
- PS (50%) 135 k€ (135 k€ in 2012)
- Art.7 (100%) 140 k€ (140 k€ in 2012)
- Mobility 220 k€ (180 k€ in 2012)
- JET (Art.6.3) 80 k€ (30 k€ in 2012)
- ITER IO 0 k€ (0 k€ in 2012)
- F4E 125 k€ (20 k€ in 2012)

Expenditures 2012 by subunit



Association staff

- Total persons 142 (113 male, 29 female)

- Total PY/year **58.1**
  - 42.3 Physicists
  - 14.6 Engineers
  - 1.2 Administration

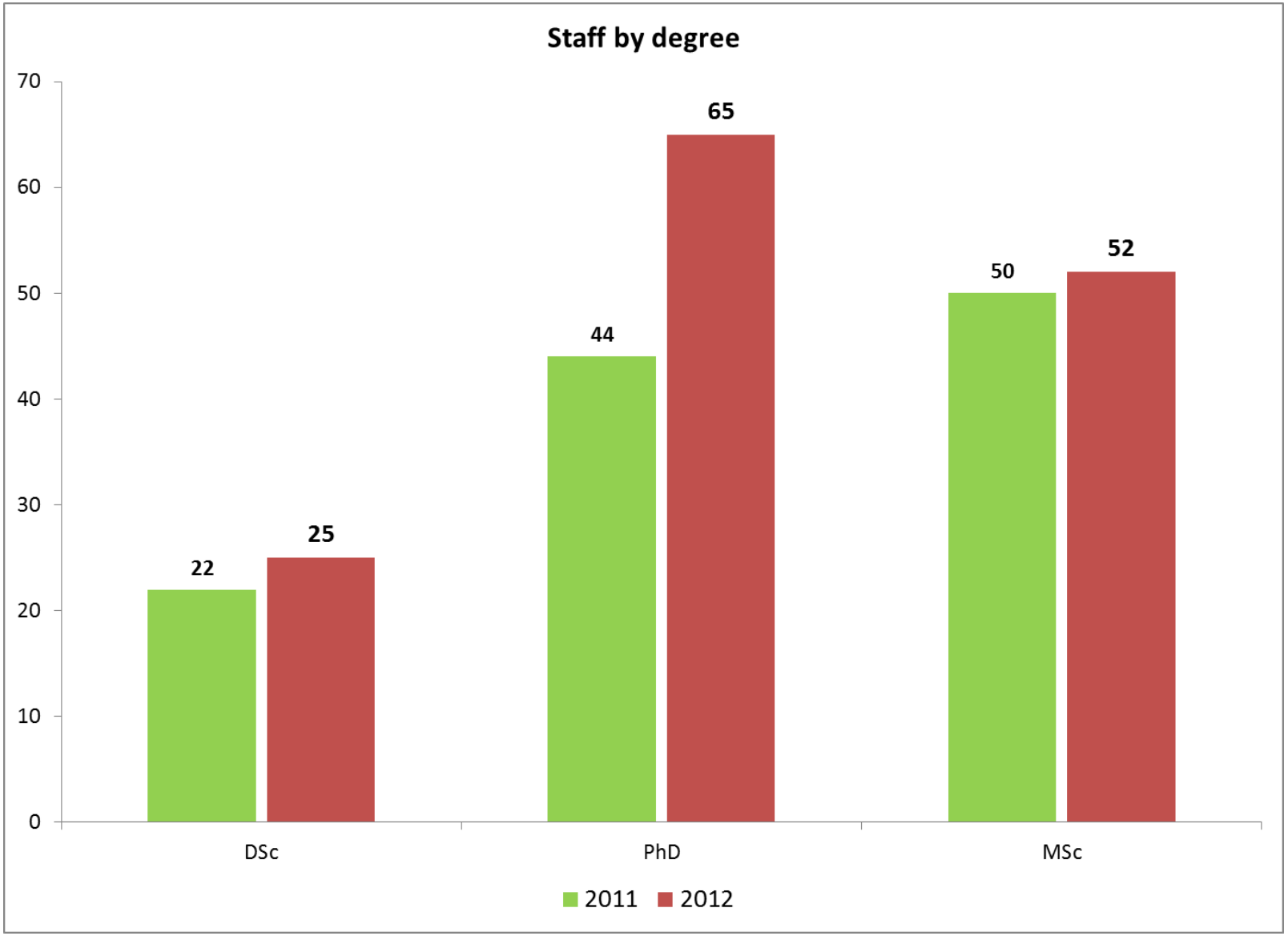
DSc (professors): **25**

PhD (doctors): **65**

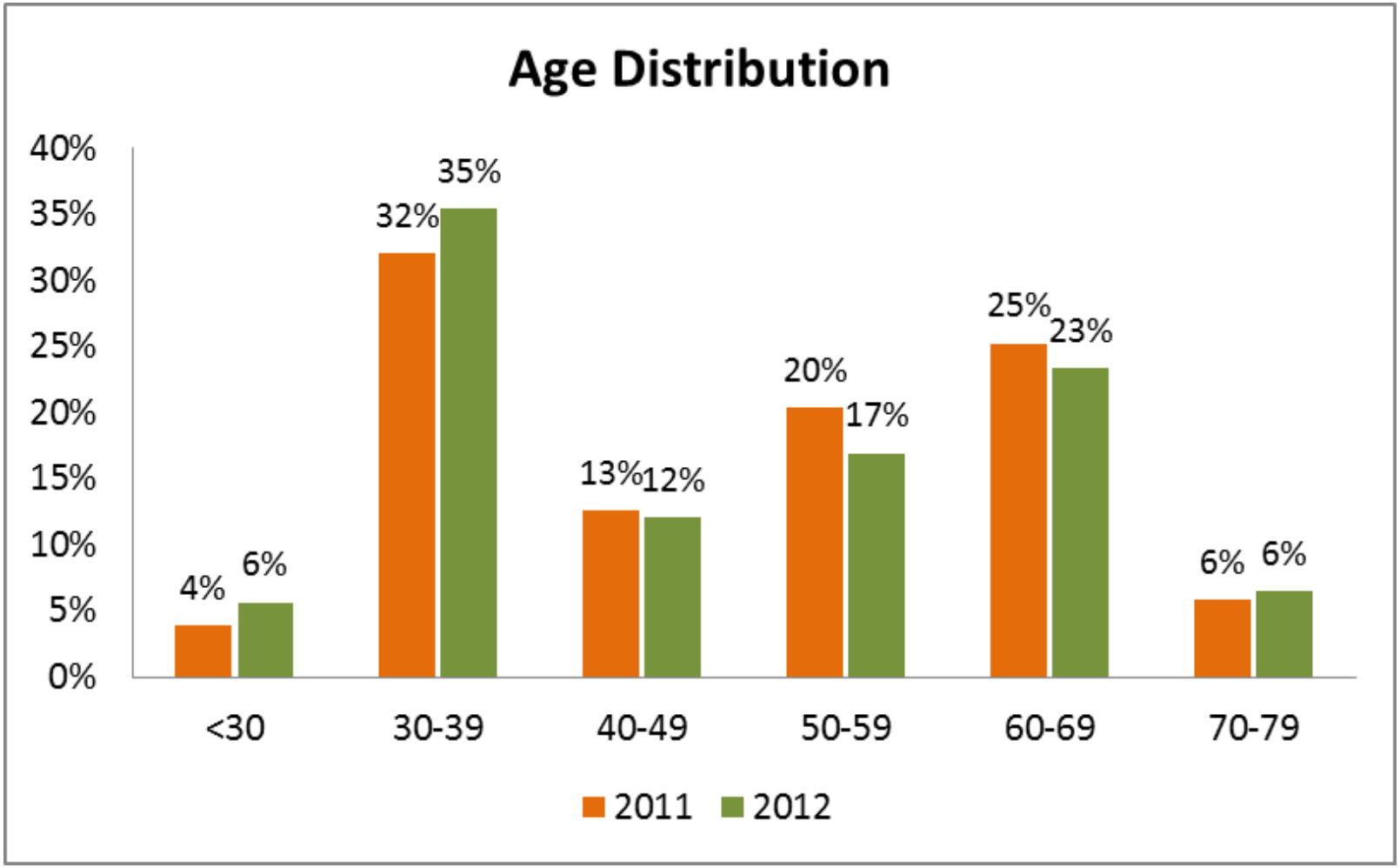
MSc (also engineers): **52**

At no cost for Euratom contract (Technology): Persons 16 (W7-X in-kind contribution, ITER)

Association staff



Association staff



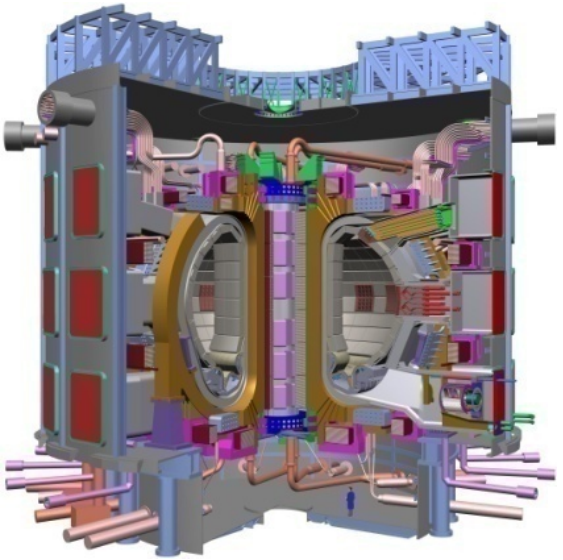
Workprogramme 2013

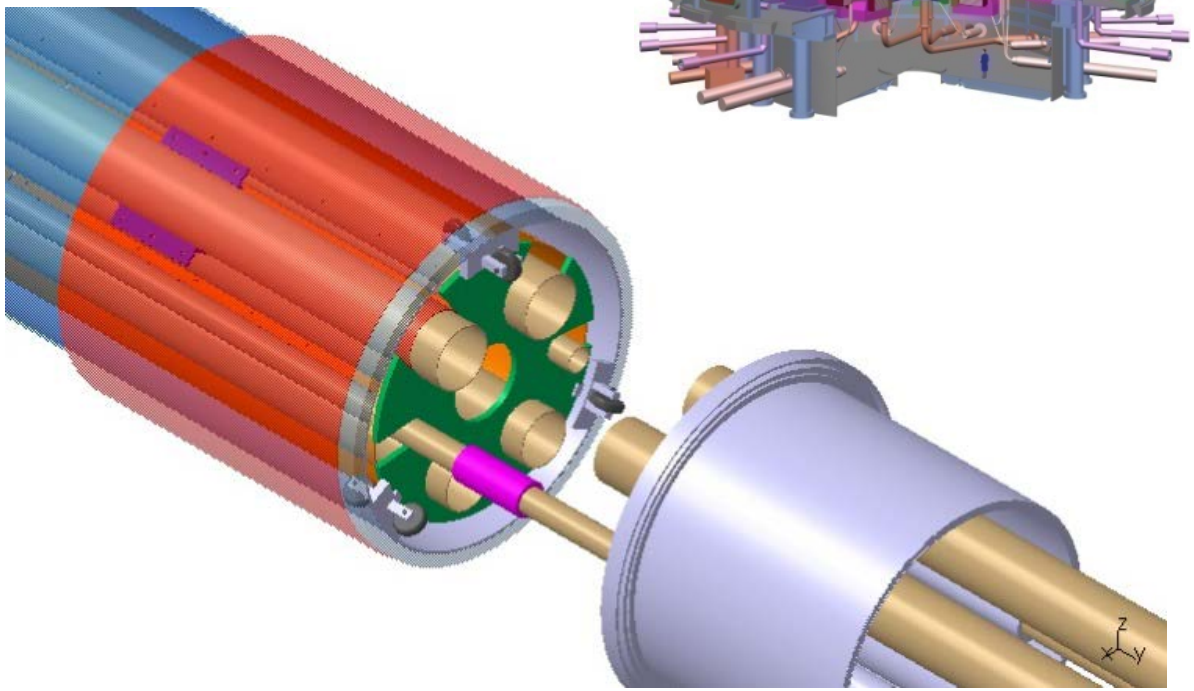
- ITER
- EFDA
  - JET
  - ITM TF
  - ITER PHYSICS
  - Diagnostic TG
  - DEMO
  - Fusion materials TG
  - SERF
- Accompanying programme
  - W7-X
  - AUG, TS, ISTOK, TEXTOR, COMPASS
  - IFE

ITER

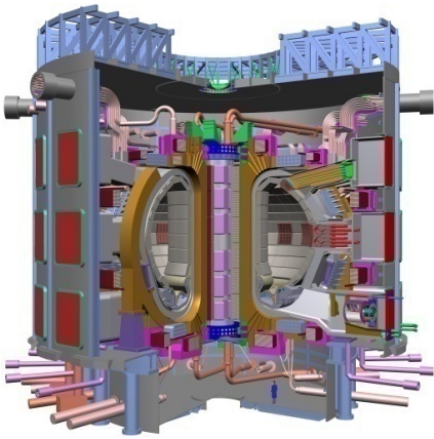
- Review of complex cryolines – support to India DA (IO Contract)

Continuation





ITER (F4E)



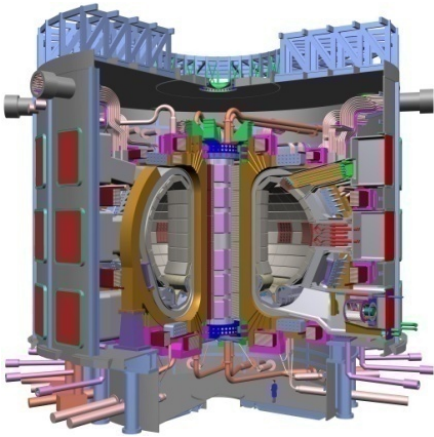
1. Continuation of the grant :

F4E-2008-GRT-014 (ES-AC): Development of an innovative 3H measurement procedure directly in LiPb, HCLL-TBM (Helium-Cooled Lithium-Lead Test Blanket Module) mock-up material

New FPA -395 signed by the Consortium:
ENEA, KIT, NRI (IPP.CR), **AGH**, JSI (MHEST)

Call for the grant agreement on „Nuclear Data" expected soon

ITER (F4E)



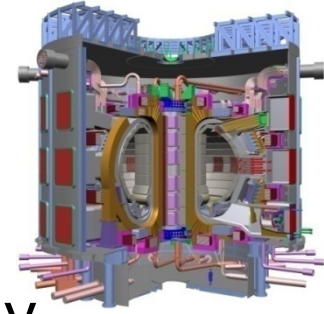
2. Call for Tender:

F4E-OFC-358: Radiation Testing Service for ITER Prototype Components and Systems

Reactor MARIA to be used for Radiation Testing

Consortium: **NCBJ**, MHEST

ITER (F4E)



3. FPA for Diagnostic Development and Design:

Radial Neutron Camera (RNC) and Radial Gamma-Ray Spectrometer (RGRS)

Objective: **Supply of R&D and design activities in connection with the ITER RNC and RGRS.**

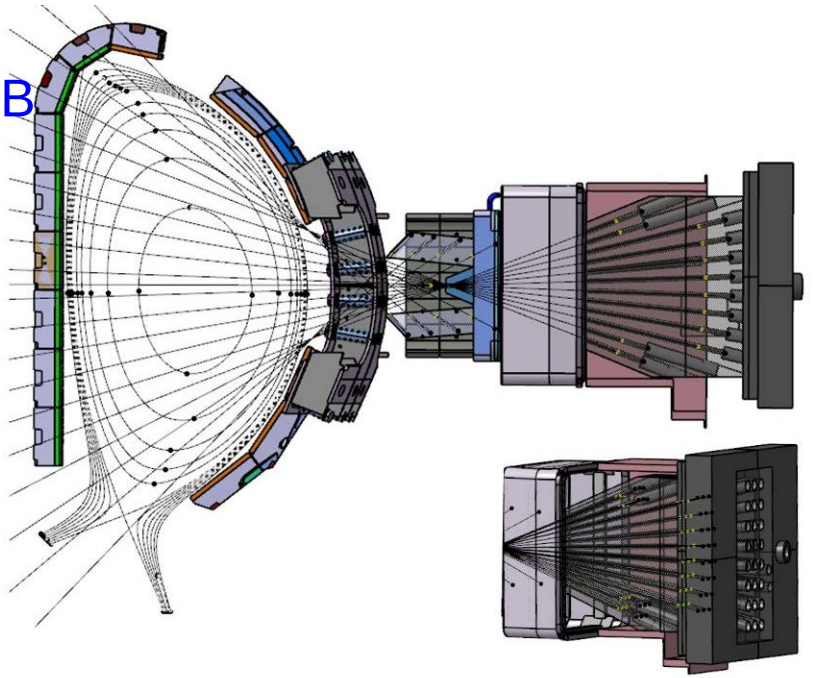
FPA awarded to the consortium:

ENEA, CNR, **IFJ PAN**, **IPPLM**, IST, UNIMIB

Two grant agreements:

SG01 (Planning Phase) and

SG02 (Coordination Office) to be launched soon.



JET Notifications

- JW11-NFT-POL-10: The activation measurements in support of the JET neutron calibration
- JW12-FT-5.45 (IPPLM-HELL-CCFE) Measurements and calculations of neutron streaming through JET Torus hall ducts

JET Orders (continuation)

- JW10-TA-SED-GXS-02: Gas Electron Multiplier Detector for X-ray Crystal Spectrometry (GXS)

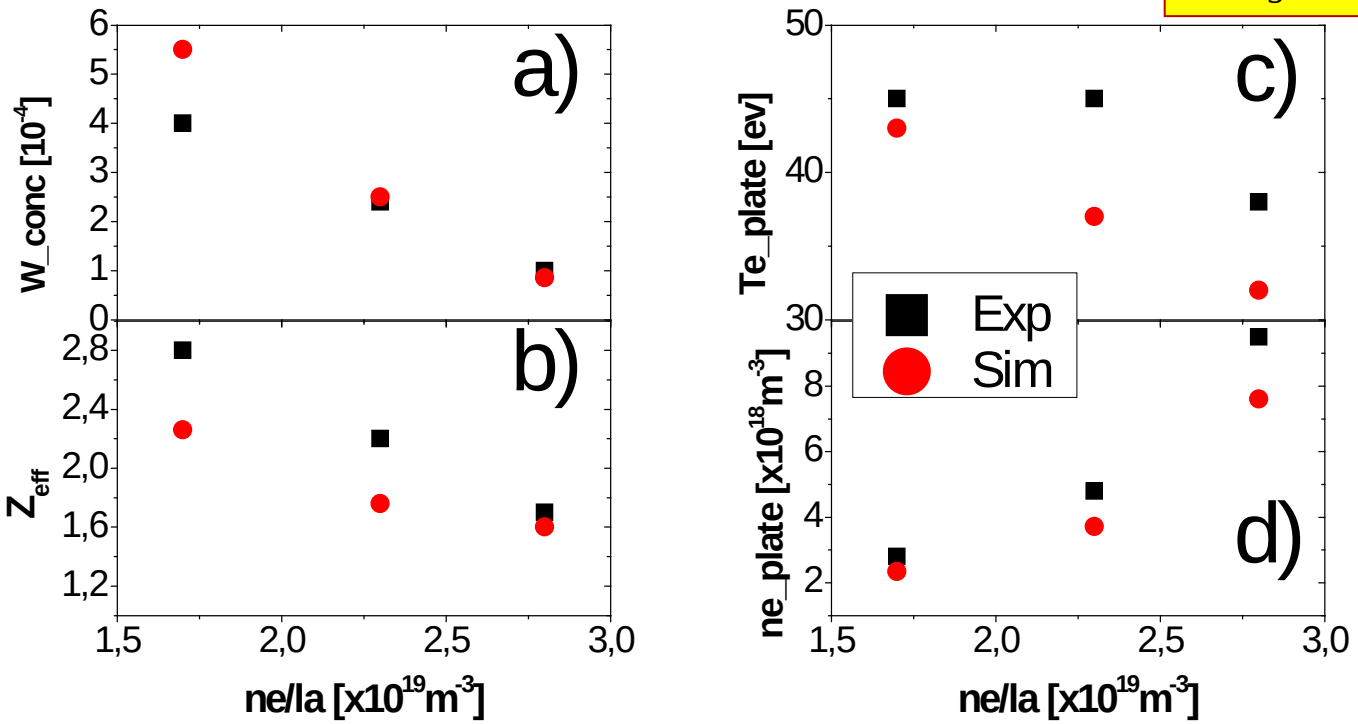
JET FT Task Agreements (2013)

- Investigation of the limits of the W coatings deposited on CFC tiles for the ITER-like wall at JET using FIB and SEM/TEM techniques
- Preparation of LIBS diagnostics for the needs of JET
- Activation measurements at JET in DD plasmas and assessment of activation reactions for DT calibration and operation

JET Experimental Campaigns C31-C32

- 14 secondees proposed (240 pw) – IPPLM, NCBJ, IFJ PAN, OU, WUT
- X-ray and VUV spectroscopy
- Neutron activation diagnostic
- Modelling of JET discharges

Experimental and simulated with COREDIV, W concentration (a), Z_{eff} (b), T_e (c) and n_e (d) measured at the outer strike point for the three L-mode discharges labeled according to their line average density, ne/la.



L-Mode

EFDA programme 2013: ITM-TF

- **European Transport Solver (IPPLM)**
  Maintenance, continuing development, verification and validation of the ETS and other core components

- **ITER Scenario Modelling (IPPLM)**
  1. Interpretative and predictive integrated scenario modelling on existing devices
  2. Support to predictive scenario modelling for future devices (e.g. JT-60SA, ITER, DEMO)
  3. Support to the validation and physics application of the ETS and ITM tools.

- **Infrastructure and Software Integration Project (PSNC)**
  1. Support the users of the ITM platform
  2. Identify and develop missing functionalities in the framework

- **Core Programming Team (Art.7)**
- **Work for HLST (HPC FF and IFERC projects)**

EFDA programme 2013: ITER PHYSICS

1. **Fuel Retention and Removal** (IPPLM/WUT)
   - Assessment of Fuel Removal Methods and Dust Generation
   - Microscopic investigation of radiation damage in tungsten and its influence on deuterium retention
   - Determination of dust morphology by unified dust analysis methods

2. **Prediction of Material Migration and Mixed Material Formation** (IPPLM/WUT)
   - Provide experimental input for material migration and mixed material formation in tokamak devices
   - Influence of mixed surface layers on fuel retention and release
   - Nitrogen retention and global deposition pattern in ASDEX and TEXTOR

EFDA programme 2013: ITER PHYSICS

3. **Shaping and Controlling Performance Limiting Instabilities**
   - Development of new MHD diagnostic: GEM gas detector for Soft X-ray measurement (IPPLM/NCBJ)
4. **Fast Particles**
   - Neutron yield monitor as an indicator of fast particles confinement (IPPLM)
5. **Operation with metallic plasma facing components including High Power ICRH** (IPPLM)
   - Ways to extend the operational window of high-Z PFCs by external impurity seeding
   - High Power ICRH operation with metallic plasma facing components

EFDA 2013: Fusion Materials TG

1. **High Heat Flux Materials (WUT)**
   - Armour materials
   - Structural materials for Low Temperature Cooling Concepts
2. **Integrated Radiation Effects Modelling and Experimental Validation (AGH)**
   - Deformation and plasticity
   - Experimental validation of models

EFDA programme 2013: DEMO

1. **SYS – System Design Integration (IPPLM)**
   - *Impact of DEMO Scenario on design*
   - *Benchmarking of MC tools on DEMO model*

2. **PEX – Power Exhaust Physics Integration Studies (WUT/IPPLM)**
   - *Plasma Boundary Modelling*
   - *Extend Physics Assessment of Novel Configurations*
   - *Erosion behaviour of W-containing steels. Laboratory measurements and impurity influx in tokamaks from eroded samples*

3. **DAS – Design Assessment Studies(WPUT, IPPLM, NCBJ, IFJ PAN)**
   - *Preparation of the SULTAN facility for testing of high-current HTS conductors at variable temperatures*
   - *Iteration of the conductor analysis for both RW and WR options*
   - Neutron, gamma ray and Soft X-ray diagnostics

EFDA WP10 Goal Oriented Trainig Programme

FabriCharMe (Fabrication and Characterization of Materials)

- Consortium: KIT, CEA, IPPLM-WUT, CRPP, CCFE-Oxford
- WUT participates in WP1: Irradiation damage – advanced characterization and modelling
- Budget 20 k€ (PS 40%)

Accompanying programme

1. Modelling

- Numerical analyses of impurity seeded plasma discharges in metallic tokamaks (JET, ASDEX-U, WEST) with the help of the code COREDIV

- Numerical simulations with the TECXY code of different divertor concepts for the FAST and DEMO tokamaks. Analyses of the snow-flake divertor.

- Modelling with COREDIV code of JT-60SA plasmas (IPPLM)

- Modeling of the emission spectrum structures for tungsten ions (MCU)

- Numerical and analytical study of nonlinear evolution of waves driven by energetic ions in a tokamak plasma close to instability threshold (WPUT)

Accompanying programme

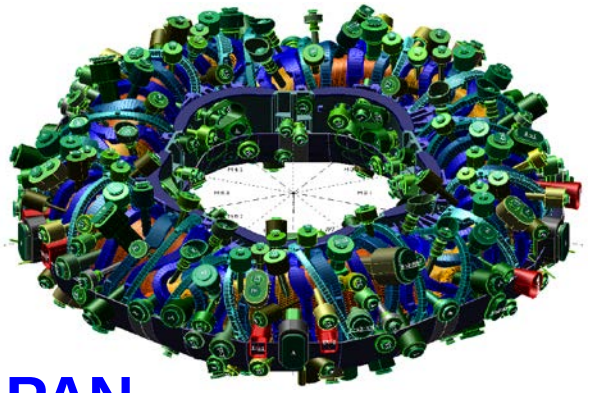
2. Diagnostic development

- CVD diamond detectors for plasma measurements (IFJ)
- Development of soft X-ray triple GEM gas detector for energy resolved soft x-ray plasma diagnostics(IPPLM)
- Feasibility studies of hard X-ray technique for the future HXR monitor (IPPLM)
- Development of nonconventional procedure of polarimetric data inversion in conditions of comparable Faraday and Cotton-Mouton effects (MUS)
- Applications of solid-state nuclear track detectors (SSNTDs) for fast ion and fusion reaction product measurements in tokamak experiments (NCBJ)

Accompanying programme

3. **IFE KIT (IPPLM)**
   - Analysis of emerging options of IFE on the basis of results of experiments and numerical modeling – continuation

Wendelstein 7-X



- **Cooperation on device assembly** **IFJ PAN**

- **Neutral beam injector** **NCBJ**
- **Diagnostics**
  - C/O monitor X-ray spectrometer **OU**
  - Development of the soft X-ray spectrometry systems (MFS, PHA) **IPPLM**
  - Adapting the activation technique for determination of neutron yield from deuterium plasmas **IPPLM**
  - Detection of the delayed neutrons **IFJ PAN**

CONFERENCES

1. PLASMA 2013 - International Conference on Research and Application of Plasmas

Warsaw, Poland, September 2-6, 2013 (http://plasma2013.ipplm.pl)

Topics:

- Elementary processes and general plasma physics
- Plasmas in tokamaks and stellarators and magnetically confinement fusion
- Plasmas generated by laser beams and inertial confinement fusion
- Plasmas produced by Z-pinch and Plasma-Focus discharges
- Low density plasmas produced by discharges
- Space plasmas and laboratory astrophysics
- Plasma diagnostic methods and applications of plasmas

2. 14th International Workshop on Plasma Edge Theory in Fusion Devices

Cracow, Poland, September 23-25, 2013, (http://pet14.ipplm.pl)

Topics:

- Basic edge plasma theory
- Models of special phenomena and edge control
- Integrated edge plasma modelling

Thank you!