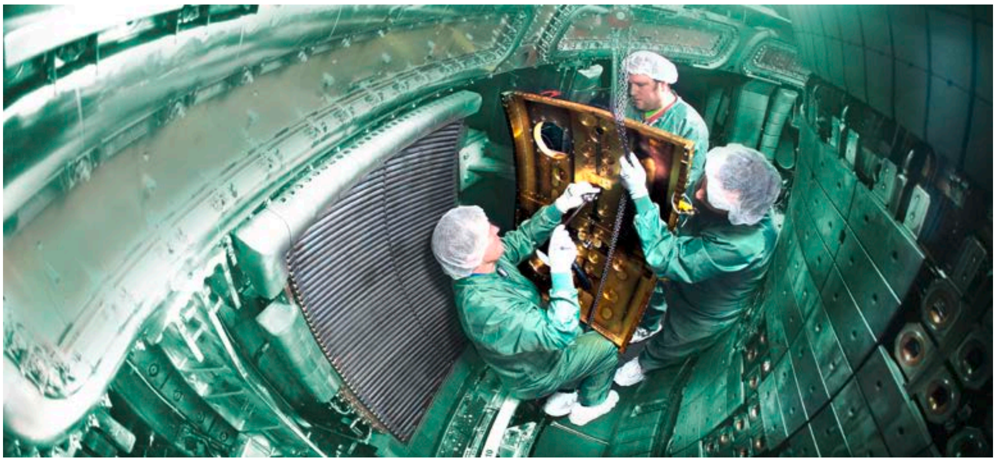
Max-Planck-Institut für Plasmaphysik



Max-Planck-Institut für Plasmaphysik

Status Report

Fachbeirat 2015

IPP, Garching

September 2 – 4, 2015

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Part I

1. Introduction and new developments

As a preparation for its 2015 meeting in Greifswald, September 2-4, the Fachbeirat will receive electronic copies the IPP Annual Report 2014 as well as of the talks and posters that will be presented at the meeting. This document provides some additional statistical material about staff, funding, publication output, and the education of junior scientists (Part I) as well as an overview over all research divisions and the CVs of the scientific members and division heads (Part II). A number of annexes[1] complement the information given in this report: Annex I is the Helmholtz "Report on the Review of the Helmholtz Programme Nuclear Fusion". Annex II is the "Report on the 36th Meeting of the W7-X Project Council", which together with Annexes III and IV, the minutes of the first two meetings of the International Programme Committee, provides information about the status of the W 7-X project. Annexes V and VI are the 2013 Report of the Fachbeirat and the response of IPP respectively.

Chapter 2 gives information about the development of IPP staff, while Chapter 3 shows the funding profile for IPP and its distribution over the organisational subunits. Chapter 4 provides some analysis about the publication output of the institute. Finally, Chapter 5 informs about education of PhD students.

Figure 1.1 shows the current organisation of the Board of Directors and the scientific divisions.

The scientific strategy of IPP foresees six scientific divisions both in Garching and in Greifswald plus one scientific director. Currently it is planned to fill five divisions on both sites, reserving the remaining two for future strategic developments, when funding permits. The materials research and plasma wall interaction activities, essential for the machines at both sites, will be carried out under the respective plasma edge and divertor divisions. The procedure for appointing a new director for the "Tokamak Theory" has not been successful so far. A new call for nominations has been sent out recently. In the division "Plasma Edge and Wall" Rudolf Neu has been appointed to a joint professorship (W2) with the Technical University of Munich, faculty for mechanical engineering. Still vacant is the director's position for the division "ITER Technology and Diagnostics", lead by an acting division head.

In addition to the scientific divisions, IPP has been hosting three Independent and Junior Research groups whose scientific activities are reported in the IPP Annual Report: Dr. Rachael McDermott: Helmholtz Young Investigator Group, "Macroscopic Effect of Microturbulence Investigated in Fusion Plasmas" (2012-2017). Dr. Matej Mayer: Helmholtz Russia Joint Research Group, "Hydrogen Isotopes Retention in First-Wall Materials for ITER and Fusion Power Reactors" (04/2011-3/2014). Prof. Frank Jenko: ERC starting/consolidator grant (2011-2015), "Turbulence in Laboratory and Astrophysical Plasmas" (additionally

[1] provided as separate documents

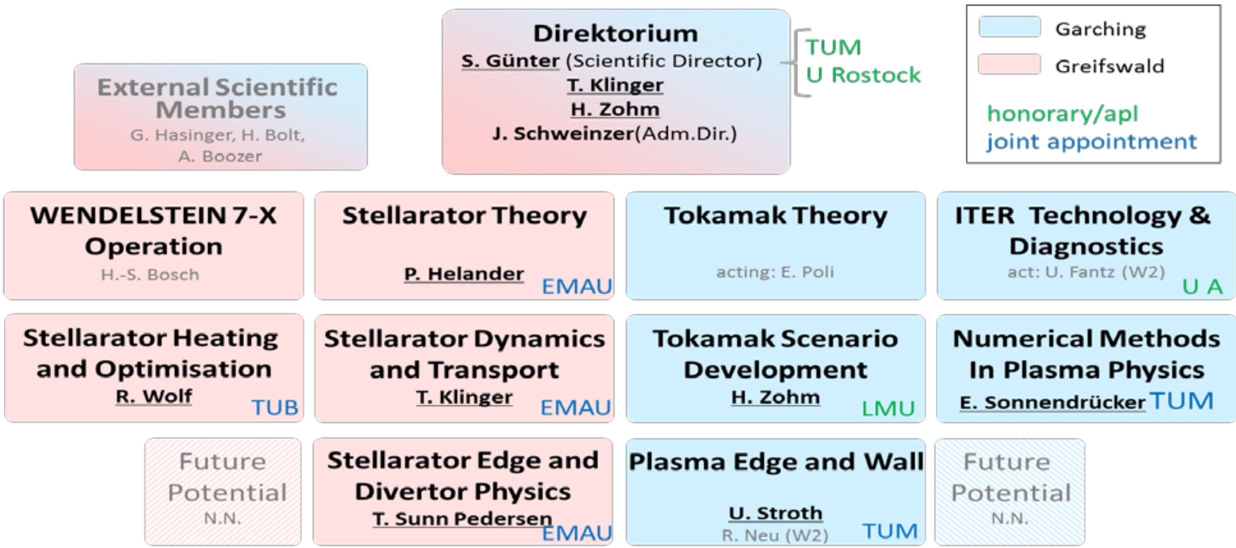
supported by the DFG). However, Prof. Frank Jenko has recently left IPP for a full professorship at the University of California, Los Angeles (UCLA).

With the end of the machine assembly and the start of the Wendelstein 7-X commissioning 2014 the project organisation is being changed to meet the requirements for the first plasma operation phases and the completion of the machine to full performance with long pulse discharges.

The “International Helmholtz Graduate School for Plasma Physics”, founded in 2011 in collaboration with the Ernst-Moritz-Arndt University Greifswald and the Technical University Munich (funded by the Helmholtz Society), provides a structured PhD-education and an interdisciplinary research environment[2]. A key aspect of the program is the exchange of lecturers to provide a homogenous portfolio across the institutions, supplemented by external guest lecturers. Currently, (July 2015), 73 students are members of the school, 37 have already graduated. Since the last meeting of the Fachbeirat 14 IPP students have enrolled in HEPP, and 12 have obtained their degrees.

The Max Planck-Princeton Center for Plasma Physics, established in March 2012, in addition to IPP involves the Max Planck institutes for Solar system research and Astrophysics as well as the Princeton Plasma Physics Laboratory and the Astrophysics Faculty of Princeton University. The German contributions to this center are financed by the Max Planck Society. The focus of this center is mainly to exploit synergies between fusion plasma research and the astrophysical plasma community. Originally the funding if the US part had been provided for a period of three years only. After a very successful evaluation, the extension of the funding has been granted for additional three years. On the German side, the Center has recently been prolonged until the end of 2017.

In 2012 the European Commission decided to stop the Contracts of Associations and the corresponding baseline support for the fusion institutes by the end of the year 2013. Since 2014 the European fusion programme is being supported by a newly developed instrument called “programme co-fund action” in the framework of Horizon 2020. Under the lead of IPP, the consortium “EUROfusion” was built, involving all 29 European fusion institutes with several associated third parties. About half of the experimental days on ASDEX Upgrade in 2014 were used in the framework of the Medium Size Tokamaks (MST1) project of the Consortium.



2 Details can be found in Section 5: PhD Education

Figure 1.1: Organisational Diagram for IPP[3]

2. Staff Statistics

Figure 2.1 shows the evolution of the IPP personnel, divided into the two institute sites, Garching and Greifswald. Until 2003 the numbers are given for individuals, since then for full-time-equivalents (FTEs), therefore a downward jump is visible in 2004. Due to the foundation of the new IPP branch in Greifswald and the start of the construction phase of the Wendelstein 7-X project, an increasing fraction of the staff had to be based in Greifswald. However, since roughly 2004 the staff in Garching has stabilized at the critical mass required to maintain the research there. In Greifswald a further growth was necessary, mainly to meet the requirements regarding engineers and technicians for W7-X construction.
It is important to point out that after several years of flat budget and a small increase over the last 5 years (~2% increase p.a.), starting from 2014, IPP again suffers from a flat national budget. Given the rising costs, in particular for personnel, the institute thus faces substantial financial pressure.

The scientific life at IPP is enriched by a substantial number of young researchers, students and Postdocs. Figure 2.2 shows the development of the numbers of PhD students and Postdocs over the last 10 years. The number of PhD students is increasing since 2014, when the scientific board decided not to limit the number of PhD students any longer.

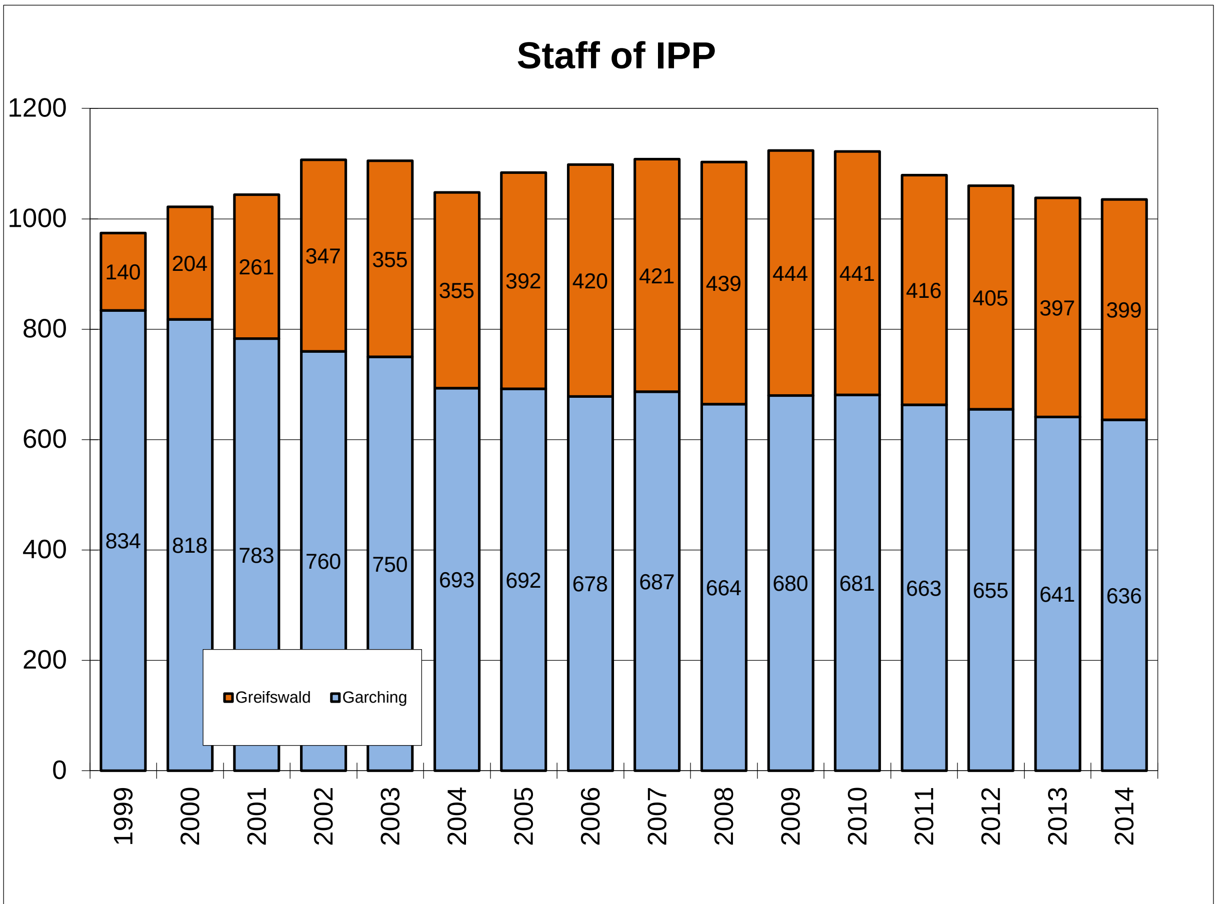


Figure 2.1: Development of IPP staff since 1999

[3] Scientific Members of the Max Planck Society are underlined

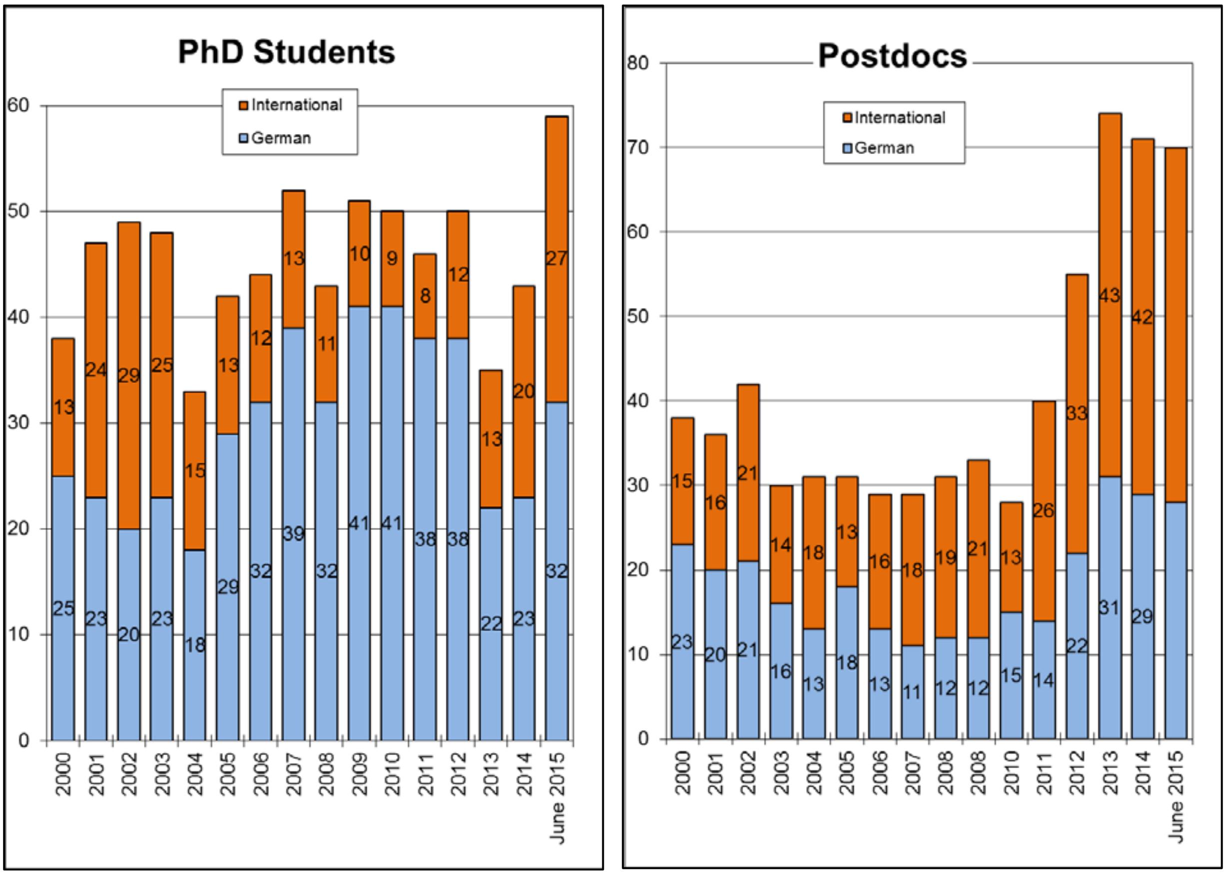


Figure 2.2: Development of IPP PhD Students and Postdocs since 2000

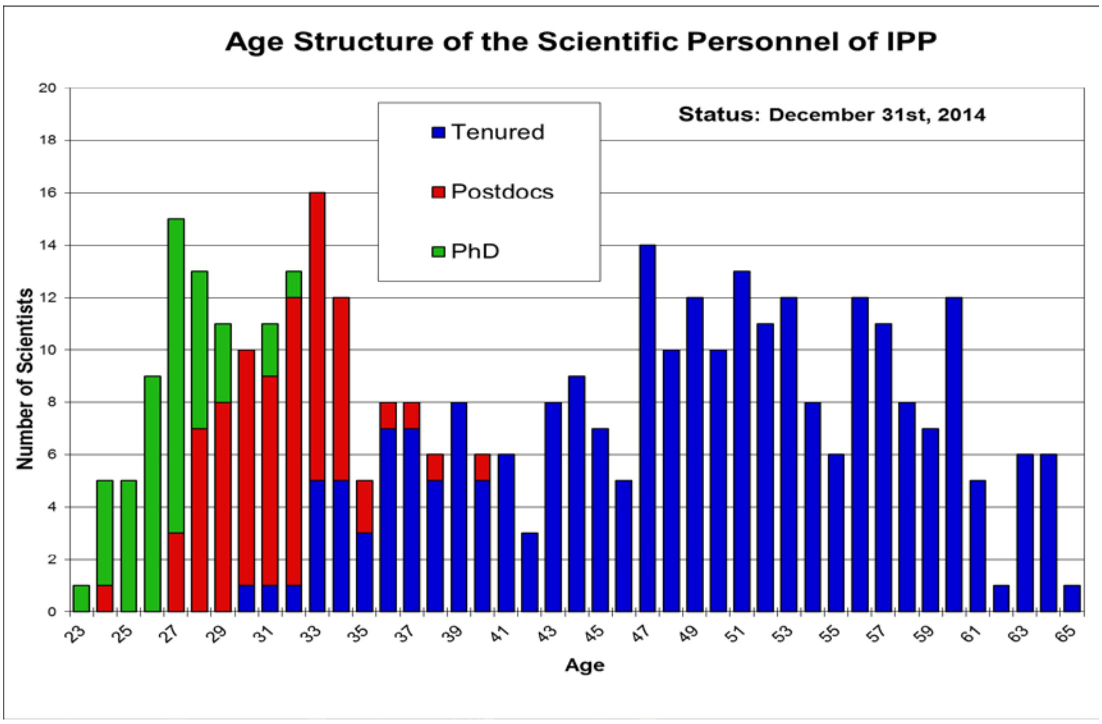


Figure 2.3: Age distribution of IPP Personnel

Figure 2.3 shows the age distribution of IPP scientific personnel in the different status groups. The bulk of the tenured status group has an age around 45-55 years.

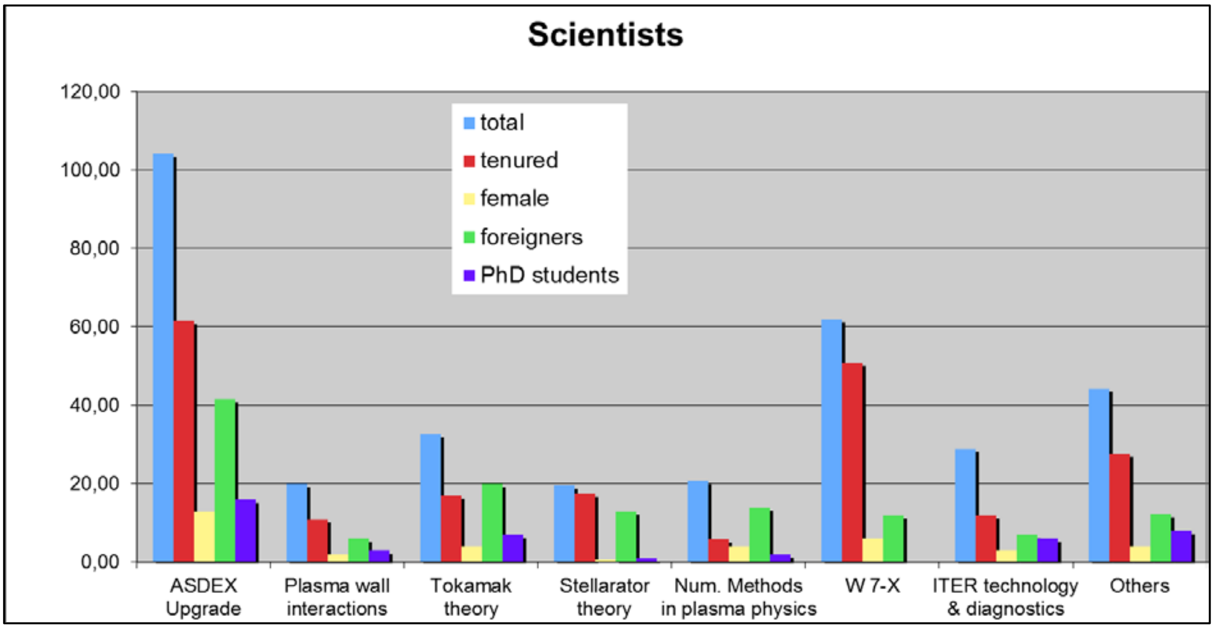


Figure 2.4: Tenure fraction, gender and international balance of IPP scientists (FTEs) on December 31st, 2014

Figures 2.4 and 2.5 show the tenure fraction, as well as the gender and international balance of IPP employees, distributed over the different organisational groups. This figure shows a healthy fraction of international employees, but a relatively low fraction of females, apart from the administrative staff.

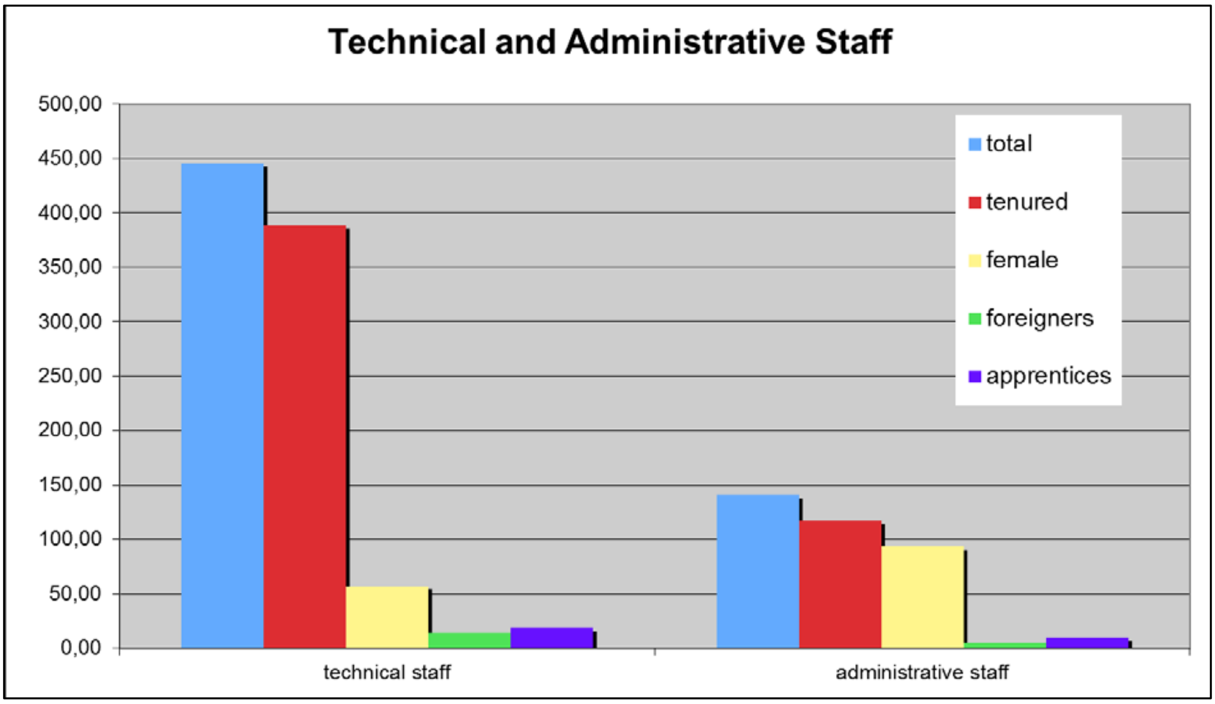


Figure 2.5: Tenure fraction, gender and international balance of IPP technical and administrative staff (FTEs) on December 31st, 2014

Table I shows how far the staffing plan “Greifswald 2014+” has been executed until today. The abbreviations mean: OP: W 7-X operation division (H.-St. Bosch), E3: Stellarator heating and optimization (R. Wolf), E4: Stellarator edge and divertor physics (Th. S. Pedersen), E5: Stellarator dynamics and transport (Th. Klinger), ST: Stellarator theory (P. Helander). “Planned” means that the positions correspond to the approved staffing concept; “existing” means that the person already had a tenured contract; “hired” means that the recruitment process is finished; “blocked” means that the position is provisionally not allowed the be filled for budgetary reasons.

	OP					**E3**					**E4**				
	planned	existing	hired	blocked	**open**	planned	exisiting	hired	blocked	**open**	planned	existing	hired	blocked	**open**
Physicists	8	8	0	0	**0**	21	15	1	1	**4**	19	11	1	2	**5**
Engineers (TU)	26	18	5	1	**2**	5	5	0	0	**0**	3	2	1	0	**0**
Engineers (FH)	49	26	21	0	**2**	11	9	2	0	**0**	5	4	1	0	**0**
Technicians	39	12	22	0	**5**	14	7	5	2	**0**	6	3	3	0	**0**
Workers	1	1			**0**					**0**					**0**
Support staff	2	2	0	0	**0**	1	1	0	0	**0**	2	2	0	0	**0**
	125	67	48	1	**9**	52	37	8	3	**4**	35	22	6	2	**5**

	E5					**ST**					**TS**				
	planned	exisiting	hired	blocked	**open**	planned	exisiting	hired	blocked	**open**	planned	exisiting	hired	blocked	**open**
Physicists	15	9	1	1	**4**	21	16	2	2	**1**					
Engineers (TU)	1	1	0	0	**0**	0				**0**	4	2	1	1	**0**
Engineers (FH)	4	4	0	0	**0**	0				**0**	16	8	7	1	**0**
Technicians	4	0	3	1	**0**	4	4	0	0	**0**	9	7	1	1	**0**
Workers					**0**					**0**	31	21	6	2	**2**
Support staff	1	1	0	0	**0**	1	1	0	0	**0**	2	2	0	0	**0**
	25	15	4	2	**4**	26	21	2	2	**1**	62	40	15	5	**2**

Table I: Execution of the staffing plan “Greifswald 2014+”

The number of positions in Garching which have to be refilled due to retirement of tenured staff are:

	2015	2016	2017	2018
Scientists and engineers	1	5	0	1
Technicians	6	1	1	3

3. Budget of the Institute

Figure 3.1 gives a summary of the institute's budget over the last 12 years. The national funding consists of two components: the federal budget providing 90% and the respective state governments contribute 10% to the budget of the institute located in their territory (Bavaria and Mecklenburg-Vorpommern). In addition, IPP is associated with EURATOM and received – until 2013 – the so-called baseline support of up to 20% of the approved Work Programme. Furthermore, there was the possibility to apply for specific preferential support actions through the EFDA program (about 20% in addition to the baseline support) plus some additional funding through various other sources. From 2014 on, the European financial contribution is managed by the Consortium EUROfusion via a so-called "programme co-fund action".

As shown in figure 3.1, the national funding has been on a nearly constant level until 2010. The increase of the national funding from 2007 to 2008 is mainly due to the compensation for the value added tax (VAT), which IPP has to carry since 2008. The ceiling imposed on the national funding line was for political reasons. From 2011 onwards this ceiling was lifted, and IPP has enjoyed a moderate increase in the national funding until 2014 when again a ceiling was defined due to political reasons. Taking into account the loss in buying power due to inflation, this situation leads to considerable constraints for IPP.

The moderate increase between 2011 and 2014 was, however, offset by a significant decrease in the EURATOM funding. Since 2009 the Baseline Support has also been consecutively decreased in anticipation of the significantly increased demands for ITER. With the new funding scheme by EUROfusion the European contribution to the IPP budget seems to stabilize.

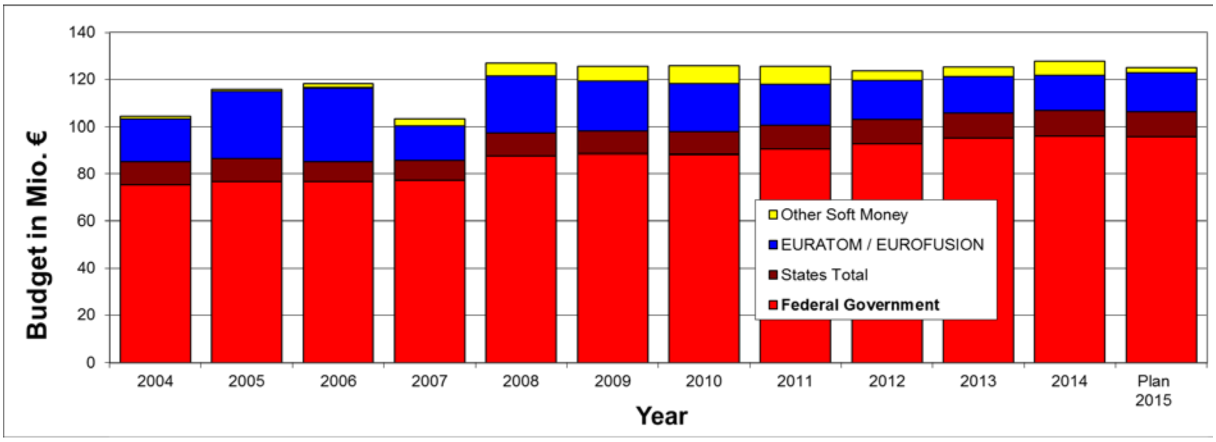


Figure 3.1: Funding profile of IPP 2004 – 2015

4. Quantitative Indicators

Publications:

Scientific publications and their impact are probably the most important criteria of the success of a fundamental research institute. For an experimentally driven Institute as IPP, another criterion is the role it plays as innovator of technology, experimental techniques, instruments and sensors, in particular the operation of large instruments with an international user base. Furthermore, the international standing of its principal scientists (as measured by invited talks, awards etc.), and the career paths of the young scientists it produces, are important criteria. Most of this information is provided in the IPP Annual Reports. Here we give some additional statistical information and analysis.

Table 4.I lists the number of refereed IPP publications over the period 2005-2014 according to data gathered from the "Web of Science", cross-checked against the entries in the MPG eDoc system.[4]

Year	IPP-Publications
2005	345
2006	269
2007	373
2008	270
2009	429
2010	297
2011	449
2012	289
2013	401
2014	378
Total	**3500**

Table 4.I: Refereed IPP publications in the period 2005-2014

Pronounced bi-annual fluctuations introduced by the frequency of large international conferences can be inferred from the table. A more reliable measure of the publication output is therefore given by the 2-year average (Figure 4.1). As will be shown subsequently, the average impact factor of IPP-publications is well above the community average. An expression of this fact is that in 2013 three of the 10 most quoted articles in the journal Nuclear Fusion and three of the 10 most quoted articles in Plasma Physics and Controlled Fusion had IPP first authors (for 2014 the figures are 2 of 10 and 4 of 10 respectively).

[4] Please note that the numbers sometimes are higher than in the former 'Reports to the Fachbeirat'. It appears that articles are continuously being added to the 'Web of Science'

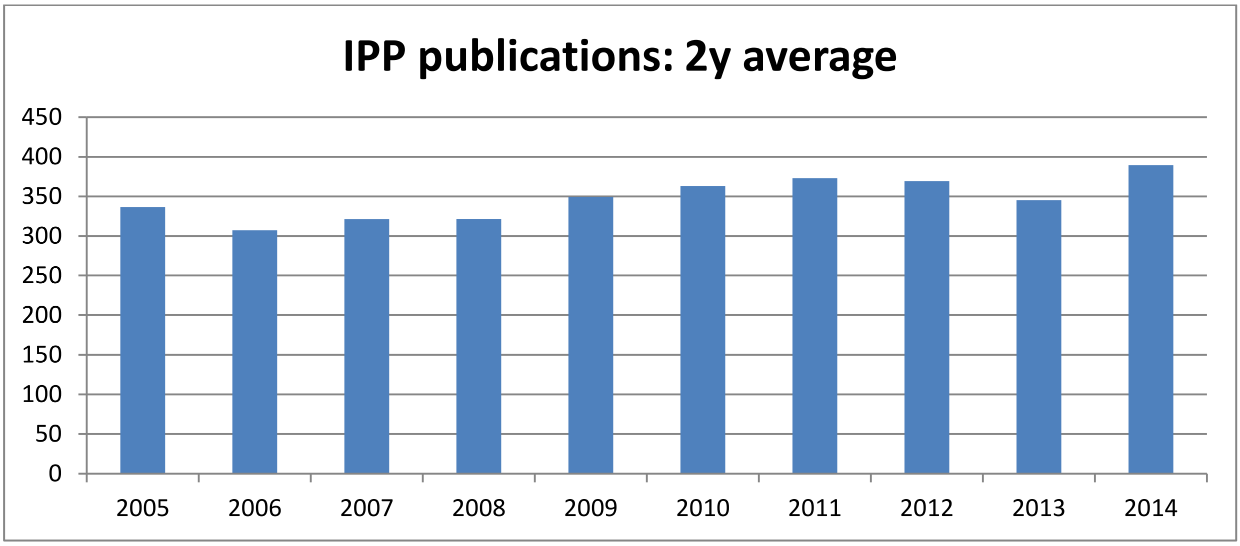


Figure 4.1: Two year-averaged number of refereed IPP publications in the 10-year period 2003-2012

In the following, we compare the scientific output of IPP within and against the relevant physics areas IPP is active in. Figure 4.2 displays the distribution of the IPP publications onto the most often chosen journals, i.e. Physics of Plasmas, Plasma Physics and Controlled Fusion (PPCF), Fusion Engineering and Design (FED), Nuclear Fusion, Journal of Nuclear Materials (JNM), Review of Scientific Instruments (RSI) and Physical Review Letters (PRL) in the last ten years (the absolute figures can be seen in the second column of Table II below). On the one hand, the selection of journals to a certain extent reflects the main research activities of IPP. On the other hand, the five journals with the most published articles provide an adequate reference frame to put the scientific output of the IPP in perspective. For these journals the average number of citations of published articles has been compared to the number of citations of IPP articles, see Figure 4.3

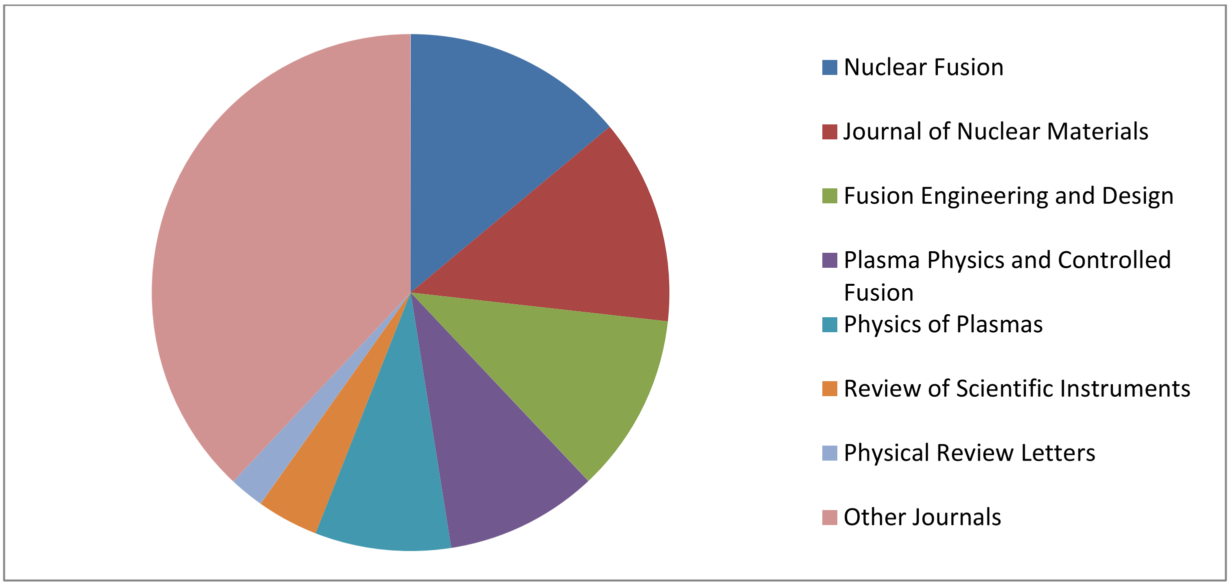


Figure 4.2: Distribution of IPP publications on different journals (2005-2014)

As can be seen from Figure 4.3, the impact of the IPP articles exceeds the respective average of the journals in most cases[5].

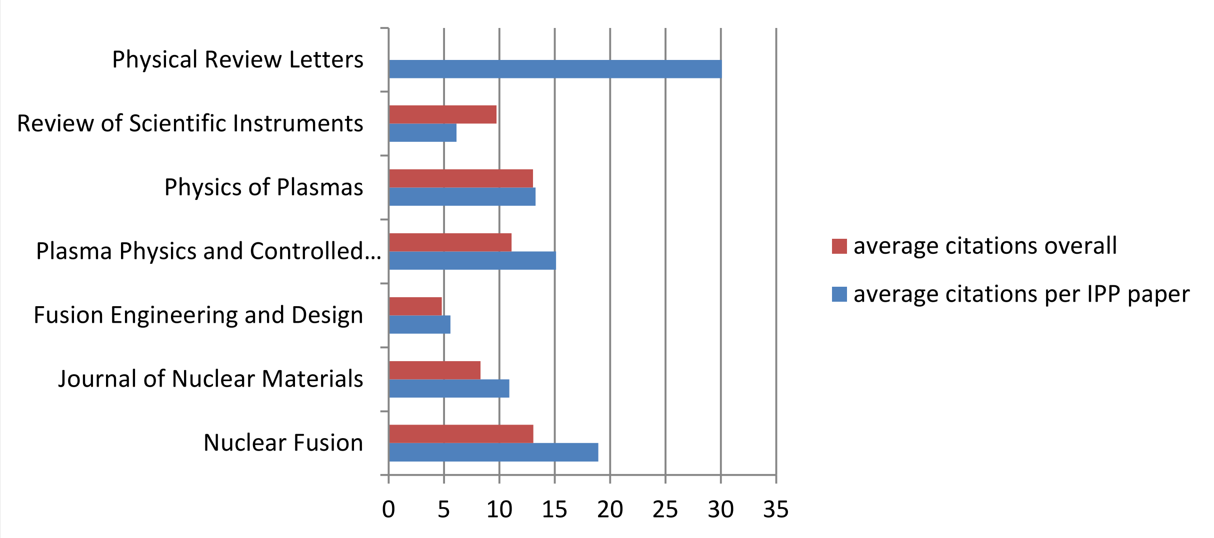


Figure 4.3: Average numbes of citations of an article in a journal (IPP vs. overall).

	Period 2005 - 2014			
	number of IPP papers	**average citations per IPP paper**	**average citations overall**	**impact factor (2014)**
IPP total	3500	11,81		-
NF	488	18,92	13,06	3,062
JNM	449	10,90	8,30	1,865
FED	392	5,58	4,80	1,152
PPCF	333	15,12	11,09	2,186
PoP	297	13,27	13,03	2,142
RSI	135	6,12	9,75	1,614
PRL	76	30,08	n. a.	7,512
Others	1330			

Table 4.II: Article citations in main journals

5 Unfortunately the overall citations figure for the PRL was not available

Prizes

The following prizes were awarded to IPP scientists during the reporting period:

Dr. Benedikt Geiger	Otto Hahn Medal 2013 (MPG)	For fundamental experimental investigations of the dynamics of fast ions in turbulent magnetic plasmas
Dr. Michael Kraus	Otto Hahn Medal 2013 (MPG)	For work on variational integrators in plasma physics
Prof. Hartmut Zohm[6]	John Dawson Award 2014 (American Physical Society)	For the theoretical predic-tion and experimental demonstration of neoclassical tearing mode stabilization by localized electron cyclotron current drive.
Dr. Felix Schauer	Fusion Technology Award 2014 (IEEE)	For the development of super-conducting magnets and stellarator power plant studies
Dr. Benedikt Geiger, Dr. Manuel Garcia Muñoz[7]	Landau-Spitzer Prize for Plasma Physics 2014 (APS and EPS)	For greater understanding of energetic particle transport in tokamaks through collaborative research
Prof. Dr. Ursel Fantz, Bernd Heinemann, Dr. Peter Franzen	Negative Ion Source Prize 2014 (NIBS Award)	For recent innovative and significant achievements in the fields of the physics, theory, technology and/or applications of sources, low energy beam transport, and/or diagnostics of negative ions

[6] shared with Prof. James D. Callen and Prof. Chris Hegna from the University of Wisconsin, Dr. Robert J. La Haye from General Atomics, USA, and Dr. Olivier Sauter from Ecole Polytechnique Fédérale de Lausanne, Switzerland.)

[7] shared with Dr. David Pace and Dr. Michael Van Zeeland from General Atomics

Cooperation with Universities

IPP has strong connections to many universities at various levels, ranging from joint appointments, joint research projects (the most common case) to financially supported development projects (e.g. for W7-X) and finally student education. For IPP it is very important to attract talented students. Teaching plasma physics at various universities has therefore a long tradition at IPP. In 2014, 25 staff members of IPP taught at universities or universities of applied sciences: Many members of the IPP staff are Honorary Professors, Adjunct Professors or Guest Lecturers at various universities and give lectures on theoretical and experimental plasma physics, fusion research, data analysis and materials science. Table 4.III gives an overview. The teaching programme has been highly successful over the years, and many students who first came into contact with plasma physics through lectures given by IPP staff have later done thesis work or even taken up a career in the fusion research. Lecturing at and cooperation with universities are supplemented by IPP's yearly Summer University in Plasma Physics and advanced courses given in the context of the Joint European Research Doctorate in Fusion Science and Engineering.

University	Members of IPP staff
University of Greifswald	Dr. Hans-Stephan Bosch Dr. Andreas Dinklage Prof. Per Helander Prof. Thomas Klinger Dr. Heinrich Laqua Prof. Thomas Sunn Pedersen
Technical University of Berlin	Prof. Robert Wolf
Technical University of Munich	Prof. Sibylle Günter Dr. Klaus Hallatschek Dr. Philipp Lauber Prof. Rudolf Neu Prof. Eric Sonnendrücker Prof. Ulrich Stroth
University of Munich	Dr. Thomas Pütterich Dr. Jörg Stober Prof. Hartmut Zohm
University of Augsburg	Prof. Ursel Fantz Dr. Marco Wischmeier
University of Ulm	Dr. Thomas Eich Prof. Frank Jenko Dr. Emanuele Poli Dr. Jeong-Ha You
Technical University of Graz	Dr. Udo v. Toussaint
University of Bayreuth	Dr. Wolfgang Suttrop
University of Gent	Prof. Jean-Marie Noterdame

Table 4.III IPP staff who taught courses at universities in 2014

EUROfusion

Enabling Research Projects

G. Conway:	Micro-turbulence properties in the core of tokamak plasmas: close comparison between experimental observations and theoretical predictions (2014 – 2017)
B. Geiger:	Velocity space resolved study of the fast-ion transport due to large scale MHD instabilities by combining multiple diagnostics (2014)
M. Hölzl:	Global non-linear MHD modeling in toroidal X-point geometry of disruptions, edge localized modes, and techniques for their mitigation and suppression (2015 – 2017)
F. Jenko:	Nonlinear gyrokinetics and ab initio transport modelling for ITER & beyond: From basic understanding to truly predictive capability and improved control (2014)
E. Sonnendrücker:	Verification of global gyrokinetic codes and development of new algorithms for gyrokinetic and kinetic codes (2014 – 2017)

Fusion Researcher Fellowships (total awarded: 17)

A. Manhard	Influence of Different Defect Types on Hydrogen Isotope Transport and Retention in Tungsten (2014 – 2015)
M. Schneller	Nonlinear Energetic Particle Transport in Fusion Plasmas (2014 – 2015)
D. Vezinet	Soft X-Ray tomography of MHD events in the presence of heavy impurities and tests of a gas detector for neutron-resilient future Soft X-Ray diagnostic (mid 2014 – mid 2016)
E. Viezzer	Impact of poloidal impurity asymmetries on edge current and pedestal stability (2014 – 2015)

EUROfusion Researcher Grants (total awarded: 11)

M. Dunne:	Interpretive and predictive stability calculations in nitrogen seeded and pellet fuelled discharges on ASDEX Upgrade (mid 2015 – mid 2017)
G. Papp	Self-consistent modelling (including experimental validation) of runaway electron dynamics in tokamak disruptions (mid 2015 – mid 2017)
M. Willensdorfer:	Impact of external magnetic perturbations and 3D effects on plasma transport (2015 – 2016)

EUROfusion Engineering Grants (total awarded: 17)

A. Bader:	Integrating a distributed ICRF antenna in DEMO (mid 2015 – mid 2017)

5. PhD Education

PhD education at the Max Planck Institute for Plasma Physics (IPP) in Garching and Greifswald is organised under the umbrella of the International Helmholtz Graduate School for Plasma Physics, HEPP. This graduate school is organising the education for doctoral candidates at IPP together with its neighbouring partner universities, the Technical University of Munich (TUM) and the Ernst Moritz Arndt University of Greifswald. Associated partners are the Leibniz Institute for Plasma Science and Technology (INP) in Greifswald and the Leibniz Computational Center (LRZ) in Garching.

HEPP provides a coherent framework at IPP and the participating universities for qualifying a new generation of internationally competitive doctoral candidates in the field of plasma physics, fusion research, computational physics, surface science and plasma technology. The intention of HEPP is to prepare the doctoral candidates for careers in a range of fusion related fields, i.e. for taking over leading positions in research, management and politics, technology development, or consulting and education. Graduate education in HEPP is structured, systematic, and adapted to the individual needs of the doctoral candidates.

By offering a dedicated training program with a broad spectrum of summer schools, special lectures, colloquia, and workshops as well as access to state-of-the art laboratory equipment and supercomputers, HEPP aims to combine excellent research opportunities and a stimulating environment. The know-how of the two universities, the associated partner institutes, and the two sites of the Max Planck Institute for Plasma Physics is brought together to provide the basis for cutting edge research and education. IPP is a partner of the European Fusion Education Network (FuseNet), and also one of the eight main partners of the Joint Doctoral College in Fusion Science and Engineering (FUSION-DC), which has been approved under the auspices of Erasmus Mundus, the European programme to promote training schemes.

All PhD students sign a work contract that specifies the expected duration (3 years[8]) and rights and duties for graduation[9]. An additional supervision contract in which all parties agree to the "Terms of good practice in doctoral training in the International Helmholtz Graduate School for Plasma Physics" is signed by the academic supervisor, the direct supervisor/mentor, an ombudsperson and the doctoral candidate. The terms of good practice together with detailed additional information on the requirements for graduation can be found on the IPP website. Students and supervisors are strongly encouraged to define a work plan as an important element to structuring the doctoral project. Doctoral candidates also discuss the choice of transferable skill courses with their thesis advisors. Generally, mentors (in many cases these are group leaders qualified as university lecturers) closely work with not more than one or two doctoral candidates, holding weekly or bi-weekly meetings, and are strongly involved in the evaluation of the thesis (in case a candidate is graduating at the university where the mentor gives lectures, the latter even acts as primary reviewer of the thesis). IPP advises quarterly meetings between the candidate, the mentor and the academic supervisor (with optional participation of the ombudsperson).

IPP students are eligible for the Graduate School of the Technical University of Munich and the Graduate Academy at the University of Greifswald, which support doctoral candidates in their research work, promote transferable skills, provide tailor-made qualification

[8] Financing is guaranteed for this period, in exceptional cases a prolongment of up to 12 months is granted
[9] As from June 2015 all PhD candidates are offered work contracts. IPP stipends are no longer issued.

programmes, individual mentoring, subject-related consultation as well as gender and diversity services contributing to optimal conditions for a successful doctorate.

In addition, some of the students take part in the FUSION-DC graduate school or the "European Doctoral Network in Fusion Science and Engineering" programme, which is supported by institutions in Germany (IPP and LMU), Italy (Consorzio RFX and University of Padua), and Portugal (Instituto Superior Técnico). In the framework of the latter, IPP organises a yearly course on "Advanced Fusion Physics'' that is credited with 6 ECTS and can be included in the curriculum of PhD students at IPP.

Supervisors have access to the numerous special training measures of MPG and HGF.

The bulk of the education for PhD students is provided by the supervisors and research teams in the laboratories. Students have the opportunity to work on first class fusion research installations such as ASDEX Upgrade and W7-X (in the near future), with basic physics experiments like VINETA, devices related to material sciences like the high heat-flux device GLADIS, state-of-the-art technology test stands such as the negative ion neutral beam source ELISE, cutting-edge laboratory equipment, and powerful computing facilities. A large number of excellent senior scientists are available for discussions or to answer questions. Furthermore, the students report frequently on their research in front of an audience with international scientists.

As from their second year, all PhD students are encouraged to engage in international exchange by attending conferences and workshops abroad[10] and are expected to publish at least one refereed article[11] as first author before they hand in their thesis.

[10] For the purpose of internationalization, a dedicated budget is provided for each student in addition to the general funding provided by IPP and the partnering universities

[11] The conditions for the latter are laid out in the work contract

Part II:

The challenges of fusion research require in many cases an interdisciplinary approach. This holds also on the institutional level. For that reason, the research at IPP is organized in a matrix-like structure based on divisions, which are cross-linked by cooperative research projects. The coarse-scale structure is provided in Figure 5.1, where the relative activities of the divisions.

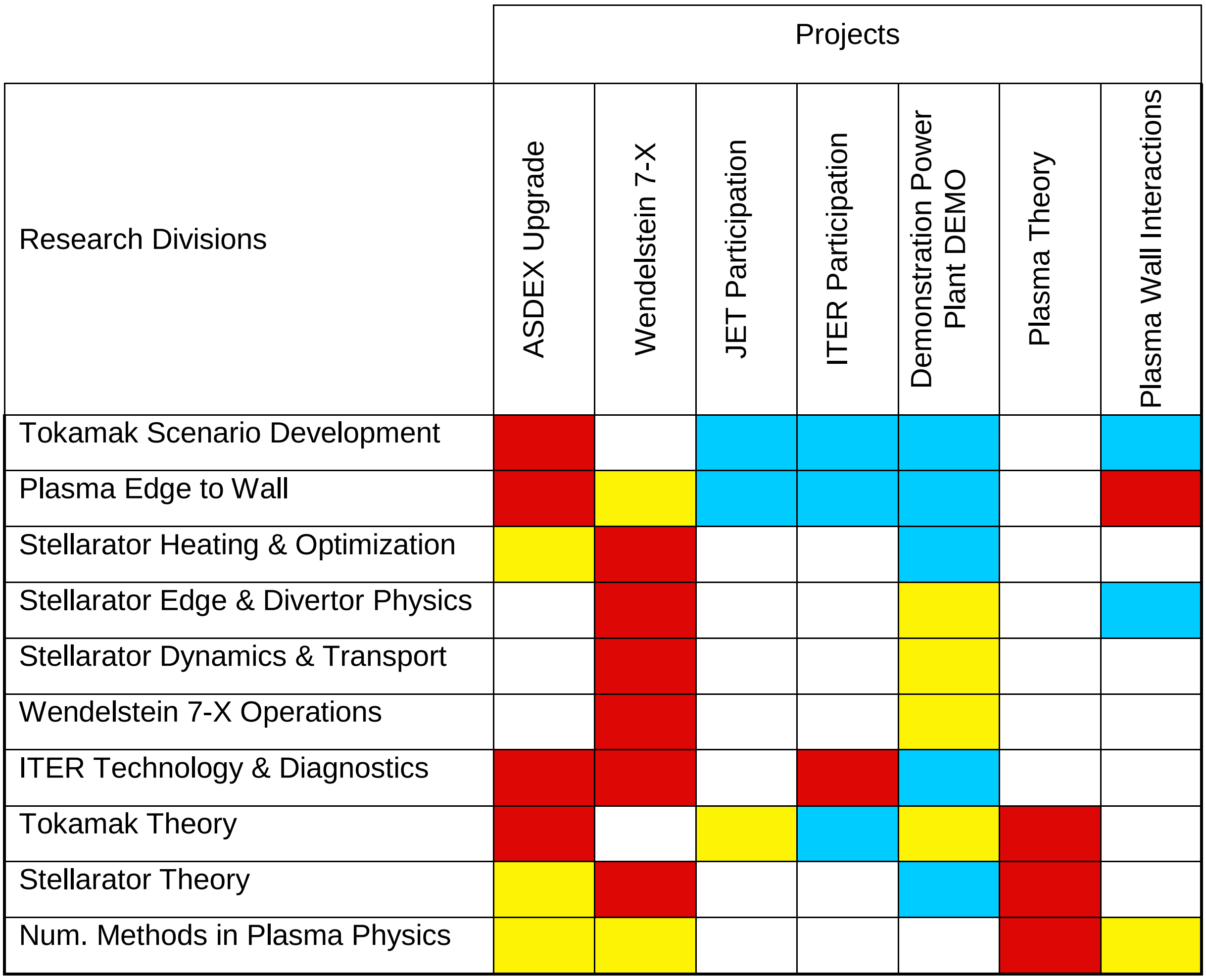
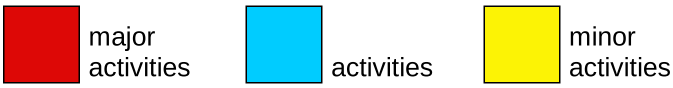


Figure 5.1: Matrix structure of IPP

within the projects is indicated by the following color scheme:



Additional information on the individual divisions and the projects is provided subsequently.

6. Information on the individual divisions and independent research groups

Wendelstein 7-X Completion project (Th. Klinger)

The project coordinates human resources, technical activities, the technical part of industry contracts as well as the contributions from other research centres, and takes care of the interfaces between physics and engineering in this complex and challenging venture. The project is managed by the Project Director Wendelstein 7-X Completion (T. Klinger), who is also member of the IPP board of directors. The project organisation relies on four technical divisions and four interfaces to the institute's scientific divisions (c.f. Figure 5.2). Around 70 professionals work inside the technical project divisions. In addition, up to 100 engineers, technicians and workers will be contracted via staff leasing agreements. EURATOM supports the project with 2 senior experts working in Greifswald and Garching on key project tasks. The quality management office (the project is QM ISO 9001 certified) reports directly to the project director.

The division "Project Coordination" (PC) is now responsible for coordinating the project management efforts of the W7-X completion Project. Its main task is the monitoring and control of the integrated financial and time planning of the project and of the hardware contributions by the scientific divisions. This includes budget control and external contract monitoring. PC is also responsible for the process organisation within the project, the coordination of project design reviews, project specification processes, and international collaborations.

The division "Design and Configuration" (DC) is responsible for all central design tasks and the fast and consistent implementation of component changes. It also takes care of the development and maintenance of IT design tools and interfaces to external collaborators.

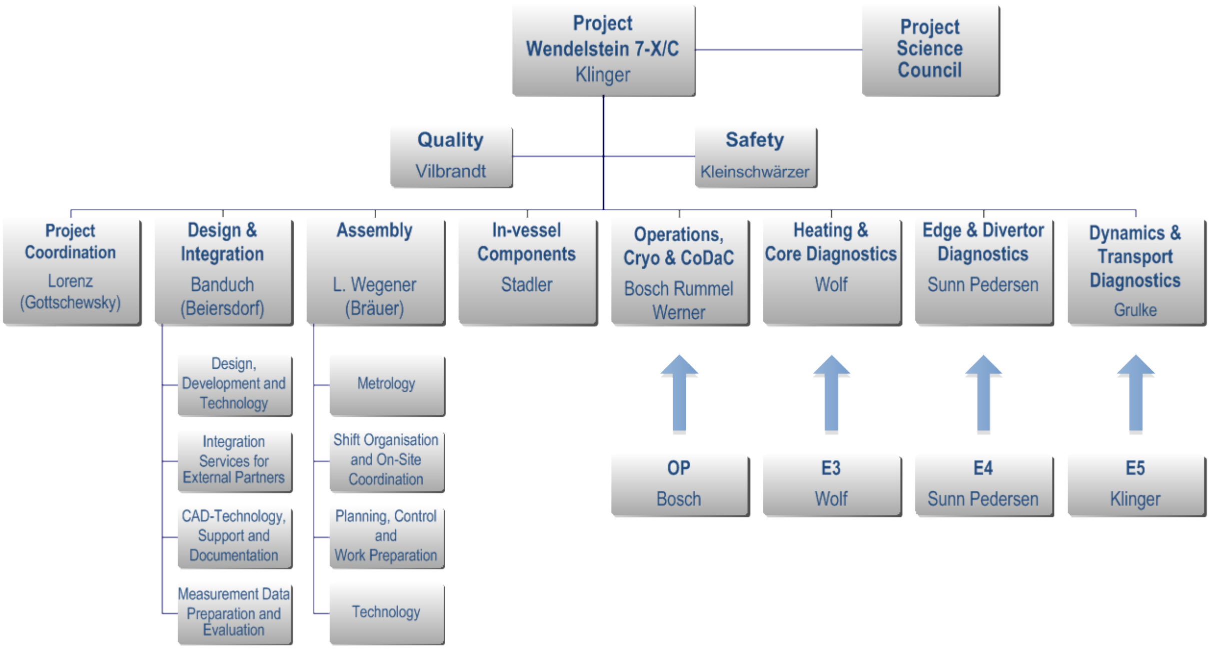


Figure 5.2: Organizational chart of the Wendelstein 7-X Completion project (7/2015)

The division “Assembly” (AS) is responsible for the integration of additional major components of the stellarator, in particular in-vessel components, cooling circuits and cryo-components. In addition, the division is responsible for the development of suitable assembly technologies and tools.

The division “In-Vessel Components” (IVC) is based in Garching, as the manufacturing takes place mainly in the Garching central workshops. In addition, Garching design capacities are used and the test programmes are conducted with Garching facilities (e.g. the GLADIS-device for the test of high heat-flux components). In particular, the division is responsible for the manufacturing of the high-heat flux divertor and related sub-systems. The other four divisions have no own personnel but are established to appropriately manage the interfaces to the scientific divisions E3, E4 and E5 and the scientific/technical division OP. The project board consists of the Project Director (chair), the heads of the technical project divisions PC, DC, AS, IVC, one representative of E3, E4, and E5, and three representatives of OP.

The collaboration with other institutions is a key element of the Wendelstein 7-X project. The cooperation with KIT on the ECRH system is well established. The diagnostics systems are being developed in collaboration (among other) with FZJ/Jülich, PTB/Braunschweig, KFKI-RMKI/Budapest, IPPLM/Warsaw, the University of Opole and CIEMAT/Madrid.

Wendelstein 7-X Operation (OP)

S. Bosch is the head of this scientific/technical Division.

This Division is dedicated on the commissioning and the later operation of Wendelstein 7-X. Therefore, in principle, it consist of four groups, namely

i. device operation, i.e. organisation of the experimental operation, device safety, configuration management and documentation,
ii. Magnets and cryo system, responsible for the cooling and operation of the superconducting magnets, but also for the normal conducting control- and trim coils.
iii. Torus and torus hall, at the moment responsible for Engineering and Vacuum technology (all other mechanical tasks for the torus are still handled in the project “W7-X completion” by the assembly division). After the completion of W-X, this group will be enlarged and will take full responsibility of all aspects of the torus and the torus hall.
iv. CoDaC, responsible for device Control, data acquisition, software and electronics development and general IT-support.

The Division has been established in the year 2014 by relocation of personnel. Envisaged are initially 7 research scientists, 20 engineers (university degree), 33 engineers (applied university degrees) and 92 staff in total.

Tokamak Scenario Development (E1): H. Zohm

The operation of the tokamak ASDEX Upgrade, as well as the integrated development of high performance ITER- and DEMO-relevant plasma scenarios, are the main tasks in the Division E1. Since 2014, operation under EUROfusion also means running the machine partly under the MST1 programme, which, from the host side, is mainly co-ordinated by E1. In terms of fusion physics, the major focus of E1 is on core physics such as core transport, MHD stability and fast particle physics as well as the physics of heating and current drive, the elements that have to be integrated for scenario development. The ASDEX Upgrade related part consists of 49 research scientists, six post-docs, four PhD students, 28 engineers and 64 technicians who are organised in the groups “ASDEX Upgrade Project Co-ordination”, “Operation”, “Maintenance & Extension”, “Power supplies”, “Control & Data Acquisition”, “Scenario Development”, “Transport”, “ECRH” and “ICRF”. Another group (“KiP”) is in charge of delivering the In-Vessel Components for the W7-X stellarator in Greifswald. Finally, 4 researchers have their main emphasis on DEMO-related projects, 3 of them via a secondment at the EUROfusion PMU.

The central task of the Division is the operation and, together with the Division “Plasma Edge and Wall”, the scientific exploitation of the ASDEX Upgrade tokamak. The Division has developed systems for plasma diagnostics, plasma heating and plasma fuelling and continues to improve and extend their capabilities. It has also developed a digital system for real-time control of the confined tokamak plasma, which forms the basis for exploring complex plasma scenarios with optimised current and pressure profiles, preparing ITER and DEMO operational scenarios. The optimisation of the tokamak principle to achieve higher performance, stability and pulse length is the overall scientific goal of the Division. Research thus focuses on the physics of the plasma core. Main fields of interest are particle and energy transport (including fast particles) as well as the physics of MHD instabilities and their active control. Disruption physics, including avoidance and mitigation techniques, are also on the agenda. For the integrated scenario development, also the physics of heating and current drive is an important area studied in E1. Frequently, these studies are conducted as joint experiments with other tokamaks to obtain important scaling information in several areas. In particular, scientists of the Division participate on a regular basis in JET campaigns. Here, one of the main aims is to test promising plasma scenarios/concepts developed on ASDEX Upgrade on a larger device in order to prove their relevance for ITER and DEMO.

Finally, scientists from this department are involved in IPP’s contributions to ITER in the field of RF heating and diagnostics as well as studies on DEMO.

Plasma Edge to Wall (E2M): U. Stroth

The Division is organized in five groups consisting of 29 research scientists, 12 post-docs and 19 PhD students, most of the post-docs and PhD students being externally funded. Besides the operation and evaluation of various diagnostics (visible, VUV, X-ray and charge exchange spectroscopy, mass spectrometry, electron cyclotron emission, conventional and Doppler reflectometry, Thomson scattering, lithium beam emission spectroscopy and Langmuir probes, a new divertor manipulator) at the tokamak ASDEX Upgrade, the scientific work concentrates on physical processes ranging from the plasma edge to the plasma-facing components. In addition to ASDEX Upgrade related work, the Division strongly contributes to the scientific program at JET and to ITER- and DEMO-related research. The Division leads the Virtual Institute on “Plasma Dynamical Processes and Turbulence Studies using Advanced Microwave Diagnostics” with nine international partners. At the plasma edge, research encompasses turbulent transport, L-H transitions and the radial electric field, the pedestal dynamics including ELMs and the effect of magnetic perturbations used for ELM mitigation on transport. One focus is on turbulent transport where together with the partners from the Virtual Institute new reflectometer systems have been brought into operation and close links with theory have been established to foster close comparison between experiment and simulations. Another focus is on divertor physics where divertor detachment, power loads and the density limit are studied by combined simulation and experimental efforts. An important objective of the Division’s different research is the development of integrated solutions for high-power plasma operation combining the choice of the plasma-facing material with safety issues, exhaust capabilities and clean plasma conditions. The exploitation of the tungsten wall in ASDEX Upgrade is continued and new activities regarding materials such as EUROFER have been started. The spectroscopy studies include the low-temperature plasma dynamical processes in the divertor up to transport of highly charged ions in the plasma core. To elucidate the impurity cycle and tritium inventory in divertor tokamaks, experiments on the fusion devices are complemented by laboratory studies of fundamental properties of plasma-wall interaction, the impact on material surfaces, reactive plasma processes, and materials synthesis and characterisation. Different aspects such as erosion and hydrogen inventory, surface modification of exposed materials, and characterisation of new materials are merged into a comprehensive assessment. The Division operates a world-wide unique surface science laboratory including a 3 MV Tandem Accelerator and the high-heat-flux test facility GLADIS which is also testing W7-X divertor modules. Further topics include ITER-related plasma-wall interaction issues such as lifetime studies of and tritium inventory investigations in plasma-facing materials, as well as material developments for doped tungsten with low oxidation rate, hydrogen diffusion barriers for tungsten coatings and on tungsten-fibre reinforced tungsten.

Stellarator Heating and Optimization (E3): R. Wolf

In preparation of the operation and the start of the scientific exploitation of Wendelstein 7-X the Division has been newly arranged. With about 50 scientists, engineers and technicians this Division is responsible for the plasma heating systems, the profile diagnostics of the main plasma parameters and the neutron counters. Its research will focus on the verification of the optimization criteria, the physics of plasma heating and fast particle confinement.
The main tasks in preparation of the first operational campaign of Wendelstein 7-X are the commissioning of the ECRH system and the implementation of diagnostics that are required for first plasma operation. The research and development programme in general focuses on preparing the plasma heating systems ECRH, NBI and ICRH for later operational phases and on upgrading and enhancing diagnostic techniques with focus on the final goal of steady state operation at reactor relevant plasma parameters. All of these activities rely on collaborations with partners from Europe, Japan and the US. In addition, stellarator power plant studies have been resumed together with Stellarator Theory and engineering support from the Operations Division. In the framework of larger collaborations the contributions of the Division include transport studies on LHD, the implementation of a new magnetic field diagnostic on ASDEX Upgrade, and contributions to the International Stellarator/Heliotron Profile Database.

Stellarator Edge and Divertor Physics (E4): Th. S. Pedersen

The Division has 35 members of staff of which about half are scientists. The main focus of the Division is on understanding and controlling the exhaust of plasma, and its interaction with the material surfaces, in particular the divertor, where the main part of the exhaust plasma heat and particle flux will be intercepted and pumped away. At the same time, an intense heat (up to 10 MW/m2) cannot be allowed to cause excessive erosion or sputtering of materials, since this would lead to impurity accumulation and radiative losses for the core plasma, or short life times of the plasma facing components. This will be investigated with a number of edge diagnostics, including infrared and visible light divertor observation, spectroscopic measurements, fast Li-beam, Langmuir probes, laser induced fluorescence, calorimetry, and a thermal He-beam diagnostic.

In OP1.1 the Division will concentrate on the verification and adjustment of the magnetic topology, making use of the flux surface measurement diagnostic and the IR/visible limiter observation systems, to demonstrate good nested flux surfaces up to the limiter (no large islands near LCFS) and on detecting and eliminating (using the trim coils) low-order magnetic errors, i.e. on ensuring equal power distribution across all 5 inboard limiters. A further focal point of OP1.1 will be scrape-off layer (SOL) physics studies, making use of the relatively short magnetic field line connection lengths of the limiter configurations, compared to the later island divertor configurations of OP1.2 and beyond. Of particular importance to this study will be SOL-width measurements and their comparison to various models taking into account the impact of recycling neutrals and impurity transport. The transition from initially helium to later hydrogen plasma operation in OP1.1 will be used to investigate the differences in plasma start-up and SOL physics behaviour.

Stellarator Transport and Stability (E5): Th. Klinger

The "Stellarator Dynamics and Transport" Division addresses (a) the magneto-hydrodynamic equilibrium and magneto-hydrodynamic instabilities, (b) neoclassical (diffusive) transport of particles, energy and impurities, (c) turbulence and anomalous transport in optimised stellarators. During the first operational phase OP 1.1, the Division runs the high-efficiency extreme-ultraviolet spectrometer (HEXOS), horizontal and vertical bolometers, correlation and Doppler reflectometry diagnostics, various magnetic diagnostics, a pulse height analysis (PHA) system, and a multi-purpose manipulator. This suite of initial plasma diagnostics allows one to address first scientific questions related to impurity levels, magnetohydrodynamic equilibrium, turbulence and transport of particles and energy. With the help of numerical models, it is intended to distinguish between neoclassical and turbulent impurity transport in the optimised magnetic configuration. Similarly, turbulence levels and turbulence localisation will be investigated. The Division is also dealing with integrated data analysis, which is understood as a cross-divisional activity.

The scientific team is under development and currently consists of 9 professional scientists, 4 postdocs, 5 PhD students, and 6 technical staff.

Parallel to the scientific activities related to Wendelstein 7-X, fundamental research on magnetic reconnection is conducted in the linear laboratory device VINETA.II. This work is done under the auspices of the Max Planck-Princeton Centre for Plasma Physics

Tokamak Theory (TOK)

E. Poli is the Acting Head of this Division since November 2014.

The "Tokamak Theory" Division in Garching consists (as of June 2015) of 11 research scientists, 1 support staff, 6 post-docs, 8 PhD students[12].

The goal of our department is the development of a quantitative, predictive model of tokamak performance based on a first-principle understanding of the related physics processes, through an effort ranging from the derivation of the appropriate physical models, through their implementation into codes, to the application of the codes for basic physics understanding, interpretation of existing experiments, planning and modelling of future machines like ITER and DEMO. On this road, emphasis is also put on the integration of the numerical tools with the final goal of comprehensive plasma simulations. In most of these activities, the Division is at the cutting edge of the current research worldwide. In the field of turbulent transport, the approaches taken include developing and using gyro-kinetic codes (both particle-in-cell, NEMORB and Eulerian, GENE), the development of gyro-fluid codes, and fluid treatments capable of treating the edge, separatrix and Scrape-Off Layer taking the real geometry into

[12] These numbers include the colleagues working in the ERC independent research group, whose activity will cease by the end of 2015 due to the appointment of its leader, Frank Jenko, at UCLA, but not those belonging to the MHD group under the leadership of Sibylle Günter, whose results are reported in a separate section.

account. Multi-scale and global problems are increasingly being addressed. In addition to the turbulence-based descriptions, effort is also going into the further development and use of transport codes, both for the core and edge/SOL (ASTRA, SOLPS). Modelling of heating scenarios in present and future machines is actively pursued, in particular for waves in the ion-cyclotron and electron-cyclotron frequency range, with codes like TORIC and TORBEAM. They are also used in support of relevant diagnostic systems. Significant effort is spent in supporting codes, which are widely used outside of IPP.

Stellarator Theory (ST): P. Helander

The "Stellarator Theory" Division in Greifswald consists of 19 research scientists, five support staff, four post-docs and three PhD students. In the Division, basic theory of magnetic confinement in three-dimensionally shaped magnetic fields is developed, and direct theoretical support is provided for Wendelstein 7-X. In terms of scientific topics, neoclassical and turbulent transport is investigated, as well as MHD equilibrium and stability, fast-ion physics, heating, edge physics, and stellarator optimisation. Fundamental studies are aimed at investigating in what ways the 3D magnetic geometry affects plasma behaviour and performance. For instance, how different are micro-instabilities and turbulence in different stellarators, and how do stellarators differ from tokamaks in this regard? On the more applied side, many of the world-leading codes for calculating transport, stability and heating in stellarators have been developed within the Division. The preparation for Wendelstein 7-X uses a suite of such codes for self-consistently calculating the evolution of plasma scenarios, which are used to develop experimental plans and to prepare for the interpretation of diagnostic data. The Division is involved in the Max Planck-Princeton Research Center for Plasma Physics, and maintains an extensive net of collaborations with almost every other fusion theory department in the world.

Numerical Methods in Plasma Physics (NMPP): E. Sonnendrücker

The "Numerical Methods in Plasma Physics" (NMPP) Division in Garching consists of 7 research scientists, 8 post-docs and 3 PhD students, structured in four research groups: Kinetic Modelling and Simulation, Fluid Modelling and Simulation, Plasma-Material Modelling and Foundations, Zonal Flows and Structure Formation in Turbulent Plasmas. The Division also hosts the six members of the EUROfusion High Level Support Team (HLST).

Its scientific aim is to develop new numerical methods and algorithms for plasma physics applications. The research emphasis is on the numerical methods not on the physics but the Division works in close collaboration with the Tokamak and Stellarator theory Divisions at IPP. The work consists on the one hand on collaborating with the other theory Divisions on major algorithmic upgrades of existing codes, like the verification of global gyrokinetic codes (also supported by EUROfusion as Enabling Research Project), the efficient inclusion of diffusive collision models in the EUTERPE PIC code and matrix free Jacobian computation in the MHD code JOREK, thus greatly extending the accessible system sizes. On the other hand the Division explores new concepts that might be helpful in future codes, like geometric integrators that transfer many important properties like conservation properties at the discrete level, and information compression concepts, i.e. tensor trains. The latter have already enabled more efficient simulations of the five or six dimensional phase space in kinetic solvers. The Division is also collaborating with Inria, University of Strasbourg and CEA Cadarache in France on the development of a library mostly aimed at kinetic plasma simulation.

The aim of HLST is to ensure optimal exploitation of the High Performance Computing equipment devoted to magnetic fusion research, by helping with sequential and parallel optimisation and implementing more efficient algorithms.

ITER Technology & Diagnostics (ITED)

U. Fantz is the Acting Head of this Division.

The Division focuses the IPP activities with respect to technology and diagnostic developments for ITER. The ITER Diagnostics group is responsible for the R&D activities of the ITER Bolometer diagnostic and the Diagnostic Pressure Gauges for ITER within long-term Framework Partnership Agreements with F4E. To perform the tasks on detector development, engineering analyses, design integration and prototype testing two European consortia are being led by IPP and several laboratory test facilities are in operation. IPP is strongly supported by the Fraunhofer ICT-IMM in the bolometer detector development and by Wigner RCP and MTA EK (Hungary) for engineering activities. For the pressure gauges, Sgenia (Spain) performs engineering simulations. The IPP contributions to ITER within Third Party contracts are coordinated by this group as well. The major task of the Neutral Beam Injection (NBI) group is the development of a powerful RF driven negative hydrogen ion source for the NBI systems of ITER. Basic research is done at the test facility BATMAN, equipped with the ITER prototype source developed at IPP (1/8 size of the ITER NBI source). The ELISE test facility – operational since 2013 – is equipped with a half size ITER NBI source and is an important part of the F4E roadmap for the ITER NBI system. The experimental programme is strongly supported by laboratory experiments at the University of Augsburg and accompanied by modelling activities. Strong collaboration exists with Consorzio RFX in Padua, the Host of the European Neutral Beam Test Facility and IPR India responsible for the ITER diagnostic beam. The NBI group participates also on the European activities regarding the assessment of a possible NBI system for DEMO; the main topics here are the reliability and the stability of the ion source operation and the overall plug-in efficiency of the system. Furthermore, the NBI group is responsible for the construction and support of the NBI-system for W7-X and the operation and further development of the 20 MW NBI-system on ASDEX Upgrade.

Independent and Junior Research groups (JRG)

Independent Research Group on “Turbulence in Laboratory and Astrophysical Plasmas” (Frank Jenko)

Our research efforts center around key issues in the areas of theoretical plasma physics and fusion research. These include the physics of turbulence and turbulent transport in magnetized plasmas, the interpretation and prediction of transport processes in tokamak experiments (in collaboration with colleagues from experimental physics), as well as aspects of basic plasma physics and plasma astrophysics. In this context we combine a wide range of analytical and numerical techniques – including extreme computing on large supercomputers – and bridge fundamental theory, applied theory, and direct experimental comparisons.

Focus areas in 2014 included the interaction of energetic particles with plasma turbulence in tokamaks, the nature of L-mode and H-mode near-edge turbulence, the character and role of electromagnetic effects in high-performance discharges, the first full-flux-surface turbulence computations in stellarator geometry, as well as various applications of gyrokinetic simulation to space and astrophysical problems (like guide-field reconnection and turbulent dissipation in the solar wind). The main tool used in these studies was the gyrokinetic GENE code.

Helmholtz Junior Research Group "Macroscopic effects of micro-turbulence investigated in fusion plasmas" (Rachael McDermott)

The Helmholtz Young Investigators group „Macroscopic effects of micro-turbulence investigated in fusion plasmas" lead by Dr. Rachael McDermott was started on December 1 2012. At that time Dr. Benedikt Geiger was hired as a postdoc and has been instrumental to the construction and exploitation of three new diagnostics systems (2CXRS and 1 BES). These systems are now fully operational. The work of a PhD student focuses on the measurement of the poloidal asymmetry in the measured toroidal rotation profiles. Comparison of initial measurements with calculations from the neoclassical code NEOART indicate that in NBI heated H-modes the total flow structure is indeed neoclassical. A second PhD position is planned for the group starting in the fall of 2015. This PhD thesis will focus on the transport of low-Z impurities in the plasma and aims to separate the convective and diffusive fluxes via modulation experiments.

Helmholtz-Russia Joint Research Group "Hydrogen Behaviour in Advanced and Radiation-damaged Materials" (Matej Mayer)

This joint research group comprised scientists from the IPP, from the Kurchatov Institute, from the Troitsk Institute for Innovation and Fusion Research (TRINITI), and from the National Research Nuclear University (MEPhI) (all three located in Moscow region). It was funded by the Helmholtz Association (4/2011-3/2014). The funding was used for one Post-Doc and one PhD student working at IPP, temporary Russian guest scientists, travel expenses and investments. The group investigated the accumulation and diffusion of hydrogen isotopes in radiation-damaged plasma-facing materials foreseen for future fusion power plants in laboratory experiments and by computer simulations.

MHD group (Sibylle Günter)

In the last years, a set of 2D MHD codes has been extended to 3D geometry in order to study the stability of 3D equilibria (CASTOR_3DW + STARWALL). General flux coordinates (in addition to straight field line coordinates) were implemented, which are more appropriate for the description of instabilities located close to the separatrix, e.g. edge localized modes (ELMs).
The non-linear MHD code JOREK is being used to investigate edge localized mode (ELM) crashes in realistic ASDEX Upgrade geometry and with realistic rotation profiles in order to validate how well experimental properties can be reproduced. Further activities are the - very successful - preparation and the kinetic modeling of runaway experiments in ASDEX Upgrade.
In the field of energetic particle physics, the group is developing, verifying and validating several theoretical and numerical models in order to understand and predict the transport of energetic particles in present-day and future tokamaks. The aim is to describe a burning plasma on several levels of complexity - ranging from simple 1-D bump on tail models via hybrid-MHD (XHMGC) and hybrid-gyrokinetic (LIGKA/HAGIS) to fully non-linear electromagnetic PIC simulations (NEMORB). Ongoing activities comprise both the principal understanding of non-linear wave-particle (Alfvén waves with energetic ions) and wave-wave (several Alfvén waves with turbulent wave spectrum) interaction as well as the application of these concepts to ASDEX Upgrade experiments and planned ITER scenarios.

7. CVs of the Directors and (Acting) Division Heads

Prof. Dr. Sibylle Günter

Personal Details:

Date/Place of Birth:	20.4.1964, Rostock
Present Position:	Scientific Director, Max-Planck-Institut für Plasmaphysik Garching/ Greifswald

Education and Training:

1982 – 1987	Study of Physics at Rostock University
1987 – 1990	PhD in Physics at Rostock University
1996	Habilitation, Rostock University

Career:

1990 – 1996	Employed at University of Rostock as Research Scientist in quantum statistics
1996 – 1998	Employed at IPP Garching as Research Scientist in MHD theory
1998 – 2000	Group leader MHD theory at IPP Garching
2000 – 2011	Scientific Member of the Max Planck Society and Director of Tokamak Physics Division at IPP
since 2001	Adjunct Professor at University of Rostock
since 2006	Honorary professor at Technical University Munich
since 2007	Member of the IPP directorate
since 2011	Chair of the scientific board and Scientific director of IPP

Awards:

2013	Cross of the Order of Merit of the Federal Republic of Germany
2014	Election as member of the National Academy of Science and Engineering

Scientific interest:

The work of Prof. Günter aims at developing an integrated understanding of the complex phenomena determining the performance of toroidal confinement devices. Her recent, personal contributions have concentrated on, the non-linear evolution of MHD instabilities as well as on computational physics (treatment of problems with extreme anisotropic properties).

Prof. Günter has been the chair of the General Assembly of the consortium EUROfusion (till end of 2014), now acting as deputy chair. She is the scientific leader of the Max Planck-Princeton Research Center on Plasma Physics. She is member of the Senate of the Max Planck Society as well as several evaluation boards and boards of trustees.

Selected Publications:

1. S. Günter et al., Interaction of energetic particles with large and small scale instabilities, Nucl. Fus. 75 (2007) 920-928
2. S. Günter and K. Lackner, A mixed implicit-explicite finite difference scheme for heat transport in magnetised plasmas, J. Comput. Phys. 228 (2008) 282
3. Q. Yu, S. Günter, K. Lackner, M. Maraschek Seed island formation by forced magnetic reconnection, Nucl. Fusion 52 063020 (2012).
4. E. Strumberger, S. Günter, C. Tichmann, MHD instabilities in 3D tokamaks, Nucl. Fusion, 54, 064019 (2014)
5. S. Günter et al., Fast sawtooth reconnection at realistic Lundquist numbers, Plasma Phys. Control. Fusion 57, 014017 (2014)

Dr. Hans-Stephan Bosch

Personal Details:

Date/Place of Birth:	29.5.1957, Stuttgart, Germany
Present Position:	Division Head Wendelstein 7-X Operation, Deputy, Scientific Director of the "Project Wendelstein 7-X", Max-Planck-Institut für Plasmaphysik Greifswald

Education and Training:

1977 – 1979	Study of physics, Westfalian Wilhelms-University, Münster (WWU)
1979 – 1983	Study of physics at Ludwig-Maximilians University, Munich (LMU)
1983 – 1986	Ph.D. work, IPP Garching and Technical University Munich (TUM)
1986	Ph.D. Rerum Naturalium
1987	Otto-Hahn medal of the Max Planck Society
2000	Habilitation in Experimental Physics, Humboldt University Berlin (HUB)
2008	Venia Legendi, Ernst-Moritz-Arndt University Greifswald (EMAU)

Career:

1987 – 1988	Post-doctoral research staff, Princeton Plasma Physics Laboratory, Princeton
1988 – 1990	Research staff at IPP (ASDEX)
1990 – 2000	Research staff at IPP (ASDEX-Upgrade) and group leader
2000 – 2003	Head of the directors staff office (WTB) at IPP
2004 – 2013	Head of Project Coordination W7-X, IPP Greifswald
since 2013	Division Head "Wendelstein 7-X Operations"

Scientific interest:

The research interests of Dr. Bosch are fusion product physics, divertor physics and particle exhaust. He was involved in all these topics as well as in the device operation of the ASDEX Upgrade tokamak until 2000. After some years devoted to science administration and the project coordination of W7-X, since 2012 he has prepared and lead the commissioning of Wendelstein 7-X and now leads the operation of Wendelstein 7-X.

Selected Publications:

1. H.-S. Bosch, G. M. Hale, *Improved Formulas for Fusion Cross Sections and Thermal Reactivities*,Nucl. Fusion **32** (4), 611-631 (1992)
2. H.-S. Bosch, W. Ullrich, D. Coster, O. Gruber, G. Haas, A. Kallenbach, R. Schneider, R. Wolf and ASDEX Upgrade Team, *Helium Transport and Exhaust with an ITER-like Divertor in ASDEX Upgrade*, J. Nucl. Mater. **290-293**, 836-839 (2001)
3. H.-S. Bosch, V. Erckmann, R. W. T. König, F. Schauer, R. J. Stadler, A. Werner, *Construction of Wendelstein 7-X – Engineering a Steady-State Stellarator*, IEEE Transactions on Plasma Science **38** (3), 265-273 (2010)
4. H.-S. Bosch, R. Wolf, T. Andreeva, J. Baldzuhn, et al., Technical challenges in the construction of the steady-state stellarator Wendelstein 7-X, Nucl. Fusion **53** (12) 126001 (2013)
5. H.-S. Bosch, R. Brakel, M. Gasparotto, H. Grote, D. A. Hartmann et al., Transition from Construction to Operation Phase of the Wendelstein 7-X Stellarator, IEEE Transactions on Plasma Science **42** (3) 432-438 (2014)

Prof. Dr.- Ing. Ursel Fantz

Personal Details:

Date/Place of Birth:	29.6.1963, Sindelfingen
Present Position:	Acting Head (W2), ITER Technology & Diagnostics Division Max-Planck-Institut für Plasmaphysik Garching Head of the Experimental Plasma Physics group at Augsburg University

Education and Training:

1984 – 1991	Study of Physics at University of Stuttgart
1991 – 1995	PhD in Electrical Engineering at University of Stuttgart
2002	Habilitation at University of Augsburg
2008	Appointment as Full Professor at University of Augsburg

Career:

1982 – 1984	Physical Technical Assistant at the Institute of Theory in Electrical Engineering, University of Stuttgart
1991 – 1995	Research Scientist at Institute of Plasma Research, University of Stuttgart
1995 – 2004	Scientific Assistant at the Chair of Experimental Plasma Physics, University of Augsburg with focus on low temperature plasma physics
since 2004	At IPP with focus on the development of negative hydrogen ion sources for ITER
since 2008	Head of the Experimental Plasma Physics group, University of Augsburg
since 2010	Division head (acting) of the ITER Technology & Diagnostics Division

Awards:

1996	Anton- and Klara-Röser-Prize for PhD Thesis, University of Stuttgart
2006	Erwin Schrödinger Prize, HGF: Helmholtz Association of National Research Centres
2014	Award of the NIBS Symposium for recent innovative and significant achievements in the field of physics and technology

Scientific interest:

Prof. Ursel Fantz's main field of interest is low temperature plasmas physics with emphasis on the negative hydrogen ion source development for the neutral beam systems of fusion devices, in particular to ITER. She is focussing on the diagnostics of molecular low temperature plasmas for which the modelling activities are always closely linked to the experiments. Fundamental research is carried out at several laboratory experiments at the university supporting strongly the negative ion source development at IPP. Her interests range from fundamentals to applications towards prototype developments combining physics with engineering issues.

Selected Publications:

1. P. Franzen, U. Fantz, D. Wünderlich, B. Heinemann, R. Riedl, W. Kraus, M. Fröschle, B. Ruf, R. Nocentini and the NNBI Team, Progress of the ELISE test facility: results of caesium operation with low RF power, Nucl. Fusion 55 (2015) 053005.
2. U. Fantz, P. Franzen, B. Heinemann, and D. Wünderlich, First results of the ITER-relevant negative ion beam test facility ELISE, Rev. Sci. Instrum. 85 (2014) 02B305.
3. P. Franzen and U. Fantz, On the NBI system for substantial current drive in a fusion powerplant: Status and R&D needs for ion source and laser neutralizer, Fus. Eng. Des., 89 (2014) 2594.
4. U. Fantz, P. Franzen and D. Wünderlich, Development of negative hydrogen ion sources for fusion: experiments and modelling, Chem. Phys. 398 (2012) 7.
5. U. Fantz, Basics of plasma spectroscopy, Plasma Sources Sci. Technol. 15 (2006) S137-S147.

Prof. Dr. Per Helander

Personal Details:

Date/Place of Birth:	17.03.1967, Umeå, Sweden
Nationality:	Swedish
Present Position:	Director, Stellarator Theory Division, Max-Planck-Institut für Plasmaphysik Greifswald

Education and Training:

1985 – 1989	Study of Physics at Chalmers University of Technology, Göteborg, Sweden
1990 – 1994	PhD in Plasma Physics at Chalmers University of Technology

Career:

1995 – 1996	Post-doc. at Massachusetts Institute of Technology, Cambridge, USA
1996 – 2006	Research Scientist at UKAEA Culham Laboratory
2004 – 2006	Honorary lecturer, Bristol University
2005 – 2008	Adjunct Professor, Chalmers University of Technology, Göteborg,
since 2006	Scientific Member and Director of Stellarator Theory Division at IPP
since 2008	Professor at Greifswald University (Chair for Theoretical Plasma Physics)

Scientific interest:

Most aspects of plasma theory, with an emphasis on the kinetic theory of transport and stability in fusion devices – both for tokamaks and stellarators. Recent contributions include work on neoclassical transport theory, plasma rotation and gyrokinetics in stellarators

Selected Publications:

1. P. Helander and D.J. Sigmar: Collisional Transport in Magnetized Plasmas, Cambridge University Press 2002, paperback edition 2005.
2. P. Helander and A.N. Simakov, Intrinsic ambipolarity and rotation in stellarators, Physical Review Letters 101, 145003 (2008).
3. J.H.E. Proll, P. Helander, J. W. Connor and G. Plunk, Resilience of quasi-isodynamic stellarators against trapped-particle instabilities', Physical Review Letters 108, 245002 (2012).
4. P. Helander, Microstability of magnetically confined electron-positron plasmas, Physical Review Letters 113, 135003 (2014).
5. P. Helander, Theory of plasma confinement in non-axisymmetric magnetic fields, Reports on Progress in Physics 77, 087001 (2014).

Prof. Dr. Thomas Klinger

Personal Details:

Date/Place of Birth:	22.3.1965, Eutin, Germany
Present Position:	Director, Stellarator Scenario Development Division, Scientific Director of the "Project Wendelstein 7-X", Member of the Board of Directors Max-Planck-Institut für Plasmaphysik Greifswald

Education and Training:

1985 – 1991	Study of physics, (CAU) Christian-Albrechts University Kiel
1991 – 1994	Ph.D. work, CAU Kiel and Université Henri Poincaré Nancy
1994	Ph.D. Rerum Naturalium
1995	Research stay Alfvén Laboratory, Royal Institute of Technology, Stockholm
1996	Research stay Centre de Physique Théorique, Marseille
1997	Research stay Max-Planck-Institut für Plasmaphysik, Garching
1998	Habilitation in Experimental Physics, Venia Legendi 1999

Career:

1994 – 1999	Research Associate, Christian-Albrechts University Kiel
1999 – 2001	Associate Professor for Experimental Physics, (EMAU) Ernst-Moritz-Arndt University Greifswald
2000 – 2001	Department Head Institute of Physics, EMAU Greifswald
2001	Scientific Member of the Max Planck Society IPP Garching/Greifswald
2002	Full Professor for Experimental Plasma Physics, EMAU Greifswald
since 2005	Elected Member of the Board of Directors, IPP
since 2005	Scientific Director of the Project Wendelstein 7-X, Director of "Stellarator Scenario Development" Division

Scientific interest:

The research interest of Prof. Klinger is experimental non-linear plasma dynamics. The current focus is on pressure driven instabilities like drift-waves and flute modes, kinetic Alfvén waves, wave-particle interaction and plasma turbulence. Related are subjects as turbulent transport and control of plasma instabilities. Recently, the non-linear dynamics and kinetics of reconnection became a central subject of interest. Until start of operation of Wendelstein 7-X goes in operation, the experiments were mostly conducted in laboratory devices with a strong emphasis on basic plasma research in magnetized plasmas.

Selected Publications:

1. T. Klinger, C. Baylard, C. D. Beidler, J. Boscary, H.-S. Bosch, A. Dinklage, D. Hartmann, P. Helander, H. Massberg, A. Peacock, T. S. Pedersen, T. Rummel, F. Schauer, L. Wegener, R. Wolf, Towards assembly completion and preparation of experimental campaigns of Wendelstein 7-X in the perspective of a path to a stellarator fusion power plant, Fusion Engineering and Design, 88(6-8), 461-465 (2013)
2. T. Windisch, O. Grulke, V. Naulin, T. Klinger, Formation of Turbulent Structures and the Link to Fluctuation Driven Shared Flows, Plasma Physics and Controlled Fusion, 53(12), Article No 124036 (2011)
3. C. Brandt, O. Grulke, T. Klinger, J. Negrete, G. Bousselin, F. Brochard, G. Bonhomme, Spatiotemporal mode structure of nonlinearly coupled drift wave modes, Physical Review E, 84(5), Article No 056405 (2011)
4. T. Windisch, O. Grulke, T. Klinger, Radial propagation of structures in drift wave turbulence, Physics of Plasmas, 13(12), Article No 122303 (2006)
5. C. Schröder, T. Klinger, D. Block, A. Piel, G. Bonhomme, V. Naulin, Mode selective control of drift wave turbulence, Physical Review Letters, 86 (25), 5711-5714 (2001)

Dr. Emanuele Poli

Personal Details:

Date/Place of Birth:	13.12.1971, Cremona, Italy
Present Position:	Acting head of Tokamak Physics Division, Max-Planck-Institut für Plasmaphysik Garching

Education and Training:

1990 – 1995	Physics Studies, University of Pavia, Italy
1996 – 1999	Dr. phil., University of Pavia & IPP Garching Thesis title: Diffraction effects on electromagnetic Gaussian wave beams in anisotropic inhomogeneous plasmas

Career:

1999 – 2001	PostDoc, Max-Planck-Institut für Plasmaphysik, Garching
Since 2001	Res. Scientist, Max-Planck-Institut für Plasmaphysik, Garching
Since 2006	Group Leader for Wave Physics and Kinetic Theory in the Tokamak Physics Division, IPP Garching
2012	Habilitation (venia legendi), University of Ulm
Since Nov. 2014	Acting head of the Tokamak Physics Division, Max-Planck-Institut für Plasmaphysik, Garching

Scientific experience and interest:

Heating and current drive in magnetic-fusion devices, in particular for electron-cyclotron (EC) waves; application to diagnostics and role of wave scattering; kinetic theory and toroidal kinetic effects on plasma instabilities, in particular tearing modes; role of waves in the stabilization of MHD instabilities and related impact on the design of the ITER/DEMO.

Selected Publications:

1. E. Poli et al.: TORBEAM, a beam tracing code for electron cyclotron waves in tokamak plasmas, Comp. Phys. Comm. 136 (2001), 90.
2. E. Poli et al., Reduction of the ion drive and scaling of the neoclassical tearing mode, Phys. Rev. Lett. 88 (2002), 075001.
3. E. Poli et al., The role of kinetic effects on the polarization current around a magnetic island, Phys. Rev. Lett. 94 (2005), 205001.
4. M. A. Henderson et al., Overview of the ITER EC upper launcher, Nucl. Fusion 48 (2008) 054013.
5. E. Poli et al., Electron-cyclotron-current-drive efficiency in DEMO plasmas, Nucl. Fusion 53 (2013), 013001.

Prof. Dr. Ulrich Stroth

Personal Details:

Date/Place of Birth:	07.09.1957, Erbach, Germany
Present Position:	Director, Plasma Edge and Wall Division, Max-Planck-Institut für Plasmaphysik Garching

Education and Training:

1977 – 1982	University education in physics, TU Darmstadt
1982 – 1986	PhD thesis at Institute Laue Langevin, Grenoble, France.
1986 – 1998	Max-Planck-Institut für Plasmaphysik
1995 – 2000	Coordinator of the European Transport Task Force for stellarator-tokamak comparisons
1996	Habilitation, University of Heidelberg

Career:

1996 – 2000	Lecturer (Privatdozent), University of Heidelberg
1999 – 2004	C3 professor for plasma physics and director at the Institut für Experimentelle und Angewandte Physik at Universität Kiel
2002 – 2003	Managing director of Institut für Experimentelle und Angewandte Physik, Universität Kiel
2004 – 2010	Full professor for plasma physics at University of Stuttgart and director of Institut für Plasmaforschung
2008 – 2010	Dean (Prodekan) of physics department, Univ. of Stuttgart
2010 – 2012	Acting head of Institut für Plasmaforschung at University of Stuttgart
2010 –	Max-Planck Director and Head of the Division Plasma Edge and Wall, Max-Planck Institut für Plasmaphysik (IPP), Garching
2012	Professor at Technical University of Munich in the field of Experimental Plasma Physics

Scientific experience and interest:

Experimental low- and high-temperature plasma physics, magnetic confinement and nuclear fusion research, plasma and fluid turbulence, neoclassical and turbulent transport, microwave applications to plasmas, waves in plasma, plasma modeling, plasma-technological applications, plasma-wall interaction and divertor physics, space plasma physics

Selected Publications:

1. U. Stroth and ASDEX Upgrade Team, Overview of ASDEX Upgrade results, Nucl. Fusion 2013
2. U. Stroth, P. Manz, M. Ramisch: On the interaction of turbulence and flows in toroidal plasmas, Plasma Phys. Contr. Fusion, 53, 24006 (2010)
3. P. Manz, M. Ramisch, U. Stroth, Physical Mechanism behind Zonal-Flow Generation in Drift-Wave Turbulence, Phys. Rev. Letter 103, 165004 (2009)
4. U. Stroth et al.: Study of Edge Turbulence in Dimensionally Similar Laboratory Plasmas, Phys. Plasmas, 11, 2558 (2004)
5. U. Stroth et al.: Internal Transport Barrier Triggered by Neoclassical Transport in W7-AS, Phys. Rev. Lett. 86, 5910 (2001)

Prof. Dr. Thomas Sunn Pedersen

Personal Details:

Date/Place of Birth*:*	01.05.1970, Roskilde, Denmark
Nationality:	American and Danish
Present position:	Director, Stellarator Edge and Divertor Division, Max-Planck-Institut für Plasmaphysik Greifswald

Education and Training:

1990 – 1995	M. Sc. in Applied Physics Engineering, Technical University of Denmark
1996 – 2000	PhD in Physics at MIT, Cambridge, MA, USA (Experimental Plasma Physics)

Career:

2000	Postdoctoral Associate, Columbia University (LDX experiment)
2000 – 2005	Assistant Professor of Applied Physics, Columbia University, USA
2005 – 2007	Associate Professor of Applied Physics, Columbia University, USA
2007 – 2011	Associate Professor of Applied Physics with tenure, Columbia University, USA
2010 –	Director of Stellarator Edge and Divertor Divison, Max-Planck-Institut für Plasmaphysik
2012 –	Professor of Physics, Ernst-Moritz-Arndt University, Greifswald

Awards:

2005	CAREER Award, NSF Division of Physics
2002	Junior Faculty Award, DOE Office of Fusion Energy Sciences (see Grants)

Scientific interest:

Prof. Thomas Sunn Pedersen's interests are related to magnetic confinement of plasmas. The plasmas of interest include fusion plasmas, pure electron plasmas, partially neutralized plasnas, and electron-positron plasmas, and the confinement devices of interest include stellarators and tokamaks. He is interested in equilibrium, stability, and confinement in a broad sense, but has worked specifically on impurity transport in tokamaks, kink stability in tokamaks, and equilbrium and stability of non-neutral plasmas in stellarators.

Selected Publications:

1. T. Sunn Pedersen, T Sunn Pedersen, J R Danielson, C Hugenschmidt, G Marx, X Sarasola, F Schauer, L Schweikhard, C M Surko and E Winkler, "Plans for the creation and study of electron--positron plasmas in a stellarator", New Journal of Physics 14, 035010 (2012)
2. Q. R. Marksteiner, T. Sunn Pedersen, J. W. Berkery, M. S. Hahn, J. M. Mendez, and H.Himura, Observations of an ion-driven instability in nonneutral plasmas confined on magnetic surfaces, Phys. Rev. Letters 100, 065002 (2008)
3. T. Sunn Pedersen, D. A. Maurer, J. Bialek, O. Katsuro-Hopkins, J. Hanson, M. E. Mauel, R. James, A. Klein, Y. Liu, G. A. Navratil, "Experiments and Modeling of External Kink Mode Control Using Modular Internal Feedback Coils", Nuclear Fusion 47, p. 1293 (2007)
4. J. P. Kremer, T. Sunn Pedersen, R. G. Lefrancois, Q. Marksteiner, "Experimental confirmation of stable, small-Debye-length, pure electron plasma equilibria in a stellarator", Phys. Rev. Letters 97 095003 (2006)
5. T. Sunn Pedersen and Allen H. Boozer, "Confinement of Nonneutral Plasmas on Magnetic Surfaces ", Phys. Rev. Letters 88, p. 205002 (2002)

Prof. Dr. Eric Sonnendrücker

Personal Details:

Date/Place of Birth:	25.10.1967, Strasbourg, France
Nationality:	French
Present position:	Director, Numerical Methods in Plasma Physics Division, Max-Planck-Institut für Plasmaphysik Garching, Professor, Zentrum Mathematik, TU München

Education and training:

1988 – 1992	Ecole Normale Supérieure de Cachan, France
1991	Agrégation de Mathématiques
1991	DEA d'Analyse Numérique, Université Paris XI, Orsay, France
1992 – 1995	PhD in Mathematics, Ecole Normale Supérieure de Cachan, France

Career:

1996	Post-doc Forschungszentrum Karlsruhe (Humboldt fellow), Germany
1996 – 2000	Research Scientist at CNRS, Nancy, France
2000 – 2012	Professor in applied mathematics, university of Strasbourg, France
2012 –	Director computational plasma physics Division, Max-Planck-Institut für Plasmaphysik, Garching bei München, Germany
2012 –	Professor in Mathematics at TU Munich

Scientific interest:

Mathematical modeling and development of numerical methods for problems in plasma physics and beam physics. This includes the development of asymptotic models when some parameters are small, and mostly the development and analysis of numerical methods for the kinetic equations of plasma physics.

Selected publications:

1. Nicolas Crouseilles, Michel Mehrenberger, Eric Sonnendrücker (2010): Conservative semi-Lagrangian schemes for the Vlasov equation, J. Comput. Phys. 229, 1927-1953.
2. Eric Sonnendrücker, Abigail Wacher, Roman Hatzky, Ralf Kleiber (2015): A split control variate scheme for PIC simulations with collisions, J. Comput. Phys., 295, pp. 402–419.
3. F. Filbet and E. Sonnendrücker (2006): Modeling and Numerical Simulation of Space Charge Dominated Beams in the Paraxial Approximation. Math. Models Methods Appl. Sci. 16, no. 5, 763–791.
4. E. Sonnendrücker, J. Roche, P. Bertrand, A. Ghizzo (1999): The semi-Lagrangian Method for the Numerical Resolution of Vlasov Equations, J. Comput. Phys. 149, 201-220
5. E. Frénod, E. Sonnendrücker (2001): The Finite Larmor Radius Approximation, SIAM J. Math. Anal. 32, no. 6, 1227–1247

Prof. Dr. Robert Wolf

Personal Details:

Date/Place of Birth:	23.02.1964, Munich, Germany
Present Position:	Director, Stellarator Optimization Division, Max-Planck-Institut für Plasmaphysik Greifswald

Education and Training:

1983 – 1989	Study of Physics at Rheinisch-Westfälische Technische Hochschule Aachen
1989 – 1993	PhD study in Plasma Physics at Joint European Torus (JET) and Heinrich-Heine-Universität Düsseldorf
2002	Habilitation, University of Mons-Hainaut, Belgium

Career:

1993 – 1995	Employed at JET, Culham, UK, as Post Doc
1995 – 1996	Employed at Max-Planck-Institut für Plasmaphysik Berlin as Post Doc
1996 – 2002	Employed at Max-Planck-Institut für Plasmaphysik Garching as Research Scientist
2000 – 2002	Deputy Task Force Leader/Task Force Leader of Task Force S2 (advanced tokamak scenarios) at JET, Culham, UK
2002 – 2007	Director at Institut für Plasmaphysik, Forschungszentrum Jülich
2003 – 2007	Full Professor for High Temperature Plasma Physics at Ruhr-Universität Bochum
since 2006	Director at Max-Planck-Institut für Plasmaphysik, Head of Department Stellarator Heating and Optimization
since 2010	Full Professor at the Astrophysics Department of the Technical University of Berlin

Scientific interest:

Prof. Wolf's main fields of interest are the transport and stability properties of fusion plasmas aiming at the development of steady state plasma operation. Starting with the characterization of the magnetic field and internal transport barriers in tokamak plasmas with large non-inductive current fractions, he extended his work towards the effect of helical magnetic field perturbations in tokamaks to control transport, plasma rotation and stability. Moving on to investigate the optimization criteria of stellarators, at present he is responsible for the development of diagnostics, heating systems, and control and data acquisition of Wendelstein 7-X, again with the objective of facilitating steady state operation.

Selected Publications:

1. R. C. Wolf et al., Motional Stark Effect Measurements of the Local Magnetic Field in High Temperature Fusion Plasmas, accepted for publication in J. Inst. (2015)
2. H.-S. Bosch, R. C. Wolf et al., Technical challenges in the construction of the steady-state stellarator Wendelstein 7-X, Nucl. Fusion 53 (2013) 126001
3. R. C. Wolf et al., A stellarator based on the optimization criteria of Wendelstein 7-X, Fusion Eng. And Design 83 (2008) 990
4. R. C. Wolf et al., Effect of the dynamic ergodic divertor in the TEXTOR tokamak on MHD stability, plasma rotation and transport, Nucl. Fusion 45 (2005) 1700
5. R. C. Wolf, Internal Transport Barriers in Tokamak Plasmas (Review Article), Plasma Phys. Contr. Fus. 45 (2003) R1

Prof. Dr. Hartmut Zohm

Personal Details:

Date/Place of Birth*:*	02.11.1962, Freiburg i. Breisgau, Germany
Present Position:	Director, Tokamak Scenario Development Division, Member of the Board of Directors Max-Planck-Institut für Plasmaphysik Garching

Education and Training:

1983 – 1988	Study of Physics at Karlsruhe University, 1988 Diploma in Physics (Theoretical Solid State Physics)
1988 – 1990	PhD in Physics at Heidelberg University (Experimental Plasma Physics)
1996	Habilitation (Experimental Physics) at Augsburg University

Career:

1990 – 1996	Employed at Max-Planck-Institut für Plasmaphysik as Research Scientist
1991 – 1992	Assigned to General Atomics (DIII-D tokamak) in San Diego, CA, USA
1996 – 1999	Professor for Plasma Research, Faculty for Electrotechnical Engineering, Stuttgart University
1996 – 1999	Head of Plasma Heating Group, Institut für Plasmaforschung, Stuttgart University
since 1999	Director at Max-Planck-Institut für Plasmaphysik, Head of Department Tokamak Scenario Development (ASDEX Upgrade tokamak experiment)
since 2002	Honorary Professor at Ludwig Maximilian University Munich (Physics)
since 2011	Member of Directorate of Max-Planck-Institut für Plasmaphysik
2013	Visiting Professor, University of Wisconsin, Madison, USA (Physics), 5 months

Awards:

Otto-Hahn-Medal (1991)
John Dawson Award for Excellence in Plasma Physics Research (2014, in team of researchers for the development of suppression of neoclassical tearing modes by ECCD)

Scientific interest:

Prof. Hartmut Zohm's main fields of interest are the magnetohydrodynamic (MHD) stability of fusion plasmas and their heating by Electron Cyclotron Resonance Heating (ECRH). By combining these two fields, he pioneered the active stabilisation of neoclassical magnetic islands, which set a major performance limit to the tokamak, by ECRH. His present field is the study of tokamak physics on the ASDEX Upgrade tokamak which is operated by his department. Most recently, he became involved in the European studies for a demonstration fusion power plant (DEMO).

Prof. Zohm is member of several committees such as the ITPA coordinating committee, the IEA Implementing Agreement on Collaboration of Tokamak Programmes, the Programme Advisory Committees of KSTAR (Deajon, Korea), EAST (ASIPP Hefei, China), the EUROFusion STAC as well as chair of the scientific advisory board of IPP.CR (Prague, Czech Republic) and the External Advisory Board of the EPSRC Centre for Doctoral Training in the Science and Technology of Fusion Energy in the UK. He is also a member of the board of editors of the 'Nuclear Fusion' journal and a member of the advisory board of the 'Annalen der Physik' journal.

Selected Publications:

1. Zohm, H., ASDEX Upgrade Team, EUROfusion MST1 Team: 'Recent ASDEX Upgrade Research in Support of ITER and DEMO', Nucl. Fusion 55 (2015) 104010.
2. Zohm, H.; Assessment of DEMO Challenges in Technology and Physics, to appear in Fusion Engineering and Design (2013).
3. Zohm, H. ; On the minimum size of DEMO, Fus. Sci. and Technology 57 (2010) 613
4. Zohm, H. et al.: Overview of ASDEX Upgrade Results, Nucl. Fusion 49 (2009) 104009.
5. Zohm, H. et al.; Control of MHD Instabilities by ECCD: ASDEX Upgrade Results and Implications for ITER, Nucl. Fusion 47 (2007) 228-232