Report from the EPS Plasma Physics Divisional Board

Sofia Conference 2009

The 36th annual conference of the EPS Plasma Physics Division was held in Bulgaria, Sofia from 29th June to 3th of July 2009. The conference was hosted by the Union of the Physics in Bulgaria under the local chairmanship of Matey Mateev. The scientific programme committee under Sylvie Jacquemot was organized in four sub-committees to represent the different fields of plasma physics. These committees were chaired by Piero Martin (Magnetic Confinement Fusion), Michel Koenig (Beam Plasmas and Inertial Fusion), Volker Schultz-von der Gathen (Low temperature Plasmas) and Tito Mendonça (Basic Plasmas and Astrophysics). They played a key role in the development of the scientific programme. The EPS Plasma Physics Division Board (EPS PPD Board) expresses its thanks to all the organisers of this conference.

The Conference Programme had three evening sessions: “ITER session" chaired by Carlos Hidalgo and Piero Martin, "Education in Plasmas" chaired by Piero Martin and "Women in Physics" chaired by Elizabeth Rachlew. Two satellite meetings were organized during the 36th EPS Conference on Plasma Physics: the 2nd International Workshop on Plasmas for Environmental Issues (2nd and 3rd July) and EFTSOMP2009 – Workshop on Electric Fields, Turbulence and Self-Organisation in Magnetized Plasmas (6th and 7th July 2009).

Dublin Conference 2010

The 2010 Local Organising Committee comprises:
Miles Turner, DCU (Chair)
Samantha Fahy, DCU (Submissions Secretary)
Deborah O’Connell, QUB (Scientific Secretary)

The 2010 **Programme Committee** met in November 2009 in Lisbon and in March 2010 in Dublin. The programme Committee was assisted by suggestions received from individual scientists through the EPS-PPD Forum.

2010 PROGRAMME COMMITTEE MEMBERS

Tito Mendoça	Portugal (Chair)
Carlos Hidalgo	Chair EPS PPD
Cary Forest	APS
Satoshi Hamaguchi	JSPF

MCF plasmas

A. Peeters	UK (sub-chair)
C. Bourdelle	France
A. Kallenbach	Germany
D. McDonald	UK
E. Gusakov	Russia
R. Sanchez	Spain
S. Zoletnik	Hungary
J. Weiland	Sweden

Basic and space plasmas

U. Stroth	Germany (sub-chair)
T. Amari	France
T. Bell	UK
A. Gomez de Castro	Spain
L. Drudy	Ireland
A. Piel	Germany

BP & IF plasmas

J. Honrubia	Spain (sub-chair)
V. Bychenkov	Russia
T. Cowan	
C. Lewis	Ireland
D. Jaroszynski	UK
D. Juraszek	

Low temperature plasmas

C. Hollenstein	Switzerland (sub-chair)
D. Block	Germany
E. Stoffels	The Netherlands
L. Zajickova	Czech Republic

Award of the Hannes Alfvén Prize 2010

The 2010 divisional **Hannes Alfvén Prize** is awarded to Allen Boozer (Professor, Columbia University) and Jürgen Nührenberg (Professor, Max-Planck Institut für Plasmaphysik and Greifswald University) *"for the formulation and practical application of criteria allowing stellarators to have good fast-particle and neoclassical energy confinement"*.

The tokamak and the stellarator are two major candidate concepts for magnetically confining fusion plasmas. They were both conceived in early 1950's, but the tokamak developed more rapidly because of its intrinsically favourable confinement properties. Indeed, the stellarator seemed fundamentally unable to confine energy and collisionless alpha-particle orbits well enough for a fusion reactor. In the 1980's, however, Allen Boozer and Jürgen Nührenberg developed methods for tailoring stellarator magnetic fields so as to guarantee confinement comparable to that in tokamaks. Allen Boozer introduced a set of magnetic coordinates, now named after him, in which the description of three-dimensionally shaped magnetic fields is particularly simple. He went on to show that if the magnetic field strength |B| is symmetric in these coordinates (so-called quasisymmetry) then the guiding-centre orbits and the neoclassical confinement properties are equivalent to those in a tokamak. In pioneering calculations a few years later, Jürgen Nührenberg showed that such magnetic fields can indeed be realised in practice, as can other configurations which have equally good confinement without being quasisymmetric. There is an unexpected vastness of configurational possibilities for toroidal plasma confinement, where the limit is likely to be set by turbulence rather than neoclassical losses. In addition, quasi-symmetry should facilitate the development of strongly sheared rotation with direct impact in the control of turbulent transport. Moreover, Jürgen Nührenberg showed that a number of other properties of the magnetic field can also be optimised simultaneously, allowing high equilibrium and stability limits to be achieved and thus opening up a road to an inherently steady-state fusion reactor.

The ideas of Allen Boozer and Jürgen Nührenberg have revolutionised stellarator research. They have already partially been confirmed on the W7-AS and HSX stellarators, and provide the basis for the world's largest stellarator under construction, Wendelstein 7-X. The award of the 2010 Hannes Alfven Prize to these two leading scientists underlines the development of understanding and transfer of knowledge in plasma physics.

The Plasma Physics Innovation Award 2010

The 2010 **Plasma Physics Innovation Prize** of the European Physical Society is awarded to Uwe Cazarnetzki**,** professor at Ruhr-Universität Bochum, *"for his outstanding contributions in the discovery of the Electrical Asymmetry Effect, its scientific characterization and for its development up to the level of successful industrial application"*.

The energy of ions impacting surfaces during plasma processing is crucial in determining both the properties of materials being deposited by plasmas and for the control of the etching of thin films. The independent control of the ion energy and the plasma density has been the object of intense industrial research. Current technologies for modifying the ion energy rely on the geometry of the plasma processing chamber or by applying low and high frequency RF power that is not phase locked. These techniques are either not applicable to some situations or have only been partially successful. The "Electrical Asymmetry Effect" allows the ion energy and plasma density to be decoupled. If the RF power applied to a plasma chamber is comprised of a phase locked fundamental and its second harmonic, the ion energy is a linear function of the phase angle between the two. This simple, but previously overlooked technique has shown to be an enabling technology for future materials and plasma applications.

The method has been patented and is presently used e.g. by leading manufacturers of large area solar cells and has resulted in unsurpassed quality and homogeneity of the devices. In addition to the "Electrical Asymmetry Effect", Uwe Czarnetzki is internationally renowned for his many important contributions in the areas of laser based plasma diagnostics and gas discharge physics. For all of these outstanding contributions to low temperature plasmas, the European Physical Society bestows its 2010 Plasma Physics Innovation Prize to Uwe Cazarnetzki.

The PhD Research Award 2010

The Plasma Physics Division 2010 PhD Research Award has been judged by a committee comprising Juergen Meyer-ter-Vehn, Emmanuel Marode and Michel Chatelier who examined all the candidatures in a process managed by Dimitri Batani. EPS PhD prize is a key element of the EPS PPD activities to recognise exceptional quality of the work carried out

by young physicists. The jury nominated 4 award winners from an impressively high quality of candidates. The 2010 citations in alphabetical order are:

Xavier Davoine for his research on intense ultra short X source obtained by acceleration of a class of electrons in the wake field of a laser pulse, improving the numerical procedure to model the electron dynamics.

Guilhem Diff-Pradalier for a fundamental discussion of the formalism needed to describe turbulence and transport in magnetized plasmas, including a collision operator in the Gysela gyrokinetic code that could modify the characteristics of the turbulence.

Emeric Falize and **Berenice Loupias** for their investigation of similarities between laser induced plasmas and astrophysical systems and for the description of a set of diagnostics for laser plasmas aimed at demonstrating the possible astrophysics character of plasma jets in laser induced plasma formation.

Peter Manz for his comprehensive analysis in turbulence in magnetized plasmas, exploring the interplay between flows, electric fields and fluctuations.

Strasbourg Conference 2011

The 2011 EPS Plasma Physics Conference will be held in Strasbourg (France) from June 27 – July 1, 2011. The Local Organising Committee will be chaired by Alain Becoulet. The conference organisation will be presented during the 2010 conference closing session, as is traditional. The 2011 Programme Committee is chaired by Ulrich Stroth and the membership includes:

Magnetic Confinement Fusion:
V. Antoni, M. Beurskens, G. Falchetto, P. Helander, J. Ongena, T. Tala, E. Wolfrum,
Beam Plasmas and Inertial Fusion:
N. Andreev, S. Baton, L. Gizzi, M Kaluza, J. Limpouch, R. Piriz, M. Zepf
Basic and Astrophysical Plasmas:
R. Brandenburg, A. Fasoli, L. Fletcher, F. Moreno, N. Vilmer,
Low Temperature Plasmas:
T. Gans, F. Gordillo, A. Von Keudell, P. Lukac, Z. Petroviç, L. Pitchford,

The EPS Plasma Physics Division Board

The Divisional Board currently has the following composition (**http://plasma.ciemat.es/**):

C. Hidalgo (chair), Joerg Winter (vice-chair), Sylvie Jacquemont (secretary), Vladimir Tikhonchuk, Holger Kersten, Dimitri Batani, Bertrand Lembege, Pascale Monier-Garbet, Elisabeth Rachlew, Boris Sharkov, Wolfgang Suttrop, Thomas Klinger, Javier Honrubia, Dirk Van Eester, Richard Dendy.

The Board met in November 2009 in Madrid and is due to meet at Dublin in June 2010.

EPS PPD

Dublin, June 2010