

CONTENTS

THE ITER PROJECT

ITER Physics Basis, Machine Design and Diagnostic Integration ITER Joint Central Team and Home Teams, G. Janeschitz, D. Boucher, T. Burges, K. Ioki, H. Pacher, R. Parker, D. Post, R. Thome, C. Walker	1
Role and Requirements for Plasma Measurements on ITER V. S. Mukhovatov, R. Bartiromo, D. Boucher, A. E. Costley, L. de Kock, K. Ebisawa, P. Edmonds, Yu. Gribov, G. Janeschitz, L. C. Johnson, S. Kasai, E. Marmor, A. Nagashima, M. Petrov, D. E. Post, P. E. Stott, V. S. Strelkov, G. Vayakis, C. I. Walker, J. Wesley, S. Yamamoto, K. M. Young, V. S. Zaveriaev, and the ITER Joint Central Team and Home Teams	25
Overview of the ITER Diagnostic System A. E. Costley, K. Ebisawa, P. Edmonds, G. Janeschitz, L. C. Johnson, S. Kasai, L. de Kock, V. Mukhovatov, P. E. Stott, G. Vayakis, C. Walker, S. Yamamoto, K. M. Young, V. Zaveriaev, and the ITER Joint Central and Home Teams	41
Diagnostic Access for ITER C. I. Walker, T. Ando, A. E. Costley, L. de Kock, K. Ebisawa, P. Edmonds, G. Janeschitz, L. C. Johnson, V. Mukhovatov, G. Vayakis, S. Yamamoto	57
Diagnostic Requirements for the ITER Divertor L. de Kock, G. Janeschitz, A. Kukushkin, H. D. Pacher, T. Ando, A. Costley, K. Ebisawa, M. Sugihara, G. Vayakis, C. Walker	67
Integration of Vacuum Coupled Diagnostics P. H. Edmonds, R. Barnsley, N. Hawkes, A. Kislyakov, G. Vayakis, C. Walker, L. de Kock, G. Janeschitz, A. E. Costley, T. Steinbacher, H. S. Hurlmeier, and the ITER Joint Central and Home Teams	79
Plasma Control Concepts for ITER J. B. Lister	83
Ignition Burn Control and Diagnostics in ITER O. Mitarai and K. Muraoka	93

REFLECTOMETRY AND ECE

Overview of the ITER Reflectometry Diagnostic Systems	
G. Vayakis, T. Ando, N. Bretz, L. de Kock, A. J. H. Donné, E. J. Doyle, J. Irby, E. Martin, M. Manso, A. Mase, J. Sanchez, V. A. Vershkov, D. Wagner, C. I. Walker, and the ITER Joint Central Team and Home Teams	97
ITER Reflectometry Diagnostics for the Main Plasma	
V. Vershkov, M. Manso, G. Vayakis, A. J. Sanchez, D. Wagner, C. Walker, S. Soldatov, L. Kuznetsova, V. Zhuravlev, B. Sestroretskii, and ITER Joint Central Team, Russian and EU Home Teams	107
Design Basis for the ITER Plasma Shape and Position Control Reflectometer System	
E. J. Doyle, N. L. Bretz, K. W. Kim, W. A. Peebles, and T. L. Rhodes.	119
ITER Position Control Reflectometry - Conceptual Design	
N. L. Bretz, C. Kessel, E. J. Doyle, G. Vayakis	129
Reflectometry in the ITER Divertor	
M. Manso, L. Cupido, G. Leclert, D. Wagner, G. Vayakis, A. Donné, L. de Kock, C. Laviro, J. Sanchez, F. Serra, A. Silva, C. Walker, and the ITER Joint Central Team and EU Home Teams.	139
Reflectometry Density Profile Measurements in Turbulent Plasmas	
J. Sánchez, T. Estrada, E. de la Luna, V. Zhuravlev, M. Francés, B. Brañas	151
Profile Initialization from O-Mode Reflectometry	
M. Manso, F. Silva, I. Nunes, J. Santos	155
Transmission Line Design for Broadband Microwave Diagnostic Systems	
D. Wagner, W. Kasperek, M. Thumm, G. Gantenbein, and H. Zohm	161
Physics Aspects of ECE T_e Measurements in ITER	
D. V. Bartlett and H. Bindslev	171
ECE Diagnostic on ITER in the Presence of Superthermals	
M. Bornatici and U. Ruffina	181
The ITER ECE Diagnostic Front End Design	
G. Vayakis, D. Bartlett, P. Edmonds, H. Hartfuss, D. Wagner, C. I. Walker, and the ITER Joint Central Team and Home Teams.	185
The Non-Imaging Flux Collector as a Compact ECE Antenna for ITER	
H. Hartfuss, M. Zerbini, P. Buratti, P. de Bernardis, and M. De Petris	189
INTERFEROMETRY, POLARIMETRY AND THOMSON SCATTERING	
Baseline Design of a Multi-Channel Interferometer and Polarimeter System for Density Measurements on ITER	
T.N. Carlstrom, R.T. Snider, C.B. Baxi, C.L. Rettig, and W.A. Peebles	193

Polarimetry for Poloidal Field Measurements	
A. J. H. Donné, T. Edlington, E. Joffrin, H. R. Koslowski, Ch. Nieswand, S. Segre, P. Stott, C. Warrick, and V. Zanza	203
Faraday Rotation Calculations for a FIR Polarimeter on ITER	
C. Nieswand	213
LIDAR Thomson Scattering for the ITER Core Plasma	
P. Nielsen, L. de Kock, C. Gowers, F. Orsitto, H. Salzmänn, C. Walker	217
ITER Edge Thomson Scattering	
D. W. Johnson and B. Grek	227
Status of Thomson Scattering Diagnostic Design for ITER X-Point and Divertor Plasmas	
G. T. Razdobarin and E. E. Mukhin	237
Ti:Sapphire Laser for ITER LIDAR Thomson Scattering System	
F. Orsitto, E. Nava, P. Nielsen, H. Salzmänn.	247
Mirror Construction and Characterization for ITER LIDAR Thomson Scattering System	
F. Orsitto, A. Brusadin, M. Di Fino, C. Gowers, P. Nielsen, H. Salzmänn	251
Collective Thomson Scattering (CTS) System on ITER	
F. Orsitto, G. Giruzzi, S. Nowak	253
Development of New Vacuum Window Seal for ITER Optical Diagnostics	
A. Nagashima, T. Fujisawa, T. Sugie, S. Kasai	257

RADIATION EFFECTS

Radiation Problems and Testing of ITER Diagnostic Components	
E. R. Hodgson	261
Irradiation Tests on ITER Diagnostic Components	
S. Yamamoto, L. de Kock, V. Belyakov, D. Orlinski, F. Engelmann, E. Hodgson, S. Kasai, T. Nishitani, E. Farnum, K. Young, S. Bender, V. Chernov, D. Griscom, R. Heidinger, T. Iida, E. Ishitsuka, T. Kakuta, H. Kawamura, A. Krasilnikov, V. Lopatin, R. Macaulay-Newcombe, K. Noda, T. Matoba, Y. Oyama, P. Pells, A. Ramsey, Y. Revyakin, T. Shikama, R. Snider, P. Stott, V. Stepanov, U. Tarabrin, I. Valeri, K. Vasili, V. Voitsenya, K. Vukolov, V. Zaveriaev, S. Zinkle, A. Costley, T. Ando, K. Ebisawa, P. Edmonds, H. Iida, L. Johnson, R. Santoro, S. Tanaka, V. Mukhovatov, G. Vayakis, C. Walker, G. Janeschitz	269
Change of the Optical Reflectivity of Mirror Surfaces Exposed to JET Plasmas	
M. Mayer, R. Behrisch, C. Gowers, P. Andrew, and A. T. Peacock.	279

Investigation of the Fiber Optic Radiating Resistance and Radioluminescence under IR-8 Reactor Condition A. A. Ivanov, S. N. Tugarinov, I. N. Rastyagaev, V. N. Amosov, Y. A. Kaschuck, A. V. Krasilnikov, S. E. Bender	287
Rad-Hard Optical Fibres for Diagnostics of Experimental Fusion Reactors O. Deparis, P. Mégret, M. Decréton, M. Blondel, K. M. Golant, A. L. Tomashuk	291

PASSIVE SPECTROSCOPY AND NPA

XUV and VUV Spectroscopy of ITER N. C. Hawkes, R. DeAngelis, S. Dillon, P. Edmonds, J. Edwards, R. M. Giannella, P. Gray, G. Janeschitz, K. D. Lawson, M. O'Mullane, N. J. Peacock, M. Valisa, C.I. Walker	297
X-Ray Spectrometry Systems for ITER R. Barnsley, P. H. Edmonds, R. M. Giannella, M. G. O'Mullane	307
Photoelectron Plasma Diagnostics Yu. V. Gott, V. A. Shurygin	319
Divertor Impurity Monitor for ITER T. Sugie, H. Ogawa, J. Katsunuma, M. Maruo, K. Ebisawa, T. Ando, Y. Kita, S. Kasai	327
VUV Divertor Impurity Monitor for ITER K. Ebisawa, T. Ando, A. Costley, G. Janeschitz, E. Martin, T. Sugie	337
Luminescent Efficiency of Thin Phosphor Screens A. Baciero, K. J. McCarthy, L. R. Barquero, A. Ibarra, B. Zurro	345
Thermonuclear Plasma X-Ray Diagnostics with Compton Scattering D. V. Portnov, Yu. A. Kaschuck, A. V. Krasilnikov	349
NPA at ITER: Physical Basis and Conceptual Design A. I. Kislyakov, V. I. Afanassiev, A. V. Khudoleev, S. S. Kozlovskij, M. P. Petrov	353

ACTIVE SPECTROSCOPY

Prospects for Core Helium Density and Related Measurements on ITER Using Active Charge Exchange D. M. Thomas, K. H. Burrell, M. R. Wade, R. T. Snider	361
Active Spectroscopy on JET and ITER R. W. T. König, H. Anderson, P. Breger, W. G. F. Core, J. P. Feist, N. Hawkes, M. G. von Hellermann, A. C. Howman, A. C. Maas, P. D. Morgan, M. F. Stamp, H. P. Summers, J. Svensson, M. Tunklev, P. R. Thomas, K.-D. Zastrow	371

Measurement of the H/D/T Mixture Based on Doppler-Free Two-Photon Spectroscopy and Neutral Beam Injection D. Voslamber and W. Mandl	381
Quantitative Measurements of Two-Photon Induced $L\alpha$ Fluorescence: a Proof for Tokamak Edge Diagnostics K. Grützmacher, A. Steiger, Ch. Seiser, M. I. de la Rosa, U. Johannsen	385

BOLOMETRY

Progress of the Reference Design for ITER Bolometers and Development of a High Performance Alternative R. Reichle, M. Di Maio, L. C. Ingesson.	389
Imaging Bolometry Development for Large Fusion Devices G. A. Wurden, B. J. Peterson	399

FUSION PRODUCTS

Overview of Fusion Product Diagnostics for ITER L. C. Johnson, C. W. Barnes, K. Ebisawa, A. V. Krasilnikov, F. B. Marcus, T. Nishitani, G. J. Sadler, C. I. Walker, and the ITER Joint Central Team and Home Teams	409
A Radial Neutron Camera Design for ITER with Integral Shielding F. B. Marcus, J. M. Adams, P. Batistoni, D. S. Bond, T. Elevant, N. Hawkes, G. Janeschitz, O. N. Jarvis, L. Johnson, L. de Kock, M. Loughlin, M. Rapisarda, G. Sadler, P. Stott, N. Watkins	419
Role of Neutron Spectrometers for ITER T. Elevant and J. Scheffel	429
Natural Diamond Neutron Spectrometer A. V. Krasilnikov	439
MPR Neutron Spectrometry at JET and Its Next Step Implications J. Källne, E. Traneus, and the NPF Team	449
High Performance Calibration of Neutron Spectrometer Detectors with α -Particles P. Prandoni, L. Ballabio, S. Conroy, G. Ericsson, J. Frenje, J. Källne, M. Tardocchi, E. Traneus	459
Fuel Density Measurement in Burning Plasmas Using Neutron Spectrometry G. Gorini, L. Ballabio, J. Källne, S. Conroy, J. Frenje, G. Ericsson, P. Prandoni, M. Tardocchi, and E. Traneus	463

Improvement of the Neutron Spectrometer, COTETRA (Counter Telescope with Thick Radiator) M. Osakabe, M. Sasao, M. Isobe, S. Itoh, T. Iida, A. L. Roquemore, L. C. Johnson	471
Experimental Estimation of Threshold Properties of the Bubble Chamber for Knock-on Neutron Measurements V. A. Agureev, V. P. Romanikhin, V. G. Rumyantsev, G. N. Cheryomukhin, T. S. Trusillo, V. S. Zaveryaev	475
Design Considerations for Neutron Activation and Neutron Source Strength Monitors for ITER C. W. Barnes, D. L. Jassby, G. Le Munyan, A. L. Roquemore, C. Walker	479
In-Vessel Neutron Monitor Using Micro Fission Chambers for ITER T. Nishitani, K. Ebisawa, L. C. Johnson, C. Walker, Y. Kita, S. Kasai	491
Calibration Issues for Neutron Diagnostics G. J. Sadler, J. M. Adams, C. W. Barnes, P. Batistoni, D. Bond, N. Hawkes, O. N. Jarvis, L. C. Johnson, F. B. Marcus, M. Loughlin, A. L. Roquemore, P. van Belle, N. Watkins	501
Gamma Ray Spectrometry in ITER: Conceptual Design V. G. Kiptily, T. Kondoh, V. O. Naidenov, I. A. Polunovski, Yu. V. Tuboltsev, I. N. Chugunov, A. E. Shevelev	511
Data Base for Ensuring the Works on Gamma-Diagnostics of Tokamak Plasma V. G. Kiptily, S. M. Taova, A. G. Zvenigorodskii	521
Development of a Thin-Foil Faraday Collector Array as a Lost Alpha Particle Diagnostic for High Yield d-t Fusion Plasmas F. E. Cecil, J. C. Barbour, P. v. Belle, D. Darrow, M. Hone, O. N. Jarvis, S. Kern, M. Loughlin, S. S. Medley, A. Nowak, A. L. Roquemore, G. Sadler, Y. Takimoto	525

OTHER DIAGNOSTICS

Magnetic Diagnostic for ITER L. de Kock, S. Bender, A. Costley, J. Leuer, P. McCarthy, F.C. Morabito, A. Portone, I. Senda, T. Shoji, R. Snider, C. Walker	529
Realtime Identification of Plasma Shape and Position on ITER Using an Equilibrium Database P. J. Mc Carthy and F. C. Morabito	541
Steady State Magnetic Sensor in a Fusion Device S. Hara, Y. Neyatani, M. Abe, A. Nagashima, S. Kasai	545
Plasma Viewing in JET Using Endoscopes and a Detailed Design for ITER J. P. Coad, J. Lingertat, J.-B. Migozzi, P. E. Stott, C. I. Walker, C. H. Wilson	549

Pressure Gauges and Neutral Pressure Measurement in ITER G. Haas, H.-S. Bosch, D. Coster, L. de Kock, R. Maingi, J. Neuhauser, R. Schneider	559
High Resolution IR Temperature Monitoring System for the ITER Target Plates A. Herrmann and H. Salzmann	569

DIAGNOSTICS OF OTHER FUSION EXPERIMENTS

The Use of X-Ray Diagnostics in Plasma Control A.W. Edwards, B. Alper, K. Blackler, R. D. Gill, M. Lennholm	573
Status Report of Preparation for Neutron Measurement on LHD M. Sasao, M. Isobe, H. Yamanishi, M. Osakabe, T. Iguchi	583
Status and Prospects of Pulse Radar Reflectometry on the START Tokamak V. F. Shevchenko	587
Bolometric and SXR Tomography in RFX P. Martin, A. Murari, G. Gadani, G. Manduchi, L. Marrelli, A. Parini, C. Taliercio	597
About the Effects of the Movements of the Critical Reflecting Layer on Swept Reflectometric Measurements R. Cavazzana, M. Moresco, E. Spada	601
Index	607