14th International Conference on Optical Fiber Sensors

11-13 October 2000
Giorgio Cini Foundation
Island of San Giorgio Maggiore, Venice, Italy

A.G. Mignani, H.C. Lefèvre
Editors

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Foreword

This volume contains summaries of the papers presented at the 14th International Conference on Optical Fiber Sensors - OFS 2000, held at the Giorgio Cini Foundation on the Island of San Giorgio Maggiore in Venice, Italy, from October 11 to 13, 2000.

The series of OFS Conferences began in London in 1983, and subsequent meetings have been held every one and a half years, in rotation, in the three geographic areas of the world: USA, Asia, and Europe, and always in a different location.

Thanks to the high technical quality of the papers accepted, and to the international character of the participants, OFS Conferences are traditionally considered to be an important international forum for reporting and discussing the latest progress in optical fiber sensors and related components.

The program for OFS 2000 is broken down into 14 oral and 3 poster sessions, in which single or distributed sensors for the measurement of physical, mechanical, chemical, environmental and electromagnetic parameters are presented, together with their application in field tests and their networking, as well as innovative ideas for new interrogation techniques and sensor components. A postdeadline session is also scheduled.
A plenary talk and 14 invited papers are presented, together with 65 oral and 138 poster presentations which have been selected from 266 papers submitted.

We are indebted to many people who have contributed to making OFS 2000 Conference and this volume possible. Firstly, we express our gratitude to the members of the International Steering Committee and particularly to the Technical Program Committee for putting together the high quality technical program. We would also like to thank the Local Organizing Committee for their continuous and untiring work and the Sponsors for their financial support. Finally, we would like to extend our thanks to the 681 authors from 33 countries, whose collaborative research work is presented in this volume.

We hope that you will enjoy OFS 2000 Conference, and the unique magnificent sights that Venice and Italy have to offer.

Anna Grazia Mignani
General Chair

Hervé C. Lefèvre
Technical Program Chair

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OFS 2000 - 14th International Conference on Optical Fiber Sensors

Agenda of Sessions

10 October 2000	11 October 2000	12 October 2000		13 October 2000
	8:00am - 9:00am Registration *'Photographs' Hall*			
	9:00am - 10:00am We 1 Opening Remarks and Plenary Talk *'Palladian Refectory' Hall*	9:00am - 10:45am Th 1 Interferometry and Polarimetry *'Cloister of the Cypress' Hall*	9:00am - 10:45am Th 2 Chemical, Environmental and Medical Sensors I *'Palladian Refectory' Hall*	9:00am - 10:45am Fr 1 Physical and Mechanical Sensors III *'Palladian Refectory' Hall*
	10:00am - 10:30am Coffee Break *'Tapestry' Hall*	10:45am -11:15am Coffee Break *'Tapestry' Hall*		10:45am - 11:15am Coffee Break *Tapestry' Hall*
	10:30am -1:00pm We 2 Physical and Mechanical Sensors I *'Palladian Refectory' Hall*	11:15am - 1:00pm Th 3 Sensors for Electromagnetic Phenomena Fiber Optic Gyroscopes *'Cloister of the Cypress' Hall*	11:15am - 1:00pm Th 4 Chemical, Environmental and Medical Sensors II *'Palladian Refectory' Hall*	11:15am - 1:00pm Fr 2 Distributed Sensing *'Palladian Refectory' Hall*
	1:00pm - 3:00pm Poster Session I and Lunch Break *'Tapestry' Hall*	1:00pm - 3:00pm Poster Session II and Lunch Break *'Tapestry' Hall*		1:00pm - 3:00pm Poster Session III and Lunch Break *'Tapestry' Hall*
	3:00pm - 4:45pm We 3 System Applications and Field Tests I *'Palladian Refectory' Hall*	3:00pm - 4:45pm Th 5 Physical and Mechanical Sensors II *'Palladian Refectory' Hall*		3:00-pm - 4:45pm Fr 3 System Applications and Field Tests II *'Palladian Refectory' Hall*
4:00pm - 6:00pm Registration *'Photographs' Hall* and Reception Cocktail *Cloister of the Cypress*	4:45pm - 5:15pm Coffee Break *'Tapestry' Hall*	4:45pm - 5:15pm Coffee Break *Tapestry' Hall*		4:45pm - 5:15pm Coffee Break *Tapestry' Hall*
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		6:45pm - 7:30pm Th 7 Postdeadline Papers *'Palladian Refectory' Hall*		
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Tabletop exhibition will be held in *'Tapestry' Hall* from Wednesday, 11 October, to Friday, 13 October 2000
Exhibition hours: 9:00am - 7:00pm

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Wednesday, 11 October 2000

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Mignani A.G., *CNR IROE, Italy,* General Chair
Lefèvre H.C., *Photonetics, France,* Technical Program Chair

9:00am
Opening Remarks
Mignani A.G.*, Lefèvre H.C.**
* CNR IROE, Italy
** Photonetics, France

2 **We 1-1** *9:20am* *Plenary Talk*
Emerging Fibre Technologies
Payne D.N., Dakin J.P.
University of Southampton, UK

10:00am – 10:30am *'Tapestry' Hall*
Coffee Break

We 2 *10:30am – 1:00pm* *'Palladian Refectory' Hall*
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Bennion I.*, Zhang L.*, Jackson D.A.**, Webb D.J.**
*Aston University, UK, **University of Kent at Canterbury, UK

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Ferreira L.A.*, Araújo F.M.**, Santos J.L.**, Farahi F.***
*INESC-Porto, Portugal, **Universidade do Porto, Portugal, ***University of North Carolina, USA

9 **We 2-3** *11:15am*
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*Imperial College London, UK, **Aston University, UK

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Patrick H.J.
US Naval Research Laboratory, USA

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*Universidade de Vigo, Spain, **TECNATOM SA., Spain

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*SMARTEC SA, Switzerland, **Università degli Studi di Genova, Italy, ***TECNITER Srl, Italy, ****Autorità Portuale di Genova, Italy

4:45pm – 5:15pm *'Tapestry' Hall*
Coffee Break

5:15pm – 7:00pm *'Palladian Refectory' Hall*
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Santos J.L., *INESC Porto, Portugal*

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*NASA, Langley Research Center, USA, **University of Rochester, USA

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*University of Maryland, USA, **System Planning and Analysis Inc., USA, *** VTT Electronics, Finland

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264 **We 4-4** *6:15pm*
Acoustic Detection Using Erbium Fibre Bragg Grating Lasers
O'Neil S.F.*, Webb D.J.*, Jackson D.A.*, Zhang L.**, Bennion I.**
*University of Kent, UK, **Aston University, UK

268 **We 4-5** *6:30pm* *invited*
A Two-Dimensional Optical Fiber Sensor Array with Matrix-Style Data Readout
Nakamura Kentaro
Tokyo Institute of Technology, Japan

7:00pm – 9:00pm *'Tapestry' Hall*
Welcome Cocktail

Thursday, 12 October 2000

Th 1 *9:00am – 10:45am* *'Cloister of the Cypress' Hall*
Interferometry and Polarimetry
Blotekjaer K., *Norwegian University of Science and Technology, Norway*
Miyagi K., *Anritsu Corporation, Japan*

276 **Th 1-1** *9:00am* *invited*
Polarization Mode Dispersion in Fiber-Optic Sensors
Tur M., Eyal A.
Tel-Aviv University, Israel

284 **Th 1-2** *9:30am*
High Resolution Static Strain Measurement Using an In-Fibre-Bragg-Grating-Based Fabry-Perot Sensor
Rao Y.J.*, Cooper M.R.**, Jackson D.A.**, Pannell C.N.**, Reekie L.***
*Chongqing University, China, **University of Kent, UK, ***University of Southampton, UK

288 **Th 1-3** *9:45am*
Optical Tomography along the Geometrical Thickness by Combination of Coherence-Gate and Confocal Imagings
Ohmi M., Yoden K., Ohnishi Y., Haruna M.
Osaka University, Japan

292 **Th 1-4** *10:00am*
Possible Applications for Berry's Topological Phase in Fibre Sensor Systems
Thursby G.*, Senthilkumaran P.**, Culshaw B.*
*University of Strathclyde, UK, **ITT Guwahati, India

296 **Th 1-5** *10:15am*
Dispersion of Birefringence and Differential Group Delay in Highly Birefringent Fibre: Application to Serial Multiplexing
Flavin D.A.*, McBride R.**, Jones J.D.C.**
*Waterford Institute of Technology, Ireland, **Heriot-Watt University, UK

300 **Th 1-6** *10:30am*
A Novel Interferometric Wavelength Shift Detection Scheme with Enhanced Resolving Power
Koo K.P., Vohra S.T.
US Naval Research Laboratory, USA

9:00am - 10:45am *'Palladian Refectory' Hall*
Th 2 **Chemical, Environmental and Medical Sensors I**
Ohno A., *Japan Aviation Electronics Ind. Ltd., Japan*
Sampson D.D., *The University of Western Australia, Australia*

306 **Th 2-1** *9:00am* *invited*
Fiberoptic Evanescent Wave Spectroscopy and its Chemical, Environmental and Medical Applications
Bormashenko E.*, Citron S.**, Eytan O.***, Kravcik S.**, Pogreb R.*, Reichlin Y.***, Sela B.****, Schulzinger E.***, Spector O.***, Vasserman I.***, Katzir A.***
*The College of Judea and Samaria, Israel, **Barzilai Hospital, Israel, ***Tel Aviv University, Israel, ****Sheba Medical Center, Israel

310 **Th 2-2** *9:30am*
Fibre Optic Bragg Grating Strain Sensor Used to Monitor the Respiratory Spectrum
Wehrle G.*, Kalinowski H.J.*, Torres P.I.**, Guedes Valente L.C.**
*CEFET, Brazil, **Pontifícia Universidade Católica do Rio de Janeiro, Brazil

314 **Th 2-3** *9:45am*
Evanescent Wave Antibody-Antigen Biosensor Based on Long Period Fiber Bragg Grating
Pilevar S.*, De Lisa M.P.**, Zhang Z.**, Davis C.C.**, Bentley W.E.**, Sirkis J.S.***
*Gould Electronics Inc., USA, **University of Maryland, USA, ***CiDRA Corp., USA

318 **Th 2-4** *10:00am*
Plastic Fiber Optic Sensor for Detecting Alcohol Vapors
Morisawa M., Amemiya Y., Kohzu H., Muto S.
Yamanashi University, Japan

322 **Th 2-5** *10:15am*
Separation of Refractive Index and Temperature Measurements Using Surface Plasmon-Coupled Fiber Grating
Ctyroky J.*, Ecke W.**, Schroeder K.**, Slavík R.***
*Institute of Radio Engineering and Electronics, Czech Republic, **IPHT, Germany, ***URE AVCR, Czech Republic

326 **Th 2-6** *10:30am*
Fiber Bragg Grating-Induced Coupling to Cladding Modes for Refractive Index Measurements
Laffont G., Ferdinand P.
CEA - Léti - Centre d'Etudes de Saclay, France

10:45am – 11:15am *'Tapestry' Hall*
Coffee Break

11:15am – 1:00pm *'Cloister of the Cypress' Hall*
Th 3 **Sensors for Electromagnetic Phenomena**
Fiber Optic Gyroscopes
Bosselmann T., *Siemens AG, Germany*
Oh M., *Agency for Defence Development, Korea*

332 **Th 3-1** *11:15am*
Improved Fiber-Optic Magnetometer Based on Iron Garnet Crystals
Rochford K.B., Espejo R.J., Rose A.H., Dyer S.D.
NIST, USA

336 **Th 3-2** *11:30am*
Temperature and Vibration Insensitive Fiber-Optic Current Sensor
Bohnert K., Gabus P., Brandle H.
ABB Corporate Research Ltd., Switzerland

340 **Th 3-3** *11:45am*
Very Sensitive Faraday Effect Fiber-Optic Current Sensor Using YIG/Ring-Core in Transverse Configuration
Yoshino T., Minegishi K., Nitta M.
Gunma University, Japan

344 **Th 3-4** *12:00am*
Performance and Stability of a Field Fibre Optics Current Sensor
Briffod F., Thévenaz L., Robert P.
EPFL, Switzerland

348 **Th 3-5** *12:15am*
Electro-Optic Kerr Effects in Spun High-Birefringent Fiber Current Sensors
Rose A.H.*, Polynkin P.G.**, Blake J.***
*NIST, USA, **Texas A&M University, USA, ***Precision Lightwave Instruments, USA

352 **Th 3-6** *12:30am*
Drift Induced by Faraday Effect in Twin-Depolarizer I-FOG: Simulation and Experiment
Hotate K., Konishi Y.
The University of Tokyo, Japan

356 **Th 3-7** *12:45am*
LPG Wavelength Compensated, Polarized, Amplified, Reduced RIN, Broadband Fiber Optic Source for Precision Fiber Optic Gyroscopes
Moeller R.P., Patrick H.J.
US Naval Research Laboratory, USA

Th 4 *11:15am - 1:00pm* *'Palladian Refectory' Hall*
Chemical, Environmental and Medical Sensors II
Baldini F., *CNR IROE, Italy*
Jackson D.A., *University of Kent, UK*

362 **Th 4-1** *11:15am* *invited*
Optical Fiber Chemical Sensors: From Artificial Perception to Molecular Biology
Epstein J.R., Albert K.J., Ferguson J.A., Schauer C.L., Stitzel S.E., and Walt D.R.
Tufts University, USA

366 **Th 4-2** *11:45am*
Distance Ranging to Biological Tissue Using Fibre-Optic Fabry-Perot, Short Tuning Range FMCW Interferometry
Armstrong J.J., Sampson D.D.
The University of Western Australia, Australia

370 **Th 4-3** *12:00am*
Optical Fibre Relative Humidity Sensor Using a Spectrally Absorptive Material
Kharaz A.H.*, Jones B.E.**, Hale K.F.**, Roche L.***, Bromley K.***
*University of Derby, UK, **Brunel University, UK, ***Building Research Establishment Ltd., UK

374 **Th 4-4** *12:15am*
Integrated, Multi-Angle, Low Turbidity Measurement Using Fluorescent Plastic Optical Fibre
Chandy R.*, Scully P.J.*, Whitworth C.**
*John Moores University, UK, **Formerly with Yorkshire Water Services and now working as a Process Applications Consultant, UK

378 **Th 4-5** *12:30am*
Underpotential Deposition of a Copper Monolayer on a Gold Film Sensed by Integrated Optical Surface Plasmon Resonance
Abanulo J.C., Harris R.D., Bartlett P.N., Wilkinson J.S.
University of Southampton, UK

382 **Th 4-6** *12:45am*
A Distributed Fibre Optic Sensor for Hydrocarbon Detection
MacLean A.*, Moran C.*, Johnstone W.*, Culshaw B.*, Marsh D.**, Watson V.**, Andrews G.**
*University of Strathclyde, UK,**PINACL Communications Systems, UK

1:00pm – 3:00pm *'Tapestry' Hall*
P 2 **Poster Session II and Lunch Break**

Chemical, Environmental and Medical Sensors
388 **P 2-01**
Surface Plasmon Resonance Hydrogen Sensor Using an Optical Fibre
Bévenot X.*, Trouillet A.*, Veillas C.*, Gagnaire H.*, Clément M.**
*UMR CNRS, France, **SNECMA Div. SEP, France
392 **P 2-02**
Digital Light-Emitting Electrocardiography
Fujii Y., Mise Y., Sato I.
Nihon University and Meisei Electric Co. Ltd., Japan
396 **P 2-03**
Optical Determination of Physiological pH in Whole Blood Using a Miniature Fibre Optic Spectrometer
Loughran M.*, Anwar A.*, Pozzi R.**, Vadgama P.*
*Manchester University, UK, **Data-Med Srl, Italy
400 **P 2-04**
A Dichloromethane Gas Optical Fiber Sensor Fabricated Using the Electronic Self-Assembly Monolayer Method
Arregui F.J. *, Matìas I.R.*, Liu Y.**, Cooper K.**, Claus R.O.***
*Universidad Publica de Navarra, Spain, **NanoSonic Inc., USA, ***Virginia Tech, USA
404 **P 2-05**
5,10,15,20-Tetrakis(N-Methylpyridium-4-yl)-Porphyrine ($H_2TMePyP$) Based Evanescent Wave Probe for Cu^{2+} Ions Detection
Rayss J., Sudolski G., Radzki S., Dargiewicz J.
Maria Curie-Sklodowska University, Poland
408 **P 2-06**
Fiber-Optic Carbon Dioxide Sensor Utilizing Sensitive Film Containing Indicator Dye
Arai Y., Onishi E., Segawa H., Yoshida K.
Oita University, Japan
412 **P 2-07**
A Neural Networks Based Approach for Determining Fouling of Multipoint Optical Fibre Sensors in Water System
Lyons W.B.*, Ewald H.**, Flanagan C.*, Lochmann S.**, Lewis E.*
*University of Limerick, Ireland, **Hochschule Wismar, Germany
416 **P 2-08**
An Intrinsic Fiber Optic H_2S Gas Sensor
Jain S.C.*, Singla M.L.*, Singh N.*, Bhasin P.**, Sing M.*, Raj B.*, Aggarwal A.K.*
*CSIO, India, **Thapar Institute of Engineering & Technology, India
420 **P 2-09**
Sensitive, Multi-Point Gas Detection Using FMCW and WMS
Ho H. L., Jin W., Yu H. B., Chan K. C., Demokan M.S.
The Hong Kong Polytechnic University, China
424 **P 2-10**
Fibre Bragg Grating Refractometer with Enhanced Sensitivity and Temperature Reference Using Distinct Evanescent Field Distributions
Schroeder K.*, Ecke W.*, Hagemann V.*, Andreev A.**, Karakoleva E.**, Mueller R.*, Willsch R.*
*IPHT, Germany, **Institute of Solid State Physics, Bulgaria
428 **P 2-11**
Fiber-Optics Sensor for In-Situ Salinity Measurement
Esteban Ó., Navarrete M.C., Gonzáles-Cano A., Bernabeu E.
Universidad Complutense, Madrid, Spain

432 **P 2-12**
Probe-Heads for Reflectance Measurements on Paintings and Textiles
Picollo M., Radicati B.
CNR IROE, Italy

436 **P 2-13**
Wavelength Modulation of Fibre Lasers - a Direct Comparison with Semiconductor DFB Lasers and Extended Cavity Lasers
Søgaard S.*, Henningsen J.*, Pedersen J.E.**
*Danish Institute of Fundamental Metrology, Denmark, **IONAS A/S, Denmark

440 **P 2-14**
Sensor Application of Metal-Coated Tapered Fibers
Díez A., Andrés M.V., Cruz J.L.
Universitat de València, Spain

444 **P 2-15**
Neural Network Analysis of Absorption Spectra and Optical Fiber Instrumentation for the Monitoring of Toxic Pollutants in Aqueous Solutions
Kuzniz T.*, Tur M.*, Mignani A.G.**, Romolini A.**, Mencaglia A.***
*Tel Aviv University, Israel , **CNR IROE, Italy, ***PRODOTEC Srl, Italy

448 **P 2-16**
Intra-Cavity and Ring-Down Cavity Absorption with Fibre Amplifiers for Trace Gas Detection
Stewart G., Atherton K., Culshaw B.
University of Strathclyde, UK

452 **P 2-17**
Research on Colonic Autofluorescence Detection Using PMT
Yu D., Xu Z., Chen X., Xie H., Chen D.
Tianjin University, China

456 **P 2-18**
Development of a Quasi-Distributed Optical Fibre pH Sensor
Wallace P.A., Elliot N., Uttamlal M., Holmes-Smith A.S., Campbell M.
Glasgow Caledonian University, UK

460 **P 2-19**
New Flow-Cell for Fiber Optic Chemical Sensors
Dybko A., Chudy M., Wróblewski W.
Warsaw University of Technology, Poland

464 **P 2-20**
A pH Sensor Made Using Cellulosic Coating on a Biconically Tapered Singlemode Optical Fiber
Arregui F.J., Fernàndez-Valdivielso C., Ilundain I., Matìas I.R.
Universidad Publica de Navarra, Spain

Interferometry and Polarimetry

468 **P 2-21**
Ultra-Low Coherence Interferometry for Determination of Refractive Index and Thickness of Transparent Film
Inoue S., Ohmi M., Haruna M.
Osaka University, Japan

472 **P 2-22**
Polarimetric Sensors with Liquid-Crystal-Core Optical Fibers
Szymanska A., Wolinski T.R.
Warsaw University of Technology, Poland

476 **P 2-23**
A System for Precise Balancing of Fiber Optic Interferometers
Sirotic I., Donlagic D.
University of Maribor, Slovenia

480 **P 2-24**
A Novel Algorithm for Passive Demodulation of Optical Fiber Interferometric Signals Using a 3x3 Coupler
Kullander F.
FOA, Sweden

484 **P 2-25**
Polarisation-Multiplexed and Phase-Stepped Fibre Optic Shearography Using Laser Diode Wavelength Tuning
Groves R.M., James S.W., Tatam R.P.
Cranfield University, UK

488 **P 2-26**
In-line Fibre Optic Reference Beam Anemometer Using a Bragg Grating
Byrne G.D., James S.W., Tatam R.P.
Cranfield University, UK

492 **P 2-27**
Passive 3x3 Sagnac Interferometer with Reciprocity and Correction for Small Departures from Ideal Coupler Properties
Basset I.M., Haywood J.H.
University of Sydney, Australia

496 **P 2-28**
Experimental Study of the Mechanical Vibrations in an Interferometric Fiber-Optic Sensor Installed in a Medium Power Transformer
Lamela H., García-Souto J.A.
Universidad Carlos III de Madrid, Spain

500 **P 2-29**
New Geometry for Bulk-Glass Optical Current Sensor, Numerical Simulations and Experimental Results
Bazzocchi R., Caimi C.
ABB Ricerca SpA, Italy

504 **P 2-30**
Integrated Optical Humidity Sensor with Symmetric Waveguide Structure
Ren Y.*, Mormile P.*, Petti L.*, Cross G.H.**
*Istituto di Cibernetica, CNR, Italy, **University of Durham, UK

508 **P 2-31**
Calibration of Current-Induced Frequency Shift In Laser Diode Using The Spatial Synchronous Phase Measurement Technique
Wu F., Zhang H., Lalor M.J., Burton D.R.
Liverpool John Moores University, UK

512 **P 2-32**
Application of Interferometric Measurement of Doppler Effect for Testing Rotation Elements
Jaroszewicz L.R., Krajewski Z., Kiezun A., Niedziela T.
Military University of Technology, Poland

Sensors for Electromagnetic Phenomena

516 **P 2-33**
The $Bi_{12}TiO_{20}$ -Based Fiber-Optic Voltage Sensor with Optically Controlled Sensitivity
Filippov V.N., Starodumov A.N., Minkovich V.P., Barmenkov Y.O.
Centro de Investigaciones en Optica AC, Mexico

520 **P 2-34**
Optical Current Sensor Using Two Flint Glass Fibers as Sensing Element
Helmig C., Peier D., Teunissen J.
University of Dortmund, Germany

524 **P 2-35**
The Photoconductivity Influence on Operation of $Bi_{12}TiO_{20}$ -Based Optical Voltage Sensor
Filippov V.N., Starodumov A.N., Kir'yanov A.V., Barmenkov Y.O.
Centro de Investigaciones en Optica AC, Mexico

528 **P 2-36**
Stabilization of Electric Current Sensor that Employs a Twisted Fiber or a Spun Highly Birefringent Fiber
Dong X.*, Chu B.C.B.**, Kong K.H.**, Chiang K.S.**
*University of Xiamen, China, **City University of Hong Kong, China

Fiber Optic Gyroscopes

532 **P 2-37**
A Novel Method of Gain Flattening of an Erbium Superfluorescent Fiber Source for Fiber-Optic Gyroscope Applications
Guillaumond D., Meunier J.P.
Université Jean Monnet, France

536 **P 2-38**
Double Phase Conjugate Multimode Fiber Optic Gyroscope
Delaye P.*, Bernhardt S.*, Audren J.T.**, Roosen G.*
*Laboratoire Charles Fabry de l'Institut d'Optique du CNRS, France, **SAGEM, France

Passive and Active Devices for Photonic Sensing

540 **P 2-39**
Chirp Tuning of a Fiber Bragg Grating by Using Different Tapered Transducers and Loading Procedures
Zhu Y.*, Spammer S.J.**
*Rand Afrikaans University, South Africa, **Corning Inc., USA

544 **P 2-40**
Folded Architecture Very High Resolution Detection Systems for Fiber Optic Sensors
Spillman Jr. W.B.
Virginia Tech, USA

548 **P 2-41**
Optical Fibers Made of Photosensitive Materials
Saito M.*, Nakajima K.*, Honda A.*, Uchida K.*, Shishido M.**
*Ryukoku University, Japan, **Furukawa Co., Ltd., Japan

552 **P 2-42**
Inpact of Hydrogen in Long-Period Gratings after 193nm UV Inscription
Guan B.-O.*, Tam H.-Y.*, Ho S.-L.*, Dong X.-Y.**
*The Hong Kong Polytechnic University, China, **Nankai University, China

556 **P 2-43**
Fibre Bragg Gratings with High Thermal Stability
Guan B.-O., Tam H.-Y., Tao X.-M.
The Hong Kong Polytechnic University, China

560 **P 2-44**
Bending Curvature Sensing Based on Measurement of Resonance Mode Splitting of Long-Period Fibre Grating
Liu Y., Zhang L., Bennion I.
Aston University, UK

564 **P 2-45**
Characterization of Semiconductor Bragg Gratings for Optical Sensor Applications
Rahman B.M.A., Gomoluch J.M., Anwar N., Rajarajan M., Grattan K.T.V.
City University, UK

568 **P 2-46**
PGP Spectrometer for Fibre Optic Bragg Grating Sensor Network Interrogation
Aikio M.*, Suopajärvi P.*, Chen S.**, Vaithyanathan K.**, Christiansen M.**, Chen P.***, Kopola H.*
*VTT Electronics, Finland, **University of Maryland, USA, ***System Planning and Analysis Inc., USA

3:00pm – 4:45pm *'Palladian Refectory' Hall*

Th 5 **Physical and Mechanical Sensors II**
Claus R.O., *Virginia Tech, USA*
Ferdinand P., *DEIN-SPE, France*

575 **Th 5-1** *3:00pm* *invited*
Optical Fiber Sensors for Spacecraft Applications
Friebele E.J.
US Naval Research Laboratory, USA

576 **Th 5-2** *3:30pm*
Strain Effects in Fluorescence Based Optical Fibre Temperature Sensors
Wade S.A.*, Baxter G.W.*, Collins S.F.*, Sun T.**, Zhang Z.Y.**, Grattan K.T.V.**
*Victoria University, Australia , **City University, UK

580 **Th 5-3** *3:45pm*
Long-Period Fibre Grating Load Sensors with High Transverse Strain Sensitivity
Liu Y., Zhang L., Bennion I.
Aston University, UK

584 **Th 5-4** *4:00pm*
High Sensitivity Fiber Bragg Grating Temperature Sensors Utilizing Polymer Coatings
Vohra S.T., Chang C.C.
US Naval Research Laboratory, USA

588 **Th 5-5** *4:15pm*
Distributed Feedback Fibre Laser Sensor for Simultaneous Strain and Temperature Measurements in the RF Domain
Hadeler O., Ibsen M., Zervas M.N.
University of Southampton, UK

592 **Th 5-6** *4:30pm*
Acoustic Sensing Using Free and Transducer-Mounted Fiber Bragg Gratings
LeBlanc M., Kirkendall C., Dandridge A.
US Naval Research Laboratory, USA

4:45pm – 5:15pm *'Tapestry' Hall*
Coffee Break

5:15pm – 6:45pm *'Palladian Refectory' Hall*
Th 6 **Passive and Active Devices for Photonic Sensing**
Haruna M., *Osaka University, Japan*
Morey W.W., *3M Bragg Grating Technologies, USA*

599 **Th 6-1** *5:15pm* *invited*
Sensor Possibilities Based on Active Fiber Lasers
Kim B.Y.
KAIST, Korea

600 **Th 6-2** *5:45pm*
Application of Chirped Moiré Fibre Bragg Gratings to Quasi-Distributed Monitoring of Strains Experienced by Fibres During Processing
Chisholm K.E.*, Sugden K.*, Murgatroyd I.J.*, Sundström B.**, Lindström B.**, Zhang L.***
*Oxford Fiber Optic Tools Ltd, UK, **Ericsson Microelectronics, Sweden, ***Aston University, UK

604 **Th 6-3** *6:00pm*
Long Period Fibre Gratings Made with Focussed Ion Beam Irradiation
Bibra M.L. von*, Roberts A.*, Canning J.**
*The University of Melbourne, Australia, **University of Sidney, Australia

608 **Th 6-4** *6:15pm*
A New Type of Low Loss Mode Converter Based on Adiabatically Tapered Hollow Silica Optical Fiber
Choi S., Oh K., Shin W., Jeong H.
Kwang-ju Institute of Science and Technology, Korea

612 **Th 6-5** *6:30pm*
Low Loss All-PANDA-Fiber Polarization Beam Splitter/Combiner
Sakamoto A., Sasaki H., Tanaka D., Matsumoto R., Okude S., Nishide K., Wada A.
Fujikura Ltd., Japan

Th 7 *6:45pm – 7:30pm* *'Palladian Refectory' Hall*
Postdeadline Papers
Bassett I., *Australian Photonics Cooperative Research Center, Australia*
Kim B.Y., *KAIST, Korea*

8:00pm - 10:00pm *Cloister of the Cypress*
Conference Dinner

Friday, 13 October 2000

Fr 1 *9:00am – 10:45am* *'Palladian Refectory' Hall*
Physical and Mechanical Sensors III
Jones J.D.C., *Heriot-Watt University, UK*
Vohra S.T., *US Naval Research Laboratory, USA*

618 **Fr 1-1** *9:00am* *invited*
Optical Sensing Technologies for Intelligent Transport Systems
Nakamura Kazunori
Furukawa Electric Co., Japan

624 **Fr 1-2** *9:30am*
Local Optical Probe Using Fluorescence and Reflectance for Measurement of Volume Fractions in Multi-Phase Flows
Ramos R.T.*, Holmes A.**
*Schlumberger-Doll Research, USA, **Schlumberger Cambridge Research, UK

628 **Fr 1-3** *9:45am*
Thermally Insensitive Pressure Measurements up to 300°C Using Fiber Bragg Gratings Written onto Side Hole Single Mode Fiber
Yamate T.*, Ramos R.T.*, Schroeder R.J.*, Udd E.**
*Schlumberger-Doll Research, USA, **Blue Road Research, USA

632 **Fr 1-4** *10:00am*
Evaluation of Sapphire-Ruby Single Crystal Fiber for Thermometric Use up to 1500°C
Shen Y.*, Tong L.*, Ding Z.*, Zhang Z.Y.**, Grattan K.T.V.**, Sun T.**
*Zhejiang University, China, **City University, UK

636 **Fr 1-5** *10:15am*
Optical Interferometric Sensors in Avionics Applications: FLAPS (Fly-by-Light Applications of Photonic Sensors)
Dobre G.M.*, Webb D.J.*, Jackson D.A.*, Greenwood J.**, Todd K.***, Foote P.****
*University of Kent, UK, ** Druck Ltd., UK, *** Bookham Technology, UK, **** BAE Systems, UK

640 **Fr 1-6** *10:30am*
Torsion Sensor Made of Corrugated Long Period Fiber Grating
Wang L.A., Lin C. Y., Chern G.W.
National Taiwan University, Taiwan

10:45am – 11:15am *'Tapestry' Hall*
Coffee Break

11:15am – 1:00pm *'Palladian Refectory' Hall*
Fr 2 **Distributed Sensing**
Kopola H., *VTT Electronics and Infotech, Finland*
Wang A., *Virginia Tech, USA*

647 **Fr 2-1** *11:15am* *invited*
Part I: Distributed Fiber Brillouin Strain Sensing with 1cm Spatial Resolution by Correlation-Based Continuous Wave Technique
Hotate K., Tanaka M.
The University of Tokyo, Japan

651 **Part II:** Correlation-Based Continuous-Wave Technique for Measuring Brillouin Gain Spectrum Distribution along an Optical Fiber with Centimeter-Order Spatial Resolution
Hotate K., Hasegawa T.
The University of Tokyo, Japan

662 **Fr 2-2** *11:45am*
A Forward Propagation Fully Distributed Microbend Sensor System
Donlagic D.*, Culshaw B.**
*University of Maribor, Slovenia, ** University of Strathclyde, UK

666 **Fr 2-3** *12:00am*
An Improved 40km Dual-Wavelength, Dual-Sagnac Sensor, with Enhanced Signal Processing Allowing Real-Time Location of Multiple Time-Varying Strain Disturbances
Russell S.J., Brady K.R.C., Dakin J.P.
University of Southampton, UK

670 **Fr 2-4** *12:15am*
A Quasi-Distributed Fiber Laser Stress Sensor
Yamashita S., Hotate K.
The University of Tokyo, Japan

674 **Fr 2-5** *12:30am*
Measurement of Distributed Brillouin Shift Frequency Using a Novel Brillouin Loop Amplification Circuit
Yamashita I., Seikai S.
Kansai Electric Power Co., Inc., Japan

678 **Fr 2-6** *12:45am*
Rayleigh Scattering Based Distributed Sensing System for Structural Monitoring
Posey R. Jr., Johnson G.A., Vohra S.T.
US Naval Research Laboratory, USA

1:00pm – 3:00pm *'Tapestry' Hall*
P 3 **Poster Session III and Lunch Break**

Physical and Mechanical Sensors
684 **P 3-01**
Novel Fibre Optic Fluid Velocity Sensor
Whelan M.P.*, Kenny R.P.**, Dalton T.***, Oakley K.****, Hussey C.D.****
*JRC-Ispra, Italy, **Smart Fibres Ltd., UK, ***PEI Technologies, Ireland, ****Feasa Ltd., Ireland
688 **P 3-02**
The Concentration Dependence in Pr^{3+}:ZBLAN Optical Fibre Temperature Sensors
Nguyen T.B., Trpkovski S., Farrell P.M., Baxter G.W., Collins S.F.
Victoria University, Australia
692 **P 3-03**
Shape Measurement by Active Homodyne Phase-Stepping in a Fibre Optic Fringe Projector
Moore A.J., McBride R., Barton J.S., Jones J.D.C.
Heriot-Watt University, UK

696 **P 3-04**
A Novel Fiber Optic System for Measuring the Dynamic Forces in Textiles
El-Sherif M.*, Fidanboylu K.*, El-Sherif D.**, Gafsi R.*, Lee C.***
*Drexel University, USA, **Photonics Lab. Inc., USA, ***US Army Soldier and Biological Command, USA

700 **P 3-05**
A Self-Referencing Fiber-Optic Sensor for Macro-Bending Detection Immune to Temperature and Strain Perturbations
Jeong Y., Baek S., Lee B.
Seoul National University, Korea

704 **P 3-06**
Measurement of Strain Around Holes in CFRP Bolted Joints by Means of Bragg Gratings
Diaz-Carrillo S.*, Sancho J.*, Torres E.*, Guemes J.A.**
*Disenos Industriales, S.A., Spain, **ETSI Aeronauticos, Spain

708 **P 3-07**
The Acceleration Responsivity of Fiber-Optic Mandrel Hydrophones
Waagaard O.H.*, Havsgård G.B.**, Wang G.**
*Norwegian University of Science and Technology, Norway, **Norwegian Defence Research Establishment, Norway

712 **P 3-08**
Economical and Multiple Fiber Grating Sensor System with Rapid Response Using CDMA
Ryu H., Lee H., Kim K.-S.
Hoseo University, Korea

716 **P 3-09**
Interrogation of Low-Finesse Fabry-Pérot Cavities Based on Coupling Length Modulation of a Wavelength Division Multiplexer
Jáuregui C.*, Araújo F.M.**, Ferreira L.A.**, Santos J.L.**, López-Higuera J.M.*
*Universidad de Cantabria, Spain, **INESC-Porto, Portugal

720 **P 3-10**
Bend Measurement Using Bragg Gratings in Multicore Fibre
Gander M.J.*, Flockhart G.M.H.*, MacPherson W.N.*, McBride R.*, Jones J.D.C.*, Zhang L.**, Bennion I.**, Blanchard P.M.***, Burnett J.G.***, Greenaway A.H.***
*Heriot-Watt University, UK, **Aston University, UK, ***DERA, UK

724 **P 3-11**
Experimental Technique for Strain Gradient Measurements with Embedded Fiber Bragg Gratings by use of a Tunable External Cavity Laser
Kjerre T.*, Farsund Ø.**, Skaar J.***, Pran K.**, Havsgård G.B.**, Wang G.**
*Royal Norwegian Navy Material Command, Norway, **Norwegian Defence Research Establishment, Norway, ***Norwegian University of Science and Technology, Norway

728 **P 3-12**
Interrogation of Fibre Bragg Sensors Based on Coupling Length Modulation of a Wavelength Division Multiplexer
Jáuregui C.*, Araújo F.M.**, Ferreira L.A.*, Santos J.L.**, López-Higuera J.M.*
*Universidad de Cantabria, Spain, **INESC-Porto, Portugal

732 **P 3-13**
New Approach to Fiber Optic Weigh-in Motion with Multiplexed Bragg Grating Sensors
Lee H.*, Kim K.-S.*, Choi N.-Y.***, Yang J.**, Cho S.-Y.***, Ryu H.*, Ha Y.*
*Hoseo University, Korea, **SsangYong Research Center, Korea, ***Korean Highway Information and Telecommunication Agency, Korea

736 **P 3-14**
Enhanced Performance of Fiber Bragg Grating Sensors
Peupelmann J., Otto M., Schuh K., Schäffer C.
Dresden University of Technology, Germany

740 **P 3-15**
Simultaneous Interrogation on Fibre Bragg Sensors for Dynamic Strain Measurements
Christmas S.P.*, Jackson D.A.*, Zhang L.**, Bennion I.**
*University of Kent, UK, **Aston University, UK

744 **P 3-16**
High-Resolution Vibration Measurements Using Wavelength-Demultiplexed Fiber-Fabry-Perot Sensors
Christmas S.P.*, Jackson D.A.**, Henderson P.J.*, Zhang L.**, Bennion I.**, Dalton T.***, Butler P.***, Kenny R.****
*University of Kent, UK, **Aston University, UK, ***University of Limerick, Ireland, ****JRC-Ispra, Italy

Distributed Sensing

748 **P 3-17**
Application of Raman Distributed Temperature Sensor to the Experimental Fast Reactor JOYO with Correction Techniques
Kimura A., Takada E., Fujita K., Nakazawa M., Takahashi H.
University of Tokyo, Japan

752 **P 3-18**
Sagnac Interferometer Based Sensor Array with Stable p/2 Phase Bias
Han K.H., Lee W.J., Kim B.Y.
KAIST, Korea

756 **P 3-19**
Compact FBG Grating Array Structure for High Spatial Resolution Distributed Strain Sensing
Gwandu B.A.L., Zhang L., Chisholm K., Liu Y., Bennion I.
Aston University, UK

760 **P 3-20**
Damage Detection in Composite Structures Using Polarimetric Low Coherence Interferometry
Mondanos M.*, Lloyd P.A.**, Giles I.P.***, Badcock R.A.***, Weir K.*
*Imperial College of Science, UK, **DERA, UK, ***Protodel International Ltd., UK

764 **P 3-21**
Signal-to-Noise Enhancement of a Distributed Fibre-Optic Temperature Sensor Using Optical Preamplification
De Souza K.*, Newson T.P.**
*University of the West Indies, Trinidad, **University of Southampton, UK

768 **P 3-22**
Remote Sensing System for a Fissure in a Rock Using Optical Fiber
Kurii M., Ogata K., Yasuhara K., Katayose H., Nomura Y.
Fujikura Ltd., Japan

772 **P 3-23**
Simultaneous Optical Fibre Distributed Measurement of Pressure and Temperature Using Noise-Initiated Brillouin Scattering
Parker T.R.*, Farhadiroushan M.*, Diatzikis E.**, Méndez A.**, Kutlik R.L.***
*Sensornet Ltd., UK, **ABB Electric Systems Technology Institute, USA, ***Chevron Research and Technology Company, USA

776 **P 3-24**
Analysis of Coherence Addressed Quasi-Distributed Optical Sensor System Using FMCW for Application to Trace Gas Measurement
Zavrsnik M.*, Stewart G.**
*University of Maribor, Slovenia, **University of Strathclyde, UK

780 **P 3-25**
Novel Distributed Fibre Sensor Using Microwave Heterodyne Detection of Spontaneous Brillouin Backscatter
Maughan S.M., Kee H.H., Newson T.P.
University of Southampton, UK

784 **P 3-26**
Fiber Adhesive Joint Analysis with Intra-Bragg-Grating Sensing
Frank A., Nellen P.M., Sennhauser U.
EMPA, Switzerland

788 **P 3-27**
Wavelength Interrogator Employing Arrayed Waveguide Grating for Distributed Fiber Bragg Grating Sensors
Sano Y.*, Hirayama N.*, Yoshino T.**
*Fuji Electric Corporate Research and Development, Ltd., Japan, **Gunma University, Japan

792 **P 3-28**
OTDR Interrogation of Fiber Bragg Gratings for Quasi-Distributed Sensing
Arce-Diego J.L., Cobo A., Álvarez-Ortego V., Jáuregui C., López-Higuera J.M.
Universidad de Cantabria, Spain

796 **P 3-29**
Stress-Location Measurement along an Optical Fiber by Synthesis of Rectangular-Shaped Optical Coherence Function
Hotate K., Kuramoto A., He Z.
The University of Tokyo, Japan

800 **P 3-30**
1.5μm Brillouin-Based Fibre Optic Distributed Temperature Sensor With High Spatial Resolution of 20cm
Kee H.H., Newson T.P.
University of Southampton, UK

804 **P 3-31**
A New Technique for Fine Spatial Resolution BOTDA
Li X.-Z., Takada S.
Mitsubishi Electric Co., Japan

System Applications and Field Tests

808 **P 3-32**
Progression Monitoring of the Flow Front in RTM Process Using Fibre Bragg Grating Sensors
Novo C.**, Frazão O.*, Costa A.N.**, Viera A.**, Correia N.**, Dias I.*, Araùjo F.M.*, Torres Marquez A.**
*INESC-Porto, Portugal, **INEGI, Portugal

812 **P 3-33**
Blast Vibration and Strain Monitoring by Fiber Bragg Grating Sensors
Meissner J.*, Baumann I.*, Mueller B.**
*Advanced Optics Solutions GmbH, Germany, **Geotechnisches Sachverstaendigenbuero Mueller, Germany

816 **P 3-34**
Development of New Nuclear Instrumentation Based on Optical Sensing: Irradiation Effects on Fiber Bragg Grating Sensors
Kakuta T.*, Yamagishi H.*, Iwamura T.*, Urakami M.**
*Japan Atomic Energy Research Institute, Japan, **Japan Atomic Power Generating Company, Japan

820 **P 3-35**
The Application of Optical Sensors for Temperature, Mechanical Stress and Moisture in Energy Cables in The Netherlands
de Wild F.H., Schmetz P.
KEMA TDP, The Netherlands

824 **P 3-36**
Mid-Infrared Laser /Fibre-Optic Methanometer
Passia H., Szade A., Motyka Z., Bochenek W.
Central Mining Institute, Poland

828 **P 3-37**
Characterization of a Prestressed Concrete Beam by Using Fiber Bragg Grating Sensors
Lin Y.B., Chang K.C., Chern J.C., Wang L.A.
National Taiwan University, Taiwan

Sensing for Optical Fiber Communication

831 **P 3-38**
Engineering the Redistribution of Power in an Erbium-Doped Superfluorescent Fibre Source
McMillan D.*, Johnstone W.*, Mauchline I.**, Moodie D.**
*University of Strathclyde, UK, **OptoSci Ltd., UK

834 **P 3-39**
Thermo-Optic Coefficient Measurement Using Long-Period Fiber Gratings
Kim Y.-J., Eom T.-J., Chung Y., Han W.-T., Paek U.-C., Lee B.H.
Kwang-ju Institute of Science and Technology, Korea

838 **P 3-40**
Development and Characterisation of Graded-Index Polymeric Films for Optical Guides and Sensors
Bartoli J.R., Da Costa R.A., Verdonck P., Mansano R.D., Carreno M.
Universidade de Sao Paulo, Brasil

842 **P 3-41**
Fabrication of Long Period Fibre Gratings Using Plano-Convex Microlens Array to Control Harmonics
Liu S.Y., Man W.S., Tam H.-Y., Demokan M.S.
The Hong Kong Polytechnic University, China

846 **P 3-42**
Spectral Domain Non-Scanning OCDR Suitable for Non-Gaussian Broadband Sources
Smith E.D.J.*, Moore S.C.*, Wada N.**, Chujo W.**, Sampson D.D.*
*The University of Western Australia, Australia, **Ministry of Posts and Telecommunications, Japan

New Concepts for Photonic Sensing

850 **P 3-43**
Spectral Characteristics of Curved Long Period Fiber Gratings
Arce-Diego J. L., Gonzáles-Fernández D.A., Quintela M.A., Madruga F.J., López-Higuera J.M.
Universidad de Cantabria, Spain

854 **P 3-44**
UV Laser Photo-Induced Refractive Index Changes in Poly-Methyl-Meth-Acrylate and Plastic Optical Fibres for Application as Sensors and Devices
Scully P.J.*, Bartlett R.*, Caulder S.*, Eldridge P.*, Chandy R.*, McTavish J.*, Alexiou V.*, Clarke I.P.**, Towrie M.**, Parker A.W.**
*Liverpool John Moores University, UK, **Rutherford Appleton Laboratory, UK

858 **P 3-45**
Description of the Evolution of the Brillouin Gain Linewidth with Temperature
Le Floch S., Riou F., Cambon P.
Institut Supérieur d'Electronique de Bretagne, France

862 **P 3-46**
Rotation Rate Measurement Using an Opto-Electronic Oscillator (OEO) Based on Sagnac Interferometer
De Almeida V.R., Adabo G.J., Oliveira J.E.B.
CTA, Brazil

3:00pm – 4:45pm *'Palladian Refectory' Hall*

Fr 3 **System Applications and Field Tests II**
Inaudi D., *SMARTEC SA, Switzerland*
Spillman Jr. W.B., *Virginia Tech, USA*

868 **Fr 3-1** *3:00pm* *invited*
The Use of Full-Field Optical Imaging Techniques in the Automotive Industry
Buckberry C.H, Towers D.P.
BMW Group, UK

872 **Fr 3-2** *3:30pm*
Monitoring Trucks, Cars and Joggers on the Horsetail Falls Bridge Using Fiber Optic Grating Strain Sensors
Udd E.*, Seim J.*, Schulz W.*, MacMahon R.*, Soltesz S.**, Laylor M.**
*Blue Road Research, USA, **Oregon Department of Transportation, USA

876 **Fr 3-3** *3:45pm*
Measurement of Pavement Response with Buried Fiber Bragg Grating Based Soil Pressure Transducers
Chang C.C., Johnson G.A., Althouse B., Vohra S.T.
US Naval Research Laboratory, USA

880 **Fr 3-4** *4:00pm*
Field Trial of In-Service Individual Line Monitoring of PONs Using a Tunable OTDR
Ozawa K.*, Shigehara M.*, Hanai J.-I.*, Ban A.**, Naitou T.**, Shimoura K.***
*Sumitomo Electric Industries, Ltd., Japan, **Osaka Media Port Corporation, Japan, ***The Kansai Electric Power Company, Japan

884 **Fr 3-5** *4:15pm*
Modular Fiber Optic Hull Monitoring System with Real Time Signal Processing
Sagvolden G.*, Pran K.*, Havsgård G.B.*, Farsund Ø.*, Wang G.*, Johnson G.A.**, Vohra S.T.**
*Norwegian Defence Research Establishment, Norway, **US Naval Research Laboratory, USA

888 **Fr 3-6** *4:30pm*
Optical Fibre Grating Strain Sensor Network for X38 Spacecraft Health Monitoring
Ecke W.*, Latka I.*, Willsch R.*, Reutlinger A.**, Graue R.**
*IPHT, Germany, **Kayser-Threde GmbH, Germany

4:45pm – 5:15pm *'Tapestry' Hall*
Coffee Break

Fr 4 *5:15pm – 7:00pm* *'Palladian Refectory' Hall*
New Concepts for Photonic Sensing
Sensing for Optical Fiber Communication
Voet M., *I.D. FOS RESEARCH e.e.i.g., Belgium*
Sirkis J.S., *CiDRA Corporation, USA*

894 **Fr 4-1** *5:15pm* *invited*
Precision Tunable Grating Devices for Sensing and Communication Networks
Kersey A.D.
CiDRA Corp., USA

895 **Fr 4-2** *5:45pm* *invited*
Microstructured Optical Fibres: New Opportunities for Sensing
Monro T.M., Belardi W., Furusawa K., Broderick N.G.R, Richardson D.J.
University of Southampton, UK

900 **Fr 4-3** *6:15pm*
A Fault Locator for Diagnosing an Optical Fiber Transmission Line with 10cm Spatial Resolution by Phase-Modulating Optical Coherence Domain Reflectometry
Shimotahira H., Kawakita K., Kinugawa S., Miyagi K.
Anritsu Corporation, Japan

904 **Fr 4-4** *6:30pm*
Macro-Bending Loss Estimation for Air-Guiding Photonic Crystal Fibres
Knudsen E., Bjarklev A., Broeng J., Barkou S.E.
Technical University of Denmark, Denmark

908 **Fr 4-5** *6:45pm*
A Highly Sensitive Smart Fiber Sensor
Angelichio J., Nannini M., Farahi F.
University of North Carolina, USA

7:00pm – 7:15pm *'Palladian Refectory' Hall*
Closing Remarks

913 **Key to Authors**