

18th International Conference on Sensors and Measurement Technology (SENSOR 2017)

Held at AMA Conferences 2017

Nuremberg, Germany
30 May - 1 June 2017

ISBN: 978-1-5108-4655-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2017) by AMA Service GmbH
All rights reserved.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact AMA Service GmbH
at the address below.

AMA Service GmbH
Postfach 2352
31506 Wunstorf
Germany

Phone: +49(0)5033-9639-0
Fax: +49(0)5033-1056

info@ama-service.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

PLENARY PAPERS

PLENARY TALK 1 - MICROPHONES MEMS DEVELOPMENT TOWARDS HIGH SNR	1
<i>A. Dehé</i>	
PLENARY TALK 2 - PHYSICAL, CHEMICAL AND BIOLOGICAL SENSORS: INNOVATIVE PLATFORMS FOR VARIOUS INDUSTRIES	2
<i>M. Lehmann</i>	
PLENARY TALK 3 - INDUCTIVE EDGE SENSORS WITH NANOMETER ACCURACY FOR THE EUROPEAN EXTREMELY LARGE TELESCOPE	3
<i>D. Patel, C. Néel</i>	

A1-MAGNETIC SENSORS

A1.1 - MONOLITHIC DIGITAL MAGNETIC HALL SENSOR WITH TWO MEASUREMENT PATHS FOR AN ASIL D APPLICATION	4
<i>F. Rasbornig, W. Granig, J. Cunha</i>	
A1.2 - SURPRISING ADVANCES IN MAGNETIC ENCODER PERFORMANCE - DO NOT EXPERT ONLY BETTER ACCURACY	9
<i>T. Becker, T. Materne, S. Cardoso De Freitas</i>	
A1.3 - USING MAGNETORESISTIVE SENSORS IN HIGH-TEMPERATURE APPLICATIONS	13
<i>R. Slatter</i>	
A1.4 - A NEW APPROACH FOR A PLANAR MINIATURIZED PCB BASED HIGH SENSITIVITY FLUXGATE SENSOR DESIGN	18
<i>M. Lenzhofer, M. Ortner, G. Schulz, J. Stahr</i>	

A2-BIOSENSORS I

A2.1 - BIOMEMS FOR SENSING IN CELL CHARACTERIZATION, DRUG SCREENING AND BIOFILM DETECTION	23
<i>H. Trieu, G. Blume, L. Von Mirbach-Wahn, D. Venegas Rojas, K. Kalaydzhyan, R. Pörtner, N. Meyne, A. Jacob, M. Jücker</i>	
A2.2 - SILICON NANOWIRE BIOSENSOR PLATFORM TO ELECTRONICALLY SENSE BIOMOLECULES IN REAL PATIENT SAMPLES	29
<i>S. Ingebrandt, D. Rani, V. Pachauri, M. Schwarz, T. Chien Nguyen, X. Thang Vu, A. Müller, D. Phu Tran, J. Wilhelm, J. Ka-Yan Law</i>	
A2.3 - SILICON BASED ELECTRICAL BIOSENSOR TECHNOLOGY FOR MOBILE DIAGNOSTICS	32
<i>L. Blohm, J. Albers, G. Piechotta, N. Nebling</i>	
A2.4 - INTEGRATED BIOSENSORS AND REFRACTOMETERS BASED ON DEPOSITED SILICON PHOTONIC MICROCAVITIES	37
<i>T. Lipka, L. Moldenhauer, K. Igeta, D. Venegas-Rojas, H. Trieu</i>	

A3-BIOSENSORS II

A3.1 - MOLECULARLY IMPRINTED POLYMERS AS SELECTIVE RECEPTORS FOR SENSING NANOSIZED SPECIES	43
<i>S. Chunta, C. Jungmann, L. Schranzhofer, P. Lieberzeit, R. Suedee</i>	
A3.2 - ENZYME FREE SENSOR BASED ON AFFINITY VISCOMETRY FOR DETECTION OF GLUCOSE	46
<i>T. Liebscher, F. Glös, A. Böhme, A. Foitzik, M. Birkholz, M. Di Vona, F. De Matteis</i>	
A3.3 - SOLID CONTACT ION SELECTIVE ELECTRODES (ISE) FOR APPLICATIONS IN LIFE SCIENCES, BIOTECHNOLOGY AND ENVIRONMENTAL MONITORING – TECHNOLOGY AND PERFORMANCE	51
<i>M. Stelzle, C. Bieg, K. Fuchsberger, G. Linke, R. Samba, S. Werner</i>	

A3.4 - BIOSENSOR BASED ON A SPLIT-RING RESONATOR	55
<i>T. Reinecke, T. Kobelt, A. Ahrens, S. Zimmermann, T. Scheper, J. Walter</i>	

A4-GAS SENSORS I

A4.1 - SETUP TO ELIMINATE THE GAS FLOW DEPENDENCY OF A HYDROCARBON SENSOR FOR AUTOMOTIVE EXHAUST APPLICATIONS	61
<i>G. Hagen, A. Harsch, R. Moos</i>	
A4.2 - DETECTION OF SHORT TRACE GAS PULSES	64
<i>T. Baur, A. Schütze, T. Sauerwald</i>	
A4.3 - HIGHLY SENSITIVE BENZENE DETECTION WITH MOS GAS SENSORS	69
<i>M. Leidinger, T. Baur, T. Sauerwald, A. Schütze, W. Reimringer, L. Spinelle, M. Gerboles</i>	
A.4.4 - LANGASITE-BASED MICROBALANCE FOR DETERMINATION OF THE NON-STOICHIOMETRY IN PRASEODYMIUM-CERIUM OXIDE THIN FILMS AT ELEVATED TEMPERATURES	75
<i>S. Schröder, H. Fritze</i>	

A5-GAS SENSORS II

A5.2 - A MINIATURIZED DRIFT TUBE ION MOBILITY SPECTROMETER FOR HAND-HELD DEVICES	81
<i>A. Ahrens, S. Zimmermann</i>	

A6-GAS SENSORS III

A6.2 - MEASUREMENT AND CONTROL OF HUMIDITY TRACES IN GASES WITH SOLID ELECTROLYTE CELLS	85
<i>J. Zosel, M. Schelter, U. Guth, M. Mertig</i>	
A6.3 - IN-SITU HT GAS SENSORS: CONTINUOUS MONITORING OF THE COMBUSTION QUALITY OF DIFFERENT WOOD COMBUSTION SYSTEMS AND OPTIMIZATION OF COMBUSTION PROCESS	86
<i>H. Kohler, B. Ojha, N. Illyaskutty, I. Hartmann, C. Tiel, K. Eisinger, M. Dambacher</i>	
A6.4 - NOVEL MIXED POTENTIAL SENSOR DEVICE TO COMPARE TWO GAS COMPARTMENTS AND TO DETERMINE DIRECTLY THE CONVERSION OF AN AUTOMOTIVE CATALYST	91
<i>T. Ritter, G. Hagen, R. Moos</i>	

A7-GAS SENSORS IV

A7.1 - SELECTIVE SOLID ELECTROLYTE SENSORS FOR TRACE GAS CONCENTRATIONS	95
<i>J. Zosel, M. Schelter, C. Vonau, U. Guth, M. Mertig</i>	

A8-WIRELESS SENSORS II

A8.1 - IO-LINK WIRELESS ENHANCED SENSORS AND ACTUATORS FOR INDUSTRY 4.0 NETWORKS	101
<i>G. Scholl, R. Heynicke, D. Krush, B. Kärcher, J. Ritter, P. Gaggero, M. Rentschler</i>	
A8.2 - TEMPERATURE ESTIMATION OF INDUCTION MACHINES BASED ON WIRELESS SENSOR NETWORKS	106
<i>Y. Huang, C. Gühmann</i>	
A8.3 - INVESTIGATION OF BIOREACTORS BY INSTRUMENTED FLOW-FOLLOWING SENSOR PARTICLES	112
<i>S. Reinecke, U. Hampel</i>	
A8.4 - TEST METHOD FOR NARROWBAND F/TDMA-BASED WIRELESS SENSOR/ACTUATOR NETWORKS	113
<i>C. Cammin, D. Krush, R. Heynicke, G. Scholl</i>	

B1-IMPEDANCE SPECTROSCOPY

B1.1 - THERMAL-ELECTRICAL IMPEDANCE SPECTROSCOPY FOR FLUID CHARACTERIZATION	119
<i>M. Jügler, H. Pernau, M. Pfützner, M. Benkendorf, X. Li, M. Bartel, O. Herm, S. Drost, D. Rutsch, J. Wöllenstein, A. Jacquot</i>	
B1.2 - CAPACITIVE FILL-LEVEL MEASUREMENT USING CONFIGURABLE ELECTRODES FOR ADAPTIVITY	123
<i>C. Kandlbinder, T. Sporer, T. Siegel, P. Mößle, A. Fischerauer, T. Zürl, G. Fischerauer</i>	
B1.3 - CHARACTERIZATION OF THE SPATIAL RESOLUTION CAPABILITY OF A NOVEL CARBON FIBER STRAIN SENSOR BASED ON CHARACTERISTIC IMPEDANCE MEASUREMENTS	128
<i>R. Höhne, P. Kostka, N. Modler</i>	
B1.4 - DETERMINING FRACTIONAL ZENER MODEL PARAMETERS FROM LOW FREQUENCY DMA MEASUREMENTS	134
<i>N. Feldmann, F. Bause, B. Henning</i>	

B2-SENSORS FOR INDUSTRIAL APPLICATIONS

B2.1 - ROBUST & TECHNOLOGY AGNOSTIC INTEGRATED IMPLEMENTATION OF FUTURE SENSORY ELECTRONICS BASED ON SPIKING INFORMATION PROCESSING FOR INDUSTRY 4.0	139
<i>A. König, A. Chandra Kammarra</i>	
B2.2 - UNIVERSAL SENSOR INTERFACE FOR HIGH PERFORMANCE SIGNAL PROCESSING BASED ON FPGA TECHNOLOGY	145
<i>M. Selke, C. Nienhaus, D. Laumann, J. Doerr</i>	
B2.3 - DISTRIBUTED MEASUREMENT FOR THE PROCESS INDUSTRY	150
<i>T. Bierweiler, W. Ens, J. Kölsch, F. Sass, S. Von Dosky</i>	
B2.4 - IMPLICATIONS FOR SENSOR READOUT CONCEPTS IN BIOMEDICAL POINT OF CARE SETTINGS WITH RESPECT TO ROBUST AND RELIABLE RECORDINGS	155
<i>S. Ingebrandt, D. Rani, V. Pachauri, T. Nguyen, R. Lanche, J. Wilhelm</i>	

B3-FIBER-OPTICAL SENSORS

B3.1 - WIRELESS READ-OUT OF OPTICAL FIBER SENSORS	159
<i>N. Neumann, T. Schuster, D. Plettemeier, E. Häntzsche, A. Nocke</i>	
B3.2 - LONG-TERM RELIABILITY OF FIBER-OPTIC CURRENT SENSORS IN DAMP HEAT	164
<i>M. Lenner, L. Yang, A. Frank, K. Bohnert</i>	
B3.3 - ELECTRICALLY ISOLATED SENSOR NETWORKS USING SINGLE POLYMER FIBERS FOR REMOTE POWERING AND DATA TRANSMISSION	168
<i>J. Fischer, T. Schuster, C. Wächter, M. Lubert, J. Vinogradov, R. Engelbrecht, O. Ziemann</i>	
B3.4 - FIBER-OPTIC MEASUREMENT OF TEMPERATURE PROFILES	174
<i>J. Schwarz, D. Samiec</i>	

B4-OPTICAL MEASUREMENT OF GEOMETRICAL QUANTITIES

B4.1 - CAMERA-BASED MICRO INTERFEROMETER FOR APPLICATIONS IN DISTANCE SENSING	179
<i>M. Will, A. Winzer, M. Schädel, J. Freitag, O. Brodersen</i>	
B4.2 - STUDY ON PREPROCESSING IN ARRAY DETECTOR BASED OPTICAL SPATIAL FILTERING VELOCIMETRY	184
<i>M. Schaeper, N. Damaschke, R. Kostbade</i>	
B4.3 - OPTICAL SENSOR SYSTEM FOR 3D MEASUREMENTS ON LARGE GEARS	189
<i>M. Auerswald, A. Von Freyberg, A. Fischer</i>	
B4.4 - HIGH-RESOLUTION SPECKLE SENSOR FOR CONTACTLESS TORQUE MEASUREMENT IN WIND ENERGY SYSTEMS	195
<i>J. Westerkamp, M. Sorg, A. Fischer</i>	

B5-OPTICAL MEASUREMENTS SYSTEMS I

B5.2 - COMPUTATIONAL METHODS IN COHERENT OPTICAL METROLOGY	200
<i>C. Falldorf, M. Agour, R. Bergmann</i>	
B5.3 - HIGH-RESOLUTION LASER-VIBROMETER MICROSCOPY	205
<i>C. Rembe, R. Kowarsch</i>	
B5.4 - LOW-COHERENCE INTERFEROMETRY FOR INDUSTRIAL APPLICATIONS.....	211
<i>J. Krauter, T. Boettcher, M. Gronle, W. Osten</i>	

B6-DISTRIBUTED AND FIBER BRAGG GRATING SENSING I

B6.1 - FIBER OPTIC STRAIN AND TEMPERATURE SENSING: OVERVIEW OF PRINCIPLES	216
<i>R. Engelbrecht</i>	
B6.2 - INCOHERENT OPTICAL FREQUENCY DOMAIN REFLECTOMETRY FOR DISTRIBUTED RAMAN AND BRAGG FIBER TEMPERATURE SENSORS.....	222
<i>M. Köppel, S. Werzinger, J. Sutter, S. Bergdolt, B. Schmauss, R. Engelbrecht</i>	
B6.3 - FIELD GUIDE TO NONLINEAR CALIBRATION OF FIBER BRAGG GRATINGS FOR TEMPERATURE SENSORS WITH A WIDE TEMPERATURE RANGE	228
<i>T. Ringel, T. Bosselmann</i>	

B7-DISTRIBUTES AND FIBER BRAGG GRATING SENSING II

B7.3 - DISTRIBUTED FIBRE OPTIC ACOUSTIC AND VIBRATION SENSORS FOR INDUSTRIAL MONITORING APPLICATIONS.....	232
<i>K. Hicke, M. Hussels, R. Eisermann, S. Chruseicki, K. Krebber</i>	
B7.4 - HEALTH MONITORING OF GEOTECHNICAL STRUCTURES BY DISTRIBUTED FIBER OPTIC SENSORS	238
<i>A. Wosniok, S. Liehr</i>	

B8-OPTICAL MEASUREMENT SYSTEMS II

B8.1 - DIGITAL HOLOGRAPHY: EVOLUTION FROM A RESEARCH TOPIC TO A VERSATILE TOOL FOR THE INLINE 100% 3D QUALITY CONTROL IN INDUSTRY	244
<i>M. Fratz, T. Beckmann, A. Schiller, T. Seyler, A. Bertz, D. Carl, K. Buse</i>	
B8.2 - WAVEFRONT SENSING BY NUMERICAL EVALUATION OF DIFFRACTED WAVEFIELDS	248
<i>M. Bichra, T. Meinecke, S. Sinzinger</i>	
B8.3 - SIMULTANEOUS MEASUREMENT OF THICKNESS AND REFRACTIVE INDEX BY CHROMATIC CONFOCAL COHERENCE TOMOGRAPHY (CCCT).....	252
<i>T. Boettcher, M. Gronle, W. Osten</i>	

C1-ACOUSTIC METHODS I

C1.1 - HIGH-RESOLUTION ULTRASONIC SPECTROSCOPY	255
<i>V. Buckin, M. Caras Altas</i>	
C1.2 - A SPECTRAL APPROACH TO ACOUSTIC ABSORPTION MEASUREMENT	261
<i>L. Claes, R. Chatwell, J. Vrabec, B. Henning</i>	
C1.4 - A SELECTIVE ALGORITHM FOR WIRELESS TEMPERATURE MONITORING OF A ROTATIONAL MOLD CASTING PROCESS WITH SURFACE ACOUSTIC WAVE (SAW) SENSORS.....	267
<i>M. Yudytskiy, S. Fischer, R. Fachberger</i>	

C2-ACOUSTIC METHODS II

C2.1 - ULTRASOUND IMAGING THROUGH MULTIMODE WAVEGUIDES USING TIME REVERSAL VIRTUAL ARRAY METHOD.....	273
<i>M. Kalibatas, R. Nauber, D. Dawidowski, L. Büttner, J. Czarske</i>	

C2.2 - DETECTION OF IRON OXIDE NANOPARTICLES FOR LOCAL CHEMOTHERAPEUTIC TREATMENT EMPLOYING CODED MAGNETOMOTIVE ULTRASOUND	279
<i>M. Fink, H. Ermert, C. Alexiou, S. Lyer</i>	
C2.3 - NOVEL MEASUREMENT TECHNIQUES WITH ANNULAR ARRAYS FOR SCANNING ACOUSTIC MICROSCOPY	285
<i>S. Kümritz, A. Juhrig, L. Timmermann, E. Kühnicke</i>	
C2.4 - TRANSDUCER MISALIGNMENT - AN INSUPERABLE OBSTACLE FOR ACOUSTIC CLAMP-ON LIQUID LEVEL MEASUREMENT?	290
<i>U. Steinmann, S. Woeckel, H. Arndt, J. Auge</i>	

C3-MODELING AND SIMULATION I

C3.1 - SIMULATION OF ELECTROMECHANICAL SENSORS AND SYSTEMS	295
<i>E. Starke</i>	
C3.2 - PREDICTION AND COMPENSATION OF REFERENCE VOLTAGE SHIFT IN IC SENSORS DUE TO MECHANICAL STRESS	298
<i>J. Warmuth, T. Schreier-Alt</i>	

C4-MODELING AND SIMULATION II

C4.1 - MODEL-BASED DESIGN AND OPTIMIZATION OF MICROFLUIDIC SYSTEMS FOR GENTLE CELLULAR PERFUSION	302
<i>M. Gusenbauer, G. Mazza, M. Brandl, T. Schrefl, R. Tothova, I. Jancigova, I. Cimrak</i>	
C4.2 - MODELING AND DESIGN OPTIMIZATION OF NEAR FIELD POSITION SENSORS	306
<i>H. Zangl, L. Faller, W. Granig</i>	
C4.3 - MECHANICAL MODEL OF A PRE-STRESSED PIEZOELECTRIC BUCKLING ACTUATOR	310
<i>F. Toth, M. Dorfmeister, M. Kaltenbacher</i>	
C4.4 - STOCHASTIC MODELLING TO ENABLE ULTRAFAST HIGH RESOLUTION CAPACITIVE POSITION SENSING OF A RESONANT MEMS MIRROR	314
<i>L. Faller, H. Zangl</i>	

C5-MODELING AND SIMULATION III

C5.1 - FINITE ELEMENT SCHEME FOR SAW UNIT-CELL-SIMULATION	319
<i>M. Kaltenbacher, K. Shaposhnikov, P. Nicolay</i>	
C5.3 - COMMON CHALLENGES IN SIMULATING THE FLUID DYNAMICS OF ELECTROWETTING-ON-DIELECTRICS DRIVEN DEVICES	325
<i>A. Tröls, B. Jakobya</i>	
C5.4 - APPLICATION OF THE SCALED BOUNDARY FINITE ELEMENT METHOD (SBFEM) FOR A NUMERICAL SIMULATION OF ULTRASONIC GUIDED WAVES	329
<i>J. Bulling, J. Prager, F. Korme</i>	

C6-WIRELESS SENSORS I

C6.1 - INVESTIGATION OF ENVIRONMENTAL INFLUENCES ON WIRELESS LOCALIZATION TECHNIQUES FOR OUTDOOR APPLICATIONS	335
<i>M. Uhlig, T. Keutel, O. Kanoun</i>	
C6.2 - WIRELESS REAL TIME TEMPERATURE MEASUREMENT FOR PROCESS CONTROL IN HIGH TEMPERATURE ENVIRONMENTS	337
<i>M. Marx, F. Meyer, K. Grundmann, A. Grabmaier</i>	
C6.3 - DESIGN AND LAYOUT OF AN ENERGY AUTARKIC WIRELESS SENSOR NETWORK IN UNDERGROUND METRO TUNNELS	342
<i>S. Kempf, N. Schnelle, J. Vincke, F. Schäfer</i>	
C6.4 - LOW-POWER OPTIMIZED, WIDELY CUSTOMIZABLE, TIME-CONTROLLED WIRELESS SENSOR/ACTUATOR DATA TRANSMISSION WITH COMMERCIAL OFF-THE-SHELF STANDARD COMPONENTS	348
<i>P. Kroh, M. Fink, H. Günther, R. Lerch</i>	

C7-TEXTILE-BASED SENSORS

C7.1 - CHARACTERIZATION OF CARBON FIBER-BASED STRAIN GAUGE MADE BY EMBROIDERY TECHNOLOGY FOR INTEGRATION IN CONCRETE	354
<i>M. Heinrich, A. Bauer, L. Kroll</i>	
C7.2 - TEXTILE-BASED SENSOR SYSTEMS FOR CONDITION MONITORING IN COMPOSITE AND MEDICAL APPLICATIONS	358
<i>A. Nocke, E. Häntzsche, J. Wendler, C. Cherif</i>	
C7.4 - SENSORIZED WOVEN TAPES AND THEIR TESTING	363
<i>K. Ullrich, W. Scheibner, A. Krahrmer, H. Oschatz, M. Weiser, U. Möhring</i>	

C8-MATERIAL CHARACTERIZATION

C8.2 - SIMULATION-BASED HOMOGENIZATION AND CHARACTERIZATION APPROACH FOR PIEZOELECTRIC ACTUATORS	367
<i>M. Weiß, S. Rupitsch</i>	
C8.3 - THERMAL WAVE AND THERMAL PULSE STUDIES OF THE IMPACT OF MANUFACTURING TECHNOLOGY ON THE POLARIZATION OF PIEZOFIBER COMPOSITES	372
<i>A. Eydram, G. Suchaneck, G. Gerlach</i>	
C8.4 - CHARACTERIZATION AND SIMULATION OF A MAGNETIZED SAMPLE	376
<i>M. Linnert, A. Sutor, S. Rupitsch, R. Lerch</i>	

D1-3D-PRINTED SENSORS AND SYSTEMS

D1.3 - EMBEDDED SENSING: MAKING THE BEST OF 3D PRINTED SENSORS	381
<i>G. Krijnen, A. Dijkshoorn, P. Werkman, M. Welleweerd, G. Wolterink, J. Delamare, R. Sanders</i>	
D1.4 - 3D PRINTED MACHINE PARTS: FUNCTIONALIZATION DURING ADDITIVE FABRICATION	388
<i>D. Gräbner, G. Dumstorff, F. Lucklum</i>	

D2-CHARACTERIZATION OF PRINTED SENSORS AND METHODS

D2.1 - PRINTED EMBEDDED TRANSDUCERS: FABRICATION, DESIGN AND CHARACTERIZATION OF SELECTED APPLICATIONS	393
<i>J. Sell, W. Hilber, M. Schatzl-Linder, B. Strauß, H. Enser, B. Jakoby</i>	
D2.2 - STRAIN TRANSMISSION CHARACTERISTICS OF STEEL SUBSTRATES FOR ADDITIVE SENSOR MANUFACTURING WITH SELECTIVE LASER MELTING	N/A
<i>M. Hessinger, M. Kniepkamp, J. Lotichius, C. Hatzfeld, R. Werthschützky, E. Abele, M. Kupnik</i>	
D2.3 - AN ALL-INKJET PRINTED SENSOR SYSTEM EMBEDDED IN INJECTION-MOLDED PLASTICS	400
<i>C. Beisteiner, T. Mitterlehner, T. Thurner, B. Zagar</i>	
D2.4 - NOVEL THERMOCOUPLES FOR TEMPERATURE MEASUREMENT IN AUTOMOTIVE APPLICATIONS	406
<i>P. Gierth, L. Rebenklau, K. Augsburg, E. Bachman, L. Niedermeyer</i>	

D3-RADAR SENSORS

D3.1 - RADAR AS AN EMERGING AND GROWING TECHNOLOGY FOR INDUSTRIAL APPLICATIONS: A SHORT OVERVIEW	410
<i>C. Waldschmidt, P. Hügler, M. Geiger</i>	
D3.3 - MILLIMETER WAVE RADAR IMAGING FOR NON-DESTRUCTIVE DETECTION OF MATERIAL DEFECTS	416
<i>I. Ullmann, J. Adametz, D. Oppelt, M. Vossiek</i>	
D3.4 - COMMERCIAL RADAR SENSORS AND APPLICATIONS	422
<i>T. Lenhard</i>	

D4-MECHANICAL SENSORS I

D4.1 - SHAPE MEMORY STRAIN GAUGES	427
<i>T. Mäder, B. Senf, M. Hamm, M. Zoch, W. Drossel, I. De Sosa, P. Wolf</i>	
D4.2 - FLEXIBLE, DYNAMIC PIEZORESISTIVE SENSOR MATRIX BASED ON CARBON NANOTUBE POLYMER COMPOSITE FOR PRESSURE DISTRIBUTION MEASUREMENT	432
<i>C. Gerlach, A. Sanli, R. Ramalingame, O. Kanoun</i>	
D4.3 - THIN-FILM CALORIMETER FOR HIGH-TEMPERATURE APPLICATIONS: THERMODYNAMIC CHARACTERIZATION ON PIEZOELECTRIC LANGASITE TEMPERATURE SENSORS	434
<i>A. Omelcenko, H. Wulfmeier, H. Fritze</i>	
D4.4 - NESTED-LIST APPROACH FOR THE STAGELESS EVALUATION OF A VECTOR PREISACH MODEL BASED ON ROTATIONAL OPERATORS	440
<i>M. Nierla, S. Rupitsch, M. Kaltenbacher</i>	

D5-MECHANICAL SENSORS II

D5.2 - NOVEL OPERATION TOOLS WITH COMPRESSION SENSORS FOR HUMAN-MACHINE INTERFACES	446
<i>H. Böse, J. Ehrlich, D. Müller</i>	
D5.3 - AN ADVANCED PARAMETRIC THERMAL MODEL FOR HIGH POWER LED MODULES	452
<i>P. Fulmek, P. Haumer, J. Nicolics, F. Wenzl, W. Nemitz, R. Beigelbeck</i>	

D6-MECHANICAL SENSORS: SPECIAL APPLICATIONS

D6.1 - ROBUST FORCE AND TORQUE MEASUREMENTS BY INTEGRATED SENSORS IN HOLLOW SHAFTS	458
<i>M. Krech, P. Groche</i>	
D6.2 - CHARACTERISATION OF A 5 MN M TORQUE TRANSDUCER BY COMBINING TRADITIONAL CALIBRATION AND FINITE ELEMENT METHOD SIMULATIONS	463
<i>P. Weidinger, C. Schlegel, G. Foyer, R. Kümme</i>	
D6.3 - INTENSITY BASED OPTICAL MEASUREMENT OF CORNEA VIBRATION	469
<i>J. Osmers, M. Sorg, A. Fischer</i>	
D6.4 - PRESSURE SENSOR FOR REMOTE READOUT IN AQUEOUS ENVIRONMENT	474
<i>M. Gerken, T. Karrock</i>	

D7-ENERGY HARVESTING

D7.1 - AN EXPERIMENTAL SETUP FOR PIEZOELECTRIC CANTILEVERED VIBRATION ENERGY HARVESTERS ON A ROTATING DRIVE SHAFT	477
<i>D. Gedeon, S. Rupitsch</i>	
D7.2 - NANO- AND MICROFLUIDIC CHANNELS AS ELECTROKINETIC SENSORS AND ENERGY HARVESTING DEVICES	482
<i>P. Árki, C. Hecker, F. Güth, Y. Joseph</i>	
D7.3 - AUTONOMOUS TUNING METHODS FOR PIEZOELECTRIC ENERGY HARVESTING GENERATORS	487
<i>L. Mateu, J. Knauer, P. Spies, H. Zessin</i>	
D7.4 - AN INKJET-PRINTED AMBIENT RF ENERGY HARVESTER	493
<i>C. Beisteiner, B. Zagar</i>	

P1-MATERIALS AND TECHNOLOGY

P1.1 - MANUFACTURE OF ELECTRODES ENTIRELY MADE OF MODIFIED PDMS	498
<i>R. Ruff, A. Brensing, K. Hoffmann</i>	
P1.2 - DETERMINATION OF THE DEGREE OF CROSS-LINKING AND CURING WITH SINGLE-SIDED NMR	504
<i>N. Halmen, C. Kugler, T. Hochrein, P. Heidemeyer, M. Bastian</i>	

P1.4 - DENSE CERAMIC NTC THERMISTOR FILMS PRODUCED AT ROOM TEMPERATURE BY THE NOVEL AEROSOL DEPOSITION METHOD (ADM) FOR TEMPERATURE SENSOR APPLICATIONS	510
<i>M. Bruckner, J. Kita, R. Moos, C. Münch, S. Schuurman, V. Poulain</i>	
P1.5 - STRUCTURING OF SPINTRONIC SENSORS BY ION BEAM MILLING WITH IN SITU INSULATOR DEPOSITION	513
<i>M. Nestler, S. Rumbke, E. Loos, A. Böhnke, N. Dohmeier</i>	
P1.6 - NEW MATERIALS, PROCESSES AND DESIGN METHODS FOR THE CHIP MOUNTING OF HIGH-TEMPERATURE SENSORS	517
<i>M. Feißt, N. Subbiah, R. Zeiser, E. Möller, J. Wilde</i>	

P2-MECHANICAL SENSORS

P2.1 - NOVEL SIMULATION ALGORITHMS FOR DEVELOPING MEASURING TECHNIQUES FOR MULTICHANNEL ULTRASONIC MICROSCOPY	521
<i>E. Kühnicke, M. Wolf</i>	
P2.4 - PRINTED EMBEDDED TRANSDUCERS INCLUDING ADDITIONAL ON-SUBSTRATE SIGNAL EVALUATION	527
<i>H. Enser, J. Sell, B. Jakoby, M. Schatzl-Linder, B. Strauß, W. Hilber</i>	
P2.5 - RELIABILITY AND LONG-TERM STABILITY OF THE MOUNTED SILICON FOR PRECISION MEASUREMENTS	531
<i>T. Frank, A. Cyriax, A. Grün, M. Kernmann, T. Ortlepp</i>	
P2.6 - STRUCTURALLY INTEGRATED JOINT TORQUE SENSORS IN AN ASSISTIVE UPPER LIMB EXOSKELETON	535
<i>M. Hessinger, J. Krenzer, E. Christmann, J. Hielscher, M. Kupnik, R. Werthschützky</i>	
P2.7 - SITUATION DETECTION IN A MOVEMENT-ASSISTIVE DEVICE	541
<i>J. Hielscher, A. Horn, M. Grün, M. Hessinger, M. Schindler, F. Bauer, R. Werthschützky</i>	
P2.9 - ACOUSTIC MATERIAL CHARACTERIZATION OF ADDITIVELY MANUFACTURED COMPONENTS	546
<i>L. Claes, S. Johannesmann, M. Webersen, B. Henning, A. Jäger, M. Kupnik</i>	
P2.10 - BULK VISCOSITY SENSING	552
<i>H. Antlinger, S. Clara, T. Voglhuber-Brunnmaier, B. Jakoby, R. Beigelbeck, S. Cerimovic, F. Keplinger</i>	

P3-INDUSTRIAL ELECTRONICS

P3.1 - A CAPACITIVE MEASUREMENT SYSTEM FOR GESTURE RECOGNITION	557
<i>L. Haslinger, S. Wasserthal, B. Zagar</i>	
P3.2 - PRINTED CAPACITIVE SENSORS FOR CONTACTLESS ICE DETECTION IN AUTOMOTIVE LIQUID CONVEYOR PIPES	562
<i>J. Happel, J. Döring, K. Krieger, J. Deitschun, D. Godlinski</i>	
P3.3 - AN ELECTRON CAPTURE DETECTOR BASED ON A NON-RADIOACTIVE ELECTRON SOURCE	568
<i>E. Bunert, A. Kirk, J. Oermann, S. Zimmermann</i>	
P3.4 - TEST PLATFORM FOR ELECTROMAGNETIC FIELD STRENGTH MEASUREMENTS NEAR WIND ENERGY CONVERTING SYSTEMS	573
<i>S. Koj, P. Akhlamov, H. Garbe, J. Bredemeyer</i>	
P3.5 - CONTACT-FREE ELECTRO-MAGNETIC REACTANCE BASED MECHANICAL TENSION SENSORS	578
<i>A. Schwersenz, P. Cörlin, C. Leiser, T. Kitzler, T. Senkbeil, S. Schwiertz, L. May</i>	
P3.6 - EFFICIENT BOOST CONVERTER FOR THERMOELECTRIC ENERGY HARVESTING	583
<i>J. Gruber, S. Mathis</i>	
P3.7 - INTEGRATED MEASUREMENT UNITS AND SENSOR SYSTEMS FOR HARSH INDUSTRIAL APPLICATIONS	587
<i>S. Grunwald, B. Bäker</i>	
P3.9 - IOT MEETS LOGISTICS DEVELOPMENT OF A MOBILE CONDITION MONITORING SYSTEM	593
<i>M. Heider, A. Rother, P. Hanesch</i>	

P4-OPTICAL SENSORS

P4.3 - UV-LED-BASED FLUORESCENCE AND REFLECTANCE SENSOR SYSTEM FOR DERMATOLOGICAL DIAGNOSTICS	596
<i>E. Wyrwich, B. Seme, R. Skoczowsky, F. Stüpmann, M. Moschall, G. Khazaka, J. Schleusener</i>	
P4.4 - ANALYSIS AND COMBINATION OF DIFFERENT APPROACHES FOR SELECTIVE AND DIRECTIONAL THERMAL EMISSION	602
<i>G. Pühringer, B. Jakoby</i>	
P4.6 - TEMPERATURE SENSING IN UNDERGROUND FACILITIES BY RAMAN-OFDR USING FIBER-OPTIC COMMUNICATION CABLES	608
<i>M. Brüne, A. Pflitsch, W. Furian, W. Hill</i>	
P4.7 - CRACK LUMINESCENCE AS INNOVATIVE METHOD FOR DETECTION OF FATIGUE DAMAGE	613
<i>R. Makris, J. Bronsert, F. Hille, D. Kirschberger, D. Sowietzki</i>	
P4.8 - OPTIMIZATION OF HIGH-QUALITY-FACTOR PHOTONIC CRYSTAL RING RESONATOR WITH APPLICATIONS FOR FLUID SENSING WITH 3D FDTD SIMULATION	618
<i>R. Jannesari, B. Jakoby, T. Grille</i>	
P4.10 - COMPONENT-LEVEL MEASUREMENT OF MOLDED FREEFORM OPTICS - AN EXAMPLE FOR "INDUSTRIE 4.0" CONCEPT	622
<i>D. Hilbig, G. Gutierrez, T. Henning, F. Fleischmann</i>	

P5-GAS, CHEMO AND BIOSENSORS

P5.1 - MINIATURIZED SENSOR FOR THE DETECTION OF ENVIRONMENTAL POLLUTANTS	627
<i>A. Graf, R. Stübner, C. Kunath, S. Meyer, H. Schenk</i>	
P5.2 - MULTILAYER - MICROFLUIDIC ONLINE MEASURING SYSTEM FOR THE ANALYSIS OF ENVIRONMENTALLY RELEVANT SUBSTANCES	632
<i>B. Blahnikova, D. Müller, M. Waas, A. Lechner</i>	
P5.3 - DETECTION OF SIMULANTS OF CHEMICAL WARFARE AGENTS ON TEXTILE CHEMIREISTORS	636
<i>M. Vrnata, A. Sýkorová, E. Maresová, D. Tomecek, S. Havlová, P. Hozák, J. Vlcek, L. Fiser, P. Fitl, M. Aleksanyan, A. Sayunts, V. Aroutiounian</i>	
P5.4 - LOW-COST CHEMICAL GAS SENSORS FOR SELECTIVE FORMALDEHYDE QUANTIFICATION AT PPB-LEVEL IN THE FIELD	638
<i>M. Bastuck, A. Schütze, D. Puglisi, P. Möller, A. Lloyd Spetz, M. Andersson, W. Reimringer</i>	
P5.5 - MWCNTS/SNO₂ HARMFUL GAS SENSORS	644
<i>V. Aroutiounian, Z. Adamyan, A. Sayunts, E. Khachaturyan, A. Adamyan, P. Fitl, J. Vlcek</i>	
P5.6 - SNO₂ AND ZNO DETECTORS OF HYDROGEN PEROXIDE VAPORS	650
<i>V. Arakelyan, V. Aroutiounian, M. Aleksanyan, A. Sayunts, G. Shahnazaryan, P. Kacer, P. Picha, J. Kovarik, J. Pekarek, B. Joost</i>	
P5.7 - SIMULATION OF A THERMOELECTRIC GAS SENSOR TO DETERMINE HYDROCARBONS IN EXHAUST GASES AND TO CHARACTERIZE CATALYST MATERIALS	656
<i>T. Ritter, S. Wiegärtner, G. Hagen, R. Moos</i>	
P5.8 - AGAMON - A MOBILE SENSOR SYSTEM FOR BREATH CONTROL	659
<i>R. Seifert, H. Keller, T. Conrad, J. Peter</i>	
P5.9 - THERMOPOWER AND CONDUCTIVITY OF AEROSOL DEPOSITED GAS SENSITIVE BAFE_{1-x}TA_xO_{3-δ} FILMS	663
<i>M. Bektas, T. Stöcker, G. Hagen, R. Moos</i>	
P5.11 - CYCLIC OPTICAL ACTIVATION OF SEMICONDUCTING GAS SENSORS: INFLUENCE OF CYCLING FREQUENCY	666
<i>T. Wagner, D. Klawinski, D. Meixner, C. Kohl</i>	
P5.14 - ESPI-ANALYSIS OF INDUCED STRESS ON CELLULAR SYSTEMS	669
<i>J. Gottschalk, A. Seeliger, C. Stollfuß, K. Lietzau, A. Foitzik, M. Richetta</i>	
P5.15 - SIMULATION, MANUFACTURING AND EVALUATION OF INJECTION MOLDED MICROBIOREACTORS	672
<i>F. Schütze, N. Matuschek, S. Zinn, A. Böhme, A. Foitzik, L. Santo</i>	
P5.17 - IN SITU MEASUREMENTS OF O₂ AND CO IN CEMENT KILNS	678
<i>O. Driesner, F. Gumprecht, U. Guth</i>	

Author Index