Septemper 5 (Sun)	
14:00 -17:00	Registration @Convention center in Osaka University
17:30 - 20:00	Welcome Reception @La Scena in Osaka University (GSE common east 15th floor)

Septemper 6 (Mon)							
8:40							Registration @1F Lobby
9:00 - 10:00	OPENING Ceremony (MO Hall)						
10:00 - 10:20	Break						
10:20 - 11:00	Plenary Lecture: T.Pfeifer (MO Hall)						
11:00 - 11:10	Break						
11:10 - 11:50	Plenary Lecture: R.Leach (MO Hall)						
11:50 - 12:30	Plenary Lecture: K.Takamasu (MO Hall)						
12:30 - 14:00	LUNCH						
14:00 - 15:20	B-1	C-1 Keynote K.D.Sommer	D-1	Keynote S.-W.KIM E-1	F-1	Industrial Exhibition @3F Lobby	
15:20 - 15:50	Coffee break						
15:50 - 17:30	B-2	C-2 Keynote H.Ina	D-2	E-2	Keynote S.Zahwi F-2		

B-1 3-D Surface Texture and its Micro Characteristics **B-2** Gear Metrology
C-1 Optical Measurement for Geometrical Quantity Evaluation (1)
C-2 MEMS/MOEMS application in Measurement field
D-1 Advanced Optoelectronic Sensors & Instrument (1) **D-2** Advanced Optoelectronic Sensors & Instrument (2)
E-1 Ultra Precision Length Measurement **E-2** CMM Metrology (1)
F-1 Macrogeometric Features & Uncertainty Evaluation **F-2** Uncertainty Evaluation & Traceability (1)

Septemper 7 (Tue)								
9:00 - 9:40	Plenary Lecture: A.Weckenmann (MO Hall)							Registration @1F Lobby
9:40 - 10:20	Plenary Lecture: B.Ramamoorthy (MO Hall)							
10:20 - 10:30	Break							
10:30 - 12:10	Best Paper Award	B-3	C-3	D-3	E-3	F-3	Industrial Exhibition @3F Lobby	
	-		Keynote Y.Gao					
12:10 - 13:30	LUNCH							
13:30 - 14:50	Poster session @3F Lobby							
14:50 - 15:20	Coffee break							
15:20 - 17:00	-	B-4	Keynote R.Jablonski	D-4	E-4	F-4		
			C-4					
18:00 -20:30	Conference Banquet @SENRI-HANKYU HOTEL							

B-3 Optical Measurement for Geometrical Quantity Evaluation (2)
C-3 Pre-, In-, Post process measurement
D-3 Quality Control
E-3 CMM Metrology (2)
F-3 Uncertainty Evaluation and Traceability (2)

B-4 Intelligent Micro and Nano Metrology (1)
C-4 Analytical Method for Uncertainty Evaluation
D-4 Optical Measurement for Geometrical Quantity Evaluation (3)
E-4 CMM Metrology (3)
F-4 Tolerance, Testing, Test Planning

Septemper 8 (Wed)							
9:00 - 10:20	B-5	C-5	D-5	E-5	F-5	Industrial Exhibition @3F Lobby	Information Desk @1F Lobby
10:20 - 10:30	Break						
10:30 - 11:50	B-6	C-6	D-6	E-6	F-6		
11:50 - 12:10	Break						
12:10 - 12:40	Closing Ceremony @Room F						

B-5 Novel Method for Medical and Biological Measurement
C-5 Machine Vision and Image Processing
C-6 Optical Measurement for Geometrical Quantity Evaluation (4)
D-5 Intelligent Micro and Nano Metrology (2)
E-5 Nano Photonics in Intelligent Measurement
F-5 Intelligent Measurement Algorithm and Simulation (1)

B-6 X-Ray Application for 3-D Measuremen
D-6 Pre-, In-, Post process measurement (2)
E-6 Geometrical Product Specification and Form Test
F-6 Intelligent Measurement Algorithm and Simulation (2)

Final Program

Plenary1 Monday, 10:20 to 11:00 – MO Hall (Room A)

Plenary1

Chair: Prof. Wei Gao

10:20 **IN-LINE MEASUREMENT OF MICRO-GEOMETRIES WITH CONFOCAL MICROSCOPY**

Tilo PFEIFER

Plenary2 Monday, 11:10 to 11:50 – MO Hall (Room A)

Plenary2

Chair: Prof. Wei Gao

11:10 **A CRITICAL REVIEW OF MICRO-CMM PROBING TECHNOLOGY**

Richard LEACH

Plenary3 Monday, 11:50 to 12:30 – MO Hall (Room A)

Plenary3

Chair: Prof. Wei Gao

11:50 **UNCERTAINTY ESTIMATION FOR PROFILE MEASUREMENT BY MULTI-SENSORS METHOD**

Kiyoshi TAKAMASU

B-1 3-D Surface Texture and its Micro Characteristics

Chair: Prof. Wen-Pin Shih, Vice-Chair: Dr.Yoshikazu Kobayashi

14:00 MULTI SCALE MORPHOLOGICAL METROLOGY OF PISTON-RING-TEXTURED CYLINDER LINER ASSEMBLY IN RELATION TO THEIR TRIBOLOGICAL PROPERTIES (148)

F-P. NINOVE, *Ecole Centrale de Lyon, Laboratoire de Tribologie et Dynamique des Systèmes (LTDS), CNRS, France*
T. G. MATHIA, *Ecole Centrale de Lyon, Laboratoire de Tribologie et Dynamique des Systèmes (LTDS), CNRS, France*
D. MAZUYER, *Ecole Centrale de Lyon, Laboratoire de Tribologie et Dynamique des Systèmes (LTDS), CNRS, France*
P. PAWLUS, *Rzeszow University of Technology, Department of Manufacturing Processes and Production Organization, Poland*
S. CARRAS, *ALTIMET SAS 1, bis Av. des Tilleuls, 74200 Thonon-les bains, France*
J. GRUSZKA, *MAHLE Polska, ul. Mahle 6, 63-700 Krotoszyn, Poland*

14:20 CHARACTERIZATION OF GEOMETRICAL PROPERTIES OF ELECTROPLATED DIAMOND TOOL (52)

Mohd Fauzi ISMAIL, *Nagaoka University of Technology, Japan, Universiti Teknologi MARA, Malaysia*
Kazuhisa YANAGI, *Nagaoka University of Technology, Japan*
Hiromi ISOBE, *Nagaoka University of Technology, Japan*

14:40 3D NATURAL SURFACE FEATURES OF NODULAR SPHEROIDAL CAST IRON AND ITS MORPHOLOGICAL BEHAVIOUR IN ABRASIVE MANUFACTURING (150)

François-Pierre NINOVE, *Ecole Centrale de Lyon, Laboratoire de Tribologie et Dynamique des Systèmes (LTDS), CNRS, France*
Cezary. RAPIEJKO, *Technical University of Lodz, Poland*
Thomas G. MATHIA, *Ecole Centrale de Lyon, Laboratoire de Tribologie et Dynamique des Systèmes (LTDS), CNRS, France*

15:00 EVALUATION OF SPREADING BEHAVIOR OF LIQUIDS ON SURFACES WITH FUNCTION-ORIENTED 3D PARAMETERS(11)

Özgür TAN, *Chair Quality Management and Manufacturing Metrology, University Erlangen-Nuremberg, Germany*
Albert WECKENMANN, *Chair Quality Management and Manufacturing Metrology, University Erlangen-Nuremberg, Germany*

C-1 Optical Measurement for Geometrical Quantity Evaluation (1)

Chair: Dr. Michael P. Krystek

14:20 HIGH-RESOLUTION IMAGING TECHNIQUE BASED ON ACTIVE SHIFT OF OPTICAL AXIS (94)

Shin USUKI, *Division of Global Research Leaders, Shizuoka University, Japan*
Kenjiro T. MIURA, *Graduate School of Science and Technology, Shizuoka University, Japan*

14:40 < KEYNOTE > MODELLING OF MEASUREMENTS FOR MEASUREMENT DATA AND UNCERTAINTY EVALUATION

Klaus-Dieter SOMMER, *Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany*
Rüdiger KESSEL, *National Institute of Standards and Technology (NIST),Gaithersburg, U.S.A.*
Albert WECKENMANN, *University of Erlangen-Nuremberg, Germany*

D-1 Advanced Optoelectronic Sensors and Instrument(1)

Chair: Prof. Ichiro Ishimaru, Vice-Chair: Prof. Zhao Hui

14:00 OTDR-BASED TECHNIQUE FOR DETECTING SIGNALS OF FBG SENSORS IN THE WIDE SPECTRAL RANGE FOR MEASURING STRAIN AND TEMPERATURE (126)

Yuri KULCHIN, *Institute for Automation and Control Processes FEB RAS, Russia*
Oleg VITRIK, *Institute for Automation and Control Processes FEB RAS, Russia*
Anton DYSHLYUK, *Institute for Automation and Control Processes FEB RAS, Russia*
Zhi ZHOU, *School of Civil Engineering, Dalian University of Technology, China*
Jinping OU, *School of Civil Engineering, Dalian University of Technology, China*

14:20 A COMPACT 2D MICRO-ANGLE SENSOR (115)

Mengdong LIAN, *The state key lab of fluid power transmission and control, Zhejiang University, China*
Bing-Feng JU, *The state key lab of fluid power transmission and control, Zhejiang University, China*

14:40 AN OPTICAL SENSOR FOR MEASUREMENT OF ANGULAR MOTIONS OF A PLANAR MOTION STAGE (15)

Hiroshi MUTO, *Nano-Metrology and Control Lab, Department of Nanomechanics, Tohoku University, Japan*
Tetsuo SUGENO, *Nano-Metrology and Control Lab, Department of Nanomechanics, Tohoku University, Japan*
Yusuke SAITO, *Nano-Metrology and Control Lab, Department of Nanomechanics, Tohoku University, Japan*
Yoshikazu ARAI, *Nano-Metrology and Control Lab, Department of Nanomechanics, Tohoku University, Japan*
Wei GAO, *Nano-Metrology and Control Lab, Department of Nanomechanics, Tohoku University, Japan*

15:00 ANALYSIS OF MECHANICAL ERRORS OF PLANAR CAPACITIVE SENSOR FOR TWO DIMENSIONAL DISPLACEMENT MEASUREMENT (125)

Wen WANG, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China*
Jianping YU, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China*
Yaohua WEN, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China*
Zichen CHEN, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China*

E-1 Ultra Precision Length Measurement

Chair: Prof. Rainer Tusch

14:00 **< KEYNOTE > ULTRAFAST OPTICS FOR ULTRAPRECISION LENGTH MEASUREMENT**

Seung-Woo KIM, *Korea Advanced Institute of Science and Technology (KAIST)*

14:40 3D MEASURMENTS OF MICROSTRUCTURES WITH LARGE LATERAL DIMENSIONS (20)

Martin BRETSCHNEIDER, *Leibniz Universität Hannover, Germany*
Moritz KRAUß, *Leibniz Universität Hannover, Germany*
Markus KÄSTNER, *Leibniz Universität Hannover, Germany*
Eduard REITHMEIER, *Leibniz Universität Hannover, Germany*

15:00 SUPER-HETRODYNE INTERFEROMETRIC LENGTH MEASUREMENT USING THE REPETITION FREQUENCY OF AN OPTICAL FREQUENCIES COMB (47)

Hirokazu MATSUMOTO, *Department of Precision Engineering, The University of Tokyo, Japan*
Satoru TAKAHASHI, *Department of Precision Engineering, The University of Tokyo, Japan*
Kiyoshi TAKAMASU, *Department of Precision Engineering, The University of Tokyo, Japan*

F-1 Macrogeometric Features and Uncertainty Evaluation

Chair: Prof. Gustavo Daniel Donatelli, Vice-Chair: Dr. Taeho Ha

14:00 AUTOCOLLIMATOR CHARACTERIZATION AND CALIBRATION AT THE PTB: CURRENT STATUS AND FUTURE PROGRESS (55)

Ralf D. GECKELER, *Physikalisch-Technische Bundesanstalt, Germany*
Andreas JUST, *Physikalisch-Technische Bundesanstalt, Germany*
Michael KRAUSE, *Physikalisch-Technische Bundesanstalt, Germany*
Harald BOSSE, *Physikalisch-Technische Bundesanstalt, Germany*

14:20 ESTIMATION OF MEASUREMENT UNCERTAINTY OF LINE EDGE ROUGHNESS BASED ON THE NEXT GENERATION GPS (154)

JIANG ZHUANGDE, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an, China, School of Mechanical Engineering, University of Birmingham, Edgbaston, Birmingham, UK*
ZHAO FENGXIA, *School of Mechanical Engineering, Zhengzhou University, Zhengzhou, China*
JING WEIXUAN, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an, China*
WANG CHENYING, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an, China*
Philip D. PREWETT, *School of Mechanical Engineering, University of Birmingham, Edgbaston, Birmingham, UK*
Kyle JIANG, *School of Mechanical Engineering, University of Birmingham, Edgbaston, Birmingham, UK*

14:40 NATURALLY GROWN SILICON STRUCTURES AS AN INTERCOMPARISON STANDARD FOR MULTISENSOR DATA FUSION IN GEOMETRICAL SURFACE CHARACTERIZATION (23)

Sophie GRÖGER, *Institute of Production Measuring Technology and Quality Assurance,Chemnitz University of Technology, Germany*
Michael DIETZSCH, *Institute of Production Measuring Technology and Quality Assurance,Chemnitz University of Technology, Germany*

B-2 Gear Metrology

Chair: Dr. Klaus Wendt, Vice-Chair: Dr. Tatsuya Kume

15:50 COMPREHENSIVE REPRESENTATION OF PITCH DEVIATIONS SUITABLE FOR ENGAGEMENT EVALUATION IN DIFFERENT TYPES OF GEARS (51)

Syuhei KUROKAWA, *Department of Mechanical Engineering, Kyushu University, Japan*
Yasutsune ARIURA, *Faculty of Engineering, Graduate School, Kyushu Univeristy, Japan*
Toshiro DOI, *Department of Mechanical Engineering, Kyushu University, Japan*

16:10 LASER INTERFEROMETRIC MEASURING METHOD OF INVOLUTE ARTIFACT (63)

Masaharu KOMORI, *Kyoto University, Japan*
Fumi TAKEOKA, *Kyoto University, Japan*
Aizoh KUBO, *Kyoto University, Japan*
Hiroshige FUJIO, *Kyoto University, Japan*
Takehiro ITO, *Kyoto University, Japan*
Sonko OSAWA, *AIST, Japan*
Osamu SATO, *AIST, Japan*
Toshiyuki TAKATSUJI, *AIST, Japan*

16:30 FAST ALGORITHMS FOR IN-LINE GEARWHEEL MEASUREMENTS (5)

A. PAHLKE, *Institute of Measurement and Automatic Control Leibniz Universität Hannover, Germany*
M. KÄSTNER, *Institute of Measurement and Automatic Control Leibniz Universität Hannover, Germany*
E. REITHMEIER, *Institute of Measurement and Automatic Control Leibniz Universität Hannover, Germany*

16:50 NOVEL ARTIFACTS USING SIMPLE GEOMETRIES FOR EVALUATION OF A GEAR MEASURING INSTRUMENT (49)

Sonko OSAWA, *National Metrology Institute of Japan/ AIST, Japan*
Osamu SATO, *National Metrology Institute of Japan/ AIST, Japan*
Yohan KONDO, *National Metrology Institute of Japan/ AIST, Japan*
Masaharu KOMORI, *Department of Mechanical Engineering and Science, Kyoto University, Japan*
Fumi TAKEOKA, *Department of Mechanical Engineering and Science, Kyoto University, Japan*
Toshiyuki TAKATSUJI, *National Metrology Institute of Japan/ AIST, Japan*

17:10 A NOVEL METHOD & ITS REALIZATION FOR SINGLE-FLANK TESTING OF FINE-PITCH GEARS (27)

Zhaoyao SHI, *College of Mechanical Engineering and Applied Electronics Technology, Beijing University of Technology, Beijing, China*
Wannian ZHANG, *College of Mechanical Engineering and Applied Electronics Technology, Beijing University of Technology, Beijing, China*
Jiachun LIN, *College of Mechanical Engineering and Applied Electronics Technology, Beijing University of Technology, Beijing, China*

C-2 MEMS/MOEMS application in Measurement field

Chair: Dr. Ralf D. Geckeler

15:50 FABRICATION AND CHARACTERIZATION OF A MINIATURE SELF-SENSING JOINT OF CARBON NANOTUBE BUNDLES (114)

Hsin-Ying LIN, *Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan*
Ding-Hao CHEN, *Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan*
Shang-Yi LIU, *Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan*
Po-Ken CHUNG, *Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan*
Wen-Pin SHIH, *Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan*
Lung-Jieh YANG, *Department of Mechanical and Electromechanical Engineering, Tamkang University, Taipei County, Taiwan*

16:10 COUNTING OF ELECTRIC CHARGE FOR CONTROL OF LOCAL METAL PLATING USING A SCANNING NANOPIPETTE PROBE MICROSCOPE (98)

So ITO, *Graduate School of Science and Technology, Shizuoka University, Japan*
Futoshi IWATA, *Graduate School of Science and Technology, Shizuoka University, Japan*

16:30 DESIGN AND EVALUATION OF OIL-FILLED ISOLATED HIGH TEMPERATURE PIEZORESISTIVE PRESSURE SENSOR (155)

Libo ZHAO, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, China*
Zhuangde JIANG, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, China*
Yulong ZHAO, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, China*
Yuanhao LIU, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, China*
Jianbo LI, *State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, China*
Jingbo XU, *State Petrochina Northwest Marketing Company, Lanzhou, China*
Yong LI, *State Key Laboratory of Tribology, Tsinghua University, Beijing, China*

16:50 **< KEYNOTE > FOCUS AND DOSE CONTROL FOR LITHOGRAPHY OF SEMICONDUCTOR MANUFACTURING USING MANY KIND MEASUREMENT TOOLS RESPECTIVELY**

Hideki INA, *Canon Inc., Japan*

D-2 Advanced Optoelectronic Sensors and Instrument(2)

Chair: Dr. Futoshi Iwata

15:50 ERROR ANALYSIS OF OPTICAL ACTIVITY FOR STANDARDIZATION BY DUAL ROTATING POLARIMETER (132)

Masanosuke TANAKA, *ATAGO CO.,LTD., Tokyo University of agriculture and Technology, Japan*
Yoshinori NAKAJIMA, *ATAGO CO.,LTD., Japan*
Hideyuki AMEMIYA, *ATAGO CO.,LTD., Japan*
Yukitoshi OTANI, *Tokyo University of agriculture and Technology, Japan*

16:10 DIMENSION MEASUREMENT OF THE INSIDE SHAPE OF SPECIAL OIL PIPE WITH THREE-DIMENTIONAL ENDOSCOPE (129)

Wei TAO, *Department of Instruement Science and Technology, Shanghai Jiaotong University, China*
Hui ZHAO, *Department of Instruement Science and Technology, Shanghai Jiaotong University, China*
Yi SHEN, *Steel Pipe factory of Shanghai Baosteel CO.LTD, China*
Weiying JI, *Steel Pipe factory of Shanghai Baosteel CO.LTD, China*

16:30 DEVELOPMENT OF A SINGLE-SHOT LASER RANGEFINDER WITH QUADRATURE REFERENCE SIGNALS SAMPLING (87)

Masahiro OHISHI, *Topcon Corporation, Japan*
Fumio OHTOMO, *Topcon Corporation, Japan*
Yosikatsu TOKUDA, *Topcon Corporation, Japan*
Chikao NAGASAWA, *Tokyo Metropolitan University, Japan*

16:50 DESIGN AND REALIZATION OF DUAL WAVEGUIDE DIFFERENTIAL MAGNETOSTRICTIVE LINEAR POSITION SENSOR (112)

Yongjie ZHANG, *Shanghai Jiao Tong University, China*
Hui ZHAO, *Shanghai Jiao Tong University, China*
Weiwen LIU, *Shanghai Jiao Tong University, China*
Ruojie TAO, *Shanghai Jiao Tong University, China*
Wei TAO, *Shanghai Jiao Tong University, China*

E-2 CMM Metrology(1)

Chair: Dr. Henny Spaan

15:50 CALIBRATION OF ARTICULATED ARM COORDINATE MEASURING MACHINE CONSIDERING MEASURING POSTURE (18)

Hiroyuki HAMANA, *Tokyo Denki University, Japan*
Mitsushi TOMINAGA, *Tokyo Denki University, Japan*
Miyu OZAKI, *Tokyo Denki University, Japan*
Ryoshu FURUTANI, *Tokyo Denki University, Japan*

16:10 INSPECTION OF SPATIAL CAMS USING COORDINATE MEASURING MACHINE (40)

Jiachun LIN, *College of mechanical engineering and applied eclectronics technology, Beijing University of Technology, P.R.China*
Zhaoyao SHI, *College of mechanical engineering and applied eclectronics technology, Beijing University of Technology, P.R.China*
Lin TANG, *College of mechanical engineering and applied eclectronics technology, Beijing University of Technology, P.R.China*

16:30 DEVELOPMENT OF MICRO CONTACT DETECTION PROBE FOR MICRO-HOLE QUALITY CONTROL (163)

Ichiro OGURA, *National Institute of Advanced Industrial Science and Technology (AIST), Japan*
Yuichi OKAZAKI, *National Institute of Advanced Industrial Science and Technology (AIST), Japan*

16:50 DESIGN AND CONTROL OF 3-DOF ACTIVE SCANNING PROBE USING PARALLEL LINK MECHANISM (145)

Takashi HARADA, *Kinki University, Japan*
Ke DONG, *Graduate School of Science and Engineering, Kinki University, Japan*

F-2 Uncertainty Evaluation and Traceability(1)

Chair: Prof. Jerzy Sladek

15:50 **< KEYNOTE > CALIBRATION OF SURFACE PLATES USING AUTOCOLLIMATOR, LASER SYSTEMS AND COORDINATE MEASURING MACHINES (CMMS)**

Sarwat Zaki Ahmed ZAHWI, *National Institute for Standards of Egypt*

16:30 ERROR BUDGETING OF A THERMALLY STABLE CALIBRATION SETUP FOR TWO-DIMENSIONAL SENSORS (116)

José A. YAGÜE-FABRA*, University of Zaragoza, Spain*
José Antonio ALBAJEZ*, University of Zaragoza, Spain*
Juan José AGUILAR*, University of Zaragoza, Spain*
Margarita VALENZUELA*, University of Zaragoza, Spain*
Sinué ONTIVEROS*, University of Zaragoza, Spain*

16:50 METROLOGICAL COMPATIBILITY AND STATISTICAL CONSISTENCY (157)

Raghu N KACKER, *National Institute of Standards and Technology (NIST), USA*
Rüdiger KESSEL, *National Institute of Standards and Technology (NIST), USA*
Klaus-Dieter SOMMER, *Physikalisch-Technische Bundesanstalt (PTB), Germany*

17:10 RE-CALIBRATION EVALUATION UTILIZING DATA MINING METHODS (160)

Adriana HORNIKOVA, *Department of Statistics at Faculty of Economics Informatics, University of Economics in Bratislava, Slovakia, Institute for Production Engineering and Laser Technology, Austria*
M. Numan DURAKBASA, *Institute for Production Engineering and Laser Technology, Austria*
Friedrich BLEICHER, *Institute for Production Engineering and Laser Technology, Austria*

Plenary4 Tuesday, 9:00 to 9:40 – MO Hall (Room A)

Plenary4

Chair: Dr. Toshiyuki Takatsuji

9:00 **THE ROLE OF METROLOGY IN THE EXCHANGE OF GOODS AND IN THE DEVELOPMENT OF MANUFACTURING TECHNOLOGIES**
– THE BACKGROUND FOR IMEKO TC 14

Albert WECKENMANN

Plenary5 Tuesday, 9:40 to 10:20 – MO Hall (Room A)

Plenary5

Chair: Dr. Toshiyuki Takatsuji

9:40 **MACHINE VISION APPLICATIONS IN METROLOGY**

Ramamoorthy BALAKRISHNAN

Award session

Chair: Prof. Masato Aketagawa

10:30 TACTILE-OPTICAL MICROPROBES FOR THREE DIMENSIONAL MEASUREMENTS OF MICROPARTS (32)

Rainer TUTSCH, *Institute of Production Metrology, University of Braunschweig, Germany*
Matthias ANDRAES, *Werth Messtechnik GmbH, Siemensstraße, Gießen*
Ulrich NEUSCHAEFER-RUBE, *Physikalisch-Technische Bundesanstalt, Bundesallee, Braunschweig*
Marcus PETZ, *Institute of Production Metrology, University of Braunschweig, Germany*
Thomas WIEDENHOEFER, *Werth Messtechnik GmbH, Siemensstraße, Gießen*
Mark WISSMANN, *Physikalisch-Technische Bundesanstalt, Bundesallee, Braunschweig*

10:50 ADVANCED ABSOLUTE LENGTH METROLOGY BASED ON PULSE TRAINS' CONSTRUCTIVE INTERFERENCE – MEASUREMENTS OF METER ORDER WITH AN ACCURACY OF NANO ORDER – (1)

Dong WEI, *Department of Precision Engineering, The University of Tokyo, Japan*
Satoru TAKAHASHI*, Department of Precision Engineering, The University of Tokyo, Japan*
Kiyoshi TAKAMASU*, Department of Precision Engineering, The University of Tokyo, Japan*
Hirokazu MATSUMOTO*, Department of Precision Engineering, The University of Tokyo, Japan*

11:10 REFLECTIVE PROPERTY OF TYPICAL MICRO STRUCTURES UNDER WHITE LIGHT INTERFEROMETER (152)

Z. SUN, *Chair Quality Management and Manufacturing Metrology,*
University Erlangen-Nuernberg, Germany
A. WECKENMANN, *Chair Quality Management and Manufacturing Metrology,*
University Erlangen-Nuernberg, Germany

B-3 Optical Measurement for Geometrical Quantity Evaluation (2)

Chair: Dr. Takashi Harada, Vice-Chair: Dr. Futoshi Iwata

10:30 3D MEASUREMENT OF THE INNER SHAPE OF ACCELERATOR CAVITIES (104)

Kazuhiro ENAMI, *Mechanical Engineering Center, High Energy Accelerator Research Organization, Tsukuba, JAPAN*

Tatsuya KUME, *Mechanical Engineering Center, High Energy Accelerator Research Organization, Tsukuba, JAPAN*

Yasuo HIGASHI, *Mechanical Engineering Center, High Energy Accelerator Research Organization, Tsukuba, JAPAN*

Kenji UENO, *Mechanical Engineering Center, High Energy Accelerator Research Organization, Tsukuba, JAPAN*

10:50 DESIGN AND CALIBRATION OF COORDINATE MEASURING SYSTEM BASED ON SCANNING LASER PLANE (107)

Dabao LAO, *National State Key Laboratory of Precision Measuring Technology and Instruments in Tianjin University of China, CHINA*

Xueyou YANG, *National State Key Laboratory of Precision Measuring Technology and Instruments in Tianjin University of China, CHINA*

Jigui ZHU, *National State Key Laboratory of Precision Measuring Technology and Instruments in Tianjin University of China, CHINA*

11:10 RESOLUTION CHARACTERISTICS OF SUPER-RESOLUTION OPTICAL INSPECTION USING STANDING WAVE ILLUMINATION (134)

Ryota KUDO, *Department of Precision Engineering, The University of Tokyo, Japan*
Shin USUKI, *Division of Global Research Leaders, Shizuoka University, Japan*
Satoru TAKAHASHI, *Department of Precision Engineering, The University of Tokyo, Japan*
Kiyoshi TAKAMASU, *Department of Precision Engineering, The University of Tokyo, Japan*

11:30 PROFILE MEASUREMENT OF LARGE ASPHERIC OPTICAL SURFACE BY SCANNING DEFLECTOMETRY WITH ROTATABLE MIRROR - METHOD FOR ENLARGING MEASURING RANGE OF AUTOCOLLIMATOR- (17)

Muzheng XIAO, *Department of Precision Engineering, The University of Tokyo, Japan*
Satomi JUJO, *Department of Precision Engineering, The University of Tokyo, Japan*
Satoru TAKAHASHI, *Department of Precision Engineering, The University of Tokyo, Japan*
Kiyoshi TAKAMASU, *Department of Precision Engineering, The University of Tokyo, Japan*

11:50 OPTICAL 3D-CHARACTERIZATION FOR MULTISCALE WORKPIECES (19)

Laura SHAW, *Chair Quality Management and Manufacturing Metrology,*
University Erlangen-Nuremberg, Germany

Albert WECKENMANN, *Chair Quality Management and Manufacturing Metrology,*
University Erlangen-Nuremberg, Germany

C-3 Pre-, In-, Post process measurement

Chair: Prof. L. Vijayaraghvan

10:30 **< KEYNOTE > EFFECTS OF COOLANT CONCENTRATION ON TRANSPARENT WINDOW SIZE FOR THE WATER BEAM ASSISTED FORM ERROR IN-PROCESS OPTICAL MEASUREMENT**

Yongsheng GAO, *Hong Kong University of Science and Technology*

11:10 RESEARCH REGARDING MEASURING THE LASER BEAM DURING LASER PROCESSING (106)

Camil Octav CHETREANU DON, *Tehnical University Cluj Napoca, Romania*
Gabriel DUMITRU

11:30 DUAL-WAVELENGTH SIMULTANEOUS PHASE SHIFTING INTERFEROMETRY (SPSI) FOR ONE-SHOT MEASUREMENT (69)

Liang-Chia CHEN, *Graduate Institute of Automation Technology, National Taipei University of Technology, Taiwan*
Sheng-Lih YEH, *Department of Mechanical Engineering, Lunghwa University of Science and Technology*
Yan-Chao LIAO, *Graduate Institute of Automation Technology, National Taipei University of Technology, Taiwan*
Abraham Mario TAPILOUW, *Graduate Institute of Automation Technology, National Taipei University of Technology, Taiwan*

11:50 THE SIMULATION AND INSPECTION FOR THE STARTING PHENOMENON OF SLIT COATING PROCESS ON GLASS SUBSTRATE (117)

Ta-Hsin CHOU, *Industrial Technology Research Institute, Taiwan R.O.C.*
Wen-Hsien YANG, *Industrial Technology Research Institute, Taiwan R.O.C.*
Kuei-Yuan CHENG, *Industrial Technology Research Institute, Taiwan R.O.C.*
Yu-Chen CHANG, *Yuan Ze University, Taiwan R.O.C.*
Thomas LUO, *Yuan Ze University, Taiwan R.O.C.*

D-3 Quality Control

Chair: Prof Ryszard Jablonski, Vice-Chair: Dr. Tatsuya Kume

10:30 GEOMETRY ASSURANCE AND QUALITY CONTROL PLANNING BY QAM (142)

Richard LINDQVIST, *Royal Institute of Technology, KTH Production Engineering, Stockholm, Sweden*
Karl-Johan KARLSSON, *Volvo Construction Equipment, Eskilstuna, Sweden*
Stefan HEDMAN, *Volvo Construction Equipment, Eskilstuna, Sweden*
Lars MATTSSON, *Royal Institute of Technology, KTH Production Engineering, Stockholm, Sweden*

10:50 SUSTAINABLE QUALITY ASSURANCE BY ASSURING COMPETENCE OF EMPLOYEES (54)

Teresa WERNER, *Chair Quality Management and Manufacturing Metrology, University Erlangen-Nuremberg, Germany*
Albert WECKENMANN, *Chair Quality Management and Manufacturing Metrology, University Erlangen-Nuremberg, Germany*

11:10 INTRODUCING QUALITY CONTROL LOOPS FOR THE INTEGRATED ANALYSIS AND DESIGN OF STABLE PRODUCTION SYSTEMS (147)

Robert SCHMITT, *Laboratory for Machine Tools and Production Engineering WZL, RWTH Aachen University, Germany*
Tilo PFEIFER, *Laboratory for Machine Tools and Production Engineering WZL, RWTH Aachen University, Germany*
Sebastian T. STILLER, *Laboratory for Machine Tools and Production Engineering WZL, RWTH Aachen University, Germany*
Patrick BEAUJEAN, *Laboratory for Machine Tools and Production Engineering WZL, RWTH Aachen University, Germany*

11:30 CAPABLE PRODUCTION PROCESSES BY DYNAMIC TOLERANCING (31)

Rainer TUTSCH, *Institute of Production Metrology, University of Braunschweig, Germany*
Carlos HERNANDEZ, *Institute of Production Metrology, University of Braunschweig, Germany*

11:50 EQUIPP – EXCHANGE OF QUALITY MEASUREMENT PROCESS PLANS (144)

Richard LINDQVIST, *Royal Institute of Technology, KTH Production Engineering, Stockholm, Sweden*
John HORST, *NIST, Gaithersburg, USA*
Robert BROWN, *Mitutoyo America Corporation, USA*
Lars MATTSSON, *Royal Institute of Technology, KTH Production Engineering, Stockholm, Sweden*

E-3 CMM Metrology (2)

Chair: Prof. Sarwat Zahwi, Vice-Chair: Dr. Ichiro Ogura

10:30 METHOD FOR A TRACEABLE GEOMETRY ASSESSMENT OF ARBITRARILY SHAPED SCULPTURED SURFACES (74)

Markus BARTSCHER, *Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin, Germany*
Marko NEUKAMM, *Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin, Germany*
Michael KRYSTEK, *Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin, Germany*

10:50 A THREE LASER INTERFEROMETERS AND ONE AUTOCOLLIMATOR SYSTEM FOR MEASURING THE YAW AND STRAIGHTNESS ERRORS OF A X-Y STAGE ON HIGH PRECISION CMM (58)

Ping YANG, *Precision Engineering, The University of Tokyo, Tokyo, Japan*
Shusaku SHIBATA, *Precision Engineering, The University of Tokyo, Tokyo, Japan*
Tomohiko TAKAMURA, *Precision Engineering, The University of Tokyo, Tokyo, Japan*
Satoru TAKAHASHI, *Precision Engineering, The University of Tokyo, Tokyo, Japan*
Kiyoshi TAKAMASU, *Precision Engineering, The University of Tokyo, Tokyo, Japan*
Osamu SATO, *Advanced Industrial Science and Technology, Tokyo, Japan*
Sonko OSAWA, *Advanced Industrial Science and Technology, Tokyo, Japan*
Toshiyuki TAKATSUJI, *Advanced Industrial Science and Technology, Tokyo, Japan*

11:10 MOBILE MULTI-LATERATION MEASURING SYSTEM FOR HIGH ACCURATE AND TRACABLE 3D MEASUREMENTS OF LARGE OBJECTS (25)

Klaus WENDT, *Physikalisch-Technische Bundesanstalt Baunschweig und Berlin, Germany*
Matthias FRANKE, *Physikalisch-Technische Bundesanstalt Baunschweig und Berlin, Germany*
Frank HÄRTIG, *Physikalisch-Technische Bundesanstalt Baunschweig und Berlin, Germany*

11:30 EFFICIENT MULTIPLE-MEASUREMENT TECHNIQUE FOR ROTATIONALLY SYMMETRIC MEASURANDS (67)

Osamu SATO, *AIST, Japan*
Yohan KONDO, *Tokyo Institute of Technology , Japan*
Sonko OSAWA, *AIST, Japan*
Toshiyuki TAKATSUJI, *AIST, Japan*

11:50 ISARA 400: ENABLING ULTRA-PRECISION COORDINATE METROLOGY FOR LARGE PARTS (53)

Henny SPAAN, *IBS Precision Engineering, The Netherlands*
Rilpho DONKER, *IBS Precision Engineering, The Netherlands*
Ivo WIDDERSHOVEN, *IBS Precision Engineering, The Netherlands*

F-3 Uncertainty Evaluation and Traceability (2)

Chair: Prof. Weijxuan Jin, Vice-Chair: Dr. Yusuke Kajihara

10:30 METHODOLOGY FOR UNCERTAINTY ESTIMATION OF COORDINATE MEASUREMENTS (159)

Władysław JAKUBIEC, *University of Bielsko-Biała, Poland*
Wojciech PŁOWUCHA, *University of Bielsko-Biała, Poland*

10:50 ANALYSIS AND DESIGN OF THE BEST LAYOUT BASED ON THE NETWORK MEASUREMENT OF WMPS (110)

Zhi XIONG, *Tianjin University, State Key Laboratory of Precision Measuring Technology and Instruments of Tianjin, China*
Ji Gui ZHU, *Tianjin University, China*
Yong Jie REN, *Tianjin University, China*
Da Bao LAO, *Tianjin University, China*
Lei GENG, *Tianjin University, China*
Xue You YANG, *Tianjin University, China*
Sheng Hua YE, *Tianjin University, China*

11:10 UNCERTAINTY IN 3D METROLOGY INTEGRATED WITH THE PROCESS OF PRODUCT AND MEASUREMENT REALIZATION (37)

Crhistian R. BALDO, *Institute for Technological Research (IPT), Brazil*
Alvaro J. ABACKERLI, *Institute for Technological Research (IPT), Brazil*
Gustavo D. DONATELLI, *Reference Centres in Technology Innovation (CERTI), Brazil*
Francisco A. ARENHART, *Reference Centres in Technology Innovation (CERTI), Brazil*

11:30 A MORE GENERAL TYPE A EVALUATION (35)

Rüdiger KESSEL, *National Institute of Standards and Technology (NIST), USA*
Raghu N KACKER, *National Institute of Standards and Technology (NIST), USA*
Klaus-Dieter SOMMER, *Physikalisch-Technische Bundesanstalt (PTB), Germany*

11:50 PROPOSAL OF A CYLINDRICAL STANDARD TO EVALUATE THE UNCERTAINTY OF MEASUREMENT FOR MICRO GEAR MEASUREMENTS (30)

Gisela LANZA, *wbk Institute of Production Science, Karlsruhe Institute of Technology, Germany*
Benjamin VIERING, *wbk Institute of Production Science, Karlsruhe Institute of Technology, Germany*

Poster Session

NEW DETECTION TECHNIQUE FOR TIMING OF CONTACT AND NONCONTACT OF ATHLETE’S FOOT WITH GROUND IN SPORTS (2)

Koichi KURITA, *Kochi National College of Technology, Japan*

A HIGH-STABLE PRESSURE SENSOR BASED ON A SOI HETEROSTRUCTURE AND MEMS TECHNOLOGY FOR MEASURING AIRCRAFT SPEED-ALTITUDE DATA (3)

Leonid SOKOLOV, *Federal State Unitary Enterprise Institute of Aircraft Equipment (NIIAO), Russia*

QA FOR BLOOD CHEMICAL ANAIYSIS BY ISO-GUM (4)

Yasuo IWAKI, *Chaos Applied Research Office Kyoto, Japan*

PARAMETERS SELECTION FOR CMM CONTACT MEASUREMENTS OF FREE-FORM SURFACES SHAPEDEVIATIONS (12)

Andrzej WERNER, *Bialystok University of Technology, Poland*
Malgorzata PONIATOWSKA, *Bialystok University of Technology, Poland*

ANALYSIS OF GEOMETRIC DEVIATIONS OF FREE-FORM SURFACES DETERMINED IN COORDINATE MEASUREMENTS (13)

Malgorzata PONIATOWSKA, *Bialystok University of Technology, Poland*
Andrzej WERNER, *Bialystok University of Technology, Poland*

GENERATION AND ASSESSMENT OF RANDOM SURFACE TEXTURE IN A WIDE AREA (16)

Yoshikazu KOBAYASHI, *College of Engineering, Nihon University, Japan*
Kenji SHIRAI, *College of Engineering, Nihon University, Japan*
Kiyotaka KAWASAKI, *Graduate Student , College of Engineering, Nihon University, Japan*

Poster Session

A MULTI-PROBE SURFACE ENCODER FOR MOSAIC XY GRATING (42)

Koji HOSONO, *Nano-Metrology & Control Lab., Department of Nanomechanics, Tohoku University, Japan*
Akihide KIMURA, *Nano-Metrology & Control Lab., Department of Nanomechanics, Tohoku University, Japan*
Woo-jae KIM, *Nano-Metrology & Control Lab., Department of Nanomechanics, Tohoku University, Japan*
Wei GAO, *Nano-Metrology & Control Lab., Department of Nanomechanics, Tohoku University, Japan*
Lijiang ZENG, *State Key Laboratory of Precision Measurement Technology and Instruments, Department of Precision Instruments, Tsinghua University, China*

INVESTIGATING METHODS OF MATHEMATICAL MODELLING OF MEASUREMENT AND ANALYSIS OF SPHERICAL SURFACES (45)

Stanisław ADAMCZAK, *Kielce University of Technology, Poland*
Dariusz JANECKI, *Kielce University of Technology, Poland*
Krzysztof STĘPIEŃ, *Kielce University of Technology, Poland*

DEVELOPMENT OF A SYSTEM FOR COMPLEX GEOMETRY PARTS MEASURING USING A ROBOT AND A TRIANGULATION LASER PROBE (46)

J.J. AGUILAR, *Desing and Manufacturing Engineering Department, C.P.S. University of Zaragoza, Zaragoza, Spain*
D. GUILLOMÍA, *Desing and Manufacturing Engineering Department, C.P.S. University of Zaragoza, Zaragoza, Spain*
C. CAJAL, *Desing and Manufacturing Engineering Department, C.P.S. University of Zaragoza, Zaragoza, Spain*
F.J. BROSED, *Desing and Manufacturing Engineering Department, C.P.S. University of Zaragoza, Zaragoza, Spain*

ACCURACY ANALYSIS OF DIFERENT PROBES USED IN ARTICULATED ARM COORDINATE MEASURING MACHINES (56)

Jorge SANTOLARIA, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*
Juan José AGUILAR, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*
Agustín BRAU, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*
Lorenzo VILA, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*

Poster Session

COMPARATIVE ANALYSIS OF INTERNATIONAL STANDARDS FOR PERFORMANCE EVALUATION OF ARTICULATED ARM COORDINATE MEASURING MACHINES: ASME B89.4.22-2004 AND VDI 2617_9-2009 (57)

Jorge SANTOLARIA, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*

Juan José AGUILAR, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*

Ana Cristina MAJARENA, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*

David SAMPER, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*

Jesús José GARCÍA, *Design and Manufacturing Engineering Department, C.P.S. Universidad de Zaragoza, Spain*

TWO-WAVELENGTH LASER INTERFEROMETER SYSTEM WHICH REDUCES THE EFFECT OF THE REFRACTIVE INDEX OF AIR (66)

Kaoru MIYATA, *Mitutoyo Corporation, Japan*
Hidekazu OOZEKI, *Mitutoyo Corporation, Japan*
Hideyuki NAKAGAWA, *Mitutoyo Corporation, Japan*
Hiroki MASUDA, *Mitutoyo Corporation, Japan*
Hisayoshi SAKAI, *Mitutoyo Corporation, Japan*

THE MEASUREMENT OF CURVATURES BY USING MOIRÉ FRINGES AND MULTI-WAVELENGTH SELF-IMAGE EFFECT OF GRATINGS (73)

Jing-Heng CHEN, *Department of Photonics, Feng Chia University, Taiwan*

Kun-Huang CHEN, *Department of Electrical Engineering, Feng Chia University, Taiwan*

Shou-Wei KUO, *Department of Photonics, Feng Chia University, Taiwan*

Wei-Lun WU, *Department of Photonics, Feng Chia University, Taiwan*

Fan-Hsi HSU, *Department of Photonics, Feng Chia University, Taiwan*

Yung-Tsung CHANG, *Department of Electrical Engineering, Feng Chia University, Taiwan*

TASK-SPECIFIC UNCERTAINTY EVALUATION OF COORDINATE MEASUREMENTS USING MULTIPLE CALIBRATED WORKPIECES (77)

Francisco A. ARENHART, *Reference Centers in Technology Innovation (CERTI), Brazil*
Gustavo D. DONATELLI, *Reference Centers in Technology Innovation (CERTI), Brazil*
Mauricio C. PORATH, *Reference Centers in Technology Innovation (CERTI), Brazil*

Poster Session

SIMPLE OPTICAL APPARATUS FOR MEASURING THE CONCENTRATION OF SOLUTIONS (82)

Kun-Huang CHEN, *Department of Electrical Engineering, Feng Chia University, Taiwan*
Jing-Heng CHEN, *Department of Photonics, Feng Chia University, Taiwan*
Jiun-You LIN, *Department of Mechatronics Engineering, National Changhua University of Education, Taiwan,*
Shi-Sheng HU, *Department of Electrical Engineering, Feng Chia University, Taiwan*
Yi-Zuo SONG, *Department of Electrical Engineering, Feng Chia University, Taiwan*
Yung-Tsung CHANG, *Department of Electrical Engineering, Feng Chia University, Taiwan*

METROLOGICAL COMPETENCE OF ANGLE CALIBRATION FACILITY AT MEASUREMENT STANDARDS LABORATORY (91)

Fazil SYED, *King Fahd University of Petroleum & Minerals, Kingdom of Saudi Arabia*
Faheem MOHAMMAD, *King Fahd University of Petroleum & Minerals, Kingdom of Saudi Arabia*
Federico CEJALVO, *King Fahd University of Petroleum & Minerals, Kingdom of Saudi Arabia*

INTERFERENCE-FREE FIVE-AXIS NC MACHINING AND IN-PROCESS MEASUREMENT OF CYLINDRICAL CAM USING ENVELOPING ELEMENT (101)

Jeng-Nan LEE, *Department of Mechanical Engineering, Cheng Shiu University, Taiwan*
Ying-Chien TSAI, *Department of Mechanical Engineering, Cheng Shiu University, Taiwan*
Hung-Shyong CHEN, *Department of Mechanical Engineering, Cheng Shiu University, Taiwan*

ROLL-TO-ROLL EMBOSSING OF SUNLIGHT GUIDE FILM WITH WIDE OUTGOING ANGLE (109)

Ta-Hsin CHOU, *Industrial Technology Research Institute, Taiwan R.O.C.*
Wen-Hsien YANG, *Industrial Technology Research Institute, Taiwan R.O.C.*
Tzu-Yu HUANG, *National Tsing Hua University, Taiwan R.O.C.*
Hong HOCHENG, *National Tsing Hua University, Taiwan R.O.C.*

A METHOD OF HIGH-ACCURACY LASER SCANNING MEASUREMENT FOR CAMSHAFT (118)

Yong-jie REN, *State key laboratory of precision measuring technology and instruments, Tianjin University, China*
Ji-gui ZHU, *State key laboratory of precision measuring technology and instruments, Tianjin University, China*
Xue-you YANG, *State key laboratory of precision measuring technology and instruments, Tianjin University, China*
Sheng-hua YE, *State key laboratory of precision measuring technology and instruments, Tianjin University, China*

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THERMAL ERROR MODELING AND FORECASTING FOR NC MACHINE TOOLS BASED ON INTELLIGENT TECHNOLOGY (121)

Jian-zhong FU, *Department of Mechanical Engineering, Zhejiang University, China*
Xin-hua YAO, *Department of Mechanical Engineering, Zhejiang University, China*
Zi-chen CHEN, *Department of Mechanical Engineering, Zhejiang University, China*

RESEARCH ON THE THERMAL STABILITY COMPONENTS WITH CELLULAR STRUCTURES AND THE PHASE CHANGE MATERIAL IN MACHINE TOOLS (122)

Yong HE, *Department of Mechanical Engineering, Zhejiang University, China*
Jian-zhong FU, *Department of Mechanical Engineering, Zhejiang University, China*
Zi-chen CHEN, *Department of Mechanical Engineering, Zhejiang University, China*

EVALUATION TECHNOLOGY OF MICRO THREE-DIMENSIONAL STRUCTURE USING PHASE-SHIFTING DIGITAL HOLOGRAPHY (137)

Yoshiaki KIYAMA, Department of Mechanical Engineering, Osaka Univesity, Japan
Terutake HAYASHI, Department of Mechanical Engineering, Osaka Univesity, Japan
Yasuhiro TAKAYA, Department of Mechanical Engineering, Osaka Univesity, Japan

SURFACE SHAPE MEASUREMENT FOR SMALL LENS USING PHASE SHIFT SHEARING INTERFEROMETER (140)

Ryohei HANAYAMA, *The Graduate School for the Creation of New Photonics Industries, Japan*
Katsuhiro ISHII, *The Graduate School for the Creation of New Photonics Industries, Japan*

MODELLING OF THE CMM PROBE HEAD ERRORS (156)

Jerzy SLADEK, *Laboratory of Coordinate Metrology, Cracow University of Technology, Poland*
Adam GASKA, *Laboratory of Coordinate Metrology, Cracow University of Technology, Poland*

B-4 Intelligent Micro and Nano Metrology (1)

Chair: Prof. Numan Durakbasa, Vice-Chair: Prof. Ichiro Ishimaru

15:20 MEASUREMENT OF LONG-TERM DIMENSIONAL STABILITY OF GLASS CERAMICS USING A HIGH-PRECISION LINE SCALE CALIBRATION SYSTEM (161)

Akira TAKAHASHI, *Instruments Company, Nikon Corporation, Japan*

15:40 NON-CONTACT REMOTE MEASUREMENTS OF RING GAUGE USING A LOW-COHERENCE INTERFEROMETER (43)

Nobuyuki OHSAWA, *Tosei Engineering Corp. Auto Metrology Division, Japan*
Hirokazu MATSUMOTO, *Dept. Prec. Eng., The University of Tokyo, Japan*
Akiko HIRAI, *NMIJ, National Institute of Advanced Industrial Science and Technology, Japan*
Masatoshi ARAI, *Tokyo Seimitsu Co., LTD Metrology Company, Japan*
Tohru SHIMIZU, *Tosei Engineering Corp. Auto Metrology Division, Japan*
Takashi KIKUCHI, *Tosei Engineering Corp. Auto Metrology Division, Japan*

16:00 STRUCTURALIZATION OF METAL NANOPARTICLES BY PHOTOINDUCED AGGREGATION (135)

Kok Foong LEE, *Department of Mechanical Engineering, Osaka University, Japan*
Terutake HAYASHI, *Department of Mechanical Engineering, Osaka University, Japan*
Yasuhiro TAKAYA, *Department of Mechanical Engineering, Osaka University, Japan*

16:20 MEASUREMENT OF ABSOLUTE OPTICAL THICKNESS DISTRIBUTION OF SEMICONDUCTOR WAFER USING A WAVELENGTH TUNING INTERFEROMETER (131)

Yangjin KIM, *Korea Institute of Machinery and Materials, Korea*
Kenichi HIBINO, *National Institute of Advanced Science and Technology, Japan*
Youichi BITOU, *National Institute of Advanced Science and Technology, Japan*
Sonko OSAWA, *National Institute of Advanced Science and Technology, Japan*
Nohiko SUGITA, *The University of Tokyo, Japan*
Mamoru MITSUISHI, *The University of Tokyo, Japan*

C-4 Analytical Method for Uncertainty Evaluation

Chair: Dr. Ichiro Ogura

15:20 **< KEYNOTE > ANALYTICAL METHOD OF CALCULATING THE MEASUREMENT ACCURACY**

Ryszard JABLONSKI, *Warsaw University of Technology*

16:00 PROBABILITY DESCRIPTION OF TWO-PROCESS SURFACE TOPOGRAPHY (85)

Wiesław GRABOŃ, *Rzeszow University of Technology, Poland*
Paweł PAWLUS, *Rzeszow University of Technology, Poland*

16:20 SOFTWARE DATUM FOR CROSS-AXIS MOTION MEASUREMENT OF X-STAGE BASED ON LEAST UNCERTAINTY CRITERION (88)

Eiki OKUYAMA, *Akita University, Japan*
Hiroshi TAKAHASHI, *Akita University, Japan*
Hiromi ISHIKAWA, *Akita University, Japan*

16:40 EVALUATION METHOD FOR CONDITIONED POLISHING PAD SURFACE TOPOGRAPHY APPLYING FOURIER TRANSFORM ANALYSIS (93)

Keiichi KIMURA, *Kyushu Institute of Technology, Japan*
Panart KHAJORNRUNGRUANG, *Kyushu Institute of Technology, Japan*
Takahisa OKUSONO, *Kyushu Institute of Technology, Japan*

D-4 Optical Measurement for Geometrical Quantity Evaluation (3)

Chair: Prof. Fu Jianzhong, Vice-Chair: Dr. Shin Usuki

15:20 FREE SPECTRAL RANGE MEASUREMENT OF FABRY-PEROT CAVITY USING FREQUENCY MODULATION AND NULL METHOD UNDER OFF RESONANCE CONDITION (70)

M. AKETAGAWA, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*

T. YASHIKI, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*

S. KIMURA, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*

H. IWATA, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*

T. Q. BANH, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*

15:40 DEVELOPMENT OF A CONSTANT TEMPERATURE/ “AIR－REFRACTIVE－INDEX” CHAMBER USING FABRY-PEROT CAVITY (71)

Tuan Quoc BANH, *Graduate School, Department of Mechanical Engineering,*
Nagaoka University of Technology, Japan

Yuria OHKUBO, *Department of Mechanical Engineeing,*
Nagaoka University of Technology, Japan

Masato AKETAGAWA, *Department of Mechanical Engineeing,*
Nagaoka University of Technology, Japan

16:00 IN-SITU MICROSCOPIC SURFACE PROFILOMETRY BY LATERAL CONFOCAL SCANNING (LCS) FOR ROLL-TO-ROLL THIN-FILM FABRICATION (68)

Liang-Chia CHEN, *National Taipei University of Technology, Taiwan*

Sheng-Han CHEN, *National Taipei University of Technology, Taiwan*

Yi-Wei CHANG, *National Taipei University of Technology, Taiwan*

Zhi-Kai LI, *National Taipei University of Technology, Taiwan*

Shih-Hsuan KUO, *Industrial Technology Research Institute, Taiwan*

Huang-Wen LAI, *Industrial Technology Research Institute, Taiwan*

16:20 INFLUENCES OF SURFACE PARAMETERS ON LASER 3D SCANNING (26)

Nermina ZAIMOVIC-UZUNOVIC, *University of Zenica, Bosnia and Herzegovina*

Samir LEMES, *University of Zenica, Bosnia and Herzegovina*

16:40 NEW OPTICAL DISTANCE MEASUREMENT WITHOUT A PRISM REFRECTOR USING AN OPTICAL FREQUENCY COMB LASER (62)

Kazumasa ISAKA, *The graduate school of engineering at the University of Tokyo, Japan*

Satoru TAKAHASHI, *The graduate school of engineering at the University of Tokyo, Japan*

Kiyoshi TAKAMASU, *The graduate school of engineering at the University of Tokyo, Japan*

Hirokazu MATSUMOTO, *The graduate school of engineering at the University of Tokyo, Japan*

E-4 CMM Metrology (3)

Chair: Dr. Kazuhiro Enami

15:20 HIGH PRECISION TACTILE PROBING SIZE AND FORM MEASUREMENTS WITH A MICRO-CMM (6)

Michael NEUGEBAUER, *Physikalisch-Technische Bundesanstalt (PTB), Germany*
Frank HÄRTIG, *Physikalisch-Technische Bundesanstalt (PTB), Germany*
Otto JUSKO, *Physikalisch-Technische Bundesanstalt (PTB), Germany*

15:40 EXPERIMENTAL EVALUATION OF TECHNIQUES FOR OUTLIER RECOGNITION AND ELIMINATION ON FORM MEASUREMENT PROFILES (78)

Felipe L. PROBST, *Reference Centers in Technology Innovation (CERTI), Brazil*
Francisco A. ARENHART, *Reference Centers in Technology Innovation (CERTI), Brazil*
Gustavo D. DONATELLI, *Reference Centers in Technology Innovation (CERTI), Brazil*
Robert SCHMITT, *Werkzeugmaschinenlabor (WZL) of RWTH-Aachen, Germany*
Susanne NISCH, *Werkzeugmaschinenlabor (WZL) of RWTH-Aachen, Germany*

16:00 VERIFICATION OF INTERIM CHECK METHOD OF CMM (7)

Yusuke ASANO, *Tokyo Denki University, Japan*
Ryoshu FURUTANI, *Tokyo Denki University, Japan*
Miyu OZAKI, *Tokyo Denki University, Japan*

16:20 EVALUATION METHOD FOR MICRO-CMM SPHERICAL STYLUS TIPS USING MICRO-EDM ON-MACHINE MEASUREMENT (60)

Dong-Yea SHEU, *National Taipei University of Technology, Taiwan*
Richard LEACH, *National Physical Laboratory, UK*

F-4 Tolerance, Testing, Test Planning

Chair: Prof. Yongseng Gao, Vice-Chair: Dr. Takashi Harada

15:20 EVALUATION OF THE MEASUREMENT ALGORITHM FOR OUT-OF-ROUNDNESS MEASUREMENT WITH CMM (149)

Michal WIECZOROWSKI, *Poznan University of Technology, Poland*
Bartosz GAPINSKI, *Poznan University of Technology, Poland*
Thomas MATHIA, *Ecole Centrale de Lyon, France*

15:40 ESTABLISHMENT OF A PRIMARY LEVEL LAB FACILITY AT MEASUREMENT STANDARDS LABORATORY TO CALIBRATE AIR VELOCITY SENSORS (81)

Fazil SYED, *King Fahd University of Petroleum & Minerals, Kingdom of Saudi Arabia*
Faheem MOHAMMAD, *King Fahd University of Petroleum & Minerals, Kingdom of Saudi Arabia*
Federico CEJALVO, *King Fahd University of Petroleum & Minerals, Kingdom of Saudi Arabia*

16:00 MEASUREMENT UNCERTAINTY IN THE ASSESSMENT OF CONFORMITY (76)

Michael KRYSTEK, *Physikalisch-Technische Bundesanstalt, Germany*
Klaus-Dieter SOMMER, *Physikalisch-Technische Bundesanstalt, Germany*
W. Tyler ESTLER, *National Institute of Standards and Technology, USA*

16:20 DESIGN AND VERIFICATION OF BONDING MODULE FOR LARGE-SCALE PCB BONDER (95)

Tien-Tung CHUNG, *National Taiwan University, Taiwan (R.O.C.)*
Chin-Te LIN, *National Taiwan University, Taiwan (R.O.C.)*
Hsun-Fu CHIAN, *National Taiwan University, Taiwan (R.O.C.)*
Shou-Heng CHEN, *National Taiwan University, Taiwan (R.O.C.)*
Kuang-Chao FAN, *National Taiwan University, Taiwan (R.O.C.)*

16:40 MORPHOLOGICAL CRITERIA FOR MICRO TOLERANCING IN MANUFACTURING PROCESSES OF ASSEMBLY JOINTS UNDER FRETTING CONDITIONS (143)

K.J. KUBIAK, *Institute of Engineering Thermofluids Surfaces and Interfaces, School of Mechanical Engineering - University of Leeds, United Kingdom*
T.G. MATHIA, *Laboratoire de Tribologie et Dynamique des Systèmes, Ecole Centrale de Lyon, France*
S. CARRAS, *ALTIMET SAS 1, France*

B-5 Novel Method for Medical and Biological Measurement

Chair: Dr. Taeho Ha

9:00 PERSPECTIVE SENSORY MEASUREMENT METHOD BY USING MULTI VIEW POINT 3D GLASS-FREE DISPLAY (39)

Yoshihito KIKUCHI, *Hokkai-Gakuen University, Japan*
Takahiro YAMANOI, *Hokkai-Gakuen University, Japan*

9:20 PHOTONIC BIOSENSOR FOR LAB-ON-A-CHIP APPLICATIONS (28)

Stefanie DEMMING, *Institut für Mikrotechnik, Technische Universität Braunschweig, Germany*
Andreu LLOBERA, *Institut für Mikrotechnik, Technische Universität Braunschweig, Germany, Centre Nacional de Microelectrònica(IMB-CNM, CSIC), Spain*
Victor Javier CADARSO, *Centre Nacional de Microelectrònica(IMB-CNM, CSIC), Spain*
Jahir OROZCO, *Centre Nacional de Microelectrònica(IMB-CNM, CSIC), Spain*
Cesar FERNÁNDEZ-SÁNCHEZ, *Centre Nacional de Microelectrònica(IMB-CNM, CSIC), Spain*
Ralph WILKE, *Institut für Mikrotechnik, Technische Universität Braunschweig, Germany*
Stephanus BÜTTGENBACH, *Institut für Mikrotechnik, Technische Universität Braunschweig, Germany*

9:40 DEVELOPMENT OF AFM SYSTEM HAVING MULTI-FUNCTIONAL TOOLS FOR MEASUREMENT AND MANIPULATION UNDER SEM OBSERVATION (100)

Hideyuki KO, *Faculty of Engineering, Shizuoka University, Japan*
Hisayuki AOYAMA, *Department of Mechanical Engineering and intelligent systems, University of Electro-Communications, Japan*
Tatsuo USHIKI, *Graduate School of Medical and Dental Sciences, Niigata University, Japan*
Futoshi IWATA, *Faculty of Engineering, Shizuoka University, Japan*

10:00 TECHNIQUE FOR SEPARATELY MEASURING VISCOUS AND ELASTIC FORCES OF A CELL USING AN OPTICALLY MANIPULATED MICROPROBE (36)

Ryosuke TSUTSUMI, *Faculty of Engineering, Kagawa University, Japan*
Kazuhiro GESHO, *Faculty of Engineering, Kagawa University, Japan*
Akira NISHIYAMA, *Faculty of Medicine, Kagawa University, Japan*
Shoichi GOHTANI, *Faculty of Agriculture, Kagawa University, Japan*
Ichirou ISHIMARU, *Faculty of Engineering, Kagawa University, Japan*

C-5 Machine Vision and Image Processing

Chair: Prof. Wen Wang, Vice-Chair: Dr. Syuhei Kurokawa

9:00 HARD- AND SOFTWARE SYSTEMS FOR EVALUATION OF NEW MULTI CHANNEL IMAGE PROCESSING ALGORITHMS (65)

Martin CORRENS, *Department of Quality Assurance, Ilmenau University Of Technology, Germany*
Maik SCHUMANN, *Department of Quality Assurance, Ilmenau University Of Technology, Germany*
Maik ROSENBERGER, *Department of Quality Assurance, Ilmenau University Of Technology, Germany*
Matthias RÜCKWARDT, *Department of Quality Assurance, Ilmenau University Of Technology, Germany*
André GÖPFERT, *Department of Quality Assurance, Ilmenau University Of Technology, Germany*
Gehard LINß, *Department of Quality Assurance, Ilmenau University Of Technology, Germany*

9:20 DEVELOPMENT OF SHAPE MEASUREMENT SYSTEM USING WHOLE-SPACE TABULATION METHOD FOR ELECTRONIC PACKAGE (99)

Motoharu FUJIGAKI, *Faculty of Systems Engineering, Wakayama University, Japan*
Akihiro MASAYA, *Faculty of Systems Engineering, Wakayama University, Japan*
Yoshiharu MORIMOTO, *Moire Institute, Japan*
Tadashi MISAKA, *YASUNAGA CORPORATION, Japan*
Minoru INADA, *YASUNAGA CORPORATION, Japan*
Ryosuke MURAKAMI, *Graduate School of Systems Engineering, Wakayama University, Japan*

9:40 A NOVEL TECHNOLOGY-MATCHING-BASED METHOD FOR DETECTING EDGES OF MICRO ACCESSORIES (127)

Weiren WU, *Beijing Institute of Technology, School of Mechanical and Vehicular Engineering, China*
Li JIANG, *Beijing Institute of Technology, School of Mechanical and Vehicular Engineering, China*
Zhijing ZHANG, *Beijing Institute of Technology, School of Mechanical and Vehicular Engineering, China*
Xin JIN, *Beijing Institute of Technology, School of Mechanical and Vehicular Engineering, China*

10:00 THE PERFORMANCES OF A VISION INSPECTION SYSTEM WITH DIFFERENT INTERFACE CAMERAS (141)

Qi LI, *The School of Instrument Science and Opto-electronics Engineering, China*
Rong-Sheng LU, *The School of Instrument Science and Opto-electronics Engineering, China*
Yan-qiong SHI, *The School of Instrument Science and Opto-electronics Engineering, China*
Qing-ping YU, *The School of Instrument Science and Opto-electronics Engineering, China*
Ning LIU, *The School of Instrument Science and Opto-electronics Engineering, China*

D-5 Intelligent Micro and Nano Metrology (2)

Chair: Prof. Jean-Pierre Kruth, Vice-Chair: Dr. Shin Usuki

9:00 DEVELOPEMENT OF AN AUTO-FOCUS SYSTEM BY THE MOIRÉ METHOD (113)

Ju-Yi LEE, *Institute of Opto-Mechatronics Engineering, National Central University, Taiwan*
Yu-Ju LIN, *Institute of Opto-Mechatronics Engineering, National Central University, Taiwan*
Yung-Hsing WANG, *Industrial Technology Research Institute, Taiwan*
Chien-Sheng LIU, *Industrial Technology Research Institute, Taiwan*

9:20 ULTRA-PRECISION SCANNING TUNNELING MICROSCOPE FOR MEASUREMENT OF HIGH-ASPECT RATIO STRUCTURES (21)

Shigeaki GOTO, *Nano-Metrology and Control Laboratory, Tohoku University, Japan*
Wei GAO, *Nano-Metrology and Control Laboratory, Tohoku University, Japan*

9:40 DESIGN OF AN ACTIVE PROBE FOR A CONTACT-TYPE MEASURING DEVICE USING LASER INTERFEROMETRY SYSTEM (138)

Yung-Tien LIU, *National Kaohsiung First University of Science and Technology, Taiwan, R.O.C*
Han-Lin WU, *National Kaohsiung First University of Science and Technology, Taiwan, R.O.C*
Yutaka YAMAGATA, *The Institute of Physical and Chemical Research (RIKEN), Japan*

10:00 SPINDLE RADIAL MOTION ERROR MEASUREMENT USING TWO-DIMENSIONAL ATOMIC ENCODER (72)

Patamaporn CHAIKOOL, *Department of Information Science and Control Engineering, Nagaoka University of Technology, Japan*
Masato AKETAGAWA, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*
Eiki OKUYAMA, *Department of Mechanical Engineering, Akita University, Japan*
Jaratsri SOEATUPTIM, *Department of Mechanical Engineering, Nagaoka University of Technology, Japan*
Nusorn NIMNUAL, *Department of Mechatronics Engineering, Pathumwan Institute of Technology, Thailand*

E-5 Nano Photonics in Intelligent Measurement

Chair: Prof. Ju Bing-Feng, Vice-Chair: Dr. Eiki Okuyama

9:00 DETECTING TERAHERTZ NEAR-FIELD RADIATION WITHOUT EXTERNAL ILLUMINATION (80)

Yusuke KAJIHARA, *The Univestsity of Tokyo, Japan Science and Technology Agency (JST), CREST, Japan*
Keishi KOSAKA, *The Univestsity of Tokyo, Japan*
Susumu KOMIYAMA, *The Univestsity of Tokyo, Japan*

9:20 HEIGHT MEASUREMENT OF A PARTICLE IN EVANECSENT FIELD CONTROLLING PENETRATION DEPTH (139)

Takayuki KURIHARA, *The University of Tokyo, Japan*
Ryuichi SUGIMOTO, *The University of Tokyo, Japan*
Ryota KUDO, *The University of Tokyo, Japan*
Satoru TAKAHASHI, *The University of Tokyo, Japan*
Kiyoshi TAKAMASU, *The University of Tokyo, Japan*

9:40 THIN FILM THICKNESS MEASUREMENT BY SURFACE PLASMON RESONANCE USING MODIFIED OTTO'S CONFIGURATION COMBINED WITH ELLIPSOMETRY (64)

Ysuhiro MIZUTANI, *The University of Tokushima, Japan*
Tetsuo IWATA, *The University of Tokushima, Japan*

10:00 STUDY OF PHOTO-DRIVEN LEVER BEAMS FABRICATED BY TWO-PHOTON POLYMERIZATION FOR SENSOR APPLICATIONS (97)

Chih-Lang LIN, *Central Taiwan University of Science and Technology, Taiwan*
Tien-Tung CHUNG, *National Taiwan University, Taiwan (R.O.C.)*
Chin-Te LIN, *National Taiwan University, Taiwan (R.O.C.)*
Yue-Lun YANG, *Central Taiwan University of Science and Technology, Taiwan*
Patrice L. BALDECK, *Joesph Fourier University, France*

F-5 Intelligent Measurement Algorithm and Simulation(1)

Chair: Prof. Weixuan Jing, Vice-Chair: Dr. Masaharu Komori

9:00 CLOSED LOOP CONTROL FOR A PARALLEL MICROROBOT BASED ON INTEGRATED CAPACITIVE POSITION SENSORS (22)

Christoph BOESE, *Institute for Microtechnology, Technische Universität Braunschweig, Germany*
Marco FELDMANN, *Project Manager Competence Centre, Olympus Winter & Ibe GmbH, Germany*
Stephanus BÜTTGENBACH, *Institute for Microtechnology, Technische Universität Braunschweig, Germany*

9:20 EXTRACTION OF GEOMETRICAL PRIMITIVES FROM A SET OF CONTOUR POINTS (29)

Maik SCHUMANN, *Ilmenau University of Technology, Germany*
Alexander SCHLEGEL, *Ilmenau University of Technology, Germany*
Martin CORRENS, *Ilmenau University of Technology, Germany*
Jörg BARGENDA, *Ilmenau University of Technology, Germany*
Maik ROSENBERGER, *Ilmenau University of Technology, Germany*
Gerhard LINß, *Ilmenau University of Technology, Germany*

9:40 SURFACE TOPOGRAPHY AFTER VAPOUR BLASTING FORECASTING (79)

Pawel PAWLUS, *Rzeszow, University of Technology Department of Manufacturing Processes and Production Organisation, Poland*
Rafal REIZER, *University of Rzeszow Institute of Technology, Poland*
Lidia GALDA, *Rzeszow, University of Technology Department of Manufacturing Processes and Production Organisation, Poland*
Andrzej DZIERWA, *Rzeszow, University of Technology Department of Manufacturing Processes and Production Organisation, Poland*
Wieslaw GRABON, *Rzeszow, University of Technology Department of Manufacturing Processes and Production Organisation, Poland*

B-6 X-Ray Application for 3-D Measurement

Chair: Dr. Ruediger Kessel, Vice-Chair: Dr. Sonko Osawa

10:30 A TEST OBJECT FOR CALIBRATION AND ACCURACY ASSESSMENT IN X-RAY CT METROLOGY (86)

Kim KIEKENS, *Groep T – International University College Leuven, Belgium*
Frank WELKENHUYZEN, *K.U.Leuven, Department of Mechanical Engineering, Belgium*
Ye TAN, *Groep T – International University College Leuven, Belgium*
Philip BLEYS, *K.U.Leuven, Department of Mechanical Engineering, Sirris ,Belgium*
Wim DEWULF, *Groep T – International University College Leuven, Belgium*
André VOET, *De Nayer Instituut, Belgium*
Jean-Pierre KRUTH, *K.U.Leuven, Department of Mechanical Engineering, Leuven, Belgium*

10:50 REPRODUCIBILITY OF DIMENSIONAL MEASUREMENTS PERFORMED BY COMPUTED TOMOGRAPHY (158)

Vitor Camargo NARDELLI, *LABMETRO – Federal University of Santa Catarina, Brazil*
Gustavo Daniel DONATELLI, *Center of Metrology and Instrumentation (CMI), CERTI Foundation, Brazil*
Carlos Alberto SCHNEIDER, *Center of Metrology and Instrumentation (CMI), CERTI Foundation, Brazil*
Christian NIGGEMANN, *Laboratory for Machine Tools and Production Engineering (WZL), Chair of Metrology and Quality Management, RWTH Aachen University, Germany*
Robert SCHMITT, *Laboratory for Machine Tools and Production Engineering (WZL), Chair of Metrology and Quality Management, RWTH Aachen University, Germany*

11:10 PROFILE MEASUREMENT OF POLISHED SURFACE WITH RESPECT TO A LATTICE PLAIN OF SILICON CRYSTAL USING A SELF-REFERENCED LATTICE COMPARATOR (151)

Hiroyuki FUJIMOTO, *National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (NMIJ/AIST), Japan*
Atsushi WASEDA, *National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (NMIJ/AIST), Japan*
Xiaowei CHANG, *Photon Factory, High Energy Accelerator Research Organization (KEK), Japan*

C-6 Optical Measurement for Geometrical Quantity Evaluation (4)

Chair: Dr. Satoru Takahashi

10:30 MONITORING OF DRYING PROCESS OF PAINT BY DIGITAL HOLOGRAPHY (133)

Masayuki YOKOTA, *Faculty of Science and Engineering, Shimane University, Japan*
Yoshiki KIMOTO, *Faculty of Science and Engineering, Shimane University, Japan*
Ichirou YAMAGUCHI, *Toyo Seiki Seisaku-sho Ltd., Japan*

10:50 INFLUENCE ANALYSIS OF THE ELASTIC MEMBRANE'S ARC LENGTH CHANGE ON THE AIR ISOLATION UNIT'S STIFFNESS (130)

Chao XIA, *Harbin institute of technology, China*
Jiubin TAN, *Harbin institute of technology, China*

11:10 A NOVEL SCANNING TUNNELING MICROSCOPY FOR LONG RANGE AND HIGH ASPECT RATIO MEASUREMENT (108)

Yuan-Liu CHEN, *The state key lab of fluid power transmission and control,*
Zhejiang University, China
Bing-Feng JU, *The state key lab of fluid power transmission and control,*
Zhejiang University, China

D-6 Pre-, In-, Post process measurement (2)

Chair: Prof. Liang-Chia Chen, Vice-Chair: Prof. Keiichi Kimura

10:30 COMBINATION OF MULTI-SENSOR TECHNOLOGY AND MULTIPLE MEASUREMENT STRATEGIES IN MICRO - AND NANOMETROLOGY (75)

Eberhard MANSKE, *Ilmenau University of Technology, Germany*
Gerd JÄGER, *Ilmenau University of Technology, Germany*
Tino HAUSOTTE, *Ilmenau University of Technology, Germany*

10:50 VERIFICATION OF GENERATION AND REMOVAL PROCESS OF SURFACE BRITTLE FILM, IN POLISHING PROCESS USING WATER SOLUBLE FULLERENOL (136)

Kazumasa KANO, *Department of Mechanical Engineering, Osaka University, Japan*
Terutake HAYASHI, *Department of Mechanical Engineering, Osaka University, Japan*
Yasuhiro TAKAYA, *Department of Mechanical Engineering, Osaka University, Japan*
Ken KOKUBO, *Division of Applied Chemistry, Graduate School of Engineering, Osaka University, Japan*

11:10 INVESTIGATION ON SLURRY FLOW AND TEMPERATURE IN POLISHING PROCESS OF QUARTZ GLASS SUBSTRATE (92)

Panart KHAJORNRUNGRUANG, *Kyushu Institute of Technology, JAPAN*
Nagisa WADA, *presently at Toppan Printing Co.,Ltd., JAPAN*
Ryuji YUI, *Kyushu Institute of Technology, JAPAN*
Keiichi KIMURA, *Kyushu Institute of Technology, JAPAN*

11:30 A PIEZODRIVEN THREE DIMENSIONAL MICROPOSITIONING STAGE FOR NANO-MANUFACTURING (128)

Wen WANG, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China, Center for Precision Metrology, UNC Charlotte, USA*
Robert J. HOCKEN, *Center for Precision Metrology, UNC Charlotte, USA*
Zhu ZHU, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China*
Zichen CHEN, *Institute of Advanced Manufacturing Engineering, Zhejiang University, P.R.China*

E-6 Geometrical Product Specification and Form Test

Chair: Dr. Masaharu Komori, Vice-Chair: Dr. Syuhei Kurokawa

10:30 THE FACTORS AFFECTING SURFACE ROUGHNESS MEASUREMENTS OF THE MACHINED FLAT AND SPHERICAL SURFACE STRUCTURES – THE GEOMETRY AND THE PRECISION OF THE SURFACE (119)

M. Numan DURAKBASA, *Vienna University of Technology, Austria*
P. Herbert OSANNA, *Vienna University of Technology, Austria*
Pinar DEMIRCIOGLU, *Adnan Menderes University, Turkey*

10:50 COMPLETE GEOMETRICAL PRODUCT SPECIFICATION FOR THE UNAMBIGUOUS VERIFICATION OF FUNCTIONAL PROPERTIES (24)

Sophie GRÖGER, *Institute of Production Measuring Technology and Quality Assurance,Chemnitz University of Technology, Germany*
Michael DIETZSCH, *Institute of Production Measuring Technology and Quality Assurance,Chemnitz University of Technology, Germany*

11:10 CURRENT SITUATION AND PROBLEMS FOR REPRESENTATION OF TOLERANCE AND SURFACE TEXTURE IN 3D CAD MODEL (48)

Fumiki TANAKA, *Graduate school of Information Science and Technology Hokkaido University, Japan*

11:30 RESEARCH ON INCREASING THE ACCURACY OF CYLINDRICITY MEASUREMENTS BY THE V-BLOCK METHOD (44)

Stanisław ADAMCZAK, *Kielce University of Technology, Poland*
Dariusz JANECKI, *Kielce University of Technology, Poland*
Krzysztof STĘPIEŃ, *Kielce University of Technology, Poland*

F-6 Intelligent Measurement Algorithm and Simulation(2)

Chair: Dr. Raghu Nath Kacher, Vice-Chair: Dr. Yusuke Kajihara

10:30 LONG DISTANCE STRAIGHTNESS MEASUREMENT USING A LEVEL (103)

Tatsuya KUME, *High Energy Accelerator Research Organization (KEK), Japan*
Eiki OKUYAMA, *Faculty of Engineering and Resource Science, Akita University, Japan*
Masanori SATOH, *High Energy Accelerator Research Organization (KEK), Japan*
Tsuyoshi SUWADA, *High Energy Accelerator Research Organization (KEK), Japan*
Kazuro FUFUKAWA, *High Energy Accelerator Research Organization (KEK), Japan*

10:50 A METHOD FOR DETERMINING THE MEDIAN LINE OF A MEASURED CYLINDER (105)

Dariusz JANECKI, *Kielce University of Technology, Poland*
Jarosław ZWIERZCHOWSKI, *Kielce University of Technology, Poland*