

Table of Contents

Preface

Sponsors and Committees

List of Reviewers

I. General Problems of Measurement

Principles of Bayesian Methods in Data Analysis

M.P. Krystek 3

Dynamic Pressure Calibration of Pressure Sensors Using Liquid Step Pressure Generator

S.H. Wang, L.L. Han and T.T. Tsung 8

Topical Tasks of Metrology due to Measuring Instruments Computerization

V.S. Alexandrov, R.E. Taymanov and A.G. Chunovkina 13

Multivariant System of Perspectives

A.M. Kovalev 18

II. Micro- / Nanomeasurements and Metrology

Coherent Optical Method for Studies of Nanoscale Objects in Liquid Media Based upon Spatial Averaging of Data

Y.N. Kulchin, O.B. Vitrik, A.D. Lantsov and N.P. Kraeva 25

Measurement and Visualization of Dynamics of Piezoelectric Microcantilever

W.J. Dong, M.W. Liu and C. Yan 30

Microrelief Measurements for White-Light Interferometer with Adaptive Algorithm Interferogram Processing

E.V. Sysoev and R.V. Kulikov 35

Model-Based Correction of Image Distortion in Scanning Electron Microscopy

D. Gnieser, C.G. Frase, H. Bosse and R. Tutsch 40

Motif Parameters Based Characterization of Line Edge Roughness of a Nanoscale Grating Structure

Z.D. Jiang, F.X. Zhao, W.X. Jing, P.D. Prewett and K. Jiang 45

Nanorelief Measurements Errors for a White-Light Interferometer with Chromatic Aberrations

E.V. Sysoev 51

Fabrication of Large Grating by Monitoring the Latent Fringe Pattern

L.J. Zeng, L. Shi and L.F. Li 56

Design and Analysis of a 6-DOF Monolithic Nanopositioning Stage

L.L. Cheng, J.W. Yu and X.F. Yu 61

In Situ Mechanical Property Measurement of Titania Nanowires

M. Chang, J.R. Deka, C.H. Lin and C.C. Chung 66

III. Optical and X-Ray Tomography and Interferometry

Computed Tomography for Application in Manufacturing Metrology

A. Weckenmann and P. Krämer 73

Achieving Traceability of Industrial Computed Tomography

M. Bartscher, M. Neukamm, U. Hilpert, U. Neuschaefer-Rube, F. Härtig, K. Kniel, K. Ehrig, A. Staude and J. Goebbels 79

Developments in Homodyne Interferometry

W. Schott 84

Development of Innovative Fringe Locking Strategies for Vibration-Resistant White Light Vertical Scanning Interferometry (VSI)

L.C. Chen, A.M. Tapilouw, S.L. Yeh, S.T. Lin, J.L. Chen and H.C. Huang 89

Compensation of Tilt Angles and Verification of Displacement Measurements with a Fabry-Perot Interferometer	
Y.C. Wang, L.H. Shyu, W.Y. Jywe and B.Y. Lee	95
A Compact Signal Processing with Position Sensitive Detectors Utilized for Michelson Interferometer	
L.H. Shyu, Y.C. Wang and J.C. Lin	98
Improvement on Measuring Optical Nonlinear Phase Shift by Self-Aligned Interferometer	
C.X. Yu, B. Liu, J.H. Yuan, X.Z. Sang and X.J. Xin	103
Programmable Holographic Optical Elements as Adaptive Optics in Optical Diagnostics Devices	
J.D. Trolinger, A. Lal, J. Jo and S. Kupiec	108
High-Resolution Dimensional Metrology for Industrial Applications	
T. Schuldt, M. Gohlke, D. Weise, A. Peters, U. Johann and C. Braxmaier	113

IV. Measurements for Geometrical and Mechanical Quantities

Traceability for Areal Surface Texture Measurement	
R. Leach, C. Giusca and K. Naoi	121
Industrial Applications of Image Based Measurement Techniques in Aerodynamics – Problems, Progress and Future Needs	
J. Kompenhans	126
Development of a Print-Through Phenomenon Measurement System Using the Fringe Reflection Method for the Fiber Reinforced Plastics	
F.J. Shiou, H.J. Chen and C.H. Hsu	131
Micro Coordinate Measuring Machine for Parallel Measurement of Microstructures	
C. Schrader, C. Herbst, R. Tutsch, S. Büttgenbach and T. Krah	136
Machine Vision for Surface Roughness Assessment of Inclined Components	
P. Priya and B. Ramamoorthy	141
Fractal Geometry Surface Modeling and Measurement for Musical Cymbal Surface Texture Design and Rapid Manufacturing	
J. Zhou, A. Vas and D. Blackmore	145
Final Results of the Geometrical Calibration of the Pressure Balances to be Used for the new Determination of the Boltzmann Constant	
O. Jusko, D. Bastam, M. Neugebauer, H. Reimann, W. Sabuga and T. Priruenrom	150
3D Inspection of Fuel Assembly Components	
A.V. Beloborodov, Y.V. Chuguy, L.V. Finogenov, A.A. Gushchina, Y.A. Lemesenko and P.S. Zav'yalov	155
High Precision Angular and Linear Measurements Using Universal Opto-Electronic Measuring Modules in Distributed Measuring Systems	
I.A. Konyakhin, A.N. Timofeev and S.N. Yaryshev	160
High Productive Optoelectronic Pellets Surface Inspection for Nuclear Reactors	
A.V. Beloborodov, E.V. Vlasov, L.V. Finogenov and P.S. Zav'yalov	165
High Throughput System for Geometry Inspection of Large-Size Distributed Objects	
S.N. Makarov and A.G. Verkhoglyad	170
Touch-Trigger Measurement of Micro-Cavity by Optical Fiber Coupling	
J.W. Cui, C.X. Song and J.B. Tan	174
A Method for Laser Measurement of Disperse Composition and Concentration of Aerosol Particles	
O.B. Kudryashova, I.R. Akhmadeev, A.A. Pavlenko, V.A. Arkhipov and S.S. Bondarchuk	179
A Novel Point Matching Method for Stereovision Measurement Using RANSAC Affine Transformation	
N.G. Lu, P. Sun, W.Y. Deng, L.Q. Zhu and X.P. Lou	184
Impact of High-Speed Image Recognition of Transition Phenomenon of Chip Formation and Chip Flow in Gear Hobbing Process	
Y. Umezaki, S. Kurokawa and Y. Ariura	189
Measurement of Straightness for Two-Dimensional Translatory Stage	
R. Furutani and M. Watanabe	194

Accuracy Enhancement for Precision Angle Measuring Structures A.V. Kiryanov	198
Optic-Electronic Systems for Control the Angle and Line Positions of the Elements Unblocked Aperture Radio-Telescope I.A. Konyakhin and A.N. Timofeev	203
Optical Hilbert Diagnostics of the Vortical Structures Induced by the Pressure Front on an Aperture V.A. Arbuzov, Y.N. Dubnishchev, N.A. Dvornikov and V.G. Nechaev	208
Uncertainty Analysis of Helical Deviation Measurements Z.Y. Shi, J.C. Lin and M.P. Krystek	212
Uncertainty Calculation of Roundness by Automatic Differentiation J.C. Lin, M.P. Krystek and Z.Y. Shi	217
Least Squares Association of Geometrical Features by Automatic Differentiation M.P. Krystek, Z.Y. Shi and J.C. Lin	222
Study and Improvement of a Destructive 3D Digitizer Based on Grinding Technique W.C. Lee and P.K. Hsu	227
Error Modeling and Compensation for High-Precision Non-Contact Four Coordinate Measuring System F. Zhang, Z.D. Jiang, B. Li, J.J. Ding and L. Chen	232
Inner-Base Optoelectronic System for the Control of Linear Displacements K.G. Arakantsev, I.A. Konyakhin and A.N. Timofeev	237
A Study of Key Optical Profiler Parameters for Form Error Measurement X. Huang and Y. Gao	242
Laser Doppler Visualization of 2D Velocity Fields with Minimization Dependence from Multi-Particle Scattering Y.N. Dubnishchev, Y.V. Chuguy and J. Kompenhans	247
Estimation of Uncertainty of Coordinate Measurements According to the Type B Method W. Jakubiec	253
Principles for Echo Position Determination Using Airborne Ultrasound G. Kaniak and H.F. Schweinzer	258
A 3D Ultrasonic Positioning System with High Accuracy for Indoor Application H.F. Schweinzer and G.F. Spitzer	263

V. Terahertz Technologies for Science, Industry, Medicine, Biology

THz-Imaging on its Way to Industrial Application T. Pfeifer and S. Bichmann	271
Development and Characterization of Quasi-Optical Mesh Filters and Metastructures for Subterahertz and Terahertz Applications S.A. Kuznetsov, A.V. Arzhannikov, V.V. Kubarev, P.V. Kalinin, M. Sorolla, M. Navarro-Cia, M. Aznabet, M. Beruete, F. Falcone, Y.G. Goncharov, B.P. Gorshunov, A.V. Gelfand and N.I. Fedorinina	276
Research on Terahertz Filters Employing the Effect of Frustrated Total Internal Reflection A.S. Syrneva, V.V. Chesnokov and D.V. Chesnokov	281
Terahertz Fabry-Perot Interferometer Constructed by Metallic Meshes with Micrometer Period and High Ratio of Linewidth/Period Z.G. Lu, J.B. Tan and Z.G. Fan	286
Micromechanical Optical Scanner for Terahertz Spectrum Diapason V.S. Korneyev, V.V. Chesnokov and D.V. Chesnokov	291

VI. Novel Measurement and Diagnostic Methods

Impact of Micro and Nano Sensors in Biomedical Measurement P. Rolfe	299
Trends in Bragg Grating Technology for Optical Fiber Sensor Applications H. Bartelt	304

Comparison of Raman and Fiber Bragg Grating-Based Fiber Sensor Systems for Distributed Temperature Measurements S.A. Babin, A.G. Kuznetsov and I.S. Shelemba	309
Interferometric Fiber-Optic Electric Current Sensor for Industrial Application N.I. Starostin, M.V. Ryabko, Y.K. Chamorovskii, V.P. Gubin, A.I. Sazonov, S.K. Morshnev and N.M. Korotkov	314
Wave Front Correction and Measurement by Using a Liquid Crystal Spatial Light Modulator J. Zhang, L.Y. Wu and L.M. Zou	319
Differential Reflectometry of Fiber Bragg Gratings Y.N. Kulchin, A.M. Shalagin, O.B. Vitrik, S.A. Babin, A.V. Dyshlyuk and A.A. Vlasov	324
Alignment of Cassegrain Telescope with Epps-Shulte Focus V.S. Obratsov and A.A. Ageichik	329
Intelligent Assessment for Pathological Gait Analysis S.E. Hussein	334
Fuzzy Clustering Algorithm of Early Fire Based on Process Characteristic R.C. Zhang and J.H. Du	339
Beam Pointing Precision Control by Using a Liquid Crystal Optical Phased Array L.Y. Wu, J. Zhang and Y. Fang	344
Detection of Indoor Formaldehyde Concentration Using LaSrFeO₃-Doped SnO₂ Gas Sensor J. Wang, X.R. Chen, P.J. Yao, M. Ji, J.Q. Qi and W. Wu	349
Polymer Based Micro Sensors Arrays for Ph and Glucose Monitoring O. Korostynska, K. Arshak, A. Arshak, E. Gill, P. Creedon and S. Fitzpatrick	354
Fiber Bragg Grating Demodulation System Based on Equi-Intensity Cantilever Beam H. Li, W.P. Yan, R.S. Shen and B.Y. Wang	359
Auto Focusing Confocal Laser Induced Fluorescence Detection System X.F. Wang, W.P. Yan, H.M. Bai and W. Li	364
Study on Measuring System for Characteristics and Distribution of Skylight Polarization Y. Cui, J.K. Chu, N.N. Cao and K.C. Zhao	369
A Preliminary Study of Micro Heat Conduction by Hot-Tip Tribological Probe Microscope Z.Y. Yue and X.P. Liu	374
Information Fusion in Human Eye Aberration Measurement J.B. Chen, P.M. Zhang and S.L. Zhuang	379
A Method for Mass Estimation of Loose Parts in Nuclear Power Plant Based on Support Vector Machine H.W. Zheng, Y.L. Cao, J.X. Yang and Y.F. He	384
Automatic Shape Grading of Pearl Using Machine Vision Based Measurement Y.L. Cao, H.W. Zheng, J.X. Yang and Y.F. He	389
Dynamic Performance of Flow Control Valve Using Different Models of System Identification H. Chang	393
Oil-Filled Isolated High Pressure Sensor for High Temperature Application Z.D. Jiang, L.B. Zhao, Y.L. Zhao, Y.H. Liu, P.D. Prewett and K. Jiang	397
Heart Rate Wireless Monitoring System “Cardiobeat”, Novel Approach to ECG Processing and Representation V.E. Antsiperov, Y.V. Obukhov and G.K. Mansurov	402
Full-Field Laser Vibrometer for Instantaneous Vibration Measurement and Non-Destructive Inspection J.M. Kilpatrick and V.B. Markov	407
Tunable Interference Colour Filter in Micromechanical Performance D.M. Nikulin, V.V. Chesnokov and D.V. Chesnokov	412
Asymmetric Thermal Structure for Frequency Stabilized Two-Mode Lasers P.C. Hu, J.B. Tan, Q. Wang and P. Zhang	416

VII. Intelligent Measuring Instruments and Systems for Industry and Transport

Application of Diode Lasers in Interferometrical Length Measurements A. Höink, K. Meiners-Hagen, O. Jusko and A. Abou-Zeid	423
Automatic High-Speed Optoelectronic System for Dimensional Inspection of Distant Articles in Industry and Transport V.E. Kalikin, A.G. Verkhogliad, S.V. Kalichkin, S.N. Makarov, V.S. Bazin, V.B. Kharhota and S.G. Savkov	429
Problems of Terminology in the Field of Intelligent Sensors and Systems R.E. Taymanov and K. Sapozhnikova	434
Automatic, Task-Sensitive and Simulation-Based Optimization of Fringe Projection Measurements J. Weickmann, A. Weckenmann and P.F. Brenner	439
Factorial and Preliminary Parameter Tests for the Water Beam Assisted Form Error In-Process Optical Measurement Y. Zhang, Y. Gao, Y.H. Lai and J.X. Wang	444
Measurements of Weld Geometry Using Image Processing Technology C.L. Chang and Y.H. Chen	449
Coordinate Measuring Machine with Large Working Volume Based on Laser Technological System I.A. Vykhristyuk	453
Optical System for On-Line Monitoring and Temperature Control in Selective Laser Melting Technology M. Doubenskaia, M. Pavlov and Y. Chivel	458
Localization Accuracy Improved Methods for Range-Free Localization Schemes in Wireless Sensor Network J.W. Hu, X.F. Yu, B. Wang and Z.Q. Li	462
Measurement of Vehicle Tire Footprint Pattern and Pressure Distribution Using Piezoresistive Force Sensor Mat and Image Analysis R.S. Lu, N. Liu and X.H. Chen	467
A Study of CFD Models for Investigating the Water Beam Assisted Form Error In-Process Optical Measurement Y.H. Lai, Y. Gao, Y. Zhang and J.X. Wang	472
Dimension Accuracy Analysis of a Micro-Punching Mold for IC Packing Bag W.S. Lin and J.C. Lin	477
Excited Energy Attenuation Study through Vibration Measurement and Spectrum Analysis S.Y. Lin, C.K. Chang, C.T. Chung, F.C. Hsu, C.C. Wang and Y.C. Hsu	482
Measurement's Result and its Error as Fuzzy Variables: Background and Perspectives G.N. Solopchenko, K.K. Semenov, V. Kreinovich and L. Reznik	487
Data Reduction Based on Bi-Directional Point Cloud Slicing for Reverse Engineering L. Chen, Z.D. Jiang, B. Li, J.J. Ding and F. Zhang	492
Research on Tool Condition Monitoring System in Auto-Balancing Machines D.D. Zhao and P. Cai	497
On-Line Test System for Vibration Measurement and Sorting of Ball Bearings Y.X. Chen and J. Liu	502

VIII. Measurements and Metrology for the Humanitarian Fields

In Search for New Paradigm for Humanitarian Measurements: Informational Path between Scylla of Subjectivism and Harybdis of Operationalism V.M. Petrov	509
Creativity and School Education: Subjects Vs Professional Identity in a Sample of Teachers in Italy O. Licciardello, M.E. De Caroli, C. Castiglione and E. Sagone	515
Asymmetry of Creative Activity: Product-Based Iterative Measurement Procedure L.A. Mazhul, V.M. Petrov and S. Mancone	520
Intensity of Creative Innovations: Construing Samples to Measure Artistic Evolution T.V. Kovalenko, P.A. Kulichkin, L.A. Mazhul and V.M. Petrov	525
Periodical Waves in the Evolution of Art: Methods of Study A.V. Kharuto	530

Methods to Measure the Extent to which Teachers' Points of View Influence Creativity and Factors of Creative Personality: A Study with Italian Pupils M.E. De Caroli, O. Licciardello, E. Sagone and C. Castiglione	535
Measures of Emotional and Motivational Processes Activated by Stress or Comfort Conditions V. Biasi, P. Bonaiuto and A.M. Giannini	540
Clarification and Measure of Vivid Illusions Favoured by Canova's Sculptures P. Bonaiuto and V. Biasi	545
Evaluation of Graphic-Pictorial Characteristics and Contents in the Representation of Legality F. Baralla, A.M. Giannini and R. Sgalla	550
Real Time Eye Gaze Logging in a 3D Game/Simulation World C.C. Sennersten and C.A. Lindley	555
Theatrical Life and Socially-Political Climate of Russian Society: Measurement of Evolution Intensity T.V. Kovalenko	560
Intensity Waves: External or Internal Forces? P.A. Kulichkin	563

IX. Metrology and Characterization of Materials

Nano- and Micropowder Laser Multy Wavelengths Sensing and Aerodynamic Classification P.V. Chartiy, V.E. Privalov and V.G. Shemanin	571
Experiments of Negative-Index Refraction in Optical Frequency Region J.B. Chen, B.M. Liang, D.W. Zhang and S.L. Zhuang	575
Measurement of Electromagnetic Shielding Effectiveness of the Composite Carbon Fibers/Nickel Thin Film H. Chang, Y.M. Yeh, C.S. Jwo and S.L. Chen	580
Comparative Analysis versus Frequency of Inception Voltage of Partial Discharges Phenomena and Breakdown Strength, in Support of Quality Assessment of Insulating Materials R.C. Ciobanu and C. Schreiner	584
Prediction of the Bilinear Stress-Strain Curve of Engineering Material by Nanoindentation Test T.S. Yang, T.H. Fang, C.T. Kawn, G.L. Ke and S.Y. Chang	589
Principle of Absorption Spectrum Measurement of the Layers Adsorbed on Transparent Substrates D.S. Mikhailova, V.V. Chesnokov and D.V. Chesnokov	594
Thermal Effects of Platinum Bottom Electrodes on PZT Sputtered Thin Films Used in MEMS Devices A. Koochekzadeh, E.K. Alamdari, A.A.G. Barzegar and A.A. Salardini	598
Requirements on a Differential Refractometer for its Use in Sizing Colloidal Particles A. García-Valenzuela and C. Sánchez Pérez	603

X. Education in Measurement Science

Assessment of the Ukrainian Quality Infrastructure: Challenges Imposed by the WTO and Commitments to EU Accession M.N. Frota, J.L. Racine, F. Blanc, P. Rodrigues, S. Ibragimov, D. Torkhov and S. Osavolyuk	611
Analysis of Phase Distribution of Focused Light in High Numerical Aperture Systems A. Normatov, B. Spektor and J. Shamir	616
Torsion Magnetic Variometer with Kevlar-Hanger-Based Sensor Y.A. Kopytenko, P.A. Sergushin, M.S. Petrishchev, V.A. Levanenko and D.B. Zaytsev	621
Device for Manufacturing Torsion Bars with Helical Anisotropy UISAT-1 Y.A. Kopytenko, P.A. Sergushin, M.S. Petrishchev, V.A. Levanenko and A.D. Perechesova	625

XI. Measurement for X-Ray Radiation Studies - Special Topic of the International Science and Technology Center (ISTC)

Innovations in X-Ray Induced Electron Emission Spectrometry (XIEES)

K.J. Pogrebitsky and M.D. Sharkov

631

Tests of Model of Absolute Measuring Instrument of Synchrotron Radiation Power

I.A. Khrebtov, V.G. Malyarov, V.Y. Zerov, A.D. Nikolenko, V.F. Pindyurin, A.A. Legkodymov and V.V. Lyah

636

Advantages in the Small-Angle Scattering of X-Ray for Studying Optoelectronic Devices within the Frames of ISTC Projects

M.E. Boiko and A.M. Boiko

641