2009 Joint Meeting of the European Frequency and Time Forum and the IEEE International Frequency Control Symposium

(EFTF/IFCS 2009)

Besancon, France
20-24 April 2009

Pages 1-608
# TABLE OF CONTENTS

## MEMS Resonators I

### Integration of AlN Micromechanical Contour-Mode Technology Filters with Three-Finger Dual Beam AlN MEMS Switches

*Nipun Sinha, University of Pennsylvania; Rashed Mahameed, University of Pennsylvania; Chengjie Zuo, University of Pennsylvania; Gianluca Piazza, University of Pennsylvania*

---

### Experimental Study of Temperature-Compensated Aluminum Nitride Lamb Wave Resonators

*Chih-Ming Lin, University of California at Berkeley; Ting-Ta Yen, University of California at Berkeley; Yun-Ju Lai, University of California at Berkeley; Valery V. Felmetsger, Tegal Corporation; Matthew A. Hopcroft, University of California at Berkeley; Jan H. Kuypers, University of California at Berkeley; Albert P. Pisano, University of California at Berkeley*

---

### Demonstration of Inverse Acoustic Band Gap Structures in AlN and Integration with Piezoelectric Contour Mode Wideband Transducers

*Nai-Kuei Kuo, University of Pennsylvania; Chengjie Zuo, University of Pennsylvania; Gianluca Piazza, University of Pennsylvania*

---

## Surface Acoustic Tags

### Review on SAW RFID Tags

*V.P. Plessky, GVR Trade SA*

---

### Ultra Wide Band SAW Correlators Using Dual Orthogonal Frequency Coded Transducers

*D.R. Gallagher, University of Central Florida; D.C. Malocha, University of Central Florida*

---

### Characterisation Setup of SAW Devices at High Temperatures and Ultra High Frequencies

*Jochen Bardong, Carinthian Tech Research AG Austria; Gudrun Bruckner, Carinthian Tech Research AG Austria; Georg Franz, Carinthian Tech Research AG Austria; René Fachberger, Carinthian Tech Research AG Austria; Artur Erlacher, RHI Refractories AG*

---

## Noise in Components

### The AM Noise Mechanism in Oscillators

*Enrico Rubiola, FEMTO-ST; Rémi Brendel, FEMTO-ST*

---

### Flicker Noise of Microwave Power Detectors

*Serge Grop, FEMTO-ST; Enrico Rubiola, FEMTO-ST*
Residual Phase Noise Modelling of Amplifiers Using Silicon Bipolar Transistors .................................. 44
Konstantinos Theodoropoulos, University of York; Jeremy Everard, University of York

Measurement of the Laser Relative Intensity Noise .................................................................................. 50
Enrico Rubiola, FEMTO-ST; Kirill Volyanskiy, Universite de Franche Comte; Laurent Larger, Universite de Franche Comte

Space Clocks & Fundamental Tests

Progress on Small Mercury Ion Clock for Space Applications ............................................................... 54
John D. Prestage, Jet Propulsion Lab, California Institute of Technology; Sang K. Chung, Jet Propulsion Lab, California Institute of Technology; Robert J. Thompson, Jet Propulsion Lab, California Institute of Technology; Paul MacNeal, Jet Propulsion Lab, California Institute of Technology

MEMS Resonators II

Enhancement of Micromechanical Resonator Manufacturing Precision via Mechanically-Coupled Arraying .................................................................................................................. 58
Yang Lin, University of California at Berkeley; Wei-Chang Li, University of California at Berkeley; Bongsang Kim, University of California at Berkeley; Yu-Wei Lin, Broadcom Corporation; Zeying Ren, University of California at Berkeley; Clark T.-C. Nguyen, University of California at Berkeley

Bandwidth Control in Acoustically Coupled AlN Contour Mode MEMS Filters ........................................ 64
Carlos R. Perez, University of Pennsylvania; Gianluca Piazza, University of Pennsylvania

AlN Contour-Mode Resonators for Narrow-Band Filters Above 3 GHz ...................................................... 70
Matteo Rinaldi, University of Pennsylvania; Chiara Zuniga, University of Pennsylvania; Chengjie Zuo, University of Pennsylvania; Gianluca Piazza, University of Pennsylvania

High Frequency Lamb Wave Resonator Using LiNbO3 Thin Film by CVD ............................................. 75
Michio Kadota, Murata Mfg Co, Ltd; Takashi Ogami, Murata Mfg Co, Ltd; Kansho Yamamoto, Murata Mfg Co, Ltd; Hikari Tochishita, Murata Mfg Co, Ltd

Coupled Mode Approach to the Analysis of Thin Film S0 Lamb Wave Resonators ............................. 79
V. Yantchev, Uppsala University; L. Arapan, Uppsala University; I. Katardjiev, Uppsala University

Wireless Sensors

Hybrid Resonant Structures for Wireless Sensor Applications ................................................................. 85
Jérémy Masson, Senseor; William Steichen, Thales Safare; Lionel Fagot-Revurat, MFPM; Alvaro Artieda, EPFL; Paul Muralt, EPFL; Sylvain Ballandras, FEMTO-ST
Optimization of Resonant Frequency Measurement Algorithm for Wireless Passive SAW Sensors

V. Kalinin, Transense Technologies plc; B. Dixon, Transense Technologies plc; J. Beckley, Transense Technologies plc

Fabrication of Surface Acoustic Wave Wireless Pressure Sensor

D. Hermelin, FEMTO-ST; W. Daniaux, FEMTO-ST; S. Ballandras, FEMTO-ST; B. Belgacem, Senseor

Surface Acoustic Wave Resonators As Passive Buried Sensors

J.-M Friedt, Senseor; T. Rétornaz, Senseor; G. Martin, FEMTO-ST; T. Laroche, FEMTO-ST; É. Carry, FEMTO-ST; S. Ballandras, FEMTO-ST; J.-P. Simonnet, Franche Comté University

SAW Pressure Sensor for Vacuum Control Applications

P. Nicolay, Nancy University; O. Elmazria, Nancy University; F. Sarry, Nancy University; L. Bouvot, Nancy University; H. Kambara, ADIXEN; K.J. Singh, Nancy University; P. Alnot, Nancy University

Improvements of Time Scales and Time Transfer

Studies and Possible Improvements on EAL Algorithm

G. Panfilo, Bureau International des Poids et Mesures; F. Arias, Bureau International des Poids et Mesures

The TAIPPPP Pilot Experiment

Gérard Petit, Bureau International des Poids et Mesures

GPS Carrier Phase and Precise Point Positioning Time Scale Comparisons Using Different Software Packages

T. Feldmann, Physikalisch-Technische Bundesanstalt; A. Bauch, Physikalisch-Technische Bundesanstalt; D. Piester, Physikalisch-Technische Bundesanstalt; H. Esteban, Real Instituto y Observatorio de la Armada; J. Palacio, Real Instituto y Observatorio de la Armada; F. J. Galindo, Real Instituto y Observatorio de la Armada; T. Gotoh, National Institute of Information and Communications Technology; H. Maeno, National Institute of Information and Communications Technology; U. Weinbach, Institut Für Erdmessung; S. Schön, Institut Für Erdmessung

Higher-Order Ionosphere Perturbations in GPS Time and Frequency Transfer

S. Pireaux, Royal Observatory of Belgium; P. Defraigne, Royal Observatory of Belgium; L. Wauters, Royal Observatory of Belgium; N. Bergeot, Royal Observatory of Belgium; Q. Baire, Royal Observatory of Belgium; C. Bruyninx, Royal Observatory of Belgium

Optical Clocks I

Blackbody Radiation Shifts and Theoretical Contributions to Atomic Clock Research

M.S. Safronova, University of Delaware; M.G. Kozlov, Petersburg Nuclear Physics Institute; Dansha Jiang, University of Delaware; Bindiya Arora, University of Delaware; Charles W. Clark, National Institute of Standards and Technology; U.I. Safronova, University of Nevada, Reno; W.R. Johnson, University of Notre Dame
Frequency Measurement of the 2S1/2 - 2D3/2 Electric Quadrupole Transition in a Single 171Yb+ Ion

Stephen Webster, National Physical Laboratory; Rachel Godun, National Physical Laboratory; Steven King, National Physical Laboratory; Guilong Huang, National Physical Laboratory; Barney Walton, National Physical Laboratory; Veronika Tsatourian, National Physical Laboratory; Helen Margolis, National Physical Laboratory; Stephen Lea, National Physical Laboratory; Patrick Gill, National Physical Laboratory

Determining the Clock Frequency Shift Due to Collisions in a 1-D Optical Lattice Clock with 88Sr

J.S.R. Vellore Winfred, Physikalisch-Technische Bundesanstalt; Ch. Lisdat, Physikalisch-Technische Bundesanstalt; T. Middelmann, Physikalisch-Technische Bundesanstalt; F. Riehle, Physikalisch-Technische Bundesanstalt; U. Sterr, Physikalisch-Technische Bundesanstalt

Materials and Relation To Devices

Poisson's Ratios of Technological Materials

Arthur Ballato, US Army

Measured Versus Predicted High Temperature Langatate Behavior Up to 900°C

Peter Davulis, University of Maine; Mauricio Pereira da Cunha, University of Maine

Assessment of Langatate Material Constants and Temperature Coefficients Using SAW Delay Line Measurements

Blake T. Sturtevant, University of Maine; Mauricio Pereira da Cunha, University of Maine

Crystal Quality of LGT Samples: Influence on BAW Resonators

Jean-Jacques Boy, FEMTO-ST

Quartz Oscillators

Effects of Radiation on Performance of Space-Borne Quartz Crystal Oscillators

M. Bloch, Frequency Electronics, Inc; O. Mancini, Frequency Electronics, Inc; T. McClelland, Frequency Electronics, Inc

Acceleration "G" Compensated Quartz Crystal Oscillators

M. Bloch, Frequency Electronics, Inc; O. Mancini, Frequency Electronics, Inc; T. McClelland, Frequency Electronics, Inc; L. Terracciano, Frequency Electronics, Inc

High Performance Oscillator Evaluation

J.L. Hanssen, US Naval Observatory; Christopher R. Ekstrom, US Naval Observatory; Warren F. Walls, US Naval Observatory

Lowest Flicker-Frequency Floor Measured on BVA Oscillators

A. Kuna, Institute of Photonics and Electronics; J. Čermák, Institute of Photonics and Electronics; L. Šojdr, Institute of Photonics and Electronics; P. Salzenstein, FEMTO-ST; F. Lefebvre, Oscilloquartz
Composite Clock Including a Cs Clock, a H-Maser Clock and a VCO ......................................................... 188
  C. Plantard, UTINAM; P.M. Mbaye, UTINAM; F. Vernotte, UTINAM

Space Applications & New Techniques

Time Transfer by Laser Link T2L2 First Results .................................................................................................................. 194
  E. Samain, OCA; P. Exertier, OCA; Ph. Guillemot, CNES; F. Pierron, OCA; D. Albanese, OCA;
  J. Paris, OCA; J.-M. Torre, OCA; I. Petitbon, CNES; S. Leon, CNES

Status of the ACES Mission .................................................................................................................................................. 199
  R. Much, European Space Agency; E. Daganzo, European Space Agency; S. Feltham, European Space Agency;
  R. Nasca, European Space Agency; M.P. Hess, Astrium Space Transportation; L. Stringhetti, Astrium Space
  Transportation; L. Cacciapuoti, European Space Agency; C. Salomon, Laboratoire Kastler Brossel

Novel Time Synchronization Techniques for Deep Space Probes ...................................................................................... 205
  E. Re, Carlo Gavazzi Space; A. Di Cintio, Carlo Gavazzi Space; G. Busca, Kytime;
  D. Giunta, European Space Agency; M. Sanchez, Deimos Space

The Cross-Link Technique for Deep Space Missions .............................................................................................................. 211
  E. Rossini, Space Engineering SpA; G. Gallinaro, Space Engineering SpA; G. Palmerini, University
  "La Sapienza"; L. Schirone, University "La Sapienza"; L. Iess, University "La Sapienza";
  D. Giunta, ESA-ESTEC

Common-View Time Transfer Experiment Based on COMPASS-M1 Satellite ................................................. 216
  Fenglei Wu, Chinese Academy of Sciences; Xuhai Yang, Chinese Academy of Sciences; Xiaohui Li, Chinese
  Academy of Sciences; Wenhui Jiao, China Satellite Navigation Project Center; Xiaolin Jia, China Satellite
  Navigation Project Center; Fen Cao, Chinese Academy of Sciences; Le Sun, Chinese Academy of Sciences

Spin Squeezing

Producing Squeezed Input States for an Atomic Clock Using an Optical Cavity ..................................................... 220
  Ian D. Leroux, Massachusetts Institute of Technology; Monika H. Schleier-Smith, Massachusetts Institute of
  Technology; Vladan Vuletić, Massachusetts Institute of Technology

High Frequency Acoustic Waves & Microwaves

A SAW Resonator with Two-Dimensional Reflectors ........................................................................................................ 226
  Marc Solal, TriQuint Semiconductor Inc.; Julien Gratier, TriQuint Semiconductor Inc.;
  Taeho Kook, TriQuint Semiconductor Inc.

High Q X-Band Distributed Bragg Resonator Utilising an Aperiodic Alumina Plate Arrangement ..................................... 232
  Simon Bale, University of York; Jeremy Everard, University of York
Self Heating Under RF Power in BAW SMR and its Predictive 1D Thermal Model .......................... 237
N.B. Hassine, STMicroelectronics; D. Mercier, CEA-LETI/MINATEC; P. Renaux, CEA-LETI/MINATEC; D. Bloch, CEA-LETI/MINATEC; G. Parat, CEA-LETI/MINATEC; B. Ivira, CEA-LETI/MINATEC; P. Waltz, STMicroelectronics; C. Chappaz, STMicroelectronics; R. Fillit, Ecole Nationale Supérieure des Mines de Saint-Etienne; S. Basrour, TIMA CNRS-UJF-INPG

Change in Piezoelectric Boundary Acoustic Wave Characteristics with Overlay and Metal Grating Materials ........................................................................................................ 241
Yiliu Wang, Chiba University; Ken-Ya Hashimoto, Chiba University; Tatsuya Omori, Chiba University; Masatsune Yamaguchi, Chiba University

New Materials and Techniques

Layer Guided Surface Acoustic Wave Sensors Using Langasite Substrates .................................. 245
Robert H. Morris, Nottingham Trent University; Michael I. Newton, Nottingham Trent University; Paul Roach, Nottingham Trent University; Nicola Doy, Nottingham Trent University; Carl R. Evans, Nottingham Trent University; Shaun Atherton, Nottingham Trent University; Glen McHale, Nottingham Trent University

Transmission Properties of a 1D Resonant Cavity ...................................................................... 248
Ralf Lucklum, Otto-von-Guericke-University; Ines Hauer, Otto-von-Guericke-University

Acoustoelectric Effect Study for SAW Sensors ............................................................................. 254
D.C. Malocha, University of Central Florida; B. Fisher, University of Central Florida

Thermal Control of a Dual Mode Parametric Sapphire Transducer ............................................... 260
Jacopol Belfi, Unità di Pisa; Nicolò Beverini, Unità di Pisa; Andrea De Michele, Unità di Pisa; Gianluca Gabbiellini, Unità di Pisa; Francesco Mango, Unità di Pisa; Roberto Passaquieti, Unità di Pisa

GPS Receivers and Calibration

Evaluation of State-of-the-Art Geodetic GPS Receivers for Frequency Comparisons ................. 263
U. Weinbach, Leibniz Universität Hannover; S. Schön, Leibniz Universität Hannover; T. Feldmann, Physikalisch-Technische Bundesanstalt

Time and Frequency Transfer by Geodetic GPS: Comparison of Receivers and Computation Techniques ........................................................................................................ 269
Gérard Petit, Bureau International des Poids et Mesures; Laurent-Guy Bernier, METAS; Pierre Uhrich, LNE-SYRTE

A GPS Calibration Trip Experience Between ROA and PTB ..................................................... 274
H. Esteban, Real Instituto y Observatorio de la Armada; J. Palacio, Real Instituto y Observatorio de la Armada; F.J. Galindo, Real Instituto y Observatorio de la Armada; T. Feldmann, Physikalisch-Technische Bundesanstalt; A. Bauch, Physikalisch-Technische Bundesanstalt; D. Piester, Physikalisch-Technische Bundesanstalt
Microwave Clocks I

Flywheel Oscillator for Atomic Fountain Clocks Using Ultra-Stable Lasers and a Fiber-Based Optical Frequency Comb ................................................................. 280
J. Millo, Observatoire de Paris; Y. Le Coq, Observatoire de Paris; S. Bize, Observatoire de Paris; J. Guéna, Observatoire de Paris; J. Jiang, Observatoire de Paris; M. Abgrall, Observatoire de Paris; E.M.L. English, Observatoire de Paris; A. Clairon, Observatoire de Paris; G. Santarelli, Observatoire de Paris; M.E. Tobar, University of Western University of Western Australia

High Power Solid-State Sapphire Whispering Gallery Mode Maser ................................................. 282
Daniel L. Creedon, The University of Western Australia; Karim Benmessai, The University of Western Australia; Michael E. Tobar, University of Western Australia; John G. Hartnett, The University of Western Australia; Pierre-Yves Bourgeois, Institut FEMTO-ST; Yann Kersale, Institut FEMTO-ST; Jean-Michel Le Floch, The University of Western Australia; Vincent Giordano, Institut FEMTO-ST

Materials, Filters & Resonators I

Hollow-Core Resonator Based on Out-of-Plane 2D Photonic Band-Gap Crystal Cladding ........ 286
Georges Humbert, XLIM UMR CNRS Université de Limoges; David Mouneyrac, XLIM, UMR CNRS Université de Limoges; Denis Férachou, XLIM, UMR CNRS Université de Limoges; Dominique Cros, XLIM, UMR CNRS Université de Limoges; Jean-Michel Le Floch, University of Western Australia; Michael E. Tobar, University of Western Australia

Mode Conversion in High Overtone Bulk Acoustic Wave Resonators .............................................. 290
M. Pijolat, CEA, LETI, MINATEC; D. Mercier, CEA, LETI, MINATEC; A. Reinhardt, CEA, LETI, MINATEC; E. Defaÿ, CEA, LETI, MINATEC; C. Deguet, CEA, LETI, MINATEC; M. Aïd, CEA, LETI, MINATEC; J.S. Moulet, Silicon-on-Insulator Technologies; B. Ghyselen, Silicon-on-Insulator Technologies; S. Ballandras, FEMTO-ST UMR CNRS-LIFC-ENSMM-UTBM

Characterization of Doped BST Thin Films Deposited by Sol-Gel for Tunable Microwave Devices ....................................................................................................................... 295
A. Khalfallaoui, Univ Lille Nord de France; G. Vélu, Univ Lille Nord de France; L. Burgnies, Univ Lille Nord de France; J.C. Carru, Univ Lille Nord de France

Time Resolved Synchrotron Radiation X-Ray Topography Study of Surface Acoustic Waves Propagation ..................................................................................................................... 299
Bernard Capelle, Institut de Minéralogie et de Physique des Milieux Condensés; Yves Epelboin, Institut de Minéralogie et de Physique des Milieux Condensés; Jacques Déatant, Institut de Minéralogie et de Physique des Milieux Condensés; Alain Soyer, Institut de Minéralogie et de Physique des Milieux Condensés; Jürgen Härtwig, European Synchrotron Radiation Facility
Thin Film BAW Resonators

Isolated Acoustic Wave Based on AlN/ZnO/Diamond Structure for Sensor Applications ............ 305
Laurent Le Brizoual, Université Nantes; Omar Elmazria, Nancy University; Sergei Zghoon, Moscow Power Engineering Institute; Akram Soussou, Université Nantes; Frederic Sarry, Nancy University; Mohammed Abdou Djouadi, Université Nantes

High-Overtone Bulk Acoustic Wave Resonator on Galliumnitride .................................................... 309
Marc Loschonsky, IMTEK; David Eisele, IMTEK; Jeremy Masson, IMTEK - Universität Freiburg; Matthias Wieneke, Otto-von-Guericke-Universität Magdeburg; Sebastian Alzuaga, CNRS-ENSMM-UTBM; Armin Dadgar, Otto-von-Guericke-Universität Magdeburg; Sylvain Ballandras, CNRS-ENSMM-UTBM; Alois Krost, Otto-von-Guericke-Universität Magdeburg; Leonhard Reindl, IMTEK

Sputtered SiO2 As Low Acoustic Impedance Material for Bragg Mirror
Fabrication in BAW Resonators .................................................................................................................. 316
J. Olivares, Universidad Politécnica de Madrid; E. Wegmann, Universidad Politécnica de Madrid; J. Capilla, Universidad Politécnica de Madrid; E. Iborra, Universidad Politécnica de Madrid; M. Clement, Universidad Politécnica de Madrid; L. Vergara, ICMM-CSIC; R. Aigner, TriQuint Semiconductor

Noise in Systems and Oscillators

The Profound Impact of Negative Power Law Noise on the Estimation of Causal Behavior ....... 322
Victor S. Reinhardt, Raytheon Space and Airborne Systems

On Modern and Historical Short-Term Frequency Stability Metrics for Frequency Sources ........ 328
Michael S. McCorquodale, Mobius Microsystems, Inc; Richard B. Brown, University of Utah

More Fundamental Instabilities in Oscillators? ...................................................................................... 334
Michael J. Underhill, Underhill Research and Toric Limited

Low Phase Noise Oscillators: Theory and Application ................................................................. 338
Jeremy Everard, University of York

Optical Clocks II

Self-Referenced Er-Fiber Laser Comb with 300 MHz Comb Spacing ....................................................... 344
Jin-Long Peng, Center for Measurement Standards; Tze-An Liu, Center for Measurement Standards; Ren-Huei Shu, Center for Measurement Standards

An Optical Lattice Clock Based on Bosonic Sr ........................................................................................................ 347
Nicola Poli, Universita’ di Firenze; Marco G. Tarallo, Universita’ di Firenze; Marco Schioppo, Universita’ di Firenze; Christopher W. Oates, Universita’ di Firenze; Guglielmo M. Tino, Universita’ di Firenze
Quartz & Related Topics

Study of the Factors Limiting the Q Factors of High Performance Quartz Resonators .............................. 352
Jacques Detaint, Institut de Minéralogie et de Physique des Milieux Condensés; Bernard Capelle, Institut de Minéralogie et de Physique des Milieux Condensés; Yves Epelboin, Institut de Minéralogie et de Physique des Milieux Condensés

Common Mode Rejection in Electrically Coupled MEMS Resonators Utilizing Mode Localization for Sensor Applications ................................................................. 358
P. Thiruvenkatanathan, University of Cambridge; J. Yan, University of Cambridge; A.A. Seshia, University of Cambridge

Emerging Applications

Emerging Applications Requiring Precision Time and Frequency ................................................................. 364
M. Bloch, Frequency Electronics, Inc; D. Léonard, Frequency Electronics, Inc; O. Mancini, Frequency Electronics, Inc; T. McClelland, Frequency Electronics, Inc

Stability Measurements of Frequency Synthesis with Cryogenic Sapphire Oscillators .................. 372
John G. Hartnett, University of Western Australia; Daniel Creedon, University of Western Australia; D. Chambon, LNE-SYRTE; G. Santarelli, LNE-SYRTE

ELISA: an Ultra-Stable Oscillator for ESA Deep Space Antennas .......................................................... 376
S. Grop, FEMTO-ST; V. Giordano, FEMTO-ST; P.Y. Bourgeois, FEMTO-ST; N. Bazin, FEMTO-ST; Y. Kersalé, FEMTO-ST; M. Oxborrow, National Physical Laboratory; G. Marra, National Physical Laboratory; C. Langham, National Physical Laboratory; E. Rubiola, FEMTO-ST; J. DeVincente, European Spatial Agency

1.05 GHz MEMS Oscillator Based on Lateral-Field-Excited Piezoelectric AlN Resonators .......... 381
Chengjie Zuo, University of Pennsylvania; Jan Van der Spiegel, University of Pennsylvania; Gianluca Piazza, University of Pennsylvania

A 1.5GHz CMOS/FBAR Frequency Reference with ±10ppm Temperature Stability ......................... 385
Shailesh Rai, University of Washington; Ying Su, University of Washington; Aron Dobos, University of Washington; Richard Kim, University of Washington; Richard Ruby, Avago Technologies; Wei Pang, Avago Technologies; Brian Otis, University of Washington

GNSS Clocks & Timing

Update on the in-Orbit Performances of GIOVE Clocks ................................................................. 388
Pierre Waller, ESA/ESTEC; Francisco Gonzalez, ESA/ESTEC; Stefano Binda, ESA/ESTEC; Ilaria Sesia, INRiM; Patrizia Tavella, INRiM; Irene Hidalgo, GMV; Guillermo Tobías, GMV
Space Passive Hydrogen Maser - Performances and Lifetime Data ................................................................. 393
Fabien Droz, SpectraTime; Pierre Mosset, SpectraTime; Qinghua Wang, SpectraTime; Pascal Rochat, SpectraTime; Marco Belloni, Selex Galileo; Marina Gioia, Selex Galileo; Alberto Resti, European Space Agency; Pierre Waller, European Space Agency

Performance Assessment of the Time Difference Between EGNOS-Network-Time and UTC ............. 399
Jérôme Delporte, CNES; Norbert Suard, CNES; Pierre Uhrich, Observatoire de Paris

Galileo Timing Applications and ACTS Prototyping ................................................................................... 405
Claudio Cantelmo, B.U. Navigation & Integrated Communications; Renzo Zanello, B.U. Navigation & Integrated Communications; Marco Blanchi, B.U. Navigation & Integrated Communications; Paola Capetti, SEPA; Stefano Scarda, EU GNSS Supervisory Authority

Precise Time and Frequency Distribution Over a Wireless Network for A-GNSS Users ................... 411

Materials, Filters & Resonators II

An Optimized SAW Chirp-Z Transform for OFDM Systems ............................................................... 416
Takaya Watanabe, World Technology Instrument Co, Ltd

Balanced Front-End SAW Modules with Improved Selectivity at Low Frequency Offsets for Handheld Transceivers ............................................................ 420
Sergei Doberstein, ONIIP

2-and-3D Analysis of Temperature Effects on Periodic Transducers Using a FEA/BEM Approach ................................................................. 424
Julien Garcia, FEMTO-ST; Thierry Laroche, FEMTO-ST; William Daniau, FEMTO-ST; Emile Carry, FEMTO-ST; Gilles Martin, FEMTO-ST; S. Ballandras, FEMTO-ST; Jean-Michel Friedt, SENSesor SAS

On the Convergence of 2D and 3D Finite Element/Boundary Element Analysis for Periodic Acoustic Waveguides ................................................................. 430
William Daniau, FEMTO-ST; Michel Lenczner, FEMTO-ST; Thierry Laroche, FEMTO-ST; Julien Garcia, FEMTO-ST; Emile Carry, FEMTO-ST; Sylvain Ballandras, FEMTO-ST

Effects of Electrode Inertia on Vibration of Piezoelectric Plate with Dissipation .............................. 435
Jianke Du, Ningbo University; Xin Yin, Ningbo University; Yook-Kong Yong, Rutgers University; Kai Xian, Ningbo University; Ji Wang, Ningbo University

Point Spread Function of Electrical Probe for Measuring Induced Charge on Surface of Piezoelectric Vibrator ................................................................................. 438
Shigetaka Kaga, Nihon Dempa Kogyo Co, Ltd; Morio Onoe, University of Tokyo
The Influence of Electrode's Stratified Structures on SAW Devices Microwave Characteristics ............................. 443
Sergey Suchkov, Saratov State University; Dmitriy Suchkov, Saratov State University;
Dmitriy Chaikovskiy, Saratov State University

Theoretical Analysis of SAW Propagation Characteristics in (100)
Oriented AlN/Diamond Structure .............................................................................................................. 446
Chia-Chi Sung, National Taiwan University; Yuan-Feng Chiang, National Taiwan University;
Ruyen Ro, I-Shou University; Ruyue Lee, I-Shou University; Sean Wu, Tung-Fang Institute of Technology

An Analysis of Vibrations of Quartz Crystal Plates with Nonlinear Mindlin Plate Equations ........ 450
Ji Wang, Ningbo University; Rongxing Wu, Ningbo University; Yook-Kong Yong, Rutgers University;
Jianke Du, Ningbo University; Dejin Huang, Ningbo University

The Fifth-Order Overtone Vibrations of Quartz Crystal Plates with
Higher-Order Mindlin Plate Equations ..................................................................................................... 455
Ji Wang, Ningbo University; Lijun Yang, Ningbo University; Nisha Sun, Ningbo University;
Rongxing Wu, Ningbo University; Jianke Du, Ningbo University; Dejin Huang, Ningbo University

The Effects of Acoustic Mismatch on Internal Dielectrically Transduced
Micromechanical Resonators ....................................................................................................................... 460
Eugene Hwang, Cornell University; Sunil A. Bhave, Cornell University

Universal Modeling of the Bulk Acoustic Wave Devices .............................................................................. 466
Boris Sveshnikov, Nizhny Novgorod State University

Oscillators, Synthesizers & Noise I

A Novel Voltage Controlled Crystal Oscillator (VCXO) .................................................................................. 470
Ulrich L. Rohde, Synergy Microwave Corporation; Ajay K. Poddar, Synergy Microwave Corporation

An RCC Receiver IC with TAD-DQD and ADPLL Using Frequency
Multiplying Number with Decimals .............................................................................................................. 478
Takamoto Watanabe, DENSO Corporation; Sumio Masuda, DENSO Corporation;
Hiroyuki Wakairo, Seiko NPC Corporation

FEM Thermal Analysis of Quartz Oscillator with COMSOL ........................................................................ 482
T. Louvet-Carron, TEMEX; J. Leost, TEMEX

The Effect of Power-Drive Level on the Calibration of the Bridge Instrument for the
Measurement of the Quartz Stability ............................................................................................................ 487
F. Sthal, FEMTO-ST; S. Galliou, FEMTO-ST; J. Imbaud, FEMTO-ST; X. Vacheret, FEMTO-ST;
P. Salzenstein, FEMTO-ST; E. Rubiola, FEMTO-ST; G. Cibiel, CNES

A Novel Phase Processing Approach Based on New Concept and Method .................................................. 492
Wei Zhou, Xidian University; Miao Miao, Xidian University; Hui Zhou, Xidian University;
Baoqiang Du, Xidian University; Hainiu Zhou, Xidian University
Synthesis Chains Based on Ultra-Stable Cryogenic Sapphire Oscillator at NICT .......................... Motohiro Kumagai, National Institute of Information and Communications Technology; Hiroyuki Ito, National Institute of Information and Communications Technology; Shigeo Nagano, National Institute of Information and Communications Technology; Mizuho Hosokawa, National Institute of Information and Communications Technology; Giorgio Santarelli, Laboratoire national de métrie et d’essais; Clayton R. Locke, University of Western Australia; John G. Hartnett, University of Western Australia

Analysis of Two-Stage Passive Vibration Isolation System for Crystal Oscillator at High-Frequency Vibration .......................................................................................................................... Wei Fu, University of Electronic Science and Technology of China; Zhichao Qian, University of Electronic Science and Technology of China; Xianhe Huang, University of Electronic Science and Technology of China; Feng Tan, University of Electronic Science and Technology of China

Study of Dual-Loop Optoelectronic Oscillators .......................................................................................... Etgar Levy, Technion Israel Institute of Technology; Moshe Horowitz, Technion Israel Institute of Technology; Olukayode Okusaga, University of Maryland Baltimore County; Curtis Menyuk, University of Maryland Baltimore County; Gary Carter, University of Maryland Baltimore County; Weimin Zhou, US Army Research Laboratory

A New Method for the Design of Digital Disciplined ............................................................................... Yu Xiang, National Time Service Center, Chinese Academy of Sciences; Yu Hua, National Time Service Center, Chinese Academy of Sciences; Wei Guo, National Time Service Center, Chinese Academy of Sciences; Wei Zhang, Xi’an Branch, Chinese Academy of Sciences

Phase Noise in Detached Crystal Oscillators ............................................................................................. Luc A. Omlin, L Omlin

Multi-Mode Crystal Oscillator for Simultaneous Excitation of Three Thickness-Shear Modes in Stress Compensated Resonator .......................................................................................................................... Vladimír Štofanik, Slovak Academy of Sciences; Igor Baláž, Slovak University of Technology in Bratislava; Marián Minárík, Slovak University of Technology in Bratislava; Stanislav Kozinka, Slovak University of Technology in Bratislava

9 MHz Vibrating Body FET Tuning Fork Oscillator .......................................................................................... Daniel Grogg, Nanoelectronic Devices Laboratory; Fabrizio Lo Conte, Ecole Polytechnique Fédérale de Lausanne; Maher Kayal, Ecole Polytechnique Fédérale de Lausanne; Adrian Mihai Ionescu, Nanoelectronic Devices Laboratory

Effect of Vibration on PM and AM Noise of Oscillatory and Non-Oscillatory Components at 10 GHz .......................................................................................................................... A. Hati, National Institute of Standards and Technology; C.W. Nelson, National Institute of Standards and Technology; D.A. Howe, National Institute of Standards and Technology

High Performance of DMTD System Used in a Composite Clock ....................................................................... C. Plantard, Besançon Observatory; P.M. Mbaye, Besançon Observatory; F. Vernotte, Besançon Observatory
Low Phase Noise Frequency Synthesiser for the Trapped Atom Clock on a Chip .......................... 535
F. Ramírez-Martínez, Observatoire de Paris; M. Lours, Observatoire de Paris; P. Rosenbusch, Observatoire de Paris; F. Reinhard, Laboratoire Kastler Brossel, Ecole Normale Supérieure; J. Reichel, Laboratoire Kastler Brossel, Ecole Normale Supérieure

Almost All-Digital Sinewave-Product Generation for Frequency Synthesis Applications ............. 540
William A. Ling, Johns Hopkins University and Sotekco Electronics, LLC; Paul Peter Sotiriadis, Johns Hopkins University and Sotekco Electronics, LLC

Timekeeping, Optical & Microwave Atomic Standards I

A New Method to Reduce Frequency-Temperature Coefficient of Sapphire Loaded Cavity for Compact Hydrogen Masers ................................................................. 544
Ren-Fu Yang, Beijing Institute of Radio Metrology & Measurement; Tie-Zhong Zhou, Beijing Institute of Radio Metrology & Measurement; Hai-bo Chen, Beijing Institute of Radio Metrology & Measurement; Nuan-Rang Wang, National Key Laboratory of Metrology and Calibration Technology; Lian-Shan Gao, National Key Laboratory of Metrology and Calibration Technology

Designs of a Miniaturized Sapphire-Loaded Cavity for Space Borne Hydrogen Masers ................. 548
Ren-Fu Yang, Beijing Institute of Radio Metrology & Measurement; Tie-Zhong Zhou, Beijing Institute of Radio Metrology & Measurement; Nuan-Rang Wang, National Key Laboratory of Metrology and Calibration Technology; Lian-Shan Gao, Beijing Institute of Radio Metrology & Measurement

Improvement of the Atomic Hydrogen Maser for Chinese Compass System .................................. 553
Yong Cai, Shanghai Astronomical Observatory Chinese Academy of Sciences; Yidong Wu, Shanghai Astronomical Observatory Chinese Academy of Sciences; Yan-jun Zhang, Shanghai Astronomical Observatory Chinese Academy of Sciences; Weiqun Zhang, Shanghai Astronomical Observatory Chinese Academy of Sciences; Yiping Zhang, Shanghai Astronomical Observatory Chinese Academy of Sciences

Study of Coherent Population Trapping Occurring in 87Rb Atoms Contained in Wall-Coated Cells ................................................................. 559
Evelina Breschi, Université de Neuchâtel; Gaetano Mileti, Université de Neuchâtel

Update on the Development of NRC-FCs1 ................................................................................. 562
L. Marmet, National Research Council

Application of New PLL in Active Atomic Frequency Standard Circuit ........................................ 565
Faxi Chen, Xidian University; Wei Zhou, Xidian University; Hao Wang, Xidian University; Ning Ding, Xidian University

Bayesian Inference of a Negative Quantity from Positive Measurement Results ............................. 568

The Chip-Scale Atomic Clock – Recent Developments .................................................................. 573
Robert Lutwak, Symmetricom
85Rb D1-Line CPT Atomic Clock with Low Power Consumption ................................................................. 578
Shigeyoshi Goka, Tokyo Metropolitan University

FM Spectroscopy of CPT Resonances with AOM Operating Purely in the
Raman-Nath Diffraction Regime As Optic Phase Modulator ............................................................... 582
Viacheslav Baryshev, FGUP VNIIFTRI; Viacheslav Epikhin, FGUP VNIIFTRI; Leonid Kopylov, FGUP VNIIFTRI; Yury Domnin, FGUP VNIIFTRI

Comparison of Achievable Performances As Regards Rubidium Gas Cell Frequency Standards
with Continuous and Pulse Laser Pumping and with Coherent Population Trapping ......................... 587
V. Zholnerov, Russian Institute of Radionavigation and Time; A. Besedina, Russian Institute of
Radionavigation and Time; G. Kazakov, St Petersburg State Polytechnic University

The European Laser Timing (ELT) Experiment on-board ACES .......................................................... 594
Ulrich Schreiber, Technische Universitaet Muenchen; Ivan Prochazka, Czech Technical University in
Prague; Pierre Lauber, Technische Universitaet Muenchen; Urs Hugentobler, Technische Universitaet
Muenchen; Wolfgang Schäfer, TimeTech GmbH; Luigi Cacciapuoti, European Space Agency;
Rosario Nasca, European Space Research

Stark Shift of the Cs Clock Transition Frequency: A New Experimental Approach ......................... 600
Jean-Luc Robyr, University of Fribourg; Paul Knowles, University of Fribourg;
Antoine Weis, University of Fribourg

Preliminary Results of the Trapped Atom Clock on a Chip ................................................................. 604
Clement Lacroute, Observatoire de Paris; Fernando Ramirez-Martinez, Observatoire de Paris;
Peter Rosenbusch, Observatoire de Paris; Friedemann Reinhard, Physikalisches Institut, Stuttgart;
Christian Deutsch, Laboratoire Kastler Brossel; Tobias Schneider, Institut für Experimentalphysik,
Düsseldorf; Jakob Reichel, Laboratoire Kastler Brossel

Sensors & Transducers I

A Study on the Metal Tube Type Ultrasonic Motor (MTTUSM) .......................................................... 609
Jou Jwo Ming, Cheng Shiu University

Application of Acoustical Activity for Measurement of Acoustic Wave Frequency .......................... 613
F.R. Akhmedzhanov, Navoi State Mining Institute

SAW Noise-Like Anti-Collision Code Study .......................................................................................... 616
N.Y. Kozlovski, University of Central Florida; D.C. Malocha, University of Central Florida

Influence of Diffraction on the SAW Tag Characteristics ................................................................. 622
Boris Sveshnikov, Nizhny Novgorod State University

Drift Errors in Passive Remote Wireless SAW Sensing with Multiple DPM ................................. 626
Yuriy S. Shmaliy, Guanajuato University; Oleksandr Shmaliy, Engineering Pedagogical Academy, Kharkiv;
Oscar Ibarra-Manzano, Guanajuato University
SATER Modem Used in Microwave Time Transfer ................................................................. 632
Wei Li, National Time Service Center; Shaowu Dong, National Time Service Center; Haibo Yuan, National Time Service Center; Chunxia Liu, National Time Service Center; Hong Zhang, National Time Service Center

Precise Time Transfer Activities in Singapore ................................................................. 634
Yanying Liu, National Metrology Centre; Z. Jiang, Bureau International des Poids et Mesures; Hideo Maeno, National Institute of Information and Communications Technology; Ryo Tabuchi, National Institute of Information and Communications Technology

The Hydrogen Maser and Cesium Clocks in Time Keeping at NTSC .............................. 639
Haibo Yuan, National Time Service Center; Lili Qu, National Time Service Center; Shaowu Dong, National Time Service Center; Wei Li, National Time Service Center; Hong Zhang, National Time Service Center

Development of Deep-Space Navigation by Pulsars in China ...................................... 643
Sun Hongwei, Xi’an University of Arts and Science; Chen Guangfeng, Xi’an University of Arts and Science; Yuan Haibo, National Time Service Center; Zhang Hong, National Time Service Center

Implementing the Galileo Precise Timing Facility ........................................................ 647
Renzo Zanello, ThalesAleniaSpace; Marco Blanchi, Thales Alenia Space; Chiara Piras, SOFITER Group/TAS ext; Edoardo Detoma, SEPA; Paola Capetti, SEPA; Angelo Bellotti, Alenia SIA; Diego Villabruna, Alenia SIA

Time and Frequency Activities at the U.S. Naval Observatory .................................... 653
Demetrios Matsakis, U.S. Naval Observatory

A GPS Carrier-Phase Aided Clock Transport for the Calibration of a Regional Distributed Time Scale ........................................................................................................ 659
Kenneth Jaldehag, SP Technical Research Institute of Sweden; Carsten Rieck, SP Technical Research Institute of Sweden

Study of Algorithm to Ensemble Atomic Time ............................................................... 664
Chong Xia Zhong, Beijing Institute of Radio Metrology and Measurement; Yue Qing Xu, Beijing Institute of Radio Metrology and Measurement; Jun Yang, Beijing Institute of Radio Metrology and Measurement; Sheng Kang Zhang, Beijing Institute of Radio Metrology and Measurement

Combination of GPS and TWSTFT Data for Time and Frequency Transfer .................. 670
Maria Carmen Martinez, Alicante University; Pascale Defraigne, Royal Observatory of Belgium

Ultrahigh Resolution Frequency Measurement Scheme Based on Phase Relationship Between Period Groups ........................................................................................................ 676
Faxi Chen, Xidian University; Wei Zhou, Xidian University; Zi Ye, Zhejiang University; Hai Wang, Xidian University

Multi-Channel Beat-Frequency Digital Measurement System for Frequency Standard .... 679
Ya Liu, National Time Service Center; Xiao-Hui Li, National Time Service Center; Yu-Lan Wang, National Time Service Center
Fast Computation of the Dynamic Allan Variance .......................................................... 685
Lorenzo Galleani, Politecnico di Torino; Patrizia Tavella, INRIM

Algorithm of Intersatellite Dynamic Two-Way Time Transfer Based on GEO Satellite .......... 688
Feijiang Huang, National Time Service Center; Xiaochun Lu, National Time Service Center;
Haitao Wu, National Time Service Center; Yujing Bian, National Time Service Center;
Hang Zhao, National Time Service Center

Research on Computer Time Synchronization ................................................................. 692
Lei Hou, National Time Service Center; Yonghui Hu, National Time Service Center; Junliang Liu, National
Time Service Center; Rui Xu, National Time Service Center; Wei Guo, National Time Service Center;
Yu Xiang, National Time Service Center

The Effect of Error in Position Co-Ordinates of the Receiving Antenna on the
Single-Satellite-Mode GPS Timing ........................................................................... 695
Suman Sharma, National Physical Laboratory; P. Banerjee, National Physical Laboratory

Digital Time Stamping System Based on Open Source Technologies ......................... 700
R. Miškinis, Semiconductor Physics Institute; D. Smirnov, Semiconductor Physics Institute;
E. Urba, Semiconductor Physics Institute; A. Burokas, Semiconductor Physics Institute;
B. Malysko, State Tax Inspectorate; P. Laud, Cybernetica AS; F. Zuliani, Nergal S.r.l.

Transmission Time-Based Authentication Scheme Using 3G Mobile Device for DRM System ...... 706
Takahiro Tsuchiya, Nihon University; Masami Kihara, Nihon University; Arjulie John P. Berena, National
Institute of Informatics

First Application of the T2L2 Ground to Space Time Transfer:
Characterisation of the DORIS USO ........................................................................ 711
Ph. Guillemot, CNES - French Space Agency; P. Exertier, Observatoire de la Côte d’Azur; E. Samain,
Observatoire de la Côte d’Azur; Ch. Jayles, CNES - French Space Agency; F. Cibiel, CNES - French Space
Agency; S. Leon, CNES - French Space Agency

Laboratory Experiment of 9.2 GHz Frequency Transfer with a Fiber .............................. 715
Weiliang Chen, Beijing Institute of Technology; Tianchu Li, National Institute of Metrology;
Pingwei Lin, National Institute of Metrology; Yige Lin, National Institute of Metrology

Composite Clock : New Simulation’s Results Obtained from an Algorithm Developed for
Locking a VCO to HM Clock and Then to Cs Frequency Standard ................................ 721
P.M. Mbaye, Laboratoire d’Astrophysique de l’Observatoire de Besanc_on; C.W. Plantard, Laboratoire
d’Astrophysique de l’Observatoire de Besanc_on; A. Makdissi, Laboratoire d’Astrophysique de l’Observatoire
de Besanc_on; F. Vernotte, Laboratoire d’Astrophysique de l’Observatoire de Besanc_on

Long Term Time Stability of Conventional GPS Receivers ........................................... 725
K. Kalliomaki, MIKES; T. Mansten, MIKES; H. Koivula, MIKES; J. Mannermaa, Nokia Corporation
Efficient Predictive Steering of Local Clocks in GPS-Based Timekeeping ........................................ 727
Yuriy S. Shmaliy, Guanajuato University; Oscar Ibarra-Manzano, Guanajuato University; Luis Arceo-Miquel, Guanajuato University

An Innovative Time Service via Telephone Network - a Study on its Potentiality ................................. 733
P. Banerjee, National Physical Laboratory; P.P. Thorat, National Physical Laboratory; A.K. Suri, National Physical Laboratory

Optical Frequency Standards & Applications I

G-Pisa gyrolaser ...................................................................................................................... 738
J. Belfi, Università di Pisa; N. Beverini, Università di Pisa; F. Bosi, Università di Pisa; G. Carelli, Università di Pisa; A. Di Virgilio, INFN, Sezione di Pisa; R. Graham, Università di Pisa; E.M.L. Maccioni, Università di Pisa; M. Pizzocaro, Università di Pisa; A. Porzio, Unità di Napoli; U. Schreiber, Universität München Fundamentalstation; S. Solimeno, Unità di Napoli; F. Sorrentino, Università di Firenze; A. Velikoseltsev, Universität München Fundamentalstation

Methods of Conversion of Stability of Femtosecond Stabilized Mode-Locked Laser to Optical Resonator ............................................................................................................. 742
Radek Šmíd, Institute of Scientific Instruments of ASCR; Ondřej Číp, Institute of Scientific Instruments of the ASCR; Josef Lazar, Institute of Scientific Instruments of the ASCR

Development of an Ultra-Narrow-Linewidth Laser for Interrogating the 1S0 - 3P0 Clock Transition in Yb Atoms ......................................................................................................................... 747
Kazumoto Hosaka, National Metrology Institute of Japan; Masami Yasuda, National Metrology Institute of Japan; Hajime Inaba, National Metrology Institute of Japan; Takuya Kohno, CREST, Japan Science and Technology Agency; Yoshiaki Nakajima, National Metrology Institute of Japan; Atsushi Onae, National Metrology Institute of Japan; Feng-Lei Hong, National Metrology Institute of Japan

Absolute Frequency Measurement of the 40Ca+ Clock Transition Using a LD-Based Clock Laser and UTC(NICT) .................................................................................................................. 751
Kensuke Matsubara, National Institute of Information and Communications Technology; Ying Li, National Institute of Information and Communications Technology; Shigeo Nagano, National Institute of Information and Communications Technology; Hiroyuki Ito, National Institute of Information and Communications Technology; Masatoshi Kajita, National Institute of Information and Communications Technology; Reiko Kojima, National Institute of Information and Communications Technology; Kazuhiro Hayasaka, National Institute of Information and Communications Technology; Yuko Hanado, National Institute of Information and Communications Technology; Mizuho Hosokawa, National Institute of Information and Communications Technology

A Compact Source of Ultracold Ytterbium for an Optical Lattice Clock ........................................ 756
Charbel Abou-Jaoudeh, University Düsseldorf; Cristian Bruni, University Düsseldorf; Florian Baumer, University Düsseldorf; Axel Görlitz, University Düsseldorf

Control of the Laser Frequency of the Virgo Gravitational Wave Interferometer with an in-Loop Relative Frequency Stability of 1.0 x 10-21 on a 100 Ms Time Scale ........................................ 760
F. Bondu and the Virgo Collaboration
Microwave Clocks II

First Dual Mode Operation of the Cs/Rb FO2 Double Fountain at SYRTE ........................................ 764
J. Guéna, Observatoire de Paris; P. Rosenbusch, Observatoire de Paris; Ph. Laurent, Observatoire de Paris,
CNRS; M. Abgrall, Observatoire de Paris; G.D. Rovera, Observatoire de Paris; G. Santarelli, Observatoire de
Paris; S. Bize, Observatoire de Paris; A. Clairon, Observatoire de Paris; M.E. Tobar, University of
Western Australia

The Cryogenic Fountain ITCsF2 ................................................................................................................. 769
Filippo Levi, Istituto Nazionale di Ricerca Metrologica; Claudio Calosso, Istituto Nazionale di Ricerca
Metrologica; Davide Calonico, Istituto Nazionale di Ricerca Metrologica; Luca Lorini, Istituto Nazionale di
Ricerca Metrologica; Elio K. Bertacco, Istituto Nazionale di Ricerca Metrologica; Aldo Godone, Istituto
Nazionale di Ricerca Metrologica; Giovanni A. Costanzo, Politecnico di Torino; Barbara Mongino, Politecnico
di Torino; Steven R Jefferts, National Institute of Standards and Technology; Thomas P Heavner, National
Institute of Standards and Technology; Elizabeth A Donley, National Institute of Standards and Technology

A New Trapped Ion Clock Based on 201Hg+ ........................................................................................................ 774
S. Taghavi-Larigani, NASA Jet Propulsion Laboratory, California Institute of Technology; E.A. Burt, NASA
Jet Propulsion Laboratory, California Institute of Technology; S.N. Lea, National Physical Laboratory;
J.D. Prestage, NASA Jet Propulsion Laboratory, California Institute of Technology; R.L. Tjoelker, NASA Jet
Propulsion Laboratory, California Institute of Technology

Sensors and Actuators

Acoustically Driven Microfluidic Applications for on-Chip Laboratories .............................................. 778
Achim Wixforth, University of Augsburg

MEMS Viscosity Sensor ........................................................................................................................................... 784
Arthur Ballato, US Army Communications-Electronics RDEC

Signal Generation & Processing

Timing and Spectral Properties of the Flying-Adder Frequency Synthesizers ............................................. 788
Paul P. Sotiriadis, Sotekco Electronics LLC

Phase Noise Evaluation of DAC for Synthesizer Applications .................................................................... 793
J. Hellén, SAAB Microwave Systems; M. Oskarsson, SAAB Microwave Systems

Quantized Amplitudes in a Nonlinear Resonant Electrical Circuit .............................................................. 797
B. Cretin, FEMTO-ST Institute; D. Vernier, FEMTO-ST Institute

Study of SAW Chirp- Z Transform for an Enhancement of OFDM/OFDMA Systems .............................. 801
Takaya Watanabe, World Technology Instrument Co, Ltd
Fiber Links

Phase-Coherent Frequency Comparison of Optical Clocks Using a Telecommunication Fiber Link ................................................................. 807
H. Schnatz, Physikalisch-Technische Bundesanstalt; O. Terra, Physikalisch-Technische Bundesanstalt; K. Predehl, Physikalisch-Technische Bundesanstalt; T. Feldmann, Physikalisch-Technische Bundesanstalt; T. Legero, Physikalisch-Technische Bundesanstalt; B. Lipphardt, Physikalisch-Technische Bundesanstalt; U. Sterr, Physikalisch-Technische Bundesanstalt; G. Grosche, Physikalisch-Technische Bundesanstalt; K. Predehl, Max-Planck-Institute for Quantum Optics; T.W. Hänsch, Max-Planck-Institute for Quantum Optics; R. Holzwarth, Max-Planck-Institute for Quantum Optics; Th. Udem, Max-Planck-Institute for Quantum Optics; Z. Lu, Max-Planck-Institute for the Science of Light; L. Wang, Max-Planck-Institute for the Science of Light; W. Ertmer, University of Hanover; J. Friebe, University of Hanover; A. Pape, University of Hanover; E.-M. Rasel, University of Hanover; M. Riedmann, University of Hanover; T. Wübbena, University of Hanover

High-Resolution Optical Frequency Dissemination on a Telecommunication Network ............ 813
Anne Amy-Klein, Laboratoire de Physique des Lasers Université Paris 13; Olivier Lopez, Laboratoire de Physique des Lasers Université Paris 13; Fabien Kéfélian, Laboratoire de Physique des Lasers Université Paris 13; Christian Chardonnet, Laboratoire de Physique des Lasers Université Paris 13; Haifeng Jiang, Observatoire de Paris; Giorgio Santarelli, Observatoire de Paris

Ultra Low Frequency Noise Laser Stabilized on Optical Fiber Spool ...................................................... 815
Haifeng Jiang, Observatoire de Paris; Pierre Lemonde, Observatoire de Paris; Giorgio Santarelli, Observatoire de Paris; Fabien Kéfélian, Laboratoire de Physique des Lasers Université Paris 13

Microcantilevers

Chemical Sensing Using Microcantilever without Sensitive Coating ............................................................... 818
Sébastien Tétin, Université de Bordeaux; Benjamin Caillard, Université de Bordeaux; Francis Ménil, Université de Bordeaux; Hélène Debéda, Université de Bordeaux; Claude Lucaï, Université de Bordeaux; Claude Pellet, Université de Bordeaux; Isabelle Dufour, Université de Bordeaux

Specific Geometries of Resonant Cantilevers for Scanning Force Microscopy ........................... 822
Julian Le Rouzic, FEMTO-ST Institute; Bernard Cretin, FEMTO-ST Institute; Pascal Vairac, FEMTO-ST Institute; Bruno Cavallier, FEMTO-ST Institute

Resonant Langasite Microsensor for Atomic Force Microscopy .............................................................. 826
G. Douchet, FEMTO-ST Institute; F. Sthal, FEMTO-ST Institute; E. Bigler, FEMTO-ST Institute; R. Bourquin, FEMTO-ST Institute; T. Leblois, FEMTO-ST Institute

FEA Calculations on the Lateral Field Electroded Sensor ................................................................. 831
E.P. EerNisse, Quartzdyne, Inc; D. Puccio, Quartzdyne, Inc; R. Lucklum, Otto-von-Guericke University Madgeburg; U. Hempel, Institute for Automation and Communication
Timing Stability in Applications

The Allan Variance – Challenges and Opportunities ................................................................. 835
Samuel R. Stein, Symmetricom, Inc

Optical Clocks III

Toward a Mercury Optical Lattice Clock: Spectroscopy of the Clock Transition in Fermionic Isotopes .......................................................... 840
S. Mejri, Observatoire de Paris; M. Petersen, Observatoire de Paris; D.V. Magalhães, Universidade de Sao Paulo; C. Mandache, Observatoire de Paris and Plasmas and Radiation, Plasmas and Nuclear Fusion Laboratory; S. Dawkins, Observatoire de Paris; R. Chicireanu, Observatoire de Paris; Y. Le Coq, Observatoire de Paris; A. Clairon, Observatoire de Paris; S. Bize, Observatoire de Paris

Fluidic Sensors

Fluidic Sensors Based on Vibrating Miniaturized Devices ....................................................... 842
Bernhard Jakoby, Johannes Kepler University Linz

Torsional Acoustic Waveguide Sensor for Temperature and Liquid Level .................................. 850
William K. Spratt, University of Maine; John F. Vetelino, Laboratory for Surface Science and Technology and Department of Electrical Engineering

Simple Frequency-Based Sensing of Viscosity and Dielectric Properties of a Liquid Using Acoustic Resonators ................................................................. 855
Diethelm Johannsmann, Clausthal University of Technology; Wendelin Bücking, Clausthal University of Technology; Berthold Bode, Flucon Fluid Control GmbH; Judith Petri, Clausthal University of Technology

A Love-Wave Sensor for Direct Detection of Biofunctionalized Nanoparticles .......................... 861
L. El Fissi, Senseor; J-M. Friedt, Senseor; V. Luzet, FEMTO-ST; F. Chérioux, FEMTO-ST; G. Martin, FEMTO-ST; S. Ballandras, FEMTO-ST

Opto-Electronic Oscillators

High-Q Optical Resonators for Stabilization of High Spectral Purity Microwave Oscillators ...... 866
P.-H. Merrer, LAAS-CNRS; A. Bouchier, LAAS-CNRS; H. Brahimi, LAAS-CNRS; O. Llopis, LAAS-CNRS; G. Cibiel, CNES

An Analytical Model of the Dual-Injection-Locked Opto-Electronic Oscillator (DIL-OEO) ........ 870
C.R. Menyuk, University of Maryland; E.C. Levy, Technion Israel Institute of Technology; O. Okusaga, University of Maryland Baltimore County and Army Research Laboratory; M. Horowitz, Technion Israel Institute of Technology; G.M. Carter, University of Maryland Baltimore County; W. Zhou, Army Research Laboratory
Experimental and Simulation Study of Dual Injection-Locked OEOs

Olukayode Okusaga, US Army Research Laboratory; Weimin Zhou, US Army Research Laboratory; Elgar Levy, Technion Israel Institute of Technology; Moshe Horowitz, Technion Israel Institute of Technology; Gary Carter, University of Maryland Baltimore County; Curtis Menyuk, University of Maryland Baltimore County

Photonic Millimeter-Wave Generation and Transmission System Applicable to the High-Frequency Radio Interferometers

Hitoshi Kiuchi, National Astronomical Observatory of Japan; Tetsuya Kawanishi, National Institute of Information and Communications Technology

Observation of Persistent Photoconductivity and Modified Permittivity in Bulk Gallium Arsenide and Gallium Phosphide Samples at Cryogenic Temperatures

David Mouneyrac, University of Western Australia; John G. Hartnett, University of Western Australia; Jean-Michel Le Floch, University of Western Australia; Michael E. Tobar, University of Western Australia; Jerzy Krupka, Institute of Microelectronics and Optoelectronics; David Mouneyrac, XLIM UMR; Dominique Cros, XLIM UMR

Bulk Acoustic Wave Filter Synthesis and Optimization for UMTS Applications

Sylvain Giraud, XLIM UMR; Stéphane Bila, XLIM UMR; Matthieu Chatras, XLIM UMR 6172; Dominique Cros, XLIM UMR; Michel Aubourg, XLIM UMR

Piezoelectric Aluminum Nitride Resonator for Oscillator

O. Mareschal, NXP Semiconductors; S. Loiseau, NXP Semiconductors; A. Fougerat, NXP Semiconductors; L. Valbin, ESIEE - ESYCOM; G. Lissorgues, ESIEE - ESYCOM; S. Saëz, GREYC - CNRS; C. Dolabdjian, GREYC - CNRS; R. Bouregba, CRISMAT - CNRS; G. Poullain, CRISMAT - CNRS

An Acoustic Waveguide Based on Doubly-Bonded Silicon/PPT/Silicon Structures

E. Courjon, FEMTO-ST; F. Bassignot, FEMTO-ST; G. Ulliacci, FEMTO-ST; T. Laroche, FEMTO-ST; J. Garcia, FEMTO-ST; D. Gachon, FEMTO-ST; S. Queste, FEMTO-ST; J-P. Romand, FEMTO-ST; S. Ballandras, FEMTO-ST; R. Petit, CELAR, DGA

Electrode Sizing for Guided Wave Resonator Above a Bragg Mirror

Issiaka Kone, CEA, LETI, MINATEC; Alexandre Reinhardt, CEA, LETI, MINATEC; Frédéric Domingue, CEA, LETI, MINATEC; Bertrand Dubus, CNRS UMR 8520; Lionel Buchaillot, CNRS UMR 8520; Fabrice Casset, CEA, LETI, MINATEC; Jean François Carpentier, STMicroelectronics; Marc Aid, CEA, LETI, MINATEC

High Frequency Crystal Monolithic Filter with High Power Level in Airborne Application

Bertrand d’Albaret, AR-Electronique; Bernard Wolcoff, AR-Electronique; Séverine Michel, AR-Electronique; Olivier Franquet, AR-Electronique; Philippe de Joffrey, AR-Electronique; Philippe Cappelle, AR-Electronique Parc La Fayette
Miniature Sapphire Acoustic Resonator (MSAR) ................................................................. 913
Rabi T. Wang, California Institute of Technology; G. John Dick, California Institute of Technology; Robert
L. Tjoelker, California Institute of Technology

Focus Adjustment System for a Fast-Scanning and Phase-Sensitive Laser Probe for
Radio Frequency Surface and Bulk Acoustic Wave Devices .................................................. 915
Nan Wu, Chiba University; Keisuke Kashiwa, Chiba University; Ken-Ya Hashimoto, Chiba University;
Tatsuya Omori, Chiba University; Masatsune Yamaguchi, Chiba University; Naoki Kasai, Neoark Co Ltd

Acoustic Wave Devices Using Periodical Poled Z-Cut LiTaO3 Plate ...................................... 919
Michio Kadota, Murata Mfg Co, Ltd; Takashi Ogami, Murata Mfg Co, Ltd; Kansho Yamamoto, Murata Mfg
Co, Ltd; Yasuo Cho, Tohoku University

Trial Production Result of MCF Adopted Narrow Band Radio Transceiver Module ................... 923
Hiroyuki Yamaguchi, Nihon Dempa Kogyo Co., Ltd; Kaoru Kobayashi, Nihon Dempo Kogyo Co., Ltd;
Shinichi Satoh, Nihon Dempo Kogyo Co., Ltd; Masanobu Okazaki, Nihon Dempo Kogyo Co., Ltd

Relation Between Physical Processes and Aging ................................................................. 927
Eberhard Seydel, Vectron International GmbH & Co KG

Design of IF Two-Track Filters Using IDT/(100) AlN/Diamond Structure ................................. 931
Ruyen Ro, I-Shou University; Ruyue Lee, I-Shou University; Chia-Chi Sung, National Taiwan University;
Yuan-Feng Chiang, National Taiwan University; Sean Wu, Tun-Fang Institute of Technology

Material Parameters of AlN and LiAlO2 Single Crystals ...................................................... 935
A.V. Sotnikov, Leibniz Institute for Solid State and Materials Research; H. Schmidt, Leibniz Institute for
Solid State and Materials Research; M. Weihnacht, Leibniz Institute for Solid State and Materials Research;
E.P. Smirnova, A.F. Ioffe Physical-Technical Institute of the Russian Academy of Sciences;
T.Yu. Chemekova, Nitride Crystals Group; Yu.N. Makarov, Nitride Crystals Group

Electrical Control for Wet Etching of Quartz Resonators ..................................................... 939
William Clower, Louisiana Tech University; Eric Rodrigue, Louisiana Tech University;
Chester Wilson, Louisiana Tech University; Ville Kaajakari, Louisiana Tech University

DCS Tx Filters Using AlN Resonators with Iridium Electrodes ............................................... 943
M. Clement, Universidad Politécnica de Madrid; E. Iborra, Universidad Politécnica de Madrid; J. Olivares,
Universidad Politécnica de Madrid; S. Giraud, Université de Limoges/CNRS; S. Bila, Université de
Limoges/CNRS; N. Rimmer, Aviza Technology Inc; A. Reinhardt, CEA, LETI, MINATEC

Oscillators, Synthesizers & Noise II

Hybrid-Coupled Planar Resonator (HPCR) Arms Miniaturized Synthesizers ............................ 949
Ajay K. Poddar, Synergy Microwave Corporation; Ullrich L. Rohde, Univ. of Cottbus

The Impact of Tuning Circuit Configuration on the Start-Up Time of Crystal Oscillators .......... 956
Mike F. Wacker, Vectron International
Tunable Active Inductor Offers Integrable and Cost-Effective Alternatives of Varactor Tuned VCOs .......................................................... 962
Ulrich L. Rohde, Univ. of Cottbus; Ajay K. Poddar, Synergy Microwave Corporation

A Wide Frequency-Regulated Precision OCXO .......................................................... 968
Wei Zhou, Xidian University; Yongbo Liu, Xidian University; Hui Zhou, Xidian University;
Miao Miao, Xidian University

Measurements of Ultra-Stable Langatate Crystal Oscillators ........................................ 970
J. Imbaud, FEMTO-ST institute; S. Galliou, FEMTO-ST institute; J.P. Romand, FEMTO-ST institute;
P. Abbé, FEMTO-ST institute; R. Bourquin, FEMTO-ST institute

An Improved Microcontroller Compensated Low Phase Noise Overtone TCXO ............... 974
Wei Fu, University of Electronic Science & Technology of China; Xianhe Huang, University of Electronic Science & Technology of China; Feng Tan, University of Electronic Science & Technology of China; Peng Dai, University of Electronic Science & Technology of China; Yan Wang, University of Electronic Science & Technology of China

The Method of Modeling of VCO Based on SPICE Simulation ......................................... 978
S.A. Zavjalov, Omsk State Technical University; A.N. Lepetaev, Omsk State Technical University;
K.V. Murasov, Omsk State Technical University; A.V. Kosykh, Omsk State Technical University

Performance of Wireline Links Synchronized to Self-Referenced Solid-State Frequency Sources .......................................................... 982
Michael S. McCorquodale, Mobius Microsystems, Inc; Dongtai Liu, Mobius Microsystems, Inc

Some Experiment Results of TCXO Based on Stress Processing ..................................... 986
Hui Zhou, Xidian University; Wei Zhou, Xidian University; Xueping Zhang, Xidian University;
Miao Miao, Xidian University; Zi Ye, Zhejiang University

A Novel Method for Low-Power, High-Precision Time-keeping Based on MCXO ............ 988
Liang Chen, National University of Defence Technology; Jian Zhang, National University of Defence Technology; Xiaohu Yu, National University of Defence Technology; Gang Ou, National University of Defence Technology; Huihuang Chen, Xiamen University; Xianjun Zeng, Xiamen University

A MOS Temperature Compensation Function Generator for TCXO Using Differential MOS Multipliers .......................................................... 990
Takehiko Adachi, Yokohama National University; Shoji Izumiya, Yokohama National University

Timekeeping, Optical & Microwave Atomic Standards II

Discharge Lamps for Rb Atomic Clocks: The Role of rf-Power ........................................ 994
James Camparo, The Aerospace Corporation; Gilda Fathi, The Aerospace Corporation

Light Shift in Modulated Coherent Population Trapping Atomic Clocks ............................ 998
Ke Deng, Peking University; Tao Guo, Peking University; Juan Su, Peking University; Dengzhu Guo, Peking University; Xuzong Chen, Peking University; Zhong Wang, Peking University
Improving Short and Long Term Stability of Pulsed Optically Pumped Vapor Cell Frequency Standards

New Method for Light-Shift Elimination
B.H. McGuyer, Princeton University; Y.-Y. Jau, Princeton University; W. Happer, Princeton University

Cs Buffer Gas Collisional Frequency Shift: Method and Preliminary Measurements
O. Kozlova, Observatoire de Paris; R. Boudot, FEMTO-ST Institute; S. Guérandel, Observatoire de Paris; E. De Clercq, Observatoire de Paris

Space Cold Atom Clock with Counter-Propagating Atoms
Desheng Lu, Shanghai Institute of Optics and Fine Mechanics; Bin Wang, Shanghai Institute of Optics and Fine Mechanics; Tang Li, Shanghai Institute of Optics and Fine Mechanics; Liang Liu, Shanghai Institute of Optics and Fine Mechanics

Microfabrication of 85Rb Vapor Cell for Chip-Scale Atomic Clocks
Juan Su, Peking University; Ke Deng, Peking University; Zhong Wang, Peking University; Deng-zhuo Guo, Peking University

Investigation on Physics Package with Slotted-Tube Microwave Cavity for Rubidium Atomic Frequency Standard
Da Zhong, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Baihua Xia, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Shaofeng An, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Hanhua Wu, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Qin Wang, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Feng Zhao, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Feng Qi, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Fang Wang, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Ganghua Mei, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences

Progress of the Fountain Frequency Standard at NMIJ in 2008
S. Yanagimachi, National Metrology Institute of Japan; A. Takamizawa, National Metrology Institute of Japan; K. Watabe, National Metrology Institute of Japan; K. Hagimoto, National Metrology Institute of Japan; T. Ikegami, National Metrology Institute of Japan

Microwave Leakage Shift Suppression Based on Home Made DDS
Pingwei Lin, National Institute of Metrology; Shi Liu, National Institute of Metrology; Nianfeng Liu, National Institute of Metrology

A Proposal for Optical High-Accuracy Atomic References Using Thin Cell Spectroscopy
N. Beverini, Università di Pisa; A.Ch. Izmailov, Azerbaijan National Academy of Sciences
Brazilian Microwave Standards of Time and Frequency ................................................................................................................. 1035
Renato Ferracini Alves, Universidade de São Paulo; Stella Torres Müller, Universidade de São Paulo;
Aida Bebeachibuli, Universidade de São Paulo; Diego Lencione, Universidade de São Paulo; Vanderlei
Salvador Bagnato, Universidade de São Paulo; Daniel Varella Magalhães, Universidade de São Paulo

Sensors & Transducers II

Quartz Crystal Oscillator Sensor for QCM Monitoring of Water Absorption in
Anticorrosion Cataphoretic Paintings ................................................................................................................................. 1038
L. Rodriguez-Pardo, University de Vigo; A. Cao-Paz, University de Vigo; J. Fariña, University de Vigo;
A. Covelo, University de Vigo; X.R. Nóvoa, University de Vigo; C. Pérez, University de Vigo

Density and Viscosity Measurements of Room Temperature Ionic Liquids Using
Patterned Quartz Crystal Microbalances ................................................................................................................................ 1043
N. Doy, Nottingham Trent University; G. McHale, Nottingham Trent University; M.I. Newton,
Nottingham Trent University; C. Hardacre, Queens University Belfast; R. Ge, Queens University Belfast;
R.W. Allen, University of Sheffield; J.M. Macinnes, University of Sheffield

Love Waves in Functionally Graded Piezoelectric Material Structures
Loaded with Viscous Liquid ...................................................................................................................................................... 1046
Jianke Du, Ningbo University; Kai Xian, Ningbo University; Yook-Kong Yong, Rutgers University;
Ji Wang, Ningbo University

Study of Piezoelectric Transducer for Liquid Ejection ............................................................................................................... 1050
S.F. Hon, Hong Kong Polytechnic University; K. W. Kwok, Hong Kong Polytechnic University

Combination of Surface Acoustic Wave Measurement and Impedance
Spectroscopy for Detection of Cell Adhesion Process .............................................................................................................. 1055
G. Guhr, Leibniz Institute for Solid State and Materials Research Dresden; R. Brünig, Leibniz Institute for
Research Dresden; M. Jüger, Dresden University of Technology; R. Poll, Dresden University of Technology;
M. Weihnacht, InnoXacs

On-Line Surveillance of Lubricants in Bearings by Means of Surface Acoustic Waves .......... 1058
G. Lindner, Coburg University of Applied Sciences, Coburg University of Applied Sciences; H. Faustmann,
Institute of Sensor and Actuator Technology, Coburg University of Applied Sciences; S. Krempel, Institute of
Sensor and Actuator Technology, Coburg University of Applied Sciences; M. Schmitt, Institute of Sensor
and Actuator Technology, Coburg University of Applied Sciences; J. Schubert, Institute of Sensor and
Actuator Technology, Coburg University of Applied Sciences
A Fiber Based Frequency Distribution System with Enhanced Output Phase Stability
Sven-Christian Ebenhag, SP Technical Research Institute of Sweden; Per Olof Hedekvist, SP Technical Research Institute of Sweden; Carsten Rieck, SP Technical Research Institute of Sweden; Håkan Skoogh, SP Technical Research Institute of Sweden; Kenneth Jaldehag, SP Technical Research Institute of Sweden

Influence of Troposphere in PPP Time Transfer
Q. Baire, Royal Observatory of Belgium; P. Defraigne, Royal Observatory of Belgium; E. Pottiaux, Royal Observatory of Belgium

Performance of Time Transfer Using Compass Satellite
Sun Hongwei, Xi’an University of Arts and Science; Yuan Haibo, National Time Service Center; Zhang Hong, National Time Service Center

Measurement of the Time Delay of GPS Timing Receiver Based on UTC(NTSC)
Xiaohui Li, National Time Service Center, Chinese Academy of Sciences; Huijun Zhang, National Time Service Center, Chinese Academy of Sciences; Shaohua Shi, National Time Service Center, Chinese Academy of Sciences; Guoqiang Wang, Huanghuai University

Concept for an Accurate Calibration of Long Baseline Two-Way Satellite Time and Frequency Transfer (TWSTFT) Links via Two Separated Transponders on One Telecommunication Satellite
D. Piester, Physikalisch-Technische Bundesanstalt; T. Feldmann, Physikalisch-Technische Bundesanstalt; A. Bauch, Physikalisch-Technische Bundesanstalt; M. Fujieda, National Institute of Information and Communications Technology; T. Gotoh, National Institute of Information and Communications Technology

Progress to Coherent Frequency Transfer Over a Telecom Fiber Link at NICT
Miho Fujieda, National Institute of Information and Communications Technology; Motohiro Kumagai, National Institute of Information and Communications Technology; Shigeo Nagano, National Institute of Information and Communications Technology; Ying Li, National Institute of Information and Communications Technology

Design and Analysis of High Dynamic CAPS Signal Simulation Testing System
Hong-Jiao Ma, National Time Service Center, Chinese Academy of Sciences; Yong-Hui Hu, National Time Service Center, Chinese Academy of Sciences; Jian-Feng Wu, National Time Service Center, Chinese Academy of Sciences; Fei-Jiang Huang, National Time Service Center, Chinese Academy of Sciences; Hong Zhang, National Time Service Center, Chinese Academy of Sciences

Mathematical Modeling and Simulation on Inter-Orbit-Links in Treble-Layer Satellite Network
Tao Han, Chinese Academy of Sciences and Northwest University; Jihong Dou, Northwest University; Xiaochun Lu, National Time Service Center, Chinese Academy of Sciences; Hang Zhao, National Time Service Center, Chinese Academy of Sciences
Time and Frequency Transfer Through a Network of GNSS Receivers
Located in Timing Laboratories ........................................................................................................ 1097
G. Cerretto, INRIM; A. Perucca, INRIM; P. Tavella, IMRIM; A. Mozo, GMV; R. Piriz, GMV; M. Romay, GMV

Real-Time MTIE Assessment with Flexible Control of Computation Process ......................... 1102
Andrzej Dobrogowski, Poznan University of Technology; Michal Kasznia, Poznan University of Technology

A Short Time Signal Generating Method Based on Time Comb Principle ................................. 1108
Hai Wang, Xidian University; Wei Zhou, Xidian University; Li Li, CAST

Study on a New Time Transfer Method by Digital Satellite TV Signal Broadcasting ............. 1111
Wei Guo, National Time Service Center, Chinese Academy of Sciences; Yu Hua, National Time Service Center, Chinese Academy of Sciences; Ke-xin Song, National Time Service Center, Chinese Academy of Sciences; Ting Cao, National Time Service Center, Chinese Academy of Sciences

Error Correction of Precise Time Transfer Experiment Between Ground and ETS-VIII .............. 1114
Yasuhiro Takahashi, National Institute of Information and Communications Technology; Maho Nakamura, National Institute of Information and Communications Technology; Fumimaru Nakagawa, National Institute of Information and Communications Technology; Ryo Tabuchi, National Institute of Information and Communications Technology; Jun Amagai, National Institute of Information and Communications Technology; Shigeru Tsuchiya, National Institute of Information and Communications Technology; Shin’ichi Hama, National Institute of Information and Communications Technology; Hiroyuki Noda, Japan Aerospace Exploration Agency

Measuring Method for Carrier Phase Based on Phase Difference Group Processing ................ 1119
Zhiqi Li, Xidian University; Wei Zhou, Xidian University; Hai Wang, Xidian University; Xueping Zhang, Xidian University; Guangyun Yu, Xidian University; Ximing Zhang, Xidian University

Precise Two Way Time Synchronization for Distributed Satellite System .............................. 1122
Gun Li, University of Electronic Science & Technology of China; Feijiang Huang, National Time Service Center, Chinese Academy of Sciences

Submicrosecond Filtering of Packet Delay Variation in Video Stream Over IP Metropolitan Area Network ....................................................................................................................... 1127
Gilles Boime, Spectracom/Orolia s.a.; Jérôme Dromer, Spectracom/Orolia s.a.; John Fischer, Spectracom Corp

A Two-Stage Time-to-Digital Converter Based on Cyclic Pulse Shrinking ............................... 1133
Ryszard Szplet, Military University of Technology; Kamil Klepacki, Military University of Technology

GNSS Clock Prediction and Integrity .............................................................................................. 1137
Francisco Gonzalez Martinez, Karlsruhe University; Pierre Waller, European Space Agency

Progress in Portable Instrumentation for Time Source Verification and Analysis ..................... 1143
Nigel Helsby, Time & Frequency Solutions Ltd; William Dean, Industrial Computing Ltd
Aces Ground Segment Functionality and Preliminary Operational Concept ........................................... 1146
E. Daganzo, European Space Agency; S. Feltham, European Space Agency; R. Much, European Space Agency; R. Nasca, European Space Agency; R. Stalford, Astrium Space Transportation; M.P. Hess, Astrium Space Transportation; L. Stringhetti, Astrium Space Transportation; L. Cacciapuoti, European Space Agency

Time Comparison Using Cs-Clocks, Uncertainty Evaluation ................................................................. 1153
Kalevi Kalliomäki, MIKES; Tapio Mansten, MIKES; Ilkka Iisakka, MIKES

TFTS: a Transfer Standard for Frequency and Time Interval Inter-Laboratory Comparisons ............. 1158

Optical Frequency Standards & Applications II

Referencing Femtosecond Laser Frequency Combs to a He-Ne/CH4 Optical Frequency Standard .............................................................. 1163
Evgeny V. Kovalchuk, Humboldt-Universität zu Berlin; Achim Peters, Humboldt-Universität zu Berlin

Back Ground Gas Induced Collision Shift for 88Sr: 1S0-3P1 Transition .................................................... 1166
Tetsuya Ido, National Institute of Information and Communications Technology; Nobuyasu Shiga, National Institute of Information and Communications Technology; Ying Li, National Institute of Information and Communications Technology; Hiroyuki Ito, National Institute of Information and Communications Technology; Shigeo Nagano, National Institute of Information and Communications Technology; Mizuhiko Hosokawa, National Institute of Information and Communications Technology; Katarzyna Bielska, Uniwersytet Mikołaja Kopernika; Ryszard S. Trawinski, Uniwersytet Mikołaja Kopernika; Roman Ciurylo, Uniwersytet Mikołaja Kopernika

An Archetype Semi-Ring Fabry-Perot (SRFP) Resonator ............................................................... 1169
Shervin Taghavi-Larigani, Jet Propulsion Laboratory California Institute of Technology; Jakob VanZyl, Jet Propulsion Laboratory California Institute of Technology

High Resolution Rotation Sensor Based on Cold Rubidium Atoms ............................................. 1173
Michael Gilowski, Leibniz University of Hanover; Christian Schubert, Leibniz University of Hanover; Thijs Wendrich, Leibniz University of Hanover; Peter Berg, Leibniz University of Hanover; Gunnar Tackmann, Leibniz University of Hanover; Wolfgang Ertmer, Leibniz University of Hanover; Ernst Maria Rasel, Leibniz University of Hanover

Industrial Devices

Autonomously Measuring an Atomic Clock’s Allan Variance ........................................................... 1176

A Microfabricated Photonic Magnetometer ...................................................................................... 1180
Jan Preusser, NIST; Svenja Knappe, NIST; John Kitching, NIST; Vladislav Gerginov, PTB
Application of Reduced Light Shift Optical Pumping Method to Chip Scale Atomic Clock

M. Zhu, Agilent Laboratories; J. DeNatale, Teledyne Scientific Company

Optical Clocks IV

Optimization of the Dick Effect in an Optical Lattice Clock

Philip G. Westergaard, Observatoire de Paris, CNRS, UPMC; Jérôme Lodewyck, Observatoire de Paris, CNRS, UPMC; Pierre Lemonde, Observatoire de Paris, CNRS, UPMC

Two-Way & GNSS Time & Frequency Transfer

Fully Use the Redundancy in TWSTFT and GNSS Time and Frequency Transfer

Z. Jiang, Bureau International des Poids et Mesures

Improving TWSTFT Short-Term Stability by Network Time Transfer

Wen-Hung Tseng, Telecommunication Laboratories; Shinn-Yan Lin, Telecommunication Laboratories; Kai-Ming Feng, National Tsing Hua University; Miho Fujieda, National Institute of Information and Communications Technology; Hideo Maeno, National Institute of Information and Communications Technology

The Comparison Between TWSTFT and GPS Time Transfer Result of PTB-TL LINK

Shinn-Yan Lin, Telecommunication Laboratories; Wen-Hung Tseng, Telecommunication Laboratories; Huang-Tien Lin, Telecommunication Laboratories; Kai-Ming Feng, National Tsing Hua University; Dirk Piester, Physikalisch-Technische Bundesanstalt

TWSTFT Activities at NTSC

Hong Zhang, National Time Service Center; Huanxin Li, National Time Service Center; W. Lewandowski, Bureau International des Poids et Mesures; Z. Jiang, Bureau International des Poids et Mesures

Results of the 2008 TWSTFT Calibration of Seven European Stations

Andreas Bauch, Physikalisch-Technische Bundesanstalt; Dirk Piester, Physikalisch-Technische Bundesanstalt; Bernd Blanzano, Joanneum Research Forschungsgesellschaft m.b.H.; Otto Koudelka, Joanneum Research Forschungsgesellschaft m.b.H.; Erik Kroon, Van Swinden Laboratory; Erik Dierikx, Van Swinden Laboratory; Peter Whibberley, National Physical Laboratory; Joseph Achkar, LNE-SYRTE, Observatoire de Paris; Daniele Rovera, LNE-SYRTE, Observatoire de Paris; Luca Lorini, INRiM; Franco Cordara, INRiM; Christian Schlunegger, METAS