

2023 Joint Conference of the European Frequency and Time Forum and IEEE International Frequency Control Symposium (EFTF/IFCS 2023)

**Toyama, Japan
15 – 19 May 2023**



**IEEE Catalog Number: CFP23FRE-POD
ISBN: 979-8-3503-1143-3**

**Copyright © 2023 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP23FRE-POD
ISBN (Print-On-Demand):	979-8-3503-1143-3
ISBN (Online):	979-8-3503-1142-6
ISSN:	1075-6787

Additional Copies of This Publication Are Available From:

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

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

Impact of Asymmetric Piezoelectricity of 100 nm Al _{0.7} Sc _{0.3} N Thin Film on Ferroelectrically Switchable Multi-Layer Bulk Acoustic Wave Resonators.....	1
<i>Li Chen, Wenjia Yang, Chen Liu, Minghua Li, Nan Wang, Yao Zhu</i>	
Autonomous Synchronization of Satellite Constellations Via Optical Inter-Satellite Links	3
<i>Christian Trainotti, Manuele Dassié, Gabriele Giorgi, Amir Khodabandeh, Christoph Günther</i>	
Reducing Impact of Stress on Coupling Coefficient in 30% Scandium Aluminum Nitride Films.....	9
<i>Sergey Mishin, Yury Oshmyansky</i>	
A Simple Digital Satellite TV Timing Method and Its Timing Accuracy Analysis	11
<i>Wang Shanhe, Hua Yu, Cao Fen, Xiang Yu</i>	
Development of Room Temperature and Cryogenic Strontium Ion Clocks with Low Uncertainties.....	13
<i>Pierre Dubé, Kosuke Kato, Scott Smale, Amar Vutha</i>	
A MEMS-Boosted Over-the-Air RF Energy Harvester for IoT Receivers	15
<i>Luca Colombo, Giuseppe Michetti, Gabriel Giribaldi, Nicolas Casilli, Ankit Mittal, Guodong Zhang, Patrick Cabrol, Aatmesh Shrivastava, Cristian Cassella, Matteo Rinaldi</i>	
Progress on Ion Microwave Frequency Standards at Tsinghua University	18
<i>H. R. Qin, Y. Zheng, L. J. Wang, N. C. Xin, S. N. Miao, Y. T. Chen, W. X. Shi, J. Z. Han, J. W. Zhang</i>	
Development of an Opensource, Openhardware, Software-Defined Radio Platform for Two-Way Satellite Time and Frequency Transfer.....	22
<i>J.-M Friedt, M. Lours, G. Goavec-Merou, M. Dupont, B. Chupin, O. Chiu, É. Meyer, F. Meyer, J. Achkar</i>	
A Lithium-Tantalate Based Acoustic Reflective Delay Line for Chemical Sensing in Water	26
<i>J.-M Friedt, D. Rabus, L. Arapan, V. Luzet, F. Chérioux, N. Nief, S. Dehez, J. R Ordonez-Varela</i>	
Cooling and Crystallization of Trapped Single ¹⁷¹ Yb ⁺ Ion for Optical Frequency Standard.....	30
<i>Jize Han, Ying Zheng, Shengnan Miao, Yiting Chen, Jianwei Zhang, Lijun Wang, Lei Han, Xing Chen, Xiaobo Xue, Shengkang Zhang</i>	
Temperature Sensing for MEMS Sensors: A Review, and Chances for the Frequency-Control Community.....	33
<i>Giacomo Langfelder, Paolo Frigerio</i>	
Simultaneous Distribution of Stable Frequency and Data Signals Over Hollow-Core Optical Fibers.....	35
<i>Zitong Feng, Eric Numkam Fokoua, Francesco Poletti, David J. Richardson, Radan Slavík</i>	
A Voigt Laser Operating on Cs 852 nm Transition.....	37
<i>Zheyi Ge, Xiaolei Guan, Zhiyang Wang, Zijie Liu, Tiantian Shi, Anhong Dang, Jingbiao Chen</i>	
LN Membrane Suspended on Pedestals as a Waveguide.....	40
<i>Victor Plessky</i>	

200 mm Surface and Bulk Acoustic Wave Devices Based on Piezoelectric-On-Insulator Substrate	42
<i>M. Bousquet, A. Joulie, C. Hellion, M. Sansa, J. Delprato, P. Perreau, G. Enyedi, G. Lima, J. Guerrero, G. Castellan, A. Tantet, S. Chevallet, T. Monniez, I. Huyet, A. Clairet, T. Laroche, S. Ballandras, A. Reinhardt</i>	
Measuring the Cavity-Pulling Coefficient of Active Optical Clock Via Pump Laser Modulation	47
<i>Jianxiang Miao, Jia Zhang, Tiantian Shi, Jingbiao Chen</i>	
High-Performance 459-nm Cs Cell Optical Frequency Standard with a Predicted Frequency Stability of 10^{-14}	51
<i>Jia Zhang, Jianxiang Miao, Tiantian Shi, Jingbiao Chen</i>	
A Voigt Anomalous Dispersion Optical Filter Immune to the Cell Temperature Fluctuation	55
<i>Zijie Liu, Xiaolei Guan, Tiantian Shi, Anhong Dang, Jingbiao Chen</i>	
Frequency Stabilization for the Faraday Laser Operating on Rb 780 nm Transition	58
<i>Zijie Liu, Xiaomin Qin, Tiantian Shi, Anhong Dang, Jingbiao Chen</i>	
Laser Frequency-Offset Locking Over a 1577 km Fiber Link Based on LSTM Neural Network	62
<i>Mingwen Zhu, Shangsu Ding, Chenglong Wu, Jianming Shang, Song Yu, Bin Luo, Hong Guo</i>	
SAW Resonators on $15^\circ\text{YX-LiNbO}_3/\text{SiO}_2/\text{Sapphire}$ Substrate with Excellent Electromechanical Coupling	64
<i>Jinbo Wu, Yang Chen, Liping Zhang, Pengcheng Zheng, Hulin Yao, Xiaoli Fang, Kai Huang, Shibin Zhang, Xin Ou</i>	
High-Precision Fiber-Optic Time Transfer System Based on Bidirectional FDM and Correlation Processing	68
<i>Kunfeng Xie, Liang Hu, Jianping Chen, Guiling Wu</i>	
Tuning Strain and Quality Factor of 2D MoS_2 NEMS Resonators Using Annealing and Electrostatic Gating	70
<i>Pengcheng Zhang, Yueyang Jia, Zuheng Liu, Rui Yang</i>	
Over 500% Frequency Tuning Range in Nanoelectromechanical Resonators Based on Ultrasoft Two-Dimensional Semiconductor BiOI	73
<i>Luming Wang, Jiankai Zhu, Fei Xiao, Bo Xu, Song Wu, Yachun Liang, Chenyin Jiao, Shenghai Pei, Zenghui Wang</i>	
Long-Term Stability of GPS Time Transfer Link	75
<i>Zhe Gao, Ji-Hai Zhang, Wei-Xiong Wang, Wen-Jun Wu, Shao-Wu Dong</i>	
Coherent Optical Frequency Transfer Over 100 km Fiber Link Using Bidirectional Active Optics	79
<i>Hanxu Wu, Xiaoming Zhang, Weinan Zhao, Yang Fu, Xinyi Chen, Sitong Jia, Wenzhe Yang, Jun Ge, Shengkang Zhang, Honglei Yang</i>	
A Hybrid Ladder Filter with Enlarged Bandwidth by Using Acoustic-Wave-Lumped-Element Resonators	82
<i>Xianli Tang, Nan Wang, Yuandong Gu, Qiaozhen Zhang</i>	
A Self-Sustained Phononic Comb MEMS Oscillator with Loop Phase Tuning	86
<i>Chin-Yu Chang, Chun-You Liu, Sheng-Shian Li</i>	
Simulation of Residual Dispersion on Stability of Optical Fiber Frequency Transfer System	89
<i>Hao Gao, Zhuoze Zhao, Jiahui Cheng, Bin Luo, Song Yu, Hong Guo</i>	

Constructive, Destructive and Differential Detection of Coherent Population Trapping Resonance	91
<i>Peter Yun, Tenghui Yang, Rodolphe Boudot, Emeric De Clercq</i>	
Thermal-Noise-Limited Transportable Ultra-Stable Laser	94
<i>Weinan Zhao, Ming Dong, Hanxu Wu, Yang Fu, Jun Ge, Shengkang Zhang, Honglei Yang</i>	
A New High-Sensitivity Differential X-Axis FM Accelerometer	96
<i>Valentina Zega, Attilio Frangi, Gabriele Gattere, Manuel Riani, Riccardo Nistri, Giacomo Langfelder</i>	
Preliminary Study of TA1000: Performance and Time-Keeping Application	100
<i>Hongqiang Du, Jianjun Gong, Wenjun Wu, Shaowu Dong, Shougang Zhang</i>	
Prediction of Common-View Based Time Differences to Build a Resilient Dissemination System	103
<i>Shilpa Manandhar, Yu Song Meng</i>	
Automatic Characterization of a Fully-Digital Doppler Cancellation Technique for Local Ultra-Stable Frequency Dissemination	105
<i>Martina Matusko, Ivan Ryger, Gwenaël Goavec-Merou, Jacques Millo, Clément Lacroûte, Émile Carry, Francisco Sebastian Ponciano Ojeda, Jean-Michel Friedt, Marion Delehay</i>	
REFIMEVE Fiber Network for Time and Frequency Dissemination and Applications.....	109
<i>Etienne Cantin, Olivier Lopez, Nicolas Cahuzac, Yuhao Liu, Mathieu Manceau, Benoît Darquié, Christian Chardonnet, Anne Amy-Klein, Nicolas Quintin, Martin Rabault, Grégoire Coget, Peter Rosenbusch, Vincent Ménoret, Mads Tønnes, Benjamin Pointard, Maxime Mazouh, Hector Alvarez-Martinez, Caroline B. Lim, Philip Tuckey, Michel Abgrall, Rodolphe Le Targat, Paul-Eric Pottie</i>	
A 780 nm Dual-Frequency Faraday Laser.....	113
<i>Xiaomin Qin, Zijie Liu, Tiantian Shi, Jingbiao Chen</i>	
Analysis of the Asymmetry of Erbium-Doped Fiber Length in Fiber RF Transmission	116
<i>Jinze Lu, Hao Gao, Zhuoze Zhao, Jiahui Cheng, Bin Luo, Song Yu, Hong Guo</i>	
Ultra Low Phase Noise VCXO with Crystal Filter Array.....	118
<i>Yu-Liang Chen, Chi-Lun Yu, Shu-Ling Yeh, Chih-Hsun Chen, Sheng-Hsiang Kao</i>	
A Scheme of 852 Nm Faraday Laser with Kilometer Level Cavity Length.....	120
<i>Zhiyang Wang, Hangbo Shi, Zijie Liu, Xiaomin Qin, Zhihong Gao, Tiantian Shi, Jingbiao Chen</i>	
Optimization of Faraday Laser's Performance by Adjusting Incident Light Intensity	123
<i>Zhiyang Wang, Huifang Hou, Hangbo Shi, Zijie Liu, Xiaomin Qin, Zhihong Gao, Tiantian Shi, Jingbiao Chen</i>	
Evaluation of Stability Performance of a Simple Time and Frequency Transfer System.....	126
<i>Yung Chuen Tan, Yu Song Meng, Chin Yi Liaw</i>	
Proof-of-Concept of a Fiber-Optic Timing Transmission for a Synthesis Radio Telescope	128
<i>Miho Fujieda, Hitoshi Kiuchi, Tadahiro Gotoh</i>	
Fiber Noise Suppression System with Additional Linewidth of mHz-Level for Ultra-Stable Lasers	130
<i>Lulu Yan, Pan Zhang, Mingkun Li, Bingjie Rao, Ru Yuan, Xiguang Yang, Xin Chen, Wenge Guo, Shougang Zhang</i>	
Ultrannarrow Bandwidth Optical Filter Based on Laser Cooled ⁸⁷ Rb Atoms	132
<i>Xiaolei Guan, Wei Zhuang, Tiantian Shi, Jianxiang Miao, Jia Zhang, Jingbiao Chen, Bin Luo</i>	

Introduction of GNSS Up-Sampled All-In-View Time Transfers.....	135
<i>Wen-Hung Tseng, Shinn-Yan Lin</i>	
Missing Data Prediction Using LSTM for Radio Frequency Transfer System	139
<i>Jiahui Cheng, Hao Gao, Chenxia Liu, Zhuoze Zhao, Yaojun Qiao, Bin Luo, Song Yu, Hong Guo</i>	
Real-Time Synchronization of Clocks at Femtosecond Level Through a 113 km-Free-Space Link.....	141
<i>Min Li, Qi Shen, Jian-Yu Guan, Ji-Gang Ren, Ting Zeng, Lei Hou, Yuan Cao, Jin-Jian Han, Meng-Zhe Lian, Yan-Wei Chen, Meng Yang, Xin-Xin Peng, Shao-Mao Wang, Dan-Yang Zhu, Yu-Xiang Cheng, Sheng-Kai Liao, Juan Yin, Cheng-Zhi Peng, Hai-Feng Jiang, Qiang Zhang, Jian-Wei Pan</i>	
Atomic Beam Distribution in Calcium Beam Optical Clock.....	143
<i>Lei Han, Xiaobo Xue, Hui Zhu, Qianqian Ji, Yu Chen, Shengkang Zhang</i>	
Improving Frequency Measurement Accuracy of Fully Digital Phase Detection Quartz Crystal Microbalance Based on Multi-Channel ADC	146
<i>Tatsuki Tamaoki, Shouta Kanno, Takeshi Imai</i>	
Low Noise Photonic Microwave Oscillator Based on a Novel Repetition Rate Stabilization.....	148
<i>Erwin Cano Vargas, Kemal Safak, Anan Dai, Marvin Edelmann, Florian Emaury, Benjamin Rudin, Philip Battle, Tony D. Roberts, Todd Hawthorne, Franz X. Kärtner</i>	
Effect of Polarity of LiTaO ₃ and Quartz on Hetro Acoustic Layer Surface Acoustic Wave Properties	150
<i>Michio Kadota, Shuji Tanaka</i>	
A Power Efficient Faraday Laser at 780nm Rb Transition	154
<i>Zhihong Gao, Jingbiao Chen</i>	
The 6-Year Long Term Total Delay Variations Investigation of TL GPS Stations – According to a Virtual Ensemble Receiver	158
<i>Shinn-Yan Lin, Ta-Kang Yeh, Tzu-Yi Lien</i>	
Characterization of Short-Term Ultra-Stable Radio Frequency Sources Generated from Cavity Based Optical Reference Systems	161
<i>Pablo N. Dominguez, Thomas Zechel, Ludwig Blümel, Tobias D. Schmidt</i>	
A Control System for Atomic Fountain Clock Based on Field-Programmable Gate Array	165
<i>Dandan Liu, Jun Ruan, Sichen Fan, Hui Zhang, Yang Bai, Xinliang Wang, Junru Shi, Yong Guan, Shougang Zhang</i>	
Analysis of Quality Factor of the Quartz Crystal Resonator with N-M Asymmetric Electrodes	169
<i>Jianguo Hu, Jing Chen, Xiaoming Wu, Tian-Ling Ren</i>	
Progress on a ¹⁷¹ Yb-Based Active Optical Atomic Clock.....	171
<i>F. S. Ponciano-Ojeda, J. El Badawi, M. Hauden, M. Matusko, M. Delehay</i>	
Experimental Study on VLBI Time Transfer Based on GEO Satellite Observation	173
<i>Jia Liu, Zhe Zhang, Xuhai Yang, Baoqi Sun, Yuanxin Wang, Hui Lei, Yuanwei Wu, Langming Ma, Xishun Li, Kai Nan, Shougang Zhang</i>	
FM Noise Measurement of Single-Frequency Lasers	177
<i>K. A. Zagorulko, A. V. Kozlov, N. P. Khatyrev</i>	

Characterization Setup of a Molecular Iodine Based Optical Clock: Long-Term Optical Frequency Generation for Time and Frequency Transfer Experiments.....	179
<i>Ludwig Blümel, Thomas Zechel, Tobias D. Schmidt, Markus Oswald, Thilo Schuldt, Claus Braxmaier, Pia Kindl, Thomas Schilling, Johann Furthner, Klaus Döringshoff, Evgeny Kovalchuk, Achim Peters, Martin Gohlke</i>	
Near-Zero TCF SH0 Plate Acoustic Wave Resonators Using 36°YX-LiTaO ₃ /SiO ₂ Film	182
<i>Shuxian Wu, Zonglin Wu, Hangyu Qian, Feihong Bao, Feng Xu, Jie Zou, Gongbin Tang</i>	
Optic Frequency Transfer Via Fiber Based on Digital Phase Unwrap Technology	187
<i>Dan Wang, Xue Deng, Jie Liu, Qi Zang, Xiang Zhang, Qian Zhou, Ruifang Dong, Tao Liu</i>	
Ultra-Stable and Tunable Fabry-Perot Cavity for an Ytterbium Based Superradiant Laser	190
<i>Martin Hauden, Martina Matusko, Jana El Badawi, Yann Kersalé, Francisco Ponciano-Ojeda, Marion Delehay</i>	
Correction Algorithm of Doppler Effect on the Comb-Based FSO-TWTFT for Satellite Application	192
<i>Long Wang, Wenhai Jiao, Liang Hu, Jianping Chen, Guiling Wu</i>	
The Miniaturized Integrating Sphere Cold Atom Clock Based on Fiber Mirrors.....	195
<i>Xiumei Wang, Danyang Wang, Yifei Wang, Wenming Wang, Bohan Deng, Shiguang Li, Yunjia Wang, Weili Wang, Liang Wang, Jin He, Jingbiao Chen</i>	
Dissemination of Optical Frequency for Future Telecom Networks and Applications	197
<i>Lakshmi Rajagopal, Andrew Lord, Mike Gilson, Yeshpal Singh</i>	
Spurious-Free Lithium Niobate Bulk Acoustic Resonator for Piezoelectric Power Conversion.....	199
<i>Kristi Nguyen, Eric Stolt, Weston Braun, Vakhtang Chulukhadze, Jeronimo Segovia-Fernandez, Sombuddha Chakraborty, Juan Rivas-Davila, Ruo Chen Lu</i>	
Optimizing Hollow Core Fibers for Stable Interferometry.....	203
<i>Bo Shi, Ian A. Davidson, Ghafour A. Mahdiraji, Jaroslaw Rzegocki, Eric R. Numkam Fokoua, Mohammad Mousavi, Zitong Feng, Meng Ding, Francesco Poletti, David J. Richardson, Radan Slavik</i>	
Polarization Control for Continuous Optical Frequency Transfer	205
<i>P. Krehlik, L. Buczek, L. Sliwczynski, Krzysztof Turza</i>	
Dual-Wavelength Ultra-Stable Optical Cavity	208
<i>A. Linek, R. Muñoz-Rodríguez, M. Zawada, M. Witkowski</i>	
Hollow Core Fibre Based Fabry-Perot Resonators with Q Factor Over 90 Billion.....	210
<i>Meng Ding, Zitong Feng, Eric Numkam Fokoua, Gregory T Jasion, Francesco Poletti, David J. Richardson, Radan Slavik</i>	
Layered SiO ₂ / LiNbO ₃ / Si SH-SAW Biological Sensor for Operation in Water	212
<i>C. Veras, I. Ouerghi, E. Soulat, M. Bousquet, A. Reinhardt, T. Alava, P. Mailley</i>	
Autonomous Frequency Stabilization in Cold Atom Experiments.....	215
<i>M. Zarei, I. Knotnerus, A. Urech, F. Schreck, M. Zawada, P. Morzynski</i>	
An BDS Spoofing Interference Detection and Identification Method Using the Radio Determination Satellite Service	217
<i>Zhengkun Chen, Jing Li, Qizhen Weng, Fan Feng, Du Li, Xuelin Yuan, Xiangwei Zhu</i>	

The High Short-Term Frequency Stability Digitally Controlled X'tal Oscillator with Small Size and Low Power Consumption	222
<i>Kotaro Hayashi, Yuichi Yokozeki, Hiroyasu Kunitomo, Takashi Matsumoto, Kazuo Akaike, Shunichi Wakamatsu</i>	
A Cs Rydberg Atomic Microwave Oscillator for Electric Field Sensing.....	228
<i>He Wang, David Rosser, Michael J. Mazon, Gabe H. Iyanu</i>	
Reducing the Effects of Correlation Between Multiple Clocks on Clock Ensemble Time Scale	233
<i>Qian Xu, Yuzhuo Wang, Zhengsen Jia, Aimin Zhang, Yu Chen</i>	
Development of Two Single-Ion Spectroscopy Systems for the $^2S_{1/2} - ^2D_{5/2}$ Transition in Ytterbium Ions Towards Measurement of Isotope Shifts.....	235
<i>Keisuke Yoshida, Mitsuharu Katagiri, Hwasun Jo, Yusuke Ueno, Takayuki Morimoto, Kazuhiko Sugiyama, Yasutaka Imai</i>	
Time Shifting Deviation Method Enhanced Laser Interferometer for Traffic Monitoring	237
<i>Zhongwang Pang, Guan Wang, Bo Wang</i>	
Coherent Optical Frequency Transfer Via Aerial Fiber Link with 10^{-19} of Instability	241
<i>Qian Zhou, Xiang Zhang, Qi Zang, Xue Deng, Mengfan Wu, Jie Liu, Dan Wang, Ruifang Dong, Tao Liu, Shougang Zhang</i>	
Coherent Optical Frequency Dissemination with Passive Phase Noise Cancellation	244
<i>Xiang Zhang, Qian Zhou, Xue Deng, Qi Zang, Mengfan Wu, Jie Liu, Dan Wang, Ruifang Dong, Tao Liu, Shougang Zhang</i>	
A Frequency Shifting Scheme for On-Chip Optical Frequency Transfer	247
<i>Ziang Qiu, Liang Hu, Jianping Chen, Guiling Wu</i>	
Light Shift Detection Using a Multiple Photodetection Method Suitable for a Chip-Scale Atomic Clock	249
<i>Masahiro Fukuoka, Shigeyoshi Goka</i>	
A 5.5 GHz S_3 Mode Plate Acoustic Wave Resonator Using Lithium Tantalate Thin Film.....	251
<i>Zonglin Wu, Shuxian Wu, Hangyu Qian, Feihong Bao, Guomin Yang, Jie Zou, Gongbin Tang</i>	
The Optical to Electrical Conversion of a Frequency Comb and Related Applications	254
<i>Po-Cheng Chang, Tien-Kuan Tseng</i>	
Digital Automatic Relocking Method and Implementation of Ultra-Stable Laser	256
<i>Weinan Zhao, Ming Dong, Hanxu Wu, Yang Fu, Jun Ge, Shengkang Zhang, Honglei Yang</i>	
Calibration of Fiber-Optic Time Synchronization System Over 800km	258
<i>Jiameng Dong, Zhaohui Wang, Rui Zhang, Song Yu, Bin Luo, Hong Guo</i>	
Atmospheric Traces Sensor Based on Visible Dual-Comb Spectroscopy Using Ti:sapphire Mode-Locked Lasers.....	260
<i>Zhaolong Li, Haitao Wu, Sibao Gui, Hao Xu, Haoyuan Lu, Tao Bi, Peng Zuo, Jianye Zhao</i>	
Microwave Extraction Based on Synchronization of Ti:sapphire Optical Frequency Comb and Optoelectronic Oscillator.....	262
<i>Haitao Wu, Zhaolong Li, Hao Xu, Sibao Gui, Haoyuan Lu, Tao Bi, Jianye Zhao</i>	
Wide Range and High-Precision 1PPS Time Interval Measurement Method	264
<i>Zhang Ruilin, Li Zhiqi, Wang Haifeng, Chang Jian, Cao Zhixin, Wei Xiangyang, Tan Zhe</i>	

A Resilient Secondary Realization of UTC(PTB) Using a Passive Hydrogen Maser	266
<i>Florian Heimbach, Egle Staliuniene, Dirk Piester, Andreas Bauch, Ekkehard Peik</i>	
A Method of High Resolution Digital Linear Phase Comparison	268
<i>Zhe Tan, Zhiqi Li, Xiangyang Wei, Ruilin Zhang, Min Fan, Wei Zhou</i>	
Optically Pumped Cesium Beam Clock Using Monochromatic Light.....	271
<i>Chen Liu, Yuanhao Li, Sifei Chen, Lifeng Fan, Yanhui Wang</i>	
Two Methods About C-Field Evaluation in Beam Clock	274
<i>Yuanhao Li, Chen Liu, Sifei Chen, Lifeng Fan, Yanhui Wang</i>	
Ultra-Low Power Time Transfer: 300 Attosecond Synchronization with 300 fW Over 300 km of Air	277
<i>Emily D. Caldwell, Jennifer Ellis, William C. Swann, Nathan R. Newbury, Laura C. Sinclair, Benjamin K. Stuhl, Jean-Daniel Deschenes, Hugo Bergeron</i>	
The Cool-Physics Oscillator Model with Asymptotes to Predict Noise, Jitter and Size Limitations	279
<i>Michael J. Underhill</i>	
Novel Open-Loop Phase Noise Measurement Technique for GHz Resonators.....	285
<i>Yao Yu, Jeronimo Segovia-Fernandez, Ernest Ting-Ta Yen, Bichoy Bahr, Swaminathan Sankaran</i>	
Polarization Modulated CPT and Population Distributions Among Ground-State Zeeman Sublevels	287
<i>Zachary Warren, Hunter Kettering, Andrew Householder, James Camparo</i>	
Vacuum Ultraviolet Search from Thorium-229 Isomer in Crystal Toward Solid-State Nuclear Clock	292
<i>S. Takatori, Y. Fukunaga, M. Guan, T. Hiraki, T. Masuda, R. Ogake, K. Okai, N. Sasao, K. Shimizu, S. Uetake, A. Yoshimi, K. Yoshimura, M. Yoshimura, K. Tamasaku, Y. Kasamatsu, Y. Yasuda, K. Beeks, F. Schaden, T. Schumm, S. Kitao, M. Seto, H. Fujimoto, T. Watanabe, K. Konashi, M. Watanabe, H. Haba, Y. Shigekawa, A. Yamaguchi, N. Nagasawa, Y. Yoda</i>	
Long-Haul Fiber-Optic Time and Frequency Synchronization	296
<i>Yufeng Chen, Hongfei Dai, Bo Wang</i>	
An Integrated Pulsed Optically Pumped Rb Clock	300
<i>Qiang Hao, Shaojie Yang, Peter Yun, Shuai Nie, Jun Ruan, Shougang Zhang</i>	
Calibration of Video Cameras Frame Rate Based on Onsets Tracking Technique	302
<i>C. F. Au Yeung, S. L. Yang, K. W. Chen, H. F. Tsang</i>	
Progress Toward a Raman-Ramsey Clock Based on a Transverse Cooled Rubidium Beam	304
<i>Pei-Qiang Yan, Wei-Chen Jia, Yan-Ying Feng</i>	
Study on Measurement Methods for GNSS Antenna Cable Delay	306
<i>Tian Yu, Kun Liang, Baoying Wei</i>	
Analysis of Rayleigh Waves in Piezoelectric Solids with Metal Coatings by the Rayleigh-Ritz Method	310
<i>Jinghui Wu, Ji Wang, Erasmo Carrera</i>	
Optical Ramsey Spectroscopy with Superradiance Enhanced Readout	313
<i>Eliot Bohr, Sofus L. Kristensen, Stefan Alaric Schäffer, Julian Robinson-Tait, Jörg Helge Müller</i>	
Applications of a TWSTFT Modem for a Fiber-Optic Timing Transfer	315
<i>Miho Fujieda, Motohiro Kumagai</i>	

Investigation of Conical Magneto-Optical Trap as a Source of Slow Atoms	317
<i>E. S. Aleinikova, E. V. Ivanchenko, D. S. Kupalov, O. V. Kupalova</i>	
A Novel Scheme for Noise Suppression of CPT Resonance	320
<i>Qinglin Li, Tenghui Yang, Peter Yun</i>	
Controllable Asymmetric Attack Against Practical Round-Trip Fiber Time Synchronization System	322
<i>Xuesong Xu, Yiming Bian, Jinlong Hu, Jiayi Dou, Yang Li, Bingjie Xu, Yichen Zhang, Song Yu, Hong Guo</i>	
A 800 MHz Fully Synthesizable PLL with Calibration-Free Feedforward Noise Cancellation.....	324
<i>Kyumin Kwon, David D. Wentzloff</i>	
Time Transfer Experiments Based on BDS Code Observations.....	328
<i>Wejin Qin, Jia Liu, Xuhai Yang</i>	
Progress Towards a Compact Cold-Atom Microwave Clock.....	336
<i>Martin Knapp, Sam Walby, Mohsin Haji, Chris Foot, Patrick Gill</i>	
Development of a Quartz-MEMS Resonator	339
<i>Baptiste Fischer Kaszuba, Pierre Lavenus, Raphael Levy, Paul Chapellier, Thomas Baron, Nicolas Vorobyev</i>	
Experimental Demonstration of Surface Acoustic Wave Propagation on α -GeO ₂ for Wireless, Passive Sensor Design.....	341
<i>W. Daniau, R. Salut, J.-M Friedt, A. Peña, J. Debray, B. Menaert, P. Armand, P. Papet, A. Penarier, P. Nouvel</i>	
Analysis of 5–10 GHz Higher-Order Lamb Acoustic Waves in Thin-Film Scandium Aluminum Nitride.....	345
<i>Sinwoo Cho, Jack Guida, Jack Kramer, Omar A. Barrera, Vakhtang Chulukhadze, Can Cui, Siddhartha Ghosh, Ruochen Lu</i>	
BAW Advantages for Low Power IoT Applications.....	349
<i>Danielle Griffith</i>	
Spurious Free SAW Resonators on LiNbO ₃ /SiO ₂ / Quartz Substrate for Wideband Application.....	351
<i>Yang Chen, Jinbo Wu, Xiaomeng Zhao, Xinjian Ke, Shibin Zhang, Pengcheng Zheng, Kai Huang, Xin Ou</i>	
Integrating Optical-Clock Technology into an Operational Timescale.....	355
<i>J. D. Whalen, T. G. Akin, Bryan Hemingway, Steven Peil</i>	
Development of a Precise Timescale for Research and Training Purposes	357
<i>Dylan Meyer, Adam Hauser, Patrick Leclair, Thejesh Bandi</i>	
Thin-Film Lithium Niobate Acoustic Resonator with High Q of 237 and k^2 of 5.1% at 50.74 GHz.....	361
<i>Jack Kramer, Vakhtang Chulukhadze, Kenny Huynh, Omar Barrera, Michael Liao, Sinwoo Cho, Lezli Matto, Mark S. Goorsky, Ruochen Lu</i>	
Time Transfer Scheme in Power Line Based on Narrow Electric Pulse.....	365
<i>Ze Li, Peng Zhang, Guangkun Guo, Ke Liu, Dong Hou</i>	
High-Precision Time Transfer Based on Power Line Communication.....	367
<i>Peng Zhang, Ze Li, Guangkun Guo, Ke Liu, Dong Hou</i>	

A UTC(NTSC) Steering Algorithm Based on an Atomic Clock Ensemble Scale	369
<i>Shuhong Zhao, Shaowu Dong, Shanshan Bai, Wenjun Wu, Lili Qu, Sufang Liu</i>	
Ultra-Accurate Time Dissemination in a Hybrid Fiber-Optic System with Frequency-Synchronized Lasers and λ -Swapping.....	372
<i>L. Sliwczynski, P. Krehlik, L. Buczek</i>	
Investigations of Rydberg-Atom Based THz-Wave Electric Field Sensor	375
<i>Motohiro Kumagai, Shigeo Nagano, Shin'ichiro Hayashi, Norihiko Sekine</i>	
Evaluation of GNSS Timing Performance in China and Belarus: Comparative Analysis on Timing Bias of GPS, GLONASS, Galileo and BDS.....	378
<i>Feng Zhu, Huijun Zhang, Ya Liu</i>	
IT-Yb1 Optical Lattice Clock: Absolute Frequency Measurement at the Cs Fountain Uncertainty Level.....	381
<i>I. Goti, S. Condio, C. Clivati, M. Risaro, M. Gozzelino, G. A. Costanzo, F. Levi, D. Calonico, M. Pizzocaro</i>	
Mode Number Determination of Optical Cavities for Next Generations of Gravity Missions	383
<i>Timm Wegehaupt, Sariga Sachit, Vitali Müller, Gerhard Heinzl, Claus Braxmaier, Jens Grosse</i>	
A Self-Driving Rb-Xe Spin Oscillator.....	387
<i>Qianjin Ma, Erwei Li, Guobin Liu</i>	
Optical Frequency and Timing Distribution System for ESA Deep Space Tracking Stations.....	389
<i>Kemal Safak, Anan Dai, Michael Hagemann, Daniel Petters, Franz X. Kärtner, Wolfgang Klische, Benjamin Rudin, Florian Emaury, Franklin G. Ascarrunz, Oliver Lange, Werner Lange, Bernardino Quaranta, Sinda Mejri</i>	
Low-Phase-Noise Microwave Generated by an Optical Frequency Comb Locked to an On-Chip Interferometer.....	393
<i>James P. Cahill, Tanvir Mahmood, Weimin Zhou, Patrick G. Sykes, Curtis R. Menyuk</i>	
Cesium Fountain Primary Frequency Standard NMIJ-F2 with Uncertainty Evaluated.....	395
<i>Akifumi Takamizawa, Shinya Yanagimachi, Ken Hagimoto</i>	
Push-Pull Resoswitch Communication Receiver	399
<i>Qitong Jin, Kevin Zheng, Clark T.-C. Nguyen</i>	
UTC(NICT) Referenced to a Timescale Based on the Optical Clock NICT-Sr1.....	403
<i>H. Hachisu, H. Ito, N. Nemitz, N. Ohtsubo, Y. Miyauchi, M. Morikawa, K. Matsubara, T. Ido</i>	
Portable Optical Atomic Clock Based on a Dichroic Two-Photon Transition in Rubidium	406
<i>C. R. Locke, S. Ng, J. Scarabel, M. O'Connor, A. N. Luiten, S. K. Scholten, E. J. Ahern, N. B Hebert, C. Perrella</i>	
Suppression of Transverse Mode on LiNbO ₃ / Quartz Hetero Acoustic Layer Surface Acoustic Wave Resonator by Zigzag Shape Apodization.....	408
<i>Yong Guo, Michio Kadota, Shuji Tanaka</i>	
Simulation and Evaluation of Time Synchronization Performance Based on NTP and PTP	411
<i>Baoying Wei, Kun Liang, Tian Yu</i>	

Frequency Locking and Power Enhancement by Coherent Addition of a Clock Laser for a Portable Multi- ⁴⁰ Ca ⁺ Optical Clock	415
<i>Akira Nagano, Utako Tanaka, Kazuhiro Hayasaka</i>	
Improvement of the Ensemble Atomic Timescale Using Hydrogen Masers in NICT	418
<i>Hiroyuki Ito, Tetsuya Ido, Yuko Hanado</i>	
Frequency Scaling Millimeter Wave Acoustic Resonators Using Ion Beam Trimmed Lithium Niobate	421
<i>Vakhtang Chulukhadze, Kenny Huynh, Jack Kramer, Michael Liao, Sinwoo Cho, Lezli Matto, Omar A. Barrera, Can Cui, Mark S. Goorsky, Ruochen Lu</i>	
Recent Results on a Rb Pulsed Optically Pumped Clock for Space Applications	425
<i>S. Micalizio, M. Gozzelino, C. E. Calosso, F. Levi, J. Belfi</i>	
Probing Material Properties Via a Pair of Piezoelectric Micromachined Ultrasound Transducers	427
<i>Hamad Raheem, Ashwin Seshia, Bernadette Craster</i>	
A Realization of QZSS Time Synchronized with UTC(NICT)	430
<i>Shigeki Murakami, Kazunori Someya, Motoyuki Miyoshi, Erika Myojin, Akihiro Matsumoto</i>	
An Embedded SHM System for Monitoring of Pipelines Using Torsional Guided Wave Ultrasonics	432
<i>Sheetal Patil, Sagar Mahajan, Sauvik Banerjee, Siddharth Tallur</i>	
TinyML-Enabled Unsupervised Ultrasonic Guided Wave SHM Under Varying Thermal Conditions.....	435
<i>Pankhi Kashyap, Kajal Shivgan, Sheetal Patil, Sagar Mahajan, Sauvik Banerjee, Siddharth Tallur</i>	
Integrated Frequency Counter for Multidimensional Seismometric System.....	438
<i>Pawel Kwiatkowski, Dominik Sondej, Ryszard Szplet, Marcin Chodnicki, Jerzy Kowalski, Henryk A. Kowalski</i>	
PZT-Based Multi-Mode Cantilever for Viscosity Sensing	441
<i>Javed N, Priyanka Singh, Sudhanshu Tiwari, Pavitra Jain, Kongbrailatpam Sandeep, Rudra Pratap, Gayathri Pillai</i>	
Laser Power Stabilization with a Cesium FADOF	445
<i>Hangbo Shi, Xiaolei Guan, Zhiyang Wang, Zijie Liu, Xiaomin Qin, Zhihong Gao, Tiantian Shi, Jingbiao Chen</i>	
Compact 2.4 GHz Microwave Generation System Based on an Ultralow Noise Femtosecond Laser	448
<i>Ya Wang, Ruao Yang, Zhendong Chen, Duo Pan, Bin Luo, Zhigang Zhang, Jingbiao Chen</i>	
Saturation Spectroscopy of H ¹³ C ¹⁴ N Absorption Lines.....	450
<i>M. Hosek, J. Hrabina, S. Rerucha, M. Cizek, L. Pravdova, O. Cip</i>	
Few NV Center Nanodiamonds Enable High-Speed and High-Resolution Sensing of Paramagnetic Species.....	453
<i>Aparajita Modak, Ayan Majumder, Madhur Parashar, Siddharth Tallur, Kasturi Saha</i>	
Piezoelectric MEMS for Frequency Control and Sensing	456
<i>Yao Zhu, Bhattacharya Shashwat, Wenjia Yang, Li Chen, Ying Zhang, Chen Liu</i>	
Development of a Sub-Kelvin Silicon Cavity	460
<i>J. Barbarat, J. Gillot, J. Millo, C. Lacroûte, V. Giordano, Y. Kersalé, T. Legero</i>	

AlScN-Based SAW Resonator with Improved RF Performance Using High-Resistivity Silicon Substrate	462
<i>Veda Sandeep Nagaraja, Sambuddha Khan, Mohammad Nasser, Brendan McCarthy, Ming-Huang Li, Dimitra Psychogiou</i>	
Status and Perspectives of INRIM Sr Cavity-Enhanced Optical Clock	466
<i>Matteo Barbiero, Gianluca Bertaina, Davide Calonico, Filippo Levi, Juan Pablo Salvatierra, Marco G. Tarallo</i>	
External Cavity Laser for Chip-Scale Atomic Clock.....	469
<i>Jie Miao, Jiqing Lian, Tianyu Liu, Duo Pan, Jingbiao Chen</i>	
Extension of REFIMEVE with a White Rabbit Network	471
<i>Caroline B. Lim, Florian Frank, Baptiste Chupin, Olivier Chiu, Michel Abgrall, Philip Tuckey, Paul-Eric Pottie, Etienne Cantin, Christian Chardonnet, Anne Amy-Klein</i>	
Chip-Scale Optical Clock Scheme Based on Dual-Wavelength Modulation Transfer Spectroscopy.....	475
<i>Jie Miao, Qiaohui Yang, Jiqing Lian, Tianyu Liu, Duo Pan, Jingbiao Chen</i>	
An Ising Tag with a LiNbO ₃ Resonator for Temperature Threshold Sensing.....	478
<i>Nicolas Casilli, Hussein M. E. Hussein, Ryan Tetro, Luca Colombo, Cristian Cassella, Tahmid Kaiser, Philip X.-L. Feng</i>	
Environmental Effects and Control Systems for GPS-Disciplined Clocks (GPSDC).....	480
<i>Andrew Novick, John Clark, Demetrios Matsakis</i>	
Development of an Ultra-Stable Cryogenic Silicon Optical Cavity	486
<i>Jonathan Gillot, Yara Hariri, Joannès Barbarat, Clément Lacroûte, Jacques Millo, Yann Kersalé</i>	
Free-Space Optical Frequency Transfer Based on Moveable Platform.....	488
<i>Lei Liu, Zhou Tong, Jialiang Wang, Qian Cao, Zhicheng Jin, Zhiyuan Xu, Youzhen Gui</i>	
Chip-Scale Optical Clock Based on Modulation Transfer Spectroscopy	490
<i>Qiaohui Yang, Tianyu Liu, Jie Miao, Duo Pan, Jingbiao Chen</i>	
A Miniature Oven-Controlled Crystal Oscillator (OCXO) with ppt Stability Over Temperature Using High-Order Polynomial Temperature Control	493
<i>Shuenn-Jyh Chang, Wen-Cheng Wang, Sheng-Hsiang Kao, Wan-Lin Hsieh</i>	
Design of Compact Vacuum Setup for Al ⁺ and Ca ⁺ Ion Trapping with Homogeneous Magnetic Field.....	496
<i>J. Grim, I. Vlček, P. Jedlička, M. T. Pham, Š. Řeřucha, M. Čížek, A. Kovalenko, L. Slodička, O. Číp</i>	
Towards a Sr Optical Lattice Clock at ROA: First Implementations	500
<i>Héctor Álvarez Martínez, Antonio Estarellas Perales, Ignacio Cortés Delgado, Jesús Romero González, José Manuel Suárez Ramírez De Arellano, Verónica Bazán Suárez, Juan Manuel González Sánchez, Jaime Cafranga Bohórquez, Carmen Vélez López, Héctor Esteban Pinillos, Jesús Romero González, Rodolphe Le Targat</i>	
Sensitivity to Dark Matter Couplings from Frequency Measurements of Acetylene Optical Clocks.....	504
<i>Florin Lucian Constantin</i>	
Acoustic Coupling and Remote Excitation in an Array of Multi-Mode Piezoelectric Micromachined Ultrasonic Transducers	510
<i>Teng Zhang, Ashwin A. Seshia</i>	

MEMS-Silicon Chip Bonding Verification Using GHz Pulse-Echo Simulation and Measurements	514
<i>Shyam Trivedi, Yi Xuan Yeo, Mantalena Sarafianou, Eva Leong Ching Wai, Jaibir Sharma, Daniel Ssu-Han Chen, Amit Lal, Kevin Tshun Chuan Chai</i>	
Fast Synchronization Algorithm of High-Stability Oscillators to GNSS Signals.....	519
<i>Pawel Kubczak, Mieczyslaw Jessa, Michal Kaszania</i>	
Optical Ranging and Synchronization for Distributed Sensing with Small Satellite Formations.....	523
<i>Christopher Flood, Emily D. Caldwell, Laura C. Sinclair, Nathan R. Newbury, Jean-Daniel Deschenes, William Swann, Ian Coddington, Fabrizio R. Giorgetta</i>	
RF Complex Permittivity Characterization of ScAlN Thin Films.....	525
<i>Aurelio Venditti, Luca Colombo, Pietro Simeoni, Matteo Rinaldi</i>	
Laterally Coupled BST/Sapphire High Overtone Bulk Acoustic Resonators Exhibiting DC Tunable Comb Filter Response with High Q_f Product	528
<i>Sandeep Sharma Kongbrailatpam, Chandrashekar L N, Gayathri Pillai, Akhil Raman T S, K. C. James Raju</i>	
Ovenized Dual-Mode ZnO-Based Solidly Mounted Resonator	531
<i>A. Tamboli, A. Kale, F. Hrnccirik, B. Bakhit, A. J. Flewitt, M. Miguel Ramos</i>	
Piezoelectric Micromachined Ultrasonic Transducer Integrated with Field Effect Transistor for Acoustic Sensing	534
<i>Jennyfer Vivas Gomez, Luke Minks, Hakhamanesh Mansoorzare, Reza Abdolvand, Sarah Shahraini, Ruth Vidana Morales, Anushka Bhardwaj, Jason Mix, Matthew Dobre</i>	
Precise Measurement Module for Laser Two Frequency Gyroscope-Based Seismometer	536
<i>Ryszard Szplet, Dominik Sondej, Pawel Kwiatkowski, Marcin Chodnicki, Jerzy Kowalski, Henryk A. Kowalski</i>	
ANOVA Investigation of Neural Network Guided Spurious Modes Reduction in Lithium Niobate MEMS Resonators	538
<i>Ryan Tetro, Luca Colombo, Mary Beth Galanko-Klemash, Sarah S. Bedair, Ryan Rudy, Matteo Rinaldi</i>	
Performance of Real-Time PPP for UTC(k) Time Transfer	543
<i>Harald Hauglin, Ole Petter Rønningen, Tor Melgård</i>	
A Curved Four-Conductor Assembly with Larger Uniform Region.....	546
<i>Chao Li, Xuwen Hu, Fuyu Sun, Jie Liu, Xiaofeng Li, Shougang Zhang</i>	
Multi-Layer Neural Network for the Stabilization of Ultra-Stable Oscillators	549
<i>Olukayode Okusaga, John Hamilton, Samuel Reynolds, Eduard Pulaha, Jeffrey Garstecki, Stephen Mitchell, Gregory Weaver</i>	
Over-the-Air Jamming and Spoofing Tests of GNSS Timing Devices.....	551
<i>Thomas Rødningen, Harald Hauglin, Anders Rødningsby</i>	
Aluminum Scandium Nitride for mm-Wave Acoustic Filtering: Challenges and Outlook	554
<i>Azadeh Ansari</i>	
Improving a Trapped-Ion Quantum Computer with a Cryogenic Sapphire Oscillator	558
<i>T. R. Tan, T. Navickas, C. Valahu, J. Jee, A. Rao, M. Millican, M. Biercuk</i>	

Author Index