

2021 Joint Conference of the European Frequency and Time Forum and IEEE International Frequency Control Symposium (EFTF/IFCS)



IEEE EFTF-IFCS 2021

2021 JOINT CONFERENCE OF EUROPEAN FREQUENCY AND TIME FORUM
& THE IEEE INTERNATIONAL FREQUENCY CONTROL SYMPOSIUM
July 7-17, 2021 // Virtual Conference

- Welcome Message
- Table of Contents
- Technical Papers
- Authors Index

2021 SYMPOSIUM PROCEEDINGS

Please visit website for more information!

2021.eftf-ifcs.org

SPONSORS AND ORGANIZERS



ISBN: 978-1-6654-3935-0
Part Number: CFP21FRE-ART

© Copyright 2021 IEEE. Personal use of this material is permitted. However, permission to reprint/republish this material for advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to use any copyrighted component of this work in other work must be obtained from the IEEE.

Technical Support



Phone: +1 352 872 5544

cdyer@conferencecatalysts.com

**2021 Joint Conference of the European Frequency and Time Forum and IEEE International
Frequency Control Symposium (EFTF/IFCS)**

© 2021 IEEE. Personal use of this material is permitted. However, permission to reprint/republish this material for advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the IEEE.

Additional copies may be ordered from:
IEEE Service Center
445 Hoes Lane
Piscataway, NJ 08855-1331 USA

+1 800 678 IEEE (+1 800 678 4333)
+1 732 981 1393
+1 732 981 9667 (FAX)
email: customer-service@ieee.org

Copyright and Reprint Permission: 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 reprint or republication permission, email to IEEE Copyrights Manager at pubs-permissions@ieee.org. All rights reserved. Copyright © 2021 IEEE.

IEEE Catalog Number: CFP21FRE-ART
ISBN: 978-1-6654-3935-0

EFTF-IFCS 2021: SCHEDULE OVERVIEW

July 7-9th

Pre-recorded tutorials become accessible to tutorial registrants. Live tutorial Q&A's take place.

July 12-16th

All oral presentations become accessible to conference registrants. Live poster sessions, plenaries, student activities, and WiE event takes place.

Live Sessions

Wednesday, July 7th

UTC 13:00 – 16:00

Tutorial Q&A: Don Malocha

Tutorial Q&A: Bob Tjoelker

Tutorial Q&A: Cecilia Clivati

Thursday, July 8th

UTC 13:00 – 16:00

Tutorial Q&A: Enrico Rubiola

Tutorial Q&A: Patrizia Tavella

Tutorial Q&A: Scott Diddams

Friday, July 9th

UTC 13:00 – 16:00

Tutorial Q&A: David Hume Tutorial

Q&A: Jean-Michel Friedt

Monday, July 12th

UTC 08:00 – 09:00

Poster Session 1A

UTC 09:00 – 10:00

Plenary: Masaki Hori

UTC 10:00 – 11:00

Poster Session 1B

UTC 15:00 – 16:00

Student Pitch Competition

UTC 16:00 – 17:00

Student Social I

Tuesday, July 13th

UTC 08:00 – 09:00

Student Social II

UTC 15:00 – 16:00

Poster Session 2A

UTC 16:00 – 17:00

Plenary: Luciano Iess

UTC 17:00 – 18:00

Poster Session 2B

Wednesday, July 14th

UTC 00:00 – 01:00

Poster Session 3A

UTC 01:00 – 02:00

Plenary – Dana Anderson

UTC 02:00 – 03:00

Poster Session 3B

UTC 08:00 – 09:00

Student Professional Networking I

UTC 16:00 – 17:00

Student Professional Networking II

Thursday, July 15th

UTC 08:00 – 09:00

Meet Your Student Representatives

Friday, July 16th

UTC 15:00 – 16:30

WiE: Dr. Joana Visa

TABLE OF CONTENTS

EFTF-IFCS 2021: SCHEDULE OVERVIEW	3
TABLE OF CONTENTS	4
WELCOME FROM THE COMMITTEE CHAIRS	5
PRACTICAL INFORMATION	6
EFTF-IFCS 2021: ORGANIZING COMMITTEE.....	7
EFTF 2021 TECHNICAL PROGRAM COMMITTEE	8
IFCS 2021 TECHNICAL PROGRAM COMMITTEE.....	10
SPECIAL THANKS	12
SPONSORS	12
PLATINUM PATRONS	12
GOLD PATRONS	13
WEBSITE PATRONS	13
IFCS 2021 AWARDS.....	14
EFTF 2020 AND 2021 AWARDS	15
2021 UFFC ACHIEVEMENT AWARD	16
STUDENT PAPER COMPETITION	17
PLENARY SPEAKER	19
IEEE WOMEN IN ENGINEERING	23
TUTORIAL SPEAKERS	24
INVITED SPEAKERS	25
STUDENT ACTIVITIES	26
PROGRAM GRID	27
TECHNICAL PROGRAM (On-Demand)	30
TECHNICAL PROGRAM (Poster Sessions).....	52
Author Index	84

WELCOME FROM THE COMMITTEE CHAIRS

Dear participant,

It is a great pleasure to welcome you to the 2021 joint virtual conference between EFTF and IFCS! While we regret that the COVID pandemic prevented us from holding the conference in-person, we are delighted to offer you a dynamic virtual conference in a multi-platform environment that closely simulates the technical, social and networking dimensions of a real conference.

Both the European Frequency and Time Forum and the International Frequency Control Symposia represent an important gathering place for our Time and Frequency Community. For this edition of the conference the Organizing Committee and the Technical Program Committee have worked hard to provide you with tutorials, technical sessions, keynote presentations, invited speakers, an industry exhibition, student events and social events.

The poster sessions and plenaries represent the interactive core of this conference. They will be presented live in a stimulating virtual conference format that is able to regain the flavor of a real conference with on-the-spot meetings, technical discussions, the ability to virtually “walk” through the exhibitor or poster areas and, why not, private chats with friends!

The plenary talks, given by Prof. Dana Anderson, Dr. Masaki Hori and Prof. Luciano Less, will guide using a journey to the edge of quantum technology, which is becoming more and more part of our daily life; what we have learned (and what we still don’t know) about antimatter; and the challenges of spacenavigation: from remote regions of the solar system to upcoming missions to the Moon and Mars.

In addition to these live events, you can access all the contributed and invited talks as well as the tutorials via on demand video, whenever you prefer to do so.

We are certain you will find all this stimulating, rewarding and meaningful, so let us wish you an inspiring conference!

Best Regards,

Marco Belloni, Eric Burt, and Ronald Holzwarth
General Chairs, 2021 joint EFTF-IFCS

PRACTICAL INFORMATION

Virtual Platform:

EFTF-IFCS 2021 will be combining Gather.town with the CONFlux Virtual Conference Platform to host the 2021 symposium. Registered attendees will receive an email 24 hours prior to the start of the conference with access information. The virtual platform will remain accessible until August 7th, 2021.

Upon logging into the virtual platform, attendees will arrive in the Gather.town space. Gather.town is where live poster sessions, the industry exhibition, and networking and socialization will take place. Please visit the Information Booths if you are looking for guides on how to utilize Gather.town and CONFlux. A representative will also be available at scheduled times to assist with any questions you may have.

The CONFlux navigation menu will always be available on the left side of your screen. CONFlux is where you will find the schedule and Zoom links of all live tutorials, plenaries, student activities and the Women in Engineering event. This is where you will also find information on the awards recipients, next year's conference, and the list of conference attendees.

No Recording or Job Postings

Please note that it is Symposium policy that there is to be NO unauthorized digital imaging or recording in any of the Tutorial or Symposium sessions. It is also IEEE policy that there be no job posting, of any kind, at the Symposium or at the Tutorials. Your cooperation is appreciated.

Symposium Proceedings

The Symposium Proceedings will be distributed via email to registered attendees after the Symposium.

Event Conduct and Safety Statement

IEEE believes that science, technology, and engineering are fundamental human activities, for which openness, international collaboration, and the free flow of talent and ideas are essential. Its meetings, conferences, and other events seek to enable engaging, thought-provoking conversations that support IEEE's core mission of advancing technology for humanity. Accordingly, IEEE is committed to providing a safe, productive, and welcoming environment to all participants, including staff and vendors, at IEEE-related events.

IEEE has no tolerance for discrimination, harassment, or bullying in any form at IEEE-related events. All participants have the right to pursue shared interests without harassment or discrimination in an environment that supports diversity and inclusion. Participants are expected to adhere to these principles and respect the rights of others.

IEEE seeks to provide a secure environment at its events. Participants should report any behavior inconsistent with the principles outlined here, to on site staff, security or venue personnel, or to eventconduct@ieee.org.

EFTF-IFCS 2021: ORGANIZING COMMITTEE



General Co-Chair
Marco Belloni
European Space Agency



General Co-Chair
Eric A. Burt
NASA Jet Propulsion Lab



General Co-Chair
Ronald Holzwarth
Menlo Systems GmbH



Technical Co-Chair
Andrew Ludlow
NIST



Technical Co-Chair
Yann Le Coq
Observatoire de Paris-YRTE

Finance Co-Chair
Debra Coler
OEWaves, Inc.

Awards Co-Chair
James Camparo
The Aerospace Corporation

Finance Co-Chair
Fabrice Sthal
SFMC

Awards Co-Chair
Per Olof Hedekvist
RISE Sweden

Tutorial Co-Chair
Jerome Delporte
CNES

Editorial Chair
Greg Weaver Johns
Hopkins APL

Tutorial Co-Chair
Troy Olsson
U.Pennsylvania

Academic Co-Chair
Pascale Defraigne
Royal Observatory Belgium

Exhibit Co-Chair
Ronald Holzwarth
Menlo Systems GmbH

Academic Co-Chair
Azadeh Ansari
Georgia Institute of Technology

Exhibit Co-Chair
Craig Nelson
NIST

Diversity and Inclusion Chair
Sinda Mejri
European Space Operations Centre - ESOC

EFTF 2021 TECHNICAL PROGRAM COMMITTEE

Group 1: Materials, Resonators and Resonator Circuits

Thomas Baron
Marie Bousquet
Mario De Miguel Ramos
Marc Faucher
Raphaël Levy
Ming-Huang Li
Matteo Rinaldi

Group 2: Oscillators, Synthesizers, Noise, and Circuit Techniques

Claudio Calosso
Jeremy Everard
Serge Galliou
Wan-Thai Hsu
Attila Kinali-Dogan
Olivier Llopis
Enrico Rubiola
Michael Underhill
François Vernotte

Group 3: Microwave Frequency Standards

Fang Fang
Marco Belloni
Rodolphe Boudot
Kurt Gibble
Motohiro Kumagai
Salvatore Micalizio
Gaetano Mileti
Stefan Weyers

Group 4: Resonant Sensors and Transducers

Ashwin Seshia
Sylvain Ballandras
Jérôme Juillard
Joshua Lee
Teona Mirea
Paul Muralt
Leonhard Reindl
Valentina Zega

Group 5: Timekeeping, Time and Frequency Transfer, GNSS and Applications

Pascale Defraigne
Anne Amy-Klein
Miho Fujieda
Per Olof Hedekvist
Paul Koppang
Kun Liang
Ilaria Sesia
Pierre Waller
Peter Whibberley

Group 6: Optical Frequency Standards and Applications

Rachel Godun
Pierre Dubé
Ronald Holzwarth
Jerome Lodewyck
Helen Margolis
Tanja Mehlstäubler
Uwe Sterr
Thomas Südmeyer
Alexey Taichenachev
Masami Yasuda

IFCS 2021 TECHNICAL PROGRAM COMMITTEE

Group 1: Materials, Resonators & Resonator Circuits

Troy Olsson
Reza Abdolvand
Azadeh Ansari
Cristian Cassela
Amelie Hagelauer
Wei-Chang Li
Alexander Reinardt
Max Zeng-Hui Wang

Group 2: Oscillators, Synthesizers, Noise, and Circuit Techniques

Archita Hati
Franklyn Ascarrunz
Magnus Danielson
Markus Lutz
Andrey Matsko
Craig Nelson
Jeronimo Segovia-Fernandez
Michael Tobar

Group 3: Microwave Frequency Standards

Francois-Xavier Esnault
Serge Grop
David Howe
John Kitching
Liang Liu
Tom McClelland
Peter Schwidt
Robert Tjoelker

Group 4: Resonant Sensors and Transducers

Laura Popa
Hanna Cho
Philip Feng
Sid Gosh
Harris Hall
Ruonan Liu
Sid Tallur
Gregory Weaver

Group 5: Timekeeping, Time and Frequency Transfer, GNSS and Applications

Davide Calonico
Jerome Delporte
Marina Gertszov
Judah Levine
Huang-Tien Lin
Giuseppe Marra
Dirk Piester
Laura Sinclair

Group 6: Optical Frequency Standards and Applications

John McFerran
Ekkehard Peik
Nils Nemitz
Tetsuya Ido
Marco Pizzocaro
Tara Fortier
David Leibbrandt
Murray Barrett
Haifeng Jiang

SPECIAL THANKS

The joint conference of the European Frequency and Time Forum and the IEEE International Frequency Control Symposium is possible with support from:

SPONSORS



IEEE Ultrasonics, Ferroelectrics,
and Frequency Control Society



PLATINUM PATRONS



GOLD PATRONS



WEBSITE PATRONS



IFCS 2021 AWARDS



The 2021 W. G. Cady Award

Martin Bloch

For the design, development, and delivery of high stability and long-lived Oven-Controlled Crystal Oscillators (OCXOs) for space applications.



The 2021 I. I. Rabi Award

Ekkehard Peik

Physikalisch-Technische Bundesanstalt

For significant contributions to the development of optical clocks, including those using trapped ions, for state-of-the-art metrology and tests of fundamental physics.



The 2021 C. B. Sawyer Memorial Award

Marc Solal

Qorvo Inc.

For contributing the improvement of SAW resonator structures and the methods to simulate their behavior and operation.

EFTF 2020 AND 2021 AWARDS



The 2020 European Frequency and Time Award

Uwe Sterr
PTB

In recognition of his seminal inventions, developments and use of ultrastable lasers for optical frequency standards, highest resolution spectroscopy and multiple other applications in space and on ground.



The 2020 EFTF Young Scientist Award

Rodolphe Boudot
Femto-ST

For his outstanding contributions to the development of high-performance compact and miniature CPT atomic clocks.



The 2020 Marcel Ecabert Award

Pascal Rochat
Spectratime SA

For his contributions to the technological transfer, industrialization and space qualification of several types of atomic clocks, quartz oscillators and other Time & Frequency precision instruments.

EFTF 2020 AND 2021 AWARDS

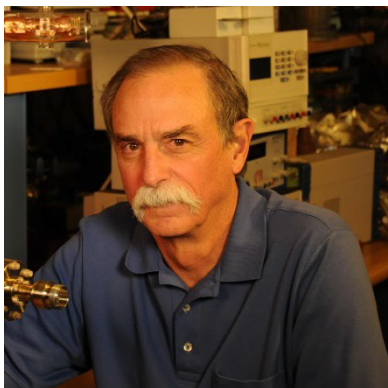


The 2021 Young Scientist Award

David Leibrandt
NIST

For exceptional scientific creativity and achievement in designing and implementing state-of-the-art trapped ion optical clocks with lowest in the world systematic uncertainty.

2021 UFFC ACHIEVEMENT AWARD



The 2021 UFFC Achievement Award

David Wineland

For sustained efforts with NIST colleagues in the development of advanced atomic clocks and laser-cooled atomic ions.

STUDENT PAPER COMPETITION

Student Paper Competition Finalists

Group 1: Materials, Resonators, and Resonator Circuits

Boyang Jiang

Single Crystal Diamond MHz Resonators

Tzong Lin Chua

Low Velocity HAL SAW Resonator Using Lithium Niobate Thin Plate on Quartz Substrate

Faysal Hakim

Ferroelectric Hf_{0.5}Zr_{0.5}O₂-on-Si Fin Bulk Acoustic Resonators with Frequencies Up to 18 GHz

Michele Pirro

Ferroelectric Considerations on cosputtered 30% AlScN with Different DC+Rf Ratios

Group 2: Oscillators, Synthesizers, Noise, and Circuit Techniques

Zhijian Yu

A Dedicated Microwave Frequency Synthesizer for the Rubidium Atomic Clock

Marco Pomponio

Ultra-Low Phase Noise Frequency Division with Array of Direct Digital Synthesizers

Antoine Baudiquez

95% upper limit comparison between the cross-spectrum and the spectrum average with 5 radio-telescopes

Group 3: Microwave Frequency Standards and Applications

Alexandre Bouvier

New Microwave Power Control Technique by Light Shift Detection in the Double-Modulation CPT Clock

Etienne Batori

Ramsey Spectroscopy in a micro-Fabricated Rb Vapor Cell for Miniature Atomic Clocks

Catriona Thomson

Using Precision Frequency Metrology for Dark Matter Searches

Fasong Zheng

Microwave-Vacuum Integrated Cavity with a Low Temperature Sensitivity for Cs Fountain Clocks

Group 4: Resonant Sensors and Transducers

Hussein Hussein

Parametric Acoustic-Based Passive Transponders for ultra-Sensitive Temperature and Temperature-Threshold Sensing

Sanjoli Narang

A Reconfigurable Hardware Emulator of MEMS Gyroscopes with built-in Error Source Models

Sushruta Surappa

Phononic Frequency Comb Generation in a Micromechanical Resonator Operating in Air and Liquid Environments

Wen Sui

Pressure Response and Air Damping of β -Ga₂O₃ Nanomechanical Resonators

Group 5: Timekeeping, Time and Frequency Transfer, GNSS Applications

Faxing Zuo

Time Synchronization Over Cascaded Backbone and Access fiber-Optic Links

Dongrui Yu

The Role of Electric-Preamplifier Noise on Determining the Frequency Instability of the Optical-Comb Based Frequency Transfer System

Mads Tonnes

Evaluation of the Behavior of Coherent Optical Fiber Links and the Aliasing Effects Arising from the Sampling of Missing Data

Martina Matusko

Assessing a New full-Digital Platform for Doppler-Cancellation of Fiber Links

Group 6: Optical Frequency Standards and Applications

Dahyeon Lee

Flicker Phase Noise Reduction in high-Speed Photodiodes Using Short Pulses for Low Noise optical-to-Microwave Conversion

Jose Valencia

A cryogenic, sapphire, ultra-Stable Optical Cavity with Crystalline Mirror Coatings

Tatiana Steshchenko

Limitations in the Frequency Stability Transfer at 1.5 μm Using a Fiber Ring Cavity

Leilei He

Vibrational Noise Investigation in a Cryogenic ultra-Stable Laser System

Martin Steinel

Sympathetic Sideband Cooling of $^{171}\text{Yb}^+$ Ions Using $^{88}\text{Sr}^+$ Ancillary Ions and Frequency Measurement of the $^{88}\text{Sr}^+$ Clock Transition at 674 nm

Wenzhe Wei

The Recent Progress of a $^{25}\text{Mg}^+$ - $^{27}\text{Al}^+$ Ion Optical Clock

Jesse Schelfhout

Isotopic Shift Spectroscopy and Atomic Structure Calculations for Yb intercombination and Clock Transitions

Alvise Vianello

Quantum non-Demolition Detection in an Optical Lattice Clock

PLENARY SPEAKER



Prof. Dana Anderson
ColdQuanta and University of Colorado/JILA

Dr. Dana Anderson is co-Founder and CTO of ColdQuanta, Inc. He is also Professor of Physics and of Electrical Engineering, and is a Fellow of the JILA Institute at the University of Colorado, Boulder. He received a BSEE degree from Cornell University in 1975 and his PhD in quantum optics from the University of Arizona in 1981; his thesis focused on the then new technology of ring-laser gyroscopes. Dr. Anderson did his postdoctoral work at Caltech, carrying out the development on the prototype gravitational wave interferometer which later evolved into “LIGO” —the Laser Interferometer Gravitational Wave Observatory. LIGO first detected gravitational waves in 2015, which were produced by a collapsing binary star system. Dr. Anderson joined the faculty at the University of Colorado in 1984 where he continued work on optical gyroscopes and also on optical neural networks using dynamic holography. The latter was recognized by the Optical Society of America’s R.W. Wood Prize. Dr. Anderson began working on cold atom quantum technology in the 1990’s, collaborating with Drs. Eric Cornell and Carl Wieman, who were awarded the 2001 Nobel Prize in Physics for their creation of the first Bose-Einstein condensate (BEC) —a quantum state of matter that appears when atoms are brought to near absolute zero temperature. Recognizing the application potential of the BEC and related forms of quantum matter, Drs. Anderson and Cornell collaborated for many years on practical applications of this new quantum technology. Dr. Anderson co-founded ColdQuanta in 2007 to become the first manufacturer of cold atom components, instruments and systems. ColdQuanta’s commercial BEC system drew the attention of NASA’s Jet Propulsion Laboratory (JPL), which then led to the NASA Cold Atom Lab (CAL) mission to put a BEC system on the International Space Station. ColdQuanta systems have been operating continuously on the ISS for almost three years.

Dr. Anderson has been heavily involved in advocating quantum technology in the US and abroad. ColdQuanta was involved in the early definitions and established a U.K. subsidiary in 2013 in response to the first government-led quantum initiative there, a £370M investment by the country. He was involved in the initial stages of the formation of €1B of the European Quantum Flagship Program and served on several quantum strategy panels in the US. He also served as external quantum consultant to Israel’s TELEM committee which structured their quantum science and technology program.

Dr. Anderson has published over 100 scientific papers as is a Fellow of the American Physical Society and of the Optical Society of America. He is also recipient of a Sloan Foundation Fellow, a Humboldt Senior Research Award, and the Colorado Governor’s CO-Labs award for the high impact research leading to the development of foundational technology.

Quantum in the Kitchen

Not infrequently I face a blank stare as I explain to a quantum curious that they can look to clocks to understand what quantum technology will do for the world. These days my listener is often a computing enthusiast — for them quantum computing is akin to rocket science; clocks are something for the kitchen wall. Humankind’s most quantum “thing” today is a clock. I expect many in this audience know the connection, both historical and physics, between timekeeping and quantum computing, but many a quantumian citizen is at a loss. I myself believe that quantum technology will change the world and clocks are the forebearers of things to come. With a rearward glance toward the revolutions engendered by the transistor and by the laser, I have come to suppose, even assume, that by 2040, quantum technology will be found in every industry, every vehicle, and every kitchen. The comment is intended not as hyperbole, but as an acknowledgment that today’s quantum technology is surely primitive, and there is a lot to do to drive down the price of a useful quantum box to the cost of a toaster. There is an implied roadmap of sorts, to move us from the exotic of 2021 to the everyday of 2040. Those that are placing large quantum bets, however, expect to see quantum technology solving meaningful problems in well shy of 20 years. Hence governments, federal agencies, and companies like ColdQuanta are pressing to develop

hero systems such as quantum computers, networks, and communications systems. But what I would like to talk about from here is more about putting quantum clocks in the kitchen than it is solving the world's most difficult problems per se.

The kitchen quantum of 2040 relies on an ecosystem involving everything from manufacturing to retail sales. The challenge facing the 2021 ecosystem is that quantum science and technology remains unfamiliar, intellectually difficult, technically difficult, and expensive. Starting with the UK government's quantum initiative in 2014, governments around the world began to invest in quantum workforce development through universities, cultivating the commercial supply chain, and promoting the development and acquisition of quantum technology for compelling end use cases. ColdQuanta has been in the business of cold atoms for 14 years: we have shrunk the size of a Bose-Einstein Condensation Machine from two full optical tables to the size of a small refrigerator and soon to the size of a 5071A cesium clock. We have put cold atom quantum systems in orbit on the International Space Station, flown them on small airplanes, and enabled them in scientific laboratories around the world. We are by no means alone in making quantum technology available to the community, yet quantum remains too difficult, too expensive, and for many, too risky to pursue.

In next few years we will see quantum technology brought to the cloud. ColdQuanta is already doing this, and I know that other companies, research groups numerous educational programs around the world will be doing the same. The intention is to lower the barrier to entry, to lower the risk of quantum exploration, and to enable quantum innovation by stakeholders that otherwise have no access to quantum technology. The effort really simply mimics the goings-on in quantum computing, where there is already an ecosystem of hardware providers, software providers, and researchers and applications engineers covering an incredible variety of disciplines. We will thus be seeing the same cloud-accessibility for non-compute applications of quantum including sensing, communications, networks, signal processing... perhaps even appliances for the kitchen.



Dr. Masaki Hori
Max Planck Institute of Quantum Optics

Masaki Hori leads two international collaborations that carry out laser spectroscopy of antiprotonic helium atoms at CERN's Antiproton Decelerator facility, and pionic helium atoms at Paul Scherrer Institute's Ring Cyclotron facility near Zurich. After obtaining a PhD in nuclear physics at the University of Tokyo in 2000, he has worked at the CERN laboratory of Geneva. In 2008 he became research group leader in the laser spectroscopy division of the Max Planck Institute of Quantum Optics in Garching, Germany. Since 2017 he teaches particle, hadron, and atomic physics at the Ludwig Maximilian University (LMU) München. He is interested in the future applications of frequency metrology in the field of particle physics for precision tests of the Standard Model and its fundamental symmetries.

Exploring Fundamental Physics by Laser Spectroscopy of Antiprotonic and Pionic Helium Atoms

Exotic helium atoms that contain the antimatter counterpart of protons, or a meson consisting of a quark and an antiquark, are studied by laser spectroscopy. By comparing the atomic transition frequencies with quantum electrodynamics calculations, the properties of antimatter and mesonic matter may be determined at the highest possible precision. This allows us to probe some of the fundamental symmetries of nature. In the field of particle physics, there is heightened interest in metrological frequency measurement techniques in view of similar future experiments at particle accelerator facilities such as the new Extra Low Energy Antiproton (ELENA) ring of CERN and the Ring Cyclotron of Paul Scherrer Institute.

PLENARY SPEAKER



Prof. Luciano Iess
Università di Roma

Luciano Iess is full professor of Space Systems at Sapienza University of Rome, and Director of Sapienza Aerospace Research Center (CRAS). He is Principal Investigator of the gravity and radio science experiments of the ESA missions BepiColombo to Mercury and JUICE to the Jovian moons. He led the Gravity Discipline Group in the Cassini mission and is a science team member in the Juno mission. He has a long time experience in deep space tracking systems and planetary geodesy. He has used the Cassini X-and Ka-band radio system to carry out the most accurate confirmation of general relativity to date, the estimation of Titan's tides and the gravity measurements at Enceladus. These radio science experiments proved the existence of a global, subsurface water ocean on Titan and the sizing of the water reservoir under Enceladus's southern polar cap. He led the measurement of Jupiter and Saturn gravity fields with the spacecraft Juno and Cassini, providing a determination of the depth of zonal flows and interior structure of the two gas giants. Almost continuously since 2000, he has been part of the advisory structure of the European Space Agency. Recently he was appointed as a member of the Voyage 2050 Senior Committee, whose goal is the long term planning of the Agency's Science Programme. He has taught thousands of students in aerospace engineering at Sapienza University of Rome, the largest university in Europe, where he supervised 18 PhD theses and more than 60 MS theses. He participated in many public outreach events and is committed to the dissemination of scientific knowledge to the civil society.

Time and Frequency in Deep Space Navigation, Planetary Geodesy, and Solar System Dynamics

Space navigation, whether for near-Earth satellites or deep space probes orbiting in remote regions of the solar system, rests on precise time and frequency measurements. However, deep space navigation, which cannot rely on the extensive and powerful infrastructure offered by GNSS constellations and the associated ground systems, faces bigger challenges. Measurements are obtained by exchanging radio signals between ground antennas and distant spacecraft, providing in most cases line-of-sight information. The observable quantities used for orbit determination in the solar system can be seen as measurements of angles, distances and velocities, but ultimately all these geometric quantities reduce to precise time and frequency measurements, requiring very stable clocks. State of the art microwave systems are able to deliver accuracies at a level of few cm for range and 10^{-6} m/s (at 1000 s integration times) for range rate, for a spacecraft located nearly everywhere in the solar system. Angular measurements, based on a VLBI technique called Δ DOR (delta-differential one-way ranging), often attain accuracies at the level of 1 nrad (corresponding to 150 m in the direction orthogonal to the line of sight at 1 AU).

Especially if augmented with dedicated instrumentation, microwave tracking systems used for space navigation are also powerful tools for planetary science, in particular for geodesy and geophysics. Most of our knowledge of planetary interiors comes from gravity measurements, enabled radio links with excellent frequency stability. Precise knowledge of solar system dynamics and tests of gravity laws also rely on the same observable quantities. This talk will review the state-of-the-art microwave technologies employed in deep space navigation, planetary geodesy and fundamental physics and offer a perspective view on new methods, including the use of atomic clocks in deep space and largely autonomous navigation infrastructure at Mars and the Moon.

IEEE WOMEN IN ENGINEERING

We will explore what is holding back STEM women from advancing their careers and share 5 ways to jump these obstacles



Dr. Joana Visa
Certified Coach
Founder, joanavisacoaching

Dr. Joana Visa is an international certified women coach with science, and academic background. Her passion is to support STEM women to transform, enabling a sustainable change, and be ready for whatever goes. She is the founder of joanavisacoaching and she feels very proud to be a STEM entrepreneur.

Conference attendees and especially women active in the technical areas of the EFTF-IFCS 2021 symposium are encouraged to attend this special networking event organized by the women of the UFFC Society.

TUTORIAL SPEAKERS

Robert Tjoelker

Microwave Atomic Frequency Standards and Clocks

Enrico Rubiola

Almost All About Phase Noise

Scott Diddams

Optical Frequency Combs: fundamentals, Technology and Applications

David Hume

Optical Atomic Clocks

Patrizia Tavella

Precise Time Scales for Timekeeping & Navigation Systems

Cecilia Clivati

Frequency and Time Dissemination with Optical Fibers

Jean-Michel Friedt

Software Defined Radio for Time & Frequency Metrology: Demonstration with GNU Radio

Don Malocha

Acoustoelectric Amplifier Modeling, Analysis, and Device Performance

INVITED SPEAKERS

Ruochen Lu, University of Texas at Austin

Eric Burt, Jet Propulsion Laboratory, California Institute of Technology

Cecilia Clivati, Istituto Nazionale di Ricerca Metrologica

Nils Nemitz, National Institute of Information and Communications Technology

William Campbell, University of Western Australia

Yannick Gruson, FEMTO-ST Institute

Kui Yao, Institute of Materials Research & Engineering, Agency for Science, Technology and Research

Yannick Bidet, ONERA

Zenghui Wang, University of Electronic Science and Technology of China

Miho Fujieda, National Institute of Information and Communications Technology

Paul Boven, JIVE, CAMRAS

Attilio Frangi, Politecnico di Milano

John Conklin, University of Florida

Ksenia Khabarova, P.N. Lebedev Physical Institute RAS

Bertrand Dubus, IEMN 8520 CNRS

Atsushi Kanno, National Institute of Information and Communications Technology

Cristian Cassella, Northeastern University

Shu-Wei Huang, University of Colorado Boulder

Yao Huang, Innovation Academy for Precision Measurement Science and Technology, Chinese Academy of Sciences

Fred Walls, Microbial Pulse Diagnostics

Lisa Hackett, Sandia National Laboratories

Khalil Najafi, University of Michigan

David B. Hume, National Institute of Standards and Technology

Hidetoshi Katori, University of Tokyo

Jeffrey A. Sherman, National Institute of Standards and Technology

Tanja Mehlstäubler, Physikalisch-Technische Bundesanstalt

Andreas Bauch, Physikalisch-Technische Bundesanstalt

Mark Kasevich, Stanford University

STUDENT ACTIVITIES

UFFC-S student representatives are proud to offer three virtual, student-focused events during the upcoming IEEE EFTF-IFCS 2021 Virtual Conference.

Student Social

This casual social event is designed to fuel connection between attendees and create future friends. It will start with a short introduction followed by a chat Roulette. Attendees will be randomly assigned to smaller four-person breakout rooms for 8-10 minutes intervals. No registration required!

Student Professional Networking

This will be a networking event for students to meet both academic professors and industry representatives. All participants will be asked to append their display name on Zoom with either “_S” for “Student” or “_P” for “Professional,” to facilitate organization. After a welcome from the student representatives, participants will be sorted into smaller breakout rooms of 4-6 people, with at least 1-2 professionals in each breakout room (exact numbers here will depend on ratio of attendees).

Student Pitch Competition

This event will be a live student pitch competition. The live event will kick off with a welcome and introduction, then followed by the live competition where student participants will deliver a 60-second pitch about their research, supplemented by a single slide if desired. The competition will be limited to a maximum of 15 student participants (first-come, first-serve), and the single slide must be submitted during the sign-up (minor changes will be allowed after submission if needed).

Additional information: This event will be an opportunity for students to present themselves to future employers and the research community. Search for a graduate position or your newest team member, and expand your professional network! Two individual juries of either leading academic or industry representatives will select their winner. Bring a single slide and show everyone your most interesting results in 60 seconds!

Participants will be judged on their single presentation slide, their clarity of speech and time management, their clarity of results/research, and the overall impression they would give if this pitch was in a job interview scenario. There will be three prizes awarded, and each winner will receive an IEEE UFFC-S certificate!

Meet your Student Representatives

Interested in taking up a role in the UFFC-S Committee? Ready to volunteer? Come and meet your student representatives during this 1 Hour virtual gathering. Ask them anything you want to know and let us surprise you with our special guests. This will be a great opportunity to hear about the activities and volunteering opportunities we have in place in our UFFC-S society.

PROGRAM GRID

Date	Description
July 7-9 th	Tutorial presentations available On-Demand. Live tutorial Q&A sessions take place.
July 12-16 th	All oral presentations available On-Demand. Live poster sessions, plenaries, student activities, and WiE event takes place.

Live Session Program Grid:

July 7 th			
UTC 13:00:00	Tutorial Q&A: Don Malocha	Tutorial Q&A: Bob Tjoelker	Tutorial Q&A: Cecilia Clivati

July 8 th			
UTC 13:00:00	Tutorial Q&A: Enrico Rubiola	Tutorial Q&A: Patrizia Tavella	Tutorial Q&A: Scott Diddams

July 10 th		
UTC 13:00:00	Tutorial Q&A: David Hume	Tutorial Q&A: Jean-Michel Friedt

July 12 th	
UTC 8:00 – 9:00	Poster Session 1A
UTC 9:00 – 10:00	Plenary: Masaki Hori
UTC 10:00 – 11:00	Poster Session 1B
UTC 15:00 – 16:00	Student Pitch Competition
UTC 16:00 – 17:00	Student Social I

July 13 th	
UTC 8:00 – 9:00	Student Social II
UTC 15:00 – 16:00	Poster Session 2A
UTC 16:00 – 17:00	Plenary: Luciano Iess
UTC 17:00 – 18:00	Poster Session 2B

July 14 th	
UTC 0:00 – 1:00	Poster Session 3A
UTC 1:00 – 2:00	Plenary: Dana Anderson
UTC 2:00 – 3:00	Poster Session 3B
UTC 8:00 – 9:00	Student Professional Networking I
UTC 16:00 – 17:00	Student Professional Networking II

July 15 th	
UTC 8:00 – 9:00	Meet Your Student Representatives

July 16 th	
UTC 15:00 – 16:30	WiE: Dr. Joana Visa

Please note that all oral lecture presentations will be on-demand and can be accessed 24/7 and at your convenience. Authors and attendees are not required to be online at any specific time for these sessions.

There are a few select presentations that are synchronous such as Tutorials, Plenary, Networking, etc. If you are unable to attend these sessions during the live scheduled time, recordings of the live sessions will be available on the virtual platform within 48 hours.

TECHNICAL PROGRAM (On-Demand)

Group 1: Materials, Resonators and Resonator Circuits

1-1: Combined Group 1 & 4 Session

Session Chair: Phillip Feng, University of Florida

7272

INVITED TALK: Long Range and High Sensitivity Remote Sensing Through Passive, Battery-Less and Harvester-Free Subharmonic Tags

Cristian Cassella

Northeastern University, United States

7051

Single Crystal Diamond MHz Resonators

Boyang Jiang, Noah Opondo, Xingyu Gao, Tongcang Li, Sunil Bhawe

Purdue University, United States

7203

INVITED TALK: The Sound of Music at the Nanoscale –Exploring the Nanoscale World with NEMS Resonators Based on Low Dimensional Nanomaterials

Zenghui Wang

University of Electronic Science and Technology of China, China

7265

INVITED TALK: Numerical Modelling of MEMS Resonators: Frequency Stability and Nonlinear Behaviour

Attilio Frangi^{1}, Valentina Zega^{1}, Gabriele Gattiere^{2}

^{1}Politecnico di Milano, Italy; ^{2}STMicroelectronics, Italy

1-2: Ferroelectric & Optomechanical Structures

Session Chair: Max Zenghui Wang, University of Electronic Science and Technology of China

7164

Ferroelectric Hf_{0.5}Zr_{0.5}O₂-on-Si Fin Bulk Acoustic Resonators with Frequencies Up to 18 GHz

Faysal Hakim, Troy Tharpe, Roozbeh Tabrizian

University of Florida, United States

7238

50nm-Thick Nano-Laminated Ferroelectric Hf_{0.5}Zr_{0.5}O₂ Transducers for In-Plane Bulk Acoustic Resonators

Troy Tharpe, Faysal Hakim, Roozbeh Tabrizian

University of Florida, United States

7240

Intrinsically Switchable UHF and SHF Ferroelectric Sc_{0.22}Al_{0.78}N Bulk Acoustic Wave Resonators

Dicheng Mo, Sushant Rassay, Roozbeh Tabrizian

University of Florida, United States

7277

Ferroelectric Considerations on Cosputtered 30% AlScN with Different DC+Rf Ratios

Michele Pirro^{1}, Gabriel Giribaldi^{2}, Bernard Herrera Soukup^{2}, Xuanyi Zhao^{2}, Giuseppe Michetti^{2}, William Zhu^{2}, Luca Colombo^{1}, Cristian Cassella^{1}, Matteo Rinaldi^{2}

^{1}Northeastern University, United States; ^{2}Smart Center, Northeastern University, United States

7140

Observation of Tunable Opto-Mechanical Responsivity in Two-Dimensional Semiconducting Nanoelectromechanical Resonators

Jiankai Zhu^{2}, Pengcheng Zhang^{1}, Jing Li^{2}, Bo Xu^{2}, Song Wu^{2}, Fei Xiao^{2}, Yachun Liang^{2}, Ting Wen^{2}, Fei Wang^{2}, Rui Yang^{1}, Zenghui Wang^{2}
^{1}Shanghai Jiao Tong University, China; ^{2}University of Electronic Science and Technology of China, China

1-3: Piezoelectric Devices

Session Chair: Troy Olsson, University of Pennsylvania

7270

INVITED TALK: Electrical Bragg Band Gaps in Piezoelectric Media: Tunability, Non-Reciprocity and Application to Surface Acoustic Wave Devices

Bertrand Dubus^{3}, Ricardo Alcorta-Galván^{1}, Sarah Tessier^{1}, C. Croënnne^{1}, Jérôme Vasseur^{5}, Brigitte Loiseaux^{4}, Matthieu Bertrand^{4}, Étienne Eustache^{4}, Thierry Laroche^{2}, Anne-Christine Hladky-Hennion^{1}
^{1}CNRS, France; ^{2}frechsys SAS, France; ^{3}IEMN 8520 CNRS, France; ^{4}Thales Research and Technology, France;
^{5}Université de Lille, France

7276

INVITED TALK: Active, Nonreciprocal, and Nonlinear Surface Acoustic Wave Devices in a Heterogenously Integrated InGaAs on Lithium Niobate Material Platform

Lisa Hackett^{2}, Michael Miller^{2}, Matthew Storey^{2}, Daniel Dominguez^{2}, Felicia Brimigion^{2}, Sara DiGregorio^{2}, Greg Peake^{2}, Anna Tauke-Pedretti^{2}, Shawn Arterburn^{2}, Thomas Friedmann^{2}, Dana Weinstein^{1}, Matt Eichenfield^{2}
^{1}Purdue University, United States; ^{2}Sandia National Laboratories, United States

7031

Low Velocity HAL SAW Resonator Using Lithium Niobate Thin Plate on Quartz Substrate

Tzong Lin Chua, Michio Kadota, Shuji Tanaka
Tohoku University, Japan

7110

Resonance Frequency Dependence of A1 Lamb Mode on the Pitch of the Electrode Structure

Victor Plessky^{1}, Soumya Yandrapalli^{1}, Seniz Küçük^{1}, Luis Guillermo Villanueva^{2}
^{1}École Polytechnique Fédérale de Lausanne, Switzerland; ^{2}École Polytechnique Fédérale de Lausanne-NEMS, Switzerland

7251

Decreased Nonlinear Harmonic Generation in Longitudinal Leaky SAW Resonators Based on YZ-cut LiNbO₃ Substrate

Xiangnan Pang, Yook-Kong Yong
Rutgers University, United States

1-4: Resonators

Session Chair: Thomas Baron, Femto-st

7112

Wideband and High Quality Factor Shear Horizontal SAW Resonators with Improved Temperature Stability in LNOI Platform

Tzu-Hsuan Hsu, Kuan-Ju Tseng, Ming-Huang Li
National Tsing Hua University, Taiwan

7141

10MHz Length-Extension Mode Quartz MEMS Resonator for Frequency and Time Applications

Paul Chapellier, Pierre Lavenus, Raphaël Levy, Olivier Le Traon

ONERA, France

7004

INVITED TALK: A 15.8 GHz A6 Mode Resonator with Q of 720 in Complementarily Oriented Piezoelectric LithiumNiobate Thin Films

Ruochen Lu^{2}, Songbin Gong^{1}

^{1}University of Illinois at Urbana-Champaign, United States; ^{2}University of Texas at Austin, United States

7025

Lithium Niobate Film Bulk Longitudinal Wave Resonator

Alexandre Reinhardt, Marie Bousquet, Alice Joulie, Chuan-Lun Hsu, Fanny Delaguillaumie, Catherine Maeder-Pachurka, Grégory Enyedi, Pierre Perreau, Gaël Castellan, Jose Lugo

Université Grenoble Alpes, CEA-Leti, France

7026

Study on the Performance of AlScN Based SAW/BAW Hybrid Resonators

Guilain Lang^{1}, Soumya Yandrapalli^{1}, Luis Guillermo Villanueva^{2}

^{1}École Polytechnique Fédérale de Lausanne, Switzerland; ^{2}École Polytechnique Fédérale de Lausanne-NEMS, Switzerland

Group 2: Oscillators, Synthesizers, Noise, and Circuit Techniques

2-1: Oscillators & Synthesizers

Session Chair: Enrico Rubiola, FEMTO-ST, INRIM

7271

INVITED TALK: Millimeter-Wave Optoelectronic Oscillator for Advanced Wireless Systems

Atsushi Kanno{1}, G.K.M. Hasanuzzaman{2}, Stavros Iezekiel{2}

{1}National Institute of Information and Communications Technology, Japan; {2}University of Cyprus, Cyprus

7273

INVITED TALK: Photonic Frequency Comb Based on Dissipative Kerr and Quadratic Solitons

Shu-Wei Huang, Mingming Nie, Bowen Li, Yijun Xie

University of Colorado Boulder, United States

7116

The World's Smallest Quartz-Based OCXO for 5G Synchronization Applications

Wan-Lin Hsieh, Wen-Cheng Wang, Erh-Shuo Hsu, Sheng-Hsiang Kao, Min-Ho Wang

TXC Corporation, Taiwan

7192

Ultra-Low Phase Noise Frequency Division with Array of Direct Digital Synthesizers

Marco Pomponio, Archita Hati, Craig Nelson

National Institute of Standards and Technology, United States

2-2: Phase & Frequency Noise

Session Chair: Magnus Danielson, Net Insight AB

7205

95% Upper Limit Comparison Between the Cross-Spectrum and the Spectrum Average with 5 Radio-Telescopes

Antoine Baudiquez, Éric Lantz, Enrico Rubiola, François Vernotte

FEMTO-ST Institute, France

7275

INVITED TALK: Rapid Detection of Bacterial Response to Antibiotics Through Induced Phase Noise of a Resonant Crystal

Fred Walls{2}, Danielle France{2}, Ward Johnson{4}, John Miles{3}, Nikki Rentz{4}, Will Cordell{5}, Shelley Kon{1}, Ian Babson{2}

{1}Colorado Infectious Disease Associates, United States; {2}Microbial Pulse Diagnostics, United States;

{3}Miles Design, United States; {4}National Institute of Standards and Technology, United States; {5}University of Wisconsin–Madison, United States

7147

Synchronized Multi-SDR Phase Meter

Kalle Hanhijärvi, Anders Wallin

National Metrology Institute VTT MIKES, Finland

7188

INVITED TALK: Artifacts and Errors in Cross-Spectrum Phase Noise Measurements

Yannick Gruson{2}, Adrian Rus{1}, Alexander Roth{3}, Enrico Rubiola{2}

{1}Famagusta, Romania; {2}FEMTO-ST Institute, France; {3}Rohde Schwarz, Germany

7201

A Faster Algorithm for Theo1

Ben Lewis

University of Strathclyde, United Kingdom

Group 3: Microwave Frequency Standards

3-1: Atomic Sensors

Session Chair: John Kitching, NIST

7285

INVITED TALK: Atom-Interferometric Test of the Equivalence Principle at the 10^{-12} Level

Mark Kasevich

Stanford University, United States

7152

Recording the Distribution of Cardiac Magnetic Fields in Unshielded Earth's Field

Chenxi Sun, Wei Xiao, Yudong Ding, Rui Zhang, Meng Liu, Teng Wu, Xiang Peng, Jingbiao Chen, Hong Guo
Peking University, China

7177

Low Power Microfabricated Rubidium Magnetometer

Fathima Niyaz{2}, Tom Heavner{2}, Brian Bryce{1}, Christopher Gardner{1}, Bradley Harden{1}, Haje Korth{1},
John Kitching{2}

{1}Johns Hopkins University Applied Physics Laboratory, United States; {2}National Institute of Standards
and Technology, United States

7200

INVITED TALK: Absolute Airborne and Marine Gravimetry with a Cold Atom Sensor

Yannick Bidel{4}, Nassim Zahzam{4}, Alexandre Bresson{4}, Cédric Blanchard{4}, Alexis Bonnin{4}, Malo
Cadoret{1}, Jeanne Bernard{2}, Didier Rouxel{5}, Marie-Francoise Lequentrec-Lalancette{5}, Sylvain
Lucas{5}, Corinne Salaun{5}, Sylvain Bonvalot{3}, Lucia Seoane{3}, Germinal Gabalda{3}, René
Forsberg{6}, Tim Enzberger Jensen{6}, Arne Vestergaard Olesen{6}

{1}CNAM, France; {2}CNAM ParisTech / ONERA, France; {3}GET, France; {4}ONERA, France; {5}Shom,
France; {6}Technical University of Denmark, Denmark

3-2: Compact Clocks

Session Chair: Francois-Xavier Esnault, CNES

7081

Progress on a Highly Compact Cesium CPT Clock Based on a Dual-Frequency VECSEL

Jeremie Cotxet{6}, François Gatty{5}, Ghaya Baili{5}, David Holleville{3}, Isabelle Sagnes{1}, Gregoire
Beaudoin{1}, Konstantinos Pantzas{1}, Gaëlle Lucas-Leclin{2}, Sylvie Janicot{2}, Stephane Guérandel{4},
Loïc Morvan{5}, Daniel Dolfi{5}

{1}Centre de Nanosciences et de Nanotechnologies-C2N, France; {2}Laboratoire Charles Fabry, École
Supérieure d'Optique, France; {3}LNE-SYRTE, Observatoire de Paris, France; {4}LNE-SYRTE, Observatoire
de Paris, Université PSL, CNRS, Sorbonne Université, France; {5}Thales R&T France, France; {6}Thales
R&T France and LNE-SYRTE, France

7153

Characteristics of the Passive Hydrogen Masers in Orbit

Pengfei Chen, Tao Shuai, Yonghui Xie, Xiaoyan Pan, Yang Zhao, Yuxian Pei, Chuanfu Lin
Shanghai Astronomical Observatory, Chinese Academy of Sciences, China

7243

Recent Advances in Compact CPT-Rubidium Frequency Standards at VNIIFTRI

Mikhail Skvortsov{3}, *Stepan Ignatovich*{3}, *Nikolay Kvashnin*{3}, *Ludmila Mesenzova*{3}, *Vadim Vasil'ev*{3}, *Victor Vishnyakov*{3}, *Denis Brazhnikov*{3}, *Aleksey V. Taichenachev*{2}, *Sergey Nagaev Bagayev*{3}, *Valeriy Yudin*{2}, *Igor Blinov*{4}, *Yury Samokhvalov*{1}, *Danil Parekhin*{1}, *Vitaly G. Palchikov*{1}
{1}FGUP VNIIFTRI, Russia; {2}Institute of Laser Physics SB RAS, NSU, Novosibirsk State Technical University, Russia;
{3}Novosibirsk State University, Institute of Laser Physics SB RAS, Russia; {4}Russian Metrological Institute of Technical Physics and Radio Engineering VNIIFTRI, Russia

7255

Noise Suppression in Pulsed Optically Pumped Atomic Clock by Differential

Detection *Zhijing Du, Yanyan Liu, Kemu Wang, Zhijian Yu, Xuwen Hu, Tao Liu, Shougang Zhang* National Time Service Center, Chinese Academy of Sciences, China

7019

INVITED TALK: The Deep Space Atomic Clock: 18 Months of Operation in Orbit

Eric Burt, John Prestage, Robert Tjoelker, Daphna Enzer, Da Kuang, David Murphy, David Robison, Jill Seubert, Rabi Wang, Todd Ely
Jet Propulsion Laboratory, California Institute of Technology, United States

7060

Demonstration of a 4-Liter Mercury Trapped Ion Clock

Thai Hoang, Sang Chung, Thanh Le, John Prestage, Lin Yi, Robert Tjoelker, Nan Yu
Jet Propulsion Laboratory, California Institute of Technology, United States

7078

New Microwave Power Control Technique by Light Shift Detection in the Double-Modulation CPT Clock

Alexandre Bouvier{2}, *Claudio Eligio Calosso*{1}, *Peter Yun*{3}, *Emeric de Clercq*{2}, *Stephane Guérandel*{2}
{1}Istituto Nazionale di Ricerca Metrologica, Italy; {2}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {3}National Time Service Center, Chinese Academy of Sciences, China

7080

Brownian Motion Effects in Vapor Cell Frequency Standards

Salvatore Micalizio, Aldo Godone, Filippo Levi, Michele Gozzelino Istituto Nazionale di Ricerca Metrologica, Italy

3-3: Fundamental Physics

Session Chair: Liang Liu, Shanghai Institute of Optics and Fine Mechanics

7111

INVITED TALK: Searching for Scalar Dark Matter and Tests of Fundamental Physics Using Photonic, Atomic, and Mechanical Oscillators

William Campbell, Ben McAllister, Maxim Goryachev, Eugene Ivanov, Michael Tobar
University of Western Australia, Australia

7239

GASTON Project: Searching Dark Matter Using the Galileo Satellites

Bruno Bertrand{2}, *Alexandra Sheremet*{1}, *Julien Chabé*{3}, *Clément Courde*{3}, *Pascale Defraigne*{2}, *Aurélien Hees*{1}, *Peter Wolf*{1}, *Pacôme Delva*{1}
{1}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {2}Royal Observatory of Belgium, Belgium; {3}Université Côte d'Azur, CNRS, Observatoire de la Côte d'Azur, IRD, Géoazur, France

7259

Using Precision Frequency Metrology for Dark Matter Searches

Catriona Thomson, Ben McAllister, Maxim Goryachev, Eugene Ivanov, Michael Tobar

University of Western Australia, Australia

3-4: Miniaturized Clocks

Session Chair: Mileti Gaetano, Laboratoire Temps-fréquence, Univ. Neuchâtel

7049

Imaging Solutions for a Planar Stacked MOT

Alan Bregazzi{5}, Paul F. Griffin{5}, Aidan S. Arnold{5}, Dave Burt{2}, Gabriela Martinez{4}, Rodolphe Boudot{1}, John Kitching{3}, Erling Riis{5}, James McGilligan{2}

{1}FEMTO-ST Institute / National Institute of Standards and Technology, United States; {2}Kelvin Nanotechnology, United Kingdom; {3}National Institute of Standards and Technology, United States; {4}University of Colorado, United States; {5}University of Strathclyde, United Kingdom

7063

Ramsey Spectroscopy in a Micro-Fabricated Rb Vapor Cell for Miniature Atomic Clocks

Etienne Batori{3}, Christoph Affolderbach{2}, Matthieu Pellaton{2}, Florian Gruet{2}, Yuanyan Su{1}, Maddalena Violetti{1}, Anja Skrivervik{1}, Gaetano Mileti{2}

{1}École Polytechnique Fédérale de Lausanne, Switzerland; {2}Université de Neuchâtel, Switzerland; {3}Université de Neuchâtel / Laboratoire temps-fréquence, Switzerland

7162

Wafer-Scale Fabrication of MEMS Atomic Vapor Cells with Measured In-Operation Clock Frequency Drifts Below $5 \cdot 10^{-12}$ Per Day

Sylvain Karlen{1}, Thomas Overstolz{1}, Fabien Droz{1}, Steve Lecomte{1}, Serge Grop{2}, Christian Schori{2}, Joseph Gouloumet{2}, Jacques Haesler{1}

{1}CSEM SA, Switzerland; {2}Orolia Spectratime SA, Switzerland

7212

Micro-Device Technologies for Mass Production of Miniaturized Atomic Clock System

Motoaki Hara{1}, Yuichiro Yano{1}, Shinsuke Hara{1}, Akifumi Kasamatsu{1}, Masaya Toda{2}, Hiroyuki Ito{3}, Takahito Ono{2}, Tetsuya Ido{1}

{1}National Institute of Information and Communications Technology, Japan; {2}Tohoku University, Japan; {3}Tokyo Institute of Technology, Japan

7254

Sub-Terahertz Heterodyne Spectroscopy of Carbonyl Sulfide

Lin Yi{1}, Hamid Javadi{1}, Wei Zhang{1}, James McKelvy{1}, Minah Kim{2}, Alec Yen{2}, Ruonan Han{2}

{1}Jet Propulsion Laboratory, California Institute of Technology, United States; {2}Massachusetts Institute of Technology, United States

7023

Ramsey-CPT Spectroscopy for a Microcell Atomic Clock

Clément Carlé{1}, Michael Petersen{1}, Nicolas Passilly{1}, Emeric de Clercq{2}, Moustafa Abdel-Hafiz{1}, Rodolphe Boudot{1}

{1}FEMTO-ST Institute, France; {2}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

3-5: Timekeeping

Session Chair: Fang Fang, National Institute of Metrology

7006

Drift Correction for Active Hydrogen MASERs

Samuel Griffin{1}, Dylan Meyer{2}, Andrew Lemmon{2}, Bryan Owings{1}

{1}Microchip Technology Inc., United States; {2}University of Alabama, United States

7072

Frequency Stability Improvement of an Active Hydrogen Maser with a Single-State Selection System

Victor Polyakov, Yuri Timofeev, Nikolai Demidov

Vremya-CH JSC, Russia

7105

Progress Towards a Transportable Sympathetic Cooling Cd⁺ Microwave Frequency Standard with Ca⁺ as Coolant Ions

Haoran Qin, Jize Han, Nongchao Xin, Shengnan Miao, Liming Guo, Huaxing Hu, Wenxin Shi, Jianwei Zhang, Lijun Wang

Tsinghua University, China

7215

Performance of the NRC-FCs2 Caesium Fountain Clock

Scott Beattie, Bin Jian, Marina Gertszov

National Research Council Canada, Canada

Group 4: Resonant Sensors and Transducers

4-1: Combined Group 1 & 4 Session

Session Chair: Phillip Feng, University of Florida

7272

INVITED TALK: Long Range and High Sensitivity Remote Sensing Through Passive, Battery-Less and Harvester-Free Subharmonic Tags

Cristian Cassella

Northeastern University, United States

7051

Single Crystal Diamond MHz Resonators

Boyang Jiang, Noah Opondo, Xingyu Gao, Tongcang Li, Sunil Bhav

Purdue University, United States

7203

INVITED TALK: The Sound of Music at the Nanoscale –Exploring the Nanoscale World with NEMS Resonators Based on Low Dimensional Nanomaterials

Zenghui Wang

University of Electronic Science and Technology of China, China

7265

INVITED TALK: Numerical Modelling of MEMS Resonators: Frequency Stability and Nonlinear Behaviour

Attilio Frangi^{1}, Valentina Zega^{1}, Gabriele Gattere^{2}

^{1}Politecnico di Milano, Italy; ^{2}STMicronics, Italy

4-2: Emerging Physical Sensors

Session Chair: Valentina Zega, Politecnico di Milano

7059

Determination of Niobium Cavity Magnetic Field Screening via a Dispersively Hybridized Magnonic Sensor

Graeme Flower, Ben McAllister, Maxim Goryachev, Michael Tobar

University of Western Australia, Australia

7214

A Reconfigurable Hardware Emulator of MEMS Gyroscopes with Built-In Error Source Models

Sanjoli Narang, Siddharth Tallur

Indian Institute of Technology Bombay, India

7220

Phononic Frequency Comb Generation in a Micromechanical Resonator Operating in Air and Liquid Environments

Sushruta Surappa, Molei Tao, Levent Degertekin

Georgia Institute of Technology, United States

7278

INVITED TALK: Navigation-Grade Precision Shell Gyroscope Made from 3D Fused-Silica Birdbath Resonators

Khalil Najafi, Jae Yoong Cho, Sajal Singh, Tal Nagourney, Jong-Kwan Woo, Ali Darvishian,

Behrooz Shiari, Guohong He, Christopher Boyd, Ester Bentley

University of Michigan, United States

7028

A 3 m×3 m Large Passive Laser Gyroscope for Geodetic Analysis

Xiaohua Feng, Kui Liu, Zongyang Li, Ke Li, Yuxuan Chen, Haobo Zhang, Zehuang Lu, Jie Zhang
Huazhong University of Science and Technology, China

4-3: Functional Materials for IoT

Session Chair: Harris Hall, Air Force Research Laboratory

7180

Direct Monitoring of Battery SOC Utilizing GMI-IDT Magnetic Sensor

Akila Khatun{2}, Florian Bender{2}, Fabien Josse{2}, Arnold Mensah-Brown{1}
{1}Ford Motor Company, United States; {2}Marquette University, United States

7191

INVITED TALK: Self-Powered Wireless Sensors Enabled by Multiple Ferroelectric Functions

Kui Yao, Szu Cheng Lai, Shuting Chen

Institute of Materials Research & Engineering, Agency for Science, Technology and Research, Singapore

7253

Pressure Response and Air Damping of β -Ga₂O₃ Nanomechanical Resonators

Wen Sui, S M Enamul Hoque Yousuf, Xu-Qian Zheng, Philip Feng

University of Florida, United States

7256

Monolayer Thin-Film Lithium Niobate Out-of-Plane Beam Actuator: Design and Analysis

Kevin Chan, Justin Phelps, Reza Abdolvand

University of Central Florida, United States

7099

Parametric Acoustic-Based Passive Transponders for Ultra-Sensitive Temperature and Temperature-Threshold Sensing

Hussein Hussein, Luca Colombo, Cristian Cassella

Northeastern University, United States

5-1: Optical Fiber Links I

Session Chair: Per Olof Hedekvist, RISE

7090

Ultraprecise Molecular Spectroscopy Using a 2000-km Optical Link

Samir Kassi{8}, Ondrej Votava{1}, Daniele Romanini{8}, Etienne Cantin{3}, Martin Rabault{5}, Vincent Ménoret{5}, Nicolas Quintin{6}, Raoul Dorge{7}, Mads Tønnes{4}, Rodolphe Le Targat{4}, Héctor Álvarez-Martínez{4}, Michel Abgrall{4}, Olivier Lopez{2}, Anne Amy-Klein{2}, Paul-Éric Pottie{4}

{1}J. Heyrovský Institute of Physical Chemistry, Czech Rep.; {2}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; {3}LNE SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université / LPL, France; {4}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {5}Muquans, France; {6}RENATER, France; {7}Université Grenoble Alpes, France; {8}Université Grenoble Alpes, Laboratoire Interdisciplinaire de Physique, France

7123

Transmission of Frequency Comb Over 7.7 km of Hollow Core Fiber

Zitong Feng{2}, Giuseppe Marra{1}, Xi Zhang{2}, Eric Numkam Fokoua{2}, Hesham Sakr{2}, John Hayes{2}, Francesco Poletti{2}, David Richardson{2}, Radan Slavík{2}

{1}National Physical Laboratory, United Kingdom; {2}Optoelectronics Research Centre, University of Southampton, United Kingdom

7131

Frequency Comparisons Below 10-16 with Mono-Directional Fiber Links

Dan Xu{2}, Olivier Lopez{1}, Anne Amy-Klein{1}, Paul-Éric Pottie{2}

{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; {2}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

7197

Frequency Transfer Over Unidirectional Fibre Links Using Optical Frequency Ratio Measurements

Giuseppe Marra{1}, Jochen Kronjäger{1}, Eric Numkam Fokoua{2}, Radan Slavík{2}

{1}National Physical Laboratory, United Kingdom; {2}Optoelectronics Research Centre, University of Southampton, United Kingdom

7079

INVITED TALK: A Phase-Stabilised Fiber Link for Quantum Key Distribution

Cecilia Clivati{1}, Alice Meda{1}, Simone Donadello{1}, Salvatore Virzi{1}, Marco Genovese{1}, Filippo Levi{1}, Alberto Mura{1}, Mirko Pittaluga{2}, Zhiliang Yuan{2}, Andrew Shields{2}, Marco Lucamarini{3}, Ivo Pietro Degiovanni{1}, Davide Calonico{1}

{1}Istituto Nazionale di Ricerca Metrologica, Italy; {2}Toshiba EU, United Kingdom; {3}University of York, United Kingdom

5-2: Optical Fiber Links II

Session Chair: Laura Sinclair, NIST

7237

Improving the Resilience of Optical Frequency Transfer Against Fiber Imperfections

Jochen Kronjäger{4}, Riley Ilieva{4}, Giuseppe Marra{4}, Etienne Cantin{2}, Anne Amy-Klein{1}, Paul-Éric Pottie{3}, Olivier Lopez{1}

{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; {2}LNE SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université / LPL, France; {3}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {4}National Physical Laboratory, United Kingdom

7198

Phase Noise and Frequency Stability Measurements of a 5,400-km-Long Intercontinental Seafloor Optical Cable Between the UK and Canada

Paul Gaynor{3}, Mattia Cantono{1}, Valey Kamalov{1}, Sean Mulholland{3}, Richard Hobson{3}, William Bowden{3}, Rileyllieva{3}, Ian R. Hill{3}, Marco Schioppo{3}, Jacques-Olivier Gaudron{3}, Irene-Barbeito Edreira{3}, Kathryn Burrows{3}, Cecilia Clivati{2}, Alberto Mura{2}, Filippo Levi{2}, Davide Calonico{2}, Giuseppe Marra{3}

{1}Google LLC, United States; {2}Istituto Nazionale di Ricerca Metrologica, Italy; {3}National Physical Laboratory, United Kingdom

7202

Silicon Circuits for Optical Frequency Transfer

Liang Hu, Liangjun Lu, Guiling Wu, Linjie Zhou, Jianping Chen
Shanghai Jiao Tong University, China

7218

First Experimental Evidence of Reciprocity Violation with Bidirectional Optical Fiber Links

Dan Xu{2}, Olivier Lopez{1}, Anne Amy-Klein{1}, Paul-Éric Pottie{2}

{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; {2}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

5-3: Satellite Time Transfer

Session Chair: Pascale Defraigne, Royal Observatory of Belgium

7266

INVITED TALK: Sub-Nanosecond Laser Time-Transfer Using Nanosatellites

John Conklin{4}, Myles Clark{4}, Danielle Coogan{4}, Tyler Ritz{4}, John Hanson{3}, David Mayer{2}, Anh Nguyen{2}, Cedric Priscal{2}, Jan Stupl{2}, Adam Zufall{2}, Kerri Cahoy{1}, Ondrej Cierny{1}, Peter Grenfell{1}, Grant Gunnison{1}, William Kammerer{1}, Paul Serra{1}, Hannah Tomio{1}

{1}Massachusetts Institute of Technology, United States; {2}NASA Ames Research Center, United States; {3}NASA Ames Research Center/ Crosstrac Engineering, United States; {4}University of Florida, United States

7096

Towards Ground-to-Space Laser Links for a Global Clock Network

David Gozzard, Lewis Howard, Benjamin Dix-Matthews, Skevos Karpathakis, Charles Gravestock, Sascha Schediwy
University of Western Australia, Australia

7174

Validation of a New BIPM Calibration System Based on GNSS Receivers for TWSTFT Links

Frédéric Meynadier{1}, Gérard Petit{1}, Laurent Tisserand{1}, Giovanni Daniele Rovera{2}, Joseph Achkar{4}, Pierre Uhrich{4}, Franziska Riedel{4}, Tung Thanh Thai{3}, Ilaria Sesia{3}, Clément Courde{5}

{1}BIPM Bureau International des Poids et Mesures, France; {2}Bureau International des Poids et Mesures, France;

{3}Istituto Nazionale di Ricerca Metrologica, Italy; {4}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {5}Geoazur, CNRS, Observatoire de la Côte d'Azur, UNS Sophia-Antipolis, France

7222

INVITED TALK: Time and Frequency Links by a New Digital TWSTFT Modem

Miho Fujieda{2}, Tadahiro Gotoh{2}, Sang-Wook Hwang{1}, Ryuichi Ichikawa{2}, Tetsuya Ido{2}, Ryo Tabuchi{2}, Tien-Kuan Tseng{3}, Wen-Hung Tseng{3}, Sung-Hoon Yang{1}

{1}Korea Research Institute of Standards and Science, Korea; {2}National Institute of Information and Communications Technology, Japan; {3}Telecommunication Laboratories, Chunghwa Telecom Co., Ltd., Taiwan

5-4: Time Dissemination

Session Chair: Marina Gertsvolf, NRC

7179

White Rabbit Multi-Point Time Distribution Network

Erik Dierikx^{2}, Adrian Savencu^{1}, Yan Xie^{2}

^{1}OPNT, Netherlands; ^{2}VSL Dutch Metrology Institute, Netherlands

7209

On Lab Test of Coherence in Event Horizon Imager

Volodymyr Kudriashov^{1}, Manuel Martin-Neira^{1}, Enrico Lia^{1}, Petar Jankovic^{1}, Jerzy Michalski^{2}, Przemyslaw Kant^{2}, Damian Trofimowicz^{2}

^{1}ESTEC ESA, Netherlands; ^{2}SpaceForest Ltd, Poland

7035

Assessing Time Transfer Methods for Accuracy and Reliability

Kristof Teichel^{2}, Tapio Lehtonen^{3}, Anders Wallin^{1}

^{1}National Metrology Institute VTT MIKES, Finland; ^{2}Physikalisch-Technische Bundesanstalt, Germany; ^{3}VTT Technical Research Centre of Finland Ltd, Finland

7073

Extending the Network Time Security Protocol for Secure Communication Between Time Server and Key Establishment Server

Martin Langer^{1}, Kai Heine^{1}, Dieter Sibold^{2}, Rainer Bermbach^{1}

^{1}Ostfalia University of Applied Sciences, Germany; ^{2}Physikalisch-Technische Bundesanstalt, Germany

5-5: Time in GNSS

Session Chair: Ilaria Sesia, INRM

7088

Intrinsic GNSS Metrological Time Traceability to UTC

Pierre Urich, Philip Tuckey, Joseph Achkar

LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

7284

INVITED TALK: Traceability to UTC from GNSS Measurement

Andreas Bauch

Physikalisch-Technische Bundesanstalt, Germany

7002

Generating a Timing Information (1-PPS) from a Software Defined Radio Decoding of GPS Signals

David Rabus^{1}, Gwenaél Goavec-Merou^{2}, Gonzalo Cabodevila^{1}, Francois Meyer^{3}, Jean-Michel Friedt^{2}

^{1}FEMTO-ST Institute, France; ^{2}FEMTO-ST Institute/ENSMM/CNRS/UBFC, France; ^{3}OSU THETA, France

7044

GRC-MS Monitoring of the Galileo Open Service Timing Performances

Jerome Delporte^{1}, Amale Kanj^{1}, Kenneth Jaldehag^{4}, Andrea Perucca^{2}, Franco Fiasca^{2},

Juan-Manuel Gonzalez^{5}, Hannah Collingwood^{3}

^{1}CNES, France; ^{2}Istituto Nazionale di Ricerca Metrologica, Italy; ^{3}National Physical Laboratory, United Kingdom;

^{4}RISE, Sweden; ^{5}ROA, Spain

7065

Validation of the UTC Information Broadcast in the Navigation Messages by All GNSS

Pascale Defraigne{2}, Gérard Petit{1}, Elisa Pinat{2}

{1}BIPM Bureau International des Poids et Mesures, France; {2}Royal Observatory of Belgium, Belgium

5-6: Time Scale I

Session Chair: Pierre Waller, ESA

7176

Updates on an Optical-Microwave-Hybrid Timescale

Jian Yao{1}, Tara M. Fortier{1}, Andrew D. Ludlow{3}, William F. McGrew{3}, Nick V. Nardelli{2}, Chun-Chia Chen{1}, Jacob Siegel{3}, Xiaogang Zhang{3}, Jeffrey A. Sherman{1}

{1}National Institute of Standards and Technology, United States; {2}National Institute of Standards and Technology / University of Colorado Boulder, United States; {3}National Institute of Standards and Technology, University of ColoradoBoulder, United States

7182

Improvements in the VNIIFTRI Primary Frequency Standard and National Time Scale UTC(SU)

Sergey Donchenko{1}, Igor Blinov{2}, Igor Noretz{1}, Evgeniy Glazov{1}, Yury Smirnov{1}, Vitaly G. Palchikov{1}
{1}FGUP VNIIFTRI, Russia; {2}Russian Metrological Institute of Technical Physics and Radio Engineering VNIIFTRI, Russia

7150

Designing a New UTC(NPL) Time Scale as Part of the UK National Timing Centre Programme

John Davis, Kathryn Burrows, Hannah Collingwood, Setnam Shemar, Peter Whibberley, Simon Ashford, Elizabeth LaierEnglish, Belinda Eglin, Robert Foot, Krzysztof Szymaniec, Conway Langham, Rich J. Hendricks, Huw Owen, Adam Parsons, Adam Richmond, Douglas Jones, Adam Peverell, Annora Sundararajan, Rebecca Lewis, Mayokun Aikomo, Josh Whale, Ali Ashkhasi, Andrew Wilson, Samuel Walby, Leon Lobo, Helen S. Margolis

National Physical Laboratory, United Kingdom

7171

On-Line Tests of Real-Time Time Scale Generation Algorithms Based on a Primary Frequency Standard and a Clock Ensemble

Valerio Formichella{1}, Giovanna Signorile{1}, Tung Thanh Thai{1}, Lorenzo Galleani{2}, Michele Gozzelino{1}, GiovanniAntonio Costanzo{2}, Ilaria Sesia{1}, Filippo Levi{1}

{1}Istituto Nazionale di Ricerca Metrologica, Italy; {2}Politecnico di Torino, Italy

5-7: Time Scale II

Session Chair: John Davis, NPL

7086

Improving UTC with Redundant Time/Frequency Links

Gérard Petit, Gianna Panfilo

BIPM Bureau International des Poids et Mesures, France

7095

INVITED TALK: TAI Calibrations by Optical Clock NICT-Sr1 - Evaluation by Direct Trace to Individual Standards

Nils Nemitz, Tadahiro Gotoh, Hiroyuki Ito, Yuko Hanado, Tetsuya Ido, Hidekazu Hachisu

National Institute of Information and Communications Technology, Japan

7250

The Time Processor: A New Platform for Forthcoming Timescales

Claudio Eligio Calosso

Istituto Nazionale di Ricerca Metrologica, Italy

7054

Using a Time-Scale Ensemble on Moving Platforms

Marc Weiss{1}, Steven Wilkinson{2}

{1}Marc Weiss Consulting LLC, United States; {2}Raytheon Technologies, United States

Group 6: Optical Frequency Standards and Applications

6-1: Clock Applications

Session Chair: Jerome Lodewyck, SYRTE

7125

Operation of an Optical Clock Based on a Highly Charged Ion

Steven King^{2}, Lukas Spieß^{2}, Peter Micke^{2}, Alexander Wilzewski^{2}, Tobias Leopold^{2}, Erik Benkler^{2}, José CrespoLópez-Urrutia^{1}, Piet Schmidt^{2}

^{1}Max-Planck-Institut für Kernphysik, Germany; ^{2}Physikalisch-Technische Bundesanstalt, Germany

7132

Isotopic Shift Spectroscopy and Atomic Structure Calculations for Yb Intercombination and Clock Transitions

Jesse Schelfhout, John McFerran

University of Western Australia, Australia

7280

INVITED TALK: Transportable Optical Lattice Clocks to Test and Use Gravitational Redshift

Hidetoshi Katori^{2}, Ichiro Ushijima^{2}, Masao Takamoto^{1}

^{1}Quantum Metrology Laboratory, RIKEN, Japan; ^{2}University of Tokyo, Japan

7040

Frequency Metrology of the HD+Molecule: Determining Fundamental Constants and Searching for Physics Beyond the Standard Model

Soroosh Alighanbari^{2}, Ivan Kortunov^{3}, Michael Hansen^{3}, Gouri Shankar Giri^{3}, Florin Lucian Constantin^{4}, Vladimir Korobov^{1}, Stephan Schiller^{3}

^{1}Bogoliubov Laboratory of Theoretical Physics, Russia; ^{2}Heinrich Heine University Düsseldorf, Germany; ^{3}Heinrich-Heine-University, Germany; ^{4}Université Lille 1, France

7084

Progress in Optical Atomic Clocks at KL FAMO, UMK

Marcin Bober^{2}, Sławomir Bilicki^{2}, Muhammad Ali Butt^{4}, Roman Ciuryło^{2}, Anahit Gogyan^{3}, Konrad Jaroszewski^{2}, Domagoj Kovačić^{2}, Piotr Morzyński^{2}, Mateusz Narożnik^{2}, Rodolfo Muñoz Rodríguez^{2}, Vijay Singh^{2}, Ara Tonoyan^{3}, Marcin Witkowski^{2}, Piotr Wcisło^{2}, Mehrdad Zarei^{2}, Beata Zjawin^{1}, Michał Zawada^{2}

^{1}International Centre for Theory of Quantum Technologies, University of Gdańsk, Poland; ^{2}Nicolaus Copernicus University, Croatia; ^{2}Nicolaus Copernicus University, Poland; ^{3}Nicolaus Copernicus University, National Academy of Sciences of Armenia, Armenia; ^{4}Samara National Research University, Russia

6-2: Clock Comparisons

Session Chair: Helen Margolis, NPL

7038

Universal Formalism for Clock Comparison Networks

Jérôme Lodewyck^{1}, Rodolphe Le Targat^{1}, Paul-Éric Pottie^{1}, Erik Benkler^{3}, Sebastian Koke^{3}, Jochen Kronjäger^{2}

^{1}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; ^{2}National Physical Laboratory, United Kingdom; ^{3}Physikalisch-Technische Bundesanstalt, Germany

7117

Absolute Frequency Measurements from Long-Term Operation of Three Optical Frequency Standards

Johannes Rahm, Stefan Weyers, Nils Huntemann, Richard Lange, Burghard Lipphardt, Roman Schwarz, Sören Dörscher, Erik Benkler, Christian Tamm, Christian Lisdat, Ekkehard Peik

Physikalisch-Technische Bundesanstalt, Germany

7144

Long-Term Comparison of $^{171}\text{Yb}^+(\text{E3})$ and ^{87}Sr Clocks

Sören Dörscher, Nils Huntemann, Roman Schwarz, Richard Lange, Erik Benkler, Burghard Lipphardt, Uwe Sterr, Ekkehard Peik, Christian Lisdat

Physikalisch-Technische Bundesanstalt, Germany

7247

Zero-Dead-Time Differential Spectroscopy Enabling Clock Interrogation Beyond the Laser

Coherence Limit William F. McGrew^{3}, May E. Kim^{1}, Nick V. Nardelli^{2}, Ethan R. Clements^{3}, Youssef S. Hassan^{3}, X. Zhang^{3}, Jose Valencia^{3}, David B. Hume^{1}, Tara M. Fortier^{1}, David R. Leibbrandt^{3}, Andrew D. Ludlow^{3}

^{1}National Institute of Standards and Technology, United States; ^{2}National Institute of Standards and Technology / University of Colorado Boulder, United States; ^{3}National Institute of Standards and Technology, University of Colorado Boulder, United States

7279

INVITED TALK: Frequency Comparisons with the AI+ Optical Clocks at NIST

David B. Hume^{2}, Kyle Beloy^{2}, Martha I. Bodine^{2}, Tobias Bothwell^{1}, Kevin Boyce^{2}, Samuel M. Brewer^{2}, Sarah

L. Bromley^{1}, Jwo-Sy Chen^{2}, Ethan R. Clements^{3}, Kaifeng Cui^{2}, Jean-Daniel Deschênes^{2}, Scott A. Diddams^{3}, Robert J. Fasano^{3}, Tara M. Fortier^{2}, Aaron M. Hankin^{2}, Youssef S. Hassan^{3}, Dhruv Kedar^{1}, Colin J. Kennedy^{1}, Isaac Khader^{2}, May E. Kim^{2}, Amanda Koepke^{2}, David R. Leibbrandt^{3}, Holly Leopardi^{2}, Andrew D. Ludlow^{3}, William F. McGrew^{3}, William R. Milner^{1}, Nathan R. Newbury^{2}, Daniele Nicolodi^{2}, Eric Oelker^{1}, Thomas E. Parker^{2}, John M. Robinson^{1}, Stefania Romisch^{2}, Stefan A. Schaeffer^{2}, Jeffrey A. Sherman^{2}, Laura C. Sinclair^{2}, Lindsay Sonderhouse^{1}, William C. Swann^{2}
^{1}Joint Institute for Laboratory Astrophysics, University of Colorado Boulder, United States; ^{2}National Institute of Standards and Technology, United States; ^{3}National Institute of Standards and Technology, University of Colorado Boulder, United States

6-3: Clock Techniques

Session Chair: Rachel Godun, National Physical Laboratory

7244

Quenched Clock Transition Laser Cooling Below the Recoil Limit in a 1D Optical Lattice Clock

Xiaogang Zhang^{2}, Youssef S. Hassan^{2}, Kyle Beloy^{1}, William F. McGrew^{2}, Chun-Chia Chen^{1}, Jacob Siegel^{2}, Andrew D. Ludlow^{2}

^{1}National Institute of Standards and Technology, United States; ^{2}National Institute of Standards and Technology, University of Colorado Boulder, United States

7283

INVITED TALK: Precision Spectroscopy in Multi-Ion Systems

Tanja Mehlstäubler

Physikalisch-Technische Bundesanstalt, Germany

7160

Heating Rate Measurement of a Paul Trap for Frequency Metrology

Bachir Achi^{1}, Thomas Lauprêtre^{1}, Moustafa Abdel-Hafiz^{1}, Lucas Groult^{1}, Marion Delehaye^{2}, Clément Lacroûte^{2}

^{1}FEMTO-ST Institute, France; ^{2}FEMTO-ST Institute/ENSMM/CNRS/UBFC, France

7167

Sympathetic Sideband Cooling of 171Yb^+ Ions Using 88Sr^+ Ancillary Ions and Frequency Measurement of the 88Sr^+ Clock Transition at 674 nm

Martin Steinel, Hu Shao, Melina Filzinger, Nils Huntemann, Richard Lange, Burghard Lipphardt, Tanja Mehlstäubler, Christian Tamm, Ekkehard Peik
Physikalisch-Technische Bundesanstalt, Germany

7185

Towards an Active Optical Clock Using an Optical Conveyor Within a Ring Cavity

Georgy Kazakov{1}, Swadheen Dubey{1}, Francesca Famà{2}, Sheng Zhou{2}, Camila Beli Silva{2}, Stefan Alaric Schäffer{2}, Shayne Bennetts{2}, Florian Schreck{2}
{1}Technische Universität Wien, Austria; {2}University of Amsterdam, Netherlands

6-4: Combs

Session Chair: Thomas Sudmeyer, University Neuchatel

7175

Flicker Phase Noise Reduction in High-Speed Photodiodes Using Short Pulses for Low Noise Optical-to-Microwave Conversion

Dahyeon Lee{2}, Takuma Nakamura{2}, Jizhao Zang{3}, Joe Campbell{3}, Scott A. Diddams{1}, Franklyn Quinlan{1}
{1}National Institute of Standards and Technology, University of Colorado Boulder, United States;
{2}University of Colorado Boulder, United States; {3}University of Virginia, United States

7189

Measuring the Centres of Absorption Lines of HCN with Potential for Mise En Pratique

Martin Hosek, Šimon Řeřucha, Jan Hrabina, Martin Cizek, Ondřej Číp
Institute of Scientific Instruments of the CAS, v. v. i., Czech Rep.

7055

Design of Dispersive Interferometers for the Self-Stabilization of Optical Frequency Combs

James Cahill{1}, Tanvir Mahmood{1}, Patrick Sykes{2}, Curtis Menyuk{2}, Weimin Zhou{1}
{1}DEVCOM Army Research Laboratory, United States; {2}University of Maryland, Baltimore County, United States

7134

Stability of Lithium Niobate Integrated Photonics in Nonlinear and Metrology Applications

Ewelina Obrzud{2}, Hamed Sattari{2}, Thibault Voumard{1}, Gregory Choong{2}, Séverine Denis{2}, Jacopo Leo{2}, Thibault Wildi{1}, Olivier Dubochet{2}, Michel Despont{2}, Steve Lecomte{2}, Tobias Herr{1}, Amir Ghadimi{2}, Victor Brasch{2}
{1}Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron, Germany; {2}CSEM SA, Switzerland

6-5: Ion Clocks

Session Chair: Pierre Dubé, NRC

7138

Tailored Optical Clock Transition in 40Ca^+

Lennart Pelzer^{3}, Kai Dietze^{3}, Johannes Kramer^{3}, Fabian Dawel^{3}, Ludwig Krinner^{3}, Nicolas Spethmann^{3}, Victor Martinez^{2}, Nati Aharon^{1}, Alex Retzker^{1}, Klemens Hammerer^{2}, Piet Schmidt^{3}
^{1}Hebrew University of Jerusalem, Israel; ^{2}Leibniz Universität Hannover, Germany; ^{3}Physikalisch-Technische Bundesanstalt, Germany

7274

INVITED TALK: Recent Progress on the 40Ca^+ Ion Optical Clocks

Yao Huang, Hua Guan, Kelin Gao

Innovation Academy for Precision Measurement Science and Technology, Chinese Academy of Sciences, China

7029

The Recent Progress of a 25Mg^+ - 27Al^+ Ion Optical Clock

Wenzhe Wei, Ke Deng, Hongli Liu, Zhiyu Ma, Peng Hao, Zhiyuan Wang, Zhuo Deng, Wenhao Yuan, Jie Zhang, Zehuang Lu

Huazhong University of Science and Technology, China

7108

Lu⁺ Clock Comparison at the 10-18 Level

Zhiqiang Zhang, Kyle Arnold, Rattakorn Kaewuam, Murray Douglas Barrett

National university of Singapore, Singapore

6-6: Laser Stabilization

Session Chair: Uwe Sterr, PTB

7217

Compact, High Finesse Optical Reference Cavity with Micro-Fabricated Mirrors

Charles McLeMore^{2}, James Hendrie^{2}, Naijun Jin^{3}, David Mason^{3}, Yizhi Luo^{3}, Megan Kelleher^{2}, Dahyeon Lee^{2}, Peter Rakich^{3}, Scott A. Diddams^{1}, Franklyn Quinlan^{1}

^{1}National Institute of Standards and Technology, University of Colorado Boulder, United States;

^{2}University of Colorado Boulder, United States; ^{3}Yale University, United States

7024

In-Progress Study of Microcell-Stabilized Lasers Using Dual-Frequency Sub-Doppler Spectroscopy

Anthony Gusching^{1}, Michael Petersen^{1}, Nicolas Passilly^{1}, Ivan Ryger^{1}, Denis Brazhnikov^{2}, Moustafa Abdel-Hafiz^{1}, Rodolphe Boudot^{1}

^{1}FEMTO-ST Institute, France; ^{2}Novosibirsk State University, Institute of Laser Physics SB RAS, Russia

7077

Ultrastable Laser Based on Spectral Hole Burning in a Rare-Earth-Doped Crystal

Bess Fang^{3}, Nicolas Galland^{4}, Nemanja Lucic^{3}, Shuo Zhang^{3}, Héctor Álvarez-Martínez^{3}, Rodolphe Le Targat^{3}, Alban Ferrier^{2}, Philippe Goldner^{1}, Signe Seidelin^{5}, Yann Le Coq^{3}

^{1}IRCP, France; ^{2}IRCP / Sorbonne Université, France; ^{3}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; ^{4}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, UGA, France; ^{5}Université Grenoble Alpes / Institut Néel, France

7126

Frequency Stability of a Cryogenic Silicon Resonator with Crystalline Mirror Coatings

Jialiang Yu{3}, Thomas Legero{3}, Fritz Riehle{3}, Daniele Nicolodi{3}, Kedar Dhruv{2}, John M. Robinson{2}, Eric Oelker{4}, Jun Ye{1}, Uwe Sterr{3}

{1}JILA, National Institute of Standards and Technology, University of Colorado Boulder, United States;

{2}Joint Institute for Laboratory Astrophysics, University of Colorado Boulder, United States; {3}Physikalisch-Technische Bundesanstalt, Germany; {4}University of Glasgow, United Kingdom

7146

Optical Link Stabilization Technique Using Digital Electronics

Shambo Mukherjee{1}, Jacques Millo{2}, Baptiste Marechal{1}, Séverine Denis{1}, Gwenaél Goavec-Merou{2}, Jean-Michel Friedt{2}, Yann Kersalé{1}, Clément Lacroûte{2}

{1}FEMTO-ST Institute, France; {2}FEMTO-ST Institute/ENSMM/CNRS/UBFC, France

6-7: Lattice Clocks

Session Chair: Nils Nemitz, NICT

7246

Systematic Effects in Strontium Optical Lattice Clocks

Yannick Foucault, William Moreno, Bruno Alves, Rodolphe Le Targat, Jérôme Lodewyck

LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

7268

INVITED TALK: Systematic Frequency Shifts in Bi-Color TM Optical Clock

Ksenia Khabarova, Artem Golovizin, Dmitry Tregubov, Denis Mishin, Daniil Provorchenko, Elena Fedorova, Vadim Sorokin, Nikolai Kolachevsky

P.N. Lebedev Physical Institute RAS, Russia

7104

Progress Report of the 171Yb Optical Lattice Clock NMIJ-Yb1

Takumi Kobayashi{1}, Daisuke Akamatsu{2}, Kazumoto Hosaka{1}, Yusuke Hisai{2}, Masato Wada{1}, Hajime Inaba{1}, Takehiko Tanabe{1}, Feng-Lei Hong{2}, Masami Yasuda{1}

{1}National Metrology Institute of Japan, Japan; {2}Yokohama National University, Japan

7158

Auto-Compensation of Collisional Shift in Atomic Clocks Based on Bosonic Atoms in an Optical Lattice

Valeriy Yudin{1}, Aleksey V. Taichenachev{1}, Maksim Basalae{1}, Oleg Prudnikov{1}, Thomas Zanon-Willette{3}, Sergey Nagaev Bagayev{2}

{1}Institute of Laser Physics SB RAS, NSU, Novosibirsk State Technical University, Russia; {2}Novosibirsk State University, Institute of Laser Physics SB RAS, Russia; {3}Sorbonne Université, France

7226

Non-Linear Lattice AC Stark Shift for Magnesium Lattice Clock

Nandan Jha, Waldemar Friesen-Piepenbrink, Steffen Sauer, Dominika Fim, Klaus Zipfel, Wolfgang Ertmer, Ernst Rasel

Leibniz Universität Hannover, Germany

6-8: Transportable Clocks

Session Chair: David Leibbrandt, NIST

7159

Microfabricated Strontium Atomic Vapor Cell

Jacob Pate{2}, John Kitching{1}, Matthew Hummon{1}

{1}National Institute of Standards and Technology, United States; {2}National Institute of Standards and Technology, University of Colorado Boulder, United States

7219

Background Light Shifts in Optical Lattice Clocks: Characterization, Suppression, and Uncertainty Evaluation

Robert J. Fasano{2}, Yun-Jhih Chen{2}, William F. McGrew{2}, Wesley Brand{2}, Richard Fox{1}, Andrew D. Ludlow{2}

{1}National Institute of Standards and Technology, United States; {2}National Institute of Standards and Technology, University of Colorado Boulder, United States

7231

Opticlock: Transportable and Easy-to-Operate Optical Single-Ion Clock

Nils Huntemann{5}, Moustafa Abdel-Hafiz{5}, Bassem Arar{1}, Ahmad Bawamia{1}, Maximilian Biethahn{11}, Stefan Brakhane{8}, Alexandre Didier{5}, József Fortágh{2}, Matthäus Halder{4}, Ronald Holzwarth{4}, Michael Johanning{10}, Robert Jördens{6}, Wilhelm Kaenders{8}, Florian Karlewski{2}, Florian Kienle{8}, Markus Krutzik{3}, Maurice Lessing{4}, Tanja Mehlstäubler{5}, Dieter Meschede{9}, Ekkehard Peik{5}, Achim Peters{3}, Piet Schmidt{5}, Hendrik Siebeneich{10}, Jürgen Stuhler{8}, Christian Tamm{5}, Enrico Vogt{7}, Andreas Wicht{1}, Christof Wunderlich{10}, Jialiang Yu{5}

{1}Ferdinand Braun Institut gGmbH, Leibniz Institut für Höchstfrequenztechnik, Germany; {2}HighFinesse GmbH, Germany; {3}Humboldt Universität zu Berlin, Germany; {4}Menlo Systems GmbH, Germany; {5}Physikalisch-Technische Bundesanstalt, Germany; {6}QUARTIQ, Germany; {7}QUBIG GmbH, Germany; {8}TOPTICA Photonics AG, Germany; {9}Universität Bonn, Germany; {10}University of Siegen, Germany; {11}VACOM Vakuum Komponenten & Messtechnik GmbH, Germany

7249

Realising a Transportable Optical Atomic Clock from Industry-Developed Components

Markus Gellesch, Alok Singh, Jonathan Jones, Qiushuo Sun, Richard Barron, Manan Jain, Vijay Singh, Kai Bongs, Yeshpal Singh

University of Birmingham, United Kingdom

7151

Progress Towards a Transportable and High-Accuracy Sr⁺ Ion Clock at NRC

Pierre Dubé, Kosuke Kato, John Bernard, Bin Jian

National Research Council Canada, Canada

TECHNICAL PROGRAM (Poster Sessions)

All poster presentations will be presented during two live sessions within Gather.Town. Posters are sorted within this program by tracks/groups. The individual poster's session times are listed below the presentation title.

Group 1: Materials, Resonators and Resonator Circuits

7235

A Novel Ring-Shaped Extensional Wine-Glass Mode RF-MEMS Resonator with High Quality Factors

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Zeji Chen, Wenli Liu, Quan Yuan, Yinfang Zhu, Jinling Yang, Fuhua Yang

Institute of Semiconductors, Chinese Academy of Sciences, China

7021

Absolute Vibration Displacement of Piezoelectric Resonators on Polished Surfaces by Laser Speckle Interferometer

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Jing Wang^{1}, Yasuaki Watanabe^{2}, Kengo Hara^{2}

{1}Taiyouden, China; {2}Tokyo Metropolitan University, Japan

7236

AIN MEMS Resonator with High Quality Factor

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Wenli Liu, Jinchao Li, Zeji Chen, Quan Yuan, Yinfang Zhu, Jinling Yang, Fuhua Yang

Institute of Semiconductors, Chinese Academy of Sciences, China

7155

Comparison Between Absolute Orientation Determination Methods of Doubly Rotated Blanks

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Guillaume Eyer^{1}, Thomas Garnier^{3}, Joël Imbaud^{2}, Xavier Vacheret^{2}, Eric Andrey^{2}, Hugues Cabane^{1}, Delphine Picchedda^{1}, Fabrice Sthal^{2}

{1}Cristal Innov, France; {2}FEMTO-ST Institute, France; {3}FEMTO-ST Institute / SYRLINKS, France

7101

Development of 76.8 MHz Crystal Unit with a built-in Thermistor Capable of High Drive Level Operation

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Kenichiro Murata, Kiyoharu Matsuo, Takahiro Ohtsuka, Itaru Miyahara

Nihon Dempa Kogyo Co., Ltd, Japan

7277

Ferroelectric Considerations on cosputtered 30% AlScN with Different DC+Rf Ratios

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Michele Pirro^{1}, Gabriel Giribaldi^{2}, Bernard Herrera Soukup^{2}, Xuanyi Zhao^{2}, Giuseppe Michetti^{2}, William Zhu^{2}, Luca Colombo^{1}, Cristian Cassella^{1}, Matteo Rinaldi^{2}

{1}Northeastern University, United States; {2}Smart Center, Northeastern University, United States

7164

Ferroelectric Hf_{0.5}Zr_{0.5}O₂-on-Si Fin Bulk Acoustic Resonators with Frequencies Up to 18 GHz

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Faysal Hakim, Troy Tharpe, Roozbeh Tabrizian

University of Florida, United States

7223

Frequency Tuning in Resonant Nano-Electromechanical Devices Based on Anisotropic Two-Dimensional Semiconductor Rhenium Disulfide

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Fei Xiao, Bo Xu, Yachun Liang, Jiankai Zhu, Shenghai Pei, Ting Wen, Jing Li, Song Wu, Juan Xia, Zenghui Wang

University of Electronic Science and Technology of China, China

7031

Low Velocity HAL SAW Resonator Using Lithium Niobate Thin Plate on Quartz Substrate

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Tzong Lin Chua, Michio Kadota, Shuji Tanaka

Tohoku University, Japan

7048

Modified Mason's and BVD Models for Analysis of Spurious Modes Due to Ohmic Losses in BAW Resonators

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Eduardo Lugo Hernández{2}, Teona Mirea{1}, José Manuel Carmona Cejas{1}, Marta Clement{1}, Jimena Olivares{1}, Juan Carlos Collado Gómez{2}, Jordi Mateu{2}

{1}CEMDATIC-ETSI Telecomunicación, Universidad Politécnica de Madrid, Spain; {2}Universitat Politècnica de Catalunya, Spain

7187

Numerical Simulation of Influence of the Thermal and Mechanical Fluctuations in the Coupling Elements of microresonators

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Vladislav Pavlov{1}, Nikita Kondratiev{2}, Nickolay Khatyrev{1}, Igor Blinov{1}

{1}Russian Metrological Institute of Technical Physics and Radio Engineering VNIIFTRI, Russia; {2}Russian Quantum Center, Russia

7135

Portable Network Analyzers for Full Characterization of FBAR sensors: Influence of Readout Parameters on Sensor Performance

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Teona Mirea{3}, Nicolo' Chiodarelli{1}, Manuel Moreno{1}, Mario DeMiguel-Ramos{2}

{1}Sorex Sensors Ltd, United Kingdom; {2}Sorex Sensors Ltd., United Kingdom; {3}Universidad Politécnica de Madrid & Sorex Sensors Ltd, Spain

7230

Reconfigurable nanoelectromechanical Computing Based on Resonant Cantilevers

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Jiawei Fang{2}, Pengcheng Zhang{1}, Rui Yang{1}, Zenghui Wang{2}

{1}Shanghai Jiao Tong University, China; {2}University of Electronic Science and Technology of China, China

7051

Single Crystal Diamond MHz Resonators

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Boyang Jiang, Noah Opondo, Xingyu Gao, Tongcang Li, Sunil Bhawe

Purdue University, United States

7221

Theoretical Study of Thermally Stable Large-Coupling Lithium Niobate SH0 Plate Wave Resonator

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Jie Zou^{1}, Shuxian Wu^{1}, Zonglin Wu^{1}, Shangyang Li^{1}, Albert P. Pisano^{2}, Yaqiu Jin^{1}
{1}Fudan University, China; {2}University of California, Berkeley, United States

7252

Top Metal Coverage Impact on the Performance of Thin-Film Piezoelectric-on-Substrate Resonators

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Parvin Akhkandi, Reza Abdolvand

University of Central Florida, United States

7205

95% Upper Limit Comparison Between the cross-Spectrum and the Spectrum Average with 5 radio-Telescopes

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Antoine Baudiquez, Éric Lantz, Enrico Rubiola, François Vernotte
FEMTO-ST Institute, France

7269

A 103 dBQ 977 MHz Transimpedance Amplifier for 149 MHz Capacitive MEMS Disk Resonator

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Hua Chen^{1}, Quan Yuan^{2}, Ke Liu^{1}, Zhen Meng^{1}, Yuepeng Yan^{1}
{1}Institute of Microelectronics Chinese Academy of Sciences, China; {2}Institute of Semiconductors, Chinese Academy of Sciences, China

7225

A 131 dBQ 146 MHz CMOS Transimpedance Amplifier for 20 MHz Capacitive MEMS Beam Resonator

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Hua Chen^{1}, Guoyong Li^{1}, Zeji Chen^{2}, Zhen Meng^{1}, Yuepeng Yan^{1}
{1}Institute of Microelectronics Chinese Academy of Sciences, China; {2}Institute of Semiconductors, Chinese Academy of Sciences, China

7098

A Dedicated Microwave Frequency Synthesizer for the Rubidium Atomic Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Zhijian Yu, Zhijing Du, Yanyan Liu, Kemu Wang, Shougang Zhang
National Time Service Center, Chinese Academy of Sciences, China

7115

A Low Noise Alternative to a 3-State Phase Detector

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Andrey Pluteshko
Advantex LLC, Russia

7206

A Novel Phase Noise Measurement Technique for Reflection-Type Device

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Yao Yu, Jeronimo Segovia-Fernandez, Ernest Ting-Ta Yen

Texas Instruments, United States

7042

Fast Automatic Frequency Calibration Assisted Phase-Locked Highly Stable Optoelectronic Oscillator

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Huanfa Peng, Peng Lei, Xiaopeng Xie, Zhangyuan Chen

Peking University, China

7091

Material Dependency of 1/F Phase Noise in a Piezoelectric MEMS Oscillator

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Marco Liffredo, Muhammad Faizan, Andrea Lozzi, Luis Guillermo Villanueva

École Polytechnique Fédérale de Lausanne-NEMS, Switzerland

7190

Novel Microhertz Comparison Measurement of Remote Frequency Standards

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Michael Underhill

Underhill Research Ltd, United Kingdom

7192

Ultra-Low Phase Noise Frequency Division with Array of Direct Digital Synthesizers

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Marco Pomponio, Archita Hati, Craig Nelson

National Institute of Standards and Technology, United States

7050

Very New Small OCXO with Low Short and Medium Term Noise and Low Thermal Sensitivity

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Didier Thorax, Vincent Candelier, Anthony Ferreira, Hamdi Henchiri, Jean-Charles Billebault, Frédéric Vittrant
RAKON, France

7043

Wideband Photonic Microwave Synthesizer Based on a Photonic Sub-Sampling Phase-Locked Optoelectronic Oscillator

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Huanfa Peng, Peng Lei, Xiaopeng Xie, Zhangyuan Chen
Peking University, China

7228

Additive Manufactured Microwave Cavity for a Compact Rb cold-Atom Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Etienne Batori{2}, Christoph Affolderbach{1}, Vladimir Dolgovskiy{1}, Matthieu Pellaton{1}, Ben Lewis{3}, Paul F.Griffin{3}, Erling Riis{3}, Gaetano Mileti{1}
{1}Université de Neuchâtel, Switzerland; {2}Université de Neuchâtel / Laboratoire temps-fréquence, Switzerland; {3}University of Strathclyde, United Kingdom

7032

Advances of Chip-Scale Atomic Clock in Peking University in 2020

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Jianye Zhao{1}, Ping Guo{1}, Hongling Meng{2}, Lin Dan{1}, Hao Xu{1}
{1}Peking University, China; {2}Zhongkeqidi Optoelectronic Technology Guangzhou Co., Ltd., China

7261

EIT/EIA Resonances Driven by the Light Field of Elliptically Polarized Waves

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Dmitriy Kovalenko, Maksim Basalaev, Valeriy Yudin, Aleksey V. Taichenachev
Institute of Laser Physics SB RAS, NSU, Novosibirsk State Technical University, Russia

7017

Enhancing the Signal-to-Noise Ratio in Optically Pumped Cesium Beam Tubes Using a hexapole Magnetic System

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Yufei Yan{1}, Haijun Chen{1}, Duo Pan{2}, Tianyu Liu{2}, Jingbiao Chen{2}, Jinjun Feng{1}
{1}Beijing Vacuum Electronics Research Institute, China; {2}Peking University, China

7107

Faraday Laser with Cavity Mode Locked for Optical Pumped Rubidium Atomic Clock

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Tianyu Liu{2}, Xiaolei Guan{2}, Dayong Chen{1}, Jianxing Wang{1}, Duo Pan{2}, Jingbiao Chen{2}
{1}Lanzhou Institute of Physics, China; {2}Peking University, China

7089

Frequency Shift Measurements in a cold-Atom Lin \perp Lin CPT Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Rachel Elvin, Michael Wright, Ben Lewis, Aidan S. Arnold, Paul F. Griffin, Erling Riis

University of Strathclyde, United Kingdom

7068

Frequency Stabilization of the Extended Cavity Diode Laser to the 87Rb - D2 Transition by Using Zeeman Modulation Method

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Ersoy Şahin

National Metrology Institute of Turkey TÜBİTAK UME, Turkey

7148

In Situ Calibration of Magnetic Field Coils Using Parametric Resonance in Optically-Pumped Magnetometers

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Wei Xiao, He Wang, Xiangzhi Zhang, Yulong Wu, Teng Wu, Xiang Peng, Jingbiao Chen, Hong Guo

Peking University, China

7129

Influence of magnetic-Field Gradient on the magneto-Optical Resonance Signal Linewidth with anti-relaxation-Coated Cells

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Junhe Zheng, Yudong Ding, Teng Wu, Xiang Peng, Jingbiao Chen, Hong Guo

Peking University, China

7119

Kr-N₂ buffer-Gas Mixture to Lower Barometric Sensitivity in Rb vapor-Cell Clocks

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Michele Gozzelino, Salvatore Micalizio, Claudio Eligio Calosso, Aldo Godone, Filippo Levi

Istituto Nazionale di Ricerca Metrologica, Italy

7069

Low Phase Noise photonic-Based Rb Atomic Frequency Standard

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Ersoy Şahin, Adem Gedik, Yücel Deniz, Çağrı Şenel, Ramiz Hamid

National Metrology Institute of Turkey TÜBİTAK UME, Turkey

7193

Magnetic-Field-Insensitive Zeeman Resonance Induced by Parametric Modulations

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Xiyu Liu, Wei Xiao, Teng Wu, Xiang Peng, Hong Guo

Peking University, China

7036

Measurements of the Hg Fill Level in Low-Pressure Hg Discharge Lamps via Macrophotography

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Kaitlin Fundell, Charles Klimcak, James Camparo

Aerospace Corporation, United States

7267

Microwave-Vacuum Integrated Cavity with a Low Temperature Sensitivity for Cs Fountain Clocks

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Fasong Zheng, Fang Fang, Weiliang Chen, Kun Liu, Shaoyang Dai, Shiyang Cao, Tianchu Li

National Institute of Metrology, China

7078

New Microwave Power Control Technique by Light Shift Detection in the Double-Modulation CPT Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Alexandre Bouvier^{2}, Claudio Eligio Calosso^{1}, Peter Yun^{3}, Emeric de Clercq^{2}, Stephane Guérandel^{2}
^{1}*Istituto Nazionale di Ricerca Metrologica, Italy;* ^{2}*LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France;* ^{3}*National Time Service Center, Chinese Academy of Sciences, China*

7046

Performance Optimizations of Optically Pumped Cesium Beam Frequency Standard

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Xuan He, Zhichao Yuan, Shengwei Fang, Qing Wang, Xianghui Qi, Xuzong Chen

Peking University, China

7097

Progress Report on the Development of a Cesium Fountain Clock at HUST

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Hui Li, Yuanbo Du, Xian Yang, Yunyi Guo, Mingming Liu, Hongli Liu, Zehuang Lu

Huazhong University of Science and Technology, China

7015

Progresses Toward a Laser Cooled Yb⁺ Microwave Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Nongchao Xin, Jianwei Zhang, Shengnan Miao, Haoran Qin, Liming Guo, Jize Han, Lijun Wang

Tsinghua University, China

7063

Ramsey Spectroscopy in a micro-Fabricated Rb Vapor Cell for Miniature Atomic Clocks

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

14 July 2021 at 15:00 UTC

Etienne Batori^{3}, Christoph Affolderbach^{2}, Matthieu Pellaton^{2}, Florian Gruet^{2}, Yuanyan Su^{1},

Maddalena Violetti^{1}, Anja Skrivervik^{1}, Gaetano Miletì^{2}

^{1}École Polytechnique Fédérale de Lausanne, Switzerland; ^{2}Université de Neuchâtel, Switzerland;

^{3}Université de Neuchâtel / Laboratoire temps-fréquence, Switzerland

7102

Research on Sympathetic Cooling ¹¹³Cd⁺-¹⁷⁴Yb⁺ System by Molecular Dynamics Simulation

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Shengnan Miao, Jianwei Zhang, Nongchao Xin, Haoran Qin, Jize Han, Liming Guo, Huaxing Hu, Wenxin Shi,

Lijun Wang

Tsinghua University, China

7045

Scalar Potassium Magnetometer Based on Amplitude Modulated Nonlinear magneto-Optical Rotation

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Yudong Ding, Rui Zhang, Junhe Zheng, Teng Wu, Jingbiao Chen, Xiang Peng, Hong Guo
Peking University, China

7067

The Preliminary Progress of Nimb Rb Fountain Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Weiliang Chen, Fang Fang, Kun Liu, Shaoyang Dai, Tianchu Li
National Institute of Metrology, China

7259

Using Precision Frequency Metrology for Dark Matter Searches

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Catriona Thomson, Ben McAllister, Maxim Goryachev, Eugene Ivanov, Michael Tobar
University of Western Australia, Australia

7214

A Reconfigurable Hardware Emulator of MEMS Gyroscopes with built-in Error Source Models

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Sanjoli Narang, Siddharth Tallur

Indian Institute of Technology Bombay, India

7057

Analysis of the Effect of Electrode Structure on the uniformization of Mass Sensitivity Distribution

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Wei Pan, Xianhe Huang

University of Electronic Science and Technology of China, China

7241

Modelling of Underwater Acoustic Networks for Source Localization in Arbitrary Bounded Reservoirs

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Sanjoli Narang, Aditya Harakare, Nayan Barhate, Andrews Varghese, Aayush Shrivastava, Ayushi Gupta

Indian Institute of Technology Bombay, India

7186

Optical WGM Resonator Sensor of Earth Gravity Acceleration Inhomogeneities

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Irina Balakireva^{1}, Igor Blinov^{2}, Nikolay Khatirev^{1}

^{1}FGUP VNIIFTRI, Russia; ^{2}Russian Metrological Institute of Technical Physics and Radio Engineering

VNIIFTRI, Russia

7099

Parametric Acoustic-Based Passive Transponders for ultra-Sensitive Temperature and Temperature-Threshold Sensing

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Hussein Hussein, Luca Colombo, Cristian Cassella

Northeastern University, United States

7220

Phononic Frequency Comb Generation in a Micromechanical Resonator Operating in Air and Liquid Environments

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Sushruta Surappa, Molei Tao, Levent Degertekin

Georgia Institute of Technology, United States

7253

Pressure Response and Air Damping of β -Ga₂O₃ Nanomechanical Resonators

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Wen Sui, S M Enamul Hoque Yousuf, Xu-Qian Zheng, Philip Feng

University of Florida, United States

7016

QCM Sensor System Based on a Phase Detector Circuit for Measurements of Density and Viscosity of Liquids

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Jacobo Costas-Costas^{1}, Loreto Rodriguez-Pardo^{3}, Hubert Perrot^{2}, Ana Cao-Paz^{3}, Jose Fariña^{3}, Daniel Rose^{2}

^{1}Indra Systems, Spain; ^{2}Sorbonne Université, CNRS, France; ^{3}University of Vigo, Spain

7122

Sensitive Elements for Wirelessly Interrogated High Temperature SAW Deformation Sensors

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Alexander Shvetsov^{2}, Sergei Zhgoon^{2}, Andrey Merkulov^{2}, Nikita Belyankin^{2}, Prince Mengue^{1}, Omar Elmazria^{1}

^{1}Institut Jean Lamour UMR 7198, Université de Lorraine - CNRS, France; ^{2}National Research University Moscow Power Engineering Institute, Russia

7003

A Physical Approach to the Uncertainties in UTC-UTC(k)

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Demetrios Matsakis

Masterclock, Inc., United States

7184

A spline-Based Weighting Function with Reduced Sensitivity at High Frequencies

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Jingxian Ji, Sebastian Koke

Physikalisch-Technische Bundesanstalt, Germany

7224

Accounting BDS3–BDS2 inter-System Biases for Precise Time Transfer

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Weijin Qin, Hang Su, Zhe Zhang, Xuhai Yang

National Time Service Center, Chinese Academy of Sciences, China

7127

An Accurate and Robust Metrological Network for Coherent Optical Frequency Dissemination

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Etienne Cantin^{2}, Mads Tønnes^{3}, Rodolphe Le Targat^{3}, Moïse Deroh^{1}, Christian Chardonnet^{1},

Anne Amy-Klein^{1}, Olivier Lopez^{1}, Paul-Éric Pottier^{3}

^{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; ^{2}LNE SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université / LPL, France; ^{3}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

7169

An out-of-Band Signal Jamming GNSS L1-Band in Observatoire De Paris

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Pierre Urrich, Michel Abgrall, Franziska Riedel, Baptiste Chupin, Joseph Achkar, Giovanni Daniele Rovera

LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France

7011

Application of Vondrak Filtering Method in Software Defined Receiver (SDR)-Two-Way Satellite Time and Frequency transfer (TWSTFT)

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Xiang Wang, Huijie Song, Dong Guo, Wenjun Wu, Shaowu Dong

Key Laboratory of Time and Frequency Primary Standards/National Time Service Center, China

7156

Assessing a New full-Digital Platform for Doppler-Cancellation of Fiber Links

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Martina Matusko, Leo Tranchart, Gwenaël Goavec-Merou, Clément Lacroûte, Jacques Millo, Jean-Michel Friedt, Marion Delehay

FEMTO-ST Institute/ENSMM/CNRS/UBFC, France

7245

Calibration of the White Rabbit Link

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Vladimir Smotlacha, Josef Vojtech

CESNET, z. s. p. o., Czech Rep.

7066

Comparison of GNSS All-in-View (AV) and Upsampled Common-View (UCV) Time Transfers

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Wen-Hung Tseng

Telecommunication Laboratories, Chunghwa Telecom Co., Ltd., Taiwan

7181

Design of “Universal Module” Based Time and Frequency System Using White Rabbit Technology

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Yan Xie, Erik Dierikx, Marijn van Veghel

VSL Dutch Metrology Institute, Netherlands

7157

Development of a Solution for Distributing Traceable Time and Frequency Signal Throughout the United Kingdom

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Belinda Eglin, John Davis, Hannah Collingwood, Robert Foot, Conway Langham, Peter Whibberley
National Physical Laboratory, United Kingdom

7100

Distributed Synchronization Network Utilizing Miniaturized Atomic Clocks

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Yuichiro Yano, Motoaki Hara, Tetsuya Ido
National Institute of Information and Communications Technology, Japan

7052

Evaluation of a New low-Cost Receiver for GNSS time-Transfer

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Michael Wouters
National Measurement Institute, Australia

7264

Evaluation of the Behavior of Coherent Optical Fiber Links and the Aliasing Effects Arising from the Sampling of Missing Data

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Mads Tønnes^{3}, Etienne Cantin^{2}, Anne Amy-Klein^{1}, Paul-Éric Pottie^{3}
^{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; ^{2}LNE SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université / LPL, France; ^{3}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Universi

7106

Extended Jones Matrix Calculus for Assessing the Impact of State of Polarization Wander in Interferometric Fiber Links

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Brian Vincent, Thomas Waterholter, Alexander Kuhl, Sebastian Koke
Physikalisch-Technische Bundesanstalt, Germany

7149

Fibre Link for Optical Frequency Transfer Between ISI and BEV

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Martin Cizek{4}, Lenka Pravdova{4}, Jan Hrabina{4}, Josef Lazar{4}, Thomas Pronebner{2}, Elke Aeikens{2}, Jörg Premper{2}, Ondrej Havlis{3}, Vladimir Smotlacha{3}, Lada Altmannova{3}, Thorsten Schumm{1}, Josef Vojtech{3}, Anton Nießner{2}, Ondřej Číp{4}
{1}Atominstitut, Vienna University of Technology, Austria; {2}BEV – Federal Office of Metrology and Surveying, Austria;
{3}CESNET, z. s. p. o., Czech Rep.; {4}Institute of Scientific Instruments of the CAS, v. v. i., Czech Rep.

In-Depth Analysis of UTC Information Broadcast in GNSS Navigation Messages

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Elisa Pinat, Pascale Defraigne
Royal Observatory of Belgium, Belgium

7074

Local Distribution of an Ultrastable and Accurate Frequency Reference Using Eavesdropping on an Optical FiberLink

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Etienne Cantin{4}, Martin Rabault{6}, Bérangère Argence{3}, Vincent Ménoret{6}, Bruno Desruelle{6}, Laurent Hilico{3}, Abdessamad Mbardi{3}, François Nez{3}, Pauline Yzombard{3}, Saida Guellati-Khelifa{3}, Pierre Cladé{3}, Hadj Elandoussi{2}, Nicolas Cahuzac{2}, Christof Janssen{2}, Thomas Zanon{2}, Christian Rouillé{2}, Benoit Darquié{1}, Michel Abgrall{5}, Rodolphe Le Targat{5}, Paul-Éric Pottie{5}, Olivier Lopez{1}, Anne Amy-Klein{1}
{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Nord, CNRS, France; {2}LERMA, Sorbonne Université, Observatoire de Paris, Université PSL, CNRS, France; {3}LKB, Sorbonne Université, CNRS, ENS-Université PSL, France; {4}LNE SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université / LPL, France; {5}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {6}Muquans, France

7210

Long Haul Single Fiber 2R (Reamplified-Reshaped) White Rabbit Transmission

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Josef Vojtech{1}, Ondrej Havlis{1}, Martin Slapak{1}, Vladimir Smotlacha{1}, Jan Kundrat{1}, Radek Velc{1}, SarbojeetBhowmick{1}, Jaroslav Roztocil{2}, Tomas Horvath{1}, Rudolf Vohnout{1}, Lada Altmannova{1}
{1}CESNET, z. s. p. o., Czech Rep.; {2}Czech Technical University Prague, Czech Rep.

7196

Microwave Transfer via 11 km Fiber Link with fiber-Loop optical-Microwave Phase Detectors

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Honglei Yang^{1}, Shengkang Zhang^{1}, Qingwen Xiao^{1}, Huan Zhao^{1}, Wenzhe Yang^{1}, Ming Dong^{2}, WenhaiJiao^{2}, Jun Ge^{1}

{1}Beijing Institute of Radio Metrology and Measurement, China; {2}Beijing Institute of Tracking and Telecommunications Technology, China

7061

Mutual Synchronization of Passive Hydrogen Masers

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Konstantin Mishagin, Artem Pelyushenko

Vremya-CH JSC, Russia

7103

Near Real-Time GPS PPP Time Transfer for Business Continuity in Singapore

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Shilpa Manandhar, Yu Song Meng

Agency for Science, Technology and Research, NMC, Singapore

7172

Network and Software Architecture Improvements for a Highly Automated, Robust and Efficient Realization of the Italian National Time Scale

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Andrea Perucca, Tung Thanh Thai, Franco Fiasca, Giovanna Signorile, Valerio Formichella, Ilaria Sesia, Filippo Levi

Istituto Nazionale di Ricerca Metrologica, Italy

7070

Next Step for Delivery of Precise Frequency and Phase OCXO for “5G” Telecom and Beyond

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Jean-Charles Billebault, Didier Thorax, Nicolas Gufflet, Alexander Kovach, Vincent Candelier, Hamdi Henchiri, UllasKumar, Frédéric Vittrant

RAKON, France

7071

Parametric Optimization of the Practical Mixer Device in the Optical Comb Frequency Transfer System

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Yufei Zhang, Dongrui Yu, Ziyang Chen, Teng Wu, Hong Guo

Peking University, China

7163

Recent and Future Activities at Leibniz University Hannover in GNSS Frequency Transfer

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Thomas Krawinkel^{1}, Steffen Schön^{1}, Andreas Bauch^{2}

^{1}Leibniz University Hannover, Germany; ^{2}Physikalisch-Technische Bundesanstalt, Germany

7093

Simultaneous Transfer of RF and Timing Signals via Optical Fiber

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Motohiro Kumagai, Miho Fujieda

National Institute of Information and Communications Technology, Japan

7207

Stability of Hardware Delays of GNSS Signals

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Pascale Defraigne^{2}, Elisa Pinat^{2}, Bruno Bertrand^{2}, Pierre Uhrich^{1}, Baptiste Chupin^{1}, Franziska Riedel^{1}

^{1}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; ^{2}Royal Observatory of Belgium, Belgium

7114

Statistical Analysis of H-Masers to Improve the long-Term Stability of UTC

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

James Milton^{2}, Gianna Panfilio^{1}

^{1}BIPM Bureau International des Poids et Mesures, France; ^{2}University of Edinburgh, United Kingdom

7092

The Frequency Transfer Over 1000 km of Fiber Using the Optical Frequency Comb

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Ziyang Chen, Dongrui Yu, Yufei Zhang, Teng Wu, Hong Guo
Peking University, China

7053

The NMIA WebTimer: a Traceable Time Service for Checking Stopwatches and Timers

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Michael Wouters, Louis Marais, Robert Williams
National Measurement Institute, Australia

7082

The Role of Electric-Preamplifier Noise on Determining the Frequency Instability of the Optical-Comb Based Frequency Transfer System

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Dongrui Yu, Yufei Zhang, Ziyang Chen, Teng Wu, Hong Guo
Peking University, China

7133

Time Synchronization of Spatial Separated Areas for AV-Production

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Heiko Bruckmeyer, Jonas Bühlmeyer, Thomas Ackermann, Georg Fischer
Friedrich–Alexander University Erlangen–Nürnberg, Germany

7014

Time Synchronization Over Cascaded Backbone and Access fiber-Optic Links

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Faxing Zuo, Kunfeng Xie, Liang Hu, Jianping Chen, Guiling Wu
Shanghai Jiao Tong University, China

7173

Ultra-Stable Atmospheric Short Link for the Optical Frequency Signal Transfer

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Gulnara Vishnyakova^{1}, Konstantin Kudeyarov^{1}, Emil Chiglintsev^{2}, Nikita Zhadnov^{1}, Denis Kryuchkov^{1},
KseniaKhabarova^{1}, Nikolai Kolachevsky^{1}
^{1}*P.N. Lebedev Physical Institute RAS, Russia;* ^{2}*RQC, Russia*

7136

A Cryogenic Optical Strontium Lattice Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Roman Schwarzh, Sören Dörscher, Christian Lisdat
Physikalisch-Technische Bundesanstalt, Germany

7166

A cryogenic, sapphire, ultra-Stable Optical Cavity with Crystalline Mirror Coatings

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Jose Valencia^{2}, David R. Leibbrandt^{2}, David B. Hume^{1}
{1}National Institute of Standards and Technology, United States; {2}National Institute of Standards and Technology, University of Colorado Boulder, United States

7109

A Proposal of polarization-Modulated Spectroscopy for Rb two-Photon Optical Transition

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Dou Li^{3}, Fangfei Wu^{1}, Liyan Tang^{2}, Songbai Kang^{2}
{1}Huazhong University of Science and Technology, China; {2}Innovation Academy for Precision Measurement Science and Technology, Chinese Academy of Sciences, China; {3}University of Chinese Academy of Sciences, China

7145

A room-Temperature Optical Cavity with ultra-Low non-Linear Drift to Measure Hydrogen Maser Noise from 1 S to 10⁵ S

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Marco Schioppo, Jake W. Paterson, Jacob Tunesi, Rich J. Hendricks, Krzysztof Szymaniec, Peter Whibberley, Alvise Vianello, William Bowden, Richard Hobson, Ian R. Hill, Helen S. Margolis
National Physical Laboratory, United Kingdom

7128

Active Optical Clock Based on Laser Cooling of Alkali-Metal Atoms

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Tiantian Shi^{2}, Duo Pan^{2}, Wei Zhuang^{1}, Xiaolei Guan^{2}, Jianxiang Miao^{2}, Jia Zhang^{2}, Jingbiao Chen^{2}
{1}National Institute of Metrology, China; {2}Peking University, China

7037

An ultra-Stable Interrogation Laser for a Transportable Optical Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Sofia Herbers, Uwe Sterr, Christian Lisdat

Physikalisch-Technische Bundesanstalt, Germany

7094

Bridging the Optical and Microwave Frequencies with the Dual-Frequency Faraday Laser

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Jianxiang Miao, Tiantian Shi, Pengyuan Chang, Hangbo Shi, Duo Pan, Jingbiao Chen

Peking University, China

7034

Continuous-Wave Mirrorless Lasing at 1470 μm in Blue-Light Pumped Cs Vapor

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Tiantian Shi, Jianxiang Miao, Jingbiao Chen

Peking University, China

7183

Designing Mode-Locking Dynamics for Low-Noise Frequency-Comb Generation

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Çağrı Şenel^{2}, Ramiz Hamid^{2}, Cihangir Erdoğan^{2}, Mehmet Celik^{2}, Fatih Omer Ilday^{1}

^{1}*Bilkent University, Turkey*; ^{2}*National Metrology Institute of Turkey TÜBİTAK UME, Turkey*

7056

Earth-Scale Network of Optical Atomic Clocks for Dark Matter

Searches

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Piotr Morzyński^{6}, Piotr Ablewski^{6}, Xiamenez Rodrigues Alves^{1}, Charles F. A. Baynham^{5}, Kyle Beloy^{3}, Sławomir Bilicki^{6}, Marcin Bober^{6}, William Bowden^{5}, Roman Ciuryło^{6}, Anne E. Curtis^{5}, Robert J. Fasano^{4}, Yannick Foucault^{1}, Rachel M. Godun^{5}, Hidekazu Hachisu^{2}, Youssef S. Hassan^{4}, Ian R. Hill^{5}, Richard Hobson^{5}, Tetsuyaldo^{2}, Rodolphe Le Targat^{1}, Jérôme Lodewyck^{1}, Andrew D. Ludlow^{4}, Helen S. Margolis^{5}, Héctor Álvarez- Martinez^{1}, William F. McGrew^{4}, William Moreno^{1}, Nils Nemitz^{2}, Daniele Nicolodi^{3}, Jake W. Paterson^{5}, B. I. Robertson^{5}, Marco Schioppo^{5}, André Silva^{5}, Alexandra Tofful^{5}, Alvise Vianello^{5}, Piotr Wcisło^{6}, Xiaogang Zhang^{4}, Beata Zjawin^{6}, Michał Zawada^{6}
{1}LNE-SYRTE, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France; {2}National Institute of Information and Communications Technology, Japan; {3}National Institute of Standards and Technology, United States; {4}National Institute of Standards and Technology, University of Colorado Boulder, United States; {5}National Physical Laboratory, United Kingdom; {6}Nicolaus Copernicus University, Poland

7175

Flicker Phase Noise Reduction in high-Speed Photodiodes Using Short Pulses for Low Noise optical-to-Microwave Conversion

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Dahyeon Lee^{2}, Takuma Nakamura^{2}, Jizhao Zang^{3}, Joe Campbell^{3}, Scott A. Diddams^{1}, Franklyn Quinlan^{1}
{1}National Institute of Standards and Technology, University of Colorado Boulder, United States; {2}University of Colorado Boulder, United States; {3}University of Virginia, United States

7041

Frequency Noise Characterization of an ultra-Stable Laser with a Frequency Instability of 1.3×10^{-16}

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Zhiyuan Wang, Jie Zhang, Wenzhe Wei, Yanxia Ye, Leilei He, Jialu Chang, Jingxuan Zhang, Qiyue Wu, Zehuang Lu
Huazhong University of Science and Technology, China

7139

High-Stability Rb Optical Clock Based on pulse-Modulated broad-Spectrum comb-Tooth Laser

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Xiaolei Guan, Tiantian Shi, Jianxiang Miao, Tian Zhao, Jingbiao Chen
Peking University, China

7137

Improved Evaluation of the Transportable Strontium Lattice Clock at PTB

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Ingo Nosske, Chetan Vishwakarma, Sofia Herbers, Roman Schwarz, Sören Dörscher, Christian Lisdat
Physikalisch-Technische Bundesanstalt, Germany

7233

INRIM Sr Optical clock: an Optically Loaded Apparatus for high-Stability Metrology

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Matteo Barbiero^{1}, Marco Tarallo^{1}, Federica Rullo^{2}, Matias Risaro^{1}, Cecilia Clivati^{1}, Davide Calonico^{1}, Filippo Levi^{1}
^{1}Istituto Nazionale di Ricerca Metrologica, Italy; ^{2}Universita degli Studi di Torino, Dipartimento di Fisica, Italy

7132

Isotopic Shift Spectroscopy and Atomic Structure Calculations for Yb intercombination and Clock Transitions

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Jesse Schelfhout, John McFerran
University of Western Australia, Australia

7064

Laser Spectroscopy Induced by Bichromatic or Polychromatic Laser for Laser Frequency Stabilization

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Pengyuan Chang, Duo Pan, Hong Guo, Jingbiao Chen
Peking University, China

7121

Limitations in the Frequency Stability Transfer at 1.5 μm Using a Fiber Ring Cavity

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Tatiana Steshchenko^{2}, Karim Manamanni^{2}, Mohamed Sahni^{2}, Amine Chaouche-Ramdane^{1}, Vincent Roncin^{2}, Frédéric Du-Burck^{1}
^{1}Laboratoire de Physique des Lasers, Université Sorbonne Paris Cité, CNRS, France; ^{2}Sorbonne Paris Nord University, CNRS, France

7242

Measurement of Magnetic Field Stability Using 40Ca^+ Ion

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Tuan Minh Pham^{1}, Adam Lesundak^{1}, Martin Cizek^{1}, Šimon Řeřucha^{1}, Petr Jedlicka^{1}, Josef Lazar^{1}, Lukas

Podhora^{2}, Lukas Slodicka^{2}, Ondřej Číp^{1}

^{1}*Institute of Scientific Instruments of the CAS, v. v. i., Czech Rep.*; ^{2}*Palacký University, Czech Rep.*

7022

Observation of the Hydrogen 1S-2S Two-Photon Transition Excited by an Ultraviolet Mode-Locked Laser

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Hao Xu, Zhaolong Li, Jianye Zhao

Peking University, China

7047

Planar, Single-Beam Mot Structures for Cold Strontium Atoms

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Saskia Bondza{2}, Tobias Leopold{1}, Stefanie Kroker{2}, Christian Lisdat{2}

{1}Deutsches Luft- und Raumfahrtzentrum e.V., Germany; {2}Physikalisch-Technische Bundesanstalt, Germany

7178

Progress of Silicon Cavity at 4 K with Crystalline Mirror Coatings

Live Session 1: 2a

13 July 2021 at 15:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Dhruv Kedar{2}, William R. Milner{2}, Eric Oelker{4}, Alexander Staron{2}, John M. Robinson{2}, Jialiang Yu{3}, Thomas Legero{3}, Fritz Riehle{3}, Daniele Nicolodi{3}, Uwe Sterr{3}, Jun Ye{1}

{1}JILA, National Institute of Standards and Technology, University of Colorado Boulder, United States;

{2}Joint Institute for Laboratory Astrophysics, University of Colorado Boulder, United States; {3}Physikalisch-Technische Bundesanstalt, Germany; {4}University of Glasgow, United Kingdom

7161

Progress on Development of Photonic Microwave Generation at NTSC

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Lulu Yan{2}, Xiguang Yang{2}, Yanyan Zhang{2}, Wenyu Zhao{2}, Pan Zhang{2}, Bingjie Rao{2}, Mingkun Li{2}, Wenge Guo{1}, Shougang Zhang{2}, Haifeng Jiang{2}

{1}Key Laboratory of Time and Frequency Primary Standards/National Time Service Center, China;

{2}National Time Service Center, Chinese Academy of Sciences, China

7248

Progress Towards a Multi-Ion Optical Clock Based on a Linear Chain of Yb Ions

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Justin Schultz, Neil Claussen, Peter Schwindt

Sandia National Laboratories, United States

7234

Project YBIS: Transportable Optical Clock Based on a Single $^{171}\text{Yb}^+$ Ion

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Iliia Zalivako^{2}, Ilya Semerikov^{1}, Alexander Borisenko^{1}, Mikhail Aksenov^{1}, Pavel Vyshnyakov^{1}, Pavel Sidorov^{1}, Ivan Sherstov^{3}, Artem Golovizin^{2}, Nikolai Kolachevsky^{2}, Ksenia Khabarova^{2}
^{1}*Lebedev Physical Institute, Russia*; ^{2}*P.N. Lebedev Physical Institute RAS, Russia*; ^{3}*Skolkovo Institute of Science and Technology, Russia*

7165

Quantum non-Demolition Detection in an Optical Lattice Clock

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Alvise Vianello, William Bowden, Richard Hobson, Marco Schioppo, Ian R. Hill
National Physical Laboratory, United Kingdom

7154

Saturated Spectroscopy of HCN

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Jan Hrabina, Martin Hošek, Šimon Řeřucha, Lenka Pravdová, Josef Lazar, Ondřej Číp
Institute of Scientific Instruments of the CAS, v. v. i., Czech Rep.

7009

Simulation of Dipole Dipole Interactions with Ultracold Sr in an Optical Lattice

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Shengnan Zhang, Preetam Ramchurn, Kai Bongs, Yeshpal Singh
University of Birmingham, United Kingdom

7195

Sr Clock Laser Systems Based on Long Room-Temperature Cavities

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Nikita Zhadnov, Konstantin Kudeyarov, Denis Kryuchkov, Gulnara Vishnyakova, Ksenia Khabarova, Nikolai Kolachevsky
P.N. Lebedev Physical Institute RAS, Russia

7085

Study of Feasibility of blue-Detuned Optical Lattices

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Domagoj Kovačić^{1}, Marcin Witkowski^{1}, Sławomir Bilicki^{1}, Marcin Bober^{1}, Vijay Singh^{1}, Ara Tonoyan^{2}, Michał

Zawada^{1}

^{1}Nicolaus Copernicus University, Poland; ^{2}Nicolaus Copernicus University, National Academy of Sciences of Armenia, Armenia

7167

Sympathetic Sideband Cooling of $^{171}\text{Yb}^+$ Ions Using $^{88}\text{Sr}^+$ Ancillary Ions and Frequency Measurement of the $^{88}\text{Sr}^+$ Clock Transition at 674 nm

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Martin Steinle, Hu Shao, Melina Filzinger, Nils Huntemann, Richard Lange, Burghard Lipphardt, Tanja Mehlstäubler, Christian Tamm, Ekkehard Peik

Physikalisch-Technische Bundesanstalt, Germany

7029

The Recent Progress of a $^{25}\text{Mg}^+$ - $^{27}\text{Al}^+$ Ion Optical Clock

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Wenzhe Wei, Ke Deng, Hongli Liu, Zhiyu Ma, Peng Hao, Zhiyuan Wang, Zhuo Deng, Wenhao Yuan, Jie Zhang, Zehuang Lu

Huazhong University of Science and Technology, China

7168

Theoretical Investigation of superradiant Lasing in 2- or 3- Level Atoms in an Optical Lattice

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Anahit Gogyan^{2}, Georgy Kazakov^{3}, Marcin Bober^{1}, Michał Zawada^{1}

^{1}Nicolaus Copernicus University, Poland; ^{2}Nicolaus Copernicus University, National Academy of Sciences of Armenia, Poland; ^{3}Technische Universität Wien, Austria

7062

Thulium Optical Lattice Clock with Zeeman-Insensitive Synthetic Clock Frequency

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Artem Golovizin, Dmitry Tregubov, Denis Mishin, Daniil Provorchenko, Elena Fedorova, Vadim Sorokin, Ksenia Khabarova, Nikolai Kolachevsky

P.N. Lebedev Physical Institute RAS, Russia

7083

Towards a Continuous Active Optical Atomic Clock with Cold Strontium Atoms

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Marcin Bober{1}, Sławomir Bilicki{1}, Anahit Gogyan{2}, Domagoj Kovačić{1}, Piotr Morzyński{1}, Mateusz Narożnik{1}, Ara Tonoyan{2}, Vijay Singh{1}, Marcin Witkowski{1}, Michał Zawada{1}

{1}Nicolaus Copernicus University, Poland; {2}Nicolaus Copernicus University, National Academy of Sciences of Armenia, Poland

7118

Towards blue-Detuned Lattice Optical Atomic Clock

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Marcin Witkowski{1}, Sławomir Bilicki{1}, Marcin Bober{1}, Domagoj Kovačić{1}, Vijay Singh{1}, Ara Tonoyan{2}, Michał

Zawada{1}

{1}Nicolaus Copernicus University, Poland; {2}Nicolaus Copernicus University, National Academy of Sciences of Armenia, Poland

7142

Towards Precision Isotope Shift Measurements in Highly Charged Ions

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Lukas Spieß{2}, Steven King{2}, Peter Micke{2}, Alexander Wilzewski{2}, Michael Rosner{1}, Tobias Leopold{2}, Erik Benkler{2}, José Crespo López-Urrutia{1}, Piet Schmidt{2}

{1}Max-Planck-Institut für Kernphysik, Germany; {2}Physikalisch-Technische Bundesanstalt, Germany

7143

Towards Space Deployable Laser Stabilisation Systems Based on 5 cm Vibration Insensitive Cubic Cavities

Live Session 1: 1b

12 July 2021 at 10:00 UTC

Live Session 2: 2a

13 July 2021 at 15:00 UTC

Robert Sütterlin{1}, Geoffrey Barwood{6}, Christoph Deutsch{2}, Paul Gaynor{6}, Domenico Gerardi{1}, Mher Ghulinyan{4}, Patrick Gill{6}, Christian Greve{1}, Rich J. Hendricks{6}, Ian R. Hill{6}, Silvio Koller{1}, Stefan Kundermann{3}, Roland Le Goff{7}, Steve Lecomte{3}, Christophe Meier{3}, Stéphane Schilt{5}, Christian Stenzel{1}, Kai Voss{8}, Anton Zhukovskiy{8}

{1}Airbus Defence & Space, Germany; {2}Crystalline Mirror Solutions, Austria; {3}CSEM SA, Switzerland; {4}Fondazione Bruno Kessler, Italy; {5}Laboratoire Temps-Fréquence, University of Neuchâtel, Switzerland; {6}National Physical Laboratory, United Kingdom; {7}Sodern, France; {8}SpaceTech, Germany

7130

Transient Frequency Effects in Cryogenic Silicon Cavities Employing Crystalline AlGaAs Coatings

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 2b

13 July 2021 at 17:00 UTC

Jialiang Yu^{3}, Thomas Legero^{3}, Fritz Riehle^{3}, Daniele Nicolodi^{3}, Kedar Dhruv^{2}, John M. Robinson^{2}, Eric Oelker^{4}, Jun Ye^{1}, Uwe Sterr^{3}

^{1}JILA, National Institute of Standards and Technology, University of Colorado Boulder, United States;

^{2}Joint Institute for Laboratory Astrophysics, University of Colorado Boulder, United States; ^{3}Physikalisch-Technische Bundesanstalt, Germany; ^{4}University of Glasgow, United Kingdom

7257

Updates on the Portable Yb Optical Lattice Clock: Towards Precision Timekeeping Outside the Lab

Live Session 1: 2b

13 July 2021 at 17:00 UTC

Live Session 2: 3a

14 July 2021 at 00:00 UTC

Wesley Brand^{2}, Robert J. Fasano^{2}, Yun-Jih Chen^{2}, Richard Fox^{1}, Andrew D. Ludlow^{2}

^{1}National Institute of Standards and Technology, United States; ^{2}National Institute of Standards and Technology, University of Colorado Boulder, United States

7027

Vibrational Noise Investigation in a Cryogenic ultra-Stable Laser System

Live Session 1: 1a

12 July 2021 at 8:00 UTC

Live Session 2: 3b

14 July 2021 at 2:00 UTC

Leilei He, Yanxia Ye, Yunlong Sun, Jingxuan Zhang, Zhiyuan Wang, Jialu Chang, Qiyue Wu, Zehuang Lu, Jie Zhang

Huazhong University of Science and Technology, China

Author Index

Abdel-Hafiz, Moustafa	37, 47, 51	Benkler, Erik	46, 47, 82
Abdolvand, Reza	10, 40, 55	Bennetts, Shayne.....	48
Abgrall, Michel	41, 66, 69	Bentley, Ester.....	39
Ablewski, Piotr	76	Berdasov, Oleg	78
Achi, Bachir	47	Bermbach, Rainer	43
Achkar, Joseph.....	42, 43, 66	Bernard, Jeanne	35
Ackermann, Thomas.....	72	Bernard, John	51
Aeikens, Elke.....	69	Bertrand, Bruno.....	36, 71
Affolderbach, Christoph	37, 59, 62	Bertrand, Matthieu	31
Aharon, Nati.....	49	Bhave, Sunil.....	30, 39, 54
Aikomo, Mayokun	44	Bhowmick, Sarbojeet	69
Akamatsu, Daisuke.....	50	Bidel, Yannick	25, 35
Akhkandi, Parvin.....	55	Biethahn, Maximilian	51
Aksenov, Mikhail.....	80	Bilicki, Sławomir	46, 76, 81, 82
Alcorta-Galván, Ricardo.....	31	Billebault, Jean-Charles	58, 70
Alighanbari, Soroosh	46	Blanchard, Cédric	35
Altmannova, Lada.....	69	Blinov, Igor	36, 44, 54, 64, 78
Álvarez- Martinez, Héctor	76	Bober, Marcín.....	46, 76, 81, 82
Álvarez-Martinez, Héctor	41, 49	Bodine, Martha I.....	47
Alves, Bruno	50	Bondza, Saskia	79
Alves, Xiamenez Rodrigues.....	76	Bongs, Kai	51, 80
Amy-Klein, Anne.....	9, 41, 42, 68, 69	Bonnin, Alexis	35
Anderson, Dana.....	3, 5, 19, 29	Bonvalot, Sylvain	35
Andrey, Eric.....	52	Borisenko, Alexander	80
Arar, Bassem.....	51	Bothwell, Tobias.....	47
Argence, Bérengère.....	69	Boudot, Rodolphe	8, 15, 37, 49
Arnold, Aidan S.....	37, 60	Bousquet, Marie.....	8, 32
Arnold, Kyle	49	Bouvier, Alexandre.....	17, 36, 61
Arterburn, Shawn.....	31	Boven, Paul	25
Ashford, Simon	44	Bowden, William	42, 74, 76, 80
Ashkhasi, Ali.....	44	Boyce, Kevin.....	47
Babson, Ian	33	Boyd, Christopher	39
Bagayev, Sergey Nagaev	36, 50	Brakhane, Stefan	51
Baili, Ghaya	35	Brand, Wesley.....	51, 83
Balakireva, Irina.....	64	Brasch, Victor.....	48
Balayev, Roman	78	Brazhnikov, Denis	36, 49
Barbiero, Matteo	77	Bregazzi, Alan.....	37
Barhate, Nayan.....	64	Bresson, Alexandre.....	35
Barrett, Murray Douglas.....	49	Brewer, Samuel M.....	47
Barron, Richard	51	Brimigion, Felicia.....	31
Barwood, Geoffrey.....	82	Bruckmeyer, Heiko.....	72
Basalaev, Maksim.....	50, 59	Bryce, Brian	35
Batori, Etienne	17, 37, 59, 62	Bühlmeyer, Jonas	72
Bauch, Andreas	25, 43, 71	Burrows, Kathryn	42, 44
Baudiquez, Antoine.....	17, 33, 56	Burt, Dave.....	37
Bawamia, Ahmad.....	51	Burt, Eric.....	5, 25, 36
Baynham, Charles F. A.....	76	Butt, Muhammad Ali.....	46
Beattie, Scott	38	Cabane, Hugues	52
Beaudoin, Gregoire.....	35	Cabodevila, Gonzalo.....	43
Beli Silva, Camila.....	48	Cadoret, Malo	35
Beloy, Kyle	47, 76	Cahill, James	48
Belyankin, Nikita	65	Cahoy, Kerri.....	42
Bender, Florian	40	Cahuzac, Nicolas	69

Calonico, Davide	11, 41, 42, 77
Calosso, Claudio Eligio	36, 45, 60, 61
Camparo, James	7, 61
Campbell, Joe.....	48, 76
Campbell, William	25, 36
Candelier, Vincent	58, 70
Cantin, Etienne	41, 66, 68, 69
Cantono, Mattia	42
Cao, Shiyang	61
Cao-Paz, Ana	65
Carlé, Clément.....	37
Carmona Cejas, José Manuel.....	54
Cassella, Cristian.....	25, 30, 39, 40, 53, 64
Castellan, Gaël.....	32
Celik, Mehmet.....	75
Chabé, Julien.....	36
Chan, Kevin	40
Chang, Jialu.....	76, 83
Chang, Pengyuan	75, 77
Chaouche-Ramdane, Amine.....	77
Chapellier, Paul	32
Chardonnet, Christian	66
Chen, Chun-Chia.....	44, 47
Chen, Dayong.....	59
Chen, Haijun.....	59
Chen, Hua	56
Chen, Jianping.....	42, 72
Chen, Jingbiao.....	35, 59, 60, 63, 74, 75, 76, 77
Chen, Jwo-Sy	47
Chen, Pengfei.....	35
Chen, Shuting.....	40
Chen, Weiliang	61, 63
Chen, Xuzong.....	62
Chen, Yun-Jhih.....	51, 83
Chen, Yuxuan.....	40
Chen, Zeji	52, 56
Chen, Zhangyuan	57, 58
Chen, Ziyang	71, 72
Chiglintsev, Emil	73
Cho, Jae Yoong.....	39
Choong, Gregory	48
Chua, Tzong Lin	17, 31, 53
Chung, Sang.....	36
Chupin, Baptiste	66, 71
Ciorny, Ondrej	42
Číp, Ondřej	48, 69, 78, 80
Ciuryło, Roman.....	46, 76
Cizek, Martin.....	48, 69, 78
Cladé, Pierre.....	69
Clark, Myles.....	42
Claussen, Neil	79
Clement, Marta	54
Clements, Ethan R.....	47
Clivati, Cecilia	3, 24, 25, 27, 41, 42, 77
Collado Gómez, Juan Carlos	54
Collingwood, Hannah.....	43, 44, 68
Colombo, Luca	30, 40, 53, 64

Conklin, John	25, 42
Constantin, Florin Lucian	46
Coogan, Danielle	42
Cordell, Will.....	33
Costanzo, Giovanni Antonio.....	44
Costas-Costas, Jacobo	65
Cotxet, Jeremie.....	35
Courde, Clément.....	36, 42
Crespo López-Urrutia, José	46, 82
Croënné, C.	31
Cui, Kaifeng	47
Curtis, Anne E.....	76
Dai, Shaoyang	61, 63
Dan, Lin	59
Darquié, Benoit	69
Darvishian, Ali.....	39
Davis, John	44, 68
Dawel, Fabian	49
de Clercq, Emeric	36, 37, 61
Defraigne, Pascale.....	7, 9, 36, 44, 69, 71
Degertekin, Levent.....	39, 65
Degiovanni, Ivo Pietro	41
Delaguillaumie, Fanny.....	32
Delehayé, Marion	47, 67
Delporte, Jerome	7, 11, 43
Delva, Pacôme.....	36
Demidov, Nikolai	38
DeMiguel-Ramos, Mario	54
Deng, Ke.....	49, 81
Deng, Zhuo	49, 81
Denis, Séverine.....	48, 50
Deniz, Yücel.....	61
Deroh, Moïse	66
Deschênes, Jean-Daniel	47
Despont, Michel	48
Desruelle, Bruno	69
Deutsch, Christoph	82
Dhruv, Kedar.....	50, 83
Diddams, Scott A.	47, 48, 49, 76
Didier, Alexandre	51
Dierikx, Erik.....	43, 67
Dietze, Kai	49
DiGregorio, Sara	31
Ding, Yudong	35, 60, 63
Dix-Matthews, Benjamin	42
Dolfi, Daniel	35
Dolgovskiy, Vladimir.....	59
Dominguez, Daniel.....	31
Donadello, Simone.....	41
Donchenko, Sergey.....	44
Dong, Ming	70
Dong, Shaowu	67
Dorge, Raoul.....	41
Dörscher, Sören.....	47, 74, 77
Droz, Fabien	37
Du, Yuanbo.....	62
Du, Zhijing.....	36, 56

Dubé, Pierre	9, 51	Gao, Xingyu	30, 39, 54
Dubey, Swadheen	48	Gardner, Christopher	35
Dubochet, Olivier	48	Garnier, Thomas	52
Du-Burck, Frédéric	77	Gattere, Gabriele	30, 39
Dubus, Bertrand	25, 31	Gaudron, Jacques-Olivier	42
Edreira, Irene-Barbeito	42	Gaynor, Paul	42, 82
Eglin, Belinda	44, 68	Ge, Jun	70
Eichenfield, Matt	31	Gedik, Adem	61
Elandoussi, Hadj	69	Gellesch, Markus	51
Elmazria, Omar	65	Genovese, Marco	41
Elvin, Rachel	60	Gerardi, Domenico	82
Ely, Todd	36	Gertsvolf, Marina	11, 38
Enyedi, Grégory	32	Ghadimi, Amir	48
Enzer, Daphna	36	Ghulinyan, Mher	82
Erdoğan, Cihangir	75	Gill, Patrick	82
Ertmer, Wolfgang	50	Giri, Gouri Shankar	46
Eustache, Étienne	31	Giribaldi, Gabriel	30, 53
Eyer, Guillaume	52	Glazov, Evgeniy	44
Faizan, Muhammad	57	Goavec-Merou, Gwenaël	43, 50, 67
Famà, Francesca	48	Godone, Aldo	36, 60
Fang, Bess	49	Godun, Rachel M.	76
Fang, Fang	8, 61, 63	Gogyan, Anahit	46, 81, 82
Fang, Jiawei	54	Goldner, Philippe	49
Fang, Shengwei	62	Golovizin, Artem	50, 80, 81
Fariña, Jose	65	Gong, Songbin	32
Fasano, Robert J.	47, 51, 76, 83	Gonzalez, Juan-Manuel	43
Fedorova, D.	78	Goryachev, Maxim	36, 37, 39, 63
Fedorova, Elena	50, 81	Gotoh, Tadahiro	42, 44
Feng, Jinjun	59	Gouloumet, Joseph	37
Feng, Philip	10, 40, 65	Gozzard, David	42
Feng, Xiaohua	40	Gozzelino, Michele	36, 44, 60
Feng, Zitong	41	Gravestock, Charles	42
Ferreira, Anthony	58	Grenfell, Peter	42
Ferrier, Alban	49	Greve, Christian	82
Fiasca, Franco	43, 70	Gribov, Artem	78
Filzinger, Melina	48, 81	Griffin, Paul F.	37, 59, 60
Fim, Dominika	50	Griffin, Samuel	38
Fischer, Georg	72	Grop, Serge	10, 37
Flower, Graeme	39	Groult, Lucas	47
Foot, Robert	44, 68	Gruet, Florian	37, 62
Formichella, Valerio	44, 70	Gruson, Yannick	25, 33
Forsberg, René	35	Guan, Hua	49
Fortágh, József	51	Guan, Xiaolei	59, 74, 76
Fortier, Tara M.	44, 47	Guellati-Khelifa, Saida	69
Foucalt, Yannick	50, 76	Guérandel, Stephane	35, 36, 61
Fox, Richard	51, 83	Gufflet, Nicolas	70
France, Danielle	33	Gunnison, Grant	42
Frangi, Attilio	25, 30, 39	Guo, Dong	67
Friedmann, Thomas	31	Guo, Hong	35, 60, 61, 63, 71, 72, 77
Friedt, Jean-Michel	3, 24, 27, 43, 67	Guo, Liming	38, 62
Friesen-Piepenbrink, Waldemar	50	Guo, Ping	59
Fujieda, Miho	9, 25, 42, 71	Guo, Wenge	79
Fundell, Kaitlin	61	Guo, Yunyi	62
Gabalda, Germinal	35	Gupta, Ayushi	64
Galland, Nicolas	49	Gurov, Mikhail	78
Galleani, Lorenzo	44	Gurova, E.	78
Gao, Kelin	49	Gusching, Anthony	49

Gutty, François	35	Hsu, Tzu-Hsuan	31
Hachisu, Hidekazu	44, 76	Hu, Huaxing	38, 62
Hackett, Lisa	25, 31	Hu, Liang	42, 72
Haesler, Jacques	37	Hu, Xuwen	36
Hakim, Faysal	17, 30, 53	Huang, Shu-Wei	25, 33
Halder, Matthäus	51	Huang, Xianhe	64
Hamid, Ramiz	61, 75	Huang, Yao	25, 49
Hammerer, Klemens	49	Hume, David B.	25, 47, 74
Han, Jize	38, 62	Hummon, Matthew	50
Han, Ruonan	37	Huntemann, Nils	47, 48, 51, 81
Hanado, Yuko	44	Hussein, Hussein	17, 40, 64
Hanhijärvi, Kalle	33	Hwang, Sang-Wook	42
Hankin, Aaron M.	47	Ichikawa, Ryuichi	42
Hansen, Michael	46	Ido, Tetsuya	11, 37, 42, 44, 68, 76
Hanson, John	42	less, Luciano	3, 5, 22, 28
Hao, Peng	49, 81	Iezekiel, Stavros	33
Hara, Kengo	52	Ignatovich, Stepan	36
Hara, Motoaki	37, 68	Ilday, Fatih Omer	75
Hara, Shinsuke	37	Ilieva, Riley	41, 42
Harakare, Aditya	64	Imbaud, Joël	52
Harden, Bradley	35	Inaba, Hajime	50
Hasanuzzaman, G.K.M.	33	Ito, Hiroyuki	37, 44
Hassan, Youssef S.	47, 76	Ivanov, Eugene	36, 37, 63
Hati, Archita	10, 33, 57	Jain, Manan	51
Havlis, Ondrej	69	Jaldehyag, Kenneth	43
Hayes, John	41	Janicot, Sylvie	35
He, Guohong	39	Jankovic, Petar	43
He, Leilei	18, 76, 83	Janssen, Christof	69
He, Xuan	62	Jaroszewski, Konrad	46
Heavner, Tom	35	Javadi, Hamid	37
Hees, Aurélien	36	Jedlicka, Petr	78
Heine, Kai	43	Jensen, Tim Enzlberger	35
Henchiri, Hamdi	58, 70	Jha, Nandan	50
Hendricks, Rich J.	44, 74, 82	Ji, Jingxian	66
Hendrie, James	49	Jian, Bin	38, 51
Herbers, Sofia	75, 77	Jiang, Boyang	17, 30, 39, 54
Herr, Tobias	48	Jiang, Haifeng	11, 79
Herrera Soukup, Bernard	30, 53	Jiao, Wenhai	70
Hilico, Laurent	69	Jin, Naijun	49
Hill, Ian R.	42, 74, 76, 80, 82	Jin, Yaqiu	55
Hisai, Yusuke	50	Johanning, Michael	51
Hladky-Hennion, Anne-Christine	31	Johnson, Ward	33
Hoang, Thai	36	Jones, Douglas	44
Hobson, Richard	42, 74, 76, 80	Jones, Jonathan	51
Holleville, David	35	Jördens, Robert	51
Holzwarth, Ronald	5, 7, 9, 51	Josse, Fabien	40
Hong, Feng-Lei	50	Joulie, Alice	32
Hori, Masaki	3, 5, 21, 28	Kadota, Michio	31, 53
Horvath, Tomas	69	Kaenders, Wilhelm	51
Hosaka, Kazumoto	50	Kaewuam, Rattakorn	49
Hosek, Martin	48	Kamalov, Valey	42
Hošek, Martin	80	Kammerer, William	42
Howard, Lewis	42	Kang, Songbai	74
Hrabina, Jan	48, 69, 80	Kanj, Amale	43
Hsieh, Wan-Lin	33	Kanno, Atsushi	25, 33
Hsu, Chuan-Lun	32	Kant, Przemyslaw	43
Hsu, Erh-Shuo	33	Kao, Sheng-Hsiang	33

Karlen, Sylvain.....	37
Karlewski, Florian	51
Karpathakis, Skevos	42
Kasamatsu, Akifumi	37
Kasevich, Mark	25, 35
Kassi, Samir	41
Kato, Kosuke	51
Katori, Hidetoshi	25, 46
Kazakov, Georgy	48, 81
Kedar, Dhruv	47, 79
Kelleher, Megan	49
Kennedy, Colin J.	47
Kersalé, Yann	50
Khabarova, Ksenia	25, 50, 73, 80, 81
Khader, Isaac	47
Khatirev, Nikolay.....	64
Khatun, Akila	40
Khatyrev, Nickolay	54
Kienle, Florian.....	51
Kim, May E.	47
Kim, Minah	37
King, Steven	46, 82
Kitching, John	10, 35, 37, 50
Klimcak, Charles.....	61
Kobayashi, Takumi	50
Koepke, Amanda	47
Koke, Sebastian	46, 66, 68
Kolachevsky, Nikolai	50, 73, 80, 81
Koller, Silvio.....	82
Kon, Shelley	33
Kondratiev, Nikita.....	54
Korobov, Vladimir	46
Korth, Haje	35
Kortunov, Ivan	46
Kostin, Alex.....	78
Kovach, Alexander.....	70
Kovačić, Domagoj.....	46, 81, 82
Kovalenko, Dmitriy.....	59
Kramer, Johannes	49
Krawinkel, Thomas	71
Krinner, Ludwig.....	49
Kroker, Stefanie	79
Kronjäger, Jochen.....	41, 46
Krutzik, Markus	51
Kryuchkov, Denis.....	73, 80
Kuang, Da	36
Küçük, Seniz.....	31
Kudeyarov, Konstantin.....	73, 80
Kudriashov, Volodymyr	43
Kuhl, Alexander	68
Kumagai, Motohiro.....	8, 71
Kumar, Ullas	70
Kundermann, Stefan.....	82
Kundrat, Jan	69
Kvashnin, Nikolay	36
Lacroûte, Clément	47, 50, 67
Lai, Szu Cheng	40

Laier English, Elizabeth.....	44
Lang, Guilain.....	32
Lange, Richard.....	47, 48, 81
Langer, Martin.....	43
Langham, Conway	44, 68
Lantz, Éric.....	33, 56
Laroche, Thierry.....	31
Lauprêtre, Thomas.....	47
Lavenus, Pierre.....	32
Lazar, Josef	69, 78, 80
Le Coq, Yann	49
Le Goff, Roland.....	82
Le Targat, Rodolphe	41, 46, 49, 50, 66, 69, 76
Le Traon, Olivier	32
Le, Thanh.....	36
Lecomte, Steve	37, 48, 82
Lee, Dahyeon.....	18, 48, 49, 76
Legero, Thomas.....	50, 79, 83
Lehtonen, Tapio	43
Lei, Peng.....	57, 58
Leibbrandt, David R.	47, 74
Lemmon, Andrew	38
Leo, Jacopo	48
Leopardi, Holly	47
Leopold, Tobias	46, 79, 82
Lequentrec-Lalancette, Marie-Francoise	35
Lessing, Maurice.....	51
Lesundak, Adam	78
Levi, Filippo.....	36, 41, 42, 44, 60, 70, 77
Levy, Raphaël.....	8, 32
Lewis, Ben	34, 59, 60
Lewis, Rebecca.....	44
Li, Bowen	33
Li, Dou	74
Li, Guoyong	56
Li, Hui	62
Li, Jinchao.....	52
Li, Jing	31, 53
Li, Ke	40, 56
Li, Ming-Huang.....	8, 31
Li, Mingkun	79
Li, Shangyang.....	55
Li, Tianchu	61, 63
Li, Tongcang	30, 39, 54
Li, Zhaolong	79
Li, Zongyang	40
Lia, Enrico.....	43
Liang, Yachun	31, 53
Liffredo, Marco	57
Lin, Chuanfu	35
Lipphardt, Burghard	47, 48, 81
Lisdat, Christian	47, 74, 75, 77, 79
Liu, Hongli.....	49, 62, 81
Liu, Ke.....	56
Liu, Kui.....	40
Liu, Kun.....	61, 63
Liu, Meng.....	35

Liu, Mingming	62	Mensah-Brown, Arnold.....	40
Liu, Tao	36	Menyuk, Curtis	48
Liu, Tianyu	59	Merkulov, Andrey	65
Liu, Wenli	52	Meschede, Dieter	51
Liu, Xiyu	61	Mesenzova, Ludmila	36
Liu, Yanyan.....	36, 56	Meyer, Dylan.....	38
Lobo, Leon	44	Meyer, Francois	43
Lodewyck, Jérôme.....	46, 50, 76	Meynadier, Frédéric	42
Loiseaux, Brigitte	31	Miao, Jianxiang	74, 75, 76
Loncar, Marko.....	25, 48	Miao, Shengnan.....	38, 62
Lopez, Olivier.....	41, 42, 66, 69	Micalizio, Salvatore	8, 36, 60
Lozzi, Andrea.....	57	Michalski, Jerzy.....	43
Lu, Liangjun	42	Michetti, Giuseppe	30, 53
Lu, Ruochen	25, 32	Micke, Peter	46, 82
Lu, Zehuang	40, 49, 62, 76, 81, 83	Miles, John.....	33
Lucamarini, Marco	41	Mileti, Gaetano.....	8, 37, 59, 62
Lucas, Sylvain	35	Miller, Michael.....	31
Lucas-Leclin, Gaelle	35	Millo, Jacques	50, 67
Lucic, Nemanja.....	49	Milner, William R.	47, 79
Ludlow, Andrew D.....	44, 47, 51, 76, 83	Milton, James.....	71
Lugo Hernández, Eduardo.....	54	Mirea, Teona.....	8, 54
Lugo, Jose	32	Mishagin, Konstantin.....	70
Luo, Yizhi.....	49	Mishin, Denis	50, 81
Ma, Zhiyu.....	49, 81	Miyahara, Itaru	53
Maeder-Pachurka, Catherine.....	32	Mo, Dicheng.....	30
Mahmood, Tanvir.....	48	Moreno, Manuel	54
Malimon, Alex	78	Moreno, William	50, 76
Manamanni, Karim.....	77	Morvan, Loic	35
Manandhar, Shilpa.....	70	Morzyński, Piotr	46, 76, 82
Marais, Louis	72	Mukherjee, Shambo	50
Marechal, Baptiste	50	Mulholland, Sean	42
Margolis, Helen S.	44, 74, 76	Muñoz Rodriguez, Rodolfo.....	46
Marra, Giuseppe	11, 41, 42	Mura, Alberto	41, 42
Martinez, Gabriela	37	Murata, Kenchiro.....	53
Martinez, Victor.....	49	Murphy, David.....	36
Martin-Neira, Manuel	43	Nagourney, Tal	39
Mason, David.....	49	Najafi, Khalil	25, 39
Mateu, Jordi.....	54	Nakamura, Takuma.....	48, 76
Matsakis, Demetrios	66	Narang, Sanjoli	17, 39, 64
Matsuo, Kiyoharu.....	53	Nardelli, Nick V.	44, 47
Matusko, Martina	18, 67	Narożnik, Mateusz	46, 82
Mayer, David	42	Nelson, Craig	7, 10, 33, 57
Mbardi, Abdessamad	69	Nemitz, Nils.....	11, 25, 44, 76
McAllister, Ben.....	36, 37, 39, 63	Newbury, Nathan R.....	47
McFerran, John	11, 46, 77	Nez, François.....	69
McGilligan, James	37	Nguyen, Anh	42
McGrew, William F.....	44, 47, 51, 76	Nicolodi, Daniele	47, 50, 76, 79, 83
McKelvy, James	37	Nie, Mingming.....	33
McLemore, Charles	49	Nießner, Anton.....	69
Meda, Alice.....	41	Niyaz, Fathima	35
Mehlstäubler, Tanja	9, 25, 47, 48, 51, 81	Noretz, Igor	44
Meier, Christophe	82	Nosske, Ingo.....	77
Meng, Hongling	59	Numkam Fokoua, Eric.....	41
Meng, Yu Song.....	70	Obrzud, Ewelina.....	48
Meng, Zhen	56	Oelker, Eric	47, 50, 79, 83
Mengue, Prince	65	Ohtsuka, Takahiro.....	53
Ménoret, Vincent	41, 69	Olesen, Arne Vestergaard.....	35

Olivares, Jimena	54	Qin, Haoran	38, 62
Ono, Takahito	37	Qin, Weijin	66
Opondo, Noah	30, 39, 54	Quinlan, Franklyn	48, 49, 76
Overstolz, Thomas	37	Quintin, Nicolas	41
Owen, Huw	44	Rabault, Martin	41, 69
Owings, Bryan	38	Rabus, David	43
Palchikov, Vitaly G.	36, 44	Rahm, Johannes	47
Pan, Duo	59, 74, 75, 77	Rakich, Peter	49
Pan, Wei	64	Ramchurn, Preetam	80
Pan, Xiaoyan	35	Rao, Bingjie	79
Panfilo, Gianna	44, 71	Rasel, Ernst	50
Pang, Xiangnan	31	Rassay, Sushant	30
Pantzas, Konstantinos	35	Reinhardt, Alexandre	32
Parekhin, Danil	36	Rentz, Nikki	33
Parker, Thomas E.	47	Řeřucha, Šimon	48, 78, 80
Parsons, Adam	44	Retzker, Alex	49
Passilly, Nicolas	37, 49	Richardson, David	41
Pate, Jacob	50	Richmond, Adam	44
Paterson, Jake W.	74, 76	Riedel, Franziska	42, 66, 71
Pavlov, Vladislav	54	Riehle, Fritz	50, 79, 83
Peake, Greg	31	Riis, Erling	37, 59, 60
Pei, Shenghai	53	Rinaldi, Matteo	8, 30, 53
Pei, Yuxian	35	Risaro, Matias	77
Peik, Ekkehard	11, 14, 47, 48, 51, 81	Ritz, Tyler	42
Pellaton, Matthieu	37, 59, 62	Robertson, B. I.	76
Pelyushenko, Artem	70	Robinson, John M.	47, 50, 79, 83
Pelzer, Lennart	49	Robison, David	36
Peng, Huanfa	57, 58	Rodriguez-Pardo, Loreto	65
Peng, Xiang	35, 60, 61, 63	Romanini, Daniele	41
Perreau, Pierre	32	Romisch, Stefania	47
Perrot, Hubert	65	Roncin, Vincent	77
Perucca, Andrea	43, 70	Rose, Daniel	65
Peters, Achim	51	Rosner, Michael	82
Petersen, Michael	37, 49	Roth, Alexander	33
Petit, Gérard	42, 44	Rouillé, Christian	69
Peverell, Adam	44	Rouxel, Didier	35
Pham, Tuan Minh	78	Rovera, Giovanni Daniele	42, 66
Phelps, Justin	40	Rozanov, Sergey	78
Picchedda, Delphine	52	Roztocil, Jaroslav	69
Pinat, Elisa	44, 69, 71	Rubiola, Enrico	3, 8, 24, 27, 33, 56
Pirro, Michele	17, 30, 53	Rullo, Federica	77
Pittaluga, Mirko	41	Rus, Adrian	33
Plessky, Victor	31	Ryger, Ivan	49
Pluteshko, Andrey	56	Sagnes, Isabelle	35
Poletti, Francesco	41	Şahin, Ersoy	60, 61
Polyakov, Victor	38	Sahni, Mohamed	77
Pomponio, Marco	17, 33, 57	Sakr, Hesham	41
Pottie, Paul-Éric	41, 42, 46, 66, 68, 69	Salaun, Corinne	35
Pravdova, Lenka	69	Samokhvalov, Yury	36
Pravdová, Lenka	80	Sattari, Hamed	48
Premper, Jörg	69	Sauer, Steffen	50
Prestage, John	36	Savencu, Adrian	43
Priscal, Cedric	42	Schaeffer, Stefan A.	47
Pronebner, Thomas	69	Schäffer, Stefan Alaric	48
Provorchenko, Daniil	50, 81	Schediwy, Sascha	42
Prudnikov, Oleg	50	Schelfhout, Jesse	18, 46, 77
Qi, Xianghui	62	Schiller, Stephan	46

Schilt, Stéphane	82	Steinel, Martin	18, 48, 81
Schioppo, Marco	42, 74, 76, 80	Stelmashenko, Yevgeniya	78
Schmidt, Piet	46, 49, 51, 82	Stenzel, Christian	82
Schön, Steffen	71	Sterr, Uwe	9, 15, 47, 50, 75, 79, 83
Schori, Christian	37	Steshchenko, Tatiana	18, 77
Schreck, Florian	48	Sthal, Fabrice	7, 52
Schultz, Justin	79	Storey, Matthew	31
Schumm, Thorsten	69	Stuhler, Jürgen	51
Schwarz, Roman	47, 74, 77	Stupl, Jan	42
Schwindt, Peter	10, 79	Su, Hang	66
Segovia-Fernandez, Jeronimo	10, 57	Su, Yuanyan	37, 62
Seidelin, Signe	49	Sui, Wen	17, 40, 65
Semenko, Anastasia	78	Sun, Chenxi	35
Semerikov, Ilya	80	Sun, Qiushuo	51
Şenel, Çağrı	61, 75	Sun, Yunlong	83
Seoane, Lucia	35	Sundararajan, Annora	44
Serra, Paul	42	Surappa, Sushruta	17, 39, 65
Sesia, Ilaria	9, 42, 44, 70	Sütterlin, Robert	82
Seubert, Jill	36	Swann, William C.	47
Shao, Hu	48, 81	Sykes, Patrick	48
Shemar, Setnam	44	Szymaniec, Krzysztof	44, 74
Sheremet, Alexandra	36	Tabrizian, Roozbeh	30, 53
Sherman, Jeffrey A.	25, 44, 47	Tabuchi, Ryo	42
Sherstov, Ivan	80	Taichenachev, Aleksey V.	36, 50, 59
Shi, Hangbo	75	Takamoto, Masao	46
Shi, Tiantian	74, 75, 76	Tallur, Siddharth	39, 64
Shi, Wenxin	38, 62	Tamm, Christian	47, 48, 51, 81
Shiari, Behrooz	39	Tanabe, Takehiko	50
Shields, Andrew	41	Tanaka, Shuji	31, 53
Shrivastava, Aayush	64	Tang, Liyan	74
Shuai, Tao	35	Tao, Molei	39, 65
Shvetsov, Alexander	65	Tarallo, Marco	77
Sibold, Dieter	43	Tauke-Pedretti, Anna	31
Sidorov, Pavel	80	Teichel, Kristof	43
Siebeneich, Hendrik	51	Tessier, Sarah	31
Siegel, Jacob	44, 47	Thai, Tung Thanh	42, 44, 70
Signorile, Giovanna	44, 70	Tharpe, Troy	30, 53
Silva, André	76	Thomson, Catriona	17, 37, 63
Sinclair, Laura C.	47	Thorax, Didier	58, 70
Singh, Alok	51	Timofeev, Yuri	38
Singh, Sajal	39	Tisserand, Laurent	42
Singh, Vijay	46, 51, 81, 82	Tjoelker, Robert	10, 24, 36
Singh, Yeshpal	51, 80	Tobar, Michael	10, 36, 37, 39, 63
Skrivervik, Anja	37, 62	Toda, Masaya	37
Skvortsov, Mikhail	36	Tofful, Alexandra	76
Slapak, Martin	69	Tomio, Hannah	42
Slavík, Radan	41	Tønnes, Mads	41, 66, 68
Slodicka, Lukas	78	Tonoyan, Ara	46, 81, 82
Slyusarev, Sergey	78	Tranchart, Leo	67
Smirnov, Yury	44	Tregubov, Dmitry	50, 81
Smotlacha, Vladimir	67, 69	Trofimowicz, Damian	43
Sonderhouse, Lindsay	47	Tseng, Kuan-Ju	31
Song, Huijie	67	Tseng, Wen-Hung	42, 67
Sorokin, Vadim	50, 81	Tuckey, Philip	43
Spethmann, Nicolas	49	Tunesi, Jacob	74
Spieß, Lukas	46, 82	Uhrich, Pierre	42, 43, 66, 71
Staron, Alexander	79	Underhill, Michael	8, 57

Ushijima, Ichiro	46	Wilzewski, Alexander	46, 82
Vacheret, Xavier	52	Witkowski, Marcin	46, 81, 82
Valencia, Jose	18, 47, 74	Wolf, Peter	36
van Veghel, Marijn	67	Woo, Jong-Kwan	39
Varghese, Andrews	64	Wouters, Michael	68, 72
Vasil'ev, Vadim	36	Wright, Michael	60
Vasseur, Jérôme	31	Wu, Fangfei	74
Velc, Radek	69	Wu, Guiling	42, 72
Vernotte, François	8, 33, 56	Wu, Qiyue	76, 83
Vianello, Alvisé	18, 74, 76, 80	Wu, Shuxian	55
Villanueva, Luis Guillermo	31, 32, 57	Wu, Song	31, 53
Vincent, Brian	68	Wu, Teng	35, 60, 61, 63, 71, 72
Violetti, Maddalena	37, 62	Wu, Wenjun	67
Virzi, Salvatore	41	Wu, Yulong	60
Vishnyakov, Victor	36	Wu, Zonglin	55
Vishnyakova, Gulnara	73, 80	Wunderlich, Christof	51
Vishwakarma, Chetan	77	Xia, Juan	53
Vittrant, Frédéric	58, 70	Xiao, Fei	31, 53
Vogt, Enrico	51	Xiao, Qingwen	70
Vohnout, Rudolf	69	Xiao, Wei	35, 60, 61
Vojtech, Josef	67, 69	Xie, Kunfeng	72
Voss, Kai	82	Xie, Xiaopeng	57, 58
Votava, Ondrej	41	Xie, Yan	43, 67
Voumard, Thibault	48	Xie, Yijun	33
Vyshnyakov, Pavel	80	Xie, Yonghui	35
Wada, Masato	50	Xin, Nongchao	38, 62
Walby, Samuel	44	Xu, Bo	31, 53
Wallin, Anders	33, 43	Xu, Dan	41, 42
Walls, Fred	25, 33	Xu, Hao	59, 79
Wang, Fei	31	Yan, Lulu	79
Wang, He	60	Yan, Yuepeng	56
Wang, Jianxing	59	Yan, Yufei	59
Wang, Jing	52	Yandrapalli, Soumya	31, 32
Wang, Kemu	36, 56	Yang, Fuhua	52
Wang, Lijun	38, 62	Yang, Honglei	70
Wang, Min-Ho	33	Yang, Jinling	52
Wang, Qing	62	Yang, Rui	31, 54
Wang, Rabi	36	Yang, Sung-Hoon	42
Wang, Wen-Cheng	33	Yang, Wenzhe	70
Wang, Xiang	67	Yang, Xian	62
Wang, Zenghui	25, 30, 31, 39, 53, 54	Yang, Xiguang	79
Wang, Zhiyuan	49, 76, 81, 83	Yang, Xuhai	66
Watanabe, Yasuaki	52	Yano, Yuichiro	37, 68
Waterholter, Thomas	68	Yao, Jian	44
Wcislo, Piotr	46, 76	Yao, Kui	25, 40
Wei, Wenzhe	18, 49, 76, 81	Yasuda, Masami	9, 50
Weinstein, Dana	31	Ye, Jun	50, 79, 83
Weiss, Marc	45	Ye, Yanxia	76, 83
Wen, Ting	31, 53	Yen, Alec	37
Weyers, Stefan	8, 47	Yen, Ernest Ting-Ta	57
Whale, Josh	44	Yi, Lin	36, 37
Whibberley, Peter	9, 44, 68, 74	Yong, Yook-Kong	31
Wicht, Andreas	51	Yousuf, S M Enamul Hoque	40, 65
Wildi, Thibault	48	Yu, Dongrui	18, 71, 72
Wilkinson, Steven	45	Yu, Jialiang	50, 51, 79, 83
Williams, Robert	72	Yu, Nan	36
Wilson, Andrew	44	Yu, Yao	57

Yu, Zhijian	17, 36, 56
Yuan, Quan	52, 56
Yuan, Wenhao	49, 81
Yuan, Zhichao	62
Yuan, Zhiliang	41
Yudin, Valeriy	36, 50, 59
Yun, Peter	36, 61
Yzombard, Pauline	69
Zahzam, Nassim	35
Zalivako, Ilia	80
Zang, Jizhao	48, 76
Zanon, Thomas	50, 69
Zanon-Willette, Thomas	50
Zarei, Mehrdad	46
Zawada, Michał	46, 76, 81, 82
Zega, Valentina	8, 30, 39
Zhadnov, Nikita	73, 80
Zhang, Haobo	40
Zhang, Jia	74
Zhang, Jianwei	38, 62
Zhang, Jie	40, 49, 76, 81, 83
Zhang, Jingxuan	76, 83
Zhang, Pan	79
Zhang, Pengcheng	31, 54
Zhang, Rui	35, 63
Zhang, Shengkang	70
Zhang, Shengnan	80
Zhang, Shougang	36, 56, 79
Zhang, Shuo	49
Zhang, Wei	37
Zhang, X.	47

Zhang, Xi	41
Zhang, Xiangzhi	60
Zhang, Xiaogang	44, 47, 76
Zhang, Yanyan	79
Zhang, Yufei	71, 72
Zhang, Zhe	66
Zhang, Zhiqiang	49
Zhao, Huan	70
Zhao, Jianye	59, 79
Zhao, Tian	76
Zhao, Wenyu	79
Zhao, Xuanyi	30, 53
Zhao, Yang	35
Zheng, Fasong	17, 61
Zheng, Junhe	60, 63
Zheng, Xu-Qian	40, 65
Zhgoon, Sergei	65
Zhou, Linjie	42
Zhou, Sheng	48
Zhou, Weimin	48
Zhu, Jiankai	31, 53
Zhu, William	30, 53
Zhu, Yinfang	52
Zhuang, Wei	74
Zhukov, Anton	82
Zipfel, Klaus	50
Zjawin, Beata	46, 76
Zou, Jie	55
Zufall, Adam	42
Zuo, Faxing	18, 72