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# **2008 CONFERENCE ON PRECISION ELECTROMAGNETIC MEASUREMENTS DIGEST**

Broomfield, Colorado U.S.A  
8-13 June 2008



# CPEM 2008 Technical Sessions

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Monday, 9 June 2008

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Speaker Breakfast	7:30 – 8:30
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Opening Session	9:00 – 9:30
Keynote Address: <b>Eric Cornell</b> NIST Quantum Physics Division-Nobel Laureate, NIST Fellow <i>“How symmetric is the electron? Looking for out-of-roundness of <math>10^{-14}</math> femtometers”</i>	9:30 – 10:30
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<b>Break: Coffee</b>	10:30 – 11:15
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Plenary 1: <b>Don Sullivan</b> Former Chief (retired), NIST Time and Frequency Division <i>“History of Time and Frequency in Boulder”</i>	11:15 – 12:00
Plenary 2: <b>Dave Wineland</b> NIST Time and Frequency Division, NIST Fellow <i>“Laser cooling and better clocks”</i>	12:00 – 12:30
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<b>MA-1: Fundamental Constants, Chair: Peter Mohr</b>	14:00 - 16:00

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<b>2. MEASURING THE GRAVITATIONAL CONSTANT WITH A CRYOGENIC TORSION PENDULUM</b> M.K. Bantel, E.C. Berg, W.D. Cross, and R.D. Newman Department of Physics and Astronomy, University of California at Irvine, Irvine, CA, USA	<b>4</b>
<b>3. THE BIPM G EXPERIMENT – FINAL RESULTS</b> T. J. Quinn <sup>1</sup> , H.V. Parks <sup>2</sup> , C.C. Speake <sup>3</sup> , R.S. Davis <sup>1</sup> 1. BIPM, Pavillon de Breteuil, France 2. Sandia National Laboratories, Albuquerque, NM, USA 3. School of Physics and Astronomy, University of Birmingham, Edgbaston, Birmingham, UK	<b>6</b>
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 1. Service de Physique de l'Etat Condensé, CEA Saclay, Gif-sur-Yvette, France  
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 1. Physikalisch-Technische Bundesanstalt, Braunschweig, Germany  
 2. University of Regensburg, Institute of Applied and Experimental Physics II, Regensburg, Germany
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 1. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba Central 3-1, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 2. Research Institute of Instrumentation Frontier, National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba C.entral 2-13, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 3. Nanoelectronics Research Institute, National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba Central 2-10, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 4. Faculty of Engineering, Musashi Institute of Technology 1-28-1, Tamazutsumi, Setagaya-ku, Tokyo, Japan
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 F. Schopfer and W. Poirier  
 Laboratoire National de Métrologie et d'Essais 29, avenue Roger Hennequin, Trappes, France

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 1. National Measurement Institute Australia (NMI) Bradfield Road, Lindfield, Australia  
 2. Physikalisch-Technische Bundesanstalt (PTB) Bundesallee, Braunschweig, Germany  
 3. Bundesamt für Eich- und Vermessungswesen (BEV) Arltgasse, Wien, Austria  
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**Break: Coffee**

*16:00 – 16:30*

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**MA-2: Fundamental Constants, Chair: Barry Wood**

*16:30 – 18:00*

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| 3. | <b>PRECISION SPECTROSCOPY OF ATOMIC HYDROGEN FOR AN IMPROVED RYDBERG CONSTANT DETERMINATION</b><br>J. L. Flowers <sup>1</sup> , P. E. G. Baird <sup>2</sup> , H. A. Klein <sup>1</sup> , C. D. Langham <sup>1</sup> , H. S. Margolis <sup>1</sup> , and B. R. Walton <sup>1</sup><br>1. National Physical Laboratory - Hampton Road, Teddington, Middlesex TW11 0LW, United Kingdom<br>2. Clarendon Laboratory, University of Oxford Parks Road, Oxford, United Kingdom  | 40 |
| 4. | <b>THE 2006 ADJUSTMENT OF THE FUNDAMENTAL CONSTANTS: LOOKING TOWARDS 2010</b><br>D. B. Newell, P. J. Mohr, and B. N. Taylor<br>National Institute of Standards and Technology, Gaithersburg, MD, USA   | 42 |

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**MB-2: Voltage, Chair: Ilya Budovsky**

*16:30 – 17:50*

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**MC-2: Time and Frequency, Chair: Alan Madej**

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| <p><b>3. DEVELOPMENT OF A LIGHT SOURCE WITH A SUB-HERTZ LINEWIDTH FOR AN Yb OPTICAL LATTICE CLOCK</b><br/> K. Hosaka<sup>2</sup>, M. Yasuda<sup>1,2</sup>, H. Inaba<sup>1,2</sup>, T. Kohno<sup>2</sup>, A. Onae<sup>1</sup>, and F.-L. Hong<sup>1,2</sup><br/> 1. NMIJ, AIST Tsukuba Central 3, Umezono, Tsukuba, Japan<br/> 2. CREST, JST, 4-1-8 Honcho Kawaguchi, Saitama, Japan</p>   | <p><b>56</b></p> |
| <p><b>4. THERMAL-NOISE-LIMITED OPTICAL CAVITY</b><br/> S.A. Webster<sup>1</sup>, S. Pugla<sup>2</sup>, J. Millo<sup>3</sup>, M. Oxborrow<sup>1</sup> and P. Gill<sup>1</sup><br/> 1. National Physical Laboratory, Hampton Road, Teddington, Middlesex TW11 0LW, UK<br/> 2. Blackett Laboratory, Imperial College London, South Kensington Campus, London SW7 2BZ, UK<br/> 3. SYRTE, Observatoire de Paris, 61, Avenue de l'Observatoire, Paris, France</p> | <p><b>58</b></p> |

# CPEM 2008 Technical Sessions

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Tuesday, 10 June 2008

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Speaker Breakfast 7:30 – 8:30

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**TuA-1: Time and Frequency, Chair: Andreas Bauch** **8:30 – 9:50**

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NIST – Time and Frequency Division, Broadway Boulder, CO
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1. SYRTE, Observatoire de Paris, 61 av. de l'observatoire 75014 PARIS, France  
2. Physics Dept, Friburg University, Friburg, Switzerland
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Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
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National Physical Laboratory Hampton Road, Teddington, Middlesex, UK
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**TuB-1: Voltage, Chair: Mark Keller** **8:30 – 9:50**

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1-National Institute of Standards and Technology, Boulder, CO, USA  
2-National Institute of Standards and Technology, Gaithersburg, MD, USA
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National Institute of Standards and Technology, Boulder, CO, USA
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B. Jeanneret<sup>1</sup>, F. Overney<sup>1</sup>, L. Callegaro<sup>2</sup>, A. Mortara<sup>1</sup>  
1. Federal Office of Metrology METAS, Lindenweg 50, 3003 Bern-Wabern, Switzerland  
2. Istituto Nazionale di Ricerca Metrologica INRIM, Strada delle Cacce 91, 10135 Torino, Italy

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 1. National Physical Laboratory, Hampton Road, Teddington, United Kingdom  
 2. Metron Designs, The Old Rectory, Alderford, Norwich, United Kingdom
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 1. Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig, Germany  
 2. National Metrology Centre, A\*STAR, 1 Science Park Drive, Singapore 118221, Republic of Singapore  
 3. D. I. Mendeleyev Institute for Metrology, Moskovsky pr. 19, 190005, St. Petersburg, Russia

**TuC-1: Power, Chair: Eddy So**

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 1. Korea Research Institute of Standards and Science Yuseong, Daejeon, Republic of Korea  
 2. National Research Council of Canada Ottawa, Ontario, K1A 0R6, Canada
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 K. Takahashi, K. Yagi  
 Japan Electric Meters Inspection Corporation (JEMIC), 15-7, Shibaura 4-Chome, Minato-ku, Tokyo, JAPAN

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**10:00 – 10:30**

**TuA-2: Time and Frequency, Chair: Feng-Lei Hong**

**10:30 – 12:30**

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 National Institute of Standards and Technology and University of Colorado Department of Physics, University of Colorado, Boulder, CO, USA

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 1. Frequency and Time Group, Institute for National Measurement Standards, National Research Council of Canada Montreal Rd. Ottawa, Ontario, Canada  
 2. Department of Physics and Astronomy, University of British Columbia, Vancouver, British Columbia, Canada
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 1. Institut fuer Experimentalphysik, Universitaet Innsbruck, Austria  
 2. Institut fuer Quantenoptik und Quanteninformation, Oestereichische Akademie der Wissenschaften, Austria  
 3. LNE-SYRTE, Observatoire de Paris, France
5. **PRECISION FREQUENCY MEASUREMENT OF THE <sup>2</sup>S<sub>1/2</sub> – <sup>2</sup>F<sub>7/2</sub> ELECTRIC OCTUPOLE TRANSITION IN A SINGLE <sup>171</sup>Yb<sup>+</sup> ION (INVITED)** 96  
 S. A. Webster<sup>1</sup>, K. Hosaka<sup>2</sup>, B. R. Walton<sup>1</sup>, H. S. Margolis<sup>1</sup> and P. Gill<sup>1</sup>  
 1. National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW, UK  
 2. National Metrology Institute of Japan, Tsukuba Central 3, Umezono 1-1-1, Tsukuba 305-8563, Japan

**TuB-2: Voltage, Chair: Ralf Behr**

**10:30 - 12:20**

1. **A SURVEY OF JOSEPHSON COMPARISONS (INVITED)** 98  
 B. M. Wood<sup>1</sup>, S. Solve<sup>2</sup>  
 1. National Research Council (NRC), Ottawa, ON K1A 06R, Canada  
 2. Bureau International des Poids et Mesures (BIPM), Pavillon de Breteuil, F-92312 Sèvres Cedex, France
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 NMi Van Swinden Laboratorium, AR Delft, The Netherlands
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 1. National Institute of Standards and Technology, Boulder, CO 80305, USA  
 2. College of Engineering and Applied Science, University of Colorado, Boulder, CO 80305, USA
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 A. M. Klushin<sup>1</sup>, M. He<sup>1,2</sup>, and A. S. Katkov<sup>3</sup>  
 1. Institute of Bio- and Nanosystems and CNI-Centre of Nanoelectronic Systems for Information Technology, Forschungszentrum Jülich GmbH, Germany  
 2. Dept. of Electronics, Nankai Univ., Tianjin, P. R. China  
 3. Mendeleev Institute for Metrology, Moskovsky pr. 19, 190005 St. Petersburg, Russia
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 Istituto Nazionale di Ricerca Metrologica Strada delle Cacce, Torino Italy

**TuC-2: Impedance, Chair: Yicheng Wang**

**10:30 – 12:20**

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 J. Schurr<sup>1</sup>, V. Bürkel<sup>1</sup>, and B. P. Kibble<sup>2</sup>  
 1. Physikalisch-Technische Bundesanstalt, Braunschweig, Germany  
 2. Guest scientist, Hampton, Middlesex, United Kingdom



2. **THE PROPERTIES OF COMMERCIAL THICK FILM RESISTANCE ELEMENTS AS AC-DC TRANSFER STANDARDS** 110  
 N. Fletcher and R. Goebel  
 Bureau International des Poids et Mesures (BIPM) Pavillon de Breteuil, Sèvres Cedex, France
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 1. Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Measurements  
 Technická 2, Prague 6, Czech Republic  
 2. Physikalisch-Technische Bundesanstalt, Bundesallee 100, Braunschweig, Germany
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 A. Morilhat<sup>1</sup>, A. Bounouh<sup>1</sup>, F. Lapostolle<sup>2</sup>, A. Billard<sup>2</sup>, F. Ziadé<sup>1</sup>, and D. Leprat<sup>1</sup>  
 1. LNE – 29 avenue Roger Hennequin, Trappes, France  
 2. LERMPS – UTBM - Belfort Cedex – France
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 B. Trinchera, V. D’Elia, and L. Callegaro  
 Istituto Nazionale di Ricerca Metrologica (INRIM), Strada delle Cacce 91, Torino, Italy

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**Break: Lunch**

**12:30 – 14:00**

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**Tuesday: Poster**

**14:00 – 16:00**

**Fundamental constants, Chairs: Peter Mohr, Barry Wood**

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 2. Institut National de Métrologie (LNE-INM/CNAM) – 61, rue du Landy, La Plaine St Denis, France  
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 1. National Physical Laboratory, Hampton Road, Teddington, Middx. UK, TW11 0LW  
 2. Cavendish Laboratory, University of Cambridge, Cambridge, UK, CB3 0HE  
 3. Physikalisches – Technische Bundesanstalt, Bundesallee 100, Braunschweig 38116, Germany  
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 1. DRFMC, CEA-Grenoble, 17 rue des martyrs, F-38054 Grenoble cedex 9, France  
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 1. Physikalisches-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany  
 2. Institute for Solid State Physics, University of Latvia, Riga LV-1063, Latvia

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## CPEM 2008 Technical Sessions

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Wednesday, 11 June 2008

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2. Physikalisch-Technische Bundesanstalt (PTB), Bundesallee, Braunschweig, Germany	
3. Istituto Nazionale di Ricerca Metrologia (INRIM), Torino, Italy	
4. Institute for Reference Materials and Measurements (IRMM), European Commission-JRC, Geel, Belgium	
5. National Measurement Institute (NMI), Lindfield, NSW, Australia	
6. National Institute of Standards and Technology (NIST), Gaithersburg, MD, USA	
7. National Physical Laboratory (NPL), TW11 0LW Teddington, UK	
8. Bureau International des Poids et Mesures (BIPM), Pavillon de Breteuil, Sèvres, France	
9. Institut für Kristallzüchtung (IKZ), Max-Born-Strasse 2, Berlin, Germany	

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1. National Metrology Institute of Japan (NMIJ), AIST, AIST Tsukuba-central, Umezono, Tsukuba-shi, Japan  
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1. The State Enterprise All-Ukrainian State Research and Production Centre for Standardization, Metrology, Certification and Consumers' Rights Protection (Ukrmetrteststandard)4, Metrologichna str., Kyiv, Ukraine  
2. Open-Stock "Ukrainian Research, Design and Technological Transformer Institute" (OSC "VIT") 11 Dnipropetrovskoe shosse, Zaporizhzhya, Ukraine
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National Metrology Centre, A\*STAR, 1 Science Park Drive, Singapore 118221, Rep. of Singapore  
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1. Nanoelectronics Research Institute, AIST Tsukuba Central 2, 1-1-1, Umezono, Tsukuba, Ibaraki, JAPAN  
2. National Metrology Institute of Japan, AIST Tsukuba Central 2, 1-1-1, Umezono, Tsukuba, Ibaraki, JAPAN
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# CPEM 2008 Technical Sessions

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Thursday, 12, June 2008

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Speaker breakfast 7:30 – 8:30

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Institute for National Measurement Standards National Research Council of Canada Ottawa, Ontario, Canada
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1. Physikalisch-Technische Bundesanstalt (PTB), Bundesallee, Braunschweig, Germany  
2. National Institute of Standards and Technology (NIST), Broadway, Boulder, CO, USA
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J.M. Le Floch<sup>1</sup>, D. Mouneyrac<sup>1,2</sup>, M.E. Tobar<sup>1</sup>, D. Cros<sup>2</sup>, J. Krupka<sup>3</sup>  
1. School of Physics, University of Western Australia, tirling Hwy, Crawley, Western Australia,  
2. XLIM -UMR CNRS n°6172 - 123, avenue A. Thomas, Limoges Cedex, France,  
3. Institute of Microelectronics and Optoelectronics, University of Technology, Koszykowa, Warsaw, Poland
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1. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaragi, Japan  
2. National Physical Laboratory, Hampton Road, Teddington, United Kingdom
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Rolf Judaschke  
Physikalisch-Technische Bundesanstalt, Bundesallee, Braunschweig, Germany

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Masahiro Horibe, Masaaki Shida and Koji Komiyama

National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba, Ibaraki, Japan

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**8:30 – 9:50**

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B.C. Waltrip<sup>1</sup>, B. Gong<sup>1</sup>, T.L. Nelson<sup>1</sup>, Y. Wang<sup>1</sup>, C.J. Burroughs<sup>2</sup>, A. Rüfenacht<sup>2</sup>, S.P. Benz<sup>2</sup>, P.D. Dresselhaus<sup>2</sup>

1. National Institute of Standards and Technology, Gaithersburg, MD, USA

2. National Institute of Standards and Technology, Boulder, MD, USA

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L. Palafox, R. Behr, W.G. Kürten Ihlenfeld, and F. Müller

Physikalisch-Technische Bundesanstalt, Bundesallee, Braunschweig, Germany

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Ilya Budovsky

National Measurement Institute, Australia, Lindfield, Australia

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W. G. Kürten Ihlenfeld, K. Dauke, A. Suchy, and P. Räther

Physikalisch-Technische Bundesanstalt – PTB

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**10:30 – 12:30**

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Konstantin Novoselov

University of Manchester, UK

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Beat Jeckelmann

Federal Office of Metrology METAS

**3. COMPENDIUM FOR PRECISE AC MEASUREMENTS OF THE QUANTIZED HALL RESISTANCE** **492**

Franz Ahlers

Physikalisch-Technische Bundesanstalt, Germany

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Peter Burke

University of California, Irvine, CA

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 2. Extremely High Frequency Medical and Technical Association, 11-7 Mokhovaya Street, Moscow, Russian Federation

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 2 National Institute of Metrology, No.18, Bei San Huan Dong Road, Beijing, China
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 1. LNE – 29 avenue Roger Hennequin, Trappes, France  
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 3. Istituto Nazionale di Ricerca Metrologica, str. delle cacce, Torino, Italy  
 4. Paul Scherrer Institut, Villigen, Switzerland

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 R. C. Wittmann, M. H. Francis, and B. K. Alpert  
 National Institute of Standards and Technology Broadway, Boulder, CO
- 2. FREE SPACE ANTENNA FACTOR EVALUATION OF LOGPERIODIC ANTENNA USING TIME-DOMAIN AND PULSE COMPRESSION TECHNIQUES** **638**  
 Satoru Kurokawa, Masanobu Hirose, Koji Komiyama  
 National Institute of Advanced Industrial Science and Technology AIST, Umezono, Tsukuba, Ibaraki, Japan
- 3. A SIMPLIFIED METHOD FOR THE MEASUREMENT OF MAGNETIC LOOP ANTENNA** **640**  
 Desmond C. Arthur, Yu Ji and Michael P.J. Daly  
 National Measurement Institute, Australia (NMI), Lindfield, Australia
- 4. TIME DOMAIN ANTENNA RANGE AT KRISS** **642**  
 Joo-Gwang Lee, Jin-Seob Kang, Jeong-Hwan Kim and Tae-Weon Kang  
 Electromagnetic Metrology Center, Korea Research Institute of Standards and Science, 1, Doryong-Dong, Yusong, Daejeon
- 5. FREE SPACE ANTENNA FACTOR OF A DIPOLE ANTENNA AND UNCERTAINTY FROM 1 TO 2 GHz** **644**  
 T. Morioka  
 Electromagnetic Fields Lab., National Institute of Advanced Industrial Science and Technology (AIST)
- 6. BI-LATERAL COMPARISON OF V-BAND ANTENNA GAIN BETWEEN KRISS AND NIST** **646**  
 J. Kang<sup>1</sup>, N. Kang, M. Francis<sup>2</sup>, and K. MacReynolds<sup>2</sup>  
 1. Electromagnetic Metrology Center, Korea Research Institute of Standards and Science (KRISS) 1 Doryong-Dong, Yuseong-Gu, Daejeon, Korea  
 2. RF Fields Group, National Institute of Standards and Technology (NIST), 325 Broadway, Boulder, CO, USA

**ThB-2: AC-DC Voltage, Chair: Kyu Tae Kim** **16:00 – 17:50**

- 1. DESIGN AND FABRICATION OF MJTCs ON QUARTZ SUBSTRATES AT NIST** **648**  
 L. Scarioni<sup>1</sup>, T. E. Lipe<sup>2</sup> and J. R. Kinard<sup>2</sup>  
 1. Universidad de Carabobo, Facultad de Ciencias y Tecnología Departamento de Física, Valencia, Venezuela.  
 2. National Institute of Standards and Technology 100 Bureau Drive, Gaithersburg MD, USA

2. **DEVELOPMENT OF AN AC-DC TRANSFER STANDARD BASED ON NbN/TiN/NbN PROGRAMMABLE JOSEPHSON JUNCTION ARRAY (INVITED)** 650  
I. Budovsky, D. Georgakopoulos, G. M. Hammond and T. Hagen  
National Measurement Institute, Lindfield, Australia
3. **SINGLE-JUNCTION THERMAL VOLTAGE CONVERTERS WITH REDUCED UNCERTAINTIES AT FREQUENCIES UP TO 1 MHz** 652  
T. Hagen and I. Budovsky  
National Measurement Institute, Australia, Lindfield, Australia
4. **EVALUATION OF LOW FREQUENCY CHARACTERISTIC OF A THERMAL CONVERTER USING A PROGRAMMABLE JOSEPHSON VOLTAGE STANDARD** 654  
H. Sasaki, H. Yamamori, T. Yamada, H. Fujiki and A. Shoji  
National Institute of Advanced Industrial Science and Technology (AIST) AIST Tsukuba Central 2, Umezono, Tsukuba, Ibaraki, Japan
5. **PRECISION AC-DC TRANSFER MEASUREMENT SYSTEM BASED ON A 1000-VOLT INDUCTIVE VOLTAGE DIVIDER** 656  
I. Budovsky and T. Hagen  
National Measurement Institute, Australia, Lindfield, Australia

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**THC-2, Fundamental Constants, Chair: Terry Quinn**

**16:00-18:00**

1. **PROGRESS ON THE LNE WATT BALANCE PROJECT** 658  
G. Genevès<sup>1</sup>, P. Gournay<sup>1</sup>, F. Villar<sup>1</sup>, D. Haddad<sup>1</sup>, C. Hauck<sup>1</sup>, M. Wakim<sup>1</sup>, P.A. Meury<sup>2</sup>, T. Madec<sup>2</sup>, P. Pinot<sup>3</sup>, P. Juncar<sup>3</sup>, S. Merlet<sup>4</sup>, F. Pereira dos Santos<sup>4</sup>, J. David<sup>5</sup>, L. Chassagne<sup>6</sup>, S. Topçu<sup>6</sup>  
1. LNE; 29, avenue Roger Hennequin, Trappes Cedex, France  
2. LNE ; 1 rue Gaston Boissier, Paris, France  
3. LNE-INM/Cnam ; 61 rue du Landy, La Plaine St Denis, France  
4. LNE-SYRTE, Observatoire de Paris, 61 Avenue de l'Observatoire, 75 Paris, France  
5. ENSAM, 8 Boulevard Louis XIV, Lille Cedex, France  
6. Laboratoire d'Ingénierie des Systèmes de Versailles - 45, avenue des Etats-Unis - Versailles – France
2. **PROGRESS ON THE BIPM WATT BALANCE** 660  
A. Picard<sup>1</sup>, H. Fang<sup>1</sup>, M. Stock<sup>1</sup> and C. Urano<sup>2</sup>  
1. Bureau International des Poids et Mesures (BIPM) Pavillon de Breteuil, Sèvres, France.  
2. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, AIST, Tsukuba Central, Umezono Tsukuba, Ibaraki, Japan, on secondment at BIPM.
3. **A MAGNETIC LEVITATION TECHNIQUE FOR THE SIMULTANEOUS COMPARISON OF MASS ARTIFACTS IN AIR AND VACUUM** 662  
Z. Jabbour, P.J. Abbott, J. Chalfoun, R. Liu, E. Williams  
National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD, USA
4. **IMPROVEMENT IN THE VOLUME DETERMINATION FOR Si SPHERES WITH AN OPTICAL INTERFEROMETER** 664  
N. Kuramoto and K. Fujii  
National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science and Technology, AIST Tsukuba central 3, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan
5. **DENSITY MEASUREMENT OF A SMALL <sup>28</sup>Si SINGLE CRYSTAL** 666  
A. Waseda and K. Fujii  
National Metrology Institute of Japan (NMIJ), AIST, Tsukuba, Ibaraki, Japan
6. **DENSITY OF A SINGLE CRYSTAL NATURAL SILICON SPHERE** 668  
W. Giardini<sup>1</sup>, P. Manson<sup>1</sup>, M. Wouters<sup>1</sup>, B. Warrington<sup>1</sup>, B. Ward<sup>1</sup>, C. Walsh<sup>2</sup>, E. Jaatinen<sup>3</sup>, M. Kenny<sup>4</sup>  
1. National Measurement Institute, Bradfield Rd. West Lindfield, Australia  
2. CUDOS, University of Sydney, New South Wales, Australia  
3. Queensland University of Technology, Brisbane, Australia  
4. NMI, Australia (retired)

# CPEM 2008 Technical Sessions

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Friday, 13 June 2008

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Speaker breakfast 7:30 – 8:30

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**FA-1: Power, Chair: Tom Nelson** 8:30 – 9:50

1. **THE CALIBRATION OF IEC STANDARD FLICKERMETERS USING COMPLEX MODULATED SIGNALS** 670  
P. Clarkson and P.S. Wright  
National Physical Laboratory, Teddington, Middlesex, UK
  2. **TECHNIQUES FOR THE CALIBRATION OF INTERHARMONIC GENERATORS IN SUPPORT OF LOW FREQUENCY IMMUNITY COMPLIANCE TESTING (IEC61000-4-13)** 672  
P.S.Wright and P.Clarkson  
National Physical Laboratory, Hampton Road, Teddington, UK.
  3. **CALIBRATION OF THE THD FUNCTIONS OF ELECTRICAL STANDARDS** 674  
R. Arseneau, M. Frigault, J. Zelle  
Institute for National Measurement Standards, National Research Council of Canada Ottawa, Ontario, Canada
  4. **SIMPLE ALGORITHM FOR SAMPLING SYNCHRONIZATION OF ADCs** 676  
W. G. Kürten Ihlenfeld and M. Seckelmann  
Physikalisch-Technische Bundesanstalt – PTB
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**FB-1: Radio Frequency, Chair: Dennis Friday** 8:30 – 9:50

1. **CALIBRATION OF THE STEP RESPONSE OF A 70 GHz SAMPLING OSCILLOSCOPE USING A NOVEL OPTOELECTRONIC TECHNIQUE** 678  
M. Bieler, M. Spitzer, G. Hein, K. Pierz, and U. Siegner  
Physikalisch-Technische Bundesanstalt, Bundesallee, Braunschweig, Germany
  2. **COMPLETE WAVEFORM CHARACTERIZATION AT NIST** 680  
P. D. Hale, D. F. Williams, A. Dienstfrey, C. M. Wang, A. Lewandowski, T. S. Clement, and D. Keenan  
National Institute of Standards and Technology, Boulder, CO, USA
  3. **MINIMUM-PHASE RESPONSE RECONSTRUCTION OF SAMPLING OSCILLOSCOPE BASED ON THE NTN CALIBRATION** 682  
Xu Qinghua, Lin Maoliu, Zhang Zhe  
Department of Information Engineering, Harbin Institute of Technology, Heilongjiang, P.R.China
  4. **CALIBRATED BROADBAND ELECTRICAL CHARACTERIZATION OF NANOWIRES** 684  
T. M. Wallis, A. Imtiaz, H. Nembach, K. A. Bertness, N. A. Sanford, P. T. Blanchard and P. Kabos  
National Institute of Standards and Technology, Boulder, CO, USA,
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**FC-1: Impedance, Chair: Nick Fletcher** 8:30 – 9:50

1. **NEXT-GENERATION CALCULABLE CAPACITOR USING A TUNABLE-LASER INTERFEROMETER** 686  
Yicheng Wang, Rae Duk Lee, Liang Lu, John Lawall and Akobuije Chijioko  
National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD, USA

2. **DC AND LOW FREQUENCY HUMIDITY DEPENDENCE OF AN AIR-GAP CAPACITOR** 688  
 Gert Rietveld and Helko E. van den Brom  
 NMi Van Swinden Laboratorium, AR Delft, The Netherlands
3. **TRACEABILITY OF CAPACITANCE MEASUREMENTS AT NMi VSL** 690  
 E.F. Dierikx  
 NMi Van Swinden Laboratorium, AR, Delft, The Netherlands
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**FA-2: Voltage, Chair: Blaise Jeaneret**

**9:50 – 10:50**

1. **DEVELOPMENT OF A VOLTAGE DIVIDER BASED ON QUANTIZED HALL RESISTANCE ARRAYS FOR A HIGH DC VOLTAGE STANDARD II** 692  
 N. Kaneko<sup>1</sup>, T. Oe<sup>1</sup>, A. Domaie<sup>1</sup>, C. Urano<sup>1</sup>, T. Itatani<sup>2</sup>, H. Ishii<sup>3</sup>, and S. Kiryu<sup>4</sup>  
 1. National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba Central 3-1, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 2. Research Institute of Instrumentation Frontier, National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba Central 2-10, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 3. Nanoelectronics Research Institute, National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba Central 2-10, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 4. Faculty of Engineering, Musasi Institute of Technology 1-28-1, Tamazutsumi, Setagaya-ku, Tokyo, Japan
2. **JOSEPHSON JUNCTION ARRAY DRIVEN BY MODULATED OPTICAL COMBS** 694  
 C. Urano<sup>1</sup>, N. Kaneko<sup>1</sup>, M. Maezawa<sup>2</sup>, T. Itatani<sup>2</sup> and S. Kiryu<sup>3</sup>  
 1. National Metrology Institute of Japan, National Institute of Advanced Industry Science and Technology  
 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 2. National Institute of Advanced Industry of Science and Technology 1-1-1 Umezono, Tsukuba, Ibaraki, Japan  
 3. Musashi Institute of Technology 1-28-1 Tamazutsumi, Setagaya-ku, Tokyo, Japan
3. **SOURCES OF NORMAL MODE OFFSET IN PRECISION DMM'S** 696  
 B. Moore, M.D. Early and L.A. Christian  
 Measurement Standards Laboratory of New Zealand (MSL) Industrial Research Ltd, Lower Hutt, New Zealand
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**FB-2: RF Noise and Power, Chair: Dennis Friday**

**9:50 – 11:30**

1. **RABI FREQUENCY MEASUREMENT FOR MICROWAVE POWER STANDARD USING DOUBLE RESONANCE SPECTRUM** 698  
 M. Kinoshita, K. Shimaoka, and K. Komiyama  
 National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science and Technology (AIST),  
 1-1-1, Umezono, Tsukuba, Ibaraki, Japan
2. **AN EXPERIMENTAL EVALUATION OF A CRYOGENIC NOISE SOURCE BY A SLIDING SHORT METHOD IN THE FREQUENCY RANGE OF 8 GHz TO 12 GHz** 700  
 H. Iida, Y. Shimada and K. Komiyama  
 National Metrology Institute of Japan - National Institute of Advanced Industrial Science and Technology  
 AIST Tsukuba Central 3, 1-1-1 Umezono, Tsukuba, Ibaraki, Japan
3. **SYSTEMATIC ERRORS IN SHOT NOISE THERMOMETER MEASUREMENTS** 702  
 Lafe Spietz<sup>1</sup>, W. Tew<sup>1</sup>, and R. J. Schoelkopf<sup>2</sup>  
 1. National Institute of Standards and Technology, USA  
 2. Departments of Applied Physics and Physics, Yale University
4. **CALIBRATION OF A 3.5 mm COAXIAL POWER SENSOR USING A TRANSFER STANDARD** 704  
 Tae-Weon Kang, Jeong-Hwan Kim, Jae-Yong Kwon, Jeong-Il Park, and Joo-Gwang Lee  
 Electromagnetic Metrology Center, Division of Physical Metrology, Korea Research Institute of Standards and Science, Yusong, Daejeon, Republic of Korea

<b>5. NOISE-PARAMETER MEASUREMENT WITH AUTOMATED VARIABLE TERMINATIONS</b>	<b>706</b>
Dazhen Gu, David K. Walker, and James Randa National Institute of Standards and Technolog, Broadway, Boulder, CO, USA	

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<b>FC-2: Impedance, Chair: Jurgen Schurr</b>	<b>9:50– 11:10</b>
<b>1. REALIZATION OF THE HENRY AT METAS</b>	<b>708</b>
F. Overney Federal Office of Metrology METAS, Lindenweg Bern-Wabern, Switzerland	
<b>2. A CURRENT-COMPARATOR-BASED HIGH-VOLTAGE INDUCTANCE BRIDGE</b>	<b>710</b>
E. So Institute for National Measurement Standards, National Research Council of Canada Ottawa, Ontario, Canada	
<b>3. A NEW SELF-CALIBRATION METHOD FOR A DECADE INDUCTIVE VOLTAGE DIVIDER BY USING BIFILAR WINDINGS AS AN ESSENTIAL STANDARD AT WIDE FREQUENCY</b>	<b>712</b>
K. Suzuki Agilent Technologies International Japan, Ltd. Measurement Standards Center 9-1 Takakura-cho, Hachioji-shi, Tokyo, Japan	
<b>4. A FOUR-TERMINAL CO-AXIAL PAIR MAXWELL-WEIN BRIDGE FOR THE MEASUREMENT OF SELF-INDUCTANCE</b>	<b>714</b>
M. Côté National Research Council, Ottawa, Canada	