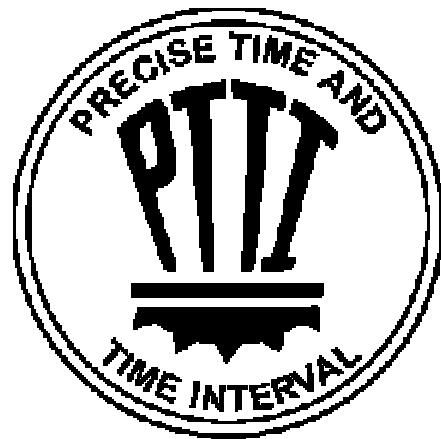


**ADVANCE PROGRAM**

**THIRTY-FIFTH ANNUAL**

**PRECISE TIME AND TIME INTERVAL (PTTI)**

**SYSTEMS AND APPLICATIONS MEETING**



**December 2 - 4, 2003**

**35 Years of Progress**  
**1969-2003**

**Hilton Resort on Mission Bay**  
**San Diego, California**

## THE SCHEDULE

### Monday, December 1, 2003

0800-1300      Exhibition setup of booth for Exhibitors  
0700-0800      Tutorial Breakfast  
0800-1715      Tutorials  
1300-1700      Exhibitor Set-Up  
1700-1830      Icebreaker-Exhibitor Area  
1830-2100      Exhibitor Set-Up  
1900-2100      Registration - PTTI Meeting\*  
1900-2100      Committee on GPS and GLONASS Time Transfer Standards

### Tuesday, December 2, 2003

0700-0800      Speakers' Breakfast  
0700-1600      Speakers' Room  
0700-0800      Attendees' Breakfast-Pre-Function Area  
0700-1600      Registration - Grand Ballroom Foyer  
0800-0835      Opening Session  
0800-1700      Technical Exhibits  
0835-0945      Session I  
0945-1005      Intermission-Exhibits Area  
1005-1135      Session II  
1135-1300      Lunch  
1300-1420      Session III  
1420-1440      Intermission-Exhibit Area  
1440-1600      Session IV-A  
1600-1720      Session IV-B  
1800-1930      Reception

### Wednesday, December 3, 2003

0700-0800      Speakers' Breakfast  
0700-1600      Speakers' Room  
0700-0800      Attendees' Breakfast-Pre-Function Area  
0700-1600      Registration - Grand Ballroom Foyer  
0800-1700      Technical Exhibits  
0800-0820      Invited Paper  
0820-0940      Session V-A  
0940-1000      Intermission - Exhibits Area  
1000-1120      Session V-B  
1120-1250      Lunch  
1250-1310      Invited Paper  
1310-1440      Session VI  
1440-1500      Intermission-Exhibits Area  
1500-1700      Session VII  
1730-1830      Joint Executive and Advisory Board Meeting

## THE SCHEDULE

**Thursday, December 4, 2003**

0700-0800	Speakers' Breakfast
0700-1600	Speakers' Room
0700-0800	Attendees' Breakfast-Pre-Function Area
0700-1430	Registration - Grand Ballroom Foyer
0800-0820	Invited Paper
0820-0920	Session VIII
0920-1020	Session IX
1020-1040	Intermission
1040-1200	Session X
1200-1330	Lunch
1330-1450	Session XI-A
1450-1510	Intermission
1510-1610	Session XI-B
1610-1640	Session XII
1640-1700	General Discussion
1700	Close of Meeting

\*Registration for the PTTI Meeting is available each day. Exhibits are open Tuesday and Wednesday only.

**REGISTRATION CARD  
THIRTY-FIFTH ANNUAL  
PRECISE TIME AND TIME INTERVAL (PTTI)  
SYSTEMS AND APPLICATIONS MEETING**

**DECEMBER 2 - 4, 2003**

NAME \_\_\_\_\_  
First \_\_\_\_\_ Initial \_\_\_\_\_ Last \_\_\_\_\_

AGENCY \_\_\_\_\_  
Company or Organization \_\_\_\_\_

ADDRESS \_\_\_\_\_  
Street \_\_\_\_\_

City, State, and Country \_\_\_\_\_

TELEPHONE \_\_\_\_\_ FAX \_\_\_\_\_

E-MAIL \_\_\_\_\_

Registration (will pay on site) † §

Registration Amount Enclosed † § No. \_\_\_\_\_ \$ \_\_\_\_\_

† \$300.00 if postmarked on or before November 7; \$350.00 thereafter. (Covers entry to all sessions, one reception ticket, three breakfasts, lunch on Tuesday and Wednesday, and one copy of the Proceedings.)

§ Student/Retiree fee - \$50.00. (Must be fully retired or full-time student to qualify for the reduced registration fee. Covers entry to the sessions and exhibits only.)

Additional Reception Tickets (\$30 each) No. \_\_\_\_\_ \$ \_\_\_\_\_

Lunch Tickets (\$25 each) No. \_\_\_\_\_ \$ \_\_\_\_\_

Tutorials (\$250) No. \_\_\_\_\_ \$ \_\_\_\_\_

Proceedings (Costs on Page viii) No. \_\_\_\_\_ \$ \_\_\_\_\_

Total Amount Enclosed No. \_\_\_\_\_ \$ \_\_\_\_\_

Mark here if purchasing Proceedings only. No. \_\_\_\_\_ \$ \_\_\_\_\_

Make checks payable to *Treasurer, PTTI*; no payment by credit card.

Speaker       Exhibitor       Session Chairman

Are you staying in the hotel? Yes \_\_\_\_\_ No \_\_\_\_\_

If you have special dietary or physical requirements, please contact Mrs. Sheila Faulkner at 703-532-6411 or E-mail: [bopenyan@aol.com](mailto:bopenyan@aol.com)

Questions? Contact Ms. Jardine at 202-767-3554 or E-mail: [jardine@ccs.nrl.navy.mil](mailto:jardine@ccs.nrl.navy.mil)

**Mail this card to Ms. Jardine at the address on Page iv.**

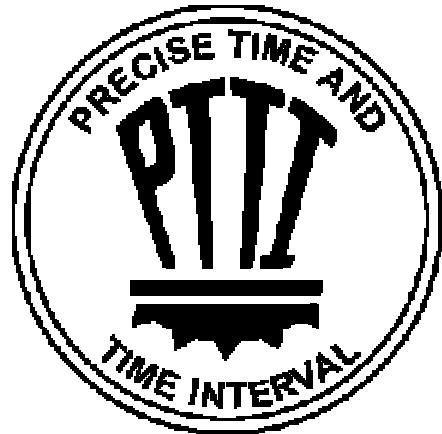
**ADVANCE PROGRAM**

**THIRTY-FIFTH ANNUAL  
PRECISE TIME AND TIME INTERVAL (PTTI)  
SYSTEMS AND APPLICATIONS MEETING**

**Sponsored by**

U.S. Naval Observatory  
U.S. Naval Research Laboratory  
NASA Jet Propulsion Laboratory  
U.S. Air Force Office of Scientific Research  
Defense Information Systems Agency  
U.S. Coast Guard Navigation Center

**December 2 - 4, 2003**



**Hilton Resort on Mission Bay  
San Diego, California**

## Table of Contents

Schedule.....	Inside Front Cover
Registration Card.....	Front of Book
Objectives .....	iii
Meeting Information.....	iv
Registration.....	iv
Cancellation Policy .....	iv
PTTI Home Page.....	iv
PTTI 2003 Tutorials (Reserve Early) .....	v
Question.....	v
Registration Desk Hours.....	v
Hotel Reservations .....	vi
Transportation.....	vi
Parking.....	vii
Directions.....	vii
Messages. ....	vii
Speakers' Room .....	vii
Presented Papers.....	vii
Temperature.....	vii
36th Annual PTTI Meeting.....	vii
Exhibit Information.....	viii
List of Potential Exhibitors .....	viii
Proceedings.....	viii
Working Groups.....	ix
Executive Committee.....	x
PTTI Meeting Officers.....	xi
PTTI Award Committee .....	xii
PTTI Advisory Board.....	xiii
Session Chairs.....	xiv
Agenda .....	XV-XXV
Hotel Registration Card .....	Rear of Book

## **OBJECTIVES**

The objectives of the PTTI Systems and Applications Meeting are to:

- Disseminate and coordinate PTTI information at the user level,
  - Review present and future PTTI requirements,
  - Inform Government engineers, technicians, and Managers of precise time and frequency technology and its problems, and
  - Provide an opportunity for an active exchange of new technology associated with PTTI.
- 

This year, the PTTI addresses:

- Satellite Time Transfer
- Galileo, GPS, and GLONASS
- Algorithms and Methods
- Advanced Clocks
- Time and Frequency Standards Laboratories, Activities and Updates
- Military Users and Systems
- Time Synchronization
- PTTI Vendor Presentations

## **WELCOME TO THE PTTI 2003**

### **MEETING INFORMATION**

#### **Registration**

Please send the PTTI registration form to:

Ms. Nicolette Jardine  
PTTI Registration  
U.S. Naval Research Laboratory  
4555 Overlook Avenue  
Code 6100A  
Washington, D.C. 20375  
202-767-3554  
FAX 202-404-7139  
E-mail: [jardine@ccs.nrl.navy.mil](mailto:jardine@ccs.nrl.navy.mil)

The registration fee is \$350.00. Note: If payment is received postmarked on or before 7 November 2003 the cost is \$300.00.

The full registration fee includes entry to all the sessions, the exhibit area, a copy of the Proceedings, the Ice Breaker, and the Welcoming Reception, breakfast each day and lunch Tuesday and Wednesday. Guest tickets are \$30.00 for the reception, and \$25.00 for lunch.

The registration fee for students and full-time retirees is \$50.00 and includes entry to the scientific sessions and exhibit area only. It does not include a copy of the Proceedings, entry to breakfasts, lunches, or receptions.

The registration fee for the tutorials is \$250. This includes lunch and a copy of the Tutorials, but does not include the PTTI proceedings or admission to the PTTI meetings or reception.

Please make checks payable to: **Treasurer, PTTI. Credit cards are not accepted.**  
Attendees, including presenters and exhibitors, must register and receive a badge, which must be worn for admission to all sessions and functions. Badges for attendees are not transferable.

Visitor badges for the exhibit area only may be obtained at the registration desk. The exhibit area is open to everyone.

#### **Cancellation policy**

All requests for cancellation must be received in writing before November 7, 2003. On or after November 7th there is a \$175.00 cancellation fee. Refunds are not given for "no shows", however, substitutions are allowed.

#### **PTTI Home Page**

Access the PTTI Home Page from the World Wide Web at:

<http://tycho.usno.navy.mil/ptti.html>

PTTI 2003 on-line registration is also available via the PTTI Home Page:

<http://tycho.usno.navy.mil/pttiregform.html>

Please remember to take advantage of the reduced early registration fee. Payment has to be postmarked on or before November 7, 2003.

## **PTTI 2003 Tutorials**

Tutorials take place prior to PTTI 2003 on Monday, December 1, 2003. For detailed information regarding the tutorials, please contact Dr. Ken Senior via voice mail at 202-767-2043, or by E-mail [Ken.Senior@nrl.navy.mil](mailto:Ken.Senior@nrl.navy.mil).

The fee for the all day tutorials is \$250. Breakfast and lunch are included. Please register using the attached "Registration Card" or "on-line" at the above Web address.

0700 – 0800	<b>Breakfast</b>
0800 – 0930	<b>Crystal Oscillators</b> Dr. John Vig, Communications-Electronics Command, U.S. Army
0930 – 1030	<b>Atomic Frequency Standards</b> Dr. Robert Tjoelker, Jet Propulsion Laboratory
1030 – 1045	<b>Intermission</b>
1045 – 1145	<b>Clocks and Timing for Telecommunications</b> Mr. George Shaton, Eagle Alliance
1145 – 1300	<b>Lunch</b>
1300 – 1400	<b>Clock Statistics</b> Dr. Don Percival, University of Washington
1400 – 1500	<b>Clock Measurement</b> Dr. Sam Stein, Timing Solutions Corporation
1500 – 1515	<b>Intermission</b>
1515 – 1615	<b>Timescales</b> Dr. Tom Parker, National Institute of Standards and Technology
1615-1715	<b>Time/Frequency Transfer</b> Dr. Judah Levine, National Institute of Standards and Technology

## **Questions**

Please contact the following people for information on matters concerning:

Technical questions:	Dr. Joe White, 202-767-5111 or <a href="mailto:joe.white@nrl.navy.mil">joe.white@nrl.navy.mil</a>
Exhibits:	Mr. Gary Geil, 949-361-0212 or <a href="mailto:gary@gmainc.cc">gary@gmainc.cc</a>
General:	Mrs. Sheila Faulkner, 703-532-6411 or <a href="mailto:bopenyan@aol.com">bopenyan@aol.com</a>
Registration:	Ms. Nikki Jardine, 202-767-3554 or <a href="mailto:jardine@ccs.nrl.navy.mil">jardine@ccs.nrl.navy.mil</a>

## **Registration Desk Hours**

The registration desk will be open during the following hours:

1 December, Monday	1900 – 2100
2 December, Tuesday	0700 – 1600
3 December, Wednesday	0700 – 1600
4 December, Thursday	0700 – 1430

## **Hotel Reservations**

Mail or FAX the hotel reservation card (found in the back of the book) to:

The Hilton Resort on Mission Bay  
(PTTI 2003 Meeting Room Block)  
1775 East Mission Bay Drive  
San Diego, California 92109  
1-800-445-8667 (Reservations)  
1-619-276-4010 (Hotel Main Number)  
FAX 1-619-275-8944

When reservations are made, mention PTTI 2003 to receive the group sleeping room rate. The PTTI rate is available from November 28 through December 9, 2003. Check-in time is 1500 (3:00 PM) and checkout time is Noon. Rooms are held until 1600 (4:00 PM PST) if not guaranteed for late arrival by a credit card or one night's deposit. The block of reserved rooms will be released November 8 so reserve early. If rooms are available after that date, reservations will be accepted at the group rate. If you leave before your scheduled departure date without informing the Hilton, you will be charged an early departure fee. San Diego offers a wide range of restaurants and shops. Reservations may be made by calling 1-800-445-8667.

## **Transportation United Airlines**

United Airlines has been chosen as the official carrier for PTTI 2003 and is pleased to offer the best available airfares and schedules that fit your travel needs.

To obtain the best fares or schedule information, please call United's Meeting Desk at 1-800-521-4041 and refer to the Meeting Plus ID code 556XF. The fares are available from November 28 through December 9, 2003.

An additional 5% discount is available if you book and purchase a ticket at least 60 days in advance of the contracted travel dates. This increases the discount to 5% plus 5% off the lowest applicable fare or 10% plus 5% off the unrestricted coach fare. You or your travel agent should call without delay, as seats may be limited.

## **Rental Car**

Avis has been chosen as the official rent-a-car company for PTTI 2003. To receive a reduced rate, call 1-800-331-1600 to book your reservation and give the Avis Meeting Sales Agent the Avis Worldwide Discount (AWD) number for PTTI 2003 - J628452. Special meeting rates are available from November 28 through December 9, 2003.

## **Airport Shuttle**

The hotel does not provide shuttle service. Commercial Shuttle service is available at the airport.

## **Parking**

Self-parking is \$10 per day. Valet parking is \$12.00 per day.

## **Directions**

### **From San Diego Airport**

Take Interstate-5 North to Sea World Drive, Sea World Drive, Left to East Mission Bay Drive, East Mission Bay Drive and Right to 1775 East Mission Bay Drive (Hilton Hotel).

### **From Los Angeles Airport (LAX)**

Take Interstate 405 South to Interstate 5 South. Interstate 5 South to Claremont Drive, Claremont Drive left to East Mission Bay Drive, East Mission Bay Drive left to 1775 East Mission Bay Drive (Hilton Hotel).

## **Messages**

Messages may be left for PTTI attendees through the hotel's telephone number of 1-619-276-4010.

## **Speakers' Room**

Please check the PTTI Registration Desk or the hotel's Function Board for the location of the Speakers' Room. Session chairpersons should alert their sessions' members to meet them in the Speakers' Room for the speakers' breakfast that is served each day. Supplies for speakers are available during the day.

## **Presented Papers**

Papers in electronic form (Word or TEX) must be submitted bye-mail or on diskette to Dr. Lee A. Breakiron, Editorial Chairman, ([lab@kepler.usno.navy.mil](mailto:lab@kepler.usno.navy.mil)) by December 1, 2003 unless prior arrangements have been made with him. If prior arrangements have not been made, the paper will not be published in the Proceedings. For paper style, see the Authors' Kit on the Web at [http://tycho.usno.navy.mil/author\\_kithtml](http://tycho.usno.navy.mil/author_kithtml)

## **Temperature**

The climate during December in the San Diego may be cool. A light coat or raincoat is recommended.

## **Thirty-Sixth Annual PTTI Meeting**

The 36th Annual PTTI Meeting will be held at the Hyatt Regency, Washington, D.C. December 7 - 9, 2004.

In 2005, the PTTI Meeting will meet jointly with the IEEE Frequency Control Symposium and will meet August 29-31, 2005 in Vancouver, British Columbia, Canada.

## **Exhibit Information**

The exhibit area is adjacent to the general session. For exhibit information, please contact:  
Gary Geil or Don Mitchell

Geil Marketing Associates  
1064 Calle Negocio, Suite D  
San Clemente, CA 92673  
1-949-361-0212  
FAX 1-949-361-0312  
E-mail: [gary@gmainc.cc](mailto:gary@gmainc.cc)

## **List of Potential Exhibitors for PTTI 2003**

Agilent Technologies	Oscilloquartz
Allen Osborne Associates, Inc.	Precise Time and Frequency, Inc.
Arbiter Systems, Inc.	Quartzlock, UK. Ltd.
Brandywine Communications	Stanford Research Systems
End Run Technologies	SpectraDynamics, Inc.
ESE	Spectrum Instruments, Inc.
FEI-Zyfer, Inc.	Symmetricom, TT&M
Femtosecond Systems	Synergy Systems
Frequency Electronics, Inc.	Temex Neuchatel Time SA
GPS World	Thales Navigation
Instrumentation Technology Systems	TIMETECH GmbH
JTIme! Meinberg USA	Timing Solutions Corporation
Lange Electronic GmbH	TRAK Microwave Corporation
Locus, Inc.	Trimble Navigation
Magellan Ashtech Products	U.S. Naval Observatory

## **Proceedings**

The proceedings, on a CD in Adobe Acrobat (PDF) format, will be mailed to the attendees in 2004. If you cannot attend, but wish to reserve a copy of the Proceedings, please return the Registration Card with a check for \$350 made out to Treasurer, PTTI. Please note or card that you are not attending. Your reserved copy will be sent to you. If you wish extra copies, they will also be available at \$350.

## **Working Groups**

On Wednesday, December 3, 2003, the PTTI is pleased to offer interactive Working Groups which give conference attendees the opportunity to contribute to the state of knowledge on one of three important topics. Participants will be able to contribute informally during the Working Group sessions. However, if you desire to make a short formal presentation, you must coordinate with the Group leader who has full discretion. Please plan to attend one of the following Working Groups to help shape the future of PTTI.

### **Group A      The Future of UTC**

Judah Levine, National Institute of Standards and Technology; Sam Stein and Tom Celano, Timing Solutions Corporation

We will start with a short introduction giving background information on how UTC is defined and realized, with special emphasis on the role that the GPS signals play in this process. We will then have an open discussion on the future of UTC. We will focus on possible changes to the current leap second system, on improvements to the definition and realization of UTC, and on measures to ensure the security and reliability of UTC in the post-9/11 environment.

### **Group B      Future PTTI Needs**

Dennis McCarthy, U.S. Naval Observatory

The Working Group will address the needs, concerns, and issues likely to arise over the next 25 years of those who use precise time and time interval. Specific user areas to be addressed include communications and geolocation/navigation. Discussions are expected to touch on the reliance on satellite navigation systems, future hardware needs, space clocks, future time and frequency dissemination, real-time robust time scales, time and frequency standards for the future, and other topics likely to drive the state of the art. The goal is to formulate recommendations that could be helpful in guiding the direction of future PTTI development.

### **Group C      Calibration Issues**

Jay Oaks, U.S. Naval Research Laboratory; E. Detoma, Sistemi Elettronica per l'Automazione

The working group will identify various types of PTTI time transfer systems that require calibration, such as GPS Time Transfer Receivers and Two Way Satellite Time Transfer (TWSTT) Systems. The methods of calibrating each type of system will be discussed, and limiting factors affecting calibrations, such as temperature dependence and repeatability of delays through electronics will be identified. The working group will also discuss methods of verifying a calibration such as direct comparison to a known reference. Last, the group will address what future developments in technology may improve the ability to calibrate PTTI time transfer systems.

**EXECUTIVE COMMITTEE**

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**Dr. Lee A. Breakiron**  
**U.S. Naval Observatory**

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**Defense Information Systems Agency**

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**NASA Jet Propulsion Laboratory**

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NASA Jet Propulsion Laboratory

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U.S. Naval Observatory (Retired)

**1995**

**DR. JAMES A. BARNES**

National Institute of Standards and Technology (Retired)

**1996**

**PROFESSOR SIGFRIDO M. LESCHIUTTA**

Politecnico di Torino

and

Istituto Elettrotecnico Nazionale Galileo Ferraris

**1997**

**PROFESSOR BERNARD RENE GUINOT**

Honorary Astronomer

Paris Observatory

**1998**

**DR. JACQUES VANIER**

National Research Counsel (Retired)

**1999**

**DR. LEONARD S. CUTLER**

Agilent Technologies

**2000**

**MR. ROGER EASTON**

U.S. Naval Research Laboratory (Retired)

**2001**

**DR. ROBERT F. C. VESSOT**

Smithsonian Astrophysical Observatory (Retired)

**2002**

**MR. HARRY PETERS**

Sigma Tau, Incorporated (Retired)

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NASA Jet Propulsion Laboratory

**DR. ANDY WU**

The Aerospace Corporation

## **PTTI 2003 SESSION CHAIRS**

### **SESSION I - Vendor Presentations**

MR. WARREN WALLS  
Femtosecond Systems, Inc.

### **SESSION II - Timing Laboratories Reports**

DR. LARA S. SCHMIDT  
The RAND Corporation

### **SESSION III - Satellite Time Transfer**

DR. JOHN DAVIS  
National Physical Laboratory, United Kingdom

### **SESSION IV-A - GPS and Galileo**

MS. CHRISTINE HACKMAN  
University of Colorado

### **SESSION IV-B - GPS and Galileo**

MR. GARY DIETER  
Boeing Corporation

### **SESSION V-A - Algorithms and Methods**

DR. CHARLES GREENHALL  
Jet Propulsion Laboratory

### **SESSION V-B - Algorithms and Methods**

MR. JIM G. SKINNER  
U.S. Naval Observatory

### **SESSION VI - Working Groups**

DR. JOE WHITE  
U.S. Naval Research Laboratory

### **SESSION VII - Poster Session**

DR. KEN SENIOR  
U.S. Naval Research Laboratory

### **SESSION VIII - Measurement Technology**

DR. HENRY FLIEGEL  
The Aerospace Corporation

### **SESSION IX - Timing Systems and Applications**

DR. TOM CLARK  
Syntomics LLC

### **SESSION X - Military Systems and Users**

MR. WILLIAM BOLLWERK  
U.S. Naval Observatory

### **SESSION XIA - Advanced Clocks**

DR. ROBERT LUTWAK  
Symmetricom

### **SESSION XIB - Advanced Clocks**

DR. ROBERT TJOELKER  
Jet Propulsion Laboratory

### **SESSION XII - Working Group Reports**

DR. JOE WHITE  
U.S. Naval Research Laboratory

**PTTI 2003**  
**THIRTY-FIFTH ANNUAL**  
**PRECISE TIME AND TIME INTERVAL (PTTI)**  
**SYSTEMS AND APPLICATIONS MEETING**

**TUESDAY, DECEMBER 2, 2003**

- 0800 – 0805 OPENING**  
Mr. Jay Oaks, U.S. Naval Research Laboratory
- 0805 – 0815 OPENING REMARKS**  
Captain D. W. Gillard, U.S. Naval Observatory
- 0815 – 0830 DISTINGUISHED PTTI SERVICE AWARD**  
Presented by Dr. Joe White, U.S. Naval Research Laboratory
- 0830 – 0835 CALL TO SESSION**  
Dr. Lara S. Schmidt, The RAND Corporation
- SESSION I PTTI VENDOR PRESENTATIONS**  
**0835 – 0945 Chairman: Warren Walls, Femtosecond Systems, Inc.**
- 0945 – 1005 INTERMISSION**
- SESSION II STANDARDS LABORATORIES REPORTS**  
Chairman: Lara S. Schmidt, The RAND Corporation
- 1005 – 1015 Paper 1: THE APL TIME AND FREQUENCY LABORATORY**  
R. Dragonette and M. Miranian, Johns Hopkins University Applied Physics Laboratory
- 1015 – 1025 Paper 2: TIME AND FREQUENCY ACTIVITIES AT THE CSIR - NATIONAL METROLOGY LABORATORY**  
E. Marais, National Metrology Laboratory, South Africa
- 1025 – 1035 Paper 3: TIME AND FREQUENCY ACTIVITIES AT THE U.S. NAVAL OBSERVATORY**  
D. Matsakis, U.S. Naval Observatory
- 1035 – 1045 Paper 4: METAS TIME AND FREQUENCY LABORATORY ACTIVITIES IN 2003**  
L-G. Bernier, G. Dudle, and C. Schlunegger, Swiss Office of Metrology and Accreditation, Switzerland

TUESDAY, DECEMBER 2, 2003

**SESSION II STANDARDS LABORATORIES REPORTS  
(CONTINUED)**

- 1045 – 1055 Paper 5: THE NATIONAL TIME AND FREQUENCY SERVICE OF THE RUSSIAN FEDERATION**  
V. Krutikov, Gosstandard of Russia; V. Kostromin and N. Koshelyaevsky, Institute of Metrology for Time and Space, Russia
- 1055 – 1105 Paper 6: THE LITHUANIAN TIME AND FREQUENCY STANDARD**  
R. Miskinis, Semiconductor Physics Institute, Lithuania
- 1105 – 1115 Paper 7: INITIAL TESTING OF A NEW GPS RECEIVER, THE POLARX2, FOR TIME AND FREQUENCY TRANSFER USING DUAL FREQUENCY CODES AND CARRIER PHASE**  
P. Defraigne, C. Bruyninx, and F. Roosbeck, Royal Observatory of Belgium, Belgium
- 1115 – 1125 Paper 8: TIME AND FREQUENCY ACTIVITIES AT THE NATIONAL PHYSICAL LABORATORY**  
J. Davis, P. Whibberley, R. Hlavac, and P. Stacey, National Physical Laboratory, United Kingdom
- 1125 – 1135 Paper 9: AN UPDATE ON PTB'S ACTIVITIES IN TIME AND FREQUENCY**  
D. Piester, A. Bauch, J. Becker, and T. Polewka, Physikalisch-Technische Bundesanstalt, Germany
- 1135 – 1300 LUNCH**
- SESSION III SATELLITE TIME TRANSFER**  
Chairman: John Davis, National Physical Laboratory, United Kingdom
- 1300 – 1320 Paper 10: THE FIRST TWO-WAY TIME TRANSFER LINK BETWEEN ASIA AND EUROPE**  
H. Lin, W. Tseng, H. Peng, and C. Liao, National Time and Frequency Laboratory, Taiwan; G. de Jong, E. Kroon, and M. Brakel, NMi Van Swinden Laboratorium, The Netherlands

TUESDAY, DECEMBER 2, 2003

**SESSION III SATELLITE TIME TRANSFER (CONTINUED)**

**1320 – 1340 Paper 11: A NEW MULTI-SYSTEM TIME RECEIVER**

J. Nawrocki and P. Nogas, Polish Academy of Sciences, Poland

**1340 – 1400 Paper 12: COMMON VIEW LORAN-C FOR PRECISION TIME RECOVERY**

LT K. Carroll, U.S. Coast Guard, T. Celano and C. Biggs, Timing Solutions Corporation; M. Lombardi, National Institute of Standards and Technology

**1400 – 1420 Paper 13: TIME TRANSFER BETWEEN USNO AND PTB: OPERATION AND CALIBRATION RESULTS**

D. Piester, A. Bauch, J. Becker, and T. Polewka, Physikalisch-Technische Bundesanstalt, Germany; D. Matsakis and A. McKinley, U.S. Naval Observatory

**1420 – 1440 INTERMISSION**

**SESSION IV-A GPS AND GALILEO**

Chairman: Christine Hackman, University of Colorado

**1440 – 1500 Paper 14: MCS ZERO AGE OF DATA MEASUREMENT TECHNIQUES**

G. Dieter, G. Hatten, and J. Taylor, Boeing Homeland Security and Services

**1500 – 1520 Paper 15: GPS IR RUBIDIUM CLOCKS: IN-ORBIT PERFORMANCE ASPECTS**

M. Epstein, G. Freed, and J. Rajan, ITT Industries

**1520 – 1540 Paper 16: UNCERTAINTY ESTIMATION ON GPS TIME TRANSFER**

M. Addouche, F. Meyer, and F. Vernotte, Observatoire de Besancon, France

**1540 – 1600 Paper 17: GPS CLOCK/TIMESCALE MANAGEMENT IN THE MASTER CONTROL STATION**

S. Hutsell, 2d Space Operations Squadron, Schriever Air Force Base; G. Dieter and G. Hatten, Boeing; T. Dass and J. Harvey, ITT

TUESDAY, DECEMBER 2, 2003

**SESSION IV-B GPS AND GALILEO**

Chairman: Gary Dieter, Boeing

- 1600 – 1620 Paper 18: REAL-TIME TIME AND FREQUENCY TRANSFER USING GPS CARRIER PHASE OBSERVATIONS**  
C. Rieck, P. Jarlemark, K. Jaldehag, and J. Johansson,  
Swedish National Testing and Research Institute,  
Sweden
- 1620 – 1640 Paper 19: PERFORMANCE SUMMARY OF GPS TIMING SIGNALS**  
J. Oaks, K. Senior, and M. Largay, U.S. Naval Research Laboratory; W. Reid; SFA, Inc.; J. Buisson, AEI, Inc.
- 1640 – 1700 Paper 20: GALILEO TIME DISSEMINATION AND COMMON VIEW: HOW ACCURATE WILL IT BE?**  
A. Moudrak and J. Furthner, German Aerospace Center (DLR), Germany
- 1700 – 1720 Paper 21: GPS AND GALILEO: USER ISSUES, CONCERNS, AND EXPECTATIONS IN A MULTI-SYSTEM GNSS**  
R. Lewis, E. Ghasghai, G. Bitko, and M. Kennedy, The RAND Corporation
- 1800 - 1930 RECEPTION**

WEDNESDAY, DECEMBER 3, 2003

- 0800 – 0820 **INVITED PAPER: WAVELET ANALYSIS OF CLOCK NOISE**  
Don Percival, University of Washington

**SESSION V-A ALGORITHMS AND METHODS**  
Chairman: Charles Greenhall, Jet Propulsion Laboratory

- 0820 – 0840 **Paper 22: APPLICATION OF THE GSF-1 ALGORITHM TO THE NEAR-OPTIMAL TIMESCALE PREDICTION OF THE HYDROGEN MASER**  
L.-G. Bernier; METAS, Switzerland

- 0840 – 0900 **Paper 23: MTIE AND TDEV ANALYSIS OF UNEVENLY SPACED TIME SERIES DATA AND ITS APPLICATIONS TO TELECOMMUNICATIONS SYNCHRONIZATION MEASUREMENTS**  
M. Li and C.S. Liao, Chunghwa Telecom, Taiwan

- 0900 – 0920 **Paper 24: THE TRADE-OFF OF SPACE STATE AND FIR FILTERING ALGORITHMS IN GPS-BASED OPTIMAL CONTROL OF A LOCAL CLOCK**  
Y. Shmaliy, Ro. Olivera-Reyna, O. Ibarra-Manzano, and Re. Olivera-Reyna; Guanajuato University, Mexico

- 0920 – 0940 **Paper 25: APPROPRIATE USE OF THE MODIFIED ALLAN VARIANCE**  
J. Skinner, U.S. Naval Observatory; L. Schmidt, The RAND Corporation

- 0940 – 1000 **INTERMISSION**

**SESSION V-B ALGORITHMS AND METHODS**  
Chairman: Jim Skinner, U.S. Naval Observatory

- 1000 – 1020 **Paper 26: UNCERTAINTY OF STABILITY VARIANCES BASED ON FINITE DIFFERENCES**  
C. Greenhall, Jet Propulsion Laboratory; W. Riley, Symmetricom, Inc.

WEDNESDAY, DECEMBER 3, 2003

**SESSION V-B ALGORITHMS AND METHODS (CONTINUED)**

**1020 – 1040 Paper 27: A KALMAN FILTER CLOCK ALGORITHM FOR USE IN THE PRESENCE OF FLICKER FREQUENCY MODULATION NOISE**

J. Davis, P. Stacey, P. Harris and M. Cox, National Physical Laboratory, United Kingdom; C. Greenhall, Jet Propulsion Laboratory

**1040 – 1100 Paper 28: A PAPER CLOCK MODEL FOR CESIUM CLOCK ENSEMBLE OF TI**

S. Un and H. Peng, Chunghwa Telecom, Taiwan

**1100 – 1120 Paper 29: A NEW REALIZATION OF TERRESTRIAL TIME**

G. Petit, Bureau International des Poids et Mesures, France

**1120 – 1250 LUNCH**

**1250 – 1310 INVITED PAPER: LEAP SECONDS**

Ron Beard, U.S. Naval Research Laboratory

**SESSION VI WORKING GROUPS**

**Chairman: Joe White; U.S. Naval Research Laboratory**

**1310 – 1440 Group A: The Future of UTC**

Judah Levine, National Institute of Standards and Technology

**Group B: Future PTTI Needs**

Dennis McCarthy, U.S. Naval Observatory

**Group C: Calibration Issues**

Jay Oaks, U.S. Naval Research Laboratory

**1440 – 1500 INTERMISSION**

**WEDNESDAY, DECEMBER 3, 2003**

**SESSION VII    POSTER SESSION**

**1500 – 1700    Chairman: Ken Senior, U.S. Naval Research Laboratory**

**Poster 1: THE APL TIME AND FREQUENCY LABORATORY**

R. Dragonette and M. Miranian, Johns Hopkins University  
Applied Physics Laboratory

**Poster 2: TIME AND FREQUENCY ACTIVITIES AT THE  
CSIR – NATIONAL METROLOGY LABORATORY**

E. Marais, National Metrology Laboratory, South Africa

**Poster 3: TIME AND FREQUENCY ACTIVITIES AT THE U.S.  
NAVAL OBSERVATORY**

D. Matsakis, U.S. Naval Observatory

**Poster 4: METAS TIME AND FREQUENCY LABORATORY  
ACTIVITIES IN 2003**

L.-G. Bernier, G. Dudle, and C. Schlunegger, METAS,  
Switzerland

**Poster 5: THE NATIONAL TIME AND FREQUENCY  
SERVICE OF THE RUSSIAN FEDERATION**

V. Krutikov, Gosstandard of Russia; V. Kostromin and N.  
Koshelyaevsky, Institute of Metrology for Time and Space,  
Russia

**Poster 6: THE LITHUANIAN NATIONAL TIME AND  
FREQUENCY STANDARD**

R. Miskinis, Semiconductor Physics Institute, Lithuania

**Poster 7: INITIAL TESTING OF A NEW GPS RECEIVER,  
THE POLARX2, FOR TIME AND FREQUENCY TRANSFER  
USING DUAL FREQUENCY CODES AND CARRIER PHASE**

P. Defraigne, C. Bruyninx, and F. Roosbeek, Royal  
Observatory of Belgium, Belgium

**Poster 8: TIME AND FREQUENCY ACTIVITIES AT THE  
NATIONAL PHYSICAL LABORATORY**

J. Davis, P. Whibberley, R. Hlavac, and P. Stacey, National  
Physical Laboratory, United Kingdom

WEDNESDAY, DECEMBER 3, 2003

SESSION VII POSTER SESSION (CONTINUED)

**Poster 9: AN UPDATE ON PTB'S ACTIVITIES IN TIME  
AND FREQUENCY**

D. Piester, A. Bauch, J. Becker, and T. Polewka,  
Physikalisch-Technische Bundesanstalt, Germany

**Poster 10: COMPARING CODE DATA FROM  
CARRIER PHASE GPS RECEIVERS TO OTHER TIME  
TRANSFER METHODS AT THE U.S. NAVAL  
OBSERVATORY**

H. Chadsey, U.S. Naval Observatory

**Poster 11: EXTENDING THE TRACKING SCHEDULE  
OF A SINGLE-CHANNEL GPS TIMING RECEIVER**

J. Palacio, F. Galindo, and J. Lima, Real Instituto y  
Observatorio de la Armada, Spain

**Poster 12: ALGORITHM FOR PROCESSING  
MULTICHANNEL GPS OBSERVATIONS**

X. Lu, Chinese Academy of Sciences, Xi Dian University;  
H. Wu, Chinese Academy of Sciences, China

**Poster 13: TIME DOMAIN FREQUENCY STABILITY  
ESTIMATION BASED ON FFT MEASUREMENTS**

P. Chang, H. Pang, and S. Un, National Standard Time  
and Frequency Laboratory, Taiwan

**Poster 14: A NEW REALIZATION STRATEGY FOR  
UTC(PTB)**

Bauch, D. Piester, and E. Staliuniene, Physikalisch-  
Technische Bundesanstalt, Germany

**Poster 15: APPLICATION OF CONTROL THEORY IN  
THE FORMATION OF A TIMESCALE**

P. Koppang, D. Johns, and J. Skinner, U.S. Naval  
Observatory

1730 – 1830 JOINT EXECUTIVE AND ADVISORY BOARD MEETING

**THURSDAY, DECEMBER 4, 2003**

- 0800 – 0820 INVITED PAPER: ADVANCED CLOCKS FOR PTTI SYSTEMS**  
Joe White, U.S. Naval Research Laboratory
- SESSION VIII MEASUREMENT TECHNOLOGY**  
**Chairman: Henry Fliegel, The Aerospace Corporation**
- 0820 – 0840 Paper 30: HIGH PRECISION COUNTER USING DSP TECHNIQUE**  
S. Chen, H. Peng, and C. Liao, Chunghwa Telecom, Taiwan
- 0840 – 0900 Paper 31: PICOSECOND-ACCURACY DIGITAL-TO-TIME CONVERTER FOR PHASE-INTERPOLATION DDS**  
F. Baronti, D. Lunardini, R. Roncella, and R. Saletti, University of Pisa, Italy
- 0900 – 0920 Paper 32: A PC-BASED TIME INTERVAL COUNTER CARD WITH 200 PS RESOLUTION**  
J. Kalisz and R. Szplet, Military University of Technology, Poland
- SESSION IX TIMING SYSTEMS AND APPLICATIONS**  
**Chairman: Tom Clark, Syntomics LLC**
- 0920 – 0940 Paper 33: MASTER CLOCK AND TIME DISTRIBUTION SYSTEM FOR THE NASA DEEP SPACE NETWORK**  
J. Lauf, M. Calhoun, P. Kuhnle, R. Sydnor, and R. Tjoelker, Jet Propulsion Laboratory
- 0940 – 1000 Paper 34: LISA: THE LASER INTERFEROMETER SPACE ANTENNA**  
M. Tinto, Jet Propulsion Laboratory
- 1000 – 1020 Paper 35: THE STATE OF THE ART IN AMATEUR TIMEKEEPING**  
T. Van Baak, LeapSecond.com
- 1020 – 1040 INTERMISSION**
- SESSION X MILITARY SYSTEMS AND USERS**  
**Chairman: Bill Bollwerk, U.S. Naval Observatory**
- 1040 – 1100 Paper 36: THE ROLE OF PRECISE GPS TIME IN MILITARY MISSIONS**  
O. Wormser and R. Swider, Office of the Secretary of Defense

THURSDAY, DECEMBER 4, 2003

**SESSION X MILITARY SYSTEMS AND USERS (CONTINUED)**

- 1100 – 1120 Paper 37: GLOBAL POSITIONING SYSTEM (GPS) - MODERNIZATION PROGRAM STATUS AND IMPLICATIONS FOR THE PTTI USER**

Major C. Cronk, Major R. Pyles, and 1st LT M. Dennis,  
U.S. Air Force Joint Program Office; D. Latterman,  
Science Applications International Corporation

- 1120 – 1140 Paper 38: DISTRIBUTED COHERENT RF OPERATIONS**

J. Kosinski, U.S. Army

- 1140 – 1200 Paper 39: FLEET USE OF PRECISE TIME**

T. Myers, Commander Fleet Forces Command

- 1200 – 1330 LUNCH**

**SESSION XI-A ADVANCED CLOCKS**

Chairman: Robert Lutwak, Symmetricom

- 1330 – 1350 Paper 40: A ONE LITER ION CLOCK: A NEW CAPABILITY FOR SPACEFLIGHT APPLICATIONS**

J. Prestage, M. Beach, S. Chung, R. Hamell, T. Le, L. Maleki,  
and R. Tjoelker, Jet Propulsion Laboratory

- 1350 – 1410 Paper 41: INVESTIGATION OF THE RUBIDIUM CLOCK'S MULTI-MONTH EQUILIBRATION FOLLOWING INITIAL ACTIVATION**

S. Herbulock, C. Klimcak, A. Presser, and J. Camparo, The Aerospace Corporation

- 1410 – 1430 Paper 42: END RESONANCES FOR ATOMIC CLOCKS**

A. Post, Y.-Y. Jau, N. Kuzma, M. Romalis, E. Miron, and W. Happer, Princeton University; A. Braun; Sarnoff Corporation

- 1430 – 1450 Paper 43: USING LASER DIODE INSTABILITIES FOR CHIP-SCALE STABLE FREQUENCY REFERENCES**

T. Simpson and F. Doft, Jaycorntan; W. Golding, U.S. Naval Research Laboratory

- 1450 – 1510 INTERMISSION**

THURSDAY, DECEMBER 4, 2003

**SESSION XI-B ADVANCED CLOCKS**

**Chairman: Robert Tjoelker, Jet Propulsion Laboratory**

- 1510 – 1530 Paper 44: THE CHIP-SCALE ATOMIC CLOCK - RECENT DEVELOPMENT PROGRESS**  
D. Emmons, T. English, R. Lutwak, and W. Riley,  
Symmetricom; A. Duwel and M. Varghese, Charles Stark Draper Laboratory; D. Serkland and G. Peak, Sandia National Laboratory

- 1530 – 1550 Paper 45: PRELIMINARY RESULTS ON A CHIP-SCALE RUBIDIUM ATOMIC CLOCK**  
C. Lee, H. Guo, and A. Lai, Cornell University; T. McCleland, Frequency Electronics, Inc.; A. Pisano, University of California, Berkeley

- 1550 – 1610 Paper 46: A MINIATURE PHOTONIC CLOCK BASED ON RB VAPOR**  
D. Strekalov, A. Matsko, N. Yu, and L. Maleki, Jet Propulsion Laboratory

**SESSION XII WORKING GROUP REPORTS**  
**Chairman: Joe White; U.S. Naval Research Laboratory**

- 1610 – 1620 Group A: The Future of UTC**  
Judah Levine, National Institute of Standards and Technology

- 1620 – 1630 Group B: Future PTTI Needs**  
Dennis McCarthy, U.S. Naval Observatory

- 1630 – 1640 Group C: Calibration Issues**  
Jay Oaks, U.S. Naval Research Laboratory

- 1640 – 1700 GENERAL DISCUSSION**  
Joe White, U.S. Naval Research Laboratory

- 1700 CLOSE OF MEETING**

**HOTEL RESERVATION CARD**

**(Cutoff date for PTTI rate is October 31)**

Please mail in an appropriate envelope or FAX to:

**HILTON RESORT ON MISSION BAY  
(PTTI 2003 Meeting Room Block)  
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619-276-4010  
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