

## ADVANCE PROGRAM

### THIRTY-NINTH ANNUAL PRECISE TIME AND TIME INTERVAL (PTTI) SYSTEMS AND APPLICATIONS MEETING



November 26 – 29, 2007

39 Years of Progress  
1969 – 2007

Hyatt Regency Hotel  
Long Beach, California

## SCHEDULE

### Monday, November 26, 2007

0800-1300	Exhibition setup of booth for Exhibitors
0730-0830	Tutorials Breakfast
0830-1715	Tutorials
1300-1700	Exhibitor Set-up
1700-1830	Icebreaker-Exhibitor Area
1830-2100	Exhibitor Set-Up
1900-2100	Registration*

### Tuesday, November 27, 2007

0700-1600	Registration*
0700-0800	Speakers' Breakfast
0700-1600	Speakers' Room
0700-0800	Attendees' Breakfast
0800-1700	Technical Exhibits**
0800-0805	Opening
0805-0825	Distinguished PTTI Award Presentation
0825-0840	Invited Speaker
0840-0845	Call to Session
0845-1010	Session I – Satellite Navigation Systems
1010-1030	Intermission-Exhibits Area
1030-1150	Session II – Vendor Presentations
1150-1300	Lunch
1300-1440	Session III – Clocks in Space
1440-1500	Intermission-Exhibit Area
1500-1630	Session IV – Poster Session
1830-2000	Reception

### Wednesday, November 28, 2007

0700-1600	Registration*
0700-0800	Speakers' Breakfast
0700-1600	Speakers' Room
0700-0800	Attendees' Breakfast
0800-1700	Technical Exhibits**
0800-1000	Session V – Laboratory Reports and Activities
1000-1020	Intermission
1020-1200	Session VI – Satellite Time & Frequency Transfer (A)
1200-1400	Lunch
1400-1540	Session VII – Advanced Atomic Clocks
1540-1600	Intermission
1600-1700	Session VIII – Satellite Navigation Hardware
1730-1830	Joint Executive and Advisory Board Meeting

### Thursday, November 29, 2007

0700-1200	Registration*
0700-0800	Speakers' Breakfast
0700-1600	Speakers' Room
0700-0800	Attendees' Breakfast
0800-0940	Session IX – Algorithms & Statistics (A)
0940-1010	Intermission
1010-1150	Session X - Satellite Time & Frequency Transfer (B)
1150-1300	Lunch
1300-1440	Session XI – Critical PTTI Applications
1440-1500	Intermission
1500-1620	Session XII – Algorithms & Statistics (B)
1620-1640	General Discussion
1640	Close of Meeting

\*Registration is available each day.

\*\*Exhibits are open Tuesday and Wednesday only.

**TYPE, PRINT AND FAX (see numbers below)**

**PTTI 2007**  
**Hyatt Regency, Long Beach, California**  
**November 26 – 29, 2007**

NAME: \_\_\_\_\_  
First \_\_\_\_\_ Last \_\_\_\_\_  
AGENCY: \_\_\_\_\_ Company or Organization \_\_\_\_\_  
ADDRESS: \_\_\_\_\_ Street \_\_\_\_\_  
\_\_\_\_\_ City, State, and Country \_\_\_\_\_  
TELEPHONE: \_\_\_\_\_ FAX: \_\_\_\_\_  
E-MAIL: \_\_\_\_\_  
 Speaker     Session Chairman     Exhibitor

**Full Registration fee - \$475; \$425, if postmarked on or before October 26, 2007.**  
Includes entry to the sessions and exhibit hall, the Tuesday and Wednesday luncheons, the Monday evening Ice Breaker, the Tuesday evening Welcoming Reception and one copy of the Proceedings.

Student/Retiree registration fee - \$50. The attendee must be fully retired or a full-time student to qualify for the reduced registration fee. Includes entry to the sessions and exhibit hall only.

Registration Fee                          \$ \_\_\_\_\_  
 Tutorials Registration (\$250)                  \$ \_\_\_\_\_  
 Extra Reception Tickets (\$30 each) No. \_\_\_\_\_ \$ \_\_\_\_\_  
 Extra Lunch Tickets (\$25 each)      No. \_\_\_\_\_ \$ \_\_\_\_\_  
 Extra Proceedings (\$150.00)                 No. \_\_\_\_\_ \$ \_\_\_\_\_  
**TOTAL AMOUNT DUE**                          \$ \_\_\_\_\_

Check Enclosed                           Will pay on-site (fax to 202-767-2845)  
 Mark here if purchasing Proceedings only and not attending conference.

**For Payment by Credit Card, fill out this form and fax it to 949-361-0312**  
The charge will appear on your statement as **Geil Marketing Associates, Inc.**

MasterCard     Visa

Name on card \_\_\_\_\_

CC Number \_\_\_\_\_

Expiration Date \_\_\_\_\_

CCV \_\_\_\_\_ (located on the back of card)

Make checks payable to **Treasurer, PTTI**. If paying in advance, mail the payment and a copy of this registration card to: **Sachs Freeman Associates, Inc., c/o Mrs. Sheila Faulkner, 3159 Patrick Henry Drive, Falls Church, VA 22044, USA**. Checks must be received no later than **November 12**.

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

Questions?

Contact Ms. Jardine at 202-767-2595, DSN 297-2595, or [nikki.jardine@nrl.navy.mi](mailto:nikki.jardine@nrl.navy.mi)

## ADVANCE PROGRAM

### THIRTY-NINTH 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  
Defense Information Systems Agency  
U.S. Coast Guard Navigation Center

November 26 – 29, 2007



Hyatt Regency Hotel  
Long Beach, California

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## 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:

- PTTI Vendor Presentations
- Time and Frequency Standards Laboratories: Activities and Updates
- Time & Frequency Transfer
- Advanced Clocks
- Measurement Technology
- Algorithms & Methods
- Timing Systems & Applications
- Military Applications
- Clock Modeling and Simulation
- Satellite Navigation (e.g., GPS, GLONASS, and Galileo)
- Student Poster Competition

## WELCOME TO PTTI 2007

### Registration

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

If you are unable to register online, please fill out the attached Registration Card and send it to Ms. Nikki Jardine via fax (202-767-2845) or email ([nikki.jardine@nrl.navy.mil](mailto:nikki.jardine@nrl.navy.mil)).

Please make checks payable to **Treasurer, PTTI**. If paying in advance, mail the payment and a copy of the registration card to:

Sachs Freeman Associates, Inc.  
c/o Mrs. Sheila Faulkner  
3159 Patrick Henry Drive  
Falls Church, VA 22044  
USA

Checks must be received **no later than November 12**.

**PTTI now accepts credit cards—MasterCard and Visa only.** All credit card payments must be faxed to **949-361-0312**. If you are registering online, please fill out, print and fax the linked PDF form. The resulting charge will appear on your statement as **Geil Marketing Associates, Inc.**

**The full registration fee is \$475. Note: If payment is received postmarked on or before October 26, 2007, the fee is \$425.** Full registration includes entry to the sessions and exhibit hall, the Tuesday and Wednesday luncheons, the Monday evening Ice Breaker, the Tuesday evening Welcoming Reception and one copy of the Proceedings. **Please remember to take advantage of the reduced early registration fee. Payment must be postmarked on or before October 26, 2007.**

The registration fee for students and full-time retirees is \$50 and includes entry to the scientific sessions and exhibit area only.

Tickets for the luncheons (\$25 each) and the reception (\$30 each) can be purchased at the PTTI Registration Desk. Extra copies of the Proceedings are also available for purchase.

The tutorials will be held **Monday, November 26**. The registration fee is \$250 and includes breakfast, lunch and a copy of the presentations.

All attendees, including presenters and exhibitors, must register and receive a badge. The badge must be worn for admission to all sessions and functions and is not transferable.

The exhibit area is open to everyone; visitor badges can be picked up at the registration desk.

If you have special dietary or physical requirements, please contact Mrs. Faulkner at 703-532-6411, FAX 703-532-6338 or [bopenyan@aol.com](mailto:bopenyan@aol.com).

### Cancellation policy

All requests for cancellation must be received in writing before October 26, 2007. On or after October 26, there is a \$225 cancellation fee. Refunds are not given for "no shows"; however, substitutions are allowed.

### PTTI on the Web

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

## Registration Desk Hours

The registration desk will be open during the following hours:

Monday, November 26, 1900 – 2100  
Tuesday, November 27, 0700 – 1600  
Wednesday, November 28, 0700 – 1600  
Thursday, November 29, 0700 – 1200

## PTTI 2007 Tutorials

Tutorials take place prior to PTTI 2007 on Monday, November 26, 2007. For information regarding the tutorials, please contact Rachel Evans, rachel.gross@jhuapl.edu.

The fee for the all-day tutorials is \$250. Breakfast, lunch and a copy of the Tutorials presentations are included. Please register using the attached Registration Card or online at the PTTI website.

0730-0830 Breakfast  
0830-0930 **Statistical and Mathematical Tools for Atomic Clocks** – Patrizia Tavella, INRIM  
0930-1030 **Time Scales** – Edoardo Detoma, SEPA  
1030-1045 Break  
1045-1145 **Satellite Time and Frequency Transfer** – Ron Beard, NRL  
1145-1300 Lunch  
1300-1400 **GNSS** – Ed Powers, USNO  
1400-1500 **Advanced Clocks** – Robert Lutwak, Symmetricom  
1500-1515 Break  
1515-1615 **Traceability / Cesium Care and Feeding** – Raimond Melkers, L-3 Titan  
1615-1715 **IEEE-1588 Standard** – John Eidson, Agilent Technologies

## Questions

Please contact the following people for information on matters concerning:

Technical questions: Joe White  
202-767-5111  
joe.white@nrl.navy.mil

Exhibits: Gary Geil  
949-361-0212  
gary@gmainc.cc

Don Mitchell  
928-474-1088  
don@gmainc.cc

General: Sheila Faulkner  
703-532-6411, Cell: 703-244-6346  
bopenyan@aol.com

Registration: Nikki Jardine  
202-767-2595  
nikki.jardine@nrl.navy.mil

## Hotel Reservations

Mail or FAX the hotel reservation card (located at the back of the book) to:

**Hyatt Regency Long Beach**  
**(PTTI 2007 Room Block)**  
**200 South Pine Avenue,**  
**Long Beach, California 90802**  
**562-491-1234, Fax: 562-983-1491**

When making your reservations, be sure to mention PTTI 2007 to receive the group sleeping room rate. The PTTI rate is available November 24 – 29, 2007. Check-in time is 1500 (3:00 PM) and checkout time is Noon. Rooms will only be held if guaranteed with a credit card. The block of reserved rooms will be released **October 29**, so reserve early.

**There are no rooms available after November 29 due to a major event in Long Beach.** If you leave before your scheduled departure date without informing the Hyatt, you will be charged an early departure fee. Long Beach offers a wide range of restaurants and shops.

The sleeping room rate is the government per diem rate of \$118 single occupancy. There is a \$25 per person charge that will be added with each additional occupant in the room.

## Messages

Messages may be left for PTTI attendees through the hotel's telephone number:  
**562-491-1234.**

## Temperature

The climate during November in the Long Beach area is sunny and warm, though a light jacket may be needed for the evenings.

## Transportation Information

### Rental Car

Avis is the official rent-a-car company for PTTI 2007. Call 800-331-1600 to book your reservation; be sure to mention the Avis Worldwide Discount (AWD) Number which is J628451.

### Airport Shuttle

**Los Angeles Airport:** Super Shuttle runs 24 hours a day. Reservations are not needed or taken. Vans are located outside on the lower level of the baggage claim area. Cross over to the center island and look for the orange sign. Shuttles pick up approximately every 10 minutes. A Super Shuttle attendant will be available to assist passengers. Cost is \$17 per person.

**Long Beach Airport:** Super Shuttle is available with advance reservations only. Please call 310-782-6600 or 800-BLUE-VAN for information and rates.

**Orange County Airport (John Wayne Airport):** Super Shuttle is available at the transportation center across the street. Look for the third Island marked Van Shuttle Service. Reservations are suggested, but not required. The cost is \$34 each way for one person and \$9 each way for each additional person. Please call 714-517-6600 or 800-862-7771 for reservations.

## Parking

Hyatt Regency Long Beach offers valet parking for \$16.00 per night and self parking for \$12.00 per night. All parking includes in and out privileges. Please note, maximum clearance height is 6'6". Parking for taller vehicles, RVs and vans is available one block away. Please contact the hotel for additional information.

## Directions

### From 405 South and Los Angeles International Airport (approximately 22 miles):

Take the San Diego Freeway (405) South to the Long Beach Freeway (710) South toward Long Beach. At the Freeway split, take the LEFT LANES for Downtown Long Beach/ Convention Center. Stay on Shoreline Drive (DO NOT TAKE Broadway/Civic Center/Pine Avenue exit), and follow the signs to Aquarium/Convention Center/ Pine Avenue. TURN LEFT on Pine Avenue (4th stop light). The hotel is on the corner of Shoreline Drive and Pine Avenue.

### From 405 North, John Wayne Airport / Orange County (approximately 24 miles) and Long Beach Airport (approximately 6 miles):

Take the San Diego Freeway (405) North to the Long Beach Freeway (710) South toward Long Beach. At the Freeway split, take the LEFT LANES for Downtown Long Beach/ Convention Center. Stay on Shoreline Drive (DO NOT TAKE Broadway/Civic Center/Pine Avenue exit), and follow the signs to Aquarium/Convention Center/ Pine Avenue. TURN LEFT on Pine Avenue (4th stop light). The hotel is on the corner of Shoreline Drive and Pine Avenue.



## Speakers' Breakfast

The author giving the oral presentation must attend the **Speakers' Breakfast** on the morning of the presentation. Please ask at the PTTI Registration Desk for the location. The Speakers' Breakfast will be held from 0700-0800 on Tuesday, Wednesday and Thursday. The purpose of this breakfast is to allow the Session Chairs to meet each of the presenters and coordinate any last minute details. This is also the time when the audio-visual equipment and the timing lights will be demonstrated. The Speakers' Breakfast is a mandatory event for each author responsible for a scheduled paper that day. If you are not in attendance, the Session Chairs will not know if you are prepared to present and may be forced to cancel your presentation.

## Presented Papers

Presenters must send their presentations in PowerPoint 2003 format (versions XP or 2000 accepted) to [webmaster@ptimeeting.org](mailto:webmaster@ptimeeting.org) by November 16. In the event this deadline cannot be met, you must hand-deliver a CD-ROM or flash drive containing the presentation to CWO David Holder by 1800 the day before the presentation.

Please provide a Microsoft Word electronic version of your paper (e-mail, CD-ROM), formatted according to the PTTI Paper Preparation Instructions included in the Author's Kit, to Dr. Lee Breakiron, Editorial Chairman ([lee.breakiron@usno.navy.mil](mailto:lee.breakiron@usno.navy.mil)) by **November 29**. If prior arrangements have not been made, the paper will not be published in the Proceedings. The PTTI Author's Kit is available on the Web at:

[http://tycho.usno.navy.mil/ptti/author\\_kit.pdf](http://tycho.usno.navy.mil/ptti/author_kit.pdf)

## Exhibit Information

The exhibit area is adjacent to the general session. For exhibit information, please contact:

Gary Geil or Don Mitchell  
Geil Marketing Associates, Inc.  
1064 Calle Negocio, Suite D  
San Clemente, CA 92673  
949-361-0212, FAX 949-361-0312  
[gary@gmainc.cc](mailto:gary@gmainc.cc) or [don@gmainc.cc](mailto:don@gmainc.cc)

## List of Potential Exhibitors for PTTI 2007

Astrogeodynamical Observatory	Pendulum Instruments
Brandywine Communications	Precise Time and Frequency, Inc.
EndRun Technologies	Quartzlock
Frequency Electronics, Inc.	SpectraDynamics, Inc.
FEI/ZYFER	Symmetricom Timing Test and Measurements
Furuno GPS OEM	Synergy Systems, LLC
Inside GNSS	Spectracom Corporation
GPS World/Questex Media	Spectratime
ITT Aerospace/Communications	TimeTech GmbH
JTime! Meinberg USA	TRAK Microwave Corporation
Lange-Electronic GmbH	Trimble Navigation
Locus	U.S. Naval Observatory
Military University of Technology	
NavTech GPS Supply	

## **Student Poster Competition**

At this year's PTTI, we will be inaugurating the PTTI Student Poster competition. Our goal is get students thinking early in their careers about the engineering and scientific applications of precise timing (in the broadest sense), and in that way maintain the vitality of our field in the 21st century. The competition also offers an opportunity for students to meet future employers, and for employers to get a better sense of what skills young engineers and scientists are bringing to the marketplace.

The competition has an undergraduate and graduate division, and students may submit abstracts in any area dealing with "precise" timekeeping systems or applications. In light of the competition's goal, there is a wide range of topics that students might address (i.e., biological to geophysical to astronomical). Consequently, the specific meaning of the word "precise" is taken in context. Students may submit abstracts for posters dealing with literature reviews, laboratory work, or computational investigations.

## **PTTI 2007 Evening Activities**

On Monday, November 26, 1700, the Icebreaker, a "Get Acquainted" function, will be held in the Exhibits Hall. Refreshments will be served.

The Welcoming reception and presentation of the awards for the Student Poster Competition will be held Tuesday, November 27, 1830.

## **Proceedings**

The Proceedings, on a CD in Adobe Acrobat (PDF) format, will be mailed to the attendees in 2008. If you cannot attend, but wish to reserve a copy of the Proceedings, please return the Registration Card with a check for \$150 made out to **Treasurer, PTTI**. Please note on the 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 \$150.

## **Fortieth Annual PTTI Meeting**

The Fortieth Annual PTTI Systems and Applications Meeting (PTTI 2008) will be held December 1 – 4, 2008 at the Hyatt Regency Hotel, Reston, Virginia.

## **PTTI EXECUTIVE COMMITTEE**

**DR. JOSEPH D. WHITE, CHAIRMAN**  
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Defense Information Systems Agency

**MR. RONALD L. BEARD**  
U.S. Naval Research Laboratory

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**DR. LEE A. BREAKIRON**  
U.S. Naval Observatory

**MR. RICHARD CAMP**  
Defense Information Systems Agency

**LT DAVID A. HOLDER**  
U.S. Coast Guard Navigation Center

**LT KENNETH B. HYDOCK**  
U.S. Coast Guard Navigation Center

**DR. DENNIS D. MCCARTHY**  
U.S. Naval Observatory

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NASA Jet Propulsion Laboratory

**MR. GEORGE SHATON**  
Department of Defense

**MS. FRANCINE M. VANNICOLA**  
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## 2007 DISTINGUISHED PTTI SERVICE AWARD

### SELECTION COMMITTEE

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U.S. Naval Observatory

### MR. DON H. MITCHELL

Geil Marketing Associates

### DR. LARA SCHMIDT

RAND Corporation

### DR. JACQUES VANIER

University of Montreal

## RECIPIENTS OF THE DISTINGUISHED PTTI SERVICE AWARD

1994

DR. GERNOT M. R. WINKLER  
U.S. Naval Observatory (Retired)

2000

MR. ROGER EASTON  
U.S. Naval Research Laboratory (Retired)

1995

DR. JAMES A. BARNES  
National Institute of Standards and  
Technology (Retired)

2001

DR. ROBERT F. C. VESSOT  
Smithsonian Astrophysical Observatory  
(Retired)

1996

PROFESSOR SIGFRIDO M. LESCHIUTTA  
Politecnico di Torino and  
Istituto Elettrotecnico Nazionale Galileo  
Ferraris

2002

MR. HARRY PETERS  
Sigma Tau, Incorporated (Retired)

1997

PROFESSOR BERNARD RENE GUINOT  
Honorary Astronomer  
Paris Observatory

2003

MR. S. CLARK WARDRIP  
National Aeronautics and Space  
Administration (Retired)

1998

DR. JACQUES VANIER  
National Research Counsel (Retired)

2005

DR. NORMAN F. RAMSEY  
Harvard University

1999

DR. LEONARD S. CUTLER  
Agilent Technologies

2006

PROFESSOR DAVID L. MILLS  
University of Delaware

## **PTTI 2007 MEETING OFFICERS**

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**MR. KIRK W. MONTGOMERY**  
Symmetricom

**TECHNICAL PROGRAM COMMITTEE CHAIRMAN**  
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The Aerospace Corporation

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U.S. Naval Observatory

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**TECHNICAL ASSISTANCE**  
**LT DAVID A. HOLDER**  
U.S. Coast Guard Navigation Center

**MEETING ARRANGEMENTS**  
**MRS. SHEILA FAULKNER**  
Sachs Freeman Associates, Inc.

**REGISTRATION**  
**MS. NICOLETTE JARDINE**  
U.S. Naval Research Laboratory

## **PTTI 2007 SESSION CHAIRS**

**SESSION I – Satellite Navigation Systems**  
**EDOARDO DETOMA**  
SEPA S.p.A

**SESSION II – Vendor Presentations**  
**JEFFREY W. MCDONALD**  
JTime! MEINBERG USA

**SESSION III – Clocks in Space**  
**PATRIZIA TAVELLA**  
Istituto Nazionale di Ricerca Metrologica (INRiM)

**SESSION IV – Poster Session**  
**RAIMOND MELKERS**  
L3/Titan Corporation

**SESSION V – Laboratory Reports and Activities**  
**MIHRAN MIRANIAN**  
JHU Applied Physics Laboratory

**SESSION VI – Satellite Time & Frequency Transfer (A)**  
**ROBERT TJOELKER**  
Jet Propulsion Laboratory

**SESSION VII – Advanced Atomic Clocks**  
**ROBERT LUTWAK**  
Symmetricom

**SESSION VIII – Satellite Navigation Hardware**  
**WARREN WALLS**  
U.S. Naval Observatory

**SESSION IX – Algorithms & Statistics (A)**  
**GEORGE SHATON**  
Department of Defense

**SESSION X – Satellite Time & Frequency Transfer (B)**  
**S. CLARK WARDRIP**  
Sachs Freeman Associates, Inc.

**SESSION XI – Critical PTTI Applications**  
**LEO MALLETT**  
Boeing

**SESSION XII – Algorithms & Statistics (B)**  
**DEMETRIOS MATSAKIS**  
U.S. Naval Observatory

**PTTI 2007**  
**THIRTY-NINTH ANNUAL**  
**PRECISE TIME AND TIME INTERVAL (PTTI)**  
**SYSTEMS AND APPLICATIONS MEETING**

**TUESDAY, NOVEMBER 27, 2007**

0800 – 0805	<b>OPENING</b> Kirk Montgomery, <i>Symmetricom</i>
0805 – 0825	<b>DISTINGUISHED PTTI SERVICE AWARD</b> Presented by Joe White, <i>U.S. Naval Research Laboratory</i>
0825 – 0840	<b>OPENING REMARKS</b> CAPT Steve Warren, <i>U.S. Naval Observatory</i>
0840 – 0845	<b>CALL TO SESSION</b> James Campano, <i>The Aerospace Corporation</i>
<b>SESSION I</b>	<b>SATELLITE NAVIGATION SYSTEMS</b> <b>Chairman:</b> Edoardo Detoma, <i>SEPA S.P.A</i>
0845 – 0910	<b>Paper 1: TECHNICAL STATUS OF THE GALILEO SYSTEM DEVELOPMENT</b> Jörg H. Hahn, <i>European Space Agency/ESTEC, Noordwijk, The Netherlands</i>
0910 – 0930	<b>Paper 2: GGTO EXPERIMENTATION IN THE GIOVE MISSION</b> Ricardo Píriz, <i>GMV S.A., Madrid, Spain</i> ; Patrizia Tavella, <i>INRIM, Torino, Italy</i> ; Jörg H. Hahn, <i>European Space Agency/ESTEC, Noordwijk, The Netherlands</i>
0930 – 0950	<b>Paper 3: COMPASS TIME AND THE PROSPECT OF ITS COORDINATION WITH OTHER GNSSS</b> S. Dong and X. Li, <i>Chinese Academy of Sciences, Lintong, Xi'an, China</i>
0950 – 1010	<b>Paper 4: CRITICAL POINTS AND TECHNICAL APPROACH IN THE E-OSPF TIME SYNCHRONIZATION AND PREDICTION ACTIVITIES</b> María D. Laínez Samper, Pedro F. Navarro Madrid and Miguel M. Romay Merino
1010 – 1030	<b>INTERMISSION</b>
<b>SESSION II</b>	<b>VENDOR PRESENTATIONS</b> <b>Chairman:</b> Jeffrey W. McDonald, <i>Jtime! MEINBERG USA</i>
1150 – 1300	<b>LUNCH</b>
<b>SESSION III</b>	<b>CLOCKS IN SPACE</b> <b>Chairman:</b> Patrizia Tavella, <i>INRIM</i>
1300 – 1320	<b>Paper 5: ATOMIC AND QUARTZ CLOCK HARDWARE FOR SPACE APPLICATIONS</b> Leo A. Mallette, <i>The Boeing Company</i>

**TUESDAY, NOVEMBER 27, 2007**

**SESSION III CLOCKS IN SPACE (cont.)**

1320 – 1340	<b>Paper 6 LONG TERM CLOCK BEHAVIOR OF GPS IIR SATELLITES</b> Dr. Marvin Epstein, Todd Dass, Dr. John Rajan and Paul Gilmour, <i>ITT Corporation</i>
1340 – 1400	<b>Paper 7: THE IN-FLIGHT FREQUENCY BEHAVIOR OF TWO ULTRA-STABLE OSCILLATORS ON-BOARD THE NEW HORIZONS SPACECRAFT</b> Robert Jensen and Gregory Weaver, <i>JHU/Applied Physics Laboratory</i>
1400 – 1420	<b>Paper 8: ONBOARD ATOMIC CLOCKS FOR GLONASS: CURRENT STATUS AND FUTURE PLANS (GLONASS MODERNIZATION, QZSS &amp; OTHER GNSS)</b> Arkady Bashevich, Boris Shebshaevich, Arkady Tyulakov and Vadim Zholnerov, <i>The Russian Institute of Radionavigation and Time, St. Petersburg, Russia</i>
1420 – 1440	<b>Paper 9: GIOVE-A APPARENT CLOCK ASSESSMENT AND RESULTS</b> Jörg H. Hahn, Francisco Gonzales, Waller and Daniel Navarro-Reyes, <i>European Space Agency/ESTEC, Noordwijk, The Netherlands</i> ; Ricardo Píriz and Virginia Fernandez, <i>GMV S.A., Madrid, Spain</i> ; Patricia Tavella and Ilaria Sesia, <i>INRIM, Torino, Italy</i>
1440 – 1500	<b>INTERMISSION</b>
<b>SESSION IV</b>	<b>POSTER SESSION</b> <b>Chairman:</b> Raimond Melkers, <i>L3/Titan Corporation</i>
1500 – 1630	<b>Poster 1: THE APPLICATION OF HYDROGEN MASERS TO THE CALCULATION OF LOCAL ATOMIC TIME AT NTSC</b> Yuan Haibo, Wang Zhengming and Dong Shaowu, <i>Chinese Academy of Sciences, Lintong, Xi'an, China</i>
	<b>Poster 2: A SIMPLIFIED OPTICAL SYSTEM FOR ATOMIC FOUNTAINS (student paper)</b> Paul Kunz, T. P. Heavner and S. R. Jefferts, <i>National Institute of Science and Technology</i>
	<b>Poster 3: DEVELOPMENT OF A CONVENTIONAL LASER-PUMPED ATOMIC CLOCK: STATUS REPORT (student paper)</b> Carlos Back, <i>Whittier College</i> ; James Campano, <i>The Aerospace Corporation</i>
	<b>Poster 4: SIMPLE MICROWAVE OSCILLATOR USING AIR DIELECTRIC RESONATOR (student paper)</b> Jason R. Knudson and David A. Howe, <i>National Institute of Science and Technology</i>

TUESDAY, NOVEMBER 27, 2007

**SESSION IV POSTER SESSION (cont.)**

**Poster 5: EFFECTS OF VCSEL POLARIZATION FLUCTUATIONS IN CPT-BASED ATOMIC CLOCKS**  
(student paper)

Michael Huang, *University of Southern California*; John Coffer and James Camparo, *The Aerospace Corporation*

**Poster 6: PROSPECTS FOR ULTRA LONG-TERM STABILITY IN MULTI-POLE TRAPPED ION FREQUENCY STANDARDS WITH SEALED-VACUUM OPERATION**

E. A. Burt and R. L. Tjoelker, *Jet Propulsion Laboratory*

**Poster 7: INFLUENCE OF THE ATMOSPHERE ON A RB CLOCK'S FREQUENCY AGING**

Charles Klimcak and James Camparo, *The Aerospace Corporation*

**Poster 8: ENHANCEMENTS TO TIME.GOV: THE NATIONAL WEB CLOCK FOR THE UNITED STATES**

Andrew N. Novick, *National Institute of Standards and Technology*

**Poster 9: SIMULATION OF PHASE LOCKED CLOCKS USING VERILOG**

Jeffrey Meyer, *Symmetricom*

**Poster 10: A 50 PS TIME INTERVAL COUNTER WITH PCI INTERFACE**

R. Szplet, J. Kalisz, Z. Jachna, K. Rózyc, *Military University of Technology, Warsaw, Poland*

**Poster 11: GLONASS STATUS UPDATE**

Dvorkin Viacheslav, Karutin Sergey, Urlichich Yury, and Stupak Grigory, *Federal Space Agency, Moscow, Russia*

**Poster 12: A SUMMARY OF THE GPS CONSTELLATION CLOCK PERFORMANCE**

Jay Oaks, *U.S. Naval Research Laboratory*; James A. Buisson, *AEI*; Marie M. Largay, *SFA, Inc.*

**1830 – 2000 RECEPTION AND STUDENT POSTER COMPETITION AWARD PRESENTATION**

WEDNESDAY, NOVEMBER 28, 2007

**SESSION V LABORATORY REPORTS AND ACTIVITIES**

**Chairman:** Mihran Miranian, *JHU Applied Physics Laboratory*

**0800 – 0815 Paper 10: BIPM REPORT ON TAI/UTC COMPUTATION**

E. F. Arias, W. Lewandowski, Z. Jiang, *Bureau International des Poids et Mesures, Sèvres Cedex, France*

**0815 – 0830 Paper 11: TIMING ACTIVITIES AT INRIM**

Patrizia Tavella, *INRIM, Torino, Italy*

**0830 – 0845 Paper 12: A SYSTEMS LEVEL ANALYSIS OF THE APL TIME AND FREQUENCY LABORATORY**

Mihran Miranian, Gregory L. Weaver, Matthew J. Reinhart and Richard Dragonette, *JHU/Applied Physics Laboratory*

**0845 – 0900 Paper 13: TIME AND FREQUENCY ACTIVITIES AT THE LITHUANIAN NATIONAL TIME STANDARD LABORATORY**

Rimantas Miškinis, *Semiconductor Physics Institute, Vilnius, Lithuania*

**0900 – 0915 Paper 14: TIME AND FREQUENCY ACTIVITIES AT THE NASA JET PROPULSION LABORATORY**

R. L. Tjoelker, *Jet Propulsion Laboratory*

**0915 – 0930 Paper 15: TIMING ACTIVITIES AT NRL**

Ronald Beard, Jay Oaks, Ken Senior and Joe White, *Naval Research Laboratory*

**0930 – 0945 Paper 16: TIME AND FREQUENCY ACTIVITIES AT THE U.S. NAVAL OBSERVATORY**

Demetrios Matsakis, *U.S. Naval Observatory*

**0945 – 1000 Paper 17: TIMEKEEPING-RELATED ACTIVITIES AT THE AEROSPACE CORPORATION**

Bernardo Jadusliwer, *The Aerospace Corporation*

**1000 – 1020 INTERMISSION**

**SESSION VI SATELLITE TIME & FREQUENCY TRANSFER (A)**

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

**1020 – 1040 Paper 18: REVIEW OF LONG TERM ACCURACIES AND STABILITIES OF UTC(USNO) DELIVERED BY THE GLOBAL POSITIONING SYSTEM**

Francine Vannicola and Edward Powers, *U.S. Naval Observatory*

**1040 – 1100 Paper 19: COMBINATION OF GPS PPP AND TWO WAY TIME TRANSFERS FOR TAI COMPUTATION**

Z. Jiang and G. Petit, *Bureau International des Poids et Mesures (BIPM), Sevres Cedex, France*

**WEDNESDAY, NOVEMBER 28, 2007****SESSION VI SATELLITE TIME & FREQUENCY TRANSFER (A)  
(cont.)**

- 1100 – 1120 **Paper 20:** STANDARD TIME AND FREQUENCY DISSEMINATION VIA EGYPTIAN DIGITAL SATELLITE  
John Lowe and Jason Heidecker, *National Institute of Standards and Technology*; Safaa Samuel and Ahmed Hisham, *National Institute for Standards, Cairo, Egypt*; Mohamed A. Swidan, *The Egyptian Satellite Co. Nilesat, 6th October City, Egypt*
- 1120 – 1140 **Paper 21:** STUDIES ON INSTABILITIES IN LONG-BASELINE TWO-WAY SATELLITE TIME AND FREQUENCY TRANSFER  
D. Piester and A. Bauch, *Physikalisch-Technische Bundesanstalt, Braunschweig, Germany*; M. Fujieda, T. Gotoh, M. Aida, H. Maeno and M. Hosokawa, *National Institute for Information and Communications Technology, Tokyo, Japan*; S. Yang, *Korea Research Institute of Standards and Science, Daejon, Korea*
- 1140 – 1200 **Paper 22:** AN EVALUATION OF GLONASS P3 TIME TRANSFER  
A. Foks, J. Nawrocki and P. Nogaś, *Astrogeodynamical Observatory, Space Research Center, Borowiec, Poland*; W. Lewandowski, *Bureau International des Poids et Mesures, Sèvres Cedex, France*
- 1200 – 1400 **LUNCH**
- SESSION VII ADVANCED ATOMIC CLOCKS**  
**Chairman:** Robert Lutwak, *Symmetricom*
- 1400 – 1420 **Paper 23:** TOWARDS DEMONSTRATION OF MOT-BASED CONTINUOUS COLD CS-BEAM ATOMIC CLOCK  
H. Wang, J. C. Camparo and G. Iyanu, *The Aerospace Corporation*
- 1420 – 1440 **Paper 24:** RF-INTERROGATED END-STATE CHIP-SCALE ATOMIC CLOCK  
A. M. Braun, T. J. Davis, M. H. Kwakernaak, J. J. Michalchuk, A. Ulmer, W. K. Chan, J. H. Abeles and Z. A. Shellenbarger, *Sarnoff Corporation*; Y-Y. Jau, F. Gong and W. Happer, *Princeton University*; T. McClelland, H. Fruehauf, R. Drap, W. Weidemann and M. Variakojis, *Frequency Electronics, Inc.*
- 1440 – 1500 **Paper 25:**  $10^{-15}$  STABLE ION CLOCK FOR DEEP SPACE AND EARTH ORBIT APPLICATIONS  
John D. Prestage, Sang Chung, Lawrence Lim, Thanh Le and Meirong Tu, *Jet Propulsion Laboratory*

**WEDNESDAY, NOVEMBER 28, 2007****SESSION VII ADVANCED ATOMIC CLOCKS (cont.)**

- 1500 – 1520 **Paper 26:** SINGLE  $\text{Ca}^+$  ION TRAPPING AND QUADRUPOLE TRANSITION MEASUREMENTS TOWARDS OPTICAL FREQUENCY STANDARD  
Kensuke Matsubara, Ying Li, Hiroyuki Ito, Shigeo Nagano, Kazuhiro Hayasaka, and Mizuhiko Hosokawa, *National Institute of Information and Communications Technology, Tokyo, Japan*
- 1520 – 1540 **Paper 27:** THE MINIATURE ATOMIC CLOCK - PROTOTYPE EVALUATION  
R. Lutwak and A. Rashed, *Symmetricom*; M. Varghese, G. Tepolt, J. LeBlanc, and M. Mescher, *Charles Stark Draper Laboratory*; D. K. Serkland, K. M. Geib, and G. M. Peake, *Sandia National Laboratory*
- 1540 – 1600 **INTERMISSION**
- SESSION VIII SATELLITE NAVIGATION HARDWARE**  
**Chairman:** Warren Walls, *U.S. Naval Observatory*
- 1600 – 1620 **Paper 28:** ABSOLUTE CALIBRATION OF TIME RECEIVERS WITH DLR'S GPS/GALILEO HW SIMULATOR  
U. Grunert, S. Thörl, H. Denks and J. Furthner, *German Aerospace Centre (DLR), Oberpfaffenhofen, Germany*
- 1620 – 1640 **Paper 29:** ABSOLUTE CALIBRATION OF GEODESIC RECEIVERS: BEHAVIOR OF ELECTRICAL DELAY AND ITS ACCURACY VS. TIME & TEMPERATURE  
A. Proia, G. Cibiel, A. de Latour, J. Dantepal and J-F. Dutrey, *Centre National d'Etudes Spatiales (CNES)*
- 1640 – 1700 **Paper 30:** EVALUATION OF CARRIER PHASE GNSS TIMING RECEIVERS FOR TAI APPLICATIONS  
Blair Fonville, Edward Powers and Francine Vannicola, *U.S. Naval Observatory*
- 1700 – 1720 **Paper 31:** EXPERIMENTS IN PRECISION COMMON TIME FOR MOBILE PLATFORMS  
John B. Lundberg and James P. Cunningham, *Naval Surface Warfare Center Dahlgren*
- 1730 – 1830 **JOINT EXECUTIVE AND ADVISORY BOARD MEETING**

**THURSDAY, NOVEMBER 29, 2007****SESSION IX ALGORITHMS & STATISTICS (A)**Chairman: George Shaton, *Department Of Defense*

- 0800 – 0820 **Paper 32:** EVALUATION OF THE GPS BLOCK IIR TIME KEEPING SYSTEM (TKS) FOR INTEGRITY MONITORING

Andy Wu, *The Aerospace Corporation*

- 0820 – 0840 **Paper 33:** AN OSCILLATOR MODEL FOR HIGH PRECISION SYNCHRONIZATION PROTOCOL DISCRETE EVENT SIMULATION

Georg Gaderer, Patrick Loschmidt, and Roman Beigelbeck, *Austrian Academy of Sciences, Wiener, Neustadt, Austria*

- 0840 – 0900 **Paper 34:** COMPOSITE CLOCKS WITH THREE-STATE MODELS

James R. Wright, *Analytical Graphics, Inc.*

- 0900 – 0920 **Paper 35:** PERFORMANCE ANALYSIS OF A PROTOTYPE REAL-TIME SOFTWARE CLOCK IN CASE OF EMULATED CLOCK ANOMALIES

U. Grunert, Thölert, M. Cuntz, M. Süß, J. Furthner, A. Moudrak and W. Klische, *German Aerospace Center (DLR), Oberpfaffenhofen, Germany*

- 0920 – 0940 **Paper 36:** ENSEMBLE TIME IN GNSS: PERFORMANCE REQUIREMENTS AND ALGORITHM TESTS

M. Suess, A. Moudrak and J. Hammesfahr, *German Aerospace Center (DLR), Wessling, Germany***0940 – 1010 INTERMISSION****SESSION X SATELLITE TIME & FREQUENCY TRANSFER (B)**Chairman: S. Clark Wardrip, *Sachs Freeman Associates, Inc.*

- 1010 – 1030 **Paper 37:** GNSS CLOCK PERFORMANCE ANALYSIS USING ONE-WAY CARRIER PHASE AND NETWORK METHODS

Francisco Gonzalez, *European Space Agency/ESTEC, Noordwijk, The Netherlands*; Pierre Waller, *GK, Geodetic Institute Karlsruhe, Germany*

- 1030 – 1050 **Paper 38:** LONG BASELINE COMPARISONS OF THE BRAZILIAN NATIONAL TIME SCALE TO UTC(NIST) USING REAL-TIME AND POST PROCESSED SOLUTIONS

Michael A. Lombardi and Victor S. Zhang, *National Institute of Standards and Technology*; Ricardo J. de Carvalho, *National Observatory, Rio de Janeiro, Brazil***THURSDAY, NOVEMBER 29, 2007****SESSION X SATELLITE TIME & FREQUENCY TRANSFER (B)  
(cont.)**

- 1050 – 1110 **Paper 39:** LONG TERM STABILITY OF REMOTE CLOCK COMPARISONS WITH IGS CLOCK PRODUCTS

Victor Zhang, Thomas E. Parker and Marc A. Weiss, *National Institute of Standards and Technology*

- 1110 – 1130 **Paper 40:** TIME TRANSFER WITH THE GALILEO PRECISE TIMING FACILITY

R. Zanello and A. Busso, *CTT/Thales Alenia Space Italia, Torino, Italy*; E. Detoma, *CTT/Sistemi Elettronici Per Automazione (SEPA), Torino, Italy*; J. Nawrocki, *AOS, Borowiec, Poland*

- 1130 – 1150 **Paper 41:** TIME TRANSFER EXPERIMENT BY TCE ON ETS-VIII SATELLITE

Fumimaru Nakagawa, Yasuhiro Takahashi, Jun Amagai, Ryo Tabuchi, Shin'ichi Hama and Mizuhiko Hosokawa, *National Institute of Information and Communications Technology, Koganei, Tokyo, Japan***1150 – 1300 LUNCH****SESSION XI CRITICAL PTTI APPLICATIONS**Chairman: Leo Mallette, *Boeing*

- 1300 – 1320 **Paper 42:** THE IMPORTANCE OF TIME AND FREQUENCY REFERENCE IN QUANTUM ASTRONOMY AND QUANTUM COMMUNICATIONS

Tommaso Ochipinti, Paolo Zoccarato, Cesare Barbieri, Ivan Capraro, G. Naletto and Paolo Villaresi, *University of Padova, Italy*; Pietro Bolli and Filippo Messina, *INAF Astronomical Observatory Cagliari, Italy*

- 1320 – 1340 **Paper 43:** TIME TRANSFER USING AN ASYNCHRONOUS COMPUTER NETWORK: RESULTS FROM A 500 KM BASELINE EXPERIMENT

Sven-Christian Ebenhag, Kenneth Jaldehag, Per Olof Hedekvist and Per Jarlemark, *SP Technical Research Institute of Sweden, Borås, Sweden*; Peter Löthberg, *STUPI*

- 1340 – 1400 **Paper 44:** RESULTS FROM A GPS TIMING CRITICALITY ASSESSMENT

James V. Carroll and John H. Kraemer, *DOT Volpe National Transportation Systems Center*

- 1400 – 1420 **Paper 45:** GALILEO TIMING APPLICATIONS

Marco Bianchi, Renzo Zanello and Claudio Cantelmo, *Thales Alenia Space Italia*; Stefano Scarda, *GSA*

THURSDAY, NOVEMBER 29, 2007

**SESSION XI CRITICAL PTTI APPLICATIONS (cont.)**

- 1420 – 1440 **Paper 46:** IMPROVING GEOSTATIONARY SATELLITE GPS POSITIONING USING DYNAMIC TWO-WAY TIME TRANSFER MEASUREMENTS

Capt. Benjamin Dainty, John Raquet, and Richard Beckman, *Air Force Institute of Technology*

- 1440 – 1500 **INTERMISSION**

**SESSION XII ALGORITHMS & STATISTICS (B)**

**Chairman:** Demetrios Matsakis, *U.S. Naval Observatory*

- 1500 – 1520 **Paper 47:** ANALYSIS OF DELAY FLUCTUATIONS IN TWO-WAY TIME TRANSFER EARTH STATIONS

J W. H. Tseng, H. T. Lin, P. C. Chang, S. Y. Lin, *Telecommunication Laboratories, Chunghwa Telecom, Taiwan, R.O.C.*; K. M. Feng, *National Tsing Hua University, Taiwan*

- 1520 – 1540 **Paper 48:** HOW TO DEAL WITH FFT SAMPLING INFLUENCES ON ADEV CALCULATIONS

P.C. Chang and S.Y. Lin, *Telecommunication Laboratories, Chunghwa Telecom, Taiwan, R.O.C.*

- 1540 – 1600 **Paper 49:** A THINNING ALGORITHM FOR GPS-BASED UNBIASED FIR ESTIMATION OF THE CLOCK TIE MODEL

Yuriy S. Shmaliy, *Guanajuato University, Salamanca, Gto., Mexico*

- 1600 – 1620 **Paper 50:** HOW EXTRACTING INFORMATION FROM DATA HIGHPASS FILTERS ITS ADDITIVE NOISE

Victor S. Reinhardt, *Raytheon Space and Airborne Systems*

- 1620 – 1640 **GENERAL DISCUSSION**

Joe White, *U.S. Naval Research Laboratory*

- 1640 **CLOSE OF MEETING**

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