

**ADVANCE PROGRAM**

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



**November 27- 29, 2001**

33 Years of Progress  
1969-2001

Hyatt Regency Hotel  
Long Beach, California

## The Schedule

### Monday, November 26, 2001

0800-1300	Exposition Set-Up of Booths for Exhibitors
0800-1600	Tutorials
1300-1700	Exhibitor Set-Up
1700-1830	Icebreaker - Exhibit Area
1830-2100	Exhibitor Set - Up
1900-2100	Registration - PTTI Meeting*
1900-2100	Committee on GPS and GLONASS Time Transfer Standards

### Tuesday, November 27, 2001

0700-0800	Speakers' Breakfast
0700-0800	Speakers' Room
0700-0800	Attendees' Breakfast
0800-1600	Registration - Grand Ballroom Foyer
0800-0835	Opening Session
0800-1700	Technical Exhibits
0835-0940	Session I - PTTI Vendor Presentations
0940-1000	Intermission - Exhibits Area
1000-1140	Session II
1140-1320	Attendees' Lunch
1320-1500	Session III
1500-1520	Intermission - Exhibits Area
1520-1700	Session IV
1800-1930	Reception

### Wednesday, November 28, 2001

0700-0800	Speakers' Breakfast
0700-0800	Speakers' Room
0700-0800	Attendees' Breakfast
0800-1600	Registration
0800-1700	Technical Exhibits
0800-0940	Session V
0940-1000	Intermission - Exhibits Area
1000-1120	Session VI
1120-1300	Attendees' Lunch
1300-1520	Session VII
1520-1540	Intermission - Exhibits Area
1540-1700	Session VIII
1730-1830	Joint Executive and Advisory Board Meeting

### Thursday, November 29, 2001

0700-0800	Speakers' Breakfast
0700-0800	Speakers' Room
0700-0800	Breakfast
0800-1430	Registration
0800-0940	Session IX
0940-1000	Intermission - Pre-Function Area
1000-1120	Session X
1120-1300	Attendees' Lunch
1300-1400	Session XI
1400-1440	Session XII
1440-1500	Intermission
1500-1640	Session XII (continued)
1640-1650	Discussion
1650-1700	Close of Meeting

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

**REGISTRATION CARD  
THIRTY THIRD ANNUAL  
PRECISE TIME AND TIME INTERVAL  
SYSTEMS AND APPLICATIONS**

**NOVEMBER 27-29, 2001**

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

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

ADDRESS \_\_\_\_\_  
Street  
\_\_\_\_\_  
City, State or Country

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

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

☐ Registration (will pay on-site) † ‡

☐ Registration Amount Enclosed † ‡ No. \_\_\_\_\_ \$ \_\_\_\_\_

† \$250.00 if postmarked on or before November 9; \$275.00 thereafter.  
(Covers entry to all sessions, one Icebreaker ticket, one reception ticket, three breakfasts and three lunches, 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 sessions and exhibits **only**.)

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

☐ Breakfast Tickets (\$20 each) No. \_\_\_\_\_ \$ \_\_\_\_\_

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

☐ Tutorial (\$200) No. \_\_\_\_\_ \$ \_\_\_\_\_

☐ Proceedings (Costs on Page ix) No. \_\_\_\_\_ \$ \_\_\_\_\_

Total Amount Enclosed \$ \_\_\_\_\_

☐ Mark here if purchasing Proceedings only

Make checks payable to Treasurer, PTTI; we cannot accept payment by credit card unless registering online at the PTTI Web Site.

- ☐ Speaker  
☐ Exhibitor  
☐ Session Chairman

Questions? Contact Ms. Jardine at 202-762-1414 or  
[jardine.nicolette@usno.navy.mil](mailto:jardine.nicolette@usno.navy.mil)

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

**ADVANCE PROGRAM**

**THIRTY-THIRD 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**

**November 27-29, 2001**



**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;
- Provide an opportunity for an active exchange of new technology associated with PTTI.

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This year, PTTI 2001 addresses:

- Commercial Timing Dissemination and Performance
- Clocks for Space
- GPS Timing Performance
- Two-Way Satellite Time and Frequency Transfer
- GPS Common View and Carrier Phase Time and Frequency Transfer
- Timing Receivers
- Time Scales and Algorithms
- Timing Laboratory Activity Updates
- PTTI Vendor Presentations

## WELCOME TO PTTI 2001

### MEETING INFORMATION

#### Registration

Please send the PTTI registration form and, if not registering on line, check to:

Ms. Nicolette Jardine  
PTTI Registration  
U.S. Naval Observatory  
Time Service Department  
3450 Massachusetts Avenue, N W  
Washington, D.C. 20393-5420  
202-762-1414  
FAX 202-762-1511  
e-mail: [jardine.nicolette@usno.navy.mil](mailto:jardine.nicolette@usno.navy.mil)

**The registration fee is \$275.00. Note: If payment is received postmarked before 9 November 2001 the cost is \$250.00.**

The full registration fee includes entry to all the sessions, the exhibit area, a copy of the Proceedings, an icebreaker on 26 November, the welcoming reception, breakfast and lunch each day. Guest tickets are \$30.00 for the reception, \$20.00 for breakfast 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 the exhibit area only. It does not include a copy of the Proceedings, entry to breakfasts, lunches, or the reception.

Please make checks payable to: **Treasurer, PTTI**. This year PTTI will accept credit card payments **ONLY** through the PTTI Web site. Please see the Web site for details. **Credit cards CANNOT be accepted at the registration desk.** Attendees, including presenters and exhibitors, must register and receive a badge and badges must be worn for admission to all sessions and functions. Badges for registered 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 16, 2001. On or after November 16<sup>th</sup> there is a \$140.00 cancellation fee. Refunds are not given for "no shows", but substitutions are allowed.**

## **PTTI 2001 Home Page**

Access the PTTI 2001 Home Page from the World Wide Web at:  
<http://tycho.usno.navy.mil/ptti.html>

PTTI 2001 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 registration fee.  
Payment has to be postmarked by November 9, 2001.

## **PTTI 2001 Tutorials**

Tutorials take place prior to PTTI 2001 on Monday, November 26, 2001 from 0800 to 1600. For detailed information regarding the tutorials, please contact Mr. S. Clark Wardrip via e-mail at [skyclark@aol.com](mailto:skyclark@aol.com), or the PTTI Home Page at: <http://tycho.usno.navy.mil/ptti.html>. The fee for the all day tutorials is \$200.00. Breakfast and lunch are included. Please register using the attached "Registration Card" or "on-line" at the above Web address.

The tutorial topics are as follows:

- 1) Atomic Frequency Standards, Dr. Robert Tjoelker, NASA Jet Propulsion Laboratory
- 2) Statistics Processes – A Graphic Tutorial, Dr. Victor Reinhardt, Boeing Space Systems
- 3) Precision Measurement of Oscillators, Dr. Sam Stein, Timing Solutions Corp.
- 4) Crystal Technology, Dr. John Vig, U.S. Army CECOM
- 5) Time and Frequency Synchronization and Measurement Techniques, Mr. Don Mitchell, TrueTime, Inc.
- 6) Time Synchronization Techniques, Dr. Paul Koppang, U.S. Naval Observatory

## **Questions**

Please contact the following people for information on:

Technical/scientific questions: Dr. Joseph White, 202-767-5111  
or [white@juno.nrl.navy.mil](mailto:white@juno.nrl.navy.mil)

Exhibiting: Mr. Don Mitchell, 707-528-1230 x118  
or [dmitchell@truetime.com](mailto:dmitchell@truetime.com)

General: Mrs. Sheila Faulkner, 703-532-6411  
or [bopenyan@aol.com](mailto:bopenyan@aol.com)

Registration: Ms. Nikki Jardine, 202-762-1414  
or [jardine.nicolette@usno.navy.mil](mailto:jardine.nicolette@usno.navy.mil)

## **Registration Desk Hours**

The registration desk will be open during the following hours:

26 November, Monday, 1900-2100  
27 November, Tuesday, 0700-1600  
28 November, Wednesday, 0700-1600  
29 November, Thursday, 0700-1430

## **Hotel Reservations**

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

The Hyatt Regency Hotel  
(PTTI 2001 Meeting Room Block)  
200 South Pine Avenue  
Long Beach, California 90802 USA  
Telephone 562-491-1234 Fax 562-432-1972



## **Hotel Reservations (Continued)**

When reservations are made, mention PTIT 2001 to receive the group sleeping room rate for single and double occupancy. Be prepared to show identification or pay with the government credit card. The PTIT rate is available from November 23 through December 2, 2001.

Check-in time is 1500 and checkout time is Noon. **Rooms are held until 1600 (4:00 p.m. EST if not guaranteed for late arrival by a credit card or one night's deposit).** The block of reserved rooms will be released 1 November, so register 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 Hyatt, you will be charged an early departure fee.** The area offers a wide range of restaurants and shops within walking distance or by the Long Beach Roundabout (bus and trolley system).

## **Directions to the Hyatt Regency Hotel Long Beach**

### **From the Los Angeles International Airport**

- Exit the Airport terminal onto Sepulveda Blvd., going South towards the 105 Freeway.
- Take the 105 Freeway going East.
- Transition onto the 405 Freeway South.
- Continue south on the 405 Freeway approximately 20 miles until you reach the 710 Freeway.
- Transition onto the 710 Freeway South.
- Continue south on the 710 Freeway until you come to the Shoreline Drive/Aquarium exit (on the left). Take this exit.
- Continue on Shoreline Drive until you reach Pine Ave.
- Turn left onto Pine Ave.
- The Hyatt is immediately on the right side at 200 S. Pine Ave.

### **From the John Wayne Airport**

- Exit the airport terminal by following the signs towards the 405 Freeway North.
- Make a left onto Mac Arthur Blvd. which will access the 405 Freeway North.
- Transition onto the 710 Freeway South
- Continue south on the 710 Freeway until you come to the Shoreline Drive/Aquarium exit (on the left). Take this exit.
- Continue on Shoreline Drive until you reach Pine Ave.
- Make a left turn onto Pine Ave.
- The Hyatt is immediately on the right side at 200 S. Pine Ave.

## **Directions to the Hyatt Regency Hotel (Continued)**

- Take Interstate 5 to the 710 Freeway South.
- Continue south on the 710 Freeway about 20 miles until you come to the Shoreline Drive/Aquarium exit (on the left).
- Continue on Shoreline Drive until you reach Pine Ave.
- Take a left onto Pine Ave.
- The Hyatt is immediately on the right side of 200 S. Pine Ave.

## **Airlines**

**United Airlines** has been chosen as the official carrier for **PTTI 2001** 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. Reservation agents are on duty 7 days a week from 0700 to Midnight EST. Please be sure to **reference ID number 556XF**. The fares are available from 25 November through 3 December 2001. 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 2001**. 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 2001 - J628452**. Special meeting rates are available from November 20 through December 6, 2001 and include unlimited free mileage.

## **Airport Shuttle**

Hotel shuttle service is available from Los Angeles Airport, Orange County Airport, and Long Beach Airport.

## **Parking**

Self and valet parking is available at the hotel. Self-parking for an overnight guest is \$9.00; valet parking is \$13.00 with in and out privileges. Self-parking for the day is \$6.00 and \$9.00 overnight.

## **Messages**

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

## **Exhibit Information**

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

Don Mitchell  
TrueTime, Inc.  
3750 Westwind Boulevard  
Santa Rosa, California 95403  
707-528-1230  
Fax 707-527-6640  
e-mail: dmitchell@truetime.com

## **List of Potential Exhibitors for PTTI 2001**

Allen Osborne Associate  
Arbiter Systems, Inc.  
Brandywine Communications  
Datum, Inc.

- Irvine
- Timing, Test and Measurement

End Run Technologies  
ESE  
Femtosecond Systems  
Frequency Electronics, Inc.  
GPS World  
Guide Technology  
Magellan Ashtech Products  
Motorola  
NovAtel Communications, Ltd.  
Oscilloquartz  
Perkin Elmer  
Quartzlock, U.K., Ltd.  
Spectracom Corp.  
SpectraDynamics, Inc.  
Spectrum Instruments, Inc.  
Stanford Research Systems  
Symmetricon  
Synergy System  
Syntonics LLC  
TEMEX Time and Frequency  
Timing Solutions Corp.  
TIMETECH GmbH  
TRAK Com  
Trimble Navigation  
TrueTime, Inc.  
U.S. Naval Observatory  
Zyfer Precision Time Division

## **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 by e-mail or on diskette to Dr. Lee A. Breakiron, Editorial Chairman ([lab@kepler.usno.navy.mil](mailto:lab@kepler.usno.navy.mil)) by 27 November unless prior arrangements have been made with him. For paper style, see the Author's Kit on the Web at [http://tycho.usno.navy.mil/ptti/ptti2001/author\\_kit.html](http://tycho.usno.navy.mil/ptti/ptti2001/author_kit.html).

## **Proceedings**

The proceedings will be mailed to the attendees in 2002. If you cannot attend, but wish to reserve a copy of the Proceedings, please return the Registration Card with a check for \$135.00 made out to Treasurer, PTTI. Please note on the card that you are not attending. Your reserved copy will then be sent to you. If you wish extra copies, they will also be available at \$135.00.

PTTI 2001 proceedings will be provided on a CD in Adobe Acrobat (PDF) format. For those wishing to have a hardcopy version instead, a printed copy may be requested for an additional \$35.00 at the time of registration.

## **Temperature**

The climate during late November and early December in the Long Beach area could be cool. A light coat or raincoat is recommended.

## **Thirty-fourth Annual PTTI Meeting**

The 34th Annual PTTI Meeting will be held at the Hyatt Regency Hotel, Reston Town Center, Reston, Virginia, on December 3-5, 2002.

## **PTTI EXECUTIVE COMMITTEE**

**Dr. Joseph D. White**, Chairman  
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Department of Defense

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U.S. Naval Observatory

**(Vacant)**  
Defense Information Systems Agency

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**SUPPORT ASSISTANCE**

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U. S. Naval Observatory

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TrueTime, Inc.

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NASA Jet Propulsion Laboratory

**RECIPIENTS OF THE  
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**1994**

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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 RENÉ GUINOT**  
Honorary Astronomer  
Paris Observatory

**1998**

**DR. JACQUES VANIER**  
National Research Counsel (Retired)

**1999**

**DR. LEONARD CUTLER**  
Agilent Technologies

**2000**

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

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#### DR. RICHARD L. SYDNOR

NASA Jet Propulsion  
Laboratory

#### DR. ANDY WU

The Aerospace Corporation



## **PTTI 2001 SESSION CHAIRS**

### **SESSION I - PTTI VENDOR PRESENTATION**

MR. PETE LOPEZ  
TrueTime, Inc.

### **SESSION II - CLOCKS FOR SPACE**

DR. BERNARDO JADUSZLIWER  
The Aerospace Corporation

### **SESSION III - TIME TRANSFER I**

MS. LISA NELSON  
National Institute of Standards and Technology

### **SESSION IV - TIME TRANSFER II**

MR. EDWARD POWERS  
U.S. Naval Observatory

### **SESSION V - CARRIER PHASE**

DR. JUDAH LEVINE  
National Institute of Standards and Technology

### **SESSION VI - COMMUNICATION**

MR. DON MITCHELL  
TrueTime, Inc.

### **SESSION VII - TIMING LABORATORIES REPORTS**

DR. FRANÇOISE BAUMONT  
Observatoire de la Côte d'Azur, France

### **SESSION VIII - POSTER SESSION**

MR. JAY OAKS  
U.S. Naval Research Laboratory

### **SESSION IX - RECEIVERS**

DR. VICTOR REINHARDT  
Boeing Space Systems

### **SESSION X - ANALYSIS**

DR. LEONARD CUTLER  
Agilent Technologies

### **SESSION XI - TIME SCALES**

DR. RICHARD SYDNOR  
Jet Propulsion Laboratory

### **SESSION XII - GPS TIMING PERFORMANCE**

MR. STEVEN HUTSELL  
U.S. Air Force

**PTTI 2001  
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SYSTEMS AND APPLICATIONS MEETING**

**TUESDAY, NOVEMBER 27, 2001**

<b>0800-0805</b>	<b>OPENING</b> Dr. Paul Koppang, U.S. Naval Observatory
<b>0805-0815</b>	<b>OPENING REMARKS</b> Captain B. J. Jaramillo, U.S. Naval Observatory
<b>0815-0830</b>	<b>DISTINGUISHED PTTI SERVICE AWARD</b> Presented by: Dr. Joe White, U.S. Naval Research Laboratory
<b>0830-0835</b>	<b>CALL TO SESSION</b> Dr. Andy Wu, The Aerospace Corporation
<b>SESSION I 0835-0940</b>	<b>PTTI VENDOR PRESENTATIONS</b> <b>Chairman: Mr. Pete Lopez, TrueTime, Inc.</b>
<b>0940-1000</b>	<b>INTERMISSION</b>
<b>SESSION II</b>	<b>CLOCKS FOR SPACE</b> <b>Chairman: Dr. Bernardo Jaduszliwer, The Aerospace Corporation</b>
<b>1000-1020</b>	<b>Paper 1: SPACE CLOCKS, WHY THEY ARE DIFFERENT</b> J. White and R. Beard, U.S. Naval Research Laboratory
<b>1020-1040</b>	<b>Paper 2: OPTICALLY-PUMPED CESIUM BEAM FREQUENCY STANDARDS FOR GPS-III</b> R. Lutwak, D. Emmons, M. Garvey, and P. Vlitaz, Datum - Timing, Test and Measurement

**TUESDAY, NOVEMBER 27, 2001**

- 1040-1100**      **Paper 3: COMPACT, CONTINUOUS BEAM COLD ATOM CLOCK FOR SATELLITE APPLICATIONS**  
W. Buell and H. Wang, The Aerospace Corporation
- 1100-1120**      **Paper 4: MERCURY TRAPPED ION FREQUENCY STANDARD FOR GPS**  
R. Tjoelker, E. Burt, S. Chung,  
R. Glaser, R. Hamell, L. Maleki,  
J. Prestage, N. Raouf, T. Radey,  
G. Sprague, B. Tucker, and B. Young,  
NASA Jet Propulsion Laboratory
- 1120-1140**      **Paper 5: AN EVALUATION OF VARIOUS SPACE CLOCKS FOR GPS IIF**  
V. Nuth, W. Feess, and A. Wu, The Aerospace Corporation
- 1140-1320**      **ATTENDEES LUNCH (Provided)**
- SESSION III**      **TIME TRANSFER I**  
**Chairman: Ms. Lisa Nelson, National Institute of Standards and Technology**
- 1320-1340**      **Paper 6: COMPARISON OF TIME TRANSFER TECHNIQUES**  
D. Matsakis, K. Senior, E. Powers,  
and J. DeYoung, U.S. Naval Observatory
- 1340-1400**      **Paper 7: SOLAR FLARES AND PRECISE SATELLITE TIMEKEEPING**  
J. Camparo and S. Moss, The Aerospace Corporation
- 1400-1420**      **Paper 8: RESULTS OF RADIO METEOR COMPARISON OF SCALES OF THE RUSSIAN UTC (SU) AND UKRAINIAN UTC (UA) TIME STANDARDS**  
V. Bavikina, Y. Koval, and A. Tkachuk,  
Kharkov State Technical University of Radioelectronics (KTURE), Ukraine

**TUESDAY, NOVEMBER 27, 2001**

**1420-1440      Paper 9: OBSERVATIONS OF WAAS  
PERFORMANCE**  
H. Chadsey, U.S. Naval Observatory

**1440-1500      Paper 10: REAL TIME ULTRA-  
PRECISE TIME TRANSFER TO UTC  
USING THE NASA DIFFERENTIAL  
GPS SYSTEM**  
E. Powers, K. Senior, U.S. Naval  
Observatory; Y. Bar-Server,  
W. Bertiger, R. Muellerschoen, and  
D. Stowers, NASA Jet Propulsion  
Laboratory

**1500-1520      INTERMISION**

**SESSION IV      TIME TRANSFER II**  
**Chairman: Mr. Edward Powers, U.S.  
Naval Observatory**

**1520-1540      Paper 11: ESTIMATION OF THE  
UNCERTAINTY OF TWO-WAY  
SATELLITE TIME AND FREQUENCY  
TRANSFER**  
W. Klepczynski, Innovative Solutions  
International; D. Kirchner, Technische  
Universität, Graz, Austria; G. de Jong,  
NMI Van Swinden Laboratorium, The  
Netherlands; W. Lewandowski and  
J. Azoubib, Bureau International des  
Poids et Mesures, France; J. DeYoung,  
U.S. Naval Observatory; J. Davis,  
National Physical Laboratory,  
Teddington, United Kingdom;  
F. Baumont, Observatoire de la Côte  
d'Azur, France; and M. Imae,  
Communications Research Laboratory,  
Japan

**TUESDAY, NOVEMBER 27, 2001**

- 1540-1600**      **Paper 12: LEAST SQUARES  
ANALYSIS OF TWO-WAY SATELLITE  
TIME AND FREQUENCY  
MEASUREMENTS**  
J. Davis, P. Harris, S. Shemar, and  
M. Cox, National Physical Laboratory,  
United Kingdom
- 1600-1620**      **Paper 13: PRECISION TIME VIA TWO-  
WAY SATELLITE TRANSFER  
(TWSTT) FOR MULTI-PLATFORM  
PASSIVE EMITTER LOCATION**  
J. Romberg, Boeing; and E. Powers,  
U.S. Naval Observatory
- 1620-1640**      **Paper 14: COMMON-VIEW TIME  
TRANSFER USING THE TWO-  
CHANNEL FAST-SEQUENCING GPS  
RECEIVER K+K GPS6-2K**  
P. Hetzel, T. Polewka, Physikalisch-  
Technische Bundesanstalt,  
Braunschweig, Germany; and  
W. Klische, K+K Messtechnik GmbH,  
Germany
- 1640-1700**      **Paper 15: A STUDY OF TWO  
COMMERCIAL RECEIVERS AND NBS-  
TYPE RECEIVERS FOR COMMON-  
VIEW TIME TRANSFER**  
M. Weiss and M. Jensen, National  
Institute of Standards and Technology
- 1800-1930**      **RECEPTION**

**WEDNESDAY, NOVEMBER 28, 2001**

- SESSION V**      **CARRIER PHASE**  
**Chairman: Dr. Judah Levine, National  
Institute of Standards and  
Technology**
- 0800-0820**      **Paper 16: ACCURACY AND  
PRECISION OF CARRIER PHASE  
CLOCK ESTIMATES**  
K. Senior and J. Ray, U.S. Naval  
Observatory

**WEDNESDAY, NOVEMBER 28, 2001**

- 0820-0840**      **Paper 17: GLOBAL TIME TRANSFER CAPABILITY USING GPS CARRIER PHASE DATA**  
R. Dach, S. Schaer, and  
T. Schildknecht, Astronomical Institute,  
University of Berne, Switzerland; and G.  
Dudle, Swiss Federal Office of  
Metrology and Accreditation, Switzerland
- 0840-0900**      **Paper 18: GPS CARRIER PHASE FREQUENCY TRANSFER ON THE NIMA MONITOR STATION NETWORK**  
B. Tolman and D. Munton, Applied  
Research Laboratory, University of  
Texas
- 0900-0920**      **Paper 19: MONITORING THE REMOTE PRIMARY CLOCK BY USING GPS CARRIER PHASE**  
S.-S. Chen, H.-M Peng, and C.-S. Liao,  
Chunghwa Telecom Co., Taiwan
- 0920-0940**      **Paper 20: MITIGATING MULTIPATH EFFECTS FOR CARRIER PHASE TIME-TRANSFER**  
A. Bilich, J. Plumb, K. Larson, and  
P. Axelrad, University of Colorado
- 0940-1000**      **INTERMISSION**
- SESSION VI**      **COMMUNICATION**  
**Chairman: Mr. Don Mitchell,**  
**TrueTime**
- 1000-1020**      **Paper 21: THE PERMEATION OF TIME IN MODERN NETWORKS**  
D. Arnold and P. Skoog, TrueTime, Inc.
- 1020-1040**      **Paper 22: A SET OF SCALEABLE MASTER CLOCK SYSTEMS BASED ON COMMERCIAL OFF THE SHELF (COTS) PRODUCTS**  
G. Shaton, U.S. Department of Defense

**WEDNESDAY, NOVEMBER 28, 2001**

- 1040-1100**      **Paper 23: DEVELOPMENT OF TIMING ARCHITECTURE FOR A SECURE GLOBAL COMMUNICATIONS NETWORK**  
G. Shaton, U.S. Department of Defense
- 1100-1120**      **Paper 24: A NEW CLASS OF PRECISION UTC AND FREQUENCY REFERENCE USING IS-95 CDMA BASE STATION TRANSMISSIONS**  
B. Penrod, EndRun Technologies
- 1120-1300**      **ATTENDEES LUNCH (Provided)**
- SESSION VII**      **TIMING LABORATORIES REPORTS**  
**Chairman: Dr. Françoise Baumont,**  
**Observatoire de la Côte d’Azur,**  
**Grasse, France**
- 1300-1315**      **Paper 25: TIME AND FREQUENCY ACTIVITIES AT THE UNITED STATES NAVAL OBSERVATORY**  
D. Matsakis, U.S. Naval Observatory
- 1315-1330**      **Paper 26: TIME ACTIVITIES IN ARGENTINA**  
C. Mondinalli, J. Osorio, J. Amenna and  
C. Esperón, Observatorio Naval Buenos Aires, Argentina; J. Pablo Soria and  
C. Kurtz, Instituto Geográfico Militar Argentino, Argentina; and  
E. Felicitas Arias, Bureau International des Poids et Mesures, France
- 1330-1345**      **Paper 27: PRIMARY FREQUENCY STANDARDS AT NIST**  
R. Drullinger, National Institute of Standards and Technology
- 1345-1400**      **Paper 28: STATUS REPORT OF TIME AND FREQUENCY ACTIVITIES OF NATIONAL PHYSICAL LABORATORIES, NEW DELHI, INDIA**  
P. Banerjee, National Physical Laboratory, New Delhi, India

**WEDNESDAY, NOVEMBER 28, 2001**

- 1400-1415      Paper 29: UPDATE ON TIME AND FREQUENCY ACTIVITIES AT PTB**  
P. Hetzel and A. Bauch, Physikalisch-Technische Bundesanstalt, Germany
- 1415-1430      Paper 30: RECENT IMPROVEMENTS ON TIME AND FREQUENCY AT CRL**  
S. Dong, Shaanxi Astronomical Observatory (CSAO), China
- 1430-1445      Paper 31: TIME AND FREQUENCY ACTIVITIES AT CRL**  
Y. Hanado, M. Hosokawa, M. Imae, N. Kurihara, and T. Morikawa, Communications Research Laboratory, Japan
- 1445-1500      Paper 32: NATIONAL TIME AND FREQUENCY STANDARD OF KAZAKHSTAN REPUBLIC: PRELIMINARY RESULTS**  
B.Gaigerov, N.Koshelyaevsky, V.Nestouley, S.Poushkin, and V.Tatarenkov, Institute of Metrology for Time and Space, GP "VNIIFTRI", Russia
- 1500-1520      Paper 33: GALILEO PROGRAM UPDATE**  
Professor Sigfrido M. Leschiutta, Istituto Elettrotecnico Nazionale Galileo Ferraris and Politecnico di Torino, Italy
- 1520-1540      INTERMISSION**
- SESSION VIII      POSTER SESSION**  
**Chairman: Mr. Jay Oaks, NRL**
- 1540-1700      Poster 1: GPS-BASED ADAPTIVE ESTIMATING OF TIME ERROR FOR CLOCK SYNCHRONIZATION WITH FIR FILTER**  
Y. Shmaliy, R. Rojas-Laguna, and O.Ibarra-Manzano, Guanajuato University, Mexico; A. Marienko, "Sichron" Center, Kharkiv, Ukraine



**WEDNESDAY, NOVEMBER 28, 2001**

**Poster 2: THE EFFECT OF THE  
NOISE FLOOR ON THREE-  
CORNERED-HAT DETERMINATIONS  
OF ALLAN VARIANCE**

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

**Poster 3: A NEW DIGITAL PHASE  
MEASUREMENT SYSTEM**

G. Landis, SFA/U.S. Naval Research  
Laboratory; I. Galysh, U.S. Naval  
Research Laboratory; and  
T. Petsopoulos, Praxis/U.S. Naval  
Research Laboratory

**Poster 4: A NEW SYNCHRONIZED  
MINIATURE RUBIDIUM OSCILLATOR  
WITH AUTO-ADAPTIVE DISCIPLINING  
FILTER**

P. Rochat and B. Leuenberger, Temex  
Neuchâtel Time SA, Switzerland

**Poster 5: DEGREES OF FREEDOM  
AND THREE-CORNERED HATS**

C. Ekstrom and P. Koppang, U.S. Naval  
Observatory

**Poster 6: RESULTS FROM THE  
NATIONAL PHYSICAL LABORATORY  
GPS COMMON-VIEW TIME  
TRANSFER SERVICE**

J. Davis and J. Clarke, National Physical  
Laboratory, United Kingdom

**Poster 7: THE MICROCOMPUTER  
COMPENSATED CRYSTAL  
OSCILLATOR - PRACTICAL  
APPLICATION OF DUAL-HARMONIC  
MODE QUARTZ THERMOMETRY**

E. Jackson, Q-Tech Corporation

**WEDNESDAY, NOVEMBER 28, 2001**

**Poster 8: A SYSTEM TO COMPARE  
AND EVALUATE THE QUALITY OF  
PRECISE FREQUENCY AND TIMING  
SYSTEMS**

W. Lange, Lange-Electronic GmbH,  
Germany

**Poster 9: THE PHASE RADIO  
METEOR EQUIPMENT FOR TIME AND  
FREQUENCY STANDARDS  
COMPARISON**

V. Bavykiha, Yu. Koval, S. Kundjukov,  
and S. Trambovetzkiy, Kharkov State  
Technical University of Radioelectronics  
(KTURE), Ukraine

**THURSDAY, NOVEMBER 29, 2001**

**SESSION IX    RECEIVERS**

**Chairman: Dr. Victor Reinhardt,  
Boeing Space Systems**

**0800-0820    Paper 34: CGGTTS GUIDELINES FOR  
MANUFACTURERS OF GNSS  
RECEIVERS USED FOR TIMING**

W. Lewandowski, Bureau International  
des Poids et Mesures, France;  
J. Levine, National Institute of Standards  
and Technology

**0820-0840    Paper 35: USE OF GEODETIC  
RECEIVERS FOR TAI**

P. Defraigne, Royal Observatory of  
Belgium; G. Petit, Bureau International  
des Poids et Mesures, France; and  
C. Bruyninx, Royal Observatory of  
Belgium

**0840-0900    Paper 36: SIMULTANEOUS  
ABSOLUTE CALIBRATION OF THREE  
TIMING RECEIVERS**

J. Plumb and K. Larson, University of  
Colorado; J. White and R. Beard, U.S.  
Naval Research Laboratory; and  
E. Powers, U.S. Naval Observatory

**THURSDAY, NOVEMBER 29, 2001**

- 0900-0920**      **Paper 37: FAST "DIRECT-P(Y)" GPS SIGNAL ACQUISITION USING A SPECIAL PORTABLE CLOCK**  
H. Fruehauf, Zyfer, Inc.
- 0920-0940**      **Paper 38: RESEARCH OF PARAMETERS OF THE TIME SCALES, WHICH FORMED BY RECEIVERS OF SIGNALS OF SATELLITE RADIONAVIGATION SYSTEM GPS**  
S. Trambovetskiy, J. Koval,  
V. Bavykina, and A. Tkachuk, Kharkov  
State Technical University of  
Radioelectronics (KTURE), Ukraine
- 0940-1000**      **INTERMISSION**
- SESSION X**      **ANALYSIS**  
**Chairman: Dr. Leonard Cutler, Agilent Technologies**
- 1000-1020**      **Paper 39: A MULTICHANNEL DUAL-MIXER STABILITY ANALYZER: PROGRESS REPORT**  
C. Greenhall, A. Kirk, and G. Stevens,  
NASA Jet Propulsion Laboratory
- 1020-1040**      **Paper 40: CLOCK REQUIREMENTS AND TRADE-OFF FOR SATELLITE-BASED NAVIGATION SYSTEMS**  
E. Detoma, AleniaSpazio, Corso  
Marche, Italy; and A. Godone, Istituto  
Elettrotecnico Nazionale "G. Ferraris"  
(IENGF), Italy
- 1040-1100**      **Paper 41: EFFECTS OF PARAMETER ESTIMATION AND CONTROL LIMITS ON STEERED FREQUENCY STANDARDS**  
J. Skinner and P. Koppang, U.S. Naval  
Observatory

**THURSDAY, NOVEMBER 29, 2001**

- 1100-1120**      **Paper 42: PRACTICAL PROBLEMS INVOLVING PHASE NOISE MEASUREMENTS**  
W. Walls, Femtosecond Systems, Inc.
- 1120-1300**      **ATTENDEES LUNCH (Provided)**
- SESSION XI**    **TIME SCALES**  
**Chairman: Dr. Richard Sydnor, NASA Jet Propulsion Laboratory**
- 1300-1320**      **Paper 43: A KALMAN FILTER FOR ATOMIC CLOCKS AND TIMESCALES**  
L. Breakiron, U.S. Naval Observatory
- 1320-1340**      **Paper 44: KALMAN PLUS WEIGHTS: A TIME SCALE ALGORITHM**  
C. Greenhall, NASA Jet propulsion Laboratory
- 1340-1400**      **Paper 45: PASSIVE METEORIC SYNCHRONIZATION OF TIME SCALES**  
I. Antipov, V. Bavikina, Y. Koval, and G. Nesterenko, Kharkov State Technical University of Radioelectronics (KTURE), Ukraine
- SESSION XII**   **GPS TIMING PERFORMANCE**  
**Chairman: Mr. Steven Hutsell. U.S. Air Force**
- 1400-1420**      **Paper 46: GLOBAL POSITIONING SYSTEM (GPS) MODERNIZATION — A REVIEW AND UPDATE FOR THE PTTI COMMUNITY**  
Major M. Hedgepeth and Major Steven Rajotte, USAF, GPS Joint Program Office, Los Angeles AFB; and D. Latterman, Science Applications International Corporation (SAIC)

**THURSDAY, NOVEMBER 29, 2001**

- 1420-1440      Paper 47: ONE-WAY GPS TIME  
TRANSFER: 2001 PERFORMANCE**  
S. Hutsell, Captain M. Rivers and  
1Lt T. Kelkenberg, 2d Space Operations  
Squadron, Schriever AFB
- 1440-1500      INTERMISSION**
- 1500-1520      Paper 48: PERFORMANCE OF GPS  
BLOCK II/IIA/IIR ON-ORBIT NAVSTAR  
CLOCKS**  
J. Oaks, T. McCaskill, and M. Largay,  
U.S. Naval Research Laboratory; and  
J. Buisson, AEI
- 1520-1540      Paper 49: MANAGEMENT OF PHASE  
AND FREQUENCY FOR GPS IIR  
SATELLITES**  
M. Epstein and T. Dass, ITT A/CD
- 1540-1600      Paper 50: OBSERVABLE  
RELATIVISTIC FREQUENCY STEPS  
INDUCED BY GPS ORBIT CHANGES**  
M. Epstein, E. Stoll, and J. Fine, ITT  
A/CD
- 1600-1620      Paper 51: USING LAGRANGE  
PERTURBATION THEORY TO  
PREDICT RELATIVISTIC FREQUENCY  
CHANGES IN SV CLOCKS DUE TO  
EARTH'S OBLATENESS, AND TO  
ORBIT CHANGES**  
N. Ashby, University of Colorado
- 1620-1640      Paper 52: STUDIES OF AN  
OPTICALLY UNBIASED MA FILTER  
INTENDED FOR GPS BASED  
TIMEKEEPING**  
Y. Shmaliy, O.Ibarra-Manzano, and  
R.Rojas-Laguna, Guanajuato University,  
Mexico
- 1640-1650      DISCUSSION, Dr. Joe White, U.S.  
Naval Research Laboratory**
- 1650-1700      CLOSE OF MEETING**