

## ADVANCE PROGRAM

### FORTIETH ANNUAL PRECISE TIME AND TIME INTERVAL (PTTI) SYSTEMS AND APPLICATIONS MEETING



December 1 – 4, 2008

40 Years of Progress  
1969 – 2008

Hyatt Regency Hotel  
Reston, Virginia

## SCHEDULE

### Monday, December 1, 2008

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

### Tuesday, December 2, 2008

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	Opening Remarks
0840-0845	Call to Session
0845-1005	Session I – Master Clocks
1005-1030	Intermission - Exhibits Area
1030-1150	Session II – Vendor Presentations
1150-1300	Lunch
1300-1440	Session III – Space Clocks
1440-1500	Intermission - Exhibit Area
1500-1620	Session IV – Time & Frequency Transfer (I)
1620-1700	Session V – Poster Session
1830-2000	Reception

### Wednesday, December 3, 2008

0700-1600	Registration*
0700-0800	Speakers' Breakfast
0700-1600	Speakers' Room
0700-0800	Attendees' Breakfast
0800-1700	Technical Exhibits**
0800-0930	Session VI – Advanced Clocks
0930-0950	Intermission
0950-1150	Session VII – NTP & IEEE 1588
1150-1300	Lunch
1300-1420	Session VIII – Time Scales & Algorithms (I)
1420-1440	Intermission
1440-1620	Session IX – Time Scales & Algorithms (II)
1730-1830	Joint Executive and Advisory Board Meeting
1900-2030	Special Event

### Thursday, December 4, 2008

0700-1200	Registration*
0700-0800	Speakers' Breakfast
0700-1600	Speakers' Room
0700-0800	Attendees' Breakfast
0800-0940	Session X – Satellite Navigation Systems
0940-1000	Intermission
1000-1200	Session XI - Time & Frequency Transfer (II)
1200-1330	Lunch
1330-1450	Session XII – PTTI Applications
1450-1510	Intermission
1510-1630	Session XIII – Time & Frequency Transfer (III)
1630-1650	General Discussion
1650	Close of Meeting

\*Registration is available each day.

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

**PTTI 2008**  
**Hyatt Regency, Reston, Virginia**  
**December 1 – 4, 2008**

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

**Full Registration fee - \$575;** \$525, if payment received/postmarked on or before October 31. 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.

**Retiree registration fee - \$75.** The attendee must be fully retired to qualify for the reduced registration fee. Includes entry to the sessions and exhibit hall only.

**Student registration fee - \$50.** The attendee must be a full-time student to qualify for the reduced registration fee. Includes all Full Registration benefits.

**One Day registration fee - \$200;** includes entry to the sessions, exhibit hall and the offered luncheon for that day ONLY.

**Tutorials Registration fee - \$300;** \$250 if payment received/postmarked on or before October 31.

□ Registration Fee                          \$ \_\_\_\_\_  
□ One Day Registration (\$200)                  \$ \_\_\_\_\_  
□ Tutorials Registration                          \$ \_\_\_\_\_  
□ Extra Reception Tickets (\$35 each) No. \_\_\_\_\_ \$ \_\_\_\_\_  
□ Extra Lunch Tickets (\$25 each)    No. \_\_\_\_\_ \$ \_\_\_\_\_  
□ Extra Proceedings (\$150.00)               No. \_\_\_\_\_ \$ \_\_\_\_\_  
**TOTAL AMOUNT DUE**                          \$ \_\_\_\_\_  
□ Check Enclosed                                  □ Will pay onsite (fax to 202-767-2845)  
□ Mark here if purchasing Proceedings only and not attending conference.

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

**Treasurer, PTTI**  
c/o Mrs. Sheila Faulkner  
3159 Patrick Henry Drive  
Falls Church, VA 22044, USA

When paying by check, the envelope must be postmarked on or before **October 31** to receive all early discounts. All checks must be received no later than **November 14**.

To register online and/or pay by credit card, visit:

<http://pttimeeting.org/registration.html>

Online registration ends **November 14**. After that date, registration must be completed onsite.

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

**ADVANCE PROGRAM**

**FORTIETH 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

December 1 – 4, 2008



Hyatt Regency Hotel  
Reston, Virginia

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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.
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This year, the PTTI addresses:

- PTTI Vendor Presentations
- Time and Frequency Standards Laboratories: Activities and Updates
- Time & Frequency Transfer
- PTTI in Communications Systems
- Advanced Clocks
- Clocks in Unique and Novel Systems
- Measurement Technology
- Algorithms & Methods
- Timing Systems & Applications
- Military Applications
- Clock Modeling and Simulation
- Satellite Navigation Systems (GPS, GLONASS, TWSTT and Galileo)
- Environmental Effect on Precision Clocks
- Student Poster Competition

## WELCOME TO PTTI 2008

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

**Treasurer, PTTI**  
c/o Mrs. Sheila Faulkner  
3159 Patrick Henry Drive  
Falls Church, VA 22044 USA

When paying by check, the envelope must be postmarked on or before **October 31** to receive all early discounts. All checks must be received no later than **November 14**.

**Register online:** <http://pttymeeting.org/registration.html>. Online registration will be available until **November 14**. After that date, registration must be completed onsite.

If you are unable to register online, please fill out the enclosed 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)).

**PTTI accepts Discover, MasterCard and Visa.** To pay with your credit card, please register online <http://pttymeeting.org/registration.html>. The resulting charge will appear on your statement as PTTI Systems and Application Meetings.

**The full registration fee is \$575 (early discount is \$525).** 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. **The fee increases on November 1, 2008.**

**The registration fee for full-time students is \$50** and includes all Full Registration benefits. **The registration fee for full-time retirees is \$75** and includes entry to the sessions and exhibit area only. **The One Day registration fee is \$200** and includes entry to the sessions, exhibit hall and the offered lunch for **that day ONLY**.

**The tutorials registration fee is \$300 (early discount is \$250)** and includes breakfast, lunch and a copy of the presentations. **The fee increases on November 1, 2008.** The tutorials will be held **Monday, December 1**.

Tickets for the luncheons (\$25 each) and the reception (\$35 each) can be purchased at the PTTI Registration Desk. Extra copies of the Proceedings are also available for purchase.

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 31, 2008. On or after October 31, there is a \$300 cancellation fee. Refunds are not given for "no shows"; however, substitutions are allowed.**

### PTTI on the Web

Access PTTI online: <http://www.pttymeeting.org>

## Registration Desk Hours

The registration desk will be open during the following hours:

Monday, December 1, 1900 – 2100

Tuesday, December 2, 0700 – 1600

Wednesday, December 3, 0700 – 1600

Thursday, December 4, 0700 – 1200

## PTTI 2008 Tutorials

Tutorials take place prior to PTTI 2008 on Monday, December 1, 2008. For information regarding the tutorials, please contact Rachel Evans, [rachel.evans@jhuapl.edu](mailto:rachel.evans@jhuapl.edu).

The fee for the all-day tutorials is \$300 (**early discount is \$250**) and includes breakfast, lunch and a copy of the presentations. **The fee increases on November 1, 2008.** Please register using the attached Registration Card or online at the PTTI website.

The Tutorials schedule is as follows:

08:30	<b>The Importance of Quality Assurance</b> Marc Damashek, Department of Defense
09:30	<b>Traceability / Setting up a Timing System</b>
10:30	<b>BREAK</b>
10:45	Time and Frequency 101
11:45	<b>LUNCH</b>
13:00	<b>The Modernized Loran System and eLoran</b> Kirk Montgomery, Symmetricom, Inc.
14:00	<b>Precise Missile Tracking with GPS Translators</b> Thomas Thompson, JHU Applied Physics Laboratory
15:00	<b>BREAK</b>
15:15	<b>Global Navigation Satellite System (GNSS)</b> Measurement Methods
16:15	

## Questions

Please contact the following people for information on matters concerning:

Technical questions: Joe White  
202-767-5111  
[joe.white@nrl.navy.mil](mailto:joe.white@nrl.navy.mil)

Exhibits: Gary Geil  
949-361-0212  
[gary@gmasales.com](mailto:gary@gmasales.com)

Don Mitchell  
928-474-1088  
[don@gmasales.com](mailto:don@gmasales.com)

General: Sheila Faulkner  
703-532-6411, Cell: 703-244-6346  
[bopenyan@aol.com](mailto:bopenyan@aol.com)

Registration: Nikki Jardine  
202-767-2595  
[nikki.jardine@nrl.navy.mil](mailto:nikki.jardine@nrl.navy.mil)

## Hotel Reservations

Mail or FAX the hotel reservation card (located on the last page) to:

**Hyatt Regency Reston**  
(PTTI 2008 Room Block)  
1800 Presidents Street  
Reston, Virginia, USA 20190  
Tel 703-709-1234, Fax 703-925-8295

When making your reservations, be sure to mention PTTI 2008 to receive the group sleeping room rate. The PTTI rate is available November 28, 2008 – December, 7 2008. 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 **November 8, 2008**, so reserve early. If you leave before your scheduled departure date without informing the Hyatt, you will be charged an early departure fee. Reston offers a wide range of restaurants and shops.

The sleeping room rate is the government per diem rate of \$209 single and double occupancy.

## Messages

Messages may be left for PTTI attendees through the hotel's telephone number:  
**703-709-1234**.

## Temperature

The climate during December in the Washington, DC area will be cold. A coat or raincoat is recommended.

## Transportation Information

### Rental Car

Avis is the official rent-a-car company for **PTTI 2008**. The Avis Worldwide Discount (AWD) Number is **J628452**. Please use this AWD number when calling Avis directly at 800-331-1600 to receive the best car rental rates available. The discount is effective 7 days before and 7 days after the event.

### Airport Shuttle

The hotel offers a complimentary shuttle that arrives at the top of each hour from 6 am to 10 pm. It takes you directly to Dulles Airport; the drop off and pick up point will be at curbs 2A and 2H, adjacent to the lower level baggage claim level.

## Parking

Covered valet and self parking are available. Valet parking is \$24.00 overnight, with in/out privileges. Valet parking for the day only is \$12.00. Self parking is available at no charge. The parking areas are large enough to accommodate vans.

## Directions

### Washington Dulles International Airport (6.59 miles)

From airport take Dulles Access Road East toward Washington, DC. At Reston, use Exit 12, Reston Parkway / VA 602 and make a Left on to Reston Parkway. Third traffic light turn left onto Bluemont Way. Turn right onto Presidents Street to the Northern VA hotel.

### Ronald Reagan Washington National Airport / Washington, DC (22 miles)

Head north on the George Washington Memorial Parkway (crossing over into Virginia). Take the VA-123 exit toward Chain Bridge / McLean. Keep right at the fork to go on VA-123 S. Merge onto VA-267 W toward I-495 N / Dulles Airport (Portions toll). Take Reston Parkway / VA-602 exit- Exit 12. At the second traffic light turn left onto Bluemont Way. Turn right onto Presidents Street to the hotel in Northern VA.

### Baltimore and Points North (55.11 miles or more)

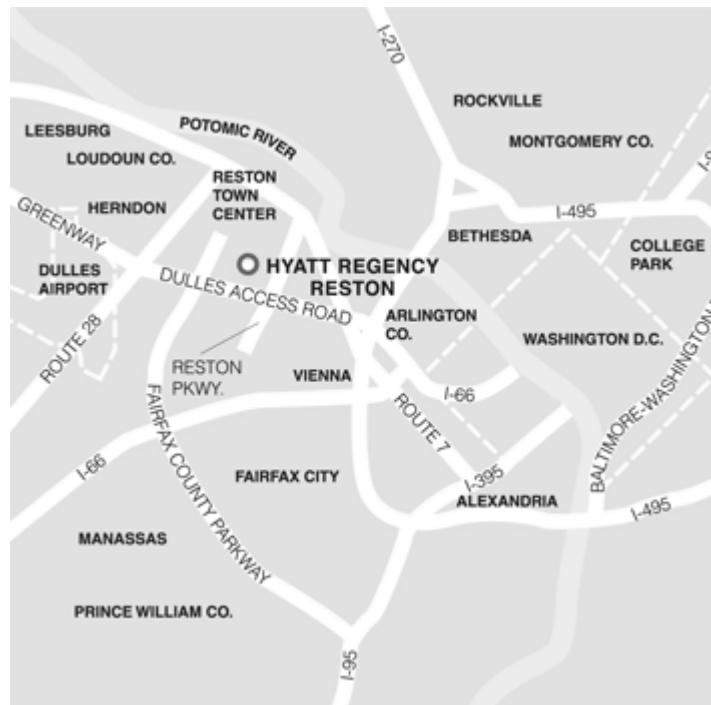
Follow I-95 South to Washington, DC beltway then exit right (west) onto I-495. Follow I-495 across the Potomac River into Virginia and exit right onto Rt. 267-Exit 45A toward Dulles Airport / Dulles Toll Road. Take Reston Parkway / VA-602 exit-Exit 12. At the second traffic light turn left onto Bluemont Way. Turn right onto Presidents Street to the Northern VA hotel.

### Richmond and Points South (115.20 miles or more)

Follow I-95 North to Washington, DC beltway (at Springfield), then exit onto I-495 (north). Follow I-495 to Rt. 267-Exit 45A, toward Dulles Airport / Dulles Toll Road. Take Reston Parkway / VA-602 exit-Exit 12. Keep right at the fork to go on Reston Parkway / VA-602 N. Turn Left onto Bluemont Way. Turn right onto Presidents Street to the hotel in Northern VA.

### Leesburg and Points West (19.72 miles or more)

Two choices: (A) Follow Rt. 7 East to Dranesville and turn right onto Reston Parkway (Rt. 602). Proceed south approximately 3 miles. Hotel will be on the right. (B) Take Dulles Greenway Toll Road East past Dulles International Airport to Exit 12, Reston Parkway. Turn left onto Reston Parkway. Third traffic light turn left onto Bluemont Way. Turn right onto Presidents Street to the Northern VA hotel.



## **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 the presenter is not in attendance, the Session Chairs will not know if the presenter is prepared to present and may be forced to cancel the presentation.

## **Presented Papers**

Presenters must send their presentations in PowerPoint 2003 format (versions XP or 2000 accepted) to [webmaster@pttimeeting.org](mailto:webmaster@pttimeeting.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://www.pttimeeting.org/author\\_kit.pdf](http://www.pttimeeting.org/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@gmasales.com](mailto:gary@gmasales.com) or [don@gmasales.com](mailto:don@gmasales.com)

## **List of Potential Exhibitors for PTTI 2008**

Astrogeodynamical Observatory  
Brandywine Communications  
Brilliant Instruments  
Brilliant Telecommunications  
Frequency Electronics, Inc.  
Furuno GPS OEM  
GPS Networking  
GPS World/Questex Media  
Inside GNSS  
ITT  
Jackson Labs  
JTime! Meinberg USA  
Lange-Electronic GmbH  
Military University of Technology  
Morion, Inc.  
NavTech GPS Supply

Osborne Technologies  
Pendulum Instruments  
Precise Time and Frequency, Inc.  
Quartzlock  
Spectracom Corporation  
SpectraDynamics, Inc.  
Spectratime  
Spectrum Instruments, Inc.  
Symmetricom Timing Test and Measurements  
Synergy Systems  
TimeTech, LLC GmbH  
TRAK Microwave Corporation  
Trimble Navigation  
U.S. Naval Observatory

## **Student Poster Competition**

The second annual PTTI Student Poster competition will take place at this year's PTTI. Our goal is to 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 2008 Evening Activities**

On Monday, December 1 at 1700, the "Get Acquainted" Icebreaker 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, December 2 at 1830.

We are delighted to have Dr. Samer Hattar, Sloan and Packard Fellow, Johns Hopkins University, present a program, "The Circadian Clock," on Wednesday, December 3 at 1900.

## **Proceedings**

The Proceedings will be available on CD and mailed to the attendees in 2009. 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.

## **Forty-first Annual PTTI Meeting**

The Forty-first Annual PTTI Systems and Applications Meeting (PTTI 2009) will be held November 16 – 19, 2009 at the Hyatt Tamaya Resort, Santa Ann, Pueblo, NM, outside of Albuquerque.

**PTTI EXECUTIVE COMMITTEE**

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U.S. Naval Research Laboratory

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Defense Information Systems Agency

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U.S. Coast Guard Navigation Center

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U.S. Naval Observatory

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RAND Corporation

**DR. JACQUES VANIER**  
University of Montreal

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1994

DR. GERNOT M. R. WINKLER  
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)

2003

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

2005

DR. NORMAN F. RAMSEY  
Harvard University

2006

PROFESSOR DAVID L. MILLS  
University of Delaware

2007

DR. R. MICHAEL GARVEY  
Symmetricom

**PTI 2008 MEETING OFFICERS**

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The Aerospace Corporation

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U.S. Coast Guard Navigation Center

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**MRS. SHEILA FAULKNER**  
Global Strategies Group (North America), Inc.

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

## PTTI 2008 SESSION CHAIRS

### SESSION I – Master Clocks

WARREN WALLS  
U.S. Naval Observatory

### SESSION II – Vendor Presentations

PETE LOPEZ  
TRAK Microwave

### SESSION III – Space Clocks

GREG WEAVER  
JHU Applied Physics Laboratory

### SESSION IV – Time & Frequency Transfer (I)

KIRK MONTGOMERY  
Symmetricom

### SESSION V – Poster Session

RAIMOND MELKERS  
L3/Titan Corporation

### SESSION VI – Advanced Clocks

PAUL SOTIRIADIS  
Johns Hopkins University

### SESSION VII – NTP & IEEE 1588

GEORGE SHATON  
Department of Defense

### SESSION VIII – Time Scales & Algorithms (I)

KEN SENIOR  
U.S. Naval Research Laboratory

### SESSION IX – Time Scales & Algorithms (II)

MHIRAN MIRANIAN  
JHU Applied Physics Laboratory

### SESSION X – Satellite Navigation Systems

BLAIR FONVILLE  
U.S. Naval Observatory

### SESSION XI – Time & Frequency Transfer (II)

S. CLARK WARDRIP  
Global Strategies Group (North America), Inc.

### SESSION XII – PTTI Applications

RANDALL ROLLO  
U.S. Navy

### SESSION XIII – Time & Frequency Transfer (III)

RACHEL EVANS  
Johns Hopkins University

## PTTI 2008

### FORTIETH ANNUAL

### PRECISE TIME AND TIME INTERVAL (PTTI) SYSTEMS AND APPLICATIONS MEETING

TUESDAY, DECEMBER 2, 2008

#### 0800 – 0805 OPENING

Warren Walls, U.S. Naval Observatory

#### 0805 – 0825 DISTINGUISHED PTTI SERVICE AWARD

Presented by Joe White, U.S. Naval Research Laboratory

#### 0825 – 0840 OPENING REMARKS

CAPT Steve Warren, U.S. Naval Observatory

#### 0840 – 0845 CALL TO SESSION

James Campano, *The Aerospace Corporation*

#### SESSION I MASTER CLOCKS

**Chairman:** Warren Walls, U.S. Naval Observatory

#### 0845 – 0915 Paper 1: COHERENT FREQUENCY REFERENCE GENERATION IN THE NASA DEEP SPACE NETWORK

B. Tucker, J. Lauf, J. Gonzalez, R. Hamell, W. Diener and R. L.

Tjoelker, *Jet Propulsion Laboratory, California Institute of Technology*

#### 0915 – 0945 Paper 2: PROVIDING SYSTEM TIME FOR GALILEO – DESIGN AND PERFORMANCE OF THE PTF

S. Bedrich, S. Müncheberg, *Kayser-Threde GmbH*, and J. Davis,

*National Physical Laboratory*

#### 0945 – 1005 Paper 3: THE MASTER CLOCK BUILDING AT USNO INFRASTRUCTURE

Warren Walls, U.S. Naval Observatory

#### 1005 – 1030 INTERMISSION

#### SESSION II VENDOR PRESENTATIONS

**Chairman:** Pete Lopez, *TRAK Microwave*

#### 1150 – 1300 LUNCH

#### SESSION III SPACE CLOCKS

**Chairman:** Greg Weaver, *JHU Applied Physics Laboratory*

#### 1300 – 1320 Paper 4: HISTORY AND PERFORMANCE OF FEI SPACE-CLASS OSCILLATORS

M. Bloch, O. Mancini and T. McClelland, *Frequency Electronics, Inc.*

#### 1320 – 1340 Paper 5: ULTRASTABLE OSCILLATORS FOR SPACE APPLICATIONS

Peter Cash, Don Emmons and Johan Welgemoed, *Symmetricom, Inc.*

TUESDAY, DECEMBER 2, 2008

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

- 1340 – 1400 **Paper 6:** ENHANCING THE ART OF SPACE OPERATIONS – PROGRESS IN JHU/APL ULTRA-STABLE OSCILLATOR CAPABILITY ROADMAP  
Gregory Weaver, Matthew Reinhart and Robert Wallis, *JHU/Applied Physics Laboratory*
- 1400 – 1420 **Paper 7:** IN-ORBIT PERFORMANCE ASSESSMENT OF GIOVE CLOCKS  
Pierre Waller, Francisco Gonzalez, Jörg Hahn, Stefano Binda, *European Space Agency, ESA-ESTEC, Noordwijk, The Netherlands*; Ricardo Piriz, Irene Hidalgo, Guillermo Tobias, *GMV S.A., Madrid, Spain*; Ilaria Sesia, Giancarlo Cerretto and Patrizia Tavella, *Istituto Nazionale di Ricerca Metrologica, Torino, Italy*
- 1420 – 1440 **Paper 8:** WENZEL SPACE CLOCKS  
J. Richardson
- 1440 – 1500 **INTERMISSION**
- SESSION IV TIME & FREQUENCY TRANSFER (I)**  
**Chairman:** Kirk Montgomery, *Symmetricom*
- 1300 – 1320 **Paper 9:** TIME TRANSFER BY LASER LINK – T2L2: AN OPPORTUNITY TO CALIBRATE RF LINKS  
Ph. Guillemot, *French Space Agency, Toulouse, France*; E. Samain, P. Exertier, P. Vrancken, *Observatoire de la Côte d'Azur, and S. Leon, French Space Agency, Paris, France*
- 1320 – 1340 **Paper 10:** PHASE TRANSFER FOR RADIO ASTRONOMY INTERFEROMETERS, OVER INSTALLED FIBRE NETWORKS, USING A ROUNT TRIP CORRECTION SYSTEM  
R. McCool, M. Bentley, R. Spencer, S. Garrington, R. Davis and B. Anderson, *The University of Manchester, Jodrell Bank Observatory*
- 1340 – 1400 **Paper 11:** EVALUATION OF OUTPUT PHASE STABILITY IN A FIBER OPTIC TWO-WAY FREQUENCY DISTRIBUTION SYSTEM  
Per Olof Hedekvist, Sven-Christian Ebenhag, Carsten Rieck and Per Jarlemark, *SP Technical Research Institute, Sweden*
- 1400 – 1420 **Paper 12:** DEVELOPMENT OF FREQUENCY TRANSFER VIA OPTICAL LINK AT NICT  
Motohiro Kumagai, Miho Fujieda, Tadahiro Gotoh, Mizuhiko Hosokawa, *National Institute of Information and Communications Technology (NICT), Japan*

TUESDAY, DECEMBER 2, 2008

**SESSION V POSTER SESSION**

1500 – 1630 **Chairman:** Raimond Melkers, *L3/Titan Corporation*

- Poster 1:** PHASE NOISE MODEL FOR AN ARRAY OF COMBINED SOURCES USING DIRECT DIGITAL SYNTHESIS (Student Paper)  
Thomas M. Comberiate, J. P. Van't Hof, Laura B. Ruppalt, Keir C. Lauritzen and Salvador H. Talisa, *The Johns Hopkins University*
- Poster 2:** RESIDUAL VIBRATION-INDUCED PM NOISE OF A RIGID OPTICAL FIBER SPOOL (Student Paper)  
J. Taylor, C. Nelson, A. Hati, N. Ashby, D. Howe, *National Institute of Standards and Technology*
- Poster 3:** HARDWARE EXPERIMENTS OF RESSOX WITH GROUND STATION EQUIPMENT (Student Paper)  
Masato Fukui, Akira Iwasaki, *University of Tokyo, Japan*; Toshiaki Iwata and Takashi Matsuzawa, *National Institute of Advanced Industrial Science and Technology (AIST), Japan*
- Poster 4:** PROGRESS ON A SIMPLIFIED LASER AND OPTICAL SYSTEM FOR ATOMIC FOUNTAINS (Student Paper)  
Paul Kunz, T. P. Heavner and S. R. Jefferts, *National Institute of Science and Technology*
- Poster 5:** TIME AND FREQUENCY ACTIVITIES AT THE U.S. NAVAL OBSERVATORY  
Demetrios Matsakis, *U.S. Naval Observatory*
- Poster 6:** ACTIVITIES AND UPDATES AT THE STATE TIME AND FREQUENCY STANDARD OF RUSSIA  
N. Koshelyaevsky, V. Kostromin and P. Krasovsky, *Department of Metrology for Time and Space FGUP VNIIIFTRI*
- Poster 7:** TIME AND FREQUENCY TRANSFER ACTIVITIES AT NIST  
V. Zhang, *National Institute of Science and Technology*
- Poster 8:** TIME AND FREQUENCY ACTIVITIES AT TIME SERVICE DIVISION OF THE NATIONAL OBSERVATORY BRAZIL  
Ricardo José de Carvalho, Mário Noto Fittipaldi and José Luiz Machado Kronenberg, *National Observatory, Brazil*
- Poster 9:** INRIM CURRENT TIMING ACTIVITIES FOR DEVELOPMENT OF THE GALILEO SYSTEM  
Ilaria Sesia, Giancarlo Cerretto and Patrizia Tavella, *Istituto Nazionale di Ricerca Metrologica, Italy*

TUESDAY, DECEMBER 2, 2008

SESSION V POSTER SESSION (*cont.*)

**Poster 10: TIME ACTIVITIES AT THE BIPM**

E. F. Arias and G. Panfilo, *Bureau International des Poids et Mesures, France*

**Poster 11: TIME AND FREQUENCY ACTIVITIES AT THE NASA JET PROPULSION LABORATORY**  
R. L. Tjoelker, *Jet Propulsion Laboratory*

**Poster 12: TIME AND FREQUENCY ACTIVITIES AT NICT, JAPAN**

Yasuhiro Koyama, Kuniyasu Immura, Tsukasa Iwama, Shin'ichi Hama, Jun Amagai, Yuko Hanado, Ryuichi Ichikawa, Motohiro Kumagai and Tadahiro Gotoh, *National Institute of Information and Communications Technology, Japan*

**Poster 13: TIME AND FREQUENCY ACTIVITIES AT THE JHU APPLIED PHYSICS LABORATORY**

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

**Poster 14: IMPROVEMENT OF TIME SCALE OF NPLI**

Suman Sharma, P. Banerjee and Arundhati Chaterjee, *National Physical Laboratory, India*

**Poster 15: ALGORITHMS OF OPTIMAL FIR FILTERING OF DISCRETE TIME STATE SPACE CLOCK MODELS**

Yuriy S. Shmaliy and Oscar Ibarra-Manzano, *Guanajuato University, Mexico*

**Poster 16: A PHASE CONTROL TECHNIQUE USING DIRECT DIGITAL SYNTHESIS FOR PHASE-LOCKED LOOP**

Hang Gong, Xiang-Wei Zhu and Shao-Wei Yong, *National University of Defense Technology*

**Poster 17: STATISTICS OF MODELING ERRORS IN AN ENSEMBLE MEAN**

J. Skinner and P. Koppang, *U.S. Naval Observatory*

**Poster 18: A SIMPLE METHOD TO MEASURE THE TIME DELAY OF GPS TIMING RECEIVER**

Xiaohui Li, Wenli-Wang, *Nation Time Service Center; Huijun-Zhang and Shaohua-Shi, Graduate School of the Chinese Academy of Sciences*

**Poster 19: POWER LAW NOISE IDENTIFICATION USING IMPROVED LAG1 AUTOCORRELATION**

Wen-ke Yang, Xiang-wei Zhu and Guang-fu Sun, *National University of Defense Technology, China*

TUESDAY, DECEMBER 2, 2008

SESSION V POSTER SESSION (*cont.*)

**Poster 20: CALIBRATING GPS WITH TWSTFT FOR ACCURATE TIME TRANSFER**

Z. Jiang and W. Lewandowski, *Bureau International des Poids et Mesures, France*

**Poster 21: A NOVEL TILTMETER**

Shervin Taghavi and Jakob VanZyl, *Jet Propulsion Laboratory*

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

**WEDNESDAY, DECEMBER 3, 2008****SESSION VI ADVANCED CLOCKS**

**Chairman:** Paul Sotiriadis, *Johns Hopkins University*

- 0800 – 0830 **Paper 13:** MEMS - BACKGROUND & STATE OF THE ART  
Wan-Thai Hsu, *Discera Inc.*

- 0830 – 0850 **Paper 14:** PHOTONIC MICROWAVE OSCILLATOR DEVELOPMENT AT THE JET PROPULSION LABORATORY  
Nan Yu, *Jet Propulsion Laboratory*

- 0850 – 0910 **Paper 15:** TOWARDS AN INTEGRATED OPTIC PHASE LOCKED OSCILLATOR  
Michael R. Watts, Anthony L. Lentine, *Sandia National Labs*; Jungwon Kim and Franz X. Kaertner, *Massachusetts Institute of Technology*

- 0910 – 0930 **Paper 16:** PROGRESS ON A SIMPLIFIED LASER AND OPTICAL SYSTEM FOR ATOMIC FOUNTAINS  
Paul Kunz, T. P. Heavner and S. R. Jefferts, *National Institute of Science and Technology*

- 0930 – 0950 **INTERMISSION**

**WEDNESDAY, DECEMBER 3, 2008****SESSION VII NTP & IEEE 1588**

**Chairman:** George Shaton, *Department of Defense*

- 0950 – 1010 **Paper 17:** STUDYING NETWORK TIMING WITH PRECISION PACKET DELAY MEASUREMENTS  
Lee Cosart, *Symmetricom, Inc.*

- 1010 – 1030 **Paper 18:** NEXT STEPS IN NETWORK TIME SYNCHRONIZATION FOR NAVY SHIPBOARD APPLICATIONS  
Karen O'Donoghue, Mark Glass and Timothy Plunkett, *NAVSEA Surface Warfare Center*

- 1030 – 1050 **Paper 19:** TIME TRANSFER USING THE DOCSIS TIMING INTERFACE  
Doug Arnold and George Zampetti, *Symmetricom, Inc.*

- 1050 – 1110 **Paper 20:** SYNCHRONIZATION OVER A PACKET INFRASTRUCTURE  
Charles Barry, *Brilliant Telecommunications*

- 1110 – 1130 **Paper 21:** FAULT TOLERANT AVERAGE ALGORITHM FOR IEEE 1588  
Georg Gaderer, Patrick Loschmidt, *Austrian Academy of Sciences*; and Nikolaus Kerö, *Oregano Systems*

**WEDNESDAY, DECEMBER 3, 2008****SESSION VII NTP & IEEE 1588 (cont.)**

- 1130 – 1150 **Paper 22:** SECURITY AND HARDWARE-BASED CLOCK SYNCHRONIZATION USING IEEE 1588  
Albert Treytl, Georg Gaderer and Aneta Nagy, *Austrian Academy of Sciences*

- 1150 – 1300 **LUNCH**

**SESSION VIII TIME SCALES & ALGORITHMS (I)**

**Chairman:** Ken Senior, *Naval Research Laboratory*

- 1300 – 1320 **Paper 23:** STEERING A TIME SCALE  
Judah Levine, *National Institute of Standards and Technology*

- 1320 – 1340 **Paper 24:** ESTIMATING UTC-UTC(APL) AT JHU APPLIED PHYSICS LABORATORY  
Mihran Miranian, *JHU/Applied Physics Laboratory*

- 1340 – 1400 **Paper 25:** ANOMALY CLOCK DETECTION ALGORITHM FOR GALILEO PRECISE TIMING FACILITY  
Qinghua Wang and Pascal Rochat, *SpectraTime, Switzerland*

- 1400 – 1420 **Paper 26:** A PROTOTYPE CESIUM CLOCK ENSEMBLE FOR THE LORAN-C RADIONAVIGATION SYSTEM  
Aaron P. Dahlen, *U.S. Coast Guard*

- 1420 – 1440 **INTERMISSION**

**SESSION IX TIME SCALES & ALGORITHMS (I)**

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

- 1440 – 1500 **Paper 27:** FREQUENCY JUMP DETECTION AND ANALYSIS  
W. J. Riley, *Hamilton Technical Services*

- 1500 – 1520 **Paper 28:** MATCHING VARIANCES TO THE STATISTICAL QUESTION  
Victor S. Reinhardt, *Raytheon Space and Airborne Systems*

- 1520 – 1540 **Paper 29:** THE GPS TOOLKIT: OPEN SOURCE CLOCK TOOLS  
Colin P. Petersen, *University of Texas at Austin*

- 1540 – 1600 **Paper 30:** SEPARATING THE VARIANCES OF A TWO-COMPONENT CLOCK MODEL BY SEQUENTIAL MINQUE  
Charles Greenhall, *Jet Propulsion Laboratory*

**WEDNESDAY, DECEMBER 3, 2008****SESSION IX TIME SCALES & ALGORITHMS (I) (cont.)**

- 1600 – 1620 **Paper 31:** MODELLING, DETECTION AND IDENTIFICATION OF CLOCK FEARED EVENTS AND OUTLIERS

Matthias Suess, Egor Bakharev and Jens Hammesfahr, *German Aerospace Center*

**1730 – 1830 JOINT EXECUTIVE AND ADVISORY BOARD MEETING**

- 1900 – 2030 **SPECIAL EVENT – “The Circadian Clock”** presented by Dr. Samer Hattar, Sloan and Packard Fellow, Johns Hopkins University

**THURSDAY, DECEMBER 4, 2008****SESSION X SATELLITE NAVIGATION SYSTEMS**

**Chairman:** Blair Fongville, *U.S. Naval Observatory*

- 0800 – 0820 **Paper 32:** GPS CHANGES AROUND THE TIME OF AND SINCE THE ARCHITECTURE EVOLUTION PLAN

Marc Weiss, *National Institute of Standards and Technology*

- 0820 – 0840 **Paper 33:** AF/NGA GPS MONITOR STATION HIGH-PERFORMANCE CESIUM FREQUENCY STANDARD STABILITY 2007/2008

Colin P. Petersen, *University of Texas at Austin*

- 0840 – 0900 **Paper 34:** GPS RECEIVER PERFORMANCE TEST AT ROA

H. Esteban, J. Palacio, F. J. Galindo and J. Garate, *ROA, Spain*

- 0900 – 0920 **Paper 35:** ESTIMATION AND PREDICTION OF THE GIOVE CLOCKS

I. Hidalgo, R. Plriz, G. Tobas, *GMV S.A., Spain*; P. Tavella, I. Sesia, G. Cerretto, *INRIM, Italy*; J. Hahn and P. Waller, *ESA/ESTEC, The Netherlands*

- 0920 – 0940 **Paper 36:** REMOTE SYNCHRONIZATION EXPERIMENTS FOR FUTURE QUASI-ZENITH SATELLITE SYSTEM USING CURRENT GEOSTATIONARY SATELLITES

Toshiaki Iwata, Tomonari Suzuyama, Michito Imae, *National Institute of Advanced Industrial Science and Technology (AIST), Japan*; Yuji Hashibe, *Space Engineering Development Co. Ltd., Japan*; and Masato Fukui, *University of Tokyo, Japan*

**0940 – 1000 INTERMISSION****SESSION XI TIME & FREQUENCY TRANSFER (II)**

**Chairman:** S. Clark Wardrip, *Global Strategies Group (North America), Inc.*

- 1000 – 1020 **Paper 37:** INFLUENCE OF IONOSPHERIC PERTURBATIONS IN GPS TIME AND FREQUENCY TRANSFER

S. Pireaux, P. Defraigne, N. Bergeot and C. Bruyninx, *Observatoire Royal de Belgique, Brussels, Belgium*

- 1020 – 1040 **Paper 38:** GPS CARRIER-PHASE TIME AND FREQUENCY TRANSFER WITH DIFFERENT VERSIONS OF PRECISE POINT POSITIONING SOFTWARE

T. Feldman, T. Feldman, T. Gotoh, A. Bauch, D. Piester

**THURSDAY, DECEMBER 4, 2008****SESSION XI TIME & FREQUENCY TRANSFER (II) (cont.)**

- 1040 – 1100 **Paper 39:** ADVANCES IN TIME AND FREQUENCY TRANSFER FROM DUAL-FREQUENCY GPS CODE AND CARRIER-PHASE OBSERVATIONS  
Paul Collins, François Lahaye, *Natural Resources Canada, Canada*; Giancarlo Cerretto and Patrizia Tavella, *Istituto Nazionale di Ricerca Metrologica, Italy*
- 1100 – 1120 **Paper 40:** REMOTE FREQUENCY CALIBRATION USING GPS CARRIER PHASE OBSERVATION MEASUREMENT AT TL  
P.C. Chang and C.S. Liao, *Chunghwa Telecom Co., Ltd., Taiwan*
- 1120 – 1140 **Paper 41:** STATISTICAL CONSTRAINTS ON STATION CLOCK PARAMETER IN THE NRCAN PPP ESTIMATION PROCESS  
Giancarlo Cerretto, Patrizia Tavella, *Istituto Nazionale di Ricerca Metrologica, Italy*; and François Lahaye, *Natural Resources Canada, Canada*
- 1140 – 1200 **Paper 42:** TWO-WAY TIME TRANSFER WITH DUAL PSEUDO-RANDOM NOISE CODES  
Tadahiro Gotoh and Jun Amagai, *National Institute of Information and Communications Technology, Japan*
- 1200 – 1330 **LUNCH**
- SESSION XII PTTI APPLICATIONS**
- Chairman:** Randall Rollo, *U.S. Navy*
- 1330 – 1350 **Paper 43:** GPS TIMING CRITICALITY ASSESSMENT  
J. V. Carroll, J. H. Kraemer, *U. S. Dept. of Transportation*; and K. Montgomery, *Symmetricom, Inc.*
- 1350 – 1410 **Paper 44:** PTTI CAPABILITIES OF THE MODERNIZED LORAN SYSTEM  
K. Montgomery, *Symmetricom, Inc.*; and M. Lombardi, *National Institute of Standards and Technology*
- 1410 – 1430 **Paper 45:** LOCKING A RUBIDIUM OSCILLATOR TO A REMOTE TIME SCALE USING REAL-TIME COMMON-VIEW GPS MEASUREMENTS  
Michael A. Lombardi, *National Institute of Standards and Technology*; and Aaron P. Dahlen, *U.S. Coast Guard*
- 1430 – 1450 **Paper 46:** CALIBRATION OF THE BEV GPS RECEIVER BY USING TWSTFT  
A. Niessner, W. Mache, B. Blanzano, O. Koudelka, J. Becker, D. Piester, Z. Jiang, F. Arias
- 1450 – 1510 **INTERMISSION**

**THURSDAY, DECEMBER 4, 2008****SESSION XIII TIME & FREQUENCY TRANSFER (III)**

**Chairman:** Rachel Evans, *JHU/Applied Physics Laboratory*

- 1510 – 1530 **Paper 47:** TIME TRANSFER FROM COMBINED ANALYSIS OF GPS AND TWSTFT DATA  
P. Defraigne, *Royal Observatory of Belgium*; M. C. Martinez, *University of Alicante, Spain*; and Z. Jiang, *Bureau International des Poids et Mesures, France*
- 1530 – 1550 **Paper 48:** CALIBRATING GPS WITH TWSTFT FOR ACCURATE TIME TRANSFER  
Z. Jiang, *Bureau International des Poids et Mesures, France*
- 1550 – 1610 **Paper 49:** THE ANALYSIS OF THE TRIANGLE CLOSURES IN ASIA-PACIFIC TWSTFT NETWORK  
Shinn-Yan Lin, Wen-Hung Tseng, Po-Cheng Chang, *Telecommunication Laboratories, Chunghwa Telecom, Taiwan*; and Kai-Ming Feng, *National Tsing Hua University, Taiwan*
- 1610 – 1630 **Paper 50:** PROGRESS ON ANALYSING CLOSURE DATA INVOLVING TWO-WAY SATELLITE TIME AND FREQUENCY TRANSFER (TWSTFT)  
D. Matsakis, L. Breakiron, *U.S. Naval Observatory*; A. Bauch, D. Piester, *Physikalisch-Technische Bundesanstalt, Germany*; and Z. Jiang, *Bureau International des Poids et Mesures, France*
- 1630 – 1650 **GENERAL DISCUSSION**  
Joe White, *U.S. Naval Research Laboratory*
- 1650 **CLOSE OF MEETING**

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

**HOTEL RESERVATION CARD**

The block of rooms for the PTTI 2008 rate will be released on **November 8**

Please mail or FAX to:

**Hyatt Regency Reston  
(PTTI 2008 Room Block)  
1800 Presidents Street,  
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Tel 703-709-1234, Fax 703-925-8295**

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Departure Date \_\_\_\_\_

Smoking    Non-Smoking      Occupants in Room \_\_\_\_\_

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Number \_\_\_\_\_

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