The Abdus Salam International Centre for Theoretical Physics

Workshop on the Future of Ionospheric Research for Satellite Navigation and Positioning: its Relevance for Developing Countries

Organizer(s): Directors: P. Doherty and S. Radicella
Trieste - Italy, 04 - 15 December 2006

Final programme

Monday, 4 December 2006 (Room:Adriatico Guest House Kastler Lecture Hall)

09:00 - 12:00	(Room: Adriatico Guest House (Lower Level 1)) --- Registration and Administrative Matters ---
12:00 - 13:30	--- Lunch ---
13:30 - 13:45	**K.R. Sreenivasan** / *ICTP Director* **Opening**
13:45 - 14:00	**S. Radicella and P. Doherty** / *ICTP, Italy and Boston College, USA* **Workshop Goals**
14:00 - 14:30	**Presentation of Participants**
14:30 - 15:30	**P. Doherty** / *Boston College, USA* **GNSS Application in Navigation Systems**
15:30 - 15:50	--- Coffee Break ---
15:50 - 16:50	**S. Radicella** / *ICTP, Italy* **Galileo System and its ionospheric model for single frequency operation**
16:50 - 17:30	**Open Discussion: What do participants hope to learn in this workshop?**

Low Latitude Ionospheric Climatology and Weather (Room:Adriatico Guest House Kastler Lecture Hall)

5 December 2006

09:00 - 09:45	**S. Radicella** / *ICTP, Italy* **Low latitude ionosphere and its impact on satellite navigation**
09:45 - 10:30	**Paluri V.S. Rama Rao** / *Andhra University, India* **Characteristics of the Indian Equatorial Ionosphere**
10:30 - 10:50	--- Coffee Break ---
10:50 - 11:35	**E. de Paula** / *INPE, Brazil* **Overview of Ionospheric Irregularities over the Brazilian Territory**
11:35 - 12:20	**R. Ezquer** / *Un. Nacional de Tucuman, Argentina* **The Argentine Ionosphere**
12:20 - 13:30	--- Lunch ---
13:30 - 14:15	**J. Adeniyi and O. Obrou** / *University of Ilorin, Nigeria and Un. of Cocody, Ivory Coast* **The African Ionosphere**
14:15 - 15:00	**M-L. Zhang** / *Chinese Academy of Sciences, Inst. of Geology and Geophysics, People's Republic of China* **The Chinese Ionosphere**
15:00 - 15:20	--- Coffee Break ---
15:20 - 17:20	**Open Discussion**

TEC and Data Workshop

6 December 2006

09:00 - 09:45	**P. Doherty** / *Boston College, USA* **Total Electron Content Measurements**
09:45 - 10:30	**L. Ciraolo** / *CNR, Italy* **GPS RINEX TEC Measurements**
10:30 - 10:50	--- Coffee Break ---
10:50 - 11:30	**I. Kantor** / *INPE, Brazil* **TEC Measurements with GPS Data**
11:30 - 12:00	**S. Delay** / *Boston College, USA* **TOPEX/JASON TEC**
12:00 - 12:45	**B. Nava** / *ICTP, Italy* **Slant to Vertical Conversion Errors**
12:45 - 13:30	--- Lunch ---
13:30 - 17:00	(Room: Computer Lab. (M)) **L. Ciraolo and S. Delay** / *CNR, Italy and Boston College, USA* **Data Analysis Workshop** Please note change of venue

19:30 - 22:00 --- Official Dinner ---
sponsored by ICTP, Italy and Boston College, USA

Scintillation theory and models, Data Workshop

7 December 2006

09:00 - 09:45 **N. Zernov** / *St. Petersburg State University, Russian Federation*
Propagation of radio waves in a fluctuating ionosphere: ionospheric scintillation (Part 1)

09:45 - 10:30 **N. Zernov** / *St. Petersburg State University, Russian Federation*
Propagation of radio waves in a fluctuating ionosphere: ionospheric scintillation (Part 2)

10:30 - 10:50 --- Coffee Break ---

10:50 - 11:30 **E. de Paula** / *INPE, Brazil*
Effects of Magnetic Storms on GPS Scintillation

11:30 - 12:15 **N.N. Zernov** / *St. Petersburg State University, Russian Federation*
Propagation of radio waves in a fluctuating ionosphere: ionospheric scintillation (Part 3)

12:15 - 13:30 --- Lunch ---

13:30 - 17:00 (Room: Computer Lab. (M))
L. Ciraolo and S. Delay / *CNR, Italy and Boston College, USA*
Data Analysis Workshop
Please note change of venue

Ionospheric Networks

8 December 2006

09:00 - 09:30 **C. Valladares** / *Boston College, USA*
LISN - South American Network

09:30 - 10:00 **C. Brunini** / *Un. Nacional de La Plata, Argentina*
SIRGAS Network

10:00 - 10:15 --- Coffee Break ---

10:15 - 10:45 **J. Villalobos** / *Universidad Nacional de Colombia, Bogota*
Ionospheric Research in Colombia

10:45 - 12:15 **led by C. Brunini and C. Valladares** / *Un. Nacional de la Plata, Argentina and Boston College, USA*
Open Discussion on GPS Networks

Monday, 11 December 2006

09:00 - 09:10 **S. Radicella and P. Doherty** / *ICTP, Italy and Boston College, USA*
Welcome and Introductions

09:10 - 10:00 **T. Walter** / *Stanford University, USA*
Introduction to SBAS (1)

10:00 - 10:45	**T. Walter** / *Stanford University, USA* **Introduction to SBAS (2)**
10:45 - 11:00	--- Coffee Break ---
11:00 - 12:15	**Round Table Discussion** **Challenges for SBAS Development in the Equatorial Regions**
12:15 - 13:30	--- Lunch ---
13:30 - 14:15	**A. Komjathy** / *California Institute of Technology, USA* **Ionopsheric Parameter Estimation Using GPS**
14:15 - 15:00	**D. Burtin** / *Alcatel-Alenia Space, France* **EGNOS algorithms behavior in harsh ionospheric condition : Example over Africa**
15:00 - 15:30	--- Coffee Break ---
15:30 - 15:50	**C. Brunini** / *Univ. Nacional de La Plata, Argentina* **Recent developments related to GNSS in Argentina**
15:50 - 16:10	**N. Dashora** / *M.L. Sukhadia University, Udaipur, India* **Study of Ionospheric Scintillations & TEC near the Crest of EIA at Udaipur, India**

Tuesday, 12 December 2006

09:00 - 09:45	**T. Walter** / *Stanford University, USA* **WAAS Estimation Routine**
09:45 - 10:15	**E. Altshuler** / *Sequoia Research Corporation, USA* **Statistics of Ionospheric Storms**
10:15 - 10:30	--- Coffee Break ---
10:30 - 11:15	**A. Komjathy** / *California Institute of Technology, USA* **Mid-latitude and Equatorial Supertruth Data**
11:15 - 12:15	**T. Walter** / *Stanford University, USA* **Ionospheric Threat Model**
12:15 - 13:30	--- Lunch ---
13:30 - 14:15	**C. Valladares** / *Boston College, USA* **Observational characteristics of two different types of equatorial plasma irregularities; bubbles and BSS using five different types of instruments**
14:15 - 15:00	**K. Groves** / *Air Force Research Lab., USA* **Global scintillation climatology derived from space- and ground-based monitoring techniques**
15:00 - 15:15	--- Coffee Break ---
15:15 - 16:00	**A.K. DasGupta** / *University of Calcutta, India* **Peculiarities of GPS Signal Scintillation in the Equatorial Regions**

16:00 - 16:20 **A.K. Singh** / *Banaras Hindu University, Varanasi, India*
Observation and Modelling of Ionospheric Irregularities at Low Latitude Station Varanasi

Wednesday, 13 December 2006

09:00 - 09:45 **K. Groves** / *Air Force Research Lab., USA*
Scintillation impacts on space-based communication and navigation systems

09:45 - 10:30 **P. Doherty** / *Boston College, USA*
Worldwide Depletion Characteristics

10:30 - 10:45 --- Coffee Break ---

10:45 - 11:30 **S. Radicella** / *ICTP, Italy*
Bubble detection over Africa

11:30 - 12:15 **D. Feng** / *Chinese Academy of Sciences, Inst. of Geology and Geophysics, Peoples's Republic of China*
Bubble Detection/China

12:15 - 13:30 --- Lunch ---

13:30 - 14:15 **M.B. El-Arini** / *The Mitre Corporation, USA*
Real-time detection of depletions in the equatorial regions

14:15 - 15:00 **L. Sparks** / *California Institute of Technology, USA*
Conical Multi-code Approach to Modeling the Low Latitude Ionosphere

15:00 - 15:15 --- Coffee Break ---

15:15 - 16:00 **T. Walter** / *Stanford University, USA*
Correlation Structure of the Equatorial Ionosphere

16:00 - 17:00 **Participant Reports on Navigation Research in their Countries**

Thursday, 14 December 2006

09:00 - 09:45 **T. Walter** / *Stanford University, USA*
Maintaining Integrity

09:45 - 10:30 **E. Altshuler** / *Sequoia Research Corporation, USA*
HMI Techniques

10:30 - 10:45 --- Coffee Break ---

10:45 - 11:30 **A.J. VanDierendonck** / *AJ Systems, USA*
TEC Calibrations Methods and What to Expect

11:30 - 12:15 **T. Walter** / *Stanford University, USA*
Introduction to GBAS

12:15 - 13:00 **Open Discussion and Closing of the Workshop**

13:00 - 13:30 --- Lunch ---

Open Meeting of the International SBAS Ionosphere Working Group (Part 1)

14 December 2006

13:30 - 13:45	**B. Arbesser-Rastburg** / *European Space Agency, the Netherlands* **Welcome and Introductions**
13:45 - 14:00	**P. Doherty** / *Boston College, USA* **SBAS Working Group Goals and Action Items**
14:00 - 14:15	**T. Walter** / *Stanford University, USA* **WAAS Update**
14:15 - 14:30	**B. Arbesser-Rastburg** / *European Space Agency, the Netherlands* **EGNOS Update**
14:30 - 14:45	**Paluri V.S. Rama Rao/A.K. DasGupta** / *Andhra University, India/University of Calcutta, India* **GAGAN Update**
14:45 - 15:00	**MSAS Update**
15:00 - 15:30	--- Coffee Break ---
15:30 - 16:15	**M. B. El-Arini** / *The Mitre Corporation, USA* **Scintillation effects on SBAS availability in North and South Americas**
16:15 - 17:00	**A.J. VanDierendonck** / *AJ Systems, USA* **Recent Upgrades in Ionosoheric Scintillation and TEC Monitoring**
19:30 - 22:00	--- Official Dinner --- sponsored by ICTP, Italy and Boston College, USA

Open Meeting of the International SBAS Ionosphere Working Group (Part 2)

15 December 2006

08:30 - 08:40	**B. Arbesser-Rastburg** / *European Space Agency, the Netherlands* **Opening Remarks**
08:40 - 09:25	**E. Altshuler** / *Sequoia Research Corporation, USA* **Scintillation Metrics from MSAS applied to Brazilian Data**
09:25 - 10:10	**Y. Beniguel** / *I.E.E.A., France* **Scintillation measurements in Africa and comparison with models**
10:10 - 10:25	--- Coffee Break ---
10:25 - 10:55	**I. Kantor** / *INPE, Brazil* **Preliminary Brazilian Testbed Data Analysis During Solar Maximum**
10:55 - 11:25	**A.J. VanDierendonck** / *AJ Systems, USA* **GNSS Modernization Impact on Scintillation and TEC**
11:25 - 12:30	**Rountable Discussion**