



TREGA PROJECT



A project funded by the European Union

Intensive All-included Training  
Technical training on GNSS Systems and Applications

**GNSS & EGNOS Module**

21/01/2014 - 11/02/2014

**Tuesday, 21 January 2014**

**Gabriella Povero, Istituto Superiore Mario Boella**

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|---|--------------|
| • Course introduction.  | 9:00-10:30   |
| Coffee Break  | 10:30-11:00  |
| • Fundamentals on Satellite Navigation: trilateration, ranges and pseudoranges, GDOP. | 11:00-12:30  |
| Lunch Break   | 12:30-14:00  |
| • Definition of integrity, accuracy, availability, and continuity.                    | 14:00-15:30  |
| Coffee Break  | 15:30-15:45  |
| • Existing and planned GNSS, with particular focus on GPS and Galileo.                | 15:45-17:00  |
| • Reception at Adriatico guest house restaurant                                       | 19:30 -20:30 |

**Wednesday, 22 January 2014**

**Gabriella Povero, Istituto Superiore Mario Boella**

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| • GNSS signals: CDMA vs. FDMA, PRN codes.                        | 9:00-10:30  |
| Coffee Break   | 10:30-11:00 |
| • GNSS signals: GPS SIS baseline (C/A, Y), GLONASS SIS baseline. | 11:00-12:30 |
| Lunch Break  | 12:30-14:00 |

- Introduction to Error Sources. Link Budget. 14:00-15:30
- Coffee Break 15:30-15:45
- Basics on noise in GNSS receivers. 15:45-17:00

#### **Thursday, 23 January 2014**

##### **Davide Margaria, Istituto Superiore Mario Boella**

- Modernized GNSS SIS: description of GPS modernization signals. 9:00-10:30
- Coffee Break 10:30-11:00
- MBOC and TMBOC. 11:00-12:30
- Lunch Break 12:30-14:00
- Galileo SIS. BOC, ALTBOC, CASM. CBOC. 14:00-15:30
- Coffee Break 15:30-15:45
- Introduction to N-FUELS simulation tool. 15:45-17:00

#### **Friday, 24 January 2014**

##### **Sandro Radicella, ICTP**

- The Ionosphere and Its Effects on GNSS 9:00-10:30
- Coffee Break 10:30-11:00
- The Ionosphere and Its Effects on GNSS  
11:00-12:30
- Lunch Break 12:30-14:00
- The Ionosphere and Its Effects on GNSS 14:00-15:30
- Coffee Break 15:30-15:45
- The Ionosphere and Its Effects on GNSS 15:45-17:00

#### **Monday, 27 January 2014**

##### **Mario Nicola, Istituto Superiore Mario Boella**

- Overview of GNSS Receivers Architecture. 9:00-10:30

Coffee Break	10:30-11:00
• GNSS Receiver: The Front-End.	11:00-12:30
Lunch Break	12:30-14:00
• GNSS Receiver: Acquisition techniques.	14:00-15:30
Coffee Break	15:30-15:45
• GNSS Receiver: Acquisition techniques.	15:45-17:00

## **Tuesday, 28 January 2014**

### **Mario Nicola, Istituto Superiore Mario Boella**

• GNSS Receiver: Tracking techniques.	9:00-10:30
Coffee Break	10:30-11:00
• GNSS Receiver: Tracking techniques.	11:00-12:30
Lunch Break 12:30-14:00	
• Hands-on session (using MATLAB): GNSS Receiver technologies.	14:00-15:30
Coffee Break	15:30-15:45
• Hands-on session (using MATLAB): GNSS Receiver technologies.	15:45-17:00

## **Wednesday, 29 January 2014**

### **Beatrice Motella, Istituto Superiore Mario Boella**

• Hands-on session (using MATLAB): Analysis of GNSS SIS with the N-FUELS simulation tool – Part 1.	9:00-10:30
Coffee Break	10:30-11:00
• Hands-on session (using MATLAB): Analysis of GNSS SIS with the N-FUELS simulation tool – Part 1.	11:00-12:30
Lunch Break	12:30-14:00
• Hands-on session (using MATLAB): Analysis of GNSS SIS with the N-FUELS simulation tool – Part 2.	14:00-15:30
Coffee Break	15:30-15:45
• Hands-on session (using MATLAB): Analysis of GNSS SIS with the N-FUELS simulation tool – Part 2.	15:45-17:00

## Thursday, 30 January 2014

### Gianluca Falco, Istituto Superiore Mario Boella

- Code-based Measurements. 9:00-10:30
- Coffee Break 10:30-11:00
- Data demodulation. 11:00-12:30
- Lunch Break 12:30-14:00
- Pseudorange computation, PVT. 14:00-15:30
- Coffee Break 15:30-15:45
- Pseudorange computation, PVT. 15:45-17:00

## Friday, 31 January 2014

### Bruno Nava, ICTP

- Ionospheric Modeling 9:00-10:30
- Coffee Break 10:30-11:00
- Ionospheric Modeling 11:00-12:30
- Lunch Break 12:30-14:00
- Ionospheric Modeling 14:00-15:30
- Coffee Break 15:30-15:45
- Ionospheric Modeling 15:45-17:00

## Monday, 3 February 2014

### Luigi Ciraolo, ICTP

- GNSS observables biases 9:00-10:30
- Coffee Break 10:30-11:00
- GNSS observables biases 11:00-12:30
- Lunch Break 12:30-14:00

- GNSS observables biases 14:00-15:30
- Coffee Break 15:30-15:45
- GNSS observables biases 15:45-17:00

**Tuesday, 4 February 2014**

**Gianluca Marucco, Istituto Superiore Mario Boella**

- Introduction to Differential GNSS. 9:00-10:30
- Coffee Break 10:30-11:00
- Local Area Augmentation Systems. 11:00-12:30
- Lunch Break 12:30-14:00
- Wide Area Augmentation Systems. 14:00-15:30
- Coffee Break 15:30-15:45
- Receiver performance in terms of accuracy and integrity. 15:45-17:00

**Wednesday, 5 February 2014**

**Gianluca Marucco, Istituto Superiore Mario Boella**

- EGNOS description: Ground and Space Segments. 9:00-10:30
- Coffee Break 10:30-11:00
- EGNOS SIS description. 11:00-12:30
- Lunch Break 12:30-14:00
- EGNOS Performance. 14:00-15:30
- Coffee Break 15:30-15:45
- EGNOS Performance monitoring (ESA Stanford Diagram, ...). 15:45-17:00

**Thursday, 6 February 2014**

**Gianluca Marucco, Istituto Superiore Mario Boella**

- EDAS and EGNOS technical documents. 9:00-10:30
- Coffee Break 10:30-11:00

- EDAS and EGNOS technical documents. 11:00-12:30
- Lunch Break 12:30-14:00
- EGNOS Wide Area Network technology. 14:00-15:30
- Coffee Break 15:30-15:45
- Wide-Area Real-Time Kinematics (WARTK). 15:45-17:00

**Friday, 7 February 2014**

**Xurxo Otero Villamide, ICTP**

- Introduction to the GNSS testing/simulation platform 9:00-10:30
- Coffee Break 10:30-11:00
- Introduction to the GNSS testing/simulation platform  
11:00-12:30
- Lunch Break 12:30-14:00
- Introduction to the GNSS testing/simulation platform  
14:00-15:30
- Coffee Break 15:30-15:45
- Introduction to the GNSS testing/simulation platform 15:45-17:00

**Monday, 10 February 2014**

**Marco Pini, Istituto Superiore Mario Boella**

- Techniques for the analysis of EGNOS Data. 9:00-10:30
- Coffee Break 10:30-11:00
- Techniques for the analysis of EGNOS Data. 11:00-12:30
- Lunch Break 12:30-14:00
- Hands-on session (using MATLAB): Analysis of EGNOS Data. 14:00-15:30
- Coffee Break 15:30-15:45
- Hands-on session (using MATLAB): Analysis of EGNOS Data. 15:45-17:00

**Tuesday, 11 February 2014**

**Marco Pini, Istituto Superiore Mario Boella**

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|--|-------------|
| • GNSS-based Applications.                             | 9:00-10:30  |
| Coffee Break   | 10:30-11:00 |
| • GNSS-based Applications.                             | 11:00-12:30 |
| Lunch Break  | 12:30-14:00 |
| • EGNOS-based Applications.                            | 14:00-15:30 |
| Coffee Break   | 15:30-15:45 |
| • Final Test. Overall assessment. Questions & Answers. | 15:45-17:00 |