COST Action: TU1302
Satellite Positioning Performance Assessment
for Road Transport – SaPPART
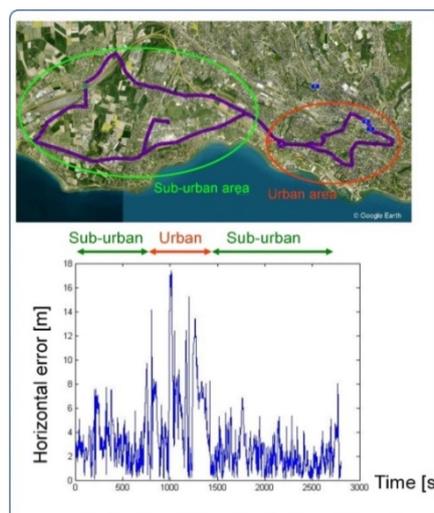
1st Training School

**Fundamentals of GNSS
for ITS applications**

Aveiro – Portugal

9 - 11 May 2016

EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY

1st SaPPART Training School

The three day intensive school will provide participants with training on the fundamental of GNSS positioning for road applications, including the role of positioning in the intelligent transport systems (ITS), the architecture of GNSS services and the practical use of GNSS receivers. Practical experiments will be proposed to the attendees with the quality evaluation of real datasets.

The school is targeted to young graduate and PhD students, engineers, researchers, consultants and government employees who wish to improve their understanding of GNSS in road and ITS applications. A reasonable country and gender balance should be respected concerning the participation.

Objective:
- To understand the basic of GNSS positioning systems
- To capture the role of positioning in ITS applications
- To collect and process GPS data and assess quality of positions

Info and deadlines:
- Maximum number of participants: **30**
- **Registration**
    - opening: End 2015
- **Registration**
    - The registration must be performed in two steps (Google form & e-COST system). Extended Deadline: **15th March 2016**
    - 1. Form: http://goo.gl/forms/5V0zPqWZzO   (pre-registration)
    - 2. Each Trainee must register a profile on e-COST at https://e-services.cost.eu and must add their bank details
    - Acceptance confirmation: March 2016
    - Acceptance: a reasonable country balance should be respected concerning Trainee participation
- **Fee**
    - No fee is due
    - Trainees will receive a grant which covers most of the travel costs and accommodation. This will be confirmed in a grant letter.
- **Pre-requisites**: before attending the training school, we encourage participants to acquire basic knowledge in geomatics (geodetic references, coordinate systems). We suggest to follow some lessons of the MOOC "éléments de géomatique" (with subtitles in English):
- https://www.coursera.org/course/geomatique (Start February 2016)

Organised by:
- COST Action Tu1302 – SaPPART
- Local organiser: Margarida Coelho (University of Aveiro)
- Organisation committee: Valérie Renaudin (IFSTTAR), Laura Ruotsalainen (NLS), Pierre-Yves Gilliéron (EPFL)
- Information: pierre-yves.gillieron@epfl.ch

SaPPART Training School -Program

Time	Lecturer Title	Lecturer
Sunday 8th May 2016		
After noon	Meeting of the instructors	
Monday 9th May 2016		
8 :30-9 :00	Welcome and presentation of the program	Margarida Coelho, Local Organiser, Uni Aveiro P.-Y Gilliéron, EPFL
Topic 1	**Role of positioning in ITS**	
9:00 – 10:00	Overview of ITS applications and services - Focus on requirements	François Fischer, ERTICO
	Break	
10:15 – 11:00	Role of positioning in ITS applications	Tbd
11:00 – 12:00	Positioning metrics, performance measures	François Peyret, Ifsttar
12:00 – 13:30	Lunch	
13:30-15:00	Lab 1: translating ITS requirements into positioning performance levels (practical exercise, use cases)	François Fischer, ERTICO P.-Yves Gilliéron, EPFL
	Break	
15:30-17:30	Lab 1: Discussion about the findings	All
Tuesday , 10th May 2016		
Topic 2	**Fundamental of Global Navigation Satellite System (GNSS)**	Before the TS, we will ask participants to follow some **MOOC** lessons (reference systems, basics of GPS)
8:30 – 09:30	Reference systems: coordinate and time (demo and use cases of coordinate transformations)	Valérie Renaudin, Ifsttar
09:30 – 11:00 Break:~10:15	Introduction to GNSS systems: - Architecture and GNSS systems - Multi GNSS signals - Receiver Implementation (Rx Architecture)	Zahidul Bhuiyan, NLS
11:00 – 12:00	Point positioning methods: - GNSS observables (Code, carrier phase)	David Bétaille, Ifsttar

	- Single Point (use cases: satellites geometry, signal obstructions)	
12:00 – 13:30	Lunch	
13:30-15:00	Lab 2a: GNSS data collection (field experiment)	EPFL + Ifsttar + NLS (PYG, VR,ZB,MO)
	Break	
15:30 – 17:30	Lab 2b: Analysis and positioning quality assessment (computer lab)	EPFL + Ifsttar + NLS
20:00	Training school dinner	
Wednesday, 11th May 2016		
Topic 3	**Differential GNSS, services and architecture**	
8:30 – 9:30	Understanding GNSS error sources	Laura Ruotsalainen, NSL Valérie Renaudin, Ifsttar
9 :30-12 :00 Break:~10:15	Error Mitigation Techniques - Differential Corrections broadcasted by terrestrial or space based means (WAAS, EGNOS) - Fusion with automotive data (Odometry, Gyroscope) (Only Loose Coupling) - Map-Matching techniques, Map Aiding Navigation (Only Loose Coupling)	Nuria Blanco Delgado, ESSP David Bétaille, Ifsttar
12:00 – 13:30	Lunch	
13:30-15:00	Lab 3a: Position Estimation using the Different Processing Techniques (I/II)	Ifsttar + NLS (DB,VR,ZB,MO)
	Break	
15:15 – 16:30	Lab 3b: Position Estimation using the Different Processing Techniques (II/II)	Ifsttar + NLS
16:30 – 17:00	Closing and evaluation	P.-Yves Gilliéron