

ICL-GNSS 2022, June 7-9, 2022 in Tampere, Finland

AGENDA

All times are in EEST

Tuesday, June 7, 2022

09:30am - 10:00am **Opening**

Session Chair: Jari Nurmi, Tampere University

10:00am - 11:00am **Keynote: Ignacio Fernandez Hernandez**

Galileo new signal-in-space features: why and how to use them?

Session Chair: Jari Nurmi, Tampere University

11:00am – 11:40am Coffee and exhibit break

11:40am – 1:00pm **GNSS Jamming and Spoofing**

Session Chair: Ignacio Fernandez Hernandez, European Commission

11:40 Detection and Classification of GNSS Jammers Using Convolutional Neural Networks
Iman Ebrahimi Mehr, Fabio Dovis
Politecnico di Torino, Italy

12:00 Participatory Sensing for Localization of a GNSS Jammer
Glädje Karl Olsson¹, Erik Axell¹, Erik G. Larson², Panos Papadimitratos³
1) FOI Totalförsvarets forskningsinstitut; 2) Linköping University; 3) Royal Institute of Technology (KTH)

12:20 Disruptive GNSS Signal Detection and Classification at Different Power Levels Using
Advanced Deep-Learning Approach
Arul Elango, Sahar Ujan, Laura Ruotsalainen
Department of Computer Science, University of Helsinki, Finland

12:40 Experimental testing and impact analysis of jamming and spoofing attacks on
professional GNSS receivers
Sanja Miljanovic¹, Francesco Ardizzone¹, Laura Crosara¹, Nicola Laurenti¹, Luca
Canzian², Enrico Lovisotto², Nicola Montini², Oscar Pozzobon², Rigas Ioannides³
*1) University of Padova, Italy, Italy; 2) Qascom, Bassano del Grappa, Italy; 3) European
Space Agency, Noordwijk, The Netherlands*

1:00pm – 2:00pm Lunch

2:00pm – 3:00pm

Positioning Security and Robustness

Session Chair: Aleksandr Ometov, Tampere University

- 14:00 Guidelines for Galileo Assisted Commercial Authentication Service Implementation
Rafael Terris-Gallego¹, Ignacio Fernandez-Hernandez², José A. López-Salcedo¹, Gonzalo Seco-Granados¹
1) *Universitat Autònoma de Barcelona (UAB), IEEC-CERES, Barcelona, Spain; 2) DG DEFIS, European Commission, Brussels, Belgium*
- 14:20 On Cryptographic Algorithms and Key Length for Delayed Disclosure Authentication of GNSS
Maki Yoshida¹, Sumio Morioka², Satoshi Obana³
1) *National Institute of Information and Communications Technology, Japan; 2) Interstellar Technologies Inc., Japan; 3) Hosei University, Japan*
- 14:40 Low-Complexity Adaptive Direct-State Kalman Filter for Robust GNSS Carrier Tracking
Iñigo Cortés^{1,2}, Natalia Conde¹, Johannes Rossouw van der Merwe¹, Elena Simona Lohan², Jari Nurmi², Wolfgang Felber¹
1) *Fraunhofer Institute for Integrated Circuits IIS, Nuremberg, Germany; 2) Tampere University, Electrical Engineering Unit, Tampere, Finland*

3:00pm - 3:30pm

Coffee and exhibit break

3:30pm - 4:30pm

IoT, Wearables and Maritime

Session Chair: Joaquin Torres Sospedra, University of Minho

- 15:30 Positioning by fingerprinting with multiple cells in NB-IoT networks
Luca De Nardis¹, Giuseppe Caso², Özgü Alay³, Usman Ali¹, Marco Neri⁴, Anna Brunstrom⁵, Maria-Gabriella Di Benedetto¹
1) *Sapienza University of Rome, Italy; 2) Ericsson Research, Sweden; 3) University of Oslo, Norway; 4) Rohde&Schwarz, Italy; 5) Karlstad University, Sweden*
- 15:50 Velocity Protection Level for Wearable Devices on TDCP-based Pedestrian Navigation
Ziyu Li, Ni Zhu, Valérie Renaudin
Université Gustave Eiffel, France
- 16:10 Backing-Up GNSS with R-Mode: Positioning Performance for Recursive Estimators
Lukas Hösch, Filippo Giacomo Rizzi, Lars Grundhöfer, Ralf Ziebold, Daniel Medina
German Aerospace Center (DLR), Germany
- 16:30 end of program

5pm – 6pm Visit to Museum Center Vapriikki

6:15pm – 9:30pm Dinner at Restaurant Finlayson Palace

Wednesday, June 8, 2022

9:15am Opening of the second day

9:20am – 10:20am

Keynote: Roberto Muscinelli:

RF threats to GNSS based applications impacting achievable performances: overview and countermeasures

Session Chair: Jari Nurmi, Tampere University

10:20am - 11:20am

GNSS Antennas

Session Chair: Roberto Muscinelli, BIP Consulting

10:20 The Gamma Project: Development of a Galileo-Based Multi-Frequency Multi-Purpose Antenna

Mario Faliero¹, Shu Wang¹, Niccolò Pastori², Gaetano Pastore², Mirko Antonini³, Roberto Muscinelli⁴, Joaquin Reyes González⁵, Franco Gottifredi⁶

1) *Amphenol SAA KE Elektronik*; 2) *Thales Alenia Space*; 3) *SpaceEXE*; 4) *Business Integration Partners*; 5) *EUSPA*; 6) *GEA Space*

10:40 Dual-Frequency EGNOS and Galileo-based GNSS Receiver and Antenna for Railway: the TRENI Project

Marco Puccitelli¹, Livio Marradi¹, Gaetano Pastore¹, Chiara Manno¹, Haana Al Bitar², Anne-Marie Tobie², Rodolfo Guidi³, Giovanni Galgani³, Francesco Inzirillo⁴, Filippo Rodriguez⁵, Alessio Martinelli⁵, Youval Bar Yossef⁶, Daniel Lopour⁷

1) *Thales Alenia Space Italy, Italy*; 2) *Thales Alenia Space France, France*; 3) *Eikontech, Italy*; 4) *Mermec, Italy*; 5) *Telespazio, Italy*; 6) *Saphyrion, CH*; 7) *EUSPA, CZ*

11:00 MAGICA project: Crossed IFA Multi-frequency GNSS Integrated Cost-effective Antenna for Automotive Applications

Marco Antonio Vélez¹, Jose Javier Vicente¹, Joan Gemio¹, Laia Vilalta¹, Laura Tantinyà¹, Alberto Gil², Adrián Cardalda³, Daniel Baños¹, Pere Mogas¹, Joaquín Reyes⁴

1) *Nextium by IDNEO Technologies, S.A.U., Spain*; 2) *SEAT S.A., Spain*; 3) *Rohde & Schwarz GmbH & Co. KG, Germany*; 4) *European Union Agency for the Space Programme, Prague*

11:20am – 12:00pm Coffee and exhibit break

12:00pm – 1:00pm

Hybrid Positioning

Session Chair: Joaquin Torres Sospedra, University of Minho

12:00 Mitigation of GNSS errors in urban canyon using Wi-Fi RTT

Miquel Garcia Fernandez, Malgorzata Siutkowska, Aleix Tejada
Rokubun, Spain

12:20 WIFI radio node location estimation based on GNSS and motion sensor data

Pavel Ivanov¹, Henri Nurminen¹, Simo Ali-Löyty², Pasi Raunonen²

1) *HERE Technologies, Finland*; 2) *Tampere University, Finland*

12:40 Subterranean positioning for a semi-autonomous robot supporting emergency task forces

Eva Reitbauer¹, Christoph Schmied¹, Hamid Didari²

1) *Institute of Geodesy, Graz University of Technology, Austria*; 2) *Institute of Software Technology, Graz University of Technology, Austria*

1:00pm – 2:00pm Lunch

2:00pm – 3:20pm **Indoor Positioning**

Session Chair: Adriano Moreira, University of Minho

14:00 Lightweight Hybrid CNN-ELM Model for Multi-building and Multi-floor Classification

Darwin Quezada-Gaibor^{1,2}, Joaquín Torres-Sospedra³, Jari Nurmi², Yevgeni Koucheryavy², Joaquín Huerta¹

1) *Institute of New Imaging Technologies, Universitat Jaume I, Castellón, Spain*;
2) *Electrical Engineering Unit, Tampere University, Tampere, Finland*;
3) *Centro Algoritmi, Universidade do Minho, Portugal*

14:20 Towards Accelerated Localization Performance Across Indoor Positioning Datasets

Lucie Klus^{1,2}, Darwin Quezada-Gaibor^{2,1}, Joaquin Torres-Sospedra^{3,2}, Elena Simona Lohan¹, Carlos Granell², Jari Nurmi¹

1) *Tampere University, Finland*; 2) *Universitat Jaume I, Spain*; 3) *Universidade do Minho, Portugal*

14:40 Implementation of Embedded Multiple Signal Classification Algorithm for Mesh IoT Networks

Tiago Troccoli^{1,2}, Juho Pirskanen², Aleksandr Ometov¹, Jari Nurmi¹, Ville Kaseva²

1) *Tampere University, Finland*; 2) *WIREPAS Ltd., Tampere, Finland*

15:00 Labeling for UWB Ranging in Weak NLOS Conditions

Philipp Peterseil, David Märzinger, Bernhard Etlzinger, Andreas Springer
Johannes Kepler University Linz, Austria

3:20pm – 4:00pm Coffee and exhibit break

4:00pm - 4:40pm **Interference**

Session Chair: Heidi Kuusniemi, University of Vaasa

16:00 Low-cost COTS GNSS interference detection and classification platform: Initial results

J. Rossouw van der Merwe, David Contreras Franco, Dorsaf Jdidi, Tobias Feigl, Alexander Rügamer, Wolfgang Felber
Fraunhofer IIS, Germany

16:20 Space Cognitive Communications: Characterizing Radiofrequency Interference to Improve Digital Space Domain Awareness

Samuel Lefcourt, Nathaniel Gordon, Hanting Wong, Gregory Falco
Johns Hopkins University, United States of America

7pm -10pm Lake cruise and dinner, gathering at Laukontori at 18:45

Thursday, June 9, 2022

9:15am Opening of the third day

9:20am – 10:20am **Keynote: Satyam Dwivedi:**

3GPP network-based positioning: past, present and immediate future

Session Chair: Jari Nurmi, Tampere University

10:20am - 11:00am **5G Positioning**

Session Chair: Satyam Dwivedi, Ericsson

10:20 A CNN Approach for 5G mmWave Positioning Using Beamformed CSI Measurements
Ghazaleh Kia¹, Laura Ruotsalainen¹, Jukka Talvitie²
1) *University of Helsinki*; 2) *Tampere University*

10:40 Deep Learning-based Fingerprinting for Outdoor UE Positioning Utilising Spatially Correlated RSSs of 5G Networks
Ahmed Al-Tahmeesschi¹, Jukka Talvitie², Miguel López-Benítez^{3,4}, Laura Ruotsalainen¹
1) *University of Helsinki, Finland*; 2) *Tampere University, Finland*; 3) *University of Liverpool, United Kingdom*; 4) *Antonio de Nebrija University, Spain*

11:00am - 11:40pm Coffee and exhibit break

11:40am - 1:00pm **GNSS Systems and Applications**

Session Chairs: Tommaso Senni, RHEA Group; Jari Nurmi, Tampere University

11:40 Differential ZTD based on high spatial resolution NWP data for the Nordic countries
Jan Erik Håkegård, Nadezda Sokolova, Aiden Morrison
SINTEF, Norway

12:00 Transmit Pulse Shaping for 1-bit GNSS Receivers
Christoph Enneking¹, Florian Christian Beck¹, Steffen Thaelert¹, Felix Antreich²
1) *German Aerospace Center (DLR), Wessling, Germany*; 2) *Aeronautics Institute of Technology (ITA), Sao Jose dos Campos, Brazil*

12:20 Evaluation of the Hungarian Algorithm for Optimal Transmission of the Galileo HAS Message from Multiple Satellites
Tommaso Senni¹, Ignacio Fernández-Hernández², Simòn Cancela³
1) *RHEA group for European Commission, Leiden, The Netherlands*; 2) *European Commission, Brussels, Belgium*; 3) *GMV, Tres Cantos, Spain*

12:40 Instantaneous real-time kinematic decimeter-level positioning with Galileo and BDS-3 penta-frequency signals over long-baseline
Liwei Liu, Shuguo Pan, Wang Gao, Chun Ma
Southeast University, China

1:00pm – 2:00pm Lunch

2:00pm – 2:40pm

Classification and Characterization

Session Chair: Jari Nurmi, Tampere University

14:00 LoRaWAN Fingerprinting with K-Means: The Relevance of Clusters Visual Inspection

Joaquín Torres-Sospedra¹, Michiel Aernouts², Adriano Moreira¹, Rafael Berkvens²

1) *University of Minho - Algoritmi Research Centre, Guimarães, Portugal;*

2) *University of Antwerp - imec, IDLab - Faculty of Applied Engineering, Antwerp, Belgium*

14:20 Agriculture Professional GNSS Receivers: Performance Comparison in Controlled and Operational Scenarios

Jacopo Capolicchio¹, Daniele Mennuti¹, Ileana Milani¹, Marco Fortunato², Riccardo Petix³, Joaquin Reyes Gonzalez⁴, Martin Sunkevic⁴

1) *Thales Alenia Space Italia;* 2) *Randstad Italia;* 3) *Business Integration Partners;*

4) *EU Agency for the Space Programme (EUSPA)*

2:40pm – 3:00pm

Awards and Closing

Session Chair: Jari Nurmi, Tampere University

6pm – 9pm *Farewell beers and dinner at brewery restaurant Plevna*