

2021 International Conference on Localization and GNSS (ICL-GNSS 2021)

**Tampere, Finland
1 – 3 June 2021**



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TUESDAY, 1st JUNE

10:00 Conference Opening

Prof. Jari Nurmi (Tampere University)

10:20 Technical Session *Localization 1*

10:20 WALLSY: The UWB and SmartMesh IP enabled Wireless Ad-hoc Low-power Localization SYstem...1
Sabin C Gheorghiu, Rene H Molnar, Kazmer Nagy-Betegh, Ryan C Grammenos
University College London, United Kingdom 


10:40 Outdoor Ranging and Positioning based on LoRa Modulation...8
Pascal Müller¹, Hannes Stoll¹, Luciano Sarperi¹, Christof Schüpbach²
1) ZHAW School of Engineering, Switzerland
2) armasuisse Science + Technology, Switzerland 


11:00 Keynote *Indoor Localization Systems and Data Privacy...N/A*


Dr. Eda Marchetti
Centro Competenza Cybersecurity Toscano, Italy


12:00 Break

12:20 Technical Session *GNSS 1*

12:20 Efficient Multi-Hypothesis Tests for Extended Coherent Acquisition Using Modified Linear Feedback Shift Register Secondary Codes...N/A
J. Rossouw van der Merwe¹, Heike Dorner¹, Xabier Zubizarreta², Alexander Rügamer¹, Ivana Lukcin¹, Daniel Rubino¹, Wolfgang Felber¹
1) Fraunhofer IIS, Germany; 2) ALOR Tech, Spain 


12:40 – *Best Paper Award Candidate*
Performance Limits and Benefits of Adaptive Autoregressive Kalman Filters for GNSS Scintillation-Robust Carrier Tracking...22
Sergi Locubiche-Serra, Gonzalo Seco-Granados, José A. López-Salcedo
Universitat Autònoma de Barcelona (UAB), IEEC-CERES, Spain 

13:00 – *Best Paper Award Winner*
Adaptive Techniques in Scalar Tracking Loops with Direct-State Kalman-Filter...28
Iñigo Cortés¹, Pablo Marín¹, Johannes Roussouw van der Merwe¹, Elena Simona Lohan², Jari Nurmi², Wolfgang Felber¹
1) Fraunhofer IIS, Germany; 2) Tampere University, TAU, Finland 

13:20 Sub-Band AGC-Based Interference Mitigation...35
Fabio Garzia, J. Rossouw van der Merwe, Alexander Rügamer, Santiago Urquijo, Simon Taschke, Wolfgang Felber
Fraunhofer IIS, Nuremberg, Germany 

13:40 Exhibit and lunch break

15:00 Technical Session *5G Positioning*

15:00 Neural Network Fingerprinting and GNSS Data Fusion for Improved Localization in 5G...41
Roman Klus, Jukka Talvitie, Mikko Valkama
Tampere University, Finland 

15:20 5G Positioning Based on the Wideband Electromagnetic Vector Antenna...N/A
Bo Sun¹, Bo Tan¹, Wenbo Wang¹, Mikko Valkama¹, Christophe Morlaas², Elena Simona Lohan¹
1) Tampere University, Finland; 2) ENAC, France

15:40 A combined Ray Tracing simulation environment for hybrid 5G and GNSS positioning...N/A
Ivana Lukcin¹, Phuong Bich Duong¹, Katrin Dietmayer¹, Sheikh Usman Ali², Sebastian Kram¹, Jochen Seitz¹, Wolfgang Felber¹
1) Fraunhofer IIS, Germany; 2) Technische Universität München (TUM), Germany

16:00 Break

16:20 Special Session *Collaborative Positioning*

- 16:20 Smartphone Distance Estimation Based on RSSI-Fuzzy Classification Approach...47
Pavel Pascacio^{1,2}, Sven Casteleyn¹, Joaquín Torres-Sospedra³
1) Universitat Jaume I, Spain; 2) Tampere University, Finland; 3) UBIK Geospatial Solutions S.L., Spain



16:40 – *Best Paper Award Candidate*

- A Multidimensional Scaling Approach for Seamless Indoor/Outdoor Cooperative GNSS Navigation...53
Ali Naouri¹, Lorenzo Ortega², Jordi Vilà-Valls¹, Eric Chaumette¹
1) ISAE-SUPAERO/University of Toulouse, France; 2) TESA, France



17:00 End of Special Session

WEDNESDAY, 2nd JUNE

10:00 Technical session *Antennas*

- 10:00 Multibeam antenna array and software switching for low-complexity low-cost GNSS beamforming...59
Nabanita Sengupta¹, J. Rossouw van der Merwe¹, Alexander Koelpin², Alexander Ruegamer¹, Matthias Kuhl², Wolfgang Felber¹
1) Fraunhofer IIS, Germany; 2) Hamburg University of Technology, TUHH, Hamburg, Germany



10:20

MAGICA project: Development of a Multi-frequency Automotive GNSS Integrated Cost Effective Antenna...N/A

Evgenii Filatov¹, Marco Antonio Vélez¹, Joan Gemio¹, Jose Javier Vicente¹, Roser Capdevila¹, Laura Tantinyà¹, Alberto Gil², Adrián Cardalda³, Daniel Baños¹, Pere Mogas¹, Joaquín Reyes⁴
1) FICOSA International; 2) SEAT; 3) Rohde & Schwarz GmbH & Co; 4) GSA

10:40

Algorithm for direction finding using spinning and omnidirectional antennas that uses all available information...N/A

Matti Raitoharju
Patria, Finland

11:00 Keynote *Improved PNT services from Low Earth Orbit satellites...N/A*




Dr. Cyril Botteron
Space PNT

12:00 Break

12:20 Technical Session *Localization 2*

- 12:20 Feasibility of Standalone TDoA-based Localization Using LoRaWAN...66
Ruthwik Muppala¹, Abhinav Navnit¹, Deeksha Devendra¹, Eustachio Roberto Matera², Nicola Accettura³, Aftab M. Hussain¹
1) PATRIoT Lab, IIIT Hyderabad, India
2) Abbia GNSS Technologies, Toulouse, France
3) LAAS-CNRS, Université de Toulouse, CNRS, Toulouse, France



- 12:40 Comparison of I/Q- and Magnitude-based UWB Channel Impulse Responses for Device-free Localization...73
 Marco Cimdins¹, Sven Ole Schmidt¹, Horst Hellbrück^{1,2}
 1) Technische Hochschule Lübeck, Germany; 2) University of Luebeck, Germany 
- 13:00 Locating the source in wireless sensor networks with unknown start transmission time...80
 Huijie Zhu¹, Sheng Liu², Wei Xu³, Zhiqiang Yao⁴, Zheng Peng²
 1) Science and Technology on Communication Information Security Control Laboratory, No. 36 Research Institute of China Electronics Technology Group Corporation
 2) School of Mathematics and Computational Science of Xiangtan University
 3) Changsha Technology Research Institute of Beidou Industry Safety
 4) School of Automation and Electronic Information of Xiangtan University 
- 13:20 Towards state-full positioning of mobile subscribers through advanced cellcoverage modeling technique...86
 Artjom Lind, Amnir Hadachi
 ITS Lab, Institute of Computer Science, University of Tartu, Estonia 

13:40 Exhibit and lunch Break

15:00 Technical Session GNSS 2

- 15:00 Message-to-Satellite Allocation Strategies for Long GNSS Messages and application to the Galileo High Accuracy Service...92
 Tommaso Senni¹, Ignacio Fernández-Hernández², Simón Cancela³
 RHEA group for European Commission, Netherlands; 2) European Commission, Brussels; 3) GMV, Madrid 
- 15:20 Are Elliptical Galileo Satellites Usable for RTK?...N/A
 Andrew Simsky, Dries Schellekens
 Septentrio N.V., Belgium
- 15:40 Machine Learning Utilization in GNSS—Use Cases, Challenges and Future Applications...99
 Akpojoto Siemuri, Heidi Kuusniemi, Mohammed S. Elmusrati, Petri Välisuo, Ahm Shamsuzzoha
 University of Vaasa, Finland 
- 16:00 Galileo performance assessment for aerial navigation...N/A
 José Alberto Gonçalves^{1,2}, Américo Magalhães¹, Luisa Bastos^{1,2}
 1) University of Porto - Science Faculty, Portugal
 2) CIIMAR - Interdisciplinary Centre of Marine and Environmental Research

16:20 Break

16:40 Special Session Smartphone Positioning

- 16:40 SmartCoop Algorithm: Improving Smartphones Position Accuracy and Reliability through Collaborative Positioning...105
 Thomas Verheyde¹, Antoine Blais², Christophe Macabiau², François-Xavier Marmet³
 1) TéSA Research Laboratory; 2) ENAC, Université de Toulouse.; 3) CNES, Centre National d'Etudes Spatiales
- 17:00 Assessing Galileo positioning using a smartphone in an airborne platform...N/A
 Américo da Silva Magalhães, José Alberto Gonçalves, Luisa Bastos
 Faculty of Sciences, University of Porto, Portugal

17:20 End of Special Session

THURSDAY, 3rd JUNE

10:00 Special Session *GNSS assessment 1*

10:00 Interoperability of GNSSs for Position, Velocity and Timing...N/A
Alessandro Caporali, Joaquin Zurutuza
University of Padova, Italy

10:20 Analysis of Galileo NeQuick ionospheric model based on the station position error...N/A
Anna Świątek, Leszek Jaworski, Paulina Woźniak
Space Research Centre, Polish Academy of Sciences, Warsaw, Poland

10:40 Performance testing and runtime optimisation of an independent NeQuick-G implementation...N/A
Nikki de Kleer, Hein Zelle
NLR (Netherlands Aerospace Centre), the Netherlands

11:00 Keynote *All-weather Positioning in real-world cases...N/A*

Dr. Jari Saarinen
Sensible 4

12:00 Break

12:20 Special Session *GNSS assessment 2*

12:20 Galileo OS navigation performance monitoring supported by RIGTC/GOP...N/A
Jan Dousa, Pavel Vaclavovic, Michael Kala, Petr Bezdeka, Lewen Zhao
Research Institute of Geodesy, Topography and Cartography, Czech Republic

12:40 Improved velocity estimation in urban areas using Doppler observations...111
Ankit Jain, Dennis Kulemann, Steffen Schön
Leibniz University Hannover, Germany



13:00 REASON – Resilience and Security of Geospatial Data for Critical Infrastructures...N/A
Sanna Kaasalainen¹, Maija Mäkelä¹, Laura Ruotsalainen², Titti Malmivirta², Thomas Fordell³, Kalle Hanhijärvi³, Anders Wallin³, Thomas Lindvall³, Sergey Nikolskiy¹, Martta-Kaisa Olkkonen¹, Jesperi Rantanen¹, Sonja Lahtinen¹, Zahidul Bhuiyan¹, Hannu Koivula¹

1) Finnish Geospatial Research Institute, Finland; 2) University of Helsinki, Finland; 3) VTT MIKES, Finland

13:20 State of the art of the agriculture professional GNSS receivers...N/A
Jacopo Capolicchio¹, Daniele Mennuti², Ileana Milani³, Luigi Villa⁴, Joaquin Reyes Gonzalez⁵, Martin Sunkevics⁵
1) Thales Alenia Space Italia, Italy; 2) Business Integration Partners, Italy; 3) Randstad Italia, Italy; 4) Akka Italia, Italy; 5) European GNSS Agency (GSA)

13:40 Exhibit and lunch Break

15:00 Technical Session *LEO and Filters*

15:00 A Review on Precise Orbit Determination of Various LEO Satellites...N/A
Kannan Selvan, Akpo Siemuri, Heidi Kuusniemi, Petri Välisuo
Digital Economy, University of Vaasa, Finland

15:20 Embedded Tightly Coupled INS/DGPS-DGAL Navigation Filter on a Mass-Market Single-Board Computer...118
Maximilian Nitsch, Jan-Jöran Gehrt, Lukas Heyn, René Zweigel, Dirk Abel
Institute of Automatic Control, RWTH Aachen University, Aachen



15:40 Kalman filtering with empirical noise models...125
Matti Raitoharju¹, Henri Nurminen², Demet Cilden-Guler³, Simo Särkkä¹

1) Aalto University, Espoo, Finland; 2) Here, Tampere, Finland; 3) Faculty of Aeronautics and Astronautics, Istanbul Technical University, Turkey



16:00 Break

16:20 Special Session *Wearable Computing*

16:20 Development of Smart Shin Guards For Soccer Performance Analysis Based On MEMS Accelerometers, Machine Learning, And GNSS...N/A

Karin Mascher, Stefan Laller, Manfred Wieser
Graz University of Technology, Austria

16:40 The transferable methodologies of detection sleep disorders thanks to the actigraphy device for Parkinson's disease detection...N/A

Justyna Anna Skibinska^{1,2}, Radim Burget¹

1) Brno University of Technology, Czech Republic; 2) Tampere University, Finland

17:00 Awards, ICL-GNSS 2022 and closing

Prof. Jari Nurmi

17:20 End of ICL-GNSS 2021