

Oral Presentations

Track: 1. GNSS and Hybridized Position determination

Topic: 1. Interference/Jamming detection/mitigation

Paper Number	Paper Title	First	Last	Company
7	Jammertest 2022 jamming and spoofing lessons learned	Aiden	Morrison	Sintef As
24	Continuous Localization Assisted Collaborative RFI Detection using the COTS GNSS Receivers	Naveed	Ahmed	Norwegian University of Science and Technology
27	The vulnerability of inland waterway AIS to GNSS radio frequency interference	Jakub	Steiner	GNSS Centre of Excellence
29	Beamforming techniques for resilient navigation with small antenna arrays	Lucía	Pallarés-Rodríguez	Universitat Autònoma de Barcelona
51	LO and Calibration Signal Distribution in a Multi-Antenna Satellite Navigation Receiver	Uwe	Stehr	TU Ilmenau
54	Interference detection, localization and mitigation capabilities of Controlled Reception Pattern Antenna for aviation	Annemarie	Van Zwol	Netherlands Aerospace Centre
62	Ground Reference Station interference mitigating GNSS phased array system.	Jacobus A.	Kegel	Eindhoven University of Technology
65	GNSS Radio Frequency Interference mitigation in Collins Commercial Airborne Receivers	Patrick	Bartolone	Collins Aerospace
78	GNSS Interference Monitoring and Detection (GIMAD) System	Enric	Obiols Bernaus	Indra Sistemas S.a.
87	Robustness Levels of Critical Infrastructures Against GNSS Global Navigation Satellite System signal Disturbances	André	Bos	S[&]t
102	Integral system for jamming and spoofing events classification and location to ensure safe PNB operations	Isaac	Ballesteros	Centum Research & Technology
109	GNSS RFI geolocation using real-world data from Android smartphones	Søren Skaarup	Larsen	Technical University Of Denmark
133	On the Quantification of the GNSS signals' quality for radiofrequency interference (RFI) detection	Naveed	Ahmed	Norwegian University of Science and Technology
137	Performance Characterization of NovAtel's Robust Dual- Antenna Receiver (RoDAR) during the Norwegian Jamming Trial 2022	Ali	Broumandan	NovAtel-Hexagon
142	Aviation resilience to GNSS frequency jamming and cyber threats (AIRING)	Alberto	De La Fuente	Gmv
186	Time/frequency and spatial technologies against RF threats to enhance GNSS receiver robustness and accuracy	Andrea	Emmanuele	Thales Alenia Space Italia
188	PASSport project. An OSNMA enabled GNSS receiver to support port operations with drones	Marco	Nisi	Sistemica S.p.A

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Topic: 2. Spoofing/Meaconing detection/mitigation

Paper Number	Paper Title	First	Last	Company
58	Feasibility of Snapshot OSNMA for Spoofing Detection in Urban Scenarios	Jose A.	Lopez-Salcedo	Universitat Autònoma de Barcelona
121	E1-E6 SDR platform based on bladeRF for testing Galileo Assisted Commercial Authentication Service	Rafael	Terris-Gallego	Univ Autonoma de Barcelona (UAB)
124	Tests of Galileo OSNMA for protection against GNSS time spoofing attacks	Harald	Hauglin	Justervesenet - Norwegian Metrology Service
144	S-Tracks: a Secure Snapshot-Based Solution for Positioning and Timing	Aram	Vroom	CGI Nederland B.V.
146	Assessing the Resilience of GNSS COTS Receivers Against Sophisticated Spoofing Attacks by the SQM Methods	Amir	Tabatabaei	IGASPIN GMBH
161	GNSS threat scene: Four years since STRIKE3 success	Luis Enrique	Aguado Bayon	GMV
164	Behaviour of COTS Receiver under Simulated Multi-Frequency GNSS Induced Spoofing	Sowmyashree	Lakshmaiah	Work Microwave GmbH
170	Collaborative Processing of Distributed Receivers of Opportunity	Terri	Richardson	GMV

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Topic: 3. Performance monitoring/assessment/prediction

Paper Number	Paper Title	First	Last	Company
23	Worldwide SBAS broadcast between 2017 and 2023: a comparative study.	Alessandra	Calabrese	GMV
28	Performance of EGNOS off the Irish coast	Rodrigo	González	ESSP
48	A comparative experimental performance assessment of RTK+OSNMA based positioning for road vehicle applications	Susanne	Schweitzer	Joanneum Research Forschungsgesellschaft mbH
63	GNSS-Finland: Resilient PNT Monitoring at a National Level	Toni	Hammarberg	Finnish Geospatial Research Institute
74	PRECISE POSITIONING FOR MASS-MARKET: OPTIMAL DATA DISSEMINATION DEMONSTRATOR	Delphine	Isambert	Telecom SudParis
98	Galileo Receiver Performance Analysis with New I/NAV Improvements Live Data	Rui	Nunes	Deimos Engenharia
99	Galileo High Accuracy Service (HAS) Performance Assessment	Davide	Imparato	Rhea Group
116	EGNOS performance prediction	Pieter Bastiaan	Ober	INTEGRICOM
149	EGNOS Service Provision & Evolutions	José Manuel	Alvarez López	European Satellites Services Provider (ESSP-SAS)
152	Evaluation of Galileo High Accuracy Service (HAS) with real-world Android smartphone navigation dataset	Frank	van Diggelen	Google
172	On the performance of direct position estimation for VDES R-Mode	Markus	Wirsing	German Aerospace Center (DLR)
184	Assessing the Galileo High Accuracy Service at high latitudes	Melania	Susi	European Commission

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Topic: 4. Alternative Position estimation concepts/techniques/results

Paper Number	Paper Title	First	Last	Company
6	Position Fixing using Radar	Chris	Hargreaves	Trinity House
15	Resilient PNT = National Security, National Sovereignty	Dana	Goward	Resilient Navigation and Timing Foundation
20	Redundant IMU Data fusion architectures for sounding rocket attitude estimation	Miguel Angel	Gomez-Lopez	Inta
21	AoA-based Coarse Positioning for GNSS Applications	Noori	Bni Lam	ESA
26	Effect of carrier frequency offset on range estimation performance in VDES R-Mode receiver	Jang Hwan	Shin	Chungnam National University
37	Classical positioning with modern optical sensors	Anton	Scheele	Netherlands Defence Academy
59	Development of a Software-Defined-Radio-based Real-Time Maritime Positioning System	Nhat Minh	Hoang	Technical University Of Munich
64	Integration of GNSS and 5G for precise positioning	Marianna	Alghisi	Politecnico Di Milano
71	Positioning system based on GSM signals of opportunity for aerial applications for GNSS denied areas	Maria Dolores	Tristán Del Barrio	Skylife Engineering
75	Preliminary Field Results of a Dedicated 5G Positioning Network for Enhanced Hybrid Positioning	José A.	Del Peral Rosado	Airbus Defence and Space
79	Performance Evaluation of Terrain-Aided Navigation for Helicopters	Jindrich	Dunik	Honeywell International
82	5G positioning: preliminary analysis of early data sets	Chiara	Pileggi	Politecnico Di Milano
94	A hybrid optical-wireless network for decimeter-level terrestrial positioning	Jeroen	Koelemeij	Vrije Universiteit Amsterdam
106	Airspace surveillance with unsynchronized low-cost ADS-B receivers using time difference of arrival observations	Clemens	Sonnleitner	University of Stuttgart - Institute of Navigation
129	Centimetres and Picoseconds without Satellites or Atomic Clocks- Independent EU Test Results of Locata Alt-PNT	Nunzio	Gambale	Locata Corporation Pty Ltd
174	Performance assessments of a Low-RF navigation system for emergencies and harsh environments	Alejandro	Pérez Conesa	GMV

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Topic: 5. Multisensor position estimation/augmented position estimation

Paper Number	Paper Title	First	Last	Company
16	Experimentation of Vision-aided Inertial Navigation System (VaINS) on a small fixed-wing UAV	Baheerathan	Sivalingam	Norwegian Defence Research Establishment (ffi)
105	Resilient navigation through a novel fusion approach for multiple inertial measurement units	Marcel	Maier	Institute Of Navigation, University Of Stuttgart
148	IMU and GNSS postprocessing for high-resolution strapdown airborne gravimetry	Vadim	Vyazmin	Lomonosov Moscow State University
150	QGyro - quantum sensors for inertial navigation	Benjamin	Tennstedt	Leibniz University Hannover
160	LiDAR-inertial Odometry Quality Control Method Based on Reliability Theory	Guoliang	Liu	Southeast University
180	Quantum-based relative inertial navigation with velocity-aided alignment and initialization	Pieter	De Vries	TNO

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Topic: 6. UAS/UAM driven PNT requirements/applications/solutions

Paper Number	Paper Title	First	Last	Company
81	DEGREE (DronEborne Galileo RecEivEr), Development of a GNSS Receiver for Specific Category UASs Operations	Sergi	Dueñas Pedrosa	Qascom
115	Local Differential GNSS Augmentation for Integration into Urban Air Mobility	Daniel	Gerbeth	German Aerospace Center (DLR)
126	Cooperative swarm geometry optimization for assured navigation with range radios in GNSS denied environments	Mats	Martens	TU Berlin

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Topic: 7. GNSS signal processing techniques

Paper Number	Paper Title	First	Last	Company
47	Multibeam GNSS using phased array antenna	Lionel	Tombakdjian	Université Côte D'azur - LEAT
70	Real-time Multi-GNSS Precise Point Positioning with Ambiguity Resolution Based on the BDS-3 Global Short-message Communication	Ziyuan	Song	Shanghai Astronomical Observatory
84	Multi-constellation/ multi-frequency GNSS signal degradation due to foliage	Uttama	Dutta	Chalmers University of Technology
93	Galileo Performance Improvements employing Meta-Signals – Robustness Analysis against Payload and Receiver Distortions	Florian C.	Beck	German Aerospace Center (DLR)
119	Quad-band multi-constellation GNSS receiver development platform with System-on-Chip architecture	Muhammad	Saad	Fraunhofer IIS Nürnberg
153	Simulation and analysis of the precise orbit determination for the high-orbit satellite using Ka/GNSS observations	Kecai	Jiang	Wuhan University

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Topic: 8. Integrity monitoring/prediction

Paper Number	Paper Title	First	Last	Company
18	Advanced Receiver Autonomous Integrity Monitoring (ARAIM) for Unmanned Aerial Vehicles	Merle	Snijders	Netherlands Aerospace Centre
43	Integrity algorithms for Galileo timing receivers	Ciro	Gioia	Piksel S.p.a.
67	Preliminary Assessment of Integrity Parameter Performance for Nation-Wide PPP-RTK Service in South Korea	Jaeyoung	Song	Maritime PNT Research Office, KRISO
145	Reliability of Smartphone Positioning in Harsh Environment	Salvatore	Gaglione	"Parthenope" University Of Naples
169	Carrier phase coasting in railway environment for SBAS TTA management	Terri	Richardson	GMV

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Topic: 9. Propagation/error models (atmospheric models etc.)

Paper Number	Paper Title	First	Last	Company
30	GNSS Monitoring and Grabbing Station Based on Software-Defined Radio and Docker Containers	Iman	Ebrahimi Mehr	Politecnico Di Torino
97	Comparison of NeQuick-G and Klobuchar model performances at single frequency user level	Ulrich	Ngayap	Euspa
165	Characterization of the ML ionosphere model's extrapolation performance using "date to forecast"	Shishir	Priyadarshi	GMV, Uk

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Topic: 10. Accuracy – precise position estimation

Paper Number	Paper Title	First	Last	Company
12	Estimating Galileo F/NAV broadcast ephemeris via inter-satellite and ground-to-satellite ranging	Manuele	Dassié	German Aerospace Center (DLR)
14	Cycle slip detection of single-frequency measurement in drone platform	Chan-hee	Lee	Hongik University
25	Comparison of interpolation methods for ionospheric slant TEC from maritime PPP-RTK service in Korea	Gimin	Kim	Maritime PNT Research Office
55	Multibeam GNSS antenna based on flatten Luneburg lens	Fabien	Ferrero	Université Côte d'Azur, LEAT, CNRS
60	Interval bounding analysis for precise point positioning	Rui	Wang	Institute of Navigation, University of Stuttgart
72	Achieving sub-decimeter Accuracy with the Galileo High Accuracy Service: Results from GMV's HAS Positioning Engine	Ana	Gonzalez Sainz	Gmv S.a.u.
83	A new real-time PPP-RTK positioning service for Germany	Franziska	Riedel	Federal Agency for Cartography and Geodesy (BKG)
85	Performance Analysis of Maritime PPP-RTK Service in Korea	TaeHyeong	Jeon	Maritime PNT Research Office, KRISO
88	Breaking the one-meter accuracy level with smartphone GNSS data	Marcus Franz	Glaner	TU Wien - Higher Geodesy
92	A satellite-datum-based PPP-RTK model for all-in-view GNSS networks	Pengyu	Hou	Innovation Academy for Precision Measurement Science and Technology, Chinese Academy of Sciences
131	Living on the edge of High Precision PNT resilience and security	Gustavo	Lopez	Septentrio
140	Prototype implementation of gridded VRS service based on SSR messages	Kwan-dong	Park	Inha University
141	Testing the Galileo HAS with the Galileo High Accuracy Reference Algorithm and User Terminal	Emilio	González	Spaceopal
154	Norsat-TD: first in-orbit demonstration of real-time Precise Point Positioning using GPS and Galileo	Javier	Tegeedor	Fugro Norway As
155	Global assessment of Galileo HAS and ambiguity-fixed Precise Point Positioning using Fugro reference station network	Javier	Tegeedor	Fugro Norway As
158	LAMBDA 4.0: an enhanced toolbox for high dimensional ambiguity resolution	Lotfi	Massarweh	Delft University Of Technology
166	THE GALILEO HIGH ACCURACY SERVICE: FIRST PERFORMANCES EVALUATION	Camille	Parra	Technische Universität München
175	Multipath mitigation and NLOS rejection with Supercorrelation on FocalPoint's real-time development platform	J. Rossouw	van der Merwe	Focal Point Positioning
182	Exploiting meta-signals for road ITS applications in GNSS-harsh environments	Amarildo	Haxhi	National Technical University of Athens

Track: 3. AI, machine learning, simulation and testing in navigation

Topic: 11. Use of AI/machine learning

Paper Number	Paper Title	First	Last	Company
33	ProNet: A Hybrid Adaptive Navigation Filter	Itzik	Klein	University of Haifa
38	Platform Supply Vessel workability prediction by Machine Learning Models	Reinier	Dick	Peterson Energy Logistics
44	Antiference: New Concept for Evolutive Mitigation of RFI to GNSS	Shahrzad	Afroozeh	OHB Digital Solutions
49	Satellite Navigation Signal Interference Detection and Machine Learning-Based Classification Techniques towards Product Implementation	Jelle	Rijnsdorp	Science and Technology
91	Flight tested results and performance analysis of a Machine-Learning software-enhanced Inertial Navigation System	Carl	Sequeira	Flare Bright
168	Accurate orbit corrections for single-frequency GNSS receiver with Transformer deep learning	Wahyudin	Syam	GMV
177	Leveraging Artificial Intelligence for Algorithm Design and Trial to Enhance Raw Measurements	Alejandro	Pérez Conesa	GMV
181	AI-Driven GNSS Carrier Phase Ambiguity Resolution: A Conceptual Approach	Amarildo	Haxhi	National Technical University of Athens
187	Innovative machine learning for GNSS signal quality monitoring and grown robustness to RF threats distortions	Andrea	Emmanuele	Thales Alenia Space Italia

Track: 4. Integral navigation system considerations

Topic: 12. Role of the human operator

Paper Number	Paper Title	First	Last	Company
61	Future role of the human in Resilient Maritime Navigation.	Hugo	Ammerlaan	MARIN
117	Where do we go now? Presenting a model for human navigation in automated vehicles	Chloe	Jackson	University of Nottingham

Track: 5. LEO PNT related developments in position determination

Topic: 13. LEO PNT related

Paper Number	Paper Title	First	Last	Company
42	Developing a Robust, Resilient GNSS PPP Positioning Service via Iridium Burst	Cara	Lewis	DDK Positioning
57	Exploring the contribution of PNT LEO Satellites to Precise Positioning Applications	Ana	Gonzalez Sainz	Gmv S.a.u.
76	Analysis on baseband algorithms for LEO PNT	Fran	Fabra	IIEC
108	LEO-based PNT augmentation	Jaz	Hill-Valler	Satellite Applications Catapult
123	Resilient Space-Based LEO PNT for the Automated and Augmented World	Chris	DeMay	TrustPoint
125	Coordinating International LEO PNT Productively	Patrick	Diamond	Leopnt Llc
127	Performance Analysis of the Pilot- and Data-Component of a CSS Signal for LEO-PNT.	Daniel	Egea-roca	Universitat Autònoma De Barcelona (uab)
130	Augmenting GNSS with Xona PULSAR	Bryan	Chan	Xona Space Systems
147	Performance Analyses of User Equipment Technologies and Techniques for LEO-PNT	Thomas	Janssen	IDLab-imec
151	THE GALILEO RETURN LINK SERVICE FOR SPACE DEBRIS COLLISION AVOIDANCE	Jesus	Cegarra	Gmvad
156	Analysis of multipath code-range errors in future LEO-PNT systems	Sibren	De Bast	Septentrio
162	Orbits-as-a-Service for Signals of Opportunity based Position, Navigation and Timing (PNT)	Luis Enrique	Aguado Bayon	GMV

Track: 4. Integral navigation system considerations

Topic: 14. Reference trajectory definition/optimization

Paper Number	Paper Title	First	Last	Company
35	Safety critical optimization of IFR – Low Level trajectories in Alpine areas	Alain	Geiger	ETH
56	Route Optimization for Hybrid Propelled Ships using High Quality Forecasts of Wind Stream and Seastate.	Stephan	Procee	Maritiem Instituut Willem Barentsz
73	Urban Route Planning Based on Network-RTK Positioning Integrity Prediction	Ali	Karimidoona	Leibniz Universität Hannover, Institut für Erdmessung
80	Ice navigation in arctic offshore wind parks: traffic coordination using route exchange and Moving Havens	Thomas	Porathe	NTNU, Norwegian University of Science And Technology
89	Risk-based UAV Flight Path Optimization in Accordance with SORA	Jannik	Heinze	Technische Universität Berlin
111	Automated route planning from LiDAR point clouds for agricultural applications	Fabian	Theurl	Graz University Of Technology
163	Concept of a human-machine interface for visualizing route progress	Robbert	Vis	Stena Line

Track: 4. Integral navigation system considerations

Topic: 15. End to end navigation systems

Paper Number	Paper Title	First	Last	Company
17	High Accuracy Performance Based Navigation Aircraft Approach Paths Combined with Precision Final based on GNSS	Thomas	Dautermann	Dlr
96	Towards Less Fuel Consumption utilizing Semi-autonomous Operations of the Vessels	Ghazaleh	Kia	Seafar
113	Required navigation performances for drone flight operations	Pablo	Haro	EUSPA
120	Smart Port Shuttle: Sensor-based Navigation for Inland Waterway Transportation	Katrin	Dietmayer	Fraunhofer Institute for Integrated Circuits IIS
132	Secure GNSS and the role with autopilot control systems	Gustavo	Lopez	Septentrio
136	True North Reference System for Aviation by Eliminating Magnetic Conversion by 2030	Anthony	MacKay	Nav Canada
171	Resilience in the Maritime transport for the next decade	Stephan	Procee	Maritiem Instituut Willem Barentsz
178	Coordinated path planning and control law architecture design considering navigation performance and resilience	Reiko	Mueller	German Aerospace Center (DLR)
189	PATHfinder. PNT as A Technology to support a scalable Fleet of IINKed Drones operating in BVLOS scenarios for preventive monitoring and Emergency missions	Marco	Nisi	Sistemica S.p.A

Track: 2. Extra terrestrial navigation

Topic: 16. Extra terrestrial position determination

Paper Number	Paper Title	First	Last	Company
39	Benefits for Space Geodesy from the Galileo System	Krzysztof	Sońnica	Institute Of Geodesy And Geoinformatics, Wrocław University Of Environmental And Life Sciences
52	ESA Moonlight Navigation Services – A paradigm change for lunar exploration for Europe and beyond	Pietro	Giordano	Esa
107	Analysis of OD&TS using ISL for MARCONI constellation around Mars including user positioning performance	Serena	Molli	University La Sapienza Of Rome
110	Cooperative Positioning-GNSS applied to the NaviMoon high-sensitivity lunar receiver	Anais	Delépaut	Politecnico Di Torino
122	Navigation Performance of a Lunar Surface Rover Using LCNS Positioning Assuming Realistic ODTS Performances	Floor	Melman	Esa/estec
134	Navigation and orbit determination for a geostationary satellite using onboard GPS and BDS observations	Wenwen	Li	Wuhan University
135	Lunar Navigation System ODTS Signal In Space Error Analysis	Martina	Cappa	Thales Alenia Space Italy

Track: 3. AI, machine learning, simulation and testing in navigation / 2. Extra terrestrial navigation

Topic: 17. Developments in Simulation/Test/Analysis/Toolsets

Paper Number	Paper Title	First	Last	Company
11	Hardware in the loop laboratory test systems for medium frequency R-Mode receivers	Lars	Grundhöfer	German Aerospace Center
53	Building highly performant and flexible navigation solutions with INSTINCT by means of flow-based programming	Thomas	Topp	Institute of Navigation, University of Stuttgart
139	Realism-oriented design, verification and validation of novel robust navigation solutions	Ivan	Petrunin	Cranfield University
176	Examining Galileo E6 HAS in Space Environment Using N-SPHERE Symlinks Receiver and Orolia GNSS Simulator	Mohamed	Tamazin	Safran Electronics & Defense

Poster Presentations

Paper Number	Paper Title	First	Last	Company
13	Characteristic differences in tropospheric delay between Nevada Geodetic Laboratory products and NWM ray-tracing	Junsheng	Ding	Shanghai Astronomical Observatory, Chinese Academy of Sciences
19	Research on GNSS and LEO satellite fusion precision positioning technology	Longtao	Kong	National Engineering Research Center For Satellite Navigation Application
22	Improving ground system deployment to ensure resilient space operations	Sandra	Brogl	Rhea Group
32	Statistical Tests of Some Binary Chaotic and Pseudorandom Sequences	Hong-Yeop	Song	Yonsei University
40	Receiver clock characteristics and modeling in the multi-GNSS Precise Point Positioning solutions	Krzysztof	Sońnica	Institute Of Geodesy And Geoinformatics, Wrocław University Of Environmental And Life Sciences
66	Complementary Corrections of the Ionospheric Model For Spaceborne GPS Receiver	Eun-hyuek	Kim	Satrec Initiative
68	Non-coherent combining correlation for low-complexity GNSS signal acquisition	Gwang Hee	Jo	Chungnam National University
69	Refined pseudolite troposphere delay models by NWM ray-tracing and their performance assessment	Wenjie	Tang	Shanghai Astronomical Observatory
77	A radio based landing aid for unmanned aerial vehicles	Daniel	Klink	Universität Stuttgart Institut für Navigation
86	An approach to cooperative azimuth estimation using multiple distributed position receivers	Marvin	Banse	Carl Von Ossietzky Universität Oldenburg
103	Effect of Sounding Rocket Attitude in GNSS Carrier Phase Tracking	Iñigo	Cortés	Fraunhofer IIS
114	Over-the-air jamming and spoofing tests of GNSS timing devices	Harald	Hauglin	Justervesenet - Norwegian Metrology Service
118	Resilient 3D Position and Navigation using Terrestrial Beacons and Cellular Signals	Rabih	Chrabieh	NextNav, LLC
157	Design of a signaling scheme for three equal-power signals in a new navigation satellite system	Hyoungsoo	Lim	Electronics And Telecommunications Research Institute
173	What Users May Want: Determining Navigation-Specific User Requirements for Drivers in Automated Vehicles	Chloe	Jackson	University of Nottingham
183	GPS Positioning Optimisation and Multisensor Fusion for Autonomous Vehicles in Challenging Environments	Haicang	Li	University of Nottingham
185	Performance of real-time PPP time transfer between UTC(k) time scales	Harald	Hauglin	Justervesenet - Norwegian Metrology Service