



Preliminary Results of a Helicopter Navigation Trial with Network RTK GNSS Positioning

X Meng¹, L Yang¹, T Marmont ², C Hill¹, S Ince¹
and J Aptone¹

¹The University of Nottingham

²Beacon Energy Ltd

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Network Real-time Kinematic (NRTK) GNSS Positioning



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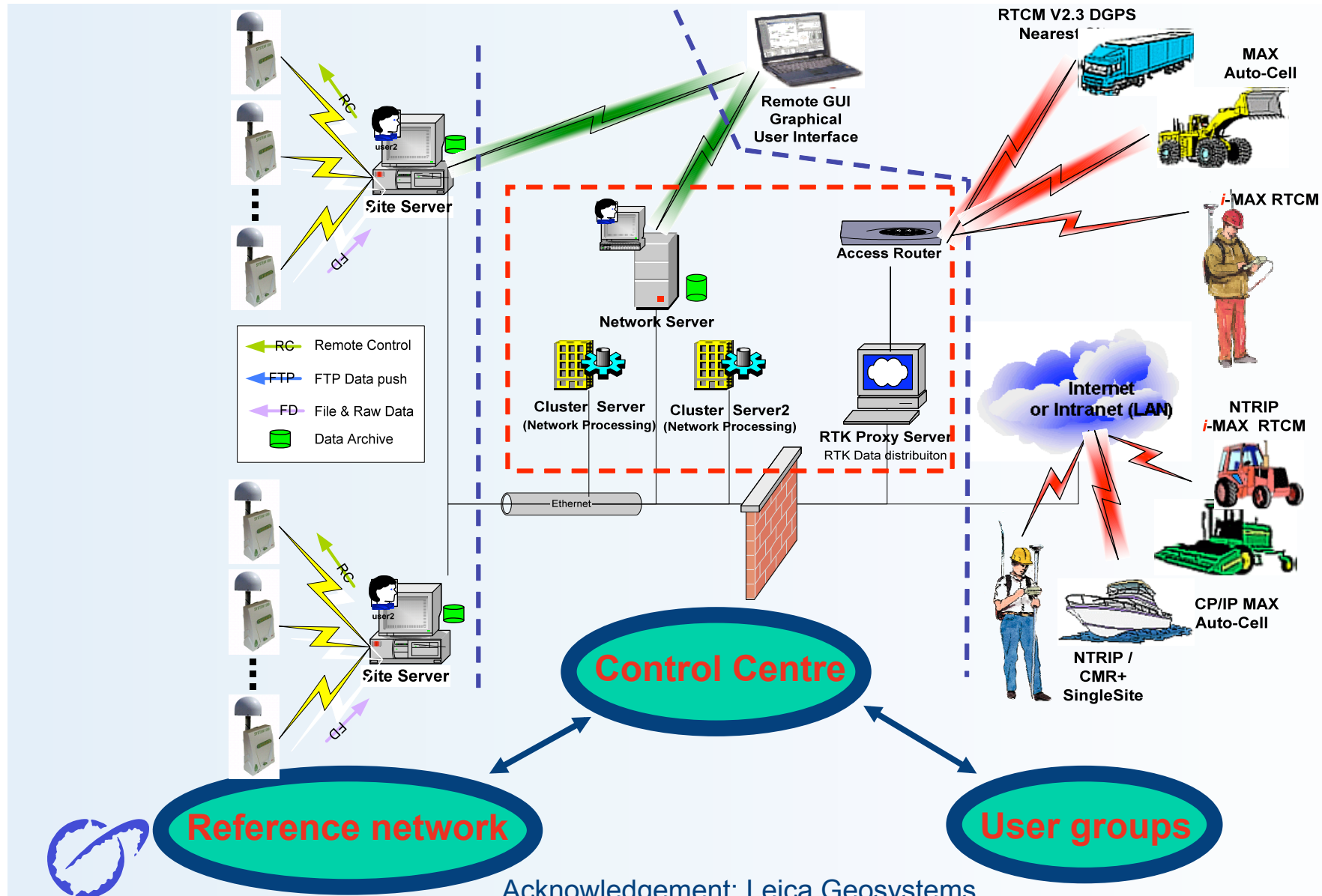
- Traditional real-time kinematic (RTK) GNSS with
 - fixed radio communication and a single reference station
- Replaced by GPRS, UMTS or satellite comm. and a network of regional/global reference stations, as **basic infrastructure** for future SatNav/Pos and delivering quality position solutions due to:
 - Much improved regional atmospheric model
 - Fast and reliable positioning solution fixes
 - Greater mobility for the user receivers
 - Longer distance (>50km) precise RTK positioning
 - More emerging applications, particularly for ubiquitous positioning



Network RTK GNSS: A Leica SpiderNET Example



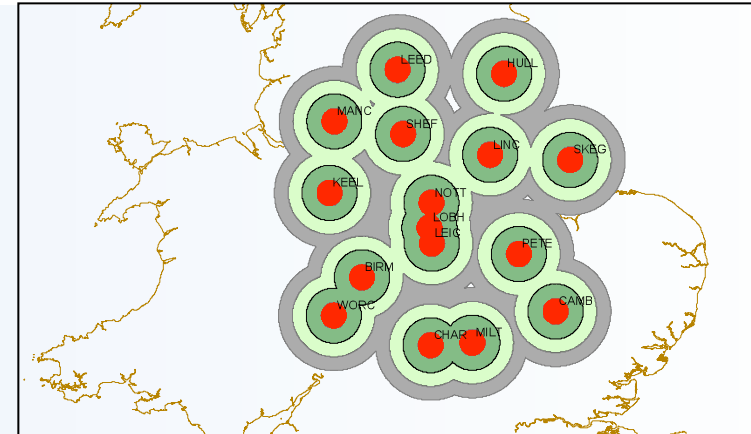
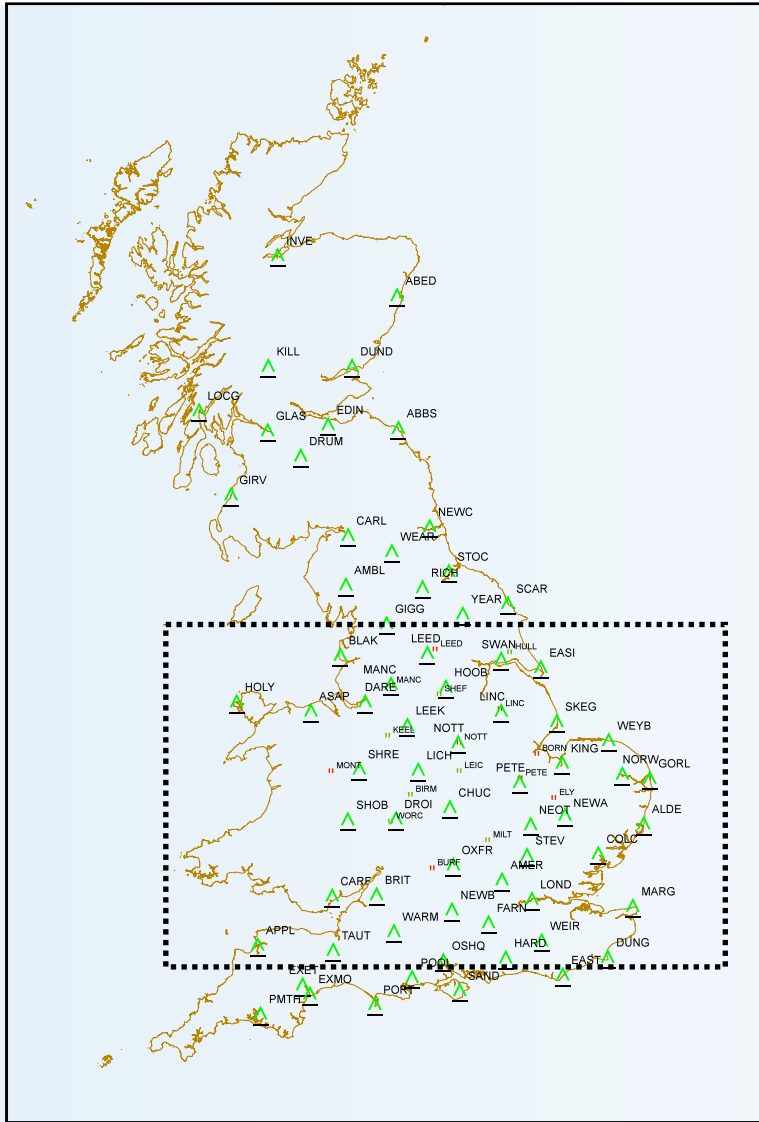
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Network RTK GPS Reference Stations in the UK



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Left: Ordnance Survey's OS Net (153+ permanent reference stations)

Above: Nottingham/Leica Network RTK Test Facility consisting 16 stations for teaching and academic research such as QC & QA testing



Acknowledgement: Ordnance Survey

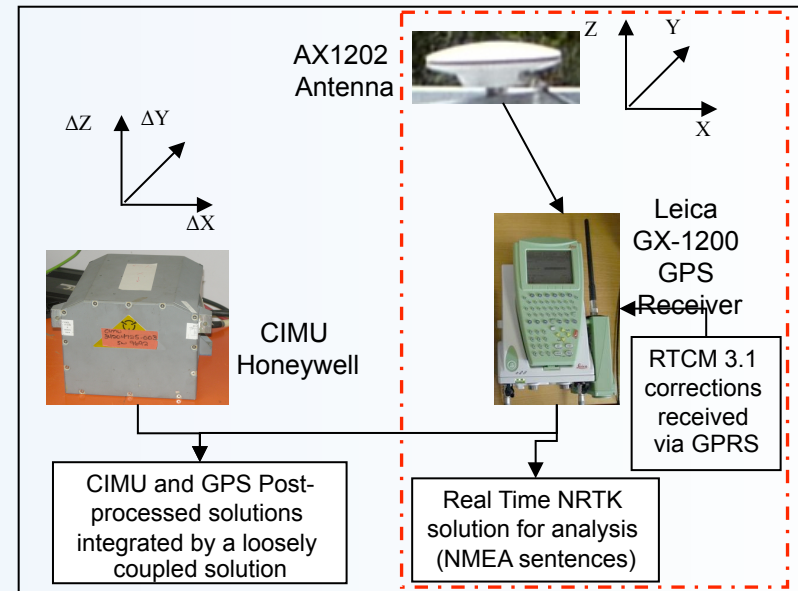
Land Transportation Tests



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IESSG's surveying van



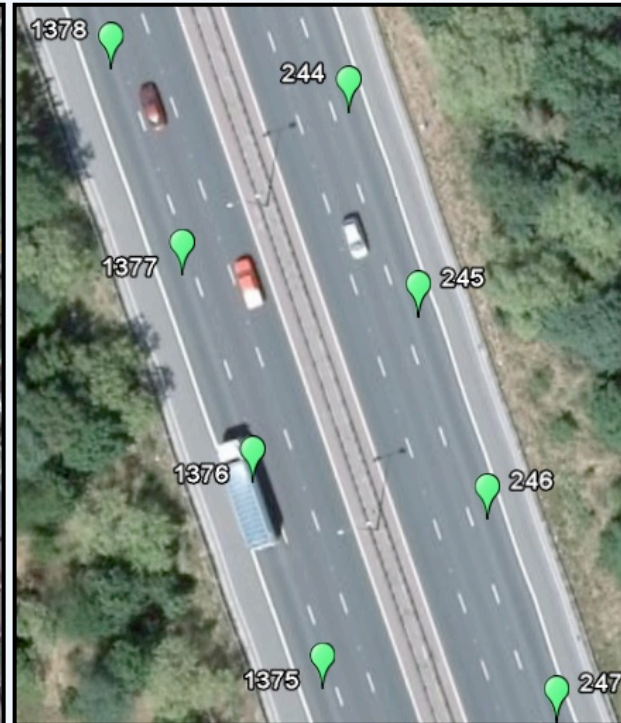
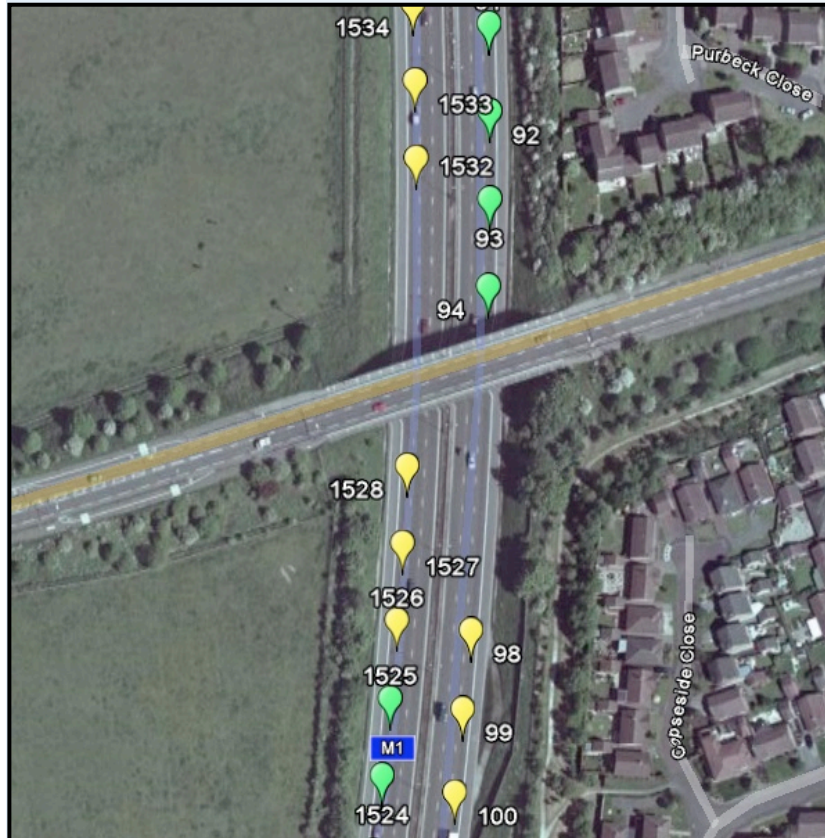
Equipment configuration



Availability and Mobility



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NRTK epochs



DGPS epochs



IMU/GPS epochs



Current Status for GNSS Based Helicopter Navigation



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- There are positioning problems caused by comm. link and satellite availability for land transportation applications
- In sky, satellite availability may not pose a major problem but how about communication link?
- Want to understand whether NRTK GNSS positioning is a feasible technology
- Helicopters widely used for
 - military reconnaissance
 - civilian surveillance
 - emergency service
 - agricultural inspection
 - mapping



Current Status for GNSS Based Helicopter Navigation



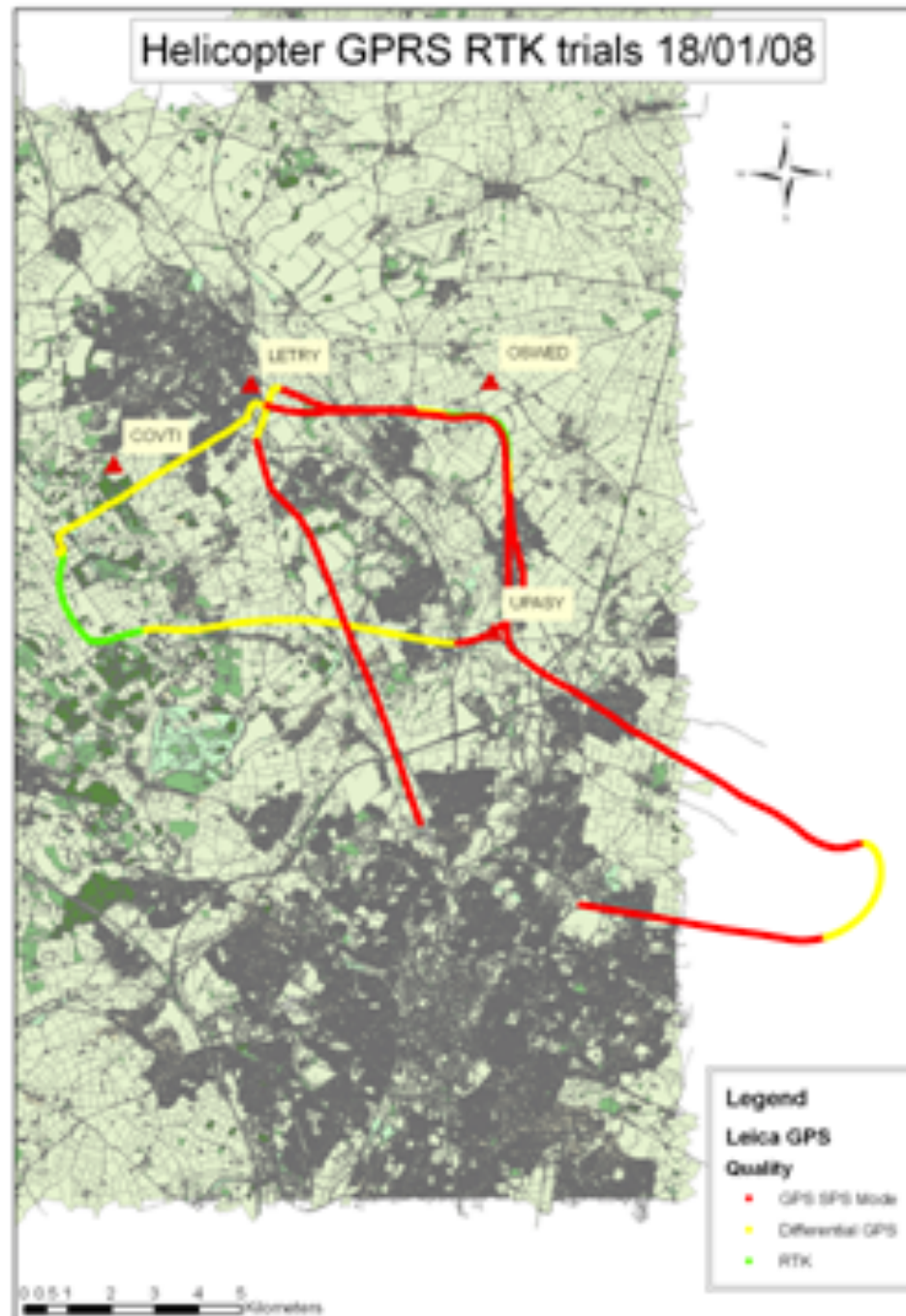
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- Under EC Framework 6 (FP6) a project investigated how EGNOS and future Galileo could provide required safety levels to aviation sector
- Most helicopters have been equipped with single frequency GPS receivers
- However, carrier phase based GPS positioning for helicopter navigation has only been tested on small size unmanned aerial vehicles (UAV) under controlled environments, Stanford Uni
- an initial test with a Eurocopter AS355 helicopter in Loughborough region on 18th January 2008



Field Test





Red: SPS

Yellow: DGPS

Green: NRTK

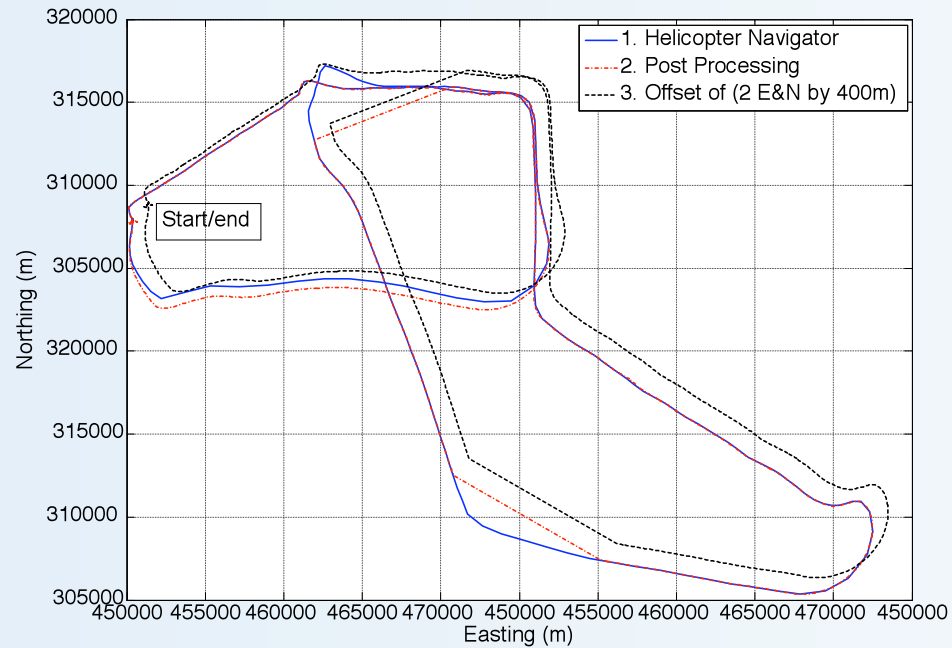
Only a small section
is NRTK solutions
when taking off



Field Test

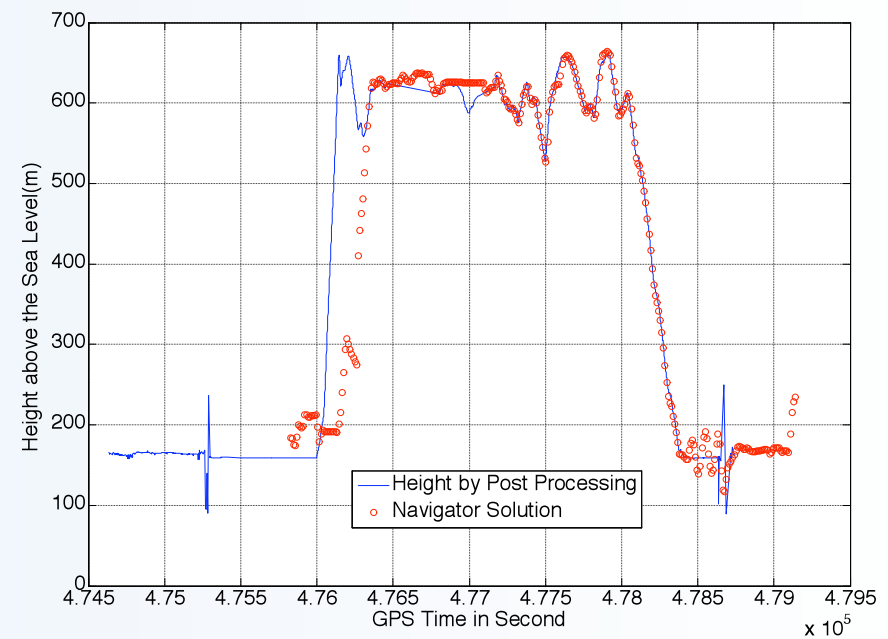


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Solutions from onboard navigator

PP recorded measurements

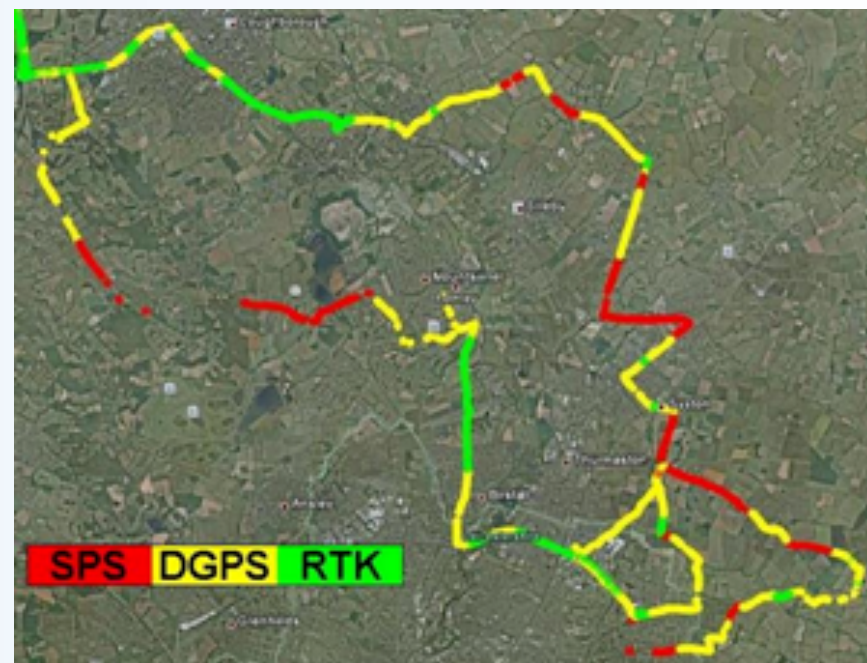
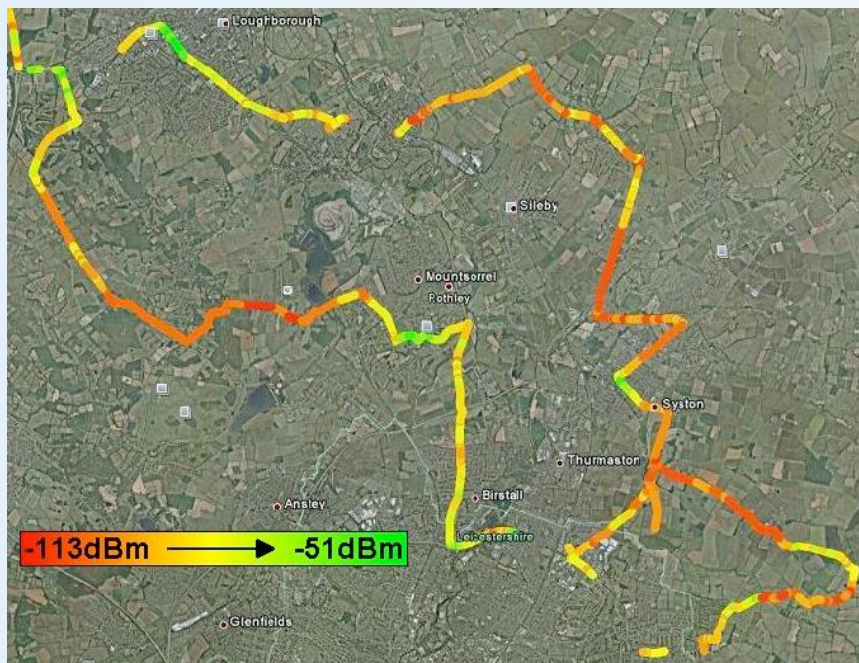


Field Test



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Re-survey the ground comm conditions and satellite availability in the same area using the survey van



Discussion and Conclusions



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- Due to GSM is a terrestrial based comm technique which cannot meet transmission of NRTK corrections at certain altitude
- Antenna location is NOT ideal for acquisition of GPS signals
- Satellite comm might be an option but at a cost for service and hardware fees
- Sensor integration is a MUST if both position continuity and quality need to be maintained



Acknowledgements

- Leica Geosystems is thanked for providing free access to its SmartNet service
- Colleagues from the IESSG involved in the tests are Mr Huib de Light and Nick Kokkas

