



EGNOS, it's there. Use it.

EDAS (EGNOS Data Access Service) for added-value applications

Elisabet Lacarra
ESSP SAS



European
Global Navigation
Satellite Systems
Agency



Precise navigation,
powered by Europe



TABLE OF CONTENT

- **EDAS overview**
- **EDAS information**
- **EDAS use cases**
- **EDAS based DGPS performance assessment**
- **Conclusions**

TABLE OF CONTENT

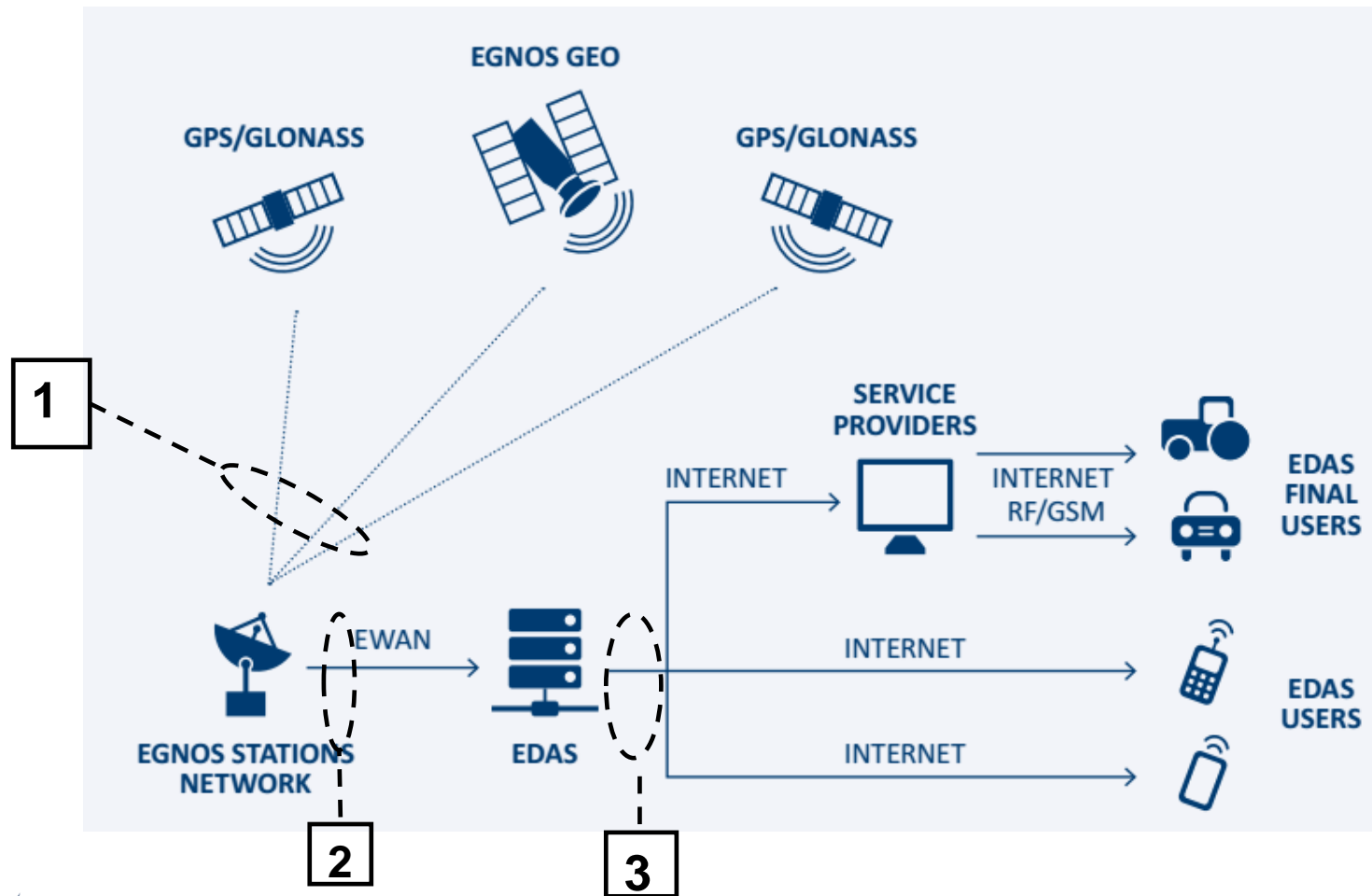
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What is EDAS?

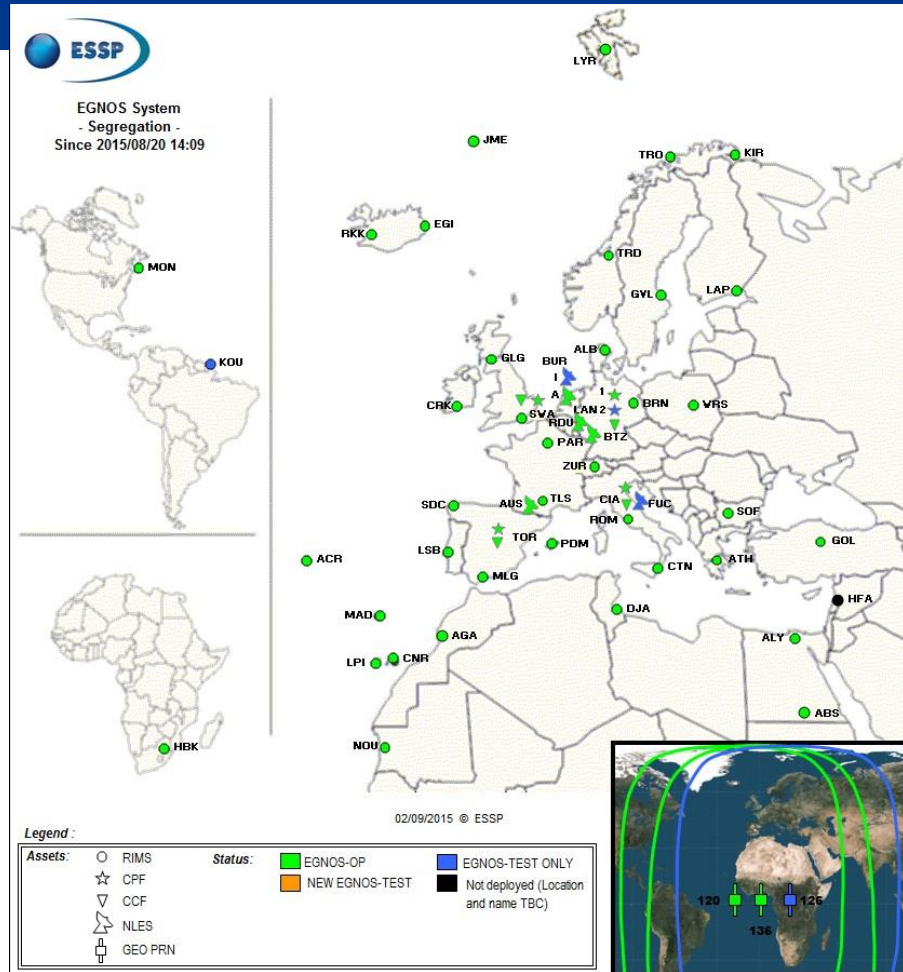
EDAS (EGNOS Data Access Service)

is a free of charge service (owned by EC) that provides access to the data gathered by the EGNOS infrastructure through the Internet.

EDAS overview



EGNOS System



EDAS Services

EDAS Service	Type of Data			Service Description	
	OBS & NAV	EGNOS MSG	RTK MSG	DGNSS COR	FORMAT

- GPS and GLONASS observations and navigation data collected by the entire network of EGNOS ground stations.

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- ❑ SBAS augmentation messages of EGNOS GEO satellites.

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- RTK (Real-Time Kinematic) messages.
- Differential GNSS (DGNSS) corrections.

EDAS Services

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Real Time	Service Level 0 Data Filtering SL0	✘	✘			ASN.1	EDAS
	Service Level 2 Data Filtering SL2	✘	✘			RTCM3.1	EDAS
	SISNET					RTCA	SISNeT
	Ntrip					RTCM 2.x RTCM 3.1	Ntrip
	FTP					RINEX, EMS, IONEX...	FTP

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	Ntrip					RTCM 2.x RTCM 3.1	Ntrip
	Archive					FTP	RINEX, EMS, IONEX...

EDAS Client SW

EDAS Services

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	Service Level 2 Data Filtering SL2	✗	✗	REAL-TIME Nominal latency < 1 second		RTCM3.1	EDAS
	SISNET		✗			RTCA	SISNeT
	Ntrip	✗		✗	✗	RTCM 2.x RTCM 3.1	Ntrip
	Archive	FTP	✗	✗			RINEX, EMS, IONEX...

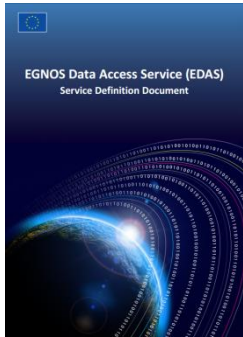
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Real Time	Service Level 0	✗	✗			ASN.1	EDAS
	Data Filtering SL0						
	Service Level 2	✗	✗	REAL-TIME		RTCM3.1	EDAS
	Data Filtering SL2			Nominal latency < 1 second			
	SISNET		✗			RTCA	SISNeT
	Ntrip	✗		✗	✗	RTCM 2.x RTCM 3.1	Ntrip
Archive	FTP	✗	✗	ARCHIVE		RINEX, EMS, IONEX	FTP

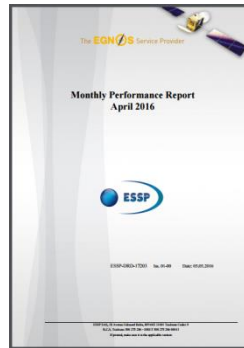
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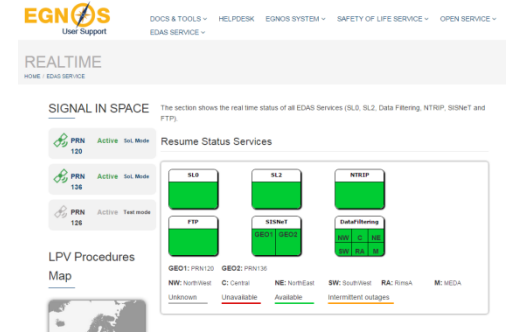
EDAS Information



EDAS SDD
(Services info & perfo
commitment)



Monthly Performance Report
(EDAS Monthly performances)

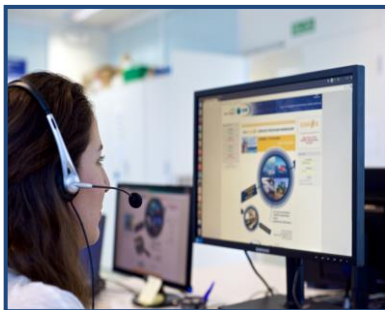


EDAS section
(EDAS info & Real-time
performances)

<http://egnos-user-support.essp-sas.eu/>

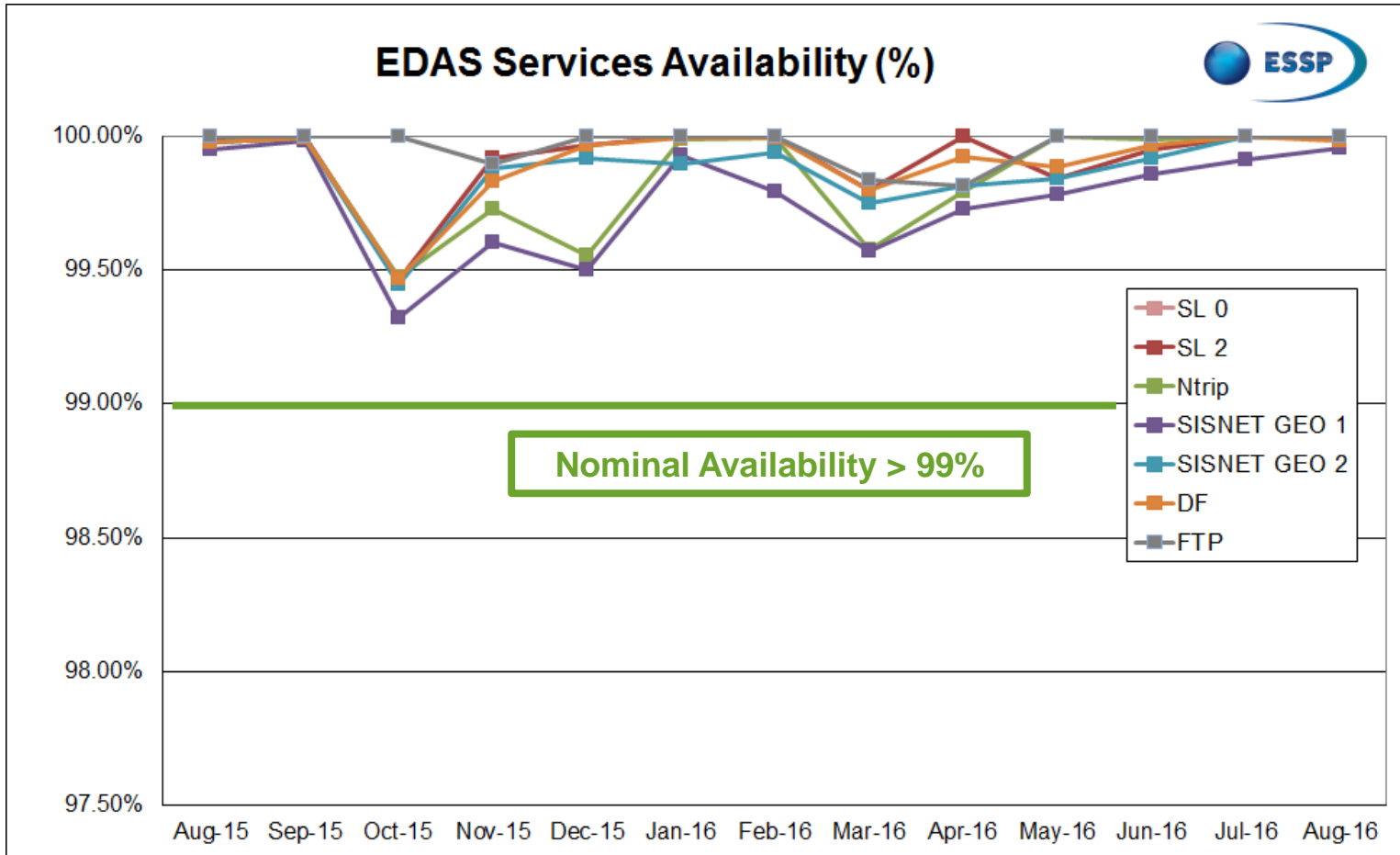


EDAS Registration Website

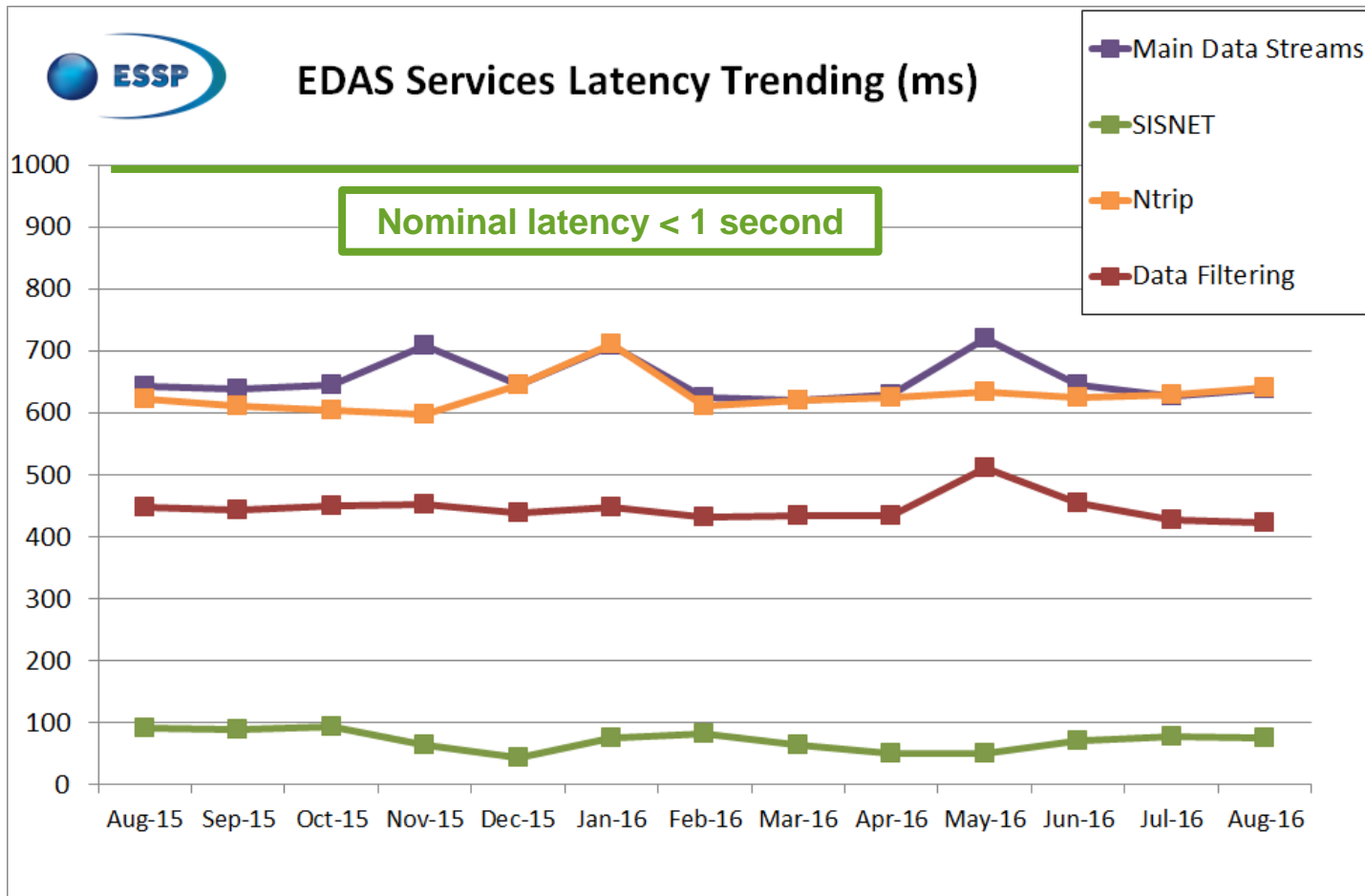


EGNOS Helpdesk
EGNOS-Helpdesk@essp-sas.eu
+34 911 236 555

EDAS Services Availability



EDAS Services Latency



EDAS active users distribution

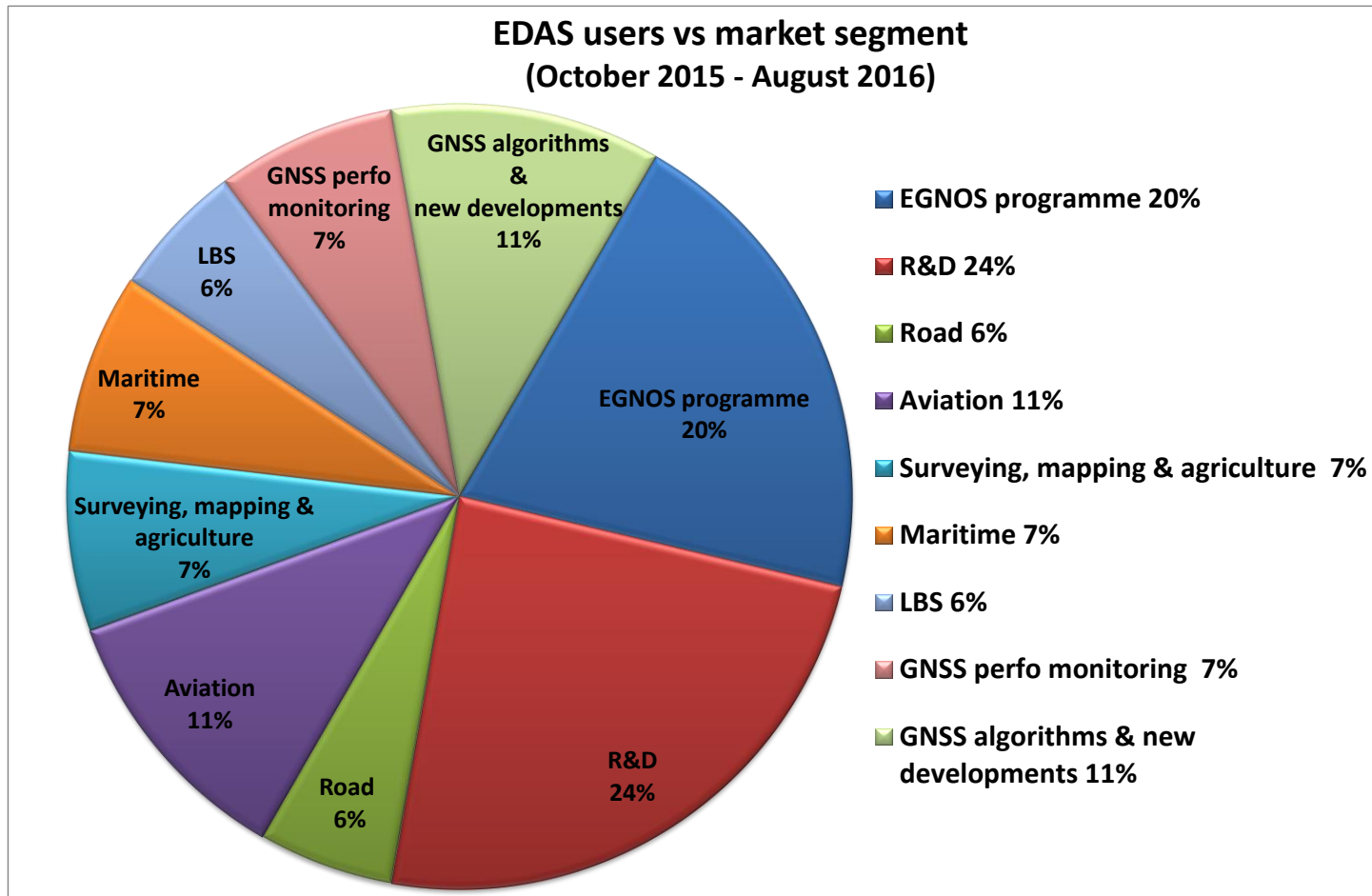
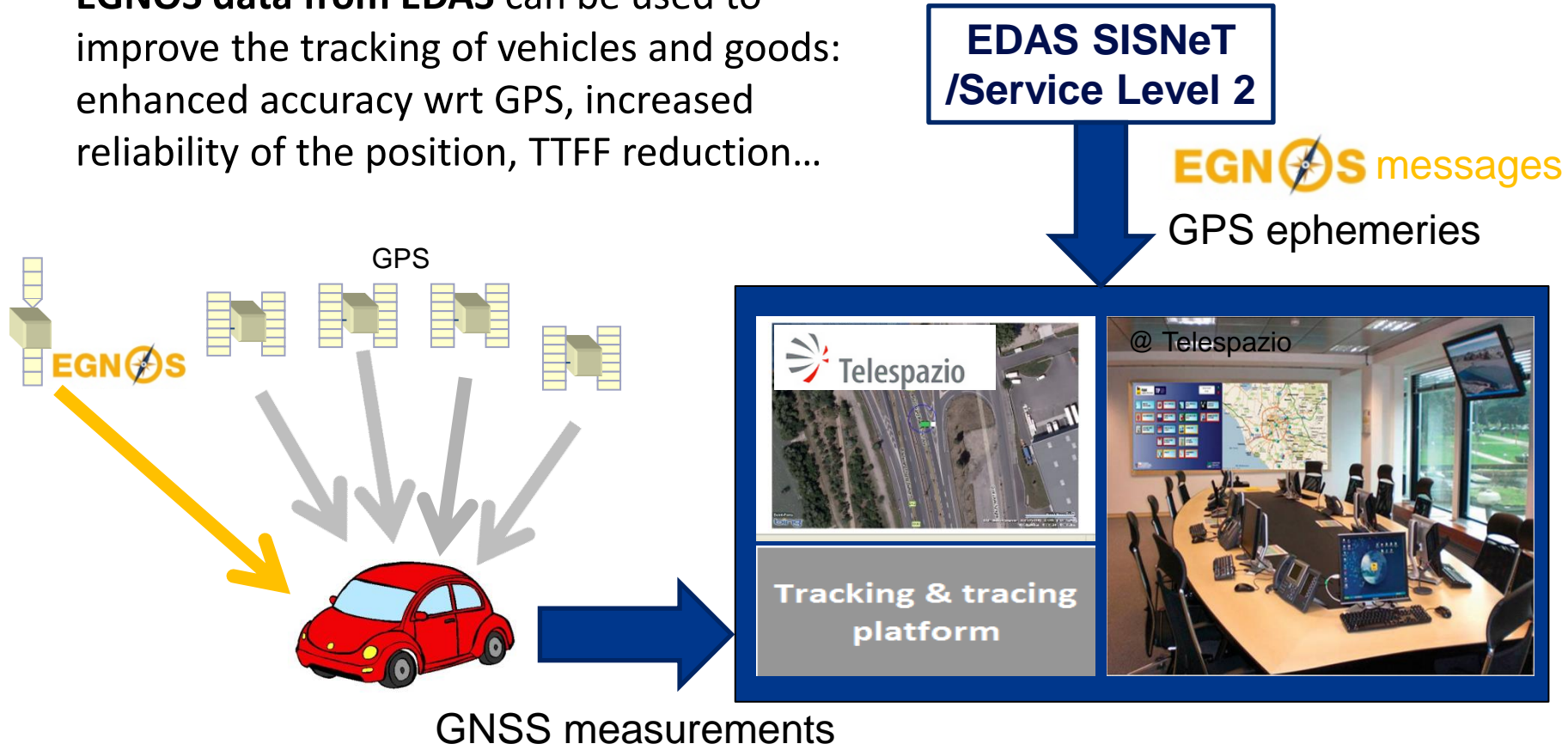


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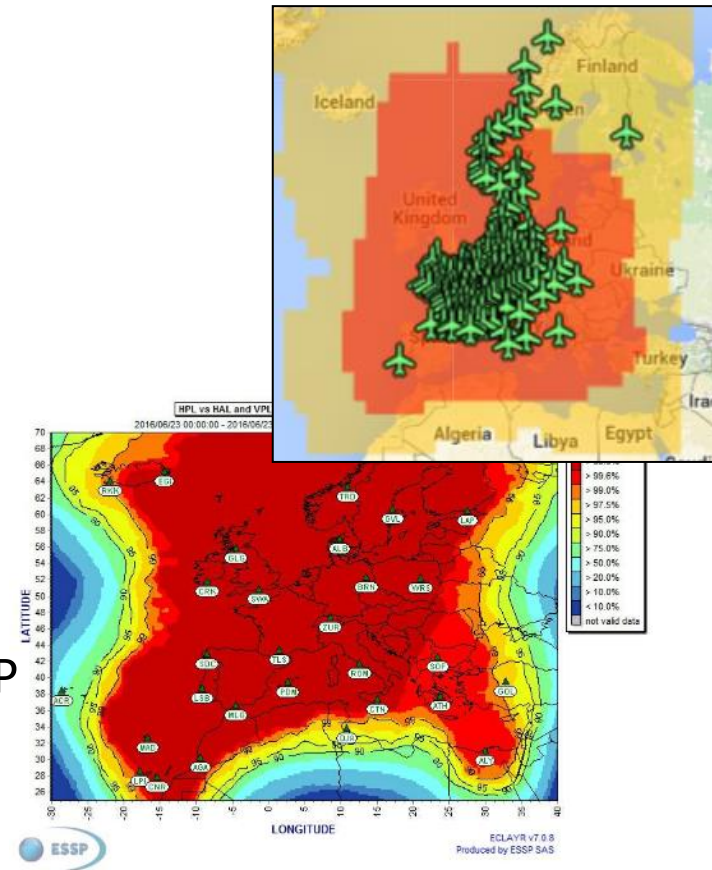
Tracking of assets

- **EGNOS data from EDAS** can be used to improve the tracking of vehicles and goods: enhanced accuracy wrt GPS, increased reliability of the position, TTFF reduction...



GNSS performance monitoring

- **GNSS data** obtained from **EDAS Services** are used as input for **GNSS performance monitoring and assessment**:
 - Analysis of different GNSS navigation solutions at the EGNOS stations.
 - Several GNSS performance tools are customized to use EDAS Services, especially NTRIP, SISNeT and FTP.
 - GNSS performances can be computed in real time and in post-processing (EDAS FTP Service).



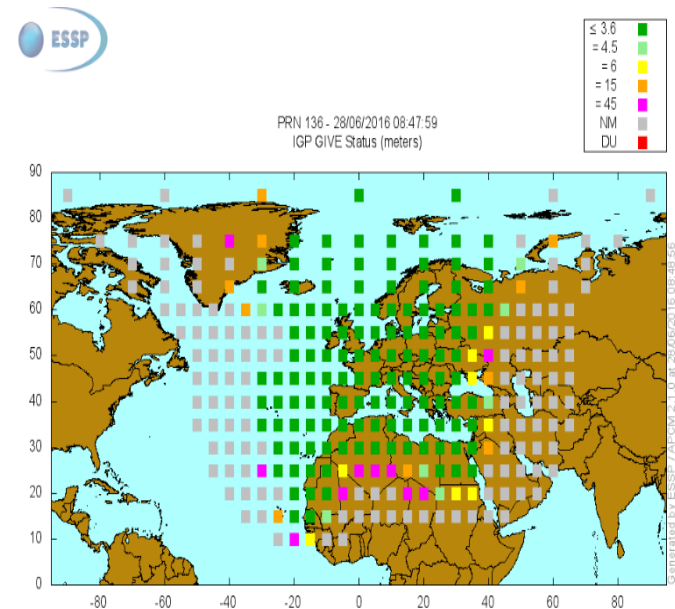
Contribution for GNSS CORS networks

- EDAS data can contribute to improve GNSS **Continuously Operating Reference Station (CORS)** networks in different ways
- GNSS raw data from EGNOS stations can be used for different purposes:
 - Higher network density
 - Cost saving
 - Extension of coverage
 - Data for validation
 - Independent performance monitoring



Development of GNSS algorithms or models.

- GNSS raw data obtained from EDAS Services are used as input for GNSS products development and atmospheric analysis:
 - Analysis of ionosphere using EDAS IONEX files based on EGNOS corrections.
 - Test of new ionospheric or tropospheric models
 - Meteorological studies based on GNSS observation measurements.
 - Development of algorithms for GNSS Systems using EDAS GNSS historical data.



Enhancement of GPS standalone position for mobile applications

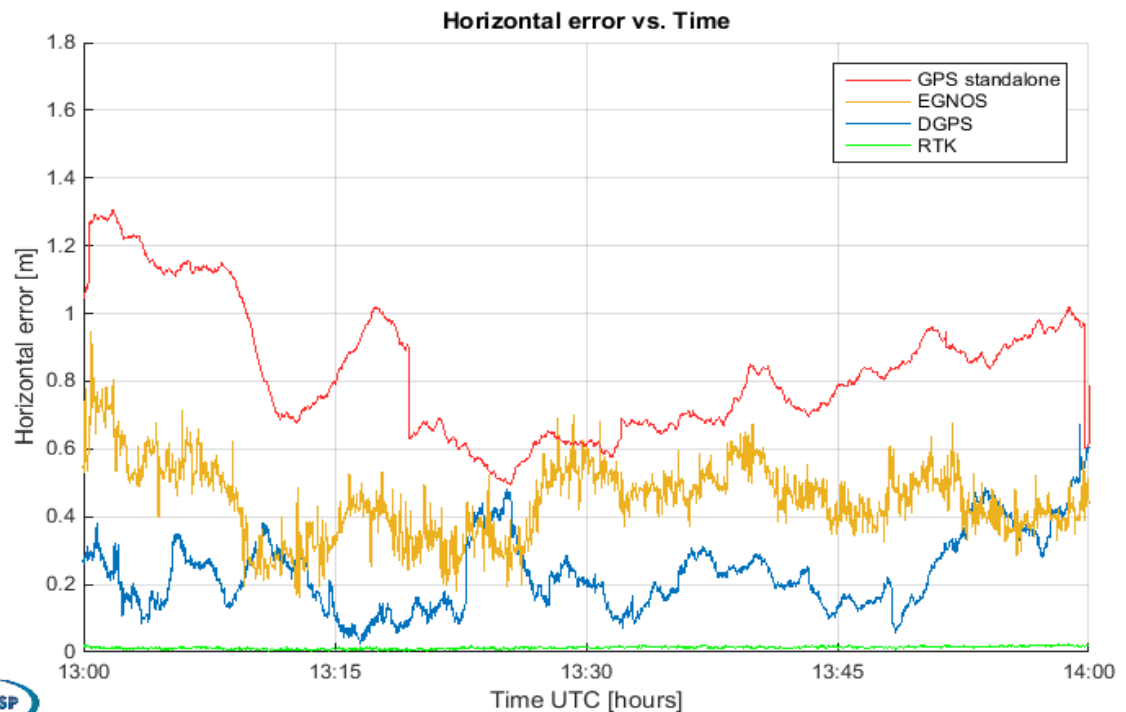
- EDAS Services can be used in mobile devices for enhancing the GPS standalone position in real time thanks to wireless internet connectivity.
- The positioning techniques supported by EDAS are the following:

Positioning technique	EDAS Service	Comments
EGNOS (SBAS)	EDAS SISNeT	Important in areas when the visibility of EGNOS Geostationary satellites can be obstructed.
DGNSS	EDAS NTRIP	DGNSS corrections from a close EGNOS station can be applied to delete common satellite errors.
RTK	EDAS NTRIP	Centimetre level accuracy can be computed when located within 40 km from the EGNOS station.

Enhancement of GPS standalone position for mobile applications

- Example:** Horizontal Position Error at Berlin on 07/06/2015

Horizontal Position Error (HPE)		
	Max (meters)	Mean (meters)
GPS	1.19	1.08
SISNeT/EGNOS	0.47	0.52
DGPS *	0.16	0.22
RTK *	0.01	0.02



(*) RIMS BRNA used as reference, baseline < 10 km

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Archive	FTP	✗	✗			RINEX, EMS, IONEX...	FTP

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DGNSS corrections for EGNOS stations provided by EDAS NTRIP Service							
Real Time	Data Filtering SL2	✗	✗			RTCM 2.x	EDAS
	SISNET		✗			RTCA	SISNeT
	Ntrip	✗		✗	✗	RTCM 2.x RTCM 3.1	Ntrip
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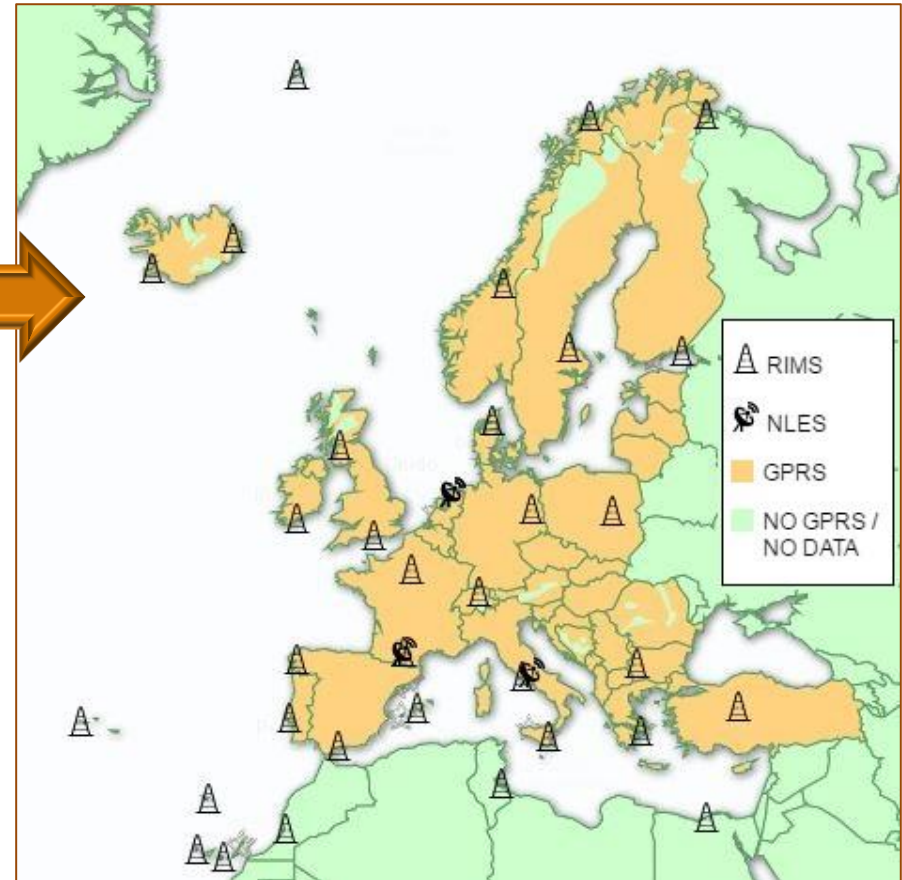
DGNSS Navigation using EDAS Ntrip Service

- **DGNSS corrections (GPS & GLONASS) for EGNOS stations are sent through the EDAS Ntrip Service via the Internet.**

Estimated GPRS Coverage in Europe

- **Performance assessment campaign to characterise EDAS DGPS performance.**

*More details: EDAS (EGNOS Data Access Service): Differential GNSS corrections for land applications, (ESSP SAS)
ION GNSS 2016*



EDAS DGPS: Scenario

- **Time period: 35 days**
2nd July– 6th August 2016
- Multiple combinations of rover and reference station locations to obtain different baseline length scenarios:

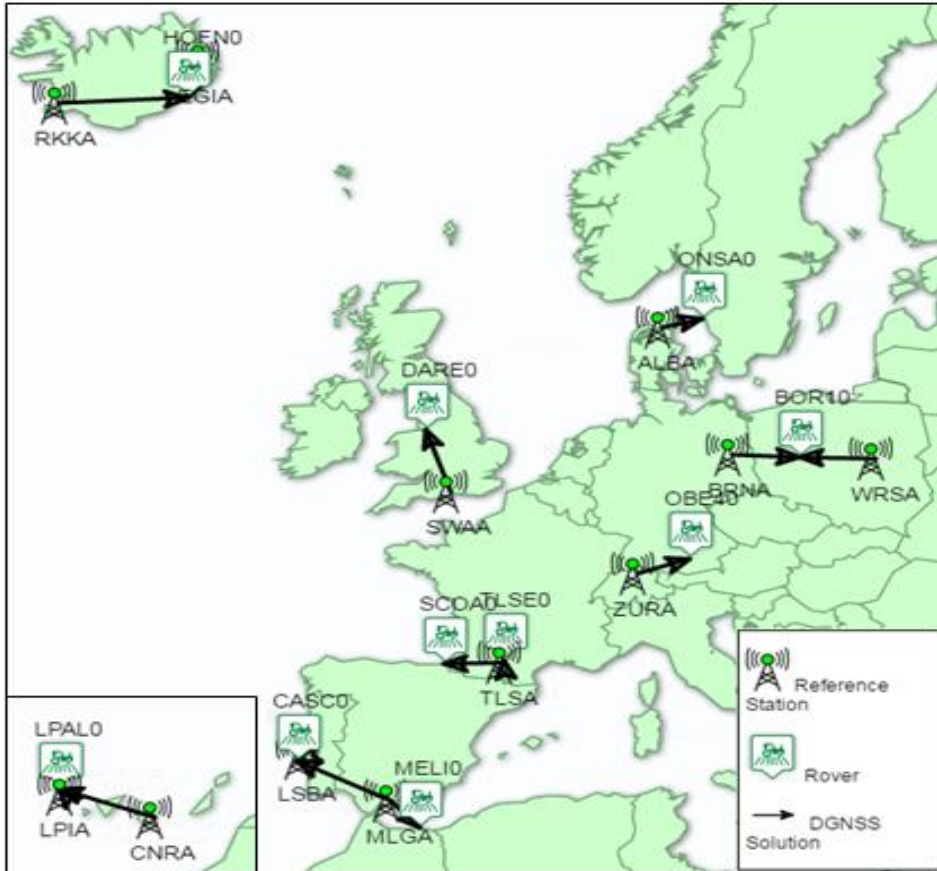
Short (<150km)
Medium (<350 km)
Long (>350 km)

- Alberding Monitor SW for the computation of EDAS DGPS positioning



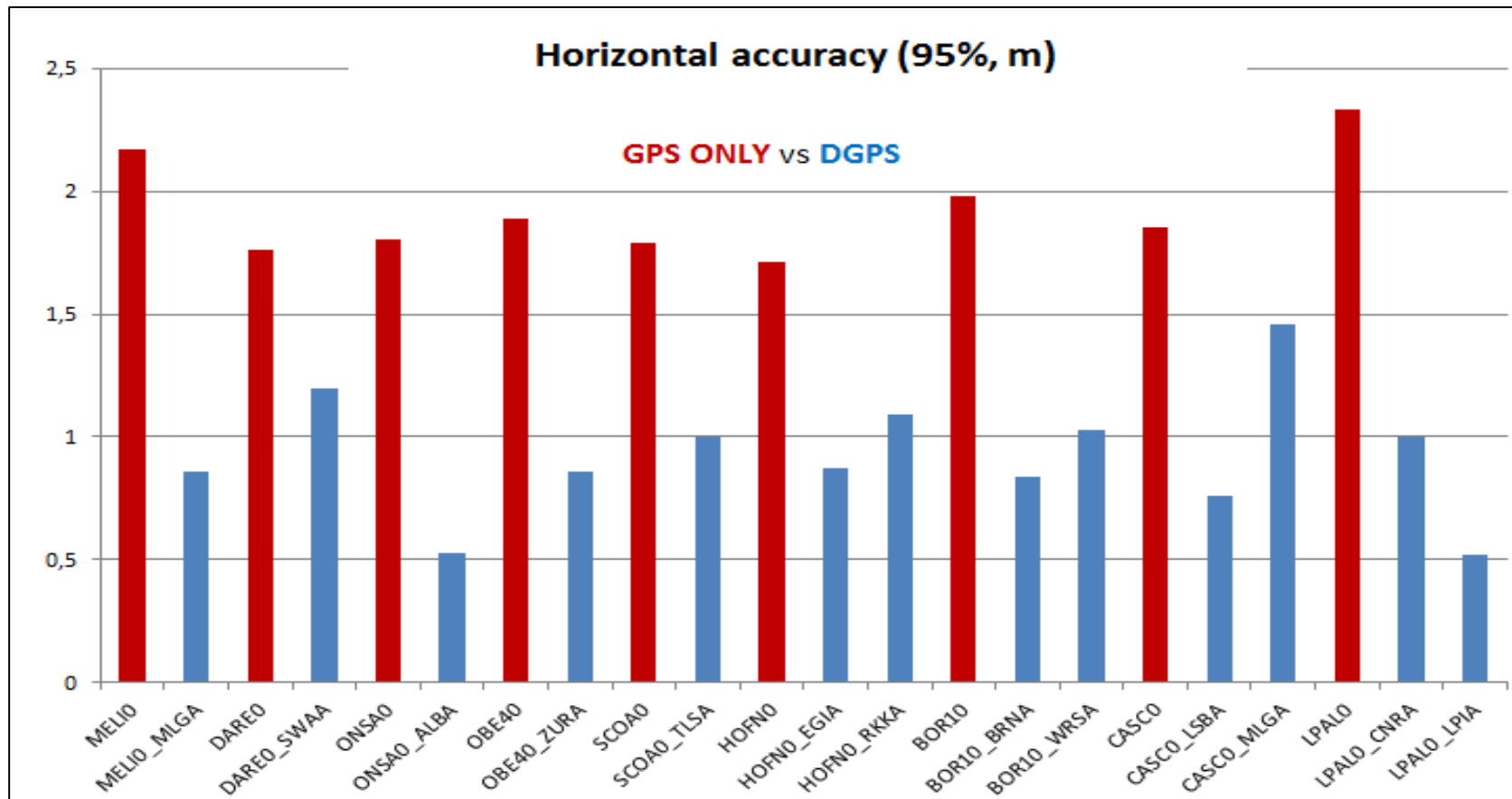
DGPS Solution		Distance type (Km)
Rover receiver (EPN)	Reference station (EDAS)	
BOR10	BRNA	Medium (241)
	WRSA	Medium (272)
DARE0	SWAA	Medium (288)
CASCO	LSBA	Short (27)
	MLGA	Long (486)
HOFNO	RKKA	Medium (327)
	EGIA	Short(119)
LPAL0	CNRA	Medium (262)
	LPIA	Short (20)
MELIO	MLGA	Medium (210)
OBE40	ZURA	Medium (215)
ONSA0	ALBA	Short (127)
SCOA0	TLSA	Medium (257)
TLSE0	TLSA	Short (14)

EDAS DGPS: Scenario

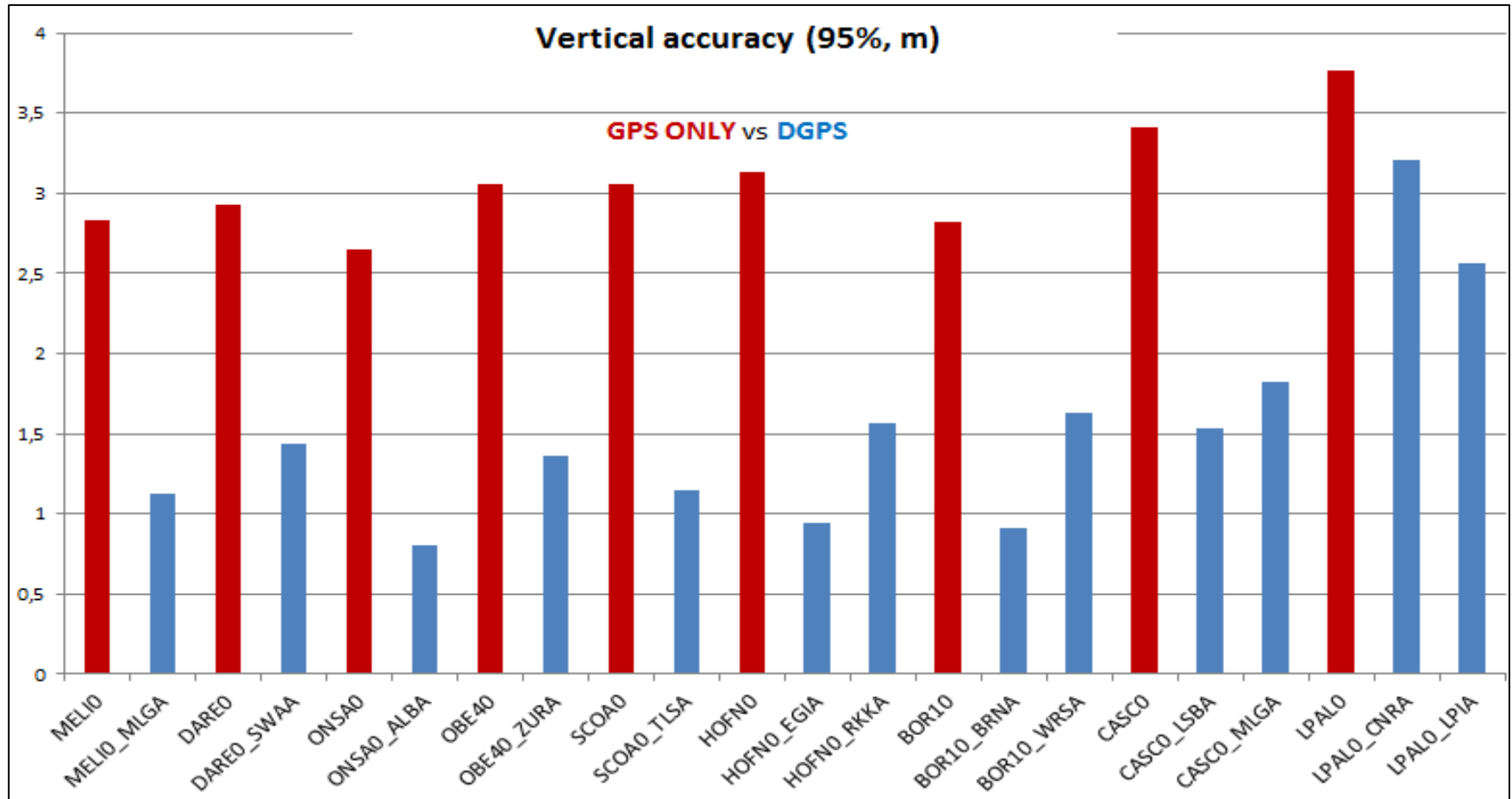


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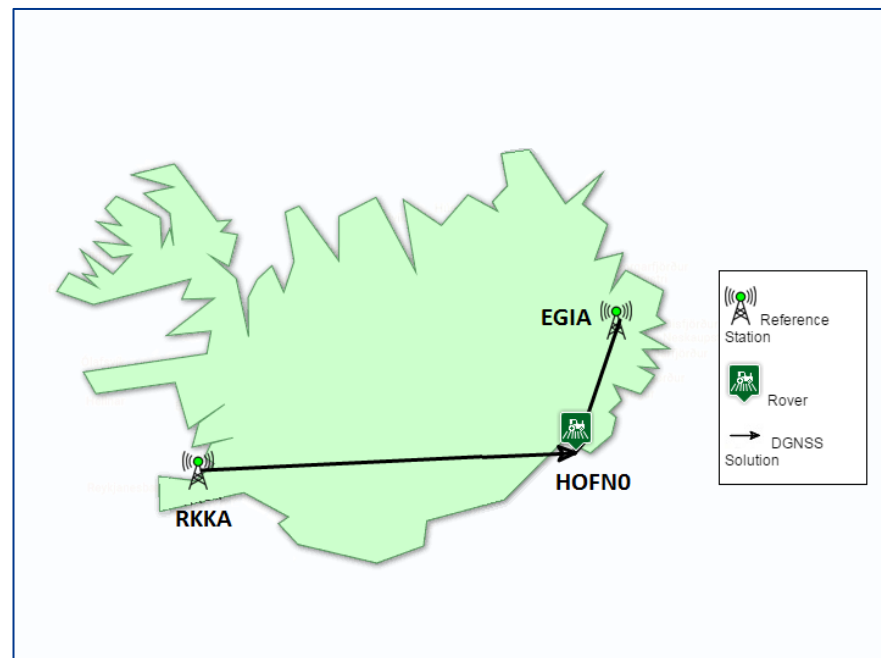
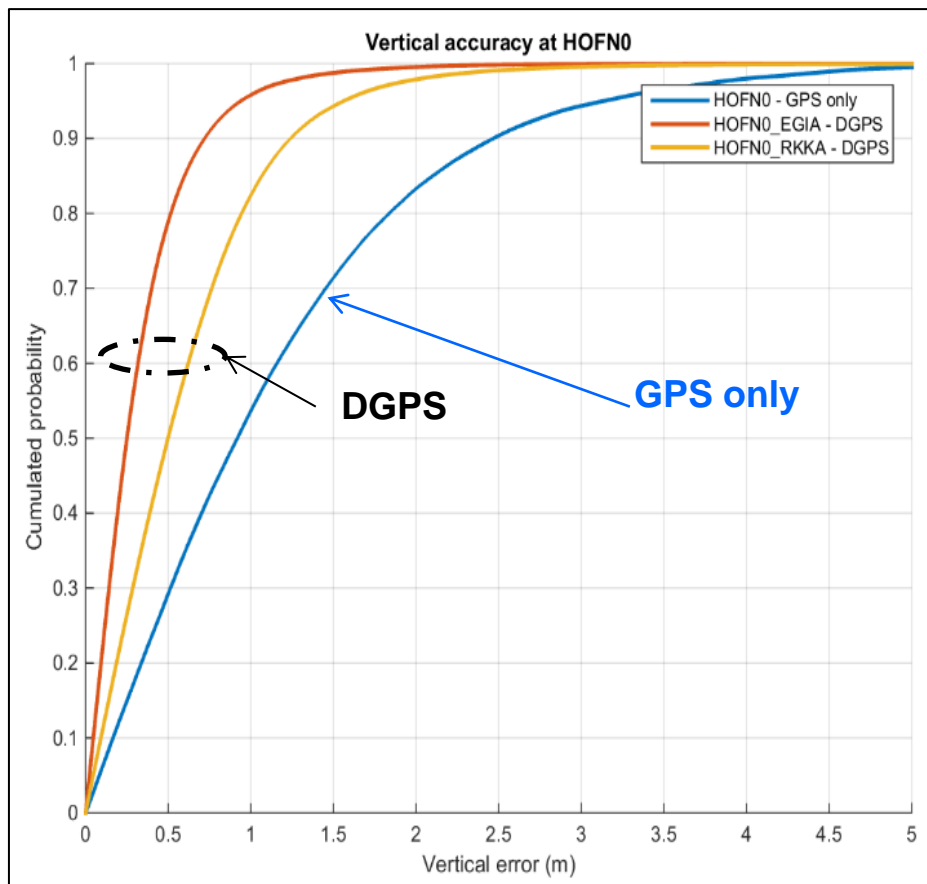
EDAS DGPS: Horizontal Accuracy



EDAS DGPS: Vertical Accuracy



Example: Horizontal error at HOFN0



2nd July– 6th August 2016 (35 days)
119 km and **327 km** baseline

EDAS DGPS: Pass-to-pass results

From 2nd July to August 6th 2016.

Solutions with horizontal accuracy (percentile 95th) < 1 m

Location	Solution	Pass to Pass -15 min, 95th-
La Palma (Spain)	LPALO_LPIA	13,9 cm
La Palma (Spain)	LPALO_CNRA	10,1 cm
Cascais (Portugal)	CASCO_LSBA	15,7 cm
Hoefn (Iceland)	HOFNO_EGIA	12,4 cm
Onsala (Sweden)	ONSAO_ALBA	10,1 cm
Melilla (Spain)	MELIO_MLGA	11,2 cm
Oberpfaffenhofen (Germany)	OBE40_ZURA	20,6 cm
Borowiec (Poland)	BOR10_BRNA	13,7 cm
Ciboure (France)	SCOA0_TLSA	18,6 cm
Toulouse (France)	TLSE_TLSA	16,5 cm



Static data, percentile 95th, 15 minutes time window.

ISO 12188-1, Tractors and machinery for agriculture and forestry-Test procedures for positioning and guidance systems in agriculture-Part1: Dynamic testing of satellite-based positioning devices

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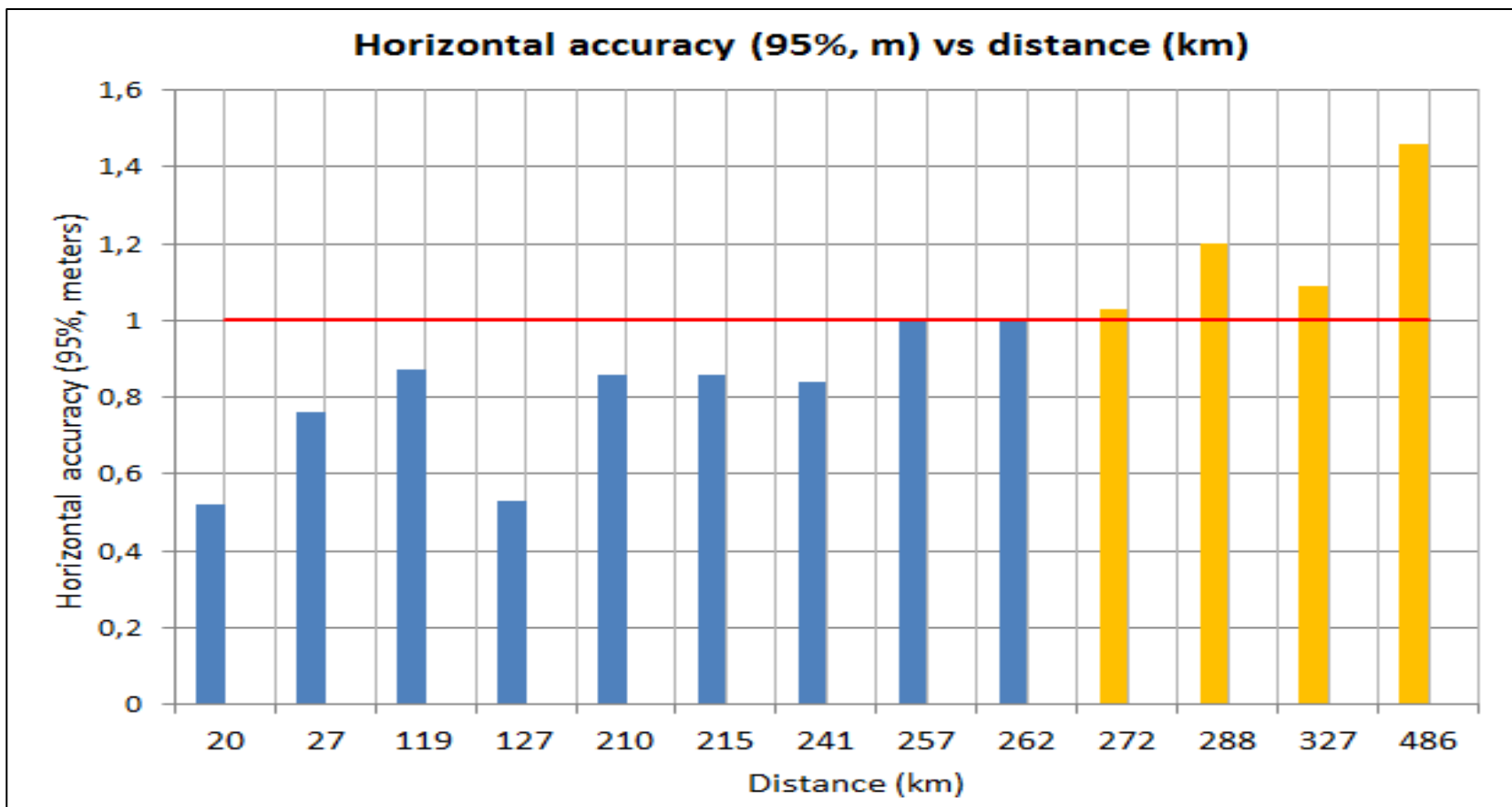
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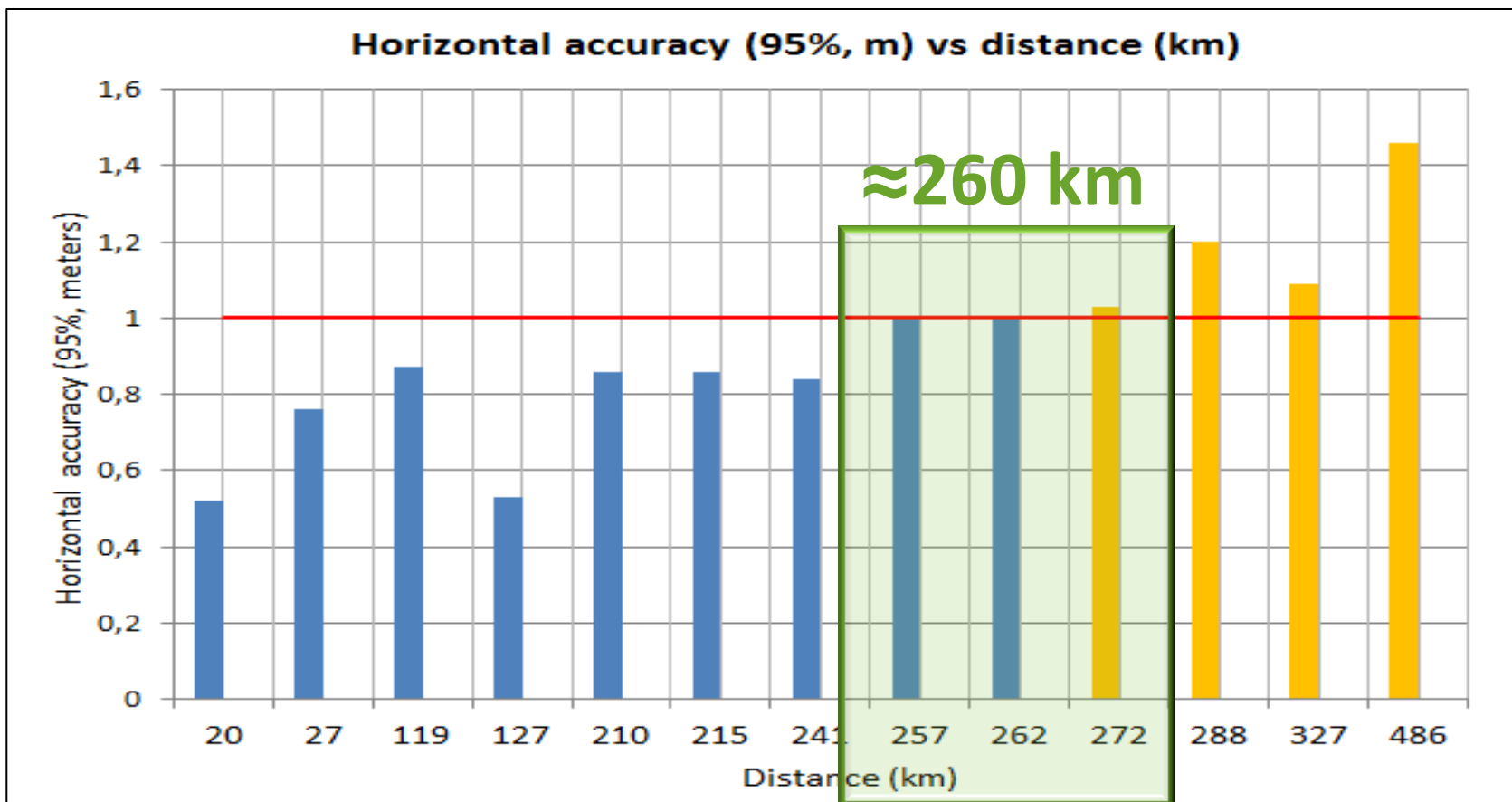
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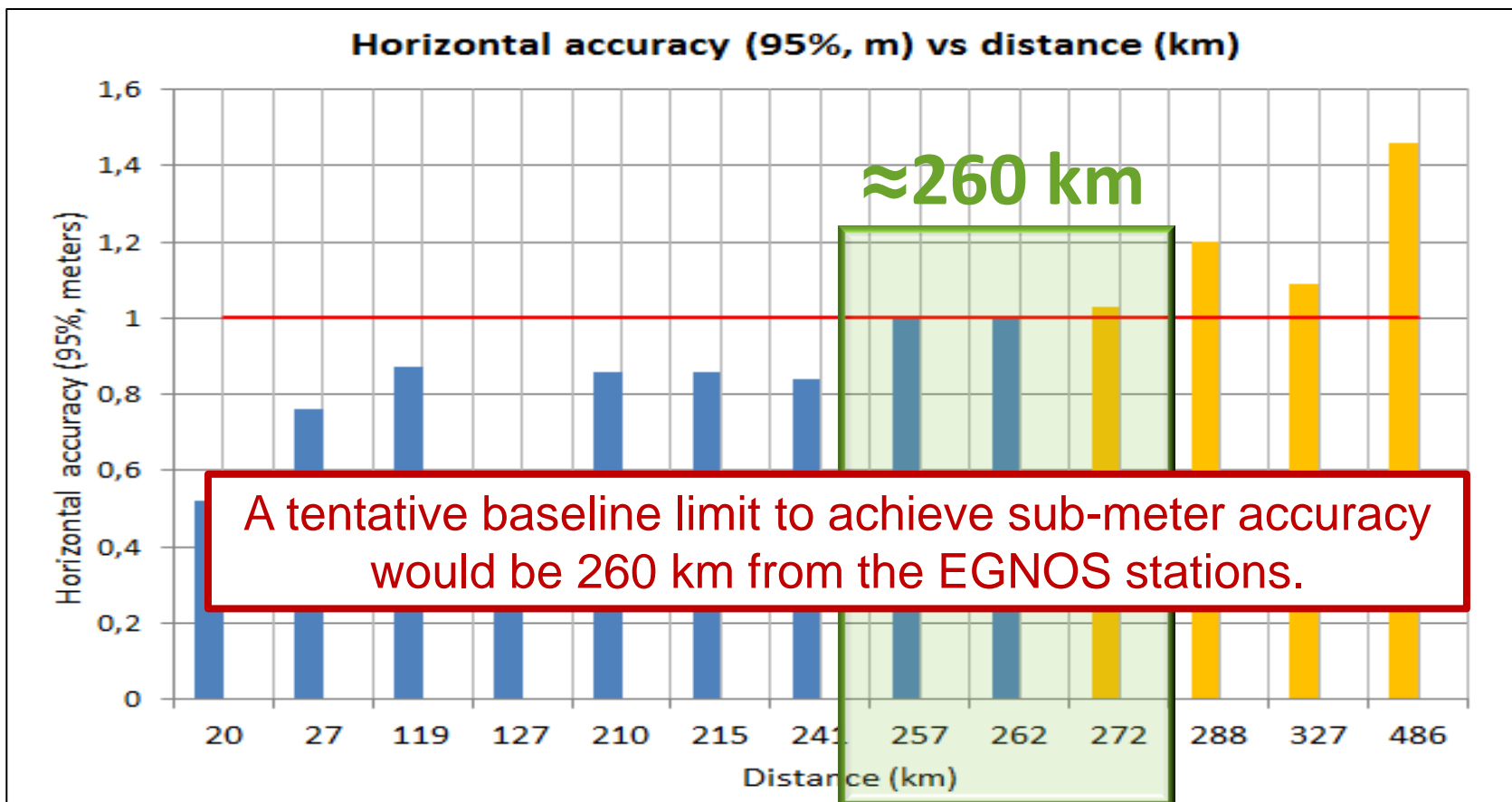
EDAS DGPS: tentative sub-meter accuracy coverage



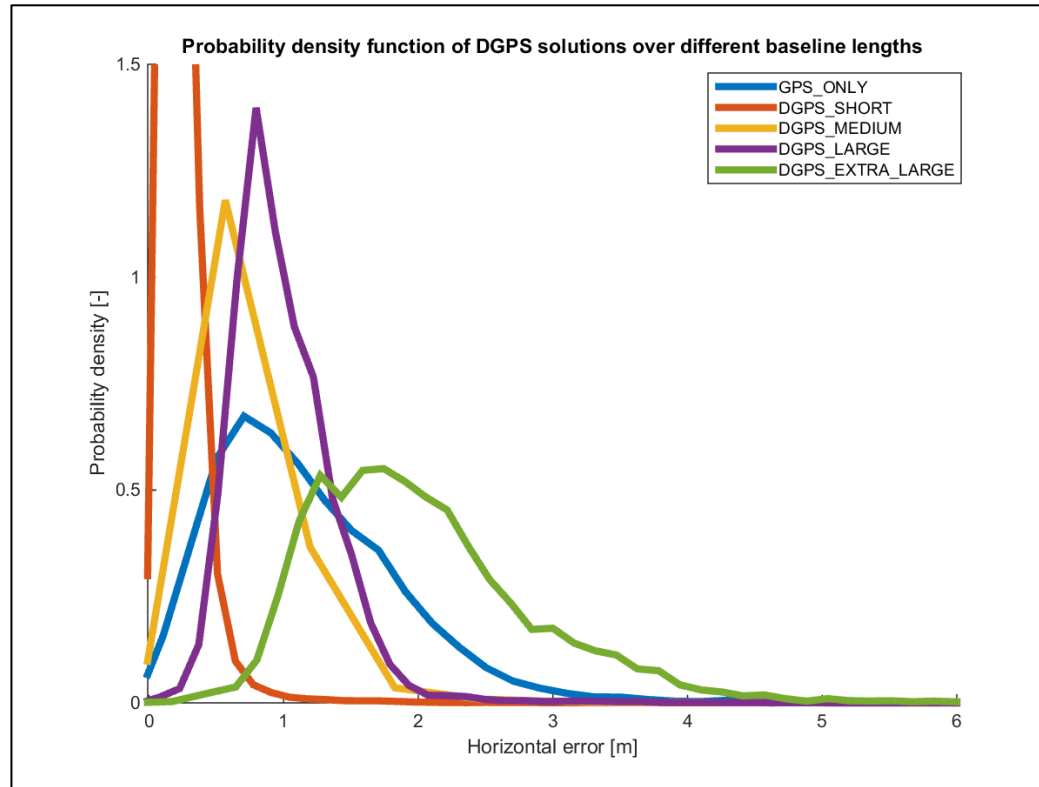
EDAS DGPS: tentative sub-meter accuracy coverage



EDAS DGPS: tentative sub-meter accuracy coverage

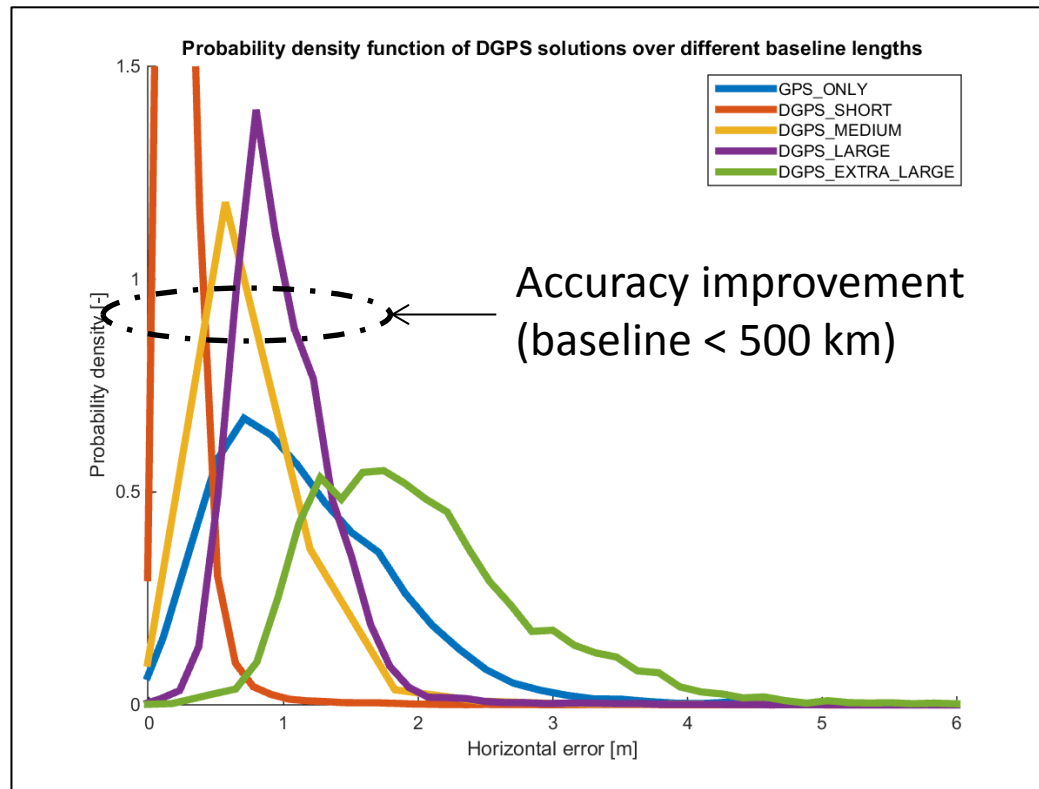


EDAS DGPS: tentative coverage for enhanced performance wrt GPS only



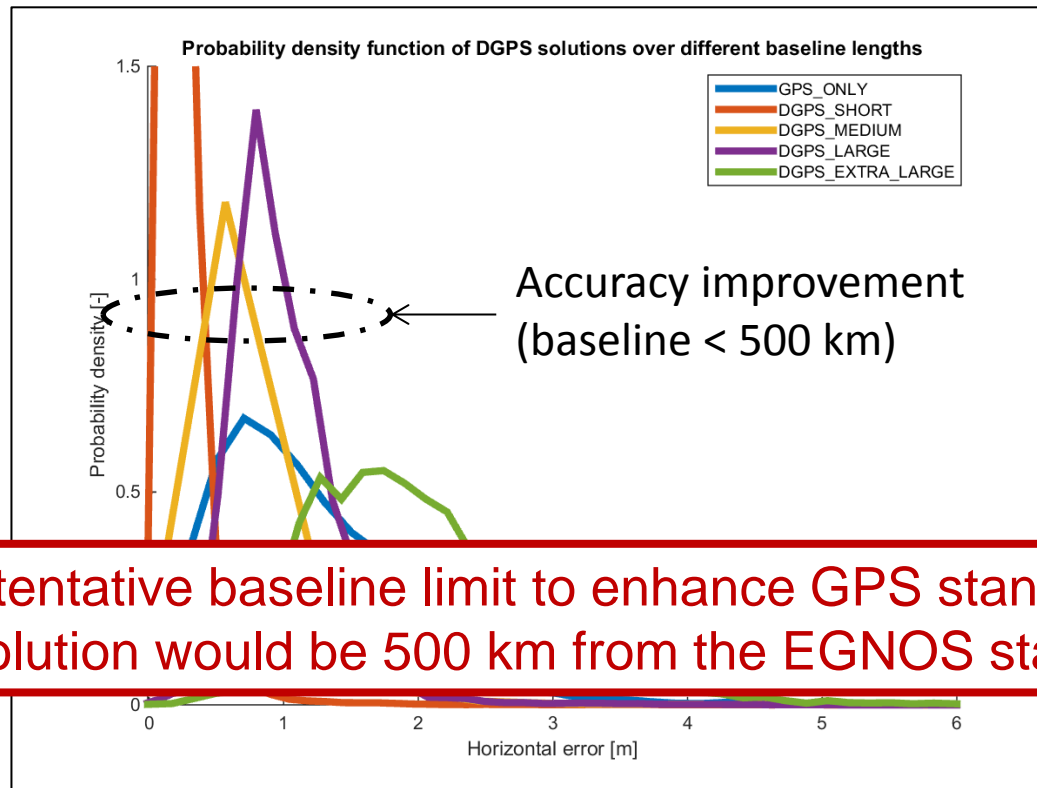
Source: EDAS (EGNOS Data Access Service): Alternative Source of Differential GPS Corrections for Maritime Users, (ESSP & Alberding GmbH) ION GNSS 2015

EDAS DGPS: tentative coverage for enhanced performance wrt GPS only



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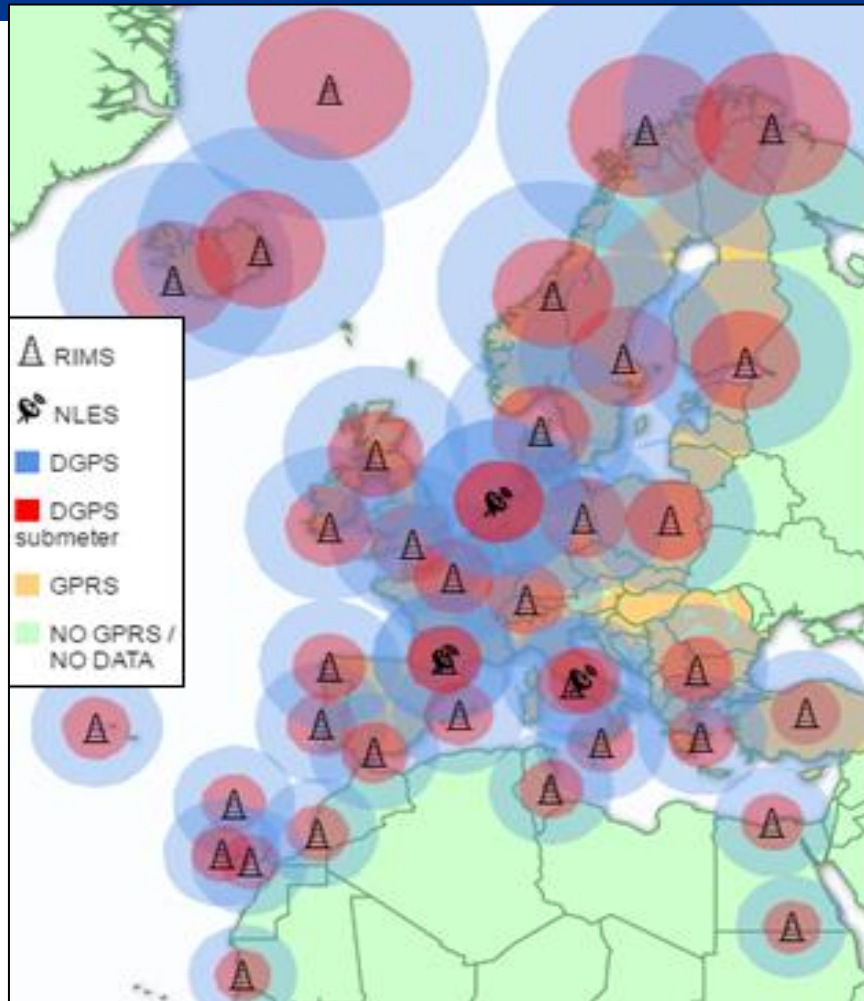
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EDAS DGPS: tentative coverage

Horizontal Accuracy



**EDAS DGPS
(percentile 95th)
< 1m**

**EDAS DGPS
(percentile 95th)
< GPS only**

** Estimated coverage based on performance assessment at specific locations and during a limited timeframe*

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Conclusions

- **EDAS** provides **free-of-charge** access to the **GNSS data** generated and gathered by **EGNOS infrastructure** in real time and in form of archive.
- **Excellent** availability and latency **performance** in the last 12 months.
- **EDAS provides an added value for a wide area of applications**
- **Analysis using EDAS DGPS corrections:**
 - Improvement to GPS standalone solution could be possible in most of EU landmasses.
 - Horizontal accuracies below 1 meter (95th %ile) could be obtained up to 260 km from the reference station.

Conclusions

You are all welcome to register to the EDAS Service and use it for your GNSS products and/or applications.



EGNOS, it's there. Use it.

Thank you!



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elisabet.lacarra@essp-sas.eu



<http://egnos-user-support.essp-sas.eu>



egnos-helpdesk@essp-sas.eu

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Corporate Video