The EGNOS Service Provider

Service Provision Yearly Report (April 2016 - March 2017)

EGNOS Service Provision

ESSP

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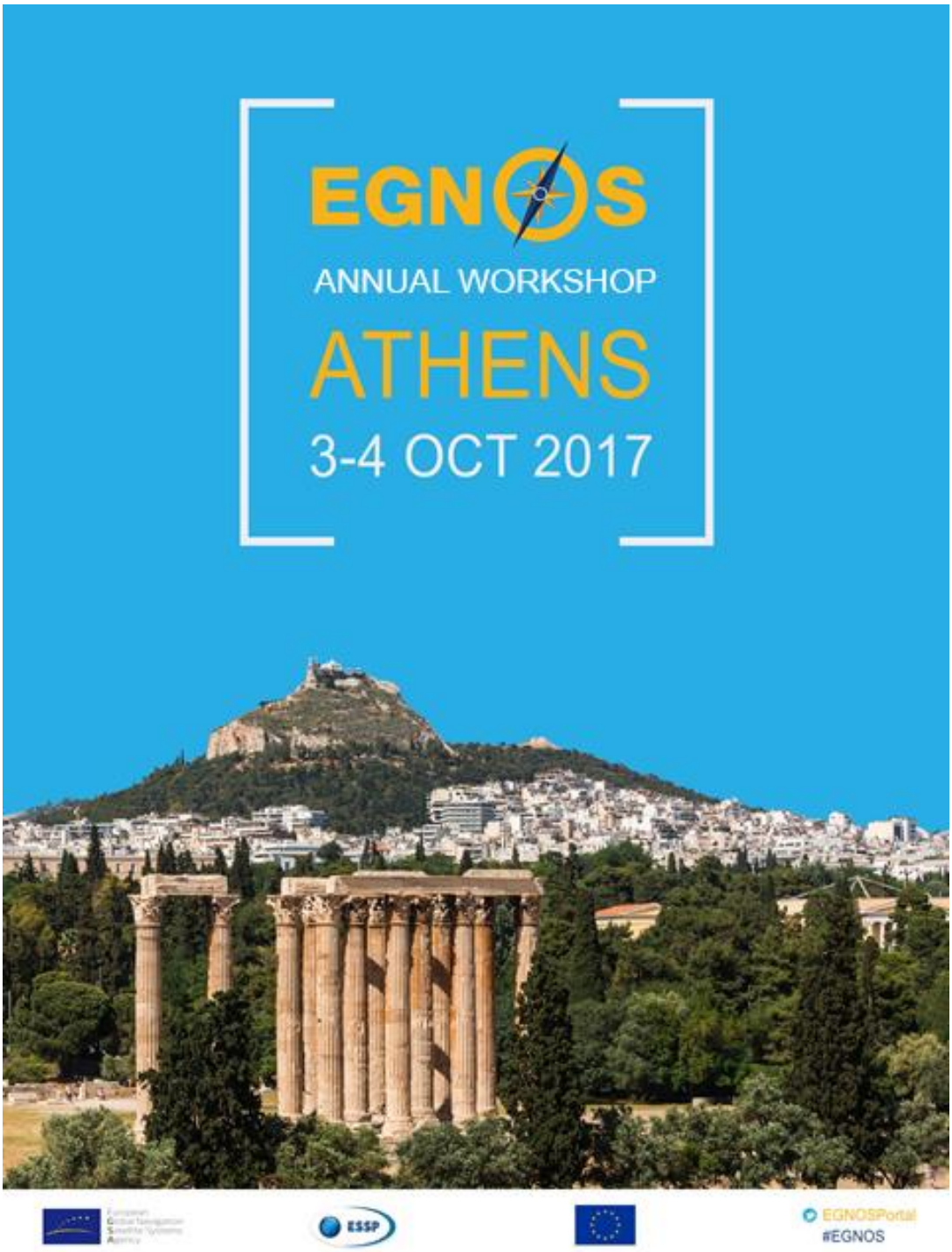
ESSP organises the EGNOS Annual Workshop for EGNOS users and stakeholders. It is the perfect place to receive updated information on the EGNOS system and services, implementation information and success stories and to gather feedback from users and share ideas and experiences among EGNOS users in different domains.

The 2017 EGNOS Annual Workshop will be held on 3-4 October in Athens.



REGISTRATION OPEN!

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1 A WORD FROM THE ESSP CEO

EGNOS performance in 2016 was the best ever, benefitting its steadily increasing number of users.

During this year, a significant effort was made to prepare for future system versions (241N_YSR#2, YSR#3, YSR#4 and V242). These new releases will increase system robustness, allow the full deployment of the new GEO, extend the service area to 72° North and to the South-East area thanks to the integration of the new RIMS in Haifa, Israel.

As regards service provision, 52 cumulative EWAs were signed at the end of March 2017 and progress was made in the definition of a framework for use of EGNOS in new scenarios (military operations, rotorcraft, Aerodrome Flight Information Service, non-instrumental runways, non-European Union non-Single European Sky like countries…).

EGNOS adoption actions were successfully conducted jointly with the GSA in aviation, but also in agriculture, surveying, rail and maritime with a growing interest in all these market segments.

It is also worth noting that the 2016 edition of the EGNOS Annual Workshop took place in Warsaw, Poland, with a record of nearly 180 participants.

On the user side, a satisfaction level of 81% was achieved.

Lastly, ESSP's ANSP certificate was renewed by EASA in July 2016 for another 2 years.

Although 2016 looks like the year of records, there are still several records to beat: be sure that we are working on them every single day!

My deepest thanks go to the ESSP teams, partners and subcontractors who have made the above possible; to our customer, the GSA, for our constructive relationship in all these achievements; and, last but not least, to the EGNOS users who are growing year after year.

Thank you,

Thierry Racaud
CEO, ESSP SAS

We certify you're there.

2 EXECUTIVE SUMMARY

This document covers the period from 1 April 2016 to 31 March 2017.

2.1 EGNOS Service Performance

During the period from 1 April 2016 to 31 March 2017, EGNOS service performance has been excellent, providing values in line or very close to the committed ones in the Open Service, Safety of Life and EDAS Service Definition Documents (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds).

The EGNOS services performance during this yearly period can be summarised as follows:

EGNOS Safety of Life (SoL) Service – Non-Precision Approach (NPA)		
NPA Availability	100% of the service area (Message Type 27)	
NPA Integrity	No integrity event for any of the monitoring sites	
NPA Continuity	Values below 5.10^{-4}/h in continental Europe	
EGNOS Safety of Life (SoL) Service – Approach with Vertical Guidance (APV-I)		
APV-I Availability	98.73% of the service area	
APV-I Integrity	No APV-I integrity event	
APV-I Continuity	99.63% of the service area ($5{\cdot}10^{-4}$/15seconds)	
EGNOS Safety of Life (SoL) Service – LPV-200		
LPV-200 Availability	99.07% of the service area	
LPV-200 Integrity	No LPV-200 integrity event	
LPV-200 Continuity	99.49% of the service area ($5{\cdot}10^{-4}$/15seconds)	
LPV-200 Accuracy Tails	No events happened during the period	
EGNOS Open Service (OS)		
Horizontal Accuracy	0.9 metres (95^{th} percentile of the cumulative data for all stations)	
Vertical Accuracy	1.5 metres (95^{th} percentile of the cumulative data for all stations)	
Open Service Availability	Above 99% for all locations	
EGNOS Data Access Service (EDAS)		
Service Level 0	99.98% availability	700.22 ms latency
Service Level 2	99.98% availability	700.96 ms latency
Ntrip	99.98% availability	651.72 ms latency
SISNeT	99.90% availability	79.53 ms latency
Data Filtering	99.98% availability	451.31 ms latency
FTP	99.98% availability	Not Applicable

Signal-In-Space (SIS) Availability	
PRN120 (EGNOS OP)	99.881%
PRN136 or PRN123 (EGNOS OP)	99.992%
EGNOS OP (at least one SIS)	100%

Table 1: EGNOS service performance during the April 2016 – March 2017 period

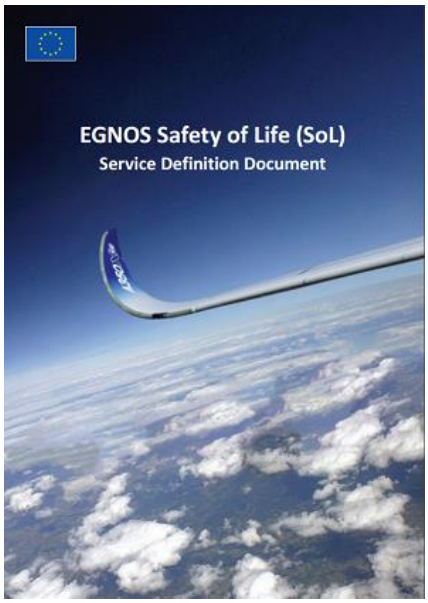
The main causes for the observed EGNOS Service Performance degradations were:

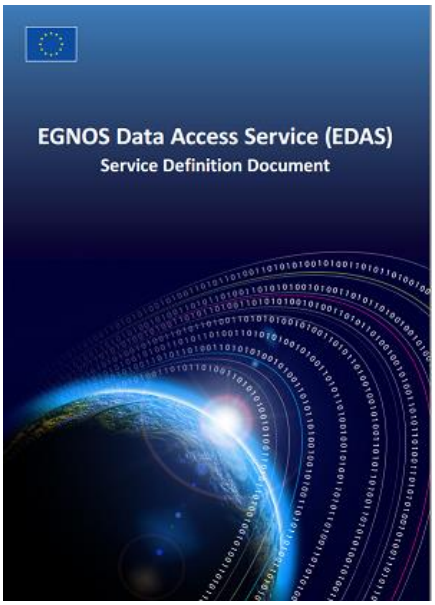
- *EGNOS OS and SoL services:*
  - **Ionosphere monitoring**: As in previous years, the problems related to ionosphere monitoring were the main cause of underperformance (around 56% of the daily underperformance events) impacting mainly the North and the South of the service area. It must be noted that after ESRv2.4.1M deployment, in July 2015, the degradations observed in the southern area decreased significantly thanks to the improvements introduced by this release.
  - **GPS monitoring**: The problems related to monitoring one or more GPS satellites by EGNOS are the second cause for underperformance. This loss of monitoring of some satellites has been especially significant in terms of performance impact during periods with degraded ionosphere monitoring conditions.
  - **RIMS and EWAN unavailability events**: Although some outages were observed over the year, most of them had a minor impact on the service performance.
  - **Data quality/RIMS anomaly**: The existence of local issues (loss of measurements, cycle slips, multipath...) in the RIMS receiver has impacted the Open Service performance (availability and accuracy) measured at some EGNOS stations on specific dates. Isolated cases were detected in Reykjavik, Golbasi, Trondheim and Sofia RIMS sites that were the responsible of those Open Service degradations.
- *EDAS:*
  - Very stable services with no significant underperformance during the reported period.

EGNOS RIMS Hartebeeshoek - Surroundings

2.2 Service Provision and Development

- **Services Evolution:**
  - **Service Definition Documents (SDD):** Following the deployment of the ESR 2.4.1M, a new version of the SoL SDD (v3.1) was published on 26 September 2016. The main changes of this new version of the SoL SDD were:
    - Extension of service area for LPV-200 service level
    - Extension of service area for APV-1 service level
    - EGNOS Space Segment updated





EGNOS Service Definition Documents (https://egnos-user-support.essp-sas.eu/)

  - **Services Notices:** the EGNOS Services' SDD content was complemented by the publication of the following Service Notices:
    - Service Notice #14 (updated): "EGNOS System Release 2.4.1.M entry in operation"
    - Service Notice #15 (updated): "EGNOS Space Segment Update"
    - Service Notice #16: "Leap Second Introduction"
  - **EGNOS Service Implementation Roadmap:** The three EGNOS Service Roadmaps were updated from April 2016 to March 2017 going from v3.3 (on 29 January 2016) to v3.4 (on 3 August 2016) according to last EGNOS service evolution plan.

- **EGNOS Annual Workshop:**
  - The 2016 EGNOS Workshop was held in Warsaw in September 2016 with more than 180 participants over the two-day event, who were highly satisfied with the event, according to the survey taken that provided an excellent satisfaction score of 8.5.

2016 EGNOS Workshop promotional advertisement

  - The 2017 EGNOS Annual Workshop is planned in Athens on 3-4 October 2017 and is under preparation. The "save the date" notification and the high-level agenda will be notified in June to the expected participants. Regular updates as the event comes closer will be posted at the EGNOS User Support Website (http://egnos-user-support.essp-sas.eu/).

- **EGNOS Users Satisfaction surveys:**
  - The EGNOS Users Satisfaction Survey was launched in October 2016 to cover 2016 calendar year. The survey was opened using a specific online platform and 186 responses were received.
  - A total of 134 EGNOS users and 52 non-EGNOS users replied to the survey. The outputs of this survey were included in the EGNOS Bulletin Q1 2017. The global satisfaction score shows a very good level of satisfaction with respect to EGNOS in general terms, with a global satisfaction score of 8.1 which represents an improvement with respect to the one of last year (7.6).

- **User Service Implementation**:
  - EGNOS Multimodal Adoption (EMA) Action Plan:
    - All the activities planned to be executed during 2016 were successfully conducted. The market segment where more effort has been made is aviation, followed by maritime, agriculture & mapping and rail.
    - ESSP has continued to engage aerodromes to publish EGNOS-based procedures and operators to get equipped and certified. During the period reported in this document more than 80 LPV procedures have been published and more than 32 aircrafts have been certified or achieved operational approval. Another 60 new aircraft/rotorcraft units have been engaged so that in the near future they retrofit, start with the certification process or request SBAS options in avionics for new unit orders.
    - In the maritime domain, further progress has been achieved in the activities already launched in previous years to implement a Maritime Service in EGNOS V2, as well as those linked to the use of EGNOS V2 SiS or EDAS as a positioning source for Aids to Navigation (IALA DGNS stations and AIS stations).
    - In agriculture and mapping, the contacts network has been notably increased and customised information for those market segments prepared and disseminated.
    - Continuous support to GSA for SoL and non-SoL applications in the rail market segment has been provided.

2.3 System Operation and Maintenance

During the past period, two releases were deployed, aiming at improving the EGNOS services performance and introducing the second SES-ASTRA GEO into the operations.

RF environmental measurement near the EGNOS RIMS in Longyearbyen (Svalbard, Norway)

3 SERVICE PERFORMANCE

3.1 EGNOS SIS Availability

Definition
Individual GEO availability: Percentage of time when each geostationary satellite broadcasts a valid EGNOS SIS. A valid SIS is defined as a Signal-In-Space compliant with ICAO SARPS and RTCA MOPS.
Grouped GEO Availability: Percentage of time when at least one geostationary satellite in the EGNOS operational configuration (EGNOS-OP) broadcasts a valid EGNOS SIS. A valid SIS is defined as a Signal-In-Space compliant with ICAO SARPS and RTCA MOPS

This section presents the yearly performance of SIS availability. It provides the yearly average performances for each GEO PRN in operational mode namely PRN 120 and PRN 136 (then PRN 123) and for the operational SIS (at least one SIS is available). It also provides the yearly trend based on the monthly data. PRN 136 was the second operational GEO until 20/03/2017. After this date, the second operational GEO was PRN 123. SIS availability of EGNOS TEST PRN is not provided in this report.

From April 2016 to March 2017, the average EGNOS message availability was:

- OP1: PRN 120: 99.881%
- OP2: PRN 136 (then PRN 123): 99.992%
- EGNOS OP (at least one SIS): 100%

Monthly results are given by the following:

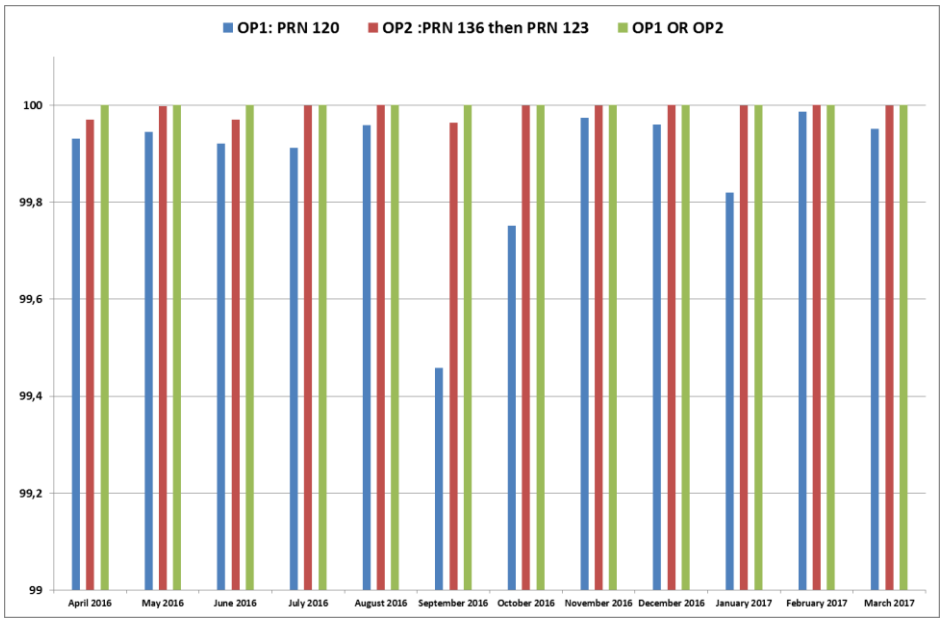


Figure 1: EGNOS SIS OP availability trend April 2016 to March 2017 (%)

Numerical values for each month and for each PRN are given in the following table:

Month	OP1: PRN 120	123	136	OP2: PRN 136 then PRN 123	OP1 OR OP2
April 2016	99.931	0.000	99.971	99.971	100
May 2016	99.945	0.000	99.998	99.998	100
June 2016	99.921	0,000	99.971	99.971	100
July 2016	99.912	87.086	100	100	100
August 2016	99.959	0.000	100	100	100
September 2016	99.458	0.000	99.964	99.964	100
October 2016	99.752	30.978	99.999	99.999	100
November 2016	99.975	94.430	99.999	99.999	100
December 2016	99.960	87.437	100	100	100
January 2017	99.820	96.587	99.999	99.999	100
February 2017	99.986	85.619	100	100	100
March 2017	99.952	99.166	90.699	100	100
Average	**99.881**	48.442	99.217	**99.992**	**100**

Table 2: EGNOS SIS OP Monthly availability From April 2016 to March 2017 (%)

3.2 SoL Service – Non-Precision Approach (NPA)

The following figures depict the minimum performance for the Non-Precision Approach (NPA) availability and continuity that can be expected from EGNOS, as defined in the EGNOS SoL Service Definition Document (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds). These values correspond to the expected average performance measured by a fault-free receiver using all GPS satellites in view over a period of one month, using all the operational EGNOS GEOs:

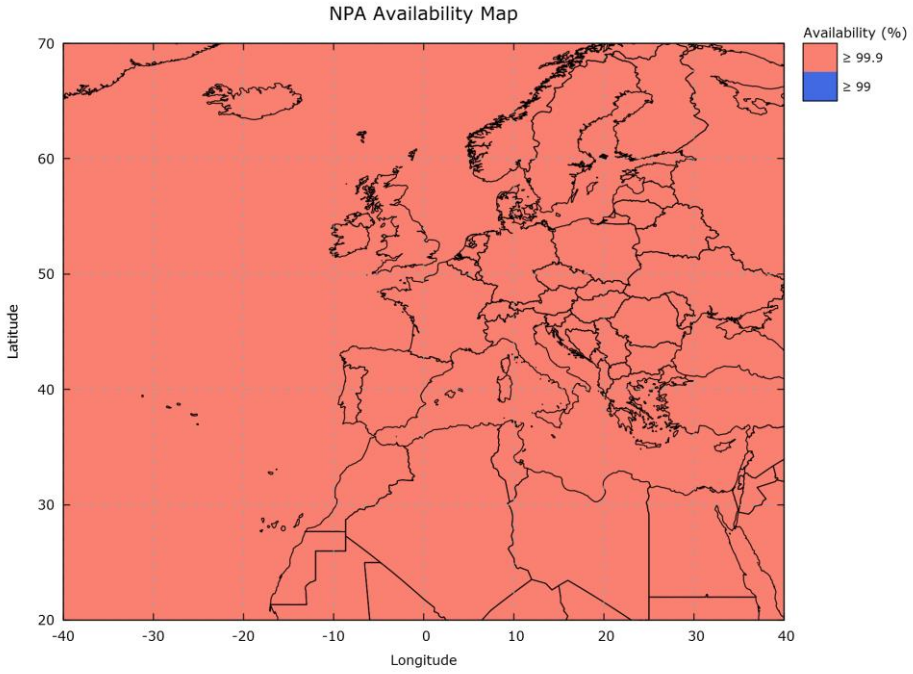


Figure 2: NPA Availability map- Expected minimum performance

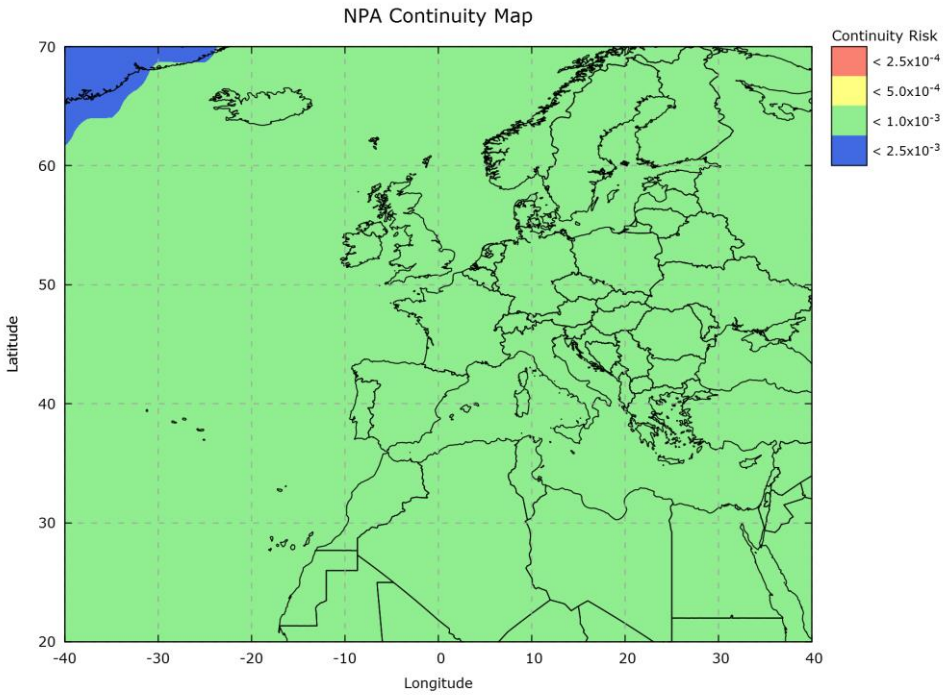


Figure 3: NPA Continuity map - Expected minimum performance

Additionally, NPA performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/monthly-performance-reports).

3.2.1 NPA availability

EGNOS NPA Availability *is defined as the percentage of samples in which the Horizontal Protection Level (HPL) is below the Alert Limit for NPA (HAL: 556m), computed over the total period.*

The following figure provides NPA availability for the reported period, for combined GEO:

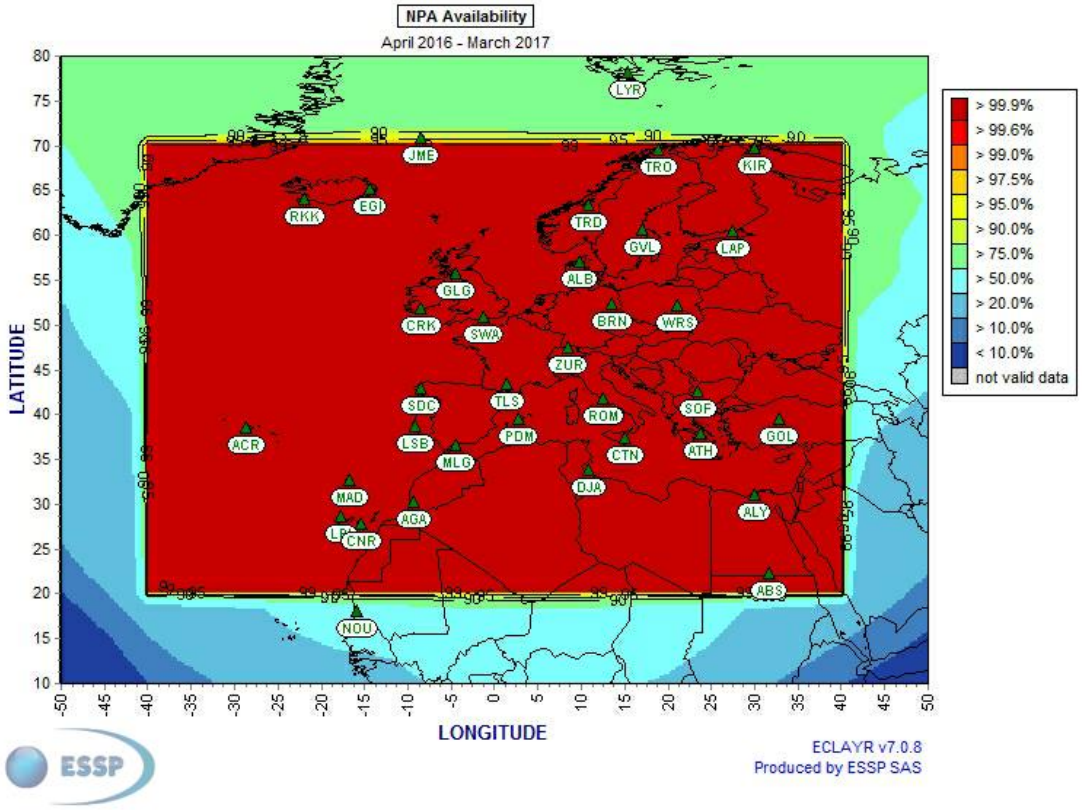


Figure 4: NPA Availability from 01/04/16 to 31/03/17

3.2.2 NPA availability – Achievement against target

The combination of the 99% NPA Availability map and the Service Area gives the following:

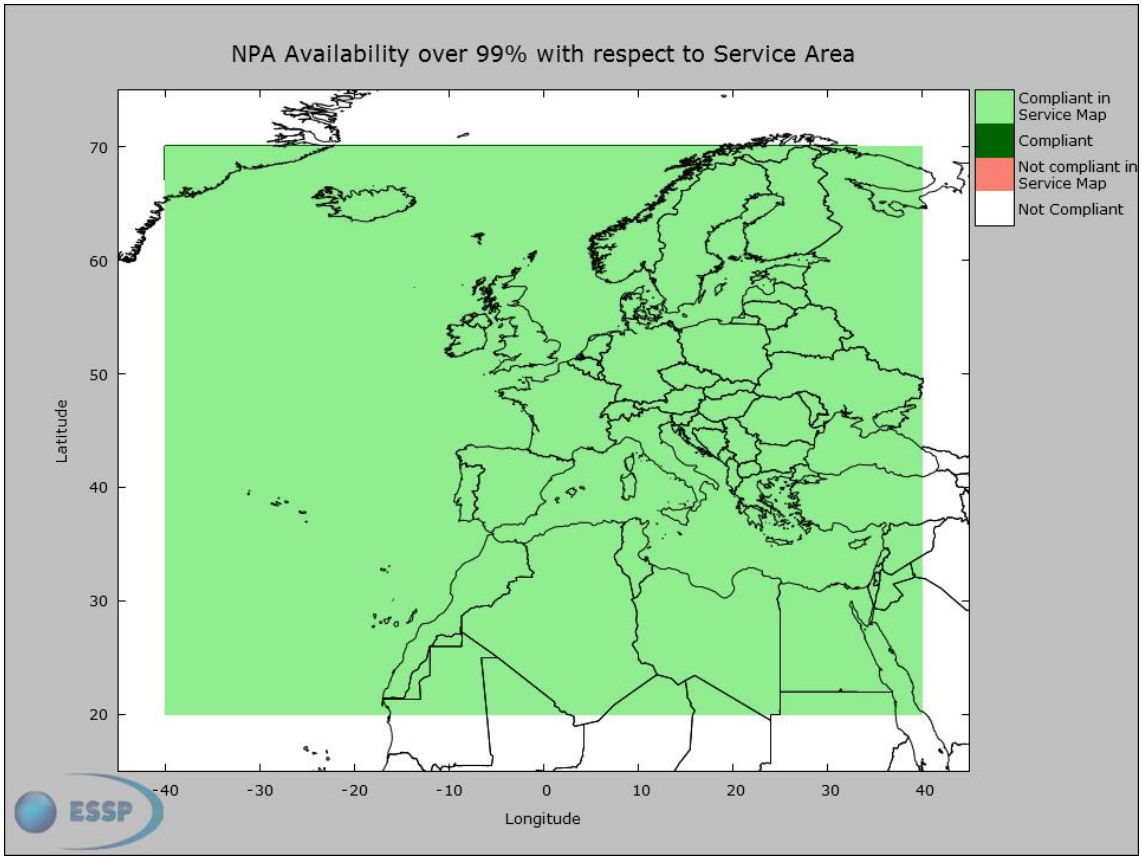


Figure 5: NPA Availability map with respect to the Service Area – 01/04/16 - 31/03/17

In the picture, the legend is read as follows:

- **Compliant in Reference Map**: This is the part of the Service Area[1] where NPA availability was above 99%.
- **Compliant**: This is the zone out of the Service Area[1] where NPA availability was also above 99% (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map**: This is the part of the Service Area[1] where NPA availability was lower than 99%.
- **Not compliant (white)**: This is any other zone out of the Service Area[1] where NPA availability is lower than 99%.

As shown in the figure above, NPA availability was greater than 99% over the entire MT27 area for the reporting period.

Considering the applicable Service Definition Document map used as the reference (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds), the percentage of points which were

[1] Service Area is the 99% NPA availability area depicted in the EGNOS Safety of Life SDD (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds)

compliant with the Service Area is **100%**. Note that the comparison with respect to the SDD SoL Service Area is included for information; the Service Area is a monthly reference, while the reported period is one year, so this comparison must be interpreted carefully.

3.2.3 NPA availability - 99% daily compliance

The percentage of days over the reported period in which the daily NPA availability was over 99% is shown in the figure below.

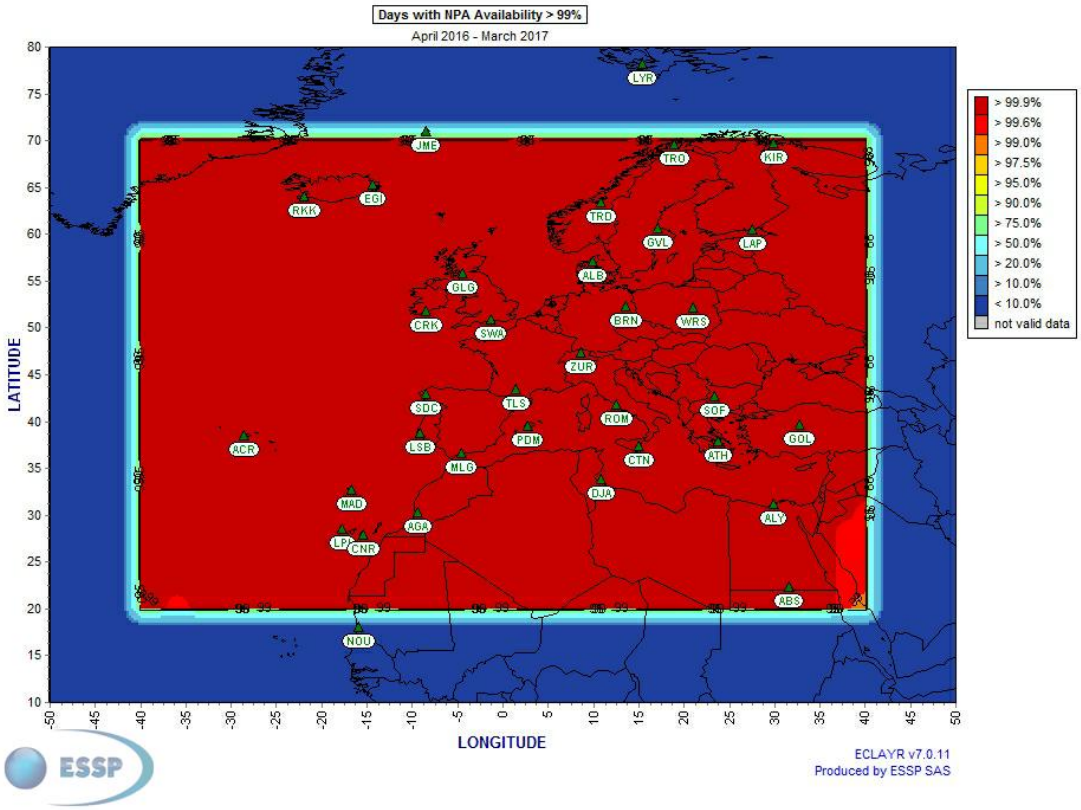


Figure 6: NPA Availability - Days over 99% - 01/04/16 to 31/03/17

As shown, the NPA daily Availability was higher than 99% for the full period over the entire MT27 region.

3.2.4 NPA Integrity events

EGNOS NPA Integrity Event *is defined as an event in which the Navigation System Error is greater than or equal to the corresponding Protection Level for NPA.*

None of the RIMS stations inside the Service Area has been impacted by integrity events in the position domain during the analysed period.

Safety index *is defined as the relation between Navigation System Error versus Protection Level (assuming NPA algorithms to compute xNSE and xPL) for each second. If the ratio xNSE/xPL is over 1, it indicates that a Misleading Information situation has occurred.*

Table 3 shows the maximum HSI at each RIMS inside of the NPA Service Area (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds).

Station	HSI	Station	HSI
Aalborg	0.24	La Palma	0.27
Abu Simbel	0.25	Lappeenranta	0.30
Agadir	0.40	Lisbon	0.24
Alexandria	0.24	Madeira	0.28
Azores	0.41	Malaga	0.22
Berlin	0.28	Palma de Mallorca	0.31
Canary Islands	0.31	Reykjavik	0.35
Catania	0.24	Rome	0.35
Cork	0.36	S. de Compostela	0.36
Djerba	0.36	Sofia	0.32
Egilsstadir	0.36	Swanwick	0.28
Gävle	0.57	Toulouse	0.37
Glasgow	0.32	Tromsoe	0.30
Golbasi	0.26	Trondheim	0.32
Kirkenes	0.52	Warsaw	0.45

Table 3: NPA Safety Index (maximum) at reference stations

The following figure provides the histogram for HSI (Horizontal Safety Index) accumulating measurements from the different EGNOS stations and for both operational GEOs over the whole period.

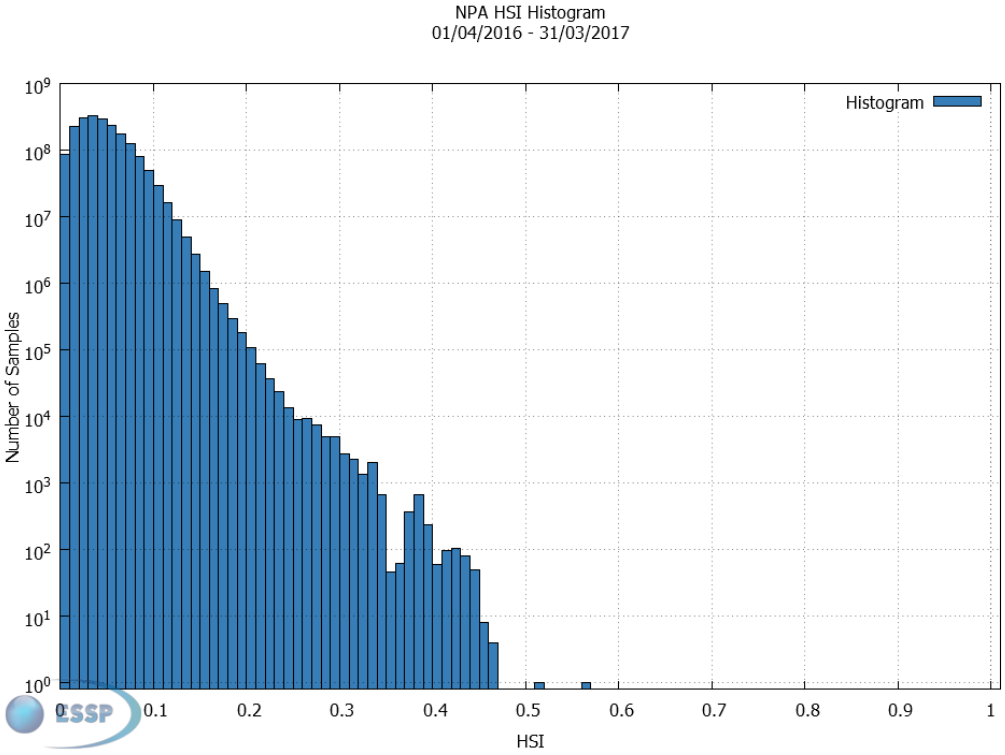


Figure 7: NPA Horizontal Safety Index

3.2.5 NPA Continuity

EGNOS NPA Continuity *is computed by dividing the total number of single continuity events, using a time-sliding window of 1 hour, by the number of samples with valid and available NPA navigation solution. A single continuity event occurs if the system is available at the start of the operation and, in at least one second within the following time-sliding window of 1 hour, the system becomes not available.*

The following figure shows the NPA Continuity Risk obtained for the GEO combined over the whole analysed period.

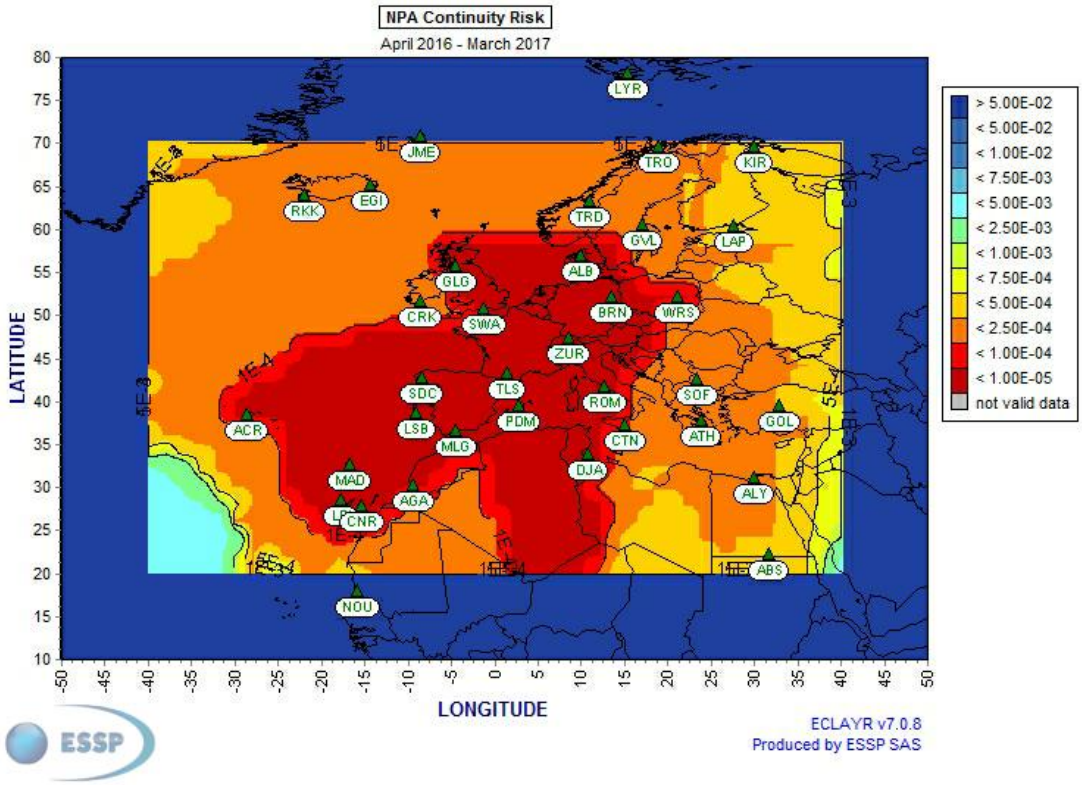


Figure 8: NPA Continuity Risk from 01/04/16 to 31/03/17

As shown in the figure above, most of the MT27 Service Area presents a continuity risk lower than $7.5 \cdot 10^{-4}$, with the exception of southwestern corner where the achieved performance is slightly worse mainly due to the low number of monitored satellites from these regions. It can be observed that the committed value was met in the central area of the MT27 Service Area.

3.3 SoL Service – APproach with Vertical guidance (APV-I)

The following figures depict the minimum performance that can be expected from EGNOS for Approach with Vertical guidance (APV-I) availability and continuity, as defined in the EGNOS SoL Service Definition Document (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds). These values correspond to the expected minimum performance measured by a fault-free receiver using all satellites in view, when averaging over a period of one month, using all the operational EGNOS GEOs.

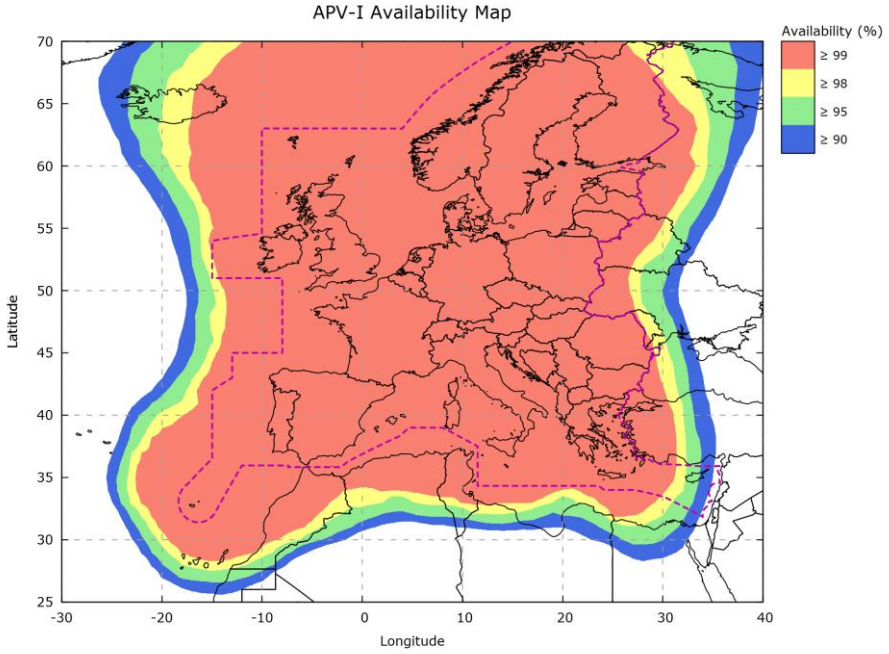


Figure 9: APV-I Availability map - Expected minimum performance

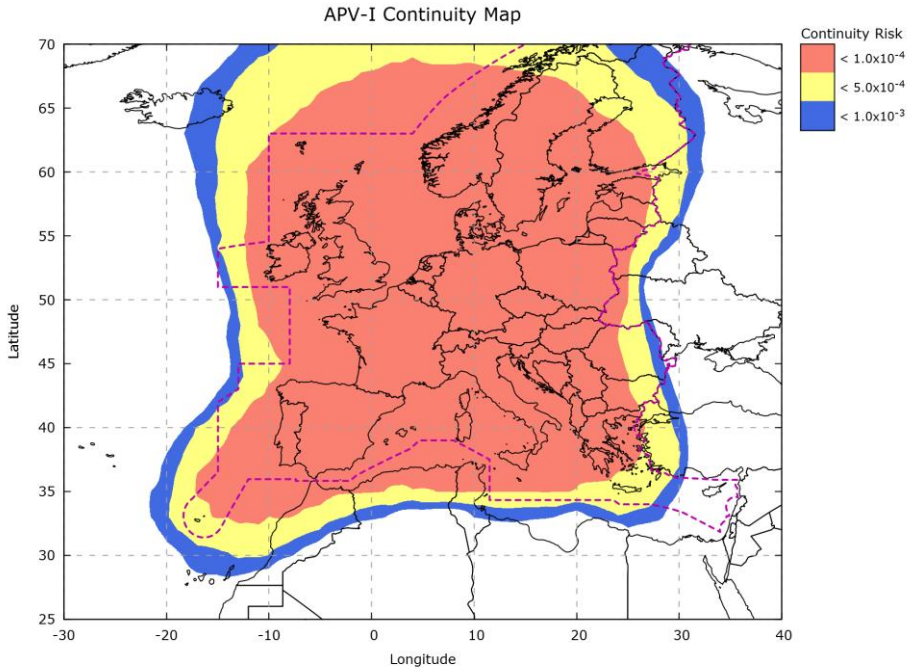


Figure 10: APV-I Continuity map - Expected minimum performance

Additionally, APV-I performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/monthly-performance-reports).

3.3.1 APV-I availability

EGNOS APV-I Availability *is defined as the percentage of epochs in the period in which the Protection Level (both HPL and VPL) is below Alert Limits for this APV-I service (HAL: 40m; VAL: 50m) over the total period.*

The following figure provides, for the combination of the operational GEOs, the GEO APV-I availability for the reported period:

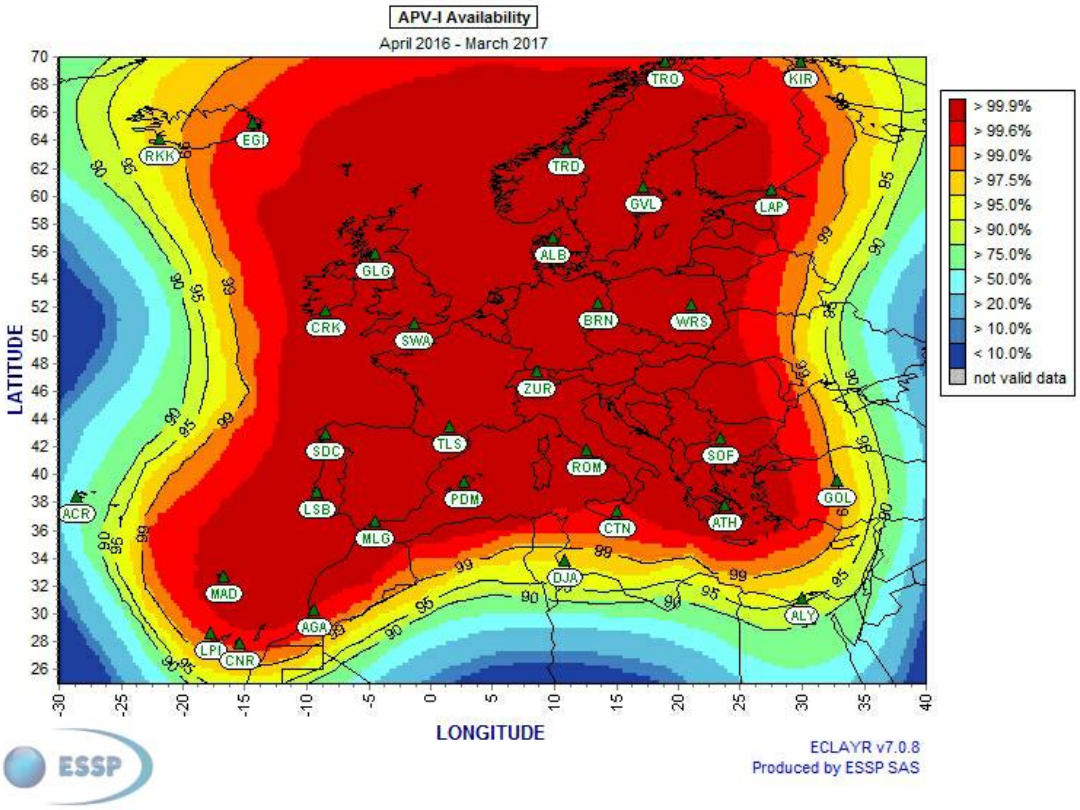


Figure 11: APV-I Availability from 01/04/16 to 31/03/17

The APV-I availability performance has been excellent during the reporting period, being greater than 99% over the entire Service Area with only minor deviations observed in the southern part.

3.3.2 APV-I availability – Achievement against target

The combination of the 99% APV-I Availability map and the Service Area gives the following:

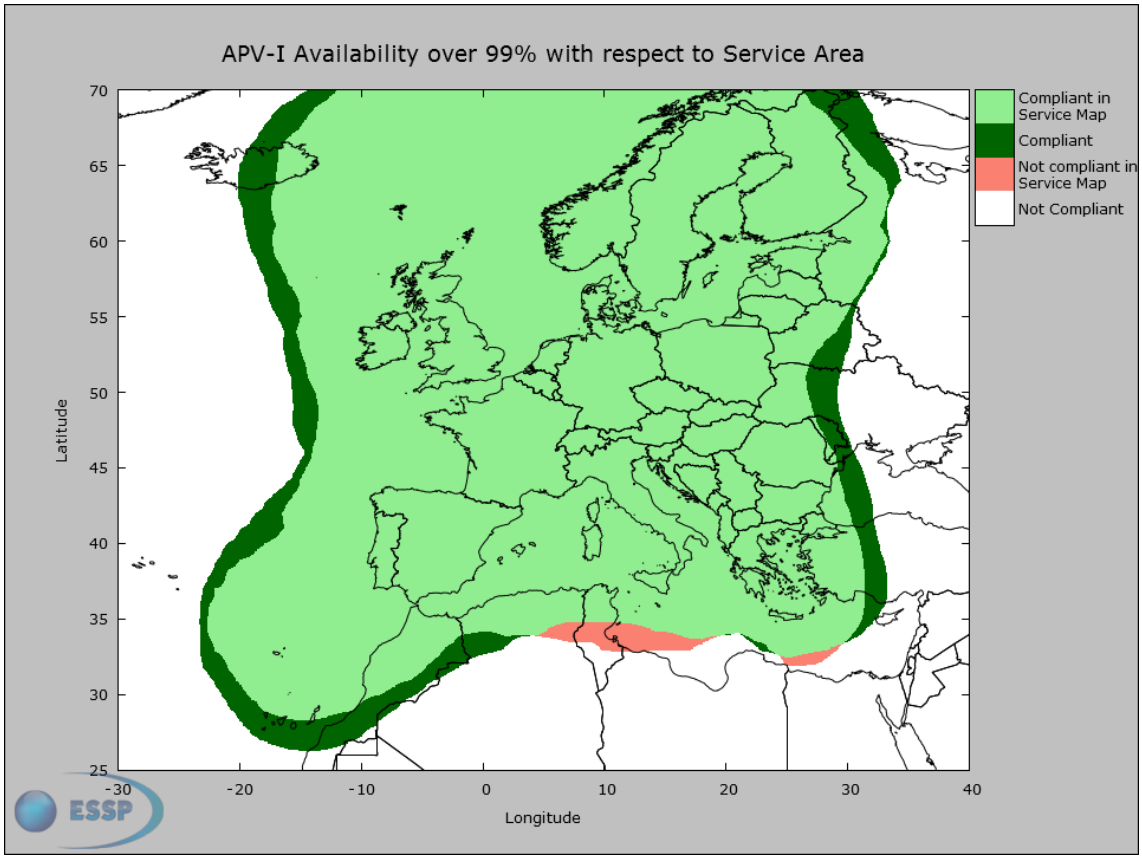


Figure 12: APV-I Availability map with respect to the Service Area - 01/04/16 to 31/03/17

In the picture, the legend is read as follows:

- **Compliant in Reference Map**: This is the part of the Service Area[2] where APV-I availability was above 99%.
- **Compliant**: This is the zone out of the Service Area[2] where APV-I availability was also above 99% (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map**: This is the part of the Service Area[2] where APV-I availability was lower than 99%.
- **Not compliant (white)**: This is any other zone out of the Service Area[2] where APV-I availability is lower than 99%.

The percentage of points which were compliant with the Service Area is **98.73%**. Just two regions in the South and Southeast have underperformance. The main reason for these deviations is the impact caused by the network issues observed at the Catania site and the failure of Djerba RIMS B observed between the end of June and the beginning of August.

[2] Service Area is the 99% APV-I availability area depicted in the EGNOS Safety of Life SDD (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds)

Note that the comparison with respect to the SDD SoL Service Area is included for information; the Service Area is a monthly reference, while the reported period is one year, so this comparison must be interpreted carefully.

3.3.3 APV-I availability – 99% daily compliance

The percentage of days over the reported period in which the daily APV-I availability was over 99% is shown in the figure below.

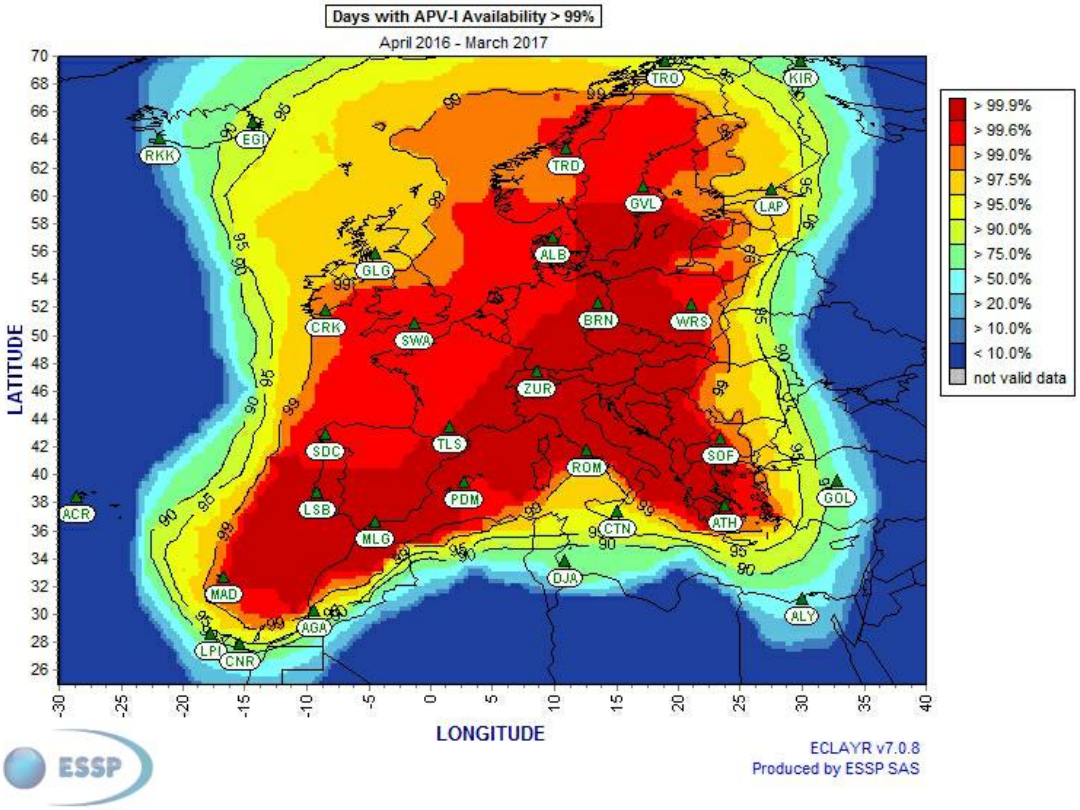


Figure 13: APV-I Availability – Days over 99% - 01/04/16 to 31/03/17

The figure above shows that the APV-I Availability was higher than 99%:

- 100% of the days in the 26.01% of the Service Area defined in the SDD v3.1[3].
- 99% of the days in the 58.16% of the Service Area defined in the SDD v3.1[3].
- 95% of the days in the 87.77% of the Service Area defined in the SDD v3.1[3].

[3] See https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds)

The figure below shows the APV-I availability compliance with respect to the target (yearly availability above 99%) at the airports with published EGNOS-based operations:

Figure 14: APV-I Availability compliance at airports with published EGNOS-based operations

Moreover, the monthly APV-I service availability was higher than 99% during the whole reporting period at all airports with EGNOS-based operations.

Airplane landing at Žilina airport (Slovak Republic). Photo credit: Jan Stehlik

3.3.4 APV-I Integrity events

EGNOS APV-I Integrity Event *is defined as an event in which the Navigation System Error is greater than or equal to the corresponding Protection Level for APV-I.*

No integrity events were detected.

Safety Index *is defined as the relation between Navigation System Error versus Protection Level (assuming PA algorithms to compute xNSE and xPL) for each second. If the ratio xPE/xPL is over 1, it indicates that a Misleading Information situation has occurred.*

Table 4 shows the maximum HSI and VSI at each RIMS inside of the APV-I Service Area (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds). Moreover, Stanford plots are available on the operations website (http://egnos-user-support.essp-sas.eu/egnos_ops/index.php).

Station	HSI	VSI	Station	HSI	VSI
Aalborg	0.25	0.25	Lisbon	0.25	0.27
Athens	0.31	0.33	Madeira	0.29	0.25
Berlin	0.28	0.26	Malaga	0.22	0.22
Canary Islands	0.29	0.20	Palma de Mallorca	0.32	0.43
Catania	0.24	0.22	Reykjavik	0.36	0.53
Cork	0.37	0.34	Rome	0.36	0.35
Djerba	0.21	0.26	S. de Compostela	0.37	0.38
Egilsstadir	0.37	0.37	Sofia	0.32	0.43
Gävle	0.59	0.50	Swanwick	0.28	0.36
Glasgow	0.33	0.28	Toulouse	0.38	0.33
Golbasi	0.24	0.27	Tromsoe	0.31	0.40
Kirkenes	0.57	0.32	Trondheim	0.33	0.40
Lappeenranta	0.31	0.27	Warsaw	0.46	0.37
La Palma	0.26	0.19	Zürich	0.23	0.29

Table 4: EGNOS APV-I Safety Index (maximum) at reference stations

The following figures provide the histogram for HSI (Horizontal Safety Index) and VSI (Vertical Safety Index) for each second when gathering measurements from the different EGNOS stations and for both operational GEOs over the reported period.

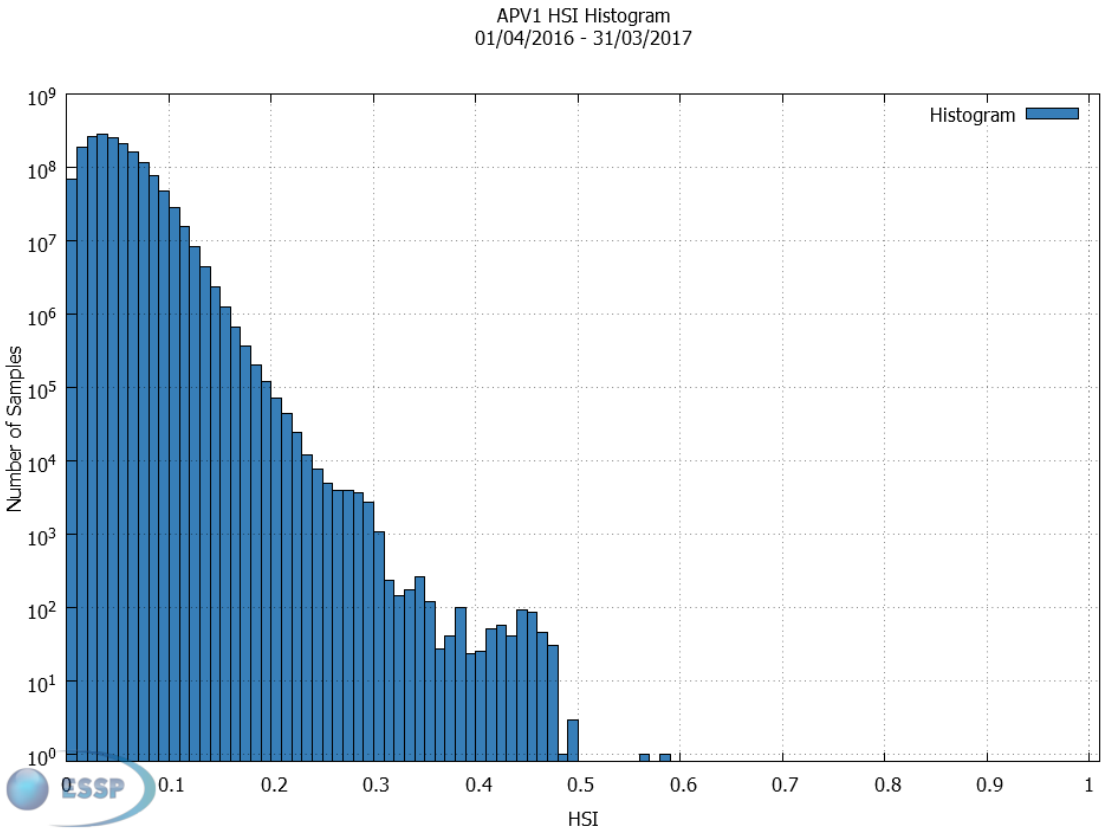


Figure 15: EGNOS APV-I Horizontal Safety Index

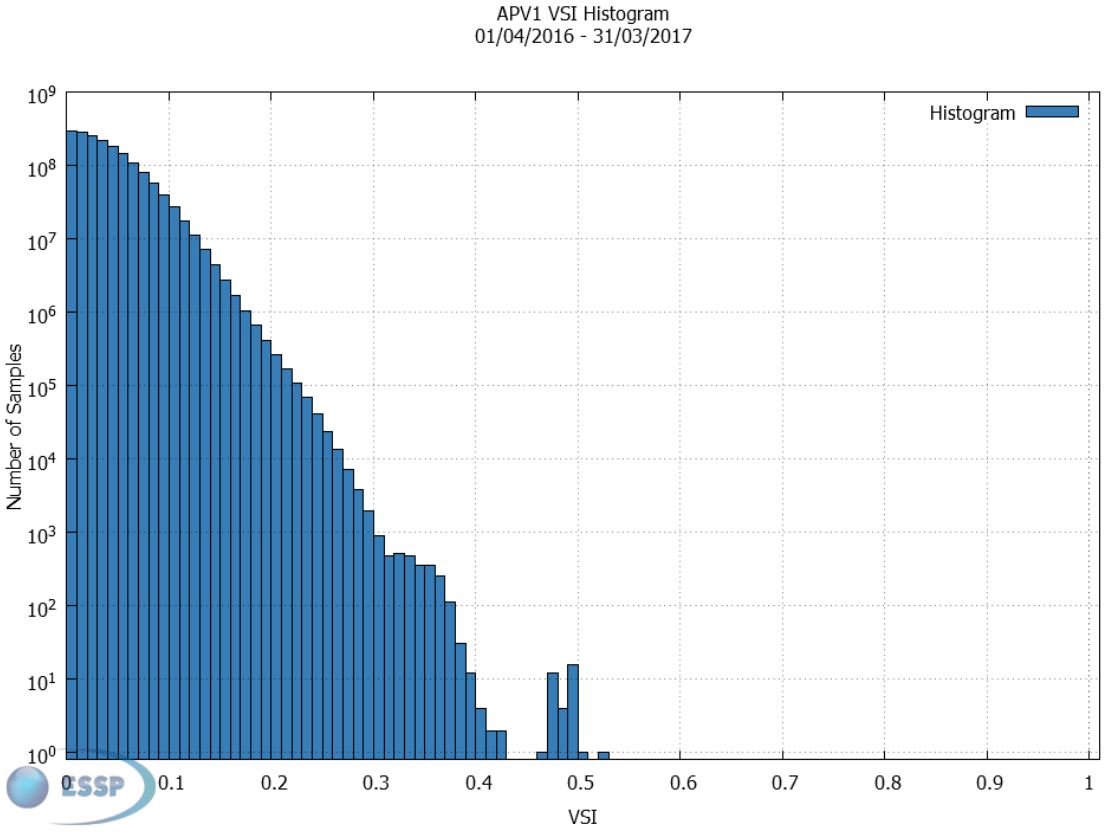


Figure 16: EGNOS APV-I Vertical Safety Index

3.3.5 APV-I Continuity risk

EGNOS APV-I Continuity Risk *is defined as the result of dividing the total number of single continuity events, using a time-sliding window of 15 seconds, by the number of samples with valid and available APV-I navigation solution.* A *single continuity break occurs if the system is available at the start of the operation and becomes unavailable during one of the following 15 seconds.*

The figure below provides the GEO combined APV-I continuity risk for the reported period:

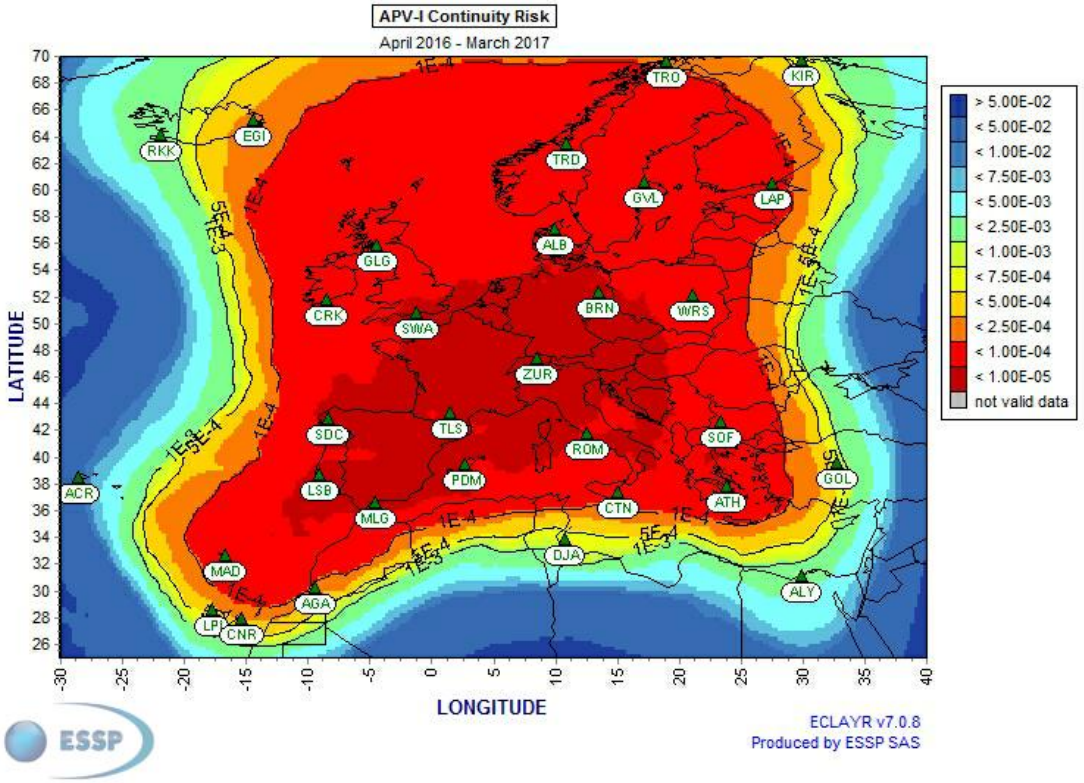


Figure 17: APV-I Continuity Risk from 01/04/16 to 31/03/17

3.3.6 APV-I Continuity – Achievement against target

The combination of the 5.10^{-4} APV-I Continuity Risk map and the Service Area gives the following:

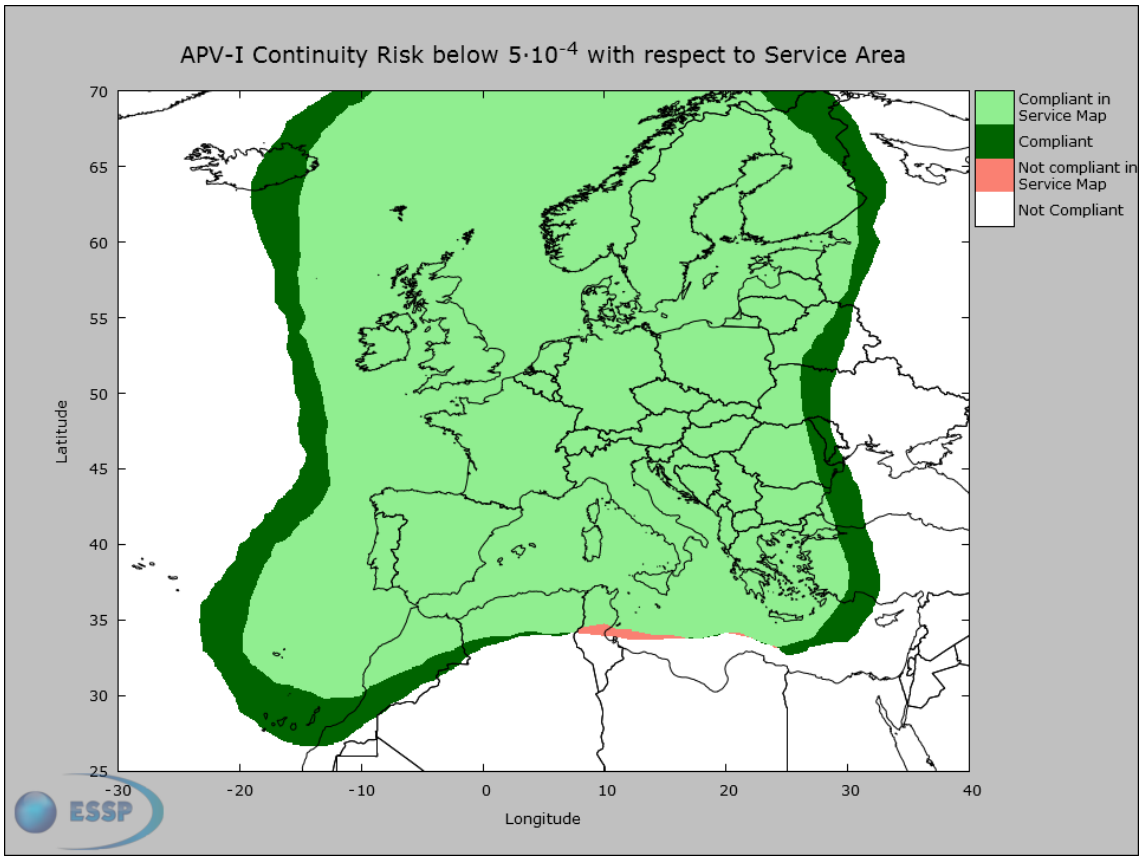


Figure 18: APV-I Continuity Risk ($5{\cdot}10^{-4}$) map with respect to the Service Area - 01/04/16 to 31/03/17

In the picture, the legend is read as follows:

- **Compliant in Reference Map**: This is the part of the Service Area[4] where APV-I continuity was above $5{\cdot}10^{-4}$.
- **Compliant**: This is the zone out of the Service Area[4] where APV-I continuity was also above $5{\cdot}10^{-4}$ (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map**: This is the part of the Service Area[4] where APV-I continuity was lower than $5{\cdot}10^{-4}$.
- **Not compliant (white)**: This is any other zone out of the Service Area[4] where APV-I continuity is lower than $5{\cdot}10^{-4}$.

Considering the SDD v3.1 map used as the reference, the percentage of points which were compliant with the Service Area (5.10^{-4}/15sec) is **99.63%**. Note that the comparison with respect to the SDD SoL Service Area is included for information; the Service Area is a monthly reference, while the reported period is one year, so this comparison must be interpreted carefully.

[4] Service Area is the $5{\cdot}10^{-4}$ APV-I continuity risk area depicted in the EGNOS Safety of Life SDD (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds)

For information, the differences with respect to the Service Area corresponding to a continuity risk of 10^{-3} and 10^{-4} are included below. For both levels, the results obtained, as for the 5.10^{-4} case, are quite good (100% for continuity risk of 10^{-3} and 98.22% for continuity risk of 10^{-4}).

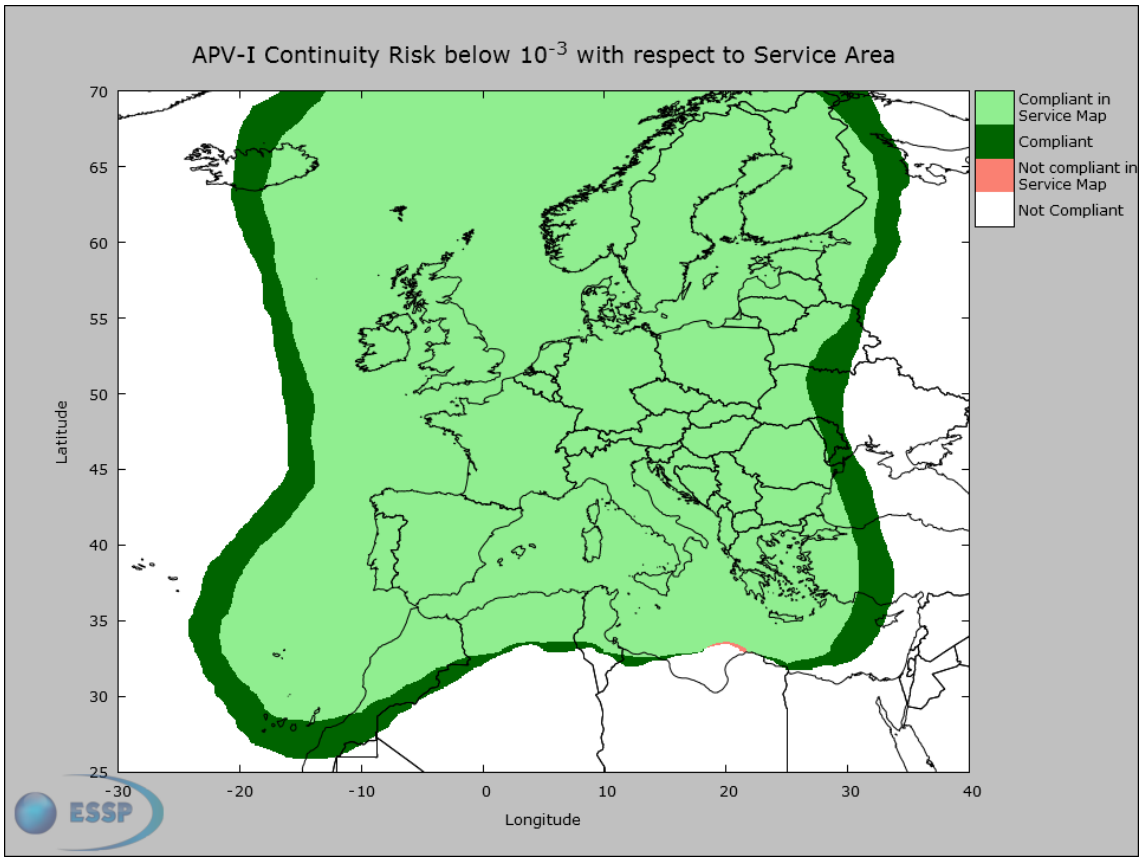


Figure 19: APV-I Continuity Risk ($1 \cdot 10^{-3}$) map with respect to the Service Area - 01/04/16 to 31/03/17

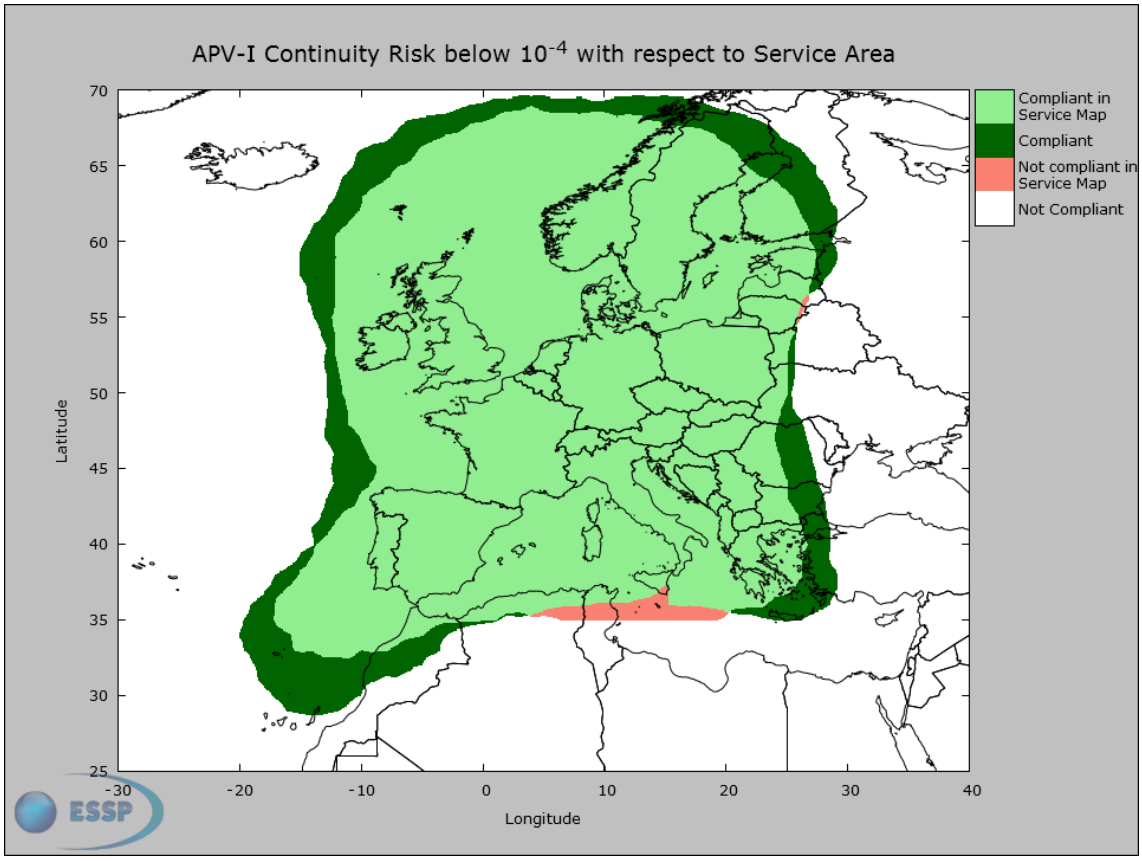


Figure 20: APV-I Continuity Risk ($1 \cdot 10^{-4}$) map with respect to the Service Area - 01/04/16 to 31/03/17

In the picture, the legend is read as explained for Figure 18, but applying the corresponding commitment level ($1 \cdot 10^{-3}$ or $1 \cdot 10^{-4}$).

3.4 SoL Service – EGNOS Localizer Performance with Vertical guidance to a decision altitude of 200 FT (LPV-200)

The following figures depict the minimum performance that can be expected from EGNOS for LPV-200 availability and continuity, as defined in the EGNOS SoL Service Definition Document (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds).

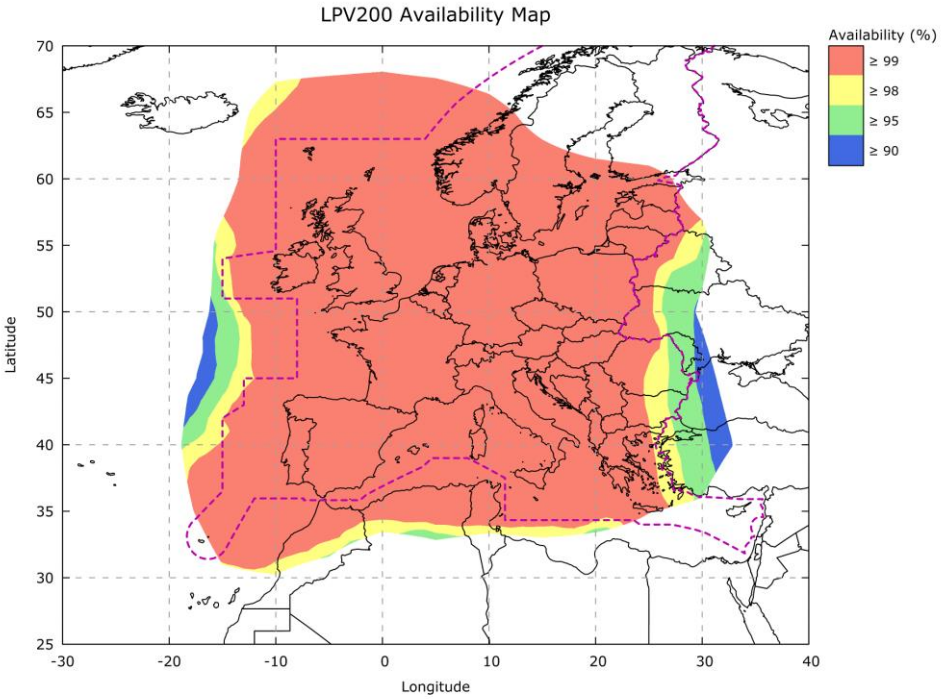


Figure 21: LPV-200 Availability map - Expected minimum performance

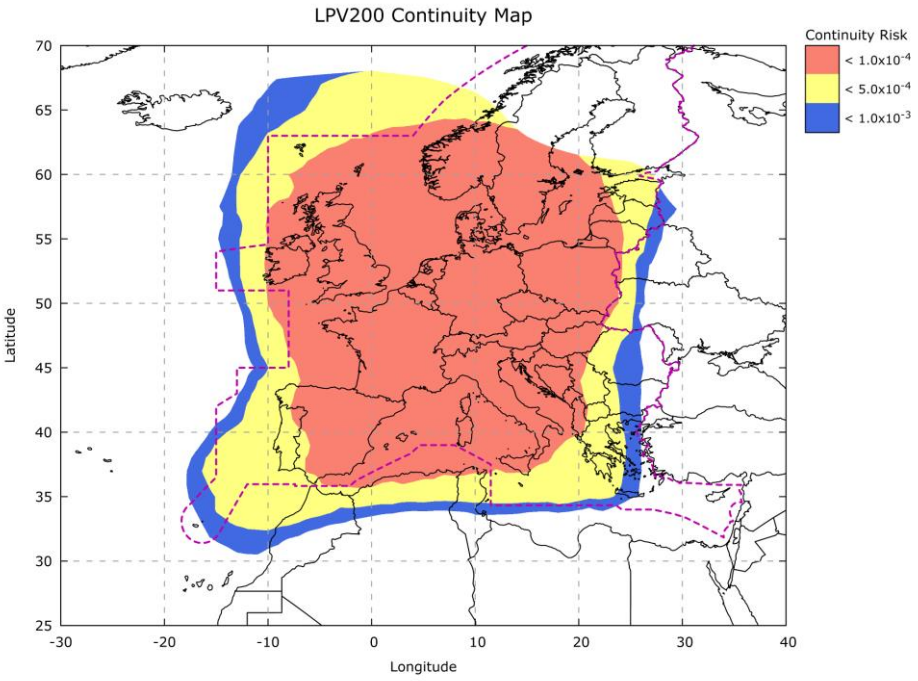


Figure 22: LPV-200 Continuity map - Expected minimum performance

These values correspond to the expected average performance measured by a fault-free receiver using all GPS satellites in view over a period of one month, using all the operational EGNOS GEOs.

Additionally, LPV-200 performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/monthly-performance-reports).

3.4.1 LPV-200 availability

EGNOS LPV-200 Availability *is defined as the percentage of epochs in the period in which the Protection Level (both HPL and VPL) is below Alert Limits for this LPV-200 service (HAL: 40m; VAL: 35m) over the total period.*

The figure below provides, for the combination of the operational GEOs, the LPV-200 availability for the period from April 2016 to March 2017:

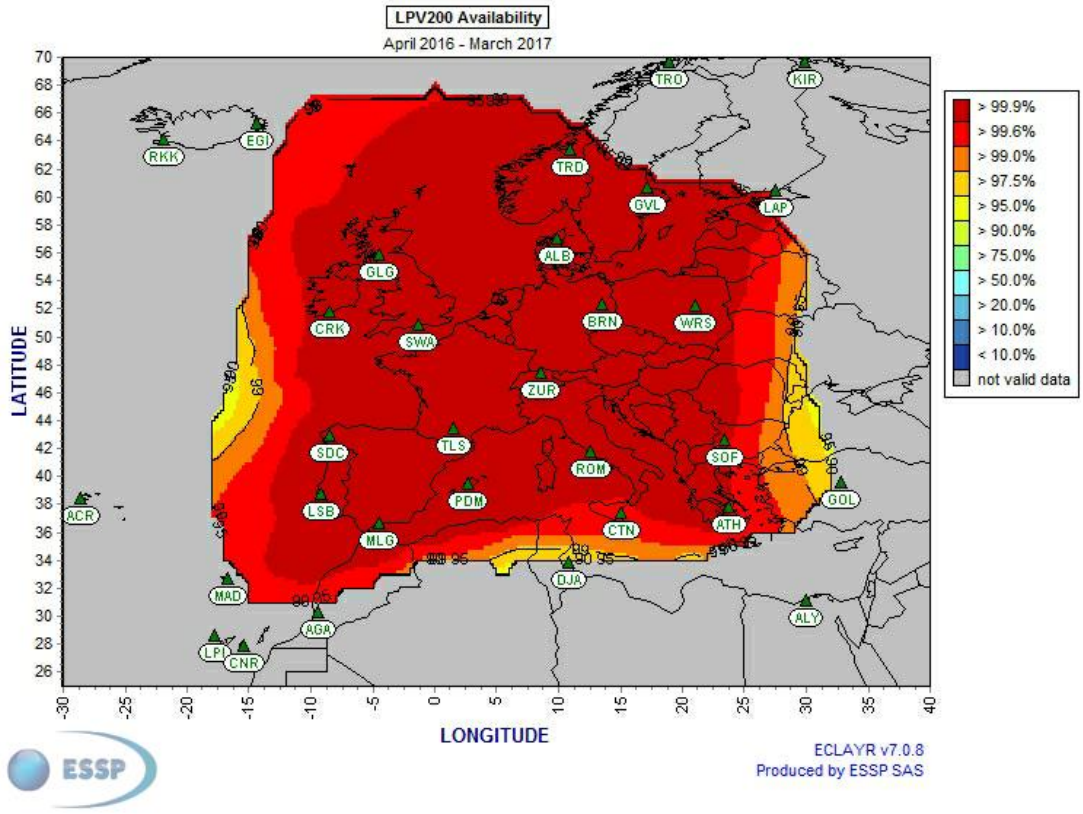


Figure 23: LPV-200 Availability from 01/04/16 to 31/03/17

LPV-200 availability performance over the Service Area has been excellent during the reporting period, greater than 99% over the entire Service Area except for a small region around Tunisia.

3.4.2 LPV-200 availability – Achievement against target

The combination of the 99% LPV-200 Availability map and the Service Area gives the following:

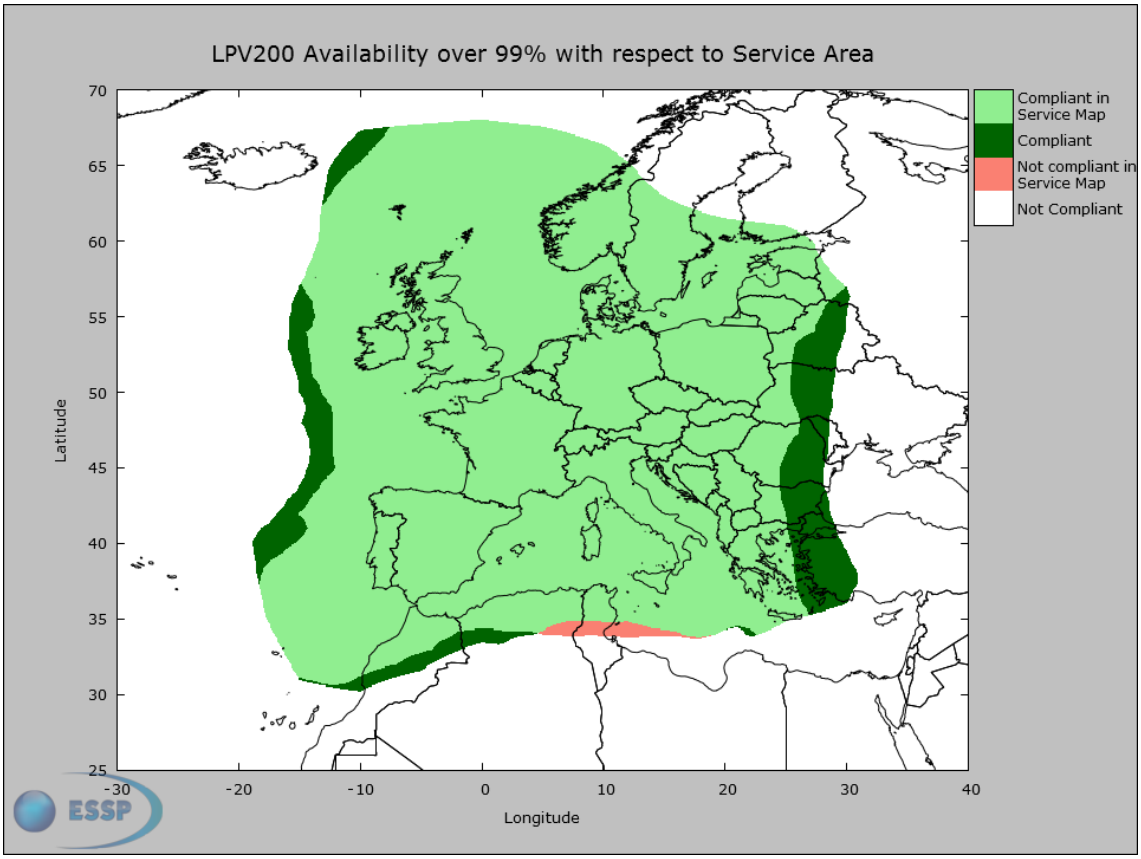


Figure 24: LPV-200 Availability map with respect to the Service Area - 01/04/16 to 31/03/17

In the picture, the legend is read as follows:

- **Compliant in Reference Map**: This is the part of the Service Area[5] where LPV-200 availability was above 99%.
- **Compliant**: This is the zone out of the Service Area[5] where LPV-200 availability was also above 99% (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map**: This is the part of the Service Area[5] where LPV-200 availability was lower than 99%.
- **Not compliant (white)**: This is any other zone out of the Service Area[5] where LPV-200 availability is lower than 99%.

Considering the applicable Service Definition Document (SDD) map as the reference (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds), the percentage of points which were compliant with the Service Area is **99.07%**. As for APV-I, only a small region in the South deviates from the SDD commitment.

[5] Service Area is the 99% LPV-200 availability area depicted in the EGNOS Safety of Life SDD (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds)

Note that the comparison with respect to SDD SoL Service Area is included for information; the Service Area is a monthly reference, while the reported period is one year, so this comparison must be interpreted carefully.

3.4.3 LPV-200 availability – 99% daily compliance

The percentage of days over the reported period in which the daily LPV-200 availability was over 99% is shown in the figure below.

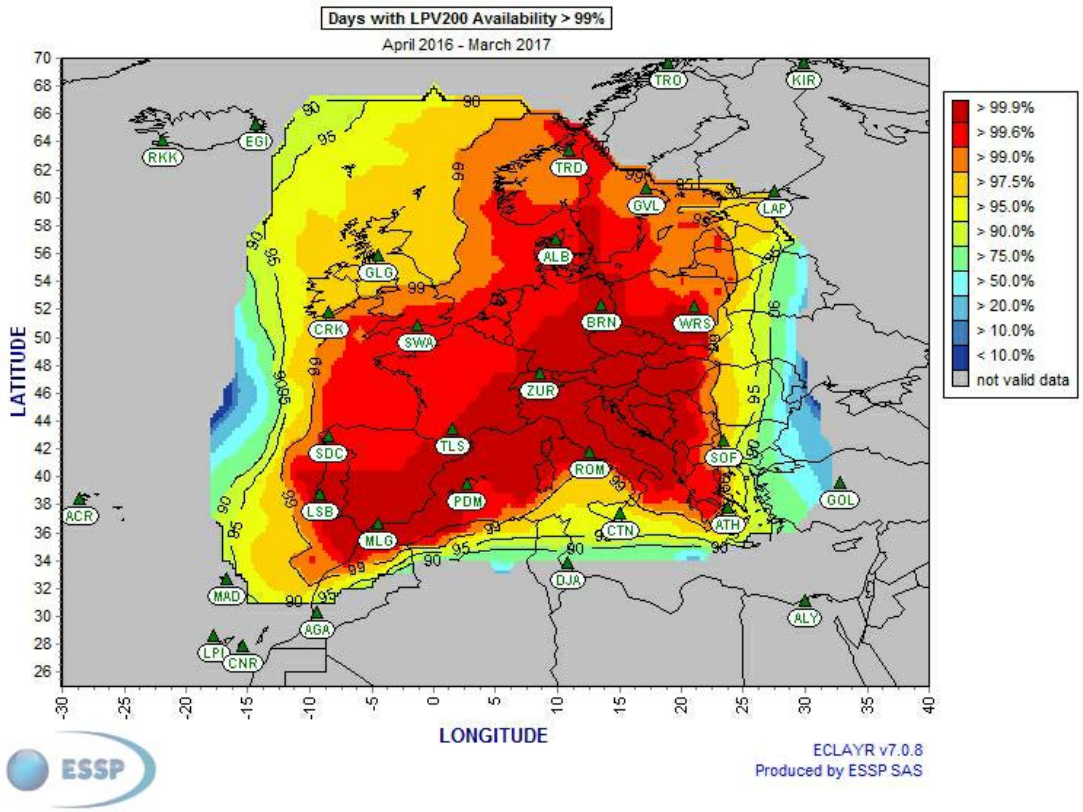


Figure 25: LPV-200 Availability – Days over 99% - 01/04/16 to 31/03/17

From the previous figure, it can be obtained that the LPV-200 Availability was higher than 99%:

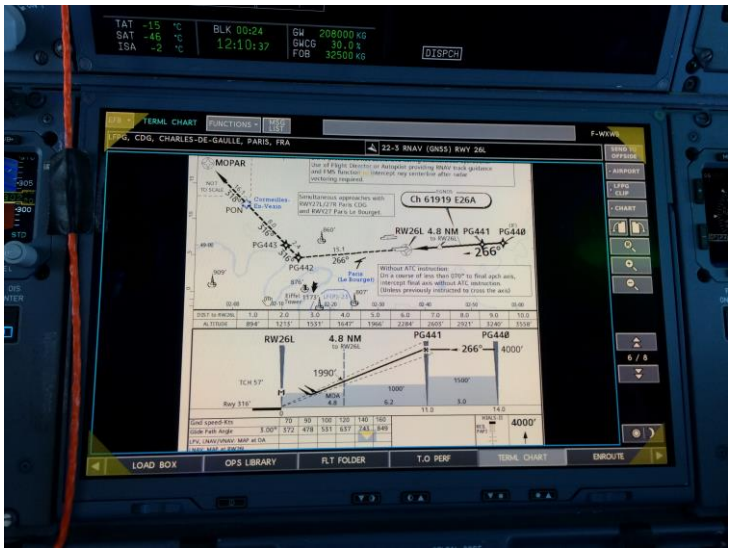
- 100% of the days in the 24.38% of the Service Area defined in the SDD v3.1[6].
- 99% of the days in the 60.37% of the Service Area defined in the SDD v3.1[6].
- 95% of the days in the 93.27% of the Service Area defined in the SDD v3.1[6].

[6] See https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds

The figure below shows the LPV-200 availability compliance (yearly availability above 99%) with respect to the target at the airports with published EGNOS-based operations:

Figure 26: LPV-200 Availability compliance at airports with published EGNOS-based operations

Moreover, the monthly LPV-200 service availability was higher than 99% during the whole reporting period at all airports with EGNOS-based operations.



RNAV GNSS (LPV-200 based) approach chart for Paris-Charles de Gaulle airport

3.4.4 LPV-200 Integrity events

EGNOS LPV-200 Integrity Event *is defined as an event in which the Navigation System Error is greater than or equal to the corresponding Protection Level for LPV-200.*

No integrity events were detected.

Safety Index *is defined as the relation between Navigation System Error versus Protection Level (assuming PA algorithms to compute xNSE and xPL) for each second. If the ratio xPE/xPL is over 1, it indicates that a Misleading Information situation has occurred.*

Table 5 shows the maximum HSI and VSI at each RIMS inside of the LPV-200 Service Area (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds). Moreover, Stanford plots are available on the operations website (http://egnos-user-support.essp-sas.eu/egnos_ops/index.php).

Station	HSI	VSI
Aalborg	0.23	0.24
Athens	0.27	0.23
Berlin	0.22	0.26
Catania	0.24	0.22
Cork	0.22	0.29
Djerba	0.21	0.24
Gävle	0.23	0.25
Glasgow	0.21	0.27
Lisbon	0.24	0.27
Malaga	0.21	0.22
Palma de Mallorca	0.32	0.41
Rome	0.20	0.22
S. de Compostela	0.23	0.31
Sofia	0.32	0.43
Swanwick	0.27	0.29
Toulouse	0.20	0.21
Trondheim	0.33	0.39
Warsaw	0.23	0.23
Zürich	0.22	0.29

Table 5: EGNOS LPV-200 Safety Index (maximum) at reference stations

The following figures provide the histogram for HSI (Horizontal Safety Index) and VSI (Vertical Safety Index) for each second when collecting measurements from the different EGNOS stations and for both operational GEOs over the reported period.

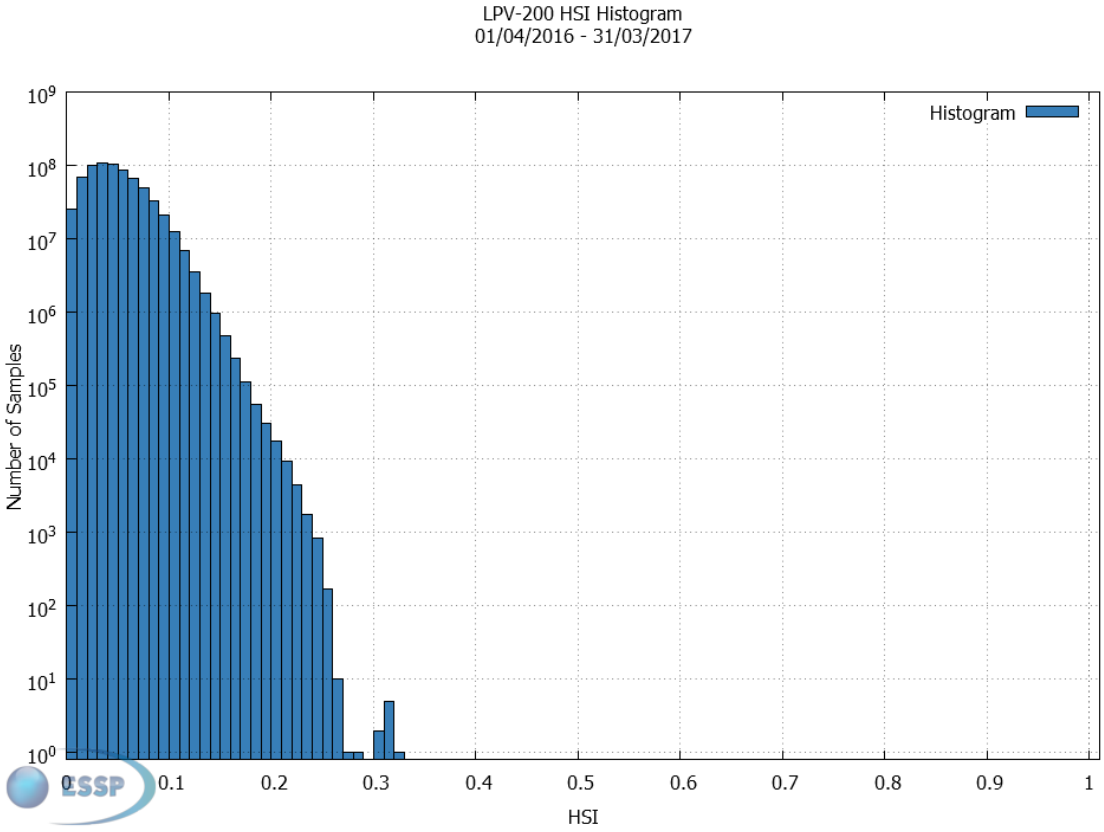


Figure 27: EGNOS LPV-200 Horizontal Safety Index

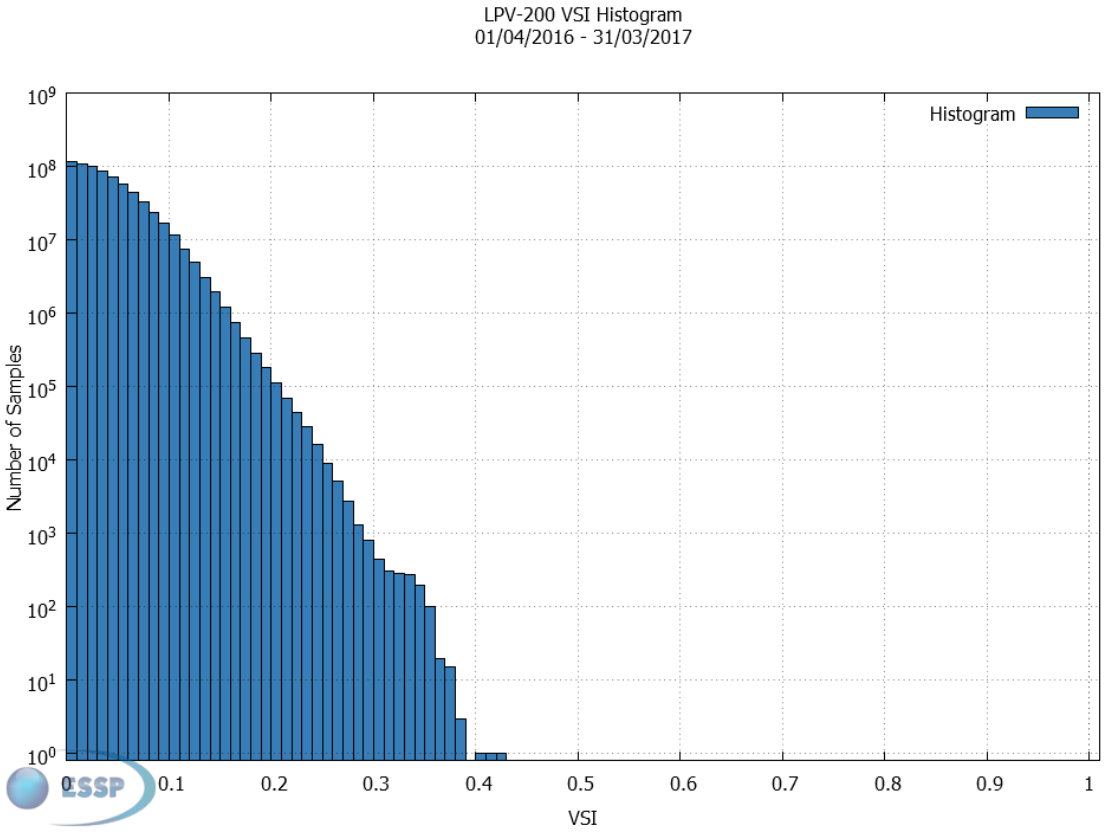


Figure 28: EGNOS LPV-200 Vertical Safety Index

3.4.5 LPV-200 Continuity risk

EGNOS LPV-200 Continuity Risk *is defined as the result of dividing the total number of single continuity events, using a time-sliding window of 15 seconds by the number of samples with valid and available LPV-200 navigation solution. A single continuity event occurs if the system is available at the start of the operation and becomes unavailable in at least one of the following 15 seconds.*

The following figure provides the GEO combined LPV-200 continuity risk for the reported period:

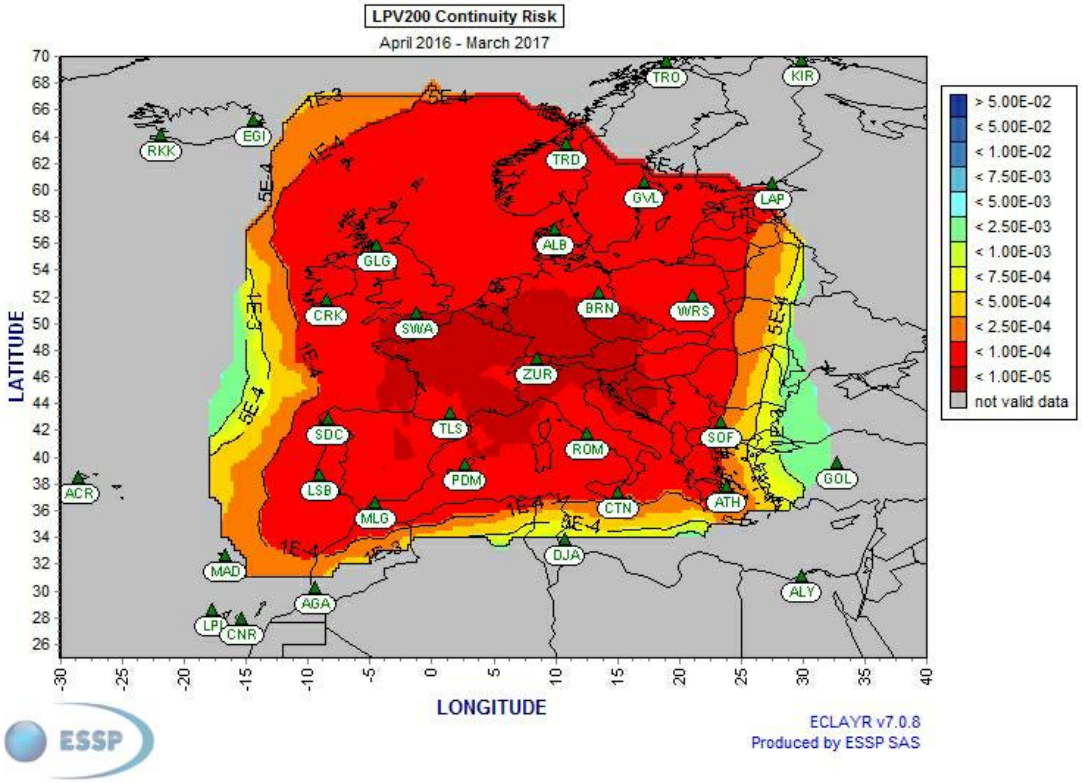


Figure 29: LPV-200 Continuity Risk from 01/04/16 to 31/03/17

3.4.6 LPV-200 Continuity – Achievement against target

The combination of the 5.10^{-4} LPV-200 Continuity Risk map and the Service Area gives the following:

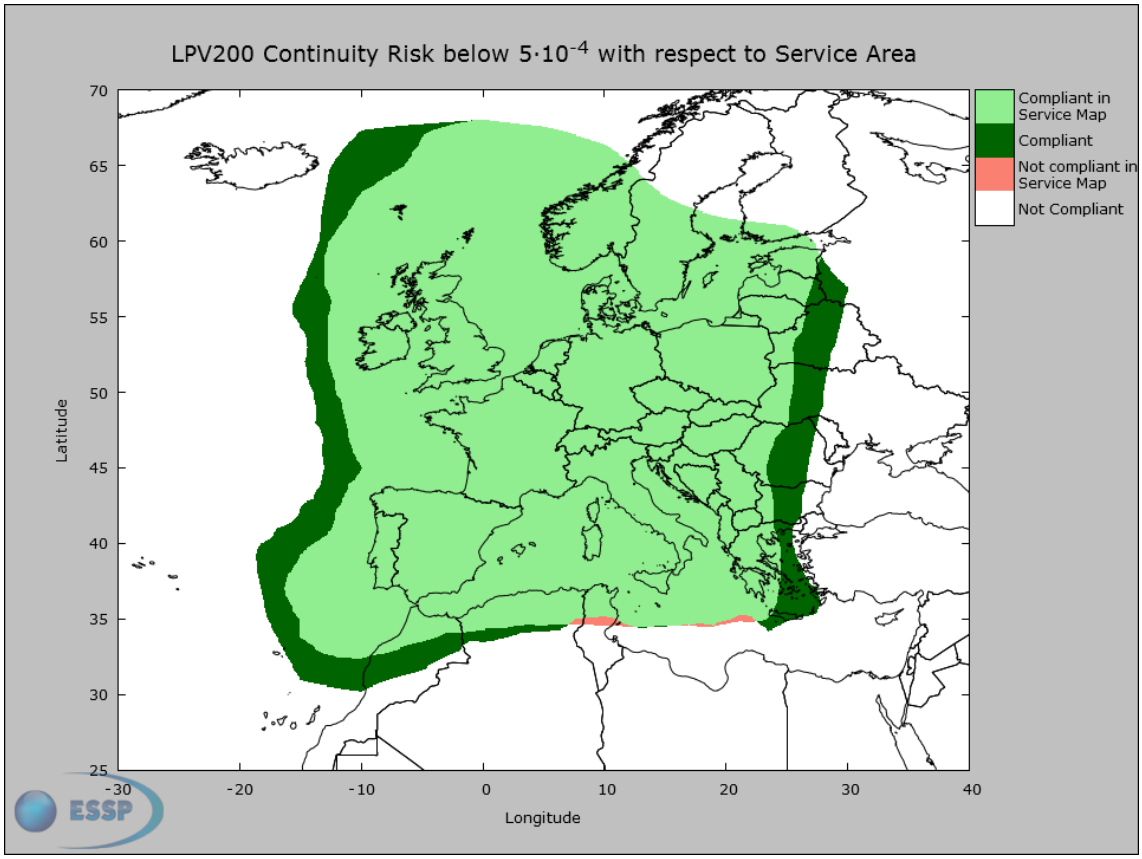


Figure 30: LPV-200 Continuity Risk ($5{\cdot}10^{-4}$) map with respect to the Service Area - 01/04/16 to 31/03/17

In the picture, the legend is read as follows:

- **Compliant in Reference Map**: This is the part of the Service Area[7] where LPV-200 continuity was above $5{\cdot}10^{-4}$.
- **Compliant**: This is the zone out of the Service Area[7] where LPV-200 continuity was also above $5{\cdot}10^{-4}$ (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map**: This is the part of the Service Area[7] where LPV-200 continuity was lower than $5{\cdot}10^{-4}$.
- **Not compliant (white)**: This is any other zone out of the Service Area[7] where LPV-200 continuity is lower than $5{\cdot}10^{-4}$.

Considering the SDD v3.1 map used as the reference, the percentage of points which were compliant with the Service Area (5.10^{-4}/15sec) is **99.49%**. Note that the comparison with respect to the SDD SoL Service Area is included for information; the Service Area is a monthly reference while the reported period is one year, so this comparison must be interpreted carefully.

[7] Service Area is the $5{\cdot}10^{-4}$ LPV-200 continuity risk area depicted in the EGNOS Safety of Life SDD (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds)

For information, the differences with respect to the Service Area corresponding to a continuity risk of 10^{-3} and 10^{-4} are included below. For both levels, the results obtained, as for the 5.10^{-4} case, are quite good (99.85% for continuity risk of 10^{-3} and 100% for continuity risk of 10^{-4}).

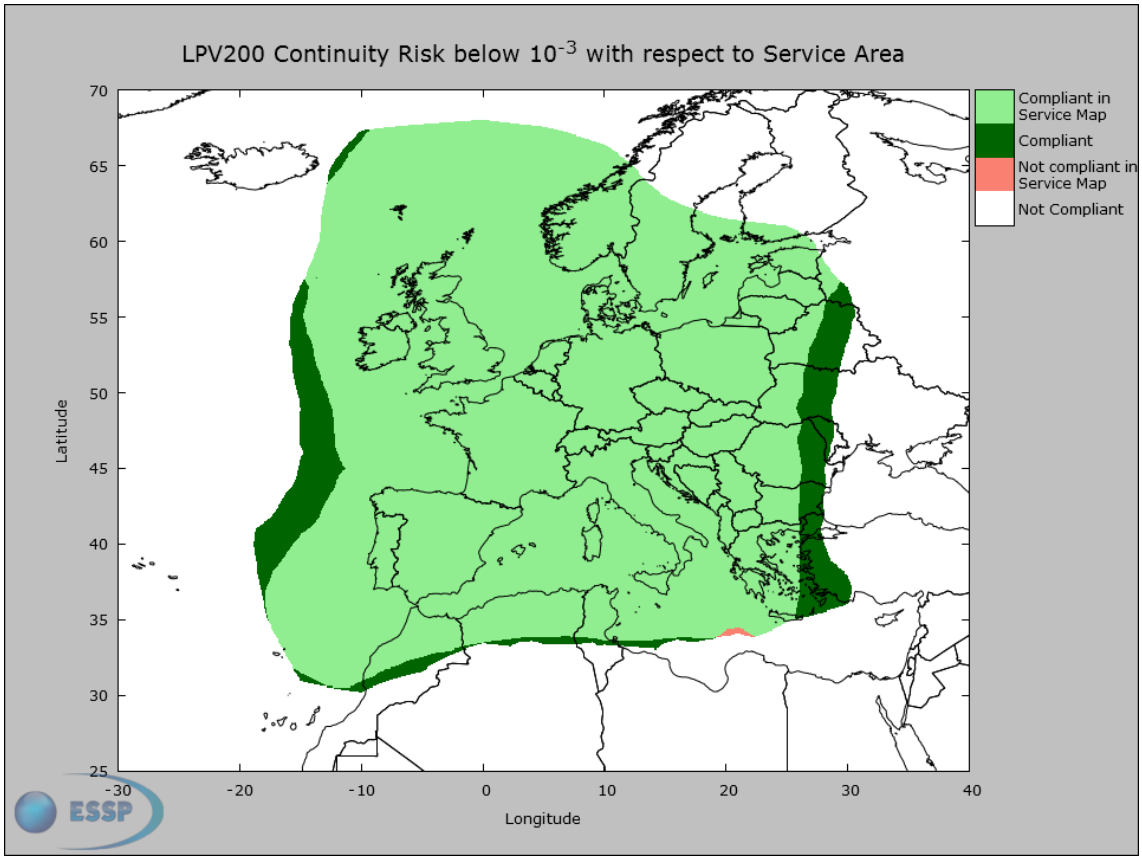


Figure 31: LPV-200 Continuity Risk ($1 \cdot 10^{-3}$) map with respect to the Service Area - 01/04/16 to 31/03/17

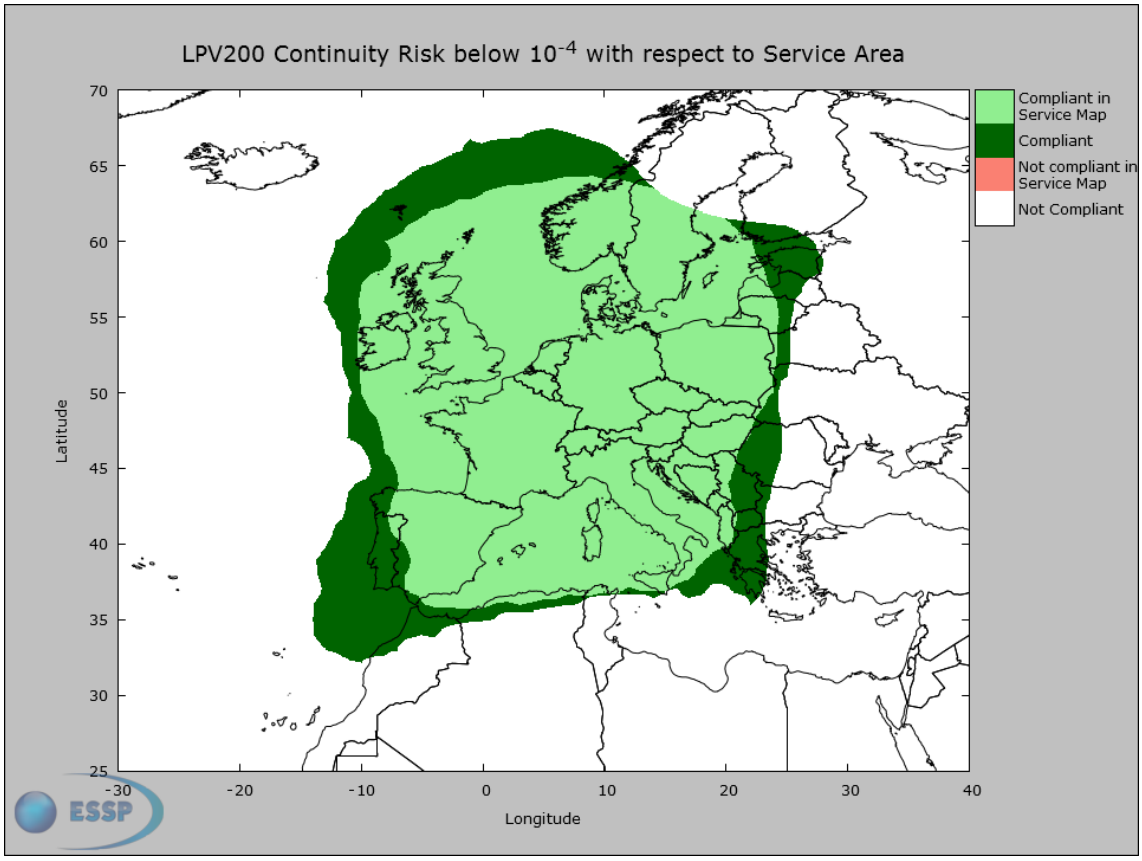


Figure 32: LPV-200 Continuity Risk ($1 \cdot 10^{-3}$) map with respect to the Service Area - 01/04/16 to 31/03/17

In the picture, the legend is read as explained for Figure 30, but applying the corresponding commitment level ($1 \cdot 10^{-3}$ or $1 \cdot 10^{-4}$).

3.4.7 EGNOS LPV-200 vertical accuracy

When compared to APV-I, LPV-200 is based on more stringent performance requirements such as Vertical Navigation System Error (VNSE) of 4 m (95%), and Vertical Alert Limit (VAL) of 35 m. In addition, specific requirements are defined regarding the probability that the VNSE exceeds 10 m in nominal system operation conditions, set to 10^{-7}/per approach, or 15 m in degraded system operation conditions, defined as 10^{-5}/per approach.

Whenever the instantaneous VNSE exceeds 10 m, in nominal conditions, or 15 m under degraded scenarios, it is said that an Accuracy Major Event (AME) occurs.

The following figures show the histogram and cumulative distribution function of VNSE, which are computed at the RIMS stations inside the LPV-200 commitment region for each second over the entire period.

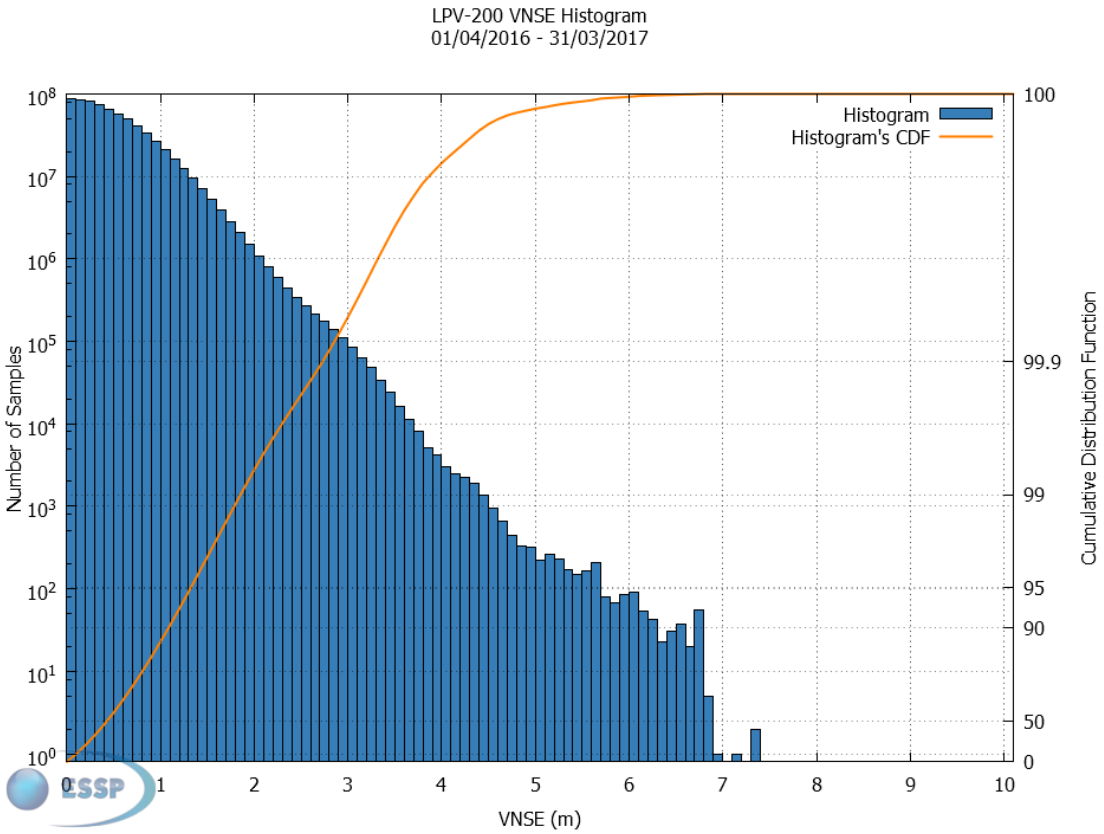


Figure 33: EGNOS LPV-200 Vertical Accuracy Histogram and Cumulative Probability

As shown, the cumulated results confirm that the vertical accuracy remained below 10 meters during the analysed period. In other words, no AME took place during the period analysed. The 95th percentile is below 1.4 metres. The worst accuracy measured in any of the stations is lower than 7.5 metres.

3.4.8 EGNOS LPV-200 accuracy extrapolated at 10^{-7}/150s

This section presents the results of extrapolating the accuracy results for every station to 10^{-7}/150 sec. This extrapolation enables the characterisation of the accuracy distribution tails by means of a Gaussian extrapolation applied to the vertical navigation error.

The following results present the values obtained from 1 January 2016 to 31 December 2016, using values obtained from both operational GEOs. For this period, all the RIMS within the LPV-200 service area (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds) present extrapolated accuracy values within the requirement: Pr(VNSE>10 m) < 10^{-7}/150s.

For the analysed period, the accuracy tail extrapolated[8] at 10^{-7}/150s values for the RIMS within the LPV-200 commitment are:

RIMS	Extrapolated VNSE at 10^{-7}/150s (m)
Aalborg	5.69
Berlin	5.56
Catania	4.92
Cork	6.91
Warsaw	6.96
Djerba	4.92
Glasgow	7.49
Lisbon	5.81
Swanwick	5.38
Malaga	5.47
Palma de Mallorca	4.39
Rome	4.92
Santiago de Compostela	6.64
Sofia	7.66
Gavle	5.75
Toulouse	4.81
Trondheim	6.02
Zürich	6.06
Athens	7.00

Table 6: Extrapolated VNSE at 10^{-7}/150s in the RIMS within the LPV-200 commitment

The highest value is 7.66 m obtained for RIMS Sofia.

[8] In order to extrapolate the VNSE, the most conservative Cumulative Distribution Function (CDF) amongst the ones overbounding the distribution of the measured vertical error samples (histogram) is computed. Then, the X value that fulfils Pr(VNSE > X) = 10^{-7}/150s is obtained.

The maps below show this information from a geographical point of view:

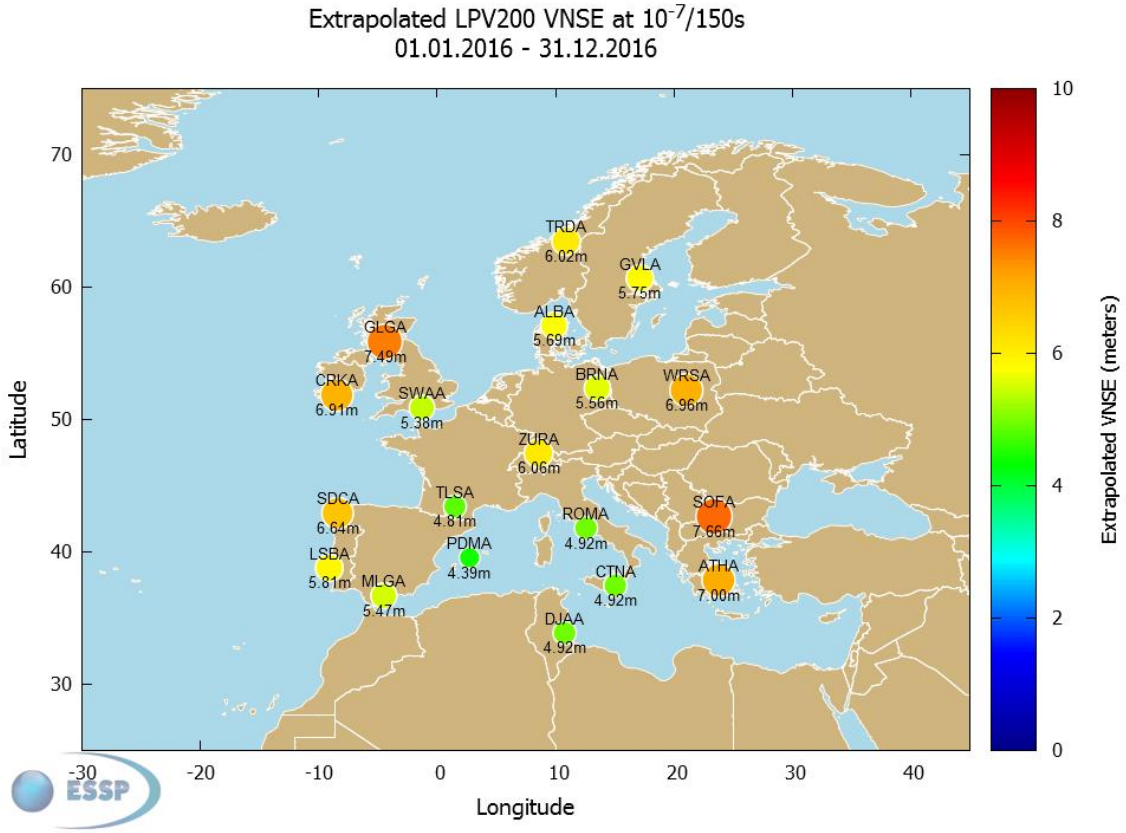


Figure 34: Extrapolated VNSE at 10^{-7}/150s in the RIMS within the LPV-200 commitment

3.5 Open Service (OS)

The EGNOS OS has been qualified by defining the minimum compliance area where 99% of the time the user is able to calculate its position and the accuracy performance is better than 3 metres horizontally and 4 metres vertically. This minimum compliance area has been obtained by using the 29 reference stations currently included in the EGNOS network and can be seen in the following figure:

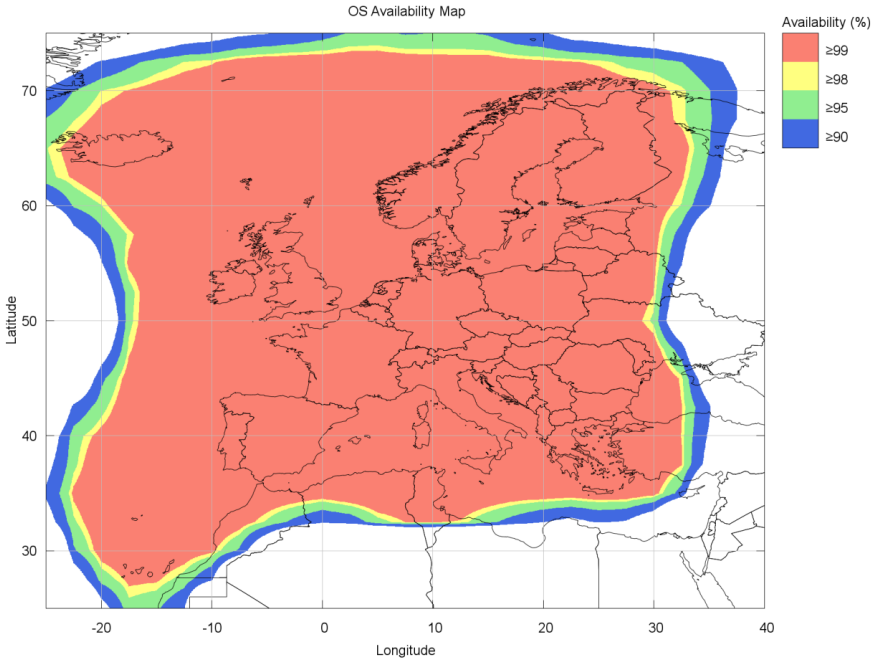


Figure 35: EGNOS OS compliance area

Further details can be found in the EGNOS OS Service Definition Document (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds). Additionally, OS performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website (https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/monthly-performance-reports).

3.5.1 RIMS monitoring network

The following map shows the location of the deployed RIMS:

Figure 36: RIMS locations[9]

The receiver network used to report Open Service corresponds to the subset of RIMS which are inside the OS SDD (see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds) commitment map.

[9]: EGNOS SDDs (OS, SoL, EDAS). See https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds

ID	Location name	Country	ID	Location name	Country
ALB	Alborg	Denmark	LSB	Lisbon	Portugal
ATH	Athens	Greece	MAD	Madeira	Portugal
BRN	Berlin	Germany	MLG	Malaga	Spain
CNR	Canary Islands	Spain	PDM	Palma de Mallorca	Spain
CRK	Cork	Ireland	RKK	Reykjavik	Iceland
CTN	Catania	Italy	ROM	Rome	Italy
DJA	Djerba	Tunisia	SDC	S. de Compostela	Spain
EGI	Egilsstadir	Iceland	SOF	Sofia	Bulgaria
GLG	Glasgow	United Kingdom	SWA	Swanwick	United Kingdom
GOL	Golbasi	Turkey	TLS	Toulouse	France
GVL	Gävle	Sweden	TRD	Trondheim	Norway
JME	Jan Mayen	Norway	TRO	Tromsoe	Norway
KIR	Kirkenes	Norway	WRS	Warsaw	Poland
LAP	Lappeenranta	Finland	ZUR	Zürich	Switzerland
LPI	La Palma	Spain			

Table 7: List of RIMS sites where performances are reported

EGNOS used for maintenance of arboreal parks in Madrid

3.5.2 Horizontal and Vertical Accuracy

EGNOS OS Horizontal (resp Vertical) Accuracy *is reported as the 95th percentile of the Horizontal (resp Vertical) Navigation System Error (HNSE/VNSE) over the period, at the monitored sites when applying EGNOS messages.*

The table below provides the values of accuracy (95%) in metres measured for the reported period.

Station	HNSE 95% (metres)	VNSE 95% (metres)	Station	HNSE 95% (metres)	VNSE 95% (metres)
Aalborg	0.8	1.5	Lisbon	0.9	1.4
Athens	0.8	1.2	Madeira	0.8	1.2
Berlin	0.9	1.2	Malaga	0.8	1.1
Canary Islands	1.2	1.4	Palma de Mallorca	0.7	1.1
Cork	0.9	1.3	Reykjavik	0.9	1.8
Catania	0.7	1.2	Rome	0.7	1.1
Djerba	0.9	1.2	S. de Compostela	0.9	1.0
Egilsstadir	0.8	1.7	Sofia	1.1	2.3
Glasgow	0.9	1.4	Swanwick	1.1	1.6
Golbasi	1.0	1.5	Toulouse	0.7	1.1
Gävle	0.7	1.6	Trondheim	0.7	1.6
Jan Mayen	1.2	2.3	Tromsoe	1.0	2.2
Kirkenes	0.9	1.9	Warsaw	0.9	1.4
Lappeenranta	0.8	1.7	Zürich	0.8	1.2
La Palma	1.0	1.4			

Table 8: EGNOS Open Service accuracy (95%)

The horizontal accuracy results for all the stations remained below 1.3 metres (95%), and the vertical accuracy below 2.4 metres (95%), what represents a very good level of accuracy.

The following figures show the histogram and cumulative distribution function of HNSE (Horizontal Navigation System Error) and VNSE (Vertical Navigation System Error), which are computed at the previous stations for each second over the whole period, across the range of values.

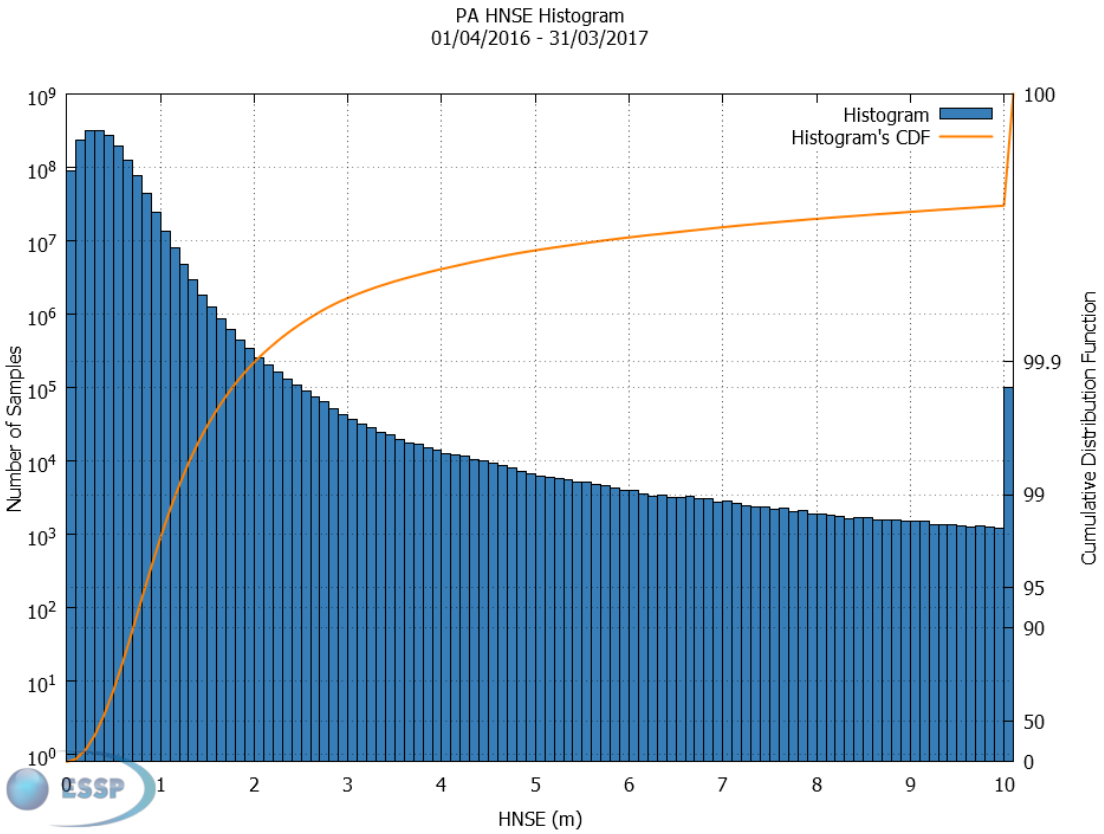


Figure 37: EGNOS Open Service HNSE Histogram and Cumulative Probability

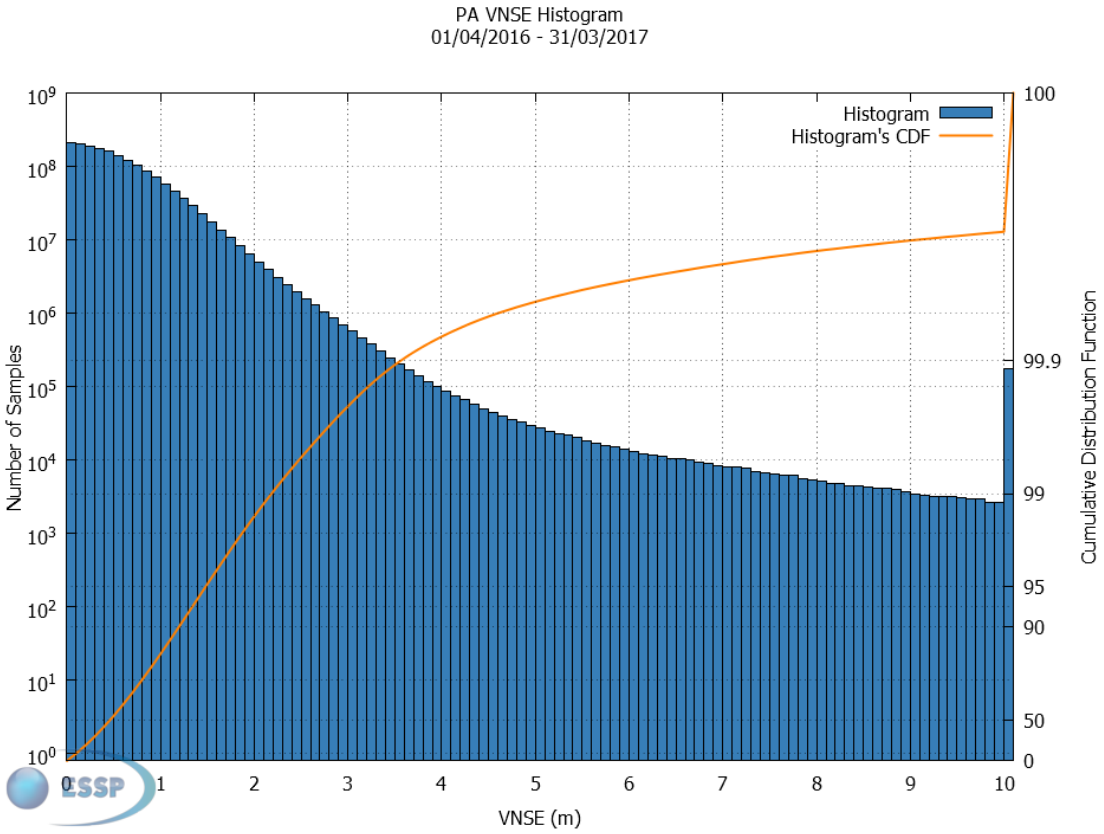


Figure 38: EGNOS Open Service VNSE Histogram and Cumulative Probability

As it can be observed, the cumulated results confirm the good values observed in all the stations. The 95th percentile of the observed accuracy performance is below 0.9 metres in the horizontal domain and below 1.6 metres in the vertical one.

Table 9 and Table 10 provide the monthly maximum of the daily values for Horizontal and Vertical Accuracy (95%) while using EGNOS message broadcast by PRN 120 and PRN 136/123 respectively.

UAV –Unmanned Aerial Vehicle

PRN 120		04/16	05/16	06/16	07/16	08/16	09/16	10/16	11/16	12/16	01/17	02/17	03/17	Average
ALB	HPE	0.77	0.94	0.70	0.69	0.75	0.76	0.80	0.96	1.11	0.92	0.94	0.79	0.84
	VPE	1.88	1.86	1.71	1.63	1.84	1.77	1.86	1.61	1.85	1.67	1.77	1.76	1.77
ATH	HPE	1.07	1.38	1.06	0.84	0.84	0.77	0.69	0.75	0.71	0.76	0.82	0.87	0.88
	VPE	1.82	1.96	1.65	1.84	1.52	1.76	1.51	1.46	1.29	1.12	1.23	1.61	1.56
BRN	HPE	0.92	1.05	0.88	0.91	0.84	0.84	1.01	1.03	1.17	0.99	0.96	0.90	0.96
	VPE	1.58	1.73	1.40	1.40	1.49	1.48	1.34	1.76	1.43	1.43	1.58	1.48	1.51
CNR	HPE	1.86	2.19	1.86	1.65	2.30	2.43	2.55	1.72	1.80	1.30	1.59	1.82	1.92
	VPE	3.18	3.06	1.93	1.84	2.60	2.03	2.28	2.10	1.78	1.55	1.72	1.94	2.17
CRK	HPE	0.94	1.22	1.14	0.90	0.86	0.88	0.89	0.93	1.18	1.07	0.97	0.95	0.99
	VPE	1.51	1.70	1.56	1.64	1.58	1.46	1.44	1.45	1.59	1.68	1.73	1.72	1.59
CTN	HPE	0.88	1.12	1.02	0.98	0.87	0.70	0.72	0.64	0.65	0.65	0.70	0.85	0.82
	VPE	1.48	1.83	1.67	1.69	1.49	1.32	1.53	1.26	1.39	1.34	1.25	1.55	1.48
DJA	HPE	1.15	1.43	2.21	4.75	2.38	0.93	1.01	0.82	0.80	0.74	0.85	0.86	1.49
	VPE	1.77	2.04	1.68	4.11	1.73	1.29	1.33	1.40	1.31	1.36	1.21	1.27	1.71
EGI	HPE	1.40	1.65	1.10	0.92	0.86	1.02	1.47	0.78	0.79	0.78	0.78	1.05	1.05
	VPE	2.69	2.52	2.24	2.25	2.55	2.69	2.94	2.20	1.92	1.88	2.36	2.87	2.43
GLG	HPE	0.92	0.98	0.95	0.75	0.80	0.84	1.01	1.04	1.16	1.07	1.02	0.93	0.96
	VPE	1.82	1.79	1.71	1.78	1.75	1.67	1.55	1.58	1.88	1.73	1.71	1.63	1.72
GOL	HPE	1.49	2.43	3.47	0.98	1.02	0.98	1.00	1.05	0.98	0.88	2.08	1.41	1.48
	VPE	2.36	3.11	3.47	1.96	1.82	1.73	1.66	1.69	1.64	1.46	2.30	2.76	2.16
GVL	HPE	1.02	1.12	0.71	0.65	0.85	0.67	0.92	0.87	0.90	0.78	0.86	0.86	0.85
	VPE	2.19	2.32	1.88	1.76	2.02	2.09	1.89	1.78	1.88	1.95	1.94	1.93	1.97
JME	HPE	1.68	1.75	1.21	1.31	1.16	1.22	2.09	1.40	1.57	1.52	1.61	1.37	1.49
	VPE	3.24	3.01	2.65	2.34	2.46	2.56	3.68	2.92	2.93	3.19	3.12	3.19	2.94
KIR	HPE	2.15	3.06	1.35	1.01	1.07	1.09	1.56	1.02	1.05	1.03	1.17	1.23	1.40
	VPE	3.86	4.55	2.46	2.32	2.48	2.68	3.39	2.61	2.51	2.29	2.28	3.10	2.88
LAP	HPE	1.23	1.51	0.84	0.78	0.82	0.71	0.97	0.92	0.92	0.86	0.89	0.94	0.95
	VPE	2.26	2.43	2.13	2.07	1.89	2.14	1.89	1.76	1.97	1.93	1.89	2.21	2.05
LPI	HPE	2.12	2.02	1.36	1.40	2.24	2.60	2.51	1.81	1.64	0.92	1.33	1.61	1.80
	VPE	3.89	3.68	2.08	1.85	2.02	1.80	2.10	1.92	1.65	1.50	1.52	1.99	2.17
LSB	HPE	1.11	1.16	1.02	1.13	1.07	0.95	1.24	1.03	0.85	0.80	0.92	0.99	1.02
	VPE	1.73	1.73	1.41	1.64	1.61	1.42	1.62	1.61	1.63	1.64	1.73	1.41	1.60
MAD	HPE	1.35	1.32	1.05	1.33	1.49	1.25	1.05	1.00	0.74	0.75	1.10	0.97	1.12
	VPE	2.32	2.23	1.63	1.43	1.48	1.68	1.68	1.50	1.44	1.29	2.04	1.72	1.70
MLG	HPE	0.99	1.04	1.03	0.94	0.90	0.87	1.08	0.85	0.81	0.73	0.77	0.86	0.91
	VPE	1.41	1.47	1.36	1.41	1.48	1.50	1.53	1.38	1.06	1.16	1.45	1.17	1.37
PDM	HPE	0.80	0.84	0.79	0.78	0.75	0.68	0.67	0.79	0.71	1.08	0.64	0.68	0.77
	VPE	1.41	1.45	1.27	1.76	1.33	1.14	1.16	1.22	1.10	2.16	1.06	1.12	1.35
RKK	HPE	2.01	2.43	1.46	1.16	1.11	1.23	1.68	1.33	1.01	1.42	1.17	1.38	1.45
	VPE	3.87	3.95	3.15	2.25	2.28	2.73	3.65	2.31	2.20	2.87	2.12	2.44	2.82
ROM	HPE	0.81	0.93	0.81	0.83	0.87	0.79	0.71	0.70	0.68	0.64	0.73	0.79	0.77
	VPE	1.38	1.38	1.35	1.42	1.33	1.28	1.27	1.13	1.19	1.13	1.22	1.33	1.28
SDC	HPE	1.11	1.15	0.93	1.02	0.93	1.14	1.19	0.98	1.04	0.87	0.87	1.03	1.02
	VPE	1.18	1.30	1.15	1.30	1.23	1.17	1.22	1.17	1.13	1.16	1.24	1.16	1.20
SOF	HPE	1.28	1.36	1.30	1.29	1.19	1.19	1.26	1.42	1.36	1.13	1.18	1.30	1.27
	VPE	2.90	2.87	2.61	2.45	2.67	2.66	2.85	4.24	2.56	2.51	2.41	2.55	2.77
SWA	HPE	1.19	1.31	1.06	1.06	1.11	1.11	1.16	1.14	1.40	1.42	1.12	1.20	1.19
	VPE	1.97	1.87	1.87	1.85	1.71	1.96	1.58	1.81	1.88	1.89	1.99	2.06	1.87
TLS	HPE	0.79	0.87	0.78	0.76	0.77	0.84	0.89	0.72	0.83	0.74	0.75	0.83	0.80
	VPE	1.28	1.21	1.38	1.29	1.19	1.16	1.13	1.05	1.10	1.31	1.25	1.44	1.23
TOR	HPE	0.97	1.04	0.96	0.92	0.95	0.96	1.12	1.00	0.93	0.94	0.93	0.97	0.97
	VPE	1.39	1.33	1.23	1.47	1.25	1.43	1.34	1.28	1.19	1.40	1.55	1.40	1.36
TRD	HPE	1.13	1.19	0.95	0.85	1.02	1.43	1.03	0.83	0.78	0.81	0.81	0.81	0.97
	VPE	2.13	2.49	1.78	1.77	2.72	5.94	2.63	1.69	1.95	1.87	2.10	1.83	2.41
TRO	HPE	2.00	2.05	1.28	1.11	1.10	1.07	1.62	1.08	1.24	1.09	0.98	1.09	1.31
	VPE	3.46	3.60	2.81	2.60	2.79	3.01	3.67	2.56	2.70	2.60	2.65	2.78	2.94
WRS	HPE	0.91	1.21	0.99	1.05	0.97	0.98	1.05	1.03	1.14	1.01	0.97	0.92	1.02
	VPE	1.88	2.42	1.48	1.99	1.80	1.90	1.70	1.85	1.66	1.47	1.66	1.70	1.79
ZUR	HPE	0.85	0.96	0.92	0.89	0.89	0.88	0.97	0.96	0.98	0.88	0.89	1.02	0.92
	VPE	1.54	1.40	1.44	1.43	1.29	1.37	1.34	1.28	1.30	1.38	1.59	1.64	1.42

Table 9: Monthly Horizontal/Vertical Accuracy at RIMS-A sites for PRN120 (in metres)

PRN 136/123		04/16	05/16	06/16	07/16	08/16	09/16	10/16	11/16	12/16	01/17	02/17	03/17	Average
ALB	HPE	0.79	0.93	0.71	0.68	0.76	0.76	0.82	0.96	1.10	0.91	0.95	0.85	0.85
	VPE	1.87	1.84	1.71	1.64	1.86	1.78	1.86	1.62	1.86	1.70	1.77	1.17	1.72
ATH	HPE	1.08	1.38	1.06	0.85	0.84	0.76	0.70	0.75	0.71	0.76	0.82	1.03	0.90
	VPE	1.84	1.92	1.66	1.82	1.53	1.77	1.47	1.48	1.29	1.14	1.23	1.16	1.53
BRN	HPE	0.93	1.06	0.87	0.90	0.84	0.84	1.01	1.04	1.17	1.00	0.96	0.68	0.94
	VPE	1.59	1.71	1.39	1.40	1.45	1.49	1.36	1.75	1.43	1.44	1.59	1.13	1.48
CNR	HPE	1.84	2.16	1.80	1.65	2.36	2.42	2.57	1.69	1.83	1.30	1.59	0.99	1.85
	VPE	3.37	3.11	1.95	1.82	2.60	2.17	2.38	2.13	1.73	1.53	1.53	1.39	2.14
CRK	HPE	0.92	1.20	1.11	0.89	0.85	0.88	0.90	0.93	1.19	1.07	0.97	0.82	0.98
	VPE	1.47	1.72	1.55	1.63	1.60	1.46	1.45	1.46	1.59	1.69	1.73	1.79	1.60
CTN	HPE	0.91	1.10	1.00	1.02	0.86	0.74	0.73	0.65	0.65	0.65	0.69	0.95	0.83
	VPE	1.41	1.82	1.67	1.70	1.48	1.32	1.51	1.27	1.42	1.34	1.28	1.72	1.50
DJA	HPE	1.13	1.50	1.79	4.93	2.28	0.93	1.01	0.81	0.81	0.74	0.85	1.04	1.49
	VPE	1.71	2.06	1.77	3.74	1.69	1.28	1.36	1.40	1.36	1.36	1.24	1.65	1.72
EGI	HPE	1.40	1.69	1.09	0.92	0.85	1.05	1.53	0.77	0.79	0.78	0.80	0.92	1.05
	VPE	2.65	2.63	2.21	2.23	2.50	2.72	3.05	2.23	1.93	1.91	2.36	1.49	2.33
GLG	HPE	0.94	0.96	0.95	0.75	0.80	0.85	1.00	1.05	1.15	1.07	1.01	0.83	0.95
	VPE	1.83	1.80	1.70	1.79	1.76	1.66	1.57	1.59	1.90	1.73	1.72	1.44	1.71
GOL	HPE	1.53	2.37	3.78	0.97	1.03	1.00	0.97	1.05	0.99	0.89	2.02	1.12	1.48
	VPE	2.35	3.04	3.33	1.94	1.79	1.74	1.66	1.69	1.64	1.44	2.12	2.79	2.13
GVL	HPE	1.04	1.13	0.71	0.66	0.85	0.68	0.93	0.86	0.90	0.78	0.87	1.22	0.89
	VPE	2.21	2.34	1.89	1.77	2.02	2.08	1.88	1.78	1.88	1.96	1.93	2.06	1.98
JME	HPE	1.69	1.82	1.22	1.29	1.16	1.23	2.16	1.38	1.59	1.46	1.57	0.80	1.45
	VPE	3.20	3.11	2.67	2.34	2.47	2.58	3.67	2.91	2.88	3.26	3.14	1.33	2.80
KIR	HPE	2.14	2.89	1.38	1.00	1.08	1.08	1.57	1.04	1.04	1.00	1.16	0.79	1.35
	VPE	3.95	4.47	2.44	2.33	2.46	2.73	3.47	2.68	2.46	2.23	2.27	1.76	2.77
LAP	HPE	1.26	1.44	0.82	0.78	0.81	0.76	1.02	0.92	0.92	0.84	0.90	0.94	0.95
	VPE	2.24	2.39	2.15	2.06	1.88	2.14	1.96	1.79	1.96	1.92	1.89	1.62	2.00
LPI	HPE	2.17	1.99	1.35	1.39	2.28	2.58	2.50	1.83	1.65	0.93	1.31	0.85	1.74
	VPE	3.98	3.77	2.12	1.86	2.03	1.99	2.08	1.92	1.68	1.50	1.53	1.92	2.20
LSB	HPE	1.09	1.19	1.03	1.14	1.06	0.95	1.23	1.03	0.86	0.80	0.91	0.91	1.02
	VPE	1.77	1.75	1.45	1.64	1.60	1.42	1.64	1.61	1.64	1.66	1.70	1.71	1.63
MAD	HPE	1.34	1.35	1.02	1.34	1.47	1.23	1.05	0.99	0.74	0.74	1.02	0.88	1.10
	VPE	2.35	2.23	1.64	1.49	1.48	1.69	1.68	1.48	1.45	1.28	1.94	1.55	1.69
MLG	HPE	0.97	1.06	1.04	0.94	0.90	0.89	1.07	0.85	0.81	0.73	0.76	0.96	0.92
	VPE	1.44	1.51	1.35	1.45	1.52	1.56	1.47	1.39	1.07	1.18	1.46	1.72	1.43
PDM	HPE	0.83	0.84	0.79	0.78	0.75	0.68	0.66	0.79	0.71	1.05	0.64	1.01	0.79
	VPE	1.44	1.41	1.26	1.75	1.34	1.15	1.15	1.21	1.11	2.16	1.07	1.42	1.37
RKK	HPE	1.97	2.32	1.51	1.16	1.10	1.25	1.70	1.33	1.07	1.69	1.16	0.91	1.43
	VPE	3.86	3.69	3.37	2.22	2.23	2.75	3.52	2.44	2.30	3.24	2.26	1.62	2.79
ROM	HPE	0.81	0.92	0.82	0.82	0.87	0.77	0.71	0.70	0.69	0.64	0.73	0.89	0.78
	VPE	1.42	1.36	1.33	1.41	1.31	1.30	1.28	1.13	1.20	1.14	1.24	1.28	1.28
SDC	HPE	1.11	1.17	0.94	1.02	0.93	1.12	1.17	0.98	1.04	0.88	0.87	1.33	1.05
	VPE	1.22	1.35	1.15	1.30	1.21	1.19	1.23	1.17	1.13	1.15	1.23	2.52	1.32
SOF	HPE	1.30	1.38	1.29	1.29	1.20	1.19	1.22	1.43	1.39	1.12	1.18	0.95	1.25
	VPE	2.92	2.90	2.59	2.42	2.68	2.66	3.09	4.20	2.52	2.52	2.40	2.18	2.76
SWA	HPE	1.20	1.30	1.06	1.07	1.11	1.10	1.14	1.14	1.41	1.41	1.13	1.24	1.19
	VPE	1.98	1.90	1.86	1.89	1.68	1.96	1.57	1.80	1.85	1.89	2.00	2.95	1.94
TLS	HPE	0.78	0.87	0.77	0.76	0.77	0.84	0.89	0.73	0.84	0.74	0.74	1.37	0.84
	VPE	1.24	1.22	1.41	1.30	1.19	1.14	1.11	1.06	1.07	1.30	1.26	3.13	1.37
TOR	HPE	0.98	1.03	0.98	0.93	0.95	0.95	1.11	1.00	0.94	0.95	0.94	1.06	0.99
	VPE	1.36	1.33	1.23	1.47	1.26	1.42	1.32	1.27	1.20	1.39	1.53	2.80	1.47
TRD	HPE	1.11	1.19	0.94	0.86	1.02	1.42	1.03	0.83	0.77	0.81	0.81	1.33	1.01
	VPE	2.12	2.44	1.78	1.75	2.75	5.67	2.64	1.70	1.95	1.88	2.10	2.28	2.42
TRO	HPE	2.01	2.08	1.29	1.09	1.11	1.13	1.62	1.08	1.23	1.08	0.97	1.64	1.36
	VPE	3.38	3.58	2.83	2.61	2.77	2.98	3.62	2.57	2.74	2.60	2.64	1.99	2.86
WRS	HPE	0.95	1.23	0.98	1.05	0.97	1.00	1.06	1.03	1.14	1.02	0.97	1.82	1.10
	VPE	1.87	2.47	1.50	1.97	1.76	1.91	1.70	1.85	1.67	1.51	1.65	1.98	1.82
ZUR	HPE	0.85	0.97	0.91	0.90	0.89	0.88	0.96	0.97	0.98	0.88	0.89	1.48	0.96
	VPE	1.55	1.41	1.45	1.44	1.29	1.38	1.32	1.28	1.30	1.37	1.60	2.87	1.52

Table 10: Monthly Horizontal/Vertical Accuracy at RIMS-A sites for PRN136/123 (in metres)

3.5.3 Open Service Availability

EGNOS OS Availability performance *is defined in the present document as the percentage of time in the month when the instantaneous HNSE is lower than 3 metres and the instantaneous VNSE is lower than 4 metres over the total number of samples with valid PA navigation solution.*

The following tables provide the values measured using PRN 120 and PRN 136/123[10] respectively.

PRN120	04/2016	05/2016	06/2016	07/2016	08/2016	09/2016	10/2016	11/2016	12/2016	01/2017	02/2017	03/2017	Average
ALBA	99.96%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
ATHA	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	100.00%
BRNA	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%
CNRA	99.52%	99.70%	99.96%	99.97%	99.88%	99.93%	99.87%	99.93%	99.97%	99.96%	99.94%	99.89%	99.88%
CRKA	99.98%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	99.96%	100.00%	100.00%	99.99%
CTNA	100.00%	100.00%	100.00%	99.96%	99.96%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%
DJAA	99.91%	99.91%	99.59%	96.44%	99.52%	99.97%	99.99%	99.99%	99.99%	100.00%	100.00%	100.00%	99.61%
EGIA	99.85%	99.90%	99.97%	99.99%	99.95%	99.91%	99.89%	99.98%	99.98%	99.98%	99.98%	99.92%	99.94%
GLGA	99.96%	99.96%	99.99%	99.98%	100.00%	99.98%	100.00%	100.00%	100.00%	99.98%	100.00%	99.97%	99.99%
GOLA	99.89%	99.68%	99.77%	100.00%	99.84%	99.94%	99.94%	99.93%	99.97%	100.00%	99.79%	99.75%	99.88%
GVLA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%
JMEA	99.76%	99.82%	99.85%	99.94%	99.91%	99.82%	99.46%	99.73%	99.66%	99.80%	99.27%	99.38%	99.70%
KIRA	99.04%	98.98%	99.69%	99.84%	99.76%	99.43%	99.51%	99.58%	99.73%	99.62%	99.36%	99.35%	99.49%
LAPA	99.90%	99.95%	99.97%	99.99%	100.00%	99.99%	99.96%	99.99%	100.00%	100.00%	99.99%	99.96%	99.98%
LPIA	99.40%	99.63%	99.93%	99.91%	99.92%	99.90%	99.90%	99.96%	99.99%	99.99%	99.90%	99.92%	99.86%
LSBA	99.99%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	100.00%	100.00%	100.00%	100.00%
MADA	99.90%	99.89%	100.00%	99.96%	99.95%	100.00%	99.95%	99.99%	100.00%	100.00%	99.97%	99.98%	99.97%
MLGA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
PDMA	99.98%	100.00%	100.00%	99.94%	100.00%	100.00%	100.00%	99.98%	99.98%	99.88%	100.00%	99.99%	99.98%
RKKA	98.83%	98.96%	99.56%	99.80%	99.73%	99.63%	99.32%	99.48%	99.54%	99.14%	99.47%	99.40%	99.41%
ROMA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%
SDCA	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%
SOFA	99.87%	99.89%	99.96%	99.98%	99.92%	99.98%	99.88%	99.65%	99.87%	99.93%	99.98%	99.84%	99.90%
SPU1	99.94%	99.98%	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	99.97%	99.99%	99.96%	100.00%	99.99%
SWAA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.97%	99.97%	100.00%	100.00%	99.99%
TLSA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
TRDA	99.99%	100.00%	99.96%	100.00%	99.86%	99.60%	99.91%	100.00%	100.00%	100.00%	100.00%	99.99%	99.94%
TROA	99.74%	99.63%	99.85%	99.96%	99.91%	99.74%	99.72%	99.84%	99.80%	99.88%	99.92%	99.92%	99.83%
WRSA	99.99%	100.00%	99.98%	100.00%	99.99%	100.00%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%
ZURA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 11: OS Availability at RIMS-A sites for PRN120

[10] Open Service Availability performance corresponds to the combination of GEOs PRN120 and 136 from 1 to 20 March, and GEOs PRN120 and 123 from 21 to 31 March, 2017.

PRN136/123	04/2016	05/2016	06/2016	07/2016	08/2016	09/2016	10/2016	11/2016	12/2016	01/2017	02/2017	03/2017	Average
ALBA	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
ATHA	99.97%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	99.98%	99.99%
BRNA	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
CNRA	99.52%	99.70%	99.96%	99.98%	99.88%	99.92%	99.89%	99.93%	99.97%	99.96%	99.96%	99.90%	99.88%
CRKA	99.96%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	100.00%	100.00%	100.00%
CTNA	99.97%	100.00%	100.00%	99.93%	99.96%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	99.99%
DJAA	99.90%	99.92%	99.63%	96.21%	99.54%	99.98%	99.98%	100.00%	99.99%	100.00%	100.00%	99.98%	99.59%
EGIA	99.84%	99.87%	99.98%	99.99%	99.95%	99.91%	99.91%	99.98%	99.98%	99.99%	99.97%	99.97%	99.95%
GLGA	99.96%	99.96%	99.98%	99.98%	100.00%	99.98%	100.00%	100.00%	100.00%	99.98%	100.00%	99.97%	99.98%
GOLA	99.84%	99.69%	99.76%	100.00%	99.82%	99.96%	99.93%	99.95%	99.97%	100.00%	99.80%	99.68%	99.87%
GVLA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
JMEA	99.76%	99.82%	99.83%	99.96%	99.92%	99.85%	99.44%	99.75%	99.68%	99.81%	99.26%	99.38%	99.71%
KIRA	99.00%	99.01%	99.70%	99.84%	99.75%	99.42%	99.45%	99.57%	99.73%	99.62%	99.37%	99.36%	99.49%
LAPA	99.88%	99.96%	99.97%	99.98%	100.00%	99.99%	99.96%	100.00%	99.99%	100.00%	100.00%	99.96%	99.97%
LPIA	99.36%	99.60%	99.93%	99.92%	99.92%	99.89%	99.90%	99.95%	100.00%	99.99%	99.90%	99.91%	99.86%
LSBA	99.98%	100.00%	99.99%	100.00%	100.00%	100.00%	99.99%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%
MADA	99.90%	99.87%	100.00%	99.97%	99.95%	99.99%	99.94%	99.99%	100.00%	100.00%	99.97%	99.98%	99.96%
MLGA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
PDMA	99.99%	100.00%	100.00%	99.94%	100.00%	100.00%	100.00%	99.98%	99.98%	99.89%	100.00%	100.00%	99.98%
RKKA	98.84%	98.99%	99.54%	99.79%	99.71%	99.60%	99.35%	99.48%	99.53%	99.12%	99.45%	99.46%	99.41%
ROMA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%
SDCA	99.95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
SOFA	99.84%	99.89%	99.95%	99.98%	99.93%	99.97%	99.84%	99.66%	99.87%	99.93%	99.98%	99.85%	99.89%
SPU1	99.92%	99.98%	100.00%	100.00%	100.00%	99.99%	99.99%	99.99%	99.97%	99.99%	99.95%	100.00%	99.98%
SWAA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.97%	99.97%	100.00%	100.00%	99.99%
TLSA	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
TRDA	100.00%	100.00%	99.96%	100.00%	99.86%	99.60%	99.91%	100.00%	100.00%	100.00%	100.00%	100.00%	99.94%
TROA	99.73%	99.66%	99.85%	99.96%	99.94%	99.74%	99.70%	99.81%	99.80%	99.89%	99.94%	99.84%	99.82%
WRSA	99.97%	100.00%	99.98%	100.00%	99.98%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	99.99%
ZURA	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 12: OS Availability at RIMS-A sites for PRN136/123

The map below shows, for each location, the value of the average OS availability value during the year. The worst value between PRN 120 and PRN 136/123 is shown:

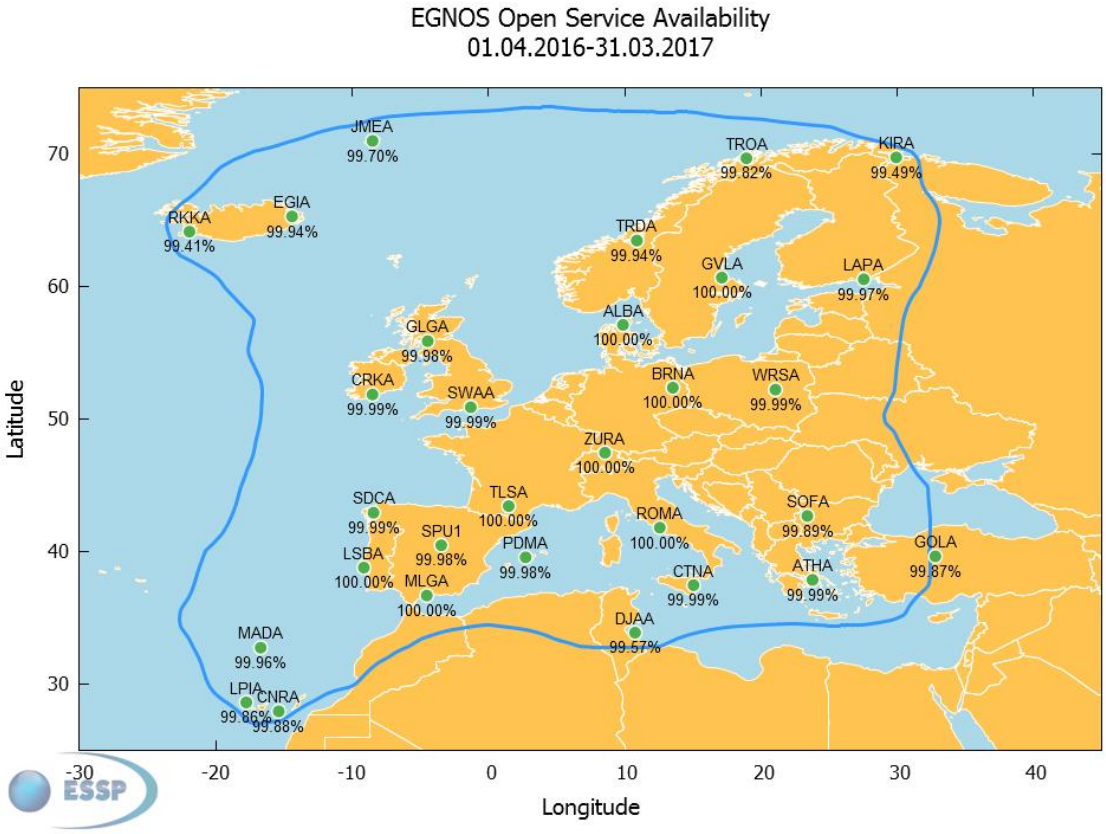


Figure 39: OS average availability for the RIMS stations

As shown in the figure above, Open Service Availability performance has been greater than 99% at all stations.

3.6 EGNOS Data Access Service (EDAS)

EDAS (EGNOS Data Access Service) is the free-of-charge ground-based access (through the Internet) to EGNOS and GNSS (GPS&GLONASS) data in real-time and also through a historical archive, which collects all the data generated by the EGNOS ground stations, mainly distributed over Europe and North Africa.

EDAS, as all the other EGNOS Services, has its own EDAS SDD (Service Definition Document, see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds). Among other content, the EDAS SDD defines the committed performances for EDAS (those that should always be met in a nominal situation) in terms of availability and latency:

- **Availability:** percentage of time in which EDAS is providing its services according to specifications. The availability of EDAS services is measured at the EDAS system output (excluding external network performance).
- **Latency:** time elapsed since the transmission of the last bit of the navigation message from the space segment (EGNOS and GPS/GLONASS satellites) until the data leave the EDAS system (formatted according to the corresponding service level specification). EDAS latency is a one-way parameter defined for real-time services.

Based on the above definitions, the tables below provide minimum availability and maximum latency for the EDAS services:

SL0	SL2	SISNeT	FTP	Data Filtering	Ntrip
98.5%	98.5%	98%	98%	98%	98%

Table 13: EDAS services minimum availability

SL0	SL2	SISNeT	FTP	Ntrip	Data Filtering	
					SL0	SL2
1.3 seconds	1.450 seconds	1.150 seconds	N/A	1.75 seconds	1.6 seconds	1.75 seconds

Table 14: Maximum latency for EDAS Services

EDAS performance is reported through the EGNOS Monthly Performance reports, available on the ESSP website (http://www.essp-sas.eu/monthly_performance_reports).

The availability achieved during the last yearly period is shown in Figure 40.

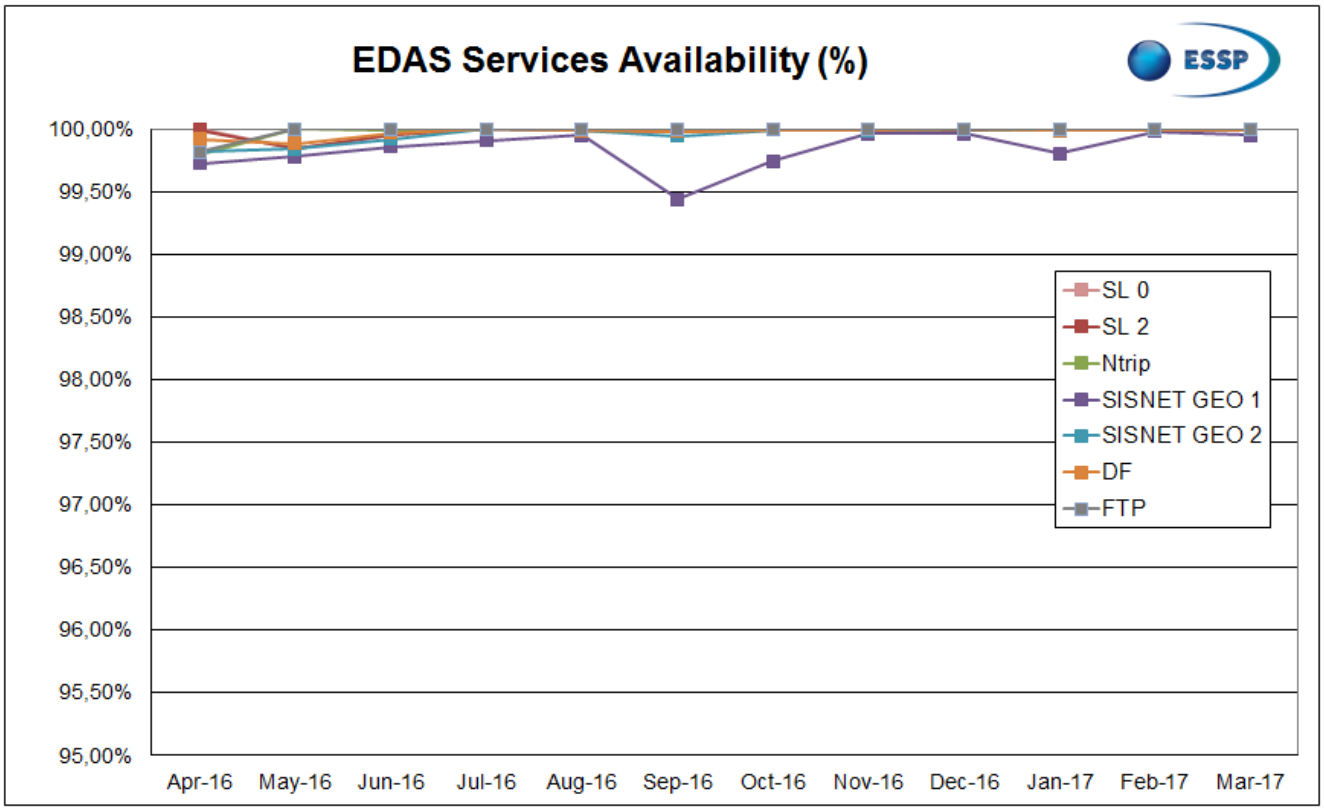


Figure 40: EDAS Services Availability (April 2016-March 2017)

As shown above, EDAS availability has been consistently above 99.5% for all services over the entire reporting period. The lower availability of GEO1 (PRN 120) data over EDAS SISNeT in September 2015, still well above the committed performance as per EDAS SDD (Service Definition Document, see https://egnos-user-support.essp-sas.eu/new_egnos_ops/content/egnos-sdds), was mainly due to the SiS outages observed on the subject EGNOS GEO satellite during that month.

The latency during the last yearly period for the real-time services (not applicable for the FTP) is shown hereafter, computed as the average of the 95% percentile latencies monitored for every 5minute period during the month.

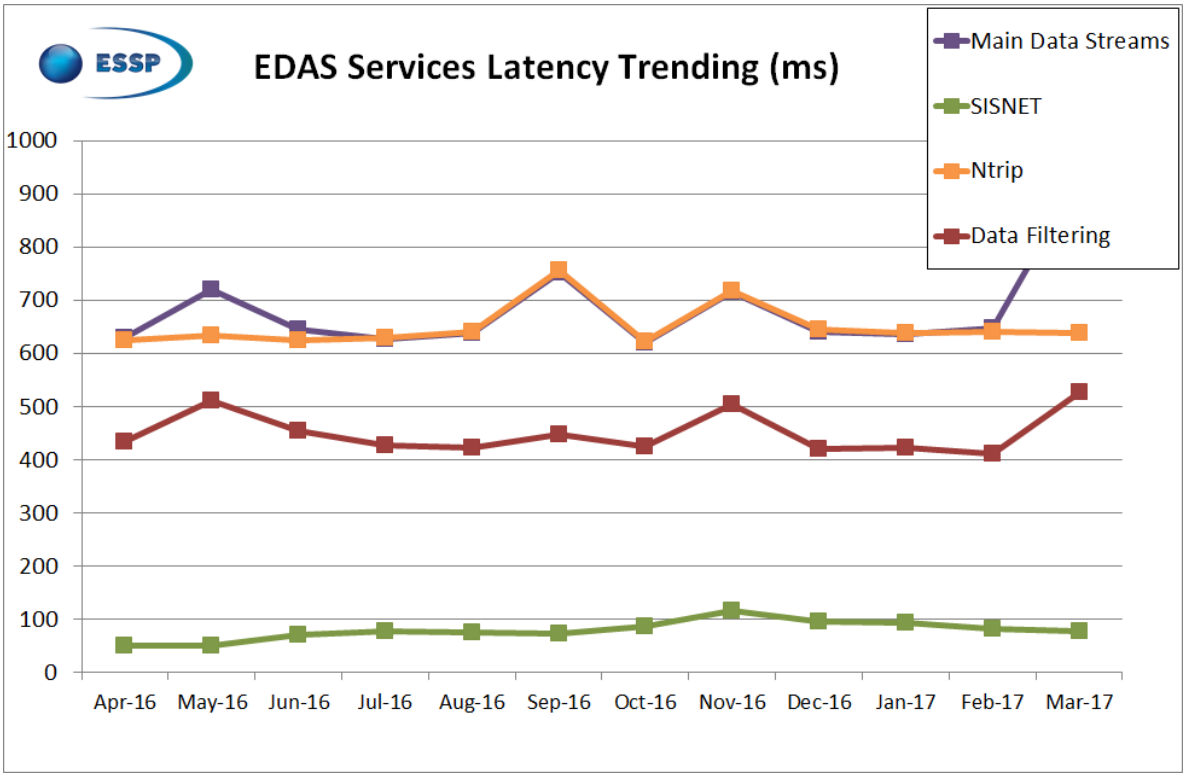


Figure 41: EDAS Services Latency (April 2016-March 2017)

As shown above, EDAS services latency has been consistently below the target delays for all the services over the entire reporting period. Moreover, all real-time services have been provided regularly with delays below the 1-second threshold.

4 EGNOS SERVICES PROVISION

4.1 SoL Aviation Service Status

Following the declaration of the EGNOS SoL service level called “LPV-200” in 2015, based on ESR241M, the available Service Levels allow aircraft approaches from NPA to those operationally equivalent to ILS CAT I. APV-I and LPV-200 Service Levels provide lateral and angular vertical guidance without the need for visual contact with the ground until a Decision Height (DH) of down to 250 ft. and 200 ft., respectively, above the runway. In particular, EGNOS LPV-200-based approaches guarantee the advantages provided by an ILS CAT I approach with the airspace design flexibility of a PBN approach.

From the deployment of ESR241M, the Service has proven to be quite stable and robust, not suffering degradations leading to contingency situations.

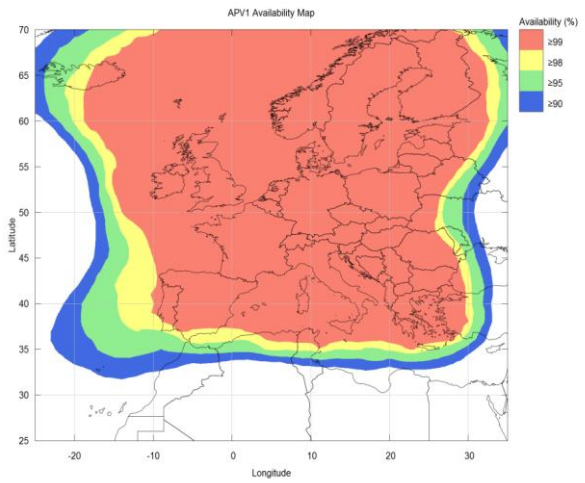
The SoL Service Definition Document (SDD 3.1) was published on 26 September 2016, including new SoL commitment maps based on ESR241M and an updated EGNOS Space Segment.

EGNOS-equipped cockpit

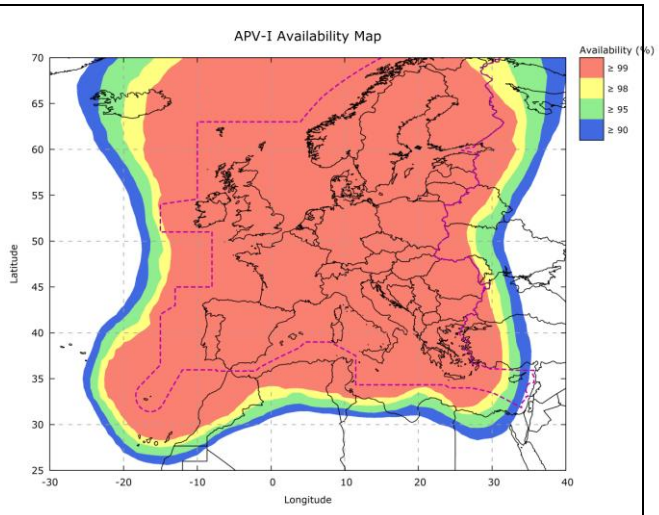
4.1.1 Service Definition Documents and Service Notices over the period

EGNOS Service Definition Documents (SDD) describe the characteristics and conditions of access to each EGNOS service (OS, SoL and EDAS). Following the deployment of the ESR 2.4.1M, a new version of the SoL SDD (v3.1) was published on 26 September 2016 and presented during the EGNOS Workshop held in Warsaw. The main changes of this new version of the SoL SDD were:

- New SoL commitment maps based on ESR241M.



SoL SDD v3.0 – APV-I availability map



SoL SDD v3.1 – APV-I availability map

Figure 42: Extension of the APV-I commitment in SoL SDD v3.1

- EGNOS Space Segment updated with the introduction of the ASTRA-5B (PRN 123) on the TEST platform.

Linked to the entry in operations of ESR 241M, at the time of writing, a new version of the OS SDD is being built-up to give users the most recent detail of the system behaviour and the associated context.

As amendments to EGNOS SDDs, ESSP generates Service Notices whenever there is any complementary information to be provided to users that could affect SDD content. Therefore, an EGNOS Service Notice is a temporary amendment to the applicable version of the EGNOS Service Definition Documents.

A snapshot of the current status of the Service Notices can be found in the figure below, which is available on the EGNOS User support website (http://egnos-user-support.essp-sas.eu/).

The published EGNOS Service Notices with its corresponding status are available hereafter:

Notice	Subject	Target Users	Date	Revision	Status
Service Notice #16	Leap Second Introduction	SoL, OS & EDAS	21/11/2016	1.0	In Force
Service Notice #15	EGNOS Space Segment Update	SoL, OS & EDAS	14/03/2017	1.2	In Force
Service Notice #14	EGNOS System Release 2.4.1.M entry in operations	SoL, OS & EDAS	26/09/2016	1.1	In Force
Service Notice #13	Upgrade of EGNOS performances status	SoL & OS	29/06/2015	1.0	Expired
Service Notice #12	Status of EGNOS performances – North of Service Area	SoL & OS	16/01/2015	1.0	Expired
Service Notice #11	EGNOS GEO PRN 124 Decommissioning and Space Segment Update	SoL, OS & EDAS	09/06/2014	1.0	Expired
Service Notice #10	Updated Status EGNOS performances - North and South West of Service Area -	SoL & OS	16/04/2014	1.1	Expired
Service Notice #9	Upgrade of the EGNOS communication network (TWAN) in January 2014	SoL, OS & EDAS	19/12/2013	1.0	Expired
Service Notice #8	EGNOS System Release v2.3.2 deployment	SoL & OS	08/11/2013	1.0	Expired
Service Notice #7	Temporary GEO swap PRN126-PRN124 in March/April 2013	SoL & OS	15/03/2013	1.1	Expired
Service Notice #6	Status of EGNOS performances – North and North East of Service Area	SoL & OS	21/06/2013	1.1	Expired
Service Notice #5	EGNOS Service unavailability from 23 to 26 June 2012	SoL, OS & EDAS	19/07/2012	1.0	Expired
Service Notice #4	Leap Second Introduction – EGNOS service available	SoL, OS & EDAS	01/07/2012	2.0	Expired
Service Notice #3	EGNOS upgrades deployed in Q1 2012	SoL & OS	02/04/2012	1.1	Expired
Service Notice #2	Status of EGNOS Performance	SoL	23/04/2012	2.0	Expired
Service Notice #1	MT9-MT17 incoherency status	SoL	08/03/2012	2.0	Expired

Figure 43: Service Notices section on the EGNOS User support website

4.2 User Consultations and Improvement Actions

4.2.1 EGNOS User Satisfaction Process 2016

Each year, a global EGNOS User Satisfaction Process is performed jointly by GSA and ESSP on the three EGNOS Services (SoL, OS and EDAS), to get valuable feedback on EGNOS use and ESSP performance and to define improvement areas and recommendations on EGNOS services.

This process considers the feedback received via different means and interfaces like the EGNOS Workshop, the EGNOS User Support activities and the participation of ESSP in multimodal forums, GNSS implementation projects, working groups or relevant events, but being the main input the customized satisfaction surveys per service type that are widely distributed to the main users and stakeholders of each EGNOS Service.

The EGNOS user satisfaction process in the 2016 period has provided very valuable information and recommendations.

The EGNOS User Satisfaction Survey was launched in September 2016 to cover the 2016 calendar year. The survey was open from 27/09/2016 to 19/12/2016 using a specific online platform and 186 answers were received from a universe of 7,708 consulted users.

The output from this survey was included in the Q1 2017 EGNOS Bulletin. It will also be included on the EGNOS User Support Website (https://egnos-user-support.essp-sas.eu/).

Main conclusions on EGNOS User Satisfaction (Evolution 2015 -2016):

EGNOS users show a satisfaction level considerably higher than those achieved in 2015 (8.1 in 2016 versus 7.6 in 2015). This represents a very good level of satisfaction with respect to EGNOS in general terms.

- **EGNOS SERVICES:** satisfaction with EGNOS Services has grown substantially. SoL, OS and EDAS performance scores are better than in 2015. In particular, the greatest increase is in EGNOS SoL coverage (8.4 in 2016 versus 7.5 in 2015).
- **EGNOS USER SUPPORT:** the use of all EGNOS support services (EGNOS User Support Website, EGNOS Documentation and EGNOS Helpdesk) has grown with respect to 2015 (this means that the satisfaction scores in 2016 are more representative than in 2015). Also, the user satisfaction level is higher in 2016 than it was in 2015 for all of them except for the "Notification Service" (8.0 in 2016 versus 8.2 in 2015) and the "Roadmap service" (8.3 in both years).

Taking the feedback from users as input, several improvement actions are under implementation with the objective to maximise the user satisfactions. Some of the key lines of action are:

- Improvement of the EGNOS User Support Website accessibility, usability and increase the amount of relevant market segment specific information.
- Generation of new reference/support material to ease EGNOS adoption.
- Definition of a tailored communication strategy towards agriculture users.

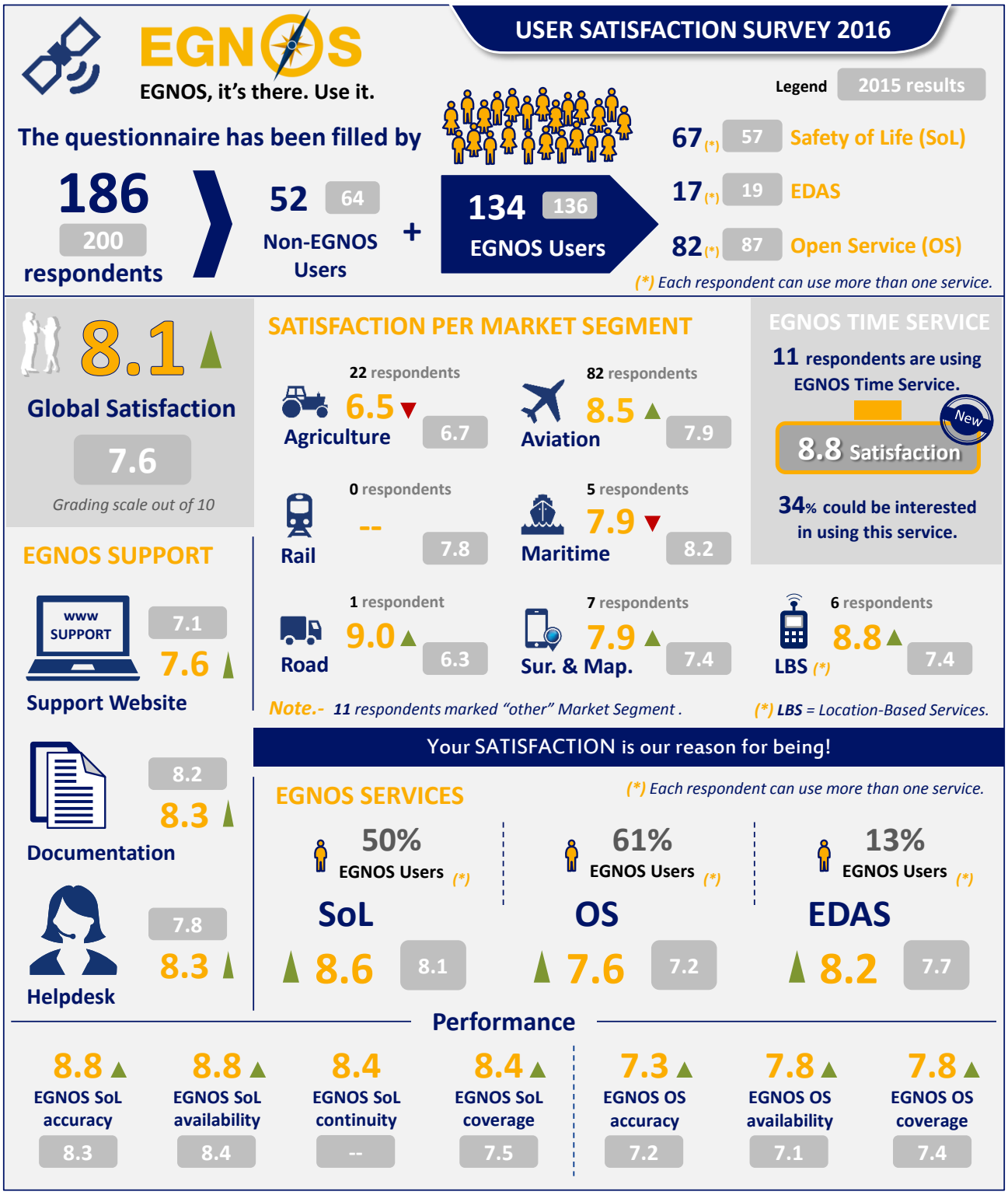


Figure 44: Summary of results from the User Satisfaction Survey

4.3 Service Implementation Roadmaps

The EGNOS Service Roadmaps provide a high-level overview of the EGNOS Services' current status and their expected evolutions in a 3-year timeframe linked to the consecutive EGNOS System Release deployments and information/interfaces improvements/changes. These roadmaps are mainly focused on 4 different areas: Service Area / Data Availability, Service Level, Service Robustness and User Interfaces.

The three EGNOS Service Roadmaps were updated to v3.4 in August 2016 and presented during the EGNOS Workshop held in Warsaw. The current applicable version is:

1. EGNOS Open Service Roadmap
2. EGNOS Safety of Life Service Roadmap
3. EGNOS Data Access Service (EDAS) Roadmap

Improvements of the SIR content and presentation were done in these three documents mainly by the inclusion of a new list of acronyms and by the new visualisation of SIR content intended to provide EGNOS users with a more user-friendly, dynamic and interactive way to get informed about EGNOS services evolution.

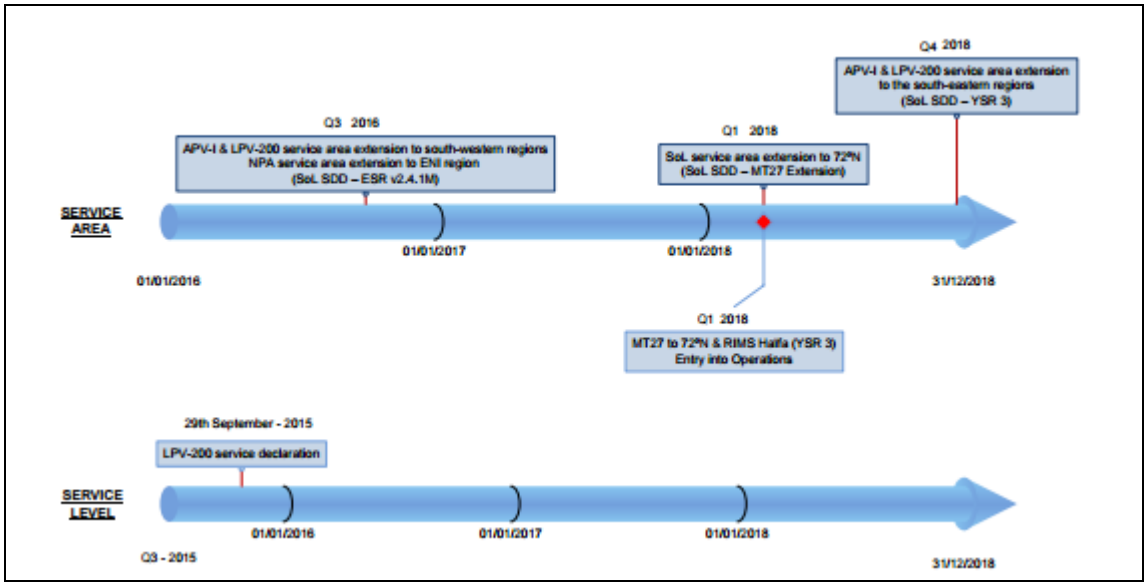


Figure 45: EGNOS Service Roadmaps – extract of SoL service roadmap

4.4 EGNOS Multimodal Adoption Plan 2016

Once again this year, EGNOS Multimodal Adoption Plan has proven to be a useful means to enhance EGNOS adoption in the aviation, maritime, agriculture & mapping and rail market segments; with the aviation and maritime markets seeing the greatest effort and activities according to the established GSA priorities.

ESSP has continued to encourage aerodromes to publish EGNOS-based procedures and operators to become equipped and certified. During the reporting period in this document more than 90 LPV procedures have been published and more than 32 aircrafts have been certified or achieved operational

approval. Another 60 new aircraft/rotorcraft units have been engaged so that in the near future they retrofit, start with the certification process or request SBAS options in the avionics for new unit orders. ESSP has proven to be a key facilitator in promoting, explaining and connecting potential partners within ANSPs, Avionics Manufacturers, Operators, Aircraft Manufacturers to present proposals in the different EU/GSA calls and initiatives.

In regard to maritime, further progress has been achieved in the activities already launched in previous years to implement a Maritime Service in EGNOS V2 as well as those linked to the use of EGNOS V2 SiS or EDAS as a positioning source for Aids to Navigation (IALA DGNS stations and AIS stations). It is also relevant to mention that in this period the first contact with European entities in charge of inland waters has been established. With regard to the use of EGNOS V2 for the "Open Service" users in this market, a promotion campaign (the "EGNOS Cup" was the last regatta held in the 52 Superseries) was undertaken based on the fact that high performance boats in regattas use EGNOS.

Sailors at the "EGNOS Cup" - the last regatta held in Cascais of the 52 Superseries

In agriculture and mapping, the contact network has been notably increased and customised information for those market segments prepared and provided either in specific workshops held at events and made available through the EGNOS User Support Website.

4.5 Communication and EGNOS Promotion Activities

4.5.1 2016 EGNOS Workshop

The 2016 EGNOS Workshop, organised by the ESSP and the GSA, took place in Warsaw (Poland) on 3 and 4 October 2016. More than 180 international participants joined the event which provided information on the EGNOS service status, applications and success stories from partners currently using EGNOS in real applications. The diverse audience included authorities, service providers, international SBAS providers, application developers, manufacturers and end users.

The 2016 edition of the EGNOS Workshop came with important new developments for the audience: participants had the possibility to fly an LPV with a Garmin G-1000 simulator, evaluate the EDAS demonstrator, and check the information on the EGNOS ArcGIS story map.

The satisfaction of the attendees at the 2016 EGNOS Workshop reached an overall score of 8.5, according to the survey conducted by ESSP using the PAPI methodology[11] through a self-completed questionnaire. Based on the attendees' feedback, the priority areas for improvement for the 2017 edition of the EGNOS Workshop are linked to technical session content and its usefulness from a knowledge acquisition perspective. Several recommendations were provided by the attendees, which have been analysed and translated into actions on the ESSP side.

Carlo Des Dorides (GSA) – Opening speech

Thierry Racaud (ESSP) – Closing speech

2016 EGNOS Workshop - Audience

Figure 46: 2016 EGNOS Workshop – Warsaw (Poland)

[11] Paper and pencil interviewing.

The **first day** was devoted to explaining the latest updates in EGNOS services & programme together with an overview of the status of the implementation of EGNOS in Aviation.

The **second day** was devoted to EGNOS in the maritime and land application. The EDAS service for added value applications was also a main theme of the day.

Further details on the EGNOS Workshop and the content of all presentations are available on the EGNOS User Support Website (https://egnos-user-support.essp-sas.eu/):

- The EGNOS Bulletin for Q3 2016 provides an extensive summary of the event contents (*Docs&Tools → EGNOS Adoption → EGNOS Bulletin*).
- The 2016 EGNOS Workshop presentation can be downloaded (*Docs & Tools → Service Provision Workshop → 2016*).

EGNOS Bulletin Q3 2016: A review on the 2016 EGNOS Workshop (pages 2-3)

5 MAIN ACTIVITIES PLANNED FOR THE YEAR AHEAD

5.1 Service Provision and Development

5.1.1 EGNOS Working Agreement Implementation in Aviation

ESSP will continue with the EWA dissemination and awareness activities to ensure that the approach followed is understood and adopted correctly by all European ANSPs supporting any additional discussion with non-EU countries upon request by the EC.

The EWA content is expected to evolve and to be improved to cover any user needs and the applicable EU regulation. The main activities planned with regard to the EWA are:

- EWA harmonisation analysis: Analysing the agreements in place by comparing them with the applicable template and the previous legacy EWAs, opening the possibility to perform a backwards update if needed, to ensure the coherency of all agreements in place.
- EWA improvement activities: addressing the improvement of the Collaborative Decision Making, GNSS Data recording service arrangements and reinforcing communication with all types of users under the EGNOS Working Agreement.
- Support to the GSA/EC in the establishment of an EWA for non-EU countries (non-SES countries such as the Balkans) beyond the EU-28 Member States, and the progress on the related discussions.
- LPV-200 Amendment#1 signature. Due to the LPV-200 Service Level Declaration the legacy EWAS (37) must be amended. The appropriate signature process is still ongoing targeting to be completed during 2017.
- Finalisation/confirmation of the EWA-like concept facilitating the implementation of EGNOS based procedures in scenarios where non-SES certified ANSPs operate, supporting the application of National Regulation (e.g.: CAP1122 in UK).

Aircraft landing gear

5.1.2 Evolution of EGNOS Service-related documents

EGNOS Service Definition Documents (SDD)

Two Service Definition Documents are planned for publication over the next yearly period:

- A new version of the OS SDD linked to ESR241M is expected to be published in Q4 2017, with a new Service Area reflecting an extension to the southern regions.
- A new version of the EDAS SDD is expected to be published to align SDD content with the in-force Service Notices by the end of 2017.

Service Implementation Roadmaps

The three EGNOS Service Roadmaps will be updated at least twice over the next yearly period.

The next publication is expected by the end of June 2017. The main changes expected in the short term can be summarised as follows (within this year):

- The OS SDD linked to ESR v2.4.1.M will show an OS service area extension to the southern regions.
- GEO Swap in the satellite constellation so that the ASTRA SES-5B (PRN123PRN136) will be re-introduced from the TEST to the Operational platform replacing satellite INMARSAT 3F2 (PRN120).
- New EGNOS release (YSR2) deployment will bring increased robustness against certain orbital configurations.

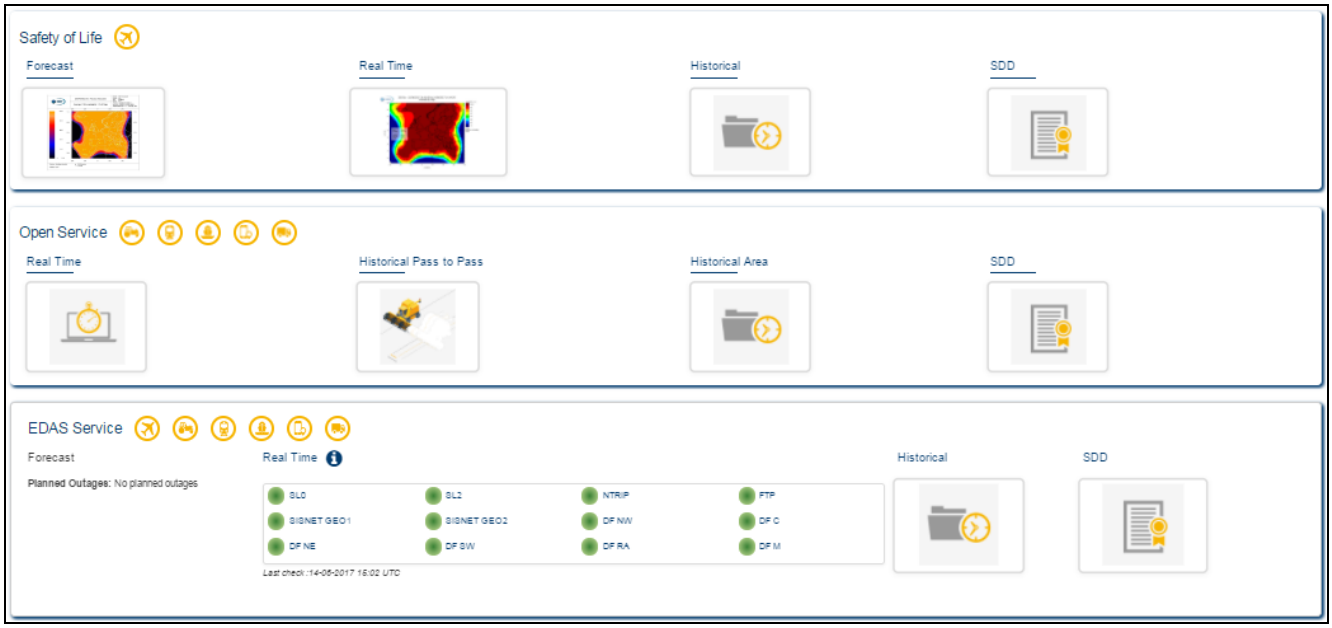
The second publication will be 6 months later, around December 2017.

5.1.3 User Services Evolution

The EGNOS User Support website is continuously evolving to better support the adoption of EGNOS and the needs from the different user communities.

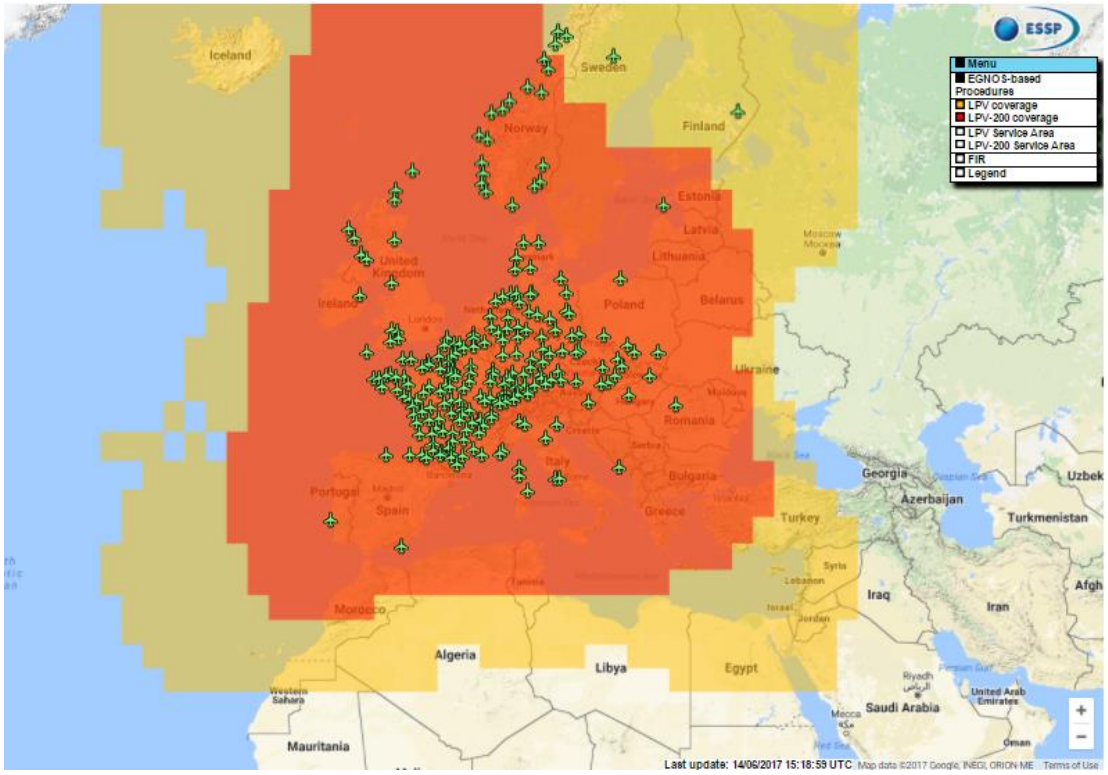
The main priorities for the next period are:

- Website revamp: Website layout, graphical appearance and content/structure will be improved with the final goal of standardising all GSA websites to follow the same graphical style and GSA affiliation.
- Website Performance and Robustness: To maintain the excellent level of availability and robustness of the website.
- Website Accessibility: To continue improving the accessibility to the different content to facilitate website usage. One of the main contributors to this point will be the website revamp explained above and the associated library module.

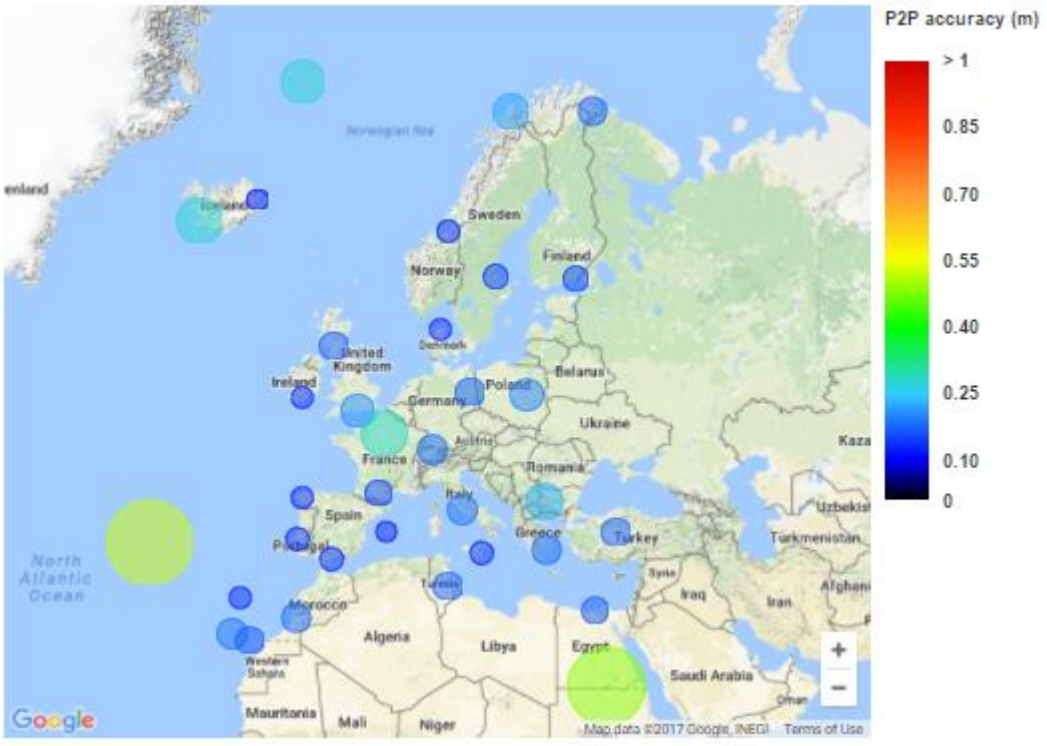


New dashboard on EGNOS User Support website

- EGNOS Performance Notifications/Alerts: To include additional notification types to cover the different EGNOS Services. For example, the alerts related to the EDAS service outages (scheduled and unscheduled) were implemented in the previous period. Additional improvements are also expected in the formatting and texts of the notification/alerts sent to users.
- EGNOS Communications Subscriptions: A specific functionality will be implemented on the website enabling subscription/unsubscription to the different EGNOS communications and official publications (EGNOS Service Definition Documents, EGNOS Service Notices, EGNOS Service Implementation Roadmaps, EGNOS Monthly Performance Reports, EGNOS Public Service Provision Yearly Reports, EGNOS Bulletins…).
- EGNOS Adoption: To implement additional functionalities supporting the adoption of EGNOS as well as to maintain and improve the existing ones.
- Innovative visualisations: Different new visualisations will be designed to simplify the use of information and to support advanced analyses. This will include the integration of GIS (Geographical Information System) engines in order to fuse EGNOS-related information with geographical data.
- Customised EGNOS performance: To include additional performance figures customised for different user communities or market segments, with special focus on agriculture, surveying and maritime.
- Customised EGNOS adoption material: To continue populating the website with adoption and promotion material specific to different market segments.



Real-time EGNOS Service availability (https://egnos-user-support.essp-sas.eu/)



EGNOS Open Service pass-to-pass accuracy (https://egnos-user-support.essp-sas.eu/)

5.1.4 2017 EGNOS Multimodal Adoption Action Plan

The EGNOS Multimodal Adoption (EMA) plan establishes, on a yearly basis, the different activities that should be put in place to leverage the use of EGNOS by all different market segments. These are agreed between the GSA and the ESSP at the beginning of the year and their progress is reviewed on a regular basis. The activities undertaken during 2017 are distributed into four different market segments: aviation (where the major effort is placed), maritime, agriculture & surveying and rail (where less effort is devoted).

Regarding aviation, the activities to be performed during 2017 are:

- Following up on the EGNOS implementation status, both for procedures and for aircrafts/rotorcrafts; and updating the PBN map tool available in the EGNOS User Support Webpage each month.
- Engaging aerodromes and ANSPs (offering Traffic Assessments, CBAs, explaining funding opportunities, performing performance and NOTAM assessments).
- Engaging operators (offering Traffic Assessments, CBAs, explaining funding opportunities).
- Engaging ANSPs to sign EWA agreements.
- Analysing aircraft lessors to evaluate their potential as relevant stakeholders deciding SBAS uptake in the aircraft avionics.
- Following up on new STC (Supplemental Type Certificate) solutions and promoting them within PART 145 entities.
- Analysing the Flight Simulation Training Device capabilities with regard to SBAS.
- Supporting GSA as technical reviewers of the Call for grants 2014 & 2015.
- Providing support to GSA at aviation events (WATM, AeroFriedrichshafen, EBACE; Helitech, ERAA, etc.).

Global transport

Regarding maritime, the main activities to be performed during 2017 are:

- Progressing in the Service provision working group established within EMRF.
- Performing a study for a preliminary maritime Service Definition Document.
- Supporting GSA in the development of guidelines for Receivers manufacturers for SBAS service based on IMO. Res. 1046 or RTCM SC-104 and Preliminary Test specification definition for RTCM SC-131.
- Customising the trade-off analysis for maritime and inland waterway authorities for the transmission of EGNOS corrections via IALA beacons and AIS stations. Supporting this analysis with a Cost Benefit Analysis.
- Studying how nautical charts are done and the accuracy required.
- Supporting GSA in the IALA eNAV and RIS-VTT committee-related activities.
- Studying SBAS-compatible devices and co-marketing.
- Supporting GSA in relevant events such as METS.
- Progressing in the Service provision working group established within EMRF.

With regard to with agriculture & mapping, the main activities to be accomplished during 2017 are:

- Undertaking a number of EDAS marketing actions.
- Understanding the role of EGNOS usage in drones providing services for agriculture.
- Supporting GSA in promoting EGNOS within CAP inspection.
- Supporting GSA in promoting EGNOS usage for municipalities.
- Preparing awareness material (guides on how to configure equipment, papers, presentations, etc.).

With regard to rail, the main activity to be performed during 2017 is:

- Supporting GSA in the development of EGNOS safety and non-safety relevant applications.

EGNOS stand at ERA General Assembly

5.1.5 EGNOS Promotion Plan

5.1.5.1 *2017 EGNOS Annual Workshop*

The 2017 EGNOS Annual Workshop will take place in Athens, Greece, on 3 and 4 October (Registration open: https://egnos-user-support.essp-sas.eu/).

The event, organised by the ESSP and the GSA, will include information on EGNOS service status, applications and success stories from partners currently using EGNOS in real applications.

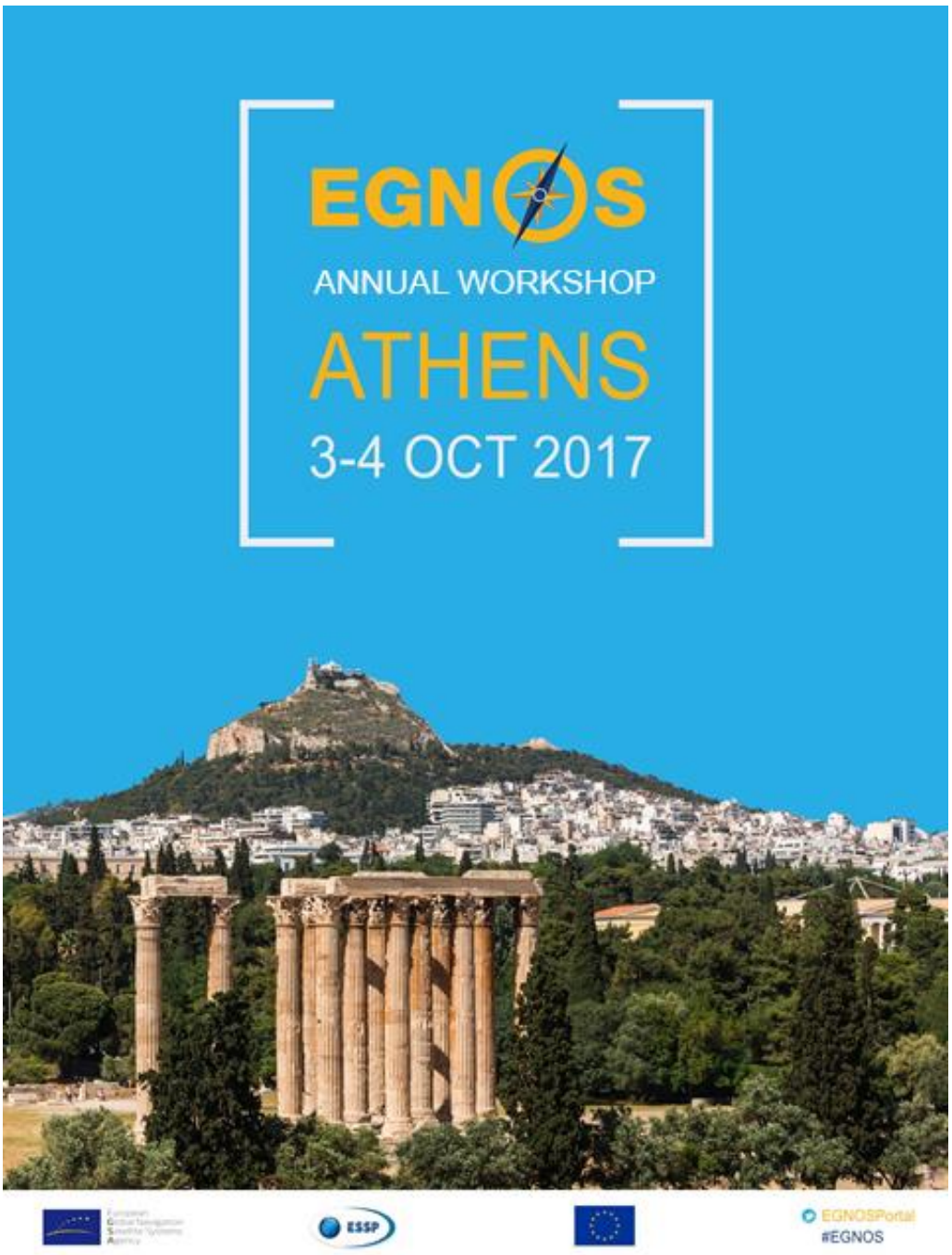


Figure 47: 2017 EGNOS Annual Workshop

5.1.5.2 *2017 EGNOS Planned Event Participation*

The table below shows the events at which ESSP participation is planned (supporting GSA stand, as visitors or as attendees) during 2017. The event planning reflects the GSA mandate to boost EGNOS adoption on multimodal domains:

Name of Event	Domain	Date	ESSP participation
Aero Friedrichshafen	Aviation	April 2017	EGNOS Flight Simulator Support to GSA stand
DemoAgro	Agriculture	May 2017	Attendance
European Navigation Conference Navigation	General GNSS	May 2017	3 Papers presented
EBACE (Geneva)	Aviation	May 2017	EGNOS Flight Simulator Support to GSA stand
ITS Europe	Road	June 2017	Paper presentation
ION GNSS	General GNSS	September 2017	Paper presentation (TBC)
INTERGEO	Mapping	September 2017	Support to GSA stand
EGNOS Annual Workshop	EGNOS stakeholders	October 2017	N/A
ERA General Assembly	Aviation	October 2017	TBD
Agritechnica	Agriculture	November 2017	TBD
European Airline Training Symposium	Aviation	November 2017	TBD
METS	Maritime	November 2017	Support to GSA stand
World ATM 2018	Aviation	March 2018	Support to EGNOS stand

Table 15: External communication events for 2017

APPENDIX A FULL LIST OF EGNOS-BASED APPROACH PROCEDURES

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Antwerpen / Deurne	Belgium	EBAW	1	10/12/2015					1
Brussels-National	Belgium	EBBR	3	02/03/2017					3
Charleroi / Brussels South	Belgium	EBCI	2	31/03/2016					2
Liège	Belgium	EBLG	4	13/10/2016					4
Bautzen	Germany	EDAB	2	27/04/2017		15/12/2011			2
Barth	Germany	EDBH			1	03/06/2010			1
Magdeburg/City	Germany	EDBM	1	13/12/2012					1
Neubrandenburg	Germany	EDBN	2	02/04/2015					2
Berlin/Schönefeld	Germany	EDDB			4	04/06/2009			4
Dresden	Germany	EDDC			2	15/12/2011			2
Erfurt-Weimar	Germany	EDDE			2	15/12/2011			2
Frankfurt Main	Germany	EDDF			4	15/12/2011			4
Münster/Osnabrück	Germany	EDDG			2	15/12/2011			2
Hamburg	Germany	EDDH			4	15/12/2011			4
Köln/Bonn	Germany	EDDK			6	15/12/2011			6
Düsseldorf	Germany	EDDL			4	15/12/2011			4
München	Germany	EDDM			4	15/12/2011			4
Nürnberg	Germany	EDDN			1	15/12/2011			1
Leipzig/Halle	Germany	EDDP			4	15/12/2011			4
Stuttgart	Germany	EDDS			1	15/12/2011			1
Berlin-Tegel	Germany	EDDT			4	15/12/2011			4
Hannover	Germany	EDDV			4	15/12/2011			4
Bremen	Germany	EDDW				15/12/2011	2	30/03/2017	2
Frankfurt Hahn	Germany	EDFH	2	23/07/2015					2

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Allendorf/Eder	Germany	EDFQ	1	21/08/2014					1
Hamburg-Finkenwerder	Germany	EDHI	2	13/12/2012					2
Memmingen	Germany	EDJA			2	15/12/2011			2
Paderborn/Lippstadt	Germany	EDLP	2	13/12/2012					2
Niederrhein	Germany	EDLV	1	23/06/2016					1
Dortmund	Germany	EDLW	2	12/12/2013					2
Augsburg	Germany	EDMA			2	15/12/2011			2
Eggenfelden	Germany	EDME	1	11/12/2014					1
Oberpfaffenhofen	Germany	EDMO	1	13/12/2012					1
Straubing	Germany	EDMS	1	11/12/2014					1
Friedrichshafen	Germany	EDNY			2	15/12/2011			2
Donauwörth	Germany	EDPR	2	08/12/2016					2
Coburg-Brandensteinsebene	Germany	EDQC	1	11/12/2014					1
Bayreuth	Germany	EDQD			1	15/12/2011			1
Giebelstadt	Germany	EDQG			2	14/02/2012			2
Karlsruhe/Baden-Baden	Germany	EDSB		17/09/2015			2	27/04/2017	2
Donaueschingen-Villingen	Germany	EDTD	1	11/12/2014					1
Lahr	Germany	EDTL	1	23/06/2016			1	27/04/2017	2
Mengen-Hohentengen	Germany	EDTM	1	11/12/2014					1
Schwäbisch-Hall	Germany	EDTY	2	13/12/2012					2
Braunschweig-Wolfsburg	Germany	EDVE	2	18/10/2012					2
Kassel-Calden	Germany	EDVK	2	04/04/2013					2
Bremerhaven	Germany	EDWB			2	15/12/2011			2
Emden	Germany	EDWE	4	30/05/2013					4
Wilhelmshaven JadeWeserAirport	Germany	EDWI			2	15/12/2011			2
Sylt	Germany	EDXW	2	10/12/2015					2

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Kuressaare	Estonia	EEKE	2	02/03/2017					2
Joensuu	Finland	EFJO	2	12/12/2013					2
Campbeltown	United Kingdom	EGEC	2	23/06/2016					2
Cardiff	United Kingdom	EGFF	2	13/10/2016					2
Bristol	United Kingdom	EGGD	2	21/08/2014					2
Land's End	United Kingdom	EGHC	4	27/04/2017					4
Alderney	Guernsey	EGJA	2	07/12/2011					2
Barrow/Walney Island	United Kingdom	EGNL	2	23/06/2016					2
Kirkwall	United Kingdom	EGPA	2	21/07/2016					2
Sumburgh	United Kingdom	EGPB	3	27/04/2017					3
Wick	United Kingdom	EGPC	2	23/06/2016					2
Islay	United Kingdom	EGPI	2	18/08/2016					2
Dundee	United Kingdom	EGPN	2	30/03/2017					2
Barra	United Kingdom	EGPR	2	18/08/2016					2
Tiree	United Kingdom	EGPU	2	04/02/2016					2
Exeter	United Kingdom	EGTE	2	21/08/2014					2
Eelde	Netherlands	EHGG	2	13/11/2014					2
Teuge	Netherlands	EHTE	1	13/11/2014					1
Aarhus	Denmark	EKAH	2	05/03/2015					2
Esbjerg	Denmark	EKEB	2	15/10/2015					2
Karup	Denmark	EKKA	2	02/04/2015					2
Sønderborg	Denmark	EKSB	2	18/08/2016					2
Ålesund/Vigra	Norway	ENAL	2	03/03/2016					2
Andøya/Andenes	Norway	ENAN	2	02/04/2015					2
Førde/Bringeland	Norway	ENBL	1	28/05/2015			1	27/04/2017	2
Brønnøysund/Brønnøy	Norway	ENBN	1	08/12/2016					1

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Bergen/Flesland	Norway	ENBR			2	03/03/2016			2
Kristiansand/Kjevik	Norway	ENCN			2	03/03/2016			2
Harstad/Narvik/Evenes	Norway	ENEV	1	30/03/2017					1
Florø	Norway	ENFL	1	02/04/2015					1
Gardermoen	Norway	ENGM					4	10/11/2016	4
Haugesund/Karmøy	Norway	ENHD			2	03/03/2016			2
Kristiansund/Kvernberget	Norway	ENKB	2	26/05/2016					2
Kirkenes/Hoybuktmoen	Norway	ENKR	2	27/04/2017					2
Leknes	Norway	ENLK	1	02/02/2017					1
Molde/Årø	Norway	ENML					1	30/03/2017	1
Mosjøen/Kjærstad	Norway	ENMS	1	30/03/2017					1
Namsos	Norway	ENNM		02/04/2015			2	27/04/2017	2
Ørland	Norway	ENOL			2	03/03/2016			2
Rørvik/Ryum	Norway	ENRM					2	02/02/2017	2
Røst	Norway	ENRS	2	06/03/2014					2
Moss/Rygge	Norway	ENRY	2	10/12/2015					2
Svolvær/Helle	Norway	ENSH	1	08/12/2016					1
Stokmarknes/Skagen	Norway	ENSK	1	08/12/2016					1
Stord/Sørstokken	Norway	ENSO			2	03/03/2016			2
Sandnessjøen/Stokka	Norway	ENST	2	23/07/2015					2
Sandefjord/Torp	Norway	ENTO	2	20/08/2015					2
Trondheim/Vårnes	Norway	ENVA			2	03/03/2016			2
Stavanger/Sola	Norway	ENZV			4	03/03/2016			4
Gdańsk Lech Wałęsa	Poland	EPGD	2	28/05/2015					2
Kraków - Balice	Poland	EPKK	2	18/08/2016					2
Katowice	Poland	EPKT	2	03/04/2014					2

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Rzeszów - Jasionka	Poland	EPRZ	1	15/09/2016					1
Wroclaw/Strachowice	Poland	EPWR	2	13/10/2016					2
Storuman	Sweden	ESUD	1	11/12/2014					1
Dubrovnik	Croatia	LDDU	1	10/12/2015					1
Almería	Spain	LEAM	1	02/02/2017					1
Santander	Spain	LEXJ	2	17/10/2013					2
Dieppe Saint Aubin	France	LFAB	1	02/03/2017					1
Calais	France	LFAC	1	20/09/2012					1
Albert Bray	France	LFAQ	2	15/11/2012					2
Le Touquet Paris Plage	France	LFAT	2	04/02/2016					2
Valenciennes Denain	France	LFAV	2	19/09/2013					2
Amiens Glisy	France	LFAY	1	27/06/2013					1
Agen La Garenne	France	LFBA	1	06/03/2014					1
Bordeaux Merignac	France	LFBD	3	08/03/2012					3
Bergerac	France	LFBE	2	09/01/2014					2
Toulouse Francazal	France	LFBF	2	23/06/2016					2
La Rochelle	France	LFBH	1	20/09/2012					1
Poitiers Biard	France	LFBI	2	12/11/2015					2
Montluçon Gueret	France	LFBK	1	17/12/2013					1
Limoges	France	LFBL	2	28/06/2012					2
Niort Marais Poitevin	France	LFBN	1	02/03/2017					1
Toulouse Blagnac	France	LFBO	4	03/05/2012					4
Pau-Pyrénées	France	LFBP	1	17/03/2011					1
Muret Lherm	France	LFBR	1	15/10/2015					1
Tarbes Lourdes Pyrénées	France	LFBT	1	28/05/2015					1
Angoulême Brie Champniers	France	LFBU	2	03/04/2014					2

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Périgueux Bassillac	France	LFBX	1	28/05/2015					1
Biarritz Bayonne Anglet	France	LFBZ	1	09/02/2012	1	01/01/2013			2
Albi Le Sequestre	France	LFCI	2	26/05/2016					2
Castres Mazamet	France	LFCK	1	22/08/2013					1
Rodez Marcillac	France	LFCR	2	31/05/2012					2
Royan Médis	France	LFCY	1	30/04/2015					1
Auch Lamothe	France	LFDH	2	28/05/2015					2
Ouessant	France	LFEC	2	11/12/2014					2
Colmar Houssen	France	LFGA	2	02/05/2013					2
Dole Tavaux	France	LFGJ	1	09/01/2014					1
Le Puy Loudes	France	LFHP	2	04/02/2016					2
Moulins Montbeugny	France	LFHY	1	01/05/2014					1
Metz Nancy Lorraine	France	LFJL	2	04/04/2013					2
Angers Marcé	France	LFJR	1	07/01/2016					1
Calvi Sainte Catherine	France	LFKC	2	30/04/2015					2
Ajaccio Napoléon Bonaparte	France	LFKJ	1	23/06/2016					1
Auxerre Branches	France	LFLA	2	21/08/2014					2
Clermont-Ferrand Auvergne	France	LFLC	1	05/05/2011					1
Bourges	France	LFLD	1	18/08/2016					1
Lyon St Exupery	France	LFLL	4	07/02/2013					4
Saint Yan	France	LFLN					2	02/03/2017	2
Annecy Meythet	France	LFLP	2	19/09/2013					2
Grenoble Isere	France	LFLS	1	07/03/2013			1	13/10/2016	2
Valence	France	LFLU	1	13/12/2012					1
Vichy Charmeil	France	LFLV	1	05/02/2015					1
Aurillac	France	LFLW	1	26/06/2014					1

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Chateauroux Deols	France	LFLX	1	06/02/2014					1
Lyon Bron	France	LFLY					2	28/09/2016	2
Cannes Mandelieu	France	LFMD	1	05/02/2015					1
Saint Étienne Bouthéon	France	LFMH		24/07/2014			2	02/02/2017	2
Carcassonne Salvaza	France	LFMK	1	03/05/2012					1
Marseille	France	LFML	4	08/01/2015	2	25/06/2015			6
Nice Côte d'Azur	France	LFMN	2	25/06/2015					2
Perpignan Rivesaltes	France	LFMP	1	15/10/2015					1
Béziers Vias	France	LFMU	2	18/10/2012					2
Mende	France	LFNB	1	17/12/2013					1
Beauvais	France	LFOB	1	20/09/2012					1
Évreux Fauville	France	LFOE	2	15/11/2012					2
Le Havre Octeville	France	LFOH	1	10/12/2015					1
Orleans Bricy	France	LFOJ	2	18/09/2014					2
Chalons Vatry	France	LFOK	2	02/02/2017					2
Blois Le Breuil	France	LFOQ	1	15/09/2016					1
Cholet le Pontreau	France	LFOU	2	04/02/2016					2
Orléans St. Denis De L'Hotel	France	LFOZ	2	28/06/2012					2
Paris-Le Bourget	France	LFPB	2	02/06/2011					2
Paris Charles de Gaulle	France	LFPG					4	28/04/2016	4
Melun Villaroche	France	LFPM	2	10/12/2015					2
Toussus Le Noble	France	LFPN					2	27/04/2017	2
Paris Orly	France	LFPO	5	30/05/2013	1	30/04/2015			6
Pontoise Cormeilles en Vexin	France	LFPT	3	01/05/2014					3
Reims Prunay	France	LFQA	1	03/04/2014					1
Troyes Barberey	France	LFQB					2	18/08/2016	2

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Nevers Fouchambault	France	LFQG	1	13/12/2012					1
Besançon La Vèze	France	LFQM	1	18/09/2014					1
Lille Lesquin	France	LFQQ	3	26/06/2014					3
Merville	France	LFQT	1	15/11/2012					1
Brest Bretagne	France	LFRB	1	03/05/2012	1	01/01/2014			2
Cherbourg Maupertus	France	LFRC					1	23/06/2016	1
Dinard	France	LFRD	2	06/02/2014					2
Deauville Saint Gatien	France	LFRG	1	18/09/2014					1
La Roche Sur Yon	France	LFRI		13/12/2012			1	10/11/2016	1
Caen Carpiquet	France	LFRK	1	11/12/2014					1
Le Mans	France	LFRM	1	15/11/2012					1
Rennes	France	LFRN	2	30/05/2013					2
Lannion	France	LFRO	1	07/01/2016					1
Quimper	France	LFRQ	1	09/01/2014					1
Nantes	France	LFRS	1	28/06/2012					1
Saint Brieuc Armor	France	LFRT	1	10/12/2015					1
Morlaix Ploujean	France	LFRU	1	13/10/2016					1
Vannes Meucon	France	LFRV	1	31/05/2012					1
Saint Nazaire Montoir	France	LFRZ	1	28/10/2014					1
Bâle-Mulhouse	France	LFSB	2	10/12/2015					2
Dijon-Longvic	France	LFSD	1	28/04/2016					1
Epinal Mirecourt	France	LFSG	1	30/05/2013					1
Brive Souillac	France	LFSL	2	22/08/2013					2
Nancy Essey	France	LFSN	1	02/05/2013					1
Strasbourg Entzheim	France	LFST	2	10/12/2015					2
Nîmes Garons	France	LFTW	2	18/10/2012					2

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Budapest Liszt Ferenc	Hungary	LHBP					4	15/09/2016	4
Olbia/Costa Smeralda	Italy	LIEO	2	12/11/2015					2
Milan/Malpensa	Italy	LIMC	2	21/08/2014					2
Milan/Linate	Italy	LIML	2	13/12/2012					2
Bologna Borgo Panigale	Italy	LIPE	1	18/11/2014					1
Venezia/Tessera	Italy	LIPZ	3	27/06/2013					3
Rome/Ciampino	Italy	LIRA	1	10/01/2013					1
Rome/Fiumicino	Italy	LIRF	6	10/01/2013					6
Karlovy Vary	Czech Republic	LKKV	2	13/11/2014					2
Ostrava	Czech Republic	LKMT	2	09/01/2014					2
Prague	Czech Republic	LKPR			4	09/01/2014			4
Brno	Czech Republic	LKTB	2	09/01/2014					2
Prague/Vodochody	Czech Republic	LKVO	2	25/06/2015					2
Graz	Austria	LOWG	1	09/01/2014					1
Linz	Austria	LOWL	1	09/01/2014			1	02/02/2017	2
Vienna - Schwechat	Austria	LOWW					3	02/02/2017	3
Lisbon	Portugal	LPPT	2	28/05/2015					2
Cluj - Napoca / Avram Iancu	Romania	LRCL	2	10/11/2016					2
Les Eplatures	Switzerland	LSGC					1	26/05/2016	1
Genève	Switzerland	LSGG	2	12/11/2015					2
Dübendorf	Switzerland	LSMD	2	21/08/2014					2
Emmen	Switzerland	LSME	1	03/04/2014					1
Payerne	Switzerland	LSMP	1	17/09/2015					1
Berne-Belp	Switzerland	LSZB	1	07/03/2013					1
Grenchen	Switzerland	LSZG	1	25/07/2013					1
St. Gallen-Altenrhein	Switzerland	LSZR	1	17/11/2011					1

Operational Aerodromes / Heliports									
Airport	Country	ICAO Code	APV-I Procedure	Activation APV-I procedure	APV Baro Procedure	Activation APV Baro Procedure	LPV-200 Procedure	Activation LPV-200 procedure	Total Procedures (LPV + APV Baro + LPV-200)
Bratislava-Milan Rastislav Štefánik	Slovak Republic	LZIB	2	05/02/2015					2
Košice	Slovak Republic	LZKZ	2	05/02/2015					2
Piešťany	Slovak Republic	LZPP					1	02/02/2017	1

Table 16: Full list of EGNOS-based Approach Procedures as of 27th April 2017 (AIRAC cycle 5)

APPENDIX B LIST OF ACRONYMS

Acronym	Definition
ABS	Abu Simbel
ACI	Airports Council International
ACR	Azores
AFTN	Aeronautical Fixed Telecommunication Network
AGA	Agadir
AIRAC	Aeronautical Information Regulation And Control
AIS	Aeronautical Information Service
ALB	Aalborg
ALY	Alexandria
AME	Accuracy Major Event
ANSP	Air Navigation Service Provider
APV	Approach with Vertical Guidance
ASECNA	Agency for Aerial Navigation Safety in Africa and Madagascar
ATH	Athens
ATM	Air Traffic Management
BE	Belgium
BRN	Berlin
CCB	Configuration Control Board
CCF	Central Control Facility
CEO	Chief Executive Officer
CNR	Canary Islands
CRK	Cork
CTN	Catania
DGNSS	Differential GNSS
DGPS	Differential GPS
DJA	Djerba
DK	Denmark
EAD	European Aeronautical Database
EBACE	European Business Aviation Conference & Exhibition
EC	European Commission
EDAS	EGNOS Data Access Service

Acronym	Definition
EGI	Egilsstadir
EGNOS	European Geostationary Navigation Overlay Service
EMA	EGNOS Multimodal Adoption
EMRF	European Maritime Radio-Navigation Forum
ENC	European Navigation Conference
ENI	European Neighbourhood Instrument
ERA	European Regions Airline Association
ESA	European Space Agency
ESR	EGNOS System Release
ESRI	Environmental Systems Research Institute
ESSP	European Satellite Services Provider
EU	European Union
EUROCAE	European Organisation for Civil Aviation Equipment
EWA	EGNOS Working Agreement
FAA	Federal Aviation Administration
FP7	Seventh Framework Programme
FTP	File Transfer Protocol
GEO	Geostationary Satellite
GLG	Glasgow
GLONASS	Globalnaya Navigatsionnaya Sputnikovaya Sistema
GNSS	Global Navigation Satellite System
GOL	Gölbasi
GPS	Global Positioning System
GSA	European GNSS Agency
GVL	Gävle
HAL	Horizontal Alert Limit
HBK	Hartebeeshoek
HNSE	Horizontal Navigation System Error
HPL	Horizontal Protection Level
HIS	Horizontal Safety Index
HU	Hungary
IAA	Irish Aviation Authority
IAIN	International Association of Institutes of Navigation

Acronym	Definition
IAP	Instrument Approach Procedure
ICAO	International Civil Aviation Organisation
IE	Ireland
ILS	Instrument Landing System
ION	Institute Of Navigation
ISO	International Organisation for Standardisation
ITS	Intelligent Transportation Systems
IWG	Interoperability Working Group
JME	Jan Mayen
KIR	Kirkeness
KOU	Kourou
LAP	Lappeenranta
LBS	Location Bases Services
LPI	La Palma
LPV	Localizer Performance with Vertical guidance
LSB	Lisbon
LYR	Longyearbyen
MAD	Madeira
MCC	Mission Control Centre
MEDA	Euro-Mediterranean Partnership
METS	Marine Equipment Trade Show
MLG	Malaga
MON	Moncton
MRD	Mission Requirement Document
MT	Message Type
N/A	Not Applicable/ Not Available
NL	Netherlands
NLES	Navigation Land Earth Station
NOF	NOTAM Offices
NOTAM	Notice to Airmen
NOU	Nouakchott
NPA	Non-Precision Approach
NSE	Navigation System Error

Acronym	Definition
NSG	Navigation Steering Group
NTRIP	Networked Transport of RTCM via Internet Protocol
OP	Operation
OS	Open Service
PA	Precision Approach
PANSA	Polish Air Navigation Services Agency
PAR	Paris
PBN	Performance Based Navigation
PDM	Palma De Mallorca
PRN	Pseudo-Random Noise
R&D	Research and Development
RAISG	RNAV Approach Implementation Support Group
RDAF	Royal Danish Air Force
RIMS	Ranging and Integrity Monitoring Station
RKK	Reykjavík
RNAV	Area Navigation
RNLAF	Royal Netherlands Air Force
RNP	Required Navigation Performance
ROM	Rome
RTCA	Radio Technical Commission for Aeronautics
RTK	Real Time Kinematic
RWY	Runway
SBAS	Satellite-Based Augmentation System
SC	Special Committee
SDC	Santiago De Compostela
SDD	Service Definition Document
SES	Single European Sky
SIS	Signal-In-Space
SISNeT	Signal-In-Space through the Internet
SL0	Service Level 0
SL2	Service Level 2
SOF	Sofia
SoL	Safety-Of-Life

Acronym	Definition
SWA	Swanwick
TF	Task Force
TLS	Toulouse
TRD	Trondheim
TRO	Tromsoe
UAS	Unmanned Aircraft Systems
UK	United Kingdom
VAL	Vertical Alert Limit
VNSE	Vertical Navigation System Error
VPL	Vertical Protection Level
VSI	Vertical Safety Index
WAAS	Wide Area Augmentation System
WG	Working Group
WRS	Warsaw
YSR	Yearly System Release
ZUR	Zurich

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