Service Provision Yearly Report (April 2022 - December 2022)

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1 EXECUTIVE SUMMARY

1.1 A word from the ESSP CEO

Another year has passed with ESSP very pleased in providing first class EGNOS services, to Safety of Life, Open Service and EDAS users: with satisfaction at 8.9 out of 10 from the 2022 user survey.

For aviation, the EGNOS service is provided in 33 countries, 463 airports/helipads, for a total of 875 EGNOS-based operations. The period up to 2030 is a pivotal period for the European Union in the field of air navigation in fact, regulation will require 100% of IFR runway-ends in Europe to offer SBAS landing by 2024; and by 2030 all CAT I landings supported by EGNOS only. The development of EGNOS based navigation procedures will continue increasing. Operational continuity is essential for the implementation of the PBN (performance-based navigation) Regulation. ESSP is committed and proud to be part of the EGNOS journey that also helps the goal of Carbon Neutrality in Europe in 2050.

ESSP continued its specific dissemination and awareness campaign related to the EGNOS Working Agreement (EWA). As a result of this activity, ESSP has signed 2 new EWAs (currently 76 in force) between April and December 2022): both of them established with rotorcraft operators.

In the maritime domain, ESSP continues with the support to the EGNOS Maritime Service Implementation Plan and we are looking forward to implementing the new SBAS-L1 EGNOS Maritime service at the end of 2023. In addition, ESSP supported closely EUSPA in the development and publication of the IEC SBAS maritime receiver standard: support which will continue, considering the likely interest of EUSPA in developing new SoL SDD for rail, road and drones, on top of aviation and maritime applications.

ESSP keeps being very responsive and efficient towards the EGNOS Programme needs, especially in the support to anomaly resolution. Such was for example, the EGNOS system release 2.4.2A-YSR#5-PSS1, which was deployed in May 2022 to correct a risk, detected four months earlier, of common mode of failure at system level.

Regarding EGNOS performance, the values are in line with the ones committed in the Open Service, Safety-of-Life, and EDAS Service Definition Documents. Nonetheless, the southwest region was slightly degraded due to ionospheric irregularities linked to the increase in solar activity as expected during the so called “Solar Cycle 25” whilst the northern border due to the occurrences of periods with high geomagnetic activity.

The EGNOS annual workshop with the users was celebrated on October 2022 as part of the European Space Week organised by EUSPA. In the EGNOS session interesting case studies of EGNOS implementation in the aviation, maritime, rail and agriculture sectors were presented (refer to EGNOS User Support Website).

Speaking about the new challenges in the coming period, I would like to highlight the transition of the current EGNOS Service Provision contract to the new one that took place in January 2023. This new contract is bringing a new relationship between EUSPA and ESSP with the aim of benefiting EGNOS users, in particular the enhancement of current security functions as one of the main objectives.

Besides, the management of risk related to EGNOS performance will continue to be a priority in order to keep first class EGNOS service provision. Some of these risks include the reallocation of certain EGNOS monitoring stations and the management of the upcoming Solar Cycle 25 with the peak expected in 2025. Namely, for the Solar Cycle 25, ESSP in coordination with EUSPA are working on mitigation actions such as anticipated communication to users, and assessing the robustness of the upcoming releases (namely the ESR 2.4.2B expected to be deployed in the last quarter of 2023).

The maturity of the ESSP Management System is demonstrated by the maintenance of the, ISO27001, ISO9001 and mostly important EASA Pan-European service provider certificate.

I would like to thank the ESSP teams for their commitment, our partners and subcontractors for adapting to the ever-evolving situations and sustaining the first-class services; and finally our customer EUSPA for their continued trust.

Charlotte Neyret
CEO, ESSP SAS

ESSP

1.2 Executive summary

This document covers the period from 1 April 2022 to 31 December 2022.

Service performance

EGNOS service performance has been good, providing values consistent with those committed in the Open Service, Safety-of-Life and EDAS Service Definition Documents.

EGNOS Safety-of-Life (SoL) Service – Non-Precision Approach (NPA)	
NPA Availability	99.73% coverage of the 99.9% NPA Service Area (EGNOS SoL SDD v3.4)
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	97.00% coverage of the 99% APV-I Service Area (EGNOS SoL SDD v3.4)
APV-I Integrity	No APV-I integrity event
APV-I Continuity	98.51% coverage of the $5{\cdot}10^{-4}$ APV-I Service Area (EGNOS SoL SDD v3.4)
EGNOS Safety-of-Life (SoL) Service – LPV-200	
LPV-200 Availability	93.28% coverage of the 99% LPV-200 Service Area (EGNOS SoL SDD v3.4)
LPV-200 Integrity	No LPV-200 integrity event
LPV-200 Continuity	87.77% coverage of the $5{\cdot}10^{-4}$ LPV-200 Service Area (EGNOS SoL SDD v3.4)
LPV-200 Accuracy Tails	No events happened during the period
EGNOS Open Service (OS)	
Horizontal Accuracy	2.3 metres (95th percentile of the cumulative data for all stations)
Vertical Accuracy	2.5 metres (95th percentile of the cumulative data for all stations)
Open Service Availability	Above 99% for all locations, except RIMS CNR and LPI

EGNOS Data Access Service (EDAS)		
Service	Availability	Latency
Service Level 0	99.96% vs 98.5% target (EDAS SDD)	652.46 ms vs 1300 ms target (EDAS SDD)
Service Level 2	99.96% vs 98.5% target (EDAS SDD)	652.77 ms vs 1450 ms target (EDAS SDD)
Ntrip	99.85% vs 98% target (EDAS SDD)	615.06 ms vs 1750 ms target (EDAS SDD)
SISNeT	99.84% vs 98% target (EDAS SDD)	57.69 ms vs 1150 ms target (EDAS SDD)
Data Filtering	99.83% vs 98% target (EDAS SDD)	459.62 ms vs 1750 ms target (EDAS SDD)
FTP	99.87% vs 98% target (EDAS SDD)	N/A

Signal-In-Space (SiS) Availability		
PRN123 (EGNOS OP)	PRN136 (EGNOS OP)	EGNOS OP (at least one SiS)
99.97%	99.99%	100%

Table 1: EGNOS service performance from April 2022–December 2022

The leading causes for the observed EGNOS Service performance degradations were the following:

- *EGNOS OS and SoL services:*
    - **Ionosphere monitoring:** the EGNOS ionosphere monitoring problems affected mainly the north and south-west of the Service Area. Since the beginning of 2022, it has become the main cause of observed underperformance, with a slightly increased impact compared to the preceding yearly period (approximately 38% of the daily underperformance events vs 35% in the preceding period). The main reason is the ramp-up of solar activity due to solar cycle #25, which has led to ionospheric disturbances occurring with more frequency.
    - **GPS monitoring:** Problems related to monitoring one or more GPS satellites (e.g. non-monitored satellites due to the lack of visibility from the EGNOS reference stations, satellites set to 'Do not use'/'Not Monitored') are some of the most recurrent causes of observed underperformance. This monitoring loss of some satellites has been especially significant in impacting performance during periods with degraded ionosphere monitoring conditions.

      This type of problem has significantly decreased compared to the preceding year (approximately 31% of the daily underperformance events vs 35% in the preceding period), mainly due to the increasing significance of ionosphere monitoring problems.
    - **Notice Advisory to Navstar Users (NANU):** The publication of NANUs that declare certain satellites as temporarily unusable has impacted the EGNOS service performance on specific days in most of the Service Area. The most notable degradations took place during the months of October, November and December when the majority of the published NANUs required the activation of the OWA to avoid the occurrence of OR-1466. This OWA implied the loss of monitoring of the affected satellites for a minimum period of 48 hrs, in some instances in multiple satellites simultaneously.

      Globally, this issue has accounted for roughly 11% of the daily underperformance events.
- *EDAS:*

  Services have been very stable, with monthly performances consistently exceeding the committed values defined in the EDAS SDD (Service Definition Document). All EDAS services were available at more than 99.95% during the entire period, except on 20 and 21 October 2022, when a network issue affected their availability, which was reduced to 99.21% (monthly average).

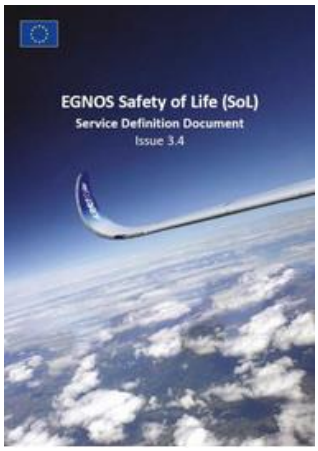
  Apart from this main service outage, during the reporting period, there was a degradation of the FTP service, where the files were published with intermittent delays from June 2022, but not affecting the availability of the FTP service. This issue continued until 27 September.

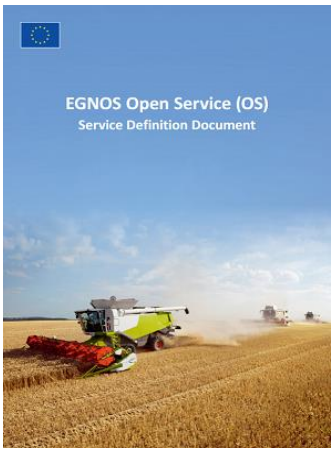
  During the reporting period, the EDAS version was upgraded from v2.5.10 to v2.5.12, including a Nagios COTS and OS upgrade to resolve obsolescence issues, RIMS configuration, FTP certificate renewal and ORs resolution.

1.3 Service provision and Development

- **Service Evolution:**
  - **Service Definition Documents (SDD)**:

    A new version of the EGNOS Data Access Service Definition Document (EDAS SDD) was published on 13 September 2023. This v2.3 is released to reflect the service's latest changes, including the inclusion of Iceland as an EGNOS participant member. Additionally, the SDD captures the GSA's transition to the European Union Agency for the Space Programme (EUSPA) and provides up-to-date information on the EDAS performances. It is important to highlight that 2022 marks 10 years since EDAS's service declaration in 2012. Throughout this decade of data provision, the set of services has grown and evolved and has oriented towards different domain applications.





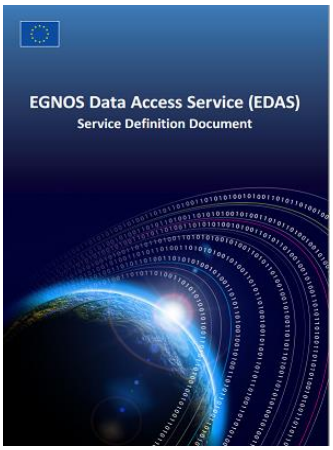


Figure 1: EGNOS Service Definition Documents

Activities towards the publication of a new version of the SoL SDD are ongoing, in close coordination with EUSPA/EC and EASA.

  - **Services Notices**:

    During this period, several Service Notices were published, as listed below:

    - Service Notice #23 "Potential EGNOS underperformance due to GPS maintenance activities", published on 18 October 2023.
    - Service Notice #24 "Potential EGNOS underperformance linked to new EGNOS RIMS configuration". The different releases were issued with updated information on RIMS configuration (v1.0 - 20/12/2022; v2.0 23/12/2022 and v3.0 27/12/2022). It should be noted that the last version v4.0 was recently published on 31/03/2023, confirming that the new RIMS configuration is the result of the decommissioning of RIMS Abu Simbel (ABS – Egypt) and Alexandria (ALY – Egypt).

  - **EGNOS Service Implementation Roadmap:**

    During the reporting period, no new version of Service Implementation Roadmaps has been published as agreed with EUSPA.

- **EGNOS Workshop:**

  The 2022 EGNOS Annual Workshop took place on 5 October 2022 in Prague as a hybrid event and as part of European Space Week. In the EGNOS session, interesting case studies on EGNOS implementation in the aviation, maritime, rail and agriculture sectors were presented.

  Presentations are available on the EGNOS User Support Website.

- **EGNOS User Satisfaction Surveys:**

  The 2022 EGNOS User Satisfaction Survey was announced by EUSPA on 24 October 2022. The survey was closed on 28 February 2023. 82 valid answers were received – 62 of them from EGNOS users and 20 from non-EGNOS users.

- **EGNOS SoL Implementation in Aviation:**

  - **EGNOS procedures:**

    At the end of the period covered by the report (31 December 2022), ESSP was supporting EGNOS-based operations for 463 airdromes and a total of 875 EGNOS-based operations (439 APV-I, 398 LPV-200, 33 APV-Baro EGNOS-based approach procedures, and 5 RNP 0.3 routes).

- **User Service Implementation:**

  - **EGNOS Multimodal Adoption**:

    - All planned activities for 2022 were successfully executed. The market segments to which more effort has been devoted are aviation and maritime, followed by rail, other market segments (energy & raw materials and smart mobility) and agriculture.
    - ESSP and EUSPA have continued engaging aerodromes to publish the EGNOS-based procedures and encouraging operators to get equipped and certified. During the period reported in this document, 36 LPV and 49 LPV200 were published, for a total of 85 EGNOS-based procedures from April to December 2022, and 47 more aircraft/rotorcraft units were engaged so that in the near future they will retrofit, initiate the certification process, or request SBAS options in the avionics for new unit orders.
      A Traffic Assessment and a CBA were performed for Smartwings. In addition, the traffic assessment prepared for Aer Lingus received very positive feedback and was a key input for them to decide to apply for funding.
    - In the maritime domain, the activities related to the use of the EGNOS V2 SiS or EDAS as a positioning source for Aids to Navigation (IALA DGNSS stations and AIS stations) have continued. Contact was established with Finland's maritime authorities and a full architecture analysis and CBA were carried out for their IALA DGNSS and AIS infrastructure to retransmit EGNOS-based corrections. Additionally, a data campaign along the Irish coast was successfully completed.
    - In the rail sector, ESSP has continued supporting EUSPA with a special focus on a market size assessment of European freight wagons to be equipped with GNSS tracking devices (non-SoL market). Nearly 235,000 European freight assets are to be retrofitted by 2024 with EGNSS receivers. It was confirmed that 178,000 smart assets in Europe had already been equipped with EGNSS telematics devices by 2022.
    - In agriculture, customised EGNOS information has been prepared and disseminated, for instance, through the production of a brochure with one use case of EGNOS & Copernicus synergy in

agriculture. There was closer contact with universities to provide practical and theoretical lectures (Munich, Madrid). Success stories in forestry were also published in the EGNOS bulletin.

- Within other markets segments, such as energy and raw materials, a complete report was produced with the outcomes of the research into positioning needs in different applications in this market. Several contacts with smart mobility companies were established, and a success story concerning EGNOS capability in scooters and electric bikes was published in the EGNOS bulletin.

- **User Support:**
  - **EGNOS Helpdesk activities**:

    During 2022, the EGNOS Helpdesk managed 162 user requests, representing 301 total iterations (internal and external). 10 of these requests were received over the phone (although several other calls were received that did not result in a Helpdesk ticket).

  - **EGNOS User Support Website activities**:

    The main task performed during this period was the upgrade from Drupal 7 to Drupal 9, which required updates to several contributed modules, the adaptation of new modules which are no longer available in Drupal 9 and the development of new modules replacing existing custom modules. Full testing of the website was required, including the verification of the existing interfaces (UPCM, Mobile Application, e-mail server EDAS monitoring tool…). Other activities were carried over this period, such as the outcomes from the User Satisfaction Action Plan 2022 proposed to EUSPA (e.g. improvements to the Airport Data Generation Tool).

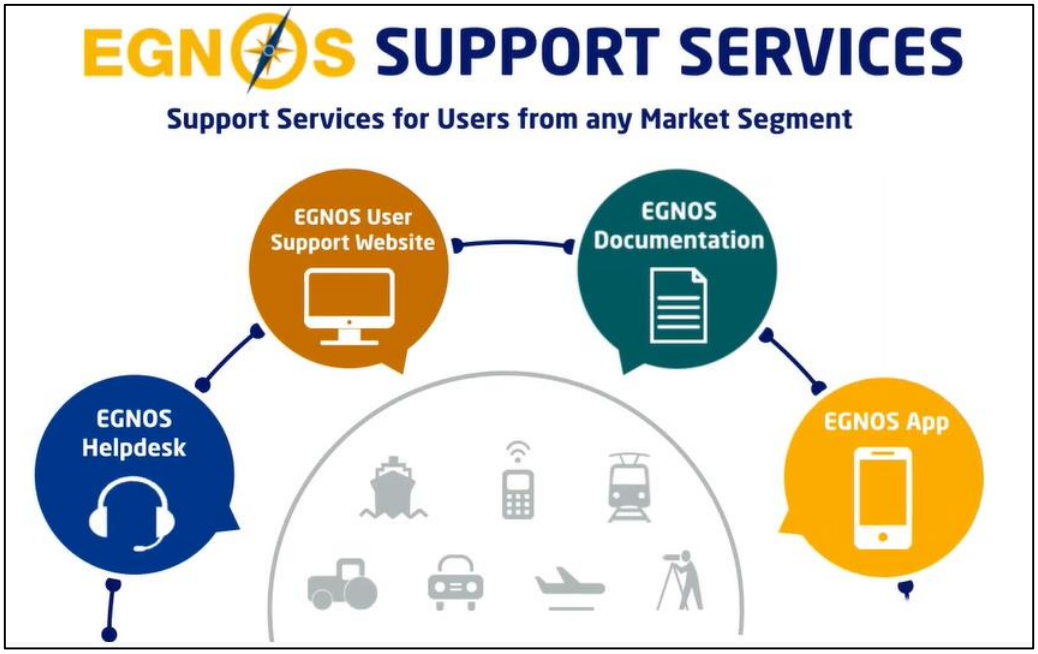


Figure 2: EGNOS Support Services

2 SERVICE PERFORMANCE

2.1 EGNOS SiS availability

2.1.1 SiS Availability Trending

Definition
Individual GEO availability: Percentage of time in which 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 in which 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 performance of SiS availability. It provides the yearly average performances for each GEO of the Operational EGNOS segregation, namely PRN123 and PRN136.

- OP1: PRN136: 99.97%
- OP2: PRN123: 99.99%
- EGNOS OP (at least one SiS): 100%

The following figure shows the monthly results:

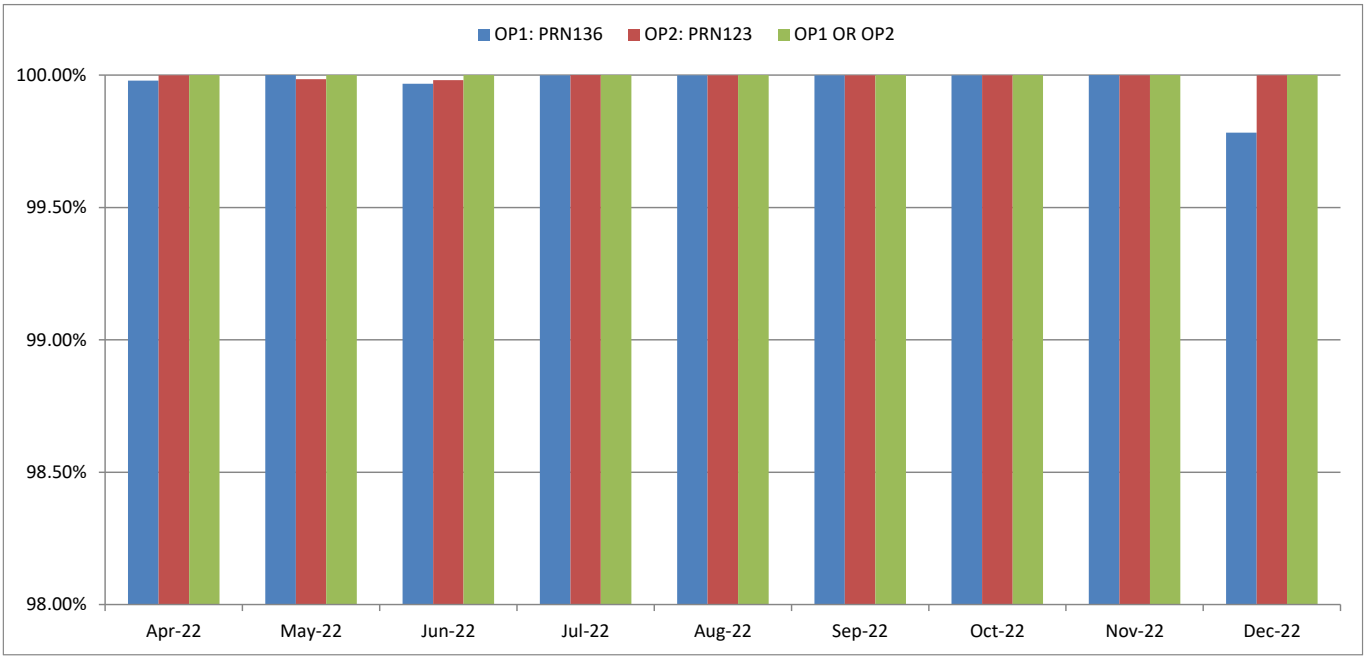


Figure 3: EGNOS SiS OP availability trend from April 2022 to December 2022 (%)

The following table shows the numerical values for each month and each PRN:

DATE	OP1: PRN136	OP2: PRN123	OP1 OR OP2
April 2022	99.9795	99.9990	100
May 2022	100.0000	99.9848	100
June 2022	99.9677	99.9809	100
July 2022	99.9991	99.9998	100
August 2022	99.9994	99.9990	100
September 2022	99.9992	99.9997	100
October 2022	99.9996	99.9990	100
November 2022	100.0000	99.9995	100
December 2022	99.7829	99.9996	100
Average monthly availability	**99.9697**	**99.9957**	**100**

Table 2: EGNOS OP SiS - Monthly availability from April 2022 to December 2022 (%)

2.2 SoL Service – Non-Precision Approach (NPA)

The following figures show the minimum performance for the Non-Precision Approach (NPA) availability and continuity that can be expected from EGNOS, as defined in the EGNOS SoL SDD (see EGNOS SoL Service Definition Document). Version v3.4 of the SoL SDD was published on 04/05/2021.

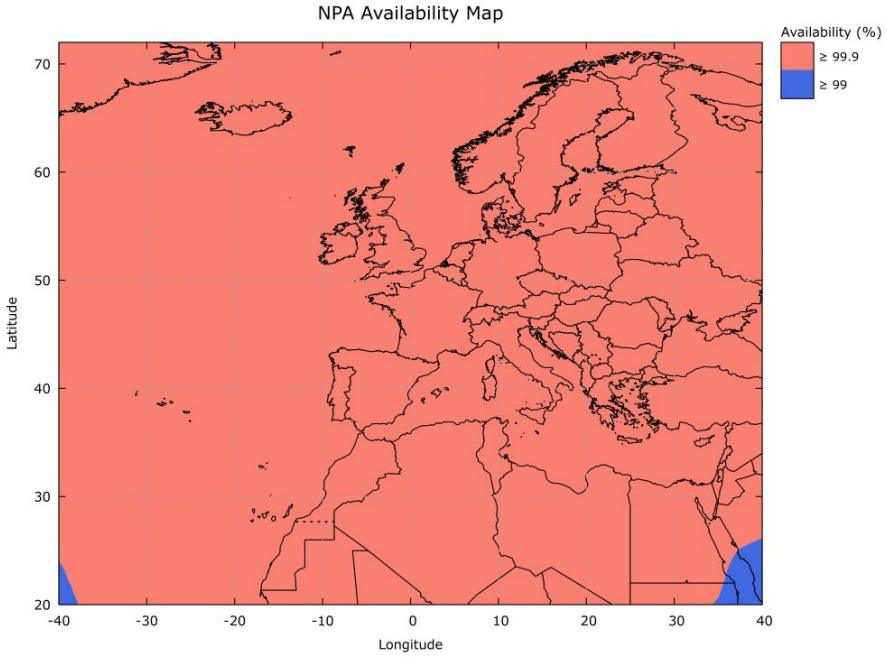


Figure 4: NPA Availability map – Expected minimum performance (SoL SDD v3.4)

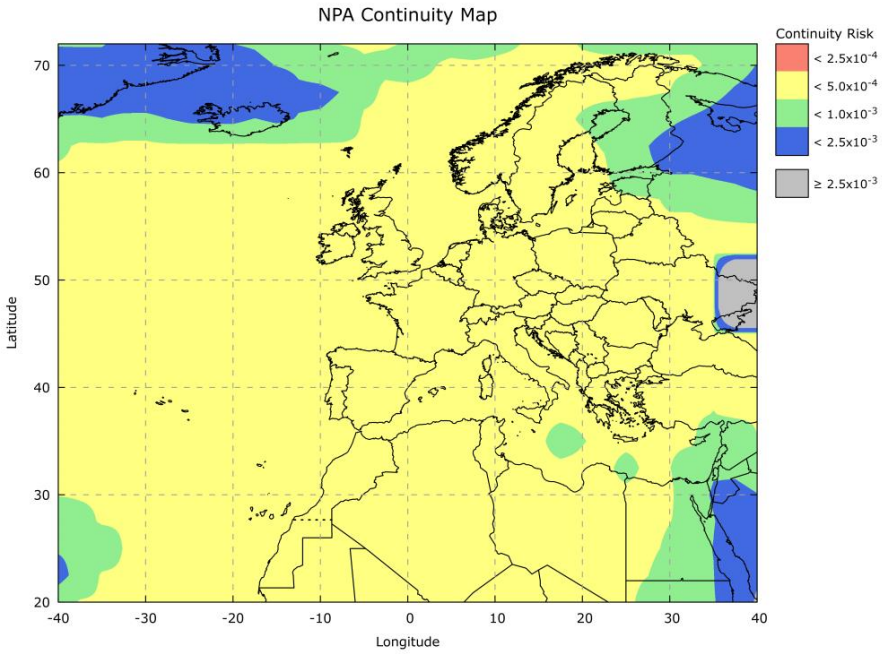


Figure 5: NPA Continuity map – Expected minimum performance (SoL SDD v3.4)

These values correspond to the expected performance measured by a fault-free receiver using all GPS satellites in view for one month and using all operational EGNOS GEOs.

The NPA performance achieved during the reporting period is shown below. Additionally, NPA performance is conveyed through the EGNOS Monthly Performance reports, available on the EGNOS User Support website.

2.2.1 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 shows the NPA availability for the reporting period for combined GEOs (understood as the use of corrections from either one of the two operational GEOs, switching between each one of them in the event that an SiS outage longer than three seconds is observed):

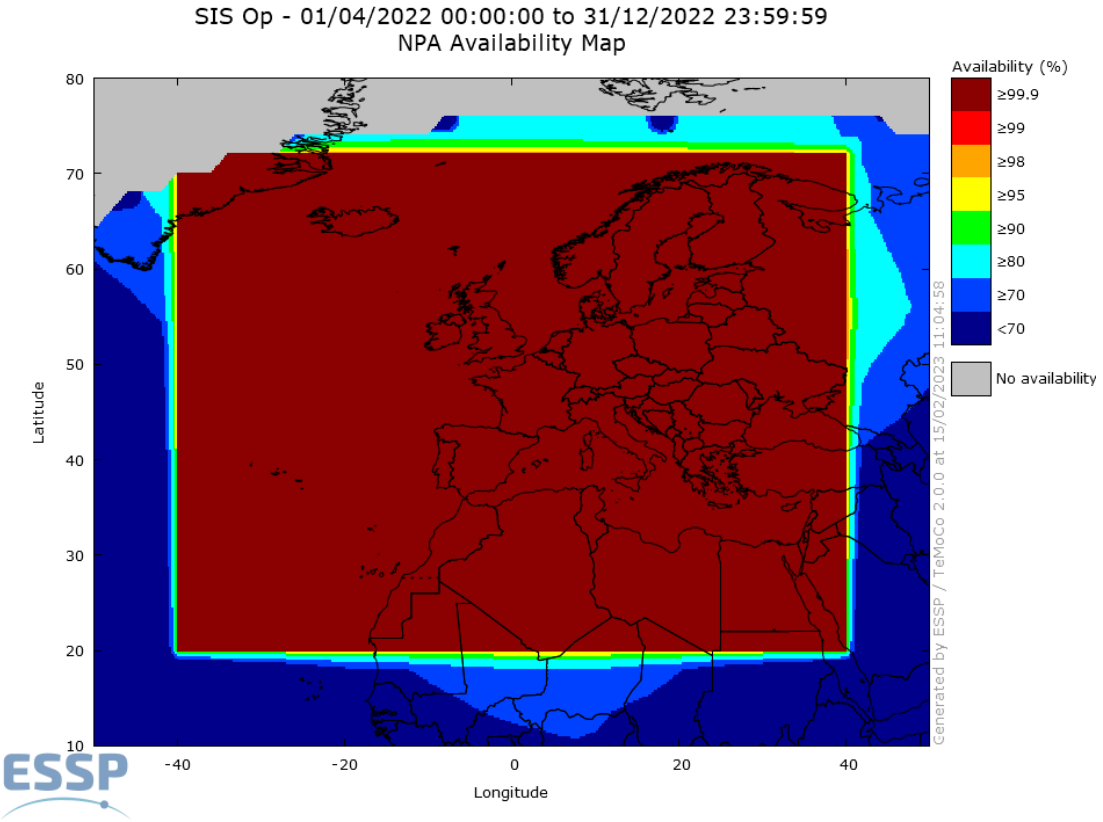


Figure 6: NPA Availability from 01/04/22 to 31/12/22

The NPA availability performance has been excellent during the reporting period: greater than 99% over the entire NPA Service Area[1], except for a very small region over Greenland due to the lack of visibility of the EGNOS operational GEO satellites (GEO-1/PRN136 and GEO-2/PRN123).

[1] The NPA Service Area is the 99% NPA availability area depicted in Figure 4 from the EGNOS Safety of Life SDD. It corresponds to the MT27 area.

2.2.2 NPA Availability – Achievement Against Target

The following figure shows the combination of the 99% NPA availability map and the NPA Service Area. It should be noted that the north-west corner was not covered by the GEO footprint during the reporting period.

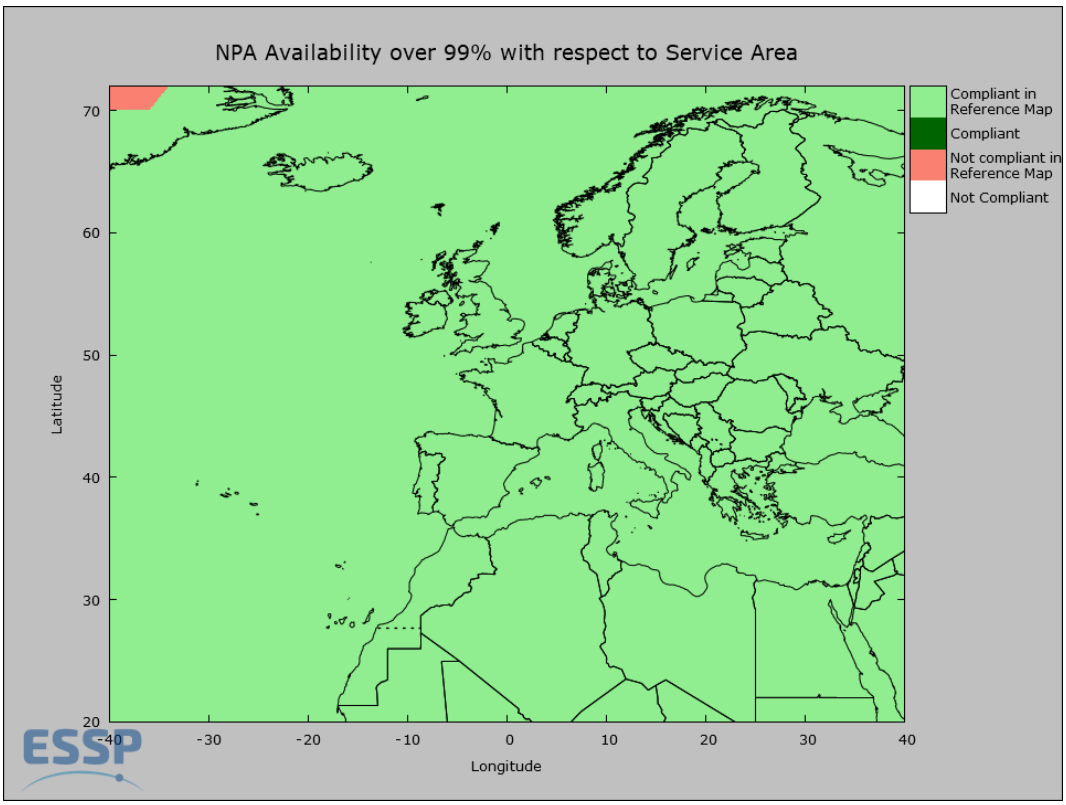


Figure 7: NPA Availability map regarding the Service Area – from 01/04/22 to 31/12/22

In the picture, the legend should be read as follows:

- **Compliant in Reference Map**: the part of the Service Area where NPA availability was above 99%.
- **Not compliant in Reference Map**: the part of the Service Area where NPA availability was lower than 99%.

As shown in the figure above, NPA availability was greater than 99% over the area where the EGNOS GEOs were visible for the reporting period.

Taking the SoL SDD v3.4 commitments as the reference, the percentage of compliant points with the 99.9% NPA Service Area is **99.73%** (this value corresponds to 100% of the 99.9% NPA Service Area not affected by lack of visibility of EGNOS GEOs). Note that the comparison concerning the SDD SoL commitment map is included for information purposes. The commitment map is a monthly reference, whereas the reporting period is one year. Consequently, this comparison must be interpreted with care.

2.2.3 NPA Integrity

*An **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.*

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

Table 3 shows the maximum Horizontal Safety Index (HSI) at each RIMS inside the NPA Service Area (Figure 4).

Station	HSI	Station	HSI
Abu Simbel	0.39	Kirkenes	0.24
Azores	0.35	Lappeenranta	0.21
Agadir	0.76	La Palma	0.60
Aalborg	0.22	Lisbon	0.33
Alexandria	0.45	Madeira	0.63
Athens	0.31	Malaga	0.50
Berlin	0.25	Palma de Mallorca	0.29
Canary Islands	0.67	Reykjavik	0.24
Cork	0.28	Roma	0.24
Catania	0.36	S. de Compostela	0.41
Djerba	0.56	Sofia	0.28
Egilsstadir	0.23	Swanwick	0.25
Glasgow	0.23	Toulouse	0.27
Golbasi	0.31	Trondheim	0.26
Gävle	0.24	Tromsoe	0.34
Haifa	0.33	Warsaw	0.24
Jan Mayen	0.31	Zürich	0.30

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

None of the RIMS stations inside the SDD commitment area were impacted by integrity events in the position domain during the analysed period.

The following figure provides the HSI histogram, collecting measurements from the different EGNOS stations and for the operational GEOs over the entire period.

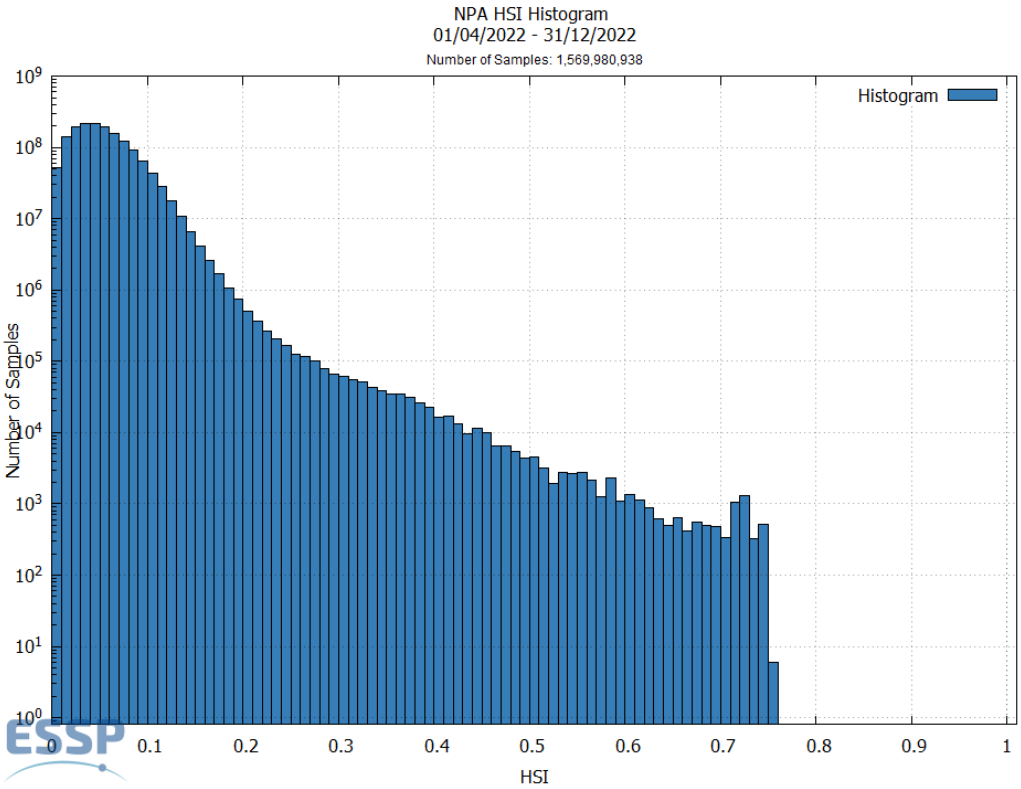


Figure 8: NPA Horizontal Safety Index[2]

[2] Note that some periods may have been removed for the computation of the different histograms presented in this document, corresponding to stations showing poor data quality linked to the local environment. Data extracted from histograms correspond to data from RIMS where any OR affecting data quality has been observed, the presence of cycle slips affecting performance have been detected, or other data quality issues have been traced as causing daily degradations.

2.2.4 NPA Continuity

EGNOS NPA Continuity *is computed by dividing the total number of single continuity events, using a time-sliding window of one hour, by the number of samples with a 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 one hour, the system becomes unavailable.*

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

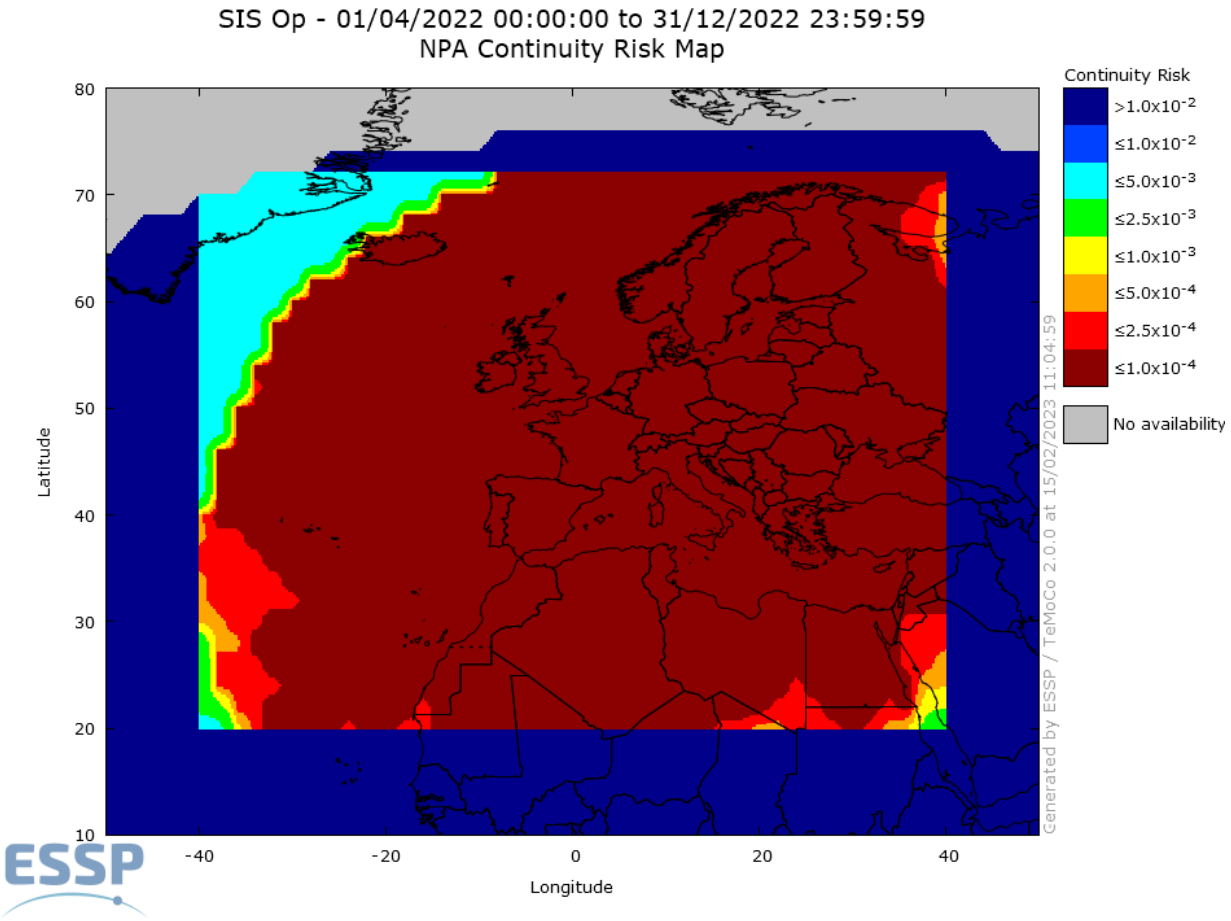


Figure 9: NPA Continuity Risk from 01/04/22 to 31/12/22

As shown in the above figure, most of the MT27 Service Area presents a continuity risk lower than $1 \cdot 10^{-4}$ except for the corners where the performance achieved is slightly worse, mainly due to the lower number of GPS satellites monitored from these regions. In particular, in the north-west corner, continuity performance is impacted by the lack of visibility of GEO123.

2.3 SoL Service – Approach with Vertical guidance (APV-I)

The following figures show the minimum performance expected from EGNOS for an Approach with Vertical guidance (APV-I) availability and continuity, as defined in the EGNOS SoL Service Definition Document. Version v3.4 of the SoL SDD was published on 04/05/2021.

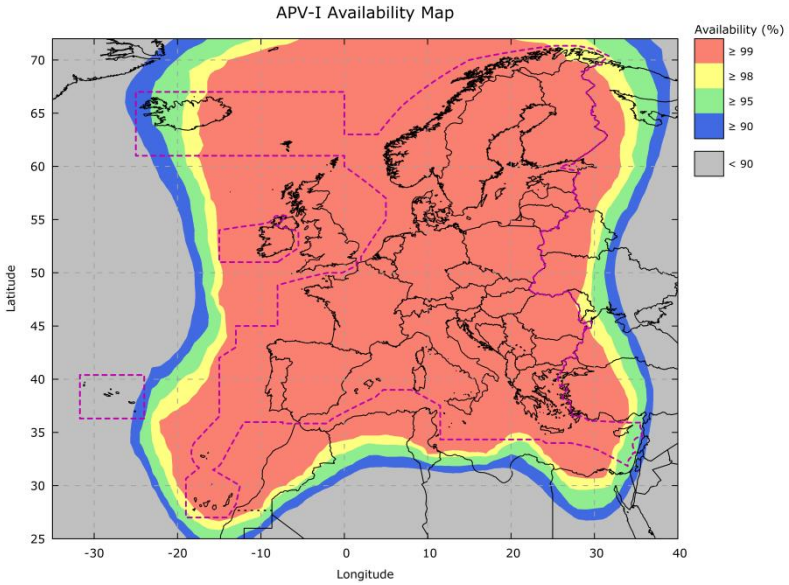


Figure 10: APV-I Availability map – Expected minimum performance (SoL SDD v3.4)

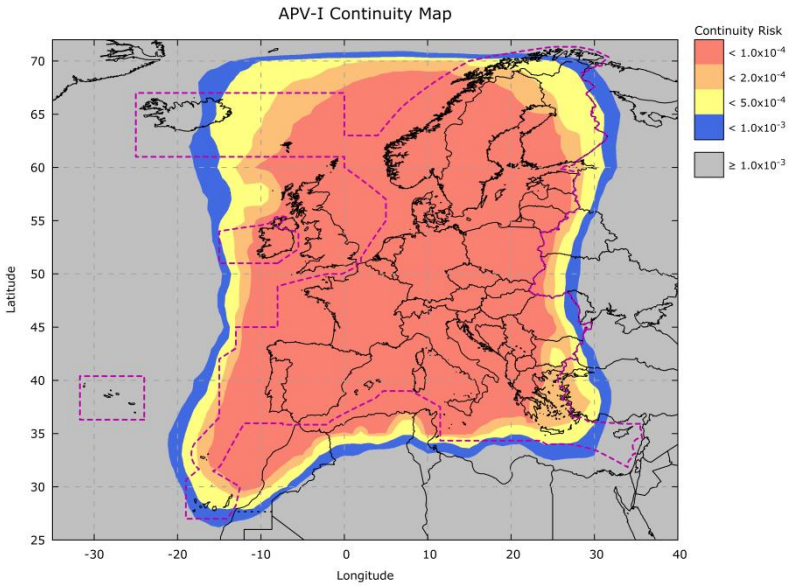


Figure 11: APV-I Continuity map – Expected minimum performance (SoL SDD v3.4)

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

The achieved APV-I performance during the reporting period is shown below. Additionally, APV-I performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website.

2.3.1 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 shows the APV-I Availability map for the combination of the operational GEOs during the reporting period:

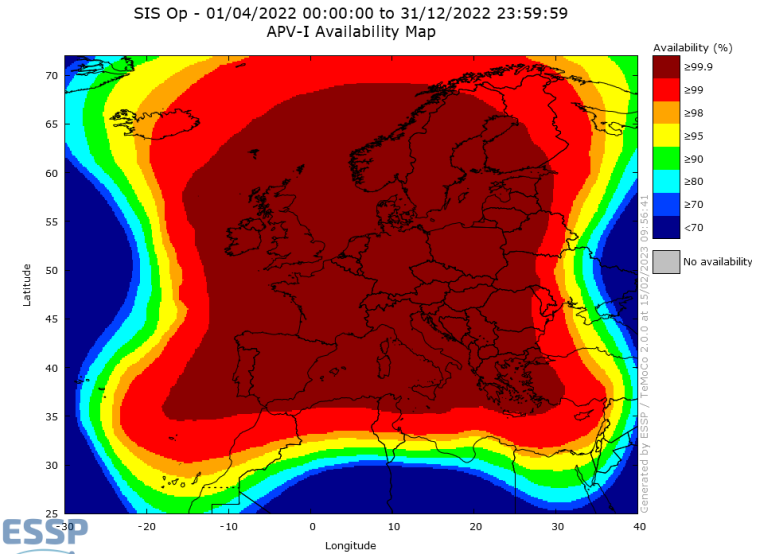


Figure 12: APV-I Availability from 01/04/22 to 31/12/22

The following figure shows the annual APV-I Availability compliance of the target at airports with published EGNOS-based operations:

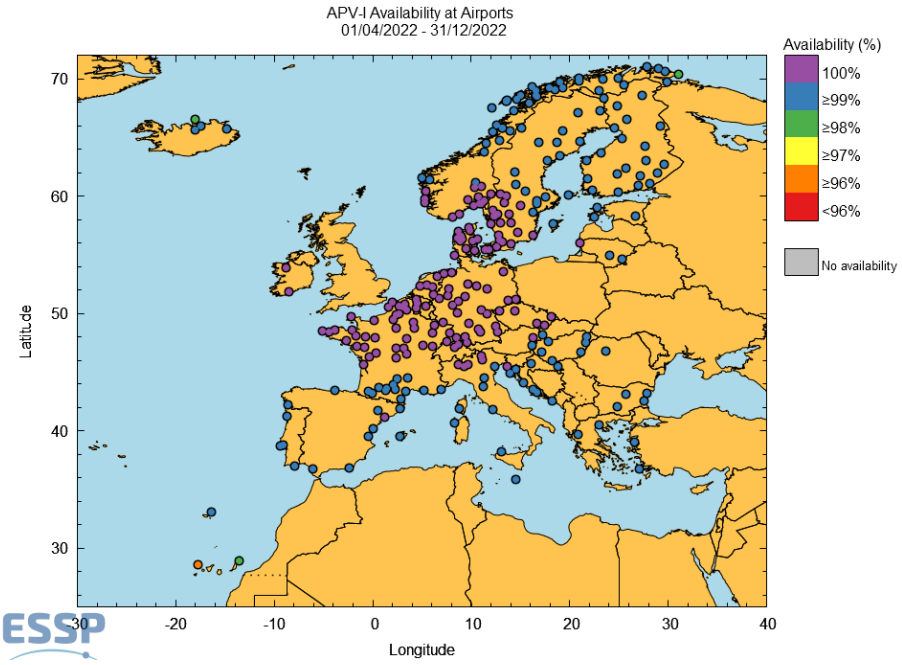


Figure 13: APV-I Availability compliance at airports with published EGNOS-based operations from 01/04/22 to 31/12/22

Moreover, the APV-I service availability commitment according to the SoL SDD was fulfilled at all airports with EGNOS-based operations, except for:

- La Palma (GCLA) and Lanzarote AD (GCRR) in Spain.

For additional information, please refer to the corresponding Monthly Performance Reports.

2.3.2 APV-I Availability – Achievement Against Target

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

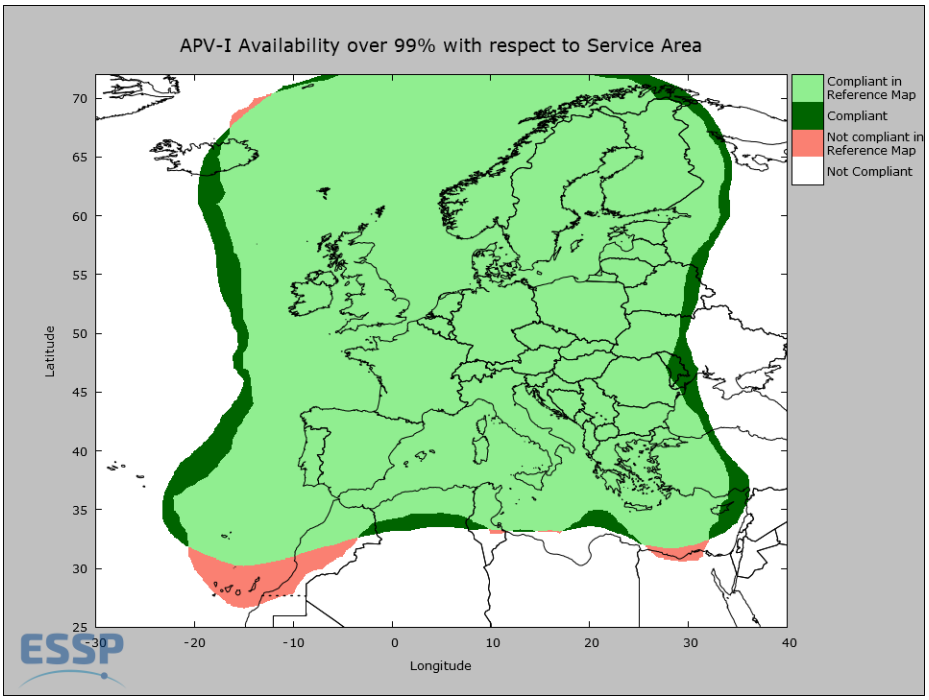


Figure 14: APV-I 99% Availability map for the 99% APV-I Service Area – from 01/04/22 to 31/12/22

In the figure, the legend should be read as follows:

- **Compliant in Reference Map**: the part of the Service Area where APV-I Availability was above 99%.
- **Compliant**: the zone outside the Service Area where APV-I Availability was also above 99% (coverage extension regarding the commitment).
- **Not compliant in Reference Map**: the part of the Service Area where APV-I Availability was lower than 99%.
- **Not compliant (white)**: any other zone outside the Service Area where APV-I Availability is lower than 99%.

The percentage of points compliant with the 99% APV-I Service Area[3] is **97.00%**. The reduced coverage in the southern border, and especially over south-west of the Service Area, is explained due to ionospheric disturbances linked to solar activity and equatorial scintillation. Additionally, a small area in the north-west also presented underperformance, mainly linked to weak GPS geometry.

Note that the comparison regarding the SDD SoL commitment map is included for information purposes. The commitment map is a monthly reference, whereas the reporting period is one year; this comparison must therefore be interpreted with care.

[3] The grey colour identifies regions where daily APV-I Availability has always been below 99%.

2.3.3 APV-I Integrity Events

*An **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.

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

Table 4 shows the maximum HSI and Vertical Safety Index (VSI) at each RIMS inside the APV-I Service Area (see Figure 10 and Figure 11). Moreover, Stanford plots are available on the EGNOS User Support Website.

Station	HSI	VSI	Station	HSI	VSI
Agadir	0.34	0.27	Lappeenranta	0.21	0.25
Aalborg	0.23	0.32	La Palma	0.46	0.26
Alexandria	0.29	0.28	Lisbon	0.26	0.31
Athens	0.32	0.30	Madeira	0.27	0.27
Berlin	0.24	0.35	Malaga	0.52	0.31
Canary Island	0.43	0.27	Palma de Mallorca	0.26	0.23
Cork	0.24	0.28	Reykjavik	0.24	0.22
Catania	0.37	0.31	Roma	0.25	0.30
Djerba	0.41	0.24	S. de Compostela	0.42	0.25
Egilsstadir	0.24	0.31	Sofia	0.29	0.35
Glasgow	0.24	0.30	Swanwick	0.26	0.28
Golbasi	0.22	0.24	Toulouse	0.21	0.27
Gävle	0.25	0.29	Trondheim	0.27	0.28
Haifa	0.29	0.28	Tromsoe	0.35	0.34
Jan Mayen	0.32	0.35	Warsaw	0.25	0.30
Kirkenes	0.25	0.27	Zürich	0.23	0.30

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

The following figures provide the HSI and the VSI histograms for each second when collecting measurements from the different EGNOS stations and for both operational GEOs over the reporting period.

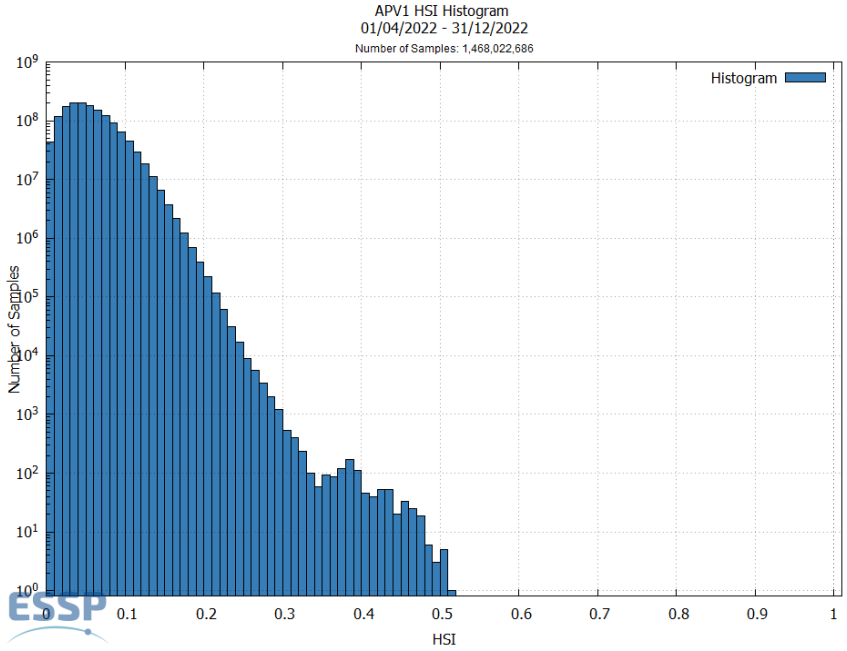


Figure 15: EGNOS APV-I Horizontal Safety Index[4]

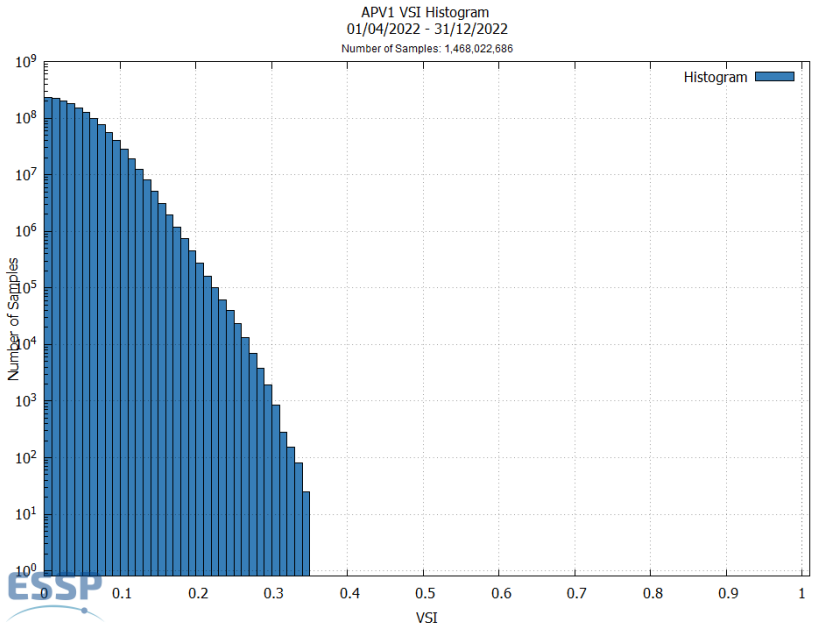


Figure 16: EGNOS APV-I Vertical Safety Index[4]

The above figures show that the horizontal and vertical safety index for APV-I remained below 0.34 and 0.39, respectively, representing a particularly favourable safety margin for all stations.

[4] Note that some periods may have been removed to compute the different histograms presented in this document, corresponding to stations showing poor data quality related to the local environment. Data removed from histograms correspond to data from RIMS where any OR affecting data quality has been observed, where the presence of cycle slips affecting performance is detected, or other data quality issues have been traced as causes of daily degradations.

2.3.4 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 a 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 following figure provides the GEO combined APV-I continuity risk for the reporting period:

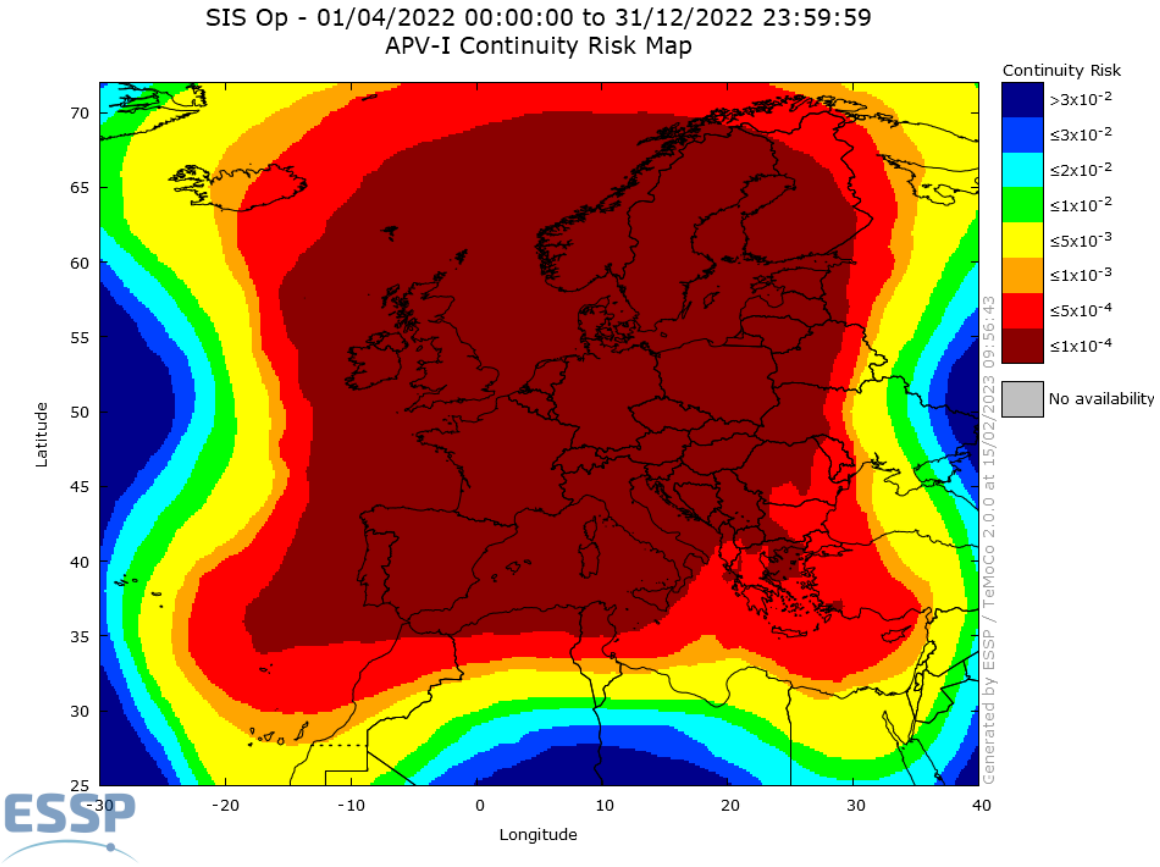


Figure 17: APV-I Continuity Risk from 01/04/22 to 31/12/22

APV-I continuity performance has been very good during the reporting period: lower than $5{\cdot}10^{-4}$ over almost the entire $5{\cdot}10^{-4}$ APV-I Service Area,[5] with small underperformances observed mainly in the south-west.

[5] $5{\cdot}10^{-4}$ APV-I Service Area is the $5{\cdot}10^{-4}$ APV-I continuity risk area depicted in Figure 11 obtained from the EGNOS Safety of Life SDD v3.4.

2.3.5 APV-I Continuity – Achievement Against Target

The combination of the 5.10^{-4} APV-I Continuity Risk map and the $5{\cdot}10^{-4}$ APV-I Service Area produces the following:

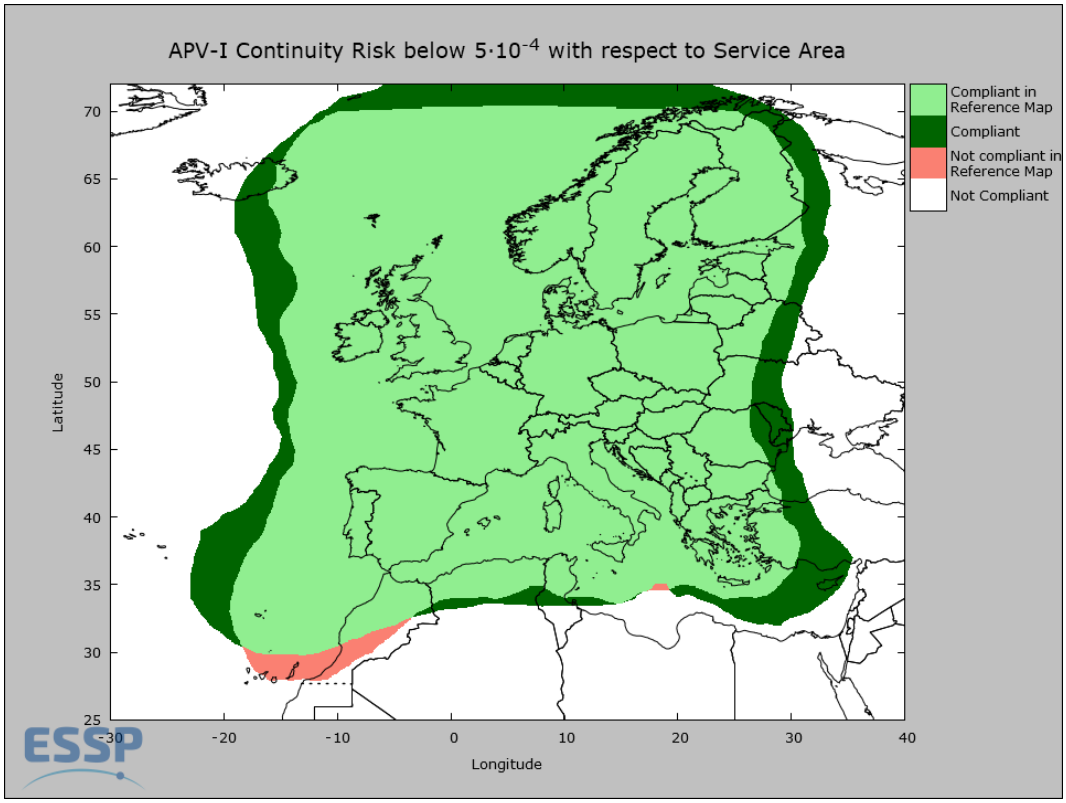


Figure 18: APV-I Continuity Risk ($5{\cdot}10^{-4}$) map regarding the $5{\cdot}10^{-4}$ APV-I Service Area – from 01/04/22 to 31/12/22

In the picture, the legend should be read as follows:

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

Using the SDD v3.4 map as the reference, the percentage of points compliant with the $5{\cdot}10^{-4}$ APV-I Service Area ($5{\cdot}10^{-4}$/15sec) is **98.51%**. Note that the comparison regarding the SDD SoL commitment map is included for information purposes. The commitment map is a monthly reference, whereas the reporting period is one year. This comparison must be interpreted with care.

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

The following figures show the minimum performance expected from EGNOS for LPV-200 availability and continuity, as defined in the EGNOS SoL Service Definition Document. Version v3.4 of the SoL SDD was published on 04/05/2021.

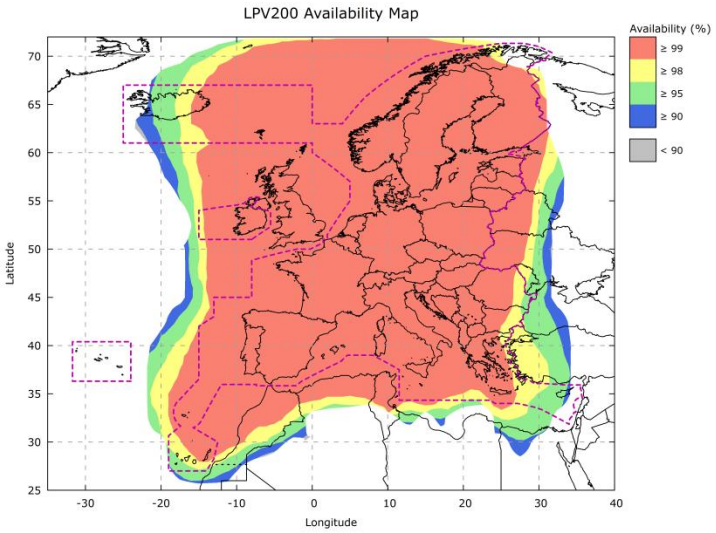


Figure 19: LPV200 Availability map – Expected minimum performance (SoL SDD v3.4)

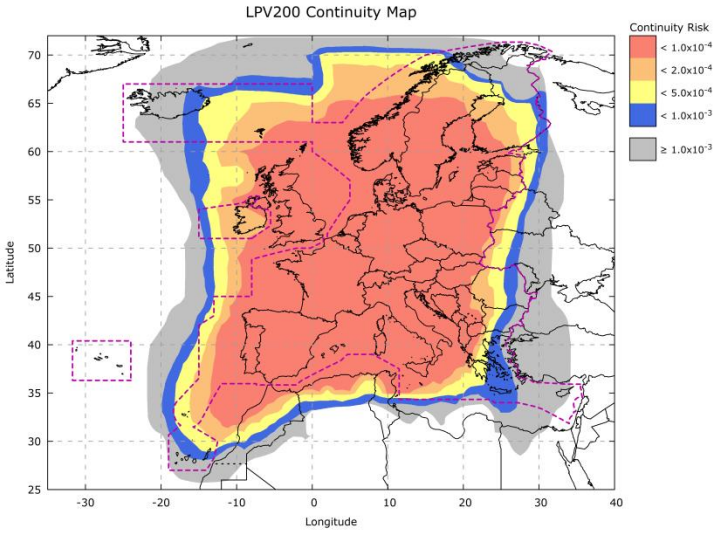


Figure 20: LPV200 Continuity map – Expected minimum performance (SoL SDD v3.4)

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

The LPV-200 performance achieved during the reporting period is conveyed below. Additionally, LPV-200 performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website.

2.4.1 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 following figure shows the LPV-200 availability for the combination of the operational GEOs for the period from April 2022 to December 2022:

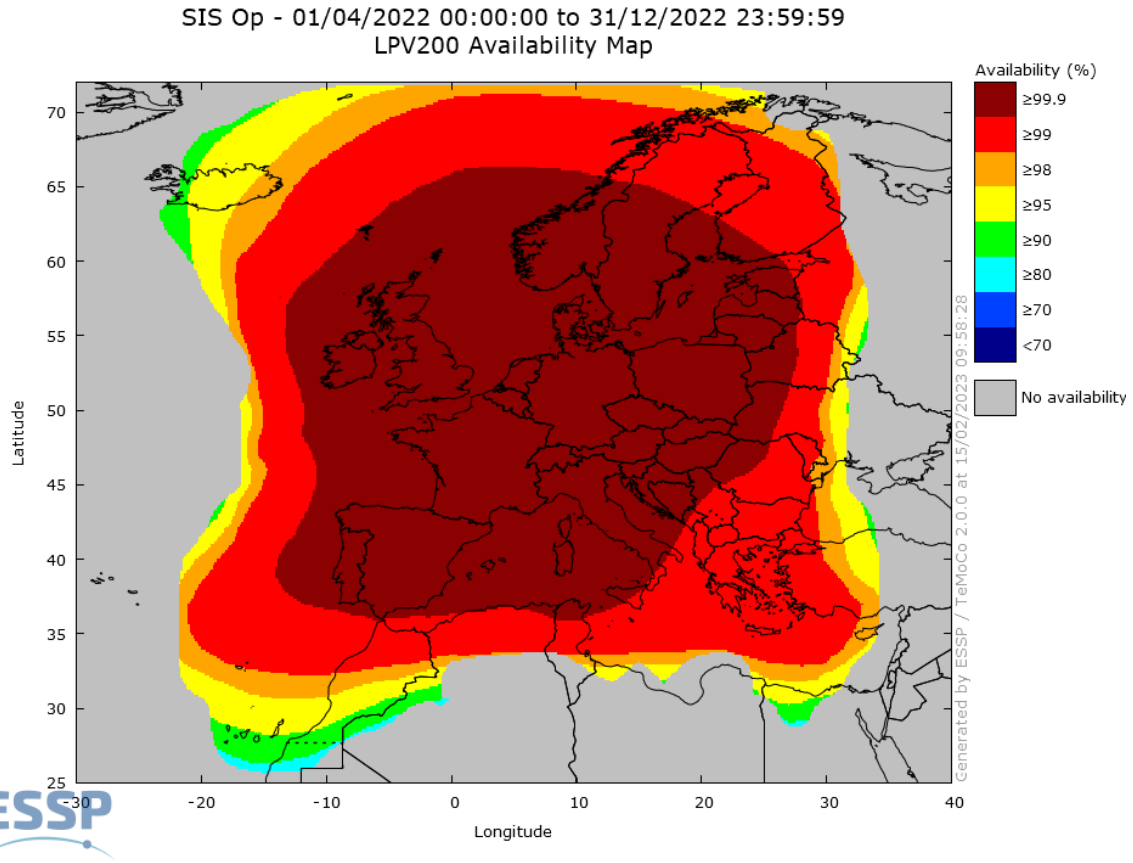


Figure 21: LPV-200 Availability from 01/04/22 to 31/12/22

The LPV-200 availability performance over the Service Area was good during the reporting period: greater than 99% over the entire LPV-200 99% Service Area[6] except for the northern border and over south-west.

[6] 99% LPV-200 Service Area is the 99% LPV-200 availability area shown in Figure 19, obtained from the EGNOS Safety of Life SDD v3.4.

The following figure shows the annual LPV-200 availability compliance concerning the target at airports with published EGNOS-based operations:

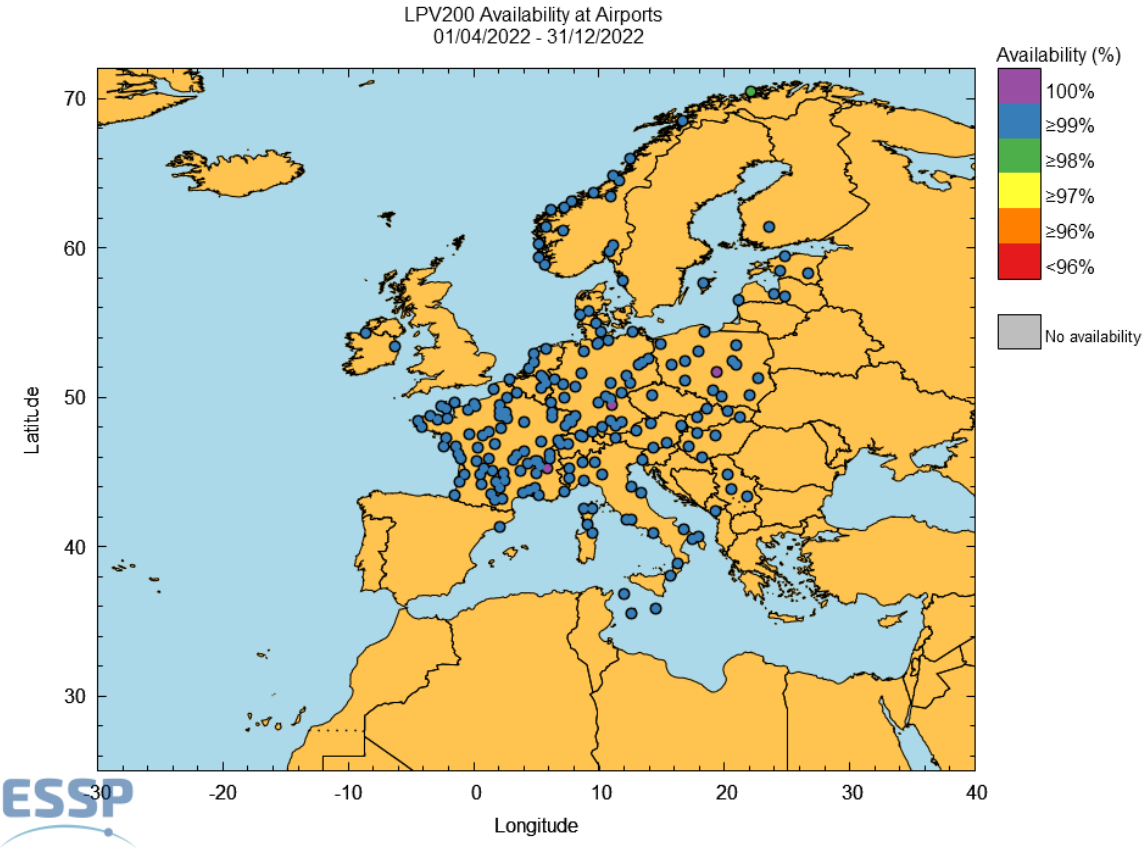


Figure 22: LPV-200 Availability compliance at airports with published EGNOS-based operations from 01/04/22 to 31/12/22

Moreover, the LPV200 service availability commitment, according to the SoL SDD, was fulfilled at all airports with EGNOS-based operations except for Hasvik (ENHK) in Norway.

For additional information, please refer to the corresponding Monthly Performance Reports.

2.4.2 LPV-200 Availability – Achievement Against Target

The following figure shows the combination of the 99% LPV-200 Availability map and the 99% LPV-200 Service Area[6]:

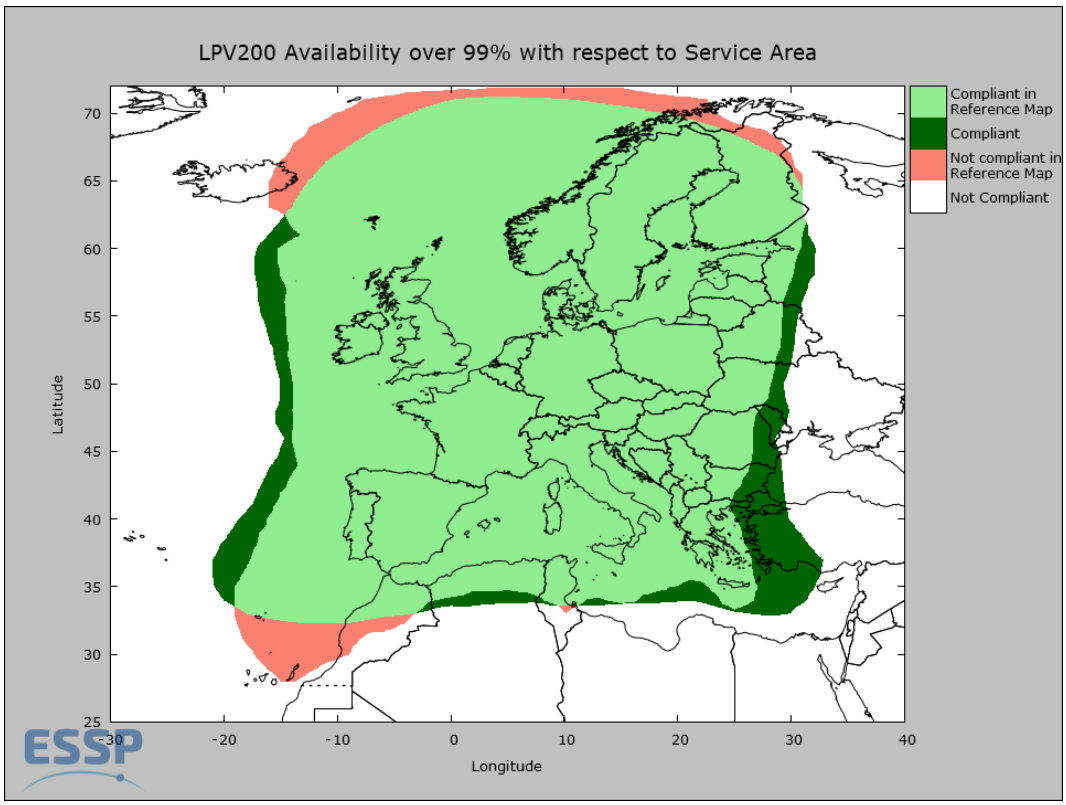


Figure 23: LPV-200 Availability map regarding the Service Area[6] – from 01/04/22 to 31/12/22

In the picture, the legend should be read as follows:

- **Compliant in Reference Map**: the part of the Service Area[6] where LPV-200 availability was above 99%.
- **Compliant**: the zone outside the Service Area[6] where LPV-200 availability was also above 99% (coverage extension regarding the commitment).
- **Not compliant in Reference Map**: the part of the Service Area[6] where LPV-200 availability was lower than 99%.
- **Not compliant (white)**: any other zone outside the Service Area[6] where LPV-200 availability is lower than 99%.

Taking the EGNOS Safety-of-Life SDD v3.4 map as the reference, the percentage of points compliant with the 99% LPV-200 Service Area[6] is **93.28%**. The area over the northern border and south-west deviated from the SDD commitment for similar reasons to the ones explained in section 2.3.2.

Note that the comparison regarding the SDD SoL commitment map is included for information purposes. The commitment map is a monthly reference, whereas the reporting period is one year; this comparison must therefore be interpreted with care.

2.4.3 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.

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

Table 5 shows the maximum HSI and VSI at each RIMS inside the LPV-200 Service Area (see Figure 19 and Figure 20). 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
Agadir	0.34	0.27	La Palma	0.46	0.26
Aalborg	0.23	0.32	Lisbon	0.26	0.31
Alexandria	0.29	0.28	Madeira	0.27	0.27
Athens	0.32	0.30	Malaga	0.52	0.31
Berlin	0.24	0.35	Palma de Mallorca	0.26	0.23
Canary Island	0.43	0.27	Reykjavik	0.24	0.22
Cork	0.24	0.28	Roma	0.25	0.30
Catania	0.37	0.31	S. de Compostela	0.42	0.25
Djerba	0.41	0.24	Sofia	0.29	0.35
Egilsstadir	0.24	0.31	Swanwick	0.26	0.28
Glasgow	0.24	0.30	Toulouse	0.21	0.27
Golbasi	0.22	0.24	Trondheim	0.27	0.28
Gävle	0.25	0.29	Tromsoe	0.35	0.34
Jan Mayen	0.32	0.35	Warsaw	0.25	0.30
Lappeenranta	0.21	0.25	Zürich	0.23	0.30

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

The following figures show the HSI and the VSI histograms for each second when collecting measurements from the different EGNOS stations and for both operational GEOs over the reporting period.

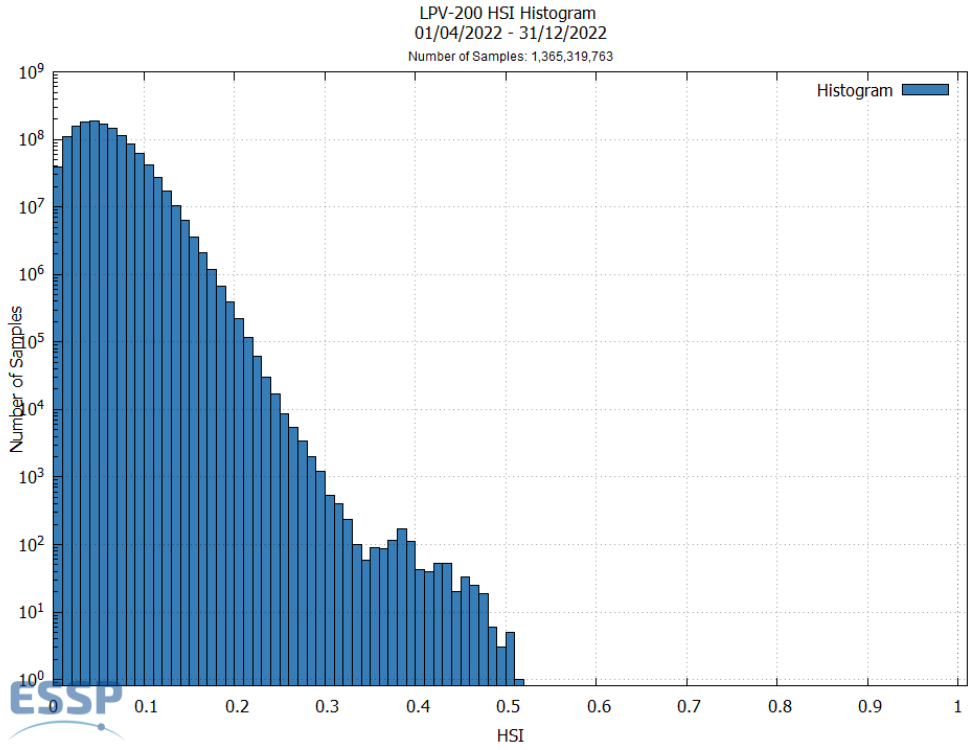


Figure 24: EGNOS LPV-200 Horizontal Safety Index

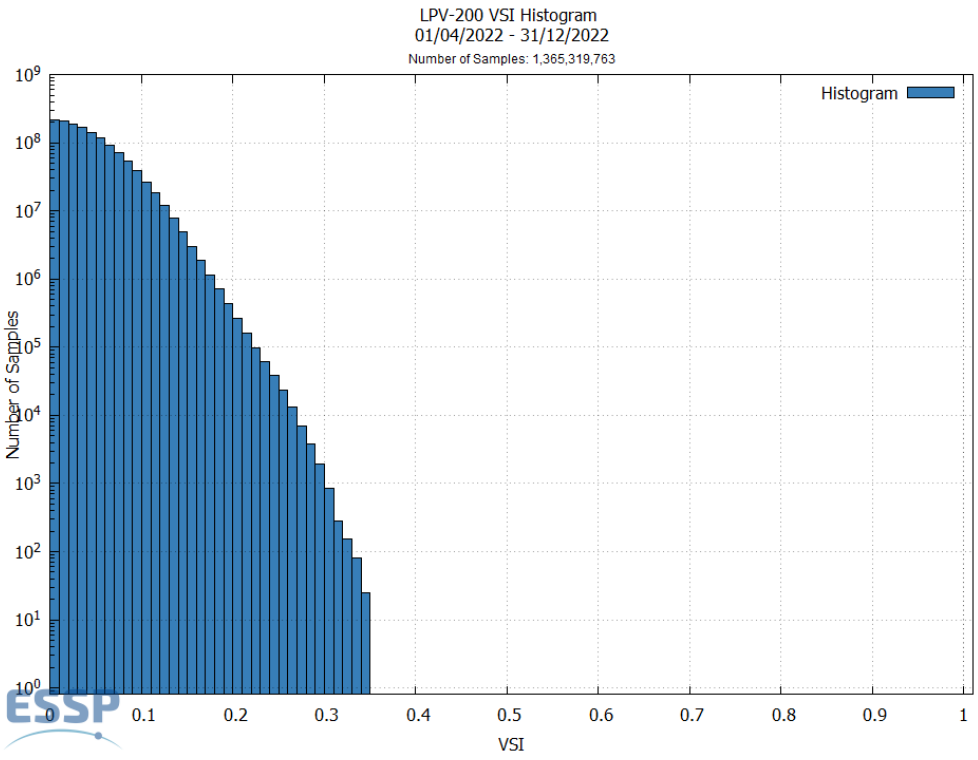


Figure 25: EGNOS LPV-200 Vertical Safety Index

The above figures show that the horizontal and vertical safety indices for LPV-200 remained below 0.52 and 0.35, respectively, for all stations, representing a good safety margin.

2.4.4 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 a 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 shows the GEO combined LPV-200 continuity risk for the reporting period:

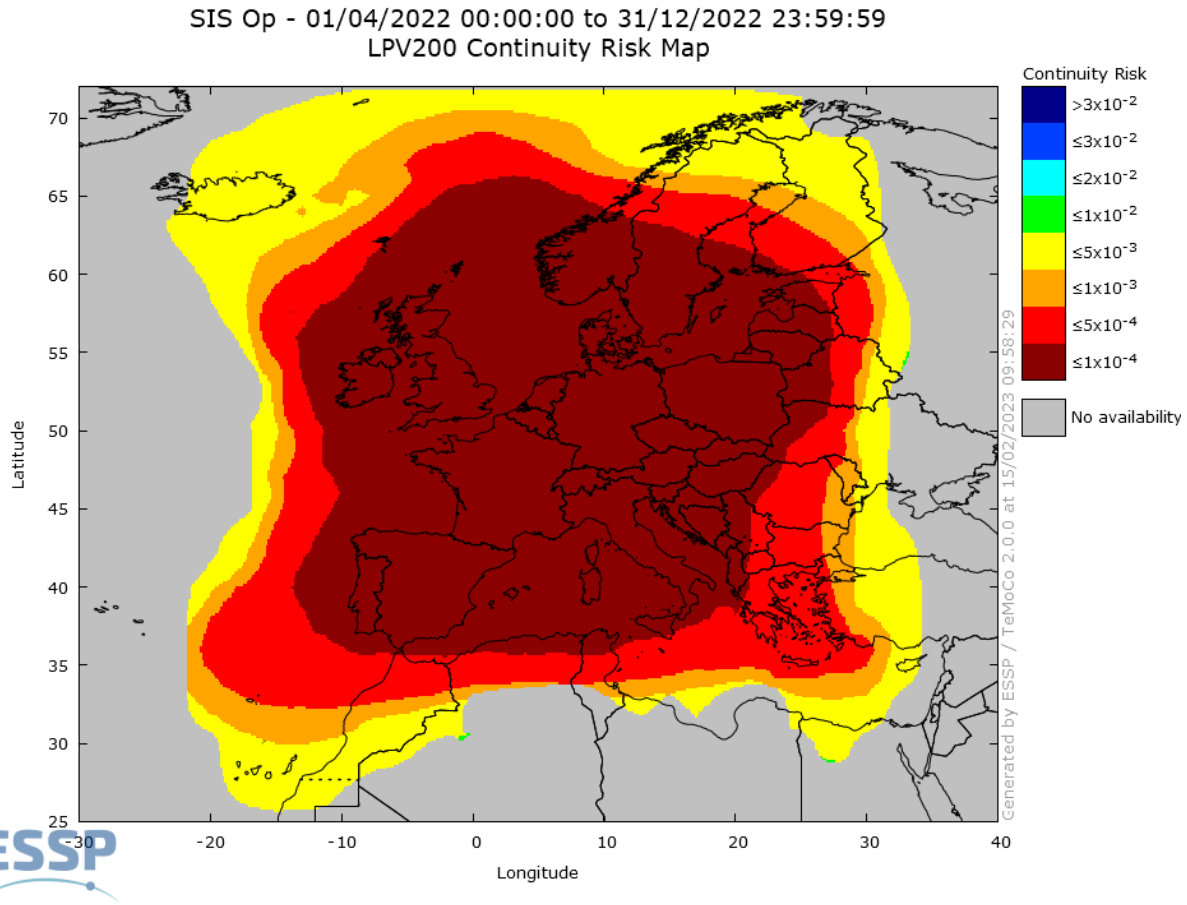


Figure 26: LPV-200 Continuity Risk from 01/04/22 to 31/12/22[7]

The LPV200 continuity performance was good during the reporting period: the entire LPV200 $5{\cdot}10^{-4}$ Service Area[8] is covered except for some border areas, mainly over the north-east, north-west and south-west.

[7] The grey colour identifies regions outside the LPV-200 Service area as defined in the EGNOS Safety of Life SDD v3.4.

[8] $5{\cdot}10^{-4}$ LPV200 Service Area is the $5{\cdot}10^{-4}$ LPV200 continuity risk area shown in Figure 20 obtained from the EGNOS Safety of Life SDD v3.4.

2.4.5 LPV-200 Continuity – Achievement Against Target

The following figure shows the combination of the 5.10^{-4} LPV-200 Continuity Risk map and the Service Area[8]:

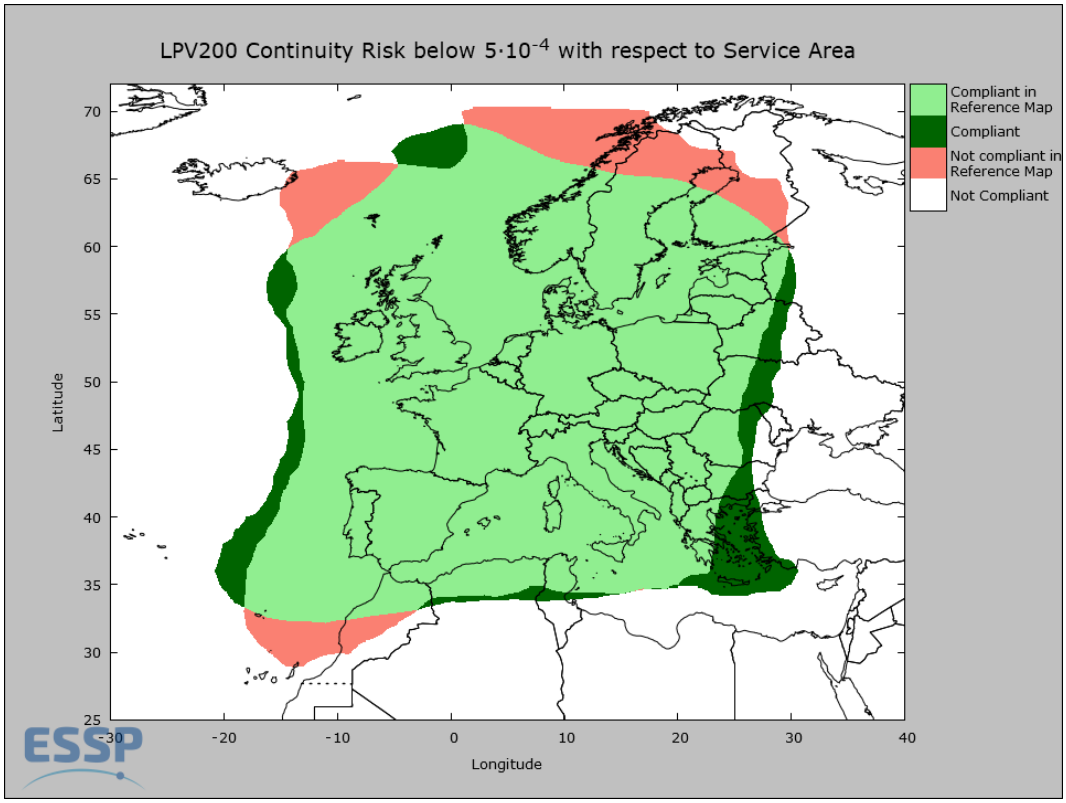


Figure 27: LPV-200 Continuity Risk ($5{\cdot}10^{-4}$) map regarding the reference map – from 01/04/22 to 31/12/22

In the picture, the legend should be read as follows:

- **Compliant in Reference Map**: the part of the Service Area[8] where LPV-200 continuity was above $5{\cdot}10^{-4}$.
- **Compliant**: the zone outside the Service Area[8] where LPV-200 continuity was also above $5{\cdot}10^{-4}$ (coverage extension regarding the commitment).
- **Not compliant in Reference Map**: the part of the Service Area[8] where LPV-200 continuity was lower than $5{\cdot}10^{-4}$.
- **Not compliant (white)**: any other zone outside the Service Area[8] where LPV-200 continuity is lower than $5{\cdot}10^{-4}$.

Considering the SDD v3.4 map used as the reference, the percentage of compliant points with the $5{\cdot}10^{-4}$ LPV-200 Service Area (5.10^{-4}/15sec) is **87.77%**. Note that the comparison with respect to the SDD SoL commitment map is included for information. The commitment map is a monthly reference, whereas the reporting period is one year; this comparison must therefore be interpreted with care.

2.4.6 EGNOS LPV-200 Vertical Accuracy

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

An Accuracy Major Event (AME) occurs whenever the instantaneous VNSE exceeds 10 m in nominal conditions or 15 m under degraded scenarios.

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

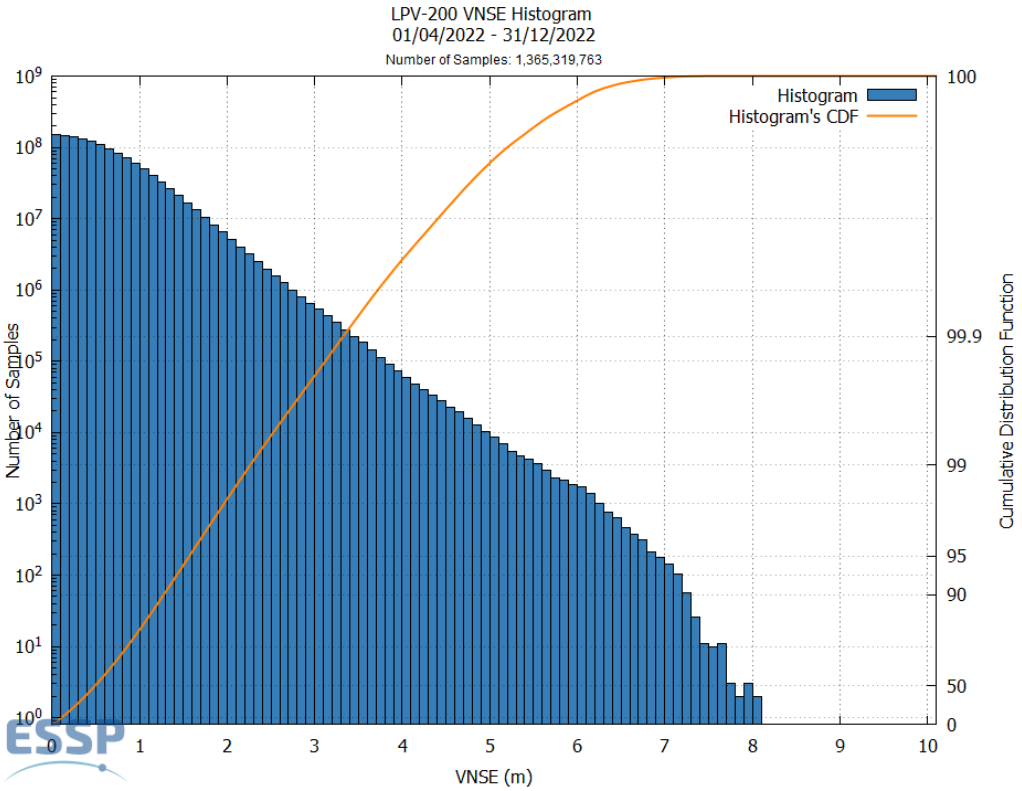


Figure 28: EGNOS LPV-200 Vertical Accuracy Histogram and Cumulative Probability

As observed, the cumulative results confirm that the vertical accuracy remained below 10 metres during the period analysed. In other words, no AME took place during this period. The 95th percentile is below 1.7 metres. The worst accuracy measured in any of the stations was 2.4 metres in RIMS TRO.

2.4.7 EGNOS LPV-200 Accuracy Extrapolated at 10-7/150 s

This section presents the results of extrapolating the accuracy results for every station to 10^{-7}/150 s. This extrapolation enables the accuracy distribution tails to be characterised through a Gaussian extrapolation applied to the vertical navigation error.[9]

The following results present the values obtained from 1 January 2022 to 31 December 2022, using values obtained from both operational GEOs. For this period, all RIMS within the LPV-200 Service Area exhibit extrapolated accuracy values within the requirement: Pr (VNSE>10 m) < 10^{-7}/150 s.

For the period of analysis, the accuracy tail extrapolated at 10^{-7}/150 s values for the RIMS within the LPV-200 commitment is as follows:

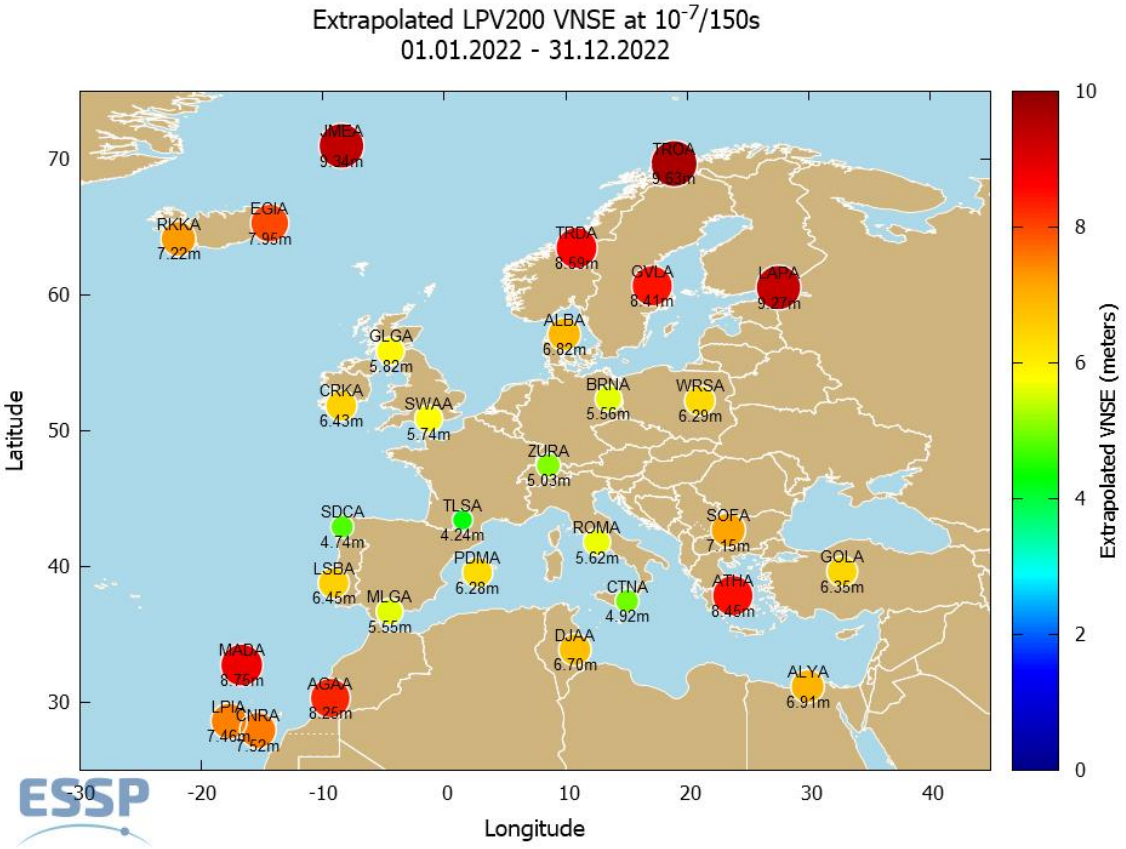


Figure 29: Extrapolated VNSE at 10-7/150 s in the RIMS within the LPV-200 commitment

The highest value is 9.63 m, obtained for RIMS Tromsoe, which still complies with the requirement.

[9] An over-bounding Gaussian distribution is computed (σbound) using the cumulative VNSE distribution, which enables the VNSE bound to be extrapolated to the required probability of 10^{-7}/150 s to be obtained. For additional details on the method used, please refer to "SBAS CAT-I available in Europe: LPV-200 commitment area and performance results" [ESSP SAS, ENC GNSS 2016].

2.5 Open Service (OS)

The EGNOS OS is qualified by defining the minimum compliance area where, 99% of the time, users can calculate their position and the accuracy performance is better than three metres horizontally and four metres vertically. The following figure shows the minimum compliance area:

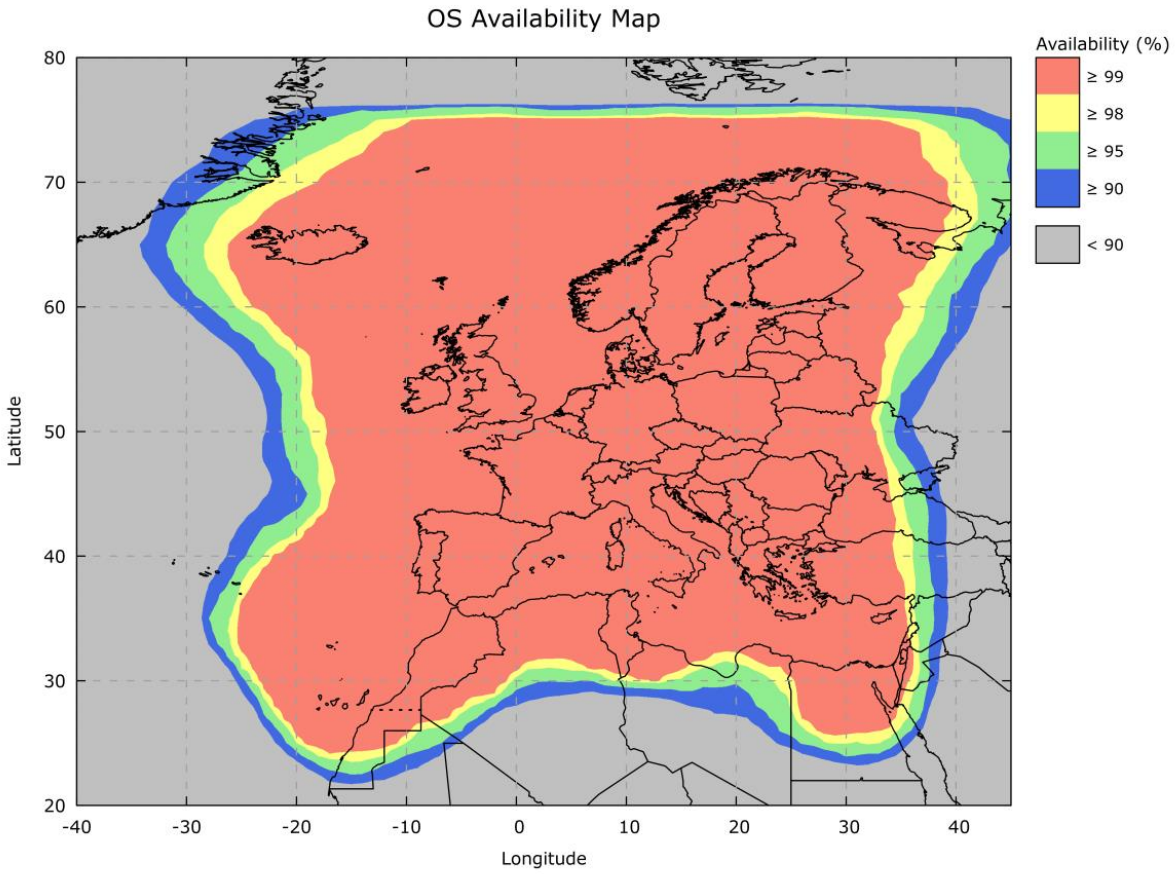


Figure 30: EGNOS OS compliance area

Further details can be found in the EGNOS OS Service Definition Document version v2.3. Additionally, OS performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website.

2.5.1 RIMS Monitoring Network

The following map shows the location of the deployed RIMS:

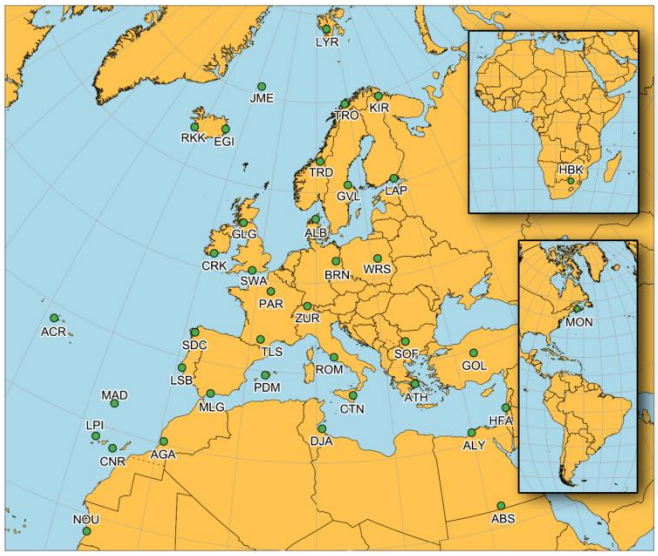


Figure 31: RIMS locations

The receiver network used to report the Open Service corresponds to the subset of RIMS inside the EGNOS OS SDD commitment map.

ID	Location name	Country	ID	Location name	Country
AGA	Agadir	Morocco	LAP	Lappeenranta	Finland
ALB	Aalborg	Denmark	LPI	La Palma	Spain
ALY	Alexandria	Egypt	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
HFA	Haifa	Israel	TRO	Tromsoe	Norway
JME	Jan Mayen	Norway	WRS	Warsaw	Poland
KIR	Kirkenes	Norway	ZUR	Zürich	Switzerland

Table 6: List of RIMS sites where OS performance is reported

2.5.2 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 following table provides the accuracy values (95%) in metres measured for the reporting period.

Station	HNSE 95% (metres)	VNSE 95% (metres)	Station	HNSE 95% (metres)	VNSE 95% (metres)
Agadir	1.70	1.90	Lappeenranta	0.80	1.70
Aalborg	0.80	1.60	La Palma	1.90	2.00
Alexandria	1.40	1.90	Lisbon	1.10	1.50
Athens	0.90	1.30	Madeira	1.10	1.40
Berlin	0.90	1.40	Malaga	1.00	1.30
Canary Islands	2.20	2.00	Palma de Mallorca	0.90	1.10
Cork	0.90	1.40	Reykjavik	1.20	2.30
Catania	0.90	1.20	Roma	0.90	1.30
Djerba	1.10	1.40	S. de Compostela	1.00	1.20
Egilsstadir	0.80	1.70	Sofia	1.30	1.80
Glasgow	0.90	1.50	Swanwick	1.10	1.60
Golbasi	1.00	1.50	Toulouse	0.90	1.30
Gävle	0.80	1.80	Trondheim	0.80	1.70
Haifa	1.40	2.00	Tromsoe	1.00	2.40
Jan Mayen	1.20	2.40	Warsaw	0.90	1.60
Kirkenes	1.00	2.00	Zürich	0.80	1.50

Table 7: EGNOS Open Service accuracy (95%)

The horizontal accuracy results for all the stations remained below 2.3 metres (95%), and the vertical accuracy below 2.5 metres (95%), which represents a particularly good accuracy level.

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

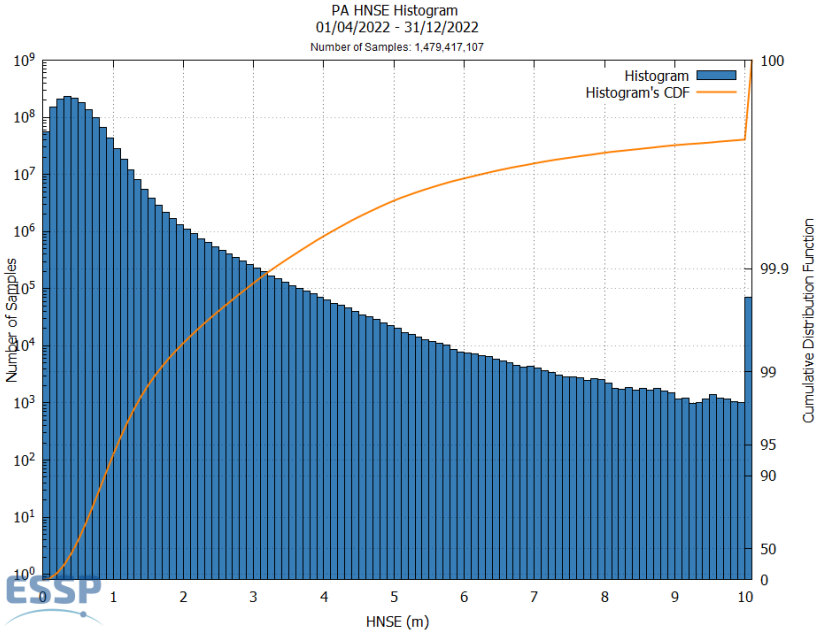


Figure 32: EGNOS Open Service HNSE Histogram and Cumulative Probability[10]

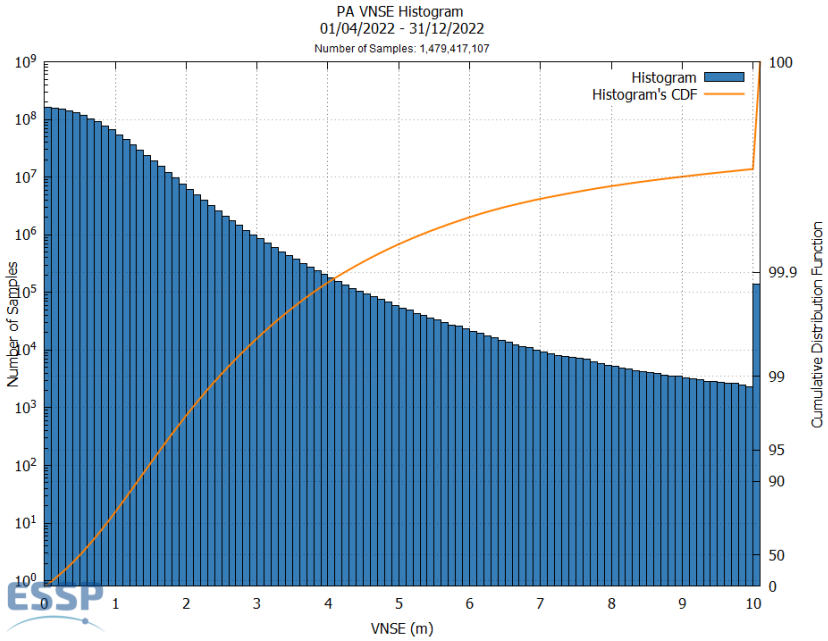


Figure 33: EGNOS Open Service VNSE Histogram and Cumulative Probability[10]

As shown, the cumulative results confirm the positive values observed at all stations. The 95th percentile of the observed accuracy performance is below 1.1 metres in the horizontal domain and below 1.7 metres in the vertical domain.

[10] Note that some periods may have been removed for the computation of the different histograms presented in this document, corresponding to stations showing poor data quality linked to the local environment. Data removed from histograms correspond to data from RIMS where any OR affecting data quality has been observed, the presence of cycle slips affecting performance is detected, or other data quality issues have been traced as a cause of daily degradations.

Table 8 and Table 9 provide the daily values of monthly maximums for Horizontal and Vertical Accuracy (95%) while using EGNOS messages broadcast by GEO123 and GEO136.

PRN 123		04/22	05/22	06/22	07/22	08/22	09/22	10/22	11/22	12/22	Average
AGA	H	2.80	2.45	2.08	1.82	1.97	2.71	4.07	5.09	3.39	2.93
	V	2.75	2.65	1.98	2.40	2.52	2.96	4.52	4.92	2.76	3.05
ALB	H	1.22	0.73	0.76	0.72	0.77	1.19	1.02	1.23	1.02	0.96
	V	2.38	1.92	1.97	2.18	1.94	1.99	2.03	1.92	1.92	2.03
ALY	H	1.76	1.59	1.47	1.48	2.58	2.78	1.98	1.74	1.69	1.90
	V	2.93	3.49	2.43	2.41	2.48	2.04	2.36	1.73	1.54	2.38
ATH	H	1.28	1.27	1.13	0.97	0.96	1.04	1.09	0.97	0.98	1.08
	V	1.60	1.83	1.58	1.80	1.34	1.46	1.36	1.36	1.36	1.52
BRN	H	0.92	1.02	0.98	0.84	0.94	1.06	0.96	1.00	1.26	1.00
	V	1.61	1.76	1.73	1.61	1.72	1.72	1.85	1.58	1.64	1.69
CNR	H	4.37	2.52	1.80	1.93	2.21	3.27	5.15	6.16	3.49	3.43
	V	3.35	2.31	2.19	2.09	2.18	3.14	4.07	4.53	3.65	3.06
CRK	H	1.12	1.01	1.00	0.91	0.96	1.15	1.07	1.28	1.19	1.08
	V	1.78	1.75	1.59	1.67	1.93	1.60	2.28	2.17	1.46	1.80
CTN	H	1.06	1.16	1.07	1.03	0.97	0.96	1.02	0.97	0.98	1.02
	V	1.53	1.62	1.39	1.46	1.34	1.34	1.33	1.46	1.17	1.40
DJA	H	1.47	1.59	1.39	1.37	1.61	1.51	1.61	2.16	1.73	1.60
	V	1.56	2.22	2.10	1.72	2.09	1.66	1.61	1.58	1.73	1.81
EGI	H	1.24	0.91	0.77	0.95	0.93	1.70	2.11	1.89	1.40	1.32
	V	2.61	2.21	1.91	1.99	2.06	2.63	2.73	3.14	2.51	2.42
GLG	H	1.34	0.86	0.88	0.86	0.91	1.17	1.22	1.17	1.20	1.07
	V	2.32	1.72	1.62	1.83	1.75	1.74	2.35	1.66	1.58	1.84
GOL	H	1.26	1.31	1.30	1.06	1.18	1.23	1.22	1.24	1.11	1.21
	V	2.44	2.12	2.02	1.86	1.69	1.63	1.88	1.70	2.01	1.93
GVL	H	1.05	0.79	0.66	0.86	1.01	1.08	1.00	1.54	1.10	1.01
	V	2.34	1.93	2.06	2.14	2.39	2.20	2.49	2.46	2.08	2.23
HFA	H	1.70	1.70	1.82	1.67	1.66	2.02	1.88	1.53	1.92	1.77
	V	2.92	3.65	2.67	2.41	2.87	2.09	2.12	2.28	2.41	2.60
JME	H	1.73	1.20	1.19	1.24	1.21	1.46	2.00	2.14	1.72	1.54
	V	3.08	3.06	2.94	2.57	2.74	3.11	3.52	3.80	2.93	3.08
KIR	H	1.90	1.02	0.82	0.99	1.07	1.27	2.00	1.80	1.24	1.35
	V	3.15	2.56	2.41	2.50	2.54	3.18	2.83	2.99	2.55	2.75
LAP	H	0.98	0.93	0.78	0.95	1.12	1.11	1.22	1.53	1.26	1.10
	V	2.21	1.79	1.90	1.91	2.36	2.25	2.43	2.46	2.07	2.15
LPI	H	3.87	2.28	2.02	1.96	2.13	3.39	4.26	5.55	3.65	3.23
	V	2.97	2.36	2.37	2.33	2.06	2.58	3.65	4.27	3.22	2.87
LSB	H	1.47	1.26	1.24	1.33	1.13	1.15	1.23	1.57	1.25	1.29
	V	1.70	1.69	1.72	1.62	1.58	1.54	2.01	1.91	1.56	1.70
MAD	H	1.59	1.58	1.32	1.11	1.10	1.46	1.85	4.82	1.67	1.83
	V	1.87	1.88	2.12	1.79	1.79	1.83	2.43	4.28	1.95	2.22
MLG	H	1.55	1.26	1.12	1.20	1.09	1.18	1.24	2.35	1.37	1.37
	V	1.43	1.67	1.58	1.58	1.50	1.62	1.55	2.67	1.33	1.66
PDM	H	1.05	1.13	1.14	1.01	0.90	0.94	0.97	1.24	1.02	1.04
	V	1.51	1.50	1.57	1.27	1.07	1.23	1.32	1.41	1.32	1.36
RKK	H	2.06	1.45	1.14	1.28	1.38	1.73	2.10	3.06	1.94	1.79
	V	3.17	2.92	2.62	2.68	2.99	3.31	4.46	4.13	2.73	3.22
ROM	H	1.16	1.21	1.02	0.89	0.88	0.85	0.90	0.97	0.96	0.98
	V	1.62	1.69	1.89	1.41	1.38	1.45	1.50	1.64	1.62	1.58
SDC	H	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.38	1.37	1.37
	V	1.57	1.48	1.35	1.27	1.22	1.25	1.29	1.44	1.21	1.34
SOF	H	1.41	3.47	1.42	1.32	1.34	1.46	1.43	1.45	1.47	1.64
	V	2.17	2.22	2.05	1.82	1.76	1.92	2.16	2.22	1.91	2.03
SWA	H	1.20	1.26	1.30	1.19	1.20	1.19	1.17	1.33	1.29	1.24
	V	2.08	2.06	2.01	1.84	1.82	1.78	2.04	1.85	1.99	1.94
TLS	H	1.13	1.12	1.08	0.94	0.91	0.92	0.98	1.16	1.00	1.03
	V	1.69	1.77	1.60	1.68	1.37	1.31	1.41	1.60	1.49	1.55
TRD	H	0.95	0.79	0.77	0.91	0.98	1.09	1.10	1.31	1.04	0.99
	V	2.60	1.79	1.96	1.84	2.13	2.59	2.41	2.27	2.05	2.18
TRO	H	1.84	1.10	0.96	1.05	1.18	1.29	1.99	1.74	1.31	1.38
	V	3.07	2.95	3.16	2.83	2.66	3.31	3.77	3.14	2.91	3.09
WRS	H	1.01	1.08	0.98	0.82	0.93	1.07	1.10	1.03	1.24	1.03
	V	1.84	1.86	2.12	2.06	2.06	1.83	2.13	1.84	1.93	1.96
ZUR	H	1.07	1.13	1.08	0.88	0.86	1.03	0.97	1.01	1.09	1.01
	V	1.63	2.00	1.77	1.92	1.76	1.68	1.87	1.60	1.83	1.78

Table 8: Monthly Horizontal/Vertical Accuracy at RIMS-A sites for GEO123 (in metres)

PRN 136		04/22	05/22	06/22	07/22	08/22	09/22	10/22	11/22	12/22	Average
AGA	H	2.79	2.38	2.05	1.82	1.96	2.67	4.05	4.91	3.30	2.88
	V	2.74	2.65	2.13	2.46	2.54	3.02	4.41	4.50	2.75	3.02
ALB	H	1.22	0.72	0.75	0.71	0.76	1.19	1.02	1.24	1.02	0.96
	V	2.41	1.92	1.98	2.16	1.94	1.98	2.04	1.92	1.98	2.04
ALY	H	1.74	1.59	1.47	1.49	2.53	2.74	2.00	1.79	1.66	1.89
	V	2.89	3.46	2.48	2.39	2.45	2.10	2.45	1.80	1.66	2.41
ATH	H	1.27	1.28	1.14	0.97	0.96	1.03	1.08	1.00	0.97	1.08
	V	1.59	1.84	1.38	1.78	1.36	1.46	1.35	1.38	1.37	1.50
BRN	H	0.92	1.01	0.98	0.84	0.95	1.06	0.94	1.00	1.27	1.00
	V	1.60	1.75	1.73	1.60	1.74	1.72	1.86	1.56	1.61	1.69
CNR	H	4.39	2.53	1.80	1.94	2.26	3.26	4.84	6.42	3.49	3.44
	V	3.36	2.26	2.20	2.10	2.06	3.13	3.81	4.59	3.35	2.98
CRK	H	1.13	1.02	1.01	0.91	0.96	1.14	1.09	1.29	1.17	1.08
	V	1.80	1.76	1.59	1.66	1.94	1.60	2.26	2.14	1.48	1.80
CTN	H	1.05	1.16	1.06	1.02	0.98	0.97	1.00	0.98	1.00	1.02
	V	1.54	1.62	1.40	1.47	1.35	1.33	1.34	1.45	1.22	1.41
DJA	H	1.54	1.61	1.42	1.38	1.59	1.61	1.70	2.20	1.66	1.63
	V	1.57	2.21	2.11	1.72	1.99	1.67	1.60	1.58	1.73	1.80
EGI	H	1.25	0.91	0.77	0.93	0.95	1.72	2.06	1.90	1.45	1.33
	V	2.64	2.24	1.93	1.99	2.04	2.59	2.72	3.16	2.60	2.43
GLG	H	1.33	0.86	0.87	0.87	0.92	1.16	1.24	1.17	1.20	1.07
	V	2.31	1.73	1.62	1.82	1.73	1.76	2.34	1.66	1.59	1.84
GOL	H	1.28	1.31	1.30	1.06	1.19	1.23	1.22	1.23	1.11	1.21
	V	2.41	2.03	1.99	1.85	1.66	1.66	1.89	1.81	1.87	1.91
GVL	H	1.05	0.81	0.66	0.85	1.00	1.07	1.00	1.48	1.11	1.00
	V	2.35	1.92	2.07	2.11	2.40	2.18	2.50	2.46	2.06	2.23
HFA	H	1.68	1.71	1.86	1.68	1.63	2.07	1.90	1.57	1.77	1.76
	V	2.87	3.67	2.77	2.41	2.83	2.09	2.15	2.32	2.42	2.61
JME	H	1.77	1.20	1.19	1.23	1.20	1.46	2.04	2.16	1.74	1.55
	V	3.07	3.08	2.96	2.58	2.77	3.06	3.55	3.99	2.95	3.11
KIR	H	1.94	0.99	0.82	1.00	1.05	1.29	2.14	1.88	1.25	1.37
	V	3.03	2.51	2.42	2.47	2.56	3.18	2.86	3.17	2.56	2.75
LAP	H	0.96	0.93	0.79	0.96	1.11	1.12	1.24	1.60	1.30	1.11
	V	2.18	1.78	1.92	1.89	2.40	2.33	2.39	2.50	2.05	2.16
LPI	H	3.88	2.30	2.02	1.95	2.13	3.31	4.24	5.75	3.71	3.25
	V	2.86	2.37	2.42	2.34	2.02	2.50	3.65	4.22	3.13	2.83
LSB	H	1.44	1.27	1.25	1.33	1.13	1.14	1.23	1.50	1.27	1.28
	V	1.67	1.70	1.68	1.58	1.58	1.55	2.01	1.88	1.57	1.69
MAD	H	1.59	1.57	1.31	1.12	1.10	1.46	1.91	4.80	1.66	1.84
	V	1.86	1.87	2.16	1.78	1.77	1.82	2.43	4.31	2.05	2.23
MLG	H	1.55	1.27	1.11	1.19	1.09	1.19	1.21	2.34	1.34	1.37
	V	1.42	1.64	1.65	1.60	1.51	1.63	1.52	2.75	1.32	1.67
PDM	H	1.03	1.12	1.14	1.00	0.91	0.93	0.97	1.23	1.02	1.04
	V	1.49	1.47	1.64	1.25	1.06	1.24	1.32	1.39	1.34	1.36
RKK	H	2.01	1.54	1.20	1.28	1.34	1.72	2.02	3.18	1.96	1.81
	V	3.14	2.97	2.61	2.57	2.95	3.28	4.23	3.98	2.84	3.17
ROM	H	1.15	1.21	1.04	0.89	0.88	0.85	0.90	0.97	0.99	0.99
	V	1.62	1.63	1.87	1.42	1.37	1.45	1.50	1.64	1.63	1.57
SDC	H	1.23	1.38	1.12	1.15	1.04	0.96	1.23	1.36	1.07	1.17
	V	1.59	1.49	1.38	1.28	1.22	1.27	1.30	1.42	1.20	1.35
SOF	H	1.44	3.56	1.46	1.31	1.33	1.46	1.43	1.43	1.46	1.65
	V	2.19	2.17	2.05	1.83	1.73	1.91	2.15	2.20	1.92	2.02
SWA	H	1.20	1.26	1.30	1.19	1.20	1.19	1.16	1.32	1.27	1.23
	V	2.05	2.06	2.01	1.85	1.80	1.78	2.05	1.87	2.00	1.94
TLS	H	1.12	1.14	1.11	0.95	0.91	0.92	0.98	1.19	1.01	1.04
	V	1.69	1.77	1.60	1.68	1.38	1.31	1.38	1.60	1.51	1.55
TRD	H	0.94	0.80	0.76	0.91	0.96	1.09	1.08	1.32	1.06	0.99
	V	2.58	1.78	1.97	1.84	2.14	2.56	2.43	2.26	2.05	2.18
TRO	H	1.82	1.10	0.98	1.05	1.16	1.29	1.99	1.81	1.31	1.39
	V	3.06	2.95	3.19	2.81	2.63	3.30	3.86	3.25	2.87	3.10
WRS	H	1.02	1.08	0.97	0.82	0.94	1.07	1.08	1.05	1.24	1.03
	V	1.85	1.83	2.13	2.06	2.05	1.84	2.13	1.84	1.94	1.96
ZUR	H	1.07	1.14	1.09	0.88	0.86	1.03	0.98	1.02	1.07	1.02
	V	1.64	2.00	1.76	1.92	1.76	1.68	1.85	1.62	1.83	1.78

Table 9: Monthly Horizontal/Vertical Accuracy at RIMS-A sites for GEO136 (in metres)

2.5.3 Open Service Availability

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

The following tables provide the values measured using GEO123 and GEO136, respectively.

PRN 123	04/22	05/22	06/22	07/22	08/22	09/22	10/22	11/22	12/22	Average
AGAA	98.99%	99.77%	99.97%	99.98%	99.93%	99.45%	97.53%	98.02%	99.01%	**99.19%**
ALBA	100.00%	100.00%	100.00%	100.00%	99.99%	99.98%	99.98%	100.00%	99.98%	**99.99%**
ALYA	99.87%	99.81%	99.91%	99.98%	99.90%	99.79%	99.89%	99.86%	100.00%	**99.89%**
ATHA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
BRNA	100.00%	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
CNRA	97.39%	99.81%	100.00%	99.98%	99.97%	98.46%	94.95%	94.69%	96.15%	**97.93%**
CRKA	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	99.94%	100.00%	**99.99%**
CTNA	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	99.98%	99.98%	**99.99%**
DJAA	99.97%	99.95%	99.98%	99.99%	99.97%	99.98%	99.93%	99.87%	99.95%	**99.95%**
EGIA	99.92%	99.96%	99.96%	99.97%	99.89%	99.54%	99.61%	99.67%	99.90%	**99.82%**
GLGA	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
GOLA	99.88%	99.90%	99.94%	99.95%	99.97%	99.99%	99.99%	99.97%	99.99%	**99.95%**
GVLA	100.00%	100.00%	100.00%	99.96%	99.98%	99.77%	99.93%	99.94%	100.00%	**99.95%**
HFAA	99.49%	99.53%	99.67%	99.62%	99.65%	99.89%	99.85%	99.87%	99.57%	**99.68%**
JMEA	99.64%	99.64%	99.80%	99.79%	99.79%	99.11%	98.92%	99.11%	99.57%	**99.49%**
KIRA	99.23%	99.45%	99.51%	99.60%	99.73%	99.35%	99.06%	99.52%	99.81%	**99.47%**
LAPA	99.99%	99.99%	100.00%	99.97%	99.98%	99.65%	99.88%	99.93%	99.98%	**99.93%**
LPIA	97.77%	99.85%	99.99%	99.96%	99.97%	99.39%	96.66%	95.41%	97.47%	**98.50%**
LSBA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.95%	100.00%	**99.99%**
MADA	99.97%	100.00%	100.00%	100.00%	99.99%	99.97%	99.89%	99.48%	99.81%	**99.90%**
MLGA	99.99%	99.95%	100.00%	100.00%	100.00%	100.00%	99.97%	99.87%	99.99%	**99.97%**
PDMA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	99.99%	**100.00%**
RKKA	98.83%	99.34%	99.70%	99.48%	99.13%	98.77%	98.22%	98.67%	99.39%	**99.06%**
ROMA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	**100.00%**
SDCA	100.00%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
SOFA	99.97%	99.72%	99.98%	99.97%	99.99%	100.00%	99.95%	99.89%	99.99%	**99.94%**
SWAA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	**100.00%**
TLSA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	**100.00%**
TRDA	99.99%	99.99%	99.99%	100.00%	99.99%	99.79%	99.86%	99.91%	100.00%	**99.95%**
TROA	99.77%	99.81%	99.77%	99.84%	99.78%	99.15%	99.05%	99.56%	99.75%	**99.61%**
WRSA	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	99.99%	**100.00%**
ZURA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**

Table 10: OS Availability at RIMS-A sites for GEO123

PRN 136	04/22	05/22	06/22	07/22	08/22	09/22	10/22	11/22	12/22	Average
AGAA	98.98%	99.77%	99.96%	99.98%	99.94%	99.47%	97.49%	98.10%	99.00%	**99.19%**
ALBA	100.00%	100.00%	100.00%	100.00%	99.99%	99.98%	99.98%	100.00%	99.98%	**99.99%**
ALYA	99.88%	99.81%	99.91%	99.99%	99.90%	99.78%	99.90%	99.85%	100.00%	**99.89%**
ATHA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
BRNA	100.00%	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	**100.00%**
CNRA	97.41%	99.81%	100.00%	99.98%	99.98%	98.51%	95.01%	94.76%	96.18%	**97.96%**
CRKA	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%	99.94%	100.00%	**99.99%**
CTNA	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	**100.00%**
DJAA	99.97%	99.95%	99.98%	99.99%	99.97%	99.98%	99.93%	99.86%	99.96%	**99.95%**
EGIA	99.92%	99.97%	99.96%	99.97%	99.89%	99.57%	99.61%	99.66%	99.89%	**99.83%**
GLGA	99.99%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
GOLA	99.87%	99.90%	99.95%	99.94%	99.97%	99.98%	99.99%	99.97%	99.99%	**99.95%**
GVLA	100.00%	100.00%	100.00%	99.96%	99.97%	99.78%	99.93%	99.95%	100.00%	**99.95%**
HFAA	99.49%	99.53%	99.66%	99.65%	99.64%	99.88%	99.83%	99.86%	99.60%	**99.68%**
JMEA	99.63%	99.65%	99.79%	99.80%	99.78%	99.12%	98.92%	99.08%	99.56%	**99.48%**
KIRA	99.27%	99.47%	99.49%	99.62%	99.73%	99.32%	99.06%	99.51%	99.85%	**99.48%**
LAPA	99.99%	99.99%	100.00%	99.97%	99.97%	99.65%	99.87%	99.93%	99.98%	**99.93%**
LPIA	97.73%	99.84%	99.99%	99.96%	99.96%	99.40%	96.66%	95.47%	97.47%	**98.50%**
LSBA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	99.95%	100.00%	**99.99%**
MADA	99.97%	99.99%	100.00%	100.00%	99.99%	99.96%	99.89%	99.51%	99.83%	**99.90%**
MLGA	99.98%	99.94%	100.00%	100.00%	100.00%	100.00%	99.97%	99.87%	99.99%	**99.97%**
PDMA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	99.99%	**100.00%**
RKKA	98.83%	99.33%	99.69%	99.51%	99.11%	98.76%	98.18%	98.71%	99.43%	**99.06%**
ROMA	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	**100.00%**
SDCA	100.00%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
SOFA	99.97%	99.72%	99.97%	99.98%	99.99%	100.00%	99.95%	99.90%	99.98%	**99.94%**
SWAA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	**100.00%**
TLSA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	**100.00%**
TRDA	99.99%	99.99%	99.99%	100.00%	99.99%	99.78%	99.87%	99.91%	99.99%	**99.94%**
TROA	99.76%	99.82%	99.76%	99.83%	99.78%	99.15%	99.05%	99.53%	99.75%	**99.60%**
WRSA	100.00%	100.00%	100.00%	100.00%	100.00%	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%**

Table 11: OS Availability at RIMS-A sites for GEO136

The following map shows the OS availability value during the year for each location. The worst value between GEO123 and GEO136 is shown.

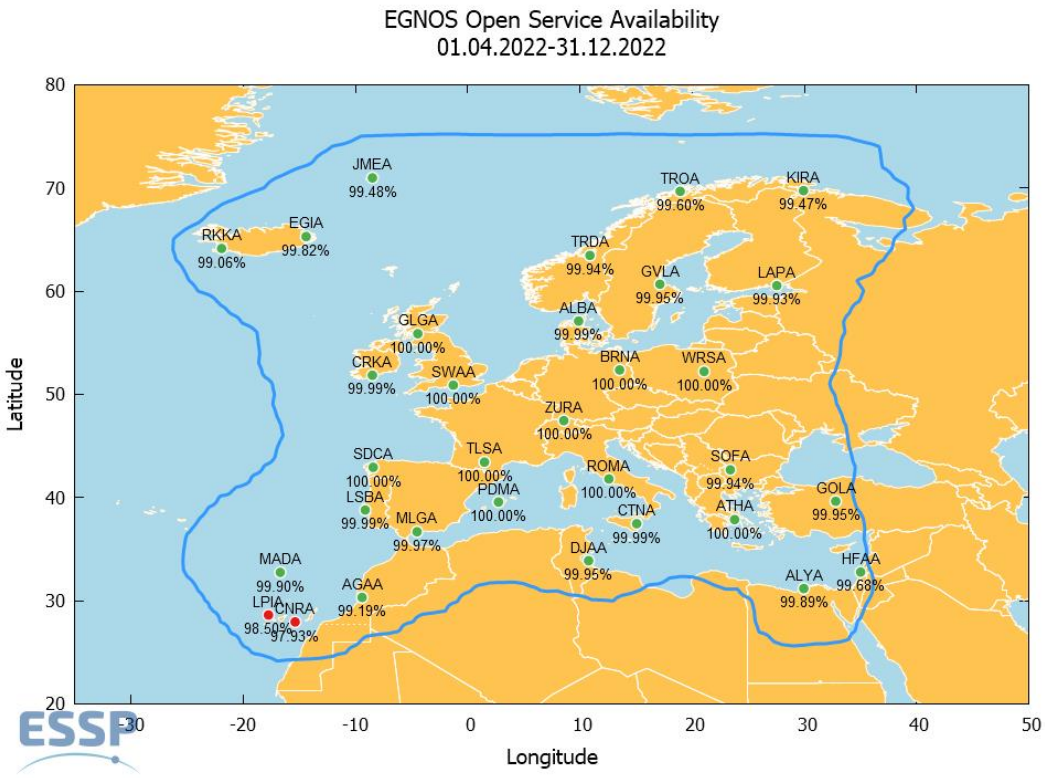


Figure 34: OS availability for the RIMS stations

As shown in the above figure, the global Open Service Availability performance has been greater than 99% at all stations except for RIMS CNR-A and LPIA.

2.6 EGNOS Data Access Service (EDAS)

EDAS provides free-of-charge internet-based access to EGNOS and GNSS (GPS and GLONASS) data in real-time and through an archive, including all data generated by the EGNOS ground stations, mainly distributed over Europe and North Africa.

EDAS, like all other EGNOS Services, has its own EDAS SDD (Service Definition Document). Among other content, the EDAS SDD defines the committed performance for EDAS (which 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 from the transmission of the last bit of the navigation message from the space segment (the EGNOS and the GPS/GLONASS satellites) until the data leave the EDAS system (formatted according to the corresponding service-level specification). The EDAS latency is a one-way parameter defined for real-time services.

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

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

Table 12: EDAS minimum service availability

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

Table 13: Maximum latency for EDAS Services

The EDAS performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website.

Figure 35 shows the availability achieved during the period.

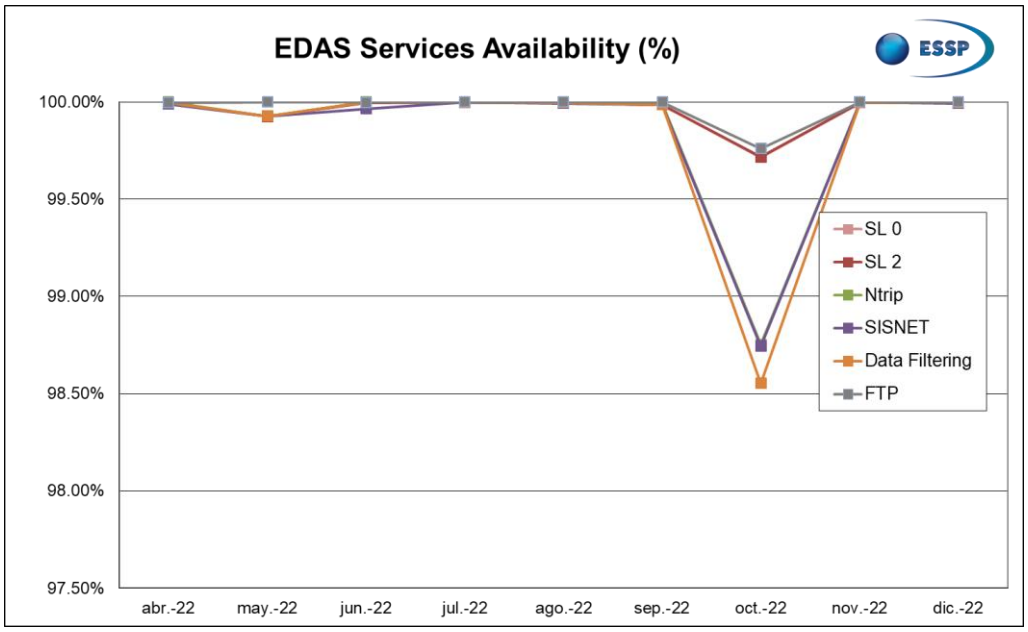


Figure 35: EDAS Services Availability (from April 2022 to December 2022)

The latency for real-time services (not applicable for the FTP service) during the previous annual period is shown below, computed as the average of the 95th percentile latencies monitored for every five minutes during the period.

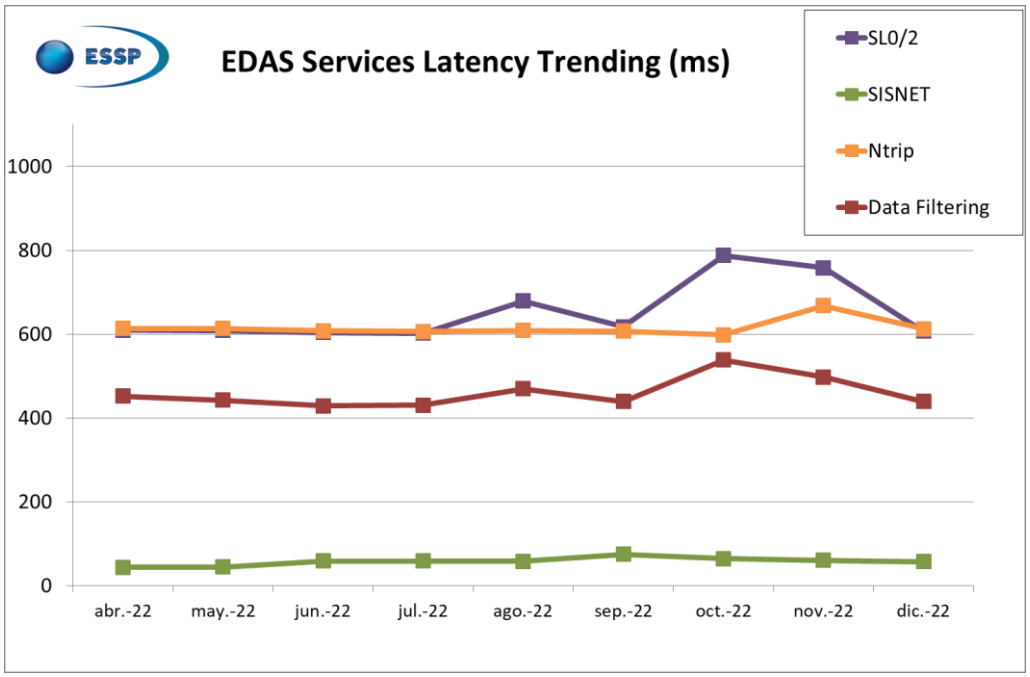


Figure 36: EDAS Services Latency (from April 2022 to December 2022)

As shown in Figure 36, the EDAS service latency has been consistently below the one-second threshold and well below the EDAS SDD commitment for all services over the entire reporting period.

3 EGNOS SERVICES PROVISION

Service Performance

From the 1 April to 31 December 2022, the EGNOS service performance has been good, providing consistent values in general with those committed through the Open Service, Safety-of-Life, and EDAS Service Definition Documents.

The southwest was slightly degraded due to ionospheric irregularities linked to the increase in solar activity which is expected during the so called “Solar Cycle 25”; whilst the northern border was degraded events linked to high geomagnetic activity.

ESSP in coordination with EUSPA is working on potential mitigations anticipating the solar peak expected in 2025: this action has been in fact established as maximum priority within the EGNOS Program. These mitigations include an anticipated communication to users and a new system release EGNOS v2.4.2B (foreseen in the last quarter of 2023), which will be more robust to this natural event.

The main causes for the observed OS and SoL Service performance degradations can be classified in:

- **Ionosphere monitoring:** the EGNOS ionosphere monitoring problems affected mainly the north and southwest of the Service Area. This has been the main cause for the EGNOS underperformance during the reporting period. The increase of solar activity due to solar cycle #25 has led to increasingly frequent ionospheric irregularities.
- **GPS monitoring:** Problems related to monitoring one or more GPS satellites. Monitoring loss of some satellites in combination with the aforementioned degraded ionosphere monitoring conditions significantly impacted the performance.
- **NANUs:** The publication of NANUs, that declare certain satellites as temporarily not usable, has impacted the EGNOS service performance on specific days on most of the Service Area. The most notable degradations took place during the months of October, November and December.

Some issues affecting the service performance have been communicated to users through the corresponding Service Notices: Service Notice 23 published on October 2022 and Service Notice 24 published in December 2022, addressed topics related to impact on performance due to GPS maintenance and RIMS configuration activities (RIMS ALY and ABS off) respectively.

Regarding EDAS, the availability and latency performance targets have always been largely compliant with the SDD commitment. Considering the whole period, all EDAS services were available more than 99.95% of the time (except on 20 and 21 October 2022 due to a network issue), with transit delays largely below the 1 second threshold.

Service Provision and Development

ESSP has provided continuous support to the definition and evolution of the services through the activities related to the Service Definition Documents (SDD). The EDAS SDD was published in September 2022 (refer to EGNOS User Support Website).

The maturity of the ESSP Management System is demonstrated by the maintenance of the ISO27001, ISO9001 and mostly important EASA Pan-European service provider certificate.

With regards to the user support improvement process, the result of the user survey held in 2022 conveyed a good satisfaction score (on average above 8.5 out of 10). At the time of writing this report ESSP is preparing an action plan based on the user feedback in order to improve their satisfaction.

The EGNOS annual workshop with the users took place in October 2022 as part of the European Space Week organised by EUSPA. During the EGNOS session interesting EGNOS' implementation case studies within the aviation, maritime, rail and agriculture sectors were presented (refer to EGNOS User Support Website).

As a result of this activity, ESSP has signed 2 new EWAs (currently 76 in force) between April and December 2022): both of them established with rotorcraft operators.

ESSP continued its specific dissemination and awareness campaign related to the EGNOS Working Agreement (EWA). As a result of this process, ESSP has signed 2 new EWAs over this period (76 in force), both of them established with non-ATS organizations: SPASU (Swedish Police Air Support Unit) and SMAHU (Swedish maritime Administration Helicopter Unit). Both organizations are air (rotorcraft) operators performing police and search & rescue (SAR) air operations, respectively. Being therefore the fifth EWA with this kind of organization to date.

ESSP and EUSPA have continued engaging with aerodrome operators to publish the EGNOS-based procedures and air operators to get equipped and certified. During the period reported in this document ESSP was supporting the EGNOS-based operations for 463 aerodromes and a total of 875 EGNOS-based operations (439 APV-I, 398 LPV-200, 33 APV-Baro EGNOS-based approach procedures and 5 RNP 0.3 routes).

In the maritime domain, ESSP continues with the support to the SBAS-L1 EGNOS Maritime Service Implementation Plan and looking forward to implementing the new EGNOS Maritime service around end 2023. The activities related to the use of the EGNOS V2 SiS or EDAS as a positioning source for Aids to Navigation (IALA DGNSS stations and AIS stations) have continued and a number of Cost-Benefit analysis (CBAs) were carried out in support to the implementation in some countries.

In addition, ESSP supported closely EUSPA in the development of the IEC SBAS maritime receiver standard: support which will continue until the publication of this standard, but also in other domains, considering the likely interest of EUSPA in developing new SoL SDDs for rail, road and drones, on top of aviation and maritime applications.

The communication with users is fluent together with the continuous support provided through the EGNOS helpdesk: in numbers during 2022 the EGNOS Helpdesk managed a total of 162 user requests.

The EGNOS User Support website continued its evolution during the reported period, adding new functionalities for the users and increasing their number: a total of 4291 registered users of which 184 are new.

The EGNOS NOTAM proposals service has provided excellent performances whilst fully complying with the applicable Key Performance Indicators as well as fulfilling adequately the target reaction times towards the users.

A continuous and stable use of EDAS services is observed. During the reporting period an average of seventy-four (74) active users were connected on a monthly basis. It is important to highlight that 2022 marks 10 years since the EDAS service was declared in 2012. Throughout this decade of data provision, the portfolio of services has grown and evolved, whilst being oriented towards different domain applications.

APPENDIX A FULL LIST OF EGNOS-BASED APPROACH PROCEDURES

The information shown in this annex corresponds to the situation at AIRAC Cycle#2,213 (31/12/2022).

Only runway ends for which the EGNOS Service Provision is activated are considered. Additional information is also shown in parentheses in the “Airports” column in cases where the number of airports with LPV, LPV-200 and/or PinS does not reflect the total number of airports in that country. This means that some airports only have APV-Baro procedures.

It needs to be borne in mind that the percentages shown should not be understood as the percentage of compliance with the PBN IR, as ESSP is not in a position to provide those figures, and EGNOS procedures published at non-instrument runways or at military airdromes are not considered.

REGULATION (EU) No 2018/1048 is not binding for Guernsey and Jersey unless transposed.

Country	Airports	LPV Procedures	LPV-200 Procedures	APV-baro (EGNOS enabled)	Instrumental runway ends	% Instrumental runway ends
Austria	8	2	13	0	12	108.33%[11]
Belgium	6	10	4	0	23	56.52%
Bulgaria	4	9	0	0	10	90.00%
Croatia	8	15	0	0	18	83.33%
Cyprus	0	0	0	0	6	0.00%
Czech Republic	6	9	4	0	18	72.22%
Denmark	17	17	6	0	34	29.41%
Estonia	5	5	7	0	10	100%
Finland	23	48	2	0	55	89.09%
France	109	69	123	5	197	95.43%
Germany	54 (45 LPV/LPV-200/PinS)	29	63	22	142	75,35%
Greece	4	6	0	0	48	12.50%
Guernsey	2	2	2	0	4	100%
Hungary	7	10	7	0	19	89.47%
Iceland	4	5	0	0	23	21.74%
Ireland	4	5	7	0	28	42.86%
Italy	28	25	32	0	75	74.67%
Jersey	1	0	2	0	2	100%
Latvia	3	0	6	0	6	100%
Lithuania	3	5	0	0	8	62.50%
Luxembourg	1	0	2	0	2	100%

[11] It is noteworthy that the percentage is over 100%. This is because the metric counts the number of procedures published on Instrumental Runway Ends (IREs). If there are several procedures (more than one) published in the same IRE, both will contribute to the percentage; thus it can be over 100%.

Country	Airports	LPV Procedures	LPV-200 Procedures	APV-baro (EGNOS enabled)	Instrumental runway ends	% Instrumental runway ends
Malta	1	2	2	0	4	100%
Montenegro	1	0	1	0	2	50.00%
Netherlands	10	6	20	0	26	96.15%
Norway	67 (65 LPV/LPV-200/PinS)	63	37	5	104	77,89%
Poland	14	0	30	0	34	88.24%
Portugal	5	7	0	0	23	30.44%
Romania	1	2	0	0	33	6.06%
Serbia	3	0	5	0	5	100%
Slovak Rep.	5	2	6	0	8	87.50%
Slovenia	1	1	0	0	3	33.33%
Spain	13	18	5	0	93	23.65%
Sweden	35	62	3	1	88	64.77%
Switzerland	9	5	9	0	16	75.00%
Total	**463 (453 LPV/LPV-200/PinS)**	**439**	**398**	**33**	**1178**	

Instrumental runway ends with APV-Baro/LPV/LPV-200 procedures published	Total of instrumental runway ends in Europe		Percentage
796	1178		67.57%

Table 14: Full list of EGNOS-based Approach Procedures as of December 2022 (AIRAC cycle#2213)

END OF DOCUMENT