PROGRAMME OF THE
EUROPEAN UNION

EGNOS

EGNOS Annual Performace Report

2024

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DOCUMENT CHANGE RECORD

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1 INTRODUCTION

This document constitutes the EGNOS Annual Performance Report and provides reports and analyses on the performance of EGNOS service provision over one full year, from 1 January 2024 to 31 December 2024, both dates included.

Daily, weekly, and monthly service performance is monitored and analysed as part of ESSP's routine operations and is reported through the dedicated EGNOS User Support Website or the monthly performance report.

2 EXECUTIVE SUMMARY

2.1 A word from the ESSP CEO

In recent years, aviation in general, and Air Traffic Management (ATM) in particular, have been significantly affected by the COVID-19 pandemic crisis. Since 2022, traffic has been increasing once again, and EGNOS services continue to contribute to a safe sky by being provided continuously, safely, and securely.

Following a challenging period for both aviation and ATM, the last two years have seen traffic levels recover and even surpass those of the pre-Covid period. EGNOS services play a pivotal role in ensuring a safe and environmentally friendly sky, with particular attention being paid to cybersecurity.

Having delivered the EGNOS Navigation service for over 15 years, ESSP takes great pride in continuing as the EGNOS Service Provider for the coming years under a contract with EUSPA.

The year 2024 has been marked by the introduction of a new Safety of Life Assisted Service for Maritime users (ESMAS), and the publication of a new Service Definition Document [RD-1] that expands EGNOS coverage in Northern Europe. This enhancement is the result of significant performance improvements observed throughout 2024, driven by the innovative ionosphere monitoring algorithms introduced in the EGNOS system release 2.4.2B, deployed at the end of 2023.

ESSP is pleased to report that throughout the year, the EGNOS service has been maintained at a high level of performance.

I would like to extend my gratitude to the ESSP teams for their dedication, to our partners and subcontractors for their adaptability in supporting the maintenance of top-tier services, and to our customer, EUSPA, for their continued trust.

Charlotte Neyret
CEO, ESSP SAS

2.2 Service Performance

Table 1 shows a summary of EGNOS performance per service along year 2024.

EGNOS Safety of Life (SoL) Service for Aviation – Non-Precision Approach (NPA)[1]				
NPA Availability	100% coverage of 99.9% of the NPA Service Area			
NPA Integrity	No integrity event for any of the monitoring sites			
NPA Continuity	100% coverage of the 5.10^{-4}/h NPA Service Area			
EGNOS Safety of Life (SoL) Service for Aviation – Approach with Vertical Guidance (APV-I)[1]				
APV-I Availability	95.56% coverage of the 99% APV-I Service Area			
APV-I Integrity	No APV-I integrity event			
APV-I Continuity	98.74% coverage of the $5 \cdot 10^{-4}$ APV-I Service Area			
EGNOS Safety of Life (SoL) Service for Aviation – LPV-200[1]				
LPV-200 Availability	92.35% coverage of the 99% LPV-200 Service Area			
LPV-200 Integrity	No LPV-200 integrity event			
LPV-200 Continuity	97.75% coverage of the $5 \cdot 10^{-4}$ LPV-200 Service Area			
LPV-200 Accuracy Tails	Accuracy events at RIMS TROA (19 April and 29 October), KIRA (29 October) and TRDA (6 October and 1 November)			
EGNOS Open Service (OS)[2]				
Horizontal Accuracy (95%)	1.2 metres (cumulative data for all monitoring stations) vs 3 meters target.			
Vertical Accuracy (95%)	1.9 metres (cumulative data for all monitoring stations) vs 4 meters target			
Open Service Availability	Above 99% for all locations, except for 2 monitoring stations (RIMS)			
EGNOS Safety of Life assisted service for Maritime users (ESMAS)[3]				
Accuracy (95%)	1.4 meters (cumulative data for all monitoring stations) vs 10 meters target.			
Availability of accuracy	Above 95% for all locations.			
EGNOS Data Access Service (EDAS)[4]				
Service	**Availability**	**Availability Target**	**Latency**	**Latency Target**
Service Level 0	99.76%	98.5%	671.20 ms	1300 ms
Service Level 2	99.76%	98.5%	670.81 ms	1450 ms
Ntrip	99.76%	98%	642.76 ms	1750 ms
SISNeT	99.76%	98%	61.09 ms	1150 ms
Data Filtering	99.77%	98%	476.15 ms	1750 ms
FTP	99.98%	98%	N/A	N/A
Signal-In-Space (SIS) Availability				
GEO PRN136	**GEO PRN123**		**EGNOS OP (at least one SIS)**	
99.99%	99.99%		100%	

Table 1: EGNOS service performance from 1 January 2024 to 31 December 2024.

[1] Refer to SoL SDD [RD-1]
[2] Refer to OS SDD [RD-2]
[3] Refer to ESMAS SDD [RD-3]
[4] Refer to EDAS SDD [RD-4]

The leading causes for the observed degradation in EGNOS Service performance were as follows:

- *EGNOS Open Service (OS) and Safety of Life (SoL) services:*
    - **Ionosphere monitoring:** Problems with EGNOS ionosphere monitoring primarily affected the north and south of the Service Area. Throughout 2024, this has been the leading cause of the observed underperformance. The main reason is the increase in solar activity due to the solar cycle, which has led to more frequent ionospheric disturbances. It must be noted that current solar cycle 25 shows higher intensity than the predictions leading to some severe conditions never faced by EGNOS so far. However, thanks to ESR242B deployment in 2023, EGNOS performance resiliency has been significantly improved.
    - **Notice Advisory to Navstar Users (NANU):** The publication of NANUs declaring certain GPS satellites temporarily unusable has impacted the performance of EGNOS services on specific days in most of the Service Area.
    - **Data quality/RIMS anomaly:** Local issues affecting the RIMS receiver used for GPS monitoring purposes have contributed to daily degradation in the area close to the affected RIMS.

2.3 Service delivery and management

2.3.1 EGNOS services user interface

2.3.1.1 EGNOS services-related documents evolution (SN, SDD, SIR)

- Service Notices (SN):

  In 2024, one Service Notice (SN) was published to communicate changes in the EGNOS system and their impact on the services defined in the corresponding Service Definition Documents (SDD). Additionally, the status of four SNs was changed to [Expired]. These service notices are available at the EGNOS User Support Website (https://egnos.gsc-europa.eu/documents/field_gc_document_type/87).

  Further details can be found in section §4.1.

- Service Definition Documents (SDDs):

  Throughout 2024, all Safety of Life for Aviation [RD-1], Open Service [RD-2] and EDAS Service Definition Documents [RD-4] were updated, and the ESMAS SDD [RD-3] was created. The published SDDs are available at the EGNOS User Support Website (https://egnos.gsc-europa.eu/documents/field_gc_document_type/89).

  Further details can be found in section §4.1.

- Service Implementation Roadmap (SIR):

  Two updates to the Service Implementation Roadmap (SIR) were published in 2024 to communicate the expected evolutions of the EGNOS system covering all EGNOS services. The latest SIR is available at the EGNOS User Support Website (https://egnos.gsc-europa.eu/documents/field_gc_document_type/93).

2.3.1.2 User Support (EGNOS OS/SoL & EDAS/ESMAS Websites & Helpdesks)

The structure of user support services has evolved, with EDAS now managed separately from the main EGNOS User Support Website and Helpdesk. Instead, EDAS support is now integrated with ESMAS.

The EDAS and Maritime User Support Website and Helpdesk were launched on behalf of EUSPA, the service provider for ESMAS and EDAS, during the EGNOS Workshop 2024, coinciding with the declaration of the Maritime Service.

Throughout the year, the EGNOS and EDAS Maritime Helpdesks handled 185 user requests. Additionally, 122 Service Degradations or Outage Notifications related to EGNOS and EDAS-Maritime services were issued.

2.3.1.3 Service Prediction Tools

The most notable achievements for the reporting year include:

- Successful deployment of a new version of NOTAM, implementing corrective measures to reinforce security.
- Provision of new firewall devices to replace the current ones due to obsolescence and the development of a new feature requested by some ANSPs for the use of multiple AFTN addresses for NOTAM proposals.
- Successful deployment of the first version of the MSI tool to provide MSI Proposals Service.
- Successful deployment of a new version of the MSI tool, which implements improvements to the system, such as incorporating additional probes to extend the scope of the MSI monitoring tool allowing new maintenance notifications, enabling an enhanced service performance.

2.3.1.4 User support improvement process

Regarding the user support improvement process, the 2023 user survey results indicated a high level of satisfaction with an average score[5] exceeding 8.2 out of 10. Additionally, the EGNOS satisfaction parameter, which evaluates the level of user recommendation[6], reached the value of 85.6%. All identified recommendations have been analysed and translated into a set of actions to be implemented during 2024-2025.

2.3.2 EGNOS services development

EGNOS Programme addressed important challenges throughout 2024 in the aviation (including drones), maritime and rail sectors.

2.3.2.1 Aviation

Regarding the development of the EGNOS Safety of Life (SoL) Service for Aviation in 2024, a total number of eight (8) new EGNOS Working Agreements (EWAs) have been successfully signed between the EGNOS Service Provider for the EGNOS SoL Service for Aviation and different organizations aiming to implement EGNOS-based procedures.

The EWA framework continues being consolidated, not only for civil Air Navigation Services Providers (ANSPs), both Air Traffic Control (ATC) and Aerodrome Flight Information Service (AFIS) providers, but also for other non-conventional organisations. Examples include military ANSPs that intend to implement EGNOS-based procedures to service General Air Traffic (GAT) at military airbases and air (rotorcraft) operators that benefit from EGNOS in terms of increased safety and accessibility, particularly in non-ATS (Air Traffic Service) locations/helipads where they regularly operate.

The status of the EGNOS SoL Service for Aviation provision has been provided in the following aviation forums to update the aviation community on the topic, such as the ICAO PBNC TF#10&11 / EUROCONTROL NSG#37&38 (April/October 2024), the LATAM SBAS virtual workshop (September 2024), the NATO MIPSP#37 meeting (June 2024) or the ninth meeting of the European GNSS General Aviation Working Group (June 2024).

It is also important to highlight the work carried out to enable and harmonise the scheme that allows the use of EGNOS in degraded scenarios without ATC Services and non-instrument runways. Notably, the support for different implementation initiatives in Sweden (Boras) and Germany (Breda) is worth mentioning.

[5] This score is calculated taking the average of the quantitative questions that each respondent has answered in a scale 1-10.

[6] This parameter represents the average number of the quantitative question (scale 1-10) "How likely would you recommend EGNOS overall services to another user?" presented as a percentage.

Unmanned Aircraft System (UAS)/drones are identified as one of the beneficiaries of EGNOS Services in the near future. Adapting the EGNOS service provision layer to meet the needs of UAS users will be crucial to maximise the added value of EGNOS both inside and outside the U-space. In this regard, EUSPA and ESSP have intensively supported different lines of work to develop the appropriate framework, capturing user needs and assessing various approaches. Particularly relevant is the contribution to EUROCAE WG-105 sb-6 for developing guidelines for SAIL III and IV UAS operations, the contribution to the GNSS use for medium-risk UAS operations developed by AESA and the preliminary assessment of potential service provision scheme, including GNSS performance monitoring and forecasting capabilities.

2.3.2.2 Maritime

In the maritime domain, the main achievements during the reporting year are as follows:

- As part of the Maritime Service Preparation Activities, the development of tools, operational processes and procedures necessary for EGNOS Maritime Service Provider support operations was completed. The successful completion of these activities contributed to the official declaration of the EGNOS Safety of Life (SoL) assisted service for MAritime userS (ESMAS) by EGNOS Maritime Service Provider (EUSPA) in March 2024.
- Active presence in the main forums related to the Maritime and Inland Waterways domains:
    - Working in the frame of the International Association of Marine Aids to Navigation (IALA) coordinating and developing an input paper titled “Development of procedures and requirements for the recognition of augmentation systems in the IMO WWRNS (World Wide Radio Navigation Systems)”, already approved, and submitted to the International Maritime Organisation (IMO) with the sponsorship of Australia and co-sponsorship of IMO Member States, particularly by New Zealand, United Kingdom, Netherlands, Finland and China.
    - In CESNI, the European Committee for the Standardisation for Inland Navigation, monitoring and exploring the potential future introduction of EGNOS in inland waterways (IWW).
    - Training material on using SBAS in the maritime sector was developed with the intention to be provided in 2025 to different stakeholders (i.e. IALA, CESNI, shipowner associations) and actors were informed about the main characteristics and benefits of using EGNOS (ESMAS) in the Maritime domain. This training material will be included in the IALA World Wide Academy training courses.
- To complement the above activities and take advantage of the experience in the maritime sector at a programme level, the following work has been done:
    - Assessment of potential mechanisms to enable the retransmission of SBAS corrections (e.g. EGNOS) through VDES technology. This activity will be continued in 2025.
    - Assessment of a possible operational concept, scenarios and service provision schemes for introducing EGNOS in inland waterways (IWW).

2.3.2.3 Rail

Regarding the Rail domain, work has continued in the definition of a future EGNOS service for safe critical applications in the Rail sector within the EGNOS4RAIL project, analysing the current regulatory framework, proposing alternatives and future lines of work. and developing an initial proposal of a Service Provision Scheme for this new EGNOS service.

3 EGNOS SERVICE PERFORMANCE

3.1 EGNOS SIS Availability

*The **Individual GEO availability** is the percentage of time each geostationary satellite broadcasts a valid EGNOS SIS. A valid SIS is defined as a Signal-In-Space delivering safety of life augmentation messages compliant with ICAO SARPS and RTCA MOPS.*

*The **Grouped GEO availability** is the percentage of time in which at least one geostationary satellite in the EGNOS operational configuration (EGNOS-OP) broadcasts a valid EGNOS SIS (as per above definition).*

This section presents the annual performance of SIS availability. It provides the monthly SIS availability for each GEO PRN in operational mode, namely PRN123, PRN136 and the operational SIS (at least one SIS available).

- Individual GEO availability (SES-5 configured with PRN136): 100.00 %
- Individual GEO availability (ASTRA-5B configured with PRN123): 99.99 %
- Grouped GEO availability (at least one SIS): 100.00 %

Numerical values for each month and each PRN are given in Table 2:

DATE	PRN136 (%)	PRN123 (%)	PRN136 OR PRN123 (%)
January 2024	100.00	100.00	100.00
February 2024	100.00	100.00	100.00
March 2024	100.00	100.00	100.00
April 2024	100.00	100.00	100.00
May 2024	100.00	99.92	100.00
June 2024	100.00	100.00	100.00
July 2024	100.00	100.00	100.00
August 2024	100.00	100.00	100.00
September 2024	100.00	100.00	100.00
October 2024	100.00	100.00	100.00
November 2024	100.00	99.99	100.00
December 2024	100.00	99.98	100.00
Average monthly availability	**100.00**	**99.99**	**100.00**

Table 2: EGNOS SIS OP Monthly availability from January to December 2024 (%)

3.2 SoL Service – Non-Precision Approach (NPA)

3.2.1 NPA minimum performance

Figure 1 and Figure 2 recall 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 for Aviation Definition Document [RD-1]).

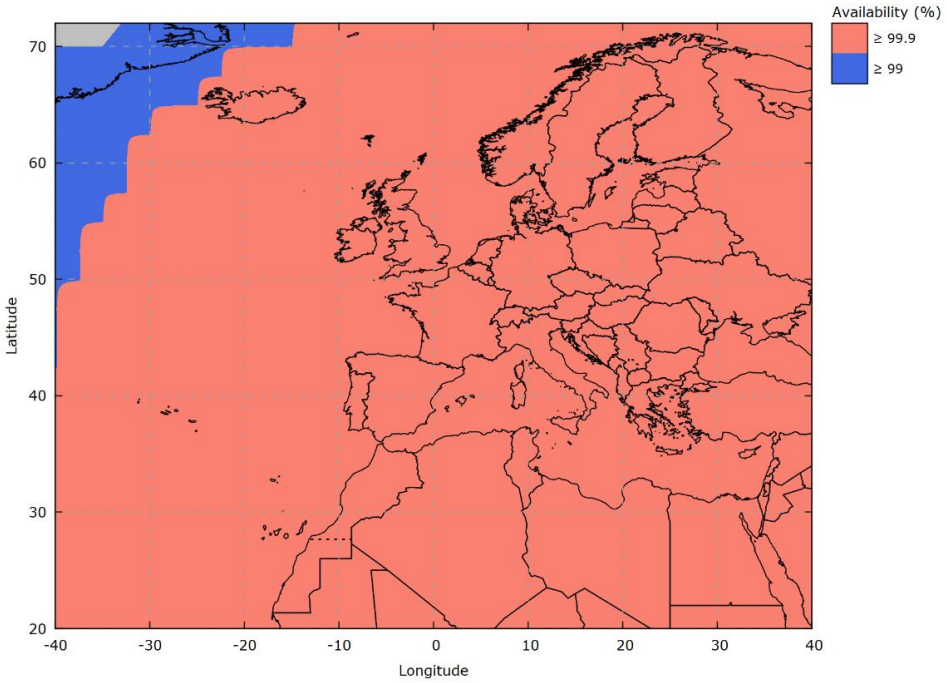

Figure 1: NPA Availability map – Expected minimum performance (SoL SDD v3.6 [RD-1])

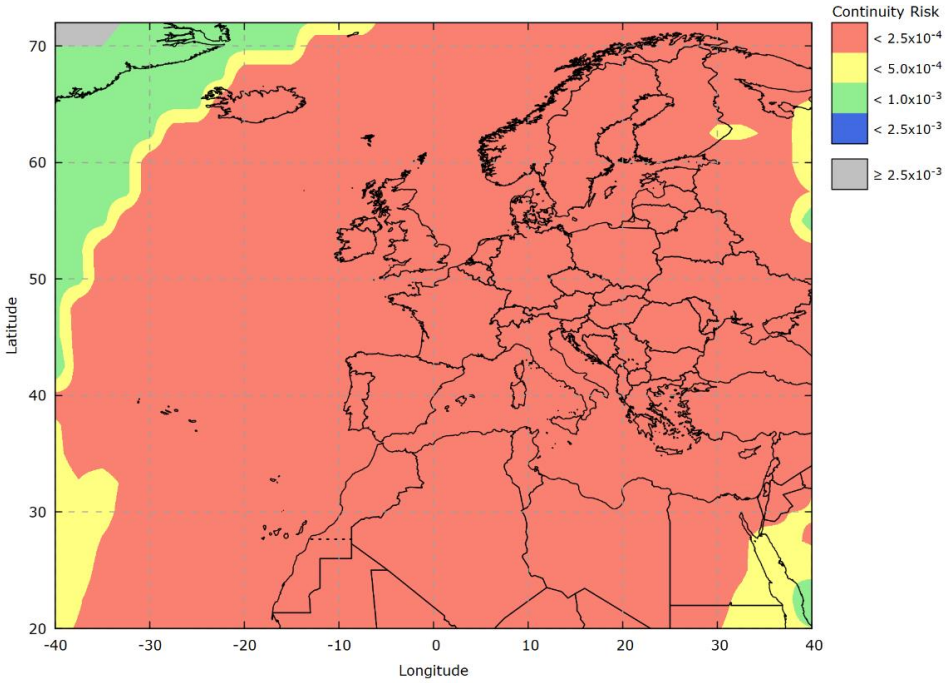

Figure 2: NPA Continuity map – Expected minimum performance (SoL SDD v3.6 [RD-1])

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.

3.2.2 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), calculated over the total period.*

Figure 3 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 if a SiS outage longer than three seconds is observed).

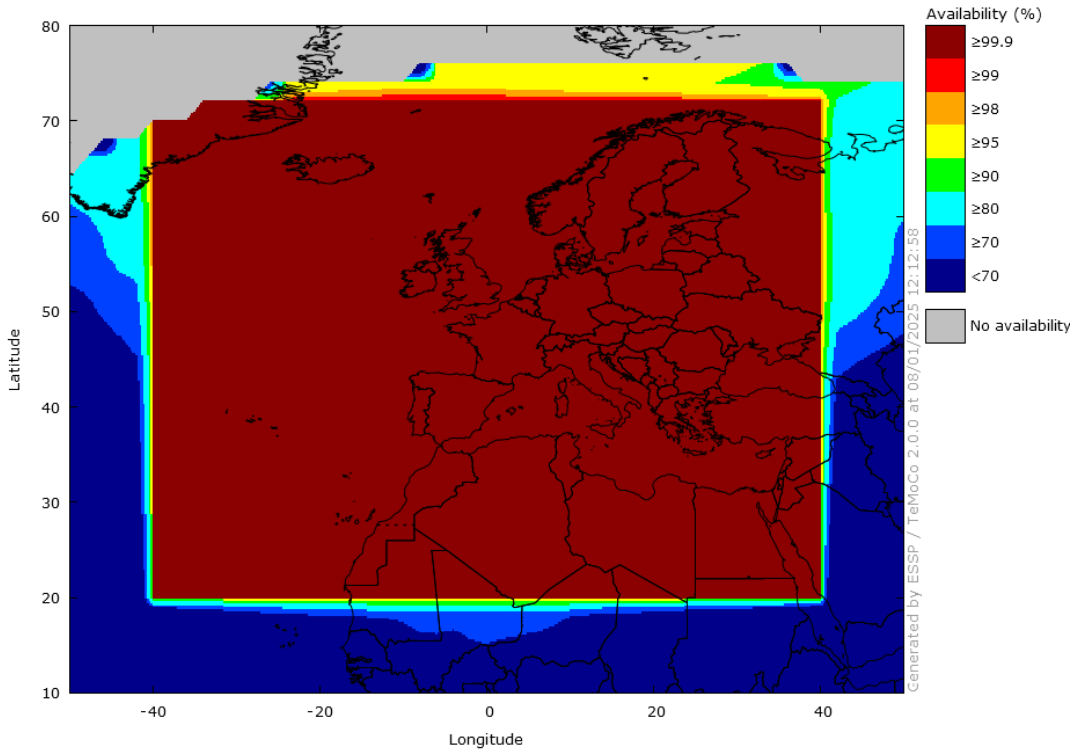

Figure 3: NPA Availability from 01/01/24 to 31/12/24

The NPA availability performance has been met during the reporting period: 100% over the entire NPA Service Area[4].

3.2.3 NPA availability – Achievement against target values

In this section, the compliance of NPA availability is established by comparing the performance with the Reference Map of the Service Area in Figure 1. The Figure 4 illustrates the combination of the 99% NPA availability map and the NPA Service Area.

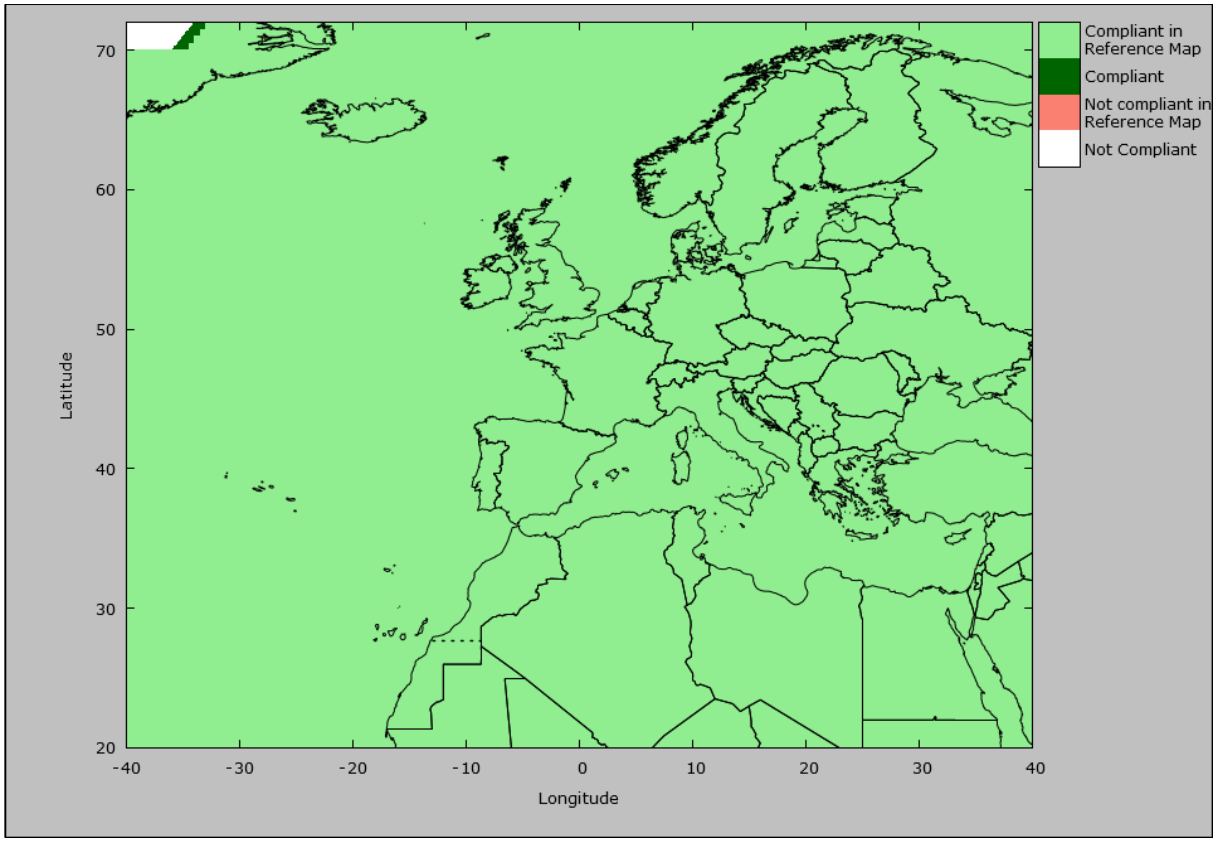

Figure 4: NPA Availability map regarding the Service Area – from 01/01/24 to 31/12/24

In Figure 4, the legend should be read as follows:

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

As shown in Figure 4, the NPA availability was greater than 99% (green colour) over the area where the EGNOS GEOs were visible (all except the top left corner in white) for the reporting period.

Taking the SoL SDD v3.6 [RD-1] commitments as the reference, the percentage of compliant points with the 99.9% NPA Service Area (i.e. availability above 99.9%) is **100%**. Note that the SoL SDD commitment map comparison is included for information purposes. The commitment map is a monthly reference, whereas the reporting period is one year.

3.2.4 NPA Integrity

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 NPA algorithms calculate 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 1 at 90%).

Station	HSI	Station	HSI
Agadir	0.88	La Palma	0.83
Aalborg	0.27	Lappeenranta	0.31
Athens	0.58	Lisbon	0.67
Azores	0.51	Madeira	0.81
Berlin	0.34	Malaga	0.96
Canary Islands	0.70	Palma de Mallorca	0.64
Cork	0.67	Reykjavik	0.28
Catania	0.31	Roma	0.63
Djerba	0.88	S. de Compostela	0.35
Egilsstadir	0.28	Sofia	0.31
Gävle	0.35	Swanwick	0.31
Glasgow	0.28	Toulouse	0.31
Golbasi	0.42	Tromsoe	0.33
Haifa[7]	N/A	Trondheim	0.29
Jan Mayen	0.33	Warsaw	0.30
Kirkenes	0.32	Zürich	0.38
Kuusamo	0.28		

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

There was no integrity event at any of the RIMS stations located within the SoL SDD [RD-1] commitment area during the year. The very high geomagnetic activity observed in certain regions (south and north of the Service Area) increased the HSI of the associated RIMS stations, but the values remain below 1.

[7] Note that RIMS HFA has been removed from EGNOS operational configuration this year due to strong interferences related to military activity observed in Israel.

Figure 5 shows the HSI histogram, which includes measurements from the different EGNOS stations and for the operational GEOs throughout the year.

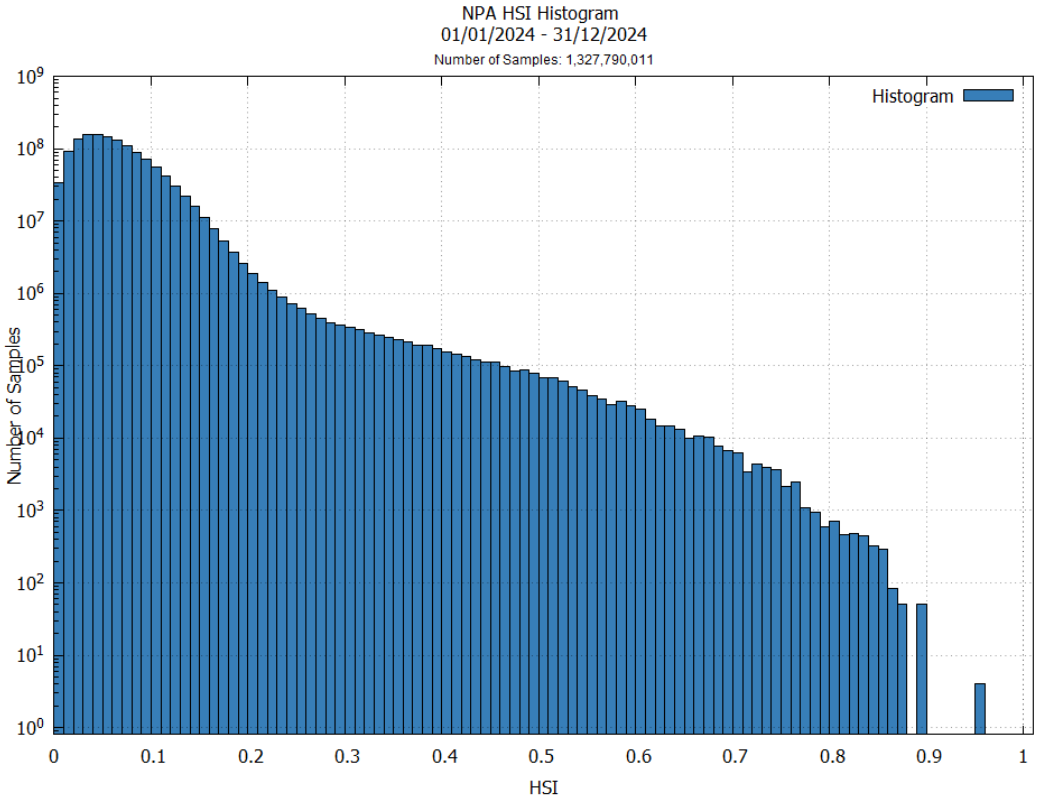

Figure 5: NPA Horizontal Safety Index[8]

The histogram shows that there was no MI event during the year. For southern RIMS (e.g., MLG, DJA), the HSI values exceed 0.80. The analyses demonstrated that these cases were not linked to EGNOS corrections, but to the use of the GPS ionospheric model (Klobuchar) which demonstrated some inaccuracies under significant ionosphere disturbances. It is recalled that NPA operations allow airborne receivers to revert on GPS ionospheric model when no ionosphere correction is available. For instance, on 26th of September, RIMS DJA presented a near MI with an HIS value of 0.82. An additional test has been performed using only the EGNOS ionospheric corrections (i.e. no use of Klobuchar model if EGNOS ionospheric data is unavailable). This resulted in a HSI reduction to 0.13, which demonstrates that the near MIs observed in Figure 5 were caused by using Klobuchar model.

Anyway, despite such significant HSI values, computed HNSE were always far below the NPA Horizontal Alert Limit (556m) confirming the absence of any possible integrity issue.

In addition, no MI or near MI was detected in stations out of MT27 area.

[8] Note that some periods may have been removed to calculate the different histograms presented in this document, corresponding to monitoring stations showing poor-quality data related to the local environment.

3.2.5 NPA Continuity

EGNOS NPA Continuity *is calculated 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 beginning of the operation and, in at least one second within the following time-sliding window of one hour, the system becomes unavailable.*

Figure 6 shows the NPA Continuity Risk obtained for the combined GEOs covering the entire analysed period.

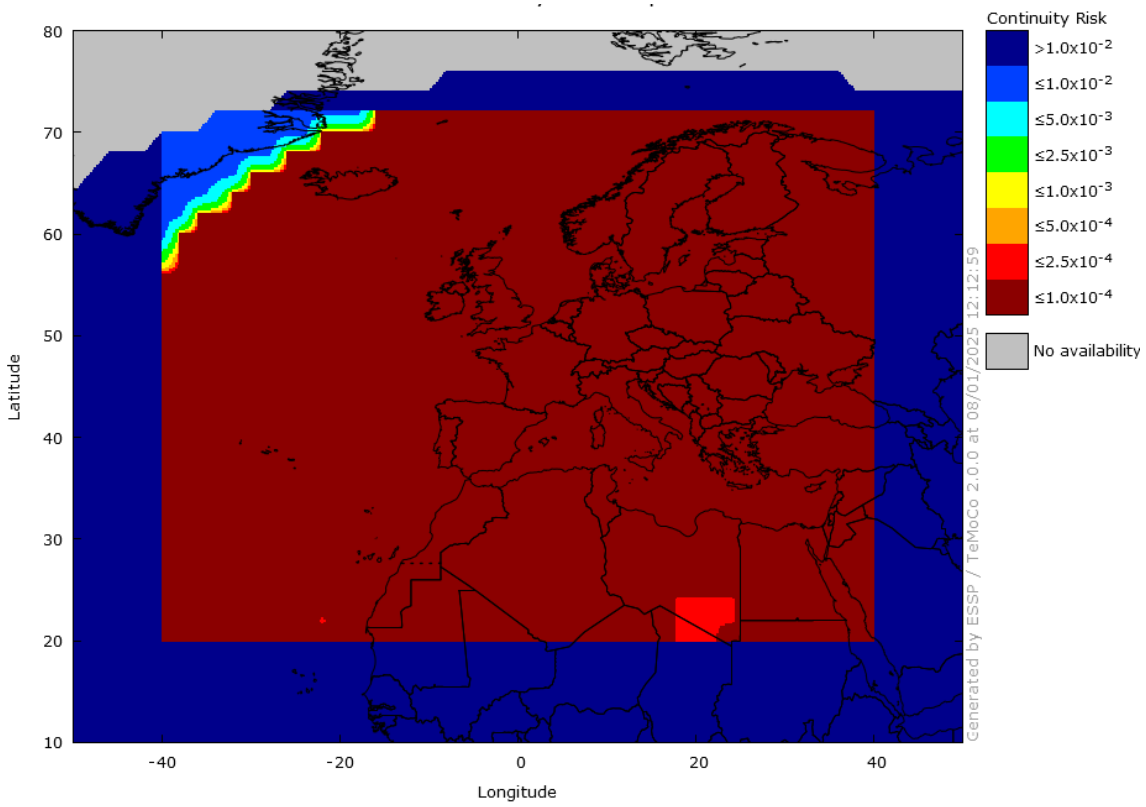

Figure 6: NPA Continuity Risk from 01/01/24 to 31/12/24

As per Figure 6, the continuity risk met 5e-4/h over the Service Area in 2024.

3.3 SoL Service – Approach with Vertical guidance (APV-I) with minimum decision altitude of 250ft

3.3.1 APV-I minimum performance

Figure 7 and Figure 8 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 for Aviation Definition Document [RD-1].

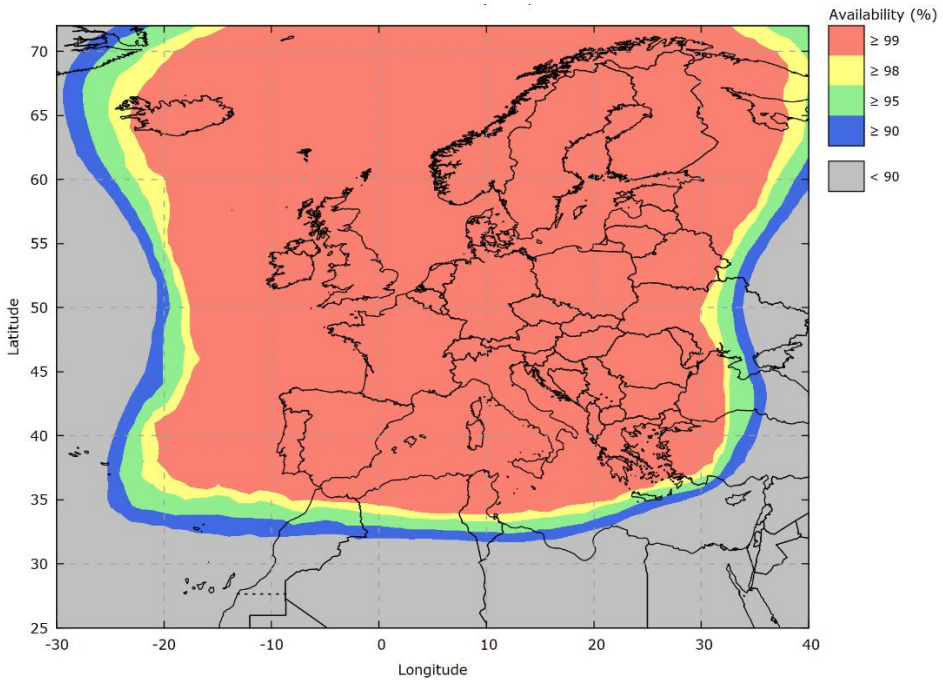

Figure 7: APV-I Availability map – Expected minimum performance (SoL SDD v3.6 [RD-1])

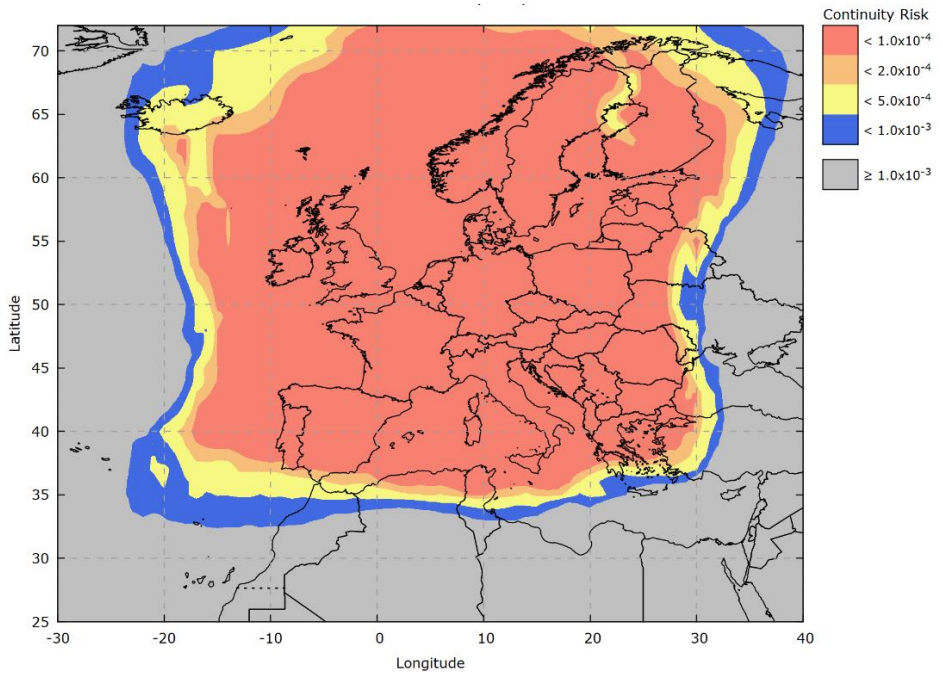

Figure 8: APV-I Continuity map – Expected minimum performance (SoL SDD v3.6 [RD-1])

These values correspond to the expected performance measured by a fault-free receiver using all satellites in view, averaged over the entire year, using all operational EGNOS GEOs.

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

3.3.2 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.*

Figure 9 shows the APV-I Availability map for the combination of the operational GEOs during the reporting period[9]:

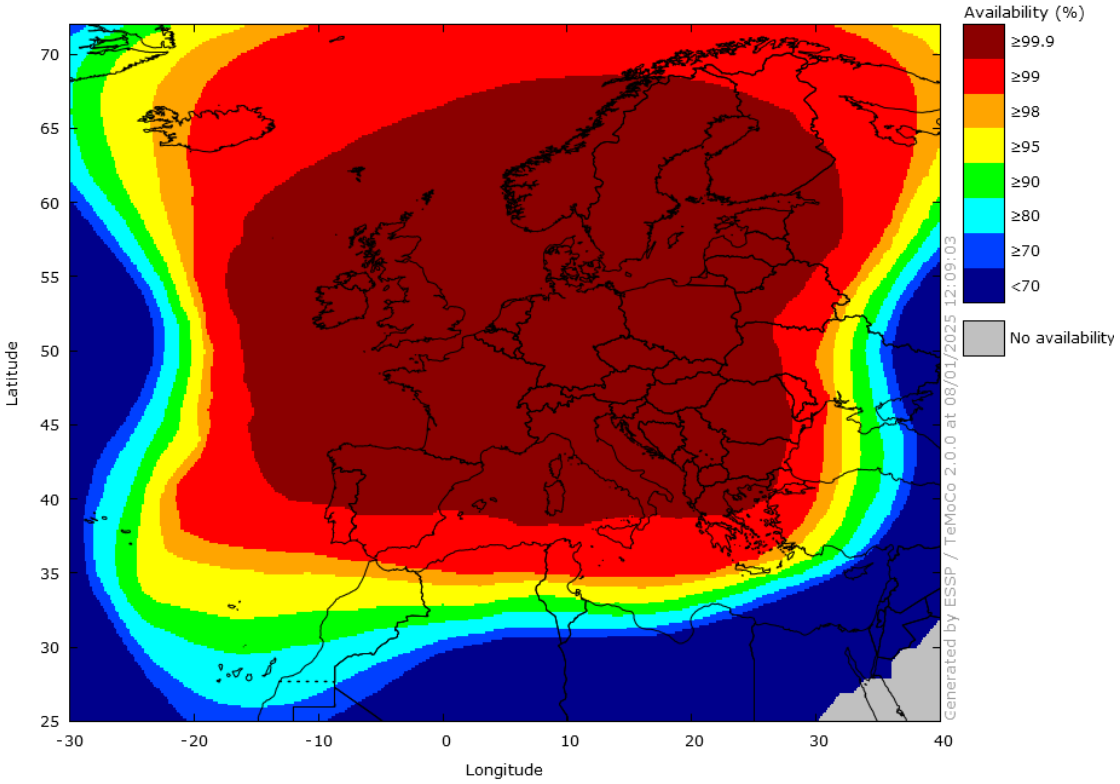

Figure 9: APV-I Availability from 01/01/24 to 31/12/24

[9] Note that the predictable outages (NOTAMs) are not considered in the computation of the performances.

Figure 10 shows the annual compliance with the APV-I Availability target of the SoL SDD [RD-1] for airports with published EGNOS-based operations.

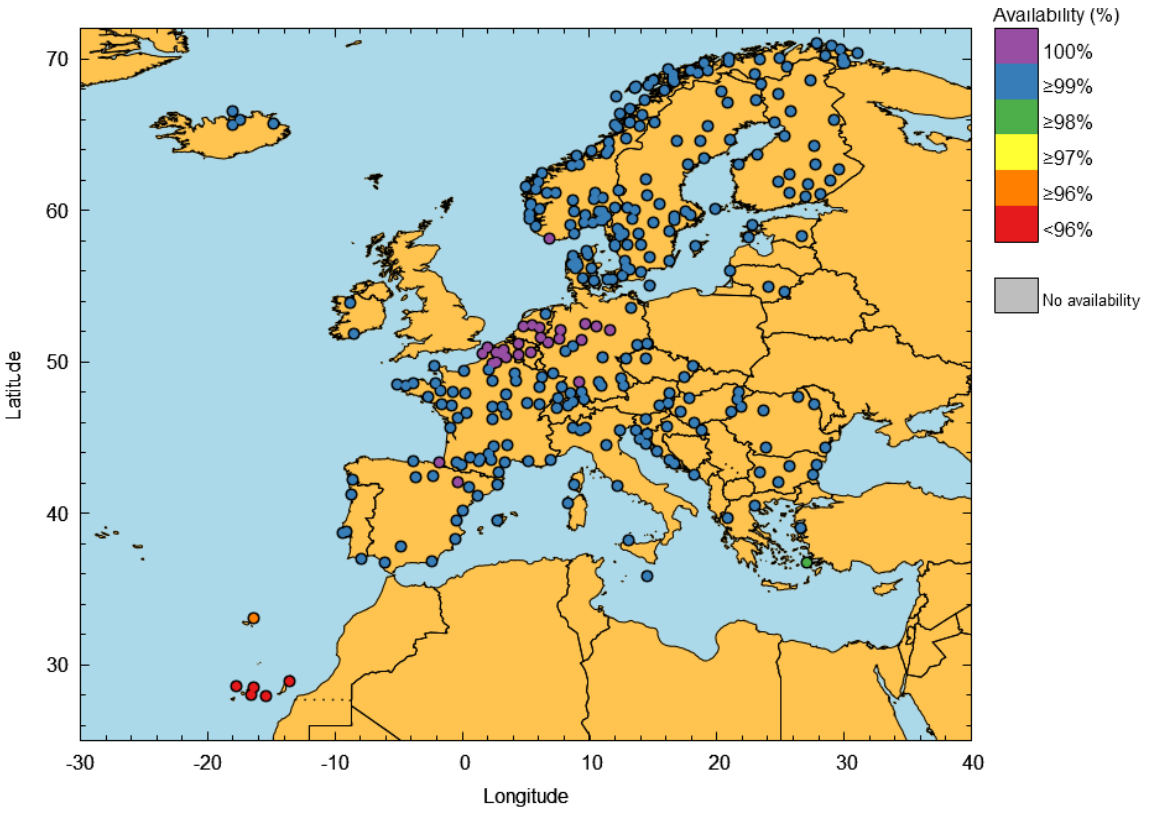

Figure 10: APV-I Availability compliance at airports with published EGNOS-based operations from 01/01/24 to 31/12/24

In addition, the 99% APV-I service availability commitment according to SoL SDD 3.6 [RD-1] was fulfilled at all airports with EGNOS-based operations, except at:

- Kos (LGKO) in Greece.

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

3.3.3 APV-I availability – Achievement against target

In this section, the fulfilment of APV-I availability is analysed by comparing performance with the reference map of the Service Area Figure 7. The combination of the 99% APV-I Availability map and the 99% APV-I Service Area is shown in Figure 11.

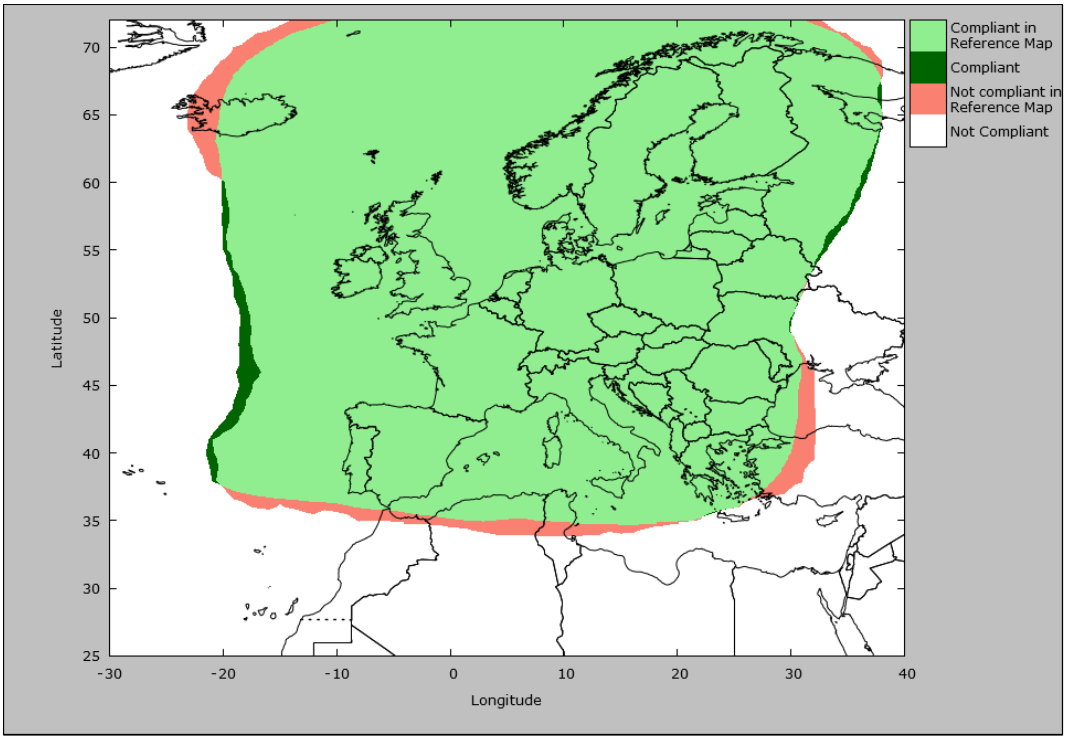

Figure 11: APV-I 99% Availability map for the 99% APV-I Service Area – from 01/01/24 to 31/12/24

In Figure 11, the legend should be read as follows:

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

The percentage of points that comply with the 99% APV-I Service Area (green) is **95.56%.** The uncovered area on the southern border is explained by ionospheric disturbances related to solar activity, equatorial scintillation and the unavailability of RIMS HFA in the southeast. Additionally, parts of the northwestern border also underperformed, mainly due to geomagnetic storms.

Note that the SoL SDD [RD-1] commitment map comparison is included for information purposes. It should be noted that the commitment map is a monthly reference, whereas the reporting period is one year.

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 event was detected.

The ***Safety Index*** *is defined as the Navigation System Error versus the Protection Level ratio (assuming PA algorithms to calculate xNSE and xPL) for each second. If the xPE/xPL ratio is over 1, 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 7 at 90%). In addition, Stanford plots are available on the EGNOS User Support Website.

Station	HSI	VSI	Station	HSI	VSI
Aalborg	0.38	0.35	Lisbon	0.32	0.35
Athens	0.27	0.26	Madeira	0.35	0.42
Berlin	0.35	0.40	Malaga	0.41	0.31
Catania	0.42	0.34	Palma de Mallorca	0.32	0.32
Cork	0.32	0.31	Reykjavik	0.25	0.58
Djerba	0.44	0.31	Roma	0.29	0.30
Egilsstadir	0.29	0.35	S. de Compostela	0.34	0.29
Gävle	0.36	0.37	Sofia	0.31	0.32
Glasgow	0.29	0.37	Swanwick	0.32	0.35
Golbasi	0.24	0.22	Toulouse	0.29	0.31
Jan Mayen	0.31	0.41	Tromsoe	0.30	0.42
Kirkenes	0.30	0.34	Trondheim	0.30	0.44
Kuusamo	0.29	0.41	Warsaw	0.31	0.35
Lappeenranta	0.32	0.35	Zürich	0.39	0.33

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

Figure 12 and Figure 13 provide the HSI and VSI histograms for each second when collecting measurements from the different EGNOS stations and for both operational GEOs throughout 2024.

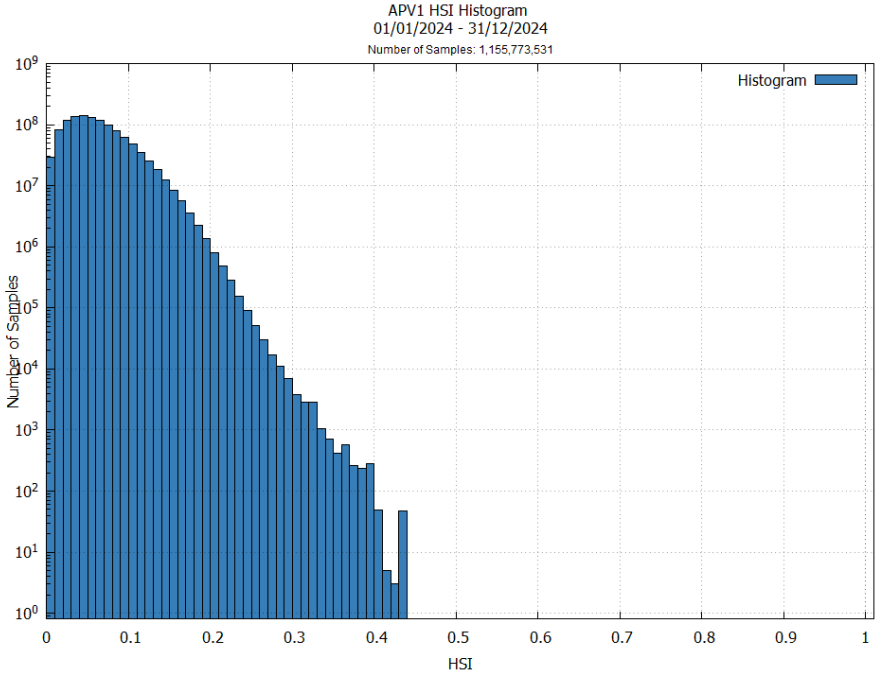

Figure 12: EGNOS APV-I Horizontal Safety Index[10]

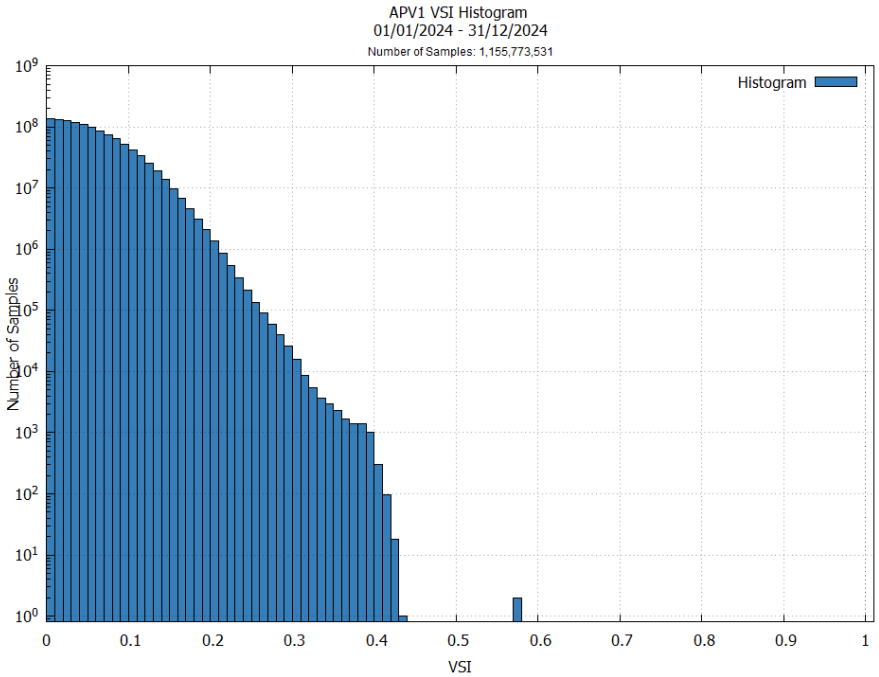

Figure 13: EGNOS APV-I Vertical Safety Index[10]

Figure 12 and Figure 13 show that the horizontal and vertical safety index for APV-I remained below 0.44 and 0.58, respectively.

[10] Note that some periods may have been removed to calculate the different histograms presented in this document, corresponding to stations showing poor-quality data related to the local environment.

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 a valid and available APV-I navigation solution. A single continuity break occurs if the system is available at the beginning of the operation and becomes unavailable within the following 15 seconds.*

Figure 14 below provides the GEO combined APV-I continuity risk for the reporting period:

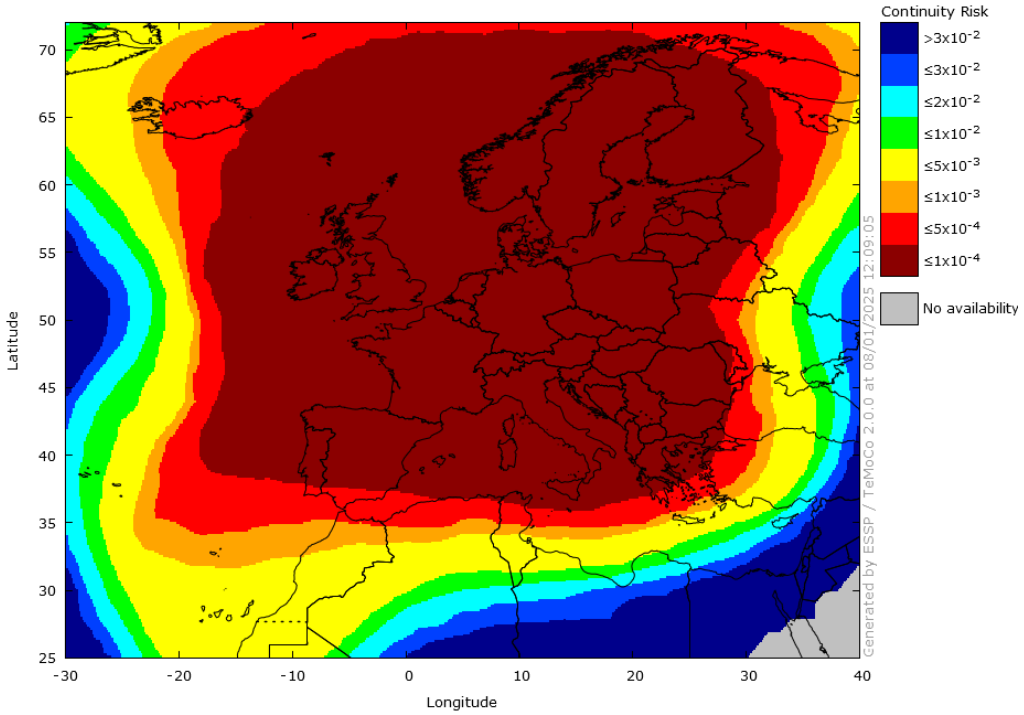

Figure 14: APV-I Continuity Risk from 01/01/24 to 31/12/24

The APV-I continuity performance has been in line with availability: lower than $5{\cdot}10^{-4}$ over the centre of the APV-I Service Area,[11] with underperformances observed mainly on the southern border.

[11] $5{\cdot}10^{-4}$ APV-I Service Area is the $5{\cdot}10^{-4}$ APV-I continuity risk area depicted in Figure 8, obtained from the EGNOS Safety of Life for Aviation SDD v3.6 [RD-1].

3.3.6 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 is shown in Figure 15.

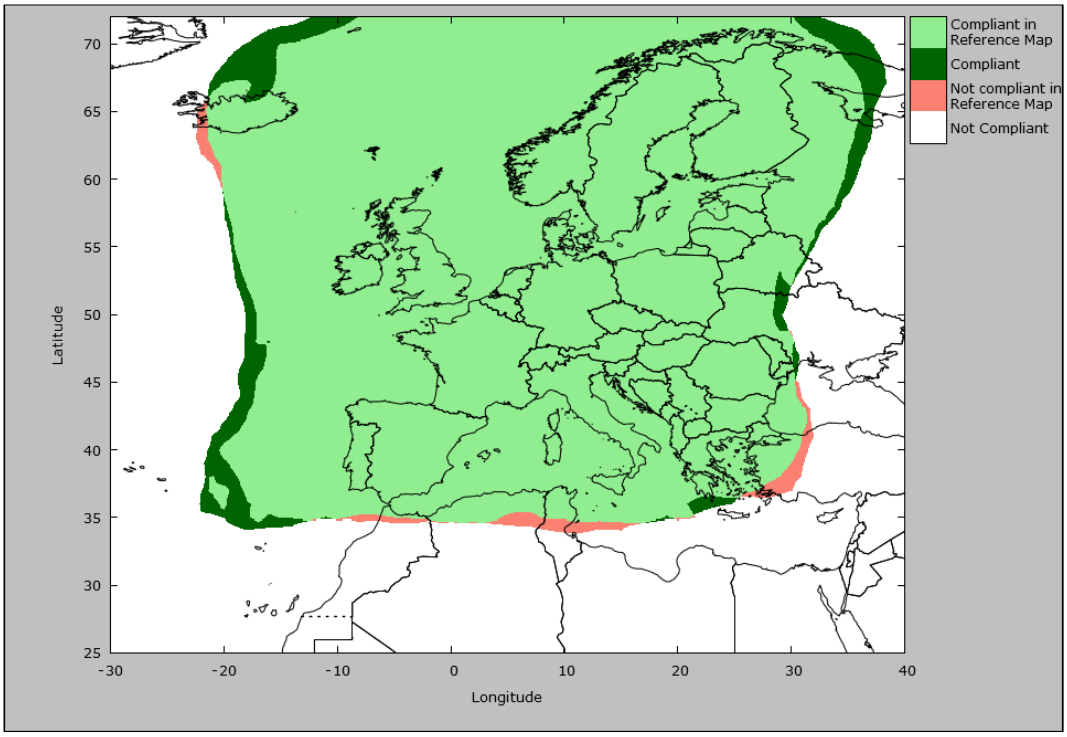

Figure 15: APV-I Continuity Risk ($5{\cdot}10^{-4}$) map regarding the $5{\cdot}10^{-4}$ APV-I Service Area – from 01/01/24 to 31/12/24

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

- Compliant on the Reference Map: the part of the Service Area where APV-I continuity was above 5·10-4.
- Compliant: the area outside the Service Area where APV-I continuity was also above 5·10-4 (coverage extension regarding commitment).
- Not compliant on the Reference Map: the part of the Service Area where APV-I continuity was lower than 5·10-4.
- **Not compliant (white):** any other area outside the Service Area where APV-I continuity is lower than 5·10-4.

Taking the SDD v3.6 [RD-1] map as a reference, the percentage of points compliant with the 5·10-4 APV-I Service Area (5·10-4/15sec) is **98.74%.** Note that the comparison of the SoL SDD commitment map is included for information purposes. The commitment map should be considered a monthly reference, whereas the reporting period is one year.

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

3.4.1 LPV-200 minimum performance

Figure 16 and Figure 17 show the minimum performance expected from EGNOS for LPV-200 availability and continuity, as defined in the EGNOS SoL Service for Aviation Definition Document [RD-1].

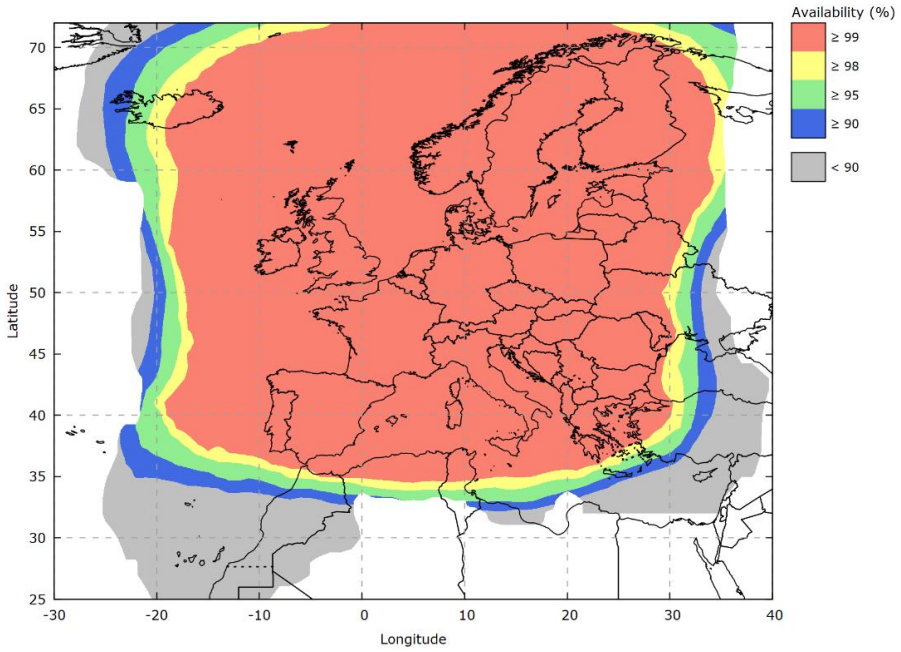

Figure 16: LPV200 Availability map – Expected minimum performance (SoL SDD v3.6 [RD-1])

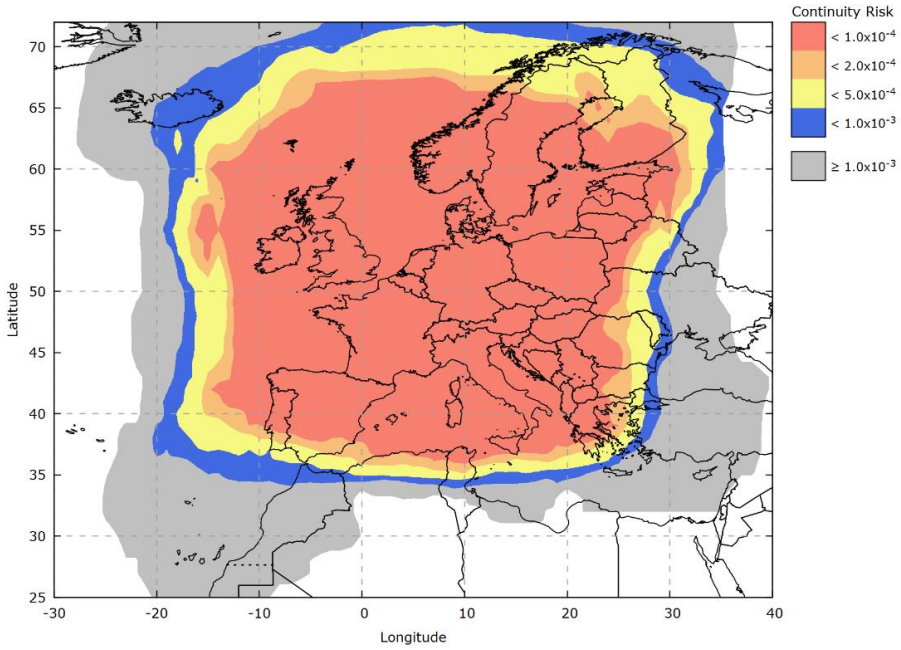

Figure 17: LPV200 Continuity map – Expected minimum performance (SoL SDD v3.6 [RD-1])

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

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

3.4.2 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.*

Figure 18 shows the LPV-200 availability for the combination of operational GEOs for the period of January 2024 to December 2024[12]:

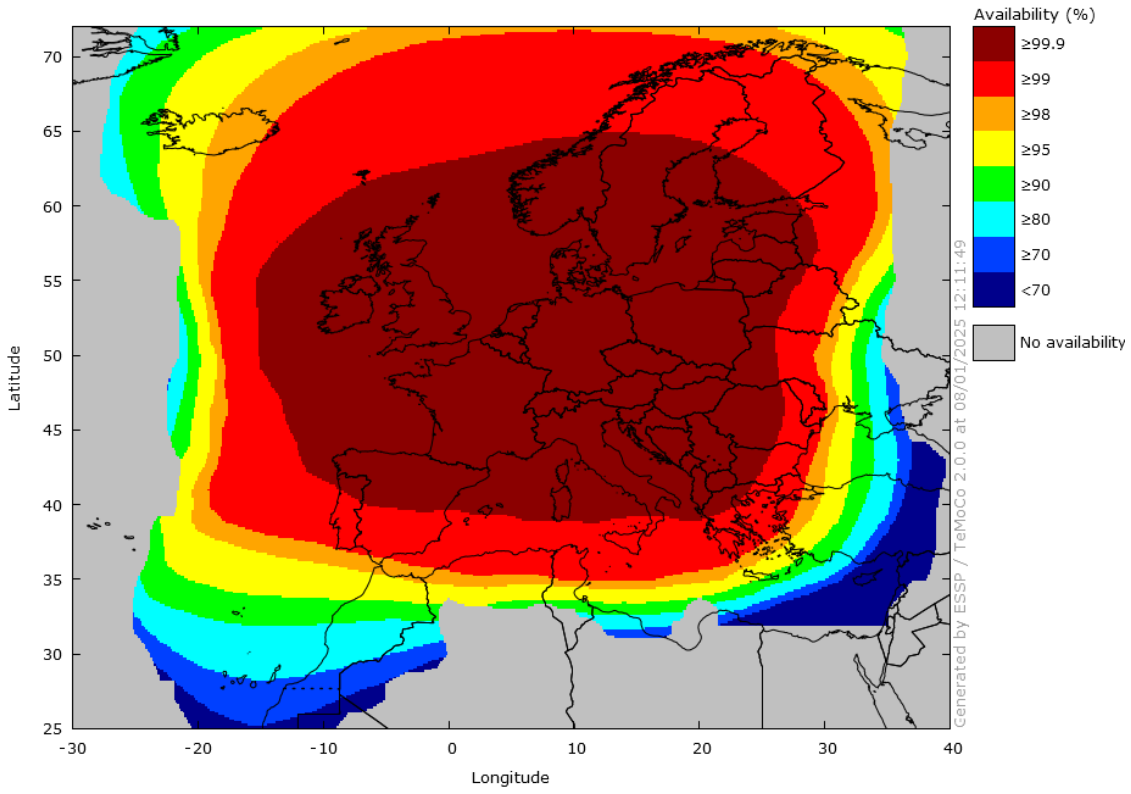

Figure 18: LPV-200 Availability from 01/01/24 to 31/12/24

[12] Note that the predictable outages (NOTAMs) are not considered in the computation of the performances.

Figure 19 shows the annual compliance with the LPV-200 availability target of the SoL SDD [RD-1] for airports with published EGNOS-based operations:

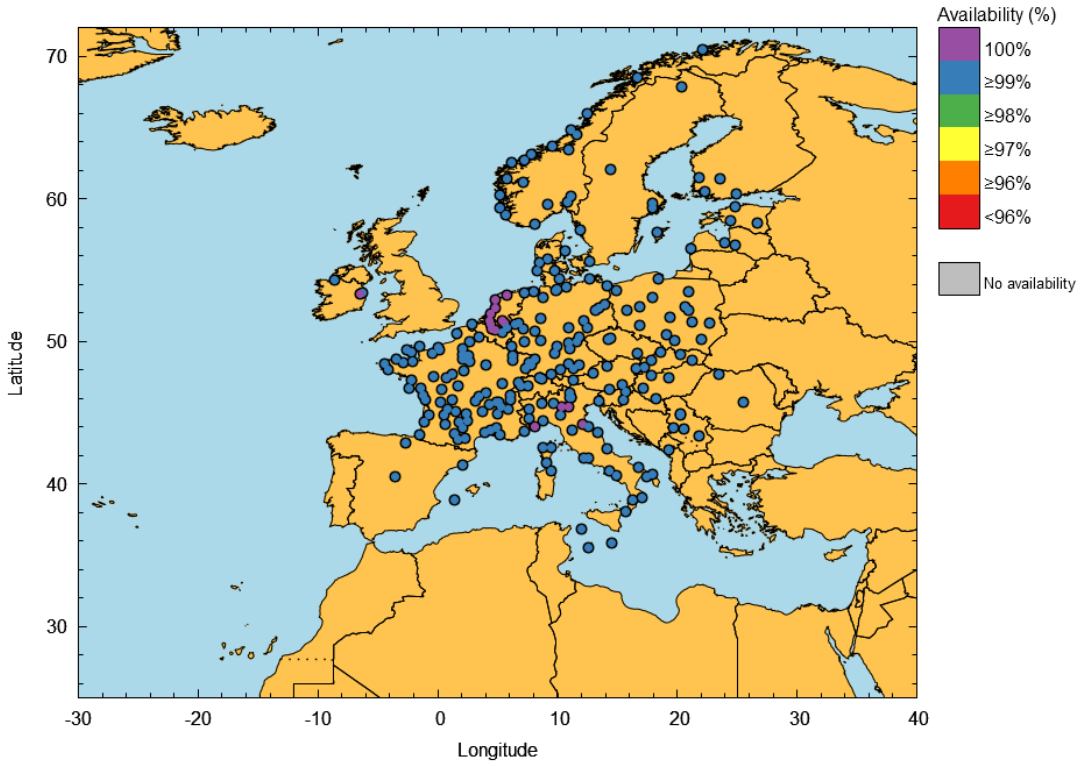

Figure 19: LPV-200 Availability compliance at airports with published EGNOS-based operations from 01/01/24 to 31/12/24

In addition, according to the SoL SDD [RD-1], the LPV200 service availability commitment was met at all airports with EGNOS-based operations.

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

3.4.3 LPV-200 availability – Achievement against target value

In this section, the compliance of LPV-200 availability is analysed by comparing performance to the Reference Map of the Service Area Figure 16. Figure 20 shows the combination between the 99% LPV-200 Availability map and the 99% LPV-200 Service Area:

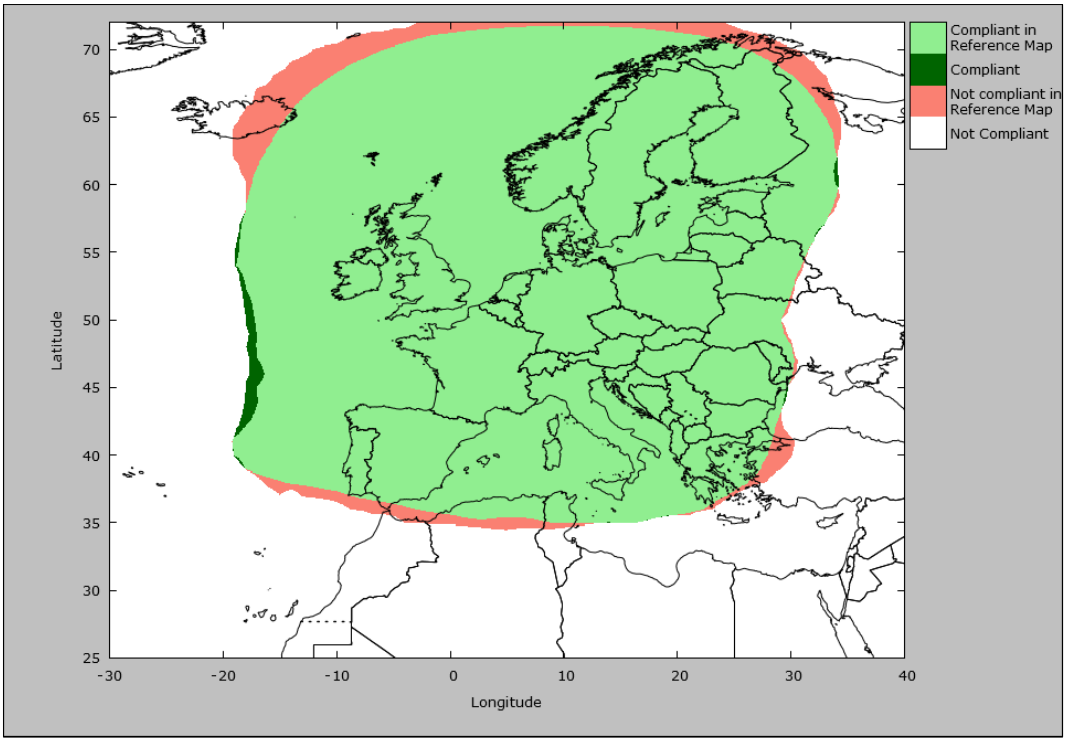

Figure 20: LPV-200 Availability map regarding the Service Area – from 01/01/24 to 31/12/24

In Figure 20, the legend should be read as follows:

- Compliant on the Reference Map: the part of the Service Area where LPV-200 Availability was above 99% (target).
- Compliant: the area outside the Service Area where LPV-200 Availability was also above 99% (coverage extension regarding the commitment).
- Not compliant on the Reference Map: the part of the Service Area where LPV-200 Availability was lower than 99%.
- **Not compliant (white):** any other area outside the Service Area where LPV-200 Availability is lower than 99% (target).

Based on the EGNOS Safety-of-Life SDD v3.6 [RD-1] map, the percentage of points meeting the 99% LPV-200 Service Area is **92.35%**. The deviations observed over the northern and southern borders from the SDD commitment are due to reasons like those explained in section 3.3.3.

Note that the SoL SDD commitment map comparison is included for information purposes. It should be noted that the commitment map is a monthly reference, whereas the reporting period is one year.

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.

The ***Safety Index*** *is defined as the Navigation System Error versus the Protection Level ratio (assuming PA algorithms to calculate xNSE and xPL) for each second. If the xPE/xPL ratio is over 1, 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 16 at 90%). In addition, 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	0.38	0.35	Lisbon	0.32	0.35
Athens	0.27	0.26	Malaga	0.41	0.31
Berlin	0.35	0.40	Palma de Mallorca	0.32	0.32
Catania	0.42	0.34	Reykjavik	0.25	0.33
Cork	0.32	0.31	Roma	0.29	0.30
Djerba	0.44	0.31	S. de Compostela	0.34	0.29
Egilsstadir	0.29	0.35	Sofia	0.31	0.32
Gävle	0.36	0.37	Swanwick	0.32	0.35
Glasgow	0.29	0.37	Toulouse	0.29	0.31
Golbasi	0.24	0.22	Tromsoe	0.30	0.42
Jan Mayen	0.31	0.41	Trondheim	0.30	0.44
Kirkenes	0.30	0.34	Warsaw	0.31	0.35
Kuusamo	0.28	0.41	Zürich	0.39	0.33
Lappeenranta	0.32	0.35			

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

Figure 21 and Figure 22 show the HSI and VSI histograms for each second when collecting measurements from the different EGNOS stations and for both operational GEOs over the year.

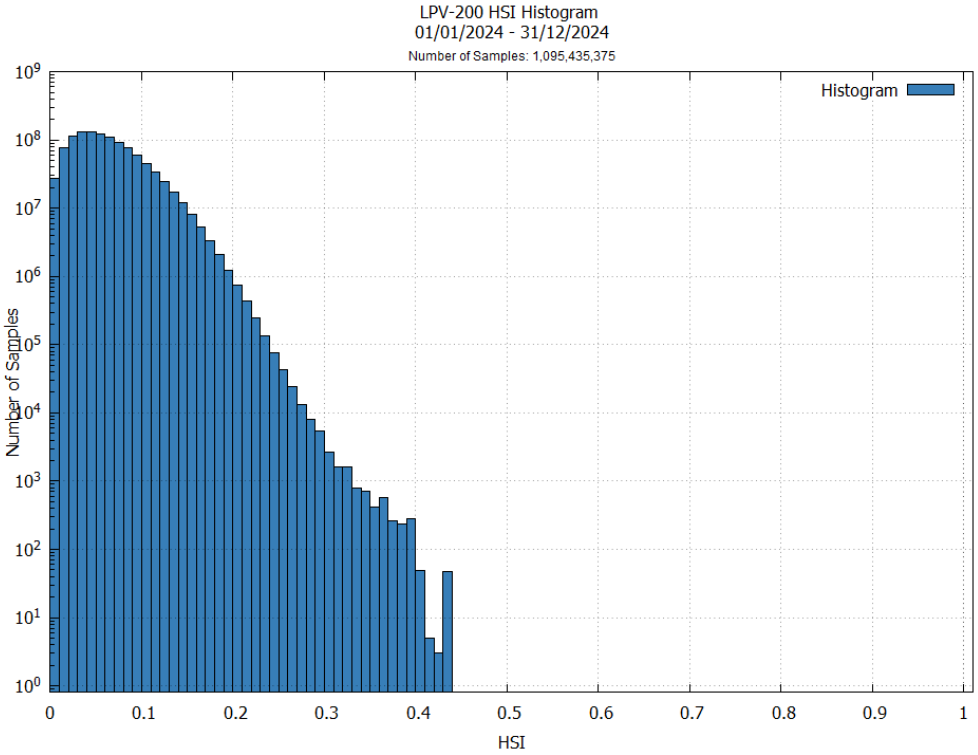

Figure 21: EGNOS LPV-200 Horizontal Safety Index

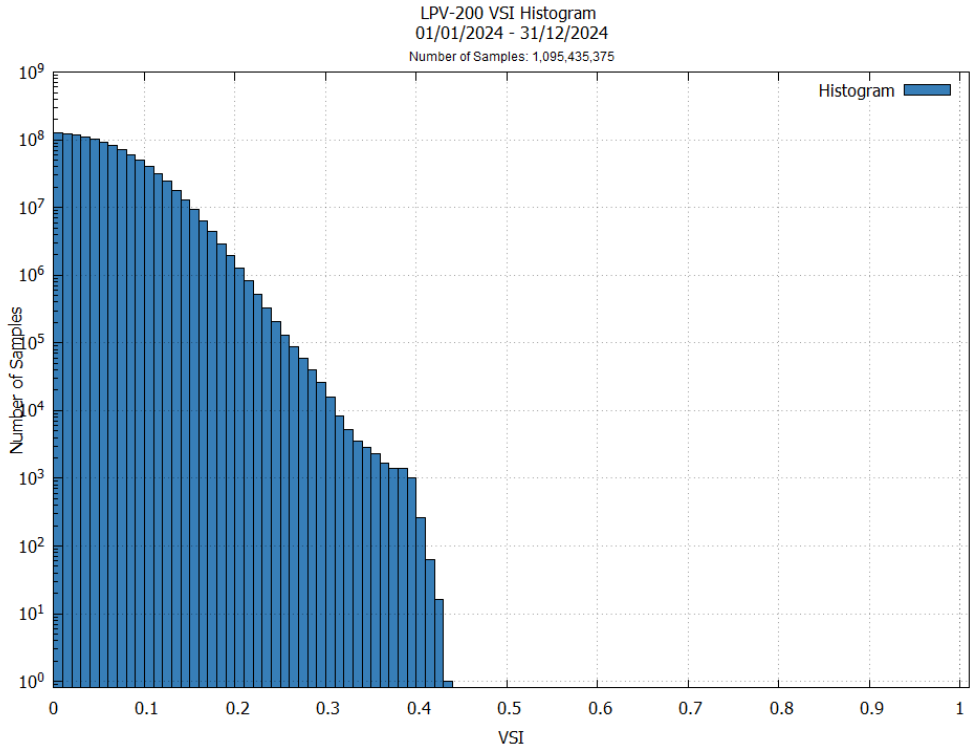

Figure 22: EGNOS LPV-200 Vertical Safety Index

Figure 21 and Figure 22 show that the horizontal and vertical safety indexes for LPV-200 remained below 0.44 for all stations.

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 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 within the following 15 seconds.*

Figure 23 shows the GEO combined LPV-200 continuity risk for the year 2024.

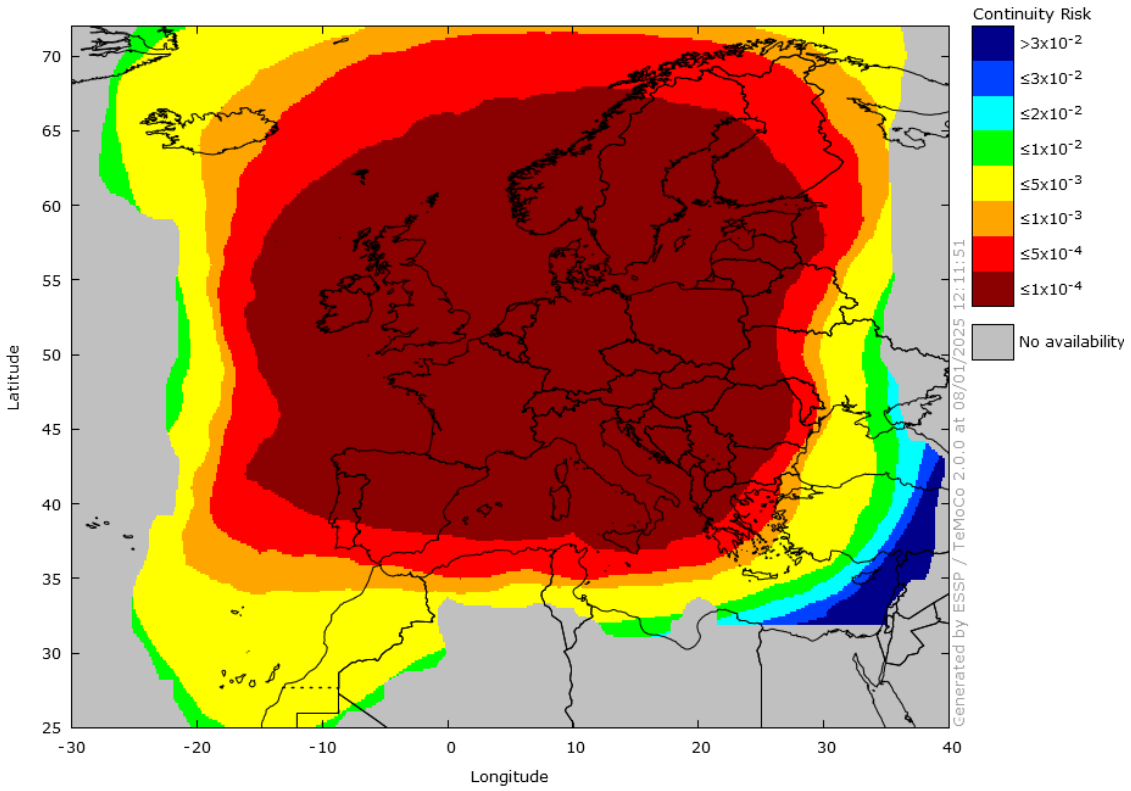

Figure 23: LPV-200 Continuity Risk from 01/01/24 to 31/12/24[13]

[13] The grey colour indicates regions outside the LPV-200 Service area as defined in the EGNOS Safety of Life SDD v3.6 [RD-1].

3.4.6 LPV-200 Continuity – Achievement against target

Figure 24 shows the combination of the 5.10^{-4} LPV-200 Continuity Risk map and Service Area.

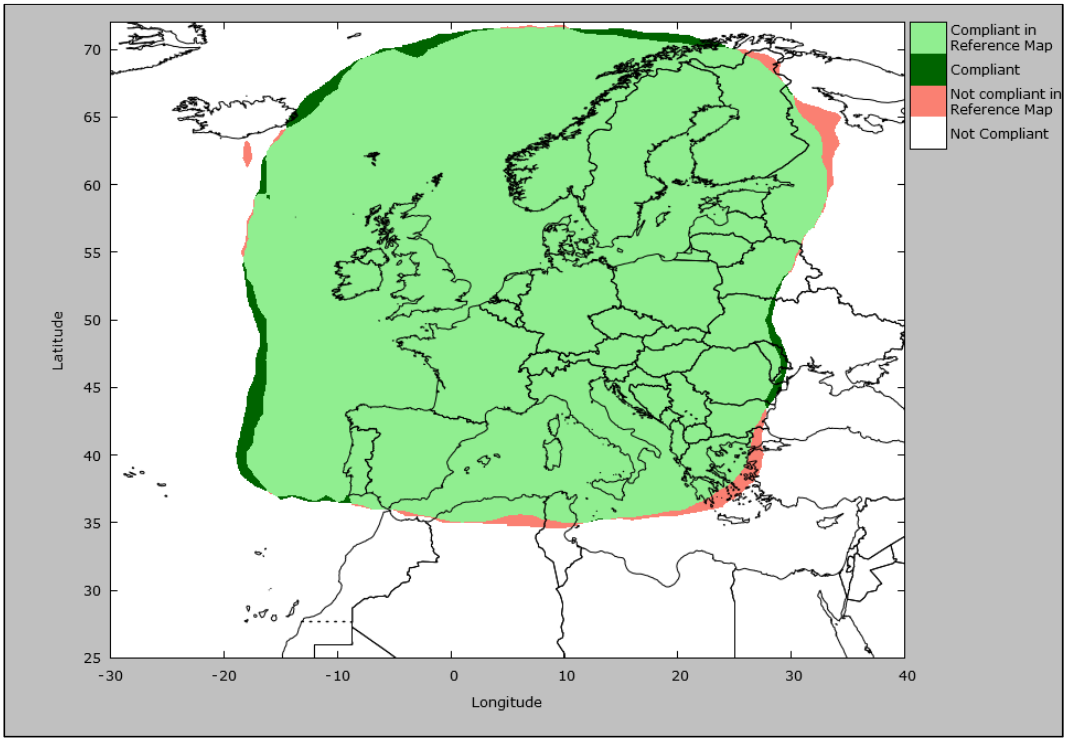

Figure 24: LPV-200 Continuity Risk ($5{\cdot}10^{-4}$) map regarding the reference map – from 01/01/24 to 31/12/24

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

- Compliant on the Reference Map: the part of the Service Area where LPV200 continuity was above 5·10-4.
- Compliant: the area outside the Service Area where LPV200 continuity was also above 5·10-4 (coverage extension regarding the commitment).
- Not compliant on the Reference Map: the part of the Service Area where LPV200 continuity was lower than 5·10-4.
- **Not compliant (white):** any other area outside the Service Area where LPV200 continuity is lower than 5·10-4.

The LPV200 continuity performance was met in the centre of Europe during the reporting period: the entire LPV200 5·10-4 Service Area is covered except for a small area in the southeast and northeast.

Taking the SDD v3.6 [RD-1] map as a reference, the percentage of points that comply with the $5{\cdot}10^{-4}$ LPV-200 Service Area (5.10^{-4}/15sec) is **97.75%**. Note that the comparison of the SoL SDD commitment map is included for information purposes. The commitment map should be considered a monthly reference, whereas the reporting period is one year.

3.4.7 EGNOS LPV-200 vertical accuracy

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. Additionally, specific requirements are defined in terms of the probability of the VNSE exceeding 10 m under nominal system operation conditions, set at 10-7/per approach or 15 m under system failure conditions, defined as a 10-5/per approach.

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

Figure 25 shows the histogram and cumulative distribution function of VNSE, calculated at the RIMS stations within the LPV-200 Service Area, for each second over the entire period. Values greater than 10 meters are grouped in the last bar.

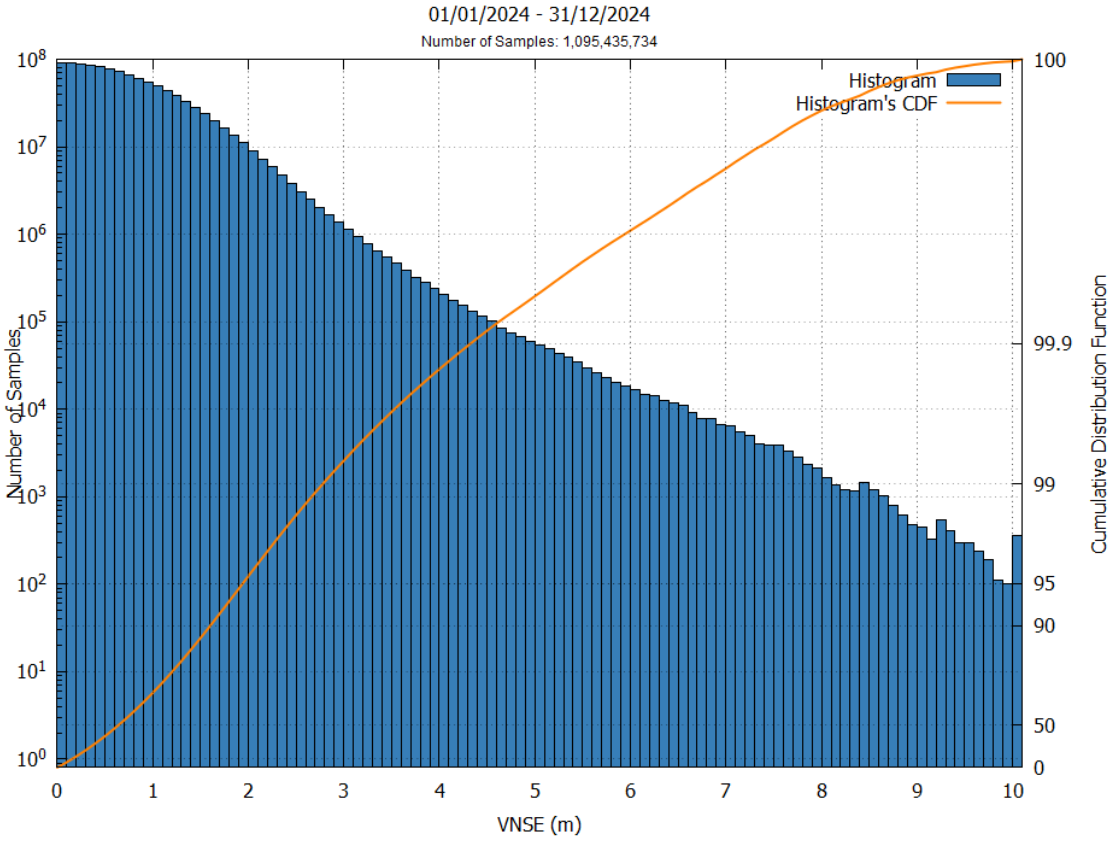

Figure 25: EGNOS LPV-200 Vertical Accuracy Histogram and Cumulative Probability

During the whole year, three RIMS were affected by potential AMEs[14]:

- RIMS TROA on 19 April and 29 October 2024.
- RIMS KIRA on 29 October 2024.
- RIMS TRDA on 6 October and 1 November 2024.

The causes of these events are mainly the occurrence of geomagnetic storms in the northeast of the Service Area. The 95th percentile of VNSE is approximately 2 metres.

[14] Investigations about these potential AMEs are still ongoing.

Figure 26 shows the absolute maximum VNSE values over the year in RIMS under LPV-200 Service Area (see Figure 16 at 90%).

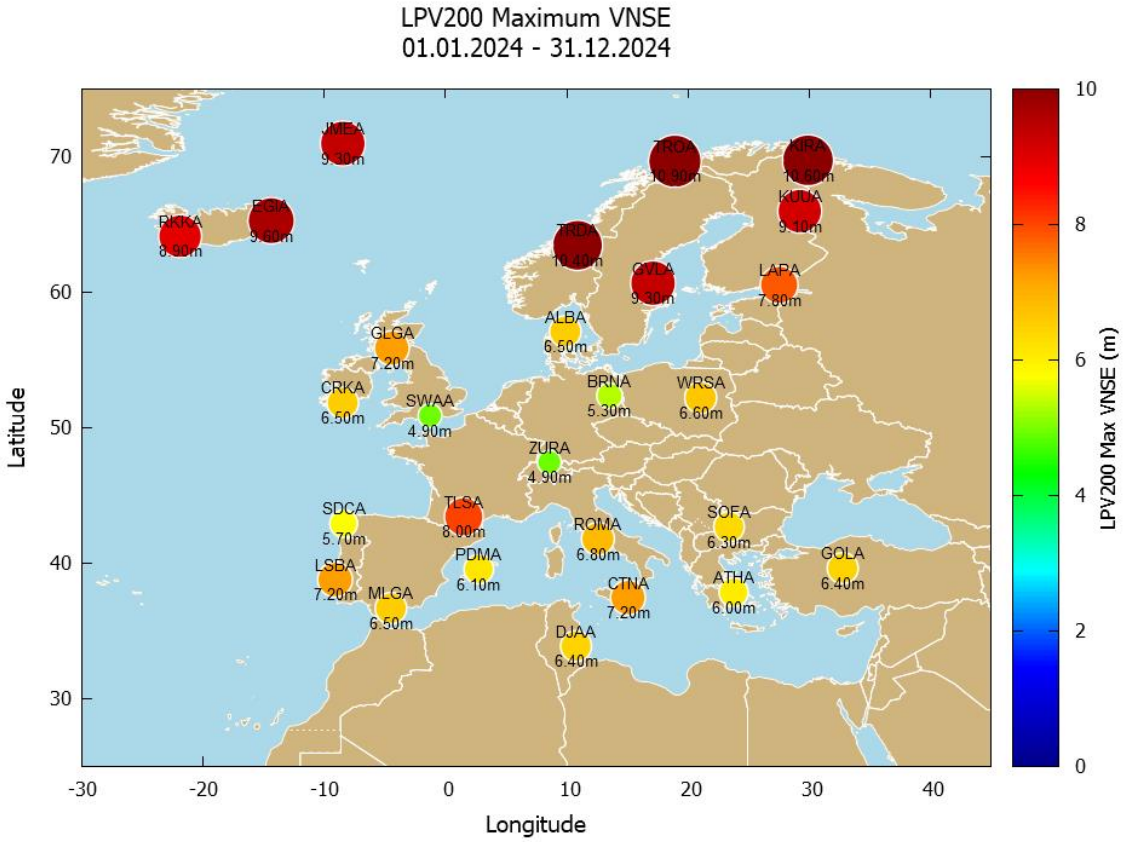

Figure 26: Maximum VNSE in the RIMS within the LPV-200 commitment

3.5 Open Service (OS)

EGNOS OS Availability performance is defined as the percentage of time when the instantaneous HNSE is lower than 3 meters and the instantaneous VNSE is lower than 4 meters over the total number of samples with valid PA navigation solution. Figure 27 shows the minimum compliance area for different percentages:

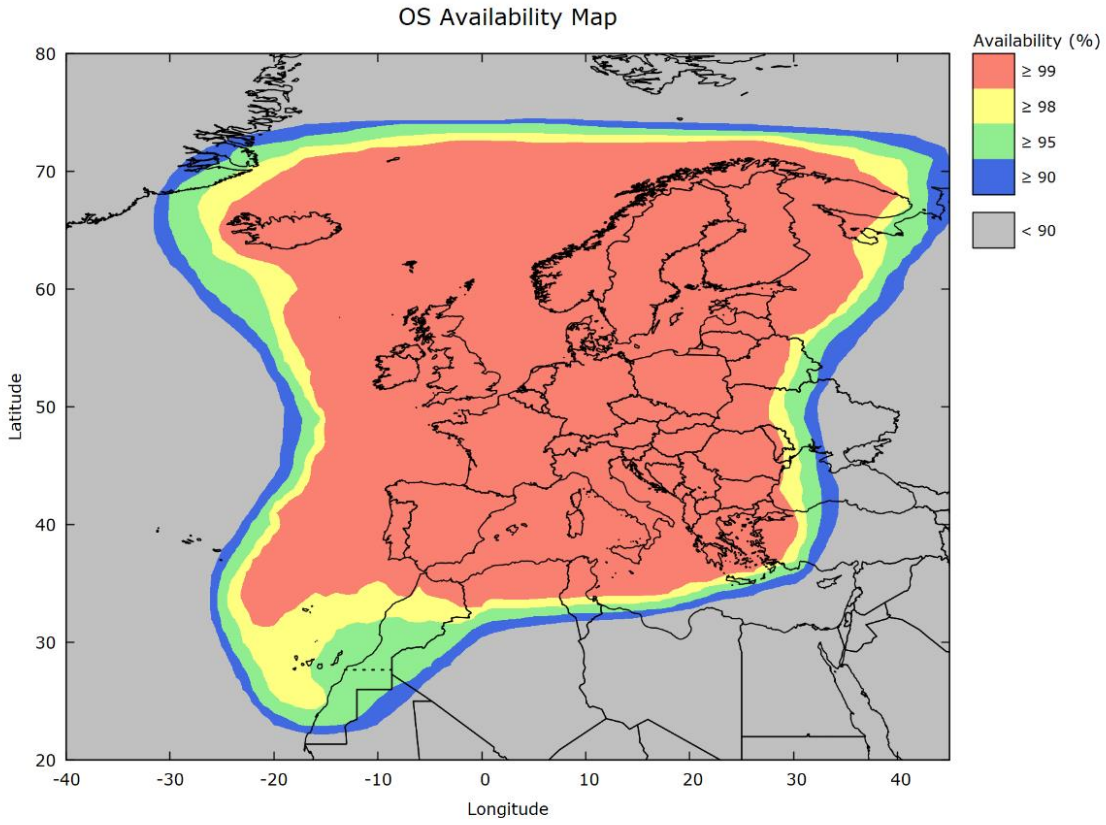

Figure 27: EGNOS OS compliance area

Further details can be found in the EGNOS OS Service Definition Document [RD-2]. Additionally, OS performance is reported through the EGNOS Monthly Performance reports, available on the EGNOS User Support website.

3.5.1 RIMS monitoring network

Figure 28 shows the location of the deployed RIMS mentioned in Table 6.

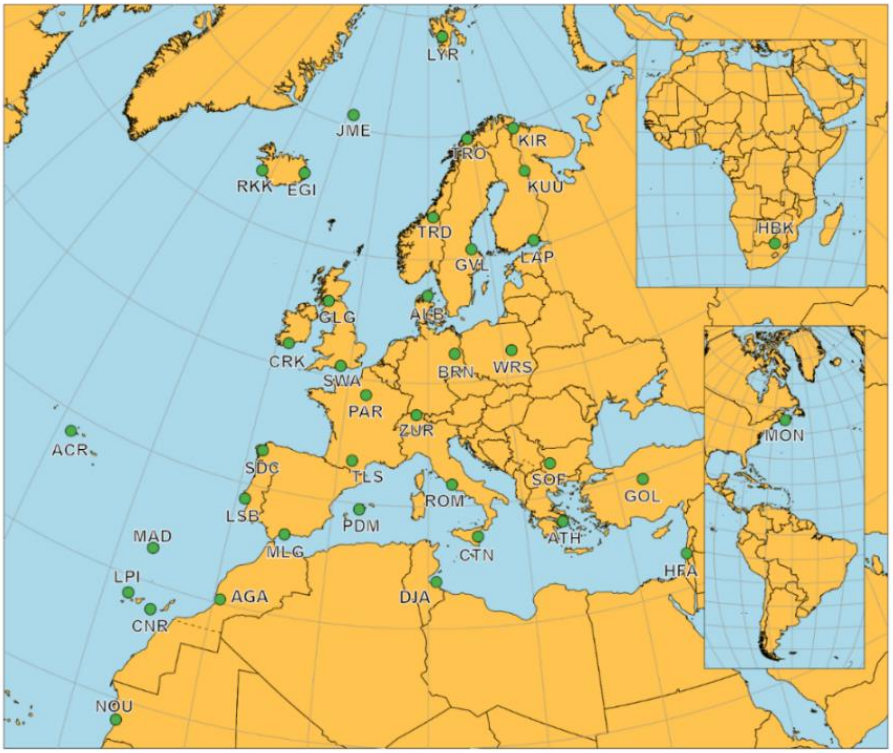

Figure 28: RIMS locations

The receiver network used to report the Open Service corresponds to the subset of RIMS inside the EGNOS OS SDD [RD-2] commitment map.

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

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

3.5.2 Horizontal and Vertical Accuracy

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

Table 7 provides the accuracy values (95%) in metres measured for the reporting period. The target values of 3 meters for horizontal accuracy and 4 meters for vertical accuracy are met for all stations.

Station	HNSE 95% (m)	VNSE 95% (m)	Station	HNSE 95% (m)	VNSE 95% (m)
Aalborg	0.9	1.6	Malaga	1.6	2.3
Athens	1.2	2.1	Palma de Mallorca	1.2	1.8
Berlin	1.1	1.7	Reykjavik	1.6	2.9
Catania	1.3	2.2	Roma	1.1	1.8
Cork	1.1	1.5	S. de Compostela	1.3	1.7
Egilsstadir	1.1	2.2	Sofia	1.4	2.1
Gävle	0.9	1.8	Swanwick	1.2	1.6
Glasgow	1.0	1.7	Toulouse	1.1	1.5
Jan Mayen	1.6	2.8	Tromsoe	1.3	2.5
Kirkenes	1.2	2.5	Trondheim	1.0	1.9
Kuusamo	1.1	2.1	Warsaw	1.1	1.5
Lappeenranta	1.0	1.8	Zürich	1.1	1.4
Lisbon	1.5	2.1			

Table 7: EGNOS Open Service accuracy (95%)

Figure 29 and Figure 30 show the histogram and cumulative distribution function of the HNSE (Horizontal Navigation System Error) and the VNSE (Vertical Navigation System Error), calculated at the stations shown in Table 7 for each second over the entire period across the value range.

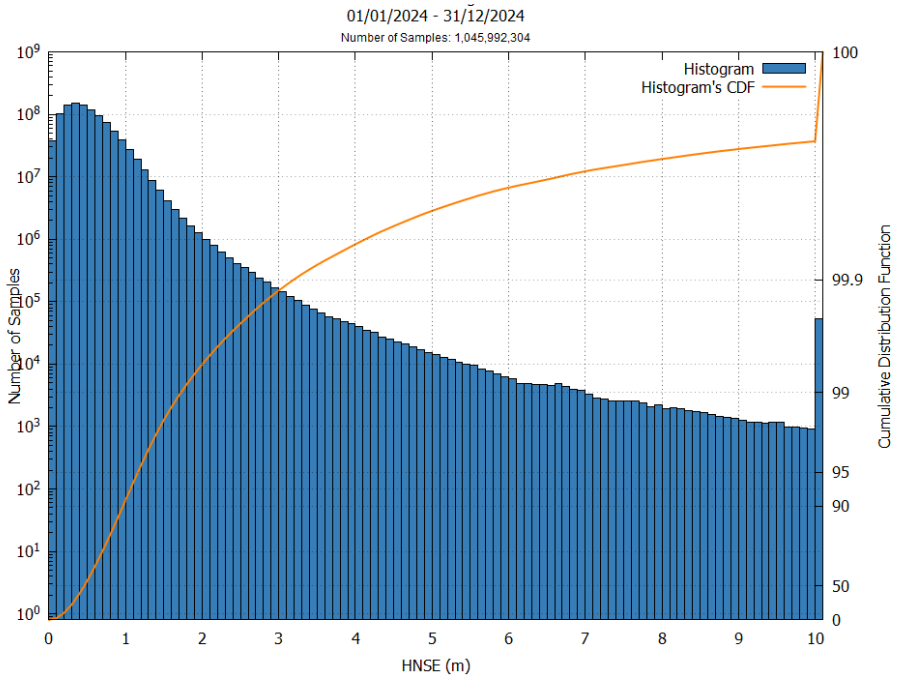

Figure 29: EGNOS Open Service HNSE Histogram and Cumulative Probability[15]

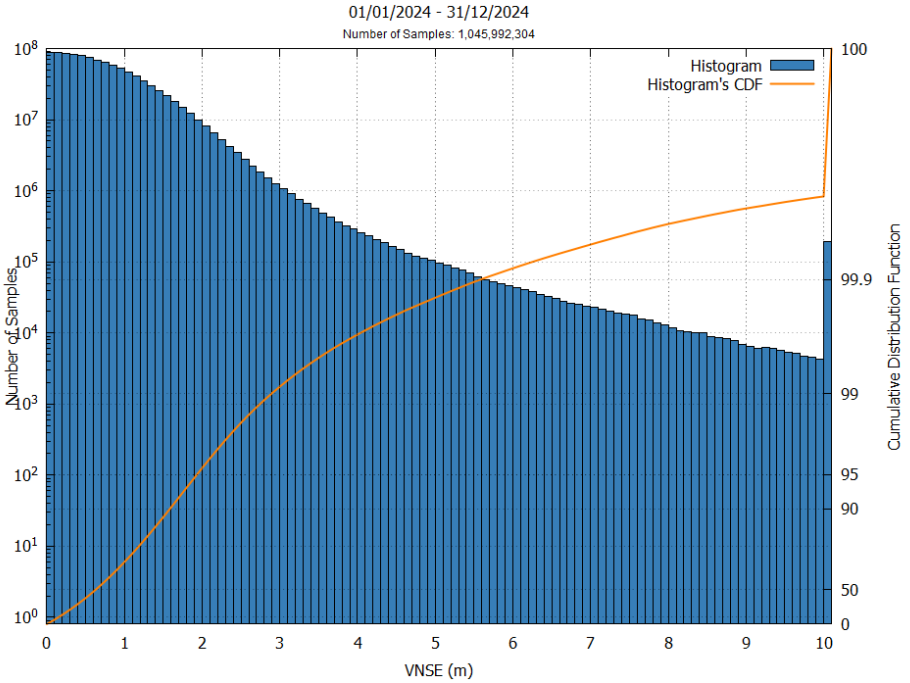

Figure 30: EGNOS Open Service VNSE Histogram and Cumulative Probability[15]

The 95th percentile of the observed accuracy performance is below 1.2 metres in the horizontal domain and 1.9 metres in the vertical domain.

[15] Note that some periods may have been removed to calculate the different histograms presented in this document, corresponding to stations showing poor-quality data related to the local environment. The data removed from histograms correspond to RIMS data 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 provides the values of monthly maximums for Horizontal and Vertical Accuracy (i.e. for each day, the 95th percentile of the horizontal/vertical error is computed, and the highest of these daily values is reported) while using EGNOS messages broadcast by PRN123 and PRN136.

Worst (PRN123/PRN136)		01/24	02/24	03/24	04/24	05/24	06/24	07/24	08/24	09/24	10/24	11/24	12/24	Average
ALBA	H	1.02	0.98	1.35	2.22	1.73	0.92	0.97	1.41	1.73	1.76	2.17	0.94	1.43
	V	2.13	2.17	2.91	3.23	2.38	1.91	1.74	2.25	2.77	3.01	3.02	2.19	2.48
ATHA	H	1.10	1.64	1.39	1.44	1.33	1.36	1.50	1.41	1.73	2.30	1.32	1.33	1.49
	V	1.77	2.00	2.20	2.94	2.33	2.39	2.85	2.61	2.89	3.27	3.05	2.14	2.54
BRNA	H	1.22	1.19	2.10	2.26	1.64	1.17	1.32	1.57	1.95	1.57	1.35	1.10	1.54
	V	1.72	1.88	1.82	2.46	2.51	2.02	1.98	2.31	2.95	2.29	2.57	1.92	2.20
CRKA	H	1.17	1.17	1.54	2.05	1.64	1.34	1.16	1.55	2.31	2.23	1.65	1.17	1.58
	V	1.87	1.98	2.01	2.18	2.15	1.63	1.88	2.54	2.18	2.86	2.46	2.00	2.15
CTNA	H	1.09	1.30	1.57	1.45	1.55	1.47	1.49	1.49	1.92	2.37	1.60	1.27	1.55
	V	1.73	2.02	2.13	2.84	2.53	3.15	3.28	2.59	3.94	3.46	3.02	2.03	2.73
EGIA	H	1.30	1.78	1.51	1.94	1.37	0.98	0.99	1.83	1.74	2.52	3.16	1.45	1.71
	V	2.61	2.66	3.22	3.34	3.48	2.02	2.04	3.35	3.45	5.19	6.16	3.00	3.38
GLGA	H	1.03	1.13	1.57	2.34	1.78	1.04	0.94	1.39	1.54	2.37	1.86	1.16	1.51
	V	2.12	2.20	2.73	3.67	2.15	1.88	2.02	2.30	2.63	2.78	3.16	2.04	2.47
GVLA	H	0.97	1.07	1.60	1.19	1.31	0.84	0.94	1.88	1.51	1.73	3.01	1.51	1.46
	V	2.51	3.45	2.75	2.76	2.28	2.04	2.17	3.00	3.44	3.01	5.60	2.53	2.96
JMEA	H	2.30	2.37	1.87	1.99	1.56	1.16	1.20	1.43	2.26	3.78	3.44	2.18	2.13
	V	3.90	4.39	3.52	4.14	3.25	2.92	2.73	3.28	3.51	6.08	5.98	3.78	3.96
KIRA	H	1.69	1.92	2.02	1.40	1.61	0.99	1.00	1.13	1.70	2.66	3.58	2.04	1.81
	V	3.19	3.57	3.45	4.18	2.98	2.44	1.96	2.83	5.21	5.25	6.15	3.55	3.73
KUUA	H	1.39	1.55	1.59	1.54	1.33	0.87	0.95	1.27	2.16	2.33	3.01	1.91	1.66
	V	2.73	3.54	3.79	3.82	2.74	2.12	1.95	2.70	3.65	5.01	7.38	2.71	3.51
LAPA	H	1.00	1.11	1.70	1.41	1.75	0.89	1.12	1.49	1.56	1.70	3.28	1.51	1.54
	V	2.39	2.38	3.11	2.78	2.51	1.87	2.04	3.25	3.66	3.18	5.81	2.88	2.99
LSBA	H	1.64	1.69	2.11	2.10	2.70	1.54	1.63	1.79	2.13	2.67	2.36	1.49	1.99
	V	1.82	2.04	1.92	2.28	3.42	2.69	2.80	2.64	3.31	3.18	2.67	1.99	2.56
MLGA	H	1.68	2.27	2.00	1.84	2.96	1.34	2.08	1.99	2.65	3.54	2.49	2.00	2.24
	V	1.66	2.10	2.25	2.87	3.28	2.89	2.83	2.53	4.04	3.88	3.05	2.14	2.79
RC13	H	1.17	1.28	1.43	1.32	2.36	1.41	1.29	1.32	2.10	2.15	1.45	0.95	1.52
	V	1.92	2.30	2.13	2.87	2.96	2.27	2.97	2.87	4.06	3.79	2.97	1.98	2.76
PDMA	H	1.06	1.25	1.34	1.40	1.79	1.43	1.35	1.63	2.04	2.51	1.76	1.11	1.56
	V	1.60	1.72	1.78	2.74	2.70	2.44	2.39	2.38	3.55	3.14	2.55	1.75	2.40
RKKA	H	2.13	2.80	2.57	2.35	1.84	1.42	1.30	1.56	2.87	4.40	6.57	2.21	2.67
	V	4.16	4.84	5.70	4.77	4.39	2.68	2.41	3.79	6.65	6.53	8.69	4.29	4.91
ROMA	H	0.97	1.13	1.38	1.22	1.19	1.15	1.33	1.23	1.83	1.68	1.24	1.00	1.28
	V	1.55	1.78	1.82	2.52	2.12	2.18	2.50	2.05	2.92	2.84	2.61	1.99	2.24
SDCA	H	1.27	1.39	1.69	1.75	2.40	1.43	1.39	1.45	2.37	1.98	1.96	1.24	1.69
	V	1.42	1.61	1.61	2.05	2.44	2.25	2.01	2.25	1.95	2.54	2.29	1.67	2.01
SOFA	H	1.45	2.41	1.97	1.60	1.49	1.49	1.57	2.39	1.62	2.53	1.67	1.81	1.83
	V	1.97	2.53	2.32	2.82	2.40	2.23	2.72	11.90	2.68	3.00	2.75	2.75	3.34
SWAA	H	1.36	1.25	1.58	1.74	1.52	1.44	1.29	1.60	2.21	2.45	1.54	1.23	1.60
	V	1.91	1.88	2.49	2.45	2.19	2.37	1.95	2.15	2.24	2.55	2.53	1.89	2.22
TLSA	H	1.01	1.27	1.31	1.31	1.59	1.45	1.48	1.43	2.20	1.77	1.57	1.01	1.45
	V	1.55	1.52	1.51	2.27	2.82	2.87	2.00	1.88	2.93	2.43	2.25	1.61	2.14
TRDA	H	1.24	1.35	1.92	1.27	1.22	1.02	0.94	1.23	1.44	2.09	3.25	1.52	1.54
	V	2.66	2.80	3.00	3.17	2.39	1.95	1.93	2.71	3.76	4.01	8.51	2.62	3.29
TROA	H	1.85	1.93	1.98	1.78	1.24	1.12	0.98	1.16	2.07	2.66	3.06	1.99	1.82
	V	3.60	3.54	3.15	4.10	2.89	2.60	2.33	2.57	5.53	5.44	5.54	3.07	3.70
WRSA	H	1.28	1.23	2.01	2.09	1.59	1.23	1.56	1.69	1.93	1.84	1.55	1.14	1.60
	V	1.91	2.00	2.06	2.35	2.58	1.79	2.03	2.12	2.70	2.08	2.42	1.81	2.15
ZURA	H	1.03	1.13	1.11	1.24	1.77	1.15	1.32	1.50	1.88	2.79	1.25	1.10	1.44
	V	1.76	1.56	1.94	2.48	1.92	1.54	1.72	1.79	2.25	2.07	2.28	1.65	1.91

Table 8: Monthly Horizontal/Vertical Accuracy at RIMS-A sites (in metres). Worst values between PRN 123 and PRN136.

Values in red are below the commitment and green above the commitment (3 m for horizontal and 4 m for vertical). In average over the year, only RKK monitoring station did not meet the 4m commitment for vertical accuracy mainly due to degraded local environment in conjunction with high ionospheric activity.

3.5.3 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.*

Table 9 provides the values measured using GEO PRN 123 and GEO PRN 136, respectively.

Worst (PRN123/PRN136)	01/24	02/24	03/24	04/24	05/24	06/24	07/24	08/24	09/24	10/24	11/24	12/24	Average
ALBA	100.00%	100.00%	99.92%	99.94%	99.94%	100.00%	100.00%	99.93%	99.94%	99.89%	99.87%	99.97%	99.95%
ATHA	100.00%	99.88%	100.00%	99.97%	100.00%	99.99%	99.98%	99.99%	99.99%	99.79%	99.97%	100.00%	99.96%
BRNA	100.00%	99.97%	99.99%	100.00%	99.98%	100.00%	100.00%	100.00%	99.95%	99.96%	100.00%	100.00%	99.99%
CRKA	100.00%	100.00%	100.00%	100.00%	99.97%	100.00%	100.00%	99.93%	99.96%	99.96%	100.00%	100.00%	99.99%
CTNA	100.00%	100.00%	100.00%	99.92%	99.95%	99.97%	99.93%	99.96%	99.75%	99.72%	99.98%	100.00%	99.93%
EGIA	99.83%	99.88%	99.71%	99.83%	99.81%	99.99%	100.00%	99.87%	99.49%	97.75%	97.16%	99.75%	99.42%
GLGA	100.00%	100.00%	99.96%	99.86%	99.94%	100.00%	100.00%	99.94%	100.00%	99.82%	99.86%	99.98%	99.95%
GVLA	99.99%	99.88%	99.89%	99.93%	99.92%	99.99%	100.00%	99.87%	99.74%	99.70%	99.21%	99.99%	99.84%
JMEA	98.84%	98.42%	99.40%	99.31%	99.65%	99.88%	99.95%	99.68%	98.68%	94.03%	95.24%	99.04%	98.51%
KIRA	99.18%	99.44%	99.57%	99.62%	99.84%	99.99%	100.00%	99.96%	99.10%	96.45%	96.24%	99.11%	99.04%
KUUA	99.86%	99.66%	99.55%	99.73%	99.80%	99.99%	100.00%	99.94%	99.49%	98.33%	97.78%	99.80%	99.49%
LAPA	99.99%	99.98%	99.83%	99.92%	99.86%	99.95%	100.00%	99.81%	99.72%	99.80%	98.98%	99.93%	99.81%
LSBA	99.96%	99.94%	99.97%	99.98%	99.78%	100.00%	99.99%	99.94%	99.70%	99.43%	99.95%	100.00%	99.89%
MLGA	99.99%	99.78%	99.87%	99.95%	99.71%	99.98%	99.87%	99.70%	99.06%	98.94%	99.64%	99.99%	99.71%
PDMA	99.92%	99.96%	100.00%	100.00%	99.98%	100.00%	100.00%	99.96%	99.91%	99.86%	100.00%	100.00%	99.97%
RC13	99.98%	99.98%	99.99%	99.97%	99.88%	99.93%	99.90%	99.93%	99.52%	99.70%	99.97%	100.00%	99.90%
RKKA	98.15%	98.14%	98.25%	98.74%	99.07%	99.65%	99.81%	99.32%	97.35%	92.41%	91.86%	98.67%	97.62%
ROMA	100.00%	99.96%	99.99%	99.99%	99.99%	100.00%	100.00%	100.00%	99.97%	99.96%	100.00%	100.00%	99.99%
SDCA	100.00%	100.00%	100.00%	100.00%	99.94%	100.00%	100.00%	99.95%	99.98%	99.91%	100.00%	100.00%	99.98%
SOFA	99.99%	99.76%	99.93%	99.98%	99.97%	99.96%	100.00%	99.79%	99.96%	99.68%	99.99%	99.76%	99.90%
SWAA	100.00%	100.00%	99.99%	99.99%	99.99%	100.00%	100.00%	99.85%	99.96%	99.95%	100.00%	100.00%	99.98%
TLSA	100.00%	99.95%	99.98%	100.00%	99.98%	100.00%	100.00%	99.96%	99.98%	99.97%	100.00%	100.00%	99.99%
TRDA	99.93%	99.97%	99.72%	99.95%	99.93%	99.98%	100.00%	99.98%	99.59%	99.16%	98.29%	99.92%	99.70%
TROA	98.87%	99.49%	99.64%	99.67%	99.81%	99.96%	100.00%	99.94%	99.23%	97.00%	97.13%	99.37%	99.18%
WRSA	100.00%	99.98%	100.00%	100.00%	99.96%	100.00%	99.92%	99.98%	100.00%	99.97%	100.00%	100.00%	99.98%
ZURA	100.00%	99.98%	99.96%	99.97%	99.99%	100.00%	100.00%	100.00%	99.99%	99.89%	100.00%	100.00%	99.98%

Table 9: OS Availability at RIMS-A sites. Worst values between PRN 123 and PRN136.

Figure 31 shows the OS availability value during the year for each location. The worst value between GEO PRN 123 and GEO PRN 136 is shown in Figure 31.

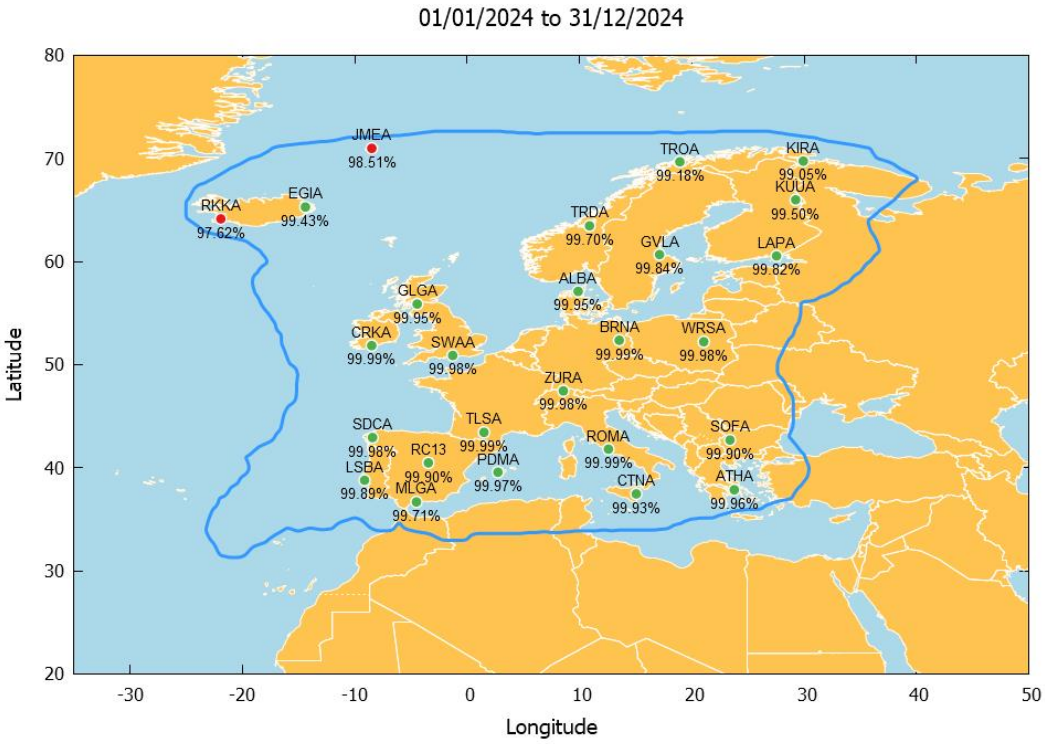

Figure 31: Worst OS availability between PRN 123 and PRN 136 for the RIMS stations

As shown in Figure 31, the worst value of the global Open Service Availability performance has been greater than 99% at all stations except for RIMS JMEA and RKKA mainly due to local environment degradations in conjunction with high ionospheric activity.

3.6 Maritime accuracy

The Maritime Service Horizontal Accuracy *corresponds, per RIMS, to the 95th percentile of the HPE after filtering out the samples with HDOP > 4*

The values obtained for this year 2024 at the RIMS locations relevant to maritime service are shown in Table 10. All the RIMS have been compliant with the target value of 10 metres (see EGNOS ESMAS SDD [RD-3])

Station	Horizontal Accuracy (m)
Agadir	3.9
Aalborg	0.8
Athens	1.1
Catania	1.2
Cork	0.9
Djerba	1.9
Egilsstadir	1.0
Gävle	0.8
Glasgow	0.9
Jan Mayen	1.4
Kirkenes	1.1
Lappeenranta	0.9
Lisbon	1.4
Madeira	2.2
Malaga	1.4
Palma de Mallorca	1.1
Reykjavik	1.4
Roma	1.0
S. de Compostela	1.2
Swanwick	1.1
Tromsoe	1.1
Trondheim	0.9

Table 10: Maritime Service Horizontal Accuracy per RIMS.

The Maritime Service Availability of Accuracy *is calculated as the percentage of time in which the instantaneous horizontal position error is equal to or less than 10m and the horizontal precision dilution is equal or lower than 4 over the total number of samples when a Maritime position is available.*

The values obtained for this year at the different RIMS locations are shown in Figure 32. The blue line represents the 95% availability isoline from the performance characterisation map included in the Maritime Service SDD [RD-3].

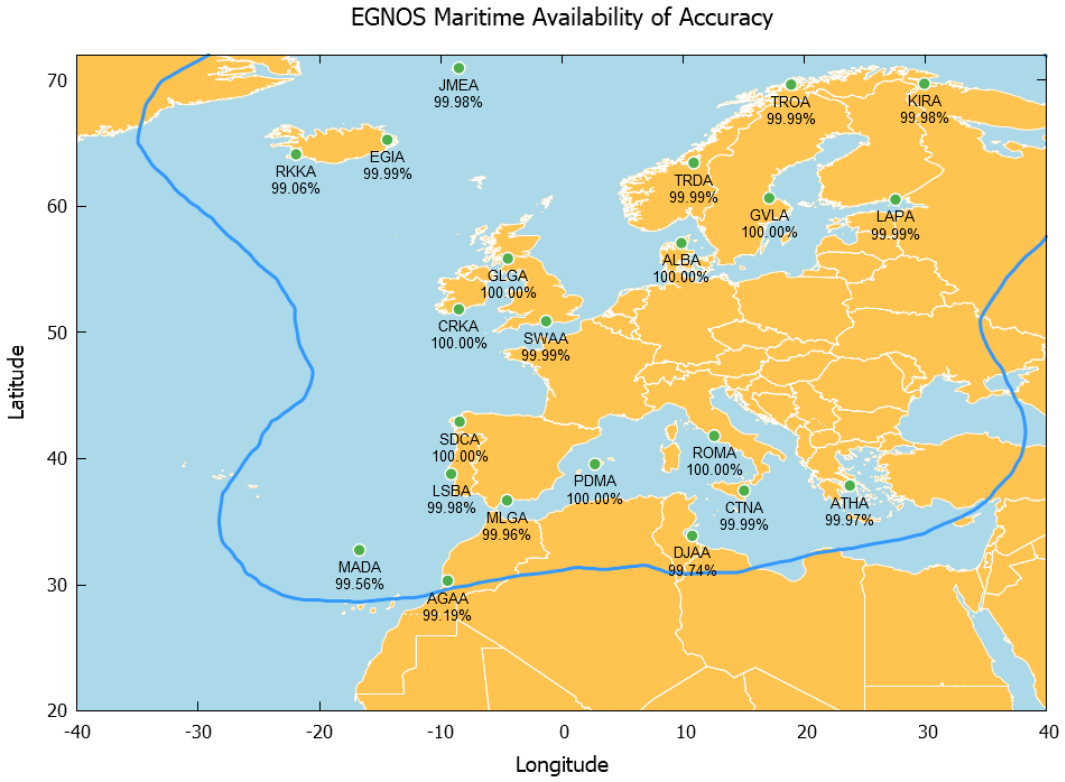

Figure 32: Maritime Service Availability of Accuracy per RIMS stations (Worst between PRN 123 and PRN136).

All the stations present a Maritime Service Availability of Accuracy higher than 95% during this year.

Regarding the commitment values of ESMAS Time to Alert (<5.2s) stated in the Maritime Service SDD [RD-3] were also met by design.

3.7 EGNOS Data Access Service (EDAS)

EGNOS Data Access Service (EDAS) provides free-of-charge Internet-based access to EGNOS and GNSS (GPS&GLONASS) data in real-time and through an archive, including all data generated by EGNOS ground stations, which are distributed mainly across Europe and North Africa.

Like all the other EGNOS Services, EDAS has its own EDAS Service Definition Document [RD-4]. Among other content, the EDAS SDD defines the committed performance for EDAS (which should always be met under a nominal situation) in terms of availability and latency:

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

Based on the above definitions, Table 11 and Table 12 provide the minimum availability and maximum latency for EDAS services:

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

Table 11: 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 12: EDAS Services maximum latency

EDAS performance is reported through the EGNOS Monthly Performance reports, available on the EDAS-Maritime User Support Website (https://edas-maritime.gsc-europa.eu/documents/field_gc_document_type/84).

Figure 33 shows the availability achieved over the period.

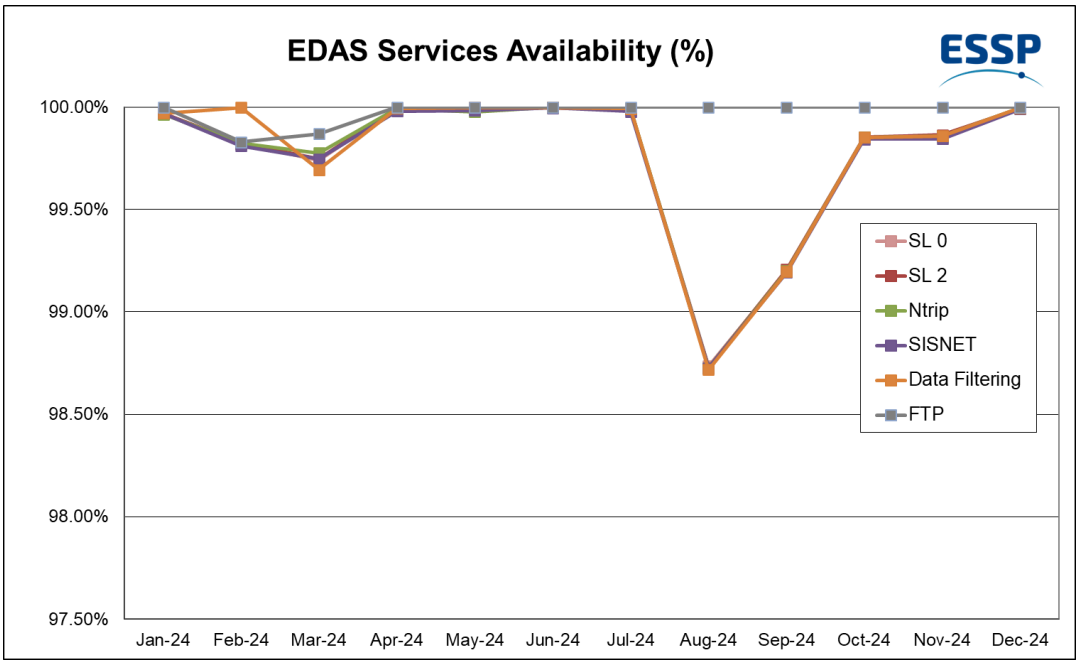

Figure 33: EDAS Services Availability (from January 2024 to December 2024)

The availability figures reported in the diagram above were mainly affected by an EDAS Service Outage on August 27th that lasted from 02:10 to 11:19 UTC and on September 3rd that lasted from 02:58 to 08:45 UTC.

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

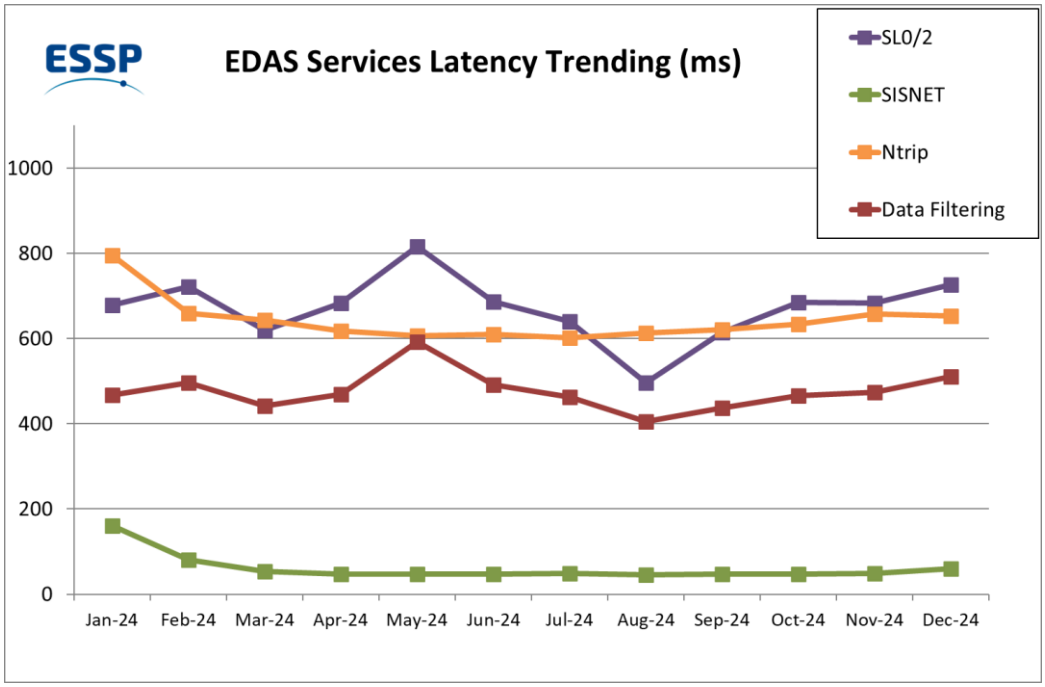

Figure 34: EDAS Services Latency (from January 2024 to December 2024)

As shown in Figure 34, the EDAS services latency has been consistently below the one-second threshold and well below the EDAS SDD [RD-4] commitment for all services over the entire reporting period.

3.8 NOTAM Proposals Service Performance

The EGNOS Safety-of-Life (SoL) Service was declared available on March 2, 2011, marking a significant milestone for European aviation. Shortly after, on March 17, 2011, the first EGNOS-based LPV approach procedure became operational at Pau Airport in France, inaugurating the practical implementation of EGNOS SoL service for aviation. This event paved the way for the expansion of EGNOS-based procedures across Europe, with the EGNOS Service Provider delivering EGNOS NOTAM proposals to support these operations at an increasing number of airports and countries.

EGNOS NOTAM Proposals are provided according to the following notification deadlines:

- Scheduled GNSS events are communicated at least 72 hours in advance.
- Unscheduled GNSS events (EGNOS and GPS) communicated within 2 hours (7D/H24).

Therefore, the current service level is in line with the ICAO recommendation for the notification of scheduled events (72 hours in advance), although it is not yet fully in line with the recommendation for unscheduled events (15-minute delay). However, the actual delays observed in the notification of predicted EGNOS service outages have typically been in the 30-minute range.

Warning NOTAM proposals are sent manually and, hence, do not depend on alarms or operators' reaction times, this is why those are not considered in the Figure 35 below. The Frequency axe reflects the number of alarms raised to operators due to new EGNOS NOTAM proposals expecting confirmation for transmission, only considering those events where notifications were finally sent.

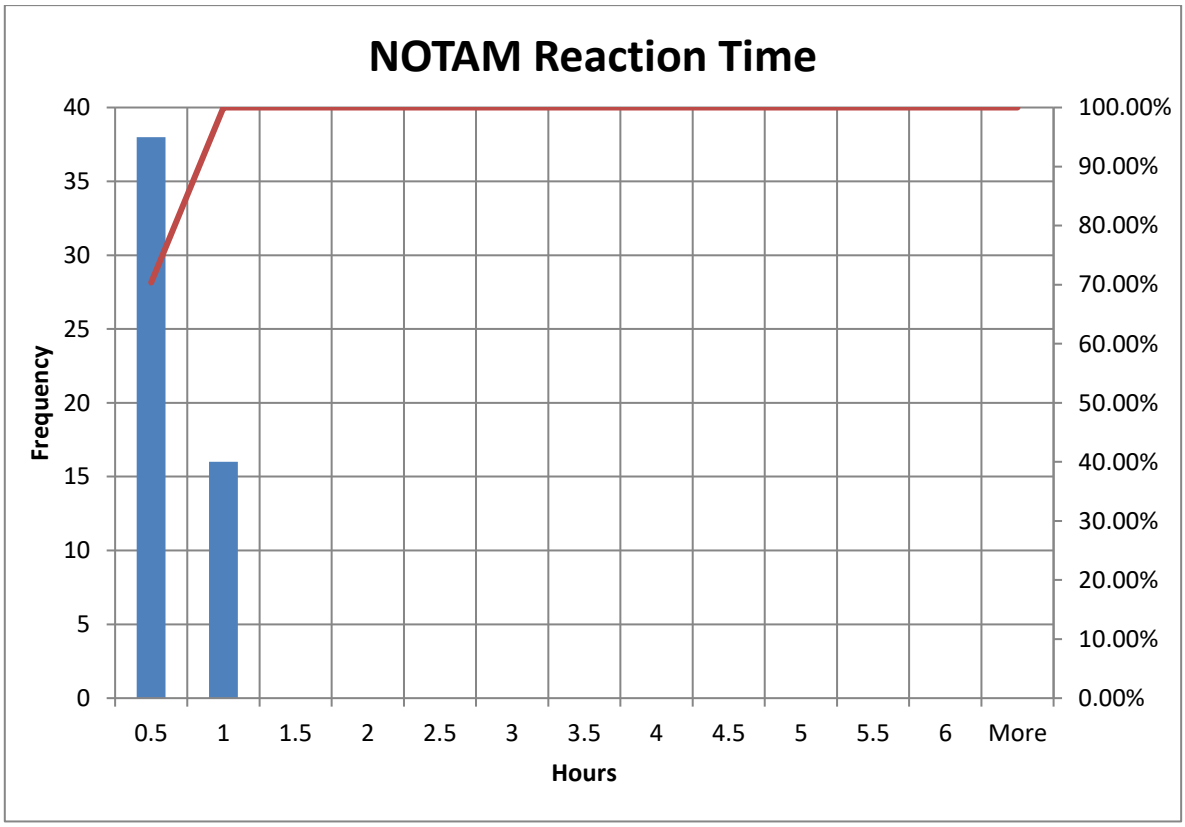

Figure 35: NOTAM reaction time during 2024

For the NOTAM service, it is remarked that feedback received from users is considered when planning evolutions. Every year, these inputs are assessed in a dedicated improvement plan. Based on this user feedback, for the year ahead, the service will implement a new feature that will allow multiple AFTN addresses for the submission of EGNOS NOTAM proposals.

Additionally, the accuracy of the prediction model is verified following the deployment of a new EGNOS system release, when a calibration exercise is performed.

4 EGNOS SERVICES PROVISION

4.1 Service Definition Documents and Service Notices over the period

All Service Definition Documents (SDDs) were updated in 2024. The published SDDs, as shown in Figure 36, are available at the EGNOS User Support Website (https://egnos.gsc-europa.eu/documents/field_gc_document_type/89).

The first EGNOS Safety of Life assisted service for Maritime Users (ESMAS) SDD v1.0 [RD-3] was published on 13 March 2024, on the day of the Service declaration.

The EGNOS Safety of Life (SoL) for Aviation SDD v3.6 [RD-1] was published on 9 September 2024. This SDD, whose name was updated to clarify its scope following the publication of the ESMAS SDD, includes new commitment maps reflecting the expected EGNOS performance with the current EGNOS ground segment configuration and the status of Solar Cycle 25. Additionally, other changes were incorporated, such as the update of the EGNOS Service Provision scheme following the ESMAS declaration

The EGNOS Open Service (OS) SDD v3.0 [RD-2] was published on 12 November 2024. This SDD includes the new commitment maps reflecting the expected performance of EGNOS, as well as the updated EGNOS Service Provision scheme and information on the EGNOS system and service.

EGNOS Data Access Service (EDAS) SDD v3.0 [RD-4] was published on 18 December 2024. This SDD introduces several updates to keep the user informed about the latest status of the service, including updated EDAS service performances, system updates and service information. This publication introduces EUSPA as the new EDAS Service Provider.

Figure 36: EGNOS Service Definition Documents published during the year 2024

ESSP generated one Service Notice as supplementary information for users that may temporarily amend the applicable version of the EGNOS Service Definition Documents. During 2024, ESSP published and/or updated the following Service Notices (the status of which, as of 31 December 2024, is provided after the description of the corresponding Service Notice):

- Service Notice 21: Entry into operations of EGNOS System Release 2.4.1N_YSR4-PSS1 [Expired]
- Service Notice 31: Update of EGNOS Services User Support Website and Helpdesk following the declaration of the new EGNOS Safety of Life (SoL) assisted service for MAritime userS (ESMAS) [In force[16]]

The following Service Notices remained in force on 31st of December 2024:

- Service Notice 17: EDAS FTP RINEX navigation files

[16] Set as 'Expired' on 15 January 2025, once all EGNOS SDDs were updated and published.

- Service Notice 24: Potential EGNOS underperformance linked to new EGNOS RIMS configuration (This new RIMS configuration refers to the decommissioning of RIMS Abu Simbel (ABS – Egypt) and Alexandria (ALY – Egypt))
- Service Notice 25: Potential EGNOS underperformance due to Solar Cycle
- Service Notice 27: EGNOS Space Segment Update
- Service Notice 29: Potential underperformance of EGNOS in the south-east linked to the new configuration of EGNOS RIMS
- Service Notice 30: Entry into service of EGNOS System Release 242B
- Service Notice 31: Updated EGNOS Services User Support Website and Helpdesk after the declaration of the new EGNOS Safety of Life (SoL) assisted service for MAritime userS (ESMAS)

The latest applicable (in Force) Service Notices are always available at the EGNOS User Support Website (https://egnos.gsc-europa.eu/documents/field_gc_document_type/87).

4.2 User Consultations and Improvement Actions

Every year, EUSPA and ESSP jointly conduct a comprehensive EGNOS User Satisfaction Process on the three EGNOS Services (SoL, OS, and EDAS). This process aims to gather valuable feedback on the use of EGNOS and the performance of ESSP, identify areas for improvement, and define recommendations for EGNOS services.

This process considers feedback received through different means and interfaces, such as the EGNOS Service Provision Workshop, EGNOS User Support activities, ESSP participation in multimodal forums, GNSS implementation projects, working groups or relevant events. However, the main contribution is the user satisfaction survey, which is widely distributed among key users and stakeholders of each EGNOS Service.

The 2023 EGNOS User Satisfaction Survey was launched in November 2023 and closed on 22 March 2024, using a specific online platform. The results can be found in the EGNOS Bulletin Autumn 2024 (https://egnos.gsc-europa.eu/news-events/egnos-bulletin) and are also published on the EGNOS User Support Website (section Documents / Yearly Reports).

In the Figure 37 below, the preliminary results of the 2024 EGNOS User Satisfaction Survey are presented. The user satisfaction action plan 2025 is currently under preparation based on these results.

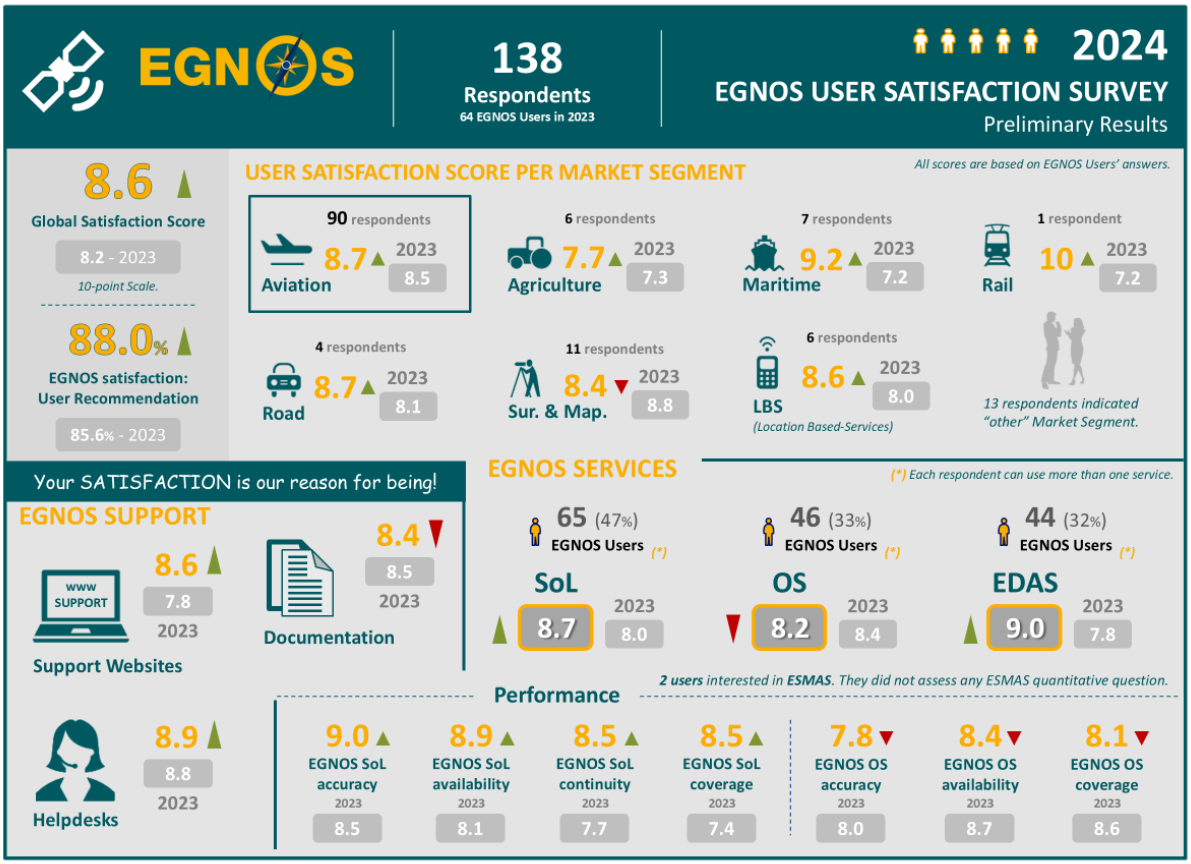

Figure 37 2024 EGNOS User Satisfaction Survey results

4.3 2024 EGNOS Multimodal Adoption Plan

The 2024 EGNOS Multimodal Adoption Plan targeted several market segments: Aviation & Drones, Maritime, Inland Waterways and Fisheries & Aquaculture and Rail, as the main lines of work, together with transversal activities covering different topics not linked to a specific market segment.

This section summarises the key highlights and outcomes of the activities performed throughout the year.

Aviation & Drones

The number of EGNOS-based procedures has continued to rise, surpassing the milestone of 1000 in November 2024. During 2024, 10 APV-I and 61 LPV200 procedures were published. This makes a total of 71 new EGNOS-based procedures, with the total number of LPV200 exceeding the number of APV-I procedures for the first time since LPV200 was declared. As EGNOS adoption expands at aerodromes, operators are also adapting their fleets to this technology. Engagement activities have revealed that at least 9 operators plan to equip their fleets shortly, and 65 new aircrafts were equipped during the year.

One of the key engagements has been supporting operators in equipping LPV using developed adoption tools, mainly Traffic Assessments, CBAs and ad-hoc presentations of EGNOS benefits. In summary:

- A Traffic Assessment was conducted for Cargolux and discussed with them. As a result, they intend to implement LPV in new orders for the B777-X, making them the first known operator to implement LPV from the Boeing manufacturing line.
- A traffic assessment was performed and presented to Corendon Airlines Europe with positive results. They are evaluating the adaptation of the 737-NG.
- The cost-benefit analysis for SAS was completed and presented to them by the end of December.
- Lufthansa City Airlines (replacement for Lufthansa Cityline) was supported on the implementation of their new fleet (A320 and A220).
- Air Nostrum confirmed the implementation of LPV in the entire new fleet. They also evaluated the adaptation of the ATRs, with the possibility of future collaboration.

This year, special attention has been given to commercial aviation with a specific analysis of the SLS functionality of the A320 after contacting the operators who have placed orders. In conclusion, nearly 30% of the A320 aircraft orders will be delivered with the SLS functionality implemented or retrofitted with a software update once the Thales Flight Management System (FMS) is certified. However, 44% of the A320 aircraft orders will not select SLS from the production line due to economic reasons primarily from Wizz Air, which is considered as an Ultra Low Cost Carrier. The remaining 26% of orders remain unclear. These results will be re-evaluated and updated, if necessary, in early 2025.

Apart from the A320, and still focusing on commercial aviation, the selection of LPV functionality and the reasons for choosing it or not have been analysed following an exhaustive contact campaign. 23% of new aircraft orders will be delivered with LPV functionality implemented. 73% of operators are unsure whether to choose LPV from the manufacturing line, but not a single operator has confirmed their refusal to implement LPV. As with the A320 analysis, these results will be re-evaluated and updated, if necessary, in early 2025.

Concerning NIREs, it has been developed the Solutions Catalogue based on previous presentations in the GNSS GA WG, national regulations and several conversations with ANSPs.

In the field of drones:

- A White paper highlighting EGNOS performance in UAS has been produced and published on the EGNOS User Support website. It gathers the results of the drone data campaigns carried out in 2023 in Madrid and Málaga with EGNOS OS and EDAS, together with further information for using EGNOS according to the specific UAS operations.

- In April, a training course for drone operators was successfully delivered at the Amsterdam Drone Week. The content of this training was also recorded to create awareness-raising material that will be available on the EGNOS User Support website.
- The added value of using EGNOS to support UAS and VCA operations was analysed, particularly for compliance with the current regulatory framework and guidance material.

To raise awareness of the synergies between Copernicus and EGNOS for procedure design, a paper was produced, addressing the potential use of Copernicus DEM 30 to obtain terrain data in the design of flight procedures. This paper was presented at the User Consultation Platform held in October, with the final objective of organising a specific webinar with the industry in the first quarter of 2025.

Considering High Altitude Operations (HAO) as a potential new EGNOS adopter, several companies have been contacted to understand their PVT needs in this type of operation, aiming to establish the requirements for a data campaign. The greatest interest and collaboration have been obtained from Stratosyst, and in the last quarter of 2024, a joint definition of the technical and financial requirements for a data campaign began.

EGNOS was present at Airspace World in Geneva; MRO Europe, where STC holders with an LPV solution and a stand at the event were visited to offer support, tools and expertise to help operators make decisions about installing STC; and at Aerospace Tech Week 2024, where feedback was obtained from relevant operators about their plans for LPV implementation.

Maritime, Inland Waterways and Fisheries & Aquaculture

The declaration of the ESMAS Service in March 2024, together with the inclusion of the IEC 61108-7 standard in the MED Directive, which took place in July 2024 with the publication of Commission Implementing Regulation 2024/1975, represents the fundamental milestones of this period and, consequently, guides the adoption strategy and subsequent actions.

ESSP and EUSPA presented the formal announcement at IALA of the ESMAS declaration and the IEC 61108-7 standard (further details on the work carried out within IALA and at RIS week can be found in section 2.3.2).

Special attention has been given to raising awareness and commitment among actors belonging to three key stakeholder groups: manufacturers, notified bodies and shipowners. At the same time, their views on the market have been gathered to draw conclusions on the cost and time involved in implementing the new IEC 61108-7 standard in the maritime segment.

The publication of Commission Implementing Regulation 2024/1975, in July, finally included the IEC 61108-7 standard. During ANAVE's second biannual meeting with its shipowner members in December, a presentation was given on "European SBAS and ESMAS Overview".

In terms of data campaigns, one was carried out on the south coast of Spain in October, and contacts were made with other authorities to launch a data campaign in Cyprus (planned for February 2025) and Iceland (scheduled for spring 2025).

Tests were carried out with Raymarine equipment to check compliance with IEC-61108-7. Koden equipment, delivered by Ostroconsult at the end of 2024, has been tested in January 2025, and other possible candidates that have shown interest. In addition, the "Guidelines for Manufacturers for the Implementation of SBAS L1 in Shipborne Receivers" was updated.

It has also been developed a European Web Map/App of Inland AIS and IALA DGPS stations, indicating which ones are operational and which ones are transmitting DGNSS corrections. This app includes functionalities to better identify GEO shadow areas in inland waterways in relation to the positions of AIS stations. This Web App was presented to CESNI members during a dedicated slot from the VTT WG at the RIS week held in November 2024.

EGNOS was present in several events like Aqua2024, in August, SMM, in September 2024, and METSTRADE in November 2024.

Rail

In rail, the EGNSS devices installed for non-safety-related applications continue under monitoring, specifically freight tracking devices and Passenger Information Systems (PIS). As a result of this exhaustive research and contact campaign, it has been discovered that at least 17 European rail companies are digitalising their entire fleet of freight wagons with GNSS-based tracking sensors. To date, some 180,000 smart assets have been equipped with EGNSS telematics devices, and more than 200,000 freight assets are expected to be retrofitted with EGNSS receivers by 2028. Similar research into PIS devices has revealed that at least 9 European manufacturers are including GNSS-based positioning in their PIS devices, and around 5,000 trains have been equipped with European GNSS-based PIS devices.

The results of this analysis have been compiled into a specific brochure titled “Precise and reliable train localisation thanks to EGNOS”, which was used as promotional material during the Innotrans exhibition. Also related to Innotrans, Europe’s Rail organised a train trip from Brussels to Berlin to showcase the evolution of the railway sector.

As a result of contacting with rail operators, tracking device manufacturers and PIS equipment manufacturers, and the support provided to interested companies regarding EGNOS capability and configuration, a success story was developed for the EGNOS bulletin featuring the Televic GSP use case. After several iterations with them, this company decided to include SBAS in their new generation of products.

Regarding safety applications, work has been put into the Service Provision Scheme proposal to gather feedback for further refinement after consulting with rail stakeholders. It has also been reviewed the User Requirements Document for input for the next User Consultation Platform.

Transversal

An important activity was the support provided to the French government in monitoring the security of the Olympic Games by creating a webpage containing real-time products for monitoring GPS/EGNOS indicators and developing an alert system that will be activated if certain anomalous situations are detected.

Moreover, several companies interested in using EGNOS were supported, particularly those related to the drone sector. This support involved using an hexacopter to record GNSS raw data under specific conditions (e.g.: flying the drone in areas where the landscape blocks the desired elevation mask angle) or to evaluate the performance of specific.

4.4 Communication and EGNOS Promotion Activities

4.4.1 EGNOS workshop 2024

The European Union Agency for the Space Programme (EUSPA) and the European Satellite Services Provider (ESSP) organized the 2024 EGNOS workshop, which took place in Dublin on 13 and 14 March 2024. The event gathered over 130 participants from 23 countries, including representatives from air navigation service providers, civil aircraft operators, maritime receiver manufacturers, rotorcraft and drone operators, and maritime users and authorities. The two full days were dedicated to EGNOS performance in the different services, roadmaps, market adoption and its current and future applications in different transport domains.

A significant milestone was announced during the workshop: the official declaration of the new EGNOS Safety of Life Assisted Service for MAritime Users (ESMAS). This service expands the EGNOS service portfolio and is now free of charge, offering enhanced support to maritime users.

During this workshop, attendees received information from maritime receiver manufacturer Kongsberg and learned about IEC standards. They also witnessed a live demonstration of an EGNOS maritime receiver in operation.

At the end of Day 1, an EGNOS Awards Ceremony was held to recognise the main actors involved in the adoption of EGNOS within the Aviation field. This included ANSPs that have recently signed an EGNOS Working Agreement (EWA) and/ or have published EGNOS-based flight procedures at their airports. Representatives from LAHTI-VESIVEHMAA AERODROME (EFLA) and SAAB DIGITAL AIR TRAFFIC SOLUTIONS (SDATS), as well as other ANSPs, received an EWA award, during the ceremony. In the category of published EGNOS flight procedures, the winners were DSNA for being the ANSP with the most LPV procedures published in Europe and Air France for being the Air Operator with the highest number of EGNOS LPV-capable units currently in service.

For more information about the latest edition of the EGNOS Workshop, visit to its dedicated space at the EGNOS User Support Website (https://egnos.gsc-europa.eu/news-events/workshops/egnos-workshop-agenda-2024).

4.4.2 EGNOS workshop 2025

The EGNOS 2025 Workshop will take place on 1-2 October 2025, in Berlin, Germany. This annual event, organized once again by the European Union Agency for the Space Programme (EUSPA) and the European Satellite Services Provider (ESSP), will bring together experts and professionals in satellite-based navigation, and will be a platform for sharing innovations, discussing challenges and continuing to shape the future of European satellite navigation.

The two-day event will feature insightful sessions, interactive discussions, and networking possibilities, exploring the latest developments in EGNOS and other satellite-based services. Topics will include advancements in positioning accuracy, new EGNOS applications, and integration with emerging technologies such as autonomous transport and urban mobility.

Attendees will have the opportunity to interact with cutting-edge technologies, with practical demonstrations and real case studies showing their impact in real environments. The event also offers a networking platform for organisations and individuals working to form new partnerships, explore new business opportunities, and learn about the latest research.

Further details, including information about the registration process and the agenda of the event, will be published on the EGNOS User Support Website.

5 KEY ACTIVITIES PLANNED FOR THE YEAR 2025

5.1 Service delivery and management

5.1.1 EGNOS services user interface

5.1.1.1 EGNOS services related document evolutions (SN, SDD)

The deployment of EGNOS System Release 2.4.3 during the summer of 2025 will require the publication of new Service Notice(s) and/or Service Definition Documents.

5.1.2 EGNOS services development

5.1.2.1 Aviation

The main activities planned for the development of the EGNOS SoL Service for Aviation will be:

- Consolidation of the EGNOS Service provision elements at specific non ATS operational scenarios where a European harmonized approach is in progress and where the benefits of EGNOS are considered highly relevant in terms of increased safety and accessibility.
- Analysis of the UAS needs for EGNOS Services within and outside U-Space for medium risk operations (e.g SAIL III-IV).

5.1.2.2 Maritime

The main activities planned for 2025 for the maritime domain will be:

- IMO recognition of EGNOS/SBAS as part of the WWRNS (World Wide Radio Navigation Systems) including the preparation of the elements for the IMO for discussion in the NSCR12 committee and the subsequent follow up and derived tasks. This recognition is necessary for the future development of DFMC (Dual Frequency Multi-Constellation) SBAS performance standards.
- Consolidation within IALA of the mechanisms to enable the retransmission of EGNOS/SBAS (corrections through VDES technology allowing maritime and inland waterways users to benefit of EGNOS corrections by this retransmission means.
- Within CESNI, the European Committee for Standardisation in the field of Inland Navigation, consolidation of the requirements for the initial concept of an EGNOS service in IWW.

5.1.2.3 Rail

The main service development activities planned for 2025 in the rail domain will be the ones aiming to freeze a consensual and harmonized Service Concept and Service Provision Scheme for EGNOS Safety of Life service for its use in Rail. Adequacy to the regulatory, certification and standardization aspects, jointly with the appropriate Service Performance and Service provision layer will be key factors to add value to the rail users within the framework of Europe´s rail EGNOS4RAIL project.

APPENDIX A LIST OF REFERENCE

[RD-1] EGNOS Safety Of Life (SoL) for Aviation Service Definition Document, EGN-SDD-SoL; v.03-06 (https://egnos.gsc-europa.eu/sites/default/files/documents/egnos_sol_sdd_in_force.pdf)

[RD-2] EGNOS Open Service (OS) Service Definition Document (SDD), EGN-SDD-OS; v.03-00 (https://egnos.gsc-europa.eu/sites/default/files/documents/egnos_os_sdd_in_force.pdf)

[RD-3] EGNOS Safety of Life assisted service for Maritime users (ESMAS), EGNOS-SDD; v.01-00 (https://egnos.gsc-europa.eu/sites/default/files/documents/egnos_esmas_sdd_in_force.pdf)

[RD-4] EGNOS Data Access Service (EDAS) Service Definition Document, EGN-SDD-EDAS; v.03-00 (https://edas-maritime.gsc-europa.eu/sites/default/files/documents/egnos_edas_sdd_in_force.pdf)

APPENDIX B LIST OF ACRONYMS

ACRONYM	DEFINITION
AESA	Agencia Estatal de Seguridad Aérea (Spain)
ANSP	Air Navigation Service Provider
APV	Approach with Vertical Guidance
ASTP	Absolute Safe Train Positioning
ASN	Abstract Syntax Notation
ATM	Air Traffic Management
ATS	Air Traffic System
CBA	Cross Border Area
CESNI	European Committee for the Standardisation for Inland Navigation
CLUG	Certifiable Localisation Unit with GNSS
ECAC	European Civil Aviation Conference
EDAS	EGNOS Data Access Service
EGNOS	European Geostationary Navigation Overlay Service
ENT	EGNOS Network Time
ERJU	Europe´s Rail Joint Undertaking
ERTMS	European Rail Traffic Management System
ESMAS	EGNOS Safety of Life (SoL) assisted service for MAritime userS
ESSP	European Satellite Services Provider
EUG	ERTMS User Group
EWA	EGNOS Working Agreement
FTP	File Transfer Protocol
FutuRe	Future Regional railways
GEO	Geostationary Satellite
GNSS	Global Navigation Satellite System

ACRONYM	DEFINITION
GPS	Global Positioning System
HAL	Horizontal Alert Limit
HNSE	Horizontal Navigation System Error
HPE	Horizontal Position Error
HPL	Horizontal Protection Level
HSI	Horizontal Safety Index
ICAO	International Civil Aviation Organization
IALA	International Organization for Marine Aids to Navigation
IMO	International Maritime Organisation
IWW	Inland Waterways
LPV	Localizer Performance with vertical guidance
LWG	Location Working Group
MI	Misleading Information
MT27	Message Type 27
NA	Not Applicable/ Not Available
NANU	Notice Advisory to Navstar Users
NLES	Navigation Land Earth Station
NPA	Non-Precision Approach
NTRIP	Networked Transport of RTCM via Internet Protocol
OP	Operation
OPS	Operations
OS	Open Service
PA	Precision Approach
PL	Protection Level
PRN	Pseudo-Random Noise
R2DATO	Rail to Digital automated up to Autonomous Train Operation
RADIUS	Railway Digitalisation Using Drones

ACRONYM	DEFINITION
RAIM	Receiver Autonomous Integrity Monitoring
RD	Reference Document
RIMS	Ranging and Integrity Monitoring Station
RTCM	Radio Technical Commission for Maritime Services
SBAS	Satellite-Based Augmentation System
SDD	Service Definition Document
SIR	Service Implementation Roadmap
SIS	Signal-In-Space
SL0	Service Level 0
SL2	Service Level 2
SLS	Satellite Based Landing System
SoL	Safety of Life
UTC	Universal Time Coordinated
UAS	Unmanned Air System / Aircraft
VAL	Vertical Alert Limit
VDES	VHF Data Exchange System
VNSE	Vertical Navigation System Error
VPE	Vertical Position Error
VPL	Vertical Protection Level
VSI	Vertical Safety Index
WWRNS	World Wide Radio Navigation Systems

Table 13: List of Acronyms

LINKING SPACE TO USER NEEDS

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