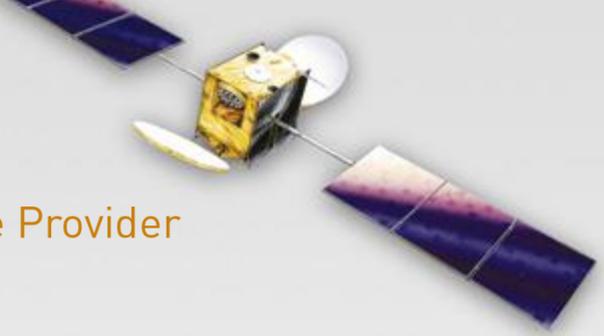


The **EGNOS** Service Provider



# Service Provision Yearly Report (April 2019 - March 2020)



ESSP-DRD-25591P Iss. 01-00 Date: 02/07/2020

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## 1 A WORD FROM THE ESSP CEO

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The first topic to be addressed this year needs to be the COVID-19 crisis, which has impacted us all, at so many different levels. As ESSP CEO, I would like to share my best wishes for you and your close ones. On the EGNOS side, this worldwide crisis has also been a concern but, thanks to the support of all programme stakeholders (EC, GSA, ESA, EASA, supply chain), services have been delivered nominally to the users.

As in past years, the EGNOS performance observed during the last period (April 2019 to March 2020) remained at high levels. In this sense, EGNOS showed its robustness once again when the “GPS Week Rollover” event was passed with no impact on the services.

During the first quarter of 2020, the EGNOS space segment configuration was updated three times. The required activities at system operations level were managed to ensure that two operational GEO satellites were available at all times and in line with the planning announced to the users ([Service Notice#22](#)). An extensive communication campaign was deployed to ensure users’ awareness throughout the process.

On the service provision side, 20 EGNOS Working Agreements (EWAs) were signed, setting a record, among which the EWA with Norsk Luftambulans AS, a rotorcraft operator flying HEMS (Helicopter Emergency Medical Services) both in Norway and Denmark, deserves to be highlighted being the first of its kind. As a result, EGNOS is supporting GNSS based operations for 33 countries, 360 airports and a total of 700 EGNOS-based approach procedures.

The programme’s efforts towards the implementation of an EGNOS-based SBAS L1 maritime navigation service continued. Also on maritime, the EDAS based French DGPS maritime service deployment was consolidated, reaching 4 operational IALA beacons in the period<sup>1</sup>. At the EGNOS Workshop in Rome, Cerema/Alberding GmbH highlighted the excellent availability performance delivered by the EDAS-based solution for France, as well as the cost savings provided by this EGNOS based set-up.

The EGNOS Annual workshop took place in Rome, gathering nearly 200 participants.

The EGNOS user satisfaction reached a score over 80% again this year (86% - the best score yet), making it the 4<sup>th</sup> year in a row with such a high result.

After two years of preparatory works, ESSP was certified ISO27001 (International Standard for the Security of Information Systems) in July.

My deepest thanks go to the ESSP teams, partners and subcontractors who have made such achievements possible, and to our customer, the GSA, for our constructive relationship during these past 6 years.



**Thierry Racaud**  
CEO, ESSP SAS



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<sup>1</sup> Refer to the [EGNOS Bulletin Q2 2019](#) for the use of EGNOS/EDAS in this context in Estonia.

## 2 EXECUTIVE SUMMARY

This document covers the period from 1 April, 2019, to 31 March, 2020.

### 2.1 EGNOS Service Performance

The EGNOS service performance has been good providing consistent values with those committed in the Open Service, Safety-of-Life, and EDAS [Service Definition Documents](#). However, for the case of the Safety-of-Life service, the commitment area was not fully covered all the time due to specific underperformance issues that are explained in this report.

EGNOS Safety of Life (SoL) Service – Non-Precision Approach (NPA)		
NPA Availability	99.73% coverage of the 99.9% NPA Service Area ( <a href="#">EGNOS SoL SDD</a> )	
NPA Integrity	No integrity event for any of the monitoring sites	
NPA Continuity	Values below $5 \cdot 10^{-4}$ /h in continental Europe	
EGNOS Safety of Life (SoL) Service – Approach with Vertical Guidance (APV-I)		
APV-I Availability	98.76% coverage of the 99% APV-I Service Area ( <a href="#">EGNOS SoL SDD</a> )	
APV-I Integrity	No APV-I integrity event	
APV-I Continuity	99.34% coverage of the $5 \cdot 10^{-4}$ APV-I Service Area ( <a href="#">EGNOS SoL SDD</a> )	
EGNOS Safety of Life (SoL) Service – LPV-200		
LPV-200 Availability	99.16% coverage of the 99% LPV-200 Service Area ( <a href="#">EGNOS SoL SDD</a> )	
LPV-200 Integrity	No LPV-200 integrity event	
LPV-200 Continuity	99.24% coverage of the $5 \cdot 10^{-4}$ LPV-200 Service Area ( <a href="#">EGNOS SoL SDD</a> )	
LPV-200 Accuracy Tails	No events happened during the period	
EGNOS Open Service (OS)		
Horizontal Accuracy	0.9 metres (95 <sup>th</sup> percentile of the cumulative data for all stations)	
Vertical Accuracy	1.5 metres (95 <sup>th</sup> percentile of the cumulative data for all stations)	
Open Service Availability	Above 99% for all locations	
EGNOS Data Access Service (EDAS)		
Service	Availability	Latency
Service Level 0	99.90% vs 98.5% target ( <a href="#">EDAS SDD</a> )	558.90 ms vs 1300 ms target ( <a href="#">EDAS SDD</a> )
Service Level 2	99.90% vs 98.5% target ( <a href="#">EDAS SDD</a> )	563.37 ms vs 1450 ms target ( <a href="#">EDAS SDD</a> )
Ntrip	99.89% vs 98% target ( <a href="#">EDAS SDD</a> )	618.99 ms vs 1750 ms target ( <a href="#">EDAS SDD</a> )
SISNeT	99.87% vs 98% target ( <a href="#">EDAS SDD</a> )	82.56 ms vs 1150 ms target ( <a href="#">EDAS SDD</a> )
Data Filtering	99.90% vs 98% target ( <a href="#">EDAS SDD</a> )	497.26 ms vs 1750 ms target ( <a href="#">EDAS SDD</a> )
FTP	99.89% vs 98% target ( <a href="#">EDAS SDD</a> )	N/A
Signal-In-Space (SIS) Availability		
GEO 1 <sup>2</sup> (EGNOS OP)	99.991 %	
GEO 2 <sup>2</sup> (EGNOS OP)	99.972 %	
EGNOS OP (at least one SIS)	100 %	

Table 1: EGNOS service performance during April 2019 – March 2020 period

<sup>2</sup> GEO PRN 123 in EGNOS test from 13/01/20 to 24/02/20. GEO PRN136 in EGNOS Test from 24/02/2020 to 23/03/20. GEO PRN126 in EGNOS OP from 13/01/20 to 23/03/20.

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

- EGNOS OS and SoL services:
  - **GPS monitoring:** Problems related to the monitoring of one or more GPS satellites (e.g. non-monitored satellites due to the lack of visibility from the EGNOS reference stations, satellites set to 'Don't use'/'Not Monitored') are one of the most frequent causes for observed underperformance. This loss of monitoring of some satellites has been especially significant in terms of performance impact during periods with degraded ionosphere monitoring conditions. The importance of this type of issues has significantly increased with respect to the previous year (around 40% of the daily underperformance events vs 15% in the previous period).
  - **Ionosphere monitoring:** the EGNOS ionospheric monitoring issues affected mainly the North and West of the Service Area. In general, the impact of this kind of events is limited to specific areas and short periods of time, without having a significant impact on the monthly performance. Although it is still one of the main causes of observed underperformance, the impact of this kind of events has significantly decreased with respect to the previous yearly period (around 22% of the daily underperformance events vs 40% in the previous period).
  - **Data quality/RIMS anomalies:** The existence of local issues in the RIMS receivers (e.g. unhealthy data) has impacted the EGNOS service performance on specific days in areas near the affected station. The most relevant degradations impacted the Northeast of the Service Area during the summer of 2019; the concerned ANSPs (4 airports affected) were duly informed of the situation in line with the applicable mechanisms defined in the frame of the EGNOS Working Agreement (EWA).
- EDAS:
  - Very stable services with monthly performances consistently exceeding the committed values defined in the EDAS SDD (Service Definition Document). Considering the whole period, all EDAS services were available more than 99.85% of the time, with transit delays largely below the 1 second threshold.
  - The main service outage during the reported period took place on July 16<sup>th</sup>, 2019, when EDAS services were unavailable for a period ranging between 30 minutes and 2 hours 50 minutes, depending on the service. The nominal system and services status was recovered during the day without any specific action required on the users' side.

## 2.2 Service Provision and Development

- **Service Definition Documents (SDD):** a new version of the EDAS SDD was published on the 3<sup>rd</sup> of June, 2019, updating its contents and including recent evolutions and use cases. More information can be found in section 4.2. In the SoL service, activities towards the publication of a new version of the SoL SDD have been initiated as a consequence of the introduction of the RIMS Haifa (Israel) in operation, expecting an extension of the commitment areas for APV-I and LPV200 in the South East of Europe.



*[EGNOS Service Definition Documents](#)*

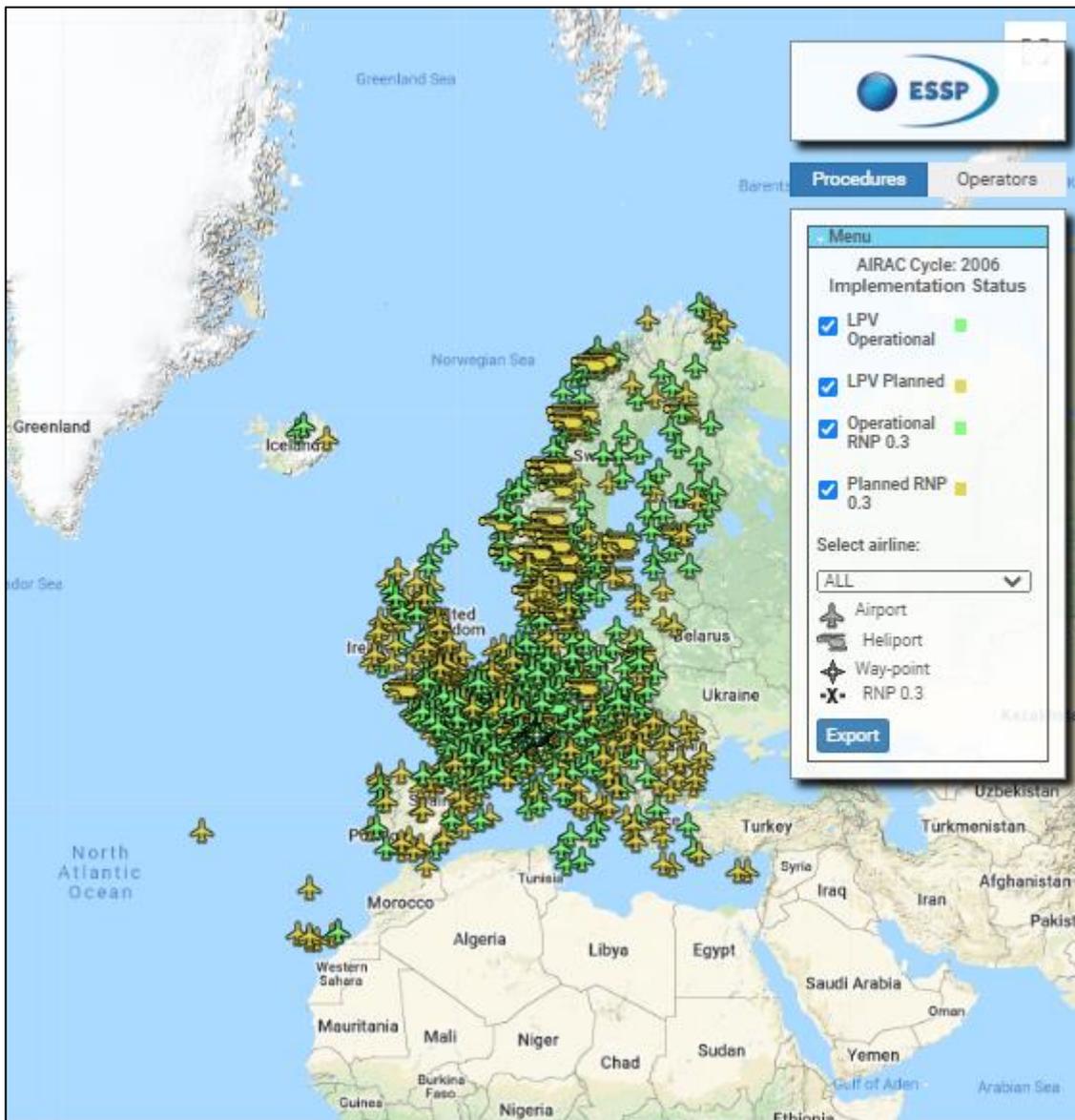
- **Services Notices:** the EGNOS Services SDDs contents were complemented by the publication of the Service Notice #22 (the EGNOS Space Segment Updates in the First Quarter of 2020), together with three updates. The main information about these Service Notices can be found in section 4.2.
- **EGNOS Service Implementation Roadmap:** The EGNOS Services Roadmaps were updated to v4.2 in September 2019 and v4.3 in April 2020, with improvements in content and format.
- **EGNOS Users' Satisfaction surveys:** The EGNOS Users' Satisfaction Survey was launched in December 2019 to cover the 2019 calendar year. The survey used a specific online platform where 124 responses were received.

A total of 98 EGNOS users and 26 non-EGNOS users responded to the survey. The main outcomes of this survey will be included in the Summer Edition of the [EGNOS Bulletin \(issue 33\)](#). The results show an excellent level of user satisfaction with respect to EGNOS services, with a global score of 8.6 out of 10.

- **EGNOS Workshop:** The 2019 EGNOS Annual Workshop was held in Rome on 24-25 September, 2019, hosting nearly 200 attendees from 29 different countries over the two-day event. According to the survey implemented, attendees enjoyed the event, which received an excellent satisfaction score of 9 out of 10, and set a new record in terms of the feedback received by attendees.

The 2020 EGNOS Annual Workshop will be integrated into the EU Space Week organised by the GSA (<https://www.euspaceweek.eu/>).

- **EGNOS SoL implementation in aviation:** At the end of the period included in the report (31<sup>st</sup> March 2020), EGNOS was supporting GNSS based operations for 33 countries, 360 airports, and a total of 700 EGNOS-based operations (363 APV-I, 244 LPV-200, 88 APV Baro EGNOS-based approach procedures and 5 RNP 0.3 routes). In total, the EGNOS approaches are being implemented in 51.96% of the instrumental runways in Europe.



*EGNOS Procedures map ([EGNOS User Support Website](#))*

- **EGNOS Multimodal Adoption:** All the activities planned to be executed during 2019 were successfully conducted. The market segments where more effort has been devoted are aviation and maritime, followed by agriculture & geomatics, and rail.

ESSP has continued engaging aerodromes to publish the EGNOS-based procedures and operators to get equipped and certified. During the period reported in this document, 137 LPV procedures have been published and 39 aircrafts have been certified or have achieved operational approval. Another 37 new aircraft/rotorcraft units have been engaged so that in the near future they will retrofit, start with the certification process, or request SBAS options in the avionics for new unit orders.

In the maritime domain, the activities launched to implement an EGNOS L1 Maritime Service have continued, as well as those linked to the use of the EGNOS V2 SiS or EDAS as a positioning source for Aids to Navigation (IALA DGNS stations and AIS stations). Contact has been established with Portuguese maritime authorities to offer our support (by means of the elaboration of a customised technical feasibility assessment and cost benefit analysis) to recapitalize their IALA DGNS stations. First steps have also been conducted in relation with AIS in inland waters.

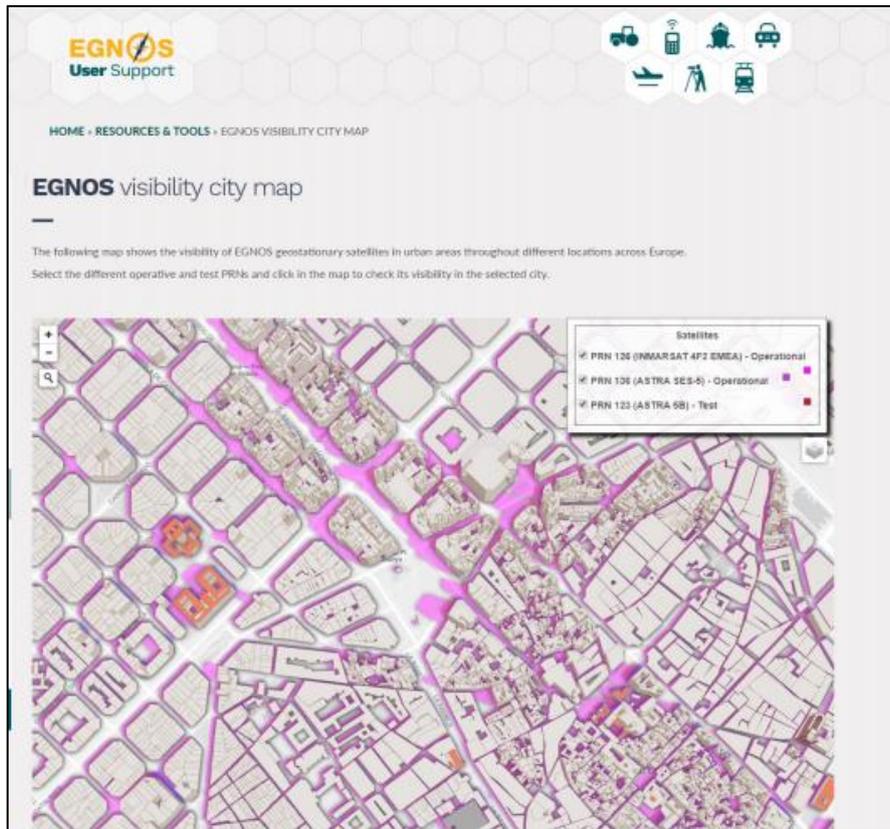
In agriculture and geomatics, the contacts network has notably been increased, and customised EGNOS information for those market segments has been prepared and disseminated. More presence in specialised forums in Precision Farming has been achieved, as well as closer contact with a great number of Universities. Webinars for the general public and specific presentations have been provided to a wide number of users. A new upgrade of the [GEAR tool](#) (EGNOS demonstrator for agriculture) has been released and uploaded in the EGNOS user support website.

In the rail sector, ESSP has continued supporting the GSA with special focus on the assessment of the market size of European freight wagons envisaged to be equipped with GNSS devices (non-SoL market). The market size of freight cargo cars was estimated to be ~170,000 units, and the foreseen timeframe necessary to equip them with EGNSS sensors was set to the year 2022. It was determined that by Q3 of 2019 ~23,000 smart wagons had already been equipped with EGNSS telematics devices in Europe. Approximately 7000 of those are already using EGNOS.

- **User Support:** The EGNOS App was updated for [Android](#) and [Apple](#) markets on April 2<sup>nd</sup>, 2019, including the new EDAS Coverage Map, latest iPhone devices adaptability, and RNP routes on LPV map.

The EGNOS User Support website continued its evolution, adding new tools, such as:

- A new Aviation Portal, where the EWA signatories can manage their own documentation and information relevant to the EGNOS Working Agreements.
- A new Alternative Operators map, providing details about the number and types of aircrafts approved for LPV operations in Europe, available through the existing LPV Procedures map.
- A new Visibility Map for urban areas. The map represents areas throughout different urban locations across Europe where there is no visibility of the EGNOS geostationary satellites.
- Increased visibility of planned outages in the homepage and simplification of the EGNOS forecast section, displaying all relevant information in a single page.
- New search functionality. The entire website is now indexed and, with the search feature, it is now possible to search for terms in documents, news, and content pages.



*EGNOS GEO satellites: urban visibility map ([EGNOS User Support Website](#))*

The EGNOS Helpdesk managed 291 user requests and an awareness campaign targeting social networks and events was launched.

Also, 65 new articles, covering all market segments, were published during this period in coordination with the Service Adoption, the Service Evolution Communication, and the GSA.

### 3 SERVICE PERFORMANCE

#### 3.1 EGNOS SIS Availability

##### 3.1.1 SIS Availability trending

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

This section presents the yearly performance of the SIS availability. It provides the yearly average performances for each GEO PRN in operational mode, namely PRN123, PRN136 and PRN126, and for the operational SIS (at least one SIS is available). Note that several GEO swaps have been performed in January, February and March 2020.

- OP1<sup>3</sup>: 99.991 %
- OP2<sup>3</sup>: 99.972 %
- EGNOS OP (at least one SIS): 100 %

Monthly results are given by the following:

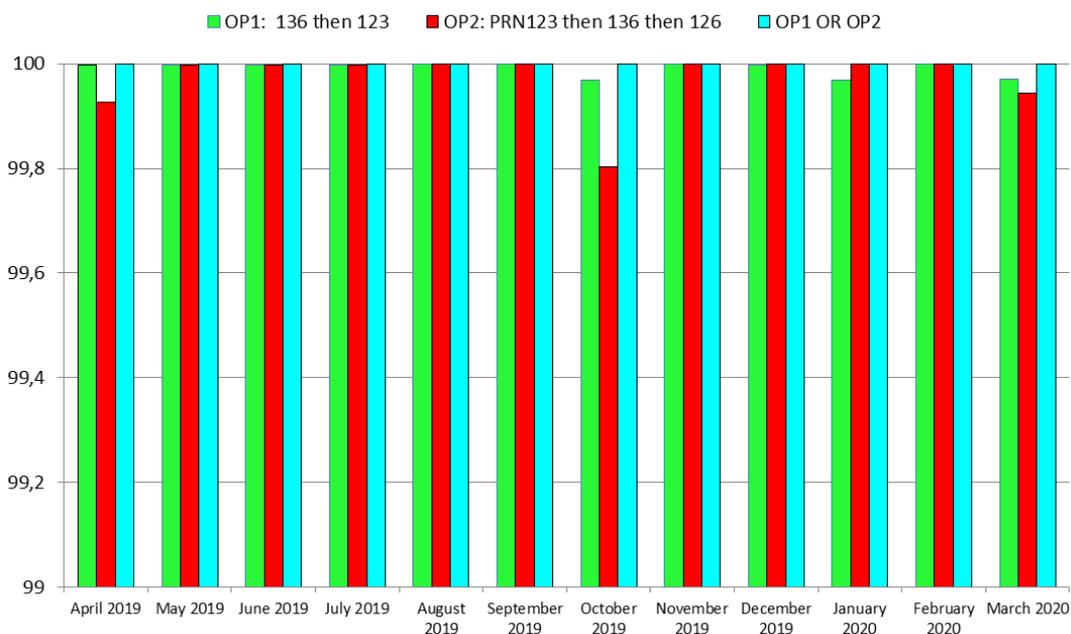


Figure 1: EGNOS SIS OP availability trend April 2019 to March 2020 (%)

<sup>3</sup> GEO PRN 123 in EGNOS test from 13/01/20 to 24/02/20. GEO PRN136 in EGNOS Test from 24/02/2020 to 23/03/20. GEO PRN126 in EGNOS OP from 13/01/20 to 23/03/20.

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

DATE	OP1 <sup>3</sup>	OP2 <sup>3</sup>	OP1 <sup>3</sup> OR OP2 <sup>3</sup>
April 2019	99.998	99.9269	100
May 2019	99.9985	99.9985	100
June 2019	99.9977	99.9986	100
July 2019	99.9981	99.9974	100
August 2019	99.999	100	100
September 2019	99.9996	99.9996	100
October 2019	99.9695	99.8038	100
November 2019	99.9996	99.9996	100
December 2019	99.9985	99.9995	100
January 2020	99.969	100	100
February 2020	99.9996	100	100
March 2020	99.9705	99.9435	100
<b>Average Monthly availability</b>	<b>99.99146667</b>	<b>99.97228333</b>	<b>100</b>

Table 2: EGNOS SIS OP Monthly availability From April 2019 to March 2020 (%)

### 3.2 SoL Service - Non-Precision Approach (NPA)<sup>4</sup>

The following figures depict the minimum performance for the Non-Precision Approach (NPA) availability and continuity that can be expected from EGNOS, as defined in the EGNOS SoL Service Definition Document (see [EGNOS SoL Service Definition Document](#)). The current version of the SoL SDD was published on 26/03/2019 and remained applicable for the whole reported period.

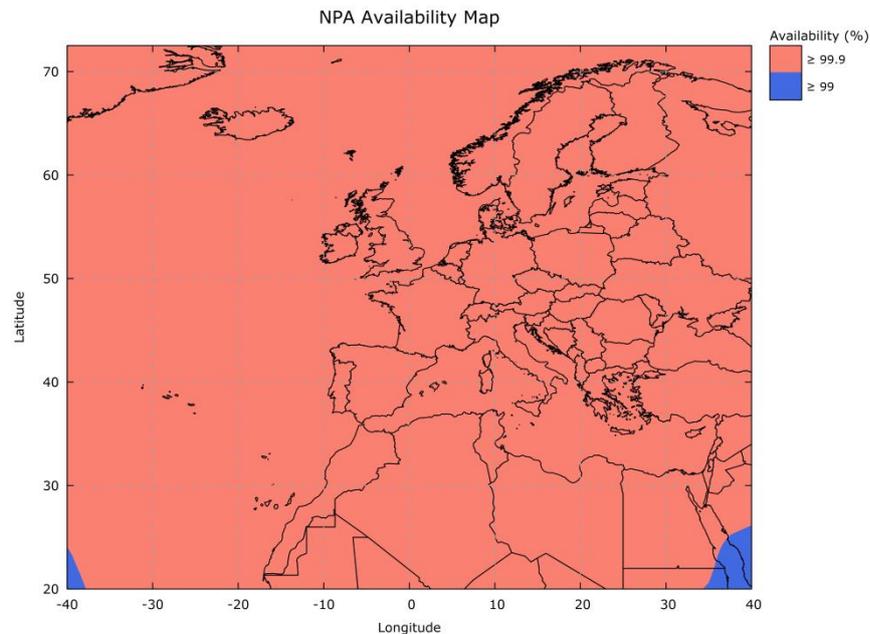


Figure 2: NPA Availability map- Expected minimum performance (SoL SDD v3.3)

<sup>4</sup> Note that EGNOS performance presented in this section is computed using SBAS corrections from the operational EGNOS GEO satellites according to [Service Notice#22](#):

- GEOs PRN136 and PRN123 from 01.04.2019 to 15.01.2020
- GEOs PRN136 and PRN126 from 16.01.2020 to 20.02.2020
- GEOs PRN123 and PRN136 from 21.02.2020 to 26.02.2020
- GEOs PRN123 and PRN126 from 27.02.2020 to 16.03.2020
- GEOs PRN123 and PRN136 from 17.03.2020 to 31.03.2020

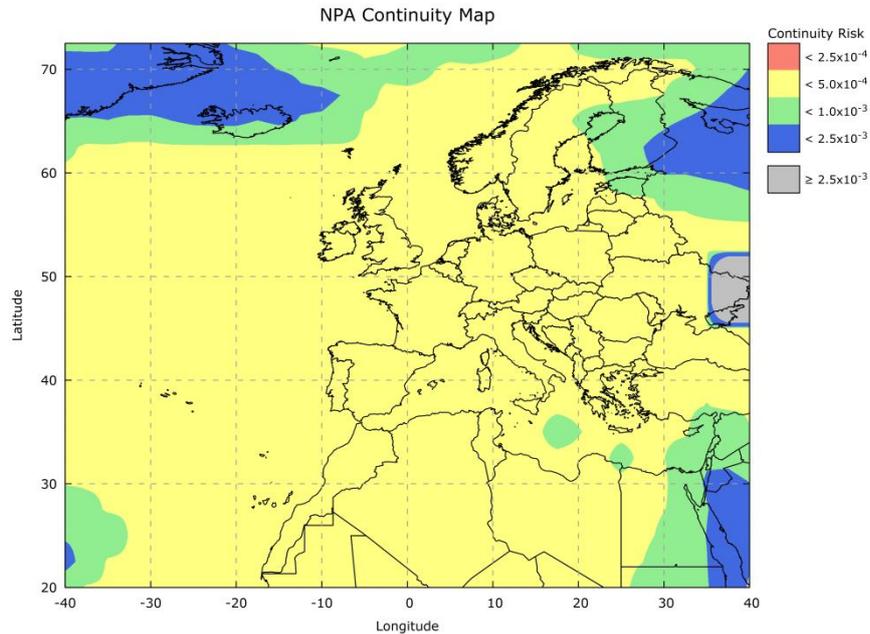


Figure 3: NPA Continuity map - Expected minimum performance (SoL SDD v3.3)

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

The NPA performance achieved during the reporting period is reported below. Additionally, the NPA performance is reported through the EGNOS Monthly Performance reports, available on the [EGNOS User Support website](#).

### 3.2.1 NPA availability

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

The following figure provides the NPA availability for the reported period, for combined GEO (understood as the use of corrections from either one of the two operational GEOs, switching between each one of them in the event a SIS outage longer than 3 seconds is observed):

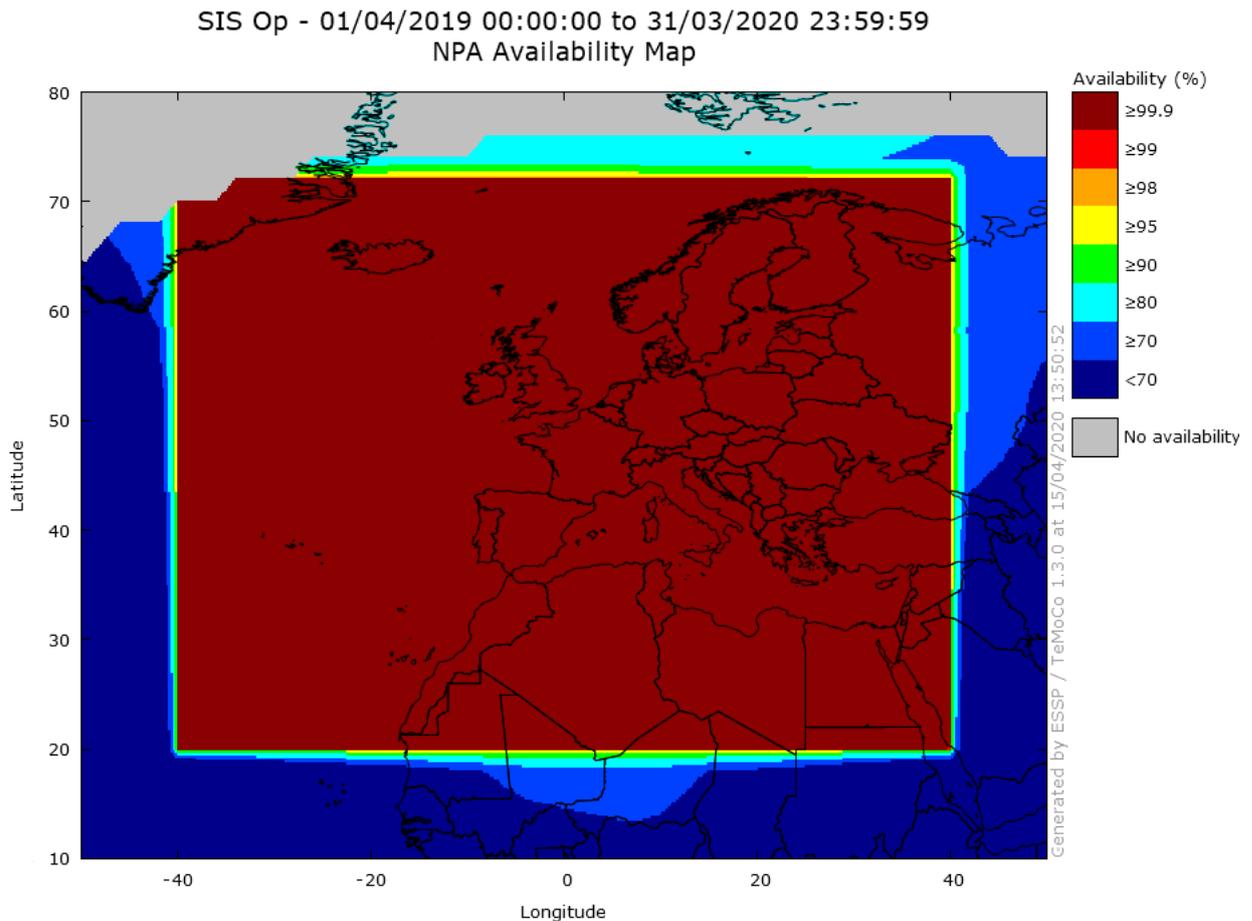


Figure 4: NPA Availability from 01/04/19 to 31/03/20

The NPA availability performance has been excellent during the reporting period: greater than 99.9% over the entire NPA Service Area<sup>5</sup> except 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)<sup>6</sup>.

<sup>5</sup> NPA Service Area is the 99% NPA availability area depicted in Figure 2 coming from the [EGNOS Safety of Life SDD](#). It corresponds to the MT27 area.

<sup>6</sup> Due to the EGNOS Space Segment configuration updates performed in Q1 2020 (users were duly informed via the different versions of [Service Notice #22](#) and other ad-hoc communications/news), NPA availability in the North West of the Service Area was affected by additional GEO visibility limitations during specific periods of time.

### 3.2.2 NPA availability - Achievement against target

The combination of the 99% NPA Availability map and the NPA Service Area<sup>7</sup> is shown in the following figure. It should be noted that, thanks to the excellent NPA service performance within the GEO satellites footprint (the North West corner was not covered by the GEO footprint for a period time during the reporting period), the same result would have been obtained taking the 99.9% availability target as reference.

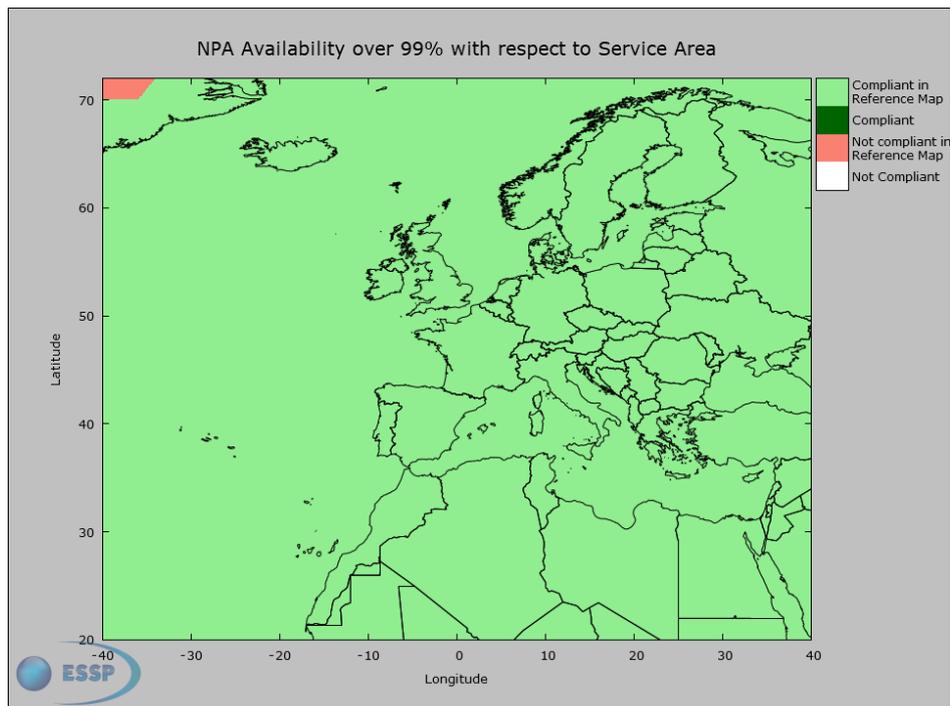


Figure 5: NPA Availability map with respect to the Service Area – 01/04/19 - 31/03/20

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

- **Compliant in Reference Map:** This is the part of the Service Area<sup>7</sup> where the NPA availability was above 99%.
- **Compliant:** This is the zone out of the Service Area<sup>7</sup> where the NPA availability was also above 99% (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map:** This is the part of the Service Area<sup>7</sup> where the NPA availability was lower than 99%.
- **Not compliant (white):** This is any other zone out of the Service Area<sup>7</sup> where the NPA availability is lower than 99%.

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

Considering the applicable [Service Definition Document](#) map used as reference, the percentage of points that were compliant with the commitment is **99.73%**. Note that the comparison with respect to the SDD SoL commitment map is included for information purposes. The commitment map is a

<sup>7</sup> NPA Service Area is the 99% NPA availability area depicted in Figure 2 coming from the [EGNOS Safety of Life SDD](#). It corresponds to the MT27 area.

monthly reference, while the reported period is one year. Therefore, this comparison must be interpreted with care.

### 3.2.3 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 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 HSI at each RIMS inside of the NPA Service Area (Figure 2).

Station	HSI	Station	HSI
Abu Simbel	0.20	Kirkenes	0.20
Azores	0.21	Lappeenranta	0.19
Agadir	0.32	La Palma	0.31
Aalborg	0.21	Lisbon	0.33
Alexandria	0.22	Madeira	0.30
Athens	0.21	Malaga	0.29
Berlin	0.21	Palma de Mallorca	0.25
Canary Islands	0.31	Reykjavik	0.23
Cork	0.26	Roma	0.19
Catania	0.17	S. de Compostela	0.30
Djerba	0.23	Sofia	0.39
Egilsstadir	0.19	Swanwick	0.27
Glasgow	0.23	Toulouse	0.25
Golbasi	0.18	Trondheim	0.20
Gävle	0.19	Tromsoe	0.23
Haifa	0.23	Warsaw	0.21
Jan Mayen	0.24	Zürich	0.23

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

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

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

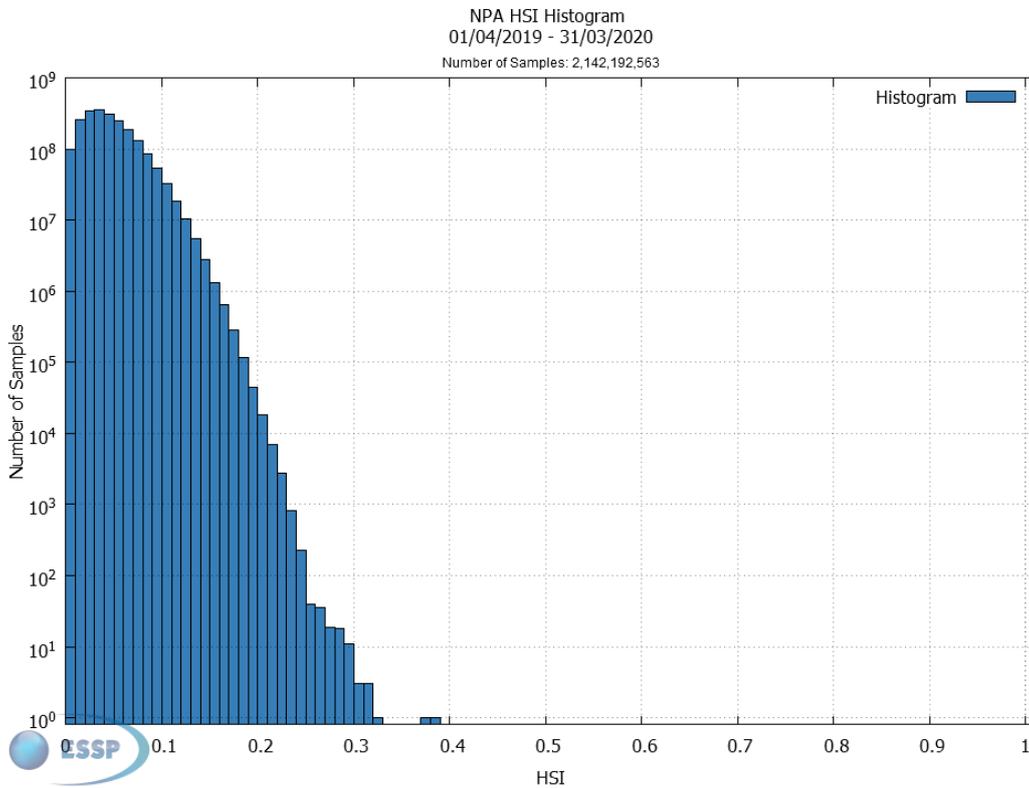


Figure 6: NPA Horizontal Safety Index<sup>8</sup>

<sup>8</sup> Note that for the computation of the different histograms presented in this document, some periods may have been removed, corresponding to stations presenting bad quality of data linked to local environment. Data removed from histograms correspond to data from RIMS in which any OR affecting data quality has been observed, or where presence of cycle slips affecting performance have been detected, or other data quality issues have been traced as cause of daily degradations.

### 3.2.4 NPA Continuity

**EGNOS NPA Continuity** is computed by dividing the total number of single continuity events, using a time-sliding window of 1 hour, by the number of samples with 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 1 hour, the system becomes unavailable.

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

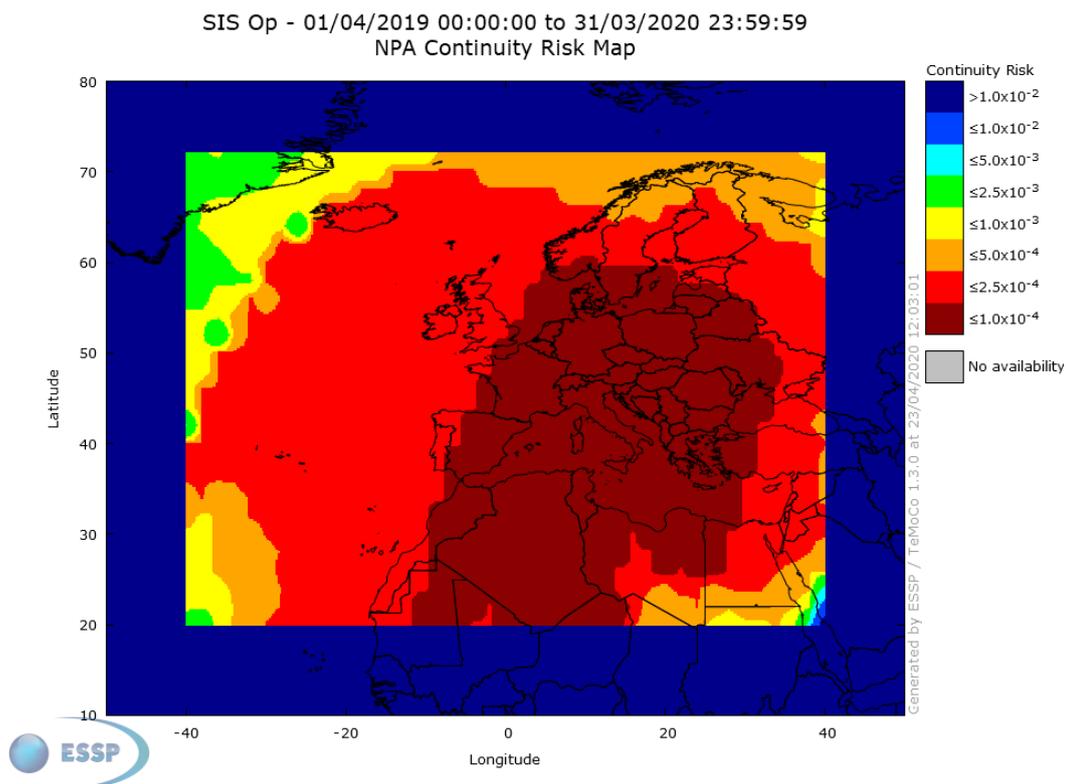


Figure 7: NPA Continuity Risk from 01/04/19 to 31/03/20

As shown in the previous figure, most of the MT27 Service Area presents a continuity risk lower than  $2.5 \cdot 10^{-4}$ , with the exception of the corners where the performance achieved is slightly worse, mainly due to the lower number of GPS satellites monitored from these regions.

### 3.4 SoL Service - Approach with Vertical guidance (APV-I)<sup>9</sup>

The following figures depict the minimum performance that can be expected from EGNOS for Approach with Vertical guidance (APV-I) availability and continuity, as defined in the [EGNOS SoL Service Definition Document](#). The current version of the SoL SDD was published on 26/03/2019 and remained applicable for the whole reported period.

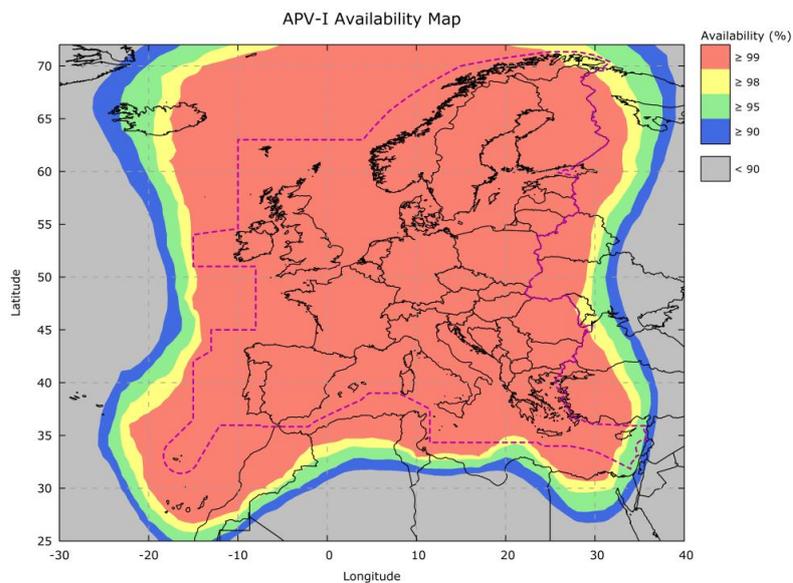


Figure 8: APV-I Availability map- Expected minimum performance (SoL SDD v3.3)

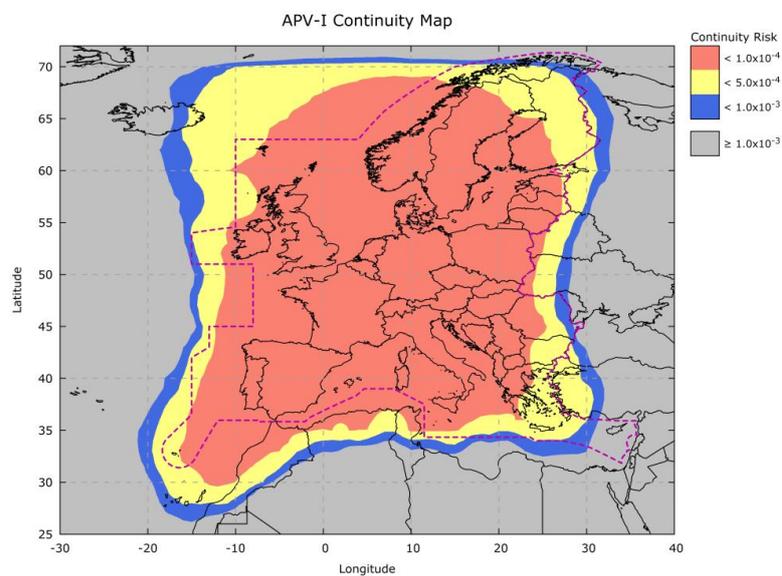


Figure 9: APV-I Continuity map - Expected minimum performance (SoL SDD v3.3)

<sup>9</sup> Note that EGNOS performance presented in this section is computed using SBAS corrections from corrections from the operational EGNOS GEO satellites according to [Service Notice#22](#)

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

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

### 3.4.1 APV-I availability

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

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

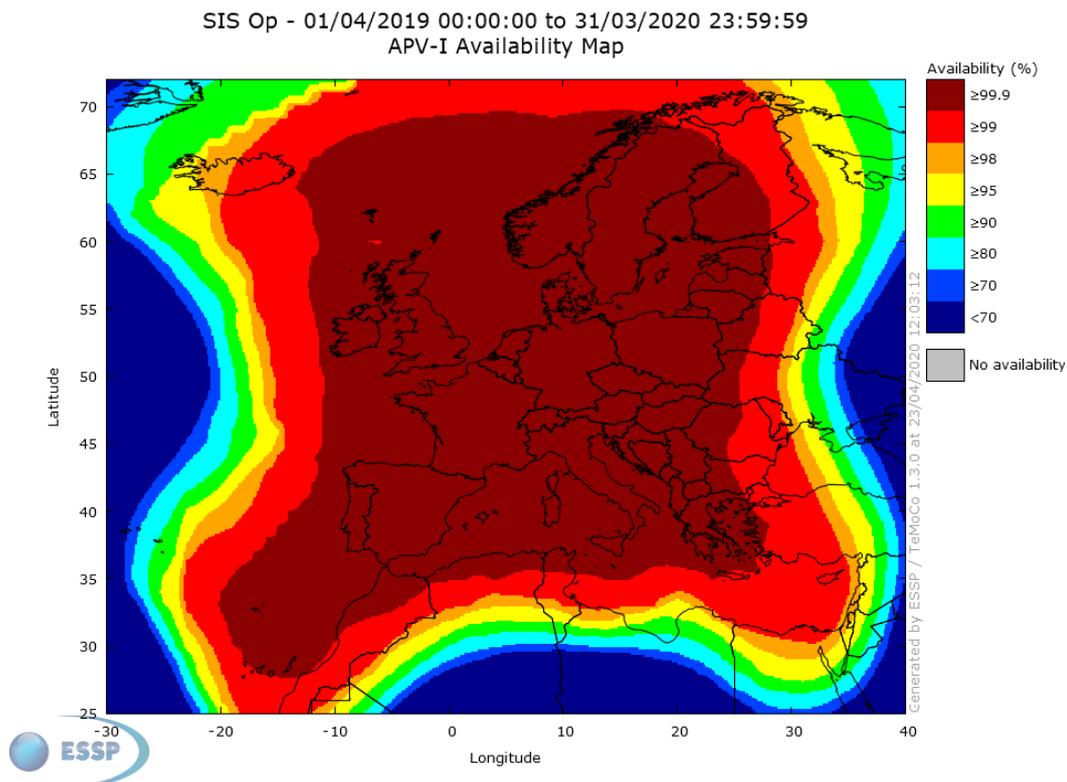


Figure 10: APV-I Availability from 01/04/19 to 31/03/20

The APV-I availability performance has been excellent during the reporting period: the coverage of 99% APV-I Service Area<sup>10</sup> is complete, with the exception of the North East area and some small regions in the East and North West.

<sup>10</sup> 99% APV-I Service Area is the 99% APV-I availability area depicted in Figure 8 obtained from the [EGNOS Safety of Life SDD](#).

The following figure shows the annual APV-I availability compliance with respect to the target at airports with published the EGNOS-based operations:

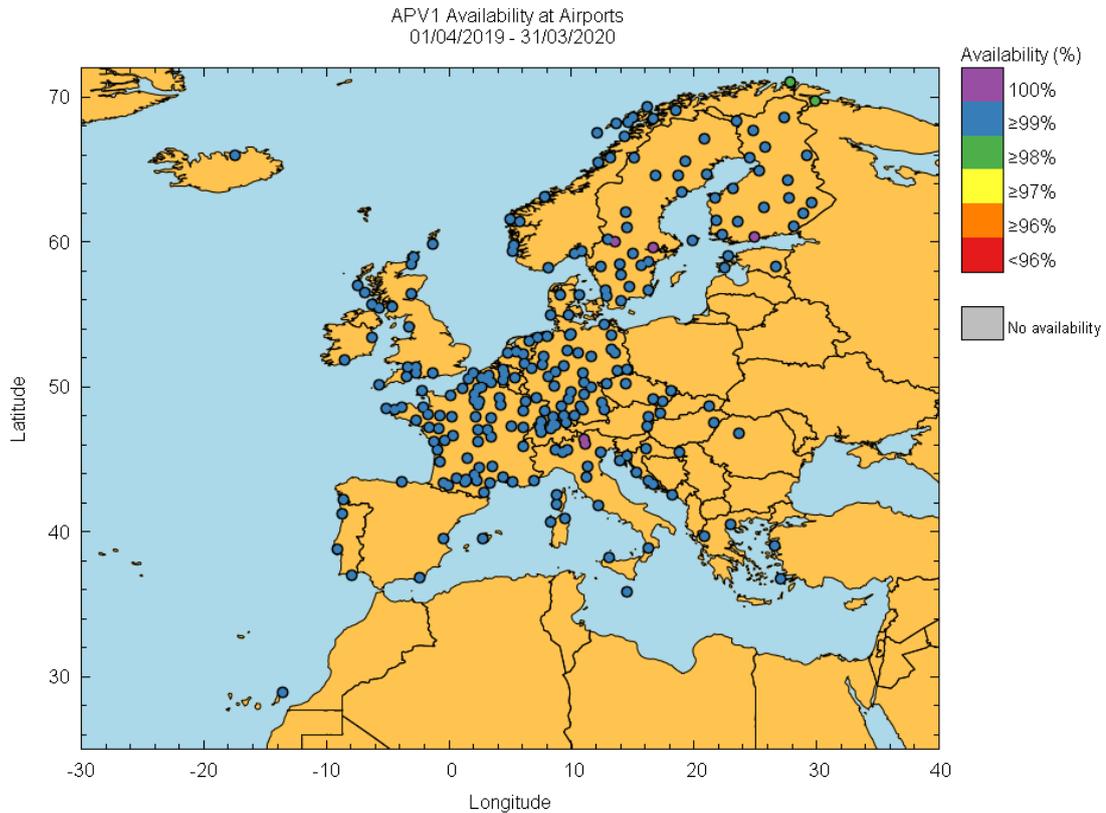


Figure 11: Annual APV-I Availability compliance at airports with published EGNOS-based operations

Moreover, the monthly APV-I service availability was greater than 99% during the entire reporting period at all airports with the EGNOS-based operations, apart from:

- Kirkenes (ENKR) Airport (Norway) in April, May, June, July, August, September, October, and November 2019, and January, February, and March 2020.
- Mehamn (ENMH) Airport (Norway) in May, July, August, September, and October 2019, and March 2020.
- Kuusamo (EFKS) Airport (Finland) in July 2019.
- Husavik (BIHU) Airport (Iceland) in September and October 2019.
- Ivalo (EFIV) Airport (Finland) in March 2020.

For additional information, please refer to the corresponding [Monthly Performance Reports](#).

### 3.4.2 APV-I availability - Achievement against target<sup>11</sup>

The combination of the 99% APV-I Availability map and the 99% APV-I Service Area<sup>12</sup> gives the following:

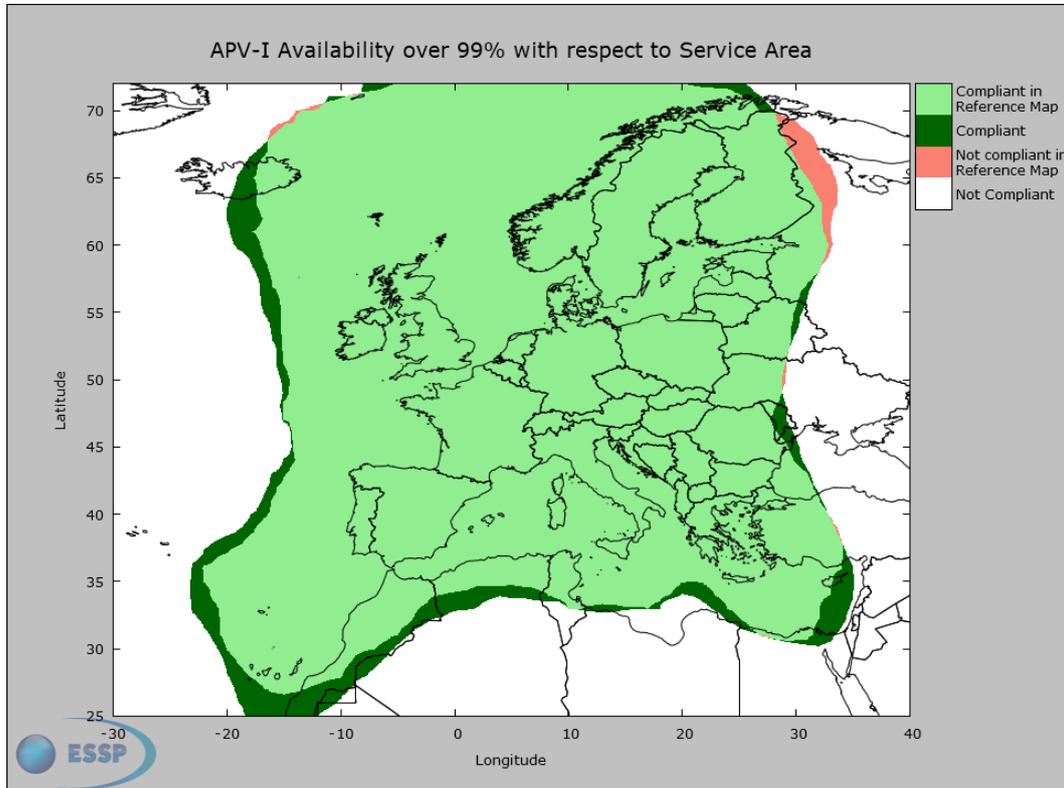


Figure 12: APV-I 99% Availability map with respect to the 99% APV-I Service Area<sup>12</sup> - 01/04/19 to 31/03/20

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

- **Compliant in Reference Map:** This is the part of the Service Area<sup>12</sup> where APV-I availability was above 99%.
- **Compliant:** This is the zone out of the Service Area<sup>12</sup> where APV-I availability was also above 99% (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map:** This is the part of the Service Area<sup>12</sup> where APV-I availability was lower than 99%.
- **Not compliant (white):** This is any other zone out of the Service Area<sup>12</sup> where APV-I availability is lower than 99%.

The percentage of points that were compliant with the 99% APV-I Service Area<sup>12</sup> is **98.76%**. Just an area in the North East and some small regions in the East and North West presented underperformance. Focusing on the North East of the Service Area, the reduced coverage in this region was mainly due to occasional data quality issues affecting some of the stations in the region<sup>13</sup>

<sup>11</sup> Service Area used as reference corresponds to the one presented in the EGNOS Safety of Life SDD v3.3.

<sup>12</sup> 99% APV-I Service Area is the 99% APV-I availability area depicted in Figure 8 obtained from the [EGNOS Safety of Life SDD](#)

<sup>13</sup> These events may occur from time to time, mostly due to environmental/local conditions. The degradation typically lasts two or three days over a month, although in some specific cases it happened for longer periods.

and some losses of the monitoring of the GPS satellites (lack of visibility from the EGNOS stations network and/or changes in the GPS constellation).

Note that the comparison with respect to the SDD SoL commitment map is included for information purposes. The commitment map is a monthly reference, while the reported period is one year and, therefore, this comparison must be interpreted with care.

### 3.4.3 APV-I Integrity events

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

No integrity events were detected.

*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 VSI at each RIMS inside the APV-I Service Area (see Figure 8 and Figure 9). Moreover, Stanford plots are available on the [EGNOS User Support Website](#).

Station	HSI	VSI	Station	HSI	VSI
Agadir	0.33	0.22	Lappeenranta	0.20	0.24
Aalborg	0.21	0.25	La Palma	0.32	0.20
Alexandria	0.23	0.23	Lisbon	0.34	0.25
Athens	0.21	0.25	Madeira	0.31	0.21
Berlin	0.21	0.26	Malaga	0.30	0.24
Canary Island	0.32	0.21	Palma de Mallorca	0.26	0.21
Cork	0.27	0.22	Reykjavik	0.24	0.41
Catania	0.18	0.25	Roma	0.20	0.21
Djerba	0.24	0.21	S. de Compostela	0.31	0.25
Egilsstadir	0.19	0.24	Sofia	0.40	0.43
Glasgow	0.24	0.25	Swanwick	0.28	0.31
Golbasi	0.19	0.22	Toulouse	0.25	0.21
Gävle	0.20	0.24	Trondheim	0.20	0.24
Haifa	0.24	0.26	Tromsoe	0.24	0.36
Jan Mayen	0.25	0.35	Warsaw	0.21	0.27
Kirkenes	0.21	0.22	Zürich	0.24	0.24

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

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

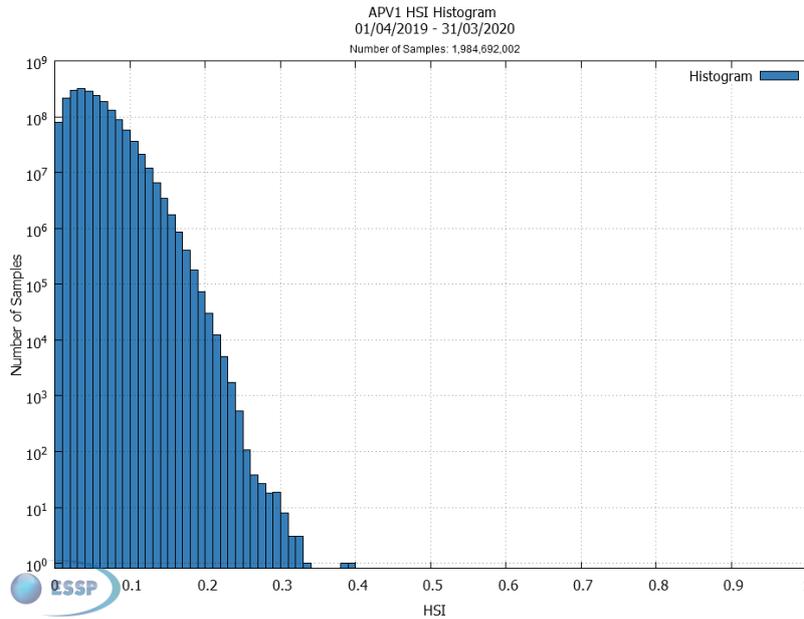


Figure 13: EGNOS APV-I Horizontal Safety Index<sup>14</sup>

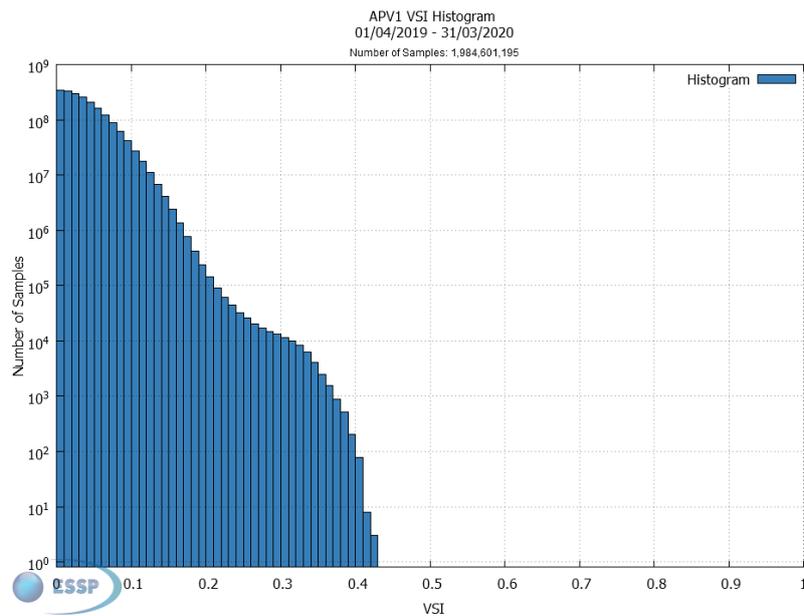


Figure 14: EGNOS APV-I Vertical Safety Index<sup>14</sup>

Previous figures show that the horizontal and vertical safety index for APV-I remained below 0.40 and 0.43 respectively for all stations, which represents a particularly good safety margin.

<sup>14</sup> Note that for the computation of the different histograms presented in this document, some periods may have been removed, corresponding to stations presenting bad quality of data linked to local environment. Data removed from histograms correspond to data from RIMS in which any OR affecting data quality has been observed, or where the presence of cycle slips affecting performance is detected, or other data quality issues have been traced as cause of daily degradations.

### 3.4.5 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 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 reported period:

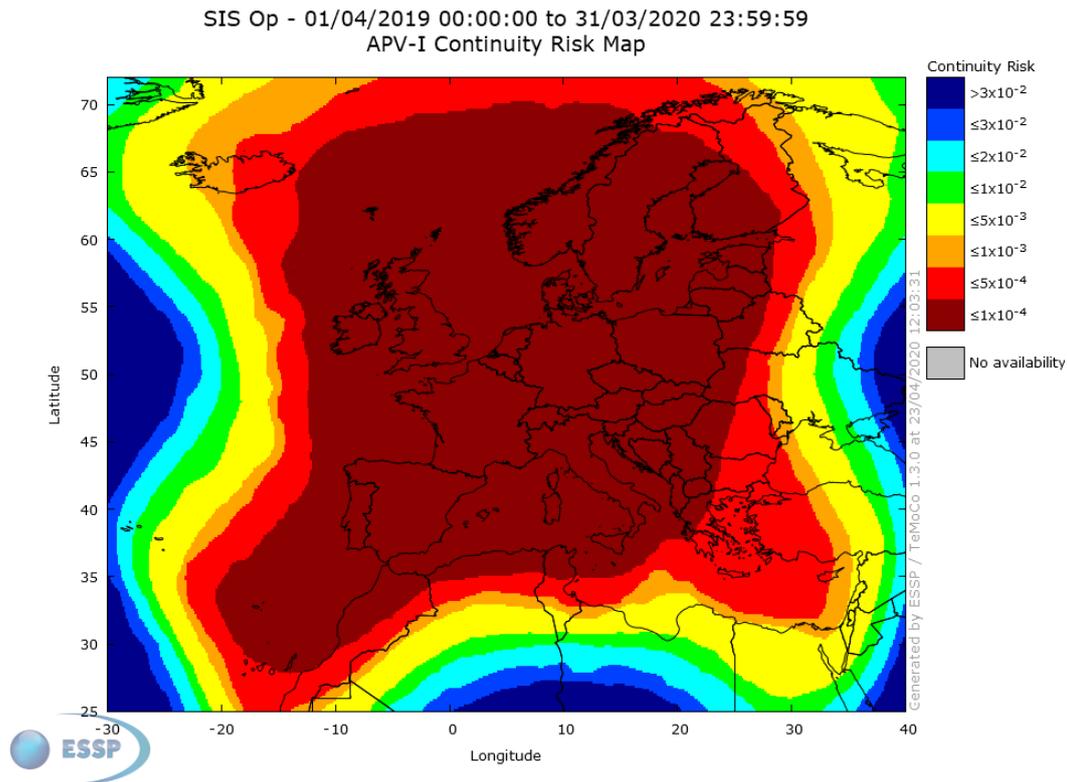


Figure 15: APV-I Continuity Risk from 01/04/19 to 31/03/20

The APV-I continuity performance has been excellent during the reporting period: lower than  $5 \cdot 10^{-4}$  over almost the entire  $5 \cdot 10^{-4}$  APV-I Service Area<sup>15</sup> with only some deviations observed in the North East and some small areas in the West and South.

<sup>15</sup>  $5 \cdot 10^{-4}$  APV-I Service Area is the  $5 \cdot 10^{-4}$  APV-I continuity risk area depicted in Figure 9 obtained from the [EGNOS Safety of Life SDD](#).

### 3.4.6 APV-I Continuity - Achievement against target<sup>16</sup>

The combination of the  $5 \cdot 10^{-4}$  APV-I Continuity Risk map and the  $5 \cdot 10^{-4}$  APV-I Service Area<sup>17</sup> gives the following:

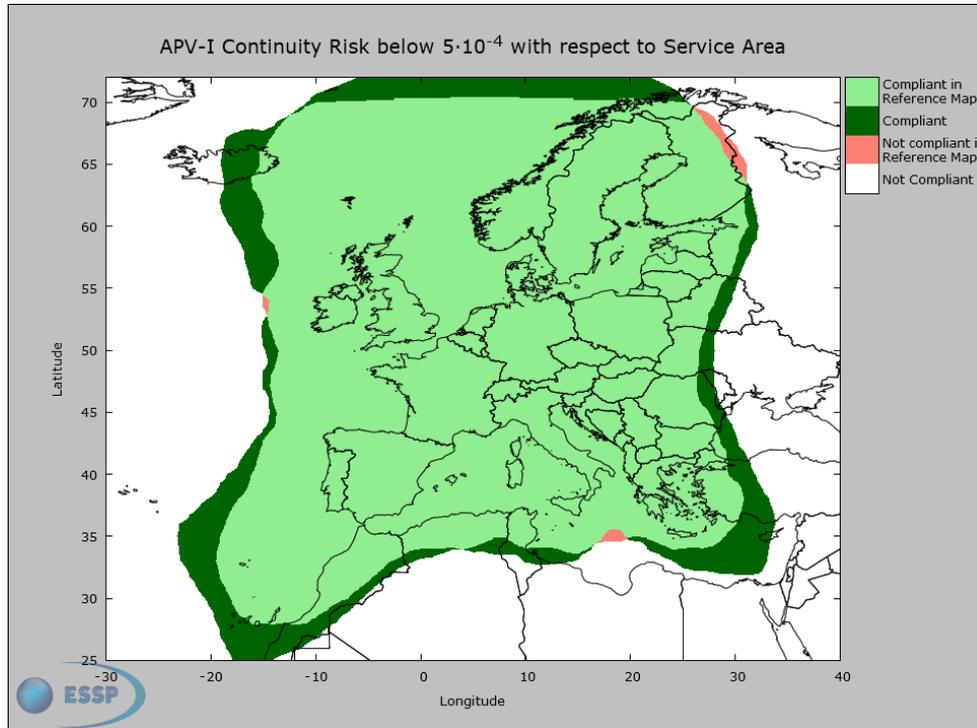


Figure 16: APV-I Continuity Risk ( $5 \cdot 10^{-4}$ ) map with respect to the  $5 \cdot 10^{-4}$  APV-I Service Area<sup>17</sup> - 01/04/19 to 31/03/20

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

- **Compliant in Reference Map:** This is the part of the Service Area<sup>17</sup> where APV-I continuity was above  $5 \cdot 10^{-4}$ .
- **Compliant:** This is the zone out of the Service Area<sup>17</sup> where APV-I continuity was also above  $5 \cdot 10^{-4}$  (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map:** This is the part of the Service Area<sup>17</sup> where APV-I continuity was lower than  $5 \cdot 10^{-4}$ .
- **Not compliant (white):** This is any other zone out of the Service Area<sup>17</sup> where APV-I continuity is lower than  $5 \cdot 10^{-4}$ .

Considering the SDD v3.3 map used as reference, the percentage of points that were compliant with the  $5 \cdot 10^{-4}$  APV-I Service Area ( $5 \cdot 10^{-4}/15\text{sec}$ ) is **99.34%**. Note that the comparison with respect to the SDD SoL commitment map is included for information. The commitment map is a monthly reference while the reported period is one year and, therefore, this comparison must be interpreted with care.

<sup>16</sup> Service Area used as reference corresponds to the one presented in the EGNOS Safety of Life SDD 3.2.

<sup>17</sup>  $5 \cdot 10^{-4}$  APV-I Service Area is the  $5 \cdot 10^{-4}$  APV-I continuity risk area depicted in Figure 9 obtained from the [EGNOS Safety of Life SDD](#).

### 3.5 SoL Service - EGNOS Localizer Performance with Vertical guidance to a decision altitude of 200 FT (LPV-200)<sup>18</sup>

The following figures depict the minimum performance that can be expected from EGNOS for LPV-200 availability and continuity, as defined in the [EGNOS SoL Service Definition Document](#). The current version of the SoL SDD was published on 26/03/2019 and remained applicable for the whole reported period.

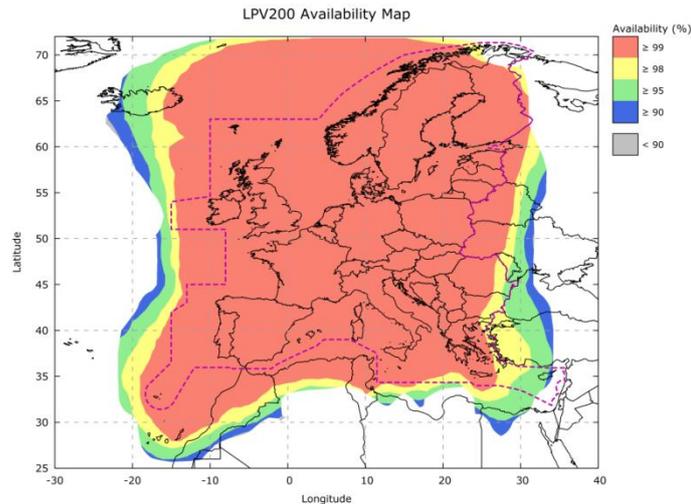


Figure 17: LPV200 Availability map- Expected minimum performance (SoL SDD v3.3)

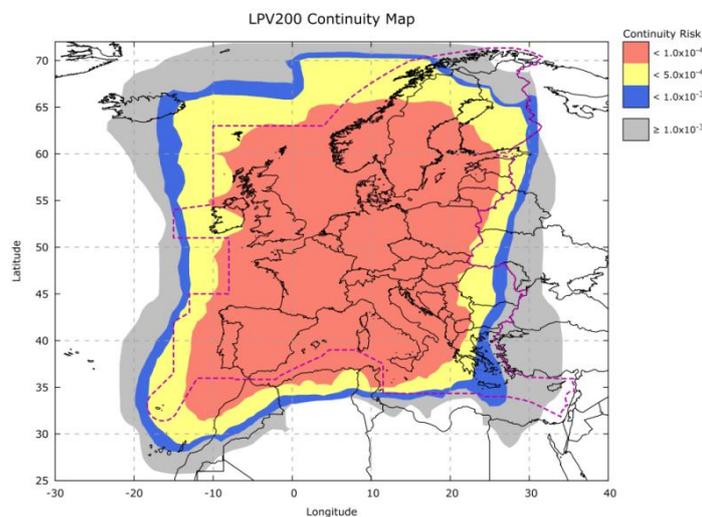


Figure 18: LPV200 Continuity map - Expected minimum performance (SoL SDD v3.3)

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

<sup>18</sup> Note that EGNOS performance presented in this section is computed using SBAS corrections from corrections from the operational EGNOS GEO satellites according to [Service Notice#22](#).

LPV-200 performance achieved during the reporting period is reported below. Additionally, LPV-200 performance is reported through the EGNOS Monthly Performance reports, available on the [EGNOS User Support website](#).

### 3.5.1 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 provides the LPV-200 availability for the combination of the operational GEOs during the period between April 2019 and March 2020:

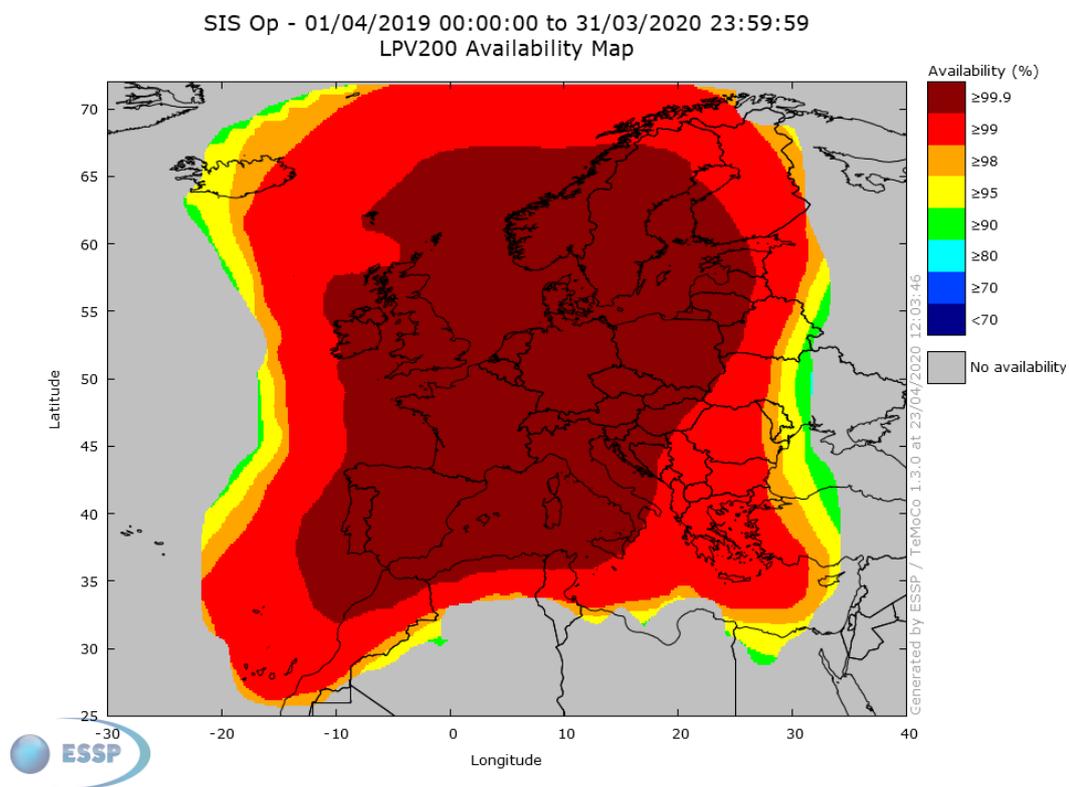


Figure 19: LPV-200 Availability from 01/04/19 to 31/03/20

LPV-200 availability performance over the Service Area has been excellent during the reporting period: greater than 99% over the entire LPV-200 99% Service Area<sup>19</sup> except for two regions in the North West and North East.

<sup>19</sup> 99% LPV-200 Service Area is the 99% LPV-200 availability area depicted in Figure 17 obtained from the [EGNOS Safety of Life SDD](#).

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

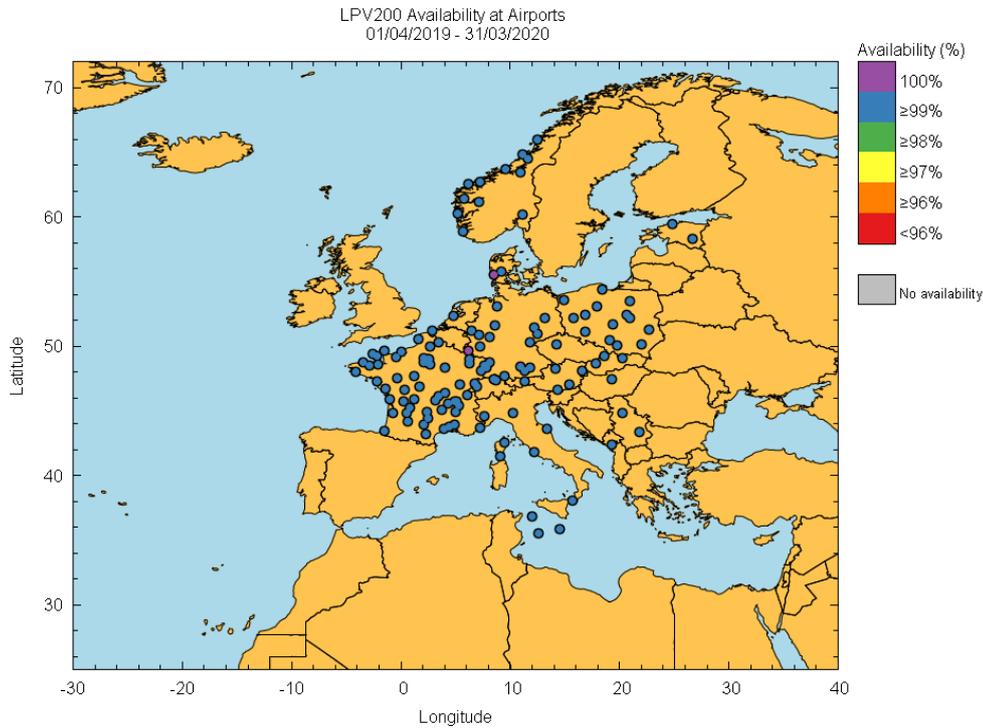


Figure 20: Annual LPV-200 Availability compliance at airports with published EGNOS-based operations

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



*DAT LT will use EGNOS onboard its fleet of x18 ATR turboprops ([EGNOS Bulletin Q2 2019](#))*

*Credits: Danish Air Transport*

### 3.5.2 LPV-200 availability - Achievement against target<sup>20</sup>

The combination of the 99% LPV-200 Availability map and the 99% LPV-200 Service Area<sup>21</sup> gives the following:

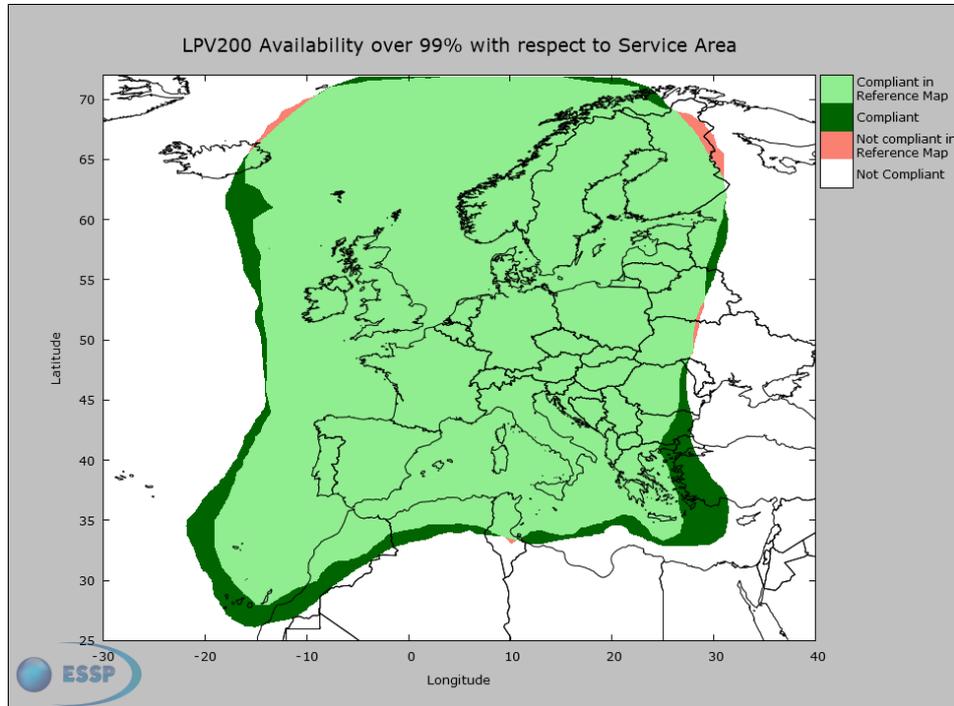


Figure 21: LPV-200 Availability map with respect to the Service Area<sup>21</sup> - 01/04/19 to 31/03/20

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

- **Compliant in Reference Map:** This is the part of the Service Area<sup>21</sup> where LPV-200 availability was above 99%.
- **Compliant:** This is the zone out of the Service Area<sup>21</sup> where LPV-200 availability was also above 99% (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map:** This is the part of the Service Area<sup>21</sup> where LPV-200 availability was lower than 99%.
- **Not compliant (white):** This is any other zone out of the Service Area<sup>21</sup> where LPV-200 availability is lower than 99%.

Considering the applicable [Service Definition Document \(SDD\)](#) map as reference, the percentage of points which were compliant with the 99% LPV-200 Service Area<sup>21</sup> is **99.16%**. Only two regions in the North West and North East deviated from the SDD commitment for similar reasons to the ones explained in section 3.4.2.

Note that the comparison with respect to the SDD SoL commitment map is included for information. The commitment map is a monthly reference while the reported period is one year and, therefore, this comparison must be interpreted with care.

<sup>20</sup> Service Area used as reference corresponds to the one presented in the EGNOS Safety of Life SDD 3.3.

<sup>21</sup> 99% LPV-200 Service Area is the 99% LPV-200 availability area depicted in Figure 17 obtained from the [EGNOS Safety of Life SDD](#)

### 3.5.3 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 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 17 and Figure 18). Moreover, Stanford plots are available on the operations website ([http://egnos-user-support.essp-sas.eu/egnos\\_ops/index.php](http://egnos-user-support.essp-sas.eu/egnos_ops/index.php)).

Station	HSI	VSI	Station	HSI	VSI
Agadir	0.33	0.22	La Palma	0.32	0.20
Aalborg	0.21	0.25	Lisbon	0.34	0.25
Alexandria	0.23	0.23	Madeira	0.31	0.21
Athens	0.21	0.25	Malaga	0.30	0.24
Berlin	0.21	0.26	Palma de Mallorca	0.26	0.21
Canary Island	0.32	0.21	Reykjavik	0.24	0.41
Cork	0.27	0.22	Roma	0.20	0.21
Catania	0.18	0.25	S. de Compostela	0.31	0.25
Djerba	0.24	0.21	Sofia	0.40	0.43
Egilsstadir	0.19	0.24	Swanwick	0.28	0.31
Glasgow	0.24	0.25	Toulouse	0.25	0.21
Golbasi	0.18	0.22	Trondheim	0.20	0.24
Gävle	0.20	0.24	Tromsoe	0.24	0.36
Jan Mayen	0.25	0.35	Warsaw	0.21	0.27
Lappeenranta	0.20	0.24	Zürich	0.24	0.24

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

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

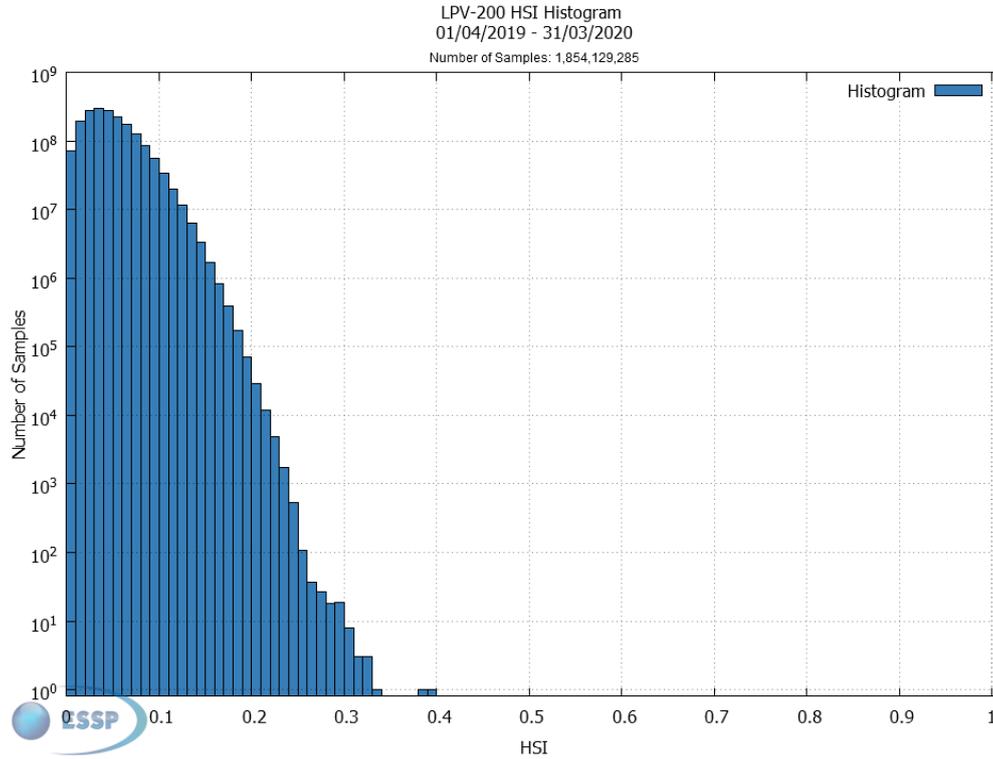


Figure 22: EGNOS LPV-200 Horizontal Safety Index

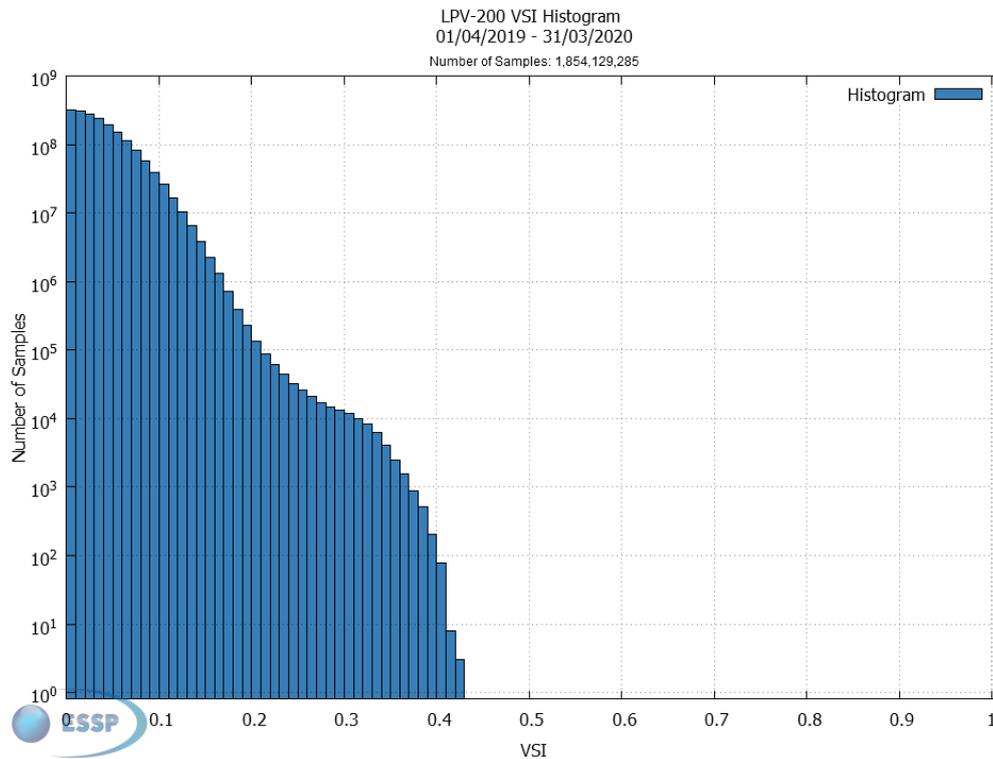


Figure 23: EGNOS LPV-200 Vertical Safety Index

The above figures show that the horizontal and vertical safety index for LPV-200 remained below 0.40 and 0.43, respectively, for all stations, which represents a particularly good safety margin.

### 3.5.4 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 provides the GEO combined LPV-200 continuity risk for the reported period:

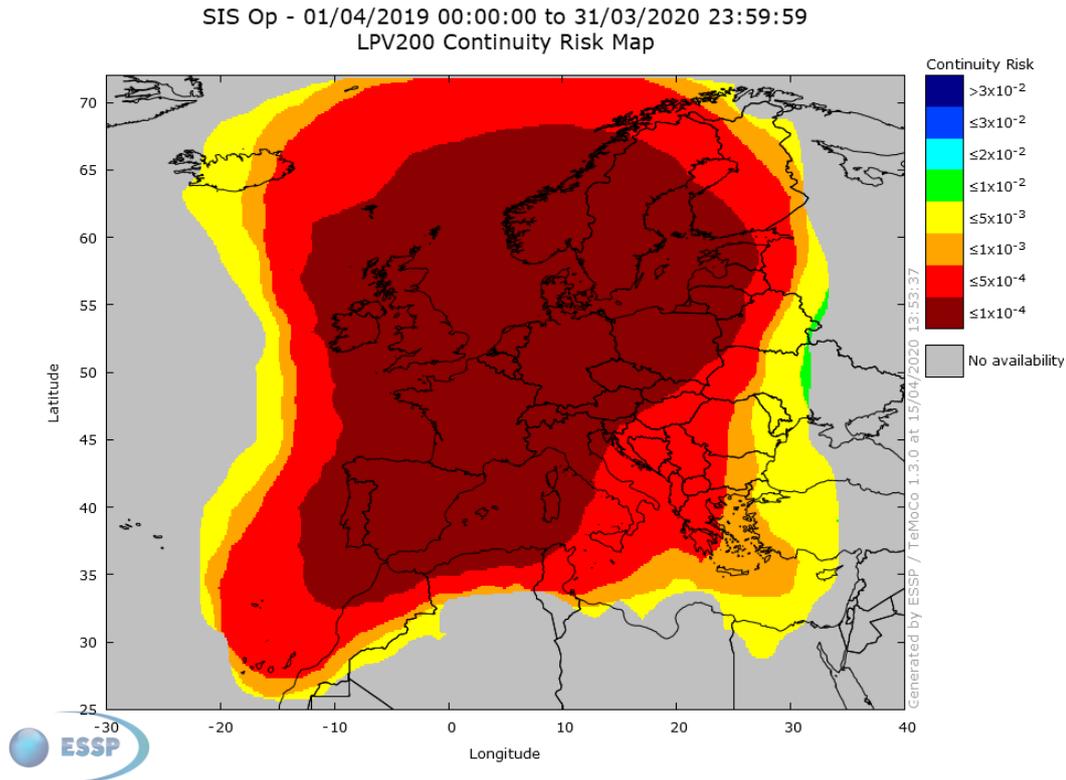


Figure 24: LPV-200 Continuity Risk from 01/04/19 to 31/03/20<sup>22</sup>

The LPV200 continuity performance has been excellent during the reporting period: the entire LPV200  $5 \cdot 10^{-4}$  Service Area<sup>23</sup> is covered with the exception of some small areas in the south-eastern part.

<sup>22</sup> The grey colour is used to identify regions outside the LPV-200 Service area as defined in the [EGNOS Safety of Life SDD](#).

<sup>23</sup>  $5 \cdot 10^{-4}$  LPV200 Service Area is the  $5 \cdot 10^{-4}$  LPV200 continuity risk area depicted in Figure 18 obtained from the [EGNOS Safety of Life SDD](#).

### 3.5.5 LPV-200 Continuity - Achievement against target<sup>24</sup>

The combination of the  $5 \cdot 10^{-4}$  LPV-200 Continuity Risk map and the Service Area<sup>25</sup> gives the following:

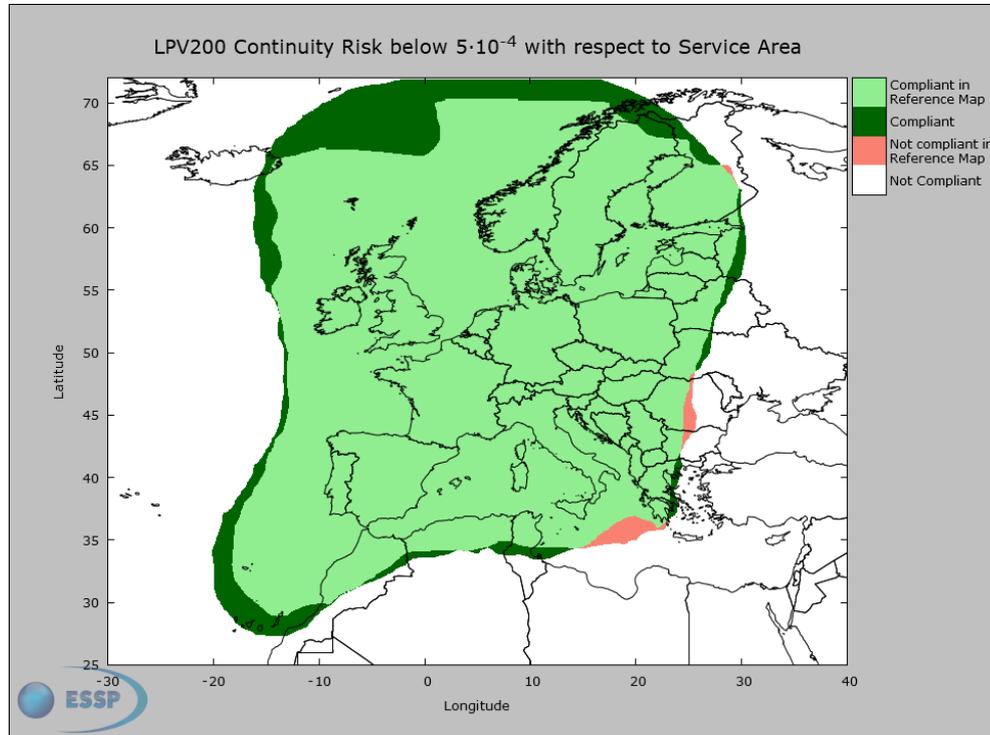


Figure 25: LPV-200 Continuity Risk ( $5 \cdot 10^{-4}$ ) map with respect to the reference map - 01/04/19 to 31/03/20

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

- **Compliant in Reference Map:** This is the part of the Service Area<sup>25</sup> where LPV-200 continuity was above  $5 \cdot 10^{-4}$ .
- **Compliant:** This is the zone out of the Service Area<sup>25</sup> where LPV-200 continuity was also above  $5 \cdot 10^{-4}$  (extension of coverage with respect to the commitment).
- **Not compliant in Reference Map:** This is the part of the Service Area<sup>25</sup> where LPV-200 continuity was lower than  $5 \cdot 10^{-4}$ .
- **Not compliant (white):** This is any other zone out of the Service Area<sup>25</sup> where LPV-200 continuity is lower than  $5 \cdot 10^{-4}$ .

Considering the SDD v3.3 map used as the reference, the percentage of points which were compliant with the  $5 \cdot 10^{-4}$  LPV-200 Service Area ( $5 \cdot 10^{-4}/15\text{sec}$ ) is **99.24%**. Note that the comparison with respect to the SDD SoL commitment map is included for information. The commitment map is a monthly reference while the reported period is one year and, therefore, this comparison must be interpreted with care.

<sup>24</sup> Service Area used as reference corresponds to the one presented in the EGNOS Safety of Life SDD 3.3.

<sup>25</sup>  $5 \cdot 10^{-4}$  LPV200 Service Area is the  $5 \cdot 10^{-4}$  LPV200 continuity risk area depicted in Figure 18 obtained from the [EGNOS Safety of Life SDD](#).

### 3.5.6 EGNOS LPV-200 vertical accuracy

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

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

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

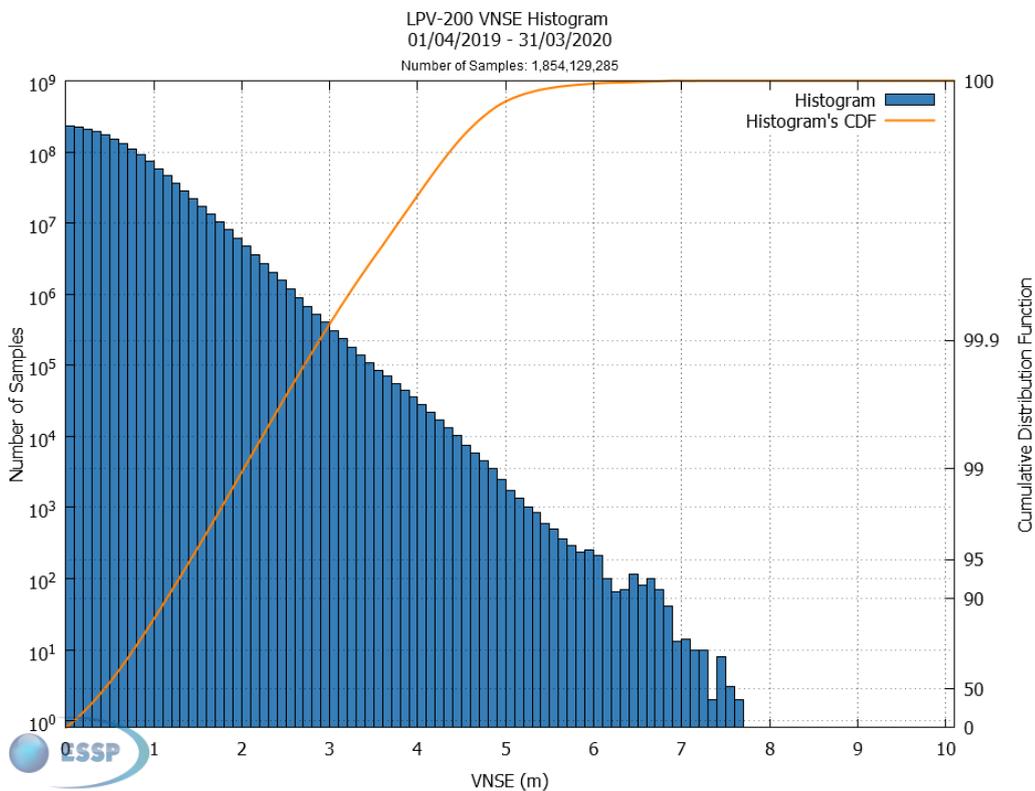


Figure 26: EGNOS LPV-200 Vertical Accuracy Histogram and Cumulative Probability

As can be 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 the period analysed. The 95<sup>th</sup> percentile is below 1.5 metres. The worst accuracy measured in any of the stations was lower than 7.7 metres.

### 3.5.7 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 characterisation of the accuracy distribution tails by means of a Gaussian extrapolation applied to the vertical navigation error<sup>26</sup>.

The following results present the values obtained from the 1<sup>st</sup> January, 2019, to the 31<sup>st</sup> December, 2019, using values obtained from both operational GEOs. For this period, all the RIMS within the [LPV-200 Service Area](#) present extrapolated accuracy values within the requirement:  $Pr(VNSE > 10\text{ m}) < 10^{-7}/150$  s.

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

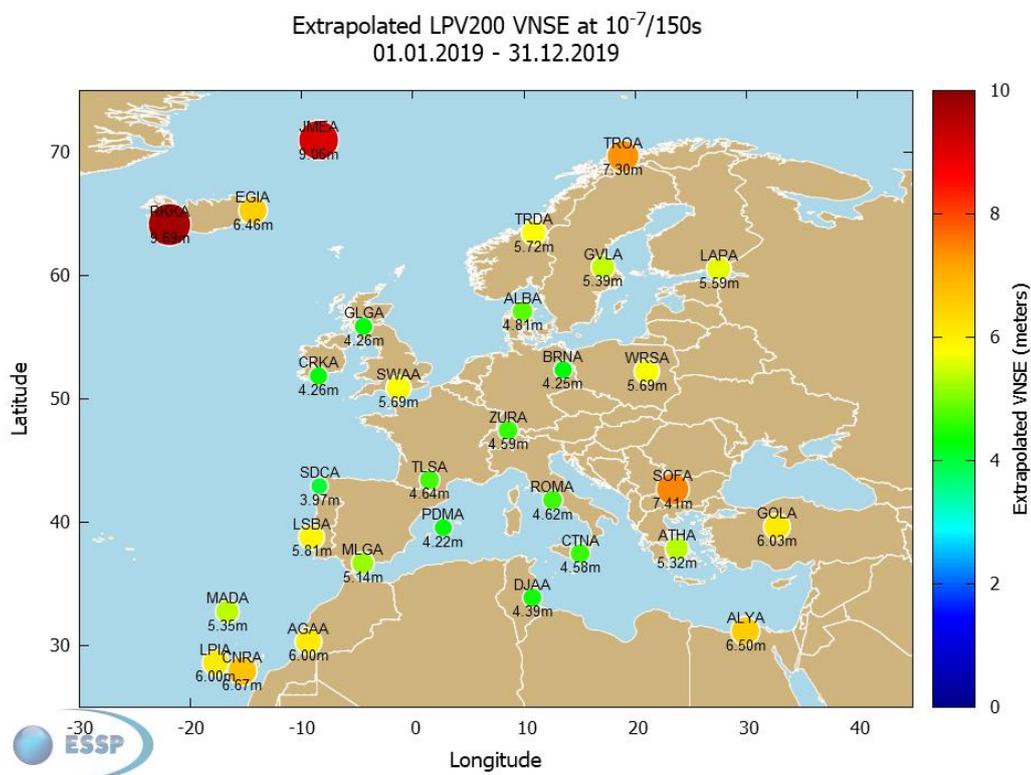


Figure 27: Extrapolated VNSE at  $10^{-7}/150$  s in the RIMS within the LPV-200 commitment

The highest value is 9.69m obtained for RIMS Reykjavik, which still complies with the requirement.

<sup>26</sup> Using the cumulative VNSE distribution, an over-bounding Gaussian distribution is computed ( $\sigma_{\text{bound}}$ ), which enables obtaining the  $VNSE_{\text{bound}}$  extrapolated to the required probability of  $10^{-7}/150$  s. 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].

### 3.6 Open Service (OS)<sup>27</sup>

The EGNOS OS has been qualified by defining the minimum compliance area where 99% of the time users are able to calculate their position, and the accuracy performance is better than 3 metres horizontally and 4 metres vertically. The minimum compliance area can be seen in the following figure:

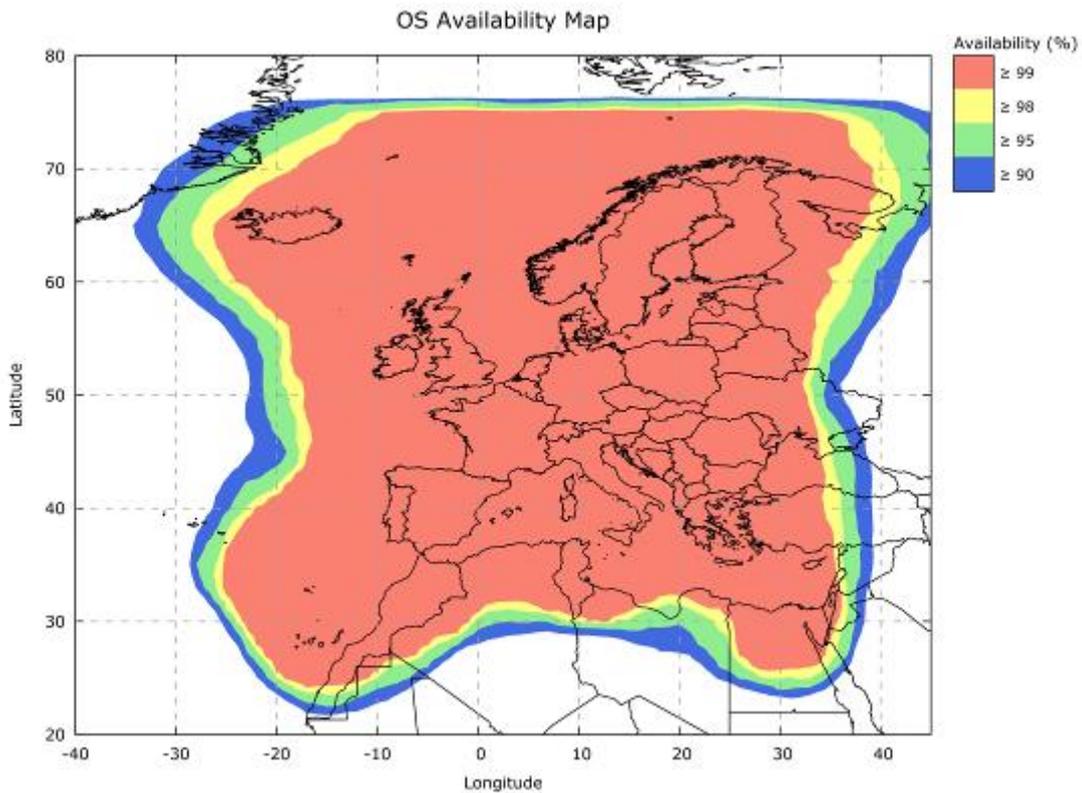


Figure 28: EGNOS OS compliance area

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

<sup>27</sup> Note that EGNOS performance presented in this section is computed using SBAS corrections from the operational combination of EGNOS GEO satellites, as per [Service Notice #22](#):

- GEOs PRN136 and PRN123 from 01.04.2019 to 15.01.2020
- GEOs PRN136 and PRN126 from 16.01.2020 to 20.02.2020
- GEOs PRN123 and PRN136 from 21.02.2020 to 26.02.2020
- GEOs PRN123 and PRN126 from 27.02.2020 to 16.03.2020
- GEOs PRN123 and PRN136 from 17.03.2020 to 31.03.2020

### 3.6.1 RIMS monitoring network

The following map shows the location of the deployed RIMS:



Figure 29: RIMS locations<sup>28</sup>

The receiver network used to report Open Service corresponds to the subset of RIMS that are inside the [EGNOS OS SDD](#) commitment map.

<sup>28</sup> Source: [EGNOS SDDs](#) (OS, SoL, EDAS)

ID	Location name	Country	ID	Location name	Country
ALB	Alborg	Denmark	LAP	Lappeenranta	Finland
AGA	Agadir	Morocco	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 performance is reported



*RIMS Station in Hartebeesthoek (South Africa)*

### 3.6.2 Horizontal and Vertical Accuracy

**EGNOS OS Horizontal (resp Vertical) Accuracy** is reported as the 95<sup>th</sup> 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 values of accuracy (95%) in metres measured for the reported period.

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

Table 7: EGNOS Open Service accuracy (95%)

The horizontal accuracy results for all the stations remained below 1.4 metres (95%), and the vertical accuracy below 2.4 metres (95%), which represents a particularly good level of accuracy.

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 range of values.

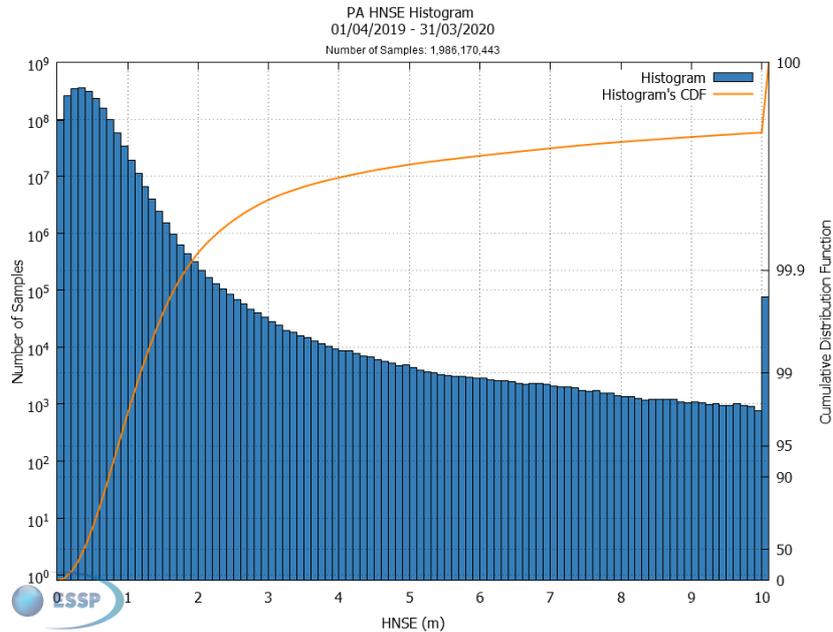


Figure 30: EGNOS Open Service HNSE Histogram and Cumulative Probability<sup>29</sup>

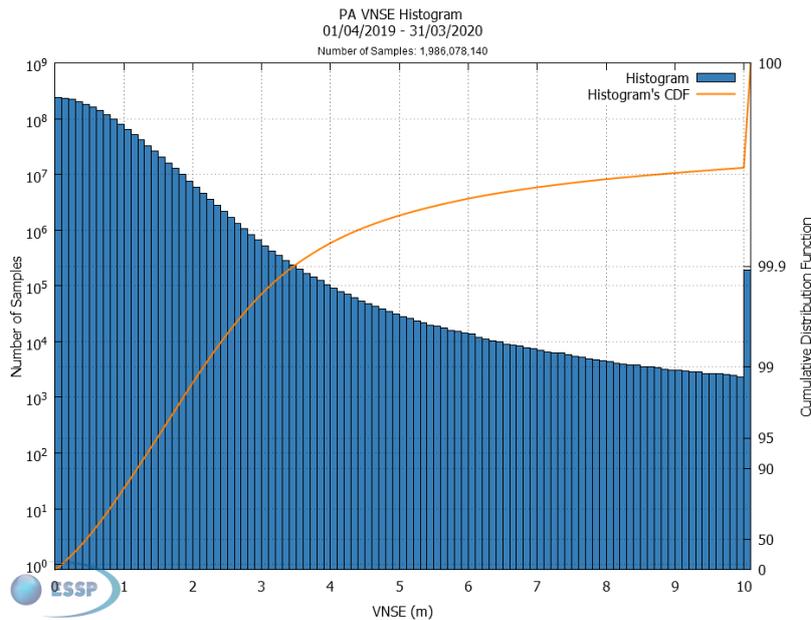


Figure 31: EGNOS Open Service VNSE Histogram and Cumulative Probability<sup>29</sup>

As shown, the cumulative results confirm the positive values observed at all stations. The 95<sup>th</sup> percentile of the observed accuracy performance is below 0.9 metres in the horizontal domain and below 1.5 metres in the vertical one.

Table 8 and Table 9 provide the monthly maximum of the daily values for Horizontal and Vertical Accuracy (95%) while using EGNOS message broadcast by GEO1 and GEO2<sup>30</sup>, respectively.

<sup>29</sup> Note that for the computation of the different histograms presented in this document, some periods may have been removed, corresponding to stations presenting bad quality of data linked to local environment. Data removed from histograms correspond to data from RIMS in which any OR affecting data quality has been observed, or the presence of cycle slips affecting performance is detected, or other data quality issues have been traced as cause of daily degradations.

GEO1		04/19	05/19	06/19	07/19	08/19	09/19	10/19	11/19	12/19	01/20	02/20	03/20	Average
AGA	HPE	1.25	1.21	0.97	1.23	1.25	1.60	1.64	1.59	1.05	1.26	1.18	1.61	1.32
	VPE	1.59	1.85	1.69	1.83	1.74	1.75	1.83	1.91	1.74	1.52	1.54	1.44	1.70
ALB	HPE	0.75	0.67	0.67	0.69	0.78	1.05	0.93	1.12	1.18	1.11	0.92	0.80	0.89
	VPE	1.63	1.82	1.98	1.66	1.57	1.69	1.69	1.59	1.56	1.71	1.68	1.61	1.68
ALY	HPE	1.32	1.30	1.25	1.69	1.35	1.22	1.23	1.17	1.16	1.55	1.50	1.40	1.35
	VPE	2.41	2.24	2.41	3.01	2.76	3.06	2.44	1.83	2.07	3.10	1.85	1.80	2.42
ATH	HPE	0.95	0.88	0.80	0.88	0.86	0.83	0.70	0.70	0.74	0.84	0.82	0.90	0.83
	VPE	1.45	1.63	1.53	1.64	1.99	2.02	1.58	1.54	1.48	1.34	1.35	1.60	1.60
BRN	HPE	0.82	0.83	0.82	0.90	0.93	0.92	0.94	1.00	1.13	1.04	0.90	0.95	0.93
	VPE	1.23	1.42	1.48	1.43	1.51	1.43	1.29	1.35	1.32	1.55	1.63	1.59	1.44
CNR	HPE	1.77	1.32	1.01	1.08	1.09	1.43	1.79	1.66	1.69	1.52	1.58	1.58	1.46
	VPE	1.55	1.62	1.69	1.83	1.91	1.95	1.87	1.68	1.78	1.71	1.73	1.89	1.77
CRK	HPE	0.85	0.87	0.92	0.89	0.97	0.90	0.97	1.11	1.15	1.31	1.12	0.94	1.00
	VPE	1.49	1.56	1.51	1.47	1.33	1.43	1.39	1.48	1.44	1.64	1.56	1.38	1.47
CTN	HPE	0.96	0.90	0.81	0.92	0.85	0.79	0.77	0.72	0.74	0.76	0.79	0.83	0.82
	VPE	1.19	1.29	1.33	1.66	1.42	1.71	1.52	1.24	1.44	1.26	1.14	1.12	1.36
DJA	HPE	0.94	0.95	1.04	1.08	1.01	0.94	1.08	0.98	0.95	0.95	0.93	0.98	0.99
	VPE	1.29	1.23	1.34	1.91	1.36	1.41	1.68	1.41	1.34	1.20	1.19	1.13	1.37
EGI	HPE	0.69	0.82	0.68	0.75	0.88	0.89	0.92	0.79	0.68	0.79	0.75	0.85	0.79
	VPE	2.27	2.39	1.87	2.05	2.19	2.27	2.12	2.12	1.99	2.22	2.06	2.09	2.14
GLG	HPE	0.92	0.82	0.87	0.84	1.02	1.06	1.12	1.19	1.21	1.19	1.10	0.96	1.03
	VPE	1.61	1.74	1.60	1.78	1.69	1.53	1.41	1.51	1.83	1.96	1.61	1.59	1.66
GOL	HPE	1.07	2.41	1.00	1.04	0.97	0.96	0.93	0.78	0.90	0.93	0.89	1.02	1.08
	VPE	2.03	2.83	1.58	1.74	1.80	2.16	1.83	1.66	1.61	1.61	1.59	1.87	1.86
GVL	HPE	0.64	0.67	0.62	0.70	0.80	0.92	1.10	0.95	1.05	0.99	0.87	0.77	0.84
	VPE	1.86	2.01	2.13	1.84	2.00	1.74	1.86	1.82	1.71	1.68	1.73	1.85	1.85
HFA	HPE	1.38	1.41	1.42	1.93	1.49	1.41	1.56	1.60	1.56	1.44	1.47	1.44	1.51
	VPE	2.51	2.69	2.65	2.81	3.38	3.15	3.02	2.66	2.28	2.55	2.23	2.70	2.72
JME	HPE	1.29	1.29	1.22	1.19	1.34	1.29	1.33	1.27	1.19	1.19	2.01	1.32	1.33
	VPE	3.01	2.80	2.72	3.08	2.53	2.83	3.22	2.45	2.45	3.00	3.12	2.67	2.82
KIR	HPE	0.89	1.44	0.97	1.24	1.35	1.32	1.99	0.96	0.78	0.93	0.97	1.02	1.16
	VPE	2.23	2.60	2.27	2.57	2.13	2.20	2.12	2.35	2.02	2.29	2.36	2.50	2.30
LAP	HPE	0.69	0.69	0.78	0.69	0.81	0.88	1.01	0.96	1.03	0.99	0.86	0.76	0.85
	VPE	1.81	2.13	2.09	1.86	2.13	1.72	1.84	1.74	1.52	1.84	1.85	1.88	1.87
LPI	HPE	1.84	1.40	1.08	0.95	1.10	1.61	1.92	1.73	1.37	1.45	1.39	1.84	1.47
	VPE	1.70	1.70	1.76	1.85	1.99	2.03	1.73	1.82	1.88	1.69	1.65	1.66	1.79
LSB	HPE	1.06	1.02	0.92	0.94	1.27	0.95	1.03	1.08	1.07	1.04	0.98	1.08	1.04
	VPE	1.71	1.56	1.45	1.52	1.57	1.99	1.67	1.54	1.66	1.73	1.64	1.50	1.63
MAD	HPE	0.84	0.95	0.78	0.93	0.84	1.44	0.88	0.92	0.76	0.85	0.85	1.11	0.93
	VPE	1.41	1.33	1.27	1.34	1.66	1.62	1.49	1.45	1.53	1.32	1.27	1.32	1.42
MLG	HPE	0.77	0.82	0.81	0.83	0.95	0.80	0.86	0.90	0.87	0.80	0.86	0.92	0.85
	VPE	1.13	1.23	1.36	1.45	1.27	1.34	1.58	1.35	1.14	1.11	1.07	1.01	1.25
PDM	HPE	0.66	0.72	0.71	0.77	0.72	0.67	0.65	0.69	0.69	0.68	0.74	0.73	0.70
	VPE	0.99	1.11	1.11	1.24	1.16	1.23	1.15	1.06	1.14	0.99	1.18	1.08	1.12
RKK	HPE	1.00	1.10	0.89	1.00	1.03	1.16	1.08	1.13	0.96	0.95	0.93	1.10	1.03
	VPE	2.43	2.76	2.16	2.38	2.19	2.38	2.08	2.34	2.30	2.12	1.84	2.30	2.27
ROM	HPE	0.79	0.82	0.73	0.85	0.80	0.80	0.73	0.76	0.75	0.82	0.75	0.81	0.78
	VPE	1.08	1.08	1.14	1.20	1.30	1.24	1.29	1.08	1.25	1.17	1.27	1.51	1.22
SDC	HPE	0.89	0.84	0.87	0.83	1.13	0.80	1.32	1.02	0.96	0.98	1.00	0.99	0.97
	VPE	1.13	1.17	1.08	1.10	1.18	1.14	2.14	1.05	1.21	1.20	1.31	1.22	1.24
SOF	HPE	1.73	1.91	1.53	1.19	1.30	1.19	1.29	1.21	1.32	1.36	1.28	1.32	1.39
	VPE	3.10	2.81	2.77	2.26	2.06	2.17	1.95	1.85	2.14	2.02	2.07	2.10	2.28
SWA	HPE	1.06	1.06	1.09	1.16	1.22	1.12	1.21	1.27	1.19	1.30	1.18	1.13	1.17
	VPE	1.76	1.91	1.87	1.75	1.88	1.86	1.83	1.55	1.74	1.80	1.81	1.74	1.79
TLS	HPE	0.77	0.85	0.78	0.82	0.88	0.77	0.81	0.84	0.84	0.86	0.87	0.93	0.84
	VPE	1.26	1.29	1.41	1.44	1.37	1.17	1.22	1.06	1.17	1.27	1.62	1.44	1.31
TOR	HPE	0.66	0.77	0.73	0.74	0.75	0.64	0.64	0.68	0.65	0.65	0.74	0.73	0.70
	VPE	1.27	1.40	1.39	1.43	1.45	1.45	1.48	1.37	1.41	1.38	1.13	1.17	1.36
TRD	HPE	0.75	0.65	0.63	0.74	0.82	0.92	0.88	0.79	0.91	0.90	0.80	0.75	0.80
	VPE	1.87	1.92	2.02	1.79	1.90	1.57	1.72	1.87	1.86	1.90	1.95	1.81	1.85
TRO	HPE	1.06	0.99	0.95	1.00	1.06	1.23	0.98	1.09	1.11	1.17	1.11	1.31	1.09
	VPE	2.55	2.66	2.51	2.74	2.72	2.48	2.74	2.73	2.84	3.25	2.45	3.32	2.75
WRS	HPE	0.95	0.96	0.85	0.96	1.03	1.16	1.00	0.98	1.07	1.01	0.92	1.01	0.99
	VPE	1.77	1.95	1.80	1.88	1.65	1.89	1.46	1.51	1.28	1.48	1.76	1.80	1.69
ZUR	HPE	0.85	0.90	0.89	0.96	0.98	0.93	0.98	0.92	0.91	0.93	0.94	0.91	0.93
	VPE	1.35	1.38	1.49	1.37	1.60	1.50	1.60	1.35	1.37	1.41	1.72	1.54	1.47

Table 8: Monthly Horizontal/Vertical Accuracy at RIMS-A sites for GEO1 (in metres)

<sup>30</sup> GEO1 and GEO2 as described in [Service Notice#22](#).

GEO2		04/19	05/19	06/19	07/19	08/19	09/19	10/19	11/19	12/19	01/20	02/20	03/20	Average
AGA	HPE	1.25	1.20	0.96	1.25	1.25	1.58	1.65	1.58	1.06	1.30	1.18	1.64	1.33
	VPE	1.58	1.83	1.67	1.85	1.74	1.76	1.87	1.91	1.74	1.50	1.53	1.43	1.70
ALB	HPE	0.75	0.66	0.68	0.68	0.78	1.06	0.93	1.12	1.18	1.11	0.91	0.80	0.89
	VPE	1.64	1.82	1.99	1.65	1.57	1.70	1.69	1.60	1.56	1.72	1.69	1.61	1.69
ALY	HPE	1.30	1.28	1.25	1.74	1.33	1.21	1.19	1.17	1.15	1.54	1.50	1.38	1.34
	VPE	2.42	2.24	2.42	3.01	2.79	3.05	2.43	1.82	2.07	3.04	1.84	1.78	2.41
ATH	HPE	0.96	0.88	0.81	0.88	0.87	0.83	0.70	0.70	0.74	0.84	0.84	0.89	0.83
	VPE	1.45	1.64	1.51	1.65	1.98	2.01	1.59	1.54	1.48	1.34	1.36	1.60	1.60
BRN	HPE	0.81	0.83	0.81	0.90	0.92	0.92	0.95	1.00	1.12	1.05	0.90	0.94	0.93
	VPE	1.23	1.41	1.49	1.42	1.51	1.44	1.29	1.36	1.32	1.55	1.63	1.58	1.44
CNR	HPE	1.77	1.34	1.01	1.09	1.09	1.42	1.78	1.66	1.68	1.53	1.54	1.58	1.46
	VPE	1.56	1.61	1.69	1.83	1.89	1.94	1.87	1.66	1.75	1.70	1.70	1.84	1.75
CRK	HPE	0.84	0.87	0.92	0.89	0.96	0.90	0.96	1.12	1.15	1.31	1.12	0.94	1.00
	VPE	1.47	1.55	1.51	1.47	1.32	1.42	1.42	1.49	1.44	1.65	1.55	1.37	1.47
CTN	HPE	0.95	0.89	0.81	0.92	0.85	0.80	0.76	0.71	0.73	0.76	0.78	0.84	0.82
	VPE	1.21	1.29	1.34	1.68	1.40	1.70	1.54	1.25	1.45	1.26	1.16	1.12	1.37
DJA	HPE	0.94	0.95	1.06	1.08	1.01	0.95	1.05	0.99	0.94	0.95	0.93	0.98	0.99
	VPE	1.30	1.22	1.35	1.93	1.35	1.41	1.65	1.41	1.33	1.21	1.20	1.13	1.37
EGI	HPE	0.70	0.81	0.68	0.75	0.88	0.87	0.94	0.78	0.69	0.79	0.75	0.85	0.79
	VPE	2.27	2.37	1.87	2.06	2.23	2.29	2.12	2.12	1.95	2.23	2.09	2.11	2.14
GLG	HPE	0.92	0.82	0.85	0.84	1.03	1.06	1.12	1.19	1.21	1.18	1.09	0.97	1.02
	VPE	1.63	1.74	1.61	1.77	1.69	1.55	1.40	1.50	1.83	1.96	1.62	1.61	1.66
GOL	HPE	1.08	2.39	0.99	1.06	0.97	0.96	0.92	0.78	0.90	0.94	0.88	1.03	1.08
	VPE	1.93	2.85	1.59	1.76	1.82	2.16	1.79	1.67	1.64	1.62	1.58	1.88	1.86
GVL	HPE	0.64	0.67	0.62	0.70	0.80	0.92	1.10	0.95	1.05	0.99	0.87	0.77	0.84
	VPE	1.85	2.01	2.13	1.84	1.99	1.73	1.84	1.81	1.74	1.66	1.74	1.84	1.85
HFA	HPE	1.37	1.40	1.40	1.91	1.47	1.42	1.51	1.60	1.60	1.42	1.45	1.46	1.50
	VPE	2.52	2.72	2.67	2.88	3.32	3.15	2.99	2.66	2.30	2.55	2.22	2.72	2.73
JME	HPE	1.30	1.28	1.23	1.19	1.37	1.31	1.30	1.26	1.18	1.18	1.99	1.30	1.32
	VPE	3.03	2.80	2.68	3.05	2.52	2.82	3.22	2.46	2.47	2.92	3.46	2.57	2.83
KIR	HPE	0.93	1.45	0.93	1.33	1.32	1.34	2.12	0.96	0.78	0.94	0.95	1.01	1.17
	VPE	2.21	2.57	2.29	2.58	2.16	2.20	2.10	2.38	2.03	2.31	2.41	2.51	2.31
LAP	HPE	0.70	0.69	0.76	0.68	0.81	0.88	1.01	0.95	1.03	0.99	0.87	0.76	0.84
	VPE	1.80	2.13	2.08	1.84	2.13	1.73	1.85	1.72	1.54	1.86	1.87	1.89	1.87
LPI	HPE	1.86	1.42	1.08	0.95	1.09	1.60	1.92	1.73	1.37	1.43	1.37	1.87	1.47
	VPE	1.69	1.70	1.78	1.86	1.99	2.00	1.73	1.80	1.89	1.67	1.67	1.65	1.79
LSB	HPE	1.05	1.02	0.92	0.94	1.26	0.94	1.03	1.08	1.08	1.03	0.97	1.08	1.03
	VPE	1.72	1.55	1.48	1.53	1.55	1.99	1.64	1.55	1.69	1.73	1.63	1.50	1.63
MAD	HPE	0.84	0.94	0.78	0.92	0.84	1.45	0.86	0.91	0.76	0.82	0.86	1.13	0.93
	VPE	1.41	1.33	1.25	1.34	1.67	1.59	1.51	1.43	1.54	1.29	1.27	1.32	1.41
MLG	HPE	0.77	0.82	0.82	0.83	0.95	0.80	0.86	0.90	0.87	0.79	0.86	0.92	0.85
	VPE	1.15	1.23	1.37	1.47	1.28	1.35	1.58	1.34	1.15	1.09	1.07	1.03	1.26
PDM	HPE	0.66	0.72	0.70	0.75	0.72	0.67	0.65	0.68	0.69	0.68	0.74	0.73	0.70
	VPE	0.99	1.11	1.10	1.25	1.17	1.24	1.15	1.07	1.14	1.00	1.19	1.08	1.12
RKK	HPE	1.05	1.11	0.89	1.03	1.06	1.18	1.09	1.12	0.96	0.95	0.93	1.09	1.04
	VPE	2.34	2.76	2.17	2.39	2.15	2.43	2.13	2.29	2.31	2.12	1.84	2.32	2.27
ROM	HPE	0.79	0.81	0.72	0.83	0.80	0.80	0.73	0.76	0.76	0.82	0.76	0.79	0.78
	VPE	1.08	1.07	1.14	1.19	1.30	1.24	1.30	1.09	1.27	1.17	1.25	1.50	1.22
SDC	HPE	0.89	0.85	0.88	0.83	1.12	0.80	1.28	1.02	0.96	0.98	1.00	0.99	0.97
	VPE	1.13	1.18	1.09	1.10	1.19	1.12	1.92	1.05	1.23	1.23	1.30	1.21	1.23
SOF	HPE	1.81	1.91	1.54	1.20	1.32	1.20	1.26	1.22	1.31	1.35	1.29	1.31	1.39
	VPE	3.23	2.78	2.69	2.27	2.02	2.19	1.89	1.85	2.16	2.05	2.07	2.14	2.28
SWA	HPE	1.07	1.05	1.10	1.14	1.21	1.11	1.21	1.27	1.18	1.30	1.18	1.13	1.16
	VPE	1.76	1.91	1.87	1.76	1.89	1.84	1.83	1.54	1.73	1.81	1.80	1.75	1.79
TLS	HPE	0.77	0.83	0.78	0.82	0.88	0.77	0.81	0.84	0.85	0.86	0.87	0.93	0.83
	VPE	1.25	1.30	1.40	1.44	1.34	1.16	1.23	1.07	1.17	1.27	1.61	1.44	1.31
TOR	HPE	0.66	0.75	0.73	0.75	0.75	0.63	0.64	0.68	0.66	0.64	1.88	0.70	0.79
	VPE	1.25	1.40	1.40	1.43	1.44	1.46	1.47	1.37	1.44	1.30	1.12	1.21	1.36
TRD	HPE	0.77	0.65	0.63	0.73	0.82	0.92	0.89	0.80	0.91	0.89	0.80	0.75	0.80
	VPE	1.85	1.93	2.05	1.79	1.91	1.55	1.71	1.86	1.87	1.90	1.98	1.81	1.85
TRO	HPE	1.07	0.98	0.95	1.00	1.06	1.24	0.98	1.10	1.11	1.17	1.10	1.31	1.09
	VPE	2.54	2.67	2.46	2.74	2.71	2.48	2.71	2.73	2.85	3.22	2.46	3.26	2.74
WRS	HPE	0.94	0.97	0.84	0.96	1.02	1.16	1.00	0.99	1.07	1.01	0.92	1.01	0.99
	VPE	1.75	1.94	1.80	1.90	1.65	1.89	1.45	1.53	1.30	1.48	1.75	1.79	1.69
ZUR	HPE	0.84	0.90	0.89	0.96	0.99	0.93	0.98	0.93	0.91	0.93	0.94	0.91	0.93
	VPE	1.34	1.38	1.48	1.38	1.59	1.51	1.60	1.35	1.36	1.42	1.72	1.54	1.47

Table 9: Monthly Horizontal/Vertical Accuracy at RIMS-A sites for GEO2 (in metres)

### 3.6.4 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 3 metres and the instantaneous VNSE is lower than 4 metres over the total number of samples with valid PA navigation solution.*

The following tables provide the values measured using GEO1 and GEO2<sup>31</sup> respectively.

GEO1	04/19	05/19	06/19	07/19	08/19	09/19	10/19	11/19	12/19	01/20	02/20	03/20	Average
AGAA	99.97%	99.97%	100.00%	99.84%	99.99%	100.00%	99.97%	99.97%	100.00%	100.00%	100.00%	100.00%	99.98%
ALBA	100.00%	100.00%	99.90%	99.95%	100.00%	100.00%	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	99.96%
ALYA	99.99%	100.00%	99.95%	99.82%	99.93%	99.98%	99.96%	100.00%	99.99%	99.78%	99.98%	99.97%	99.97%
ATHA	99.95%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%
BRNA	99.98%	100.00%	99.96%	99.98%	100.00%	99.98%	99.99%	100.00%	99.94%	99.94%	99.89%	99.93%	99.98%
CNRA	99.89%	99.97%	99.99%	100.00%	99.99%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%
CRKA	99.99%	100.00%	100.00%	100.00%	99.98%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
CTNA	99.97%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%
DJAA	99.97%	99.96%	100.00%	99.99%	99.99%	100.00%	99.82%	99.89%	100.00%	99.94%	100.00%	100.00%	99.98%
EGIA	100.00%	99.99%	100.00%	99.98%	99.98%	99.99%	99.97%	99.99%	100.00%	100.00%	100.00%	100.00%	99.99%
GLGA	99.97%	99.99%	100.00%	99.96%	100.00%	100.00%	99.98%	100.00%	99.93%	100.00%	99.99%	100.00%	99.94%
GOLA	99.95%	99.10%	99.96%	99.96%	100.00%	100.00%	99.96%	99.98%	99.99%	99.99%	99.99%	99.96%	99.95%
GVLA	100.00%	99.99%	99.95%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.83%
HFAA	99.84%	99.77%	99.67%	99.55%	99.57%	99.52%	99.53%	99.73%	99.76%	99.82%	99.81%	99.53%	99.74%
JMEA	99.66%	99.78%	99.88%	99.82%	99.93%	99.73%	99.86%	99.92%	99.93%	99.85%	99.47%	99.93%	99.66%
KIRA	99.48%	99.41%	99.67%	99.51%	99.56%	99.55%	99.45%	99.58%	99.57%	99.48%	99.48%	99.42%	99.76%
LAPA	100.00%	100.00%	99.99%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%
LPIA	99.78%	99.96%	99.98%	99.99%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%	99.98%	99.98%	99.98%
LSBA	99.94%	100.00%	100.00%	99.99%	99.97%	99.99%	100.00%	100.00%	99.96%	100.00%	100.00%	100.00%	99.99%
MADA	99.97%	99.98%	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
MLGA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
PDMA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.79%
RKKA	99.58%	99.50%	99.61%	99.46%	99.31%	99.45%	99.70%	99.75%	99.85%	99.68%	99.70%	99.48%	99.79%
ROMA	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	99.99%
SDCA	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	99.89%	100.00%	99.96%	100.00%	100.00%	100.00%	99.91%
SOFA	99.59%	99.57%	99.58%	99.81%	99.84%	99.89%	99.94%	99.94%	99.98%	99.99%	99.97%	99.98%	99.92%
SWAA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	99.99%	100.00%	100.00%	99.99%
TLSA	99.95%	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	100.00%	100.00%	99.99%	99.99%
TRDA	100.00%	100.00%	99.92%	99.97%	100.00%	100.00%	100.00%	99.90%	100.00%	100.00%	100.00%	100.00%	99.91%
TROA	99.95%	99.90%	99.94%	99.76%	99.76%	99.70%	99.73%	99.87%	99.93%	99.76%	99.91%	99.74%	99.91%
WRSA	99.99%	100.00%	99.99%	99.95%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	99.98%	99.99%
ZURA	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 10: OS Availability at RIMS-A sites for GEO1

<sup>31</sup> GEO1 and GEO2 as described in [Service Notice#22](#).

GEO2	04/19	05/19	06/19	07/19	08/19	09/19	10/19	11/19	12/19	01/20	02/20	03/20	Average
AGAA	99.97%	99.97%	100.00%	99.85%	99.99%	100.00%	99.97%	99.98%	100.00%	100.00%	100.00%	100.00%	99.98%
ALBA	100.00%	100.00%	99.88%	99.95%	100.00%	100.00%	99.97%	99.99%	100.00%	100.00%	100.00%	100.00%	99.98%
ALYA	99.99%	100.00%	99.95%	99.83%	99.94%	99.97%	99.96%	100.00%	99.99%	99.78%	99.98%	99.98%	99.95%
ATHA	99.94%	100.00%	99.99%	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%
BRNA	99.98%	99.99%	99.95%	99.98%	100.00%	99.98%	99.99%	100.00%	99.95%	99.94%	99.90%	99.93%	99.97%
CNRA	99.87%	99.97%	99.99%	100.00%	99.99%	100.00%	99.98%	100.00%	100.00%	100.00%	99.97%	100.00%	99.98%
CRKA	99.99%	100.00%	100.00%	100.00%	99.98%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
CTNA	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
DJAA	99.97%	99.96%	100.00%	100.00%	100.00%	100.00%	99.83%	99.89%	100.00%	99.94%	99.99%	100.00%	99.96%
EGIA	100.00%	100.00%	100.00%	99.98%	99.98%	99.99%	99.97%	99.99%	99.99%	99.99%	100.00%	100.00%	99.99%
GLGA	99.98%	99.99%	100.00%	99.96%	100.00%	99.99%	99.98%	100.00%	99.92%	100.00%	100.00%	100.00%	99.98%
GOLA	99.95%	99.11%	99.96%	99.97%	100.00%	99.99%	99.97%	99.98%	99.98%	100.00%	99.99%	99.98%	99.91%
GVLA	100.00%	99.99%	99.95%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%
HFAA	99.85%	99.77%	99.69%	99.55%	99.55%	99.52%	99.56%	99.73%	99.73%	99.80%	99.80%	99.54%	99.67%
JMEA	99.66%	99.78%	99.88%	99.83%	99.93%	99.74%	99.85%	99.92%	99.93%	99.90%	100.00%	99.92%	99.86%
KIRA	99.46%	99.41%	99.67%	99.50%	99.57%	99.53%	99.41%	99.57%	99.55%	99.50%	99.49%	99.42%	99.51%
LAPA	100.00%	100.00%	99.99%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
LPJA	99.78%	99.97%	99.98%	99.99%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%	100.00%	99.98%	99.97%
LSBA	99.94%	100.00%	100.00%	99.99%	99.97%	99.99%	100.00%	100.00%	99.96%	100.00%	100.00%	100.00%	99.99%
MADA	99.98%	99.98%	99.97%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%
MLGA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
PDMA	99.99%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
RKKA	99.55%	99.48%	99.60%	99.47%	99.31%	99.44%	99.71%	99.73%	99.85%	99.74%	99.78%	99.26%	99.58%
ROMA	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	100.00%	100.00%
SDCA	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	99.90%	100.00%	99.97%	100.00%	100.00%	100.00%	99.99%
SOFA	99.58%	99.56%	99.59%	99.81%	99.84%	99.90%	99.93%	99.94%	99.98%	99.99%	99.97%	99.99%	99.84%
SWAA	99.99%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	100.00%	100.00%	100.00%
TLJA	99.95%	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.98%	100.00%	100.00%	99.99%	99.99%
TRDA	100.00%	100.00%	99.92%	99.97%	100.00%	100.00%	100.00%	99.88%	100.00%	100.00%	100.00%	100.00%	99.98%
TROA	99.95%	99.90%	99.93%	99.77%	99.79%	99.73%	99.73%	99.87%	99.93%	99.76%	99.92%	99.73%	99.84%
WRSA	99.99%	100.00%	99.98%	99.95%	100.00%	100.00%	99.99%	100.00%	100.00%	100.00%	100.00%	99.98%	99.99%
ZURA	99.97%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 11: OS Availability at RIMS-A sites for GEO2

The monthly Open Service availability performance in all the RIMS stations was over 99%.



EGNOS RIMS station in Golbasi (Turkey)

The following map shows the OS availability value during the year for each location. The worst value between GEO1 and GEO2<sup>32</sup> is shown.

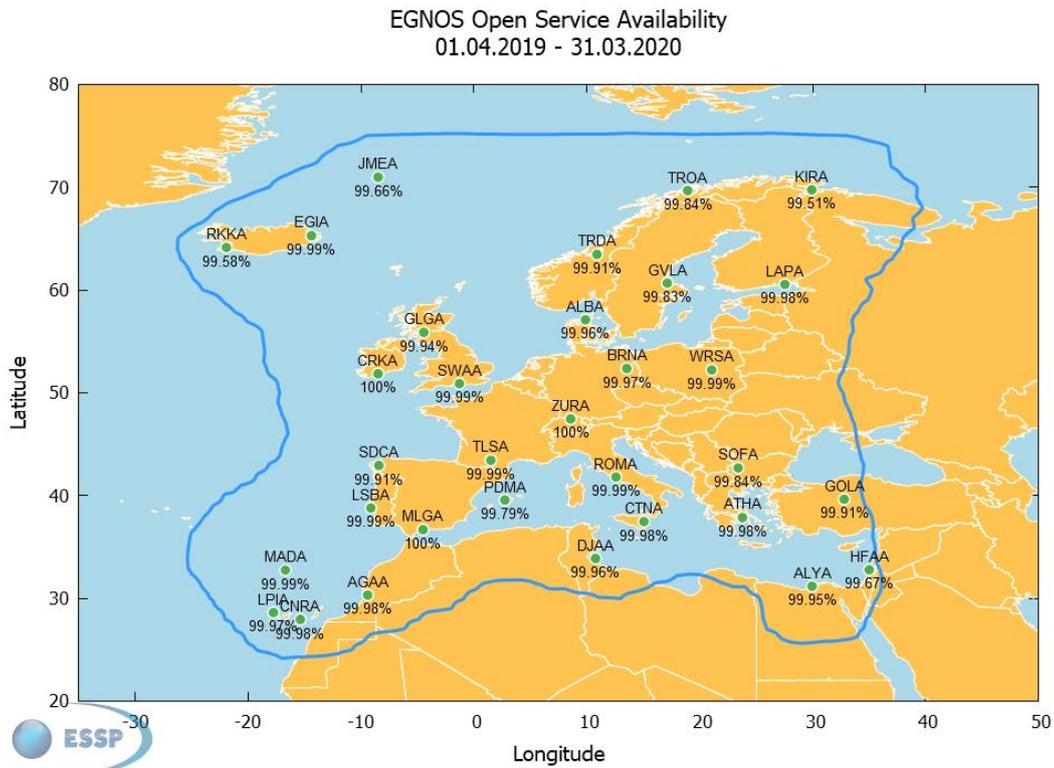


Figure 32: OS availability for the RIMS stations

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

<sup>32</sup> GEO1 and GEO2 as described in [Service Notice#22](#).

### 3.7 EGNOS Data Access Service (EDAS)

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

EDAS, as 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 provide minimum availability and maximum latency for the EDAS services:

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

Table 12: 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 13: Maximum latency for EDAS Services

The EDAS performance is reported through the EGNOS Monthly Performance reports, available on the [EGNOS User Support website](#).

The availability achieved during the last annual period is shown in Figure 33.

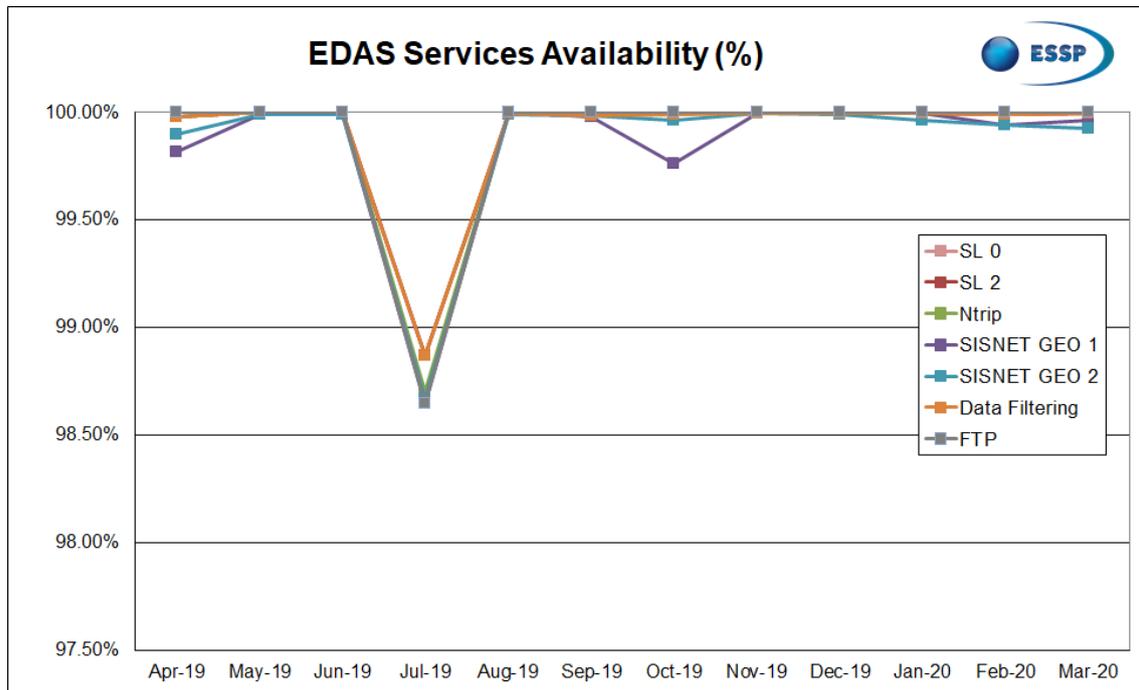


Figure 33: EDAS Services Availability (April 2019-March 2020)

As shown above, the EDAS availability has been consistently above 99.8% for all services over the entire reporting period, except in July 2019, when the availability of the services dropped to 98.6%-98.9%. This degraded availability was due to an unplanned outage that was recovered within the day. Nevertheless, the monthly availability figure remained above the commitments defined in the [EDAS SDD \(Service Definition Document\)](#).



EDAS is the primary input for the French DGPS Maritime Service ([EGNOS Bulletin Q2 2020](#))

Credits: MTES-Terra, Laurent Mignaux

The latency during the last yearly period for real-time services (not applicable for the FTP service) is shown below, computed as the average of the 95<sup>th</sup> percentile latencies monitored for every 5-minute period during the year.

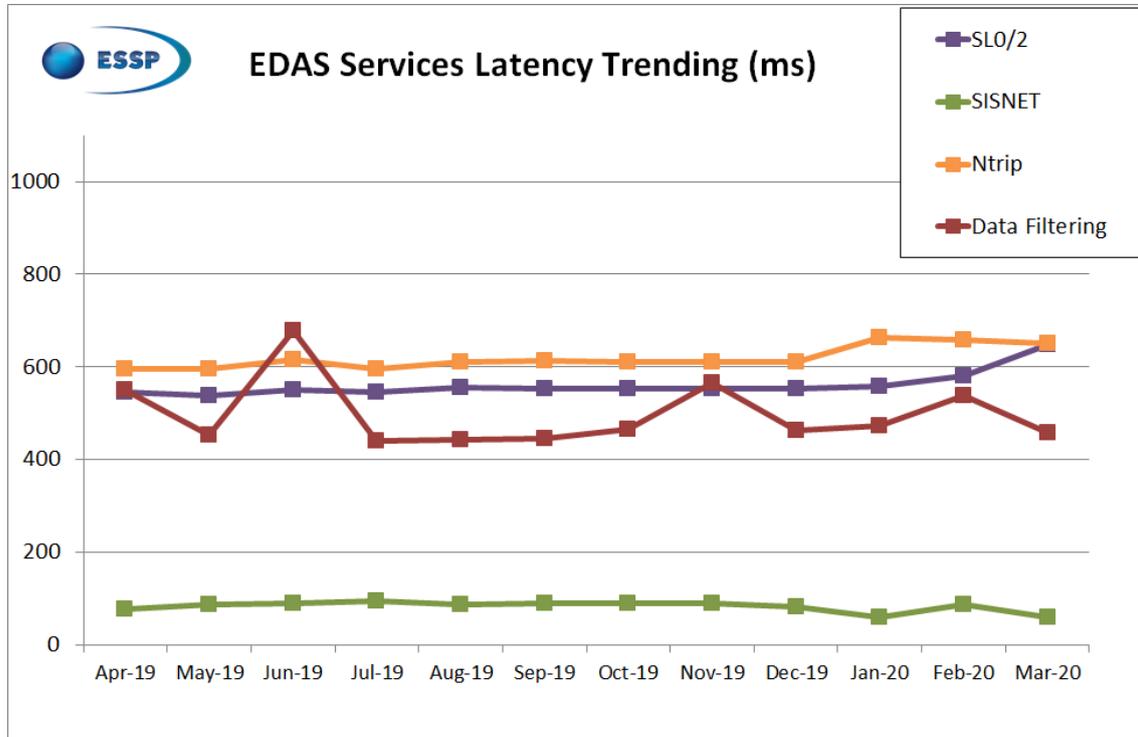


Figure 34: EDAS Services Latency (April 2019-March 2020)

As shown in Figure 34, the EDAS services latency has been consistently below the 1-second threshold and well below the [EDAS SDD \(Service Definition Document\)](#) commitment for all the services over the entire reporting period.

## 4 EGNOS SERVICES PROVISION

### 4.1 SoL Aviation Service Status

On the basis of the current EGNOS System Release (ESR) version 2.4.2i, all the available Service Levels enable aircraft approaches from NPA to those operationally equivalent to ILS CAT I. APV-I and LPV-200 Service Levels provide lateral and angular vertical guidance without the need for visual contact with the ground, until a Decision Height (DH) of 250 ft. and 200 ft., respectively, above the runway threshold. In particular, the EGNOS LPV-200 Service Level based approaches guarantee the advantages provided by an ILS CAT I approach with the airspace design flexibility of a PBN approach.

The EGNOS SoL Service remained stable and robust during the reported period, only suffering degradations affecting specific airports in Norway (Kirkenes and Menham) and in Finland (Kuusamo and Ivalo), which were duly communicated to the concerned ANSPs, in line with the applicable mechanisms, as per the EGNOS Working Agreement. The EGNOS Working Agreement (EWA) lays the operational and legal foundations formalising working procedures, technical baseline, and required interfaces between ESSP and SES Certified Air Navigation Service Provider (ANSP), or other organisations entitled by the corresponding competent authority willing to use the EGNOS Safety-of-Life Service as a navigation aid. This Agreement is the necessary step before the publication of SBAS-based operations, being mandatory even for ANSPs.

The [SoL Service Definition Document \(SDD 3.3\)](#) has been in force for the full reporting period.



Guidance documentation from the [EGNOS User Support Website](#)

## 4.2 Service Definition Documents and Service Notices over the period

EGNOS Service Definition Documents (SDD) describe the characteristics and conditions of access to each EGNOS service (OS, SoL and EDAS).

A new version of the EDAS SDD was published on the 3<sup>rd</sup> of June, 2019, addressing the following changes:

- The EDAS Ntrip service evolution (Ntrip v1 and Ntrip v2 support over HTTP) implemented in 2018.
- The use of EGNOS corrections over IALA beacons.
- Clarifications regarding the redistribution of EDAS data.
- The update of the EGNOS system and service information, EDAS related contents, and service performances.

After the deployment of the ESR 2.4.1N (YSR#4\_PSS1), which saw the introduction of the RIMS Haifa (Israel) into operation, the activities towards the publication of a new issue of the SoL SDD are being performed. As anticipated in the SoL Service Implementation Roadmap, this new version will include the updated performances with an extension of the commitment areas for APV-I and LPV200 in the SoL SDD to the South East of Europe, expecting to fully cover Cyprus at APV-I level.

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

During the period being reported, ESSP published/updated 4 Service Notices: 3 Service Notices have been changed to “Expired” status and 1 Service Notice has been set to “Superseded” status:

Number	Subject	Version	Date of Publication	Date of Status Change	Status	Target Users
22	EGNOS Space Segment Configuration	4.0	27/03/2020	-	In Force	All Users
22	EGNOS Space Segment Updates in 2020	3.0	28/02/2020	-	(Updated)	All Users
22	EGNOS Space Segment Updates in 2020	2.0	17/01/2020	-	(Updated)	All Users
22	EGNOS Space Segment Updates in 2020	1.0	05/12/2019	-	(Updated)	All Users
20	PRN120 Decommissioning	1.0	20/12/2018	05/12/2019	Expired	All Users
19	Single GEO coverage in North-West corner of SDD service areas	1.0	31/08/2018	17/01/2020	Expired	SoL
18	EDAS Ntrip service evolution: support to HTTP based communication	1.0	19/07/2018	03/06/2019	Superseded	EDAS
15	EGNOS Space Segment Update	2.2	20/12/2018	05/12/2019	Expired	All Users

Figure 35: Service Notices published/updated during this period

The current status of the Service Notices is available at the [EGNOS User support website](#).

## 4.3 User Consultations and Improvement Actions

### 4.3.1 2019 EGNOS User Satisfaction Process

Each year, an overall EGNOS User Satisfaction Process is performed jointly by the GSA and ESSP on the three EGNOS Services (SoL, OS and EDAS) to obtain valuable feedback on the EGNOS use and ESSP's performance, and to identify areas of improvement and define recommendations on the EGNOS services.

This process considers the feedback received via different means and interfaces like the EGNOS Service Provision Workshop, EGNOS User Support activities, and the ESSP's participation in multimodal forums, the GNSS implementation projects, working groups or relevant events. The main input, however, are the user satisfaction surveys that are widely distributed to the key users and stakeholders of each of the EGNOS Services.

The EGNOS User Satisfaction Survey was launched in December 2019 and closed on 16/03/2020, using a specific online platform. A total of 124 responses were received.

The outputs from this survey will be included in the [EGNOS Bulletin Summer 2020](#) and published on the EGNOS User Support Website.

#### Key conclusions on the EGNOS User Satisfaction (Evolution from 2018 to 2019):

EGNOS users show a satisfaction level higher than that obtained in 2018 (8.6 in 2019 versus 8.3 in 2018). In general terms, this represents an exceptionally good level of satisfaction with respect to EGNOS. In particular, note the increase achieved in Aviation (from 8.5 in 2018 to 8.8 in 2019).

- **EGNOS SERVICES:** the scores have improved for all EGNOS Services (SoL, OS and EDAS), with all of them being rated over 8.0. Note that performance scores have increased with respect to those obtained in 2018 for all services.
- **EGNOS USER SUPPORT:** the user satisfaction level is higher in 2019 than it was in 2018 for the website (8.1 versus 8.0), for the documentation (8.6 versus 8.3), and for the helpdesk (9.0 versus 8.7). Among the EGNOS Documentation elements, the EGNOS Service Implementation Roadmaps have significantly increased in satisfaction level (8.9 versus 8.2).

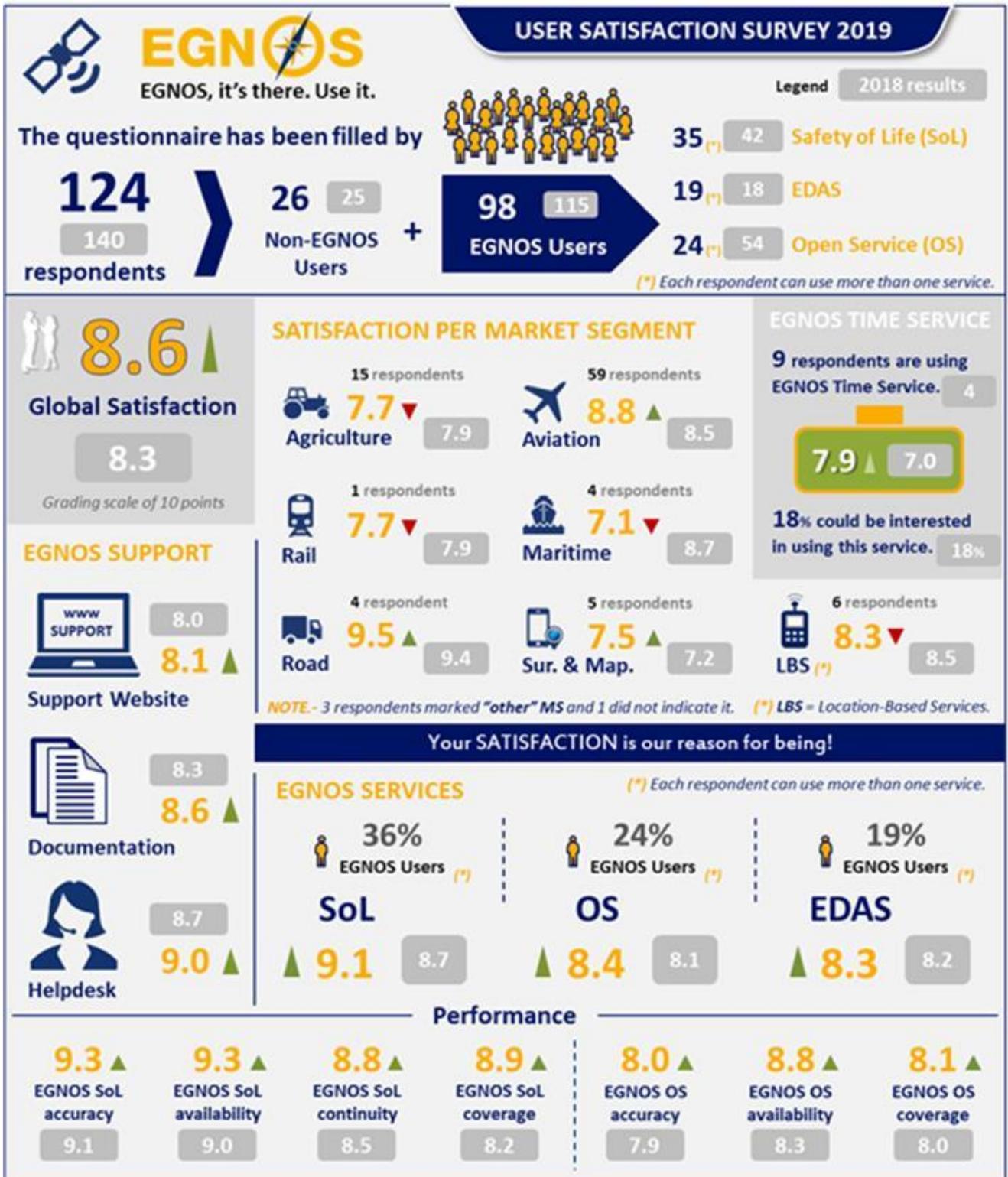


Figure 82: Summary of results from User Satisfaction Survey

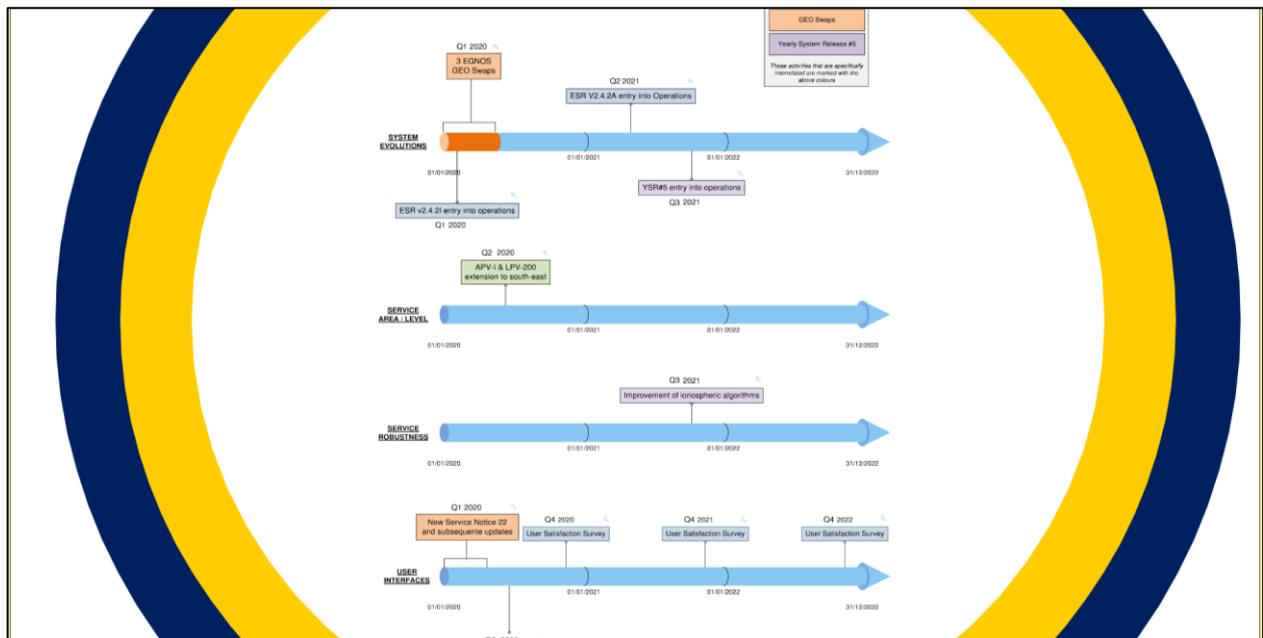
#### 4.4 Service Implementation Roadmaps

The EGNOS Services Implementation Roadmaps (SIR) provide a high-level overview of the current status of the EGNOS Services, and their expected evolution in a 3-year timeframe, linked to the subsequent EGNOS System Releases' deployments and information/interfaces improvements/changes. These roadmaps are mainly focused on 4 different areas: Service Evolution, Service Area / Service Level (or Data availability in EDAS), Service Robustness, and User Interfaces.

The three EGNOS Services' Roadmaps were updated twice since the previous report: first in September 2019 (v4.2) and subsequently in April 2020 (v4.3). The current applicable version is available at:

- [EGNOS Open Service Roadmap](#)
- [EGNOS Safety of Life Service Roadmap](#)
- [EGNOS Data Access Service \(EDAS\) Roadmap](#)

Several improvements of the SIR content and presentation were done in these three documents, mainly to provide the EGNOS users with a more user-friendly, dynamic, and interactive way of obtaining information on the evolution of the EGNOS services.



High level view of the EGNOS SoL service roadmap ([EGNOS User Support Website](#))

#### 4.5 2019 EGNOS Multimodal Adoption Plan

The EGNOS adoption activities have proven to be a useful means of enhancing the EGNOS use in aviation, maritime, agriculture & mapping, and rail market segments. In aviation, ESSP and the GSA have continued engaging aerodromes to publish the EGNOS-based procedures and operators to get equipped and certified. Relevant stakeholders have also been identified during this period: aircraft lessors, who represent a significant percentage of EU aircraft owners, as seen in the latest edition of the EGNOS Annual workshop celebrated in Rome. Additionally, ESSP performed traffic assessments and Cost Benefit Analyses to support airlines, OEM, and airport decision-making processes regarding the adoption of EGNOS.

During the period reported in this document, 57 new LPVs, 4 new PinS, 56 new LPV200s, 19 LPV200 (upgrades from LPV to LPV200), and 1 new APV-Baro have been published (a total of 137 EGNOS-based procedures in this period – the first months of 2020 having been quite active in terms of new procedures published).

37 More aircraft/rotorcraft units have been engaged so that in the near future they will retrofit, start with the certification process, or request SBAS options in the avionics for new unit orders. ESSP has proven to be a key facilitator in promoting, explaining, and connecting potential partners within ANSPs, Avionics Manufacturers, Operators, and Aircraft Manufacturers.

The virtual flight simulator (that offers new procedures available each year, some not even published yet) has proven to be a useful tool to demonstrate the benefits EGNOS can bring to aviation users.

Regarding the maritime domain, the work done during previous years has been continued in 2019:

- a) Supporting Portuguese maritime authorities by providing technical feasibility analysis and CBAs to recapitalise their maritime DGNSS stations.
- b) Further market analysis on SBAS-enabled equipment, pilot portable units, and awareness.



*The EGNOS Multimodal Adoption plan aims at fostering EGNOS use in all market segments.*

*Credits: MTES-Terra, Laurent Mignaux*

In agriculture and geomatics, the contacts network has increased significantly, particularly in farming, where both “Precision Farming Instructors” and leading tractor manufacturers have been approached, enabling further understanding of the use of EGNOS in this market segment, and liaising with key stakeholders to foster the EGNOS awareness and promotion. New subsegments are being explored: irrigation, fruit-yard machinery, water, and gas commodities. A new upgrade of [GEAR tool](#) (EGNOS demonstrator for agriculture) has been released and uploaded in the EGNOS user support website.



*EGNOS tests with Topcon Auto-guidance solution ([EGNOS User Support Website](#))*

In this period, ESSP has also continued preparing customized information for those market subsegments including specific workshops and webinars (Geomatics webinar provided via the Geospatial Media platform). All this information is made available to users through the [EGNOS User Support Website](#).

In relation to rail activities, ESSP has continued supporting the GSA in the market size assessment of European freight wagons envisaged to be equipped with GNSS devices: the freight cargo cars market size, estimated at ~170,000 units, and the time-frame foreseen to equip with EGNSS sensors until 2022. By Q3 2019 it was confirmed that ~23,000 smart wagons in Europe had already been equipped with the EGNSS telematic devices. Approximately 7000 of those are already using EGNOS.

## 4.6 Communication and EGNOS Promotion Activities

### 4.6.1 2019 EGNOS Workshop

The EGNOS Annual Workshop 2019, organised by the GSA and the ESSP, took place in Rome (Italy) on 24-25 September, 2019, at the Italian Space Agency (ASI) premises. Nearly 200 international participants from 29 different countries joined the event. Information about the EGNOS services status, applications, and success stories from partners currently using EGNOS in real life applications were shared with the attendees. The diverse audience included authorities, service providers, international SBAS providers, application developers, manufacturers, and end users.

During the 2019 edition of the EGNOS Workshop, participants had the possibility of flying an LPV approach with a Garmin G-1000 simulator, and understanding the benefits of EGNOS for agriculture by trying the EGNOS Demonstrator. Additionally, key experts from different market segments made their first appearance at the EGNOS Workshop. For instance, VistaJet (business aviation), Norsk Luftambulans (Helicopter Emergency Services), CNH (Precision Agriculture manufacture), and IMBA Spain (International Mountain Bike Associated) provided their views on the benefits of EGNOS for their operations and customers, highlighting the potential of EGNOS supporting users in a wide range of application domains.

The satisfaction of the attendees regarding the EGNOS Workshop 2019 reached an overall score of 9.0, according to the survey conducted by ESSP using the PAPI methodology<sup>33</sup> through a self-completion questionnaire.



*Carlo des Dorides (GSA) during the Opening Speech*



*Conference room (ASI)*



*Garmin G-1000 LPV simulator*



*Attendee trying the EGNOS Demonstrator for Agriculture (GEAR)*

Figure 36: EGNOS Workshop 2019 – Rome (Italy)

<sup>33</sup> Paper and pencil interviewing.

The **first day** was devoted to explaining the latest updates in the EGNOS services & programme, together with an overview of the implementation status of EGNOS in aviation, as well as an international session where other SBAS programmes also reported their latest updates.

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

Further details on the EGNOS Workshop and the content of the presentations are available at the [EGNOS User Support Website](#):

- The EGNOS Bulletin for Q3 2019 provides an extensive summary of the event’s content (*News & Events* → *EGNOS Bulletin*).
- The EGNOS Workshop 2019 presentations can be downloaded (*News & Events* → *Workshops* → *Workshop 2019*).



Figure 37: EGNOS Bulletin Q3 2019 (Pages 5 and 15)

## 5 KEY ACTIVITIES PLANNED FOR THE YEAR AHEAD

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### 5.1 Service Provision and Development

#### 5.1.1 EGNOS Working Agreement Implementation in Aviation

The EWA contents are expected to evolve and be improved to cover the users' eventual needs and the applicable EU regulation. The main activities planned with regards to the EWA are:

- EWA improvement activities: addressing the improvement of the Collaborative Decision Making, GNSS' Data recording service arrangements, and reinforcing the communication with all types of users under the EGNOS Working Agreement.
- Finalizing/confirmation of EWA for Aerodrome Operators, facilitating the implementation of the EGNOS-based procedures in scenarios where non SES certified ANSPs operate, supporting the application of National Regulation.



*Wideroe's DHC-8 cockpit flying an EGNOS approach in Norway ([EGNOS Bulletin – Spring 20](#))*

### 5.1.2 EGNOS Services' related documents evolutions

#### **EGNOS Service Definition Documents (SDD)**

One Service Definition Document is planned to be published over the next yearly period:

- A new version of the SoL SDD, linked to ESR 2.4.1N (YSR#4\_PSS1), with the inclusion of operations at the new RIMS station in the Eastern Mediterranean Region (RIMS Haifa). This new SoL SDD is expected to be published before the end of 2020.

#### **Service Implementation Roadmaps**

The three EGNOS Services' Roadmaps will be updated at least twice over the next period.

The next publication is expected after the summer of 2020. The main items addressed in the next versions of the Service Roadmaps are:

- The publication of the next possible SDDs.
- New GEO swaps.
- Information regarding the next EGNOS releases.

### 5.1.3 User Services Evolution

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

The main priorities for the next period are:

- Improvements on the content organization and accessibility.
- Continue publishing news and articles in coordination with the GSA/communication.

### 5.1.4 2020 EGNOS Multimodal Adoption Action Plan

On a yearly basis, the EGNOS Multimodal Adoption (EMA) plan establishes the different activities that should be put in place to leverage the use of EGNOS by all different market segments. These are agreed between the GSA and the ESSP at the beginning of the year, and their progress is reviewed on a regular basis. The activities to be developed during 2020 are distributed into four different market segments: aviation (where the major effort is placed), maritime, agriculture & geomatics, and rail.

In relation with aviation, the activities focus on an active promotion and engagement of aviation stakeholders (aerodromes, ANSPs, and operators) by means of Traffic Assessments, the CBAs, and the continuous follow-up of the EGNOS implementation status (that allows updating the LPV procedures map every month in the [EGNOS User Support Website](#)). Drones activities and identification of potential new applications, as the ADS-B, have been launched.

In the maritime segment, support will be provided to those maritime and inland waterway authorities interested in the transmission of EGNOS corrections via IALA beacons and AIS stations, by offering a trade-off architecture analysis (supported with a CBA). Additionally, a continuous analysis of the

available Portable Pilot Unit (PPUs) products, different SBAS compatible devices, also focusing on the notified bodies, will be performed.

In the scope of agriculture & mapping, contacts triggered in previous years will be maintained to keep supporting users and demonstrating the EGNOS benefits.

Finally, in the rail sector, a market assessment of telematics wagons in freight cargo operators and passenger information systems is ongoing. Work is already in motion to prepare a performed and track-side units preliminary receiver requirements document for the on-board and track-side units, that use the EGNOS L1 to support safe train positioning in the ERTMS.



*The EGNOS Multimodal Adoption Plans aims at fostering EGNOS use in all market segments*

### 5.1.5 2020 EU Space Week

The 2020 EGNOS Annual Workshop will be integrated into the EU Space Week, organised by the GSA (<https://www.euspaceweek.eu/>).

## APPENDIX A FULL LIST OF EGNOS-BASED APPROACH PROCEDURES

The information shown in this annex corresponds to the situation at AIRAC Cycle#2004 (26/03/2020). For an up to date list of the published EGNOS based procedures, please refer to the [EGNOS User Support Website](#).

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Vöslau	Austria	LOAV	1	28/02/2019							1
Aerodrome	ÖAMTC/Oberwart	Austria	LODO	1	28/02/2019							1
Aerodrome	Graz	Austria	LOWG		09/01/2014			1	01/03/2018			1
Aerodrome	Innsbruck	Austria	LOWI					1	01/02/2018			1
Aerodrome	Klagenfurt	Austria	LOWK					1	11/10/2018			1
Aerodrome	Linz	Austria	LOWL		09/01/2014			2	02/02/2017			2
Aerodrome	Wien - Schwechat	Austria	LOWW					5	02/02/2017			5
Aerodrome	Antwerpen / Deurne	Belgium	EBAW	1	10/12/2015							1
Aerodrome	Brussels-National	Belgium	EBBR	4	06/12/2018							4
Aerodrome	Charleroi / Brussels South	Belgium	EBCI	2	31/03/2016							2
Aerodrome	Liège	Belgium	EBLG	2	13/10/2016							2
Aerodrome	Kortrijk/Wevelgem	Belgium	EBKT	1	09/11/2017							1
Aerodrome	Oostende-Brugge	Belgium	EBOS					2	03/01/2019			2
Aerodrome	Dubrovnik	Croatia	LDDU	1	10/12/2015							1
Aerodrome	Pula	Croatia	LDPL	2	26/04/2018							2
Aerodrome	Osijek/Klisa	Croatia	LDOS	1	29/03/2018							1

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Rijeka	Croatia	LDRI	2	12/09/2019							2
Aerodrome	Brač	Croatia	LDSB	2	05/12/2019							2
Aerodrome	Split/Kastela	Croatia	LDSP	1	29/03/2018							1
Aerodrome	Zagreb/Pleso	Croatia	LDZA	2	29/03/2018							2
Aerodrome	Zadar	Croatia	LDZD	4	11/10/2018							4
Aerodrome	Kunovice	Czech Republic	LKKU	1	01/12/2017							1
Aerodrome	Karlovy Vary	Czech Republic	LKKV	2	13/11/2014							2
Aerodrome	Ostrava	Czech Republic	LKMT	2	09/01/2014							2
Aerodrome	Prague	Czech Republic	LKPR				09/01/2014	4	05/12/2019			4
Aerodrome	Brno	Czech Republic	LKTB	2	09/01/2014							2
Aerodrome	Praha/Vodochody	Czech republic	LKVO	2	25/06/2015							2
Aerodrome	Aarhus	Denmark	EKAH	2	05/03/2015							2
Aerodrome	Billund	Denmark	EKBI					2	20/07/2017			2
Aerodrome	Esbjerg	Denmark	EKEB		15/10/2015			2	26/03/2020			2
Aerodrome	Karup	Denmark	EKKA	2	02/04/2015							2
Aerodrome	Sønderborg	Denmark	EKSB	2	18/08/2016							2
Aerodrome	Kärdla	Estonia	EEKA	2	31/01/2019							2
Aerodrome	Kuressaare	Estonia	EEKE	2	02/03/2017							2
Aerodrome	Lennart Meri Tallinn	Estonia	EETN					2	06/12/2018			2
Aerodrome	Tartu	Estonia	EETU	1	18/07/2019			1	18/07/2019			2
Aerodrome	Enontekiö	Finland	EFET			2	07/12/2017					2

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Helsinki-Vantaa	Finland	EFHK	6	27/02/2020							6
Aerodrome	Ivalo	Finland	EFIV			2	07/12/2017					2
Aerodrome	Joensuu	Finland	EFJO	2	12/12/2013							2
Aerodrome	Jyväskylä	Finland	EFJY			2	07/12/2017					2
Aerodrome	Kemi-Tornio	Finland	EFKE			2	07/12/2017					2
Aerodrome	Kajaani	Finland	EFKI			2	07/12/2017					2
Aerodrome	Kokkola-Pietarsaari	Finland	EFKK			2	07/12/2017					2
Aerodrome	Kuusamo	Finland	EFKS			2	07/12/2017					2
Aerodrome	Kittilä	Finland	EFKT			2	07/12/2017					2
Aerodrome	Kuopio	Finland	EFKU			2	07/12/2017					2
Aerodrome	Lappeenranta	Finland	EFLP			2	07/12/2017					2
Aerodrome	Mariehamn	Finland	EFMA			2	08/12/2017					2
Aerodrome	Oulu	Finland	EFOU			2	07/12/2017					2
Aerodrome	Pori	Finland	EFPO			1	07/12/2017					1
Aerodrome	Rovaniemi	Finland	EFRO			2	07/12/2017					2
Aerodrome	Savonlinna	Finland	EFSA			2	07/12/2017					2
Aerodrome	Tampere-Pirkkala	Finland	EFTP	2	27/02/2020		07/12/2017					2
Aerodrome	Turku	Finland	EFTU	2	27/02/2020		07/12/2017					2
Aerodrome	Vaasa	Finland	EFVA			2	07/12/2017					2
Aerodrome	Dieppe Saint Aubin	France	LFAB	1	02/03/2017							1
Aerodrome	Calais	France	LFAC	1	20/09/2012							1

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Albert Bray	France	LFAQ	1	15/11/2012			1	21/11/2017			2
Aerodrome	Le Touquet Paris Plage	France	LFAT	1	04/02/2016			1	21/11/2017			2
Aerodrome	Valenciennes Denain	France	LFAV	1	19/09/2013			1	21/11/2017			2
Aerodrome	Amiens Glisy	France	LFAY	1	27/06/2013							1
Aerodrome	Agen La Garenne	France	LFBA		06/03/2014			1	21/11/2017			1
Aerodrome	Bordeaux Merignac	France	LFBD	1	08/03/2012			3	21/11/2017			4
Aerodrome	Bergerac	France	LFBE		09/01/2014			2	21/11/2017			2
Aerodrome	Toulouse Francazal	France	LFBF	2	23/06/2016							2
Aerodrome	La Rochelle	France	LFBH	1	20/09/2012							1
Aerodrome	Poitiers Biard	France	LFBI	1	12/11/2015			1	21/11/2017			2
Aerodrome	Montluçon Gueret	France	LFBK	1	17/12/2013							1
Aerodrome	Limoges	France	LFBL		28/06/2012			2	21/11/2017			2
Aerodrome	Niort Marais Poitevin	France	LFBN	1	02/03/2017							1
Aerodrome	Toulouse Blagnac	France	LFBO	4	03/05/2012							4
Aerodrome	Pau-Pyrénées	France	LFBP	1	17/03/2011							1
Aerodrome	Muret Lherm	France	LFBR	1	15/10/2015							1
Aerodrome	Tarbes Lourdes Pyrénées	France	LFBT	1	28/05/2015							1
Aerodrome	Angoulême Brie Champniers	France	LFBU		03/04/2014			2	21/11/2017			2
Aerodrome	Périgueux Bassillac	France	LFBX		28/05/2015			1	25/05/2017			1
Aerodrome	Biarritz Bayonne Anglet	France	LFBZ		09/02/2012		01/01/2013	2	26/04/2018			2

Operational Aerodromes / Heliports /Routes												
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Aerodrome	Albi Le Sequestre	France	LFCI	1	26/05/2016			1	21/11/2017			2
Aerodrome	Castres Mazamet	France	LFCK	1	22/08/2013							1
Aerodrome	Rodez Marcillac	France	LFCR	1	31/05/2012			1	21/11/2017			2
Aerodrome	Royan Médis	France	LFCY	1	30/04/2015							1
Aerodrome	Auch Lamothe	France	LFDH	2	28/05/2015							2
Aerodrome	Rochefort Charente Maritime	France	LFDN					1	23/05/2018			1
Aerodrome	Ouessant	France	LFEC	2	11/12/2014							2
Aerodrome	Colmar Houssen	France	LFGA		02/05/2013			2	21/06/2018			2
Aerodrome	Dole Tavaux	France	LFGJ		09/01/2014			1	21/11/2017			1
Aerodrome	Le Puy Loudes	France	LFHP		04/02/2016			2	28/02/2019			2
Aerodrome	Moulins Montbeugny	France	LFHY	1	01/05/2014							1
Aerodrome	Metz Nancy Lorraine	France	LFJL	1	04/04/2013			1	21/11/2017			2
Aerodrome	Angers Marcé	France	LFJR		07/01/2016			1	21/11/2017			1
Aerodrome	Bastia Poretta	France	LFKB					1	07/12/2017			1
Aerodrome	Calvi Sainte Catherine	France	LFKC	2	30/04/2015							2
Aerodrome	Ajaccio Napoléon Bonaparte	France	LFKJ	1	23/06/2016							1
Aerodrome	Figari Sud Corse	France	LFKF					1	21/11/2017			1
Aerodrome	Auxerre Branches	France	LFLA	2	21/08/2014							2
Aerodrome	Clermont-Ferrand Auvergne	France	LFLC		05/05/2011			1	21/11/2017			1
Aerodrome	Bourges	France	LFLD	1	18/08/2016							1

Operational Aerodromes / Heliports /Routes												
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Aerodrome	Lyon St Exupery	France	LFLN		07/02/2013			4	15/08/2019			4
Aerodrome	Saint Yan	France	LFLN					2	02/03/2017			2
Aerodrome	Annecy Meythet	France	LFLP	2	19/09/2013							2
Aerodrome	Grenoble Isere	France	LFLS		05/12/2019			2	13/10/2016			2
Aerodrome	Valence	France	LFLU		13/12/2012			1	21/11/2017			1
Aerodrome	Vichy Charmeil	France	LFLV		05/02/2015			1	26/04/2018			1
Aerodrome	Aurillac	France	LFLW		26/06/2014			1	15/08/2019			1
Aerodrome	Chateauroux Deols	France	LFLX		06/02/2014			2	15/08/2019			2
Aerodrome	Lyon Bron	France	LFLY					2	28/09/2016			2
Aerodrome	Cannes Mandelieu	France	LFMD	1	05/02/2015							1
Aerodrome	Saint Étienne Bouthéon	France	LFMH		24/07/2014			2	02/02/2017			2
Aerodrome	Carcassonne Salvaza	France	LFMK		03/05/2012			2	21/11/2017			2
Aerodrome	Marseille	France	LFML	4	08/01/2015	2	25/06/2015					6
Aerodrome	Nice Côte d'Azur	France	LFMN		25/06/2015			2	25/04/2019			2
Aerodrome	Perpignan Rivesaltes	France	LFMP	1	15/10/2015							1
Aerodrome	Montpellier Mediterranee	France	LFMT					1	05/12/2019			1
Aerodrome	Béziers Vias	France	LFMU	2	18/10/2012							2
Aerodrome	Avignon Caumont	France	LFMV					3	21/06/2018			3
Aerodrome	Mende	France	LFNB	1	17/12/2013							1
Aerodrome	Beauvais	France	LFOB	1	20/09/2012							1

Operational Aerodromes / Heliports /Routes												
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Aerodrome	Le Havre Octeville	France	LFOH		10/12/2015			2	21/11/2017			2
Aerodrome	Chalons Vatry	France	LFOK	2	02/02/2017							2
Aerodrome	Blois Le Breuil	France	LFOQ		15/09/2016			1	25/04/2019			1
Aerodrome	Cholet le Pontreau	France	LFOU	2	04/02/2016							2
Aerodrome	Laval Entrammes	France	LFOV	2	26/04/2018							2
Aerodrome	Orléans St. Denis De L'Hotel	France	LFOZ	2	28/06/2012							2
Aerodrome	Paris-Le Bourget	France	LFPB	1	02/06/2011			1	21/11/2017			2
Aerodrome	Paris Charles de Gaulle	France	LFPG					8	28/04/2016			8
Aerodrome	Melun Villaroche	France	LFPM		10/12/2015			2	21/11/2017			2
Aerodrome	Toussus Le Noble	France	LFPN					2	27/04/2017			2
Aerodrome	Paris Orly	France	LFPO	3	30/05/2013	1	30/04/2015	2	21/11/2017			6
Aerodrome	Pontoise Corneilles en Vexin	France	LFPT	1	01/05/2014			2	21/11/2017			3
Aerodrome	Reims Prunay	France	LFQA	1	03/04/2014							1
Aerodrome	Troyes Barberey	France	LFQB					2	18/08/2016			2
Aerodrome	Nevers Fouchambault	France	LFQG	1	13/12/2012							1
Aerodrome	Besançon La Vèze	France	LFQM	1	18/09/2014							1
Aerodrome	Lille Lesquin	France	LFQQ	3	26/06/2014							3
Aerodrome	Merville	France	LFQT	2	15/11/2012							2
Aerodrome	Brest Bretagne	France	LFRB	1	03/05/2012	1	01/01/2014					2
Aerodrome	Cherbourg Maupertus	France	LFRC					1	23/06/2016			1

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Aerodrome	Dinard	France	LFRD	1	06/02/2014			1	21/11/2017			2
Aerodrome	Deauville Saint Gatien	France	LFRG	1	18/09/2014							1
Aerodrome	La Roche Sur Yon	France	LFRI		13/12/2012			1	10/11/2016			1
Aerodrome	Caen Carpiquet	France	LFRK		11/12/2014			1	21/11/2017			1
Aerodrome	Le Mans	France	LFRM	1	15/11/2012							1
Aerodrome	Rennes	France	LFRN	2	30/05/2013							2
Aerodrome	Lannion	France	LFRQ		07/01/2016			1	21/11/2017			1
Aerodrome	Quimper	France	LFRQ		29/03/2019			2	21/11/2017			2
Aerodrome	Nantes	France	LFRS	1	28/06/2012							1
Aerodrome	Saint Brieuc Armor	France	LFRT		10/12/2015			1	21/11/2017			1
Aerodrome	Morlaix Ploujean	France	LFRU	1	13/10/2016							1
Aerodrome	Vannes Meucon	France	LFRV	1	31/05/2012							1
Aerodrome	Saint Nazaire Montoir	France	LFRZ		28/10/2014			1	21/11/2017			1
Aerodrome	Bâle-Mulhouse	France	LFSB	2	10/12/2015							2
Aerodrome	Dijon-Longvic	France	LFSD	1	28/04/2016							1
Aerodrome	Epinal Mirecourt	France	LFSG	1	30/05/2013							1
Aerodrome	Brive Souillac	France	LFSL	2	22/08/2013							2
Aerodrome	Nancy Essey	France	LFSN		02/05/2013			1	26/04/2018			1
Aerodrome	Strasbourg Entzheim	France	LFST		10/12/2015			2	21/11/2017			2
Aerodrome	Nîmes Garons	France	LFTW	1	18/10/2012			1	21/11/2017			2
Aerodrome	Bautzen	Germany	EDAB	2	27/04/2017		15/12/2011					2

Operational Aerodromes / Heliports /Routes												
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Aerodrome	Leipzig/Altenburg	Germany	EDAC					2	28/03/2019			2
Aerodrome	Schoenhagen	Germany	EDAZ					1	11/10/2018			1
Aerodrome	Barth	Germany	EDBH			1	03/06/2010					1
Aerodrome	Magdeburg/City	Germany	EDBM	1	13/12/2012							1
Aerodrome	Neubrandenburg	Germany	EDBN	2	02/04/2015							2
Aerodrome	Berlin/Schönefeld	Germany	EDDB			2	04/06/2009					2
Aerodrome	Dresden	Germany	EDDC			2	15/12/2011					2
Aerodrome	Erfurt-Weimar	Germany	EDDE			2	15/12/2011					2
Aerodrome	Frankfurt Main	Germany	EDDF			4	15/12/2011					4
Aerodrome	Münster/Osnabrück	Germany	EDDG			2	15/12/2011					2
Aerodrome	Hamburg	Germany	EDDH			4	15/12/2011					4
Aerodrome	Köln/Bonn	Germany	EDDK				15/12/2011	6	12/09/2019			6
Aerodrome	Düsseldorf	Germany	EDDL			4	15/12/2011					4
Aerodrome	München	Germany	EDDM				15/12/2011	4	23/05/2019			4
Aerodrome	Nürnberg	Germany	EDDN			1	15/12/2011					1
Aerodrome	Leipzig/Halle	Germany	EDDP				15/12/2011	4	30/01/2020			4
Aerodrome	Saarbrücken	Germany	EDDR		01/03/2018	2	28/03/2019					2
Aerodrome	Stuttgart	Germany	EDDS			1	15/12/2011					1
Aerodrome	Berlin-Tegel	Germany	EDDT			4	15/12/2011					4
Aerodrome	Hannover	Germany	EDDV			4	15/12/2011					4
Aerodrome	Bremen	Germany	EDDW				15/12/2011	2	30/03/2017			2

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Aerodrome	Frankfurt Hahn	Germany	EDFH		23/07/2015			2	14/09/2017			2
Aerodrome	Allendorf/Eder	Germany	EDFQ	1	21/08/2014							1
Aerodrome	Siegerland	Germany	EDGS	1	12/10/2017			1	12/10/2017			2
Aerodrome	Hamburg- Finkenwerder	Germany	EDHI	2	13/12/2012							2
Aerodrome	Memmingen	Germany	EDJA			2	15/12/2011					2
Aerodrome	Moenchengladbach	Germany	EDLN					2	06/12/2018			2
Aerodrome	Paderborn/Lippstadt	Germany	EDLP		13/12/2012			2	10/10/2019			2
Aerodrome	Niederrhein	Germany	EDLV	1	23/06/2016							1
Aerodrome	Dortmund	Germany	EDLW	2	12/12/2013							2
Aerodrome	Augsburg	Germany	EDMA			1	15/12/2011	1	11/10/2018			2
Aerodrome	Eggenfelden	Germany	EDME	1	11/12/2014							1
Aerodrome	Oberpfaffenhofen	Germany	EDMO		13/12/2012			1	23/05/2019			1
Aerodrome	Straubing	Germany	EDMS	1	11/12/2014							1
Aerodrome	Friedrichshafen	Germany	EDNY				15/12/2011	2	19/07/2018			2
Aerodrome	Donauwörth	Germany	EDPR	2	08/12/2016							2
Aerodrome	Coburg- Brandensteinsebene	Germany	EDQC	1	11/12/2014							1
Aerodrome	Bayreuth	Germany	EDQD			1	15/12/2011					1
Aerodrome	Giebelstadt	Germany	EDQG			2	14/02/2012					2
Aerodrome	Hof-Plauen	Germany	EDQM					2	21/06/2018			2
Aerodrome	Karlsruhe/Baden- Baden	Germany	EDSB		17/09/2015			2	27/04/2017			2

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Aerodrome	Donaueschingen- Villingen	Germany	EDTD	1	11/12/2014							1
Aerodrome	Lahr	Germany	EDTL	1	23/06/2016			1	27/04/2017			2
Aerodrome	Mengen-Hohentengen	Germany	EDTM	1	11/12/2014							1
Aerodrome	Schwäbisch-Hall	Germany	EDTY	2	13/12/2012							2
Aerodrome	Braunschweig- Wolfsburg	Germany	EDVE	2	18/10/2012							2
Aerodrome	Kassel-Calden	Germany	EDVK	2	04/04/2013							2
Aerodrome	Emden	Germany	EDWE	4	30/05/2013							4
Aerodrome	Wilhelmshaven JadeWeserAirport	Germany	EDWI			2	15/12/2011					2
Aerodrome	Sylt	Germany	EDXW	2	10/12/2015							2
Aerodrome	Ioannina	Greece	LGIO	2	27/02/2020							2
Aerodrome	Kos	Greece	LGKO	2	27/02/2020							2
Aerodrome	Mitilini	Greece	LGMT	1	27/02/2020							1
Aerodrome	Thessaloniki	Greece	LGTS	1	27/02/2020							1
Aerodrome	Alderney	Guernsey	EGJA	2	07/12/2011							2
Aerodrome	Guernsey	Guernsey	EGJB					2	10/10/2019			2
Aerodrome	Budapest Liszt Ferenc	Hungary	LHBP					4	15/09/2016			4
Aerodrome	Debrecen International Airport	Hungary	LHDC	1	30/01/2020							1
Aerodrome	Husavik	Iceland	BIHU	1	29/03/2019							1
Aerodrome	Cork Airport	Ireland	EICK	3	16/08/2018							3
Aerodrome	Dublin	Ireland	EIDW	4	25/05/2017							4

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Aerodrome	Cles Heli-pad	Italy	DT71	2	30/01/2020							2
Aerodrome	Lamezia Terme	Italy	LICA	1	23/05/2018							1
Aerodrome	Lampedusa	Italy	LICD					1	30/01/2020			1
Aerodrome	Pantelleria	Italy	LICG					2	21/06/2018			2
Aerodrome	Palermo/Punta Raisi	Italy	LICJ	3	11/10/2018							3
Aerodrome	Reggio Calabria	Italy	LICR					1	19/07/2018			1
Aerodrome	Trento/Mattarello	Italy	LIDT	2	30/01/2020							2
Aerodrome	Alghero/Fertilia	Italy	LIEA	2	11/10/2018							2
Aerodrome	Olbia/Costa Smeralda	Italy	LIEO	1	12/11/2015							1
Aerodrome	Milano/Malpensa	Italy	LIMC	2	21/08/2014							2
Aerodrome	Bergamo / Orio al Serio	Italy	LIME	1	20/07/2017							1
Aerodrome	Milano/Linate	Italy	LIML	2	13/12/2012							2
Aerodrome	Parma	Italy	LIMP					1	23/05/2018			1
Aerodrome	Cuneo/Levaldigi	Italy	LIMZ					1	23/05/2018			1
Aerodrome	Bologna/Borgo Panigale	Italy	LIPE	2	03/01/2019							2
Aerodrome	Ancona/Falconara	Italy	LIPY					1	03/01/2019			1
Aerodrome	Venezia/Tessera	Italy	LIPZ	4	27/06/2013							4
Aerodrome	Verona/Villafranca	Italy	LIPX		22/06/2017							0
Aerodrome	Roma/Fiumicino	Italy	LIRF	6	10/01/2013			2	23/05/2019			8
Aerodrome	Firenze/Peretola	Italy	LIRQ	1	22/06/2017							1

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Aerodrome	Luxembourg	Luxembourg	ELLX					2	26/03/2020			2
Aerodrome	Luqa	Malta	LMML	2	11/10/2018			2	11/10/2018			4
Aerodrome	Podgorica	Montenegro	LYPG					1	26/03/2020			1
Aerodrome	Amsterdam	Netherlands	EHAM	1	21/06/2018			4	05/12/2019			5
Aerodrome	Eelde	Netherlands	EHGG	2	13/11/2014							2
Aerodrome	Lelystad	Netherlands	EHLE	2	05/12/2019							2
Aerodrome	Teuge	Netherlands	EHTE	1	13/11/2014							1
Aerodrome	Ålesund/Vigra	Norway	ENAL		03/03/2016			2	07/11/2019			2
Aerodrome	Andøya/Andenes	Norway	ENAN	2	02/04/2015							2
Aerodrome	Førde/Bringeland	Norway	ENBL	1	28/05/2015			1	27/04/2017			2
Aerodrome	Brønnøysund/Brønnøy	Norway	ENBN	1	08/12/2016							1
Aerodrome	Bodo	Norway	ENBO	1	06/12/2018							1
Aerodrome	Bergen/Flesland	Norway	ENBR				03/03/2016	2	28/02/2019			2
Aerodrome	Kristiansand/Kjevik	Norway	ENCN			2	03/03/2016					2
Aerodrome	Bardufoss	Norway	ENDU	2	26/04/2018							2
Aerodrome	Harstad/Narvik/Evenes	Norway	ENEV	1	30/03/2017							1
Aerodrome	Florø	Norway	ENFL	1	02/04/2015							1
Aerodrome	Gardermoen	Norway	ENGM					4	10/11/2016			4
Aerodrome	Haugesund/Karmøy	Norway	ENHD			2	03/03/2016					2
Aerodrome	Kristiansund/Kvernberget	Norway	ENKB	2	26/05/2016							2

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Aerodrome	Kirkenes/Hoybukmoe n	Norway	ENKR	2	27/04/2017							2
Aerodrome	Leknes	Norway	ENLK	1	02/02/2017	1	10/10/2019					2
Aerodrome	Mehamn	Norway	ENMH	2	05/12/2019		28/03/2019					2
Aerodrome	Molde/Årø	Norway	ENML					2	30/03/2017			2
Aerodrome	Mosjøen/Kjærstad	Norway	ENMS	1	30/03/2017							1
Aerodrome	Namsos	Norway	ENNM		02/04/2015			2	27/04/2017			2
Aerodrome	Ørland	Norway	ENOL				03/03/2016	2	12/10/2017			2
Aerodrome	Rørvik/Ryum	Norway	ENRM					2	02/02/2017			2
Aerodrome	Røst	Norway	ENRS	2	06/03/2014							2
Aerodrome	Moss/Rygge	Norway	ENRY	2	10/12/2015							2
Aerodrome	Sogndal/Haukasen	Norway	ENSG		17/08/2017			1	14/09/2017			1
Aerodrome	Svolvær/Helle	Norway	ENSH	1	08/12/2016							1
Aerodrome	Stokmarknes/Skagen	Norway	ENSK	1	08/12/2016							1
Aerodrome	Stord/Sørstokken	Norway	ENSO			2	03/03/2016					2
Aerodrome	Sandnessjøen/Stokka	Norway	ENST		23/07/2015			2	30/01/2020			2
Aerodrome	Sandefjord/Torp	Norway	ENTO	2	20/08/2015							2
Aerodrome	Trondheim/Vårnes	Norway	ENVA				03/03/2016	2	27/02/2020			2
Aerodrome	Stavanger/Sola	Norway	ENZV				03/03/2016	4	09/11/2017			4
Aerodrome	Bydgoszcz - Szvederowo	Poland	EPBY					2	26/04/2018			2
Aerodrome	Gdańsk Lech Wałęsa	Poland	EPGD		28/05/2015			2	26/04/2018			2

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Kraków - Balice	Poland	EPKK		18/08/2016			2	26/04/2018			2
Aerodrome	Katowice	Poland	EPKT		03/04/2014			2	26/04/2018			2
Aerodrome	Lublin	Poland	EPLB					2	26/04/2018			2
Aerodrome	Łódź - Lublinek	Poland	EPLL					2	21/06/2018			2
Aerodrome	Warszawa/Modlin	Poland	EPMO					2	26/04/2018			2
Aerodrome	Poznan Lawica	Poland	EPPO					2	18/07/2019			2
Aerodrome	Rzeszów - Jasionka	Poland	EPRZ		15/09/2016			2	26/04/2018			2
Aerodrome	Szczecin - Goleniów	Poland	EPSC					2	26/04/2018			2
Aerodrome	Olsztyn - Mazury	Poland	EPSY					2	26/04/2018			2
Aerodrome	Warszawa - F. Chopin	Poland	EPWA					4	26/04/2018			4
Aerodrome	Wroclaw/Strachowice	Poland	EPWR		13/10/2016			2	26/04/2018			2
Aerodrome	Zielona Góra - Babimost	Poland	EPZG					2	18/07/2019			2
Aerodrome	Faro	Portugal	LPFR	1	18/07/2019							1
Aerodrome	Porto	Portugal	LPPR	1	12/10/2017							1
Aerodrome	Lisboa	Portugal	LPPT	2	28/05/2015							2
Aerodrome	Cluj - Napoca / Avram Iancu	Romania	LRCL	2	10/11/2016							2
Aerodrome	Beograd/Nikola Tesla	Serbia	LYBE					2	26/03/2020			2
Aerodrome	Niš/Konstantin Veliki	Serbia	LYNI					1	26/03/2020			1
Aerodrome	Bratislava-Milan Rastislav Štefánik	Slovak Republic	LZIB	2	05/02/2015							2
Aerodrome	Košice	Slovak Republic	LZKZ	2	05/02/2015							2

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Piešťany	Slovak Republic	LZPP					1	02/02/2017			1
Aerodrome	Poprad-Tatry	Slovak Republic	LZTT					2	29/03/2018			2
Aerodrome	Žilina	Slovak Republic	LZZI					1	25/05/2017			1
Aerodrome	Lanzarote AD	Spain	GCRR	1	23/05/2019							1
Aerodrome	Almería	Spain	LEAM	2	02/02/2017							2
Aerodrome	Palma de Mallorca	Spain	LEPA	3	01/03/2018							3
Aerodrome	Valencia Airport	Spain	LEVC	2	01/02/2018							2
Aerodrome	Vigo	Spain	LEVX	2	05/12/2019							2
Aerodrome	Santander	Spain	LEXJ	2	17/10/2013							2
Aerodrome	Jönköping	Sweden	ESGJ	2	09/11/2017							2
Aerodrome	Skövde	Sweden	ESGR	2	31/05/2018							2
Aerodrome	Trollhättan- Vänersborgs flygplats	Sweden	ESGT	2	29/03/2018							2
Aerodrome	Mora/Siljan	Sweden	ESKM	2	30/01/2020							2
Aerodrome	Kristianstad	Sweden	ESMK	2	06/12/2018							2
Aerodrome	Kalmar Öland Airport	Sweden	ESMQ	1	28/03/2019	1	28/03/2019					2
Aerodrome	Halmstad	Sweden	ESMT	2	08/11/2018							2
Aerodrome	Växjö Kronoberg	Sweden	ESMX	2	25/04/2019							2
Aerodrome	Sveg	Sweden	ESND	2	31/01/2019							2
Aerodrome	Lapland Airport	Sweden	ESNG	2	20/06/2019							2
Aerodrome	Lycksele Airport	Sweden	ESNL	2	15/08/2019							2

Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Örnsköldsvik	Sweden	ESNO	2	07/12/2017							2
Aerodrome	Skellefteå Airport	Sweden	ESNS			2	28/03/2019					2
Aerodrome	Vilhelmina	Sweden	ESNV	2	27/02/2020							2
Aerodrome	Arvidsjaur	Sweden	ESNX	2	05/12/2019							2
Aerodrome	Örebro Airport	Sweden	ESOE	2	16/08/2018							2
Aerodrome	Hagfors	Sweden	ESOH	1	30/01/2020							1
Aerodrome	Stockholm/Västerås	Sweden	ESOW	2	30/01/2020							2
Aerodrome	Linköping/Saab	Sweden	ESSL	2	31/01/2019							2
Aerodrome	Norrköping Kungsängen	Sweden	ESSP	2	29/03/2018							2
Aerodrome	Torsby	Sweden	ESST	2	23/05/2019							2
Aerodrome	Ängelholm	Sweden	ESTA			2	19/07/2018					2
Aerodrome	Storuman	Sweden	ESUD		11/12/2014							0
Aerodrome	Hemavan Tärnaby Airport AB	Sweden	ESUT	1	11/10/2018							1
Aerodrome	Les Eplatures	Switzerland	LSGC					2	26/05/2016			2
Aerodrome	Genève	Switzerland	LSGG		12/11/2015			2	13/09/2018			2
Aerodrome	Dübendorf	Switzerland	LSMD	2	21/08/2014			1	30/01/2020			3
Aerodrome	Emmen	Switzerland	LSME	1	03/04/2014							1
Aerodrome	Payerne	Switzerland	LSMP		17/09/2015			1	05/12/2019			1
Aerodrome	Berne-Belp	Switzerland	LSZB	1	07/03/2013							1
Aerodrome	Grenchen	Switzerland	LSZG	1	25/07/2013							1



Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Zurich	Switzerland	LSZH	1	06/12/2018			1	25/05/2017			2
Aerodrome	St. Gallen-Altenrhein	Switzerland	LSZR	1	17/11/2011							1
Route	Hel Low-Flight Route KY251	Switzerland	KY251							1	22/06/2017	1
Route	Hel Low-Flight Route KY252	Switzerland	KY252							1	22/06/2017	1
Route	Hel Low-Flight Route KY253	Switzerland	KY253							1	22/06/2017	1
Route	Hel Low-Flight Route KY256	Switzerland	KY256							1	22/06/2017	1
Route	Hel Low-Flight Route KY257	Switzerland	KY257							1	22/06/2017	1
Aerodrome	Campbeltown	United Kingdom	EGEC	2	23/06/2016							2
Aerodrome	Cardiff	United Kingdom	EGFF	2	13/10/2016							2
Aerodrome	Bristol	United Kingdom	EGGD	2	21/08/2014							2
Aerodrome	Lands End	United Kingdom	EGHC	4	27/04/2017							4
Aerodrome	Yeovil	United Kingdom	EGHG	2	09/06/2017							2
Aerodrome	Southampton	United Kingdom	EGHI	1	11/10/2018							1
Aerodrome	Jersey	United Kingdom	EGJJ					2	23/05/2019			2
Aerodrome	Barrow/Walney Island	United Kingdom	EGNL	2	23/06/2016							2
Aerodrome	Kirkwall	United Kingdom	EGPA	2	21/07/2016							2
Aerodrome	Sumburgh	United Kingdom	EGPB	3	11/10/2018							3
Aerodrome	Wick	United Kingdom	EGPC	2	23/06/2016							2
Aerodrome	Islay	United Kingdom	EGPI	2	18/08/2016							2
Aerodrome	Prestwick	United Kingdom	EGPK	3	30/01/2020							3

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Operational Aerodromes / Heliports /Routes												
Aerodrome/ Route	Name	Country	ICAO Code	# APV-I Procedure (s)	Activation APV-I procedure	#APV Baro Procedure (s)	Activation APV Baro Procedure	# LPV- 200 Procedure (s)	Activation LPV-200 procedure	# RNP 0.3 Procedure (s)	Activation RNP 0.3 procedure	Total Procedures
Aerodrome	Dundee	United Kingdom	EGPN	2	30/03/2017							2
Aerodrome	Barra	United Kingdom	EGPR	2	18/08/2016							2
Aerodrome	Tiree	United Kingdom	EGPU	2	04/02/2016							2
Aerodrome	Exeter	United Kingdom	EGTE	2	21/08/2014							2

Table 14: Full list of EGNOS-based Approach Procedures as of 26<sup>th</sup> March 2020 (AIRAC cycle#2004)

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