NAVIGATION SOLUTIONS POWERED BY EUROPE

EUROPEAN GNSS (GALILEO) INITIAL SERVICES

OPEN SERVICE

QUARTERLY PERFORMANCE REPORT

JANUARY - MARCH 2017

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1 INTRODUCTION

This document is the *Galileo Initial Open Service (IS OS) Public Performance Report* for the period of January, February and March 2017. Following the declaration of Initial Services in December 2016, a new edition will be published after each quarter, in order to provide the public with information about the Galileo Open Service measured performance statistics.

This document reports on the following performance parameters, with respect to their Minimum Performance Levels (MPLs) declared in the [OS-SDD]:

- ◊ Galileo Initial Open Service Ranging Performance;
- ◊ Galileo UTC Dissemination and GGTO Determination Performance;
- ◊ Galileo Positioning Performance;
- ◊ Timely Publication of Notice Advisory to Galileo Users (NAGUs)[1].

The document comprises the following sections:

Section 1: Introduces the Galileo Constellation Status over the quarterly reporting period. Some information about planned evolution of the Constellation is given in Section 2.

Section 2: Provides an executive summary about achieved performance. Details are reported in the following chapters.

Section 3: The Initial Open Service Ranging Performance is organized in two subsections: "Availability of the Galileo SF/DF Ranging Service" and "Galileo Signal in Space Ranging Accuracy". Furthermore, "Per-slot Availability of HEALTHY Signal in Space" is provided.

Section 4: The "UTC Dissemination and GGTO Determination Performance" is presented in two subsections: the "Availability of the Galileo Time Correlation Parameters" and the "Accuracy of the Galileo Time Correlation Parameters". Performance is evaluated for the Universal Time Coordinated (UTC) Time & Frequency Dissemination service and the GST-GPS Time Offset (GGTO) Determination.

Section 5: The "Galileo Positioning Performance" is illustrated in three subsections: "Availability of Global Horizontal Dilution of precision (HDOP)", "Availability of Galileo Horizontal Positioning" and "Galileo measured Positioning Performance".

Section 6: The "Timely Publication of Notice Advisory to Galileo Users (NAGUs)" is analysed.

Section 7: The cited reference documents are listed, along with a short abstract of the Minimum Performance Levels (MPLs) definitions as per [OS-SDD].

[1] NAGUs are issued publicly by the European GNSS Service Centre (GSC)

1.1 GALILEO CONSTELLATION STATUS

Table 1 provides the status of the Galileo constellation for which the performance data has been derived for the reporting period.

Satellite Code	SV ID (PRN)	CCSDS ID [hex]	Orbital Slot	Status
GSAT-0101	11	3A5	B05	Available
GSAT-0102	12	3A6	B06	Available
GSAT-0103	19	3A7	C04	Available
GSAT-0203	26	263	B08	Available
GSAT-0204	22	264	B03	Available
GSAT-0205	24	265	A08	Available
GSAT-0206	30	266	A05	Available
GSAT-0208	8	268	C07	Available
GSAT-0209	9	269	C02	Available
GSAT-0210	1	26A	A02	Available
GSAT-0211	2	26B	A06	Available

Table 1: Galileo Reported Constellation Information

For the most up-to-date information, please refer to the European GNSS Service Centre (GSC) Web pages:

GNSS Service Centre Web Resources	
Constellation Information	https://www.gsc-europa.eu/system-status/Constellation-Information
Reference Constellation Orbital and Technical Parameters	https://www.gsc-europa.eu/system-status/orbital-and-technical-parameters
Incident Reporting	https://www.gsc-europa.eu/helpdesk/galileo-incident-report-form (Galileo Incidents Report Form)
Interactive support to users	https://www.gsc-europa.eu/contact-us/helpdesk (Galileo Help Desk)

Table 2: GSC Main Information web pages about Galileo Status (1/2)

Note that the Galileo Help Desk allows close interaction with users, both to support the exploitation of Galileo services and to collect relevant information on signal performance as observed by the users.

Finally, an important service provided by the GSC consists of the timely publication of Notice Advisory to Galileo Users (NAGU) messages, as detailed in Section 6.

2 EXECUTIVE SUMMARY

During this first quarterly reporting period after declaration of Initial Services, the measured Galileo Initial Open Service performance figures in general exceed the Minimum Performance Level (MPL) targets specified in the [OS-SDD] with significant margins. The following dashboards summarize the compliance with MPLs, using the colour coding defined in the legend below:

OS MPLs			Target Value	Jan-17	Feb-17	Mar-17
OS SIS Ranging Service	Accuracy, Any Satellite	E5a-E1 user	≤ 7m [95%]			
		E5b-E1 user				
		E1 user				
		E5a user				
		E5b user				

Table 3: MPL Fulfilment Status Dashboard (1/2)

Allocation of Satellites in previous table

GSAT-0101	GSAT-0102	GSAT-0103	GSAT-0210
GSAT-0203	GSAT-0204	GSAT-0205	GSAT-0211
GSAT-0206	GSAT-0208	GSAT-0209	-

Legend

- MPL measurement not available (e.g.: satellite not yet declared available)
- Target Value for MPL is fulfilled
- Target Value for MPL is NOT fulfilled (less than 10% away from the Target Value)
- Target Value for MPL is NOT fulfilled (more than 10% away from the Target Value)

OS MPLs				Target Value	Jan-17	Feb-17	Mar-17
SIS Ranging	Accuracy, Over All Satellites	E5a-E1 user		≤ 2m [95%]			
		E5b-E1 user					
		E1 user					
		E5a user					
		E5b user					
	Availability	Per-slot	E5a-E1	≥ 87%			
			E5b-E1				
			E1				
			E5a				
			E5b				
		Ranging Service	SF / DF Worst Case @ WUL	≥ 87%			
Timing	Accuracy	UTC Time Dissemination		≤ 30ns [95%]			
		UTC Frequency Dissemination		< 3E-13 [95%]			
		GGTO Determination		≤ 20ns [95%]			
	Availability	UTC Determination Service		≥ 87%			
		GGTO Determination Service		≥ 80%			
User Interface	NAGU	Planned Timeliness		≥ 1 day	N/A		
		Unplanned Timeliness		≤ 3 days			

Table 4: MPL Fulfilment Status Dashboard (2/2)

Availability of the Galileo Ranging Service at the Worst User Location (WUL), with monthly values of **100%,** is significantly above expectations, where the MPL is **87%**. The "per-satellite" **Availability of a Healthy Signal**, with average monthly values better than **97.33%**, is also significantly better than the MPL of **87%**.

The **Signal in Space Ranging Accuracy** shows a 95th percentile monthly accuracy better than **1.07 [m]** for individual space vehicles. Compliance with the [OS-SDD] MPL is also achieved in this case, with the threshold fixed to **7 [m].**

The average over all space vehicles provides figures better than **0.7 [m]**, which is comfortably within the specified [OS-SDD] MPL threshold of **2 [m]**.

Availability of the Galileo UTC Time Determination Service is achieved, with a monthly value of **100%,** compared to the [OS-SDD] MPL target of **87%.**

Availability of GGTO Determination (not declared as a Service in this phase) was **100%** in January and March, showed a slightly lower figure of **96.44%** in February. This was still well above the [OS-SDD] MPL target of **80%.**

Excellent values are achieved for **UTC Time Dissemination Service Accuracy** (≤ **11.70 [ns]**), **UTC Frequency Dissemination Service Accuracy** (normalized offset better than $\mathbf{4.55\times10^{-14}}$) and the **GGTO Determination Accuracy** (≤ **7.3 [ns]**), all computed by accumulating samples over the previous 12 months [2]. The [OS-SDD] MPL targets are all met, respectively **30 [ns]**, $\mathbf{3\times10^{-13}}$ and **20 [ns]**.

The **Availability of HDOP ≤ 5** is at least **67.71%,** while the Availability of **Galileo Horizontal Positioning** is at least **78.97%.** These figures are in line with the deployment status of the Galileo constellation during the reporting period (11 declared operational satellites) and with the expected minimum threshold for Initial Services, defined in the [OS-SDD] as **50%** in both cases. These figures will continuously improve with the constellation completion towards the final operational capability.

Availability figures are complemented with "Galileo-only" measured 3D positioning performance attainable when PDOP ≤ 6, notwithstanding the fact that positioning is not yet declared as a Galileo Service. The 95th percentile of **Horizontal and Vertical Positioning Errors** (HPE and VPE, correspondingly) does not exceed **3.56 [m]** and **4.12 [m]** respectively during the reporting period. **Horizontal and Vertical 3D Positioning Errors** are within **2.85 [m]** and **4.87 [m]** respectively for HPE and VPE during the same observation interval. In line with the [OS-SDD], no MPL is presently applicable to HPE and VPE values.

Regarding **Publication of NAGUs**, [OS-SDD] MPLs are met for both Planned and Unplanned events, so that the target of at least **24 hours** before a scheduled event starts is always achieved, as well as not more than **72 hours** after an unscheduled one.

Further performance improvements are expected with the on-going Galileo System deployment.

A successful simultaneous launch of four Galileo satellites (GSAT-0207, -0212, -0213, -0214) occurred on November 17th, 2016; these satellites are currently in the commissioning phase.

[2] Monthly figures related to time scales result from processing measurements accumulated since an initial time that is prior to the declaration of Galileo Initial Services.

3 INITIAL OPEN SERVICE RANGING PERFORMANCE

In this section of the report the following performance figures for the Galileo Initial Open Service are provided:

- ◊ Availability of the Galileo SF/DF Ranging Service in section 3.1.
- ◊ Per-slot Availability of HEALTHY Signal in Space in section 3.2.
- ◊ Galileo Signal in Space Ranging Accuracy in section 3.3.

3.1 AVAILABILITY OF THE GALILEO SF/DF RANGING SERVICE

The Availability of the Galileo SF/DF Ranging Service is computed at any user location as the percentage of time that the user is provided with at least one HEALTHY[3] Galileo Open Service (OS) Signal in Space (SiS).

The following figure shows the monthly availabilities of the Galileo Single Frequency (SF) and Dual Frequency (DF) Ranging Services at the Worst User Location (WUL). WUL is selected among the nodes of an equally spaced geographic grid, within the Navigation Service coverage area.

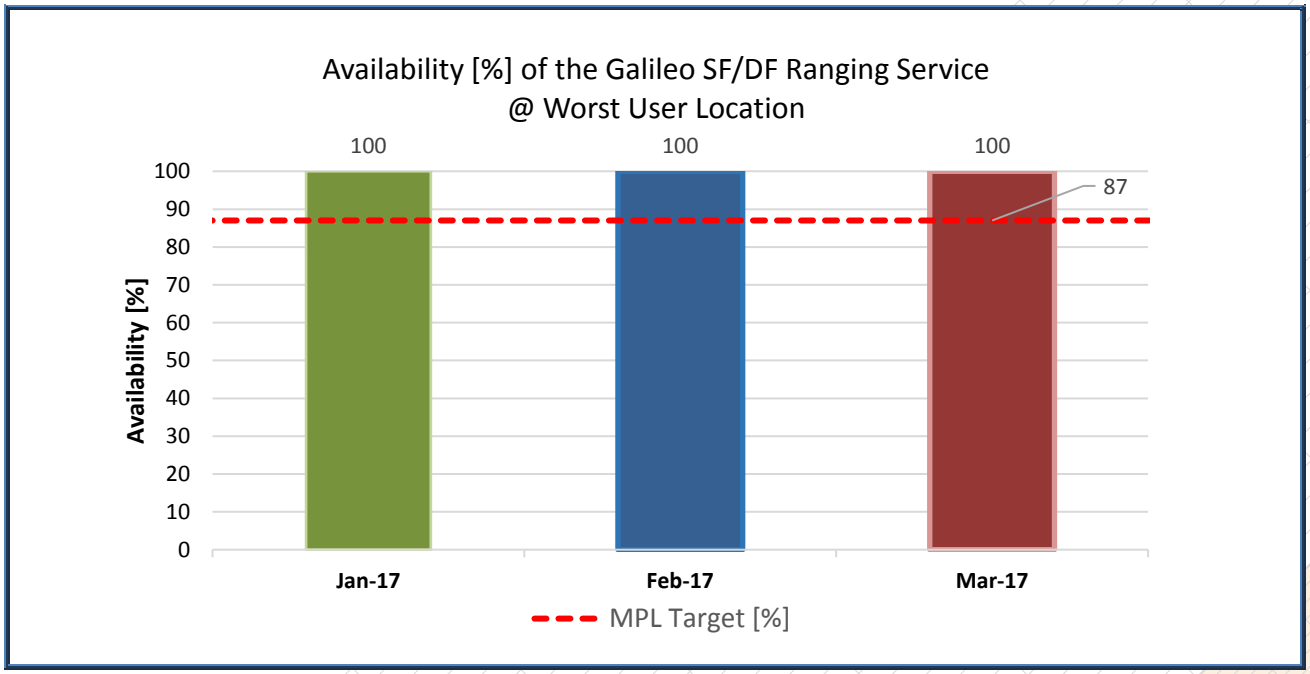


Figure 1: Monthly Availability of the Galileo SF/DF Ranging Service

[3] ***HEALTHY*** *Galileo Open Signal in Space* is defined in [OS-SDD] .

The availability of the Galileo Dual Frequency and Single Frequency Ranging Service is always **100%** for the reported months, well above the Minimum Performance Level from [OS-SDD], specified as **87%** [4] .

3.2 PER-SLOT AVAILABILITY OF HEALTHY SIGNAL IN SPACE

The "Availability of HEALTHY Signal in Space" is defined, for each Galileo constellation operational satellite, as the percentage of time that the specific satellite broadcasts HEALTHY[3] Galileo Open Service Signals in Space. Figure 2 provides the Signal in Space "per slot", constellation averaged monthly availability of Galileo HEALTHY Signals in Space over the reporting period.[5] The worst-case among Single Frequency/Dual Frequency RF signals and signal combinations is considered, per each space vehicle, and for each month. The [OS-SDD] Minimum Performance Level (MPL) specifies **87%** [6] as target for the annually normalised constellation average. A moving average is implemented starting from January 2017; the monthly constellation behaviour is in line with the required annual figure.

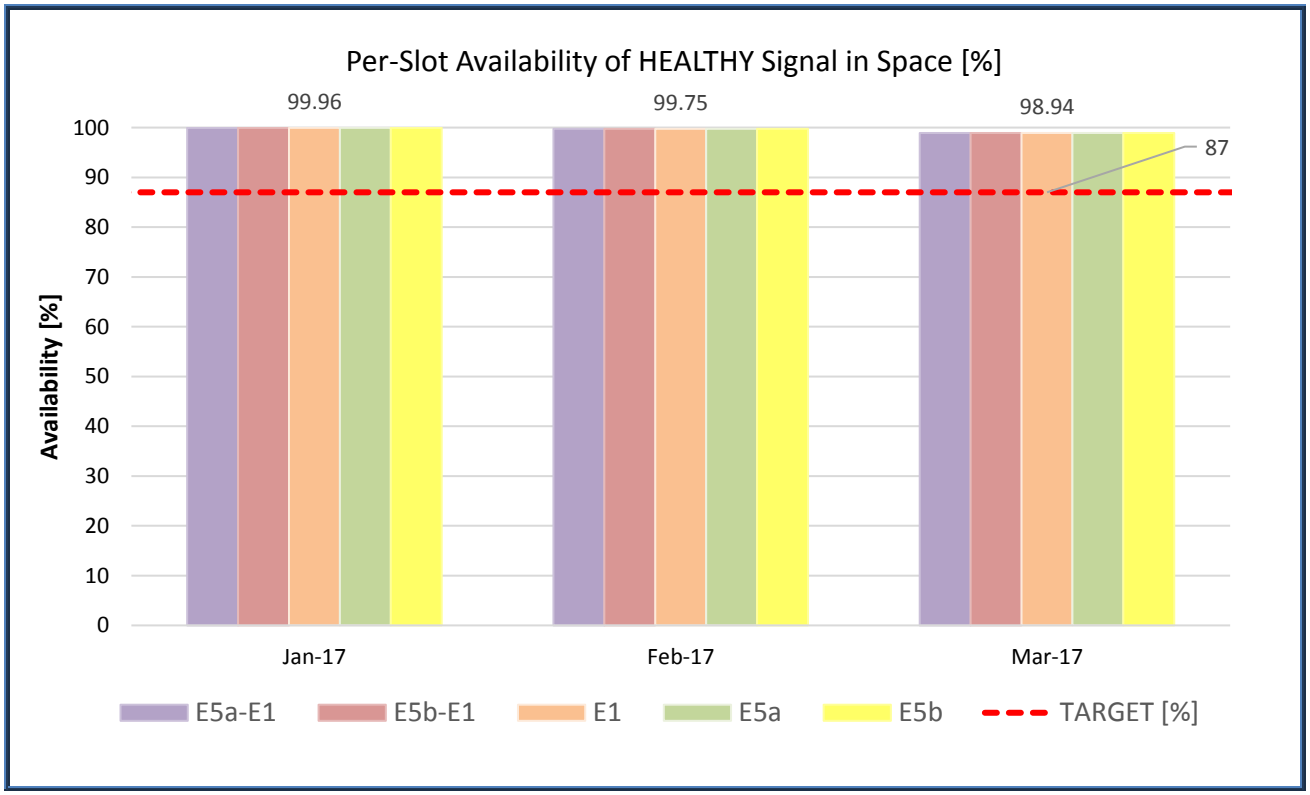


Figure 2: "Per-Slot" availability of HEALTHY Signal in Space for the reporting period

[4] Ref.: [OS-SDD] , §3.5.2 (Table 15) and §3.5.3 (Table 16)

[5] The [OS-SDD] foresees an "annual normalisation", which is actually implemented with an incremental averaging process, accumulating data after the declaration of Initial Services in December 2016

[6] Ref.: [OS-SDD] , §3.5.1 (Table 14)

3.3 GALILEO SIGNAL IN SPACE RANGING ACCURACY

The Galileo Signal In Space Error (SISE) vector provides the instantaneous difference between the Galileo satellite position/clock offset as obtained from the broadcast Navigation message, and the "true" satellite position/clock offset. The true orbit path and clock performance are precisely reconstructed using sophisticated tools. When projecting SISE to the user location, the obtained scalar value is also named Ranging Accuracy and represents the ranging error affecting a user receiver. The following figures show the 95th percentile of the monthly global average of the instantaneous Ranging Accuracy, achieved for each Galileo operational satellite and Single Frequency/Dual Frequency combinations. Projection of SISE is implemented at the nodes of a virtual grid, representing all user locations within the Navigation Service coverage area. Any signals carrying Navigation message information with Ageing of Time of Ephemeris beyond the validity period of 4 hours are filtered out, as per [OS-SDD] and explained in §5.3.

As shown in the following figures, the Galileo Signal in Space Ranging Accuracy "for any space vehicle" is below **1.07** [m] over all satellites and frequency combinations. Compliance with [OS-SDD] MPL is achieved, where a maximum threshold of **7 [m]** [7] is specified for the individual satellite monthly performance.

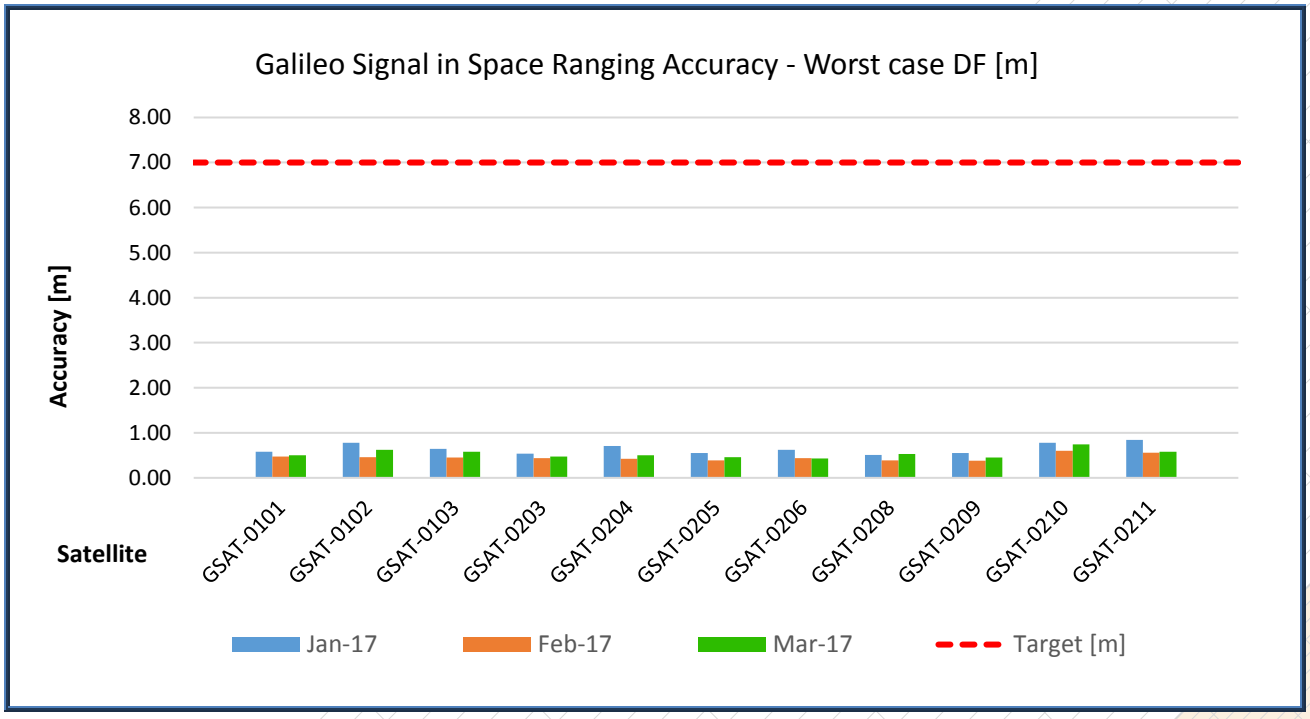


Figure 3: Monthly Galileo SIS Ranging Accuracy (95th percentile) "for any satellite", measured during reporting period for worst-case, Dual-Frequency (DF)

[7] Ref.: [OS-SDD] , §3.4.1 (Table 9)

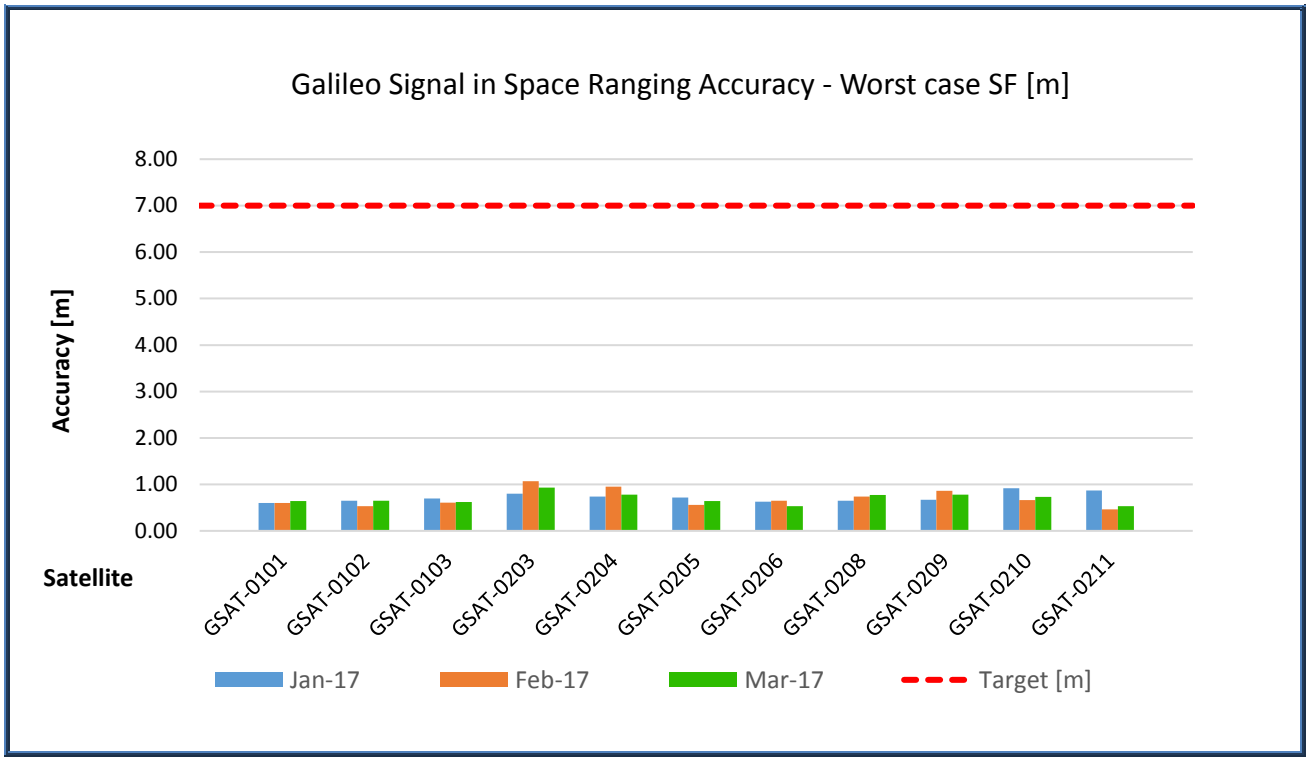


Figure 4: Monthly Galileo SIS Ranging Accuracy (95th percentile) "for any satellite", measured during reporting period for worst-case, Single-Frequency (SF)

As shown in the following figure, the average "over all satellites" provides figures better than **0.7 [m]** for all possible Single Frequency and Dual Frequency combinations. Compliance with [OS-SDD] MPL is therefore achieved, where a maximum threshold of **2 [m]** [8] is specified for the constellation mean.

[8] Ref.: [OS-SDD] , §3.4.1 (Table 10)

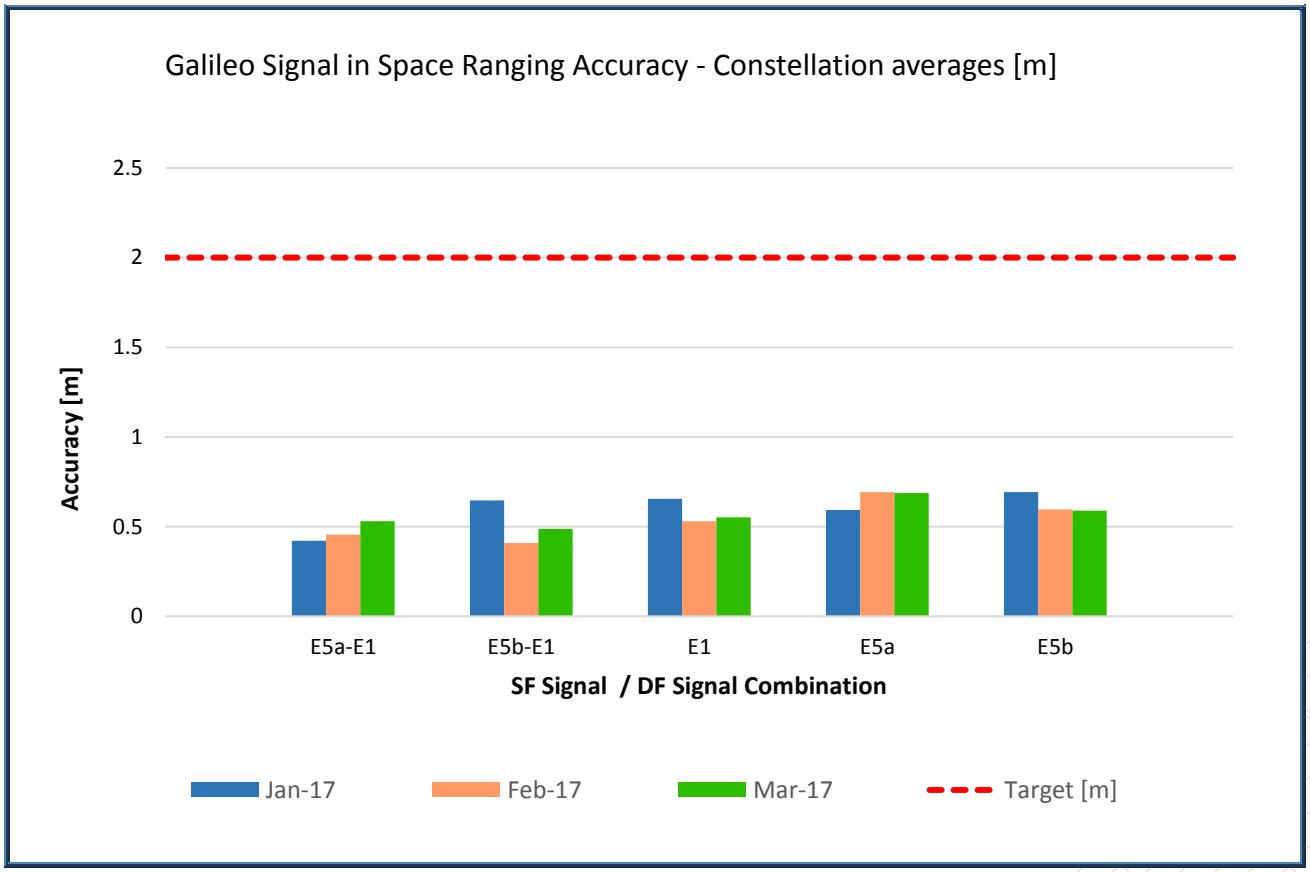


Figure 5: Monthly Galileo SIS Ranging Accuracy (95th percentile) "over all satellites" (constellation average), measured during the reporting period

4 UTC DISSEMINATION AND GGTO DETERMINATION PERFORMANCE

In this section of the report the following performance figures are provided:

- ◊ Availability of the Galileo Time Correlation Parameters in section 4.1.
- ◊ Accuracy of the Galileo Time Correlation Parameters in section 4.2.

4.1 AVAILABILITY OF THE GALILEO TIME CORRELATION PARAMETERS

The *Availability of the Galileo Universal Time Coordinated (UTC) Time Determination Service* is defined as the percentage of time that the system provides at least one HEALTHY[3] ranging/timing Signal in Space above a minimum elevation angle of 5 degrees. The following figure provides the Worst User Location Availability of the UTC Determination service, computed for a virtual grid of user locations over the service coverage area.

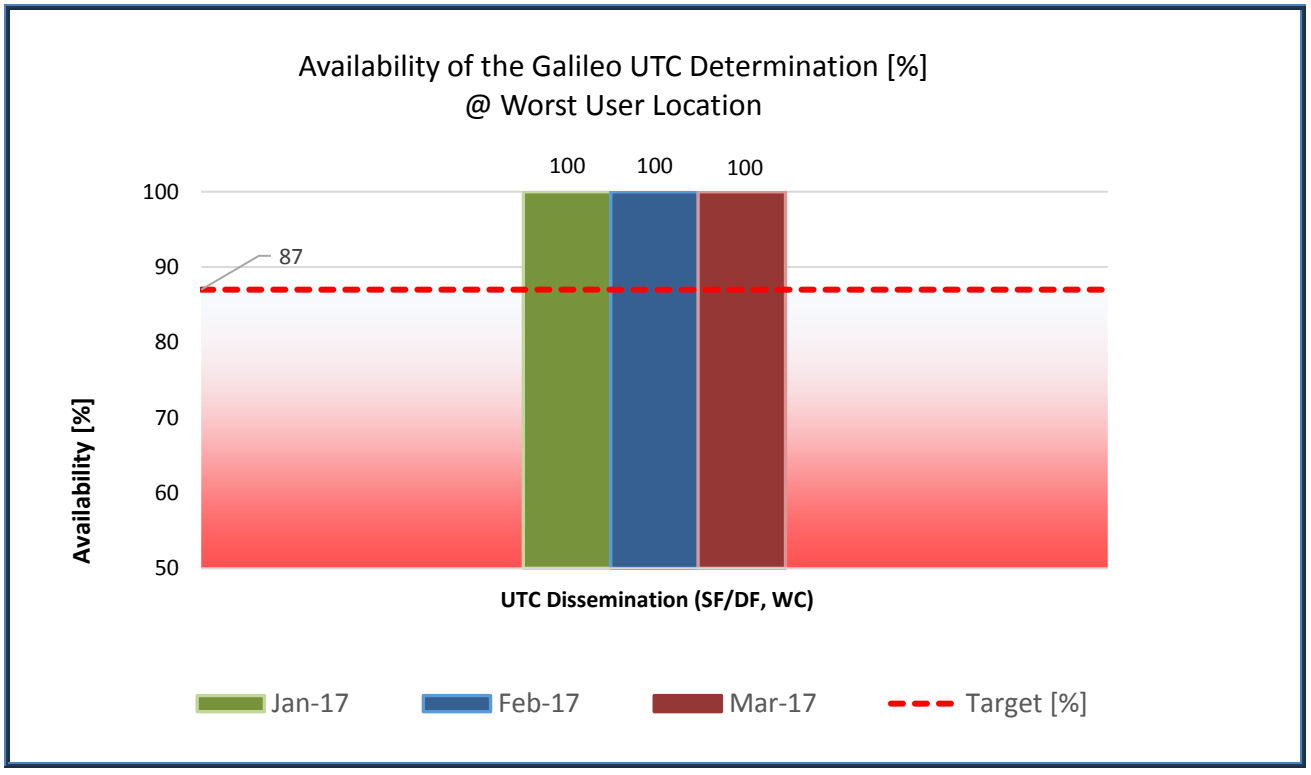


Figure 6: Monthly availability of the UTC Determination Service during the reporting period

The *Availability of Galileo to GPS Time Offset (GGTO) Determination* is the percentage of time that the system provides at least one non-dummy GGTO[9] set of coefficients within the Navigation message, acquiring SiS from a space vehicle seen above a minimum elevation angle of 5 degrees. The following figure provides the worst user location availability of the GGTO Determination computed for a virtual grid of user locations over the service coverage area.

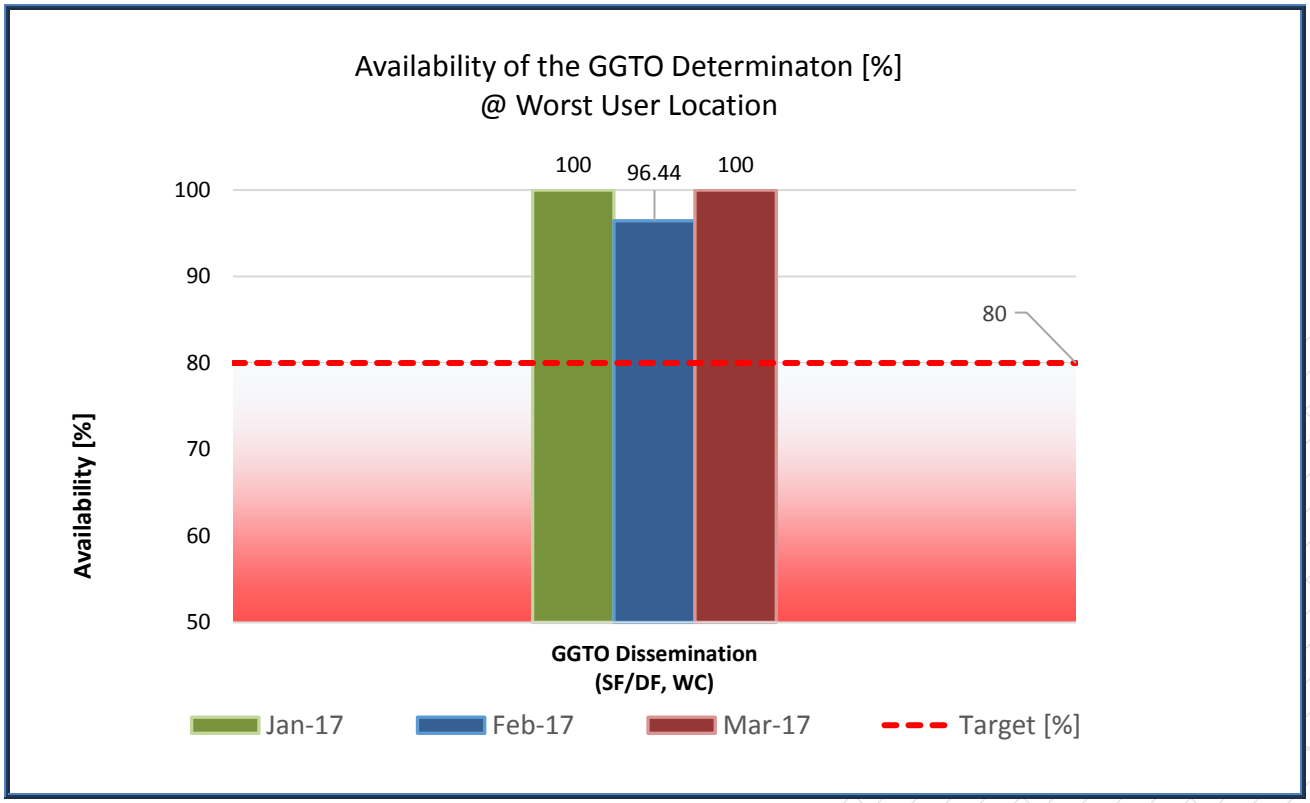


Figure 7: Monthly availability of the GGTO Determination during the reporting period

The monthly availability of the Galileo UTC Determination Service always reaches **100%** over the reporting period. The Galileo user GGTO Determination capability is **100%** in January and March, while it is **96.44%** in February; the reason for the drop in availability was the dissemination of "dummy" GST-GPS Time correlation coefficients, due to known issues affecting the system under deployment that are planned to be resolved in the short term.

However, the MPL of **87%** [10] specified by [OS-SDD] is fully achieved in both cases.

[9] "Dummy" GGTO is defined in [OS-SDD] and in Galileo SiS ICD in terms of "all 1's" appearing in the GGTO parameters binary slot(s) carried by the Navigation message.

[10] Ref.: [OS-SDD] , §3.5.4 (Table 17) and §3.6.1.2 (Table 19)

4.2 ACCURACY OF THE GALILEO TIME CORRELATION PARAMETERS

The Galileo Signal in Space *Universal Time Coordinated (UTC) Time Dissemination Accuracy* and the Galileo Signal in Space *Universal Time Coordinated (UTC) Frequency Dissemination Accuracy* are computed as the daily average error of the normalized time and frequency offset relative to UTC for a user equipped with a Standard Timing / Calibration Laboratory Receiver. [11]

The *Galileo to GPS Time Offset (GGTO) Determination Accuracy* is computed as the daily average of the difference between the GST-GPS Time Offset computed using the Galileo navigation message and the true GST-GPS Time Offset.

Figure 8 shows the 95th percentile of the daily average of the UTC Dissemination Accuracy and the GGTO Determination Accuracy, while Figure 9 shows the 95th percentile of the UTC Frequency Dissemination Accuracy, computed accumulating measurement data over the past 12 months [12].

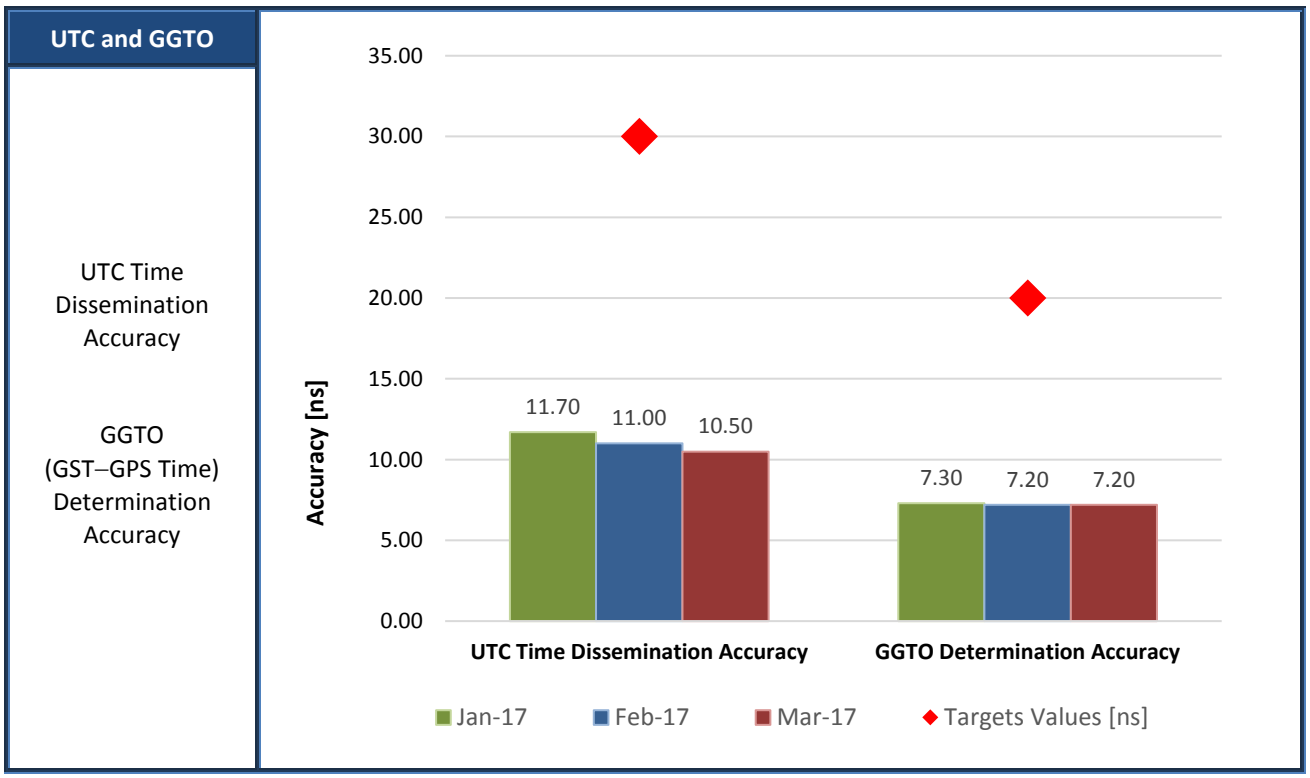


Figure 8: Long-term 95th percentile of UTC Time Dissemination Accuracy and GGTO Determination Accuracy

[11] Note that the final UTC Determination Accuracy experienced by the user will be also affected by ranging errors, on top of the reported UTC Dissemination Accuracy

[12] Monthly figures result from a processing that includes measurements accumulated since an initial time which is antecedent to the declaration of Galileo Initial Services

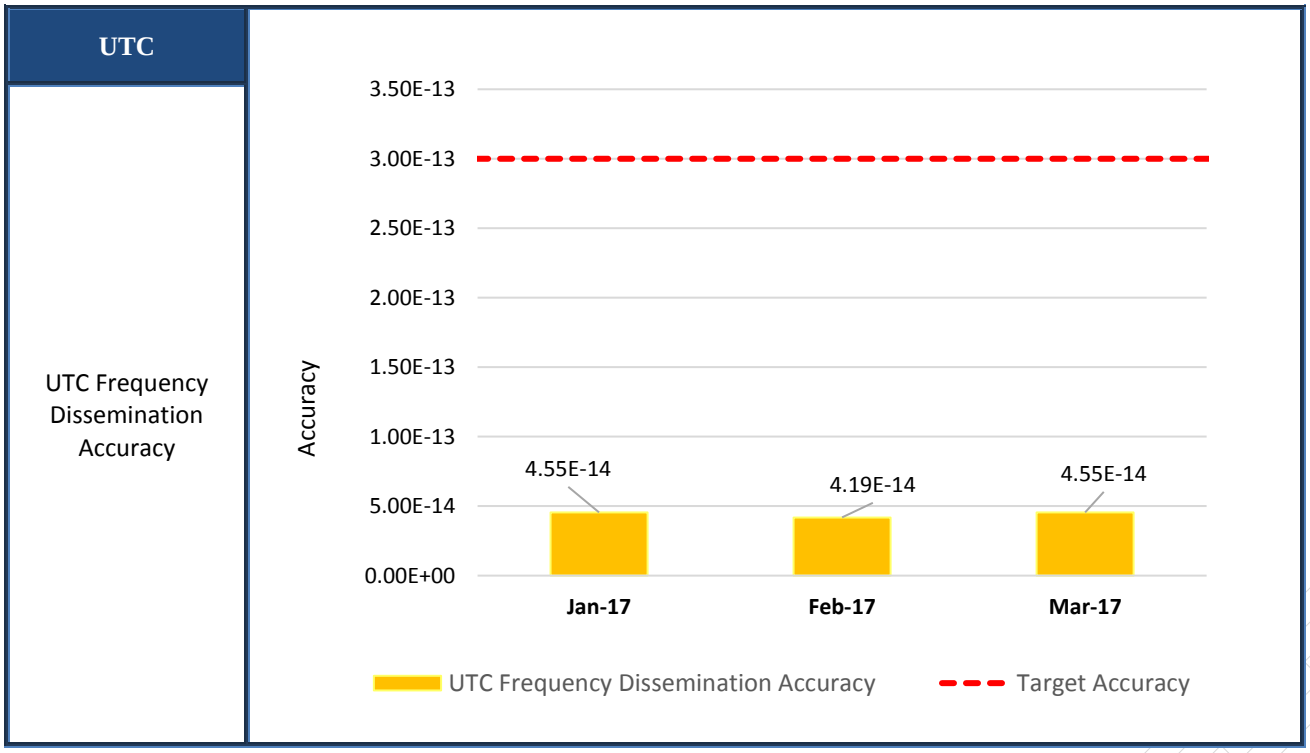


Figure 9: Long-term 95th percentile of UTC Frequency Dissemination Accuracy

As seen in Figure 8, the long term 95th percentile of UTC Dissemination Accuracy is always better than **11.7 [ns]** and the GGTO Determination Accuracy of **7.3 [ns]**, which are both well within the [OS-SDD] Minimum Performance Level specifications of **30 [ns]** and **20 [ns]**, respectively [13].

Regarding UTC Frequency Dissemination accuracy, Figure 9 shows that the maximum measured 95th percentile value of **4.55E–14** is well within the [OS-SDD] MPL normalised annual ceiling of **3.0E–13** [14].

[13] Ref.: [OS-SDD] , §3.4.3 (Table 12) and §3.6.1.2 (Table 18)

[14] Ref.: [OS-SDD] , §3.4.4 (Table 13)

5 GALILEO POSITIONING PERFORMANCE

In this section of the report the following performance figures are provided:

- ◊ Availability of Global Horizontal Dilution of precision (HDOP) in section 5.1
- ◊ Availability of Galileo Horizontal Positioning in section 5.2
- ◊ Galileo measured Positioning Performance in section 5.3

No specific MPLs are defined in this case, but the target expectation is an availability of at least 50% [15].

5.1 AVAILABILITY OF GLOBAL HORIZONTAL DILUTION OF PRECISION (HDOP)

The *Availability of Global* Horizontal Dilution of precision (HDOP) is defined as the percentage of time that at least 3 Galileo satellites transmitting HEALTHY Galileo Open Service Signal in Space, above a minimum elevation angle of 5 degrees and satisfying a condition of HDOP below 5, are in view from the user location.

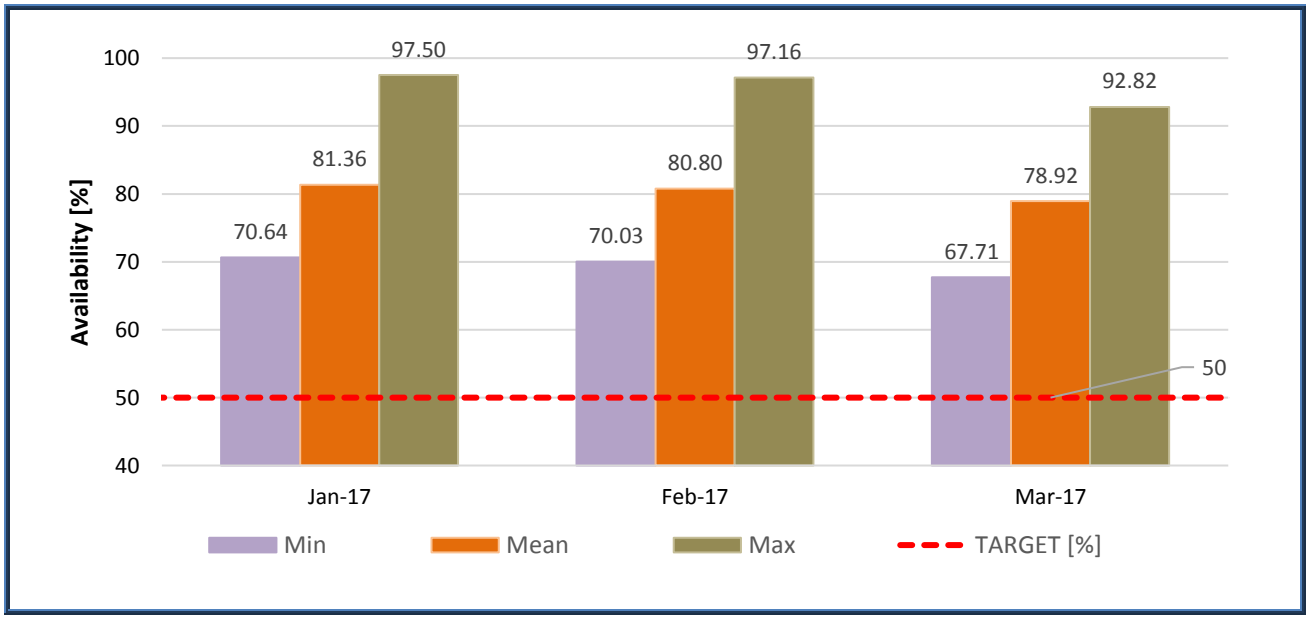


Figure 10: Availability of HDOP ≤ 5

[15] Ref.: [OS-SDD] , §C.7.1 (Table 25) and §C.7.2 (Table 26)

Figure 10 above the monthly HDOP average availability computed for a grid of user locations within the service coverage area.

5.2 AVAILABILITY OF GALILEO HORIZONTAL POSITIONING

The Availability of Galileo Horizontal Positioning is defined as the percentage of time with a horizontal positioning error less than or equal to 10 [m], considering only HEALTHY[3] Galileo Open Signal in Space from satellites above a minimum elevation angle of 5 degrees and assuming a receiver operating in "altitude hold" mode, with HDOP filtering . Note that Horizontal Positioning assumes that Navigation Equations are to be solved in 2 dimensions [16].

Figure 11 shows the monthly average availability computed for a grid of user locations within the service coverage area, considering only system level contributions to the positioning error.

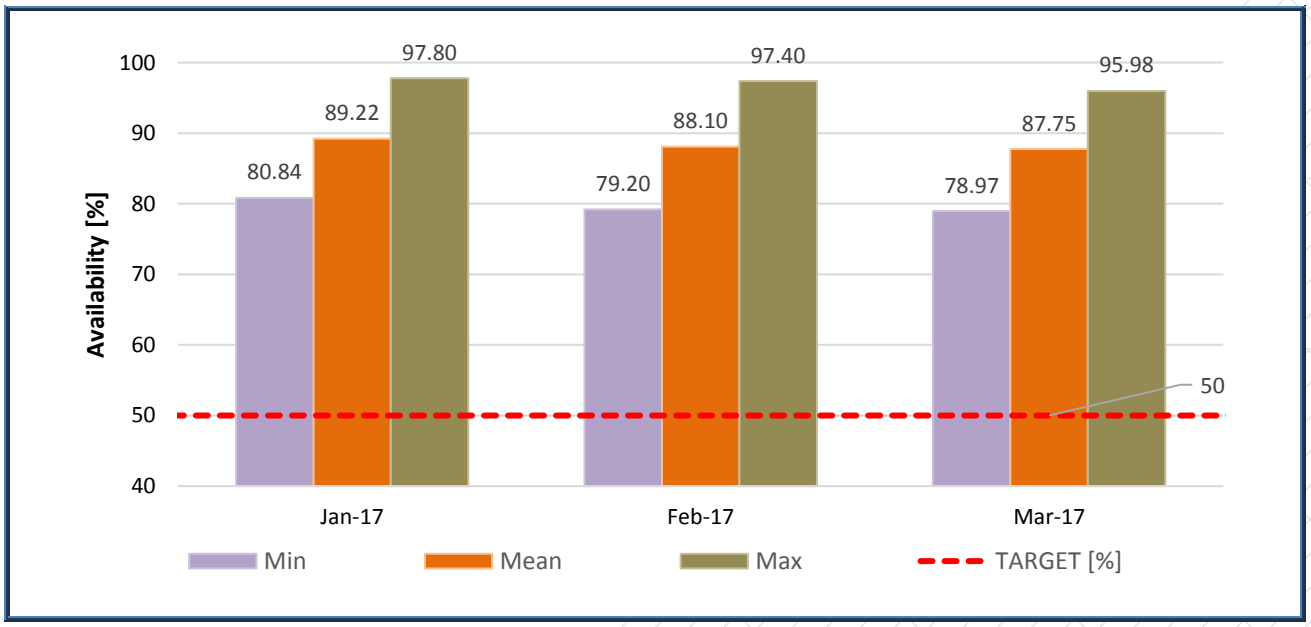


Figure 11: Availability of the Galileo Horizontal Positioning Service with Accuracy ≤ 10 [m]

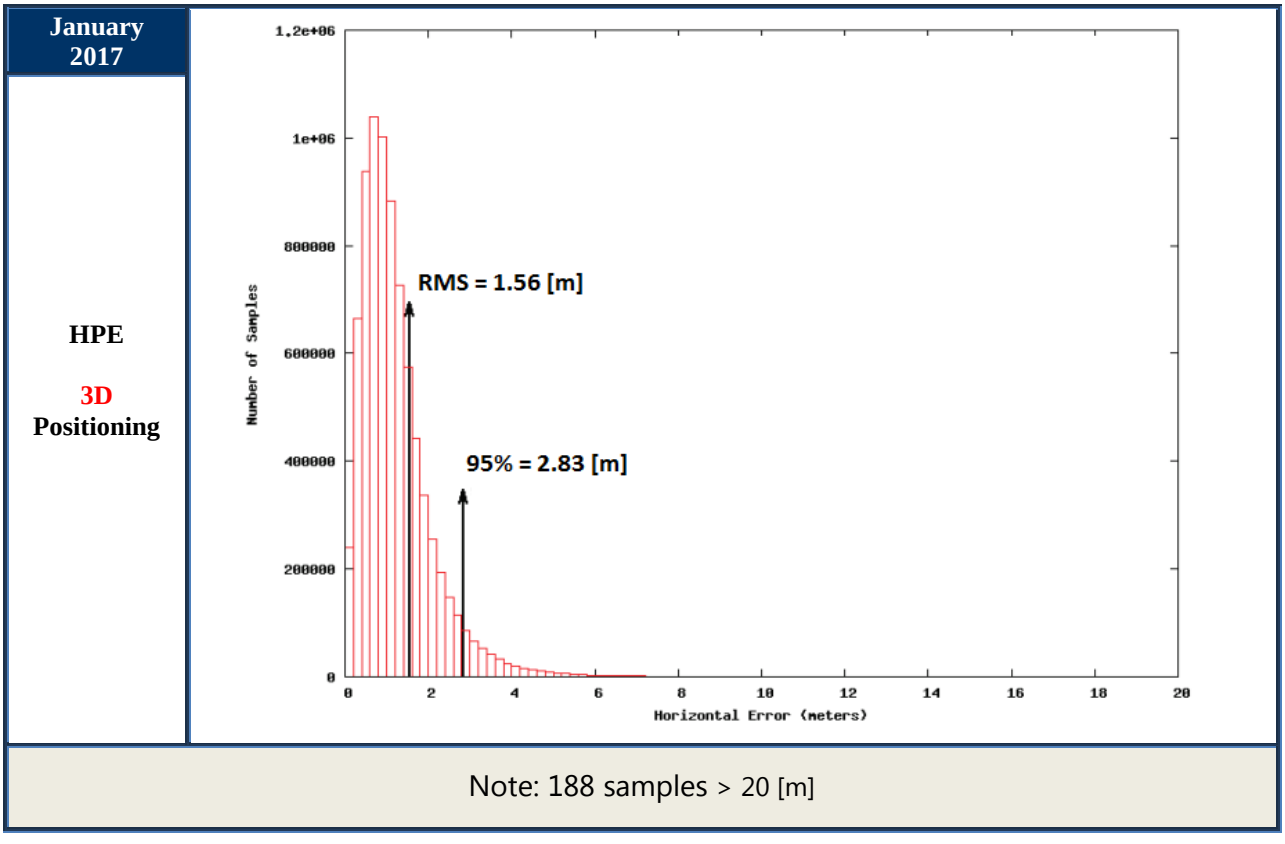
[16] E.g.: determining only user latitude and longitude, while the altitude over Earth ellipsoid is provided as input known *a priori*

5.3 GALILEO MEASURED POSITIONING PERFORMANCE

Although the Galileo FOC constellation is not yet complete and positioning is not declared as a Galileo Service, this section provides Navigation Sensor Error estimates as an indication of Galileo Navigation Positioning performance capabilities.

The following figures show the *Horizontal and Vertical Positioning Accuracy Performance* based on measurements collected over a number of test receivers, solving for user coordinates by following OS-SDD recommendations about SIS health status, "Ageing of toE" [17] and PDOP ≤ 6. To this aim it is recalled that, according to the [OS-SDD] directions, Navigation message coefficients with an Ageing of toE beyond 4 hours have expired validity, so that ranging observables from a corresponding satellite and signal should not be used for positioning and/or time measurement purposes. The horizontal axis is limited on each plot to a maximum error of 20 metres. Each figure reports also the number of samples exceeding a horizontal or vertical error larger than 20 [m].

Figure 12: Horizontal Positioning Error (HPE) for "Galileo-only" users (January 2017)



[17] Parameter "toE" (Time of Ephemeris) is disseminated in the Navigation message, as part of the Ephemeris Set. See [SIS-ICD], section 5.1.1

Figure 13: Horizontal Positioning Error (HPE) for "Galileo-only" users (February 2017)

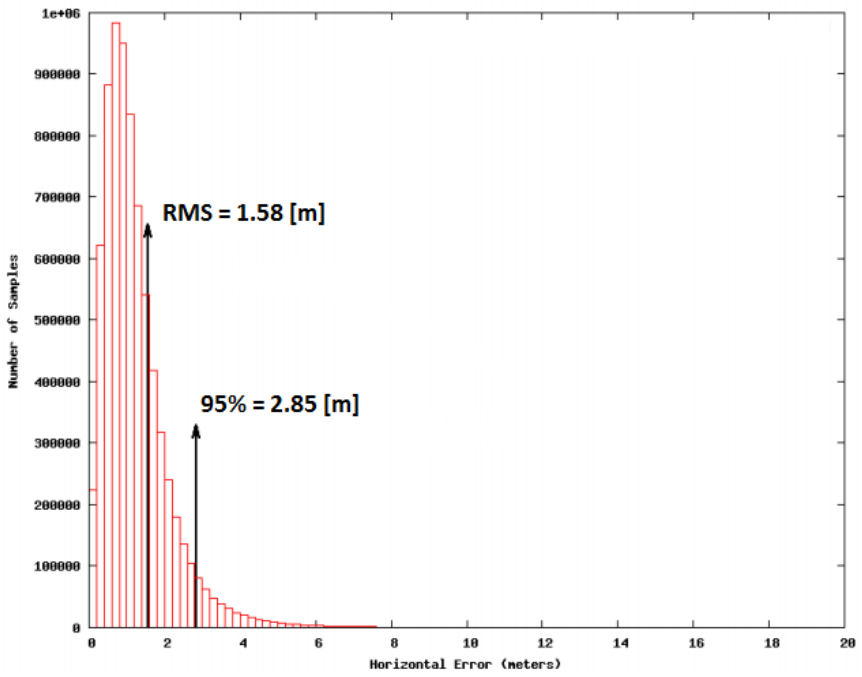
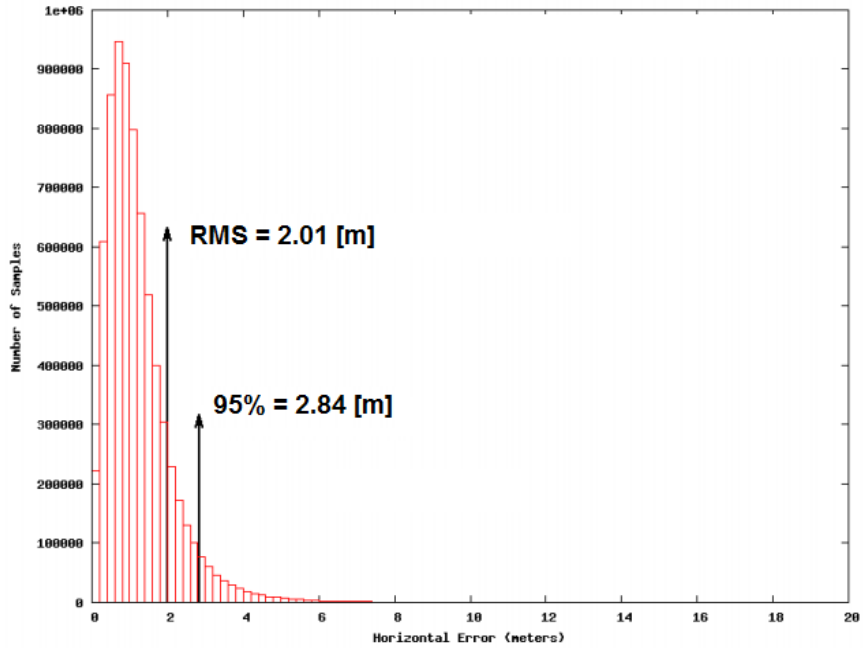
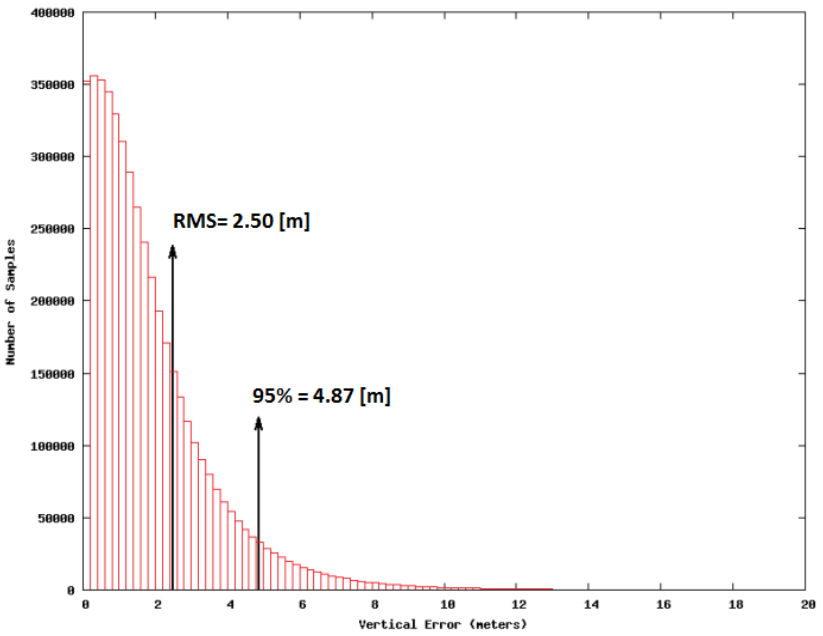
February 2017	
HPE **3D Positioning**	
Note: 731 samples > 20 [m]	

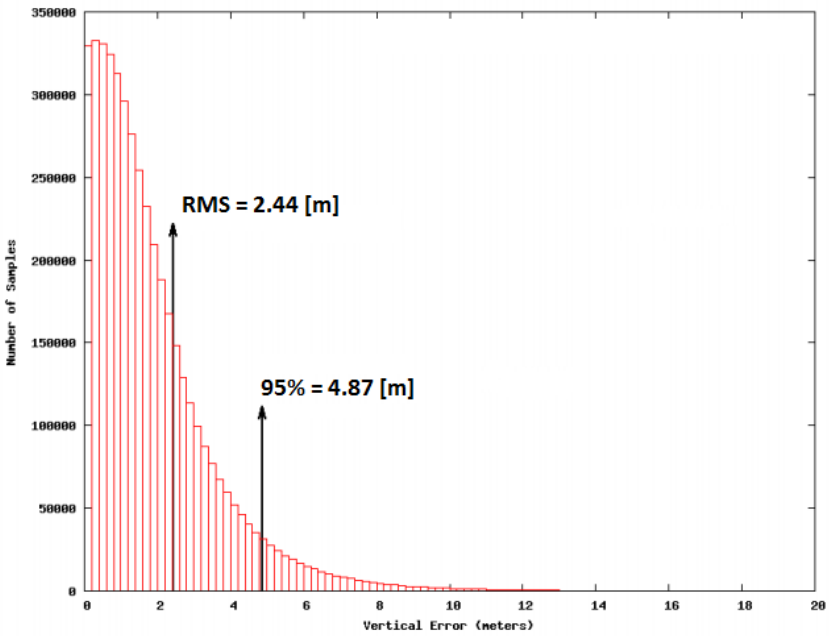
Figure 14: Horizontal Positioning Error (HPE) for "Galileo-only" users (March 2017)

March 2017	
HPE **3D Positioning**	
Note: 509 samples > 20 [m]	

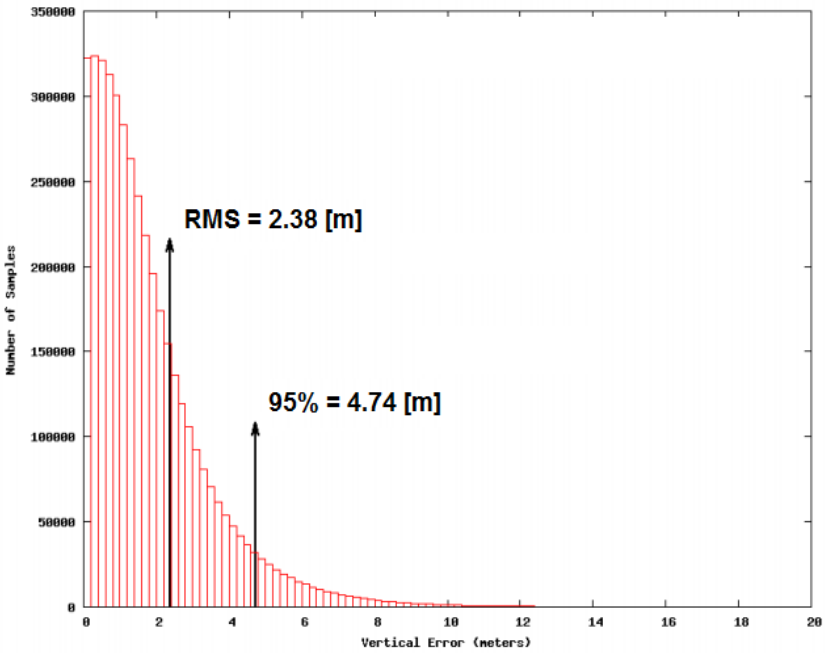
Figures 15: Vertical Positioning Error (VPE) for Galileo only users (January 2017)

January 2017	
VPE 3D Positioning	
Note: 219 samples > 20 [m]	

Figures 16: Vertical Positioning Error (VPE) for Galileo only users (February 2017)

February 2017	
VPE 3D Positioning	
Note: 217 samples > 20 [m]	

Figures 17: Vertical Positioning Error (VPE) for Galileo only users (March 2017)

March 2017	
VPE **3D** **Positioning**	
Note: 579 samples > 20 [m]	

6 TIMELY PUBLICATION OF NOTICE ADVISORY TO GALILEO USERS (NAGUS)

The European GNSS Service Centre (GSC) is responsible for the timely publishing of Notice Advisory to Galileo Users (NAGU) messages on its web pages:

GNSS Service Centre NAGU Publication Service Web Pages		
NAGUs Information	https://www.gsc-europa.eu/system-status/user-notifications	(Active user Notifications)
	https://www.gsc-europa.eu/system-status/user-notifications-archive	(Archived user Notifications)

Table 5: GSC Main Information web pages about Galileo Status (2/2)

During the reporting period, the following NAGUs have been published:

Month	Notice Advisory [ID]	Type
January	"USABLE" – Space vehicle GSAT-0205 (E24) [2017001]	U
February	"GENERAL" – Short term GGTO Outage [2017002]	U
	"PLN_OUTAGE" – GSAT-0203 (E26) [2017003]	P
	"PLN_OUTAGE" – GSAT-0206 (E30) [2017004]	P
March	"USABLE" – Space vehicle GSAT-0203 (E26) [2017005]	U
	"UNP_UNUFN " – Space vehicle GSAT-0205 (E24) [2017006]	U
	"USABLE" – Space vehicle GSAT-0205 (E24) [2017007]	U
	"USABLE" – Space vehicle GSAT-0206 (E30) [2017008]	U
	"PLN_OUTAGE" – GSAT-0208 (E08) [2017009]	P
	"PLN_OUTAGE" – GSAT-0209 (E09) [2017010]	P
	"USABLE" – Space vehicle GSAT-0208 (E08) [2017011]	U
	"USABLE" – Space vehicle GSAT-0209 (E09) [2017012]	U
NAGU Type Categorization: "P" = Planned, "U" = Unplanned		

Table 6: NAGUs published during Quarter

According to MPLs in the [OS-SDD], NAGUs related to Planned events need to be published at least **24** hours [18] before the event starts. During the reporting period, the target MPL for Planned NAGUs has been achieved in all cases, with an average of more than **135** hours and a worst case of 61 hours before occurrence of the event.

For Unplanned events, the [OS-SDD] allows a delay of up to **72** hours [18] from the detection of the unplanned event until a corresponding NAGU is issued.

The target MPL for Unplanned NAGUs is achieved in all cases, with an average less than **37** hours and a worst case of 61 hours after detection of the unplanned event.

[18] Ref.: [OS-SDD] , §3.7.1 (Table 20)

7 REFERENCES

This section identifies the documents explicitly referenced in this Galileo Initial Open Service Public Performance Report.

[SIS-ICD] European GNSS (Galileo) Open Service Signal-In-Space Interface Control Document (OS-SIS-ICD), Issue 1.3, European Union, December 2016

[IONO] Ionospheric Correction Algorithm for Galileo Single Frequency Users, Issue 1.2, European Union, September 2016

[OS-SDD] European GNSS (Galileo) Open Service Definition Document (OS-SDD), Issue 1.0, European Union, December 2016.

Previous documents are made available to users through the web portal of the European GNSS Service Centre (http://www.gsc-europa.eu/).

For an exhaustive description about Minimum Performance Levels (MPLs), the reader is referred to the [OS-SDD]: individual sections of the Service Definition Document have been addressed throughout this report when referring to MPL target values.

8 LIST OF ACRONYMS

Acronym	Definition
AOD	Age Of Data – Elapsed time, since a data set was generated by GMS
DF	(Galileo OS) Dual Frequency combination (E5a-E1, E5b-E1)
DOP	Dilution of Precision
DVS	Data Validity Status L-band flag
FOC	Full Operational Capability
GGTO	GST-GPS Time Offset
GESS	Galileo Experimental Sensor Stations
GPS	Global Positioning System
GSC	European GNSS Service Centre
GST	Galileo System Time
HDOP	Horizontal Dilution of Precision
HPE	Horizontal Positioning Error
ICD	Interface Control Document
IOV	In-Orbit Validation
IS	(Galileo) Initial Services
MPL	Minimum Performance Level
NAGU	Notice Advisory to Galileo Users
NAPA	No Accuracy Prediction Available
NDV	Navigation Data Valid
OOS	Out Of Service
OS	(Galileo Navigation) Open Service
PDOP	Position Dilution of Precision
RMS	Root Mean Square

Acronym	Definition
SDD	Service Definition Document
SF	(Galileo OS) Single Frequency (E1, E5a, E5b)
SHS	Signal Health Status L-band flag
SIS	Signal in Space
SISE	Signal In Space Error vector (4-dimensional)
SISA	Signal in Space Accuracy L-band flag
UTC	Universal Time Coordinated
VPE	Vertical Positioning Error
WUL	Worst User Location

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