



GSA/NP/02/19 - EGNOS GEOSTATIONARY SBAS PAYLOAD SERVICE GEO-4 - Service Descriptive document (Annex 2 to the TIP)

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1 Introduction

The purpose of this document is to provide a description of the GEO-4 services to be procured to allow the Candidate to have a first understanding of the scope of the procurement.

2 Reference documents

[RD-1] ICAO SARPS Annex 10, including up to Amendment 91, 08/11/2018.

[RD-2] DFMC SBAS SARPS Part A and Part B, 12/11/2018

3 Definitions

“Candidate”	means those who have asked to be allowed to take part in this procurement procedure.
“Coverage Area”	means all the points in the field of view of the satellite transmit antenna, including hosting satellite pointing error, that receive the downlink navigation signal(s) with a minimum elevation of 5 degrees.
“Contractor”	means the company who has been awarded the Contract “EGNOS GEOSTATIONARY SBAS PAYLOAD SERVICE” (GEO-4).
“EGNOS V3”	means the next generation of EGNOS including in particular DFMC feature and Galileo. Current generation of EGNOS is V2.
“EGNOS V3 Service Provider”	means the EGNOS Service Provider in charge for operating and maintaining the EGNOS V3 and providing the EGNOS V3 SIS services.
“Operation Start Date”	means the end of the Service Preparation phase and the start of the Service Provision phase. It can only be declared after successful ITR and readiness of KPI monitoring and reporting means.
“Pre-selected Candidate”	means Candidate invited to submit an initial proposal.
“RFGEO Couple”	means the attribute that includes the EGNOS GEO-4 RF ground station plus the EGNOS GEO-4 payload (NLES is not included).
“Service Preparation phase”	<p>means the first phase of the Contract. It shall start from the Contract Kick-off and end at Operation Start Date.</p> <p>This phase shall include all development activities on the GEO-4 payload, RF uplink stations and hosting sites preparation until their formal acceptance. It covers the tasks from the design and manufacturing to the integration, testing and qualification. It covers also the GEO satellite launch until the in-orbit tests and formal acceptance of the GEO-4 payload and all other preparation activities necessary to start the Service Provision phase.</p>
“Service Provision phase”	means the second phase of the Contract. It shall start from the Operation Start Date and last until the end of the contract.

This phase shall include the recurring service provision activities related to the GEO-4 payload, RF ground stations and NLES Hosting sites, in line with the Service Level Agreement.

“Tender Specifications”

means the full set of input documents which will be provided for the phase 2 of this procurement procedure to allow the Pre-Selected Candidate to prepare the initial proposal.

4 EGNOS System presentation

The European Geostationary Navigation Overlay Service (EGNOS) is providing an augmentation service to the Global Positioning System (GPS) Standard Positioning Service (SPS). Presently, EGNOS augments GPS using the L1 (1575.42 MHz) Coarse/Acquisition (C/A) civilian signal function by increasing the accuracy of existing GPS satellites while providing a crucial ‘integrity message’, informing users in the event of signal problems. The current system is known as EGNOS V2. In the future, EGNOS V3 which is under development will also augment Galileo using L5 (1176.45 MHz) frequency and will then provide dual-frequency multi-constellation (DFMC) services.

4.1 Overview of EGNOS Services

EGNOS Services are provided free of charge to users. Based on the dissemination means (SIS broadcasted from the GEO satellites or data via Internet) and the safety implications of the applications (either safety critical application or non-safety critical applications), they can be classified in three main categories:

- The EGNOS Safety of Life (SoL) Services: aimed at users for whom safety is essential, typically for transport applications in different domains, and accessible via the EGNOS Signal-in-Space (SIS). The EGNOS product has been designed so that the EGNOS SIS is compliant to the ICAO SARPS for SBAS and at this stage, a detailed performance characterisation has been conducted only against the requirements expressed by civil aviation.

The EGNOS SoL Service has been available since March 2nd 2011 and it supports today the following civil aviation operations:

- Non-Precision Approach operations and other flight operations supporting PBN navigation specifications other than RNP APCH, not only for approaches but also for other phases of flight.
- Approach operations with Vertical Guidance supporting RNP APCH PBN navigation specification down to LPV minima as low as 250 ft.
- Category I precision approach with a Vertical Alert Limit (VAL) equal to 35m and supporting RNP APCH PBN navigation specification down to LPV minima as low as 200 ft.

Complete information on the EGNOS SoL Service can be found in the SOL Service Definition Document (SoL SDD: <https://www.gsa.europa.eu/library/technical-documents>)

Currently, only single-frequency services are available. Dual-frequency SoL services will be provided with EGNOS V3.

- The EGNOS Open Service (OS): it is aimed at users of non-safety critical applications in any domain that require improved positioning with respect to the GPS stand-alone performance. It is accessible also through the EGNOS SIS to any user equipped with a GPS/SBAS compatible receiver for which no specific receiver certification is required.

EGNOS OS SIS also offers a precise and stable atomic time reference which allows users to have a highly accurate time reference to be used for synchronisation and timing applications.

EGNOS OS has been available since 1st October 2009. More information on the EGNOS OS can be found in the OS Definition Document (OS SDD: <https://www.gsa.europa.eu/library/technical-documents>).

Currently, only single-frequency services are available. Dual-frequency OS services will be provided with EGNOS V3 to any user equipped with a dual-frequency receiver.

- The EGNOS Data Access Service (EDAS): it is the EGNOS terrestrial data service which offers ground-based access to EGNOS data in real time and also in a historical FTP archive to authorised users (e.g. added-value application providers). EDAS is the single point of access for the data collected and generated by the EGNOS ground infrastructure mainly distributed over Europe and North Africa. EDAS also offers DGPS and RTK products in different formats and protocols to users. In addition, application providers are able to connect to the EGNOS Data Server, and exploit the EGNOS data, offering high-precision services to final customers.

The EGNOS EDAS is available since July 26th 2012. More information on EDAS can be found in the EDAS Definition Document (EDAS SDD: <https://www.gsa.europa.eu/library/technical-documents>).

4.2 Overview of EGNOS System Architecture

EGNOS high level system architecture (common to the EGNOS V2 and EGNOS V3) comprises three segments:

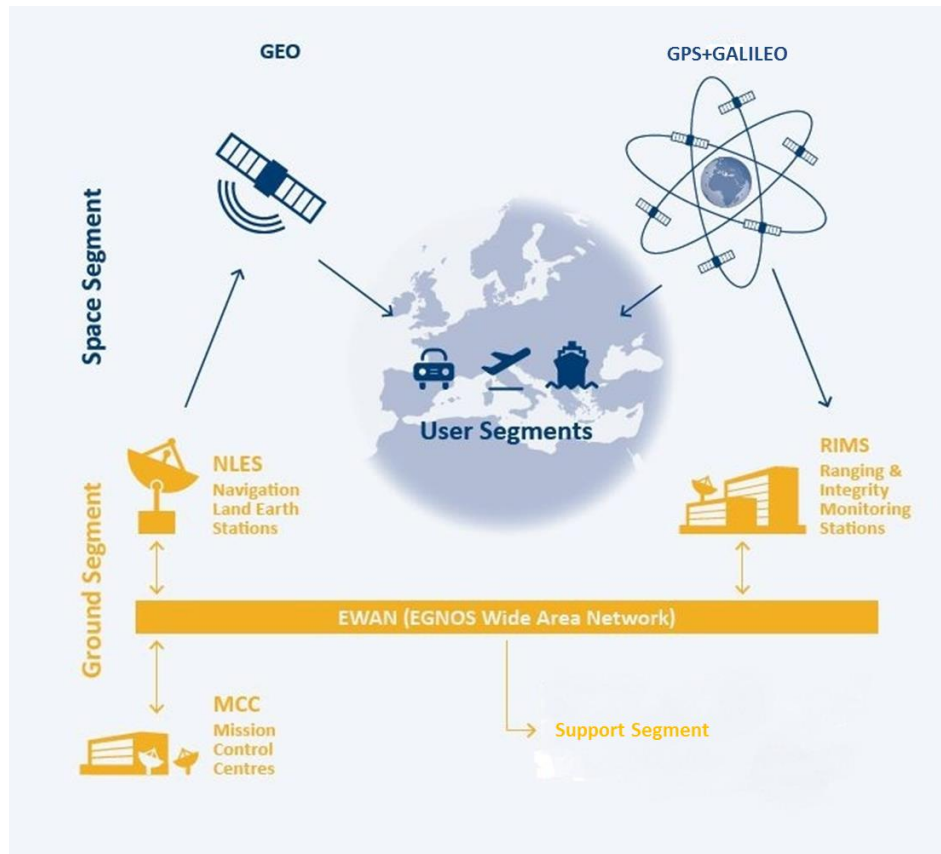


Figure 1 EGNOS High level architecture

- The EGNOS Space segment, composed of geostationary (GEO) satellites, relay the EGNOS messages generated on ground containing corrections and integrity information to be applied to GPS and Galileo (in the future) solutions. The coverage area are primarily the EU-Member States, Norway and Switzerland Flight Instrument Regions (FIRs).
- The EGNOS ground segment is responsible for the computation of the integrity measurements and wide area differential corrections. To this purpose, Ranging and Integrity Monitoring Stations (RIMS) are deployed over the European Union territories (and for some of them worldwide) which collect the GPS and Galileo (in EGNOS V3) raw pseudo-range measurements. The network of RIMS is connected to two Mission Control Centres (MCCs) (of which one is master) where the integrity, differential corrections, ionospheric delays are computed by the Central Processing Facility (CPF). This information is sent in a message to the Navigation Land Earth Stations (NLES) to be uplinked in a GPS-like signal (following the SBAS signal specification as defined in [RD-5]) to the space segment (GEO satellites). The GEO satellites broadcast transparently the SBAS signals on the GPS L1 (1575.42 MHz) and L5 (1176.45 MHz) frequencies. The ground segment is operated from the Central Control Facility (CCF) located in the MCCs. All EGNOS sites are connected through an EGNOS Wide Area Network (EWAN).

EGNOS service provision and operations are supported by specific tools hosted in the EGNOS support facilities sites.

- The EGNOS User Segment is made of all users in the different domains benefiting from EGNOS services.

Further information on the EGNOS system architecture can be found in [RD-01].

4.3 EGNOS Space Segment Current Situation

EGNOS Space Segment (Figure 3) is composed of:

- Inmarsat-4F2 (63.9° E) with uplink stations in The Netherlands and Italy
- GEO-1 (SES-5 at 5°E) with uplink stations in Belgium and Luxembourg
- GEO-2 (Astra-5B at 31.5°E) with uplink stations in Belgium and Luxembourg
- GEO-3 (E5WB at 5°W), currently under development, with uplink stations in France and Italy.

The current operational configuration is based on GEO-1 and GEO-2 while Inmarsat-4F2 remains in test. GEO-3 (yellow contour in Figure 3) is planned for launch in August 2019; it will join the EGNOS GEO fleet in the second half of 2019.

Figure 2 below shows the coverage achieved with the current GEO baseline.

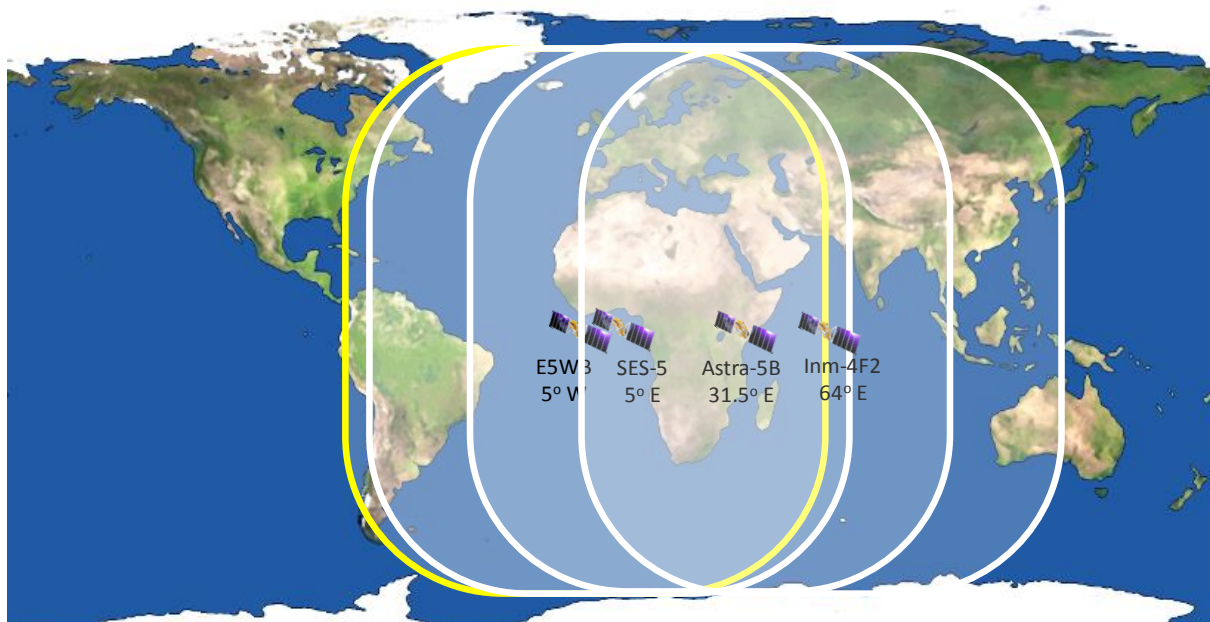


Figure 2 Current GEO Coverage for EGNOS

5 EGNOS Exploitation organisation overview

5.1 Programme governance

The delivery of EGNOS SIS involves 5 major actors, namely the European Commission (EC) as responsible for Programme Supervision, the GSA as EGNOS Exploitation Manager following the conclusion of the delegation agreement with EC on the Exploitation of the EGNOS programme, the European Space Agency (ESA) as EGNOS System Architect following the conclusion of the EGNOS Working Arrangement with GSA, the EGNOS Service Provider (ESP) following the conclusion of the EGNOS service provision contract with the GSA, and the Industry Prime as EGNOS system manufacturer (on the basis of the contracts below specified).

5.2 Roles of the different stakeholders

5.2.1 Role of GSA

GSA, or “The Agency” hereinafter, guarantees the programmatic consistency between technical, planning and financial aspects of all components of the EGNOS exploitation, including safety and risk management.

GSA is responsible for the procurement of the EGNOS based navigation services and for the system design evolutions or changes related to Version 2 and Version 3. GSA manages the overall coordination of the exploitation of EGNOS for what concerns the provision of EGNOS Services, the operations, maintenance and Product Evolutions of the EGNOS product via a contract with the ESP and a Working Arrangement with ESA.

5.2.2 Role of ESA

On the basis of the EGNOS Working Arrangement concluded between GSA and ESA, ESA is the EGNOS system architect. ESA is the EGNOS design and procurement authority for major design changes contracted to the Industry Prime. In charge of the conception, design, monitoring, procurement, validation and qualification of major system evolutions and future generations of the system (EGNOS V3), including end-to-end system engineering activities.

As far as EGNOS GEO-3 Services procurement is concerned, ESA will support the GSA for the GEO-4 procurement and be the technical responsible for the follow up of the development phase of the Contract until the end of Service Preparation Phase.

5.2.3 Role of ESP

ESP ensures the EGNOS operations and the maintenance, prepares and implements the deployment of new EGNOS System Releases, obtains and maintains its status of certified Air Navigation Service Provider (ANSP), and reports to the European Aviation Safety Agency (EASA) on the matter.

The current EGNOS V2 service provision contract between the GSA and ESSP shall run until the end of 2021. The future EGNOS V3 service provider, hereinafter “ESP V3”, is subject of a dedicated procurement (hereinafter “ESP V3”).

5.2.4 Role of Industry Prime

Industry Prime is in charge of the development and qualification of the EGNOS product and commits on its performances. It also provides maintenance services. Industry Prime for EGNOS Version 2 and EGNOS Version 3 are different entities.

6 EGNOS GEO Payload Service Procurement

6.1 Scope

The scope of procurement of the “EGNOS GEOSTATIONARY SBAS Payload Service - GEO-4” comprises the following:

- Provision of the services of an EGNOS SBAS payload on-board a GEO satellite and compliant to requirements expressed in SBAS specifications [RD-1], [RD-2];
- Provision of two independent ground stations connected to each SBAS payload for the transmission of the EGNOS signals generated by the NLES equipment. This includes hosting and maintenance services for the NLES equipment at each ground station during the period of the service provision phase. The hosting sites shall be located in European Union territories.
- A service provision phase of 15 years starting from the operational qualification or Operational Start Date (OSD). The contractor performance during this phase will be governed by a Service Level Agreement (SLA) which define Key Performance Indicators (KPI) to be fulfilled.

Figure below presents the overall framework of the GEO-4 Service procurement:

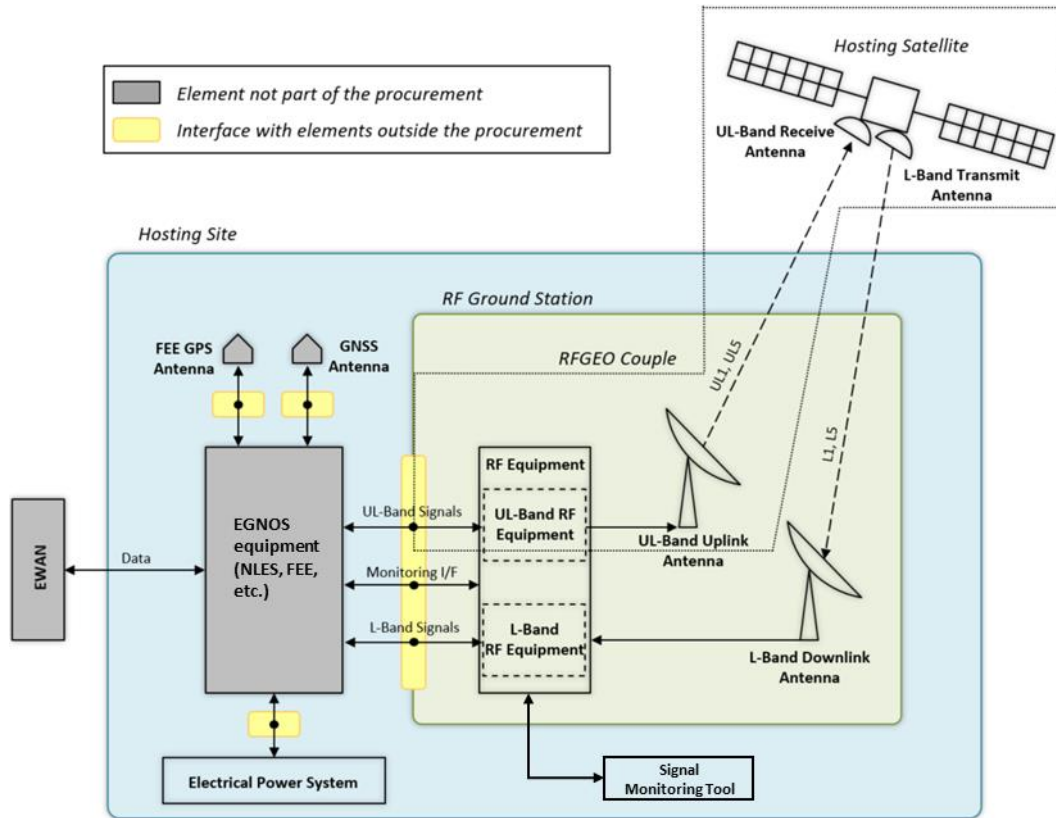


Figure 4 GEO-4 service contract boundaries

6.2 EGNOS GEO-4 Service High Level Description

The description in the present document have to be considered as preliminary, the detailed complete list of requirements will be provided in the Tender Specifications as part of Phase 2 of the procurement procedure.

Further details on the required SBAS signal characteristics and performance can be found in [RD-1], and [RD-2].

6.2.1 EGNOS GEO-4 project phases

The EGNOS GEO-4 project, which will be under the responsibility of the Contractor, will be composed of 2 phases:

- Phase 1: Service Preparation phase;
- Phase 2: Service Provision phase.

6.2.1.1 EGNOS GEO-4 Service Preparation phase

The main activities of the Service Preparation Phase will be:

- the development of the GEO-4 EGNOS SBAS payload and its integration into the GEO satellite;
- the development of the two RF ground stations and the preparation of the two NLES hosting sites;
- the launch of the satellite followed by the in-orbit tests;
- the preparation of the Service Provision phase including readiness of SLA monitoring means (comprising a signal monitoring tool) and reporting templates to be used for the Service Provision phase.

In more details, this phase shall start after the Contract Kick-Off and shall last until the OSD will be declared by the Agency at a successful Operational Readiness Review (ORR).

The GEO-4 payload, RF ground stations and signal monitoring tool shall follow the development cycle hereafter:

- Detailed specification of the GEO-4 payload, RF ground stations and signal monitoring tool, submitted to the System Requirements Review (SRR);
- Preliminary definition of the GEO-4 payload, RF ground stations and signal monitoring tool with the Preliminary Design Review (PDR);
- Detailed design of the GEO-4 payload, RF ground stations and signal monitoring tool including tests procedures concluding with the Critical Design Review (CDR);
- Validation of the GEO-4 payload on ground, the RF ground stations and the signal monitoring tool concluding with the Acceptance Review (AR);
- In-orbit test of the GEO-4 payload including end-to-tend test with the RF ground stations, concluding at IOT Review (ITR);

The Contractor may propose a payload whose development has already started in which case the proposal shall include detailed description of the engineering standards that have been followed, of the status of the development, of the milestones that have been passed, the complete documentation corresponding to such milestone and a plan to join the development cycle requested by the Agency.

The hosting services preparation shall involve the following cycle:

- Baseline the site development plan and the measures to be implemented to obtain full site compliance to the site implementation requirements [AD-271] at the Site Implementation Key Point (SIKP).
- Agree on the implementation of measures and security procedures to obtain the sites security accreditation certificate at the Site Implementation Key Point (SIKP-SEC).
- Execute the works in the two sites and validate the compliance in the Infrastructure Acceptance Review (IAR). An IAR will be held in each site.
- Obtain the site accreditation certificate from the Local Security Accreditation Authority (LSAA) declaring the site ready for the deployment of EGNOS assets at the Security Acceptance Review (SAR).
- Prepare all SLA monitoring and reporting means for the Service Provision Phase.

The Operational Start Date (OSD) will be declared only when all of the above (ITR, IAR, SAR, SLA readiness) will be validated at the ORR.

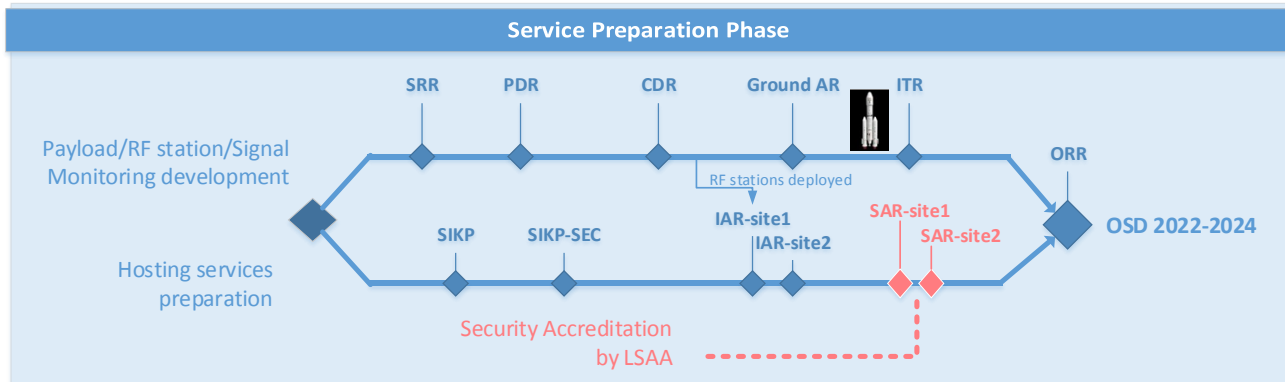


Figure 3 GEO-4 service preparation phase milestones

6.2.1.2 EGNOS GEO-4 Service Provision phase

Starting from the OSD and for a duration of 15 years, the Contractor shall deliver the operational GEO-4 services. Nevertheless, at OSD, NLES will not yet be installed on-site and the ESP V3 operations and maintenance baseline will not be ready. Therefore, after the OSD, the GEO-4 Service Provision will be in an initial mode, i.e the initial operations mode, until the Service Qualification Review (SQR) is passed.

Throughout the entire Service Provision Phase, the Contractor shall support the Customer in the process to obtain and maintain the Site Authorisation To Operate (SATO) certificate granted by the LSAA after a successful Security Accreditation Milestone (SAM). The SATO certificate is not directly linked to the SQR.

The main activities of the Service Provision Phase will be:

- In the initial operations mode:
 - to support the deployment and integration of the NLES in the hosting sites by the EGNOS V3 Industry Prime;
 - to define the operation & maintenance procedures and points of contact with ESP V3;
 - to obtain the training certificates of the operators;
 - to report on KPIs on a monthly basis as per GEO-4 SLA (in the initial operations mode, some exclusions may apply);

The initial operations period will end at the Service Qualification Review (SQR) whose objectives will be:

- To verify the completeness of the support to EGNOS V3 Industry Prime for GEO-4 EGNOS payload integration within EGNOS;
- To baseline the Contractor operation and maintenance processes, including interfaces and points of contact, derived from the ESP V3 processes requiring the involvement of the Contractor;
- To demonstrate the Contractor's operators have been successfully trained by ESP V3.

- In the nominal operations mode:
 - to provide the payload and RF ground station services;
 - to provide on-site support for the maintenance of the EGNOS NLES equipment, including support for troubleshooting, replacement, packaging, handling and transportation of failed equipment;
 - to support to the ESP V3 in its task of end-to-end service certification activities, including auditing rights towards the ESP V3/EASA;
 - to report on KPIs on a monthly basis as per GEO-4 SLA;
 - the regular training of the Contractor's operators according to ESP V3 operation and maintenance procedures.

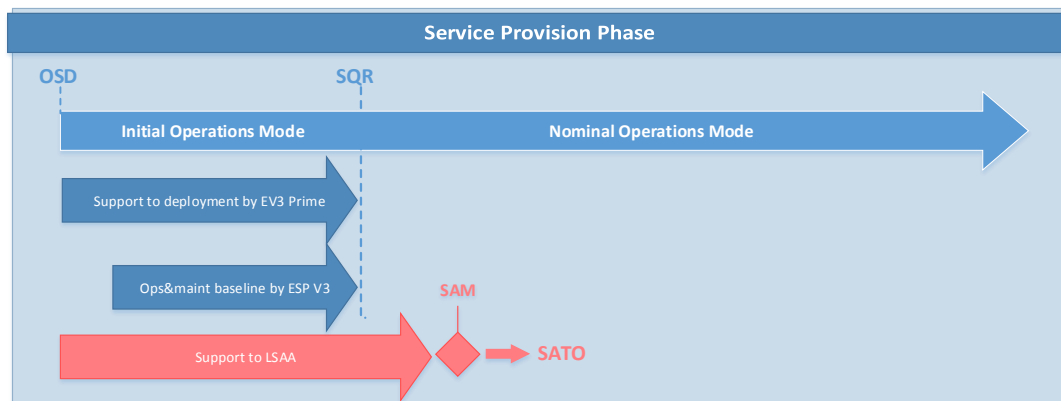


Figure 4 GEO-4 service provision phase

Please note that as specified in the TIP the Contract will only initially be signed until the end of 2021 due to the fact that EU funds are only currently allocated for this period. Renewal of the Contract for the full duration shall be contingent upon the allocation of EU funds to EGNOS programme.

Further details, including the list of deliverable documents for each phase, will be provided in the Tender Specifications.

6.2.2 EGNOS GEO-4 general implementation requirements

OSD date

The OSD shall be declared between 1st January 2022 and 31st July 2024.

The precondition for the declaration will be the successful completion of the ITR and the readiness of SLA monitoring and reporting means.

Satellite orbital position

The GEO-4 reference orbital position shall be fixed within the EGNOS GEO arc delimited by 10° W and 30.5° E and it shall be separated from the EGNOS satellites located at 5E and 5W by at least 1°.

Service availability

The mean duration of the EGNOS GEO-4 Service (payload, platform and RF station) outages shall not exceed the values reported in Table 1, irrespectively of the possible switches between the two RF Ground Stations.

Outage	Outage Interval	Mean Outage Duration
Short term	1 year	10 minutes
Long term	10 years	36 hours

Table 1 Outage Modes

Service continuity

The MTTO of the EGNOS GEO-4 Service (payload, platform and RF station) shall be greater or equal to 1 year (8766 h).

Ground stations geographical position

The two RF ground stations shall be located in two different sites within EU Member States territories or Norway or Switzerland with a minimum separation of 100 km. Only one of the sites can be located less than 100 km away from an existing EGNOS uplink site, i.e. one RF ground station can be located in/near Betzdorf (Luxemburg), Redu (Belgium), Rambouillet (France), Cagliari (Italy).

GEO-4 payload procurement

The Contractor shall be responsible for the design, manufacturing, integration, test and qualification of the EGNOS GEO-4 payload and its equipment on the satellite throughout all phases of the satellite manufacturing process up to the satellite in-orbit acceptance.

RF uplink/downlink stations

The Contractor shall be responsible for the design, manufacturing, integration, test and qualification of the two RF ground stations.

Signal monitoring tool

The Contractor shall be responsible for the design, manufacturing, integration, test and qualification of the signal monitoring tool.

GEO satellite launch

The Contractor shall be responsible to cover all the preparation activities linked to the launch of the GEO satellite hosting the EGNOS GEO-4 payload.

ITU filing

The Contractor shall be responsible for the regulatory aspects concerning the filing with the International Telecommunication Union (ITU) for the use of all downlink and uplink frequencies associated to the GEO-4 services. Proper coordination with other satellite operators for uplink frequencies shall also be performed in due time.

6.2.3 EGNOS GEO-4 management requirements

Space Standards

The Contractor shall implement ECSS standards or equivalent for the Service Preparation Phase.

Security Management

The Contractor shall ensure that security risks on the EGNOS Programme are managed according to the rules, principles and requirements set out by EU Member States, the owners of the EGNOS Infrastructure, by complying with European Union Classified Information (EUCI) regulation and with the EGNOS security requirements as defined in the GNSS Programmes Security Instructions (PSI), the PSI annex "EGNOS V3 Security Classification Guide (SCG)" and the Security Aspect Letter (SAL).

In addition to the deployment of physical security controls (access control, intrusion detection system, CCTV...) the Contractor shall define/enforce a security policy and associated security management plan (including processes/procedures) to protect EGNOS assets.

These physical and organisational security measures will support the EGNOS V3 security accreditation process in connection with the Agency and National Security Authorities involvement.

ISO27001 certification

The Contractor shall obtain the ISO 27001 certification, not later than OSD + 1 year and maintain the certificate throughout the duration of the Contract.

The certified Information Security Management System shall identify, protect from, detect, respond to and recover from those information security incidents which could potentially affect the EGNOS service. The ISMS

certification shall be provided and oversight during the contract execution by a national accreditation body as per regulation 765/2008¹.

The ISO 27001 certification shall cover the Contract and its objectives hereinabove stated, taking into account related information security risks inherent to the GEO Service Provider organisation, facilities and activities, to the equipment, systems and services it provides, maintains and operates, and to its interaction with other organisations. For the avoidance of doubt, previous ISO 27001 certification acquired by the Contractor which would not cover the scope of the GEO4 contract shall not be considered as fulfilling this requirement.

For a smooth integration within the operational EGNOS system, the ISMS shall consider the known dispositions of the future EASA regulation on information risk management (currently drafted within the NPA 2019-07).

SLA compliance and Performance Monitoring

The Service Provision shall be compliant with the SLA and the reporting provisions that will be included in the Contract. The SLA, that will be part of the Tender Specifications in Phase II of the procurement, will define KPIs to assess the Contractor's performance: payload and RF ground station availability, RF GEO couple impact on EGNOS signal, hosting services availability, management of NLES maintenance, reports delivery, etc. Liquidated damages shall apply.

Required compliance until EoL

All requirements shall be fulfilled during the entire lifetime of the service, until End-of-Life (EoL).

6.2.4 EGNOS GEO-4 RF ground station and payload technical requirements

6.2.4.1 Payload and RF signals characteristics

L-Band downlink channels

The EGNOS GEO-4 Service shall broadcast the EGNOS L1/L5 navigation signals provided by NLES through two L-band channels. The signals have the characteristics described in Table 2. L5 channel can potentially include a quadrature component.

	L1 channel	L5 channel
Frequency Band Name	L1	L5
Centre Frequency [MHz]	1575.42	1176.45
Modulation	BPSK-R	BPSK-R
Polarisation	RHCP	RHCP

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32008R0765>

Channel Bandwidth [MHz]	24	24
Chip rate [chips per second]	1.023e6	1.023e6

Table 2 L-Band downlink channels

Transparent navigation payload

The EGNOS GEO-4 payload shall provide transparent transposition between two uplink channels (UL1 and UL2) and the two L-band downlink channels (L1 and L5) .

Payload functionality

The EGNOS GEO-4 payload shall provide a means for reception of the uplink signals, frequency conversion to L-band, separate amplification and filtering for broadcasting of the L1 and L5 channels, including appropriate redundancy. The payload may incorporate channel amplifiers and linearizers, where required, to meet signal performance requirements.

Frequency linearity between channels

The frequency translation error between UL2 and L5 channel frequency shall be linked by a constant relationship to the frequency translation error between UL1 and L1 channel frequency.

Frequency spectrum inversion

The frequency spectrum of the L1/L5 navigation signals shall not be inverted with respects to the input spectrum generated on ground.

Power levels

The EGNOS GEO-4 Service shall provide for the two L-band channels a received radiated power on-ground according to Table 3.

	L1 channel	L5 channel (per each component, in-phase or quadrature)
Minimum Rx Power [dBW]	-158.5	-158
Maximum Rx Power [dBW]	-152.5	-150.5

Table 3 Minimum/Maximum On-Ground Received Power

Note: The min/max received power level on-ground for each navigation signal within the respective transmitting bandwidth is considered into an ideally matched RHCP 0 dBi receiver antenna.

C/No degradation

The uplink shall be dimensioned such that the degradation of the total C/No on ground is below 0.2 dB with respect to the downlink C/No in a range between 38 dBHz and 55 dBHz.

Effective Isotropic Radiated Power Stability

The EIRP variation from any location and within any location in the coverage area shall not exceed 1.2 dB (peak-to-peak) for any 24 hours, including Transmit L-Band Antenna(s) gain variation.

Payload antennas

The following dedicated antennas shall be accommodated for the EGNOS GEO-4 payload:

- Transmit L-Band antenna(s)
- Receive antenna in the uplink frequency selected by the Contractor

Note: The Transmit L-band antenna(s) can be separate antennas or combined in a single aperture depending on the specific design choice.

Receive antenna coverage

The Receive antenna shall ensure that the uplink signal can be received from two different RF uplink stations within EU Member States territories or Norway or Switzerland.

Latency time

The time delay between the on-ground navigation signals transmission and the on-ground navigation signals reception through the RFGE0 couple (including the two-way propagation delay) shall be less than 300 ms.

Uplink robustness

The Contractor shall propose measures to make the uplink more robust to interferences.

6.2.4.2 RF Ground Station

RF ground station functionality

The EGNOS GEO-3 RF ground station shall transmit the navigation signals generated on-ground (UL1 and UL2) and receive the L1 and L5 navigation signals transmitted by the EGNOS GEO-4 payload.

RF ground station antennas

The following dedicated antennas shall be part of the EGNOS GEO-4 RF Ground Station:

- Uplink antenna
- Downlink L-band antenna

Uplink steerability and tracking accuracy

The antenna shall be capable of being pointed to any location on the geostationary arc visible to the RF ground station and be capable of tracking the satellite movements with accuracy compatible with the EIRP stability.

RF uplink frequency tunability

The RF uplink transmitting equipment shall accommodate the full range of uplink Doppler shift for up to ± 5 deg of orbital inclination, with an additional ± 2 kHz allowance for frequency translation errors.

Robustness against Interference by another SBAS-GEO

The RF Ground Station shall be able to uplink or receive the GEO-4 navigation signals without degradation of performance in presence of any SBAS GEO signals, under the following conditions:

- with more than 0.5 deg separation between the interfering SBAS GEO and GEO-4,
- with SBAS GEO interfering power levels up to 6 dB above the GEO-4 power levels

6.2.4.3 Operational requirements

L-Band navigation signals vs signal operation modes

The EGNOS GEO-4 Service shall allow for independent operation of the L1/L5 channels and shall support multiple combinations of signals, called Signal Operation Modes (SOM). The SOM are listed in Table 4.

L1 channel	L5 channel	SOM
X		L1 Operations Only
	X	L5 Operations Only
X	X	L1/L5 Operations

Table 4 L-Band Navigation Signals vs Signal Operation Modes

Payload channels control

The two EGNOS GEO-4 Payload Channels shall have independent adjustments and command functions for power amplifier switch ON/OFF, channel gain and level control setting. The gain shall be adjustable in steps of 0.5 dB.

Boost of Uplink Power

The RFGE0 couple shall allow to boost the uplink power of each individual channel up to TBD dB by ground command with steps of 0.5 dB while meeting the rest of the requirements.

Availability of telemetry

The telemetry values recovered from the payload shall be made available on request during the service preparation and service provision phases.

6.2.5 EGNOS GEO-4 hosting site requirements

GNSS antenna clear horizon

Each GEO-4 hosting site shall allow up to 4 GNSS antenna locations with clear horizon above 12°

6.2.6 EGNOS V2 Service provision with GEO-4

The Contractor shall perform the necessary tasks to ensure GEO-4 can provide EGNOS V2 service, if required, before the entry in operation of EGNOS V3. The tasks will include:

- Support for the installation and test of NLES V2 and the EGNOS V2 associated release;
- ICD and SoC to V2 IRD;
- Training of operators for NLES V2;
- Definition of operational V2 procedures in coordination with ESP;
- Support for the GEO-4 handover between V2 and V3 services;
- Organisation of a SQR-V2 to verify Contractor's baseline and readiness to support NLES V2 operations and maintenance;
- Support to V2 decommissioning.

Note: the same RF station to NLES interfaces are applicable for NLES V2 and NLES V3.



6.3 EGNOS GEO-4 Service Options

E5b optional channel

The requirements for a third channel in E5b frequency band will be provided in the Tender Specifications for Phase 2.

Annex A – Acronyms

AR	Acceptance Review
CCF	Central Control Facility
CDR	Critical Design Review
CPF	Central Processing Facility
C/A	Coarse/Acquisition
DFMC	Dual Frequency Multi-Constellation
DGPS	Differential GPS
EASA	European Aviation Safety Agency
EC	European Commission
ECAC	European Civil Aviation Conference
ECSS	European Cooperation for Space Standardization
EDAS	EGNOS Data Access Service
EGNOS	European Geostationary Navigation Overlay Service
EIRP	Effective Isotropic Radiated Power
ESA	European Space Agency
ESP	EGNOS Service Provider
ESSP	European Satellite Service Provider
EWAN	EGNOS Wide Area Network
FIR	Flight Information Region
GEO	Geostationary Orbit
GPS	Global Positioning System
GSA	European GNSS Agency
IAR	Infrastructure Acceptance Review
ICD	Interface Control Document
IOT	In-Orbit Test
ITR	In-Orbit Test Review
ITU	International Telecommunication Union
KPI	Key Performance Indicators

LPV	Localizer performance with vertical guidance
MCC	Mission Control Centre
MOPS	Minimum Operational Performances Standards
NLES	Navigation Land Earth Station
OS	Open Service
OSD	Operation Start Date
PBN	Performance Based Navigation
PDR	Preliminary Design Review
PRN	Pseudo-Random Noise sequence
RF	Radio-Frequency
RFI	Request For Information
RHCP	Right-Hand-Circularly-Polarized
RIMS	Ranging and Integrity Monitoring Station
RNP	Required Navigation Performance
RNP APCH	Required Navigation Performance for APproaCH
RTCA	Radio Technical Committee for Aeronautics
RTK	Real Time Kinematic
SARPS	Standards and Recommended Practices
SBAS	Satellite Based Augmentation System
SDD	Service Definition Document
SES	Single European Sky initiative
SIS	Signal In Space
SLA	Service Level Agreement
SoL	Safety of Life
SOM	Signal Operation Modes
SPS	Standard Positioning Service
SQR	Service Qualification review
SRR	System Requirement Review
TBD	To Be Defined
TIP	Tender Information Package



European
Global Navigation
Satellite System
Agency

**GSA/NP/02/19 - EGNOS GEOSTATIONARY SBAS PAYLOAD
SERVICE GEO-4 - Service Descriptive document (Annex 2 to
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