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Working Group WG 3

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IEC Standardisation for SBAS maritime receivers

# PURPOSE

Satellite Based Augmentation System (SBAS) is installed in several regions worldwide to augment the navigation system constellations by broadcasting additional signals. The basic scheme is to use a reference monitoring network to receive GNSS signals that are processed in order to estimate satellite (position and clock) and ionospheric errors. Once these estimations have been computed, they are transmitted in the form of “differential corrections” by means of SBAS satellite(s). Along with these correction messages which increase accuracy against GNSS standalone solution, some integrity data for the satellites that are in the view of this network of monitoring stations are also broadcast, increasing the confidence that a user can have in the satellite navigation positioning solution.

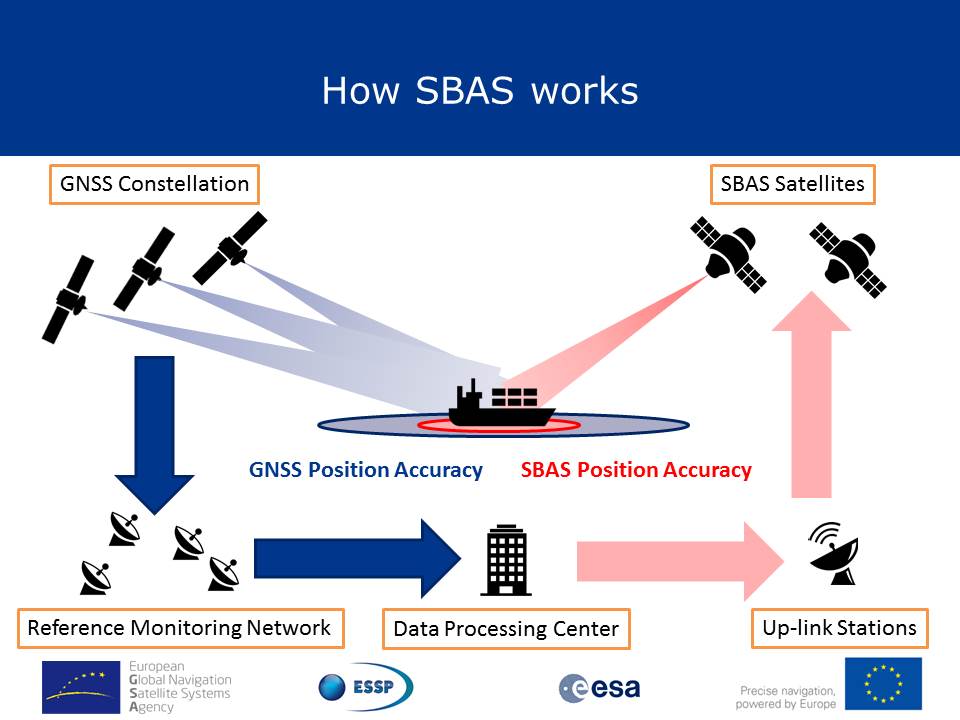


Figure 1‑1 SBAS architecture

SBAS systems are designed according to the same standard (SARPs [8]) worldwide. So far, SBAS have already been commissioned in the following regions:

* Europe: European Geostationary Navigation Overlay Service (EGNOS).
* USA: Wide Area Augmentation System (WAAS).
* Japan: Multi-functional Satellite Augmentation System (MSAS).

Analogous systems are under commissioning or deployment in other regions of the world, for example:

* Russia: System for Differential Corrections and Monitoring (SDCM)
* India: the GPS and GEO Augmented Navigation (GAGAN) system
* Republic of Korea: Korea Augmentation Satellite System (KASS).
* China: Beidou Satellite-based Augmentation System (BDSBAS).
* Australia: Australian SBAS.
* Nigeria: The Agency for Air Navigation Safety in Africa and Madagascar (ASECNA) SBAS over Africa and the Indian Ocean (AFI) region, called African SBAS (A-SBAS).
* South/Central America and the Caribbean: SBAS initiative called SACCSA (Soluciόn de Aumentaciόn para Caribe, Centro y Sudamérica)



Figure 1‑2 Existing and under definition SBAS systems (Source: GSA User Technology Report 2018)

Nowadays, GPS, GALILEO, GLONASS and Beidou systems are recognised by the International Maritime Organization (IMO) as components of the World Wide Radio Navigation System but not suitable for Harbour entrances, harbour approaches and coastal waters. It is required that differential services (i.e. DGPS/DGLONASS, SBAS…) broadcast information for augmenting the GNSS systems to provide the accuracy and integrity required for harbour entrances/approaches and coastal waters in which the freedom to manoeuvre is limited (i.e. accuracy requirement of 10 meters according to IMO Res. 1046 [9]).

Navigation with SBAS can provide many benefits for maritime community. Apart from reducing position errors, SBAS provides safety alerts to avoid some threats existing in GNSS-standalone positioning. Furthermore, SBAS coverage area complements terrestrial DGNSS systems, which would improve maritime safety. As observed in Figure 1‑2, SBAS systems are spread worldwide and the plan is to cover in the future most of coastal waters. Besides, navigation using SBAS is more efficient, reducing the route duration, the fuel consumption and the gas emissions.

Maritime community is interested in using SBAS for ocean waters, coastal waters and harbour entrances/approaches considering operational needs (IMO Res. 1046 [9]), especially where there is no back-up infrastructure (i.e. DGPS/DGLONASS) or in poorly covered environments. IMO MSC.401 [1] and IEC 61108-4 [5] (Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment) allow the use of SBAS in shipborne receivers but there is no standard for its implementation. Most of maritime GNSS receiver models are SBAS compatible but they could present important differences in their performance since there are not certified according to any test standard.

As highlighted in the IALA Guidelines G-1152 on SBAS Maritime Service [10], in order to ensure a safe use of SBAS by all shipborne receivers, a test standard for SBAS receiver equipment should be published. IEC 61108 is a collection of IEC standards for "Maritime navigation and radio-communication equipment and systems - Global navigation satellite systems (GNSS)". IEC has published International Standards for the following GNSS systems: 61108-1 for GPS [2], 61108-2 for GLONASS [3], 61108-3 for Galileo [4] and 61108-5 for BDS [6], and launched a new proposal 1108-6 for IRNSS [7]. In addition, IEC has published International Standard 61108-4 for DGPS and DGLONASS [5], which is a kind of GNSS Augmentation system based on an enhancement to primary GNSS constellations (GPS and GLONASS).

A new IEC 61108 part could be develop to include the minimum performances for SBAS L1 maritime GNSS receivers to be achieved by the receiver equipment in order to be compliant with the IMO Res. A.1046(27) [9] operational requirements for harbour entrances, harbour approaches and coastal waters, along with the methods of testing and required test results.

# STANDARDISATION PROCESS and status

The standardisation process to produce a new standard IEC 61108-7 has started. The title proposal is “*Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) – Part 7: Satellite Based Augmentation Systems – Receiver Equipment – Performance requirements and method of testing”*.

At this point, two initiatives are currently working to support this standardisation process:

* First, the GNSS Space Agency (GSA) and the European Commission (EC) have launched the MARESS (MAritime Receiver SBAS Standardisation) project, where ESSP, BNAE, CEREMA, University Gustave Eiffel will be working during 2021 in the production of technical documentation to support the International Electrotechnical Commission (IEC) standardisation.
* Second, CEN, the European Standardisation Committee through its Technical Committee 5 dedicated to Space has created the Working Group 8 (CEN/CLC JTC5 /WG 8) of SBAS receiver performance for maritime applications in September 2020. In this group, MARESS project’s outputs will be presented to commonly agree on the final draft of IEC-61108 Part 7 for SBAS receiver equipment, which will be submitted to IEC Technical Committee 80 (Maritime navigation and radiocommunication equipment and systems). **Interested people are welcome to join to this group to participate in the standard definition**.

The New Work Item Proposal IEC 61108-7 standard has been submitted to IEC TC80 in February 2021, starting the international process. The ballot is planned to be open in March 2021 and thus, **it is requested to the national bodies with representation in IEC to vote in favour with participation**. This ballot will be a key milestone since it is required to pass the approval criteria in terms of participation and positive support in order to continue with the process. Please, note that the work produced in the ENG Committee WG3 defining the SBAS Maritime Service (G1152) could be updated with the standardisation of the maritime ship receiver.

Hereafter, the preliminary standardisation plan is presented:

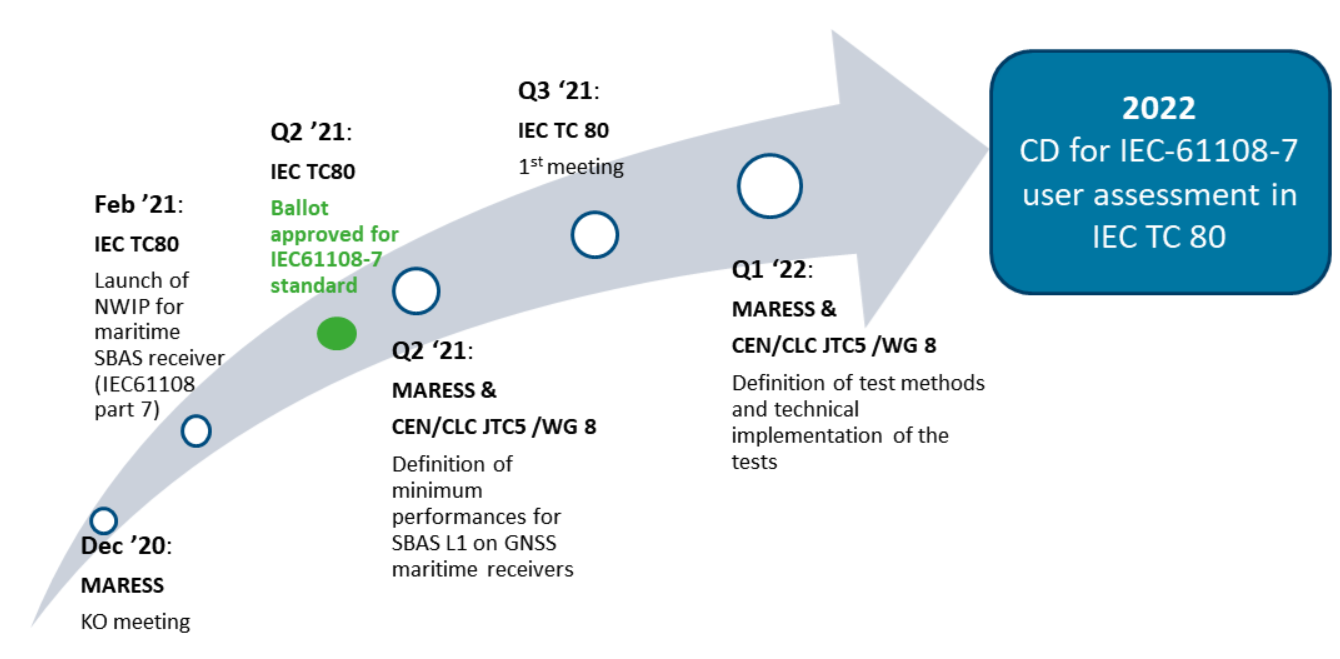


Figure 2‑1 Tentative plan for standardisation process

As presented in Figure 2‑1, the approval of the New Work Item Proposal (NWIP) IEC 61108-7 standard for SBAS is expected to be approved in Q2 2021. If the New Work Item Proposal is approved, the IEC standardisation process within IEC TC 80 group will start. Assuming that the NWIP is approved considering the support expected for several countries, by May-June the first meeting of the European Working Group CEN/CLC JTC5 /WG 8 is planned to discuss the inputs provided by MARESS Project, which would include an outline of the IEC standard and the proposal for the definition of the minimum performances for SBAS L1 on GNSS Maritime receivers. Later in Q3 2021, the first meeting of IEC TC 80 could be held presenting the draft agreed within CEN/CLC JTC5 /WG 8. Finally, in 2022 a Committee Draft for IEC 61108-7 standard is expected to be under assessment within IEC TC 80. Note that these dates are tentative milestones; the final plan will be scheduled by IEC TC 80.

# REQUEST TO MARITIME COMMUNITY

In order to ensure a safe use of SBAS by all shipborne receivers, an IEC 61108 standard for SBAS receiver equipment should be published. The members of ENG WG that would like to support this standardisation process are requested to:

* Liaise with the national bodies with representation in IEC to provide a positive vote. This would be highly appreciated to support the New Work Item proposal IEC 61108-7 standard for SBAS receiver equipment launched in IEC TC 80. New Work Item Proposal was submitted in February 2021 and the ballot will be public during March 2021.
* Join and participate in CEN European Working Group (CEN/CLC JTC5 /WG 8) of SBAS receiver performance for maritime applications within Technical Committee 5 dedicated to Space. The group has been already created and the first meeting is expected by May-June 2021.

# References

[1] IMO Resolution MSC.401 (95) performance standards for multi-system shipborne radio-navigation receivers.

[2] IEC 61108-1: 2003, Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 1: Global positioning system (GPS) – Receiver equipment – Performance standards, methods of testing and required test results

[3] IEC 61108-2: 1998, Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 2: Global navigation satellite system (GLONASS) - Receiver equipment– Performance standards, methods of testing and required test results.

[4] IEC 61108-3: 2010, Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 3: Galileo receiver equipment – Performance requirements, methods of testing and required test results.

[5] IEC 61108-4: 2004, Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 4: Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment – Performance requirements, methods of testing and required test results.

[6] IEC 61108-5: 2020, Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 5: BeiDou navigation satellite systems (BDS)– Receiver equipment – Performance standards, methods of testing and required test results

[7] New Proposal launched for IEC 61108-6: Maritime navigation and radiocommunication equipment and systems – Global navigation satellite systems (GNSS) – Part 6: Indian Regional Navigation Satellite System (IRNSS) – Receiver equipment – Performance standards, methods of testing and required test results.

[8] ICAO Standards and Recommended Practices (SARPS) Annex10 Volume I (Radio Navigation Aids).

[9] IMO Resolution A.1046 (27) Worldwide Radionavigation System, 30 November 2011.

[10] IALA Guidelines G-1152 SBAS Maritime Service, December 2019.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Input papers should be assigned to a work task as listed in the Committee work plan which is available in input papers. Leave open if uncertain but consider how the paper is to be processed if not relevant to a work task [↑](#footnote-ref-2)