European
Global Navigation
Satellite Systems
Agency

Market strategy update in Maritime segment

This presentation can be interpreted only together with the oral comments accompanying it

Market sub-segments and applications

Recreational navigation: GNSS systems are widely used across recreational vessels, both overseas and in high traffic areas

Merchant Navigation: commercial vessels transporting goods or passengers differentiating in SOLAS* ("regulated" by IMO) and Non-SOLAS vessels

Inland Waterways (IWW) Navigation: GNSS is used to ensure safe navigation in rivers, canals, lakes and estuaries

NAVIGATION APPLICATIONS

Search & Rescue (SAR): Provision of aid to people in danger by means of dedicated beacons and transponders (e.g. EPIRB, PLB and AIS-SART)

Including Autonomous vessels

Fishing vessels: GNSS enables to track fishing vessels position and to monitor the access to protected marine areas

Inland Waterways (IWW) traffic info: Provision of traffic information to IWW users

Traffic management and surveillance: Activities supported by GNSS-based systems including Automatic Identification System (AIS) and Long-Range Identification & Tracking (LRIT)

Homeland Security: GNSS supports border patrolling operations

Ports: GNSS helps monitoring the transit progress of cargos and supervising docking and loading operations

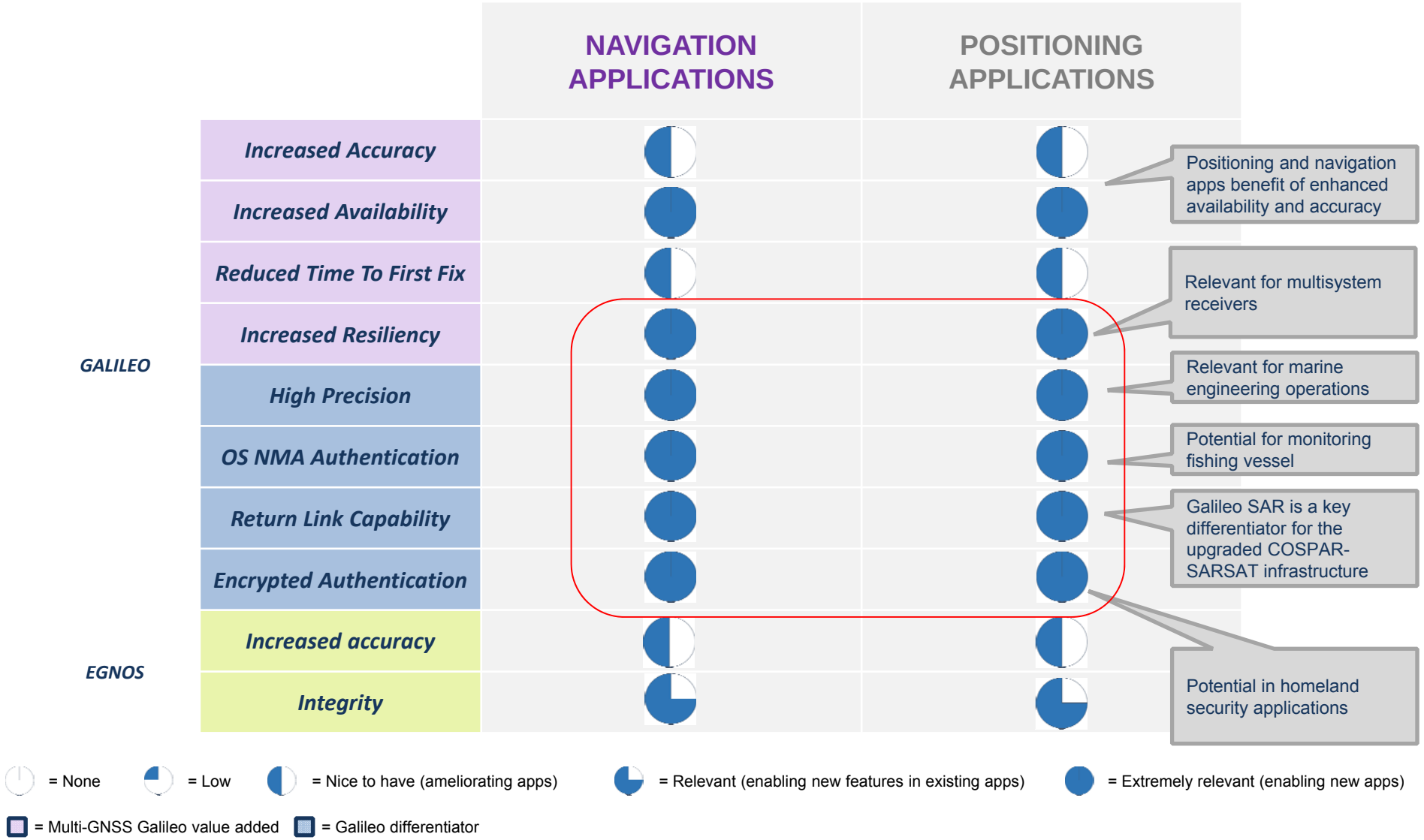
Marine Engineering: Construction activities in harbors and off-shore rely on GNSS (e.g. cable and pipeline laying)

POSITIONING APPLICATIONS

(*) All passenger and cargo ships larger than 500 gross tonnage (300 tons for international voyages) fall into this category

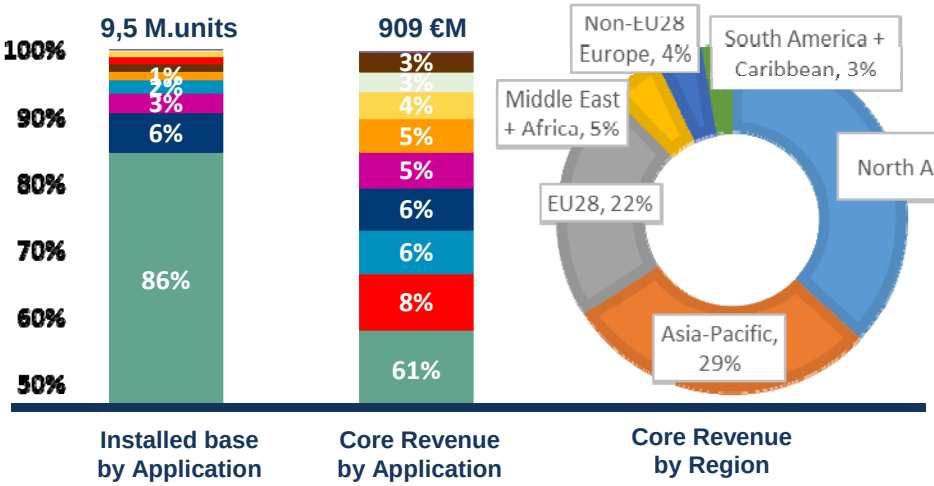
EPIRB= Emergency Position-Indicating Radio Beacons, PLB = Personal Locator Beacons, AIS-SART = Search and Rescue Transponder, SOLAS = Safety of Life at Sea

E-GNSS contribution and added value

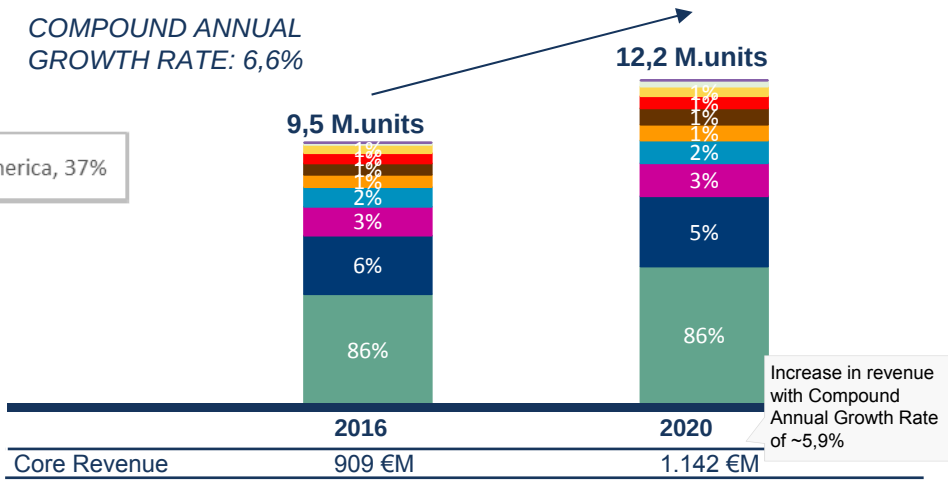


General Navigation and Search and Rescue will continue being the largest applications

WORLDWIDE GNSS MARKET IN 2017



WORLDWIDE GNSS INSTALLED BASE EVOL. '16-'20



	2016	2020
Core Revenue	909 €M	1.142 €M

KEY MARKET AND TECHNOLOGY TRENDS

- **Recreational represents by far the largest sub-market** in terms of GNSS devices number, but it is very fragmented and difficult to reach
- Multi-constellation GNSS receivers will be the core of the **e-Navigation concept** integrating other systems available in the vessel
- **General Navigation and Search and Rescue** will continue being the largest applications, driven by recreational users
- **Automatic maneuvering operations** in ports will benefit from high precision positioning
- GNSS increasingly used in **conjunction with other technologies** (e.g. telecommunication, electronic charting display), especially images taken from Copernicus satellites and UAVs

LEGEND

NAVIGATION APPLICATIONS
- Recreational navigation
- Merchant Navigation
- IWW Navigation

POSITIONING APPLICATIONS
- Search & Rescue (SAR)
- Fishing vessels
- IWW Traffic info
- Traffic management and surveillance
- Homeland Security
- Ports
- Marine Engineering

Overall E-GNSS adoption depends on four main enablers/barriers

IMO Recognition – *WWRNS*

Galileo has to be compliant with operational requirements in IMO Res. A.1046 on World Wide Radionavigation Systems

Current Status:
- Galileo recognition since May 2016

Standards

Current Status:
- IMO Res. MSC 401: Performance Standards (PS) for multisystem shipborne radionavigation receivers, which includes Galileo and SBAS
- IMO Res. MSC 233: Adoption of PS for Galileo Rx
- IEC 61108-3: PS and tests for Galileo Rx
- RTCM Guidelines for SBAS under development in SC-104
- No IEC publication regarding SBAS receiver equipment tests

Economical -> Ratio price/new functions

- In regulated segment there is the tendency to buy the cheapest devices compliant with regulations
- In leisure segment the main market drivers are first technology and then price

Legacy Systems

- DGNSS- IALA radiobeacon is the internationally accepted means of providing differential GNSS corrections and integrity information to maritime users

Our 2020 objectives

Where we want to be

General for recreational and regulated

- Galileo and/or EGNOS enabled in ca. 80% maritime receivers' models

Regulated (e.g. SOLAS vessels)

- EGNOS complementing Differential GNSS infrastructure providing integrity information for inland and coastal waters

- Galileo used for navigation in ocean, coastal & restricted waters
- Galileo-SAR return link capability adopted in beacons
- Galileo Authentication used for vessels monitoring
- Differential EGNSS available for high precision operations and maneuvering in ports

Levers contributing to objectives

How to get there

General for recreational and regulated

- Promote the benefits of Galileo and EGNOS in the maritime industry, targeting manufacturers, integrators and user communities
- Analyse user needs to support the definition of technical requirements for maritime services and related receivers

Specific for regulated (e.g. SOLAS Vessels)

- Perform and disseminate cost-benefit analysis of Differential GNSS infrastructure optimization using EGNOS
- Build a maritime service based on EGNOS v2 compliant with IMO Resolution 1046 and related receivers
- Upgrade IALA beacons and AIS (VDES) stations to enable the transmission of EGNOS corrections

- Galileo testing campaign for receiver manufacturers leveraging on Galileo recognition in the IMO WWRNS
- Include Galileo and return link feature in EPIRB/ PLBs beacons leveraging on Galileo SAR
- Support EC to propose updates for restricted areas regulations leveraging Galileo authentication (e.g. fisheries)
- Support (i) Differential Galileo and (ii) EGNOS standardisation at RTCM

EGNOS in Non-Regulated: Demonstrating the benefits for recreational vessels

https://www.youtube.com/watch?v=ygaphK44yOw&feature=youtu.be

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GSA and maritime authorities work together in user fora to shape future maritime applications

The European Maritime Radionavigation Forum

It gathers together different bodies from maritime administrations to shipowners' organisations to focus on the co-ordination of European maritime interests in the field of radionavigation systems for development within Europe

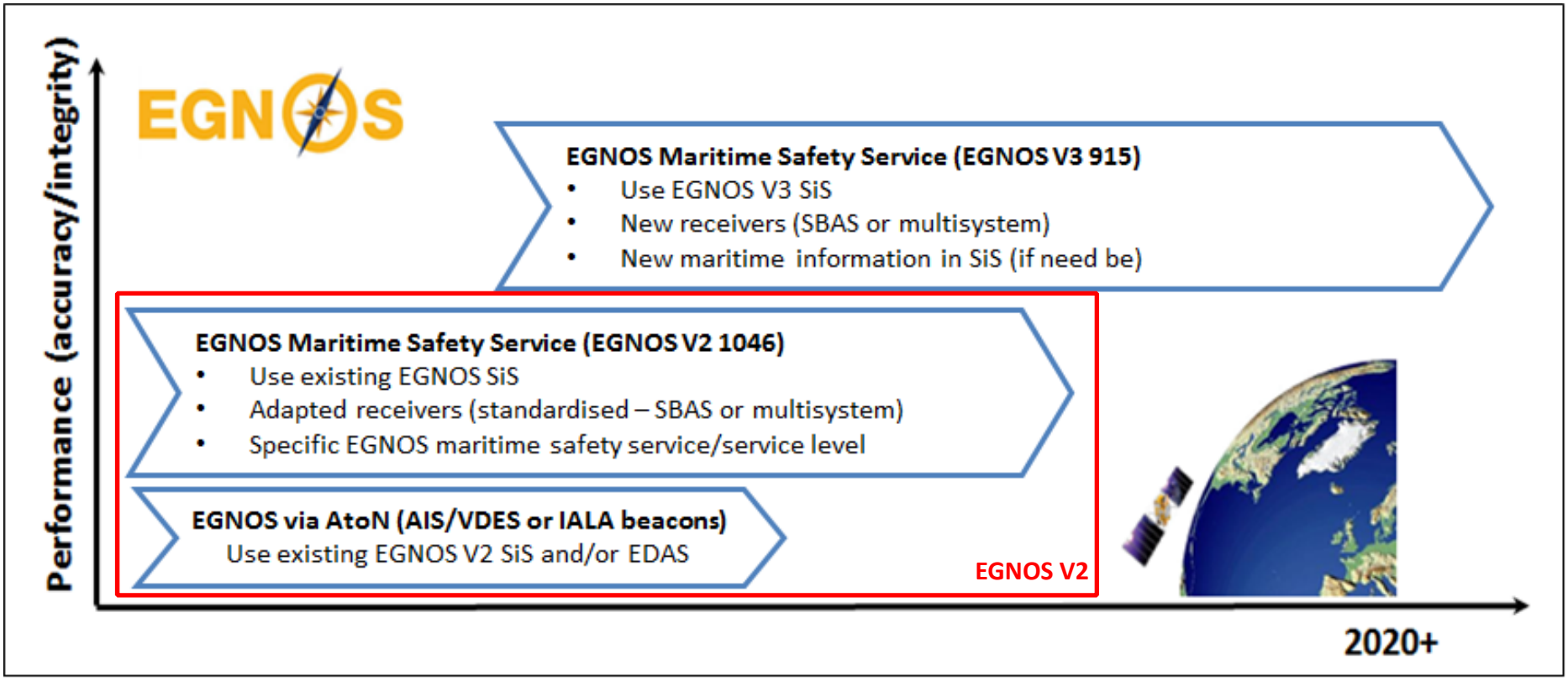
NMSP Forum involves EU national maritime service providers

Last Joint EMRF-NMSP Workshop covered the following topics:

- Roadmap update for EGNOS v2 adoption in SOLAS Vessels
- IMO recognition process
- Service Provision Aspects
- Transmission of EGNOS corrections via IALA beacons and AIS
- New EGNOS maritime safety service and shipborne receivers
- User's requirements for navigation and operations in ports

EMRF= European **Maritime Radionavigation Forum,** NMSP = **National Maritime Service Providers**

High level roadmap for EGNOS in maritime



Roadmap of adoption of EGNOS v2 (IMO A1046)

The European Maritime Radio-Navigation Forum (EMRF) agrees to follow the following **roadmap for adoption**, endorsedby different maritime authorities that basically consists in:

1.- **IMO recognition of SBAS as part of WWRNS**. This will accelerate the adoption in different countries enabling the possibility for maritime authorities to decide the best way to rationalise the DGNSS infrastructure.

2.- **Service provision aspects** – Service definition document

3.- **R&D actions on shore stations** (AIS / IALA DGNSS) and test campaign/pilot project

4.- **Standardisation process** in receivers on-going for SBAS:

- IMO Res.401(95) includes the use of SBAS (EGNOS) in Multisystem receivers (2015)
- the draft PNT Guidelines for multisystem receivers recently submitted to NCSR3 also include the use of EGNOS in Multisystem receivers (final version expected by NCSR4)
- IEC test specifications for multi-system receivers, supported by RTCM SC-104 and SC-131 will include SBAS as well (expected by mid-2019)

5.- R&D actions on Rx and **test campaign**

Leveraging R&D

MARITIME VALUE CHAIN

Maritime Organisations

- **IMO** sets the standards for safety, security of shipping and pollution prevention
  - Guideline for multisystem PNT Rx
  - Galileo Recognition
- **IALA** is an international technical association harmonising aids to navigation:
  - Guideline for the use of SBAS in IALA beacons and AIS stations

Receiver Manufacturers

FE: under evaluation

- EGNOS Maritime Receiver Development, Test and Validation
- MEOSAR Beacon prototyping

System Integrators

H2020:

- Maritime surveillance (both in coastal areas and the open sea) based on a Galileo based passive bistatic radar (SPYGLASS)
- Development of a personal SAR beacon (PLB) for mariners making use of Galileo (SAT406M)
- Development of Galileo enabled SAR beacons (HELIOS)

Ship owners/ Operators

FP7:

- Demonstrating benefits for ship routing through cooperative satellite navigation (COSMEMOS)
- Marine park Enhanced applications based on Use of integrated GNSS Services (MEDUSE)

Ports

FP7:

- EGNOS for safety, security and productivity in ports: accuracy and integrity are key for navigating in restricted waters (SAFEPORT)
- Coastal Surveying of Depths with EGNOS to Enhance Charts(CoSuDEC)

H2020:

- Advanced automated navigation GNSS-based solution for Straddle carriers vehicles in ports (Logimatic)

FP/ H2020 | Fundamental Elements | Other MKD activities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QUESTION TIME
Thank You!

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5.- R&D actions on Rx and test campaign

1.- EGNOS Recognition at IMO

How to get there

IMO recognition of SBAS as part of the WWRNS

- EC started a dialogue with WAAS via WG-C stablish to check the interest to join a SBAS recognition at IMO
- EC aims at submitting the proposal for EGNOS (alone or with WAAS) recognition to MSC 98th before the IMO Assembly 30th at the end of 2017
- Assembly 30th is expected to adopt the recognition process as planned output for the next biennium (2018-2019)
- The process will permit to adopt EGNOS as part of WWRNS by mid-2019. Member states support needed, as happened for Galileo

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GSA

2.- Service Provision Aspects and SDD

How to get there

SERVICE PROVISION ASPECTS AND SERVICE DEFINITION DOCUMENT

- Service provision aspects have to be defined and implemented
- A working group led by ESSP and with maritime authorities cooperating is ongoing
- This will be the input for the Service Definition Document
- The implementation will be prolonged in time beyond the IMO recognition process

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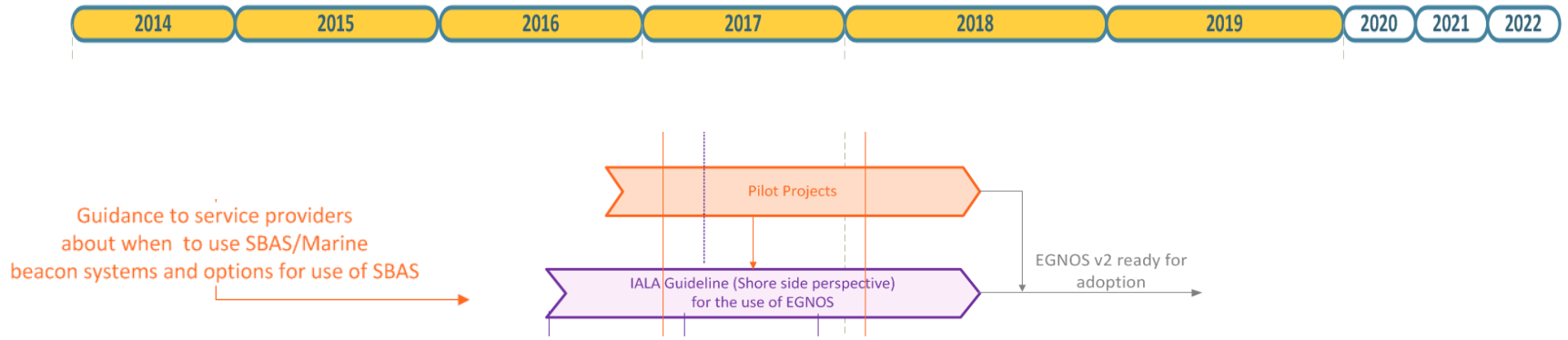
GSA

3.- IALA Guidelines – AIS/VDES and IALA beacons (1/4)

How to get there



- IALA Guideline for the use of EGNOS. Work already started in IALA eNAV17 meeting in WG5-PNT (2015)
- Pilot Project/Test Campaigns
  - Duration of the project foreseen: c.a. 1.5 years

3.- Status of IALA guidelines (2/4)

How to get there

- GSA, ESSP and ESA started the work at IALA for the preparation of IALA guidelines (maritime shore side) on the use of EGNOS, where several input papers were submitted

- The last input papers focused on an assessment of the best configurations for the transmission of EGNOS corrections over IALA beacons and AIS Stations

- Next paper will focus on CBA (March 2017)

3.- Status of Pilot Project (3/4)

How to get there

- Following the Call of interest launched on the use of EGNOS via another means of transmissions different from GEOs (i.e. IALA beacons, AIS and VDES), GSA received the confirmation of 14 countries interested in participating in a pilot

- GSA is analysing how to support testing activities and we have the intention to launch a pilot project in Q1 2017

3.- Expressions of interest in the pilot project of EGNOS over AIS/VDES and IALA beacons (4/4)

How to get there

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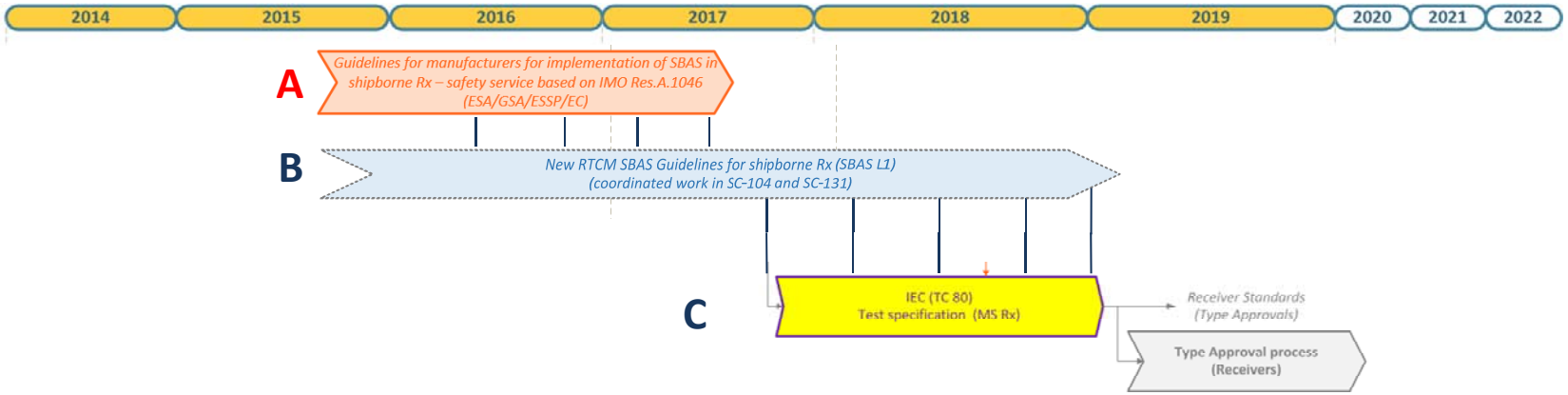
5.- R&D actions on Rx and test campaign

4.- Implementation of SBAS in Maritime Receivers

How to get there



A. Guideline for manufacturers for SBAS shipborne Receivers based on IMO Res. A.1046.

Outcome: a document describing the minimum set of SBAS messages to process for compliance with IMO Res. A.1046.

B. Definition at RTCM (SC-104 and SC-131) with **A** supporting this process.

C. Definition of test specification at SC 131 for IEC TC-80 with **B** supporting this process.

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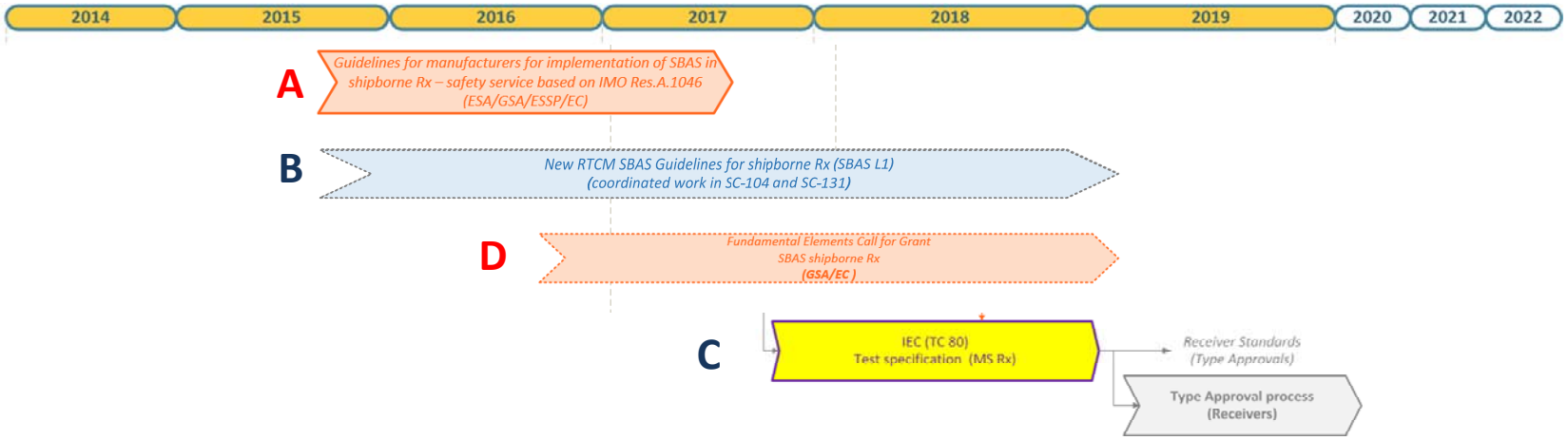
5.- R&D actions on Rx and test campaign

GSA

5.- GSA Call for Proposals 2016: Grant to support SBAS Rx Guidelines

How to get there



D. Fundamental Elements Grant for SBAS Maritime shipborne Rx by GSA.

- KO by Q2 2017 (indicative)
- Indicative duration: 1.5 years
- Budget: 1 Mln