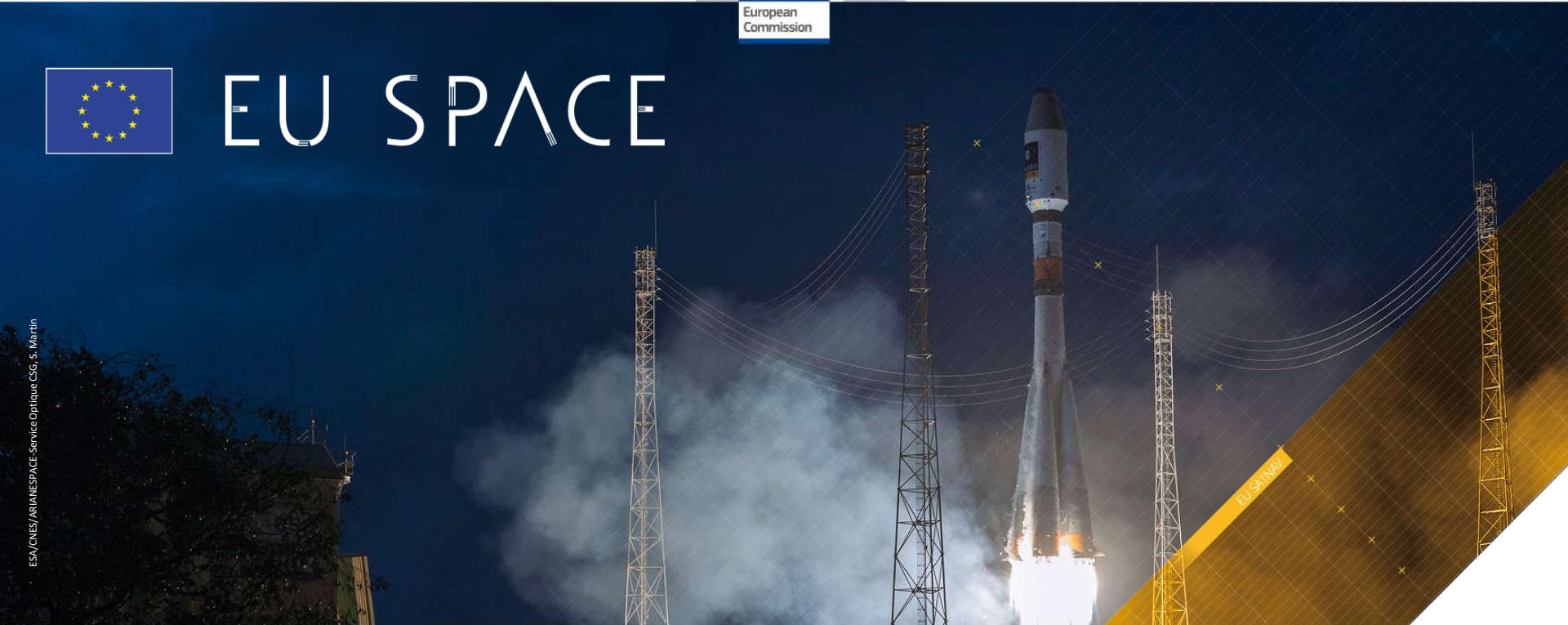




EU SPACE

ESA/CNES/ARIANESPACE - Service Optique CSG, S. Martin



United Nations / Mongolia Workshop on the applications of GNSS (October 2021)

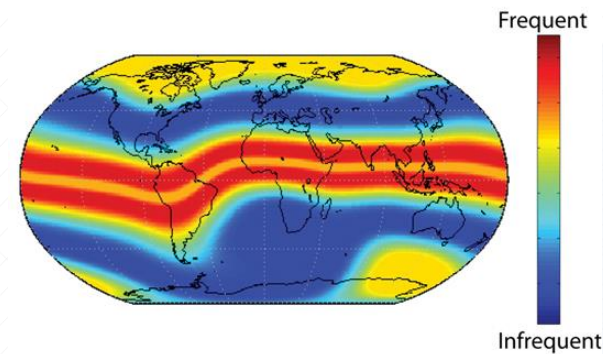
What is GALILEO?

Dominic Hayes
European Commission



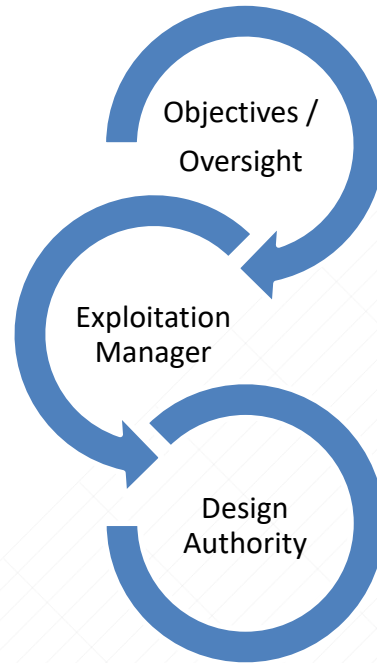
GALILEO - SOME KEY FEATURES

- CIVIL
 - Managed by a civil organisation
- DUAL FREQUENCY (L1/L5)
 - Less impact from solar conditions/ionosphere
- SEARCH AND RESCUE + RETURN LINK
 - Finding you in emergencies, when every second counts
- DIGITAL SIGNATURE (Authentication)
 - ‘Signed by Galileo’



Galileo

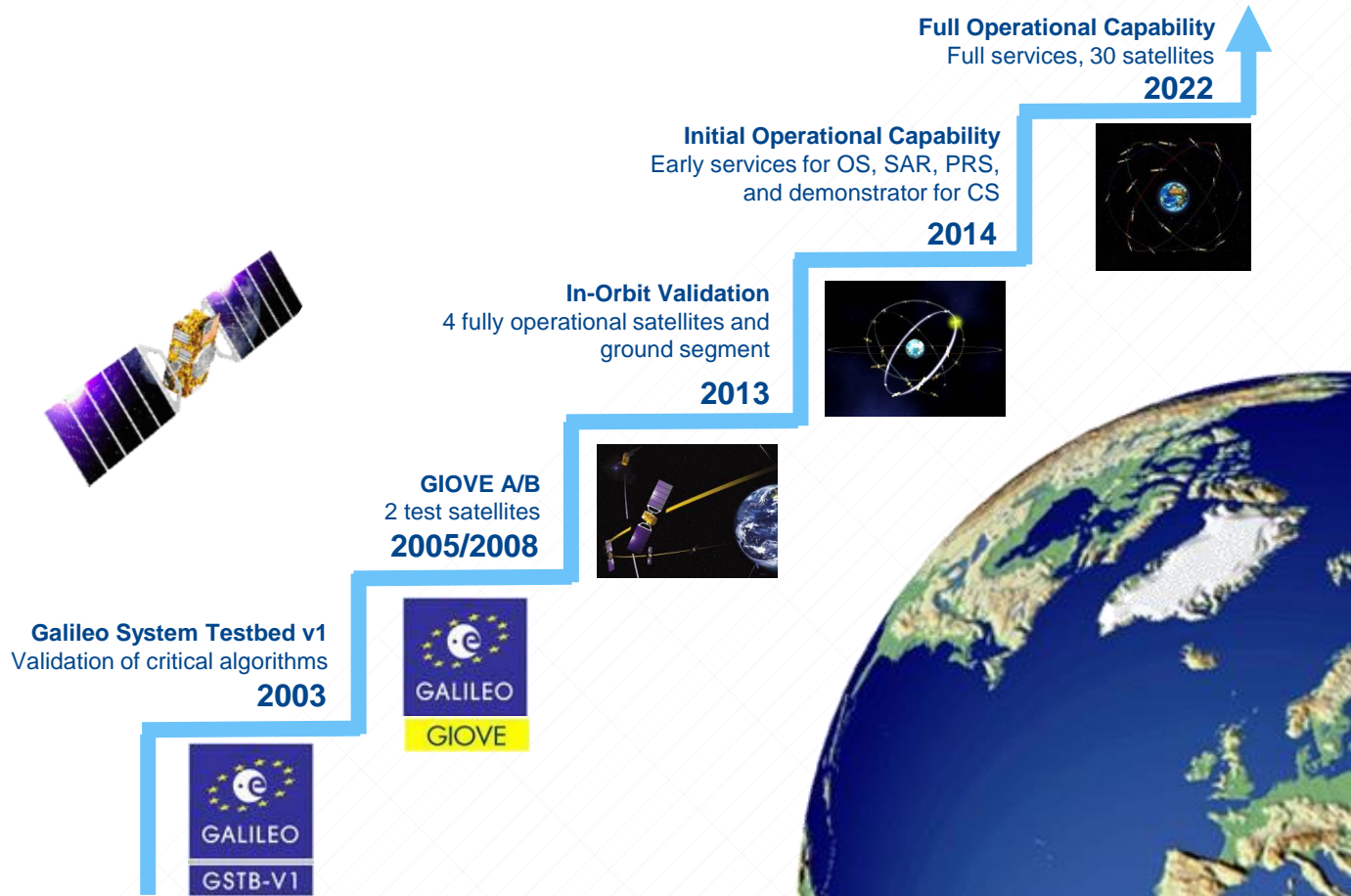
EUROPEAN PARTNERS WORKING TOGETHER



Framework
Partnership
Agreement



GALILEO IMPLEMENTATION HISTORY



Open Service (OS)

- Freely accessible service for positioning, navigation and timing



Public Regulated Service (PRS)

- Encrypted service for greater robustness and higher availability



Search and Rescue (SAR) - contribution

- Assists locating people in distress and confirms that help is on the way



Commercial Service (CS)

- Authentication and high accuracy services for commercial applications

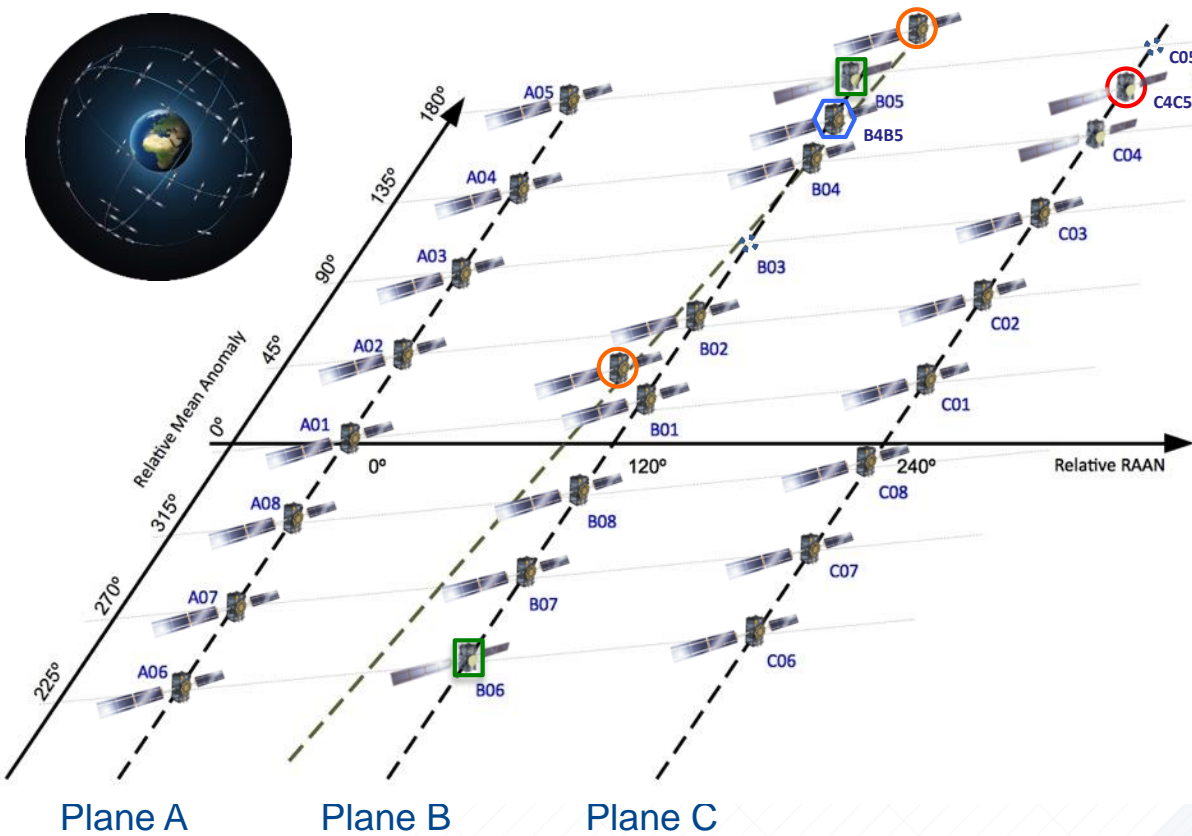


Safety-of-Life (SoL) - contribution




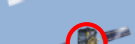

- Provides vital integrity information for life-critical applications



Galileo Constellation Status



Navigation (22 in service)
Search and Rescue (24 in service)

-  26 satellites in orbit
-  2 unhealthy (NAV P/L only)
-  1 spare
-  1 unavailable
-  2 no SAR (by design)

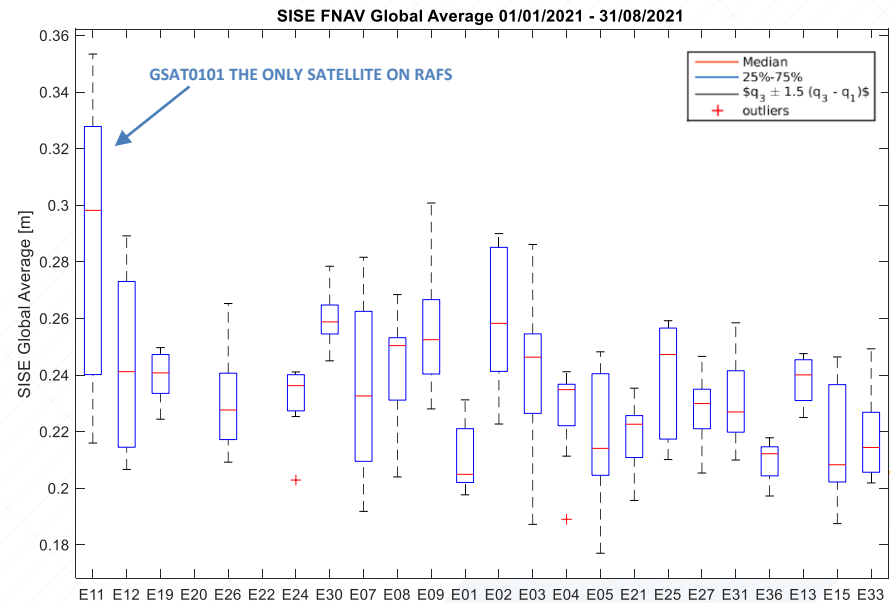
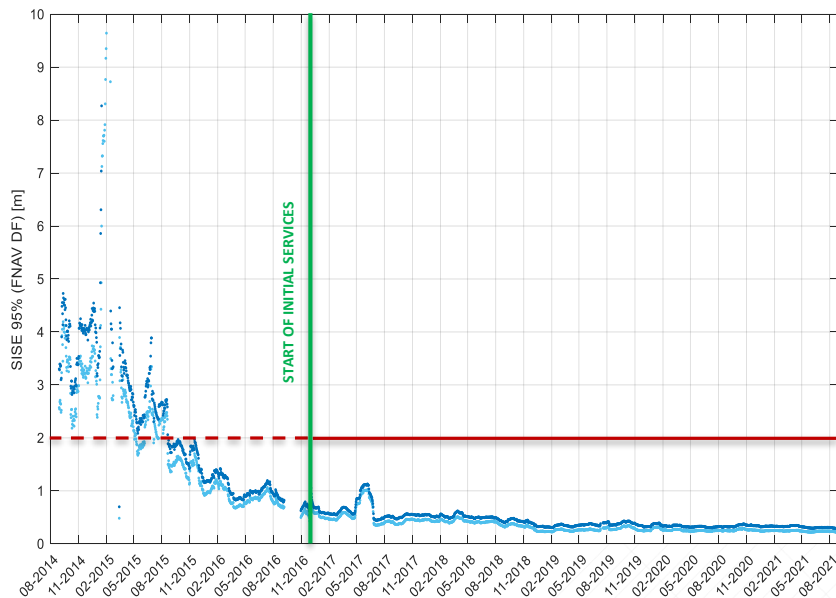
GSAT 104 (Spare, NAVANT failure), relocation from C05 to C4C5 completed on 12/05/2021

GSAT 204 (Spare, SAR operational), relocation from B03 to B4B5 completed on 06/05/2021

GSAT 201/202 (set to unhealthy)

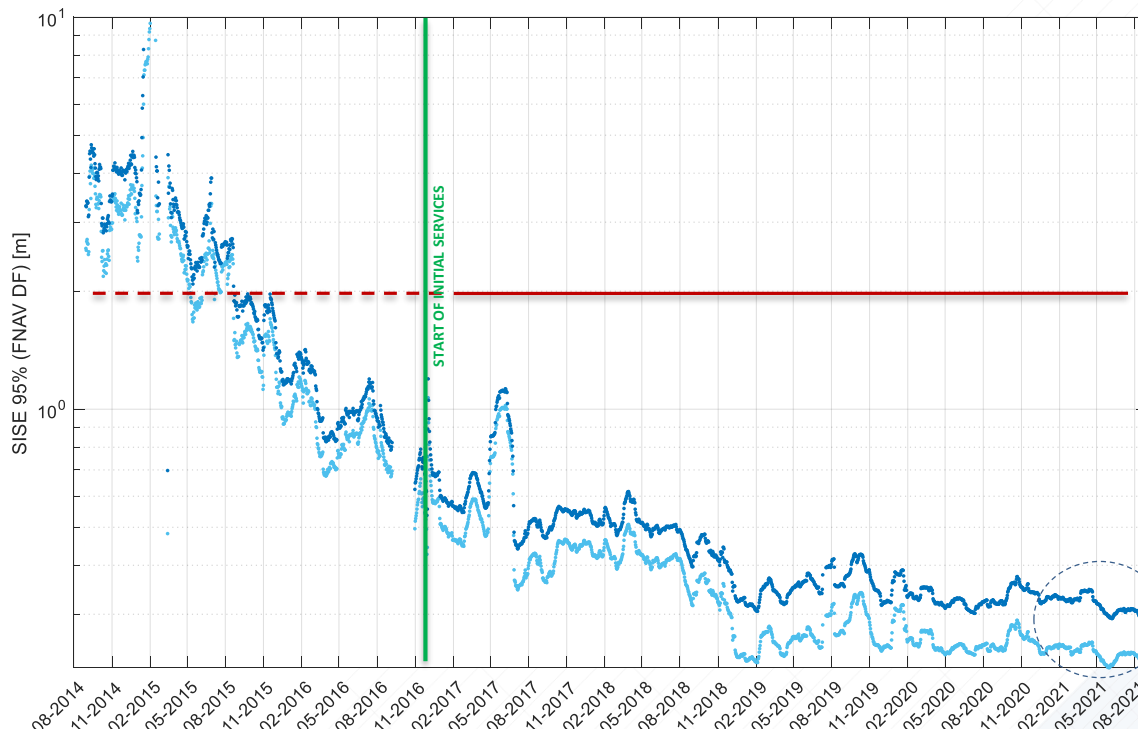
L11 slots in Plane B: B03, B5B6

Stable As-observed Ranging Performance



- Decreasing Ranging Error trend due to increasing number of Satellites and G/S improvements
- **Ranging accuracy (95%) 0.22m** all satellites, in **August 2021** (FNAV)

Ranging Performance (Log scale)



NEW MINIMUM reached since GSS sites consolidated!

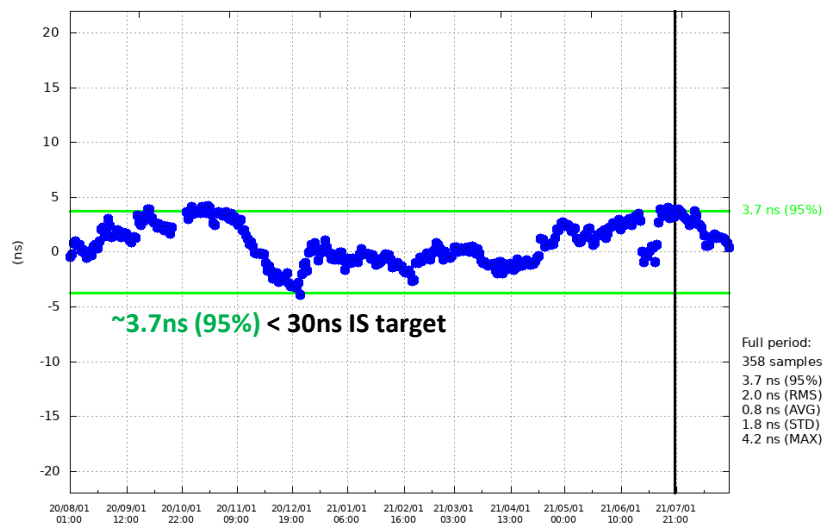
Improved OSPF robustness and GSS data availability

- SISE Constellation Average computed as 30 days moving average
- Decreasing Ranging Error trend due to increasing number of Satellites and G/S improvements
- **Ranging accuracy (95%) 0.22m** all satellites, in **August 2021** (FNAV)

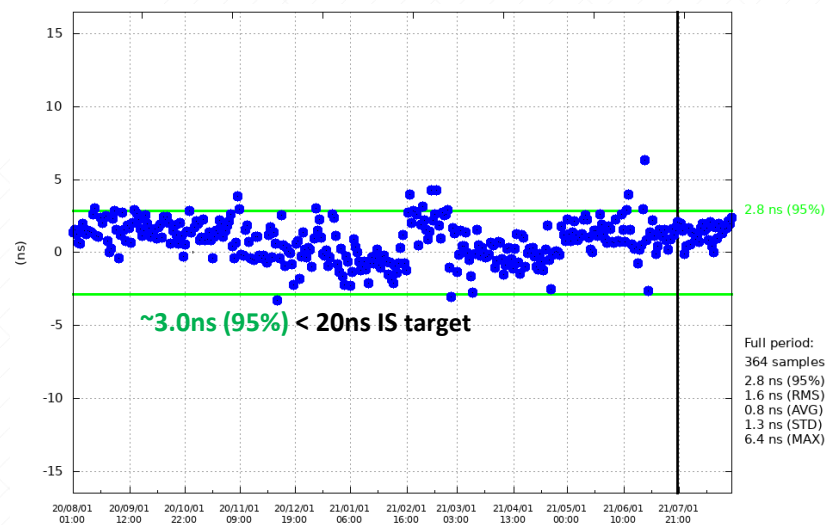
Best Satellite GSAT0214 (PHM-A) **16cm (95%)** in May 2021 | Worst Satellite GSAT0101 (RAFS-A) **40cm (95%)** in Jan 2021

Galileo Timing Availability **STABLE**

Broadcast UTC Offset



GGTO accuracy



- Evaluated with calibrated timing GPS/Galileo receiver operated in UTC(k) laboratory (PTB, INRIM)
- Deployment of new V2B.08.01.00 in all 4 GSS PTFs, including GRCPs
- GSSPTFs delay calibration complete for GRCNs and GRCPs

GALILEO IMPROVES SEARCH AND RESCUE

- Fully integrated into Cospas Sarsat
- SAR operational since 2016
- EU rescue centres coordinate European & Indian Ocean areas
- Other rescue centres managed locally by various countries using Galileo SAR
- Return Link feature operational since 2020, lets you know help is on its way
- See how it works here:
<https://youtu.be/NKS43FAWk2k>



NEW SERVICES TO COME: **HIGH ACCURACY AND AUTHENTICATION**

- **High Accuracy** will be based on PPP transmission (E6B freq)
 - **Free of charge to users**
 - Testing under way (20cm achieved)
 - Gradual implementation between **2022-23**
- **Authentication** will be based on a
 - **Navigation Message Authentication:**
 - Integrated in the E1 OS. Aimed at consumer users and offered for free. From 2022
 - **Spreading Code Authentication:**
 - uses encrypted signal on E6B frequency
 - From around 2023



GALILEO - INCREASINGLY CRITICAL TO EU POLICIES

- ENERGY UNION policy: more energy-efficient, modern and cleaner mobility solutions
- Road: eCall, Digital Tachograph, eTolling
- Aviation: PBN, Drones, Surveillance & Tracking,
- Timing for Critical Infrastructures
- Approved as a Global Maritime Distress & Safety System
- European Radio-Navigation Plan
 - modernise navigation infrastructure
 - rationalise investments
 - synergies between sectors



ALREADY THERE : eCALL COMPULSORY FROM 2018

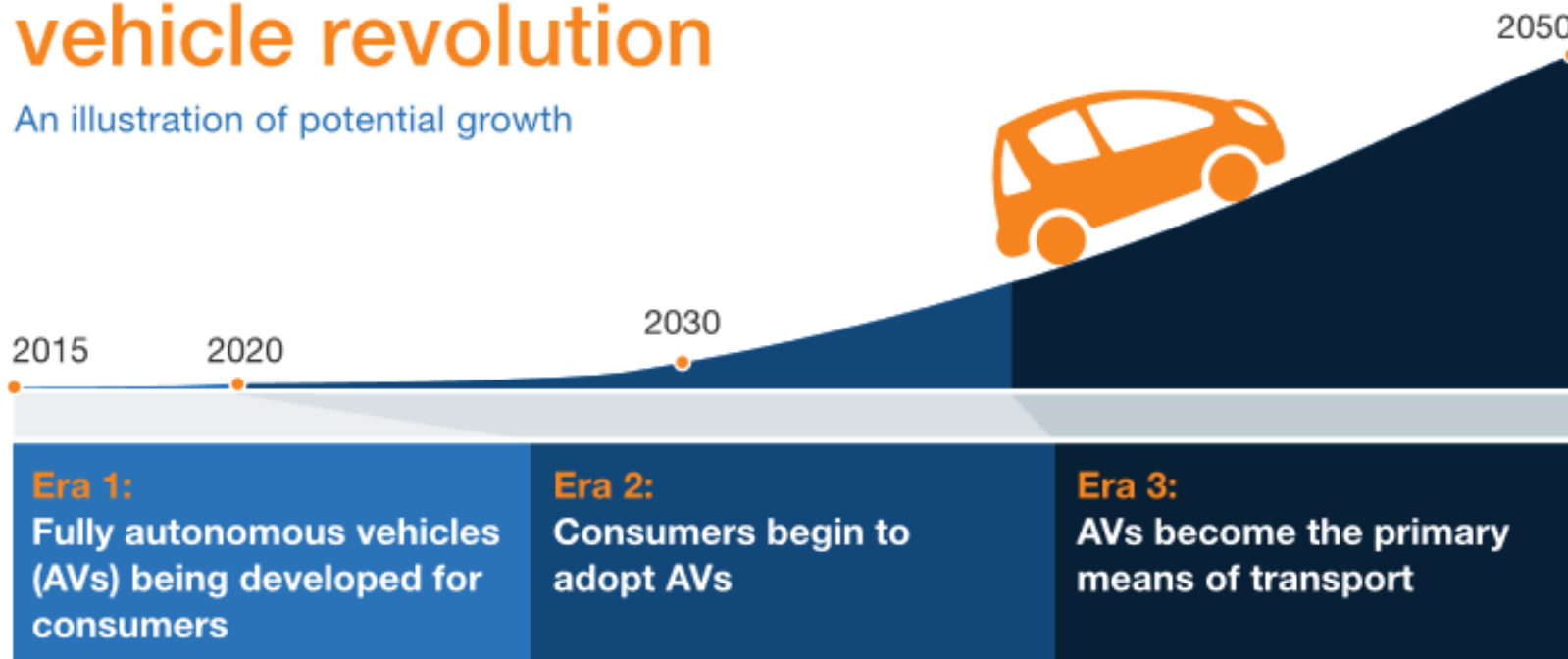


COMING SOON: GALILEO FOR AUTONOMOUS VEHICLES

Autonomous vehicles need robust, high accuracy positioning
– human lives will be at stake.

The self-driving vehicle revolution

An illustration of potential growth



COMPATIBLE RECEIVERS

2010



2021

TIMING  **spectracom**
Synchronizing Critical Operations

SMARTPHONES/MASS MARKET



AUTOMOTIVE



UAVs



HIGH PRECISION

THALES



JAVAD



**Galileo in almost everything
everywhere**

DESIGNED FOR SERVICE: GALILEO SERVICE CENTER (MADRID)

- ★ Operated by EUSPA



<https://www.gsc-europa.eu>

- ★ Publication of Galileo official documents
- ★ Publication of the state of the constellation, NAGUs (Notice Advisory to Galileo Users) and Galileo performance
- ★ Helpdesk



GNSS MARKET REPORT



https://www.euspa.europa.eu/system/files/reports/market_report_issue_6_v2.pdf

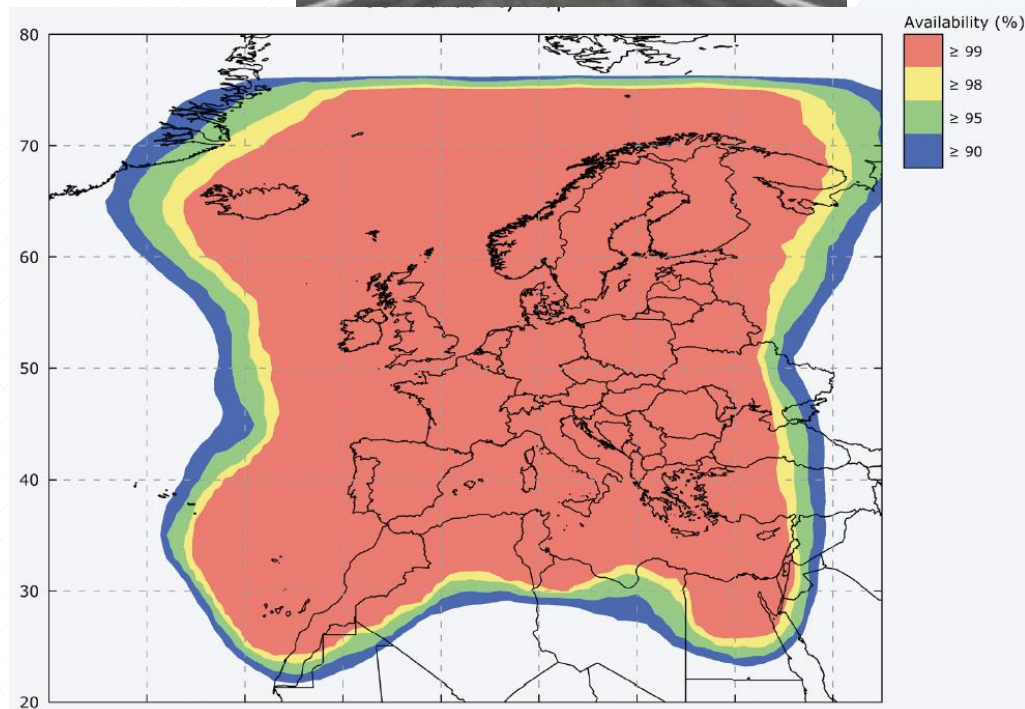
International cooperation is **crucial** for the development of European GNSS

Objectives of international cooperation

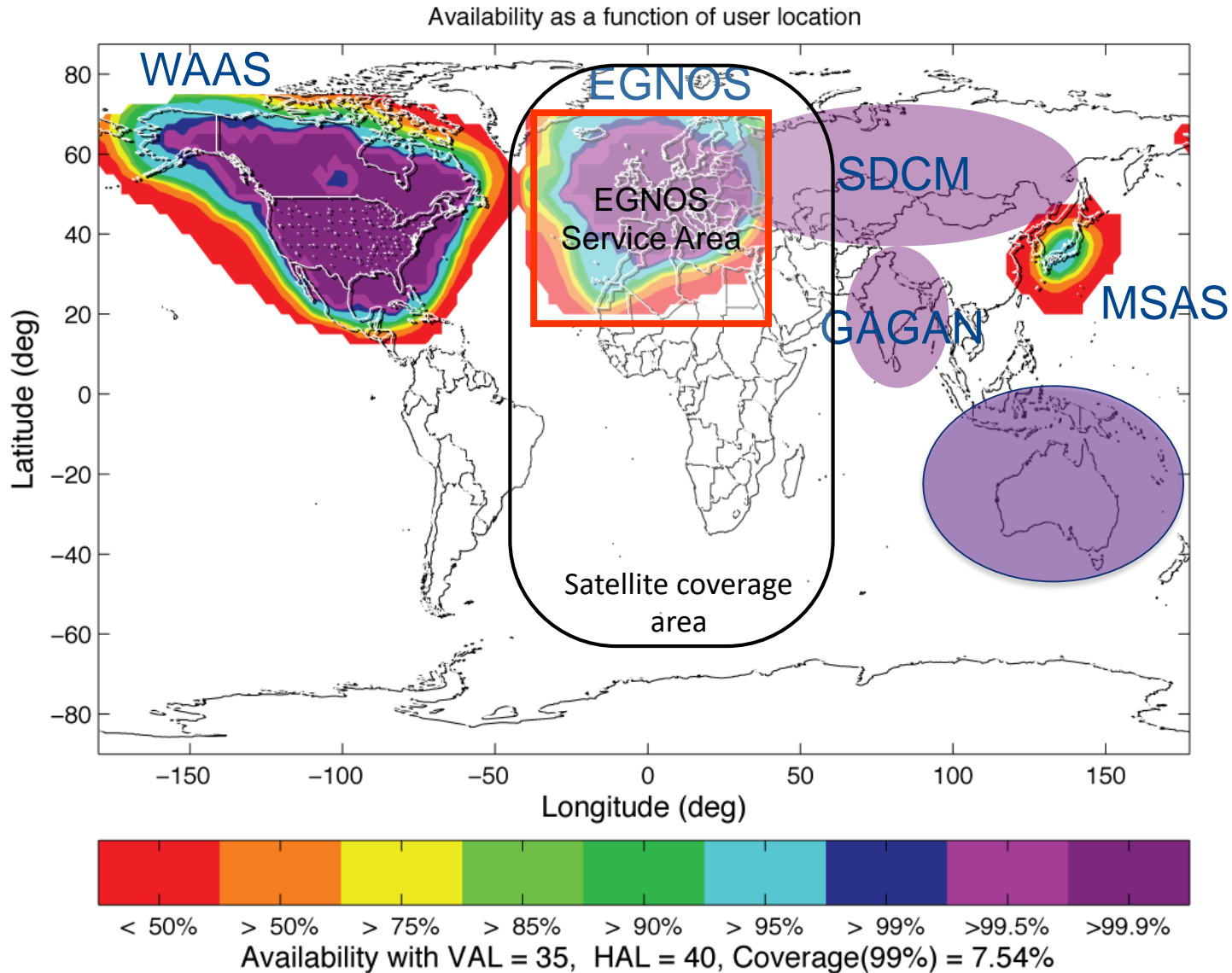
- Promoting and expanding worldwide the use and uptake of the services offered by the European GNSS programmes;
- Ensuring access to relevant key technologies and the security of its supply for the exploitation of the European GNSS systems;
- Coordinating with other GNSS providers on issues such as frequency questions, interoperability and security.

EGNOS - EUROPE'S SBAS

- EGNOS Open Service fully operational since 2009
- Its Safety of Life service has been declared operational in 2011
- EGNOS Data Access Service (EDAS) available since 2012
- EGNOS for aircraft landings approved for around 600+ approach procedures in 20+ Countries
- Future extensions planned



EGNOS AS PART OF A WORLDWIDE SBAS SYSTEM



THANK YOU FOR YOUR ATTENTION



<http://ec.europa.eu/galileo>
<http://ec.europa.eu/egnoss>