Directorate-General for Energy and Transport

EUROPEAN COMMISSION

European GNSS Programmes EGNOS and Galileo

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EU satellite navigation programmes
European Commission

GALILEO

Presentation content

1. EGNOS

2. Galileo

3. EU-USA

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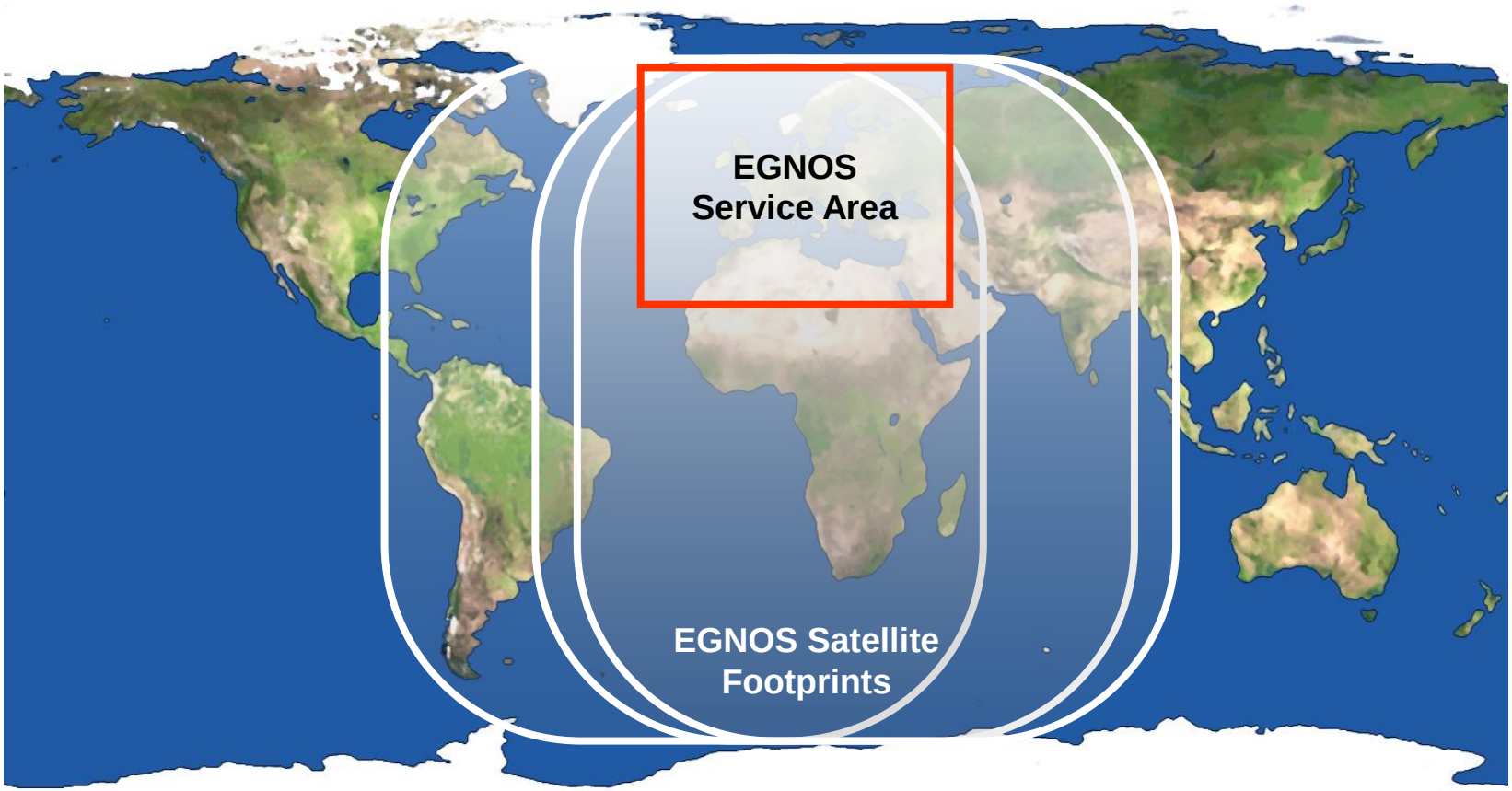
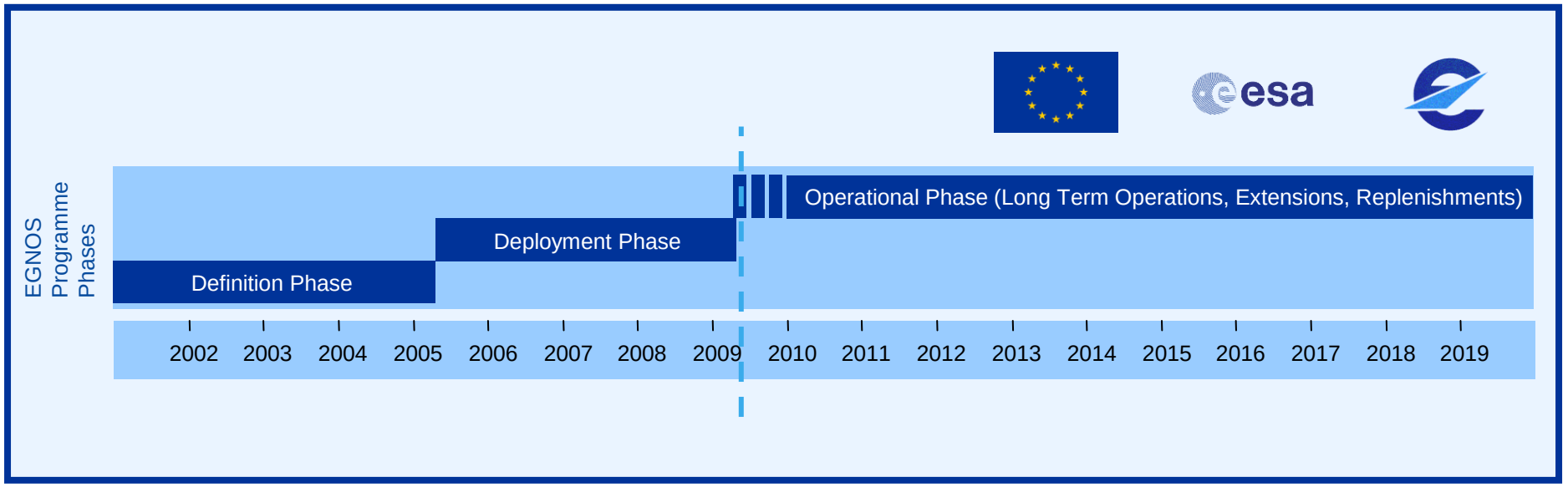
EGNOS: GPS augmentation service



INMARSAT AOR-E (15.5°W), ARTEMIS (21.3°E), INMARSAT IOR-W (25°E)

EGNOS Timeline

Regional Infrastructure & Services



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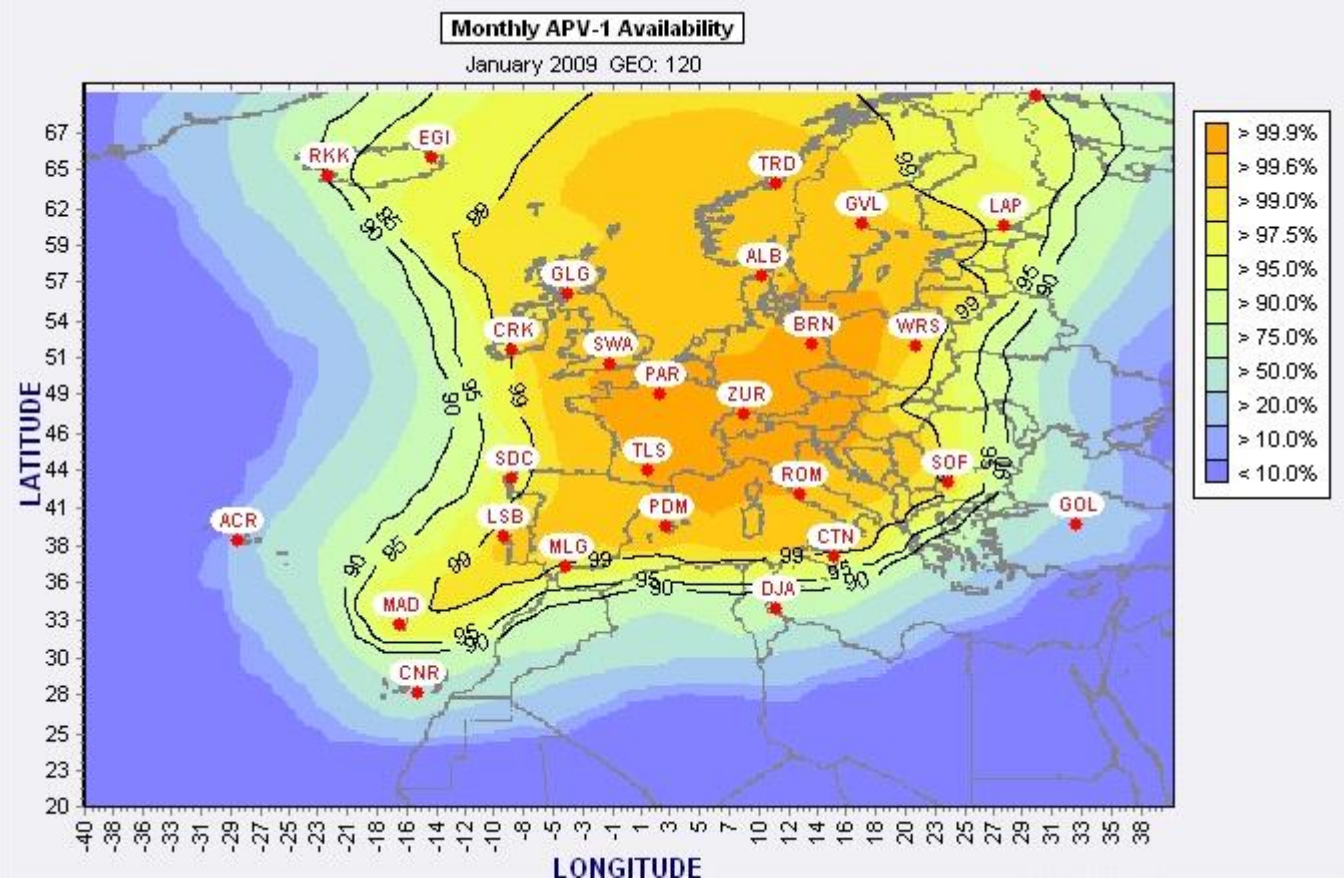
IOP … Initial Operations

EGNOS Performance (January 2009)

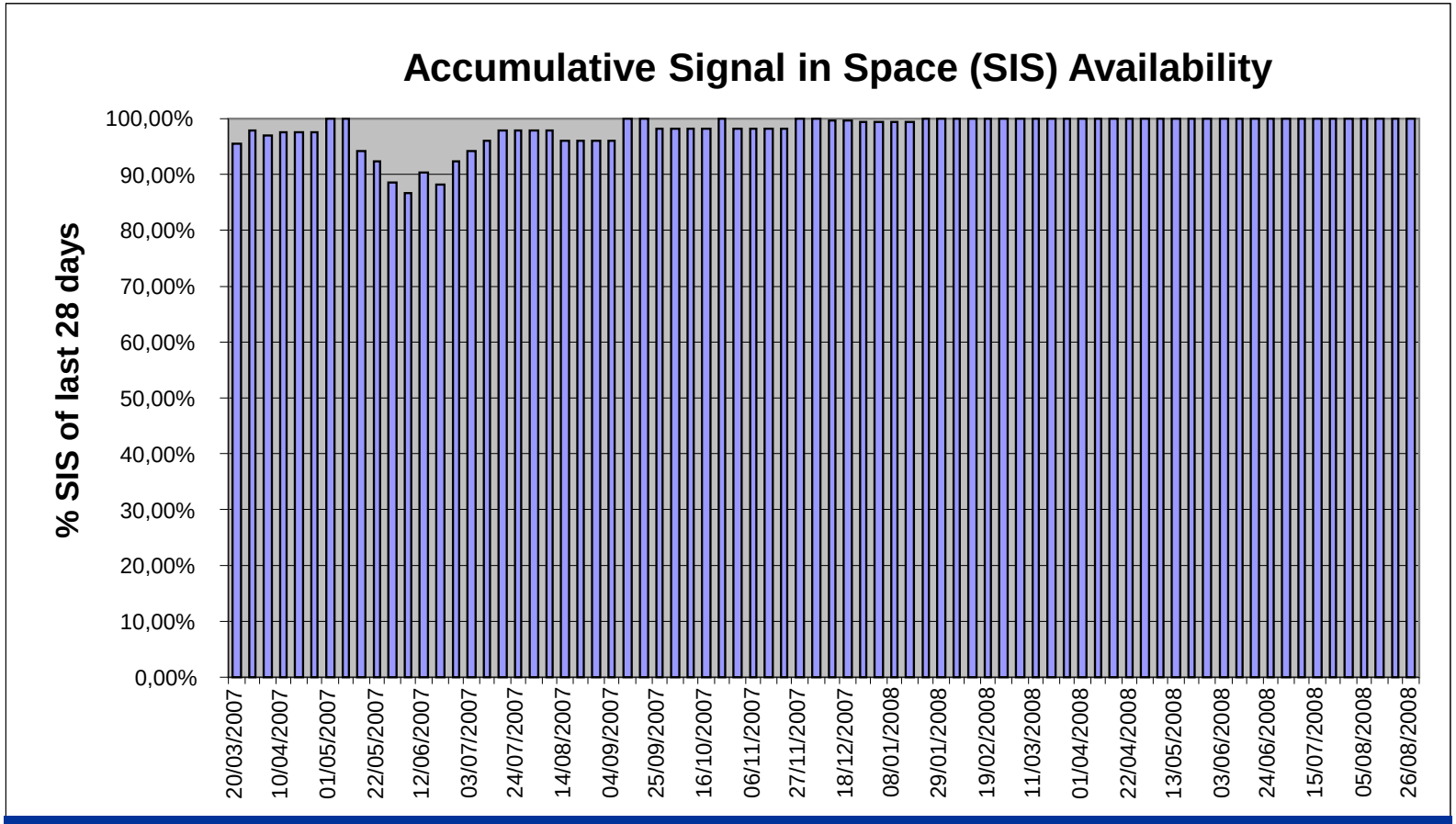


Source: Service Management Report ESSP for January 2009

The deployment of additional RIMS in Northern Europe, Southern Europe, and Northern Africa will increase the coverage area of APV-1 Availability.

APV … Approach with vertical guidance

EGNOS Performance (March 2007 – August 2008)



EGNOS is already broadcasting signals of excellent quality.
Signal in Space availability has been continuous since January 2008*.

* with exception of 28 December 2008

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EGNOS Programme Status

- EGNOS is already broadcasting signals of excellent quality
- 2009:
  - Assets have been transferred from ESA to the European Community in April 2009
  - **First EGNOS operator** contract as of 1st April 2009
  - New **OS ICD release** planned for autumn 2009
  - Lease completed of an EGNOS transponder to replace ARTEMIS as of 2011
  - Procurement action ongoing for replacement of a 2nd EGNOS transponder
  - Geographical service extension is under study
- 2010:
  - **SOL declaration** of "entry into service" planned for mid-2010 (after certification milestone)

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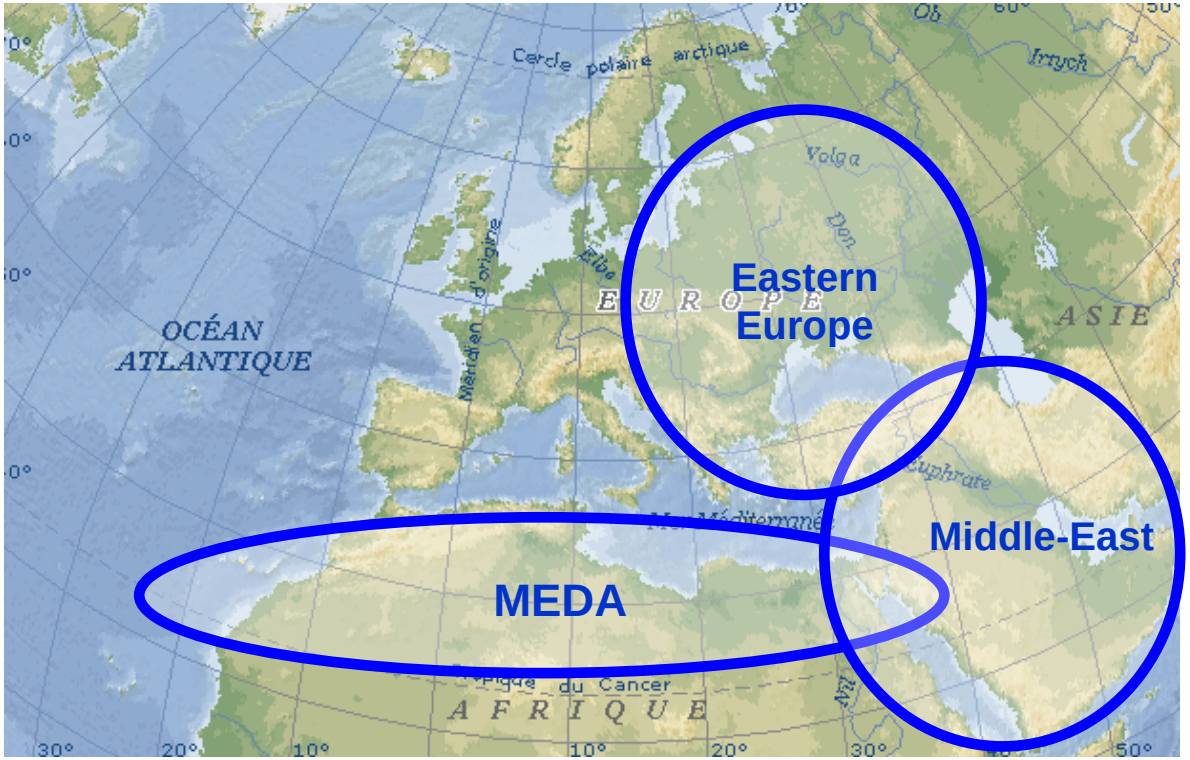
EGNOS potential extensions



Depending on the extension area, technical implementation may vary from:

- Homogeneous extension with deployment of **additional RIMS**
- **Regional infrastructure** including additional processing capabilities

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EGNOS Service Evolutions

- Service Provision Improvements ▶short/medium term
- Coverage Evolution
  - » Eastern Europe, MEDA, Middle East/ACAC ▶medium term
  - » Africa ▶medium/long term
- Frequency Evolution
  - » Extension to the E5a/E5b frequency decided on ARTEMIS replacement
- Evolution of Standards ▶long term
  - » Standardisation of E5a and E5b, L1 CBOC on-going
  - » Augmentation of new GNSS
- Additional Services
  - » LPV200 service level ▶medium term (2011)
    EGNOS capability to meet this service level currently under technical evaluation
  - » EGNOS time service ▶medium term
  - » Possible critical communication message

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EGNOS Value Added

EGNOS appls / Markets		EGNOS Value Added (versus GPS)			
		Accuracy	Integrity	Availability	Continuity
LBS	E112	●	●	●	n/a
	Non Reg LBS	●	●	●	n/a
Road	eCall	●	n/a	●	n/a
	Truck Telematics	●	n/a	●	n/a
	Pay as you drive	●	n/a	●	n/a
Freight multimodality	Dangerous goods - perishables	●	●	●	●
Specialist tracking	HGV - Livestock - City Logistics	●	●	●	●
Aviation	APV	●	●	●	●
	A-SMGCS (Aircraft Gnd Vehicles)	●	n/a	●	n/a
Rail	Shunting	●	n/a	●	n/a
Other professional	High Precision	●	n/a	●	●
Farming	Precision agriculture (OS)	●	n/a	●	●
	Precision agriculture (HPP)	●	n/a	●	●
Inland waterways	Traffic management & surveillance	●	n/a	●	●

1. **Size of circles** indicates importance of each attribute of EGNOS to the market,
   (large = very important)

2. The extent to which EGNOS meets these attributes is identified by the **colour**:
   - green … meets requirements
   - red … does not meet

3. **Integrity** may be useful to Road applications, primarily RUC, but there little awareness of the value or potential role or need for it.

4. **Precision agriculture** in OS includes crop spraying, yield management and field / plot measurement

Presentation content

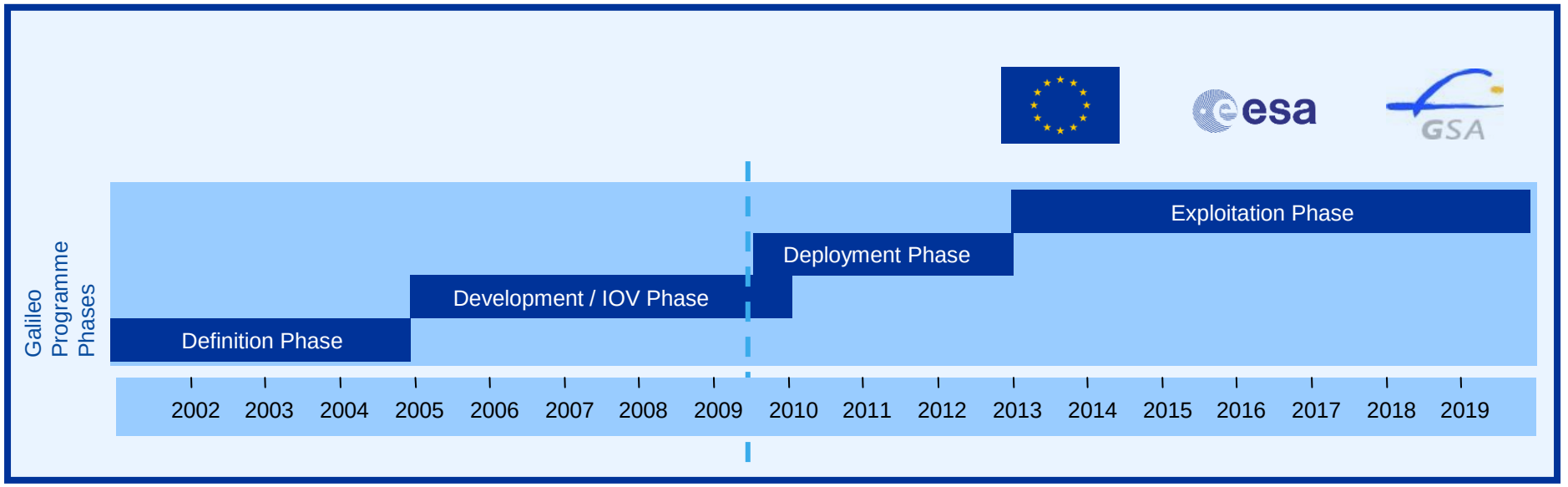
1. EGNOS

2. Galileo

3. EU-USA

Galileo Timeline

Global Infrastructure & Services



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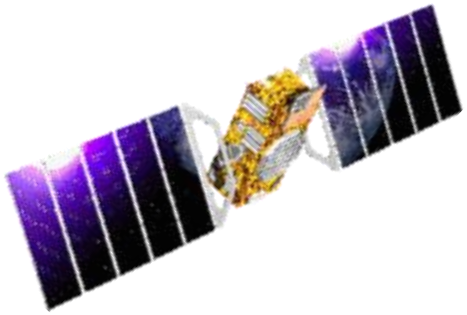
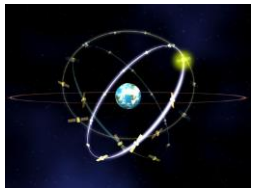
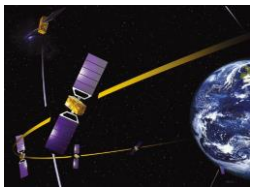
Galileo Implementation Plan



Full Operational Capability
27 (+3) Galileo satellites
2013



In-Orbit Validation
4 IOV satellites plus ground segment
2010



Galileo System Testbed v2
2 initial test satellites
2005

GALILEO
GIOVE

Galileo System Testbed v1
Validation of critical algorithms
2003

GALILEO
GSTB-V1

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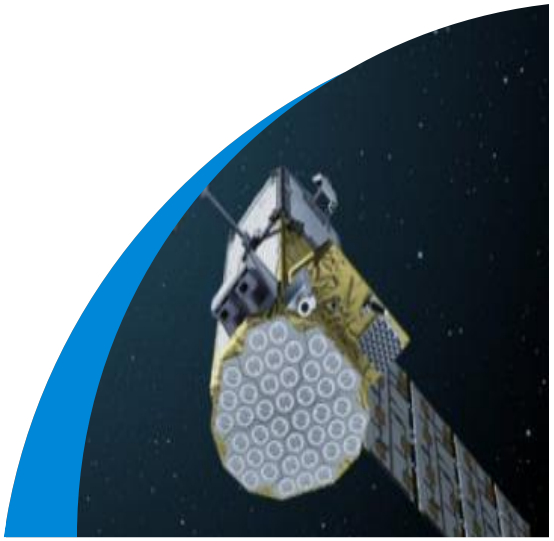
Galileo Test Satellites

- Giove-A launched on 28 December 2005
  - » Secured Galileo frequencies

- Giove-B launched on 27 April 2008
  - » First Passive Hydrogen Maser atomic clock ever flown
  - » Implementation of CBOC signal
  - » Working as expected



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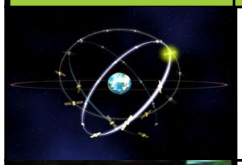
Galileo IOV vs FOC

	Component	IOV Phase	FOC Phase
	Satellites	4	27(+3)
	Control Centres	1	3
	Mission Uplink Stations	5	9
	TT&C Stations	2	5
	Sensor Stations	20	30-40

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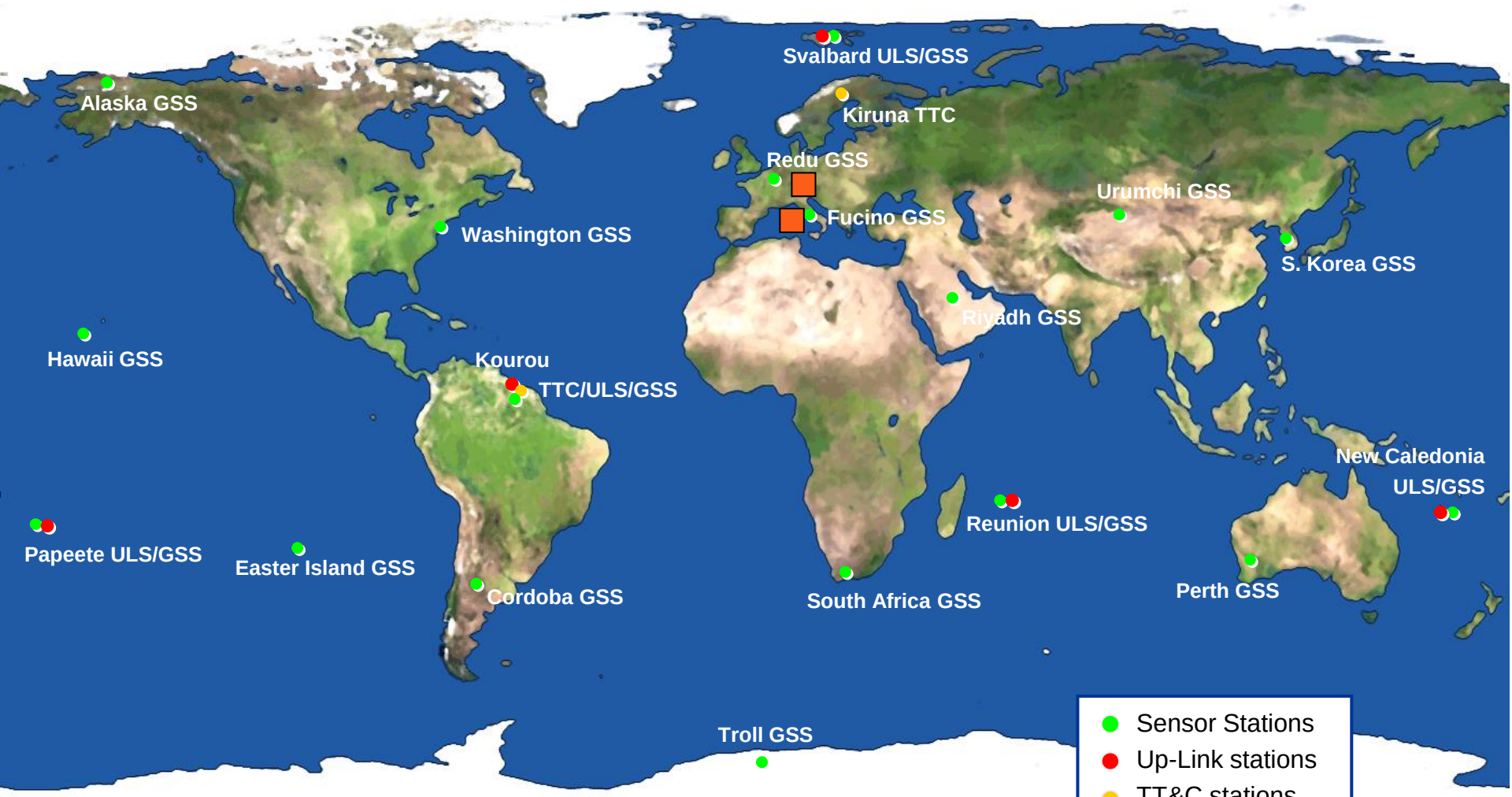
IOV (In Orbit Validation), FOC (Full Operational Capability)

IOV Ground Segment Sites



Galileo FOC Procurement

- Contract notice: 1 July 2008
- Infrastructure procurement in 6 work packages
- Operational Capability in 2013

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Galileo Procurement

Retained Candidates

Work Package	Retained Candidates
1. System Support	• ThalesAleniaSpace (IT) • Logica (NL)
2. Ground Mission Segment	• ThalesAleniaSpace (FR) • Logica (UK)
3. Ground Control Segment	• Astrium (UK) • G-Nav grouping represented by Lockheed Martin IS&S (UK)
4. Space Segment	• Astrium (DE) • OHB System (DE)
5. Launch Services	• Arianespace (FR)
6. Operations	• Nav-up grouping represented by Inmarsat (UK) • DLR (DE) and Telespazio (IT)

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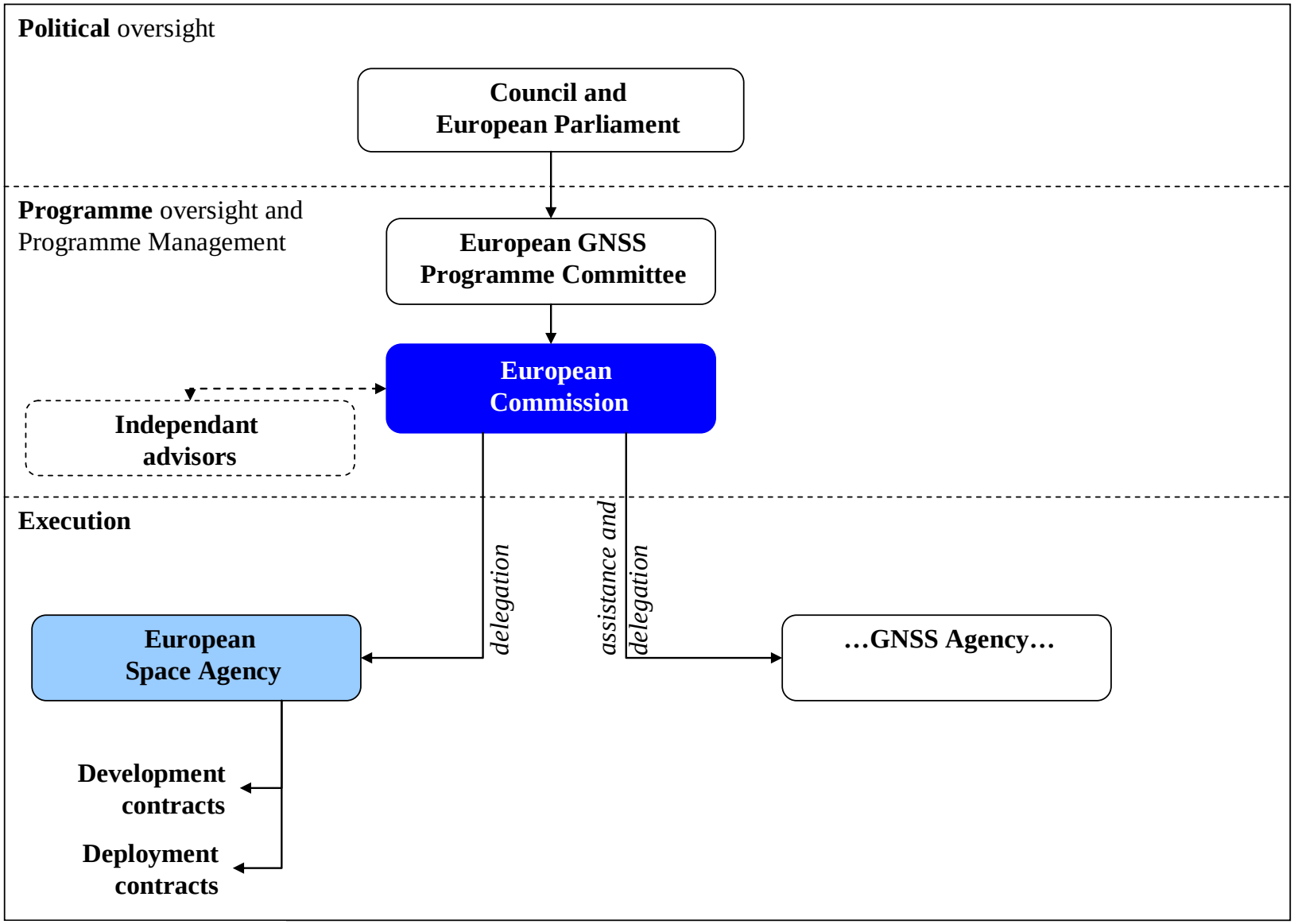
Updated Governance



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Presentation content

1. EGNOS

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3. EU-USA

EU-USA

- Common approach with regard to an overall GNSS strategy
  - Solving the compatibility issues and enhancing interoperability
  - Developing a common GNSS standard for Safety of Life
  - Coordinating inputs to UN ICG/Providers' Forum

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EU-USA

- Galileo and GPS are compatible and interoperable
  - » Thanks to detailed and lengthy bilateral discussions through Working Groups, established by the EU US 2004 Agreement and following close monitoring by the senior levels chaired by US DoS and EC
  - » Excellent results to-date
    - MBOC common modulation
    - National Security Compatibility Compliance
    - GGTO implemented on IOV and tested on GIOVE
- But, many more joint efforts are needed to ensure C&I for all GNSS

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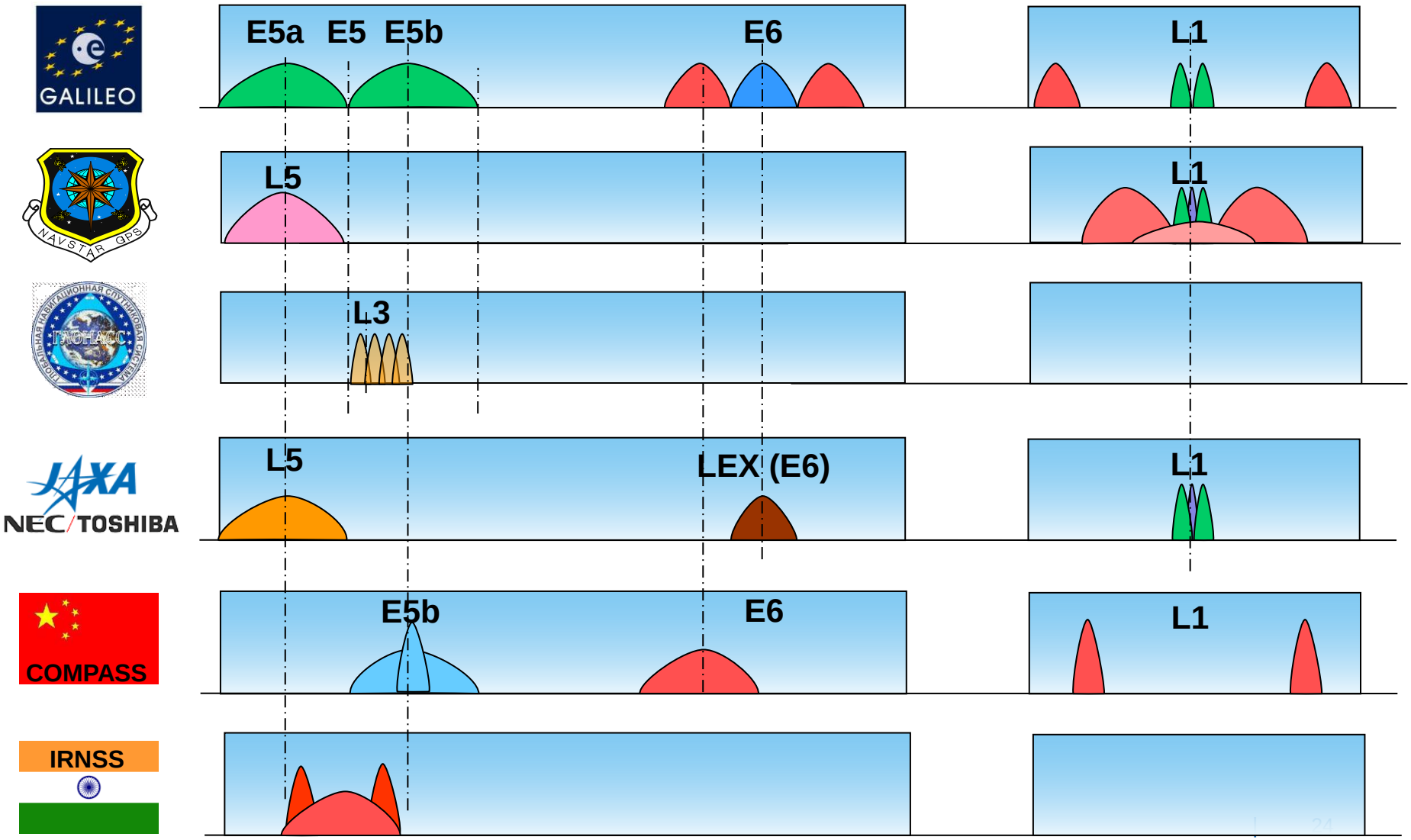
GNSS Compatibility & Interoperability



EU-USA

- Other issues
  - Trade working-group
    - Further definition of « non-discriminatory approach to trade in GNSS goods and services (WTO)
    - Discussion on IPR aspects of Galileo R&D
    - Galileo spectrum in U.S. National Table of Frequency Allocations
    - Joint outreach (GPS-Galileo fact sheet etc)
    - Procurement of GPS and Galileo
  - Security
    - Sofar: Export controls, technology control
    - Next: Endorsement of new legal basis for exchange of classified information
    - Protection/hosting of ground stations
    - Security roles and responsibilities

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EU-USA

- Safety of Life Service: common GNSS standard
  - 1st generation SBAS (WAAS EGNOS MSAS GAGAN) has reached a good level of maturity, but are based on GPS only
  - Galileo has designed a SoL standard
  - Integrity concepts likely to evolve with increasing number of constellations
  - Other constellations are interested in developing built-in integrity
  - Users need a single interface, single standard
  - Need common vision for the future

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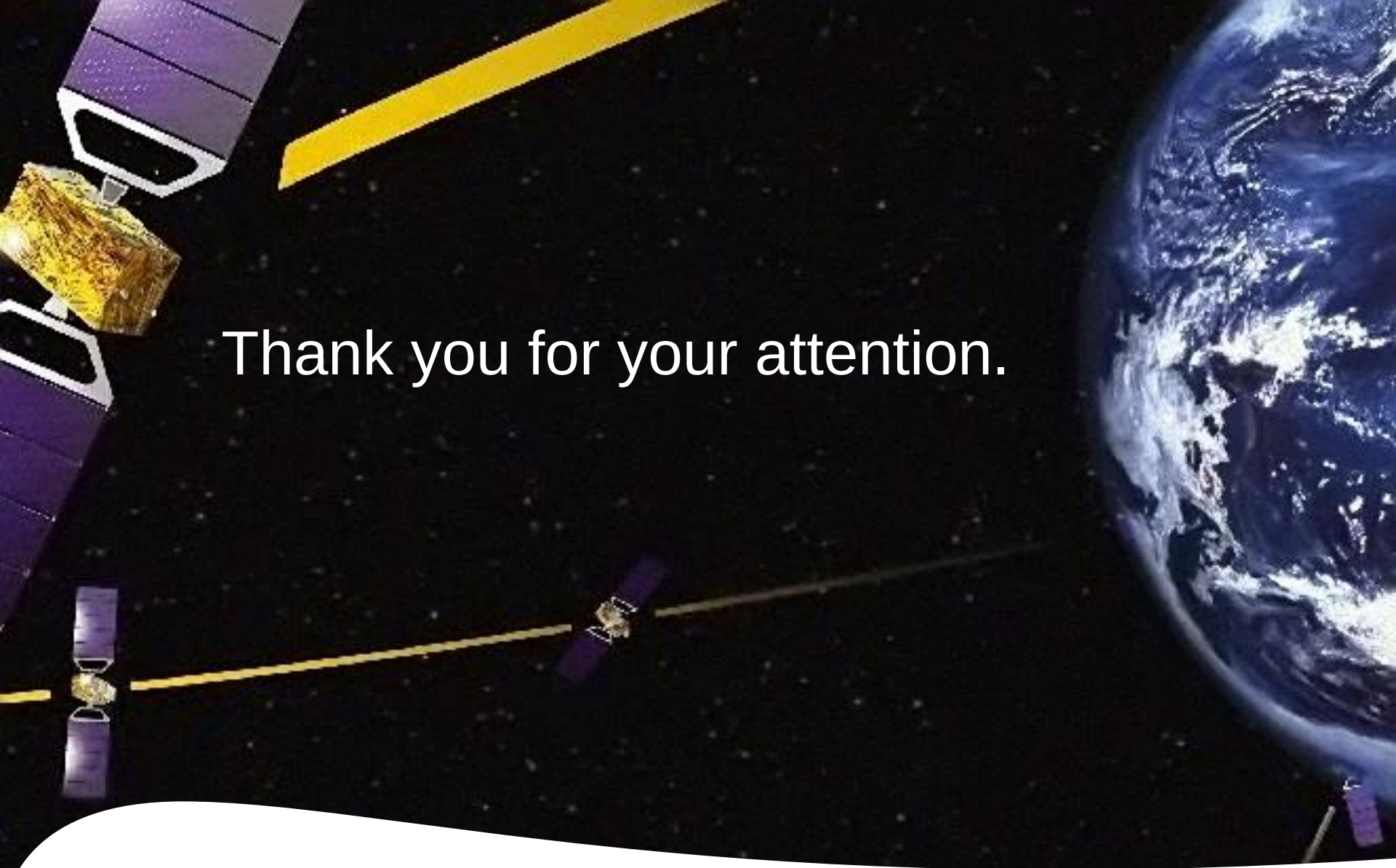
Thank you for your attention.