

# CMIN 22 Preparation Presentation of the programmes to the Belgian actors

Antwerp Expo, 30 September 2022

## Directorate of Navigation, ESA

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## GALILEO

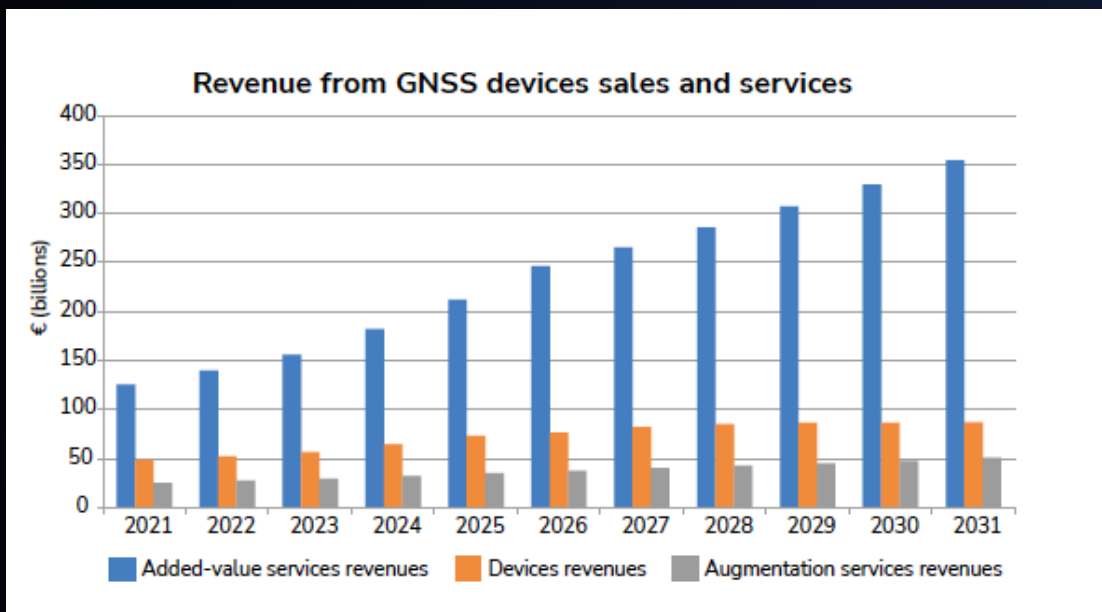
- Most accurate satnav system worldwide
- 3.5 billions users
- Finding your way and saving lives
- 2nd Generation on the way



## EGNOS

- Ensuring safety-of-life for aviation, maritime, rail and road
- Regional coverage over EU, worldwide compatibility
- 1500 procedures in 360+ airports in Europe

# The success of GNSS and the rise of PNT



**10 Billion+**  
GNSS devices will be used worldwide by 2031, for applications in road, automotive, consumer solutions, tourism, health and agriculture, with opportunities for growth in aviation and drones, maritime activities and agriculture

Global GNSS downstream market revenues are expected to reach  
**€492 Billion** by 2031

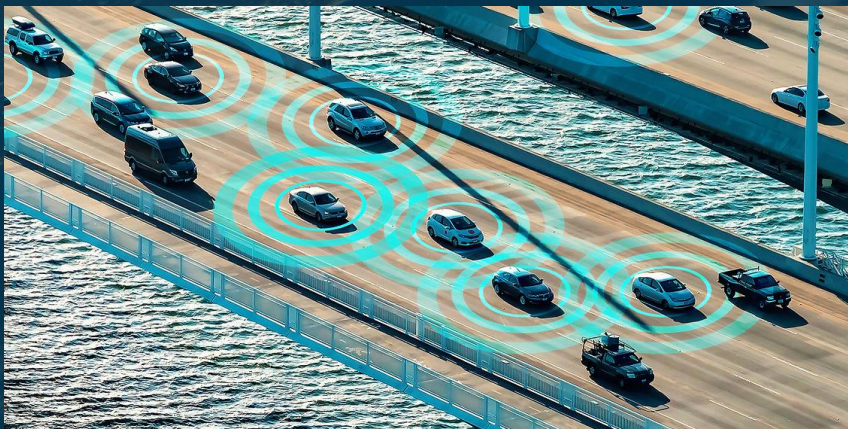
**PNT = 10%**  
European economy and growing rapidly



# Global Mobility: future PNT market trends

GNSS huge success inspires more demanding needs for the next decade:

- Fast convergence, high accuracy, secure, resilient PNT
- Outdoor, autonomous vehicles, UAVs
- Indoor, Personal LBS and Industrial IOT (logistics, machine control)
- Low-energy IOT asset tracking
- Integration with Terrestrial 5G/6G for ubiquitous PNT
- Connected PNT (2-way data channels)





# CMIN 22 - Navigation

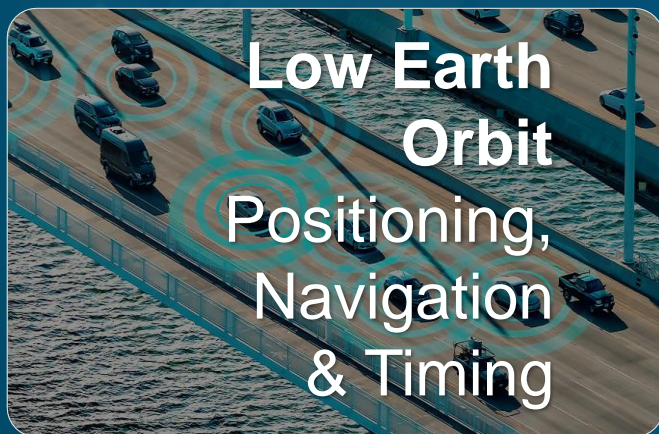
Strengthening Europe's global leadership in Positioning, Navigation & Timing



## NAVISP Phase 3

new system technologies, pre-operational activities, innovative services, and offer support to ESA Member States

## Future NAV



Low Earth Orbit Positioning, Navigation & Timing



# NAVISP – PHASE 3



- **GNSS is the largest spin-off of space technology**
- **NAVISP: Innovative technologies and stimulating competitiveness of PNT industry in Europe for the benefit of users**
- **200+ project supported; 100+ million euro invested since 2017**

# NAVISP: Some Areas of Interest from past involvements of Belgian Actors

## Scope of Opportunities

Proof of concept of a test range for drone cybersecurity

HAPS for PNT, Multilayer PNT for Search and Rescue

Hybrid GNSS/INS, NAV sensor switching

Several activities under negotiation

BE subscription for NAVISP Phase 1: 2 M€

BE subscription for NAVISP Phase 2: 6 M€

NAVISP Phase 3 will have to enjoy a further increase of NAVISP Belgium subscription in line with the upcoming opportunities and demand of the national PNT ecosystem



# Future NAV: preparing the future of European GNSS

**Program Objectives:** secure **strategic capabilities** for independent European satellite navigation infrastructure and services, through support to the **early development** of advanced satellite navigation technology which has the potential to support operational and scientific missions, both private commercial as well as institutional programmes defined by the European Union



**Future NAV comprises 2 components:**

- a) The **LEO PNT Component**, which includes the definition, development, launch operations and experimentation of a LEO PNT In-Orbit Demonstration system
- b) The **GENESIS Component**, which includes the definition, development, launch and operations of the GENESIS Mission

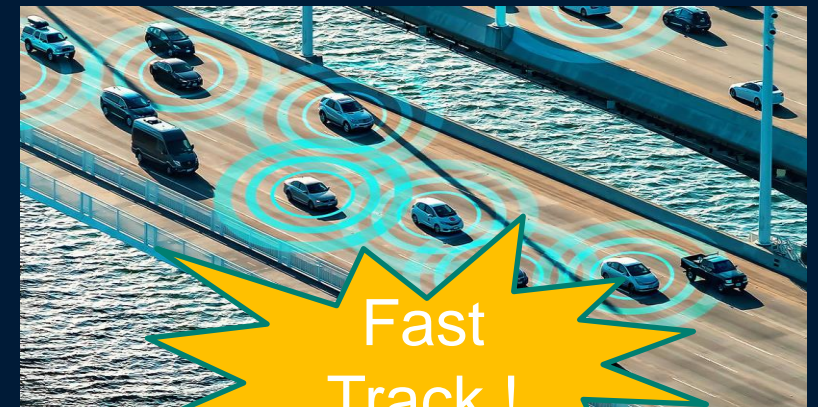
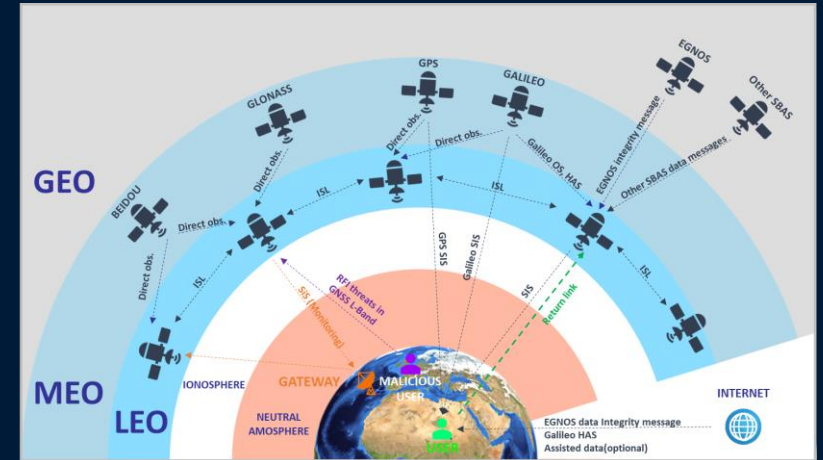


# LEO Positioning, Navigation & Timing

1. **Program Objectives:** Prepare the future of GNSS by anticipating PNT market trends and more demanding needs i.e.:

- Fast convergence, high accuracy, secure, resilient PNT
- Outdoor, autonomous vehicles, UAVs
- Indoor, Personal LBS and Industrial IOT (logistics, machine control)
- Low-energy IOT asset tracking
- Integration with Terrestrial 5G/6G for ubiquitous PNT
- Connected PNT (2-way data channels)

2. **Demonstration of LEO PNT:** Fast convergence PPP, additional data channel, two way communication for IOT, in-door positioning, robustness increase, frequency diversity (UHF, L, S, Ku, Ka band), optical ISL connectivity on-board autonomy





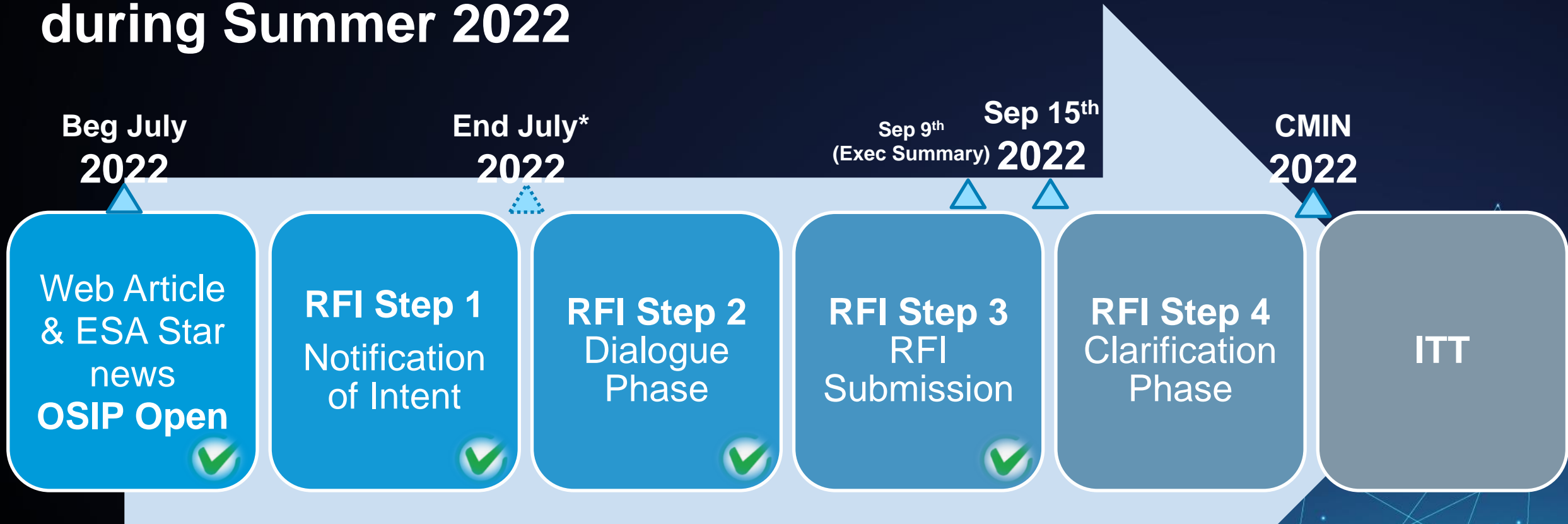
# GENESIS: Colocation of Geodetic Techniques in Space

1. **Program Objectives:** on-board collocation of four space GNSS/Geodetic techniques (GNSS Rx, VLBI, DORIS, SLR) to contribute to improve GNSS, Geodetic and Earth Science techniques, and supporting the “Space for a Green Future” Accelerator
2. **Scientific fields:**
  1. **Navigation** - Improvement on GNSS orbits and GNSS positioning
  2. **Geodesy** - Improvement of the International Terrestrial Reference Frame (ITRF)
  3. **Earth Sciences** - Improvements in sea level change measurements, ice mass losses, gravity field improvement,





# FutureNAV RFI – Intense Industrial Consultation during Summer 2022





# GENESIS – RFI Overview

- G** Interest received for **all aspects of the mission**
- E** Prime role covered
- N** **All Instruments** covered - the 4 different geodetic techniques and on-board clock payload (Incl. Scientific follow up/operations)
- E** Launchers (New space)
- S** A good number of additional companies identified as possible equipment providers in prime proposals
- I** Proposed Optional Instruments also covered in the RFI
- S** Possibility of integration of NASA payload (remains feasible)





# GENESIS – RFI Proposal Outcomes

## Areas of Interest provided by Belgian Actors

### Scope of Opportunities

Prime Role including Platform Development

Payload Prime Role including VLBI Development

Significant Scientific Contribution

Optional Payload

Required Belgian  
Contribution Level:  
16 - 58 MEUR



# LEO-PNT – RFI overview



- L** Large number of Notification of Interests (NoI) received
- E** Lot of interest, information and feedbacks, confirming expectations
- O** Multi purpose (Institutional / Commercial prospects)
- Large interest and engagement of European industry across domains (PNT, New Space, Services)
- P** Confirmation of attractiveness of all **identified LEO PNT capabilities**
- N** Entities from large majority of **Member States** identified
- T** Significant interest from **SMEs** and **NewSpace companies**





# LEO-PNT – RFI Proposal Outcomes

## Areas of Interest provided by Belgian Actors

## Scope of Opportunities

Candidate for LEO-PNT prime / Satellite Platform

PNT Payload

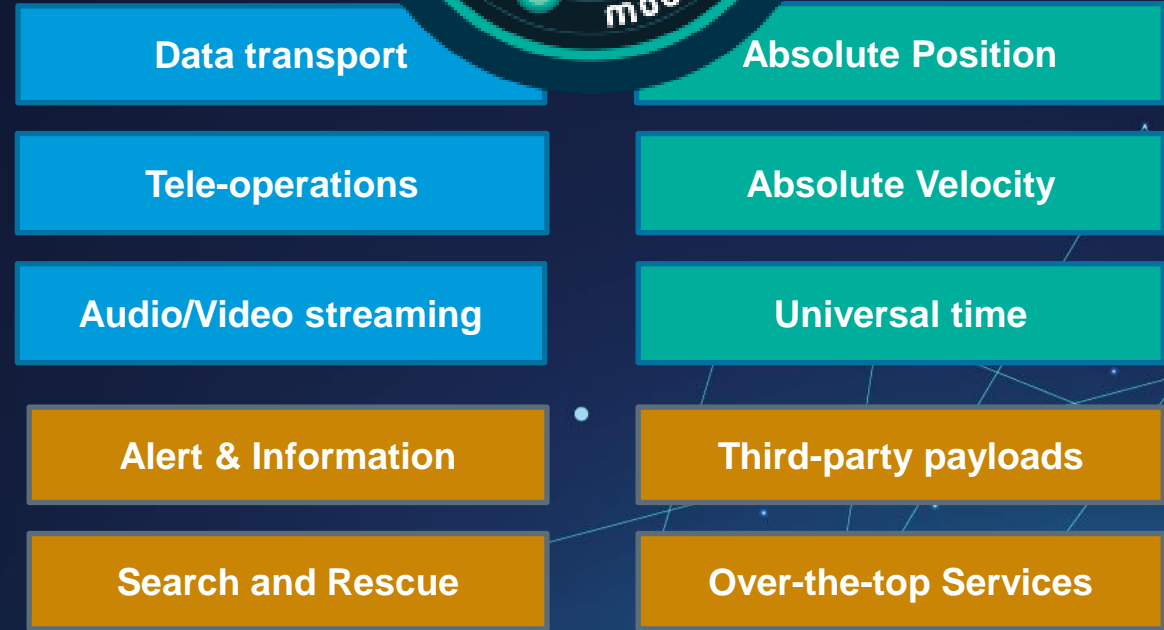
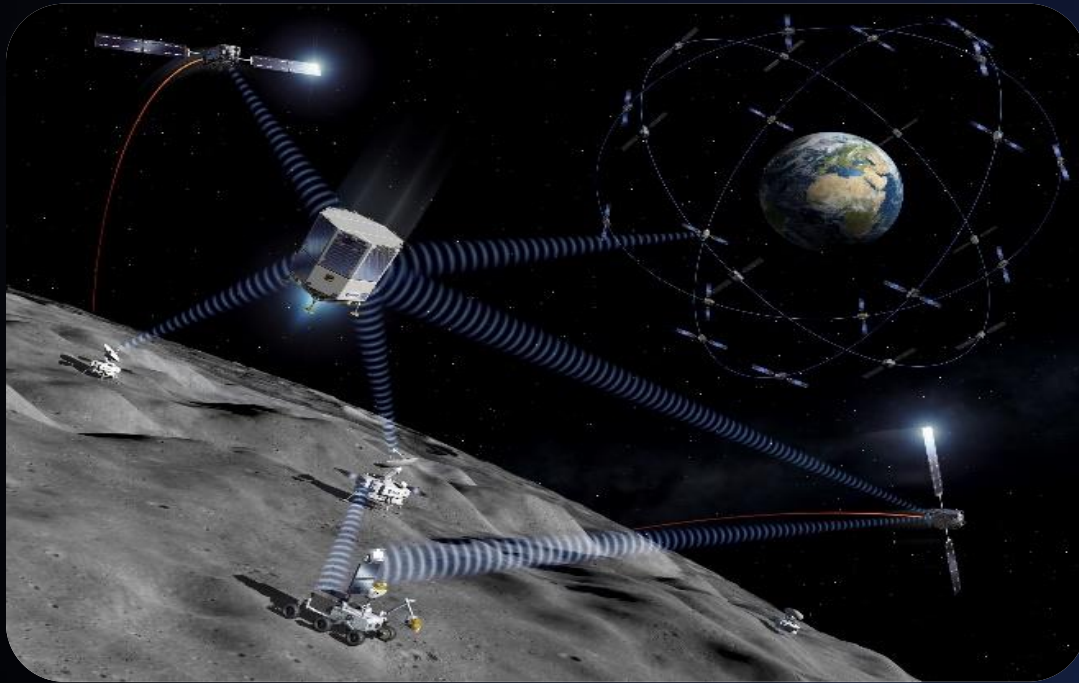
Other aspects

Required Belgium Contribution Level:  
>5 MEUR (PL)  
>3 MEUR (Test Users)  
> 30 MEUR (Prime/PF)



# Moonlight

## Lunar Communication and Navigation Services



- A dedicated constellation of satellites around the Moon providing Communication and Navigation services
- ESA supporting infrastructure development (80%) and acting as Anchor customer
- Moonlight is a key constituent of the European lunar exploration strategy for next 20 years





**European Satellite Navigation programmes offer a unique opportunity for industry to develop state-of-the-art operational space and ground infrastructure and down-stream PNT user equipment, applications and services**

- ✓ **ESA CMIN22: NAVISP, Future NAV, Moonlight**
- ✓ **EU-ESA FFPA: Galileo, EGNOS, Horizon Europe**

**Europe's ambition to maintain  
SATNAV World-wide competitiveness and leadership  
on the Earth ... and Beyond**