

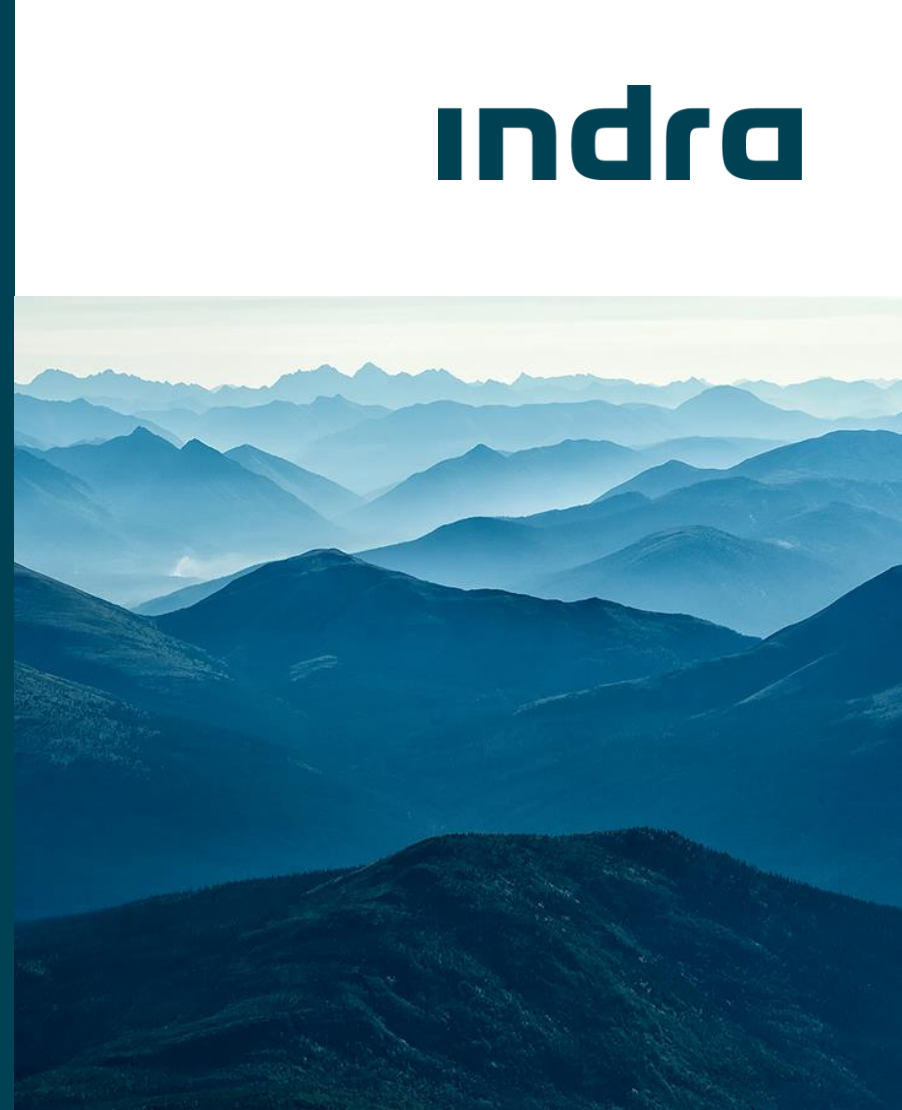
GNSS Interference Monitoring And Detection System

GIMAD status

NAVISP Industry Day
June 16th

GIMAD

indra



16/06/2022

Agenda

Who we are

Project summary and
team

Project outcomes

Impact

WHO WE ARE

Agenda



Indra is a leading global technology and consulting company

We are the technological partner for core business operations of our customers worldwide

Main figures



3,043 M€

in Revenues



48,000

Professionals



+140

Countries



265 M€

in R&D

Defence and Security Agenda

Our solutions and services

We combine the
solidity of the
physical world with
the innovations of the
digital world



Platforms

We develop the most rigorous systems for state-of-the-art land, maritime and airborne platforms



Defence Systems

We design integrated Command and Control systems to support the most complex operations scenarios



Security

We create protection technologies to anticipate and deal with all kinds of threats



Cyber-defence

We manage all kinds of cyberspace threats through innovative solutions



Space

We lead the use of space technologies applied to military operations



Logistics & Maintenance

We guarantee the optimal development of defence systems' lifespans



Training Solutions & Services

We encompass every level of civilian and military simulations

Air Traffic

Global player

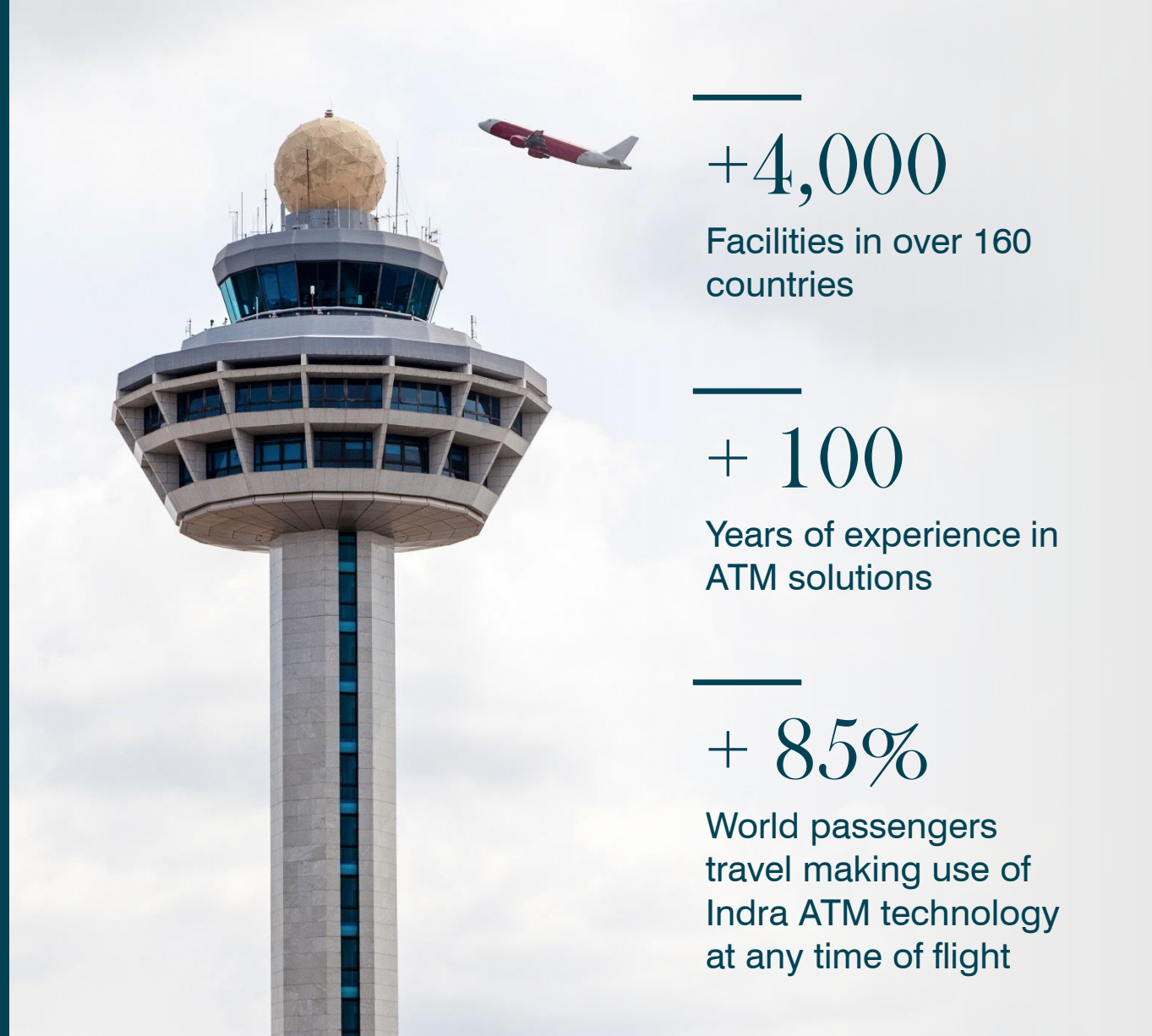
Guaranteeing safe, efficient and profitable flights, in a difficult context with constantly increasing air traffic

Innovative solutions

For our partners business success which improve service resilience

Environmental benefit

Enabling flights CO2 and noise footprint reduction, whilst improving capacity



+4,000

Facilities in over 160 countries

+ 100

Years of experience in ATM solutions

+ 85%

World passengers travel making use of Indra ATM technology at any time of flight

PROJECT SUMMARY & TEAM



Project summary and team

GNSS Interference Monitoring and Detection (GIMAD) System is designed to efficiently detect and support the location of threads that can jeopardize satellite-navigation based critical activities.

The initial users of the GIMAD Product could be users of safety critical applications where the presence of undetected RF Interference is a serious threat.

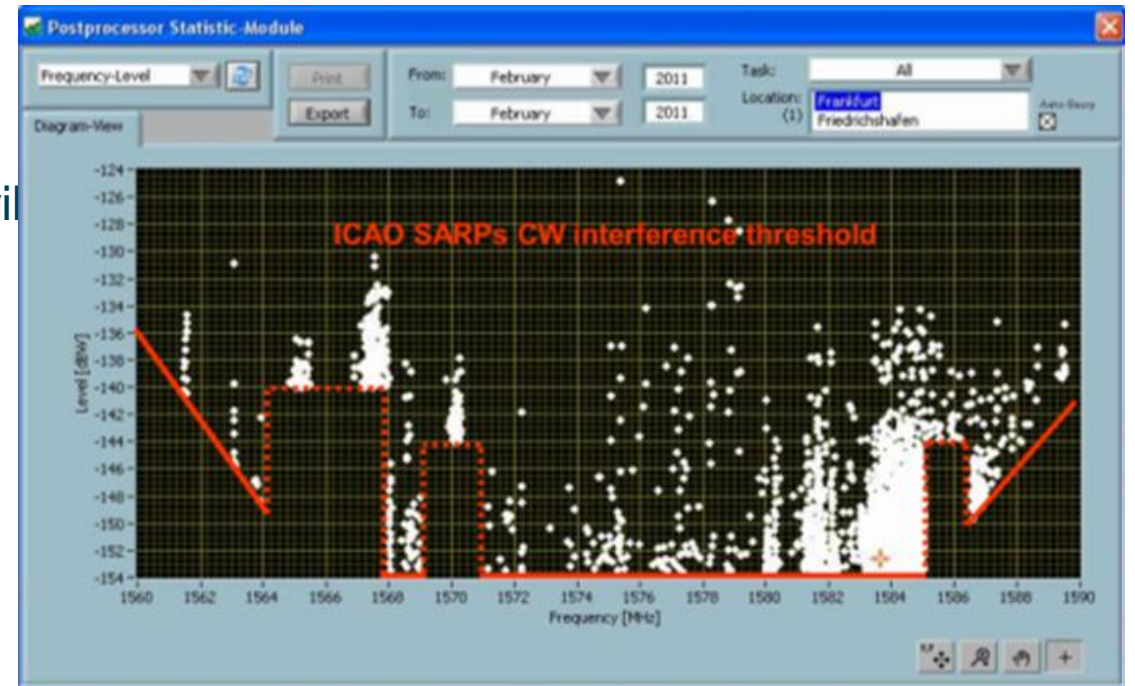
- 1) EGNOS / Galileo Ground Segment manufacturers
- 2) GBAS Ground Station manufacturers
- 3) Air Navigation Service Providers (ANSP)



Project summary and team

Key requirements

- The GIMAD System shall detect/characterize/locate RFI in the GNSS In-band frequencies (GPS L1, GPS L5, GALILEO E1, GALILEO E5a).
- The GIMAD System shall detect/characterize/locate RFI in the GNSS out-of-band frequencies (800 MHz to 1,9 GHz).
- EGNOS v3 Interference masks taken into account.
- GBAS RFI masks are derived from International Civil Aviation Organization (ICAO) SARPS Annex 10.



RFI events detected at Frankfurt airport.

Project team

Industrial organisation

PROJECT LEADER

indra

PARTNERS

IEEC^R

Institut d'Estudis
Espacials de Catalunya

ENAIRe 

PROJECT OUTCOMES

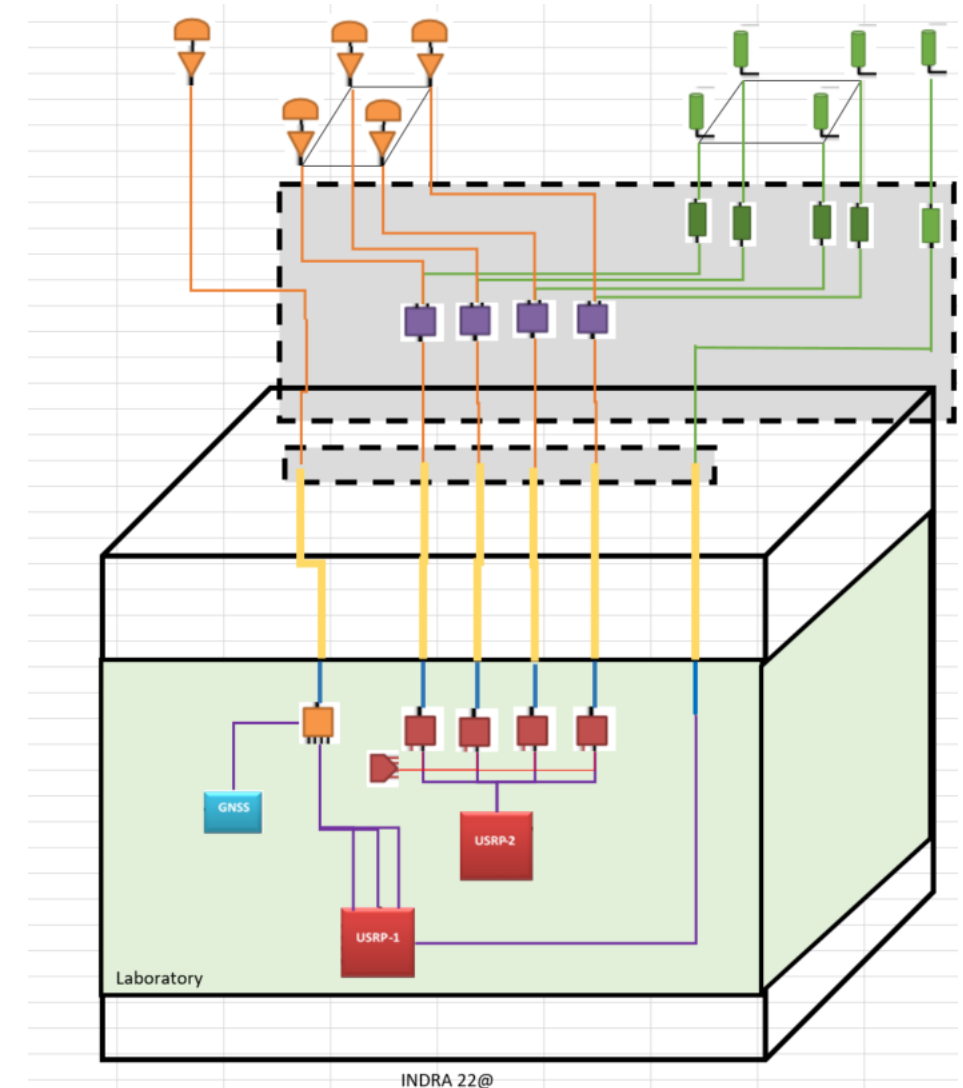
Agenda



Project outcomes

RF Front End Roof Installation

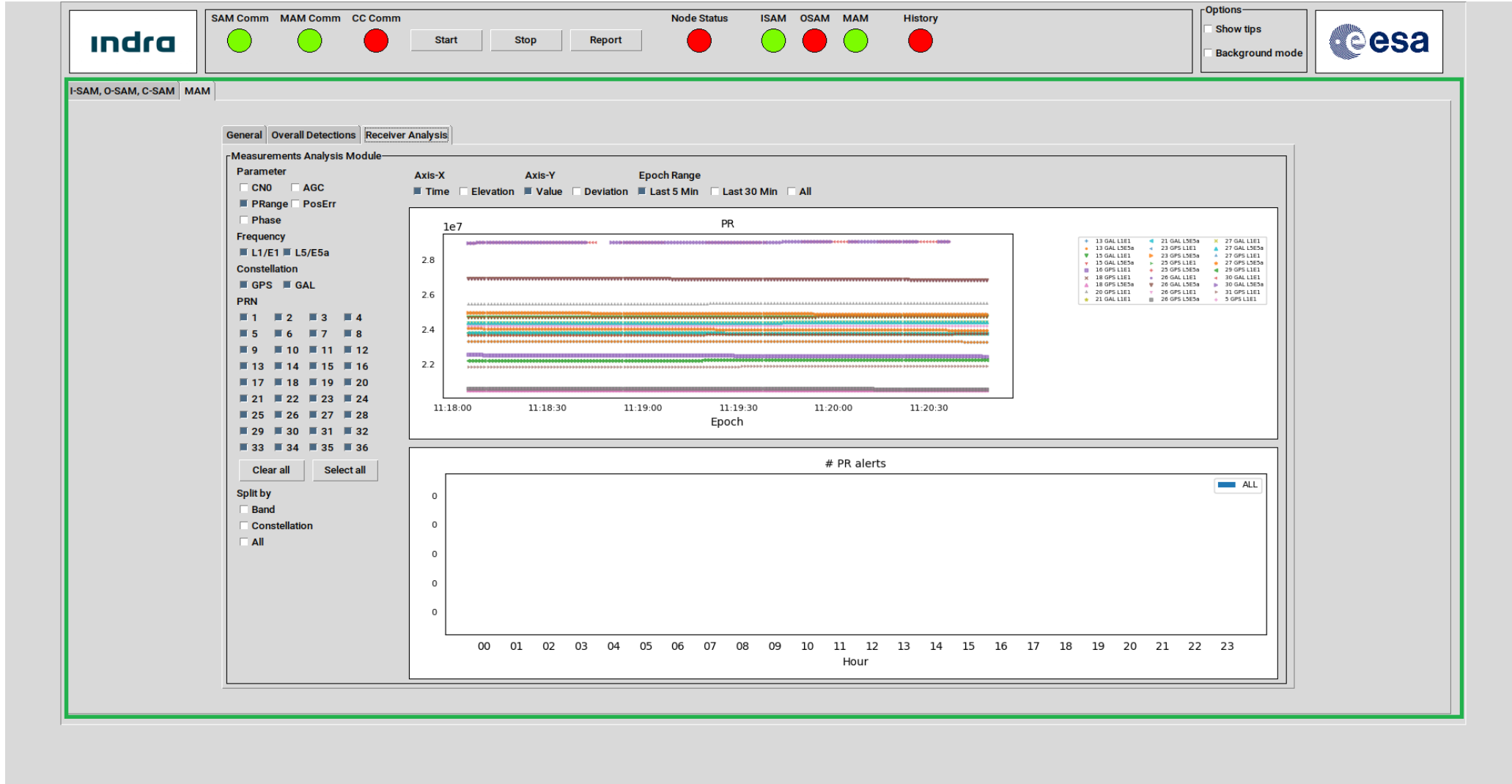
- RF Front End installed at the roof of INDRA's Barcelona 22@ premises.



Project outcomes

Alert management module

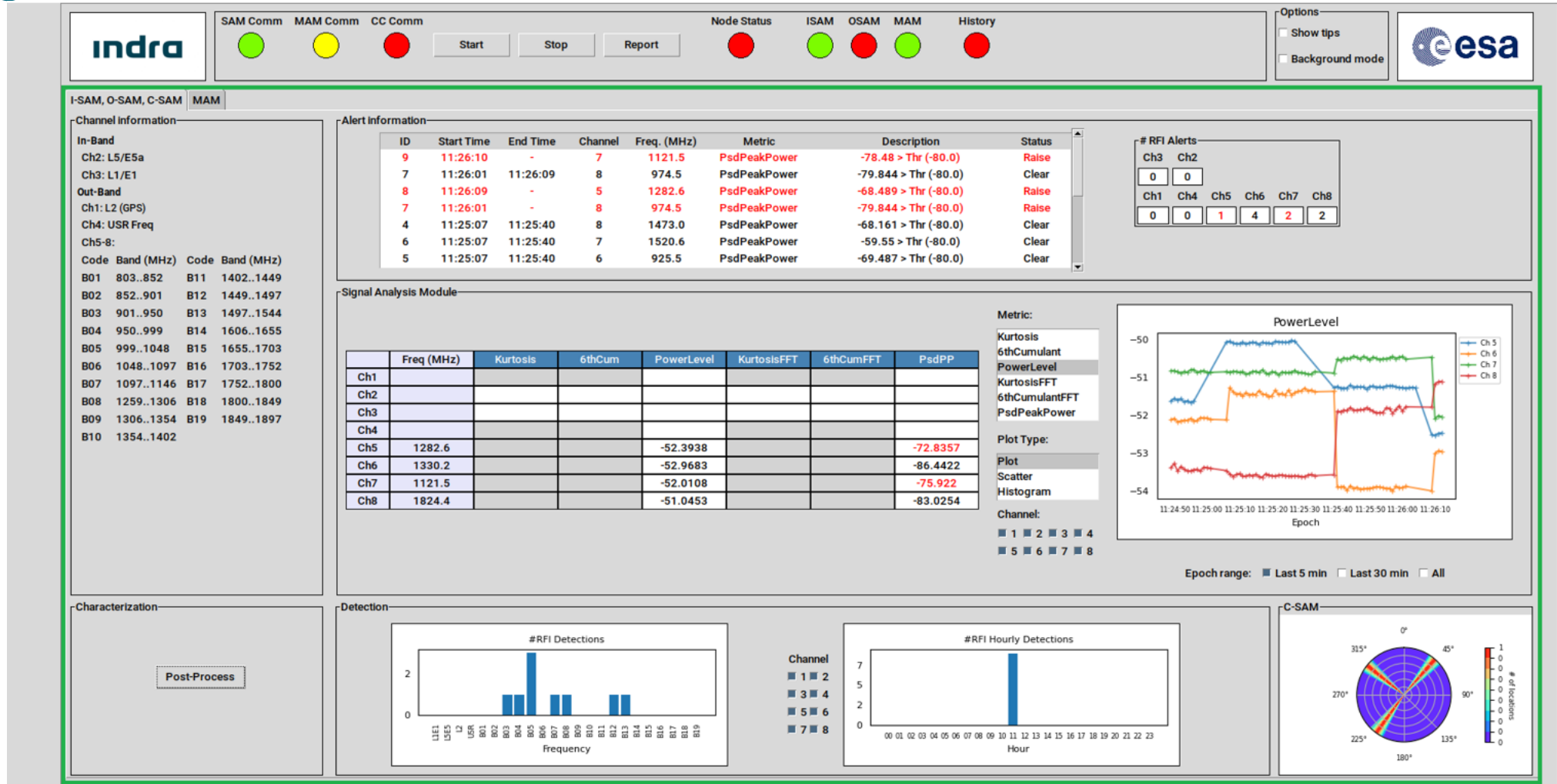
- Algorithms based on GNSS Rx observables processing.



Project outcomes

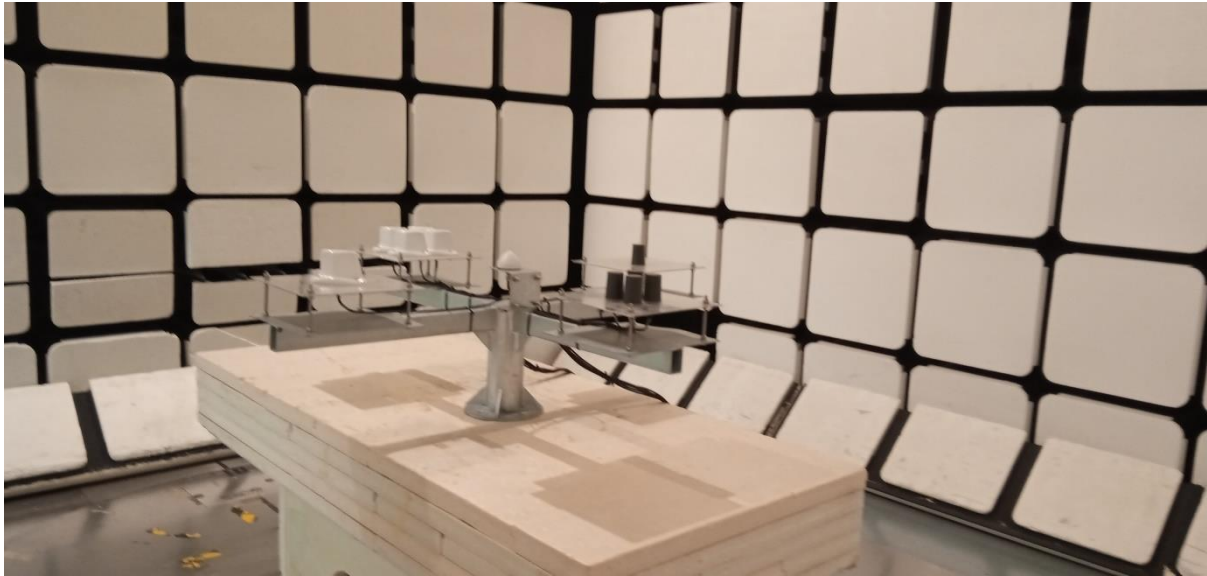
Alert management module

- Algorithms based on I/Q samples processing
- RFI Detection, characterization & location



Project outcomes

RFI location algorithms calibration



- RF Front End has been rotated at different azimuth angles



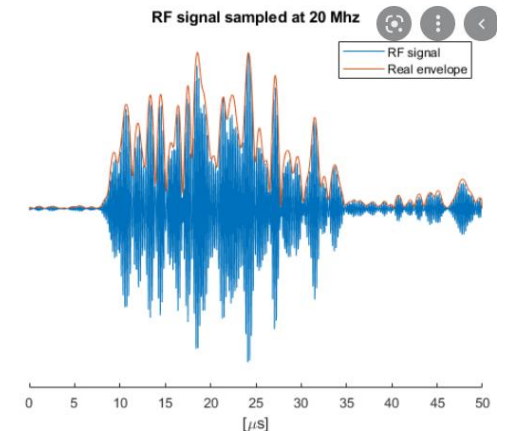
- RFI radiated into anechoic chamber

New capabilities due to NAVISP GIMAD

New project/market opportunities



- Up to NAVISP GIMAD, the RFI projects were based on GNSS observables processing.
- NAVISP GIMAD has provided technical skills on RF signal digitizing as well as RFI detection, characterization and location based on I/Q samples processing.
- NAVISP Programme has supported this transition to RFI projects with I/Q samples processing through the NAVISP funding as well as the technical follow up.
- This delta know-how matches in the overall INDRA's anti-jamming system as described in the next impact slide.



IMPACT

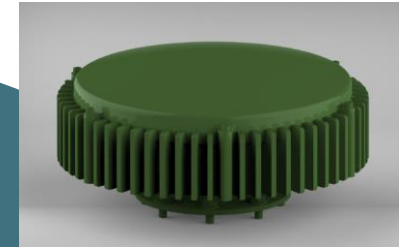
Agenda



Impact

Market

- The GIMAD product has been designed taking into account the RFI masks of EGNOS and GBAS. Therefore, it **provides a competitive advantage** to cover this market niche.
- The GIMAD product can be adapted to cover other RFI masks and therefore it can be potentially proposed to reach **other operational requirements**.
- The evolution of this prototype will be included inside the **Indra's portfolio of new GNSS interferences products**.



Location
System

Antijammin
g Systems

Detection System



Impact

GIMAD Evolutions

- Evolve the current Architecture towards a **higher TRL** maturity level.
- **Critical Review of the HW Architecture** including Antenna Front End Set, Reception Set and the Storage & Processing Set,
- Critical Review of the Software Architecture including the Data Acquisition, Signal Processing Modules and **GUI evolution** (operational dashboard)..
- Re-assessment of **key stakeholders needs** in order to evaluate the incorporation of additional functionalities in the GIMAD system, and new operational uses:
 - ✓ Services for studies for new Ground Segment Locations
 - ✓ Ensure GNSS signals at critical assets or premises
 - ✓ Law enforcement to find GNSS sabotages (including legal recording)
- **Network of GIMAD building blocks** scattered geographically (GNSS situational awareness)

indra
At the core