

# **Alternative Position, Navigation and Timing (AltPNT) technologies Demonstration Day**

European Commission, Joint Research Centre  
18 May 2022, Ispra, Italy



# Welcome Address

D. Chirondojan (JRC.E)

P. Flament (DEFIS.C.2)

G. GIANNOPOULOS (JRC.E.2)



# Overview of the AltPNT project

I. ALCANTARILLA-MEDINA (DEFIS.C.2)



# Scope and Highlights of AltPNT Demonstrations in the JRC Ispra Site

J. FORTUNY-GUASCH (JRC.E.2)

# Scope of Testing and Demonstration Activities at JRC

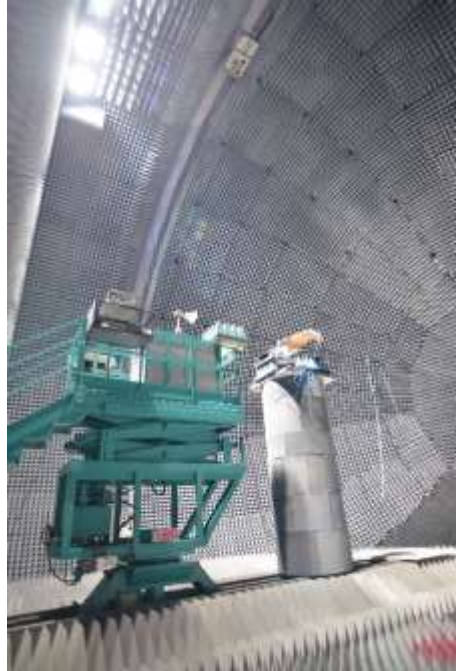
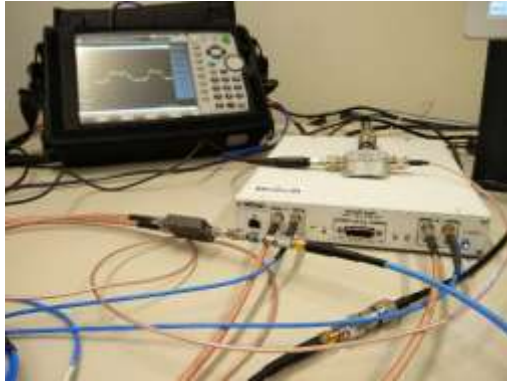


- Agreement with DEFIS and EUSPA under EGNSS stream of EU Space Programme
- Facilitation of testing and demonstration activities in the Campus of the JRC in the context of:
  - H2020/GFE/HE Calls of EUSPA and DEFIS under EU Space Programme
  - Open calls addressed to Rx Manufacturers (e.g., E-Call, shipborne receivers, Smart Tachograph,...)
  - Programmatic actions requiring testing of GNSS user equipment (e.g., pilot testing of new EGNSS services, compatibility assessment, performance monitoring,...)
  - **AltPNT demonstrations in the frame of the ERNP and the need to strengthen resilience of EU PNT infrastructures**



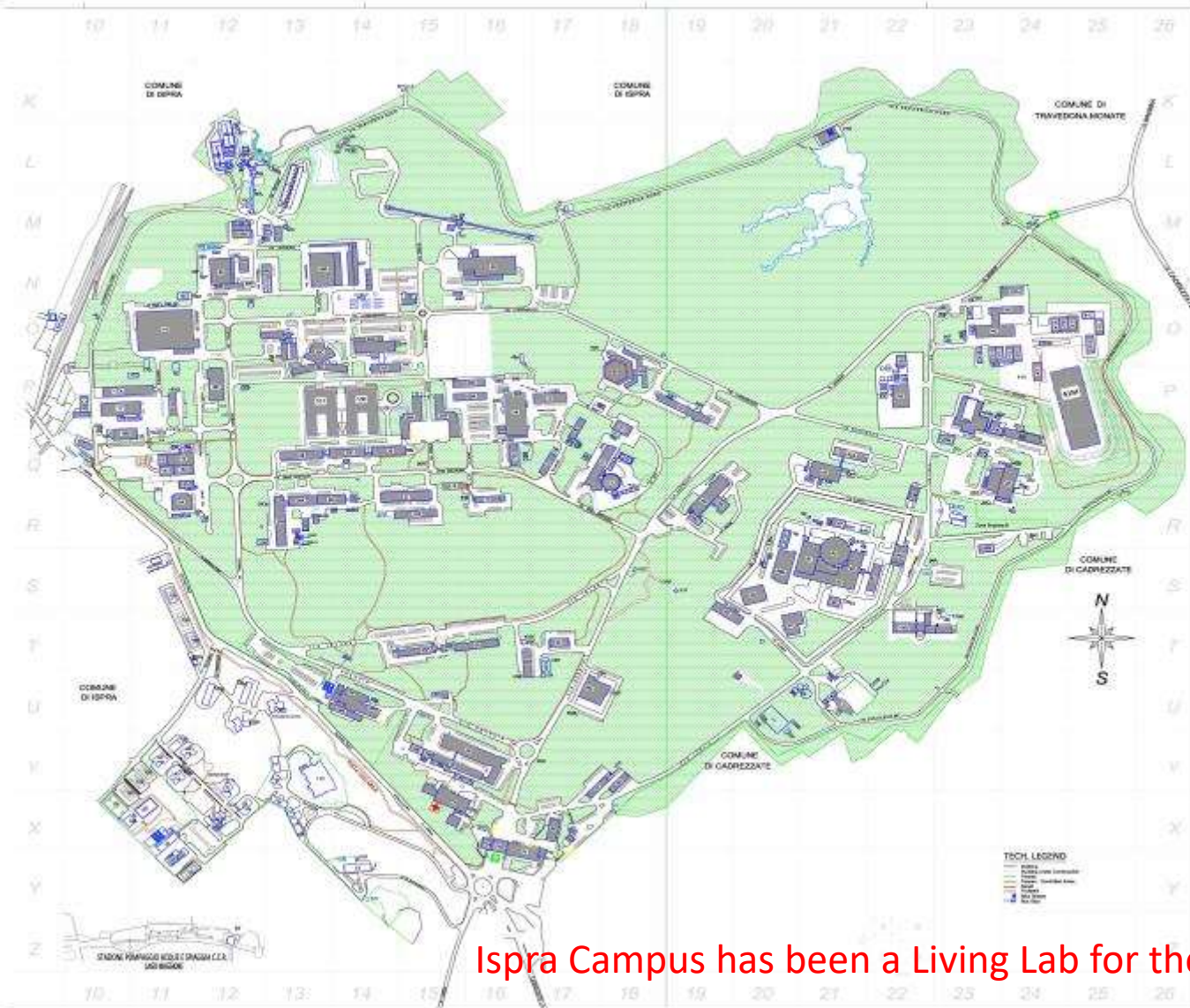
# JRC's GNSS Receiver Testing Hub

<https://op.europa.eu/s/vMWq>





# Potential of the JRC Ispra Site for Demonstrations



170 ha – largest site of the JRC  
ca 2250 people present on site every day (+ ca 200 visitors)

>100 buildings heated/staffed

36 km roads

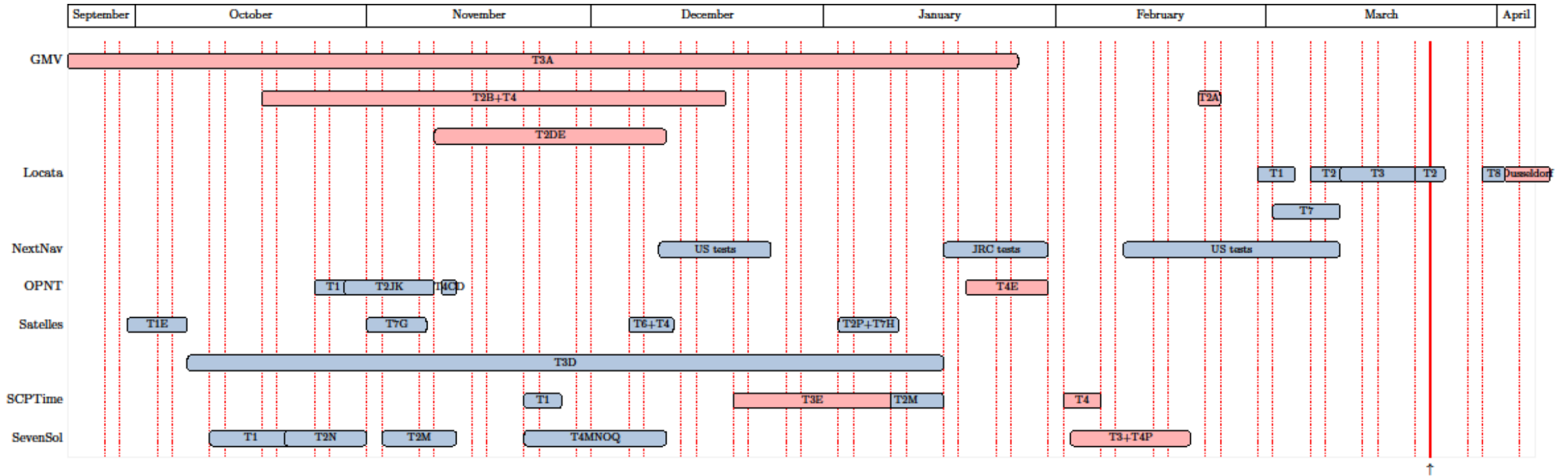
modern ICT network infrastructure

Customs, security, firefighters station,  
medical service...

***...just like a small town***

Ispra Campus has been a Living Lab for the AltPNT demonstrations

# Timetable of the AltPNT Testing



- Oct 2020 - call for tender published
- Aug 2021 - Six companies awarded + one additional participant
- Oct-March'22 - Testing conducted on site
- Q2 '22 - *Demo Day presentation*
- Q3 '22 - *public report*



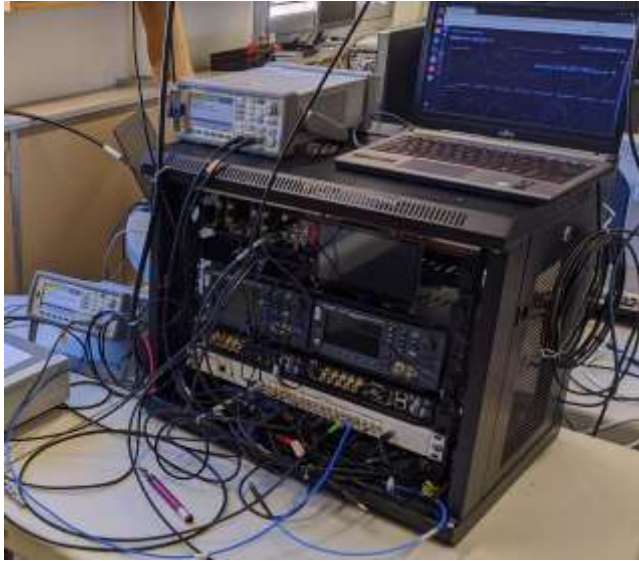
# ISD Support to the AltPNT Demonstrations

- Activities and installations on the site, have been agreed and supported by colleagues from **Ispra Site Directorate**
- Work with **JRC-NOC** to granted secure connectivity to several AltPNT platforms. This has been instrumental because the whole campaign was conducted with COVID-19 restrictions in place
- **Security Service** timely granted the access to the site to visitors (many non-EU Nationals)
- **JRC Customs** supported us with the shipments with CARNET ATA from US and Australia
- AltPNT demonstrations hosted in BD72C, BD24, BD18, BD48, BD102, and the Atmospheric Tower





# Demonstrators of the AltPNT Timing Services



Six Time Interval Counters used, more than 3.2 GByte of PPS time difference log data collected (>200 Measurement Days)



# JRC Time Reference Traceability to UTC(IT)

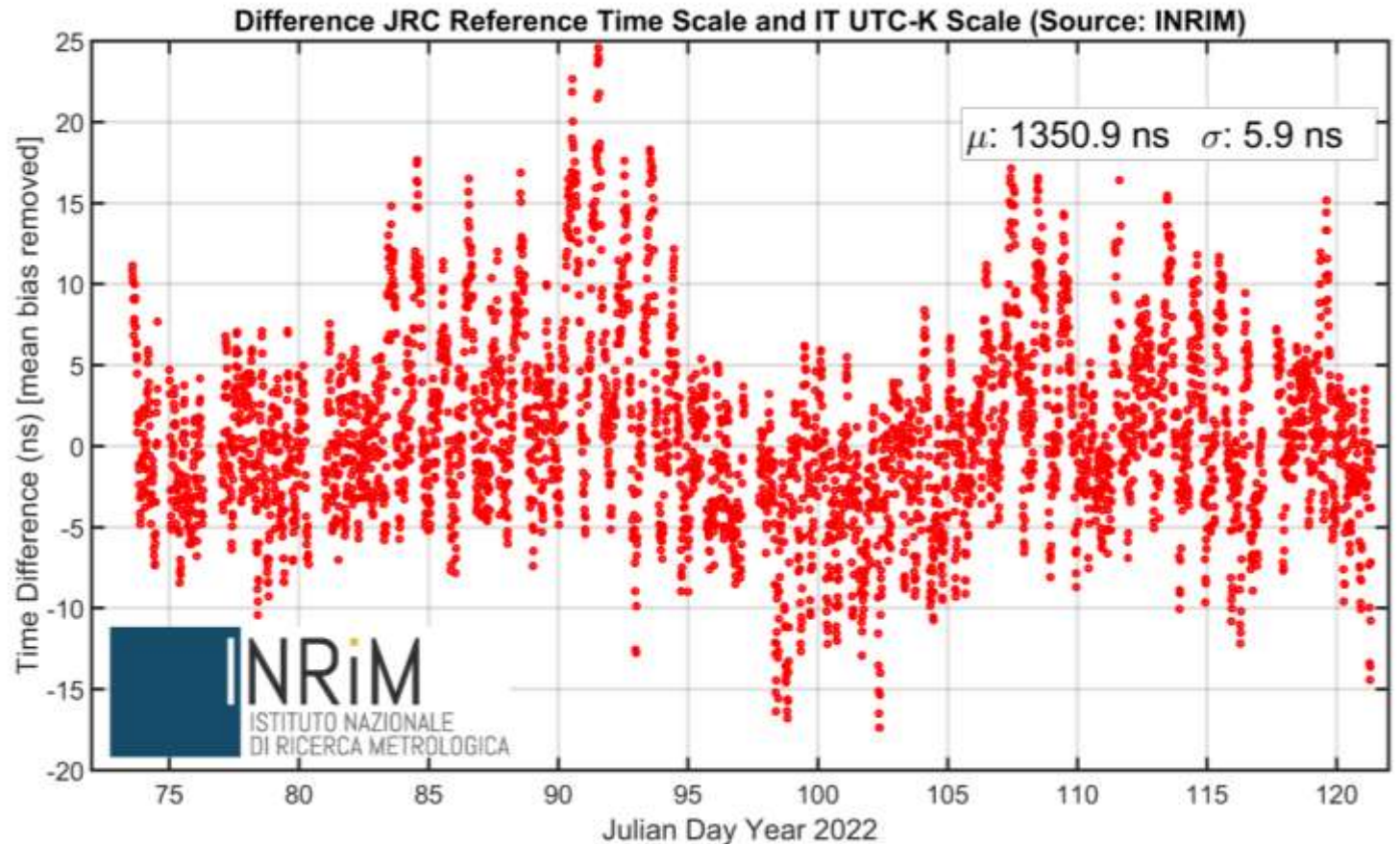
- INRIM (the Metrology Institute providing the UTC Time in Italy) has calibrated our setup.
- Using GNSS signals we can virtually transfer our time reference to INRIM and get its traceability to UTC with nanosecond accuracy.
- The time scale for the AltPNT tests is UTC and therefore traceability to this scale is needed.





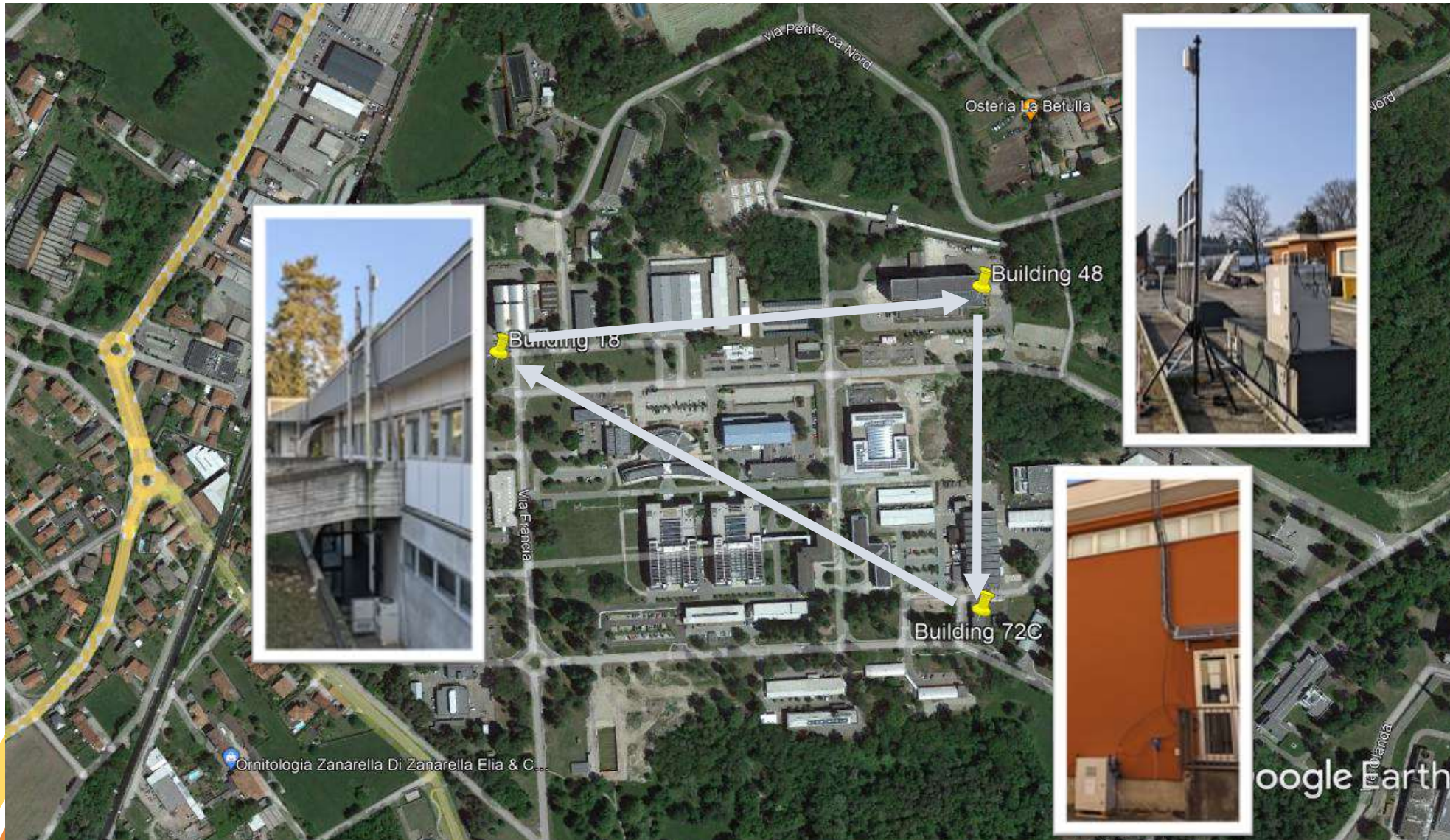
# JRC Time Reference Traceability to UTC(IT)

- INRIM (the Metrology Institute providing the UTC Time in Italy) has calibrated our setup.
- Using GNSS signals we can virtually transfer our time reference to INRIM and get its traceability to UTC with nanosecond accuracy.
- The time scale for the AltPNT tests is UTC



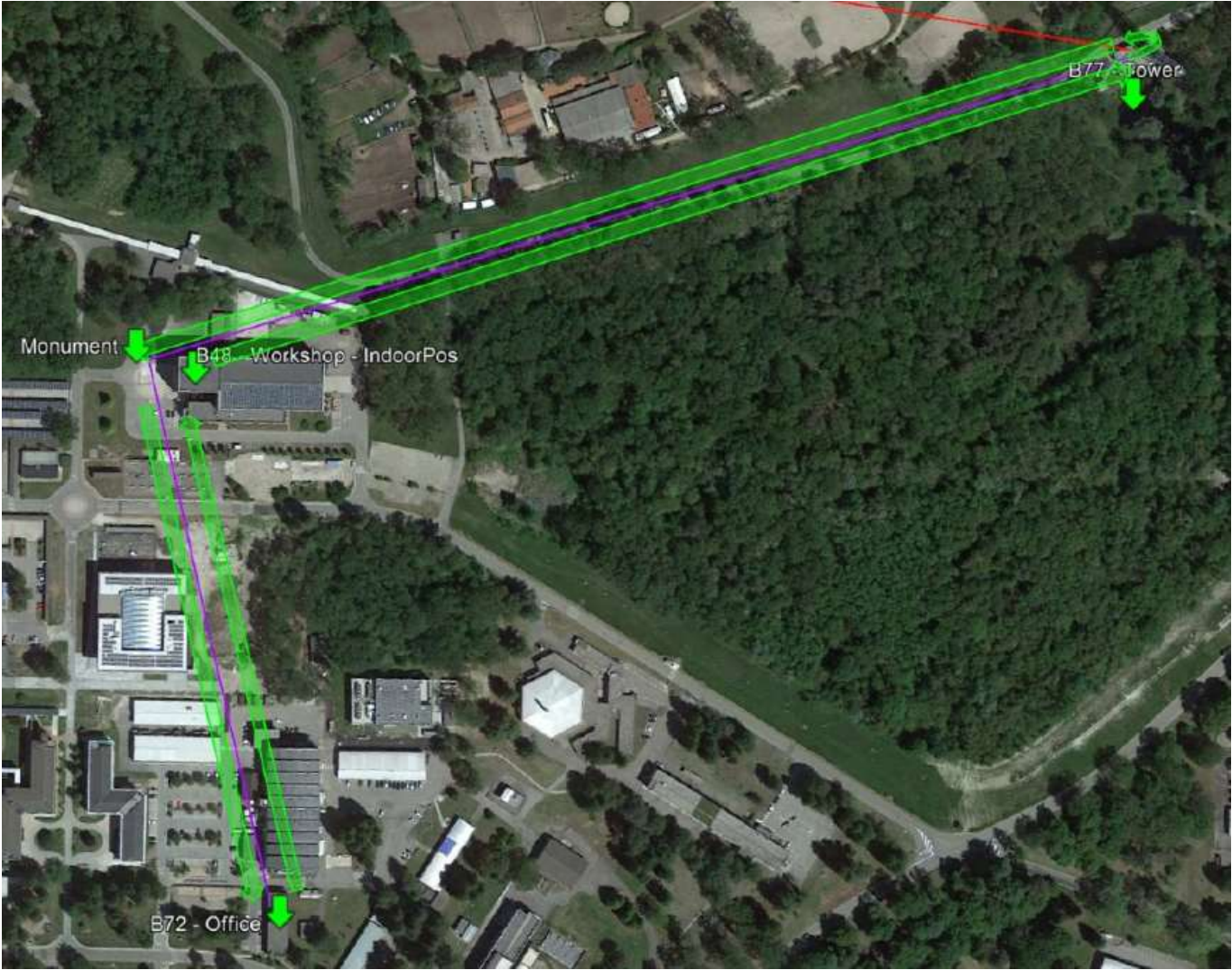


# Deployment of Radio Beacons in the JRC Campus (1 of 2)



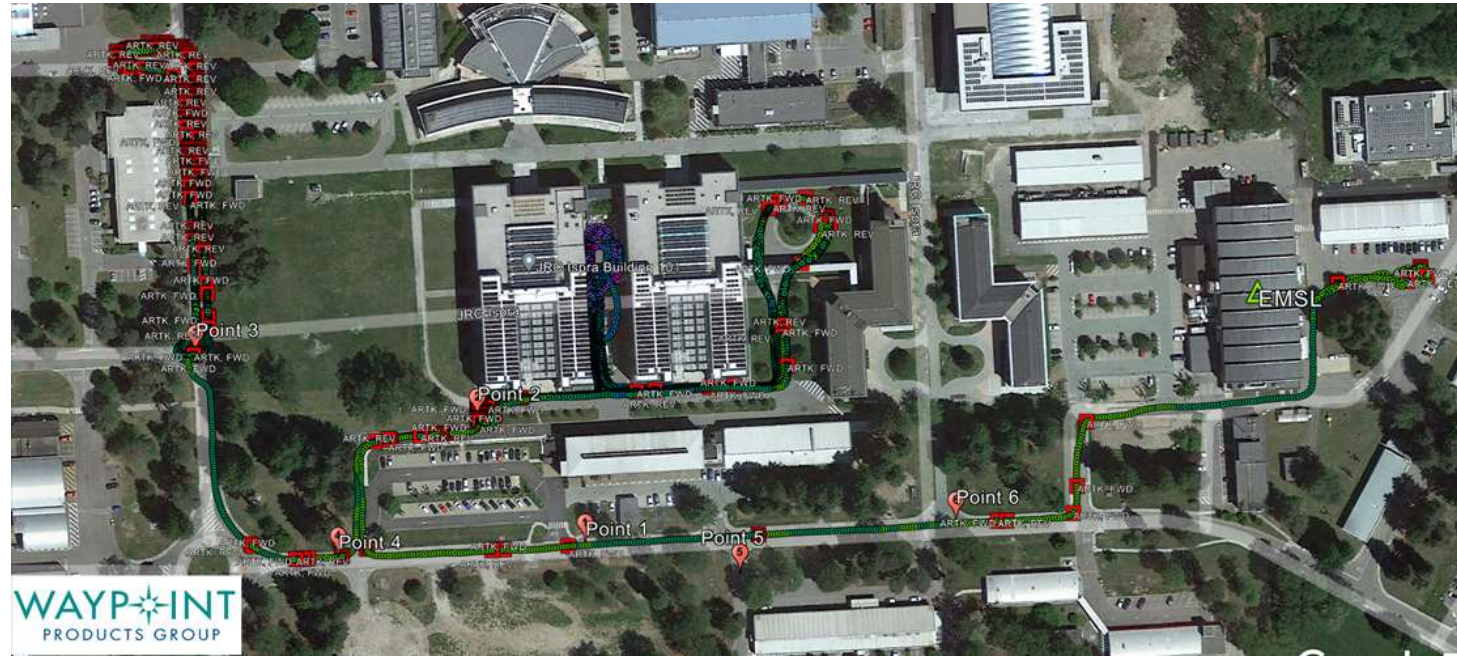


# Deployment of Radio Beacons in the JRC Campus (2 of 2)





# Reference Trajectories to assess the performance of AltPNT Positioning

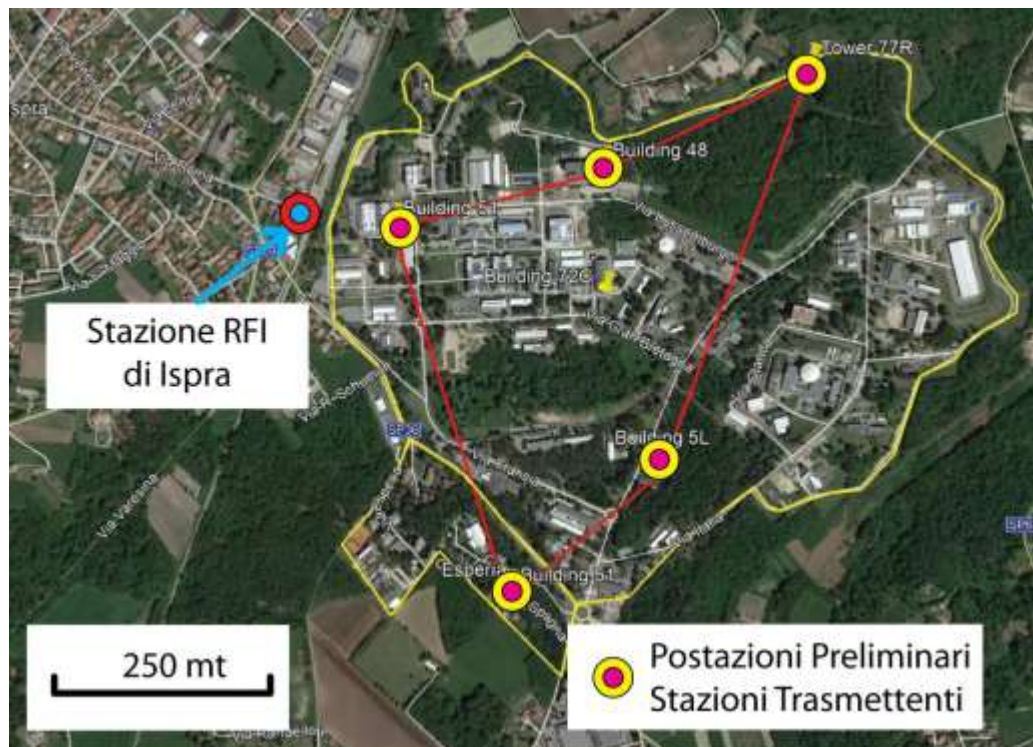


- The Galileo team operated the reference navigation system to assess the accuracy of the AltPNT position solutions.
- A Total Station and a SPAN system were used.





# Temporary License Granted by IT Spectrum Regulator



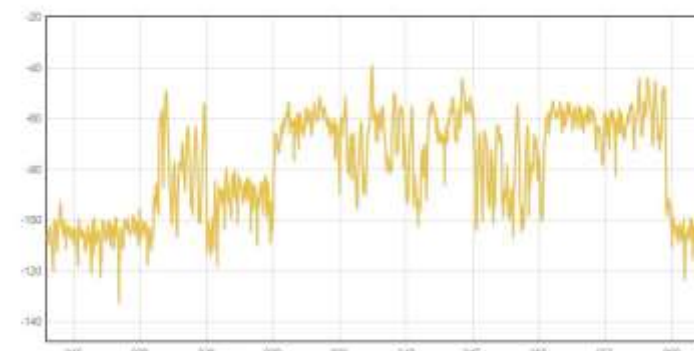
Frequency Band: 921.0 - 927.0 MHz  
Currently in use in the USA

## No Licensed Bands for Terrestrial AltPNT Currently Allocated in the EU

915,0000 - 921,0000	FISSO 112B	Ministero difesa	
	MOBILE escluso mobile aeronautico 112B		
921,0000 - 925,0000	MOBILE escluso mobile aeronautico 111 112B	MISE	-GSM-R
925,0000 - 960,0000	MOBILE escluso mobile aeronautico 112 112A 112B	MISE	-GSM -IMT -MCV -Servizi di comunicazioni elettroniche terrestri



Spectral Plot



# Coordination with Licensed Users during AltPNT Demo



- Formal request submitted to IT Spectrum Regulator (MISE)
- **Green light under the conditions to coordinate the activation of the beacons with licensed users** (Italian Railways Network and a Mobile Operator)
- Beacons activated for two hours when GSM-R base station was under maintenance
- Users of Base Station **did not suffer any harmful interference** and it kept on functioning all the time
- One night 1 to 5 AM beacons were switched on and GSM-R base station was powered off remotely from the Control Center in Rome
- **Coordination went perfectly fine and no harmful interference was reported at any time**
- **AltPNT system under test also functioned nominally**



# Highlights on AltPNT Testing at JRC

- **Almost 7 months of testing in the JRC completed**, 7 AltPNT platforms brought to Ispra to check its performance against the requirements set
- Some AltPNT platforms demonstrating **positioning services (indoor and outdoors)** using networks of terrestrial radio beacons
- Some AltPNT platforms demonstrating **precise and robust timing provision and transfer**
- AltPNT testing has exploited the potential of the **JRC Ispra Campus as a living lab** to its full extent
- **Reference time** used in the demonstrations based on **UTC-K Time Scale from NMIs**
- **Availability of spectrum** is an issue to be tackled in case of an EU wide AltPNT deployment

# **Visit to Laboratories / AI+PNT Technology Demonstrations**