

6G SNS



*6G LINO: From lab validation
to real-world NTN trials workshop*

The 6G-SANDBOX NTN Large-Scale Trials

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A short view back to the past..

ESA & 6G-SANDBOX
Sign a Memorandum
of Understanding

6G-SANDBOX
Announces NTN
Large-Scale Trials

ESA & SNS-JU
Sign a Memorandum
of Understanding

Press Release

06 June, 2023



6G-SANDBOX Signs Memorandum of Understanding with **European Space Agency (ESA)** to Integrate Satellites with **5G** and **6G** Communications



6G-SANDBOX LARGE SCALE NTN EXPERIMENTATION

SNS JU AND ESA JOIN FORCES TO ACCELERATE THE INTEGRATION OF SATELLITE NETWORKS IN 6G

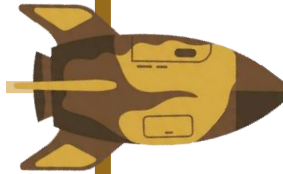
SNS JU AND ESA JOIN FORCES TO ACCELERATE THE INTEGRATION OF SATELLITE NETWORKS IN 6G

STRATEGIC PARTNERSHIP OPENS NEW ERA OF COLLABORATION FOR UBIQUITOUS CONNECTIVITY IN EUROPE

June 2023

September 2025

October 2025



...and a reality check on the present

GEO/LEO gateway

- Expensive (in terms of cost and time)
- Usually delegated to sub-contractors → hard to manage delays

Spectrum licenses

- Long procurement process
- Gateway- and satellite-specific
- Lack of European framework → only country-level licenses

**CONFIDENTIAL
obstacle**

**5G NR NTN
Experimentation**

Today

...and a reality check on the present

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Spectrum licenses

- Long procurement process
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GEO/LEO satellite

- Very limited availability (LEOs)
- Potential commissioning delays (ESA MIXELS)

5G NR NTN Experimentation

Today



6G-SANDBOX NTN Large-Scale Trials

- Akin to a plug-fest
- Call for active actors in NTN to:
 - Test their technology (satellites/UEs/ground stations)...
 - .. by running experimentation on the 6G-SANDBOX & ESA platforms
- 6G-SANDBOX
 - Coordinates the trials
 - Provides experimentation infrastructure to perform end-to-end NTN testing

Received 10+
expressions of
interest...

..to date, 2
experimenters
executed.

Experimental platforms for 6G-SANDBOX NTN trials

Malaga's 6G-S platform
5/6G testbed, Keysight's NTN testing portfolio

**ESA's REMI and
LIDE satellites**

**Malaga NTN ground
station and UE antennas**

**Keysight
PROPSIM**

**..other satellite
providers**

6G-SANDBOX & Sateliot Trial

Goal: Test and validate Sateliot 5G NTN gNB

- 5G NR NTN over LEO satellite
- Regenerative gNB with entire gNB hosted on the satellite

Focus on conducted, in-lab testing

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Experimental setup:



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Experimental setup:



Results:

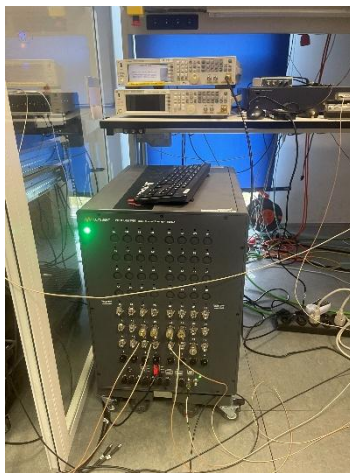
- UE performs initial attachment
- UE establishes PDU session
- UE pings the UPF
-more to come!

6G-SANDBOX & ITRI Trial

Goal: Test and validate ITRI 5G NTN gNB

- 5G NR NTN over GEO satellite
- Transparent gNB with gNB hosted on the ground

First phase conducted, in-lab testing, second phase over-the-air



6G-SANDBOX & ITRI Trial

Goal: Test and validate ITRI 5G NTN gNB

- 5G NR NTN over GEO satellite
- Transparent gNB with gNB hosted on the ground

**1st Phase:
Conducted
experiment**

Conducted experimental setup:



Results:

- UE performs initial attachment, establishes PDU session
- **UE can transmit/receive end-to-end traffic!**

6G-SANDBOX & ITRI Trial

Goal: Test and validate ITRI 5G NTN gNB

- 5G NR NTN over GEO satellite
- Transparent gNB with gNB hosted on the ground

2nd Phase:
Over-the-air
experiment

Over-the-air experimental setup:



Results:

- ...Working on getting past "MSG2" in the initial attachment procedure.

Conclusions and takeaways

- Complexity of the trials cannot be underestimated: this is not just a Terrestrial Network.
- Need for a complete infrastructure, from UE to gateway/gNB.
- Obtaining frequency licenses from authorities is complex.
- Emulation and IQ replay capabilities can play a key role: testing windows can be as limited as ~10 minutes every other couple days.
- Effort to prepare the trials was about 4MM, execution was 2 to 3MM.
- A big thank you to ESA and the SNS JU for the cooperation; without you, this would not have been possible!
- Would I redo it? Yes absolutely, and we will!



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6G SNS

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www.smart-networks.europa.eu

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