NTN Activities, Portfolio & Collaboration with esa

Smart Networks and Services Joint Undertaking

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SNS JU mandate is to build **Europe’s future connectivity ecosystem**

- Europe's **flagship public-private partnership** for 6G research and innovation
- Brings together **industry, academia, and policymakers** to develop next-generation network technologies
- Underpins the next generation of digital networks and services **powering European competitiveness and sovereignty**

Why NTN is a Priority for SNS JU

TN-NTN integration is a **structural 6G requirement** that SNS JU must address to fulfil its mandate

Technological Sovereignty(1)

Ability to **develop, provide, protect, and retain** critical technologies

Ability to **act and decide independently** in a globalised environment

Ubiquitous Coverage

~70% Earth's surface unserved by terrestrial RAN;
NTN is the only answer

Standardization 6G Architectural

3GPP Rel-17, 18, 19 → 20, 21

TN-NTN convergence decisions made at Rel-21 will be irreversible at deployment

(1) **Source**: https://www.europarl.europa.eu/RegData/etudes/STUD/2021/697184/EPRS_STU(2021)697184_EN.pdf

TN-NTN integration requires that we **answer multiple questions**

Key areas: spectrum, sovereignty and security

6G natively integrates satellites, HAPS, UAVs as nodes.
Seamless handovers to maritime, aviation and cross-border areas

FROM

- Networks are **territorial**
- **Single-Layer** Vulnerability
- Connectivity as **National Infrastructure**
- TN-NTN **Coexistence**

TO

- NTN **cross borders** continuously
- Traffic routing may **bypass national gateways**
- **Multi-Layer** Redundancy
- Connectivity as **Global Utility**
- TN-NTN **Integration**

New questions

| USO vs Global service delivery | Lawful intercept | Security | | Spectrum coordination | Data sovereignty | Licensing |

Some of our NTN-related projects

5G-Stardust	• Satellite and Terrestrial Access for Distributed, Ubiquitous, and Smart Telecommunications • Demonstrated TN-NTN convergence via regenerative satellite gNB, self-organised networking, and AI-driven RRM. Contributed to 3GPP Rel-19/20 on unified radio interface and multi-connectivity.	Rel-19/20 Completed Dec 2025
6G-NTN	• Full and seamless unification of the Non-Terrestrial Network (NTN) component into the 6G system • Sustainable and resilient 3D multi-layered (GSO, NGSO, HAPS, drones) network architecture • Drive 6G NTN standardization in 3GPP. **Built NTN Forum (200+ industry stakeholders).**	Rel-19/20 Completed Dec 2025
ETHER	• Multi-layered and unified 3D space-aerial-terrestrial architecture • Novel zero-touch resource management framework for unified 3D mobile network (terrestrial + aerial + satellite). Delivered architectural blueprint for **integrated TN-NTN ecosystem with AI-based orchestration.**	Rel-19/20 Completed early 2026
6G-Sandbox	• Pan-European 6G Large-Scale Trial Infrastructure. Complete and modular facility for European experimentation. Testbeds in Athens, Berlin, Malaga and Oulu. • Terrestrial 5G/6G RAN and core infrastructure. **Orchestrating large-scale NTN trial in H1 2026 (EuCNC)**	Rel-19/20 Active /NTN trials H1 2026
NexaSphere	• NexGen 3D Networks: Unified TN/NTN across 6G, AI, and aerial layers • Integrating spaceborne, airborne, and terrestrial platforms. Multi-path transmission, AI-driven resource management, edge-cloud continuum. **PoC demonstrations in aviation, automotive, and rail.**	Rel-20/21 Active — 2025–2027
6G-NTN² Nexus	• Flagship project targeting seamless TN-NTN service continuum: architectures requiring tight SNO-MNO cooperation, roaming across segments, and a unified network fabric. • **Direct input to 3GPP Rel-21 normative specifications.**	Rel-20/21 New — open H2 2026

ESA-SNS JU synergies

A European TN-NTN Experimentation Platform

SNS JU/ 6G projects bring

- EU funding instruments (Horizon Europe grants)
- Research community: 100+ project consortia
- Expertise in managing NTN-dedicated projects: 5G-STARDUST, 6G-NTN, ETHER, NexaSphere, 6G-NTN Unification
- 3GPP NTN standardisation track record (Rel-19→21)
- **Pan-European 5G/6G testbeds** (i.e. 6G-SANDBOX facilities in Athens, Berlin, Malaga, Oulu)

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ESA / 6G LINO bring

- 6G LINO in-orbit regenerative payload (LEO)
- On-board 5G NR NTN gNB + UPF — edge computing at altitude
- Open-lab model for third-party experiments (Phase 2)
- AI-driven S-band spectrum management
- Scalability path to 6-satellite LEO constellation

Together: Europe's end-to-end TN-NTN experimental platform anchored in
6G standardization and knowledge-transfer loops (3GPP/ETSI)

In summary….

- The definition of the 6G vision has begun at 3GPP and **NTN is recognized as playing a pivotal role** in future fully integrated systems.
- SNS vision is multilayer and involves the **cooperation of terrestrial, airborne and space nodes**.
- A **complex landscape for research ahead** as each layer of the architecture presents differing challenges.
- Europe should not miss this opportunity to be at the forefront of the next frontier in telecommunications
- **Our goal now**: move from lab validation to real-world NTN trials

6GSNS

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THANK YOU FOR YOUR ATTENTION

Contact us: smart-networks.europa.eu