Digital Twin of the PHY Layer: A Global Dataset Generation Platform for 6G AI

Project Call: HORIZON-JU-SNS-2026-STREAM-B-01

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12.01.2026

Teaser

- This project aims to address one of the most critical needs for AI/ML in 6G networks: **generalizable, real-world-like, and standards-compliant data**.

- We will develop a system that is **independent of any specific condition, region, or simulator**, producing datasets that are **3GPP-compliant** and act as a **digital twin of the physical layer**.

- This ensures accessibility for universities, research institutes, operators, and vendors alike—without dependency on proprietary environments.

Teaser

- The platform will model all coverage scenarios worldwide—from dense urban areas to rural regions—capturing regional diversity to enable **AI/ML solutions that generalize across environments**.

- Beyond dataset generation, it will provide **open APIs, validation mechanisms, and standardized metadata**, empowering the entire ecosystem and reinforcing Europe's leadership in the global 6G vision.

Core Objectives

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1. **Universal Coverage Representation**
    - Develop a dataset generator that models **all coverage area types worldwide** (dense urban, suburban, rural, NTN, etc.).
    - Ensure datasets capture **regional variations** (e.g., dense urban in Tokyo vs. Paris vs. São Paulo).

2. **PHY Layer-Centric Approach**
    - Focus on **physical layer realism**: channel models, propagation environments, interference patterns.
    - Comply with **3GPP standards** for PHY layer modeling to ensure interoperability and standardization.

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3. **High-Powered Generalization**
    - Design datasets that enable AI models to **generalize across diverse environments**, reducing overfitting to specific regions.
    - Include **metadata descriptors** for reproducibility and benchmarking.

4. **Synthetic + Real Data Fusion**
    - Combine **real-world measurements** (where available) with **synthetic data** from advanced simulators.
    - Simulator spans **multi-RAT** (cellular, NTN) and disaggregated RAN architectures.

Impact

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- Enables AI generalization for 6G networks globally.
- Supports AIaaS for verticals like autonomous systems and immersive XR.
- Strengthens Europe’s leadership in standardization and innovation.

Any Questions?