6G SHort range extreme communication IN Entities
(6G-SHINE)

**Motivation**

6G is expected to take the form of a ‘network of networks’. It will integrate subnetworks with diverse characteristics in terms of coverage, operational purpose, and spectrum, including cellular, non-terrestrial, drone, campus and private networks.

**In-X subnetworks** are located at the very end of the 6G ‘network of networks’ to support highly localized and high-performance connectivity. For example, in-vehicle wireless subnetworks may replace the wired infrastructure for the anti-lock braking system (ABS), motor control and advanced driver-assisted systems (ADAS); in-robot subnetworks can wirelessly support fast closed loop control, e.g. force control; in-classrooms subnetworks can be used for extended reality (XR) applications for educational purposes. These use cases may be demanding extremely high data rates, or low latencies and high reliability – especially for life-critical applications.

**Workplan**

The 6G-SHINE project plans to pioneer the main technology components for wireless in-X subnetworks and prepare their adoption to the future 6G standards. In this respect, the project plans to:

- Define relevant application scenarios, use cases and architectures for in-X subnetworks, and analyze related performance requirements.
- Characterize the radio propagation channel in the short-range scenarios and frequency bands of interest, considering <10 GHz, mmWave and sub-THz spectrum regions.
- Design new physical layer (PHY) and medium access control (MAC) enablers for scalable requirements in terms of latency, reliability or data rate, leveraging the opportunities offered by short

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**Budget**

5.46 Mio. € over all, funding of 4.99 Mio. € by the European Union

**Project Duration**

01.03.2023 to 31.08.2025
(30 months)

**Website**

http://www.6gshine.eu

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range subnetworks. Envisioned PHY/MAC enablers include short range beamfocusing techniques for constrained devices, reflective intelligent surfaces, intra-subnetwork macro diversity, predictive schedulers, flexible/full duplexing transmission.

- Develop cost effective radio resource and spectrum management techniques (considering both legitimate and malicious interferers) in dense dynamic subnetwork crowds. The project will explore fully distributed solutions where subnetworks perform their decisions independently, as well as centralized and hybrid approaches where an umbrella 6G network can aid operations of subnetworks in its coverage area.


**Perspective**

The 6G-SHINE technology components will leverage the opportunities offered by short-range communications and connectivity with a broader 6G network, to ensure a low-cost high-performance radio design while dealing with major challenges such as signal blockage, interference due to densification, and proneness to malicious attacks.