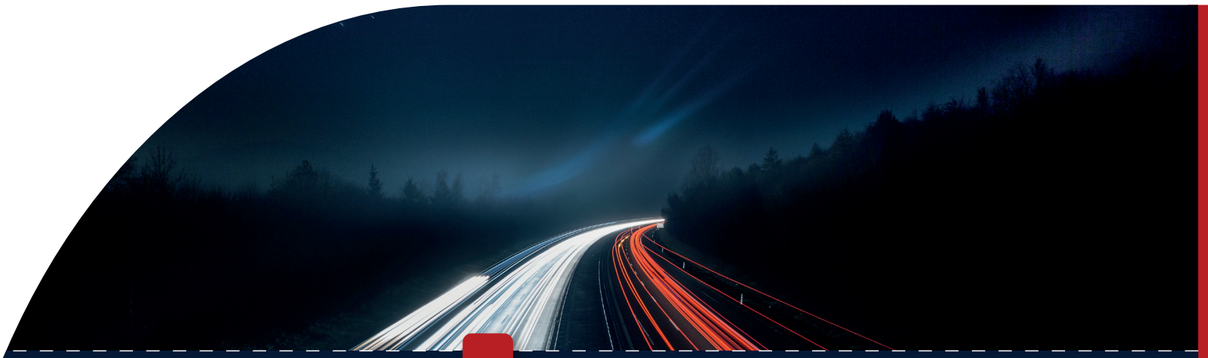

5G DRIVE OBJECTIVES

5G-DRIVE aims to achieve technical, regulatory and business objectives:

TECHNICAL OBJECTIVES

- **Research and develop eMBB and V2X key technologies and services and trial them** based on pre-commercial end-to-end testbeds in three EU locations: Surrey, JRC Ispra and Espoo;
- **Analyse potential system interoperability issues in Europe and China** and provide joint reports, white papers, and recommendations to address them accordingly;
- **Submit joint contributions to 3GPP and other 5G standardisation bodies** regarding the key 5G technologies developed and evaluated in the project.

REGULATORY OBJECTIVES

- **Evaluate spectrum usage at 3.5GHz** for indoor and outdoor environments in selected trial sites;
- **Investigate regulatory issues** regarding the deployment of V2X technologies.

BUSSINESS OBJECTIVES

- **Investigate and promote 5G business potential;**
- **Strengthen industrial 5G cooperation;**
- **Promote early 5G market adoption.**

If you have new ideas, suggestions or questions don't hesitate to contact us!

5G-DRIVE-Contact@5g-ppp.eu

www.5g-drive.eu

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement nº 780498. This publication reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

5G PPP

EU-China collaboration: objectives, expected impact

5G HARMONISED RESEARCH AND TRIALS FOR SERVICE EVOLUTION BETWEEN EU AND CHINA

The objective of 5G-DRIVE is to develop key 5G technologies and pre-commercial testbeds for eMBB and V2X services in collaboration with the Chinese twin project led by China Mobile, aiming to bridge 5G developments in **Europe and China** through joint trials and research activities, facilitating technology convergence, spectrum harmonisation and business innovation before launching the large-scale commercial deployments of 5G networks.

5G-DRIVE will work in parallel on research and experimental trials that will focus on joint experimental activities with the major 5G trial project in China.

Main expected impacts:

- Global interoperability demonstrations for 5G networks;
- Joint contributions to global 5G standards specifications in relevant organisations, especially in view of 5G phase 2 standardisation (beyond eMBB), and to harmonised spectrum bands;
- Successful showcasing events with joint demonstration across regions;
- New or reinforced cooperation between 5G R&I stakeholders from the EU and China, with a focus on private companies (industry, telecom operators, SMEs).

The expected impact will be built upon the continued collaboration between Europe and China in the context of 5G-DRIVE research and innovation initiatives.

5G research topics being done in collaboration with China: topics and expected results

5G-DRIVE has established a solid bilateral cooperation with the Chinese "5G Large-scale Trial" project coordinated by China Mobile Research Institute.

The main **purpose of the project is to verify the large-scale deployment of 5G networks for eMBB and cellular V2X (C-V2X) tests in real-world environments**, covering indoor and outdoor scenarios in complex urban areas.

The Chinese project will run large-scale trials in five cities. These twinned trials aim to evaluate synergies and interoperability issues and provide recommendations for technology and spectrum harmonization.

In this context, 5G-DRIVE will conduct joint trials for eMBB and LTE-V2X scenarios with the 5G project in China. These joint trials will be based on common test end-to-end-architectures, use case applications, and test procedure and KPIs.

Furthermore, **5G-DRIVE will investigate the application of new technologies and services such as network slicing, MEC, and privacy-friendly communications for connected and automated vehicles.**

The overarching a**mbition of 5G-DRIVE is to contribute to a common understanding and harmonisation of technical conditions between the EU and China**, i.e. standards, interoperability requirements, coexistence conditions, and resilience.

EMBB trial results achieved (in cooperation with the Chinese twin project)s

The eMBB trials were jointly performed among University of Kent, VTT, University of Surrey and CMRI team on both non-standalone (NSA) and standalone (SA) architectures in Hangzhou in 2019.

These trials consisted of the NSA basic performance trial, Massive MIMO trial, Outdoor gNB to indoor coverage, SA basic performance trial and 2.6GHz/4.8GHz coexisting trial.

Several radio access technologies were implemented and spectrum optimisation was performed to ensure appropriate high date rate or low latency for eMBB.

Impact already achieved (quantitative and qualitative) and planned

Defining the trial plan for eMBB, and in particular for the spectrum band at 3.5GHz, the tests covered massive MIMO beamforming, network slicing, and latency measurement with MEC, transport network and spectrum usage.

V2X trial results achieved (in cooperation with the Chinese twin project)

The V2X trial comprised the IoT/MEC/GLOSA latency test and DENM latency & PER test. The result of the 1st test showed vehicles can receive data from IoT platform after MAP and SPAT being sent directly via V2X to OBU and RSU synchronises with IoT platform.

The result of the 2nd test indicated in-vehicle OBU can work together with the traffic camera and RSU systems in order to detect and track VRUs when they are on the zebra crossing, which will enable the vehicle to perform self-decision making.

The next step is to enable C-V2X tests with implementing the new devices. In addition, a wrapper will be created for harmonising the message format between the EU and China. This is important for having harmonised metrics.

The project has described 5G V2N and V2V applications for automated vehicles, providing test scenarios for evaluating the feasibility of the technology.

The set of selected use cases in the context of the two fundamental project scenarios (eMBB and V2X) were included, identifying the critical modules of the proposed joint architectures and covering issues related to spectrum harmonisation usage in the EU and China. The trial specification for eMBB for two regions was agreed and it will be further detailed together with the Chinese twin project.

Defining the requirements of the specifications of V2V and V2N implementation for exchanging low latency data, the data channel bandwidth and connection to the in-vehicle and roadside unit was specified.

The project has identified potential vulnerabilities and defined the test setup and procedures for penetration testing, and coexistence and performance evaluation of 3GPP and IEEE standards for V2N and V2V communications.