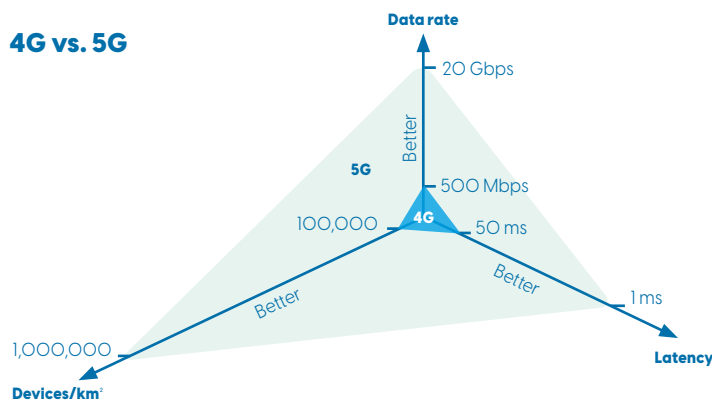# 5G
The backbone of future mobility

A paradigm shift

The automotive industry is now at a critical intersection of technology where communication, information and control have become pervasive aspects of everyday life. With the first-to-market 5G-ready Telematics Control Unit (TCU), HARMAN enables real-world Vehicle-to-Everything (V2X) communication and lays the groundwork for automated driving. As the 5G networks evolve, data speeds as high as 20 Gbps will eventually be realized.

4G vs. 5G

New service opportunities

The HARMAN TCU modules and associated telematics software and services support a host of functions, such as Firmware Over-The-Air (FOTA) and V2X. FOTA technology enables secure over-the-air software updates to any ECU in the car, improving vehicle safety, saving time and cost. With V2X and HARMAN's NeTS Software Development Environment, the creation of new applications is made possible.

HARMAN ExP
Making Time in the Car, Time Well spent

Mobility is more than getting from one place to another. It's about shifting from one state of being to the next. HARMAN ExP doesn't just move people from one place to another, it delivers in-vehicle experiences that put people first, so time in the car, becomes time well spent.
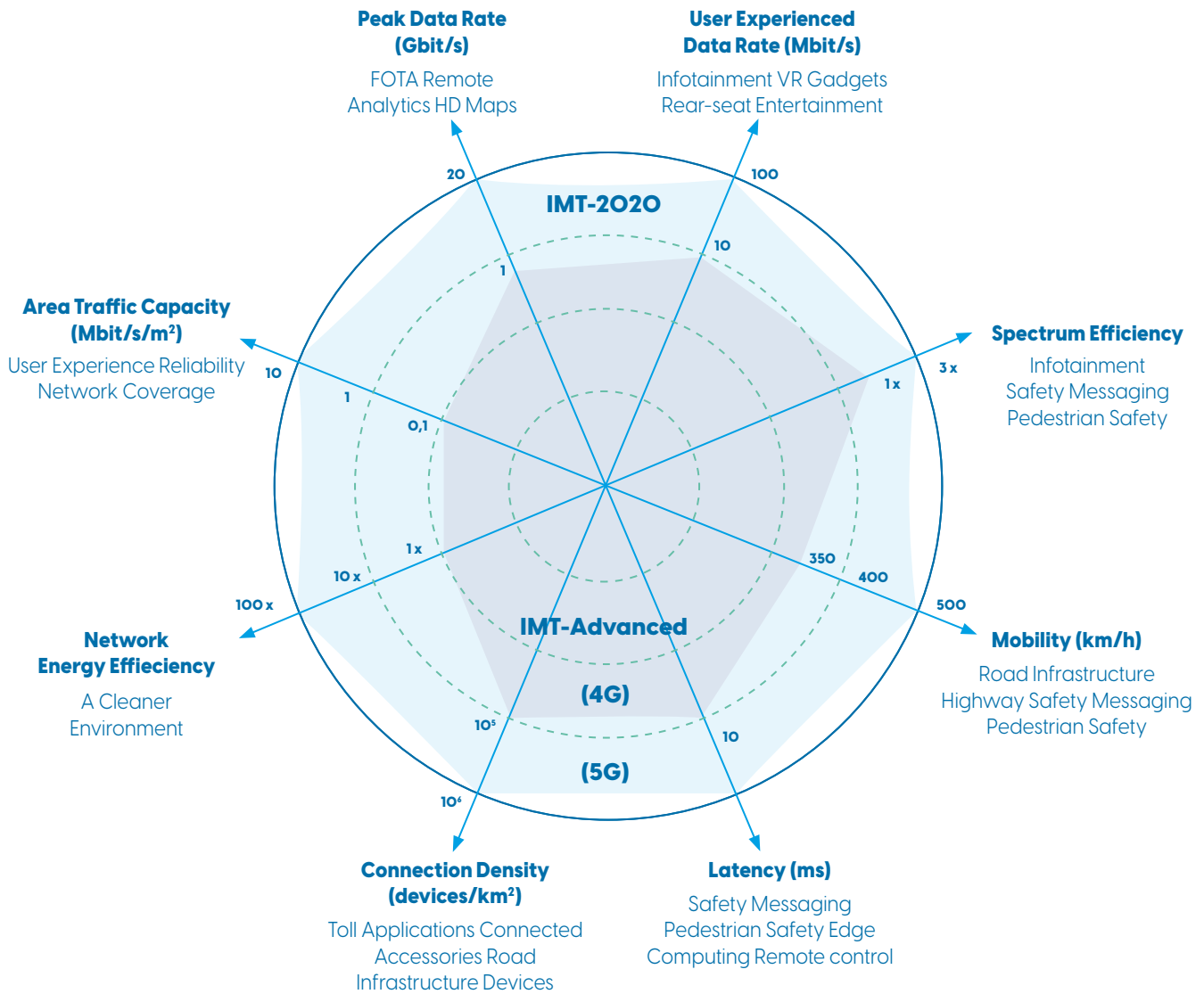
HARMAN ExP bundles advanced technologies to deliver meaningful consumer experiences; enables OEMs to unlock new market opportunities; and empowers HARMAN to create value today while positioning our customers to thrive tomorrow.

HARMAN ExP maximizes consumers' time and quality of life in four key consumer benefits:

- **Accomplishment,**
- **Well-being,**
- **Social Connection,** and
- **Enjoyment.**

Key highlights

5G TCUs enable a paradigm shift in automotive safety, reliability and user experience

The promise of 5G delivers improved data speeds, latency and network coverage, enabling a world of new applications

Update gateway enabled for FOTA

V2X ready supporting DSRC and Cellular V2X (C-V2X)

5G improvements

Peak Data Rate (Gbit/s)
FOTA Remote Analytics HD Maps

User Experienced Data Rate (Mbit/s)
Infotainment VR Gadgets Rear-seat Entertainment

Spectrum Efficiency
Infotainment
Safety Messaging
Pedestrian Safety

Mobility (km/h)
Road Infrastructure
Highway Safety Messaging
Pedestrian Safety

Latency (ms)
Safety Messaging
Pedestrian Safety Edge
Computing Remote control

Connection Density (devices/km²)
Toll Applications Connected
Accessories Road
Infrastructure Devices

Network Energy Effieciency
A Cleaner
Environment

Area Traffic Capacity (Mbit/s/m²)
User Experience Reliability
Network Coverage

IMT-2020

IMT-Advanced

(4G)

(5G)

A wide range of new applications will be enabled through the 5G network

- Improved Safety
- Enhanced User Experience
- Superior Reliability

As the number of IoT devices enter service, legacy 4G systems will struggle to keep up

- 5G networks have been designed to accommodate the increased number of devices
- As 5G becomes mature, 4G spectrum will be reallocated to 5G
- Higher bandwidth (>2 Gbps) will become possible with millimeter wave technologies

HARMAN

More than 50 million automobiles on the road today are equipped with HARMAN audio and connected car systems. Our software services power billions of mobile devices and systems that are connected, integrated and secure across all platforms, from work and home to car and mobile. HARMAN's latest innovations leverage Samsung's connected lifestyle and hardware expertise, allowing automakers to create an ecosystem of unique, smart, enhanced and rich in-vehicle experiences. Together HARMAN and Samsung are architects of experience, designing the most intuitive and immersive interactions with in-vehicle technology. HARMAN is a wholly-owned subsidiary of Samsung Electronics Co., Ltd.

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