Let’s get ready for testing of 5G terminals

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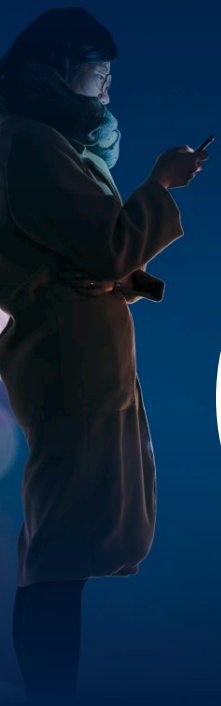
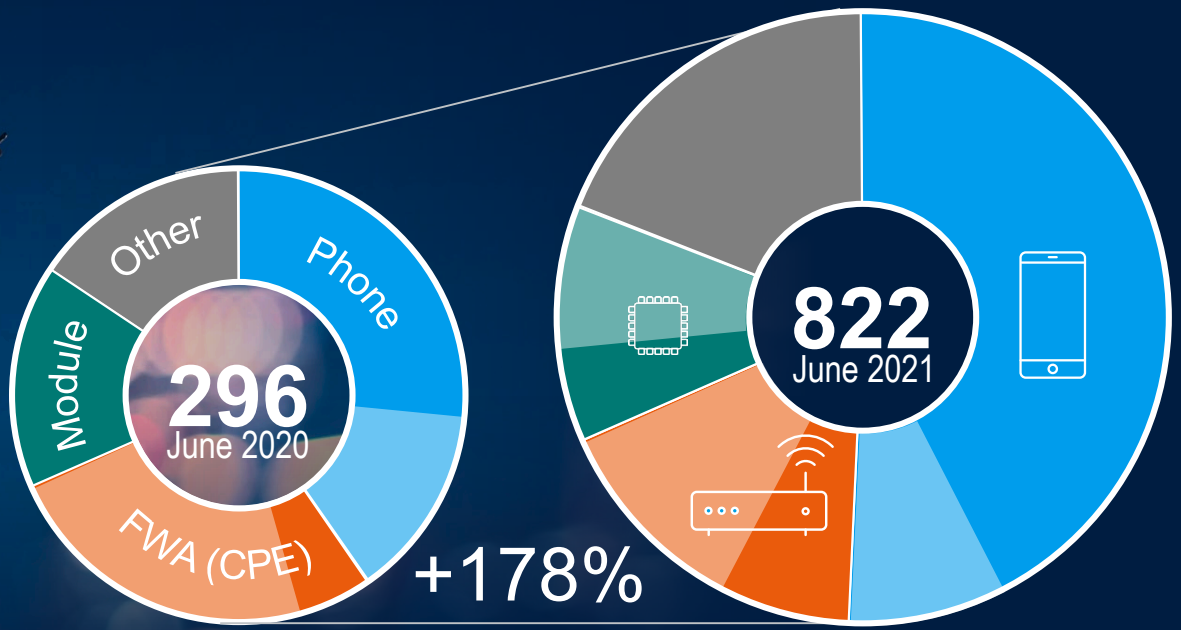
Rohde & Schwarz

ROHDE&SCHWARZ
Make ideas real

Let’s get ready for testing of 5G terminals

In June 2021 the number of announced 5G devices has surpassed 800 from 128 vendors ⇨ 500 commercially available





In June 2021

350 **5G phones** are commercially available (416 announced)

56 **FWA CPE devices** are commercially available (144 announced)

46 **Modules** are commercially available (106 announced)

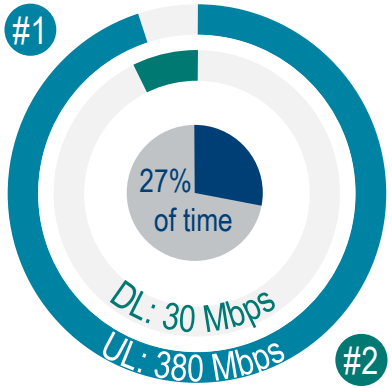
Source: GSA 5G ECOSYSTEM REPORT MEMBER REPORT JUNE 2021

5G is now, but does it meet customers expectations?

Source: GSMA
"The Mobile Economy 2021"
June 2021

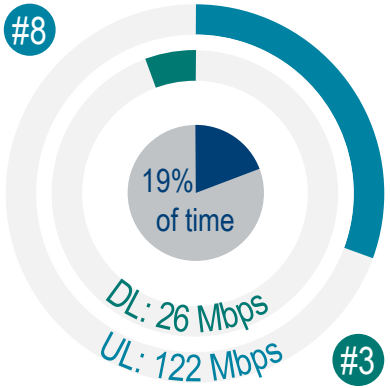
APAC has some of the highest quality 5G experiences seen by Open Signal users in 2021

South Korea



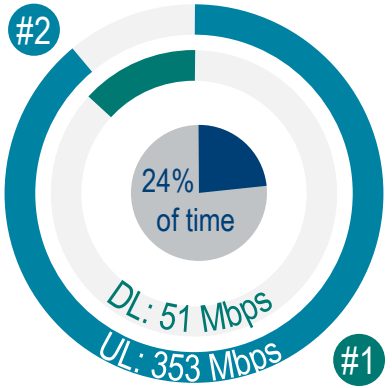
- #2 5G Video experience
- #1 5G Game experience
- #1 5G Voice experience

Thailand



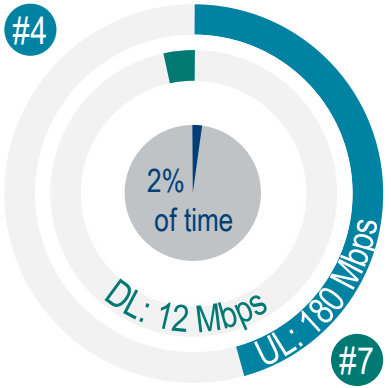
- #4 5G Video experience
- #5 5G Game experience
- #5 5G Voice experience

Taiwan



- #1 5G Video experience
- #3 5G Game experience
- #2 5G Voice experience

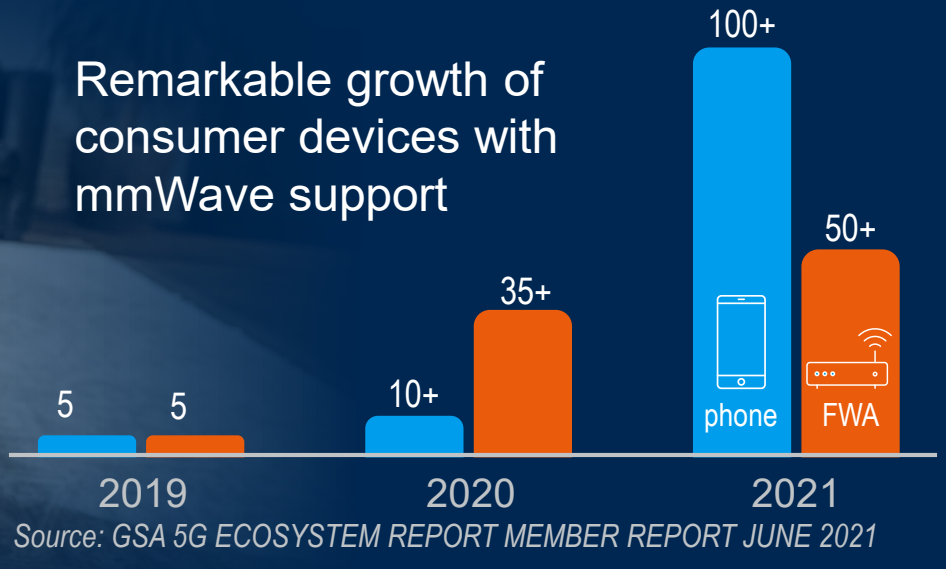
Japan



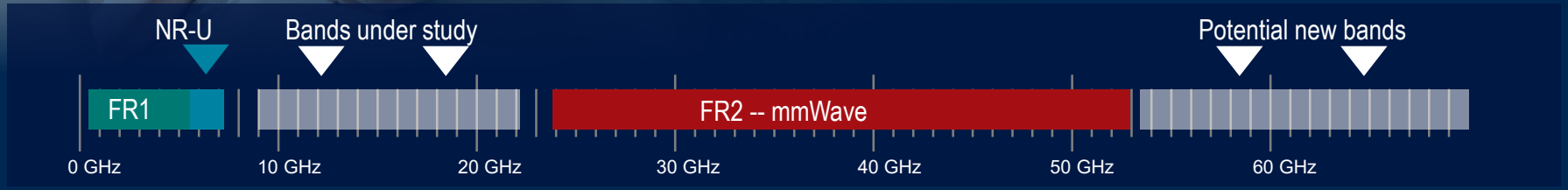
- #8 5G Video experience
- #8 5G Game experience
- #8 5G Voice experience

Source: Open Signal Benchmarking the 5G Experience — Asia Pacific — June 2021

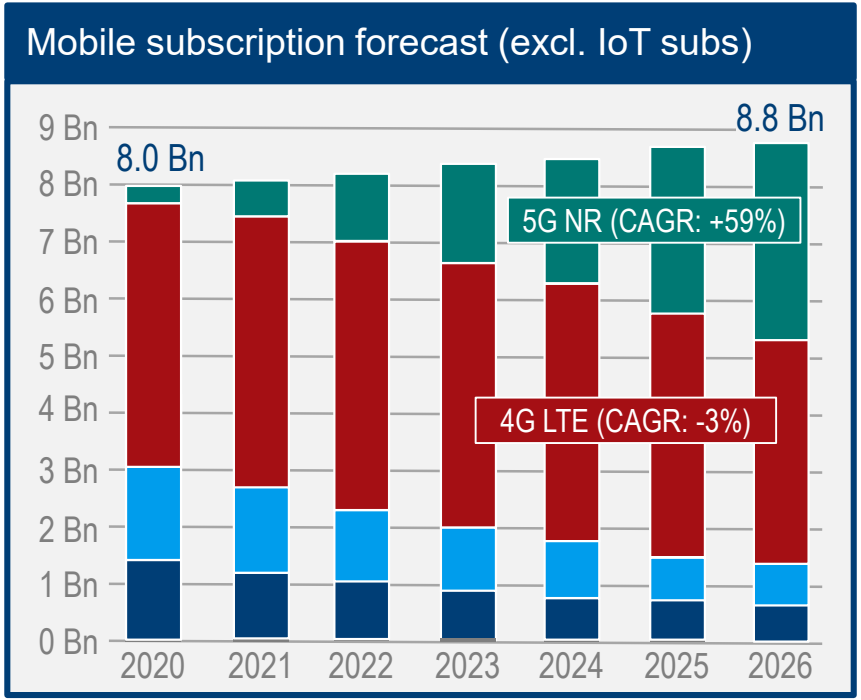
mmWave bands are critical to meet speed & latency demands



Source: GSA 5G ECOSYSTEM REPORT MEMBER REPORT JUNE 2021

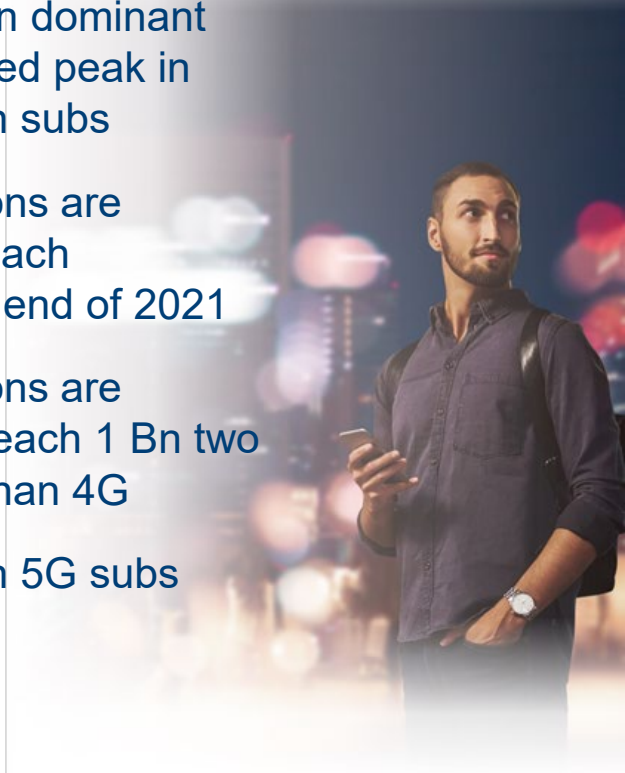


5G subscriptions with a 5G-capable device grew by 70 million during the first quarter 2021, to reach around 290 million

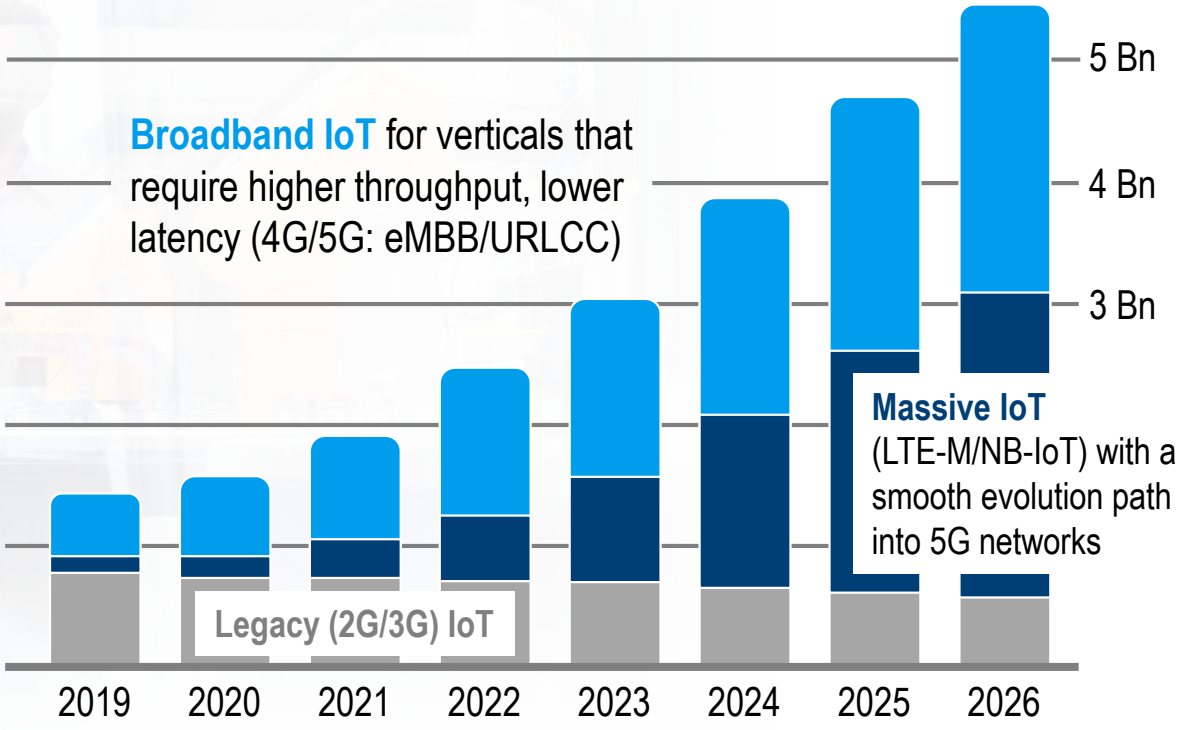


Source: Ericsson Mobility Report, June 2021

- LTE will remain dominant with a projected peak in 2021 at 4.8 Bn subs
- 5G subscriptions are expected to reach 580 million by end of 2021
- 5G subscriptions are estimated to reach 1 Bn two years earlier than 4G
- In 2026 3.9 Bn 5G subs are projected



Broadband IoT (4G/5G) will overtake 2G and 3G as the segment that enables the biggest share of IoT applications.



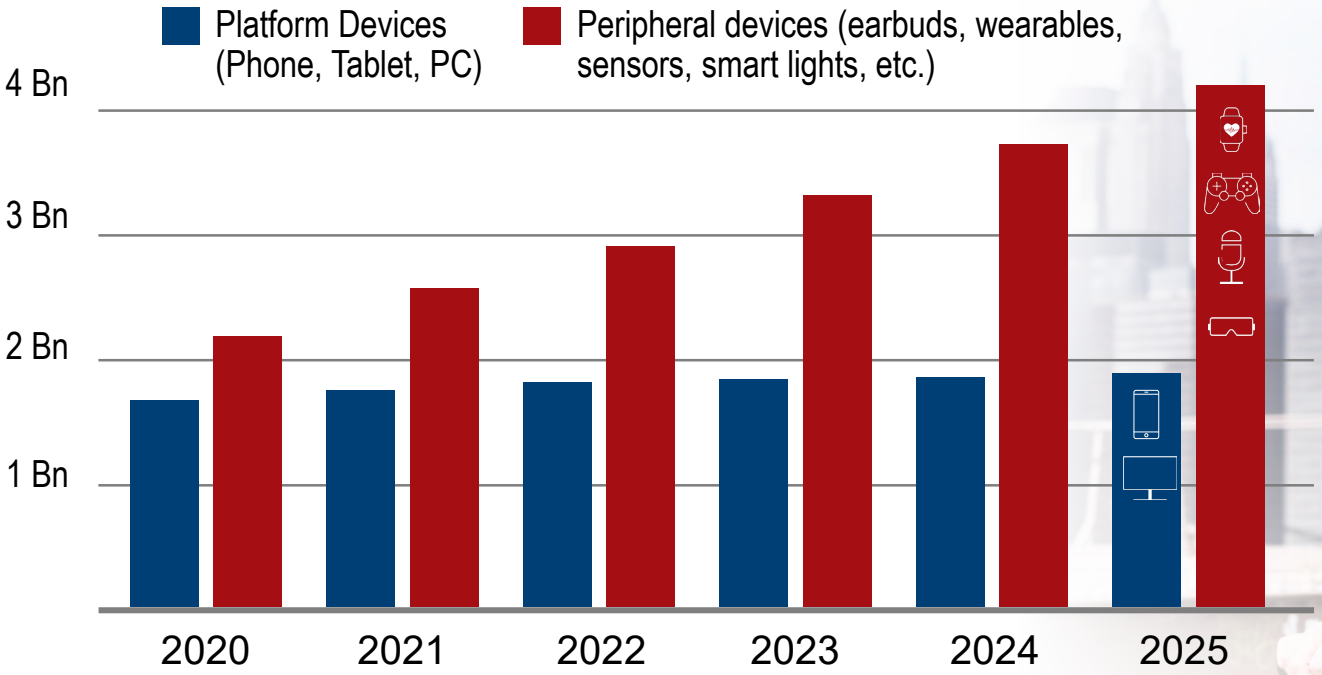
Source: Ericsson Mobility Report, June 2021

Let’s get ready for testing of 5G terminals

Mobile device experience enabled by mobile communication …

… and essential wireless ‘add-ons’

70% of Bluetooth® enabled device shipments in 2025 will be peripheral devices

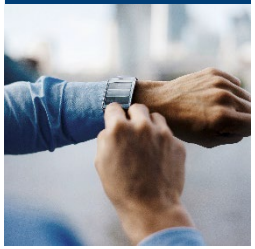


Source Bluetooth SIG/ABI Research - 2021Market Update
https://www.bluetooth.com/wp-content/uploads/2021/01/2021-Bluetooth_Market_Update.pdf

Bluetooth® and especially Bluetooth® LE is continuously evolving to meet upcoming demands

Speed

100% data rate improvement for low latency

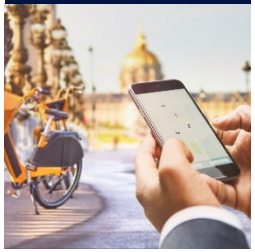


Range

4x range to cover smart home or office

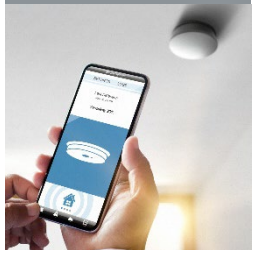
Broadcast

Extended advertising capabilities



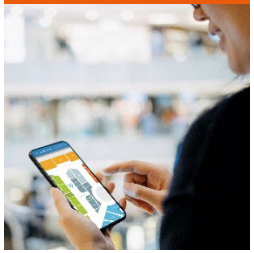
Mesh

Meshed networking



Direction

Angle of Arrival and Angle of Departure

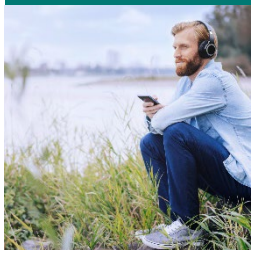


Power Ctrl

Dynamic optimization of tx power

Audio

Isochronous physical channels

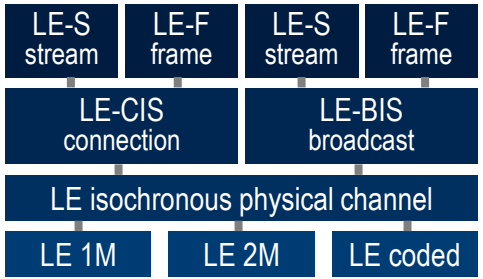


Bluetooth 5.0 | Bluetooth 5.1 | Bluetooth 5.2

Bluetooth® 5.2:
Native Bluetooth® LE audio incl. hearing aids support

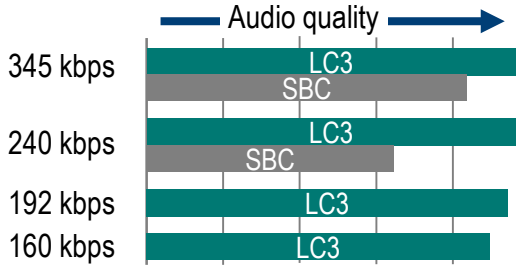
LE isochronous channels

Allows communication of time-bound data to one or more devices for time-synchronized processing.
- Multi-channel audio streaming incl. hearing aids
- Audio broadcasting



LC3 audio codec

The new low complexity codec developed by Fraunhofer IIS is optimized for high-resolution music streaming operating at low latency, low computational complexity and low memory footprint.



THE GLOBAL 6 GHZ BAND RACE IN ON

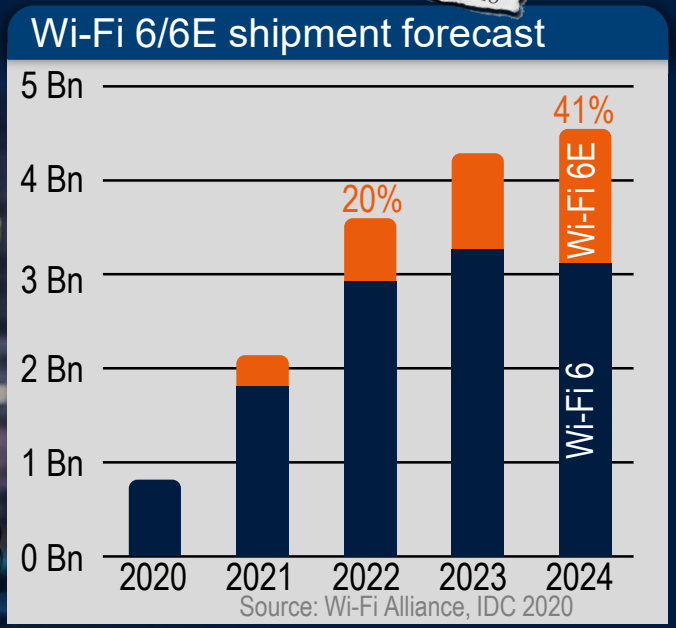
FCC unlocks a massive amount of bandwidth for next-gen Wi-Fi devices cnet April 2020

Korea first country in Asia to release 6 GHz band to Wi-Fi wifinowglobal Oct 2020

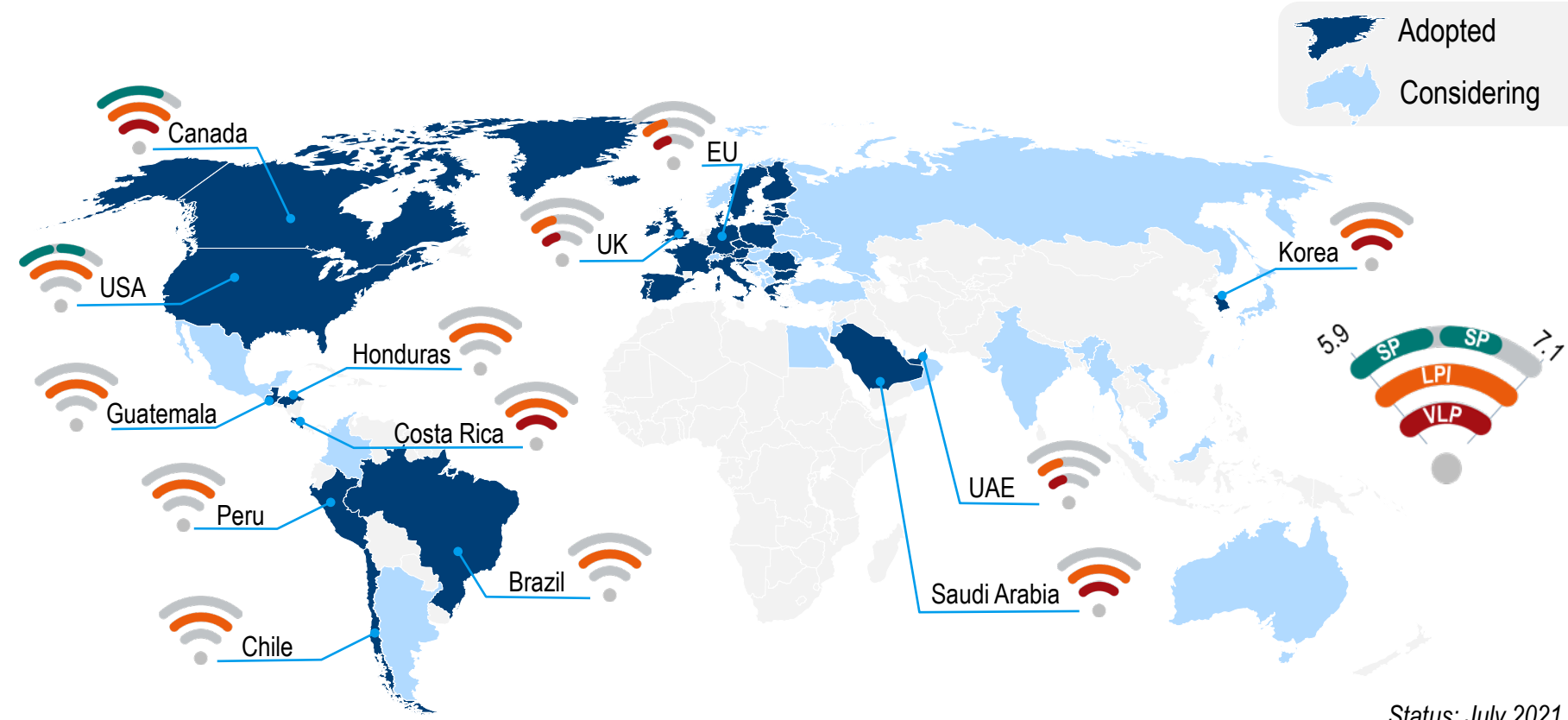
Wi-Fi Alliance® certification for Wi-Fi 6E is now available .... January 2021

Canada opens 6Ghz band for Wi-Fi, tripling spectrum access Reuters May 2021

Wi-Fi 6E era begins: Samsung releases world's first 6 GHz Wi-Fi smartphone wifinowglobal Jan 2021



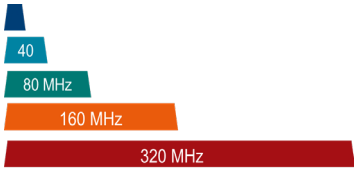
Global 6 GHz band regulation for licensed exempt use



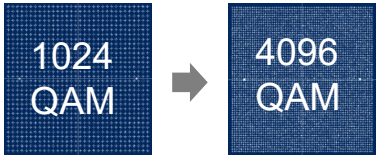
Status: July 2021

WI-FI7 FOR EXTREME HIGH THROUHPUT (EHT)

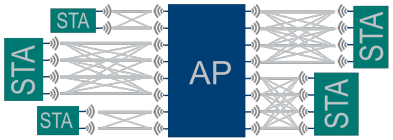
320 MHz channels



4096QAM

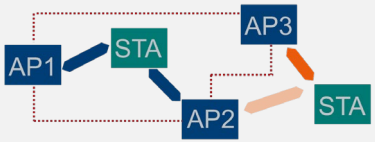


Up to 16 spatial streams

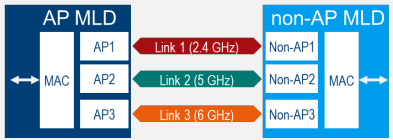


Multi-RU per user

Multi AP coordination



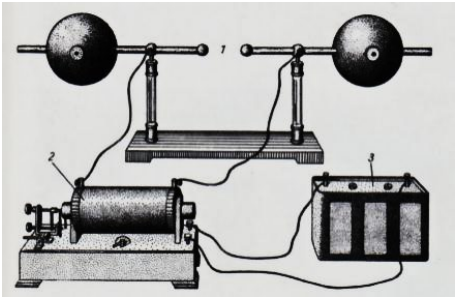
Multi-link operation



A little history on pulse radio

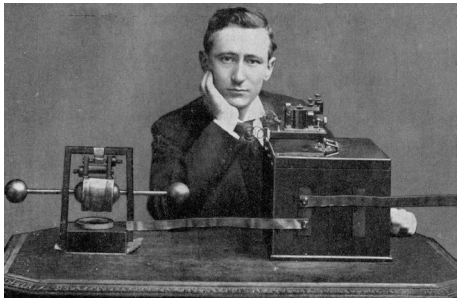
1893

German physicist **Heinrich Hertz** used a spark discharge to produce electromagnetic waves



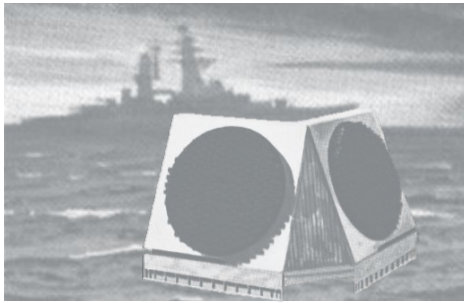
1901

The Italian electrical engineer **Guglielmo Marconi** sent the letter S (•••) more than 2,100 miles across the Atlantic



1950s

Lincoln Lab. & Sperry invented a phased array radar systems. (ESR) for marine purpose



20 Years of ultra-wideband communication and precise ranging

In 2002 the Federal Communication Commission (FCC) finally allowed the unlicensed use of UWB systems in radar, public safety and data communication applications.

2002

WiMedia ALLIANCE

Promotes wireless multimedia connectivity and interoperability between devices in a personal area network. First UWB spec.

wimedia.org

2005

ECMA-368
Low Rate Pulse Repetition UWB

2007

IEEE 802.15.4a
High Rate Pulse Repetition UWB

2012

IEEE 802.15.4f
Low Rate Pulse Repetition UWB

2015

IEEE 802.15.4-2015
HRP Chap. 16 & LRP Chap. 19

2018

UWB ALLIANCE

Mission to be the voice of UWB ecosystem in order to support growth of UWB techn. through e2e, vendor-agnostic interoperability.

uwballiance.org

2019

fira | The Power to Be Precise

Provide seamless user experiences using the secured FIne RAnging and positioning capabilities of inter-operable UWB technology

firaconsortium.org

Rohde & Schwarz member of fira | The Power to Be Precise

2020

omlox

Industry standard to integrate all existing techn. such as UWB, BLE, RFID, 5G or GPS and deliver positioning data via a uniform interface

omlox.com

2020

IEEE 802.15.4z
HRP/LRP UWB enhancements

2021

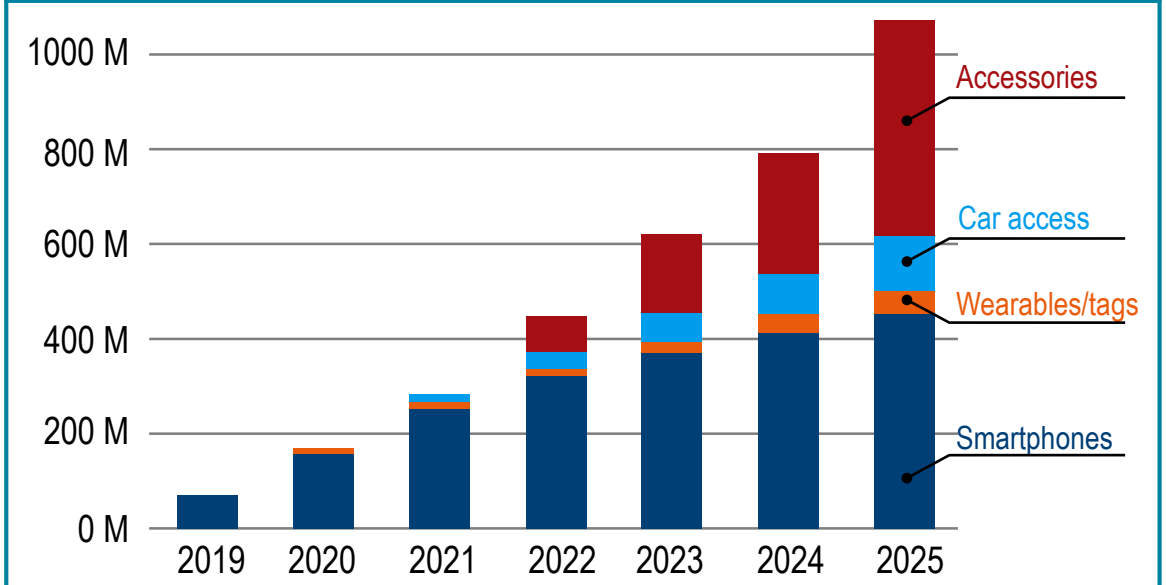
CARCONNECTIVITY consortium®

Digital Key Release 3.0 specification – which adds Bluetooth LE and UWB to enable passive keyless access and engine start

carconnectivity.org

Market pushed by emerging smartphone applications

Projected annual UWB device shipment



Source: UWB Alliance (August 2020, see link)

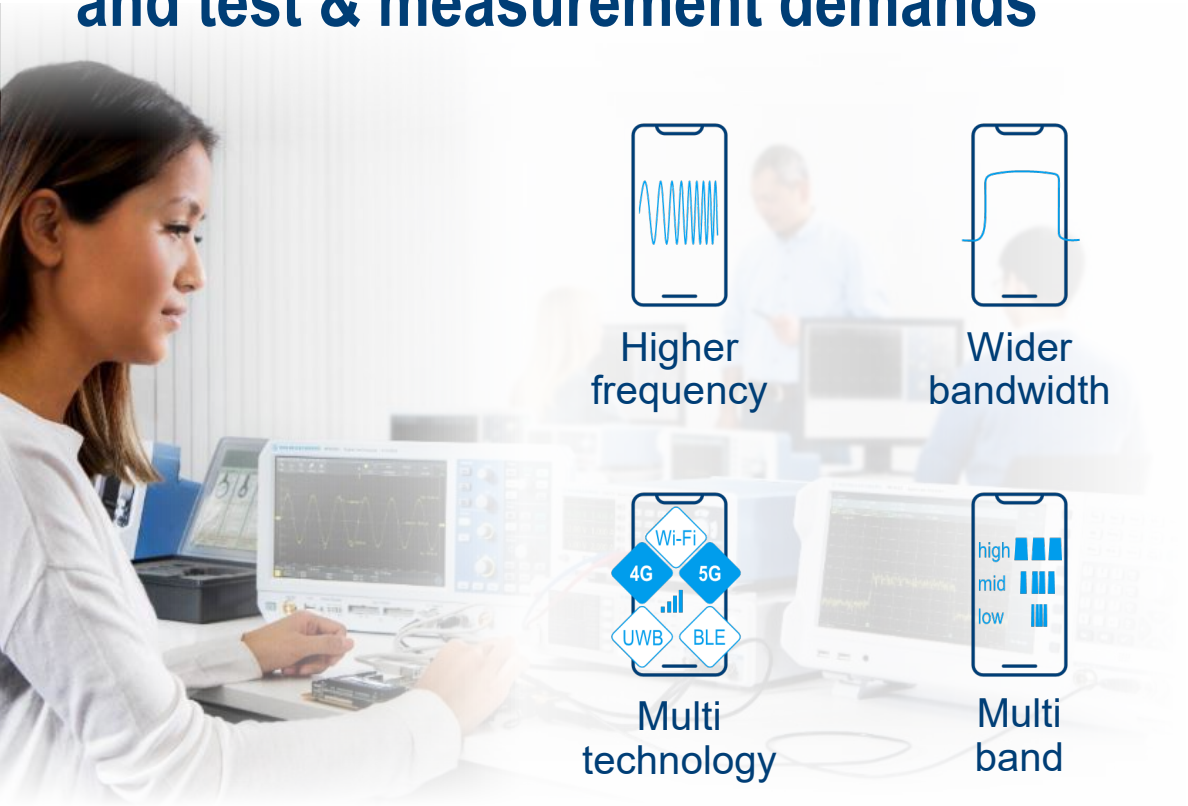
UWB is on the growth path to deliver well over **1 Billion** devices annually **by 2025**

Smart phones and related accessories count for more than **80% of devices** in 2025

Car access devices count for more than **11% of devices** in 2025

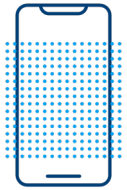
Let’s get ready for testing of 5G terminals

Wireless technology evolutions drive design innovations and test & measurement demands

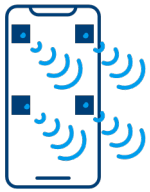


Higher frequency

Wider bandwidth



Higher modulation



More streams

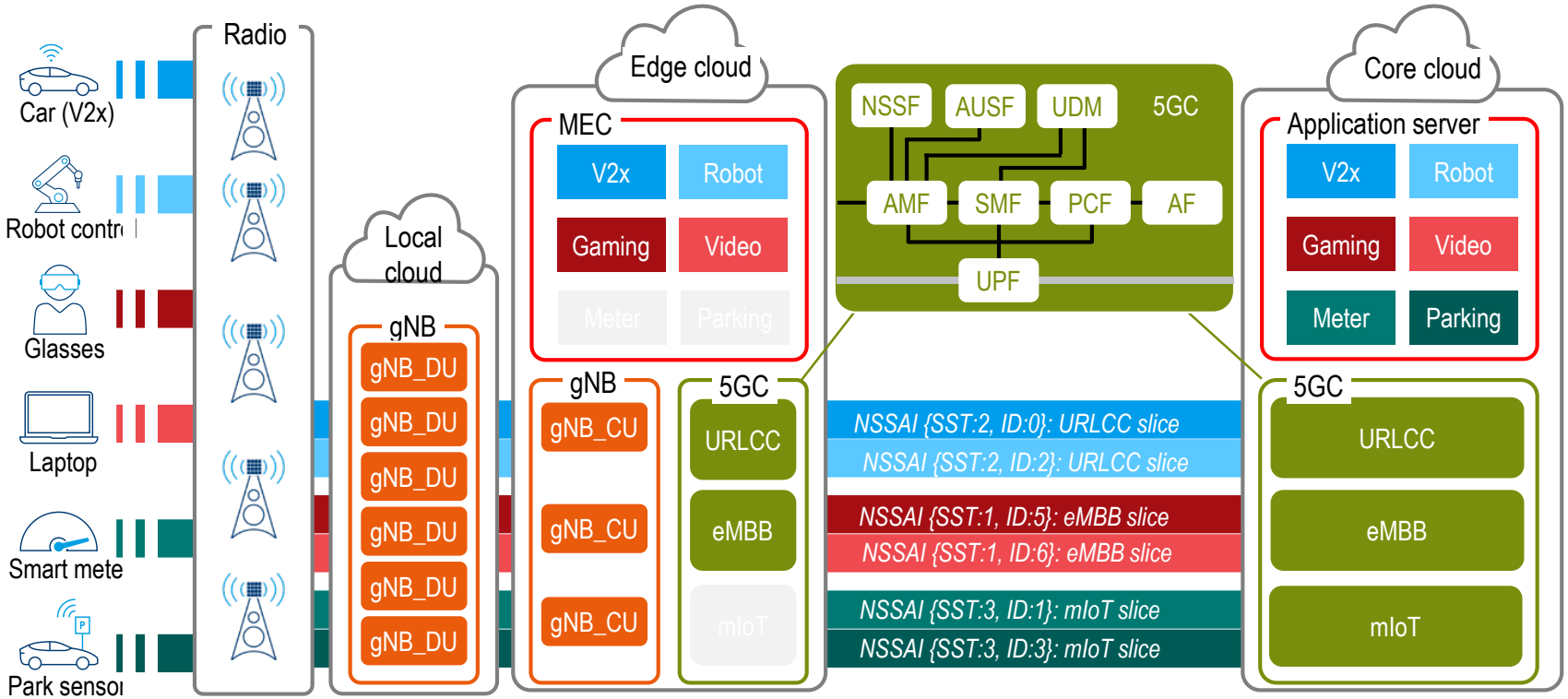
Multi technology

Multi band

Multi antenna

Application requirements

Impact of network virtualization and edge computing



The three essential pillars to regain trust in IoT

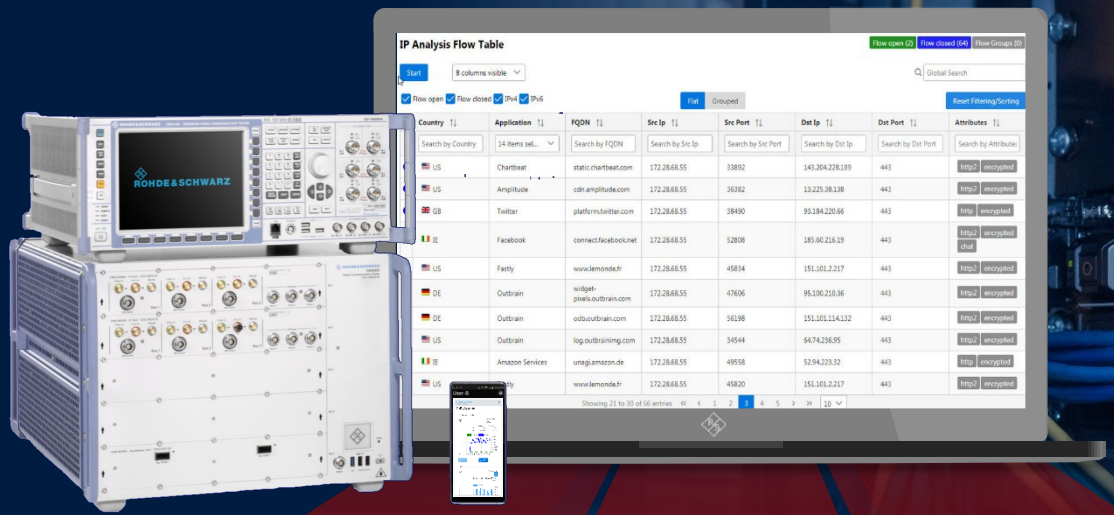
Device Security
Security by design verified by certification and maintained over the whole lifecycle

Network Security
Set of technologies, equipment and processes to protect the usability and integrity of networks and data

Monitoring
Unknown threats and new layer of vulnerabilities require continuous monitoring, analysis and adaptation

Establishing an certification framework to guarantee a substantial level of security of every connected device

Endpoint communications security is the biggest threat to Endpoints in IoT.

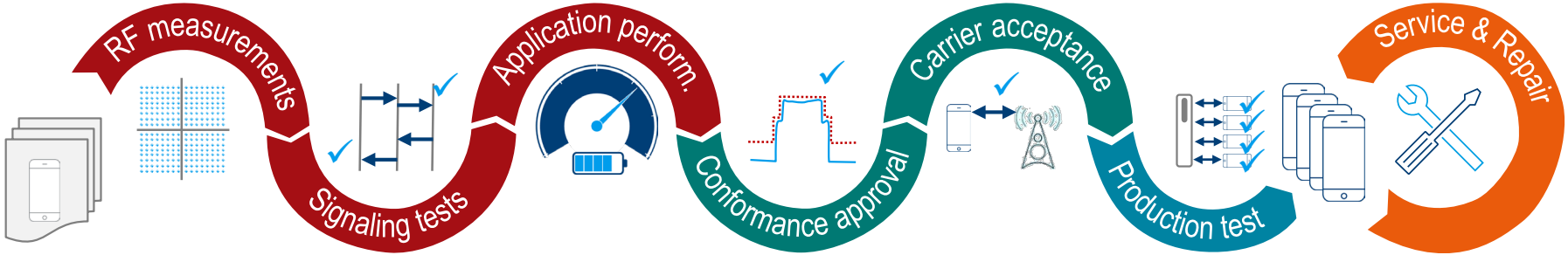


Application & protocols detection

Cryptography algorithms details

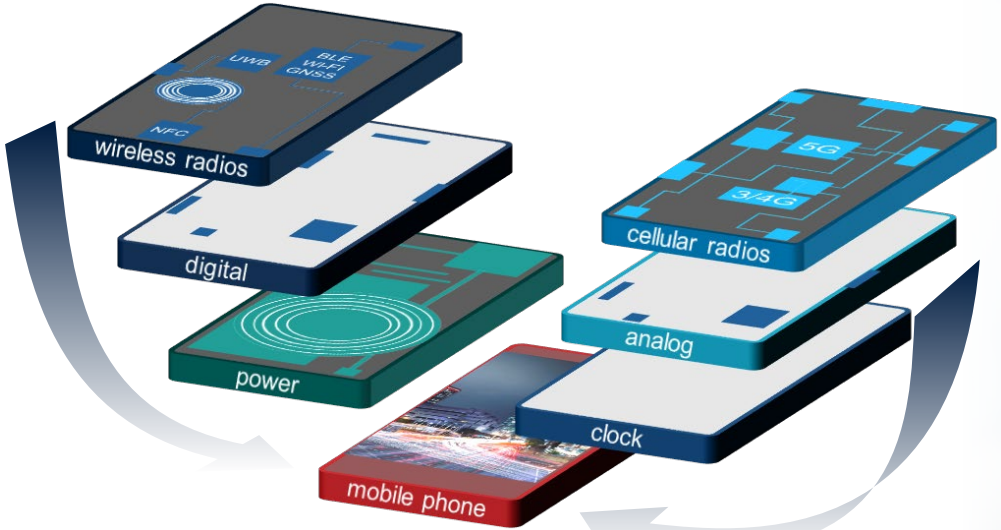
Geolocation of endpoints

Our Comprehensive portfolio for 5G terminal testing in all phases of the product life cycle – today and tomorrow



FSW/SMW CMX500 ATS800R TS8990 CMW100 CMP200 CMQ200 CMP180

Test solutions to deal with complex terminal designs, fully packed with powerful hardware



ZNA RTO6 NGM

Are you ready Now for testing of 5G terminals?

ROHDE&SCHWARZ

Make ideas real