WRC-19 | 1 November

CITEL

GSMA

Introduction

Moderator

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MNO

GSA

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SPECTRUM

THE FUNDAMENTAL ELEMENT OF MOBILE

Welcome

Brett Tarnutzer

GSMA

2G

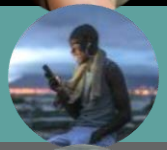
3G

4G

5G

All about calls and texts

The start of mobile data

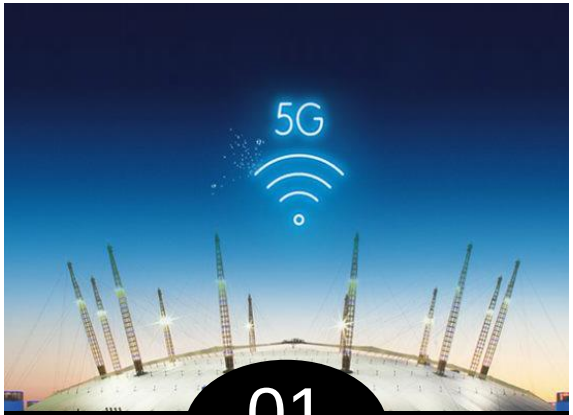


The arrival of mobile broadband services and applications

The network adapts to the application

Ultra high speed
Ultra low latency
New applications

5G Ramps Up



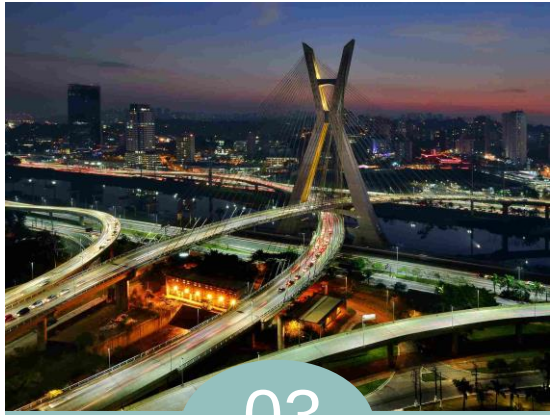
01

In the United States
2 MILLION
SUBSCRIBERS
by the end of 2019

5 MILLION
ADDITIONS
Each quarter of 2020

5G users now experience over
1800 Mbps powered by mmWave spectrum

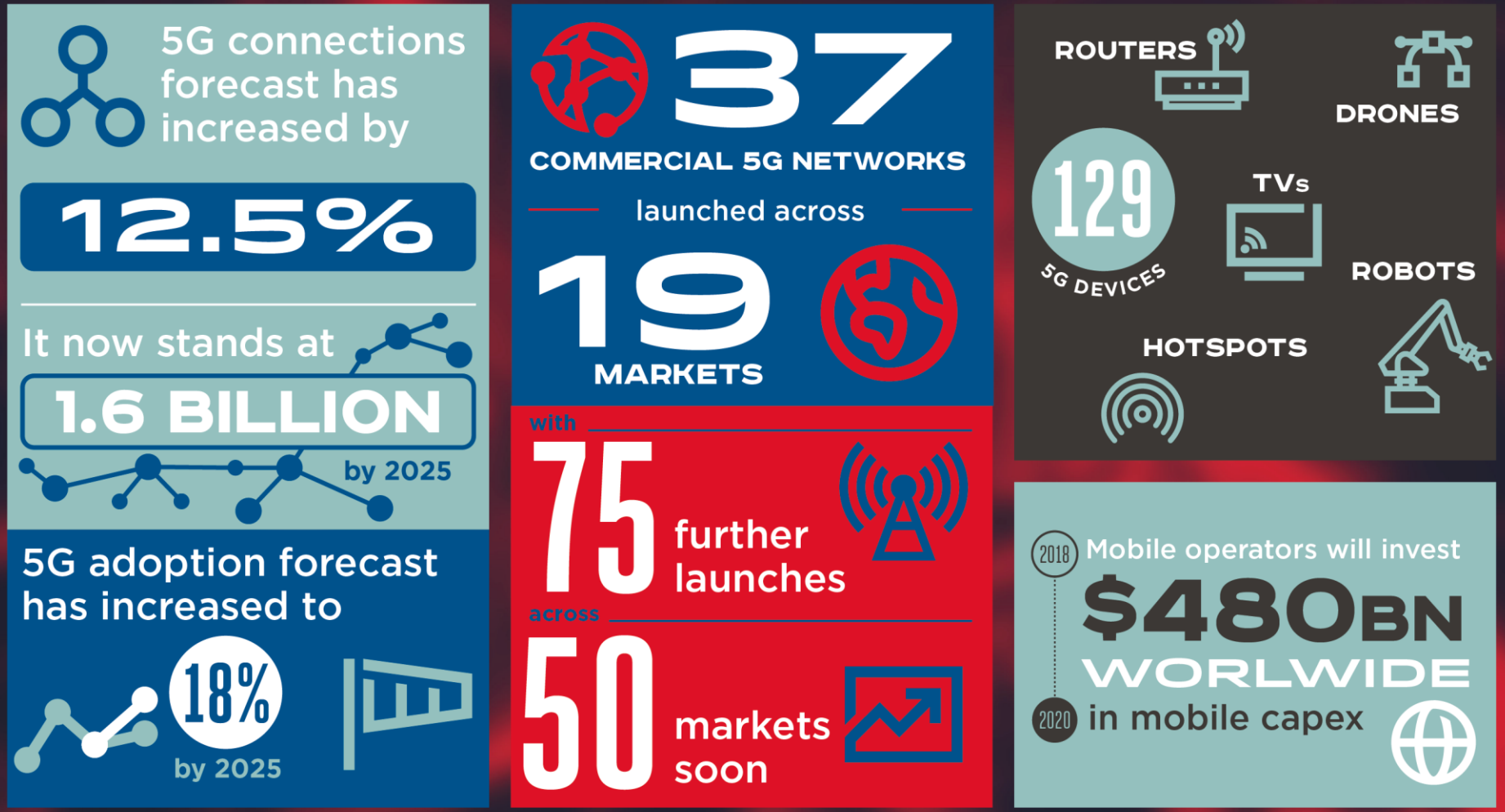
02



03

5G IN AMERICAS
4 live networks
53 trials

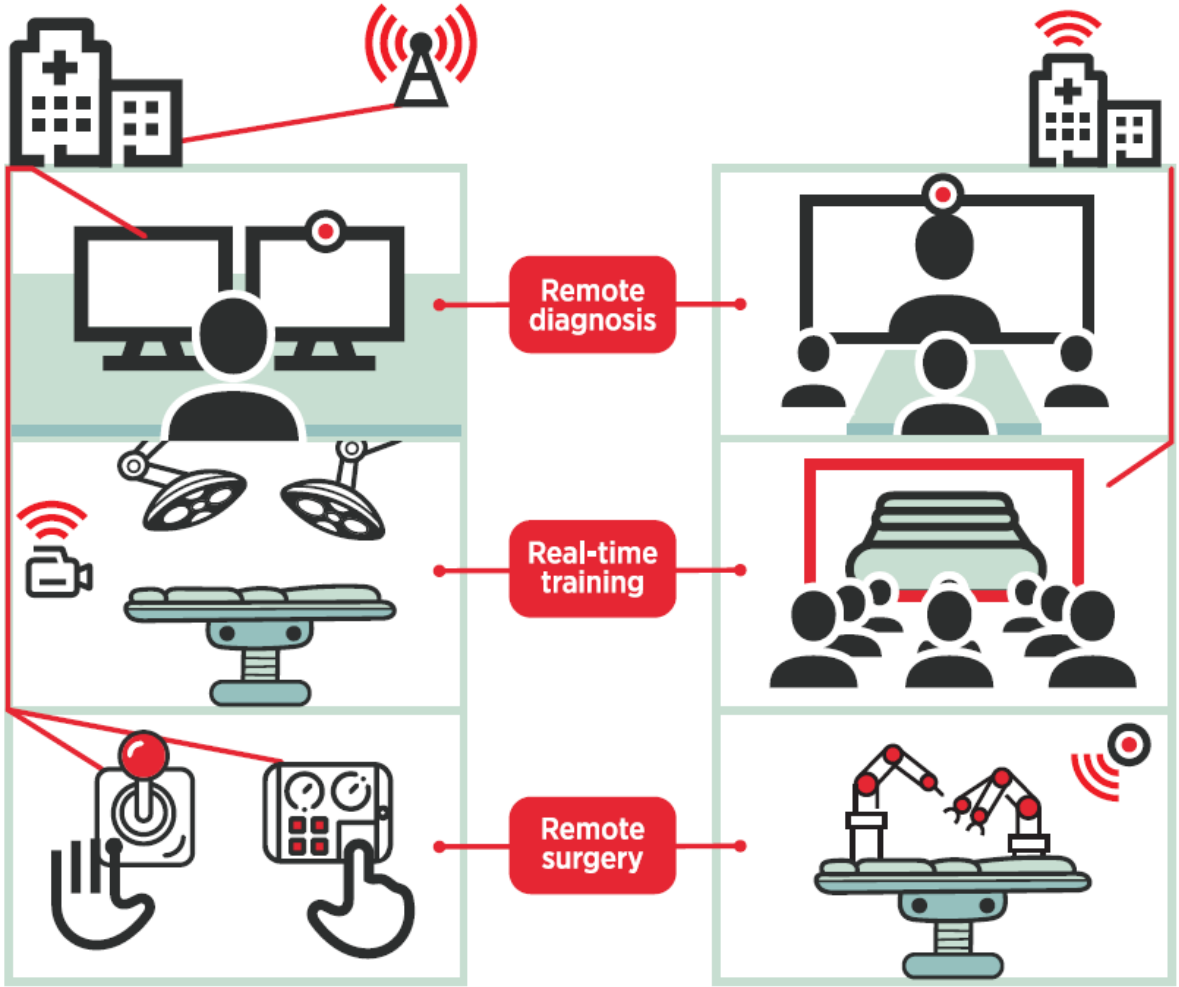
Brazil set to auction 26 GHz in 2020


5G connections forecast has increased by
12.5%
It now stands at
1.6 BILLION
by 2025
5G adoption forecast has increased to
18%
by 2025
37
COMMERCIAL 5G NETWORKS
launched across
19
MARKETS
with
75
further launches
across
50
markets soon
ROUTERS
DRONES
129
5G DEVICES
TVs
ROBOTS
HOTSPOTS
2018
Mobile operators will invest
$480BN
WORLDWIDE
2020
in mobile capex

Use Case

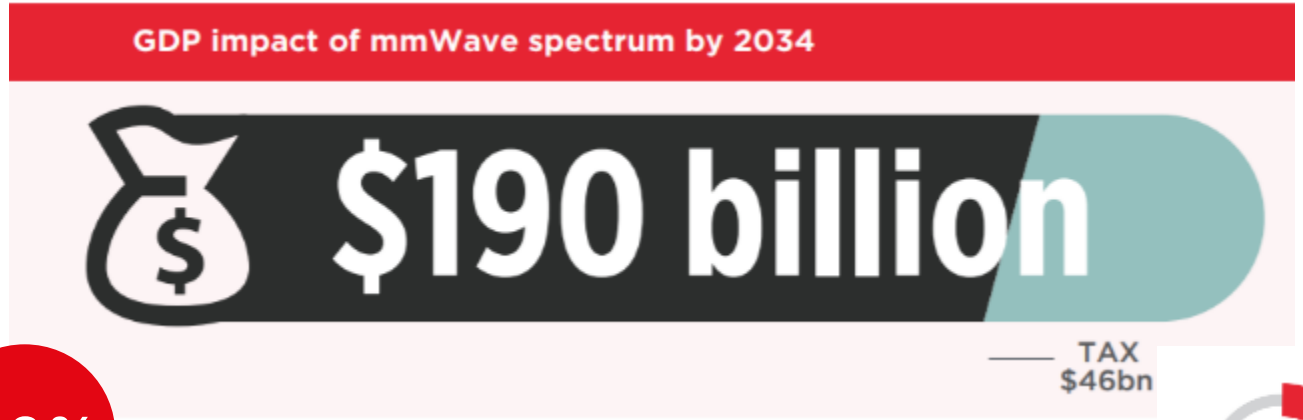
5G CAN MAKE IT HAPPEN

Healthcare



The socio-economic benefits of mmWave 5G (2020-2034)

Americas Edition



SPECTRUM

THE FUNDAMENTAL ELEMENT OF MOBILE

5G Trials and Launches

Roberto Rodriguez

GSMA

5G TELEFONICA TRIALS AND 5G FIRST EXPERIENCES

GSMA CITEL Seminar in WRC-19 (Sharm el Sheik)

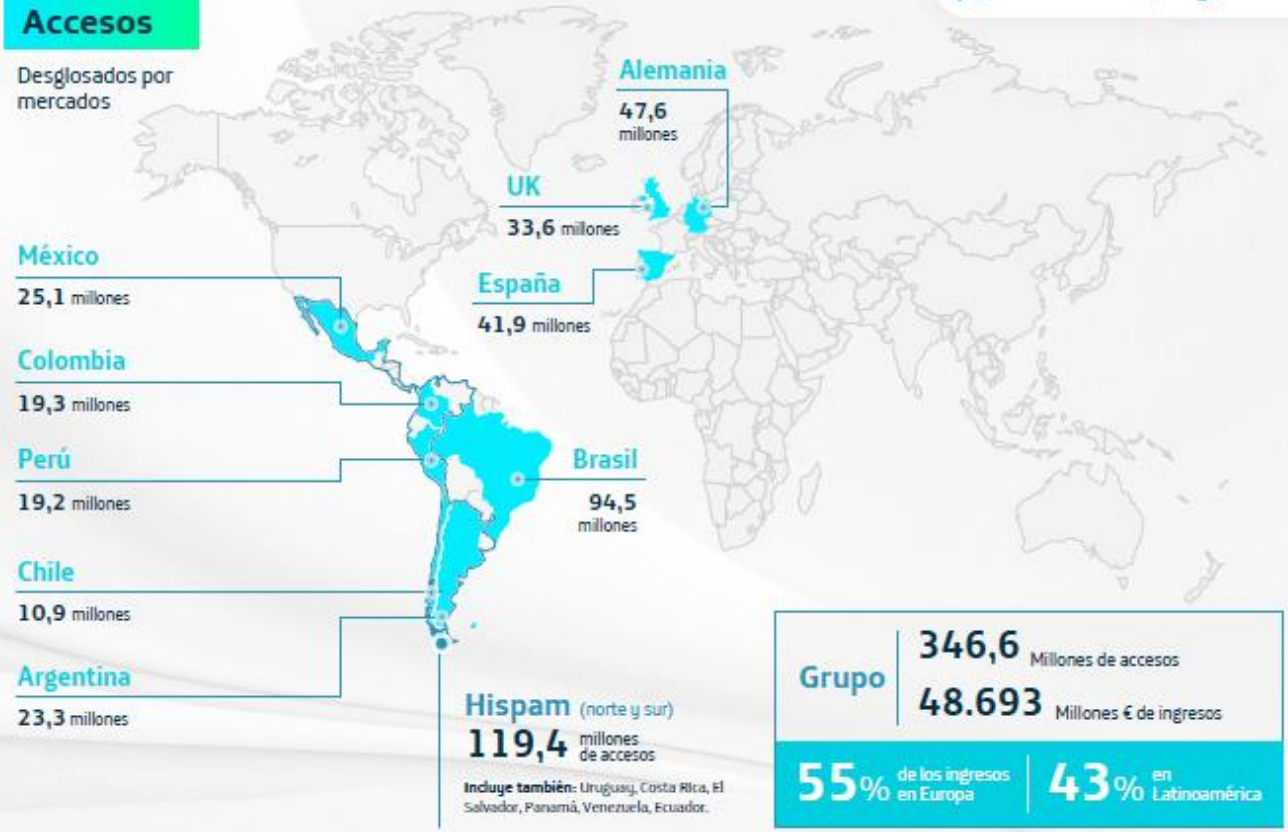
#RECONNECT

Telefónica en cifras

- Telefónica tiene operaciones en **14 países***
- Ofrece **servicios de telecomunicaciones y soluciones digitales en más de 170 países** mediante acuerdos estratégicos con partners.

Accesos

Desglosados por mercados



Grupo

346,6 Millones de accesos

48.693 Millones € de ingresos

55% de los ingresos en Europa

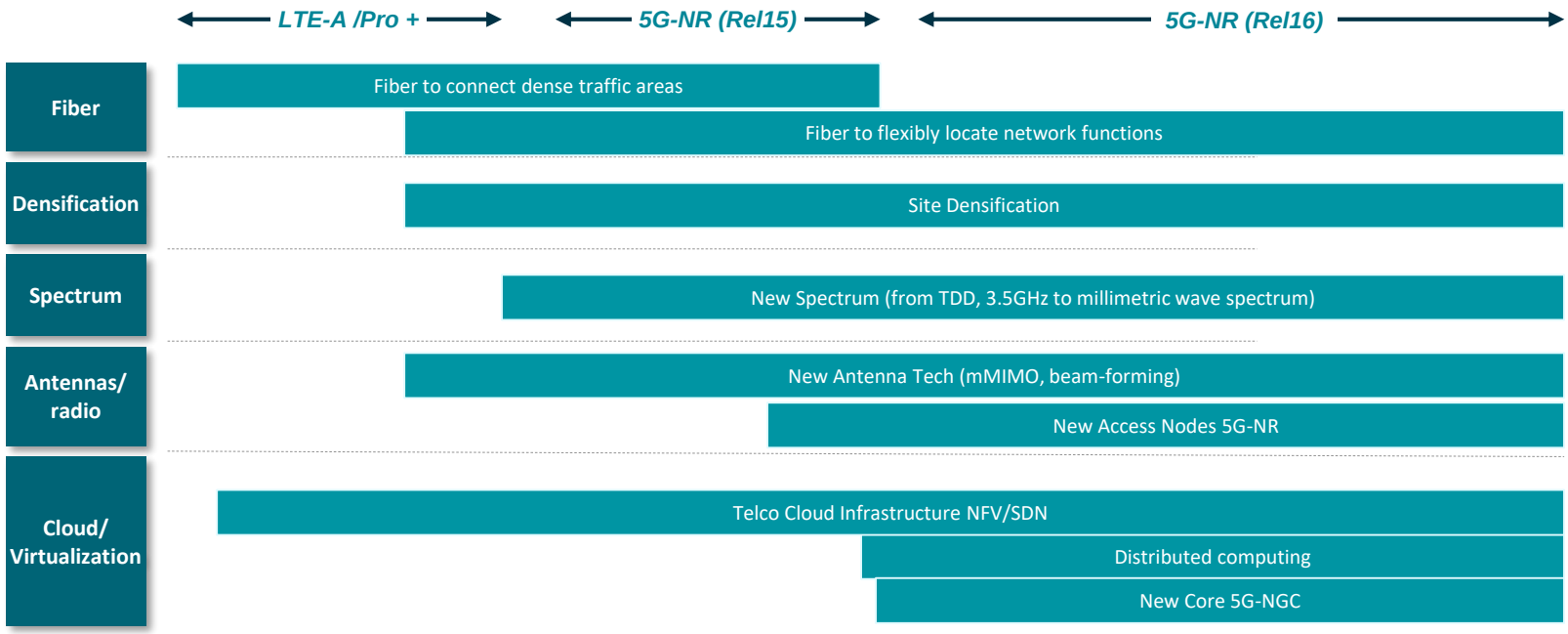
43% en Latinoamérica

Ingresos: datos a cierre de 2018 | **Accesos**: datos a cierre de junio 2019

*Se han alcanzado acuerdos para vender las operaciones en Centroamérica, algunas aún pendientes de aprobaciones regulatorias locales. El número de operaciones está actualizado a agosto 2019.

Key (pre)5G technical initiatives

Telefonica is testing and preparing each stage of future 5G rollout, exhausting LTE possibilities while 5G is mature



What is Telefónica doing? 5G Tech City Segovia

Scope

- **Location**: Segovia
- **Date**: From Q1 2018
- **Objective**: Deployment on a commercial network in a medium city that provides a real environment to exploit 5G capabilities
- The plan is to deploy the 5G trial and maintain the trial infrastructure for introducing progressively 5G new capabilities

Description

- **Vendor**: Nokia
- 5G Macro cells: 3-4 5G NR nodes in 3.5 GHz band
- **Architecture**: Non Standalone (Option 3.x)

Results

- Detail performance analysis of 5G NR 3x option

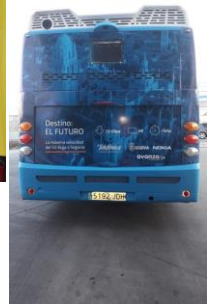
Use cases

5G Inmersive Turism (Distributed Reality)

- Partners: Telefónica, Nokia and Samsung

Display of video 4K in mobility (Bus entertainment)

- Partners: Telefónica, Nokia, TELDAT y Avanza



Other Use cases

- **Connected Cars Cellular-V2X**

What is Telefónica doing? 5G Tech City Talavera

ERICSSON

Scope

- **Location**: Talavera (Toledo)
- **Date**: From Q1 2018
- **Objective**: Deployment on a commercial network in a medium city that provides a real environment to exploit 5G capabilities
- The plan is to deploy the 5G trial and maintain the trial infrastructure for introducing progressively 5G new capabilities

Description

- **Vendor**: Ericsson
- 5G Macro cells: 3-4 5G NR nodes in 3.5 GHz band
- **Architecture**: Non Standalone (Option 3.x)

Results

- Detail performance analysis of 5G NR 3x option

Use cases

5G use case with autonomous driving and content consumption

- Partners: Telefónica, Ericsson, CarMedia, and EasyMile

Bike Blackout: VR use case of ultra low latency

Other use cases

- **Connected Cars Cellular-V2X:** Connected car for security using V2X communication

Telefónica

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What is Telefónica doing? 5G Tech City Málaga

Scope

- **Location**: Málaga
- **Date**: From Q2 2018
- **Objective**: Deployment on a 5G network for introducing progressively 5G new capabilities

Description

- **Vendor**: Huawei
- 5G Macro cells (B43:3,6-3,8 GHz): 3-4 5G NR nodes in 3.5 GHz band
- **Architecture**: Non Standalone (Option 3.x)

Results

- Detail performance analysis of 5G NR 3x option

Use cases

5G international videocall with 5G in the real network

5G based remoted assisted system for surgeries

- Quirón Salud Málaga Hospital and Telefónica present the first system of expert remote assistance to surgeries based on 5G and the integration of medical data through augmented reality
- Doctor in Málaga performed the surgeries (live, interactive digestive endoscopy interventions retransmitted through 5G) with the real-time assistance from Doctor in Japan. 5G's low latency and high video transmission performance made possible the operations.

Future Use cases

- VR Basket competition retransmission: Video 4K and 360º

Telefónica

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What is Telefónica doing? 5G Tech City Alcobendas

Scope

- **Location**: Alc4bendas (Madrid)
- **Date**: From Q2 2018
- **Objective**: Deployment on a 5G network for introducing progressively 5G new capabilities

Description

- **Vendor**: ZTE
- 5G Macro cells (B43:3,6-3,8 GHz): 4 5G NR nodes in 3.5 GHz band
- **Radio Solution**: Massive MIMO
- **Architecture**: Standalone (option 2)

Results

- Detail performance analysis of NSA and SA option for radio point of view

Use cases

5G technology applied to the banking sector

- Banco Santander and Telefónica have launched a joint innovation project on 5G technology applied to the banking sector
- This is the first banking offices connected by 5G technology in Europe.
- The project comprises of three use cases:
    1. **4K videoconference between two bank offices that offers**, through the 5G network, an ultra-high resolution image (4096x2160) and natural motion thanks to its 30 frames per second with zero delay.
    2. **5G storage, a low latency cloud storage** solution provided by Telefónica and based on the Hitachi Content Platform Anywhere Edge solution embedded on Telefónica's edge computing infrastructure.
    3. **Virtual visit** to co-working spaces developed in collaboration with Idronia that use **Virtual Reality, 360 video and Edge Computing technologies**. This immersive reality service allows customers to remotely visit co-working spaces such as the Santander Work Cafe located at the Santander banking office in the center of Madrid.

What is Telefonica doing? Connected Car

5GBarcelona, the 5G hub for Southern Europe

Scope

- **Location**: Barcelona
- **Date**: Demo Mobile World Congress
- **Objective**: Telefónica is upgrading its networks to 5G, so we are able to connect the city with the car.
- **Partners:** SEAT, **Telefónica**, FICOSA, ETRA, Qualcomm y 5G Barcelona

Motivation

C-V2X technology over 5G with our 5G Connected Car is the first step on the track for a completely autonomous and cooperative driving.

Use cases

- **Safety Use Cases:**
- Warning of pedestrian at crossing with low visibility
- Warning of bike in cyclist lane during turn right
- Warning of unforeseen road-objects

- **Infotainment use case:**
- Making the onboard experience even more exciting

5G is the driver for vehicle communications, providing ultra-low latencies and intelligence at the network edge, **being able to make decisions in advance in order to improve road safety**

Thanks to the big bandwith offered by 5G, the **travelling experience improves**, offering, for example, **ultra high definition video streaming**.

TEF is member of the 5GAA from 2017

https://www.telefonica.com/web/press-office/-/telefonica-joins-efforts-with-the-5g-automotive-association

#RECONNECT

5G enables “Fixed Wireless Access” (FWA)

5G FWA-trial (12/18-02/19) from TEF DE and Samsung proves successful:

- (Wireless) Internet surfing at the “lighting speed” of up to 1 GB/s
  - Streaming films in 8K UHD
  - Typical everyday applications of the highest quality
- New customer experience was made possible thanks to a wireless connection for private households: 800 MHz @ 26 GHz (26,65 - 27,5 GHz)
- The combination of newly developed technology and special software enables high transmission speeds of several gigabits per second over the ‘last mile’.

https://www.telefonica.de/fixed/news/6191/conclusion-of-three-month-pilot-in-hamburg-5-g-fixed-wireless-access-from-telefonica-deutschland-and-samsung-proves-successful.html

5G Industrial IoT: Factory 56 Daimler

Mercedes-Benz ERICSSON Telefónica Deutschland

Mobile network of the future in "Factory 56" in Sindelfingen: Mercedes-Benz Cars and Telefónica Deutschland establish the world's first 5G network for automobile production

Scope

- **Location**: Sindelfingen (Germany)
- **Date**: Kick-off: April 19. Ongoing
- **Objective**: First 5G Industrial IoT
- **Partners: Telefónica**, Daimler and Ericsson

First use cases

- Autonomous Guide Vehicle
- Factory automation

First 5G indoor mobile network provides gigabit data rates with short latency times for industrial data communication and digitilised vehicle assembly in "Factory 56" at the Mercedes-Benz Sindelfingen plant

The 5G network facilitates smart production at Mercedes-Benz Cars by allowing the wireless networking of all production systems and machines, thereby setting new standards for flexibility, efficiency and Industry 4.0 in automobile production

Telecommunications company Telefónica Deutschland is setting up the 5G network, which will then be operated by Mercedes-Benz Cars

Telefónica

#RECONNECT

5G launch O2 UK

Network rollout begins across the UK today in Belfast, Cardiff, Edinburgh, London, Slough and Leeds, reaching a total of 20 towns and cities in 2019

Exclusive partnership with MelodyVR and Oculus from Facebook gives music fans intimate access to gigs and musicians through cutting edge Virtual Reality

The network will be live in a total of 20 towns and cities by the end of the year, and 50 by summer 2020

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5G Ecosystem

Hector Marin

GSMA

5G ECOSYSTEM UPDATE

Hector Marin
GSA CITEL

VISION

VISION

wirelessly connect almost all 7 billion people globally to new and exciting services through 100 billion devices and things, by 2030

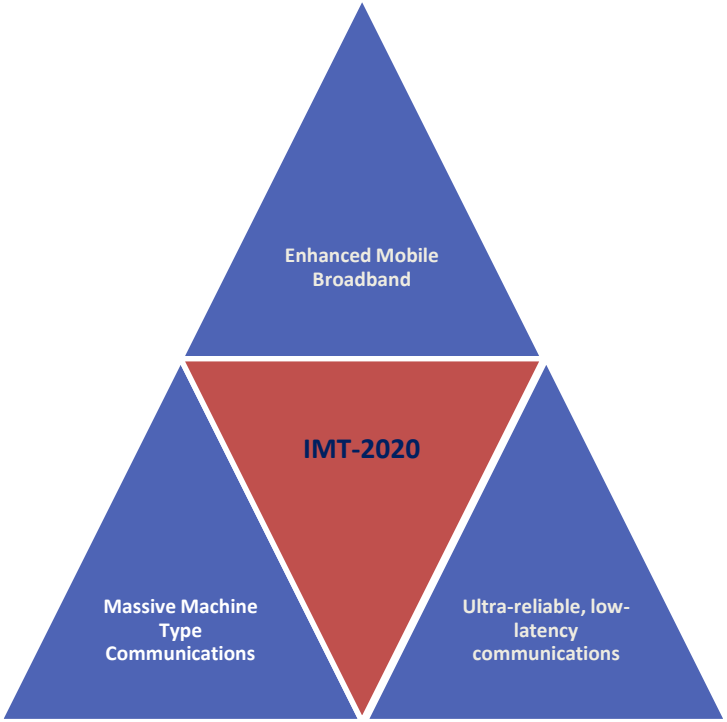
HOW

spectrum from the low-band, mid-band and high-band frequency ranges helps realise the Vision

WRC-19 GOAL

large contiguous amounts of high band (mmWave) harmonised spectrum, with suitable regulatory conditions, helps enable extreme capacity and ultra fast local area services.
planning for the future with WRC-23 mid & low band agenda item

USE CASES



STANDARDS

GLOBAL INITIATIVE

Release 15 complete (2017-2019)

Release 16 development (2018-2020)

Enhancements, Unlicensed, URLLC+ & IoT+, V2X, etc

Release 17 planning (2019-2021)

Enhancements to support verticals, coverage improvements, NTN, etc

3GPP 5G specs complete – work underway on enhancements

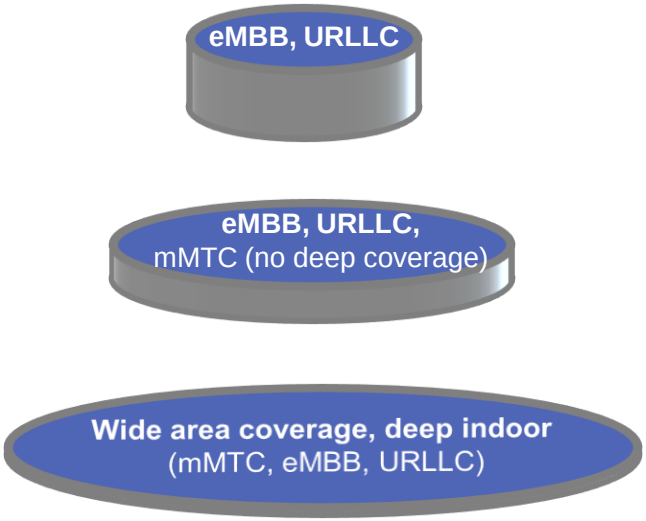
PRODUCTS

BASE STATIONS

DEVICES

CHIPSETS

SPECTRUM



High band
Extreme capacity

e.g. 24.25-29.5, 37-43.5 GHz etc
800-1000 MHz MNO/Network contiguous 2020 onwards

Mid band
Both coverage & capacity

e.g. 2.3, 2.6, 3.3–4.2, 4.4-5 GHz etc
80-100 MHz MNO contiguous 2020 onwards

Low band
Extended coverage

e.g. 600, 700 MHz etc
Upto 20 MHz channel bandwidth 2020 onwards

Various applications and services require access to spectrum from low, mid and high bands

THANK YOU

Check out www.gsacom.com for regular report updates

5G ecosystem update

5G licensing update

ERICSSON Qualcomm HUAWEI NOKIA intel SAMSUNG

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THE FUNDAMENTAL ELEMENT OF MOBILE

Conclusion

Brett Tarnutzer

GSMA

Our Asks

26 GHz
(24.25-27.5 GHz)

- Limits to protect EESS (passive) -28 to -32 dB(W/200MHz)
- No conditions necessary for FSS/ISS since sharing studies show significant protection margin

40 GHz
(37-43.5 GHz)

- Identification of whole range provides harmonisation with other Regions
- FSS downlink: ES sharing is a national issue
- FSS uplink: sharing studies show a significant protection margin

50 GHz
(45.5-52.6 GHz)

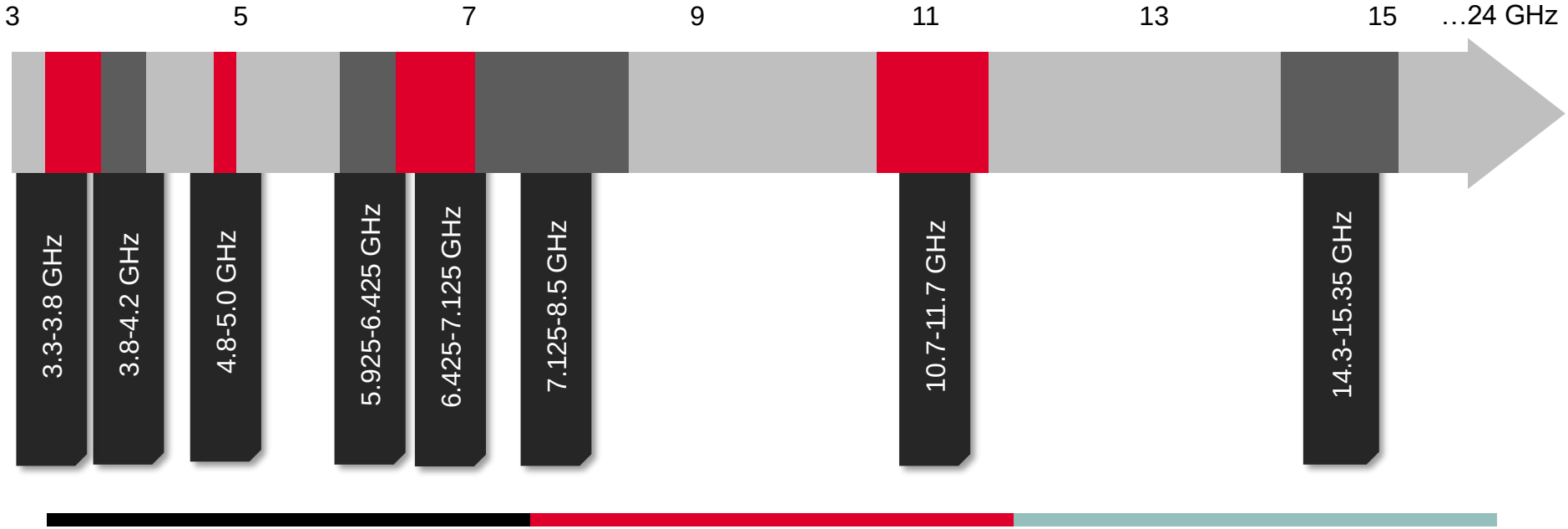
- Good options to support future 5G growth
- Studies have been performed and show sharing is possible

66 GHz
(66-71 GHz)

- Flexible use for unlicensed 5G systems - both IMT and non-IMT technologies
- Shared with WiGig
- Supported by APT, ATU, ASMG, CEPT

WRC-23 supported bands

GSMA supports WRC-23 AIs for IMT in 470-960 MHz, and consideration of the bands below



Visit the GSMA stand

Live 5G demos

City of the Future VR experience

Interactive library – all reports straight to your inbox