

# 5G mmWave Summit

Accelerating into  
2023 & Beyond

# 5G mmWave Summit

## Accelerating into 2023 & Beyond

Henry Calvert  
Head of Networks  
GSMA



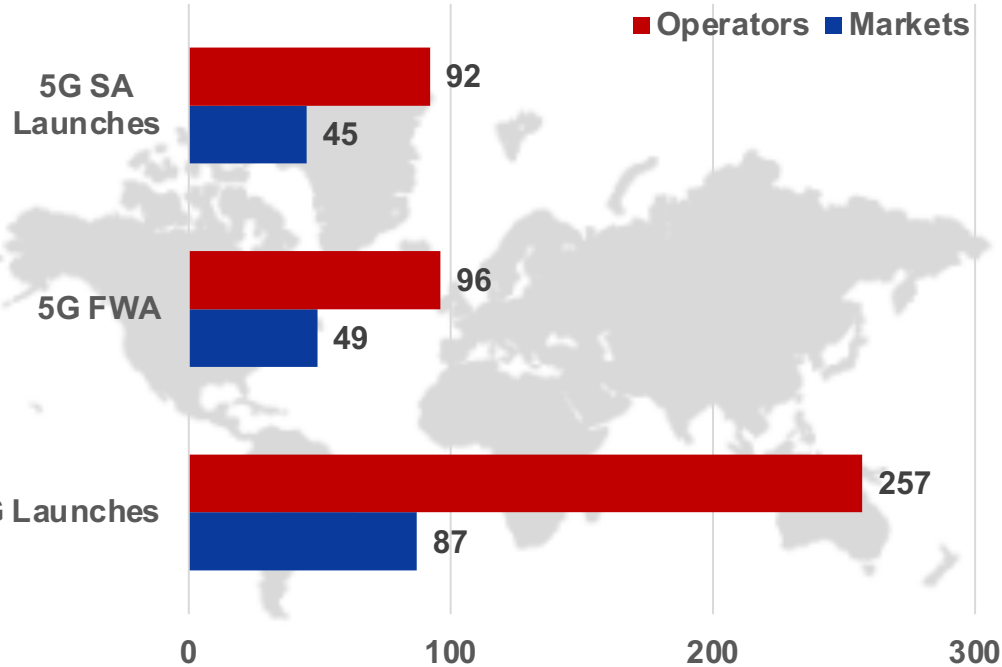
**GSMA**<sup>™</sup>

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**Intelligence**

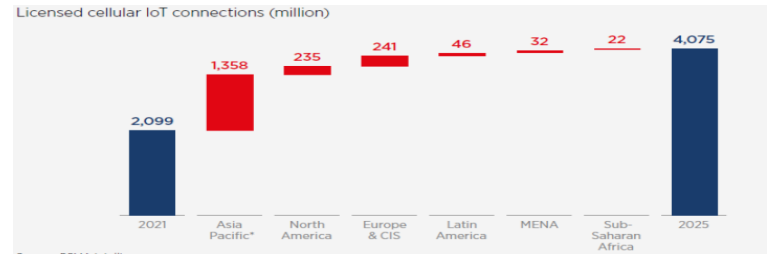
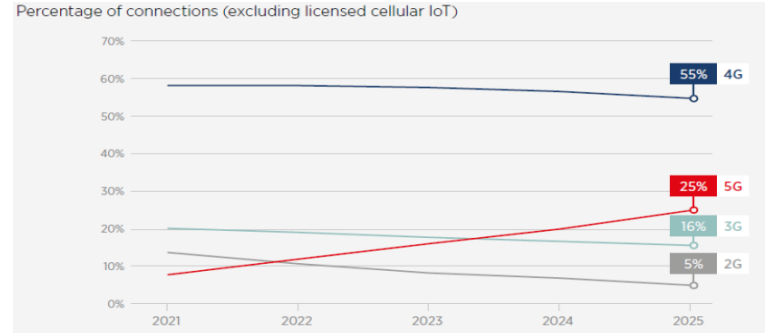
# 5G & Advancing 5G

Henry Calvert, GSMA

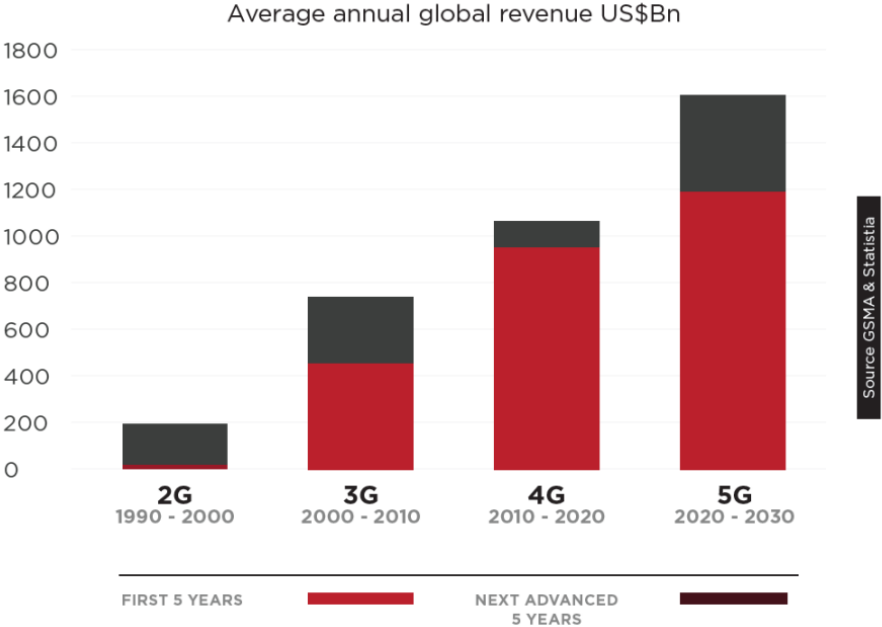
# 5G Progress: 257 Launches supporting 1.024Bn Subscribers



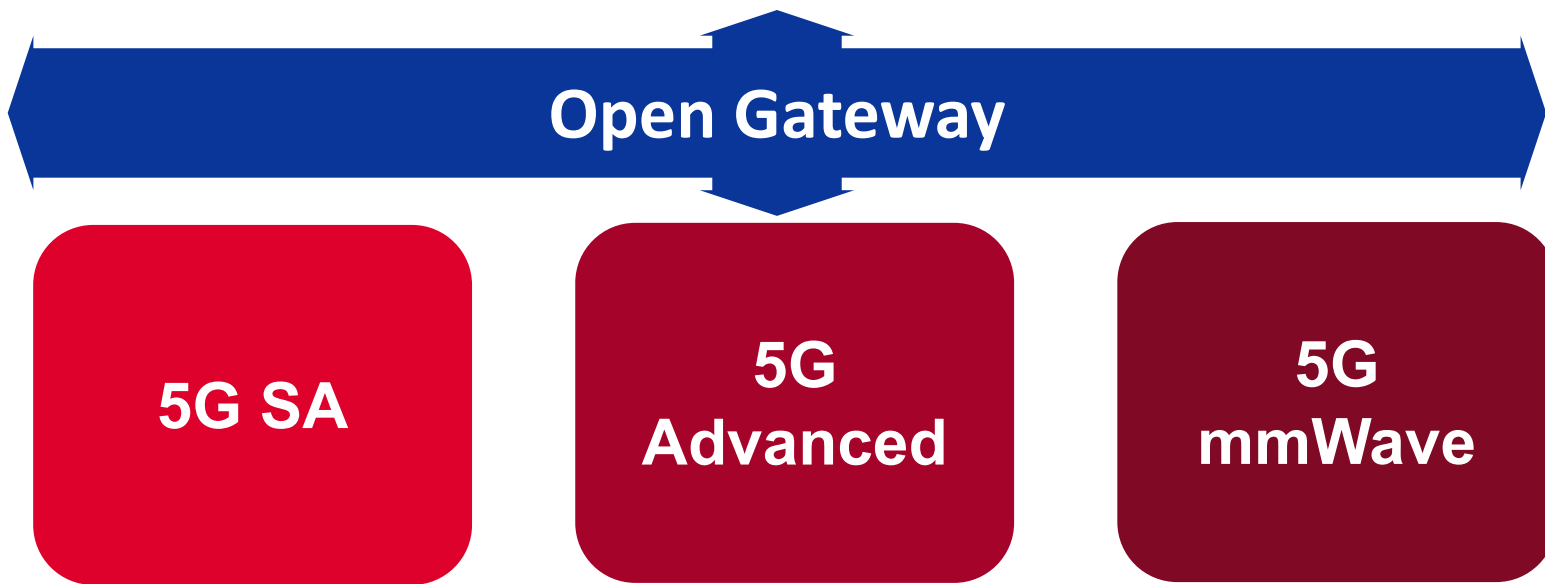
## 5G Growth as 4G growth de-accelerates. What underpins 5G growth and can it accelerate faster with 5G-Advance



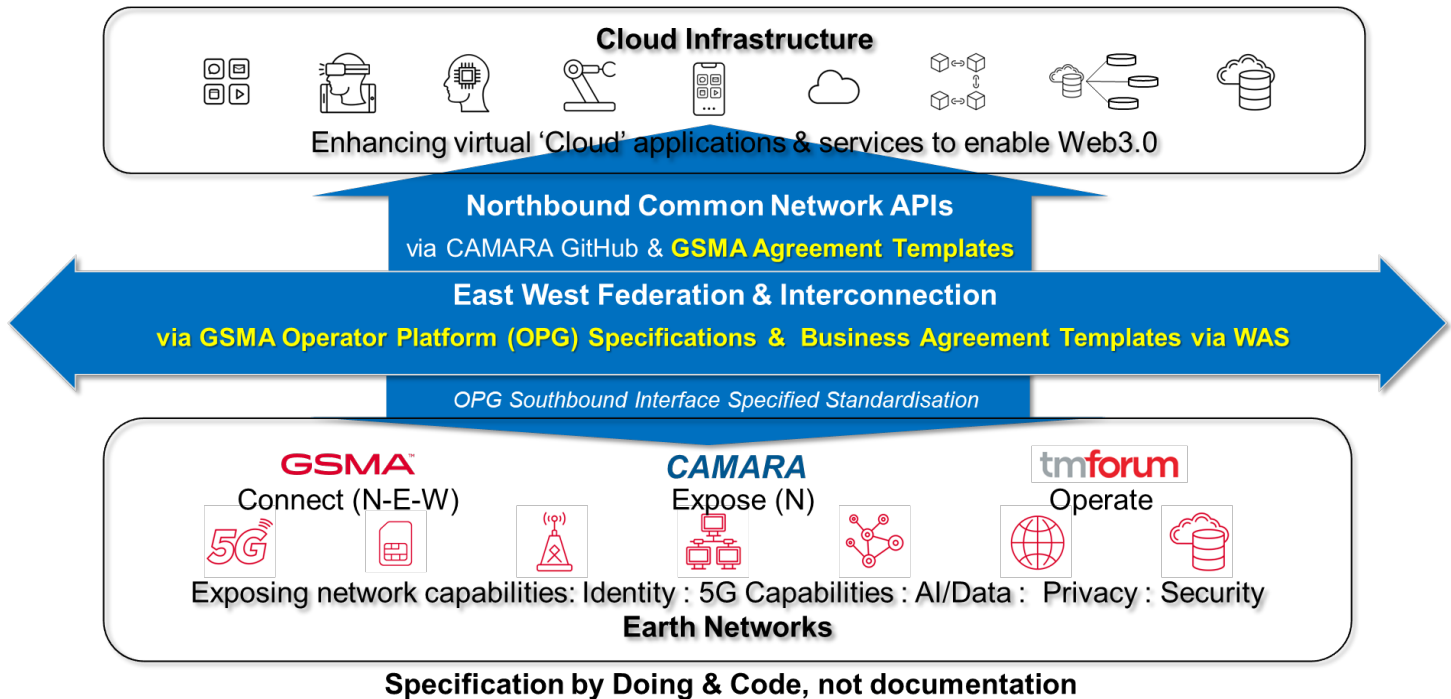
# Generational Advancements create Value...



# Critical 5G Advancements



# Open Gateway: delayering, NaaS API economy



# 5G Advance Release 18 June 2024



## 5G-Advanced Promises Step Change for Extended Reality

Cross-layer collaboration tech could enable fivefold increase in simultaneous XR users

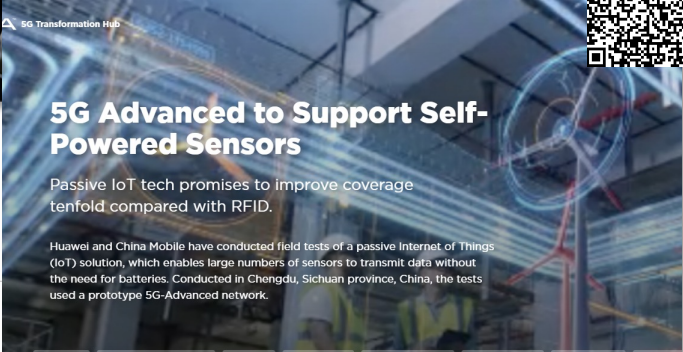
Tests of 5G-Advanced cross-layer collaboration technology have demonstrated that forthcoming cellular networks will be able to deliver highly immersive extended reality (XR) experiences. Conducted in Hangzhou, Zhejiang province, China, the tests explored how 5G-Advanced networks could support very high-resolution virtual environments generated by computer technologies and wearable devices



## 5G Advanced Could Turbocharge Video Uploads

Field test of UCBC tech achieves uplink of more than 1 Gbps for a single user

Huawei and China Mobile have conducted field tests that demonstrate that 5G Advanced can provide the uplink capacity and throughput to support the fast and efficient transmission of high-resolution videos from anywhere with network coverage.



## 5G Advanced to Support Self-Powered Sensors

Passive IoT tech promises to improve coverage tenfold compared with RFID.

Huawei and China Mobile have conducted field tests of a passive Internet of Things (IoT) solution, which enables large numbers of sensors to transmit data without the need for batteries. Conducted in Chengdu, Sichuan province, China, the tests used a prototype 5G-Advanced network.





# 5G mmWave – Use Cases



PRODUCTIVITY

MMWAVE

**Subways**

📍 East Asia



SMART PRODUCTION

MMWAVE

**Robots**

📍 East Asia



ENTERTAINMENT

MMWAVE

**5G Theatre**

📍 East Asia



ENTERTAINMENT

MMWAVE

**Broadcast**

📍 North America



ENTERTAINMENT

MMWAVE

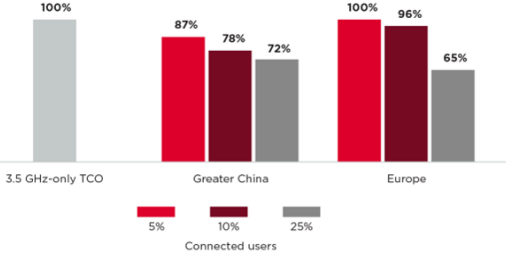
**5G Stadiums**

📍 North America

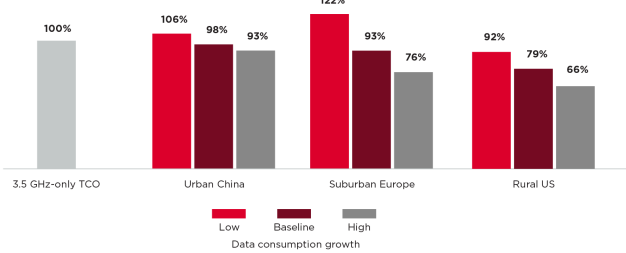


# 5G mmWave - TCO

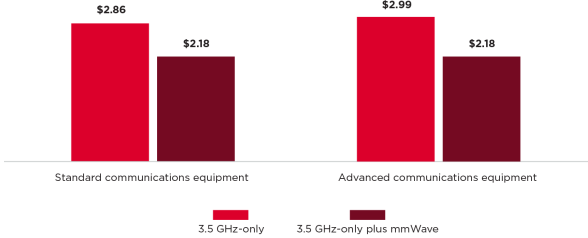
TCO mmWave 5G network



TCO mmWave FWA network



\$/sqm of indoor office space



# 5G mmWave – Your Next Steps



## 5G mmWave – Unlocking the Full Potential of 5G

5G in the 3.5GHz band allows for higher capacity than previous generations of mobile networks. To achieve even higher capacity, 5G can also use higher frequencies known as millimeter waves (mmWave) where much more spectrum is available. mmWaves are not new and have been used for decades in satellite and other communication networks.

The quickly growing number of 5G use cases demands a fully coordinated, multi-layer network where 5G mmWave spectrum provides the massive capacity and low latency needed for a full 5G experience.

### What is 5G mmWave?

Many mmWave deployments are at frequencies similar to 5G/4G mobile networks and Wi-Fi. This also means that many existing antenna sites can be reused for 5G, while low- and mid-band provide wide area coverage each has limited bandwidth, whereas 5G mmWave provides greatly increased bandwidth in localized areas for each user and enables higher density of users. 5G mmWave refers to the higher range of radio frequencies (above about 24 GHz) supported by 5G.

### Summary

5G mmWAVES ARE RADIO SIGNALS

### INTERNATIONAL RADIOFREQUENCY GUIDELINES (300 kHz to 300 GHz)



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## 5G mmWave Deployment Best Practices

November 2022



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GSMA

## 5G mmWave Coverage Extension Solutions Whitepaper

December 2022





BARCELONA  
27 FEBRUARY - 2 MARCH 2023

**Thankyou**

# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Peter Jarich**  
**Head of GSMA Intelligence**

**Moderator**



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**Intelligence**

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*5G mmWave Summit: Accelerating into 2023 and Beyond*

# 5G mmWave Circa 2023

## State of the Market and Look Back at our Accomplishments

P. Jarich  
February 2023

# Who is GSMA Intelligence?

*What do we do and why should you bother listening to me?*

## 5G in Context, Q2 2022

Data-driven insight into areas influential to the development of 5G

August 2022

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**30+**  
analysts &  
industry experts



**350**  
data metrics  
tracked



**44K+**  
users  
worldwide



**170**  
data metrics modelled  
and forecasted up to  
2030



**150+**  
reports published  
annually



**2k+**  
news items curated  
on our platform,  
updated quarterly



**50m**  
data points  
updated daily



**6K+**  
operator  
networks  
tracked

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GSMA  
**Intelligence**

**Enterprise Opportunity 2022:  
operator strategies, plans and  
expectations**

December 2021  
© 2022 GSMA

GSMA  
**Intelligence** IoT and enterprise markets: five trends to watch

#### INSIGHT SPOTLIGHT

Throughout 2022, we have analysed important developments and innovation spanning all areas of the telecoms industry and wider digital ecosystem. How will the industry evolve in 2023? Which trends will continue to run their course? Which trends will take a new direction? And which will enter the fray for the first time?

To help navigate the year ahead, we are releasing a series of reports that highlight the key trends to watch in 2023 and the implications for ecosystem players. The analysis covers five key areas: 5G and network transformation; spectrum; IoT and the wider enterprise space; the digital consumer; and fixed and pay-TV markets. This Insight Spotlight addresses the IoT and enterprise markets.



# Who is GSMA Intelligence?

*What do we do and why should you bother listening to me?*



## Vision 2030: mmWave Spectrum Needs

Estimating High-Band Spectrum Needs in the 2025-2030 Time Frame

June 2022

### GSMA Intelligence Consumer 5G: how much users would pay for mmWave

INSIGHT SPOTLIGHT

January 2023

Over the past two years, GSMA Intelligence has investigated the value of mmWave spectrum in great depth, with a focus on cost savings from a network efficiency perspective ([LCCO](#), [PWA](#), [spectrum needs](#)). However, there could also be a revenue opportunity for operators if consumers are willing to pay more for new or improved services. This was the main reason for developing a series of three reports investigating how consumers view the value of mmWave to improve 5G services.

Leveraging consumer survey data from Qualcomm, the first [report](#) looked at the pain points consumers face when using mobile broadband in a scenario where mmWave could improve experiences, and how big those pain points are. The [second](#) report looked at what consumers want from mmWave 5G specifically, and how it impacts their loyalty to a given operator. This final report quantifies the extent to which consumers are willing to pay to obtain the experiences they really want from mmWave 5G.



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analysts &  
industry experts



**350**



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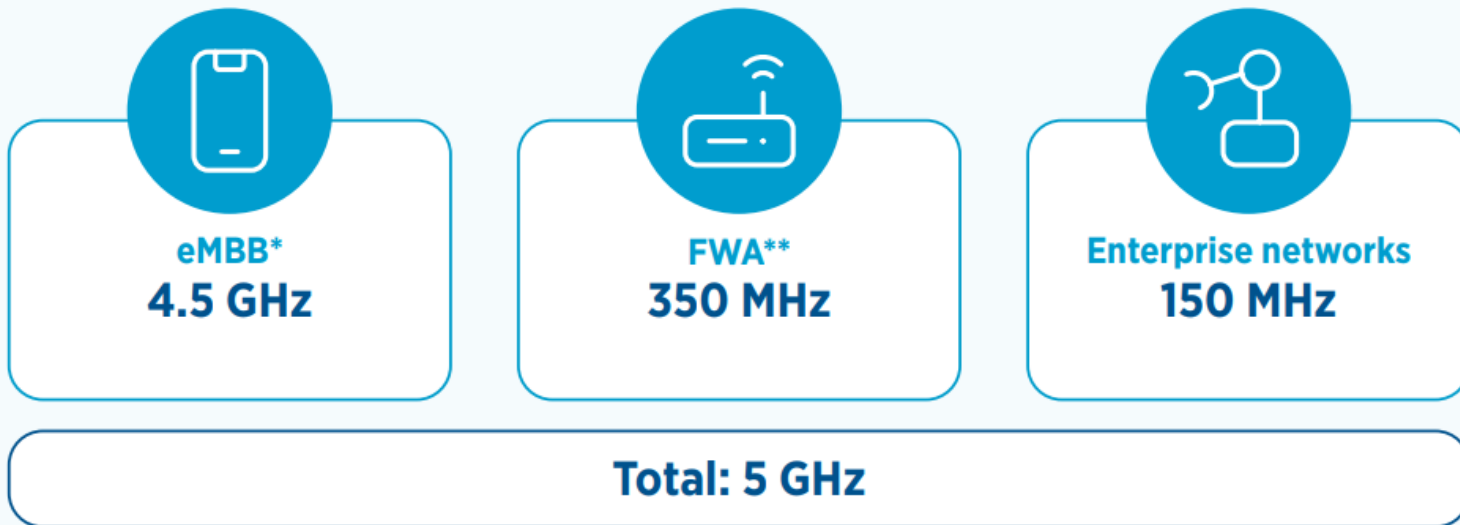
**50m**  
data points  
updated daily



**6K+**  
operator  
networks  
tracked

# 5G mmWave: a reminder

*There's a reason we think of it as a "when" not "if" technology.*



\* In early adopter countries

\*\* In dense urban environments

# 5G mmWave: 2021 vs. 2022

*It was a decent year for operator and mmWave momentum...*

**Operators Assigned Spectrum: Up 13%**



**Operators Launching Services: Up 50%**



# 5G mmWave: 2021 vs. 2022

*...and a pretty good year for mmWave 5G device availability.*

**Commercially Available mmWave Devices: Up 40%**



# 5G mmWave: 2021 vs. 2022

*Let's not forget about the network innovations and service showcases.*

**5G drives network capacity at Super Bowl LVII: SRG**

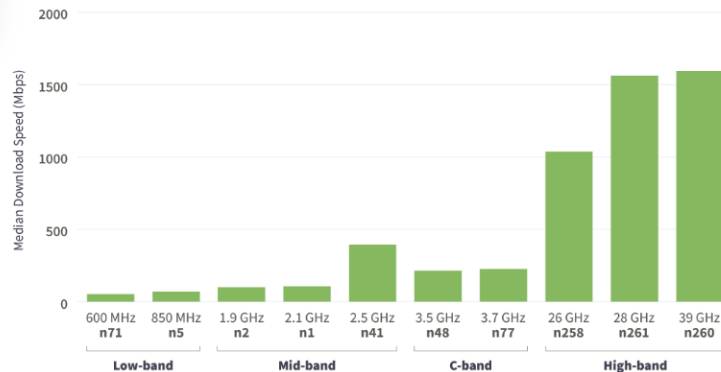
UK researchers develop 3D-printed mmWave antennas

**Pivotal Commware Announces Commercial Launch of Pivotal Turnkey Services**

NTT DoCoMo targets indoor mmWave with new multisector antenna

Verana Networks announces field trial agreement with Verizon for its ground-breaking 5G mmWave IAB solution

Median 5G Download Speed by Spectrum Band, All Operators Combined, USA  
Speedtest Intelligence\* | Q4 2022



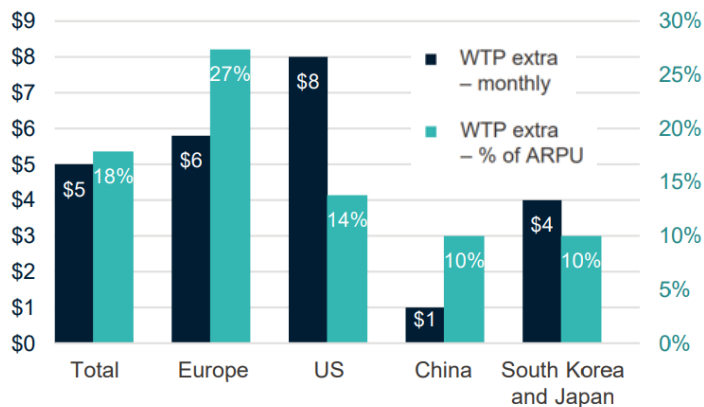
# 5G mmWave: 2023 and Beyond

*Reality Check: The mmWave fundamentals are solid, but work remains.*

## The Good News

There's a clear business case beyond capacity.

Willingness to pay (WTP) for a 5G enhanced service



## The Challenge

mmWave remains a minor part of 5G story.

**20%** share of operators with 5G mmWave spectrum who have launched services

**10%** share of commercial 5G devices supporting mmWave bands

**PLUS** flagship phones w/o mmWave in some markets

**The mmWave proposition is clear, and ecosystem progress is commendable, but there is some way to go ...**

**This Summit will highlight the path towards full attainment of 5G mmWave**



# Thanks

P. Jarich

Head of GSMA Intelligence

[pjarich@gsma.com](mailto:pjarich@gsma.com)

# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Zhiqin Wang, Vice President**  
**China Academy of Information and**  
**Communications Technology (CAICT)**



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**Intelligence**



# Setting Sail on a New Journey with 5G Commercialization

WANG Zhiqin

CAICT

Mar. 2023



## Multiple ministries support 5G innovations and development

MIIT released the "Fourteenth Five-Year Plan for the Development of the ICT Industry"

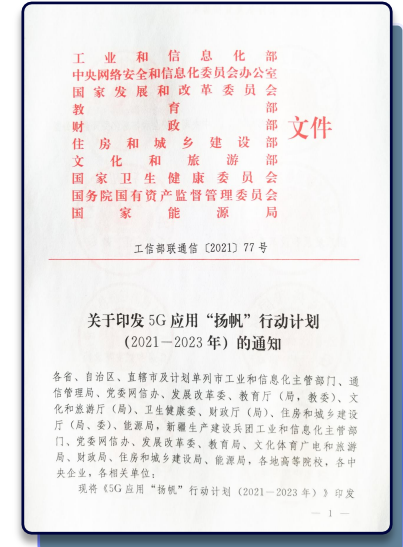
MIIT released the Notice on "5G+Industrial Internet" 512 Project Promotion Plan

NDRC, NEA, CAC and MIIT jointly released the Implementation Plan for 5G Applications in the Energy Sector

MIIT with the NHC jointly issued the "Notice on Organizing the Application for 5G+ Medical Health Application Pilot Project", and MIIT with the Ministry of Education jointly issued the "Notice on Organizing the Application for "5G+ Smart Education" Pilot Project"

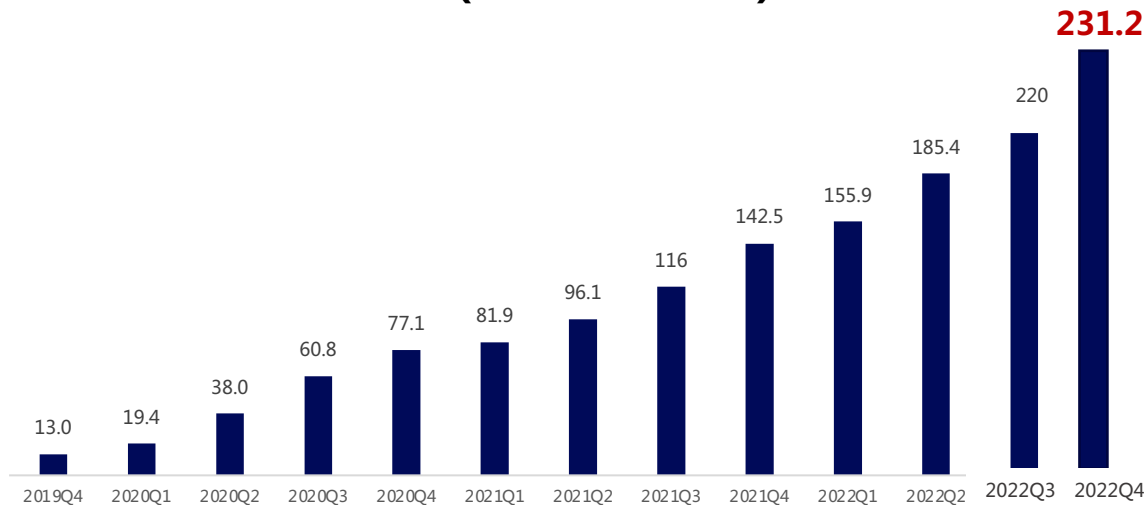
MIIT, in collaboration with other 9 central government bodies released "Set Sail" Action Plan for 5G Applications (2021-2023) in July 2021

- MIIT
- CAC
- NDRC
- Ministry of Education
- Ministry of Finance
- Ministry of Housing and Urban-Rural Development
- Ministry of Culture and Tourism
- National Health Commission
- SASAC
- NEA



- By the end of December 2022, China has built approximately **2.31 million** 5G base stations, covering all prefecture-level cities and county areas in the country.

## 5G base stations construction in China (ten thousand)



## 5G network co-construction and sharing



Co-construction and sharing one single 5G access network. Total 918,000 5G BSs by Aug. 2022.



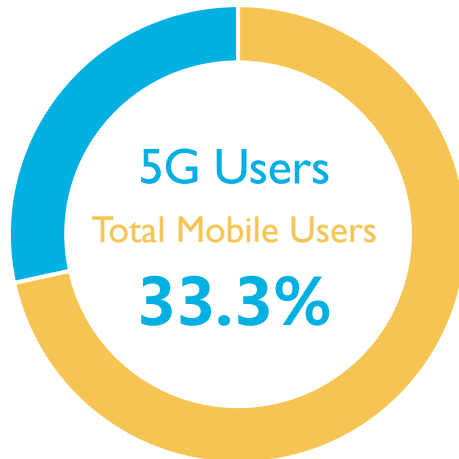
Jointly invest in the construction of 5G networks @700Mhz

- ✓ CBN (China Broadcasting Network) has announced 5G commercial service on June 2022. 97% of China Tower's 5G base stations are shared, and the concept of sharing serves the economy and society.

- By the end of 2022, the number of 5G mobile phone users reached **561 million**, accounting for **33.3%** of mobile phone users.

## 5G penetration rate increases with the number of 5G users

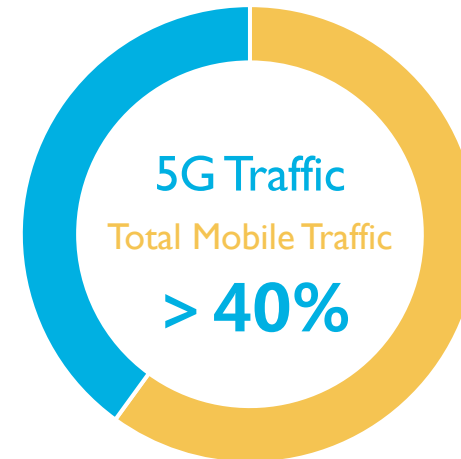
- ✓ With the gradual improvement of the network construction, the penetration of 5G users is steadily increasing.



By the end of 2022

## The utilization rate of 5G network continues to increase

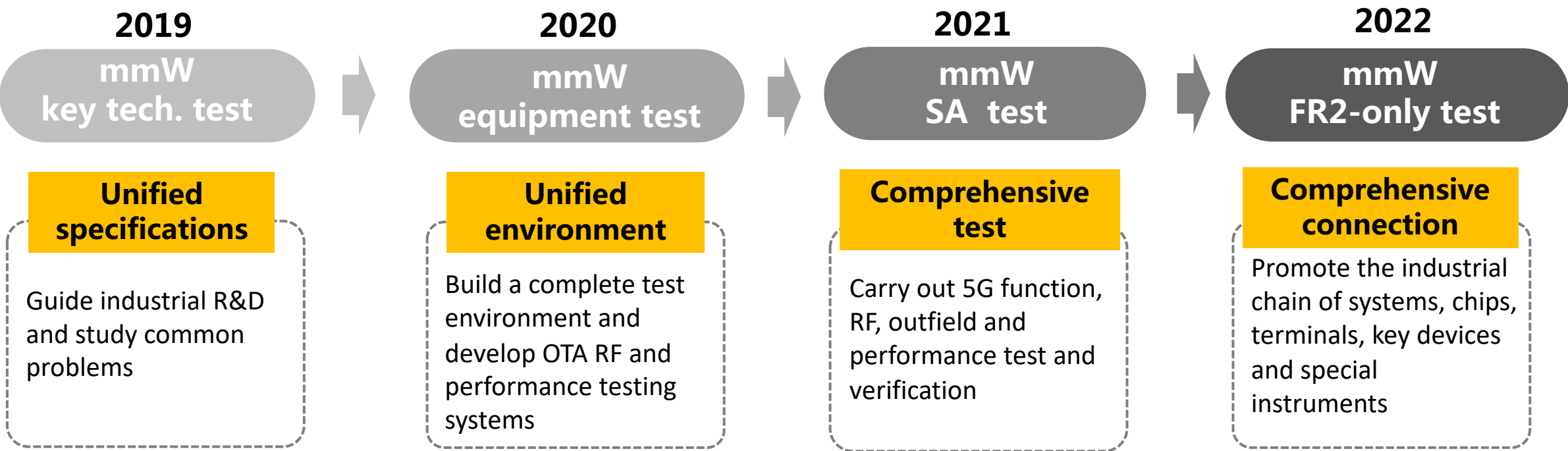
- ✓ Driven by the expansion of 5G user scale combined with the promotion of new applications (such as VR/AR), 5G traffic was prominent, accounted for **more than 40%** of total mobile traffic during Spring Festival holiday.



During Spring Festival holiday

## 5G mmWave can supplement the coverage and enhance the network capabilities

- IMT-2020(5G) Promotion Group organizes trials to promote the development of the industrial chain, improve the performance of mmWave products, and support commercial deployment.
- Coordinate equipment function and performance index requirements, and develop trial specifications to support product research.
- Research on mmWave test technology, building mmWave function test system of RF, performance, to support mmWave trial.



## 5G Enhancement Technology R&D Trials

### mmWave key technology

- Key technical requirements for mmW
- Key technologies of test methods of mmW
- Field performance test methods of mmW

### mmWave SA ( DC/CA )

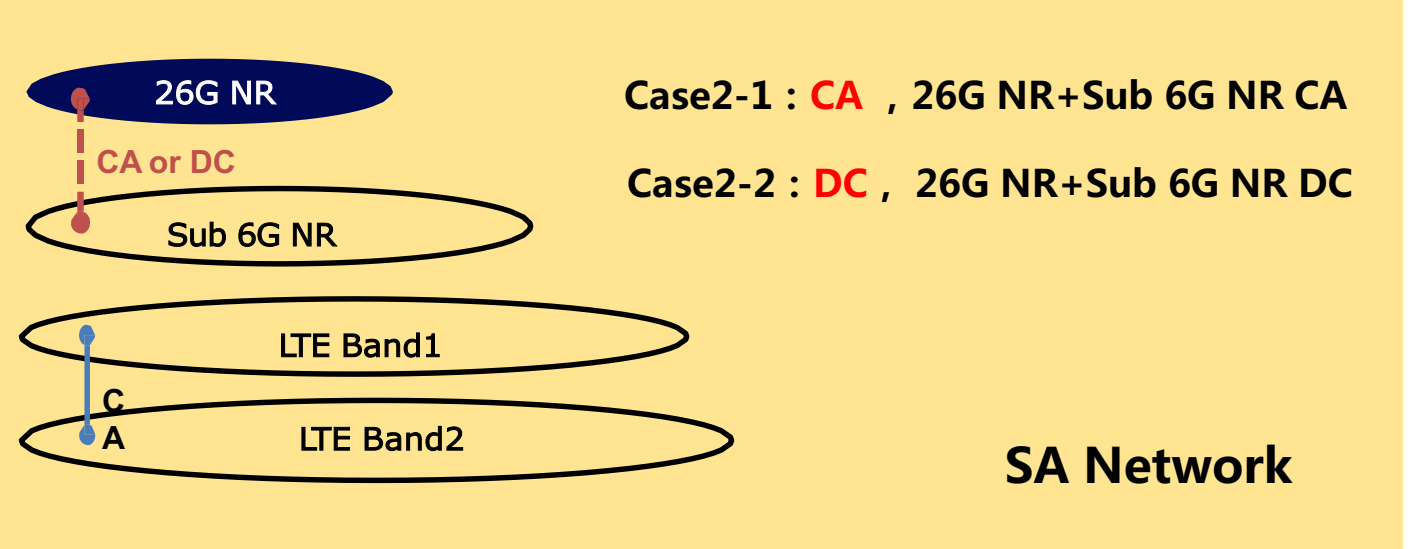
- Technical requirements for mmW base station equipment
- Technical requirements for mmW terminal equipment
- Test methods of mmW base station equipment
- Test methods of mmW terminal equipment
- Test methods of mmW field performance
- Test methods of key RF technologies of mmW terminals

### mmWave FR2-only

- Key technical requirements for mmW
- Test methods for key technologies of mmW
- Test methods for mmW field performance

### MmW trial to support 5G network requirements in China

- **Frequency** : 26 GHz
- **Carrier Band** : 200 MHz
- **Flexible Frame Structure** : DDDSU/DSUUU
- **Network type** : SA ( DC/CA ) / FR2 only



Case2-1 : **CA** , 26G NR+Sub 6G NR CA

Case2-2 : **DC** , 26G NR+Sub 6G NR DC

- **Explorations on integration:** Actively explore the deep integration of 5G with cultural and tourism, industrial, medical, energy, and other industries to effectively address their pain points and create new industry dynamics.



✓ 5G + cultural tourism:  
Performance on the cloud



✓ 5G+converged media: Free  
viewpoint + AR



✓ 5G+information consumption:  
Smart home brings new  
experience-based consumption



✓ 5G+health: Remote real-  
time diagnosis

## More than 10,000 5G industry virtual private networks



256  
5G+ Grid



1796  
5G+ Factory



201  
5G+ Mines

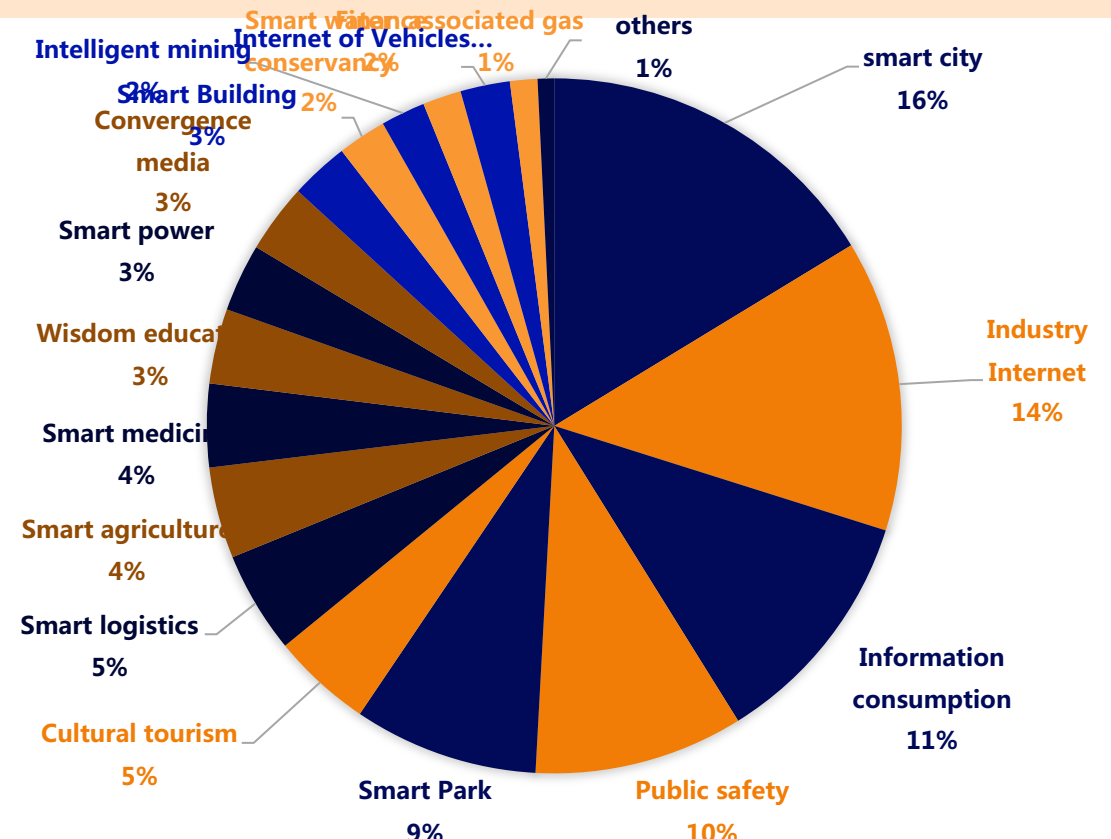
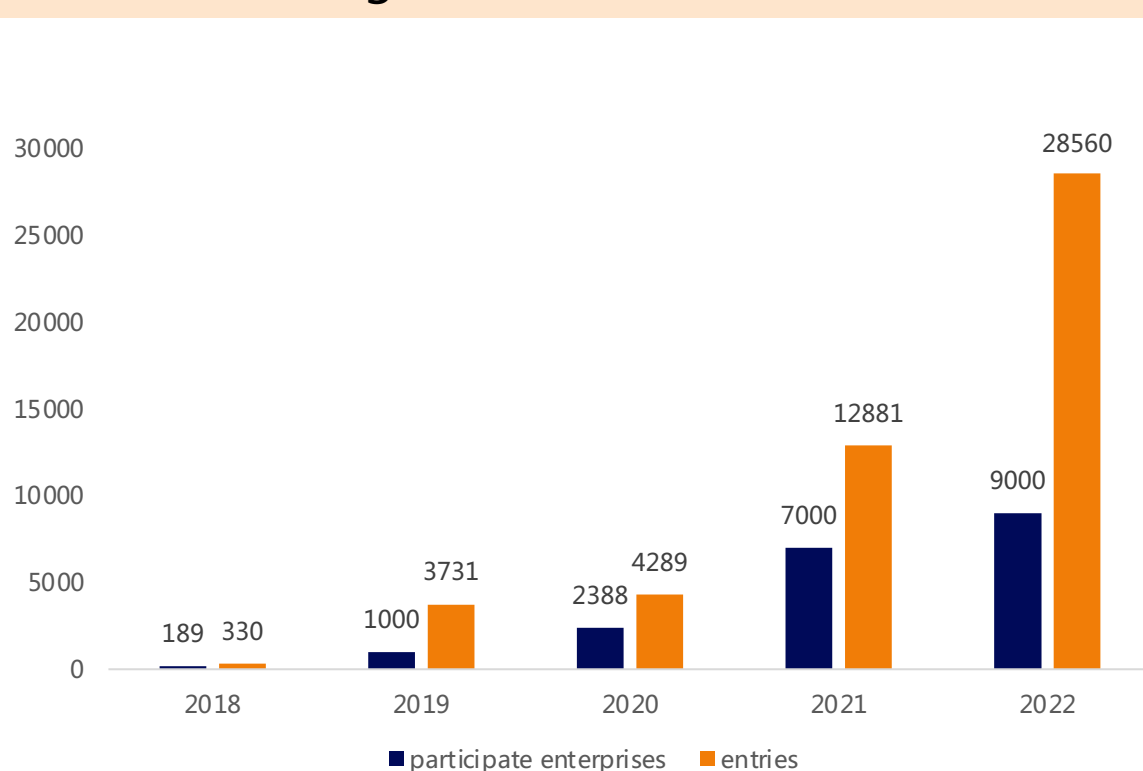


89  
5G+ Port



607  
5G+ Hospital

- The "Blooming Cup" 5G Application Competition has been held for five years, with the number of participating projects (entries) increasing from 330 in 2018 to 28,560 in 2022
- The entries covered many areas, including smart city, Industrial Internet, medical and health services, intelligent transportation, smart finance, sports and entertainment.
- This is not only competition, but also a chance for suppliers and demanders to know each other and close together.







- ① Take a future-oriented approach in network construction to meet the needs of individual and industrial users
- ② Improve the supply capacity of the 5G industry and promote the diversification and cost performance of devices
- ③ Promote the development of 5G applications and develop a strong industrial ecosystem

**Thanks**

# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Juan Cambeiro**  
**5G Customer Innovation**  
**Telefónica de España**



**GSMA™**

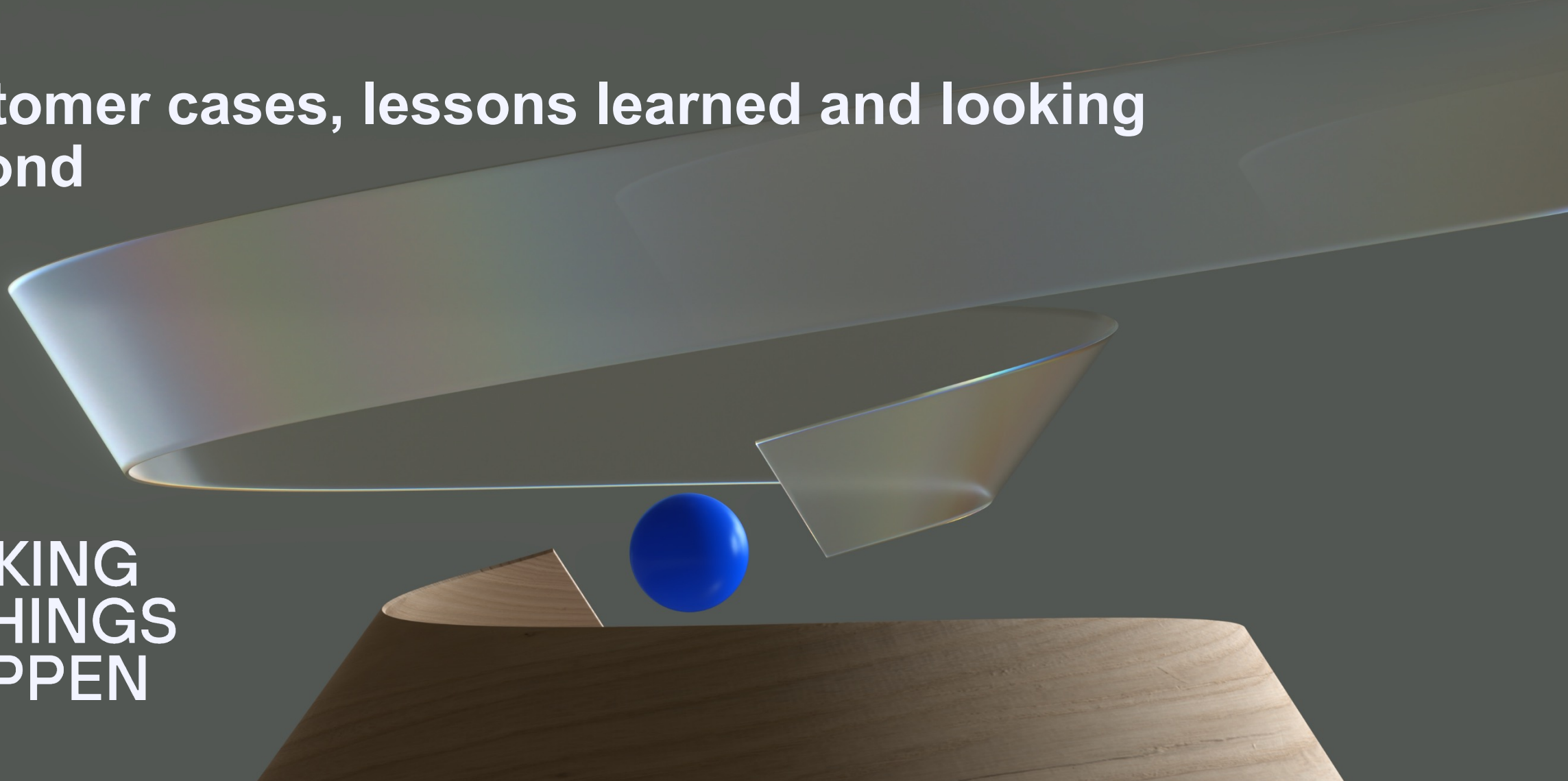
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# mmWave in Spain

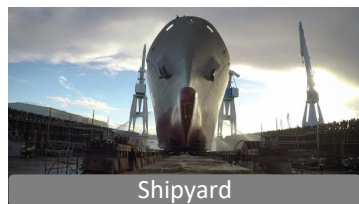
Customer cases, lessons learned and looking beyond

MWC 2023

MAKING  
THINGS  
HAPPEN



# More than 90 5G projects with customers



Shipyard



Logistics Hub



Maersk



Collaborative Drones



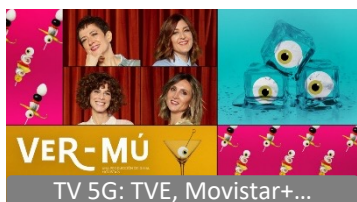
Ship to Shore



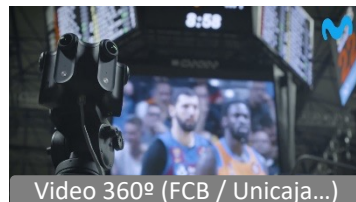
AI in Ophthalmology



Hospital Quirón



TV 5G: TVE, Movistar+...



Video 360° (FCB / Unicaja...)



Railway inspections



Factory 56



Critical Slicing



5G Stadium(Riazor)



Quirófano 360



Instituto de Empresa



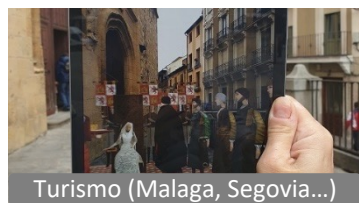
Infraestructuras viarias



Telepresencia Eventos



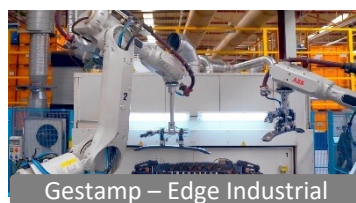
Prosegur



Turismo (Malaga, Segovia...)



Idiomas 5G (Meliá)



Gestamp – Edge Industrial



Open Golf Madrid



Roche



SailGP

But the most desired features are still to come...



26 GHz



**Telefónica is the only Spanish operator that has obtained a full 1 GHz spectrum at the 26 GHz auction**



## Telefónica is the only Spanish operator that has obtained a full 1 GHz spectrum at the 26 GHz auction

- We understand this frequency band as an essential asset in the pursue of a sound 5G strategy
- It shows Telefónica's commitment in the development and leadership of a solid and future proof 5G ecosystem.
- Telefónica will be the fist operator in reaching speeds like 5 Gbps downlink and 1 Gbps uplink.





A photograph of a modern warehouse interior. In the foreground, a white robotic arm is positioned on the left, and a small white mobile robot carrying a stack of cardboard boxes is on the right. The background shows high industrial shelving units filled with boxes. A network diagram consisting of blue lines and nodes is overlaid on the scene, suggesting a connected industrial environment. The text '26 GHz' is prominently displayed in the upper left quadrant of the image.

26 GHz

## Why is this band so important ?

- ; Bandwidth !
- Uplink
- Low Latency
- Slicing
- Massive connections

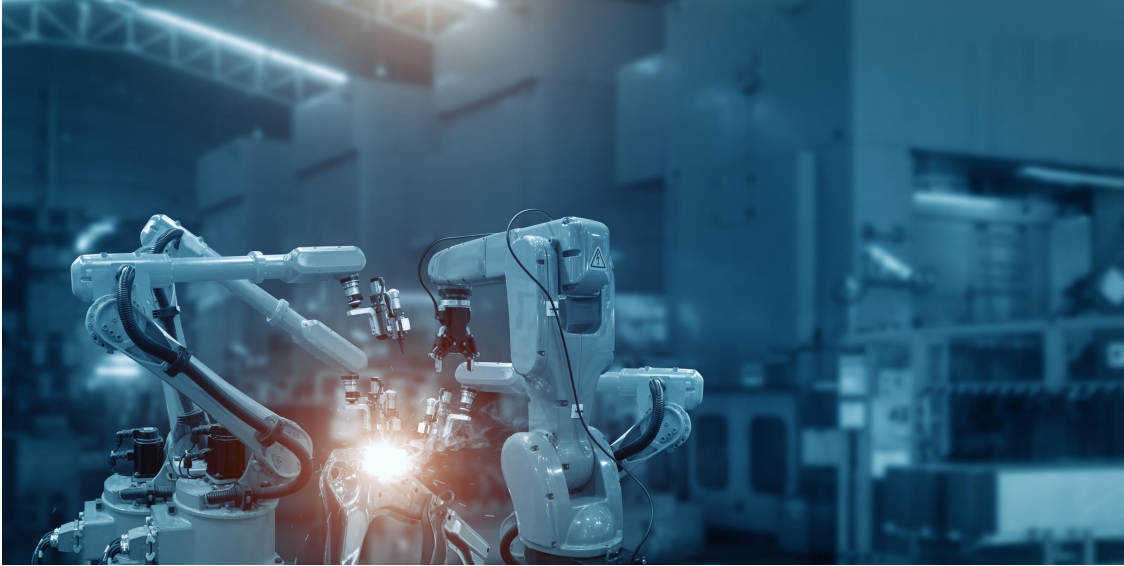


A photograph of a modern building interior, likely a transit station or office lobby, featuring a glass railing and a blue arrow pointing right. The background is blurred, showing architectural details and lights.

# Looking Beyond

- **More focus on the uplink:** current ecosystem is solely focused on the downlink
- **Further development of the device ecosystem:** Not only smartphones, but we also need CPEs, industrial routers, IoT, etc.
- **Stability and reliability :** the occasional 1 ms is not useful. We need predictability (5G SA, Slicing and uRLLC).

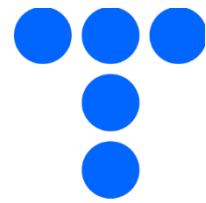
# Where first ?



- **Factories:** Industry 4.0, Manufacturing plants, seaports, refineries, logistic hubs... (going full wireless, cloud robotics, machinery remote control, video analytics on Edge, etc.)



- **Hot Spots:** Football Stadiums, Downtowns, Grand Prix, venues of high concentration ...



Telefónica

# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Takahiro Nakamura**  
Chief Technology Architect  
NTT Docomo



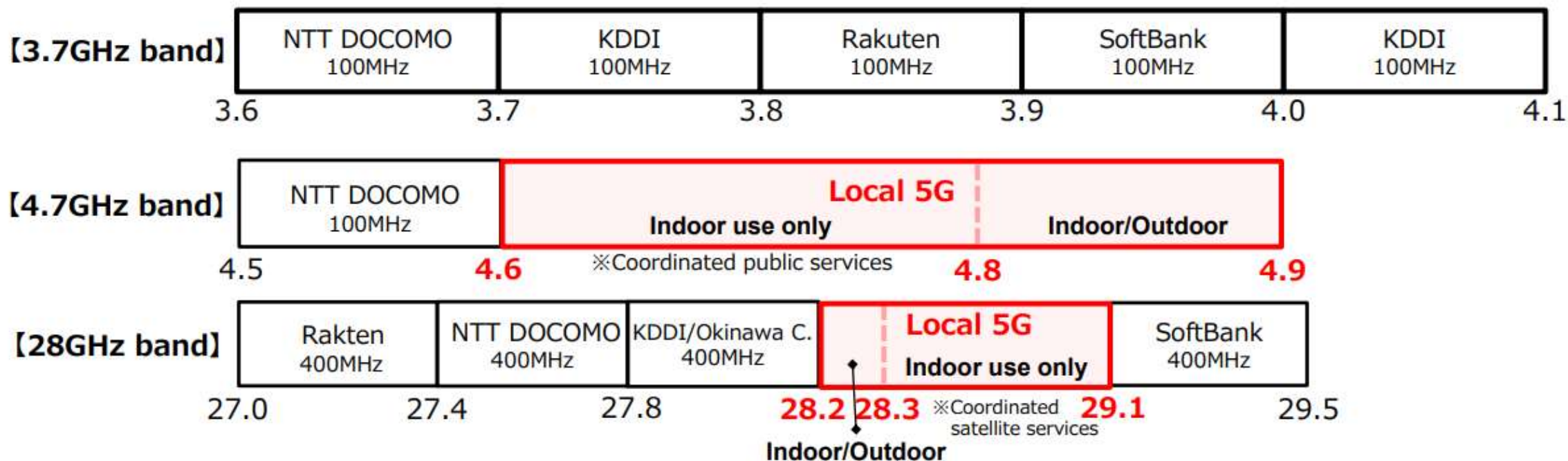
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# mmWave Promotion

NTT DOCOMO, Inc.  
Chief Technology Architect  
Takehiro Nakamura

# Frequency Assignment for 5G in Japan





# High-speed 5G with mmW

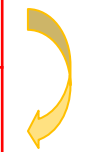
- 5G SA and Dual Connectivity with Sub6 + mmW was deployed from August 2022
- UL performance was drastically improved by mmW



	Frequency	DL	UL
NSA	LTE+Sub6	4.2Gbps	218Mbps
	LTE+mmW	4.1Gbps	480Mbps
SA	Sub6+mmW	4.9Gbps	1.1Gbps

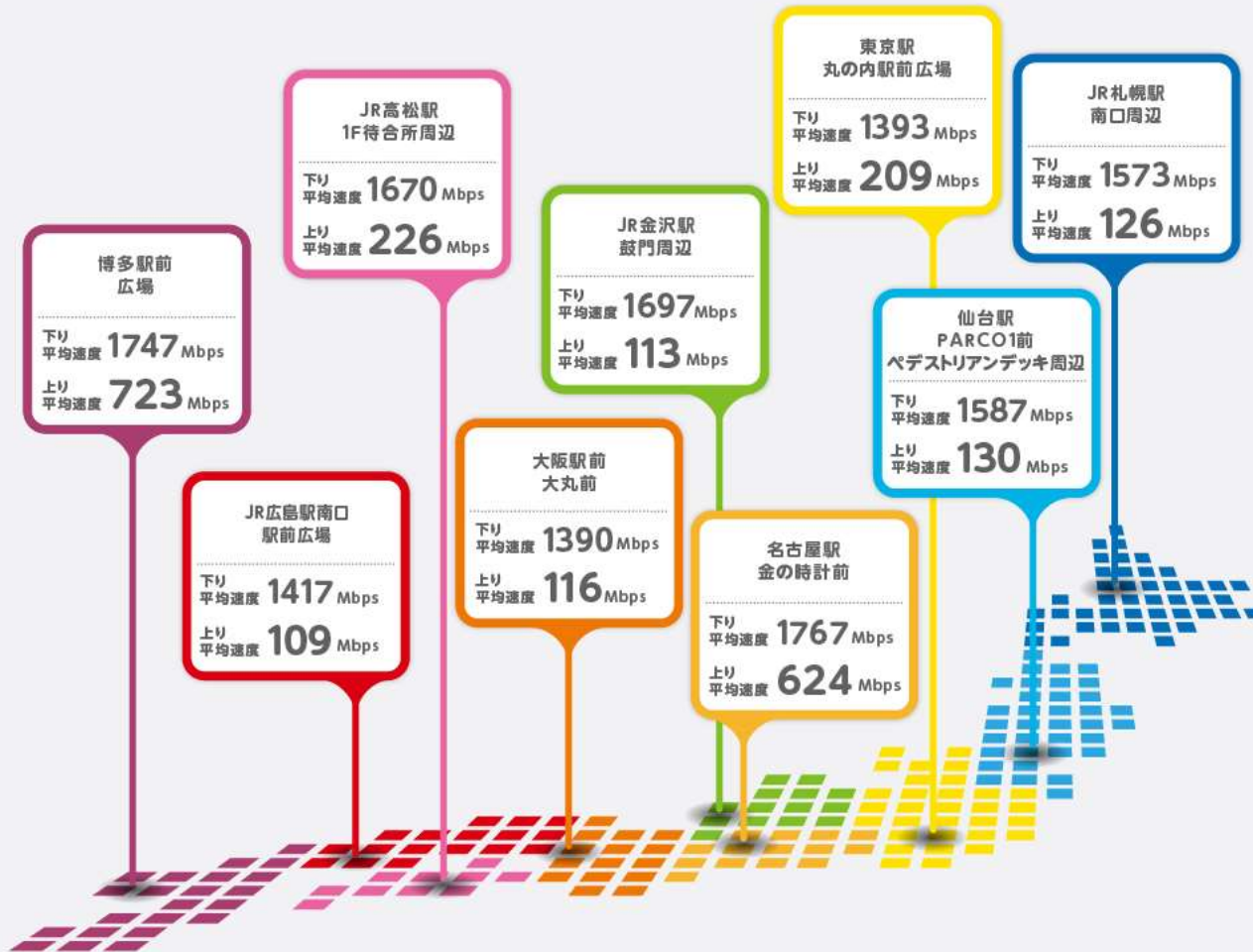
about 2 times

about 5 times



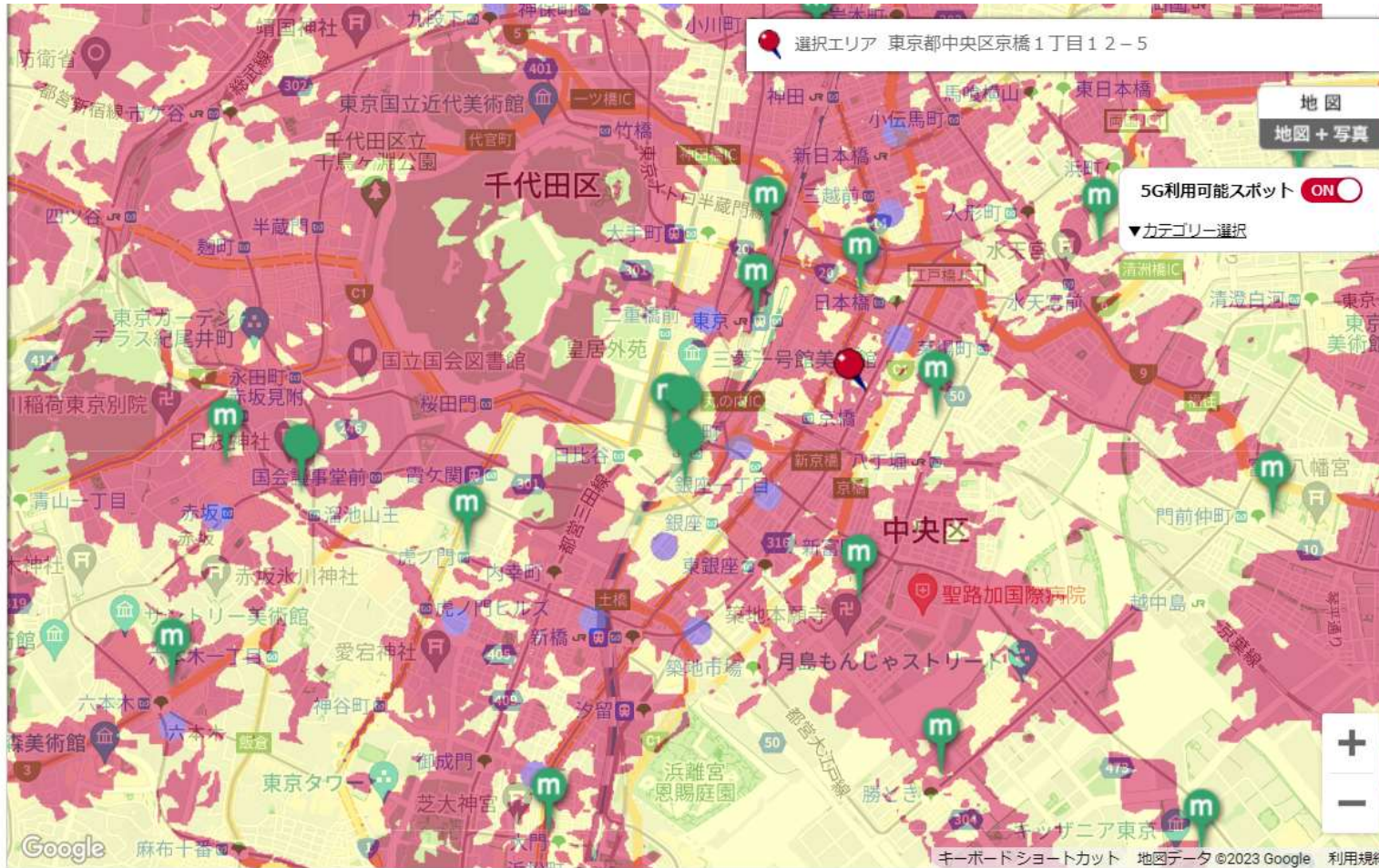
# 5G SA Throughput Measurement Results

## 「5G SA」のスループット計測結果

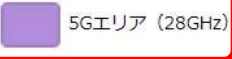
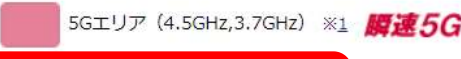
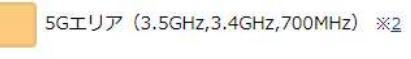


[https://www.docomo.ne.jp/special\\_contents/change/5g/realization/article/s/article\\_37/?icid=CRP\\_AREA\\_servicearea\\_to\\_CRP\\_SPE\\_change\\_5g\\_realization\\_articles\\_article\\_37](https://www.docomo.ne.jp/special_contents/change/5g/realization/article/s/article_37/?icid=CRP_AREA_servicearea_to_CRP_SPE_change_5g_realization_articles_article_37)

# 5G mmW Area in Tokyo



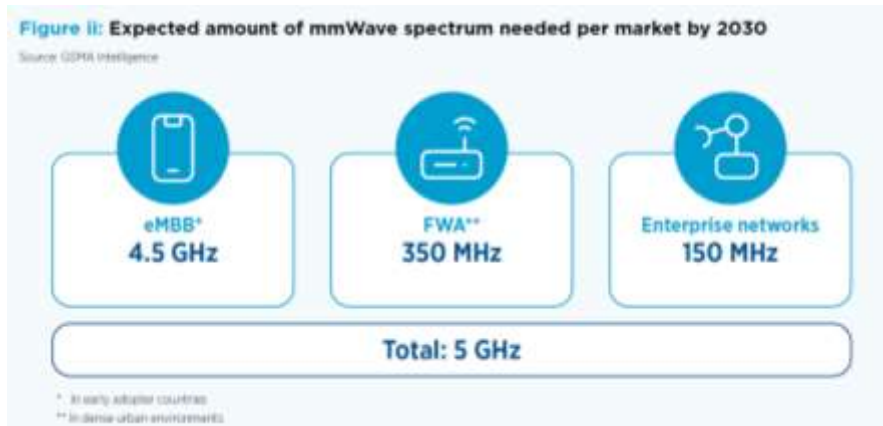
凡例 (5Gエリア)

	5Gエリア (28GHz) ※1		5Gエリア (4.5GHz, 3.7GHz) ※1		5Gエリア (3.5GHz, 3.4GHz, 700MHz) ※2		
	LTEエリア		海上エリア ※3		5G利用可能スポット (ミリ波対応)		5G利用可能スポット

[https://www.docomo.ne.jp/area/servicearea/?rgcd=03&cmcd=5G&scale=2048000&lat=35.690767&lot=139.756853&icid=CRP\\_IPH\\_area-5g\\_to\\_CRP\\_AREA\\_servicearea](https://www.docomo.ne.jp/area/servicearea/?rgcd=03&cmcd=5G&scale=2048000&lat=35.690767&lot=139.756853&icid=CRP_IPH_area-5g_to_CRP_AREA_servicearea)

# Why mmW needed?

Guarantee enough spectrum resources for future traffic increase



Reference: GSMA Vision 2030: mmWave Spectrum Needs, Full Report  
<https://www.gsma.com/spectrum/wp-content/uploads/2022/06/5G-mmWave-Spectrum.pdf>

Provide high data rate and capacity for spread of high-quality 5G services such as XR, video transmission, robotics

Video Transmission & AI



XR



Robotics

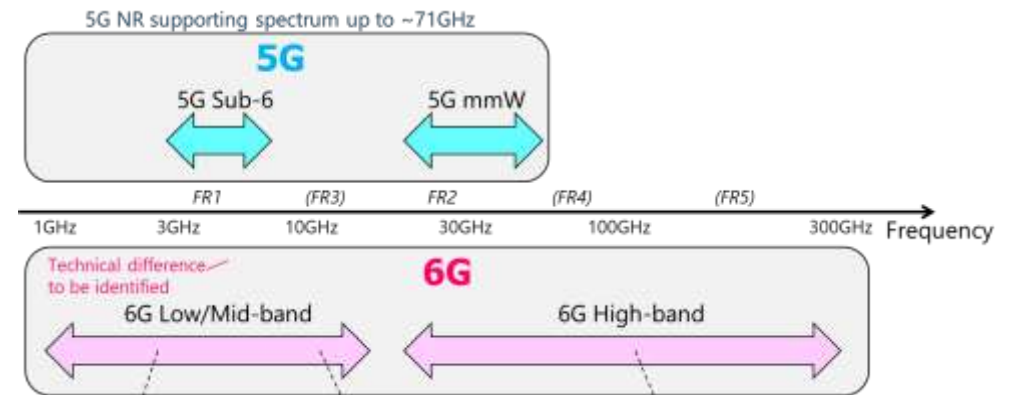


<https://www.ntt.com/en/lp/5g/>

mmW use for accurate sensing  
 - Joint communication & sensing -

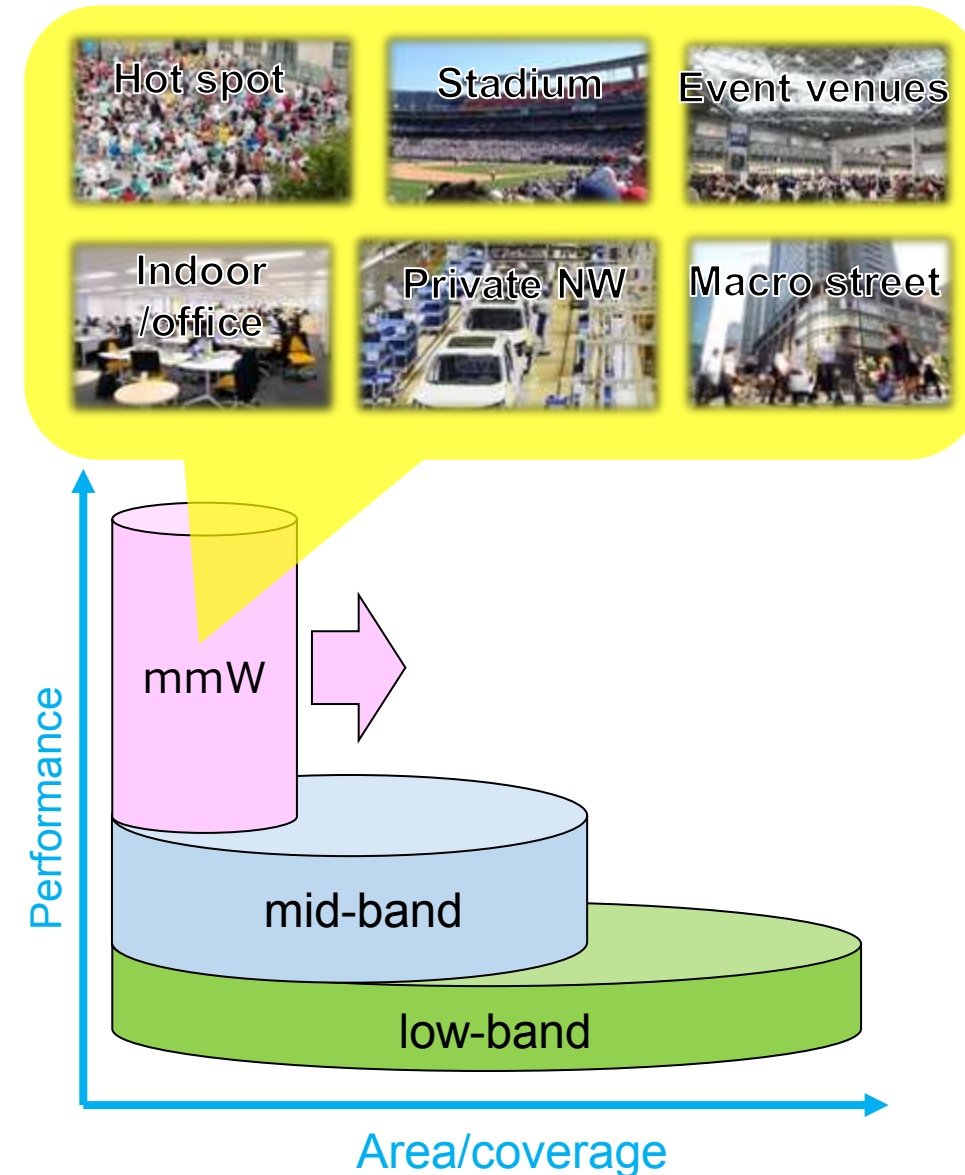


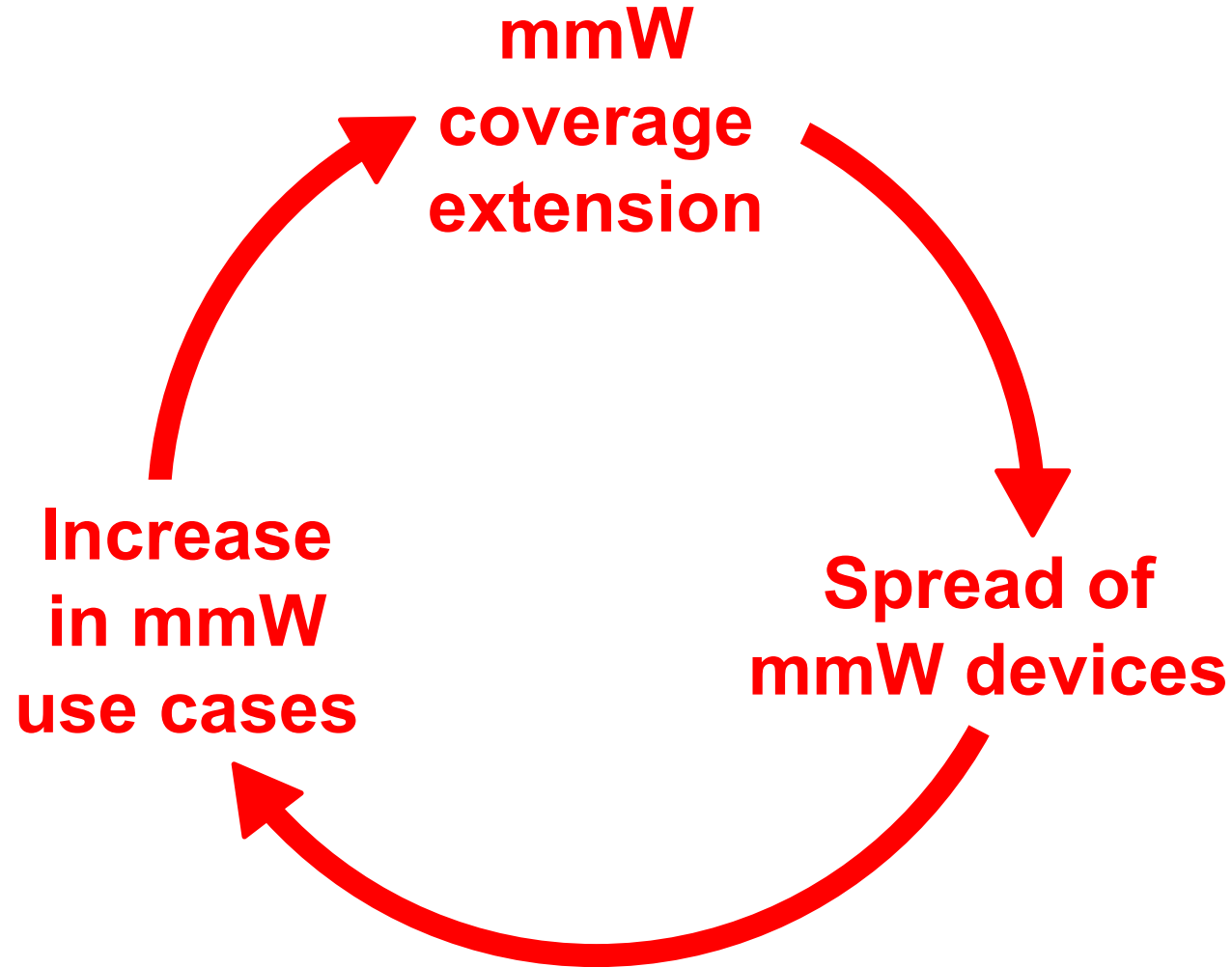
An initial accomplishment that opens the way for mmW and sub-THz development in 6G era



# 5G Frequency Deployment Scenarios

- Considering various use cases, functions and frequency bands to deploy 5G needs to be chosen appropriately
- mmW deployment utilizing mmW characteristics
  - Initial phase: smaller and closed area where higher performance required
    - Hot spot/Stadium/event venues
    - indoor/office
    - Private NW/Local 5G
    - Macro street
  - mmW area to be extended according to spread of mmW devices and increase in needs for higher performance





- Cost reduction
  - Price of mmW radio devices and RU
  - Cost for RU installation
  - New radio NW solutions, e.g. reflectors
- Spread of CPE, which can improve UL performance
- Promotion of emerging high-quality services, e.g. XR, 8K
- Create new mmW use cases

## Antenna technologies



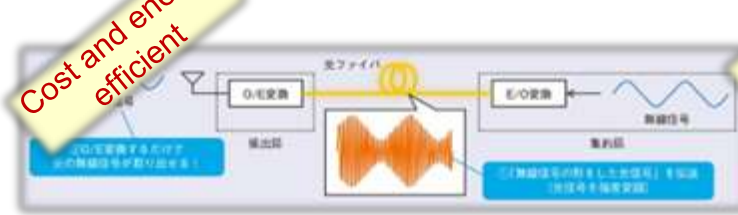
On-glass antenna



Pinching antenna

## Radio x-haul

Cost and energy efficient



Radio on Fiber(RoF)

Super high speed  
Super high capacity



OAM-MIMO multiplexing.

## Radio repeater technologies

Easy & ready to use



mmW repeater system

Easy & ready to use  
Power supply free



Passive reflector

Easy & ready to use  
Energy efficient



RIS reflector

Inconspicuous  
Power supply free



Meta-surface lens

# Activities for mmW promotion in Japan

- **5G Business Design WG** was established by MIC in this January to explore 5G business utilizing mmW, etc.
  - Major operators including DOCOMO and vendors were invited and provided their presentations on mmW
  - All of members expressed issues and positive opinions for mmW deployment
- **mmW Promotion Ad Hoc** was established in 5G Mobile communications promotion Forum(5GMF) to promote mmW deployment through activities to;
  - develop White Paper
  - develop applications/services utilizing mmW and appeal to stakeholders and industries
  - organize events on mmW





## ■ Objective

- Promotion of mm Wave
  - to provide high quality communications services for industries
  - to solve social issues
  - as prerequisite condition to allocate additional frequency bands



## ■ Action plan

- Develop White Paper
  - Ver. 1.0 by the end of March 2023
  - Ver. 2.0 by the end of June 2023
- Organize mmW events, such as talk session, exhibition

Changing worlds with you.

<sup>NTT</sup>  
docomo



# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Philippe Poggianti**  
Vice President, Business Development  
Qualcomm



**GSMA™**

**GSMA™**  
**Intelligence**

# Deploying 5G mmWave to unleash the full 5G potential

Philippe Poggianti

Vice President, Business Development

Qualcomm France S.A.R.L

United States

AT&T | T-Mobile | Verizon | US Cellular



5G

Denmark, Finland  
Norway, Sweden

United Kingdom  
France

Germany

Spain

Italy  
Greece

5G

5G

5G

5G

5G

5G

Brazil

5G

India

5G

China

5G

Thailand  
Indonesia  
Vietnam

5G

5G

5G

2

Japan

Docomo | KDDI |  
Rakuten | Softbank

Australia

Optus | Telstra | NBN  
TPG Telecom/Vodafone

5G

3

5G Strategic Pillars  
using 28GHz

5G n258 band 5G  
mmWave (26GHz)

Confidential - Qualcomm Technologies, Inc. and/or its affiliated companies - May Contain Trade Secrets



Australia is the 3<sup>rd</sup> pillar opening up the "26GHz market"

China, India, Europe being part of 26GHz market (3GPP n258 band)

## Fixed wireless access

Urban cities, suburban towns, rural villages



## Indoor/outdoor venues

Stadiums, Shopping malls, Busy streets, music venues



## Transportation hubs

Train terminals, subway stations, airports



## Indoor enterprises

Offices, auditoriums, education campuses



## Industrial IoT

Factories, warehouses, logistic hubs



Bridge digital divide

Best Quality of Experience in high-density areas

Free up mobility and power hybrid work

Unleash Industry 4.0

## 5G smartphones



## PCs



170+  
5G mmWave devices  
launched or announced  
by 65+ vendors

Source: GSA, Dec. 2022

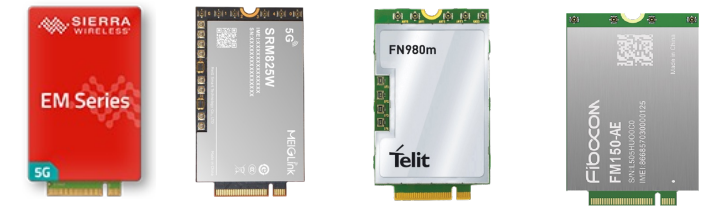
## Hotspots & IoT



## CPEs

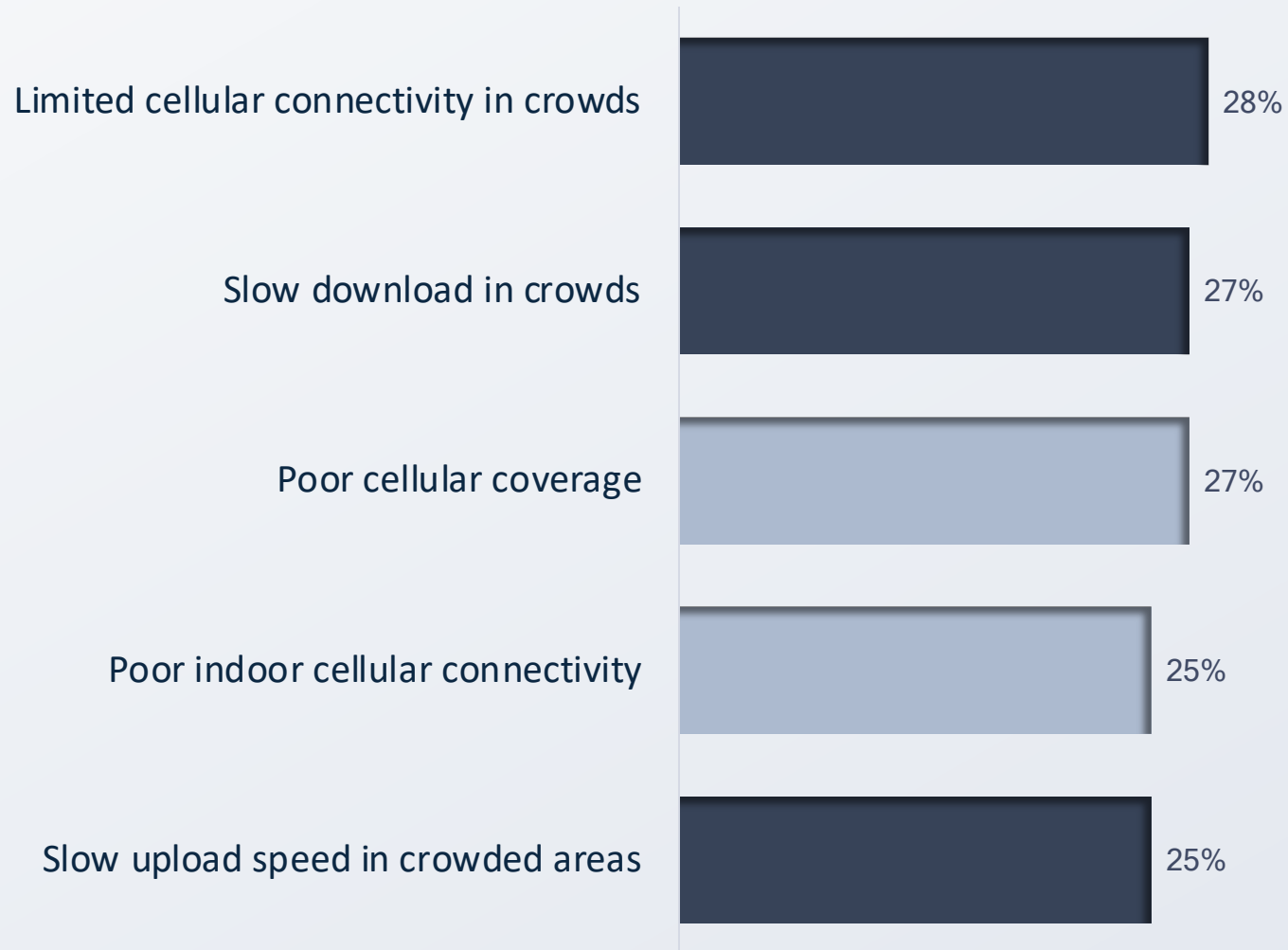


## Modules



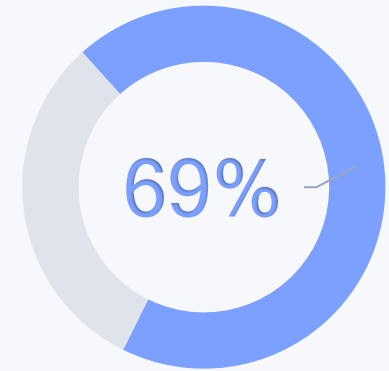
Expanding breadth, availability of 5G mmWave devices

# 3 out of 5 top connectivity pain points related to crowded areas



Pain points drive interest in 5G mmWave Service

Connectivity Issues  
At least weekly in crowded areas



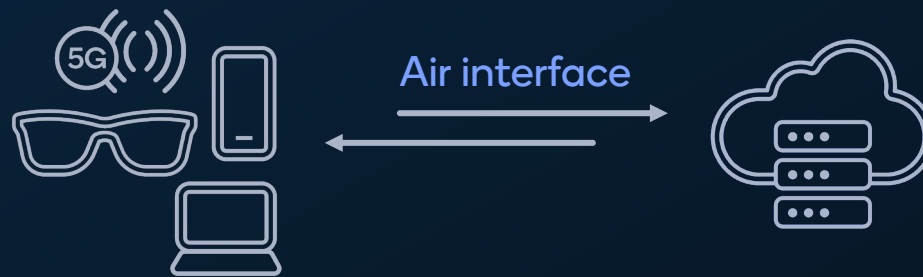
Will pay a premium for 5G Enhanced Service

76%

Screening Requirements:  
Min 50% experience cellular issues at least a few times a year



# Latency from air interface can impact user experience



# 5G mmWave + mid-band = best possible QoE wherever people are

5G mmWave can deliver more **uniform user experiences** even in congested network

5G mmWave delivers on the promise of **extreme capacity** and **blazing-fast speeds** under heavy network loads



Stadiums



Train Stations

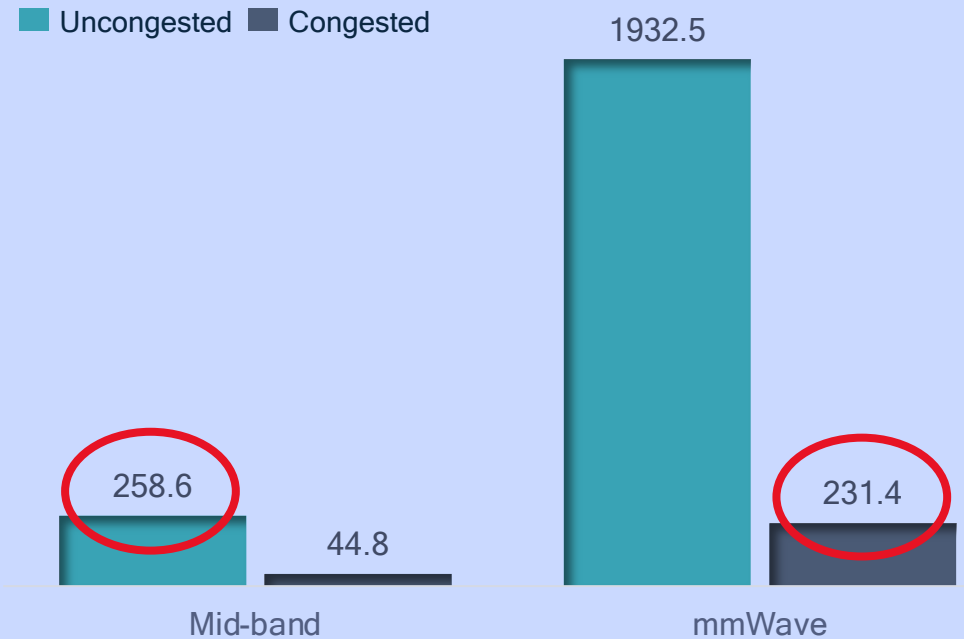


Indoor malls

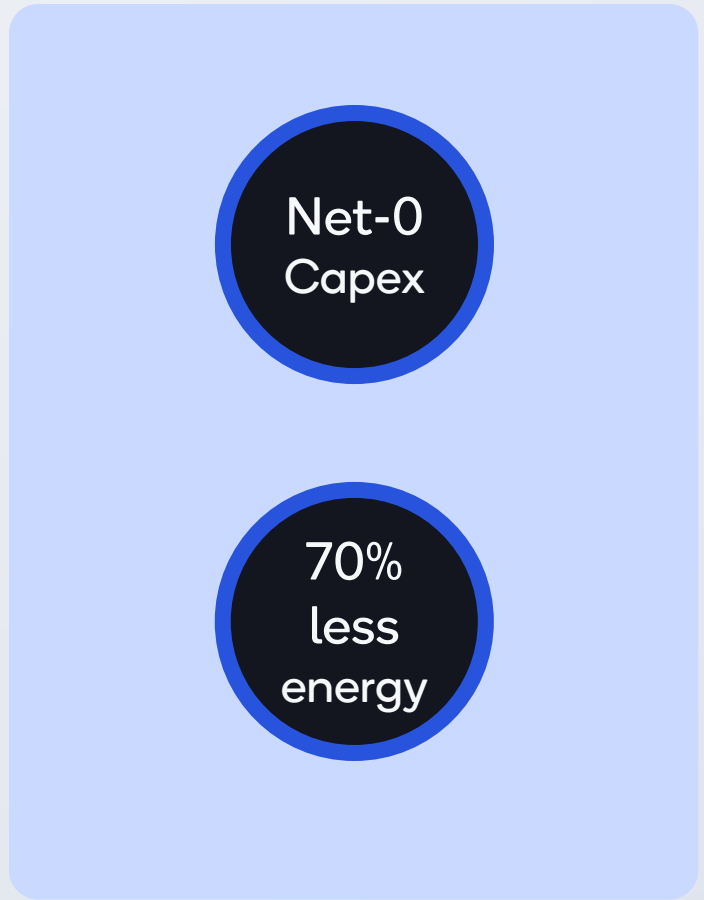
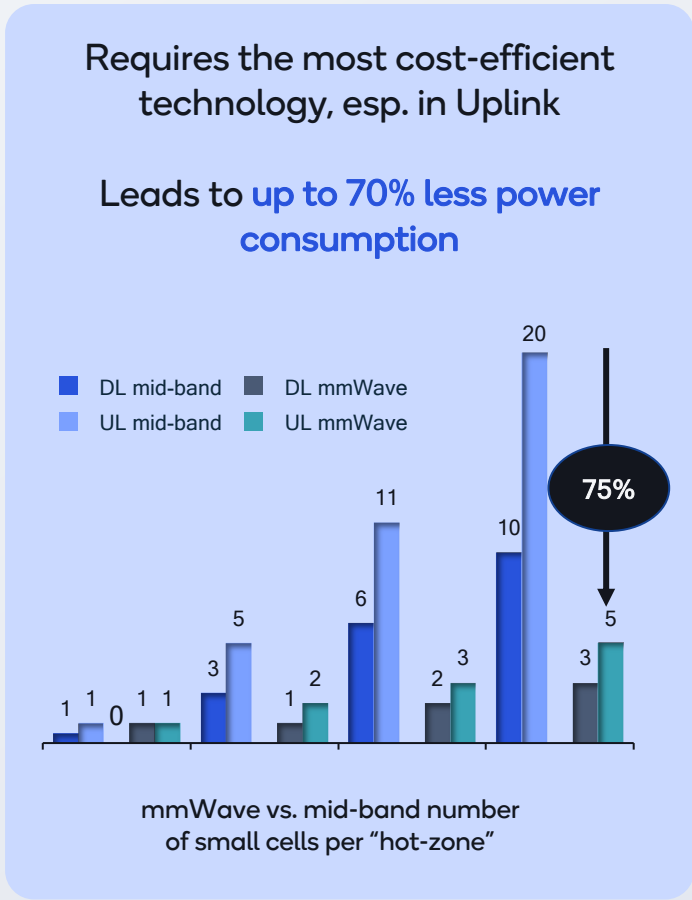


Outdoor hot zones

### Median download throughput (Mbps)



# 5G mmWave in "islands of capacity" positions the operator as a quality leader, cost-efficiently



\* Subscribers able to experience mmWave daily. \*\* Hypothetical UK operator with 30% market share  
 Source: Qualcomm Technologies and Bell Labs Consulting study, April 2022

# Intelligent 5G mmWave network planning

Demonstration at Qualcomm Technologies booth - Hall 3

## Manchester, England

Test location: 6.8 sq km

Densification with Sub-7 GHz macro cells

**54**  
Sub-7 GHz macro cells

**+ 14**  
Sub-7 GHz macro cells

Densification with 5G mmWave small cells

**54**  
Sub-7 GHz macro cells

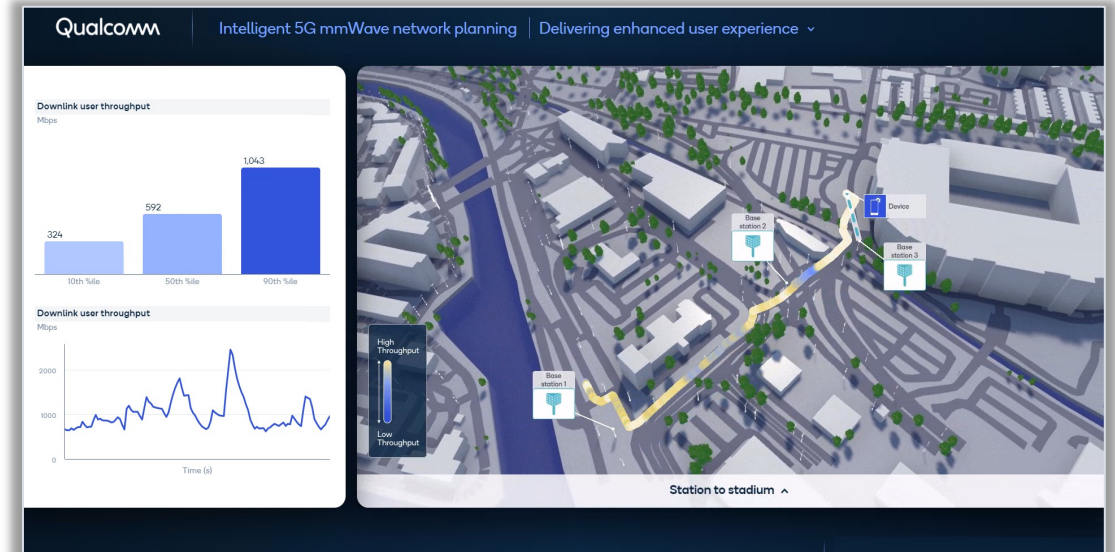
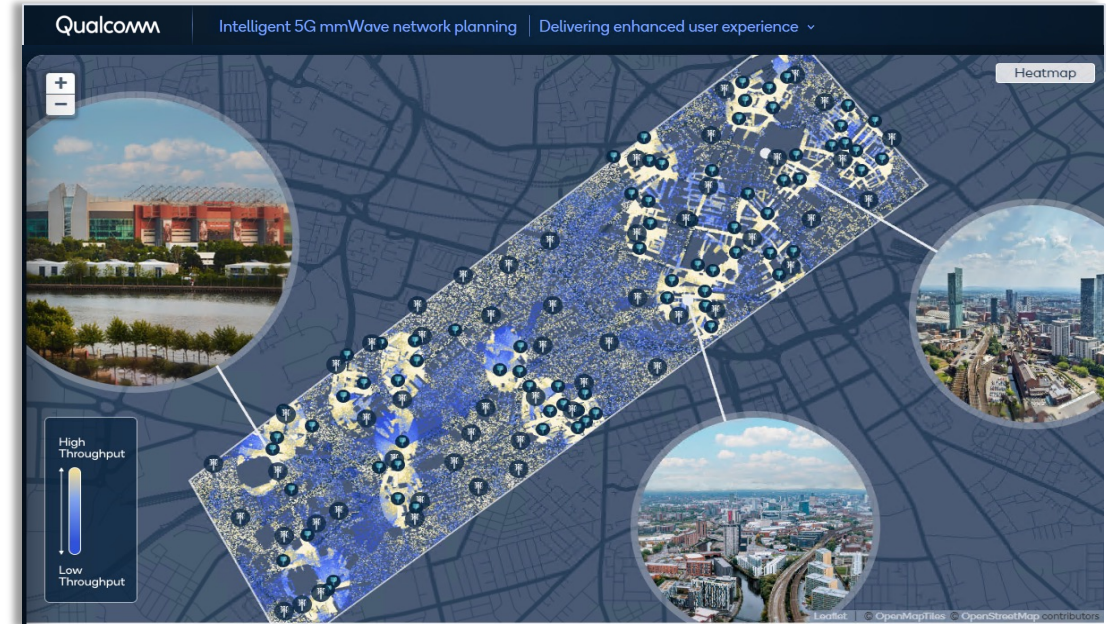
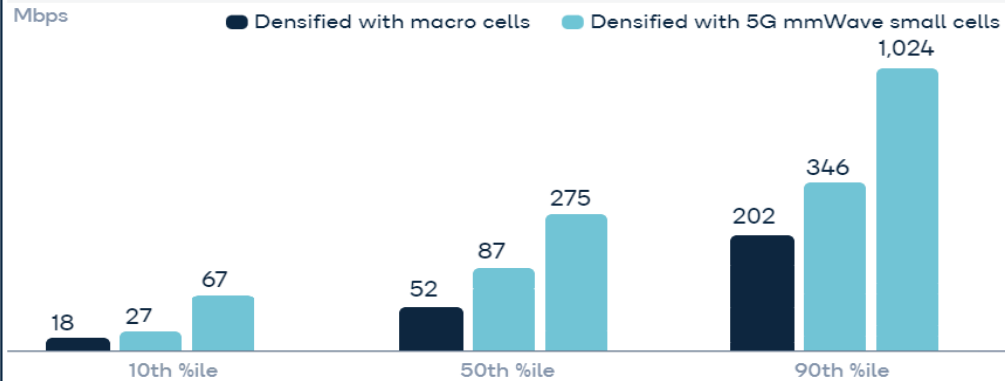
**+ 14**  
5G mmWave pole-mounted small cells

Densification with 5G mmWave small cells

**54**  
Sub-7 GHz macro cells

**+ 77**  
5G mmWave pole-mounted small cells

### Downlink user throughput



# 5G mmWave in Europe



TIM  
Italy



City of Tampere  
Finland



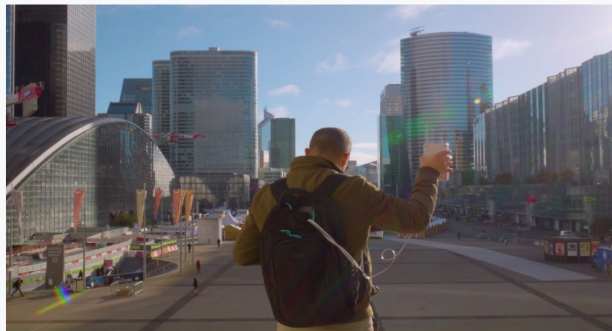
SNCF Rennes  
France



University of Dresden  
Germany



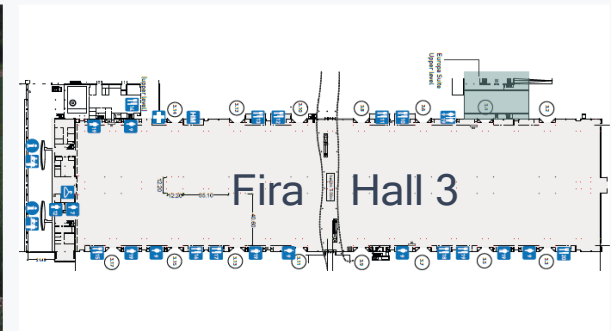
France Television  
France



Paris La Defense  
France



Dorset Council  
UK



Telefonica, Barcelona  
Spain



5G  
mmWave

## A mature ecosystem

1. Commercial in all parts of the world
2. Mature device and infrastructure ecosystem
3. Subscribers want more capacity in crowded locations
4. 5G mmWave is the cheapest solution to cope with it
5. More to come for consumers and businesses in Europe
6. See you on our booth!

# Thank you



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[snapdragon.com](http://snapdragon.com) & [snapdragoninsiders.com](http://snapdragoninsiders.com)

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# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Christian Leon**  
**Vice President, Network and Managed  
Services, Europe & Latin America**  
**Ericsson**



**GSMA™**

**GSMA™**  
**Intelligence**



# mmWave

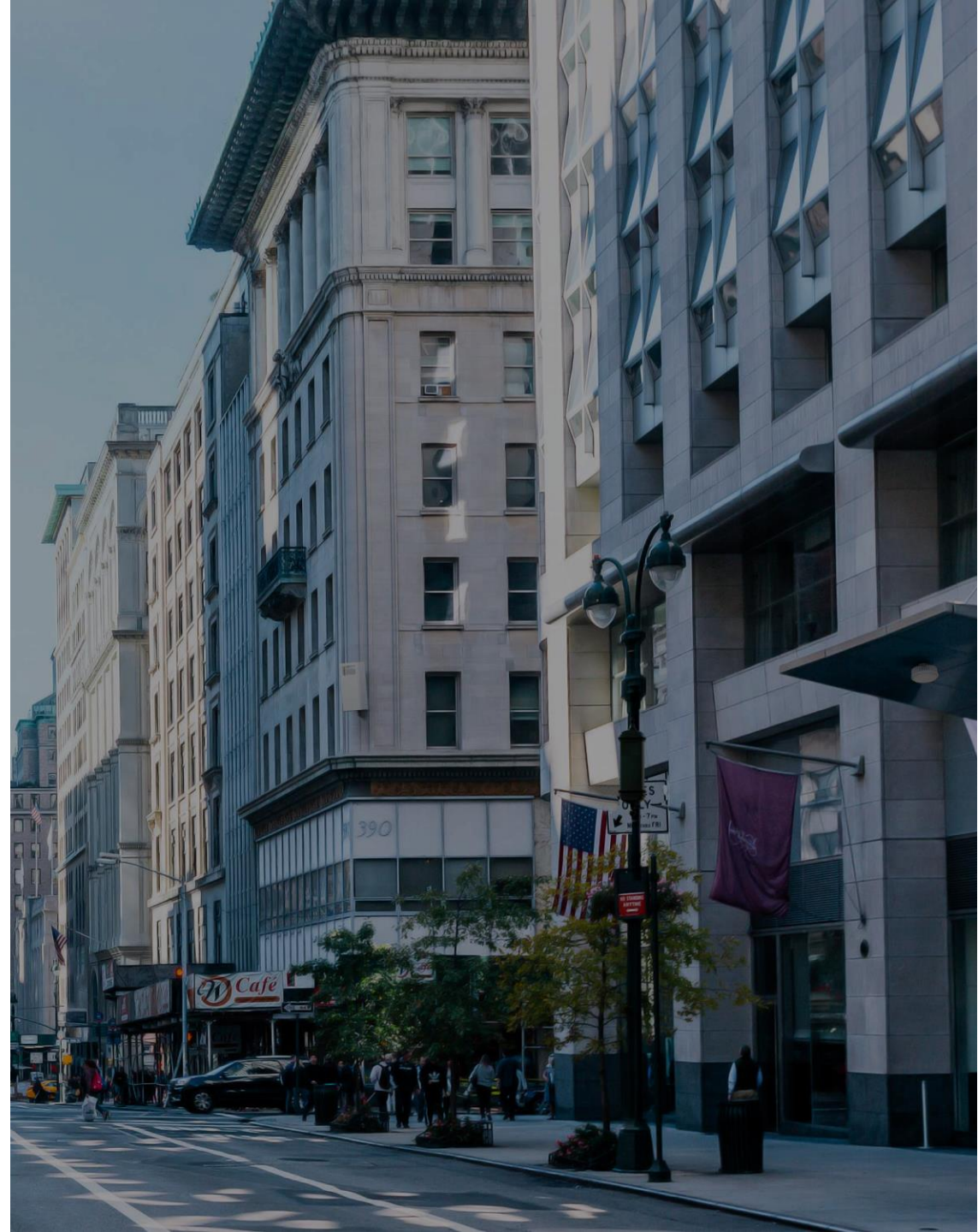
Use cases

Performance

Ecosystem

Ericsson portfolio commitment

Christian Leon - Ericsson

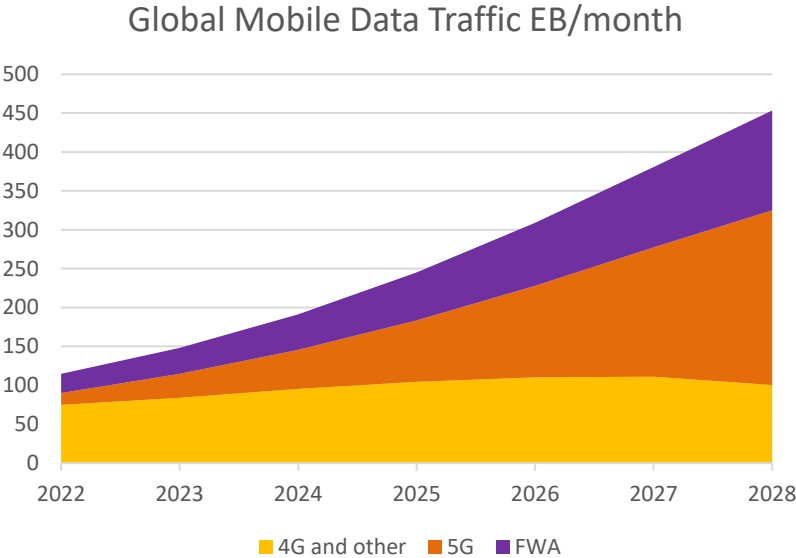


# mmWave in high traffic areas secures performance when capacity demands grow

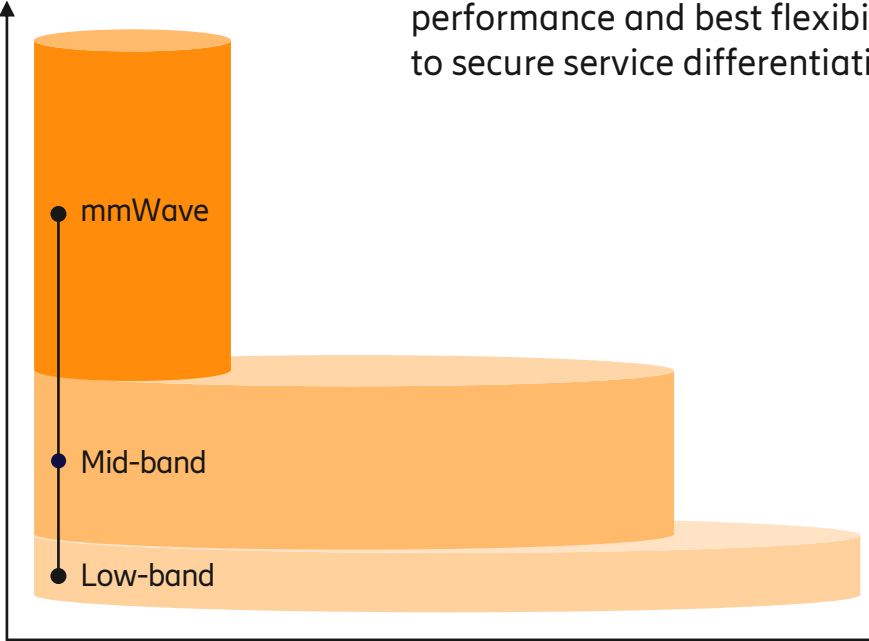


4x

Total mobile data traffic to grow globally to 2028



Bandwidth



10x more spectrum with mmWave, defined and ready

mmWave devices from all vendors, field proven

# mmWave deployment

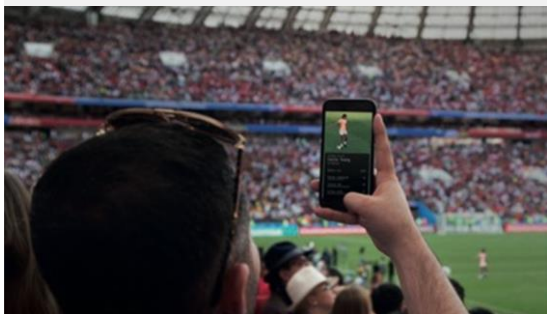


## Enhanced Mobile Broadband

### Hot capacity Spot

All Customers

- Performance + capacity
- Indoor & outdoor



### City macro sites

Japan, Australia

- Leverage existing sites
- Spotty coverage



## Fix Wireless Access

### Street sites

US, Australia

- Densify for best coverage
- Urban + Suburban



### Macro tower

Europe, US

- Coverage targeting FWA customer



# mmWave deployment – Superbowl 57

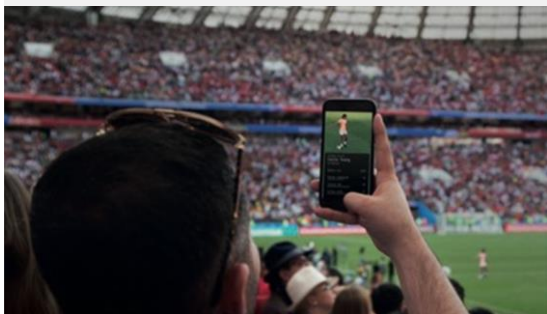


## Hot capacity Spot

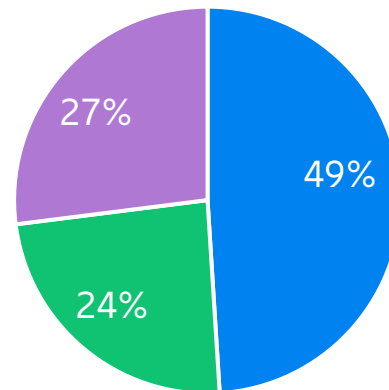
All Customers

→ Performance + capacity

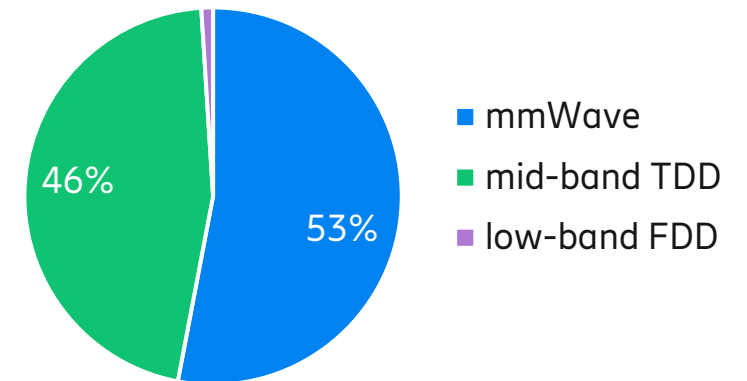
→ Indoor & outdoor



Radio distribution per band



Traffic distribution per band



- mmWave
- mid-band TDD
- low-band FDD

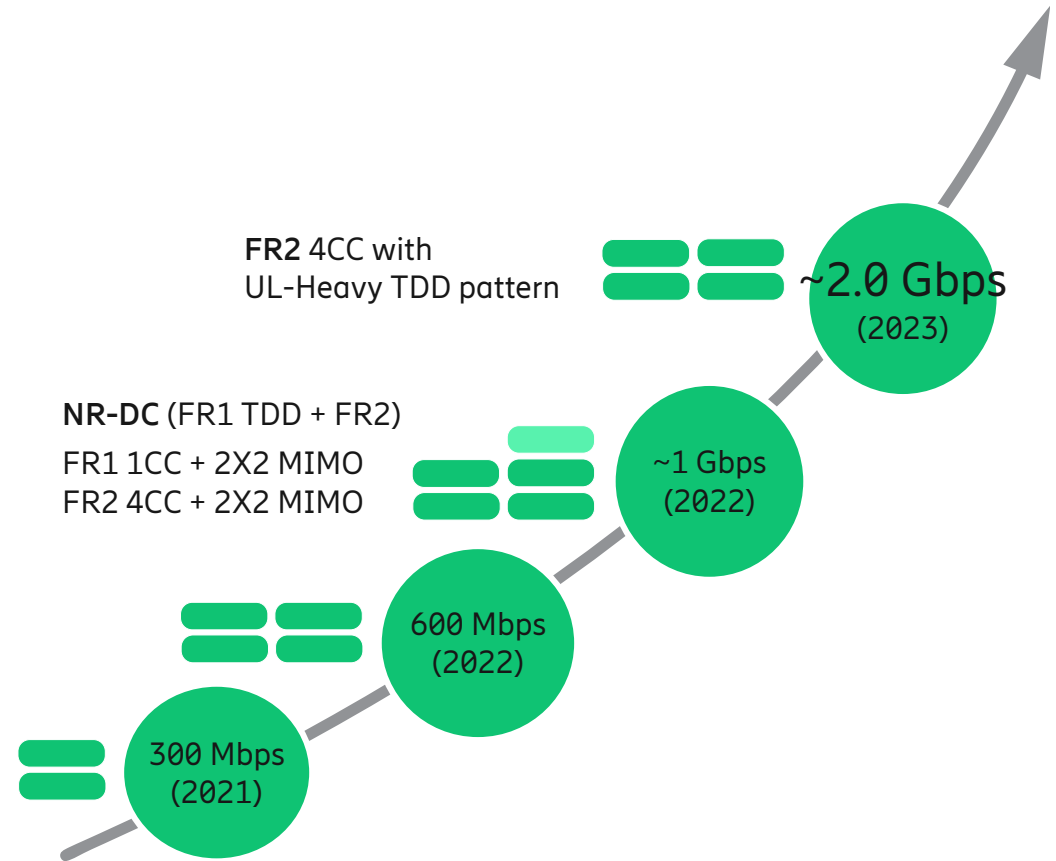
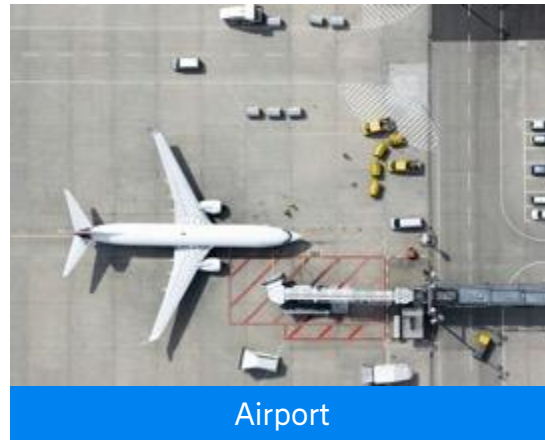
mmWave is built for high-capacity locations

# mmWave FWA performance (28GHz)

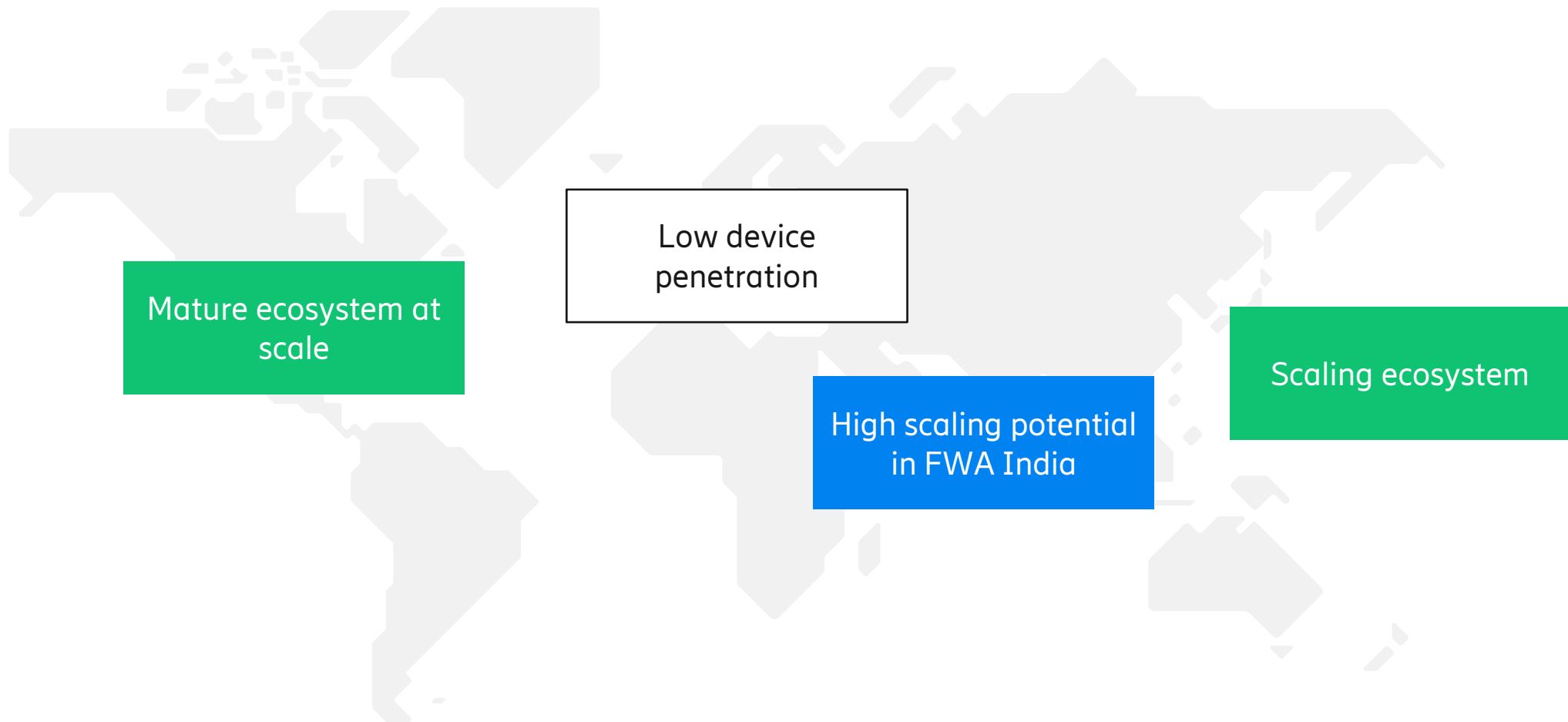


# mmWave 5G technology for industries

## disruptive Up Link



# Scaling into in new geographies







# 5G mmWave Summit

## Accelerating into 2023 & Beyond

**Eduardo Fichmann**  
**Innovation & Product Strategy**  
**Global Director**  
**Cellnex**





## Reinventing business districts with 5G mmWave

5G mmWave Summit, MWC'23

**Eduardo Fichmann**

Innovation & Product Strategy Global Director  
Barcelona, 1st March 2023

# Agenda for today

- 1. Background**
- 2. Overview of the trial**
- 3. Next Steps**

# Cellnex, Europe's leading operator of wireless telecommunications infrastructures

NETHERLANDS

**4,316**  
sites

UNITED KINGDOM

**14,411**  
sites

IRELAND

**2,474**  
sites

FRANCE

**28,777**  
sites

PORTUGAL

**6,837**  
sites

SPAIN

**11,323**  
sites

DENMARK

**1,881**  
sites

SWEDEN

**5,177**  
sites

POLAND

**21,128**  
sites

SWITZERLAND

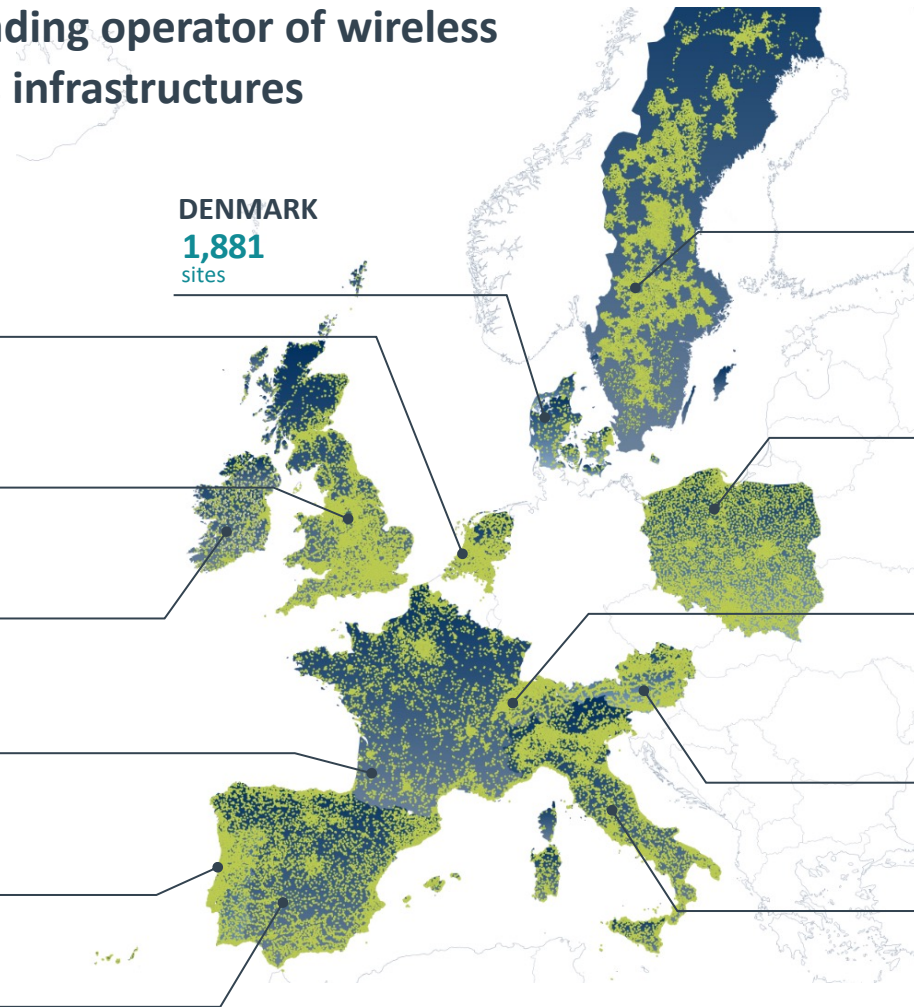
**6,187**  
sites

AUSTRIA

**4,922**  
sites

ITALY

**26,635**  
sites



# Project background: Promoting mmWave, active neutral host infrastructure in metropolitan areas in France

In January 2019, the French Government and Arcep (French telecom Regulator) issued a joint call for the creation of 5G trial platforms that would be open to third parties, and using the 26 GHz band

Aim: pave the way for all players to embrace the possibilities this frequency band provides, and to discover new uses for 5G.



 <b>Cité des sciences et de l'industrie</b> Universcience, Nokia	 <b>Vélodrome national de Montigny-le-Bretonneux</b> Saint-Quentin-en-Yvelines, Nokia, Qualcomm, France TV
 <b>Gare de Rennes</b> Orange, SNCF	 <b>Châtillon</b> Orange
 <b>Nozay</b> Alcatel-Lucent International	 <b>Puteaux</b> Paris la Défense
 <b>Gare de Lyon Part-Dieu</b> Bouygues Telecom, SNCF	 <b>Saint-Priest</b> Bouygues Telecom

# Paris la Defense, the perfect playground to test 5G mmWave

## 1st district business in Europe

- 42,000 inhabitants, 180,000 workers
- 500 companies, 150 restaurants
- Shopping centers
- Train and metro stations
- La Défense Arena, Europe's largest indoor concert hall

## Key Challenges:

- How to satisfy the growing demand of network capacity?
- How to minimize the impact of deploying new telco infrastructure?



# Cellnex France partner with Paris La Défense, the iconic business district in France, to deploy a 5G mmWave neutral host network

**Validate neutral host** as an efficient deployment model that allows the sharing of antennas and infrastructure in dense urban areas

**5G**  
mmWave  
(26 GHz)

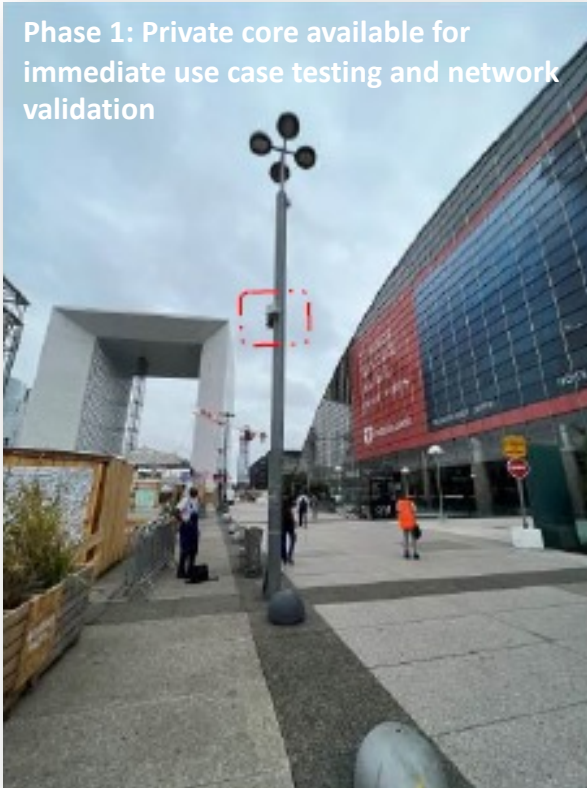
**Transforming La Défense square into a 5G mmWave sandbox** to test new use cases in smart city, mobility, events coverage and more.

## Consortium partners:



# Cellnex deployed a 5G NSA mmWave smallcells in Paris La Défense square providing ultra high speed, capacity and reliable network

Phase 1: Private core available for immediate use case testing and network validation



3 sites 26GHz (n258) w/ 2-sectors, up to 800MHz bandwidth;



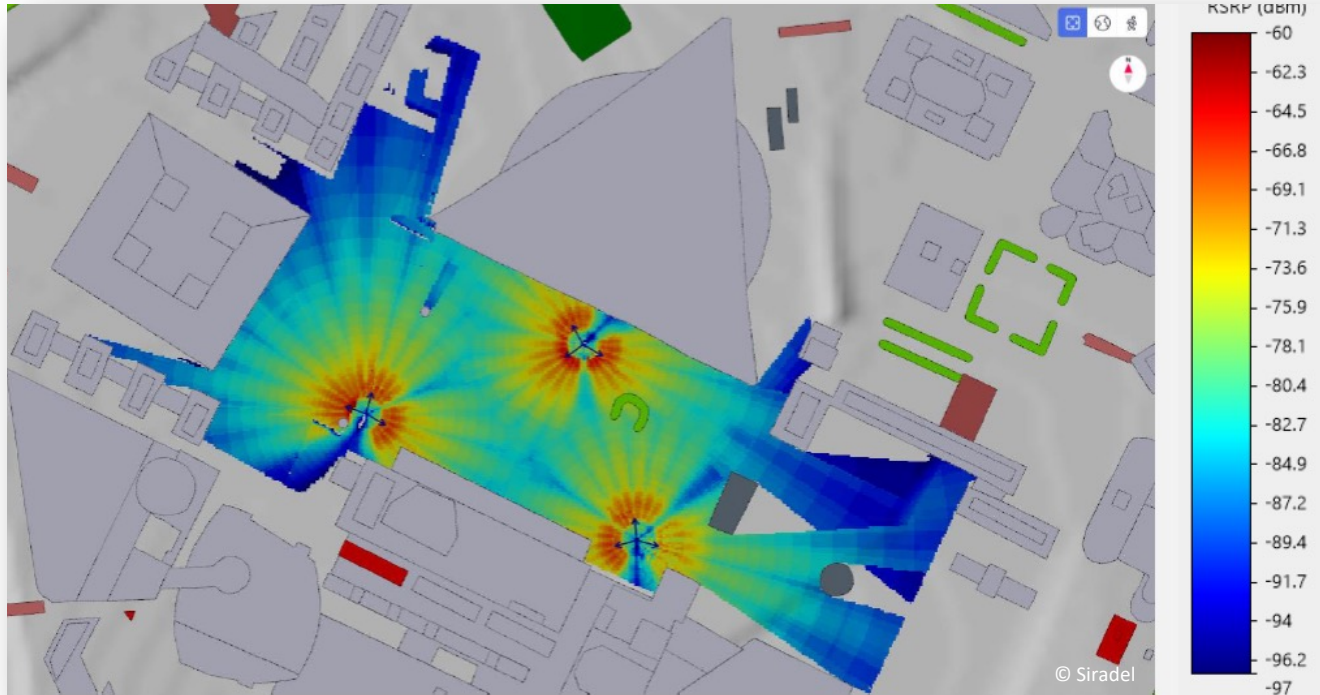
1 Site LTE for Anchor band – 2,6 MHz  
TDD 20MHz BW

Phase 2. MOCN RAN Sharing





The project is enabling Cellnex to understand how to maximise 5G coverage to support crowds of people on immersive 5G experience



# Next steps: replicate the model across Cellnex footprint



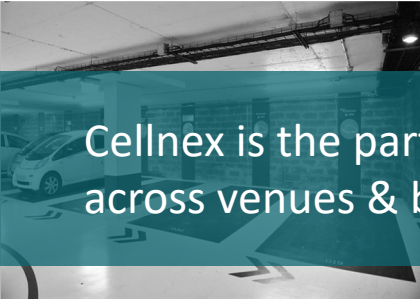
Underground



Railway



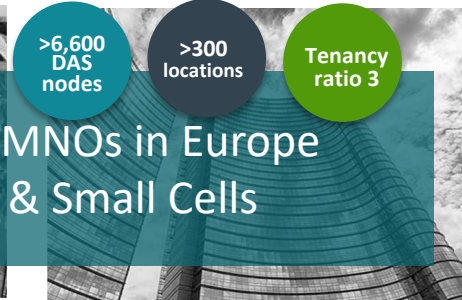
Stadiums, Sport & Concert Halls



Parkings



Retail



>6,600  
DAS  
nodes

>300  
locations

Tenancy  
ratio 3

Offices & Large Buildings



Hospitals



Tunnels



Airports



Downtowns and Hot-spots

Cellnex is the partner of choice for most MNOs in Europe across venues & buildings to deploy DAS & Small Cells

Salt.

PLAY



Telefonica



iliad



free



# Thank you!

[www.cellnex.com](http://www.cellnex.com)

# 5G mmWave Summit

**Thank you**

**We look forward to seeing you next time**