# INTERNATIONAL PANEL

Moderator:
Prakash Moorut (Shure)

(WInnForum Chief Regulatory Officer)

2 December 2021

## Panelists:

1. Christopher Hose (ACMA/Australia)
2. Harin Grewal (IMDA/Singapore)
3. Eric Fournier (ANFR/France)
4. Martin Fenton (OFCOM/UK)
5. Shalini Periyalwar (ISED/Canada)
6. Agostinho Linhares (Anatel/Brazil)

# WInnForum Regulatory Advisory Committee

## Main goals are to:

- facilitate the exchange of knowledge on technical topics, not to advocate for one policy position or another.
- help Forum members better understand emerging regulatory trends across all ITU regions.
- help the advisors understand emerging technologies that may impact or be impacted by the regulatory landscape.

## Meetings:

- A conference call every 2-3 months.
- Face-to-Face meeting that suits the majority of proposed advisory committee members if possible.

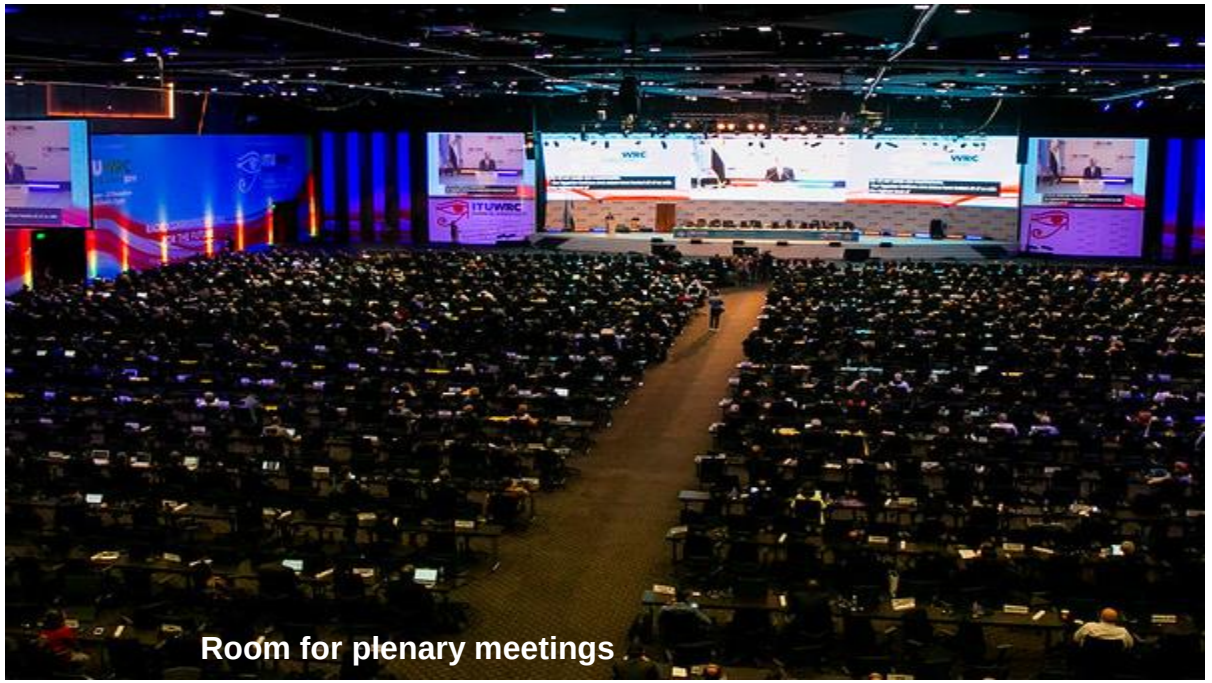
## 2021 Topics:

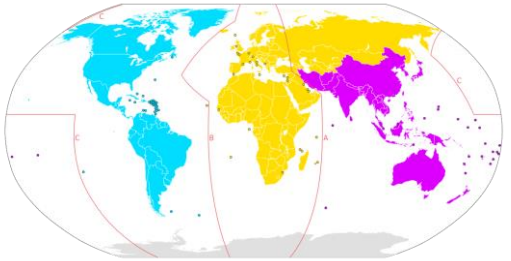
1. 2/9: German regulator, BNetzA, Licensing framework 3.7-3.8 and 26 GHz in Germany, (Josch Luxa)
2. 3/22: French regulator, ANFR, Spectrum Monitoring with drones in France, (Catherine Gabay, Frédéric Couturier)
3. 6/7: Spectrum outlook in Saudi Arabia, (Noel Kirkaldy from Nokia)
4. 9/27: ETSI enhanced Licensed Assisted Access (eLSA), (María Pérez from Sennheiser)
5. 11/4: Canadian regulator, ISED, Update on 3.8 / 6 GHz rules, (Mark Saunders, Shalini Periyalwar)

# World Radiocommunication Conferences (WRCs)

- **WRCs take place every 3-4 years, decide the changes in spectrum regulations.**
- **Set the agenda for next WRC.**
- **WRC of 2019 in Egypt in numbers:**
  - 4+ years of work
  - 4 weeks (Oct 28, 2019 – Nov 22, 2019)

  (+ 1 week of Radio Assembly before + 1 week of next Conference Prep Meeting after)
  - Around 3400 participants, 164 Member States
  - More than 20 agenda items and issues
- **WRC of 2023 in United Arab Emirates on 20 Nov-15 Dec 2023.**
  - Agenda Item 1.2: 6 425-7 025 MHz (EMEA, Russia), 7 025-7 125 MHz (global)



ITUWRC
SHARM EL-SHEIKH2019
28 October - 22 November 2019
Sharm El-Sheikh, Egypt

Source: https://en.wikipedia.org/wiki/File:International_Telecommunication_Union_regions_with_dividing_lines.svg#file

WInnForum Standards™

WIRELESS INNOVATION FORUM

# Presentations

Australian Government | acma Australian Communications and Media Authority

# ACMA Spectrum Management Update

WInnComm 2021

Chris Hose

# Outline

> What we have done

> What we are doing

> What is next

# Recently completed

- **Technical framework reviews**
  - 2.3 GHz, 3.4 GHz
  - General updates, including compatibility with AAS
- **26 and 28 GHz allocations**
  - Support for wireless broadband and satellite
  - Use of new ‘area wide licence’ construct
- **850/900 MHz**
  - Planning completed, finalisation of technical frameworks

# Underway

- **Technical framework reviews**
  - 1800 MHz
- **6 GHz**
  - Consulting on LPI, VLP RLANs in 5925-6425 MHz
- **3.7-4 GHz**
  - Planning, licensing and allocation arrangements for multiple uses/user
  - Wireless broadband coexistence with radioaltimeters
- **1880-1920 MHz review**
- **1980-2010/2170-2200 MHz**
  - Implementing support for 2 by 5 MHz for narrowband MSS
- **5 GHz RPAS**
- **850/900 MHz**
  - Allocation

# Planned for the future

- **Technical framework reviews**
  - 700 MHz, 2.1 GHz and 2.5 GHz
- **6 GHz**
  - Further investigate 6425-7125 MHz – RLAN?
  - Investigate possibility of AFC/database sharing across some or all of the band
- **1.5 GHz review**
- **1980-2010/2170-2200 MHz**
  - Allocate 2 by 25 for MSS/CGC/DA2G (Q3 2023)

# Thank you

# REGULATORY UPDATE

2 DECEMBER 2021


**HARIN S GREWAL**

CLUSTER DIRECTOR

NETWORKS TECHNOLOGY & RESOURCE

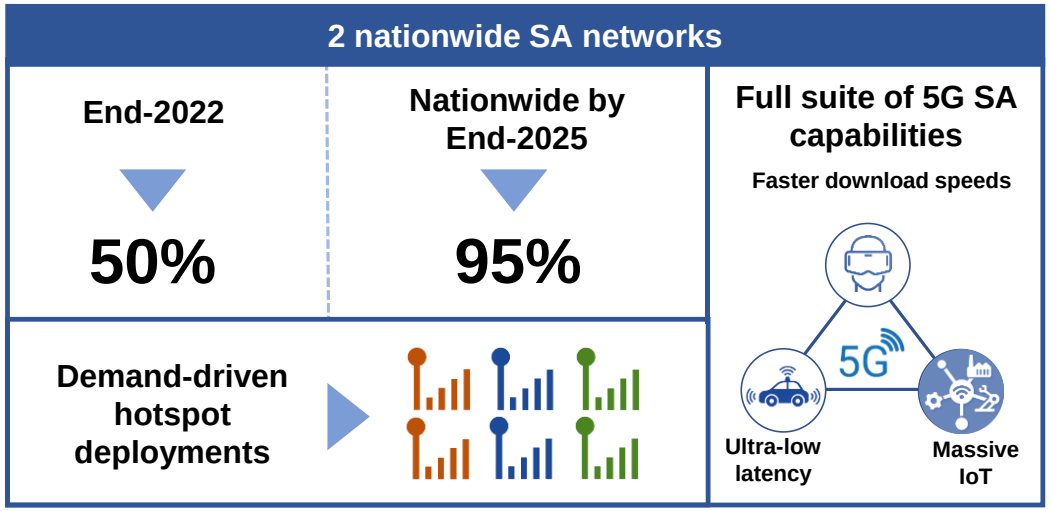
IMDA, SINGAPORE

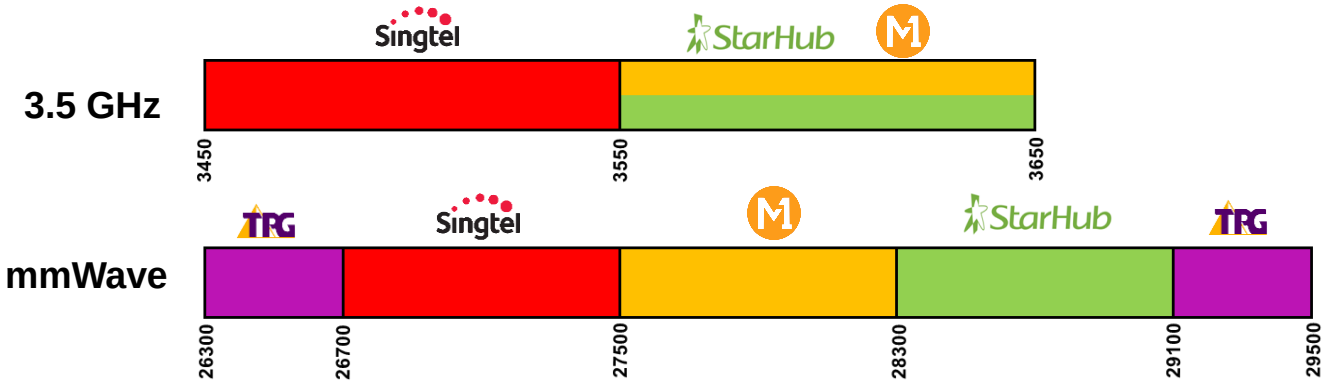

SG:D
EMPOWERING POSSIBILITIES

INFOCOMM MEDIA DEVELOPMENT AUTHORITY

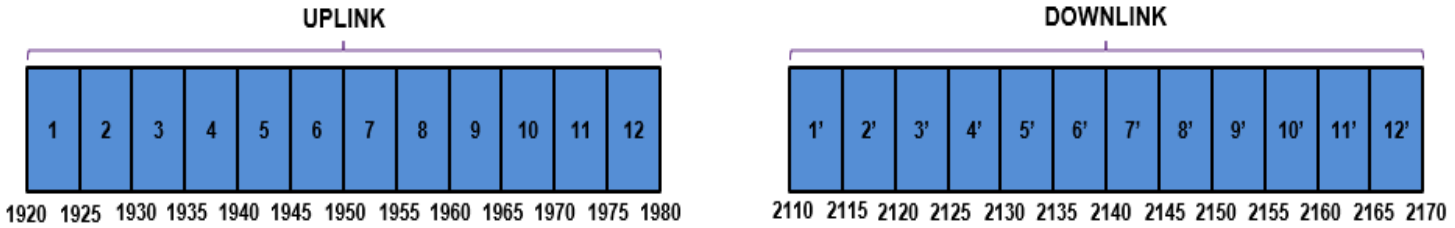
# 5G SPECTRUM IN SINGAPORE

- Singapore awarded 2 nationwide 5G networks in June 2020 via Call for Proposal to JVCo and Singtel




- 2.1 GHz to be allocated for 5G SA network via auction in Q4 2021
  - New spectrum rights for 5G SA will commence on 1 January 2022 for a period of 15 years

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# DEPLOYMENT OF COMMERCIAL NETWORK THROUGH 5G SPECTRUM ALLOCATION AND REGULATORY FRAMEWORK

**7 May 2017** — **Launched 5G Public Consultation**

**17 Oct 2019** — **Issued 5G Decision and started Call for Proposal (CFP)**

**24 Jun 2019** — **Concluded 5G CFP process**

- Winners were Singtel and the Joint-Venture Consortium (JVCo) formed by StarHub and M1
- SingTel and Starhub-M1 JVCo have been assigned 100MHz of 3.5GHz spectrum each
- SingTel, Starhub, M1 and TPG are also assigned 800 MHz of the mmWave spectrum for localised mmWave deployments

**1 Jan 2021** — **5G roll-out has started**

- Singapore is on track to meet our target of deploying 5G standalone outdoor coverage

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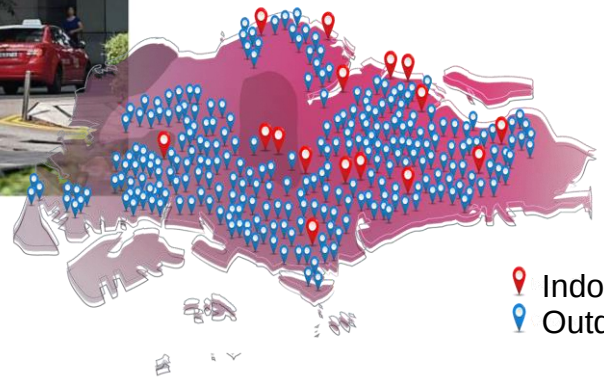
# SINGAPORE IS ON TRACK TO PROVIDE 5G COVERAGE TO HALF OF SINGAPORE BY END 2022


Singtel launches 5G SA network in Singapore

By Juan Pedro Tomás on MAY 25, 2021

https://www.rcrwireless.com/20210525/5g/singtel-launches-5g-sa-network-singapore

https://www.singtel.com/personal/products-services/mobile/5g#5g5



Indoor 5G
Outdoor 5G

M1 launches 5G standalone network with 50% coverage across the island

JULY 28, 2021 PUBLISHED AT 9:00 AM
By LIU HONGZUO | HARDWARE ZONE


https://www.asiaone.com/digital/m1-launches-5g-standalone-network-50-coverage-across-island

https://www.m1.com.sg/sites/true-5g/index

StarHub begins consumer market trial for its 5G standalone network

By Liu Hongzuo - on 4 Aug 2021, 6:39pm


https://www.hardwarezone.com.sg/tech-news-starhub-begins-consumer-market-trial-its-5g-standalone-network

https://www.starhub.com/5G

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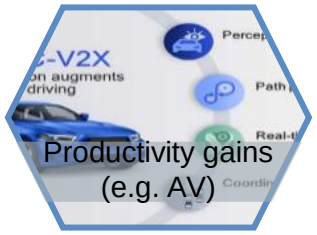
# SINGAPORE CONTINUES TO FACILITATE PERVASIVE DEPLOYMENT OF 5G NETWORKS

**Support industry use cases that accelerate 5G adoption and commercialisation**


Increased automation



Productivity gains (e.g. AV)


New business & market models

**Work with industry partners such as IBM, Samsung, Airbus, etc to create a vibrant 5G ecosystem**

IBM SAMSUNG AIRBUS

**Equip members of the Singapore workforce with relevant 5G skillsets**

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# SINGAPORE BEGINS THE BUILD-UP TO THE WORLD RADIOCOMMUNICATION CONFERENCE 2023 (WRC-23)

- **IMDA has organised the Singapore Preparatory Group Meetings to consult the industry and key stakeholders to identify and develop recommendations for key spectrum issues or areas of significant importance to Singapore in preparation for WRC-23**

- Several input contributions for the identified key WRC-23 agenda items at the APT Conference Preparatory Group for WRC-23 (APG-23) have been developed

ITU Committed to connecting the world


**<u>WRC-23 Agenda Item 1.7 on Space-based VHF Voice Comms</u>**

- Singapore is supportive of this agenda item which helps to overcome the limitations of ground-based VHF voice communications and for resilient Commercial Aviation Air Traffic Control (ATC) application over oceanic airspace

**<u>WRC-23 Agenda Item 1.2 on IMT identification in the 3 GHz, 6 GHz and 10 GHz bands</u>**

- Singapore is monitoring global developments especially in the 6 GHz and will determine the use of the band for Wi-Fi 6E or for mobile broadband in tandem with international technology adoption
- IMDA will consult the industry on their views


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# Spectrum regulation – hot topics

***Eric Fournier***

# Update on current actions in France

- **Regulatory: implementation of European harmonisation measures**
  - Authorization for WiFi 6 GHz (5925-6425 MHz)
  - Modifications of MFCN technical conditions for AAS in the bands 1-3 GHz
  - New BEM/Technology neutral approach for 900 MHz and 1800 MHz
  - Relaxation of the conditions to protect radars <3.4 GHz for microcell stations
  - Use of harmonised MFCN bands for drones – conditions to protect other services
  - Regulatory framework for 5G in 26 GHz (number of trials already in place)

- **Ongoing work on blockchain/database**
  - Increase use of blockchain for assignment/coordination of PMSE audio in major event
  - Testbed for the 6 GHz

# Europe: 3.8-4.2 GHz for 5G local-area network connectivity?

**RSPG** recommended “that MS investigate the possible use of the band 3.8-4.2 GHz for local vertical applications (i.e. low/medium power) while protecting receiving satellite earth stations and other existing applications and services”

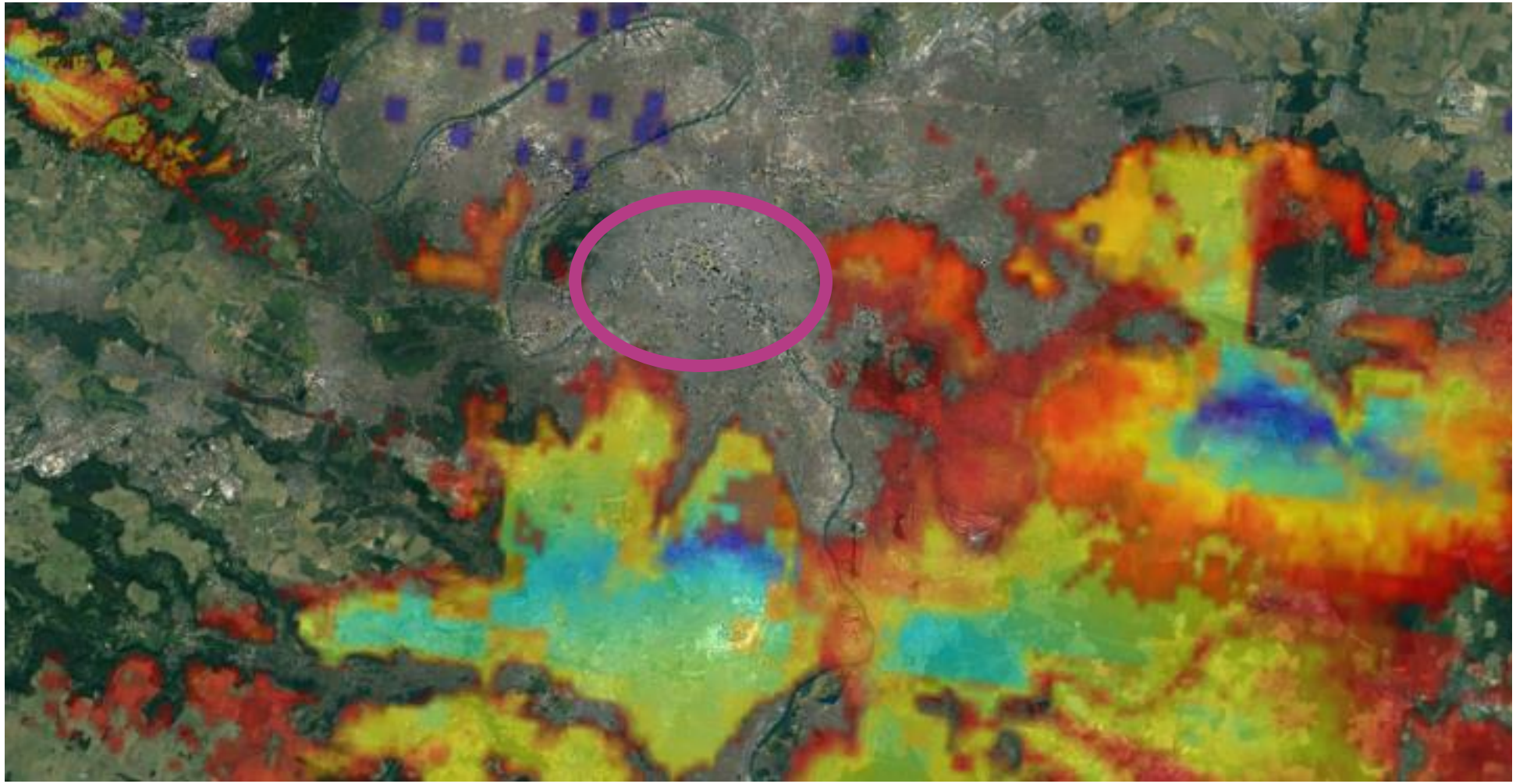
… a response  to the lack of European common mid-band for verticals: 2,6 GHz in France, 3,7 GHz in Germany/Sweden, 2,3 GHz

**New EC mandate to CEPT**

- Only low/medium power local-area networks (no macro-cells, no national coverage)
- Shared use : protection and future evolution and development of receiving satellite earth stations

**… Results in 2024**

# 3.8-4.2 GHz availability around Paris for 40 dBm/MHz + low antenna height 5G verticals (co-channel)



# The lower 6 GHz (5935-6425 MHz) for RLAN/WiFi

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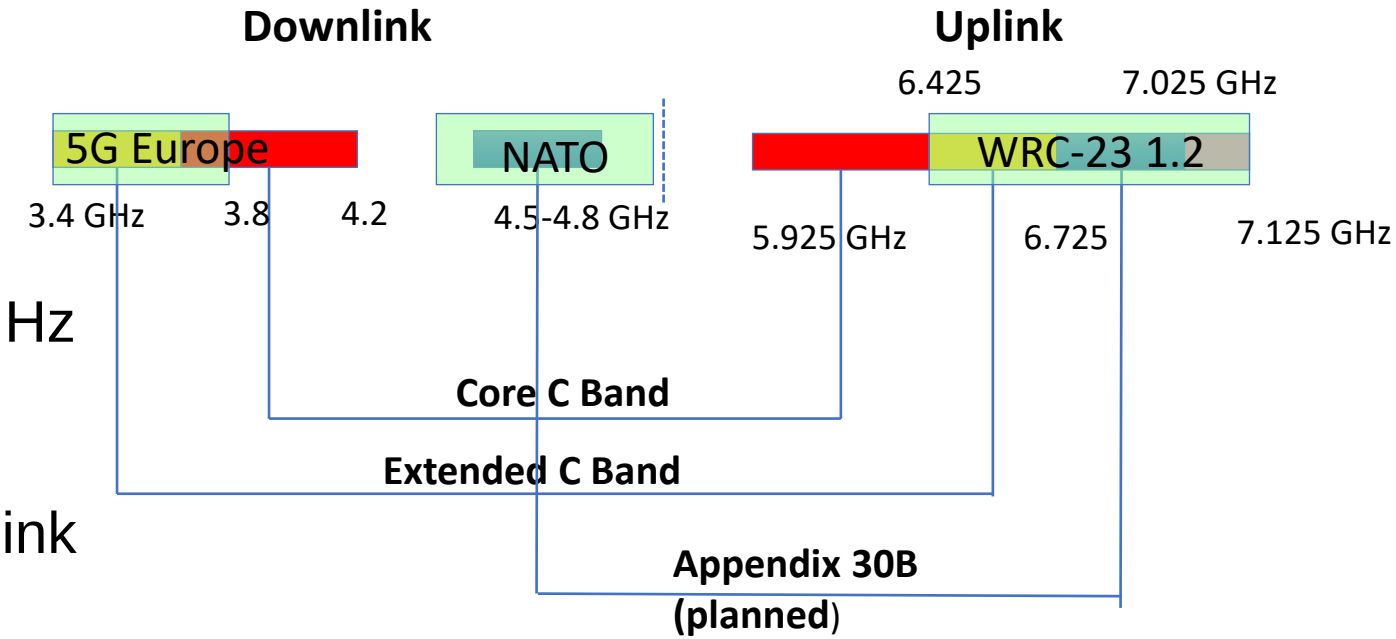
- **The lower 6 GHz** now harmonised in Europe for LPI (200 mW) and VLP (25 mW) … soon implemented in France
  - Ongoing issue for VLP unwanted emissions below 5935 MHz (ITS protection): -45 dBm/MHz, to be reviewed before 2025

- **Why not standard power (36 dBm) like in North America ?**
  - WiFi community wanted fast track approach for LPI/VLP … simple rules
  - No « experience » of AFC in Europe in other bands
  - Additional complexity: multiple countries – single market
  - Market for standard power ?

  … but, if needed, why not studying AFC/Standard power for Europe?

# 6425-7125 MHz: IMT or WiFi?

- **WRC-23 Agenda item 1.2**
  - 6425-7125 MHz for IMT in Region 1?
  - Initial request from Africa
  - Main issue: FSS uplink protection
    - International obligation (RR)…
    - But most satellites are 5925-6425 MHz (paired with 3700-4200 MHz)
    - ITU-R studies are diverging so far
  - Other services: fixed links, FSS downlink




- **RLAN/WIFI:**
  - Big fight between WiFi and IMT to access the band
  - Studies initiated in CEPT  on coexistence between WiFi and other services (inc.IMT)
  - Europe will consider in 2024 WRC-23 and studies results

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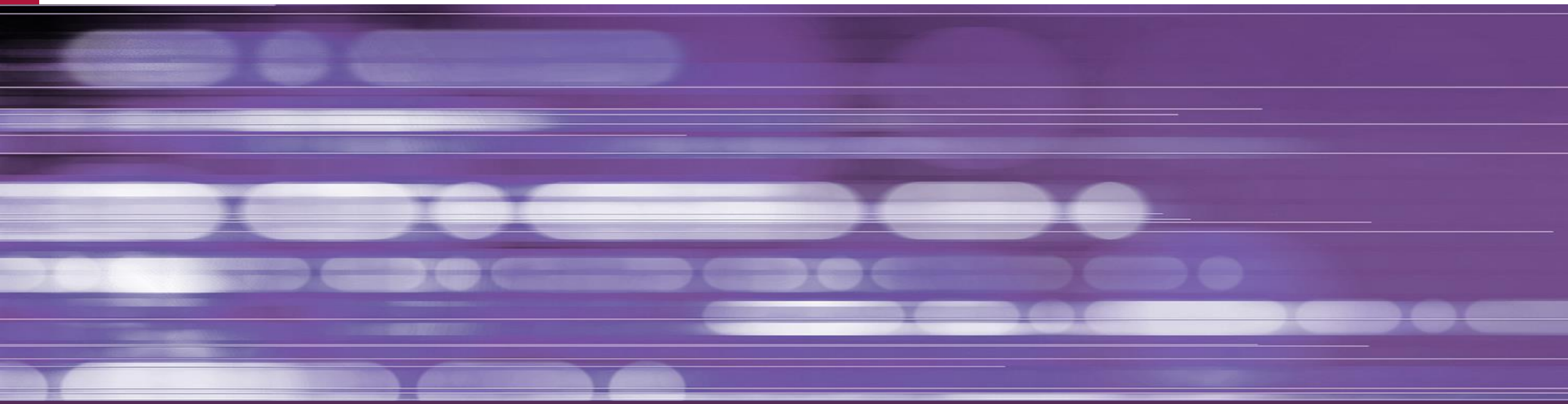
# WInnComm 2021 – UK view on spectrum

Martin Fenton, Director of Spectrum Analysis - Ofcom

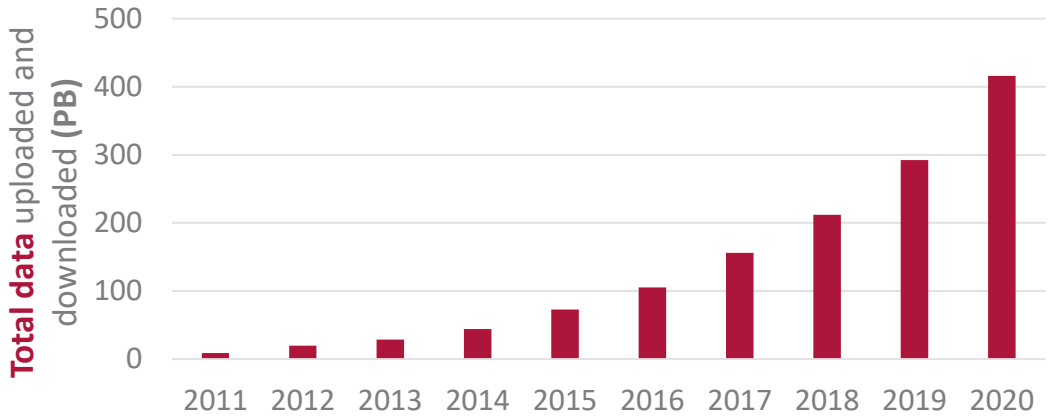
2 December 2021



# Consumer and industry demand for connectivity continues to increase

## *1. Mobile data and satellite launches are one example…*

…**mobile data use has grown exponentially** in the last decade…

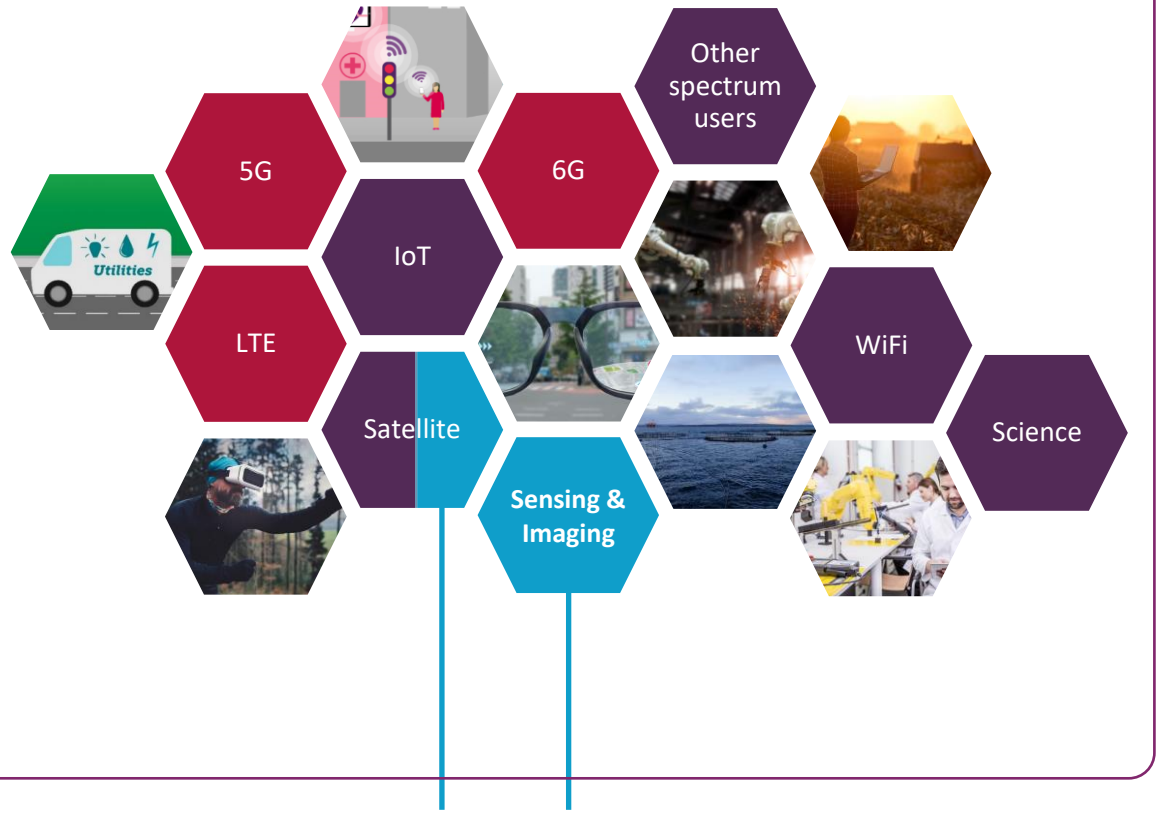



…and we saw over ***1,200 satellite launches in 2020*** *compared to under 500 in 2019. Thousands more are planned*

**c. 2,300**
Global satellites launched, 2009 – 2018 (all types)

**c. 25,000**
Future planned global satellite launches (all types)

## *2. But these are just two of the **many ways in which Spectrum is being use***

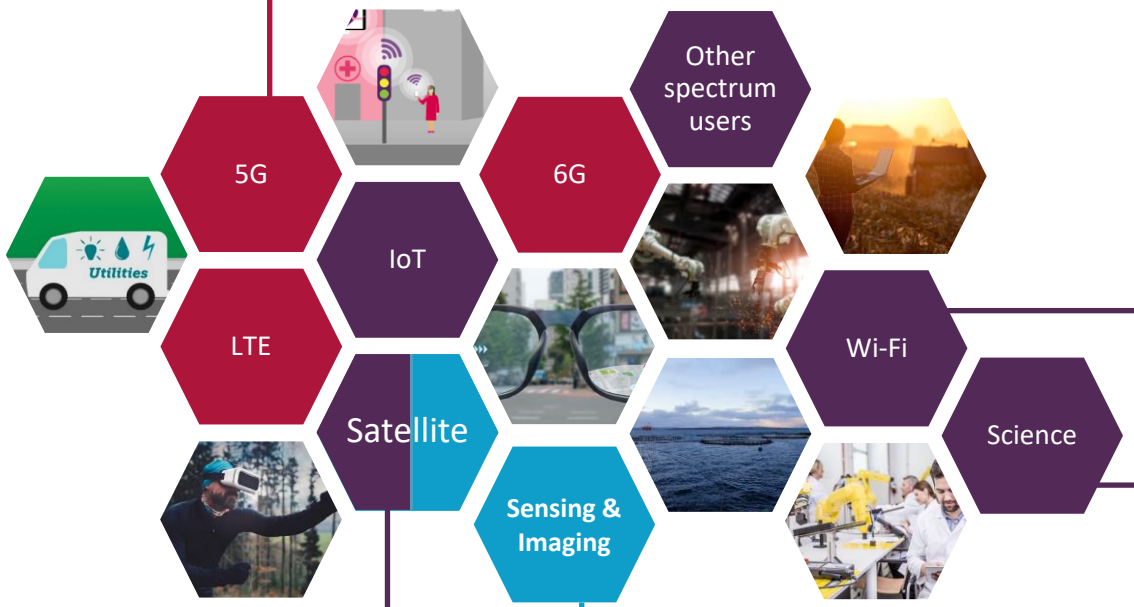



***3. We expect growth in Spectrum demand across most of these areas**, including newer areas such as sensing & imaging and satellite connectivity via Low Earth Orbit (LEO) constellations.*

# New technologies and business models will continue to increase the demand for spectrum

New 3GPP releases alongside the development of compatible kit in different bands. Network virtualisation and software defined radio supporting new entrants

Release of WiFi6E and development of WiFi7. New features such as greater channel width to provide higher speeds, but requiring more spectrum




All of this means there will be **more demand for spectrum coming from more users** for a greater range of applications and technologies.

The upward trend is clear, but **the exact nature of future demand is still uncertain.**

Evolution of new business models, supported by heavy investment. For example, seeking to serve underserved markets using low earth orbit (LEO)

Exploration of spectrum bands including mmWave and THz for sensing and other nanoscale applications

Increasing need of data to inform weather forecasting and climate change models

# …and different spectrum bands

- **Spectrum is critical for wireless.** We are making sure that spectrum bands, with different characteristics, can be accessed by a wide range of players, including MNOs, system integrators and directly by businesses, to deploy the connectivity solutions that meet their requirement.

- We have been engaging with different businesses and organisations, through a series of workshops, to better understand their evolving needs and to highlight the options available and their characteristics.

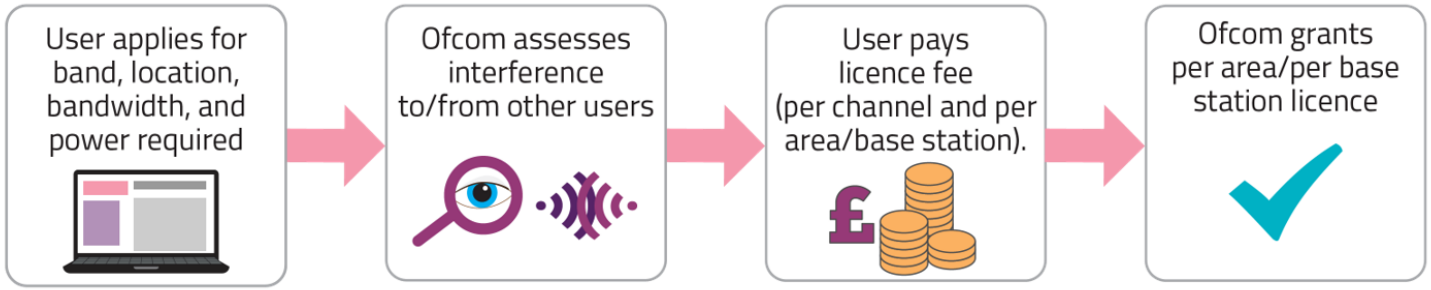

**Auction**: Spectrum mostly authorised on a nationwide basis. MNOs can offer slices of their network to meet business requirements.

**Sharing**: Low cost licences enabling localised access to spectrum. Can be used for private networks and to extend coverage.

**Exempt and light licence:** Access to spectrum with low barriers is an important enabler of innovation. Wi-Fi technology is currently common across many businesses.

# In 2019 we launched our spectrum sharing framework to enable a range of different use cases and players

**Shared access licence** for access to licensed mobile spectrum, 1800 MHz, 2300 MHz, 3.8-4.2 GHz and 26 GHz → deployment within 6 months of obtaining licence




**Local access licence** for access to licensed mobile spectrum (700MHz, 800MHz, 900MHz, 1400MHz, 1800MHz, 2350-2390MHz, 2.6 GHz, 3.4-3.8 GHz)

# We see clear demand for this form of local spectrum authorisation

- As of 10 November we have on issue over 1,300 Shared Access held by over 50 different companies.

| Shared Access | Low Power | Medium Power |
|---|---|---|
| 1800 MHz | 872 | 104 |
| 2.3 GHz | 31 | |
| 3.8-4.2 GHz | 76 | 223 |
| 26 GHz | 1 | |

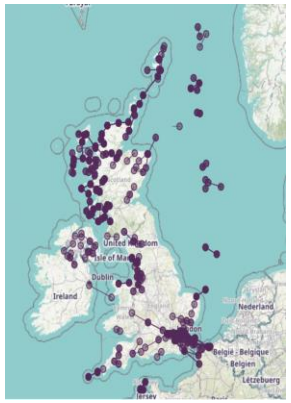
- Issued 18 Local Access licences to 5 different companies.

| Local Access | Licences issued |
|---|---|
| 1800 MHz | 1 |
| 2.6 GHz | 17 |

# Enabling growth and innovation – upper 6 GHz (6.425 – 7.025 GHz)

## Sharing offers a route to optimal use of spectrum by enabling existing and new services to grow

- Band is currently used by a number of services including **fixed links**, **satellite earth stations** and **radio astronomy**




- **Wi-Fi** and high power **mobile** are interested in this band, which also has the potential to provide connectivity for **industrial applications**

- IMT identification is being considered for region 1 at WRC-23. But coexistence between existing users and high power outdoor mobile is not possible – would require clearing incumbents.
- There is demand from businesses for more inbuilding solutions.
- Technology neutral local licensing could enable growth from both existing and new users, leveraging the developing ecosystem of devices in this band.
- Our objective is to ensure optimal use and promote innovation.

# Supporting the UK's wireless future: Our spectrum management strategy for the 2020s

- Existing activities will continue to be important to achieving our vision
- In considering the challenges of the future, we have identified **three themes for particular focus**

## Supporting wireless innovation

- Expanding our work to understand, assist and inform organisations who may benefit from wireless technologies in the future
- Making more spectrum available for innovation before long-term use is certain
- Supporting innovation in new wireless technologies

## Licensing to fit local and national services

Considering further options for **localised spectrum access**

## Promoting spectrum sharing

Encouraging spectrum users to be 'good neighbours'

# Up coming spectrum publications

*Ofcom has several Spectrum related publications planned for the coming months, including:*

Today

**Terahertz Discussion Paper**

*Exploring the new opportunities these frequencies present and how we can unlock their full potential*

**Mobile Spectrum Demand**

*Exploring the spectrum implications of growing demand for mobile services*

**26 GHz OOB consultation**

*Setting out proposals on additional measure to protect EESS and RAS from future 26 GHz OOB*

**Space Spectrum Strategy**

*A consultation on Ofcom's proposed strategy priorities for space spectrum.*

**Spectrum Roadmap**

*Setting out Ofcom's key areas of Spectrum work and consideration of the longer term trends in markets and technologies*

April 2021

Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada

Canada

# UPDATE ON SPECTRUM RELEASES IN CANADA

Shalini Periyalwar

WINNCOMM 2021

Dec. 2 , 2021

# What is Driving the Increased Focus on Spectrum Sharing?

- Support for telecom objectives: Quality, Coverage, Innovation
- Clearing bands is more and more difficult
- There is unused spectrum in rural/remote areas, and providers want access to serve Canadians
- Increasing number of requests for spectrum to support private networks (private LTE/5G, verticals, industry 4.0)
- Getting to “Yes” for more stakeholders and streamlining processes

# Challenges/Barriers for Spectrum Sharing

## Information on spectrum use

- High quality data on incumbents needed to enable spectrum sharing
- Stakeholders - Concerns about confidentiality, could be practically onerous

## Concerns about spectrum value and return-on-investment when sharing spectrum

## Coexistence/sharing may add technical complexity and cost

## Burden on spectrum operations (monitoring, compliance check and enforcement)

# Spectrum Sharing - Towards Dynamic Spectrum Access (DSA)

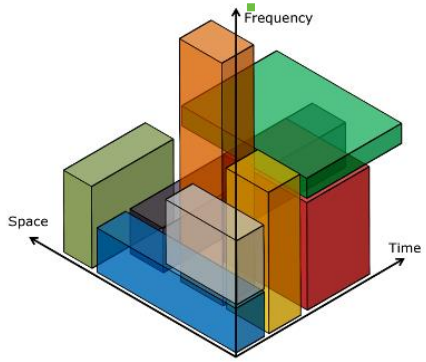
Dynamic spectrum access (DSA) is *a machine-based system that supports intensive use of spectrum by assigning frequencies based on immediate availability and need*. ISED is developing this DSA capacity to support more efficient use of spectrum with two main streams:

## ***Database driven DSA***

- Spectrum sharing with incumbent users using a database driven model
- Providing access to **licence-exempt** devices through a spectrum-sharing database system

### Bands

- Television White Space (TVWS)
- 6 GHz




## ***Spectrum management advances for non-auction local licensing***

- Improvements to spectrum management tools to support sharing between wide area licences and large numbers of licences over small areas and for shorter licence duration

### Possible Bands

- Access licensing framework- shared between unused spectrum in auctioned wide area licensing and non-auction local licensing
  - Up to 170 MHz made available in 800 MHz Cellular and 1900 MHz PCS bands
  - 6 MHz available in 900 MHz
- 3900 MHz (80MHz) – shared between WBS and flexible use for non-auction local licensing
- Expansion to other bands in the future

# Spectrum Updates Snapshot

**Database-driven Spectrum Sharing /DSA 2021-22**

TVWS:

- Updated White space database specifications
- Designated two WSDBAs in 2021 - RED Technologies, Phnx Technologies
- Currently operational in various parts of Canada

6 GHz:

- Decision - May 2021
- Technical Standard for Low Power Indoor Only Devices (RSS-248 issue 1)- Nov 2021

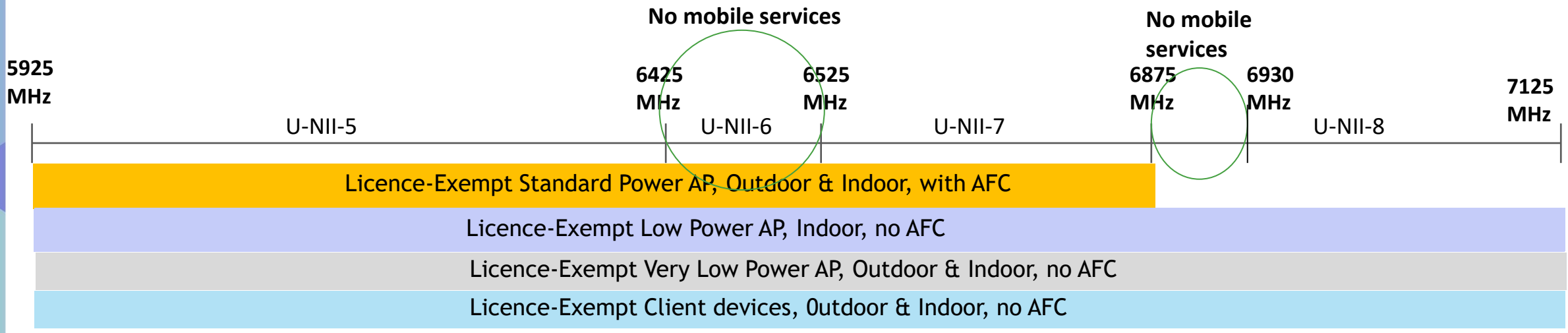
**Other Updates 2021-22**

3450-3650 MHz: auction rules released in March 2020, auction completed in July 2021
3650- 4200 MHz: decision on licensing framework released in May 2021
Spectrum access licensing framework consultation published in August 2021

**Future 2022-**

6 GHz: Further technical standards updates planned for very low-power devices, standard-power devices and for AFC in 2022
3650- 3900 MHz: preparing for auction in 2023
3900-3980 MHz: consultation planned
mmwave bands: licensing framework decision planned, to be followed by auction in 2024

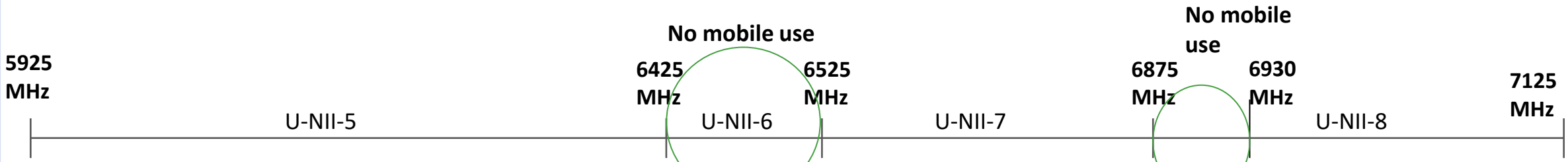
# Policy on Licence-Exempt Use of 6 GHz Band




- Standard Power AP (36 dBm EIRP, PSD of 23 dBm/MHz) with Automated Frequency Coordination (AFC)
- Low Power indoor AP (30 dBm EIRP, PSD of 5 dBm/MHz) Integrated antenna and no weather shielding
- Very Low Power AP (14 dBm EIRP, PSD of -8 dBm/MHz)
- Client Devices Under AP Control (Power limited to 6 dB below limit of its associated AP)

All devices are required to use a listen before talk protocol

# Protecting Licensed Incumbent Services from Standard-power RLANs

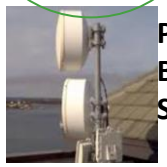



Use AFC system

- exclusion zones to protect fixed links
- AFC determines permissible frequencies and power for operation of license-exempt devices

Restrict antenna elevation angles from pointing upward for outdoor devices, including power limit of 125 mW e.i.r.p. above 30 degrees (vertical elevation mask).

**Point-to-Point Backhaul Systems**



**Point to Point Backhaul Systems**

**Point to Point Backhaul Systems, including Studio to Transmitter Links (6590-6770 MHz)**

**Radio Astronomy 6650-6675.2 MHz**

**Point to Point Backhaul Systems**

**FSS Earth Station (Earth-to Space)**

**FSS Earth Station (Earth-to Space)**

**FSS Earth Station (Earth-to Space)**

**FSS Earth Station (Earth-to Space) (Space-to-Earth)**

**Electronic News Gathering 6930-7125 MHz**

# Thank you

# Spectrum Regulation Advances in Brazil

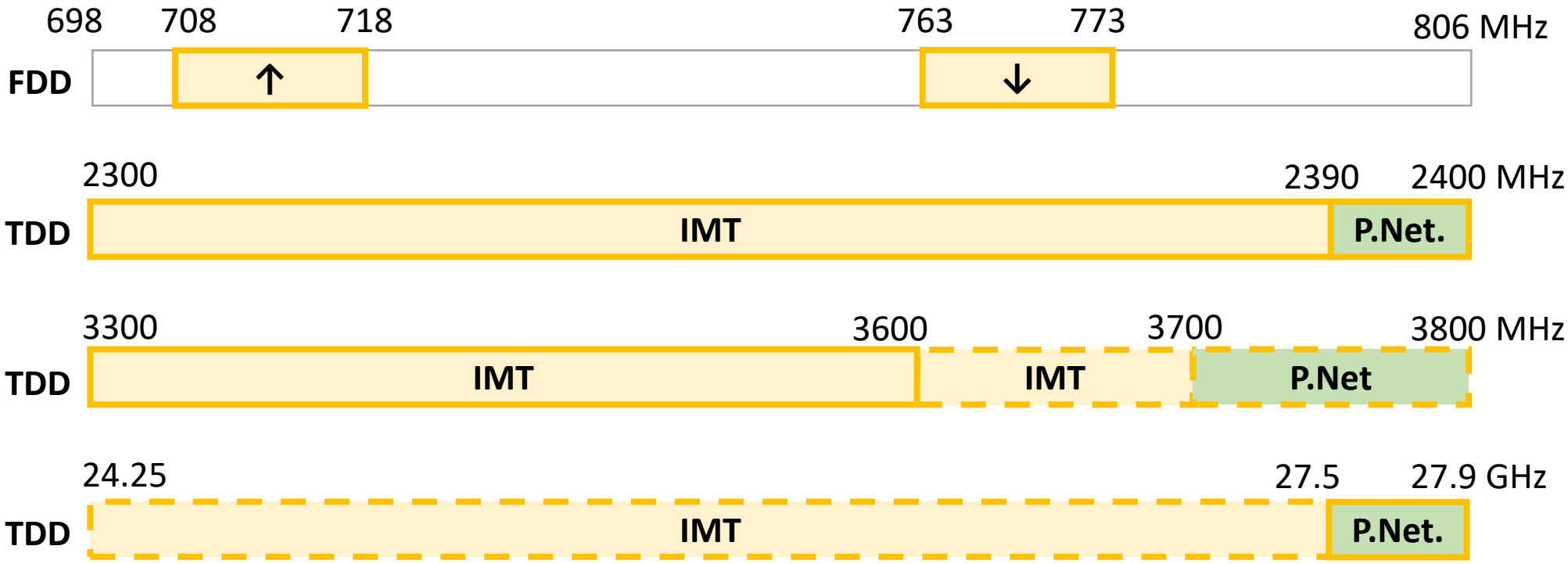

*Agostinho Linhares, PhD*

*Manager of Spectrum, Orbit and Broadcasting*


December/2021

# Brazil's 5G Spectrum Auction

The purpose of the Auction was granting licenses to use radio frequencies in the following bands:




Legend:

- Auctioned
- Not to be auctioned (Industry 4.0)
- Allocated before 2021
- Allocated in 2021

# Obligations Summary

- 700 MHz – federal roads and localities without 4G;
- 2.3 GHz – municipalities and localities without 4G ;
- 3.5 GHz – Optical fiber backbone to a list of municipalities; 5G BS according schedule; cleaning 3.625 – 3700 / TVRO / Protecting C-band Earth stations; ‘PAIS’; Federal Private Network;
- 26 GHz – Connect basic education schools.

# Future Bands for IMT

- 814 – 824 MHz and 859 – 869 MHz, or portions thereof *(ongoing regulation process)*;
- 1427 -1518 MHz *(allocation and 'designation' done; usage condition to be approved soon)*
- 1980 – 2010 MHz and 2110 – 2200 MHz *(allocation and 'designation' done)*;
- 4800 – 4990 MHz, or portions thereof *(ongoing regulation process)*;
- mmWave *(parts of 37 – 43.5 GHz; 45.5 – 47 GHz; 47.2 – 48.2 GHz)*.

# Wireless Access System in 6 GHz

**WRC-03 was a milestone for WAS/RLAN**

- In 2004 Brazil reflected this result in its regulation, adding 5 150 – 5 350 MHz and 5 470 – 5725 MHz for RLAN

**There was a long debate between Anatel, IMT industry/operator and Wi-Fi industry**

**Board Decision at February 2021 →** Wi-Fi7 ready regulation!

- ✓ **5925 – 7125 MHz for WAS/RLAN**
- ✓ **Very-low power and low-power indoor devices regulation.**

**Next steps:**

1) **Short-term: discussions on out-of-band emissions in the band 5,850 – 5,925 MHz in order to guarantee coexistence with ITS;**
2) **Medium-term: include the standard power equipment with automatic frequency coordinator.**

# WRC-23 – Agenda Item 1.2

## Possible Identification of 10 – 10.5 GHz for Region 2

- MOBILE and FIXED Services allocation in Regions 1 & 3 (10 – 10.45 GHz)
- MOBILE and FIXED Services allocation in some countries of Region 2 (FN 5.480 & 5.481)

**Co-channel: EESS(*active*) and RADIOLOCATION**

**Adjacent Channel: EESS(*passive*)**

- ✓ **Mitigation techniques would be necessary**

**General Comments: So far, some Admnistrations have demonstrated more concerns with RADIOLOCATION studies, while other with EESS(*active*).**

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# Thank you!

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# Panel discussions