



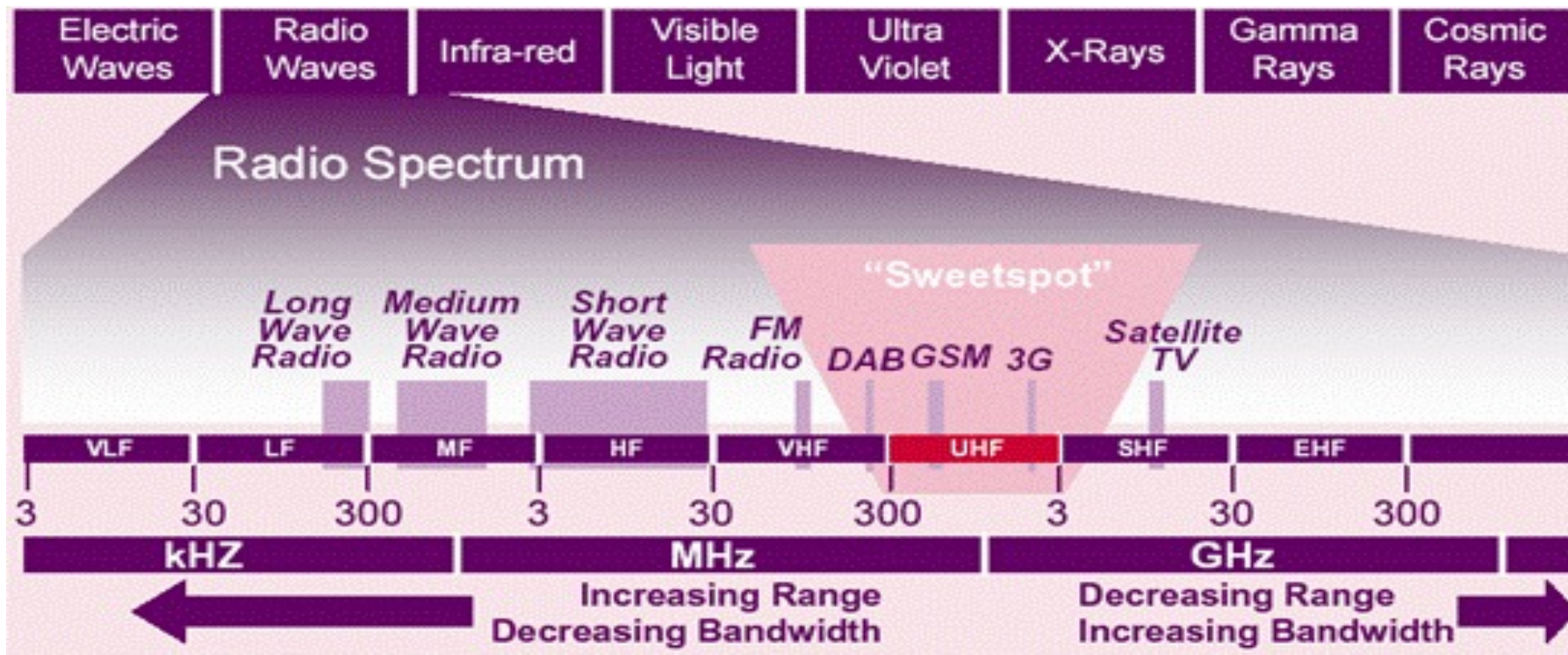
# ITU-APT Foundation of India

## Spectrum Management

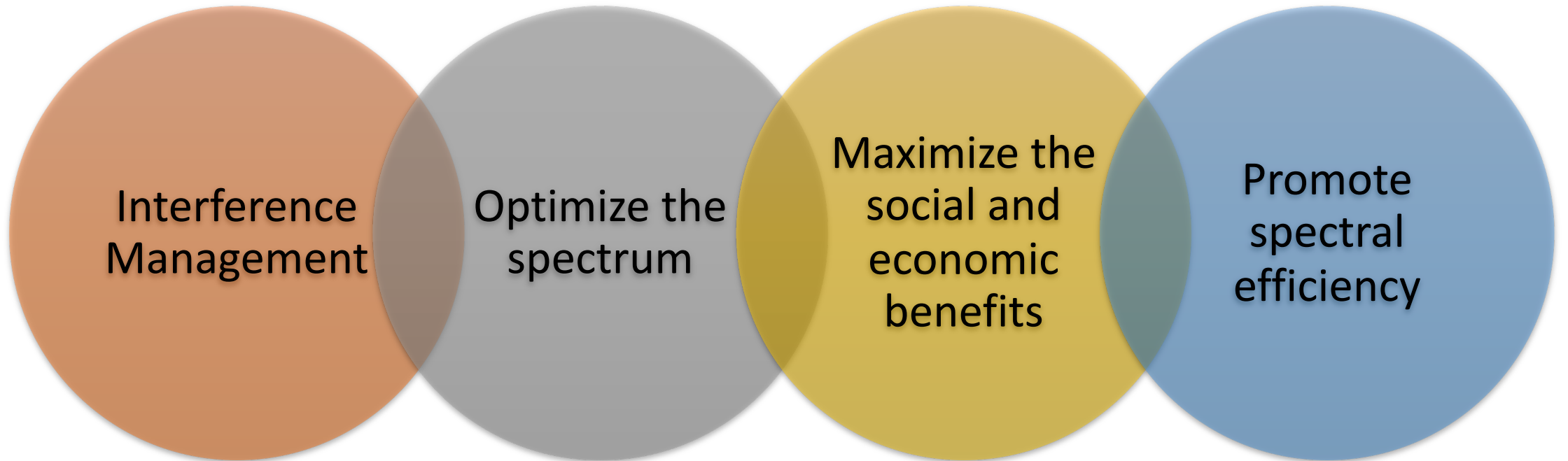
Bharat Bhatia  
President, ITU-APT Foundation of India  
Vice Chairman, WWRF  
Chair, ITU-R WP5D SWG SA  
Chair, AWG Task group on PPDR

# About Spectrum

- Spectrum is a natural and scarce resource which is wasted if not used. It does not respect country or state boundaries
- Used and managed through international treaties and national policies, rules and licenses
- In most cases, some specific portions are licensed for providing broadcasting or communications or navigation services while other portions are delicensed for all to use under specified conditions



# Why Spectrum Management



Effective use of spectrum can make a big difference to a country's prosperity, especially where communications are heavily reliant upon wireless technologies

# Spectrum Harmonization

- A harmonised frequency arrangement facilitates economies of scale resulting in the availability of affordable equipment and services
- Global harmonization of spectrum bands support the same application ensuring efficient spectrum use, seamless communication services over wide areas, and improved overall usage quality
- In India, the high point of spectrum management has been the harmonisation of spectrum below 2.5 GHz

Clear Demarcation of Services

Interference Management

Improved Efficiency

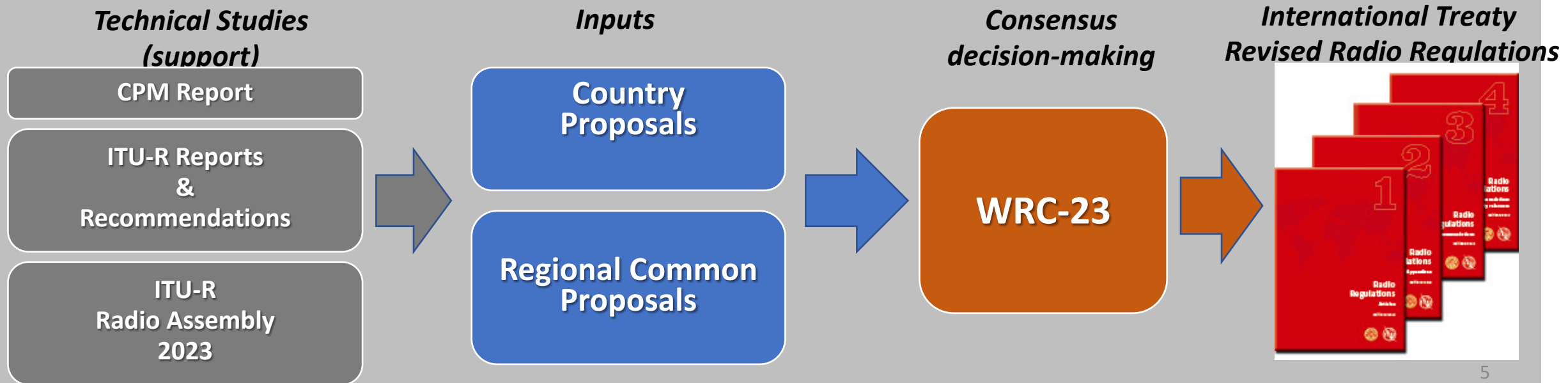
Device ecosystem

Newer technologies

# ITU World Radio Conferences decide which service gets what Frequency spectrum

- WRC is a Global conference organized by the ITU every 3-4 years to update Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and satellite orbits
- Each WRC prepares the agenda for the next WRC and initiates a new study cycle, in preparation for the next WRC. Technical Studies for WRC Agenda items are done by ITU-R Study Group and are presented in the CPM Report to administrations and the WRC.

## High level process diagram of WRCs:



# Current Spectrum Management Issues

## Global

1. WRC-23 Preparations
2. 6G Technology and Spectrum
3. WRC-19 Implementation
4. NGSO ESIM Satellite spectrum Regulations
5. New bands for IMT (4.8 GHz, 600 MHz,.....)
6. HIBS spectrum
7. GMDSS and Civil Aviation issues

## National

1. 5G spectrum Auctions and pricing: 700 MHz, 3.5GHz & mm wave bands
2. V Band and 6 GHz delicensing for Wi-Fi
3. Private Satellite licensing and Spectrum Policy
4. Spectrum for Private/captive 4G/5G networks
5. NFAP-21
6. 600 MHz opening
7. Delicensing of spectrum for R&D

# Spectrum Management – 5G

- **5G needs spectrum within three key frequency ranges to deliver widespread coverage and support all use cases.**

**The three ranges are: Sub-1 GHz, 1-6 GHz and above 6 GHz.**

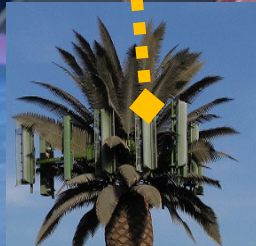
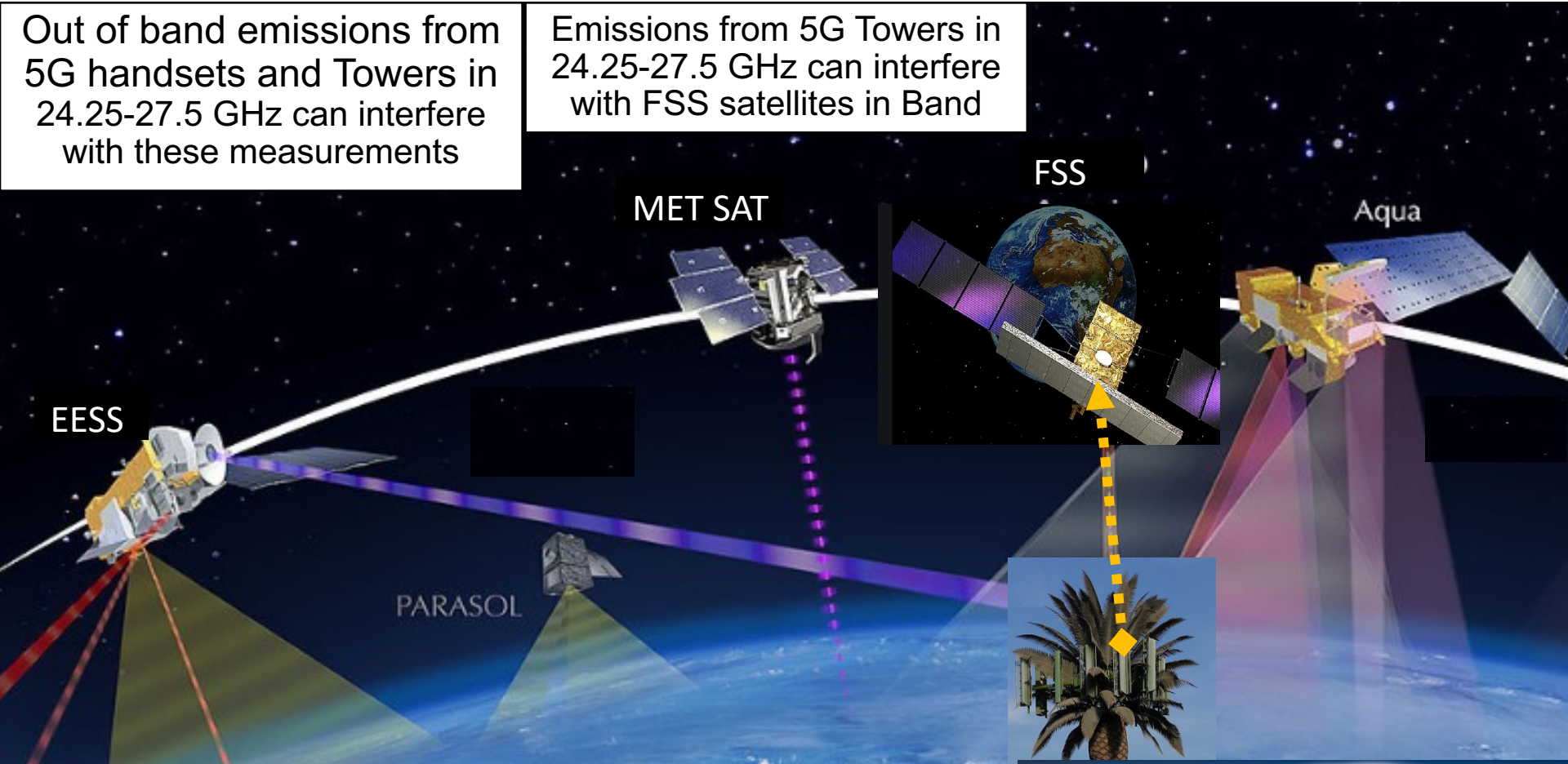
- **Sub-1 GHz** will support widespread coverage across urban, suburban and rural areas and help support Internet of Things (IoT) services
- **1- 6 GHz** offers a good mixture of coverage and capacity benefits. This includes spectrum within the 3.3-3.8 GHz range which is expected to form the basis of many initial 5G services
- **Above 6 GHz** is needed to meet the ultra-high broadband speeds envisioned for 5G. A focus will be on bands above 24 GHz – this includes growing interest in the 24 GHz and/or 28 GHz bands which could be easily implemented together in a single device due to their close proximity.

# WRC-19 identified the bands 24.25-27.5 GHz (26 GHz), 37-43.5 GHz (40 GHz), 45.5- 47 GHz/47.2- 48.2 (50 GHz), 66-71 (70 GHz) GHz for IMT – 5G

Out of band emissions from 5G handsets and Towers in 24.25-27.5 GHz can interfere with these measurements

Emissions from 5G Towers in 24.25-27.5 GHz can interfere with FSS satellites in Band

The Main Issue for 5G spectrum in 26 GHz band (24.25-27.5 GHz) at WRC-19 was the Protection of Earth Exploration Satellites(EESS) in adjacent band (in 23.6-24 GHz) and Fixed Satellites (FSS) in band (24.25-27.5 GHz)



H<sub>2</sub>O Molecular absorption peak in 23.6-24 GHz  
Key to accurate measurement of the vertical water vapour content



# WRC-19 took place in Sharm El-Sheikh, Egypt with 3500 delegates from Oct. 28 to Nov. 22, 2019. 165 countries signed the final treaty

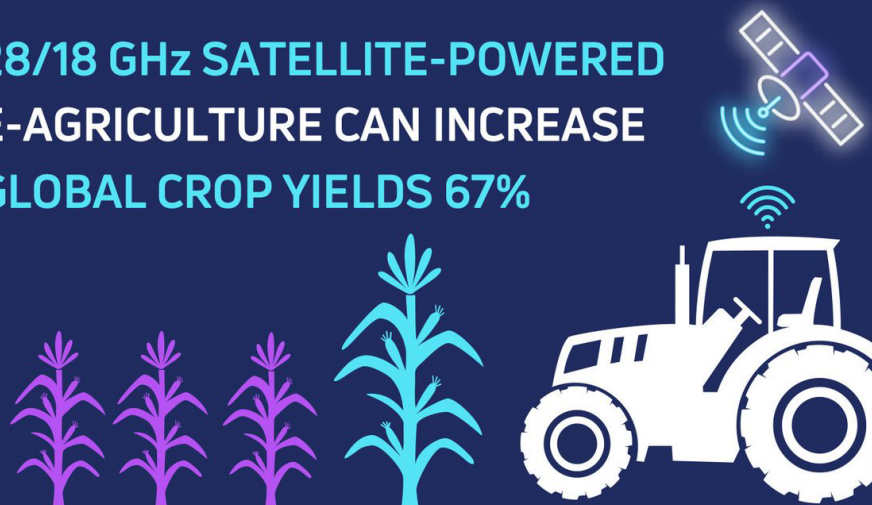


Largest ever India participation with 53 Registered delegates representing various ministries, departments, service providers, vendors and industry associations.

22 New Agenda items and 11 issues from previous conference were addressed. Agenda for WRC-23 was also developed.

WRC-19 also prescribed conditions for use of 18/28 GHz spectrum for Earth Stations in Motion (E-SIM) with suitable provisions to protect Terrestrial 5G and microwave links

**28/18 GHz SATELLITE-POWERED E-AGRICULTURE CAN INCREASE GLOBAL CROP YIELDS 67%**



**28/18 GHz SATELLITE ESIMs CONNECT PASSENGERS + CREW**



**GATE-TO-GATE**

**Easier In flight Connectivity with Ku/Ka bands for Aeronautical E-SIMs**



**WRC-19 resolution will boost deployment of Earth stations in motion**



The WRC-19 resolution lays out technical and regulatory conditions for any ESIM communicating with a GSO FSS space station within the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz

# WRC19 decisions on Haps and GSO will bring the Internet to the whole world

GEO



Altitude 36,000km

LEO



Altitude 1,200km

HAPS



Altitude 20km

# WRC Decision on satellite filing procedure will spur growth of Small Satellite Constellations



WRC-19 under Agenda Item 7 issue A has established Regulatory procedures for non-geostationary satellite constellations in the fixed-satellite service, opening the skies to next-generation communication capabilities. Mega-constellations of satellites consisting of hundreds to thousands of spacecraft in low-Earth orbit are becoming a popular solution for global telecommunications, as well as remote sensing, space research and education.

**Questions**

