

---

# INTERNATIONAL SPECTRUM MANAGEMENT BASICS AND STATE

**Dr. Vadim Nozdrin,  
Counsellor of Study Groups,  
Radiocommunication Bureau**



# ITU overview

Since 17 May 1865

193 Member States  
+900 Sector Members & Academies

## ITU-T

Standardization of telecommunication, ICTs, regulation of numbering, international tariffs



## ITU-D

Assisting implementation and operation of telecommunications in developing countries

## ITU-R

Radiocommunication standardization and global radio spectrum management

# ITU-R activity



## World and Regional Radiocommunication Conferences

Establish and update international regulations governing use of the spectrum- **Radio Regulations, Agreements (GE-06, GE-85 etc.)**



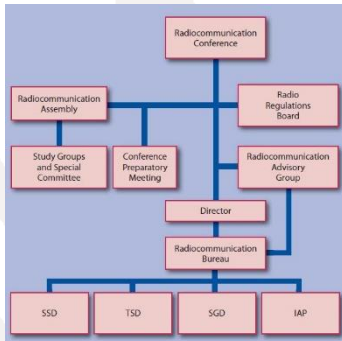
## Study Groups

Efficient management and use of the spectrum/orbit resource; characteristics and performance of radio systems; distress and safety matters of radiocommunication-

## Recommendations, Reports, Handbooks

## Radiocommunication Bureau

Apply the international regulations governing use of the spectrum – to ensure the most **efficient use of the orbit/spectrum resource** for operation of radiocommunication services free from harmful interference- **MIFR, Service publications, BR software**



# Radio Regulations

## Concept:

- Frequency block allocations intended for use by radio services (from 8.3 kHz to 3000 GHz)
- Regulatory and technical provisions

## Objectives:

- International spectrum sharing and protection
- Interoperability and roaming: public mobile networks, maritime and aviation communications (Cospas/Sarsat etc.)
- Mass production and roadmap for industry, operators and investors
- Worldwide passive bands protection



### 81-86 GHz

Allocation to services		
Region 1	Region 2	Region 3
81-84	FIXED 5.338A FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	
84-86	FIXED 5.338A FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.149	5.561B

# WRC-19 Highlights

- **IMT** global identification: 24.25-27.5 GHz, 37-43.5 GHz, 66-71 GHz
- **IMT** regional and country identification: 45.5-47 GHz, 47.2-48.2 GHz
- **HAPS** global identification: 31–31.3 GHz; 38–39.5 GHz; 47.2–47.5 GHz and 47.9–48.2 GHz
- **Earth station in motion (ESIM)** provisions 17.7-19.7 GHz and 27.5-29.5 GHz
- **FSS NGSO** provisions 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz
- **IMO GMDSS** development (Iridium), NAVDAT, SatVHF data exchange system (VDES)

World Radiocommunication  
Conference 2019  
(WRC-19)  
Provisional Final Acts

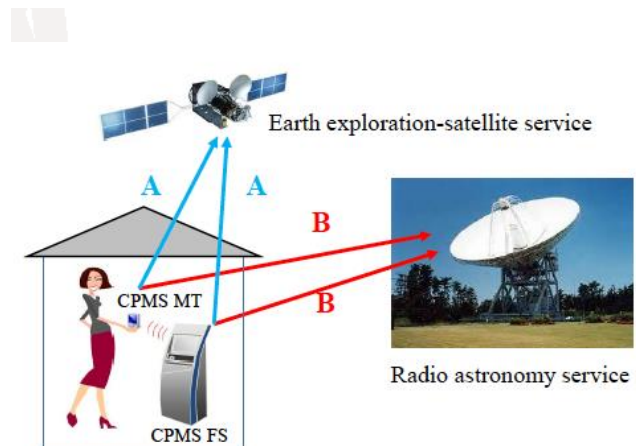
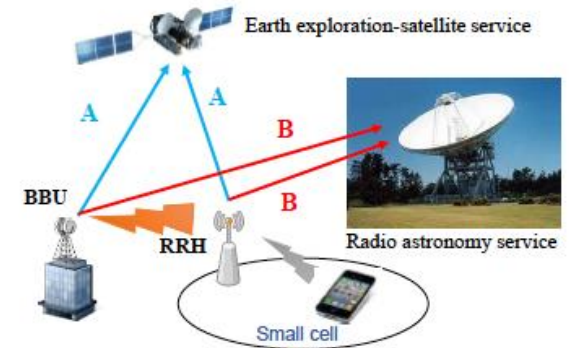


# WRC-19 Highlights

## RR № 5.565

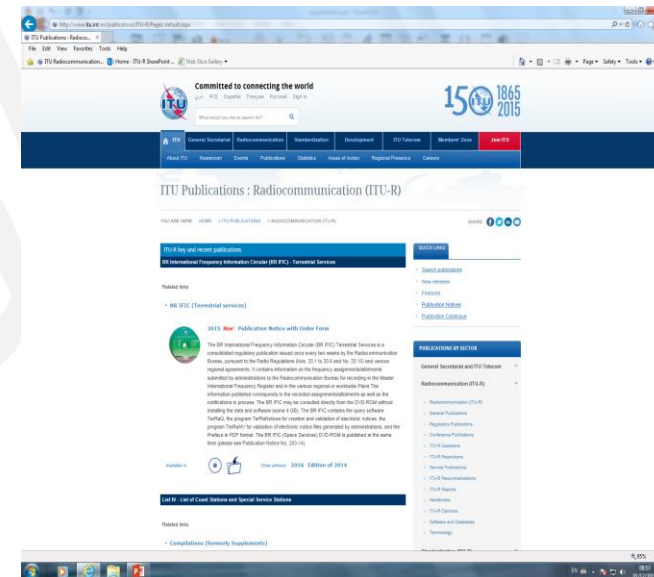
The following frequency bands in the range 275-1 000 GHz are identified for use by administrations for passive service applications:

- radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz;
- Earth exploration-satellite service (passive) and space research service (passive): 275-286 GHz, 296-306 GHz, 313-356 GHz, 361-365 GHz, 369-392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, 439-467 GHz, 477-502 GHz, 523-527 GHz, 538-581 GHz, 611-630 GHz, 634-654 GHz, 657-692 GHz, 713-718 GHz, 729-733 GHz, 750-754 GHz, 771-776 GHz, 823-846 GHz, 850-854 GHz, 857-862 GHz, 866-882 GHz, 905-928 GHz, 951-956 GHz, 968-973 GHz and 985-990 GHz.



# ITU-R Study Groups

- **SG 1: Spectrum management** (Wireless Power Transmission, SRD, radiomonitoring, strategies for spectrum utilization)
- **SG 3: Radiowave propagation** (radio noise recommended levels, propagation methods)
- **SG 4: Satellite services** (efficient GSO use, NGSO constellation, small satellites)
- **SG 5: Terrestrial services** (IMT, IoT, HAPS, sub-orbital flights, unmanned planes, ITS, maritime and aviation *e*-navigation )
- **SG 6: Broadcasting services** (UHDTV, IBB)
- **SG 7: Science services** (space weather, leap second, planetary commercial missions, meteorological satellites)



# ITU-R Study Groups- THz

## ITU-R Reports

**SM.2352.** Technology trends of active services in 275-3000 GHz

**SM.2422.** Visible light for broadband communications

**SM.2450.** Sharing and compatibility in frequency range 275-450 GHz

**F.2107.** Characteristics and application of fixed systems between 57 GHz and 134 GHz

**RS. 2194.** Passive bands of scientific interest to EESS/SRS from 275 to 3000 GHz

**RS.2431.** Technical and operational characteristics of EESS (passive) systems in the frequency range 275-450 GHz

## ITU-R Recommendations

**P.1622.** Prediction methods required for the design of Earth-space systems operating between 20 THz and 375 THz

**P.1853.** Prediction methods required for the design of terrestrial free-space optical links

**P.1238.** Propagation data and prediction methods for the planning of indoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 450 GHz

**P.676.** Attenuation by atmospheric gases



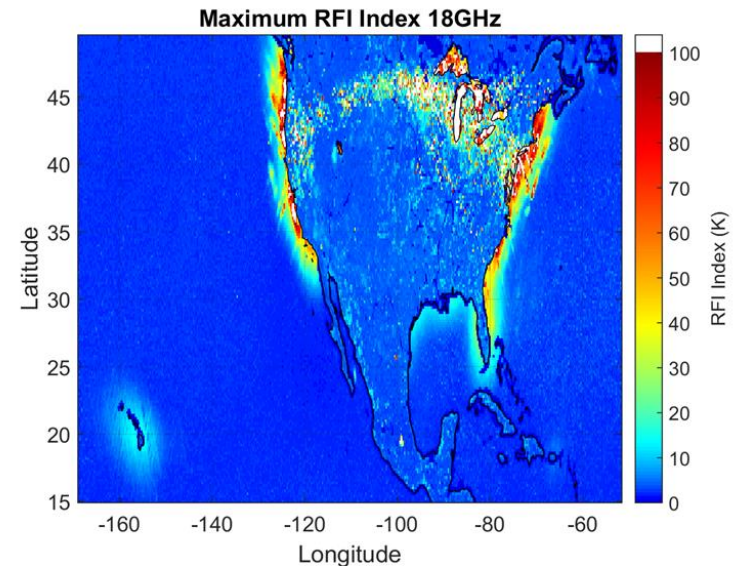
# Application of RR

- International recognition of spectrum use (RR No.8.3)
- Conformity with Radio Regulations
- Coordination procedures
- Notification and recording in Master International Frequency Register
- International radiomonitoring system
- Assistance in interference resolution

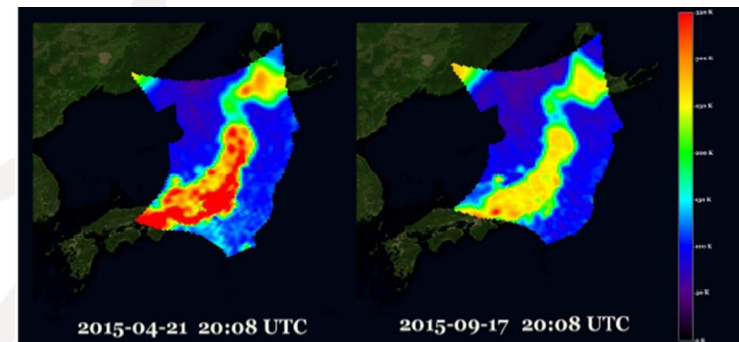


# Current challenges

- Booming of spectrum demand and spectrum/orbit scarcity
- Transactional costs of spectrum access
- New interference scenarios
  - NGSO vs.GSO, HAPS, earth station on move
  - TV receivers (1400-1427 MHz)
  - Reflection (18.6-18.8 GHz)
- Non-conformity with regulations

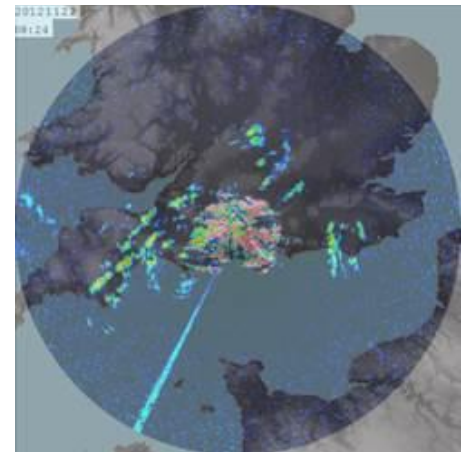
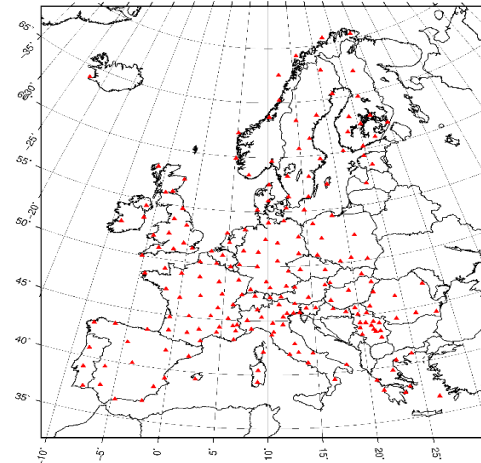


Maximum RFI index 1400-1427 MHz



# Interference case study (RLAN-meteo radars)

<b>Starting</b>	2006
<b>Current status</b>	180 existing radars only in EC (average CAPEX 1 million Euros per site)
<b>Scale of degradation</b>	110 radars in 21 EU States, up too thousands cases per site, 5600-5650 MHz band
<b>Applications</b>	the conditions of the atmosphere, severe weather detection for navigation, wind and precipitation detection and estimates, detection of aircraft icing conditions
<b>Type approval</b>	RTTE Directive (Self approval)
<b>Market surveillance campaign</b> <i>(ECC REPORT 192)</i>	64 different 5 GHz WAS/WLAN devices 38 samples: DFS function could be directly or indirectly deactivated 3 samples: DFS does not exist



# Current challenges

## *Spectrum limits*

- Power balance
- Health-related limits-the potential effects of electromagnetic fields?
- Ecological limits – *e*-waste, space debris, CO<sub>2</sub>, space launches
- Bio-geotechnical limits- potential impact on biota (Le Chatelier's principle, Gorchkov 1% Law, natural Earth emissions- 239 W/m<sup>2</sup>)

# Agenda for the future

- High frequency ranges
- Software defined radio/cognitive radio
- UWB
- International radiomonitoring and enforcement mechanism
- Planetary boundaries



**Thank you**