



**ДЕРЖАВНИЙ  
УНІВЕРСИТЕТ  
ТЕЛЕКОМУНІКАЦІЙ**



***ITU Regional Workshop  
for 12 Member states  
17-18 November 2016***

# ***Spectrum and compatibility issues of IMT-Advanced and IMT-2020 networks***

Radiocommunication  
Bureau



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- ITU and Radio Regulations
- International Mobile Telecommunication (IMT)
- Global Trend in IMT
- Spectrum for IMT
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- Compatibility issues of IMT-Advanced
- Compatibility issues of IMT-2020
- Conclusion



# Overview of the ITU

1865

**Committed to connecting the world!**

2016



A specialized UN agency

193 Member-States, 558 Sector-Members, 165 Associated-Members and 128 Academies



# Radio Regulations

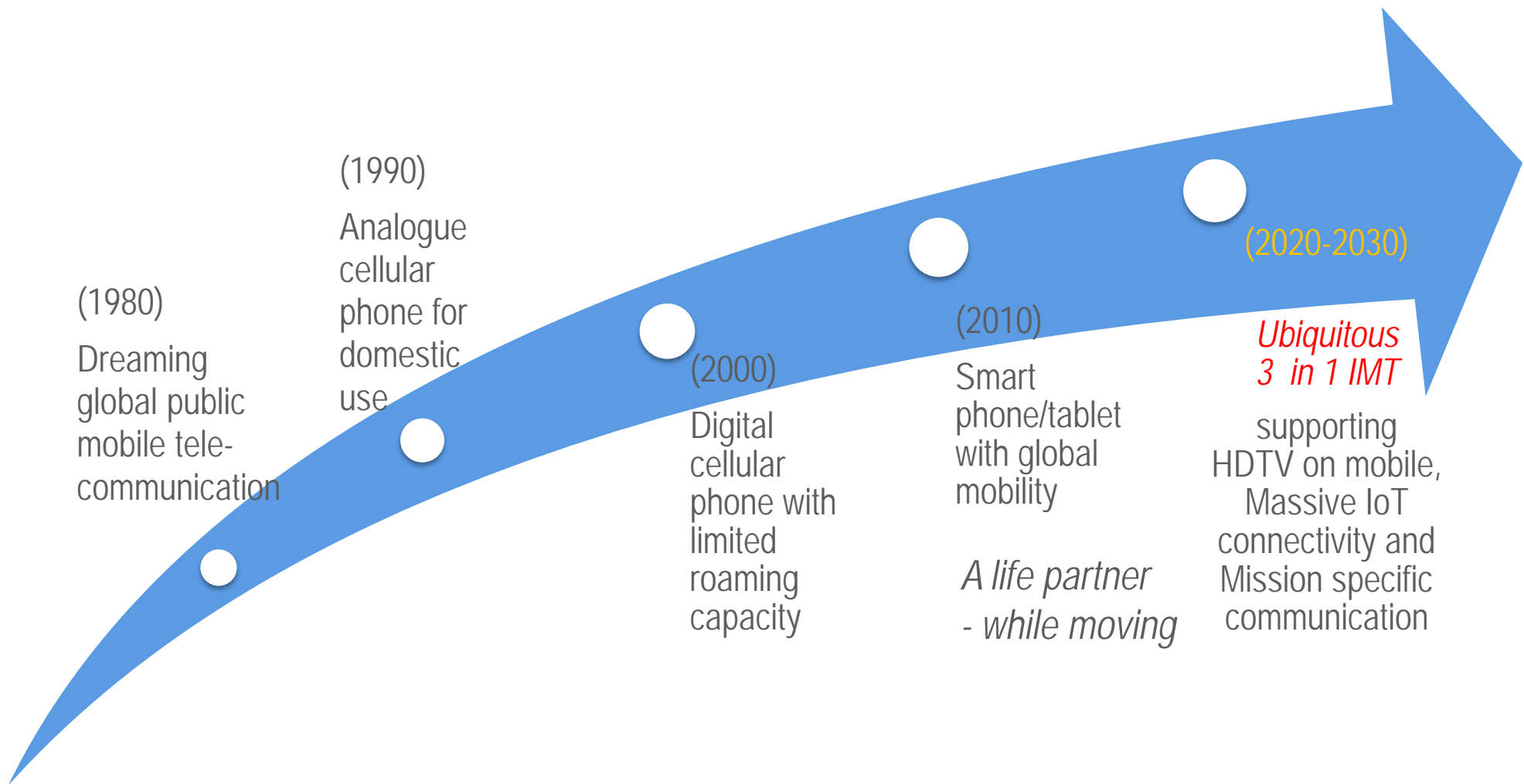
1906 **Harmonized use of Spectrum and orbit!** 2016

- RR is a set of international regulations on use of spectrum/orbit
- RR is intergovernmental treaty ratified by governments
- Define the rights and obligations of Member States on the use of spectrum/orbit resources and on the procedures of obtaining and keeping the right
- Updated every 3-4 years by World Radiocommunication Conference (WRC)
- Main goals of the RR:
  - harmonization of spectrum usage
  - interference free operation of radio stations



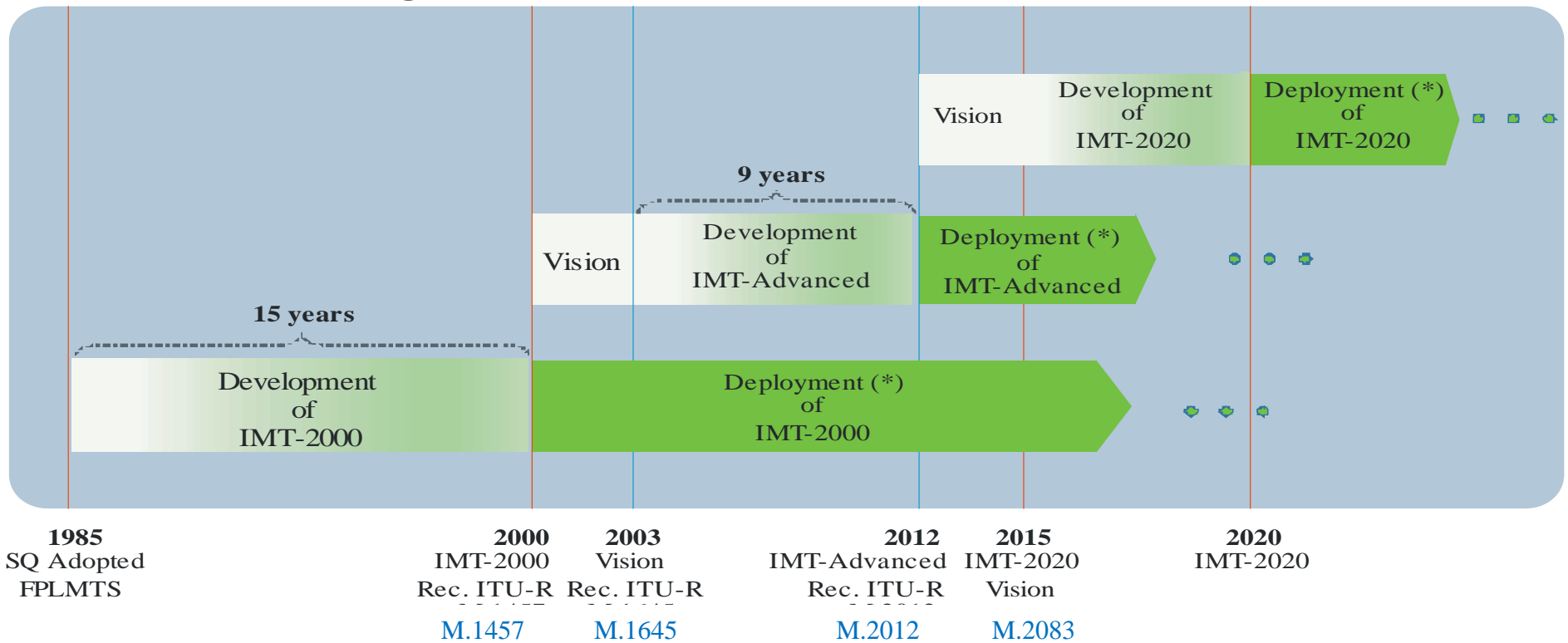


# International Mobile Telecommunication (IMT)



# IMT - time line

- **IMT** is the root name that encompasses all of **IMT-2000**, **IMT-Advanced** and **IMT-2020** collectively. (ITU-R [Res. 56-2](#) )



(\*) Deployment timing may vary across countries.



# IMT – ITU-R Activities



- Developing the IMT Vision
  - Rec. ITU-R M.1645, M.2083
- Ensuring the required spectrum
  - Regional preparation and harmonization activity
  - Summarizing the sharing studies and proposals on frequency usage (CPM Report)
  - WRC decisions on frequency usage (WRC Final Acts)
- Evaluating proposed standards and developing the global core standard (GCS)
  - Rec. ITU-R M.1457, M.2012
- Developing supporting Recommendations, and Reports and Handbooks
- Disseminating information on IMT to support Member States for their sustainable development



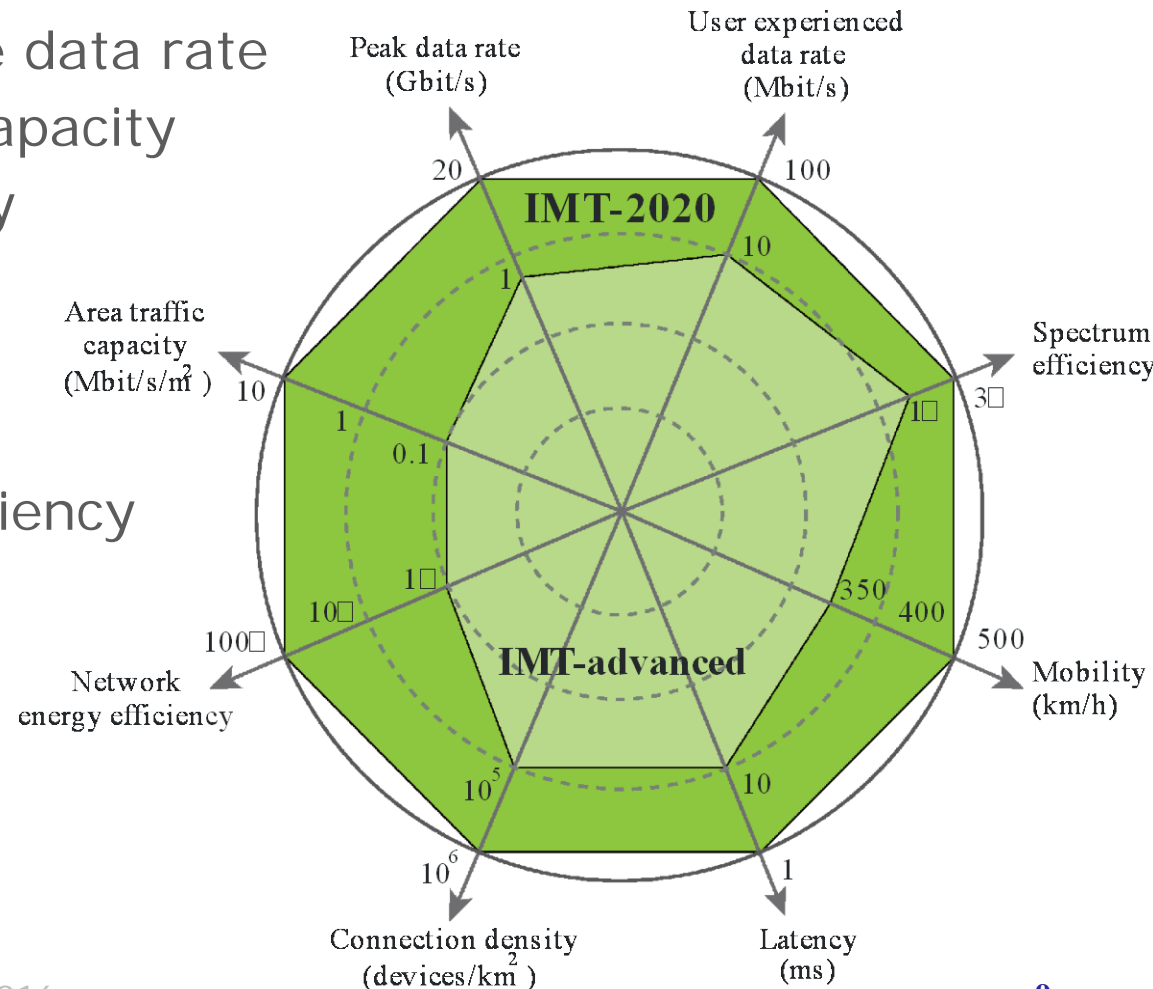
## IMT – 2000/Advanced

- high degree of commonality of design worldwide;
- compatibility of services within IMT-2000 and with the fixed networks;
- high quality mobile service;
- small terminal for worldwide use;
- worldwide roaming capability;
- capability for multimedia applications, and a wide range of services and terminals.
- **100 Mbps for high and 1 Gbps for low mobility**



# IMT - 2020

- 20 Gbit/s peak data rate
- 100 Mbit/s user experience data rate
- 10 Mbit/s/m<sup>2</sup> area traffic capacity
- 10<sup>6</sup>/km<sup>2</sup> connection density
- 3 x spectrum efficiency
- 1 ms over-the-air latency
- 500 km/h mobility
- 100 x network energy efficiency

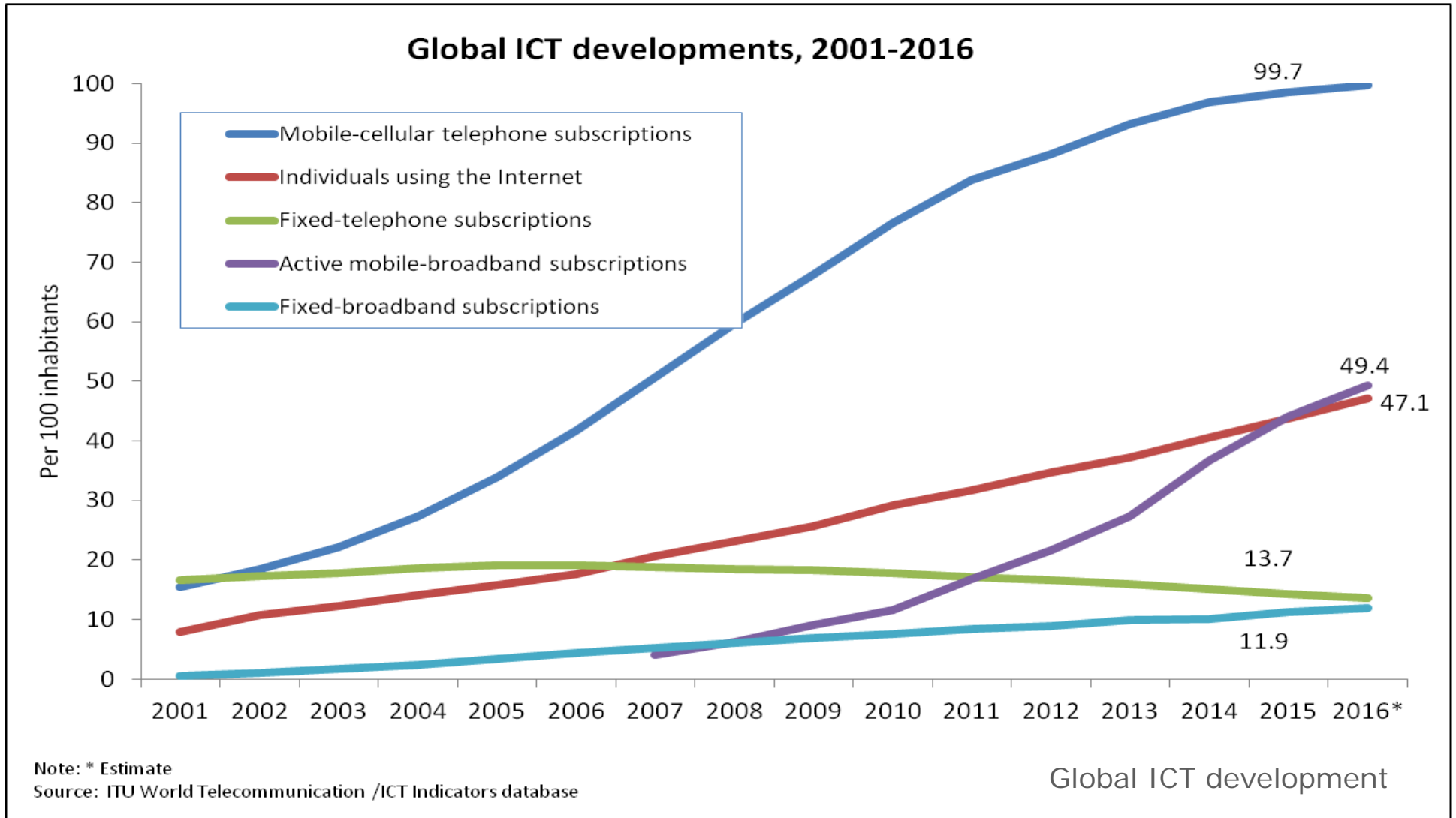




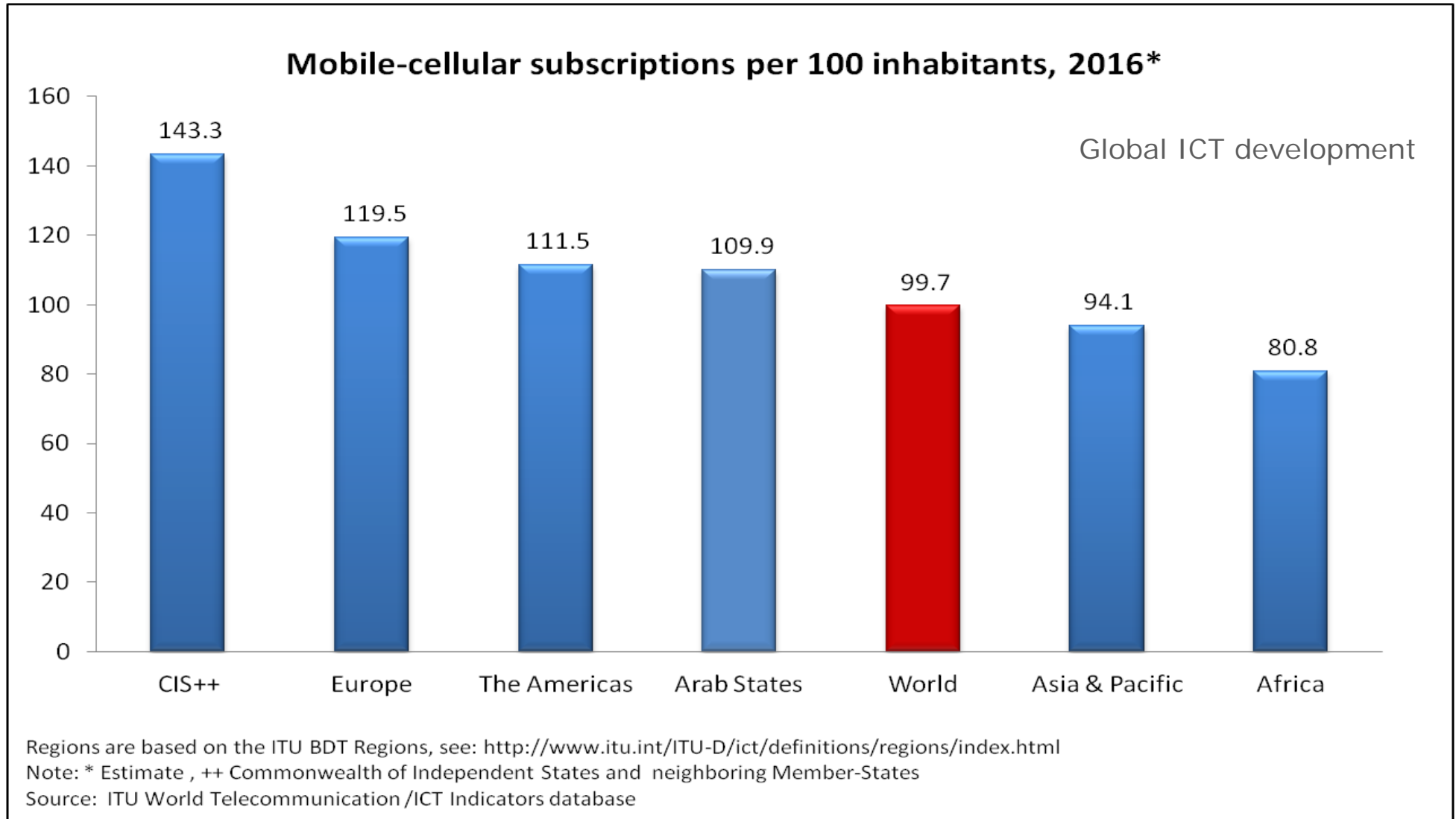
# Global Trend in IMT

- ITU-R [Handbook on Global Trend in IMT](#)
  - Provides integrated summary of many ITU-R documents by 2015 (before WRC-15) as follows:
    - Usage trends and service requirements
    - System characteristics, technologies and standards (Rec. ITU-R [M.1457](#) and [M.2012](#))
    - IMT spectrum (Rec. ITU-R [M.1036](#))
    - Regulatory issues (including licensing issue)
    - Deployment step of IMT systems (including some scenario for migration of GSM and 3G to 4G)
    - Criteria leading to technology decisions (policy)

# Global Trend in IMT

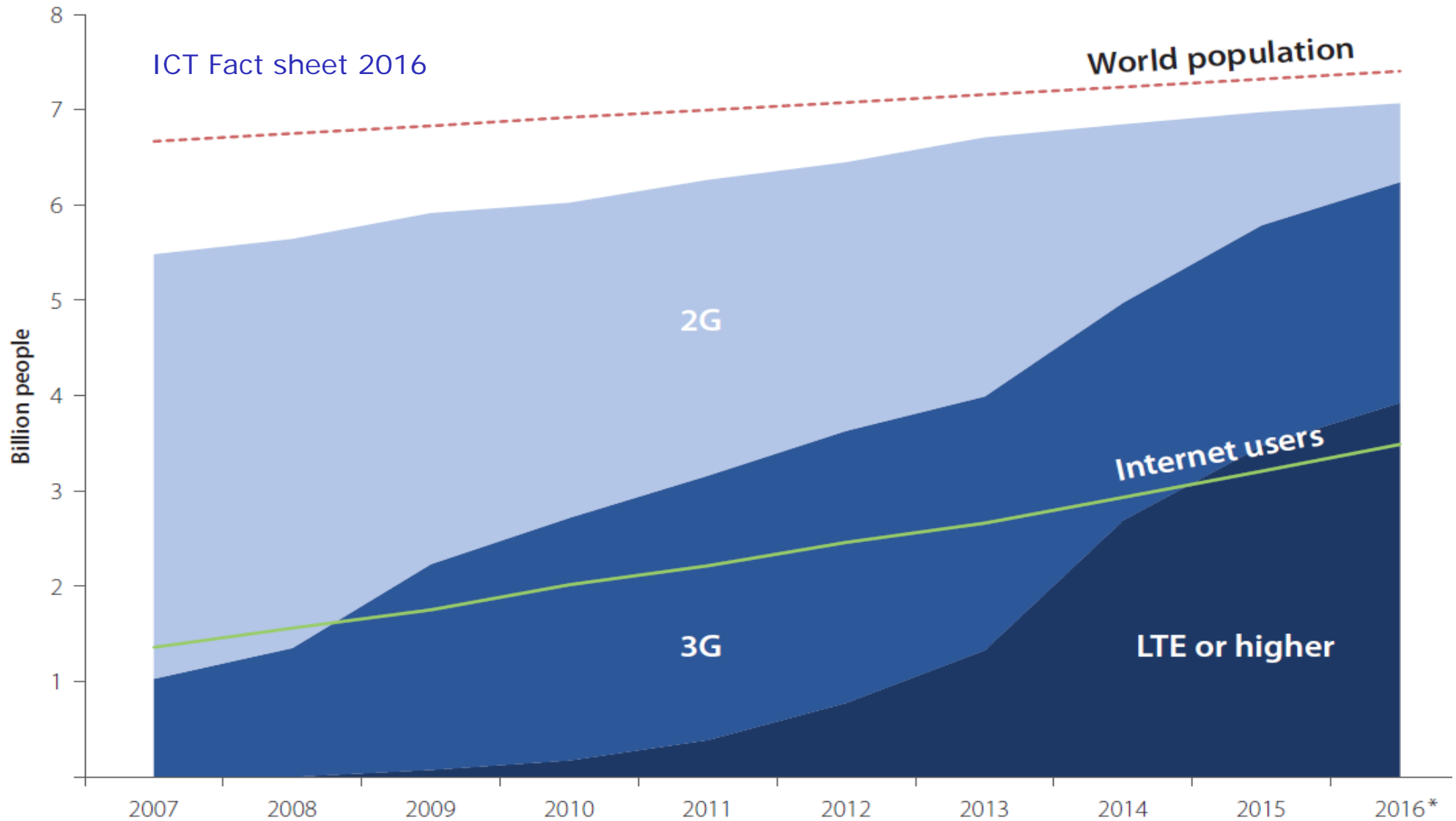


# Global Trend in IMT

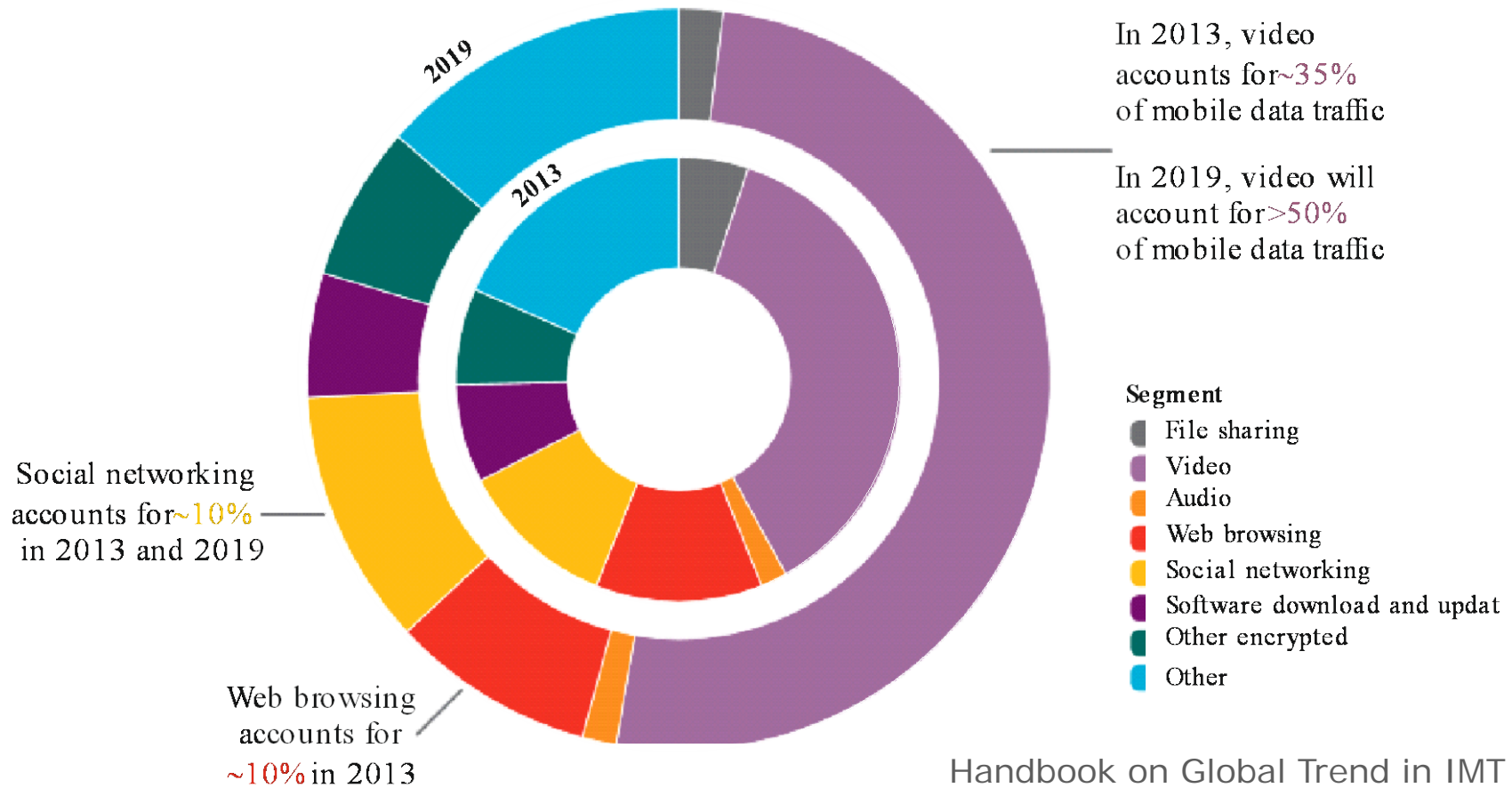




# Global Trend in IMT



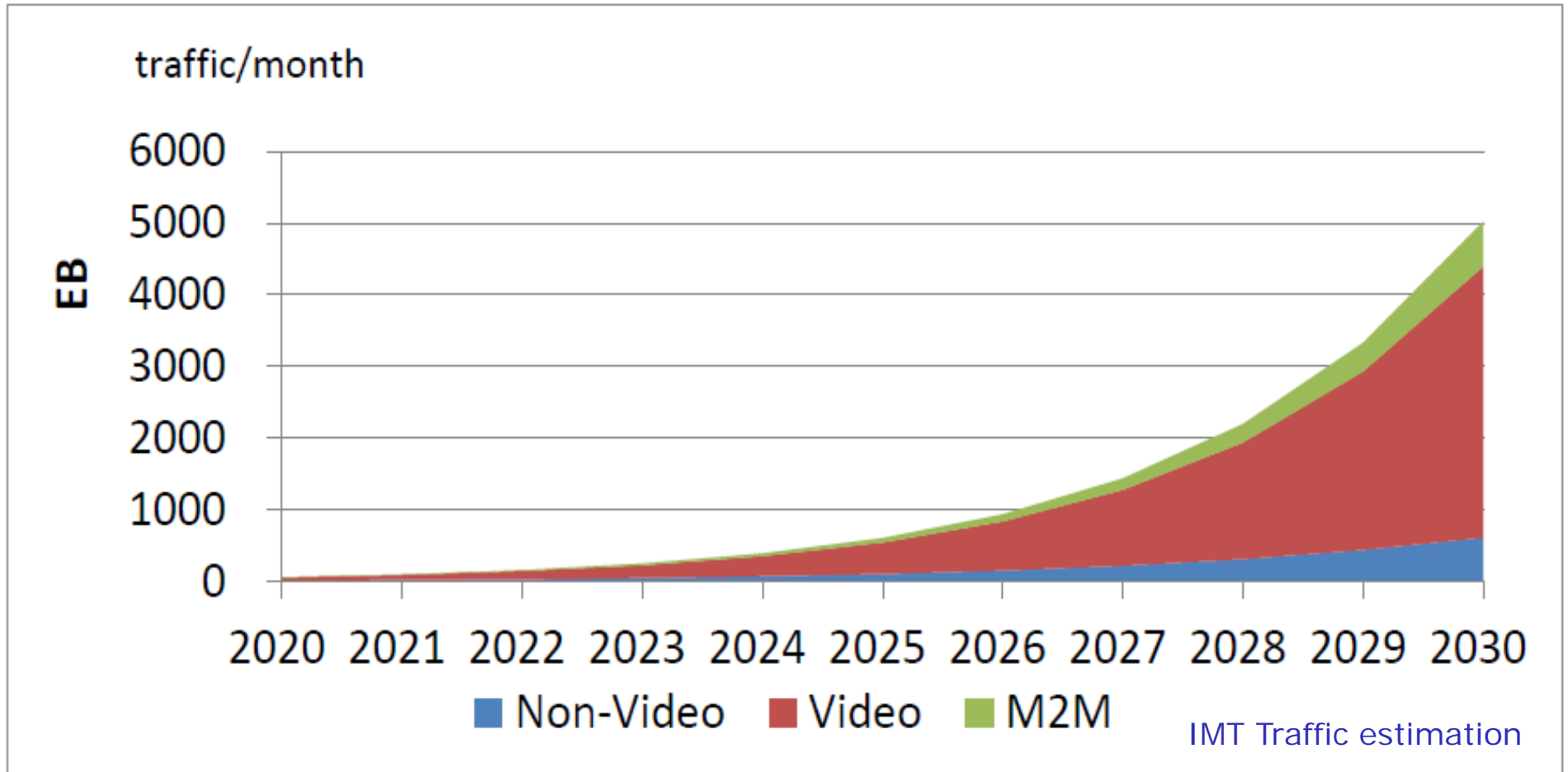
## Mobile traffic 2013-2019



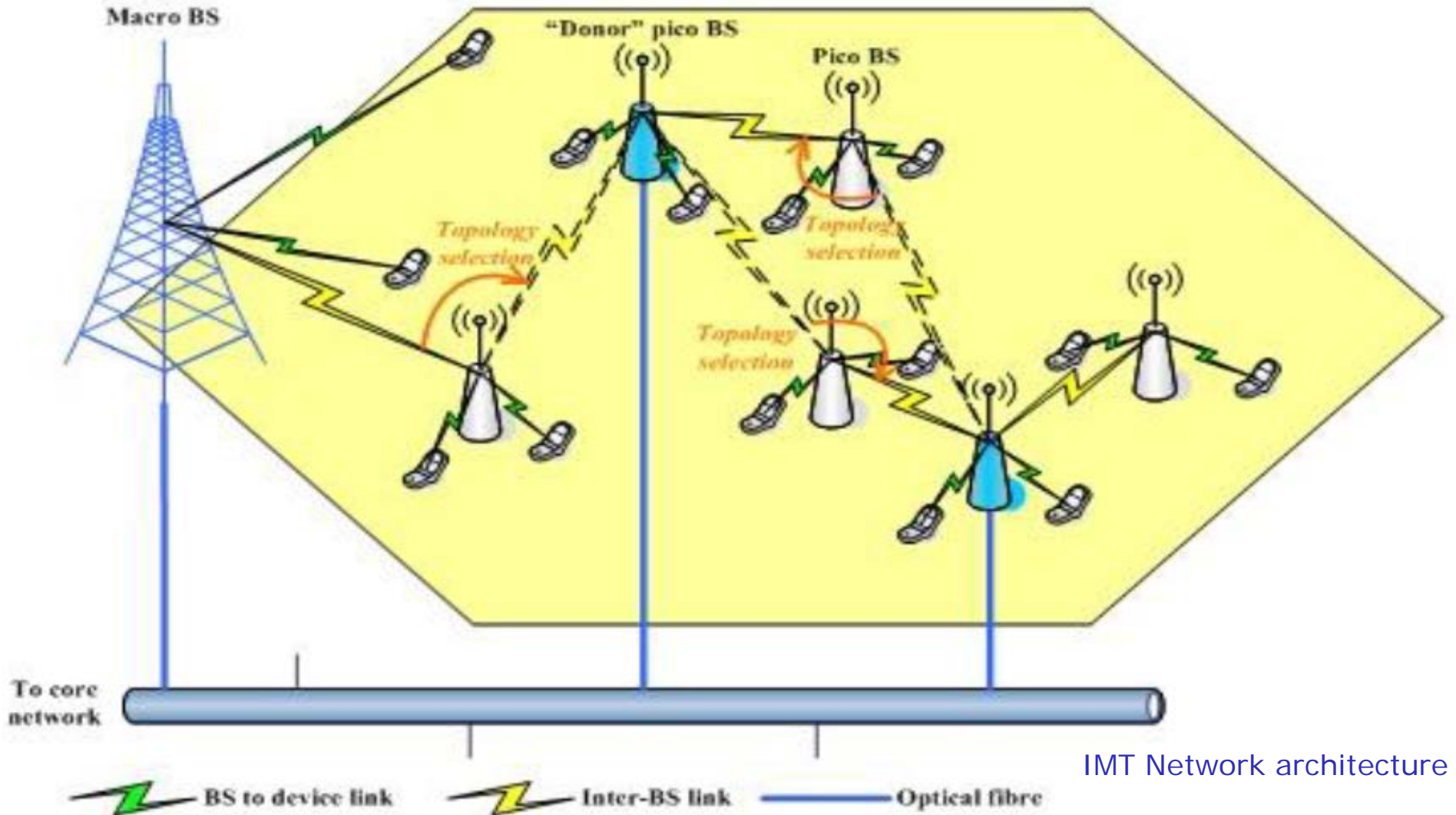
Handbook on Global Trend in IMT

# Global Trend in IMT

Estimation of mobile traffic by different service types globally



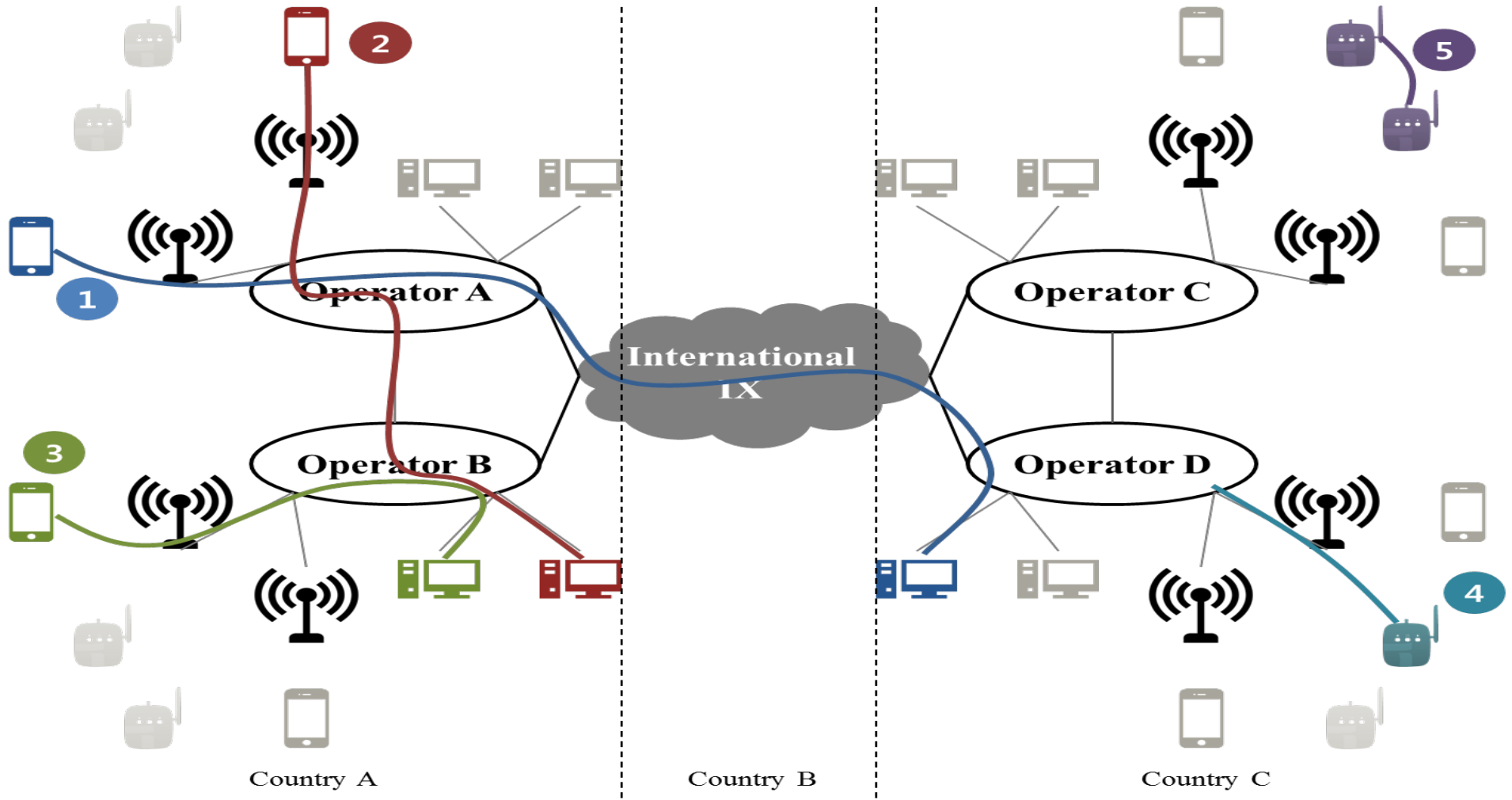
# Global Trend in IMT



IMT Network architecture



# Global Trend in IMT



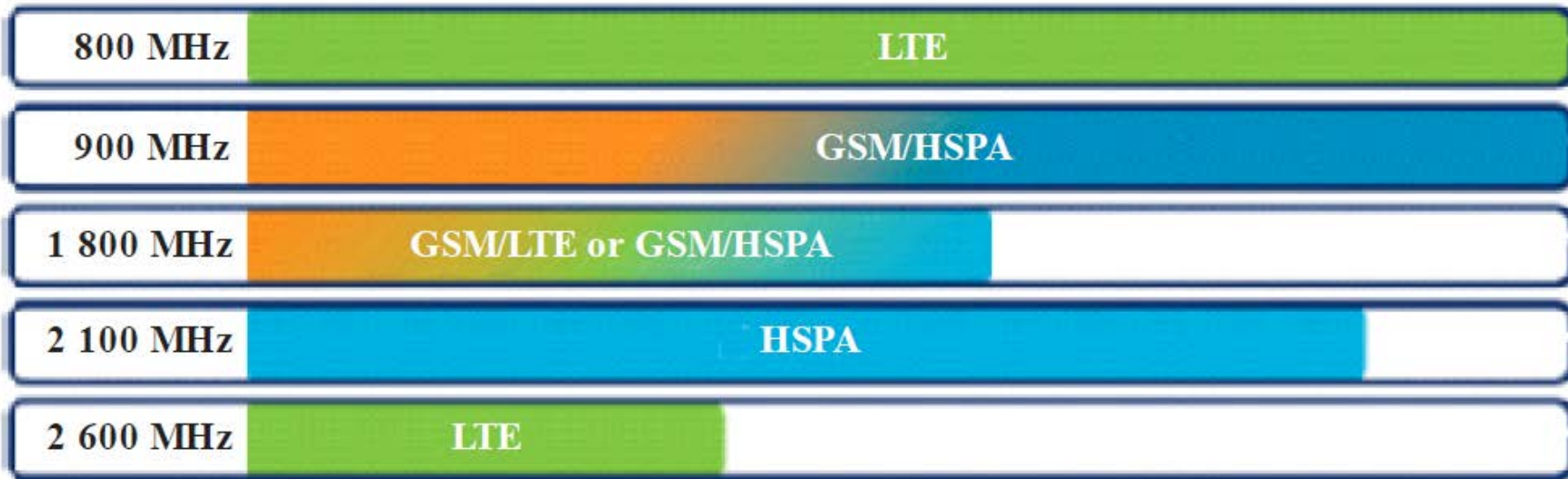
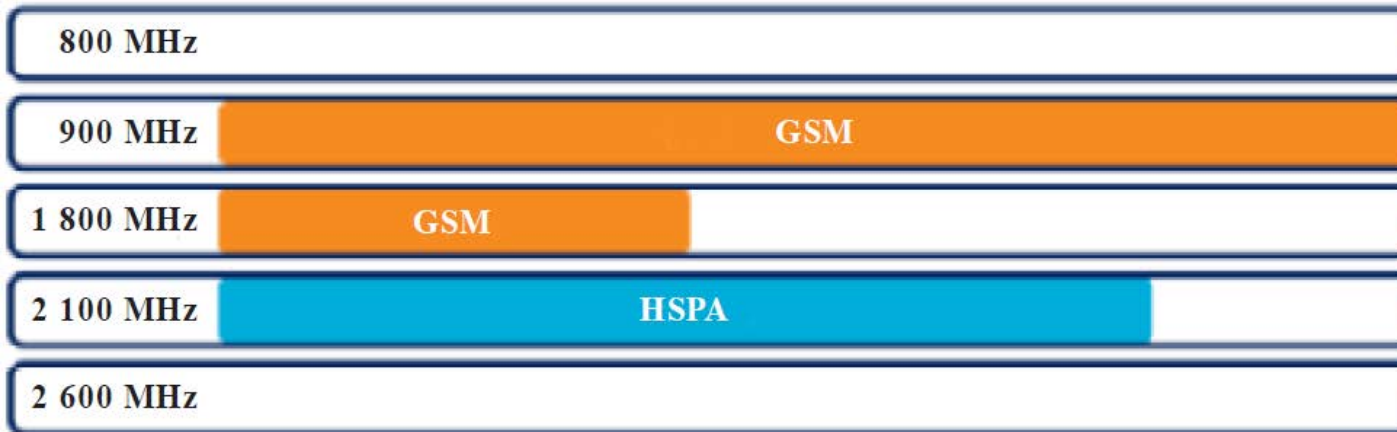


# Global Trend in IMT

- **IMT-2000** (Rec. ITU-R M.1457)
  - IMT-2000 CDMA Direct Spread
  - IMT-2000 CDMA Multi-Carrier
  - IMT-2000 CDMA TDD
  - IMT-2000 TDMA Single-Carrier
  - IMT-2000 FDMA/TDMA
  - IMT-2000 OFDMA TDD WMAN
- **IMT-Advanced** (Rec. ITU-R M.2012)
  - LTE-Advanced
    - Developed by 3GPP as LTE Release 10 and beyond.
  - WirelessMAN-Advanced
    - Incorporated in IEEE Std 802.16
      - MAN (Metropolitan Area Network)

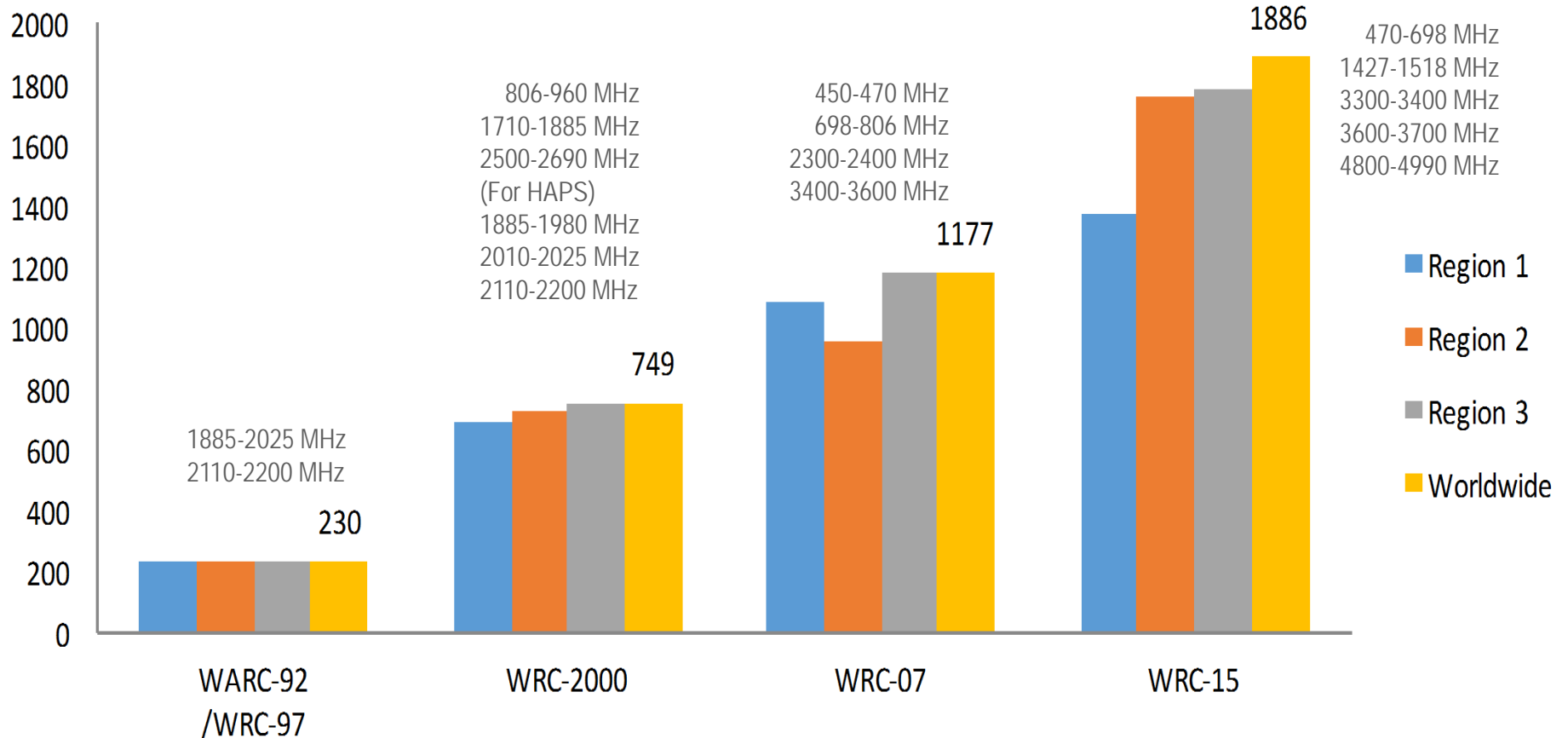
Handbook on Global Trend in IMT

- Migration stratege



# Spectrum for IMT

## Total amount of spectrum identified for IMT (MHz)



# Spectrum for IMT

Frequency bands (bandwidth) in MHz	RR provisions identifying the band for IMT	Area	WRC
450-470 (20)	5.286AA	Worldwide	WRC-07
470-694/698 (224/228)	5.295, 5.296A, 5.308A	Some of Regions 2 and 3 countries	WRC-15
694/698-806 (112/108)	5.313A, 5.317A	Worldwide except some of Region 3 countries from 698-790 MHz	WRC-07 WRC-15
806-960 (154)	5.317A	Worldwide	WRC-2000
1 427-1 518 (91)	5.341A, 5.341B, 5.341C, 5.346, 5.346A	Worldwide except some of Region 1 countries from 1452-1492 MHz	WRC-15
1 710-1 885 (175)	5.384A	Worldwide	WRC-2000
1 885-2 025 (140)	5.388 (RR746A – Future Public Land Mobile Telecommunication System)	Worldwide	WARC-92
2 110-2 200 (90)	5.388 (RR746A - FPLMTS)	Worldwide	WRC-92
2 300-2 400 (100)	5.384A	Worldwide	WRC-07
2 500-2 690 (190)	5.384A	Worldwide	WRC-2000
3 300-3 400 (100)	5.429B, 5.429D, 5.429F	45 countries	WRC-15
3 400-3 600 (200)	5.430A, 5.432A, 5.432B, 5.433A	Worldwide except some of Region 3 countries	WRC-07
3 600-3 700 (100)	5.434A	Some of Region 2 countries	WRC-15
4 800-4 990 (190)	5.441A, 5.441B	Some of Regions 2 and 3 countries	WRC-15



# Spectrum for IMT



Freq_fm (MHz)	Freq_to (MHz)	BW (MHz)
450	470	20
470	608	138
608	610	2
610	614	4
614	694	80
694	698	4
698	790	92
790	902	112
902	928	26
928	960	32
1427	1452	25
1452	1492	40
1492	1518	26
1710	1885	175
1885	2025	140
2110	2200	90
2300	2400	100
2500	2690	190
3300	3400	100
3400	3500	100
3500	3600	100
3600	3700	100
4800	4900	100
4900	4990	90
<b>Total BW</b>	<b>(MHz)</b>	<b>1886</b>

Number of Member states			
Region 1	Region 2	Region 3	Worldwide
121	35	37	193
-	5	4	9
-	-	4	4
-	-	7	7
-	7	7	14
121	7	7	135
121	35	26	182
121	35	37	193
121	12	37	170
121	35	37	193
121	35	37	193
53	35	37	125
121	35	37	193
121	35	37	193
121	35	37	193
121	35	37	193
121	35	37	193
121	35	37	193
33	6	6	45
121	35	11	167
121	35	10	166
-	4	-	4
-	1	3	4
-	-	3	3
<b>1372</b>	<b>1796</b>	<b>1786</b>	<b>1886</b>

Number of Region1 Member States			
Africa	Arab	Europe	This Area
44	23	42	12
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
44	23	42	12
44	23	42	12
44	23	42	12
44	23	42	12
44	23	42	12
44	23	42	12
37	16	-	-
44	23	42	12
44	23	42	12
44	23	42	12
44	23	42	12
44	23	42	12
44	23	42	12
31	2	-	-
44	23	42	12
44	23	42	12
-	-	-	-
-	-	-	-
-	-	-	-
<b>1372</b>	<b>1372</b>	<b>1232</b>	<b>1232</b>

# Spectrum for IMT

- Candidate frequency bands for IMT-2020

Freq. From	(GHz) To	BW (MHz)	APT	ASMG	CEPT	CITEL	This Region	WRC-15 decision Res. 238
24.25	27.5	3,250	Yes	No	Yes	Yes	Yes	24.25 – 27.5
27.5	29.5	2,000	No	No	No	Yes	No	27.5-29.5
31.8	33.4	1,600	Yes	Yes	Yes	Yes	Yes	31.8 – 33.4
37	40.5	3,500	Yes	Yes	No	Yes	No	37 – 40.5
40.5	42.5	2,000	Yes	Yes	Yes	No	Yes	40.5 – 42.5
42.5	43.5	1,000	Yes	Yes	Yes	No	No	42.5 - 43.5
45.5	47	1,500	Yes	Yes	Yes	Yes	Yes	45.5 - 47
47	47.2	200	No	Yes	Yes	No	Yes	47 – 47.2
47.2	50.2	3,000	Yes	Yes	Yes	Yes	Yes	47.2 – 50.2
50.4	52.6	2,200	Yes	Yes	No	Yes	Yes	50.4 -52.6
59.3	66	6,700	No	Yes	No	Yes	No	59.3-66
66	76	10,000	Yes	Yes	Yes	Yes	Yes	66 - 76
81	86	5,000	Yes	Yes	Yes	No	Yes	81 - 86



# Compatibility general

- Frequency sharing! WHY?
  - Because the demand for spectrum rapidly grows and usable spectrum resources are limited
  
- Compatibility study! WHY?
  - Because the radio wave can't be confined within a specific area
  - To ensure coexistence of two or more services
  - To avoid a harmful interference between countries, services and stations





# Compatibility general

- Compatibility! HOW?
  - Technical aspect
    - Protection criteria
    - Interference [prediction](#) and measurement
    - Private sectors' effort – (ex. 3GPP Network ID)
  
  - Regulatory/Administrative aspect
    - International Frequency allocation
    - International channel plans / coordination (administrations)
    - National frequency allocation
    - National channel plans / licensing (operators)

# Compatibility general

- Compatibility in the technical aspect

Frequency separation	Spatial separation	Time separation	Signal separation
Frequency division multiple access (FDMA)	Space division multiple access (SDMA)	Time division multiple access (TDMA)	Code division multiple access (CDMA)
Channelling plans	Allotment plan	Dynamic frequency assignment	Othogonal frequency devision multiple access (OFDMA)
Band segmentation	Antenna system characteristics:	Duty cycle control	Signal coding and processing
Frequency agile systems	–adaptive antenna (smart antenna)		Adaptive signal processing
Dynamic frequency assignment	–antenna polarization discrimination		Spread spectrum:
	- Physical barriers and site shielding		–direct sequence
	Dynamic power control		–frequency hopping
			–pulsed FM
			Antenna polarization

See Rec. ITU-R SM.1131



## Compatibility general

- Compatibility in the technical aspect
  - Need to ensure Frequency, Space, Time, Signal separation
  - Protection criteria is given as
    - A hard limit (I/N criteria)
      - Sometimes it is expressed as a permissible interference signal level in a form of RF receiving power (dBW), RF power flux density (dBW/m<sup>2</sup>), electric field strength (dBuV/m) or IF domain channel power (dBW)
    - A coordination margin (C/I or W/U criteria)
  - Application of propagation model
    - To determine service area : 50% time and 50% place
    - To determine interference : 1-20 % time and 50% place

# Compatibility general

- Administrative aspect – Frequency allocation

Region 1	Region 2	Region 3
<b>3 300-3 400</b> RADIOLOCATION  5.149 <b>5.429</b> 5.429A <b>5.429B</b> 5.430	<b>3 300-3 400</b> RADIOLOCATION Amateur, Fixed, Mobile  <b>5.149 5.429C 5.429D</b>	<b>3 300-3 400</b> RADIOLOCATION Amateur  5.149 <b>5.429</b> 5.429E <b>5.429F</b>
<b>3 400-3 600</b> FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile <b>5.430A</b> Radiolocation	<b>3 400-3 500</b> FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.431A <b>5.431B</b> Amateur Radiolocation 5.433 5.282	<b>3 400-3 500</b> FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile <b>5.432 5.432B</b> Radiolocation 5.433 5.282 5.432A
	<b>3 500-3 600</b> FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.431B Radiolocation 5.433	<b>3 500-3 600</b> FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.433A Radiolocation 5.433
5.431		



# Compatibility general

- Administrative aspect – Footnotes to FAT
  - *Additional allocation*: to add a certain service
  - *Alternative allocation*: to except a certain table allocation
  - *Different category of service*: to upgrade a secondary to a primary
  - Conditions of frequency use: to make an identification or to impose an operational criteria
  
- Example Footnotes
  - **5.430A** The **allocation** of the frequency band 3 400-3 600 MHz to the mobile, except aeronautical mobile, service **is subject to agreement obtained under No. 9.21**. This frequency band is **identified for International Mobile Telecommunications (IMT)**. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. The provisions of Nos. **9.17** and **9.18** shall also apply in the coordination phase. Before an administration brings into use a (base or mobile) station of the mobile service in this frequency band, it shall ensure that the power flux-density (pfd) produced at 3 m above ground does not exceed  $-154.5 \text{ dB(W/(m}^2 \text{ 4 kHz))}$  for more than 20% of time at the border of the territory of any other administration.

# Compatibility general

## ■ Example Footnotes

- **5.429** *Additional allocation:* in Saudi Arabia, Bahrain, Bangladesh, Benin, Brunei Darussalam, Cambodia, Cameroon, China, Congo (Rep. of the), Korea (Rep. of), Côte d'Ivoire, Egypt, the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Japan, Jordan, Kenya, Kuwait, Lebanon, Libya, Malaysia, Oman, Uganda, Pakistan, Qatar, the Syrian Arab Republic, the Dem. Rep. of the Congo, the Dem. People's Rep. of Korea, Sudan and Yemen, the band 3 300-3 400 MHz is also allocated to the fixed and mobile services on a primary basis. The countries bordering the Mediterranean shall not claim protection for their fixed and mobile services from the radiolocation service. (WRC-15)
- **5.432** *Different category of service:* in Korea (Rep. of), Japan and Pakistan, the allocation of the band 3 400-3 500 MHz to the mobile, except aeronautical mobile, service is on a primary basis. (WRC-2000)
- **5.412** *Alternative allocation:* in Kyrgyzstan and Turkmenistan, the band 2 500-2 690 MHz is allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis. (WRC-12)

- To except BSS from the table allocation

**2 520-2 655**

FIXED 5.410

MOBILE except aeronautical mobile 5.384A

BROADCASTING-SATELLITE 5.413 5.416

# Compatibility general

## ■ Goal of frequency coordination

- To ensure sharing of frequencies especially in the border areas;
- To aid long-term frequency planning;
- To promote efficient spectrum utilisation, and
- To help interference avoidance.

## ■ Frequency coordination! WHEN?

- Interference signal level > Permissible/Accepted interference
  - **permissible interference:** Observed or predicted interference which **complies** with quantitative interference and sharing criteria contained in these Regulations or in ITU-R Recommendations or in special agreements as provided for in these Regulations (RR 1.167).
  - **accepted interference:** Interference at a higher level than that defined as permissible interference and which has been **agreed upon between two or more administrations** without prejudice to other administrations (RR 1.168).

# Compatibility general

- Coordination mandated by RR

Provisions	Service	Frequency bands	Area
RR9.16 or RR9.18	Terrestrial service (Mostly fixed and mobile service)	Frequency bands above 100 MHz, allocated to a terrestrial service and to a space service on an equal right	Worldwide
RR9.19	Terrestrial service (Mostly fixed and mobile service)	Frequency bands above 100 MHz, allocated to a terrestrial service and to a space service on an equal right	Worldwide
RR9.21	Terrestrial service subject to the obtain agreement of concerning administrations under No. 9.21	Frequency bands having a footnote referring to No. 9.21	Worldwide
RR Article 6 (Plans)	Planned service	Planned frequency	Planned area





# Compatibility issue for IMT-Advanced

- All compatibility issues have been addressed:
  - [CPM Report](#) to WRC-15
  - The [JTG 4-5-6-7 Chairman's report](#)
  - Many ITU-R [Recommendations](#) and [Reports](#)
- However many frequency bands are allocated to the land mobile service or identified for IMT
  - Subject to obtain agreement from concerning administrations under No. **9.21** of the RR
  - This means **further coordination is required** when IMT is to be brought into use.

# Compatibility issue for IMT-Advanced in Region 1, subject to No. 9.21 of the RR

Freq_fm	Freq_to	Service	Area	Protected	Criteria	Reference
<b>694</b>	<b>790</b>	LMS, MMS	Region 1 countries within 450 km from countries listed in No. 5.312 (ARM, AUT, AZE, BIH, BLR, BUL, CZE, D, DNK, EST, FIN, GEO, GRC, HNG, HRV, IRQ, KAZ, KGZ, LTU, LVA, MDA, MNG, NOR, POL, ROU, RUS, S, SRB, SVK, SYR, TJK, TKM, TUR, UKR, UZB)	ARM, AZE, BLR, , GEO, KAZ, KGZ, RUS, TJK, TKM, UKR, UZB	Res. 760 (Rev. WRC-15)	5.312A (WRC-15)
726 766	758 790	LMS, MMS	Region 1 countries within 450 km from countries listed in No. 5.312 (ALB, I, MKD, MNE)	BUL		
<b>790</b>	<b>862</b>	LMS, MMS	Region 1 countries within 450 km from countries listed in No. 5.312 (ARM, AUT, AZE, BIH, BLR, BUL, CZE, D, DNK, EST, FIN, GEO, GRC, HNG, HRV, IRQ, KAZ, KGZ, LTU, LVA, MDA, MNG, NOR, POL, ROU, RUS, S, SRB, SVK, SYR, TJK, TKM, TUR, UKR, UZB)	ARM, AZE, BLR, GEO, KAZ, KGZ, RUS, TJK, TKM, UKR, UZB	Res. 749 (Rev. WRC-15)	5.316B (WRC-15)
790 822	814 862	LMS, MMS	Region 1 countries within 450 km from countries listed in No. 5.312 (ALB, I, MKD, MNE)	BUL		
860	862	LMS, MMS	Region 1 countries within 450 km from countries listed in No. 5.312 (SVN (until 31.12.2017))	POL		

# Compatibility issue for IMT-Advanced in Region 1, subject to No. 9.21 of the RR

Freq_fm	Freq_to	Service	Area	Protected	Criteria	Reference
1429 1492	1452 1518	LMS (IMT)	Region 1 countries within 670 km from countries listed in No. 5.342 (ALB, ARM, AUT, AZE, BIH, BLR, BUL, CZE, D, DNK, EST, FIN, GEO, GRC, HNG, HRV, I, IRQ, KAZ, KGZ, LTU, LVA, MDA, MKD, MNE, MNG, NOR, POL, ROU, RUS, S, SRB, SVK, SVN, SYR, TJK, TKM, TUR, UKR, UZB)	ARM, AZE, BLR, KGZ, RUS, UKR, UZB	RoP B6	5.341A (WRC-15)
1452	1492	LMS (IMT)	Countries in No. 5.346 within 670 km from countries listed in No. 5.342 (IRQ)	ARM, AZE, BLR, KGZ, RUS, UKR, UZB	RoP B6	5.346 (WRC-15)
3400	3600	LMS, MMS	XR1	XAA	RoP B6	5.430A (WRC-15)



# Compatibility issue for IMT-Advanced in Region 1, subject to No. 9.21 of the RR for an **example base station**



The screenshot shows a Google Maps interface with a red pin placed on a building labeled "Державний університет телекомунікацій". A label "SUT-FB-001" has been added to this pin. The map shows surrounding streets like "Solomińska St" and "Mekyvizatoriv St", and other landmarks like "lifecell" and "Вища кваліфікаційна комісія суддів України". The interface includes a search bar, a "Directions" button, and various map controls like zoom and street view.



# An example base station



Pending notice - UKR - GE06L - 116197049 (L06)

**Data** | Emission Characteristics | **Antenna Characteristics** | Station and Site Information | Coordination Information | Finding Information | Publication History | Status Information | Remarks | Coordination examination details

Distance: 248.78 km  
Azimuth: 27.1°

32°08'38" E - 52°24'32" N - RUS  
Reference point geographic coordinates: 30°28'34" E - 50°25'43" N

**1000 km contour** | **Field Strength Contour** | **Geographic Site & Service Area**

Show on map

**Affected Administrations**

BLR				
RUS				

Trigger field strength: 25.00000 dBuV/m  
Antenna height: 10.00000 m  
System type: \_\_\_

Azimuth (°)	Geographic coordinates	Distance (km)	Field strength (dBuV/m)
0.00000	30°28'34"E - 52°40'34"N	250.00000	
1.00000	30°32'26"E - 52°40'38"N	250.00000	

**Administrative Data**  
Emission Characteristics  
Antenna Characteristics  
Station and Site Information  
Coordination Information  
Finding Information  
Publication History  
Status Information  
Remarks  
Coordination examination details

Use reference point

**Examined on**  
09/11/2016 15:12:32

Details for RX  
Details for TX

---

**Data** | Emission Characteristics | **Antenna Characteristics** | Station and Site Information | Coordination Information | Finding Information | Publication History | Status Information | Remarks | Coordination examination details

Distance: 432.83 km  
Azimuth: 65.4°

36°12'57" E - 51°54'43" N - RUS  
Reference point geographic coordinates: 30°28'34" E - 50°25'42" N

**1000 km contour** | **Field Strength Contour** | **Geographic Site & Service Area**

Show on map

**Affected Administrations**

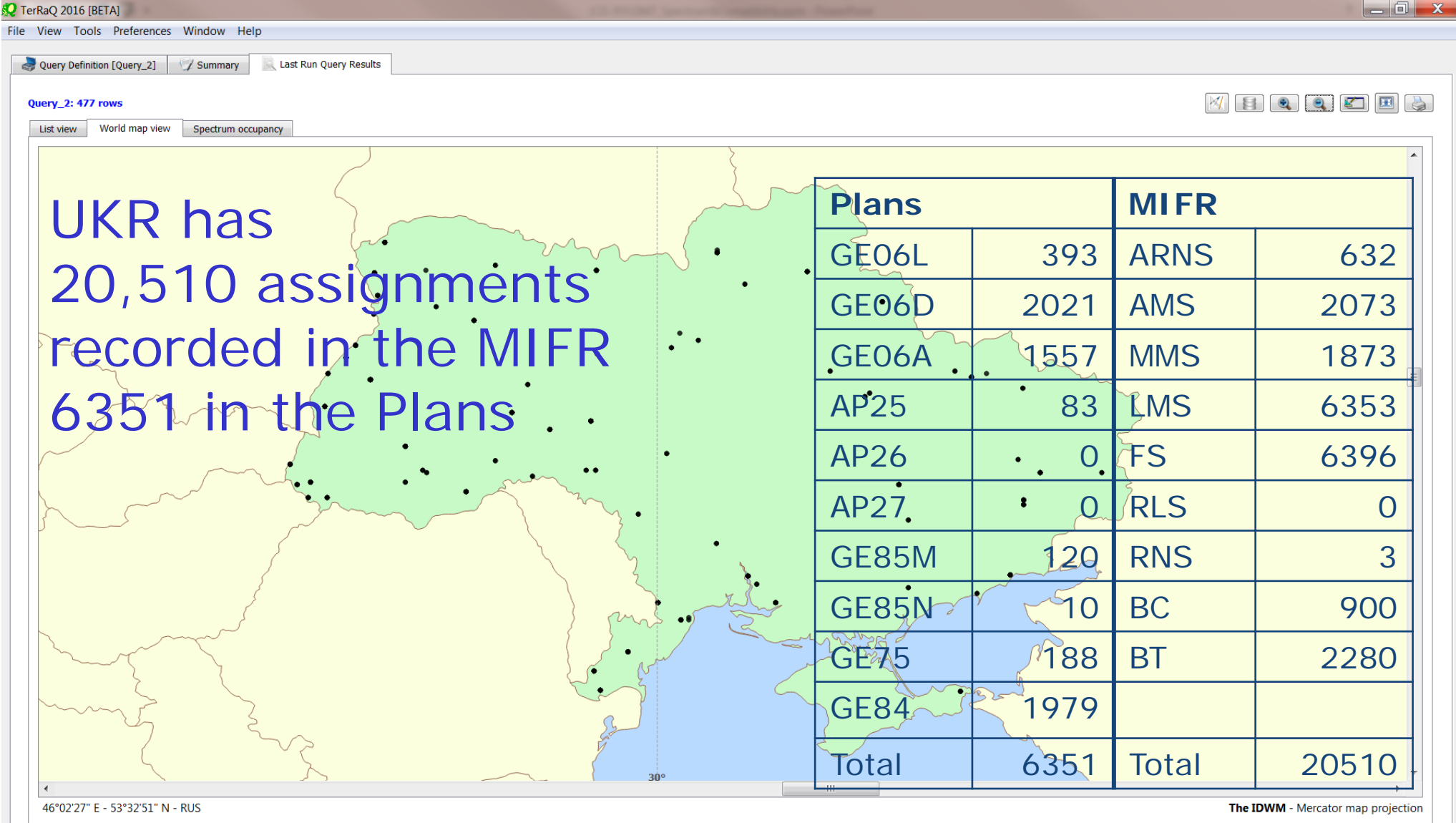
BLR				
MDA				
RDU				
RUS				

Trigger field strength: 14.37050 dBuV/m  
Antenna height: 20.00000 m  
System type: \_\_\_

Azimuth (°)	Geographic coordinates	Distance (km)	Field strength (dBuV/m)
0.00000	30°28'34"E - 54°20'08"N	434.59750	14.68712
1.00000	30°35'34"E - 54°19'46"N	433.99090	14.74356



# An example status of registered frequencies





# Compatibility issue for IMT-2020



- All compatibility issues should be addressed:
  - [CPM Report](#) to WRC-19
  - The TG5/1 [Chairman's report](#)
  - Many ITU-R [Recommendations](#) and [Reports](#)
- Many frequency bands are allocated to the land mobile service or identified for IMT
  - Subject to obtain agreement from concerning administrations under No. **9.21** of the RR
  - This means further coordination is required when IMT is to be brought into use.

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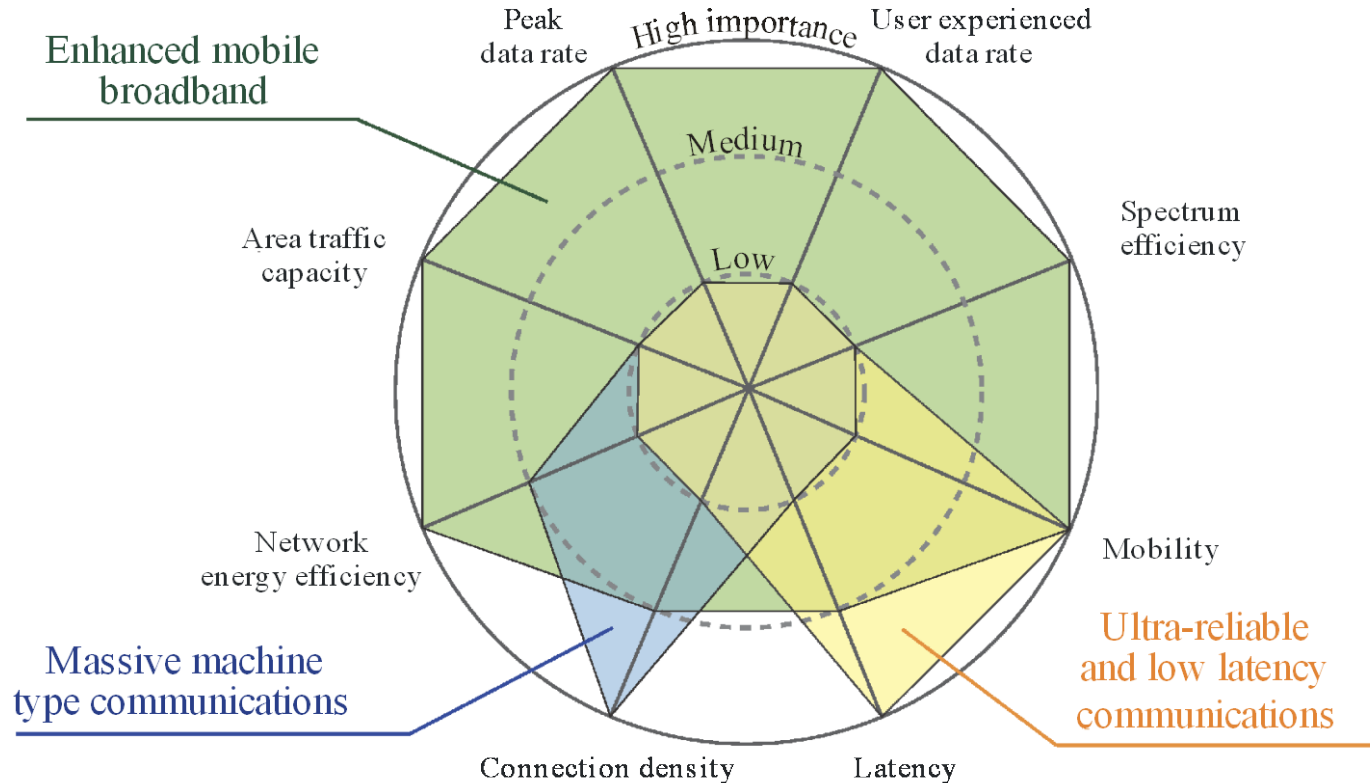
- Protected services and required action

Res. 238 (WRC-15) (GHz)	Bandwidth (MHz)	Protected service	Required action
24.25 – 27.5	3,250	FS, MS, FSS(E-s), EESS(s-E), SRS (s-E), ISS	Allocation of 24.25-25.25 GHz to LMS
31.8 – 33.4	1,600	FS, RNS, SRS (s-E), ISS	Allocation to LMS
37 – 40.5	3,500	FS, MS, FSS (s-E), SRS (s-E), MSS (s-E), EESS (E-s)	
40.5 – 42.5	2,000	FS, BS, FSS (s-E), BSS	Upgrade of allocation to LMS
42.5 - 43.5	1,000	FS, MS, FSS (E-s), RAS	
45.5 - 47	1,500	FS, MS, FSS (E-s), RAS	
47 – 47.2	200	AS, ASS	Allocation to LMS
47.2 – 50.2	3,000	FS, MS, FSS (E-s/s-E)	
50.4 -52.6	2,200	FS, MS, FSS (E-s)	
66 - 76	10,000	FS, MS, BS, FSS (s-E), BSS, MSS (s-E)	
81 - 86	5,000	FS, MS, FSS (E-s), MSS (E-s)RAS	



# Compatibility issue for IMT-2020

- 3 categories of IMT-2020 application
  - Deployment scenario affects the compatibility study





# Concluding remarks



- ITU is with you for more than 150 years.
  - ITU has a firm regulatory guideline for communication including IMT.
- ITU supports Member countries
  - for their sustainable development
  - by IMT vision, IMT spectrum and core standards
- IMT Spectrum demand is growing
  - compatibility is not easy but to be resolved
- To ensure the right of spectrum use
  - get allocation and identification
  - register frequencies to the Plans and MIFR