Broadband for Driving Sustainable Development: *Challenges on RF side*

ITU Regional Forum on Reshaping Policy and Regulatory Landscape for Accelerating Broadband Access

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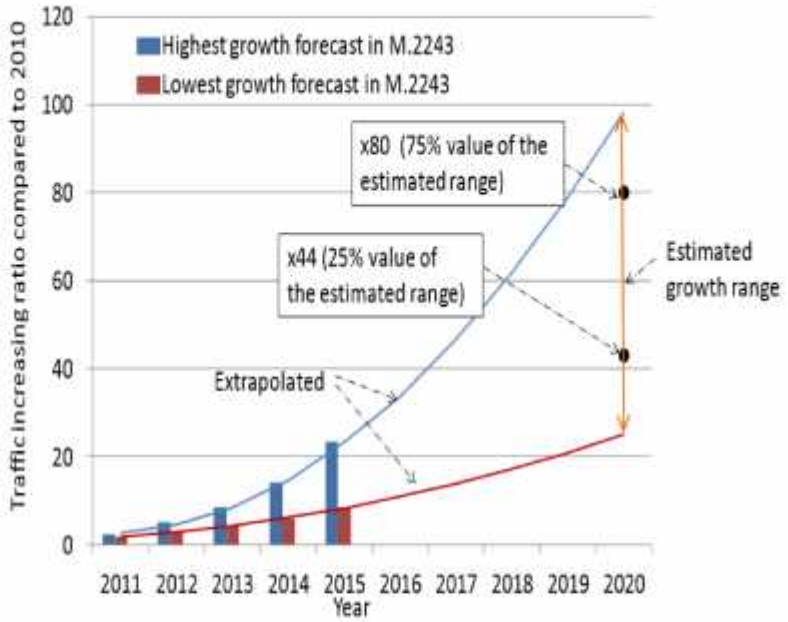
AIM

- Highlight Demand and supply side challenges for Mobile Broadband (BB) in future
- Note on strategies that may be adopted to resolve these challenges
- ITU spectrum related activities for IMT/IMT advanced

Why the need for Efficient SM now?

Demand of Content – Internet Traffic Explosion



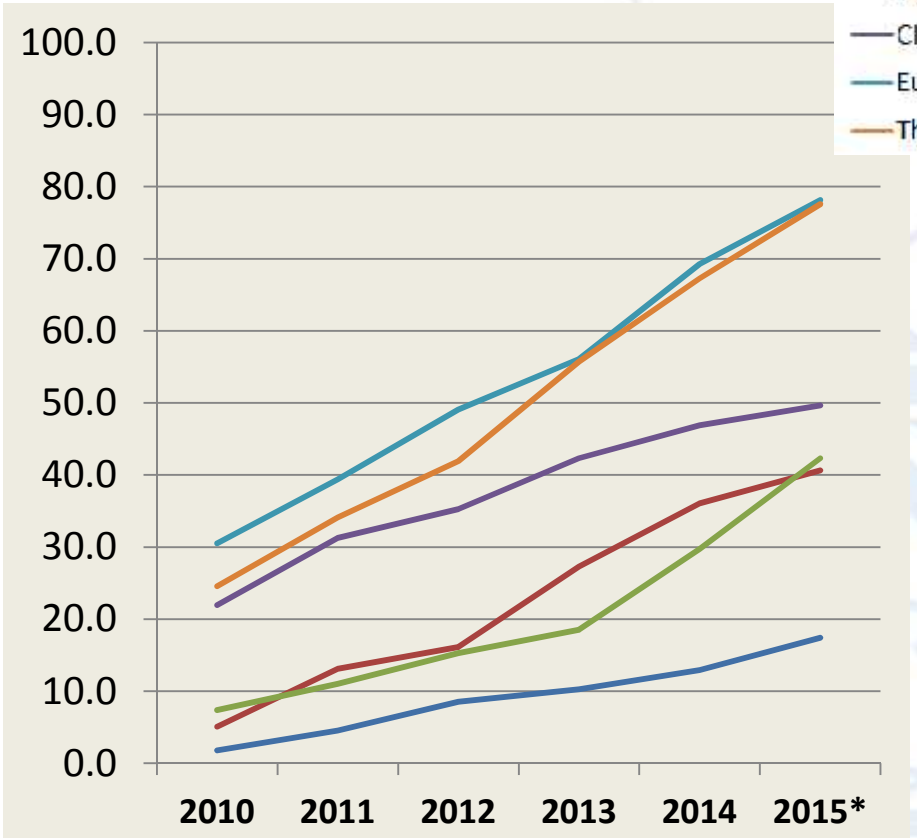
37% of Internet traffic during prime time is online video

Video	Smartphones	Mobile Internet	Machine-to-Machine
~ 70% of internet traffic **by 2014**	**2.5 billion** devices **by 2015** **32x** increase per km^2	**~ 70%** of mobile traffic **by 2014**	**3x** growth in the **next five years**

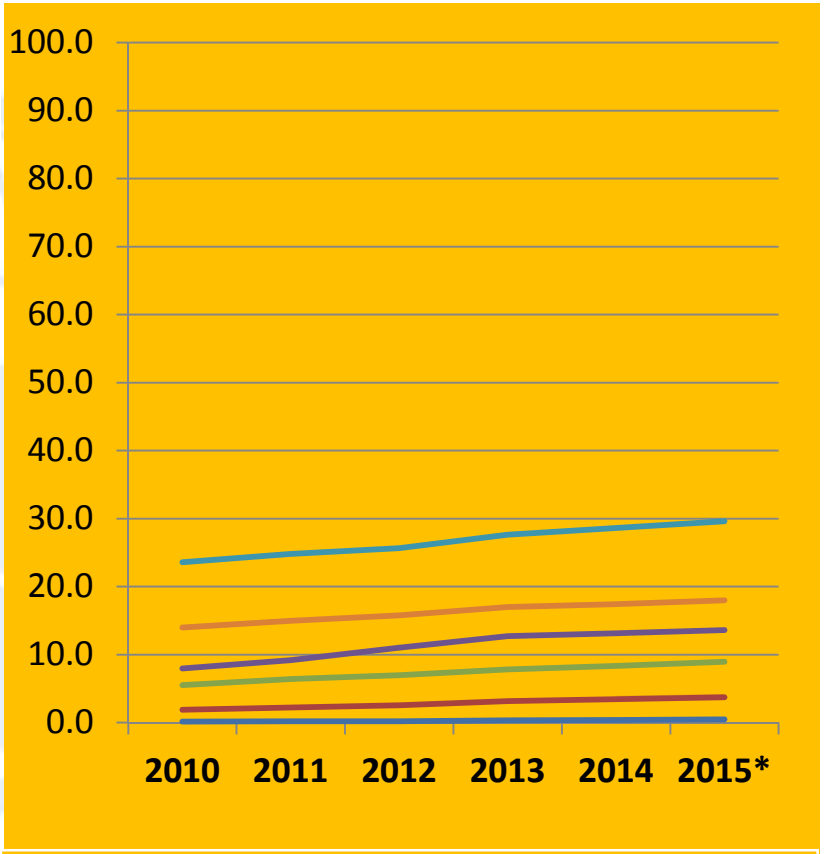
Mobile broadband networks are at the heart of this trend ...

Source: ITU M. 2243 and Alcatel Lucent

Fixed v/s Mobile BB Growth



Active Mobile Broadband subscriptions per 100 inhabitants 2010-2015*



Fixed Broadband subscriptions per 100 inhabitants 2010-2015*

Note: * Estimate

But RF is a Limited resource !

Features	Natural Resource			
	Spectrum	Land	Oil	Water
Is the resource varied?	**YES**	YES	Not very	Not very
Is it scarce?	**YES**	YES	YES	YES
Is it renewable?	**YES**	Partially	NO	YES
Can it be stored for later use?	**NO**	NO	YES	YES
Can it be exported?	**NO**	NO	YES	YES
Can it be traded?	**YES**	YES	YES	YES
Can it be made more productive?	**YES**	YES	YES	NO

Only way is to manage this resource Efficiently

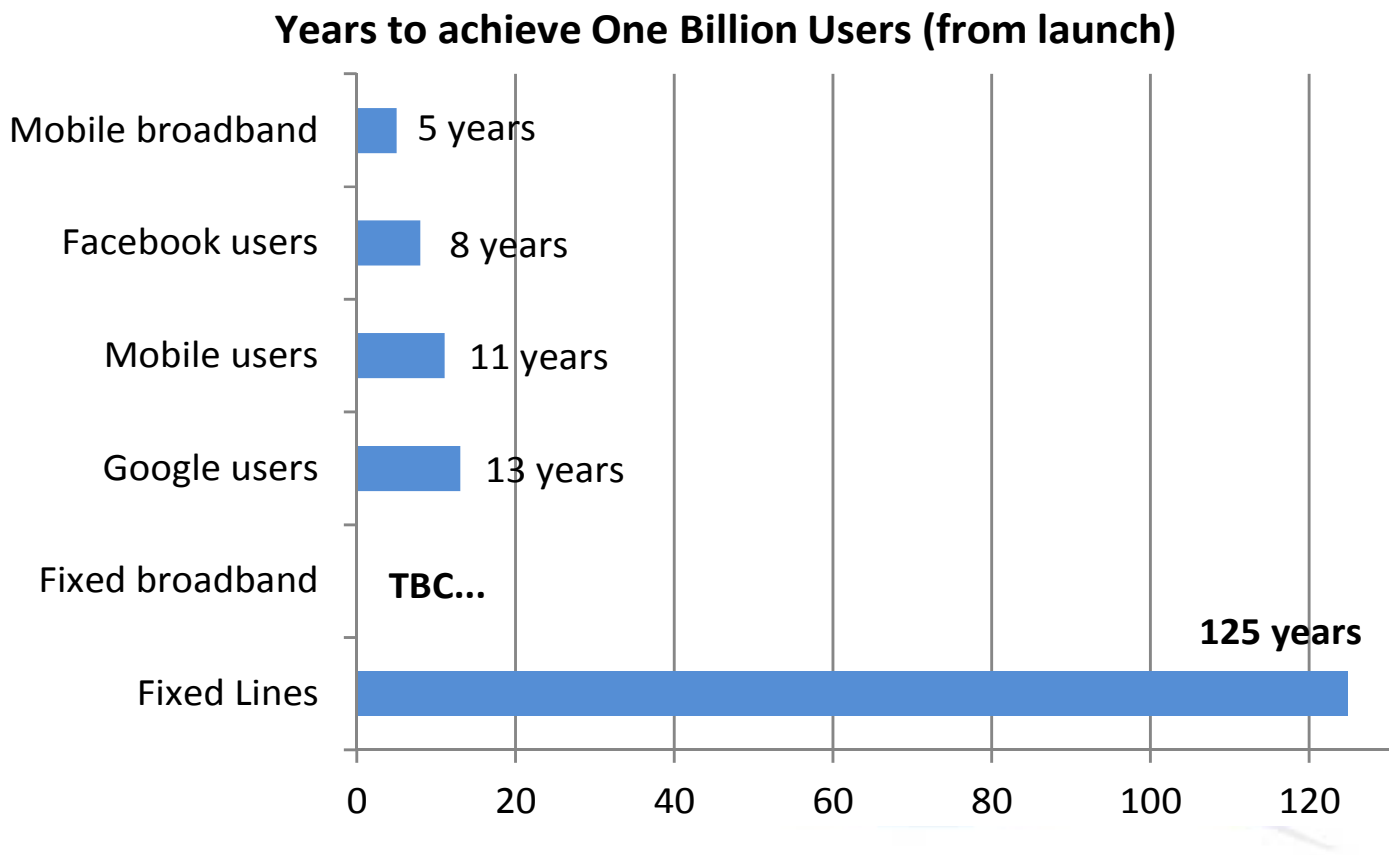
Radio spectrum shall continue playing ever more vital role in provisioning of broad variety of radiocommunications services - public, private and governmental alike

Pressure on spectrum managers to find solutions to ensure unrestricted long term growth of services through allocation of new bands and finding innovative ways of more efficient utilisation of spectrum

TIME TO CRANK EFFICIENCY OF SPECTRUM USE, TIME TO SHARE ITS BENEFITS EVEN MORE ..

Challenges for Mobile BB

Mobile BB fast Growing Industry



ITU forecasts that there will be 7.09 billion mobile cellular subscriptions (as opposed to subscribers) by end 2015, equivalent to a global penetration rate of 97 mobile cellular subscriptions per 100 capita.

Source: ITU – Based various sources

Future trends in Mobile BB

	2013	2014	2015	2020
Mobile cellular subscriptions	• 6.67bn (ITU)	• 6.95bn(ITU) • 7.1 bn (E)	• 7.09 bn (ITU)	• 9.2 bn (Eric)
Unique mobile phone users	• 5.2 bn (MM)	• 4.5bn(GSMA) 3.65bn (WeAreSocial) • 5 bn (Cisco)	• 3.7 bn mid-2015 (GSMA) • 4.9 bn (E) • 5.2bn(W.Bank)	-/-
LTE Subscriptions	• 200m (E)	• 500m (E)	• Q1 - 600m (E) • 1.37 bn (ABI Research)	• 2.5 bn (GSMA) • 3.5 bn (ABI); • 3.7 bn (E)
Mobile broadband subscriptions	• 1.95 bn (ITU) • 2.1 bn (E)	• 2.69bn (ITU) •	• 3.46 bn (ITU) - 48.8% of mobile subscriptions	• 7.7 bn; 85% of all subscriptions (E)
Fixed broadband (ITU)	• 710m (ITU)	• 748m	• 794m	
Internet users (ITU)	• 2.71 bn (ITU)	• 2.94bn (ITU)	• 3.17bn (ITU)	• 4 bn by 2019 (Facebook)
Facebook users	• 1.23 bn MAU • 757 DAU (Facebook, Dec 2013)	• 1.393 bn MAU • 890m DAU • (Dec 2014)	• 1.44 bn MAU** • 936 DAU**(Q1 2015) (Facebook)	--/--
Smartphone subscriptions	• 1.7 bn (MM)	• 2.1 bn (MM)	• 40% total mobile subscriptions (E);	• 70% world's population (E)
Smartphone stock		• 1.8 bn (Del) • 2.7 bn (E); Q1/14 - 64% of all mobile phones (E)	• 2.2 bn (Del); Q1/15 - 75% of all mobile phones (E)	• 6.1 bn subscriptions(E); 70% world's population (E)
Smartphone handset shipments or sales	• 30% of all mobiles (MM) • 6.06 bn total (MM)		• 1 bn (IDC);	--/--

Source: Various. MM = Mary Meeker. E = Ericsson Mobility report at: Note: For Facebook figures, MAU = monthly average users; DAU = daily average users. ** Q1 2015 figures

Demand Challenges – Multilingual Web

- In expanding the Internet and web to accommodate the all people, among several major demand-side challenges, one major barrier that must be overcome is the online representation and use of the world's languages.

- According to W3Techs' survey of the most popular 10 million websites, 55.2% are in English, with Russian, German, Japanese, Spanish and French being used by between 4 and 5.8% of websites.

Demand Challenges - Others

- Low level of purchasing power, and relatively high service prices
- Low level of education, especially regarding ICT skills
- Limited availability of (and high taxes on) consumer electronic equipment

MBB Demand Drivers - RF Devices

Technological Growth of Devices: Examples

- ***Automotive devices*** *(in-vehicle infotainment devices)*
- ***Cellular devices*** *(basic and feature phones, smartphones, mobile hotspots)*
- ***Computing devices*** *(desktops, mini-notes, notebooks, tablets)*
- ***Networking devices*** *(broadband routers, residential gateways, wireless access points, FTTH residential gateways, network attached storage)*
- ***Peripheral devices*** (*multifunction peripherals, ink jet printers, laser printers, USB adapters)*
- ***Portable Consumer Electronics devices*** (*digital still cameras, E-readers, portable media players [PMPs], personal navigation devices [PNDs], handheld game consoles)*
- ***Stationary Consumer Electronics devices*** (*Blu-ray players, digital photo frames, digital televisions, cable set top boxes, IP/DSL set top boxes, satellite set top boxes, standalone PVRs, terrestrial set top boxes, video game consoles)*

Demand Challenges – Strategies

- **Availability and affordability of broadband-enabled devices and services**
- **Development of local and relevant broadband applications and content, including in multiple languages;**
- **Broadband availability mapping** to increase consumer awareness about choice of services and service providers
- **Transparency and control of market information** to inform consumers about market prices and their rights to enable them to make informed decisions.
- **Communication campaigns** to increase trust and security
- **Digital skills courses** to boost consumer awareness, capabilities and interest

Supply side Challenges

- **Major supply-side challenges exist in expanding the Internet and web to accommodate the next four billion people**
  - *The challenge of universal access stems from steep increases in marginal costs of network deployments for less densely populated or more remote areas, jeopardizing the viability of service provision on a commercial for-profit basis.*
- **Upgrading networks to cope with the growth in traffic**
- **Availability of RF spectrum** *(both access and backhaul)*

MBB RF Spectrum Supply – Macro Economic Challenges

- **International Markets and Globalization –** *the need to be competitive*
- **Government use –** *(Security, Military, Govt. High through-put projects)*
- **International developments –** *(ITU, ICAO, IMO, ETSI)*
- **Competition in radio services -** *(C-Band: satellite or IMT)*

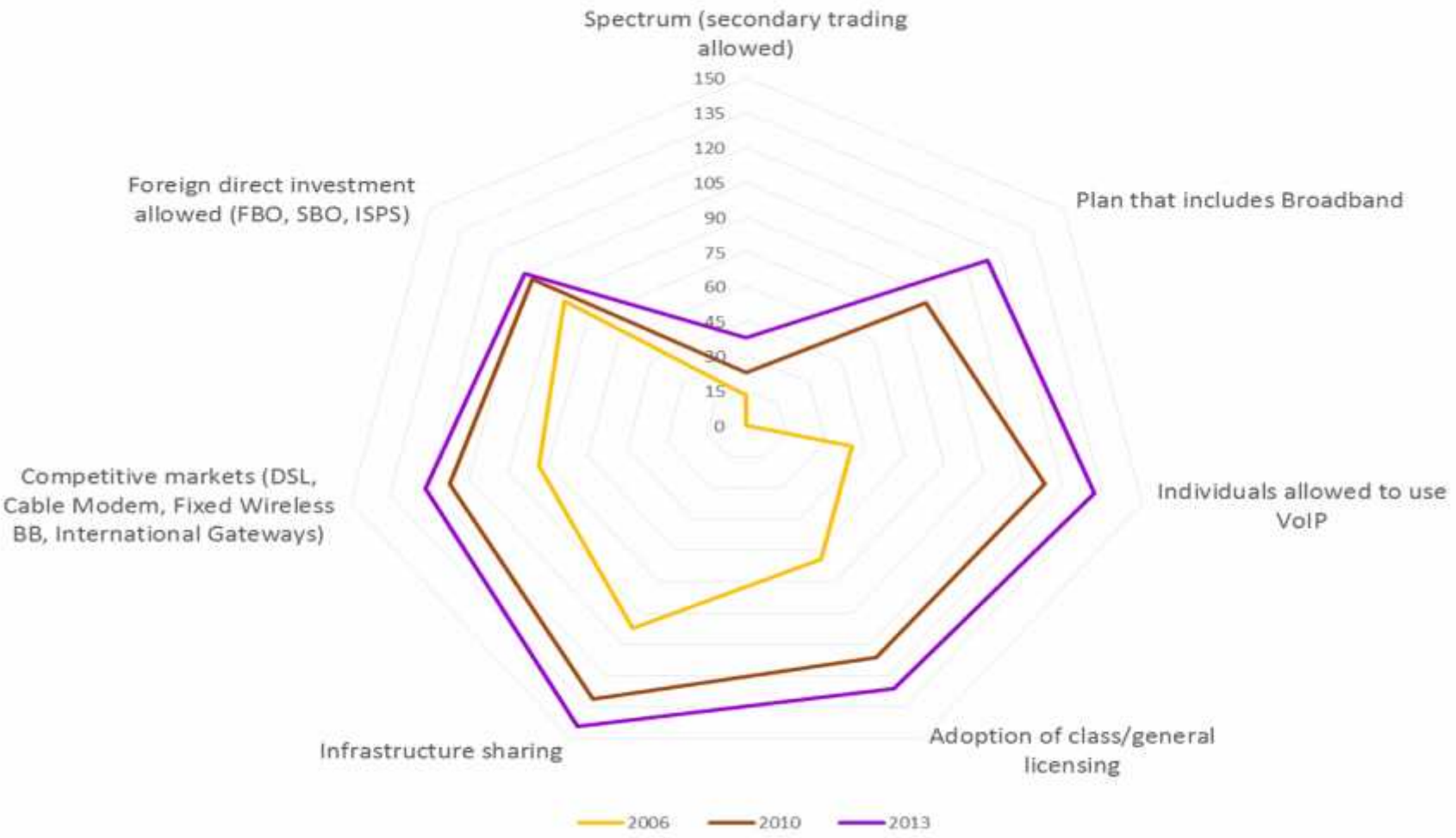
Supply side Challenges – Strategies 1/2

- **Co-deployment, infrastructure-sharing of telecom and non-telecom infrastructure**
- **Co-investment to reduce prices**
- **Timely, low cost Availability of access spectrum on technology neutral basis**
- **Develop effective technical standards** *to achieve economies of scale and enhance quality of services.*

Supply side Challenges – Strategies 2/2

- **Spectrum re-farming and making full use of Universal Service Obligations**
- **Focus on expanding network coverage**
  - *E.g. via coverage obligations, rather than on spectrum proceeds*
- **Promote effective and functional wholesale and retail markets to lower prices**
  - *Including allowing Spectrum Trading*

Changes in frameworks - Global



Source: ITU's Trends in Telecommunication Regulatory Reform Report, 2015.

Global spectrum of IMT

Current Spectrum Availability for IMT *(from the RR)*

Frequency bands (bandwidth) in MHz	RR provisions identifying the band for IMT
450-470 (**20**)	5.286AA
694/698-960 (**266/262**)	5.312A, 5.313A, 5.316B, 5.317A
1 710-2 025 (**315**)	5.384A, 5.388
2 110-2 200 (**90**)	5.388
2300-2400 (**100**)	5.384A
2500-2690 (**190**)	5.384A
3400-3600 (**200**)	5.430A, 5.432A, 5.432B, 5.433A

Additional Spectrum Requirements (from CPM15 Report)

User density	Total requirement by 2020 (MHz)	Region 1		Region 2		Region 3	
		Already identified (MHz)	Additional demand (MHz)	Already identified (MHz)	Additional demand (MHz)	Already identified (MHz)	Additional demand (MHz)
Low	1 340	981-1 181	159-359	951	389	885-1 177	163-455
High	1 960		779-979		1 009		783-1 075

Candidate frequency bands for allocation at WRC-15

Frequency bands (MHz)	Frequency bands (MHz)	Frequency bands (MHz)
470-698 (228 MHz)	2 700-2 900 (200 MHz)	4 400-4 990 (590 MHz)
1 350-1 400 (50 MHz)	3 300-3 400 (100 MHz)	5 350-5 470 (120 MHz)
1 427-1 518 (91 MHz)	3 400-3 600 (400 MHz)	5 725-5 850 (125 MHz)
1 518-1 525 (17 MHz)	3 600-3 800 (400 MHz)	5 925-6 425 (500 MHz)
1 695-1 710 (15 MHz)	3 800-4 200 (400 MHz)	

WRC-15 in Geneva, 2-27 November 2015
will address worldwide harmonized frequency bands

Summary of relevant study results (CPM15 Report)

Frequency bands	Counter Services	Study results
470-694/698 MHz	BS (television)	Inside GE06 - separation distances (sharing is not feasible with SAB/SAP).
1 350-1 400 MHz	Radiolocation (FS and MS in Reg.1) RAS (1 400-1 427)	Feasible with limitations. No adjacent band sharing with RNSS.
1 427-1 452 MHz	Aeronautical mobile telemetry (AMT), FS	Feasible with limitations.
1 452-1 492 MHz	FS, BS, RDS, AMT, BSS	FS, AMT, BSS feasible with limitations. Sharing is not feasible with BS and RDS.
1 492-1 518 MHz	FS, AMT	Feasible with limitations.
1 518-1 525 MHz	FS, AMT, MSS	Feasible with limitations.
1 695-1 710 MHz	Met.Aids, Met.Sat, FS	Sharing is not feasible with MetSat
2 700–2 900 MHz	ARNS, Met.Radar	Sharing is not feasible with radar.
3 300–3 400 MHz	Radiolocation (FS and MS in Reg. 1 and 3)	Sharing is not feasible with radar.
3 400-4 200 MHz	FS, FSS	Feasible with limitations.
4 400-4 990 MHz	FS, AMS	Feasible with limitations.
5 350-5 470 MHz	EESS(active), Radiolocation, ARNS, SRS	Sharing is not feasible with EESS. Radar studies are not conclusive.
5 725-5 850 MHz	FSS, Radiolocation	Studies are not conclusion.
5 925-6 425 MHz	FS, FSS	Feasible with limitations.

I Thank U

"Committed to connecting the WORLD"

Major ITU SM Global Events in 2015

ITU-D Study Group Meeting (Res. 9)
14 – 18 September 2015,
Geneva, Switzerland

World Radio-communication Conference
2 – 27 November 2015,
Geneva Switzerland

Your active participation in and contribution to these events is most welcome!