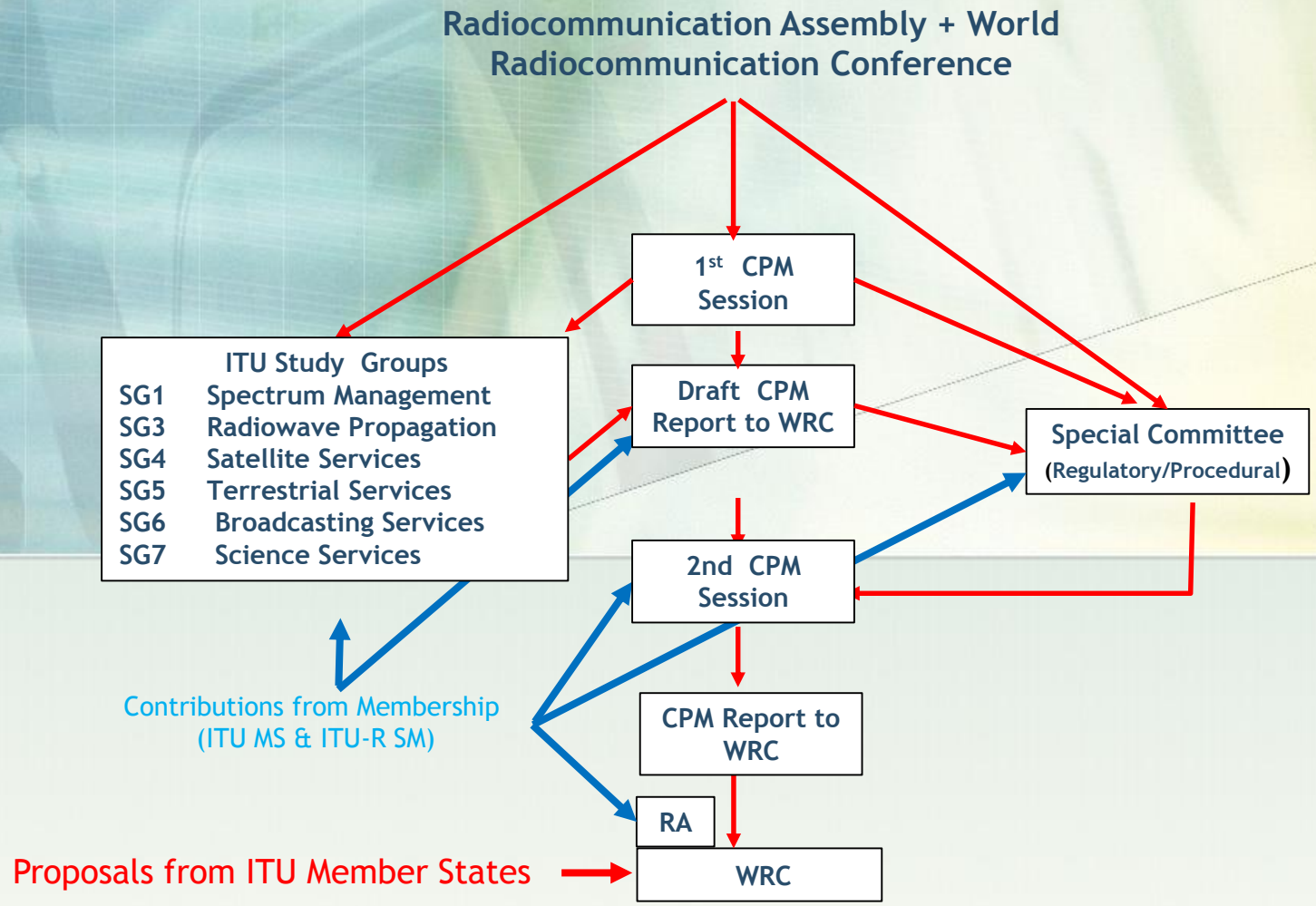
WRC-15 Agenda Issues

World Radio Conferences (WRC)

- ✓ Updates the Radio Regulations
  - Spectrum Allocation
  - Notification procedures
  - Administrative and operational procedures
- ✓ Adopts Resolutions
- ✓ Held every 3-4 years
- ✓ The last WRC (WRC-12) was held in Geneva during January 23- February 17, 2012
- ✓ The next WRC (WRC-15) will be held in Geneva during November 2-27, 2015
- ✓ Conference Preparatory Meetings (CPMs) for World Radio Conferences are constituted and organised in accordance with Resolution ITU-R 2-6

WRC-15 Preparatory Work Organisaton



Conference Preparatory Meetings

- The first session of the WRC-15 Conference Preparatory Meeting (CPM15-1) was held in Geneva immediately after WRC-12
- The second (and last) session of the WRC-15 Conference Preparatory Meeting (CPM15-2) was held in Geneva, 23 March – 2 April 2015. The CPM Report to WRC 15 has been prepared and may be accessed at: www.itu.int/md/R12-CPM15.02-R-0001

Outcomes of CPM15-1

One of the outcomes of CPM15-1 was the establishment of a Joint Task Group among Study Groups 4, 5, 6 and 7 ("JTG 4-5-6-7") and charged with the responsibility of conducting relevant studies in accordance with the Terms of Reference specified in Annex 10 of the Administrative Circular CA/201. In addition ITU-R Working Party 5D ("WP 5D") was tasked with determining "suitable frequency ranges" for International Mobile Telecommunications ("IMT") systems. These two study groups undertook their work during the period February 2012 to July 2014

WRC -15 Agenda

- The Agenda for WRC 15 can be found on the ITU website at:

http://www.itu.int/dms_pub/itu-r/oth/12/01/R12010000014A01PDFE.pdf

- In the CPM15-2 Report, the Agenda Items have been presented under the following Chapters:

Chapter	Title	Agenda Items
Chapter 1	Mobile and Amateur issues	Agenda Items 1.1, 1.2, 1.3, 1.4
Chapter 2	Science issues	Agenda items 1.11, 1.12, 1.13, 1.14, 9.2 (issues 9.2.1, 9.2.2)
Chapter 3:	Aeronautical, Maritime and Radiolocation issues	Agenda items 1.5, 1.15, 1.16, 1.17, 1.18
Chapter 4	Satellite services	Agenda items 1.6, 1.7, 1.8, 1.9.1, 1.9.2, 1.10
Chapter 5	Satellite regulatory issues	Agenda items 7, 9.1 (issues 9.1.1, 9.1.2, 9.1.3, 9.1.5, 9.1.8), 9.3
Chapter 6	General issues	Agenda items 2, 4, 9.1 (issues 9.1.4, 9.1.6, 9.1.7), 9.2, 10

Agenda Item 1.1

to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12)

Agenda Item 1.1 (Cont'd 1)

Some of the Bands under consideration (the "Candidate Bands") under the Agenda Item are in the C-Band which is a part of the spectrum traditionally allocated to Satellite Services on a Primary Basis.

What is C-band?

L band	1 to 2 GHz
S band	2 to 4 GHz
C band	4 to 8 GHz
X band	8 to 12 GHz
K_u band	12 to 18 GHz
K band	18 to 26.5 GHz
K_a band	26.5 to 40 GHz
Q band	30 to 50 GHz
U band	40 to 60 GHz
V band	50 to 75 GHz
E band	60 to 90 GHz
W band	75 to 110 GHz
F band	90 to 140 GHz
D band	110 to 170 GHz

An Overview of Satellite Applications, Services and Characteristics Applications and Services

In general, fixed satellite systems are able to support a broad range of applications and services, both domestically and internationally. Typical services include, among others:

- Broadband Internet access;
- Backhaul for terrestrial mobile networks
- Broadcasting of high quality TV in digital or High Definition formats;
- Disaster relief and emergency communications;
- Distance learning;
- Rural telecommunications;

An Overview of Satellite Applications, Services and Characteristics Applications and Services (Cont'd)

Satellite-based Internet and broadband services provide an opportunity to extend connectivity to even the most remote areas, where terrestrial-based services are unavailable or expensive to deploy. Satellite-based services have several advantages, including:

- Ubiquitous coverage;
- Cost-effective and easy-to-install solutions, even for remote and rural areas;
- No significant ground infrastructure investment required;
- Sustains large end-user populations;

A look at C-band Allocations to Satellite Services

- The frequency bands 3,400-4,200 MHz (space-to-Earth) and 5,925-6,725 MHz (Earth-to-space) which are normally referred to as “C-band”, are used for satellite applications. Whereas the bands 3,700-4,200 MHz (space-to-Earth) and 5,925-6,425 MHz (Earth-to-space) are usually referred to as “Standard” C-band, the bands 3,400-3,700 MHz (space-to-Earth), 5,850-5,925 MHz (Earth-to-space), and 6,425-6,725 MHz (Earth-to-space) are usually referred to as “Extended” C-band.

A look at C-band Allocations to Satellite Services (Cont'd)

- The frequency band 4,500-4,800 MHz, allocated to FSS (space-to-Earth), is specified in the Appendix 30B Plan, which aims to guarantee, for all countries, equitable access to the geostationary-satellite orbit in this and certain other frequency bands. The bands 3,400-4,200 MHz and 5,850-6,425 MHz are part of the non-planned C-band FSS spectrum.

C-band Radio Propagation Characteristics

- The C-band was allocated to and has been in use by the satellite industry as far back as some 40 years ago. Although today's satellite networks also utilize higher frequency bands, the C-band remains of outstanding importance primarily because transmissions in this band do not significantly degrade in rainy conditions. While other frequency bands may be used by commercial FSS operators, specifically Ku-band and Ka-band, these bands are not practical alternatives for many C-band applications. The increased rain attenuation in the Ku- and Ka-bands means that the high availability of C-band cannot be achieved in many regions of the world.

Capacity Constraints in Ku and Ka Bands

- Furthermore, it should be emphasized that other satellite bands cannot necessarily be substituted for C-band because the capacity is simply not there. Ku-band is heavily in demand and spectrum requirements are increasing. The geostationary arc is very congested with Ku-band satellites in many regions, giving very limited opportunities to expand satellite capacity. Ka-band infrastructure developments are only now starting. Therefore, current C-band traffic cannot be transferred to other existing Ku- and/or Ka-band satellites.

Agenda Item 1.1 (Cont'd 2)

Frequencies identified for consideration under Agenda Item 1.1 as suitable for possible future deployment of IMT:

Frequency band 470-694/698 MHz
Frequency band 1 350-1 400 MHz
Frequency band 1 427-1 452 MHz
Frequency band 1 452-1 492 MHz
Frequency band 1 492-1 518 MHz
Frequency band 1 518-1 525 MHz
Frequency band 1 695-1 710 MHz
Frequency band 2 700-2 900 MHz
Frequency band 3 300-3 400 MHz
Frequency band 3 400-3 600 MHz
Frequency band 3 600-3 700 MHz
Frequency band 3 700-3 800 MHz
Frequency band 3 800-4 200 MHz
Frequency band 4 400-4 500 MHz
Frequency band 4 500-4 800 MHz
Frequency band 4 800-4 990 MHz
Frequency band 5 350-5 470 MHz
Frequency band 5 725-5 850 MHz
Frequency band 5 925-6 425 MHz

Allocated on a Primary Basis to FSS (Space -to-Earth)

Allocated on a Primary Basis to FSS (Space -to-Earth)

Note: The information below and in the next 3 slides thereafter is primarily based on inputs by the satellite industry at various international fora

Use of C-band frequencies by IMT

- Under a footnote arrangement, a number of countries identified the band 3,400-3,600 MHz for terrestrial IMT at WRC-07. Since that time, several administrations have licensed parts of this band for IMT systems and some terrestrial systems based on WiMAX technology. What is true though is that in some European administrations these IMT licences were returned and in the case of WiMAX use, there has not been significant commercial success.

- This lack of success is attributable to a number of factors including: the propagation conditions for terrestrial mobile applications are not optimum, given that the range of a macro-cell base station in this band is about 2.5 km and is probably lower in an urban environment; second, the wall and glass penetration losses at C-band are relatively high when compared to the lower frequency bands; and third, there is limited availability at present of consumer equipment for terrestrial mobile broadband systems in C-band.

Sharing Concerns - FSS downlink bands

- Due to the limited power available on a satellite, ground terminals are designed to receive very low-power signals transmitted by a satellite located thousands of kilometers away and as a consequence, receiving hardware is usually very sensitive to any external interference.
- Although historically, the C-band FSS frequencies have also been used for terrestrial radio-relay systems, sharing with such systems has been possible due to the limited number of radio-relay stations required in most. In addition, due to the fact that radio-relay systems are usually authorised on a station-by-station basis, coordination can be easily done.

Sharing Concerns - FSS downlink bands (Cont'd 1)

- On the other hand, given that IMT terrestrial networks normally make use of an extensive distribution of base stations within a given geographic area, transmitting high power simultaneously in every horizontal direction, sharing frequencies with FSS stations becomes much harder. And therefore planning for an adequate frequency and geographical separation between IMT systems and FSS earth stations is a major challenge considering that studies have shown that distance separations of at least tens of kilometres, and in some specific cases more than 100 km, between a transmitting IMT station and a receiving FSS station would be required in order to avoid harmful interference to the FSS earth station.

Sharing Concerns - FSS downlink bands (Cont'd 1)

Furthermore, the requirement to protect ubiquitously deployed FSS earth stations by maintaining large separation distances would lead to large holes in any potential coverage by terrestrial IMT networks and in the same vein, implementation of IMT stations would preclude the use of C-band receiving stations within a relatively large area around each IMT station, thus restricting further development/expansion of C-band satellite services.

The foregoing issues are largely supported by the outcomes of the studies carried out by JTG: 4-5-6-7.

Concluding Statements of CPM15-2 on Agenda Item 1.1

The conclusions as summarized in the above report on the sharing and compatibility studies for the band 3400-4200 MHz highlight the following aspects that are reflected below verbatim:

- The sharing between IMT-Advanced and the FSS is feasible only when FSS earth stations are at known, specific locations, and deployment of IMT-Advanced is limited to the areas outside of the minimum required separation distances for each azimuth to protect these specific FSS earth stations. In this case, the FSS protection criteria should be used to determine the necessary separation distances to ensure protection of the existing and planned FSS earth stations.
- When FSS earth stations are deployed in a typical ubiquitous manner or with no individual licensing, sharing between IMT-Advanced and the FSS is not feasible in the same geographical area since no minimum separation distance can be guaranteed.
- Deployment of IMT-Advanced would constrain future FSS earth stations from being deployed in the same area in the bands 3 400-4 200 MHz as shown by the studies.

Concluding Statements of CPM15-2 on Agenda Item 1.1 (Cont'd)

- Some administrations are of the view that, considering the extent of the FSS deployment worldwide in the band 3 600-4 200 MHz, there is no potential for harmonization of the band 3600-4 200 MHz, either regionally or globally, for IMT or other mobile broadband.
- Some administrations are of the view that there is potential for harmonization in portions or the whole of the band 3 600-4 200 MHz, either regionally or globally, for IMT or other mobile broadband. Some administrations are of the view that WRC-07 under agenda item 1.4, after extensive and lengthy discussions and hard work, reached a consensus on the band 3400-3600 MHz which is currently included in the RR together with the conditions thereto. These administrations are of the strong view that there should be no change to those agreements reached and thus 3 400-3 600 MHz is outside WRC-15 agenda item 1.1 except for Region 2.
- Some administrations are of the view that WRC-15 agenda item 1.1 also includes the consideration of the frequency band 3 400-3 600 MHz, including worldwide allocation

Analysis of Results of Studies –A sample

Extract from the CPM report page 35:

It is worth mentioning that RR Appendix **30B** contains worldwide Plans in the 4/6 GHz and 10-11/13 GHz frequency bands. The Plans and their associated procedures are a worldwide treaty. This Appendix and its 4/6 GHz Plan are envisaged and used as a supporting backbone to the telecommunication infrastructure of many developing countries, in particular those which are located in high rain fall zones/areas of the globe.

WRC-07 revised the regulatory procedure of the above-mentioned Appendix using the approach currently applied in RR Appendices **30** and **30A**. As a consequence of that, the application of the procedure became much more rapid by administrations and the Bureau. Member States are therefore applying the procedure of Articles 6 and 7 of that Appendix more frequently than they applied before WRC-07.

Agenda Item 1.1 (Cont'd-3)

Methods To Satisfy Agenda Items

The following methods are considered to satisfy this agenda item and may be applied to potential candidate frequency bands. These are:

- **Method A** – No change, which may be accompanied by reasons.
  - **Option A1 -** No change for Region 1.
  - **Option A2 -** No change for Region 2.
  - **Option A3 -** No change for Region 3.
- **Method B** – Make an allocation to the MS on a primary basis (either by a new allocation or the upgrade of an existing secondary allocation) with a view to facilitate the development of terrestrial mobile broadband applications.
  - **Method B-ToA** - Make an allocation to the MS on a primary basis in the Table of Frequency Allocations. (**Options B1**, **B2** and **B3** may be used)
  - **Method B-FN** - Make an allocation to the MS on a primary basis in a footnote. **Option B4** applies
- **Method C** - To identify the frequency band for IMT either in a new or existing footnote. This Method can be applied individually if there is already a primary mobile allocation or in conjunction with Method B. (**Options C1, C2** and **C3** may be used)

Questions for the Conclusion on Agenda Item 1.1

Is it justifiable to allocate C-Band frequencies to terrestrial Operations ?

Is it Technically feasible to share C-Band between Satellite and Mobile Services ?

This question will be answered and conclusions made at the WRC-15.

Agenda Item 7

to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution 86 (Rev.WRC-07) to facilitate rational, efficient, and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

Agenda Item 7 (Cont'd-1)

Issues A,B,C,D,E,F,……., L

Issue A – Informing the Bureau of a suspension under RR No. 11.49 beyond six months

Issue B – Publication of information on bringing into use of satellite networks at the ITU website

Issue C – Review or possible cancellation of the advance publication mechanism for satellite networks subject to coordination under section II of Article 9 of the Radio Regulations

Issue D – General use of modern electronic means of communications in coordination and notification procedures

Issue E – Failure of a satellite during the bringing into use period

Issue F – Modifications to RR Appendix 30B in relation to the suspension of use of a frequency assignment recorded in the MIFR

Issue G – Issue G – Clarification of bringing into use information provided under RR Nos. 11.44/11.44B

Agenda Item 7 (Cont'd-2)

Issues A,B,C,D,E,F……..L

Issue H – Issue H – Using one space station to bring frequency assignments at different orbital locations into use within a short period of time

Issue I – Possible method to mitigate excessive satellite network filings

Issue J – Issue J – Removal of the link between the date of receipt of the notification information and the date of bringing into use in RR No. 11.44B

Issue K – Issue K – Addition of a regulatory provision in RR Article 11 for the case of launch failure

Issue L – Modification of certain provisions of Article 4 of RR Appendices 30 and 30A for Regions 1 and 3 namely replacement of tacit agreement with explicit agreement or alignment of those provisions of RR Appendices 30 and 30A for Regions 1 and 3 with those of Appendix 30B

Agenda Item 7 (Cont'd-3)

Methods To Satisfy Agenda Items

Issue	Methods Proposed in CPM Report					
A	Method A 1	Method A2 (Option A , Option B)				
B	Method B1 (Option A , Option B)	Method B2(Option A , Option B)	Method B3			
C	Method C1	Method C2 (Option A , Option B)	Method C3 (Option A , Option B)			
D	Method D					
E	Method E1	Method E2	Method E3	Method E4	Method E5	Method E5
F	Method F					
G	Method G					
H	H1(Option A , Option B)	H2	H3	H4	H5	H6
I	Method I1.1	Method I1.2	Method I1.3	Method I1.4		
	Method I2.1	Method I2.2	Method I2.3			
J	Method J1	Method J2				
K	Method K.1	Method K.2	Method K.3			
L	Method L.1	Method L.2	Method L.3			

A Quick Look inside CPM15-2 Report

CPM15-2 Report

Thank You!

Questions/Feedback?