



Broadcasting Frequency Management National, Regional and Global Issues

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Chair : Australian Radiocommunications Study Group 6
(Broadcasting)

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BroadSpectrum Consultants Pty Ltd

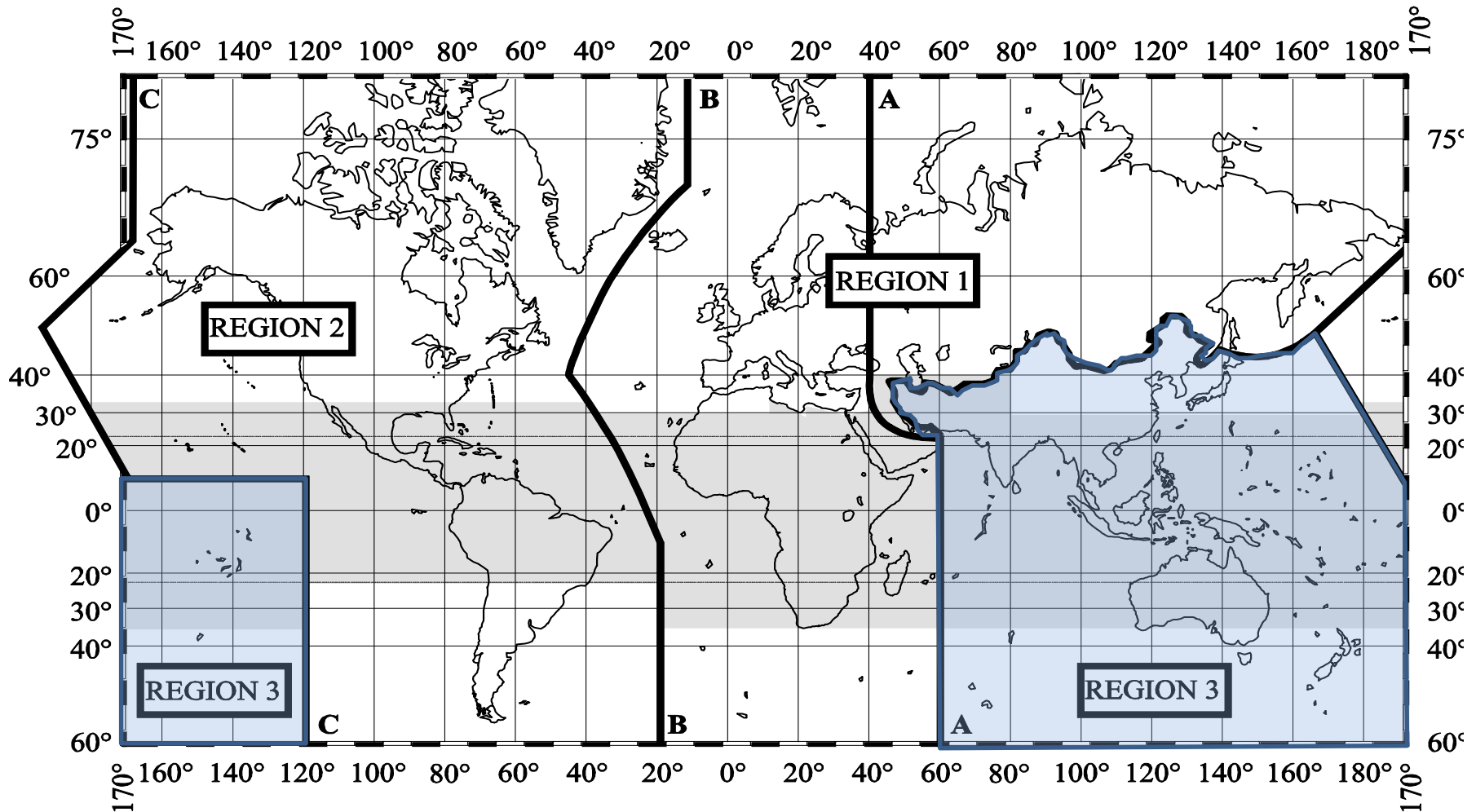
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Outline



- ITU-R Broadcast Bands
 - Current
 - Future
- Country Analysis
- Benefits of Each Band
- Spectrum Planning
- Standards

ITU Regions





Allocation to services

Footnotes



5.233 *Additional allocation:* **in China**, the band 174-184 MHz is also allocated to the space research (space-to-Earth) and the space operation (space-to-Earth) services on a primary basis, subject to agreement obtained under No. **9.21**. These services shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations.

5.238 *Additional allocation:* **in Bangladesh, India, Pakistan and the Philippines**, the band 200-216 MHz is also allocated to the aeronautical radionavigation service on a primary basis.

5.240 *Additional allocation:* **in China and India**, the band 216-223 MHz is also allocated to the aeronautical radionavigation service on a primary basis and to the radiolocation service on a secondary basis.

5.245 *Additional allocation:* **in Japan**, the band 222-223 MHz is also allocated to the aeronautical radionavigation service on a primary basis and to the radiolocation service on a secondary basis.

5.250 *Additional allocation:* **in China**, the band 225-235 MHz is also allocated to the radio astronomy service on a secondary basis.

UHF Bands IV and V



Allocation to services		
Region 1	Region 2	Region 3
470-790 BROADCASTING	470-512 BROADCASTING Fixed Mobile 5.292 5.293	470-585 FIXED MOBILE BROADCASTING 5.291 5.298
	512-608 BROADCASTING 5.297	585-610 FIXED MOBILE BROADCASTING RADIONAVIGATION 5.149 5.305 5.306 5.307
	608-614 RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)	
	614-698 BROADCASTING Fixed Mobile 5.293 5.309 5.311A	610-890 FIXED MOBILE 5.313A 5.317A BROADCASTING
	698-806 MOBILE 5.313B 5.317A BROADCASTING Fixed 5.293 5.309 5.311A	
5.149 5.291A 5.294 5.296 5.300 5.304 5.306 5.311A 5.312 5.312A	806-890 FIXED MOBILE 5.317A BROADCASTING	
790-862 FIXED MOBILE except aeronautical mobile 5.316B 5.317A BROADCASTING 5.312 5.314 5.315 5.316 5.316A 5.319	5.317 5.318	5.149 5.305 5.306 5.307 5.311A 5.320
862-890 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322 5.319 5.323		

Footnotes



5.291 *Additional allocation:* **in China**, the band 470-485 MHz is also allocated to the **space research (space-to-Earth) and the space operation (space-to-Earth) services** on a primary basis subject to agreement obtained under No. **9.21** and subject to not causing harmful interference to existing and planned broadcasting stations.

5.149 In making assignments to stations of other services to which the bands: **608-614 MHz** in Regions 1 and 3, are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 4.5 and 4.6 and Article 29). (WRC 07)

5.298 *Additional allocation:* **in India**, the band 549.75-550.25 MHz is also allocated to the **space operation service (space-to-Earth)** on a secondary basis.

5.305 *Additional allocation:* **in China**, the band 606-614 MHz is also allocated to the **radio astronomy service** on a primary basis.

5.306 *Additional allocation:* in Region 1, except in the African Broadcasting Area (see Nos. **5.10** to **5.13**), and in Region 3, the band **608-614 MHz** is also allocated to the **radio astronomy service on a secondary basis**.

5.307 *Additional allocation:* **in India**, the band 608-614 MHz is also allocated to the **radio astronomy service** on a primary basis.



Footnotes

5.311A For the frequency band **620-790 MHz**, see also Resolution **549 (WRC-07)**. (WRC-07)

5.313A The band, or portions of the band **698-790 MHz**, in **Bangladesh, China, Korea (Rep. of), India, Japan, New Zealand, Pakistan, Papua New Guinea, Philippines and Singapore** are identified for use by these administrations wishing to implement **International Mobile Telecommunications (IMT)**. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. In China, the use of IMT in this band will not start until 2015. (WRC-12)

5.317A Those parts of the band 698-960 MHz in Region 2 and the band **790-960 MHz in Regions 1 and 3** which are allocated to the mobile service on a primary basis are identified for use by administrations wishing to implement **International Mobile Telecommunications (IMT)** – see Resolutions **224 (Rev.WRC-12)** and **749 (Rev.WRC-12)**, as appropriate. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-12)

- **RESOLUTION 224 (REV.WRC-12) Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz**
- **RESOLUTION 749 (REV.WRC-12) Use of the band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services**

Views and Proposals



ASIA-PACIFIC TELECOMMUNITY

The 5th Meeting of the APT Conference Preparatory

Group for WRC-15 (APG15-5)

27 July – 1 August 2015, Seoul, Republic of Korea

Document

APG15-5/INP-119

20 July 2015



Palau (Republic of), Papua New Guinea (Independent State of), Samoa (Independent State of), Solomon Islands (Independent State of), Vanuatu (Republic of), Tuvalu (Independent State of)

VIEWS AND PROPOSALS ON WRC-15 AGENDA ITEMS 1.1

2. Views and Proposals

470-698 MHz

Dangerous for broadcasters as this potentially will lead to loss of the whole UHF band for broadcasting

It is proposed that the APT support the identification, for use by IMT, of the frequency band 470-698 MHz.

698-960 MHz

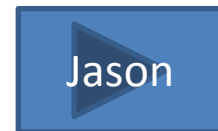
For the band 698-960 MHz, planned for use for IMT systems in the Pacific Islands and consistent with the Asia-Pacific Telecommunity (APT) 700 MHz plan, the contributing countries support the amalgamation of Radio Regulations Article 5 Table of Frequency Allocations footnote Nos. **5.313A** and **5.317A** to facilitate a Regional IMT identification from 698-960 MHz. Furthermore, contingent on outcomes of Agenda item 1.2 the contributing countries support the amalgamation of footnote Nos. **5.313A** and **5.317A** into a revised No. **5.384A** to facilitate a global IMT identification from 698-960 MHz.

Should it be necessary, the contributing countries, in accordance with Resolution **26 (Rev.WRC-07)**, intend to identify the band 698-790 MHz for IMT by adding their country names to footnote No. **5.313A** of the Radio Regulations Article 5 Table of Frequency Allocations. In response to an invitation issued by Australia (APG15-4 /INP-63) the contributing countries would propose to join in a multi-country proposal to WRC-15 for this purpose.

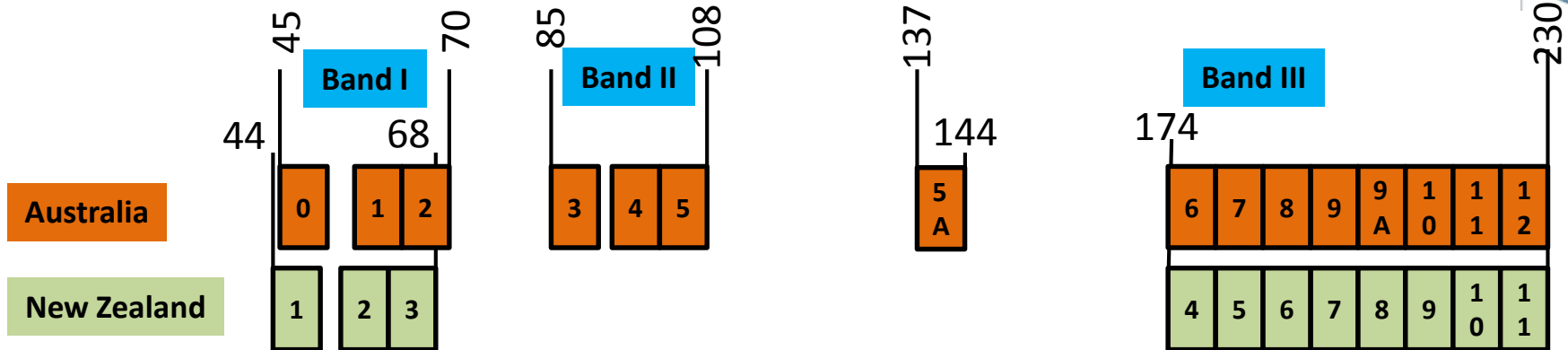
Band Sharing



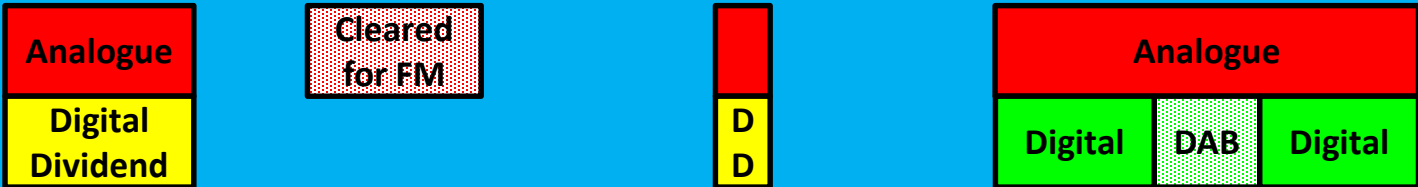
- Can Mobile phone services share with Broadcasting?
- In the same area, only by band segmentation
 - BUT, guardbands are needed, spectrally inefficient
- In different areas, yes
 - BUT, separation distances mean no services in some areas, waste of spectrum capability.



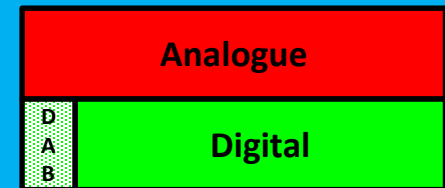
VHF Bands I, II, III



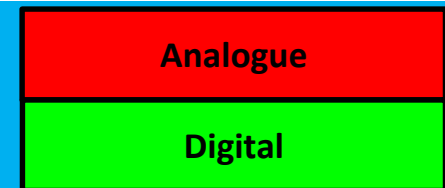
Australia
 Digital 56 MHz
 incl 14 MHz DAB
 Dividend 32 MHz



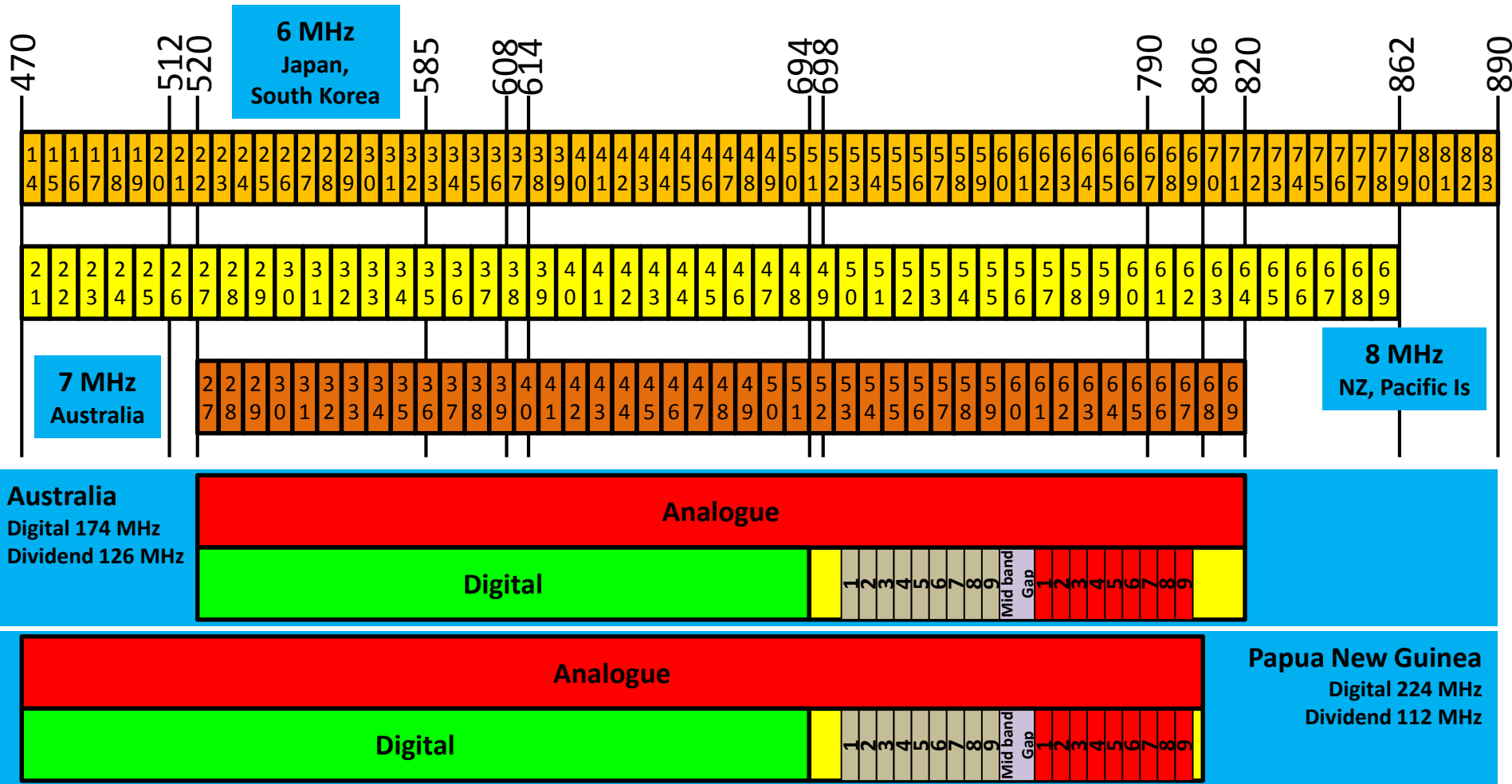
Papua New Guinea
 Digital 56 MHz
 incl 7 MHz DAB



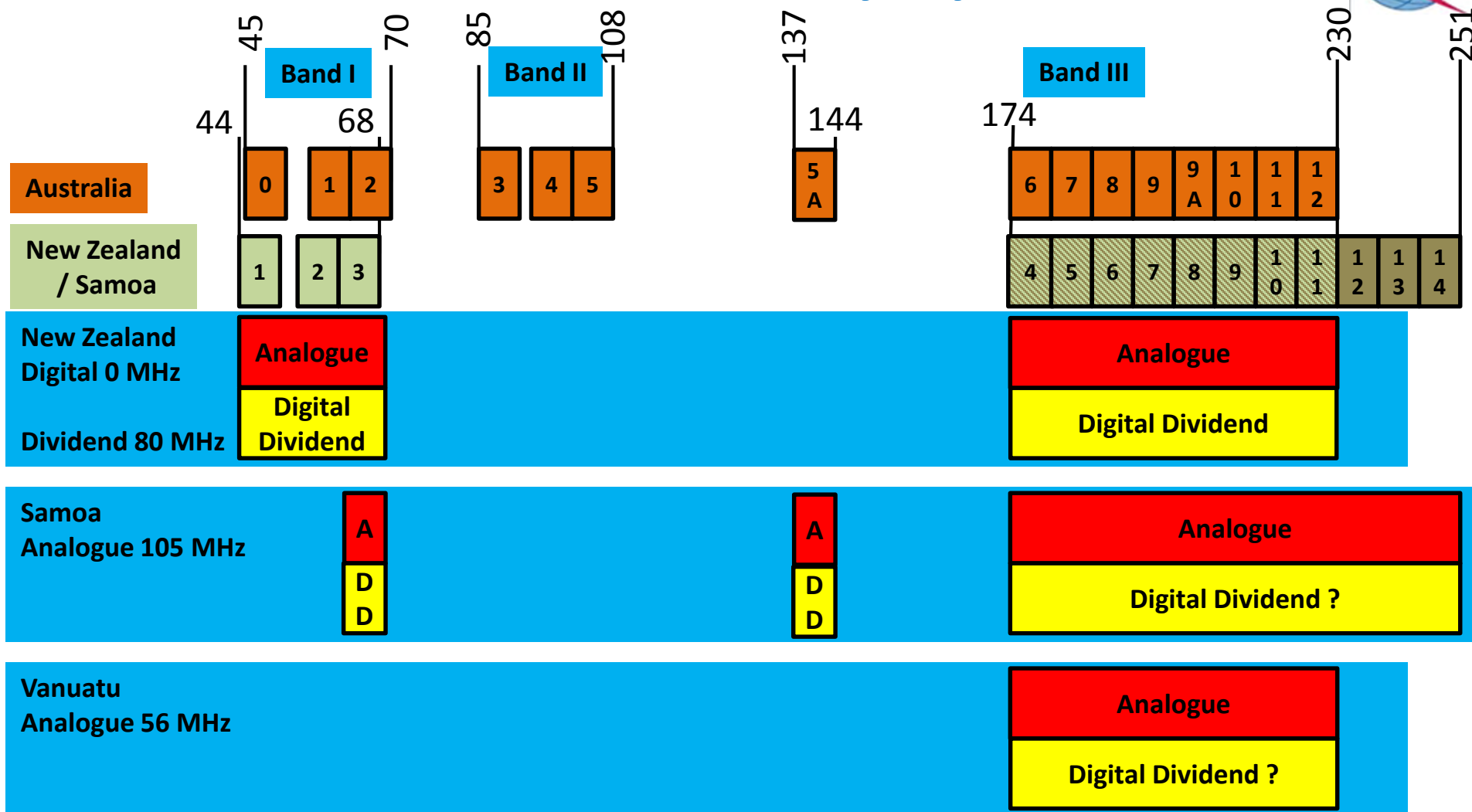
Tonga
 Digital 56 MHz



UHF Bands IV, V

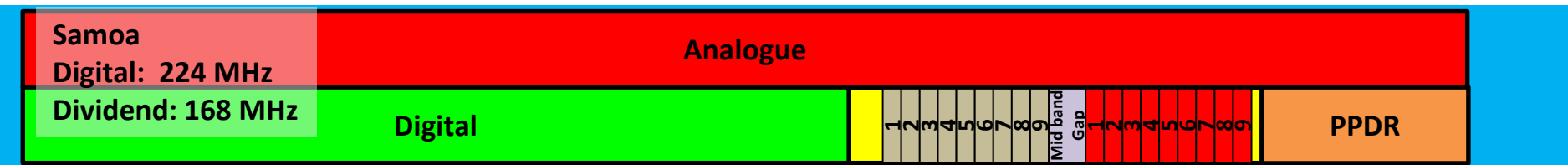
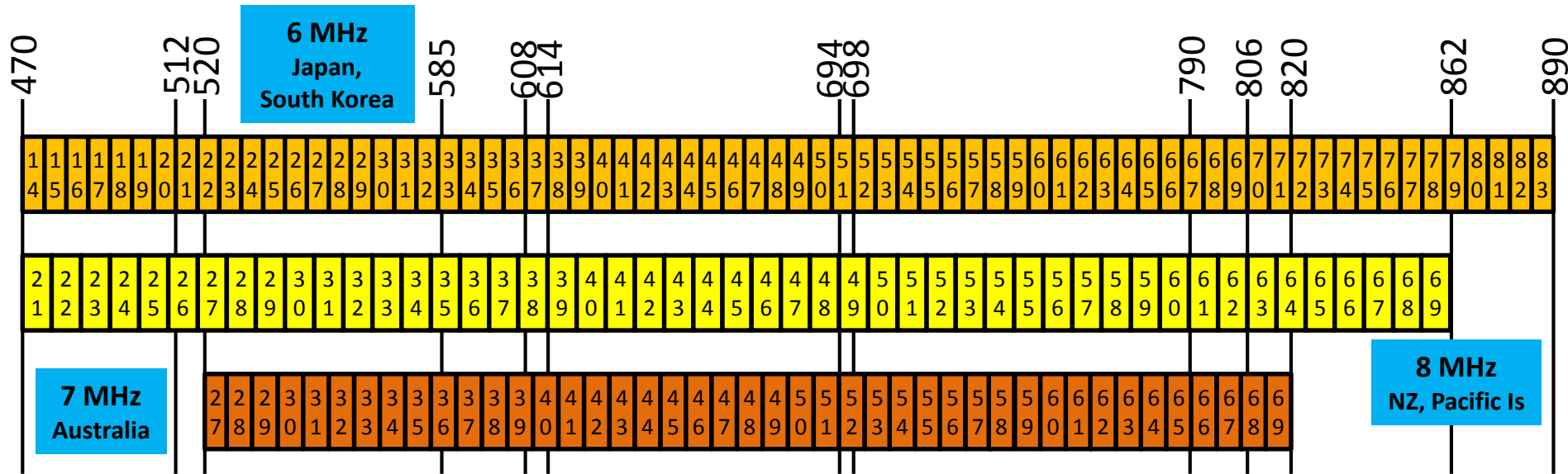


VHF Bands I, II, III





UHF Bands IV, V



Comparing VHF and UHF



Parameter	VHF (Band III)	UHF (Band IV)	Benefit of VHF	Comment
Received Field Strength	44 dBuV/m	50 dBuV/m	6 dB	Value may vary between administrations, but difference the same
Transmit Antenna Gain	8 dBd	11.9 dBd	3.9 dB	Comparing similar pattern antennas, RFS 655 and PHP
Feeder Loss	1 dB	1.5 dB	0.5 dB	Relative amount varies depending on length
Net VHF Benefit			2.6 dB	

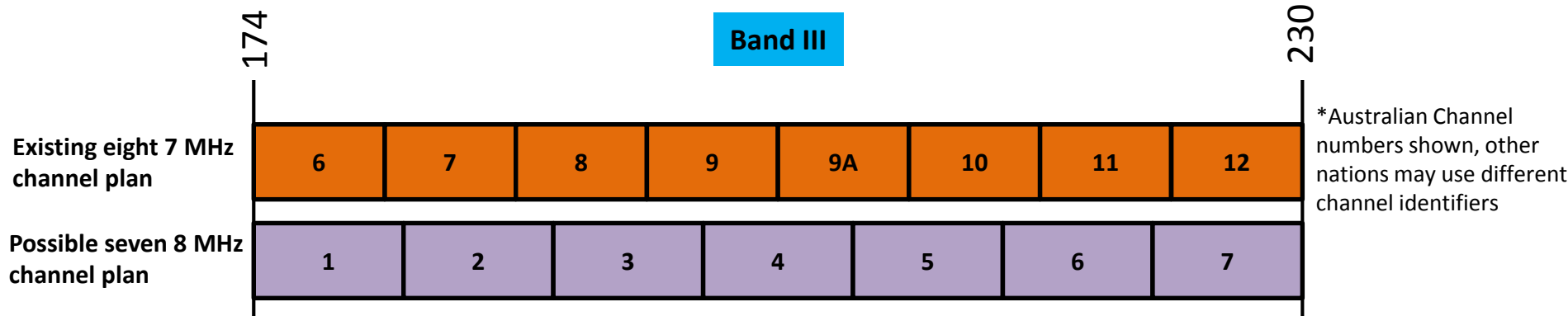
- VHF requires 2.6 dB LESS transmitter power than UHF in this example
- VHF power only 55% of UHF power needed.
- Translated to Tongan example saving of 12.5 MWh annually (2 digital txs).

Considering VHF and UHF



- Transmit power saving at VHF
 - Saving logistics of power generation / reliability (backup genset, supply of diesel, etc)
 - Cost savings for broadcasters
- Many existing services are on VHF
 - Possible re-use of transmit antenna
 - Viewers antennas already VHF
 - But, needs available spectrum to simulcast both analogue and digital
- Better propagation at VHF
 - Particularly when vegetative clutter considered
 - Better diffraction over hills

A New VHF Band Plan for Digital?



- For Digital, wider bandwidth carriers are more efficient
- Wider Bandwidth = More useable bits in the multiplex
- More bits means more capability for statistical multiplexing of different video services
- Allows more services in the fixed channel
- Better accommodates future television developments such as UHD TV (with HEVC coding)
- UHF plans in Pacific are already 8 MHz
- Changing VHF to an 8 MHz plan (where possible) allows for simpler “gap filler” repeaters of VHF onto UHF
- Trade-off is the number of multiplexes required for the country
 - If planning 4 muxes, two channel “sets” are possible in a 7 MHz raster plan

Spectrum Planning



- Broadcast spectrum allocated for a number of broadcasters / mux operators in each area / town
- Need to consider spectrum for:
 - Adjacent areas
 - Adjacent other radio systems
 - Adjacent countries
- Consider broadcaster network topology, e.g.:
 - main tx / infill system (e.g. Australia / NZ)
 - satellite feed to all transmitters

Standards



- Transmission System Standard
 - E.g. ATSC, DTMB, DVB-T / T2, ISDB-T
- Service Information Standard
- Encoding Standards
 - E.g. SD, HD, UHD, audio, captioning, etc
- If Pacific Islands select the same transmission standard, consider the benefits of a common equipment standard
 - Common standard = larger market
 - Common standard = lower cost supply
 - Common standard = likely more competitors
 - Some differences can be accommodated by making standard inclusive
- Spectrum, Standards and Equipment all inter-related
- Consider product development lead-times

Neighbouring Country Digital Transmission Systems



Country	Australia	New Zealand	Singapore	Possible Pacific
Digital Commenced	2001	2007	2013	2015/2016?
Digital Broadcast Bands	VHF & UHF	UHF	VHF & UHF	VHF & UHF
Channel Bandwidth	7 MHz	8 MHz	7 MHz (VHF) & 8 MHz (UHF)	7/8 MHz (VHF) & 8 MHz (UHF)
Modulation System	DVB-T	DVB-T & DVB-T2	DVB-T2	DVB-T2
Video / Audio Coding	MPEG-2 / MPEG-1 Layer II	H.264 / AAC	Video : MPEG-2 & H.264 Audio : MPEG-1 Layer II & HE AAC	Video : MPEG-2 & H.264 Audio : MPEG-1 Layer II & HE AAC

Summary



- VHF and UHF bands are used for broadcasting across Pacific Nations
- The broadcast bands are being reduced to allow for more mobile services
- Broadcasters should retain an active dialogue with their regulators / governments to retain adequate spectrum for broadcasting and allow for future broadcast services
- The VHF band offers benefits to Pacific Nations and should not be overlooked
- Spectrum Planning and Standards selection are key to the success of a digital transition
- Consider developing a regional standard

Thank You for your attention



Questions?