

Radio Spectrum Allocation

ISPANZ Conference

11 May 2016

Intend to cover ...

- International framework
- New Zealand allocations
 - Cellular & fixed wireless bands
 - Industrial, Scientific and Medical (ISM) bands
 - Wi-Fi bands
- Interference issues
- Challenges ahead for Wi-Fi



International Framework

- Signatory to international treaty
 - World Radiocommunication Conference
 - Once every four years (last met: Nov 2015)
 - Review and revise IRR
- Incorporated by reference into *Radiocommunications Act 1989*
- Article 5 of IRR – *Table of Frequency Allocations*



*International Radio
Regulations (IRR)*

A snapshot of
Article 5 of IRR
*Table of Frequency
Allocations*

Allocation to services		
Region 1	Region 2	Region 3
2 170-2 200	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A 5.388 5.389A 5.389F	
2 200-2 290	SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392	
2 290-2 300	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)	
2 300-2 450 FIXED MOBILE 5.384A Amateur Radiolocation 5.150 5.282 5.395	2 300-2 450 FIXED MOBILE 5.384A RADIOLOCATION Amateur 5.150 5.282 5.393 5.394 5.396	
2 450-2 483.5 FIXED MOBILE Radiolocation 5.150 5.397	2 450-2 483.5 FIXED MOBILE RADIOLOCATION 5.150	
2 483.5-2 500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIODETERMINATION- SATELLITE (space-to-Earth) 5.398 Radiolocation 5.398A 5.150 5.399 5.401 5.402	2 483.5-2 500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION RADIODETERMINATION- SATELLITE (space-to-Earth) 5.398 5.150 5.402	2 483.5-2 500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION RADIODETERMINATION- SATELLITE (space-to-Earth) 5.398 5.150 5.401 5.402





Radio Spectrum Allocation in NZ

- NZ being an island country
 - PRO:** does not share land border with other countries
 - ⇒ no issue with cross-border terrestrial coordination
 - CON:** 4.5M population is a small market
 - ⇒ technology taker
- Economies of scale – very important!
 - EITHER Influence the world to follow NZ's way
 - OR Harmonise with Asia Pacific, US or Europe?

RADIO SPECTRUM MANAGEMENT



To be updated soon

Wavelength	3x10 ⁵ m	3x10 ⁴ m	3x10 ³ m	30,000 m	3,000 m	300 m	30 m	3 m	0.3 m	0.03 m	3x10 ⁻³ m	3x10 ⁻⁴ m	3x10 ⁻⁵ m	3x10 ⁻⁶ m	3x10 ⁻⁷ m	3x10 ⁻⁸ m	3x10 ⁻⁹ m	3x10 ⁻¹⁰ m	3x10 ⁻¹¹ m	3x10 ⁻¹² m	3x10 ⁻¹³ m	3x10 ⁻¹⁴ m	3x10 ⁻¹⁵ m	3x10 ⁻¹⁶ m	3x10 ⁻¹⁷ m	3x10 ⁻¹⁸ m	3x10 ⁻¹⁹ m	3x10 ⁻²⁰ m	
Band	Very Low Frequency (VLF)			LF	MF	HF	VHF	UHF	SHF	EHF	Infrared		Visible			Ultraviolet			X-Ray		Gamma-Ray		Cosmic						
Usage				Long Wave	Medium Wave	Short Wave	Microwave					Visible Light																	
Frequency	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	100 MHz	1 GHz	10 GHz	100 GHz	1 THz	10 THz	100 THz	1x10 ¹⁵ Hz	1x10 ¹⁶ Hz	1x10 ¹⁷ Hz	1x10 ¹⁸ Hz	1x10 ¹⁹ Hz	1x10 ²⁰ Hz	1x10 ²¹ Hz	1x10 ²² Hz	1x10 ²³ Hz	1x10 ²⁴ Hz	1x10 ²⁵ Hz	1x10 ²⁶ Hz	1x10 ²⁷ Hz	1x10 ²⁸ Hz	1x10 ²⁹ Hz

As published on 1 April 2014

Radio Spectrum Allocation in NZ

For the most up-to-date allocation, refer to the Table of Radio Spectrum Usage in New Zealand (PIB 21)

<http://www.rsm.govt.nz/online-services-resources/publications/pibs/21>

Spectrum harmonisation

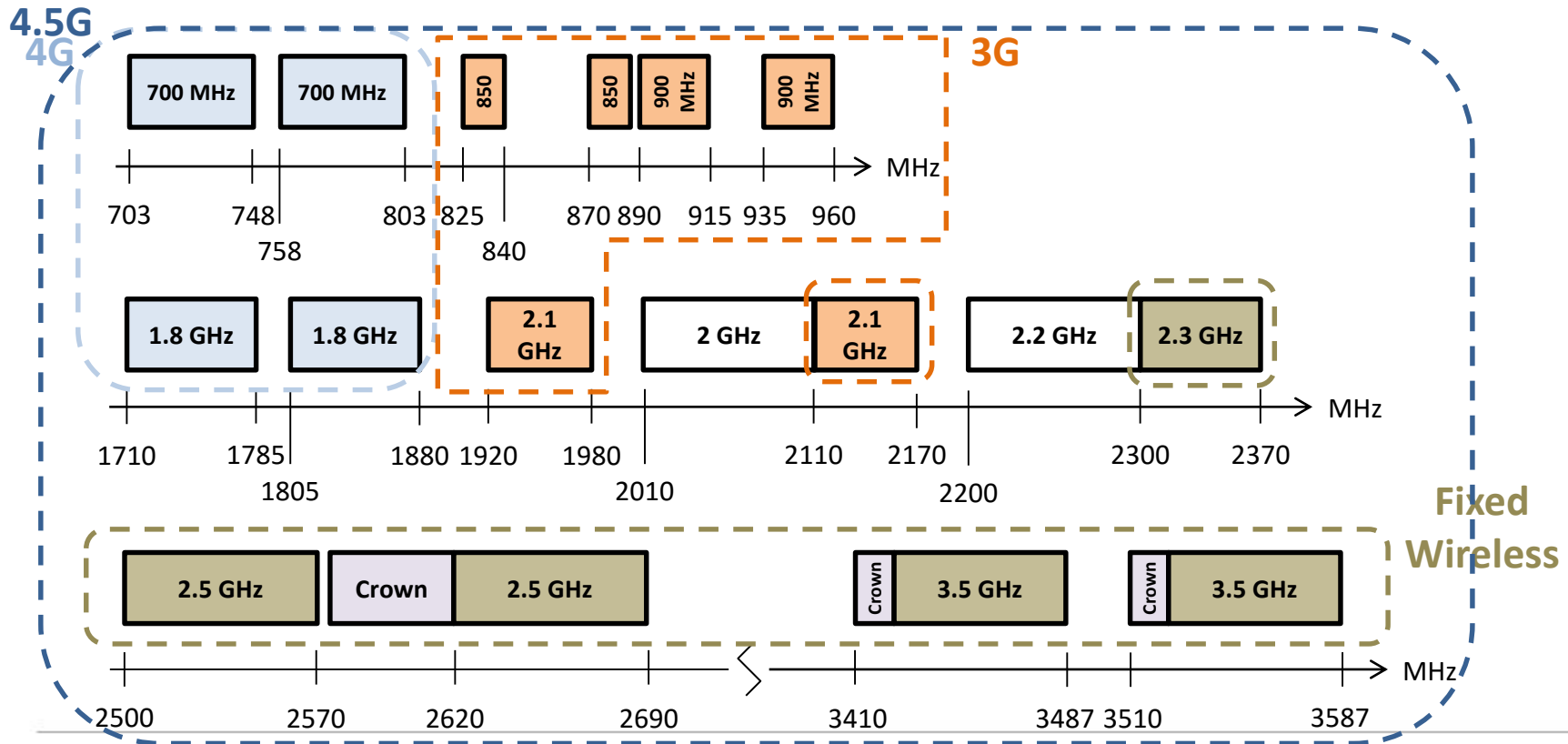
- Cellular & fixed wireless bands
- Industrial, Scientific and Medical (ISM) bands
- Wi-Fi bands
- And many more – TV/radio broadcasting, satellite, radionavigation, etc.



Cellular Mobile & Fixed Wireless

	Frequency Band	Frequency Range (Uplink)	Frequency Range (Downlink)
Asia Pac	700 MHz	703-748 MHz	758-803 MHz
US	850 MHz	825-840 MHz	870-885 MHz
	900 MHz	890-915 MHz	935-960 MHz
Asia Pac	1.8 GHz	1710-1785 MHz	1805-1880 MHz
Europe	2.1 GHz	1920-1980 MHz	2110-2170 MHz
	2.3 GHz	2300-2370 MHz (TDD)	
	2.5 GHz	2500-2570 MHz	2620-2690 MHz
	2.5 GHz	2575-2620 MHz (TDD)	
	3.5 GHz	3410-3487 MHz (opt. TDD)	3510-3587 MHz (opt. TDD)

Cellular Mobile & Fixed Wireless



Industrial, Scientific & Medical (ISM)

- 6.765-6.795 MHz
- 13.553-13.567 MHz
- 26.957-27.283 MHz
- 40.66-40.68 MHz
- 433.05-434.79 MHz
- **915-928 MHz*** **Wi-Fi HaLow (802.11ah)**

a) Different to US version 902-928 MHz

b) Stricter out-of-band limit than AUS

- Wi-Fi**
- 2.4-2.5 GHz
 - 5.725-5.875 GHz
 - 24-24.25 GHz
- Wi-Gig**
- 61-61.5 GHz
 - 122-123 GHz
 - 244-246 GHz



Wi-Fi & Wi-Gig bands

- 2.4 GHz (i.e. 802.11b/g/n)
 - 2400-2483.5 MHz
- 5 GHz (i.e. 802.11a/n/ac)
 - 5150-5350 MHz
 - 5470-5725 MHz
 - 5725-5875 MHz
- 60 GHz (i.e. 802.11ad)
 - 57-66 GHz

Refer to ***General User Radio Licence
for Short Range Devices***

- 5 GHz
 - 5725-5850 MHz
- 60 GHz
 - 57-64 GHz

Refer to ***General User Radio Licence
for Fixed Radio Link Devices***



Issues with 5 GHz Wi-Fi band

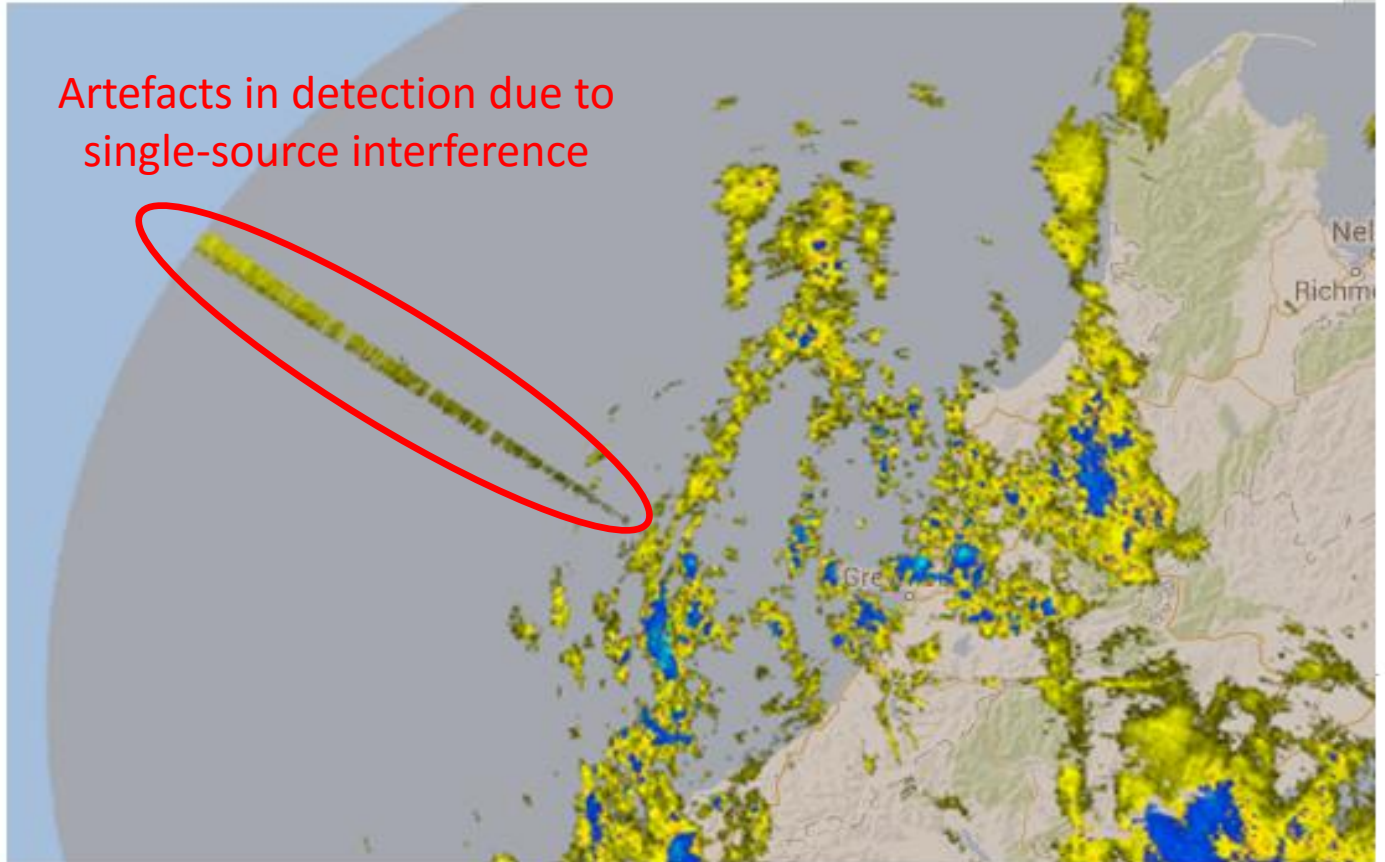
- MetService's **weather radars** are licensed **around 5600-5650 MHz** at the following **nine locations**:
Kaeo, Tamahunga, Mamaku, New Plymouth airport, Mahia, Outlook Hill, Rakaia Trig, Blue Spur Range and Invercargill airport
- Overlapped Wi-Fi channels **must be avoided**
 - a) when configuring equipment on-site or near the radars
 - b) within radial line-of-sight to the radars

Interference incident – Example 1

Rain Radar - Westland

19 Jun 2013 16:13
19 Jun 2013 16:20
19 Jun 2013 16:28
19 Jun 2013 16:35
19 Jun 2013 16:43
19 Jun 2013 16:50
19 Jun 2013 16:58
19 Jun 2013 17:05
19 Jun 2013 17:13
19 Jun 2013 17:20
19 Jun 2013 17:28
19 Jun 2013 17:35
19 Jun 2013 17:43
19 Jun 2013 17:50
19 Jun 2013 17:58
19 Jun 2013 18:05
19 Jun 2013 18:13
19 Jun 2013 18:20
19 Jun 2013 18:28
19 Jun 2013 18:35

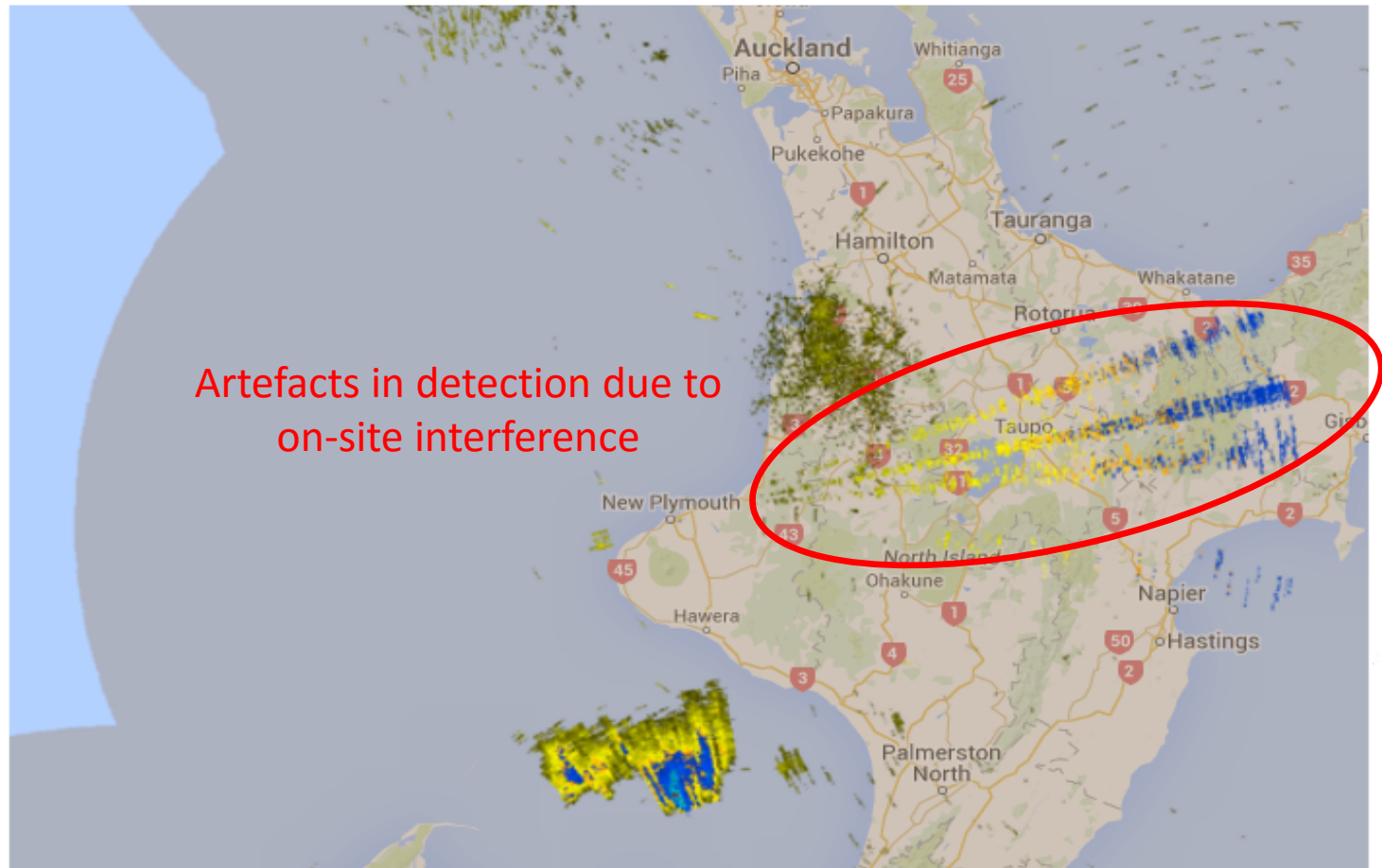
Artefacts in detection due to
single-source interference



Interference incident – Example 2

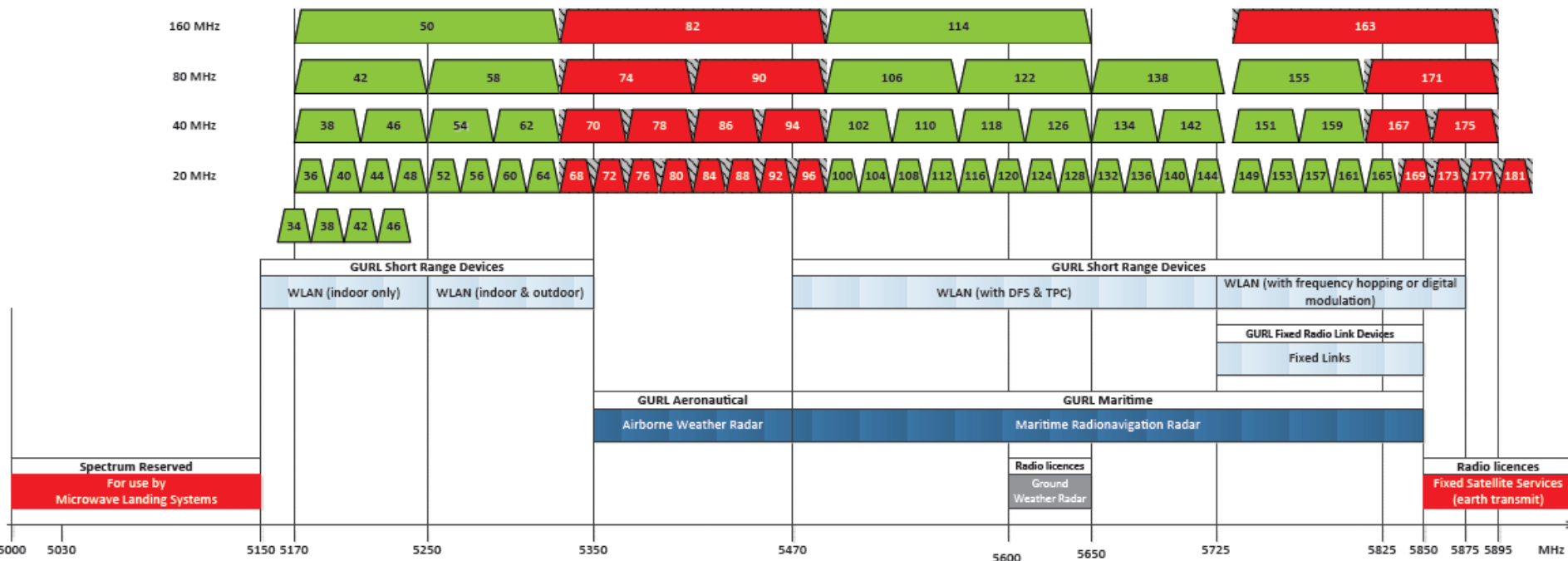
Rain Radar - Taranaki

26 Feb 2016 09:43
26 Feb 2016 09:51
26 Feb 2016 09:58
26 Feb 2016 10:06
26 Feb 2016 10:13
26 Feb 2016 10:21
26 Feb 2016 10:28
26 Feb 2016 10:36
26 Feb 2016 10:43
26 Feb 2016 10:51
26 Feb 2016 10:58
26 Feb 2016 11:06
26 Feb 2016 11:13
26 Feb 2016 11:21
26 Feb 2016 11:28
26 Feb 2016 11:36
26 Feb 2016 11:43
26 Feb 2016 11:51
26 Feb 2016 11:58
26 Feb 2016 12:06
26 Feb 2016 12:13
26 Feb 2016 12:21
26 Feb 2016 12:28
26 Feb 2016 12:36



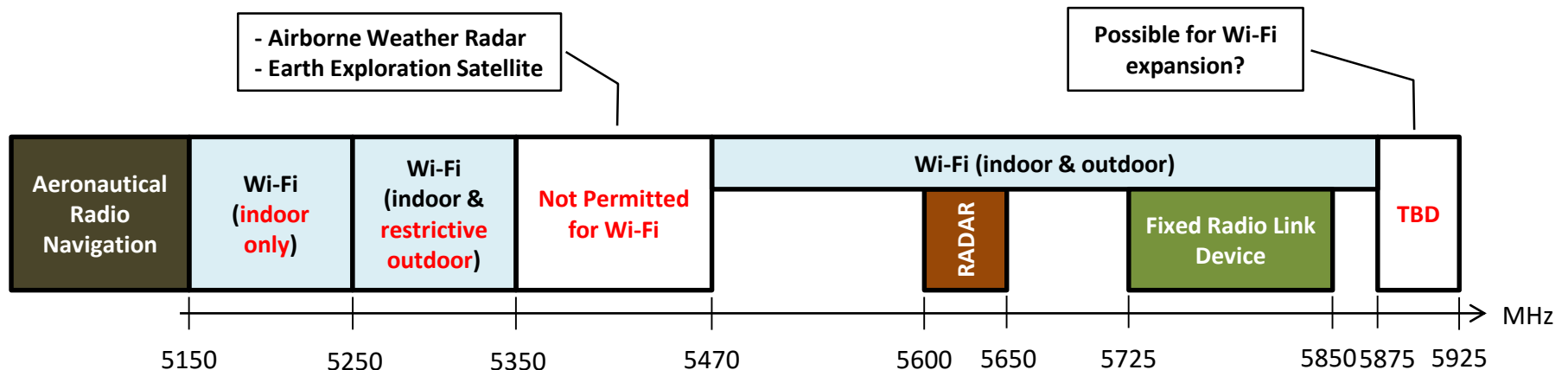
5 GHz Wi-Fi channel plan

IEEE 802.11 channels (available, not available)



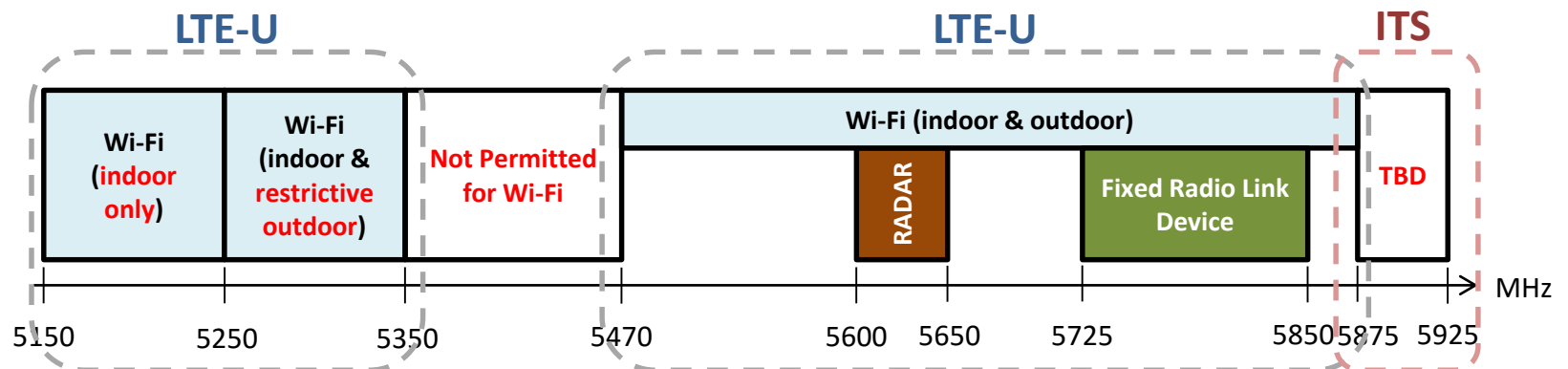
Challenges ahead for Wi-Fi

- Congestion in 2.4 GHz Wi-Fi band
- Further studies to expand 5 GHz Wi-Fi band



Challenges ahead for Wi-Fi

- Possible competition for spectrum in 5 GHz band
 - LTE-U (Unlicensed)
 - Intelligent Transport Systems (ITS)



Watch this space

- Monitor ongoing international studies
 - Relaxing outdoor conditions for 5 GHz Wi-Fi band?
 - Expanding Wi-Fi into other parts of 5 GHz?
- Continue to resolve interference to weather radars with help from wireless ISP industry



Q & A

RADIO SPECTRUM MANAGEMENT

