

The Opportunity for Spectrum Sharing in 6GHz ACMA RadComms 2022

Mark Krischer Principal Wireless Architect 15 November 2022



Wi-Fi has succeeded despite little bandwidth

- 1	2.4 GHZ (nanneis	80 MHz					
	ISM Band	2407 + 5 X Ch. Number	Wavelength 12.5cm -	4.9" to 12.0cm - 4.7"				
Qty	Channel	1 6 11						
3	Center Freq	2.412 2.437 2.462						
	5 GHz C	hannels	500 MHz					
	Frequency	5000 + 5 X Ch. Number	Wavelength 5.8cm - 2	3" to 5.1cm - 2.0"				
			DFS Channels		DFS Channels			
					TDWR			
	Radio Band	U-NII-1	U-NII-2a		U-NII-2c (Extended)		U-NII-3	
Qty	Center Freq	5.200 5.200 5.220 5.240	5.280 5.300 5.320	5.500 5.520 5.540 5.560	5.580 5.600 5.620 5.640	5.660 5.700 5.720	5.745 5.765 5.785 5.805 5.805 5.825	
25	20 MHz	36 40 44 48	52 56 60 64	100 104 108 112	116 120 124 128	132 136 140 144	149 153 157 161 165	
11	40 MHz	38 46	54 62	102 110	118 126	134 142	151 159	
5	80 MHz	42	58	106 122		138	155	
2	160 MHz	50		114			165 was ISM, now U-NII-3	

"Unlicensed devices ... have become indispensable for providing low-cost wireless connectivity in countless products...."

- United States Federal Communications Commission

6GHz will provide Wi-Fi room to grow

- 1	2.4 GHz (Channels	80 MHz						he b (it	Hz band	TIST ar
	ISM Band	2407 + 5 X Ch. Number	Wavelength 12.5cm -	4.9" to 12.0cm - 4.7"							
Qty	Channel	1 6 11						consider	rina sr	oectrun	ı shar
3	Center Freq	2.437 2.437 2.462						001101001	"'g Y		· onan
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1		bannala						provid		55 101 11	
- 5	5 GHZ C	nanneis	500 MHZ				,	maintaini	na aco	acc and	proto
	Frequency	5000 + 5 X Ch. Number	Wavelength 5.8cm - 2.	3" to 5.1cm - 2.0"			1	I all Itali II	ny acce	255 anu	protec
			DFS Channels	DFS Channels				lipipio	tion	Calana	
	Radio Band	U-NII-1	U-NII-2a	U-NII-2c (Extended)		U-NII-3		- $IIIIC$	ivalion,	Science	e and
	Center Freg	220 220 220 220 220 220 220 220 220 220	260 300 320	500 540 580 60 60 640	660 680 720	745 765 785 805	825				\sim
Oty	20 MH-			iii iiiii iiii iiiiii iiiiiiii iiiiiiiii iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	122 124 140 144	140 152 157 141	City				Cana
11	40 MHz	38 46	54 62		134 140	151 150	11				
5	80 MHz	40	58		134 142	151 157	5				
	440 141	F0				100	-				
2	100 MHZ	50		114		165 was ISM, now U	I-NII-3 2				
2	160 MHz			114		165 was ISM, now U	I-NII-3 2				
2	6 GHz C	Channels	1,200 MHz	114		165 was ISM, now U	I-NII-3 2				
2	6 GHz C	Channels	1,200 MHz	114		165 was ISM, now U	<i>⊾.NII⊦</i> 3 2				
2	6 GHz C	5950 + 5 X Ch. Number	1,200 MHz Wavelength 5.1cm - 2	114 0" to 4.2cm - 1.6"		165 was ISM, now U	2				
2	6 GHz C FCC - USA	5950 + 5 X Ch. Number	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6"		165 was ISM, now U	-NII-3 2	923 943			
2	6 GHz C FCC - USA Low Power Indoor Radio Band	5950 + 5 X Ch. Number	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6" UNII-5		165 was ISM, now U	-NII-3 2 999 UNII-6	6335		UNII-7	
2 Oty	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq	5950 + 5 X Ch. Number 5950 + 5 X Ch. Number 50	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6" UNII-5 92 19 19 19 19 19 19 19 19 19 19 19 19 19	6.275 6.295 6.315 6.315	165 was ISM, now U	×8133 2 5435 54455 54455 UNII-6	6.495 6.515 6.535 6.555 6.575	5.655 5.615 5.635 5.655	56763 26763 26763	s.755 s.775 s.795
2 Oty 59	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz	Channels 5950 + 5 X Ch. Number 5 568m/MHz - 565 5 9 13	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	UNII-5 97 67 57 57 67 33 37 41 45 49 53 57 61	£67 667 73 77 7	165 was ISM, now U	-XNI-3 2 Style Style Style 97 101 105 1	\$64 \$15 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5 \$5	56 51 56 55 56 56 56 56 56 56 56 56 56 56 56	UNII-7 52.99 145 149 153 157	6 1.75 6 1.75 6 1.75 6 1.75
2 Cty 59 29	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz	Stannels 5950 + 5 X Ch. Number 5950 + 5 X Ch. Number 50 50 50 50 50 50 50 50 50 50 50 1 5 3 11	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	UNII-5 97 to 4.2cm - 1.6" UNII-5 98 51 52 52 52 52 52 52 52 52 52 52 53 57 61 33 37 41 45 49 53 57 61 35 43 51 59	Sc Sc<	165 was ISM, now U 50 Fr 9 Fr 9 81 85 89 93 83 91	+ANI-3 2 UNII-6 Sty 9 97 101 105 1 99 107	\$67 55 55 55 55 55 55 55 55 55 55 55 55 55	55 57 58 59 129 133 137 141 131 139	UNII-7 52.99 145 147 153 157	56, L° 9 56, L° 9 56, L° 9 161 165 169 163 171
2 Oty 59 29 14	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz	Stannels 5950 + 5 X Ch. Number 5 5 5 5 5 5 9 1 5 3 11 7	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	UNII-5 UNII-5 97 91 97 91 97 91 97 91 91 97 95 97 91 97 95	K K	165 was ISM, now U 27 K K K K 81 85 89 93 83 91 87	۲۹۹۰ ۷ΝΙΙ-6 ۲۰۰ ۲۰۰ ۲۰۰ </th <th>50 50<</th> <th>55 57 58 58 129 133 137 141 131 139 135</th> <th>UNII-7 52.99 145 147 153 157 151</th> <th>SL SL SL<</th>	50 50<	55 57 58 58 129 133 137 141 131 139 135	UNII-7 52.99 145 147 153 157 151	SL SL<
2 Oty 59 29 14 7	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz	200 200 200 200 200 200 200 200	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	UNII-5 97 to 4.2cm - 1.6" UNII-5 97 97 97 97 97 97 97 97 97 97 97 97 97 9	£; \$; \$; \$; \$; \$; \$; \$; \$; \$; \$; \$; \$; \$;	165 was ISM, now U 57 Kg & 5 9 S & 5 81 85 89 93 83 91 87	HANI-3 2 SF0 UNII-6 SF Y 97 101 105 103 103	50 51 52<	89 97 98 98 129 133 137 141 131 139 135 135	UNII-7 52.99 145 147 153 157 151 143 151	52 52 56 50 50 50 50 50 50 50 50 50 50 50 50 50
2 Qty 59 29 14 7	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz	Channels 5950 + 5 X Ch. Number 5050 + 5 X C	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	UNII-5 9" to 4.2cm - 1.6" UNII-5 9" 9" 9" 9" 9" 9" 9" 9" 9" 9" 9" 9" 9" 9	£2 £2<	165 was ISM, now U 57 47 57 9 9 9 81 85 89 93 83 91 87	×₩I-3 2 ¥0-5 ¥0	\$64 0 113 117 121 125 115 123 111 125 111 125 115 123 119	89 92 93<	UNII-7 \$2.9 \$2.9 \$2.9 \$2.9 \$2.9 \$2.2 \$2.2 \$2.5	52 52 56 50 109 101 165 169 1171 163 171 167 167 167
2 Crty 59 29 14 7	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz 160 MHz tandard Power AP Radio Band	Channels 5950 + 5 X Ch. Number 5950 + 5 X Ch. Number 5050 - 5 X C	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6" UNII-5 UNII-5 UNII-5 0" to 4.2cm - 1.6" UNII-5 0" to 4.2cm - 1.6" UNII-5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	\$\$ \$\$<	165 was ISM, now U 57 Kr 8 Kr 4 9 9 9 9 81 85 89 93 83 91 87	×₩I-3 2 VINII-6 SEP 9 97 101 105 1 103 SP3 VINII-6	5270 5270 5279 5279 5279 5279 5279 5279 5279 5279	89 99 99 99 99 99 99 91 129 1133 137 141 131 139 135 135 135 135 135	UNII-7 \$2,9 9 145 149 153 157 151 43 UNII-7	52 52 9 161 165 169 163 171 167
2 Oty 59 29 14 7	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz 160 MHz tandard Power AP Radio Band Center Freq	200 201 201 201 201 201 201 201	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6" UNII-5 14 15 16 17 17 17 17 17 17 17 17 17 17 17 17 17 17 18 10 10 10 11 10 10 11 10 11 10 11 12 13 14 14 15 16 16 17 17 </th <th>\$£ \$5 \$6 \$7 \$77 \$ \$6 \$7 \$75 \$ \$6 \$7 \$71 \$ \$79 \$£ \$2 \$£<</th> <th>165 was ISM, now U</th> <th>×₩I-3 2 VINII-6 SEP 9 97 101 105 1 103 103 SEP 9 VINII-6 SE 9 SE 9</th> <th>\$64 P 0 \$65 P 0 \$65 S 0 \$125 \$113 \$117 \$121 \$125 \$113 \$117 \$121 \$125 \$119 \$119 \$117 \$119 \$111 \$119 \$117 \$125 \$111 \$119 \$117 \$125 \$111 \$119 \$117 \$125 \$111 \$119 \$117 \$125 \$125 \$125 \$255 \$255</th> <th>95 91 92 99 91 129 133 137 141 131 139 135 135 93 93 93 135 135 93 93 93 93 135 135 93 93 93 93 135 135 135 93 93 93 93 93 93 135 <td< th=""><th>UNII-7 SEC 9 SEC 9 S</th><th>56.2 9 161 163 562 55.2 9 161 163 171 167 562 165 167 562 552</th></td<></th>	\$£ \$5 \$6 \$7 \$77 \$ \$6 \$7 \$75 \$ \$6 \$7 \$71 \$ \$79 \$£ \$2 \$£<	165 was ISM, now U	×₩I-3 2 VINII-6 SEP 9 97 101 105 1 103 103 SEP 9 VINII-6 SE 9 SE 9	\$64 P 0 \$65 P 0 \$65 S 0 \$125 \$113 \$117 \$121 \$125 \$113 \$117 \$121 \$125 \$119 \$119 \$117 \$119 \$111 \$119 \$117 \$125 \$111 \$119 \$117 \$125 \$111 \$119 \$117 \$125 \$111 \$119 \$117 \$125 \$125 \$125 \$255 \$255	95 91 92 99 91 129 133 137 141 131 139 135 135 93 93 93 135 135 93 93 93 93 135 135 93 93 93 93 135 135 135 93 93 93 93 93 93 135 <td< th=""><th>UNII-7 SEC 9 SEC 9 S</th><th>56.2 9 161 163 562 55.2 9 161 163 171 167 562 165 167 562 552</th></td<>	UNII-7 SEC 9 SEC 9 S	56.2 9 161 163 562 55.2 9 161 163 171 167 562 165 167 562 552
2 Cıty 59 29 14 7 Cıty 24	6 GHz C FCC - USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz 160 MHz tandard Power AP Radio Band Center Freq 20 MHz	200 201 201 201 201 201 201 201	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6" UNII-5 5 33 37 41 45 49 53 57 61 35 43 51 59 37 47 Ination (AFC) UNII-5 9 47 33 37 41 45 49 53 57 61	\$£2 \$£2 <th>165 was ISM, now U St Fr St Fr St St St St</th> <th>Sign UNII-6 Sign Sign 97 101 99 107 103 103 Sign Sign Sign VINII-6 Sign Sign Sign VINII-6 Sign Sign Sign Sign Sign Sign Sign Sign Sign</th> <th>529 529 529 529 529 529 113 117 119 111 529</th> <th>95 51 96<</th> <th>UNII-7 \$2,0 9 145 149 153 157 157 157 43 UNII-7 \$2,9 9 145 157 151 43</th> <th>52 L 9 161 163 167 52 L 9 161 163 167 52 L 9 52 L 9 161 163 171 167 52 L 9 52 L 9 52 L 9 161 163 171 167 52 L 9 52 L 9 5</th>	165 was ISM, now U St Fr St Fr St St	Sign UNII-6 Sign Sign 97 101 99 107 103 103 Sign Sign Sign VINII-6 Sign Sign Sign VINII-6 Sign Sign Sign Sign Sign Sign Sign Sign Sign	529 529 529 529 529 529 113 117 119 111 529	95 51 96<	UNII-7 \$2,0 9 145 149 153 157 157 157 43 UNII-7 \$2,9 9 145 157 151 43	52 L 9 161 163 167 52 L 9 161 163 167 52 L 9 52 L 9 161 163 171 167 52 L 9 52 L 9 52 L 9 161 163 171 167 52 L 9 52 L 9 5
2 City 59 29 14 7 City 24 12	6 GHz C FCC- USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz tandard Power AP Radio Band Center Freq 20 MHz 40 MHz	200 201 201 201 201 201 201 201	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	0" to 4.2cm - 1.6" UNII-5 5 33 37 41 45 37 37 41 43 5 39 5 47 Ination (AFC) UNII-5 41 43 5 33 37 41 47 INII-5 UNII-5 5 33 33 25 37 6 5 47 INII-5 14 47 33 37 61 33 37 37 51 59	\$\$\$ \$\$	St. St. <th>Sign UNII-6 Sign Sign 97 101 99 107 103 103 Sign Sign Sign Sign</th> <th>5299 5299 5299 519 115 115 111 5299 5299 5199 111 5299</th> <th>55 51 52 59 59 129 133 137 141 131 139 135 135 55 59 59 59 59 129 133 137 141 131 139 137 141 131 137 141</th> <th>UNII-7 \$2.9 9 145 149 153 157 157 147 155 43 UNII-7 \$2.9 9 145 151 43 UNII-7 \$2.9 9 149 153 157 155 157 157</th> <th>52.6 9 56.6 9 163 171 167 167 52.6 9 56.6 9 161 165 163 171 167 167 163 171 163 171</th>	Sign UNII-6 Sign Sign 97 101 99 107 103 103 Sign Sign	5299 5299 5299 519 115 115 111 5299 5299 5199 111 5299	55 51 52 59 59 129 133 137 141 131 139 135 135 55 59 59 59 59 129 133 137 141 131 139 137 141 131 137 141	UNII-7 \$2.9 9 145 149 153 157 157 147 155 43 UNII-7 \$2.9 9 145 151 43 UNII-7 \$2.9 9 149 153 157 155 157 157	52.6 9 56.6 9 163 171 167 167 52.6 9 56.6 9 161 165 163 171 167 167 163 171 163 171
2 Qty 59 29 14 7 Qty 24 12 6	6 GHz C FCC- USA Low Power Indoor Radio Band Center Freq 20 MHz 40 MHz 80 MHz 160 MHz tandard Power AP Radio Band Center Freq 20 MHz 40 MHz 80 MHz	200 201 201 201 201 201 201 201	1,200 MHz Wavelength 5.1cm - 2 Net EIRP 18dBM	114 0" to 4.2cm - 1.6" 114 115 116 117 118 119 119 110 110 111 <	\$\$\$ \$\$	165 was ISM, now U 57 67 67 7 7 7 81 85 89 93 83 91 87 81 85 89 93 81 87 7 7 81 85 89 93 81 85 89 93 81 85 89 93 81 85 89 93 81 85 89 93 83 91 87 83	Sign UNII-6 Sign Sign 97 101 99 107 103 103 Sign Sign	\$200 \$200	55 51 52 59 99 9 129 133 137 141 131 139 137 141 135 135 137 141 131 139 135 131 137 129 133 137 141 131 137 141 135 137 141 131 137 141 135 135 135	UNII-7 \$2,9 9 145 149 151 43 UNII-7 \$2,9 9 145 151 43 UNII-7 \$2,9 9 145 151 43 UNII-7 \$2,9 9 149 153 \$157	52, 69 56, 69 163 171 163 171 163 171 163 171 163 171 163 171 163 171 163 171 165 169 163 171 167 167

n opportunity to begin ring techniques in order to ervices in the band while ction for existing services." Economic Development ada

177 181

181

185 189

6875

195

193 197 201 205 209 213 217 221

211

219

203

320 MHz

233

227

The Need for 1200MHz

- In the 5GHz band, 40MHz is the sweet spot for high density designs at a 12m spacing minimum
- Real-time voice and video
 requires 100ms latency
- Augmented and virtual reality requires 10ms latency



Area	1K ft² /	[/] 93 m ²	1.2K ft ² / 111 m ²	1.5K ft ² / 130 m ²	
BW	80 MHz	40 MHz	40 MHz	40 MHz	
Pass/Fail					







Automated Frequency Coordination



Incumbent Fixed Service

Incumbent Fixed Service UNII 5 and 7 Bands

<u>ID</u> \$	Frequency	Emission Designator	Authorisation Date	T/R	Client	Licence	Site/Area
8274101	6.72 GHz	73M5D7WET	14/Apr/2022	R	Telstra Corporation Limited (39310)	11015100/2	Telstra Site DJAMBIDJIMBA NT 0872
8274100	6.72 GHz	73M5D7WET	14/Apr/2022	т	Telstra Corporation Limited (39310)	11015100/2	Telstra Radio Site Coonega, 24 km WSW of Mount Eclipse NT
8274065	6.019325 GHz	56M0G7W	05/Aug/2021	R	Optus Mobile Pty Limited (20017363)	11309311/1	Wellington Shire Council Site Mount Bodangora Near WELLINGTON NSW 2820
8274064	6.019325 GHz	56M0G7W	05/Aug/2021	т	Optus Mobile Pty Limited (20017363)	11309311/1	Optus Site Lulworth Park off Mitchell Hwy GEURIE NSW 2830
8274063	6.271365 GHz	56M0G7W	05/Aug/2021	R	Optus Mobile Pty Limited (20017363)	11309311/1	Optus Site Lulworth Park off Mitchell Hwy GEURIE NSW 2830
8274062	6.271365 GHz	56M0G7W	05/Aug/2021	т	Optus Mobile Pty Limited (20017363)	11309311/1	Wellington Shire Council Site Mount Bodangora Near WELLINGTON NSW 2820

ACMA Register of Radiocommunications Licences





SoFi :: Stadium by the numbers

- 53 petabytes of traffic traversed the IP Fabric for Media network
- 31.7 TB of traffic to the internet
- Over 33k concurrent clients on the Wi-Fi network
- Peak traffic to internet: 14.2Gbps up / 5.4Gbps down



ACMA 6 GHz 220722

Rx green points, P2P white lines, https://web.acma.gov.au/rrl/assignment_range.search 4925-7125 MHz shows 16332 licensed nodes; >4000 links Legend 🕴 Feature 1 O Feature 2 • Jakarta ஃ T

6500.0 1192927/11 7000.0 119207801 6500.0 1192958/11 7050.0 1192958/11 7050.0 1192958/11 7050.0 1192958/11 6460.0 1192958/11 0000.0 1192951/1 1000.0 1122263/1 6640.0 11629642677 5 16128504WESTERN AUSTRALIA 703010 11923/104 204010 11929/5/1 670010 11929/72/1 665010 11929/72/1 7080 0 1192985/1 6880 0 1192982/1 6107,241 1911 1950/1 6330.665 111705237 6279.36 6226 89 1974273 4 6540.0 10407972/1

demo Ras

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