

Table 8.2-2: Output power measurement results

Port	RF output power, dBm	RF output power, W	Dual band combined power, dBm	Dual band combined power, W
000	39.85	9.661	42.63	18.323
010	40.13	10.304	42.77	18.923
020	39.84	9.638	42.73	18.750
030	40.16	10.375	42.83	19.187
031	39.88	9.727	42.66	18.450
021	40.12	10.280	42.84	19.231
011	39.90	9.772	42.62	18.281
001	39.99	9.977	42.67	18.493
070	39.84	9.638	42.64	18.365
060	40.09	10.209	42.83	19.187
050	39.90	9.772	42.67	18.493
040	40.15	10.351	42.84	19.231
041	39.93	9.840	42.71	18.664
051	40.02	10.046	42.77	18.923
061	39.96	9.908	42.70	18.621

Note: The measurement results in the table above were obtained during single band and multi band operation. 10 MHz channel BW (worst case) was used. Frequency of carriers were 2155.0 MHz and 1962.5 MHz for dual band config.

Note: it was determined that the highest level of output power is at antenna port **021**, while tested together with Band 66, despite the fact, that the single band 2/25a the port 021 is not the highest. Since the difference between the highest measured level (at port **030**) and port **021** is only 0.04 dB, which was considered negligible and for testing time concerns it was decided to use port **021** as a representative one and all the rest of the measurements were performed on it.

Table 8.2-3: Output power density measurement results for single-carrier configuration for Port 021

Remarks	Frequency, MHz	RF power density, dBm/MHz	Antenna gain, dBi	EIRP, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
QPSK, 10 MHz, Low channel	1935.0	31.00	14.50	45.50	62.15	16.65
16QAM, 10 MHz, Low channel	1935.0	30.94	14.50	45.44	62.15	16.71
64QAM, 10 MHz, Low channel	1935.0	30.78	14.50	45.28	62.15	16.87
256QAM, 10 MHz, Low channel	1935.0	30.88	14.50	45.38	62.15	16.77
QPSK, 10 MHz, Mid channel	1962.5	31.01	14.50	45.51	62.15	16.64
QPSK, 10 MHz, High channel	1990.0	30.95	14.50	45.45	62.15	16.70
QPSK, 15 MHz, Low channel	1937.5	29.27	14.50	43.77	62.15	18.38
16QAM, 15 MHz, Low channel	1937.5	29.84	14.50	44.34	62.15	17.81
64QAM, 15 MHz, Low channel	1937.5	29.33	14.50	43.83	62.15	18.32
256QAM, 15 MHz, Low channel	1937.5	29.27	14.50	43.77	62.15	18.38
16QAM, 15 MHz, Mid channel	1962.5	30.07	14.50	44.57	62.15	17.58
16QAM, 15 MHz, High channel	1987.5	29.83	14.50	44.33	62.15	17.82
QPSK, 20 MHz, Low channel	1940.0	27.89	14.50	42.39	62.15	19.76
16QAM, 20 MHz, Low channel	1940.0	28.13	14.50	42.63	62.15	19.52
64QAM, 20 MHz, Low channel	1940.0	28.08	14.50	42.58	62.15	19.57
256QAM, 20 MHz, Low channel	1940.0	28.05	14.50	42.55	62.15	19.60
16QAM, 20 MHz, Mid channel	1962.5	28.18	14.50	42.68	62.15	19.47
16QAM, 20 MHz, High channel	1985.0	28.32	14.50	42.82	62.15	19.33

Linear sum of 8 ports of each polarization was based on the worst-case scenario, then all ports transmit at the maximum found power density of 31.01 dBm/MHz. Maximum PSD sum = $31.01 \text{ dBm/MHz} + 10 \times \log_{10}(8) = 40.04 \text{ dBm/MHz}$



Table 8.2-4: Total EIRP calculation for a single-carrier operation

Maximum PSD sum,	Antenna Gain, dBi	Antenna Array Column	EIRP per polarization ² ,	EIRP per polarization,
dBm/MHz		Gain ¹ , dB	dBm/MHz	W/MHz
40.04	14.50	9.00	63.54	2259.904

Notes: ¹ Antenna Array Column Gain = $10 \times Log_{10}(8)$

Total EIRP calculation for a single Macro Narrow traffic beam: 40.04 + 25 dBi (directional beam) = 65.04 dBm or 3191.5 W

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Table 8.2-5: Output power densit	y measurement results	jor two-carrier o	peration for Port 021

Frequency, MHz	RF power density, dBm/MHz	Antenna gain, dBi	EIRP, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
1935.0 + 1945.0	27.98	14.50	42.48	62.15	19.67
1957.5 + 1967.5	28.15	14.50	42.65	62.15	19.50
1980.0 + 1990.0	28.07	14.50	42.57	62.15	19.58
1937.5 + 1952.5	26.79	14.50	41.29	62.15	20.86
1955.0 + 1970.0	27.04	14.50	41.54	62.15	20.61
1972.5 + 1987.5	27.37	14.50	41.87	62.15	20.28
1940.0 + 1960.0	25.49	14.50	39.99	62.15	22.16
1952.5 + 1972.5	25.58	14.50	40.08	62.15	22.07
1965.0 + 1985.0	25.42	14.50	39.92	62.15	22.23

Linear sum of 8 ports of each polarization was based on the worst-case scenario, then all ports transmit at the maximum found power density of 28.15 dBm/MHz. Maximum PSD sum = $28.15 \text{ dBm/MHz} + 10 \times \log_{10}(8) = 37.18 \text{ dBm/MHz}$

Table 8.2-6: Total EIRP calculation for a two-carrier operation

Maximum PSD sum,	Antenna Gain, dBi	Antenna Array Column	EIRP per polarization ² ,	EIRP per polarization,
dBm/MHz		Gain ¹ , dB	dBm/MHz	W/MHz
37.18	14.50	9.00	60.68	1169.742

Notes: ¹ Antenna Array Column Gain = 10 × Log₁₀(8)

²EIRP = PSD Sum + Antenna Gain + Antenna Array Column Gain

Table 8.2-7: Output power density measurement results for LTE with IoT operation

Remarks	Frequency, MHz	RF power density, dBm/MHz	Antenna gain, dBi	EIRP, dBm/MHz	EIRP limit, dBm/MHz	Margin, dB
10 MHz low channel with 2 × GB loT	1935.0	30.81	14.50	45.31	62.15	16.84
10 MHz mid channel with 2 × GB IoT	1962.5	31.01	14.50	45.51	62.15	16.64
10 MHz high channel with 2 × GB IoT	1990.0	30.69	14.50	45.19	62.15	16.96
15 MHz low channel with 2 × GB loT	1937.5	29.54	14.50	44.04	62.15	18.11
15 MHz mid channel with 2 × GB IoT	1962.5	29.53	14.50	44.03	62.15	18.12
15 MHz high channel with 2 × GB IoT	1987.5	29.23	14.50	43.73	62.15	18.42
20 MHz low channel with 2 × GB IoT	1940.0	28.47	14.50	42.97	62.15	19.18
20 MHz mid channel with 2 × GB IoT	1962.5	28.33	14.50	42.83	62.15	19.32
20 MHz high channel with $2 \times GB$ IoT	1985.0	28.52	14.50	43.02	62.15	19.13

Linear sum of 8 ports of each polarization was based on the worst-case scenario, then all ports transmit at the maximum found power density of 31.01 dBm/MHz. Maximum PSD sum = $31.01 \text{ dBm/MHz} + 10 \times \log_{10}(8) = 40.04 \text{ dBm/MHz}$

²EIRP = PSD Sum + Antenna Gain + Antenna Array Column Gain



Table 8.2-8: Total EIRP calculation for	or an LTE + IoT operation
---	---------------------------

Maximum PSD sum,	Antenna Gain, dBi	Antenna Array Column	EIRP per polarization ² ,	EIRP per polarization,
dBm/MHz		Gain ¹ , dB	dBm/MHz	W/MHz
40.04	14.50	9.00	63.54	2259.436

Notes: ¹ Antenna Array Column Gain = 10 × Log₁₀(8) ²EIRP = PSD Sum + Antenna Gain + Antenna Array Column Gain

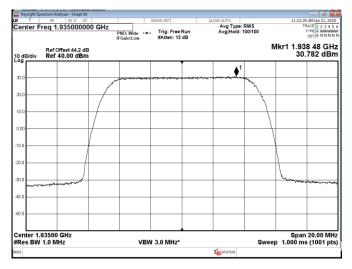


Figure 8.2-5: PSD sample plot, single carrier 10 MHz bandwidth

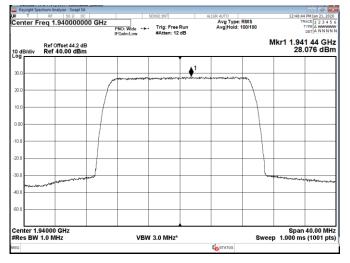


Figure 8.2-7: PSD sample plot, single carrier 20 MHz bandwidth

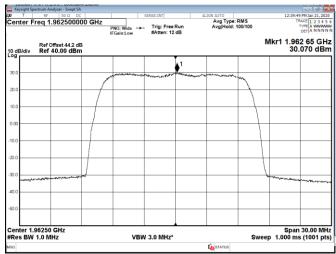


Figure 8.2-6: PSD sample plot, single carrier 15 MHz bandwidth

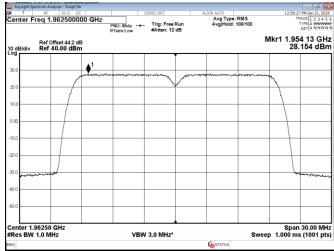


Figure 8.2-8: PSD sample plot, two-carrier 10 MHz bandwidth



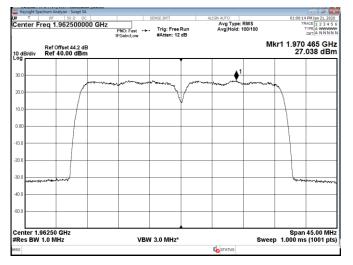


Figure 8.2-9: PSD sample plot, two-carrier 15 MHz bandwidth

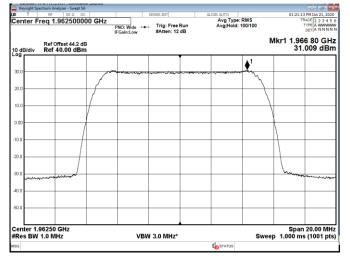


Figure 8.2-11: PSD sample plot, 10 MHz channel bandwidth with IoT

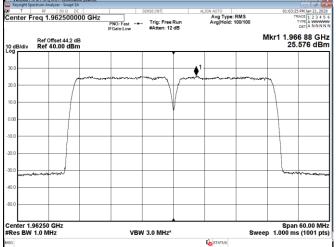


Figure 8.2-10: PSD sample plot, two-carrier 20 MHz bandwidth

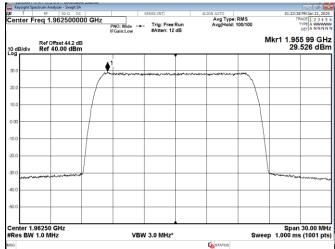


Figure 8.2-12: PSD sample plot, 15 MHz channel bandwidth with IoT



Keysight Spectrum Analyzer - Swe	ipt SA				
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enter Freq 1.94000 Ref Offset 44:	PNO IFGa 2 dB	:Wide Trig: Fre in:Low #Atten: 1		100/100	TRACE 1 2 3 4 5 TYPE A WWW DET A NNNN
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Figure 8.2-13: PSD sample plot, 20 MHz channel bandwidth with IoT

Table 8.2-9: Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for single-carrier operation

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
QPSK, 10 MHz, Low channel	1935.0	7.27	13.00	5.73
16QAM, 10 MHz, Low channel	1935.0	7.26	13.00	5.74
64QAM, 10 MHz, Low channel	1935.0	7.28	13.00	5.72
256QAM, 10 MHz, Low channel	1935.0	7.27	13.00	5.73
QPSK, 10 MHz, Mid channel	1962.5	7.36	13.00	5.64
QPSK, 10 MHz, High channel	1990.0	7.24	13.00	5.76
QPSK, 15 MHz, Low channel	1937.5	7.30	13.00	5.70
16QAM, 15 MHz, Low channel	1937.5	7.29	13.00	5.71
64QAM, 15 MHz, Low channel	1937.5	7.30	13.00	5.70
256QAM, 15 MHz, Low channel	1937.5	7.33	13.00	5.67
16QAM, 15 MHz, Mid channel	1962.5	7.36	13.00	5.64
16QAM, 15 MHz, High channel	1987.5	7.25	13.00	5.75
QPSK, 20 MHz, Low channel	1940.0	7.37	13.00	5.63
16QAM, 20 MHz, Low channel	1940.0	7.37	13.00	5.63
64QAM, 20 MHz, Low channel	1940.0	7.36	13.00	5.64
256QAM, 20 MHz, Low channel	1940.0	7.37	13.00	5.63
16QAM, 20 MHz, Mid channel	1962.5	7.37	13.00	5.63
16QAM, 20 MHz, High channel	1985.0	7.31	13.00	5.69

Table 8.2-10: Complementary Cumulative Distribution Function (CCDF) of the PAPR reduction measurement results for single-carrier operation with IoT

Remarks	Frequency, MHz	0.1% CCDF, dB	PAPR reduction limit, dB	Margin, dB
10 MHz low channel with 2 × GB IoT	1935.0	7.43	13.00	5.57
10 MHz mid channel with 2 × GB IoT	1962.5	7.54	13.00	5.46
10 MHz high channel with 2 × GB IoT	1990.0	7.40	13.00	5.60
15 MHz low channel with 2 × GB IoT	1937.5	7.38	13.00	5.62
15 MHz mid channel with 2 × GB IoT	1962.5	7.48	13.00	5.52
15 MHz high channel with 2 × GB IoT	1987.5	7.37	13.00	5.63
20 MHz low channel with 2 × GB IoT	1940.0	7.45	13.00	5.55
20 MHz mid channel with 2 × GB IoT	1962.5	7.46	13.00	5.54
20 MHz high channel with 2 × GB IoT	1985.0	7.41	13.00	5.59



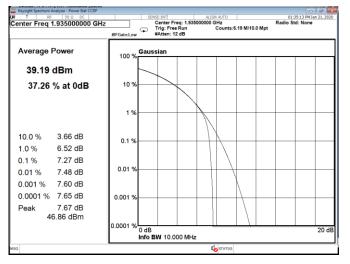


Figure 8.2-14: CCDF sample plot, 10 MHz channel

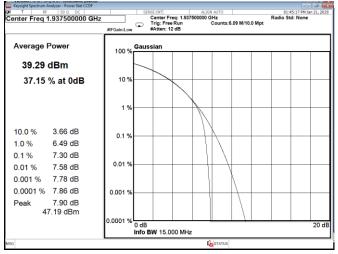


Figure 8.2-15: CCDF sample plot, 15 MHz channel

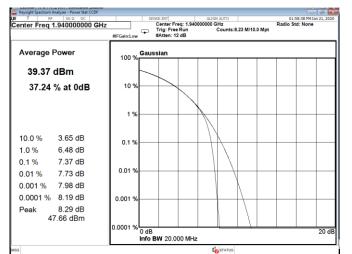


Figure 8.2-16: CCDF sample plot, 20 MHz channel

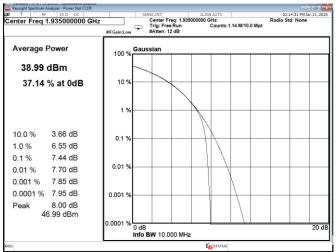


Figure 8.2-17: CCDF sample plot, 10 MHz channel LTE + IoT

Testing data FCC 24.232(a)(2) and RSS-133, 6.4 Transmitter output power (EIRP) and antenna height FCC Part 24 and RSS-133 Issue 6



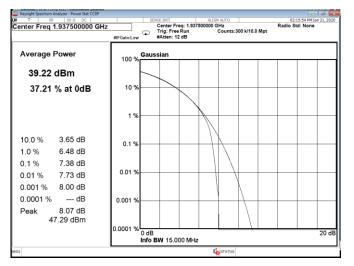


Figure 8.2-18: CCDF sample plot, 15 MHz channel LTE + IoT

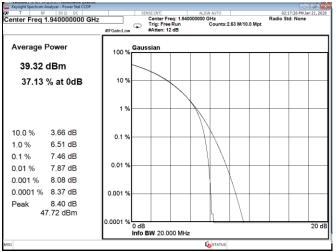


Figure 8.2-19: CCDF sample plot, 20 MHz channel LTE + IoT



8.3 FCC 27.53 and RSS-139, 4.2, RSS-170, 5.4 Spurious emissions at RF antenna connector (Band 66)

8.3.1 Definitions and limits

FCC:

(h) AWS emission limits

(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}$ (P) dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

RSS-139, Section 6.6:

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log₁₀ p (watts) dB.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10} p$ (watts) dB.

RSS-170, Section 5.4:

The transmitter unwanted emissions shall be measured for all channel bandwidths with the carrier frequency set at both the highest and lowest channels in which the equipment is designed to operate.

The e.i.r.p. density of unwanted and carrier-off state emissions outlined in this section (Section 5.4) shall be averaged over any 2-ms active transmission using an RMS detector with a resolution bandwidth of 1 MHz for broadband emissions and a resolution bandwidth of 1 kHz for discrete emissions, unless stated otherwise.

For ATC equipment operating in the bands 2000–2020 MHz and 2180–2200 MHz, the unwanted emission limits shall be determined using a measurement bandwidth of 1 MHz or greater. However, in the 1 MHz band immediately outside and adjacent to the equipment's operating frequency block, a resolution bandwidth of at least 1% of the occupied bandwidth may be employed.

5.4.1.2 ATC Base Station Equipment operating in bands 2000–2020 MHz and 2180–2200 MHz

The unwanted emissions of ATC base station equipment transmitting in the bands 2000-2020 MHz and 2180-2200 MHz shall comply with the following:

(1) The power of any unwanted emissions at frequencies outside the equipment's operating frequency block shall be attenuated below the transmitter power P (dBW), by 43 + 10 log p (watts), dB.

(2) For equipment operating in the band 2180–2200 MHz, in addition to (1), the power of any emissions on all frequencies between 2200 MHz and 2290 MHz shall not exceed an e.i.r.p. of -100.6 dBW/4 kHz (-70.6 dBm/4 kHz).*

* This requirement is for implementation and is enforced at the time of licensing. Therefore, results are not included in this report.

8.3.2 Test summary

Test date January 21, 2020



#Avg Type: RMS AvalHold:>100/100

> Mkr1 2.157 2 GHz 29.839 dBm

8.3.3 Observations, settings and special notes

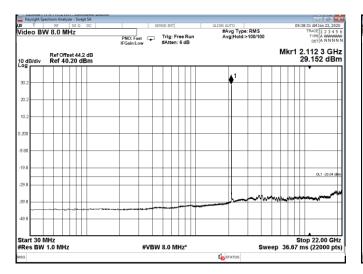
The spectrum was searched from 30 MHz to the 10th harmonic. All measurements were performed using an average (RMS) detector per ANSI C63.26 Paragraph 5.7.2 method. Limit line was adjusted for MIMO operation by 12.04 dB (for *16* ports: $10 \times Log_{10}(16)$): -13 dBm - 12.04 dB = -25.04 dBm RBW 1 MHz, VBW was wider than RBW.

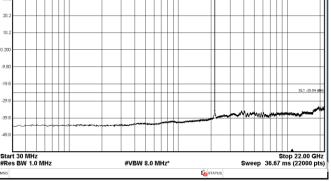
deo BW 8.0 MHz

10 dB/div

Ref Offset 44.2 dB Ref 40.20 dBm

8.3.4 Test data





PNO: Fast Trig: Free Run IFGain:Low #Atten: 6 dB

Figure 8.3-1: Conducted spurious emissions of 10 MHz low channel, single carrier operation

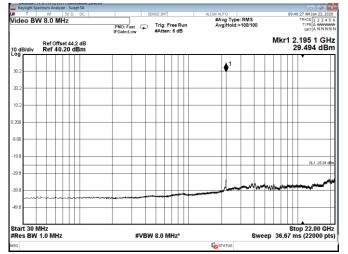


Figure 8.3-3: Conducted spurious emissions of 10 MHz high channel, single carrier operation

Figure 8.3-2: Conducted spurious emissions of 10 MHz mid channel, single carrier operation

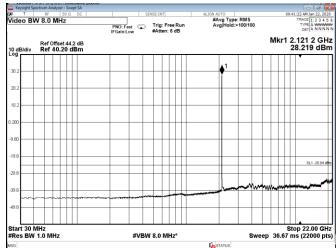
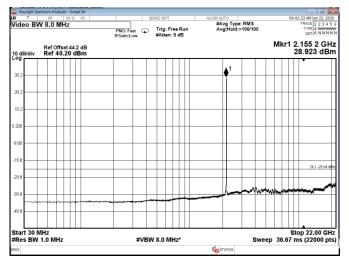
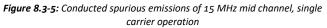


Figure 8.3-4: Conducted spurious emissions of 15 MHz low channel, single carrier operation







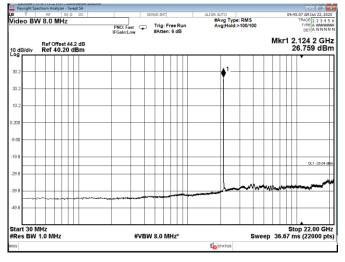


Figure 8.3-7: Conducted spurious emissions of 20 MHz low channel, single carrier operation

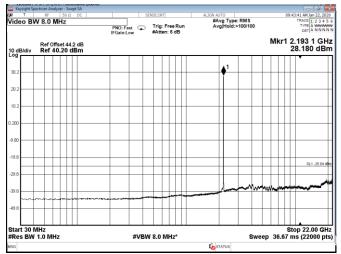


Figure 8.3-6: Conducted spurious emissions of 15 MHz high channel, single carrier operation

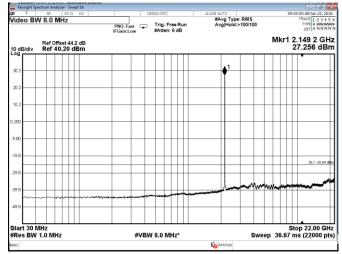
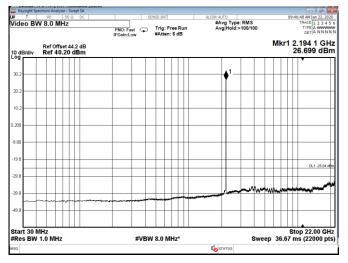
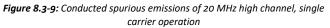


Figure 8.3-8: Conducted spurious emissions of 20 MHz mid channel, single carrier operation







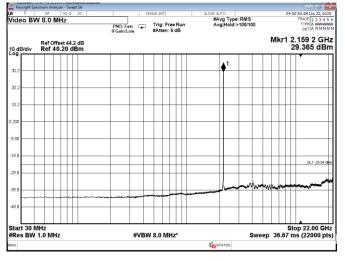


Figure 8.3-11: Conducted spurious emissions of 10 MHz mid channel, single carrier operation with IoT

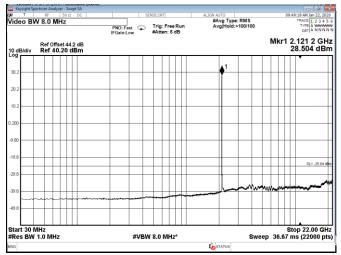


Figure 8.3-10: Conducted spurious emissions of 10 MHz low channel, single carrier operation with IoT

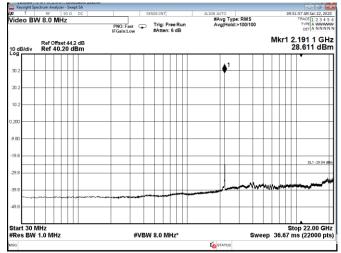
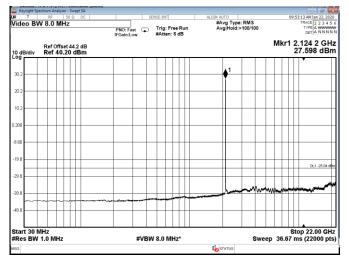
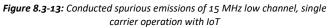


Figure 8.3-12: Conducted spurious emissions of 10 MHz high channel, single carrier operation with IoT







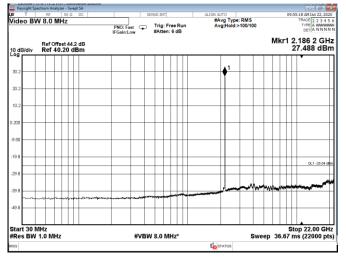


Figure 8.3-15: Conducted spurious emissions of 15 MHz high channel, single carrier operation with IoT

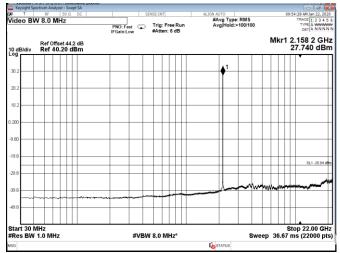


Figure 8.3-14: Conducted spurious emissions of 15 MHz mid channel, single carrier operation with IoT

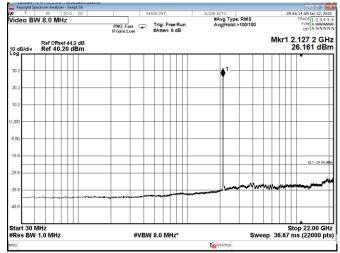
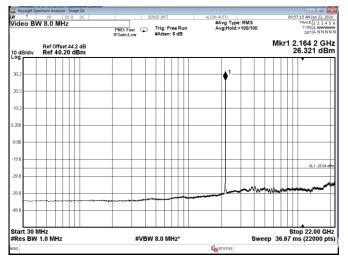
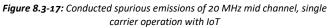


Figure 8.3-16: Conducted spurious emissions of 20 MHz low channel, single carrier operation with IoT







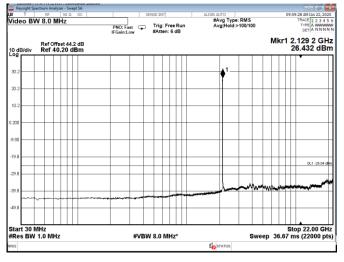


Figure 8.3-19: Conducted spurious emissions of 10 MHz bottom channels, two-carrier operation with IoT

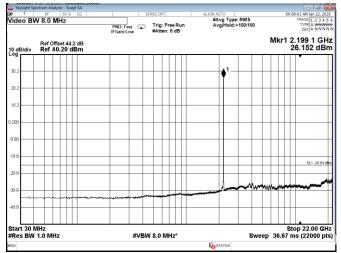


Figure 8.3-18: Conducted spurious emissions of 20 MHz high channel, single carrier operation with IoT

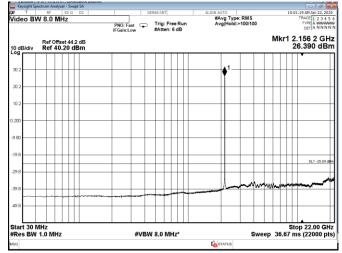
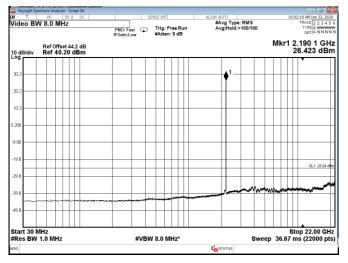
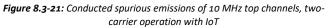


Figure 8.3-20: Conducted spurious emissions of 10 MHz middle channels, two-carrier operation with IoT







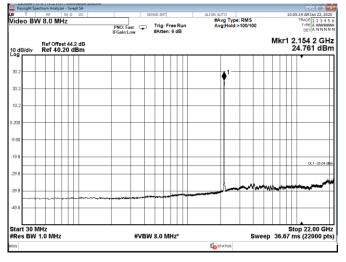


Figure 8.3-23: Conducted spurious emissions of 15 MHz middle channels, two-carrier operation with IoT

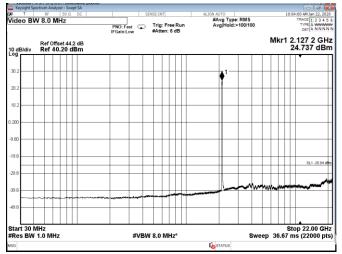


Figure 8.3-22: Conducted spurious emissions of 15 MHz bottom channels, two-carrier operation with IoT

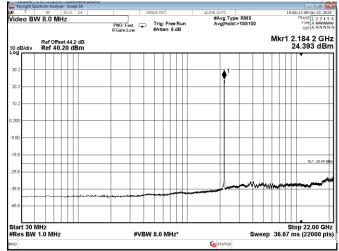
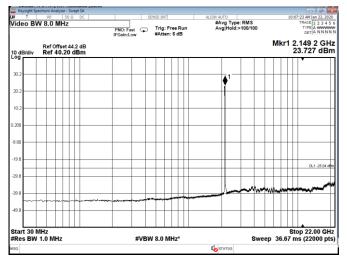
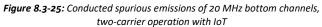


Figure 8.3-24: Conducted spurious emissions of 15 MHz top channels, twocarrier operation with IoT

Testing data Clause 27.53 and RSS-139, 4.2, RSS-170, 5.4 Spurious emissions at RF antenna connector FCC Part 27, RSS-139, Issue 3, RSS-170 Issue 3







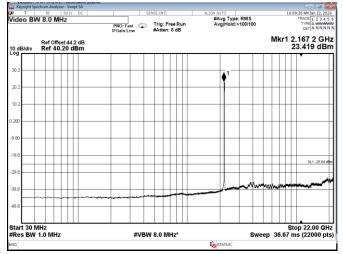


Figure 8.3-26: Conducted spurious emissions of 20 MHz middle channels, two-carrier operation with IoT

Keysight Spectrum Analyzer - Swept SA #Avg Type: RMS Avg|Hold:>100/100 Video BW 8.0 MHz PNO: Fast Trig: Free Run IFGain:Low #Atten: 6 dB Mkr1 2.148 2 GHz 23.604 dBm Ref Offset 44.2 dB Ref 40.20 dBm 10 dBi Log 30 20. 10. DL1 -25.04 -29.8 -49. Start 30 MHz #Res BW 1.0 MHz Stop 22.00 GHz Sweep 36.67 ms (22000 pts) #VBW 8.0 MHz* **K**STATUS

Figure 8.3-27: Conducted spurious emissions of 20 MHz top channels, twocarrier operation with IoT



Keysight Spectrum Analyzer - Cl T RF 50 S	hannel Power	cruer turi	ALIGN AUTO	11:41:09 AM Jan 22, 202		
g T RF 50 Span 25.000 MHz	2 00	SENSE:INT Center Freq: 2.1	109950000 GHz	Radio Std: None		
ASS	#IFGain	Low Trig: Free Run #Atten: 6 dB	Avg Hold:>100/100	Radio Device: BTS		
0 dB/div Ref 44.2	20 dBm			Mkr1 2.11 GH -40.811 dBr		
og						
4.2						
4.2						
4.2						
.20						
80		1				
5.8		1				
5.8		1		+ +		
5.8				- L.		
5.8	and a start of the					
enter 2.11 GHz Res BW 51 kHz		#VBW	1 MHz	Span 25 MH Sweep 11.47 m		
Nes Bir of Kilz		#VBH	1 1112	Gweep 11.47 m		
Channel Powe	r	Power Sp	ectral Density			
-38.92 dBm / 100 kHz		-88	-88.92 dBm /Hz			

Figure 8.3-28: Conducted band edge emission at 2110 MHz, 10 MHz channel single-carrier operation (RBW = 1% of EBW)

Keysight Spectrum An								AM Jan 22, 202	
Span 35.000 N				q: 2.10992500		400/400	Radio Std: N		
PASS		#IFGain:Low	Trig: Free #Atten: 6 d	iB	Avg Hold:>	100/100	Radio Devic	e: BTS	
	ef 44.20 dBm							2.11 GH 840 dBn	
34.2									
24.2									
14.2					- war war	man		n	
4.20				1				1	
5.80								t –	
5.8				1				1	
5.8				ý 1				1	
15.8								harman	
	and the second sec								
	enter 2.11 GHz Res BW 51 kHz		#VBW 1 MHz				Span 35 MH Sweep 16 m		
Channel P	ower		Power	Spectra	I Density	,			
-37.97 dBm / 150 kHz			-	89.73	dBm /⊦	z			
					-4				
IG					STATUS				

Figure 8.3-30: Conducted band edge emission at 2110 MHz, 15 MHz channel single-carrier operation (RBW = 1% of EBW)

	m Analyzer - Channel Power RF 50 Q DC		SENSE:INT	ALIGN AUTO		10:50:3	9 AM Jan 22, 202
weep Time			Center Freq: 2.1	08500000 GHz	d:>100/100	Radio Std: 1	
ASS		#IFGain:Low	#Atten: 6 dB	Avginoi	0:>100/100	Radio Devic	e: BTS
						Mkr1 2	.109 GH
) dB/div	Ref 44.20 dBm					-44.	427 dBr
og 4.2							
4.2						n	
4.2				1			
20							
80				1			
5.8				1			
5.8				1			
5.8			•	1		+	
5.8							March Colored
enter 2.10						Sp	an 30 MH
Res BW 51 kHz			#VBW	Sweep 13.73 m			
Channe	Power		Power Sp	ectral Densi	ty		
-32.17 dBm / 1 мнz		1 MHz	-92	.17 dBm	/Hz		
				~			
3				STATUS			

Figure 8.3-29: Conducted band edge emission at 2109 MHz, 10 MHz channel single-carrier operation (RBW = 1 MHz)

5pan 40.000 MH PASS	50 Ω DC Z	#IFGain:Low	Center Fre Trig: Free #Atten: 6 d	eq: 2.1085000 Run	ALIGN AUTO 00 GHz Avg Hold:>10	10/100	Radio Std: N Radio Device	E: BTS
0 dB/div Ref 4			Trig: Free	Run	Avg Hold:>10	0/100	Radio Device	E: BTS
0 dB/div Ref 4	14.20 dBm		#Atten: 6 o	dB				
og 4.2	14.20 dBm		ŕ				Mkr1 2	100 CL
og 4.2			· · · · ·					415 dB
		_		1				
4.2								
		-						
4.2					-prost-sounds	حديمتم	mann	
20								
80								
5.8								
5.8				11 /				-
5.8				₩1/				
5.8								horas
5.0			and the second s	Π.				
enter 2.109 GHz								an 40 Mi
Res BW 51 kHz			#VE	BW 1 MHz		Sweep 18.33 r		
Channel Pov	ver		Power	r Spectra	al Density			
-32.88	dBm / 1 м	Hz	-	92 .88	dBm /Hz			
a					STATUS			

Figure 8.3-31: Conducted band edge emission at 2109 MHz, 15 MHz channel single-carrier operation (RBW = 1 MHz)



pan 45.000 MHz	#FGain:Low	SENSE:INT Center Freq: 2.10990 Trig: Free Run #Atten: 6 dB	ALIGN AUTO 0000 GHz Avg Hold:>100/100	11:51:03 AM Jan Radio Std: None Radio Device: BTS	
0 dB/div Ref 44.20	1Bm			Mkr1 2.11 -42.872	
og 4.2					
4.2					
20					
80					
5.8				+	
5.8		1		+ + }	
5.8					
enter 2.11 GHz	and the second sec			Span 45	
Res BW 51 kHz		#VBW 1 MH	Sweep 20	.6 m	
Channel Power		Power Spect	ral Density		
-37.58 dB	n / 200 kHz	-90.59	dBm /Hz		
			4		
IG .			STATUS		

Figure 8.3-32: Conducted band edge emission at 2110 MHz, 20 MHz channel single-carrier operation (RBW = 1% of EBW)

Keysight Spectrum Analyzer - Channel Power T RF 50 Ω DC	SENSE:INTI ALIGN AUTO	11:43:05 AM Jan 22, 20
Span 25.000 MHz	Center Freq: 2.200050000 GHz	Radio Std: None
PASS	Trig: Free Run Avg Hold #FGain:Low #Atten: 6 dB	I:>100/100 Radio Device: BTS
10 dB/div Ref 44.20 dBm		Mkr1 2.2 GH -43.409 dBi
.og 34.2		
24.2		
4.2		
20		
80		
5.8		
5.8		
5.8	₹ ′	
	and the second s	and and a second second and a second s
enter 2.2 GHz Res BW 51 kHz	#VBW 1 MHz	Span 25 MH Sweep 11.47 n
KC3 BW OT KILL	#VDIT 1 Mil2	046669 11.411
Channel Power	Power Spectral Densi	ty
-41.23 dBm / 100	kHz -91.23 dBm	<i></i>
-41.25 UBIII / 100	KHZ -91.23 UBIII	HZ
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	
a	STATUS	

Figure 8.3-34: Conducted band edge emission at 2200 MHz, 10 MHz channel single-carrier operation (RBW = 1% of EBW)

Keysight Spectrum	Analyzer - Channel Pe F 50 Ω DC	wer		SENSE:INT		4	LIGN AUTO		10:52:	👝 🕼 📕
pan 50.000			· · · · ·	Center F				0/400	Radio Std:	
ASS		#	IFGain:Low	#Atten: 6	dB		Avg Hold:>10	0/100	Radio Devi	ce: BTS
	Ref 44.20 dB	m								2.109 GH .028 dBr
og 4.2										
4.2										
4.2						~~~~	min	-		_
.20						1				1
.80						-				11
5.8					Ш.,	<u> </u>				
5.8					/					
5.8					- ∳1/					+
15.8					- And					- manna
enter 2.109										pan 50 MH
Res BW 51 kHz Channel Power		#VBW 1 MHz						Swee	p 22.87 m	
			Power Spectral Density							
-31.	83 dBm	/ 1 MH	z		-91	.83 (dBm /нz			

Figure 8.3-33: Conducted band edge emission at 2109 MHz, 20 MHz channel single-carrier operation (RBW = 1 MHz)

T RF 50 Q DC	er.	SENSE:INT	ALIGN AUTO	10:59:40 AM Jan 22, 20
oan 25.000 MHz		Center Freq: 2.201	500000 GHz	Radio Std: None
ASS	#FGain:Low	Trig: Free Run #Atten: 6 dB	Avg Hold:>100/100	Radio Device: BTS
dB/div Ref 44.20 dBr				Mkr1 2.201 GF -47.387 dB
9g 1.2				
1.2				
1.2 particular and a				
20				
80				
i.8				
5.8			and the second	
enter 2.202 GHz				Span 25 MH
Res BW 51 kHz		#VBW 11	Sweep 11.47 n	
Channel Power		Power Spe	ctral Density	
-35.13 dBm	/ 1 MHz	-95.1	I3 dBm /Hz	
3			STATUS	
			NO OINING	

Figure 8.3-35: Conducted band edge emission at 2201 MHz, 10 MHz channel single-carrier operation (RBW = 1 MHz)



Keysight Spectrur	m Analyzer - Channel Power				- 0
pan 35.00	RF 50 Ω DC		SENSE:INT Center Freg: 2.20007	ALIGN AUTO	11:45:03 AM Jan 22, 202 Radio Std: None
			Trig: Free Run	Avg Hold:>100/100	Namo and None
ASS		#IFGain:Low	#Atten: 6 dB		Radio Device: BTS
) dB/div	Ref 44.20 dBm				Mkr1 2.2 GH -45.709 dBr
4.2					
4.2					
4.2	- man		- Terreral		
20	11				
80	1				
.8	/				
5.8					
1			1		
5.8			1		
5.8					
				and the second sec	
enter 2.2 C Res BW 51			#VBW 1 MI	-	Span 35 MH Sweep 16 m
Kes BW 51	KHZ		#VBW 11	nz	Sweep 10 m
Channel	Power		Power Spect	tral Density	
-41	.71 dBm /	150 kHz	-93.47	7 dBm /Hz	
3				STATUS	

Figure 8.3-36: Conducted band edge emission at 2200 MHz, 15 MHz channel single-carrier operation (RBW = 1% of EBW)

Keysight Spectrum Analyzer - Channel Power				
α Τ RF 50Ω DC		SENSE:INT Center Freq: 2.200100	ALIGN AUTO	11:53:41 AM Jan 22, 202 Radio Std: None
	#IFGain:Low	#Atten: 6 dB	Avg Hold:>100/100	Radio Device: BTS
0 dB/div Ref 44.20 dBm				Mkr1 2.2 GH -46.250 dBr
4.2				
12				
20	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	w.m.		
80				
1.8				
5.8		1		
5.8		1		
5.8			Non-Astronome	
enter 2.2 GHz				Span 45 MH
Res BW 51 kHz		#VBW 1 MH	z	Sweep 20.6 n
Channel Power -41.25 dBm / 200 kHz		Power Spect	ral Density	
		-94.26		
		•		
a			STATUS	

Figure 8.3-38: Conducted band edge emission at 2200 MHz, 20 MHz channel single-carrier operation (RBW = 1% of EBW)

Keysight Spectrum Analyzer - Channel P	ower			- 6	
T RF 50 Ω DC pan 35.000 MHz	<u> </u>	Center Freq: 2.2015000		11:00:22 AM Jan 22 Radio Std: None	, 202
ASS	#FGain:Low	Trig: Free Run #Atten: 6 dB	Avg Hold:>100/100	Radio Device: BTS	
0 dB/div Ref 44.20 dE	m			Mkr1 2.201 0 -48.209 d	
og 34.2					_
4.2					
42 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~			
.20					
80					
5.8		+ \			
5.8					_
5.8		t t t t			_
5.8		the second second			
enter 2.202 GHz Res BW 51 kHz		#VBW 1 MHz		Span 35 Sweep 16	
				Sweep 10	<u>, m</u>
Channel Power		Power Spectra	al Density		
-35.68 dBm	/ 1 MHz	-95.68	dBm /Hz		

Figure 8.3-37: Conducted band edge emission at 2201 MHz, 15 MHz channel single-carrier operation (RBW = 1 MHz)

	rum Analyzer - Channel				11:00:53 AM Jan 2	
pan 45.0	RF 50 Ω DO		SENSE:INT Center Freg: 2.20150	SENSE:INT ALIGN AUTO Center Freq; 2.201500000 GHz		
			Trig: Free Run	Avg Hold:>100/100	Radio Std: None	
ASS		#IFGain:			Radio Device: BTS	
0 dB/div	Ref 44.20 d	Bm			Mkr1 2.201 (-48.275 c	
og	Rei 44.20 di					_
34.2						
24.2						_
4.2		man	~~~~			
1.20						
.80						
5.8						
5.8						
15.8						_
15.8			Lithermore			
enter 2.2	02 CH2			and the second s	Span 45	0.01
Res BW 5			#VBW 1 MH	łz	Sweep 20.	.6 n
						_
Channe	el Power		Power Spect	ral Density		
-3/	5.73 dBn	0 / 1 MU-	-95 73	B dBm /Hz		
-0.	J.75 UDI		-35.75			
				STATUS		

Figure 8.3-39: Conducted band edge emission at 2201 MHz, 20 MHz channel single-carrier operation (RBW = 1 MHz)



Keysight Spectrum Analyzer - Channe T RF 50 Ω E	I Power	SENSE:INT	ALIGN AUTO	11:40:42 AM Jan 22, 2
pan 25.000 MHz		Center Freq: 2.10995		Radio Std: None
ASS	#IFGain:Low	Trig: Free Run #Atten: 6 dB	Avg Hold:>100/100	Radio Device: BTS
odB/div Ref 44.20 d	IBm			Mkr1 2.11 G -37.722 dB
og 4.2				
4.2				
4.2		Λ		A A A A A A A A A A A A A A A A A A A
20				
80				
5.8		1		
5.8		1		
5.8		1		
5.8				
0.0				
enter 2.11 GHz Res BW 51 kHz		#VBW_1 MI	Hz	Span 25 M Sweep 11.47
NC3 DW STRIIZ		# VDN 1 M	12	Uncep 11.47
Channel Power		Power Spect	tral Density	
-36.05 dBr	n / 100 kHz	-86.0		
3			STATUS	
1			CO PIA DO	

Figure 8.3-40: Conducted band edge emission at 2110 MHz,
10 MHz channel single-carrier operation with IoT (RBW = 1% of EBW)

Keysight Spectrum Analyzer T RF	r - Channel Power 50 Ω DC	SENSE:IN	π	ALIGN AUTO	11:47:31 AM Jan 22, 20
pan 35.000 MHz ASS			ter Freq: 2.10992 : Free Run en: 6 dB	25000 GHz Avg Hold:>100/100	Radio Std: None Radio Device: BTS
	4.20 dBm				Mkr1 2.11 GH -39.987 dB
og 4.2					
4.2			_		
4.2					
20					
80					
i.8					
.8			1		
5.8					\
enter 2.11 GHz	and the state of t				Span 35 Mi
Res BW 51 kHz			#VBW 1 M	Hz	Sweep 16 n
Channel Pov	ver	Po	wer Spec	tral Density	
-36.70	7	-88.4			
		-	00.1		
3				STATUS	

Figure 8.3-42: Conducted band edge emission at 2110 MHz, 15 MHz channel single-carrier operation with IoT (RBW = 1% of EBW)

	m Analyzer - Chann RF 50 Ω	el Power DC		SENSE:INT		ALIGN AUTO		10:57:1	- 🖓 📕
Span 25.00				Center Fre	eq: 2.1085000		0/100	Radio Std:	
ASS			IFGain:Low	#Atten: 6		Avginoid.>10	0/100	Radio Devi	ce: BTS
0 dB/div	Ref 44.20	dBm						Mkr1 2 -42	2.109 GH .976 dBr
4.2									
4.2									
4.2					Λ				
.20									
80	_								
5.8					+				
5.8					1.1				
5.8									
5.8									
enter 2.10 Res BW 5				#VE	BW 1 MH			S Swee	pan 25 MH p 11.47 m
Channe	Power			Powe	r Snectr	al Density			
onanne					opeou	ar benony			
-31.48 dBm / 1 MHz			z	-91.48 dBm /Hz					
g						STATUS			
-						•			

Figure 8.3-41: Conducted band edge emission at 2109 MHz, 10 MHz channel single-carrier operation with IoT (RBW = 1 MHz)

Keysight Spectrum Analyzer - Ch						0
T RF 50 0 pan 35.000 MHz	DC	SENSE:INT	eg: 2.1085000	ALIGN AUTO	10:57:50 Radio Std: N	AM Jan 22, 202
		Trig: Free		Avg Hold:>100/100	Radio Sta. N	one
ASS	#FGain:Lo	w #Atten: 6	dB	-	Radio Device	BTS
dB/div Ref 44.2	0 dBm				Mkr1 2. -44.	109 GH 882 dB
og 4.2						
12						
12			n			ĥ
20						
80						
i.8						1
.8						1
5.8						
5.8		A 10 10 10 10 10 10 10 10 10 10 10 10 10	-		-	
enter 2.109 GHz	a to see the second				Sp	an 35 MH
Res BW 51 kHz		#V	BW 1 MHz		Swe	ep 16 n
Channel Power		Powe	r Spectra	al Density		
-32.31 dl	Bm / 1 MHz		-92.31	dBm /Hz		
a				STATUS		

Figure 8.3-43: Conducted band edge emission at 2109 MHz, 15 MHz channel single-carrier operation with IoT (RBW = 1 MHz)



T RF 50 Ω pan 45.000 MHz	DC		SE:INT Center Freq: 2.1099 Trig: Free Run	ALIGN AUTO 00000 GHz AvglHold:>100/100	11:52:10 AM Jan 22, 20 Radio Std: None
	#IFGa	in:Low 🍸 🕴	#Atten: 6 dB	•	Radio Device: BTS
dB/div Ref 44.2	0 dBm				Mkr1 2.11 GH -41.925 dB
og 4.2					
4.2					
4.2			ham		
20					
80)		
5.8					
5.8			11		
5.8			•'		
5.8		*****			
enter 2.11 GHz Res BW 51 kHz			#VBW 1 M	Hz	Span 45 MH Sweep 20.6 n
Channel Power			Power Spec	tral Density	
				•	
-36.32 dE	3m / 200 kHz	2	-89.3	3 dBm /Hz	

vr ⊤ Span 45.000 N	50 Ω DC			eq: 2.1085000		10:58:20 AM Jan 22 Radio Std: None
PASS		#IEGain:Low	Trig: Free #Atten: 6		Avg Hold:>100/10	0 Radio Device: BTS
10 dB/div Re	f 44.20 dBm	in dumiton				Mkr1 2.109 0 -43.152 d
.og 34.2						
24.2						
4.2				Am		
.20						
.80				++		
5.8				11 /		
5.8				↓ 1		
15.8				<u>ب</u>		
		and the second s				
enter 2.109 G Res BW 51 kH			#VE	BW 1 MHz		Span 45 Sweep 20.6
Channel P	ower		Power	r Spectra	al Density	
-31.3	4 dBm /·	1 MHz	-	91.34	dBm /Hz	
					STATUS	

Figure 8.3-44: Conducted band edge emission at 2110 MHz, 20 MHz channel single-carrier operation with IoT (RBW = 1% of EBW)

Keysight Spectrum An.									
ø ⊤ _ № Span 25.000 M	50 Ω DC			SENSE:INT	Aleg: 2.20005000	IGN AUTO		11:43:23 Radio Std: N	AM Jan 22, 202
ASS	1112		IEGain:Low	Toley Free	Run	Avg Hold:>	100/100	Radio Devic	BTS
			IFGaIn:Low	#Atten. 01					
0 dB/div Re	f 44.20 dB	m							2.2 GH 986 dBr
og	1 44.20 dB								
4.2									
1.2	٨			۵					
4.2	homenantigen			- states and					
20									
80					-				
.8									
.8					1				
5.8									
5.8					man				
enter 2.2 GHz								Sn	an 25 MH
Res BW 51 kH				#VE	SW 1 MHz			Sweep	11.47 m
Channel P	ower			Power	r Spectra	I Density	/		
-36.1	8 dBm	/ 100 k	Hz		86.18	dBm /ŀ	łz		
a						K STATUS			

Figure 8.3-46: Conducted band edge emission at 2200 MHz, 10 MHz channel single-carrier operation with IoT (RBW = 1% of EBW)

Figure 8.3-45: Conducted band edge emission at 2109 MHz, 20 MHz channel single-carrier operation with IoT (RBW = 1 MHz)

Keysight Spectrum Analyzer - Channel Po	wer			
T RF 50 Ω DC		SENSE:INT Center Freg: 2.2015	ALIGN AUTO	11:03:27 AM Jan 22, 202 Radio Std: None
pan 25.000 MHz		Trig: Free Run	Avg Hold:>100/100	Radio Std: None
ASS	#FGain:Low			Radio Device: BTS
dB/div Ref 44.20 dB	m			Mkr1 2.201 GH -46.119 dB
og 4.2				
4.2				
12 Am				
20				
80				
5.8				
5.8				
5.8				
5.8				
enter 2.202 GHz				Span 25 MH
Res BW 51 kHz		#VBW 1 M	Hz	Sweep 11.47 n
Channel Power		Power Spec	tral Density	
-34.31 dBm	/ 1 MHz	-94.3	1 dBm /Hz	
3			STATUS	

Figure 8.3-47: Conducted band edge emission at 2201 MHz, 10 MHz channel single-carrier operation with IoT (RBW = 1 MHz)



Keysight Spectrum Analyzer - T RF 5	Channel Power	CE 1	ISE:INT	ALIGN AUTO	11:44:44 AM Jan 22, 20
pan 35.000 MHz	112 DC	SE	Center Freq: 2.2000	75000 GHz	Radio Std: None
ASS		Gain:Low	Trig: Free Run #Atten: 6 dB	Avg Hold:>100/100	Radio Device: BTS
	*11	Gameow	artten. 0 00		Mkr1 2.2 GH
dB/div Ref 44	l.20 dBm				-42.775 dBi
og	.20 0011				
4.2					
4.2					
4.2 1					
20					
80					
			1		
5.8					
5.8					
5.8			¥1		
5.8				Annual and a second	
enter 2.2 GHz				and the second designed and the se	Span 35 MH
Res BW 51 kHz			#VBW 1N	147	Sweep 16 n
CO DIT OT KILL			*******	1112	Gweep Ion
Channel Pow	or		Bower Spec	tral Density	
Chaimer FOW	51		Fower Spec	trai Density	
20.05	dBm / 150 kH		04.0	2 dBm /Hz	
-39.85 (ивт / 150 kF	1Z	-91.6	Z abm /Hz	
				STATUS	

Keysight Spectrum Analyzer - Channel Power T RF 50 Ω DC	SENSE:INT ALIGN AUTO	11:03:57 AM Jan 22, 20
pan 35.000 MHz	Center Freg: 2.201500000 GHz	Radio Std: None
4.00	Trig: Free Run Avg Hold:>100/100 #EGain:Low #Atten: 6 dB	Radio Device: BTS
	#PGainLow #Attent out	Mkr1 2.201 GI
0 dB/div Ref 44.20 dBm		-46.736 dB
og		
4.2		
1.2		
4.2		
20		
80 /		
1.8		
18		
5.8		
58		
	The loss not been and the second seco	
enter 2.202 GHz		Span 35 M
Res BW 51 kHz	#VBW 1 MHz	Sweep 16
Channel Power	Power Spectral Density	
-35.07 dBm / 1 м	нz -95.07 dBm /нz	
a	STATUS	

Figure 8.3-48: Conducted band edge emission at 2200 MHz, 15 MHz channel single-carrier operation with IoT (RBW = 1% of EBW)

Keysight Spectrum Analyzer - Cha	nnel Power			- 4
a T RF 50 Ω Span 45.000 MHz	DC	SENSE:INT Center Freq: 2.	ALIGN AUTO	11:52:48 AM Jan 22, 202 Radio Std: None
pan 45.000 MHz		Trig: Free Run	Avg Hold:>10	00/100
	#IFGain:Low			Radio Device: BTS
dB/div Ref 44.20) dBm			Mkr1 2.2 GH -45.518 dBr
og 4.2				
12				
		0		
1.2 hardenversee				
20				
80				
1.8				
1.8				
5.8		1-		
58		•		
enter 2.2 GHz				Span 45 MH
Res BW 51 kHz		#VBW	1 MHz	Sweep 20.6 n
Channel Power		Power Sp	pectral Density	
-40.58 dE	3m / 200 kHz	-93		
				-
3			STATUS	

Figure 8.3-50: Conducted band edge emission at 2200 MHz, 20 MHz channel single-carrier operation with IoT (RBW = 1% of EBW)

Figure 8.3-49: Conducted band edge emission at 2201 MHz, 15 MHz channel single-carrier operation with IoT (RBW = 1 MHz)

	11:04:22 AM Jan 22, 20 Radio Std: None
	Radio Device: BTS
	Mkr1 2.201 GH -47.606 dB
n	
and the second sec	the second state of the se
#VBW 1 MHz	Span 45 MH Sweep 20.6 n
#VBW 1 Mill2	04000 20.01
Power Spectral Density	
-95.30 dBm /Hz	
To STATUS	
	#VBW 1 MHz #VBW 1 MHz Power Spectral Density -95.30 dBm /Hz

Figure 8.3-51: Conducted band edge emission at 2201 MHz, 20 MHz channel single-carrier operation with IoT (RBW = 1 MHz)



Keysight Spectrum Ana T RF	yzer - Channel Power 50 Ω DC		SENSE:INT		ALIGN AUTO		11:42:	🕞 🥔 📕 02 AM Jan 22, 202	
pan 45.000 M ASS	Hz		Center Freq: 2.109950000 GHz Trig: Free Run Avg Hold:>100/100 #Atten: 6 dB				Radio Std: None Radio Device: BTS		
A00		#FGain:Low	#Atten: 6	dВ				2.11 GH	
	f 44.20 dBm							.614 dBr	
og 4.2							_		
4.2				<u> </u>			_		
4.2				mon	mound	y me			
20						++		+	
80						11/			
5.8				1		W			
5.8				1		V			
5.8				7		ļ.			
enter 2.11 GH	7	Careful and the second s						pan 45 MH	
Res BW 51 kH			#V	BW 1MH	z			ep 20.6 m	
Channel Po	ower		Powe	r Spect	ral Density	/			
-38.6	1 dBm / 1	00 kHz		-88. <mark>6</mark> 1	dBm /	Ηz			
a					STATUS				
1					No sintos				

Figure 8.3-52: Conducted band edge emission at 2110 MHz, 10 MHz channel two-carrier operation (RBW = 1% of EBW)

Keysight Spectrum Analys				1				9 AM Jan 22, 202
pan 65.000 MH	50 Ω DC Z			q: 2.10992500			Radio Std: 1	
ASS	,	#FGain:Low	Trig: Free #Atten: 6 d		Avg Hold:>	100/100	Radio Devic	e: BTS
	44.20 dBm			_				2.11 GH 616 dB
og 4.2								
4.2								
4.2				mon	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	M NOW	mon	
20								
80				1				
5.8				1		M		
5.8				1		V		
5.8						Ÿ		<u>ل</u>
enter 2.11 GHz		and the second s					0.	an 65 Mi
Res BW 51 kHz			#VE	SW 1 MHz				o 29.73 n
Channel Po	wer		Power	Spectra	I Density	,		
27.22	dBm / 150 I			00.00	dBm /H	_		
-37.33	UDIII / 150 P	(HZ	-	69.09 (z		
3					STATUS			
					•			

Figure 8.3-54: Conducted band edge emission at 2110 MHz, 15 MHz channel two-carrier operation (RBW = 1% of EBW)

Keysight Spectru T	m Analyzer - Channel Power RF 50 Ω DC			ALIGN AUTO	10:54:17 AM Jan 22, 202
pan 50.00	0 MHz		Center Freq: 2.1085000 Trig: Free Run	00 GHz Avg Hold:>100/100	Radio Std: None
ASS		#IFGain:Low	#Atten: 6 dB		Radio Device: BTS
) dB/div	Ref 44.20 dBm				Mkr1 2.109 GH -43.354 dBr
4.2					
4.2					
4.2				many me	Longenery
.20					
80					
5.8					
5.8			1	l l	
5.8				'	human
enter 2.10 Res BW 5			#VBW 1 MHz	1	Span 50 MH Sweep 22.87 m
Channe	el Power		Power Spectra	al Density	
-31	.38 dBm /	1 MHz	-91.38	dBm /Hz	
g				STATUS	

Figure 8.3-53: Conducted band edge emission at 2109 MHz, 10 MHz channel two-carrier operation (RBW = 1 MHz)

Keysight Spectrum Analyzer - 4 T RF 50		s	ENSE:INT		ALIGN AUTO			09 AM Jan 22, 202
pan 65.000 MHz ASS	#16	Gain:Low	Center Fre Trig: Free #Atten: 6 c	Run	Avg Hold:	>100/100	Radio Std: Radio Devi	
	20 dBm							2.109 GH 2.672 dB
4.2								
4.2								
4.2					marmon	n mar	mon	mont
80								
5.8								
5.8				1		- V-		- · ·
5.8				\$]—		<u> </u> ↓		
5.8			and the second se					
enter 2.109 GHz Res BW 51 kHz			#VE	3W 1 M	Hz		S Swee	pan 65 MH p 29.73 n
Channel Powe	r		Power	Spec	tral Density	,		
-30.22 d	Bm / 1 мна	:	-	90.2	2 dBm //	Ηz		
a					STATUS			
4					NO STATUS			

Figure 8.3-55: Conducted band edge emission at 2109 MHz, 15 MHz channel two-carrier operation (RBW = 1 MHz)



pan 85.000 MHz	#FGain:Low	Center Freq: 2.10990 Trig: Free Run #Atten: 6 dB	ALIGN AUTO 00000 GHz Avg Hold:>100/100	11:51:50 AM Jan 22, 202 Radio Std: None Radio Device: BTS
dB/div Ref 44.20 dB	m			Mkr1 2.11 GH -41.985 dBr
4.2				
4.2				
20			makerson was how	when we want the second s
5.8				
5.8			V	
5.8		1		
5.8				
enter 2.11 GHz Res BW 51 kHz		#VBW 1 M	Hz	Span 85 MH Sweep 38.87 m
Channel Power		Power Spect	tral Density	
-36.48 dBm	/ 200 kHz	-89.49	9 dBm /Hz	
			STATUS	

Figure 8.3-56: Conducted band edge emission at 2110 MHz, 20 MHz channel two-carrier operation (RBW = 1% of EBW)

Keysight Spectrum Analyzer - Channel Power	Let.			- 0 0 E
α T RF 50 Ω DC Span 45.000 MHz		SENSE:INT Center Freq: 2.2		11:42:46 AM Jan 22, 2020 Radio Std: None
PASS	#IFGain:Low	Trig: Free Run #Atten: 6 dB	Avg Hold:>10	0/100 Radio Device: BTS
10 dB/div Ref 44.20 dBm				Mkr1 2.2 GHz -44.474 dBm
Log 34.2				
24.2				
14.2	m mene	mon		
4.20		1		
.80				
5.8	-VI			
5.8	-V	1		
15.8	1	• • •		
			and a familie of a sub-	
enter 2.2 GHz Res BW 51 kHz		#VBW	1 MHz	Span 45 MH Sweep 20.6 m
Channel Power		Power Sp	ectral Density	
-42.44 dBm / 1	l00 kHz	-92	.44 dBm /Hz	
			41	
ia.			STATUS	

Figure 8.3-58: Conducted band edge emission at 2200 MHz, 10 MHz channel two-carrier operation (RBW = 1% of EBW)

Keysight Spectrum	Analyzer - Channel Power 50 Ω DC		SENSE:INT	ALIGN AUTO			😑 🕼 📕
pan 85.000 ASS	MHz	#IFGain:Low	Center Freq: 2.10 Trig: Free Run #Atten: 6 dB	8500000 GHz Avg Hold:	>100/100	Radio Std: Radio Devid	
	Ref 44.20 dBm						.109 GH .377 dBn
og 4.2							
4.2							
.20				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man man		
80							
5.8					+ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$		+ +
5.8			1		V		
5.8					V		
enter 2.109						S	pan 85 MH
Res BW 51	KHZ		#VBW 1	MHZ		Swee	p 38.87 m
Channel	Power		Power Spe	ectral Densit	у		
-29.	75 dBm / 1	MHz	-89.	75 dBm /	Hz		
a				STATUS			

Figure 8.3-57: Conducted band edge emission at 2109 MHz, 20 MHz channel two-carrier operation (RBW = 1 MHz)

Keysight Spectrum Analyzer - Channel Power T RF 50 Ω DC	SENSE:INT ALIGN AUTO	- 🖉
pan 45.000 MHz	Center Freg: 2.201500000 GHz	Radio Std: None
100	Trig: Free Run Avg Hold:>100/10	
ASS #IFGain	Low #Atten: 6 dB	Radio Device: BTS
dB/div Ref 44.20 dBm		Mkr1 2.201 GH -47.708 dB
42		
12		
20		
80		
.8		
i.8		
5.8	and the second s	
enter 2.202 GHz		Span 45 MH
Res BW 51 kHz	#VBW 1 MHz	Sweep 20.6 n
Channel Power	Power Spectral Density	
-35.32 dBm / 1 мнz	-95.32 dBm /Hz	
a	L STATUS	

Figure 8.3-59: Conducted band edge emission at 2201 MHz, 10 MHz channel two-carrier operation (RBW = 1 MHz)



Keysight Spectrum Analyzer - Char T RF 50 Ω pan 65.000 MHz	DC	SENSE:INT Center Freq: 2.2	ALIGN AUTO 00075000 GHz Avg Hold:>100/100	11:45:43 AM Jan 22, Radio Std: None
ASS	#IFGain:		Anglitola Toor Too	Radio Device: BTS
dB/div Ref 44.20	dBm	-		Mkr1 2.2 G -46.170 dl
4.2				
4.2				
4.2 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man non	m m m m		
20				
80				
i.8	V			
.8				
5.8	V I	•1		
			and the second s	Beridan Branda
enter 2.2 GHz Res BW 51 kHz		#VBW 1	MHz	Span 65 M Sweep 29.73
Channel Power		Power Sp	ectral Density	
-42.14 dB	m / 150 kHz	-93.	.90 dBm /Hz	

Figure 8.3-60: Conducted band edge emission at 2200 MHz, 15 MHz channel two-carrier operation (RBW = 1% of EBW)

Keysight S		alyzer - Channel									
T	RF	50 Ω DC	2			SENSE:INT	Ag: 2.2001000	LIGN AUTO		11:54: Radio Std:	6 AM Jan 22, 20
pan 8	5.000 N	MHZ						Avg Hold:	100/100	Radio Std:	None
				#1	FGain:Low	#Atten: 6		Avginoid.	100/100	Radio Devi	ce: BTS
dB/div	R	ef 44.20 dl	Bm								2.2 GI .311 dB
^g											
1.2											
2							<u> </u>				
2		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0.000		mumm					-	
	nan ne	********	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	r	arturun (1)						
			1	1							
			1	T		}					
1 1											
8				t –			1				
8 -				ſ					-		
	2.2 GHz										pan 85 Mi
	2.2 GH2 N 51 kH					#\/	SW 1 MHz				pan 85 M p 38.87 r
	JIN	12				#1	544 1 141112			Swee	h 20.01 l
Char	nnel P	ower				Powe	r Spectra	al Density	/		
	40.0							-			
	42.0	8 dBn	n / 20	10 k	Hz		95.09	dBm /I	z		
								STATUS			

Figure 8.3-62: Conducted band edge emission at 2200 MHz, 20 MHz channel two-carrier operation (RBW = 1% of EBW)

T RF 50 pan 65.000 MHz	Ω DC	Center Freq: 2.20150000	IGN AUTO O GHz Avg Hold:>100/100	11:02:19 AM Jan 22, 202 Radio Std: None
ASS	#FGain:Lo		Avginola.>100/100	Radio Device: BTS
dB/div Ref 44.	20 dBm			Mkr1 2.201 GH -46.896 dBi
0g 4.2				
4.2				
1.2 10000000000	many man	mining		
80				
5.8				
.8				
.8	¥			
.8 🚽	Ÿ	and the second second		
enter 2.202 GHz				Span 65 MH
Res BW 51 kHz		#VBW 1 MHz		Sweep 29.73 m
Channel Powe	r	Power Spectra	I Density	
-34.28 d	Bm / 1 MHz	-94.28	dBm /Hz	
			4	
3			STATUS	

Figure 8.3-61: Conducted band edge emission at 2201 MHz, 15 MHz channel two-carrier operation (RBW = 1 MHz)

ipan 85.000 MHz Center Free: 220050000 GHz Radio Stet: Nor iASS #FGainstow Trig: Free Run Avg Hold:>100/100 rdiditiv Ref 44.20 dBm MKr1 2.2 48.60 343	Radio Sut: None AvgijHodi:>100/100 Radio Device: BTS Mkr1 2.201 GH -48.609 dBr -48.609 dBr
ASS IFGainLow Trig: Free Run Avg Hold->100/100 Radio Device: BEGainLow Ref 44.20 dBm 448.61 Ass If CainLow Ref 44.20 dBm	Avg Held:>100100 Radio Device: BTS Mkr1 2:201 GH -48.609 dBr -48.6
Image: Second	Mkr1 2.201 GH -48.609 dBr
0.48.61 0.48.61 0.42	-48.609 dBi
og min (c) file of min (c) fil	Span 85 Mi
22 22 23 58 58 58 58 59 50 50 50 50 50 50 50 50 50 50 50 50 50	Span 85 MH 2 Sweep 38.87 m
12 20 00 50 50 50 50 50 50 50 50 50 50 50 50	Span 85 MHz Sweep 38.87 m
	Span 85 MH 2 Sweep 38.87 m
	Span 85 MH 2 Sweep 38.87 m
80 50 50 50 50 50 50 50 50 50 50 50 50 50	Span 85 MH 2 Sweep 38.87 m
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Span 85 MH 2 Sweep 38.87 m
a a a enter 2.202 GHz Spa	Span 85 Mi 2 Sweep 38.87 n
n a a a a a a a a a a a a a a a a a a a	Span 85 Ml z Sweep 38.87 m
a de la constante de la consta	Span 85 Mi z Sweep 38.87 m
enter 2.202 GHz Spa	Span 85 Mł z Sweep 38.87 n
enter 2.202 GHz Spa	Span 85 MH z Sweep 38.87 n
enter 2.202 GHz Spa Res BW 51 kHz #VBW 1 MHz Sweep	Span 85 Mi z Sweep 38.87 n
Res BW 51 kHz #VBW 1 MHz Sweep	z Sweep 38.87 m
Channel Power Power Spectral Density	al Density
-35.93 dBm / 1 мнz -95.93 dBm /нz	
	dBm /Hz

Figure 8.3-63: Conducted band edge emission at 2201 MHz, 20 MHz channel two-carrier operation (RBW = 1 MHz)



8.4 FCC 27.53 and RSS-139, 4.2, RSS-170, 5.4 Radiated spurious emissions (Band 66 & Band 2/25)

8.4.1 Definitions and limits

FCC:

(h) AWS emission limits

(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log₁₀ (P) dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

RSS-139, Section 6.6:

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log₁₀ p (watts) dB.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 $\log_{10} p$ (watts) dB.

RSS-170, Section 5.4:

The transmitter unwanted emissions shall be measured for all channel bandwidths with the carrier frequency set at both the highest and lowest channels in which the equipment is designed to operate.

The e.i.r.p. density of unwanted and carrier-off state emissions outlined in this section (Section 5.4) shall be averaged over any 2-ms active transmission using an RMS detector with a resolution bandwidth of 1 MHz for broadband emissions and a resolution bandwidth of 1 kHz for discrete emissions, unless stated otherwise.

For ATC equipment operating in the bands 2000-2020 MHz and 2180-2200 MHz, the unwanted emission limits shall be determined using a measurement bandwidth of 1 MHz or greater. However, in the 1 MHz band immediately outside and adjacent to the equipment's operating frequency block, a resolution bandwidth of at least 1% of the occupied bandwidth may be employed.

5.4.1.2 ATC Base Station Equipment operating in bands 2000-2020 MHz and 2180-2200 MHz

he unwanted emissions of ATC base station equipment transmitting in the bands 2000-2020 MHz and 2180-2200 MHz shall comply with the following:

(1) The power of any unwanted emissions at frequencies outside the equipment's operating frequency block shall be attenuated below the transmitter power P (dBW), by 43 + 10 log p (watts), dB.

(2) For equipment operating in the band 2180–2200 MHz, in addition to (1), the power of any emissions on all frequencies between 2200 MHz and 2290 MHz shall not exceed an e.i.r.p. of -100.6 dBW/4 kHz (-70.6 dBm/4 kHz).*

* This requirement is for implementation and is enforced at the time of licensing. Therefore, results are not included in this report.

8.4.2 Test summary

Test date	July 18, 2018
Test engineer	Predrag Golic

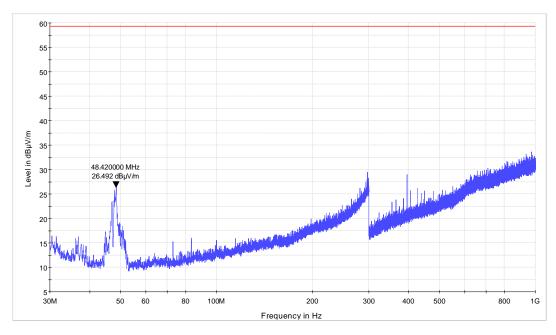


8.4.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic per ANSI C63.26 Paragraph 5.5.3.2 method. RBW within 30–1000 MHz was 100 kHz and 1 MHz above 1 GHz. VBW was wider than RBW. Testing was performed with RF ports terminated with 50 Ohm load.

Testing was performed with dual band (Band 2/25a and Band 66a) simultaneous transmission.

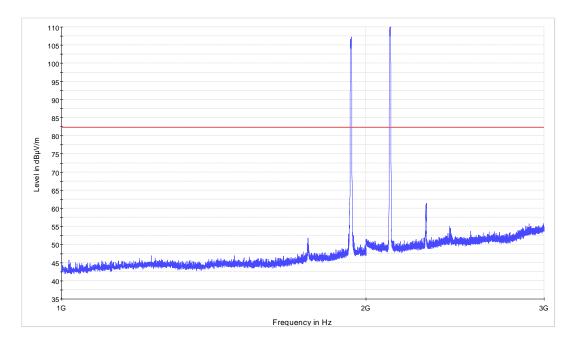
Test data 8.4.4



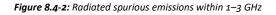
10 MHz - Two Carrier PK+ MAXH Limit (59.23 dBuV = -36 dBm)

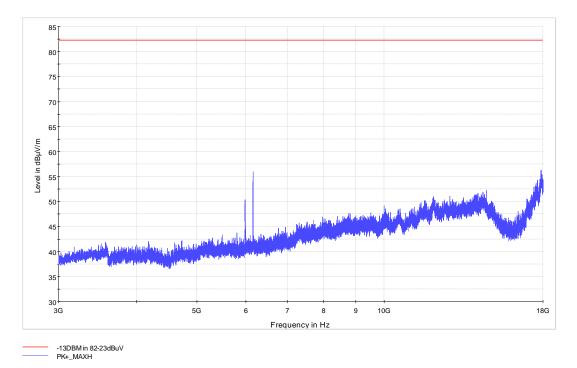
Figure 8.4-1: Radiated spurious emissions below 1 GHz

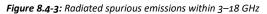




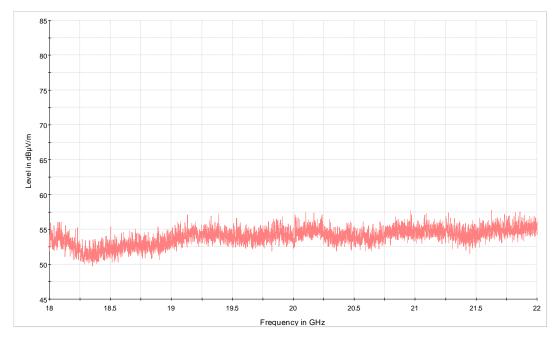
PK+_MAXH -13DBM in 82-23dBuV











PK+_MAXH

Figure 8.4-1: Radiated spurious emissions above 18 GHz



8.5 FCC 24.238(a) and RSS-133, 6.5.1 Spurious out-of-band emissions (Band 2/25a)

8.5.1 Definitions and limits

FCC:

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RSS-133, Section 6.5.1:

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log₁₀ p (watts) dB. ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log₁₀ p (watts) dB. I log₁₀ p (watts) dB. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

8.5.2	Test summ	iary						
Test date		January 22, 2020						
				_				

8.5.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.

All measurements were performed using an average (RMS) detector per ANSI C63.26 Paragraph 5.7.2 method. Limit line was adjusted for MIMO operation by 12.04 dB (for *16* ports: $10 \times Log_{10}(16)$): -13 dBm - 12.04 dB = -25.04 dBm RBW 1 MHz, VBW was wider than RBW. Testing data FCC 24.238(a) and RSS-133, 6.5.1 Spurious out-of-band emissions FCC Part 24 and RSS-133, Issue 6



8.5.4 Test data

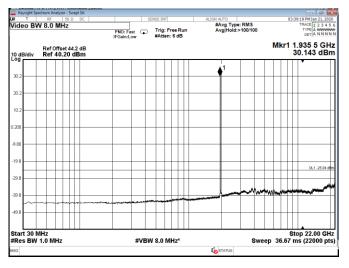


Figure 8.5-1: Conducted spurious emissions of 10 MHz low channel, singlecarrier operation

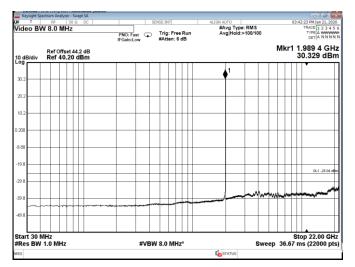
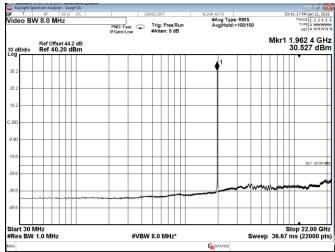
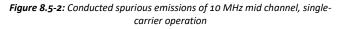


Figure 8.5-3: Conducted spurious emissions of 10 MHz high channel, singlecarrier operation





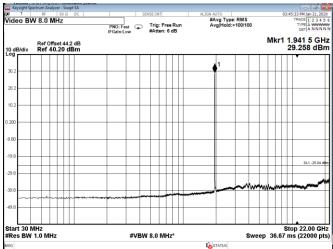


Figure 8.5-4: Conducted spurious emissions of 15 MHz low channel, singlecarrier operation