Section 8TestTest nameSpuSpecificationFCC

Testing data Spurious out-of-band emissions (Band 2/25) FCC Part 24 and RSS-133, Issue 6



Test data, continued



Figure 8.5-59: Conducted emission at the lower band edge





Figure 8.5-61: Conducted emission at the upper band edge

Single-carrier operation

NR 15 MHz

None

Frequency:	1995 MHz	Mode:
Meas. BW:	1% of EBW	Tech.:
Limit:	–19 dBm/150 kHz	Notes:

LBE 1M Channel	Power	OBW Occupied B	3W	UBE 1PC Channel	Power	UBE 1M Channel Power	• +
	T Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corrections: Off Freq Ref: Ext (S) NFE: Off	Atten: 6 dB Preamp: Off µW Path: Standard #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 1.9285 Avg Hold:>100/100 Radio Std: None	00000 GHz	
1 Graph	•		,	Ref LvI Offset 52	.50 dB	Mkr1 1.9	29000000 GHz
Scale/Div 10	0.0 dB		F	Ref Value 42.50	dBm		-34.181 dBm
22.5							
22.5							
12.5							
2.50							
.7.50							
-17.5							
-27.5					1		
-37.5							
-47.5							
Center 1.92 #Res BW 10	850 GHz 10.00 kHz		#	Video BW 3.000	0 MHz*	Swee	Span 35 MHz p 4.20 ms (1001 pts)
2 Metrics	•						
Total Cha	nnel Power	-24.28 dBm / 1.00	MHz				
Total Pow	ver Spectral Densit	y -84.28 dB	m/Hz				
1 5		Dec 03, 2021 12:08:16 PM				.::	

Figure 8.5-60: Conducted emission 1 MHz away from the lower band edge

Frequency:	1929 MHz	Mode:	Single-carrier operation
Meas. BW:	1 MHz	Tech.:	NR 15 MHz
Limit:	–19 dBm/MHz	Notes:	None

LE	BE 1F	PC el Por	wer			LBE 1M Channel P	ower		OBV	N upiec	IBW		UBE 1PC Channel Power		+	
KEY	'SIG	÷HT ₽	Input: RI Coupling Align: Ai	r DC ito	Input 2 Correct Freq F	2:50 Ω ctions:Off Ref:Ext(S) Off	Atten: 6 dB Preamp: Off µW Path: Standard #PNO: Fast	Trig: F Gate: #IF G	ree R Off sin: Lo	un w	Center Fred Avg[Hold:> Radio Std: I	: 1.996500000 100/100 None	GHz			
1 Gra	ph			•			,	Ref Lv	Offs	et 52	.50 dB		Mkr	1 1.996000	000 GH	z
Scale	e/Div	10.0	dB				F	Ref Va	lue 42	2.50 0	iBm			-32.6	545 dBn	n
LOG																
22.5		-														
125																
2.50																
7.50																
-17.5																
27.5										1						
37.5									Ser.	4-						_
47.5																-
-47.5																
Cente #Res	BW 9	9650 100.0	0 GHz 10 kHz				#	Video	BW 3	1.000	0 MHz*			S Sweep 4.20 m	pan 35 MH s (1001 pts	z 5)
2 Met	rics			•												7
				_												
To	tal Cl	hann	el Power		-23.84	dBm / 1.00	MHz									
To	tal Po	ower	Spectra	Density		-83.84 dB	m/Hz									
4	F) (2	■ ?	Dec 12:2	03, 2021 0:28 PM								.:: 😽 [- - - 	l

Figure 8.5-62: Conducted emission 1 MHz away from the upper band edge

Frequency:	1996 MHz
Meas. BW:	1 MHz
Limit:	–19 dBm/MHz

Mode:Single-carrier operationTech.:NR 15 MHzNotes:None

Report reference ID: 454153-1TRFWL-R1

Section 8 Test name Specification

Testing data Spurious out-of-band emissions (Band 2/25) FCC Part 24 and RSS-133, Issue 6



Test data, continued



Figure 8.5-63: Conducted emission at the lower band edge





Figure 8.5-65: Conducted emission at the upper band edge

Multi-carrier operation

2× NR 5 MHz

None

Frequency:	1995 MHz	Mode:
Meas. BW:	1% of EBW	Tech.:
Limit:	–19 dBm/50 kHz	Notes:

Channel F	ower	Channel I	Power	,	Channel	; Power		UBE 1M Channel Power		+
	T Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Corrections: Off Freq Ref: Ext (S) NFE: Off	Atten: 6 dB Preamp: Off µW Path: Standard #PNO. Fast	Trig: F Gate: #IF Ga	ree Run Off ain: Low	Center Frei Avg[Hold:> Radio Std:	‡ 1.928500000 100/100 None	GHz		
1 Graph Scale/Div 10	• .0 dB		;	tef Lvi tef Val	Offset 52 ue 42.50 (.50 dB 1Bm		Mkr1	1.92900)0000 GHz 4.738 dBm
Log 32.5 22.5 12.5						<u></u>				
2.50 -7.50 -17.5 -27.5						.1				
-37.5									, 	
Zenter 1.928 #Res BW 100 2 Metrics	50 GHZ 0.00 kHz T		#	Video	BW 3.000	0 MHZ"			Sweep 4.20	Span 35 MHz ms (1001 pts)
Total Char Total Powe	nel Power er Spectral Densit	-25.77 dBm / 1.0	0 MHz Bm/Hz							

Figure 8.5-64: Conducted emission 1 MHz away from the lower band edge

Frequency:	1929 MHz	Mode:	Multi-carrier operation	
Meas. BW:	1 MHz	Tech.:	2× NR 5 MHz	
Limit:	–19 dBm/MHz	Notes:	None	
LBE 1PC Channel Power	LBE 1M Channel Power	UBE 1PC Channel Pow	UBE 1M Channel Power	· +

On		in ci	Onumber	ower	Onume	ar onci	Onum	or ronor	
KEYS	SIGHT	Input: RF Coupling: DC Align: Auto	Input Z 50 Ω Corrections: Off Freq Ref: Ext (S) NFE: Off	Atten: 6 dB Preamp: Off µW Path: Standard #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: Avg[Hold >10 Radio Std: N	1.996500000 GHz 00/100 one		
1 Grapi Scale/	h Div 10.0	T dB			Ref Lvi Offset 5 Ref Value 42.50	2.50 dB dBm		Mkr1 1	.996000000 GHz -33.956 dBm
Log						1 1			
32.5									
22.5			\						
12.5									
2.50									
7.50									
47.5									
-17.5									
-21.5			hanne	- V	Le la				
-37.5							- management		
-47.5									
Center #Res E	1.9965 3W 100.0	0 GHz 00 kHz		#	Video BW 3.00	00 MHz*		Sw	Span 35 MHz eep 4.20 ms (1001 pts)
2 Metri	cs	•							
Tota	al Chann	el Power	-24.50 dBm / 1.00	MHz					
Tota	al Power	Spectral Densit	-84.50 dE	im/Hz					
-	5	C 🔳 🕯	Dec 03, 2021 1:05:55 PM					.1	: 🕃 🗄 🔀

Figure 8.5-66: Conducted emission 1 MHz away from the upper band edge

Frequency: 1996 MHz Meas. BW: 1 MHz l imit[.] -19 dBm/MHz Mode: Multi-carrier operation 2× NR 5 MHz Tech.: None Notes:

Section 8 Test name Specification

Frequency:

1930 MHz

Testing data Spurious out-of-band emissions (Band 2/25) FCC Part 24 and RSS-133, Issue 6



Test data, continued



Figure 8.5-67: Conducted emission at the lower band edge Mode:

Multi-carrier operation



Figure 8.5-69: Conducted emission at the upper band edge

Frequency:	1995 MHz	Mode:	Multi-carrier operation
Meas. BW:	1% of EBW	Tech.:	3× NR 5 MHz
Limit:	–19 dBm/50 kHz	Notes:	None



Figure 8.5-68: Conducted emission 1 MHz away from the lower band edge

-							-
Freque	ency:	1929 MHz		Mode:	Multi-car	rier operation	
Meas.	BW:	1 MHz		Tech.:	3× NR 5 I	MHz	
L	imit:	–19 dBm/N	1Hz	Notes:	None		
LBE 1PC Channel P	ower	LBE 1M Channel I	Power	UBE 1PC Channel F	2ower	UBE 1M Channel Power	• +
	Input RF Coupling DC Align: Auto	Input Z: 50 Ω Corrections: Off Freq Ref: Ext (S) NFE: Off	Atten: 6 dB Preamp: Off µW Path: Standard #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 1.99650000 Avg Hold:>100/100 Radio Std: None	IO GHZ	
1 Graph				Ref Lvi Offset 52.	50 dB	Mkr1 1	.996000000 GHz
Log	UUB			ter value 42.50 u	Bm		-52.050 UDII
32.5							
22.5							
12.5							
2.50							
-7.50							
-17.5							
-27.5				L (]-			
-37.5		and the second s			and the second se		
-47.5							
Center 1.9965 #Res BW 100	i0 GHz .00 kHz		"	Video BW 3.0000	MHz*	Swe	Span 45 MHz eep 5.40 ms (1001 pts)
2 Metrics	•						
Total Chan	nel Power	-23.46 dBm / 1.0	0 MHz				
Total Powe	r Spectral Den	sity -83.46 d	Bm/Hz				
		Dec 03, 2021					
u u ~)	(- I	1:57:23 PM					

Figure 8.5-70: Conducted emission 1 MHz away from the upper band edge

Frequency:	1996 MHz	Mode:	Multi-carrier operation
Meas. BW:	1 MHz	Tech.:	3× NR 5 MHz
Limit:	–19 dBm/MHz	Notes:	None



8.6 Occupied bandwidth (Band 66)

8.6.1 Definitions and limits

FCC §2.1049:

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-Gen, 6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.6.2 Test summary

Test date	December 3, 2021
Test engineer	Andrey Adelberg

8.6.3 Observations, settings and special notes

Testing was performed per ANSI C63.26 Paragraphs 5.4.3 and 5.4.4 methods.

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	≥1% of EBW
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.6.4 Test data

Table 8.6-1: Occupied bandwidth results for LTE 5 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
5 MHz, Low channel	2112.5	4.810	4.4821
5 MHz, Mid channel	2155.0	4.802	4.4819
5 MHz, Top channel	2197.5	4.789	4.4791

Table 8.6-2: Occupied bandwidth results for LTE 10 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
10 MHz, Low channel	2115.0	9.527	8.9415
10 MHz, Mid channel	2155.0	9.521	8.9369
10 MHz, Top channel	2195.0	9.531	8.9323

Table 8.6-3: Occupied bandwidth results for LTE 15 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
15 MHz, Low channel	2117.5	14.23	13.403
15 MHz, Mid channel	2155.0	14.25	13.400
15 MHz, Top channel	2192.5	14.24	13.404



Test data, continued

Table 8.6-4: Occupied bandwidth results for NR 5 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
5 MHz, Low channel	2112.5	4.827	4.4828
5 MHz, Mid channel	2155.0	4.824	4.4837
5 MHz, Top channel	2197.5	4.826	4.4834

Table 8.6-5: Occupied bandwidth results for NR 10 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
10 MHz, Low channel	2115.0	9.727	9.2632
10 MHz, Mid channel	2155.0	9.728	9.2619
10 MHz, Top channel	2195.0	9.732	9.2654

Table 8.6-6: Occupied bandwidth results for NR 15 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
15 MHz, Low channel	2117.5	14.56	14.095
15 MHz, Mid channel	2155.0	14.56	14.095
15 MHz, Top channel	2192.5	14.55	14.093



Figure 8.6-1: Occupied bandwidth sample plot for LTE 5 MHz channel



Figure 8.6-2: Occupied bandwidth sample plot for LTE 10 MHz channel

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Test data, continued







Figure 8.6-5: Occupied bandwidth sample plot for NR 10 MHz channel

LBE 1PC Channel Power LBE 1M Channel Po OBW Occupied BW UBE 1PC Channel Power + KEYSIGHT Input RF It Z: 50 Ω rections: Off a Ref: Ext (S) Atten: 6 Preamp uW Pat Trig: Free Run Gate: Off Center Freq: 2. Avg|Hold:>10/1 Radio Std: Non Align: Auto Freq Ref: NFE: Off Ļя 1 Graph Scale/Div 10.0 dB Ref Lvi Offset 52.50 dB Ref Value 43.80 dBm Center 2.155000 GHz #Res BW 51.000 kHz #Video BW 150.00 kHz Span 10 MHz Sweep 3.73 ms (1001 pts) letrics Occupied Bandwidth 4.4837 MHz Total Power 51.9 dBm Transmit Freq Error x dB Bandwidth -14.363 kHz 4.824 MHz % of OBW Power x dB 99.00 % -26.00 dB 📲 🎦 🌈 🔳 ? Dec 03, 2021 🗩





Figure 8.6-6: Occupied bandwidth sample plot for NR 15 MHz channel



8.7 Occupied bandwidth (Band 2/25)

8.7.1 Definitions and limits

FCC §2.1049:

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-Gen, 6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.7.2 Test summary

Test date	December 3, 2021
Test engineer	Andrey Adelberg

8.7.3 Observations, settings and special notes

Testing was performed per ANSI C63.26 Paragraphs 5.4.3 and 5.4.4 methods.

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	≥1% of EBW
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.7.4 Test data

Table 8.7-1: Occupied bandwidth results for LTE 5 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
5 MHz, Low channel	1932.5	4.810	4.4791
5 MHz, Mid channel	1962.5	4.798	4.4812
5 MHz, Top channel	1992.5	4.817	4.4826

Table 8.7-2: Occupied bandwidth results for LTE 10 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
10 MHz, Low channel	1935.0	9.526	8.9334
10 MHz, Mid channel	1962.5	9.519	8.9436
10 MHz, Top channel	1990.0	9.546	8.9361

Table 8.7-3: Occupied bandwidth results for LTE 15 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
15 MHz, Low channel	1937.5	14.23	13.397
15 MHz, Mid channel	1962.5	14.21	13.402
15 MHz, Top channel	1987.5	14.22	13.403



Test data, continued

Table 8.7-4: Occupied bandwidth results for NR 5 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
5 MHz, Low channel	1932.5	4.824	4.4783
5 MHz, Mid channel	1962.5	4.823	4.4815
5 MHz, Top channel	1992.5	4.833	4.4826

Table 8.7-5: Occupied bandwidth results for NR 10 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
10 MHz, Low channel	1935.0	9.729	9.2645
10 MHz, Mid channel	1962.5	9.730	9.2662
10 MHz, Top channel	1990.0	9.735	9.2680

Table 8.7-6: Occupied bandwidth results for NR 15 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
15 MHz, Low channel	1937.5	14.53	14.091
15 MHz, Mid channel	1962.5	14.55	14.094
15 MHz, Top channel	1987.5	14.56	14.096





Figure 8.7-1: Occupied bandwidth sample plot for LTE 5 MHz channel

Figure 8.7-2: Occupied bandwidth sample plot for LTE 10 MHz channel

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Test data, continued







Figure 8.7-5: Occupied bandwidth sample plot for NR 10 MHz channel



Figure 8.7-4: Occupied bandwidth sample plot for NR 5 MHz channel



Figure 8.7-6: Occupied bandwidth sample plot for NR 15 MHz channel



Section 9. Block diagrams of test setups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz





9.3 Conducted emissions set-up

