

Plots for 1.4 MHz channel bandwidth, QPSK

Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz







Plot 3: Highest channel, 10 MHz to 18 GHz



Plots for 1.4 MHz channel bandwidth, 16-QAM

Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz







Plot 3: Highest channel, 10 MHz to 18 GHz



16.2.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

For the measurement the lowest, middle and highest channel bandwidth was used. If spurious were found the other bandwidths were measured, too.

Measurement:

Measurement parameters				
Detector:	RMS			
Sweep time:	180s			
Video bandwidth:	100 kHz			
Resolution bandwidth:	20 kHz			
Span:	1 MHz			
Trace-Mode:	Max Hold			
Used equipment:	See chapter 7.2 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13			

Test report no.: 1-6998_23-02-08_TR1-R1



Limits:

FCC	ISED				
§ 27.53(h)(1) & (3)	RSS-139, 6.6				
 (1) 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) 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. 	 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 log10 (P) (watts) dB. 				
-13	-13 dBm				
Correction factor according to KDB 890810 if RBW < 1 % emission bandwidth:					
⊠N/A nere □10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z					

 \Box 10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z



Results: 1.4 MHz channel bandwidth

Plot 1: Lowest channel, QPSK modulation

Spect	rum									
Ref Lo Att SGL Co	evel ount 1	10.00 30 /1	dBm) dB e SWT 90 s TDF	● RBW ● VBW	20 kHz 100 kHz N	1ode Auto	Sweep	I		
Controlle	ed by	CTC a	dvanced LTE Teste	er, Test Ca	ase Verdict: R	ASS 🔵 1 Rm	n Max			
0 dBm-	Í					M	1[1]		1.7099	39.45 dBm 97312 GHz
-10 dBn	<u>+</u>					M	2[1]		1.7095	48.52 dBm 00000 GHz I
-20 dBm	-+-									
-30 dBm	n-+-									N
-40 dBm	n-+-								M	2
-50 dBm	n-+-				M4	+		M3	and the second se	
-60 dBm	M6		M5		The state of the s	indiana di kata di kata	A COLOR			
-70 авл	1		ALLER ALTONOMIC ADDRESS	ploating of						
-80 dBm	۰ 									
Start 1	.705	GHz			10001	pts			Stop	1.71 GHz
Marker										
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fun	ction Result	
M1		1	1.709997312	GHz	-39.45 dBr	n				
M2		1	1.7095	GHz	-48.52 dBr	n Band	Power		-	30.38 dBm
MЗ		1	1.7085	GHz	-55.78 dBr	n Band	Power			38.56 dBm
M4		1	1.7075	GHZ	-59.31 dBr	n Band	Power		-	44.24 dBm
M5 M6		1	1.7055	GHZ GHZ	-64.89 dBr -67.50 dBr	n Band	Power Power		-	48.84 aBm 50.99 dBm
		Π					eady		170	18.02.2024

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Spect	rum						
Ref L	evel	10.00	iBm 😑 🖡	RBW 20 kHz			
🕨 Att		30	idB 👄 SWT 90 s 👄 V	/BW 100 kHz M	ode Auto Swee	ep	
SGL Co	ount 1,	/1	TDF				
Controlle	ed by	CTC a	dvanced LTE Tester, Te	st Case Verdict: P	ASS 🔵 1Rm Max		
					M1[1]		-39.09 d
0 dBm-							1.755000192 (
					M2[1]		-46.58 d
-10 dBm	1 — -						1.755500000
00 40-							
-20 aBn							
-30 dBm	ι <u></u>						
1							
-40 dBm	1/2						
E0 d0m							
-30 001	'	1.0	A DESCRIPTION OF THE OWNER OF THE	M4			
-60 dBm	η 						MG
-70 dBm	ר - ר						
-80 dBm							
00 000	·						
Start 1	755	GHz		10001	nts		Ston 1 76 G
Marker				10001	P(3		0000 1.70 0
Type	Ref	Trc	X-value	Y-value	Function	Eun	ction Result
M1		1	1.755000192 GHz	-39.09 dBm	1		
M2		1	1.7555 GHz	-46.58 dBm	Band Power	•	-27.99 dB
MЗ		1	1.7565 GHz	-55.16 dBm	Band Power	•	-37.68 di
M4		1	1.7575 GHz	-59.51 dBm	Band Power	·	-43.21 dB
M5		1	1.7585 GHz	-64.58 dBm	Band Power	·	-47.82 de
M6		1	1.7595 GHz	-67.67 dBm	Band Power	·	-50.15 dł

Plot 2: Highest channel, QPSK modulation



Spect	rum						(9
Ref L	evel	10.00 dB	m 🖷 R	BW 20 kHz			
Att		30 0	18 👄 SWT 90 s 👄 V	BW 100 kHz Mc	de Auto Sweep)	
SGL Co	ount 1	/1	TDF				
Controlle	ed by	CTC adv	anced LIE lester, les	st Case Verdict: PA	SS OIRm Max		
					M1[1]		-37.78 dB
0 dBm-					MOLTI		1.709993728 G
-10 dBm					M2[1]		-48.32 UE
-10 000	'					1	1.709300000 G
-20 dBm	n						
-30 dBm	<u></u>						
40 dp-							
-40 ubii	-						M2
-50 dBm	n——					MB	and the second se
60 ID				IV 4	Contraction of the second	ALC: NOT THE OWNER OF THE	
-60 aBN	Ц			and a strate state of the state	The second s		
-70 dBn	<u>, 177-110</u>	Conversion of the	THE DESCRIPTION OF THE OWNER OF THE OWNER OF				
-80 dBm	-+-י						
Start 1	.705	GHz		10001 p	ts		Stop 1.71 GH
Marker							
Туре	Ref	Trc	X-value	Y-value	Function	Func	tion Result
M1		1	1.709993728 GHz	-37.78 dBm			
M2		1	1.7095 GHz	-48.32 dBm	Band Power		-29.29 dBr
M3		1	1.7085 GHz	-54.76 dBm	Band Power		-37.87 dBr
MF		1	1.7075 GHZ	-58,59 aBm -64 67 dBm	Band Power		-43.58 GBr -47 91 der
M6		1	1.7055 GHz	-66.45 dBm	Band Power		-47.81 dBr -50.30 dBr
	_	-	2222 0/12				22.20 46

Plot 3: Lowest channel, 16 – QAM modulation

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Spect	rum								
Ref Lo Att SGL Co	e vel ount 1,	10.00 30 /1	dBm) dB e SWT 90 TDF	e Re s e Ve	W 20 kHz W 100 kHz M	ode Auto	Sweep)	X
Controlle	ed by	СТС а	dvanced LTE Tes	ter, Test	: Case Verdict: P.	ASS 🔵 1 Rm	n Max		
0 dBm-						M	1[1]		-39.17 dBm 1.755002752 GHz
-10 dBm	<u>ا</u> ر					M	2[1]		-45.64 dBm 1.755500000 GHz
-20 dBm	η 								
-30 dBm	ו—ר								
-40 dBm	1-M2-								
-50 dBm	1 1		Man Man		M4				
-60 dBm	n				The second second			MS	MB
-70 dBm	ı—————————————————————————————————————						alawarini (1111)	ananan termutuk	In the second of the second
-80 dBm	<u>ا</u> ل-۱								
Start 1	.755	GHz			10001	pts			Stop 1.76 GHz
Marker									
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fun	ction Result
M1		1	1.75500275	2 GHz	-39.17 dBm				
M2		1	1.755	5 GHz	-45.64 dBm	Band	Power		-28.22 dBm
M3		1	1.756	5 GHZ	-55.05 dBm	Band	Power		-37.53 dBm
M4 ME		1	1.757.		-59.63 GBM	Band	Power Dower		-43.52 dBm -47.77 dBm
M6		1	1.759	5 GHz	-66.49 dBm	Band	Power		-49.95 dBm
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Plot 4: Highest channel, 16 - QAM modulation

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16.2.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement parameters				
Detector:	Peak			
Sweep time:	180s			
Video bandwidth:	100 kHz			
Resolution bandwidth:	30 kHz			
Span:	2 x nominal bandwidth			
Trace-Mode:	Max Hold			
Used equipment:	See chapter 7.4 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7			

FCC	ISED			
§ 2.1049	RSS-Gen, 6.7			
Reporting only				



Results:

Occupied Bandwidth – QPSK					
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)			
1710.7	1089	1277			
1732.5	1094	1303			
1754.3	1086	1290			

Occupied Bandwidth – 16-QAM					
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)			
1710.7	1091	1293			
1732.5	1090	1281			
1754.3	1091	1290			





Plots: QPSK, worst case plots

Plot 1: mid channel, 99% OBW



Plot 2: mid channel, -26 dBc OBW



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Plots: 16-QAM, worst case plots

Plot 1: low channel, 99% OBW



Plot 2: low channel, -26 dBc OBW



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16.3 Results LTE band 12

The EUT was set to transmit the maximum power.

16.3.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters				
Detector:	Sample			
AQT:	See plot			
Resolution bandwidth:	1 MHz			
Used equipment:	See chapter 7.2 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1046 ISED: RSS-Gen, 6.12			

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FCC	ISED			
47 CFR 27.50(c)(9)	RSS-130, 4.6.1 & 4.6.3			
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.	 4.6.1: The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission. 4.6.3: The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment. 			
Power: 34. 7	77 dBm ERP			
PAPR: 13 dB (ISED only)				



Results:

Output Power (conducted)						
Bandwidth (MHz)	Channel No. / Frequency (MHz)	Resource block allocation	Average Output Power (dBm) QPSK	Peak to Average Ratio (dB)	Average Output Power (dBm) 16-QAM	Peak to Average Ratio (dB)
	00017 /	1 RB low	14,5	5,9	13,3	6,9
	230177	1 RB high	14,4	5,9	13,4	6,9
	099.7	100% RB	12,4	6,6	12,5	7,3
	00005 /	1 RB low	14,5	5,9	13,3	7,0
1.4	23095/	1 RB high	14,3	5,9	13,2	7,0
	707.5	100% RB	12,2	6,4	12,5	7,2
	00170 /	1 RB low	14,9	5,8	14,0	6,8
	231/3/	1 RB high	14,7	5,9	13,8	6,9
	/15.3	100% RB	12,7	6,5	12,9	7,2
		1 RB low	7,8	11,2	13,3	7,0
	23025 /	1 RB high	14,3	6,0	13,3	7,0
	700.5	100% RB	12,5	6,6	12,6	7,3
		1 RB low	14,5	5,9	12,5	7,7
3	23095 / 707.5	1 RB high	14,3	5,9	12,6	7,7
		100% RB	12,5	6,5	1,5	16,5
		1 RB low	11,7	9,0	12,9	7,7
	23165 / 714.5	1 RB high	14,6	5,9	13,5	7,0
		100% RB	12,7	6,4	12,8	7,2
	23035 /	1 RB low	16,4	4,1	16,2	4,8
		1 RB high	16,2	4,2	16,1	4,8
	701.5	100% RB	15,2	4,8	14,2	5,7
		1 RB low	16,3	4,1	15,9	4,7
5	23095 /	1 RB high	16,1	4,1	15,7	4,8
	/07.5	100% RB	15,1	4,7	13,9	5,7
	23155 / 713.5	1 RB low	17,0	4,1	17,1	4,5
		1 RB high	16,9	4,1	16,9	4,6
		100% RB	15,6	4,7	14,7	5,6
		1 RB low	16,3	4,1	16,0	4,8
	23060 /	1 RB high	16,0	4,2	16,0	4,8
	704.0	100% RB	15,3	4,7	15,3	5,5
		1 RB low	16,2	4,1	15,7	4,8
10	23095 /	1 RB high	16,0	4,1	15,7	4,8
	/0/.5	100% RB	15.2	4.7	15.2	5,5
		1 RB low	16,9	4,1	16,9	4,6
	23130 /	1 RB high	16,7	4,1	16,7	4,6
	/11.0	100% RB	15,7	4,8	15,9	5,4



Output Power (ERP)				
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm) QPSK	Average Output Power (dBm) 16-QAM	
	699.7	16,5	15,4	
1.4	707.5	16,6	15,4	
	715.3	16,5	15,6	
	700.5	16,6	15,6	
3	707.5	16,6	14,7	
	714.5	16,2	15,1	
5	701.5	18,4	18,2	
	707.5	18,4	18,0	
	713.5	18,6	18,7	
10	704.0	18,3	18,0	
	707.5	18,3	17,8	
	711.0	18,5	18,5	

The radiated output power is measured in the mode with the highest conducted output power.



16.3.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.

2. Subject the mobile station to overnight soak at -30 C.

3. With the mobile station, powered with V_{nom} , connected to the CMW500 and in a simulated call on channel 1412 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.

5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.

6. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters				
Detector:				
Sweep time:				
Video bandwidth:	Macourad with CMW/E00			
Resolution bandwidth:				
Span:				
Trace-Mode:				
Used equipment:	See chapter 7.4 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1055 ISED: RSS-Gen, 6.11			



Limits:

FCC	ISED
§ 27.54	RSS-130, 4.5
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.1	-6	-0.01
3.7	-8	-0.01
2.5	-9	-0.01

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-20	-0.03
-20	-22	-0.03
-10	-14	-0.02
± 0	-9	-0.01
10	-12	-0.02
20	-6	-0.01
30	4	0.01
40	8	0.01
50	13	0.02

Additional measurements for RSS-130 (4.3 b)

f _L = MHz	f _H = MHz
$f_L - (max freq. error) = MHz$	f _H + (max freq. error) = MHz



16.3.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 711 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 12.

Measurement:

Measurement parameters		
Detector:	Peak	
Sweep time:	2 sec.	
Resolution bandwidth:	1 MHz	
Video bandwidth:	3 MHz	
Span:	100 MHz Steps	
Trace mode:	Max Hold	
Used equipment:	See chapter 7.1 setup A; 7.2 setup A, B	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13	

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FCC	ISED			
§ 27.53(g)	RSS-130, 4.7.1			
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.			
-13 dBm				



Results:

<u>QPSK</u>

Spurious Emission Level						
Lowest channel		Middle channel		Highest channel		
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-		All detected emissions are more than 20 dB below the limit.		-/-		
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	

<u> 16-QAM</u>

Spurious Emission Level						
Lowest channel		Middle channel		Highest channel		
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-		All detected emissions are more than 20 dB below the limit.		-/-		
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	





<u>QPSK</u>

Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 GHz to 8 GHz







<u>16-QAM</u>

Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 GHz to 8 GHz





16.3.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station. 1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Measurement:

Measurement parameters			
Detector:	Peak		
Sweep time:	Auto		
Video bandwidth:	300 kHz		
Resolution bandwidth:	100 kHz		
Span:	10 MHz – 7.5 GHz		
Trace-Mode:	Max Hold		
Used equipment:	See chapter 7.4 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13		

FCC	ISED	
§ 27.53(g)	RSS-130, 4.7.1	
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.	
-13 dBm		



Results: for 1.4 MHz channel bandwidth

<u>QPSK</u>

Spurious Emission Level					
Lowest o	hannel	Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

<u>16-QAM</u>

Spurious Emission Level					
Lowest o	channel	Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-



Plots for 1.4 MHz channel bandwidth, QPSK

Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz











Plots for 1.4 MHz channel bandwidth, 16-QAM

Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz











16.3.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters		
Detector:	RMS	
Sweep time:	180s	
Video bandwidth:	300 kHz	
Resolution bandwidth:	100 kHz	
Span:	1 MHz	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13	

FCC	ISED	
§ 27.53(g)	RSS-130, 4.7.1	
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.	
-13 dBm		
Correction factor according to KDB 890810 if RBW < 1 % emission bandwidth: ⊠N/A here		
□10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z		



Results: 1.4 MHz channel bandwidth

Plot 1: Lowest channel, QPSK modulation



Plot 2: Highest channel, QPSK modulation



Date: 8.FEB.2024 15:55:35





Plot 3: Lowest channel, 16 - QAM modulation

Plot 4: Highest channel, 16 - QAM modulation



Date: 8.FEB.2024 16:00:59



16.3.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement parameters		
Detector:	Peak	
Sweep time:	180s	
Video bandwidth:	100 kHz	
Resolution bandwidth:	30 kHz	
Span:	2 x nominal bandwidth	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7	

FCC	ISED	
§ 2.1049	RSS-Gen, 6.7	
Reporting only		



Results:

Occupied Bandwidth – QPSK			
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)	
699.7	1090	1270	
707.5	1093	1294	
715.3	1088	1284	

Occupied Bandwidth – 16-QAM			
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)	
699.7	1092	1284	
707.5	1090	1279	
715.3	1092	1325	




Plots: QPSK, worst case plots

Plot 1: mid channel, 99% OBW



Plot 2: mid channel, -26 dBc OBW



Date: 8.FEB.2024 15:47:21





Plots: 16-QAM, worst case plots

Plot 1: high channel, 99% OBW



Plot 2: high channel, -26 dBc OBW



Date: 8.FEB.2024 16:02:05



16.4 Results LTE band 13

The EUT was set to transmit the maximum power.

16.4.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters		
Detector:	Sample	
AQT:	See plot	
Resolution bandwidth:	1 MHz	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1046 ISED: RSS-Gen, 6.12	

Limits:

FCC	ISED		
§ 27.50(b)(10)	RSS-130, 4.6.1 & 4.6.3		
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.	 4.6.1: The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission. 4.6.3: The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment 		
Power: 34 77 dBm FPD			
PAPR. 13 di			



Results:

Output Power (conducted)						
Bandwidth (MHz)	Channel No. / Frequency (MHz)	Resource block allocation	Average Output Power (dBm) QPSK	Peak to Average Ratio (dB)	Average Output Power (dBm) 16-QAM	Peak to Average Ratio (dB)
	00005 /	1 RB low	17,9	3,9	17,6	4,4
	232057	1 RB high	17,9	3,9	17,5	4,5
//	779.0	100% RB	16,9	4,5	15,7	5,4
5 232 78 232 784	00000 /	1 RB low	18,0	3,8	17,5	4,5
	782	1 RB high	17,8	3,9	17,4	4,5
		100% RB	16,8	4,4	15,8	5,4
	00055 /	1 RB low	18,5	3,8	18,4	4,1
	23255/	1 RB high	18,3	3,8	18,4	4,2
	704.5	100% RB	17,2	4,5	16,3	5,3
10	00000 /	1 RB low	17,8	3,9	17,5	4,5
	232307 782	1 RB high	17,6	3,9	17,4	4,5
		100% RB	16,9	4,4	16,8	5,1

The radiated output power is measured in the mode with the highest conducted output power.

Output Power (ERP)				
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm) 16-QAM		
	779.5	18,6	18,3	
5	782.0	18,7	18,2	
	784.5	19,0	18,9	
10	782.0	18,5	18,2	



16.4.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.

2. Subject the mobile station to overnight soak at -30 C.

3. With the mobile station, powered with V_{nom} , connected to the CMW500 and in a simulated call on channel 1412 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.

5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.

6. At all temperature levels hold the temperature to +/-0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters			
Detector:			
Sweep time:			
Video bandwidth:	Macourad with CMW/E00		
Resolution bandwidth:	Measured with CMW500		
Span:			
Trace-Mode:			
Used equipment:	See chapter 7.4 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1055 ISED: RSS-Gen, 6.11		

Limits:

FCC	ISED
§ 27.54	RSS-130, 4.5
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.



Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.1	-8	-0.01
3.7	-7	-0.01
2.5	-9	-0.01

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-23	-0.03
-20	-24	-0.03
-10	-17	-0.02
± 0	-10	-0.01
10	-6	-0.01
20	-8	-0.01
30	2	0.00
40	7	0.01
50	4	0.01

Additional measurements for RSS-130 (4.3 b)

f _L = MHz	f _H = MHz
f _L – (max freq. error) = MHz	f _H + (max freq. error) = MHz



16.4.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 782 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 13.

Measurement:

Measurement parameters		
Detector:	Peak / RMS	
Sweep time:	2 sec.	
Resolution bandwidth:	1 MHz	
Video bandwidth:	3 MHz	
Span:	100 MHz Steps	
Trace mode:	Max Hold	
Used equipment:	See chapter 7.1 setup A; 7.2 setup A, B	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13	

Limits:

FCC	ISED		
\$ 27.53(c)	RSS-130, 4.7.1		
 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB. 	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.		

-13 dBm



Results:

<u>QPSK</u>

Spurious Emission Level					
Lowest channel Middle channel		Highest channel			
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/- All detected emissions are more than 20 dB below the limit.		-/·			
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

<u>16-QAM</u>

Spurious Emission Level					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions [dBm]		Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-





<u>QPSK</u>





Plot 2: Middle channel, 30 MHz to 1 GHz



Test report no.: 1-6998_23-02-08_TR1-R1



Plot 3: Middle channel, 1 MHz to 8 GHz







<u>16-QAM</u>

Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz



Test report no.: 1-6998_23-02-08_TR1-R1



Plot 3: Middle channel, 1 MHz to 8 GHz





16.4.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station. 1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested data taken from 10 MHz to 8 GHz. 2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Measurement:

Measurement parameters		
Detector:	Peak	
Sweep time:	Auto	
Video bandwidth:	300 kHz	
Resolution bandwidth:	100 kHz	
Span:	10 MHz – 8 GHz	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13	

Limits:

FCC	ISED
\$ 27.53(c)	RSS-130, 4.7.1
 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB. 	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

-13 dBm



Results: for 1.4 MHz channel bandwidth

<u>QPSK</u>

Spurious Emission Level					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

<u>16-QAM</u>

Spurious Emission Level					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-



Plots for 1.4 MHz channel bandwidth, QPSK

Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz











Plots for 1.4 MHz channel bandwidth, 16-QAM

Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz











16.4.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters		
Detector:	RMS	
Sweep time:	180s	
Video bandwidth:	300 kHz	
Resolution bandwidth:	100 kHz	
Span:	1 MHz	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.2 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13	

Limits:

FCC	ISED		
\$ 27.53(c)	RSS-130, 4.7.1		
 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB. 	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.		
-13 dBm			
Correction factor according to KDB 890810 if RBW < 1 % emission bandwidth: ⊠N/A here □10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z			



Results: 1.4 MHz channel bandwidth

Plot 1: Lowest channel, QPSK modulation



Plot 2: Highest channel, QPSK modulation



Date: 9.FEB.2024 08:12:52







Plot 4: Highest channel, 16 - QAM modulation



Date: 9.FEB.2024 08:19:42



16.4.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement parameters			
Detector:	Peak		
Sweep time:	180s		
Video bandwidth:	100 kHz		
Resolution bandwidth:	300 kHz		
Span:	2 x nominal bandwidth		
Trace-Mode:	Max Hold		
Used equipment:	See chapter 7.4 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7		

Limits:

FCC	ISED	
§ 2.1049	RSS-Gen, 6.7	
Reporting only		



Results:

Occupied Bandwidth - QPSK					
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)			
779.5	1099	1315			
782.0	1096	1308			
784.5	1099	1329			

Occupied Bandwidth – 16-QAM				
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)		
779.5	1107	1330		
782.0	1102	1394		
784.5	1099	1380		





Plots: QPSK, worst case plots

Plot 1: high channel, 99% OBW



Plot 2: high channel, -26 dBc OBW



Date: 9.FEB.2024 08:13:58





Plots: 16-QAM, worst case plots

Plot 1: low channel, 99% OBW



Plot 2: mid channel, -26 dBc OBW



Date: 9.FEB.2024 08:07:04



16.5 Results LTE band 26b

The EUT was set to transmit the maximum power.

16.5.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters		
Detector:	Sample	
AQT:	See plot	
Resolution bandwidth:	1 MHz	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1046	

Limits:

FCC			
§ 90.635			
b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).			
Power: 50 ERP PAPR: -/-			

Results:

Results:

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Output Power (conducted)							
Bandwidth (MHz)	Channel No. / Frequency (MHz)	Resource block allocation	Average Output Power (dBm) QPSK	Peak to Average Ratio (dB)	Average Output Power (dBm) 16-QAM	Peak to Average Ratio (dB)	
		1 RB low	16,5	5,6	15,2	6,6	
	26697/	1 RB high	16,3	5,7	15,3	6,6	
	014.7	100% RB	14,5	6,2	14,5	7,0	
	00740 /	1 RB low	16,5	5,6	15,2	6,6	
1.4	267407	1 RB high	16,3	5,7	15,3	6,6	
	019.0	100% RB	14,4	6,1	14,5	7,0	
	00700 /	1 RB low	16,5	5,6	15,2	6,6	
	267837	1 RB high	16,3	5,7	15,3	6,6	
	023.5	100% RB	14,4	6,1	14,5	7,0	
	00705 /	1 RB low	16,5	5,6	15,3	6,6	
	267057	1 RB high	16,3	5,7	15,3	6,6	
	010.0	100% RB	14,5	6,3	14,6	6,9	
	26740 / 819.0	1 RB low	16,5	5,6	15,3	6,6	
3		1 RB high	16,3	5,7	15,3	6,6	
		100% RB	14,4	6,1	14,5	7,0	
	26775 / 822.5	1 RB low	16,5	5,6	15,3	6,6	
		1 RB high	16,4	5,7	15,3	6,6	
		100% RB	14,4	6,1	14,6	7,0	
	26715 / 816.5	1 RB low	18,3	3,8	18,2	4,3	
		1 RB high	18,1	3,9	18,1	4,4	
		100% RB	17,3	4,5	16,2	5,4	
	26740 / 819.0	1 RB low	18,2	3,9	18,2	4,3	
5		1 RB high	18,1	3,9	18,1	4,4	
		100% RB	17,3	4,5	16,2	5,4	
	26765 / 820.5	1 RB low	18,2	3,9	18,3	4,3	
		1 RB high	18,2	3,9	18,2	4,4	
		100% RB	17,4	4,5	16,3	5,4	
10	26740 /	1 RB low	18,3	3,9	18,1	4,3	
		1 RB high	17,9	3,9	18,0	4,4	
	010.0	100% RB	17,3	4,4	17,2	5,1	
	26740 /	1 RB low	18,2	3,9	18,2	4,3	
	267407	1 RB high	17,9	3,9	18,0	4,4	
		100% RB	17,3	4,4	17,2	5,1	
	26745 /	1 RB low	18,2	3,9	18,1	4,3	
	267157 819.0	1 RB high	17,9	3,9	18,0	4,4	
		100% RB	17,3	4,4	17,1	5,2	



Output Power (ERP)						
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm) QPSK	Average Output Power (dBm) 16-QAM			
	814.7	16,5	15,3			
1.4	819.0	16,5	15,3			
	823.3	16,5	15,3			
3	815.5	16,5	15,3			
	819.0	16,5	15,3			
	822.5	16,5	15,3			
	816.5	18,3	18,2			
5	819.0	18,2	18,2			
	820.5	18,2	18,3			
10	-/-	-/-	-/-			
	819.0	18,2	18,2			
	-/-	-/-	-/-			

The radiated output power is measured in the mode with the highest conducted output power.



16.5.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.

2. Subject the mobile station to overnight soak at -30 C.

3. With the mobile station, powered with V_{nom} , connected to the CMW500 and in a simulated call on channel 1412 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.

5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.

6. At all temperature levels hold the temperature to +/-0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters				
Detector:				
Sweep time:				
Video bandwidth:	Macourad with CMW/500			
Resolution bandwidth:	Measured with CMW500			
Span:				
Trace-Mode:				
Used equipment:	See chapter 7.4 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1055			

<u>Limits:</u>

FCC
§ 90.213 (Mobile Station, 814 – 824 MHz)
The carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table 1 to §90.213(a).
± 2.5 ppm

Results:



FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)	
4.1	7	0.01	
3.7	10	0.01	
2.5	11	0.01	

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-23	-0.03
-20	-11	-0.01
-10	-13	-0.02
± 0	1	0.00
10	-2	0.00
20	7	0.01
30	-11	-0.01
40	-19	-0.02
50	6	0.01

Additional measurements for RSS-130 (4.3 b)

f _L = MHz	f _H = MHz
f _L − (max freq. error) = MHz	f _H + (max freq. error) = MHz



16.5.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 824 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 90. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 26b.

Measurement:

Measurement parameters			
Detector:	Peak / RMS		
Sweep time:	2 sec.		
Resolution bandwidth:	1 MHz		
Video bandwidth:	3 MHz		
Span:	100 MHz Steps		
Trace mode:	Max Hold		
Used equipment:	See chapter 7.1 setup A; 7.2 setup A, B		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13		

Limits:

FCC
§ 90.691 (a)(2)
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
-13 dBm



Results:

<u>QPSK</u>

Spurious Emission Level							
Lowest channel		Middle channel		Highest channel			
Spurious emissions	Level [dBm]	Spurious emissions Level [dBm] Spurious emissions Leve [dBm]			Level [dBm]		
-/-		All detected emissions are more than 20 dB below the limit.		-/-			
-/-	-/-	-/-	-/-	-/-	-/-		
-/-	-/-	-/-	-/-	-/-	-/-		

<u>16-QAM</u>

Spurious Emission Level							
Lowest channel		Middle channel		Highest channel			
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]		
-/-		All detected emissions are more than 20 dB below the limit.		-/-			
-/-	-/-	-/-	-/-	-/-	-/-		
-/-	-/-	-/-	-/-	-/-	-/-		





<u>QPSK</u>

Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 MHz to 8 GHz







<u>16-QAM</u>

Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz



Test report no.: 1-6998_23-02-08_TR1-R1



Plot 3: Middle channel, 1 MHz to 8 GHz




16.5.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station. 1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested data taken from 10 MHz to 8 GHz. 2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Measurement:

Measurement parameters			
Detector:	Peak		
Sweep time:	Auto		
Video bandwidth:	300 kHz		
Resolution bandwidth:	100 kHz		
Span:	10 MHz – 8 GHz		
Trace-Mode:	Max Hold		
Used equipment:	See chapter 7.4 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13		

<u>Limits:</u>

FCC
§ 90.691 (a)(2)
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
-13 dBm

Results: for 1.4 MHz channel bandwidth



<u>16-QAM</u>

Spurious Emission Level					
Lowest channel		Middle c	hannel	Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-



Plots for 1.4 MHz channel bandwidth, QPSK

Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz











Plots for 1.4 MHz channel bandwidth, 16-QAM

Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz











16.5.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters		
Detector:	RMS	
Sweep time:	180s	
Video bandwidth:	300 kHz	
Resolution bandwidth:	100 kHz	
Span:	1 MHz	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.2 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1051	

Limits:

FCC§ 90.691 (a)(1)For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power
of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1)
decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the
frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than
12.5 kHz.-20 dBmCorrection factor according to KDB 890810 if RBW < 1 % emission bandwidth:</td>

⊠N/A here □10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z

Results: 1.4 MHz channel bandwidth

Plot 1: Lowest channel, QPSK modulation



Date: 11.MAR.2024 16:24:00

Plot 2: Highest channel, QPSK modulation



Date: 11.MAR.2024 16:53:55

cetecom advanced



Plot 3: Lowest channel, 16 – QAM modulation



Date: 11.MAR.2024 16:32:16

Spectr	um									
Ref Le	vel	10.00 0	lBm	● RBW	20 kHz					
🛛 Att		30	dB 👄 SWT 90 s	VBW	' 100 kHz 🛛	Mode Auti	o Sweep)		
SGL Cou	unt 1,	/1	TDF					-		
Controlle	а бу	cetecc	m advanced LIE I	ester, le	est Case Verd	ICT: PASS	O1Rm №	lax		
						P.	11[1]			-34.34 dBr
0 dBm—						<u> </u>			824.	012224 MH
10 d8m						19	12[1]		004	-41.82 dBr
-10 0000								1	024.	
-20 dBm-										-
130 dBm-										
-40 dBn	M2									
10 0.011		The second second								
-50 dBm			Manna M3							
-60 dBm		_	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		M	4		M5		Ma
					and a state of the	the state of the s	The second s	minimizer and		
-70 dBm·								·	-	
-80 dBm-										
00 00										
Start 82	24.0	MHz			10001	l pts			Stop	829.0 MHz
Marker										
Type	Ref	Trc	X-value		Y-value	Fund	ction		Function Resu	lt
M1		1	824.012224 N	/Hz	-34.34 dBr	m				
M2		1	824.5 N	/Hz	-41.82 dBr	m Band	Power			-22.56 dBm
MЗ		1	825.5 N	/Hz	-57.80 dBr	m Band	Power			-37.91 dBm
M4		1	826.5 N	/IHZ	-62.28 dBr	m Band	Power			-44.94 dBm
M5 M6		1	827.5 N 828 5 N	/IHZ /IHZ	-65,77 dBi	m Band m Band	Power			-48.11 dBm
1410	_		020.3 1	0112	03.77 UBI	n banu	FOWEI			79.10 UDIII
									1,0	1110392024

Plot 4: Highest channel, 16 - QAM modulation

Date: 11.MAR.2024 17:02:11



16.5.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement parameters		
Detector:	Peak	
Sweep time:	180s	
Video bandwidth:	100 kHz	
Resolution bandwidth:	300 kHz	
Span:	2 x nominal bandwidth	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7	

Limits:

FCC	
§ 2.1049	
Reporting only	

FCC	ISED	
§ 2.1049	-/-	
Reporting only		



Results:

Occupied Bandwidth - QPSK					
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)			
814.7	1097	1331			
819.0	1094	1336			
823.3	1097	1323			

Occupied Bandwidth – 16-QAM				
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)		
814.7	1094	1293		
819.0	1095	1317		
823.3	1096	1282		





Plots: QPSK, worst case plots

Plot 1: low channel, 99% OBW



Plot 2: mid channel, -26 dBc OBW



Date: 11.MAR.2024 16:42:33



Plots: 16-QAM, worst case plots

Plot 1: mid channel, -26 dBc OBW



Date: 11.MAR.2024 16:49:09

Plot 2: high channel, 99% OBW



Date: 11.MAR.2024 17:03:59



16.6 Results LTE band 66

The EUT was set to transmit the maximum power.

16.6.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters		
Detector:	Sample	
AQT:	See plot	
Resolution bandwidth:	1 MHz	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1046 ISED: RSS-Gen, 6.12	

Limits:

FCC	ISED	
§ 27.50(d)(4) & (5)	RSS-139, 6.5	
 (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. (5) In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB. 	The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.	
Power: 33 dBm EIRP		



Results:

Output Power (conducted)						
Bandwidth (MHz)	Channel No. / Frequency (MHz)	Resource block allocation	Average Output Power (dBm) QPSK	Peak to Average Ratio (dB)	Average Output Power (dBm) 16-QAM	Peak to Average Ratio (dB)
		1 RB low	17,7	5,9	16,3	7,1
	1710.7	1 RB high	17,5	6,0	16,3	7,1
		100% RB	15,6	6,8	15,6	7,4
		1 RB low	17,6	6,1	16,4	7,2
1.4	1745	1 RB high	17,5	6,1	16,4	7,2
		100% RB	15,5	6,8	15,6	7,5
		1 RB low	17,5	6,1	16,6	7,1
	1779.3	1 RB high	17,4	6,2	16,5	7,1
		100% RB	15,5	7,0	15,5	7,6
	1711.5	1 RB low	17,7	5,9	15,5	7,9
3		1 RB high	17,5	6,0	16,3	7,1
		100% RB	14,7	7,5	14,8	8,2
	1745	1 RB low	17,6	6,1	16,4	7,2
		1 RB high	17,4	6,2	16,2	7,3
		100% RB	5,0	16,8	14,3	8,6
		1 RB low	17,4	6,1	16,2	7,2
	1778.5	1 RB high	17,2	6,2	16,2	7,2
		100% RB	15,4	6,9	15,7	7,5
		1 RB low	19,5	4,2	19,4	4,8
	1712.5	1 RB high	19,3	4,3	19,2	4,9
		100% RB	18,3	4,9	17,4	5,9
		1 RB low	19,4	4,3	19,0	5,0
5	1745	1 RB high	19,1	4,4	18,8	5,0
		100% RB	18,1	5,0	17,1	6,1
		1 RB low	19,6	4,3	19,5	4,8
	1777.5	1 RB high	19,4	4,3	19,3	4,9
		100% RB	18,4	5,0	17,3	6,0



	1715	1 RB low	19,5	4,2	19,3	4,8
		1 RB high	19,2	4,3	19,2	4,9
		100% RB	18,3	4,9	18,4	5,6
		1 RB low	19,2	4,3	18,9	5,0
10	1745	1 RB high	18,9	4,4	18,7	5,1
		100% RB	18,3	5,0	18,1	5,8
		1 RB low	19,1	4,4	18,9	5,0
	1775	1 RB high	19,2	4,4	19,2	4,9
		100% RB	17,9	5,1	18,0	5,8
		1 RB low	19,2	4,2	19,2	4,8
	1717.5	1 RB high	19,1	4,3	19,2	4,8
		100% RB	19,2	4,6	19,3	5,1
	1745	1 RB low	19,2	4,3	18,8	5,0
15		1 RB high	19,0	4,4	18,8	5,0
		100% RB	18,9	4,7	18,9	5,4
	1772.5	1 RB low	19,5	4,3	19,5	4,7
		1 RB high	19,1	4,4	19,4	4,8
		100% RB	19,1	4,8	19,2	5,2
		1 RB low	18,9	4,2	18,9	4,8
	1720	1 RB high	18,9	4,3	18,8	4,9
		100% RB	18,9	4,6	19,0	5,1
		1 RB low	19,0	4,2	18,5	5,0
20	1745	1 RB high	18,6	4,4	18,4	5,0
		100% RB	18,8	4,7	18,8	5,3
		1 RB low	19,4	4,3	19,2	4,8
	1770	1 RB high	19,1	4,3	19,0	4,9
		100% RB	19,0	4,8	19,1	5,2



Output Power (EIRP)				
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm) QPSK	Average Output Power (dBm) 16-QAM	
	1710.7	17,8	16,4	
1.4	1745	17,7	16,5	
	1779.3	17,6	16,7	
	1711.5	17,8	16,7	
3	1745	17,7	16,5	
	1778.5	17,5	16,3	
	1712.5	19,6	19,5	
5	1745	19,5	19,1	
	1777.5	19,7	19,6	
10	1715	19,6	19,4	
	1745	19,3	19,0	
	1775	19,3	19,3	
	1717.5	19,3	19,4	
15	1745	19,3	19,0	
	1772.5	19,6	19,6	
	1720	19,0	19,1	
20	1745	19,1	18,9	
	1770	19,5	19,3	

The radiated output power is measured in the mode with the highest conducted output power.



16.6.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.

2. Subject the mobile station to overnight soak at -30 C.

3. With the mobile station, powered with V_{nom} , connected to the CMW500 and in a simulated call on channel 1412 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.

5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.

6. At all temperature levels hold the temperature to +/-0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters		
Detector:		
Sweep time:		
Video bandwidth:	Macourad with CMW/E00	
Resolution bandwidth:	Measured with CMW500	
Span:		
Trace-Mode:		
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1055 ISED: RSS-Gen, 6.11	

Limits:

FCC	ISED
§ 27.54	RSS-139, 6.4
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.



Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.1	-43	-0.02
3.7	-40	-0.02
2.5	-39	-0.02

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-18	-0.01
-20	-29	-0.02
-10	-59	-0.03
± 0	-17	-0.01
10	-26	-0.02
20	-43	-0.02
30	-19	-0.01
40	11	-0.01
50	1	0.00



16.6.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1780 MHz. Measured up to 18 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 66.



Measurement:

Measurement parameters		
Detector:	Peak / RMS	
Sweep time:	2 sec.	
Resolution bandwidth:	1 MHz	
Video bandwidth:	3 MHz	
Span:	100 MHz Steps	
Trace mode:	Max Hold	
Used equipment:	See chapter 7.1 setup A; 7.2 setup A, B	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13	

Limits:

FCC	ISED
§ 27.53(h)(1) & (3)	RSS-139, 6.6
 (1) 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) 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 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. 	 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 log10 (P) (watts) dB.
13.	Due

-13 dBm



Results:

<u>QPSK</u>

Spurious Emission Level					
Lowest o	channel	Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Spurious emissions Level [dBm] Spurious emiss		
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

<u>16-QAM</u>

Spurious Emission Level						
Lowest channel		Middle channel		Highest channel		
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-		All detected emissions are more than 20 dB below the limit.		-/-		
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	





<u>QPSK</u>





Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 MHz to 18 GHz







<u>16-QAM</u>





Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 MHz to 18 GHz





16.6.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station. 1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

For the measurement the lowest, middle and highest channel bandwidth was used. If spurious were found the other bandwidths were measured, too.

Measurement:

Measurement parameters		
Detector:	Peak	
Sweep time:	Auto	
Video bandwidth:	300 kHz	
Resolution bandwidth:	100 kHz	
Span:	10 MHz – 18 GHz	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13	

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Limits:

FCC	ISED
§ 27.53(h)(1) & (3)	RSS-139, 6.6
 (1) 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) 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. 	 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 log10 (P) (watts) dB.
-13	dBm



Results: for 1.4 MHz channel bandwidth

<u>QPSK</u>

Spurious Emission Level						
Lowest channel		Middle channel		Highest channel		
Spurious emissions [dBm]		Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	

<u>16-QAM</u>

Spurious Emission Level						
Lowest channel		Middle channel		Highest channel		
Spurious emissions [dBm]		Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	



Plots for 1.4 MHz channel bandwidth, QPSK

Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz







Plot 3: Highest channel, 10 MHz to 18 GHz



Plots for 1.4 MHz channel bandwidth, 16-QAM

Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz







Plot 3: Highest channel, 10 MHz to 18 GHz



16.6.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

For the measurement the lowest, middle and highest channel bandwidth was used. If spurious were found the other bandwidths were measured, too.

Measurement:

Measurement parameters				
Detector:	RMS			
Sweep time:	180s			
Video bandwidth:	100 kHz			
Resolution bandwidth:	20 kHz			
Span:	1 MHz			
Trace-Mode:	Max Hold			
Used equipment:	See chapter 7.2 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13			

Test report no.: 1-6998_23-02-08_TR1-R1



Limits:

FCC	ISED
§ 27.53(h)(1) & (3)	RSS-139, 6.6
 (1) 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) 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. 	 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 log10 (P) (watts) dB.
-13	dBm
Correction factor according to KDB 890	0810 if RBW < 1 % emission bandwidth:
⊠N/# □10 log (RBW1/RBW2) = X dB;	whereas: RBW1 = Y, RBW2 = Z

 \Box 10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z



Results: 1.4 MHz channel bandwidth

Plot 1: Lowest channel, QPSK modulation

Spect	rum						Ē
Ref Lo Att SGL Co	e vel iunt 1	10.00 (30 1/1	dBm •) dB • SWT 90 s • TDF	RBW 20 kHz VBW 100 kHz Mo	de Auto Sweep)	
Controlle	ed by	CTC a	dvanced LTE Tester, T	est Case Verdict: PA	SS 🔵 1 Rm Max		
					M1[1]		-38.91 dBn
0 dBm—	_						1.709999232 GH
					M2[1]		-47.92 dBr
-10 dBm							1.709500000 GH
-20 dBm	-						
-30 dBm							
40 dBm							
-40 080	'						M2
-SU dBm				M4		M3	
-60 dBm	M6		M5	A DESCRIPTION OF THE OWNER OF THE			
ALC DED			Character States and a state of the	TIPPIN THE T			
90 abri	'						
-80 dBm	<u>+</u>						
Start 1	.705	GHz		10001 p	ts		Stop 1.71 GHz
1arker							
Type	Ref	Trc	X-value	Y-value	Function	Euno	tion Result
M1		1	1.709999232 GHz	-38.91 dBm			
M2		1	1.7095 GHz	-47.92 dBm	Band Power	-29.46 dB	
MЗ		1	1.7085 GHz	-55.97 dBm	Band Power	-38.56 d	
M4		1	1.7075 GHz	-59.65 dBm	1 Band Power -44.		-44.56 dBm
M5		1	1.7065 GHz	-67.45 dBm	Band Power		-49.32 dBm
M6		1	1.7055 GHz	-68.10 dBm	Band Power		-51.22 dBm

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Reflevel	10.00 dB	m 🖷 R	BW 20 kHz			(
Att	30 1	18 🖷 SWT 90 5 🖷 V	BW 100 kHz Mo	de Auto Sween		
SGL Count 1	l/1	TDF				
Controlled by	CTC adv	anced LTE Tester, Tes	t Case Verdict: PAS	55 😑 1 Rm Max		
				M1[1]		-38.74 di
						1.780014208 0
				M2[1]		-44.79 di
-10 dBm						1.780500000 G
00 d0m						
-20 ubiii						
-30 dBm						
AU dem						
-50 dBm	THE OWNER WATER	MD				
	1 T	THE R. P. LEWIS CO., LANSING MICH.	Devel			
-60 dBm			A REAL PROPERTY AND INCOME.		MS	M ₆
-70 dBm					والمالم الماريك والطاقان	and the state of the second
-80 dBm						
Start 1.78 0	iHz		10001 pt	ts		Stop 1.785 GI
Marker						
Type Ref	Trc	X-value	Y-value	Function	Fu	nction Result
M1	1	1.780014208 GHZ	-38.74 dBm	Dand Dower		07.41.40
M3	1	1.7805 GHZ	-44.79 dBm	Band Power		
M4	1	1.7825 GHz	-66.04 dBm	Band Power	-37.07 UB	
	-	1 7025 CU-	-65 27 dBm	Band Power		-47 OF de
M5	1	1.7835 GHZ I	-03,37 übiii i			- T(, 50 UE

Plot 2: Highest channel, QPSK modulation

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Spectr	um						
Ref Le	vel	10.00 dB	m 🖷 R	BW 20 kHz			· · · · · · · · · · · · · · · · · · ·
🛛 Att		30 d	18 👄 SWT 90 s 👄 V	'BW 100 kHz Mo	de Auto Sweep)	
SGL Co	unt 1,	/1	TDF				
Controlle	d by	CTC adv	anced LTE Tester, Tes	st Case Verdict: PA	SS 😑 1Rm Max		
					M1[1]		-38.23 dBr
0 dBm—							1.709990784 GH
					M2[1]		-47.90 dBr
-10 dBm							1.709500000 GH
00 -10							
-20 aBm							
-30 dBm							
-40 dBm							M2 -
E0 d0m							
-JU UDIII				M4			
-60 dBm	MG		M5-		THE OWNER WHEN THE PARTY OF		· · · · · · · · · · · · · · · · · · ·
			THE OWNER WATCHING THE PARTY NAMED	Interest of the second second			
-70 aBM							
-90 dBm							
-00 0011							
01	705	011-		10001	•-		01
start 1.	705	GHZ		10001 p	ts		Stop 1.71 GHz
Marker							
Type	Ref	Irc	X-value	Y-value	Function	Fui	nction Result
MO		1	1.709990784 GHz	-38.23 dBm	Dand Dower		00.04 d0m
M2 M2		1	1.7095 GHZ	-47.90 dBm	Band Dower		-29.24 dBm
M4		1	1.7065 GHz	-53.52 UBM	Band Dower		-30.35 UBIII -44 12 dBm
M5		1	1.7075 GHz	-64 88 dBm	Band Power		-48 47 dBm
M6		1	1.7055 GHz	-67.12 dBm	Band Power		-50.82 dBm
)[Ready		09.02.2024

Plot 3: Lowest channel, 16 – QAM modulation

Spectr	um								
Ref Le	evel	لل 10.00 c 30	iBm ∣dB ⊜ SWT 90 < ●	RBW	20 kHz 100 kHz M	ode Auto	Sween		() () () () () () () () () ()
SGL Co	unt 1	/1	TDF						
Controlle	ed by	CTC ac	ivanced LTE Tester,	Test Ca	ase Verdict: P/	ASS 🔵 1Rm	n Max		
						M	1[1]		-38.91 dBr
0 dBm—									1.780000256 GH
						M	2[1]		-45.77 dBr
-10 dBm									1.780500000 GH
-20 dBm	-								
-30 dBm	-								
4U aBm	12								
-50 dBm	1	No. of Concession, name	MB						
			A DESCRIPTION OF THE OWNER.		M4			ME	
ър авт				and a dealer			B rains		Mb
-70 dBm	4						al a faith an	alula al Balada da la sula	Contraction of the Contract of
-80 dBm	' -								
Start 1	.78 G	Hz			10001	pts			Stop 1.785 GHz
1arker									
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fun	ction Result
M1		1	1.780000256 G	Ηz	-38.91 dBm				
M2		1	1.7805 G	Hz	-45.77 dBm	Band	Power		-27.85 dBm
M3		1	1.7815 G	1Z	-54.72 dBm	Band	Power		-37.64 dBm
M4 M5		1	1.7825 G	72 47	-59.07 UBM	Band	Power		-43.05 UBM -47 08 dBm
M6		1	1.7845 G	Hz	-66.62 dBm	Band	Power		-50.12 dBm
		1					eady		09.02.2024

Plot 4: Highest channel, 16 - QAM modulation

Date: 9.FEB.2024 12:27:49

Date: 9.FEB.2024 11:54:25



16.6.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement parameters			
Detector:	Peak		
Sweep time:	180s		
Video bandwidth:	100 kHz		
Resolution bandwidth:	30 kHz		
Span:	2 x nominal bandwidth		
Trace-Mode:	Max Hold		
Used equipment:	See chapter 7.4 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7		

Limits:

FCC	ISED		
§ 2.1049	RSS-Gen, 6.7		
Reporting only			



Results:

Occupied Bandwidth – QPSK				
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)		
1710.7	1090	1284		
1745	1094	1301		
1779.3	1086	1292		

Occupied Bandwidth – 16-QAM				
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)		
1710.7	1091	1281		
1745	1092	1276		
1779.3	1092	1291		

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Plots: QPSK





Plot 2: low channel, -26 dBc OBW



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Plot 3: mid channel, 99% OBW



Plot 4: mid channel, -26 dBc OBW



Date: 9.FEB.2024 12:03:09



Plot 5: high channel, 99% OBW



Plot 6: high channel, -26 dBc OBW



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Test report no.: 1-6998_23-02-08_TR1-R1



Plots: 16-QAM





Plot 2: low channel, -26 dBc OBW



Date: 9.FEB.2024 11:55:31



Plot 3: mid channel, 99% OBW



Plot 4: mid channel, -26 dBc OBW



Date: 9.FEB.2024 12:10:40



Plot 5: high channel, 99% OBW



Plot 6: high channel, -26 dBc OBW



Date: 9.FEB.2024 12:28:56



16.7 Results LTE band 85

The EUT was set to transmit the maximum power.

16.7.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters			
Detector:	Sample		
AQT:	See plot		
Resolution bandwidth:	1 MHz		
Used equipment:	See chapter 7.2 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1046 ISED: RSS-Gen, 6.12		

Test report no.: 1-6998_23-02-08_TR1-R1



Limits:

FCC	ISED			
47 CFR 27.50(c)(9)	RSS-130, 4.6.1 & 4.6.3			
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.	 4.6.1: The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission. 4.6.3: The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment. 			
Power: 34.77 dBm ERP				
PAPR: 13 dB (ISED only)				



Results:

Output Power (conducted)						
Bandwidth (MHz)	Channel No. / Frequency (MHz)	Resource block allocation	Average Output Power (dBm) QPSK	Peak to Average Ratio (dB)	Average Output Power (dBm) 16-QAM	Peak to Average Ratio (dB)
	104007 /	1 RB low	17,2	3,9	17,0	4,5
	700 5	1 RB high	17,2	3,9	16,9	4,5
	700.5	100% RB	16,3	4,6	15,2	5,4
	124002 /	1 RB low	17,3	3,8	16,9	4,5
5	707.0	1 RB high	17,1	3,9	16,8	4,5
		100% RB	16,2	4,5	15,2	5,4
	134157 / 713.5	1 RB low	17,9	3,7	17,9	4,1
		1 RB high	17,7	3,8	17,8	4,2
		100% RB	16,6	4,5	15,7	5,4
	134052 / 703.0	1 RB low	17,2	3,9	16,8	4,5
		1 RB high	16,9	3,9	16,9	4,4
		100% RB	16,4	4,4	16,3	5,1
	104000 /	1 RB low	17,2	3,8	16,8	4,4
10	1340927	1 RB high	17,0	3,9	16,7	4,5
	707.0	100% RB	16,3	4,5	16,3	5,1
	104100 /	1 RB low	17,7	3,7	17,7	4,1
	134132/ 711.0	1 RB high	17,5	3,8	17,6	4,2
	/11.0	100% RB	16,6	4,5	16,8	5,0



Output Power (ERP)				
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm) QPSK	Average Output Power (dBm) 16-QAM	
	700.5	19,3	19,1	
5	707.0	19,4	19,0	
	713.5	19,7	19,7	
	703.0	19,3	19,0	
10	707.0	19,3	18,9	
	711.0	19,5	19,5	

The radiated output power is measured in the mode with the highest conducted output power.



16.7.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.

2. Subject the mobile station to overnight soak at -30 C.

3. With the mobile station, powered with V_{nom} , connected to the CMW500 and in a simulated call on channel 1412 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.

5. Remeasure carrier frequency at room temperature with V_{nom} . Vary supply voltage from V_{min} to V_{max} , in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.

6. At all temperature levels hold the temperature to +/-0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters				
Detector:				
Sweep time:				
Video bandwidth:	Macourad with CMW/E00			
Resolution bandwidth:				
Span:				
Trace-Mode:				
Used equipment:	See chapter 7.4 setup A			
Measurement uncertainty:	See chapter 9			
Measurement procedure	FCC: § 2.1055 ISED: RSS-Gen, 6.11			



Limits:

FCC	ISED
§ 27.54	RSS-130, 4.5
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.1	12	0.02
3.7	14	0.02
2.5	15	0.02

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-13	-0.02
-20	-16	-0.02
-10	-7	-0.01
± 0	-11	-0.02
10	4	0.01
20	12	0.02
30	26	0.04
40	14	0.02
50	3	0.00

Additional measurements for RSS-130 (4.3 b)

f _L = MHz	f _H = MHz
$f_L - (max freq. error) = MHz$	f _H + (max freq. error) = MHz



16.7.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 716 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 85.



Measurement:

Measurement parameters			
Detector:	Peak / RMS		
Sweep time:	2 sec.		
Resolution bandwidth:	1 MHz		
Video bandwidth:	3 MHz		
Span:	100 MHz Steps		
Trace mode:	Max Hold		
Used equipment:	See chapter 7.1 setup A; 7.2 setup A, B		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13		

Limits:

FCC	ISED
§ 27.53(g)	RSS-130, 4.7.1
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
12	dDm

-13 dBm



Results:

<u>QPSK</u>

Spurious Emission Level					
Lowest o	channel	Middle channel		I Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions [dBm]		Spurious emissions	Level [dBm]
-/-	-	All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

<u>16-QAM</u>

Spurious Emission Level					
Lowest o	channel	Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions [dBm]		Spurious emissions	Level [dBm]
-/-	-	All detected emissions are more than 20 dB below the limit.		-/·	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-





<u>QPSK</u>

Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 MHz to 8 GHz







<u>16-QAM</u>





Plot 2: Middle channel, 30 MHz to 1 GHz







Plot 3: Middle channel, 1 MHz to 8 GHz





16.7.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station. 1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Measurement:

Measurement parameters			
Detector:	Peak		
Sweep time:	Auto		
Video bandwidth:	300 kHz		
Resolution bandwidth:	100 kHz		
Span:	10 MHz – 7.5 GHz		
Trace-Mode:	Max Hold		
Used equipment:	See chapter 7.4 setup A		
Measurement uncertainty:	See chapter 9		
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13		

Limits:

FCC	ISED			
§ 27.53(g)	RSS-130, 4.7.1			
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.			
-13 dBm				



Results: for 1.4 MHz channel bandwidth

<u>QPSK</u>

Spurious Emission Level						
Lowest o	channel	Middle c	Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	

<u>16-QAM</u>

Spurious Emission Level						
Lowest o	hannel	Middle o	Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	
-/-	-/-	-/-	-/-	-/-	-/-	



Plots for 1.4 MHz channel bandwidth, QPSK

Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz











Plots for 1.4 MHz channel bandwidth, 16-QAM

Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz











16.7.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters		
Detector:	RMS	
Sweep time:	180s	
Video bandwidth:	300 kHz	
Resolution bandwidth:	100 kHz	
Span:	1 MHz	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13	

Limits:

FCC	ISED		
§ 27.53(g)	RSS-130, 4.7.1		
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.		
-13 dBm			
Correction factor according to KDB 890810 if RBW < 1 % emission bandwidth: ⊠N/A here			
□10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z			



Results: 1.4 MHz channel bandwidth

Plot 1: Lowest channel, QPSK modulation



Plot 2: Highest channel, QPSK modulation



Date: 13.FEB.2024 16:06:32



Stop 698.0 MHz



Plot 3: Lowest channel, 16 - QAM modulation

Date: 13.FEB.2024 15:53:12

Plot 4: Highest channel, 16 - QAM modulation

-70 dBm -80 dBm-

Start 693.0 MHz



10001 pts

Date: 13.FEB.2024 16:11:59



16.7.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement parameters		
Detector:	Peak	
Sweep time:	180s	
Video bandwidth:	100 kHz	
Resolution bandwidth:	30 kHz	
Span:	2 x nominal bandwidth	
Trace-Mode:	Max Hold	
Used equipment:	See chapter 7.4 setup A	
Measurement uncertainty:	See chapter 9	
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7	

Limits:

FCC	ISED	
§ 2.1049	RSS-Gen, 6.7	
Reporting only		



Results:

Occupied Bandwidth – QPSK				
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)		
699.7	1098	1302		
707.5	1094	1263		
715.3	1096	1313		

Occupied Bandwidth – 16-QAM			
Frequency (MHz)	99% OBW (kHz)	-26 dBc BW (kHz)	
699.7	1105	1318	
707.5	1098	1316	
715.3	1098	1390	





Plots: QPSK, worst case plots

Plot 1: low channel, 99% OBW



Plot 2: high channel, -26 dBc OBW



Date: 13.FEB.2024 16:07:40



Plots: 16-QAM, worst case plots





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Plot 2: high channel, -26 dBc OBW



Date: 13.FEB.2024 16:13:08



17 Observations

No observations except those reported with the single test cases have been made.


18 Glossary

AVG	Average
C	Compliant
C/N ₀	Carrier to noise-density ratio, expressed in dB-Hz
CAC	Channel availability check
CW	Clean wave
DC	Duty cycle
DFS	Dynamic frequency selection
DSSS	Dynamic sequence spread spectrum
DUT	Device under test
EN	European Standard
ETSI	European Telecommunications Standards Institute
EMC	Electromagnetic Compatibility
EUT	Equipment under test
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
FHSS	Frequency hopping spread spectrum
FVIN	Firmware version identification number
GNSS	Global Navigation Satellite System
GUE	GNSS User Equipment
HMN	Host marketing name
HVIN	Hardware version identification number
HW	Hardware
IC	Industry Canada
Inv. No.	Inventory number
MC	Modulated carrier
NA	Not applicable
NC	Not compliant
NOP	Non occupancy period
NP	Not performed
OBW	Occupied bandwidth
00	Operating channel
OCW	Operating channel bandwidth
OFDM	Orthogonal frequency division multiplexing
OOB	Out of band
OP	Occupancy period
PER	Packet error rate
PMN	Product marketing name
PP	Positive peak
QP	Quasi peak
RLAN	Radio local area network
S/N or SN	Serial number
SW	Software
UUT	Unit under test
WLAN	Wireless local area network



19 Document history

Version	Applied changes	Date of release
-/-	Draft	2024-09-04