8.3.5. WCDMA BAND 4

DATE: March 06, 2020 ISED: 649E-SMA715W

LIMITS

FCC: §27.53(h)

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



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DATE: March 06, 2020 ISED: 649E-SMA715W



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8.3.6. LTE BAND 2

DATE: March 06, 2020 ISED: 649E-SMA715W

LIMITS

FCC: §24.238

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

ISED: RSS133§6.5

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



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8.3.7. LTE BAND 5

DATE: March 06, 2020 ISED: 649E-SMA715W

LIMITS

FCC: §22.917

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

ISED: RSS132§5.5

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



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DATE: March 06, 2020 ISED: 649E-SMA715W



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DATE: March 06, 2020 ISED: 649E-SMA715W



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8.3.8. LTE BAND 7

DATE: March 06, 2020 ISED: 649E-SMA715W

LIMITS

FCC: §27.53 (m)

The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.

RSS199§4.5

The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



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DATE: March 06, 2020 ISED: 649E-SMA715W



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DATE: March 06, 2020 ISED: 649E-SMA715W



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DATE: March 06, 2020 ISED: 649E-SMA715W



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8.3.9. LTE BAND 12

LIMITS

FCC: §27.53 (g)

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

ISED: RSS130§4.7

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



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DATE: March 06, 2020 ISED: 649E-SMA715W



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DATE: March 06, 2020 ISED: 649E-SMA715W



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8.3.10. LTE BAND 13

LIMITS

FCC: §27.53 (c), (f)

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts. The band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

ISED: RSS130§4.7

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

4.7.1 General unwanted emissions limits

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.

4.7.2 Additional unwanted emissions limits

ii.

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

- (a) the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775
 - MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least: i.
 - 76 + 10 log₁₀ p (watts), dB, for base and fixed equipment and
 - 65 + 10 log₁₀ p (watts), dB, for mobile and portable equipment
- (b) the e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

Note: Radiated data in section 9.1.6 confirms a compliance for the emissions in GPS 1559-1610 MHz band were wideband emissions therefore the -40dBm/MHz limit was used.



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Note: Radiated data in section 9.2.10 confirms a compliance with narrowband limits for GPS1559-1610 MHz band.

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8.3.11. LTE BAND 41 (FCC)

LIMITS

FCC: §27.53 (m)

The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



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Keysight Spectrum Analyzer - UL: 59005 \ R Date 08/19	9/2019 \ CLT: 2.7	1	12 42 18 48 54 12 2020		Keysight Spe	trum Analyzer - UL: 39005	1 R Date 03/19/2019 1 C	LT 27	T	12.02.55 (M.C.). 12.2020	
- 64 67 50 D	Teles Free Due	#Avg Type: RMS	TRACE 11 3 4 3 6	Frequency	AL	- 1.20.0 DC	1 I	Trias Free Dun	#Avg Type: RMS	TRACE 11 3 4 3 6	Frequency
NFE PNO: IFGain	Fast #Atten: 26 dB		DET PPPPP	12000	1	NFE	PNO: Fast C	#Atten: 26 dB		DET PPPPP	1.000
Ref Offset 13.67 dB 10 dB/div Ref 29.67 dBm	Auto Tune	Ref Offset 13.67 dB Mkr2 25.760 1 GH 10 dB/dlv Ref 29.67 dBm -32.40 dBr						Auto Tun			
97 97 98				Center Freq 13.515000000 GHz	197 967	1					Center Fre 13.515000000 GH
101 101 101			11 - 2 m	Start Freq 30.000000 MHz	-101					0ST 2 m	Start Fre 30.000000 Mi
41.7 50.3 10.7				Stop Freq 27.00000000 GHz	-40.7 -50.3 -67.7	-					Stop Fre 27.00000000 GF
Start 30 MHz Res BW 1.0 MHz	CF Step 2.697000000 GHz Auto Man	Start 30 M #Res BW	Hz 1.0 MHz	VBW	3.0 MHz	Sweep 4:	Stop 27.00 GHz .33 ms (40001 pts)	CF Ste 2.697000000 Gr Auto M			
1 N 1 f (Δ) 2.6710 G 2 N 1 f 25.588 8 G 4 5	Hz (Δ) 27.07 dBm Hz -32.91 dBm			Freq Offset 0 Hz	1 N 1 2 N 1 3 4 5	f ^(Δ)	2.671 0 GHz (Δ) 25.760 1 GHz	27.676 dBm -32.40 dBm			Freq Offs 0 F
7 8 9 10				Scale Type	7 8 9 10						Scale Typ
80		STATUS	1.1		i≺ MBQ				STATU	8	
E 1201 122 122 123 12571 0 0 1 N 1 ((Δ) 2571 0 0 1 N 1 (Δ) 25598 8 0 4 5 5 7 7 8 9 10 10 11 11 11 11 11 11 11 11	Hz (Δ) 27 07 dBm Hz -32 91 dBm	action (raaction work) pranas		Auto Man Freq Offset 0 Hz Scale Type Log Lin	UDDE UDDOS BER 1 N 1 2 N 1 3 4 5 6 6 7 7 8 9 9 10 11 1 1 1 1 1 1 1 1 1 1 1 1 1	[Δ]	2.671 0 GHz (Δ) 25.760 1 GHz	¥ 27.676 dBm -3240 dBm			Auto Freq O Scale Log

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8.3.12. LTE BAND 41 (IC)

LIMITS

RSS199§4.5

The minimum permissible attenuation level of any spurious emissions is 55 + 10 log (P) dB where transmitting power (P) in Watts.



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Keysight Spectrum Analyzer - UIL: 59005 \ R Date: 08/19	9/2019 CLT: 2.7	T	12.20.24 (0.54) 12.2020		Keysight Spe	etznum Analyzer - UL: 1900	05 \ R Date 08/19/2019 \	CLT: 27		12.21.02 (0.04.04.02.02.00	100 M
NE Nº 1302 DC	Senae SAU	#Avg Type: RMS	TRACE 11. 1 4 3 6	Frequency		W 1202 0		Senderina	#Avg Type: RMS	TRACE 11 3 4 3 6	Frequency
NFE PNO: I IFGain:	Fast Trig: Free Run #Atten: 26 dB		DET P P P P P	12004	1	NFE	PNO: Fast C IFGain:Low	#Atten: 26 dB		DET PPPPP	12000
Ref Offset 13.67 dB Mkr2 23.901 8 GHz 10 dB/dly Ref 29.67 dBm -33.39 dBm				Auto Tune	Ref Offset 13.67 dB Mkr2 25.603 6 GH						Auto Tune
97 97				Center Freq 13.516000000 GHz	197 967	11					Center Fre 13.515000000 GH
201			2 Station	Start Freq 30.000000 MHz	-10 3					10-50 ₂ m	Start Fre 30.000000 MH
417 403 197				Stop Freq 27.000000000 GHz	-417 -411 -677						Stop Fre 27.000000000 GH
Start 30 MHz #Res BW 1.0 MHz	CF Step 2.697000000 GHz Auto Man	Start 30 M #Res BW	AHZ 1.0 MHZ	VBW	3.0 MHz	Sweep 45	Stop 27.00 GHz 5.33 ms (40001 pts)	CF Stej 2.697000000 GH Auto Ma			
1 Ν 1 f (Δ) 2.671 0 Gł 2 Ν 1 f 23.901 8 Gł 4 5	Hz (Δ) 28.23 dBm Hz -33.39 dBm			Freq Offset 0 Hz	1 N 1 2 N 1 3 4 5	ţ (Δ)	2.671 0 GHz (Δ 25.603 6 GHz) 28.474 dBm -33.33 dBm			Freq Offse 0 H
7 8 9 10 11				Scale Type	7 8 9 10 11						Scale Type
80)		STATUS) + (NSQ				STATU	8	
		(Lligh Char	anal DD1 (244 2014			annal DD1	0

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8.3.13. LTE BAND 66

DATE: March 06, 2020 ISED: 649E-SMA715W

LIMITS

FCC: §27.53 (h)

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

ISED: RSS139§6.6

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



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8.3.14. LTE BAND 71

LIMITS

FCC: §27.53 (g)

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.

ISED: RSS130§4.7

The minimum permissible attenuation level of any spurious emissions is 43 + 10 log (P) dB where transmitting power (P) in Watts.



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** Agilent 15:18:01 Feb 6, 2020 R T Freq/Channel UL: 19480 \ R Date: 08/19/2019 \ CLT: 2.7 Mkr2 13.658 7 GHz Center Freq Ref 30 dBm •Atten 30 dB -34.50 dBm 10.0150000 GHz •Peak 1 1 10.0150000 GHz 10.0150000 GHz	** Agilent 15:18:35 Feb 6, 2020 R T Freq/Channel UL: 19480 \ R Date: 08/19/2019 \ CLT: 2.7 Mkr2 13.249 1 GHz Center Freq Ref 30 dBm +Htten 30 dB -34.81 dBm 10.0150000 GHz 10.0150000 GHz
Log Start Freq 10 30.0000000 MHz	Log 10 dB/ Offst 30.000000 MHz
10.6 dB DI DI DI DI DI DI DI DI DI DI	10.6 dB DI DI
-1.5.0 L	-13.0 dBm •PAvg •PAvg •PAvg •PAvg •PAvg
Center 10.015 GHz Span 19.97 GHz •Res BW 1 MHz •VBW 3 MHz Sweep 50.24 ms (81.92 pts) Marker Trace Type X Mxis Amplitude Marker Trace Type X Mxis Amplitude	Center 10.015 GHz Span 19.97 GHz •Res BW 1 MHz •VBW 3 MHz Sweep 50.24 ms (8192 pts) Freq Offset Marker Trace Type X Axis Replicate 0.00000000 Hz Marker Trace Type X Axis Replicate 0.00000000 Hz
2 (1) Freq 13.658 7 6Hz -34.50 dBm Signal Track	2 (1) Freq 13.249 1 GHz -34.81 dBm Signal Track On <u>Off</u>
UL:19480 \ R Date:08/19/2019 \ CLT:2.7	UL:19480 \ R Date:08/19/2019 \ CLT:2.7
LTE B71 20MHz QPSK High Channel RB1-0	LTE B71 20MHz 16QAM High Channel RB1-0

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8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, and §27.54 ISED: RSS130§4.5, RSS132§5.3; RSS133§6.3, RSS139§6.4, RSS199§4.3.

LIMITS

FCC: §22.355

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC: §24.235 & §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS130§4.5

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – Internet of Things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

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.

RSS132§5.3

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 SRSP for mobile stations and±1.5 ppm for base stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the occupied bandwidth stays within each of the sub-bands (see Section 5.1) when tested to the temperature and supply voltage variations specified in RSS-Gen.

RSS133§6.3

The carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile stations and ± 1.0 ppm for base stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

RSS139§6.4, RSS140§4.2

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.

RSS199§4.3

Transmitter Frequency Stability

a. The transmitter frequency stability limit shall be determined as follows:

The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;

b. Using a resolution bandwidth equal to that permitted within the 1 MHz band immediately outside the channel edge, as found in clause 4.6, reference points will be selected at the unwanted emission levels which comply with the attenuation specified in 4.6, for the type of device under test, on the emission mask of the lowest and highest channels, and the frequency at these points shall be recorded as fL and fH respectively.

The applicant shall ensure frequency stability by showing that fL minus the frequency offset and fH plus the frequency offset shall be within the frequency range that the equipment is designed to operate.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

• Temp. = −30°C to +50°C

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• Voltage = (85% - 115%)

Low voltage, 3.23VDC, Normal, 3.8VDC and High voltage, 4.37VDC. End Voltage, 2.8VDC.

Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50°C is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

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8.4.1. GSM

LIMITS

FCC §22.355

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC §24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

FCC §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	43575	Test Date:	2/20/2020

<u>GPRS 850</u>

Limit		824	849		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		824.0183	848.9815		
Extreme (50C)		824.0183	848.9815	20.0	0.024
Extreme (40C)		824.0183	848.9815	18.3	0.022
Extreme (30C)		824.0183	848.9815	33.0	0.039
Extreme (10C)	Normal	824.0183	848.9815	23.0	0.027
Extreme (0C)		824.0183	848.9815	21.5	0.026
Extreme (-10C)		824.0183	848.9815	20.9	0.025
Extreme (-20C)		824.0183	848.9815	13.0	0.015
Extreme (-30C)		824.0183	848.9815	15.2	0.018
	15%	824.0183	848.9815	24.1	0.029
20C	-15%	824.0183	848.9815	21.3	0.025
	End Point	824.0183	848.9815	24.9	0.030

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GPRS 1900

Limit		1850	1910		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		1850.0237	1909.9734		
Extreme (50C)		1850.0237	1909.9734	5.6	0.003
Extreme (40C)		1850.0237	1909.9734	15.4	0.008
Extreme (30C)		1850.0237	1909.9734	23.6	0.013
Extreme (10C)	Normal	1850.0237	1909.9734	32.7	0.017
Extreme (0C)		1850.0237	1909.9734	31.1	0.017
Extreme (-10C)		1850.0237	1909.9734	25.3	0.013
Extreme (-20C)		1850.0237	1909.9734	25.3	0.013
Extreme (-30C)		1850.0237	1909.9734	18.0	0.010
	15%	1850.0237	1909.9734	28.9	0.015
20C	-15%	1850.0237	1909.9734	27.4	0.015
	End Point	1850.0237	1909.9734	26.8	0.014

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8.4.2. WCDMA

LIMITS

FCC §22.355

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC §24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

FCC §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	43575	Test Date:	2/20/2020

WCDMA REL 99 BAND 5

Limit		824	849		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		824.1103	848.8950		
Extreme (50C)		824.1103	848.8950	-2.8	-0.0033
Extreme (40C)		824.1103	848.8950	2.0	0.0024
Extreme (30C)		824.1103	848.8950	-21.4	-0.0256
Extreme (10C)	Normal	824.1103	848.8950	-6.9	-0.0083
Extreme (0C)		824.1103	848.8950	-4.4	-0.0052
Extreme (-10C)		824.1103	848.8950	-13.7	-0.0163
Extreme (-20C)		824.1103	848.8950	8.8	0.0105
Extreme (-30C)		824.1103	848.8950	9.1	0.0108
	15%	824.1103	848.8950	-10.0	-0.0120
20C	-15%	824.1103	848.8950	-9.1	-0.0109
	End Point	824.1103	848.8950	-8.1	-0.0097

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REPORT NO: 13211873-E1V3 FCC ID: A3LSMA715W WCDMA REL 99 BAND 2

Limit		1850	1910		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		1850.1161	1909.8745		
Extreme (50C)		1850.1161	1909.8745	19.3	0.0103
Extreme (40C)		1850.1161	1909.8745	18.8	0.0100
Extreme (30C)		1850.1161	1909.8745	17.7	0.0094
Extreme (10C)	Normal	1850.1161	1909.8745	16.5	0.0088
Extreme (0C)		1850.1161	1909.8745	18.0	0.0096
Extreme (-10C)		1850.1161	1909.8745	20.0	0.0106
Extreme (-20C)		1850.1161	1909.8745	19.6	0.0104
Extreme (-30C)		1850.1161	1909.8745	17.9	0.0095
	15%	1850.1161	1909.8745	17.2	0.0092
20C	-15%	1850.1161	1909.8745	17.0	0.0090
	End Point	1850.1161	1909.8745	17.3	0.0092

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Limit 1710 1755 Frequency F high @ F low @ Condition Delta -13dBm -13dBm Stability (Hz) (ppm) Temperature Voltage (MHz) (MHz) Normal (20C) 1710.1049 1754.8943 Extreme (50C) 1710.1049 1754.8943 22.1 0.0128 Extreme (40C) 1710.1049 1754.8943 20.7 0.0119 Extreme (30C) 1710.1049 1754.8943 15.9 0.0092 Extreme (10C) Normal 1710.1049 1754.8943 18.3 0.0106 Extreme (0C) 1710.1049 1754.8943 17.5 0.0101 Extreme (-10C) 1710.1049 16.6 1754.8943 0.0096 Extreme (-20C) 1710.1049 1754.8943 18.4 0.0106 Extreme (-30C) 1710.1049 19.0 1754.8943 0.0110 15% 1710.1049 1754.8943 14.7 0.0085 -15% 20C 1710.1049 1754.8943 14.9 0.0086 End Point 1710.1049 1754.8943 13.8 0.0080

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8.4.3. LTE BAND 2

<u>LIMITS</u>

FCC: §24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

ISED: RSS133§6.3

The carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile stations and ± 1.0 ppm for base stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

Test Engineer ID:	50820	Test Date:	2/21/2020
-------------------	-------	------------	-----------

QPSK, (20MHz BANDWIDTH)

Limit		1850	1910		
Conditio	on	F low @ -13dBm	F high @ -13dBm	F high @ Delta Fre	
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		1851.0132	1909.0011		
Extreme (50C)		1851.0132	1909.0011	13.8	0.007
Extreme (40C)		1851.0132	1909.0011	14.1	0.008
Extreme (30C)	Normal	1851.0132	1909.0011	12.5	0.007
Extreme (10C)		1851.0132	1909.0011	13.4	0.007
Extreme (0C)		1851.0132	1909.0011	12.5	0.007
Extreme (-10C)		1851.0132	1909.0011	13.4	0.007
Extreme (-20C)		1851.0132	1909.0011	11.9	0.006
Extreme (-30C)		1851.0132	1909.0011	12.6	0.007
	15%	1851.0132	1909.0011	11.0	0.006
20C	-15%	1851.0132	1909.0011	12.0	0.006
	End Point	1851.0132	1909.0011	14.5	0.008

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8.4.4. LTE BAND 5

LIMITS

FCC: §22.355

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations. ISED: RSS132§5.3

The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 SRSP for mobile stations and ± 1.5 ppm for base stations.

In lieu of meeting the above stability values, the test report may show that the frequency stability is sufficient to ensure that the occupied bandwidth stays within each of the sub-bands (see Section 5.1) when tested to the temperature and supply voltage variations specified in RSS-Gen.

Test Engineer ID:	39005	Test Date:	2/21/2020

QPSK, (10MHz BANDWIDTH)

Limit		824	849		
Condition		F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		824.4628	848.5296		
Extreme (50C)		824.4628	848.5296	-8.4	-0.010
Extreme (40C)		824.4628	848.5296	-8.3	-0.010
Extreme (30C)		824.4628	848.5296	-8.3	-0.010
Extreme (10C)	Normal	824.4628	848.5296	-9.2	-0.011
Extreme (0C)		824.4628	848.5296	-7.1	-0.009
Extreme (-10C)		824.4628	848.5296	-6.4	-0.008
Extreme (-20C)	1	824.4628	848.5296	-6.1	-0.007
Extreme (-30C)		824.4628	848.5296	-5.9	-0.007
	15%	824.4628	848.5296	-4.6	-0.005
20C	-15%	824.4628	848.5296	-8.3	-0.010
	End Point	824.4628	848.5296	-6.8	-0.008

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8.4.5. LTE BAND 7

LIMITS

FCC: §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

ISED: RSS199§4.3

Transmitter Frequency Stability

a. The transmitter frequency stability limit shall be determined as follows:

The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;

b. Using a resolution bandwidth equal to that permitted within the 1 MHz band immediately outside the channel edge, as found in clause 4.6, reference points will be selected at the unwanted emission levels which comply with the attenuation specified in 4.6, for the type of device under test, on the emission mask of the lowest and highest channels, and the frequency at these points shall be recorded as fL and fH respectively.

The applicant shall ensure frequency stability by showing that fL minus the frequency offset and fH plus the frequency offset shall be within the frequency range that the equipment is designed to operate.

Test Engineer ID:	39005	Test Date:	2/21/2020
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Limit		2500	2570		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		2501.0141	2568.9954		
Extreme (50C)		2501.0141	2568.9954	10.6	0.004
Extreme (40C)	1	2501.0141	2568.9954	10.4	0.004
Extreme (30C)	1	2501.0141	2568.9954	9.5	0.004
Extreme (10C)	Normal	2501.0141	2568.9954	9.0	0.004
Extreme (0C)	1	2501.0141	2568.9954	11.2	0.004
Extreme (-10C)	1	2501.0141	2568.9954	10.9	0.004
Extreme (-20C)	1	2501.0141	2568.9954	11.5	0.005
Extreme (-30C)	1	2501.0141	2568.9954	12.3	0.005
	15%	2501.0141	2568.9954	10.6	0.004
20C	-15%	2501.0141	2568.9954	11.6	0.005
	End Point	2501.0141	2568.9954	11.3	0.004

QPSK, (20MHz BANDWIDTH)

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8.4.6. LTE BAND 12

LIMITS

FCC: §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

ISED: RSS130§4.5

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – Internet of Things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

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.

Test Engineer ID: 50820 Test Date: 2/21/2020	Engineer ID:	50820 Test Date:	2/21/2020
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QPSK, (10MHz BANDWIDTH)

Limit		699	716		
Conditio	n	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		699.4999	715.5205		
Extreme (50C)		699.4999	715.5205	-7.5	-0.011
Extreme (40C)		699.4999	715.5205	-6.8	-0.010
Extreme (30C)		699.4999	715.5205	-5.5	-0.008
Extreme (10C)	Normal	699.4999	715.5205	-6.1	-0.009
Extreme (0C)		699.4999	715.5205	-8.2	-0.012
Extreme (-10C)		699.4999	715.5205	-5.8	-0.008
Extreme (-20C)		699.4999	715.5205	-5.0	-0.007
Extreme (-30C)		699.4999	715.5205	-6.6	-0.009
	15%	699.4999	715.5205	-5.8	-0.008
20C	-15%	699.4999	715.5205	-7.3	-0.010
	End Point	699.4999	715.5205	-5.5	-0.008

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8.4.7. LTE BAND 13

LIMITS

FCC: §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

ISED: RSS130§4.5

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband - Internet of Things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

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.

Test Engineer ID: 39005 Test Date: 2/21/2020	est Engineer ID:	39005	Test Date:	2/21/2020
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QPSK, (10MHz BANDWIDTH)

Limit		777	787		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		777.4945	786.5080		
Extreme (50C)		777.4945	786.5080	-5.2	-0.007
Extreme (40C)		777.4945	786.5080	-5.2	-0.007
Extreme (30C)		777.4945	786.5080	-4.3	-0.005
Extreme (10C)	Normal	777.4945	786.5080	-5.0	-0.006
Extreme (0C)		777.4945	786.5080	-5.7	-0.007
Extreme (-10C)		777.4945	786.5080	-6.0	-0.008
Extreme (-20C)		777.4945	786.5080	-4.4	-0.006
Extreme (-30C)		777.4945	786.5080	-5.0	-0.006
	15%	777.4945	786.5080	-6.7	-0.009
20C	-15%	777.4945	786.5080	-5.8	-0.007
	End Point	777.4945	786.5080	-6.5	-0.008

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8.4.8. LTE BAND 41 (FCC)

LIMITS

FCC: §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Engineer ID:	39005	Test Date:	2/21/2020

QPSK, (20MHz BANDWIDTH)

Limit		2496	2690		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		2496.9451	2689.0546		
Extreme (50C)		2496.9451	2689.0546	11.2	0.004
Extreme (40C)		2496.9451	2689.0546	10.2	0.004
Extreme (30C)		2496.9451	2689.0546	10.1	0.004
Extreme (10C)	Normal	2496.9451	2689.0546	9.9	0.004
Extreme (0C)		2496.9451	2689.0546	13.3	0.005
Extreme (-10C)		2496.9451	2689.0546	13.6	0.005
Extreme (-20C)		2496.9451	2689.0546	13.0	0.005
Extreme (-30C)		2496.9451	2689.0546	14.2	0.005
	15%	2496.9451	2689.0546	12.5	0.005
20C	-15%	2496.9451	2689.0546	13.1	0.005
	End Point	2496.9451	2689.0546	10.6	0.004

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8.4.9. LTE BAND 41 (IC)

<u>LIMITS</u>

ISED: RSS199§4.3 Transmitter Frequency Stability

a. The transmitter frequency stability limit shall be determined as follows:

The frequency offset shall be measured according to the procedure described in RSS-Gen and recorded;

b. Using a resolution bandwidth equal to that permitted within the 1 MHz band immediately outside the channel edge, as found in clause 4.6, reference points will be selected at the unwanted emission levels which comply with the attenuation specified in 4.6, for the type of device under test, on the emission mask of the lowest and highest channels, and the frequency at these points shall be recorded as fL and fH respectively.

The applicant shall ensure frequency stability by showing that fL minus the frequency offset and fH plus the frequency offset shall be within the frequency range that the equipment is designed to operate.

Test Engineer ID: 50820 Test Date: 2/21/2020
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QPSK, (20MHz BANDWIDTH)

Limit		2500	2690		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)		2500.9535	2689.0534		
Extreme (50C)		2500.9535	2689.0534	11.0	0.004
Extreme (40C)		2500.9535	2689.0534	10.3	0.004
Extreme (30C)		2500.9535	2689.0534	10.2	0.004
Extreme (10C)	Normal	2500.9535	2689.0534	10.3	0.004
Extreme (0C)		2500.9535	2689.0534	14.2	0.005
Extreme (-10C)		2500.9535	2689.0534	13.8	0.005
Extreme (-20C)		2500.9535	2689.0534	12.9	0.005
Extreme (-30C)		2500.9535	2689.0534	13.6	0.005
	15%	2500.9535	2689.0534	11.0	0.004
20C	-15%	2500.9535	2689.0534	10.6	0.004
	End Point	2500.9535	2689.0534	10.8	0.004

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8.4.10. LTE BAND 66

LIMITS

FCC: §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

ISED: RSS139§6.4

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.

Test Engineer ID:	39005	Test Date:	2/21/2020

Limit		1710	1780		
Conditio	on	F low @ -13dBm	F high @ -13dBm	Delta (Hz)	Frequency Stability
Temperature	Voltage	(MHz)	(MHz)	(12)	(ppm)
Normal (20C)		1711.0007	1779.0128		
Extreme (50C)		1711.0007	1779.0128	9.5	0.005
Extreme (40C)	1	1711.0007	1779.0128	9.0	0.005
Extreme (30C)	1	1711.0007	1779.0128	8.0	0.005
Extreme (10C)	Normal	1711.0007	1779.0128	10.0	0.006
Extreme (0C)	1	1711.0007	1779.0128	8.9	0.005
Extreme (-10C)	1	1711.0007	1779.0128	8.9	0.005
Extreme (-20C)	1	1711.0007	1779.0128	9.8	0.006
Extreme (-30C)	1	1711.0007	1779.0128	9.7	0.006
		-		-	-
	15%	1711.0007	1779.0128	8.6	0.005
20C	-15%	1711.0007	1779.0128	9.0	0.005
	End Point	1711.0007	1779.0128	7.9	0.005

QPSK, (20MHz BANDWIDTH)

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8.4.11. LTE BAND 71

LIMITS

FCC: §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

ISED: RSS130§4.5

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – Internet of Things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

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.

Test Engineer ID: 50820 Test Date: 2/21/2020	Engineer ID:	50820 Test Date:	2/21/2020
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QPSK, (20MHz BANDWIDTH)

Limit		663	698	Delta (Hz)	Frequency Stability
Condition		F low @ -13dBm	F high @ -13dBm		
Temperature	Voltage	(MHz)	(MHz)	()	(ppm)
Normal (20C)	Normal	664.0027	697.0603		
Extreme (50C)		664.0027	697.0603	4.0	0.006
Extreme (40C)		664.0027	697.0603	6.0	0.009
Extreme (30C)		664.0027	697.0603	4.8	0.007
Extreme (10C)		664.0027	697.0603	7.0	0.010
Extreme (0C)		664.0027	697.0603	3.5	0.005
Extreme (-10C)		664.0027	697.0603	3.9	0.006
Extreme (-20C)		664.0027	697.0603	5.7	0.008
Extreme (-30C)		664.0027	697.0603	4.5	0.007
20C	15%	664.0027	697.0603	6.3	0.009
	-15%	664.0027	697.0603	5.3	0.008
	End Point	664.0027	697.0603	8.6	0.013

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8.5. PEAK-TO-AVERAGE POWER RATIO

<u>LIMIT</u>

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.

RESULT

The results from all CCDF measurements are passed with 13dB peak-to-average power ratio criteria.

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8.5.1. GSM



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8.5.2. WCDMA



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8.5.4. LTE BAND 5



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8.5.5. LTE BAND 7



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8.5.6. LTE BAND 12



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