

# **FCC REPORT**

#### Certification

Applicant Name: GS Instech Co., Ltd.		Date of Issue: November 22, 2016
Address:		HCT CO., LTD., 74, Seoicheon-ro 578beon-ail
70, Gilpa-ro 71beon-gil, Nam-	gu, Inchen, Korea	Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
		Report No.: HCT-R-1611-F007-2
		HCT FRN: 0005866421
		ISED Registration Number: 5944A-5
FCC ID:	U88GSTICELITE1	943
APPLICANT:	GS Instech Co., L	td.
FCC Model(s):	GST-IC-ELITE-1943	
EUT Type:	LTE/CDMA ICS RF Repea	ter
Frequency Ranges :	DL: 1 930 MHz ~ 1 995 MH	Hz /
	UL: 1 850 MHz ~ 1 915 MH	Ηz
Conducted Output Power:	Downlink: 20 W / Uplink: 1	W
Date of Test:	October 14, 2016 ~ Novem	nber 21, 2016
New York, Name of Street, Name		

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 90 of the FCC Rules under normal use and maintenance.

Report prepared by : Kyung Soo Kang Test engineer of RF Team

Approved by : Yong Hyun Lee Manager of RF Team

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# <u>Version</u>

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1611-F007	November 14, 2016	- First Approval Report
HCT-R-1611-F007-1	November 18, 2016	- Revise the 'Out of band rejection' test table.
HCT-R-1611-F007-2	November 22, 2016	- Retest the 'Out of band rejection'.



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## 1. CLIENT INFORMATION

The EUT has been tested by request of

Company	GS Instech Co., Ltd. 70, Gilpa-ro 71beon-gil, Nam-gu, Inchen, Korea
EUT Type:	LTE/CDMA ICS RF Repeater
FCC Model(s):	GST-IC-ELITE-1943
Power Supply:	AC 110 VAC ~ 220 VAC
Frequency Ranges :	DL: 1 930 MHz ~ 1 995 MHz / UL: 1 850 MHz ~ 1 915 MHz
Conducted Output Powe	r: Downlink 20 W / Uplink 1 W
Antenna Gain(s):	Manufacturer does not provide an antenna.
Measurement standard(s	): ANSI/TIA-603-C-2004, KDB 971168 D01 v02r02 KDB 935210 D02 v03r02, KDB 935210 D05 v01r01 CFR 47 Part 2, Part 24
Place of Tests:	HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi- do, 17383, Rep. of KOREA (ISED Registration Number : 5944A-5)

## 2. FACILITIES AND ACCREDITATIONS 2.1. FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661).

### 2.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



# 3. TEST SPECIFICATIONS

## 3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 24.

Description	Reference (FCC)	Results
Conducted RF Output Power	§2.1046, §24.232	Compliant
Occupied Bandwidth	§2.1049	Compliant
Passband Gain and Bandwidth & Out of Band Rejection	KDB 935210 D05 v01r01	Compliant
Spurious Emissions at Antenna Terminals	§2.1051, §24.238	Compliant
Radiated Spurious Emissions	§2.1053, §24.238	Compliant
		N/A
Frequency Stability	§2.1055, §24.235	The EUT does not perform
		frequency translation

## 3.2. MODE OF OPERATION DURING THE TEST

The EUT was operated in a manner representative of the typical usage of the equipment.

During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

The device does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports for radiated spurious emission testing.

### 3.3. MAXIMUM MEASUREMENT UNCERTAINTY

The value of the measurement uncertainty for the measurement of each parameter.

Coverage factor k = 2, Confidence levels of 95 %

Description	Condition	Uncertainty
Conducted RF Output Power	-	± 0.72 dB
Occupied Bandwidth	OBW ≤ 20 MHz	± 52 kHz
Passband Gain and Bandwidth & Out of Band Rejection	Gain 20 dB bandwidth	± 0.89 dB ± 0.58 MHz
Spurious Emissions at Antenna Terminals	-	± 1.08 dB
Radiated Spurious Emissions	f ≤ 1 GHz f > 1 GHz	± 4.80 dB ± 6.07 dB
Frequency Stability	-	± 1.22 x 10 <sup>-6</sup>

## 4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	+ 15 ℃ to + 35 ℃
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1 060 mbar



## **5. TEST EQUIPMENT**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Agilent	E4438C /Signal Generator	09/02/2016	Annual	MY42082646
Agilent	N5182A /Signal Generator	03/29/2016	Annual	MY50141649
Agilent	N5182A /Signal Generator	05/13/2016	Annual	MY47070230
Agilent	N9030A / Signal Analyzer	11/24/2015	Annual	MY49431210
Weinschel	67-30-33 / Fixed Attenuator	02/16/2016	Annual	CC7264
Weinschel	1506A / Power Divider	02/15/2016	Annual	MD793
DEAYOUNG ENT	DFSS60 / AC Power Supply	04/06/2016	Annual	1003030-1
NANGYEUL CO., LTD.	NY-THR18750 / Temperature and Humidity Chamber	10/21/2016	Annual	NY-2009012201A
Innco system	MA4000-EP / Antenna Position Tower		N/A	N/A
Innco system	CT0800 / Turn Table	N/A	N/A	N/A
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
ETS	2090 / Controller(Turn table)	N/A	N/A	1646
Rohde&Schwarz	Loop Antenna	02/23/2016	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/15/2015	Biennial	255
Schwarzbeck	BBHA 9120D / Horn Antenna	12/11/2015	Biennial	9120D-1191
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	09/03/2015	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	09/29/2016	Annual	836650/016
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/23/2016	Annual	101068-SZ
Wainwright Instruments	WHK1.2/15G-10EF / Highpass Filter	04/11/2016	Annual	4
Wainwright Instruments	WHK3.0/18G-10EF / Highpass Filter	06/24/2016	Annual	8
CERNEX	CBLU1183540 / Power Amplifier	02/01/2016	Annual	24614
CERNEX	CBL06185030 / Power Amplifier	02/01/2016	Annual	24615
CERNEX	CBL18265035 / Power Amplifier	07/11/2016	Annual	22966



## 6. RF OUTPUT POWER

#### **FCC Rules**

#### **Test Requirements:**

#### § 2.1046 Measurements required: RF power output:

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated. (b) For single sideband, independent sideband, and single channel, controlled carrier radio telephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter. (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

#### § 24.232 Power and antenna height limits.

(a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see* Tables 1 and 2 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

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#### **Test Procedures:**

Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05 v01r01.

a) Connect a signal generator to the input of the EUT.

b) Configure to generate the AWGN (broadband) test signal.

c) The frequency of the signal generator shall be set to the frequency f0 as determined from 3.3.

d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.

e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.

f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.

g) Remove the EUT from the measurement setup. Using the same signal generator settings,

repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.

h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.

i) Repeat steps e) to h) with the narrowband test signal.

j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.

#### Power measurement Method :

Guidance for performing input/output power measurements using a spectrum or signal analyzer is provided in 5.2 of KDB Publication 971168 D01 v02r02.



Block Diagram 1. RF Power Output Test Setup



#### **Test Results:**

Input Signal	Input Level (dBm)		Maximum Amp Gain	
	DL	UL	DL	UL
LTE 5 MHz				
LTE 10 MHz	-62	-75	1(	)5
CDMA				

#### Single channel Enhancer

\* Due to EUT's ALC function (Auto Level Control), even if input signal is increased,

The same output power is transmit.

#### [Downlink]

		Frequency	Output Power	
	Channel	(MHz)	(dBm)	(W)
	Low	1932.50	43.09	20.365
LTE 5 MHz_ AGC threshold	Middle	1962.50	43.04	20.147
	High	1992.50	43.03	20.106
LTE 5 MHz	Low	1932.50	43.14	20.609
+3dB above	Middle	1962.50	43.16	20.688
	High	1992.50	43.24	21.077
	Low	1935.00	43.07	20.262
LTE 10 MHz_ AGC threshold	Middle	1962.50	43.04	20.141
	High	1990.00	43.02	20.022
LTE 10 MHz_ +3dB above AGC threshold	Low	1935.00	43.12	20.508
	Middle	1962.50	43.07	20.260
	High	1990.00	43.10	20.422



	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
	Low	1931.25	43.30	21.388
CDMA_ AGC threshold	Middle	1962.50	43.36	21.667
	High	1993.75	43.01	20.005
СДМА	Low	1931.25	43.34	21.586
+3dB above	Middle	1962.50	43.30	21.360
	High	1993.75	43.61	22.949



[Uplink]

	Channel	Frequency (MHz)	Output Power	
	Channel		(dBm)	(W)
	Low	1852.50	30.02	1.005
LTE 5 MHz_ AGC threshold	Middle	1882.50	30.00	1.000
	High	1912.50	30.07	1.016
LTE 5 MHz	Low	1852.50	30.11	1.027
+3dB above	Middle	1882.50	30.29	1.068
AGC threshold	High	1912.50	30.08	1.018
	Low	1855.00	30.10	1.022
LTE 10 MHz_ AGC threshold	Middle	1882.50	30.15	1.035
	High	1910.00	30.12	1.028
LTE 10 MHz	Low	1855.00	30.27	1.065
+3dB above	Middle	1882.50	30.23	1.055
AGC threshold	High	1910.00	30.10	1.023
	Low	1851.25	30.12	1.029
CDMA_ AGC threshold	Middle	1882.50	30.02	1.004
	High	1913.75	30.07	1.016
CDMA	Low	1851.25	30.06	1.013
+3dB above	Middle	1882.50	30.11	1.026
AGC threshold	High	1913.75	30.07	1.017



#### Single channel Enhancer Plots of RF Output Power

#### LTE 5 MHz DL

[LTE 5 MHz AGC threshold Downlink Low]



#### [LTE 5 MHz AGC threshold Downlink Middle]







#### [LTE 5 MHz AGC threshold Downlink High]

#### [LTE 5 MHz +3dB above the AGC threshold Downlink Low]

Agilent Spectrum Analyzer - Channel Power							
Center Freq 1.932500000 G	ORREC SENSE:	INT ALIGN #	UTO 01:45:38Pf Radio Std:	M Oct 12, 2016 None	Frequency		
#	FGain:Low #Atten: 20 dl	un Avg Hold: 100/1 B Ext Gain: -10.00	00 ∣dB Radio Dev	ice: BTS			
10 dB/div Ref 50.00 dBm							
40.0					Center Fred		
30.0					1.932500000 GHz		
20.0							
10.0							
0.00							
-10.0			\				
-20.0				to many many			
-30.0							
-40.0							
Center 1.933 GHz	#\/B\A	300 647	Spa #Sweet	n 10 MHz	CF Step		
#Res DW TOO KHZ	#V DVV	JUU KH2	#Swee	5 100 1115	1.000000 MHz		
Channel Power	P	ower Spectral D	ensitv		Mari		
			,		FregOffset		
43.14 dBm /	5 MHz	-23.85 dE	3m /Hz		0 Hz		
MSG			STATUS				





#### [LTE 5 MHz +3dB above the AGC threshold Downlink Middle]

#### [LTE 5 MHz +3dB above the AGC threshold Downlink High]

Agilent Spectrum Analyzer - Channel Power							
LXIRL	RF 50 Ω	AC CORREC	SENSE:INT	ALIGN A	UTO 01:41:22	PM Oct 12, 2016	Frequency
Center F	req 1.99250	0000 GHZ	Trig: Free Run	Avg Hold: 100/10	00	u. None	
		#IFGain:Lo	w #Atten: 20 dB	Ext Gain: -10.00	dB Radio De	vice: BTS	
10 dB/div	Ref 50.00	0 dB <u>m</u>					
40 0							Contor From
30.0							
20.0							1.992500000 GH2
20.0							
0.00							
0.00							
-10.0							
-20.0							
-30.0							
-40.0							
Center 1	.993 GHz				Sp	an 10 MHz	
#Res BW	100 kHz		#VBW 300	) kHz	#Swee	ep 100 ms	CF Step
							Auto Man
Chan	nel Power		Pow	er Spectral D	ensity		
							Freq Offset
	43.24 dE	3m / 5 мн <sub>2</sub>	Z	-23.75 dB	Sm /Hz		0 Hz
MSG	ISG STATUS						



#### LTE 10 MHz DL



#### [LTE 10 MHz AGC threshold Downlink Low]

#### [LTE 10 MHz AGC threshold Downlink Middle]

Agilent Spectr	<mark>um Analyzer - Chanr</mark> RF 50 Ω	AC CORREC	SENSE:INT	ALIGNAUTO	02:17:58 PM Oct 12, 2016	Frequency
Center Fr	req 1.962500	1000 GHz #IFGain:Lo	Center Freq: 1.9625 Trig: Free Run #Atten: 20 dB	Avg Hold: 100/100 Ext Gain: -10.00 dB	Radio Std: None Radio Device: BTS	ricqueriey
10 dB/div	Ref 50.00	dBm				
40.0 30.0						Center Freq 1.962500000 GHz
20.0						
-10.0						
-30.0						
Center 1. #Res BW	963 GHz 180 kHz		#VBW 560	kHz	Span 20 MHz #Sweep  100 ms	<b>CF Step</b> 2.000000 MHz
Chanr	nel Power		Powe	r Spectral Dens	sity	<u>Auto</u> Man
<b>43.04 dBm</b> / 10 MHz			Hz	-26.96 dBm /Hz		
MSG				STATU	s	





#### [LTE 10 MHz AGC threshold Downlink High]

[LTE 10 MHz +3dB above the AGC threshold Downlink Low]

Agilent Spectrum Analyzer - Channel Power							
	SENSE:INT Center Freq: 1.935000	ALIGNAUTO	02:26:51 PM Oct 12, 2016 Radio Std: None	Frequency			
++ #IFGain:Low	<ul> <li>Trig: Free Run #Atten: 20 dB</li> </ul>	Avg Hold: 100/100 Ext Gain: -10.00 dB	Radio Device: BTS				
10 dB/div Ref 50.00 dBm							
40.0				Center Fred			
30.0				1.935000000 GHz			
20.0							
10.0							
0.00							
-10.0							
-20.0							
-30.0							
-40.0							
Center 1.935 GHz	#\/R\M_560 K	47	Span 20 MHz #Sween 100 ms	CF Step			
WRCS DW TOO KHZ	#VDV4 500 Ki	12	#aweep 100 ms	2.000000 MHz			
Channel Power	Power	Spectral Dens	itv	Mart			
				Freg Offset			
43.12 dBm / 10 мнz	-2	26.88 dBm	/Hz	0 Hz			
MSG		STATUS	5				





#### [LTE 10 MHz +3dB above the AGC threshold Downlink Middle]

[LTE 10 MHz +3dB above the AGC threshold Downlink High]

Agilent Spectrum Analyzer - Channel Power							
LXI RL	RF 50 Ω A		SENSE:INT	ALIGNAUTO	02:23:37 PM Oct 12, 2016	Frequency	
Center Fre	eq 1.9900000		Trig: Free Run	Avg Hold: 100/100	Radio Sta. None		
		#IFGain:Low	#Atten: 20 dB	Ext Gain: -10.00 dB	Radio Device: BTS		
10 dB/div	Ref 50.00 d	Bm					
Log							
40.0						Center Freq	
30.0						1.990000000 GHz	
20.0							
10.0							
0.00							
-10.0							
-20.0							
-30.0							
40.0							
-40.0							
Center 1.9	9 GHz				Span 20 MHz	CE Stop	
#Res BW /	180 kHz		#VBW 5601	(Hz	#Sweep 100 ms	2.000000 MHz	
						<u>Auto</u> Man	
Chann	el Power		Power	r Spectral Dens	ity		
						Frea Offset	
4	3.10 dBn	n / 10 MHz		-26.90 dBm	/Hz	0 Hz	
MSG				STATU	3		



#### CDMA DL

[CDMA AGC threshold Downlink Low]



#### [CDMA AGC threshold Downlink Middle]









#### [CDMA +3dB above the AGC threshold Downlink Low]









#### [CDMA +3dB above the AGC threshold Downlink Middle]

[CDMA +3dB above the AGC threshold Downlink High]





#### LTE 5 MHz UL

Chan B L 03:00:03PM Oct 12, 2016 Radio Std: None ALIGN AUTO Center Freq: 1.852500000 GHz Trig: Free Run Avg|Hold: 100/100 #Atten: 20 dB Frequency Center Freq 1.852500000 GHz Radio Device: BTS #IFGain:Low Ref 40.00 dBm 0 dB/div .og Center Fred 1.852500000 GHz Center 1.853 GHz #Res BW 100 kHz Span 10 MHz #Sweep 100 ms **CF** Step #VBW 300 kHz 1.000000 MHz Man <u>Auto</u> **Channel Power Power Spectral Density** Freq Offset -36.97 dBm /Hz 30.02 dBm / 5 мнz 0 Hz STATUS

#### [LTE 5 MHz AGC threshold Uplink Low]

#### [LTE 5 MHz AGC threshold Uplink Middle]







[LTE 5 MHz AGC threshold Uplink High]

#### [LTE 5 MHz +3dB above the AGC threshold Uplink Low]

Agilent Spect	Agilent Spectrum Analyzer - Channel Power							
Center F	rea 1.8525000		Center Freq: 1.8525	00000 GHz	03:14:37 PM O Radio Std: N	one one	Frequency	
		++ #IEGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold: 100/100	Radio Device	: BTS		
		" Sumeow _						
10 dB/div	Ref 40.00 dl	Bm						
Log 30.0							Contor From	
20.0							1.852500000 GHz	
10.0				+				
0.00								
-10.0								
-20.0		/						
-30.0				<u> </u>				
-40.0								
-50.0								
Center 1	.853 GHz				Span	10 MHz	CESten	
#Res BW	100 kHz		#VBW 300	kHz	#Sweep	100 ms	1.000000 MHz	
Ob an			B		- :4		<u>Auto</u> Man	
Cnan	nel Power		Powe	r Spectral Den	sity			
	30 11 dBm			-36 88 dBm	) /Ц-		Freq Offset	
		1 7 3 141 112		-00.00 dBii	1782		0 H2	
MSG				STAT	us			
				UIAI				





#### [LTE 5 MHz +3dB above the AGC threshold Uplink Middle]

[LTE 5 MHz +3dB above the AGC threshold Uplink High]

Agilent Spectru	ım Analyzer - Cha	annel Power									-
LXI RL	RF 50 Ω	AC COI	RREC	SENS	E:INT	000 CH-	ALIGN AUTC	04:02:02P	4 Oct 12, 2016	Frequency	
Center Fr	eq 1.91250	00000 GH	IZ	Trig: Free	q: 1.912500 Run	AvalHold:	100/100	Radio Sta	None		
		#IF	Gain:Low	#Atten: 20	dB			Radio Dev	ice: BTS		
10 dB/div	Ref 40.0	0 dB <u>m</u>									
Log											
30.0										Center F	req
20.0										1.912500000	GHz
10.0		-									
0.00											
-10.0							_\				
-20.0		/					<u>\</u>				
20.0							L.				
-30.0											
-40.0											
-50.0											
Contor 1								Eno	n 40 MUz		
#Pec BIM				#\/R)	AC 300 KH	17		sµa #Sweet	100 mc	CF S	tep
WILCS DW				#VD1	9 300 KI	12		#owce	7 100 1115	1.000000	MHz
					-					Auto	Man
Chann	iel Power				Power	Spectra	al Den	isity			
										Freq Off	fset
3	0.08 dE	3m / 5	MHz		-3	36.91	dBm	)/Hz			рнz
MSG							STAT	US			
											_



#### LTE 10 MHz UL



#### [LTE 10 MHz AGC threshold Uplink Low]

#### [LTE 10 MHz AGC threshold Uplink Middle]

Agilent Spectr	um Analyzer - Cha	annel Power	RREC	CEI			ALIGN ALIT	10 02:46	5/32 DM Oct 12/2	016	
Center Fr	req 1.88250	00000 GI	lz	Center F	req: 1.88250	0000 GHz	. 400/400	Radio	Std: None	010	Frequency
		#IF	⊶ Gain:Low	#Atten: 2	0 dB	Avginoid	. 100/100	Radio	Device: BTS	_	
10 dB/div	Ref 40.0	0 dBm								_	
30.0											Center Fred
20.0											1.882500000 GHz
10.0		$\vdash$					$\square$				
0.00											
-10.0											
-20.0											
-40.0											
-50.0											
Contor 1	993 CH-								Enan 20 M	U 7	
#Res BW	180 kHz			#VE	3W 560 k	Hz		#Sv	veep 100	ms	CF Step 2 000000 MHz
											<u>Auto</u> Mar
Chanr	nel Power				Power	Spectr	al De	nsity			
	0 45 45	<b>.</b>				20.05	dDr				Freq Offset
	ou. 15 ar	<b>DIII</b> / 1	0 MHZ			<b>ა</b> შ.80	аÞr	n /Hz			0 Hz
MSG							ST/	ATUS			
MSG							ST/	ATUS			





#### [LTE 10 MHz AGC threshold Uplink High]

[LTE 10 MHz +3dB above the AGC threshold Uplink Low]

Agilent Spectrum Analyzer - Channel Power						
LXIRL RF 50Ω	AC CORREC	SENSE:INT	ALIGNAUTO	02:44:59 PM Oct 12, 2016	Frequency	
Center Fred 1.855000		Trig: Free Run	Avg Hold: 100/100	Radio Sta. None		
	#IFGain:Low	#Atten: 20 dB		Radio Device: BTS		
10 dB/div Ref 40.00	dBm					
20.0					Conton From	
30.0					Center Freq	
20.0					1.855000000 GHz	
10.0						
0.00						
-10.0						
-20.0						
-30.0						
.40.0						
-40.0						
-30.0						
Center 1.855 GHz				Span 20 MHz		
#Res BW 180 kHz		#VBW 560 k	Hz	#Sweep 100 ms	2 00000 MH7	
					Auto Man	
Channel Power		Power	Spectral Dens	itv		
			epooliai bollo			
20.27 40			20 72 dDm	(1)_	FreqOffset	
<b>30.27 u</b> d			ତ୍ୟ.ମ୍ଭ <b>ପ</b> ାମ	/HZ	0 Hz	
100						
MSG			STATUS			







#### [LTE 10 MHz +3dB above the AGC threshold Uplink Middle]

#### [LTE 10 MHz +3dB above the AGC threshold Uplink High]

Agilent Spectrum Analyzer - Channel Power							
Center F	RF 50 Ω AC		SENSE:INT Center Freg: 1.9100	ALIGN AUTO	02:55:54 PM Oct 12, 2016 Radio Std: None	Frequency	
Center P	req 1.9100000	#IFGain:Low	<ul> <li>Trig: Free Run</li> <li>#Atten: 20 dB</li> </ul>	Avg Hold: 100/100	Radio Device: BTS		
10 dB/div	Ref 40.00 dl	З <u>т</u>					
Log 30.0						Center Fred	
20.0						1 91000000 GHz	
10.0				+		1.5 10000000 0112	
0.00							
-10.0							
-20.0							
-30.0		-		\			
-40.0							
-50.0							
Center 1	.91 GHz		#VRM 5601		Span 20 MHz #Sween 100 mc	CF Step	
TRES DW			#VDVV J001	M112	#aweep 100 ms	2.000000 MHz	
Chan	nel Power		Powe	r Spectral Den	sitv	Auto Man	
- Chian						Erog Offect	
	30.10 dBn	ר / 10 MHz		-39.90 dBm	ו /Hz	0 Hz	
MSG				STAT	us		
				01A			



#### CDMA UL

[CDMA AGC threshold Uplink Low]



#### [CDMA AGC threshold Uplink Middle]









#### [CDMA +3dB above the AGC threshold Uplink Low]







#### [CDMA +3dB above the AGC threshold Uplink Middle]

#### [CDMA +3dB above the AGC threshold Uplink High]



## 7. OCCUPIED BANDWIDTH

#### **FCC Rules**

#### Test Requirement(s):

#### § 2.1049 Measurements required: Occupied bandwidth:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

#### **Test Procedures:**

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r01 and section 4.2 of KDB 971168 D01 v02r02.

Test is 99% OBW measured and used.

a) Connect a signal generator to the input of the EUT.

b) Configure the signal generator to transmit the AWGN signal.

c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.

d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.

f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be  $\geq$  3 × RBW.

g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level.

Steps f) and g) may require iteration to enable adjustments within the specified tolerances.

h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.

i) Set spectrum analyzer detection function to positive peak.

j) Set the trace mode to max hold.

k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency as  $f_0$ .

I) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the -26 dB down amplitude.



The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the -26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the -26 dB down amplitude point.

m) Repeat steps e) to I) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).

n) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step I) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.
o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.

p) Repeat steps e) to o) with the signal generator set to the narrowband signal.

q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

#### Test Results:

The EUT complies with the requirements of this section.

Input Signal	Input Lev	vel (dBm)	Maximum Amp Gain		
input Signal	DL	UL	DL	UL	
LTE 5 MHz					
LTE 10 MHz	-62	-75	105		
CDMA					



#### [Downlink Output]

	Channel	Frequency (MHz)	OBW (kHz)	
	Low	1932.50	4.4963	
LTE 5 MHz AGC threshold	Middle	1962.50	4.4981	
	High	1992.50	4.4880	
	Low	1932.50	4.4924	
+3dB above	Middle	1962.50	4.4978	
AGC threshold	High	1992.50	4.4872	
	Low	1935.00	8.9239	
LTE 10 MHz AGC threshold	Middle	1962.50	8.9639	
	High	1990.00	8.9334	
LTE 10 MHz	Low	1935.00	8.9284	
+3dB above	Middle	1962.50	8.9619	
AGC threshold	High	1990.00	8.9286	
	Low	1931.25	1.3063	
CDMA AGC threshold	Middle	1962.50	1.3024	
	High	1993.75	1.3048	
СДМА	Low	1931.25	1.2996	
+3dB above	Middle	1962.50	1.3101	
AGC threshold	High	1993.75	1.3053	



### [Uplink Output]

	Channel	Frequency (MHz)	OBW (kHz)
LTE 5 MHz AGC threshold	Low	1852.50	4.4961
	Middle	1882.50	4.5007
	High	1912.50	4.4903
LTE 5 MHz +3dB above AGC threshold	Low	1852.50	4.4942
	Middle	1882.50	4.4976
	High	1912.50	4.4932
LTE 10 MHz AGC threshold	Low	1855.00	8.9545
	Middle	1882.50	8.9573
	High	1910.00	8.9601
LTE 10 MHz +3dB above AGC threshold	Low	1855.00	8.9577
	Middle	1882.50	8.9504
	High	1910.00	8.9576
CDMA AGC threshold	Low	1851.25	1.3255
	Middle	1882.50	1.2813
	High	1913.75	1.3143
CDMA +3dB above AGC threshold	Low	1851.25	1.3188
	Middle	1882.50	1.2750
	High	1913.75	1.3163



#### [Downlink Input]

	Channel	Frequency (MHz)	OBW (kHz)
LTE 5 MHz AGC threshold	Low	1932.50	4.5152
	Middle	1962.50	4.5146
	High	1992.50	4.5119
LTE 10 MHz AGC threshold	Low	1935.00	9.0423
	Middle	1962.50	9.0355
	High	1990.00	9.0167
CDMA AGC threshold	Low	1931.25	1.2744
	Middle	1962.50	1.2762
	High	1993.75	1.2772


# [Uplink Input]

	Channel	Frequency (MHz)	OBW (kHz)
	Low	1852.50	4.5138
LTE 5 MHz AGC threshold	Middle	1882.50	4.5138
	High	1912.50	4.5133
	Low	1855.00	9.0437
LTE 10 MHz AGC threshold	Middle	1882.50	9.0191
	High	1910.00	9.0237
	Low	1851.25	1.2740
CDMA AGC threshold	Middle	1882.50	1.2742
	High	1913.75	1.2720



# Plots of Occupied Bandwidth

# LTE 5 MHz DL\_Output

Agilant Spectrum Analyzer - Occupied BW				
X RL RE 50.9 AC CORREC	SENSE:INT	ALIGNAUTO	01:18:38 PM Oct 12, 2016	
Center Freq 1.932500000 GHz	Center Freq: 1.93250	0000 GHz	Radio Std: None	Frequency
#IEGair	How #Atten: 20 dB	Avg Hold: 100/100 Ext Gain: -10.00 dB	Radio Device: BTS	
10 dB/div Ref 50.00 dBm				
40.0				Center Freq
30.0	an and provide the second s	AN MARCENCE		1 932500000 GHz
20.0		<u> </u>		
10.0		۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲. ۲		
0.00		htter of the second sec	Wheley marth bases dill	
-10.0				
-20.0				
-30.0				
-40.0				
Center 1.933 GHZ	#\/B\M_200 L	-u	Span 10 MHZ	CF Step
#Res BW 100 KHZ	#VDW 300 M	.Π2	#Sweep Joins	1.000000 MHz
Occupied Bandwidth	Total P	ower 51.3	dBm	<u>Auto</u> Man
	0 B.41 I			
4.496	3 IVIAZ			Freq Offset
Transmit Fred Error 20	0530 kHz OBW P	ower 99	0.00 %	0 Hz
x dB Bandwidth 4	.916 MHZ X dB	-26.		
MSG		STATUS	3	

## [LTE 5 MHz AGC threshold Downlink Low]

# [LTE 5 MHz AGC threshold Downlink Middle]

Agilent Spectrum Analyzer - Occupied BV	V						
02 RL RF 50 Ω AC Center Freq 1.962500000	CORREC GHz #IFGain:Low	SENSE:INT Center Freq: 1.96250 Trig: Free Run #Atten: 20 dB	ALIO 00000 GHz Avg Hold: 10 Ext Gain: -10	0/100 .00 dB	01:25:22 PI Radio Std: Radio Dev	4 Oct 12, 2016 None ice: BTS	Frequency
10 dB/div Ref 50.00 dBm							
40.0	mander	***-**********************************	ar when any				<b>Center Freq</b> 1.962500000 GHz
20.0				۲ ۲			
0.00				VI.na	n de la company de la comp	Conflightenting	
-20.0							
Center 1.963 GHz					Spa	n 10 MHz	
#Res BW 100 kHz		#VBW 3001	KHZ		#Swee	ep 50 ms	CF Step 1.000000 MHz
Occupied Bandwidth	ı	Total P	ower	51.3	dBm		<u>Auto</u> Man
4.4	4981 MH	Z					Freq Offset
Transmit Freq Error	-1.574 kł	lz OBW P	ower	99	0.00 %		0 Hz
x dB Bandwidth	4.934 MH	lz xdB		-26.	00 dB		
MSG				STATUS	5		





#### [LTE 5 MHz AGC threshold Downlink High]

[LTE 5 MHz +3dB above the AGC threshold Downlink Low]

Agilen	t Spectrum	n Analyzer - Occ	upied BW	/									
KI RI	tor Fro	RF 50 Ω	AC		Cent	SENSE:INT	2500000 GHz	ALIGN/	AUTO	01:45:49 P	M Oct 12, 2016	F	requency
Cell		q 1.95250	0000	GHZ	Trig: Free Run Avg Hold: 10			ld: 100/1	100/100				
			i	#IFGain:Lo	w #Atte	en: 20 dB	Ext Gai	n: -10.00	DqB	Radio Dev	rice: BTS		
10 di Loa	3/div	Ref 50.00	0 dBm										
40.0							A AND A MIN						Center Freq
30.0				mouran	and later to be a second and	ĸ₽∿ġ₽°ijĸŗġţĬĸĿ₩∕ţĸĨ`₩	****	····				1.93	2500000 GHz
20.0								{					
10.0								1	<b>\</b>				
0.00			1 - 110 kV						M.G. Bar				
-10.0		and pressing the second se	l <sup>e</sup> nten ille						WY W	WWRATHAN	in hereiter auf all all		
-20.0	er tes												
-30.0													
-40.0													
Cen #Po	ter 1.93	33 GHZ				#VBM 300	1682			Spa #Swo	n 10 MHz an 50 me		CF Step
#NG	5 0 9 9	OO KHZ				#VDVV JU	J KHZ			#GWee	ep Joins		1.000000 MHz
0	ccupi	ed Band	width			Total	Power		51.5	dBm		Auto	Man
			<u> </u>	1924	MHz								
				10/21									Freq Offset
Ti	ransmi	t Freq Err	or	18.7	'63 kHz	OBW	Power		99	.00 %			0 Hz
x	dB Ba	ndwidth		4.9	31 MHz	x dB			-26.0	)0 dB			
MSG									STATUS				





#### [LTE 5 MHz +3dB above the AGC threshold Downlink Middle]

[LTE 5 MHz +3dB above the AGC threshold Downlink High]

Agilent Spectrum Analyzer - Occupied BW			
LX RL RF 50Ω AC CORREC	SENSE:INT	ALIGNAUTO 01:41:33PM Oct 12, Radio Std: None	2016 Frequency
Center Fred 1.992500000 GH2	Trig: Free Run Avg Ho	Id: 100/100	
#IFGain:Lov	v #Atten: 20 dB Ext Gai	n: -10.00 dB Radio Device: BT	s
10 dB/div Ref 50.00 dBm			
40.0			Center Fred
30.0	and a second and a second s		1 992500000 GHz
20.0			1.552666666 6112
10.0			
10.0			
had the walk pertails the property in the		Unterel west with the phone	d 144
-20.0			anage.
30.0			
-40.0			
Center 1.993 GHz		Span 10 ľ	VIHz
#Res BW 100 kHz	#VBW 300 kHz	#Sweep 50	ms 1 000000 MHz
	Tetal Demor	Ed C alDen	<u>Auto</u> Man
Occupied Bandwidth	Total Power	51.0 dBm	
4.4872	MHz		Freg Offset
Trancmit From Error 47.40		00.00 %	0 Hz
	OBW Power	99.00 %	
x dB Bandwidth 4.92	5 MHz x dB	-26.00 dB	
MSG		STATUS	



# LTE 10 MHz DL\_Output



#### [LTE 10 MHz AGC threshold Downlink Low]

# [LTE 10 MHz AGC threshold Downlink Middle]

Agilent Spectrum Analyzer - Occupied	BW					
X RL RF 50Ω AC		SENSE:INT Center Freg: 1.96250	ALIGN	NAUTO 02:18:11 P Radio Std	M Oct 12, 2016	Frequency
Center Fred 1.50250000		Trig: Free Run	Avg Hold: 100	/100		
	#IFGain:Low	#Atten: 20 dB	Ext Gain: -10.0	DO dB Radio Dev	/ice:BTS	
10 dB/div Ref 50.00 dE	m					
40.0						Center Freq
30.0	and the second states	and the second				1.962500000 GHz
20.0	_{		\	l		
10.0	<u> </u>					
0.00						
-10.0	4			Wall Mary Robert	with program	
-20.0						
-30.0						
-40.0						
Center 1.963 GHz		#\/D\// 560 L		Spa #Suuce	in 20 MHz	CF Step
#RES DW 180 KHZ		#VEVV 300 P	17	#SWe	ep ou ms	2.000000 MHz
Occupied Bandwid	th	Total P	ower	51.9 dBm		<u>Auto</u> Man
0	9639 ML	17				
0	.3033 101	12				Freq Offset
Transmit Freq Error	-16.557 k	Hz OBW P	ower	99.00 %		0 Hz
x dB Bandwidth	9.626 M	Hz xdB		-26.00 dB		
MSG				STATUS		





### [LTE 10 MHz AGC threshold Downlink High]

[LTE 10 MHz +3dB above the AGC threshold Downlink Low]

Agilent Spectrum Analyzer - Occ	cupied BW				
LX/ RL RF 50Ω	AC CORREC	SENSE:INT	ALIGN AUTO	02:27:03 PM Oct 12, 2016	Frequency
Center Fred 1.93500		Trig: Free Run	Avg Hold: 100/100	Radio Sta. None	
	#IFGain:Low	#Atten: 20 dB	Ext Gain: -10.00 dB	Radio Device: BTS	
10 dB/div Ref 50.0	0 dBm				
40.0					Contor From
20.0	and the second states	Really and the second second	droom		Center Freq
30.0					1.935000000 GHZ
20.0					
10.0					
0.00	. mm		mathe	when me and the fill and	
-10.0					
-20.0					
-30.0					
-40.0					
Center 1 935 GHz				Snan 20 MH	
#Res BW 180 kHz		#VBW 560 k	Hz	#Sweep 50 ms	CF Step
				-	Auto Man
Occupied Band	width	Total P	ower 52.	.0 dBm	
	8.9284 M	-IZ			Ener Offerst
					FreqOffset
Transmit Freq Err	or 37.727 k	HZ OBW P	ower 9	9.00 %	0 Hz
x dB Bandwidth	9.551 N	lHz xdB	-26	6.00 dB	
MSG			STAT	US	





#### [LTE 10 MHz +3dB above the AGC threshold Downlink Middle]

[LTE 10 MHz +3dB above the AGC threshold Downlink High]

Agilent Spectrum Analyzer - Occupied I	3W						
KL RF 50 Ω AC Contor From 1 00000000		SENSE:INT	ALIO	GNAUTO	02:23:48 PM	4 Oct 12, 2016	Frequency
Cerner Fred 1.99000000	, GH2 →-	Trig: Free Run	00/100				
	#IFGain:Low	#Atten: 20 dB	Ext Gain: -10	.00 dB	Radio Dev	ice: BTS	
10 dB/div Ref 50.00 dB	n						
40.0							Comton Enon
20.0	and the second states and	Mannananan	montenne				
20.0	/			\ I			1.99000000 GH2
10.0				1			
0.00							
10.0							
20.0 antillingel American and any and the				Leven	Texture and the second		
20.0						where a starter warder	
.40.0							
40.0							
Center 1.99 GHz					Spa	n 20 MHz	CE Sten
#Res BW 180 kHz		#VBW 5601	KHZ		#Swee	ep 50 ms	2.000000 MHz
Occupied Bandwidt	th	Total P	ower	51.9	dBm		<u>Auto</u> Man
occupica Baildina	0206 ML	1-					
O.	3200 111	12					Freq Offset
Transmit Freq Error	-35.527 k	Hz OBW P	Power	99	.00 %		0 Hz
x dB Bandwidth	9.592 M	Hz xdB		-26.0	)0 dB		
MSG				STATUS			
				_			



# CDMA DL\_Output

[CDMA AGC threshold Downlink Low]



### [CDMA AGC threshold Downlink Middle]

Agilent Spectrum	Analyzer - Oc	cupied BW								
LXI RL	RF 50 Ω		SEI	NSE:INT reg: 1 96250	AI	LIGNAUTO	10:59:17 A	MOct 12, 2016	F	requency
Center Fred	q 1.90250	00000 GH2	Trig: Free	e Run	Avg Hold: 5	00/500				
		#IFGain:Low	#Atten: 20	0 dB	Ext Gain: -'	10.00 dB	Radio Dev	ice: BTS		
10 dB/div	Ref 50.0	0 dBm								
Log										
40.0		Mann	mm	mon	mon				100	Center Freq
30.0						<b>N</b>			1.96	2500000 GHz
20.0										
10.0										
0.00										
-10.0	man	and the second				MARC .	manylyn	1.000		
-20.0 -20.0								C. VIGWA		
-30.0										
-40.0										
Center 1.96	3 GHz				·		Sp	an 3 MHz		05.04
Res BW 27	kHz		#VE	3W/82 kH	z		Sweep	3.933 ms		CF Step 300.000 kHz
Occupie	ed Band	width		Total P	ower	51.9	dBm		<u>Auto</u>	Man
		1 3024 1								
		1.5024	11 12							Freq Offset
Transmit	Freq Err	ror 4	56 Hz	OBW P	ower	99	9.00 %			0 Hz
x dB Ban	ndwidth	1.433	MHz	x dB		-26.	00 dB			
MSG						STATU	5			
						_	-		_	







# [CDMA +3dB above the AGC threshold Downlink Low]

Agilent Spectrum Analyzer - Occupie	ed BW						
Center Freq 1.9312500		SENSE:INT Center Freq: 1.9312	50000 GHz	.IGN AUTO	11:13:22 AF	40ct 12, 2016 None	Frequency
	+⊫ #IEGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold: 5 Ext Gain: -1	00/500 0.00 dB	Radio Dev	ice: BTS	
10 dB/div Ref 50.00 d	Bm						
40.0							Center Fred
30.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mar have been a for	un m				1.931250000 GHz
20.0				Υ			
10.0				$\square$			
0.00							
-10.0				harrow	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
-20.0 - when have a second sec						Muran and and and and and and and and and a	
-30.0							
-40.0							
Center 1.931 GHz					Sp	an 3 MHz	CE Sten
Res BW 27 kHz		#VBW 82 k	HZ		Sweep	3.933 ms	300.000 kHz
Occupied Bandwi	idth	Total F	ower	51.9	dBm		<u>Auto</u> Man
	1.2996 MH	17					En a Offerst
Tronomit From France	4 242 1			00	00.1/		
	4.31Z M		ower	99	.00 %		0112
x dB Bandwidth	1.432 №	Hz xdB		-26.0	)0 dB		
MSG				STATUS			





#### [CDMA +3dB above the AGC threshold Downlink Middle]

[CDMA +3dB above the AGC threshold Downlink High]

Agilent	Spectrum	Analyzer - Oc	cupied B	N									
LXI RL		RF 50 Ω	2 AC	CORREC	Contor	SENSE:INT	50000 GH-	ALIGN	AUTO	11:04:46 A	MOct 12, 2016	F	requency
Cent	er ⊦reo	q 1.9937	50000	GHZ	Trig: Fi	Tria: Free Run AvalHold: 50			500/500				
				#IFGain:Low	#Atten:	20 dB	Ext Gair	n: -10.00	0 dB	Radio Dev	rice: BTS		
10 dB	/div	Ref 50.0	00 dBm	۱ <sub>.</sub>									
40.0													Center Fred
30.0				mann	man	reven	- mark	-				1 00	3750000 GHz
20.0								7				1.9	5750000 GH2
20.0								$\langle \rangle$					
10.0													
0.00		1 An	mound						han	m An			
-10.0	᠕ᡶ᠕᠕᠕										- www.		
-20.0 –													
-30.0													
-40.0													
Cent	er 1 00									Sn	an 3 MHz		
Res I	SW 27	kHz			#\	/BW 82 k	Hz			Sweep	3.933 ms		CF Step
												Auto	300.000 KHZ Man
00	ccupie	ed Banc	lwidt	h		Total I	ower		52.1	dBm			
			1 :	3053 N	IH7								
													FreqOffset
Tra	ansmit	Freq Er	ror	2.761	kHz	OBW	Power		99	.00 %			0 Hz
xc	lB Bar	ndwidth		1.435	MHz	x dB			-26.	00 dB			
MSG									STATUS				
								_	0171100			_	



# LTE 5 MHz UL\_Output



#### [LTE 5 MHz AGC threshold Uplink Low]

[LTE 5 MHz AGC threshold Uplink Middle]

Agilent Spec	trum Analyzer - Occu	ipied BW						
LXI RL Contor	RF 50Ω		SENSE:INT	AL 500000 GHz	IGNAUTO	03:16:35 PM Radio Std:	1 Oct 12, 2016	Frequency
Center	Freq 1.882500	5000 GH2	Trig: Free Run	Avg Hold: 1	00/100			
		#IFGain:Low	#Atten: 20 dB			Radio Dev	ice: BTS	
10 dB/div	Ref 40.00	dBm			·			
30.0								Center Freg
20.0		and the second second	entry alter all and a strategy and	had an and the second	<b>.</b>			1.882500000 GHz
10.0					<u>\</u>			
0.00		/						
-10.0		_/						
-20.0					Viordan			
-30.0	Mar					a sea a s	monor	
-40.0								
-50.0								
Center	1.883 GHz					Spai	n 10 MHz	CE Step
#Res Bv	V 100 kHz		#VBW 300	kHz		#Swee	p 50 ms	1.000000 MHz
Occi	inied Bandy	width	Total	Power	38.3	dBm		<u>Auto</u> Man
			11_					
		4.5007 10	HZ					Freq Offset
Trans	smit Freg Erro	or 1.543	kHz OBW	Power	99.	00 %		0 Hz
v dB	Bandwidth	1 0/8			-26.0	0 dB		
A UB	Bandwidth	4.540			-20.0	uв		
MSG					STATUS			





### [LTE 5 MHz AGC threshold Uplink High]



Agilent Spectru	m Analyzer - Occ	cupied BV	/										
(XI RL Contor Erd	RF 50 Ω	AC			SEI	NSE:INT reg: 1.85250	0000 GHz	ALI	GNAUTO	03:14:49 P	M Oct 12, 2016	F	requency
Center Fre	sq 1.05250	0000	GHZ	j	rig: Fre	Run	Avg Hol	d: 10	0/100				
			#IFGain:I	_ow#	Atten: 20	Jab				Radio Dev	rice: BTS		
10 dB/div	Ref 40.0	0 dBm				1	1	_		1			
30.0													Center Freg
20.0			m	man	(puttingeneral)	مىر مەرىكەر مىرىمىيى مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكەر مەرىكە مەر		4.00°A				1.85	2500000 GHz
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0.00									1				
-10.0		ļ/							1				
-20.0													
-30.0	(barry realistic for the	a walk								Nest ward	and an all a superior		
-40.0													
-50.0													
30.0													
Center 1.8	53 GHz									Spa	n 10 MHz		CE Sten
#Res BW	100 kHz				#VE	SW 300 k	Hz			#Swee	ep 50 ms		1.000000 MHz
Occup	ied Band	width	,			Total P	ower		38.4	dBm		<u>Auto</u>	Man
Occup			040										
		4.4	1942	IVIHZ	<u>/</u>								Freq Offset
Transm	it Freq Err	or	-1.	649 kH	z	OBW P	ower		99	0.00 %			0 Hz
x dB Ba	ndwidth		4	944 MH	7	x dB			-26	00 dB			
	anamatri				_	A GE			201				
NEC									CTA71				
MSG									STATUS				







#### [LTE 5 MHz +3dB above the AGC threshold Uplink Middle]



Agilent	t Spectrum Analy	/zer - Occ	upied BW	/										
L <mark>XI</mark> RL	RF	50 Ω	AC	CORREC		9	SENSE:INT		ALIC	GNAUTO	04:02:15P	M Oct 12, 2016	F	requency
Cent	ter Freq 1.	91250	0000	GHz		Center Trig: Fr	Freq: 1.9125 ee Run	00000 GHz AvalHo	ld: 10	0/100	Radio Std	: None		requeriey
				#IFGain:	Low	#Atten:	20 dB				Radio Dev	/ice: BTS		
10 dE	3/div <b>R</b> e	ef 40.00	0 dBm											
30.0														Contor From
20.0				man	-mar aller	Langth-Weiserha	www.www.www.	of Werthness and the	walk the				10	Center Freq
20.0			1							1			1.9	12500000 GHZ
10.0			1							1				
0.00										1				
-10.0														
-20.0	Proton of the Way of the	- Andrewske a	a Frank							- <b>1</b>	the work with			
-30.0												and a part when		
-40.0														
-50.0														
000.0														
Cent	ter 1.913 G	Hz									Spa	n 10 MHz		CE Sten
#Res	s BW 100 k	Hz				#\	/BW 300	kHz			#Swe	ep 50ms		1.000000 MHz
		Donali					Total P	owor		20/	1 dBm		<u>Auto</u>	Man
	ccupied	Band	wiatr	1			ινιαι Γ	Ower		JO.4	+ UDIII			
			4.4	932	2 MF	Z								Freq Offset
Tr	ansmit Fre	eq Erre	or	-4	.421 k	Hz	OBW	ower		99	9.00 %			0 Hz
x	dB Bandw	idth		4.	937 N	Hz	x dB			-26.	.00 dB			
MSG										STATU	s			
					_				_	_				



# LTE 10 MHz UL\_Output



#### [LTE 10 MHz AGC threshold Uplink Low]

# [LTE 10 MHz AGC threshold Uplink Middle]

Agilent Spectrum Analyzer - Occupied	I BW					
Center Freg 1.88250000		SENSE:INT Center Freq: 1.88250	0000 GHz	DTO [02:46:43PM Radio Std:	1 Oct 12, 2016 None	Frequency
	+iECainil aw	Trig: Free Run #Atten: 20 dB	Avg Hold: 100/10	0 Radio Dev	ice: BTS	
	#IFGall.LUW	HIGHLE WE		That Del	100.010	
10 dB/div Ref 40.00 dE	3m					
20.0						Contor From
20.0	market and an and them	Borgonado and an an an and the				1 882500000 GHz
10.0	/					1.862300000 GHz
0.00			\			
-10.0						
-20.0	N		\	Water Street and a second		
-30.0					all have frequention	
-40.0						
-50.0						
Contor 1 002 Olla				<b>C</b> rac	- 20 MU-	
#Res BW 180 kHz		#VBW 560 k	Hz	sµa #Swee	20 MHZ	CF Step
						2.000000 MHz Auto Man
Occupied Bandwic	lth	Total P	ower 3	39.0 dBm		
8	8.9573 MH	lz				Freg Offset
Transmit Freq Error	-3.921 k	Hz OBW P	ower	99.00 %		0 Hz
x dB Bandwidth	9.640 N	lHz xdB		-26.00 dB		
MSG			S	TATUS		





### [LTE 10 MHz AGC threshold Uplink High]

[LTE 10 MHz +3dB above the AGC threshold Uplink Low]

Image: Note of the service o
Center Freq     Trig: Free Run     Avg Hold: 100/100     Radio Device: BTS       10 dB/div     Ref 40.00 dBm     Center Freq     Center Freq     1.85500000 GF       200     10.0     1.00     1.00     1.85500000 GF     1.85500000 GF
Image: Wire of the second s
10 dB/div     Ref 40.00 dBm     Center Fre       30 0
Center Fre     Center Fre       20.0     10.0
30.0 Center Fra 20.0 10.0 Center Fra 1.85500000 Ge
20.0 10.0 1.85500000 GI
20.0 Karran market and the second sec
-40.0
50.0
Center 1.855 GHz Span 20 MHz
#Res BW 180 kHz #VBW 560 kHz #Sweep 50 ms 2.000000 MI
Occupied Bandwidth Total Power 39.2 dBm
Freq Offs
Transmit Freq Error -7.939 kHz OBW Power 99.00 %
x dB Bandwidth 9.611 MHz x dB -26.00 dB
MSG STATUS







#### [LTE 10 MHz +3dB above the AGC threshold Uplink Middle]

[LTE 10 MHz +3dB above the AGC threshold Uplink High]

Agilent Spectrum Analyzer - Occupied B	W				
LX/RL RF 50Ω AC	CORREC	SENSE:INT	ALIGNAUTO	02:56:06 PM Oct 12, 2016	E
Center Freq 1.91000000	GHz Ce	nter Freq: 1.9100000	0 GHz	Radio Std: None	Frequency
	Tri	g:FreeRun A	vg Hold: 100/100	Dedie Deuleer DTC	
	#IFGain:Low #A	tten: 20 dB		Radio Device: B15	-
10 dB/div Ref 40.00 dBr	n				
Log					
30.0		an and an a survey of the	4		Center Freq
20.0			Watt TV Inestal Day		1.91000000 GHz
10.0	<b>/</b>		A		
0.00					
10.0					
-10.0					
-20.0 What a los and a start of the second				Without	
-30.0					
-40.0				Marthan Martine Ma Martine Martine Mar	
-50.0					
30.0					
Center 1.91 GHz				Span 20 MHz	
#Res BW 180 kHz		#VBW 560 kHz		#Sweep 50 ms	CF Step
					2.000000 MHZ
Occupied Bandwidt	h	Total Pow	er 38.9	9 dBm	Auto
8.	9576 IVIHZ				Freq Offset
Trancmit From Error	12 724 64-		or 00	0.00 %	0 Hz
Hansmit Freq Entor	-12.721 KHZ	OBW FOW	'ଟା ଅ 	9.00 %	
x dB Bandwidth	9.610 MHz	x dB	-26.	00 dB	
MSG			STATU	S	



# CDMA UL\_Output

[CDMA AGC threshold Uplink Low]



### [CDMA AGC threshold Uplink Middle]

Agilent Spectrum Analyzer - Occupied BW							
LX RL RF 50 Ω AC	CORREC GHZ	SENSE:INT Center Freq: 1.882	500000 GHz	ALIGN AUTO	09:18:18 Al Radio Std:	MOct 13, 2016	Frequency
		Trig: Free Run	Avg Hold:	500/500	Padia Dou	ico: BTS	
	FIFGain:Low	#Atten: 20 dB			Radio Dev	ice. BTS	
10 dB/div Ref 40.00 dBm				-			
30.0 <b></b>							Center Fred
20.0	mm	mm	mm				1.882500000 GHz
10.0	/			14			
0.00							
-10.0				<u>}</u>			
-20.0					<u></u>		
-30.0					Jul and a second	man	
-40.0							
-50.0							
					0		
Res BW 27 kHz		#VBW 82 k	Hz		Sween	an 3 MHZ 3.933 ms	CF Step
							300.000 kHz Auto Man
Occupied Bandwidth		Total	Power	38.5	5 dBm		<u>Auto</u> man
1.2	2813 MH	Z					Freq Offset
Transmit Freq Error	5.859 kH	z OBW	Power	99	9.00 %		0 Hz
x dB Bandwidth	1.423 MH	lz x dB		-26.	00 dB		
MSG				STATUS	5		







# [CDMA +3dB above the AGC threshold Uplink Low]

Agilent Spectrum Analyzer - Occupied	i BW				
X RL RF 50 Ω AC		SENSE:INT enter Freg: 1.851250000	ALIGNAUTO GHz	09:14:29 AM Oct 13, 2016 Radio Std: None	Frequency
	→→ Tr	ig:FreeRun Av tten:20.dB	g Hold: 500/500	Radio Device: BTS	
,	#IFGain:Low #A	aten: 20 GB		Radio Device: B15	
10 dB/div Ref 40.00 dE	3m				
30.0					Center Freq
20.0	mann mann	Martin Martin	m		1.851250000 GHz
10.0					
0.00					
-10.0	/				
-20.0				Mana A.	
-30.0 mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm					
-40.0					
-50.0					
Center 1.851 GHz				Span 3 MHz	CE Oton
Res BW 27 kHz		#VBW 82 kHz		Sweep 3.933 ms	300.000 kHz
Occupied Bandwic	lth	Total Powe	r 38.	5 dBm	<u>Auto</u> Man
1	.3188 MHz				Freq Offset
Transmit Freq Error	-1.445 kHz	OBW Powe	r 9!	9.00 %	0 Hz
x dB Bandwidth	1.454 MHz	x dB	-26	.00 dB	
MSG			STATU	s	





#### [CDMA +3dB above the AGC threshold Uplink Middle]

[CDMA +3dB above the AGC threshold Uplink High]

Agilent Spectrum Analyzer - Occupied BW	
X     RL     RF     50 Ω     AC     CORREC     SENSE:INT     ALIGN AUTO     09:28:51 AMOct 13, 2016	Frequency
Center Freq 1.913750000 GHz Center Freq 1.913750000 GHz Radio Std: None	riequency
#IFGain:Low #Atten: 20 dB Radio Device: BTS	
10 dB/div Ref 40 00 dBm	
30.0	Center Freq
20.0	1.913750000 GHz
.10.0	
20.0 mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	
-40.0	
-50.0	
Center 1 014 CHz Snan 2 MHz	
Res BW 27 kHz #VBW 82 kHz Sween 3 933 ms	CF Step
	300.000 kHz
Occupied Bandwidth Total Power 38.6 dBm	<u>Auto</u> Wan
1.3 I03 I∛I⊓Z	Freq Offset
Transmit Freq Error -2.232 kHz OBW Power 99.00 %	0 Hz
x dB Bandwidth 1 447 MHz x dB -26 00 dB	
MSG STATUS	



# LTE 5 MHz DL\_Input



#### [LTE 5 MHz AGC threshold Downlink Low]

# [LTE 5 MHz AGC threshold Downlink Middle]







#### [LTE 5 MHz AGC threshold Downlink High]



### LTE 10 MHz DL\_Input



#### [LTE 10 MHz AGC threshold Downlink Low]

# [LTE 10 MHz AGC threshold Downlink Middle]

Agilent Spectrum A	nalyzer - Occupied I	3W						
	F 50 Ω AC		SENSE:INT Center Freg: 1.96	0000000 GHz	ALIGN AUTO	04:19:19 Pt Radio Std:	1 Oct 17, 2016 None	Frequency
Center ried	1.30000000	, GHZ ↔	Trig: Free Run	Avg Hold	I: 500/500	Dedie Deu	DTC	
		#IFGain:Low	#Atten: 20 dB			Radio Dev	ICE: B15	
10 dB/div	Ref 30.00 dBi	n						
								Conton From
10.0								
0.00			ma da sud a una	and the second				1.96000000 GH2
-10.0				different of a contract				
-20.0					٦ ٦			
-20.0					۱ Y			
40.0								
50.0	والمروية ويجيدون والمراجع					ᠧᡟᡫᡡᡯᡘᢇᢙᡗᠳ	eren and and a	
-50.0								
-00.0								
Center 1.96	GHz					Spa	n 20 MHz	CE Sten
#Res BW 20	0 kHz		#VBW 62	0 kHz		Swe	ep 1ms	2.000000 MHz
Occupie	d Bandwid	th	Tota	Power	16.3	dBm		<u>Auto</u> Man
	9.	0355 M	Hz					Freq Offset
Transmit	Freq Error	16.426	kHz OBW	Power	99	0.00 %		0 Hz
x dB Band	dwidth	9.988	MHz xdB		-26.	00 dB		
MSG					STATUS	3		





#### [LTE 10 MHz AGC threshold Downlink High]



### CDMA DL\_Input

[CDMA AGC threshold Downlink Low]



### [CDMA AGC threshold Downlink Middle]

Agilent Spectrum Analyzer - Occupied BW						
Center Freg 1.962500000 0	CORREC Ce	SENSE:INT nter Freq: 1.962500	ALIO	GNAUTO  04:22:20 P Radio Std	M Oct 17, 2016 : None	Frequency
	⊷⊷ Tri #ECain:law #At	g: Free Run ten: 20 dB	Avg Hold: 50	0/500 Radio Dev	vice: BTS	
	iroan.cow with			Thur bei		
10 dB/div Ref 30.00 dBm						
						Question From
10.0						Center Freq
0.00	nor and a strain	hanna				1.962500000 GH2
-10.0			· ·			
-20.0			`	<u>\</u>		
-30.0						
-40.0						
-50.0				$\sim \sim $	ᠬ᠕ᡎ᠕᠕	
-60.0						
Center 1.963 GHZ #Res BW 27 kHz		#VBW 82 kH	Z	Sp Sweep	an 3 MHz 3.933 ms	CF Step
Occupied Departuriate		Total Pr	war	16.5 dBm		Auto Man
Occupied Bandwidth		TOTALLE	144 GI	10.5 GBIII		
1.2	762 MHz					Freq Offset
Transmit Freq Error	3.743 kHz	OBW P	ower	99.00 %		0 Hz
x dB Bandwidth	1.424 MHz	x dB		-26.00 dB		
MSG				STATUS		









# LTE 5 MHz UL\_Input



#### [LTE 5 MHz AGC threshold Uplink Low]



Agilent Spectrum Analyzer - Occupied	BW				
Center Freg 1.88250000		SENSE:INT Center Freq: 1.88250	r Freq: 1.882500000 GHz Radio St		Frequency
	+++ #IEGain:Low	Trig: Free Run #Atten: 20 dB	Avg Hold: 500/500	Radio Device: BTS	
10 dB/div Ref 30.00 dE	sm				
20.0					Center Freg
10.0					1.882500000 GHz
0.00	man	and the second secon	marther and		
-10.0			<u> </u>		
-20.0	<i>{</i>				
-30.0					
-40.0 www.www.www.www.			un.	whitemptormanter	
-50.0					
-00.0					
Center 1.883 GHz #Res BW 100 kHz		#VBW 300 k	Hz	Span 10 MHz Sweep 5 ms	CF Step
Occurried Dendusia	141-	Total B	ower 15.9	dBm	Auto Man
Occupied Bandwid			Jwei 13.0	u Bill	
4	.5138 1015	1Z			Freq Offset
Transmit Freq Error	1.094 k	Hz OBW P	ower 99	0.00 %	0 Hz
x dB Bandwidth	5.054 M	Hz xdB	-26.	00 dB	
MSG			STATUS	\$	





[LTE 5 MHz AGC threshold Uplink High]



# LTE 10 MHz UL\_Input



#### [LTE 10 MHz AGC threshold Uplink Low]

[LTE 10 MHz AGC threshold Uplink Middle]







# [LTE 10 MHz AGC threshold Uplink High]



# CDMA UL\_Input

[CDMA AGC threshold Uplink Low]



### [CDMA AGC threshold Uplink Middle]

Agilent Spectrum Analyzer - Occupied BV	/					
Center Freg 1.882500000	GHZ CORREC	SENSE:INT enter Freq: 1.88250	0000 GHz	IGNAUTO  04:13:34 Radio St	PM Oct 17, 2016 d: None	Frequency
	+→ Tr #IEGain:Low #A	rig: Free Run Atten: 20 dB	Avg Hold: 50	00/500 Radio De	evice: BTS	
,	Gameon					
10 dB/div Ref 30.00 dBm						
20.0						Center Fred
10.0						1.882500000 GHz
0.00		man house	m			
-10.0				h		
-20.0				$\rightarrow$		
-30.0						
				hurm	mm	
-50.0						
Center 1.883 GHz Res BW 27 kHz		#VBW 82 kH	7	Sween	pan 3 MHz 3 933 ms	CF Step
		#1011 02 MI	2	Gueep	0.000 1115	300.000 kHz Auto Man
Occupied Bandwidth	ı	Total Po	ower	16.3 dBm		
1.2	2742 MHz					Freq Offset
Transmit Freq Error	1.118 kHz	OBW P	ower	99.00 %		0 Hz
x dB Bandwidth	1.426 MHz	x dB		-26.00 dB		
MSG				STATUS		



[CDMA AGC threshold Uplink High]



# 8. OUT OF BAND REJECTION

#### **FCC Rules**

### Test Requirement(s):

### KDB 935210 D05 v01r01

Out of Band Rejection – Test for rejection of out of band signals. Filter freq. response plots are acceptable.

#### Test Procedures:

Measurements were in accordance with the test methods section 3.3, 4.3 of KDB 935210 D05 v01r01.

- 3.3 Out-of-band rejection
  - a) Connect a signal generator to the input of the EUT.
  - b) Configure a swept CW signal with the following parameters:
    - 1) Frequency range =  $\pm 250$  % of the passband, for each applicable CMRS band.
    - 2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.
    - 3) Dwell time = approximately 10 ms.
    - 4) Number of points = SPAN/(RBW/2).
  - c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.

e) Set the resolution bandwidth (RBW) of the spectrum analyzer to be 1 % to 5 % of the EUT passband, and the video bandwidth (VBW) shall be set to  $\geq$  3 × RBW.

f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.

- g) Place a marker to the peak of the frequency response and record this frequency as f0.
- h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the -20 dB down
- amplitude, to determine the 20 dB bandwidth.
- i) Capture the frequency response of the EUT.
- j) Repeat for all frequency bands applicable for use by the EUT.

#### 4.3 Out-of-band rejection

Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

- a) Connect a signal generator to the input of the EUT.
- b) Configure a swept CW signal with the following parameters:

1) Frequency range =  $\pm$  250 % of the manufacturer's specified pass band.

2) The CW amplitude shall be 3 dB below the AGC threshold (see 4.2), and shall not activate the AGC threshold throughout the test.

- 3) Dwell time = approximately 10 ms.
- 4) Frequency step = 50 kHz.
- c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

d) Set the RBW of the spectrum analyzer to between 1 % and 5 % of the manufacturer's rated passband, and VBW =  $3 \times RBW$ .

e) Set the detector to Peak and the trace to Max-Hold.

f) After the trace is completely filled, place a marker at the peak amplitude, which is designated

as f0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth

(i.e., at the points where the level has fallen by 20 dB).

g) Capture the frequency response plot for inclusion in the test report.

# Test Results:

The EUT complies with the requirements of this section.

Input Signal	Input Level (dBm)		Maximum Amp Gain	
	DL	UL	DL	UL
LTE 5 MHz	-62	-75	105	
LTE 10 MHz				
CDMA				

# [Downlink]

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
1929.5 ~ 1998.1	43.614	105.614

# [Upnlink]

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
1849.30 ~ 1915.64	30.202	105.202



# Plots of Passband Gain and Bandwidth & Out of Band Rejection



[Downlink]

# [Uplink]



# 9. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

#### FCC Rules

### Test Requirement(s):

### § 2.1051 Measurements required: Spurious emissions at antenna terminals:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

#### § 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

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

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

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) *Interference caused by out of band emissions.* If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

Report No.: HCT-R-1611-F007-2

#### **Test Procedures:**

Measurements were in accordance with the test methods section 3.6 and 4.7 of KDB 935210 D05 v01r01.

#### 3.6.1. General

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle and high channels or frequencies within each authorized frequency band of operation. Out-of-band/block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single channel boosters that cannot accommodate two simultaneous signals within the passband, can be excluded from the test stipulated in step a).

3.6.2. Out-of-band/out-of-block emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

If the signal generator is not capable of generating two modulated carriers simultaneously,

then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.

b) Set the signal generator to produce two AWGN signals as previously described.

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.

d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168 [R8], but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168 [R8].

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the EBW or 100 kHz or 1 MHz)

g) Set the VBW =  $3 \times RBW$ .

h) Set the detector to power averaging (rms) detector.

i) Set the Sweep time = auto-couple.
j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (rms) mode.

I) Use the marker function to find the maximum power level.

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.

n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.

o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.

p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.

q) Repeat steps k) to n).

r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.

s) Repeat steps a) to r) with the narrowband test signal.

t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

## 3.6.3. Spurious emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

b) Set the signal generator to produce the broadband test signal as previously described.

c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.

d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).

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g) Set the VBW  $\geq$  3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

The number of measurement points in each sweep must be  $\geq$  (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be



subdivided, depending on the available number of measurement points provided by the spectrum analyzer.2

j) Select the power averaging (rms) detector function.

k) Trace average at least 10 traces in power averaging (rms) mode.

I) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.

m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see § 2.1057). The number of measurement points in each sweep must be  $\geq$  (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

n) Trace average at least 10 traces in power averaging (rms) mode.

o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.

## Notes:

In 9 KHz-150 KHz and 150 KHz-30 MHz bands, RBW was reduced to 1% and 10% of the reference bandwidth for measuring unwanted emission level(typically, 100KHz if the authorized frequency band is below 1GHz) and power was integrated. (1% = +20 dB, 10% = +10 dB)



## Single channel Enhancer Plots of Spurious Emission

## LTE 5 MHz











[Downlink\_Middle]



