

# FCC REPORT

## **FCC Certification**

Applicant Name: ADRF Korea, inc

#### Address:

5-5, Mojeon-Ri, Backsa-Myun, Icheon-City,

Kyunggi-Do, Korea

Date of Issue: July 08, 2015 Test Site/Location: HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majangmyeon, Icheon-si, Gyeonggi-do, Korea Report No.: HCT-R-1506-F075-1

HCT FRN: 0005866421

# FCC ID : N52-ADX-HPR-P

# APPLICANT : ADRF Korea, inc

EUT Type:	DAS(DISTRIBUTED ANTENNA SYSTEM)
Model:	ADX-HPR-P46
Frequency Ranges:	DL:1930 MHz~1995 MHz UL:1850 MHz~1915 MHz
Conducted Output Power:	DL : 50 W(47 dBm) UL : 0.1 mW(-10.00 dBm)
FCC Rules Part(s):	CFR 47, Part 24

Engineering Statement:

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 24 of the FCC Rules under normal use and maintenance.

Report prepared by : Yong Hyun Lee Test engineer of RF Team

Approved by

Approved by : Sang Jun Lee Manager of RF Team

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# <u>Version</u>

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1506-F075	June 30, 2015	- First Approval Report
HCT-R-1506-F075-1	July 08, 2015	-Revised the Output max power



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# 1. CLIENT INFORMATION

#### The EUT has been tested by request of

Company	ADRF Korea, inc 5-5, Mojeon-Ri, Backsa-Myun, Icheon-City, Kyunggi-Do, Korea
Contact Point	Attention/ E-Mail: HK Song/ hk4464@adrftech.com Tel./ H.P. : +82-31-637-4435/ +82-10-3191-4773

- FCC ID: N52-ADX-HPR-P
- APPLICANT: ADRF Korea, inc
- EUT Type: DAS(Distributed Antenna System)
- Model: ADX-HPR-P46
- Frequency Ranges: DL : 1930 MHz ~ 1995 MHz UL : 1850 MHz ~ 1915 MHz
- Conducted Output Power: DL : 50 W(47 dBm) UL : 0.1 mW(-10.00 dBm)
- Antenna Gain(s) : 3 dBi
- Date(s) of Tests: 2015. 05. 18. ~ 2015. 06. 18
- FCC Rules Part(s): CFR Title 47 Part 24
- Measurement standard(s): ANSI/TIA-603-C-2004, KDB 971168 D01 v02r02, KDB 935210 D02 v03, KDB 935210 D05 v01
- Place of Tests: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggido, Korea. (IC Recognition No. : 5944A-3)



# 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, 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 February 28, 2014 (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 SUMMARY

## 3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with

FCC Part 24.

Description Reference		Results
Conducted RF Output Power	§2.1046; §24.232	Compliant
Occupied Bandwidth	§2.1049	Compliant
Out of Band Rejection	KDB 935210 D02 v03	Compliant
Spurious Emissions at Antenna Terminals §2.1051, §24.238		Compliant
Radiated Spurious Emissions	§2.1053, §24.238	Compliant
Frequency Stability	§2.1055, §24.235	N/A 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.



# 4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

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



# **5. TEST EQUIPMENT**

Manufacturer	Model / Equipment	Cal Interval	Calibration Date	Serial No.
Agilent	E4438C /Signal Generator	Annual	09/11/2014	MY42082646
Agilent	N5182A /Signal Generator	Annual	04/07/2015	MY50141649
NANGYEUL CO., LTD.	NY-THR18750/ Temperature and Humidity Chamber	Annual	10/29/2014	NY-2009012201A
Agilent	N9020A /Signal Analyzer	Annual	04/10/2015	US46220219
WEINSCHEL	67-30-33 / Fixed Attenuator	Annual	11/04/2014	BU5347
Weinschel	AF9003-69-31 / Step Attenuator	Annual	10/24/2014	11787
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
MITEQ	AMF-6D-001180-35-20P/AMP	Annual	09/04/2014	1081666
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	09/01/2014	147
Schwarzbeck	VULB 9160/TRILOG Antenna	Biennial	11/17/2014	3150

# 6. RF OUTPUT POWER

#### **Test Requirements:**

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

**§ 2.1046 (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.

**§ 2.1046 (b)** For single sideband, independent sideband, and single channel, controlled carrier radiotelephone 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.

§ 2.1046 (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) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below. See §24.53 for HAAT calculation method.

Base station antenna heights may exceed 300 meters with a corresponding reduction in power; see Table 1 of this section.

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

#### **Test Procedures:**

Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05 v01.

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 of (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 the output power of the EUT and record (Power measurement with a spectrum analyzer).

g) Remove the EUT from the measurement setup and using the same signal generator settings, repeat the power measurement on the input signal to the EUT and record as input power.

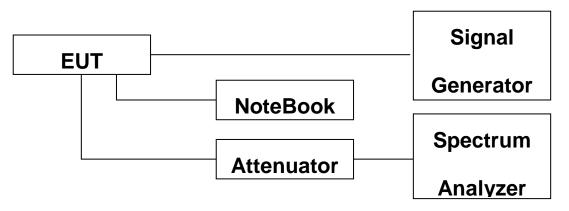
h) Repeat the procedure with the narrowband test signal.

i) Repeat the procedure for both test signals with input signal amplitude set to 3 dB above the AGC threshold level.

j) Repeat 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.



Block Diagram 1. RF Power Output Test Setup



## **Test Results:**

Input Signal	Input Level (dBm)	Maximum Amp Gain
LTE 20 MHz	DL : -5.0 dBm UL : -47.0 dBm	DL : 51 dB UL : 38 dB



[Downlink]

	Obernal	Frequency	Output Power	
	Channel	(MHz)	(dBm)	(W)
	Low	1940.00	46.99	50.00
LTE 20MHz (AGC threshold)	Middle	1962.50	46.97	49.77
	High	1985.00	46.79	47.75
LTE 20MHz ('+3dBm above the AGC threshold )	Low	1940.00	46.70	46.77
	Middle	1962.50	46.75	47.32
	High	1985.00	46.22	41.88

# [Uplink]

	Channel	Frequency (MHz)	Output Power	
	Channel		(dBm)	(mW)
LTE 20MHz (AGC threshold)	Low	1860.00	-8.31	0.148
	Middle	1882.50	-8.29	0.148
	High	1905.00	-8.81	0.132





## Plots of RF Output Power



## [LTE 20MHz Downlink Low]\_( AGC threshold)

[LTE 20MHz Downlink Middle] \_( AGC threshold)





## [LTE 20MHz Downlink High] \_( AGC threshold)

## [LTE 20MHz Downlink Low]\_( '+3dBm above the AGC threshold)





## [LTE 20MHz Downlink Middle] \_( '+3dBm above the AGC threshold)

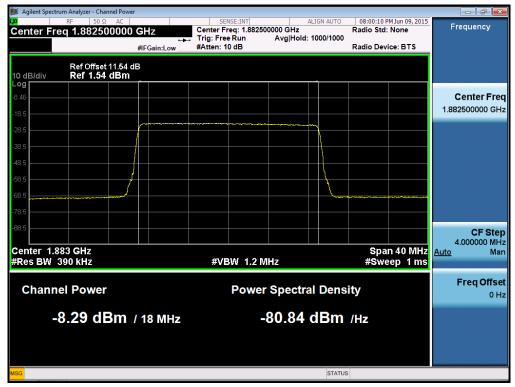
## [LTE 20MHz Downlink High] \_( '+3dBm above the AGC threshold)



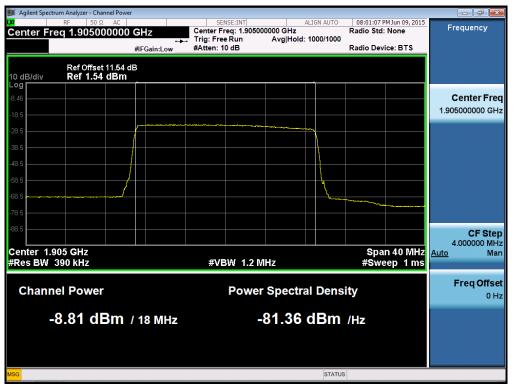


## [LTE 20MHz Uplink Low]\_( AGC threshold)

## [LTE 20MHz Uplink Middle] \_( AGC threshold)







## [LTE 20MHz Uplink High] \_( AGC threshold)



# 7. OCCUPIED BANDWIDTH

#### 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 v01 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 OBW.

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

NOTE—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) Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

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

m) Compare the spectral plot of the input signal (determined from step I) to the output signal
 (determined from step k) 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.

n) Repeat for all frequency bands authorized for use by the EUT.

## **Test Results:** The EUT complies with the requirements of this section.

Input Signal	Input Level (dBm)	Maximum Amp Gain
LTE 20 MHz	DL : -5.0 dBm UL : -47.0 dBm	DL : 51 dB UL : 38 dB

## [Downlink Output]

	Channel	Frequency (MHz)	OBW (MHz)
	Low	1940.00	17.926
LTE 20MHz	Middle	1962.50	17.926
	High	1985.00	17.900

## [Downlink Input]

	Channel	Frequency (MHz)	OBW (MHz)
	Low	1940.00	17.925
LTE 20MHz	Middle	1962.50	17.939
	High	1985.00	17.937

## [Uplink Output]

	Channel	Frequency (MHz)	OBW (MHz)
	Low	1860.00	17.937
LTE 20MHz	Middle	1882.50	17.913
	High	1905.00	17.871

## [Uplink Input]

	Channel	Frequency (MHz)	OBW (MHz)
LTE 20MHz	Low	1860.00	17.941
	Middle	1882.50	17.928
	High	1905.00	17.931

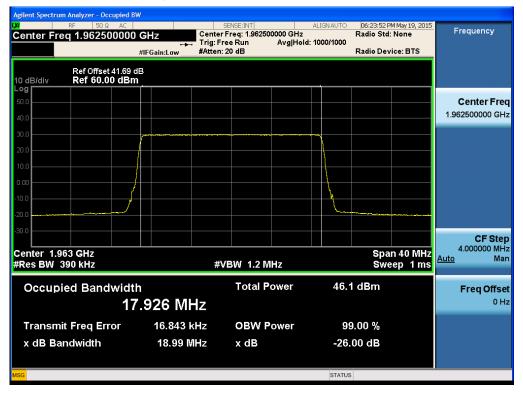


## Plots of Occupied Bandwidth

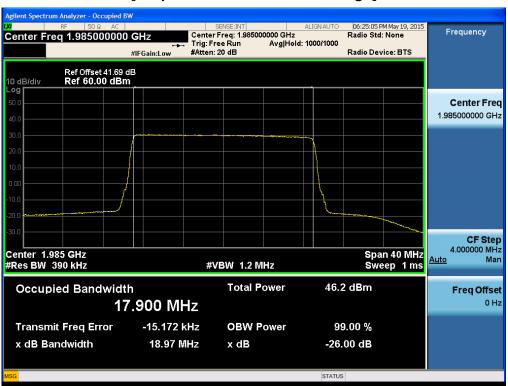
enter Fre	rf 50 Ω AC q 1.940000000	) GHz #IFGain:Low	SENSE:INT Center Freq: 1.94 Trig: Free Run #Atten: 20 dB		ALIGN AUTO	D6:23:07 P Radio Std: Radio Dev		Frequency
0 dB/div	Ref Offset 41.69 Ref 60.00 dBr							
<b>og</b> 60.0 10.0								Center Fre 1.940000000 G⊦
0.0 0.0				····				
0.0								
0.0						martilitier	manna	
0.0								CF Ste 4.000000 M⊦
enter 1.94 Res BW 3			#VBW 1.2	2 MHz		Spa Swe	n 40 MHz ep 1 ms	Auto Ma
Occupie	ed Bandwidt 17	։հ 7.926 MI		Power	46. <i>′</i>	l dBm		Freq Offs( 0 ⊦
Transmit	Freq Error	38.277	kHz OBW	/ Power	99	9.00 %		
x dB Bar	ndwidth	18.96 N	/IHz xdB		-26.	00 dB		

## [Output LTE 20MHz Downlink Low]

## [Output LTE 20MHz Downlink Middle]







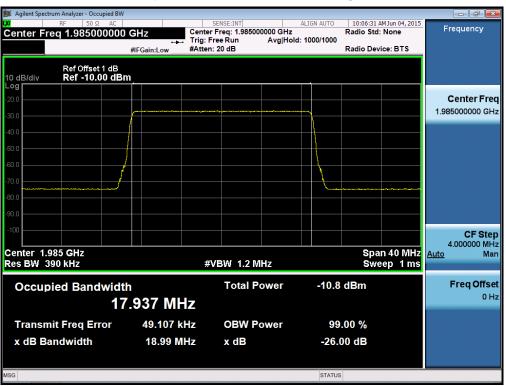
## [Output LTE 20MHz Downlink High]



## [Input LTE 20MHz Downlink Low]

#### [Input LTE 20MHz Downlink Middle]





## [Input LTE 20MHz Downlink High]

## [Output LTE 20MHz Uplink Low]



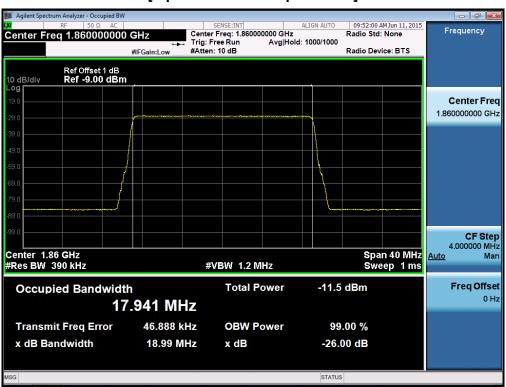
#### [Output LTE 20MHz Uplink Middle]







## [Output LTE 20MHz Uplink High]



### [Input LTE 20MHz Uplink Low]

#### [Input LTE 20MHz Uplink Middle]







## [Input LTE 20MHz Uplink High]

# 8. OUT OF BAND REJECTION

## Test Requirement(s): KDB 935210 D02 v03

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 of KDB 935210 D05 v01.

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 from the center of the passband.

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 = approx. 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 of the spectrum analyzer to be 1 % to 5 % of the passband and the video bandwidth shall be set to  $\geq$  3  $\times$  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. Capture the frequency response of the EUT.

Input Level (dBm) Input Signal : Sinusoidal	Maximum Amp Gain
DL: -5.0 dBm	DL : 51 dB
UL : -47.0 dBm	UL : 38 dB

**Test Results:** The EUT complies with the requirements of this section.



# [Downlink]

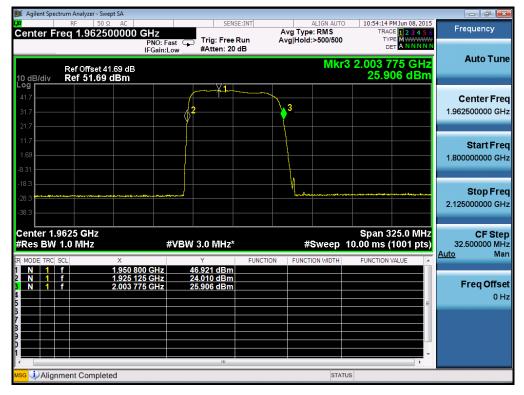
20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)	
1925.125 ~ 2003.775	46.92	51.92	

# [Uplink]

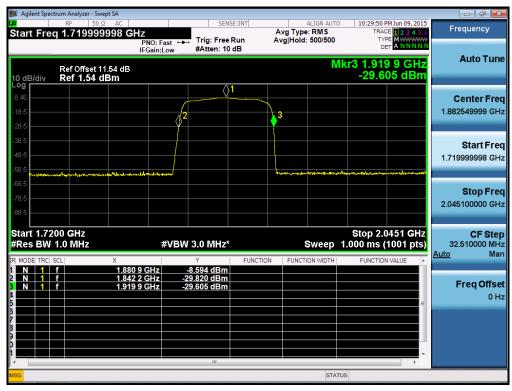
20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)	
1842.20 ~ 1919.90	-8.59	38.41	

#### Out of Band Rejection

[Downlink]



#### [Uplink]





# 9. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

# 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.

**Test Procedures:** Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05 v01.

#### 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).

2. EUT out-of-band/block emissions conducted measurement

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

NOTE—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 the two-tone test.

b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).

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 of interest.

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, 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.

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 emission bandwidth, 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 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 (i.e., 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 the procedure with the composite input power level set to 3 dB above the AGC threshold.

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

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. EUT spurious emissions conducted measurement

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 (e.g., 4.1 MHz OBW AWGN).

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). g) Set the VBW  $\geq$  3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the analyzer start frequency to the lowest radio frequency 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. NOTE—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.

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

k) Trace average at least 10 traces in power averaging (i.e., 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 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 analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see §2.1057). Note that 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 (i.e., 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 and provide tabular data, if required.

p) Repeat the procedure with the input test signals tuned to a middle band/block frequency/channel and then a high band/block frequency/channel.

q) Repeat entire procedure with the narrowband test signal.

r) Repeat for all authorized frequency bands/blocks used by the EUT.

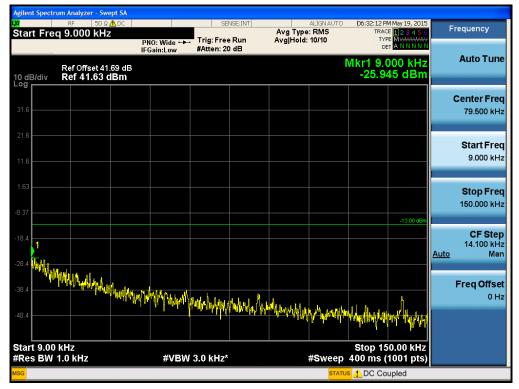
**Test Results:** The EUT complies with the requirements of this section. There were no Detectable Spurious emissions for this EUT.



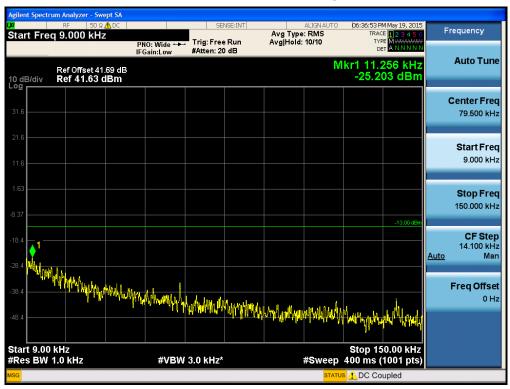
#### Plots of Spurious Emission Conducted Spurious Emissions (9 kHz – 150 kHz) [LTE 20MHz Downlink Low]



## [LTE 20MHz Downlink Middle]







#### [LTE 20MHz Downlink High]

#### [LTE 20MHz Uplink Low]







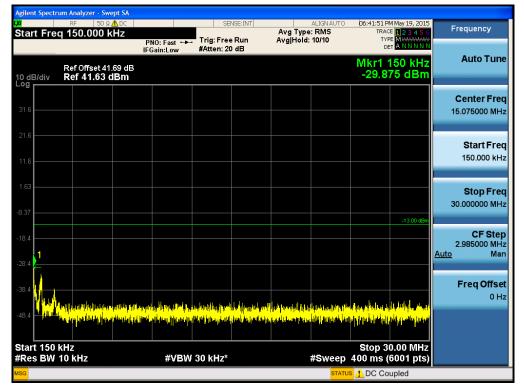
#### [LTE 20MHz Uplink Middle]



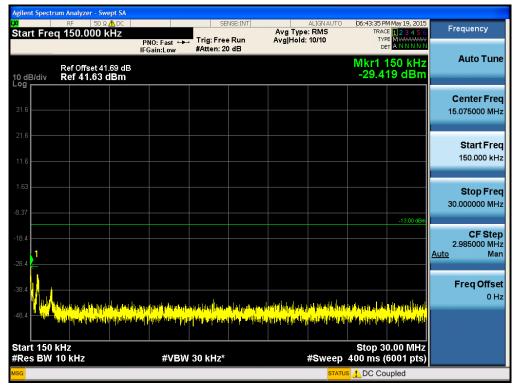


# Conducted Spurious Emissions (150 kHz – 30 MHz)

#### [LTE 20MHz Downlink Low]



#### [LTE 20MHz Downlink Middle]





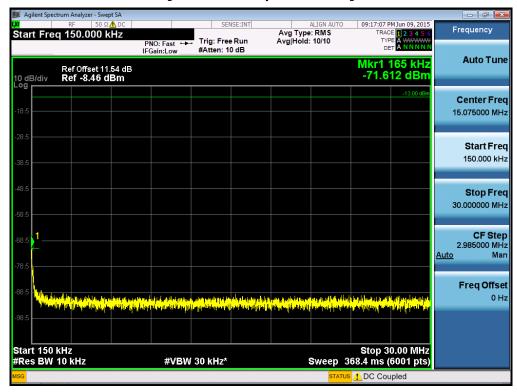
								-		
Agilent Spectrun		Pept SA		CE	NSE:INT		ALIGNAUTO	D6:44:00 D	4 May 19, 2015	
Start Freq		kHz P	NO: Fast ↔⊷ Gain:Low		Run	Avg Type Avg Hold:	RMS	TRAC	E 1 2 3 4 5 6 E MWWWW T A NNNN	Frequency
	Ref Offset 41 <b>Ref 41.63</b>	1.69 dB	Sum E Sw					Mkr1 7 -29.7	150 kHz 47 dBm	Auto Tune
31.6										Center Freq 15.075000 MHz
11.6										Start Freq 150.000 kHz
-8.37									-13.00 dBm	Stop Freq 30.000000 MHz
-18.4										CF Step 2.985000 MHz <u>Auto</u> Man
-38.4	'a (1 <sup>11</sup> ) <sup>(</sup> dan serie dan ser	in satisfact days	l sont held cit. Is, si	duk ika andaka	and bell had a surface	al na da pala da san da	eda billio nel 11	Altrada a bibli	ra di si kanalar	Freq Offset 0 Hz
-48.4	And the processing of the second s	a ah da bada a d	, international	te pillitet an a terrar		ladina populational	and and a second	(ant hardy that	0.00 MHz	
#Res BW 1			#VBW	30 kHz*			#Sweep		6001 pts)	
MSG							STATU	s 🦺 DC Co	upled	



#### Agilent Spectrum Analyzer - Swept SA 09:17:44 PM Jun 09, 2019 TRACE 1 2 3 4 5 TYPE A WWWW DET A NNNN SENSE:INT Avg Type: RMS Avg|Hold: 10/10 Frequency Start Freg 150.000 kHz PNO: Fast +++ Trig: Free Run IFGain:Low #Atten: 10 dB Auto Tune Mkr1 160 kHz -70.704 dBm Ref Offset 11.54 dB Ref -8.46 dBm 10 dB/div **Center Freq** 15 075000 MHz Start Freq 150.000 kHz Stop Freq 30.000000 MHz CF Step 2.985000 MHz <u>Auto</u> Man Freq Offset alla line line line li 0 Hz يري بالارتباط المرابع والمراجع والمراجع المراجع والمراجع والمراجع والمراجع والمراجع Water a final sector and the sector and parts and sector and sector and the sector of the sector and the Start 150 kHz #Res BW 10 kHz Stop 30.00 MHz Sweep 368.4 ms (6001 pts) #VBW 30 kHz\* L C Coupled

### [LTE 20MHz Uplink Low]

#### [LTE 20MHz Uplink Middle]





🊺 Ag	gilent Spec	trum Analyzer										e X
<mark>IXI</mark> Sta	rt Ero	<sub>R</sub> ⊧ q 150.00	50 Ω 🚹 DC		SEN	ISE:INT		ALIGN AUTO		M Jun 09, 2015	Frequen	icy
Citat		q 150.00		PNO: Fast ↔	Trig: Free #Atten: 1		Avg Hold		TYP	E A WWWWW T A N N N N N		
				IFGain:Low	#Atten: 10	Jab				165 kHz	Auto	Tune
	B/div	Ref Offs Ref -8.4	et 11.54 dB <b>16 dBm</b>							73 dBm		
Log										-13.00 dBm	0	
-18.5											Cente 15.07500	
10.0											15.07500	
-28.5												
											Star	t Freq
-38.5	<u> </u>										150.0	00 kHz
-48.5	$\vdash$										Stor	Freq
											30.0000	
-58.5												
	1										CF	- Step
-68.5	F										2.98500	DO MHZ
-78.5											<u>Auto</u>	Man
-70.0												
-88.5	L.,										Freq	Offset
	THE	likerelle is die stat Antonio in state	itali in alcali taili a Infini a sufficiente	ada balan balanda	nd o di litili de la Altra di litili de la	last of streets in	ah Kanalogi na kata ka Katalogi na katalogi na kat	laine II dinà materi Anna Para Mitana	de propié de travén de la serie de la serie de la s	idente li tradicióni Informatione entit		0 Hz
-98.5	L		she ili e see	and a descent		10, 0	Come of Acce	date of been as	1 1[4] 11	i le de altrar t		
Star	L 150								Stop 3	0.00 MHz		
		10 kHz		#VBW	30 kHz*			Sweep 3				
MSG									1 DC Cou			





#### Conducted Spurious Emissions (30 MHz – 1 GHz) [LTE 20MHz Downlink Low]

# [LTE 20MHz Downlink Middle]





		_		-	-	
u	rum Analyzer - Swept S/ RF 50 Ω AC q 30.000000 M		SENSE:INT Trig: Free Run #Atten: 20 dB	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	D6:53:55 PM May 19, 2015 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
0 dB/div	Ref Offset 41.69 o Ref 31.63 dBm			Mkr	1 912.700 MHz -38.268 dBm	Auto Tune
21.6						Center Free 515.000000 MH
.63						Start Fre 30.000000 MH
.37					-13.00 dBm	<b>Stop Fre</b> 1.000000000 GH
8.4					<b>↓</b> 1	<b>CF Stej</b> 97.000000 MH <u>Auto</u> Ma
8.4						Freq Offse 0 H
i8.4	MHz				Stop 1.0000 GHz	
	100 kHz	#VBW	300 kHz*	#Sweep	1.00 s (10001 pts)	



#### Agilent Spectrum Analyzer - Swept SA 09:45:17 PM Jun 09, 2015 TRACE 1 2 3 4 5 ( TYPE A WWWW DET A NNNN Avg Type: RMS Avg|Hold: 100/100 Frequency Start Freq 30.000000 MHz PNO: Fast +++ Trig: Free Run IFGain:Low #Atten: 10 dB Mkr1 904.358 MHz -80.114 dBm Auto Tune Ref Offset 11.54 dB Ref -8.46 dBm 10 dB/div **Center Freq** 515 000000 MHz Start Freq 30.000000 MHz Stop Freq 1.000000000 GHz CF Step 97.000000 MHz Man <u>Auto</u> 1 Freq Offset 0 Hz Start 30.0 MHz #Res BW 100 kHz Stop 1.0000 GHz Sweep 120.0 ms (10001 pts) #VBW 300 kHz\*

### [LTE 20MHz Uplink Low]

### [LTE 20MHz Uplink Middle]





1	ctrum Analyzer - Swept SA RF 50 Ω AC		SENSE:IN	г	ALIGN AUTO	09:47:25 PM Jun 09, 2015	
tart Fre	q 30.000000 MH:	PNO: Fast ++ IFGain:Low	<ul> <li>Trig: Free Run #Atten: 10 dB</li> </ul>		be: RMS d: 100/100	TRACE 123456 TYPE A WWWWW DET A NNNNN	Frequency
) dB/div	Ref Offset 11.54 dB <b>Ref -8.46 dBm</b>				Mk	r1 921.430 MHz -80.246 dBm	Auto Tun
8.5						-13.00 dBm	Center Fre 515.000000 M⊦
3.5							Start Fre 30.000000 MH
3.5							<b>Stop Fre</b> 1.000000000 GF
3.5							CF Ste 97.000000 MH <u>Auto</u> Ma
3.5							Freq Offs 0 H
e.5						Stop 1.0000 GHz	
Res BW	100 kHz	#VBN	/ 300 kHz*		Sweep 12	0.0 ms (10001 pts)	



#### Conducted Spurious Emissions (1 GHz –26.5 GHz)

#### [LTE 20MHz Downlink Low]







📕 Agilent Spe 🛛	RF 50 Ω AC		SENSE:INT	ALIGN AUTO	03:26:16 PM May 27, 2015	Exe museum
start Fre	q 1.000000000 G	CHZ PNO: Fast ↔		Avg Type: RMS Avg Hold: 10/10	TRACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNN	Frequency
		IFGain:Low	#Atten: 14 dB			Auto Tun
0.107-0	Ref Offset 41.69 dB			Mkr1 1	.926 907 3 GHz -19.152 dBm	Auto Tu
0 dB/div <sup>og</sup>	Ref 40.00 dBm					
						Center Fre
30.0						1.463500000 GH
20.0						
						Start Fre 1.000000000 GH
10.0						1.00000000 Gr
J.00						
						Stop Fre 1.927000000 GI
0.0					-13.00 dPm	
~ ~						CF Ste
20.0						4.000000 MI Auto Mi
30.0						<u>M</u>
						Freq Offs
40.0						. 01
50.0						
tart 1 0						
	000 GHz				Stop 1.9270 GHz	
	000 GHz 1.0 MHz	#VBV	V 3.0 MHz*	#Sweep	Stop 1.9270 GHz 1.000 s (10001 pts)	
Res BW			V 3.0 MHz*	#Sweep	1.000 s (10001 pts)	
Res BW <sup>sg</sup> 🐼 Mas	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA			STATU	1.000 s (10001 pts) s	
Res BW	1.0 MHz s storage error;Directo	ry not found	SENSE:INT	ALIGN AUTO AVg Type: RMS	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 12, 3, 4,5, 6	
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Ω AC	ry not found	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN	Frequency
Res BW	1.0 MHz           s storage error; Directo           ctrum Analyzer - Swept SA           RF         50 Ω           Q         1.998000000 Q           Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF   50 Ω AC   cq 1.998000000 C	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN	Frequency
Res BW	1.0 MHz           s storage error; Directo           ctrum Analyzer - Swept SA           RF         50 Ω           Q         1.998000000 Q           Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency C
Res BW	1.0 MHz           s storage error; Directo           ctrum Analyzer - Swept SA           RF         50 Ω           Q         1.998000000 Q           Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency C Auto Tur Center Fre
Res BW G ⊗ Mass Agilent Spe tart Fre 0 dB/div 0 g 0 0	1.0 MHz           s storage error; Directo           ctrum Analyzer - Swept SA           RF         50 Ω           Q         1.998000000 Q           Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency C Auto Tur Center Fre
Res BW	1.0 MHz           s storage error; Directo           ctrum Analyzer - Swept SA           RF         50 Ω           Q         1.998000000 Q           Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency Auto Tur Center Fre 14.24900000 Gł Start Fre
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency Auto Tur Center Fre 14.24900000 Gł Start Fre
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency Auto Tur Center Fre 14.24900000 GI Start Fre 1.998000000 GI
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency Auto Tur Center Fre 14.24900000 GH Start Fre 1.998000000 GH Stop Fre
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A DET A NNNNN kr1 1.998 0 GHz	Frequency Auto Tur Center Fre 14.24900000 GI Start Fre 1.998000000 GI
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2.3.4.5 G TYPE A WWWWW kr1 1.998 0 GHz -18.117 dBm	Frequency Auto Tur Center Frr 14.249000000 Gi Start Frr 1.998000000 Gi Stop Frr 26.500000000 Gi
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2.3.4.5 G TYPE A WWWWW kr1 1.998 0 GHz -18.117 dBm	Frequency         C           Auto Tur         Center Fre           14.249000000 Gl         Start Fre           1.998000000 Gl         Stop Fre           26.50000000 Gl         CF Ste           4.000000 MI         Stop Start
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 23 4 5 6 TYPE A NUNNN kr1 1.998 0 GHz -18.117 dBm	Frequency         C           Auto Tur         Center Frequency           14.249000000 Gl         Start Frequency           1.998000000 Gl         Start Frequency           Start Frequency         Start Frequency           1.998000000 Gl         Start Frequency           CF Step         4.000000 MI
Res BW 30 ⊘ Mas 4 Agilent Spe 10.0 10	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Q AC or 1.998000000 C Ref Offset 41.69 dB	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 23 4 5 6 TYPE A NUNNN kr1 1.998 0 GHz -18.117 dBm	Start Frequency           Auto Tur           Center Frequency           14.249000000 GI           Start Frequency           1.998000000 GI           Stop Frequency           26.50000000 GI           CF Ste           4.000000 MI           Auto
Res BW 30 ⊘ Mas 4 Agilent Spe 10.0 10	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Ω AC cq 1.998000000 C Ref Offset 41.69 dB Ref 40.00 dBm	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 23 4 5 6 TYPE A NUNNN kr1 1.998 0 GHz -18.117 dBm	Start Frequency           Auto Tur           Center Frequency           14.249000000 Gl           Start Freq           1.998000000 Gl           Stop Freq           26.50000000 Gl           CF Ste           4.000000 MI           Auto           Muto           Freq Offs
Res BW           S0         Mass           ▲ Agilent Spe           Itart Fre           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0           0         0	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Ω AC cq 1.998000000 C Ref Offset 41.69 dB Ref 40.00 dBm	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 23 4 5 6 TYPE A NUNNN kr1 1.998 0 GHz -18.117 dBm	Start Frequency           Auto Tur           Center Frequency           14.249000000 GH           Start Freq           1.998000000 GH           Stop Freq           26.50000000 GH           Auto Mit           Auto Mit           Freq Offs
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Ω AC cq 1.998000000 C Ref Offset 41.69 dB Ref 40.00 dBm	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 23 4 5 6 TYPE A NUNNN kr1 1.998 0 GHz -18.117 dBm	Start Frequency           Auto Tur           Center Frequency           14.249000000 GH           Start Freq           1.998000000 GH           Stop Freq           26.50000000 GH           Auto Mit           Auto Mit           Freq Offs
Res BW	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Ω AC iq 1.998000000 G Ref Offset 41.69 dB Ref 40.00 dBm	ry not found GHZ PNO: Fast → IFGain:Low	SENSE:INT	ALIGN AUTO Avg Type: RMS Avg Hold: 10/10	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 2 3 4 5 0 TYPE 2 3 5 0 TYPE 2 5 0 TYPE 2 5 0 TYPE 2 5 0 TYPE 2 5 0 T	Start Frequency           Auto Tur           Center Frequency           14.249000000 GI           Start Freq           1.998000000 GI           Stop Freq           26.50000000 GI           CF Ste           4.000000 MI           Auto           Mito           Freq Offs
Res BW         Image: Specific spec	1.0 MHz s storage error;Directo ctrum Analyzer - Swept SA RF 50 Ω AC iq 1.998000000 G Ref Offset 41.69 dB Ref 40.00 dBm	ry not found	SENSE:INT	ALIGN AUTO	1.000 s (10001 pts) s 03:28:37 PM May 27, 2015 TRACE 2 23 4 5 6 TYPE A NUNNN kr1 1.998 0 GHz -18.117 dBm	Start Frequency           Auto Tur           Center Frequency           14.249000000 GH           Start Frequency           1.998000000 GH           Stop Frequency           26.50000000 GH           CF Step           4.000000 MH

# [LTE 20MHz Downlink Middle]



:Fast ↔ Trig: n:Low #Atter	SENSE:INT	ALIGN AUTO	03:30:19 PM May 27, 2015	- 5
	ree Run n: 14 dB	Avg Type: RMS Avg Hold: 10/10	TRACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNN	Frequency
		Mkr1	1.927 000 0 GHz -19.434 dBm	Auto Tur
			-19.454 dBm	
				Center Fre
				1.463500000 GH
				Start Fre
				1.000000000 Gi
				Stop Fre
			13.00 dBm	1.927000000 GI
			1	CF Ste
				4.000000 Mi Auto Mi
				Freq Offs
				01
				-
#VBW 3.0 M	Hz*	#Sweep	Stop 1.9270 GHz 1.000 s (10001 pts)	
		STAT	US	
	SENSE:INT	Avg Type: RMS	TRACE 1 2 3 4 5 6	
	Free Run n: 14 dB	Avg Hold: 10/10		
			DET A WWWWW	
		N	Ikr1 1.998 0 GHz -15.106 dBm	
		V	DET A WWWWW	Auto Tur
		V	DET A WWWWW	Auto Tur Center Fre
		W	DET A WWWWW	Auto Tur Center Fre
			DET A WWWWW	Auto Tur Center Fra 14.249000000 GH Start Fra
			DET A WWWWW	Auto Tur Center Fre 14.249000000 GH Start Fre
			DET A WWWWW	Auto Tur Center Fre 14.24900000 GH Start Fre 1.998000000 GH
			DET A WWWWW	Auto Tur Center Fre 14.24900000 GF 1.99800000 GF Stop Fre
			DET A WWWWW	Auto Tur Center Fre 14.24900000 GF 1.99800000 GF Stop Fre 26.50000000 GF
			Ikr1 1.998 0 GHz -15.106 dBm	
			Ikr1 1.998 0 GHz -15.106 dBm	Auto Tur Center Fre 14.24900000 GF 1.99800000 GF 26.50000000 GF 26.50000000 GF
			Ikr1 1.998 0 GHz -15.106 dBm	Auto Tur Center Fre 14.249000000 GF 1.998000000 GF 26.50000000 GF 26.50000000 GF CF Ste 4.000000 MF Auto Mi
			Ikr1 1.998 0 GHz -15.106 dBm	Auto Tur Center Fre 14.249000000 GF 1.998000000 GF 26.50000000 GF 26.50000000 GF 4.000000 MF Auto Mi Freq Offs
			Ikr1 1.998 0 GHz -15.106 dBm	Auto Tur Center Fre 14.24900000 GH Start Fre 1.99800000 GH Stop Fre 26.50000000 GH CF Ste 4.00000 MH
			Ikr1 1.998 0 GHz -15.106 dBm	Auto Tur Center Fre 14.24900000 GF 1.99800000 GF 1.99800000 GF 26.50000000 GF 26.50000000 GF 4.000000 MF Auto Ma
#VBW 3.0 M			Ikr1 1.998 0 GHz -15.106 dBm	Auto Tur Center Fre 14.24900000 GH 1.998000000 GH 26.50000000 GH 26.50000000 GH 4.00000 MH Auto Ma Freq Offso 0 H
	Fast ↔→ Trig:	Fast ↔ Trig: Free Run	STAT	SENSE:INT ALIGN AUTO 04:01:20 PM May 27, 2015





#### [LTE 20MHz Uplink Low]

### [LTE 20MHz Uplink Middle]









#### Intermodulation Spurious Emissions



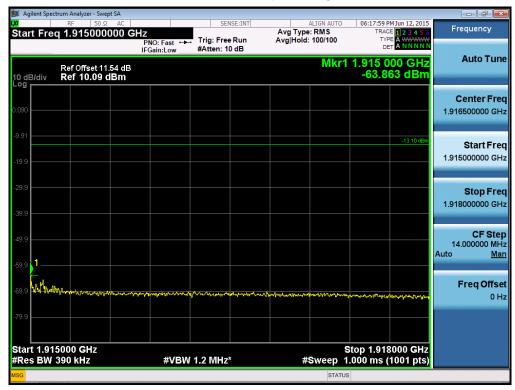
# [LTE 20MHz Downlink Low]





#### Agilent Spectrum Analyzer - Swept SA AUTO 06:14:13 PM Jun 12, 2015 TRACE 2 3 4 5 6 00 TYPE A WWWW DET A NNNN Avg Type: RMS Avg|Hold: 100/100 Frequency Start Freq 1.847000000 GHz PNO: Fast ↔→ Trig: Free Run IFGain:Low #Atten: 10 dB Auto Tune Mkr1 1.849 967 GHz -61.540 dBm Ref Offset 11.54 dB Ref 10.09 dBm 10 dB/div **Center Freq** 1 848500000 GHz Start Freq 1.847000000 GHz Stop Freq 1.850000000 GHz CF Step 14.000000 MHz Auto Man ANNA Freq Offset 0 Hz Start 1.847000 GHz #Res BW 390 kHz Stop 1.850000 GHz #Sweep 1.000 ms (1001 pts) #VBW 1.2 MHz\*

# [LTE 20MHz Uplink Low]



#### Page 55 of 58

#### Band Edge

#### Agilent Spectrum Analyzer - Swept SA 01:07:42 PM May 27, 2015 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N SENSE:INT ALIGN AUTO Avg Type: RMS Avg|Hold: 10/10 Frequency Start Freq 1.927000000 GHz Trig: Free Run #Atten: 14 dB PNO: Fast ↔→ IFGain:Low Mkr1 1.930 000 GHz -16.640 dBm Auto Tune Ref Offset 41.69 dB Ref 40.00 dBm 10 dB/div **Center Freq** 1.928500000 GHz Start Freq 1.927000000 GHz Stop Freq 1.930000000 GHz -13.00 c 1 CF Step 4.000000 MHz Auto Man Freq Offset 0 Hz Stop 1.930000 GHz #Sweep 1.000 s (1001 pts) Start 1.927000 GHz #Res BW 390 kHz #VBW 1.2 MHz\* File <Screen\_0090.png> saved

# [LTE 20MHz Downlink Low]





# [LTE 20MHz Uplink Low]

🊺 Ag		n Analyzer - Swe										
<mark>IXI</mark> Stat		RF 50 Ω		-	SEN	NSE:INT	Avg Type	ALIGN AUTO		M Jun 09, 2015	Fr	equency
ona	u moq	10411000		PNO: Fast +++ IFGain:Low	Trig: Free #Atten: 14		Avg Hold:		TYP			
10 dB Log		tef Offset 11 Ref 15.54						Mkr	1 1.849 9 -58.80	79 GHz 09 dBm		Auto Tune
5.54												<b>Center Freq</b> 8500000 GHz
-4.46 -14.5										-13.00 dBm	1.847	Start Freq 7000000 GHz
-24.5 -34.5											1.850	Stop Freq 0000000 GHz
-44.5 -54.5										1	<u>Auto</u>	<b>CF Step</b> 300.000 kHz Man
-64.5	whit what has	arwayny	hanna	and a regrandration of	⊷a∿#vt∕~#vt~fwr	ngn han ng mu	r freed free to an an an an	and the second second	e-gotom-ogn/strips	wwww	F	Freq Offset 0 Hz
-74.5 Star	t 1.8470	00 GHz							Stop 1.850	0000 GHz		
	s BW 39			#VBW	/ 1.2 MHz*			Sweep	1.000 ms (	1001 pts)		
MSG								STATI	US			





# **10. FIELD STRENGTH OF SPURIOUS RADIATION**

# Test Requirement(s): § 2.1053 Measurements required: Field strength of spurious radiation.

§ 2.1053 (a) Measurements shall be made to detect spurious emissions that may be Radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

**§ 2.1053 (b):** The measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emissions are required to be 60 dB or more Below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz.

(3) All equipment where the antenna is an integral part of, and attached directly to The transmitter.

(4) Other types of equipment as required, when deemed necessary by the Commission.

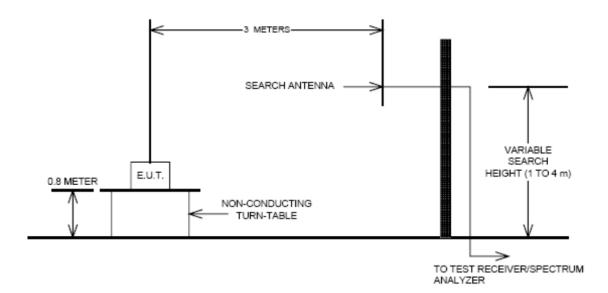
**Test Procedures:** As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of ANSI/TIA-603-C-2004 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semianechoic chamber.

The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360

and the receiving antenna scanned from 1-3m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried. out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated.

# **Radiated Spurious Emissions Test Setup**



## **Test Result:**

Note.

Input signal is the LTE 20 MHz signal.

Harmonics were not found.

#### [Downlink]

		<u>Substitute</u>	Ant. Gain			ERP	Margin
Tx Freq.(MHz)	Freq.(MHz)	Level	(dBd)	C.L	Pol.	(dBm)	(dB)
		[dBm]					
1940.0							
1962.5			No Peal	k Found			
1985.0							