

# FCC LTE REPORT

### **FCC Certification**

Applicant Name: LG Electronics MobileComm U.S.A., Inc. Address:		Date of Issue: November 15, 2016 Location: HCT CO., LTD.,
1000 Sylvan Avenue, E	nglewood Cliffs NJ 07632	74, Seoicheon-ro 578beon-gil, Majang-myeon,
		Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
		Report No.: HCT-R-1609-F013-3
		HCT FRN: 0005866421
FCC ID:	<b>ZNFW281</b>	
APPLICANT:	LG Electronics M	lobileComm U.S.A., Inc.
FCC Model(s):	LG-W281	
Additional FCC Model(s):	LGW281, W281	
EUT Type:	Portable Wrist Device	
FCC Classification:	Licensed Non-Broadcast Transmit	ter Worn on Body (TNT)
FCC Rule Part(s):	§22, §2	

Normal:

Mada	To Freedom	Englasian		ERP			
ModeTx FrequencyEmission(MHz)(MHz)Designator			Modulation	Max. Power (W)	Max. Power (dBm)		
LTE Dends (1.4)	004 7 040 0	1M10G7D	QPSK	0.076	18.79		
LTE – Band5 (1.4)	824.7 - 848.3	1M10W7D	16QAM	0.064	18.07		
LTE – Band5 (3)	825.5 - 847.5	2M71G7D	QPSK	0.078	18.93		
		2M70W7D	16QAM	0.066	18.20		
LTE – Band5 (5)	000 F 040 F	4M51G7D	QPSK	0.081	19.07		
	826.5 - 846.5	4M50W7D	16QAM	0.068	18.35		
		8M97G7D	QPSK	0.082	19.13		
LTE – Band5 (10)	829.0 - 844.0	8M94W7D	16QAM	0.070	18.43		



#### With wireless charging pad:

Mada	Tu Francisco au		ERP			
Mode (MHz)	Tx Frequency (MHz)	Modulation	Max. Power (W)	Max. Power (dBm)		
	004 7 040 0	QPSK	0.051	17.11		
LTE – Band5 (1.4)	824.7 - 848.3	16QAM	0.043	16.38		
	825.5 – 847.5 –	QPSK	0.048	16.86		
LTE – Band5 (3)		16QAM	0.041	16.13		
	000 5 040 5	QPSK	0.047	16.71		
LTE – Band5 (5)	826.5 - 846.5	16QAM	0.040	16.00		
		QPSK	0.052	17.12		
LTE – Band5 (10)	829.0 - 844.0	16QAM	0.044	16.40		

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant

to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by : Jeong Ho Kim Test engineer of RF Team

Approved by : Yong Hyun Lee Manager of RF Team

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Report No.: HCT-R-1609-F013-3

# **Version**

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1609-F013	September 30, 2016	- First Approval Report
HCT-B-1609-F013-1	October 07, 2016	- Revised LTE Band 2 Ant gain
HC1-H-1009-F013-1		- Revised the FCC Classification (PCB $\rightarrow$ PCT)
HCT-R-1609-F013-2	November 09, 2016	- Deleted the LTE Band 2
HCT-R-1609-F013-3	November 15, 2016	- Revised FCC Classification



Model: LG-W281

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# **MEASUREMENT REPORT**

# **1. GENERAL INFORMATION**

Applicant Name:	LG Electronics MobileComm U.S.A., Inc.			
Address:	1000 Sylvan Avenue, Englewood Cliffs NJ 07632			
FCC ID:	ZNFW281			
Application Type:	Certification			
FCC Classification:	Licensed Non-Broadca	ast Transmitter Worn on Body (TNT)		
FCC Rule Part(s):	§22, §2			
EUT Type:	Portable Wrist Device			
FCC Model(s):	LG-W281			
Additional FCC Model(s):	LGW281, W281			
Tx Frequency:	825.5 MHz – 847.5 Mł 826.5 MHz – 846.5 Mł	Hz (LTE – Band 5 (1.4 MHz)) Hz (LTE – Band 5 (3 MHz)) Hz (LTE – Band 5 (5 MHz)) Hz (LTE – Band 5 (10 MHz))		
Max. RF Output Power:	Band 5 (1.4 MHz) :	0.076 W (QPSK) (18.79 dBm)		
Normal:	Band 5 (3 MHz) :	0.064 W (16-QAM) (18.07 dBm) 0.078 W (QPSK) (18.93 dBm) 0.066 W (16-QAM) (18.20 dBm)		
	Band 5 (5 MHz) :	0.081 W (QPSK) (19.07 dBm) 0.068 W (16-QAM) (18.35 dBm)		
	Band 5 (10 MHz) :	0.082 W (QPSK) (19.13 dBm) 0.070 W (16-QAM) (18.43 dBm)		
With wireless charging pad:				
	Band 5 (1.4 MHz) : Band 5 (3 MHz) :	0.051 W (QPSK) (17.11 dBm) 0.043 W (16-QAM) (16.38 dBm) 0.048 W (QPSK) (16.86 dBm) 0.041 W (16-QAM) (16.13 dBm)		
	Band 5 (5 MHz) :	0.047 W (QPSK) (16.71 dBm) 0.040 W (16-QAM) (16.00 dBm)		
	Band 5 (10 MHz) :	0.052 W (QPSK) (17.12 dBm) 0.044 W (16-QAM) (16.40 dBm)		
Emission Designator(s):	Band 5 (1.4 MHz) : Band 5 (3 MHz) : Band 5 (5 MHz) : Band 5 (10 MHz) :	1M10G7D (QPSK) / 1M10W7D (16-QAM) 2M71G7D (QPSK) / 2M70W7D (16-QAM) 4M51G7D (QPSK) / 4M50W7D (16-QAM) 8M97G7D (QPSK) / 8M94W7D (16-QAM)		
Date(s) of Tests:	August 02, 2016 ~ Sej	otember 27, 2016		
Antenna Specification:	Antenna type: MON	Co.LTD. OPOLE 5 : -1.45 dBi		



# 2. INTRODUCTION

### 2.1. EUT DESCRIPTION

The LG Electronics MobileComm U.S.A., Inc. LG-W281 Portable Wrist Device consists of LTE 5.

#### 2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 2.3. TEST FACILITY

The Fully-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**.



# **<u>3. DESCRIPTION OF TESTS</u>**

# 3.1 ERP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: ERP(Effective Radiated Power) Test Procedure

Radiated emission measurements are performed in the Fully-anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-D-2010 Clause 2.2.17. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using a RMS detector.

A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

 $P_{d(dBm)} = Pg_{(dBm)} - cable loss_{(dB)} + antenna gain_{(dB)}$ 

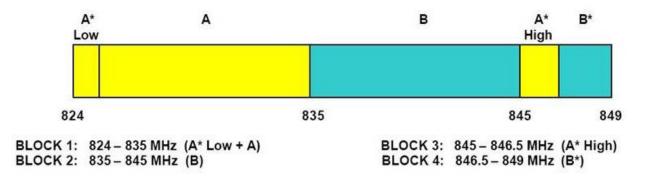
Where: Pdis the dipole equivalent power and Pgis the generator output power into the substitution antenna.

#### Radiated spurious emissions

: Frequency Range : 9 kHz ~ 10<sup>th</sup> Harmonics of highest channel fundamental frequency.

### **3.2 FREQUENCY RANGE**

§22.917(a): Cellular – Mobile Frequency Blocks





#### 5.1.1 Peak power measurements with a spectrum/signal analyzer or EMI receiver

The following procedure can be used to determine the total peak output power.

- a) Set the RBW  $\geq$  OBW.
- b) Set VBW  $\geq$  3 × RBW.
- c) Set span  $\ge 2 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Ensure that the number of measurement points  $\geq$  span/RBW.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the peak amplitude level.

# 5.2.2 Procedures for use with a spectrum/signal analyzer when EUT cannot be configured to transmit continuously and sweep triggering/signal gating cannot be properly implemented

If the EUT cannot be configured to transmit continuously (burst duty cycle < 98%), then one of the following procedures can be used. The selection of the applicable procedure will depend on the characteristics of the measured burst duty cycle.

Measure the burst duty cycle with a spectrum/signal analyzer or EMC receiver can be used in zero-span mode if the response time and spacing between bins on the sweep are sufficient to permit accurate measurement of the burst on/off time of the transmitted signal.

#### 5.2.2.2 Constant burst duty cycle

If the measured burst duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then:

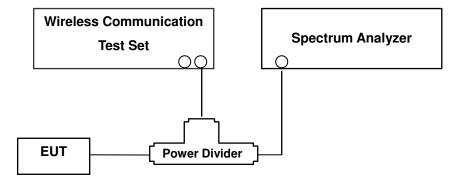
- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW  $\ge$  3 x RBW.
- d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
- e) Sweep time = auto.
- f) Detector = RMS (power averaging).
- g) Set sweep trigger to "free run".
- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- j) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).

For example, add 10 log (1/0.25) = 6 dB if the duty cycle is a constant 25%.



### **3.3 OCCUPIED BANDWIDTH.**

#### Test set-up



(Configuration of conducted Emission measurement)

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

#### **Test Procedure**

OBW is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 4.2.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth



## 3.4 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

#### Test Procedure

Spurious and harmonic emissions at antenna terminal is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 6.0.

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer.

The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1 % of the emission bandwidth to show compliance with the -13 dBm limit, in the 1 MHz bands immediately outside and adjacent to the edge of the frequency block. The 1 MHz RBW was used to scan from 30 MHz to 10<sup>th</sup> Harmonics. A display line was placed at -13 dBm to show compliance. The high, lowest and a middle channel were tested for out of band measurements.

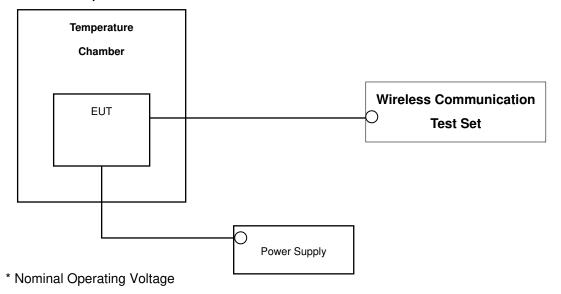
- Band Edge Requirement : In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

**NOTES:** The analyzer plot offsets were determined by below conditions.

• For LTE Band 5, total offset 26.9 dBm = 20 dBm attenuator + 6 dBm Divider + 0.9 dBm RF cables.

# 3.5 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

# Test Set-up



#### **Test Procedure**

Frequency stability is tested in accordance with ANSI/TIA-603-D-2010 section 2.2.2

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from the end point to 100 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability of the transmitter shall be maintained within  $\pm$  0.000 25 %( $\pm$  2.5 ppm) of the center frequency.

#### Time Period and Procedure:

The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).

1. The equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

2. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

#### NOTE: The EUT is tested down to the battery endpoint.



# **4. LIST OF TEST EQUIPMENT**

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	Annual	09/01/2017
Wainwright	WHK1.2/15G-10EF/H.P.F	4	Annual	04/11/2017
Wainwright	WHK3.3/18G-10EF/H.P.F	2	Annual	04/11/2017
Hewlett Packard	11667B / Power Splitter	10545	Annual	02/15/2017
Hewlett Packard	11667B / Power Splitter	11275	Annual	04/29/2017
Agilent	E3632A/DC Power Supply	KR75303243	Annual	07/12/2017
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/23/2017
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	03/23/2017
EXP	EX-TH400/ Chamber	None	Annual	05/31/2017
Schwarzbeck	BBHA 9120D/ Horn Antenna	1298	Biennial	10/16/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	1299	Biennial	05/15/2017
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	Biennial	04/30/2017
Schwarzbeck	BBHA 9170/ Horn Antenna(15~35GHz)	BBHA9170124	Biennial	04/30/2017
Agilent	N9020A/Signal Analyzer	MY52090906	Annual	05/13/2017
Hewlett Packard	8493C/ATTENUATOR	17280	Annual	06/22/2017
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/15/2017
Agilent	8960 (E5515C)/ Base Station	MY48360800	Annual	10/30/2016
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6200863156	Annual	02/26/2017
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6201026545	Annual	02/16/2017
Schwarzbeck	VULB9160/ Bilog Antenna	3150	Biennial	11/17/2016
Schwarzbeck	VULB9160/ Bilog Antenna	3368	Biennial	10/10/2016

# **5. MEASUREMENT UNCERTAINTY**

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (±dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	6.07



# 6. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	
2.1049	Occupied Bandwidth	N/A		PASS	
2.1051, 22.917(a)	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	< 43 + 10log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions	CONDUCTED	PASS	
2.1046	* Conducted Output Power	N/A		PASS	
2.1055, 22.355	Frequency stability / variation of ambient temperature	< 2.5 ppm (Part22)		PASS	
22.913(a)(2)	Effective Radiated Power (Band 5)	< 7 Watts max. ERP		PASS	
2.1053, 22.917(a)	Radiated Spurious and Harmonic Emissions	< 43 + 10log10 (P[Watts]) for all out-of band emissions	RADIATED	PASS	

\*: See SAR Report



# 7. SAMPLE CALCULATION

# A. ERP Sample Calculation

Mode	Ch	./ Freq.	Measured	Substitute	Ant. Gain	C.L	Pol.	Limit	EF	RP
Mode	channel	Freq.(MHz)	Level(dBm)	LEVEL(dBm)	(dBd)	U.L	P01.	w	w	dBm
LTE Band5	20525	836.50	-6.73	40.89	-10.54	0.96	V	< 7.00	0.869	29.39

#### ERP = Substitute LEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a wooden tripod is 2.5 meter above test site ground level.

- 2) During the test, the turn table is rotated until the maximum signal is found.
- 3) Record the field strength meter's level.
- 4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
- 5) Increase the signal generator output till the field strength meter's level is equal to the item (3).

6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radio power (ERP).

# **B. Emission Designator**

### **QPSK Modulation**

5MHz Bandwidth	10MHz Bandwidth
Emission Designator = 4M48G7D	Emission Designator = 8M95G7D
LTE BW = 4.48 MHz	LTE BW = 8.95 MHz
G = Phase Modulation	G = Phase Modulation
7 = Quantized/Digital Info	7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand	D = Data transmission; telemetry; telecommand

### **16QAM Modulation**

5MHz Bandwidth	10MHz Bandwidth		
Emission Designator = 4M48W7D	Emission Designator = 8M95W7D		
LTE BW = 4.48 MHz	LTE BW = 8.95 MHz		
W = main carrier modulated in a combination of two	W = main carrier modulated in a combination of two		
or more of the following modes;	or more of the following modes;		
amplitude, angle, pulse	amplitude, angle, pulse		
7 = Quantized/Digital Info	7 = Quantized/Digital Info		
D = Data transmission; telemetry; telecommand	D = Data transmission; telemetry; telecommand		



# 8. TEST DATA

# 8.1 EFFECTIVE RADIATED POWER (Band 5)\_Normal

Freq	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHz)			Level (dBm)	Level (dBm)	Gain(dBd)			w	W	dBm
824.7		QPSK	-31.57	31.05	-10.59	1.67	Н		0.076	18.79
024.7		16-QAM	-32.29	30.33	-10.59	1.67	Н		0.064	18.07
836.5	1.4 MHz	QPSK	-33.48	30.08	-10.54	1.68	Н	< 7.00	0.061	17.86
030.5		16-QAM	-34.28	29.28	-10.54	1.68	Н	< 7.00	0.051	17.06
040.2		QPSK	-36.84	26.25	-10.49	1.69	Н		0.026	14.07
848.3		16-QAM	-37.60	25.49	-10.49	1.69	Н		0.021	13.31

#### Effective Radiated Power Data (1.4 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHz)			Level (dBm)	Level (dBm)	Gain(dBd)			W	W	dBm
825.5		QPSK	-31.51	31.19	-10.59	1.67	н		0.078	18.93
825.5		16-QAM	-32.24	30.46	-10.59	1.67	н		0.066	18.20
906 F	3 MHz	QPSK	-33.23	30.33	-10.54	1.68	н	. 7.00	0.065	18.11
836.5	3 10172	16-QAM	-33.96	29.60	-10.54	1.68	н	< 7.00	0.055	17.38
847.5		QPSK	-36.52	26.57	-10.49	1.69	Н		0.027	14.39
047.3		16-QAM	-37.27	25.82	-10.49	1.69	Н		0.023	13.64

#### Effective Radiated Power Data (3 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case



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Freq	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHz)			Level (dBm)	Level (dBm)	Gain(dBd)			W	W	dBm
826.5		QPSK	-31.50	31.32	-10.58	1.67	Н		0.081	19.07
820.5		16-QAM	-32.22	30.60	-10.58	1.67	Н		0.068	18.35
836.5	5 MHz	QPSK	-33.24	30.32	-10.54	1.68	Н	< 7.00	0.065	18.10
030.5		16-QAM	-33.97	29.59	-10.54	1.68	Н	< 7.00	0.055	17.37
946 5		QPSK	-35.54	27.63	-10.50	1.69	Н		0.035	15.44
846.5		16-QAM	-36.26	26.91	-10.50	1.69	Н		0.030	14.72

#### Effective Radiated Power Data (5 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHz)			Level (dBm)	Level (dBm)	Gain(dBd)			W	W	dBm
820.0		QPSK	-31.73	31.37	-10.57	1.67	н		0.082	19.13
829.0		16-QAM	-32.43	30.67	-10.57	1.67	н		0.070	18.43
000 F	10 МИ-	QPSK	-33.63	29.93	-10.54	1.68	н	. 7.00	0.059	17.71
836.5	10 MHz	16-QAM	-34.38	29.18	-10.54	1.68	н	< 7.00	0.050	16.96
844.0		QPSK	-33.21	30.15	-10.51	1.69	н		0.062	17.95
844.0		16-QAM	-34.11	29.25	-10.51	1.69	Н		0.051	17.05

#### Effective Radiated Power Data (10 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

#### NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For LTE signals, RBW = 1-5% of the OBW, not to exceed 1MHz, VBW  $\ge 3 \times$  RBW, Detector = RMS.

A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is x plane in LTE mode. Also worst case of detecting Antenna is horizontal polarization in LTE mode.

# 8.2 EFFECTIVE RADIATED POWER (Band 5) \_ With wireless charging pad

Freq (MHz)	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHZ)			Level (dBm)	Level (dBm)	Gain(dBd)			W	W	dBm
904 7	-	QPSK	-33.88	28.74	-10.59	1.67	Н		0.044	16.48
824.7		16-QAM	-34.63	27.99	-10.59	1.67	Н		0.037	15.73
836.5	1.4 MHz	QPSK	-34.23	29.33	-10.54	1.68	Н	< 7.00	0.051	17.11
030.5		16-QAM	-34.96	28.60	-10.54	1.68	Н	< 7.00	0.043	16.38
040.2		QPSK	-35.21	27.88	-10.49	1.69	Н		0.037	15.70
848.3		16-QAM	-36.00	27.09	-10.49	1.69	Н		0.031	14.91

#### Effective Radiated Power Data (1.4 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHz)			Level (dBm)	Level (dBm)	Gain(dBd)			W	W	dBm
905 F		QPSK	-33.77	28.93	-10.59	1.67	Н		0.046	16.67
825.5		16-QAM	-34.52	28.18	-10.59	1.67	Н		0.039	15.92
906 E	3 MHz	QPSK	-34.48	29.08	-10.54	1.68	Н	. 7.00	0.048	16.86
836.5	3 10112	16-QAM	-35.21	28.35	-10.54	1.68	Н	< 7.00	0.041	16.13
047.5		QPSK	-35.52	27.57	-10.49	1.69	Н		0.035	15.39
847.5		16-QAM	-36.29	26.80	-10.49	1.69	Н		0.029	14.62

#### Effective Radiated Power Data (3 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case



Report No.: HCT-R-1609-F013-3

Model: LG-W281

Freq (MHz)	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHZ)			Level (dBm)	Level (dBm)	Gain(dBd)			w	W	dBm
826.5		QPSK	-33.88	28.94	-10.58	1.67	Н		0.047	16.69
820.5		16-QAM	-34.62	28.20	-10.58	1.67	Н		0.039	15.95
836.5	5 MHz	QPSK	-34.63	28.93	-10.54	1.68	Н	< 7.00	0.047	16.71
030.5		16-QAM	-35.34	28.22	-10.54	1.68	Н	< 7.00	0.040	16.00
946 5		QPSK	-35.09	28.08	-10.50	1.69	Н		0.039	15.89
846.5		16-QAM	-35.86	27.31	-10.50	1.69	Н		0.033	15.12

#### Effective Radiated Power Data (5 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq	Bandwidth	Modulation	Measured	Substitute	Ant.	C.L	Pol	Limit	EF	RP
(MHz)			Level (dBm)	Level (abm)	Gain(dBd)			W	W	dBm
829.0		QPSK	-34.19	28.91	-10.57	1.67	Н		0.046	16.67
829.0		16-QAM	-34.95	28.15	-10.57	1.67	Н		0.039	15.91
926 F	10 MU-	QPSK	-35.23	28.33	-10.54	1.68	Н	. 7.00	0.041	16.11
836.5	10 MHz	16-QAM	-35.98	27.58	-10.54	1.68	Н	< 7.00	0.034	15.36
844.0		QPSK	-34.04	29.32	-10.51	1.69	Н		0.052	17.12
844.0		16-QAM	-34.76	28.60	-10.51	1.69	Н		0.044	16.40

#### Effective Radiated Power Data (10 MHz Band 5 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

#### NOTES:

# Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For LTE signals, RBW = 1-5% of the OBW, not to exceed 1MHz, VBW  $\ge 3 \times$  RBW, Detector = RMS.

A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is z plane in LTE mode. Also worst case of detecting Antenna is horizontal polarization in LTE mode.

# 8.3 RADIATED SPURIOUS EMISSIONS\_Normal 8.3.1 RADIATED SPURIOUS EMISSIONS (1.4 MHz Band 5 LTE)

OPERATING FREQUENTY:	<u>824.70 MHz</u>
MEASURED OUTPUT POWER:	<u>18.79 dBm = 0.076 W</u>
MODULATION SIGNAL:	1.4 MHz QPSK
DISTANCE:	<u>3 meters</u>
LIMIT: 43 + 10 log10 (W) =	31.79 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitute Level (dBm)	C.L	Pol	ERP (dBm)	dBc
	1,649.40	-49.33	9.16	-51.43	2.40	V	-44.67	63.46
20407 (824.7)	2,474.10	-49.71	10.92	-48.73	2.99	V	-40.80	59.59
(02)	3,298.80	-56.97	11.94	-56.40	3.45	Н	-47.91	66.70
	1,673.00	-49.23	9.23	-51.25	2.42	Н	-44.44	63.23
20525 (836.5)	2,509.50	-50.68	10.96	-49.64	2.89	Н	-41.57	60.36
(000.0)	3,346.00	-58.64	10.03	-56.51	3.47	V	-49.95	68.74
	1,696.60	-51.05	9.32	-53.17	2.43	Н	-46.28	65.07
20643 (848.3)	2,544.90	-51.07	10.98	-50.15	2.96	Н	-42.13	60.92
(0.0)	3,393.20	-57.26	12.14	-57.29	3.58	V	-48.73	67.52

NOTES: <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u> according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

2. We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3.We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case



#### 8.3.2 RADIATED SPURIOUS EMISSIONS (3 MHz Band 5 LTE)

OPERATING FREQUENTY:	825.50 MHz
MEASURED OUTPUT POWER:	<u>18.93 dBm = 0.078 W</u>
MODULATION SIGNAL:	<u>3 MHz QPSK</u>
DISTANCE:	<u>3 meters</u>
LIMIT: 43 + 10 log10 (W) =	<u>31.93 dBc</u>

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitute Level (dBm)	C.L	Pol	ERP (dBm)	dBc
	1,651.00	-49.46	9.16	-51.56	2.40	Н	-44.80	63.73
20415 (825.5)	2,476.50	-47.73	10.92	-46.75	2.99	Н	-38.82	57.75
(825.5)	3,302.00	-58.37	11.94	-57.80	3.45	Н	-49.31	68.24
	1,673.00	-49.77	9.23	-51.79	2.42	Н	-44.98	63.91
20525 (836.5)	2,509.50	-49.99	10.96	-48.95	2.89	Н	-40.88	59.81
(000.0)	3,346.00	-59.14	10.03	-57.01	3.47	Н	-50.45	69.38
	1,695.00	-53.44	9.32	-55.56	2.43	Н	-48.67	67.60
20635 (847.5)	2,542.50	-50.17	10.98	-48.95	2.96	Н	-40.93	59.86
(0.7.0)	3,390.00	-59.94	12.13	-59.90	3.60	Н	-51.37	70.30

### **NOTES:** <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u> according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

2. We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3.We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case



#### 8.3.3 RADIATED SPURIOUS EMISSIONS (5 MHz Band 5 LTE)

OPERATING FREQUENTY:	826.50 MHz
MEASURED OUTPUT POWER:	<u>19.07 dBm = 0.081 W</u>
MODULATION SIGNAL:	<u>5 MHz QPSK</u>
DISTANCE:	<u>3 meters</u>
LIMIT: 43 + 10 log10 (W) =	<u>32.07 dBc</u>

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitute Level (dBm)	C.L	Pol	ERP (dBm)	dBc
	1,653.00	-49.88	9.18	-52.07	2.40	Н	-45.29	64.36
20425 (826.5)	2,479.50	-49.88	10.93	-49.15	2.98	Н	-41.20	60.27
(020.0)	3,306.00	-59.27	11.95	-58.84	3.45	Н	-50.34	69.41
	1,673.00	-50.76	9.23	-52.78	2.42	Н	-45.97	65.04
20525 (836.5)	2,509.50	-51.09	10.96	-50.05	2.89	Н	-41.98	61.05
(000.0)	3,346.00	-58.28	10.03	-56.15	3.47	V	-49.59	68.66
	1,693.00	-55.22	9.32	-57.34	2.43	Н	-50.45	69.52
20625 (846.5)	2,539.50	-48.57	10.98	-47.35	2.96	Н	-39.33	58.40
(0.0)	3,386.00	-59.63	12.12	-59.66	3.54	V	-51.07	70.14

**NOTES:** <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u> according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

2. We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3.We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case



#### 8.3.4 RADIATED SPURIOUS EMISSIONS (10 MHz Band 5 LTE)

OPERATING FREQUENTY:	<u>829.00 MHz</u>
MEASURED OUTPUT POWER:	<u>19.13 dBm = 0.082 W</u>
MODULATION SIGNAL:	10 MHz QPSK
DISTANCE:	<u>3 meters</u>
LIMIT: 43 + 10 log10 (W) =	<u>32.13 dBc</u>

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitute Level (dBm)	C.L	Pol	ERP (dBm)	dBc
	1,658.00	-50.86	9.20	-53.14	2.40	Н	-46.34	65.47
20450 (829.0)	2,487.00	-50.80	10.94	-49.55	2.98	Н	-41.59	60.72
(02010)	3,316.00	-59.54	11.97	-59.25	3.54	Н	-50.82	69.95
	1,673.00	-53.65	9.23	-55.67	2.42	V	-48.86	67.99
20525 (836.5)	2,509.50	-48.89	10.96	-47.85	2.89	Н	-39.78	58.91
(000.0)	3,346.00	-58.84	10.03	-56.71	3.47	V	-50.15	69.28
	1,688.00	-48.76	9.30	-50.83	2.42	Н	-43.95	63.08
20600 (844.0)	2,532.00	-51.68	10.98	-50.94	2.90	Н	-42.86	61.99
(0.1.0)	3,376.00	-57.90	12.10	-57.95	3.46	Н	-49.31	68.44

**NOTES:** <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u> according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

2. We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3.We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

# 8.4 RADIATED SPURIOUS EMISSIONS With wireless charging pad 8.4.1 RADIATED SPURIOUS EMISSIONS (1.4 MHz Band 5 LTE)

OPERATING FREQUENTY:	<u>836.50 MHz</u>
MEASURED OUTPUT POWER:	<u>17.11 dBm = 0.051 W</u>
MODULATION SIGNAL:	1.4 MHz QPSK
DISTANCE:	<u>3 meters</u>
LIMIT: 43 + 10 log10 (W) =	<u>30.11 dBc</u>

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitute Level (dBm)	C.L	Pol	ERP (dBm)	dBc
	1,673.00	-50.67	9.23	-52.69	2.42	Н	-45.88	62.99
20525 (836.5)	2,509.50	-55.44	10.96	-54.40	2.89	Н	-46.33	63.44
(000.0)	3,346.00	-57.50	10.03	-55.37	3.47	V	-48.81	65.92

**NOTES:** <u>1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method</u> <u>according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:</u>

2. We are performed all frequency to 10<sup>th</sup> harmonics from 9 kHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3.We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

5. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

6. The test with wireless charging pad measured the worst channel of stand alone.



# 8.5 OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data ( MHz )		
			QPSK	6	0	1.0998		
	1.4 MHz 3 MHz 5 5 MHz 10 MHz		16-QAM	6	0	1.0972		
		000 F	QPSK	15	0	2.7101		
5			16-QAM	15	0	2.7024		
5		5 141		836.5	QPSK	25	0	4.5147
			16-QAM	25	0	4.5028		
			QPSK	50	0	8.9654		
			16-QAM	50	0	8.9414		

- Plots of the EUT's Occupied Bandwidth are shown Page 32  $\sim$  35.

# **8.6 CONDUCTED SPURIOUS EMISSIONS**

**■FACTORS FOR FREQUENCY** 

Frequency Range (GHz)	Factor [dB]
0.03 – 1	27.145
1 – 5	26.960
5 – 10	27.542
10 – 15	28.439
15 – 20	29.144
Above 20	30.148

#### NOTES:

Factor(dB) = Cable Loss + Attenuator + Power Splitter

Band	Band Width (MHz)	Frequency (MHz)	Frequency of Maximum Harmonic (GHz)	Factor (dB)	Measurement Maximum Data (dBm)	Result (dBm)	Limit (dBm)
		824.7	5.62925	27.542	-58.81	-31.268	
	1.4	836.5	4.59544	26.960	-58.95	-31.990	
		848.3	3.66506	26.960	-58.66	-31.700	
		825.5	3.69041	26.960	-58.62	-31.660	
	3	836.5	3.68295	26.960	-58.94	-31.980	
5		847.5	2.68572	26.960	-58.83	-31.870	-13.00
5		826.5	3.18520	26.960	-58.14	-31.180	-13.00
	5	836.5	3.70382	26.960	-59.06	-32.100	
		846.5	3.71774	26.960	-58.80	-31.840	
		829.0	3.06717	26.960	-59.01	-32.050	
	10	836.5	3.75278	26.960	-58.17	-31.210	
		844.0	3.70035	26.960	-57.66	-30.700	

#### NOTES:

1. Conducted Spurious Emissions was Tested QPSK Modulation, Resource Block Size 1 and Resource Block Offset 0

2. Result (dBm) = Measurement Maximum Data (dBm) + Factor (dB)

- Plots of the EUT's Conducted Spurious Emissions are shown Page 48 ~ 59.

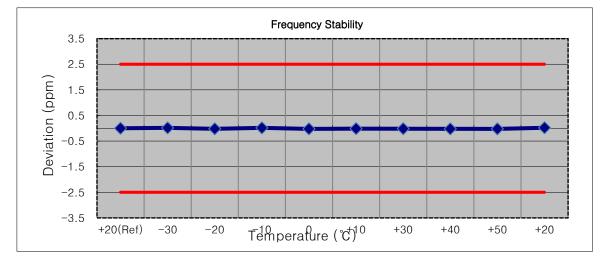
#### 8.6.1 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 36 ~ 47.

# 8.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE 8.7.1 FREQUENCY STABILITY (1.4 MHz Band 5 LTE)

OPERATING FREQUENCY:	<u>836,500,000 Hz</u>
CHANNEL:	<u>20525 (1.4 MHz)</u>
REFERENCE VOLTAGE:	<u>3.8 VDC</u>
DEVIATION LIMIT:	<u>± 0.000 25 % or 2.5 ppm</u>

Voltage	Power	Temp.	Frequency	Frequency	Deviation	
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	ppm
100%		+20(Ref)	836 499 984	0.0	0.000 000	0.000
100%		-30	836 499 997	13.4	0.000 002	0.016
100%		-20	836 499 967	-17.2	-0.000 002	-0.021
100%		-10	836 499 997	13.5	0.000 002	0.016
100%	3.8	0	836 499 964	-19.5	-0.000 002	-0.023
100%		+10	836 499 973	-11.0	-0.000 001	-0.013
100%		+30	836 499 969	-14.5	-0.000 002	-0.017
100%		+40	836 499 966	-17.9	-0.000 002	-0.021
100%		+50	836 499 965	-19.3	-0.000 002	-0.023
Batt. Endpoint	3.6	+20	836 500 001	17.1	0.000 002	0.020

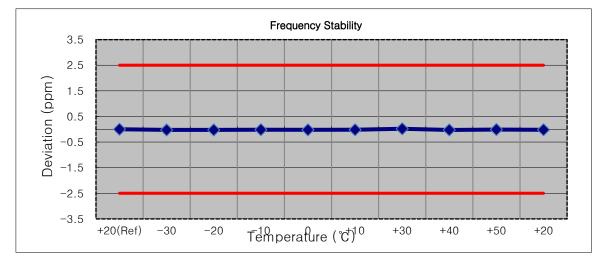




### 8.7.2 FREQUENCY STABILITY (3 MHz Band 5 LTE)

OPERATING FREQUENCY:	<u>836,500,000 Hz</u>
CHANNEL:	<u>20525 (3 MHz)</u>
REFERENCE VOLTAGE:	<u>3.8 VDC</u>
DEVIATION LIMIT:	<u>± 0.000 25 % or 2.5 ppm</u>

Voltage	Power	Temp.	Frequency	Frequency	Deviation	
(%)	(VDC)	(°C)	(Hz)	Error (Hz)	(%)	ppm
100%		+20(Ref)	836 499 989	0.0	0.000 000	0.000
100%		-30	836 499 969	-20.5	-0.000 002	-0.025
100%	3.8	-20	836 499 969	-20.4	-0.000 002	-0.024
100%		-10	836 499 974	-14.8	-0.000 002	-0.018
100%		0	836 499 970	-18.7	-0.000 002	-0.022
100%		+10	836 499 974	-15.1	-0.000 002	-0.018
100%		+30	836 500 005	15.8	0.000 002	0.019
100%		+40	836 499 967	-22.3	-0.000 003	-0.027
100%	]	+50	836 499 980	-9.1	-0.000 001	-0.011
Batt. Endpoint	3.6	+20	836 499 972	-17.2	-0.000 002	-0.021

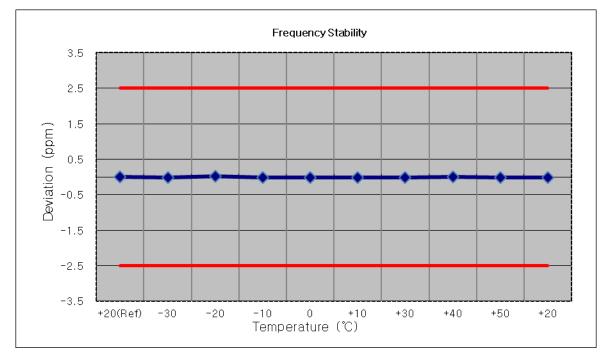




### 8.7.3 FREQUENCY STABILITY (5 MHz Band 5 LTE)

OPERATING FREQUENCY:	<u>836,500,000 Hz</u>
CHANNEL:	<u>20525 (5 MHz)</u>
REFERENCE VOLTAGE:	<u>3.8 VDC</u>
DEVIATION LIMIT:	<u>± 0.000 25 % or 2.5 ppm</u>

Voltage	Power	Temp.	Frequency	Frequency	Deviation	
(%)	(VDC)	(ື ()	(Hz)	Error (Hz)	(%)	ppm
100%		+20(Ref)	836 499 983	0.0	0.000 000	0.000
100%		-30	836 499 964	-18.2	-0.000 002	-0.022
100%	3.8	-20	836 500 001	18.4	0.000 002	0.022
100%		-10	836 499 971	-11.2	-0.000 001	-0.013
100%		0	836 499 966	-16.5	-0.000 002	-0.020
100%		+10	836 499 965	-17.1	-0.000 002	-0.020
100%		+30	836 499 967	-15.4	-0.000 002	-0.018
100%		+40	836 499 990	7.4	0.000 001	0.009
100%		+50	836 499 962	-20.1	-0.000 002	-0.024
Batt. Endpoint	3.6	+20	836 499 970	-12.4	-0.000 001	-0.015

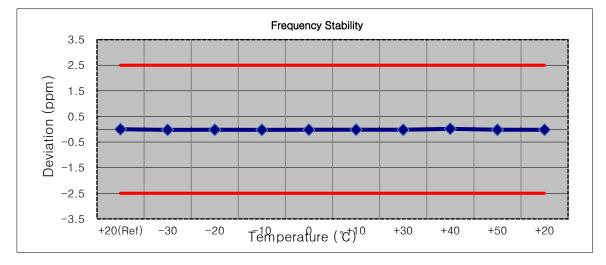




### 8.7.4 FREQUENCY STABILITY (10 MHz Band 5 LTE)

OPERATING FREQUENCY:	<u>836,500,000 Hz</u>
CHANNEL:	<u>20525 (10 MHz)</u>
REFERENCE VOLTAGE:	<u>3.8 VDC</u>
DEVIATION LIMIT:	<u>± 0.000 25 % or 2.5 ppm</u>

Voltage	Power	Temp.	Frequency	Frequency	Deviation	
(%)	(VDC)	(ື ()	(Hz)	Error (Hz)	(%)	ppm
100%		+20(Ref)	836 499 986	0.0	0.000 000	0.000
100%		-30	836 499 966	-20.1	-0.000 002	-0.024
100%	3.8	-20	836 499 971	-15.0	-0.000 002	-0.018
100%		-10	836 499 967	-19.4	-0.000 002	-0.023
100%		0	836 499 971	-15.1	-0.000 002	-0.018
100%		+10	836 499 972	-14.2	-0.000 002	-0.017
100%		+30	836 499 970	-15.9	-0.000 002	-0.019
100%		+40	836 500 001	14.9	0.000 002	0.018
100%		+50	836 499 971	-14.9	-0.000 002	-0.018
Batt. Endpoint	3.6	+20	836 499 969	-16.5	-0.000 002	-0.020





Model: LG-W281

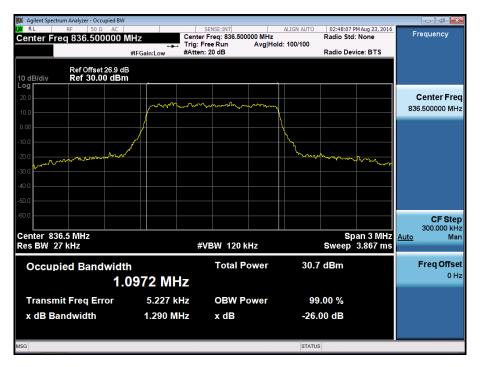
# 9. TEST PLOTS



	rum Analyzer - Occupied BV	V					
Center Fre	RF 50 Ω AC eq 836.500000	+			Radio St 100/100		Frequency
10 dB/div	Ref Offset 26.9 o Ref 30.00 dBi		#Atten: 20 dB		Radio De	evice: BTS	
20.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m			Center Freq 836.500000 MHz
-10.0	1 mar mar and a mar and a mar and a mar				munn	mon	
-30.0 -40.0 -50.0							
Center 830 Res BW 23			#VBW 120	kHz		pan 3 MHz 3.867 ms	CF Step 300.000 kHz <u>Auto</u> Man
Occup	ied Bandwid 1.	<sup>th</sup> .0998 MH	Total F	Power	31.7 dBm		<b>Freq Offset</b> 0 Hz
	it Freq Error Indwidth	4.166 k 1.280 M		Power	99.00 % -26.00 dB		
MSG					STATUS		

#### BAND 5. Occupied Bandwidth Plot (1.4M BW Ch.20525 QPSK\_RB6\_0)

#### BAND 5. Occupied Bandwidth Plot (1.4M BW Ch.20525 16QAM\_RB6\_0)

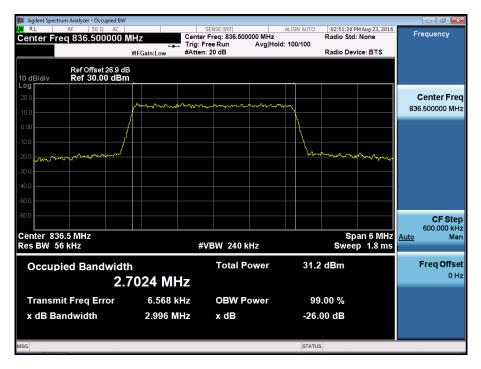




	ım Analyzer - Occupied BW							
Center Fre	RF 50 Ω AC eq 836.500000 Γ	WIHZ #IFGain:Low	SENSE:INT Center Freq: 836.50 Trig: Free Run #Atten: 20 dB		100/100	02:51:17 P Radio Std: Radio Dev		Frequency
10 dB/div	Ref Offset 26.9 dl Ref 30.00 dBm							
20.0		mm	man ware	•••••••	~~			Center Freq 836.500000 MHz
-10.0		/						
-20.0	monorman				hand	harrow from the	Y~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
-40.0								
-60.0	5 MU7					- Cn	an 6 MHz	CF Step 600.000 kHz
Res BW 56			#VBW 240	kHz		Swee	p 1.8 ms	<u>Auto</u> Man
Occupi	ed Bandwidt 2.	<sup>h</sup> 7101 M⊦	Total I	Power	32.1	dBm		Freq Offset 0 Hz
Transm	it Freq Error	6.235 k	Hz OBW F	Power	99.	00 %		
x dB Ba	ndwidth	2.995 M	Hz x dB		-26.0	0 dB		
MSG					STATUS			

#### BAND 5. Occupied Bandwidth Plot (3M BW Ch.20525 QPSK\_RB15\_0)

BAND 5. Occupied Bandwidth Plot (3M BW Ch.20525 16QAM\_RB15\_0)

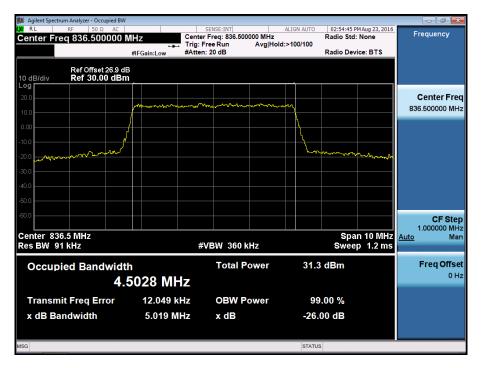




Ref So Q AC ENSE:INT ALION AUTO Q2:4:35 PM Aug 23, 2016   Center Freq 836.500000 MHz Center Freq 836.500 MHz Radio Std: None   #IFGain:Low #IFGain:Low Avg Hold: 100/100   #Atten: 20 dB Avg Hold: 100/100   Ref Offset 26.9 dB Center Freq 836.500000 MHz   Log Center Freq 830.00 dBm   Log Center Freq 830.00 dBm   0 Alion Auton   0.00 Alion Auton
Ref Offset 26.9 dB     AvglHold: 100/100       Ref Offset 26.9 dB     Center Fri       10 dB/div     Ref 30.00 dBm       200     Center Fri       000     Center Fri
Ref Offset 26.9 dB     Center Fr       10 dB/div     Ref 30.00 dBm       200
10 dB/div   Ref 30.00 dBm     200   Center Fr     300   Second   Second   Second     4000   Second   Second
200     Center Fr       100
100
100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100   100 100
-10.0 -20.0 -30.0 -40.0
-20 0
-40.0
-40.0
-60.0 CF Ste
Center 836.5 MHz Span 10 MHz Auto M
Res BW 91 kHz #VBW 360 kHz Sweep 1.2 ms
Occupied Bandwidth Total Power 32.2 dBm Freq Offs
4.5147 MHz
Transmit Freq Error 17.034 kHz OBW Power 99.00 %
x dB Bandwidth 5.024 MHz x dB -26.00 dB
MSG STATUS

#### BAND 5. Occupied Bandwidth Plot (5M BW Ch.20525 QPSK\_RB25\_0)

BAND 5. Occupied Bandwidth Plot (5M BW Ch.20525 16QAM\_RB25\_0)

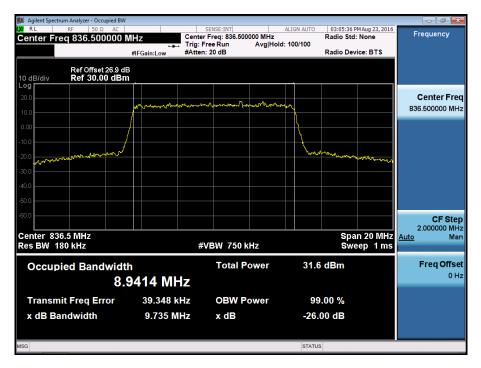




🎉 Agilent Spectru	um Analyzer - Occupied BW	1					- 6 -
Center Fre	RF 50 Ω AC eq 836.500000	····	SENSE:INT Center Freq: 836.500 Trig: Free Run #Atten: 20 dB		Radio St 0/100	7 PM Aug 23, 2016 td: None evice: BTS	Frequency
10 dB/div	Ref Offset 26.9 d Ref 30.00 dBr						
20.0		for and the second second	unsalle have been a strand	mon to the the			Center Freq 836.500000 MHz
0.00							
-20.0 10 10 10 10 10 10 10 10 10 10 10 10 10	- Arther and -					and the second second	
-40.0 -50.0 -60.0							OF Store
Center 836 Res BW 18			#VBW 7501	kHz	Sp Sv	an 20 MHz veep 1 ms	<b>CF Step</b> 2.000000 MHz <u>Auto</u> Man
Occupi	ied Bandwidi 8.	<sup>th</sup> 9654 MH:	Total P Z	ower	32.4 dBm		Freq Offset 0 Hz
	it Freq Error	25.628 kH		ower	99.00 %		
x dB Ba	ndwidth	9.873 MH	z xdB		-26.00 dB		
MSG					STATUS		

#### BAND 5. Occupied Bandwidth Plot (10M BW Ch.20525 QPSK\_RB50\_0)

BAND 5. Occupied Bandwidth Plot (10M BW Ch.20525 16QAM\_RB50\_0)







#### BAND 5. Lower Band Edge Plot (1.4M BW Ch.20407 QPSK\_RB1\_Offset 0)

BAND 5. Lower Band Edge Plot (1.4M BW Ch.20407 QPSK\_RB6\_Offset 0)







## BAND 5. Lower Extended Band Edge Plot (1.4M BW Ch.20407 QPSK\_RB6\_0)

BAND 5. Lower Band Edge Plot (3M BW Ch.20415 QPSK\_RB1\_Offset 0)







# BAND 5. Lower Band Edge Plot (3M BW Ch.20415 QPSK\_RB15\_Offset 0)

BAND 5. Lower Extended Band Edge Plot (3M BW Ch.20415 QPSK\_RB15\_0)

	ctrum Analyzer - Swept SA								- 6 -
X/ RL	RF 50 Ω AC		SEN	ISE:INT	#Avg Typ	ALIGN AUTO		M Aug 23, 2016	Frequency
Center F	req 821.000000	PNO: Wide ↔→ IFGain:Low	Trig: Free #Atten: 20		#Avg iyp	e: RIVIS	TYP	E 1 2 3 4 5 6 E M WWWW A N N N N N	
10 dB/div	Ref Offset 26.9 dB Ref 30.00 dBm					Mk		76 MHz 06 dBm	Auto Tune
20.0									Center Free
									821.000000 MH;
10.0									Start Fred 819.000000 MH;
0.00									8 19.00000 MH
10.0								-13.00 dBm	Stop Free 823.000000 MH;
20.0								<b>\</b>	823.000000 MIH
30.0					www.www.www.	and the second	and the second	and a start of the	CF Ster 400.000 kH
40.0 <b>38.<sup>840000</sup></b>	a la de la calega de	g. Alerana and the							<u>Auto</u> Mai
50.0									Freq Offse
60.0									011
Center 82 Res BW	21.000 MHz 100 kHz	#VBW	300 kHz			#Sweep	Span 4 1.000 s (	.000 MHz 1001 pts)	
SG						STATUS			





## BAND 5. Lower Band Edge Plot (5M BW Ch.20425 QPSK\_RB1\_Offset 0)

BAND 5. Lower Band Edge Plot (5M BW Ch.20425 QPSK\_RB25\_Offset 0)

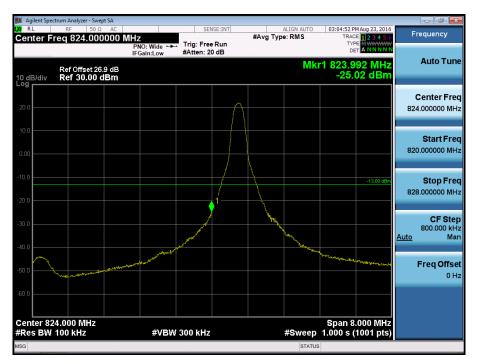




RL	rum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT	ALIGN AUTO	02:53:48 PM Aug 23, 2016	
enter Fr	eq 821.000000	MHz PNO: Wide ↔ IFGain:Low	→ Trig: Free Run #Atten: 20 dB	#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET A NNNNN	Frequency
0 dB/div	Ref Offset 26.9 dB Ref 30.00 dBm			Mk	r1 822.968 MHz -26.84 dBm	Auto Tun
0.0						Center Fre 821.000000 MH
.00						Start Fre 819.000000 M⊦
D.0					-13.00 dBm	Stop Fre 823.000000 M⊦
).0	1 y type of a start and a start of a start o	where a shirt a second s	and an a start of the start of	en en fan fan en fan en fan fan fan fan fan fan fan fan fan fa	a la hellen an	CF Ste 400.000 k⊦ <u>Auto</u> Ma
).0						Freq Offs 0 ⊦
enter 82	1.000 MHz				Span 4.000 MHz	
Res BW 1		#VBW	300 kHz	#Sweep	1.000 s (1001 pts)	
G				STATUS	3	

BAND 5. Lower Extended Band Edge Plot (5M BW Ch.20425 QPSK\_RB25\_0)

BAND 5. Lower Band Edge Plot (10M BW Ch.20450 QPSK\_RB1\_Offset 0)





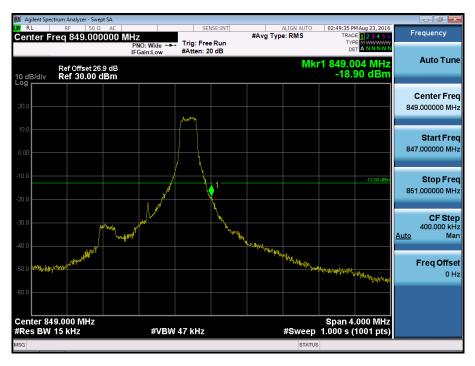


# BAND 5. Lower Band Edge Plot (10M BW Ch.20450 QPSK\_RB50\_Offset 0)

BAND 5. Lower Extended Band Edge Plot (10M BW Ch.20450 QPSK\_RB50\_0)

	ctrum Analyzer - Swept S										- 6
RL	RF 50 Ω			SEN	ISE:INT		ALIGN AUTO		M Aug 23, 2016	En	equency
enter F	req 821.0000	Р	Z NO: Wide ↔ Gain:Low	Trig: Free #Atten: 20		#Avg Typ	e:RMS	TY	CE 1 2 3 4 5 6 PE M WWWWW ET A N N N N N		
0 dB/div	Ref Offset 26.9 Ref 30.00 dE	dB Sm					Mk		984 MHz 46 dBm		Auto Tun
29										c	enter Fre
10.0										821	.000000 MH
0.0											Start Fre
										819	.000000 MH
D.O											Oton En
0.0									-13.00 dBm	823	Stop Fre
									1		CF Ste
D.0	and monthly shared and a	Where and the second second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Juli Istory of Mary Mary Mary Mary Mary Mary Mary Mary	ո <del>վոր</del> դիններդ-աՐա	**************************************		-paper of the second	«ለተኑሱሳሳሊቢስሲስ	<u>Auto</u>	400.000 kH
0.0										F	Freq Offs
5.0											0 H
0.0											
	21.000 MHz							Span 4	.000 MHz		
Res BW	100 kHz		#VBW	300 kHz			#Sweep	1.000 s	1001 pts)		
G							STATUS	3			





# BAND 5. Upper Band Edge Plot (1.4M BW Ch.20643 QPSK\_RB1\_Offset 5)

BAND 5. Upper Band Edge Plot (1.4M BW Ch.20643 QPSK\_RB6\_Offset 0)

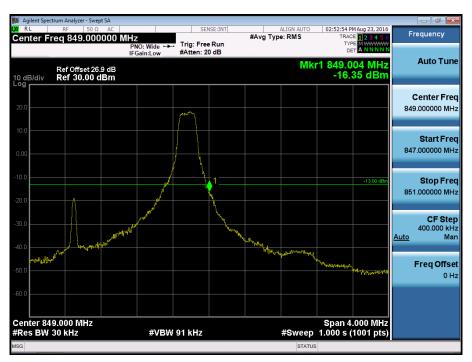






## BAND 5. Upper Extended Band Edge Plot (1.4M BW Ch.20643 QPSK\_RB6\_0)

BAND 5. Upper Band Edge Plot (3M BW Ch.20635 QPSK\_RB1\_Offset 14)







# BAND 5. Upper Band Edge Plot (3M BW Ch.20635 QPSK\_RB15\_Offset 0)

BAND 5. Upper Extended Band Edge Plot (3M BW Ch.20635 QPSK\_RB15\_0)

Agilent Spec	ctrum Analyzer - Swept SA RF 50 Ω AC		SEN	SE:INT		ALIGN AUTO	02:52:42 P	M Aug 23, 2016	
	req 852.000000	PNO: Wide +++	Trig: Free #Atten: 20	Run	#Avg Typ		TRAC	E 1 2 3 4 5 6 E M WWWW A N N N N N	Frequency
0 dB/div og r	Ref Offset 26.9 dB Ref 30.00 dBm					Mk		20 MHz 93 dBm	Auto Tu
20.0									Center Fr 852.000000 M
).00									Start Fr 850.000000 M
0.0								-13.00 dBm	Stop Fr 854.000000 M
	the fill a special second s	NONDAN ALAMANIA SAN	WWW TO MININ	u-raynana	Nddyfyrfyrfyrfyddynarwy	- wesevery of styles	maria ang ang ang ang ang ang ang ang ang an	and and a second second	<b>CF St</b> 400.000 k <u>Auto</u> M
0.0									Freq Offs 0
:0.0	62.000 MHz						Span 4	.000 MHz	
	100 kHz	#VBW 3	300 kHz			#Sweep	1.000 s (	1001 pts)	
G						STATUS			





# BAND 5. Upper Band Edge Plot (5M BW Ch.20625 QPSK\_RB1\_Offset 24)

BAND 5. Upper Band Edge Plot (5M BW Ch.20625 QPSK\_RB25\_Offset 0)





Agilent Spec	trum Analyzer - Swept SA RF 50 Ω AC		SENSE:INT	ALIGN AUTO	02:56:03 PM Aug 23, 2016	
	req 852.000000	MHz PNO: Wide ↔ IFGain:Low		#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET A N N N N N	Frequency
0 dB/div	Ref Offset 26.9 dB Ref 30.00 dBm			Mk	r1 850.044 MHz -26.89 dBm	Auto Tun
0.0						Center Fre 852.000000 M⊦
.00						Start Fre 850.000000 MF
					-13.00 dBm	Stop Fre 854.000000 M⊦
	www.monnenaahhanen	and a stand of the s	فالمواجدين ويدعدون والجاجد المسام و	and the processing of the second s	and an and the second	CF Ste 400.000 kH <u>Auto</u> Ma
0.0						Freq Offs 0 H
enter 85	2.000 MHz				Span 4.000 MHz	
Res BW	100 kHz	#VBV	/ 300 kHz	#Sweep	1.000 s (1001 pts)	

BAND 5. Upper Extended Band Edge Plot (5M BW Ch.20625 QPSK\_RB25\_0)

BAND 5. Upper Band Edge Plot (10M BW Ch.20600 QPSK\_RB1\_Offset 49)







# BAND 5. Upper Band Edge Plot (10M BW Ch.20600 QPSK\_RB50\_Offset 0)

BAND 5. Upper Extended Band Edge Plot (10M BW Ch.20600 QPSK\_RB50\_0)







BAND 5. Conducted Spurious Plot \_1 (20407ch\_1.4MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20407ch\_1.4MHz\_QPSK\_RB 1\_0)

	ctrum Analyzer - Swe									
xv <sub>RL</sub> Center F	RF 50 Ω req 7.50000	AC 00000	GHz		ISE:INT	#Avg Typ	ALIGN AUTO	TRAC	MAug 23, 2016 E 1 2 3 4 5 6 E M WWWWW	Frequency
	Def 40.00		PNO: Fast ++	Trig: Free #Atten: 20			M	or 1 5.629		Auto Tune
10 dB/div Log	Ref 10.00 (	dBm						-30.		
0.00										Center Freq 7.50000000 GHz
0.00										7.50000000 GH2
-10.0										Start Fred
-20.0										5.00000000 GHz
-30.0										Stop Freq
-40.0										10.00000000 GH2
-50.0										CF Step
00.0	1									500.000000 MH: <u>Auto</u> Mar
-60.0 <mark>1979-49</mark> 9	an a	الغيبويغووليغاب	landa a subana a subana a subana s	ater and the fi	lanning hadda		والمراجع والمراجع	فالمراطعة والمراط	antici a printer la	
-70.0	المالمردار بالألمان ويناطرو	la luna a stabilitati an	and Profile and a second second second	n parti de la constante de la c	dalification substances	landar ta	والمتحد ومحادثا	n fa su mattikka iki	and the second of the	Freq Offset 0 Hz
										0 Hz
-80.0										
Start 5.00	00 GHz							Stop 10	.000 GHz	
#Res BW			#VBW	3.0 MHz		S	weep 9	9.333 ms (2	0001 pts)	
ISG							STAT	US		



Start 30 MHz #Res BW 1.0 MHz

02:48:50 PM Aug 23, 2016 #Avg Type: RMS Frequency Center Freq 2.515000000 GHz RACE 1 2 3 4 5 TYPE MWWWW DET A NNNN Trig: Free Run #Atten: 20 dB PNO: Fast ++ IFGain:Low Auto Tun .595 44 GHz -58.95 dBm Mkr′ Ref 10.00 dBm 10 dB/div **Center Freq** 2.515000000 GHz Start Freq 30.000000 MHz Stop Freq 5.00000000 GHz CF Step 497.000000 MHz

♦1

Stop 5.000 GHz Sweep 9.333 ms (20001 pts) Auto

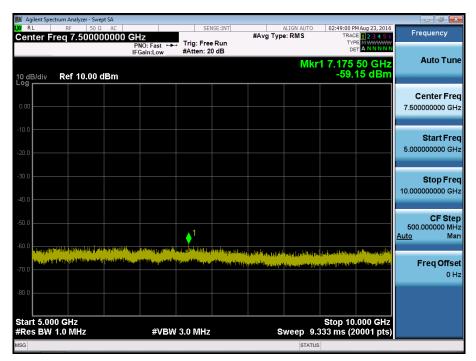
Man

Freq Offset 0 Hz

# BAND 5. Conducted Spurious Plot \_1 (20525ch\_1.4MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20525ch\_1.4MHz\_QPSK\_RB 1\_0)

#VBW 3.0 MHz

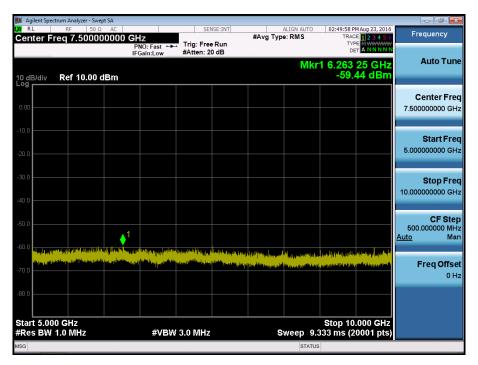




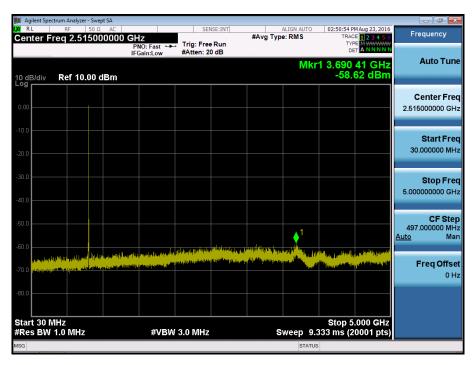
📕 Agilent Spe 🛛 R L	ctrum Analyzer - Sw RF 50 9			0.0	NSE:INT		ALIGN AUTO	02:40:40 D	1 Aug 23, 2016	
	req 2.5150	00000 G	<b>Hz</b> PNO: Fast ↔ FGain:Low		e Run	#Avg Typ		TRACE	<b>1 2 3 4 5</b> 6 <b>M WWWWW</b> <b>A N N N N N</b>	Frequency
0 dB/div	Ref 10.00	dBm					Mkr	1 3.665 -58.6	06 GHz 66 dBm	Auto Tune
										Center Fre 2.515000000 GH
20.0										Start Free 30.000000 MH
80.0										<b>Stop Fre</b> 5.000000000 GH
0.0							↓1			CF Ste 497.000000 MH <u>Auto</u> Ma
0.0 1019 10.0	and the state of the	alla <mark>n palender</mark> te Kangelenderte	al and a part of the second	perfecti fill a finite news de chanaida	n og for store store for en store store For an	an a shekara na bashi a		Alder and Alder Materia and Alder	n der Gande <sup>re</sup> Fr <sup>anke</sup> issejen	Freq Offse 0 H
30.0	MHz							Stop 5	000 GHz	
	1.0 MHz		#VBW	/ 3.0 MHz		S	weep 9.3	33 ms (2)	000 GH2 0001 pts)	
iG							STATUS			

BAND 5. Conducted Spurious Plot \_1 (20643ch\_1.4MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20643ch\_1.4MHz\_QPSK\_RB 1\_0)

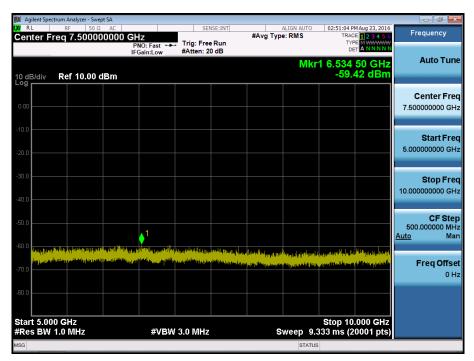






BAND 5. Conducted Spurious Plot \_1 (20415ch\_3MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20415ch\_3MHz\_QPSK\_RB 1\_0)

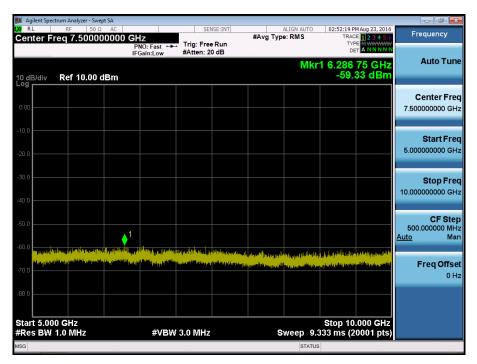




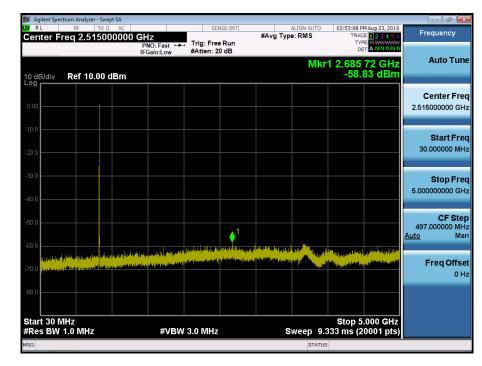


BAND 5. Conducted Spurious Plot \_1 (20525ch\_3MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20525ch\_3MHz\_QPSK\_RB 1\_0)

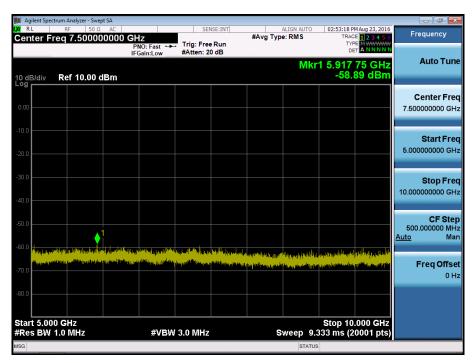






BAND 5. Conducted Spurious Plot \_1 (20635ch\_3MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20635ch\_3MHz\_QPSK\_RB 1\_0)

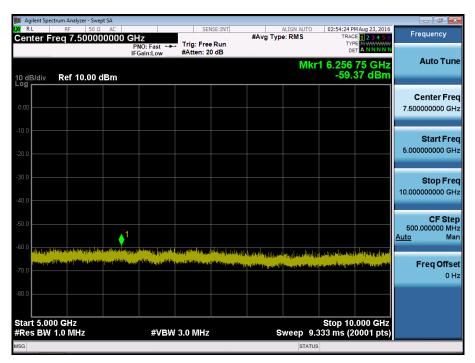






BAND 5. Conducted Spurious Plot \_1 (20425ch\_5MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20425ch\_5MHz\_QPSK\_RB 1\_0)







BAND 5. Conducted Spurious Plot \_1 (20525ch\_5MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20525ch\_5MHz\_QPSK\_RB 1\_0)

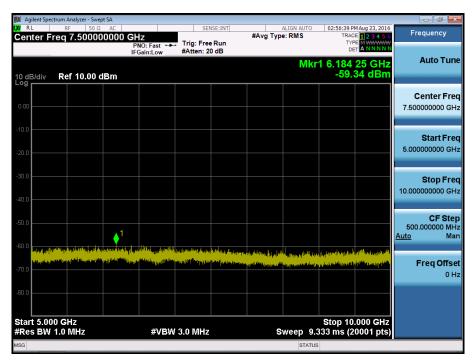






### BAND 5. Conducted Spurious Plot \_1 (20625ch\_5MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20625ch\_5MHz\_QPSK\_RB 1\_0)

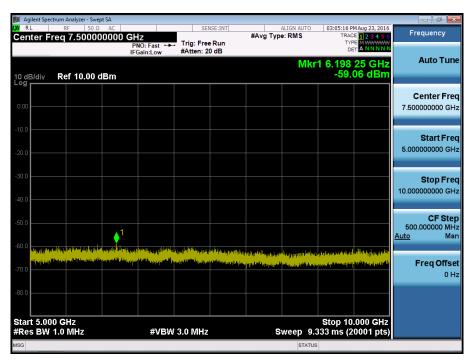




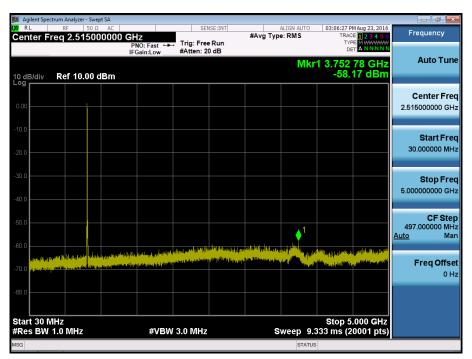


#### BAND 5. Conducted Spurious Plot \_1 (20450ch\_10MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20450ch\_10MHz\_QPSK\_RB 1\_0)







BAND 5. Conducted Spurious Plot \_1 (20525ch\_10MHz\_QPSK\_RB 1\_0)

BAND 5. Conducted Spurious Plot \_2 (20525ch\_10MHz\_QPSK\_RB 1\_0)







#### BAND 5. Conducted Spurious Plot \_1 (20600ch\_10MHz\_QPSK\_RB 1\_0)

### BAND 5. Conducted Spurious Plot \_2 (20600ch\_10MHz\_QPSK\_RB 1\_0)

