

# FCC BT LE REPORT

#### **FCC Certification**

#### **Applicant Name:**

LG Electronics MobileComm U.S.A., Inc.

#### Address:

1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Date of Issue: July 07, 2016 Test Site/Location: HCT CO., LTD., 74,Seoicheon-ro 578beon-gil,Majangmyeo,Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA Report No.: HCT-R-1606-F027 HCT FRN: 0005866421

IC Recognition No.: 5944A-5

# FCC ID : ZNFK200F APPLICANT : LG Electronics MobileComm U.S.A., Inc.

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID: ZNFK200MT report.

Model(s):	LG-K200F
Additional Model(s):	LGK200F, K200F
EUT Type:	Portable Handset
<b>RF Peak Output Power:</b>	-1.434 dBm (0.719 mW)
Frequency Range:	2402 MHz -2480 MHz
Modulation type	GFSK
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s): Engineering Statement:	Part 15.247

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.

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 : Seul Ki Lee Test Engineer of RF Team

Approved by : Jong Seok Lee Manager of RF Team

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# **Version**

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1606-F027	July 07, 2016	- First Approval Report



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Model: LG-K200F

# **1. GENERAL INFORMATION**

Applicant:	LG Electronics MobileComm U.S.A., Inc.				
Address:	1000 Sylvan Avenue, Englewood Cliffs NJ 07632				
FCC ID:	ZNFK200F				
EUT Type:	Portable Handset				
Model (s):	LG-K200F				
Date(s) of Tests:	May 03, 2016 ~ June 01, 2016				
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea (IC Recognition No. : 5944A-5)				

# 2. EUT DESCRIPTION

Model	LG-K200	LG-K200F		
Additional Model(s):	LGK200F	LGK200F, K200F		
EUT Type	Portable	Handset		
Power Supply	DC 3.8 V			
Patters Information	Model: B	L-41A1HB		
Battery Infomation	Type: Li-i	on Battery		
Frequency Range	TX: 2402 I	MHz ~ 2480 MHz		
	RX: 2402 MHz ~ 2480 MHz			
May DE Outrut Dawar	Peak	-1.434 dBm (0.719 mW)		
Max. RF Output Power	Average	-1.70 dBm (0.676 mW)		
BT Operating Mode	BT_Low Energy Mode			
Modulation Type	GFSK			
Number of Channels	40 Channels			
	Manufacturer: KOMATECH Co., Ltd.			
Antenna Specification	Antenna ty	/pe: INTERNAL ANTENNA		
	Peak Gain : 2.37 dBi			



# 3. TEST METHODOLOGY

FCC KDB 558074 D01 DTS Meas Guidance v03r05 dated April 8, 2016 entitled "Guidance for Performing Compliance Measurements on Digital Transmission Systems(DTS) and the measurement procedure described in ANSI C63.10(Version : 2013) 'the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices'.

### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### 3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

#### 3.3 GENERAL TEST PROCEDURES

#### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

#### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

#### **Conducted Antenna Terminal**

See Section from 9.1 to 9.2.(KDB 558074 v03r05)

#### 3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.



## 4. 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 equipments, which is traceable to recognized national standards.

Espectially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

# 5. FACILITIES AND ACCREDITATIONS

#### 5.1 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 :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661)

#### 5.2 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. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. 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."

# 6. ANTENNA REQUIREMENTS

#### According to FCC 47 CFR §15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

\* The antennas of this E.U.T are permanently attached.

\*The E.U.T Complies with the requirement of §15.203



## 7. 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



# 8. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result		
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz		PASS		
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS		
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band	CONDUCTED	PASS		
Band Edge(Out of Band Emissions)	§15.247(d)	Conducted > 20 dBc		PASS		
AC Power line Conducted Emissions	§15.207 cf. Section 8.7		§15.207 cf. Section 8.7			PASS
Radiated Spurious Emissions §15.205, 15.209		cf. Section 8.6.1	RADIATED	PASS		
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.6.2	RADIATED	PASS		

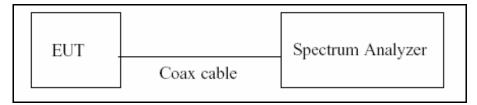


## 9. TEST RESULT 9.1 DUTY CYCLE

#### TEST PROCEDURE

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW  $\geq$  OBW if possible; otherwise, set RBW to the largest available value. Set VBW  $\geq$  RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T  $\leq$  16.7 microseconds.)

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zerospan measurement method, 6.0)b) in KDB 558074 v03r05.

The largest available value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if  $T \le 6.25$  microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/T.

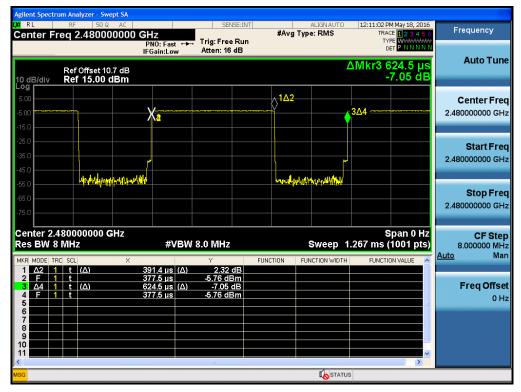
- 1. RBW = 8 MHz (the largest available value)
- 2. VBW = 8 MHz (≥ RBW)
- 3. SPAN = 0 Hz
- 4. Detector = Peak
- 5. Number of points in sweep > 100
- 6. Trace mode = Clear write
- 7. Measure  $T_{\text{total}} \, \text{and} \, T_{\text{on}}$
- 8. Calculate Duty Cycle =  $T_{on}/T_{total}$  and Duty Cycle Factor = 10\*log(1/Duty Cycle)

LE Mode	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor (dB)
	0.3914	0.6245	0.6268	2.03



Model: LG-K200F

#### RESULT PLOTS





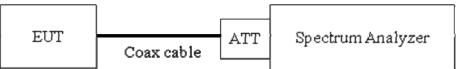
#### 9.2 6 dB BANDWIDTH MEASUREMENT

#### Test Requirements and limit, §15.247(a)(2)

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6 dB bandwidth is 500 kHz.

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.1 in KDB 558074 v03r05)

RBW = 100 kHz $VBW \ge 3 \text{ x RBW}$ Detector = PeakTrace mode = max holdSweep = auto coupleAllow the trace to stabilize

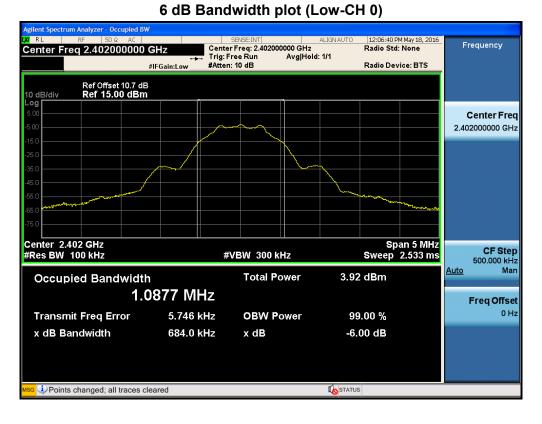
Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

#### TEST RESULT

Mode	Channel	6 dB Bandwidth	Limit	Pass/Fail	
	Channel	(kHz)	(kHz)	Pass/Fall	
	0	684.0		Pass	
BT LE	19	690.0	> 500	Pass	
	39	700.3		Pass	



#### RESULT PLOTS



#### 6 dB Bandwidth plot (Mid-CH 19)

	n Analyzer - Occupied BW								
Center Fre	RF 50 Ω AC cq 2.440000000 G	Hz	SENSE:INT Center Freq: 2.4		ALIGN AUTO	12:09:12 P	1 May 18, 2016 None	Frequ	uency
		⊶⊷ FGain:Low	Trig: Free Run #Atten: 10 dB	Avg Hold	l: 1/1	Radio Dev	ice: BTS		
		Gamillow							
10 dB/div	Ref Offset 10.7 dB Ref 15.00 dBm								
Log 5.00								Cor	tor From
-5.00									nter Freq 0000 GHz
-15.0								2.44000	0000 0112
-25.0									
-35.0	<i>-</i>				<b>\</b>				
-45.0	+								
-55.0	and a second and a second and a second								
-65.0							and the second sec		
-75.0									
Center 2.44							an 5 MHz		CE Oton
#Res BW 1	l00 kHz		#VBW 30	00 kHz		Sweep	2.533 ms		CF Step 0.000 kHz
Occupi	ed Bandwidth		Tota	l Power	5.01	l dBm		<u>Auto</u>	Man
		880 MH	z					En	a Offeret
Transmi	it Freq Error	4.036 k		Power	00	9.00 %		Fre	e <b>q Offset</b> 0 Hz
x dB Bai	nawiath	690.0 ki	Hz xdB		-0.	00 dB			
мsg 🕕 Points (	changed; all traces clea	ared			STATU:	6			



	Trig: I	SENSE:INT er Freq: 2.480000000 GHz Free Run Avg Hol n: 10 dB	Radio St d: 1/1	PM May 18, 2016 d: None evice: BTS	Frequency
Ref Offset 10.7 dB 10 dB/div Ref 15.00 dBm Log					
-5.00					Center Freq 2.480000000 GHz
-15.0	~				
-35.0					
-65.0				men and and and and and and and and and an	
Center 2.48 GHz #Res BW 100 kHz	#	VBW 300 kHz		pan 5 MHz 2.533 ms	CF Step 500.000 kHz
Occupied Bandwidth		Total Power	3.16 dBm		<u>Auto</u> Man
1.0	878 MHz				Freq Offset
Transmit Freq Error	2.889 kHz	OBW Power	99.00 %		0 Hz
x dB Bandwidth	700.3 kHz	x dB	-6.00 dB		
мsg Points changed; all traces cle	ared		STATUS		

## 6 dB Bandwidth plot (High-CH 39)



#### 9.3 OUTPUT POWER MEASUREMENT

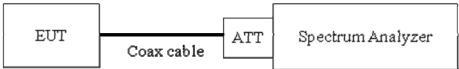
#### Test Requirements and limit, §15.247(b)(3)

A transmitter antenna terminal of EUT is connected to the input of a Spectrum Analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function.

This EUT TX condition is actual operating mode by BT LE mode test program.

The Spectrum Analyzer is set to

- Peak Power (Procedure 9.1.1 in KDB 558074 v03r05)
  - RBW ≥ DTS Bandwidth
  - $VBW \ge 3 \times RBW$
  - SPAN ≥ 3 x RBW
  - Detector Mode = Peak
  - Sweep = auto couple

Trace Mode = max hold

Allow trace to fully stabilize.

Use peak marker function to determine the peak amplitude level

Average Power (Procedure 9.2.2.4 in KDB 558074 v03r05)

Measure the duty cycle

Set span to at least 1.5 times the OBW

RBW = 1-5 % of the OBW, not to exceed 1 MHz.

VBW  $\geq$  3 x RBW.

Number of points in sweep  $\ge 2 x$  span / RBW. (This gives bin-to-bin spacing  $\le$  RBW/2,

so that narrowband signals are not lost between frequency bins.)

Sweep time = auto.

Detector = RMS(i.e., power averaging)

Do not use sweep triggering. Allow the sweep to "free run".



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

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.

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.

#### Sample Calculation

Output Power = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor Output Power = 10 dBm + 10 dB + 0.8 dB + 0.2 dB = 21.0 dBm

Note :

- 1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.
- 2. Spectrum offset = Attenuator loss + Cable loss
- 3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band.



#### TEST RESULTS-Peak

#### **Conducted Output Power Measurements**

LE Me	ode	Measured	Limit
Frequency[MHz]	Channel No.	Power(dBm)	(dBm)
2402	0	-2.543	30
2440	19	-1.434	30
2480	39	-3.248	30

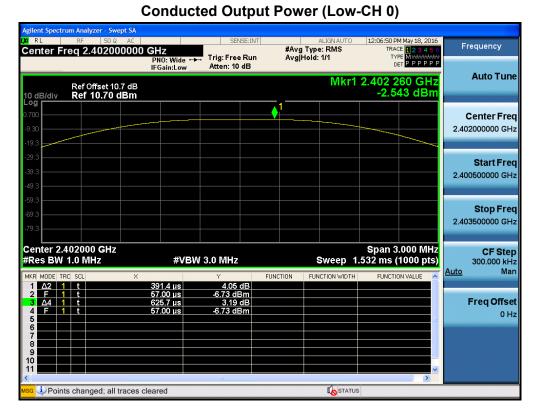
#### TEST RESULTS-Average

#### **Conducted Output Power Measurements**

LE Me	ode		Duty Cycle	Measured		
Frequency[MHz]	Channel No.	Measured Power(dBm)	Duty Cycle Factor (dB)	Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)	
2402	0	-4.76	2.03	-2.73	30	
2440	19	-3.73	2.03	-1.70	30	
2480	39	-5.58	2.03	-3.55	30	



#### RESULT PLOTS-Peak



#### Conducted Output Power (Mid-CH 19)

LXI RL	rum Analyzer - Swept SA RF 50 Ω AC req 2.44000000	0 GHz PN0: Wide ↔	SENSE:IN	#Avg	ALIGN AUTO 1 Type: RMS Hold: 1/1	12:09:22 PM May 1 TRACE 1 2 TYPE M	3 4 5 6	Frequency
10 dB/div	Ref Offset 10.7 dB Ref 10.70 dBm		Atten: 10 dB		Mkr1	оет Р Р 2.439 755 ( -1.434 с	GHz	Auto Tune
Log 0.700 -9.30 -19.3								Center Freq 2.440000000 GHz
-29.3 -39.3 -49.3								Start Freq 2.438500000 GHz
-59.3 -69.3 -79.3								<b>Stop Freq</b> 2.441500000 GHz
Center 2.4 #Res BW			V 3.0 MHz	FUNCTION	Sweep 1	Span 3.000 .532 ms (1000	pts)	<b>CF Step</b> 300.000 kHz <u>Auto</u> Man
1 Δ2 1 2 F 1 3 Δ4 1 4 F 1 5 6		391.4 μs 122.9 μs 624.5 μs 122.9 μs	-6.49 dB -2.33 dBm -1.38 dB -2.33 dBm	TONCHON		Ponentin vale		<b>Freq Offset</b> 0 Hz
7 8 9 10 11								
Kan se	ts changed; all traces	cleared				3	>	



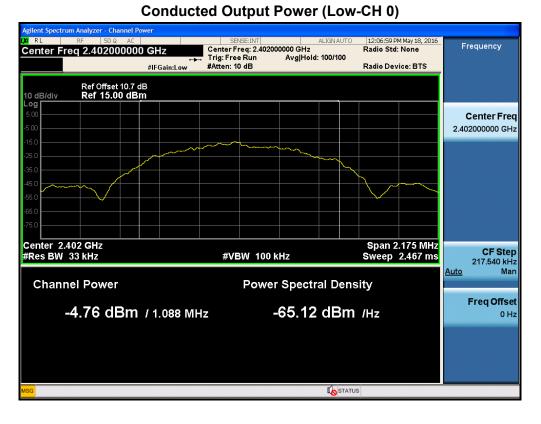
Agilent Spectrum Analyzer - Swept SA						
M RL RF 50Ω AC Center Freq 2.480000000		SENSE:II	#Avg	ALIGN AUTO Type: RMS	12:11:23 PM May 18, 2010 TRACE 1 2 3 4 5	Frequency
	PNO: Wide ↔ IFGain:Low	. Trig: Free Ru Atten: 10 dB	n Avg	Hold: 1/1		
Ref Offset 10.7 dB 10 dB/div Ref 10.70 dBm				WIK <b>r</b> 1	2.479 758 GHz -3.248 dBm	
Log 0.700 -9.30 -19.3		<b>♦</b> <sup>1</sup>				Center Freq 2.480000000 GHz
-19.3 -29.3 -39.3 -49.3						Start Freq 2.478500000 GHz
-59.3 -69.3 -79.3						<b>Stop Freq</b> 2.481500000 GHz
Center 2.480000 GHz #Res BW 1.0 MHz	#VBW	/ 3.0 MHz			Span 3.000 MH: .532 ms (1000 pts	300.000 kHz Auto Man
MKR MODE TRC SCL X	391.4 us	Y 2.32 dB	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> man
2 F 1 t 3 Δ4 1 t 4 F 1 t 5 Δ	377.5 μs 624.5 μs 377.5 μs	-5.76 dBm -7.05 dB -5.76 dBm				Freq Offset 0 Hz
6 7 8 9 10						
MSG Points changed; all traces of	leared					

#### Conducted Output Power (High-CH 39)

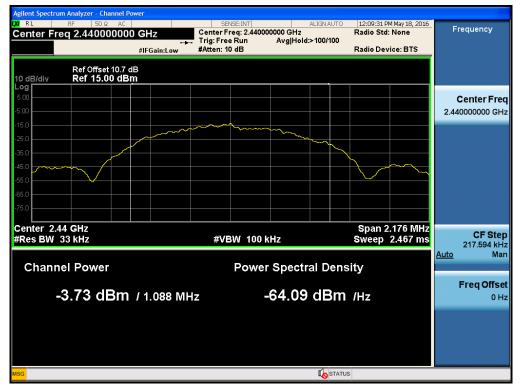


Model: LG-K200F

#### **RESULT PLOTS-Average**



#### Conducted Output Power (Mid-CH 19)







#### **Conducted Output Power (High-CH 39)**



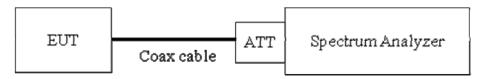
#### 9.4 POWER SPECTRAL DENSITY

#### Test Requirements and limit, §15.247(e)

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

# Minimum Standard – The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

We tested according to Procedure 10.2 in KDB 558074, issued 01/07/2016

The spectrum analyzer is set to :

Set analyzer center frequency to DTS channel center frequency.

Span = 1.5 times the DTS channel bandwidth.

 $RBW = 3 kHz \le RBW \le 100 kHz.$ 

VBW  $\geq$  3 x RBW.

Sweep = auto couple

Detector = peak

Trace Mode = max hold

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea) Output Power = -5 dBm + 10 dB + 0.8 dB = 5.8 dBm Note :

- 1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
- 2. Spectrum offset = Attenuator loss + Cable loss
- 3. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So,10.7 dB is offset for 2.4 GHz Band.



Model: LG-K200F

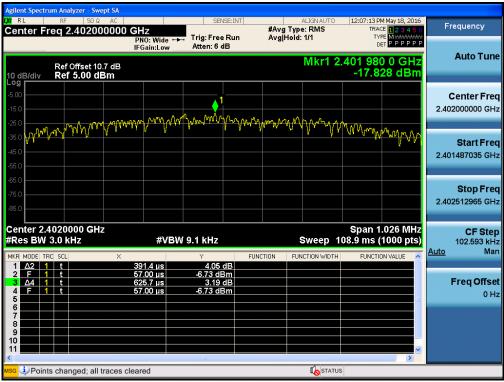
#### TEST RESULTS

Frequency	Channel		Test F	Test Result						
(MHz)	No.	Mode	PSD	Limit	Pass/					
(11112)	NO.		(dBm)	(dBm)	Fail					
2402	0		-17.828	8	Pass					
2440	19	LE	-16.985	8	Pass					
2480	39		-18.594	8	Pass					

#### **Conducted Power Density Measurements**



#### RESULT PLOTS



#### Power Spectral Density (Low-CH 0)

#### Power Spectral Density (Mid-CH 19)

· · · · · · · · · · · · · · · · · · ·	um Analyzer - Swept							
Center F	RF 50 Ω reg 2.440000	AC 000 GHz	SENSE	#A\	ALIGNAUTO	TRAC	4 May 18, 2016 E <mark>1 2 3 4 5 6</mark>	Frequency
		PNO: Wide ↔ IFGain:Low	Trig: Free R Atten: 6 dB	lun Avg	[Hold: 1/1	TYF	E MWWWWWW P P P P P P	
	Ref Offset 10.7				Mkr1 2	.439 979	8 GHz	Auto Tune
10 dB/div Log	Ref 5.00 dBn					-16.98	35 dBm	
-5.00			<u> </u>					Center Freq
-15.0								2.440000000 GHz
-25.0	MAMM	man mar	1 Warman Mar	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ᡗᡀᠰᡳᡀᢦᠰᡙ	MANNIN	Marca - 1	
-35.0	AND ALL A				¥ ¥.	W' יזייר W	"WIMA	Start Freq
-45.0								2.439482521 GHz
-55.0								
-65.0								Stop Freq
-75.0								2.440517479 GHz
Center 2. #Res BW	4400000 GHz	#\/B)	V 9.1 kHz		Sween 1	Span 1. () 09.8 ms	.035 MHz 1000 pts)	CF Step 103.496 kHz
MKR MODE T		×	Y	FUNCTION	FUNCTION WIDTH			Auto Man
1 42 1	t	391.4 µs 122.9 µs	-6.49 dE	3				
2 F 1	t	624.5 µs	-2.33 dBn -1.38 dE	3				Freq Offset
4 7 1		122.9 µs	-2.33 dBn	1			=	0 Hz
6								
8								
10							~	
<			ш		-1		>	
MSG 2 Poin	ts changed; all tra	ces cleared				S		



Agilent Spect												
	RF req					ISE:INT	#Avg Ty		TRA	M May 18, 2016 <sup>DE</sup> <mark>1 2 3 4 5 6</mark>	F	requency
				O: Wide ↔ ain:Low	Trig: Free Atten: 6		Avg Hold	1: 1/1		PE M WWWWWW ET P P P P P P		
	Ba	f Offset 10.	7 dP					Mkr1 2	.479 97	9 5 GHz		Auto Tune
10 dB/div		f 5.00 dE							-18.5	94 dBm		
Log -5.00												Center Frea
-15.0					<b>↓</b>							80000000 GHz
-25.0		MAL MO	<u>ኣ ፖኅስየ</u> ማየርሶ	man	mm	᠕᠕᠕	man	$\pi$	N n Ga			
-35.0 MY	ul W	γ Ψ¥Ψ	<u> </u>	Y Y			• •	·V· VI	Munda	ᡅ᠕ᡰ᠕ᠰ		Start Freq
-45.0											2.47	9474790 GHz
-55.0												
-65.0												Stop Freq
-75.0											2.48	80525210 GHz
-85.0												
Center 2.										.050 MHz		CF Step
#Res BW	3.0	kHz		#VBV	/ 9.1 kHz			Sweep 1	11.5 ms (	1000 pts)	Auto	105.042 kHz Man
MKR MODE T	RC SCI	L	×	1.4 us	Y 2.32		TION FL	NCTION WIDTH	FUNCTI	ON VALUE	Auto	wan
2 F 1	1 t		37	7.5 µs	-5.76 di	3m						
3 <u>A</u> 4 · · · · · · · · · · · · · · · · · · ·	1 t 1 t			4.5 µs 7.5 µs	-7.05 -5.76 di							Freq Offset 0 Hz
5										=		
7												
9												
11										~		
К мsg JPoin	te obr	angod: all t	acos cloar	ad				STATUS	1			
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#### Power Spectral Density (High-CH 39)

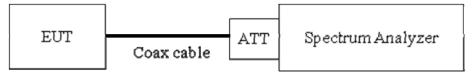


# 9.5 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS Test Requirements and limit, §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.205(c)).

#### Limit : 20 dBc

#### **TEST CONFIGURATION**



#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. (Procedure 11.0 in KDB 558074, issued 01/07/2016)

RBW = 100 kHz

VBW ≥ 3 x RBW

Set span to encompass the spectrum to be examined

Detector = Peak

Trace Mode = max hold

Sweep time = auto couple

Ensure that the number of measurement points  $\geq 2^{*}$ Span/RBW

Allow trace to fully stabilize.

Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 10<sup>th</sup> harmonic range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1(KDB558074 v03r05), so the peak output power measured in any 100 kHz bandwidth outside



of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

- 2. The band edge results in plot is already including the actual values of loss for the attenuator and cable combination.
- 3. Spectrum offset = Attenuator loss + Cable loss
- 4. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB. So, 10.7 dB is offset for 2.4 GHz Band.
- 5. In case of conducted spurious emissions test, please check factors blow table.
- 6. In order to simplify the report, attached plots were only the worst case channel and data rate.

Freq(MHz)	Factor(dB)
30	11.30
100	9.83
200	10.19
300	10.13
400	10.23
500	10.25
600	10.32
700	10.35
800	10.35
900	10.34
1000	10.39
2000	10.64
2400*	10.65
2500*	10.67
3000	10.68
4000	10.89
5000	11.07
6000	11.06
7000	11.35
8000	11.32
9000	11.48
10000	11.56
11000	11.56
12000	11.68

#### **FACTORS FOR FREQUENCY**



Model: LG-K200F

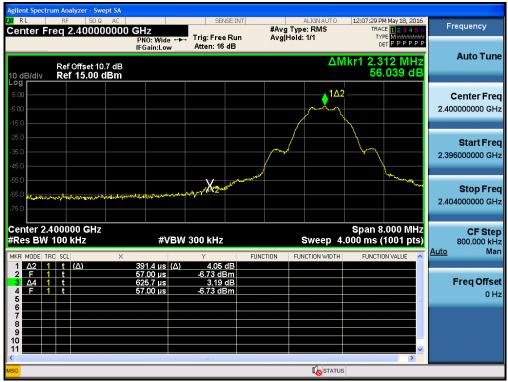
13000         11.83           14000         11.90           15000         11.98           16000         12.04           17000         12.02           18000         12.08           19000         12.07           20000         12.14           21000         12.31           23000         12.34           25000         12.53		
15000         11.98           16000         12.04           17000         12.02           18000         12.08           19000         12.07           20000         12.14           21000         12.17           22000         12.31           23000         12.34	13000	11.83
16000         12.04           17000         12.02           18000         12.08           19000         12.07           20000         12.14           21000         12.17           22000         12.31           23000         12.60           24000         12.34	14000	11.90
17000         12.02           18000         12.08           19000         12.07           20000         12.14           21000         12.17           22000         12.31           23000         12.60           24000         12.34	15000	11.98
18000         12.08           19000         12.07           20000         12.14           21000         12.17           22000         12.31           23000         12.60           24000         12.34	16000	12.04
19000         12.07           20000         12.14           21000         12.17           22000         12.31           23000         12.60           24000         12.34	17000	12.02
20000         12.14           21000         12.17           22000         12.31           23000         12.60           24000         12.34	18000	12.08
21000         12.17           22000         12.31           23000         12.60           24000         12.34	19000	12.07
22000         12.31           23000         12.60           24000         12.34	20000	12.14
23000         12.60           24000         12.34	21000	12.17
24000 12.34	22000	12.31
	23000	12.60
25000 12.53	24000	12.34
	25000	12.53

Note : 1. '\*' is fundamental frequency range.

2. Factor = Cable loss + Attenuator loss



#### RESULT PLOTS



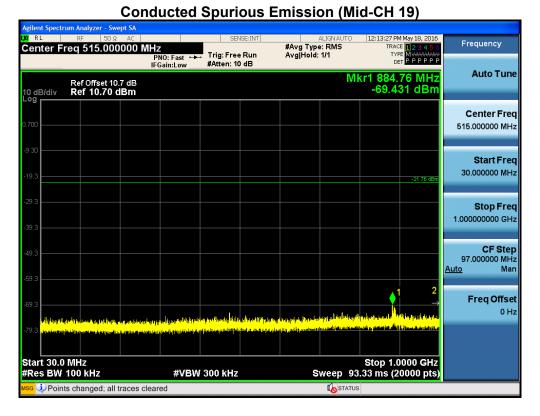
#### BandEdge (Low-CH 0)

#### BandEdge (High-CH 39)





#### 30 MHz ~ 1 GHz



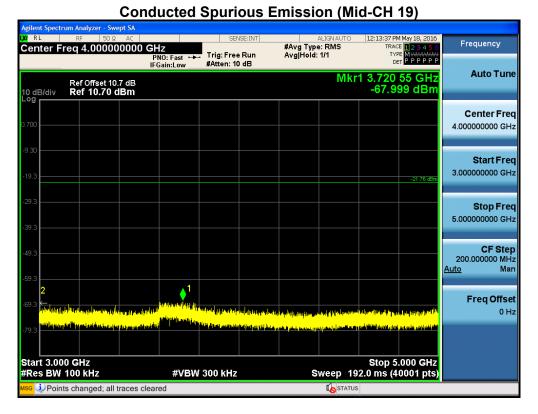
#### 1 GHz ~ 3 GHz



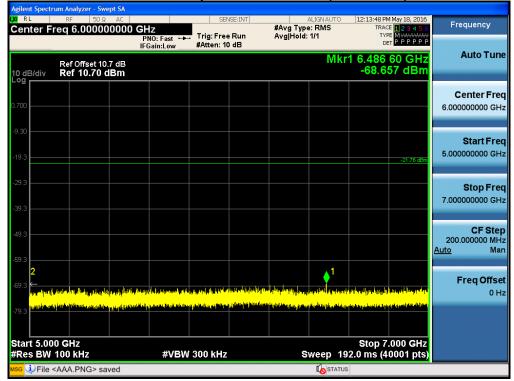
XI RL		RI		00000 G	PNO: Fast +	► Trig: Free		#Avg Tyj Avg Hold			TRAC TYP	4 May 18, 2016 E 1 2 3 4 5 6 E M WWWWW T P P P P P	Frequ	uency
10 dB	3/div		f Offset 1 f 10.70	0.7 dB	FGain:Low	#Atten: 10	dB		ľ		2.712	90 GHz 41 dBm	A	uto Tune
Log 0.700 - -9.30 - -19.3									<b>∂</b> <sup>1</sup>			21.76 dBm		nter Free 10000 GH
-29.3 -39.3 -49.3														tart Free
-59.3 -69.3 -79.3		er la ciji , wite cije	generated distants of the		n bay sing of the state of state of the	nger - Self Hard Long and John A vie dieg voor aander ander gevee								<b>top Fre</b> 10000 GH
	t 1.00 s BW				#VB	W 300 kHz			Sweep			.000 GHz 0001 pts)		CF Ste 0000 MH Ma
1	10DE TI N 1 N 1	f			00 GHz 90 GHz	Y _1.757 dB _68.641 dB	n	CTION FL	INCTION V	WIDTH	FUNCTIO	ON VALUE		eq Offso 0 H
6 7 9 10 11														
c SG 🤳	Poin	ts ch	anged; all	traces clea	ared				<b>1</b> 08	STATUS				



#### 3 GHz ~ 5 GHz



#### 5 GHz ~ 7 GHz



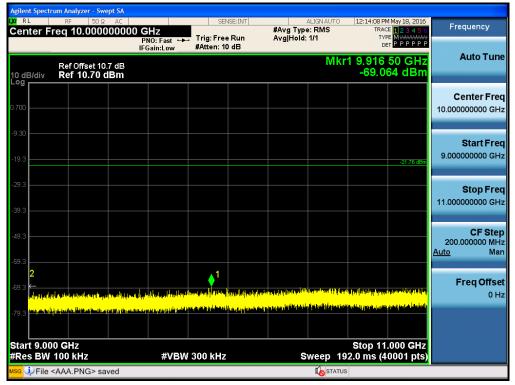


#### 7 GHz ~ 9 GHz

12:13:58 PM May 18, 2016 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P RL Frequency Center Freq 8.000000000 GHz #Avg Type: RMS Avg|Hold: 1/1 PNO: Fast +++ IFGain:Low Trig: Free Run #Atten: 10 dB Auto Tune Mkr1 7.370 85 GHz -68.741 dBm Ref Offset 10.7 dB Ref 10.70 dBm 10 dB/div **Center Freq** 8.00000000 GHz Start Freq 7.00000000 GHz Stop Freq 9.00000000 GHz CF Step 200.000000 MHz Man <u>Auto</u> **Freq Offset** 0 Hz Stop 9.000 GHz Sweep 192.0 ms (40001 pts) Start 7.000 GHz #Res BW 100 kHz #VBW 300 kHz File <AAA.PNG> saved

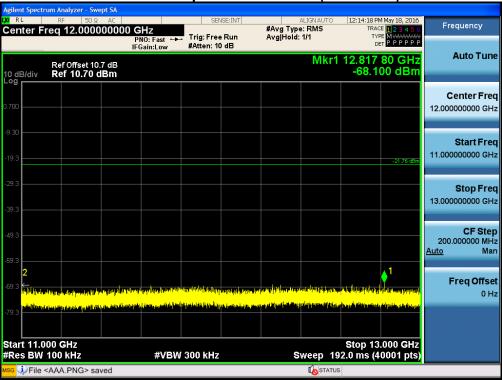
#### **Conducted Spurious Emission (Mid-CH 19)**

#### 9 GHz ~ 11 GHz





#### 11 GHz ~ 13 GHz



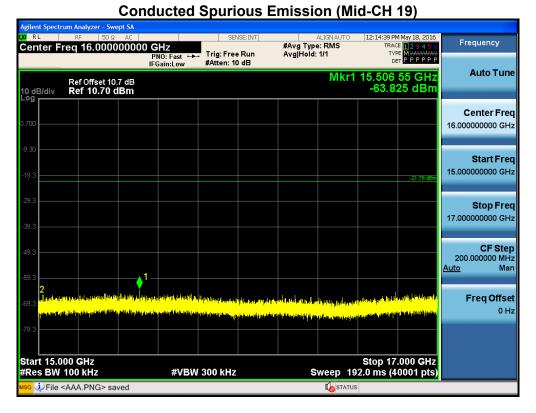
# Conducted Spurious Emission (Mid-CH 19)

#### 13 GHz ~ 15 GHz

Agilent Spectr	r <mark>um Analyzer - Swept SA</mark> RF 50 Ω AC		05110					10.0016	
	RF   50 Ω AC   req 14.00000000	PNO: Fast ↔	SENS Trig: Free F #Atten: 10 (	Run	#Avg Type Avg Hold:		TRA	M May 18, 2016 CE 123456 PE M WWWWWW DET P P P P P P	Frequency
10 dB/div	Ref Offset 10.7 dB Ref 10.70 dBm	IFGain:Low	#Atten: 10			Mk	r1 14.990		Auto Tune
0.700									Center Fred 14.000000000 GHz
-9.30								-21.76 dBm	Start Free 13.000000000 GH
-29.3									Stop Fred 15.000000000 GH
49.3									CF Stej 200.000000 MH <u>Auto</u> Ma
-59.3 2 -69.3 ←	ereling word they builty a line of an and still the free	na an agus airte tírsean a méire ta		n'apine secolitit	aan ji jaga ka	desigli berkenda Deservabili service			Freq Offse
-79.3	n en bereg gingen for general for de la servicie de	n (baya)) op falskog processi de sek de s	nyang perjembah di kana perjembah di ka						
Start 13.0 #Res BW		#VBW	300 kHz		S	weep	: Stop 1 / 192.0 ms	5.000 GHz 40001 pts)	
<mark>⊿sg</mark> File ⊲	<aaa.png> saved</aaa.png>					<b>I</b> STA	TUS		



#### 15 GHz ~ 17 GHz

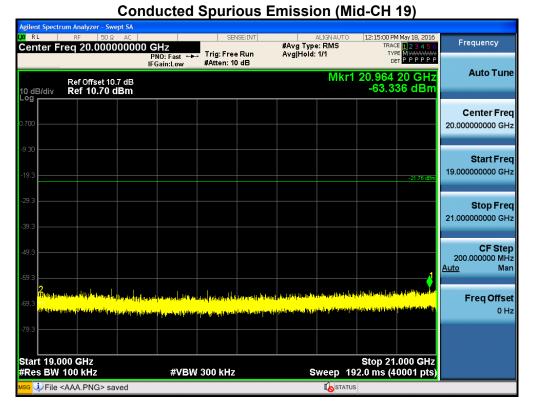


#### 17 GHz ~ 19 GHz

Agilent Spectru	m Analyzer - Swep									
	RF 50Ω eq 18.00000	00000 G	Hz			#Avg Type Avg Hold:		TRAC	M May 18, 2016 CE 123456 PE M WWWWWW	Frequency
	Ref Offset 10.7 Ref 10.70 dE	IFG dB	NO: Fast ↔ Gain:Low	#Atten: 10		Avginoid.		DE 18.308	30 GHz 23 dBm	Auto Tune
0.700										Center Fred 18.000000000 GH;
-9.30									-21.76 dBm	Start Free 17.000000000 GH
-29.3										Stop Fred 19.000000000 GH:
-49.3						1				CF Step 200.000000 MH <u>Auto</u> Mar
-69.3 <b>-69.3</b>	lale ( en are li en del , a <mark>Letter en ante en el an a</mark> re	a scored s	the second		a series and the		ntintentingtet <sub>er</sub> Nyme <sub>ter</sub> neter		e traing a different na ang inak ing sin	Freq Offse 0 H
-79.3 Start 17.00 #Res BW 1			#VBW	300 kHz		s	weep 19		.000 GHz	
	AAA.PNG> save	ed						· · · ·		



#### 19 GHz ~ 21 GHz



#### 21 GHz ~ 23 GHz

	rum Analyzer - Swept SA					
Center F	RF 50 Ω AC		SENSE:INT	ALIGNAUTO #Avg Type: RMS	TRACE 1 2 3 4 5 6	Frequency
	Ref Offset 10.7 dB	PNO: Fast ↔ IFGain:Low	Trig: Free Run #Atten: 10 dB	Avg Hold: 1/1 Mkr	туре Милини рет Р Р Р Р Р Р Р 1 22.976 45 GHz	Auto Tune
10 dB/div Log	Ref 10.70 dBm				-62.693 dBm	
0.700						Center Freq 22.000000000 GHz
-9.30					-21.76 dBm	Start Freq 21.00000000 GHz
					-211045	
-29.3						Stop Fred 23.000000000 GHz
-49.3						CF Step 200.000000 MHz
-59.3						<u>Auto</u> Man
- co o 🧹	<mark>ha Manda a la dana sa Manang Pa</mark> ng	1 - C - C - C - C - C - C - C - C - C -		vinalienny han e die twee tier als jadates a		Freq Offset
	nd het na den en en er er fan det de bekenden bij de de meder Andere	i pilonak primera (di presionali di	n na na fheil a na scoilte na bha na chuiltean an An Air ann an An Air ann an An Air ann an An Air ann an An Ai An Ann an Ann	tin teri kantala jugu serinti ding para pakana jugu se		0 Hz
-79.3						
Start 21.0 #Res BW		#VBW	300 kHz	Sweep 1	Stop 23.000 GHz 92.0 ms (40001 pts)	
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#### 23 GHz ~ 25 GHz

	um Analyzer - Swept S								
Center F	RF 50Ω AC		SENS		#Avg Type		TRAC	1 May 18, 2016 E <mark>1 2 3 4 5 6</mark>	Frequency
10 dB/div	Ref Offset 10.7 dE Ref 10.70 dBm	PNO: Fast ↔ IFGain:Low	Trig: Free F #Atten: 10		Avg[Hold:		DE 24.938	10 GHz 06 dBm	Auto Tune
Log									Center Freq 24.00000000 GHz
-9.30								-21.76 dBm	<b>Start Freq</b> 23.000000000 GHz
-29.3									<b>Stop Freq</b> 25.000000000 GHz
-49.3			-1.41.1.42.40.4.44				al. dhir ka		<b>CF Step</b> 200.000000 MHz <u>Auto</u> Man
-69.3 <mark>(1997)</mark> -69.3	yg dae hyf a far far diw fan fan staf fa yr ar ar yn fan yn far far fan synaw f	under Heinen der einen der Stationen nicht der Stationen der Station Stationen der Stationen der	n andra da sin da s In an andra da sin d	Lahim dipat	an na an a	ved of the state of the second states of	n alfar afrikara karata	and a subsection of the subsec	<b>Freq Offset</b> 0 Hz
-79.3									
Start 23.0 #Res BW		#VBW	300 kHz		s	weep 19	Stop 25. 92.0 ms (4	.000 GHz 0001 pts)	
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# 9.6 RADIATED MEASUREMENT.

9.6.1 RADIATED SPURIOUS EMISSIONS.

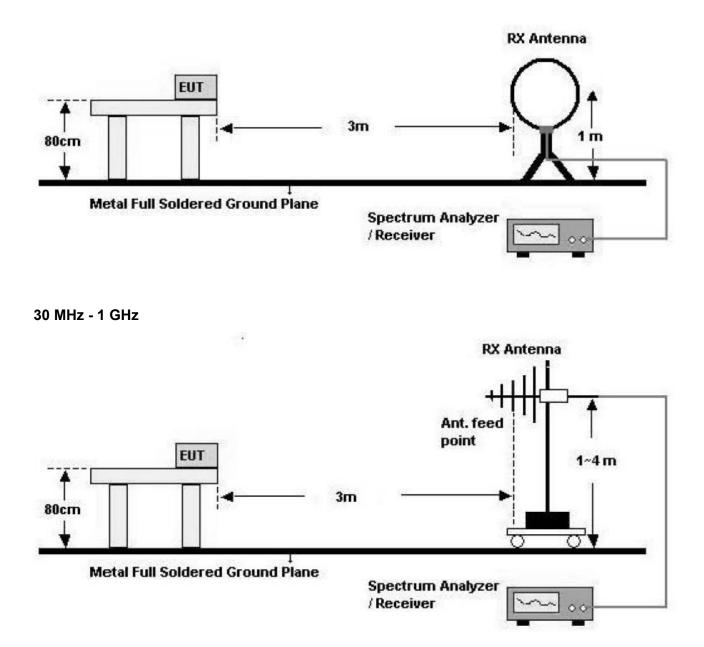
Test Requirements and limit, §15.205, §15.209

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)		
0.009 - 0.490	2400/F(kHz)	300		
0.490 – 1.705	24000/F(kHz)	30		
1.705 – 30	30	30		
30-88	100	3		
88-216	150	3		
216-960	200	3		
Above 960	500	3		



#### **Test Configuration**

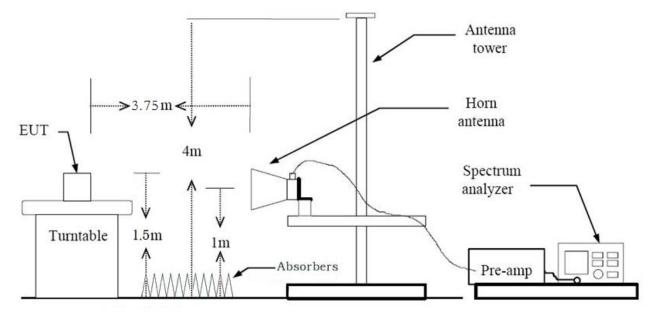
#### Below 30 MHz





Model: LG-K200F

#### Above 1 GHz



#### TEST PROCEDURE USED

Method 12.1 in KDB 558074 v03r05

#### Spectrum Setting

- Peak

Peak emission levels are measured by setting the instrument as follows:

RBW = cf. Table 1.

VBW  $\geq$  3 x RBW.

Detector = Peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweeps to continue until the trace stabilizes.

(Note that the required measurement time may be longer for low duty cycle applications).

	nequency
Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

#### Table 1 — RBW as a function of frequency



Average (duty cycle < 98%, duty cycle variations are less than ±2%)</li>
Set RBW = 1 MHz
Set VBW ≥ 3 x RBW
Detector = RMS.
Averaging type = power (*i.e.*, RMS).
Sweep time = auto.

Trace mode = average (at least 100 traces).

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

#### Note :

1. We are performed the RSE and radiated band edge using standard radiated method(RMS).

2. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).

3. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

LE Mode	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor (dB)
	0.3914	0.6245	0.6268	2.03



#### **TEST RESULTS**

#### 9 kHz – 30MHz

#### Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

- 1. Measuring frequencies from 9 kHz to the 30MHz.
- 2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
- 3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
- 4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
- 5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.



### TEST RESULTS

#### Below 1 GHz

#### Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dBuV/m	dBm/m	dBm	(H/V)	dBuV/m	dBuV/m	dB
No Critical peaks found							

- 1. Measuring frequencies from 30 MHz to the 1 GHz.
- 2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
- 3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.



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#### Above 1 GHz

**Operation Mode: CH.0** 

Frequency	Reading	Duty Cycle Factor	A.F.+C.LA.G.+D.F.	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV/m]	[dB]	[dBm]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Туре
4804	47.49	0.00	-1.02	V	46.47	73.98	27.51	PK
4804	36.27	2.03	-1.02	V	37.28	53.98	16.70	AV
7206	46.25	0.00	8.82	V	55.07	73.98	18.91	PK
7206	33.81	2.03	8.82	V	44.66	53.98	9.32	AV
4804	48.08	0.00	-1.02	Н	47.06	73.98	26.92	PK
4804	36.32	2.03	-1.02	Н	37.33	53.98	16.65	AV
7206	46.58	0.00	8.82	Н	55.4	73.98	18.58	PK
7206	33.88	2.03	8.82	Н	44.73	53.98	9.25	AV

\*A.F. : Antenna Factor / C.L. : Cable Loss / A.G. : Amplifier Gain / D.F. : Distance Factor

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Measurements above show only up to 6 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. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- 4. Total = Reading Value + Antenna Factor + Cable Loss Amp Gain + Distance Factor
   + Duty Cycle Factor
- 5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- 6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.



Model: LG-K200F

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Frequency	Reading	Duty Cycle Factor	A.F.+C.LA.G.+D.F.	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV/m]	[dB]	[dBm]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Туре
4882	49.29	0.00	-0.66	V	48.63	73.98	25.35	PK
4882	37.35	2.03	-0.66	V	38.72	53.98	15.26	AV
7323	46.03	0.00	8.05	V	54.08	73.98	19.90	PK
7323	34.09	2.03	8.05	V	44.17	53.98	9.81	AV
4882	49.27	0.00	-0.66	Н	48.61	73.98	25.37	PK
4882	37.47	2.03	-0.66	Н	38.84	53.98	15.14	AV
7323	49.53	0.00	8.05	Н	57.58	73.98	16.40	PK
7323	34.24	2.03	8.05	Н	44.32	53.98	9.66	AV

#### **Operation Mode: CH.19**

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Measurements above show only up to 6 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. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- 4. Total = Reading Value + Antenna Factor + Cable Loss Amp Gain + Distance Factor + Duty Cycle Factor
- 5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- 6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.



Model: LG-K200F

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Frequency	Reading	Duty Cycle Factor	A.F.+C.LA.G.+D.F.	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBuV/m]	[dB]	[dBm]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Туре
4960	49.62	0.00	-0.59	V	49.03	73.98	24.95	PK
4960	37.79	2.03	-0.59	V	39.23	53.98	14.75	AV
7440	45.86	0.00	7.67	V	53.53	73.98	20.45	PK
7440	33.98	2.03	7.67	V	43.68	53.98	10.30	AV
4960	49.34	0.00	-0.59	Н	48.75	73.98	25.23	PK
4960	37.81	2.03	-0.59	Н	39.25	53.98	14.73	AV
7440	45.93	0.00	7.67	Н	53.60	73.98	20.38	PK
7440	34.03	2.03	7.67	Н	43.73	53.98	10.25	AV

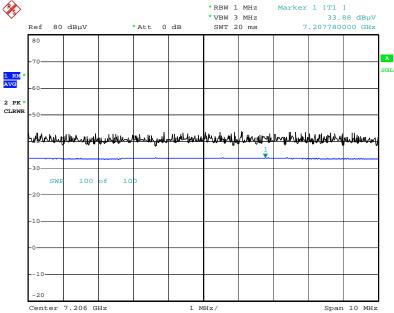
**Operation Mode: CH.39** 

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. Measurements above show only up to 6 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. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- 4. Total = Reading Value + Antenna Factor + Cable Loss Amp Gain + Distance Factor + Duty Cycle Factor
- 5. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- 6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

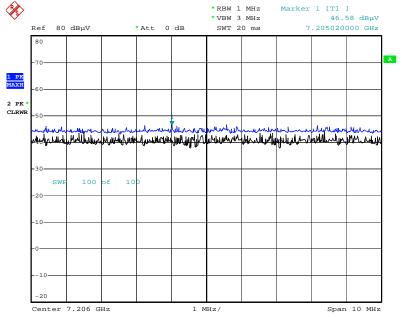


## RESULT PLOTS (Worst case : X-H)

Radiated Spurious Emissions plot – Average Reading (Ch.0 3rd Harmonic)



Date: 19.MAY.2016 14:38:28



#### Radiated Spurious Emissions plot – Peak Reading (Ch.0 3rd Harmonic)

#### Note : Only the worst case plots for Radiated Spurious Emissions.

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### 9.6.2 RADIATED RESTRICTED BAND EDGES

#### Test Requirements and limit, §15.247(d) §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Operation Mode	BT_LE
Operating Frequency	2402 MHz
Channel No.	0

Frequency	Reading	Duty Cycle Factor	A.F.+C.L.+D.F.	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBuV/m]	[dB]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Туре
2390.0	15.56	0.00	33.25	н	48.81	73.98	25.17	PK
2390.0	4.08	2.03	33.25	н	39.36	53.98	14.62	AV
2390.0	15.67	0.00	33.25	V	48.92	73.98	25.06	PK
2390.0	4.10	2.03	33.25	V	39.38	53.98	14.60	AV

- 1. Frequency range of measurement = 2310 MHz ~ 2390 MHz
- 2. Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Factor + Distance Factor
- 3. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)
- 4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.



Operation Mode	BT_LE
Operating Frequency	2480 MHz
Channel No.	39

Frequency	Reading	Duty Cycle Factor	A.F.+C.L.+D.F.	Ant. Pol.	Total	Limit	Margin	Measurement
[MHz]	[dBuV/m]	[dB]	[dB]	[H/V]	[dBuV/m]	[dBuV/m]	[dB]	Туре
2483.5	15.89	0.00	33.31	н	49.20	73.98	24.78	PK
2483.5	4.09	2.03	33.31	Н	39.43	53.98	14.56	AV
2483.5	16.06	0.00	33.31	V	49.37	73.98	24.61	PK
2483.5	4.11	2.03	33.31	V	39.45	53.98	14.53	AV

#### Notes:

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz

2. Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Factor + Distance Factor

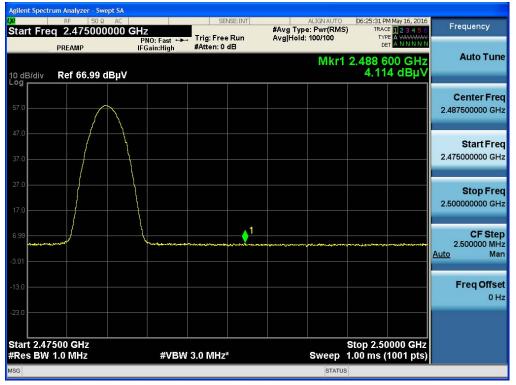
3. Distance extrapolation factor = 20 log (test distance / specific distance) (dB)

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

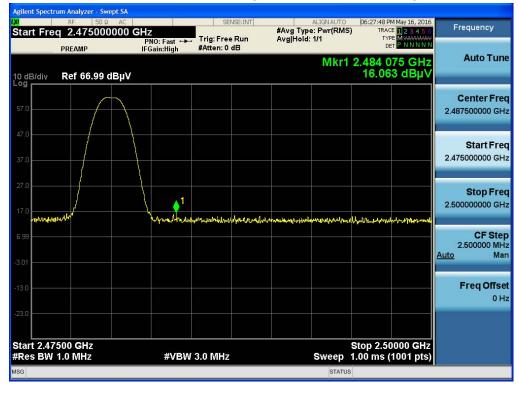


#### RESULT PLOTS (Worst case : z-V)

#### Radiated Restricted Band Edges plot – Average Reading (Ch.39)



#### Radiated Restricted Band Edges plot - Peak Reading (Ch.39)



Note : Only the worst case plots for Radiated Restricted Band Edges.



## 9.7 POWERLINE CONDUCTED EMISSIONS

#### Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

	Limits	(dBµV)
Frequency Range (MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

#### **Test Configuration**

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

#### **TEST PROCEDURE**

- 1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
- 2. The EUT is connected via LISN to a test power supply.
- 3. The measurement results are obtained as described below:
- 4. Detectors Quasi Peak and Average Detector.

#### Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor



# RESULT PLOTSConducted Emissions (Line 1)

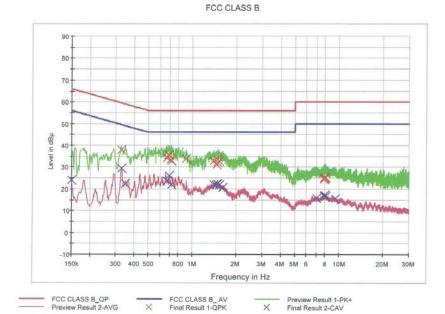
BT LE MODE L1

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## **HCT TEST Report**

#### Common Information

EUT: Manufacturer: Test Site: Operating Conditions: LG-K200MT LG SHIELD ROOM BT LE MODE



#### **Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.328000	37.9	9.000	Off	L1	9.6	21.6	59.5
0.672000	34.1	9.000	Off	L1	9.7	21.9	56.0
0.688000	35.6	9.000	Off	L1	9.7	20.4	56.0
0.696000	35.5	9.000	Off	L1	9.7	20.5	56.0
0.710000	33.7	9.000	Off	L1	9.7	22.3	56.0
0.718000	32.9	9.000	Off	L1	9.7	23.1	56.0
0.908000	33.8	9.000	Off	L1	9.7	22.2	56.0
1.404000	33.0	9.000	Off	L1	9.7	23.0	56.0
1.462000	31.2	9.000	Off	L1	9.7	24.8	56.0
1.488000	33.5	9.000	Off	L1	9.7	22.5	56.0
1.492000	32.0	9.000	Off	L1	9.7	24.0	56.0
1.524000	32.8	9.000	Off	L1	9.7	23.2	56.0
7.906000	24.5	9.000	Off	L1	10.0	35.5	60.0
7.954000	25.1	9.000	Off	L1	10.0	34.9	60.0
7.958000	25.1	9.000	Off	L1	10.0	34.9	60.0
7.972000	24.7	9.000	Off	L1	10.0	35.3	60.0
8.096000	25.0	9.000	Off	L1	10.0	35.0	60.0
8.100000	25.5	9.000	Off	L1	10.0	34.5	60.0

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#### BT LE MODE L1

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Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	24.2	9.000	Off	L1	9.7	31.8	56.0
0.330000	29.3	9.000	Off	L1	9.6	20.1	49.5
0.348000	22.4	9.000	Off	L1	9.6	26.6	49.0
0.672000	23.8	9.000	Off	L1	9.7	22.2	46.0
0.694000	26.2	9.000	Off	L1	9.7	19.8	46.0
0.718000	22.0	9.000	Off	L1	9.7	24.0	46.0
1.404000	21.8	9.000	Off	L1	9.7	24.2	46.0
1.448000	21.9	9.000	Off	L1	9.7	24.1	46.0
1.486000	22.2	9.000	Off	L1	9.7	23.8	46.0
1.490000	22.5	9.000	Off	L1	9.7	23.5	46.0
1.524000	21.8	9.000	Off	L1	9.7	24.2	46.0
1.610000	20.6	9.000	Off	L1	9.7	25.4	46.0
7.046000	15.8	9.000	Off	L1	9.9	34.2	50.0
7.952000	16.7	9.000	Off	L1	10.0	33.3	50.0
7.980000	17.1	9.000	Off	L1	10.0	32.9	50.0
8.096000	16.5	9.000	Off	L1	10.0	33.5	50.0
8.100000	16.5	9.000	Off	L1	10.0	33.5	50.0
9.400000	15.6	9.000	Off	L1.	10.0	34.4	50.0

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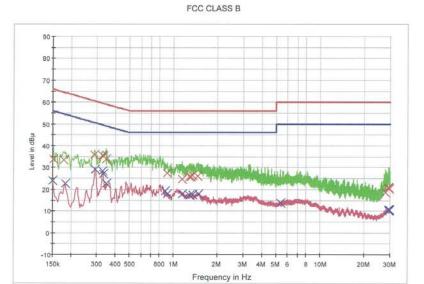
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#### **Conducted Emissions (Line 2)**

BT LE MODE N

**HCT TEST Report** 





#### FCC CLASS B\_QP Preview Result 2-AVG FCC CLASS B\_ AV Final Result 1-QPK Preview Result 1-PK+ Final Result 2-CAV × ×

#### **Final Result 1**

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	33.8	9.000	Off	N	9.6	32.0	65.9
0.178000	33.7	9.000	Off	N	9.6	30.9	64.6
0.290000	35.9	9.000	Off	N	9.6	24.6	60.5
0.328000	35.5	9.000	Off	N	9.6	24.0	59.5
0.332000	35.4	9.000	Off	N	9.6	24.0	59.4
0.348000	33.8	9.000	Off	N	9.6	25.2	59.0
0.910000	27.5	9.000	Off	N	9.7	28.5	56.0
1.146000	24.6	9.000	Off	N	9.7	31.4	56.0
1.288000	25.8	9.000	Off	N	9.7	30.2	56.0
1.322000	25.7	9.000	Off	N	9.7	30.3	56.0
1.360000	26.6	9.000	Off	N	9.7	29.4	56.0
1.464000	26.0	9.000	Off	N	9.7	30.0	56.0
28.000000	18.5	9.000	Off	N	10.5	41.5	60.0
29.210000	20.9	9.000	Off	N	10.5	39.1	60.0
29.402000	20.7	9.000	Off	N	10.5	39.3	60.0
29.464000	20.7	9.000	Off	N	10.5	39.3	60.0
29.646000	20.3	9.000	Off	N	10.5	39.7	60.0
29.814000	20.4	9.000	Off	N	10.5	39.6	60.0

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#### BT LE MODE N

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Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	24.1	9.000	Off	N	9.6	31.9	56.0
0.184000	22.6	9.000	Off	N	9.6	31.7	54.3
0.292000	29.2	9.000	Off	N	9.6	21.3	50.5
0.328000	28.3	9.000	Off	N	9.6	21.2	49.5
0.332000	27.0	9.000	Off	N	9.6	22.4	49.4
0.348000	22.7	9.000	Off	N	9.6	26.3	49.0
0.882000	19.1	9.000	Off	N	9.7	26.9	46.0
0.908000	17.8	9.000	Off	N	9.7	28.2	46.0
1.146000	17.9	9.000	Off	N	9.7	28.1	46.0
1.288000	17.3	9.000	Off	N	9.7	28.7	46.0
1.360000	17.4	9.000	Off	N	9.7	28.6	46.0
1.482000	17.9	9.000	Off	N	9.7	28.1	46.0
5.368000	13.9	9.000	Off	N	9.8	36.1	50.0
29.210000	10.6	9.000	Off	N	10.5	39.4	50.0
29.402000	10.6	9.000	Off	N	10.5	39.4	50.0
29.464000	10.7	9.000	Off	N	10.5	39.3	50.0
29.488000	10.6	9.000	Off	N	10.5	39.4	50.0
29.646000	10.5	9.000	Off	N	10.5	39.5	50.0

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## 10. LIST OF TEST EQUIPMENT 10.1 LIST OF TEST EQUIPMENT(Conducted Test)

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/28/2015	Annual	100073
Rohde & Schwarz	ESCI / Test Receiver	12/28/2015	Annual	100584
Agilent	N9020A / Signal Analyzer	06/30/2015	Annual	MY51110085
Agilent	N9030A / Signal Analyzer	11/24/2015	Annual	MY49431210
Agilent	N1911A / Power Meter	07/09/2015	Annual	MY45100523
Agilent	N1921A / Power Sensor	03/11/2016	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/30/2015	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/15/2015	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	03/09/2016	Annual	KR75303962
Agilent	8493C / Attenuator(10 dB)	07/21/2015	Annual	07560



## 10.2 LIST OF TEST EQUIPMENT(Radiated Test)

Manufacturer	Model / Equipment	Calibration	Calibration	Serial No.
Audix	AM4000 / Antenna Position Tower	N/A	N/A	N/A
Audix	Turn Table	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Rohde & Schwarz	Loop Antenna	02/23/2016	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/15/2015	Biennial	255
Schwarzbeck	BBHA 9120D / Horn Antenna	05/07/2015	Biennial	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	09/03/2015	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	09/24/2015	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/23/2015	Annual	101068-SZ
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/29/2015	Annual	8
Wainwright Instruments	WHFX7.0/18G-8SS / High Pass Filter	05/13/2016	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520- 60/12SS / Band Reject Filter	07/06/2015	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/26/2016	Annual	2
Agilent	8493C-10 / Attenuator(10 dB)	08/20/2015	Annual	76649
CERNEX	CBLU1183540 / Power Amplifier	07/21/2015	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/21/2015	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	07/27/2015	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	07/09/2015	Annual	25956