



HCT CO., LTD.

CERTIFICATE OF COMPLIANCE FCC Class II Permissive Change

Applicant Name: LG Electronics MobileComm U.S.A., Inc.	Date of Issue: February 28, 2012
Address: 10101 Old Grove Road, San Diego, CA 92131	Test Site/Location: HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea
	Report No.: HCTR1202FR35
	HCT FRN: 0005866421

FCC ID	:ZNFLS840
APPLICANT	:LG Electronics MobileComm U.S.A., Inc.

FCC Model(s):	LS840
Additional FCC Model(s):	LGLS840, LG-LS840
EUT Type:	Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN
Frequency Range:	2402 MHz - 2480 MHz (Bluetooth)
Modulation type	GFSK(Normal), PSK(EDR)
FCC Classification:	FCC Part 15 Spread Spectrum Transmitter
FCC Rule Part(s):	Part 15 subpart C 15.247

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

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
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Approved by
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FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1202FR35	February 28, 2012	- First Approval Report

Table of Contents

1.	GENERAL INFORMATION	4
2.	EUT DESCRIPTION	4
3.	TEST METHODOLOGY	5
3.1	EUT CONFIGURATION	5
3.2	EUT EXERCISE	5
3.3	GENERAL TEST PROCEDURES	5
3.4	DESCRIPTION OF TEST MODES	5
4.	INSTRUMENT CALIBRATION	6
5.	FACILITIES AND ACCREDITATIONS	6
5.1	FACILITIES	6
5.2	EQUIPMENT	6
6.	ANTENNA REQUIREMENTS.....	6
7.	SUMMARY OF TEST RESULTS.....	7
8.	FCC PART 15.247 REQUIREMENTS	8
8.1	PEAK POWER	8
8.1.1	RADIATED RESTRICTED BAND EDGE MEASUREMENTS.....	16
9.	LIST OF TEST EQUIPMENT.....	18

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840



1. GENERAL INFORMATION

Applicant Name: LG Electronics MobileComm U.S.A., Inc.
Address: 10101 Old Grove Road, San Diego, CA 92131
FCC ID: ZNFLS840
EUT: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN
Model name(s): LS840
Additional Model name(s): LGLS840, LG-LS840
Date(s) of Tests: February 09, 2012 ~ February 24, 2012
Contact Person: Name: Dai Seung, Choi
 Phone #: +82-2-2033-1124
Place of Tests: HCT Co., Ltd.
 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811,
 KOREA. (IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

EUT Type	Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN
FCC Model Name	LS840
Additional FCC Model Name	LGLS840, LG-LS840
Power Supply	DC 3.7 V
Battery type	Li-ion Battery(Standard)
Frequency Range	2402 MHz - 2480 MHz (Bluetooth)
BT Operating Mode	Nomal, EDR, AFH
Modulation Type	GFSK(Normal), PSK(EDR),
Modulation Technique	FHSS
Number of Channels	79Channels, Minimum 20 Channels(AFH)
Antenna Specification	Manufacturer: Mobitech Antenna type: Internal Antenna Peak Gain : -1.69 dBi

※ 15.247 Requirements for Bluetooth transmitter

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:
 - 1) This system is hopping pseudorandomly.
 - 2) Each frequency is used equally on the average by each transmitter.
 - 3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters
 - 4) The receiver shifts frequencies in synchronization with the transmitted signals.
- 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.
- 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840



3. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz(ANSI C63.4-2003) and FCC Public Notice DA 00-705 dated March 30, 2000 entitled “Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems” were used in the measurement of the **LG Electronics MobileComm U.S.A., Inc. Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN FCC ID: ZNFLS840**

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 13.1.4.1 of ANSI C63.4. (Version :2003) 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. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 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 13.1.4.1 of ANSI C63.4. (Version: 2003)

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.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840



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.

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 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated March 02, 2011 (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

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

7. SUMMARY OF TEST RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 8.6.2	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.6.3		PASS

8. FCC PART 15.247 REQUIREMENTS

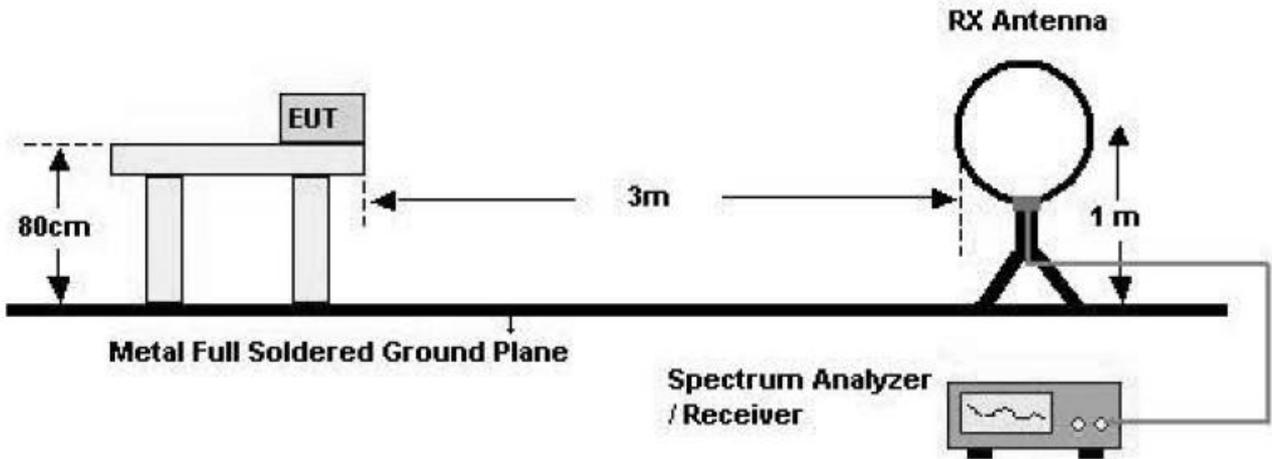
8.1 PEAK POWER

LIMIT 20dBc in any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

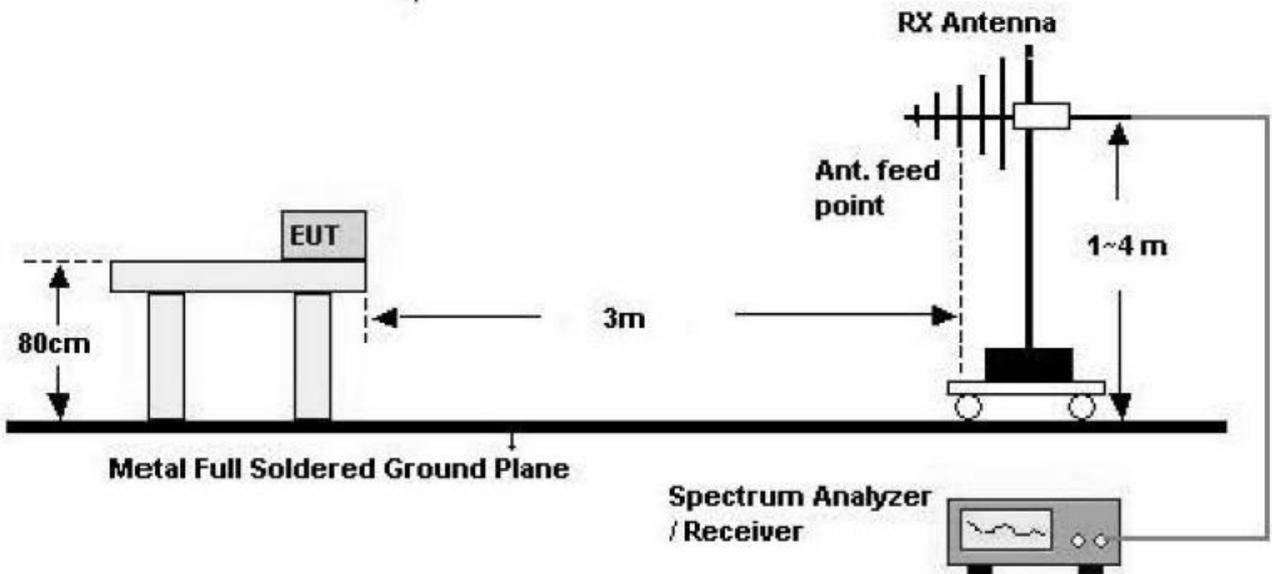
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

Below 30 MHz

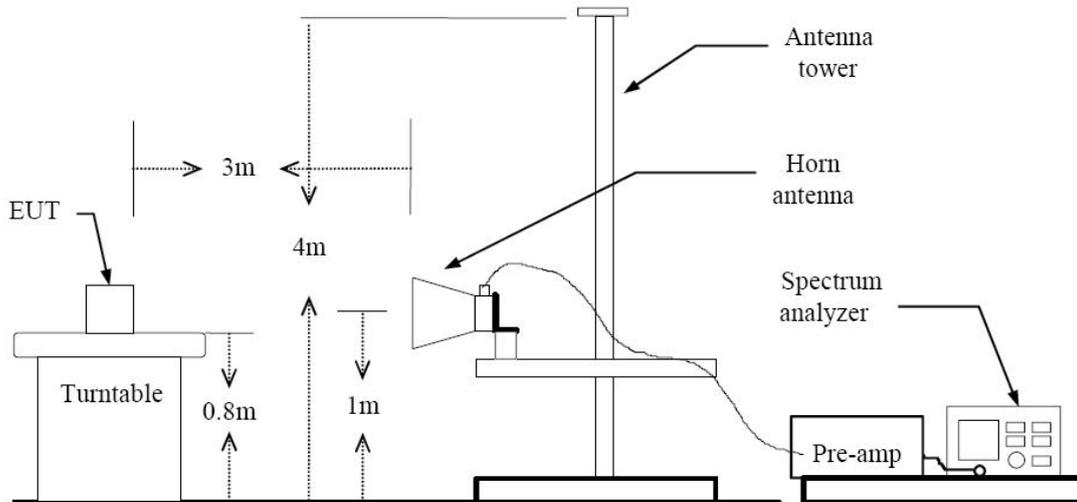


30 MHz - 1 GHz



FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840



TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

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

Notes:

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. This test is performed with hopping off.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840



TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

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

Notes:

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. This test is performed with hopping off.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

Above 1 GHz

Operation Mode: CH Low(GFSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4804	49.95	-0.20	V	49.75	74	24.25	PK
4804	37.68	-0.20	V	37.48	54	16.52	AV
7206	48.51	10.34	V	58.85	74	15.15	PK
7206	36.10	10.34	V	46.44	54	7.56	AV
4804	49.75	-0.20	H	49.55	74	24.45	PK
4804	37.81	-0.20	H	37.61	54	16.39	AV
7206	49.27	10.34	H	59.61	74	14.39	PK
7206	36.22	10.34	H	46.56	54	7.44	AV

※ A:F: ANTENNA FACTOR
C:L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

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 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.
6. This test is performed with hopping off.

Operation Mode: CH Mid(GFSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4882	49.55	0.25	V	49.80	74	24.20	PK
4882	36.40	0.25	V	36.65	54	17.35	AV
7323	48.40	10.01	V	58.41	74	15.59	PK
7323	35.64	10.01	V	45.65	54	8.35	AV
4882	49.22	0.25	H	49.47	74	24.53	PK
4882	36.63	0.25	H	36.88	54	17.12	AV
7323	48.39	10.01	H	58.40	74	15.60	PK
7323	35.82	10.01	H	45.83	54	8.17	AV

※ A·F: ANTENNA FACTOR

C·L: CABLE LOSS

AMP GAIN: AMPLIFIER GAIN

Notes:

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 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.
6. This test is performed with hopping off.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

Operation Mode: CH High(GFSK)

Frequency [MHz]	Reading dBuV	*A.F+CL-AMP GAIN [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4960	48.62	0.75	V	49.37	74	24.63	PK
4960	35.86	0.75	V	36.61	54	17.39	AV
7440	48.06	10.11	V	58.17	74	15.83	PK
7440	35.14	10.11	V	45.25	54	8.75	AV
4960	48.52	0.75	H	49.27	74	24.73	PK
4960	35.96	0.75	H	36.71	54	17.29	AV
7440	47.32	10.11	H	57.43	74	16.57	PK
7440	34.95	10.11	H	45.06	54	8.94	AV

※ A:F: ANTENNA FACTOR
C:L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

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 > 20dB 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. Spectrum setting:
 - a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normal Mode.
6. This test is performed with hopping off.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

8.1.1 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

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	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH 0, CH 78

Frequency [MHz]	*Fund. Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	*Fundamental [dBuV/m]	Delta Value [dBuV/m]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2390.0	74.15	33.86	H	108.01	56.99	0	51.02	74	22.98	PK
2390.0	73.66	33.86	H	107.52	56.99	-30.78	19.75	54	34.25	AV
2390.0	70.49	33.86	V	104.35	51.46	0	52.89	74	21.11	PK
2390.0	69.95	33.86	V	103.81	51.49	-30.78	21.54	54	32.46	AV
2483.5	73.74	34.02	H	107.76	58.55	0	49.21	74	24.79	PK
2483.5	73.10	34.02	H	107.12	58.55	-30.78	17.79	54	36.21	AV
2483.5	70.08	34.02	V	104.10	54.31	0	49.79	74	24.21	PK
2483.5	69.51	34.02	V	103.53	54.31	-30.78	18.44	54	35.56	AV

※ A:F: ANTENNA FACTOR
C:L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

- Spectrum setting:
 - Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
- Duty Cycle Correction Factor = $20 \log(\text{Worst Case Dwell Time} / 100\text{ms}) \text{ dB} = -30.78 \text{ dB}$
- Duty Cycle Correction Factor(AFH):
 - Time to cycle through all channels = $\Delta t = \tau [\text{ms}] \times 20 \text{ channels} = 57.84 \text{ ms}$, where τ = pulse width
 - $100 \text{ ms} / \Delta t [\text{ms}] = H \rightarrow$ Round up to next highest integer, $H' = 1.728907$
 - Worst Case Dwell Time = $\tau [\text{ms}] \times H' = 5.0 \text{ ms}$

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840



- d. Duty Cycle Correction(AFH) = $20\log(\text{Worst Case Dwell Time} / 100\text{ms}) \text{ dB} = -26.02 \text{ dB}$
- 4. Radiated Restricted Band Edge measures by marker-delta method according to FCC guideline.
- 5. We have done Normal Mode and EDR Mode test. Worst case of EUT is Normla Mode.
- 6. This test is performed with hopping off.
- 7. Marker-Delta Method

In making radiated band-edge measurements, there can be a problem obtaining meaningful data since a measurement instrument that is tuned to a band-edge frequency may also capture some in-band signals when using the resolution bandwidth (RBW) required by measurement procedure ANSI C63.4-1992 (hereafter C63.4). In an effort to compensate for this problem, we have developed the following technique for determining band-edge compliance.

STEP 1) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4 and our Rules for the frequency being measured. For example, for a device operating in the 902-928 MHz band under Section 15.249, use a 120 kHz RBW with a CISPR QP detector (a peak detector with 100 kHz RBW may alternatively be used). For transmitters operating above 1 GHz, use a 1 MHz RBW, a 1 MHz VBW, and a peak detector (as required by Section 15.35). Repeat the measurement with an average detector (i.e., 1 MHz RBW with 10 Hz VBW). Note: For pulsed emissions, other factors must be included. Please contact the FCC Lab for details if the emission under investigation is pulsed. Also, please note that radiated measurements of the fundamental emission of a transmitter operating under 15.247 are not normally required, but they are necessary in connection with this procedure.

STEP 2) Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.

STEP 3) Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance as required by Section 15.205.

FCC PT.15.247 TEST REPORT	FCC Class II Permissive Change REPORT		www.hct.co.kr
Test Report No. HCTR1202FR35	Date of Issue: February 28, 2012	EUT Type: Cellular/PCS BC 10 CDMA and LTE Phone with Bluetooth and WLAN	FCC ID : ZNFLS840

9. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Rohde & Schwarz	ESH2-Z5/ LISN	Annual	02/03/2013	861741/013
Schwarzbeck	VULB 9168/ TRILOG Antenna	Biennial	02/09/2013	200
Rohde & Schwarz	ESI 40 / EMI TEST RECEIVER	Annual	05/26/2012	831564103
Agilent	E4440A/ Spectrum Analyzer	Annual	05/02/2012	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	Annual	09/23/2012	MY51110020
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	ESH3-Z2/ PULSE LIMITER	Annual	08/01/2012	375.8810.352
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	Annual	09/19/2012	10094
MITEQ	AFS44-00102650-42-10P-44-PS/ POWER AMP	Annual	09/23/2012	1532439
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	10/17/2013	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	Biennial	10/26/2012	BBHA9170342
Rohde & Schwarz	FSP / Spectrum Analyzer	Annual	02/09/2013	839117/011
Agilent	E4440A / Spectrum Analyzer	Annual	05/02/2012	US45303008
Agilent	E4416A /Power Meter	Annual	11/07/2012	GB41291412
Agilent	E9327A /POWER SENSOR	Annual	05/02/2012	MY4442009
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	05/02/2012	1
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	Annual	05/02/2012	1
Hewlett Packard	11636B/Power Divider	Annual	11/07/2012	11377
Hewlett Packard	11667B / Power Splitter	Annual	11/04/2012	10126
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	11/07/2012	3110117
ITECH	IT6720 / DC POWER SUPPLY	Annual	11/07/2012	010002156287001199
TESCOM	TC-3000C / BLUETOOTH TESTER	Annual	11/14/2012	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	Annual	05/02/2012	100422
EMCO	6502.LOOP ANTENNA	Biennial	01/11/2014	9009-2536
MITEQ	AMF-6D-001180-35-20P/ POWER AMP	Annual	12/26/2012	990893

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