



HCT CO., LTD.

Product Compliance Division

TEL : +82 31 639 8518 FAX : +82 31 639 8535

CERTIFICATE OF COMPLIANCE

FCC Certification

Applicant Name:

Nokia, Inc.

12278 Scripps Summit Drive, San Diego, CA 92131

Date of Issue:

April 30, 2009

Location:

HCT.CO., LTD., San 136-1 Ami-ri, Bubal-eup, Icheon-si,
Kyungki-do, Korea

Test Report No.: HCT-RF09-0401-6

HCT FRN: 0005866421

IC Recognition No.: IC 5944A

FCC ID: **QMNRN-464**

IC: **661X-RM464**

APPLICANT: **Nokia, Inc.**

Model(s): RM-464

EUT Type: Dual-band CDMA phone with+BT2.1+EDR

Max. RF Output Power: GFSK : 1.56 dBm (1.43 mW) , EDR : 3.55 dBm(2.26 mW)

Frequency Range: 2402 - 2480 MHz (Bluetooth)

Modulation type: GFSK, PSK

FCC Classification: FCC Part 15 Frequency Hopping Spread Spectrum Transceiver

FCC Rule Part(s): Part 15 subpart C 15.247

IC Rule : RSS-210 Issue 7_June 2007, RSS-GEN Issue 2_June 2007

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 been denied FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.862

Hyo Sun Kwak
Report prepared by

: Hyo Sun Kwak

Test engineer of RF Part

Sang Jun Lee
Approved by

: Sang Jun Lee

Manager of RF Part

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FCC & IC CERTIFICATION REPORT				www.hct.co.kr
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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF09-0401-1	April 1, 2009	Change the EUT Type Add the MEID Number
HCT-RF09-0401-2	April 21, 2009	Page numbering update
HCT-RF09-0401-3	April 23, 2009	Version control update
HCT-RF09-0401-4	April 27, 2009	Test information update Rule change of 7.6.4 Receiver Spurious Emissions Modified the section 7.7 drawing
HCT-RF09-0401-5	April 29, 2009	Remove Receiver spurious emission data Add the measurement uncertainty Correct the information of LISN
HCT-RF09-0401-6	April 30, 2009	Add the version for IC rule

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1. GENERAL INFORMATION

Applicant: Nokia, Inc.
Address: 12278 Scripps Summit Drive, San Diego, CA 92131
FCC ID: QMNRN-464
IC CODE: 661X-RM464
EUT: Dual-band CDMA phone with+BT2.1+EDR
Model: RM-464
Date of Test: March 26, 2009 ~ March 30, 2009
Contact person: Name: Sang Won, Bang
Phone #: +858 – 831 - 5000
Fax #: +858 – 831 - 6500

2. EUT DESCRIPTION

Product		Dual-band CDMA phone with+BT2.1+EDR
Model Name		RM-464
Serial No.: HW Version : SW Version :		A0000001593C22, A0000001593C35 4200 ST_4020T11_VZW_116
Power Supply		DC 3.7 V
Battery	Model Name: Power Rating: Type:	BL-4C(Standard) 3.7 V, 860mAh Li-ion
Frequency Range		2402 ~ 2480 MHz
Transmit Power		GFSK : 1.56 dBm (1.43 mW) , EDR : 3.55 dBm(2.26 mW)
Modulation Type		GFSK(Normal), PSK(EDR)
Modulation Technique		FHSS
Number of Channels		79 Channels
Antenna Specification		Manufacturer: E.M.W ANTENNA Co., LTD. Antenna type: CHIP ANTENNA Peak Gain : -1.00 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 pseudo randomly.
 - 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.

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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 9 kHz 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 **Nokia, Inc.**

Dual-band CDMA phone with+BT2.1+EDR FCC ID: QMNRN-464

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)

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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.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, Maekok-Ri, Hobup-Myun, Ichon-Si, Kyoungki-Do, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 6, 2006(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."

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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

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7. FCC PART 15.247 REQUIREMENTS

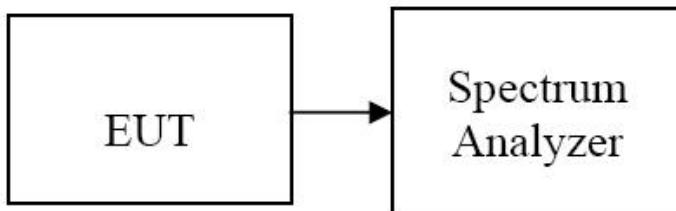
7.1 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. For systems using digital modulation in the bands of 902 ~ 928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5850 MHz: 1 watt.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the peak detector mode.

1. Span = 5 MHz (GFSK) / 5 MHz (8DPSK)
2. RBW = 3 MHz (GFSK) / 3 MHz (8DPSK)
3. VBW = 3 MHz (GFSK) / 3 MHz (8DPSK)
4. Sweep = auto
5. Packet type= DH5 (GFSK) / 3-DH5 (8DPSK)

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Measurement Uncertainty

Contributions	Probability Distribution	Standard Uncertainty (dB)
Absolute error	Rectangular	0.29
Frequency response	Rectangular	1.44
Error of bandwidth switching	Rectangular	0.12
Drift of temperature for DUT	Rectangular	0.15
Time-duty cycle error for DUT	Rectangular	0.05
Supply voltage dependency for DUT	Rectangular	0.08
Mismatch: Spectrum : Divider	U-Shaped	0.26
Mismatch: Divider : DUT	U-Shaped	0.16
Combined standard uncertainty		1.52
Expanded uncertainty (confidence interval of 95.45 %, Coverage Factor of $k = 2$)		3.04

TEST RESULTS

No non-compliance noted

Test Data

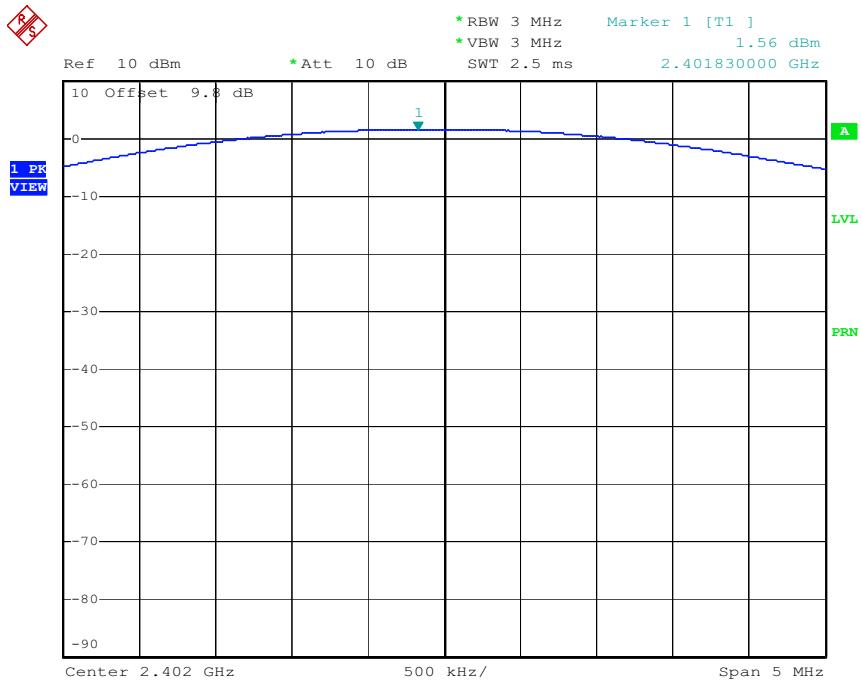
Channel	Frequency (MHz)	Output Power(GFSK)		Output Power(8DPSK)		Limit (W)	Result
		(dBm)	(mW)	(dBm)	(mW)		
Low	2402	1.56	1.43	3.55	2.26	1	PASS
Mid	2441	1.02	1.26	3.14	2.06		PASS
High	2480	0.21	1.05	2.03	1.60		PASS

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Test Plots

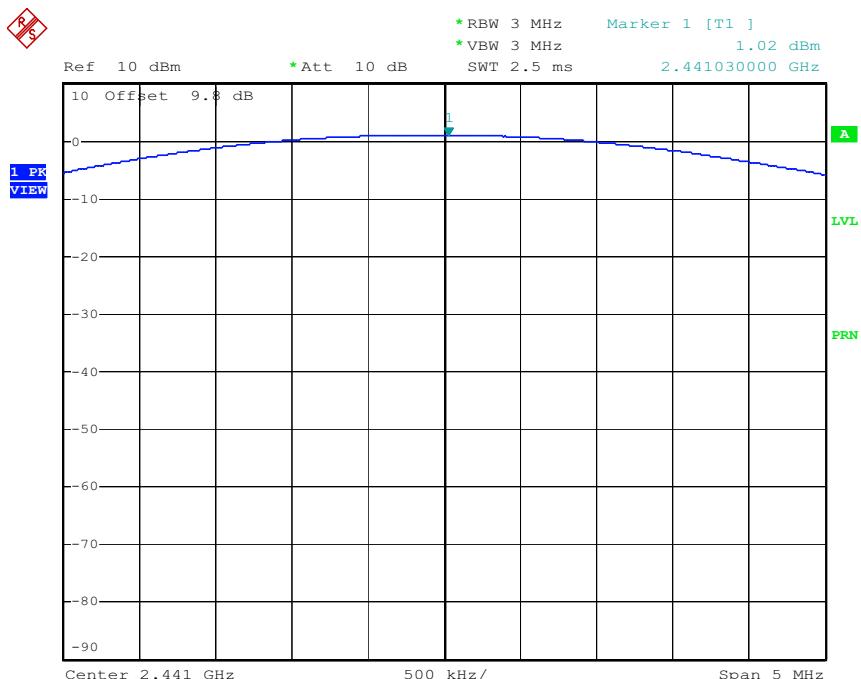
(GFSK)

Peak Power (Low CH)



Date: 26.MAR.2009 10:15:20

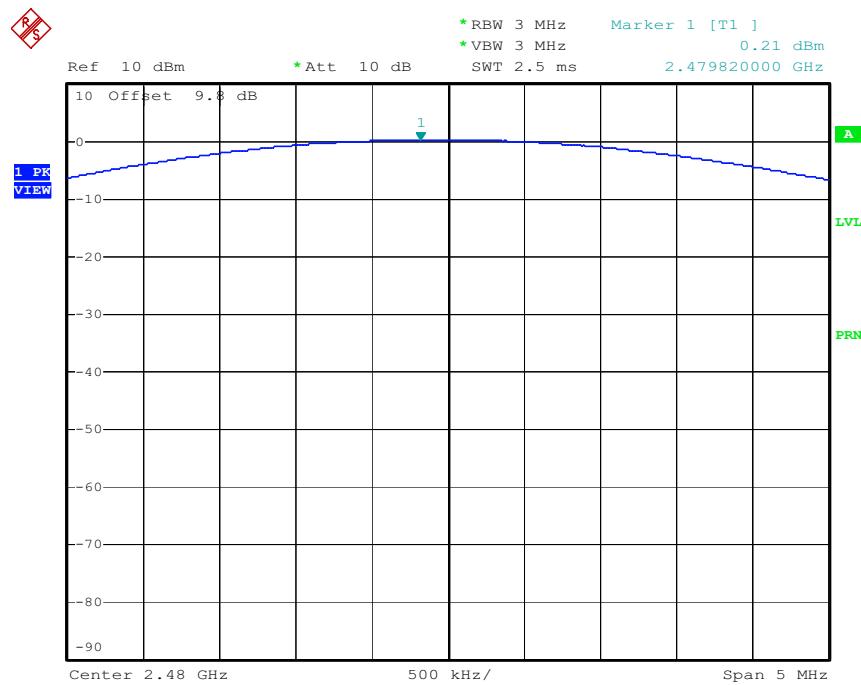
Peak Power (Mid CH)



Date: 26.MAR.2009 10:17:48

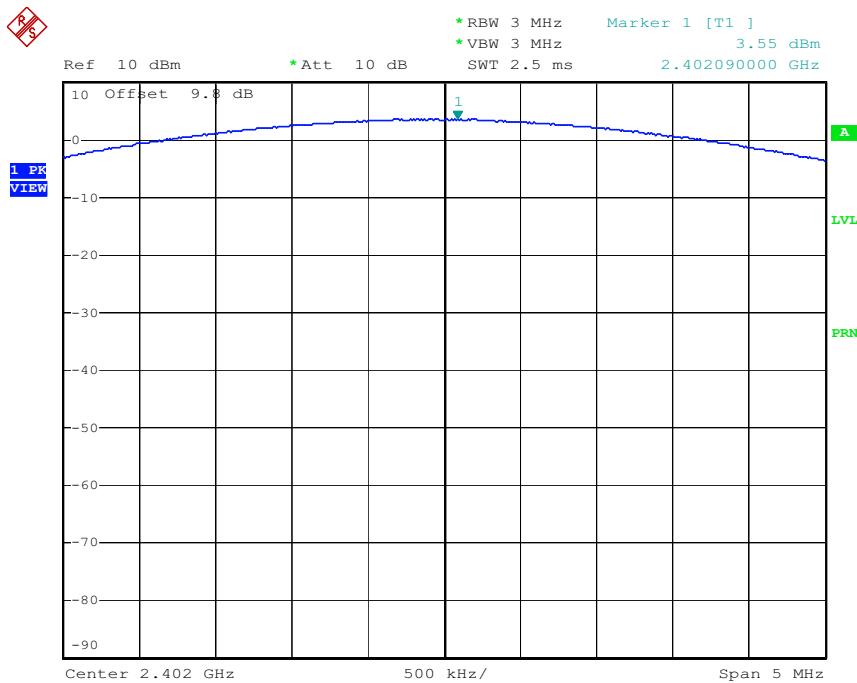
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Peak Power (High CH)



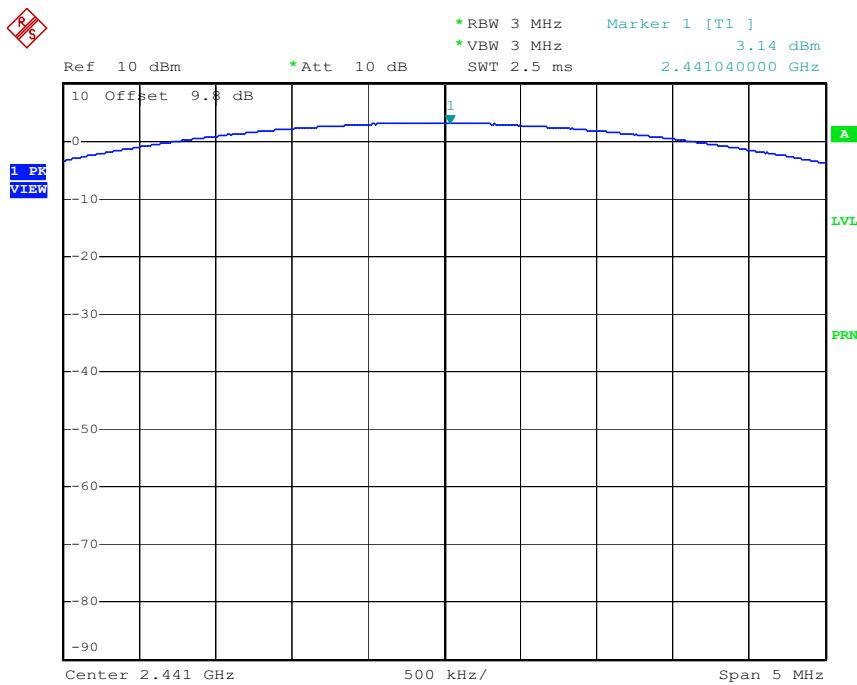
(8DPSK)

Peak Power (Low CH)



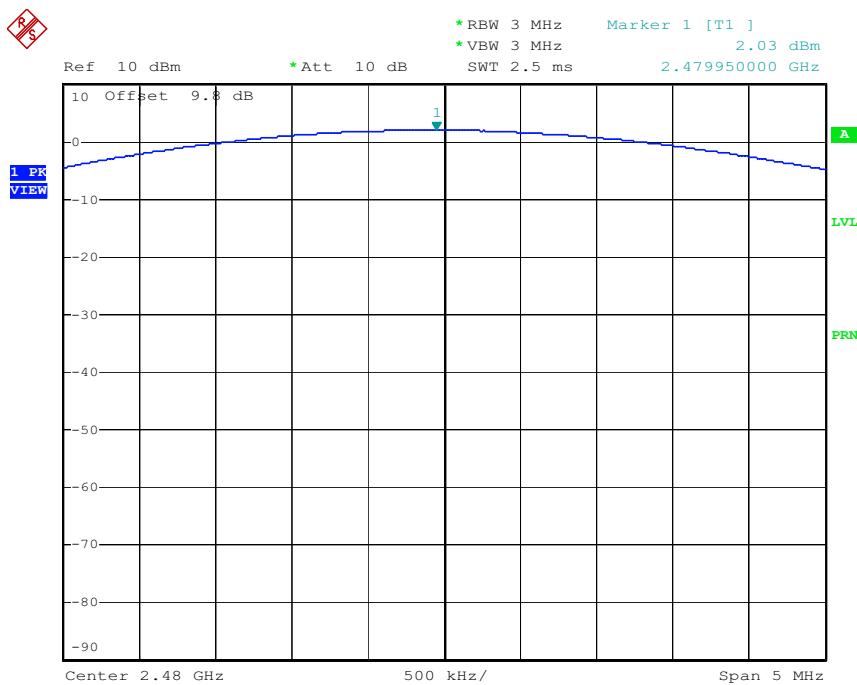
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Peak Power (Mid CH)



Date: 26.MAR.2009 10:19:27

Peak Power (High CH)



Date: 26.MAR.2009 10:21:07

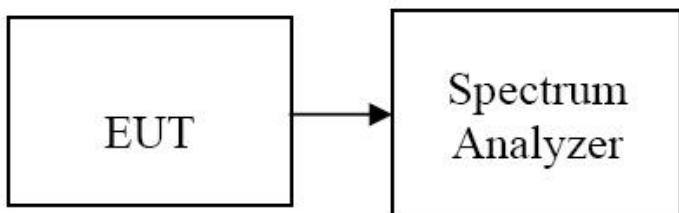
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7.2 BAND EDGES MEASUREMENT

LIMIT

According to §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.

Test Configuration



TEST PROCEDURE

The spectrum analyzer is set to :

1. Span = 8 MHz
2. RBW = 100 kHz
3. VBW = 300 kHz
4. Sweep = auto
5. Detector Mode = Peak

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Measurement Uncertainty

Contributions	Probability Distribution	Standard Uncertainty (dB)
Absolute error	Rectangular	0.29
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Error of bandwidth switching	Rectangular	0.12
Drift of temperature for DUT	Rectangular	0.15
Time-duty cycle error for DUT	Rectangular	0.05
Supply voltage dependency for DUT	Rectangular	0.08
Mismatch: Spectrum : Divider	U-Shaped	0.26
Mismatch: Divider : DUT	U-Shaped	0.16
Combined standard uncertainty		1.52
Expanded uncertainty (confidence interval of 95.45 %, Coverage Factor of $k = 2$)		3.04

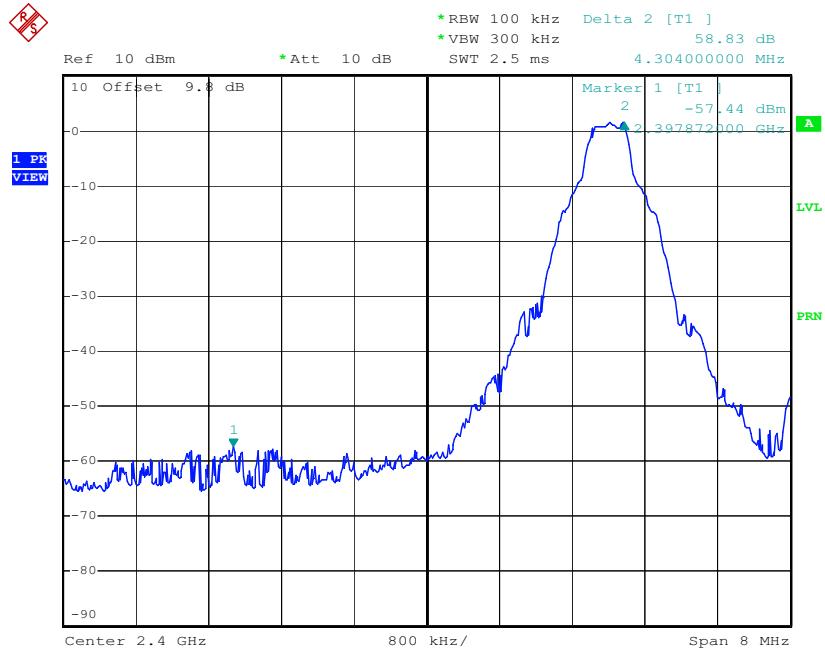
TEST RESULTS

See attached.

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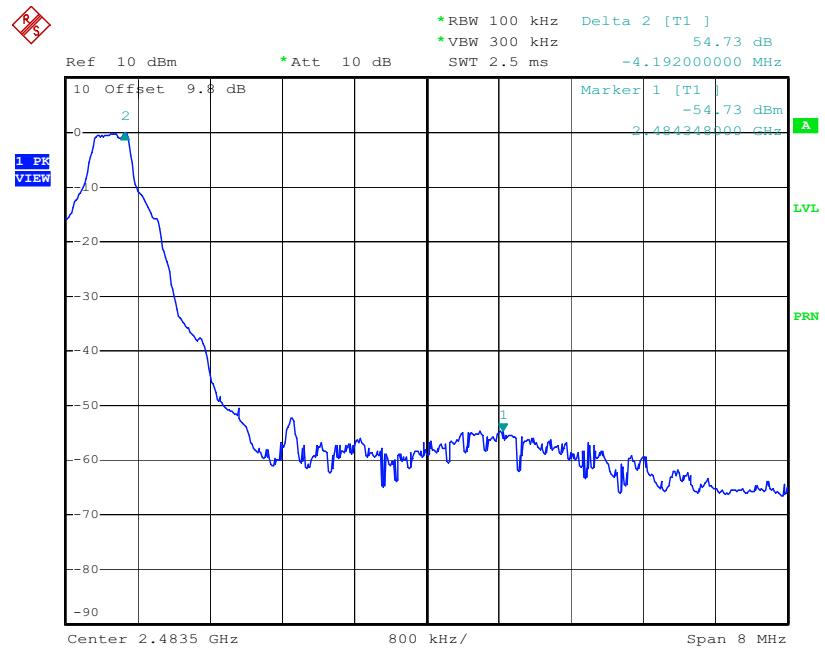
Test Data (GFSK)

Band Edges (Low- CH)



Date: 26.MAR.2009 10:23:09

Band Edges (High-CH)

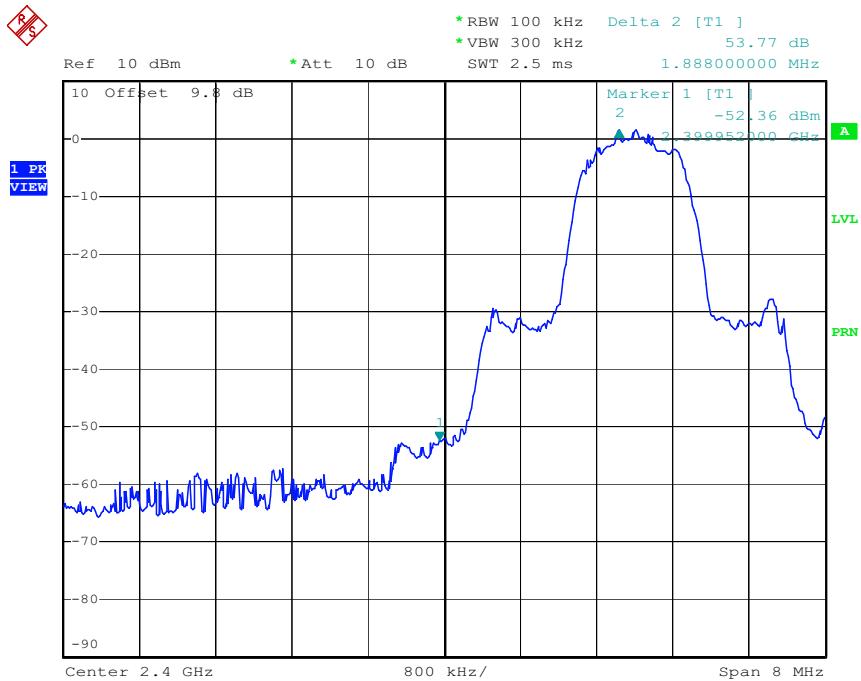


Date: 26.MAR.2009 10:24:30

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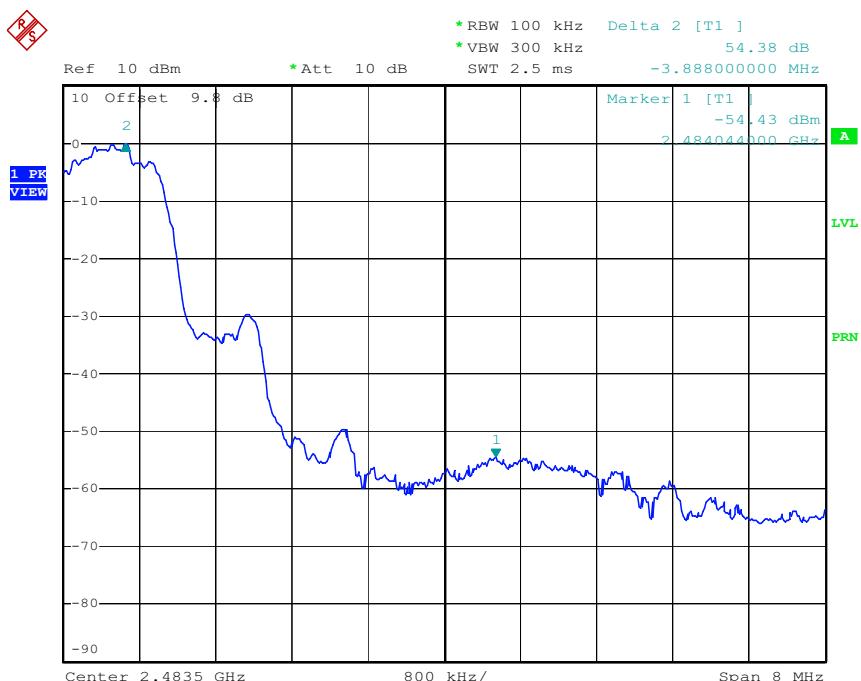
Test Data (8DPSK)

Band Edges (Low- CH)



Date: 26.MAR.2009 10:27:39

Band Edges (High-CH)



Date: 26.MAR.2009 10:28:54

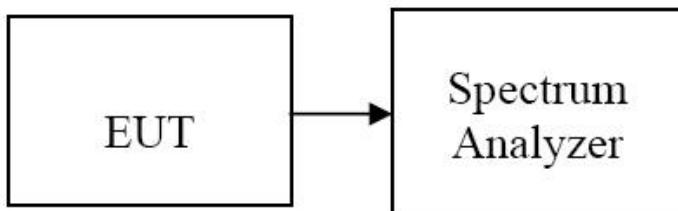
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7.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99% BW)

LIMIT

According to §15.247(a)(1), Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Configuration



TEST PROCEDURE

The spectrum analyzer is set to :

1. Span = 3 MHz
2. RBW = 30 kHz
3. VBW = 100 kHz
4. Sweep = auto

The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

Measurement Uncertainty

Contributions	Probability Distribution	Standard Uncertainty (Hz)
Year aging of oscillator	Rectangular	721.69
Drift of temperature	Rectangular	72.17
Marker count accuracy	Rectangular	721.69
DUT drift of temperature	Rectangular	115.47
Combined standard uncertainty	1029.66	
Expanded uncertainty (confidence interval of 95.45 %, Coverage Factor of $k = 2$)	2059.33	

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TEST RESULTS

No non-compliance noted

Test Data

Channel Separation (kHz)		20dB Bandwidth (kHz)			Limit (kHz)	Result
GFSK	8DPSK	Channel	GFSK	8DPSK		
1002	996	Low CH	1050	1302	>25	Pass
		Middle CH	1044	1296		
		High CH	1050	1278		

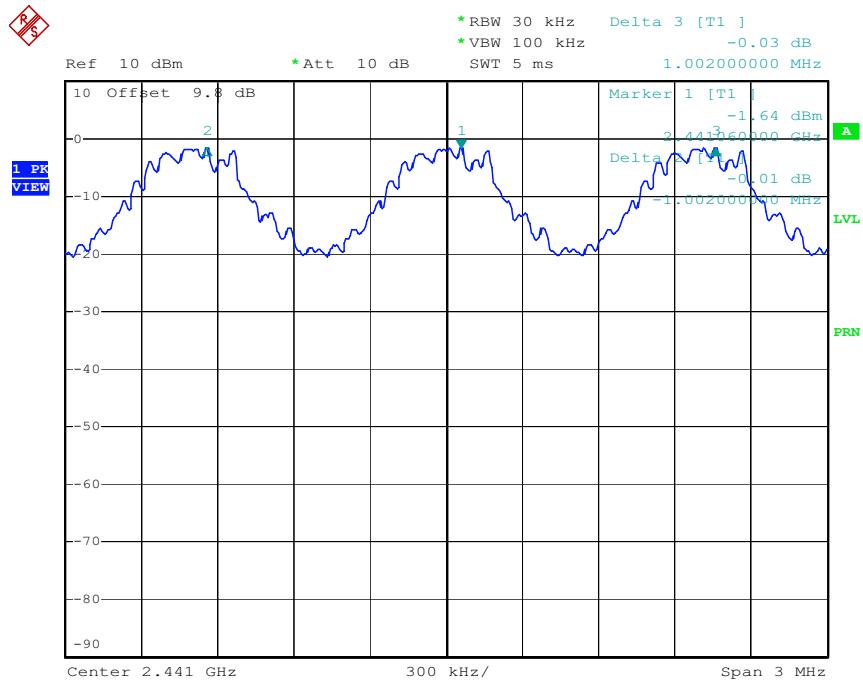
Occupied Bandwidth (99% BW)

99% BW (KHz)			Result
Channel	GFSK	8DPSK	
Low CH	900	1200	Pass
Middle CH	912	1200	
High CH	924	1206	

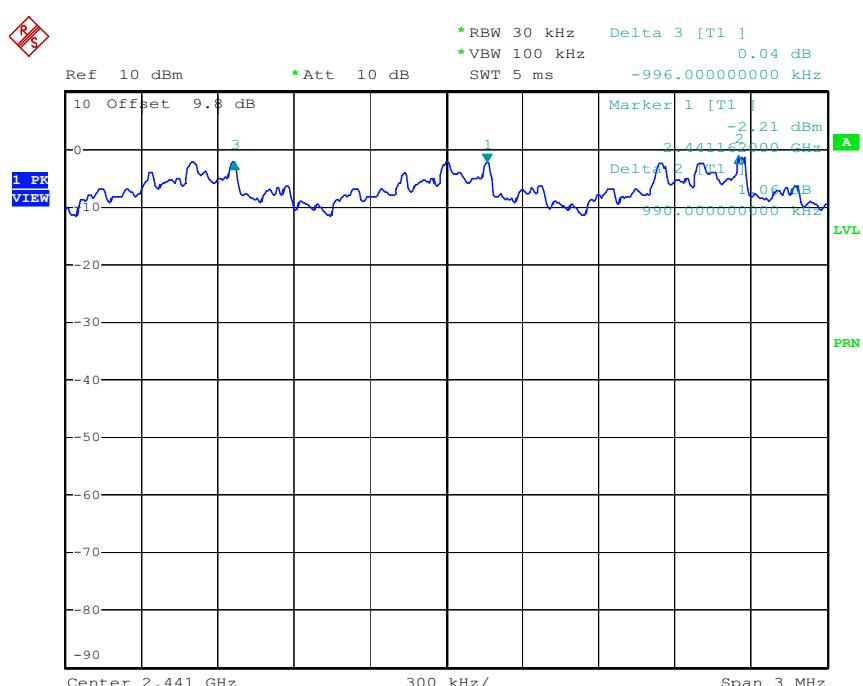
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Test Plot

Measurement of Channel Separation



Measurement of Channel Separation(8DPSK)

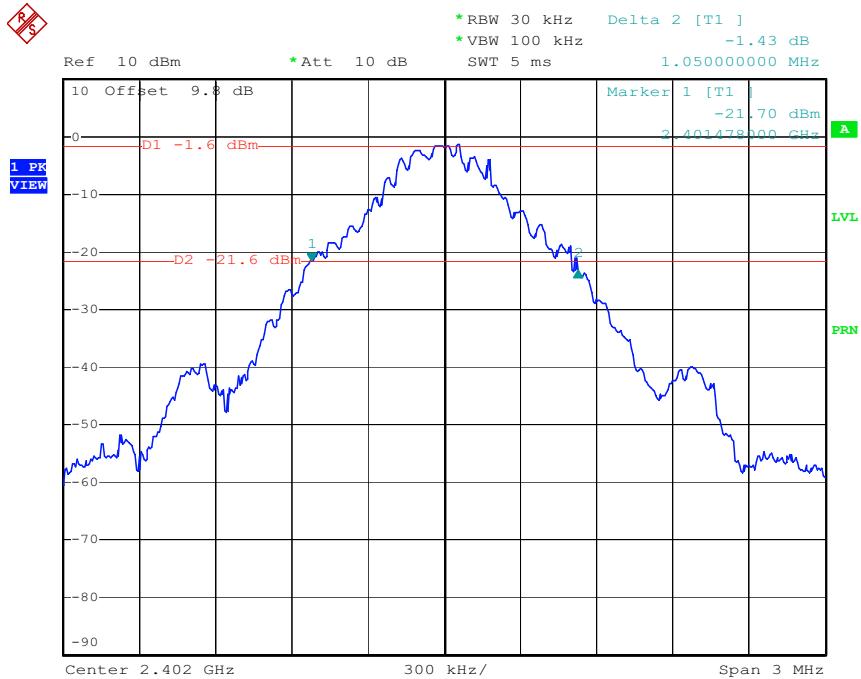


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Test Plot (GFSK)

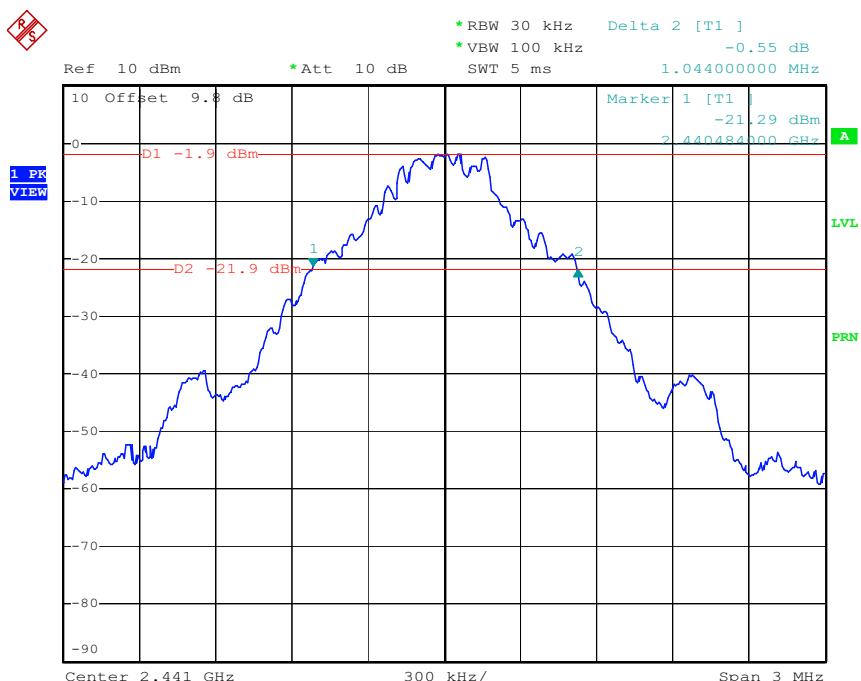
20 dB bandwidth

(Low CH)



Date: 26.MAR.2009 09:53:25

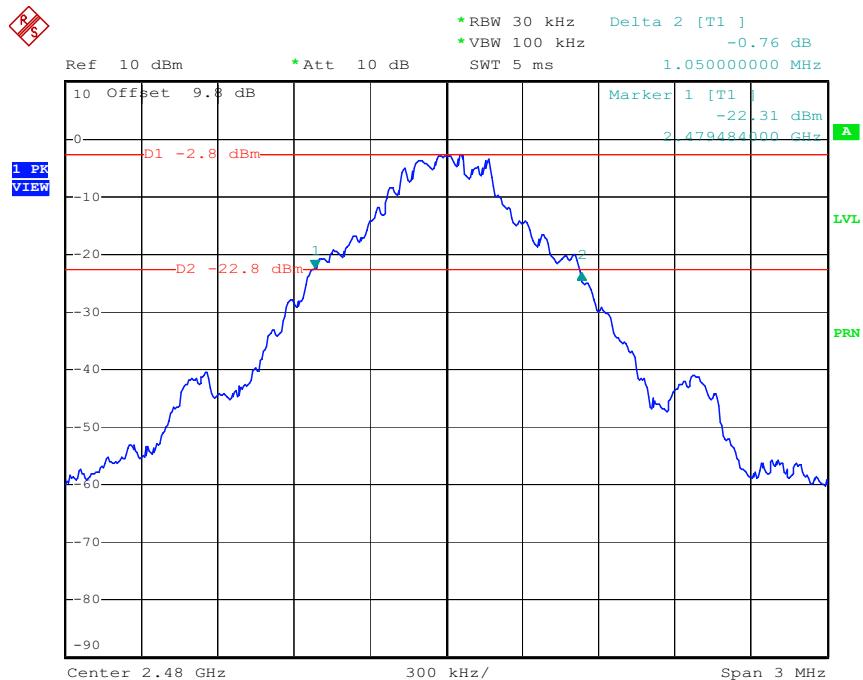
(Mid CH)



Date: 26.MAR.2009 09:54:47

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(High CH)

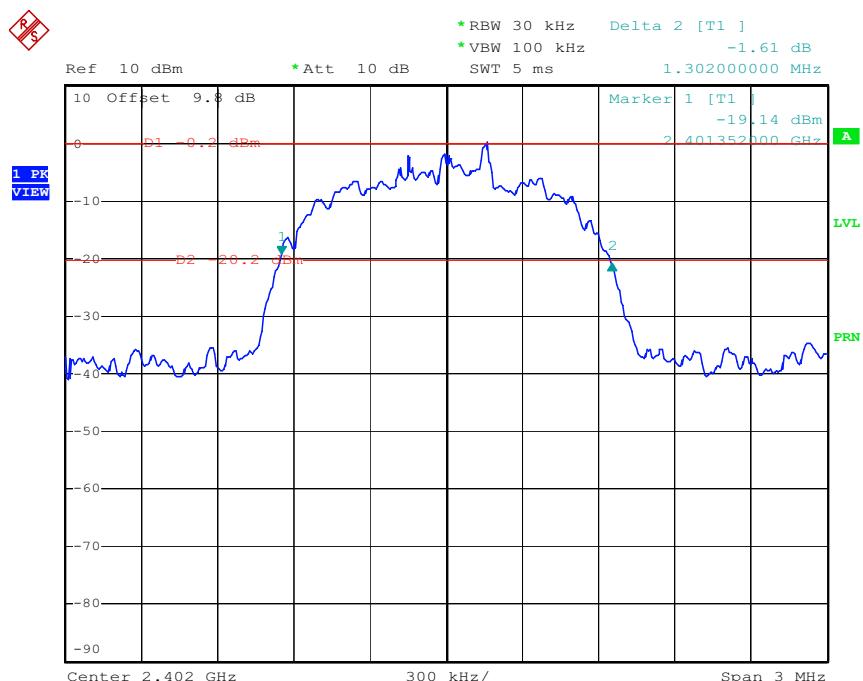


Date: 26.MAR.2009 09:56:25

Test Plot (8DPSK)

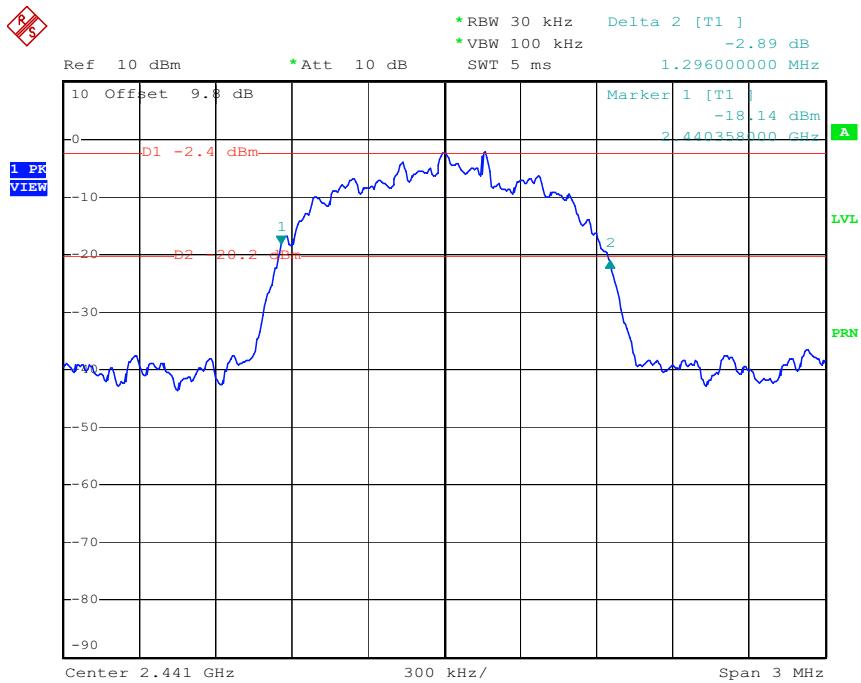
20 dB bandwidth

(Low CH)

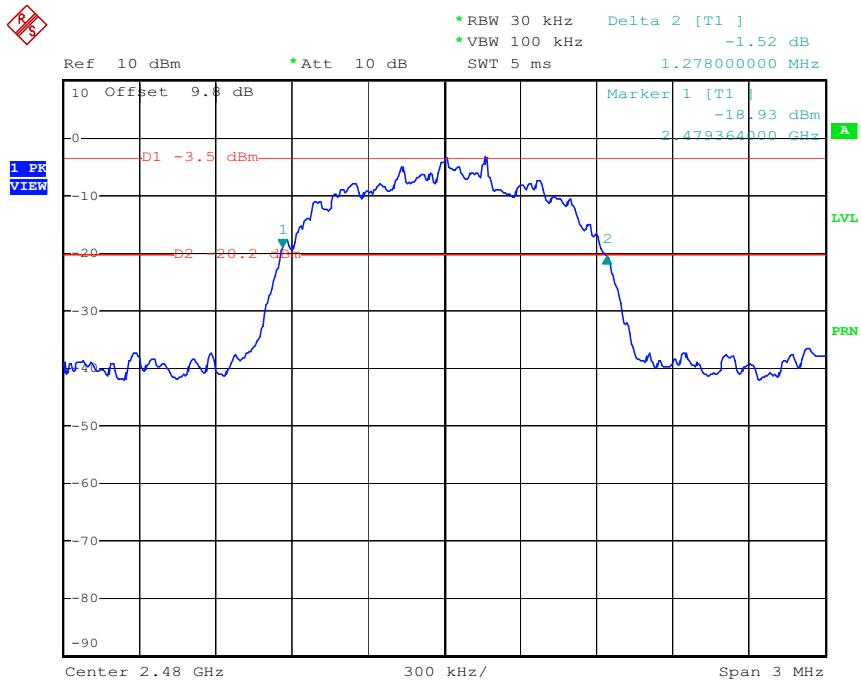


Date: 26.MAR.2009 09:59:18

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

(Mid CH)


Date: 26.MAR.2009 10:02:32

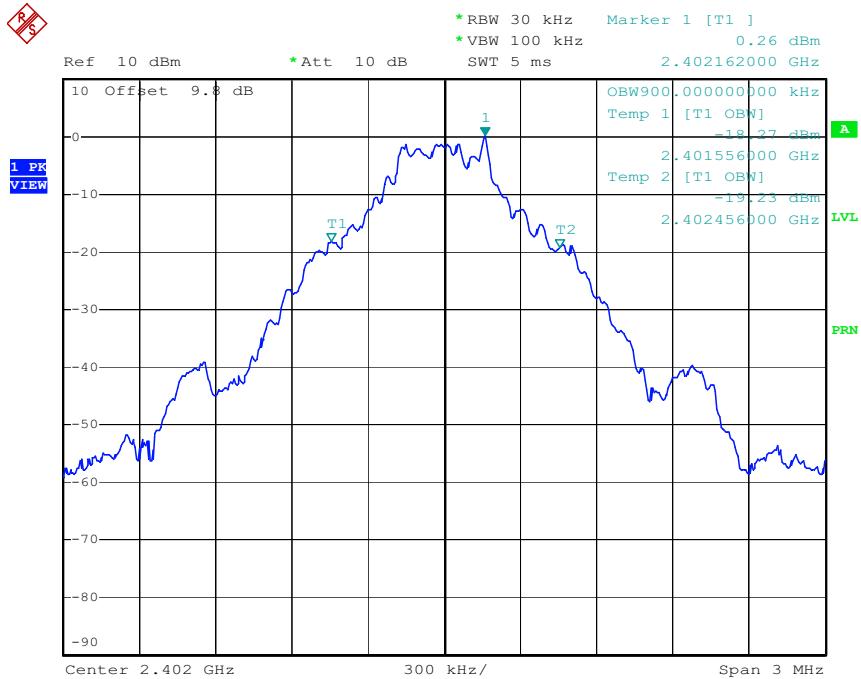
(High CH)


Date: 26.MAR.2009 10:04:34

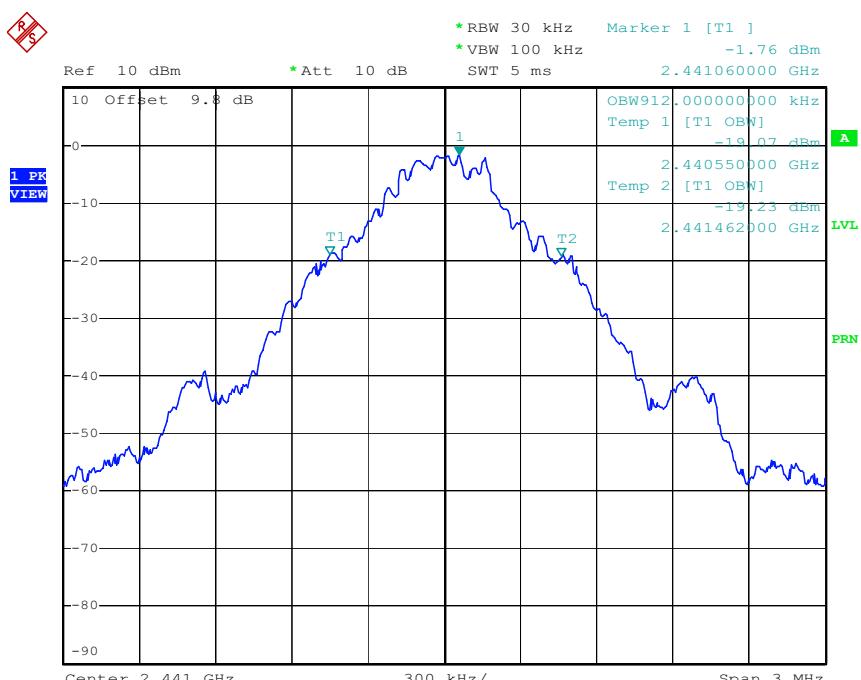
HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

Test Plot

Measurement of Occupied Bandwidth (GFSK) (Low CH)

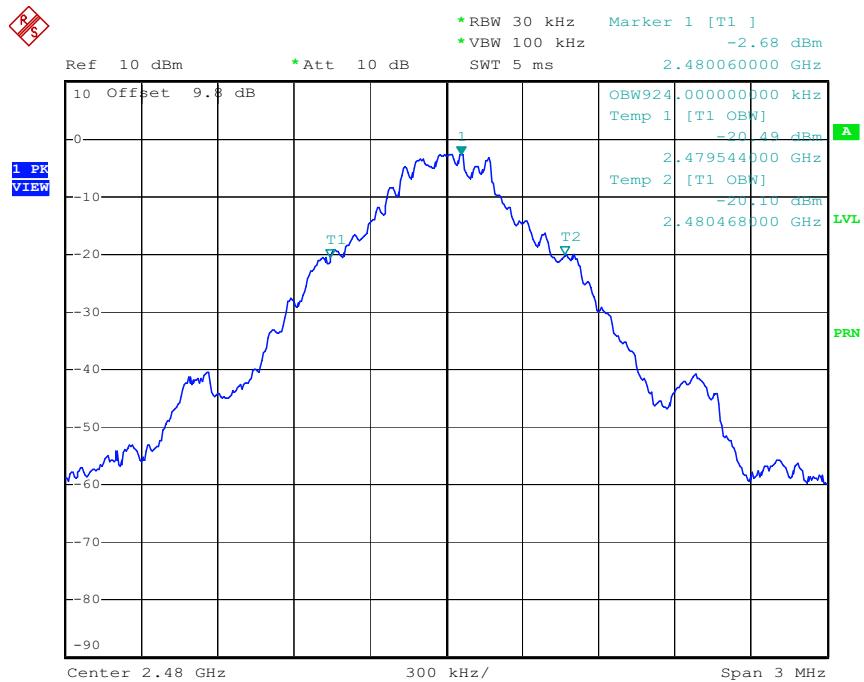


(Mid CH)



HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

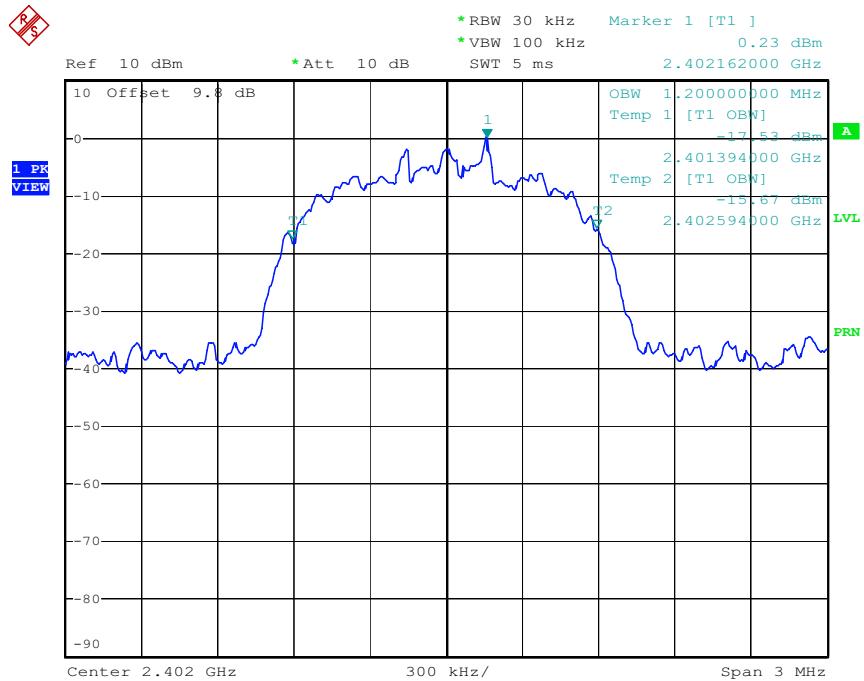
(High CH)



Date: 29.MAR.2009 10:23:52

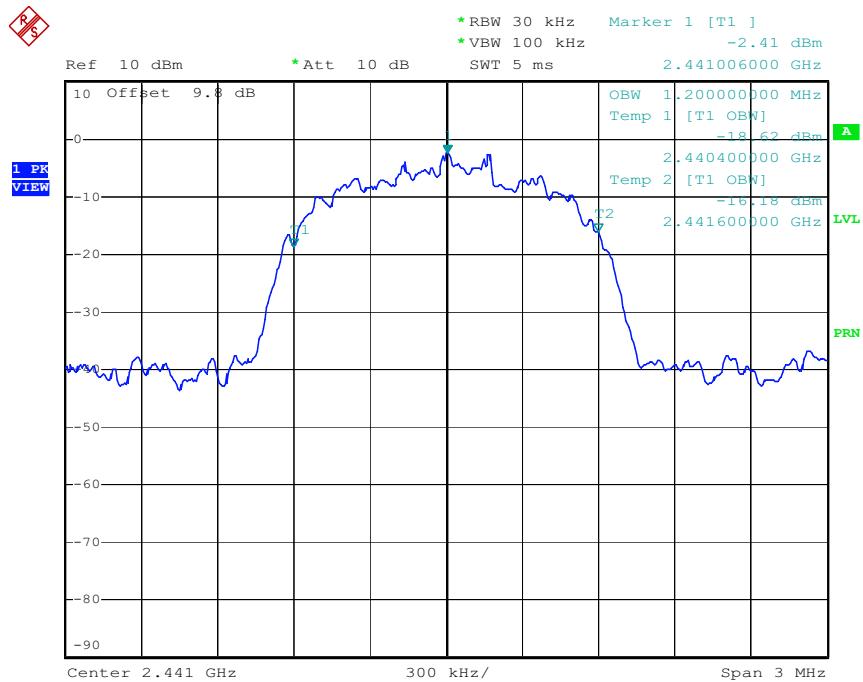
Measurement of Occupied Bandwidth (8DPSK)

(Low CH)

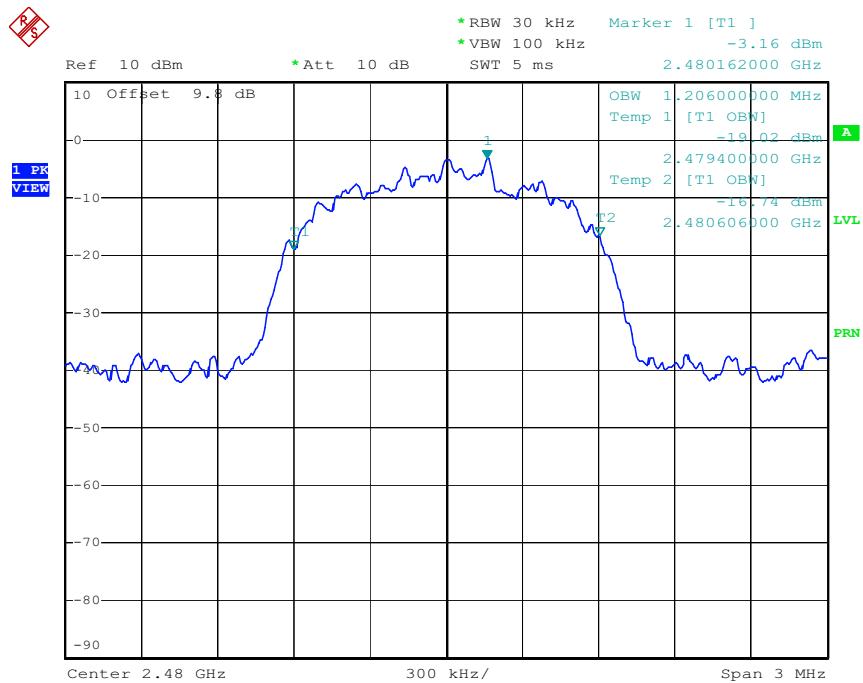


Date: 29.MAR.2009 10:24:43

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

(Mid CH)


Date: 29.MAR.2009 10:42:35

(High CH)


Date: 29.MAR.2009 10:43:59

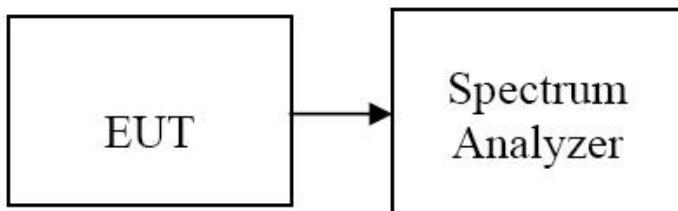
HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

7.4 NUMBER OF HOPPING FREQUENCY

LIMIT

According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands shall use at least 15 hopping frequencies.

Test Configuration



TEST PROCEDURE

The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer was set to :

1. Span = the frequency band of operation (Start = 2400 MHz, Stop = 2483.5 MHz)
2. RBW = 300 kHz
3. VBW = 300 kHz
4. Sweep = auto

The trace was allowed to stabilize.

Measurement Uncertainty

N/A

TEST RESULTS

No non-compliance noted

Test Data

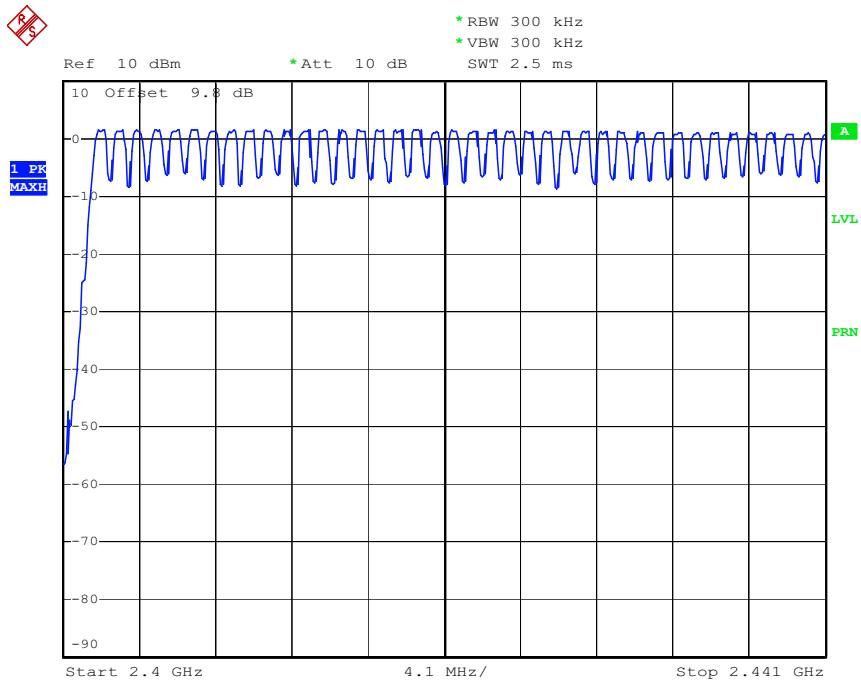
Result (No. of CH)	Limit (No. of CH)	Result
79	>75	Pass

HCT PT.15.247 TEST REPORT	FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464

Test Plot

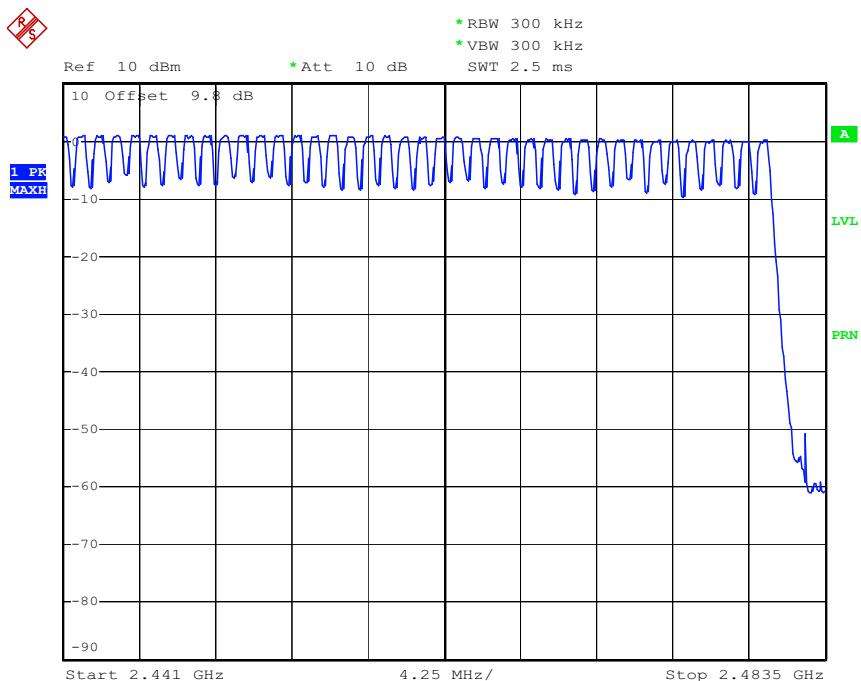
Number of Channels (GFSK)

2.4 GHz – 2.441 GHz



Date: 26.MAR.2009 10:37:46

2.441 GHz – 2.4835 GHz

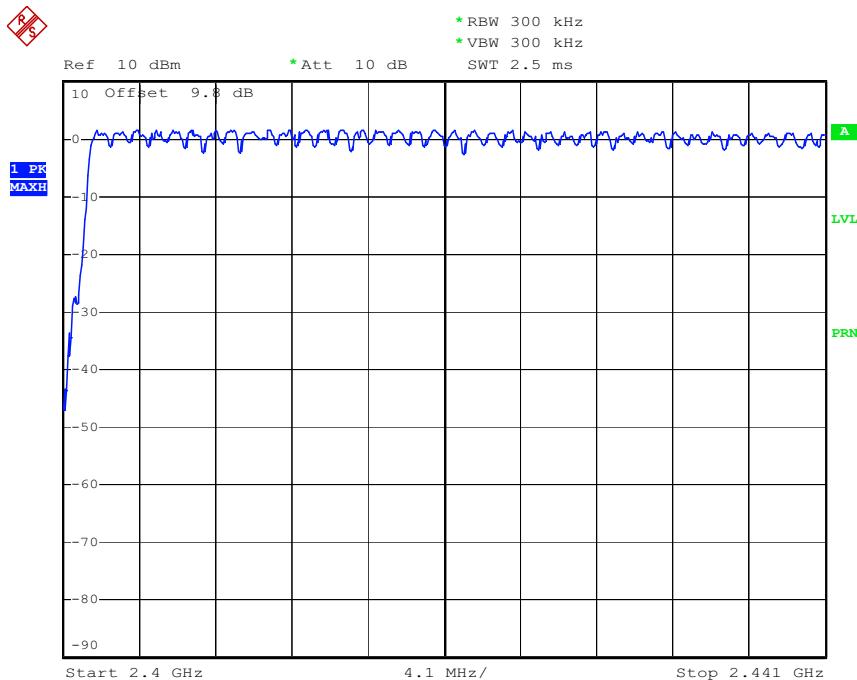


Date: 26.MAR.2009 10:38:43

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR		FCC ID: QMNRN-464	IC: 661X-RM464

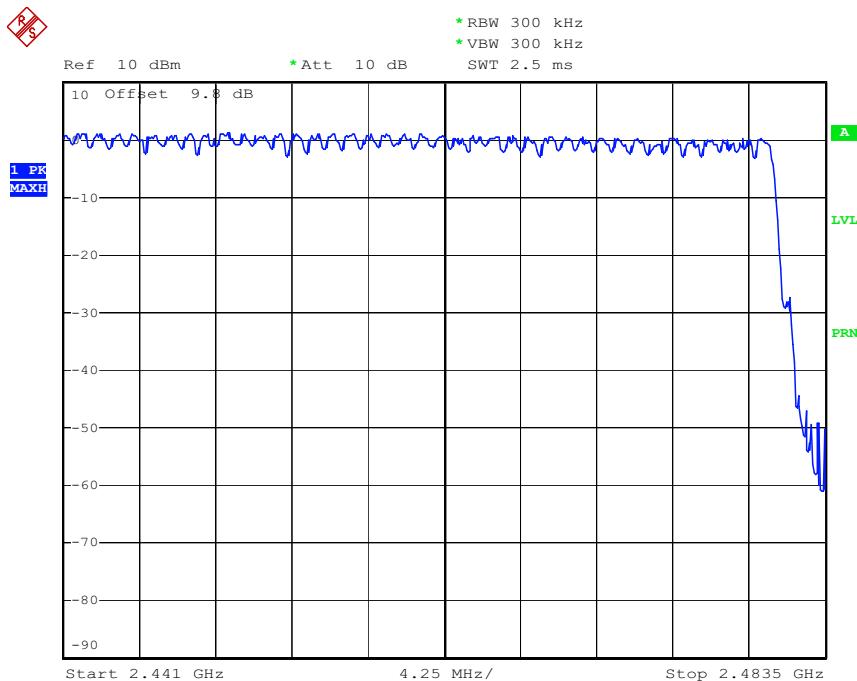
Number of Channels (8DPSK)

2.4 GHz – 2.441 GHz



Date: 26.MAR.2009 10:40:02

2.441 GHz – 2.4835 GHz



Date: 26.MAR.2009 10:41:20

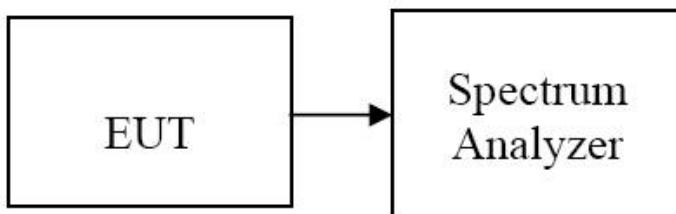
HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

7.5 TIME OF OCCUPANCY (DWELL TIME)

LIMIT

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

Test Configuration



TEST PROCEDURE

EUT was set to transmit the longest packet type (DH5)

1. Span = zero span
2. RBW = 1 MHz
3. VBW = 1 MHz
4. Sweep = as necessary to capture the entire dwell time per channel

The marker-delta function was used to determine the dwell time.

Measurement Uncertainty

Contributions	Probability Distribution	Standard Uncertainty (Hz)
Year aging of oscillator	Rectangular	721.69
Drift of temperature	Rectangular	72.17
Marker count accuracy	Rectangular	721.69
DUT drift of temperature	Rectangular	115.47
Combined standard uncertainty		1029.66
Expanded uncertainty (confidence interval of 95.45 %, Coverage Factor of $k = 2$)		2059.33

HCT PT.15.247 TEST REPORT	FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464



TEST RESULTS

See the table.

DH 5(The longest packet type for GFSK)

CH Mid : $2.89 * (1600/6)/79 * 31.6 = 308.27$ (ms)

3-DH 5(The longest packet type for 8DPSK)

CH Mid : $2.90 * (1600/6)/79 * 31.6 = 309.33$ (ms)

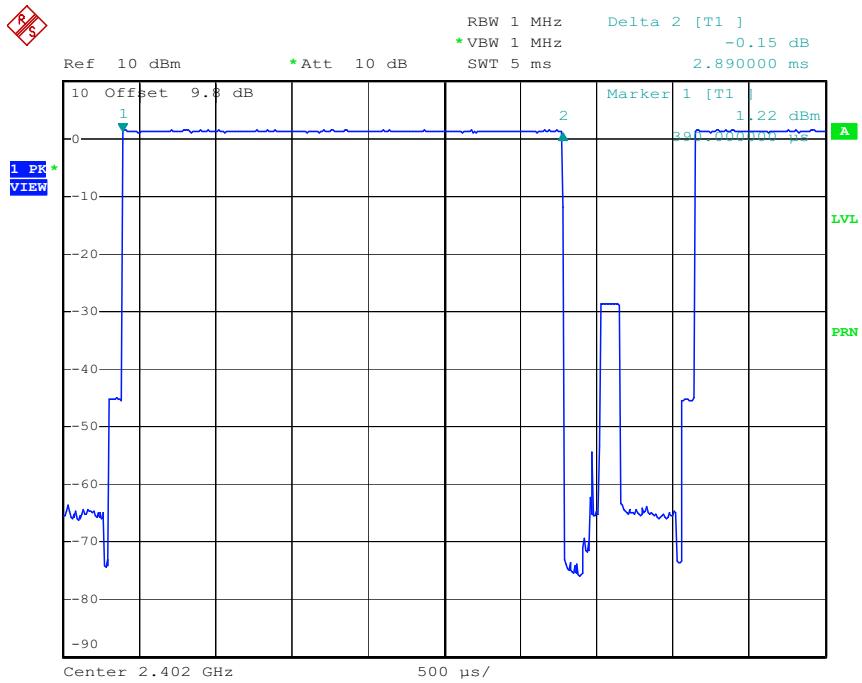
Channel	Pulse Time (ms)		Total of Dwell (ms)		Period Time (s)	Limit (ms)	Result
	GFSK	8DPSK	GFSK	8DPSK			
Low	2.89	2.90	308.27	309.33	31.6	400	PASS
Mid	2.89	2.90	308.27	309.33	31.6		PASS
High	2.90	2.90	309.33	309.33	31.6		PASS

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

Test Plots (GFSK)

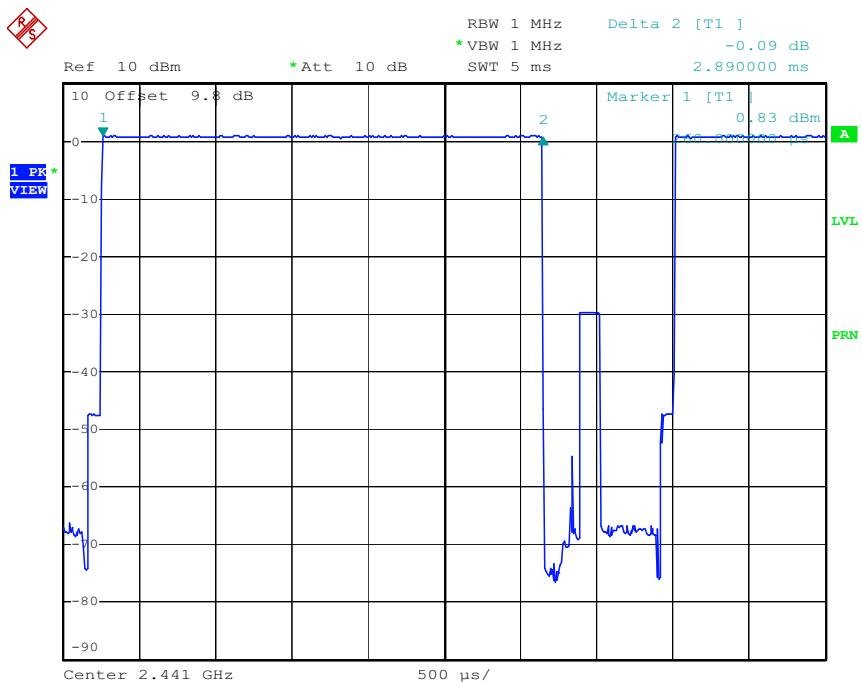
DH 5

(Low CH)



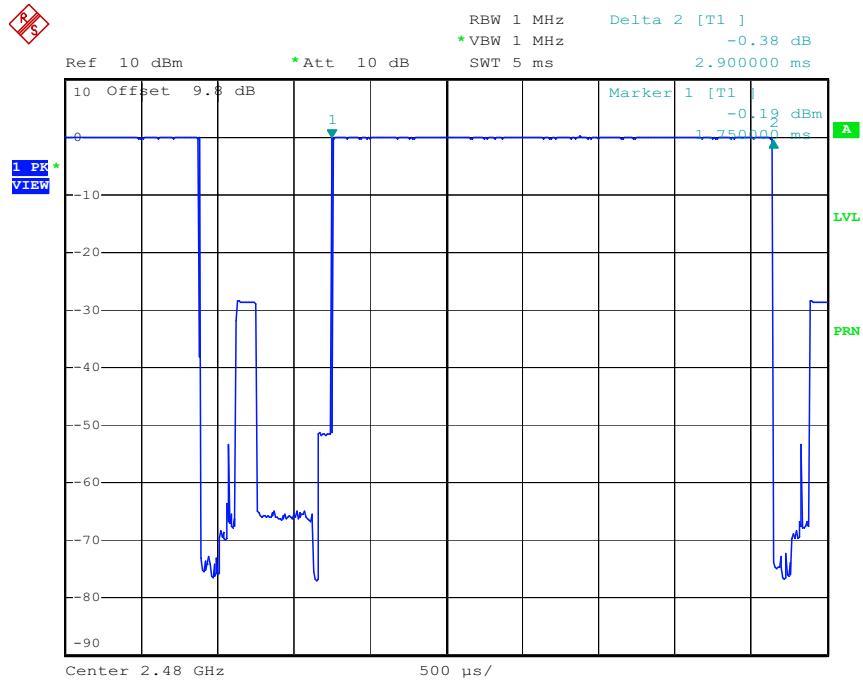
Date: 26.MAR.2009 10:06:31

(Mid CH)

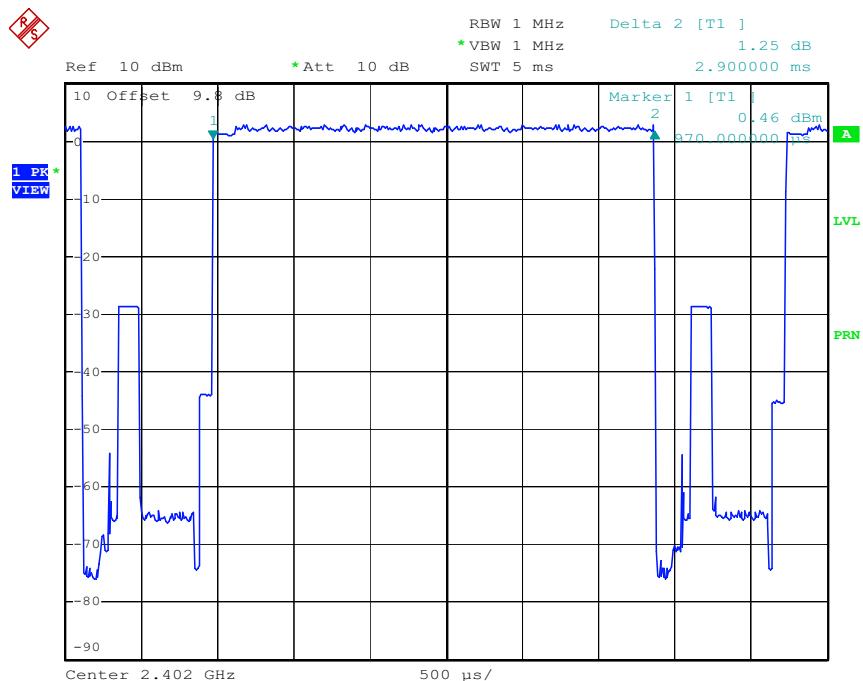


Date: 26.MAR.2009 10:07:03

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

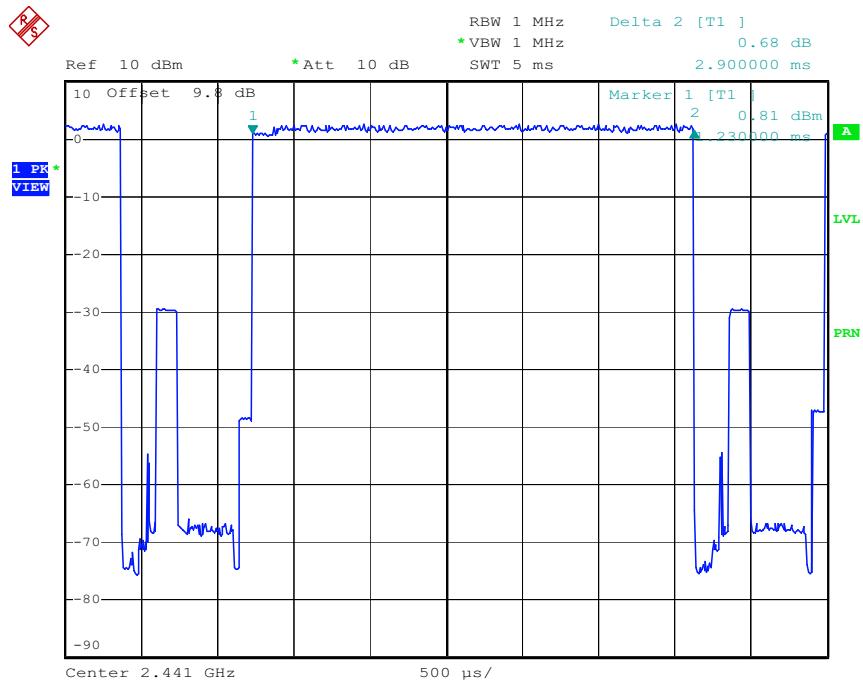
(CH High)


Date: 26.MAR.2009 10:07:51

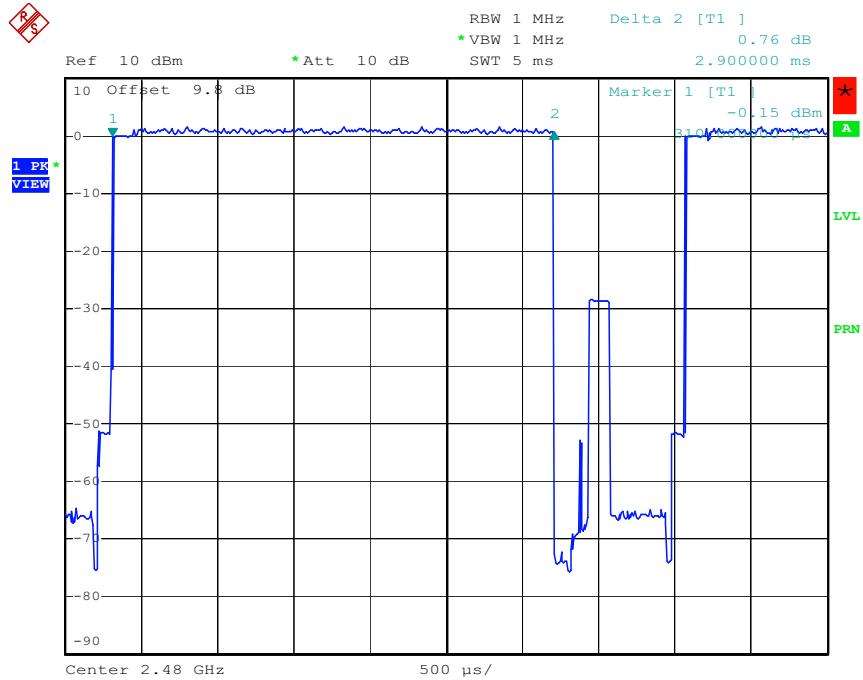
Test Plots (8DPSK)
3-DH 5
(Low CH)


Date: 26.MAR.2009 10:08:20

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

(Mid CH)


Date: 26.MAR.2009 10:12:28

(CH High)


Date: 26.MAR.2009 10:13:06

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

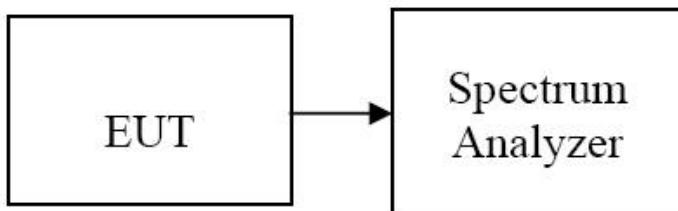
7.6 SPURIOUS EMISSIONS

7.6.1 Conducted Spurious Measurement

LIMIT

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. 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)).

Test Configuration



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

Detector Mode is set to a peak detector Mode.

Measurements are made over the 30 MHz to 26 GHz range with the transmitter set to the lowest, middle, and highest channels.

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	



Measurement Uncertainty

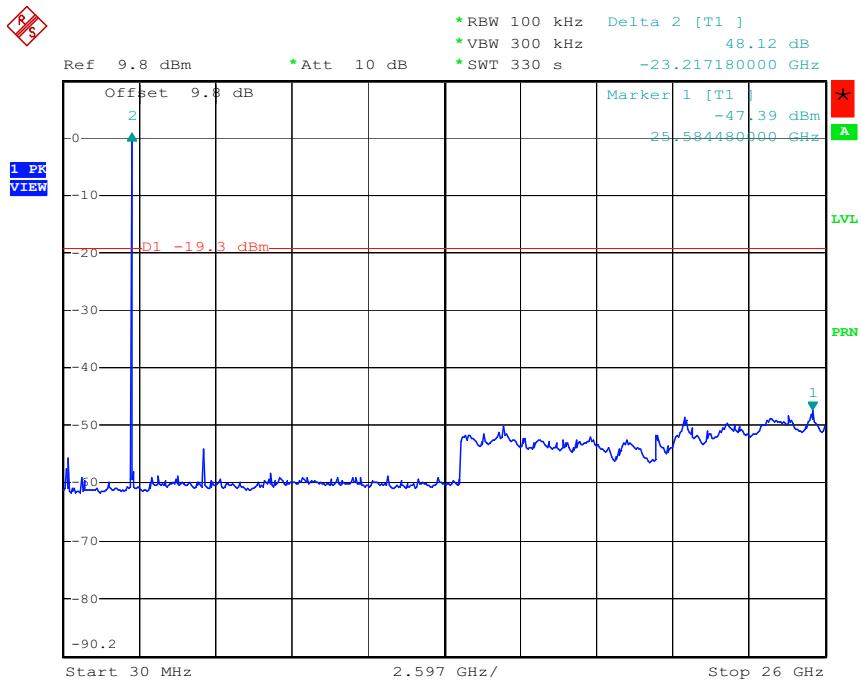
Contributions	Probability Distribution	Standard Uncertainty (dB)
Absolute error	Rectangular	0.29
Frequency response	Rectangular	1.44
Error of bandwidth switching	Rectangular	0.12
Drift of temperature for DUT	Rectangular	0.15
Time-duty cycle error for DUT	Rectangular	0.05
Supply voltage dependancy for DUT	Rectangular	0.08
Mismatch: Spectrum : Divider	U-Shaped	0.26
Mismatch: Divider : DUT	U-Shaped	0.16
Combined standard uncertainty	1.52	
Expanded uncertainty (confidence interval of 95.45 %, Coverage Factor of $k = 2$)	3.04	

TEST RESULTS

No non-compliance noted

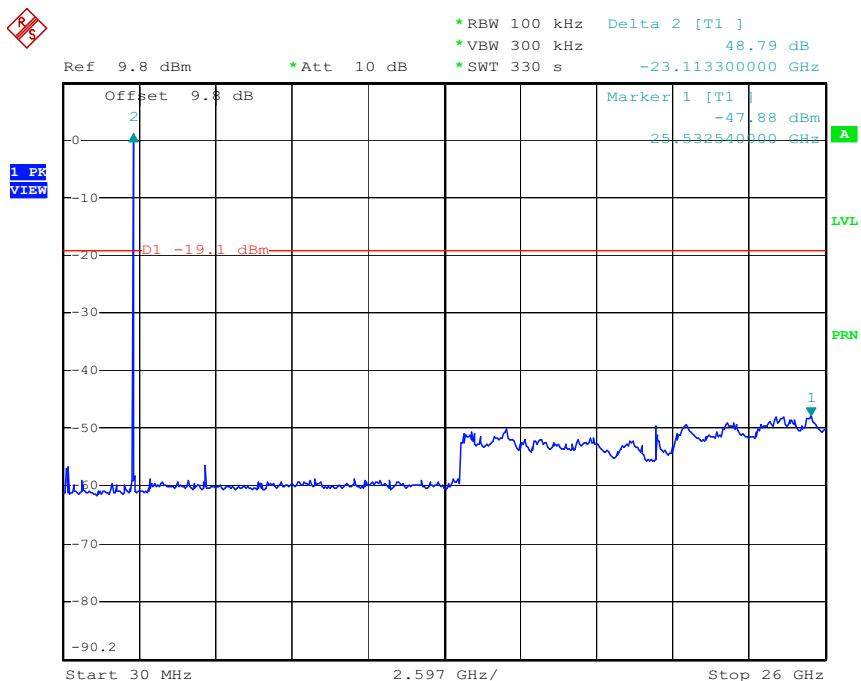
HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

Test Plots (GFSK): 30 MHz ~ 26 GHz (Low CH)



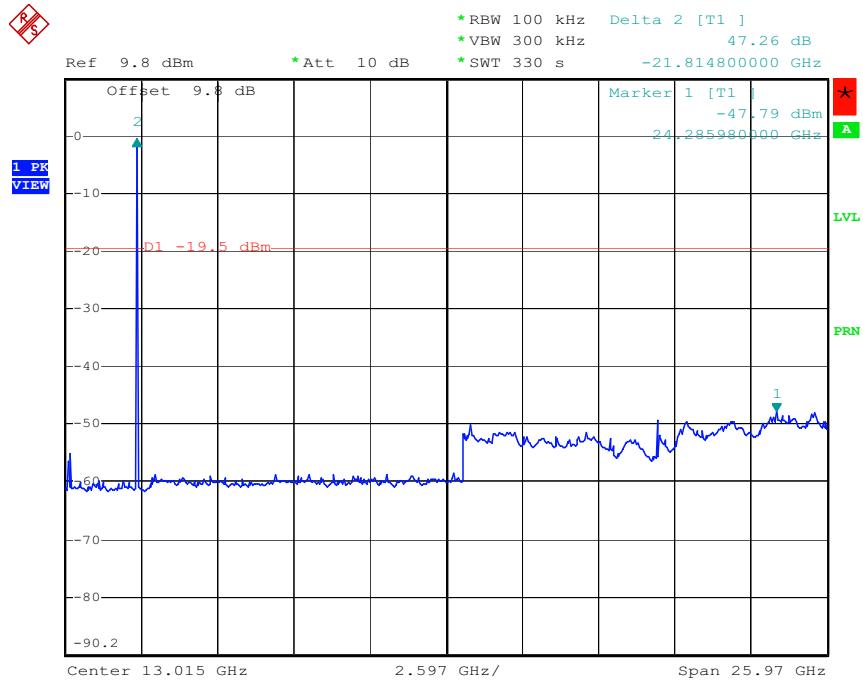
Date: 10.APR.2009 16:56:45

(Mid CH)

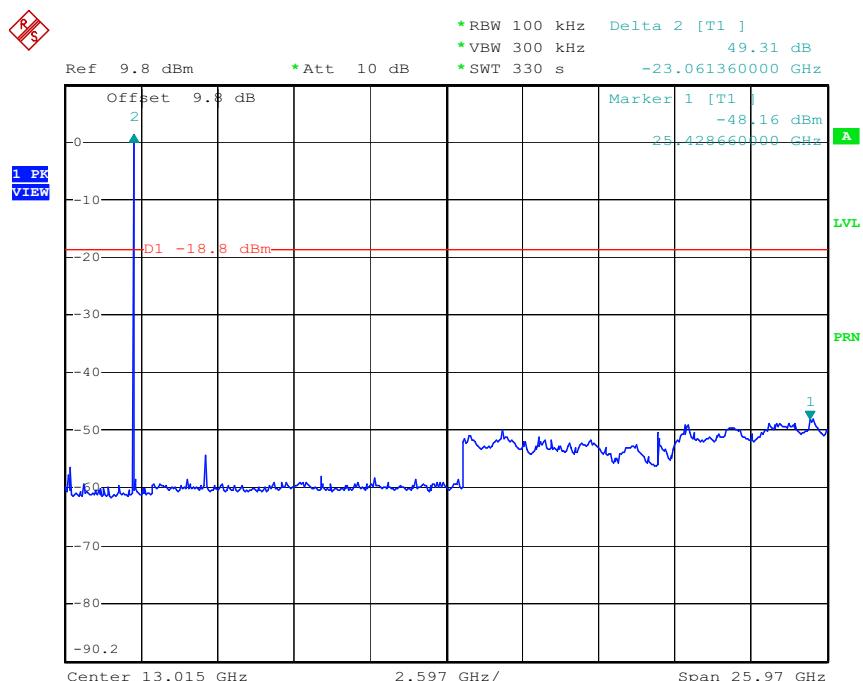


Date: 10.APR.2009 17:15:24

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRM-464	IC: 661X-RM464	

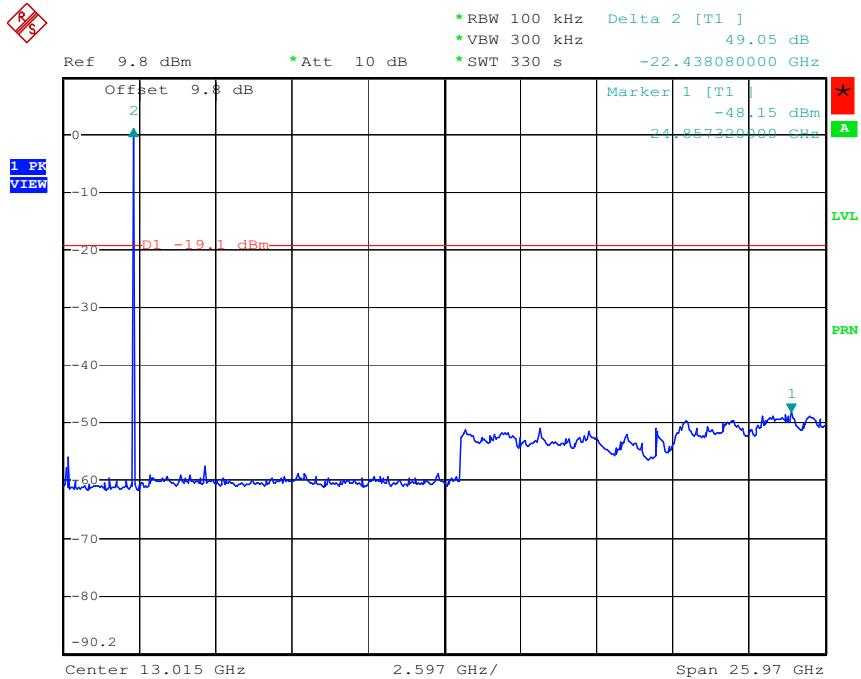
(High CH)


Date: 10.APR.2009 17:25:25

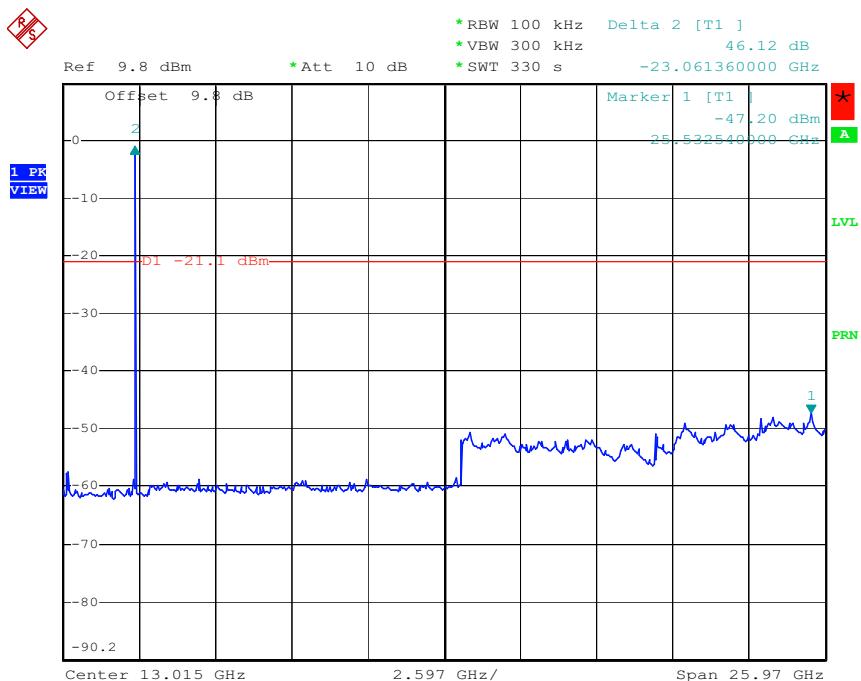
Test Plots (8DPSK): 30 MHz ~ 26 GHz
(Low CH)


Date: 10.APR.2009 17:40:56

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

(Mid CH)


Date: 10.APR.2009 17:48:56

(High CH)


Date: 10.APR.2009 17:56:24

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	



7.6.2 Radiated Spurious Emissions

LIMIT

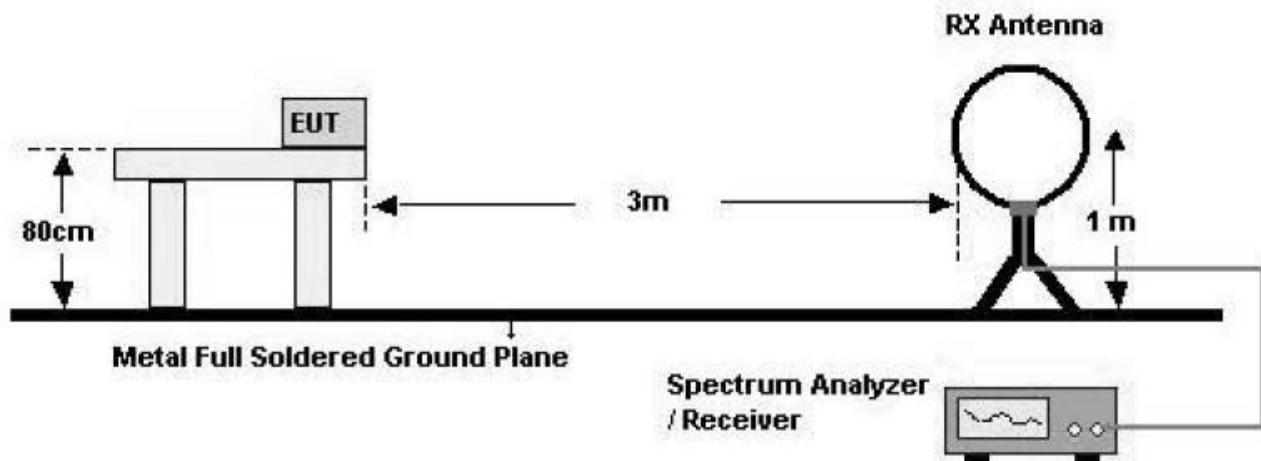
1. 20dBc in any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed

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 (29.5 dBuV/m)	30
30-88	100 (40 dBuV/m)	3
88-216	150 (43.5 dBuV/m)	3
216-960	200 (46 dBuV/m)	3
Above 960	500 (54 dBuV/m)	3

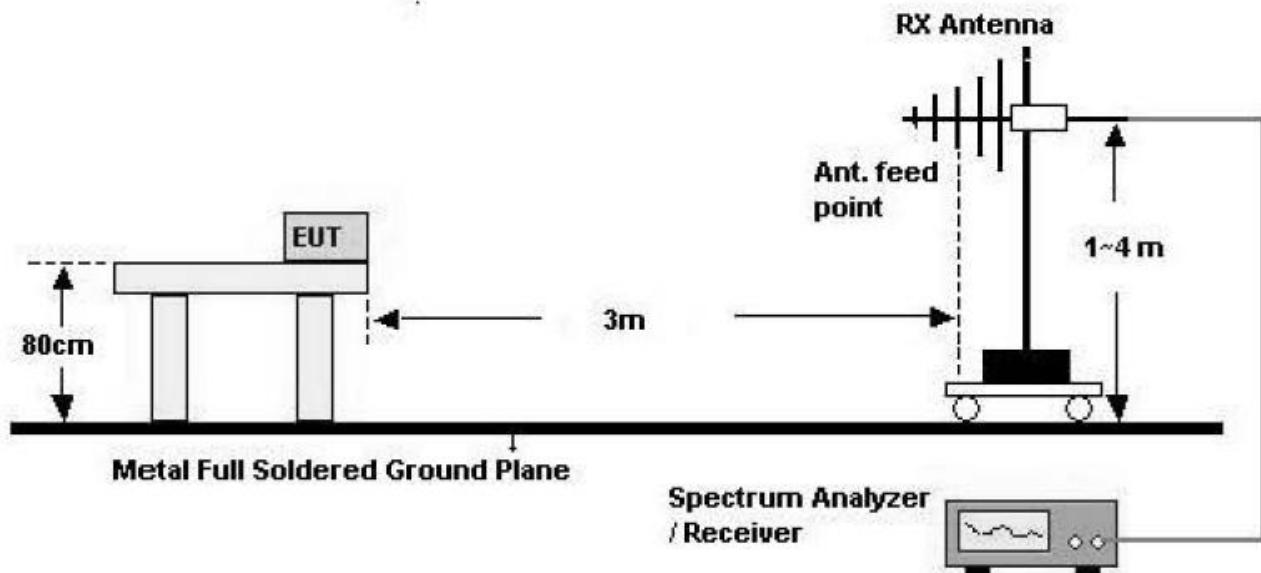
HCT PT.15.247 TEST REPORT	FCC & IC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464

Test Configuration

Below 30 MHz

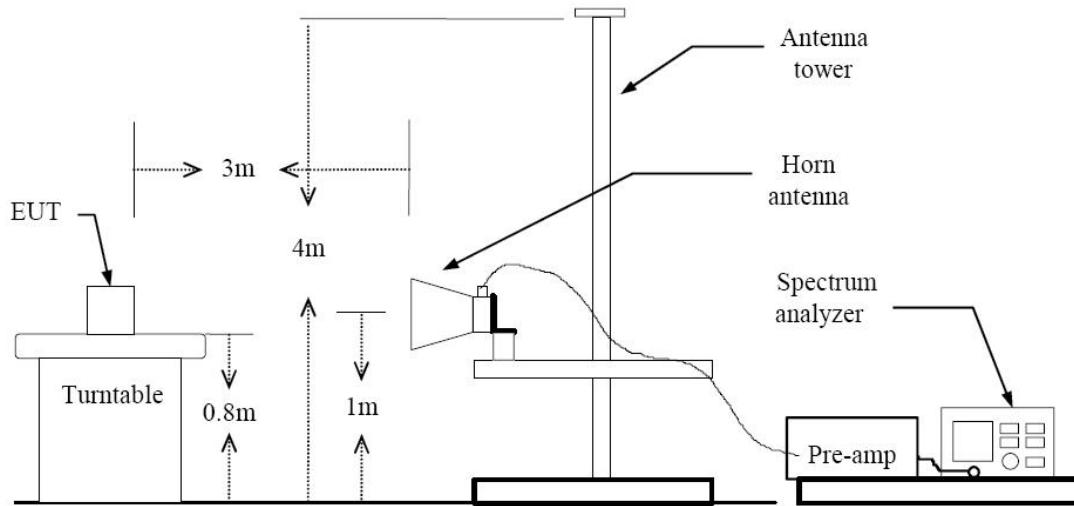


30 MHz - 1 GHz



HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr	
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR		FCC ID: QMNRN-464	IC: 661X-RM464	

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.

Measurement Uncertainty

For a 95 % confidence level, the measurement uncertainties for defined system.

30 MHz ~ 1 GHz	± 5.6 dB ($k=2$)
Above 1 GHz	± 5.8 dB ($k=2$)

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464



TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Link

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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. Limit line = specific Limits (dB μ V) + Distance extrapolation factor
5. Detector : Quasi-peak
6. Preliminary Test was performed the both normal & EDR and three channels(Low, Mid, High).
The final test was performed the worst case mode only.

HCT PT.15.247 TEST REPORT	FCC & IC CERTIFICATION REPORT				www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	



TEST RESULTS

Below 1 GHz

Operation Mode: Normal Link (Mid: 2441 MHz)

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	dB μ N	dB /m	dB	(H/V)	dB μ N/m	dB μ N/m	dB
176.0	12.0	11.8	3.2	H	27.0	43.5	16.5
192.0	11.3	10.6	3.3	H	25.2	43.5	18.3
480.0	14.2	17.0	5.2	H	36.4	46.0	9.6
480.0	13.0	17.0	5.2	V	35.2	46.0	10.8

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. RBW: 120 kHz, VBW: 300 kHz
4. Preliminary Test was performed the both normal & EDR and three channels (Low, Mid, High).
The final test was performed the worst case mode only.

HCT PT.15.247 TEST REPORT	FCC & IC CERTIFICATION REPORT				www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	



Above 1 GHz

Operation Mode: CH Low (EDR)

Frequency [MHz]	Reading dBuV	AN.+CL-AMP GAIN. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4804	47.21	-4.79	V	42.42	74	31.58	PK
4804	34.14	-4.79	V	29.35	54	24.65	AV
7206	49.34	1.21	V	50.55	74	23.45	PK
7206	36.35	1.21	V	37.56	54	16.44	AV
4804	47.88	-4.79	H	43.09	74	30.91	PK
4804	34.82	-4.79	H	30.03	54	23.97	AV
7206	49.18	1.21	H	50.39	74	23.61	PK
7206	36.25	1.21	H	37.46	54	16.54	AV

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 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 = 10 Hz.

HCT PT.15.247 TEST REPORT	FCC & IC CERTIFICATION REPORT				www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR	FCC ID: QMNRN-464	IC: 661X-RM464	

**Operation Mode: CH Mid (EDR)**

Frequency [MHz]	Reading dBuV	AN.+CL-AMP GAIN. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4882	48.11	-4.61	V	43.50	74	30.50	PK
4882	34.86	-4.61	V	30.25	54	23.75	AV
7323	49.95	1.62	V	51.57	74	22.43	PK
7323	37.29	1.62	V	38.91	54	15.09	AV
4882	48.36	-4.61	H	43.75	74	30.25	PK
4882	35.00	-4.61	H	30.39	54	23.61	AV
7323	50.49	1.62	H	52.11	74	21.89	PK
7323	37.28	1.62	H	38.90	54	15.10	AV

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 = 10 Hz.

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**Operation Mode: CH High (EDR)**

Frequency [MHz]	Reading dBuV	AN.+CL-AMP GAIN. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4960	50.78	-4.42	V	46.36	74	27.64	PK
4960	35.06	-4.42	V	30.64	54	23.36	AV
7440	50.18	2.04	V	52.22	74	21.78	PK
7440	37.36	2.04	V	39.40	54	14.60	AV
4960	48.64	-4.42	H	44.22	74	29.78	PK
4960	35.52	-4.42	H	31.10	54	22.90	AV
7440	50.36	2.04	H	52.40	74	21.60	PK
7440	37.48	2.04	H	39.52	54	14.48	AV

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 = 10 Hz.

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7.6.3 Radiated Restricted Band Edge Measurements

Test Requirements and limit, §15.247(d)

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:	GFSK(Normal)		
Operating Frequency	2402, 2480 MHz		
Channel No.	0, 78 Ch		

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2383.28	48.11	-10.19	H	37.92	74	36.08	PK
2383.28	35.81	-10.19	H	25.62	54	28.38	AV
2366.48	47.78	-10.26	V	37.52	74	36.48	PK
2366.48	35.12	-10.26	V	24.86	54	29.14	AV
2496.96	48.97	-9.71	H	39.26	74	34.74	PK
2496.96	35.60	-9.71	H	25.89	54	28.11	AV
2492.87	48.05	-9.72	V	38.33	74	35.67	PK
2492.87	35.78	-9.72	V	26.06	54	27.94	AV

Notes:

1. 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 = 10 Hz.

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7.7 POWERLINE CONDUCTED EMISSIONS

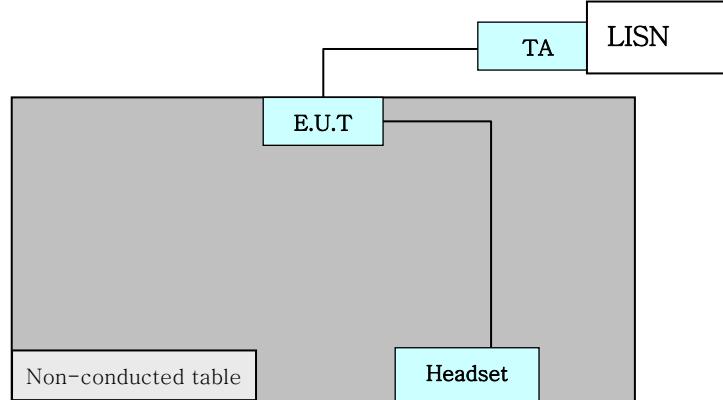
LIMIT

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 microvolt (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:

Frequency Range (MHz)	Limits (dB μ V)	
	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 (HOT and NEUTRAL) and ground at the power terminals.

Test Configuration



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.

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Measurement Uncertainty

For a 95 % confidence level, the measurement uncertainties for defined system.

150 kHz ~ 30 GHz \pm 3.7 dB ($k=2$)

- ※ Preliminary Test was performed the both normal & EDR.
The final test was performed the worst case mode only.

FCC & IC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCT-RF09-0401-6	Date of Issue: April 30, 2009	EUT Type: Dual-band CDMA phone with+BT2.1+EDR

Conducted emissions (Line 1 / Mid CH / EDR) - HOT

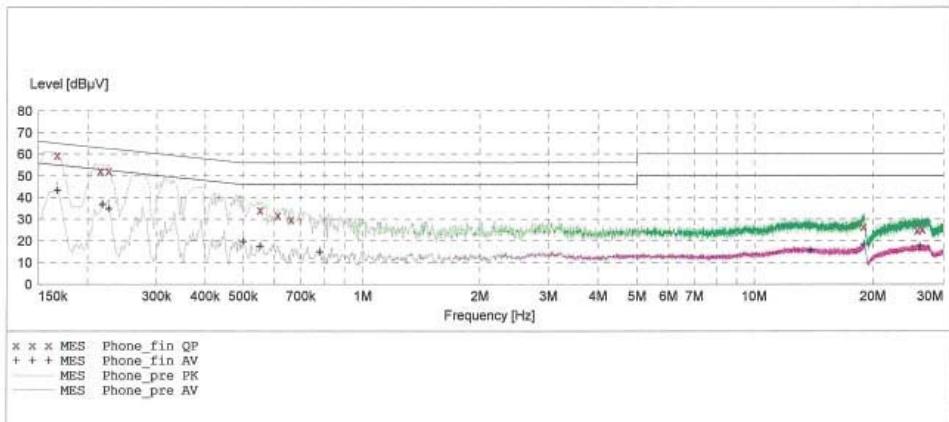
HCT

EMC TEST LAB.

EUT: RM-464
 Manufacturer: Nokia
 Operating Condition: Bluetooth Mode
 Test Site: SHIELD ROOM
 Operator: YH, LEE
 Test Specification: CISPR 22 CLASS B
 Comment: H

SCAN TABLE: "CISPR 22 Voltage"

CISPR 22 Voltage						
Start Frequency	Stop Frequency	Step Width	Detector	Meas.	IF Time	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "Phone_fin QP"

3/30/2009 5:12PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.167600	59.60	10.1	65	5.5	---	---
0.215100	52.50	10.1	63	10.5	---	---
0.225100	52.50	10.1	63	10.1	---	---
0.552000	34.40	10.2	56	21.6	---	---
0.612000	31.80	10.2	56	24.2	---	---
0.660000	29.90	10.2	56	26.1	---	---
18.916000	26.80	12.3	60	33.2	---	---
25.832000	24.90	12.9	60	35.1	---	---
26.532000	25.50	12.9	60	34.5	---	---

HCT PT.15.247 TEST REPORT		FCC & IC CERTIFICATION REPORT			www.hct.co.kr	
Test Report No.	Date of Issue:	EUT Type:		FCC ID:	IC:	
HCT-RF09-0401-6	April 30, 2009	Dual-band CDMA phone with+BT2.1+EDR		QMNRN-464	661X-RM464	



MEASUREMENT RESULT: "Phone fin AV"

3/30/2009 5:12PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.167600	43.40	10.1	55	11.7	---	---
0.217600	36.90	10.1	53	16.0	---	---
0.225100	35.00	10.1	53	17.7	---	---
0.500000	19.80	10.2	46	26.2	---	---
0.552000	17.70	10.2	46	28.3	---	---
0.780000	15.00	10.2	46	31.0	---	---
13.912000	15.80	11.7	50	34.2	---	---
18.968000	18.50	12.4	50	31.5	---	---
26.136000	18.00	12.9	50	32.0	---	---

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Conducted emissions (Line 2 / Mid CH / EDR) - NEUTRAL

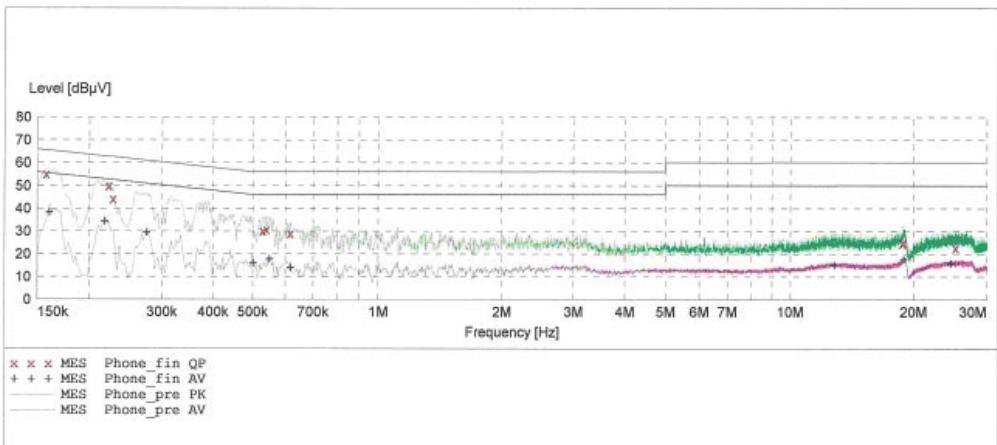
HCT

EMC TEST LAB.

EUT: RM-464
 Manufacturer: Nokia
 Operating Condition: Bluetooth Mode
 Test Site: SHIELD ROOM
 Operator: YH, LEE
 Test Specification: CISPR 22 CLASS B
 Comment: N

SCAN TABLE: "CISPR 22 Voltage"

CISPR 22 Voltage						
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "Phone_fin_QP"

3/30/2009 5:15PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.157600	55.10	10.1	66	10.5	---	---
0.222600	49.80	10.1	63	12.9	---	---
0.227600	44.00	10.1	63	18.5	---	---
0.528000	30.00	10.2	56	26.0	---	---
0.540000	30.70	10.2	56	25.3	---	---
0.616000	28.90	10.2	56	27.1	---	---
18.824000	24.60	12.3	60	35.4	---	---
18.880000	25.30	12.3	60	34.7	---	---
25.228000	22.70	12.9	60	37.3	---	---

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MEASUREMENT RESULT: "Phone_fin AV"

3/30/2009 5:15PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.160100	38.30	10.1	56	17.2	---	---
0.217600	34.30	10.1	53	18.6	---	---
0.275100	29.40	10.1	51	21.5	---	---
0.500000	16.10	10.2	46	29.9	---	---
0.548000	17.90	10.2	46	28.1	---	---
0.616000	14.00	10.2	46	32.0	---	---
12.804000	15.20	11.6	50	34.8	---	---
18.900000	17.70	12.3	50	32.3	---	---
24.504000	16.00	12.8	50	34.0	---	---

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8. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
EMCO	3816/2SH/ LISN	Annual	02/06/2010	9706-1071
Schwarzbeck	VULB 9160/ TRILOG Antenna	Biennial	12/18/2010	9160-3150
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	10/30/2009	375.8810.352
MITEQ	AMF-60-0010 1800-35-20P	Annual	05/20/2009	1200937
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	03/26/2010	147
EMCO	6502/Loop Antenna	Biennial	12/26/2009	9009-2536
Rohde & Schwarz	FSP30/Spectrum Analyzer	Annual	07/31/2009	839117/011
Rohde & Schwarz	ESCI/EMI TEST Receiver	Annual	06/01/2009	100033
Agilent	E4416A /Power Meter	Annual	01/21/2010	GB41291412
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	06/28/2009	1
Hewlett Packard	11636B/Power Divider	Annual	12/24/2009	11377
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	01/07/2010	3110117

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