

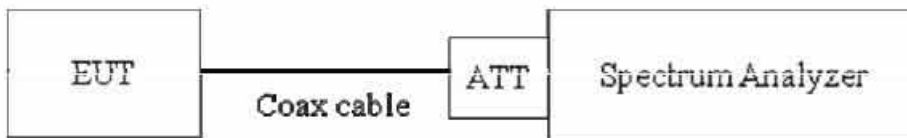
8.3 POWER SPECTRAL DENSITY (802.11b/g/n)

Test Requirements and limit, §15.247(e)

The peak power spectral 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 power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

■ TEST CONFIGURATION



■ TEST PROCEDURE

We tested according to Procedure 10.2 in KDB 558074, issued 04/09/2013

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 ≤ RBW ≤ 100 kHz.

VBW ≥ 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

$$\begin{aligned} \text{PSD} &= \text{Reading Value} + \text{ATT loss} + \text{Cable loss}(1 \text{ ea}) \\ &= -5 \text{ dBm} + 10 \text{ dB} + 0.8 \text{ dB} = 5.8 \text{ dBm} \end{aligned}$$

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. Actual value of loss for the attenuator and cable combination is below table.
So, 10.1 dB is offset. And the offset gap in the 2.4 GHz range do not affect the power spectral density final result.

FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	10.11
	2437	10.10
	2462	10.12

(Actual value of loss for the attenuator and cable combination)

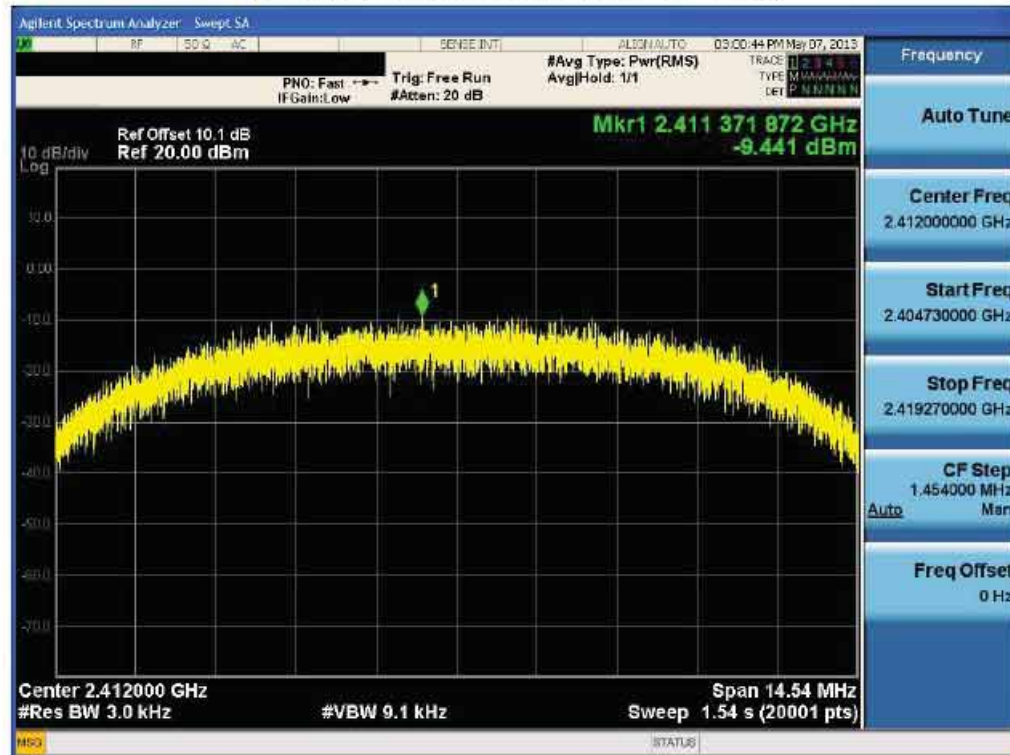
■ TEST RESULTS

Conducted Power Density Measurements

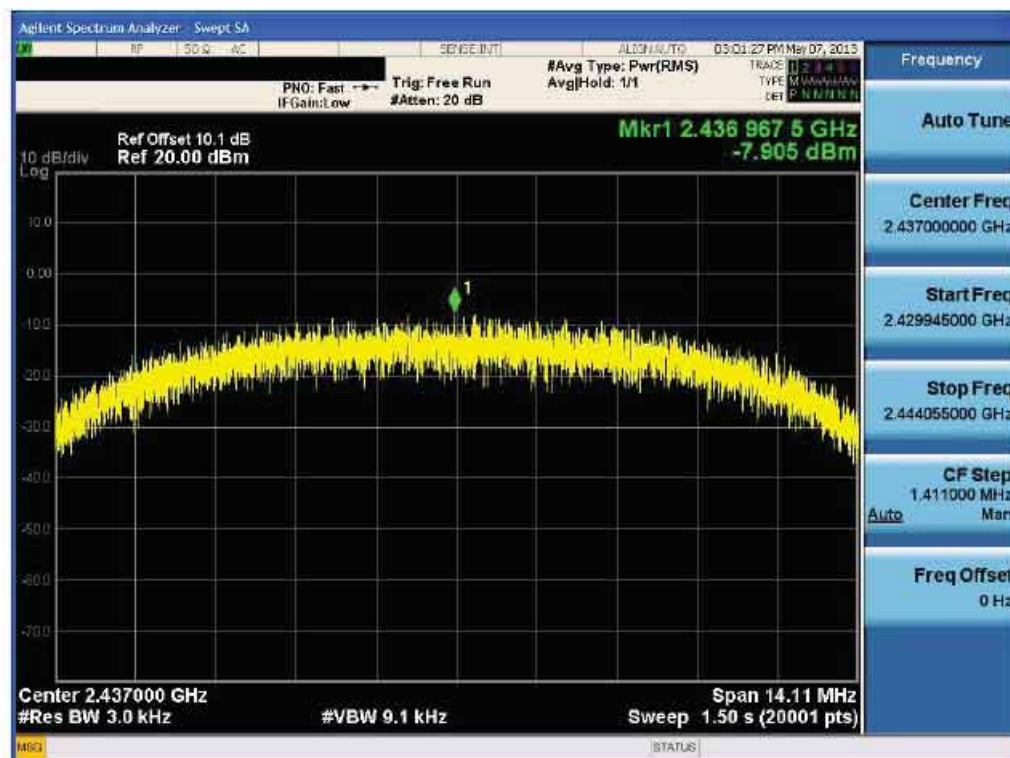
Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b	-9.441	8	Pass
2437	6		-7.905	8	Pass
2462	11		-8.875	8	Pass
2412	1	802.11g	-14.740	8	Pass
2437	6		-13.872	8	Pass
2462	11		-14.703	8	Pass
2412	1	802.11n (20 MHz BW)	-17.724	8	Pass
2437	6		-16.240	8	Pass
2462	11		-16.416	8	Pass
2422	3	802.11n (40 MHz BW)	-22.232	8	Pass
2437	6		-22.177	8	Pass
2452	9		-21.585	8	Pass

■ **RESULT PLOTS**

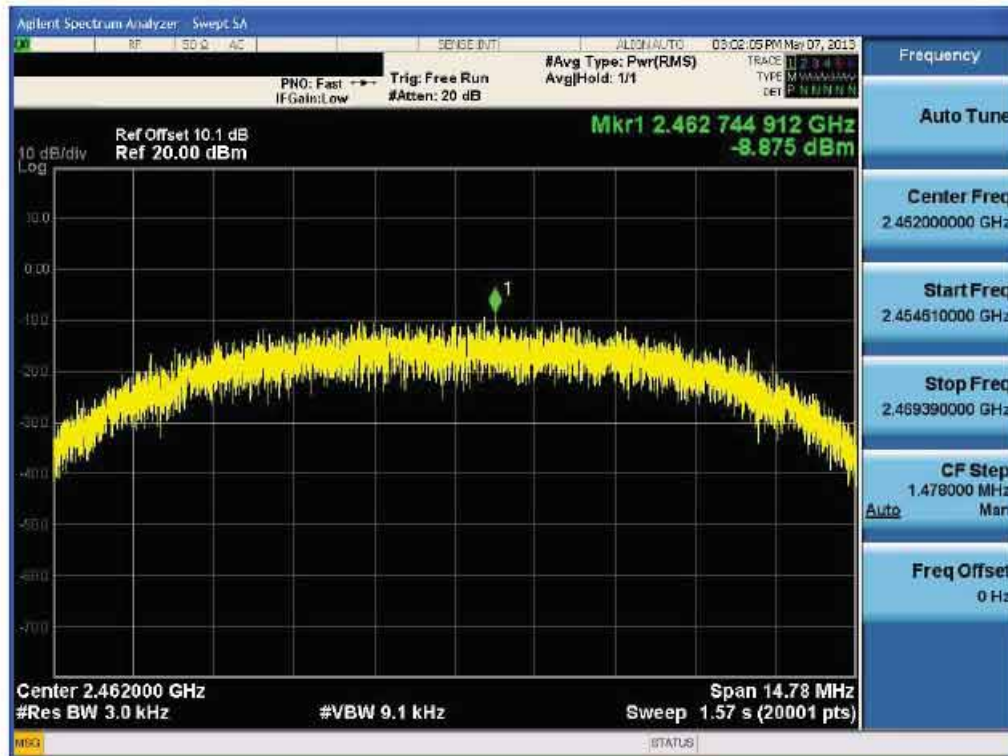
Power Spectral Density (802.11b-CH 1)



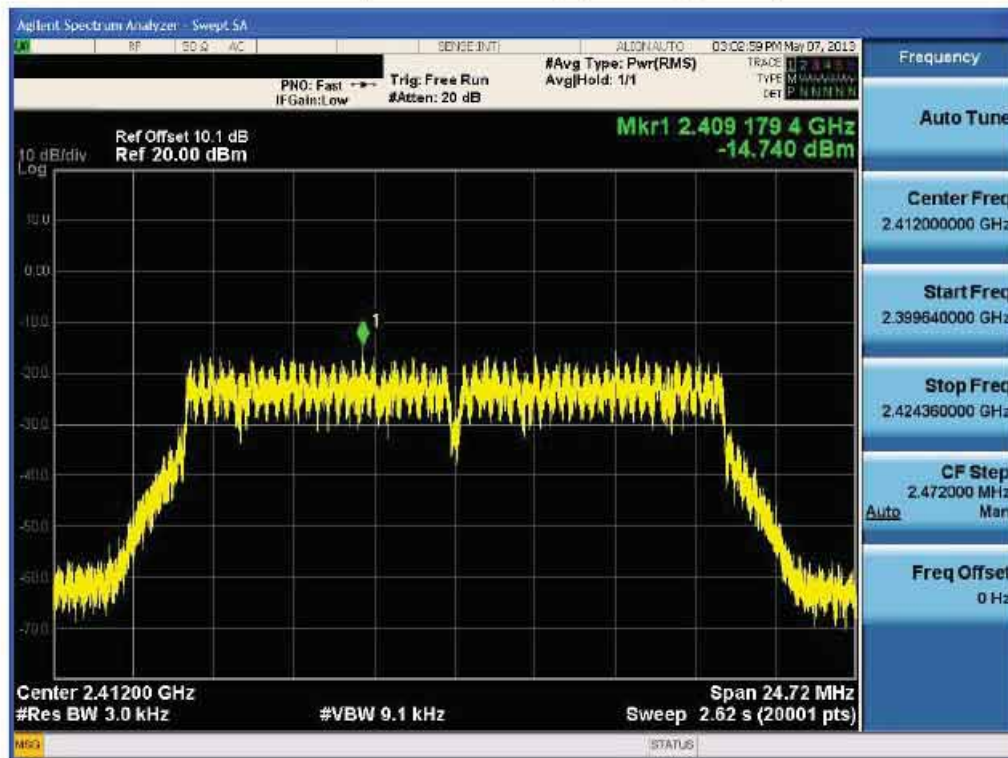
Power Spectral Density (802.11b-CH 6)



Power Spectral Density (802.11b-CH 11)

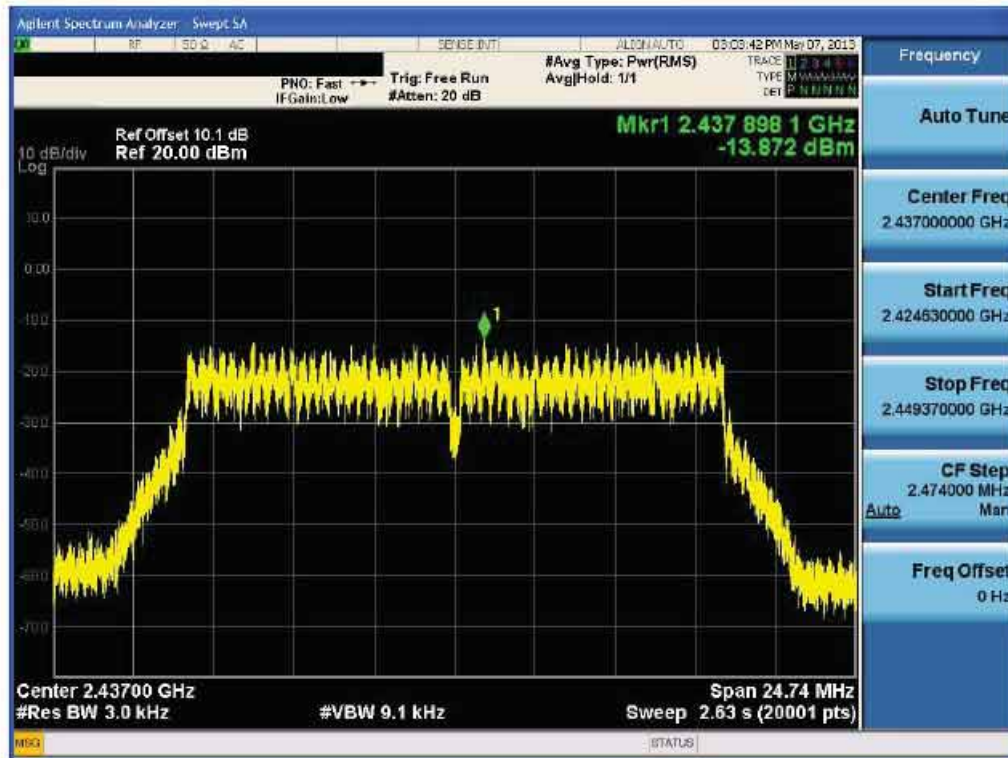


Power Spectral Density (802.11g-CH 1)

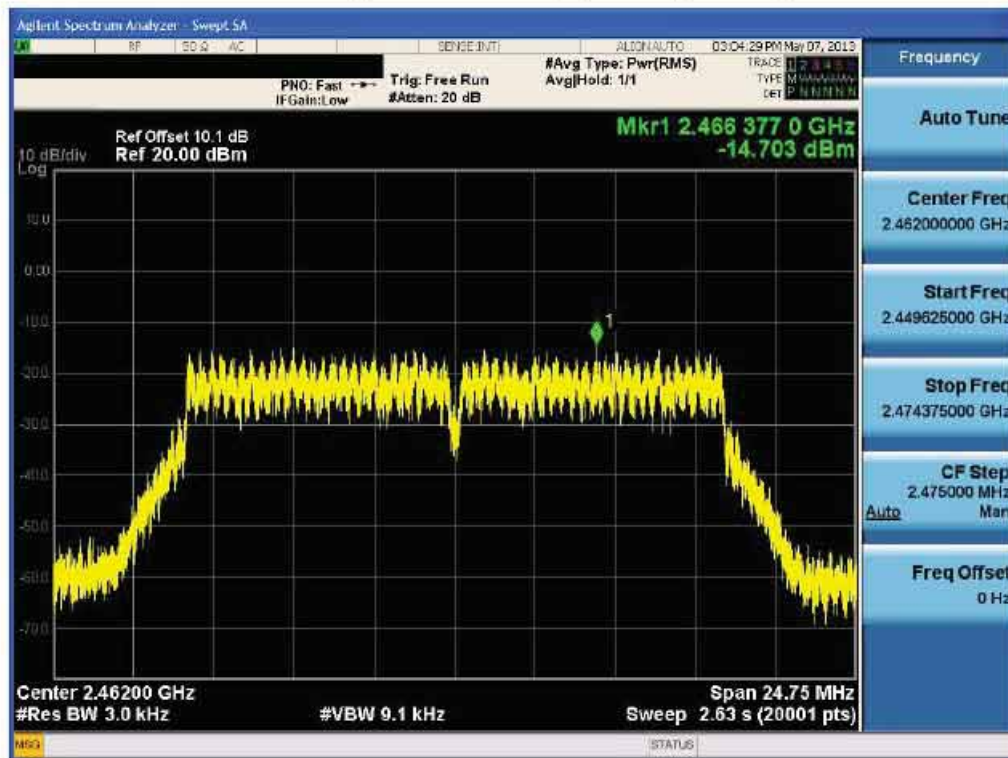


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

Power Spectral Density (802.11g-CH 6)

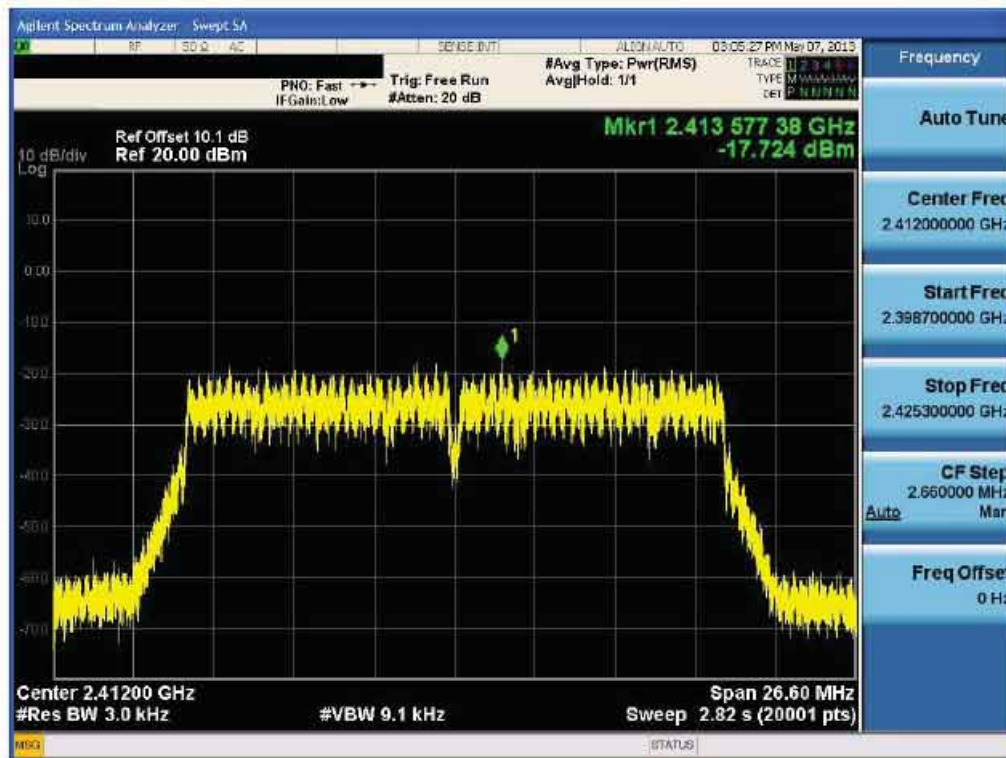


Power Spectral Density (802.11g-CH11)

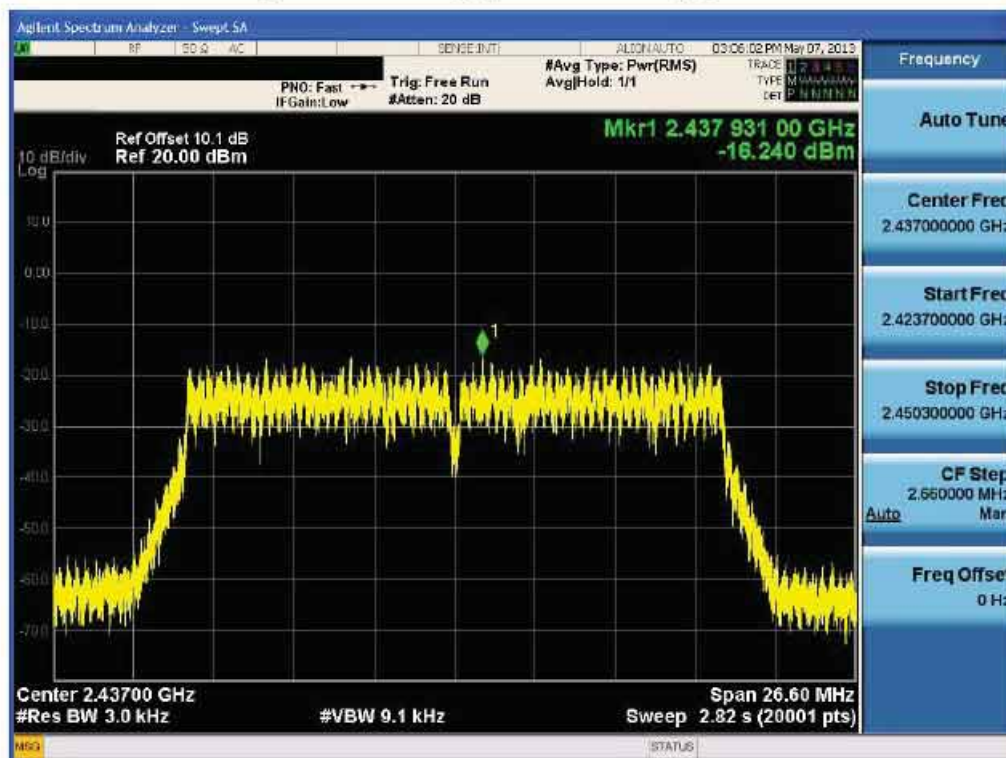


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

Power Spectral Density (802.11n-CH 1) _ 20 MHz BW

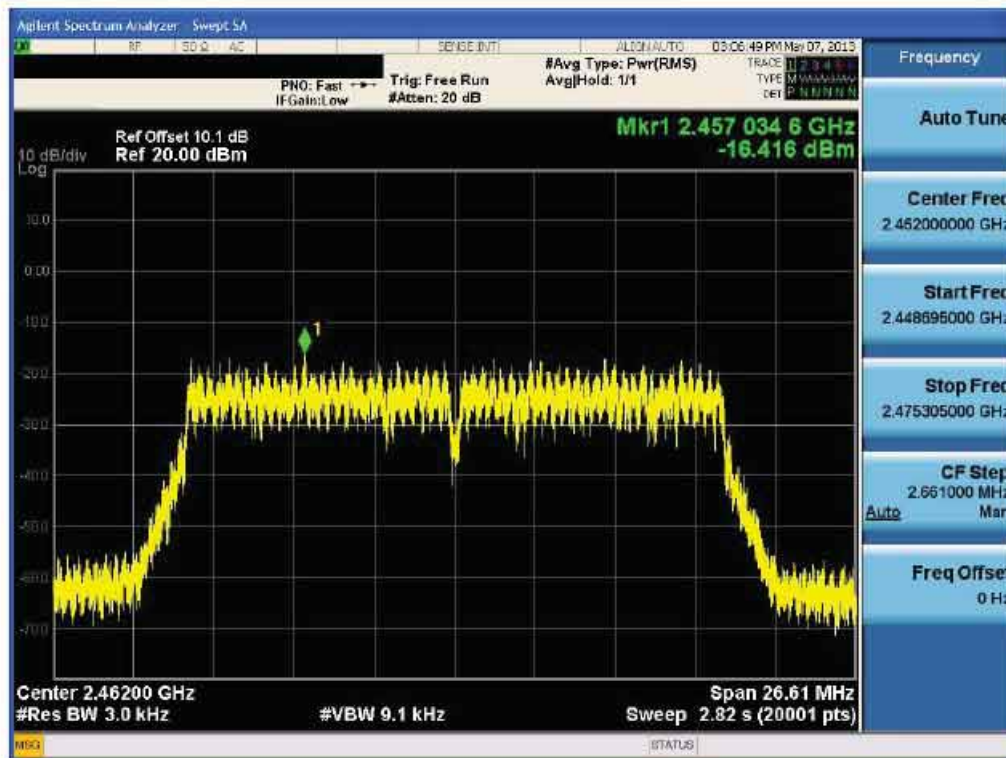


Power Spectral Density (802.11n-CH 6) _ 20 MHz BW

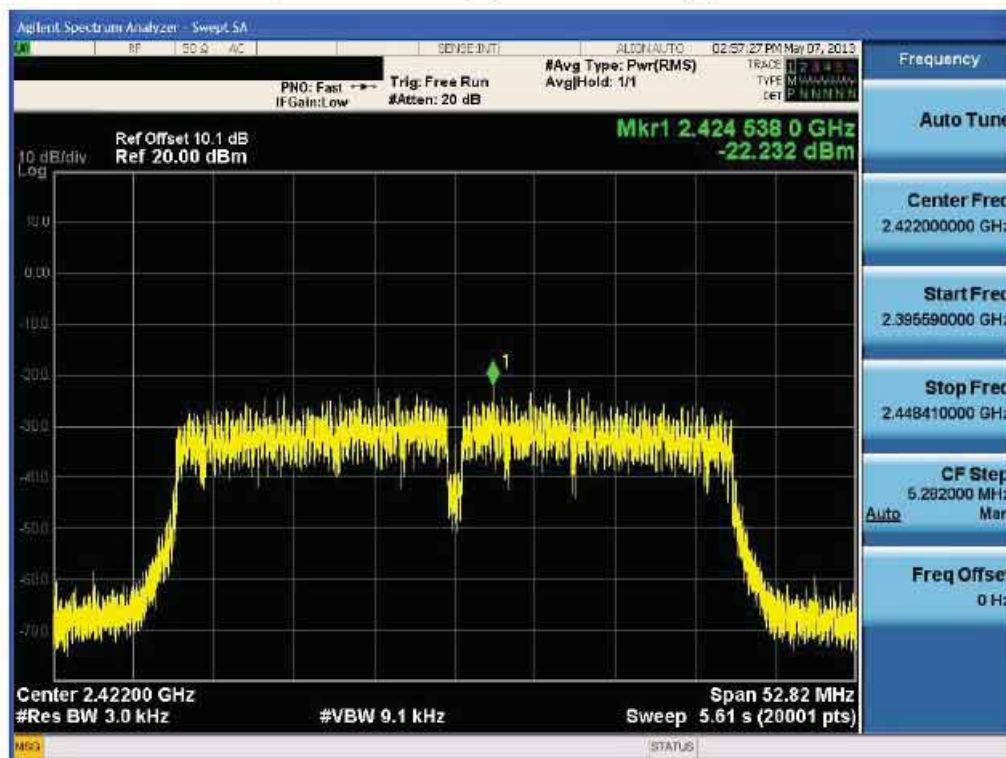


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

Power Spectral Density (802.11n-CH11) _ 20 MHz BW

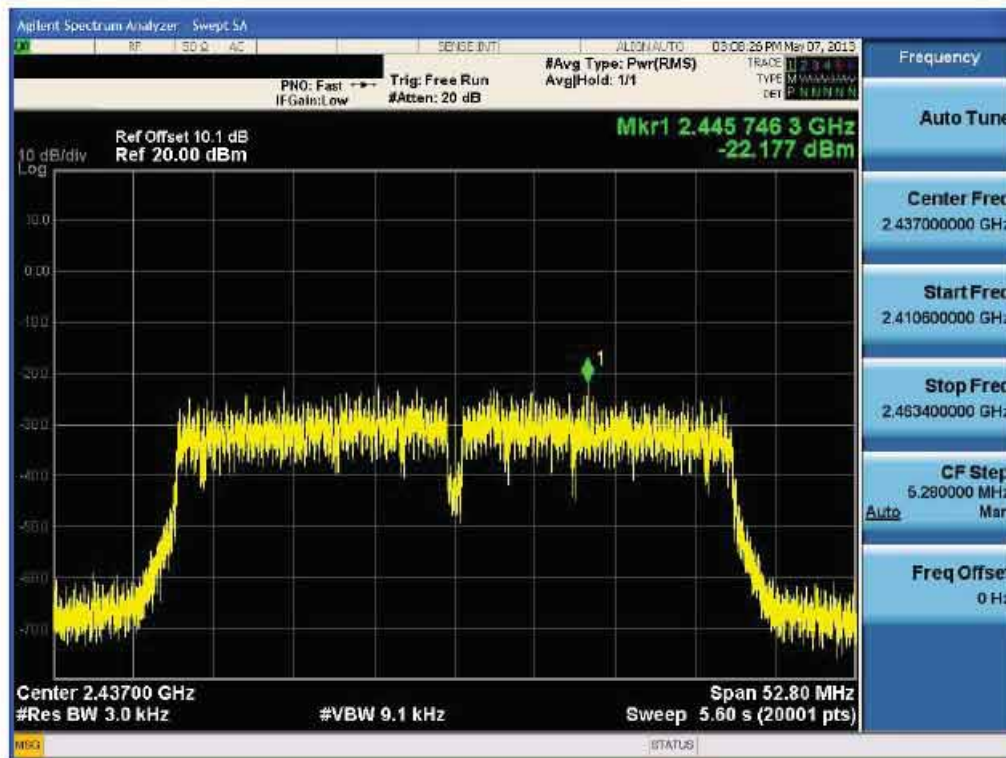


Power Spectral Density (802.11n-CH 3)_ 40 MHz BW

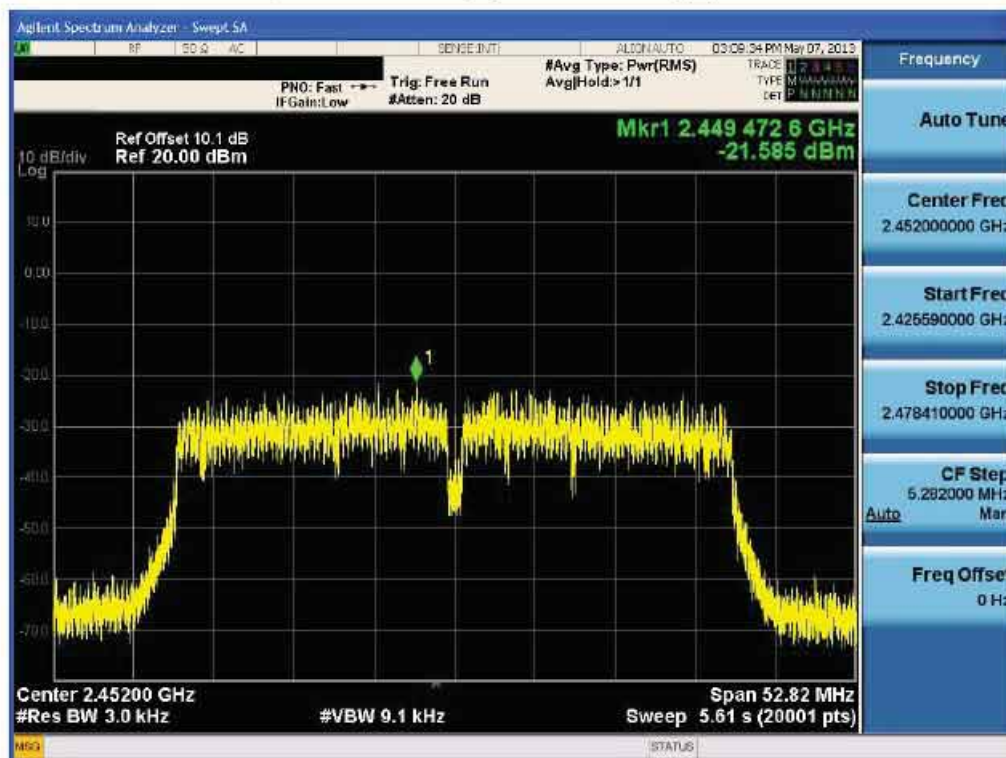


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

Power Spectral Density (802.11n-CH 6) _ 40 MHz BW



Power Spectral Density (802.11n-CH9) _ 40 MHz BW



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

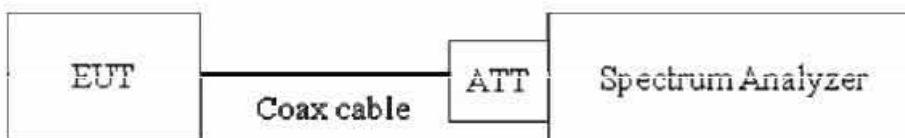
8.4 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

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 § 15.209(a) (see § 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 04/09/2013)

RBW = 100 kHz(Upon 1 GHz = 1 MHz).

VBW $\geq$ 3 x RBW(Upon 1 GHz = 3 MHz).

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 $\geq$ 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 10th harmonic range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The band edge 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. Actual value of

FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

loss for the attenuator and cable combination is below table.

So, 10.1 dB is offset. And the offset gap in the 2.4 GHz range do not affect the band edge final result.

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	10.11
	2437	10.10
	2462	10.12

(Actual value of loss for the attenuator and cable combination)

4. In case of conducted spurious emissions test, please check factors blow table.

■ FACTORS FOR FREQUENCY

Freq(MHz)	Factor(dB)
30	10.37
100	10.16
200	10.15
300	10.14
400	10.18
500	10.19
600	10.20
700	10.30
800	10.25
900	10.28
1000	10.29
2000	10.17
2412*	10.11
2437*	10.10
2462*	10.12
3000	10.26
4000	10.31
5000	9.85
6000	10.20
7000	10.60
8000	10.53
9000	10.23
10000	10.41
11000	10.65
12000	11.19
13000	10.97
14000	11.42
15000	12.01
16000	11.77
17000	10.78
18000	10.76
19000	11.15
20000	10.75
21000	10.82
22000	10.82
23000	11.26
24000	11.08
25000	11.18
26000	10.90

Note : 1. * is fundamental frequency range.

2. Factor = Cable loss + Attenuator loss

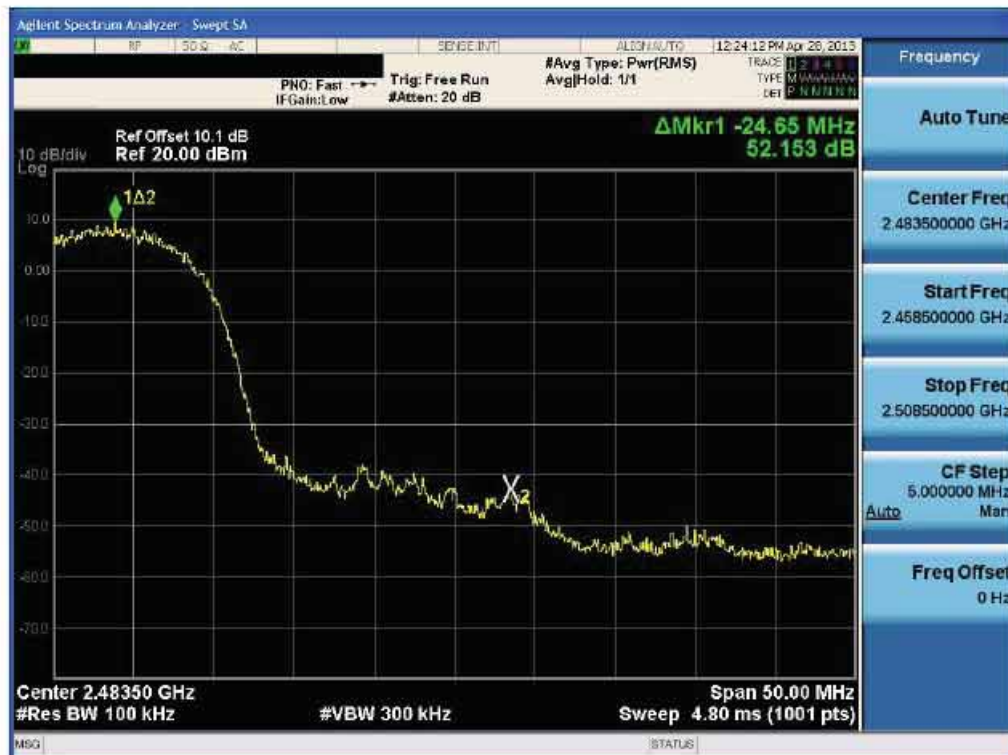
FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

■ **RESULT PLOTS**

BandEdge (802.11b-CH1)



BandEdge (802.11b-CH11)

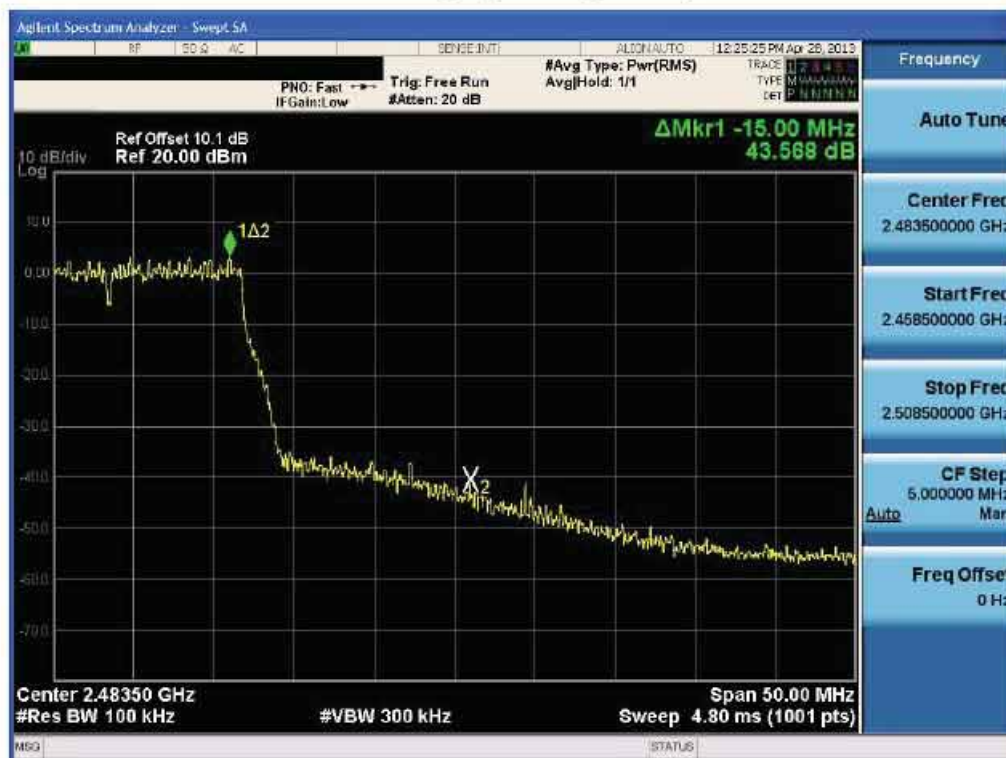


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

BandEdge (802.11g-CH1)

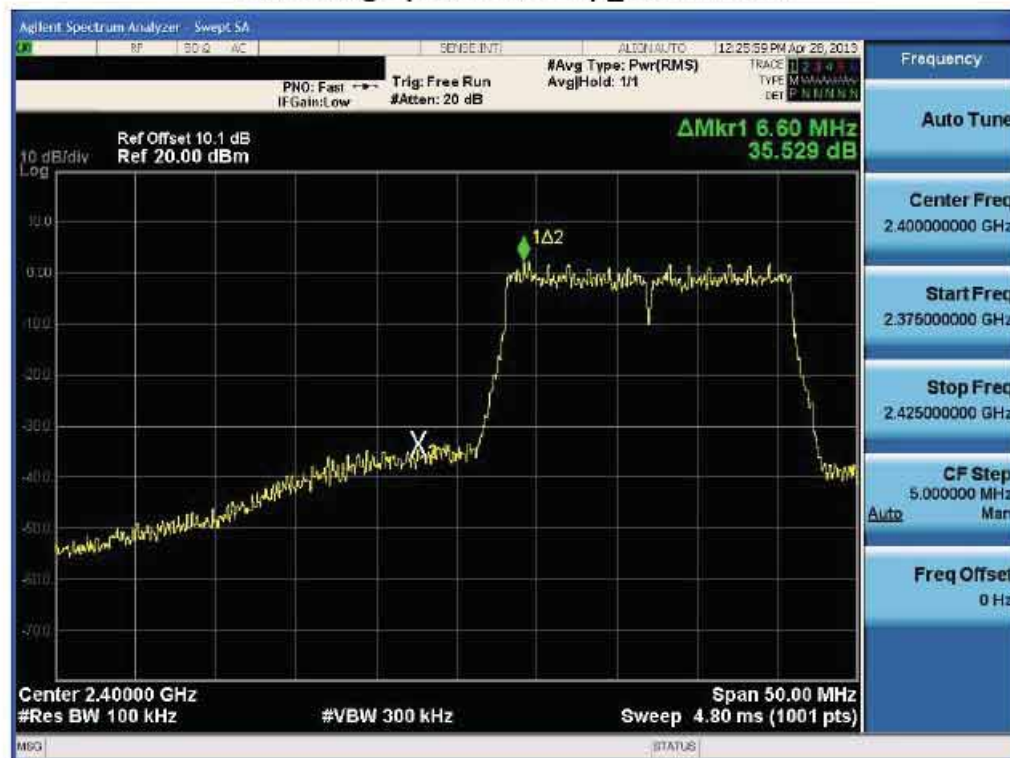


BandEdge (802.11g-CH11)

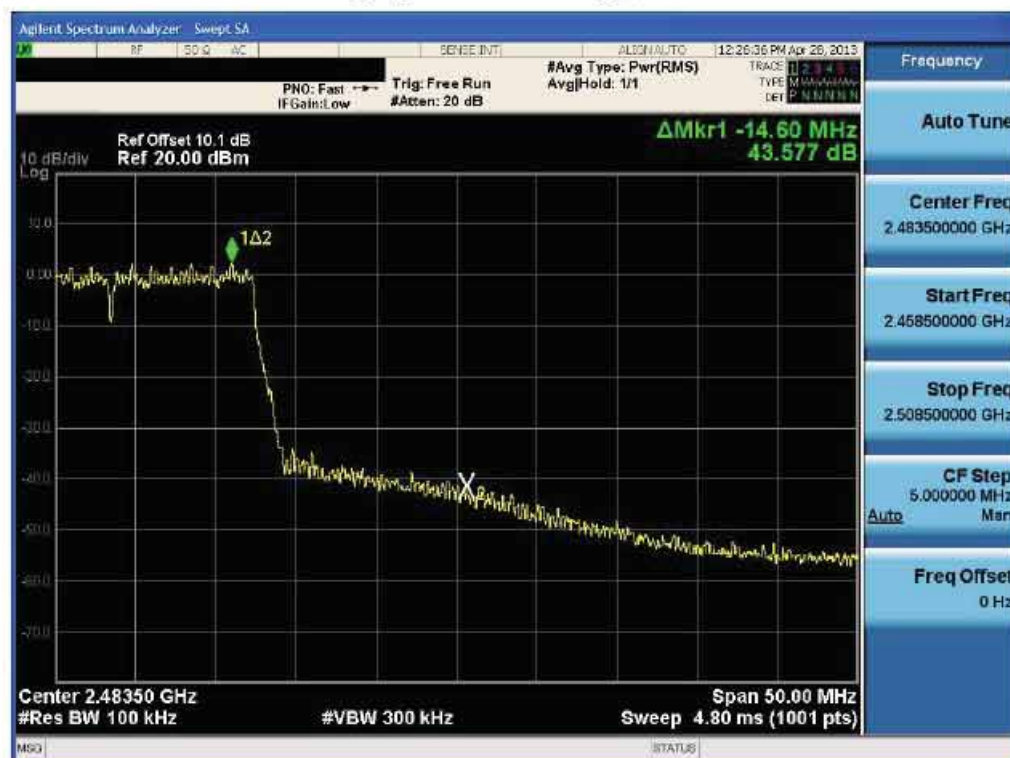


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

Band Edge (802.11n-CH1) _ 20 MHz BW

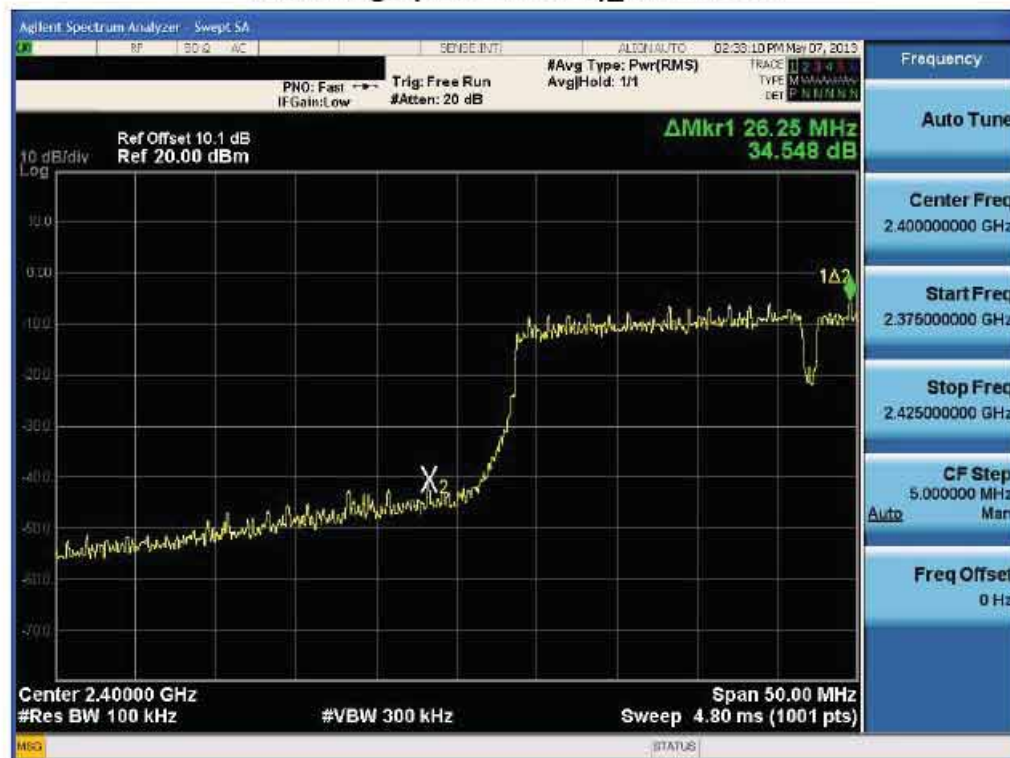


Band Edge (802.11n-CH11) _ 20 MHz BW

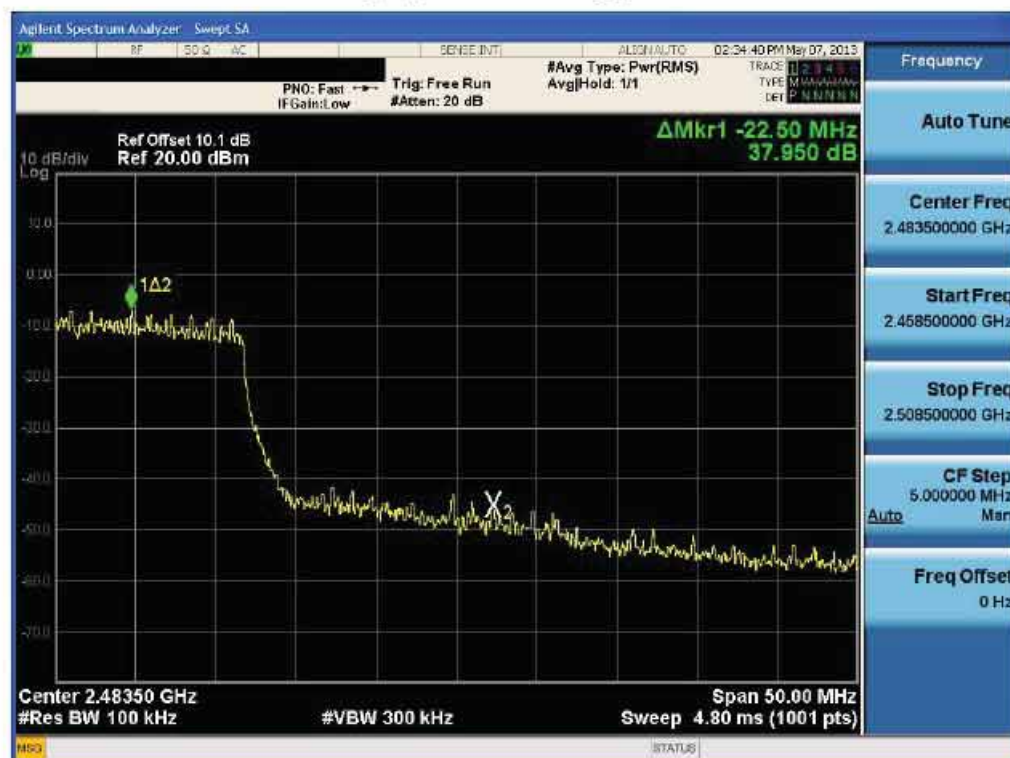


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

Band Edge (802.11n-CH3)_40 MHz BW

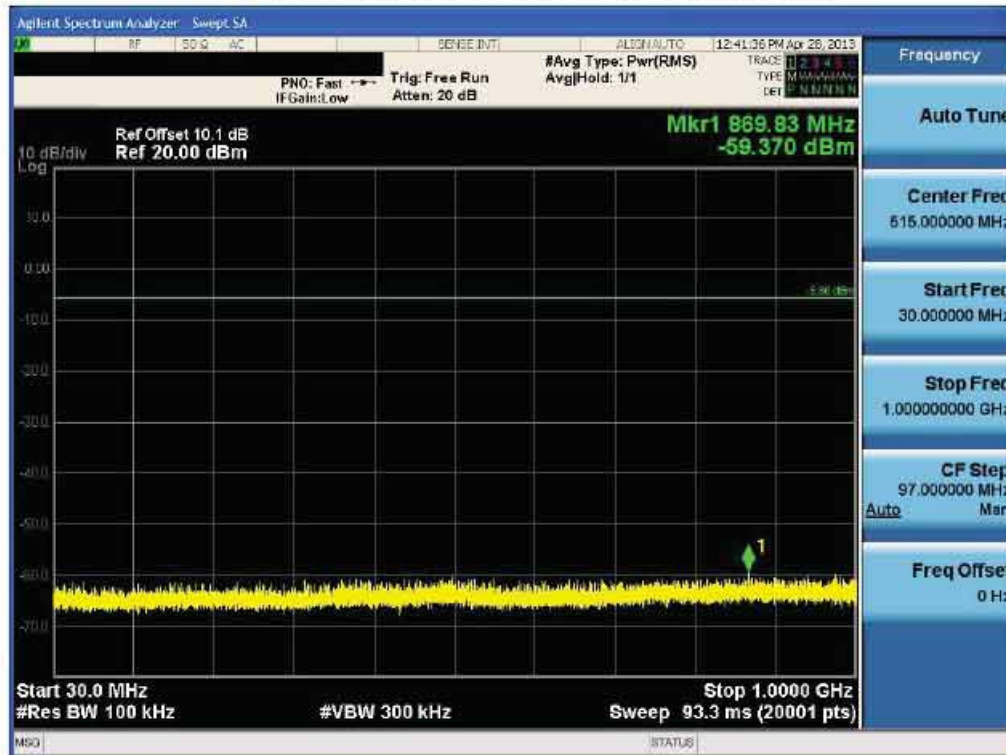


Band Edge (802.11n-CH9)_40 MHz BW

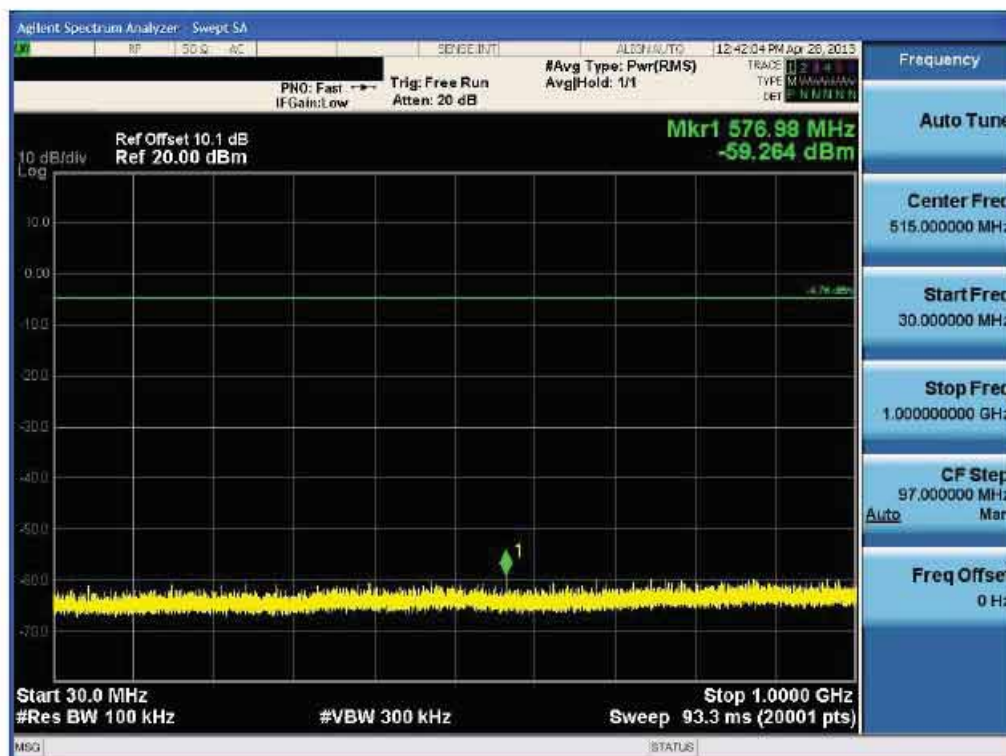


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J	

Conducted Spurious Emission (802.11b-CH1)



Conducted Spurious Emission (802.11b-CH6)



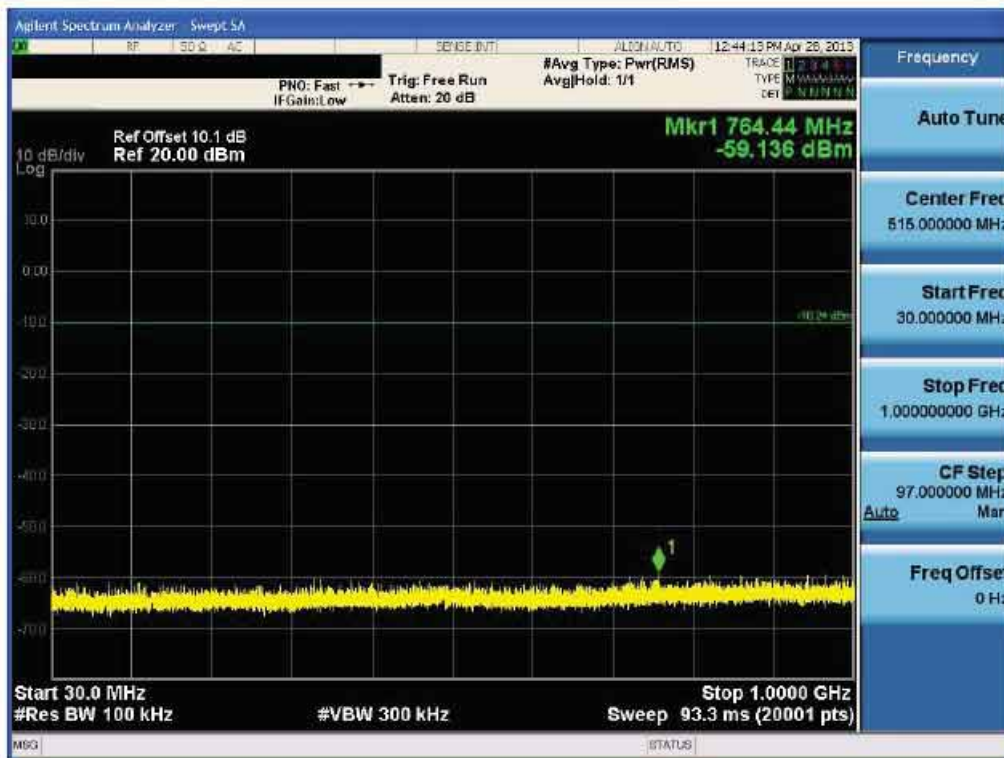
Conducted Spurious Emission (802.11b-CH11)



Conducted Spurious Emission (802.11g-CH1)



Conducted Spurious Emission (802.11n-CH1)_20 MHz BW



Conducted Spurious Emission (802.11n-CH6)_20 MHz BW



Conducted Spurious Emission (802.11n-CH11) _20 MHz BW

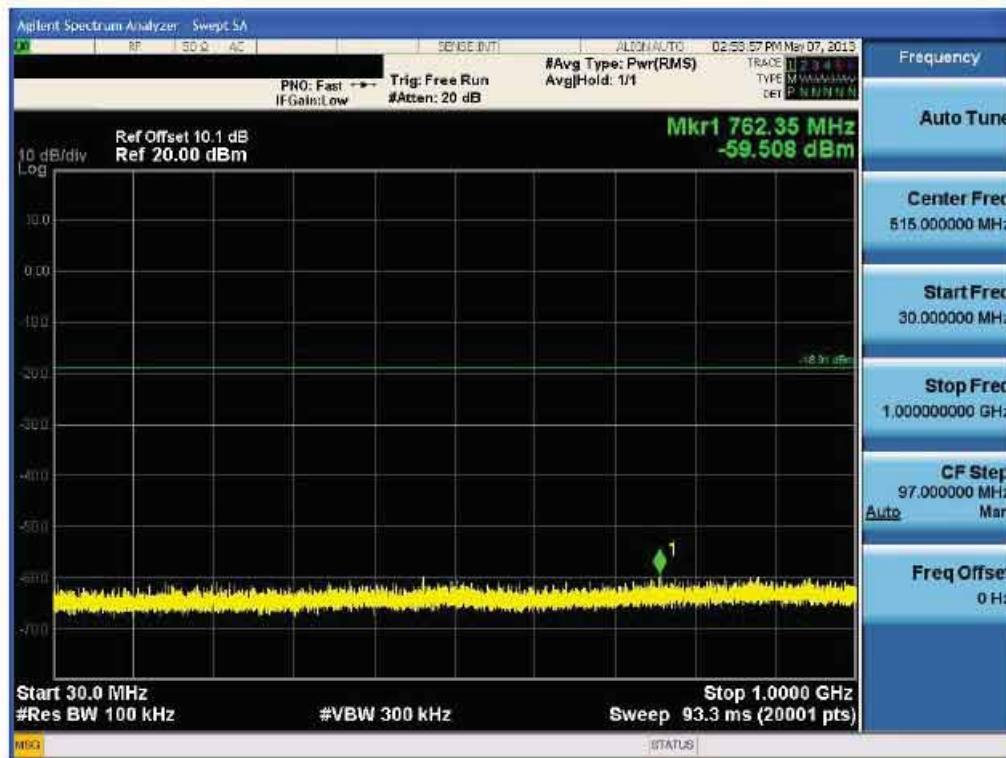


Conducted Spurious Emission (802.11n-CH3) _40 MHz BW

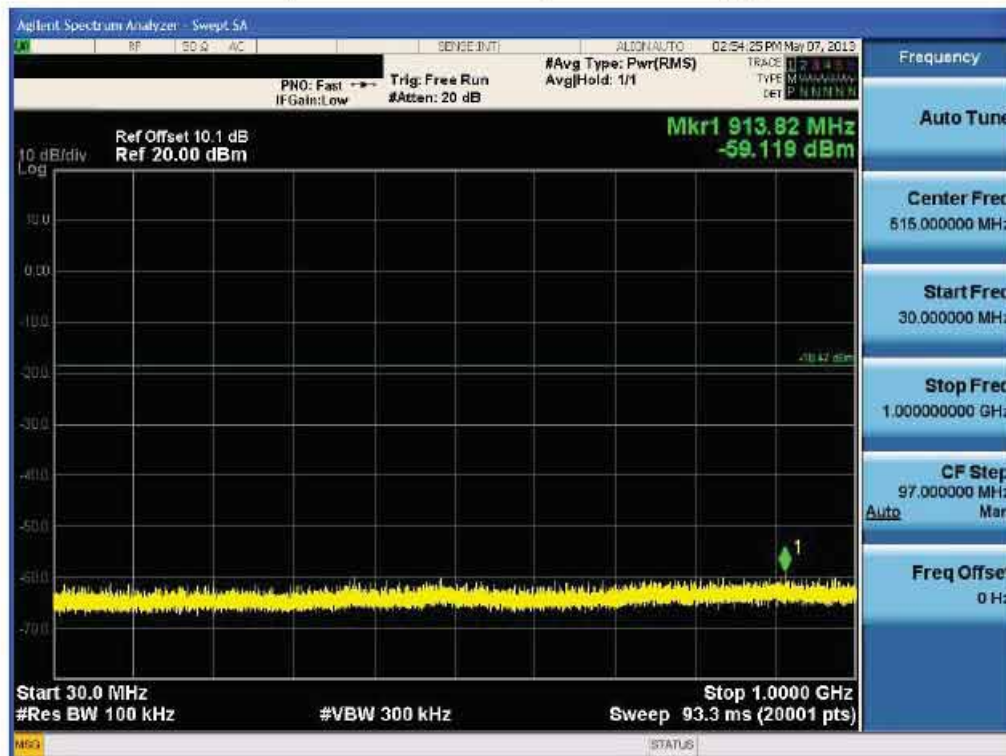


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

Conducted Spurious Emission (802.11n-CH6)_40 MHz BW



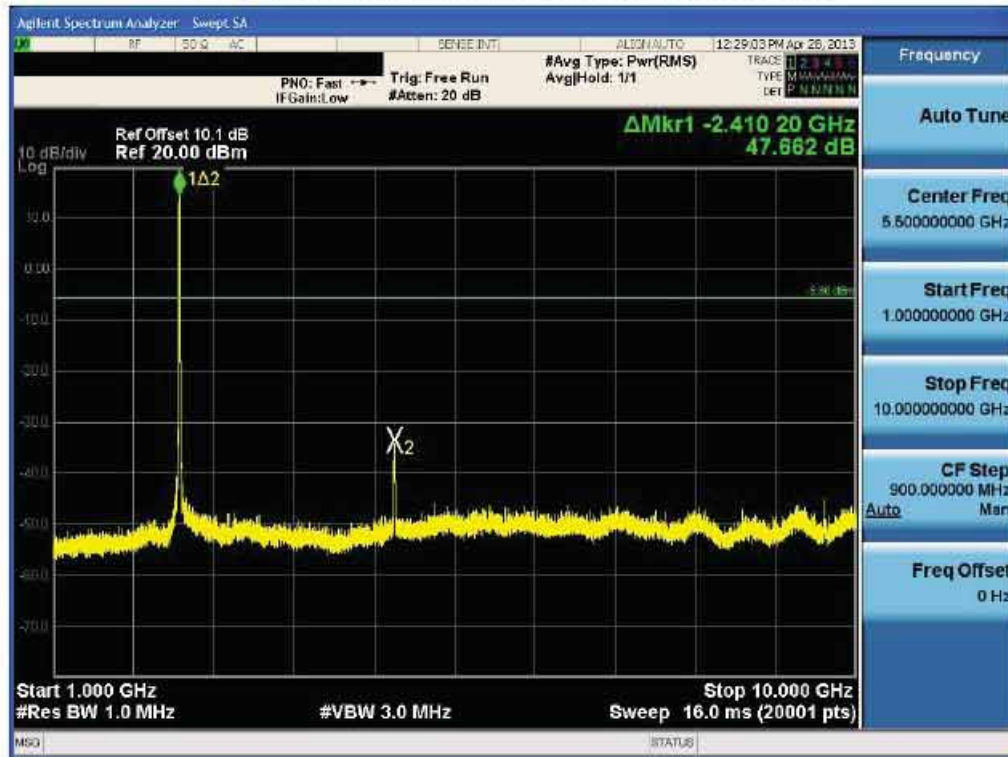
Conducted Spurious Emission (802.11n-CH9)_40 MHz BW



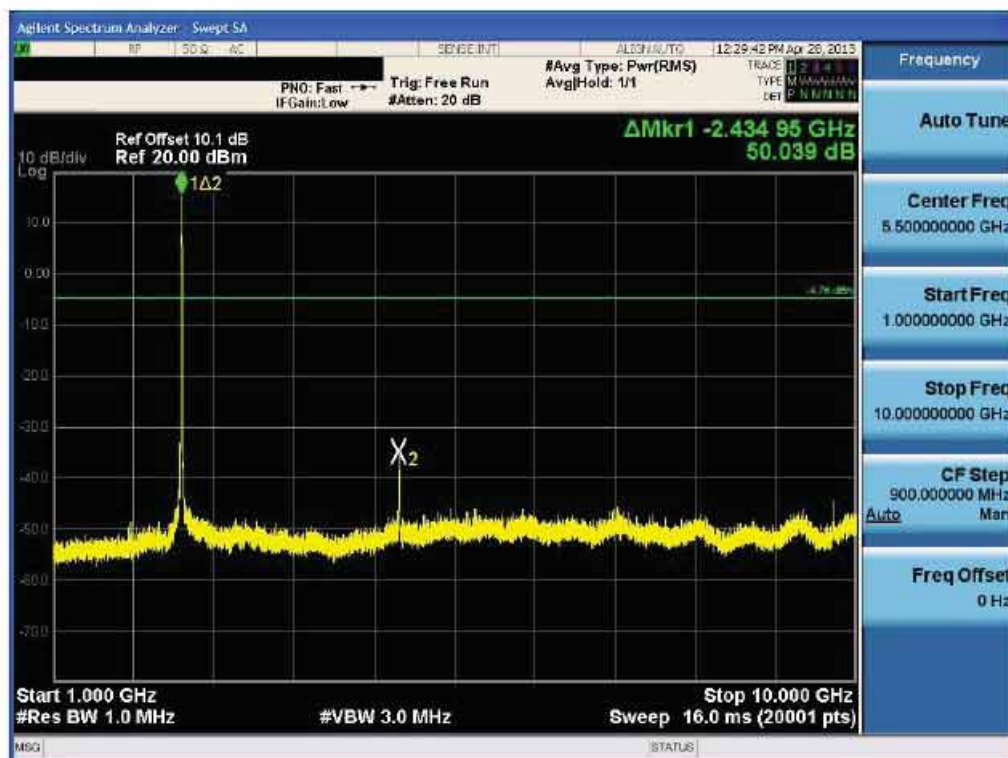
FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

1 GHz ~ 10 GHz

Conducted Spurious Emission (802.11b-CH1)

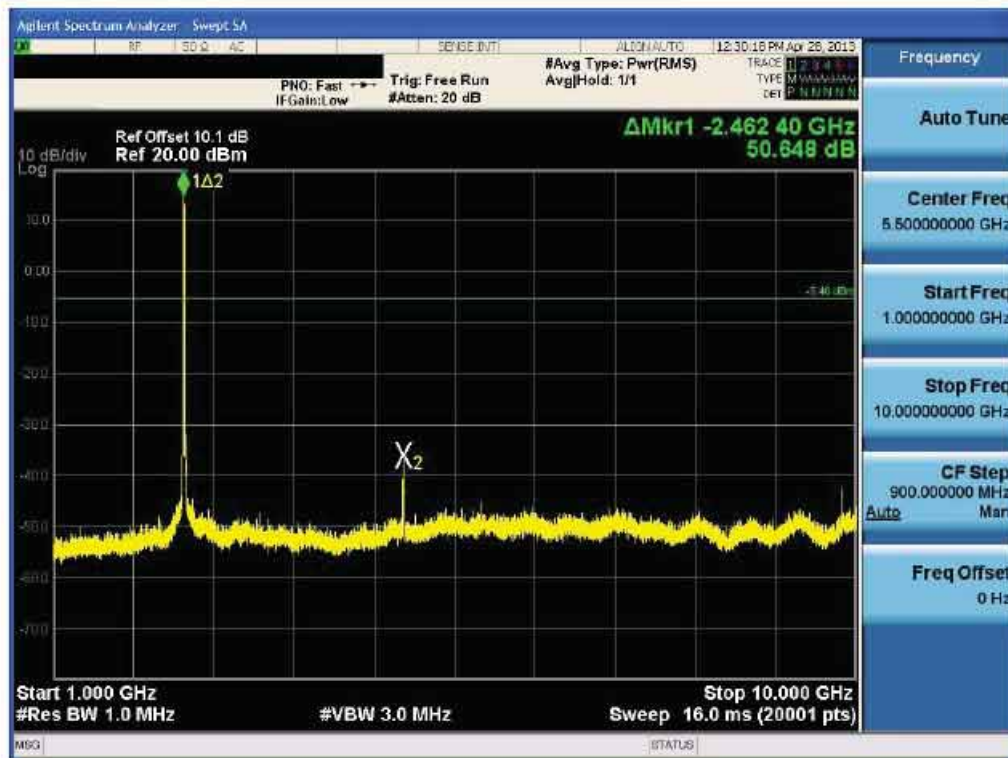


Conducted Spurious Emission (802.11b-CH6)

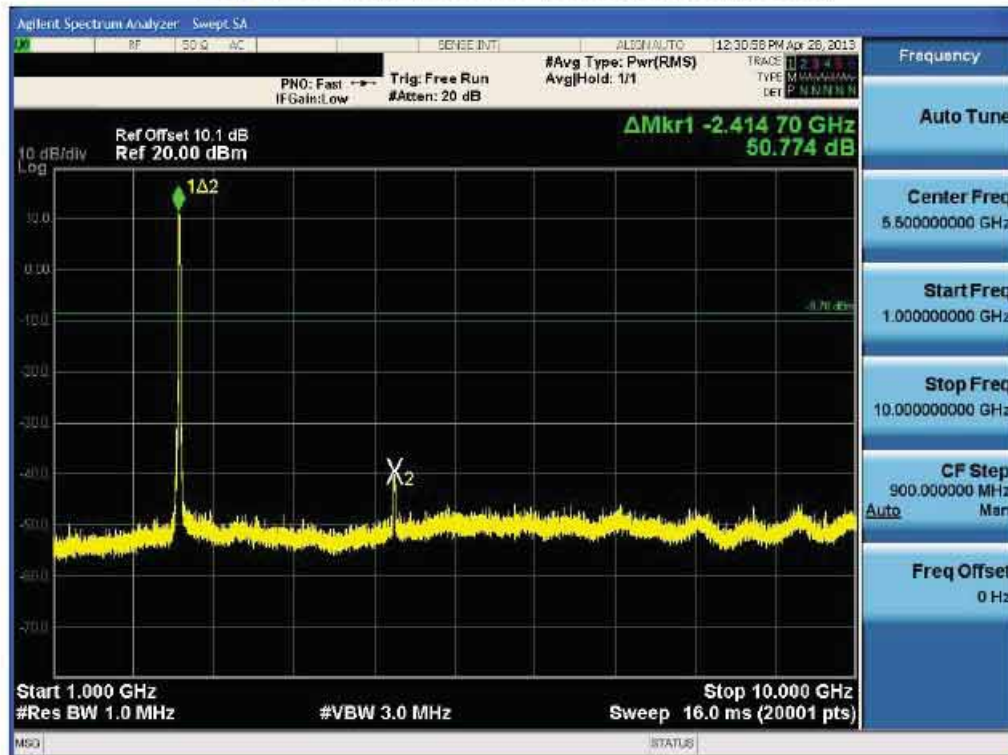


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

Conducted Spurious Emission (802.11b-CH11)

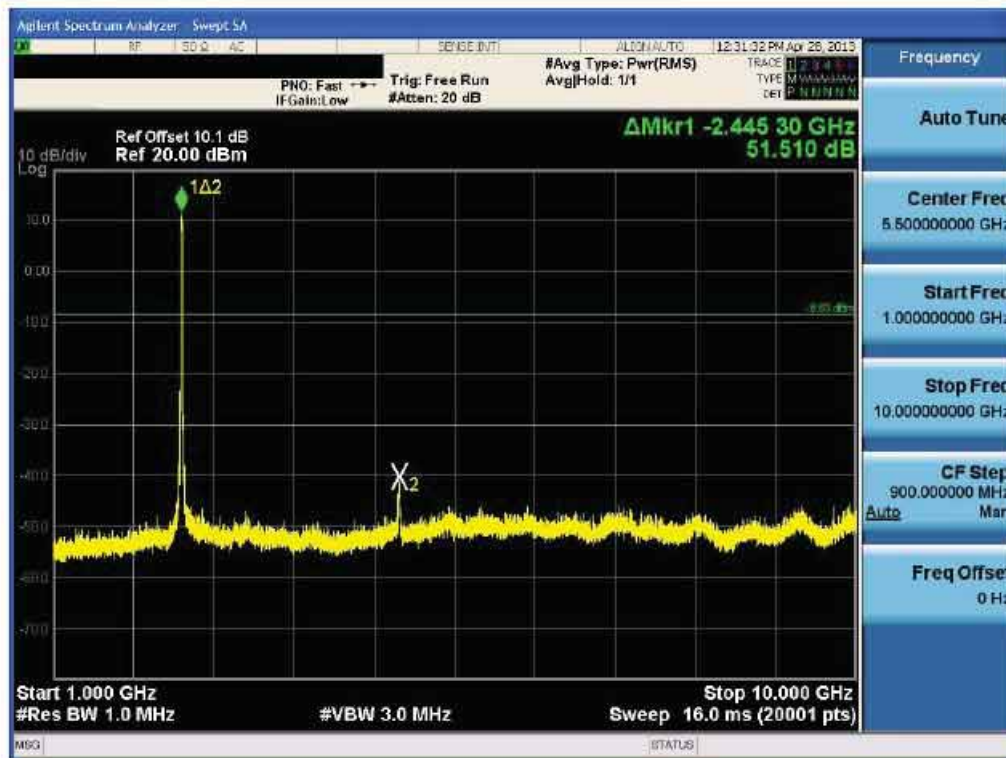


Conducted Spurious Emission (802.11g-CH1)

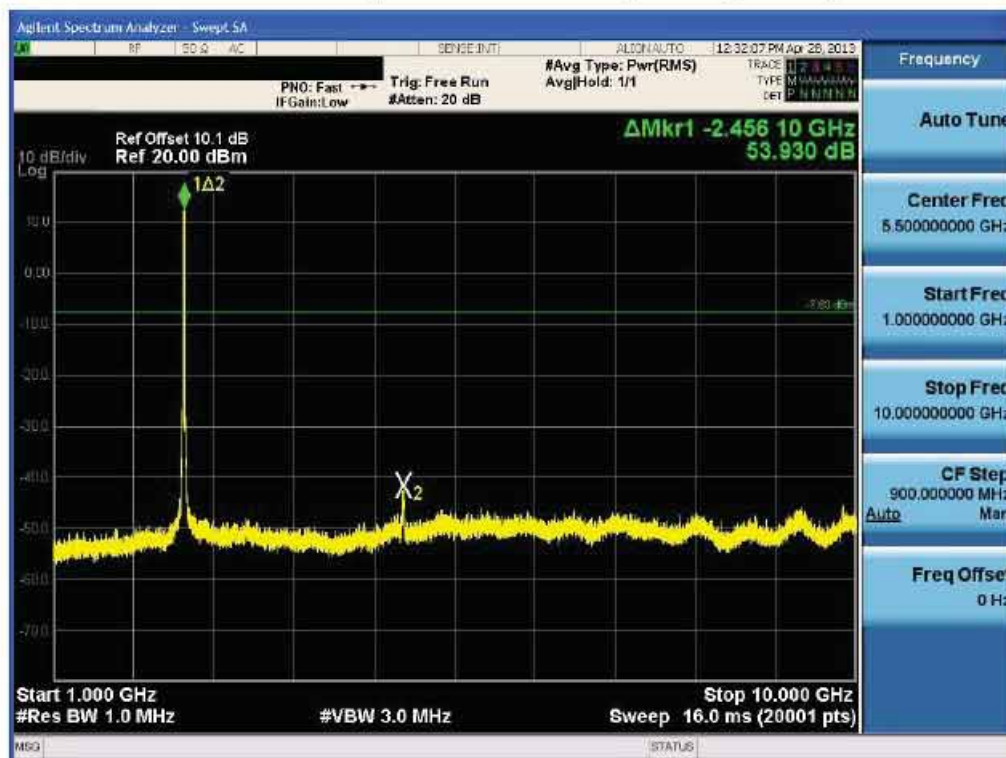


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J

Conducted Spurious Emission (802.11g-CH6)

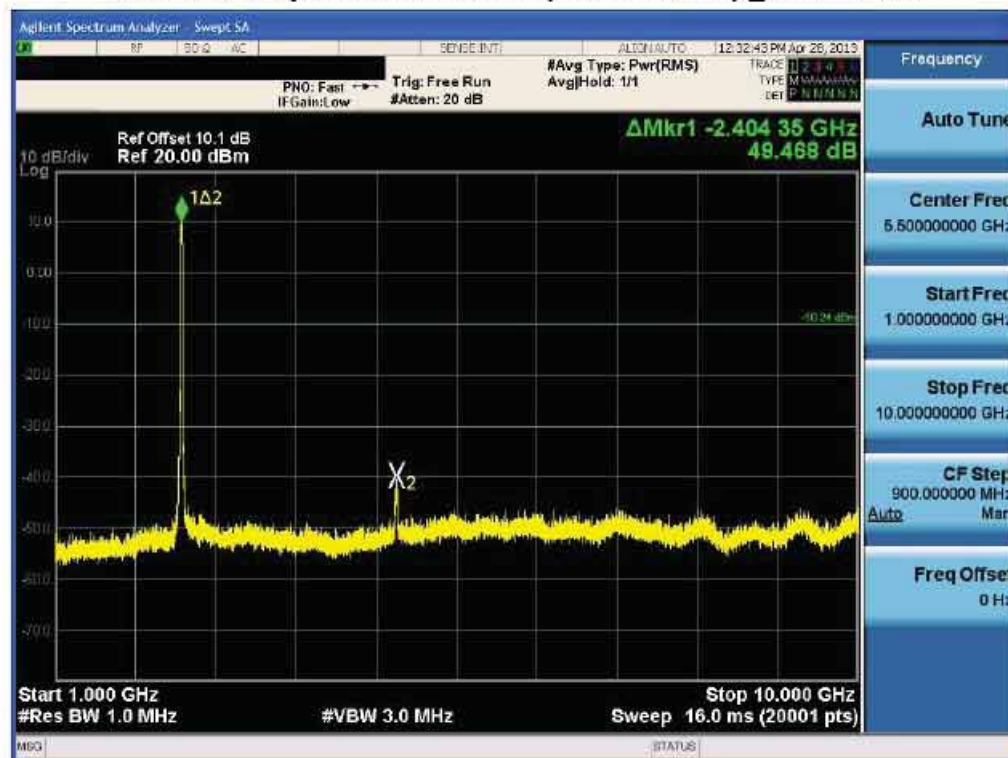


Conducted Spurious Emission (802.11g-CH11)

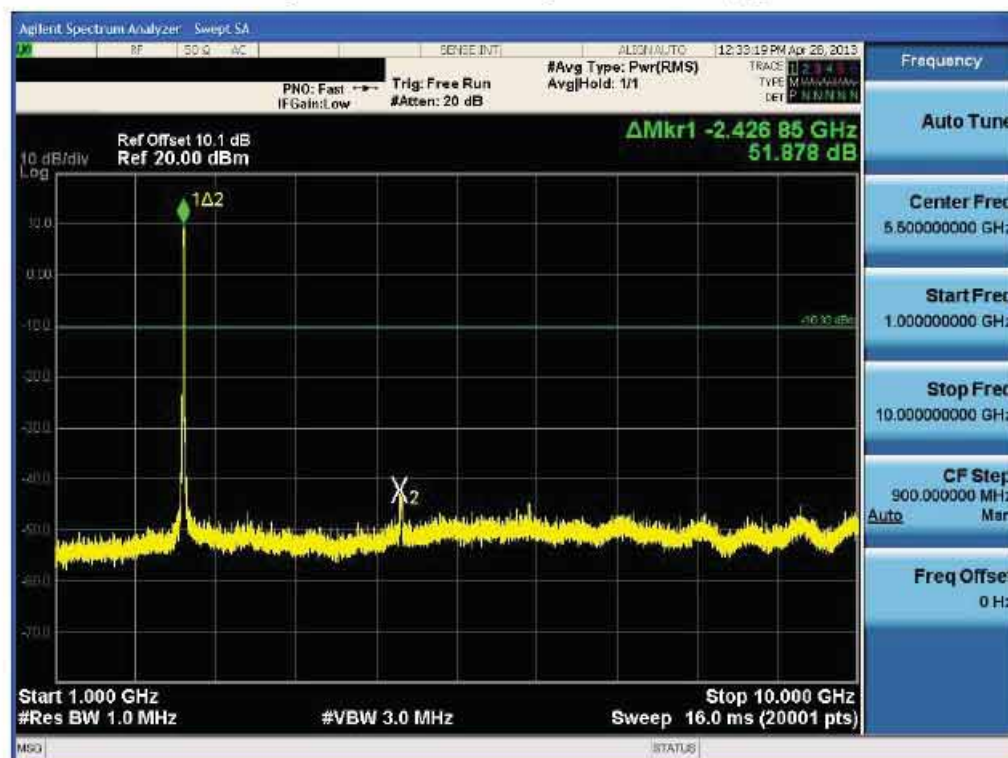


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J

Conducted Spurious Emission (802.11n-CH1) _20 MHz BW

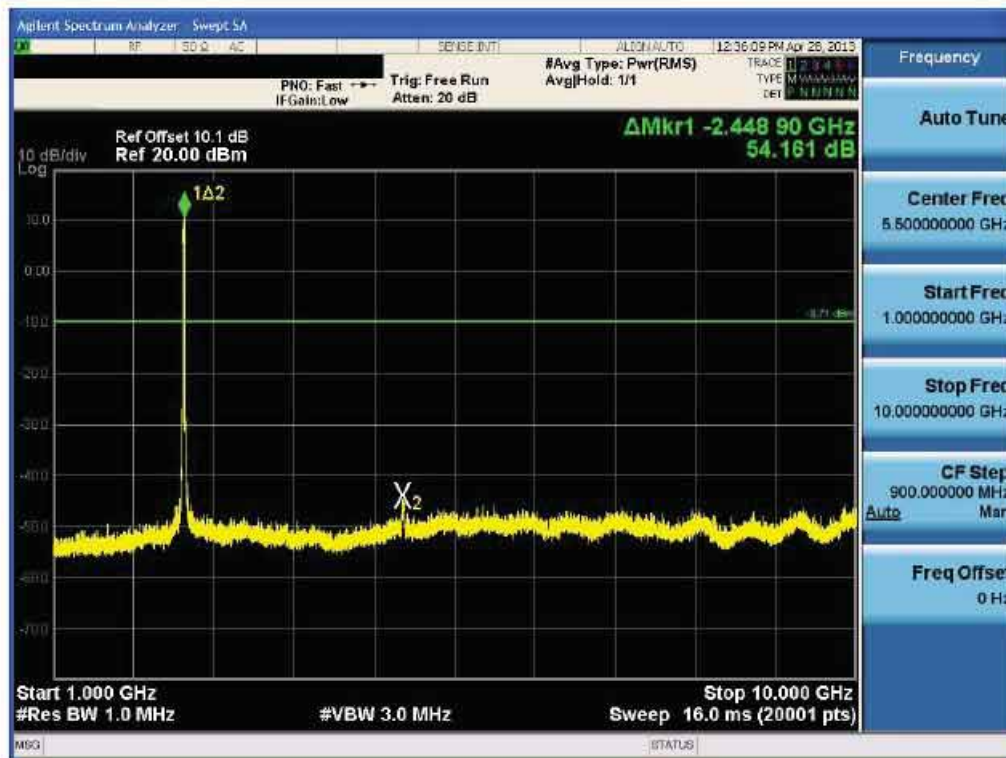


Conducted Spurious Emission (802.11n-CH6) _20 MHz BW

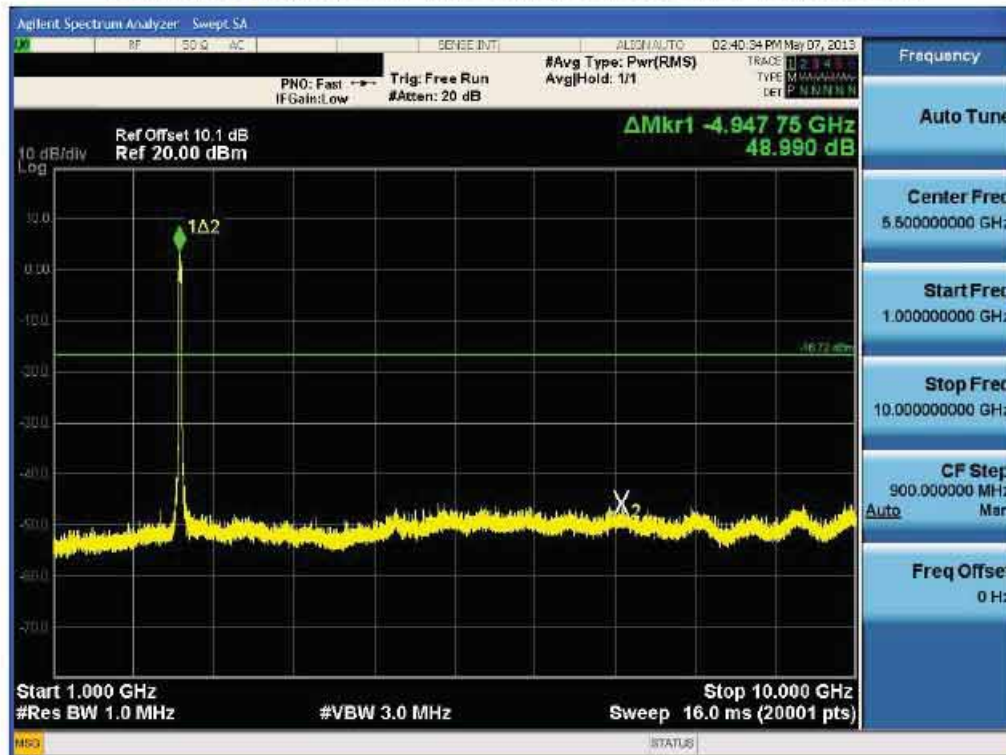


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J	

Conducted Spurious Emission (802.11n-CH11) _20 MHz BW

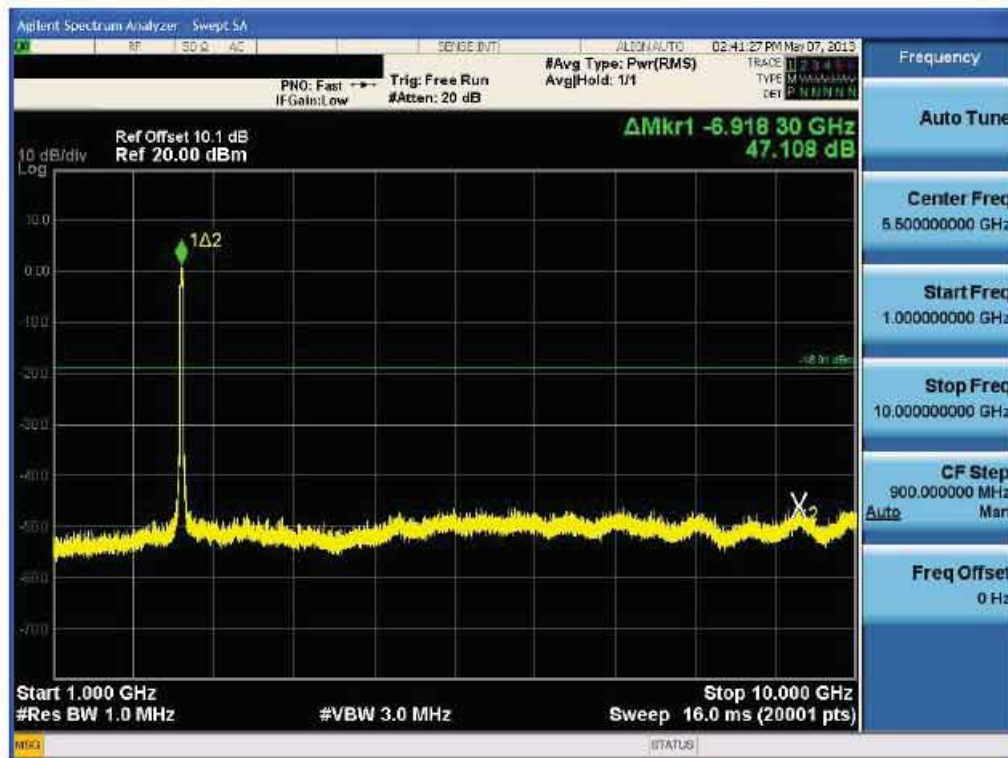


Conducted Spurious Emission (802.11n-CH3) _40 MHz BW

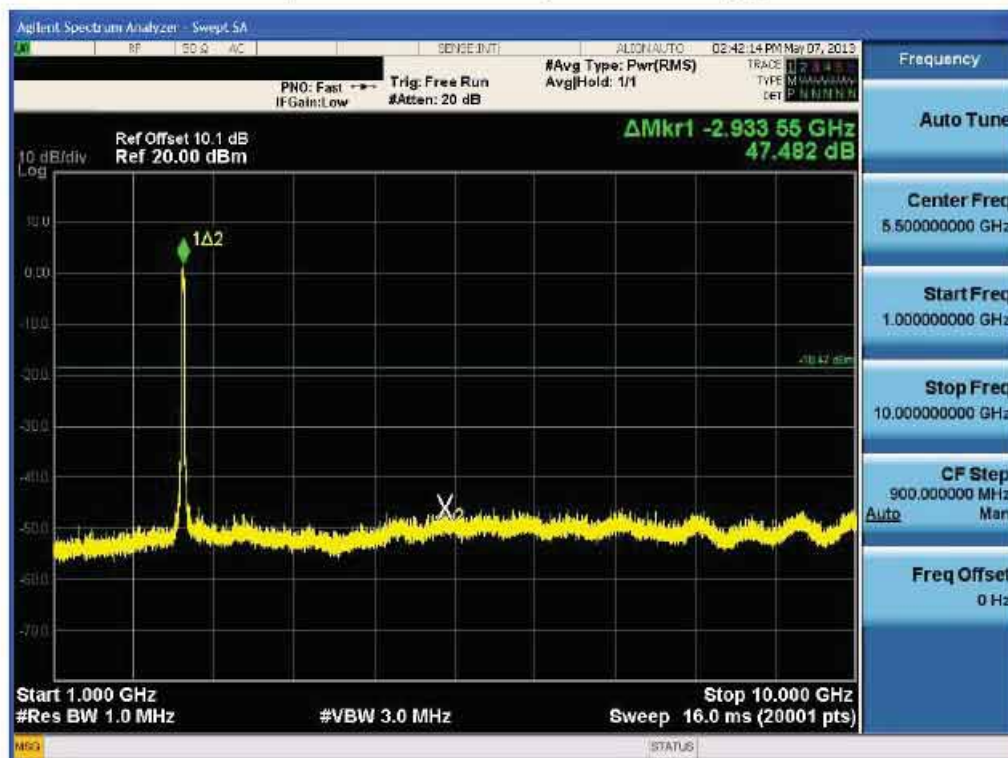


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT			www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WIFI802.11 b/g/n	FCC ID: ZNFE440J	

Conducted Spurious Emission (802.11n-CH6)_40 MHz BW



Conducted Spurious Emission (802.11n-CH9)_40 MHz BW



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1305FR11-1	Date of Issue: May 23, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth3.0, WiFi802.11 b/g/n	FCC ID: ZNFE440J