

# TEST REPORT

of

FCC Part 15 Subpart E §15.407 / RSS-210 Issue 8, RSS-Gen Issue 3

FCC ID/IC Certification: A3LWIDT20R / 649E-WIDT20R

Equipment Under Test : Wi-Fi Module  
Model Name : WIDT20R  
Serial No. : N/A  
Applicant : SAMSUNG ELECTRONICS CO., LTD.  
Manufacturer : SAMSUNG ELECTRONICS CO., LTD.  
Date of Test(s) : 2011.11.08 ~ 2011.12.21  
Date of Issue : 2011.12.22

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date

2011.12.22

Duke Ko

Approved By:



Date

2011.12.22

Feel Jeong

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## Table of contents

1. General information -----	3
2. Transmitter radiated spurious emissions and conducted spurious emission -----	7
3. Receiver Radiated Spurious Emission-----	46
4. 26 dB Bandwidth and 99 % Occupied bandwidth -----	48
5. Output power -----	100
6. Peak power spectral density -----	135
7. Peak excursion -----	163
8. DFS (Dynamic Frequency Selection)-----	167

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## 1. General information

### 1.1. Testing laboratory

SGS Korea Co., Ltd.(Gunpo Laboratory)

- 705, Dongchun-Dong Sooji-Gu, Yongin-Shi, Kyungki-Do, South Korea.
- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

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### 1.2. Details of applicant

Applicant : SAMSUNG ELECTRONICS CO., LTD.

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Contact Person : Lee, Jay Woo

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### 1.3. Description of EUT

<b>Kind of Product</b>	Wi-Fi Module
<b>Model Name</b>	WIDT20R
<b>Serial Number</b>	N/A
<b>Power Supply</b>	DC 5 V
<b>Frequency Range</b>	2 412 MHz ~ 2 462 MHz (11b/g/n_HT20) 2 422 MHz ~ 2 452 MHz (11b/g/n_HT40) 5 745 MHz ~ 5 825 MHz (11a/n_HT20) 5 755 MHz ~ 5 795 MHz (11a/n_HT40) 5 180 MHz ~ 5 240 MHz (11a/n_HT20 – Non DFS) 5 190 MHz ~ 5 230 MHz (11a/n_HT40 – Non DFS) 5 260 MHz ~ 5 320 MHz (11a/n_HT20 – DFS) 5 270 MHz ~ 5 310 MHz (11a/n_HT40 – DFS) 5 500 MHz ~ 5 700 MHz (11a/n_HT20 – DFS) 5 510 MHz ~ 5 670 MHz (11a/n_HT40 – DFS)
<b>Modulation Technique</b>	DSSS, OFDM
<b>Number of Channels</b>	11 channel(11b/g/n_HT20), 7 channel(11b/g/n_HT40), 5 channel(11a/n_HT20), 2 channel(11a/n_HT40), 4 channel(11a/n_HT20 – Non DFS), 2 channel(11a/n_HT40 – Non DFS), 15 channel (11a/n_HT20 - DFS), 7 channel (11a/n_HT40 - DFS)
<b>Antenna Type</b>	Fixed type (2 Tx / 2 Rx)
<b>Antenna Gain</b>	<b>ANT0</b> 2.19 dB i(11b/g/n), 2.48 dB i(11a/n), 0.56 dB i(11a/n – Non DFS), 1.47 dB i(11a/n -DFS) <b>ANT1</b> 2.92 dB i(11b/g/n), 1.21 dB i(11a/n), 2.13 dB i(11a/n – Non DFS), 2.37 dB i(11a/n -DFS)

### 1.4. Declaration by the manufacturer

- EUT is SLAVE without DFS and TPC.
- We found out the test mode with the highest power level after we analyze all the data rates. So we choose 54 Mbps data rate for 11a and MCS32 for 11n (worst case) as a representative.
- EUT uses Cyclic Delay Diversity (CDD) modes and the signals are correlated.

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### 1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Due.
Signal Generator	R & S	SMR40	100272	Jul. 15, 2012
Signal Generator	R & S	SMBV100A	255834	Jul. 20, 2012
PXA Spectrum Analyzer	Agilent	N9030A	US51350132	Oct. 28, 2012
Spectrum Analyzer	R&S	FSL6	100639	Jul, 05, 2012
Power Divider	MCLI	PS4-196	12466	Jun. 28, 2012
Attenuator	AEROFLEX	26A-10dB	2	Apr. 06, 2012
Attenuator	AEROFLEX	26A-10dB	3	Apr. 13, 2012
Attenuator	AEROFLEX	18N-20dB	3	Apr. 26, 2012
Power Splitter	Mini-Circuits	ZFSC-2-10G	1	Sep. 27, 2012
Power Splitter	Mini-Circuits	ZFSC-2-10G	2	Sep. 27, 2012
High Pass Filter	Wainwright	WHK3.0/18G-10SS	344	Jul. 07, 2012
DC power Supply	Agilent	U8002A	MY49030063	Jan. 05, 2012
Preamplifier	H.P.	8447F	2944A03909	Jul. 04, 2012
Preamplifier	R & S	SCU 18	10117	Mar. 23, 2012
Test Receiver	R & S	ESU26	100109	Feb. 21, 2012
Bilog Antenna	SCHWARZBECK MESSELEKTRONIK	VULB9163	396	Apr. 27, 2013
Horn Antenna	R & S	HF 906	100229	May. 04. 2012
Horn Antenna	SCHWARZBECK MESSELEKTRONIK	BBHA9170	BBHA9170223	Jun. 30, 2012
Antenna Master	EMCO	1050	N.C.R.	N.C.R.
Turn Table	Daeil EMC	DI-1500	N.C.R.	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	N.C.R.	N.C.R.

#### ► Support equipment

Description	Manufacturer	Model	Serial Number
Access Point( master)	Cisco	AIR-AP1242AG-K-K9	FHK1034407S
Notebook	IBM	T43	2669CC8

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## 1.6. Summary of test result

The EUT has been tested according to the following specifications:

APPLIED STANDARD:FCC Part15, RSS-210,RSS-Gen			
Section in FCC 15	Section in RSS-210 RSS-Gen	Test Item	Result
15.205(a) 15.209(a) 15.407(b)(1) 15.407(b)(2) 15.407(b)(3)	RSS-Gen 7 A9.2(1) A9.2(2) A9.2(3)	Transmitter radiated spurious emissions and Conducted spurious emission	Complied
15.109(a)	RSS-Gen 6	Receiver Radiated Spurious Emission	Complied
15.407(a)(1) 15.407(a)(2)	A9.2(1) A9.2(2) A9.2(3)	Output power	Complied
15.407(a)(1) 15.407(a)(2)	A9.2(1) A9.2(2) A9.2(3)	Peak power spectral density	Complied
15.407(a)(6)	-	Peak excursion	Complied
15.407(h)	A9.3	DFS -Channel closing transmission time -Channel move time -Non occupied period	Complied

## 1.7. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL005205	Initial

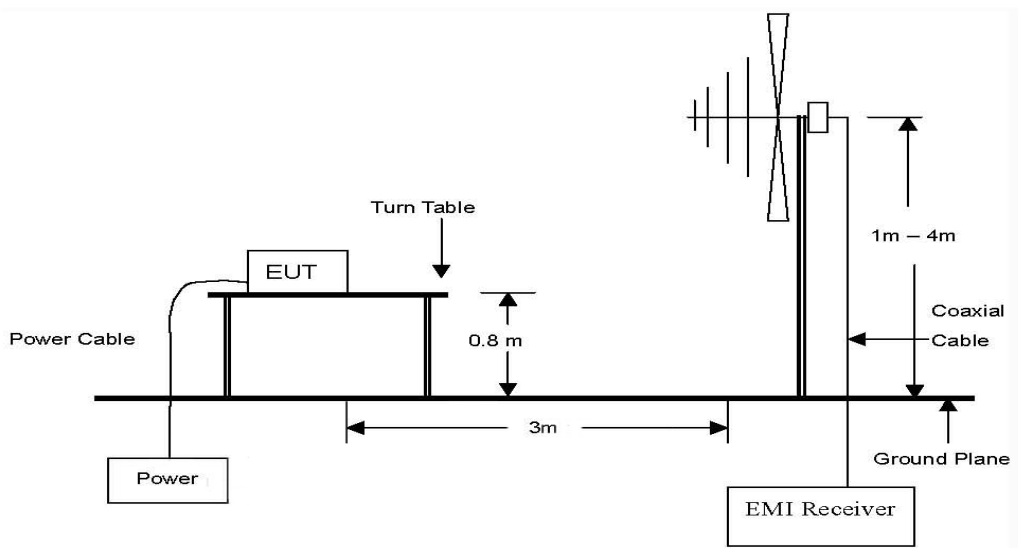
*The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.*

## 2. Transmitter radiated spurious emissions and conducted spurious emission

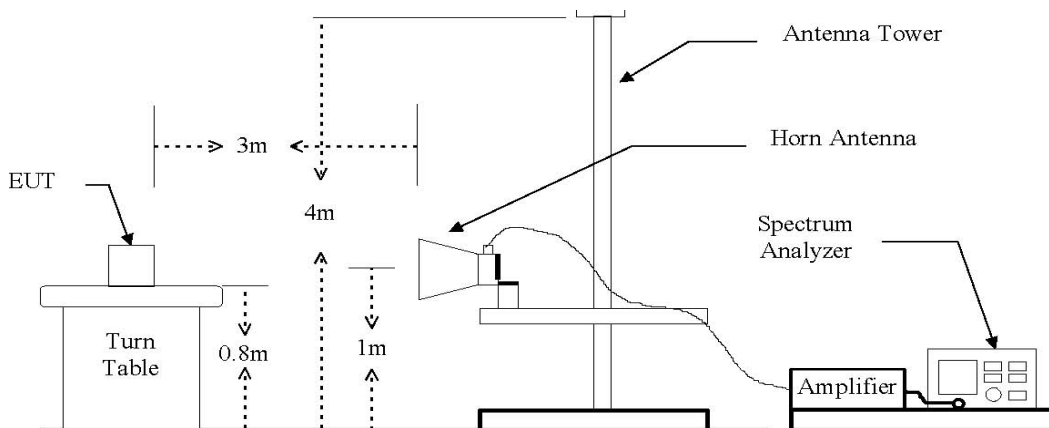
### 2.1. Test setup

#### 2.1.1. Transmitter radiated spurious emissions

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 40 GHz Emissions.



#### 2.1.2. Conducted spurious emissions



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## 2.2. Limit

For transmitters operating in the 5.15 ~ 5.25 GHz band : all emissions outside of the 5.15 ~ 5.35 GHz band shall not exceed an EIRP of -27 dB m

For transmitters operating in the 5.25 ~ 5.35 GHz band: all emissions outside of the 5.15 ~ 5.35 GHz band shall not exceed an EIRP of -27 dB m/MHz. Devices operating in the 5.25 ~ 5.35 GHz band that generate emissions in the 5.15 ~ 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 ~ 5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dB m/MHz in the 5.15 ~ 5.25 GHz band.

For transmitters operating in the 5.47 ~ 5.725 GHz band: all emissions outside of the 5.47 ~ 5.725 GHz band shall not exceed an EIRP of -27 dB m/MHz.

## 2.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

### 2.3.1. Test procedures for radiated spurious emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. Compliance shall be demonstrated using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.
7. At frequencies above 1000 MHz, measurements performed using the peak and average measurement, respectively, must satisfy the respective peak and average limits. If all peak measurements satisfy the average limit, then average measurements are not required.
8. Peak emission levels are measured by setting the analyzer as follows:RBW = 1 MHz, VBW  $\geq$  3 MHz, Detector = Peak, Sweep time = auto, Trace hold = max hold.
9. Average emission levels are measured by setting the analyzer as follows:RBW = 1 MHz, VBW  $\leq$  RBW/100 (but not less than 10 Hz), Detector = Peak, Sweep time = auto, Trace hold = max hold.

### 2.3.2. Test procedures for conducted spurious emissions

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Peak emission levels are measured by setting the analyzer as follows : RBW = 1 MHz, VBW  $\geq$  3 MHz, Detector = Peak, Sweep time = auto, Trace hold = max hold.

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## 2.4. Test result

Ambient temperature : (24 ± 2) °C  
 Relative humidity : 49 % R.H.

### 2.4.1. Spurious radiated emission (Worst case configuration\_11a mode)

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions are not reported much lower than the prescribed limits.

Radiated emissions			Ant	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Detect Mode	Pol.	AF (dB/m)	Amp gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
458.46	39.1	Peak	V	15.0	-24.5	29.6	46.0	16.4
564.79	42.8	Peak	V	17.0	-24.4	35.4	46.0	10.6
631.60	39.5	Peak	V	18.2	-24.4	33.3	46.0	12.7
798.32	41.2	Peak	V	20.9	-23.9	38.2	46.0	7.8
Above 800.00	Not detected	-	-	-	-	-	-	-

#### ▣ Remark:

1. All spurious emission at channels are almost the same below 1 GHz, so that the channel was chosen at representative in final test.
2. Actual = Reading + AF + AMP + CL
3. To get a maximum emission level from the EUT, the EUT was moved throughout the X, Y and Z planes. The worst case is Y.

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## 2.4.2. Spurious radiated emission for above 1 GHz

### ANT0

#### 802.11a (Non-DFS)

##### A. Low Channel (5 180 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 150.00*	18.44	Peak	H	33.57	8.24	60.25	74.00	13.75
5 150.00*	5.83	Average	H	33.57	8.24	47.64	54.00	6.36
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 356.58	33.93	Peak	H	37.27	-32.58	38.62	74.00	35.38
Above 10 400.00	Not Detected	-	-	-	-	-	-	-

##### B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 436.82	33.92	Peak	H	37.33	-33.63	37.62	74.00	36.38
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

##### C. High Channel (5 240 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 480.14	33.55	Peak	H	37.36	-33.27	37.64	74.00	36.36
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

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**802.11a (DFS)**
**A. Low Channel (5 260 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 520.00	34.97	Peak	H	37.40	-33.02	39.35	74.00	34.65
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 300 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 597.11	33.95	Peak	H	37.49	-33.71	37.73	74.00	36.27
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 320 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 350.00*	19.13	Peak	H	33.84	8.36	61.33	74.00	12.67
5 350.00*	6.67	Average	H	33.84	8.36	48.87	54.00	5.13
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 637.40*	33.92	Peak	H	37.53	-33.35	38.10	74.00	35.90
Above 10 700.00	Not Detected	-	-	-	-	-	-	-

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**802.11a (DFS)**
**A. Low Channel (5 500 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 460.00*	18.77	Peak	H	33.99	8.18	60.94	74.00	13.06
5 460.00*	6.91	Average	H	33.99	8.18	49.08	54.00	4.92
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 999.13*	35.10	Peak	H	37.94	-32.88	40.16	74.00	33.84
Above 11 000.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 600 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 196.53*	34.09	Peak	H	38.05	-32.76	39.38	74.00	34.62
Above 11 200.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 700 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 404.63*	35.19	Peak	H	38.17	-32.94	40.42	74.00	33.58
Above 11 500.00	Not Detected	-	-	-	-	-	-	-

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**ANT1**
**802.11a (Non-DFS)**
**A. Low Channel (5 180 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 150.00*	19.25	Peak	H	33.57	8.24	61.06	74.00	12.94
5 150.00*	5.82	Average	H	33.57	8.24	47.63	54.00	6.37
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 366.08	35.16	Peak	H	37.28	-32.67	39.77	74.00	34.23
Above 10 400.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 220 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 458.58	34.98	Peak	H	37.35	-33.70	38.63	74.00	35.37
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 240 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 473.92	35.30	Peak	H	37.36	-33.39	39.27	74.00	34.73
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

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**802.11a (DFS)**
**A. Low Channel (5 260 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 554.56	34.35	Peak	H	37.44	-33.28	38.51	74.00	35.49
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 300 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 598.84	34.24	Peak	H	37.49	-33.72	38.01	74.00	35.99
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 320 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 350.00*	19.58	Peak	H	33.84	8.36	61.78	74.00	12.22
5 350.00*	6.67	Average	H	33.84	8.36	48.87	54.00	5.13
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 635.66*	35.73	Peak	H	37.53	-33.36	39.90	74.00	34.10
Above 10 700.00	Not Detected	-	-	-	-	-	-	-

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**802.11a (DFS)**
**A. Low Channel (5 500 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 460.00*	19.58	Peak	H	33.99	8.18	61.75	74.00	12.25
5 460.00*	6.88	Average	H	33.99	8.18	49.05	54.00	4.95
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 999.13*	35.10	Peak	H	37.94	-32.88	40.16	74.00	33.84
Above 11 000.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 600 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 196.53*	34.09	Peak	H	38.05	-32.76	39.38	74.00	34.62
Above 11 200.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 700 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 404.63*	35.19	Peak	H	38.17	-32.94	40.42	74.00	33.58
Above 11 400.00	Not Detected	-	-	-	-	-	-	-

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**ANT0 + ANT1**
**802.11n-HT20 (Non-DFS)**

## A. Low Channel (5 180 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 150.00*	18.70	Peak	H	33.57	8.24	60.51	74.00	13.49
5 150.00*	5.78	Average		33.57	8.24	47.59	54.00	6.41
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 359.13	36.55	Peak	H	37.27	-32.60	41.22	74.00	32.78
Above 10 400.00	Not Detected	-	-	-	-	-	-	-

## B. Middle Channel (5 220 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 439.13	34.37	Peak	H	37.33	-33.68	38.02	74.00	35.98
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

## C. High Channel (5 240 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 474.21	35.36	Peak	H	37.36	-33.39	39.33	74.00	34.67
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

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**802. 11n-HT20 (DFS)**
**A. Low Channel (5 260 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 514.21	34.19	Peak	H	37.40	-32.98	38.61	74.00	35.39
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 300 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 593.81	35.02	Peak	H	37.49	-33.67	38.84	74.00	35.16
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 320 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 350.00*	19.63	Peak	H	33.84	8.36	61.83	74.00	12.17
5 350.00*	6.54	Average	H	33.84	8.36	48.74	54.00	5.26
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 623.62*	35.47	Peak	H	37.52	-33.49	39.50	74.00	34.50
Above 10 700.00	Not Detected	-	-	-	-	-	-	-

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**802. 11n-HT20 (DFS)**
**A. Low Channel (5 500 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 460.00*	19.10	Peak	H	33.99	8.18	61.27	74.00	12.73
5 460.00*	6.98	Average	H	33.99	8.18	49.15	54.00	4.85
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 995.08*	36.03	Peak	H	37.93	-32.85	41.11	74.00	32.89
Above 11 000.00	Not Detected	-	-	-	-	-	-	-

**B. Middle Channel (5 600 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 195.95*	35.51	Peak	H	38.05	-32.76	40.80	74.00	33.20
Above 11 200.00	Not Detected	-	-	-	-	-	-	-

**C. High Channel (5 700 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 391.61*	35.84	Peak	H	38.16	-33.01	40.99	74.00	33.01
Above 11 400.00	Not Detected	-	-	-	-	-	-	-

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**802.11n-HT40 (Non-DFS)**

## A. Low Channel (5 190 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 150.00*	17.53	Peak	H	33.57	8.24	59.34	74.00	14.66
5 150.00*	5.84	Average	H	33.57	8.24	47.65	54.00	6.35
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 393.89	33.99	Peak	H	37.30	-32.93	38.36	74.00	35.64
Above 10 400.00	Not Detected	-	-	-	-	-	-	-

## B. High Channel (5 230 MHz)

Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 466.95	33.87	Peak	H	37.35	-33.54	37.68	74.00	36.32
Above 10 500.00	Not Detected	-	-	-	-	-	-	-

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**802. 11n-HT40 (DFS)**
**A. Low Channel (5 270 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 551.29	33.89	Peak	H	37.44	-33.24	38.09	74.00	35.91
Above 10 600.00	Not Detected	-	-	-	-	-	-	-

**B. High Channel (5 310 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 350.00*	19.14	Peak	H	33.84	8.36	61.34	74.00	12.66
5 350.00*	6.47	Average	H	33.84	8.36	48.67	54.00	5.33
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
10 600.90*	33.52	Peak	H	37.49	-33.72	37.29	74.00	36.71
Above 10 700.00	Not Detected	-	-	-	-	-	-	-

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**802. 11n-HT40 (DFS)**
**A. Low Channel (5 510 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
5 460.00*	19.29	Peak	H	33.99	8.18	61.46	74.00	12.54
5 460.00*	6.90	Average	H	33.99	8.18	49.07	54.00	4.93
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 004.95*	33.57	Peak	H	37.94	-32.88	38.63	74.00	35.37
Above 11 000.00	Not Detected	-	-	-	-	-	-	-

**B. High Channel (5 670 MHz)**

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dB uV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dB uV/m)	Limit (dB uV/m)	Margin (dB)
11 360.26*	34.16	Peak	H	38.14	-33.08	39.22	74.00	34.78
Above 11 400.00	Not Detected	-	-	-	-	-	-	-

**▣ Remarks**

1. "\*" means the restricted band.
2. Measuring frequencies from 1 GHz to the 40 GHz of highest fundamental Frequency.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. To get a maximum emission level from the EUT, the EUT was moved throughout the x-axis, y-axis and z-axis. The worst case is y-axis.

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### 2.4.3. Spurious RF Conducted Emissions: Plot of Spurious RF Conducted Emission ANTO

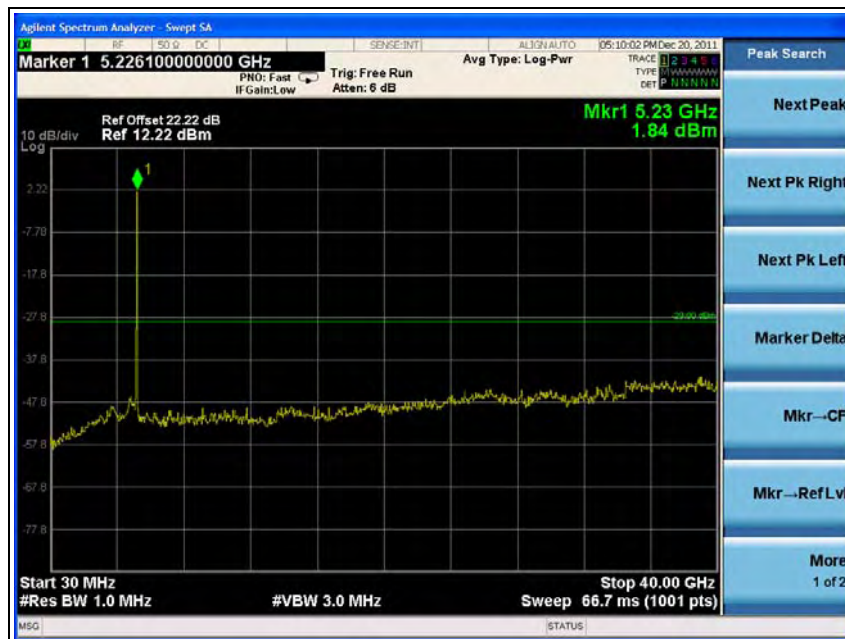
For 5.15-5.25 GHz, the combination antenna gain is 0.56 dBi, so the EIRP limit is -29.00 dBm/MHz.

#### 802.11a (Non-DFS)

5 180 MHz



5 220 MHz



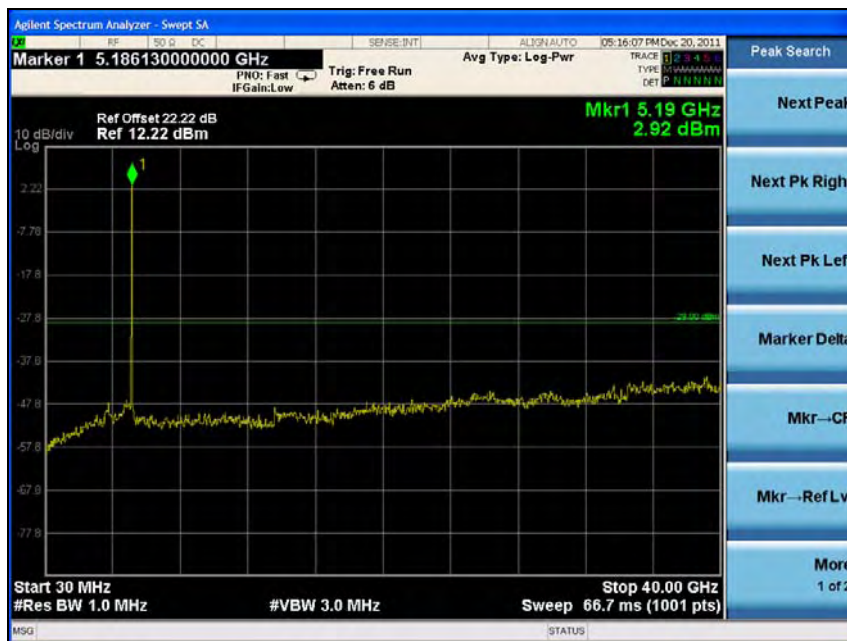
5 240 MHz

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## 802.11n-HT20 (Non-DFS)

5 180 MHz

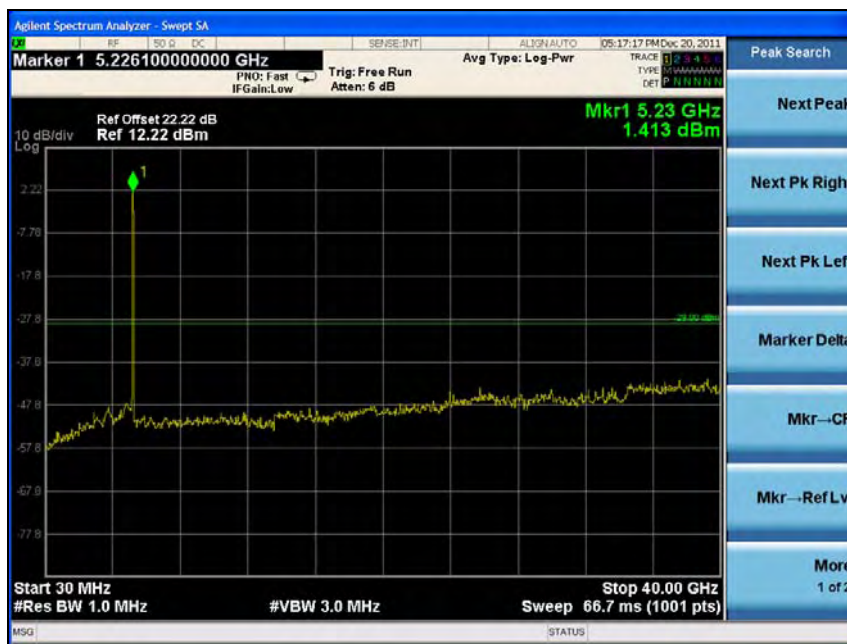


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5 220 MHz



5 240 MHz



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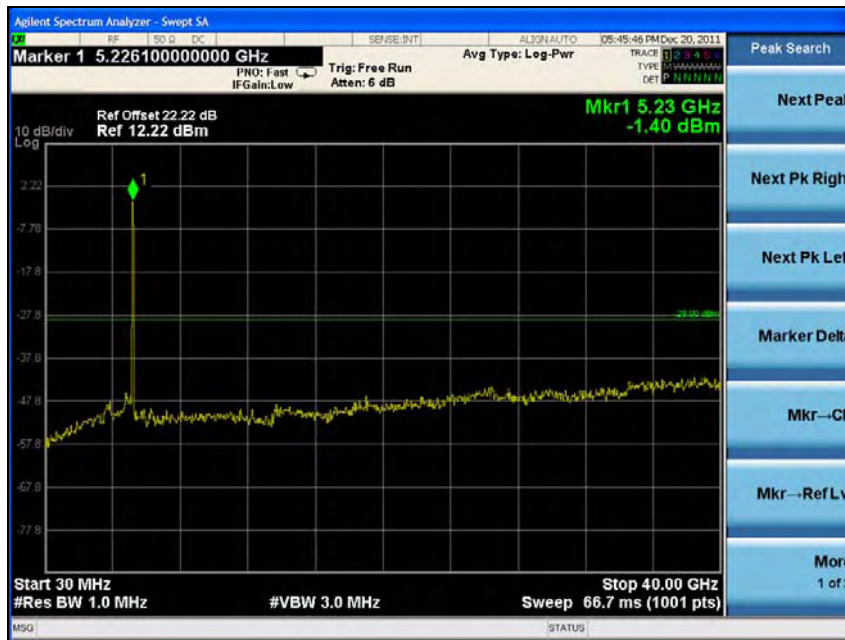


## 802.11n-HT40 (Non-DFS)

5 190 MHz



5 230 MHz



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## 802.11a (DFS)

For 5.25-5.725 GHz, the combination antenna gain is 1.47 dBi, so the EIRP limit is -29.00 dBm/MHz.

5 260 MHz



5 300 MHz

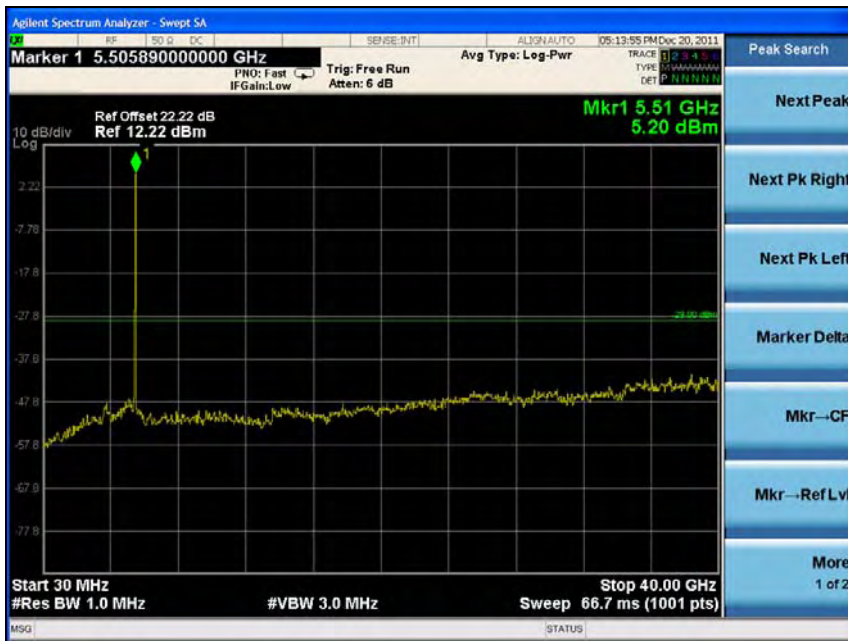


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5 320 MHz



5 500 MHz

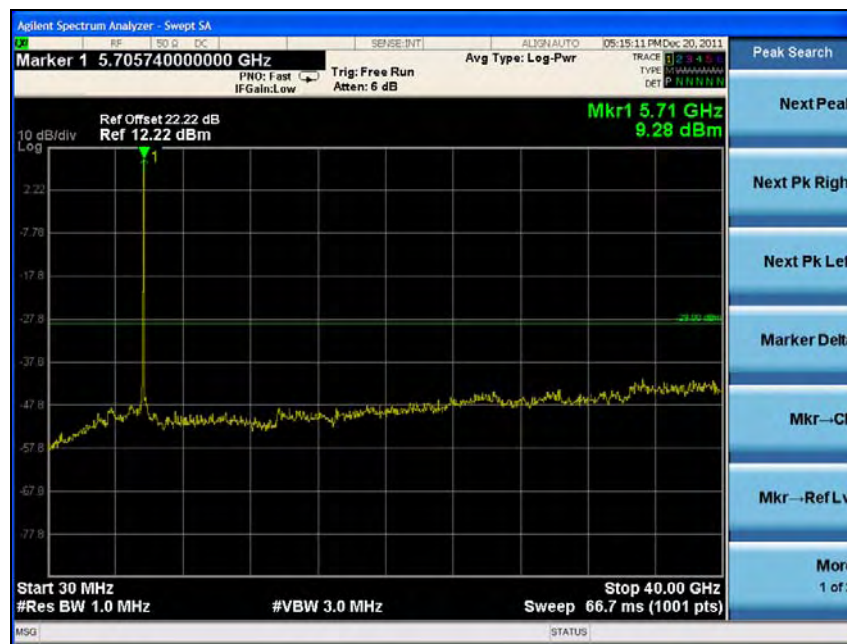


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5 600 MHz



5 700 MHz



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## 802.11n-HT20 (DFS)

5 260 MHz



5 300 MHz



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5 320 MHz



5 500 MHz

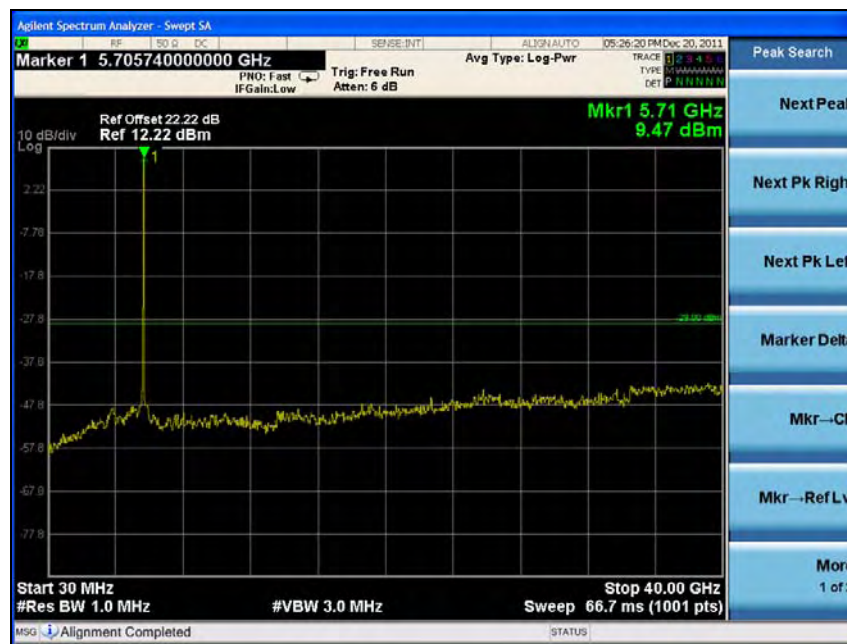


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5 600 MHz



5 700 MHz



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Tel. +82 31 428 5700 / Fax. +82 31 427 2371

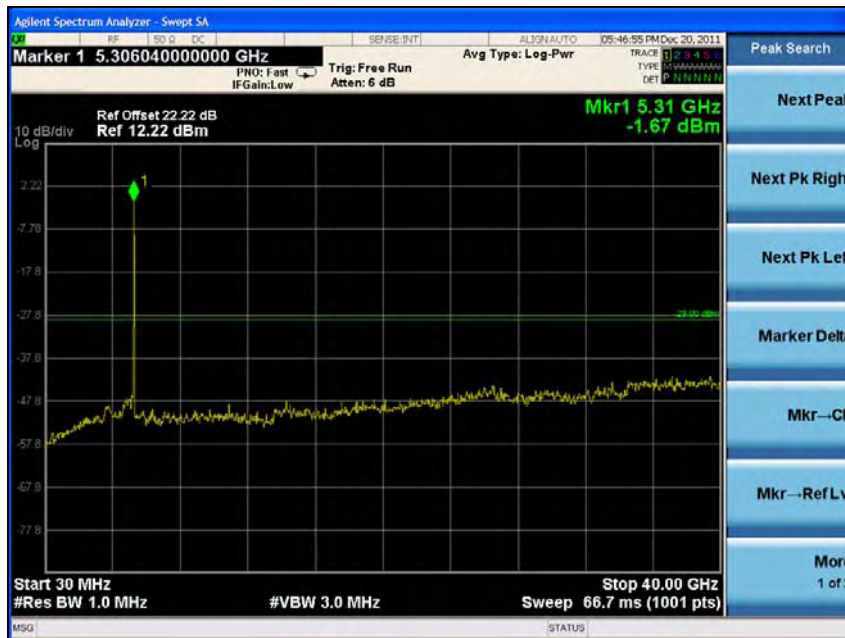
[www.kr.sgs.com/ee](http://www.kr.sgs.com/ee)

## 802.11n-HT40 (DFS)

5 270 MHz



5 310 MHz



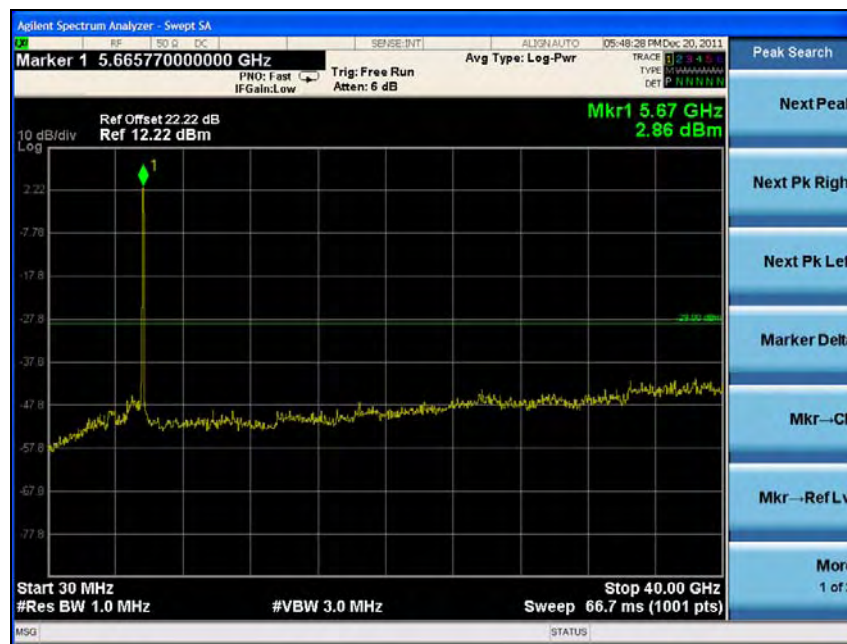
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5 510 MHz



5 670 MHz



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**ANT1**

5.15-5.25 GHz, the combination antenna gain is 2.13 dBi, so the EIRP limit is -29.13 dBm/MHz.

**802.11a (Non-DFS)**

5 180 MHz

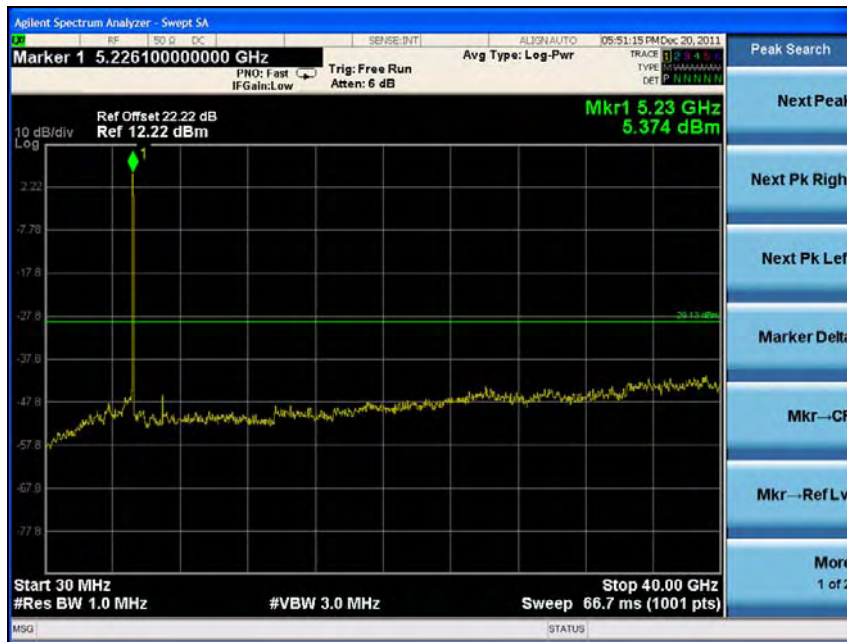


5 220 MHz



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5 240 MHz



802.11n-HT20 (Non-DFS)

5 180 MHz



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5 220 MHz



5 240 MHz



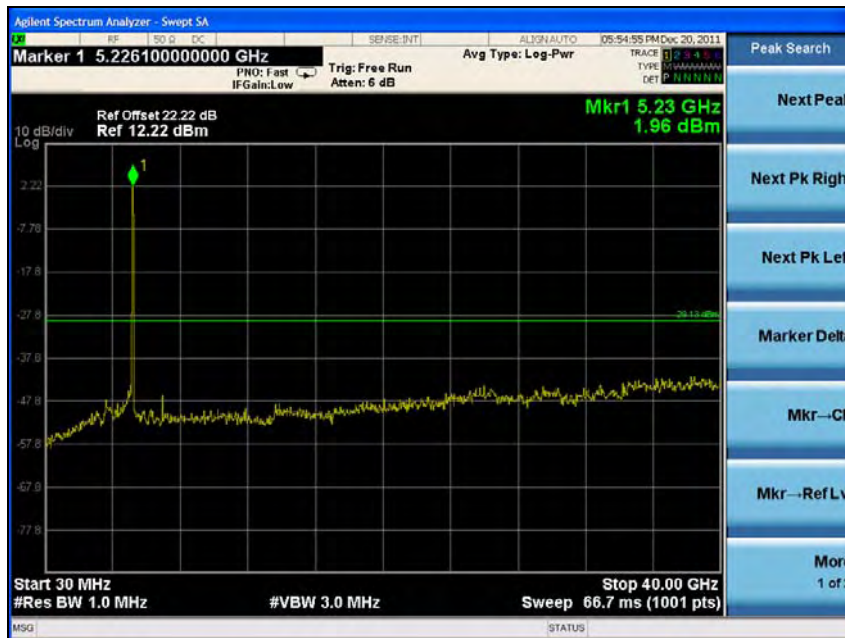
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## 802.11n-HT40 (Non-DFS)

5 190 MHz



5 230 MHz



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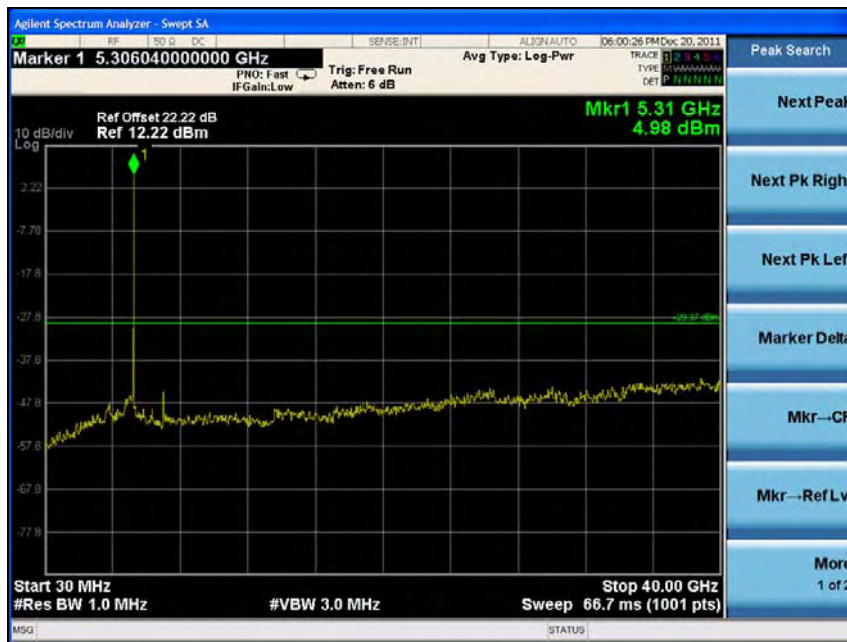
## 802.11a (DFS)

For 5.25-5.725 GHz, the combination antenna gain is 2.37 dBi, so the EIRP limit is -29.37 dBm/MHz.

5 260 MHz



5 300 MHz



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5 320 MHz



5 500 MHz



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5 600 MHz



5 700 MHz

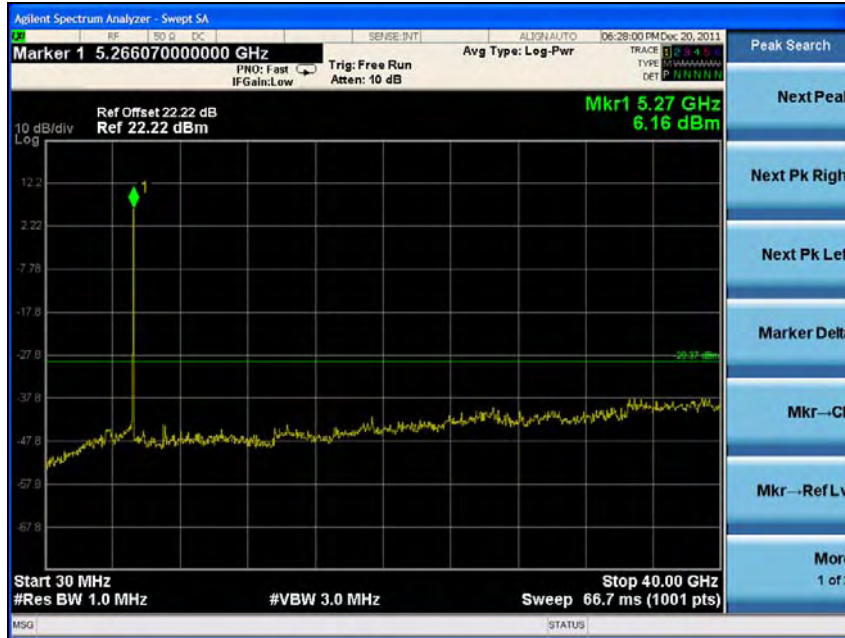


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## 802.11n-HT20 (DFS)

5 260 MHz



5 300 MHz

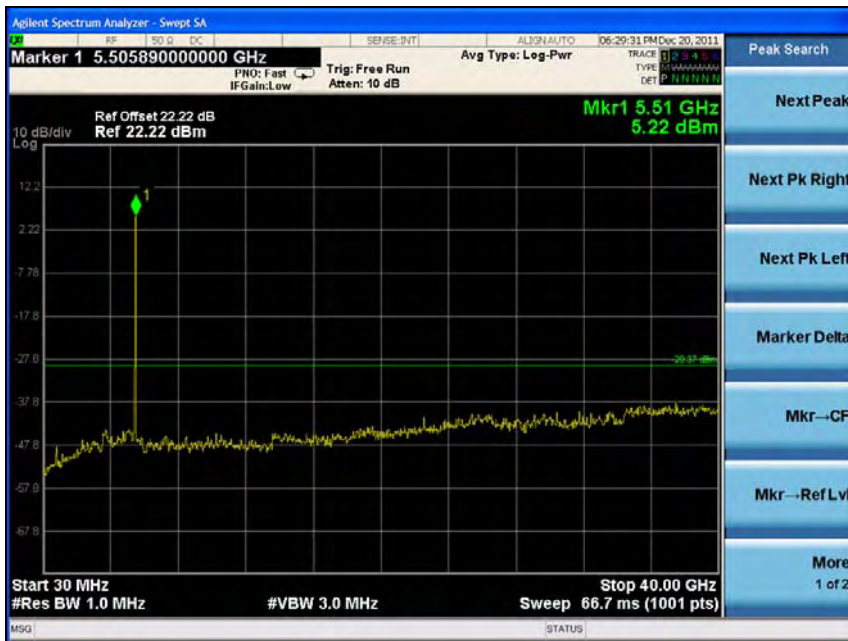


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5 320 MHz



5 500 MHz

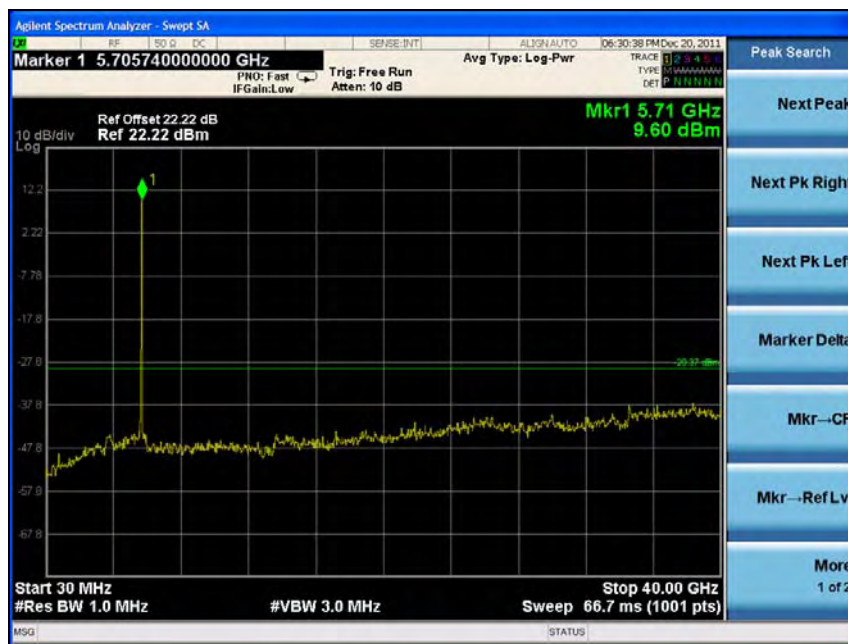


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5 600 MHz



5 700 MHz



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## 802.11n-HT40 (DFS)

5 270 MHz



5 310 MHz



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5 510 MHz



5 670 MHz



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### 3. Receiver Radiated spurious emissions

#### 3.1. Test setup - Same as clause 2.1.

##### 3.1.1. Receiver Radiated Spurious Emissions - Same as clause 2.1.1.

#### 3.2. Limit

According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission from unintentional radiator at a distance of 3 m shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB <sub>μ</sub> V/m)	Radiated (μV/m)
30 - 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
Above 960	3	54.0	500

#### 3.3. Test Procedures - Same as clause 2.3.

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

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### 3.3.1. Test Procedures for Radiated Spurious Emissions- Same as clause 2.3.1.

### 3.4. Test Results

Ambient temperature : (24 ± 2) °C  
 Relative humidity : 47 % R.H.

#### 3.4.1. Spurious Radiated Emission (Worst case configuration\_11a mode)

The frequency spectrum from 30 MHz to 40 GHz was investigated. Emission levels are not reported much lower than the limits by over 30 dB. All reading values are peak values.

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
531.85	38.6	Peak	V	16.5	-24.6	30.5	46.0	15.5
565.00	42.6	Peak	V	17.0	-24.4	35.2	46.0	10.8
631.04	39.1	Peak	V	18.2	-24.4	32.9	46.0	13.1
798.40	41.7	Peak	V	20.9	-23.9	38.7	46.0	7.3
Above 800.00	Not detected	-	-	-	-	-	-	-

#### Remark:

1. All spurious emission at channels are almost the same from 30 MHz to 40 GHz, so that the middle channel was chosen as representative in final test.
2. Actual = Reading + AF + AMP + CL

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## 4. 26 dB bandwidth and 99 % occupied bandwidth

### 4.1. Test setup



### 4.2. Limit

None; for reporting purpose only

### 4.3. Test procedure

#### 4.3.1. 26 dB bandwidth

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = approximately 1 % of the emission bandwidth, VBW > RBW, Detector = peak, Trace mode = max hold.
4. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.
5. Repeat until all the test channels are investigated.

#### 4.3.2. 99% occupied bandwidth

1. Same as step1 & step 2 above 26 dB bandwidth procedure.
2. Set the spectrum analyzer as SPAN = 2 or 3 times necessary bandwidth, RBW = approximately 1 % of the SPAN, VBW is set to 3 times RBW, Detector = sampling, Trace mode = max hold.
4. Measure lowest and highest frequencies are placed in a running sum until 0.5 % and 99.5 % of the total is reached.
5. Record the SPAN between the lowest and the highest frequencies for the 99 % occupied bandwidth.
6. Repeat until all the test channels are investigated.

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#### 4.4. Test result

Ambient temperature : (24 ± 2) °C  
 Relative humidity : 49 % R.H.

#### ANT0

Mode : 11a

Operating mode	Frequency (MHz)	26 dB bandwidth (MHz)	99% bandwidth (MHz)
Non - DFS	5 180	18.82	16.58
	5 220	18.58	16.61
	5 240	18.84	16.54
DFS	5 260	19.01	16.59
	5 300	18.61	16.59
	5 320	18.76	16.62
DFS	5 500	18.67	16.60
	5 600	18.51	16.64
	5 700	18.90	16.66

Mode : 11n\_HT20

Operating mode	Frequency (MHz)	26 dB bandwidth (MHz)	99% bandwidth (MHz)
Non - DFS	5 180	19.64	17.52
	5 220	19.51	17.56
	5 240	19.69	17.54
DFS	5 260	19.47	17.55
	5 300	19.55	17.60
	5 320	19.51	17.55
DFS	5 500	19.65	17.57
	5 600	19.73	17.60
	5 700	19.67	17.53

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Mode : 11n\_HT40

Operating mode	Frequency (MHz)	26 dB bandwidth (MHz)	99% bandwidth (MHz)
Non - DFS	5 190	39.9	36.3
	5 230	39.5	36.4
DFS	5 270	39.2	36.3
	5 310	39.3	36.3
	5 510	39.2	36.3
	5 670	39.4	36.3

**ANT1**

Mode : 11a

Operating mode	Frequency (MHz)	26 dB bandwidth (MHz)	99% bandwidth (MHz)
Non - DFS	5 180	18.22	16.62
	5 220	18.71	16.61
	5 240	18.66	16.64
DFS	5 260	18.65	16.59
	5 300	18.91	16.58
	5 320	18.83	16.66
DFS	5 500	18.92	16.65
	5 600	18.76	16.57
	5 700	18.45	16.59

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Mode : 11n\_HT20

Operating mode	Frequency (MHz)	26 dB bandwidth (MHz)	99% bandwidth (MHz)
Non - DFS	5 180	19.65	17.58
	5 220	19.49	17.56
	5 240	19.60	17.51
DFS	5 260	19.69	17.53
	5 300	19.53	17.58
	5 320	19.58	17.59
DFS	5 500	19.55	17.52
	5 600	19.49	17.56
	5 700	19.58	17.58

Mode : 11n\_HT40

Operating mode	Frequency (MHz)	26 dB bandwidth (MHz)	99% bandwidth (MHz)
Non - DFS	5 190	39.7	36.4
	5 230	39.2	36.2
DFS	5 270	39.3	36.3
	5 310	39.5	36.3
	5 510	39.5	36.2
	5 670	39.2	36.3

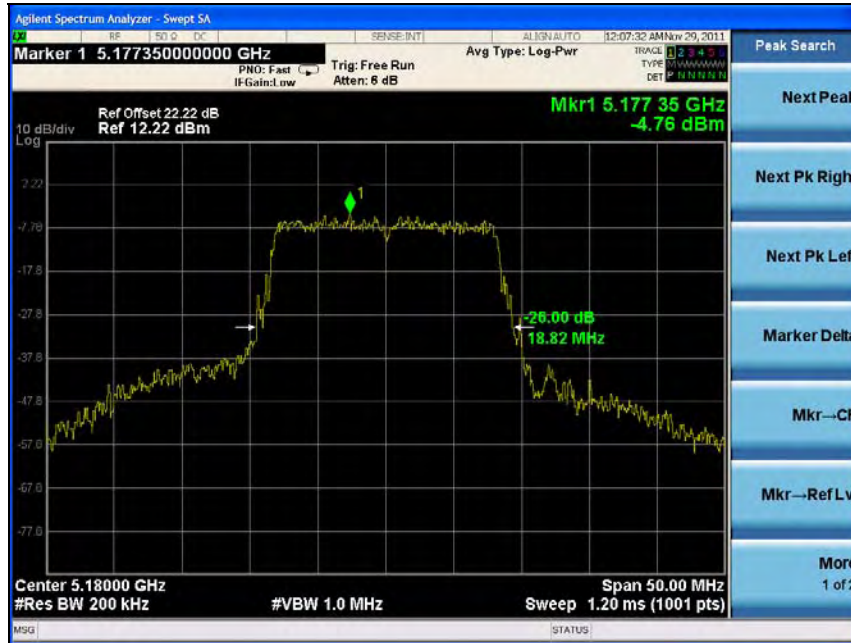
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

## 26 dB Bandwidth

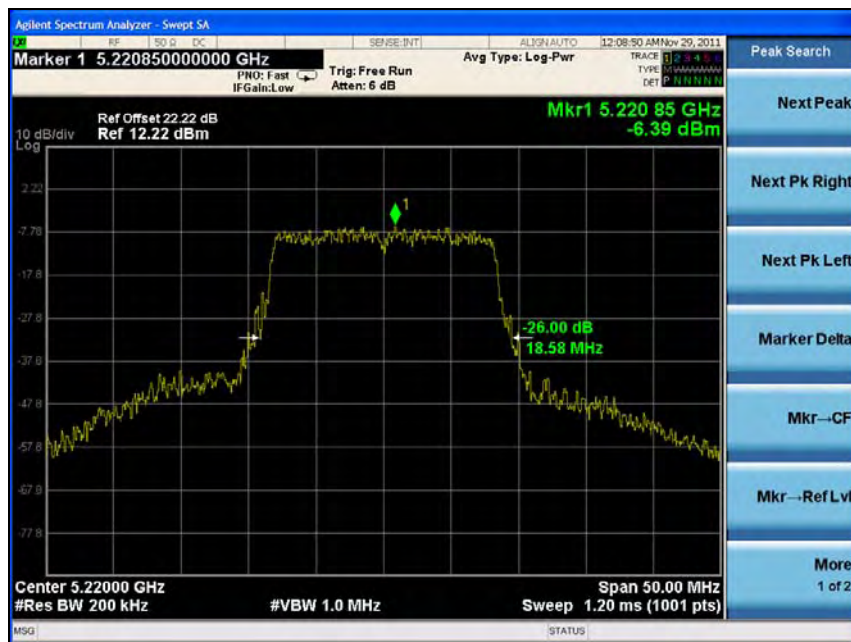
ANT0

802.11a (Non-DFS)

Low Channel (5 180 MHz)

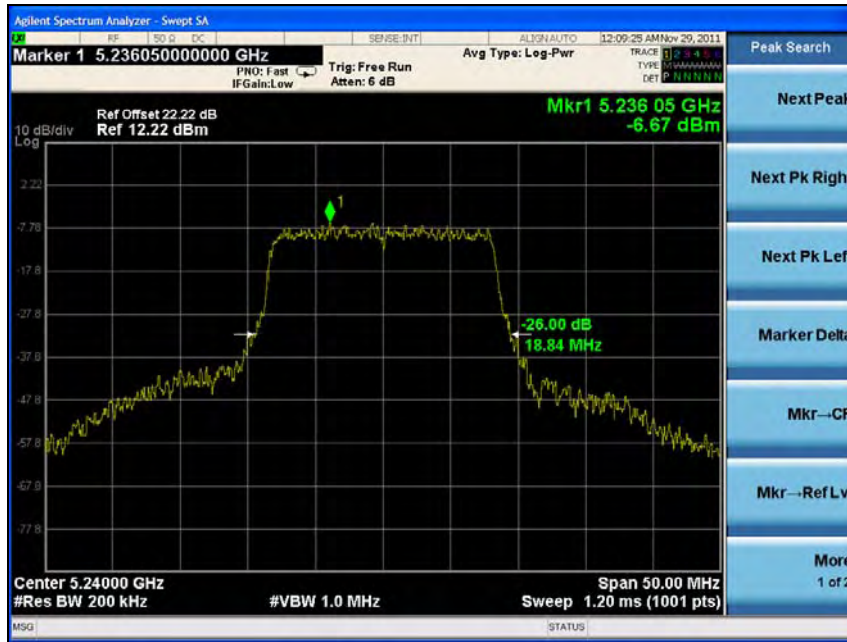


Middle Channel (5 220 MHz)



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## High Channel (5 240 MHz)



## 802.11a (DFS)

## Low Channel (5 260 MHz)

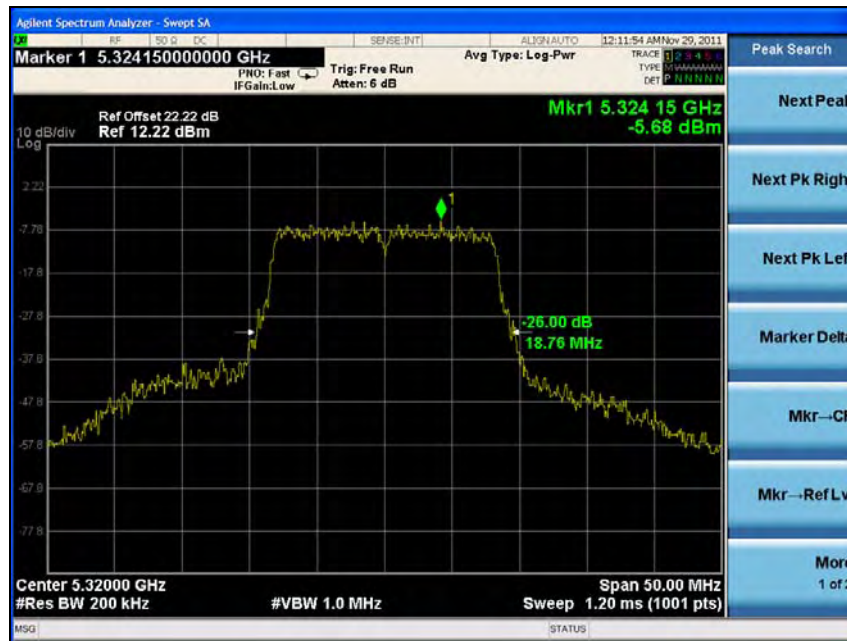


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### Middle Channel (5 300 MHz)



### High Channel (5 320 MHz)



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## 802.11a (DFS)

### Low Channel (5 500 MHz)



### Middle Channel (5 600 MHz)



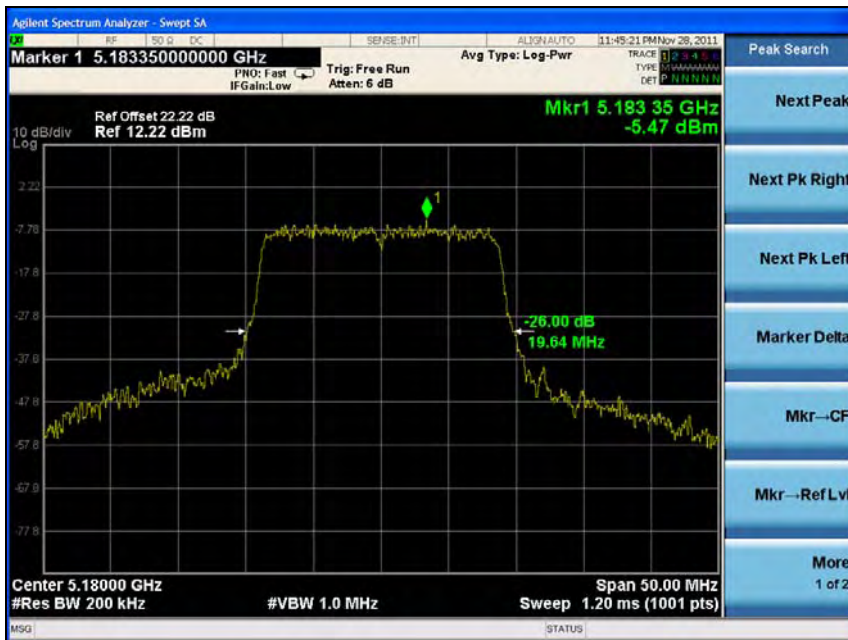
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## High Channel (5 700 MHz)



## 802.11n-HT20 (Non-DFS)

## Low Channel (5 180 MHz)



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Middle Channel (5 220 MHz)



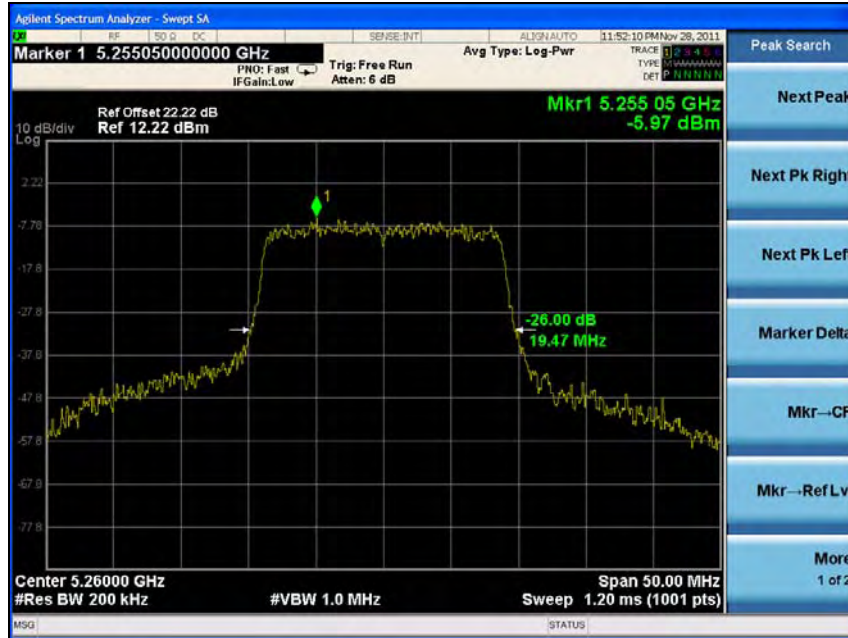
High Channel (5 240 MHz)



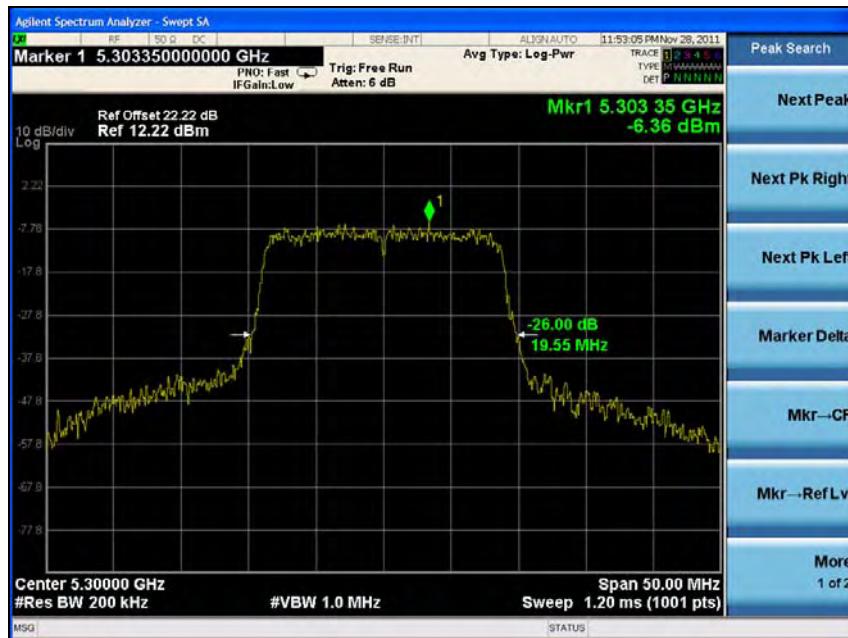
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## 802.11n-HT20 (DFS)

### Low Channel (5 260 MHz)



### Middle Channel (5 300 MHz)



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## High Channel (5 320 MHz)



## 802.11n-HT20 (DFS)

## Low Channel (5 500 MHz)



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### Middle Channel (5 600 MHz)



### High Channel (5 700 MHz)



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