RF TEST REPORT

Test item	:	Cellular/PCS GSM/GPRS & Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth, WLAN and NFC
Model No.	:	L-01E
Order No.	:	DEMC1207-01233
Date of receipt	:	2012-07-20
Test duration	:	2012-07-26 ~ 2012-08-15
Date of issue	:	2012-08-17
Use of report	:	Original Grant

Applicant : LG Electronics MobileComm U.S.A., Inc.
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	FCC Part 15.407 Subpart E ANSI C63.4-2003, KDB 789033
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer H.S.Son	N/A	Technical Director Harvey sung

CONTENTS

1. EUT information

1.1 EUT description

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
Product	Cellular/PCS GSM/GPRS & Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth, WLAN and NFC
Model Name	L-01E
Add Model Name	N/A
Equipment serial no.	Identical prototype
Frequency Range	802.11a/n(20MHz) : Band I: 5180 ~ 5240MHz Band II: 5260 ~ 5320MHz Band III: 5500 ~ 5700MHz
	802.11n(40MHz) : Band I: 5190 ~ 5230MHz Band II: 5270 ~ 5310MHz Band III: 5510 ~ 5670MHz
Channels	802.11a/n(20MHz): 4 (Band I) / 4 (Band II) / 8 (Band III) 802.11n(40MHz): 2 (Band I) / 2 (Band II) / 3 (Band III)
Modulation type	802.11a/n : OFDM
Data rate	802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n(20MHz): 6.5, 7.2, 13, 14.4, 19.5, 21.7, 26, 28.9, 39, 43.3, 52, 57.8, 58.5, 65, 72.2 Mbps 802.11n(40MHz): 13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150 Mbps
Antenna Specification	Internal Antenna (1TX / 1RX) / Max. peak gain: -0.43dBi
Power Supply	DC 3.8 V

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2. Information about test items

2.1 Test mode / Channel Information

5GHz Band	Mode	Data Rate
Band I	802.11a	6Mbps
	802.11n(20MHz)	MCS0
	802.11n(40MHz)	MCS0
Band II	802.11a	6Mbps
	802.11n(20MHz)	MCS0
	802.11n(40MHz)	MCS0
Band III	802.11a	6Mbps
	802.11n(20MHz)	MCS0
	802.11n(40MHz)	MCS0

For all test items, the low, middle and high channels of the modes were tested with above worst case data rate.

2.2 Tested Channel Information

5GHz Band	802.11a/n(20MHz)		802.11n(40MHz)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
Band I	36	5180	38	5190
	40	5200	-	-
	48	5240	46	5230
Band II	52	5260	54	5270
	56	5280	-	-
	64	5320	62	5310
Band III	100	5500	102	5510
	116	5580	110	5550
	140	5700	134	5670

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.4 Tested environment

Temperature	:	22 ~ 25 °C
Relative humidity content	:	34 ~ 44 % R.H.
Details of power supply	:	DC 3.8 V

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.407(a)	N/A	26 dB Bandwidth for FCC	N/A	Conducted	C
15.407(a)	RSS-210 [A9.2]	Maximum Conducted Output Power	< 4 + 10log$_{10}$(B) dBm (5150-5250) < 11 + 10log$_{10}$(B) dBm (5250-5350) < 11 + 10log$_{10}$(B) dBm (5470-5725)		C
15.407(a)	RSS-210 [A9.2]	Peak Power Spectral Density	< 4 dBm/MHz (5150-5250) < 11 dBm/MHz (5250-5350) < 11 dBm/MHz (5470-5725)		C
15.407(a)	N/A	Peak Excursion	< 13 dB/MHz maximum difference		C
15.407(g)	N/A	Frequency Stability	N/A		C
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	N/A		C
15.407(b)	RSS-210 [A9.2]	Undesirable Emissions	< -27 dBm/MHz EIRP (5150-5725)	Radiated	C
15.205 15.209 15.407(b)	RSS-Gen [7.2.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		C
15.407(h)	RSS-210 [A9.3]	Dynamic Frequency Selection	See DFS Test Report		C Note3
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	FCC 15.207	AC Line Conducted	C
15.203	RSS-Gen [7.1.2]	Antenna Requirements	FCC 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: These test items were performed in each axis and the worst case data was reported.

Note 3: Refer to the DFS Test Report.

3.2 Transmitter requirements

3.2.1 26 dB Bandwidth

Test Requirements

The bandwidth at 26 dB down from the highest in-band 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. The 26dB bandwidth is used to determine the conducted output power limit.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033**.

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW.
2. Set the video bandwidth **(VBW) > RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.
   Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

▣ TEST RESULTS: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	Band I	36	5180	21.750
		40	5200	21.770
		48	5240	21.940
	Band II	52	5260	21.890
		60	5300	21.790
		64	5320	21.500
	Band III	100	5500	21.930
		116	5580	21.630
		140	5700	21.950
802.11n (20MHz)	Band I	36	5180	22.270
		40	5200	22.010
		48	5240	22.050
	Band II	52	5260	21.860
		60	5300	22.280
		64	5320	22.210
	Band III	100	5500	21.730
		116	5580	22.070
		140	5700	21.950
802.11n (40MHz)	Band I	38	5190	42.970
		46	5230	43.740
	Band II	54	5270	42.930
		62	5310	43.280
	Band III	102	5510	43.110
		110	5550	43.090
		134	5670	42.880

▣ RESULT PLOTS

26 dB Bandwidth

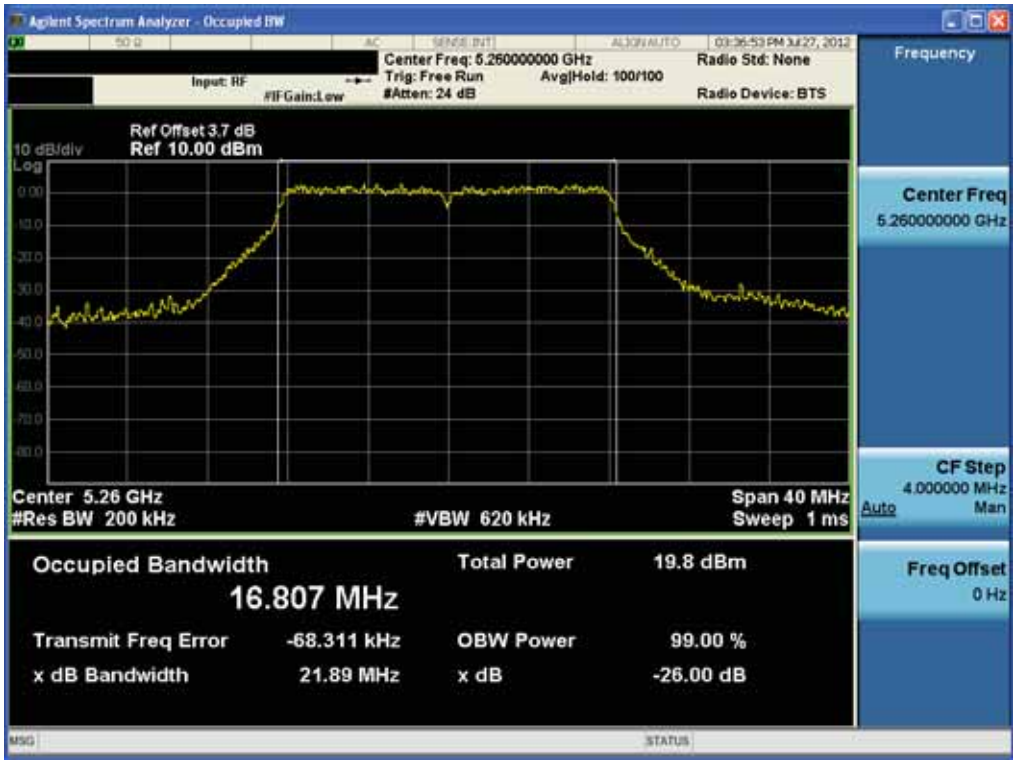
Test Mode: 802.11a & Ch.36

26 dB Bandwidth

Test Mode: 802.11a & Ch.40

26 dB Bandwidth Test Mode: 802.11a & Ch.48

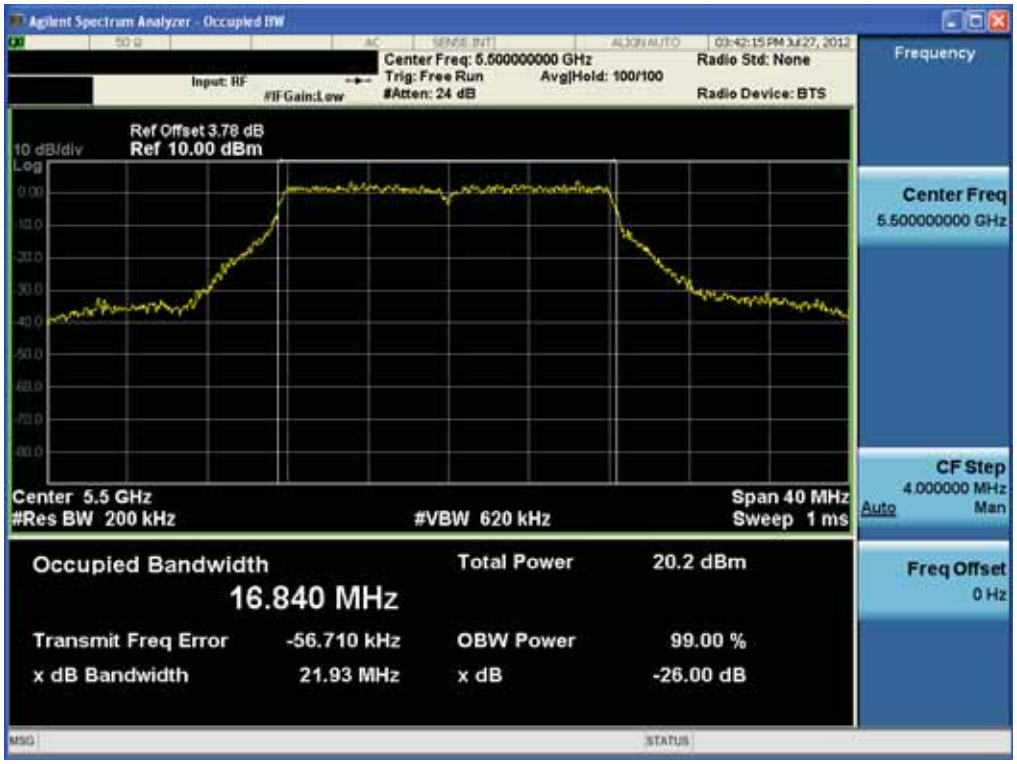
26 dB Bandwidth Test Mode: 802.11a & Ch.52



26 dB Bandwidth Test Mode: 802.11a & Ch.60

26 dB Bandwidth Test Mode: 802.11a & Ch.64

26 dB Bandwidth Test Mode: 802.11a & Ch.100



26 dB Bandwidth Test Mode: 802.11a & Ch.116

26 dB Bandwidth Test Mode: 802.11a & Ch.140

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.36

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.40

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.48

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.52

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.60

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.64

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.100

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.116

26 dB Bandwidth Test Mode: 802.11n-HT20 & Ch.140

26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.38

26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.46

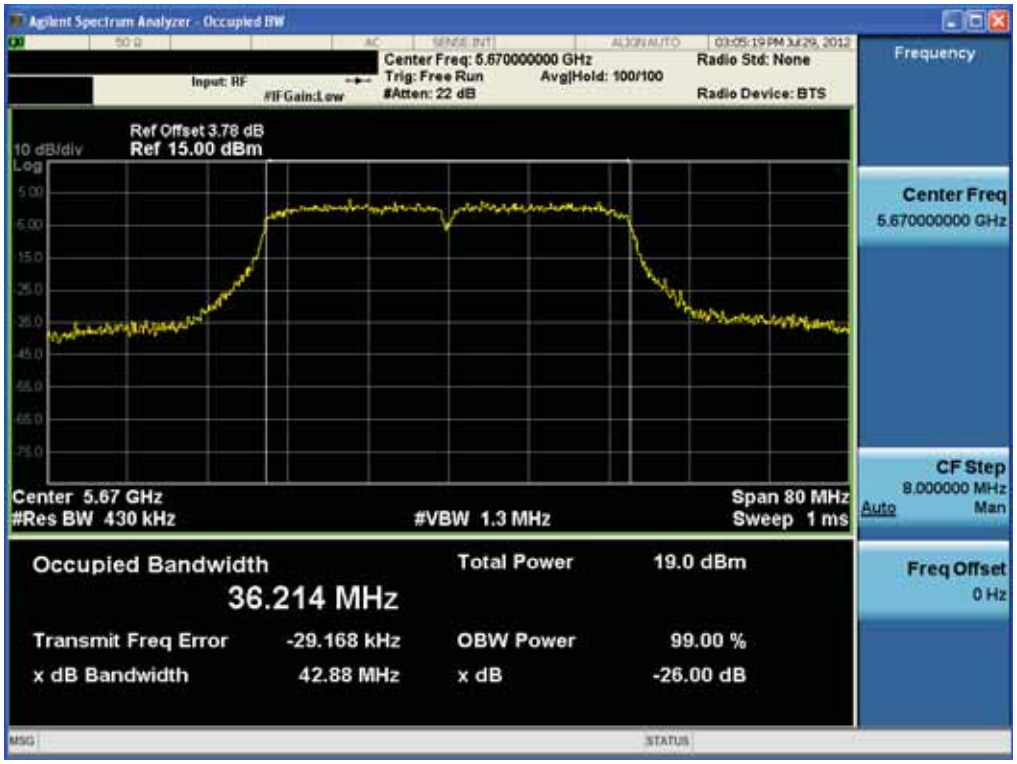
26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.54

26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.62

26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.102

26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.110

26 dB Bandwidth Test Mode: 802.11n-HT40 & Ch.134



3.2.2 Output Power

Test Requirements

(1) For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26 dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

- Output power Limit Calculation

Bands	Mode	Power Limit [mW] / Least 26dBC BW [MHz]	Calculated Limit [dBm]	ANT Gain	Determined Limit [dBm]
Band I	802.11a	50	**16.98**	-5.911	16.98
		21.75	17.37		
	802.11n HT20	50	**16.98**		16.98
		22.01	17.42		
	802.11n HT40	50	**16.98**		16.98
		42.97	20.33		

Bands	Mode	Power Limit [mW] / Least 26dBC BW [MHz]	Calculation Limit [dBm]	ANT Gain	Determined Limit [dBm]
Band II	802.11a	250	**23.97**	-3.305	23.97
		21.50	24.32		
	802.11n HT20	250	**23.97**		23.97
		21.86	24.39		
	802.11n HT40	250	**23.97**		23.97
		42.93	27.32		
Band III	802.11a	250	**23.97**	-0.431	23.97
		21.63	24.35		
	802.11n HT20	250	**23.97**		23.97
		21.73	24.37		
	802.11n HT40	250	**23.97**		23.97
		42.88	27.32		

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ **TEST PROCEDURE:**

Maximum Conducted Output Power is measured using Measurement Procedure **Method SA-2 of KDB789033**

1. Set the **RBW = 1 MHz**.
2. Set the **VBW ≥ 3 MHz**.
3. Set **SPAN to encompass the entire EBW** of signal.
4. Detector = **RMS (power averaging)**
5. Sweep time = **auto couple**.
6. **Trace average at least 100 traces in power averaging**.
7. **Compute power by integrating the spectrum across the 26 dB EBW** of the signal using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges.
8. **Add 10 log(1/x), where x is the duty cycle**, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission)

▣ **TEST RESULTS : Comply**

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Test Result [dBm]
				On Time[ms]	On+Off Time[ms]	X		
802.11a	36	5180	10.62	2.04	2.14	0.95	0.22	10.84
	40	5200	10.41					10.63
	48	5240	11.22					11.44
	52	5260	12.12	2.03	2.13	0.95	0.22	12.34
	60	5300	12.33					12.55
	64	5320	12.62					12.84
	100	5500	12.64	2.03	2.13	0.95	0.22	12.86
	116	5580	12.49					12.71
	140	5700	12.46					12.68

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Result
				On Time[ms]	On+Off Time[ms]	X		
802.11n (20MHz)	36	5180	9.35	1.90	2.00	0.95	0.22	9.57
	40	5200	9.51					9.73
	48	5240	11.07					11.29
	52	5260	10.90	1.89	1.99	0.95	0.22	11.12
	60	5300	11.29					11.51
	64	5320	11.66					11.88
	100	5500	11.44	1.89	1.99	0.95	0.22	11.66
	116	5580	11.62					11.84
	140	5700	11.14					11.36
802.11n (40MHz)	38	5190	10.37	0.93	0.98	0.95	0.22	10.59
	46	5230	10.68					10.90
	54	5270	11.04	0.93	0.98	0.95	0.22	11.26
	62	5310	11.15					11.37
	102	5510	11.24	0.93	0.98	0.95	0.22	11.46
	110	5550	11.12					11.34
	134	5670	11.12					11.34

Note 1 : DCF = 10log(1 / X), X = On Time / On+Off time
Note 2 : Test Result = Measurement Data + DCF

▣ Measurement Data PLOTS

Output Power Test Mode: 802.11a & Ch.36

Output Power Test Mode: 802.11a & Ch.40

Output Power Test Mode: 802.11a & Ch.48

Output Power Test Mode: 802.11a & Ch.52

Output Power Test Mode: 802.11a & Ch.60

Output Power Test Mode: 802.11a & Ch.64

Output Power Test Mode: 802.11a & Ch.100

Output Power Test Mode: 802.11a & Ch.116

Output Power Test Mode: 802.11a & Ch.140

Output Power Test Mode: 802.11n HT20 & Ch.36

Output Power Test Mode: 802.11n HT20 & Ch.40

Output Power Test Mode: 802.11n HT20 & Ch.48

Output Power Test Mode: 802.11n HT20 & Ch.52

Output Power Test Mode: 802.11n HT20 & Ch.60

Output Power Test Mode: 802.11n HT20 & Ch.64

Output Power Test Mode: 802.11n HT20 & Ch.100

Output Power Test Mode: 802.11n HT20 & Ch.116

Output Power Test Mode: 802.11n HT20 & Ch.140

Output Power Test Mode: 802.11n HT40 & Ch.38

Output Power Test Mode: 802.11n HT40 & Ch.46

Output Power Test Mode: 802.11n HT40 & Ch.54

Output Power Test Mode: 802.11n HT40 & Ch.62

Output Power Test Mode: 802.11n HT40 & Ch.102

Output Power Test Mode: 802.11n HT40 & Ch.110

Output Power Test Mode: 802.11n HT40 & Ch.134

3.2.3 Peak Power Spectral Density

Test requirements

(1) For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1MHz band.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

- Peak Power Spectral Density Limit Calculation

Band	Limit [dBm]	ANT Gain [dBi]	Determined Limit [dBm]
Band I	4	-5.911	4
Band II	11	-3.305	11
Band III	11	-0.431	11

▣ **TEST CONFIGURATION**

Refer to the APPENDIX I.

▣ **TEST PROCEDURE**

Peak Power Spectral Density is measured using Measurement Procedure **of KDB789033**

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section C)3) for measuring maximum conducted output power using a spectrum analyzer: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2) Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
3) Make the following adjustments to the peak value of the spectrum, if applicable:
a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum.
b) If Method SA-3 Alternative was used and the linear mode was used in step C)3)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4) The result is the PPSD.

▣ **TEST RESULT : Comply**

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Test Result [dBm]
				On Time[ms]	On+Off Time[ms]	X		
802.11a	36	5180	0.230	2.04	2.14	0.95	0.22	0.450
	40	5200	-0.284					-0.064
	48	5240	0.693					0.913
	52	5260	1.288	2.03	2.13	0.95	0.22	1.508
	60	5300	1.471					1.691
	64	5320	1.796					2.016
	100	5500	0.909	2.03	2.13	0.95	0.22	1.129
	116	5580	1.630					1.850
	140	5700	1.326					1.546

Mode	Channel	Frequency [MHz]	Reading [dBm]	Duty Cycle			DCF [dB]	Test Result [dBm]
				On Time[ms]	On+Off Time[ms]	X		
802.11n (20MHz)	36	5180	-1.570	1.90	2.00	0.95	0.22	-1.350
	40	5200	-1.301					-1.081
	48	5240	-0.664					-0.444
	52	5260	-0.061	1.89	1.99	0.95	0.22	0.159
	60	5300	-0.008					0.212
	64	5320	0.105					0.325
	100	5500	0.032	1.89	1.99	0.95	0.22	0.252
	116	5580	-0.265					-0.045
	140	5700	-0.638					-0.418
802.11n (40MHz)	38	5190	-3.341	0.93	0.98	0.95	0.22	-3.121
	46	5230	-2.360					-2.140
	54	5270	-2.304	0.93	0.98	0.95	0.22	-2.084
	62	5310	-2.115					-1.895
	102	5510	-1.476	0.93	0.98	0.95	0.22	-1.256
	110	5550	-2.483					-2.263
	134	5670	-2.473					-2.253

Note 1 : DCF = 10log(1 / X), X = On Time / On+Off time
Note 2 : Test Result = Measurement Data + DCF

▣ Measurement Data PLOTS

Peak Power Spectral Density Test Mode: 802.11a & Ch.36

Peak Power Spectral Density Test Mode: 802.11a & Ch.40

Peak Power Spectral Density Test Mode: 802.11a & Ch.48

Peak Power Spectral Density Test Mode: 802.11a & Ch.52

Peak Power Spectral Density Test Mode: 802.11a & Ch.60

Peak Power Spectral Density Test Mode: 802.11a & Ch.64

Peak Power Spectral Density Test Mode: 802.11a & Ch.100

Peak Power Spectral Density Test Mode: 802.11a & Ch.116

Peak Power Spectral Density Test Mode: 802.11a & Ch.140

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.36

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.40

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.48

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.52

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.60

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.64

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.100

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.116

Peak Power Spectral Density Test Mode: 802.11n HT20 & Ch.140

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.38

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.46

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.54

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.62

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.102

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.110

Peak Power Spectral Density Test Mode: 802.11n HT40 & Ch.134

3.2.4 Peak Excursion Ratio

Test requirements

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed **13 dB/MH**z.

▣ **TEST CONFIGURATION**

Refer to the APPENDIX I.

▣ **TEST PROCEDURE**

Peak Excursion Ratio is measured using Measurement Procedure **of KDB789033**

1) Compliance with the peak excursion requirement of Section 15.407(a)(6) shall be demonstrated by confirming that the ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum for continuous transmission does not exceed 13 dB. (Earlier procedures that required computing the ratio of the two spectra at each frequency across the emission bandwidth can lead to unintended failures at band edges and will no longer be required.)
2) Set the spectrum analyzer span to view the entire emission bandwidth.
3) Find the maximum of the peak-max-hold spectrum.
   a) Set **RBW = 1 MHz.**
   b) **VBW ≥ 3 MHz**.
   c) **Detector = peak.**
   d) **Trace mode = max-hold.**
   e) Allow the sweeps to continue until the trace stabilizes.
   f) Use the peak search function to find the peak of the spectrum.
4) **Use the procedure found under E) to measure the PPSD.**
5) Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

▣ **TEST RESULT : Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [dB/MHz]	Limit [dB/MHz]
802.11a	Band I	36	5180	8.496	13.000
		40	5200	8.920	
		48	5240	9.331	
	Band II	52	5260	9.174	
		60	5300	8.344	
		64	5320	8.513	
	Band III	100	5500	8.750	
		116	5580	8.803	
		140	5700	8.393	
802.11n (20MHz)	Band I	36	5180	8.348	
		40	5200	7.905	
		48	5240	8.407	
	Band II	52	5260	8.991	
		60	5300	9.472	
		64	5320	9.296	
	Band III	100	5500	9.038	
		116	5580	8.639	
		140	5700	8.792	
802.11n (40MHz)	Band I	38	5190	7.893	
		46	5230	8.958	
	Band II	54	5270	8.425	
		62	5310	8.831	
	Band III	102	5510	9.036	
		110	5550	9.209	
		134	5670	8.316	

▣ Measurement Data PLOTS

Peak Excursion Ratio Test Mode: 802.11a & Ch.36

Peak Excursion Ratio Test Mode: 802.11a & Ch.40

Peak Excursion Ratio Test Mode: 802.11a & Ch.48

Peak Excursion Ratio Test Mode: 802.11a & Ch.52

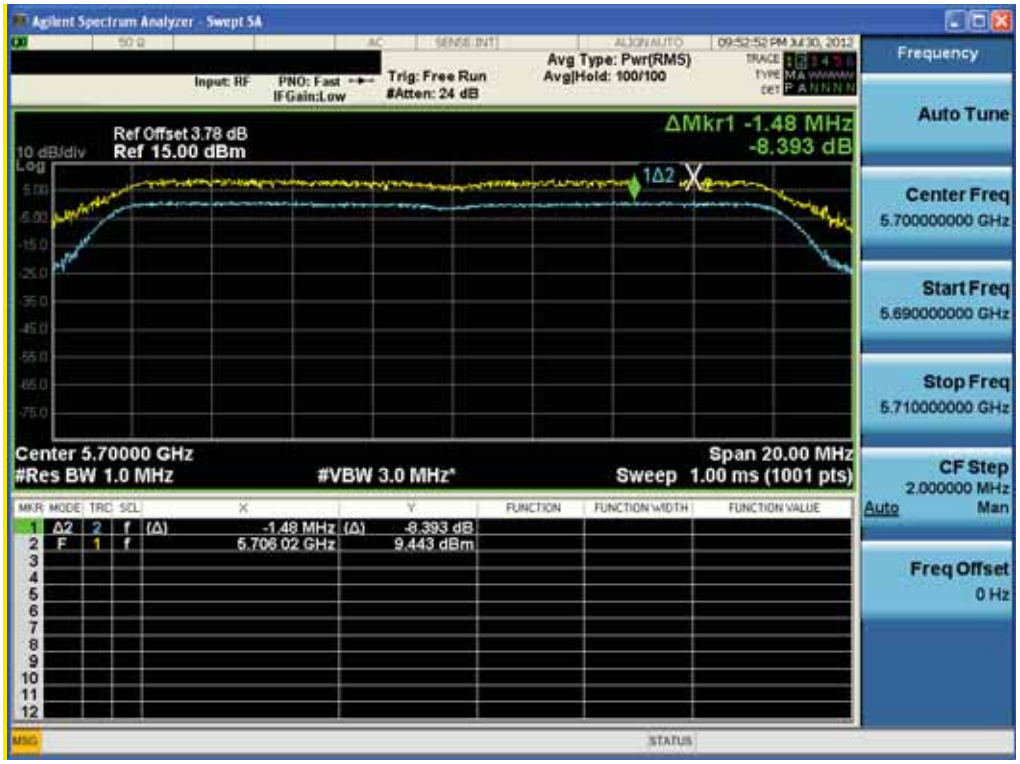
Peak Excursion Ratio Test Mode: 802.11a & Ch.60

Peak Excursion Ratio Test Mode: 802.11a & Ch.64

Peak Excursion Ratio Test Mode: 802.11a & Ch.100

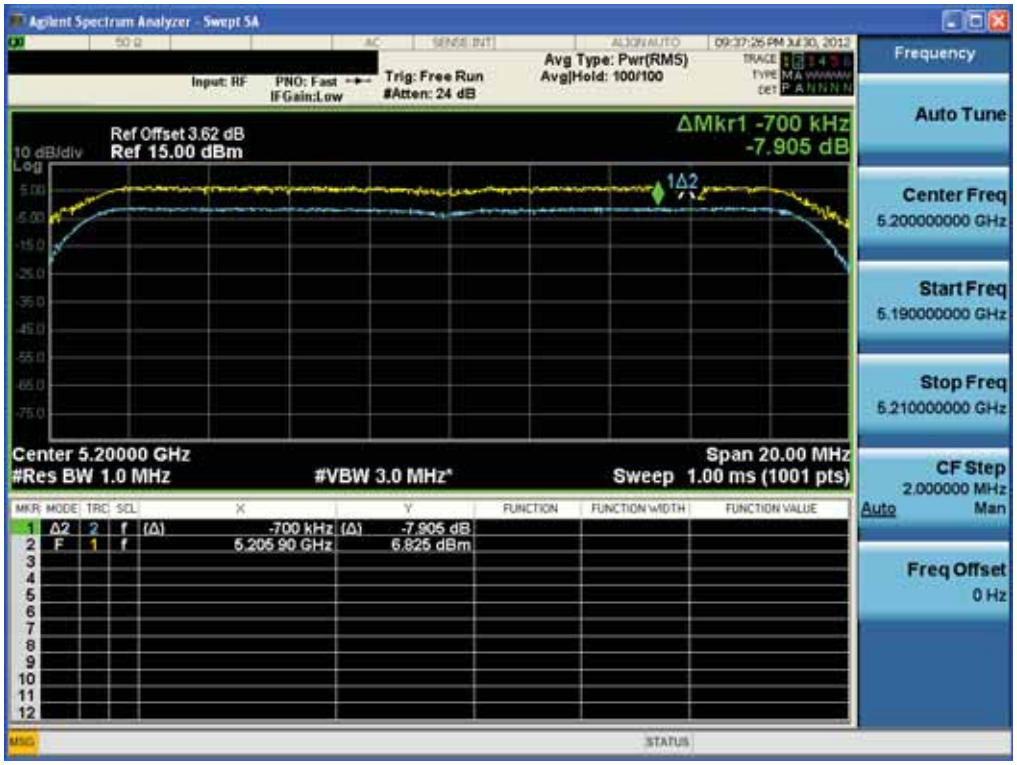
Peak Excursion Ratio Test Mode: 802.11a & Ch.116

Peak Excursion Ratio Test Mode: 802.11a & Ch.140



Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.36

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.40



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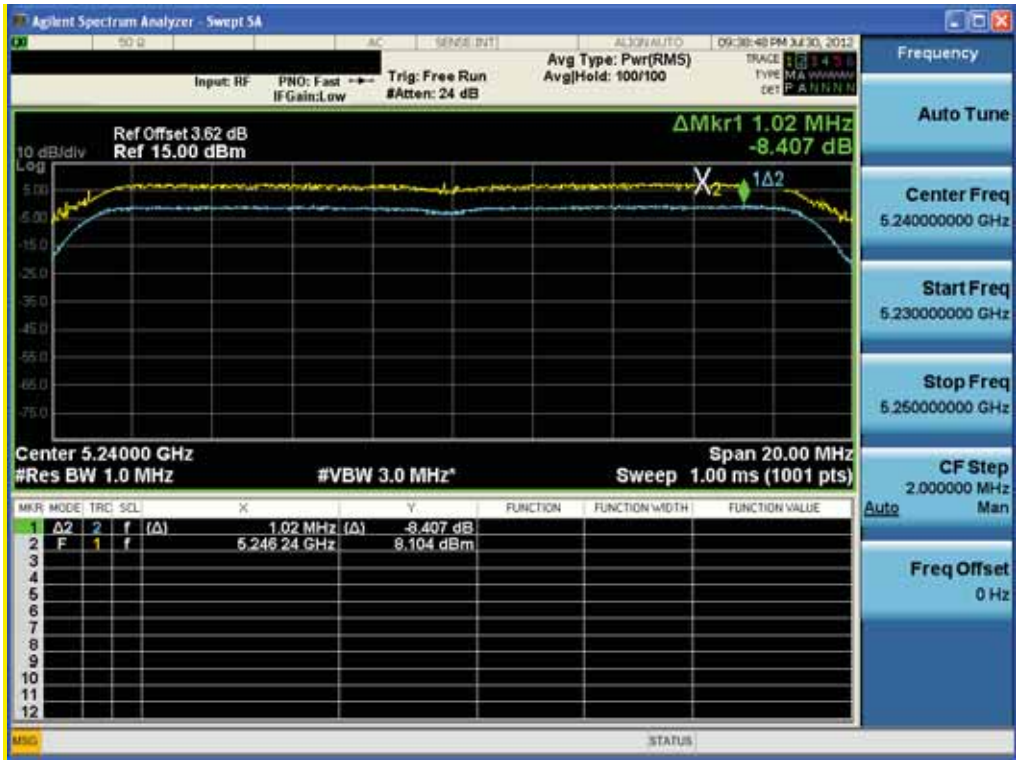
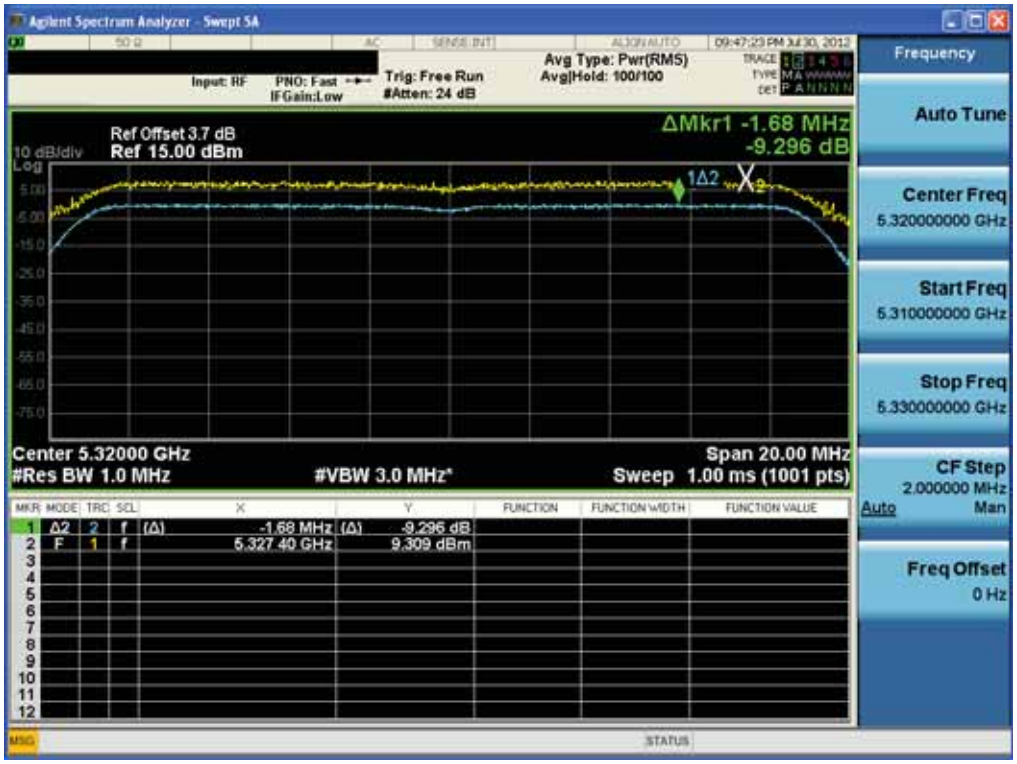


Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.52

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.60

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.64



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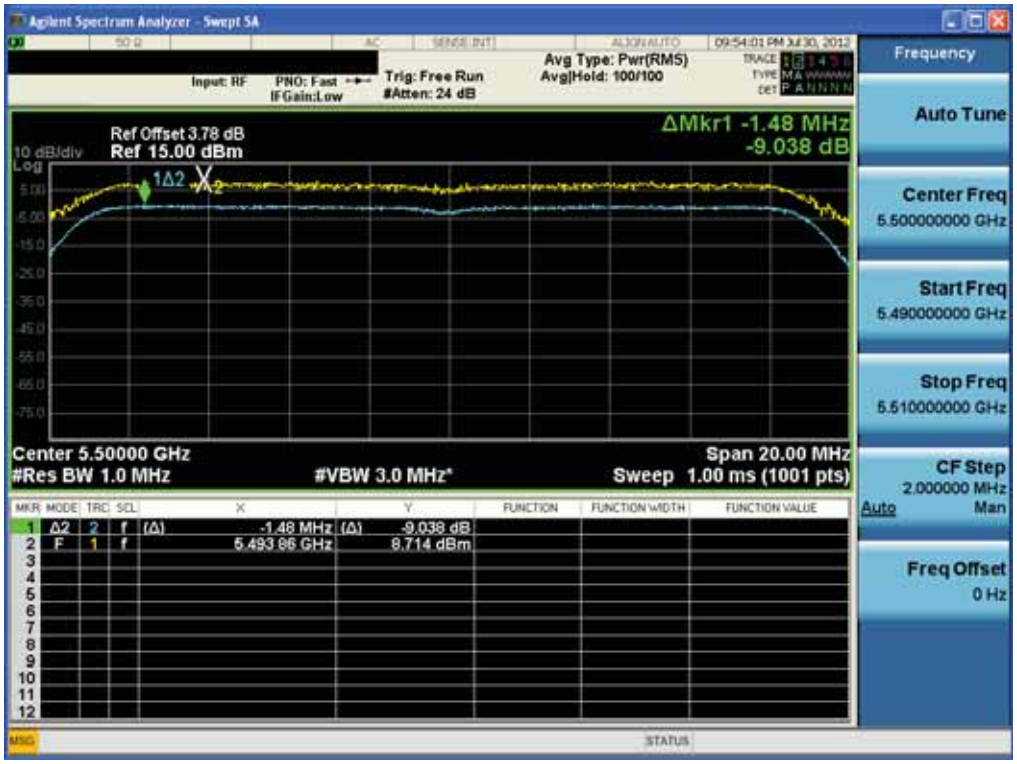
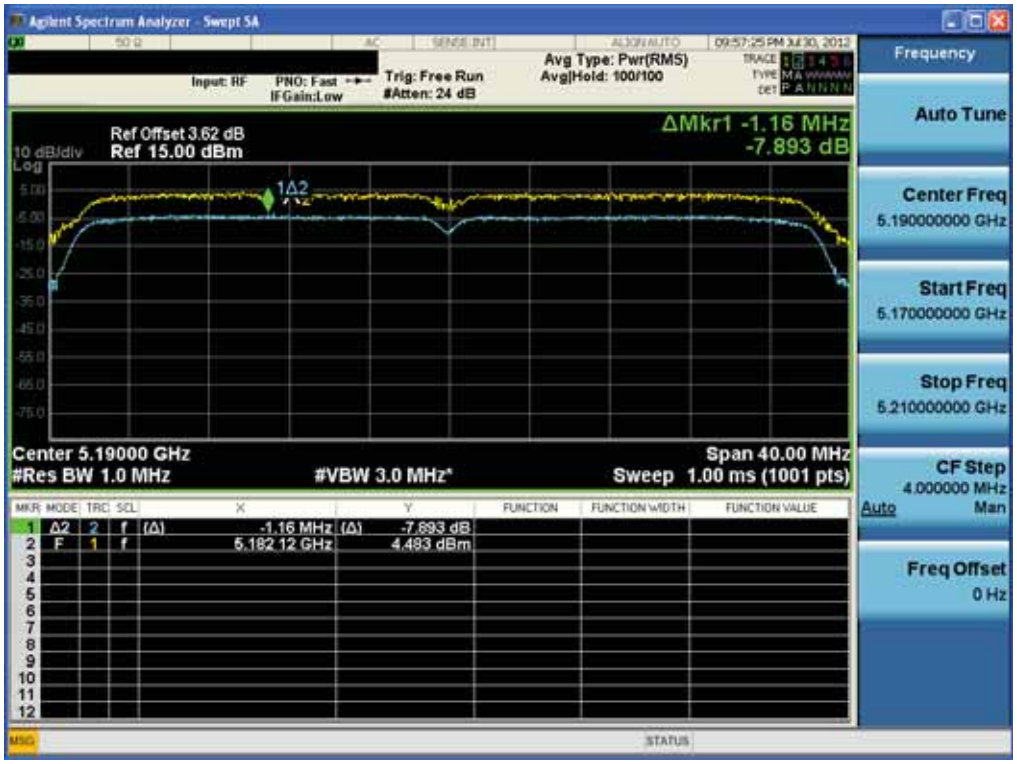


Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.116

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.140

Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.38



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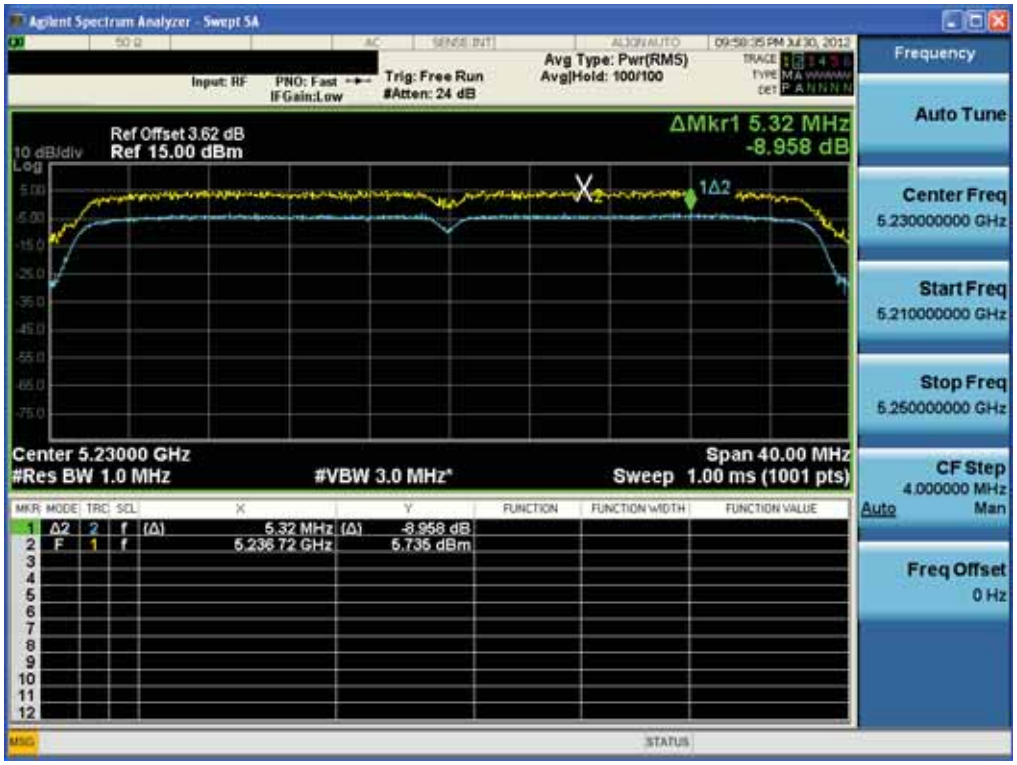
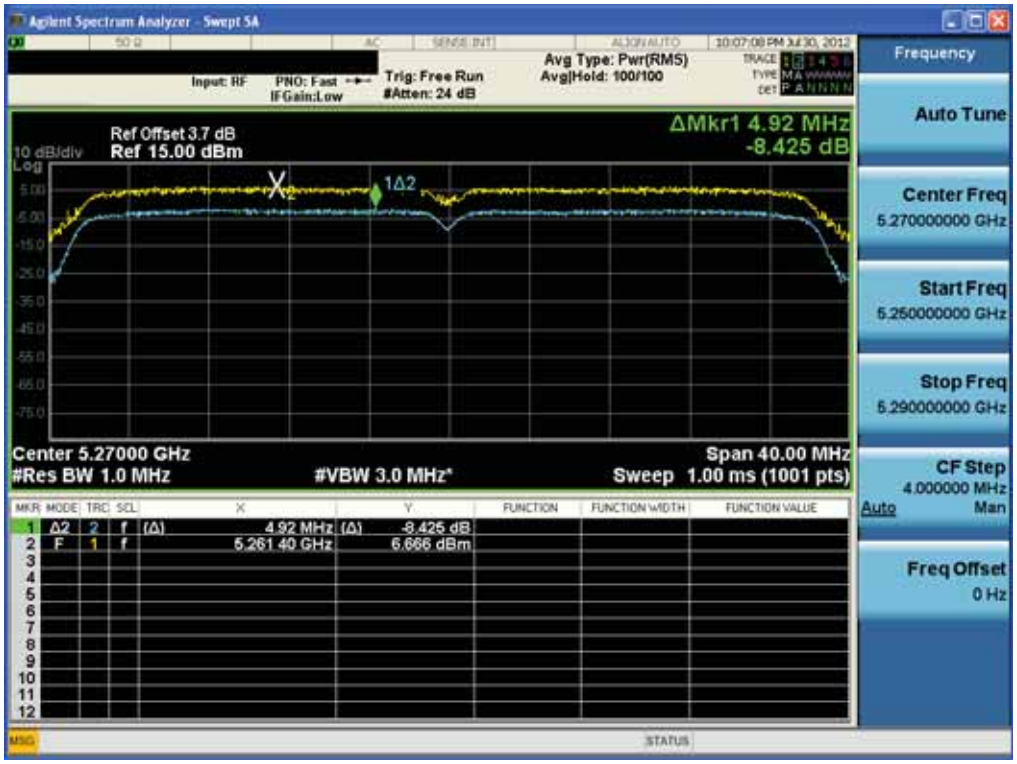


Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.54



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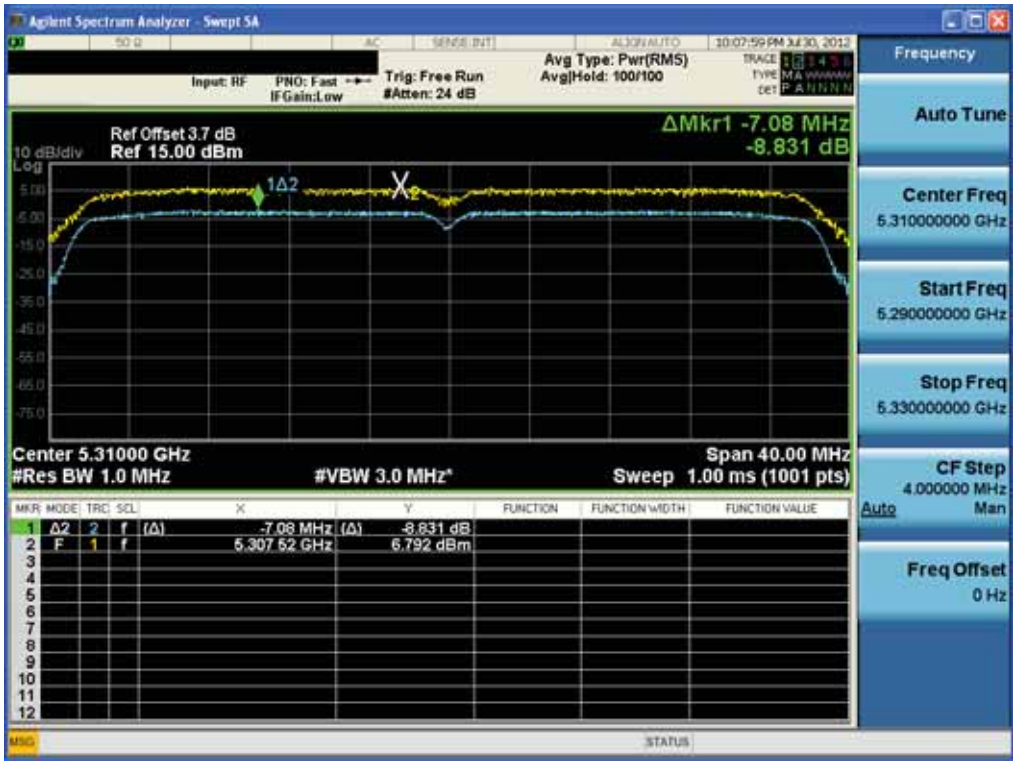
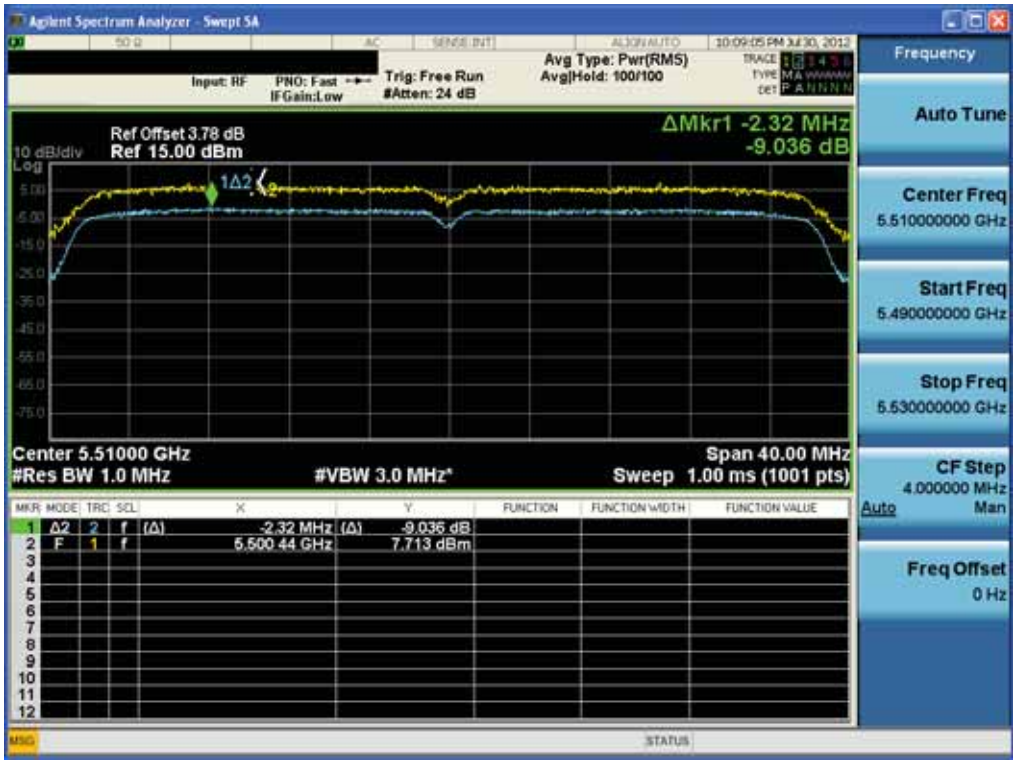
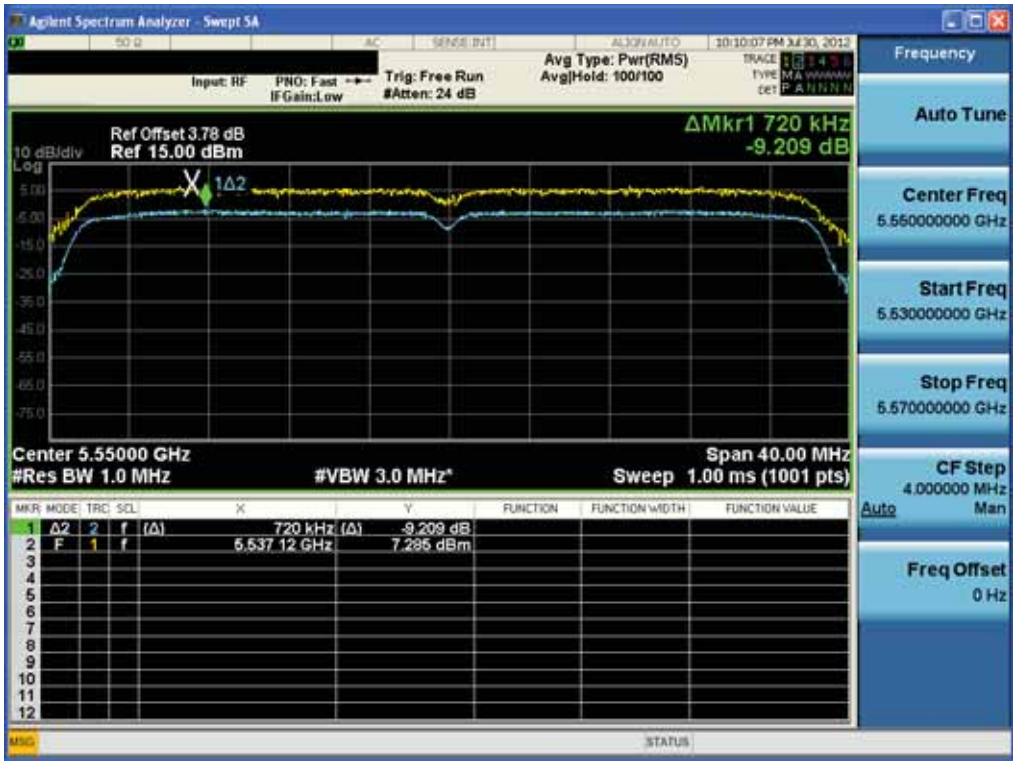


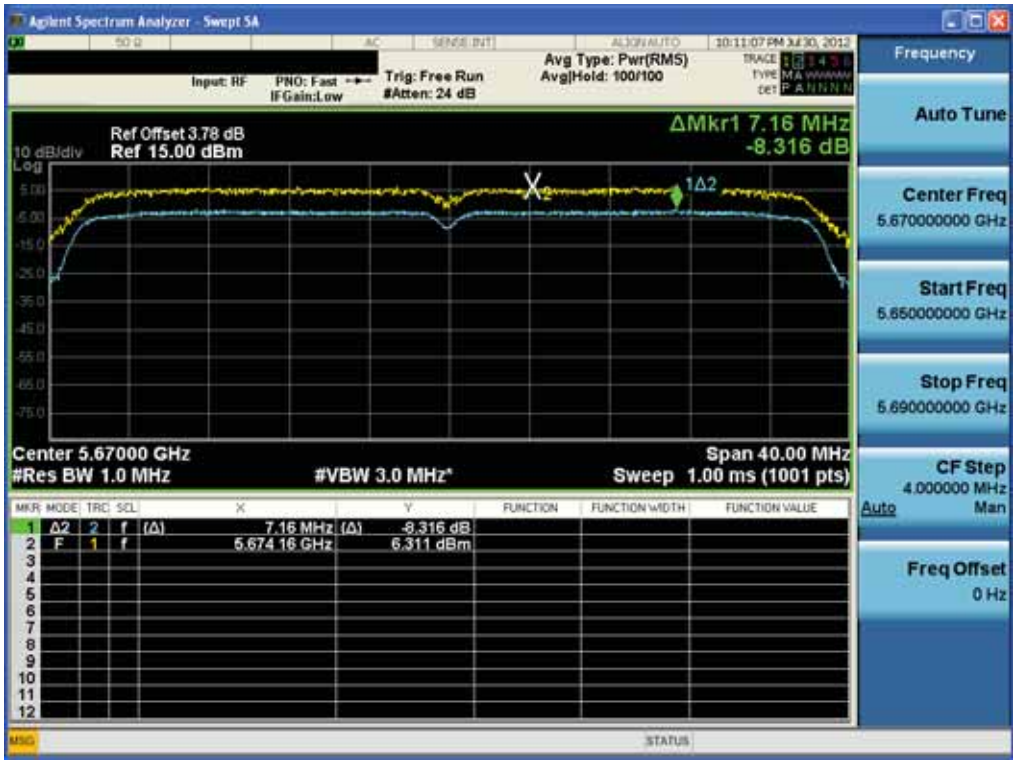
Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.102



Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.110



Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.134



3.2.5 Frequency Stability

Test requirements

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

▣ **TEST PROCEDURE**

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -30℃ and +50℃. The temperature was incremented by 10℃ intervals and the unit was allowed to stabilize at each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

▣ **TEST RESULT : Comply**

- Measurement Data:

OPERATING FREQUENCY : 5,180,000,000 Hz
CHANNEL : 36
REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,180,032,742	0.000632
100%		-30	5,180,064,083	0.001237
100%		-20	5,180,042,047	0.000812
100%		-10	5,180,023,011	0.000444
100%		0	5,180,014,032	0.000271
100%		+10	5,180,017,202	0.000332
100%		+20	5,180,019,403	0.000375
100%		+30	5,180,020,202	0.000390
100%		+40	5,180,021,893	0.000423
100%		+50	5,180,022,640	0.000437
100%		+60	5,180,024,209	0.000467
85%	3.230	+25	5,180,032,893	0.000635
115%	4.370	+25	5,180,032,331	0.000624
BATT.ENDPOINT	3.200	+25	5,180,032,667	0.000631

- Minimum Standard: The emission is maintained within the band of the operation.

- Measurement Data:

OPERATING FREQUENCY : 5,260,000,000 Hz

CHANNEL : 52

REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,260,031,441	0.000598
100%		-30	5,260,059,072	0.001123
100%		-20	5,260,030,871	0.000587
100%		-10	5,260,018,574	0.000353
100%		0	5,260,014,385	0.000273
100%		+10	5,260,018,242	0.000347
100%		+20	5,260,019,543	0.000372
100%		+30	5,260,020,111	0.000382
100%		+40	5,260,021,487	0.000408
100%		+50	5,260,022,432	0.000426
100%		+60	5,260,024,204	0.000460
85%	3.230	+25	5,260,031,899	0.000606
115%	4.370	+25	5,260,031,104	0.000591
BATT.ENDPOINT	3.200	+25	5,260,031,674	0.000602

- Minimum Standard: The emission is maintained within the band of the operation.

- Measurement Data:

OPERATING FREQUENCY : 5,500,000,000 Hz

CHANNEL : 100

REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,500,031,242	0.000568
100%		-30	5,500,042,710	0.000777
100%		-20	5,500,024,359	0.000443
100%		-10	5,500,031,810	0.000578
100%		0	5,500,016,378	0.000298
100%		+10	5,500,020,337	0.000370
100%		+20	5,500,022,108	0.000402
100%		+30	5,500,022,875	0.000416
100%		+40	5,500,024,558	0.000447
100%		+50	5,500,026,358	0.000479
100%		+60	5,500,027,876	0.000507
85%	3.230	+25	5,500,031,943	0.000581
115%	4.370	+25	5,500,031,820	0.000579
BATT.ENDPOINT	3.200	+25	5,500,031,802	0.000578

- Minimum Standard: The emission is maintained within the band of the operation.

3.2.6 Radiated Spurious Emission Measurements

▣ TEST PROCEDURE

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in semi anechoic chamber. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine the worst-case orientation for maximum emissions.

Radiated spurious emission measured using following Measurement Procedure **of KDB789033**

- **Measurements Below 1000MHz**

a) Follow the requirements in section G)3), "General Requirements for Unwanted Emissions Measurements"
b) Compliance shall be demonstrated using **CISPR quasi-peak detection**; however, **peak detection** is permitted as an alternative to quasi-peak detection.

G)3), General Requirements for Unwanted Emissions Measurements. The following requirements apply to all unwanted emissions measurements, both in and outside of the restricted bands:

a) EUT Duty Cycle

(1) The EUT shall be configured or modified to **transmit continuously** except as stated in (ii), below. The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (**to no lower than 98 percent**) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

(2) If **continuous transmission (or at least 98 percent duty cycle) cannot be achieved** due to hardware limitations of the EUT (e.g., overheating), the following additions to the measurement and reporting procedures are required:

- The EUT shall be configured to operate at the maximum achievable duty cycle.
- Measure the duty cycle, x, of the transmitter output signal.
- Adjustments to measurement procedures (e.g., increasing test time and number of traces averaged) shall be performed as described in the procedures below.
- The test report shall include the following additional information:
  - The reason for the duty cycle limitation.
  - The duty cycle achieved for testing and the associated transmit duration and interval between transmissions.
  - The sweep time and the amount of time used for trace stabilization during max-hold measurements for peak emission measurements.

(3) **Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.**

- **Measurements Above 1000MHz (Peak)**

a) Follow the requirements in section G)3), “General Requirements for Unwanted Emissions Measurements”.
b) Peak emission levels are measured by setting the analyzer as follows:
(1) **RBW = 1 MHz**.
(2) **VBW ≥ 3 MHz**.
(3) **Detector = Peak.**
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately 1/x, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

- **Measurements Above 1000MHz (Method AD)**

(1) **RBW = 1 MHz.**
(2) **VBW ≥ 3 MHz.**
(3) **Detector = RMS**, if span/(# of points in sweep) ≤ RBW/2. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
(4) Averaging type = power (i.e., RMS)
• As an alternative, the detector and averaging type may be set for linear voltage averaging. Some analyzers require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
(5) Sweep time = auto.
(6) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of 1/x, where x is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces should be averaged.
(7) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
• If power averaging (RMS) mode was used in step (iv) above, the correction factor is 10 log(1/x), where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.
• **If linear voltage averaging mode was used in step (iv) above, the correction factor is 20 log(1/x), where x is the duty cycle.** For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.

▣ Minimum Standard:

▪ **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3600 ~ 4400	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240			
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▪ **FCC Part 15.407(b)(2)**

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 –27dBm/MHz.

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5180MHz(Ch. 36)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5127.600	V	Y	PK	44.3	3.08	-	-	47.38	74.00	26.62
5126.750	V	Y	AV	34.36	3.08	0.45	-	37.89	54.00	16.11
10359.945	V	X	PK	48.56	11.39	-	-	59.95	68.20	8.25

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5200MHz(Ch. 40)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10399.955	V	X	PK	47.78	11.98	-	-	59.76	68.20	8.44
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5240MHz(Ch. 48)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10480.000	V	X	PK	48.16	12.36	-	-	60.52	68.20	7.68
-	-	-	-	-	-	-	-	-	-	-

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5260MHz(Ch. 52)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10519.840	V	X	PK	48.8	12.40	-	-	61.20	68.20	7.00
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5300MHz(Ch. 60)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10599.905	V	X	PK	44.76	12.45	-	-	57.21	68.20	10.99
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5320MHz(Ch. 64)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5350.140	V	Y	PK	46.05	3.61	-	-	49.66	74.00	24.34
5350.330	V	Y	AV	33.61	3.61	0.45	-	37.67	54.00	16.33
10639.985	V	X	PK	43.54	12.53	-	-	56.07	74.00	17.93
10639.840	V	X	AV	37.43	12.53	0.45	-	50.41	54.00	3.59

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5500MHz(Ch. 100)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5447.040	V	Y	PK	44.18	3.85	-	-	48.03	74.00	25.97
5448.020	V	Y	AV	35.16	3.85	0.45	-	39.46	54.00	14.54
10999.865	V	X	PK	42.79	12.92	-	-	55.71	74.00	18.29
10999.800	V	X	AV	36.47	12.92	0.45	-	49.84	54.00	4.16

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5580MHz(Ch. 116)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11159.765	V	X	PK	42.53	13.61	-	-	56.14	74.00	17.86
11159.880	V	X	AV	34.89	13.61	0.45	-	48.95	54.00	5.05

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5700MHz(Ch. 140)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11399.890	V	X	PK	40.72	14.65	-	-	55.37	74.00	18.63
11399.895	V	X	AV	32.82	14.65	0.45	-	47.92	54.00	6.08

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5180MHz(Ch. 36)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5125.700	V	Y	PK	44.39	3.08	-	-	47.47	74.00	26.53
5126.000	V	Y	AV	34.18	3.08	0.45	-	37.71	54.00	16.29
10359.760	V	X	PK	47.45	11.39	-	-	58.84	68.20	9.36

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5200MHz(Ch. 40)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10399.640	V	X	PK	47.64	11.98	-	-	59.62	68.20	8.58
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5240MHz(Ch. 48)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10479.625	V	X	PK	48.55	12.36	-	-	60.91	68.20	7.29
-	-	-	-	-	-	-	-	-	-	-

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5260MHz(Ch. 52)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10519.915	V	X	PK	47.82	12.40	-	-	60.22	68.20	7.98
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5300MHz(Ch. 60)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10599.965	V	X	PK	44.29	12.45	-	-	56.74	68.20	11.46
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5320MHz(Ch. 64)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5351.240	V	Y	PK	44.24	3.61	-	-	47.85	74.00	26.15
5350.740	V	Y	AV	33.27	3.61	0.45	-	37.33	54.00	16.67
10639.800	V	X	PK	44.36	12.53	-		56.89	74.00	17.11
10639.805	V	X	AV	37.12	12.53	0.45		50.1	54.00	3.90

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5500MHz(Ch. 100)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5448.090	V	Y	PK	44.25	3.85	-	-	48.10	74.00	25.90
5447.600	V	Y	AV	35.11	3.85	0.45	-	39.41	54.00	14.59
10999.870	V	X	PK	43.22	12.92	-	-	56.14	74.00	17.86
10999.900	V	X	AV	36.94	12.92	0.45	-	50.31	54.00	3.69

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5580MHz(Ch. 116)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11159.780	V	X	PK	43.27	13.61	-	-	56.88	74.00	17.12
11159.890	V	X	AV	35.12	13.61	0.45	-	49.18	54.00	4.82

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5700MHz(Ch. 140)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11399.895	V	X	PK	41.44	14.65	-		56.09	74.00	17.91
11399.890	V	X	AV	33.92	14.65	0.45	-	49.02	54.00	4.98

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5190MHz(Ch. 38)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5148.950	V	Y	PK	46.22	3.42	-	-	49.64	74.00	24.36
5148.800	V	Y	AV	35.08	3.42	0.45	-	38.95	54.00	15.05
10379.625	V	Y	PK	48.16	11.39	-	-	59.55	68.20	8.65

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5230MHz(Ch. 46)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10459.730	V	X	PK	47.59	12.38	-	-	59.97	68.20	8.23
-	-	-	-	-	-	-	-	-	-	-

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5270MHz(Ch. 54)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
10539.635	V	X	PK	48.58	12.42	-	-	61.00	68.20	7.20
-	-	-	-	-	-	-	-	-	-	-

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5310MHz(Ch. 62)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5350.510	V	Y	PK	51.02	3.61	-	-	54.63	74.00	19.37
5350.240	V	Y	AV	36.81	3.61	0.45	-	40.87	54.00	13.13
10619.885	V	X	PK	43.82	12.42	-	-	56.24	74.00	17.76
10619.840	V	X	AV	37.5	12.42	0.45	-	50.37	54.00	3.63

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

▣ **Measurement Data:**

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5510MHz(Ch. 102)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5448.120	V	Y	PK	47.72	3.85	-	-	51.57	74.00	22.43
5448.020	V	Y	AV	33.92	3.85	0.45	-	38.22	54.00	15.78
11019.565	V	X	PK	40.57	13.08	-	-	53.65	74.00	20.35
11019.800	V	X	AV	34.82	13.08	0.45	-	48.35	54.00	5.65

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5550MHz(Ch. 110)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11100.050	V	X	PK	41.48	13.15	-	-	54.63	74.00	19.37
11099.945	V	X	AV	34.78	13.15	0.45	-	48.38	54.00	5.62

30MHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT40 & 5670MHz(Ch. 134)*

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector	Reading (dBuV)	T.F (dB/m)	DUTY Correction Factor (dB)	Distance Correction Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11339.355	V	X	PK	39.87	14.27	-	-	54.14	74.00	19.86
11339.850	V	X	AV	32.89	14.27	0.45	-	47.61	54.00	6.39

Note.

1. This test item was performed in each axis and the worst case data were reported.
2. Sample Calculation.
   Margin = Limit – Result
   Result = Reading + T.F + DUTY Correction Factor + Distance Correction Factor
   T.F = AF + CL – AG
   DUTY Correction Factor : 0.45 dB = 20*log(1/0.95) for Method AD.
3. Measurement Distance above 15 GHz = 1.5 m. So Distance Correction Factor : -6.02dB = 20*log(1.5m/3m)

3.2.7 AC Conducted Emissions

▣ **TEST PROCEDURE :**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode (AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

▣ **Measurement Data: Comply**

Note 1: See next pages for actual measured spectrum plots and data.

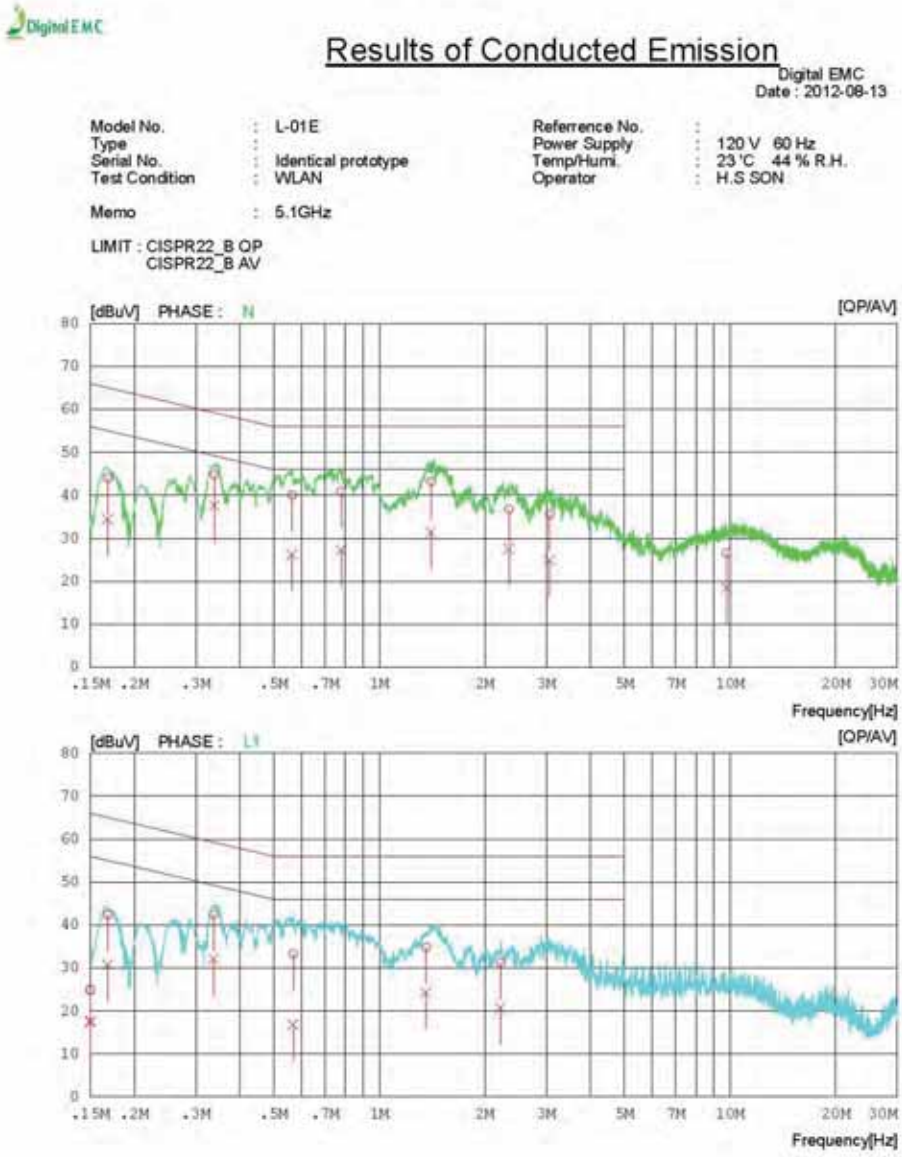
▣ **Minimum Standard: FCC Part 15.207(a)/EN 55022**

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

AC Line Conducted Emissions (Graph)

Test Mode: 802.11a_5.1G



AC Line Conducted Emissions (Data List)

Test Mode: 802.11a_5.1G

Results of Conducted Emission

Digital EMC
Date : 2012-08-13

Model No.	: L-01E	Referrence No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 23 'C 44 % R.H.
Test Condition	: WLAN	Operator	: H.S SON

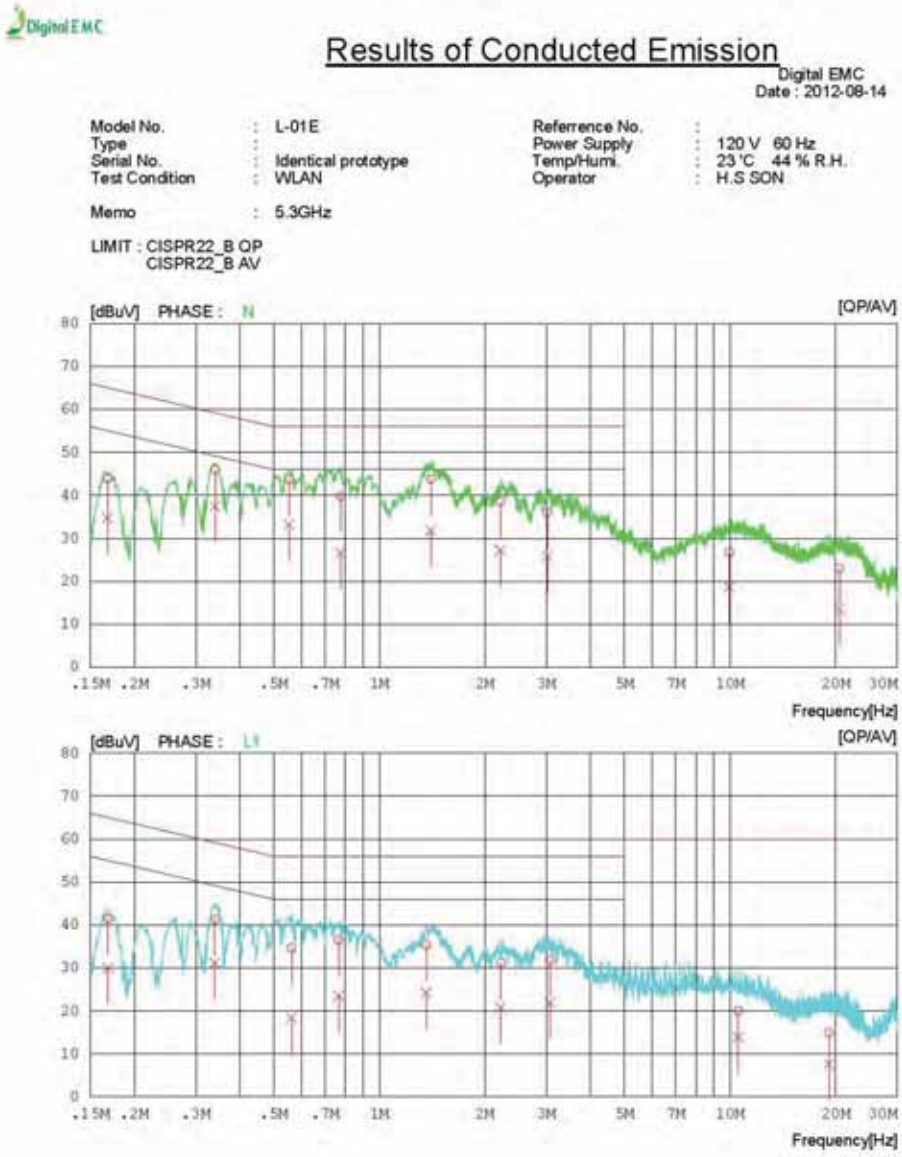
Memo : 5.1GHz

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16834	43.8	34.2	0.2	44.0	34.4	65.0	55.0	21.0	20.6	N
2	0.33879	44.5	37.3	0.3	44.8	37.6	59.2	49.2	14.4	11.6	N
3	0.56465	39.8	26.0	0.2	40.0	26.2	56.0	46.0	16.0	19.8	N
4	0.77914	40.6	27.1	0.2	40.8	27.3	56.0	46.0	15.2	18.7	N
5	1.40600	42.9	31.1	0.3	43.2	31.4	56.0	46.0	12.8	14.6	N
6	2.34450	36.4	27.3	0.3	36.7	27.6	56.0	46.0	19.3	18.4	N
7	3.05950	35.2	24.5	0.4	35.6	24.9	56.0	46.0	20.4	21.1	N
8	9.77150	25.9	17.7	0.7	26.6	18.4	60.0	50.0	33.4	31.6	N
9	0.15000	24.6	17.2	0.3	24.9	17.5	66.0	56.0	41.1	38.5	L1
10	0.15000	24.6	17.2	0.3	24.9	17.5	66.0	56.0	41.1	38.5	L1
11	0.15001	24.7	17.4	0.3	25.0	17.7	66.0	56.0	41.0	38.3	L1
12	0.16813	42.2	30.5	0.2	42.4	30.7	65.1	55.1	22.7	24.4	L1
13	0.33708	42.2	31.8	0.3	42.5	32.1	59.3	49.3	16.8	17.2	L1
14	0.56831	33.1	16.6	0.2	33.3	16.8	56.0	46.0	22.7	29.2	L1
15	1.35900	34.6	24.0	0.3	34.9	24.3	56.0	46.0	21.1	21.7	L1
16	2.21750	30.9	20.4	0.3	31.2	20.7	56.0	46.0	24.8	25.3	L1

AC Line Conducted Emissions (Graph)

Test Mode: 802.11a_5.3G



AC Line Conducted Emissions (Data List)

Test Mode: 802.11a_5.3G

Results of Conducted Emission

Digital EMC
Date : 2012-08-14

Model No.	: L-01E	Referrence No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 23 'C 44 % R.H.
Test Condition	: WLAN	Operator	: H.S SON

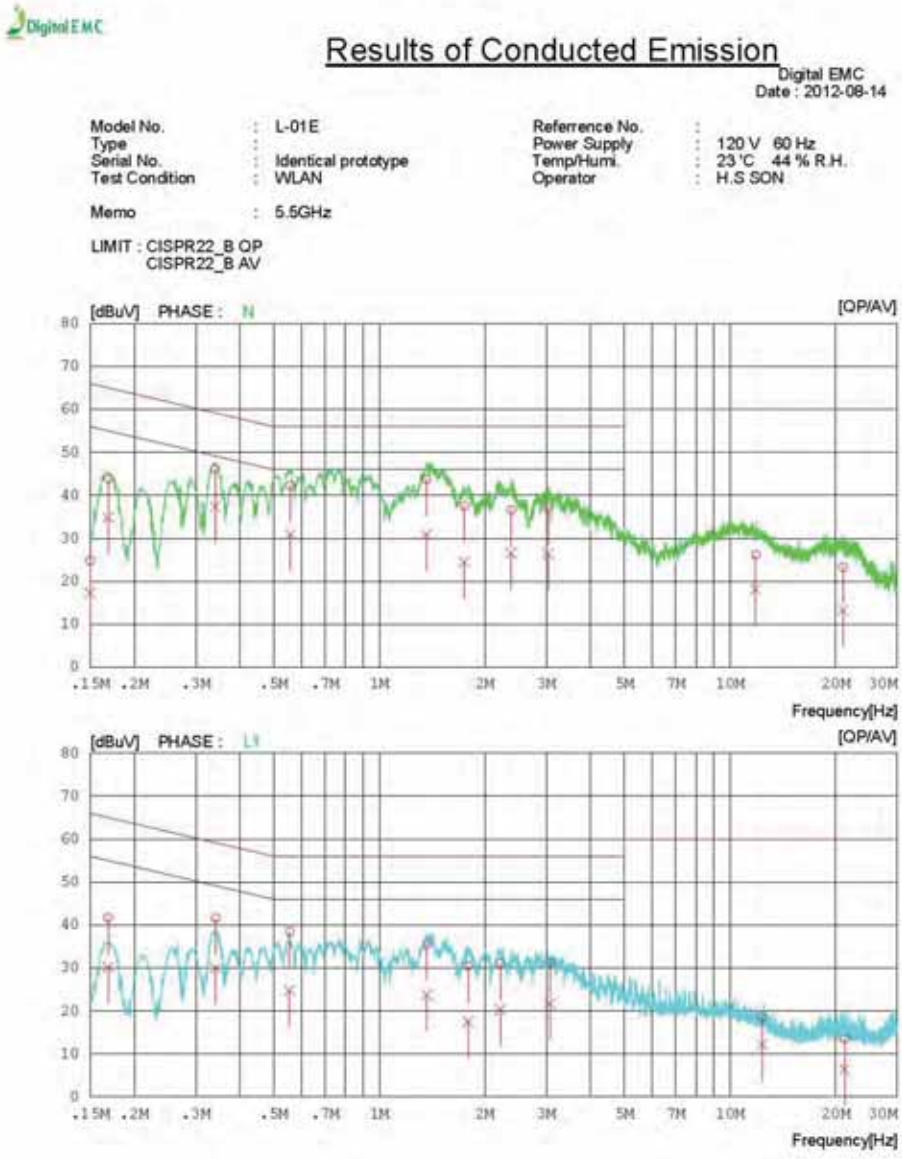
Memo : 5.3GHz

LIMIT : CISPR22_B QP
CISPR22_B AV

NO.	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16820	43.7	34.6	0.2	43.9	34.8	65.0	55.0	21.1	20.2	N
2	0.34064	45.7	37.1	0.3	46.0	37.4	59.2	49.2	13.2	11.8	N
3	0.55349	43.5	33.0	0.2	43.7	33.2	56.0	46.0	12.3	12.8	N
4	0.77625	39.6	26.4	0.2	39.8	26.6	56.0	46.0	16.2	19.4	N
5	1.40500	43.5	31.4	0.3	43.8	31.7	56.0	46.0	12.2	14.3	N
6	2.21300	38.2	26.9	0.3	38.5	27.2	56.0	46.0	17.5	18.8	N
7	3.01650	35.6	25.4	0.4	36.0	25.8	56.0	46.0	20.0	20.2	N
8	9.95500	26.0	17.9	0.7	26.7	18.6	60.0	50.0	33.3	31.4	N
9	20.50850	21.8	12.4	1.2	23.0	13.6	60.0	50.0	37.0	36.4	N
10	0.16835	41.2	29.8	0.2	41.4	30.0	65.0	55.0	23.6	25.0	L1
11	0.34001	41.0	30.9	0.3	41.3	31.2	59.2	49.2	17.9	18.0	L1
12	0.56274	34.4	18.2	0.2	34.6	18.4	56.0	46.0	21.4	27.6	L1
13	0.76578	36.3	23.3	0.2	36.5	23.5	56.0	46.0	19.5	22.5	L1
14	1.36150	35.1	24.0	0.3	35.4	24.3	56.0	46.0	20.6	21.7	L1
15	2.22050	30.9	20.6	0.3	31.2	20.9	56.0	46.0	24.8	25.1	L1
16	3.06800	31.4	21.6	0.4	31.8	22.0	56.0	46.0	24.2	24.0	L1
17	10.56600	19.2	13.0	0.8	20.0	13.8	60.0	50.0	40.0	36.2	L1
18	19.15100	13.7	6.5	1.2	14.9	7.7	60.0	50.0	45.1	42.3	L1

AC Line Conducted Emissions (Graph)

Test Mode: 802.11a_5.5G



AC Line Conducted Emissions (Data List)

Test Mode: 802.11a_5.5G

Results of Conducted Emission

Digital EMC
Date : 2012-08-14

Model No.	: L-01E	Referrence No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 23 'C 44 % R.H.
Test Condition	: WLAN	Operator	: H.S SON

Memo : 5.5GHz

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15001	24.5	16.9	0.3	24.8	17.2	66.0	56.0	41.2	38.8	N
2	0.15000	24.4	16.9	0.3	24.7	17.2	66.0	56.0	41.3	38.8	N
3	0.16888	43.7	34.7	0.2	43.9	34.9	65.0	55.0	21.1	20.1	N
4	0.34071	45.8	37.1	0.3	46.1	37.4	59.2	49.2	13.1	11.8	N
5	0.55779	42.0	30.7	0.2	42.2	30.9	56.0	46.0	13.8	15.1	N
6	1.36300	43.5	30.6	0.3	43.8	30.9	56.0	46.0	12.2	15.1	N
7	1.74950	37.3	24.3	0.3	37.6	24.6	56.0	46.0	18.4	21.4	N
8	2.37750	36.3	26.3	0.3	36.6	26.6	56.0	46.0	19.4	19.4	N
9	3.02850	36.6	26.0	0.4	37.0	26.4	56.0	46.0	19.0	19.6	N
10	11.83150	25.4	17.3	0.8	26.2	18.1	60.0	50.0	33.8	31.9	N
11	21.01950	22.1	12.0	1.2	23.3	13.2	60.0	50.0	36.7	36.8	N
12	0.16853	41.5	30.0	0.2	41.7	30.2	65.0	55.0	23.3	24.8	L1
13	0.34158	41.3	29.7	0.3	41.6	30.0	59.2	49.2	17.6	19.2	L1
14	0.55506	38.3	24.7	0.2	38.5	24.9	56.0	46.0	17.5	21.1	L1
15	1.36750	35.3	23.5	0.3	35.6	23.8	56.0	46.0	20.4	22.2	L1
16	1.79000	30.2	17.2	0.3	30.5	17.5	56.0	46.0	25.5	28.5	L1
17	2.21450	30.8	20.0	0.3	31.1	20.3	56.0	46.0	24.9	25.7	L1
18	3.07600	31.0	21.4	0.4	31.4	21.8	56.0	46.0	24.6	24.2	L1
19	12.36750	17.8	11.3	0.8	18.6	12.1	60.0	50.0	41.4	37.9	L1
20	21.27300	12.4	5.2	1.2	13.6	6.4	60.0	50.0	46.4	43.6	L1

3.2.8 Antenna Requirements

▣ **Procedure:**

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

▣ **Conclusion:** **Comply**

The internal antenna is attached on the main PCB using the special spring tension. (Refer to Internal Photo file.)

▣ **Minimum Standard:**

> An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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.

3.2.9 Occupied Bandwidth

▣ **TEST Requirements**

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured

▣ **TEST CONFIGURATION**

▣ **TEST PROCEDURE :**

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual

▣ **TEST RESULT : N/T**

Minimum Standard : N/A

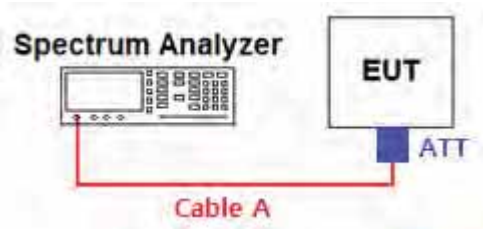
▣ **RESULT PLOT : N/T**

4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
Spectrum Analyzer	Rohde Schwarz	FSQ26	12/01/09	13/01/09	200445
Harmonic Mixer	OML	M28HWD	12/02/06	13/02/06	Ka100224-1
Digital Multimeter	H.P	34401A	12/03/05	13/03/05	3146A13475, US36122178
Spectrum Analyzer	Agilent	N9020A	12/01/09	13/01/09	MY49100833
Signal Generator	Rohde Schwarz	SMR20	12/03/05	13/03/05	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	12/01/09	13/01/09	100148
Thermo hygrometer	BODYCOM	BJ5478	12/01/13	13/01/13	090205-2
DC Power Supply	HP	6622A	12/03/05	13/03/05	3448A03760
High-Pass Filter	Wainwright	WHKX8.5	11/09/19	12/09/19	1
BILOG ANTENNA	SCHAFFNER	CBL6112D	10/12/21	12/12/21	2737
HORN ANT	ETS	3115	12/02/20	13/02/20	6419
HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
Attenuator (3dB)	WEINSCHEL	56-3	11/09/30	12/09/30	Y2342
Amplifier (22dB)	H.P	8447E	12/01/09	13/01/09	2945A02865
Amplifier (30dB)	Agilent	8449B	12/03/05	13/03/05	3008A01590
EMI TEST RECEIVER	R&S	ESU	12/03/05	13/03/05	100014
RFI/Field intensity Meter	KYORITSU	KNM-2402	12/07/02	13/07/02	4N-170-3
Spectrum Analyzer	H/P	8591E	12/03/05	13/03/05	3649A05889
CVCF	NF	4420	11/09/15	12/09/15	3049354420023
Artificial Mains Network	Narda S.T.S. / PMM	PMM L2-16B	12/03/13	13/03/13	000WX20305
LISN	R&S	ESH2-Z5	11/09/30	12/09/30	8287391006
10dB Attenuator	Aeroflex/Weinschel	86-10-11	11/09/30	12/09/30	408

APPENDIX I
Conducted Test set up Diagram & Path loss Information

- **Conducted Measurement**



Path loss value information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
5.180 ~ 5.240	3.62	5.500 ~ 5.700	3.78
5.260 ~ 5.320	3.70	-	-

Note. 1: The path loss from EUT to Spectrum analyzer was measured and used for test.
Path loss (=S/A's offset value) = Cable A + ATT (Attenuator, Applied only when it was used externally)