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 F) 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	7.937	13.000
		40	5200	8.241	
		48	5240	8.212	
	Band II	52	5260	8.496	
		56	5280	8.055	
		64	5320	8.293	
	Band III	100	5500	8.241	
		116	5580	8.393	
		140	5700	8.468	
802.11n (20MHz)	Band I	36	5180	8.460	
		40	5200	8.041	
		48	5240	7.839	
	Band II	52	5260	8.063	
		56	5280	8.715	
		64	5320	8.638	
	Band III	100	5500	8.660	
		116	5580	8.217	
		140	5700	8.436	
802.11n (40MHz)	Band I	38	5190	7.860	
		46	5230	7.811	
	Band II	54	5270	7.966	
		62	5310	8.369	
	Band III	102	5510	8.141	
		110	5550	8.567	
		134	5670	8.249	

▣ 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.56

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

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.48

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

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.56

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

Peak Excursion Ratio Test Mode: 802.11n HT20 & Ch.100

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

Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.46

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

Peak Excursion Ratio Test Mode: 802.11n HT40 & Ch.62

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 : 5,200,000,000 Hz
CHANNEL : 40
REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,199,986,423	-0.000261
100%		-30	5,200,021,022	0.000404
100%		-20	5,200,016,945	0.000326
100%		-10	5,200,005,734	0.000110
100%		0	5,199,996,577	-0.000066
100%		+10	5,199,994,467	-0.000106
100%		+20	5,199,985,623	-0.000276
100%		+30	5,199,983,467	-0.000318
100%		+40	5,199,980,231	-0.000380
100%		+50	5,199,980,334	-0.000378
100%		+60	5,199,976,785	-0.000446
85%	3.230	+25	5,199,981,145	-0.000363
115%	4.370	+25	5,199,983,022	-0.000327
BATT.ENDPOINT	3.200	+25	5,199,980,135	-0.000382

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

- Measurement Data:

OPERATING FREQUENCY : 5,280,000,000 Hz

CHANNEL : 56

REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,279,978,562	-0.000406
100%		-30	5,280,014,857	0.000281
100%		-20	5,280,012,236	0.000232
100%		-10	5,280,008,671	0.000164
100%		0	5,280,002,238	0.000042
100%		+10	5,279,995,139	-0.000092
100%		+20	5,279,988,344	-0.000221
100%		+30	5,279,985,025	-0.000284
100%		+40	5,279,980,328	-0.000373
100%		+50	5,279,978,341	-0.000410
100%		+60	5,279,970,826	-0.000553
85%	3.230	+25	5,279,982,766	-0.000326
115%	4.370	+25	5,279,982,455	-0.000332
BATT.ENDPOINT	3.200	+25	5,279,987,239	-0.000242

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

- Measurement Data:

OPERATING FREQUENCY : 5,580,000,000 Hz

CHANNEL : 116

REFERENCE VOLTAGE : 3.800 V DC

VOLTAGE (%)	POWER (V DC)	TEMP (℃)	FREQ (Hz)	Deviation (%)
100%	3.800	+25(Ref)	5,579,984,744	-0.000273
100%		-30	5,580,013,742	0.000246
100%		-20	5,580,005,348	0.000096
100%		-10	5,580,004,127	0.000074
100%		0	5,580,003,458	0.000062
100%		+10	5,579,997,238	-0.000049
100%		+20	5,579,992,987	-0.000126
100%		+30	5,579,987,033	-0.000232
100%		+40	5,579,981,038	-0.000340
100%		+50	5,579,975,027	-0.000448
100%		+60	5,579,970,722	-0.000525
85%	3.230	+25	5,579,973,978	-0.000466
115%	4.370	+25	5,579,980,268	-0.000354
BATT.ENDPOINT	3.200	+25	5,579,980,837	-0.000343

- 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 H)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.

H)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 H)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. (If a specific emission is demonstrated to be continuous—i.e., 100 percent duty cycle—rather than turning on and off with the transmit cycle, at least 100 traces shall 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 (4) 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 (4) 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.
• If a specific emission is demonstrated to be continuous (100 percent duty cycle) rather than turning on and off with the transmit cycle, no duty cycle correction is required for that emission.

▣ Minimum Standard:

▪ **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F(KHz)	300
0.490 – 1.705	24000/F(KHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** 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 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		

▪ **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):** Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) 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 dBm/MHz**.
(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 -27 dBm/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 dBm/MHz in the 5.15-5.25 GHz band.
(3) 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 dBm/MHz.**
(4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
(6) Unwanted emissions **below 1 GHz** must comply with the general field strength limits set forth in **Section 15.209**. Further, any U-NII devices using an **AC power line** are required to comply also with the conducted limits set forth in **Section 15.207**.

▣ **Measurement Data:**

9KHz ~ 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)
5149.68	V	Z	PK	48.13	2.95	-	-	51.08	74.00	22.92
5149.94	V	Z	AV	37.93	2.95	0.09	-	40.97	54.00	13.03
10360.24	H	Z	PK	52.85	10.29	-	-9.54	53.60	68.20	14.60
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
10400.08	H	Z	PK	51.56	10.60	-	-9.54	52.62	68.20	15.58
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
10479.94	H	Z	PK	52.29	11.10	-	-9.54	53.85	68.20	14.35
-	-	-	-	-	-	-	-	-	-	-

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 : 0.09 dB = 10*log(1/0.98) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
10520.21	H	Z	PK	52.98	10.86	-	-9.54	54.30	68.20	13.90
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 40GHz Radiated Spurious Emissions: *802.11a & 5280MHz(Ch. 56)*

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)
10560.22	H	Z	PK	52.34	11.49	-	-9.54	54.29	68.20	13.91
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
5350.05	V	Z	PK	51.71	3.27	-	-	54.98	74.00	19.02
5350.14	V	Z	AV	39.63	3.27	0.09	-	42.99	54.00	11.01
10640.08	H	Z	PK	52.33	11.72	-	-9.54	54.51	74.00	19.49
10640.01	H	Z	AV	48.09	11.72	0.09	-9.54	50.36	54.00	3.64
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

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 : 0.09 dB = 10*log(1/0.98) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
5459.47	V	Z	PK	47.98	3.35	-	-	51.33	74.00	22.67
5459.51	V	Z	AV	37.49	3.35	0.09	-	40.93	54.00	13.07
5469.24	V	Z	PK	48.61	3.33	-	-	51.94	68.20	16.26
10999.91	V	Z	PK	52.19	11.27	-	-9.54	53.92	74.00	20.08
11000.11	V	Z	AV	47.22	11.27	0.09	-9.54	49.04	54.00	4.96

9KHz ~ 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)
11160.10	V	Z	PK	52.72	11.70	-	-9.54	54.88	74.00	19.12
11160.06	V	Z	AV	47.63	11.7	0.09	-9.54	49.88	54.00	4.12

9KHz ~ 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)
5725.31	V	Z	PK	48.11	3.27	-	-	51.38	68.20	16.82
11400.07	V	Z	PK	51.16	12.19	-	-9.54	53.81	74.00	20.19
11399.98	V	Z	AV	46.42	12.19	0.09	-9.54	49.16	54.00	4.84

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 : 0.09 dB = 10*log(1/0.98) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
5147.82	V	Z	PK	48.14	2.95	-	-	51.09	74.00	22.91
5147.03	V	Z	AV	38.32	2.95	0.09	-	41.36	54.00	12.64
10359.96	H	Z	PK	50.22	10.29	-	-9.54	50.97	68.20	17.23
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
10399.96	H	Z	PK	50.14	10.60	-	-9.54	51.20	68.20	17.00
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
10480.75	H	Z	PK	50.37	11.10	-	-9.54	51.93	68.20	16.27
-	-	-	-	-	-	-	-	-	-	-

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 : 0.09 dB = 10*log(1/0.98) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
10519.81	H	Z	PK	49.89	10.86	-	-9.54	51.21	68.20	16.99
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 40GHz Radiated Spurious Emissions: *802.11n HT20 & 5280MHz(Ch. 56)*

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)
10560.18	H	Z	PK	49.79	11.49	-	-9.54	51.74	68.20	16.46
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
5350.09	V	Z	PK	48.21	3.27	-	-	51.48	74.00	22.52
5350.27	V	Z	AV	38.28	3.27	0.09	-	41.64	54.00	12.36
10639.93	H	Z	PK	51.32	11.72	-	-9.54	53.50	74.00	20.50
10640.10	H	Z	AV	45.43	11.72	0.09	-9.54	47.70	54.00	6.30
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

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 : 0.09 dB = 10*log(1/0.98) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
5459.47	V	Z	PK	47.77	3.35	-	-	51.12	74.00	22.88
5459.51	V	Z	AV	37.75	3.35	0.09	-	41.19	54.00	12.81
5469.24	V	Z	PK	48.22	3.33	-	-	51.55	68.20	16.65
11000.03	V	Z	PK	51.42	11.27	-	-9.54	53.15	74.00	20.85
11000.05	V	Z	AV	47.35	11.27	0.09	-9.54	49.17	54.00	4.83

9KHz ~ 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)
11159.97	V	Z	PK	50.09	11.70	-	-9.54	52.25	74.00	21.75
11160.10	V	Z	AV	46.29	11.7	0.09	-9.54	48.54	54.00	5.46

9KHz ~ 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)
5725.22	V	Z	PK	48.01	3.27	-	-	51.28	68.20	16.92
11399.97	V	Z	PK	48.92	12.19	-	-9.54	51.57	74.00	22.43
11400.05	V	Z	AV	44.56	12.19	0.09	-9.54	47.30	54.00	6.70

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 : 0.09 dB = 10*log(1/0.98) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
5149.91	V	Z	PK	61.52	2.95	-	-	64.47	74.00	9.53
5149.71	V	Z	AV	44.26	2.95	0.05	-	47.26	54.00	6.74
10379.96	H	Z	PK	51.90	10.55	-	-9.54	52.91	68.20	15.29

9KHz ~ 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)
10459.89	H	Z	PK	51.67	10.83	-	-9.54	52.96	68.20	15.24
-	-	-	-	-	-	-	-	-	-	-

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 : 0.05 dB = 10*log(1/0.99) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
10539.88	H	Z	PK	50.7	10.72	-	-9.54	51.88	68.20	16.32
-	-	-	-	-	-	-	-	-	-	-

9KHz ~ 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)
5350.46	V	Z	PK	51.67	3.27	-	-	54.94	74.00	19.06
5350.09	V	Z	AV	39.26	3.27	0.05	-	42.58	54.00	11.42
10620.17	H	Z	PK	50.32	11.61	-	-9.54	52.39	74.00	21.61
10620.05	H	Z	AV	46.32	11.61	0.05	-9.54	48.44	54.00	5.56

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 : 0.05 dB = 10*log(1/0.99) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/3m)

▣ **Measurement Data:**

9KHz ~ 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)
5459.93	V	Z	PK	51.32	3.35	-	-	54.67	74.00	19.33
5459.02	V	Z	AV	37.77	3.35	0.05	-	41.17	54.00	12.83
5468.98	V	Z	PK	55.42	3.33	-	-	58.75	68.20	9.45
11019.83	V	Z	PK	49.81	11.19	-	-9.54	51.46	74.00	22.54
11020.11	V	Z	AV	45.84	11.19	0.05	-9.54	47.54	54.00	6.46

9KHz ~ 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)
11099.93	V	Z	PK	49.07	11.66	-	-9.54	51.19	74.00	22.81
11100.06	V	Z	AV	45.01	11.66	0.05	-9.54	47.18	54.00	6.82

9KHz ~ 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)
5726.08	V	Z	PK	47.43	3.27	-	-	50.70	68.20	17.50
11339.93	V	Z	PK	48.98	12.15	-	-9.54	51.59	74.00	22.41
11340.09	V	Z	AV	44.53	12.15	0.05	-9.54	47.19	54.00	6.81

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 : 0.05 dB = 10*log(1/0.99) for Method AD.
3. Measurement Distance above 10 GHz = 1m. So Distance Correction Factor : -9.54dB = 20*log(1m/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.

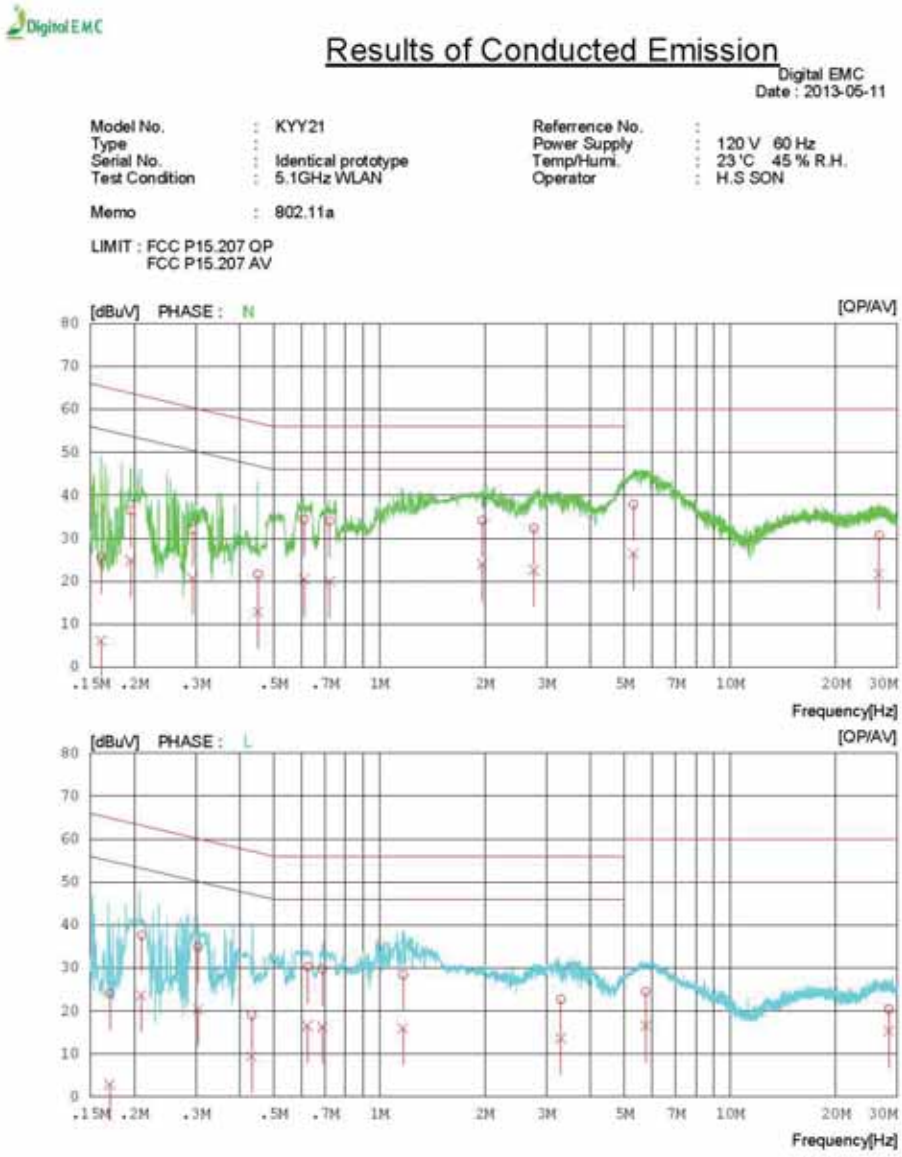
▣ **Minimum Standard: FCC Part 15.207(a)/EN 55022**

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 : 2013-05-11

Model No.	: KYY21	Referrence No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 23 °C 45 % R.H.
Test Condition	: 2.4GHz WLAN	Operator	: H.S SON

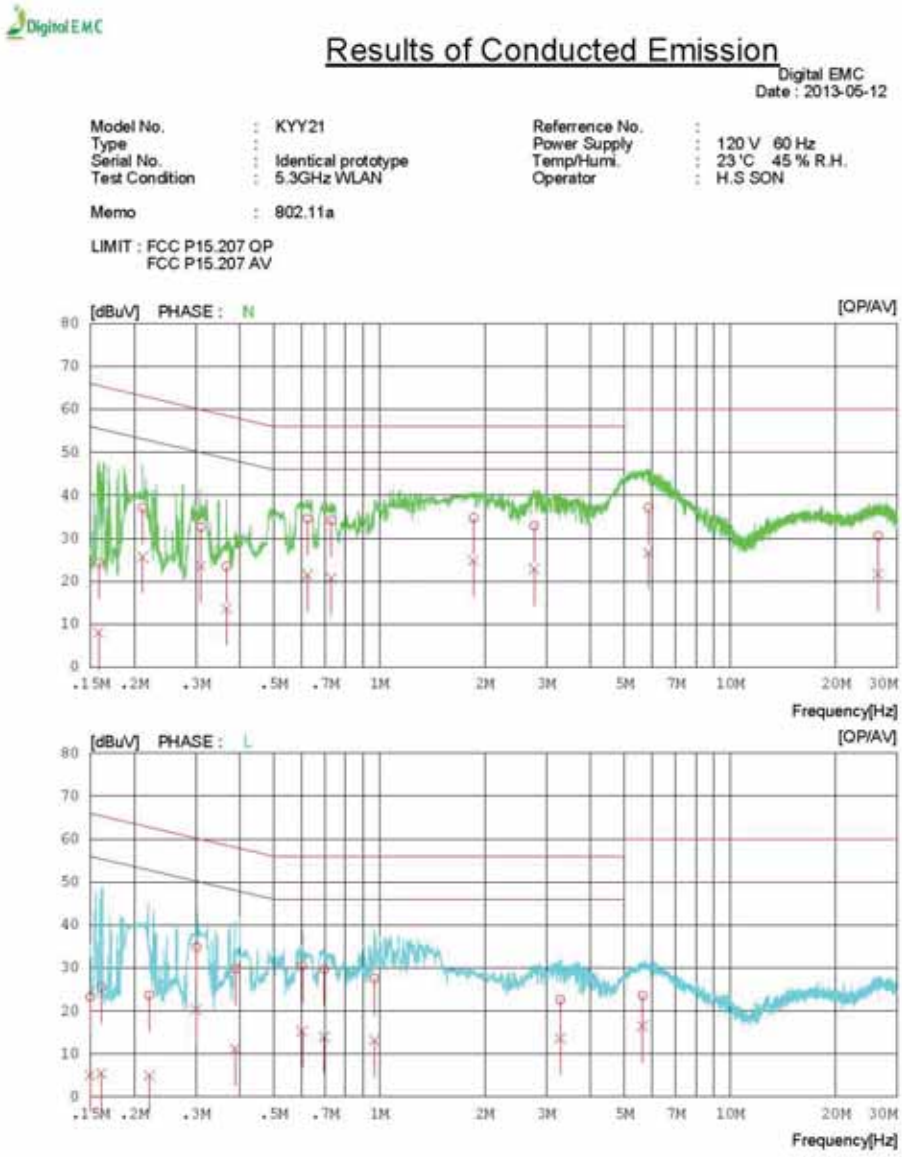
Memo : 802.11b

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING		C.FACTOR	RESULT		LIMIT		MARGIN		PHASE
		QP	AV		QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.16055	25.6	7.0	0.1	25.7	7.1	65.4	55.4	39.7	48.3	N
2	0.21146	36.5	25.3	0.1	36.6	25.4	63.1	53.1	26.5	27.7	N
3	0.31770	32.1	20.8	0.1	32.2	20.9	59.8	49.8	27.6	28.9	N
4	0.47383	24.7	13.0	0.1	24.8	13.1	56.4	46.4	31.6	33.3	N
5	0.63680	33.5	20.4	0.1	33.6	20.5	56.0	46.0	22.4	25.5	N
6	1.21750	33.2	21.3	0.1	33.3	21.4	56.0	46.0	22.7	24.6	N
7	1.96650	34.1	21.8	0.1	34.2	21.9	56.0	46.0	21.8	24.1	N
8	3.30850	31.7	19.4	0.1	31.8	19.5	56.0	46.0	24.2	26.5	N
9	5.64700	36.9	25.8	0.2	37.1	26.0	60.0	50.0	22.9	24.0	N
10	17.39400	28.1	19.1	0.4	28.5	19.5	60.0	50.0	31.5	30.5	N
11	0.15295	26.9	8.9	0.1	27.0	9.0	65.8	55.8	38.8	46.8	L
12	0.21250	37.3	21.7	0.1	37.4	21.8	63.1	53.1	25.7	31.3	L
13	0.31815	34.7	18.4	0.1	34.8	18.5	59.8	49.8	25.0	31.3	L
14	0.39503	29.9	11.9	0.1	30.0	12.0	58.0	48.0	28.0	36.0	L
15	0.50910	30.1	15.6	0.1	30.2	15.7	56.0	46.0	25.8	30.3	L
16	0.72100	29.2	14.2	0.1	29.3	14.3	56.0	46.0	26.7	31.7	L
17	1.16850	28.7	16.5	0.1	28.8	16.6	56.0	46.0	27.2	29.4	L
18	3.30000	23.8	13.1	0.1	23.9	13.2	56.0	46.0	32.1	32.8	L
19	6.16000	23.4	15.9	0.2	23.6	16.1	60.0	50.0	36.4	33.9	L
20	24.49950	20.1	15.0	0.5	20.6	15.5	60.0	50.0	39.4	34.5	L

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 : 2013-05-12

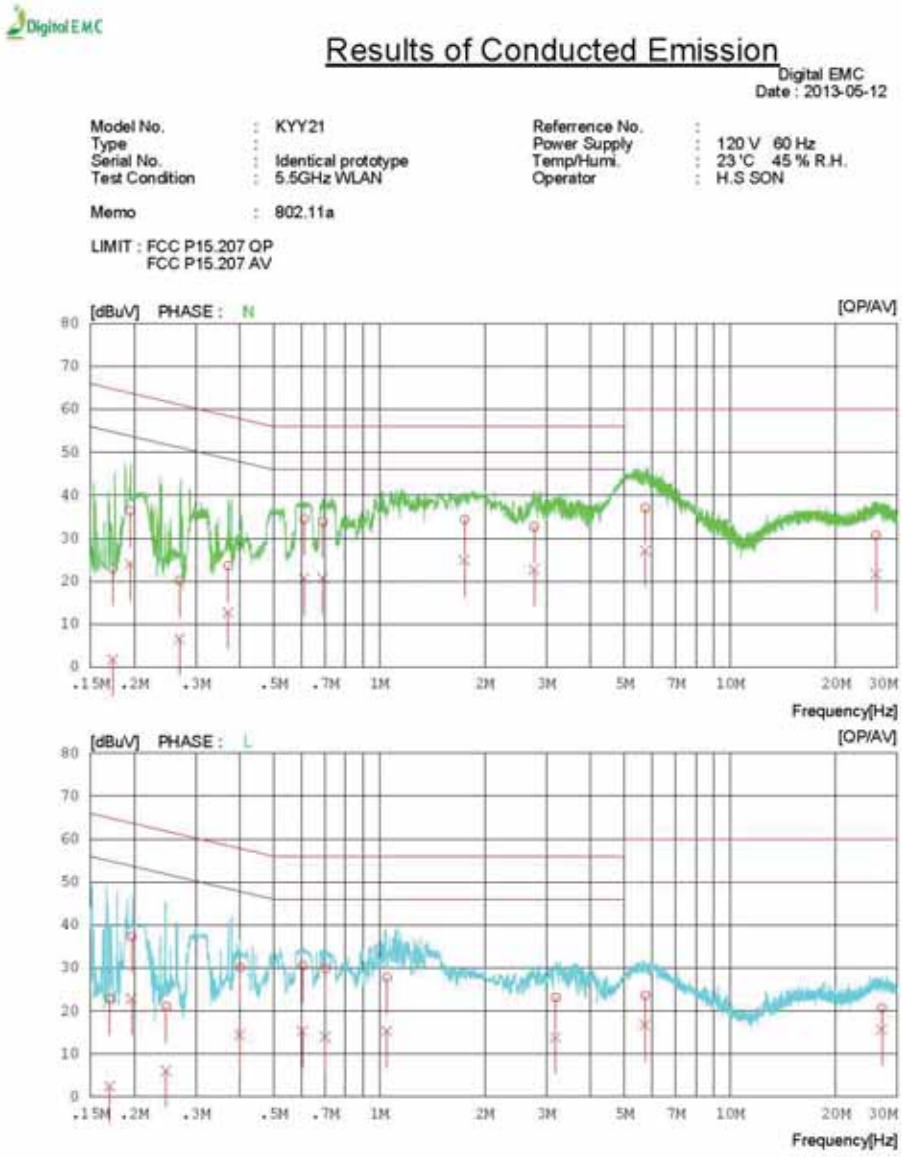
Model No.	: KYY21	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 23 'C 45 % R.H.
Test Condition	: 5.3GHz WLAN	Operator	: H.S SON
Memo	: 802.11a		

LIMIT : FCC P15.207 QP
FCC P15.207 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	0.15883	24.2	7.9	0.1	24.3	8.0	65.5	55.5	41.2	47.5	N
2	0.21141	36.9	25.6	0.1	37.0	25.7	63.1	53.1	26.1	27.4	N
3	0.33974	32.5	23.4	0.1	32.6	23.5	60.0	50.0	27.4	26.5	N
4	0.38679	23.4	13.6	0.1	23.5	13.7	58.6	48.6	35.1	34.9	N
5	0.62434	34.5	21.4	0.1	34.6	21.5	56.0	46.0	21.4	24.5	N
6	0.73011	34.1	20.7	0.1	34.2	20.8	56.0	46.0	21.8	25.2	N
7	1.05900	34.6	24.8	0.1	34.7	24.9	56.0	46.0	21.3	21.1	N
8	2.76400	32.8	22.7	0.1	32.9	22.8	56.0	46.0	23.1	23.2	N
9	5.85200	36.9	26.5	0.2	37.1	26.7	60.0	50.0	22.9	23.3	N
10	26.41600	30.1	31.1	0.5	30.6	21.6	60.0	50.0	29.4	28.4	N
11	0.15001	23.2	4.9	0.1	23.3	5.0	66.0	56.0	42.7	51.0	L
12	0.16141	25.5	5.4	0.1	25.6	5.5	65.4	55.4	39.8	49.9	L
13	0.22104	23.7	4.8	0.1	23.8	4.9	62.8	52.8	39.0	47.9	L
14	0.30103	34.8	20.2	0.1	34.9	20.3	60.2	50.2	25.3	29.9	L
15	0.38915	29.8	11.1	0.1	29.9	11.2	58.1	48.1	28.2	36.9	L
16	0.40208	30.4	15.2	0.1	30.5	15.3	58.0	48.0	27.5	32.7	L
17	0.69820	29.7	14.0	0.1	29.8	14.1	56.0	46.0	26.2	31.9	L
18	0.96828	27.4	13.1	0.1	27.5	13.2	56.0	46.0	28.5	32.8	L
19	3.28200	22.5	13.5	0.1	22.6	13.6	56.0	46.0	33.4	32.4	L
20	5.63550	23.4	16.3	0.2	23.6	16.5	60.0	50.0	36.4	33.5	L

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 : 2013-05-12

Model No.	: KYY21	Reference No.	:
Type	:	Power Supply	: 120 V 60 Hz
Serial No.	: Identical prototype	Temp/Humi.	: 23 °C 45 % R.H.
Test Condition	: 5.5GHz WLAN	Operator	: H.S SON
Memo	: 802.11a		

LIMIT : FCC P15.207 QP
FCC P15.207 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	0.17403	22.8	1.7	0.1	22.9	1.8	64.8	54.8	41.9	53.0	N
2	0.19478	36.3	28.0	0.1	36.4	28.1	63.8	53.8	27.4	25.7	N
3	0.26978	20.1	6.5	0.1	20.2	6.6	61.1	51.1	40.9	44.5	N
4	0.37024	23.5	12.6	0.1	23.6	12.7	58.5	48.5	34.9	35.8	N
5	0.61099	34.4	20.5	0.1	34.5	20.6	56.0	46.0	21.5	25.4	N
6	0.63994	33.8	20.6	0.1	33.9	20.7	56.0	46.0	22.1	25.3	N
7	1.75050	34.3	24.8	0.1	34.4	24.9	56.0	46.0	21.6	21.1	N
8	2.76350	32.8	22.7	0.1	32.7	22.8	56.0	46.0	23.3	23.2	N
9	5.73600	36.9	26.9	0.2	37.1	27.1	60.0	50.0	22.9	22.9	N
10	26.03150	30.2	21.2	0.5	30.7	21.7	60.0	50.0	29.3	28.3	N
11	0.17039	22.8	2.4	0.1	22.9	2.5	64.9	54.9	42.0	52.4	L
12	0.19666	37.2	28.8	0.1	37.3	28.9	63.8	53.8	26.5	20.9	L
13	0.21676	20.9	6.0	0.1	21.0	6.1	61.9	51.9	40.9	45.8	L
14	0.40080	30.0	18.3	0.1	30.1	18.4	57.8	47.8	27.7	33.4	L
15	0.60400	30.4	15.2	0.1	30.5	15.3	56.0	46.0	25.5	30.7	L
16	0.73120	29.7	13.9	0.1	29.8	14.0	56.0	46.0	26.2	32.0	L
17	1.05100	27.7	15.2	0.1	27.8	15.3	56.0	46.0	28.2	30.7	L
18	3.15050	23.1	13.8	0.1	23.2	13.9	56.0	46.0	32.8	32.1	L
19	5.72900	23.5	16.6	0.2	23.7	16.8	60.0	50.0	36.3	33.2	L
20	27.10550	29.2	19.2	0.5	29.7	19.7	60.0	50.0	30.3	24.3	L

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 unique coupling method.

▣ **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/A**

Minimum Standard : N/A

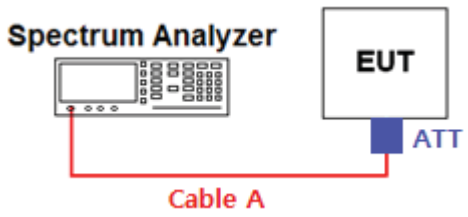
▣ **RESULT PLOT : N/A**

4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Multimeter	HP	34401A	13/02/27	14/02/27	3146A13475
DC Power Supply	HP	6622A	13/02/27	14/02/27	3448A03760
Horn Antenna	ETS	3115	12/02/20	14/02/20	6419
Signal Analyzer	Rohde Schwarz	FSQ26	13/02/14	14/02/14	200445
Horn Antenna	A.H.Systems Inc.	SAS-574	13/03/20	15/03/20	154
High-pass filter	Wainwright Instruments	WHNX8.5	12/09/17	13/09/17	1
PreAmplifier	Agilent	8449B	13/02/27	14/02/27	3008A00370
Signal Generator	Rohde Schwarz	SMR20	13/02/27	14/02/27	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	13/01/08	14/01/08	100148
MXA Signal Analyzer	Agilent Technologies, Inc	N9020A	13/01/08	14/01/08	MY49100833
3dB Attenuator	Aeroflex/Weinschel	56-3	12/09/17	13/09/17	Y2342
Spectrum Analyzer	Agilent Technologies	E4440A	12/10/22	13/10/22	US45303051
Thermohygrometer	BODYCOM	BJ5478	12/06/20	13/06/20	120612-2
Loop Antenna	Schwarzbeck	FMZB1513	12/09/24	13/09/24	1513-128
BILOG ANTENNA	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
Amplifier	H/P	8447E	13/01/08	14/01/08	2945A02865
EMI TEST RECEIVER	R&S	ESU	13/01/08	14/01/08	100014
EMI TEST RECEIVER	R&S	ESCI	13/02/27	14/02/27	100364
AC POWER SUPPLY	KIKUSUI	PCR1000L	12/09/15	13/09/15	14110610
ARTIFICIAL MAINS NETWORK	R&S	ESH2-Z5	12/09/18	13/09/18	828739/006
Harmonic Mixer	OML	M28HWD	13/02/14	14/02/14	Ka100224-1

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)	Frequency (GHz)	Path Loss (dB)
5180	5.09	5260	**5.27**	5500	4.94
5190	5.12	5270	5.08	5510	4.97
5200	**5.16**	5280	5.05	5550	4.99
5230	5.15	5310	5.15	5580	4.96
5240	5.13	5320	5.13	5670	5.00
				5700	**5.07**

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)
Note. 2: The worst case path loss was used as below.
BAND1 : 5.16dB, BAND2 : 5.27dB, Band3 : 5.07dB

APPENDIX II
Duty cycle plots

▣ **TEST PROCEDURE**

Duty Cycle [X = On Time / (On + Off time)] is measured using Measurement Procedure **of KDB789033**

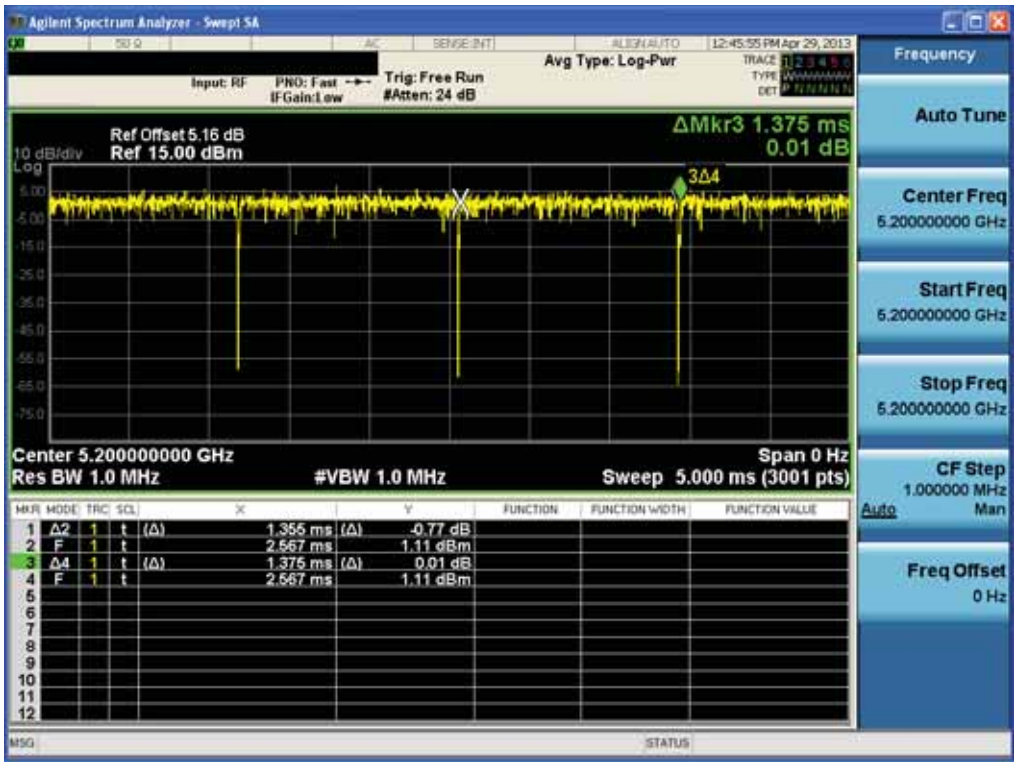
1. Set the center frequency of the spectrum analyzer to the center frequency of the transmission.
2. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value.
3. Set VBW ≥ RBW.
4. Set detector = peak.
5. Note : The zero-span measurement method shall not be used unless both **RBW and VBW are > 50/*T***, where *T* is defined in section B)1)a), and **the number of sweep points across duration *T* exceeds 100**. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if *T* ≤ 16.7 microseconds.)

- **Summary of Duty Cycle Calculation Table**

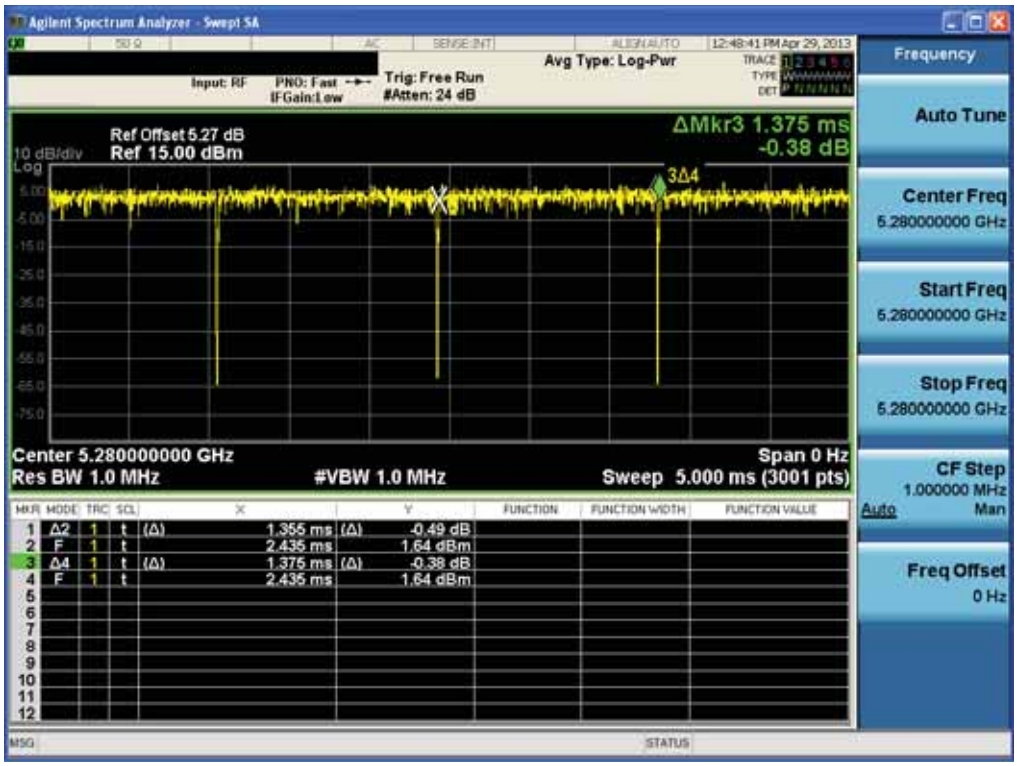
Mode	Channel	Frequency [MHz]	Maximum Achievable Duty Cycle (*x*) = On / (On+Off)		
			On Time [ms]	(On+Off) Time [ms]	*x*
802.11a	36	5180	1.355	1.375	0.98
	40	5200			
	48	5240			
	52	5260	1.355	1.375	0.98
	56	5280			
	64	5320			
	100	5500	1.355	1.375	0.98
	116	5580			
	140	5700			
802.11n (20MHz)	36	5180	1.268	1.287	0.98
	40	5200			
	48	5240			
	52	5260	1.268	1.287	0.98
	56	5280			
	64	5320			
	100	5500	1.268	1.287	0.98
	116	5580			
	140	5700			
802.11n (40MHz)	38	5190	0.636	0.642	0.99
	46	5230			
	54	5270	0.636	0.642	0.99
	62	5310			
	102	5510	0.636	0.642	0.99
	110	5550			
	134	5670			

- Description for duty cycle plot data on next pages : **1 Δ = On Time , 2Δ = (On + Off) Time So Off Time = 2Δ -1 Δ**
- *T* : The minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
  (***T* = On time** of the above table since the EUT operates with above fixed Duty Cycle and it is the minimum On time)
  For Duty Cycle with zero span method, both RBW/VBW > 50/*T*
  (For example, this case **RBW/VBW (1 MHz) > 50/0.000636 = 78.6 KHz**)
- The reason for the Duty Cycle Limitation : The test S/W provided by the applicant supports transmission with above maximum fixed duty cycle.
- The number of sweeps were increased by factor of **1/*x*** until the trace stabilizes for Peak Measurement
  The number of average traces were increased by factor of **1/*x*** for Method AD

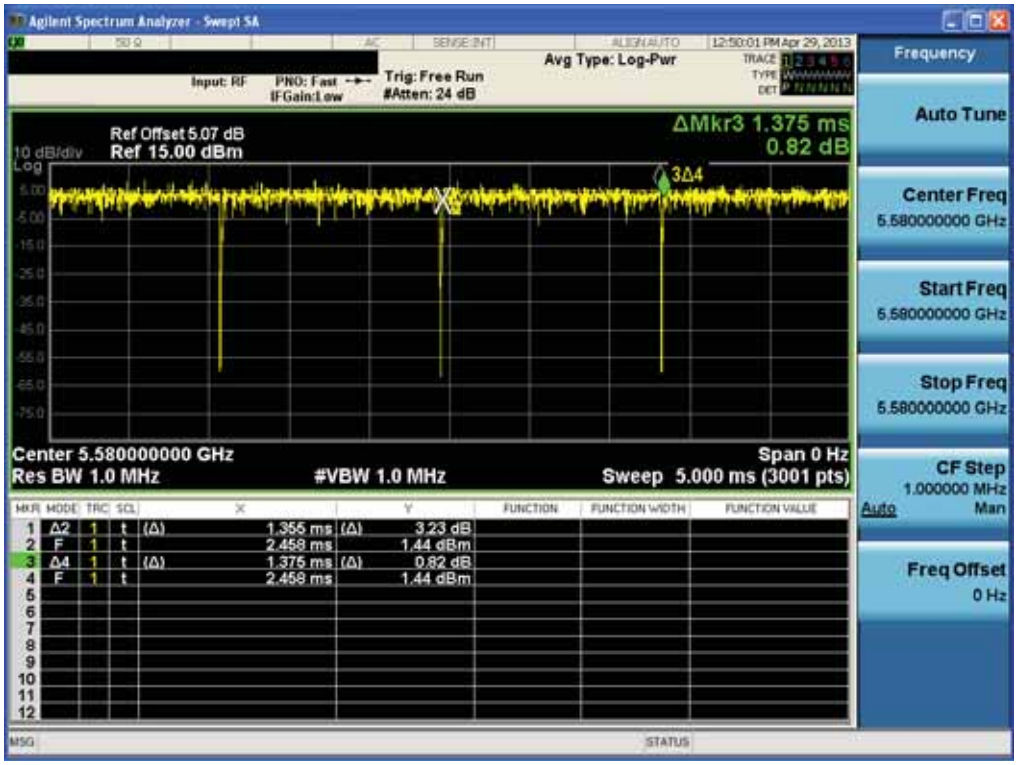
Duty Cycle Test Mode: 802.11a & Ch.40



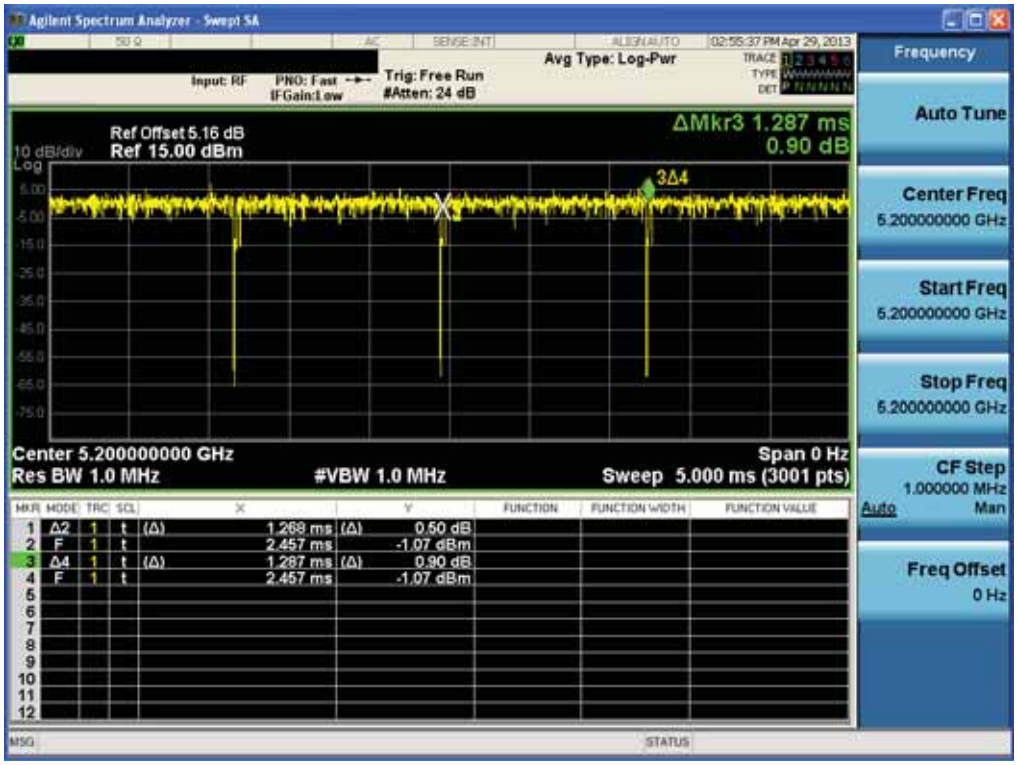
Duty Cycle Test Mode: 802.11a & Ch.56



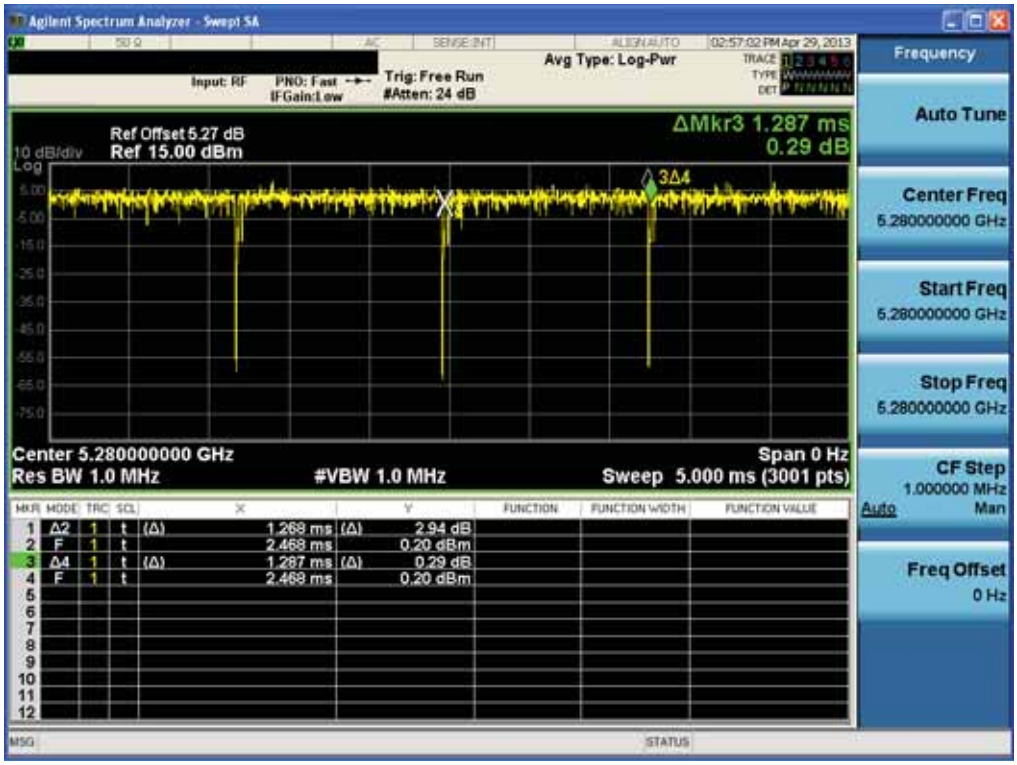
Duty Cycle Test Mode: 802.11a & Ch.116



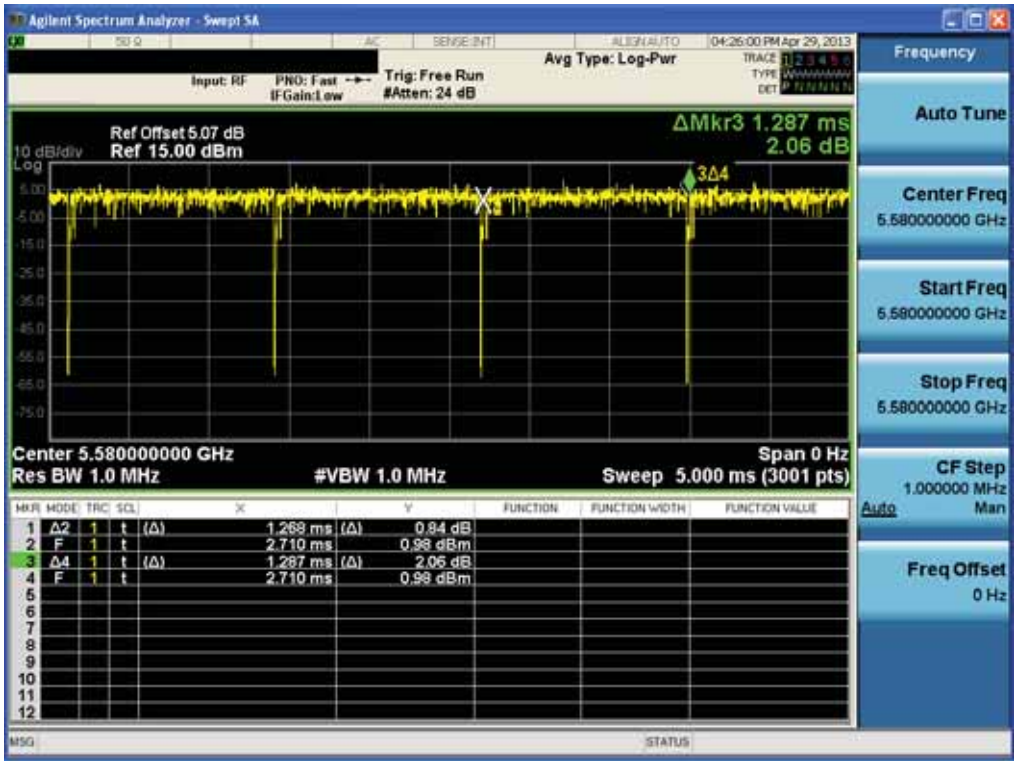
Duty Cycle Test Mode: 802.11n(HT20) & Ch.40



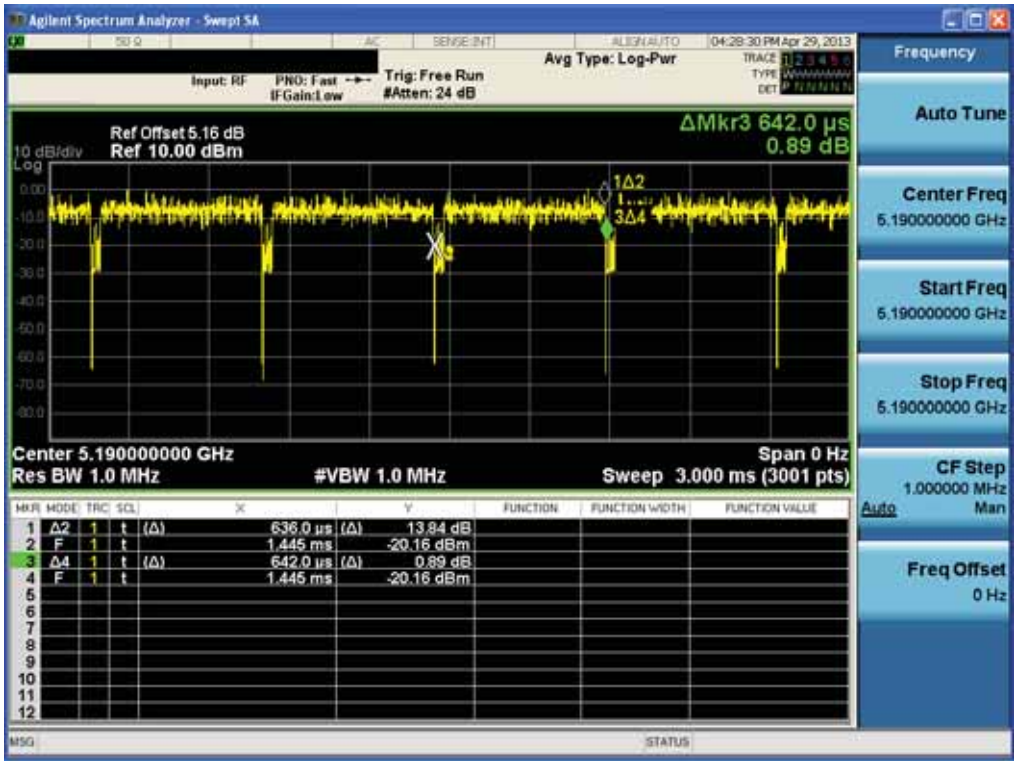
Duty Cycle Test Mode: 802.11n(HT20) & Ch.56



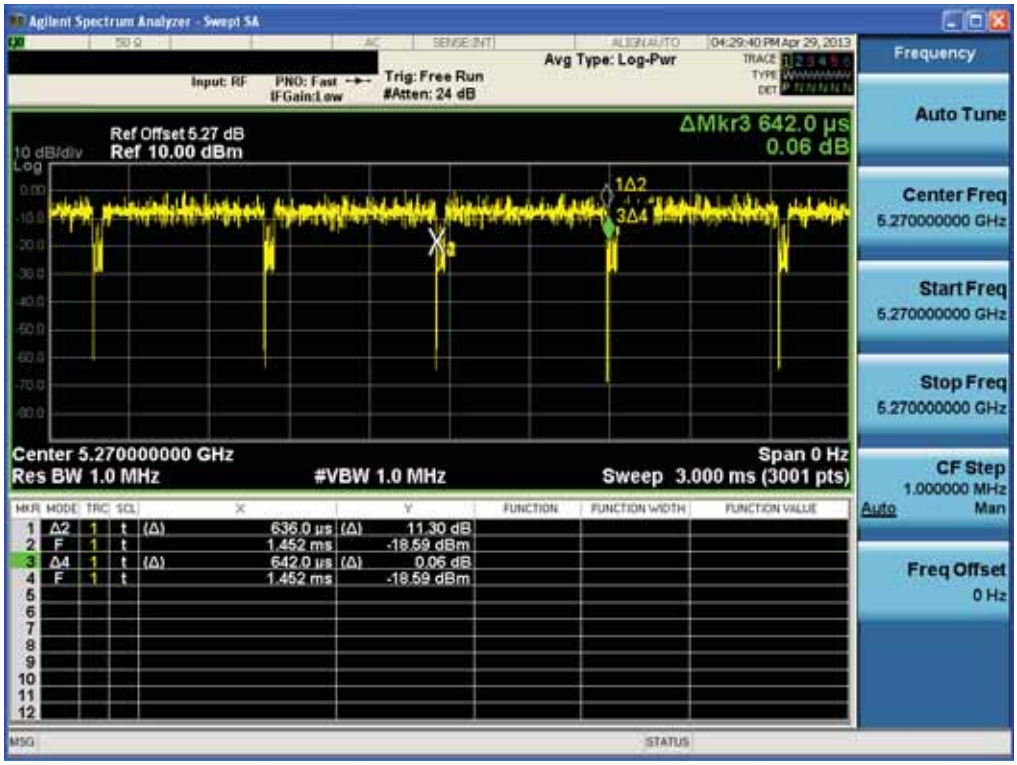
Duty Cycle Test Mode: 802.11n(HT20) & Ch.116



Duty Cycle Test Mode: 802.11n(HT40) & Ch.46



Duty Cycle Test Mode: 802.11n(HT40) & Ch.62



Duty Cycle Test Mode: 802.11n(HT40) & Ch.110