FCC 47 CFR PART 15 SUBPART C

for

MP90

Model: MP90,MP90DV

Brand: N/A

Test Report Number:

C180410Z04-RP1-1

Issued Date: May 11, 2018

Issued for

CE Labs,LLC.

3209 Wood Drive Garland, TX 75041United States

Issued by:

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	May 11, 2018	Initial Issue	ALL	Anna Liu

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1 TEST CERTIFICATION

Product	MP90
Model	MP90,MP90DV
Brand	N/A
Tested	April 10~May 11, 2018
Applicant	**CE Labs,LLC.** 3209 Wood Drive Garland, TX 75041United States
Manufacturer	**CE Labs,LLC.** 3209 Wood Drive Garland, TX 75041United States

APPLICABLE STANDARDS			
Standard	**Test Type**	**Standard**	**Test Type**
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions
15.247(a)(2)	6dB Bandwidth Measurement	15.247(b)(3) 15.247(b)(4)	Peak Power Measurement
15.247(d)	Band Edges Measurement	15.247(e)	Peak Power Spectral Density

We hereby certify that:

The above equipment was tested by Compliance Certification Services (Shenzhen) Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in **ANSI C63.10: 2013** and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.
The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Eve. Wang

Eve Wang
Supervisor of EMC Dept.
Compliance Certification Services (Shenzhen) Inc.

Reviewed by:

Nancy Fu

Nancy Fu
Supervisor of Report Dept.
Compliance Certification Services (Shenzhen) Inc.

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2 TEST RESULT SUMMARY

APPLICABLE STANDARDS			
Standard	**Test Type**	**Result**	**Remark**
15.247(a)(2)	6dB Bandwidth Measurement	Pass	Meet the requirement of limit.
15.247(b)(3) 15.247(b)(4)	Peak Power Measurement	Pass	Meet the requirement of limit.
15.247(d)	Band Edges Measurement	Pass	Meet the requirement of limit.
15.247(e)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions	Pass	Meet the requirement of limit.
15.207(a)	Power line Conducted Emissions	Pass	Meet the requirement of limit.

Note: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.

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3 EUT DESCRIPTION

Product	MP90
Model Number	MP90,MP90DV
Brand	N/A
Model Discrepancy	They are the same product except product's name.
Identify Number	C180410Z04-RP1-1
Received Date	April 10, 2018
Power Supply	DC 12V charged by adapter
Adapter Specification	SHENZHEN FUJIA APPLIANCE CO.,LTD. Model: FJ-SW1201500U INPUT: AC100-240V~50/60Hz 0.6A OUTPUT: 12V-1500mA DC Cable: Unshielded, 1.15m
Transmit Power	IEEE 802.11b mode: 17.25dBm IEEE 802.11g mode: 21.77dBm IEEE 802.11n HT20 MHz mode: 21.19Bm IEEE 802.11n HT40 MHz mode: 20.29Bm
Modulation Technique	IEEE 802.11b mode: DSSS(CCK,QPSK, BPSK) IEEE 802.11g mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT20 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT40 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM)
Transmit Data Rate	IEEE 802.11b: 11Mbps(CCK) with fall back rates of 5.5/2/1Mbps IEEE 802.11g: 54Mbps with fall back rates of 48/36/24/18/12/9 /6Mbps IEEE 802.11n HT20: 65Mbps with fall back rates of 65/58.5/52/ 39/26/19.5/13/6.5Mbps IEEE 802.11n HT40: 135Mbps with fall back rates of 135/121.5/108/ 81/54/40.5/27/13.5Mbps
Number of Channels	IEEE 802.11b mode: 11 Channels IEEE 802.11g mode: 11 Channels IEEE 802.11n HT20 MHz mode: 11 Channels IEEE 802.11n HT40 MHz mode: 7 Channels
Antenna Specification	Dipole Antenna with 3.02dBi gain (Max)
Channels Spacing	IEEE 802.11b/g ,802.11n HT20/HT40 : 5MHz
Temperature Range	-20°C ~ +60°C
Hardware Version	V1
Software Version	CElabs V1.0

Note: *1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

2. This submittal(s) (test report) is intended for FCC ID: 2AO9Q-6GFC3D filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

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4 TEST METHODOLOGY

4.1. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.
Used the “RFTestTool-com.ampak.rftesttool-1.0-1.apk”software to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Test Item	Test mode	Worse mode
Conducted Emission	**Mode 1:** Normal(120V/60Hz)	☒
	Mode 1: Normal(240V/50Hz)	☒
Radiated Emission	**Mode 1:** Continuously Transmitting	☒

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only, and power line conducted emission below 30MHz, which worst case was in normal link mode.

IEEE802.11b mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE802.11g mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT20 MHz mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT40 MHz mode: Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.

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5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	Notebook	ProBook 5310m	N/A	DoC	HP	Unshielded 2.00m (RJ45 Cable)	Shielded 0.80m (AC Cable) Unshielded 1.20m (DC Cable)

Note:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

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6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at
No.10-1 Mingkeda Logistics park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.10, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA	**A2LA**
China	**CNAS**

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA	**FCC**
Japan	**VCCI (C-4815,R-4320,T-2317, G-10624)**
Canada	**INDUSTRY CANADA**

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccssz.com

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site : 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB
Conducted Emissions	+/-3.6836dB
Band Width	178kHz
Peak Output Power MU	+/-1.906dB
Band Edge MU	+/-0.182dB
Channel Separation MU	416.178Hz
Duty Cycle MU	0.054ms
Frequency Stability MU	226Hz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.

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7 FCC PART 15.247 REQUIREMENTS

7.1. POWER LINE CONDUCTED EMISSIONS MEASUREMENT

7.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

NOTE:
(1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	01/27/2018	01/26/2019
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	01/27/2018	01/26/2019
LISN	EMCO	3825/2	8901-1459	01/27/2018	01/26/2019
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	01/29/2018	01/28/2019
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

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7.1.3. TEST PROCEDURES (please refer to measurement standard)

- The EUT and Support equipment, if needed, was placed on a non-conducted table, which is 0.8m above the ground plane and 0.4m away from the conducted wall.

- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane. All support equipment power received from a second LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

- The frequency range from 150 kHz to 30 MHz was searched. The test data of the worst-case condition(s) was recorded. Emission levels under limit 20dB were not recorded.

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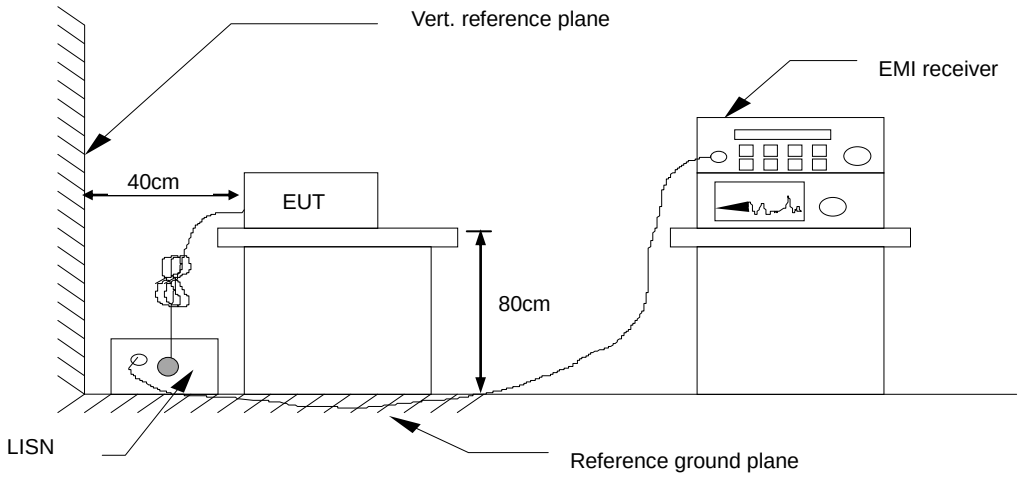
7.1.4. TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XXXX	32.69	25.65	11.52	44.21	37.17	65.78	55.79	-21.57	-18.62	Pass

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

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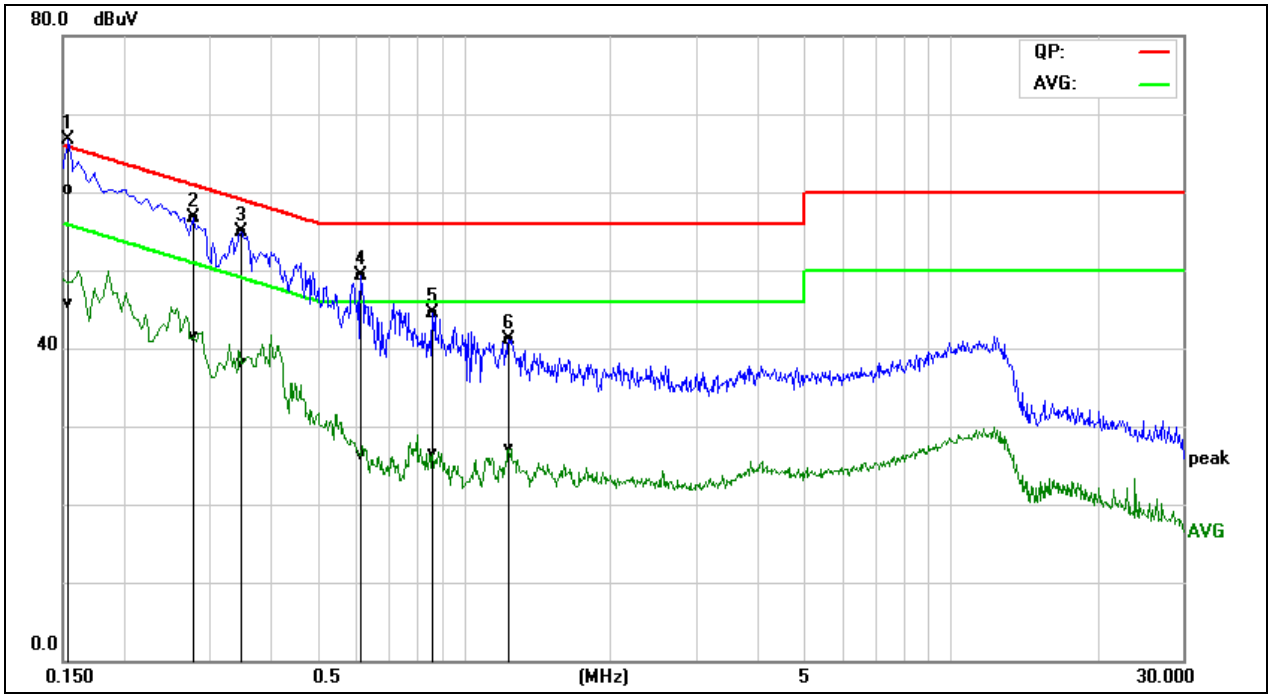
7.1.6. TEST RESULTS

Model No.	MP90	**RBW,VBW**	9 kHz
Environmental Conditions	22°C, 45% RH	**Test Mode**	Mode 1
Tested by	Evan Ai	**Line**	L
Test Date	April 17, 2018	**Test Voltage**	AC 120V/60Hz



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1539	40.78	26.18	19.62	60.40	45.80	65.78	55.79	-5.38	-9.99	Pass
0.2779	37.19	21.93	19.61	56.80	41.54	60.88	50.88	-4.08	-9.34	Pass
0.3500	35.37	18.57	19.58	54.95	38.15	58.96	48.96	-4.01	-10.81	Pass
0.6140	29.63	6.82	19.58	49.21	26.40	56.00	46.00	-6.79	-19.60	Pass
0.8660	24.92	6.96	19.58	44.50	26.54	56.00	46.00	-11.50	-19.46	Pass
1.2420	21.52	7.60	19.59	41.11	27.19	56.00	46.00	-14.89	-18.81	Pass

REMARKS: *L= Line One (Live Line)*

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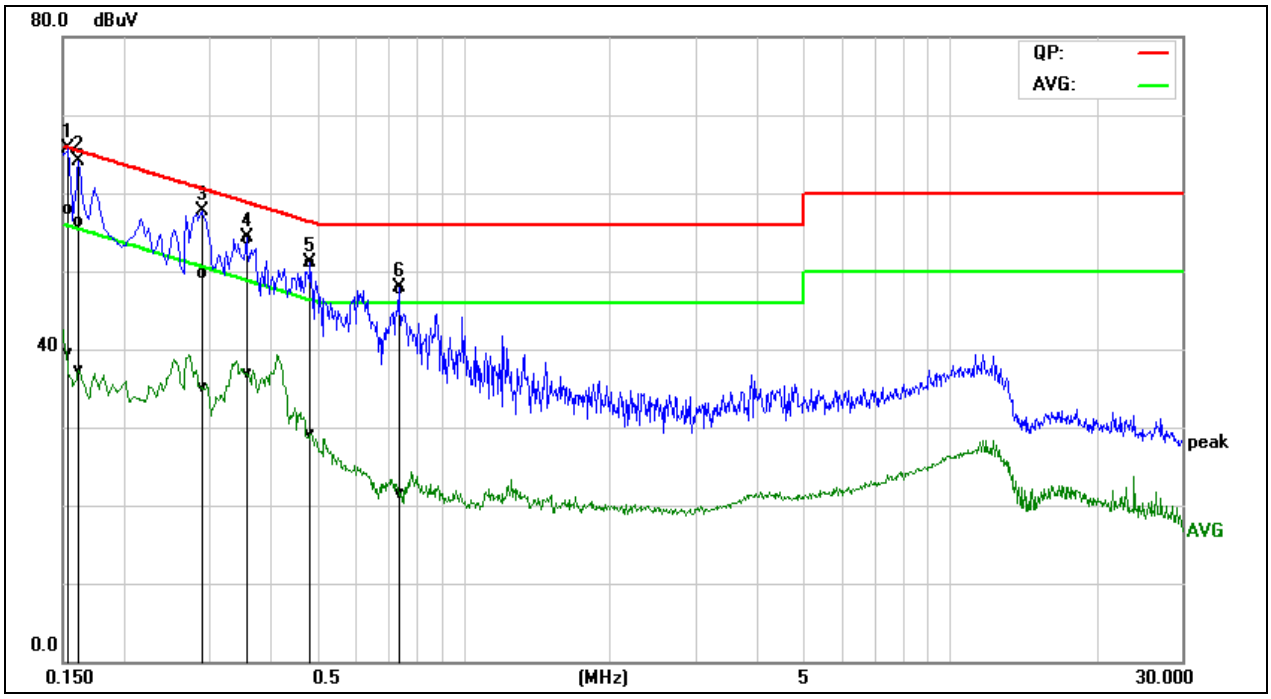
Model No.	MP90	**RBW,VBW**	9 kHz
Environmental Conditions	22°C, 45% RH	**Test Mode**	Mode 1
Tested by	Evan Ai	**Line**	N
Test Date	April 17, 2018	**Test Voltage**	AC 120V/60Hz



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.1539	38.38	20.08	19.52	57.90	39.60	65.78	55.79	-7.88	-16.19	Pass
0.1620	36.88	17.72	19.52	56.40	37.24	65.36	55.36	-8.96	-18.12	Pass
0.2900	30.26	15.47	19.54	49.80	35.01	60.52	50.52	-10.72	-15.51	Pass
0.3580	34.67	17.28	19.53	54.20	36.81	58.77	48.77	-4.57	-11.96	Pass
0.4860	31.50	9.66	19.53	51.03	29.19	56.24	46.24	-5.21	-17.05	Pass
0.7380	28.20	1.97	19.60	47.80	21.57	56.00	46.00	-8.20	-24.43	Pass

REMARKS: *N = Line Two (Neutral Line)*

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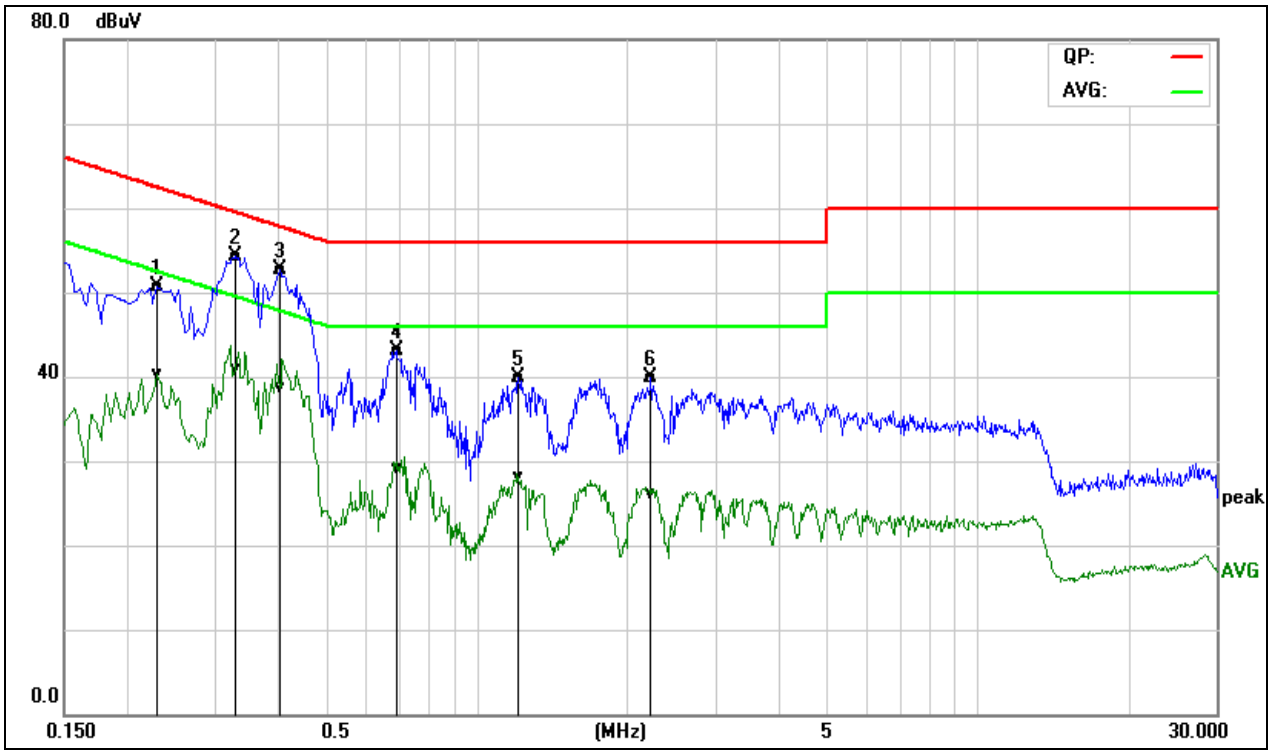
Model No.	MP90	**RBW,VBW**	9 kHz
Environmental Conditions	22°C, 45% RH	**Test Mode**	Mode 2
Tested by	David Dong	**Line**	L
Test Date	May 11, 2018	**Test Voltage**	AC 240V/50Hz



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.2300	31.11	20.58	19.63	50.74	40.21	62.45	52.45	-11.71	-12.24	Pass
0.3300	34.63	21.32	19.60	54.23	40.92	59.45	49.45	-5.22	-8.53	Pass
0.4060	33.09	19.24	19.56	52.65	38.80	57.73	47.73	-5.08	-8.93	Pass
0.6900	23.41	9.40	19.61	43.02	29.01	56.00	46.00	-12.98	-16.99	Pass
1.2100	20.29	8.50	19.58	39.87	28.08	56.00	46.00	-16.13	-17.92	Pass
2.2260	20.13	6.34	19.72	39.85	26.06	56.00	46.00	-16.15	-19.94	Pass

REMARKS: *L = Line One (Live Line)*

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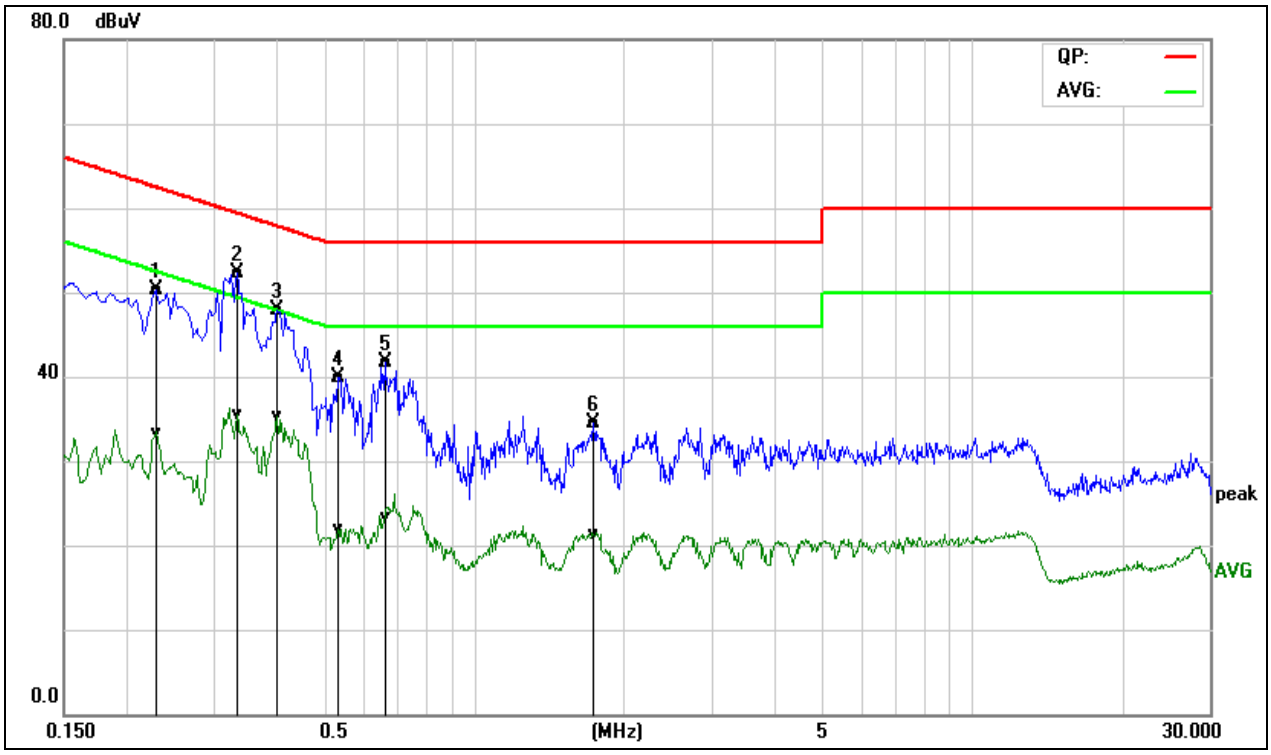
Model No.	MP90	**RBW,VBW**	9 kHz
Environmental Conditions	22°C, 45% RH	**Test Mode**	Mode 2
Tested by	David Dong	**Line**	N
Test Date	May 11, 2018	**Test Voltage**	AC 240V/50Hz



Frequency (MHz)	QuasiPeak Reading (dBuV)	Average Reading (dBuV)	Correction Factor (dB)	QuasiPeak Result (dBuV)	Average Result (dBuV)	QuasiPeak Limit (dBuV)	Average Limit (dBuV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
0.2300	30.80	13.86	19.54	50.34	33.40	62.45	52.45	-12.11	-19.05	Pass
0.3339	32.68	15.90	19.54	52.22	35.44	59.35	49.35	-7.13	-13.91	Pass
0.4020	28.30	15.73	19.53	47.83	35.26	57.81	47.81	-9.98	-12.55	Pass
0.5340	20.40	2.31	19.54	39.94	21.85	56.00	46.00	-16.06	-24.15	Pass
0.6620	22.17	3.73	19.59	41.76	23.32	56.00	46.00	-14.24	-22.68	Pass
1.7420	14.91	1.63	19.67	34.58	21.30	56.00	46.00	-21.42	-24.70	Pass

REMARKS: *N = Line Two (Neutral Line)*

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7.2. SPURIOUS EMISSIONS MEASUREMENT

7.2.1. CONDUCTED EMISSIONS MEASUREMENT

7.2.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

§15.247(d)specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:
If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3)requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.
If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b) (3) requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

7.2.1.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY55370330	01/27/2018	01/26/2019

7.2.1.3. TEST PROCEDURE (please refer to measurement standard)

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
Measurements are made over the 9 kHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels. No emission found between lowest internal used/generated frequency to 10MHz，it is only recorded 10MHz to 26GHz.

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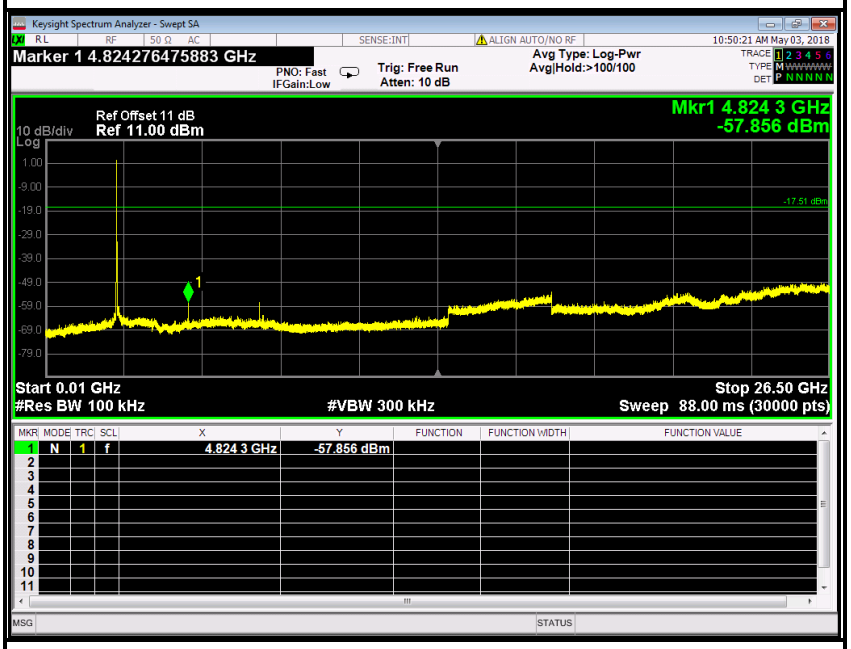
7.2.1.4. TEST RESULTS

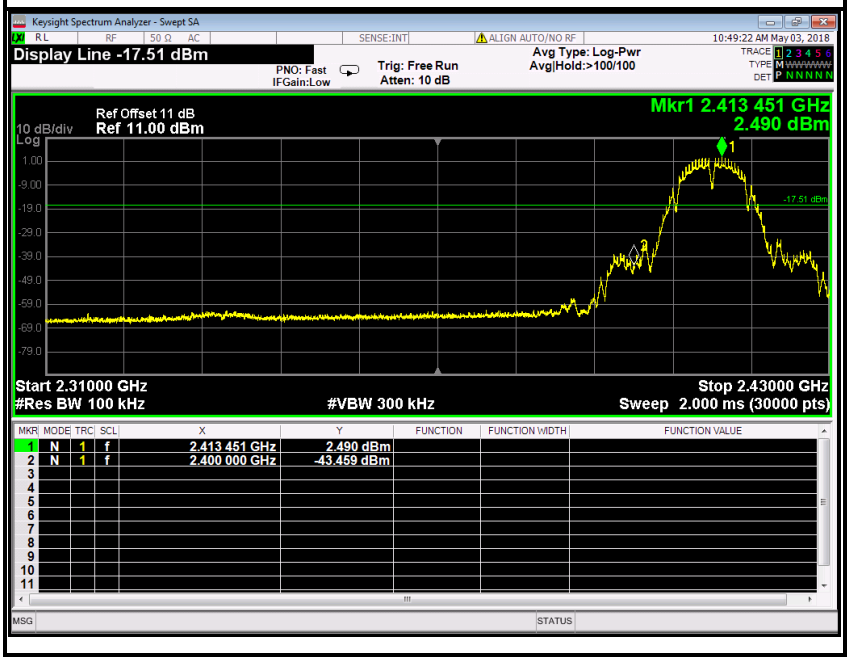
Test Plot

IEEE 802.11b mode

CH Low (10MHz ~26.5GHz)



CH Low (2.31GHz ~2.43GHz)



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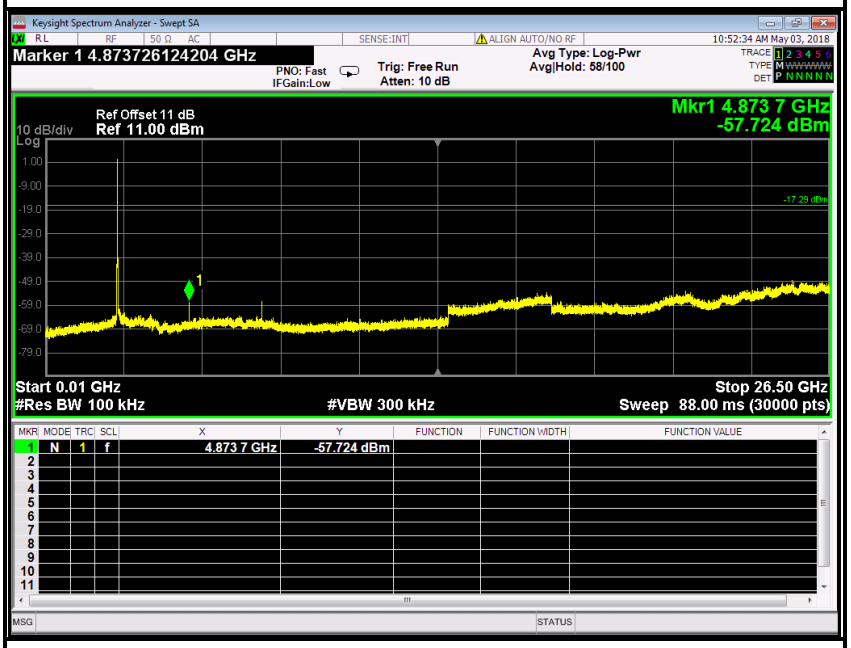
CH Mid (10MHz ~26.5GHz)



CH Mid

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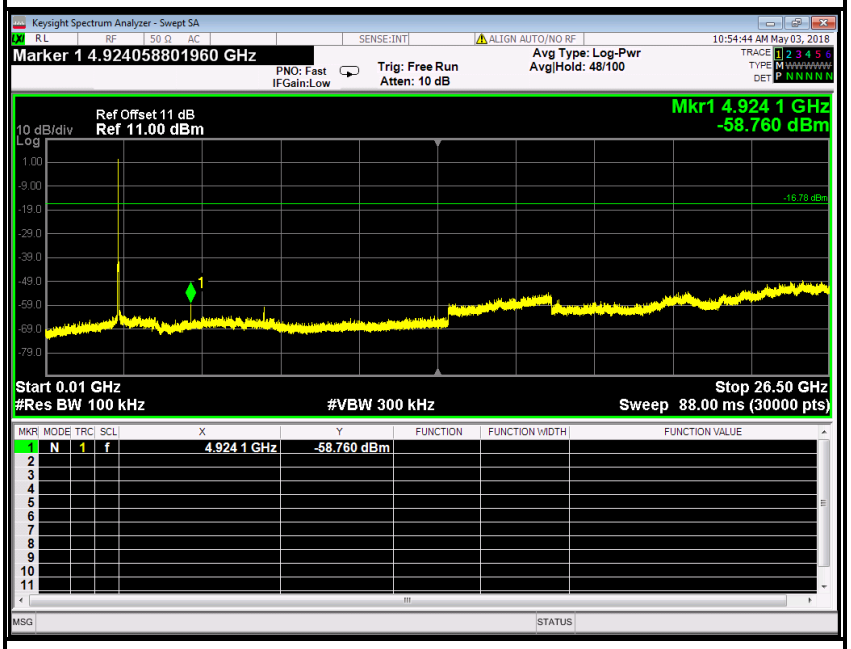
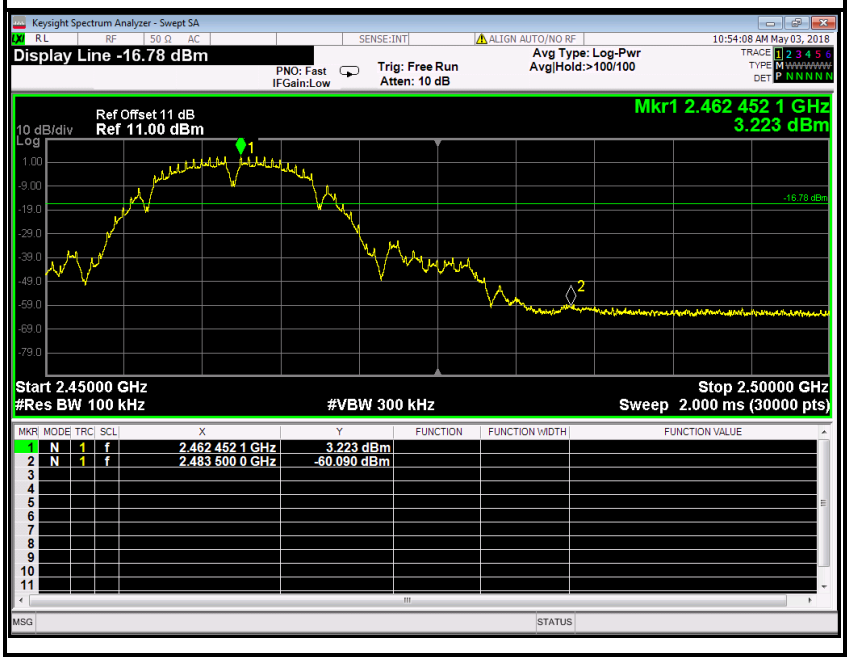
CH High (10MHz ~26.5GHz)



CH High (2.45GHz ~2.5GHz)



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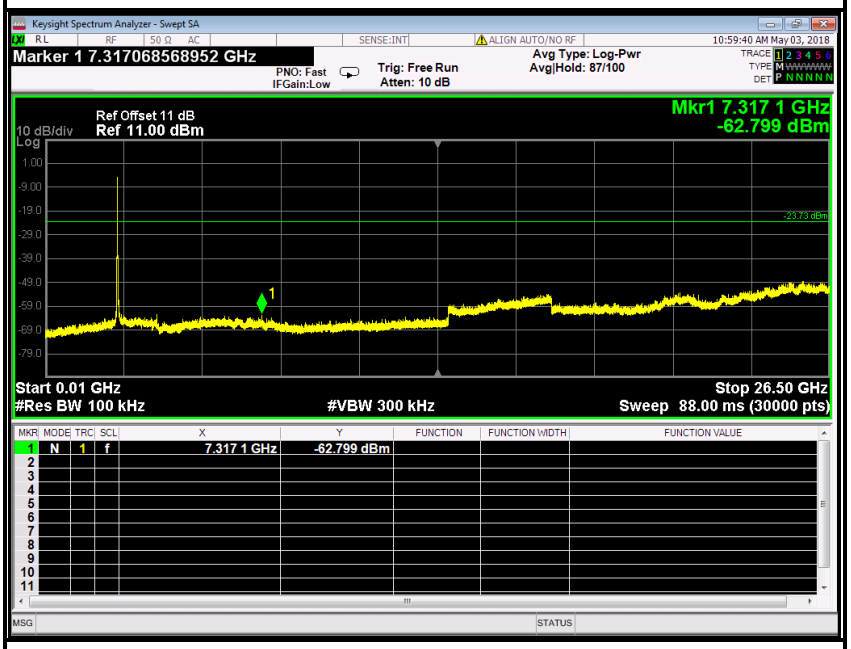
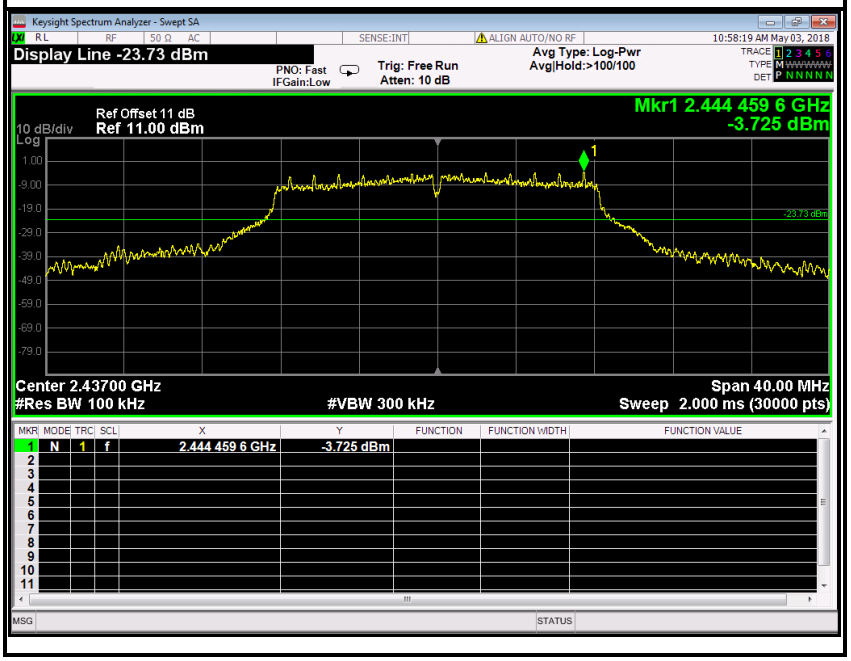
IEEE 802.11g mode

CH Low (10MHz ~26.5GHz)



CH Low (2.31GHz ~2.43GHz)



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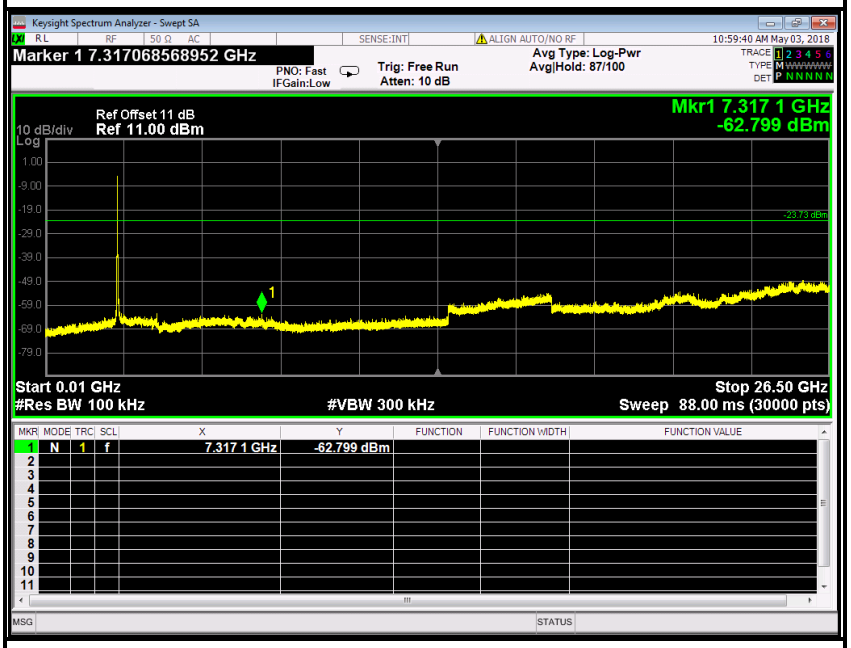
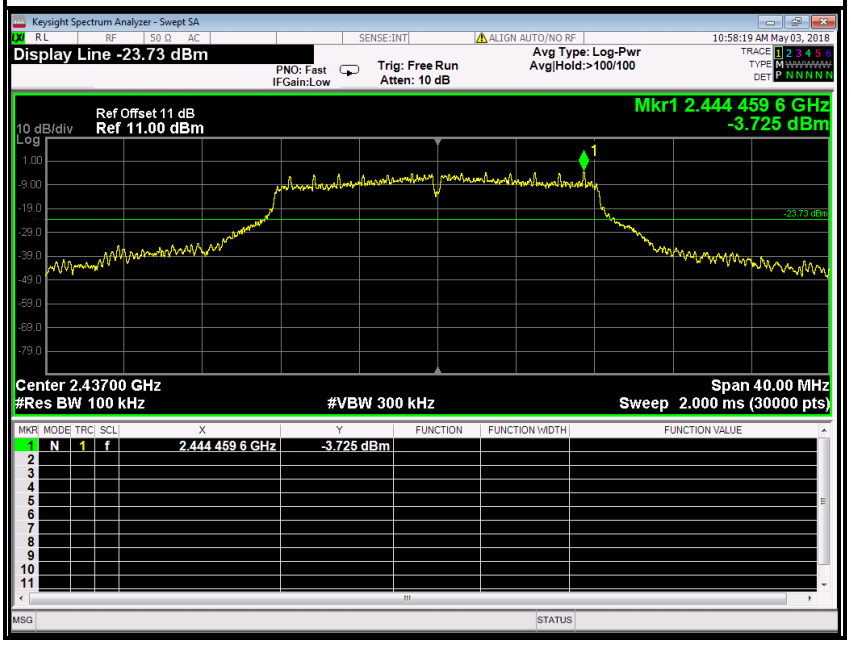
CH Mid (10MHz ~26.5GHz)



CH Mid



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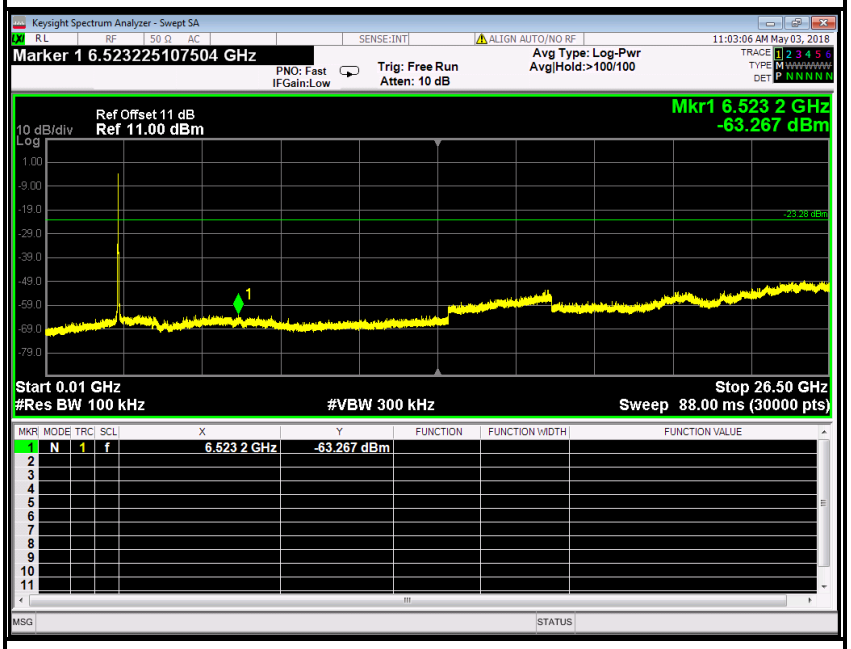
CH High (10MHz ~26.5GHz)



CH High (2.45GHz ~2.5GHz)

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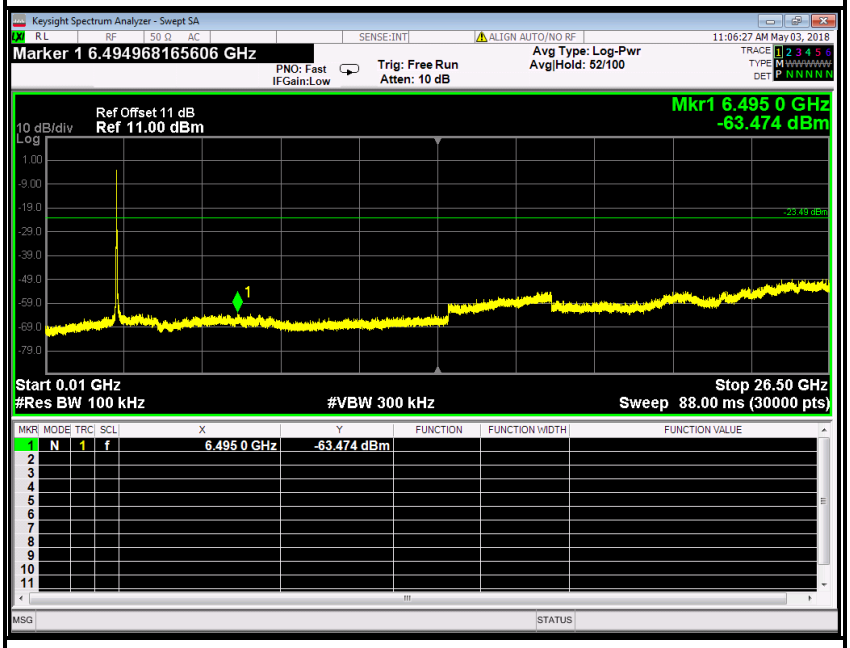
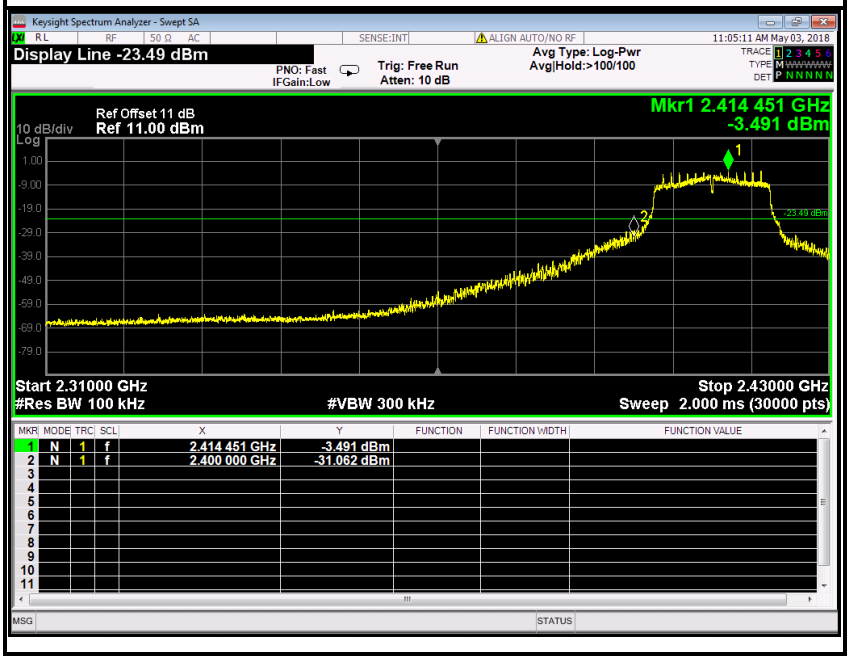
IEEE 802.11n HT20 MHz mode

CH Low (10MHz ~26.5GHz)



CH Low (2.31GHz ~2.43GHz)



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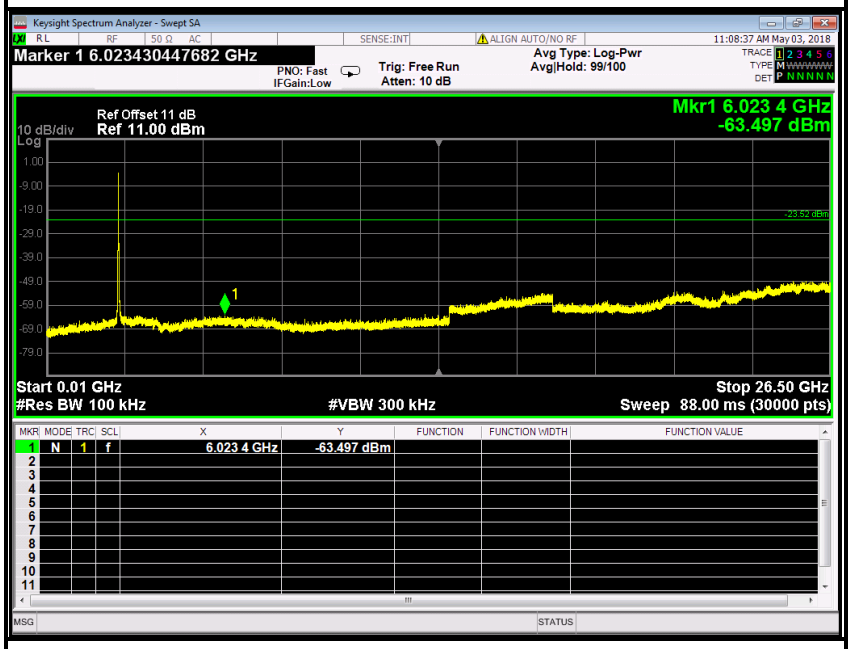
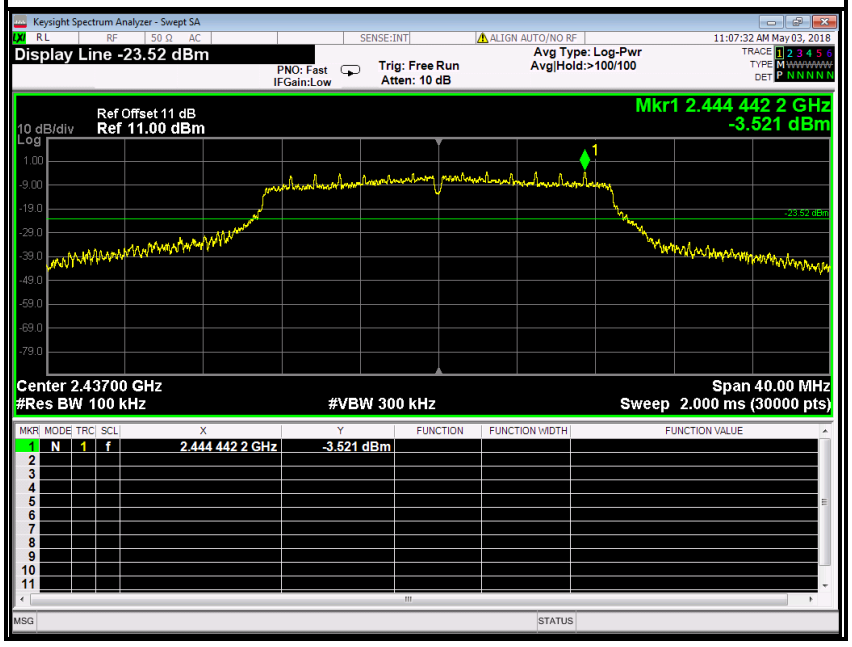
CH Mid (10MHz ~26.5GHz)



CH Mid



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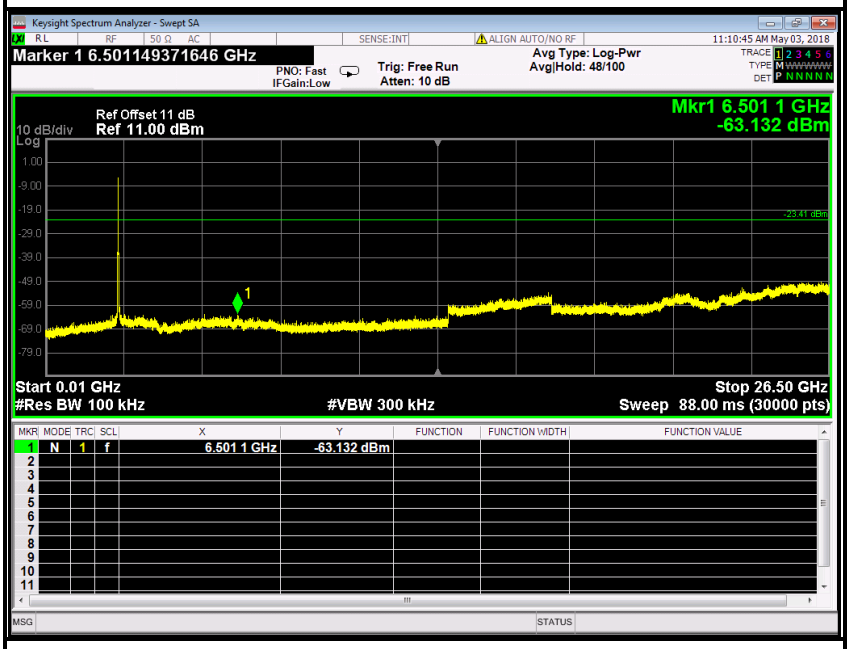
CH High (10MHz ~26.5GHz)



CH High (2.45GHz ~2.5GHz)

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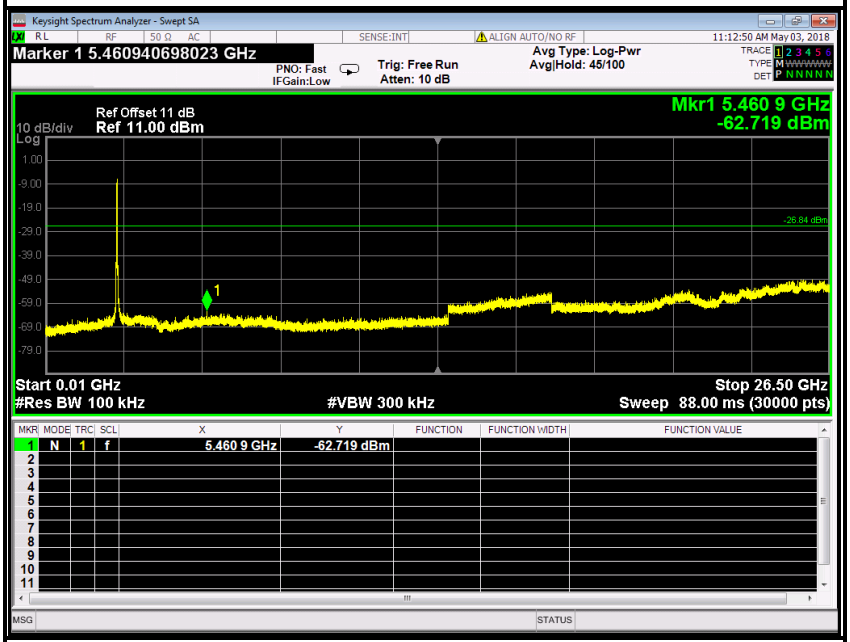
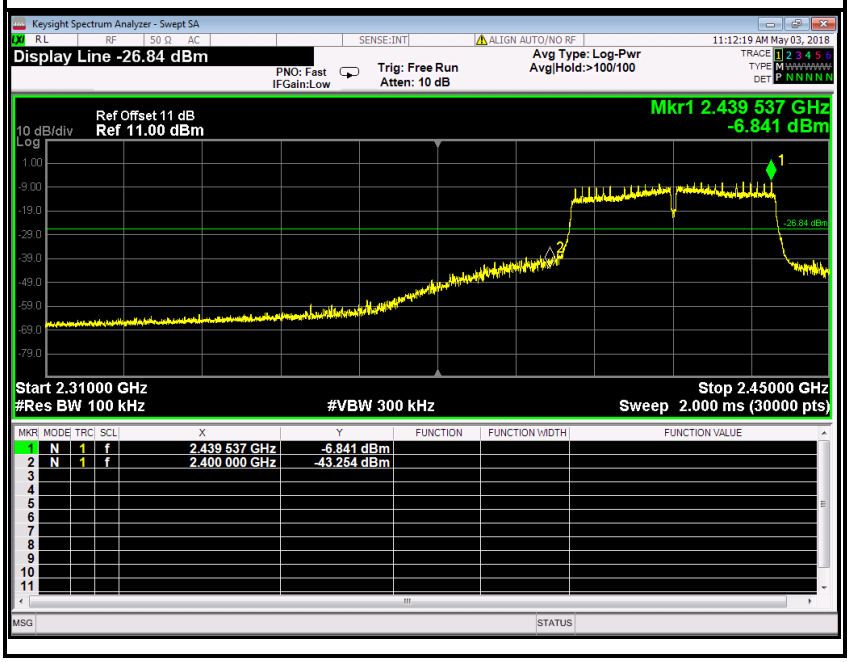
IEEE 802.11n HT40 MHz mode

CH Low (10MHz ~26.5GHz)



CH Low (2.31GHz ~2.45GHz)



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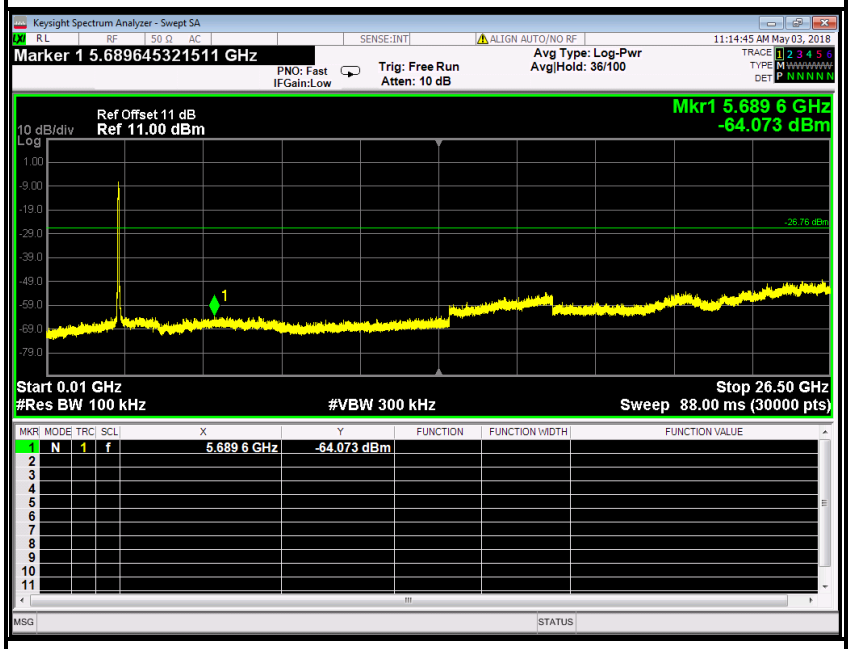
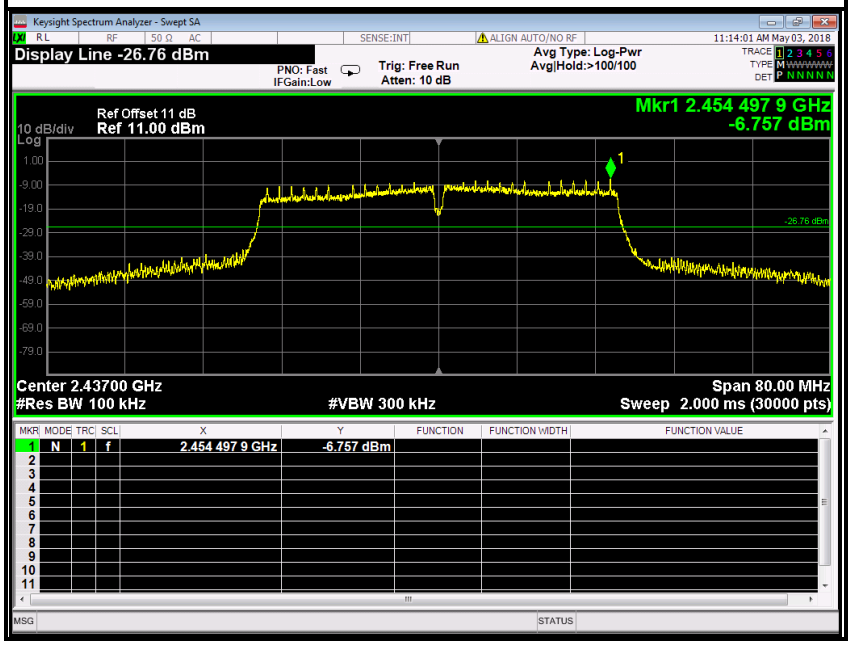
CH Mid (10MHz ~26.5GHz)



CH Mid



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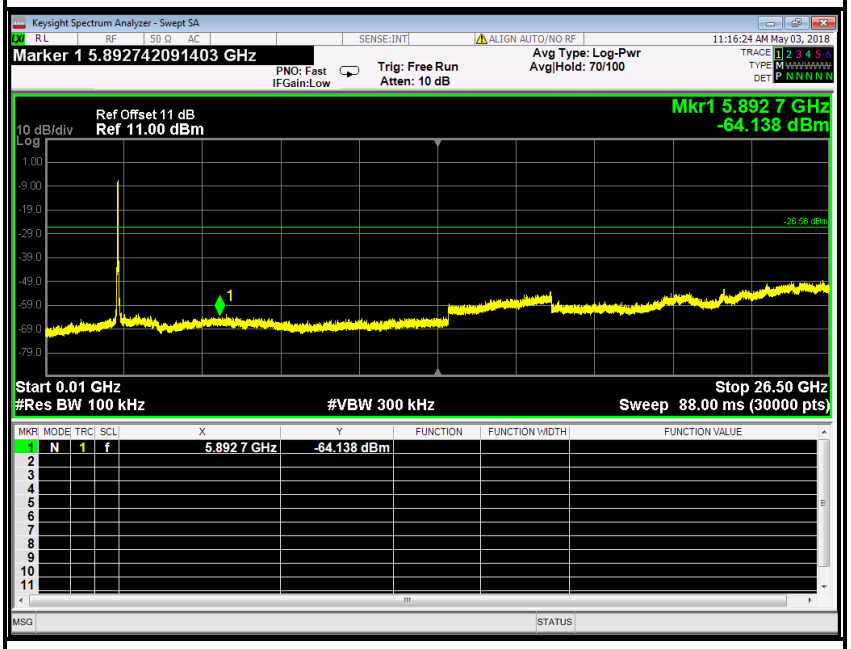
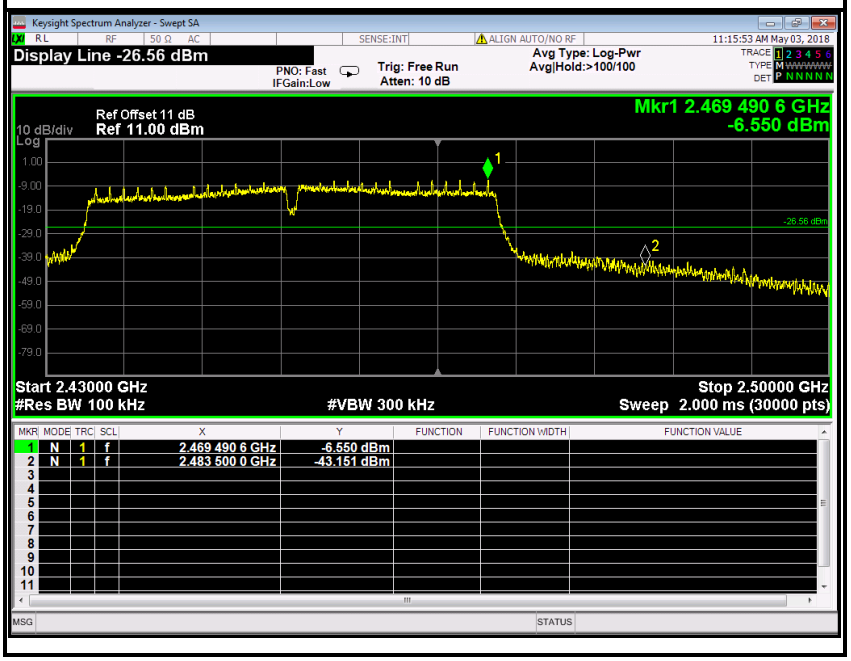
CH High (10MHz ~26.5GHz)



CH High (2.43GHz ~2.5GHz)



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7.2.2. RADIATED EMISSIONS MEASUREMENT

7.2.2.1. LIMITS OF RADIATED EMISSIONS MEASUREMENT

According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
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

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

1. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

NOTE:(1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

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7.2.2.2. TEST INSTRUMENTS

Radiated Emission Test Site 966（2）					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
PSA Series Spectrum Analyzer	Agilent	N9010A	MY55370330	01/27/2018	01/26/2019
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100786	01/27/2018	01/26/2019
Amplifier	EMEC	EM330	060661	01/27/2018	01/26/2019
High Noise Amplifier	Agilent	8449B	3008A01838	01/27/2018	01/26/2019
Antenna	SCHAFFNER	CBL6143	5063	01/27/2018	01/26/2019
Horn Antenna	SCHWARZBECK	BBHA9120	D286	01/27/2018	01/26/2019
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	01/24/2018	01/23/2019
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	01/29/2018	01/28/2019
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The FCC Site Registration number is 101879.

3. N.C.R = No Calibration Required.

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7.2.2.3. Measuring Instruments and Setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

7.2.2.4. TEST PROCEDURE (please refer to measurement standard)

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

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Final measurement:

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

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Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

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Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz
Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Pre measurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

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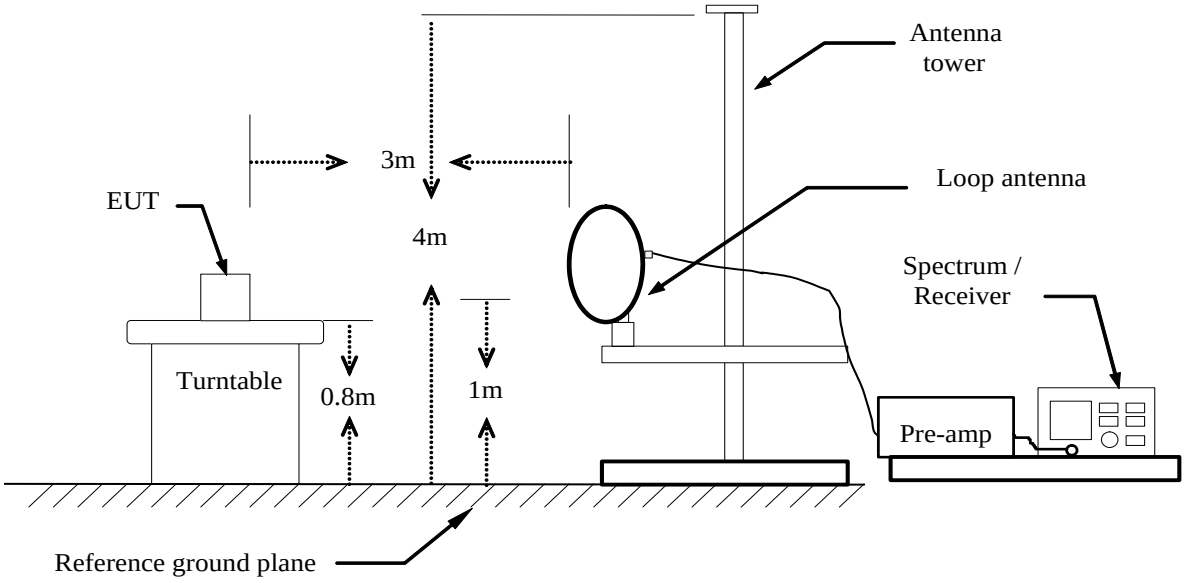
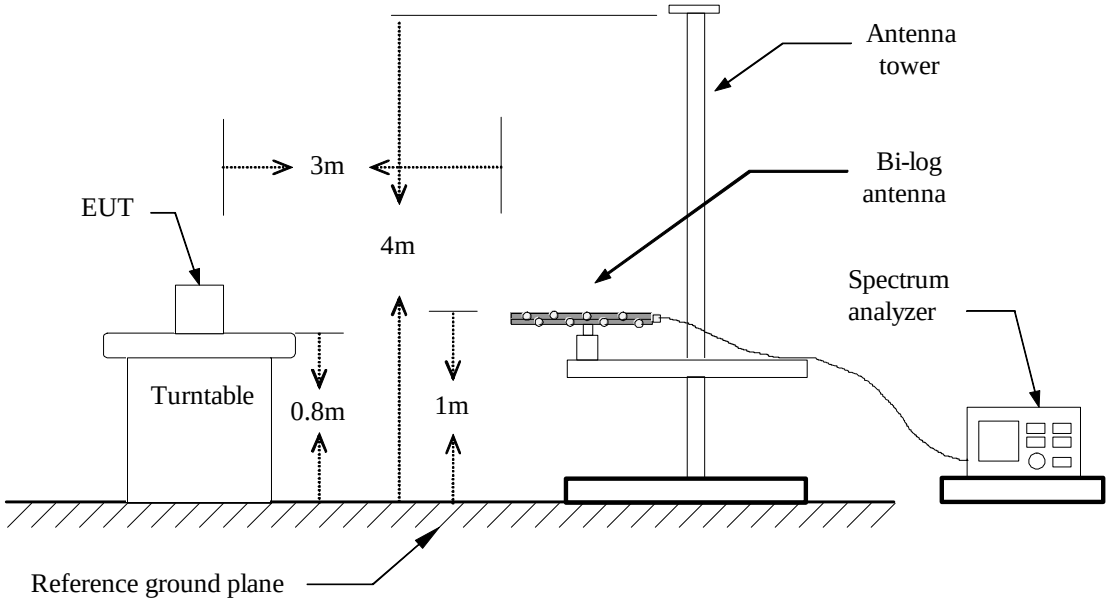
7.2.2.5. TEST SETUP

Below 30MHz



Below 1 GHz



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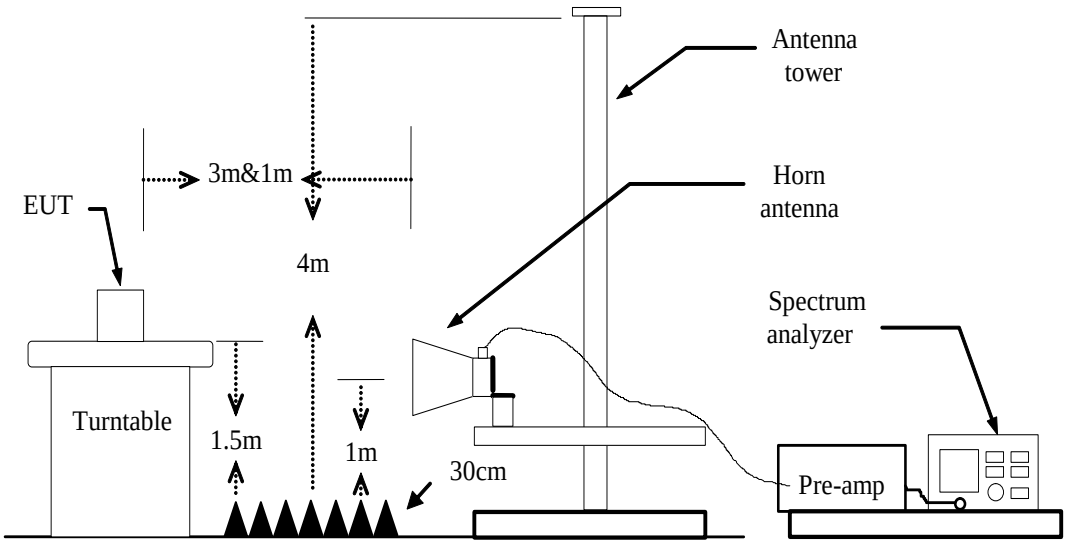
Above 1 GHz



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

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7.2.2.6. DATA SAPLE

Below 1GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXX.XXXX	36.37	-12.20	24.17	40.00	-15.83	V	QP

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correct Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
Q.P. = Quasi-peak Reading

Above 1GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
XXXX.XXXX	62.09	-11.42	50.67	74.00	-23.33	V	Peak
XXXX.XXXX	49.78	-11.42	38.36	54.00	-15.64	V	AVG

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
Peak = Peak Reading
AVG = Average Reading

Calculation Formula

Margin (dB) = Result (dBuV/m) – Limits (dBuV/m)
Result (dBuV/m) = Reading (dBuV) + Correction Factor

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7.2.2.7. TEST RESULTS

Below 1 GHz

Test Mode: TX / IEEE 802.11b(CH Low) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** May 8, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
53.2800	43.87	-12.60	31.27	40.00	-8.73	V	QP
213.3300	41.18	-11.26	29.92	43.50	-13.58	V	QP
285.1100	41.14	-9.77	31.37	46.00	-14.63	V	QP
454.8600	41.94	-8.04	33.90	46.00	-12.10	V	QP
549.9200	38.31	-6.40	31.91	46.00	-14.09	V	QP
666.3200	36.04	-4.87	31.17	46.00	-14.83	V	QP
68.8000	39.30	-14.52	24.78	40.00	-15.22	H	QP
302.5700	42.72	-9.99	32.73	46.00	-13.27	H	QP
398.6000	44.73	-8.57	36.16	46.00	-9.84	H	QP
457.7700	37.96	-7.76	30.20	46.00	-15.80	H	QP
602.3000	38.85	-5.80	33.05	46.00	-12.95	H	QP
676.0200	38.12	-4.68	33.44	46.00	-12.56	H	QP

Notes:

1. No emission found between lowest internal used/generated frequency to 30MHz.
2. Pre-scan all mode and recorded the worst case results in this report (802.11b (Low Channel)

Remark:

1. Radiated emissions measured in frequency range from 9 kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
2. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
3. The IF bandwidth of Receiver between 30MHz to 1GHz was 120 kHz.
4. Frequency (MHz). = Emission frequency in MHz
   Reading (dBμV/m) = Receiver reading
   Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
   Limit (dBμV/m) = Limit stated in standard
   Margin (dB) = Measured (dBμV/m) – Limits (dBμV/m)
   Antenna Pol e (H/V) = Current carrying line of reading

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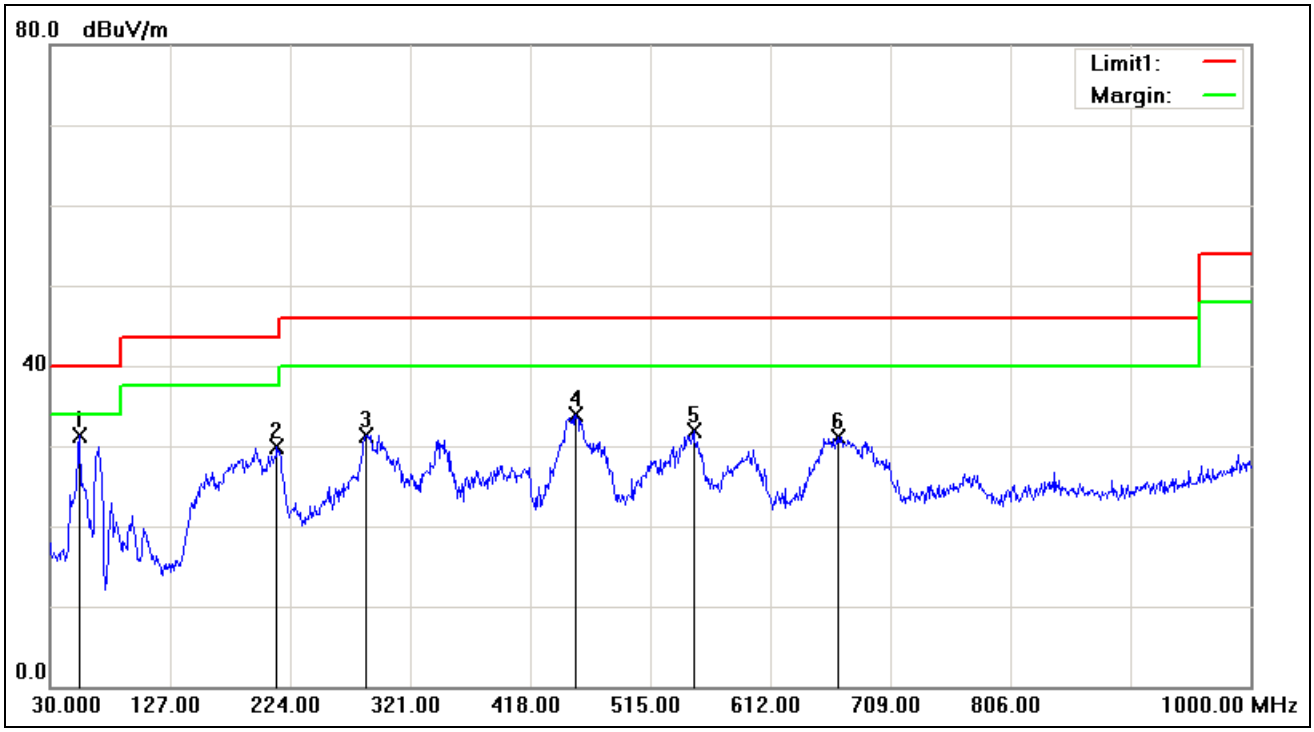
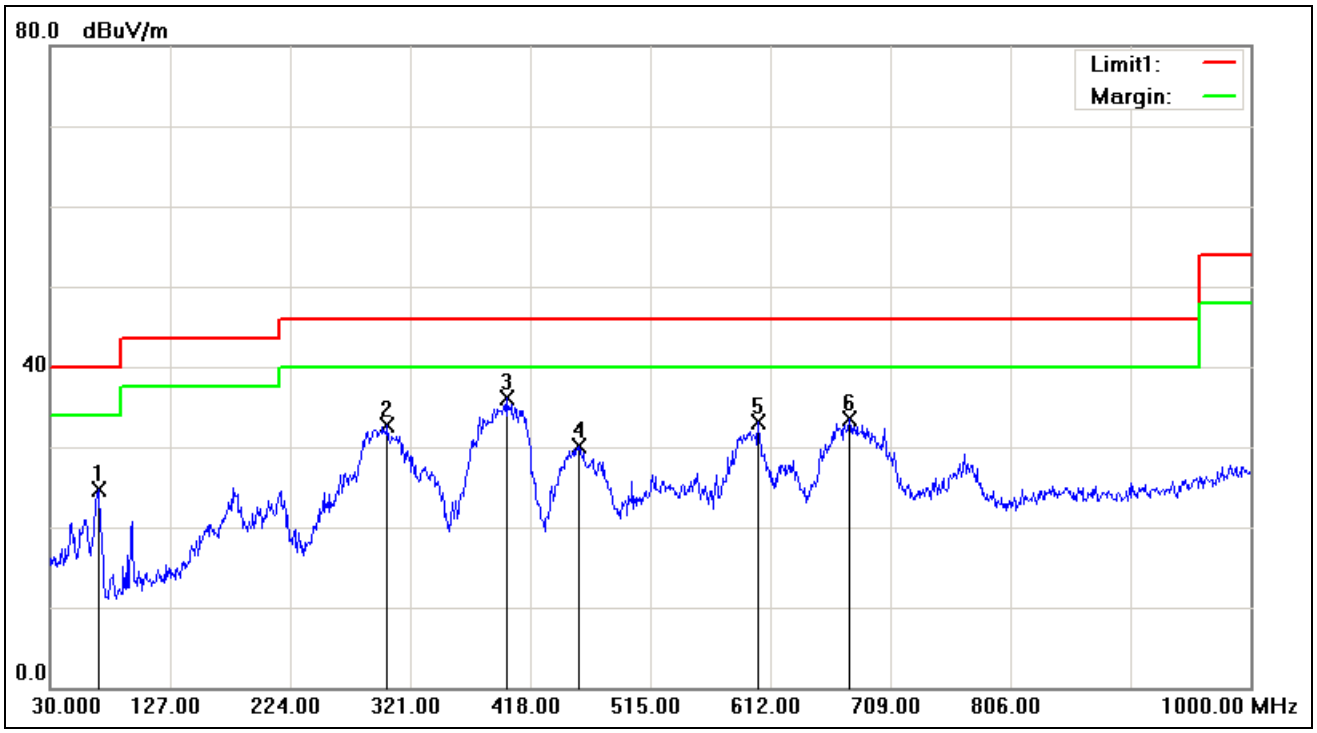
Vertical



Horizontal



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Above 1 GHz

Test Mode: TX / IEEE 802.11b(CH Low) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 28, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2107.000	46.42	-4.41	42.01	74.00	-31.99	V	peak
2629.000	45.70	-2.03	43.67	74.00	-30.33	V	peak
3592.000	42.63	-0.13	42.50	74.00	-31.50	V	peak
4348.000	42.67	2.81	45.48	74.00	-28.52	V	peak
4879.000	41.60	4.59	46.19	74.00	-27.81	V	peak
5446.000	41.87	5.77	47.64	74.00	-26.36	V	peak
1342.000	47.22	-7.27	39.95	74.00	-34.05	H	Peak
2260.000	45.46	-3.58	41.88	74.00	-32.12	H	Peak
2638.000	46.45	-2.01	44.44	74.00	-29.56	H	Peak
3331.000	43.88	-0.80	43.08	74.00	-30.92	H	Peak
3646.000	43.19	0.10	43.29	74.00	-30.71	H	Peak
4240.000	42.92	2.43	45.35	74.00	-28.65	H	peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

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Test Mode: TX / IEEE 802.11b (CH Mid) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 28, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1414.000	49.58	-7.03	42.55	74.00	-31.45	V	Peak
2188.000	45.31	-3.97	41.34	74.00	-32.66	V	Peak
2656.000	45.65	-1.98	43.67	74.00	-30.33	V	Peak
3655.000	43.43	0.13	43.56	74.00	-30.44	V	Peak
4663.000	41.92	3.88	45.80	74.00	-28.20	V	Peak
5122.000	41.60	5.20	46.80	74.00	-27.20	V	Peak
1351.000	47.28	-7.24	40.04	74.00	-33.96	H	Peak
1945.000	46.14	-5.35	40.79	74.00	-33.21	H	Peak
2107.000	45.32	-4.41	40.91	74.00	-33.09	H	Peak
2638.000	46.13	-2.01	44.12	74.00	-29.88	H	Peak
4033.000	42.34	1.71	44.05	74.00	-29.95	H	Peak
4789.000	41.51	4.29	45.80	74.00	-28.20	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

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Test Mode: TX / IEEE 802.11b (CH High) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 28, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2251.000	45.12	-3.62	41.50	74.00	-32.50	V	Peak
2647.000	45.59	-2.00	43.59	74.00	-30.41	V	Peak
3349.000	42.71	-0.77	41.94	74.00	-32.06	V	Peak
4330.000	41.93	2.75	44.68	74.00	-29.32	V	Peak
4735.000	41.40	4.12	45.52	74.00	-28.48	V	Peak
5680.000	40.81	5.95	46.76	74.00	-27.24	V	Peak
1333.000	48.20	-7.30	40.90	74.00	-33.10	H	Peak
2107.000	46.47	-4.41	42.06	74.00	-31.94	H	Peak
2665.000	45.79	-1.96	43.83	74.00	-30.17	H	Peak
2809.000	44.08	-1.70	42.38	74.00	-31.62	H	Peak
3817.000	42.58	0.82	43.40	74.00	-30.60	H	Peak
4726.000	41.70	4.09	45.79	74.00	-28.21	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

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Test Mode: TX / IEEE 802.11g(CH Low) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 28, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1351.000	47.08	-7.24	39.84	74.00	-34.16	V	Peak
1900.000	49.71	-5.63	44.08	74.00	-29.92	V	Peak
3349.000	43.47	-0.77	42.70	74.00	-31.30	V	Peak
4195.000	40.73	2.28	43.01	74.00	-30.99	V	Peak
4870.000	41.24	4.56	45.80	74.00	-28.20	V	Peak
5059.000	41.87	5.09	46.96	74.00	-27.04	V	Peak
1315.000	47.23	-7.37	39.86	74.00	-34.14	H	Peak
2080.000	44.01	-4.56	39.45	74.00	-34.55	H	Peak
2215.000	44.22	-3.82	40.40	74.00	-33.60	H	Peak
3979.000	41.69	1.50	43.19	74.00	-30.81	H	Peak
4564.000	40.59	3.56	44.15	74.00	-29.85	H	Peak
4987.000	40.68	4.94	45.62	74.00	-28.38	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

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Test Mode: TX / IEEE 802.11g (CH Mid) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 28, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1900.000	47.19	-5.63	41.56	74.00	-32.44	V	Peak
2260.000	44.32	-3.58	40.74	74.00	-33.26	V	Peak
3349.000	42.60	-0.77	41.83	74.00	-32.17	V	Peak
3970.000	41.33	1.46	42.79	74.00	-31.21	V	Peak
4294.000	42.05	2.62	44.67	74.00	-29.33	V	Peak
4402.000	43.02	3.01	46.03	74.00	-27.97	V	Peak
1324.000	47.27	-7.34	39.93	74.00	-34.07	H	Peak
2107.000	44.25	-4.41	39.84	74.00	-34.16	H	Peak
2260.000	45.34	-3.58	41.76	74.00	-32.24	H	Peak
3943.000	41.89	1.35	43.24	74.00	-30.76	H	Peak
5014.000	41.53	5.00	46.53	74.00	-27.47	H	Peak
5392.000	41.22	5.68	46.90	74.00	-27.10	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

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