

FCC 47 CFR PART 15 SUBPART C

for

Circle

Model: Circle3

Brand: N/A

Test Report Number:

C181015Z02-RP1

Issued Date: November 13, 2018

Issued for

Circle Media Inc.

1104 NW 15th Ave Suite 400, Portland, OR, 97209, USA

Issued by:

GRG Metrology & Test (Shenzhen) Co., Ltd.

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 13, 2018	Initial Issue	ALL	Sinphy Xie

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1 TEST CERTIFICATION

Product	Circle
Model	Circle3
Brand	N/A
Tested	October 15~ November 12, 2018
Applicant	Circle Media Inc. 1104 NW 15th Ave Suite 400, Portland, OR, 97209, USA
Manufacturer	Circle Media Inc. 1104 NW 15th Ave Suite 400, Portland, OR, 97209, USA

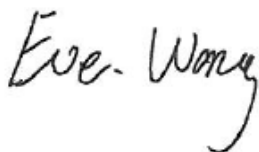
APPLICABLE STANDARDS			
Standard	Test Type	Standard	Test Type
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	<ul style="list-style-type: none"> ● Spurious Emissions ● Conducted Measurement ● Radiated Emissions
15.247(a)(2)	6dB Bandwidth Measurement	15.247(b)(3) 15.247(b)(4)	Peak Power Measurement
15.247(d)	Band Edges Measurement	15.247(e)	Peak Power Spectral Density

We hereby certify that:

The above equipment was tested by GRG Metrology & Test (Shenzhen) Co., Ltd. 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
Supervisor of EMC Dept.
GRG Metrology & Test (Shenzhen) Co., Ltd.

Reviewed by:



Nancy Fu
Supervisor of Report Dept.
GRG Metrology & Test (Shenzhen) Co., Ltd.

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)	<ul style="list-style-type: none">● 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.

3 EUT DESCRIPTION

Product	Circle
Model Number	Circle3
Brand	N/A
Model Discrepancy	N/A
Identify Number	C181015Z02-RC1
Received Date	October 15, 2018
Power Supply	DC5V supply by the adapter
Adapter Manufacturer /Model No.	SHENZHEN KEYU POWER SUPPLY TECHNOLOGY CO.,LTD. Model: KA1517-0502000USU Input: AC100-240V, 50/60Hz , 0.35A Max Output: DC5V, 2000mA
USB Cable	Unshielded 1.02m
RJ45 Cable	Unshielded 0.495m
Transmit Power	IEEE 802.11b mode: 14.39dBm (Antenna 0) IEEE 802.11b mode: 13.39dBm (Antenna 1) IEEE 802.11b mode: 12.70dBm (Antenna 2) IEEE 802.11g mode: 20.93dBm (Antenna 0) IEEE 802.11g mode: 22.77dBm (Antenna 1) IEEE 802.11g mode: 20.61dBm (Antenna 2) IEEE 802.11n HT20 MHz mode: 25.80dBm(Combine with Antenna 0 and Antenna 1 and Antenna 2) IEEE 802.11n HT40 MHz mode: 25.45dBm(Combine with Antenna 0 and Antenna 1 and Antenna 2)
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: 130Mbps with fall back rates of 130/117/104/78/52/39/26/13Mbps IEEE 802.11n HT40: 270Mbps with fall back rates of 270/243/216/162/108/81/54/27Mbps
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	Diple type antenna with 5dBi gain (Max)
Directional Gain	Directional Gain= $G_{ant} + 10\log(N_{ant})$ dBi=9.77dBi
Channels Spacing	IEEE 802.11b/g ,802.11n HT20/HT40 : 5MHz
Temperature Range	0°C ~ +40°C
Hardware Version	Circle V2
Software Version	Circle-Agent V3.1.1.5

- 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: 2AF7ECIRCLE3 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

4 TEST METHODOLOGY

4.1. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Use “artgui.exe” to control the EUT for staying in continuous transmitting and receiving mode.

Test Item	Test mode	Worse mode
Conducted Emission	Mode 1: Normal (AC120V/60Hz)	☒
	Mode 2: Normal (AC240V/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 13Mbps data rate were chosen for full testing.

IEEE 802.11n HT40 MHz mode: Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 27Mbps data rate were chosen for full testing.

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	TianYi 310-14ISK	MP18DLC6	DoC	LENOVO	N/A	Unshielded 1.00m (AC Cable) Shielded 1.80m (DC Cable)
2	Adapter (Notebook)	ADLX65NCC3A	N/A	N/A	LENOVO	N/A	Unshielded 1.00m (AC Cable) Shielded 1.80m (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.

5.3. 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			

Radiated Emission Test Site 966 (2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	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
Loop Antenna	COM-POWER	AL-130	121044	01/30/2018	01/29/2019
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2018	02/20/2019
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
Antenna Tower	SUNOL	TLT2	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
Temp. / Humidity Meter	Anymetre	JR913	N/A	01/29/2018	01/28/2019
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

Antenna Conducted Spurious Emission					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019

6dB Bandwidth					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019

Antenna Gain					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019

Peak Output Power					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Power Meter	Anritsu	ML2495A	1204003	01/27/2018	01/26/2019
Power Sensor	Anritsu	MA2411B	1126150	01/27/2018	01/26/2019

Band edges					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019

Peak Power Spectral Density					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019

- 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.

6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at **Building 10-1, Mingkeda Logistics Park, No.18, Huanguan South Road, Guanlan, Bao'an District, Shenzhen, Guangdong, 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.

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 μ H/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 (dB μ V)	
	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

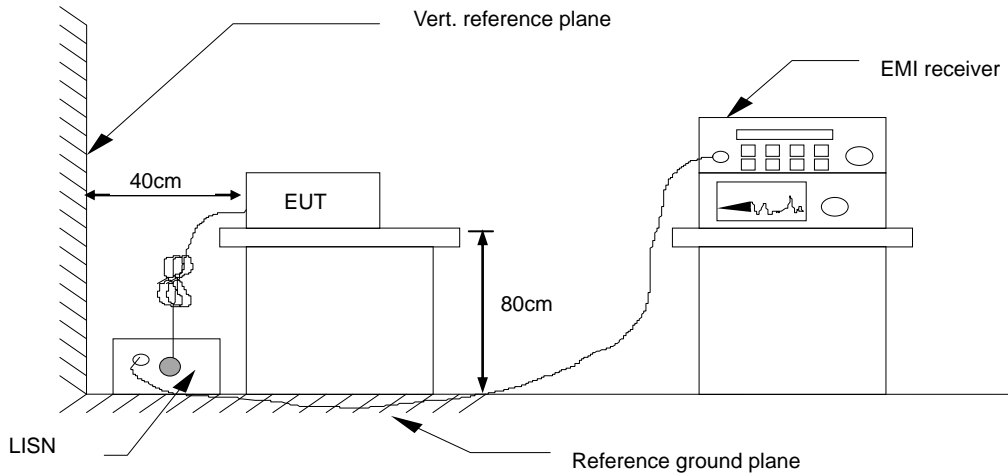
NOTE:

- (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 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.

7.1.3. TEST SETUP



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

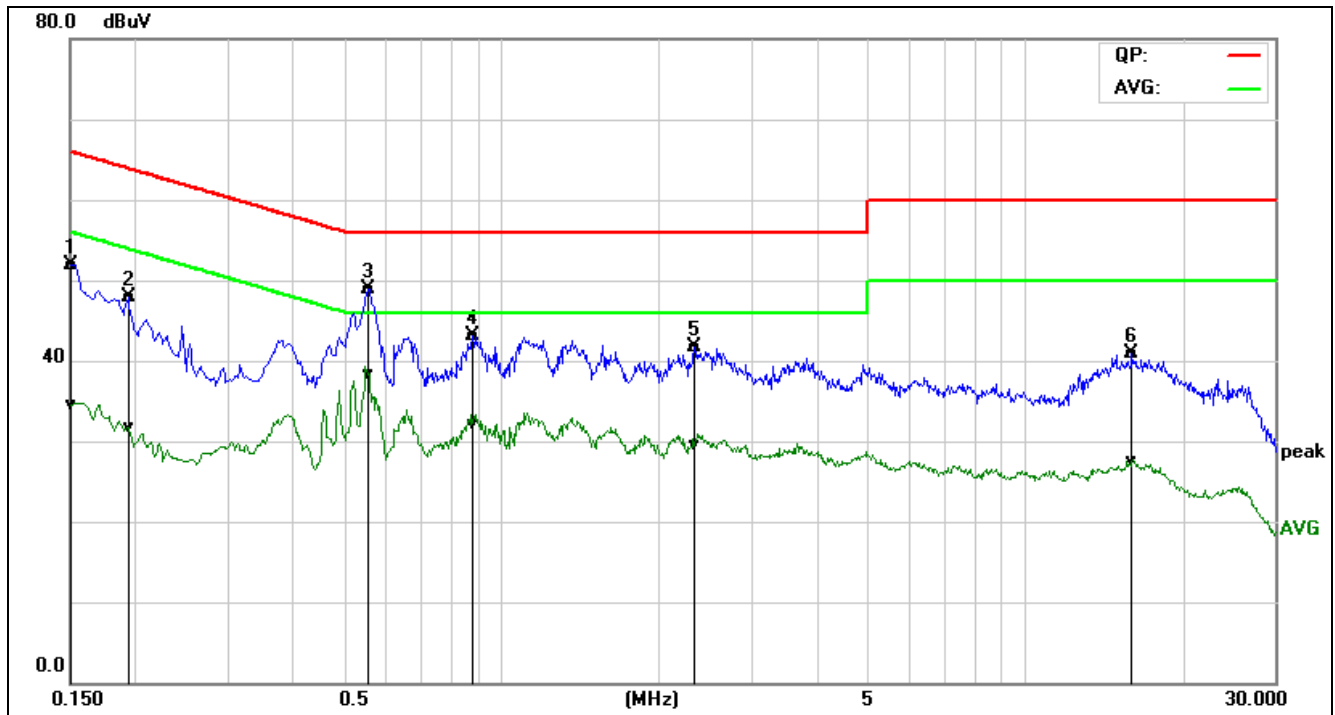
7.1.4. DATA SAMPLE

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)
XXX.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)

7.1.5. TEST RESULTS

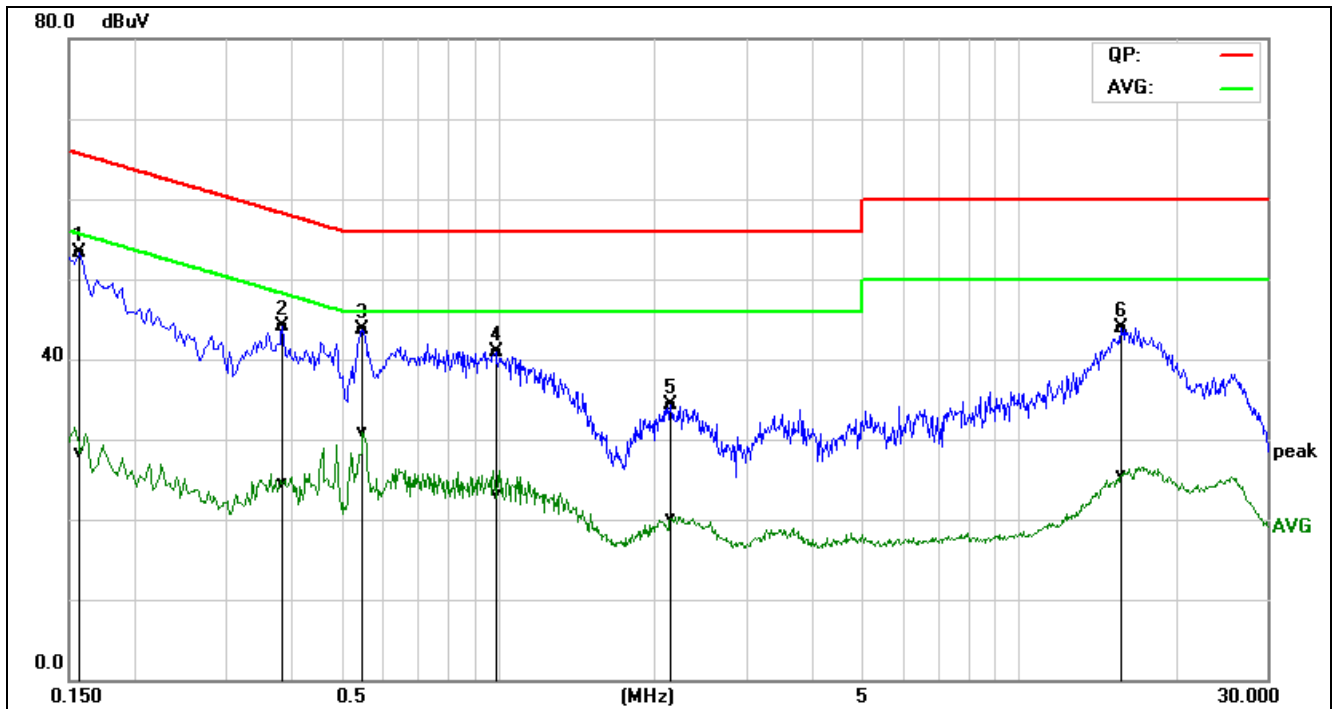
Model No.	Circle3	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Darry Wu	Line	L
Test Date	October 23, 2018	Test Voltage	AC120V/60Hz



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)	Line (L)
0.1500	32.42	14.90	19.52	51.94	34.42	65.99	56.00	-14.05	-21.58	Pass	L
0.1940	28.32	12.22	19.54	47.86	31.76	63.86	53.86	-16.00	-22.10	Pass	L
0.5580	29.44	18.85	19.55	48.99	38.40	56.00	46.00	-7.01	-7.60	Pass	L
0.8820	23.53	12.63	19.57	43.10	32.20	56.00	46.00	-12.90	-13.80	Pass	L
2.3380	22.01	9.76	19.73	41.74	29.49	56.00	46.00	-14.26	-16.51	Pass	L
16.0060	20.84	7.51	20.05	40.89	27.56	60.00	50.00	-19.11	-22.44	Pass	L

REMARKS: L = Live Line

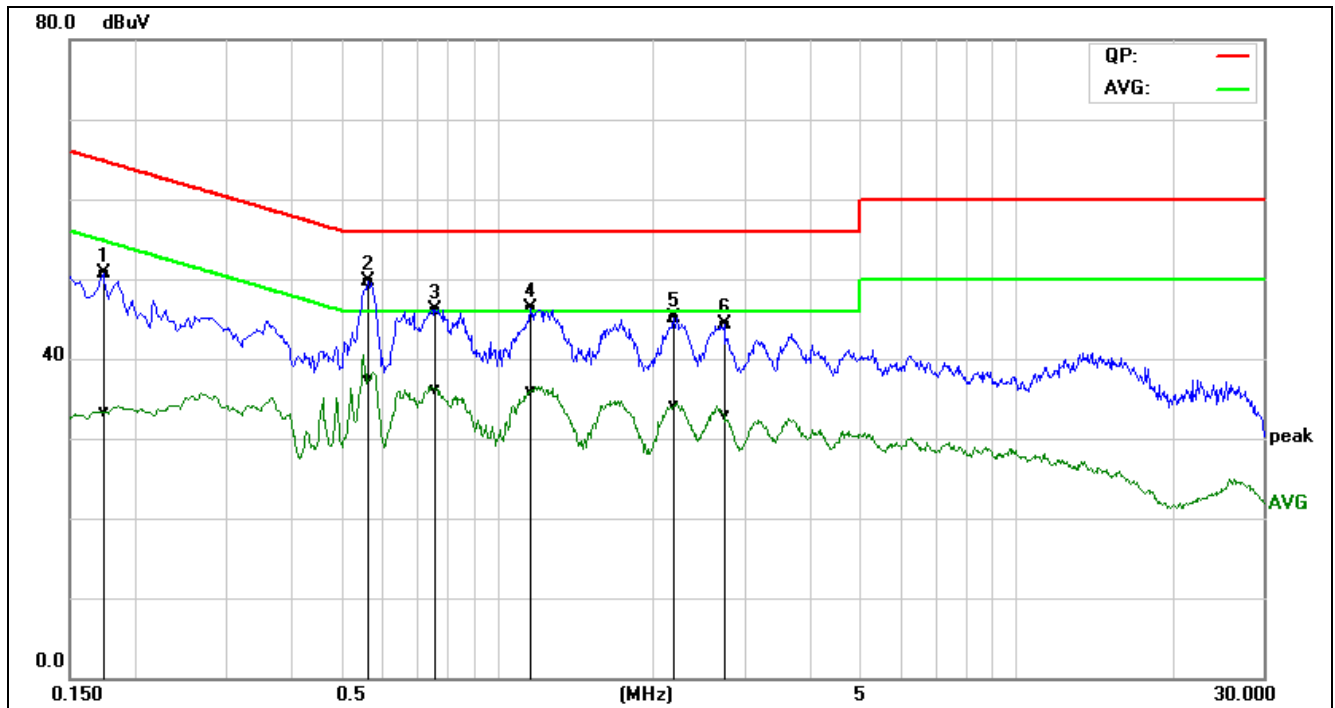
Model No.	Circle3	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 1
Tested by	Darry Wu	Line	N
Test Date	October 23, 2018	Test Voltage	AC120V/60Hz



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)	Line (L1/L2)
0.1580	33.71	8.76	19.52	53.23	28.28	65.56	55.57	-12.33	-27.29	Pass	N
0.3860	24.48	5.06	19.53	44.01	24.59	58.15	48.15	-14.14	-23.56	Pass	N
0.5500	24.08	11.44	19.55	43.63	30.99	56.00	46.00	-12.37	-15.01	Pass	N
0.9940	21.31	3.64	19.55	40.86	23.19	56.00	46.00	-15.14	-22.81	Pass	N
2.1500	14.59	0.40	19.72	34.31	20.12	56.00	46.00	-21.69	-25.88	Pass	N
15.7820	23.88	5.49	20.05	43.93	25.54	60.00	50.00	-16.07	-24.46	Pass	N

REMARKS: L2 = Line Two (Neutral Line)

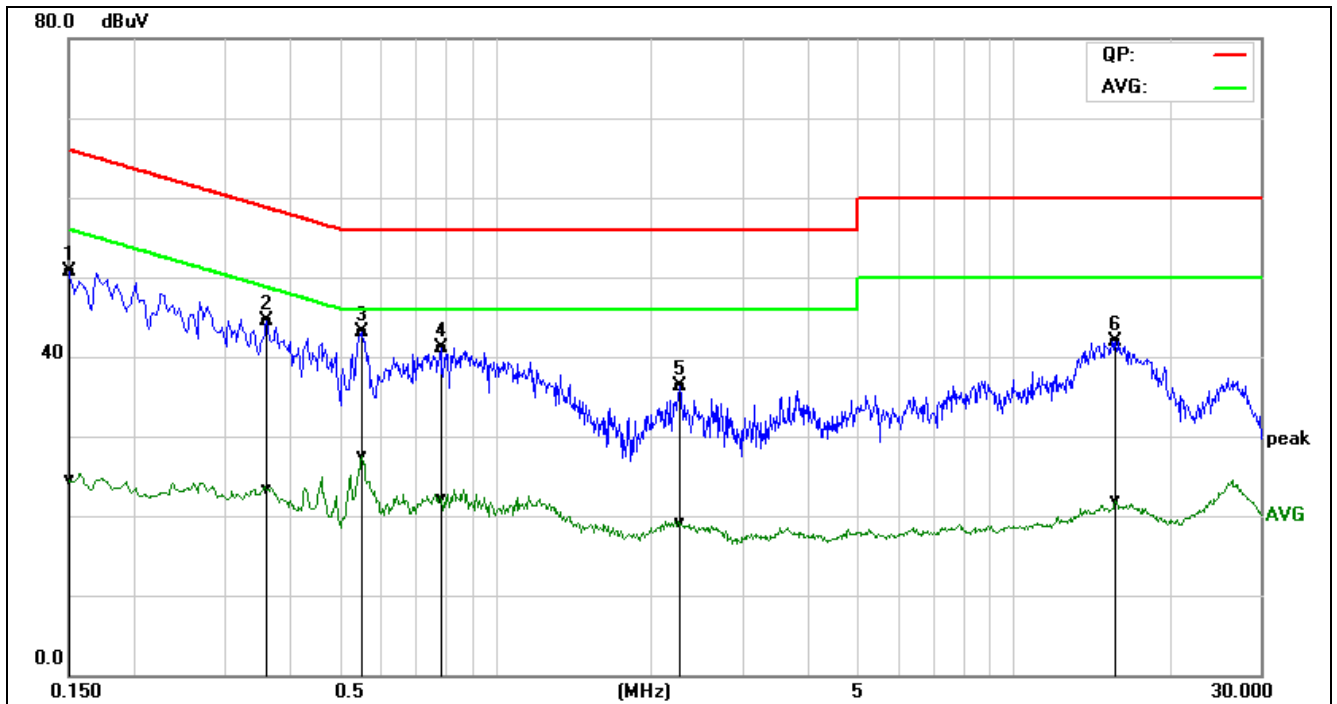
Model No.	Circle3	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 2
Tested by	Darry Wu	Line	L
Test Date	October 23, 2018	Test Voltage	AC240V/50Hz



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)	Line (L)
0.1740	31.16	13.69	19.63	50.79	33.32	64.76	54.77	-13.97	-21.45	Pass	L
0.5660	30.13	17.72	19.56	49.69	37.28	56.00	46.00	-6.31	-8.72	Pass	L
0.7620	26.50	16.53	19.60	46.10	36.13	56.00	46.00	-9.90	-9.87	Pass	L
1.1620	26.77	16.26	19.58	46.35	35.84	56.00	46.00	-9.65	-10.16	Pass	L
2.1900	25.37	14.41	19.72	45.09	34.13	56.00	46.00	-10.91	-11.87	Pass	L
2.7460	24.57	13.12	19.72	44.29	32.84	56.00	46.00	-11.71	-13.16	Pass	L

REMARKS: L1 = Line One (Live Line)

Model No.	Circle3	RBW,VBW	9 kHz
Environmental Conditions	22°C, 45% RH	Test Mode	Mode 2
Tested by	Darry Wu	Line	N
Test Date	October 23, 2018	Test Voltage	AC240V/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)	Line (N)
0.1500	31.09	4.89	19.52	50.61	24.41	65.99	56.00	-15.38	-31.59	Pass	N
0.3620	25.01	3.78	19.53	44.54	23.31	58.68	48.68	-14.14	-25.37	Pass	N
0.5540	23.54	8.03	19.55	43.09	27.58	56.00	46.00	-12.91	-18.42	Pass	N
0.7860	21.55	2.46	19.59	41.14	22.05	56.00	46.00	-14.86	-23.95	Pass	N
2.2820	16.58	-0.70	19.73	36.31	19.03	56.00	46.00	-19.69	-26.97	Pass	N
15.7700	21.83	1.93	20.05	41.88	21.98	60.00	50.00	-18.12	-28.02	Pass	N

REMARKS: N = Neutral Line

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 PROCEDURE (please refer to measurement standard)

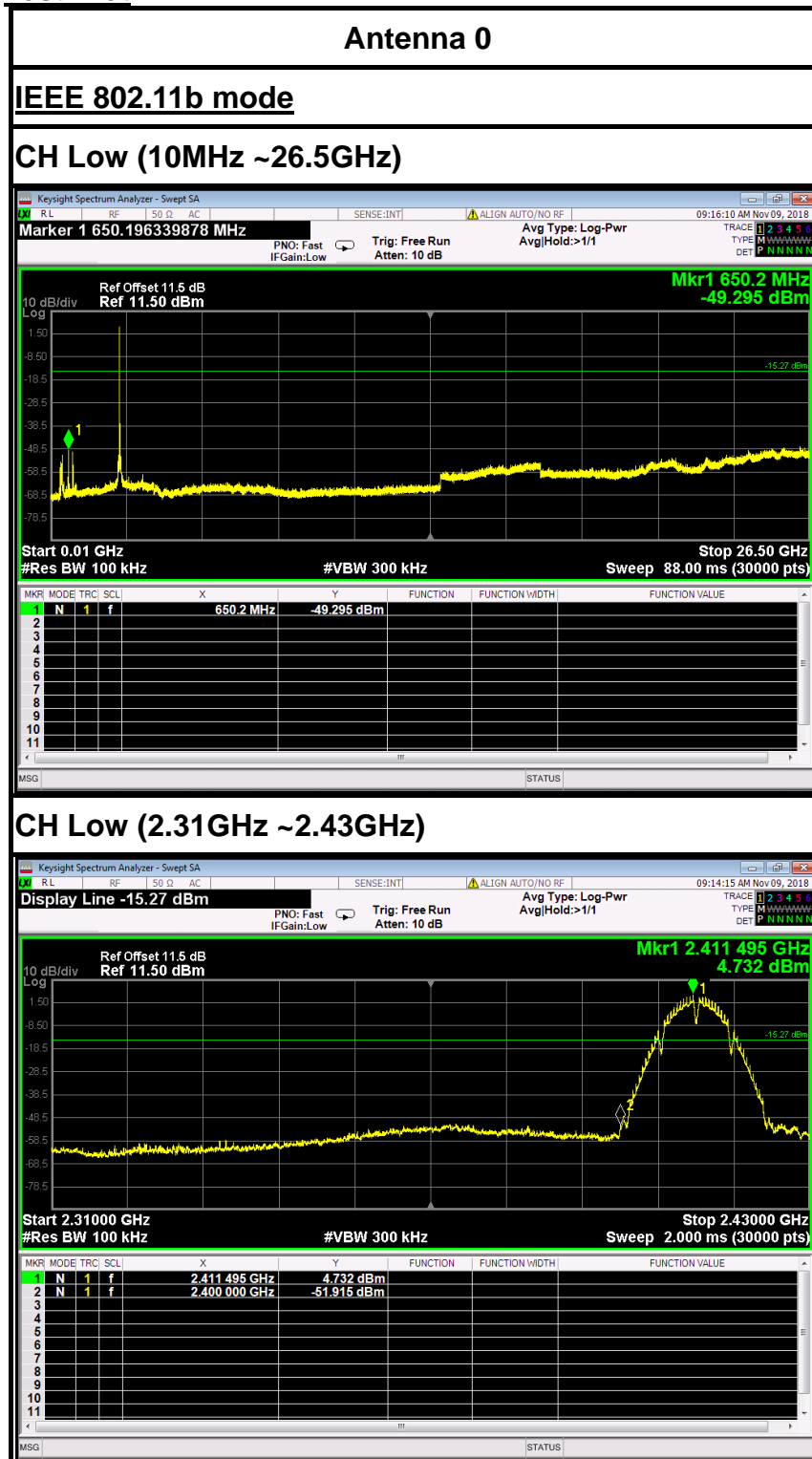
Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

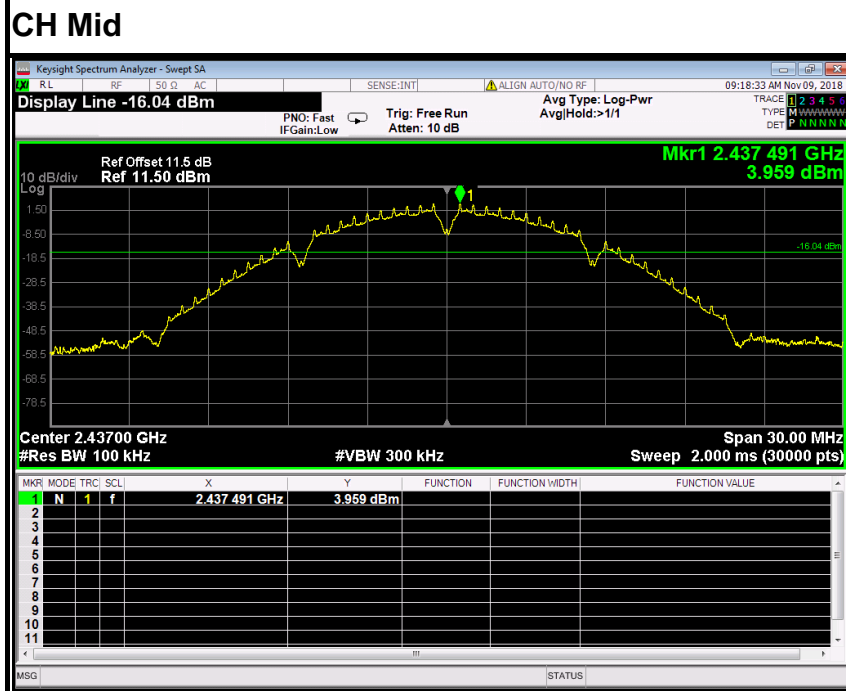
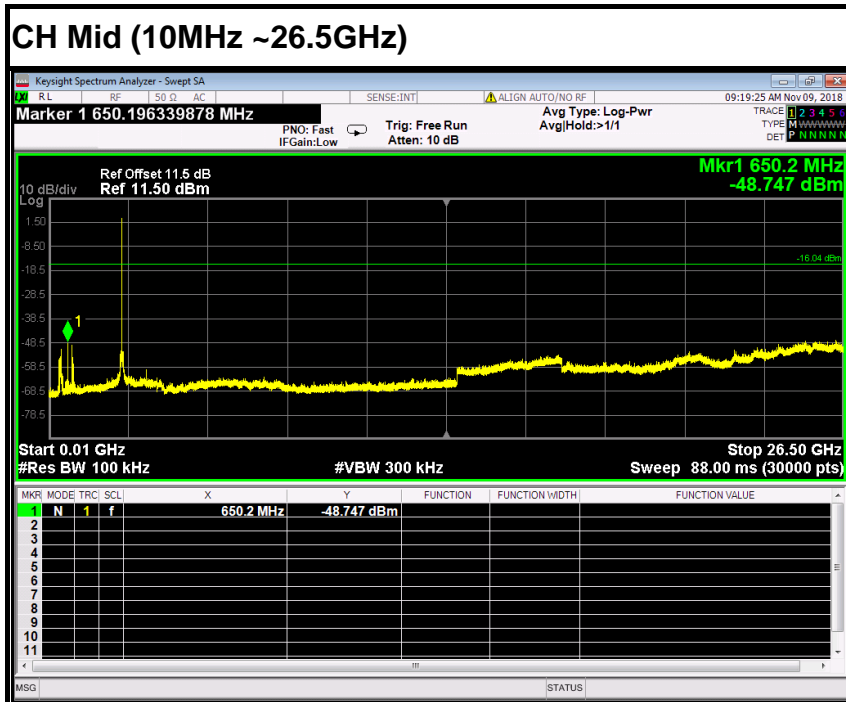
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

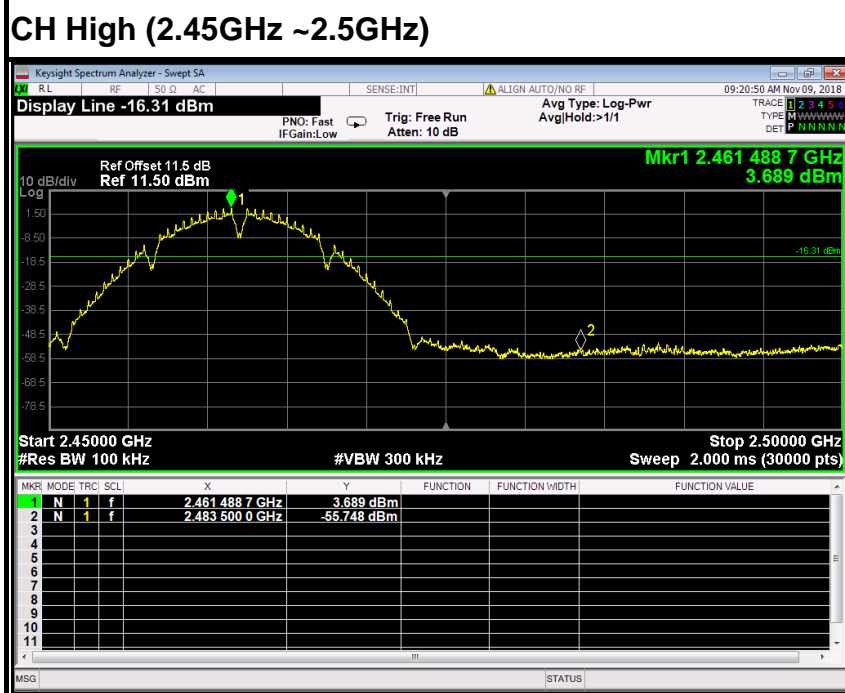
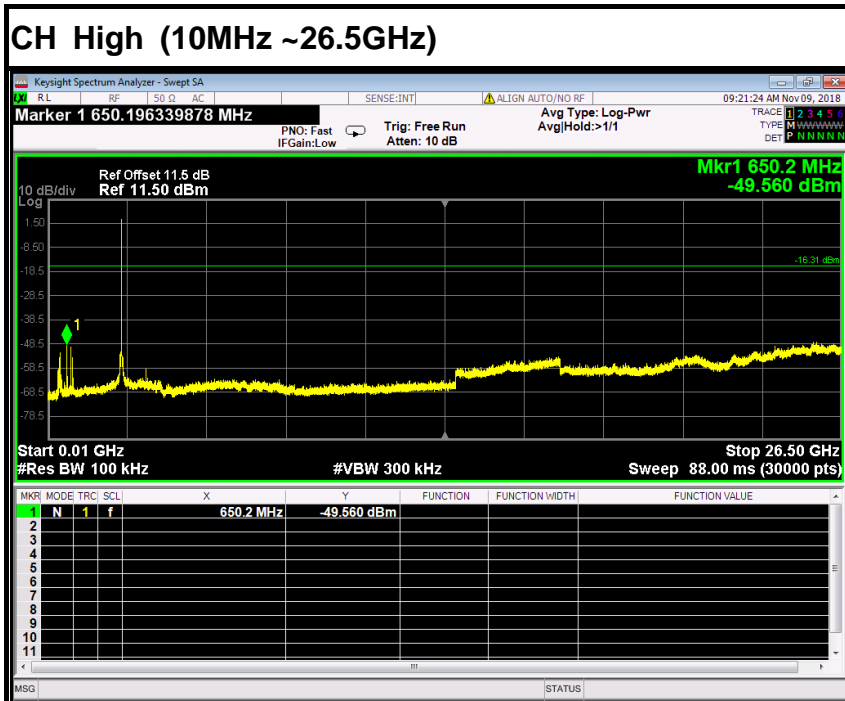
Measurements are made over the 9 kHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels. No emission found between lowest internal used/generated frequency to 10MHz, it is only recorded 10MHz to 26GHz.

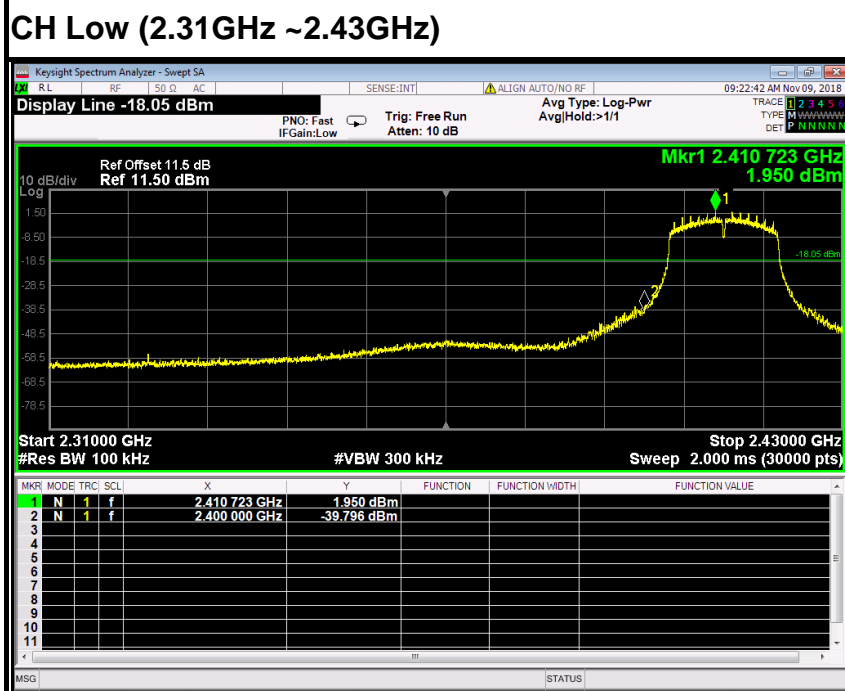
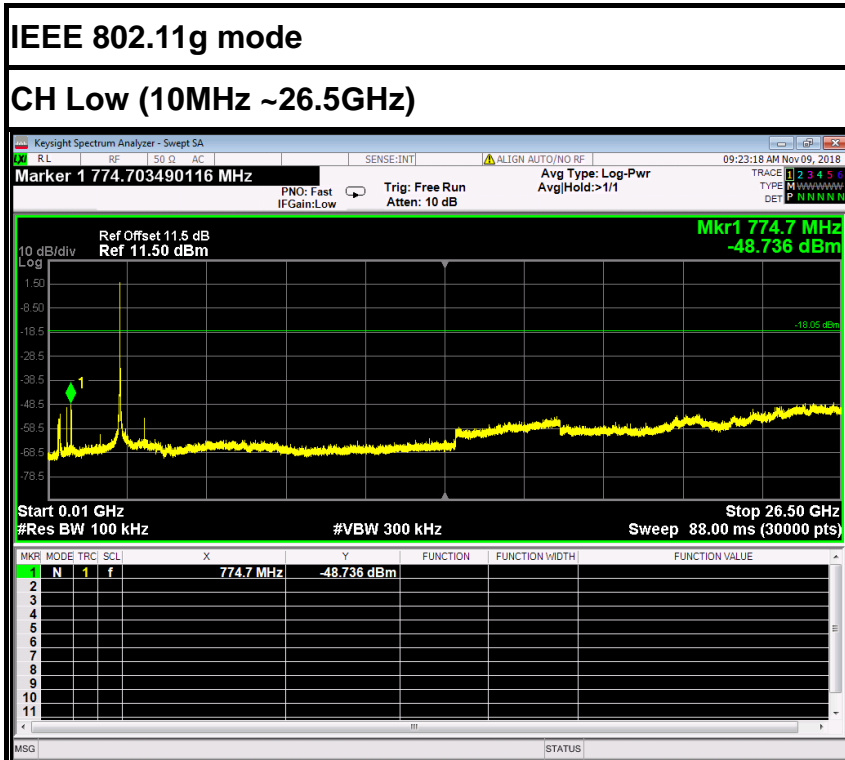
7.2.1.3. TEST RESULTS

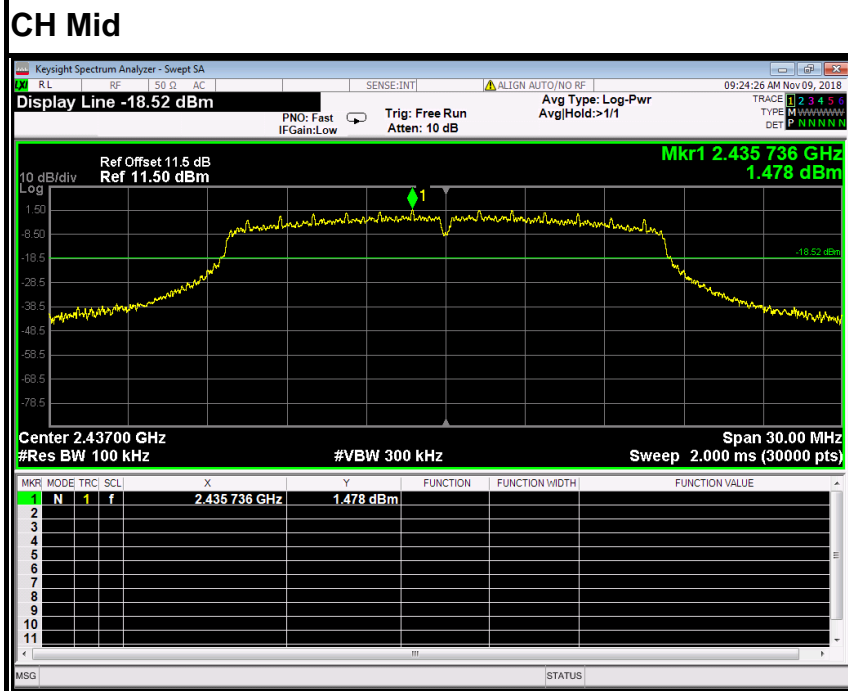
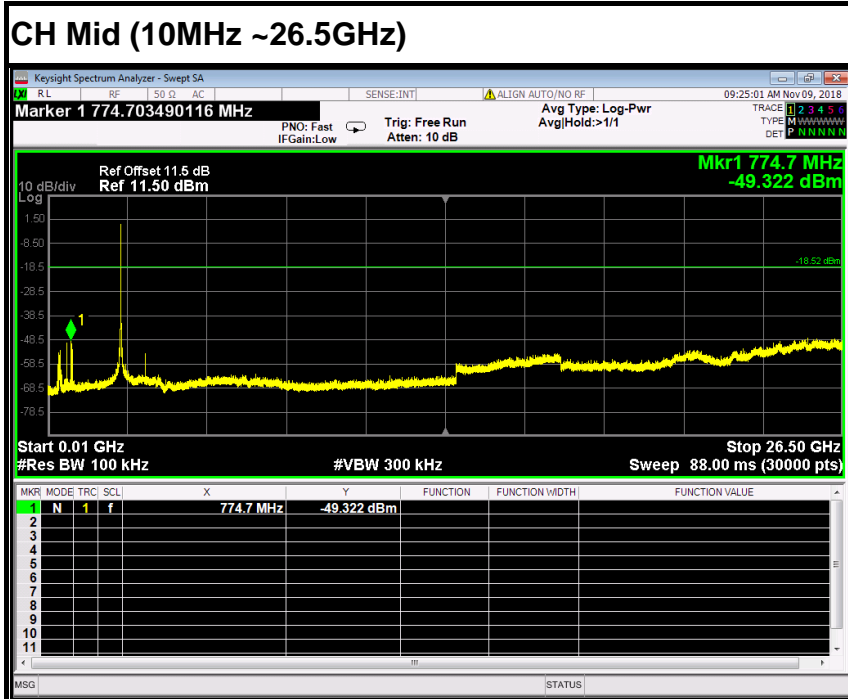
Test Plot

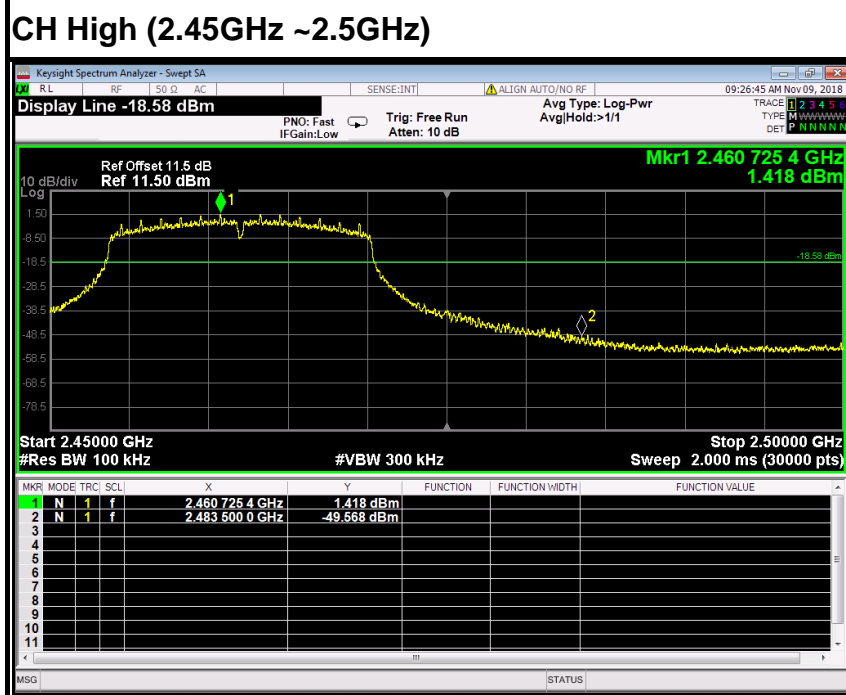
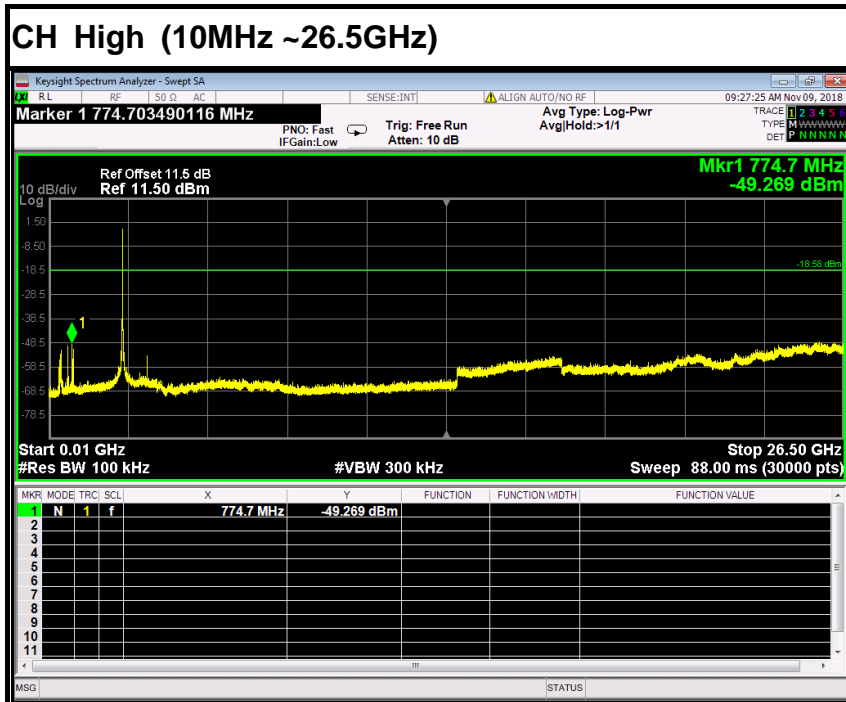


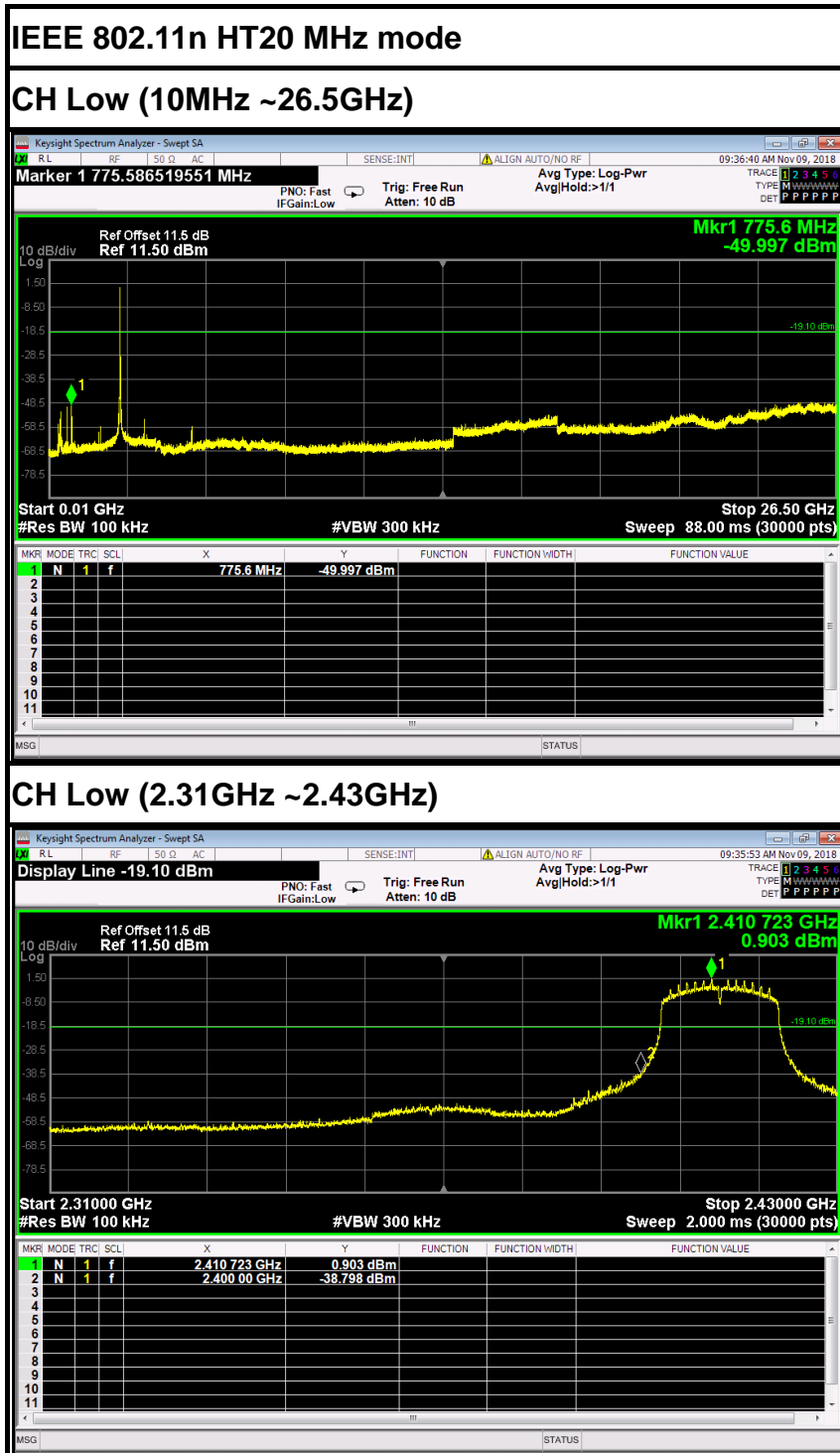


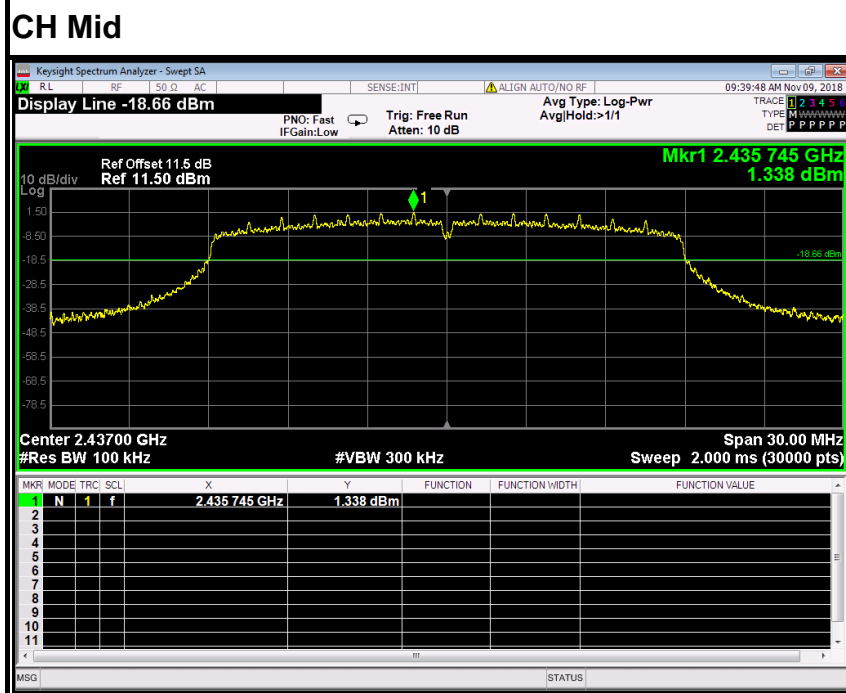
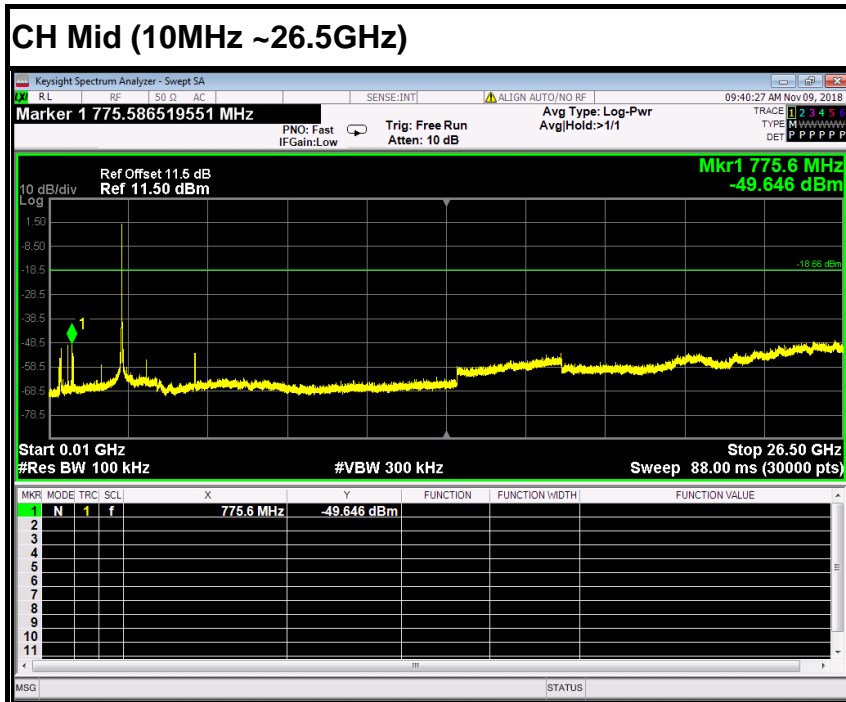


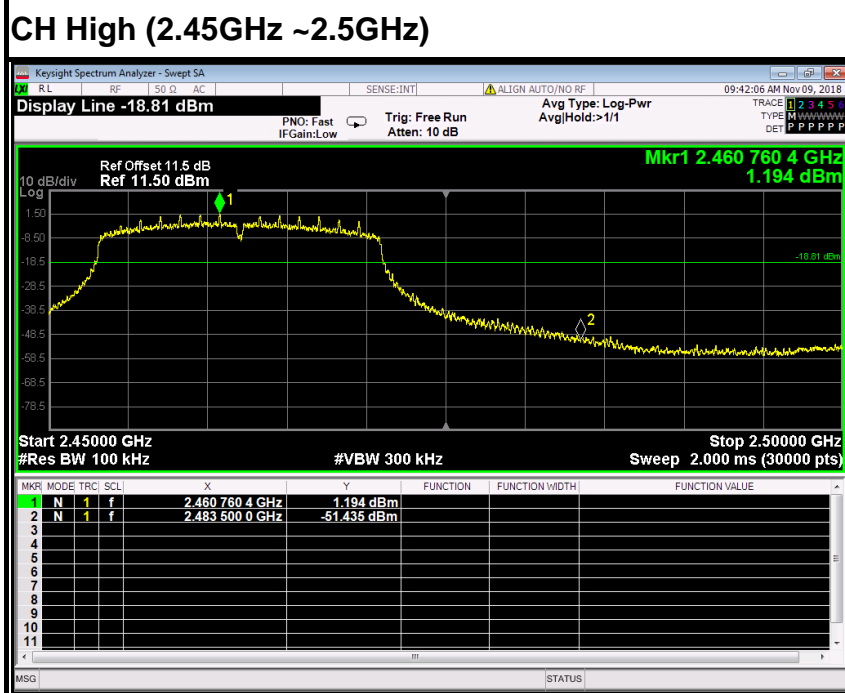
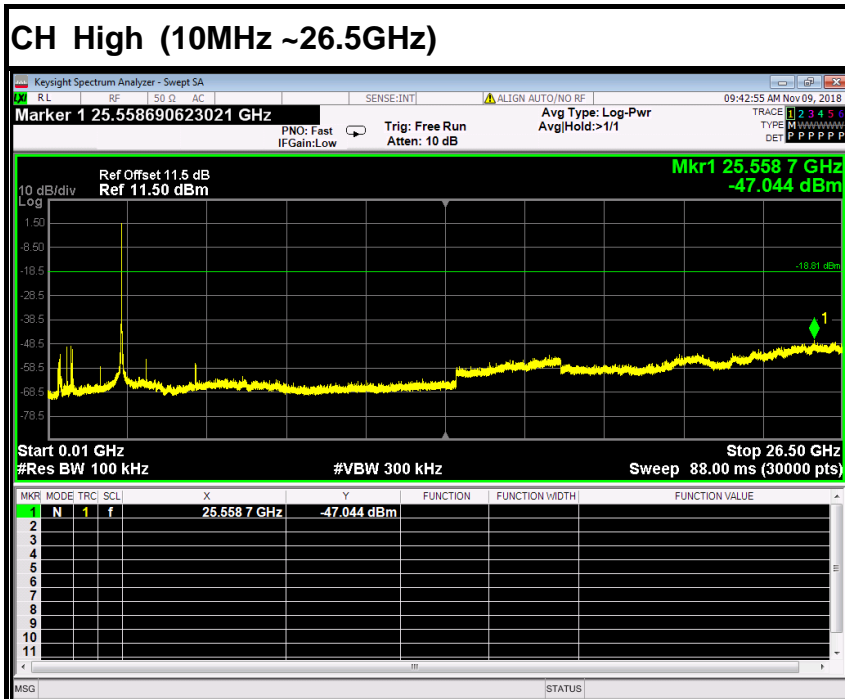


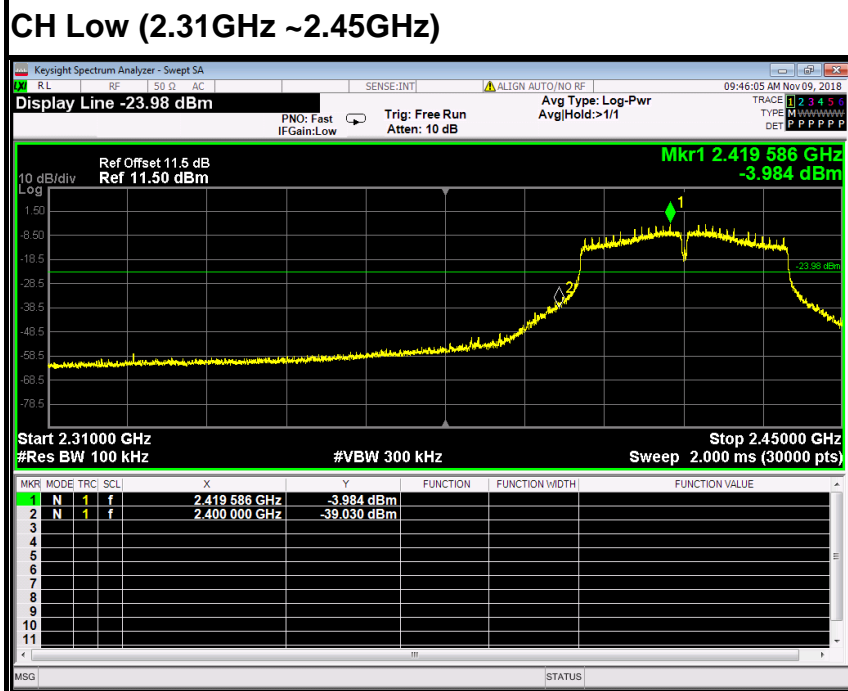
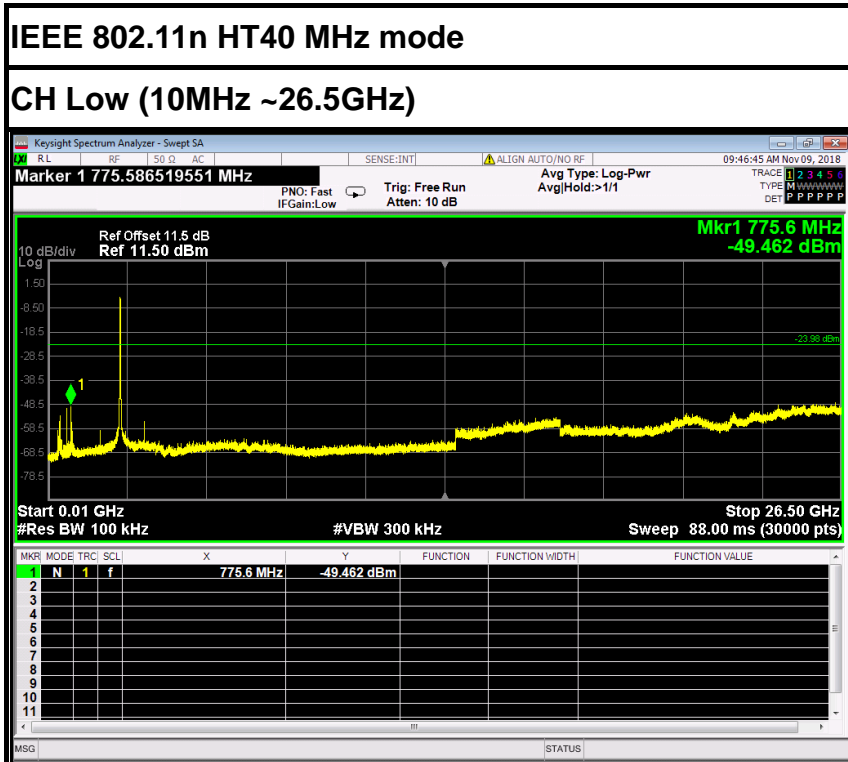


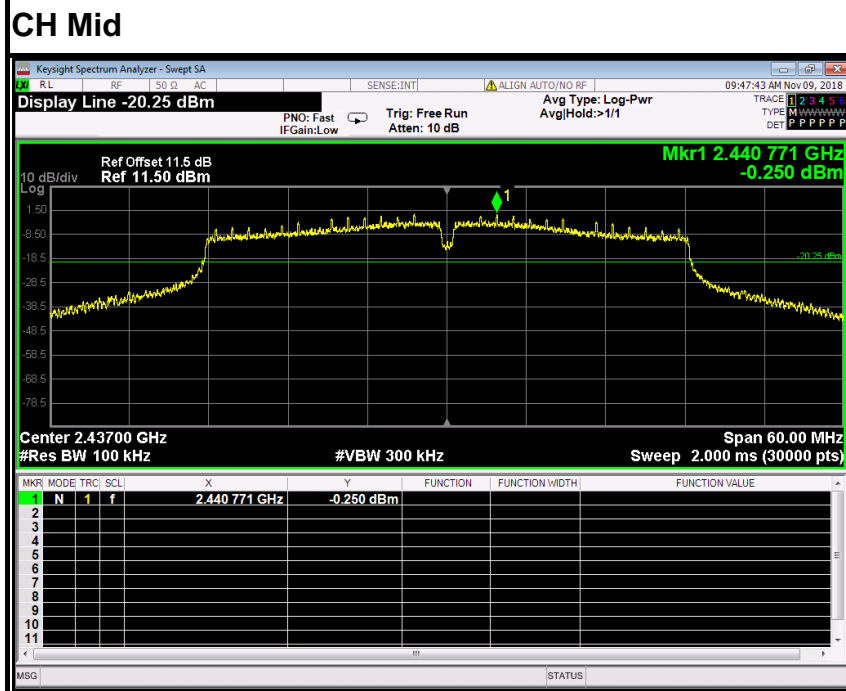
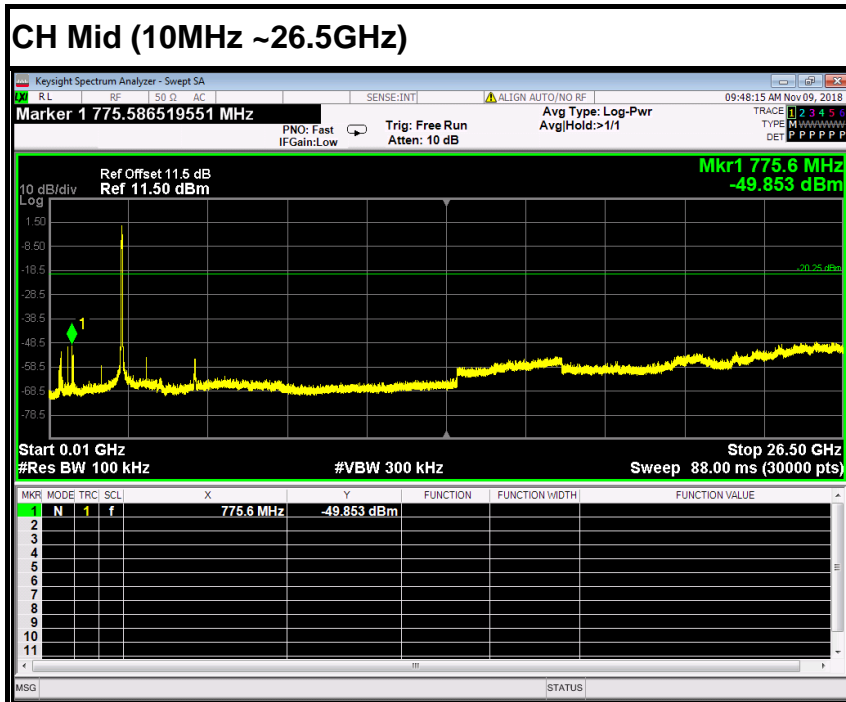


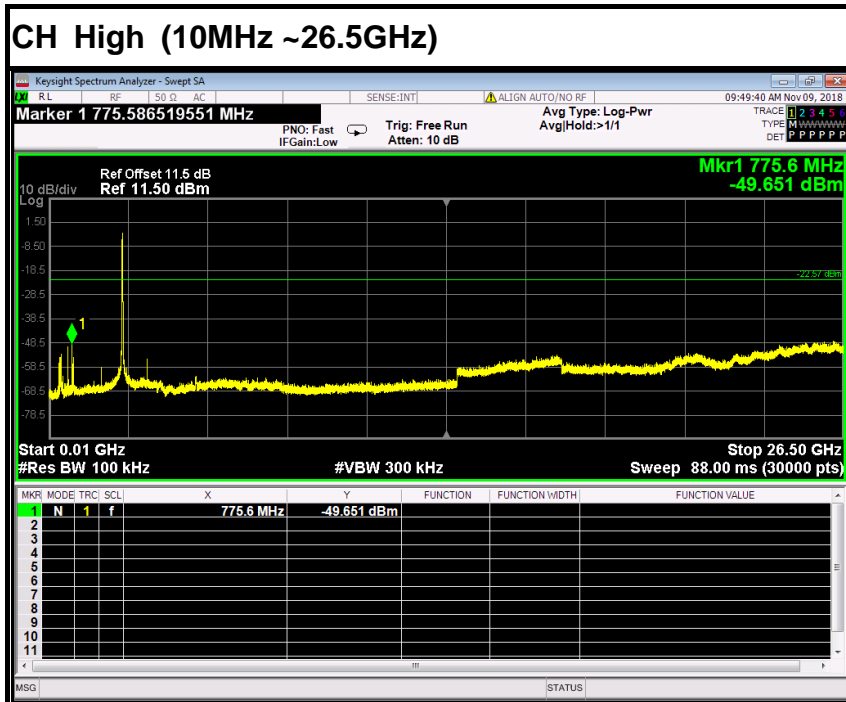


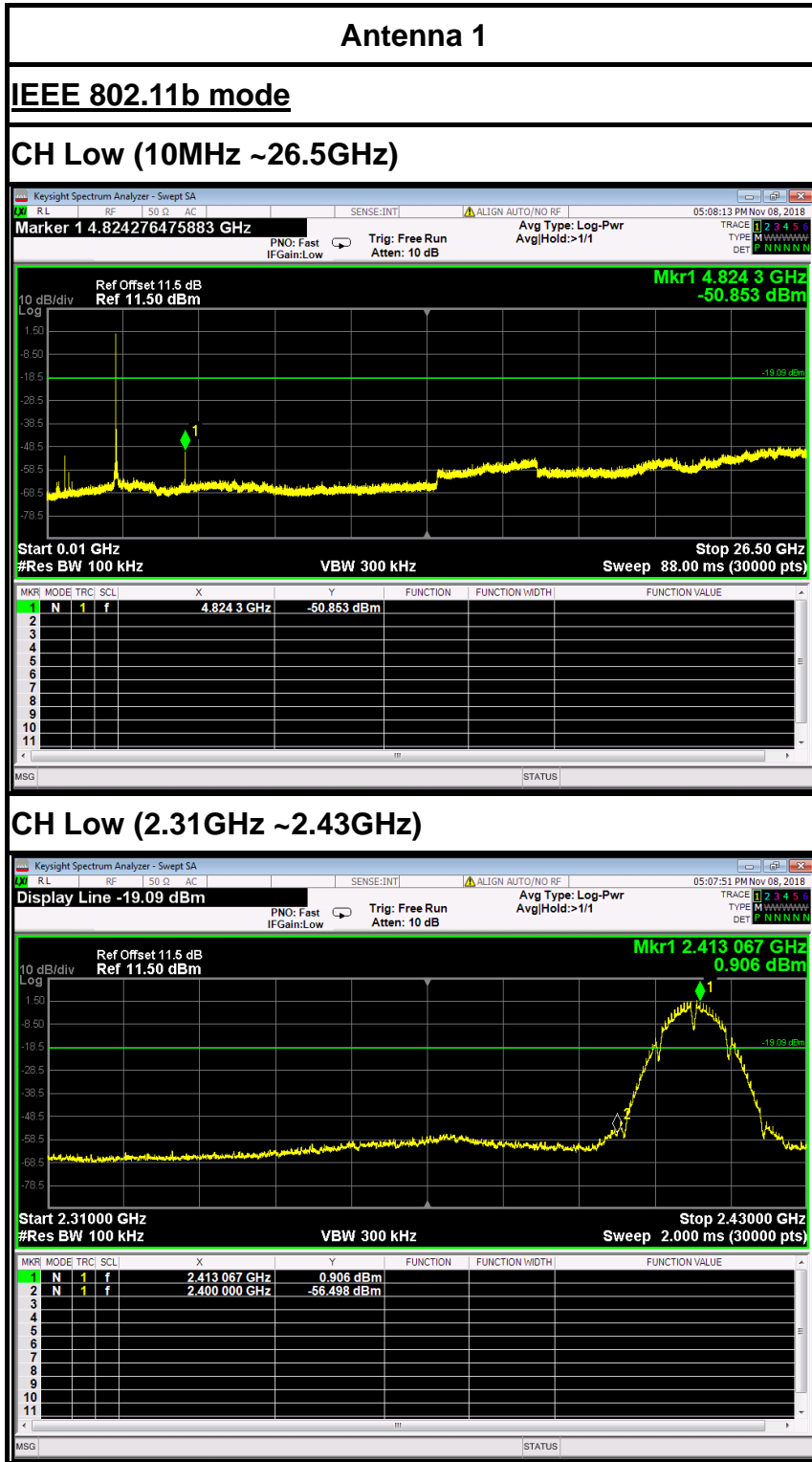


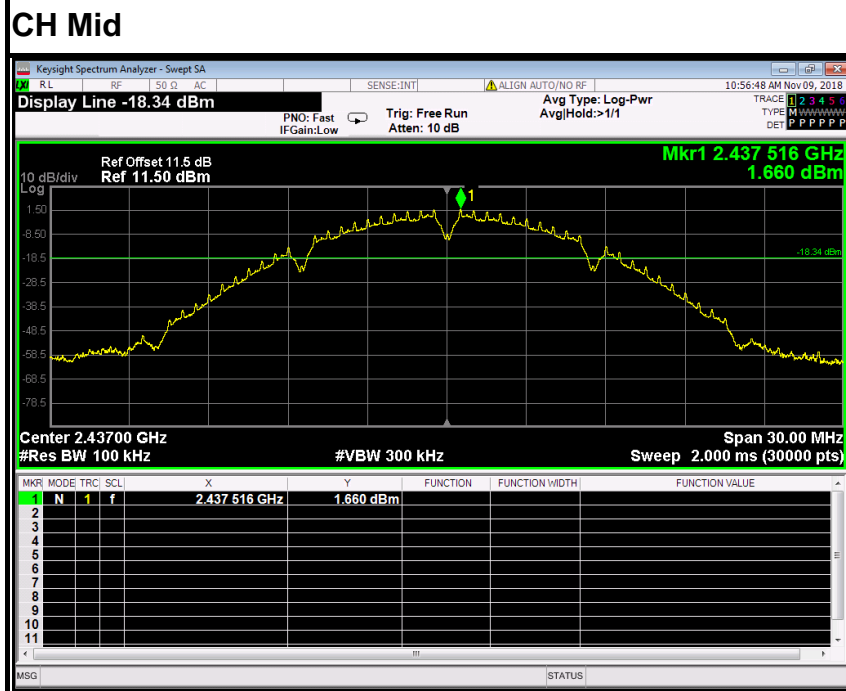
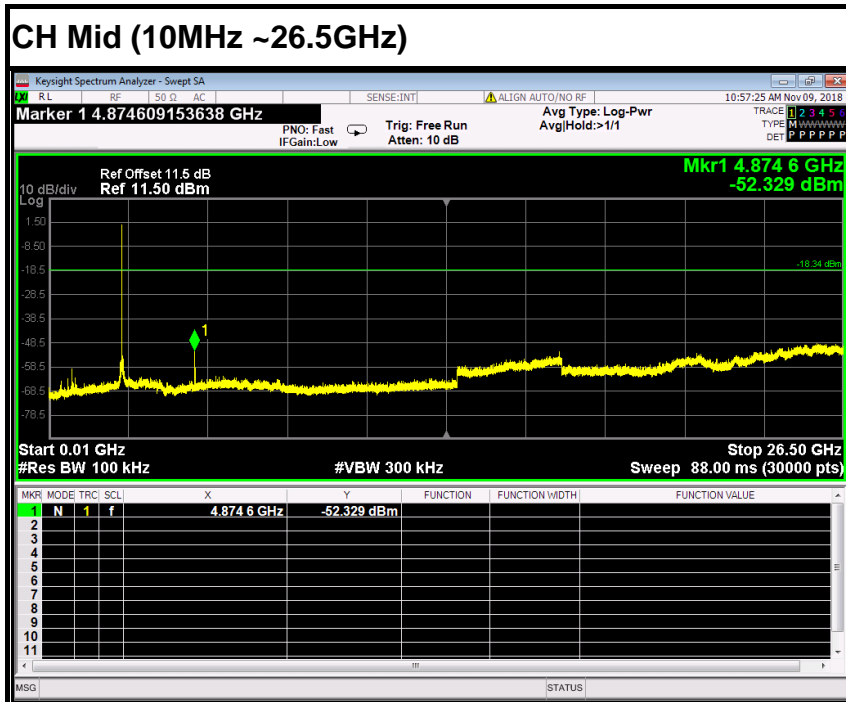


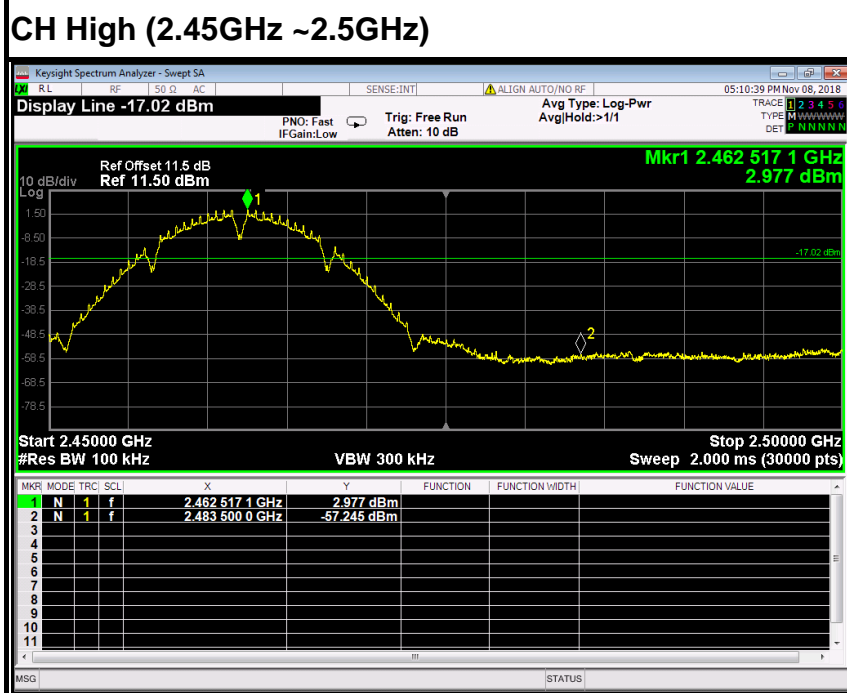


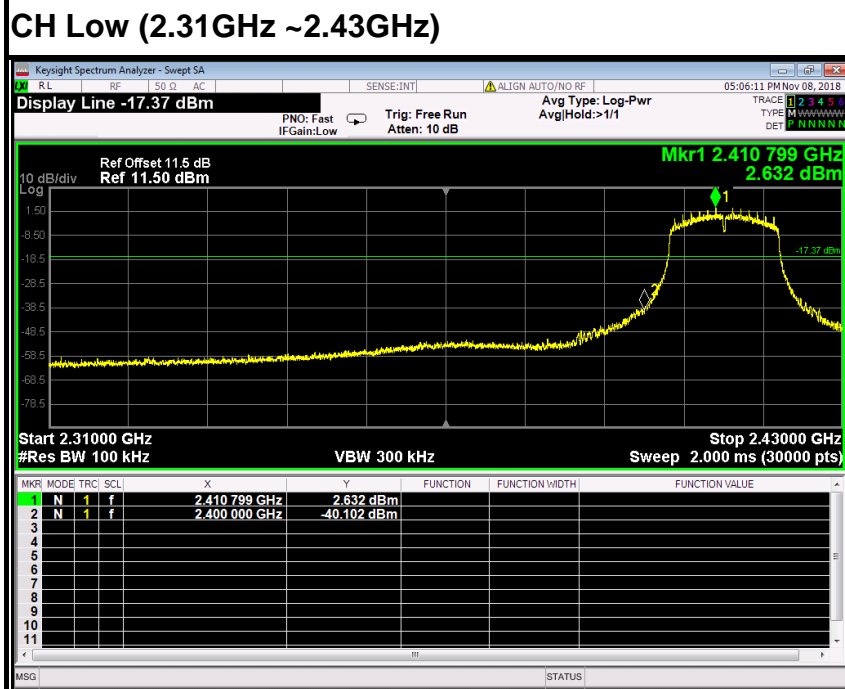
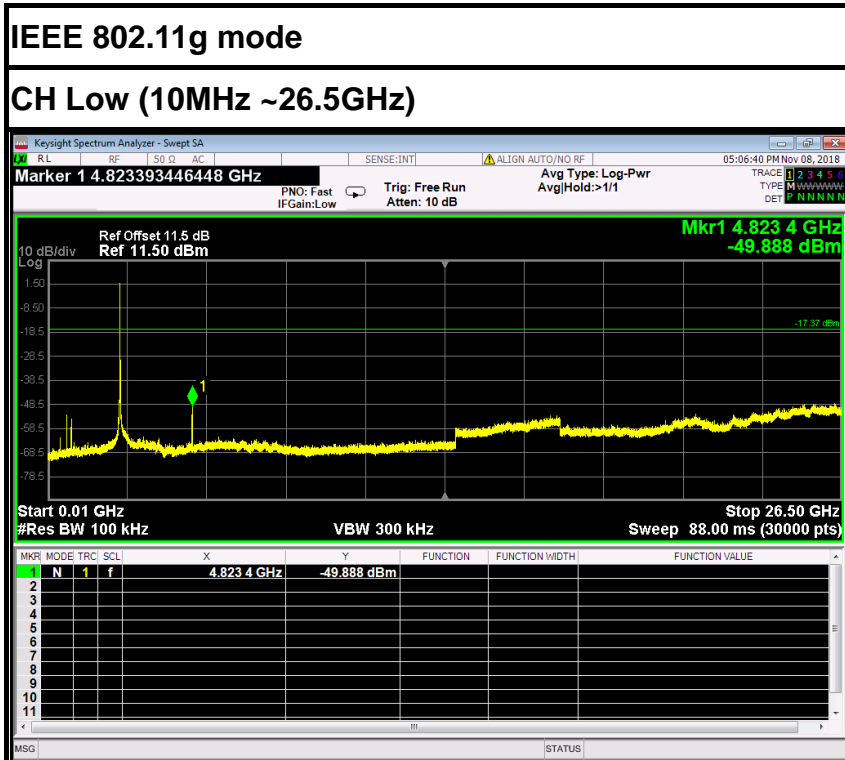


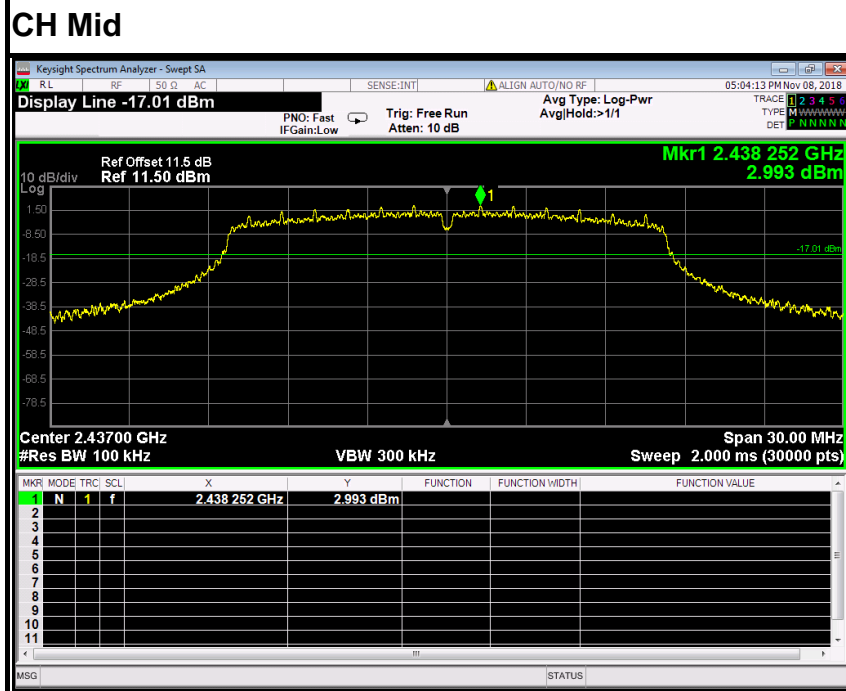
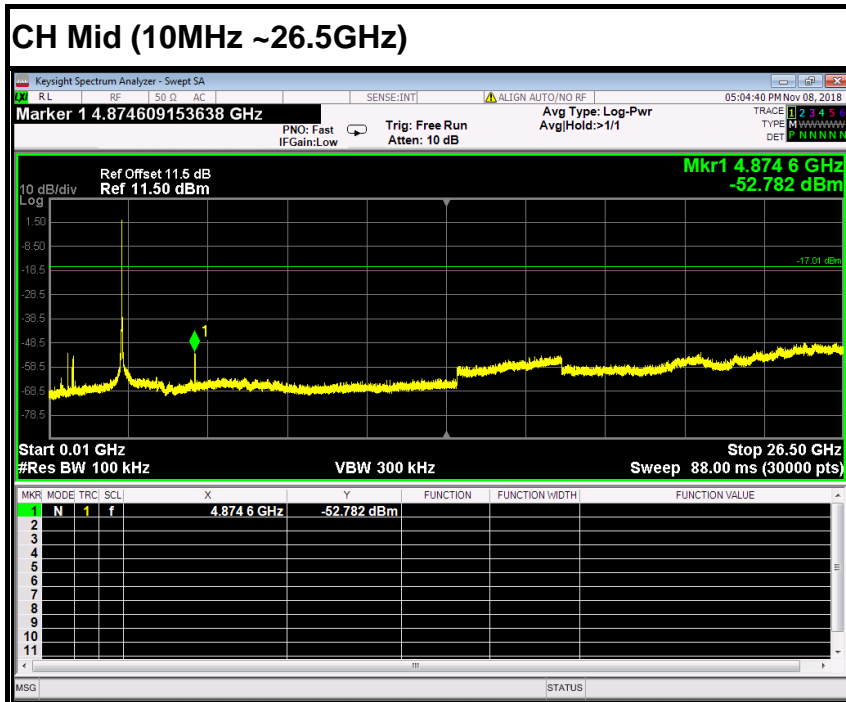


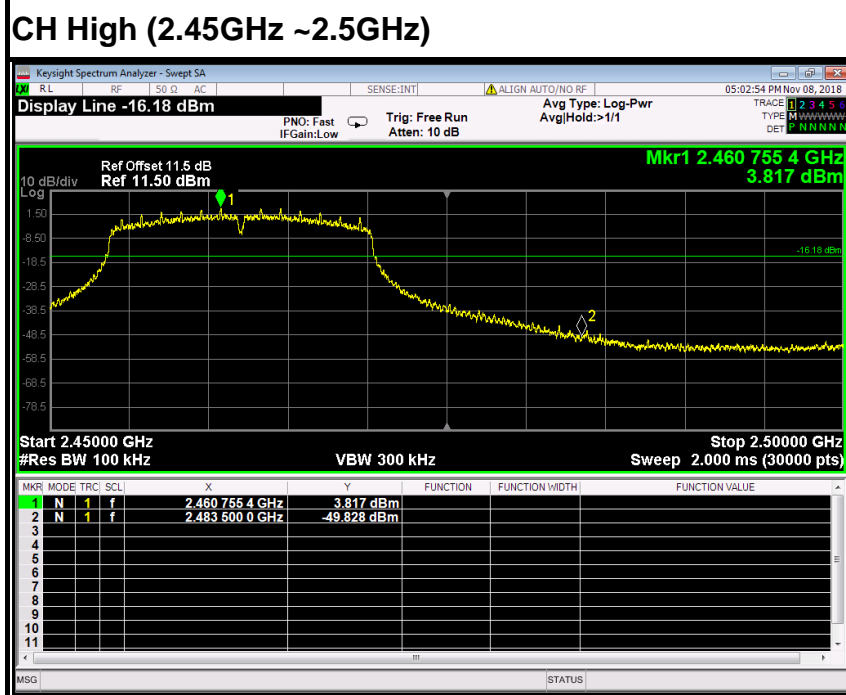
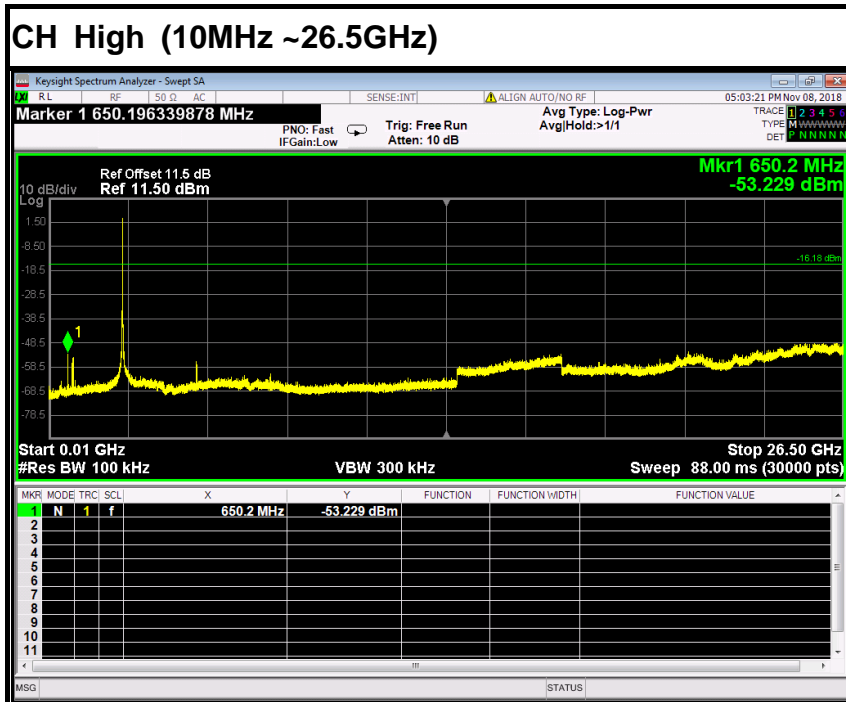


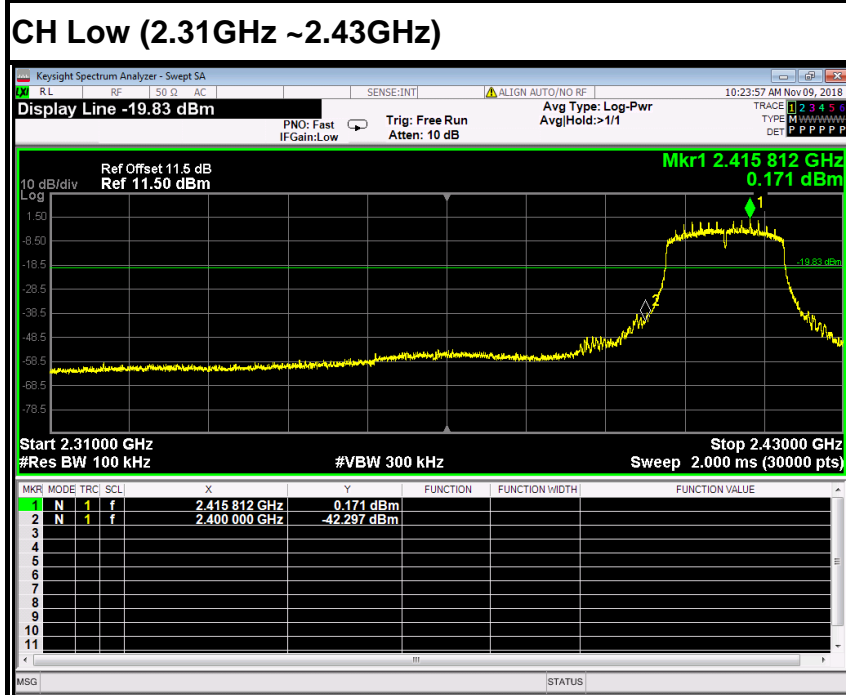
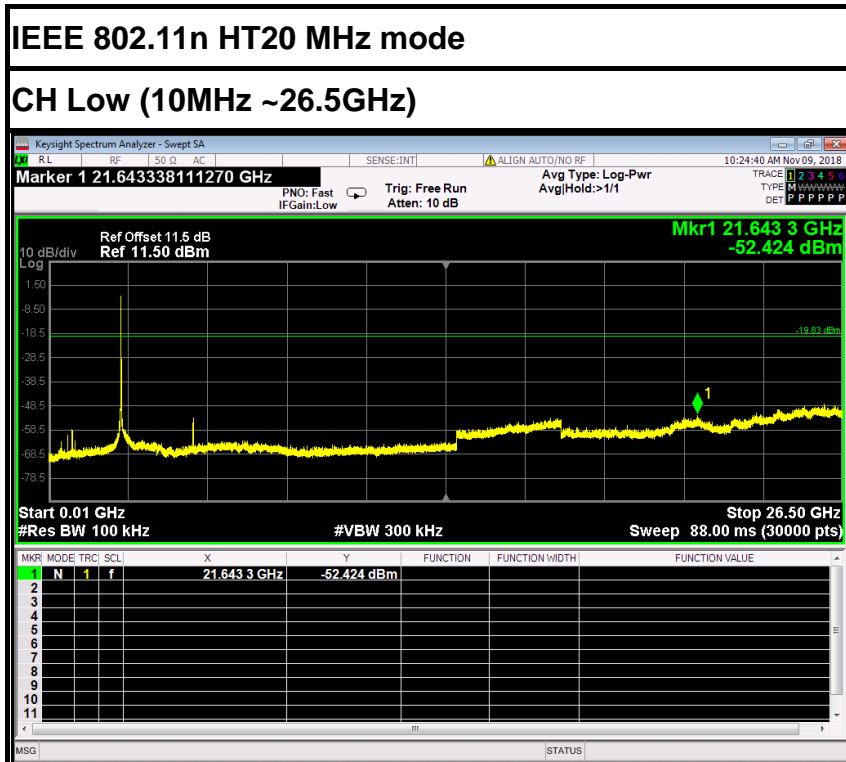


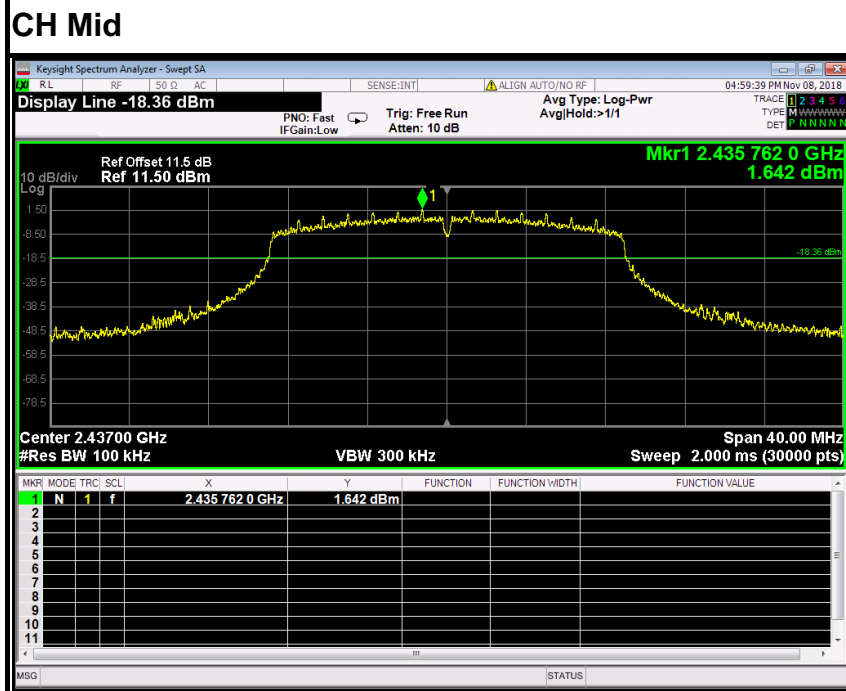
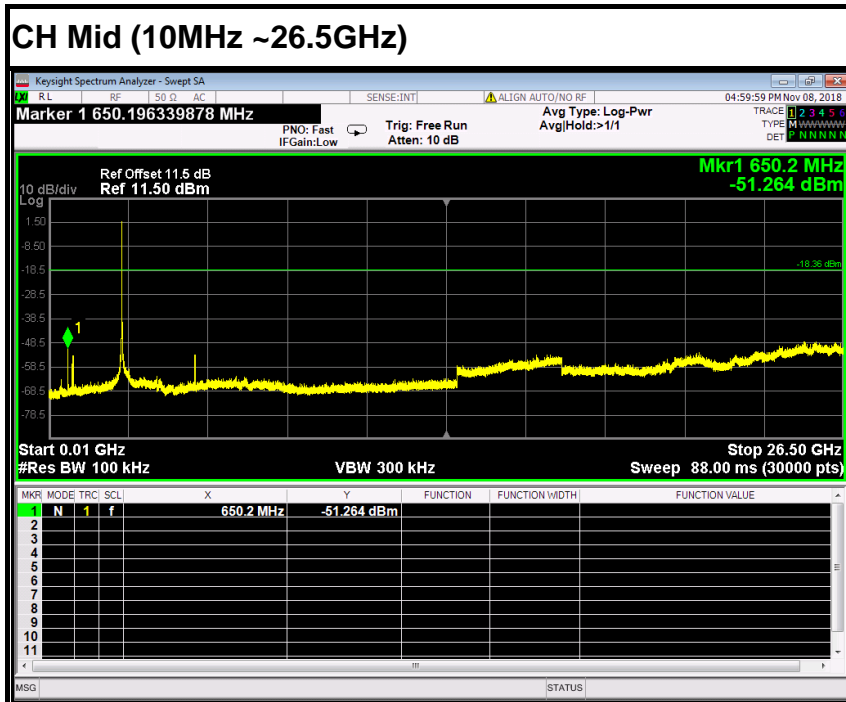


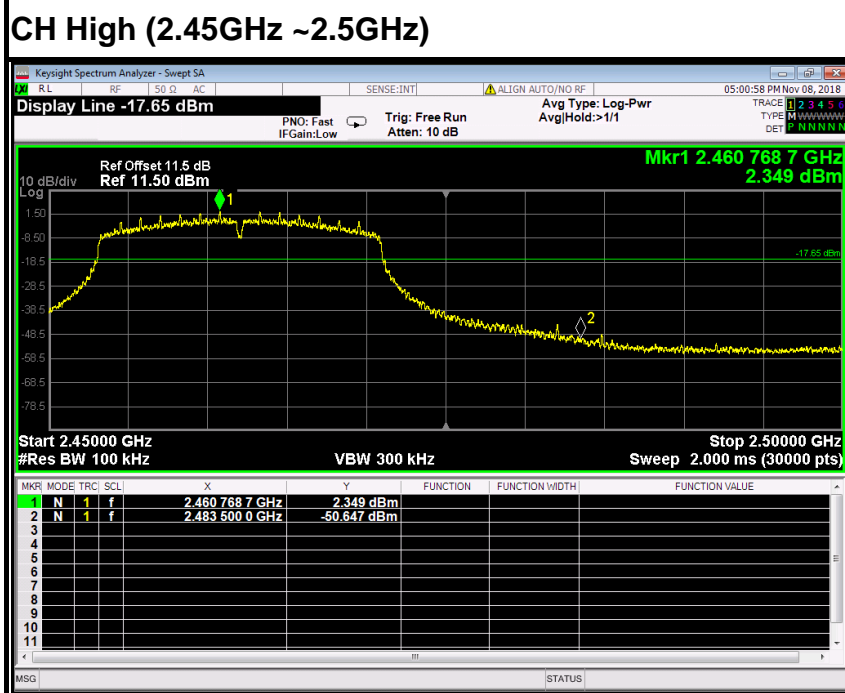
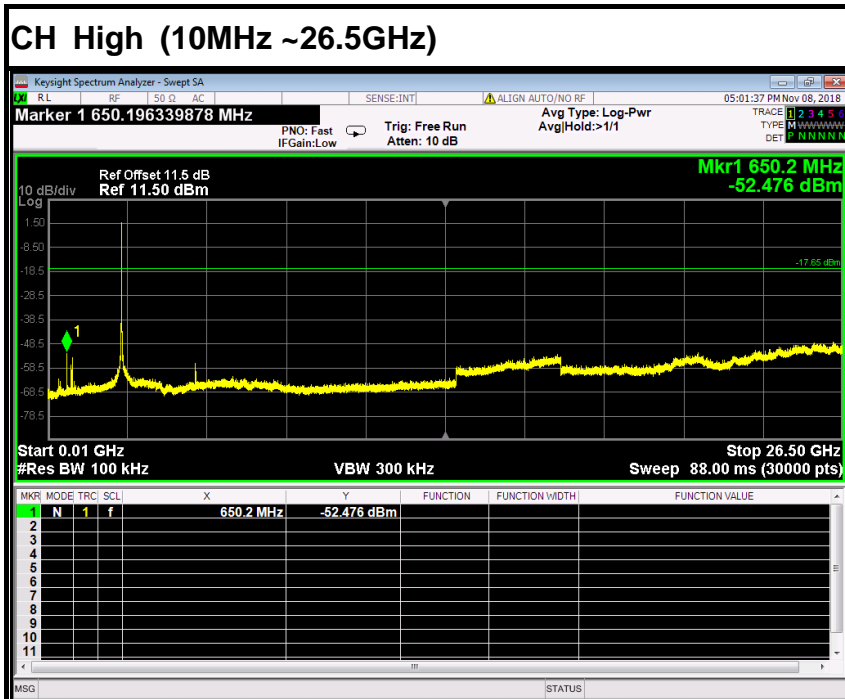


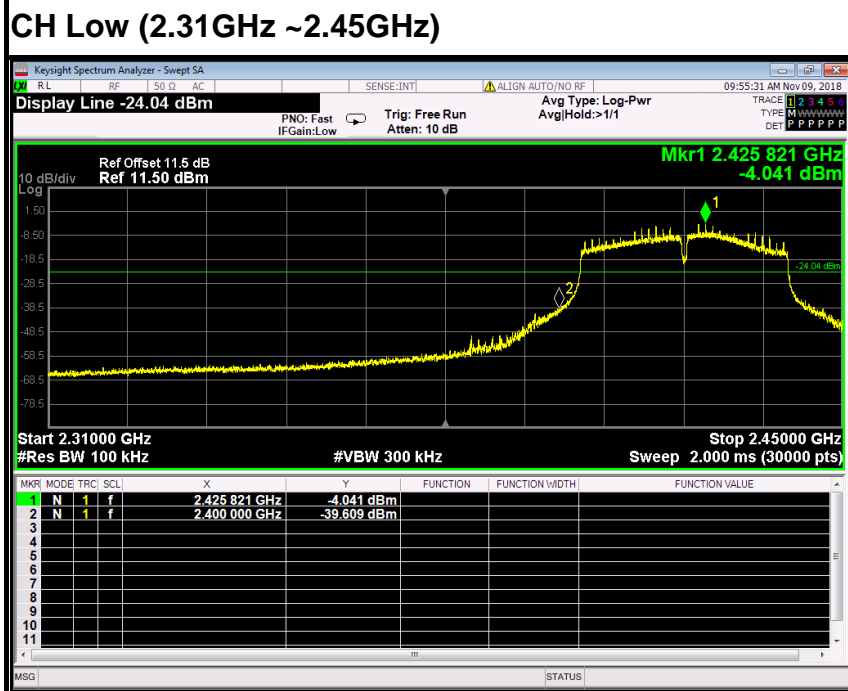
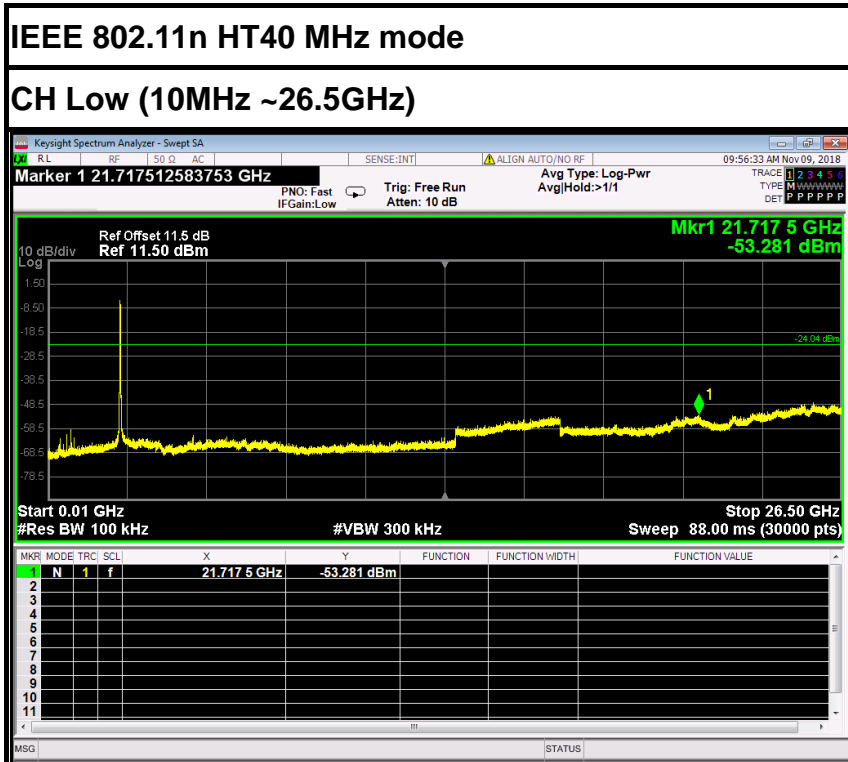


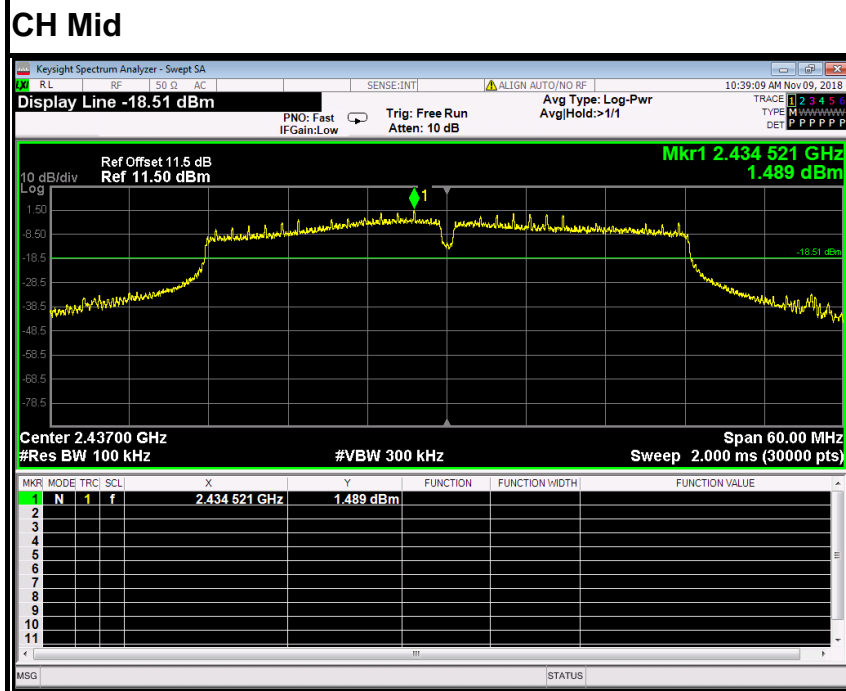
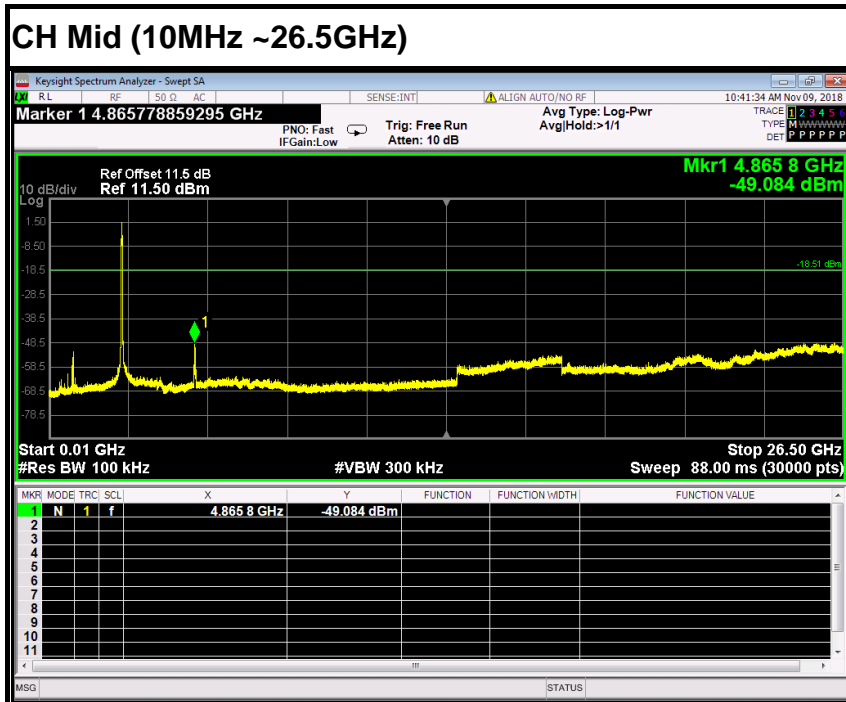


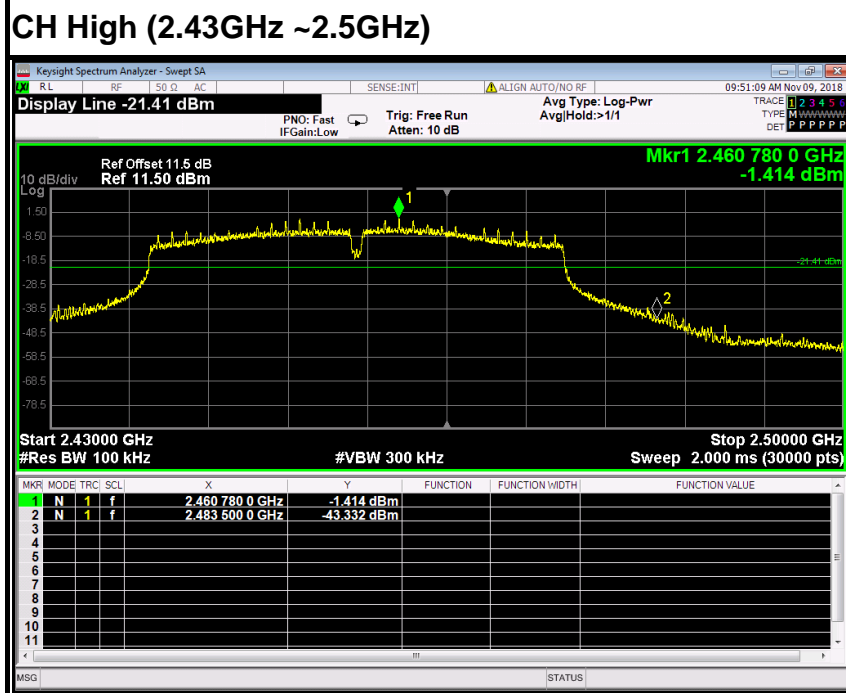
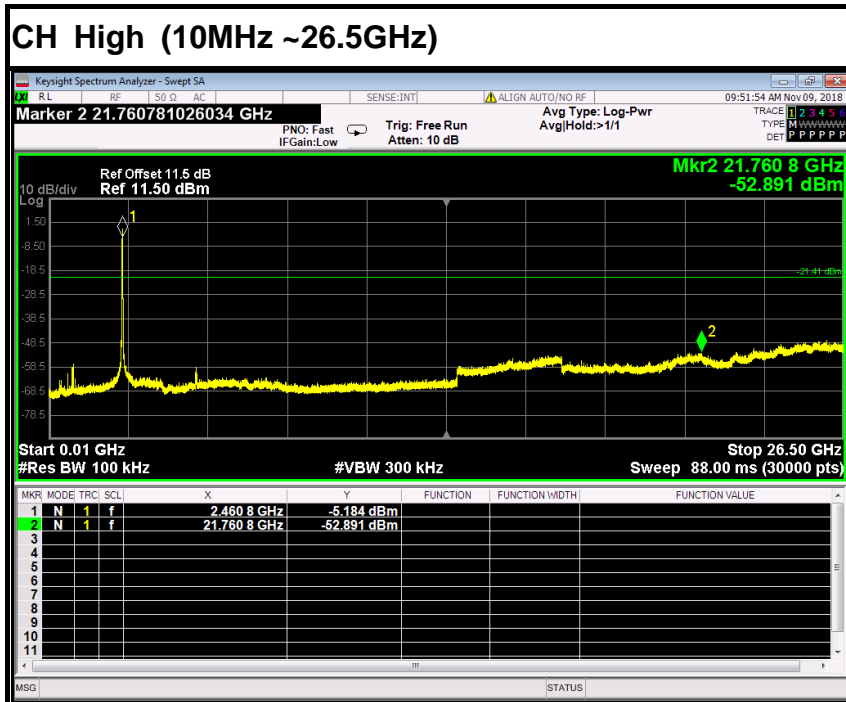


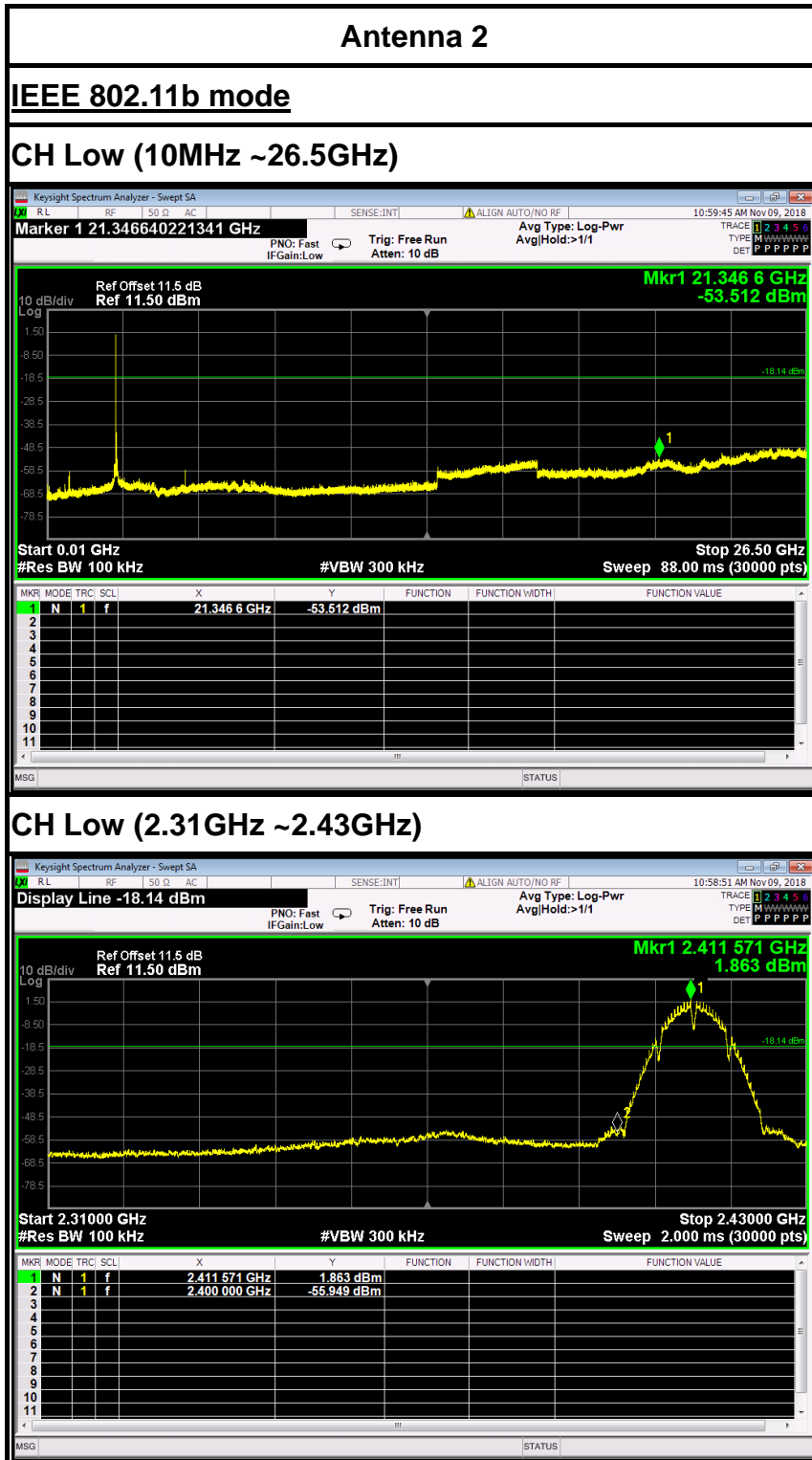


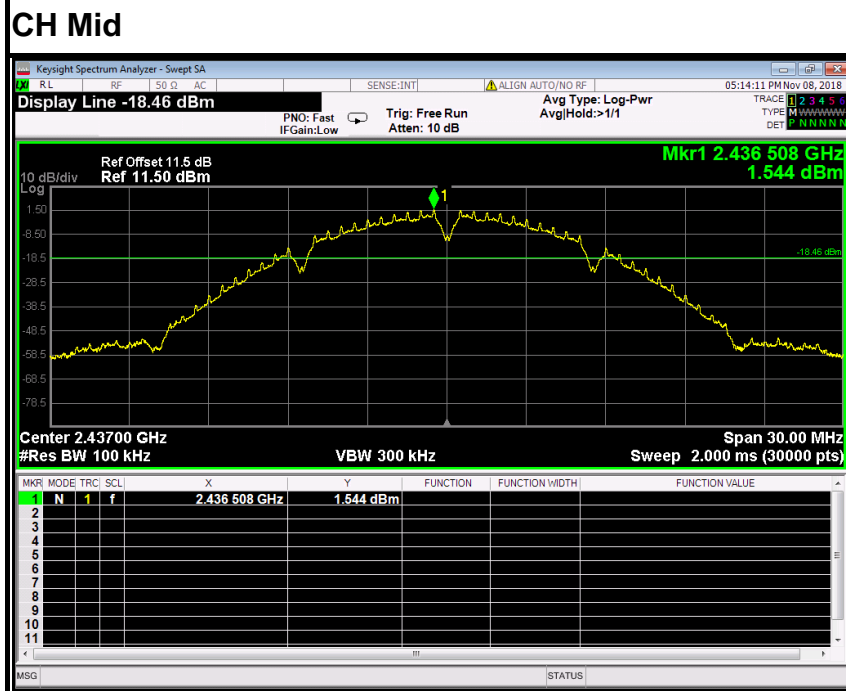
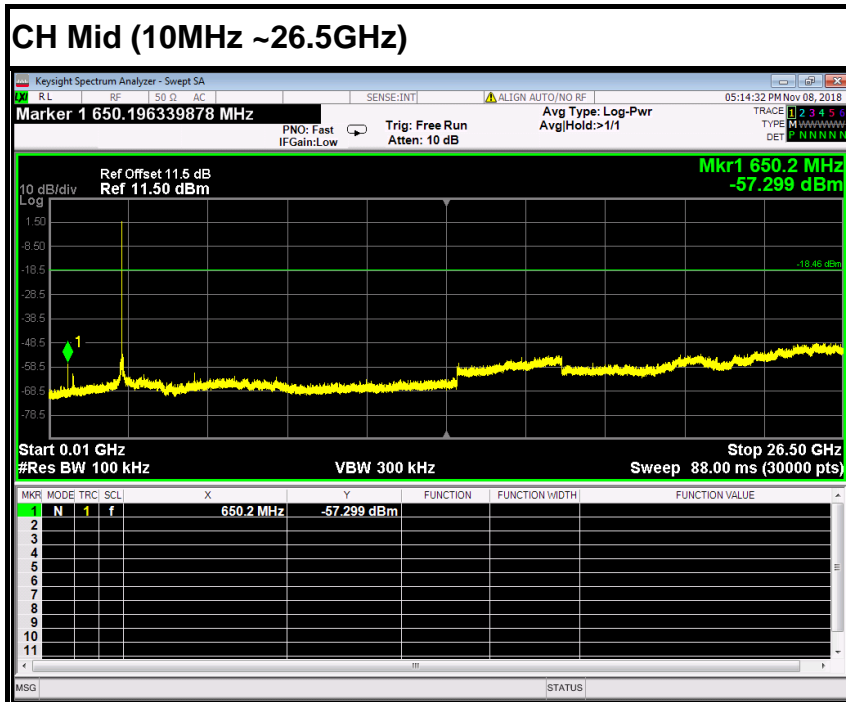


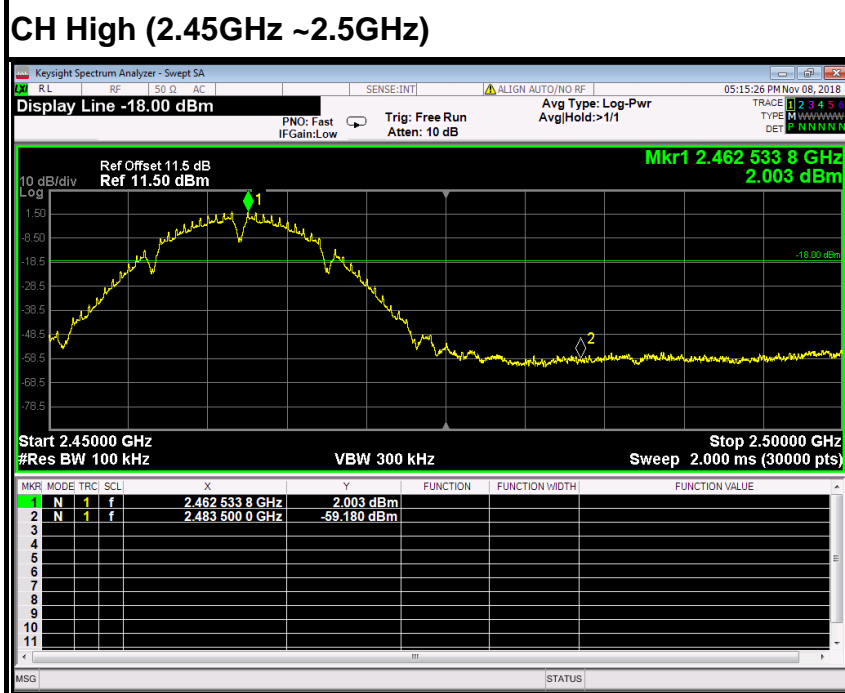
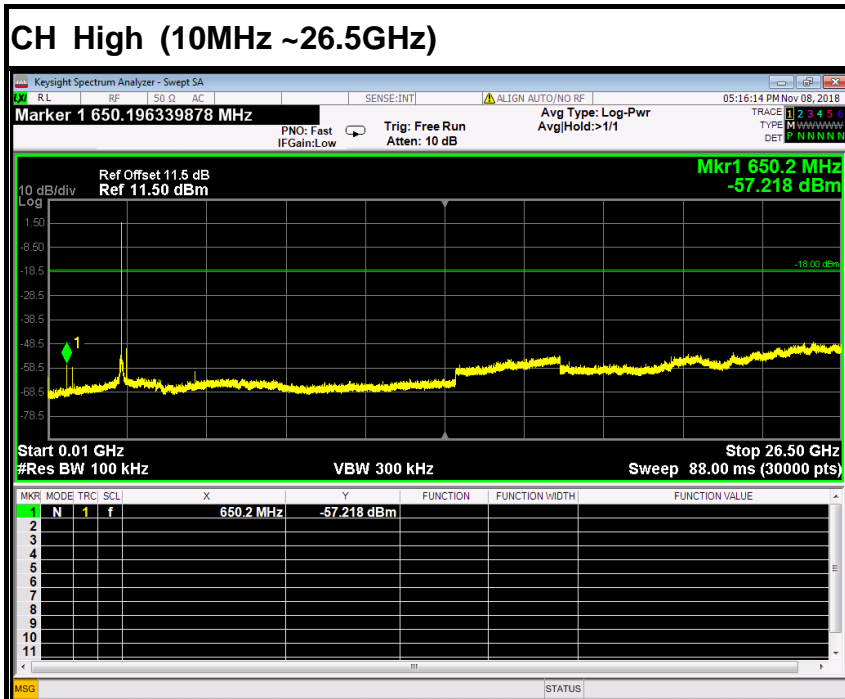


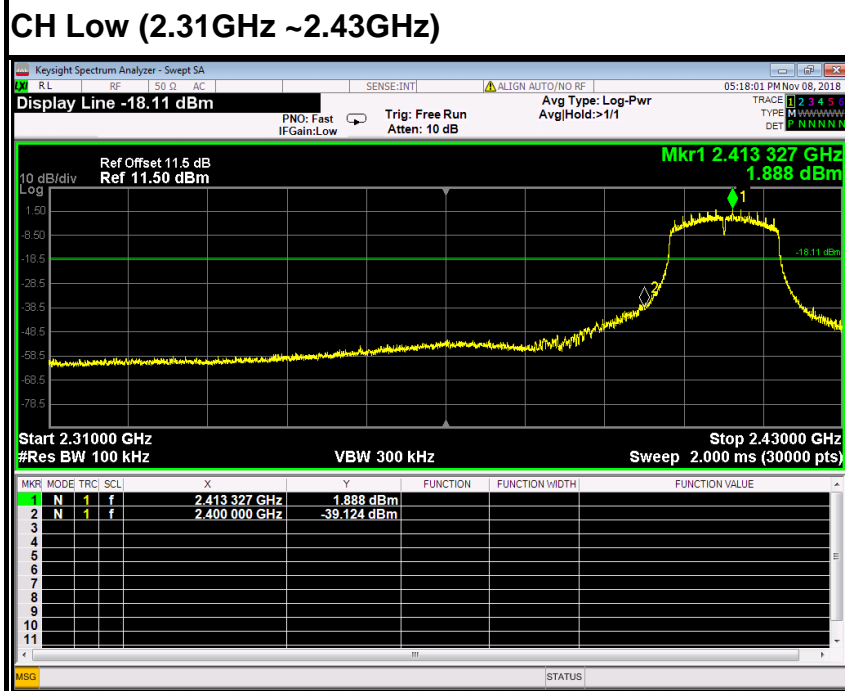
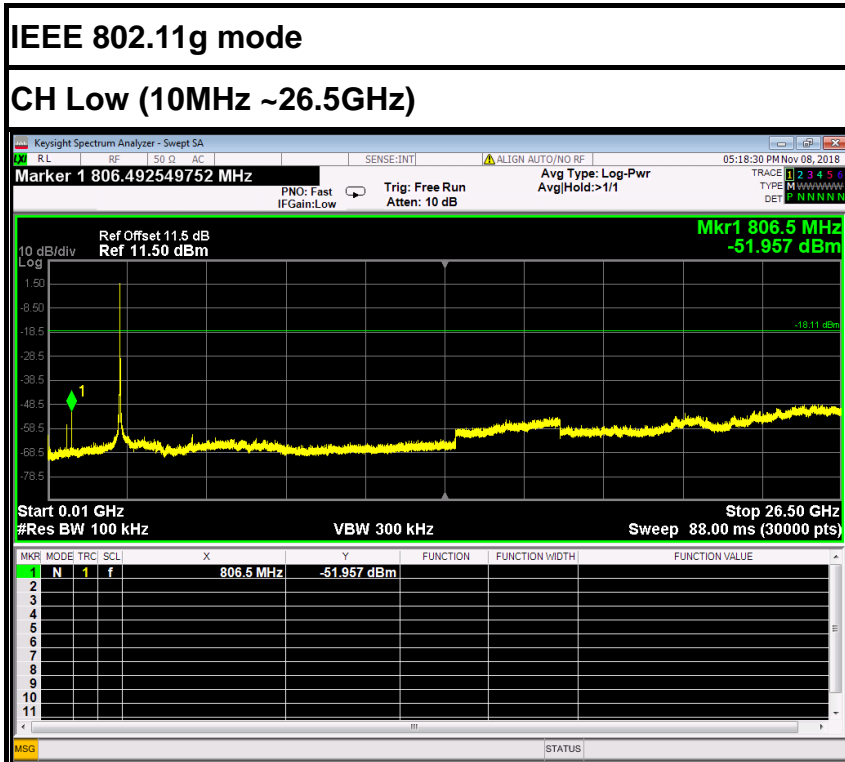


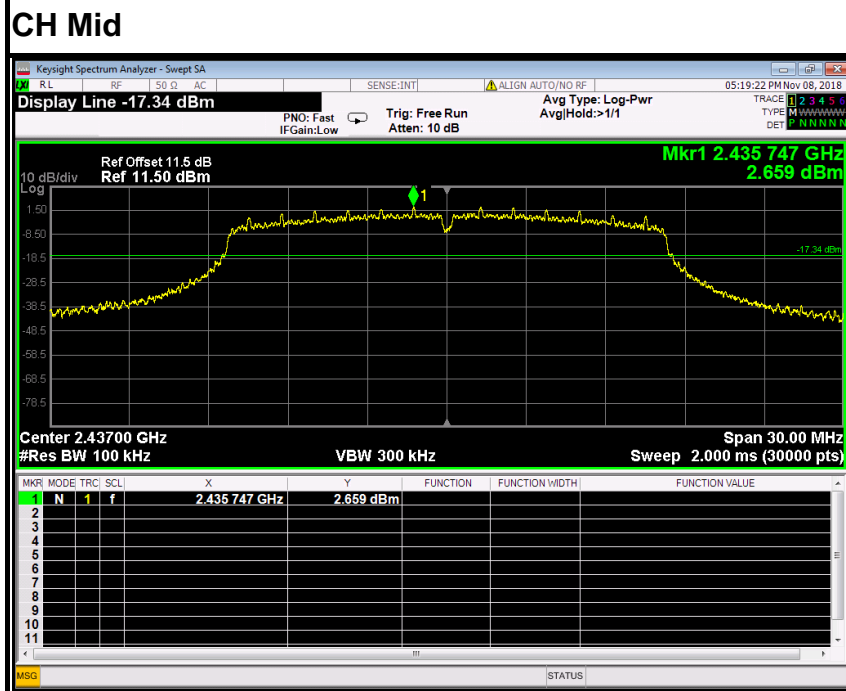
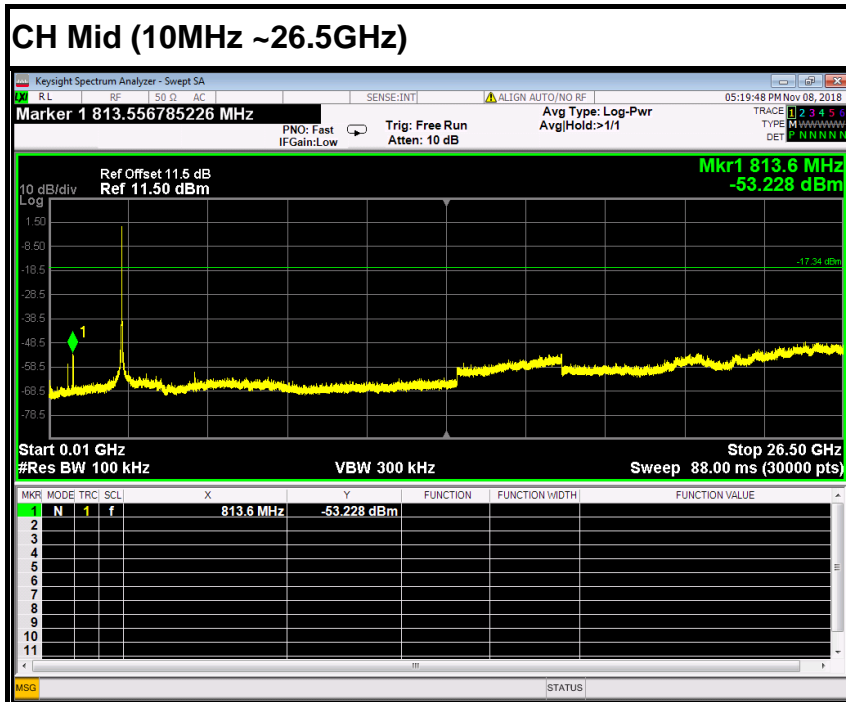


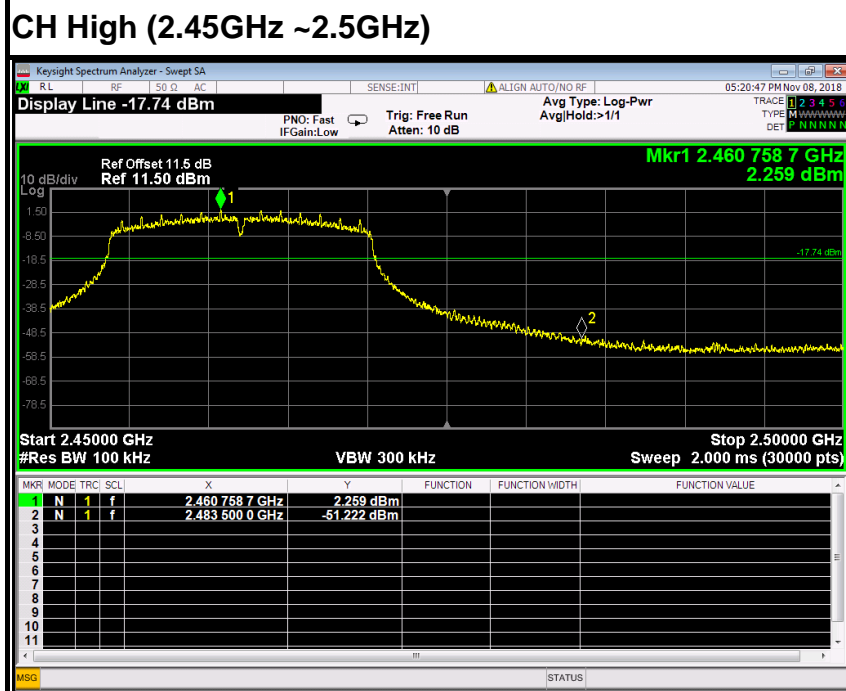
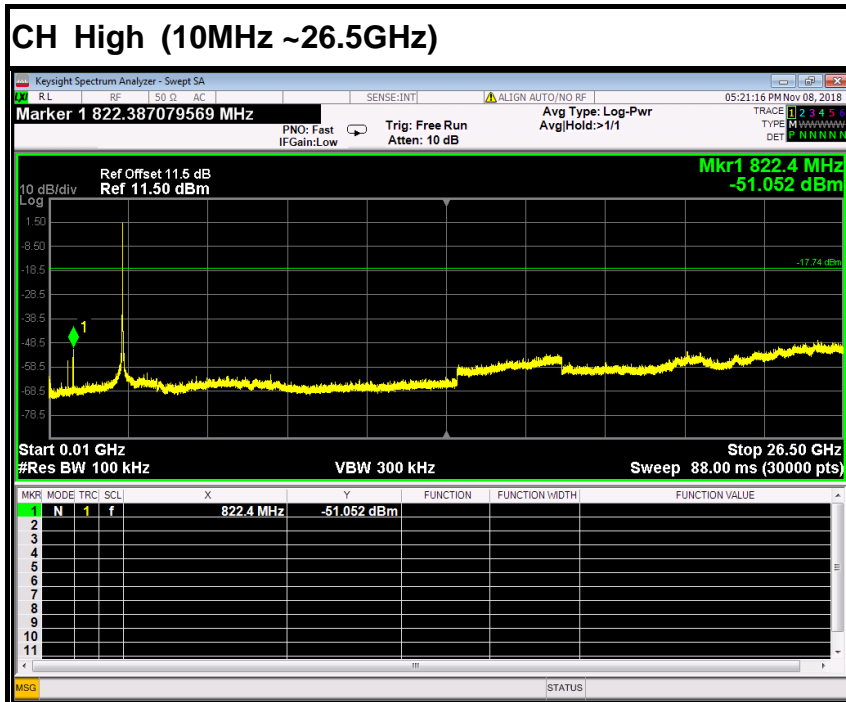


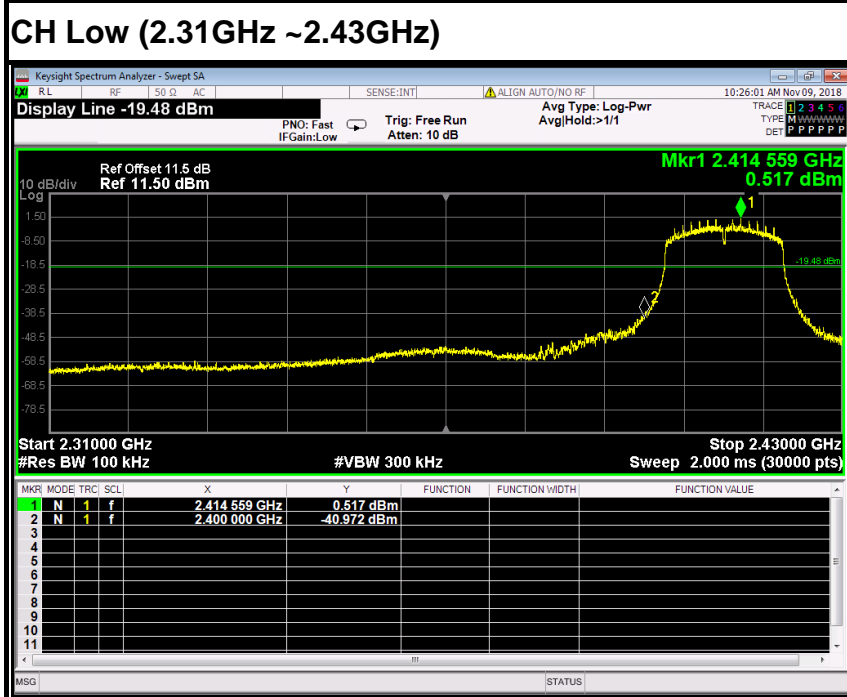
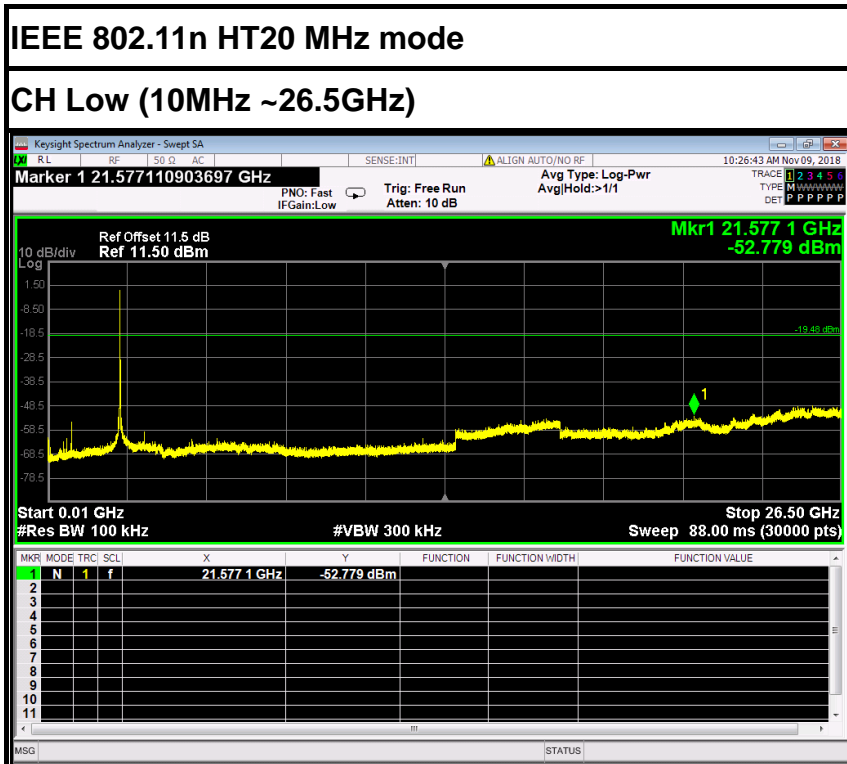


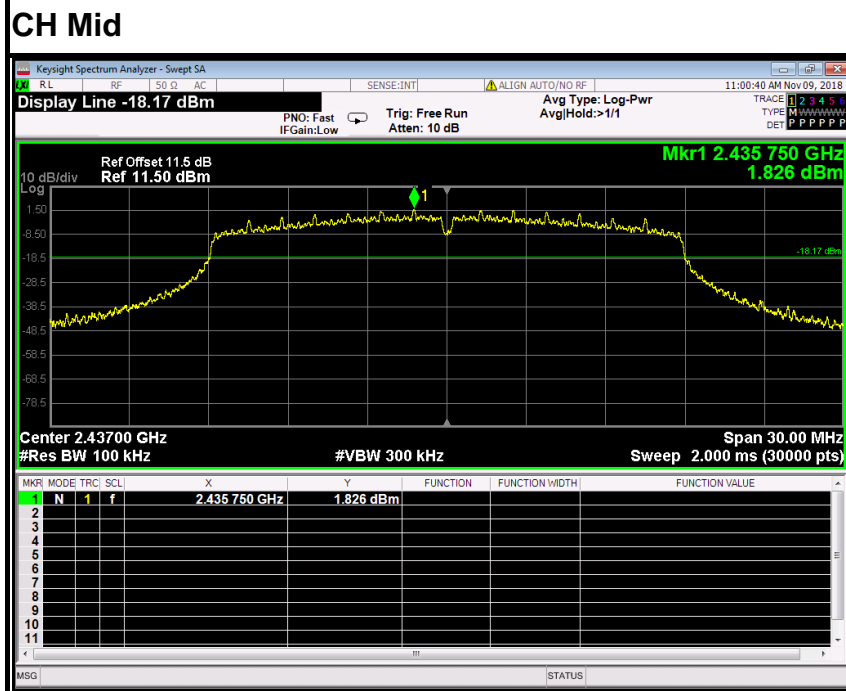
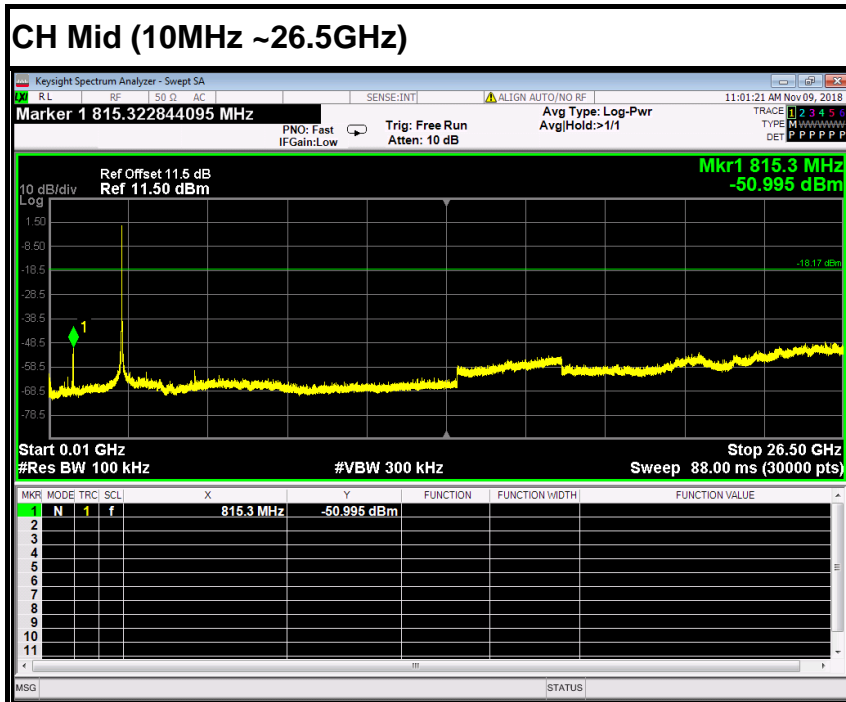


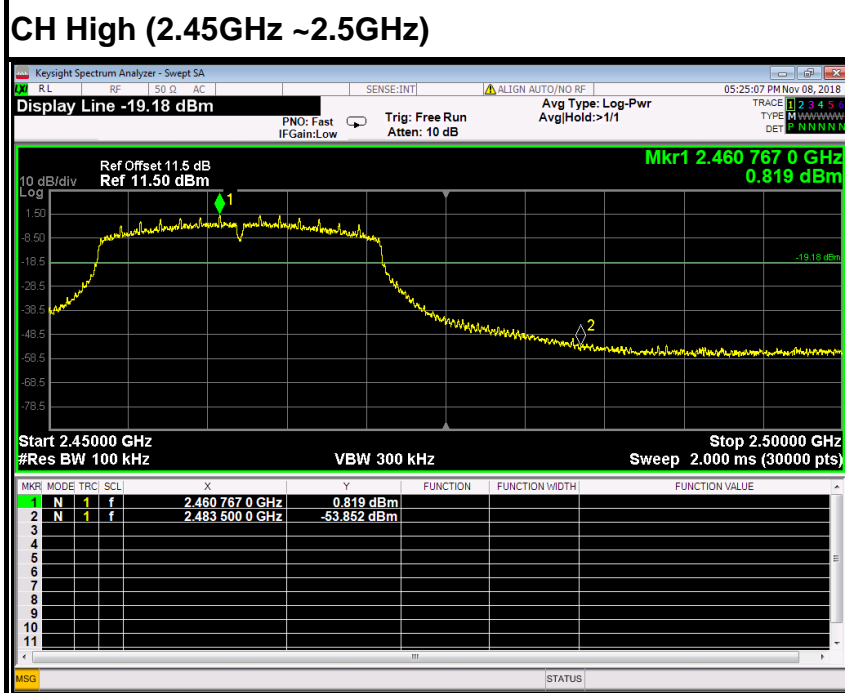
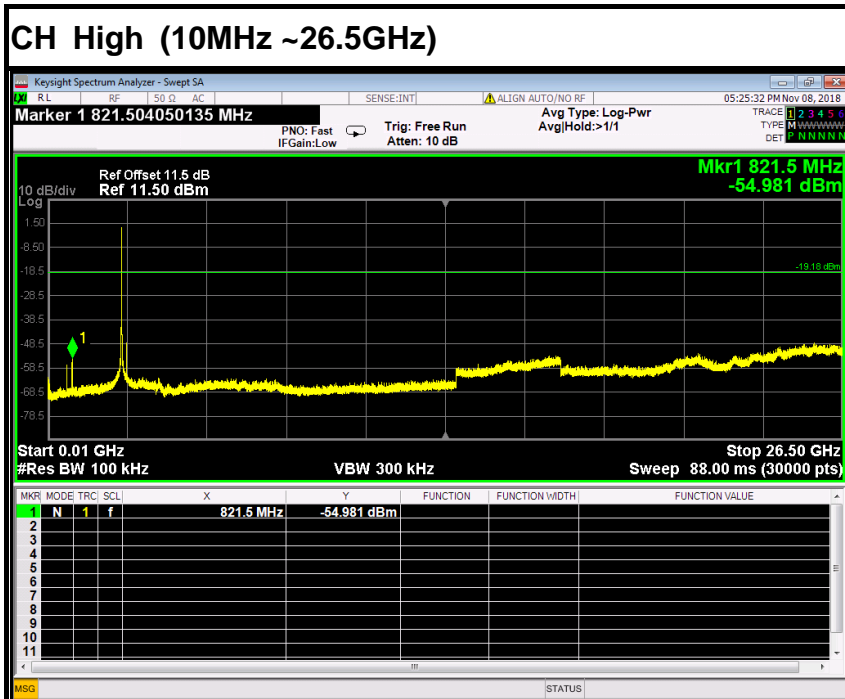


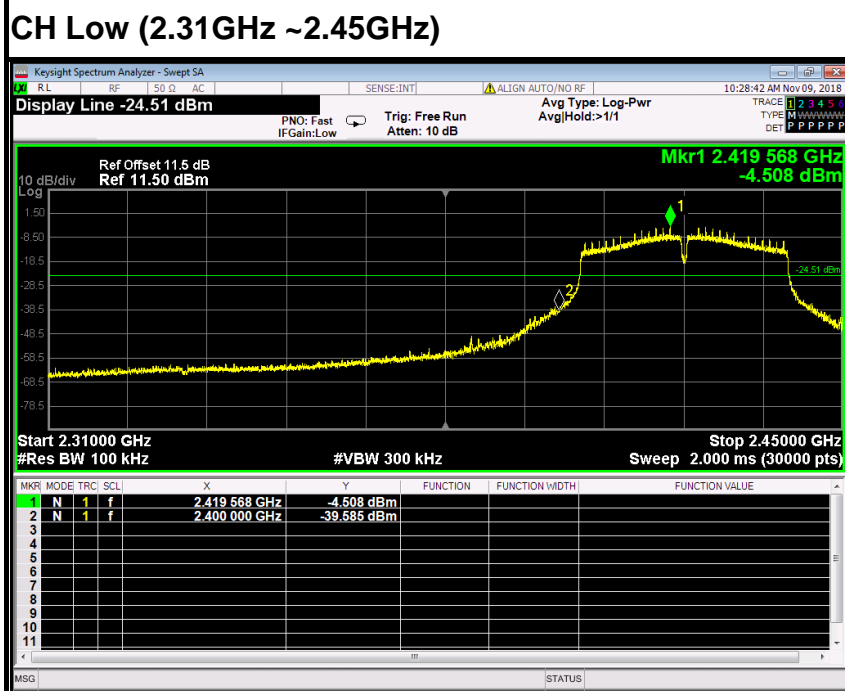
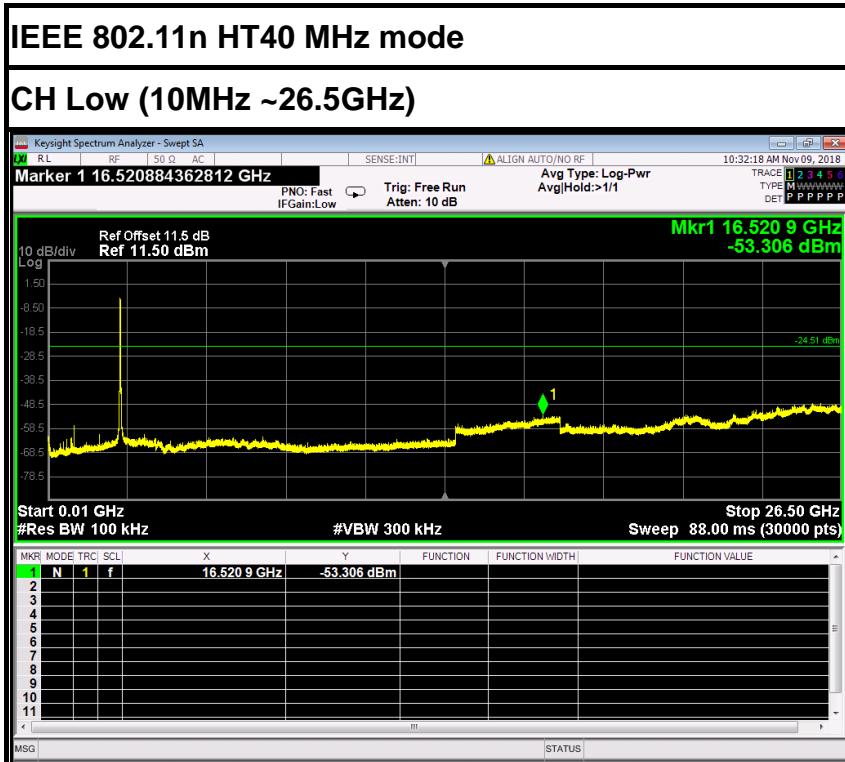


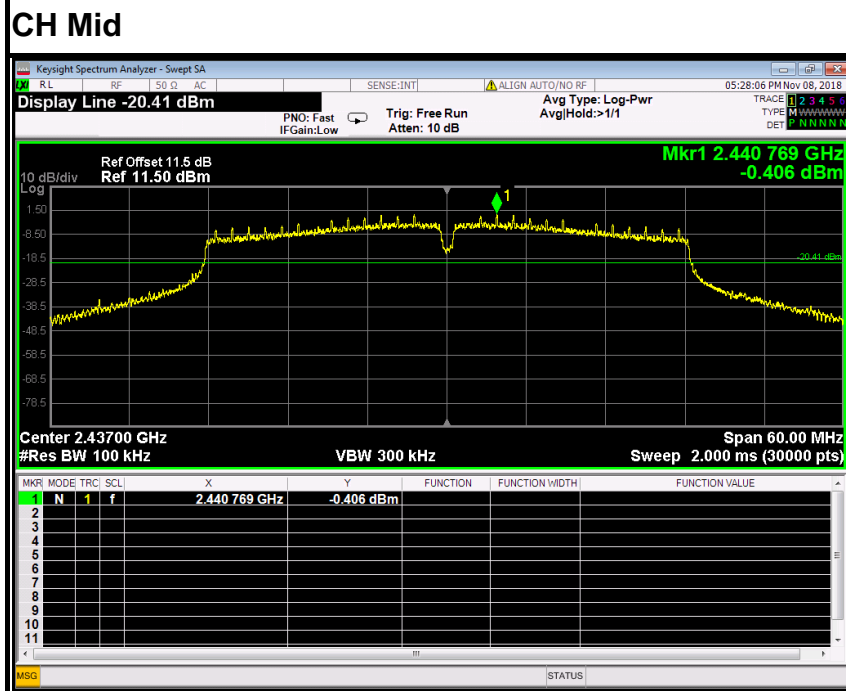
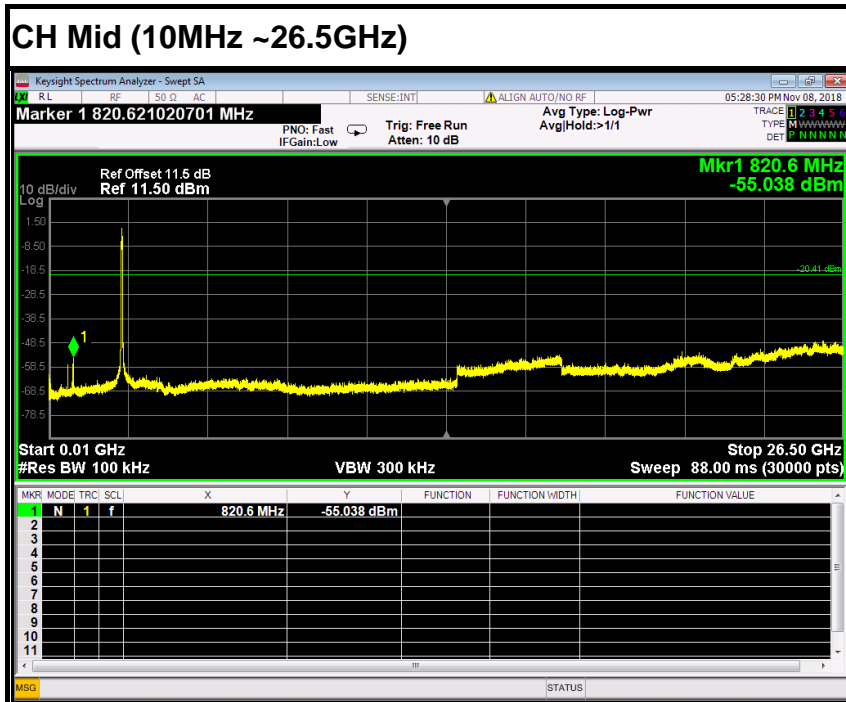


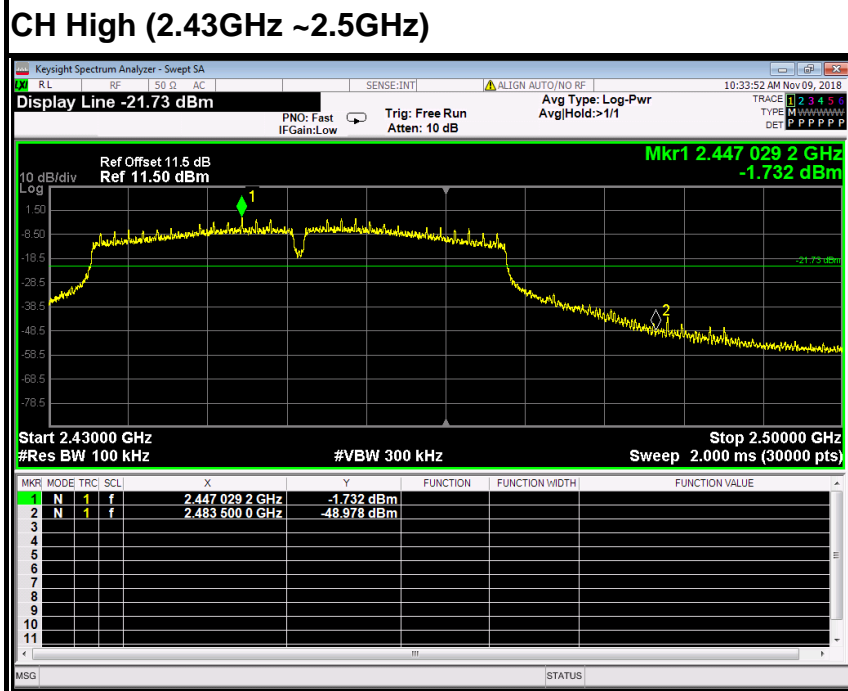
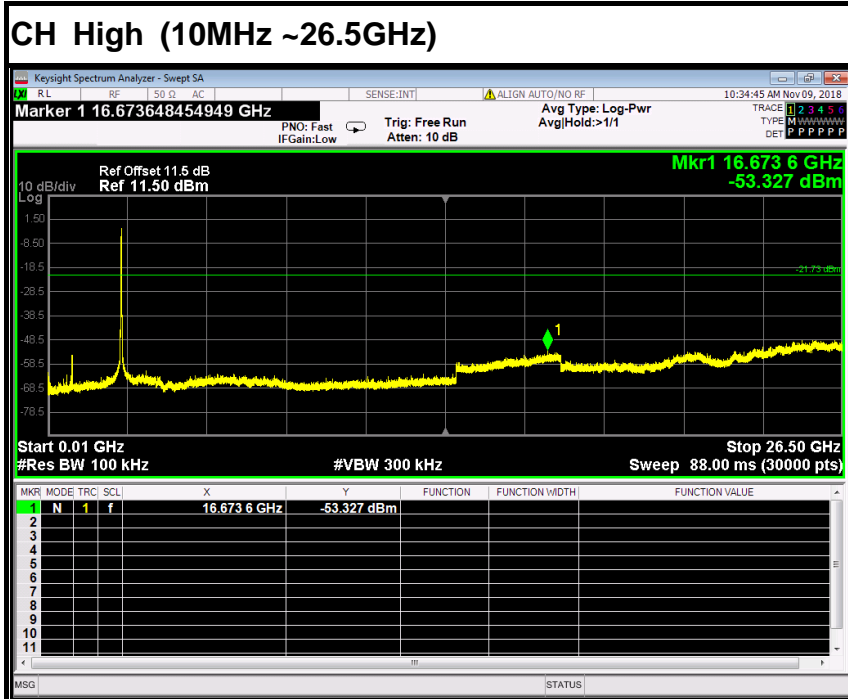












7.2.2. RADIATED EMISSIONS MEASUREMENT

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 ($\mu\text{V}/\text{m}$ at 3-meter)	Field Strength ($\text{dB}\mu\text{V}/\text{m}$ 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 ($\text{dB}\mu\text{V}/\text{m}$) = $20 \log$ Emission level ($\mu\text{V}/\text{m}$).

7.2.2.2. 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

7.2.2.3. 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

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.

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 ($\pm 45^\circ$) 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.

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 ($\pm 45^\circ$) 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:

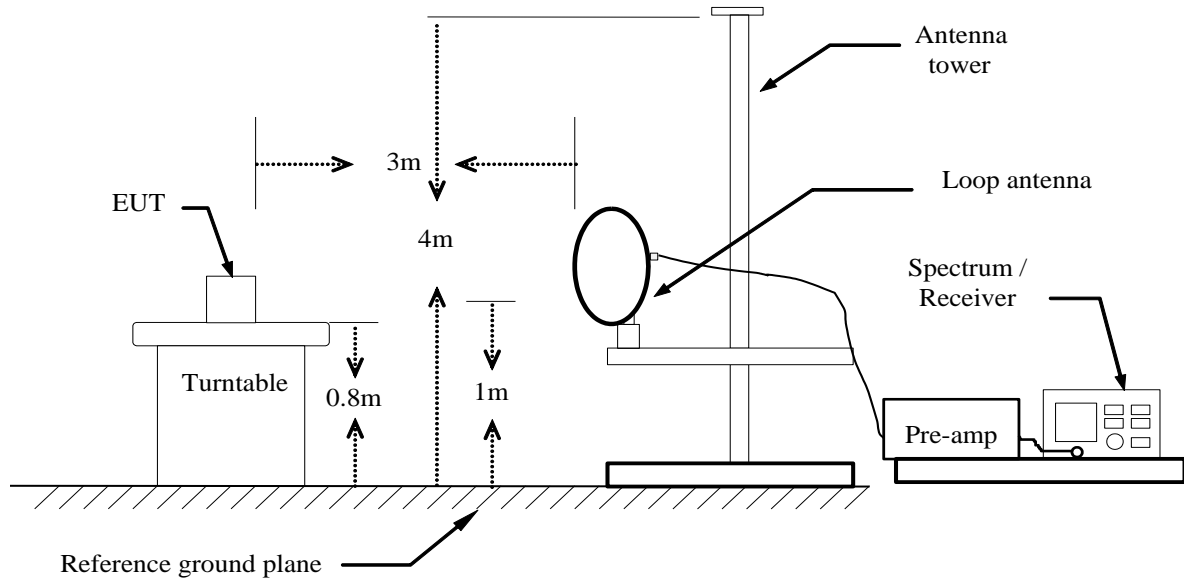
- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

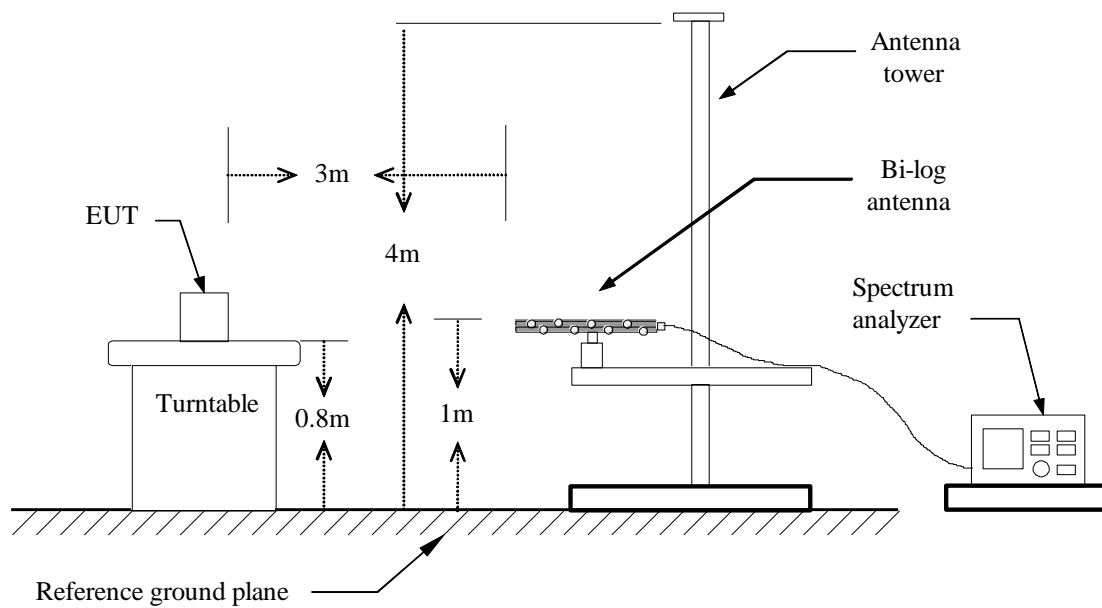
- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded.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

7.2.2.4. TEST SETUP

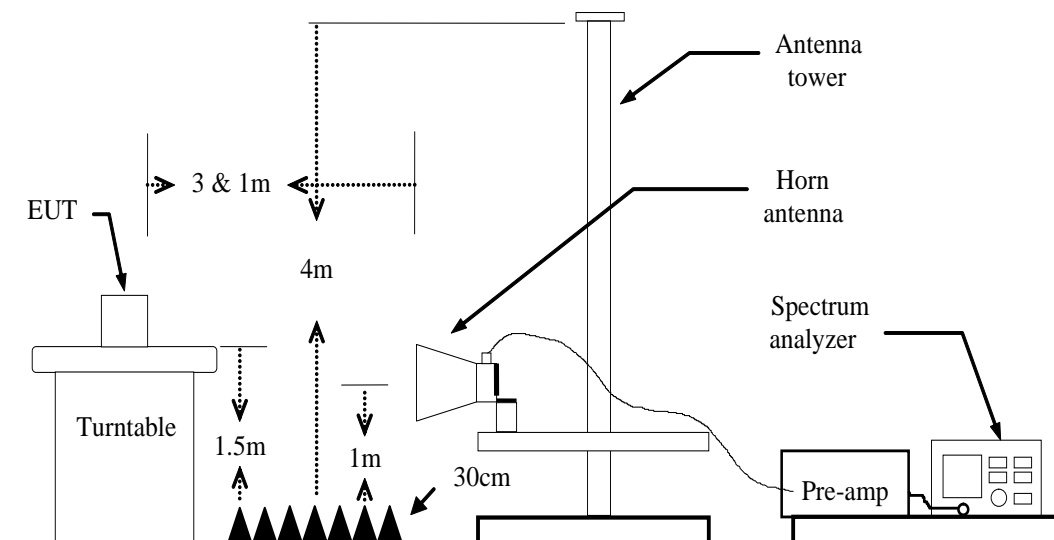
Below 30MHz



Below 1 GHz



Above 1 GHz



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

7.2.2.5. 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
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	62.09	-11.42	50.67	74.00	-23.33	V	Peak
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

7.2.2.6. TEST RESULTS

Below 1 GHz

Test Mode: TX / IEEE 802.11b(CH Low)

Tested by: Darry Wu

Ambient temperature: 24°C Relative humidity: 52% RH Date: November 7, 2018

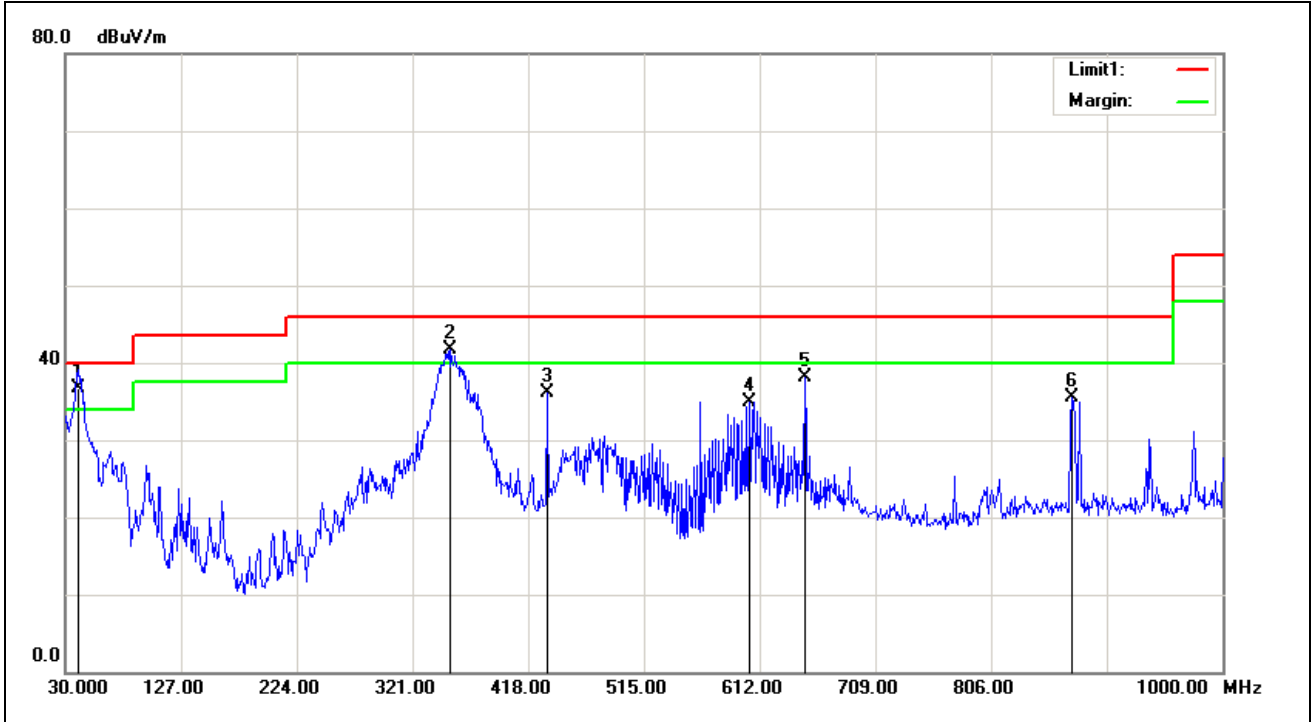
Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
40.6700	54.89	-18.19	36.70	40.00	-3.30	V	QP
353.0100	55.32	-13.65	41.67	46.00	-4.33	V	QP
433.5200	46.60	-10.59	36.01	46.00	-9.99	V	QP
603.2700	40.20	-5.28	34.92	46.00	-11.08	V	QP
649.8300	42.93	-4.81	38.12	46.00	-7.88	V	QP
873.9000	38.77	-3.28	35.49	46.00	-10.51	V	QP
80.4400	56.97	-21.19	35.78	40.00	-4.22	H	QP
99.8400	51.59	-20.01	31.58	43.50	-11.92	H	QP
352.0400	51.85	-13.70	38.15	46.00	-7.85	H	QP
607.1500	43.47	-5.24	38.23	46.00	-7.77	H	QP
649.8300	48.21	-4.81	43.40	46.00	-2.60	H	QP
880.6900	35.75	-3.27	32.48	46.00	-13.52	H	QP

Pre-scan all mode and recorded the worst case results in this report (802.11b (Low Mid))

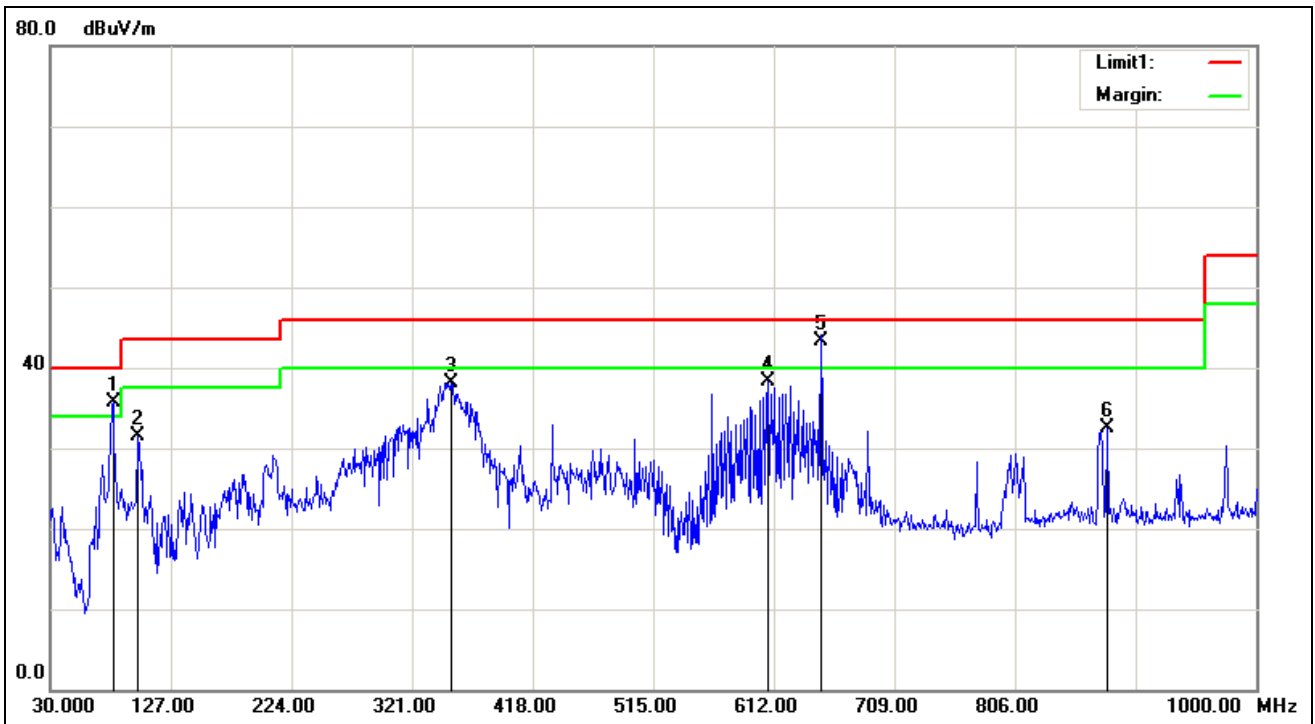
Remark:

- No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)
- Radiated emissions measured in frequency range from 9kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
- 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.
- The IF bandwidth of Receiver between 30MHz to 1GHz was 120kHz.
- | | |
|------------------------|--|
| Frequency (MHz) | = Emission frequency in MHz |
| Reading (dBuV/m) | = Receiver reading |
| Correction Factor (dB) | = Antenna factor + Cable loss – Amplifier gain |
| Limit (dBuV/m) | = Limit stated in standard |
| Margin (dB) | = Measured (dBuV/m) – Limits (dBuV/m) |
| Antenna Pole (H/V) | = Current carrying line of reading |

Vertical



Horizontal



Above 1 GHz
Antenna 0
Test Mode: TX / IEEE 802.11b(CH Low)

Tested by: Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1540.000	54.16	-6.81	47.35	74.00	-26.65	V	peak
1954.000	50.37	-5.29	45.08	74.00	-28.92	V	peak
3061.000	48.32	-1.26	47.06	74.00	-26.94	V	peak
3754.000	48.82	0.55	49.37	74.00	-24.63	V	peak
4825.000	50.95	4.41	55.36	74.00	-18.64	V	peak
4825.000	48.54	4.41	52.95	54.00	-1.05	V	AVG
5563.000	44.89	5.90	50.79	74.00	-23.21	V	peak
1297.000	54.38	-7.44	46.94	74.00	-27.06	H	Peak
1603.000	55.56	-6.69	48.87	74.00	-25.13	H	Peak
3061.000	51.35	-1.26	50.09	74.00	-23.91	H	Peak
3754.000	46.45	0.55	47.00	74.00	-27.00	H	peak
4825.000	50.61	4.41	55.02	74.00	-18.98	H	peak
4825.000	48.16	4.41	52.57	54.00	-1.43	H	AVG
8191.000	42.18	9.54	51.72	74.00	-22.28	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).

Test Mode: TX / IEEE 802.11b (CH Mid)

Tested by: Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1540.000	50.23	-6.81	43.42	74.00	-30.58	V	Peak
1954.000	48.52	-5.29	43.23	74.00	-30.77	V	Peak
3187.000	47.25	-1.05	46.20	74.00	-27.80	V	Peak
3754.000	46.92	0.55	47.47	74.00	-26.53	V	Peak
4870.000	52.21	4.56	56.77	74.00	-17.23	V	Peak
4870.000	48.26	4.56	52.82	54.00	-1.18	V	AVG
5689.000	44.33	5.95	50.28	74.00	-23.72	V	Peak
1297.000	50.31	-7.44	42.87	74.00	-31.13	H	Peak
3061.000	49.14	-1.26	47.88	74.00	-26.12	H	Peak
3187.000	49.67	-1.05	48.62	74.00	-25.38	H	Peak
3754.000	46.20	0.55	46.75	74.00	-27.25	H	Peak
4870.000	48.04	4.56	52.60	54.00	-1.40	H	Peak
5563.000	42.14	5.90	48.04	74.00	-25.96	H	Peak

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 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.
- 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.
- Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11b (CH High)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1621.000	50.86	-6.65	44.21	74.00	-29.79	V	Peak
3061.000	47.22	-1.26	45.96	74.00	-28.04	V	Peak
3754.000	47.04	0.55	47.59	74.00	-26.41	V	Peak
4924.000	48.72	4.73	53.45	74.00	-20.55	V	Peak
4924.000	45.64	4.73	50.37	54.00	-3.63	V	AVG
5563.000	43.83	5.90	49.73	74.00	-24.27	V	Peak
8128.000	41.52	9.58	51.10	74.00	-22.90	V	Peak
1297.000	51.25	-7.44	43.81	74.00	-30.19	H	Peak
3061.000	48.26	-1.26	47.00	74.00	-27.00	H	Peak
3187.000	50.20	-1.05	49.15	74.00	-24.85	H	Peak
3754.000	47.76	0.55	48.31	74.00	-25.69	H	Peak
4924.000	52.62	4.73	57.35	74.00	-16.65	H	Peak
4924.000	47.32	4.73	52.05	54.00	-1.95	H	AVG
7669.000	41.53	9.00	50.53	74.00	-23.47	H	Peak

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 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.
- 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.
- Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Antenna 1
Test Mode: TX / IEEE 802.11b(CH Low)

Tested by: Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1630.000	52.28	-6.64	45.64	74.00	-28.36	V	peak
3061.000	47.82	-1.26	46.56	74.00	-27.44	V	peak
3754.000	47.71	0.55	48.26	74.00	-25.74	V	peak
4825.000	64.80	4.41	69.21	74.00	-4.79	V	peak
4825.000	47.78	4.41	52.19	54.00	-1.81	V	AVG
5563.000	43.36	5.90	49.26	74.00	-24.74	V	peak
7237.000	46.93	8.16	55.09	74.00	-18.91	V	peak
7237.000	42.46	8.16	50.62	54.00	-3.38	V	AVG
1297.000	50.53	-7.44	43.09	74.00	-30.91	H	Peak
1891.000	53.11	-5.69	47.42	74.00	-26.58	H	Peak
3061.000	48.90	-1.26	47.64	74.00	-26.36	H	Peak
3187.000	49.59	-1.05	48.54	74.00	-25.46	H	peak
4825.000	47.76	4.41	52.17	74.00	-21.83	H	peak
4825.000	45.22	4.41	49.63	54.00	-4.37	H	AVG
5563.000	42.68	5.90	48.58	74.00	-25.42	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).

Test Mode: TX / IEEE 802.11b (CH Mid)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1297.000	50.78	-7.44	43.34	74.00	-30.66	V	Peak
1630.000	50.74	-6.64	44.10	74.00	-29.90	V	Peak
3061.000	47.80	-1.26	46.54	74.00	-27.46	V	Peak
3754.000	46.63	0.55	47.18	74.00	-26.82	V	Peak
4870.000	54.03	4.56	58.59	74.00	-15.41	V	Peak
4870.000	48.14	4.56	52.70	54.00	-1.30	V	AVG
5563.000	43.29	5.90	49.19	74.00	-24.81	V	Peak
1297.000	50.38	-7.44	42.94	74.00	-31.06	H	Peak
3187.000	49.18	-1.05	48.13	74.00	-25.87	H	Peak
3754.000	47.45	0.55	48.00	74.00	-26.00	H	Peak
4870.000	54.54	4.56	59.10	74.00	-14.90	H	Peak
4870.000	48.08	4.56	52.64	54.00	-1.36	H	AVG
5464.000	42.14	5.81	47.95	74.00	-26.05	H	Peak
7309.000	49.65	8.30	57.95	74.00	-16.05	H	Peak
7309.000	41.08	8.30	49.38	54.00	-4.62	H	AVG

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).

Test Mode: TX / IEEE 802.11b (CH High)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1297.000	50.48	-7.44	43.04	74.00	-30.96	V	Peak
3187.000	47.54	-1.05	46.49	74.00	-27.51	V	Peak
3754.000	46.21	0.55	46.76	74.00	-27.24	V	Peak
4924.000	60.16	4.73	64.89	74.00	-9.11	V	Peak
4924.000	48.41	4.73	53.14	54.00	-0.86	V	AVG
6814.000	42.51	7.40	49.91	74.00	-24.09	V	Peak
7921.000	41.31	9.50	50.81	74.00	-23.19	V	Peak
1297.000	50.60	-7.44	43.16	74.00	-30.84	H	Peak
3061.000	49.78	-1.26	48.52	74.00	-25.48	H	Peak
3187.000	49.42	-1.05	48.37	74.00	-25.63	H	Peak
3754.000	47.00	0.55	47.55	74.00	-26.45	H	Peak
4924.000	46.99	4.73	51.72	74.00	-22.28	H	Peak
6634.000	41.77	7.11	48.88	74.00	-25.12	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).

Antenna 2
Test Mode: TX / IEEE 802.11b(CH Low)

Tested by: Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3061.000	47.87	-1.26	46.61	74.00	-27.39	V	peak
3754.000	48.09	0.55	48.64	74.00	-25.36	V	peak
4825.000	49.13	4.41	53.54	74.00	-20.46	V	peak
4825.000	46.29	4.41	50.70	54.00	-3.30	V	AVG
5563.000	43.26	5.90	49.16	74.00	-24.84	V	peak
8956.000	42.19	9.12	51.31	74.00	-22.69	V	peak
9829.000	41.23	11.49	52.72	74.00	-21.28	V	peak
9829.000	35.69	11.49	47.18	54.00	-6.82	V	AVG
1297.000	50.24	-7.44	42.80	74.00	-31.20	H	Peak
3061.000	48.92	-1.26	47.66	74.00	-26.34	H	Peak
3187.000	49.15	-1.05	48.10	74.00	-25.90	H	Peak
3754.000	48.32	0.55	48.87	74.00	-25.13	H	peak
4825.000	56.42	4.41	60.83	74.00	-13.17	H	peak
4825.000	48.34	4.41	52.75	54.00	-1.25	H	AVG
5689.000	41.69	5.95	47.64	74.00	-26.36	H	peak

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 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.
- 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.
- Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11b (CH Mid)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1297.000	50.50	-7.44	43.06	74.00	-30.94	V	Peak
3061.000	48.95	-1.26	47.69	74.00	-26.31	V	Peak
3754.000	45.83	0.55	46.38	74.00	-27.62	V	Peak
4870.000	51.36	4.56	55.92	74.00	-18.08	V	Peak
4870.000	47.83	4.56	52.39	54.00	-1.61	V	AVG
5563.000	43.32	5.90	49.22	74.00	-24.78	V	Peak
7543.000	41.44	8.76	50.20	74.00	-23.80	V	Peak
1297.000	49.92	-7.44	42.48	74.00	-31.52	H	Peak
3061.000	49.40	-1.26	48.14	74.00	-25.86	H	Peak
3187.000	49.90	-1.05	48.85	74.00	-25.15	H	Peak
3754.000	46.37	0.55	46.92	74.00	-27.08	H	Peak
4870.000	52.44	4.56	57.00	74.00	-17.00	H	Peak
4870.000	48.16	4.56	52.72	54.00	-1.28	H	AVG
9316.000	41.32	10.01	51.33	74.00	-22.67	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).

Test Mode: TX / IEEE 802.11b (CH High)

Tested by: Darry Wu

Ambient temperature: 24°C Relative humidity: 52% RH Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1468.000	54.30	-6.94	47.36	74.00	-26.64	V	Peak
3187.000	47.40	-1.05	46.35	74.00	-27.65	V	Peak
3754.000	46.25	0.55	46.80	74.00	-27.20	V	Peak
4924.000	45.67	4.73	50.40	74.00	-23.60	V	Peak
5689.000	43.50	5.95	49.45	74.00	-24.55	V	Peak
6499.000	41.80	6.89	48.69	74.00	-25.31	V	Peak
1297.000	50.27	-7.44	42.83	74.00	-31.17	H	Peak
3061.000	49.17	-1.26	47.91	74.00	-26.09	H	Peak
3187.000	49.31	-1.05	48.26	74.00	-25.74	H	Peak
3754.000	46.83	0.55	47.38	74.00	-26.62	H	Peak
4924.000	54.99	4.73	59.72	74.00	-14.28	H	Peak
4924.000	48.23	4.73	52.96	54.00	-1.04	H	AVG
5689.000	42.00	5.95	47.95	74.00	-26.05	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).

Antenna 0
Test Mode: TX / IEEE 802.11g(CH Low)

Tested by: Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1621.000	52.39	-6.65	45.74	74.00	-28.26	V	Peak
3061.000	48.38	-1.26	47.12	74.00	-26.88	V	Peak
3754.000	46.90	0.55	47.45	74.00	-26.55	V	Peak
4825.000	52.17	4.41	56.58	74.00	-17.42	V	Peak
4825.000	40.15	4.41	44.56	54.00	-9.44	V	AVG
5563.000	44.43	5.90	50.33	74.00	-23.67	V	Peak
7228.000	45.58	8.14	53.72	74.00	-20.28	V	Peak
7228.000	35.83	8.14	43.97	54.00	-10.03	V	AVG
1297.000	49.96	-7.44	42.52	74.00	-31.48	H	Peak
3061.000	49.84	-1.26	48.58	74.00	-25.42	H	Peak
3187.000	49.25	-1.05	48.20	74.00	-25.80	H	Peak
3754.000	45.90	0.55	46.45	74.00	-27.55	H	Peak
4825.000	50.66	4.41	55.07	74.00	-18.93	H	Peak
4825.000	44.95	4.41	49.36	54.00	-4.64	H	AVG
6832.000	42.11	7.43	49.54	74.00	-24.46	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).

Test Mode: TX / IEEE 802.11g (CH Mid)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1297.000	51.30	-7.44	43.86	74.00	-30.14	V	Peak
3061.000	47.11	-1.26	45.85	74.00	-28.15	V	Peak
3754.000	48.26	0.55	48.81	74.00	-25.19	V	Peak
4879.000	50.08	4.59	54.67	74.00	-19.33	V	Peak
4879.000	40.12	4.59	44.71	54.00	-9.29	V	AVG
5689.000	43.38	5.95	49.33	74.00	-24.67	V	Peak
7309.000	47.42	8.30	55.72	74.00	-18.28	V	Peak
7309.000	37.01	8.30	45.31	54.00	-8.69	V	AVG
1297.000	50.19	-7.44	42.75	74.00	-31.25	H	Peak
1711.000	50.14	-6.46	43.68	74.00	-30.32	H	Peak
3061.000	49.62	-1.26	48.36	74.00	-25.64	H	Peak
3187.000	49.34	-1.05	48.29	74.00	-25.71	H	Peak
3754.000	47.02	0.55	47.57	74.00	-26.43	H	Peak
4879.000	49.43	4.59	54.02	74.00	-19.98	H	Peak
4879.000	39.20	4.59	43.79	54.00	-10.21	H	AVG

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).

Test Mode: TX / IEEE 802.11g (CH High)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1621.000	53.60	-6.65	46.95	74.00	-27.05	V	Peak
1711.000	58.19	-6.46	51.73	74.00	-22.27	V	Peak
3754.000	47.49	0.55	48.04	74.00	-25.96	V	Peak
4933.000	49.15	4.76	53.91	74.00	-20.09	V	Peak
4933.000	42.06	4.76	46.82	54.00	-7.18	V	AVG
5563.000	43.63	5.90	49.53	74.00	-24.47	V	Peak
7381.000	41.77	8.44	50.21	74.00	-23.79	V	Peak
1621.000	52.88	-6.65	46.23	74.00	-27.77	H	Peak
1711.000	55.02	-6.46	48.56	74.00	-25.44	H	Peak
3061.000	49.33	-1.26	48.07	74.00	-25.93	H	Peak
3187.000	49.53	-1.05	48.48	74.00	-25.52	H	Peak
3754.000	46.95	0.55	47.50	74.00	-26.50	H	Peak
4915.000	48.61	4.70	53.31	74.00	-20.69	H	Peak
4915.000	42.53	4.70	47.23	54.00	-6.77	H	AVG

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).

Antenna 1
Test Mode: TX / IEEE 802.11g(CH Low)

Tested by: Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1630.000	50.82	-6.64	44.18	74.00	-29.82	V	Peak
3187.000	47.65	-1.05	46.60	74.00	-27.40	V	Peak
3754.000	47.91	0.55	48.46	74.00	-25.54	V	Peak
4834.000	61.14	4.44	65.58	74.00	-8.42	V	Peak
4834.000	47.23	4.44	51.67	54.00	-2.33	V	AVG
5689.000	43.05	5.95	49.00	74.00	-25.00	V	Peak
7228.000	44.19	8.14	52.33	74.00	-21.67	V	Peak
7228.000	36.82	8.14	44.96	54.00	-9.04	V	AVG
1297.000	50.07	-7.44	42.63	74.00	-31.37	H	Peak
3061.000	49.93	-1.26	48.67	74.00	-25.33	H	Peak
3187.000	48.71	-1.05	47.66	74.00	-26.34	H	Peak
3754.000	47.28	0.55	47.83	74.00	-26.17	H	Peak
4825.000	55.28	4.41	59.69	74.00	-14.31	H	Peak
4825.000	40.08	4.41	44.49	54.00	-9.51	H	AVG
7237.000	51.64	8.16	59.80	74.00	-14.20	H	Peak
7237.000	37.36	8.16	45.52	54.00	-8.48	H	AVG

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).

Test Mode: TX / IEEE 802.11g (CH Mid)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1954.000	49.59	-5.29	44.30	74.00	-29.70	V	Peak
3061.000	47.88	-1.26	46.62	74.00	-27.38	V	Peak
3754.000	46.81	0.55	47.36	74.00	-26.64	V	Peak
4879.000	57.79	4.59	62.38	74.00	-11.62	V	Peak
4879.000	45.88	4.59	50.47	54.00	-3.53	V	AVG
5689.000	42.85	5.95	48.80	74.00	-25.20	V	Peak
7318.000	43.73	8.32	52.05	74.00	-21.95	V	Peak
7318.000	41.07	8.32	49.39	54.00	-4.61	V	AVG
1297.000	50.38	-7.44	42.94	74.00	-31.06	H	Peak
1711.000	53.42	-6.46	46.96	74.00	-27.04	H	Peak
3061.000	48.98	-1.26	47.72	74.00	-26.28	H	Peak
3187.000	49.13	-1.05	48.08	74.00	-25.92	H	Peak
4879.000	53.12	4.59	57.71	74.00	-16.29	H	Peak
4879.000	43.00	4.59	47.59	54.00	-6.41	H	AVG
7309.000	49.91	8.30	58.21	74.00	-15.79	H	Peak
7309.000	37.82	8.30	46.12	54.00	-7.88	H	AVG

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).

Test Mode: TX / IEEE 802.11g (CH High)

Tested by: Darry Wu

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: November 7, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1900.000	53.04	-5.63	47.41	74.00	-26.59	V	Peak
3061.000	48.25	-1.26	46.99	74.00	-27.01	V	Peak
3754.000	48.03	0.55	48.58	74.00	-25.42	V	Peak
4924.000	56.89	4.73	61.62	74.00	-12.38	V	Peak
4924.000	45.36	4.73	50.09	54.00	-3.91	V	AVG
5563.000	43.60	5.90	49.50	74.00	-24.50	V	Peak
7381.000	42.49	8.44	50.93	74.00	-23.07	V	Peak
1297.000	49.78	-7.44	42.34	74.00	-31.66	H	Peak
3061.000	49.86	-1.26	48.60	74.00	-25.40	H	Peak
3187.000	49.41	-1.05	48.36	74.00	-25.64	H	Peak
3754.000	46.61	0.55	47.16	74.00	-26.84	H	Peak
4933.000	54.15	4.76	58.91	74.00	-15.09	H	Peak
4933.000	41.80	4.76	46.56	54.00	-7.44	H	AVG
7390.000	46.31	8.46	54.77	74.00	-19.23	H	Peak
7390.000	36.83	8.46	45.29	54.00	-8.71	H	AVG

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).