

TEST REPORT

Reference No...... : WTD21D01003711W001 V2
FCC ID : 2ADCS6310
Applicant..... : Smart Wireless Computing, Inc
Address..... : 39870 Eureka Dr, Newark, CA 94560, United States of America
Manufacturer : Smart Wireless Computing, Inc
Address..... : 39870 Eureka Dr, Newark, CA 94560, United States of America
Product..... : 6310™ APPLICATION READY PLATFORM
Model(s) : 6310
Standards..... : FCC CFR47 Part 15.247
Date of Receipt sample : 2021-01-13
Date of Test : 2021-01-14 to 2021-03-12
Date of Issue..... : 2021-06-09
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

Waltek Testing Group Co., Ltd.

Address: No. 77, Houjie Section, Guantai Road, Houjie Town, Dongguan City, Guangdong, China

Tel: +86-769-2267 6998

Fax: +86-769-2267 6828

Compiled by:

Levi Xiao

Levi Xiao / Project Engineer

Approved by:



Daniel Liu

Daniel Liu / Designated Reviewer

2 Contents

	Page
1 COVER PAGE.....	1
2 CONTENTS	2
3 REVISION HISTORY	3
4 GENERAL INFORMATION.....	4
4.1 GENERAL DESCRIPTION OF E.U.T.	4
4.2 DETAILS OF E.U.T.	4
4.3 CHANNEL LIST	5
4.4 TEST MODE	6
5 TEST SUMMARY	7
6 EQUIPMENT USED DURING TEST	8
6.1 EQUIPMENTS LIST	8
6.2 DESCRIPTION OF SUPPORT UNITS	8
6.3 MEASUREMENT UNCERTAINTY	9
6.4 TEST FACILITY.....	9
6.5 TEST EQUIPMENT CALIBRATION	9
7 RADIATED EMISSIONS.....	10
7.1 EUT OPERATION.....	10
7.2 TEST SETUP	11
7.3 SPECTRUM ANALYZER SETUP	12
7.4 TEST PROCEDURE	13
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION	13
7.6 SUMMARY OF TEST RESULTS	14
8 CONDUCTED SPURIOUS EMISSIONS.....	30
8.1 TEST PROCEDURE	30
8.2 TEST RESULT	31
9 BAND EDGE MEASUREMENT	47
9.1 TEST PRODUCE.....	47
9.2 TEST RESULT	48
10 6 DB BANDWIDTH AND 99% BANDWIDTH MEASUREMENT	53
10.1 TEST PROCEDURE:.....	53
10.2 TEST RESULT:	53
11 MAXIMUM PEAK OUTPUT POWER	70
11.1 TEST PROCEDURE:.....	70
11.2 TEST RESULT:	71
12 POWER SPECTRAL DENSITY	80
12.1 TEST PROCEDURE:.....	80
12.2 TEST RESULT:	80
13 ANTENNA REQUIREMENT	89
14 RF EXPOSURE.....	90
15 PHOTOGRAPHS OF TEST SETUP AND EUT.....	90

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D01003711 W001	2021-01-13	2021-01-14 to 2021-03-12	2021-03-17	Original	-	Replaced
WTD21D01003711 W001 V1	2021-01-13	2021-01-14 to 2021-03-12	2021-05-14	Version 1	Updated	Replaced
WTD21D01003711 W001 V2	2021-01-13	2021-01-14 to 2021-03-12	2021-06-09	Version 2	Updated	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	6310™ APPLICATION READY PLATFRM
Model(s):	6310
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/n/ac HT20 /n/ac HT40 /ac HT80
Bluetooth Version:	Bluetooth v4.2 with BLE
Hardware Version:	6310 Rev P2 PCB
Software Version:	Android 10

4.2 Details of E.U.T.

Operation Frequency:	WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz BLE:2402-2480MHz
Max. RF output power:	WiFi(2.4G): 20.88dBm BLE: 2.46 dBm
Type of Modulation:	WiFi: DSSS, OFDM BLE:GFSK
Antenna installation:	WiFi/BLE: Balance Flex Antenna
Antenna Gain:	WiFi/BLE (2.4G): 3.0dBi
Ratings:	DC 12V For Battery

4.3 Channel List

WIFI

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

BT BLE

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

4.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Power Spectral Density	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
6dB Bandwidth	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Band Edge	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Transmitter Spurious Emissions	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX

Table 2 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	BT BLE	1 Mbps	0/19/39	TX
Power Spectral Density	BT BLE	1 Mbps	0/19/39	TX
6dB Bandwidth	BT BLE	1 Mbps	0/19/39	TX
Band Edge	BT BLE	1 Mbps	0/19/39	TX
Transmitter Spurious Emissions	BT BLE	1 Mbps	0/19/39	TX

Note :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

5 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.247(d) 15.205(a) 15.209(a)	PASS
Conducted Spurious Emissions	15.247(d)	PASS
Conducted Emissions	15.207(a)	N/A
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

6 Equipment Used during Test

6.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2020-04-20	2021-04-19
2	Amplifier	Agilent	8447D	2944A10178	2020-04-20	2021-04-19
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2020-08-22	2021-08-21
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2020-04-20	2021-04-19
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2020-04-25	2021-04-24
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2020-04-20	2021-04-19
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2020-04-20	2021-04-19
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2020-04-20	2021-04-19
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2020-04-20	2021-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2020-04-25	2021-04-24
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2020-05-06	2021-05-05
4	Amplifier	ANRITSU	MH648A	M43381	2020-04-20	2021-04-19
5	Cable	HUBER+SUHNER	CBL2	525178	2020-04-20	2021-04-19
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2020-04-20	2021-04-19
2.	Spectrum Analyzer	R&S	FSP30	100091	2020-04-20	2021-04-19
3.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2020-04-20	2021-04-19

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
Computer	Dell	K053	/
Mouse	Lenovo	AP01	/

6.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Conducted Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)
Conducted Spurious Emissions test	± 3.12 dB (9kHz~30MHz)
	± 4.21 dB (30M~1000MHz)
	± 5.14 dB (1000M~26500MHz)

6.4 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476. Certificate Number: 4243.01

Waltek Testing Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

6.5 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

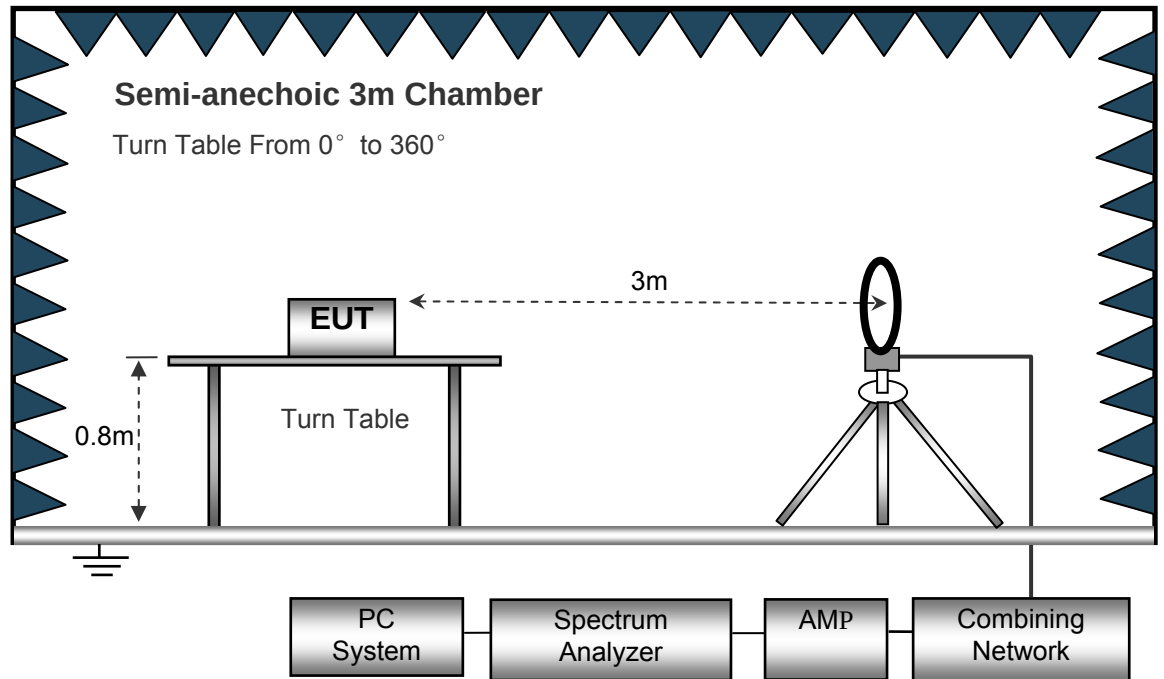
EUT Operation :

The test was performed in WIFI link and BLE link mode, the test data were shown in the report.

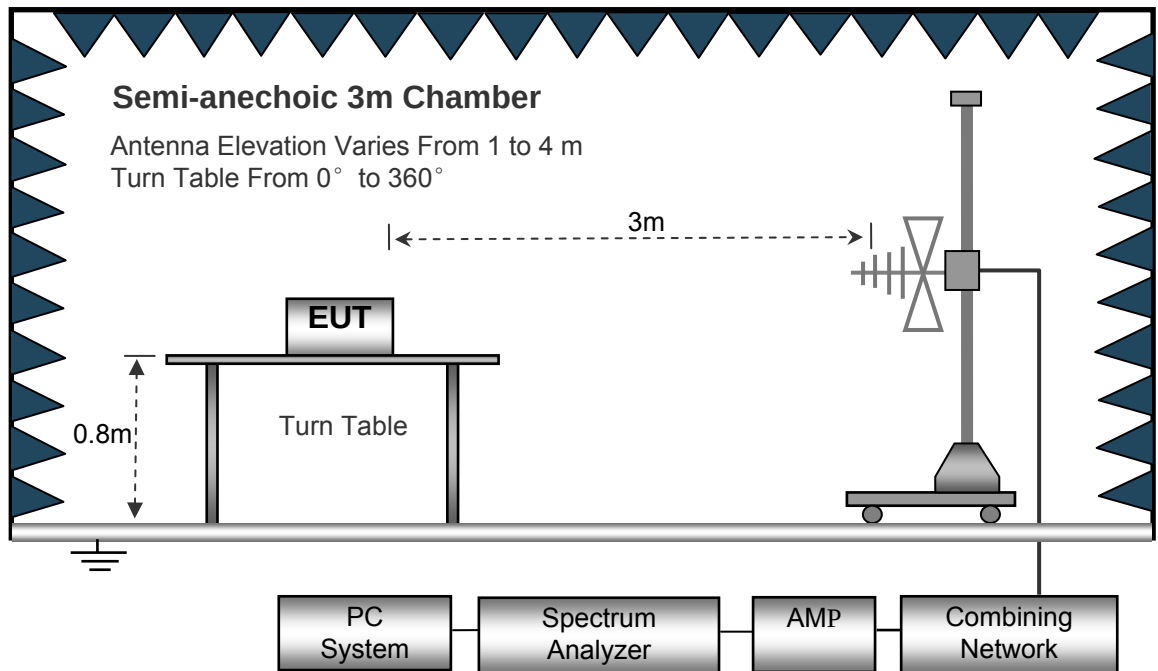
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

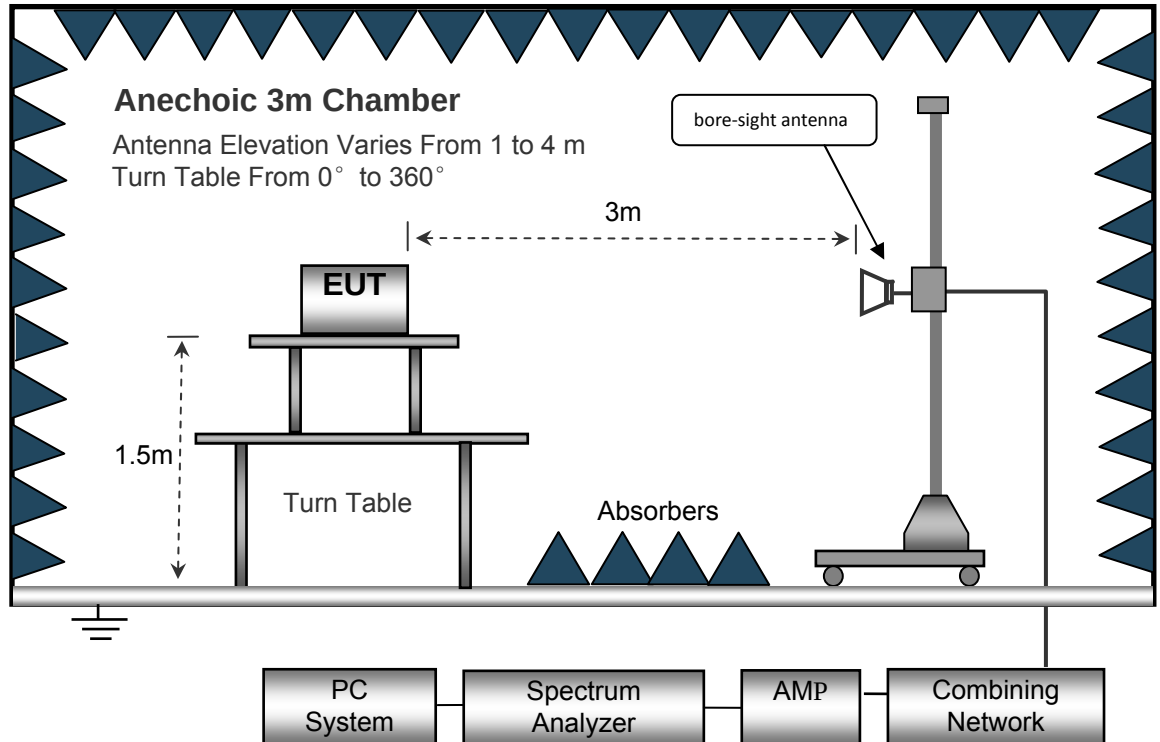
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed Auto
 IF Bandwidth..... 10kHz
 Video Bandwidth..... 10kHz
 Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed Auto
 Detector PK
 Resolution Bandwidth..... 100kHz
 Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed Auto
 Detector PK
 Resolution Bandwidth..... 1MHz
 Video Bandwidth..... 3MHz
 Detector Ave.
 Resolution Bandwidth..... 1MHz
 Video Bandwidth..... 10Hz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used during radiated emissions above 1GHz measurement.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

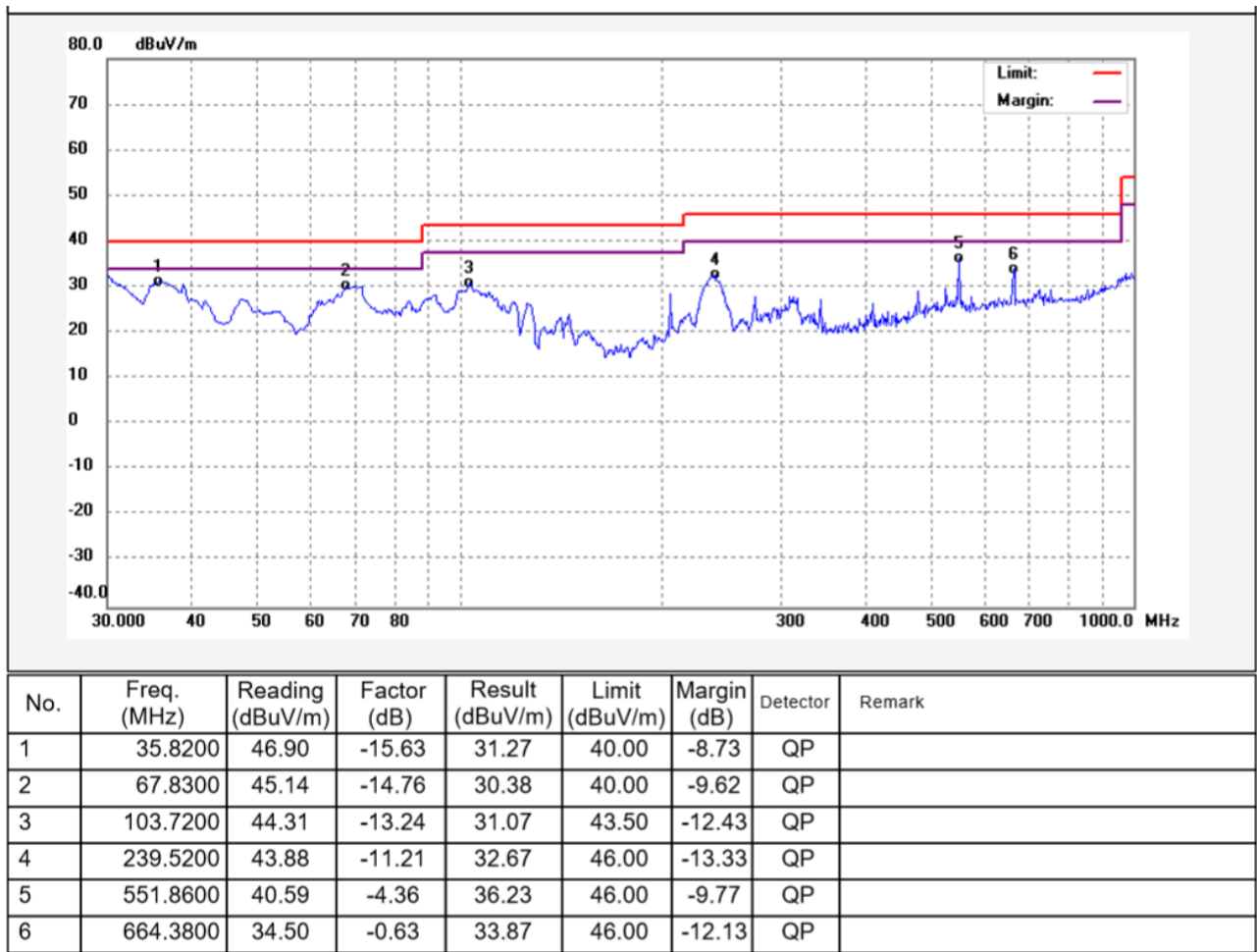
$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

7.6 Summary of Test Results

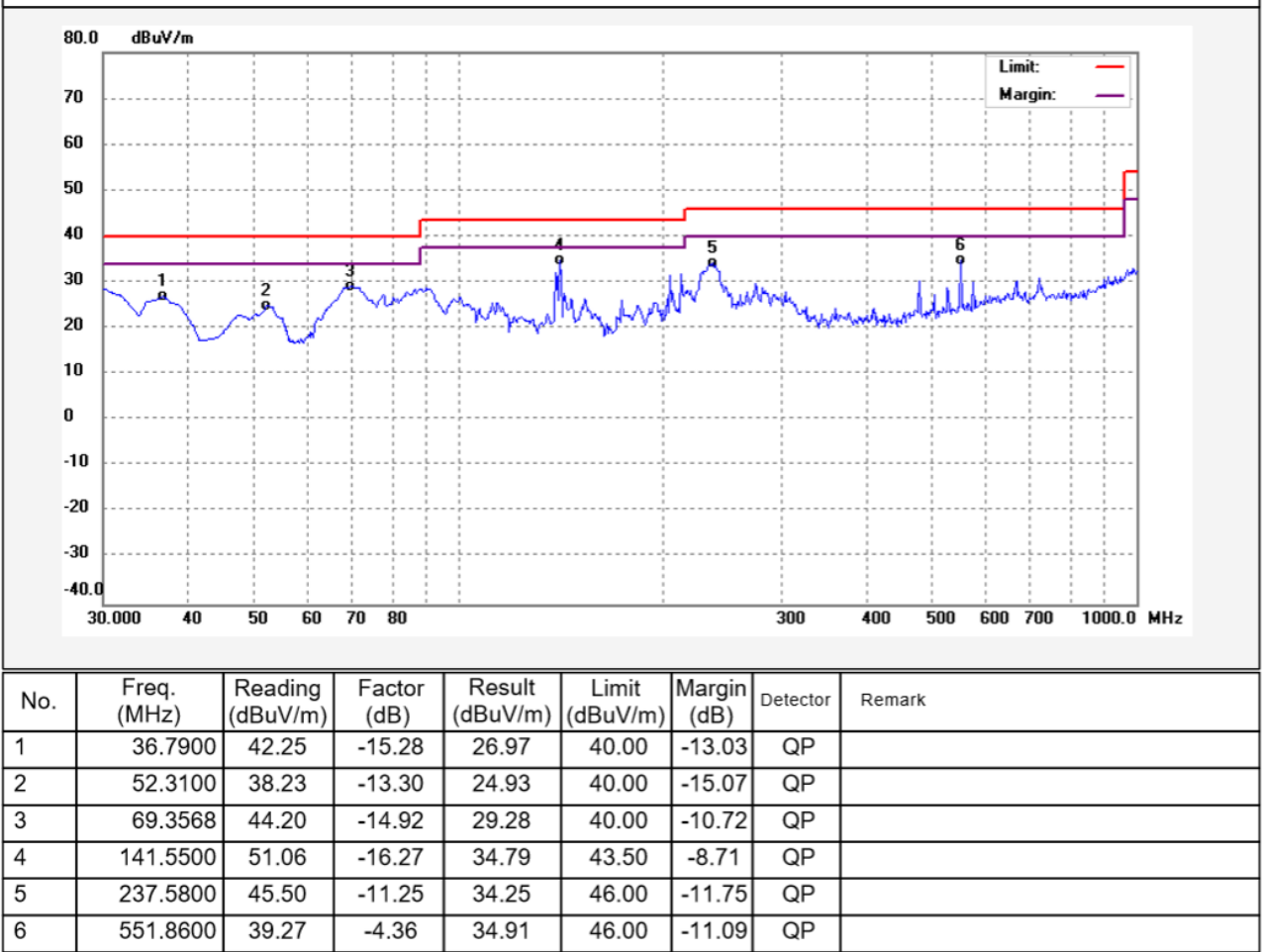
Wifi:
Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.
Test Frequency : 30MHz ~ 1GHz (only the worst-case plots for each mode)

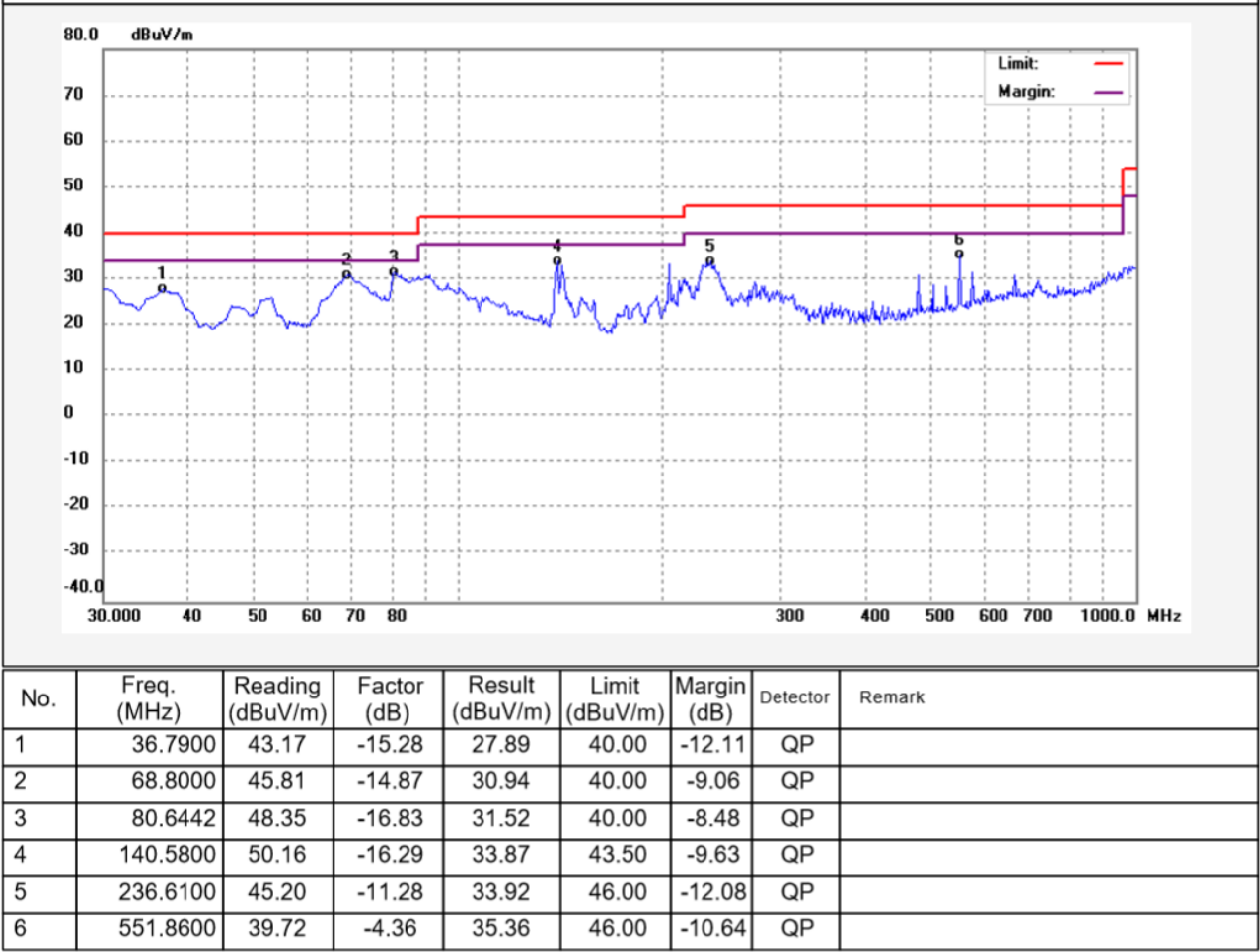
802.11b: Middle Channel 2437MHz (Vertical)



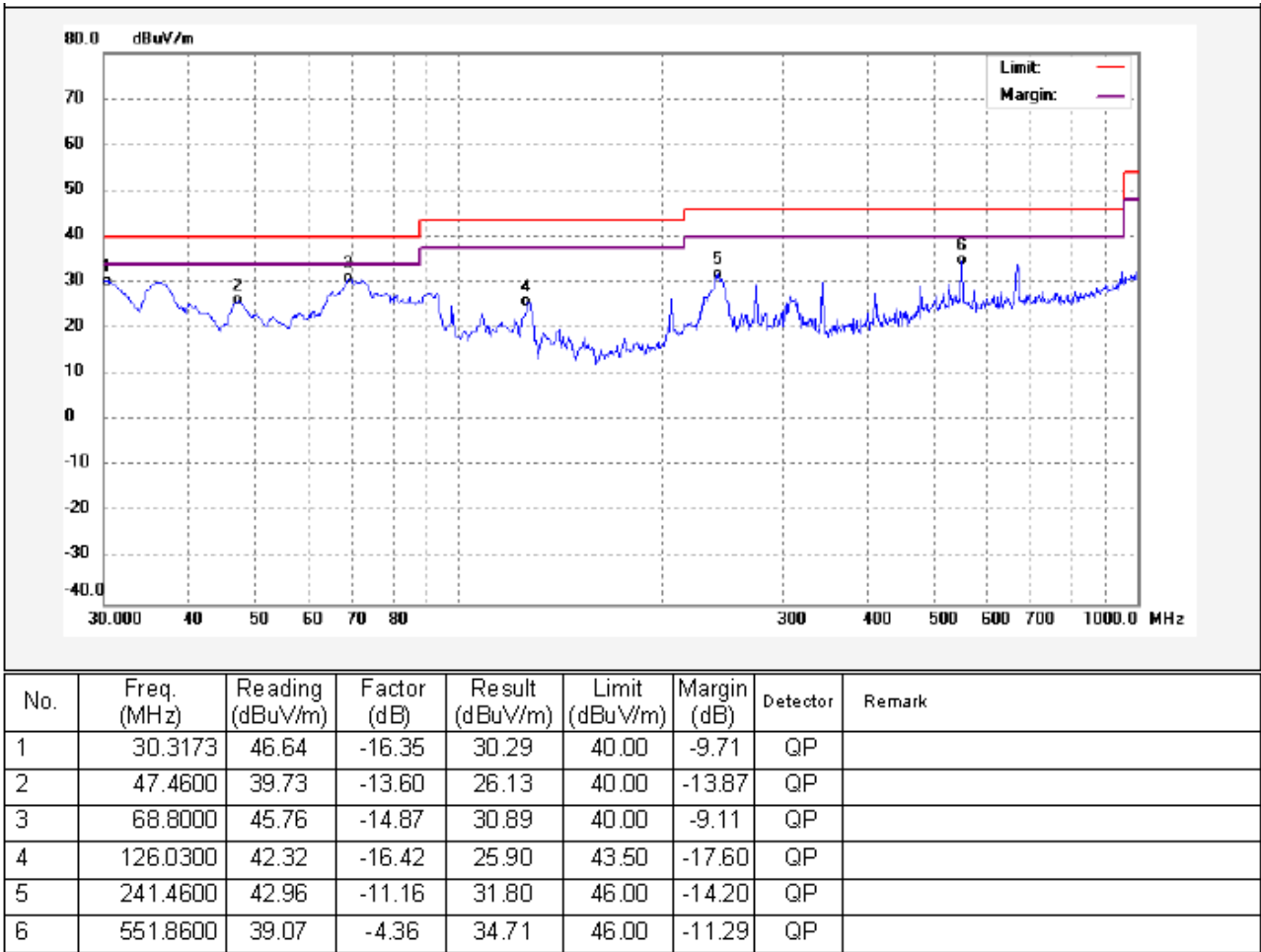
802.11b: Middle Channel 2437MHz (Horizontal)



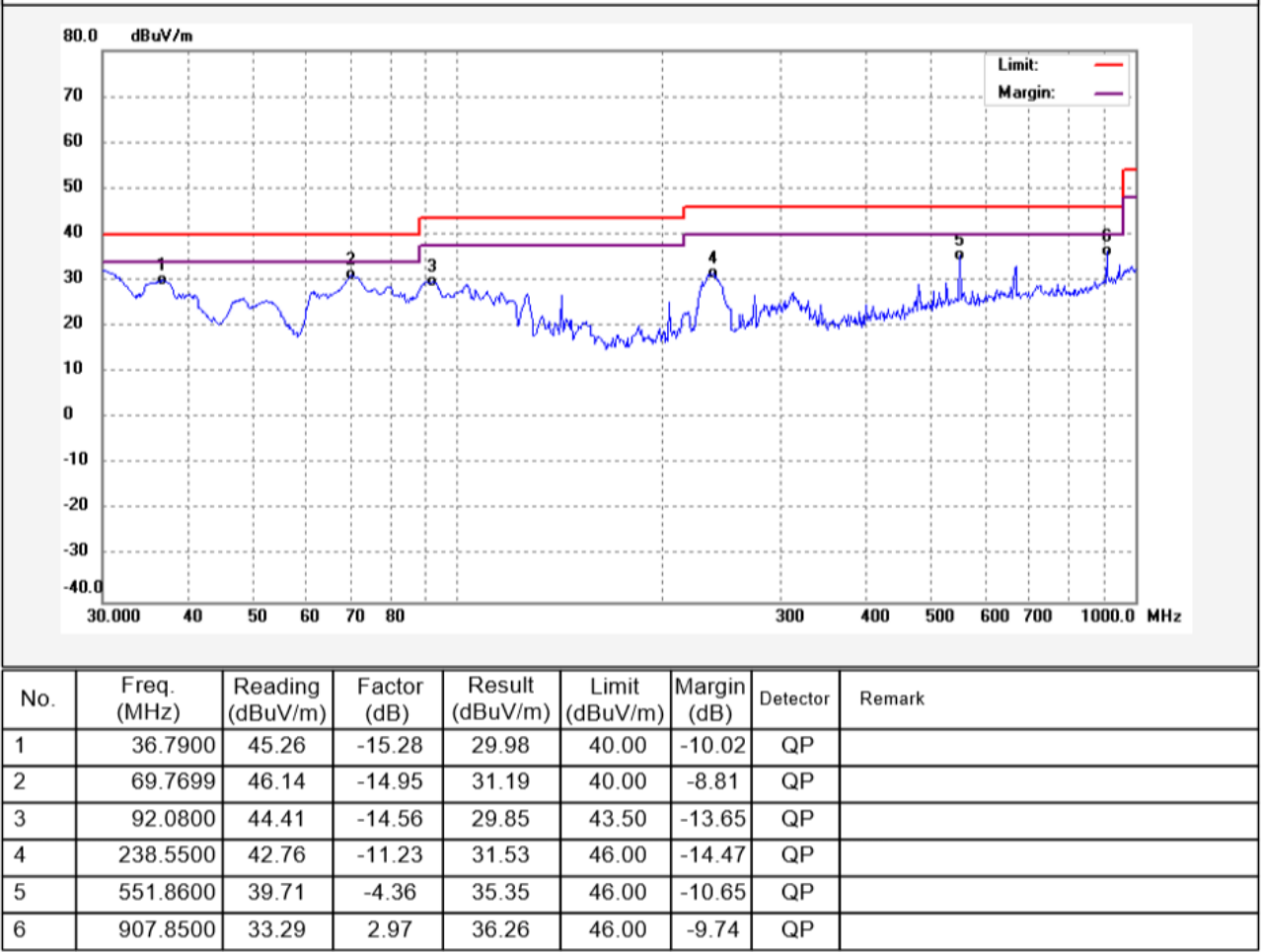
802.11g: Low Channel 2412MHz (Vertical)



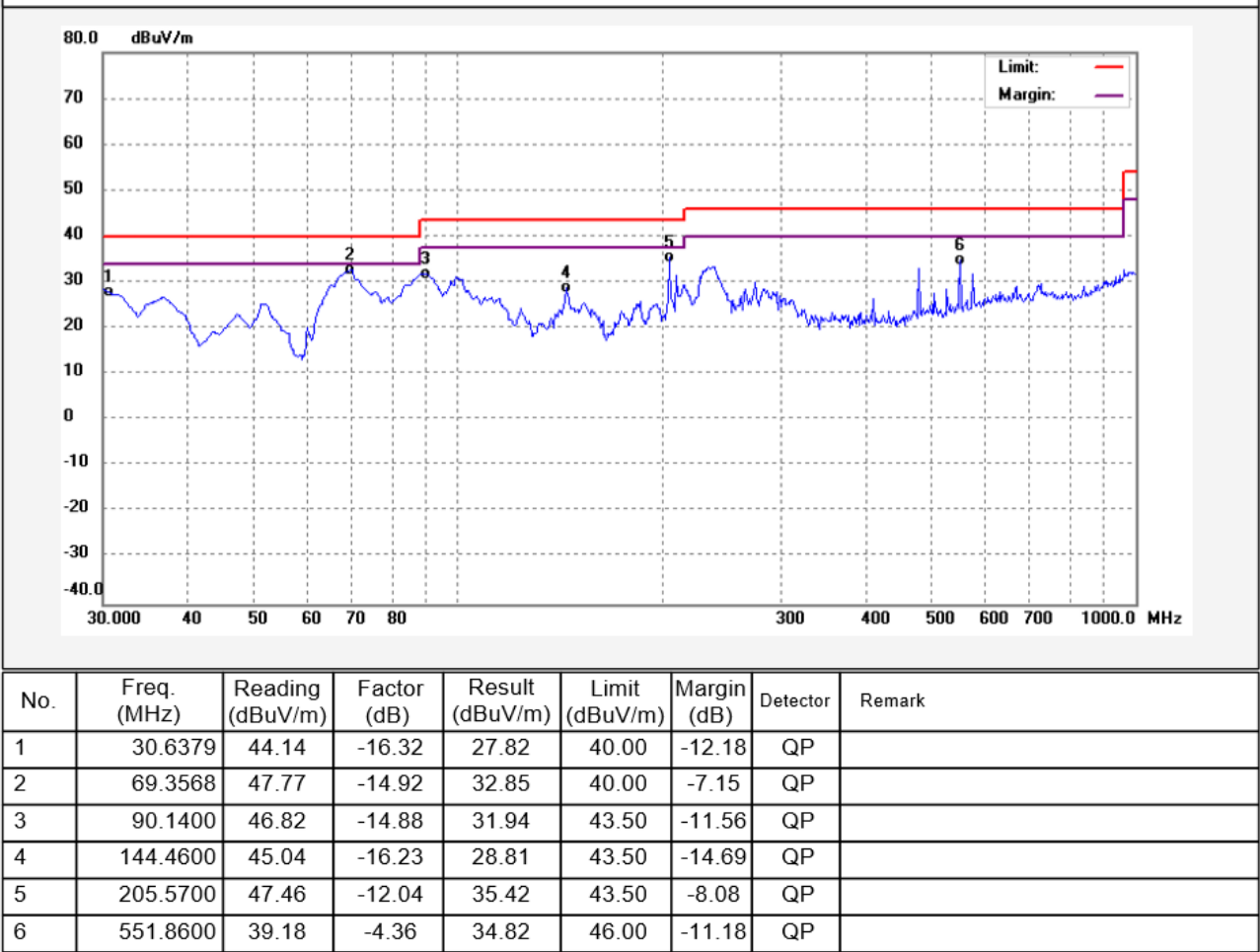
802.11g: Low Channel 2412MHz (Horizontal)



802.11n: Low Channel 2412MHz (Vertical)



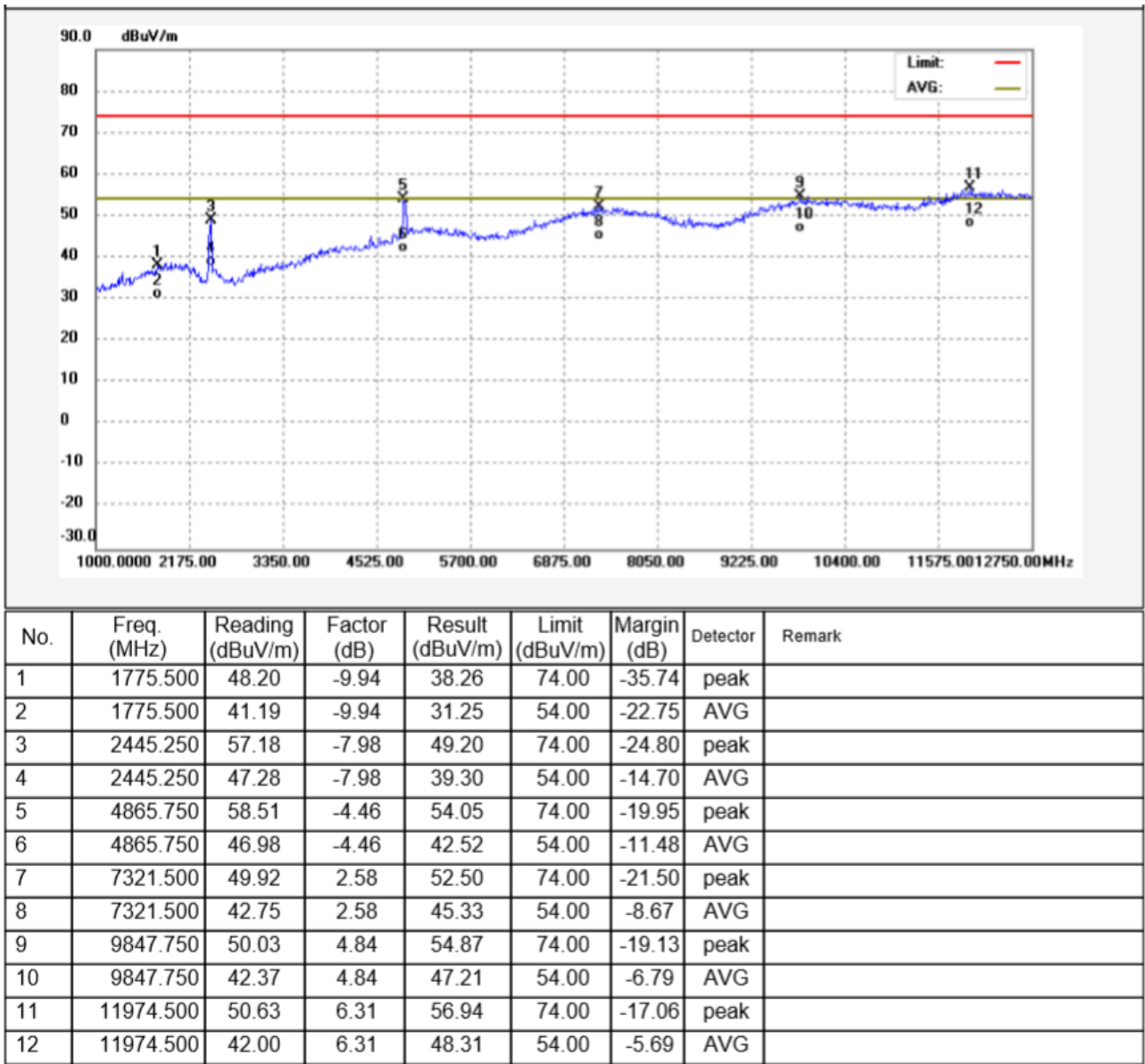
802.11n: Low Channel 2412MHz (Horizontal)



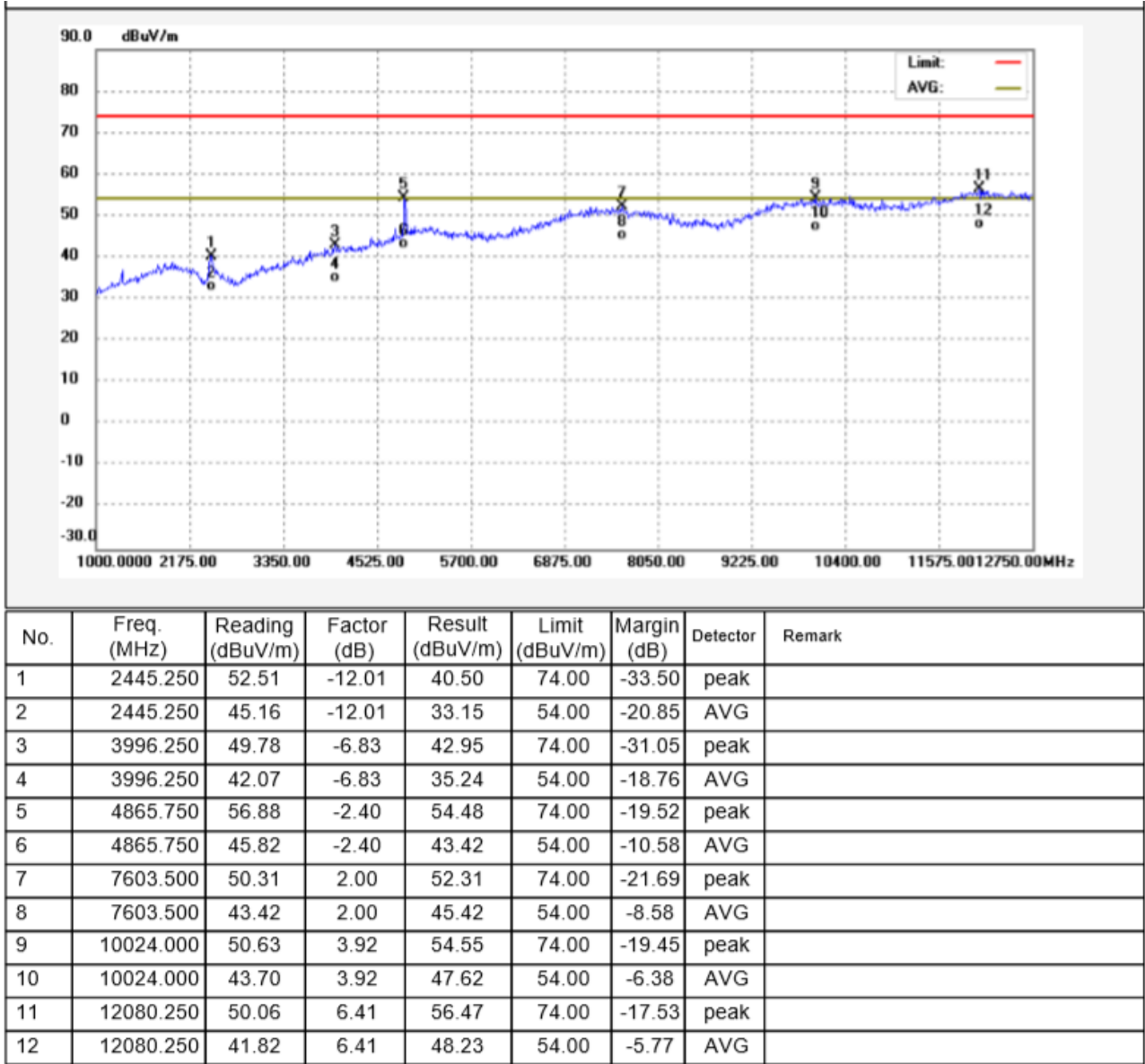
Test Frequency: 1GHz~12.75GHz (only the worst-case plots for each mode)

Remark: The current test plots doesn't have the fundamental signal, It's blocked by the filter

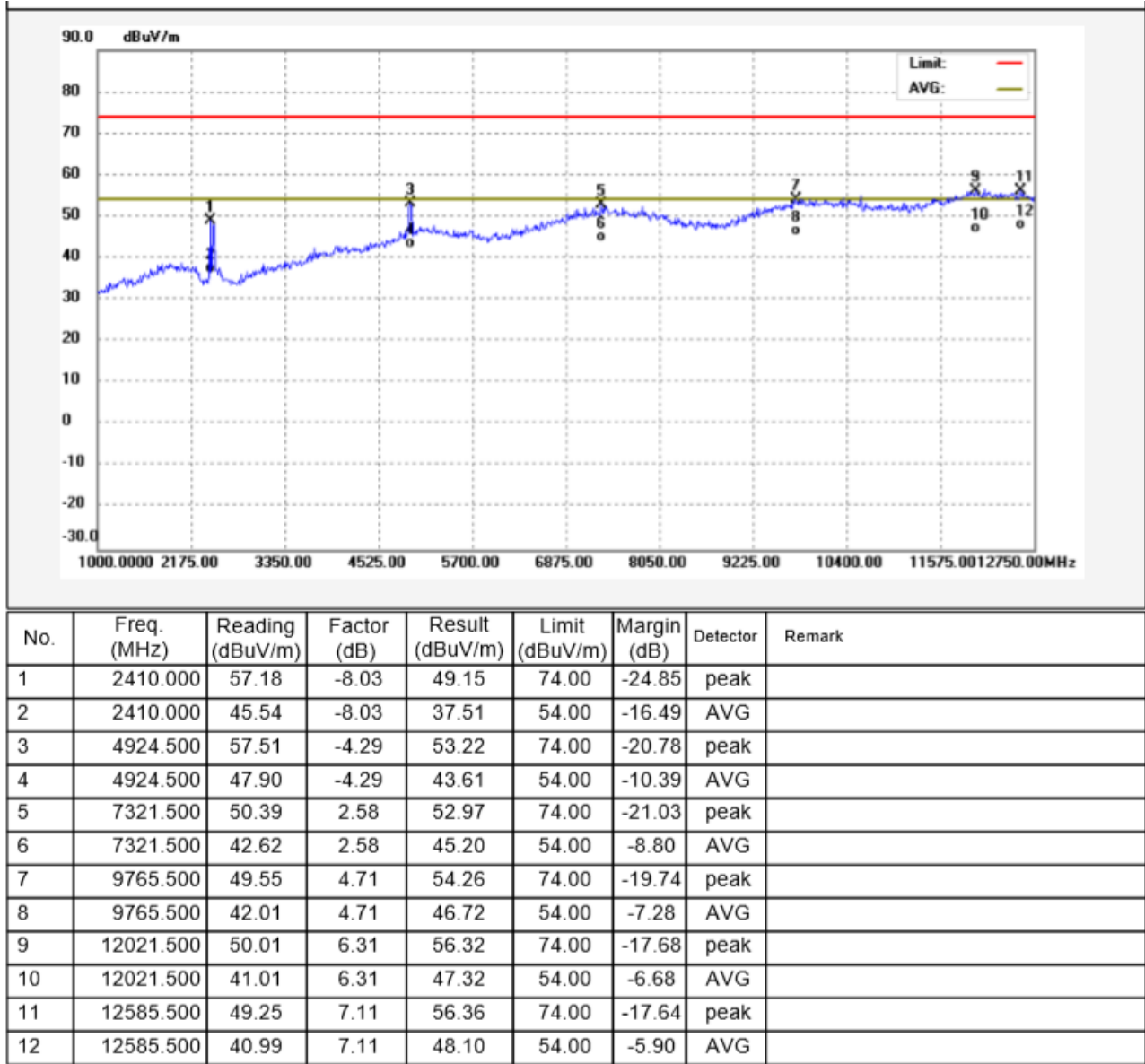
802.11b: Middle Channel 2437MHz (Vertical)



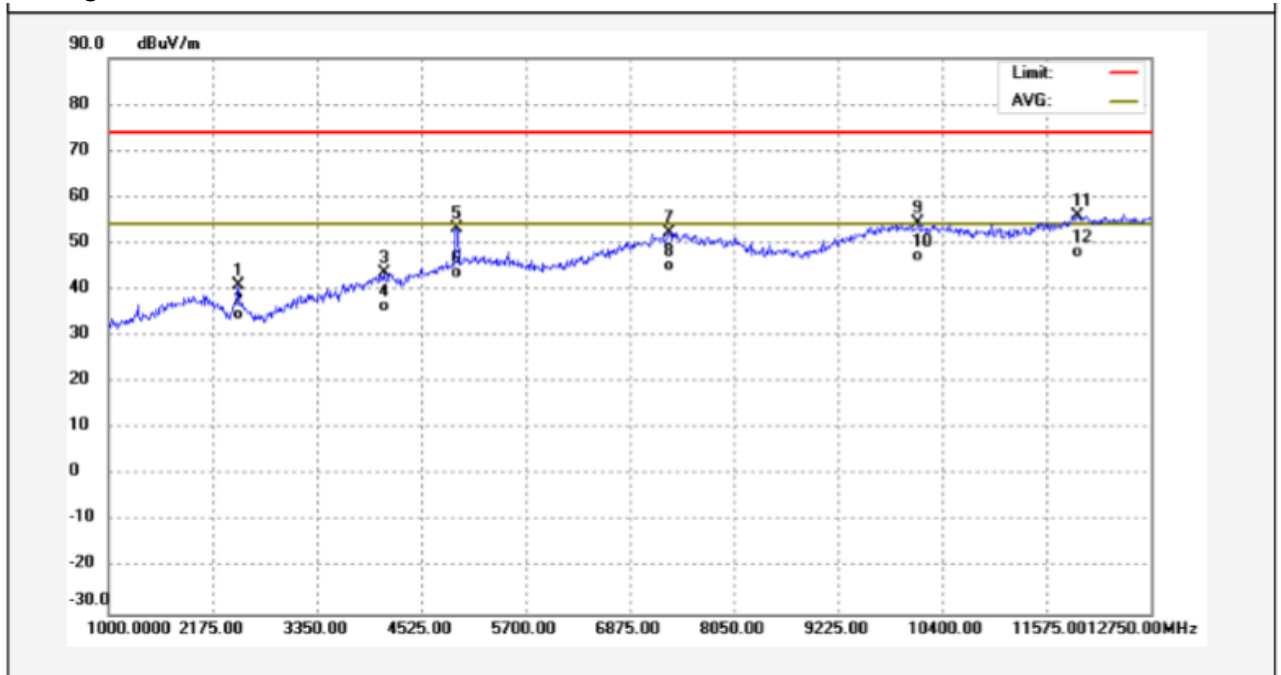
802.11b: Middle Channel 2437MHz (Horizontal)



802.11g: Low Channel 2412MHz (Vertical)

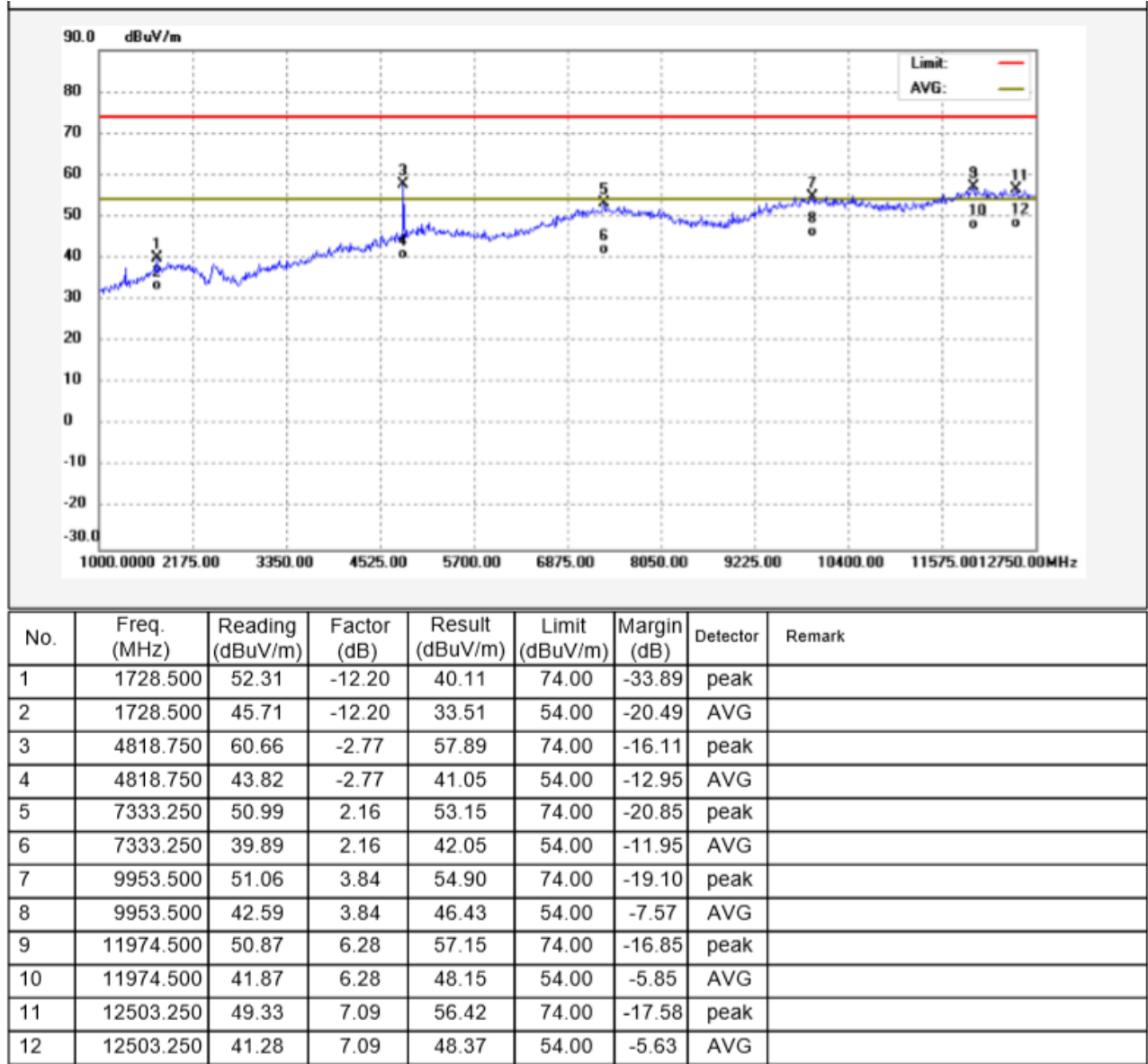


802.11g: Low Channel 2412MHz (Horizontal)

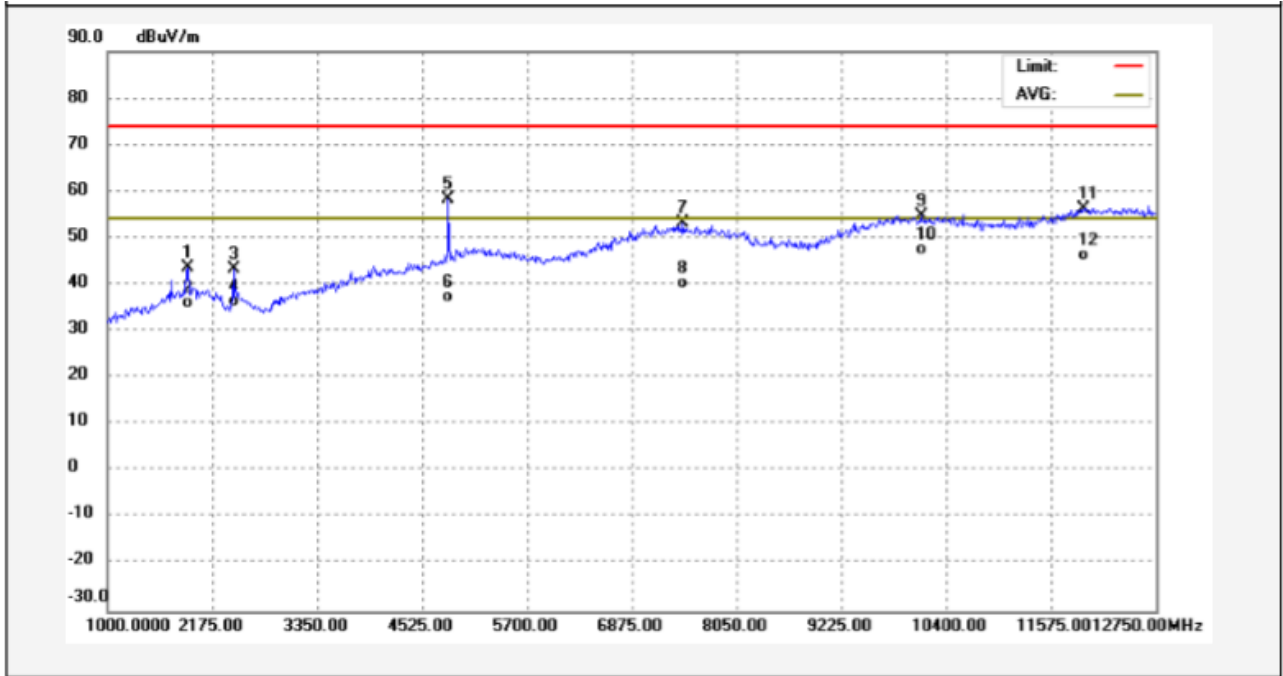


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2457.000	53.11	-12.05	41.06	74.00	-32.94	peak	
2	2457.000	46.57	-12.05	34.52	54.00	-19.48	AVG	
3	4102.000	50.23	-6.50	43.73	74.00	-30.27	peak	
4	4102.000	42.82	-6.50	36.32	54.00	-17.68	AVG	
5	4924.500	55.35	-1.95	53.40	74.00	-20.60	peak	
6	4924.500	45.47	-1.95	43.52	54.00	-10.48	AVG	
7	7321.500	50.32	2.17	52.49	74.00	-21.51	peak	
8	7321.500	43.03	2.17	45.20	54.00	-8.80	AVG	
9	10129.750	50.39	4.08	54.47	74.00	-19.53	peak	
10	10129.750	43.28	4.08	47.36	54.00	-6.64	AVG	
11	11927.500	49.72	6.26	55.98	74.00	-18.02	peak	
12	11927.500	41.89	6.26	48.15	54.00	-5.85	AVG	

802.11n: Low Channel 2412MHz (Vertical)



802.11n: Low Channel 2412MHz (Horizontal)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1893.000	52.77	-9.21	43.56	74.00	-30.44	peak	
2	1893.000	45.48	-9.21	36.27	54.00	-17.73	AVG	
3	2410.000	51.27	-8.03	43.24	74.00	-30.76	peak	
4	2410.000	44.44	-8.03	36.41	54.00	-17.59	AVG	
5	4818.750	63.01	-4.60	58.41	74.00	-15.59	peak	
6	4818.750	41.90	-4.60	37.30	54.00	-16.70	AVG	
7	7450.750	50.42	2.69	53.11	74.00	-20.89	peak	
8	7450.750	37.57	2.69	40.26	54.00	-13.74	AVG	
9	10118.000	49.62	5.20	54.82	74.00	-19.18	peak	
10	10118.000	42.31	5.20	47.51	54.00	-6.49	AVG	
11	11939.250	50.05	6.33	56.38	74.00	-17.62	peak	
12	11939.250	39.99	6.33	46.32	54.00	-7.68	AVG	

Test Frequency : 12.75GHz ~ 25GHz

The measurements were more than 20 dB below the limit and not reported.

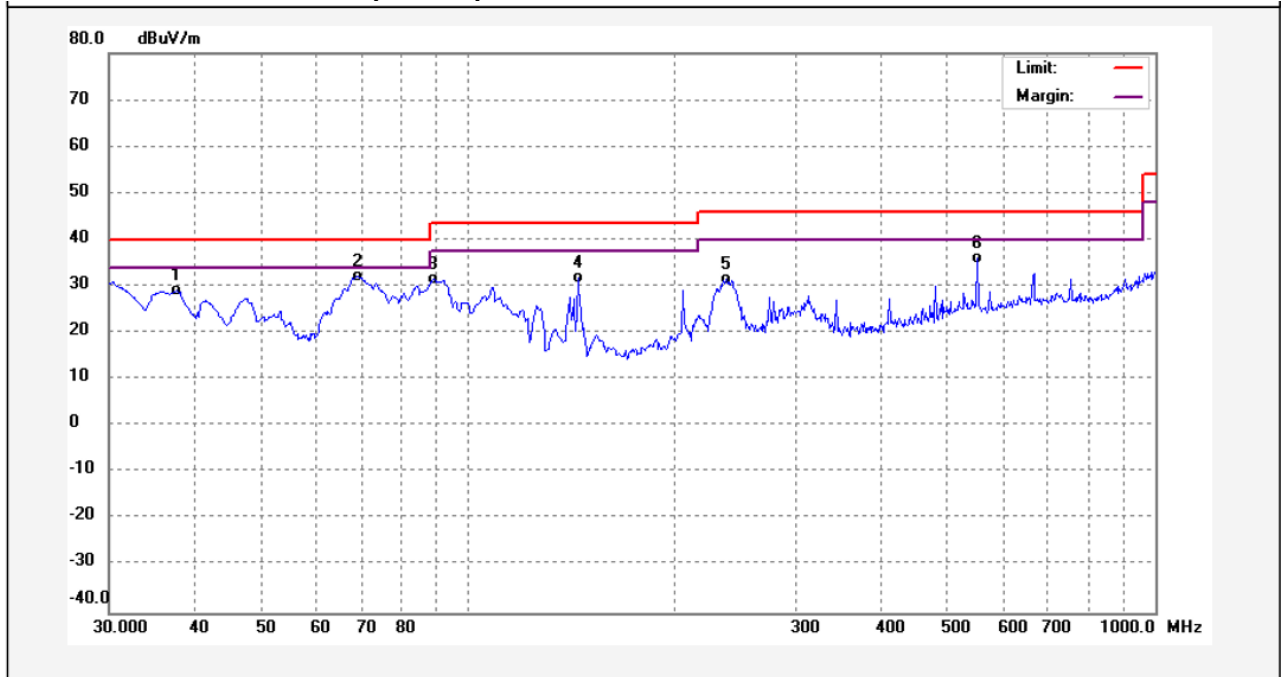
BT BLE:

Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

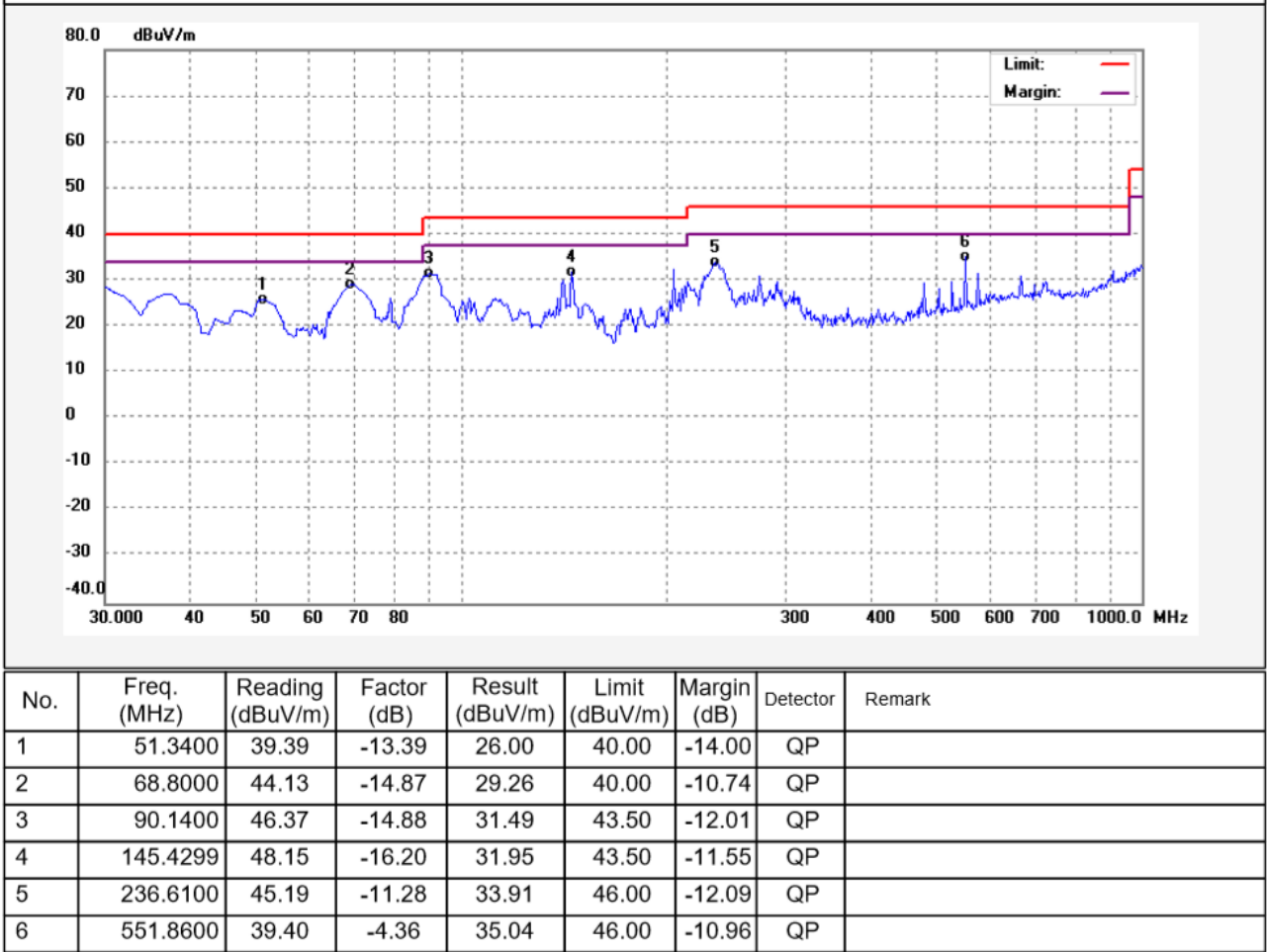
Test Frequency : 30MHz ~ 1GHz

GFSK Low Channel 2402MHz(Vertical)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.7599	44.12	-14.92	29.20	40.00	-10.80	QP	
2	69.1141	47.15	-14.89	32.26	40.00	-7.74	QP	
3	89.1700	46.58	-15.08	31.50	43.50	-12.00	QP	
4	144.4600	48.22	-16.23	31.99	43.50	-11.51	QP	
5	237.5800	42.86	-11.25	31.61	46.00	-14.39	QP	
6	551.8600	40.33	-4.36	35.97	46.00	-10.03	QP	

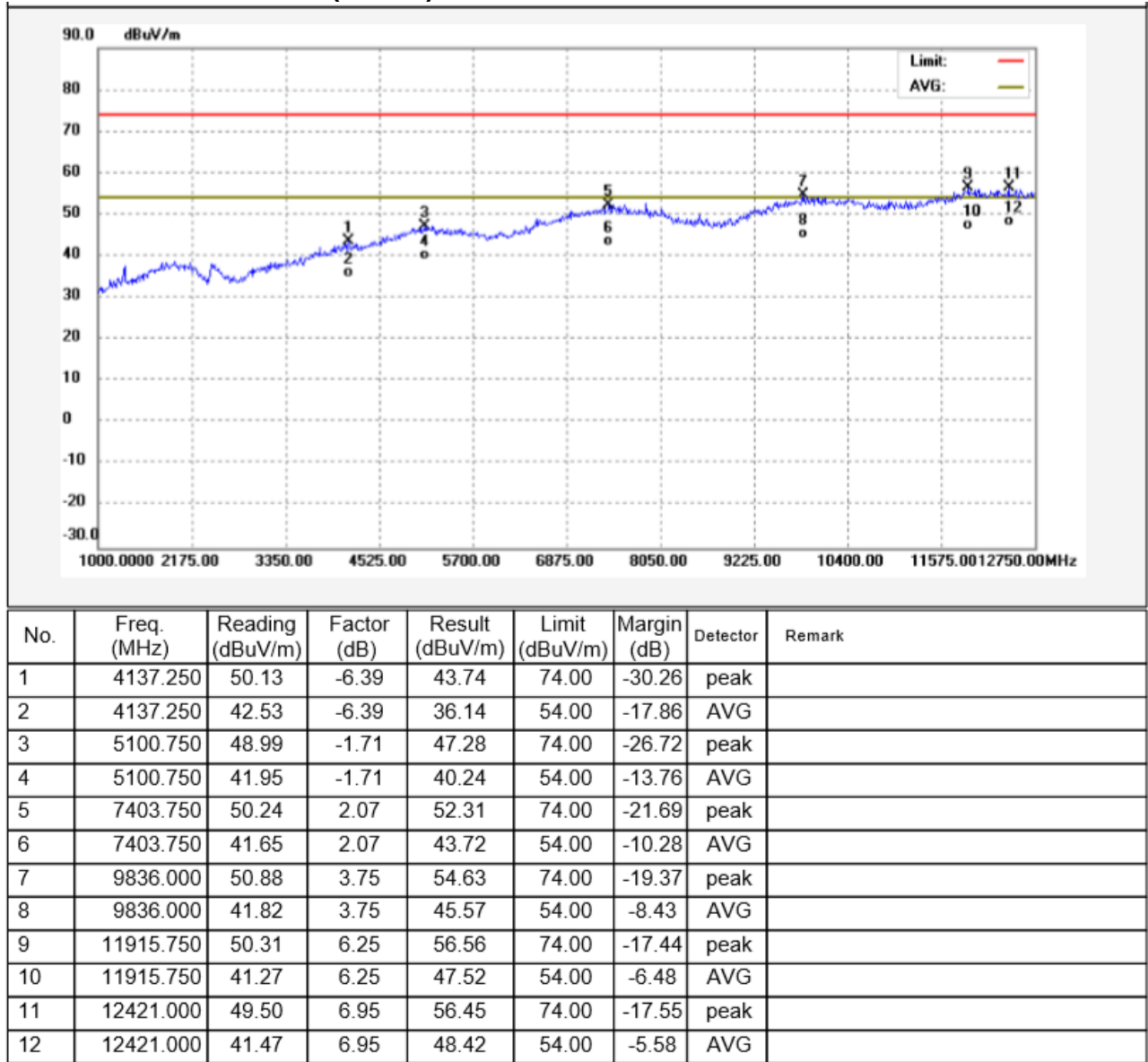
GFSK Low Channel 2402MHz(Horizontal)



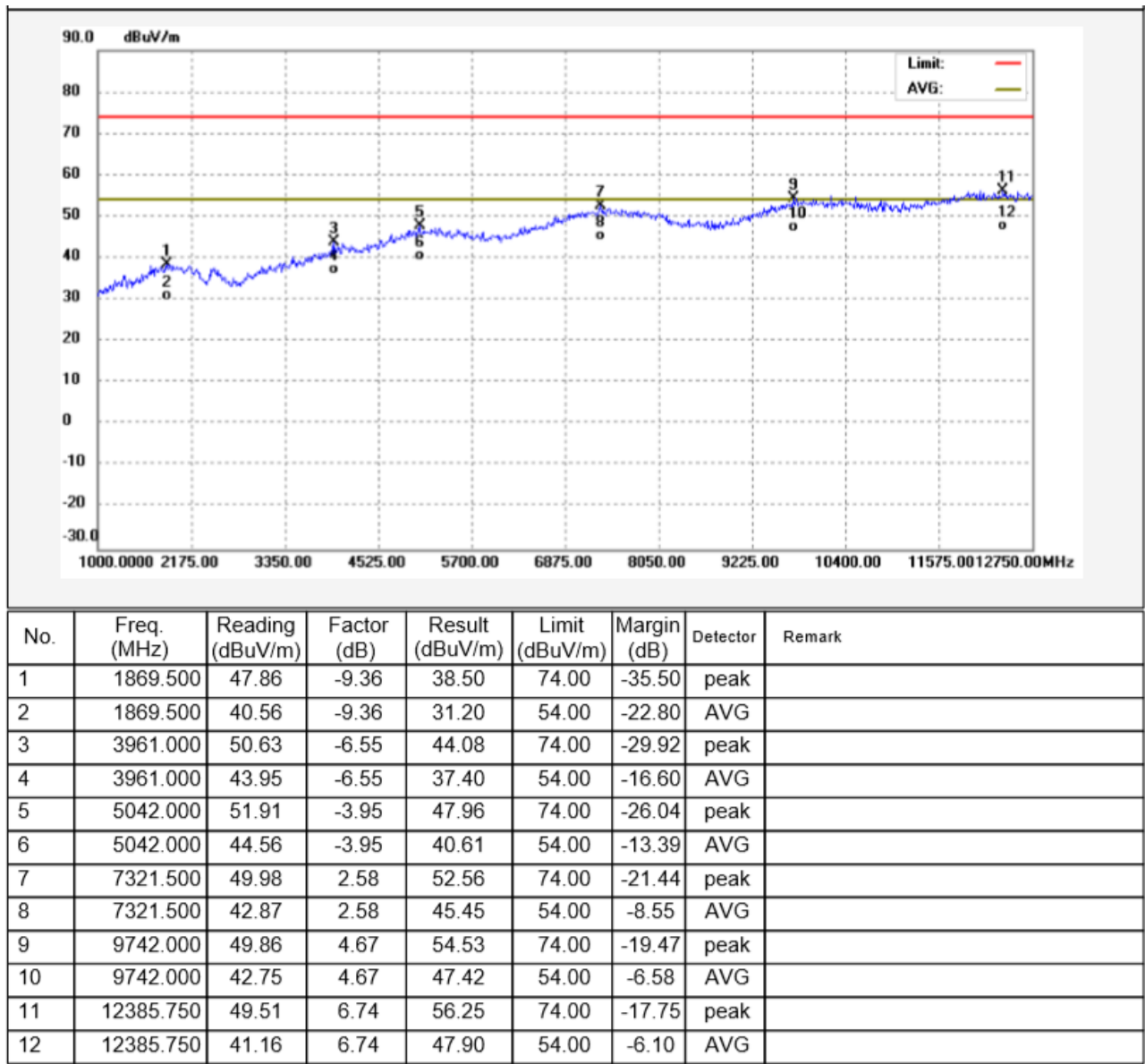
Test Frequency : 1GHz ~ 12.75GHz

Remark: The current test plots doesn't have the fundamental signal, It's blocked by the filter

GFSK Low Channel 2402MHz(Vertical)



GFSK Low Channel 2402MHz(Horizontal)



Test Frequency: 12.75GHz~25GHz

The measurements were more than 20 dB below the limit and not reported.

8 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

Test Result: PASS

Limit:

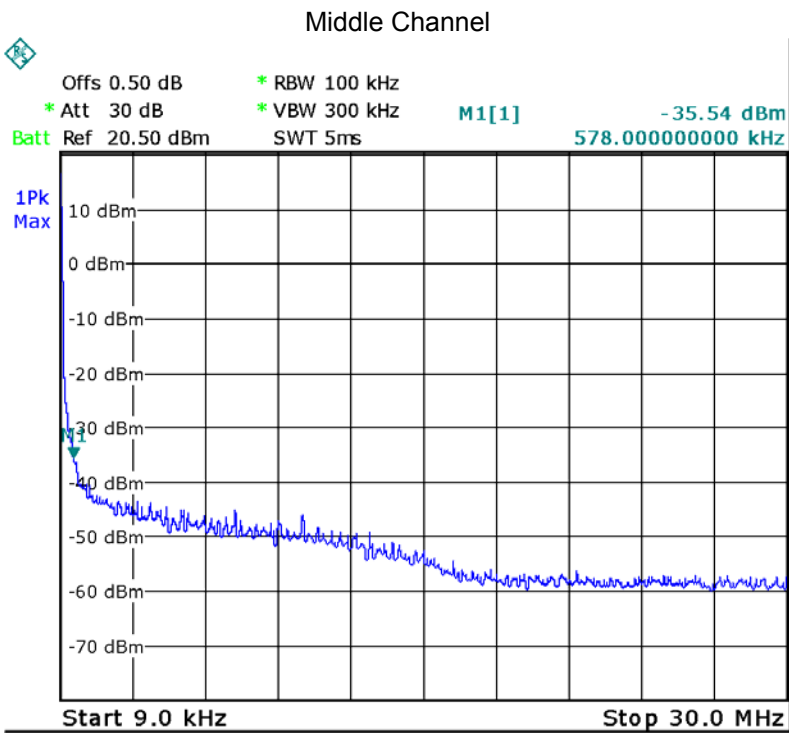
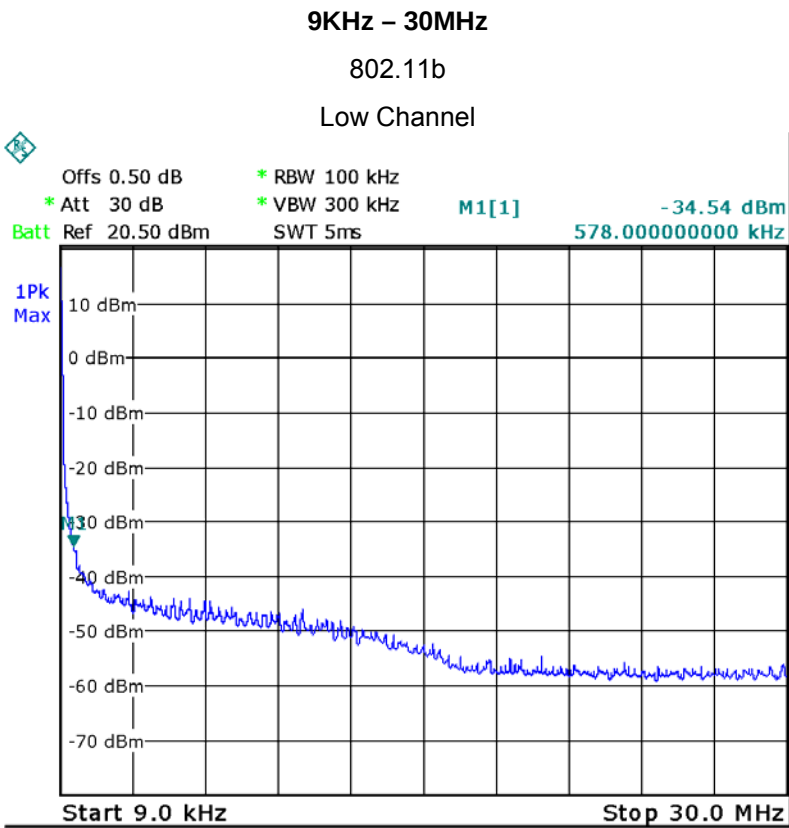
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

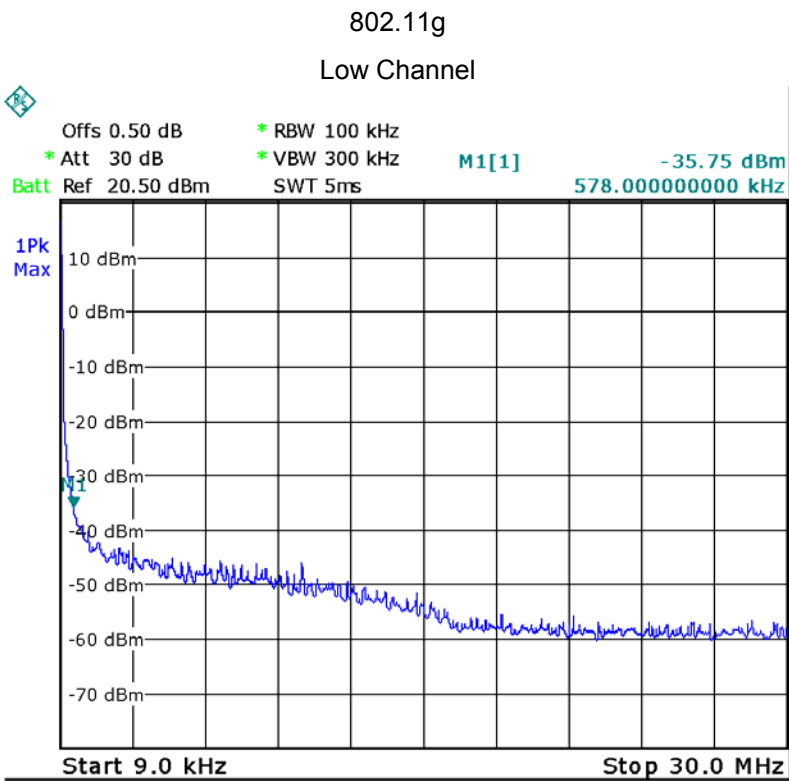
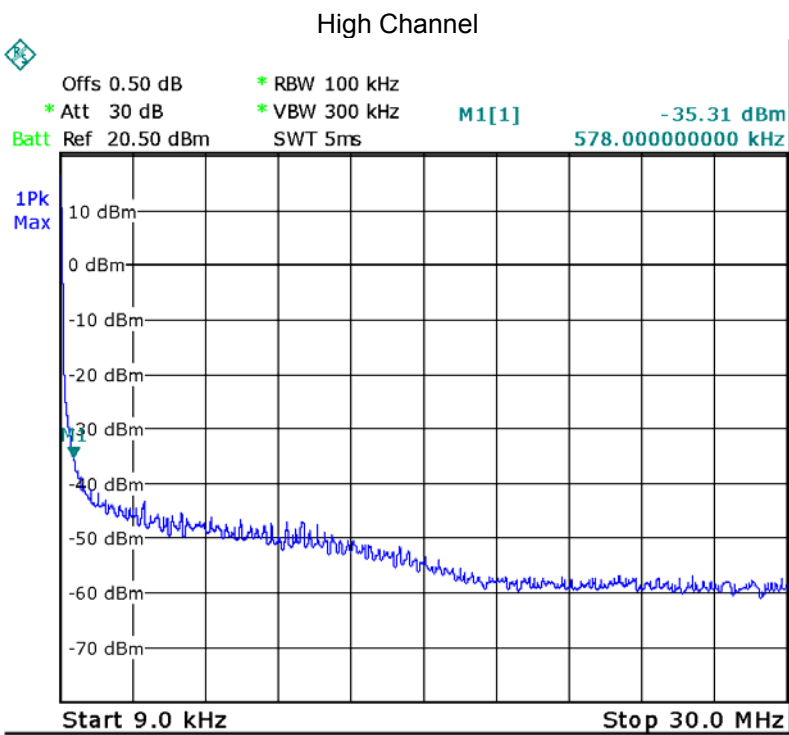
8.1 Test Procedure

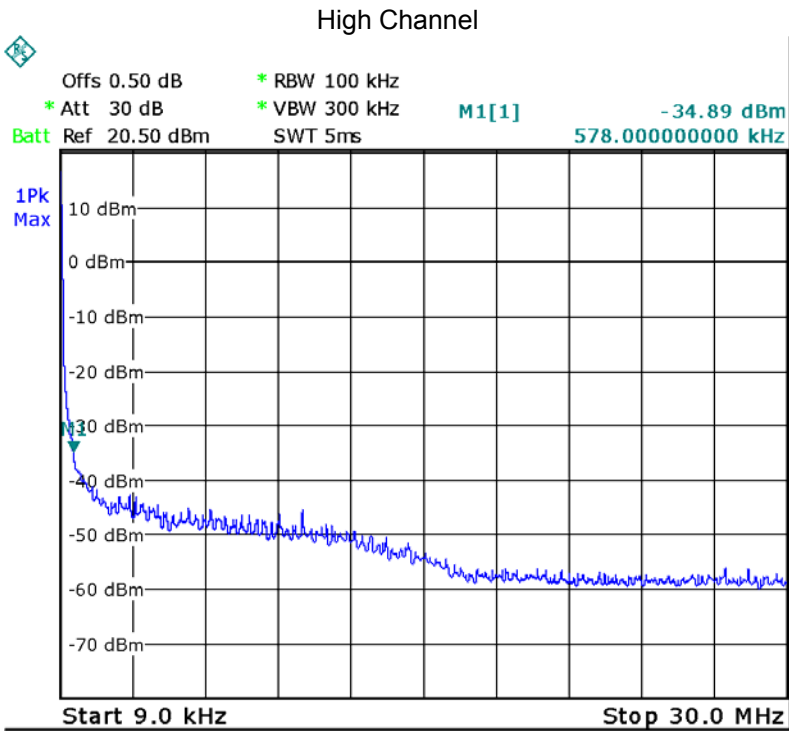
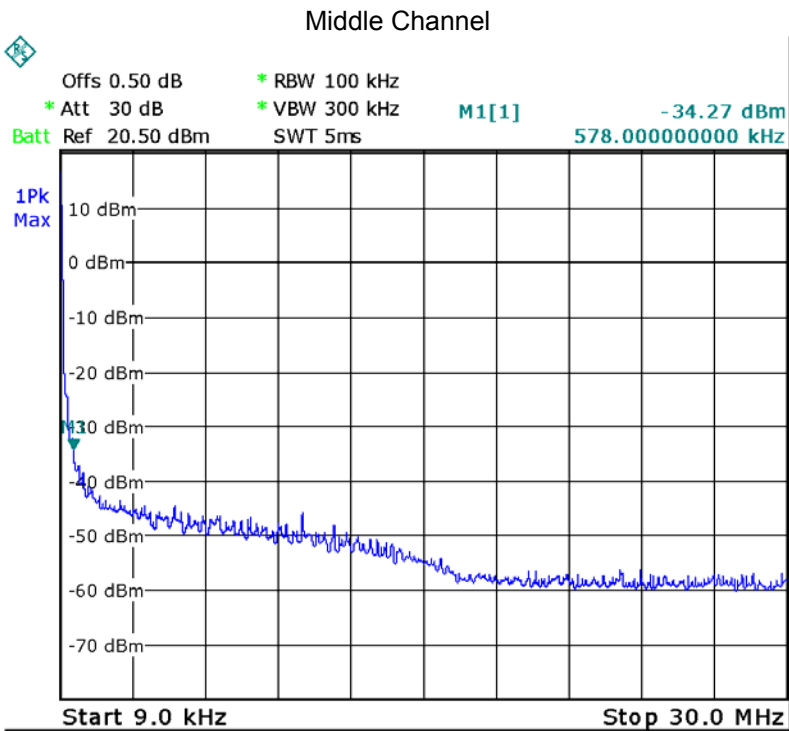
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
 - a) Set instrument center frequency to DTS channel center frequency.
 - b) Set the span to _ 1.5 times the DTS bandwidth.
 - c) Set the RBW = 100 kHz.
 - d) Set the VBW _ $[3 \times \text{RBW}]$.
 - e) Detector = peak.
 - f) Sweep time = auto couple.
 - g) Trace mode = max hold.
 - h) Allow trace to fully stabilize.
 - i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

8.2 Test Result

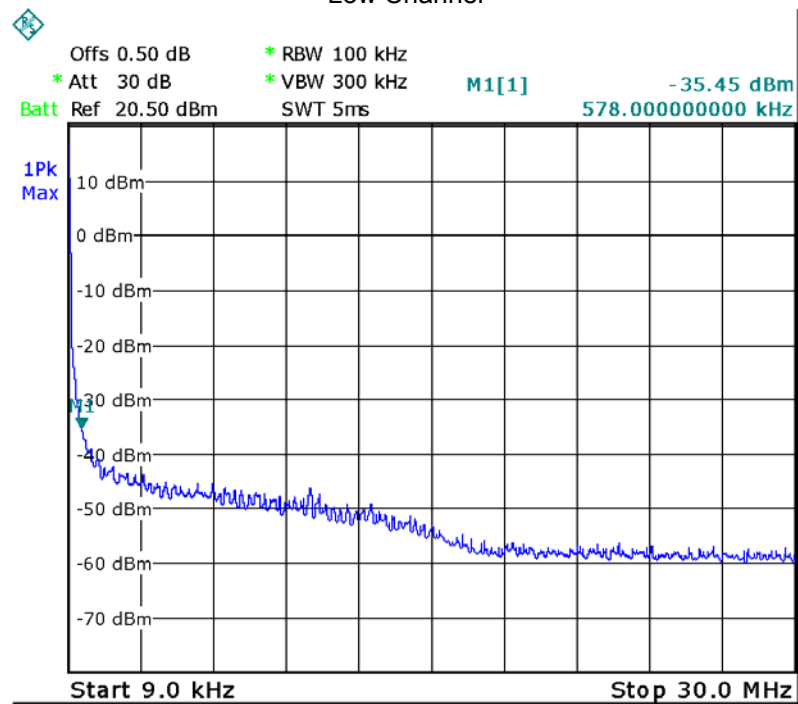




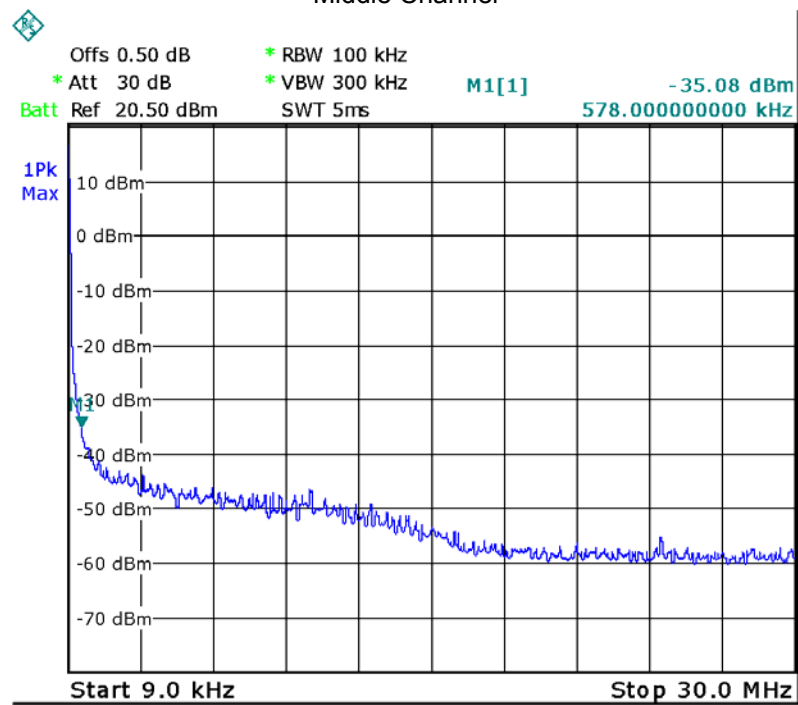


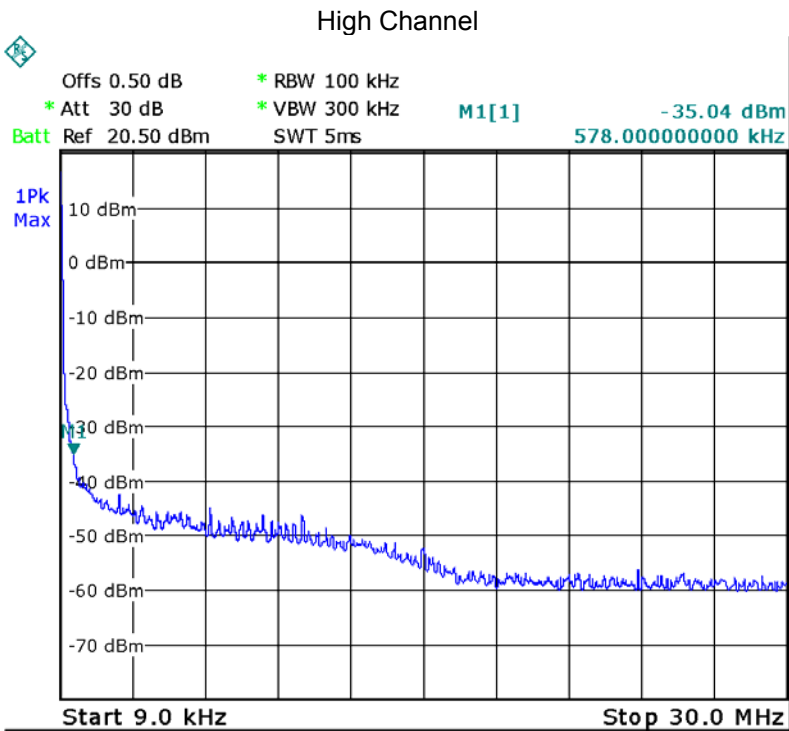
802.11n HT20

Low Channel

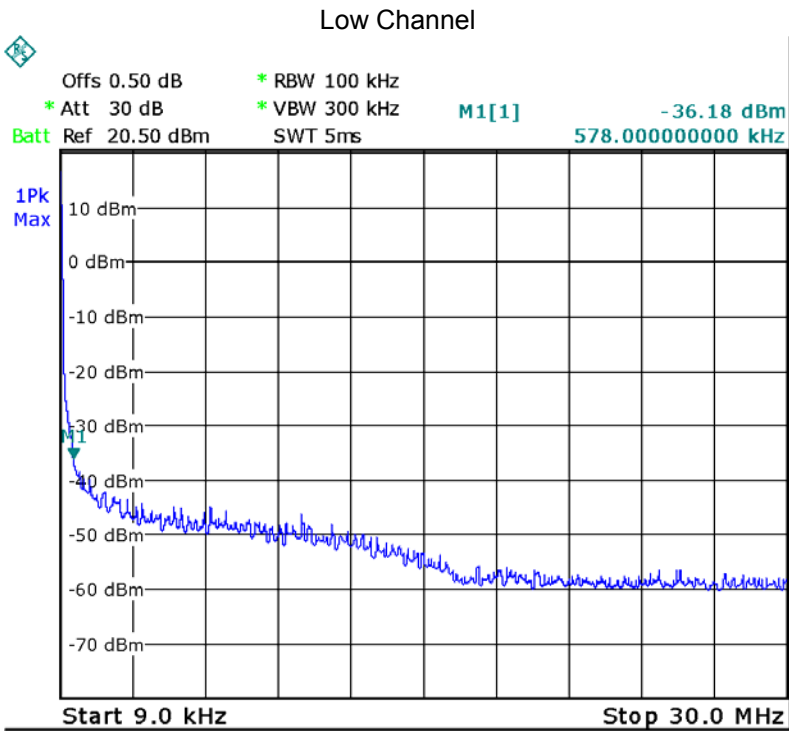


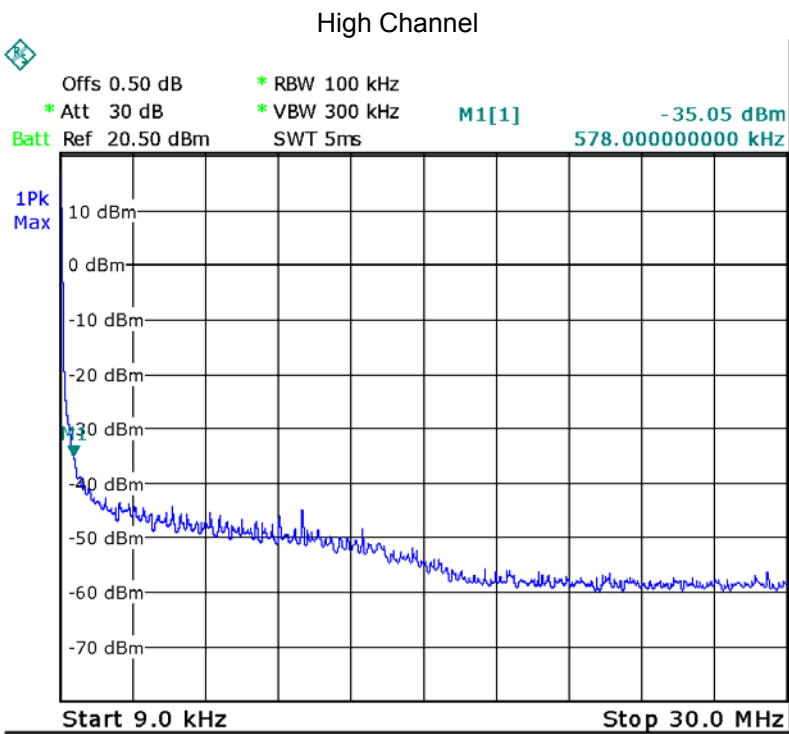
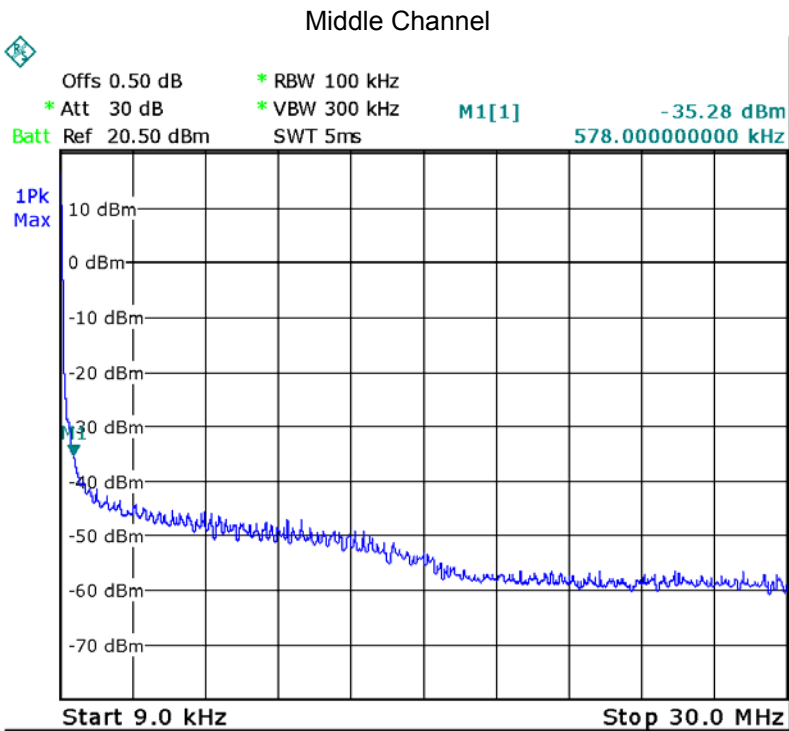
Middle Channel





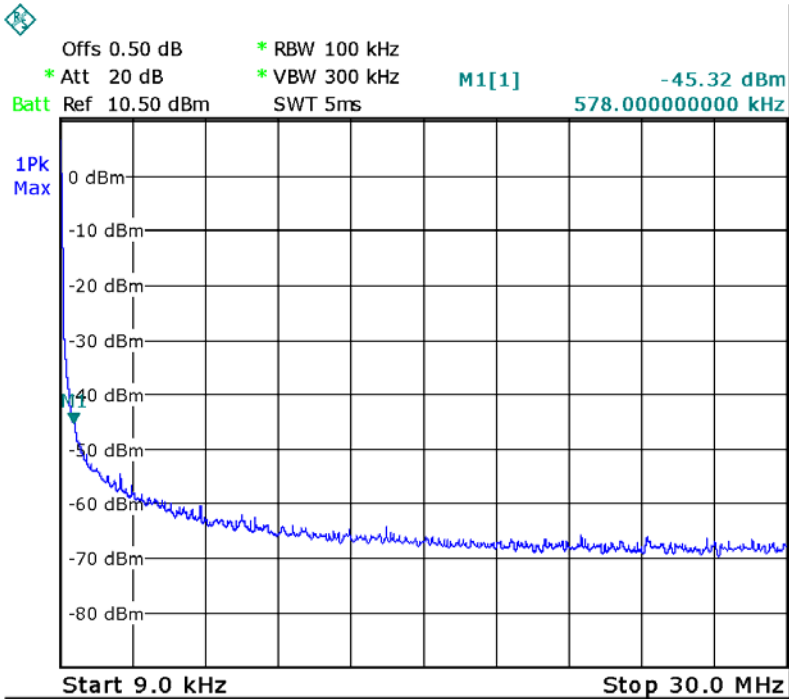
802.11n HT40



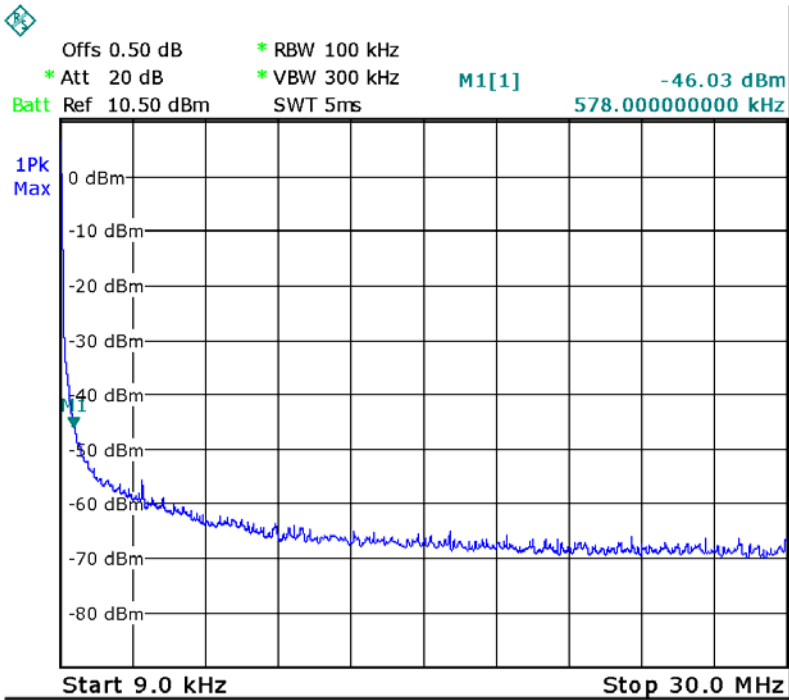


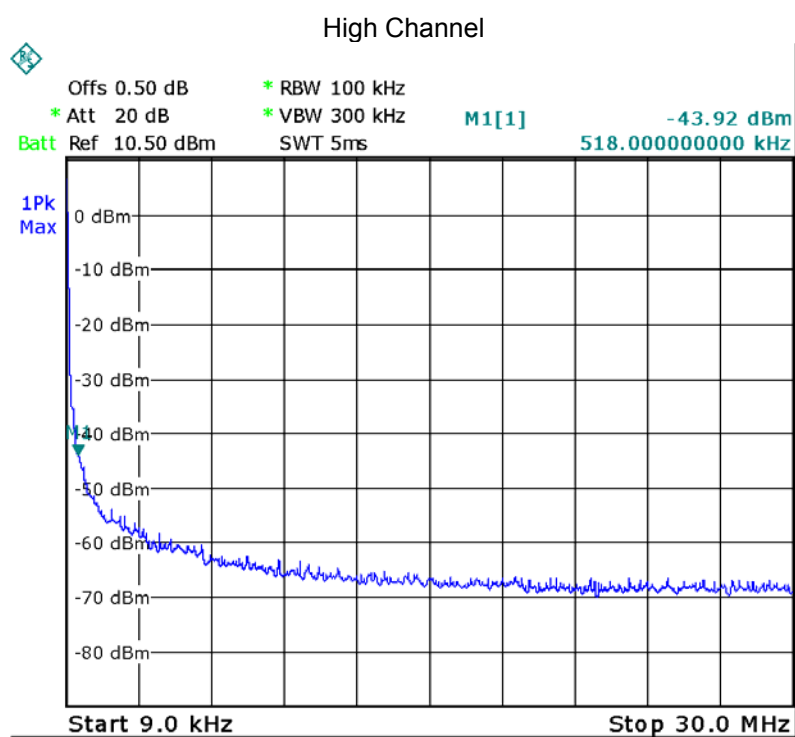
BLE

Low Channel



Middle Channel



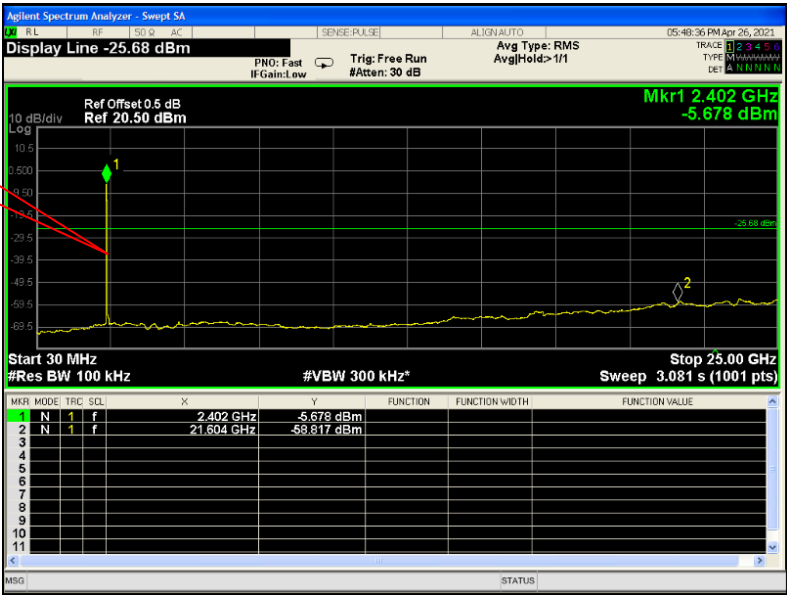


Above 30MHz

802.11b

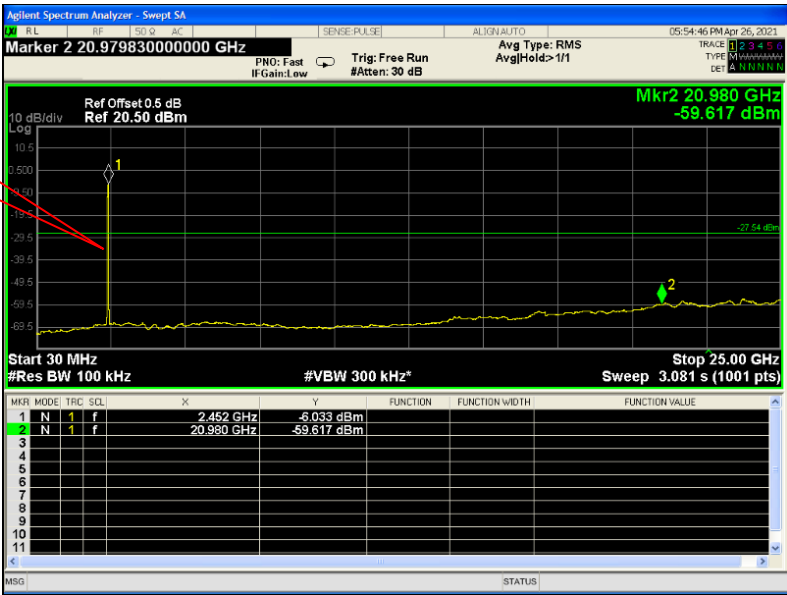
Low Channel

Fundamental



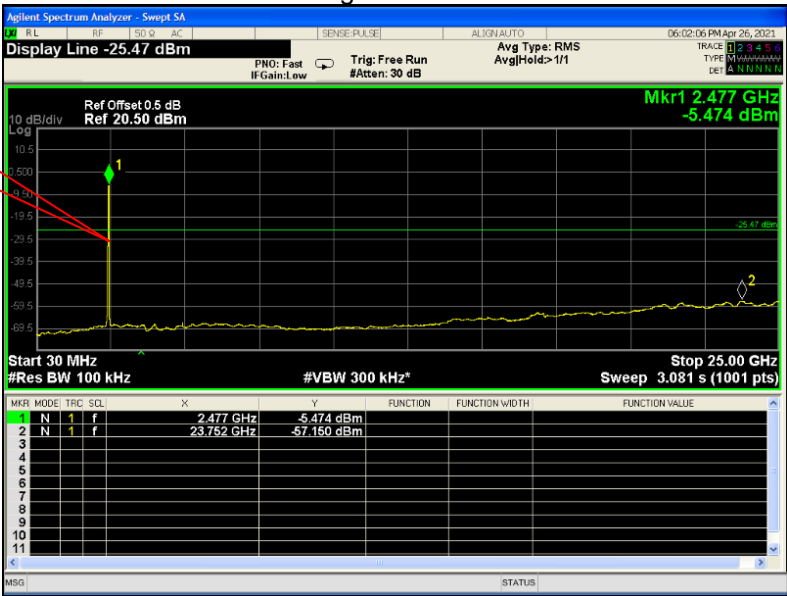
Middle Channel

Fundamental



High Channel

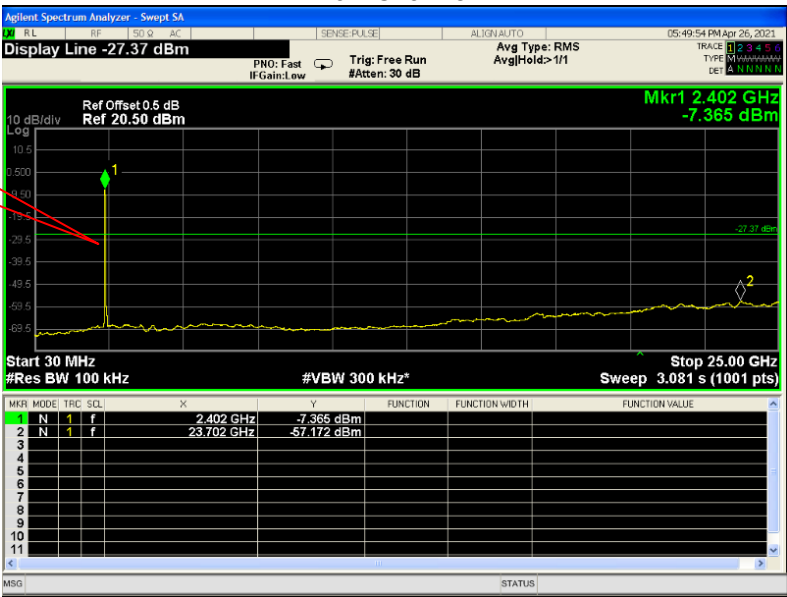
Fundamental



802.11g

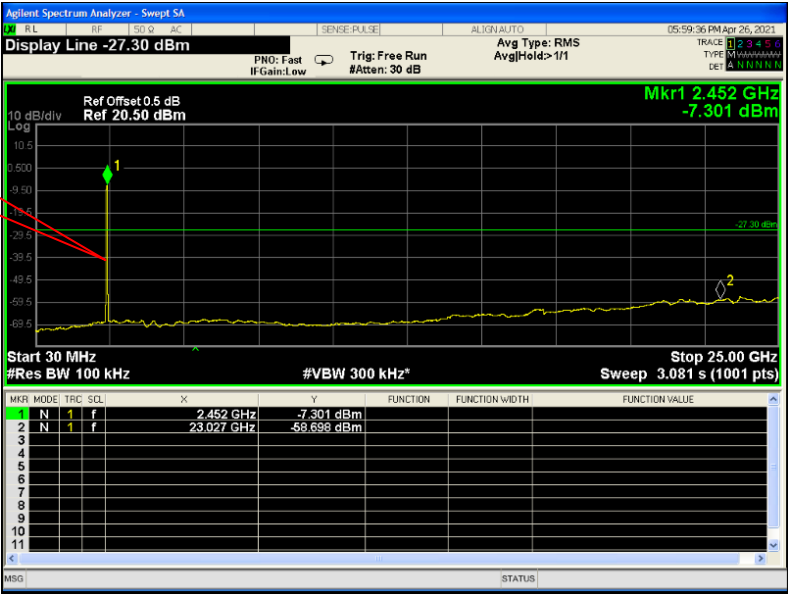
Low Channel

Fundamental



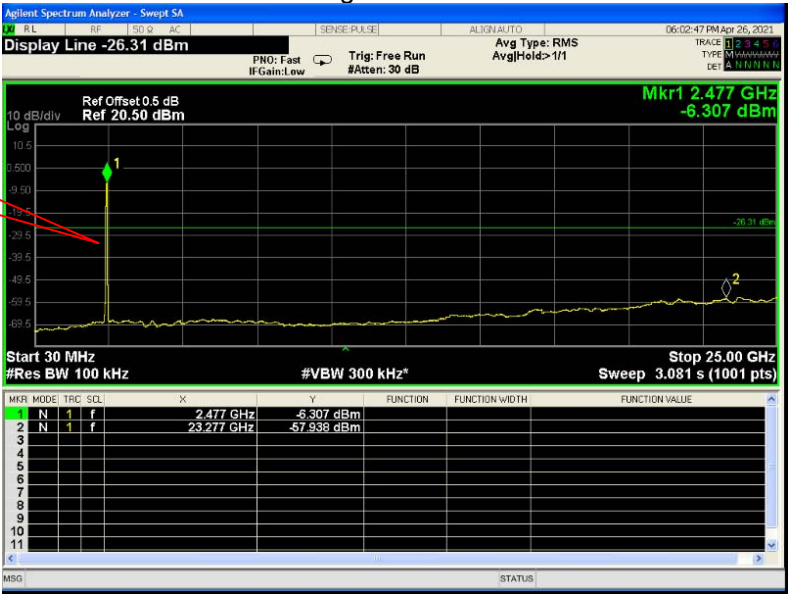
Middle Channel

Fundamental



High Channel

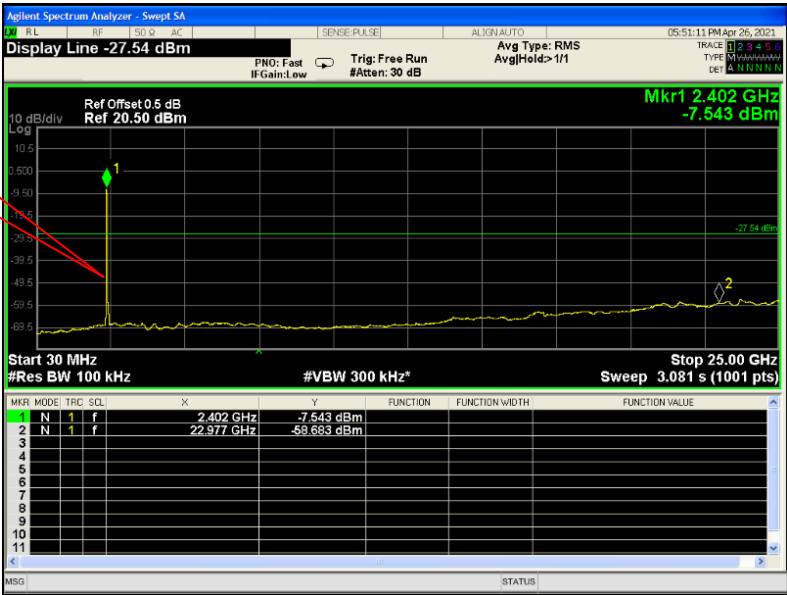
Fundamental



802.11n HT20

Low Channel

Fundamental



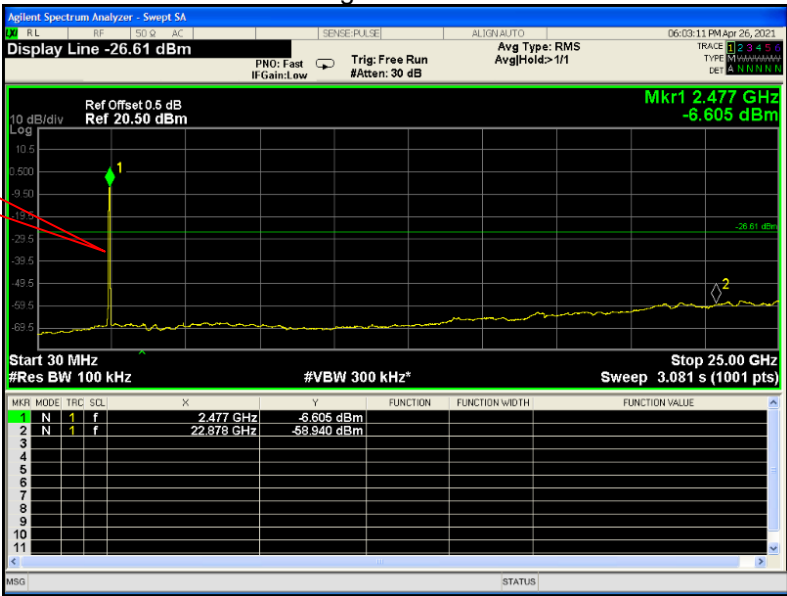
Middle Channel

Fundamental



High Channel

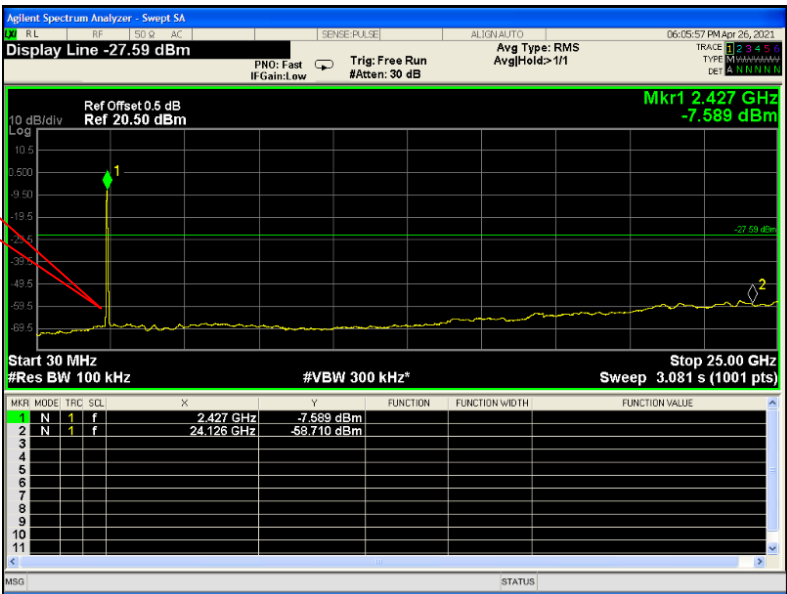
Fundamental



802.11n HT40

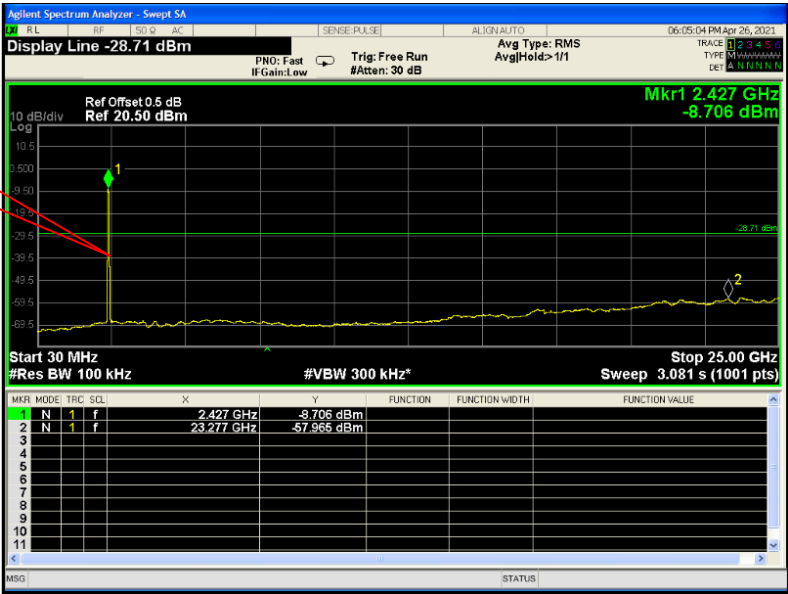
Low Channel

Fundamental



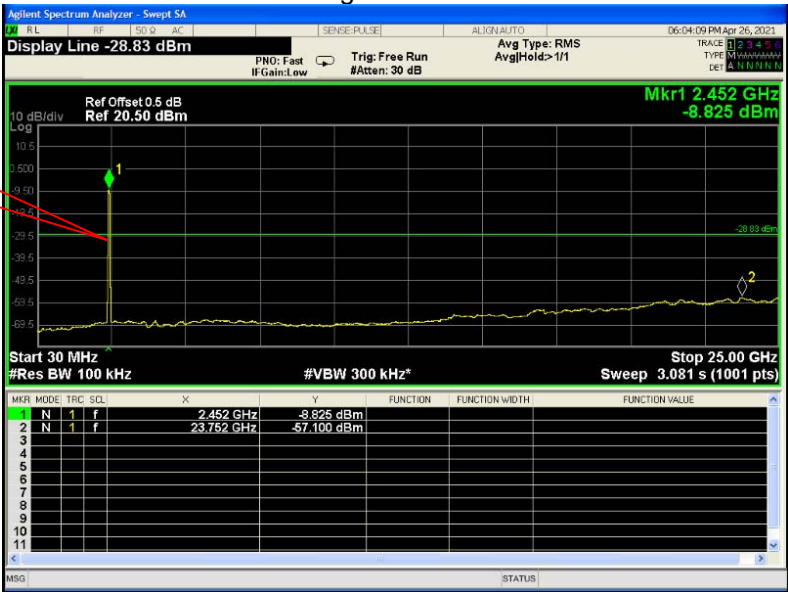
Middle Channel

Fundamental



High Channel

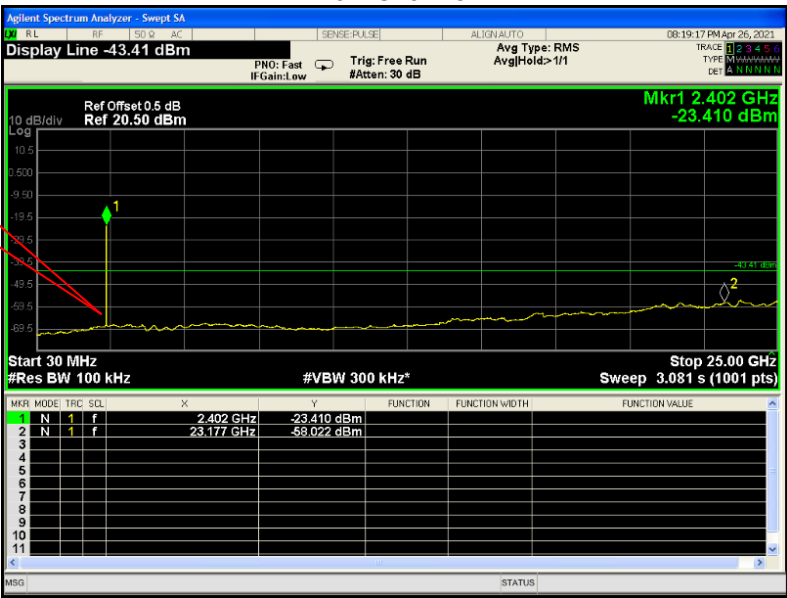
Fundamental



BLE

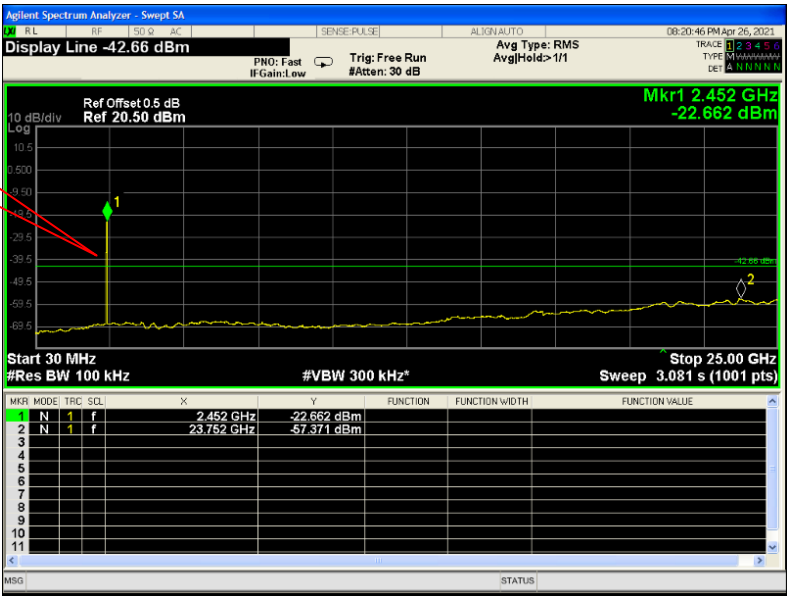
Low Channel

Fundamental



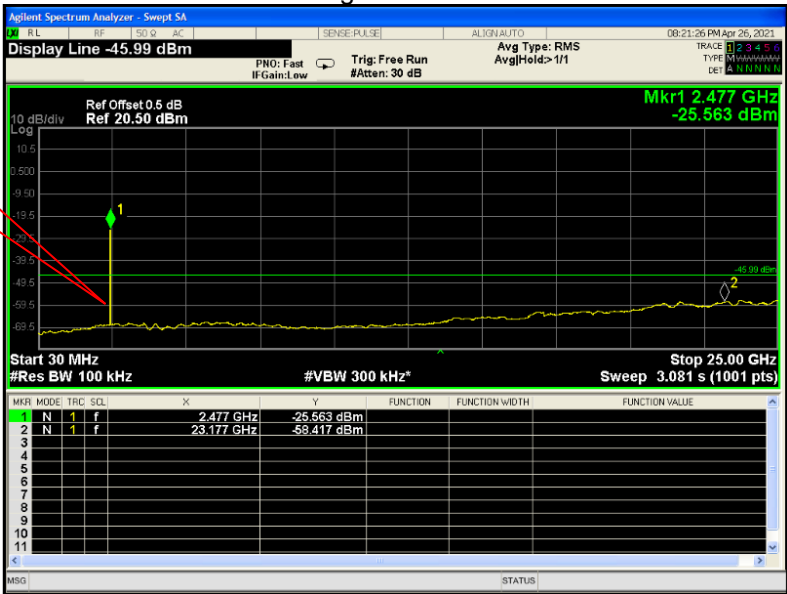
Middle Channel

Fundamental



High Channel

Fundamental



9 Band Edge Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

Test Limit: Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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 §15.205(c)).

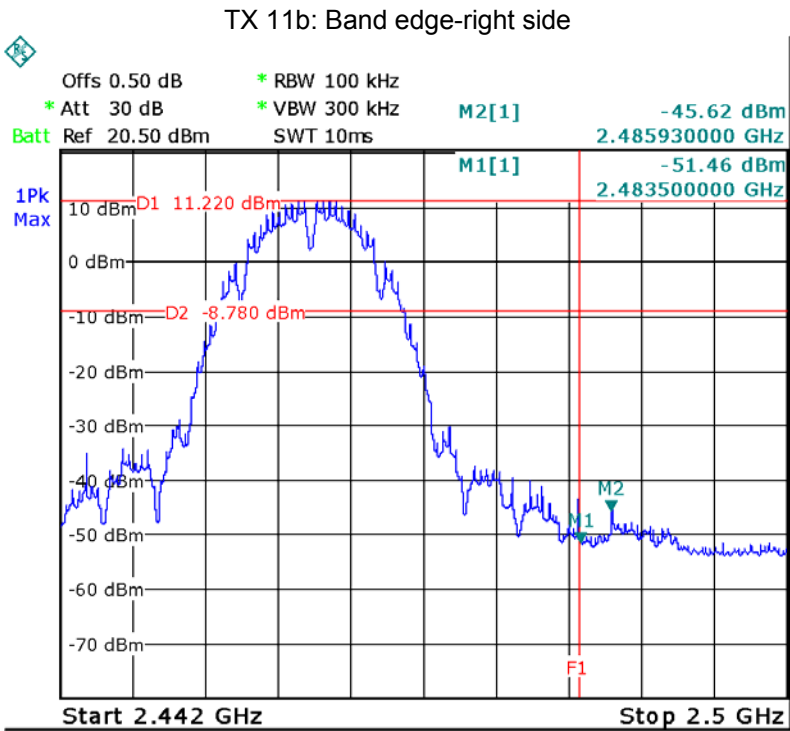
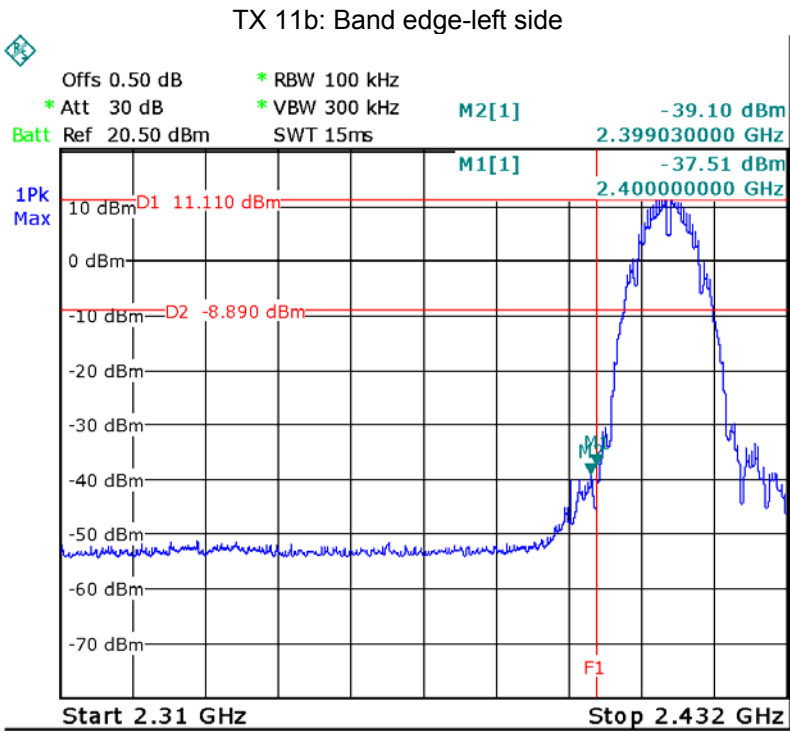
Test Mode: Transmitting

9.1 Test Produce

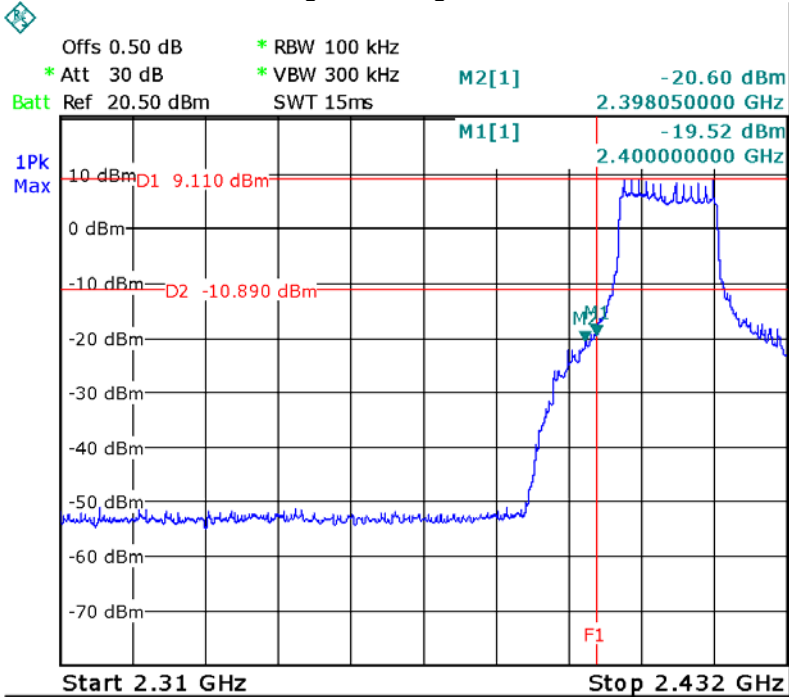
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.2 Test Result

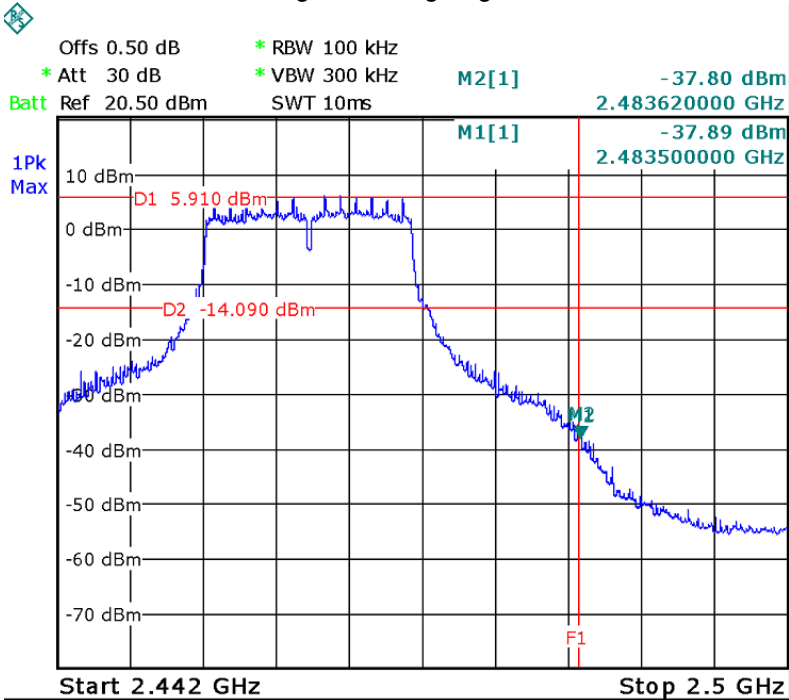
Test result plots shown as follows:

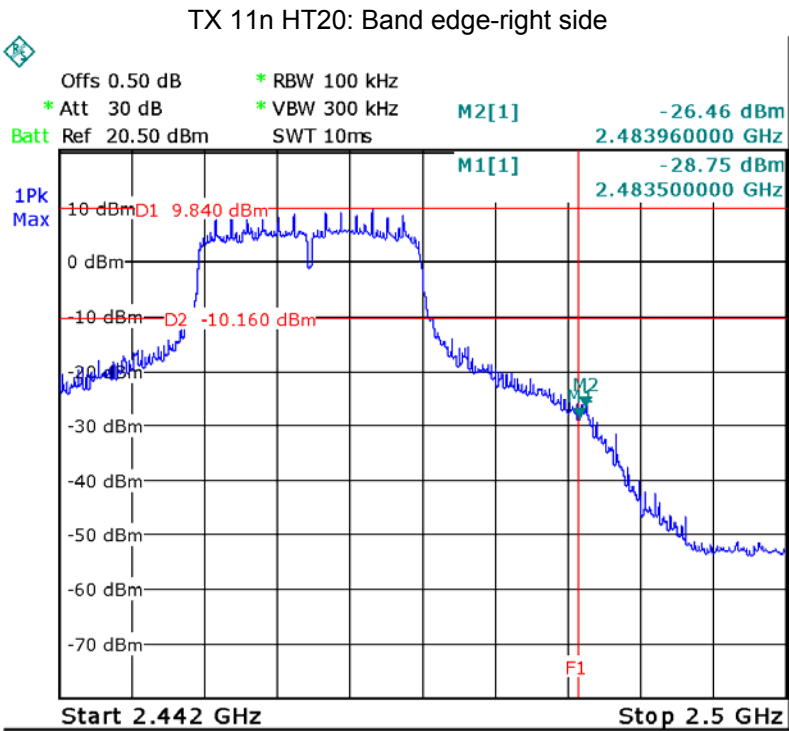
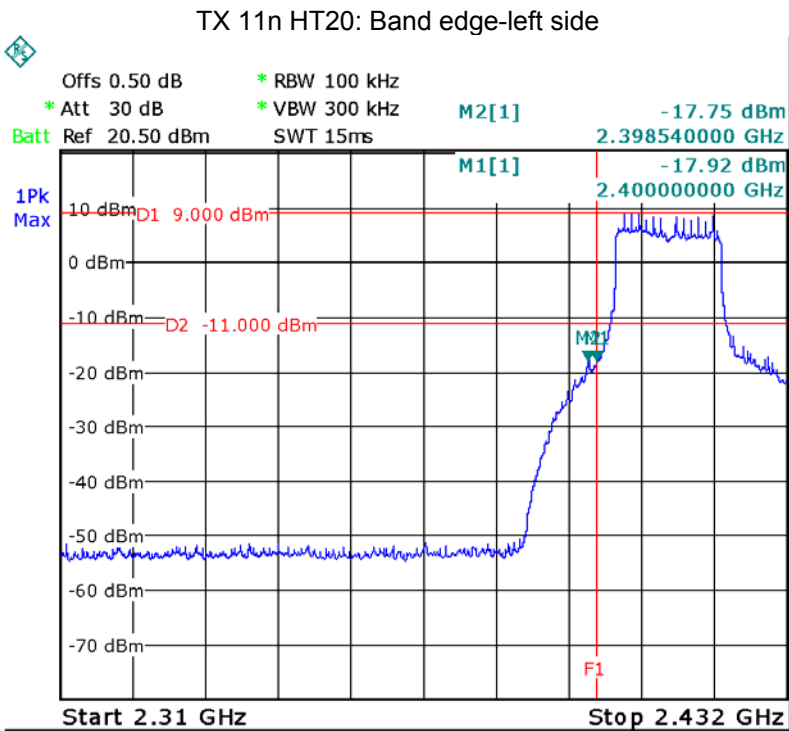


TX 11g: Band edge-left side

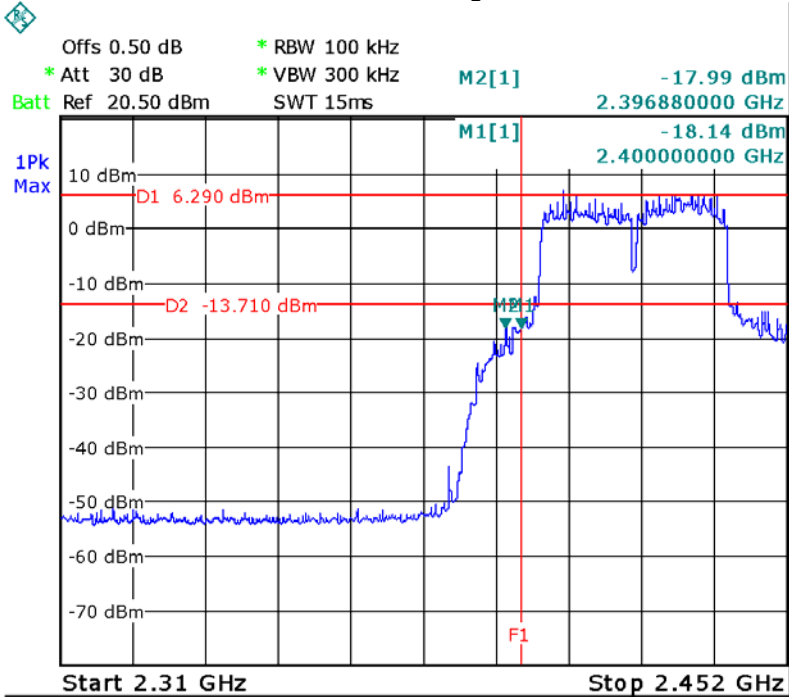


TX 11g: Band edge-right side

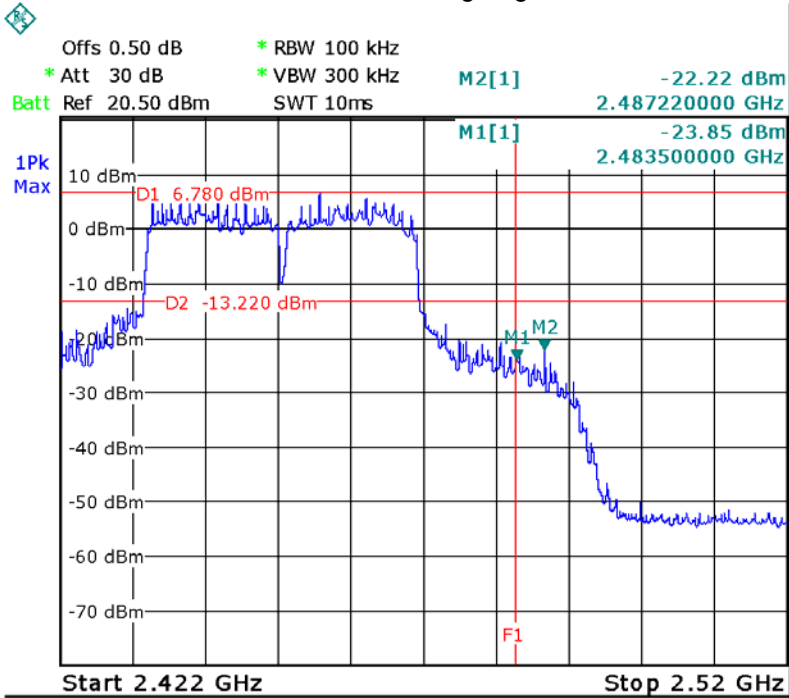


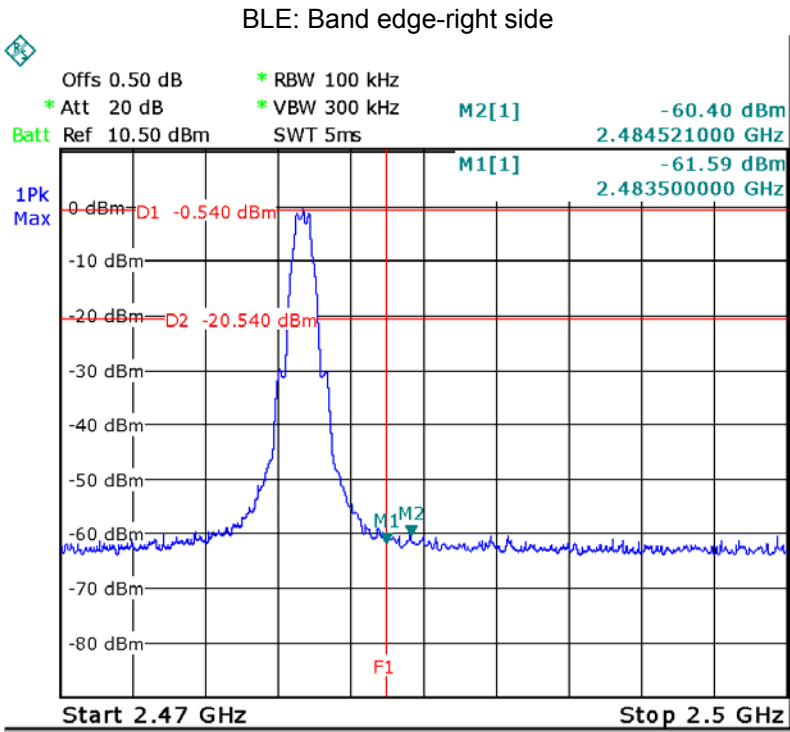
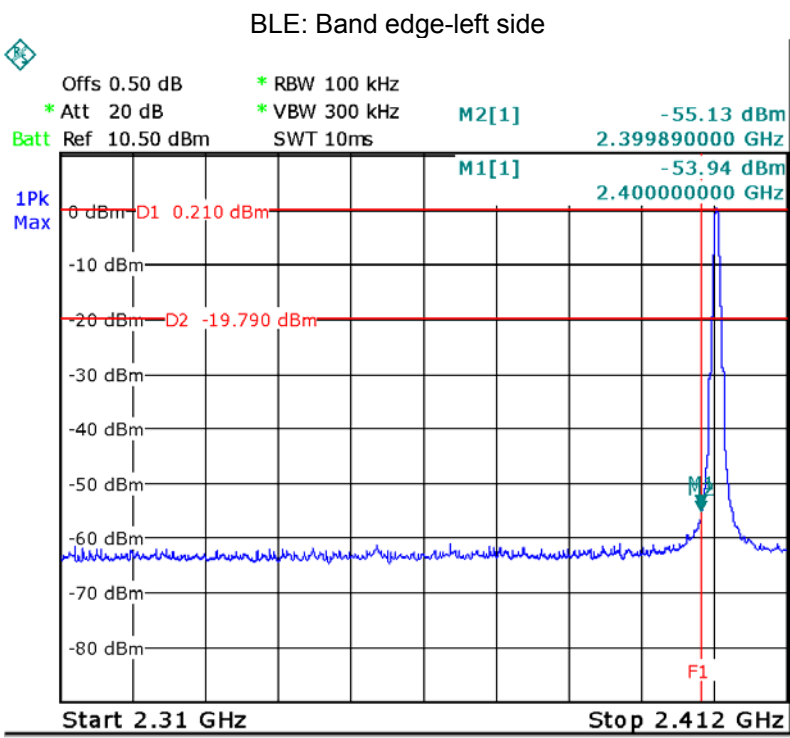


TX 11n HT40: Band edge-left side



TX 11n HT40: Band edge-right side





10 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019.;
ANSI C63.10:2013

Limit: Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

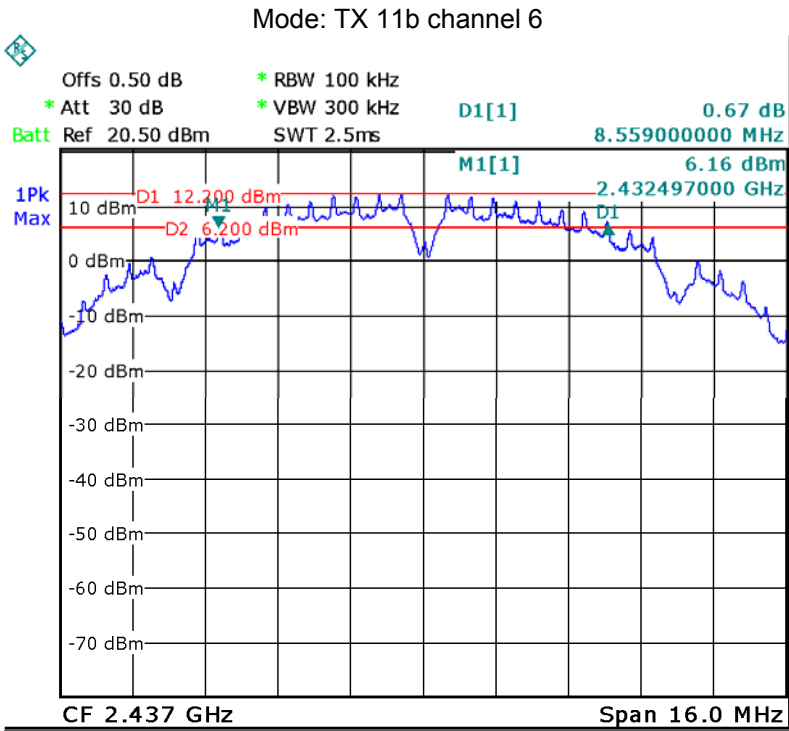
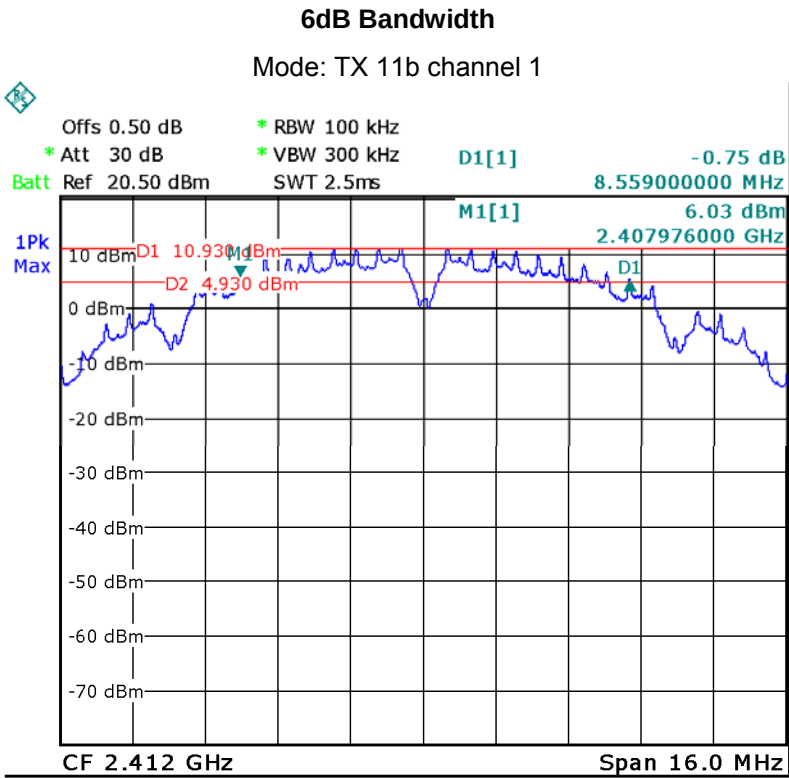
10.1 Test Procedure:

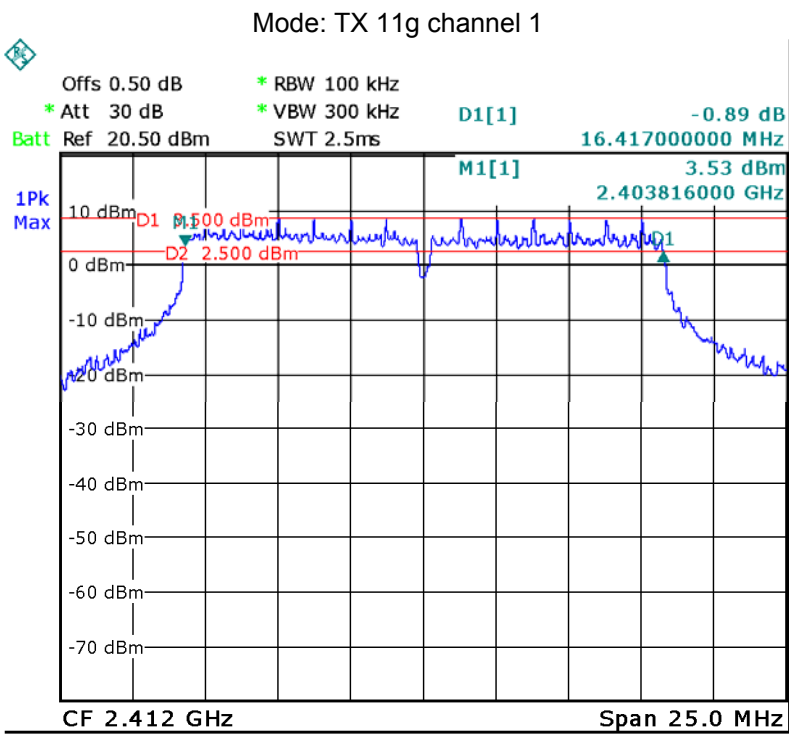
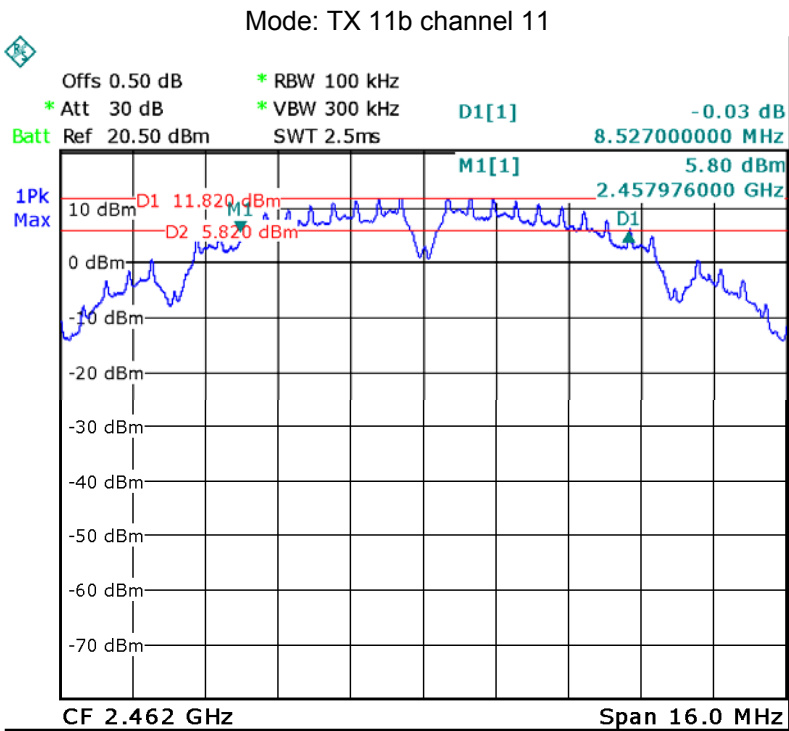
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

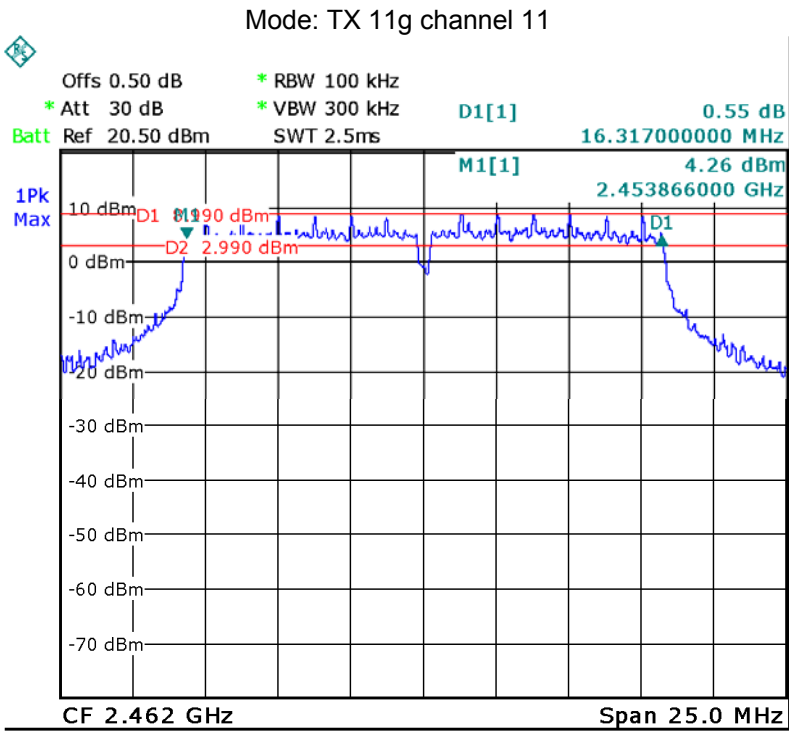
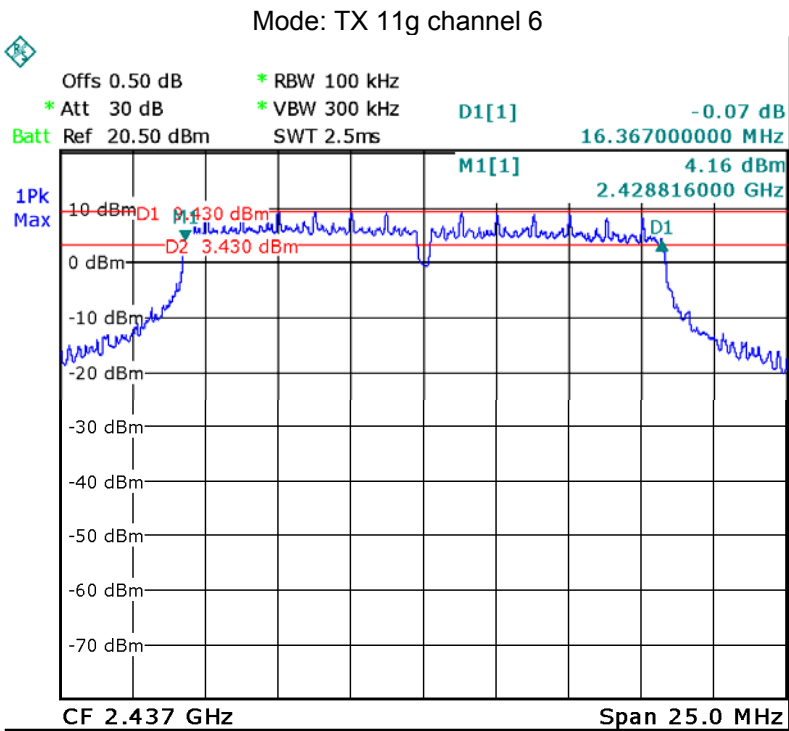
10.2 Test Result:

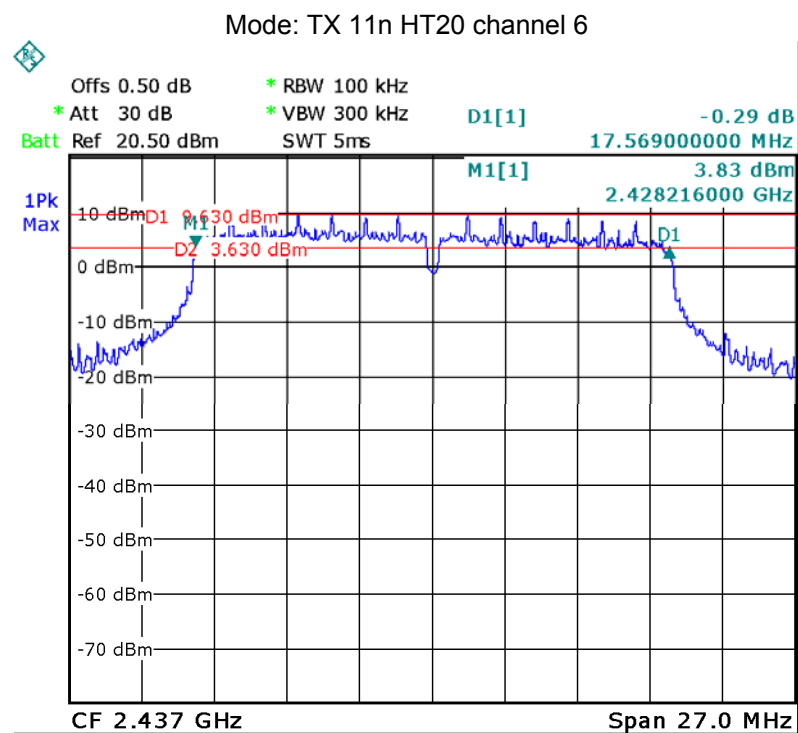
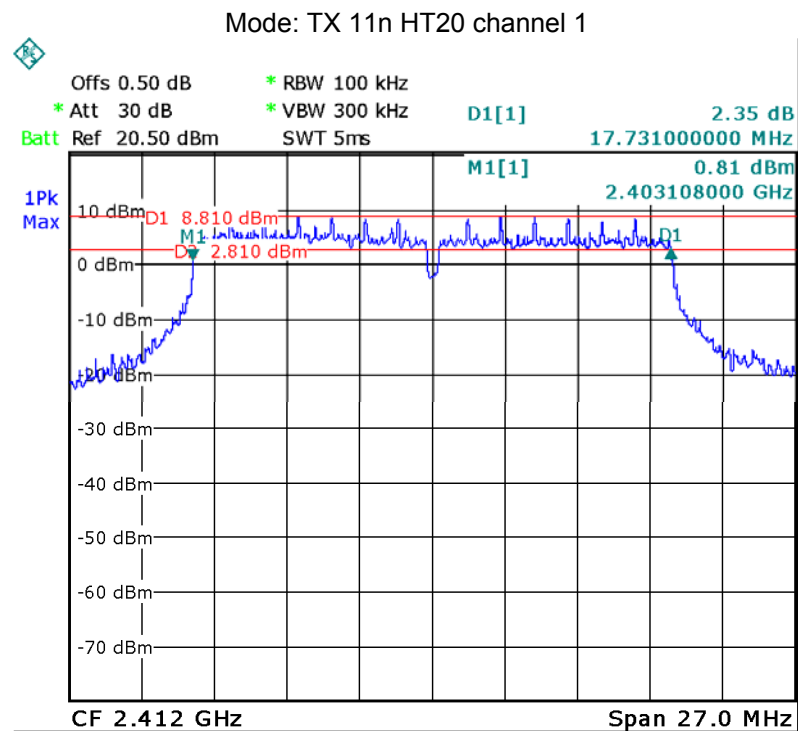
Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	8.559	13.16
	Channel 6	8.559	12.97
	Channel 11	8.527	12.97
TX 11g	Channel 1	16.42	16.57
	Channel 6	16.37	16.62
	Channel 11	16.32	16.57
TX 11n HT20	Channel 1	17.73	17.78
	Channel 6	17.57	17.78
	Channel 11	17.62	17.73
TX 11n HT40	Channel 3	36.12	36.01
	Channel 6	35.68	35.79
	Channel 9	36.01	36.23
BLE	Channel 0	0.683	1.060
	Channel 19	0.683	1.060
	Channel 39	0.683	1.066

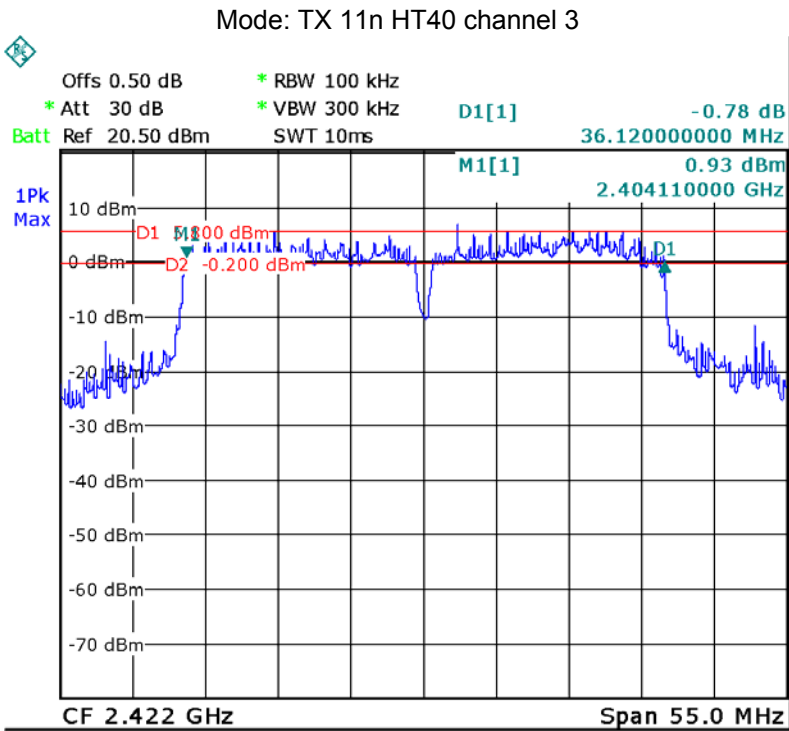
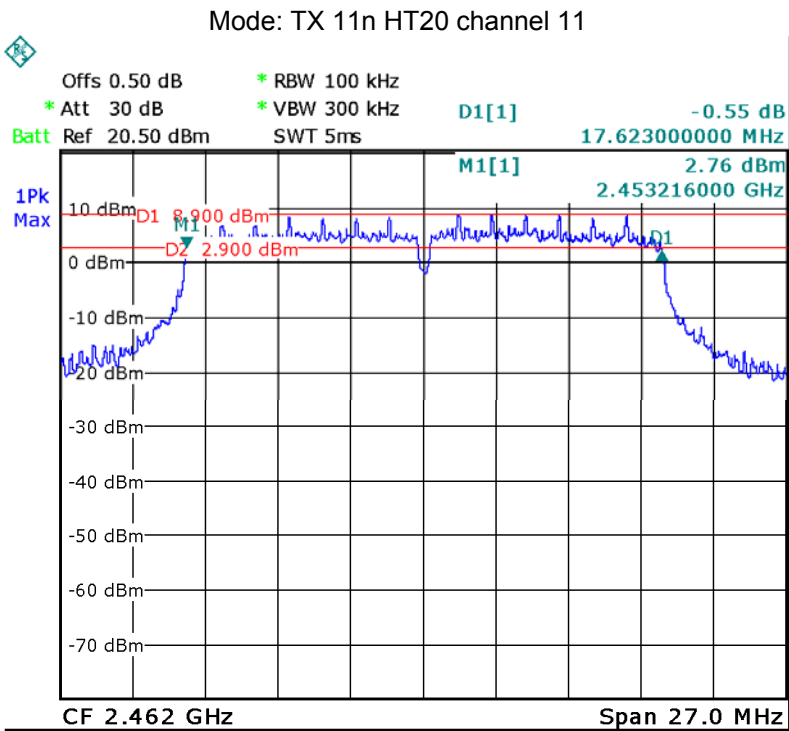
Test result plot:

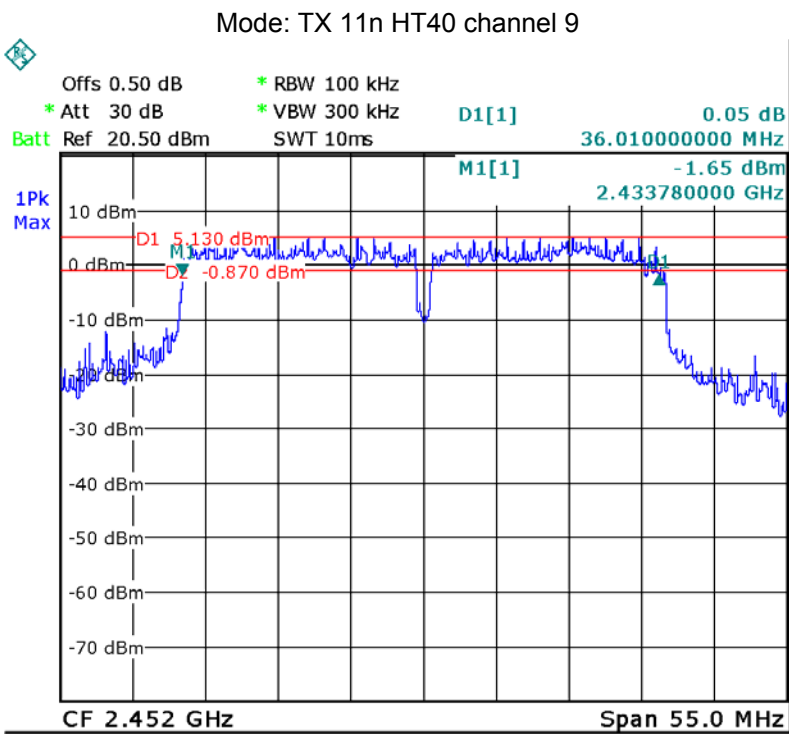
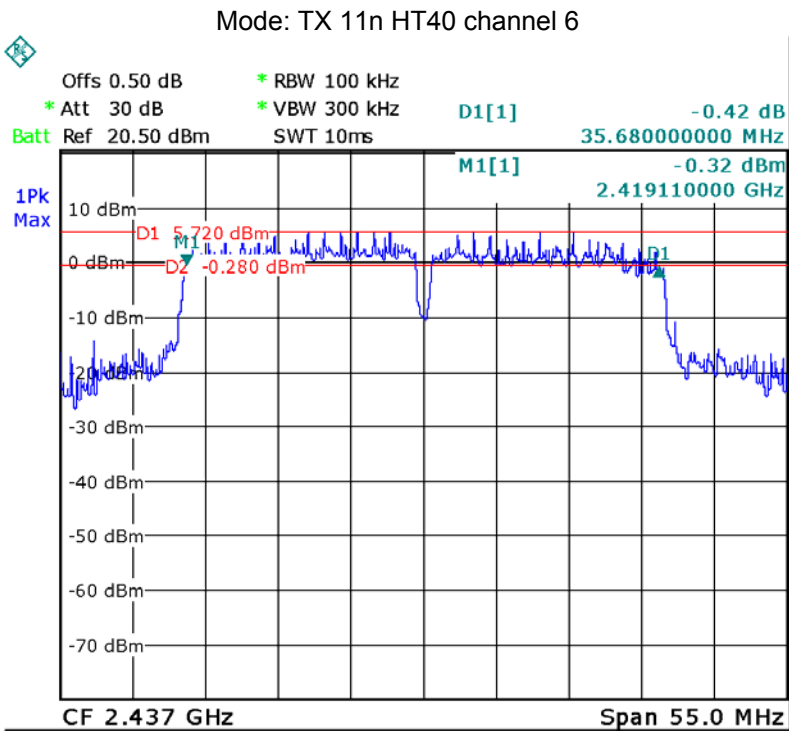


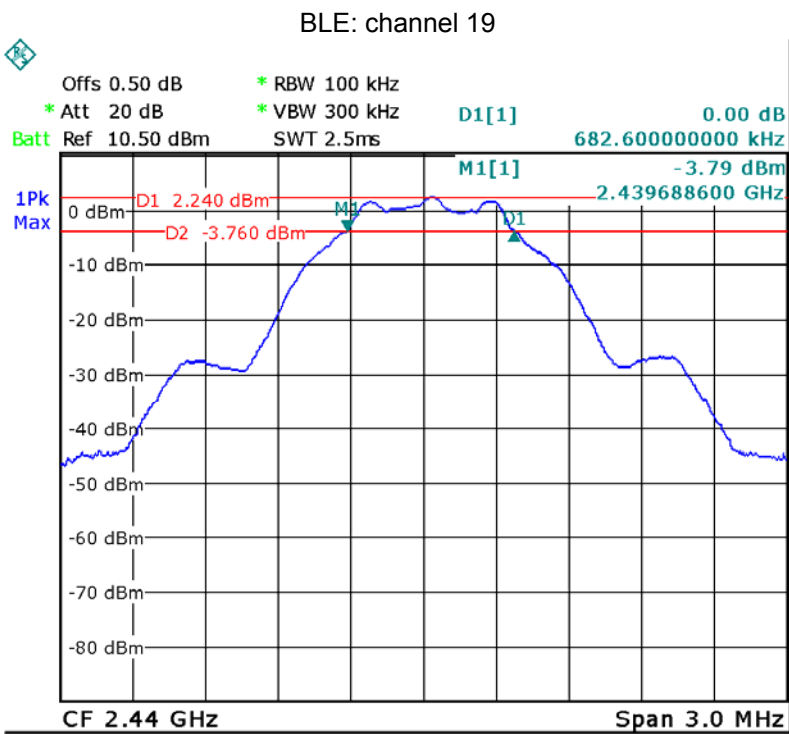
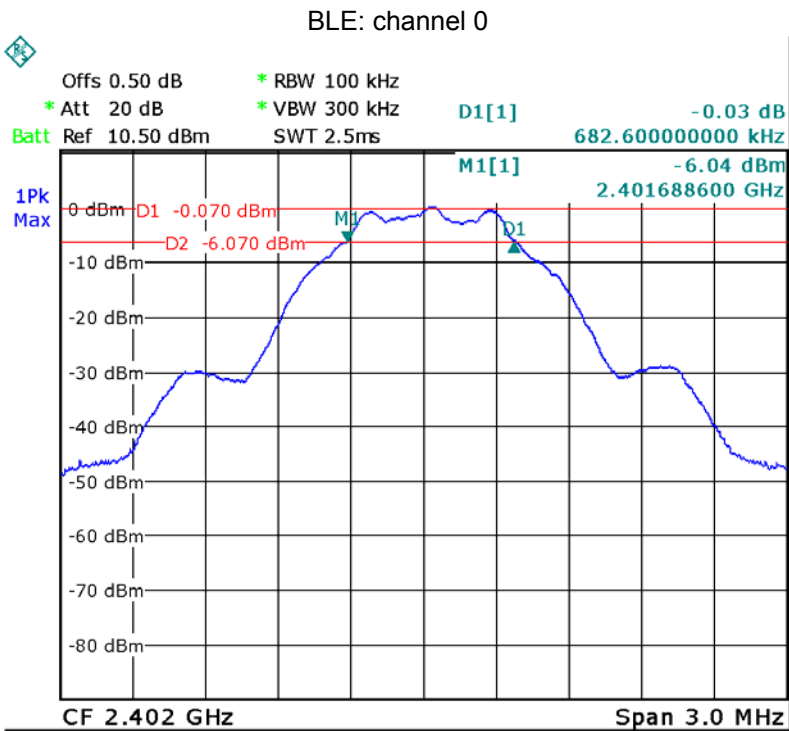


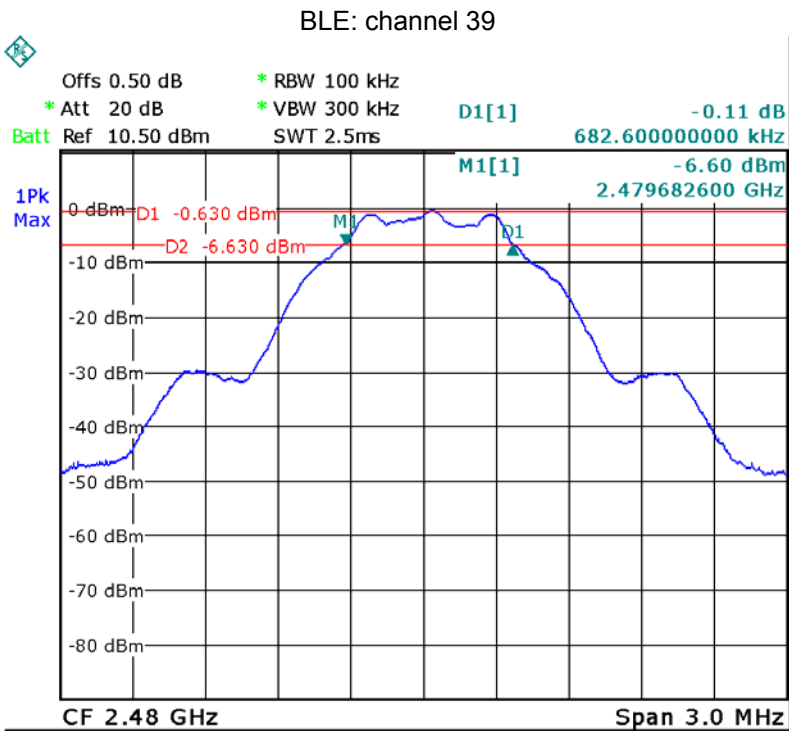






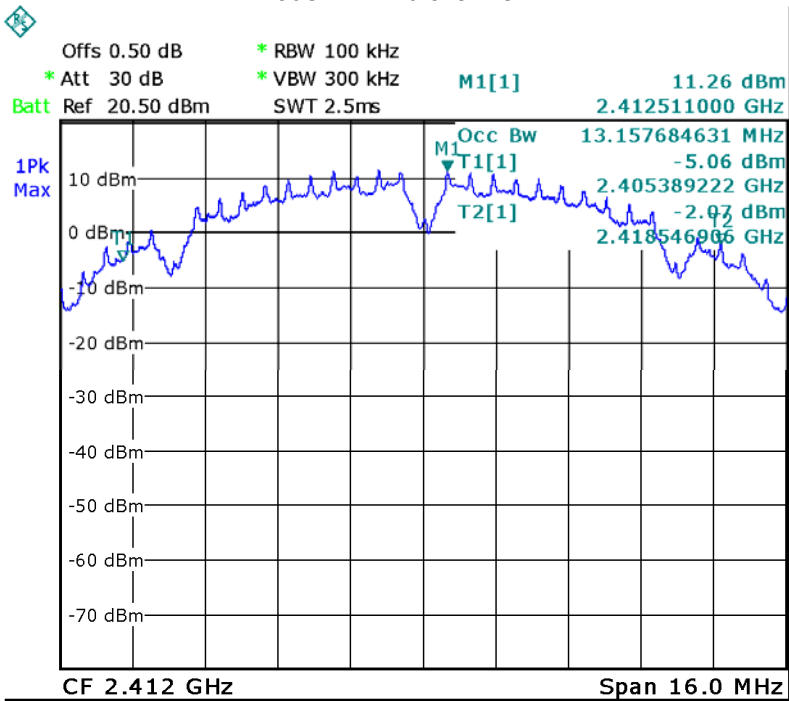




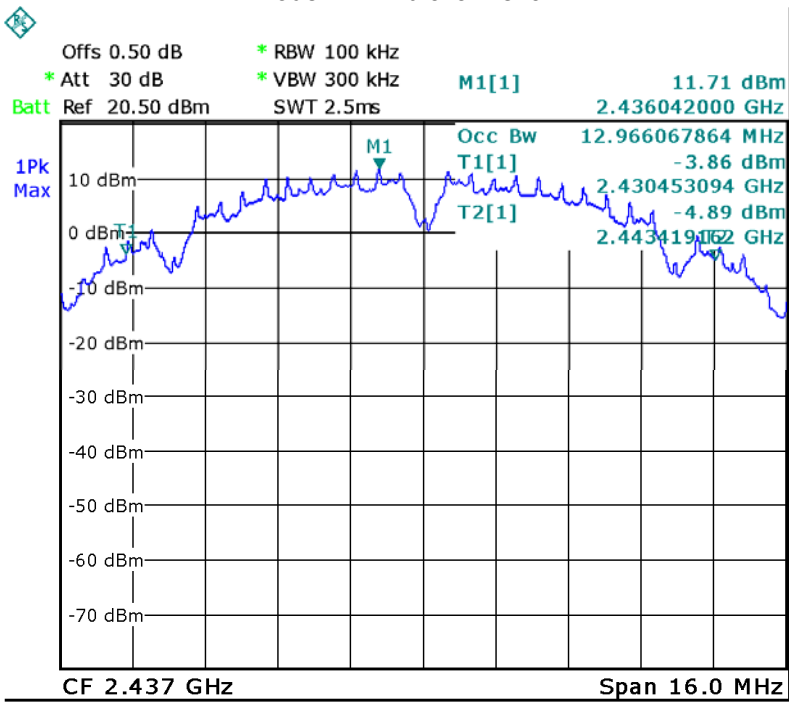


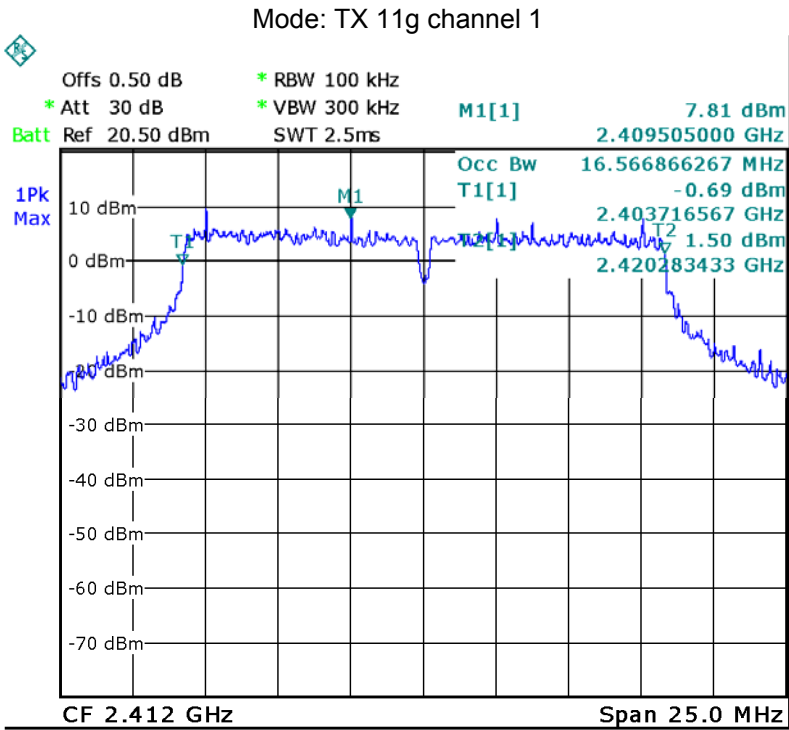
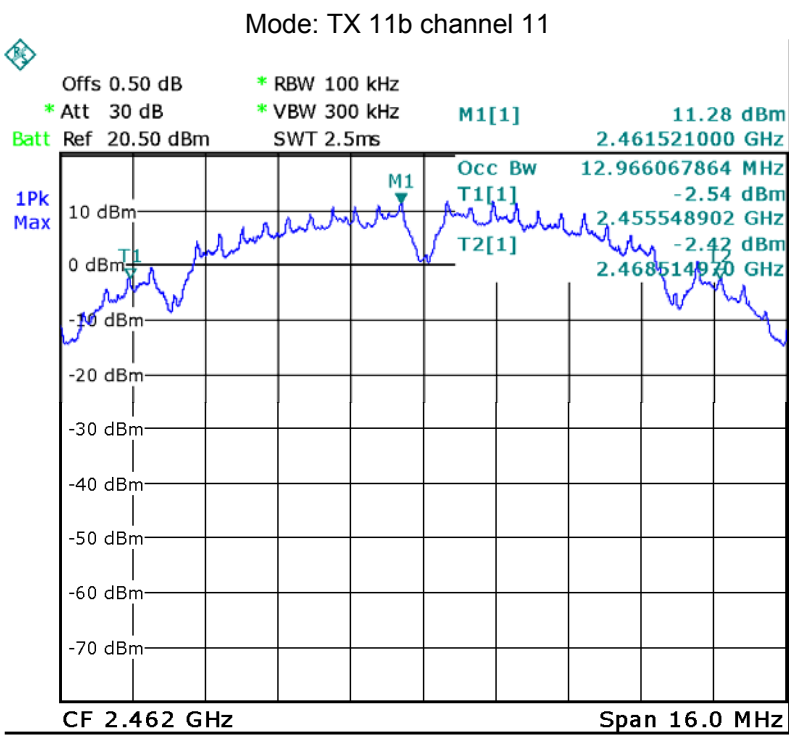
99% Bandwidth

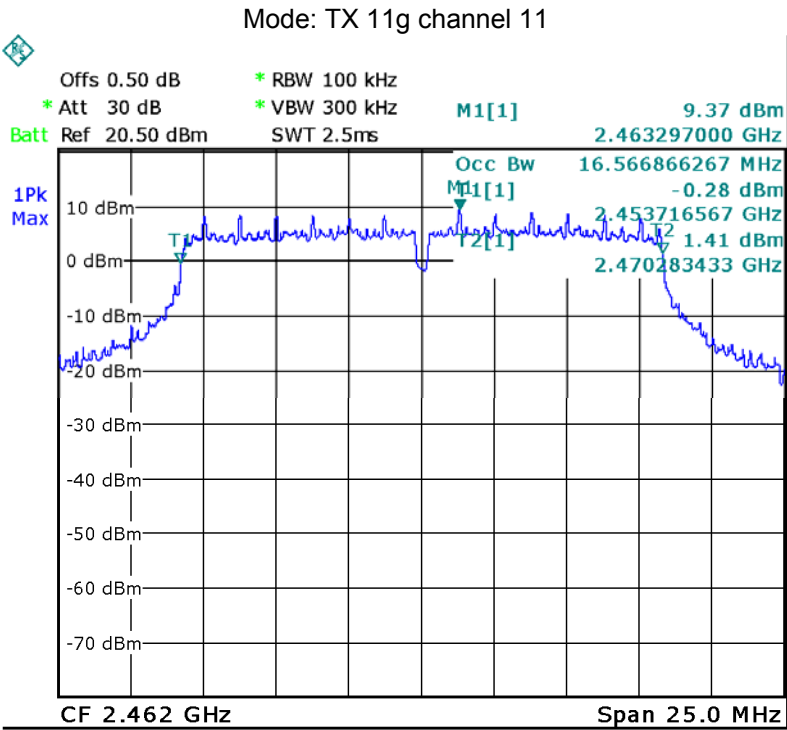
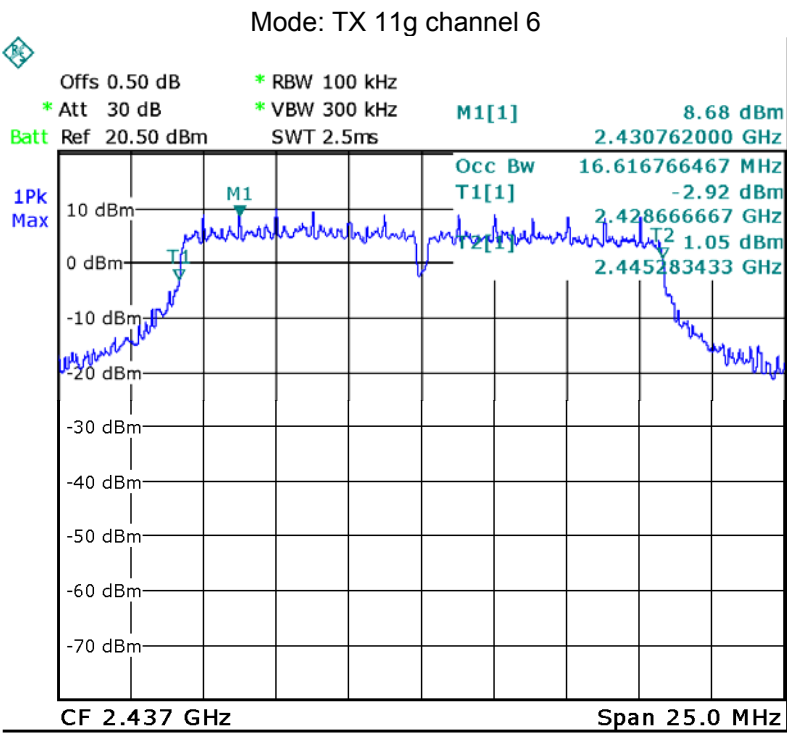
Mode: TX 11b channel 1

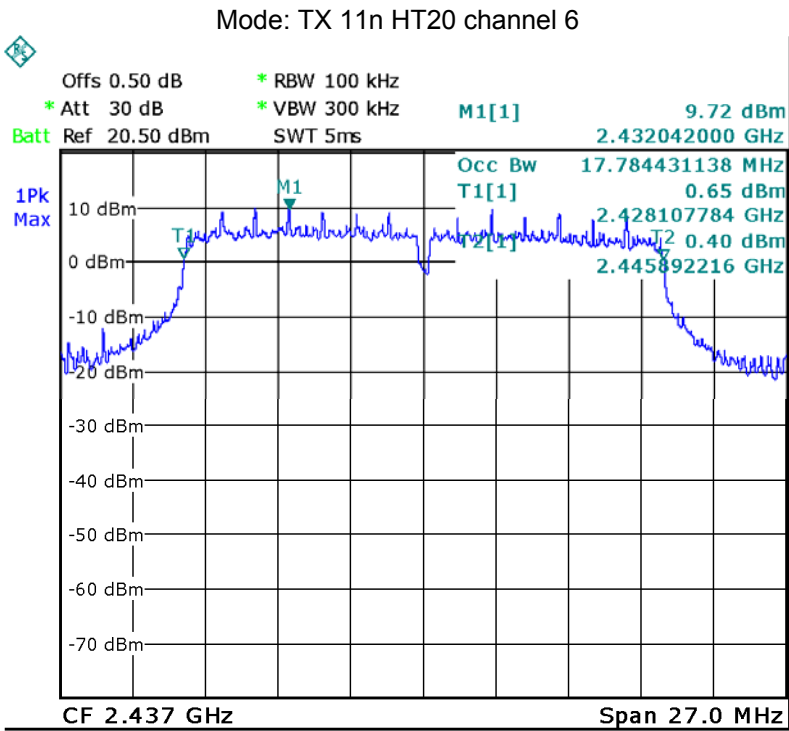
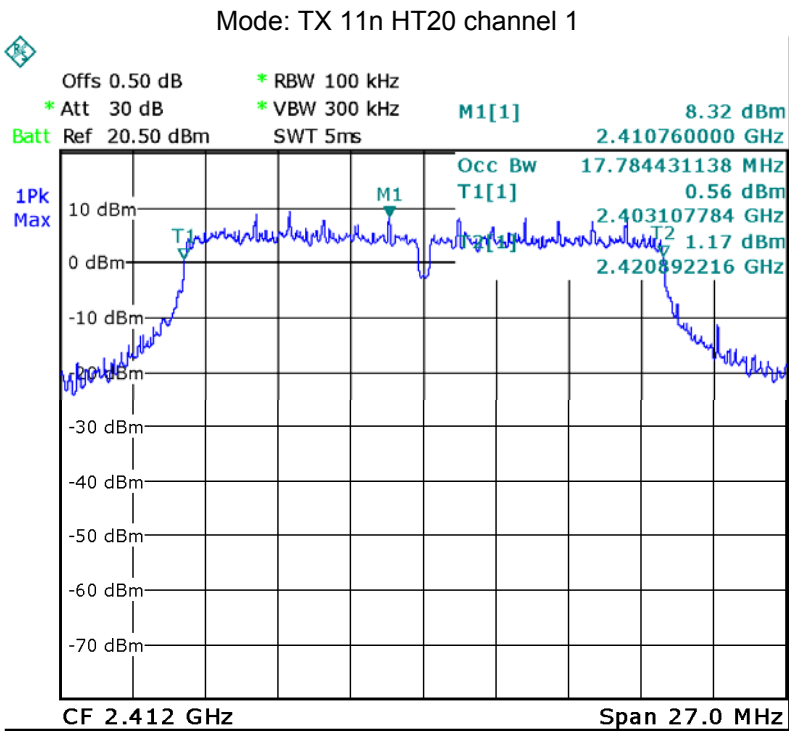


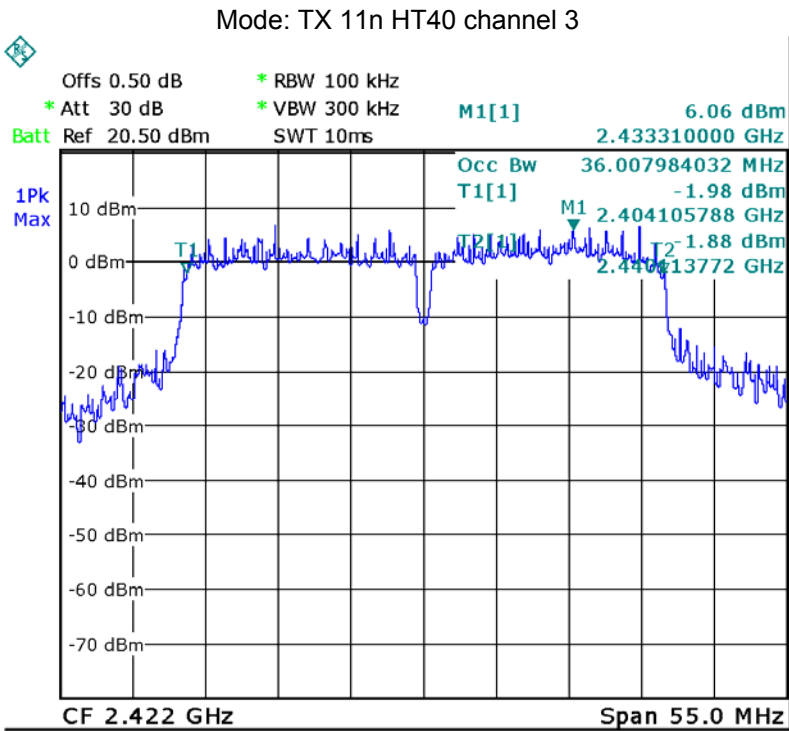
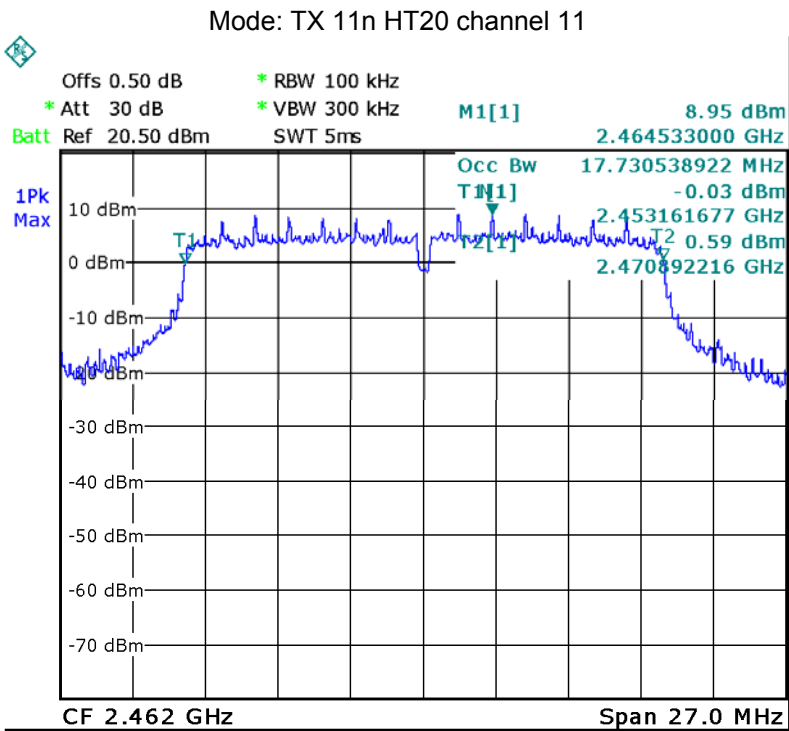
Mode: TX 11b channel 6

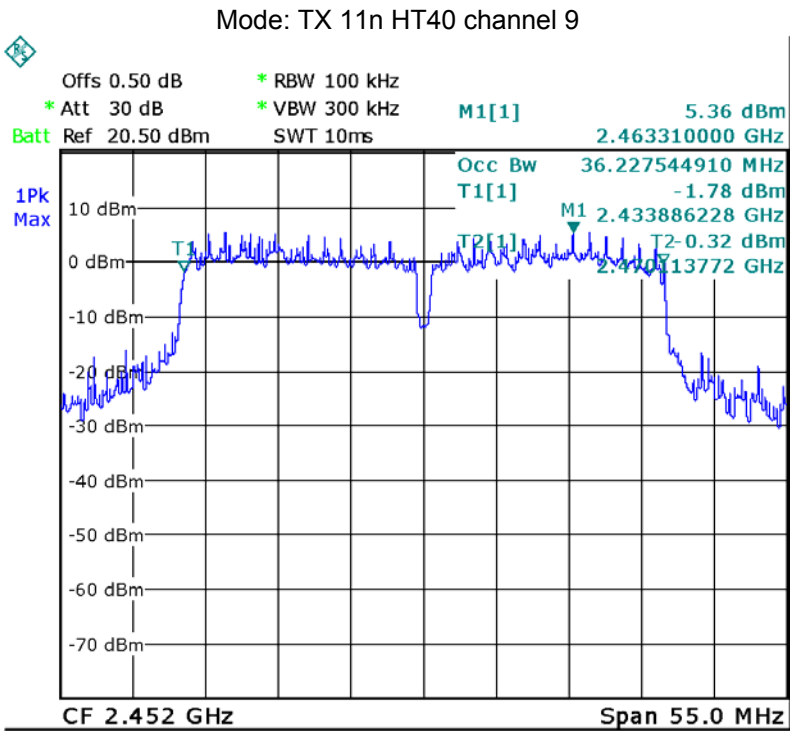
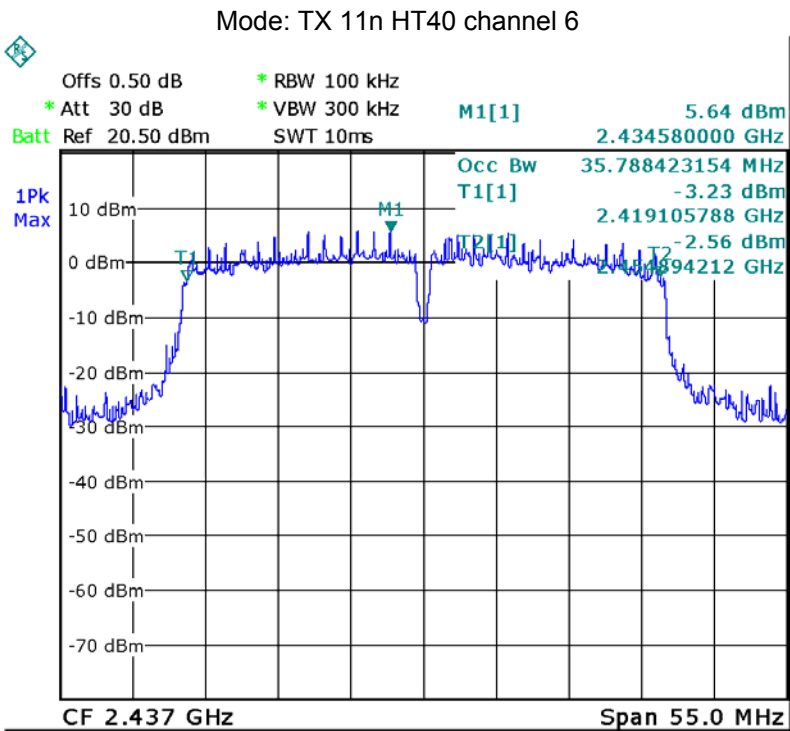


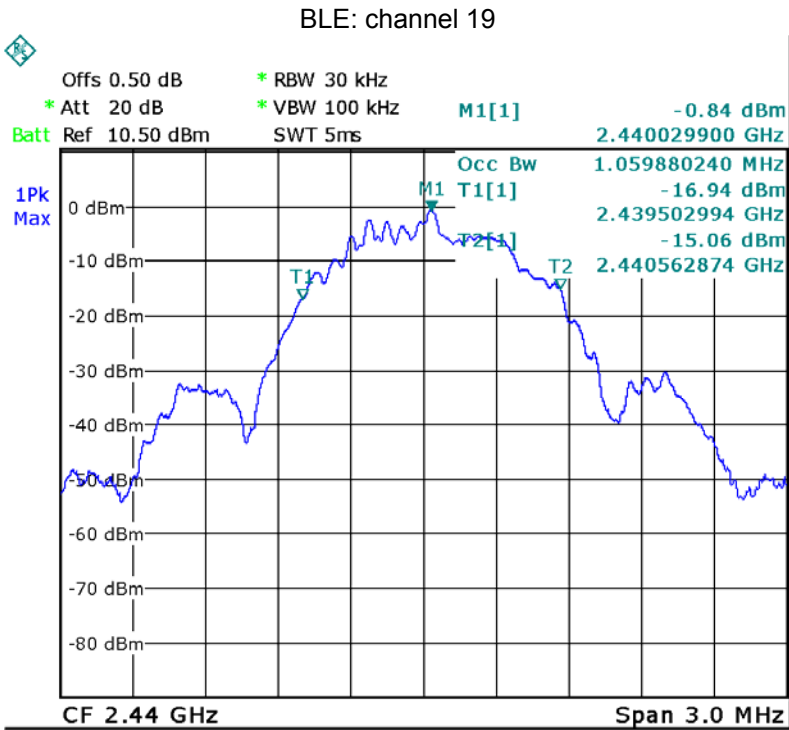
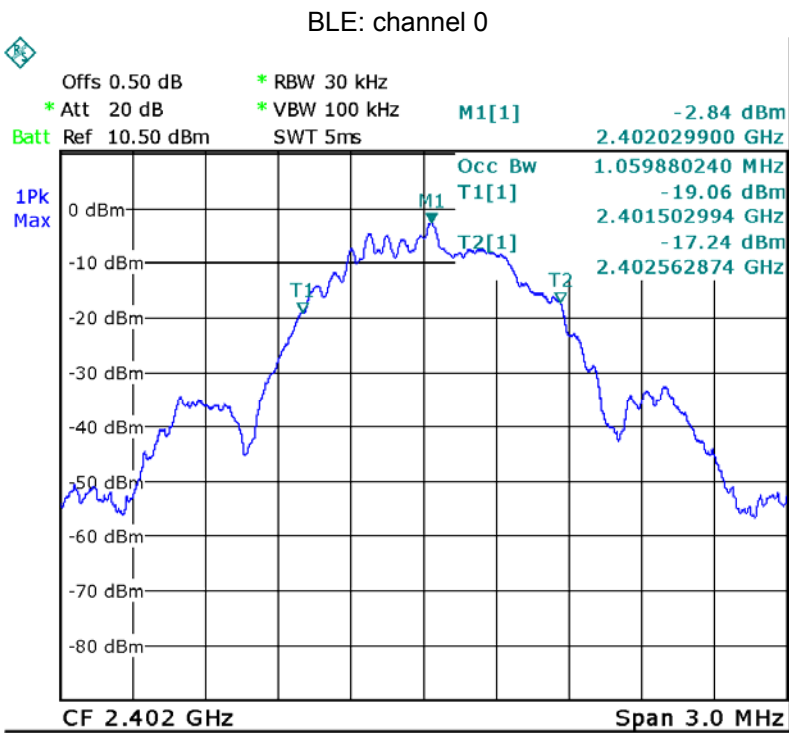


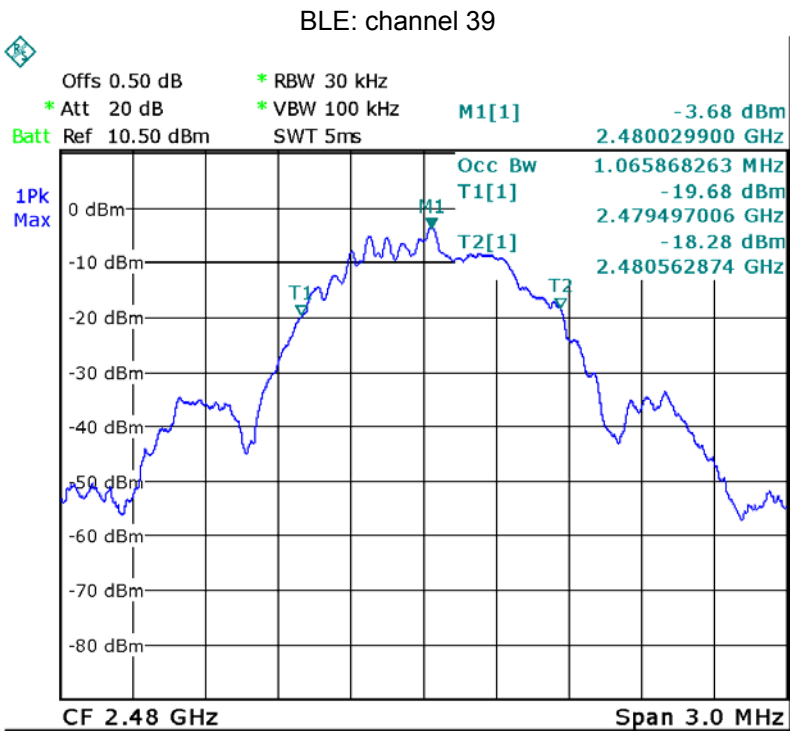












11 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

11.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018

section 8.3.1.1 (For BLE)

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the $RBW \geq DTS$ bandwidth.
- b) Set $VBW \geq 3 \times RBW$.
- c) Set span $\geq 3 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

section 8.3.1.2 (For WIFI)

This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.

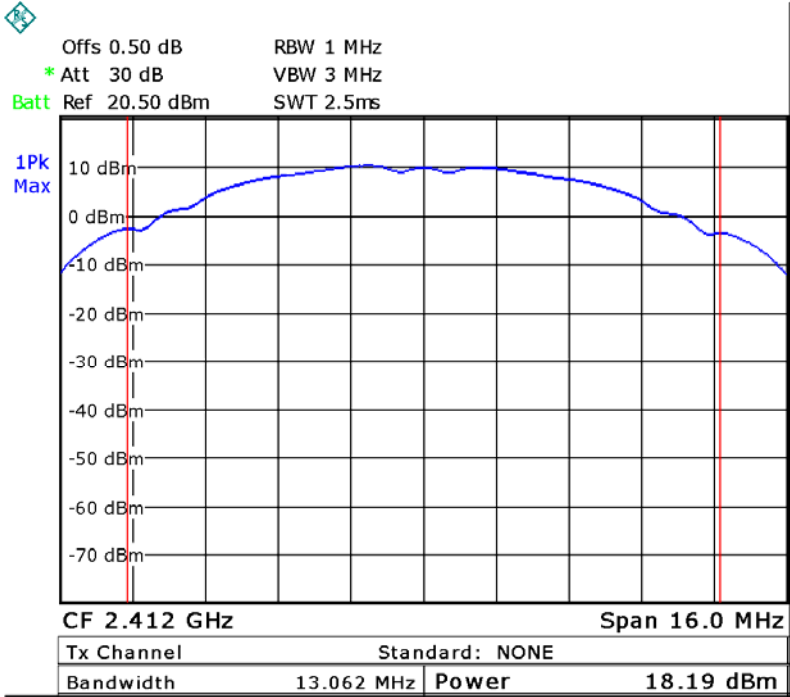
- a) Set the $RBW = 1\%$ to 5% of the OBW, not to exceed 1 MHz..
- b) Set the $VBW \geq 3 \times RBW$
- c) Set the span $\geq 1.5 \times OBW$.
- d) Detector = RMS.
- e) Sweep time = auto couple.
- f) trigger = free run..
- g) Number of points in sweep $\geq [2 \times \text{span} / RBW]$. (This gives bin-to-bin spacing $\geq RBW / 2$, so that narrowband signals are not lost between frequency bins.)
- h) Trace average at least 100 traces in power averaging (rms) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum..

11.2 Test Result:

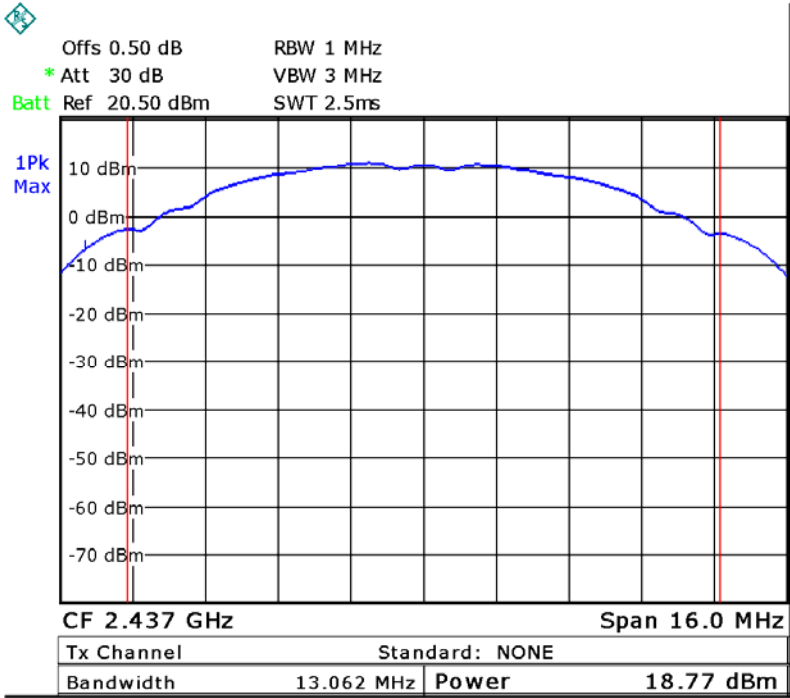
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	18.19	1W/30dBm
	Middle-2437	18.77	1W/30dBm
	High-2462	18.34	1W/30dBm
TX 11g	Low-2412	19.56	1W/30dBm
	Middle-2437	20.64	1W/30dBm
	High-2462	19.84	1W/30dBm
TX 11n HT20	Low-2412	20.01	1W/30dBm
	Middle-2437	20.81	1W/30dBm
	High-2462	20.03	1W/30dBm
TX 11n HT40	Low-2422	20.88	1W/30dBm
	Middle-2437	20.84	1W/30dBm
	High-2452	20.31	1W/30dBm
BLE	Low-2402	0.19	1W/30dBm
	Middle-2440	2.46	1W/30dBm
	High-2480	-0.11	1W/30dBm

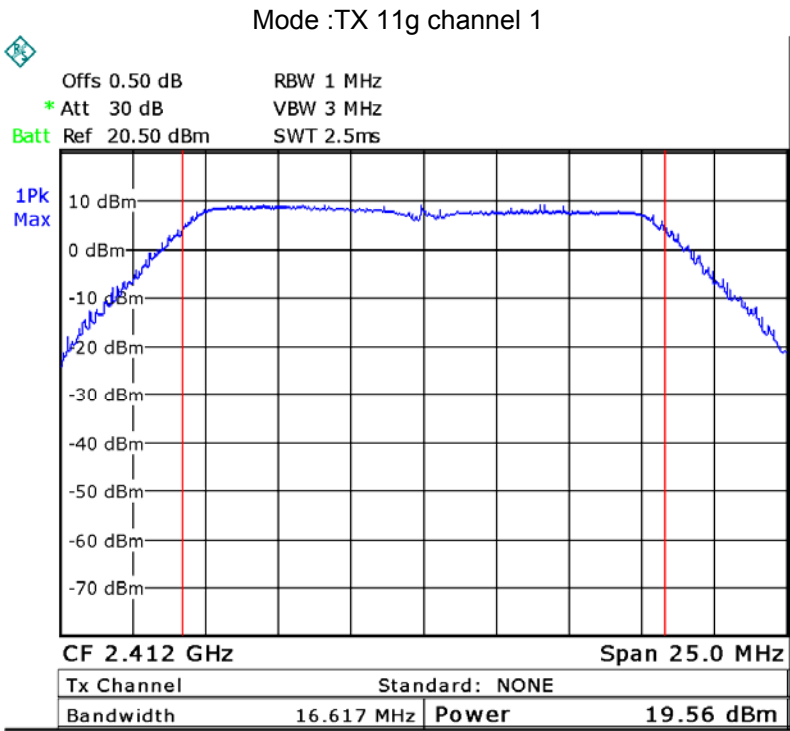
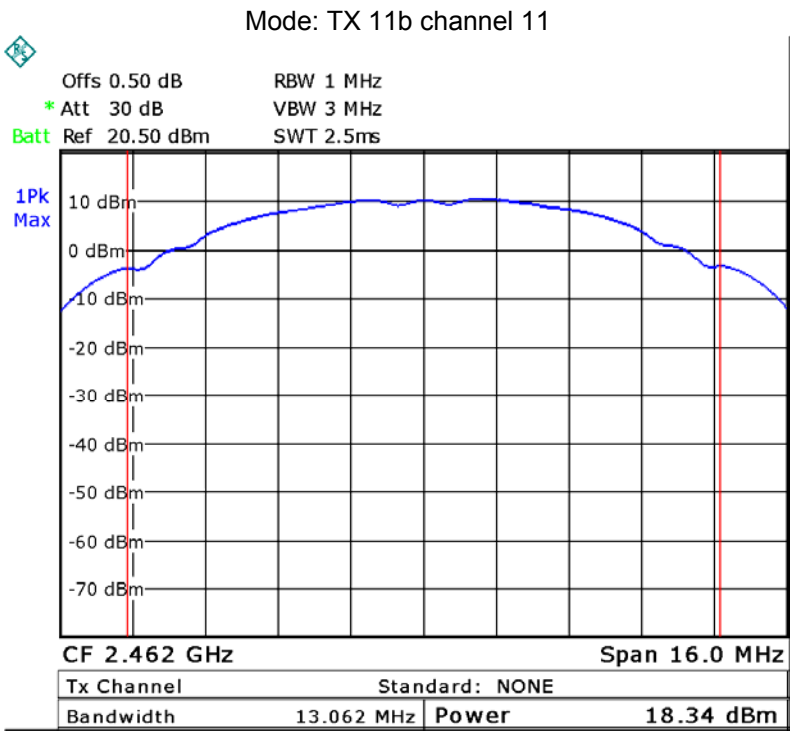
Test Plot

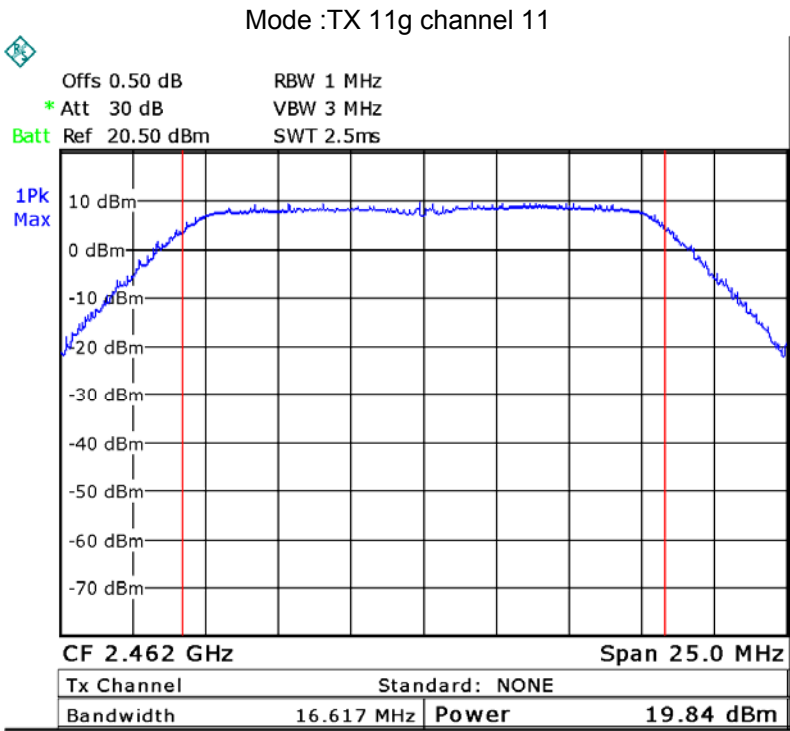
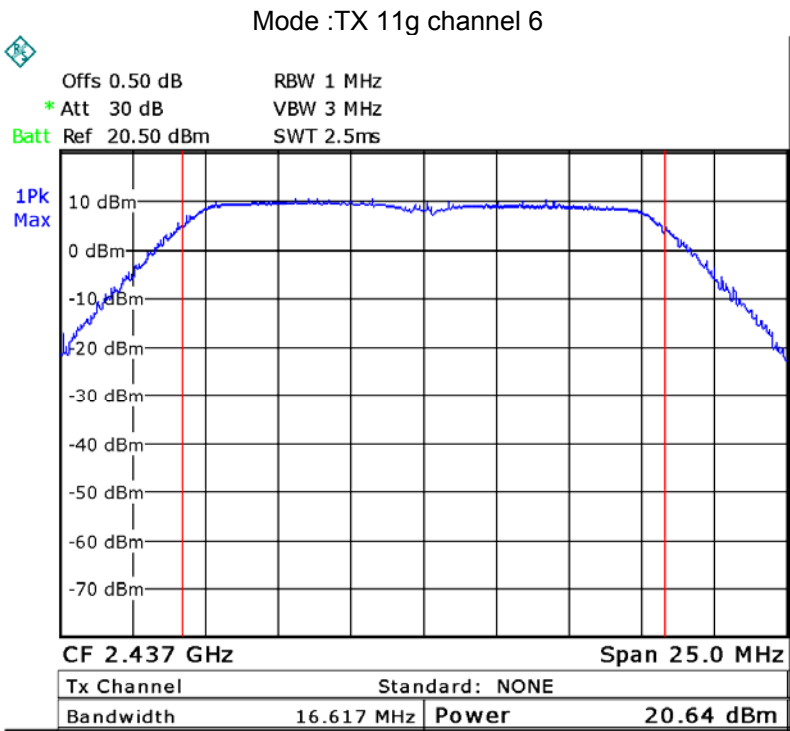
Mode: TX 11b channel 1

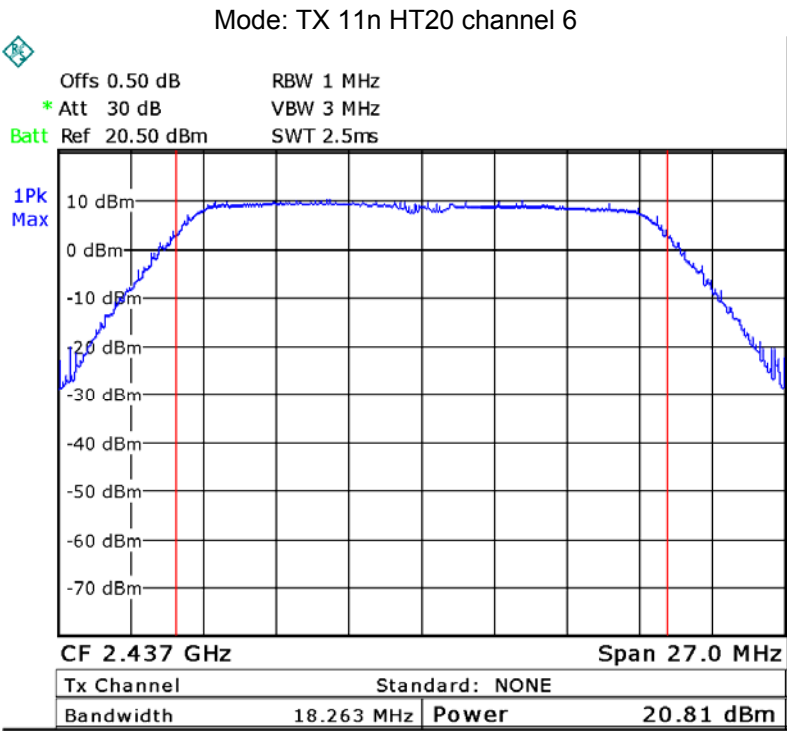
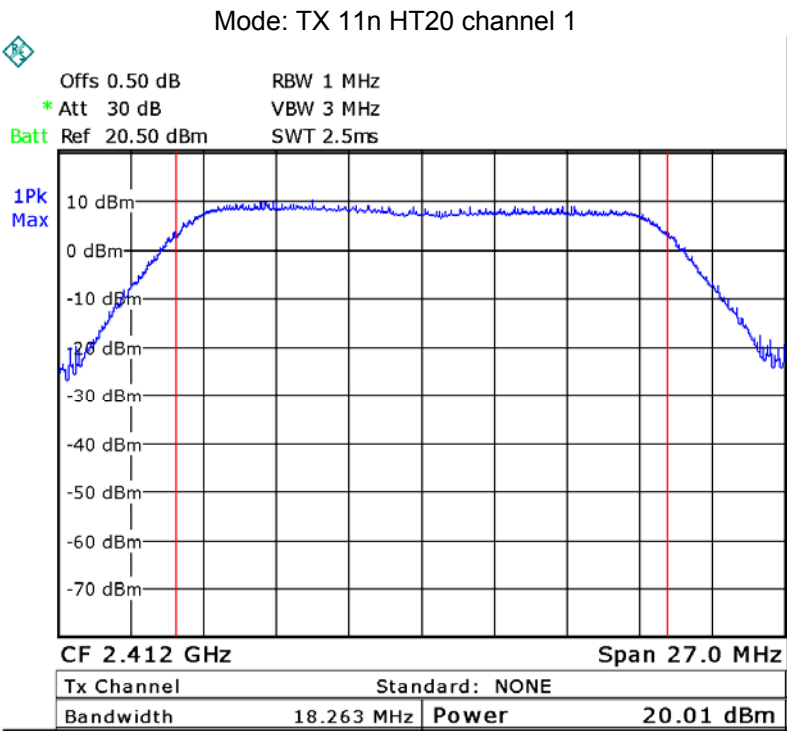


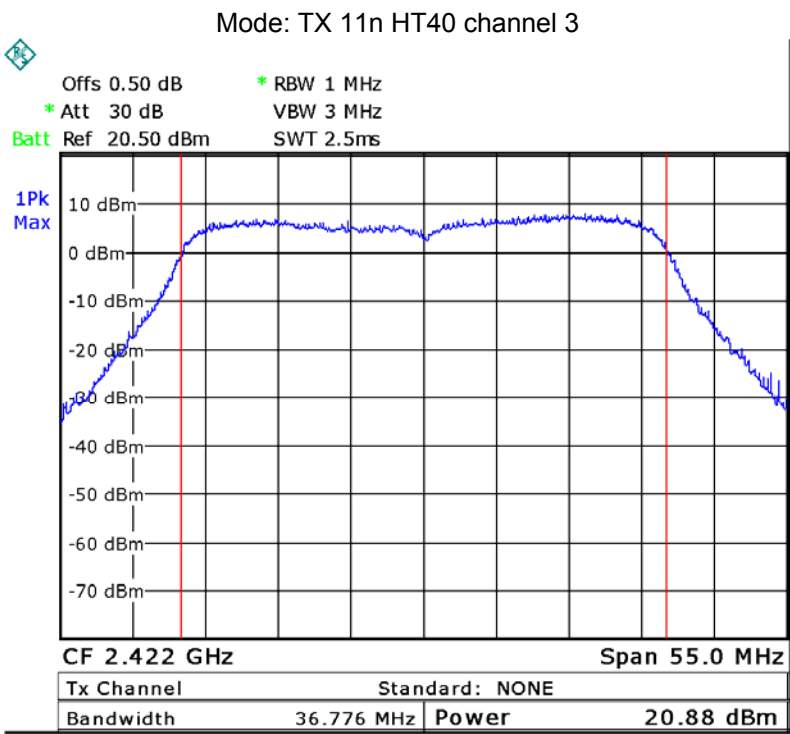
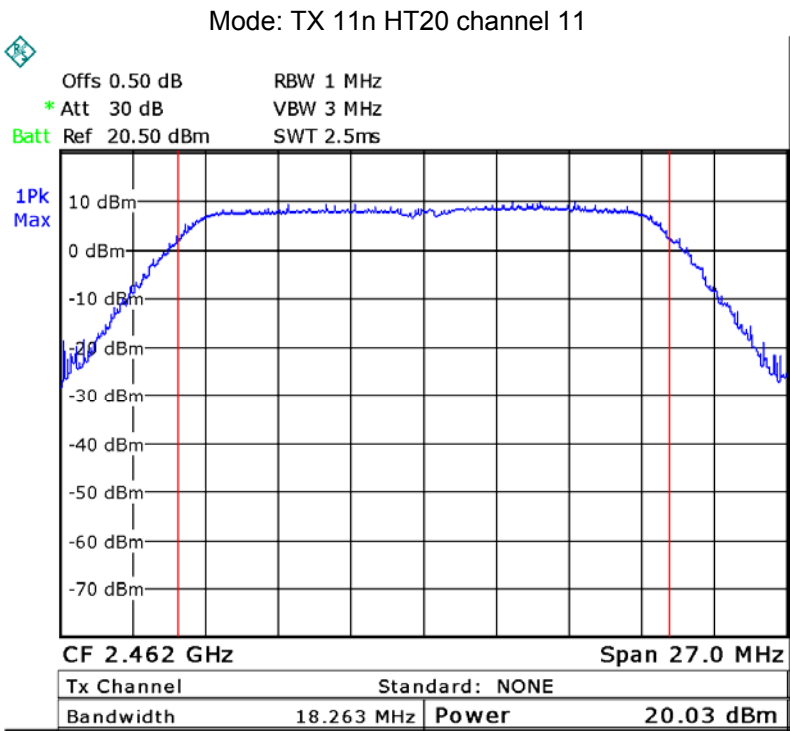
Mode: TX 11b channel 6

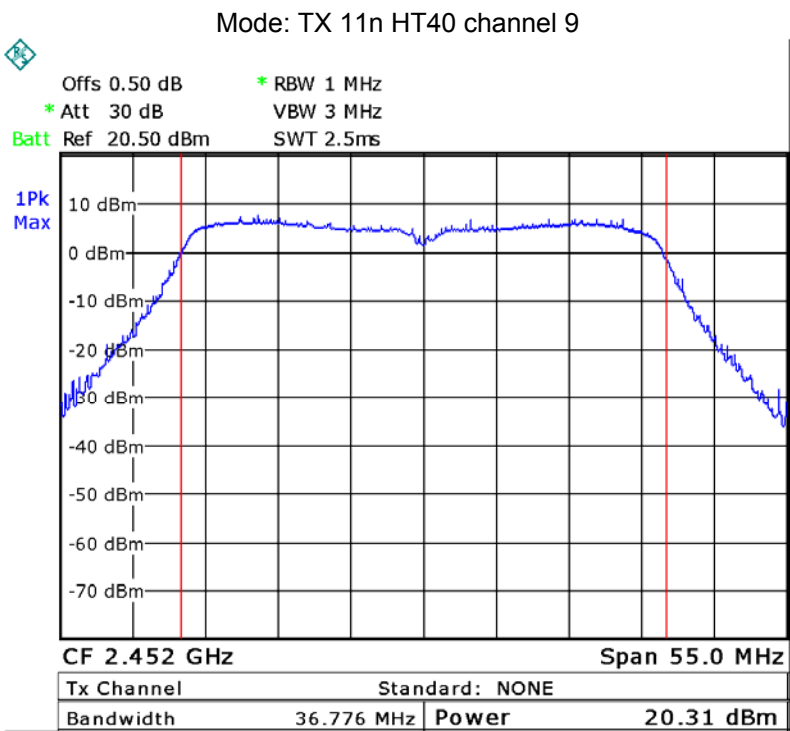
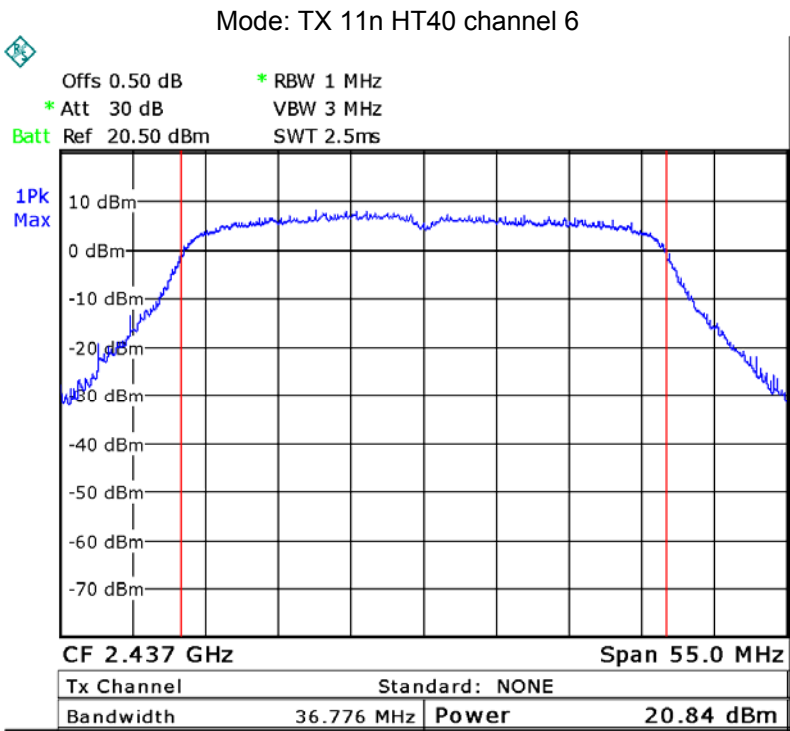


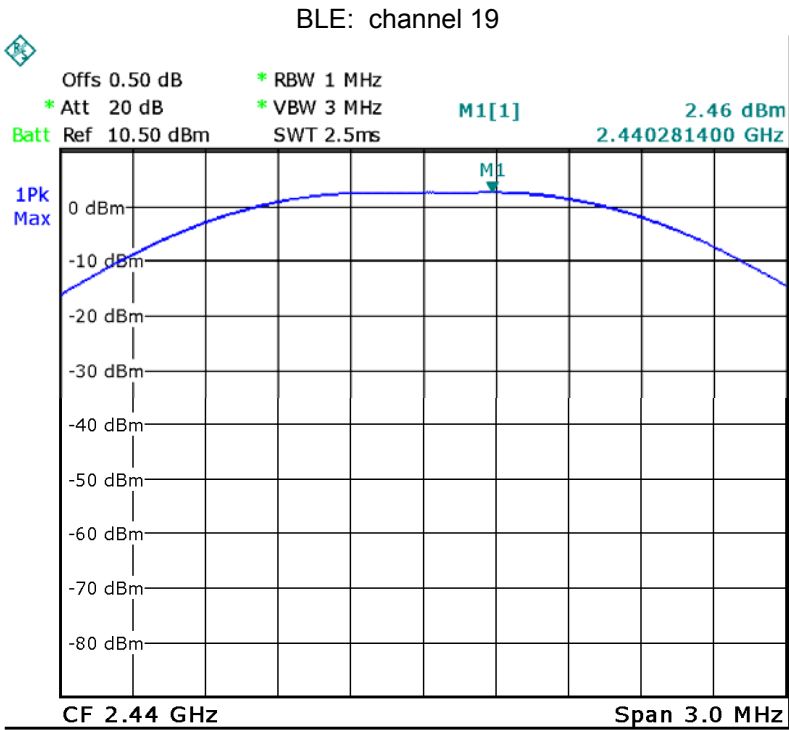
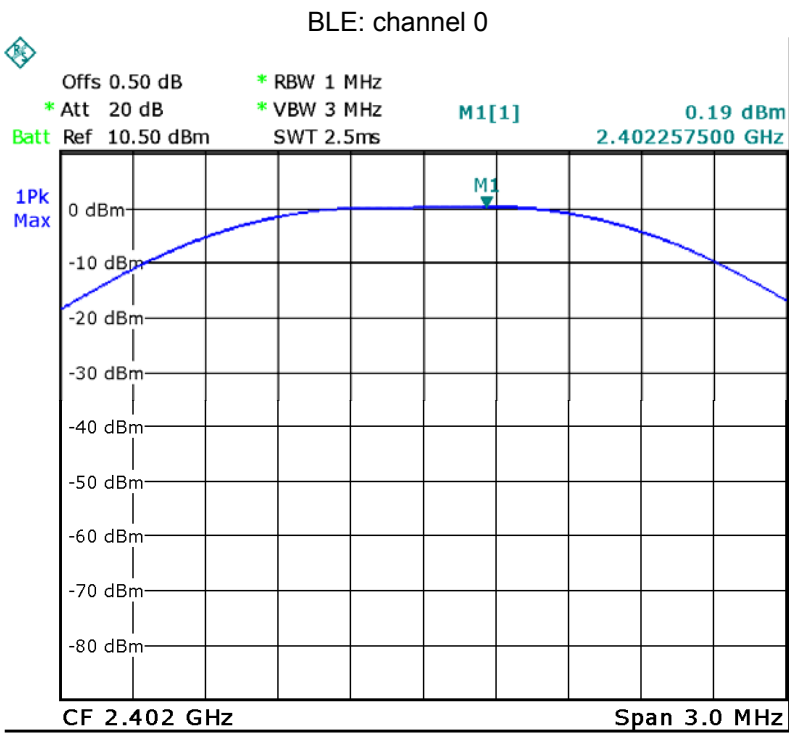


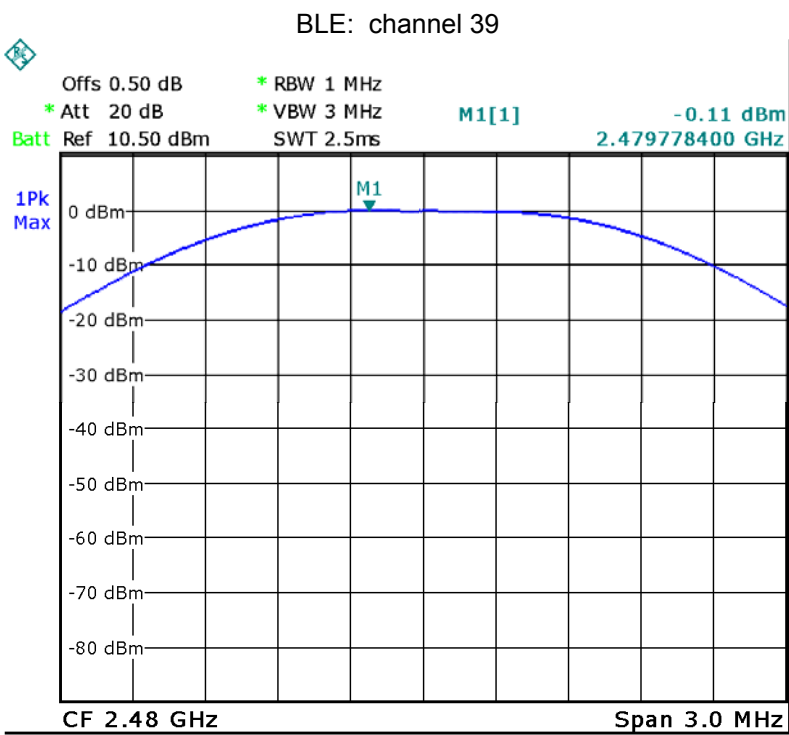












12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

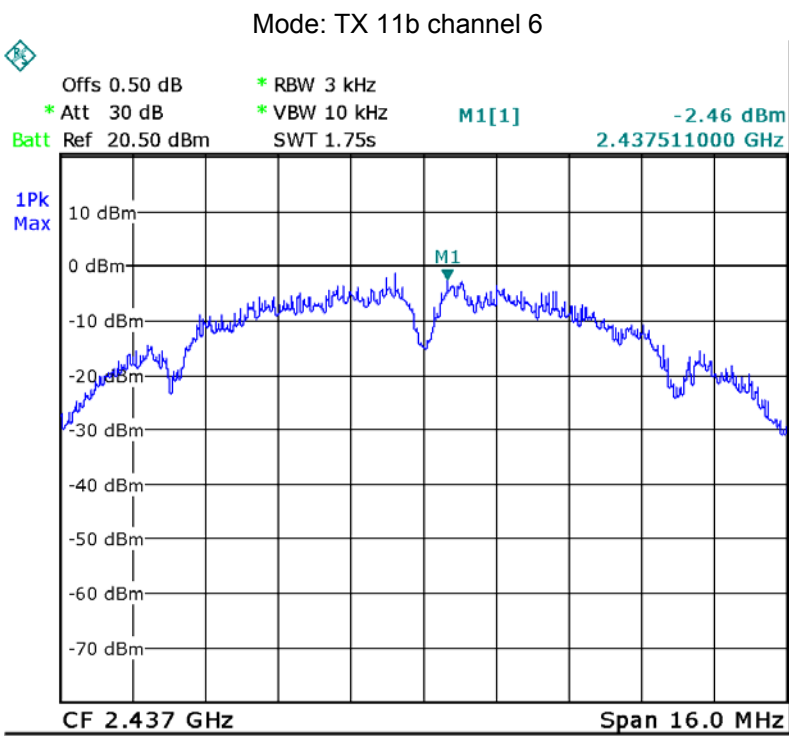
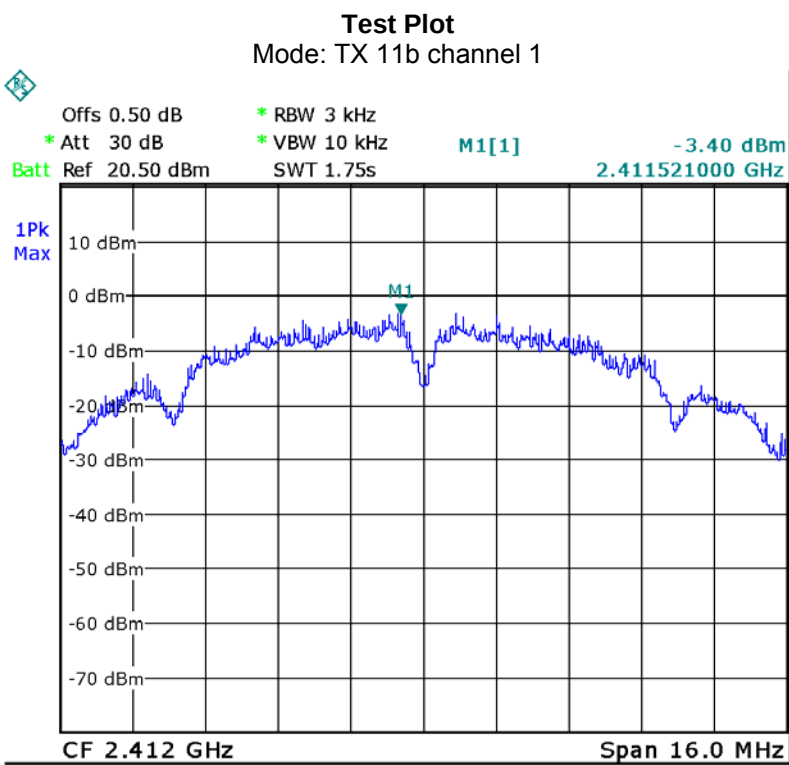
12.1 Test Procedure:

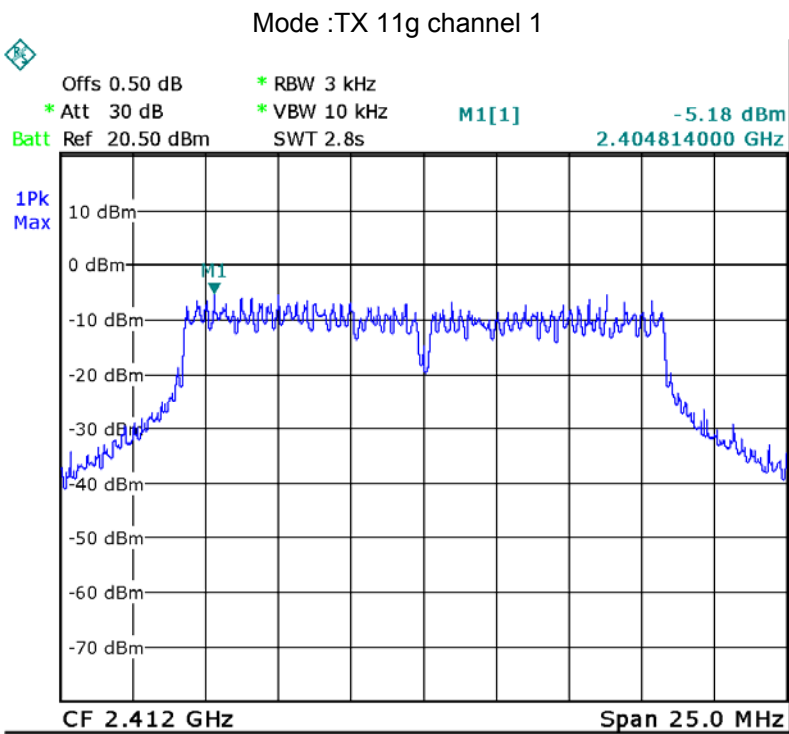
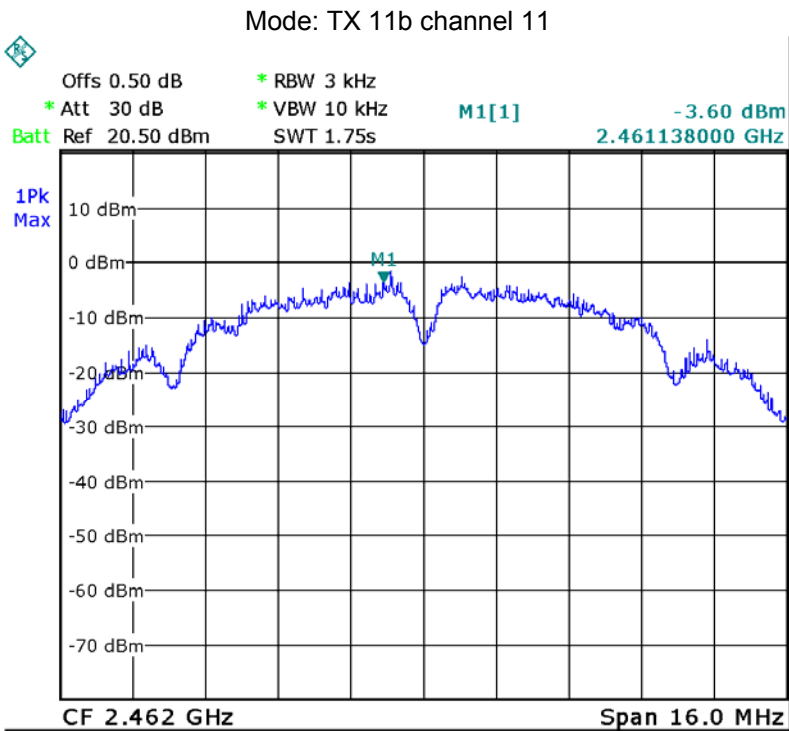
KDB 558074 D01 DTS Meas Guidance v04 April 5, 2017 section 10.2

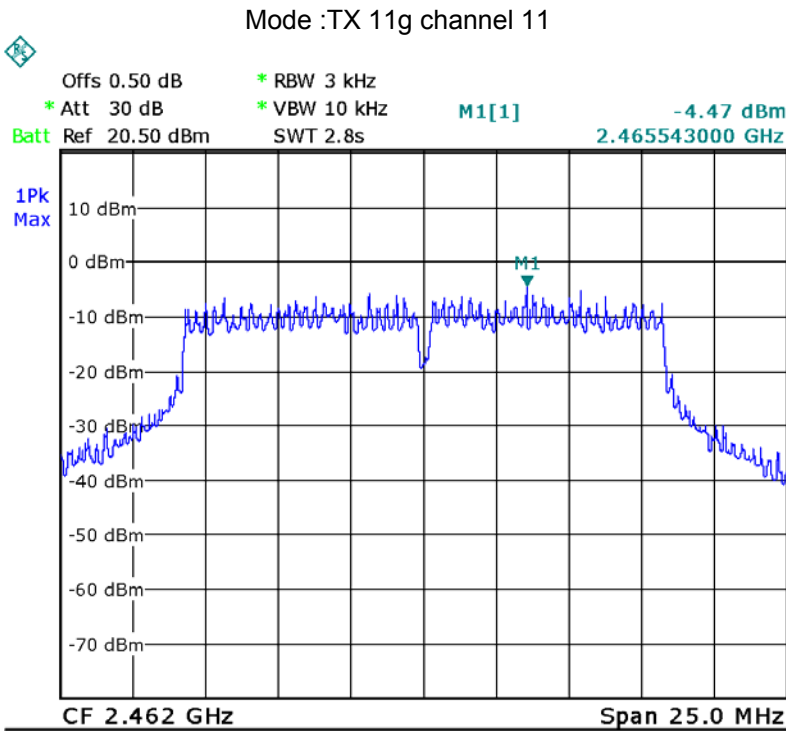
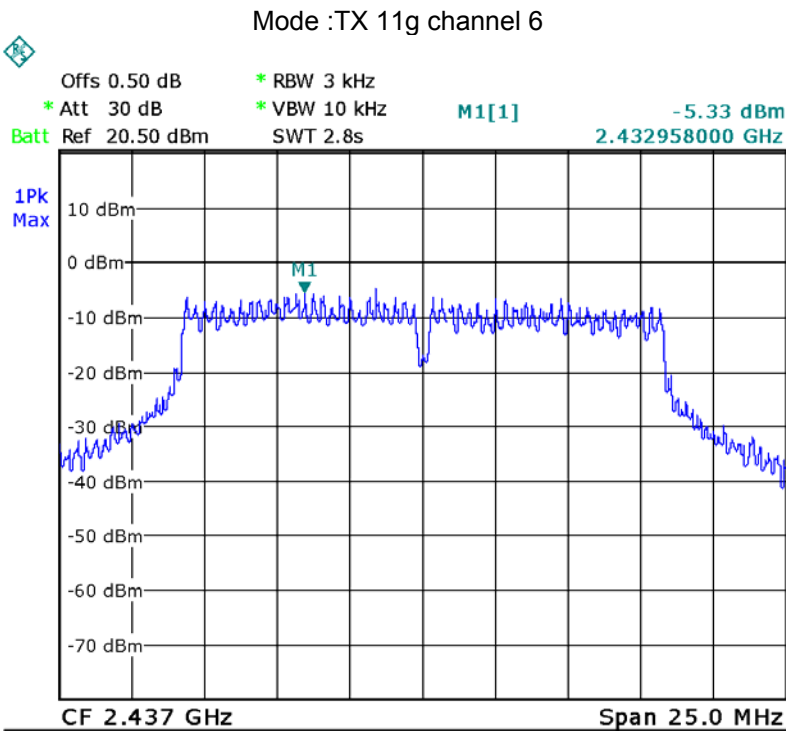
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section
Submit this plot.

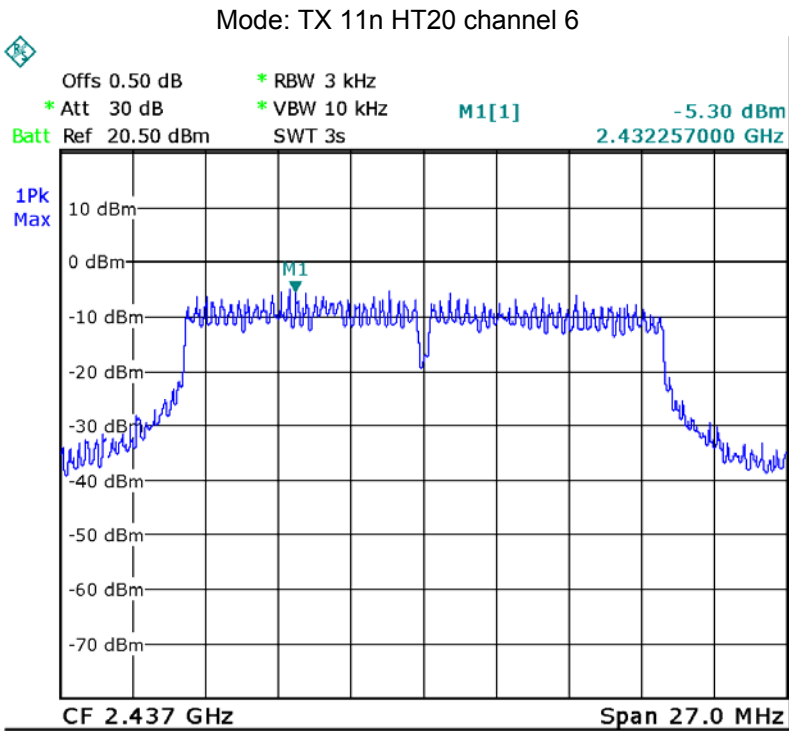
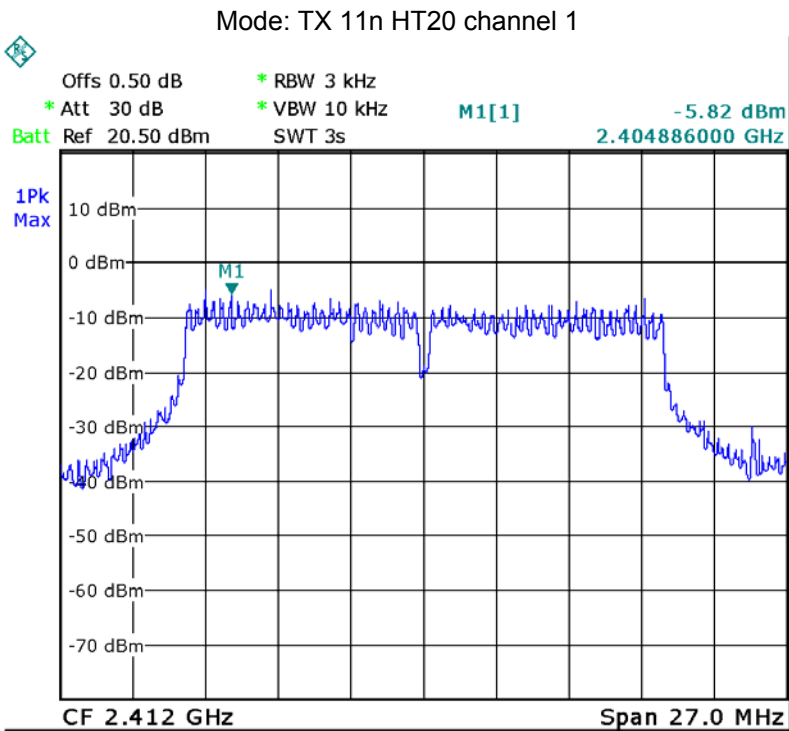
12.2 Test Result:

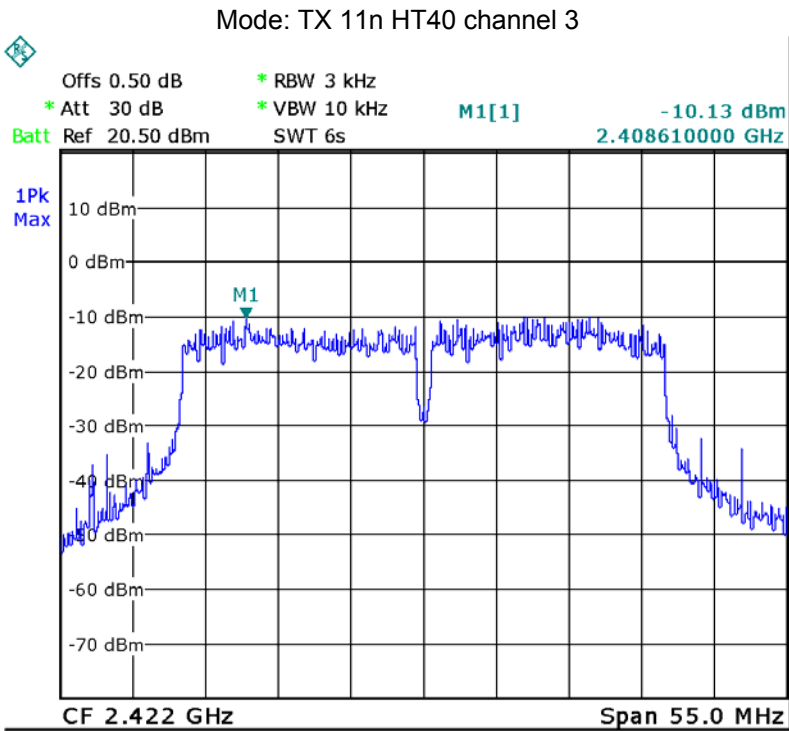
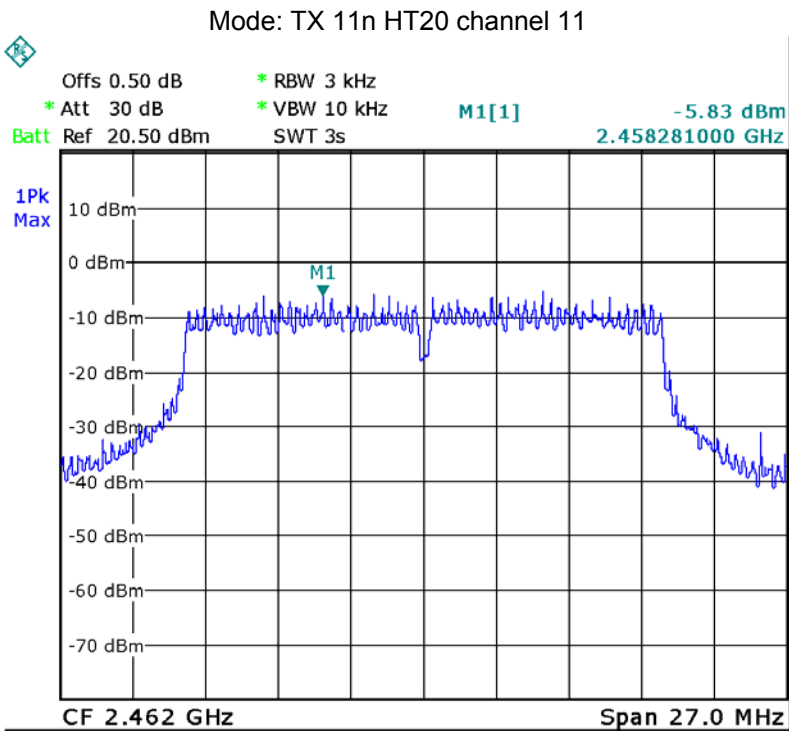
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-3.40	8dBm per 3kHz
	Middle-2437	-2.46	8dBm per 3kHz
	High-2462	-3.60	8dBm per 3kHz
TX 11g	Low-2412	-5.18	8dBm per 3kHz
	Middle-2437	-5.33	8dBm per 3kHz
	High-2462	-4.47	8dBm per 3kHz
TX 11n HT20	Low-2412	-5.82	8dBm per 3kHz
	Middle-2437	-5.30	8dBm per 3kHz
	High-2462	-5.83	8dBm per 3kHz
TX 11n HT40	Low-2422	-10.13	8dBm per 3kHz
	Middle-2437	-9.06	8dBm per 3kHz
	High-2452	-9.67	8dBm per 3kHz
BLE	Low-2402	-15.08	8dBm per 3kHz
	Middle-2440	-13.11	8dBm per 3kHz
	High-2480	-15.94	8dBm per 3kHz

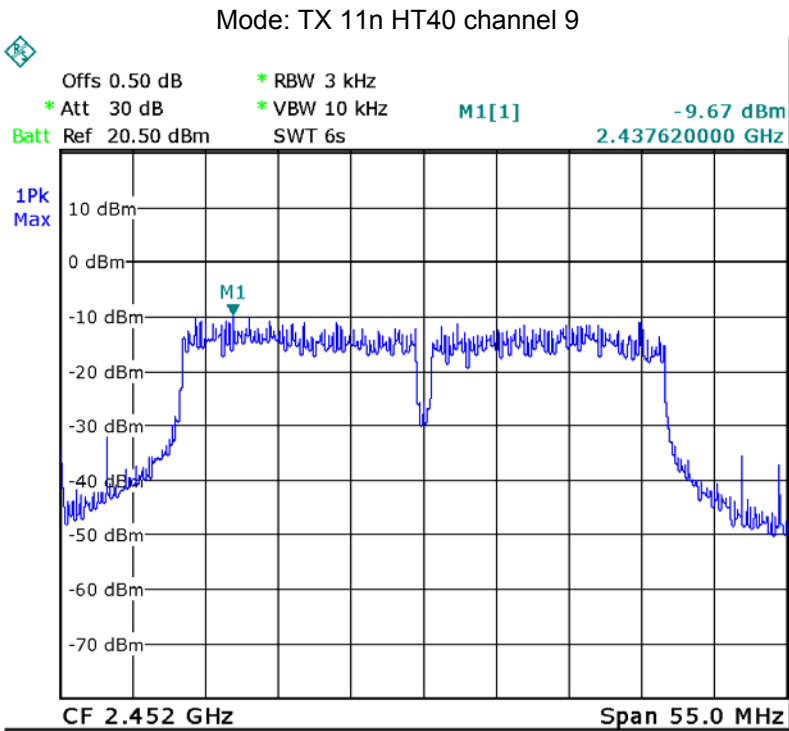
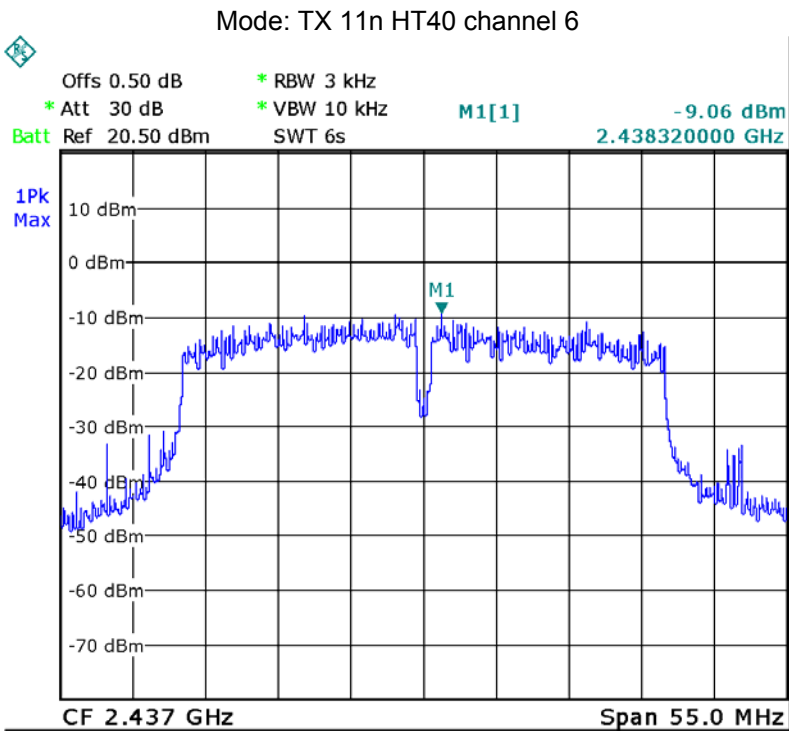


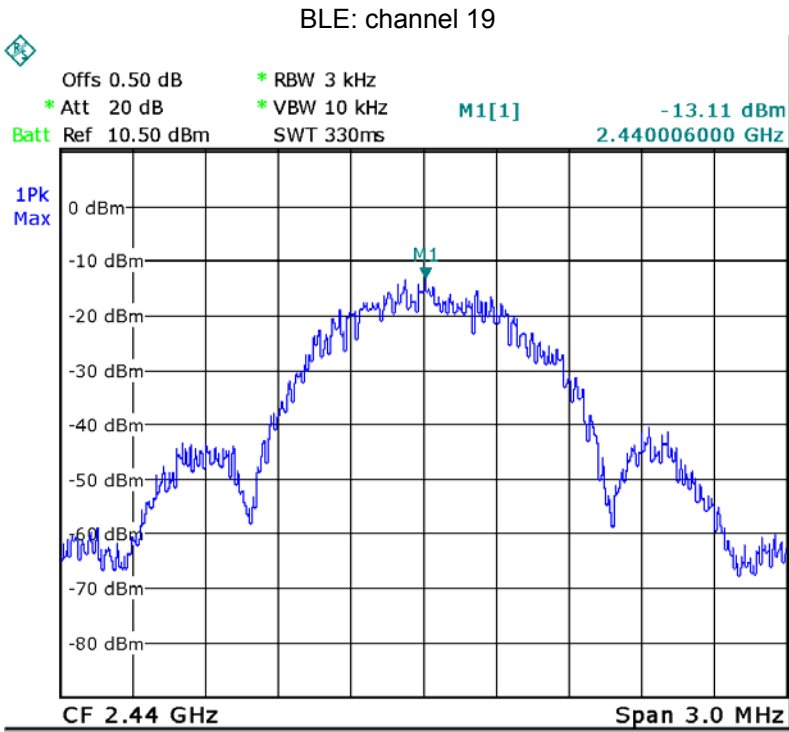
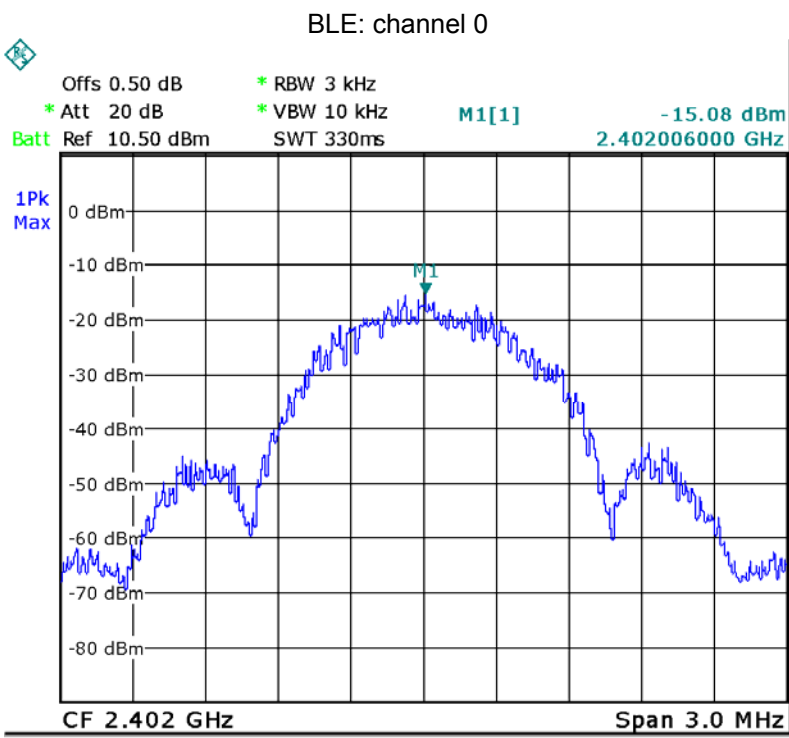


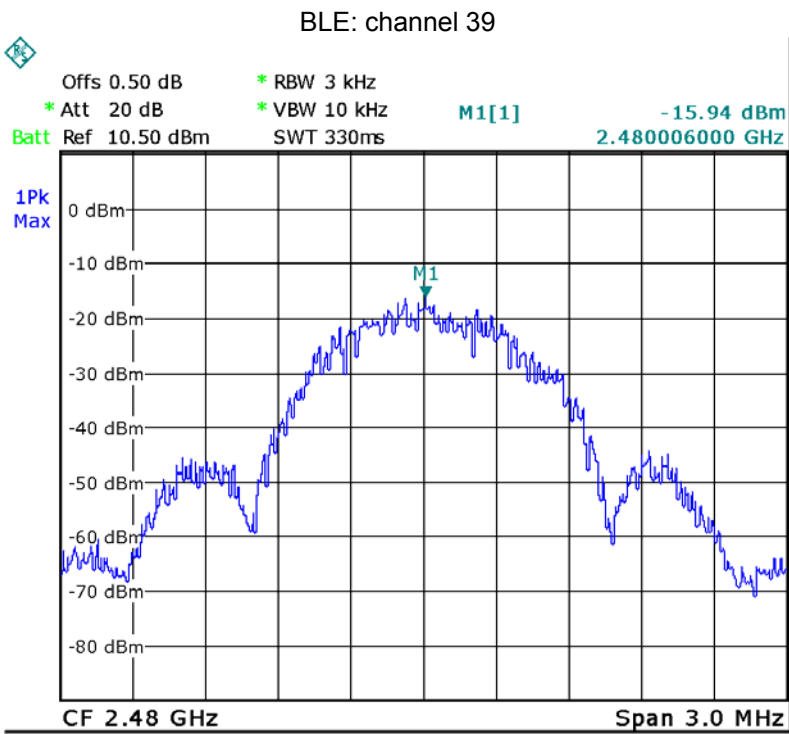












13 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This product has an integrated antenna fulfill the requirement of this section.

14 RF Exposure

Remark: refer to MPE test report: WTD21D01003711W005.

15 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix- 6310 -Photos.

=====End of Report=====