



FCC Radio Test Report

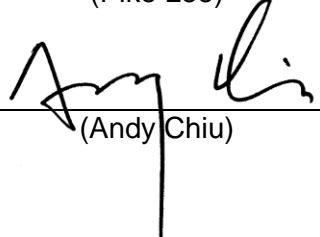
FCC ID: 2AB9W-8110N-UR

Project No. : 1906T016
Equipment : WIFI MODULE
Test Model : 8110N-UR
Series Model : N/A
Applicant : XYZprinting, Inc.
Address : 10F., No.99, Sec. 5, Nanjing E. Rd., Songshan Dist.,
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Date of Receipt : 2019/6/10
Date of Test : 2019/6/10 ~ 2019/6/21
Issued Date : 2019/8/16
Tested by : BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	2019/7/17
R01	Revised report to address TCB's comments.	2019/8/16

1 CERTIFICATION

Equipment : WIFI MODULE
Brand Name : Fn-Link
Test Model : 8110N-UR
Series Model : N/A
Applicant : XYZprinting, Inc.
Manufacturer : HUNAN FN-LINK TECHNOLOGY LIMITED
Address : No.8, Litong Road, Liuyang Economic & Technical Development Zone,
Changsha, Hunan, China 410329
Factory : HUNAN FN-LINK TECHNOLOGY LIMITED
Address : No.8, Litong Road, Liuyang Economic & Technical Development Zone,
Changsha, Hunan, China 410329
Date of Test : 2019/6/10 ~ 2019/6/21
Test Sample : Engineering Sample
Standard(s) : FCC Part15, Subpart C (§15.247)
ANSI C63.10-2013

The above equipment has been tested and found in compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1906T016) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

FCC Part15, Subpart C (§15.247)				
FCC Clause No	Description	Test Result	Judgement	Remark
§15.207	AC Power Line Conducted Emissions	APPENDIX A	Pass	-----
§15.205 §15.209 §15.247(d)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	Pass	-----
§15.247(a)	Bandwidth	APPENDIX E	Pass	-----
§15.247(b)	Peak Output Power	APPENDIX F	Pass	-----
§15.247(d)	Antenna Conducted Spurious Emissions	APPENDIX G	Pass	-----
§15.247(e)	Power Spectral Density	APPENDIX H	Pass	-----
§15.203	Antenna Requirement	-----	Pass	-----

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

CB05: (FCC RN:674415; FCC DN:TW0659)

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

CB15: (VCCI RN: R-20020; FCC RN:674415; FCC DN:TW0659; ISED Assigned Code:20088-5)

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

2.2 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. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U,(dB)
C05	CISPR	150 kHz ~ 30MHz	3.44

B. Radiated emissions below 1 GHz test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U (dB)
CB15 (3m)	CISPR	30 MHz ~ 200 MHz	V	4.20
		30 MHz ~ 200 MHz	H	3.64
		200 MHz ~ 1,000 MHz	V	4.56
		200 MHz ~ 1,000 MHz	H	3.90

C. Radiated emissions above 1 GHz test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U (dB)
CB15 (3m)	CISPR	1 GHz ~ 6 GHz	V	4.46
		1 GHz ~ 6 GHz	H	4.40
		6 GHz ~18 GHz	V	3.88
		6 GHz ~18 GHz	H	4.00

Test Site	Method	Measurement Frequency Range	U (dB)
CB15 (1m)	CISPR	18 GHz ~ 26.5 GHz	4.62
		26.5 GHz ~ 40 GHz	5.12

NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR} , as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

3 GENERAL INFORMATION

3.1 DESCRIPTION OF EUT

Equipment	WIFI MODULE
Brand Name	Fn-Link
Test Model	8110N-UR
Series Model	N/A
Model Difference	N/A
Power Source	System supplied.
Power Rating	DC 3.3V
Products Covered	N/A
Operation Frequency	2412 MHz to 2462 MHz
Modulation Type	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n: OFDM
Bit Rate of Transmitter	IEEE 802.11b: 11/5.5/2/1 Mbps IEEE 802.11g: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 72.2 Mbps
Maximum Output Power	IEEE 802.11b: 16.62 dBm (0.0459 W) IEEE 802.11g: 21.84 dBm (0.1528 W) IEEE 802.11n (HT20): 22.21 dBm (0.1663 W)

NOTE:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

(2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	05	2432	09	2452
02	2417	06	2437	10	2457
03	2422	07	2442	11	2462
04	2427	08	2447		

(3) Table for Filed Antenna:

Ant.	Brand	Test Model	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PIFA	N/A	3.56

3.2 TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
1	TX B MODE CHANNEL 01/06/11
2	TX G MODE CHANNEL 01/06/11
3	TX N (HT20) MODE CHANNEL 01/06/11

Following mode(s) as (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test	
Test Mode	Description
1	TX N (HT20) MODE CHANNEL 06

Radiated emissions test for Bandedge	
Test Mode	Description
1	TX B MODE CHANNEL 01/11
2	TX G MODE CHANNEL 01/11
3	TX N (HT20) MODE CHANNEL 01/11

Radiated emissions test for Harmonic	
Test Mode	Description
1	TX B MODE CHANNEL 01/06/11
2	TX G MODE CHANNEL 01/06/11
3	TX N (HT20) MODE CHANNEL 01/06/11

Conducted test	
Test Mode	Description
1	TX B MODE CHANNEL 01/06/11
2	TX G MODE CHANNEL 01/06/11
3	TX N (HT20) MODE CHANNEL 01/06/11

NOTE:

- (1) The measurements are performed at the low, middle and high available channels.
- (2) For radiated emission tests, the highest output powers were set for final test.
- (3) For radiated emission below 1 GHz test, the IEEE 802.11N (HT20) was found to be the worst case and recorded.
- (4) For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst case (Horizontal) is recorded.

3.3 PARAMETERS OF TEST SOFTWARE

Test Software Version	ART2_IoE 2.3		
Frequency (MHz)	2412	2442	2462
IEEE 802.11b	16	17	17
IEEE 802.11g	16.5	21	13.5
IEEE 802.11n (HT20)	21	21	12.5

3.4 DUTY CYCLE

If duty cycle is $\geq 98\%$, duty factor is not required.
 If duty cycle is $< 98\%$, duty factor shall be considered.

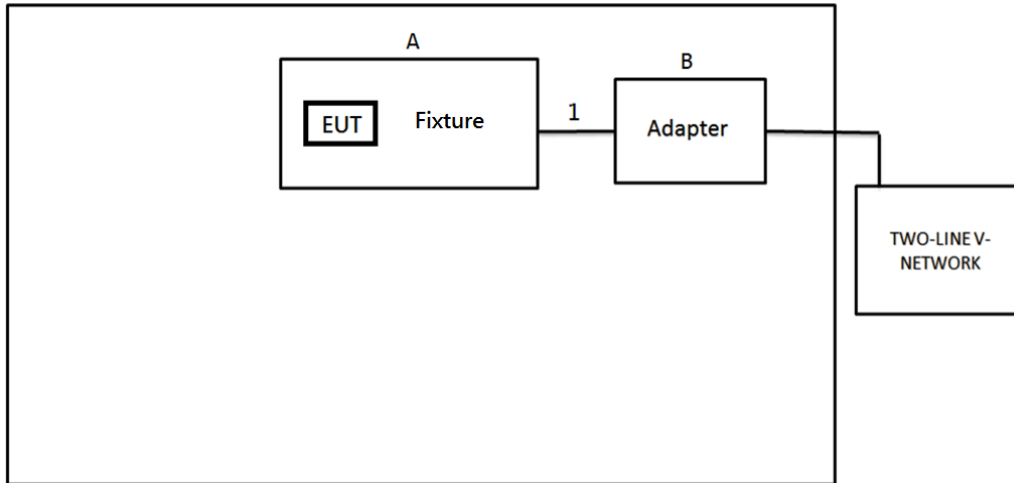
IEEE 802.11b	IEEE 802.11g
<p>Date: 13.JUN.2019 13:57:03</p>	<p>Date: 19.JUN.2019 17:44:54</p>
<p>Duty cycle = 100 % Duty Factor = $10 * \log(1 / 1) = 0$</p>	<p>Duty cycle = 1.888 ms / 1.960 ms = 96.33 % Duty Factor = $10 * \log(1 / 0.9633) = 0.16$</p>
IEEE 802.11n (HT20)	
<p>Date: 19.JUN.2019 17:44:48</p>	
<p>Duty cycle = 1.888 ms / 1.952 ms = 96.72 % Duty Factor = $10 * \log(1 / 0.7766) = 0.14$</p>	

NOTE:

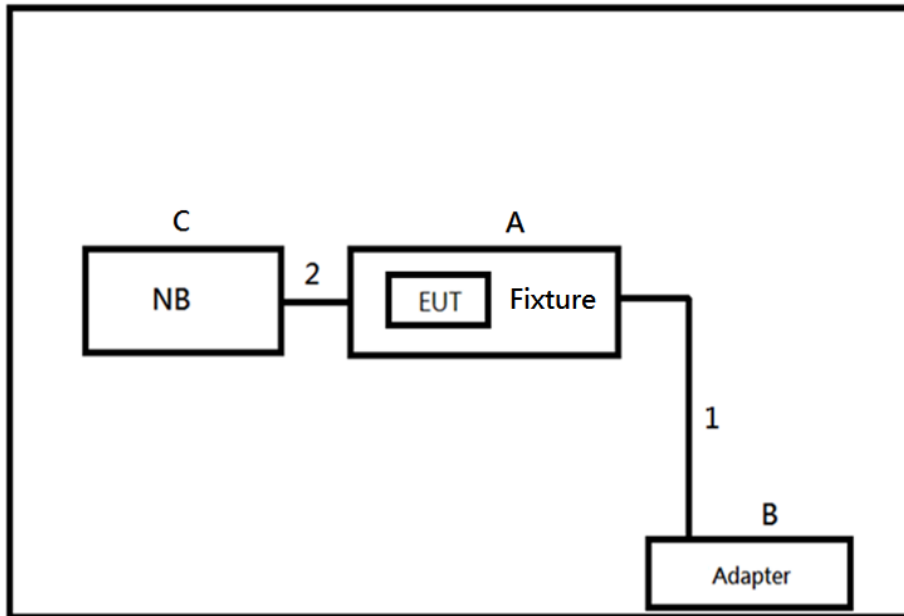
For IEEE 802.11g and IEEE 802.11n (HT20):
 For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz (Duty cycle $< 98\%$).

3.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

AC power line conducted emissions test



Radiated emissions test



3.6 SUPPORT UNITS

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	Fixture	NA	3FJSP TEN00S	N/A	N/A
B	Adapter	FSP GROUP INC.	FSP180-AAAN3	N/A	N/A
C	NB	HP	TPN-I119	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	2.2m	Power Cable
2	NO	NO	0.3m	USB COM Port

4 AC POWER LINE CONDUCTED EMISSIONS TEST

4.1 LIMIT

Frequency (MHz)	Class A (dBµV)		Class B (dBµV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56 *	56 - 46 *
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
 Margin Level = Measurement Value – Limit Value

The following table is the setting of the receiver.

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

4.2 TEST PROCEDURE

- a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
 All other support equipment were powered from an additional LISN(s).
 The LISN provides 50 Ohm/50uH of impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle to keep the cable above 40 cm.
- c. Excess I/O cables that are not connected to a peripheral shall be bundled in the center.
 The end of the cable will be terminated, using the correct terminating impedance.
 The overall length shall not exceed 1 m.
- d. The LISN is spaced at least 80 cm from the nearest part of the EUT chassis.
- e. For the actual test configuration, please refer to the related Item - EUT Test Photos.

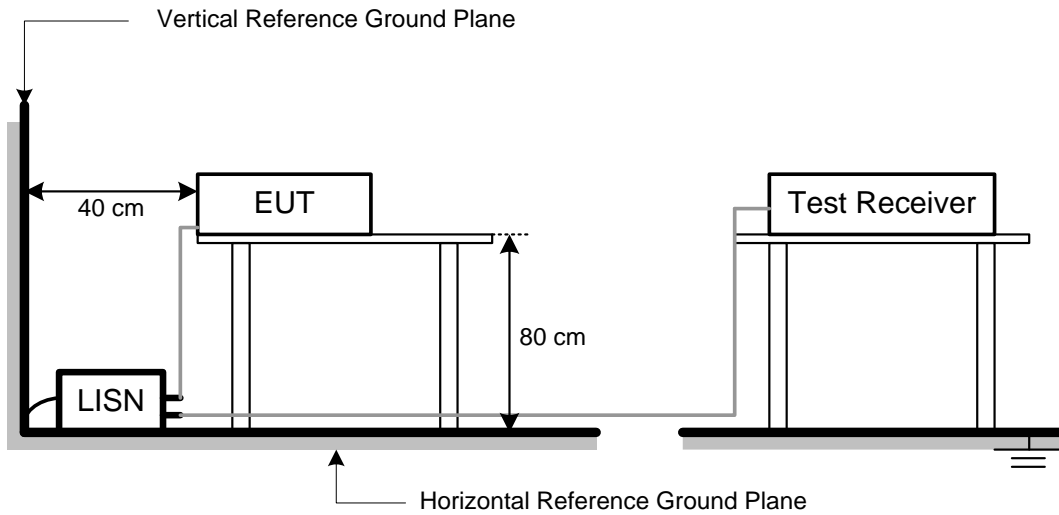
NOTE:

- (1) In the results, each reading is marked as Peak, QP or AVG per the detector used.
 BW=9 kHz (6 dB Bandwidth)
- (2) All readings are Peak unless otherwise stated QP or AVG in column of Note. Both the QP and the AVG readings must be less than the limit for compliance.

4.3 DEVIATION FROM TEST STANDARD

No deviation.

4.4 TEST SETUP



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in normal link mode.

4.6 TEST RESULT

Temperature: 25 °C Relative Humidity: 45 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX A.

5 RADIATED EMISSIONS TEST

5.1 LIMIT

In case the emission fall within the restricted band specified on §15.205, then the §15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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
960~1000	500	3

LIMITS OF RADIATED EMISSIONS MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Radiated Emissions (dBuV/m)		Measurement Distance (meters)
	Peak	Average	
Above 1000	74	54	3

NOTE:

- (1) The limit for radiated test was performed according to FCC Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
 Margin Level = Measurement Value - Limit Value

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

5.2 TEST PROCEDURE

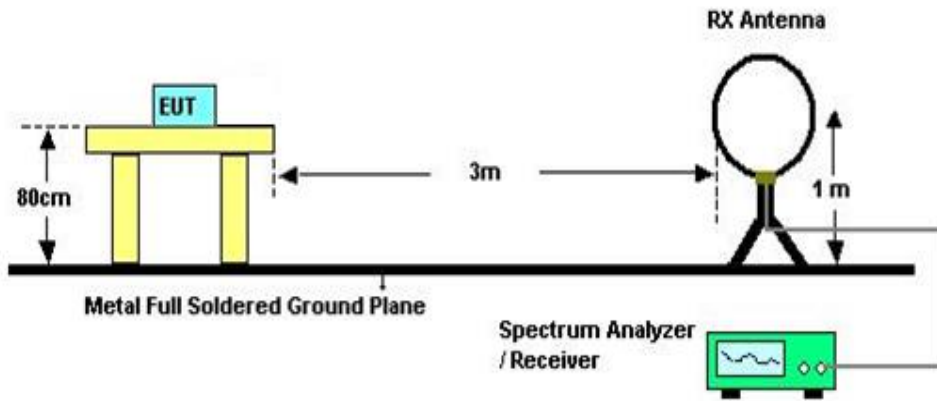
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

5.3 DEVIATION FROM TEST STANDARD

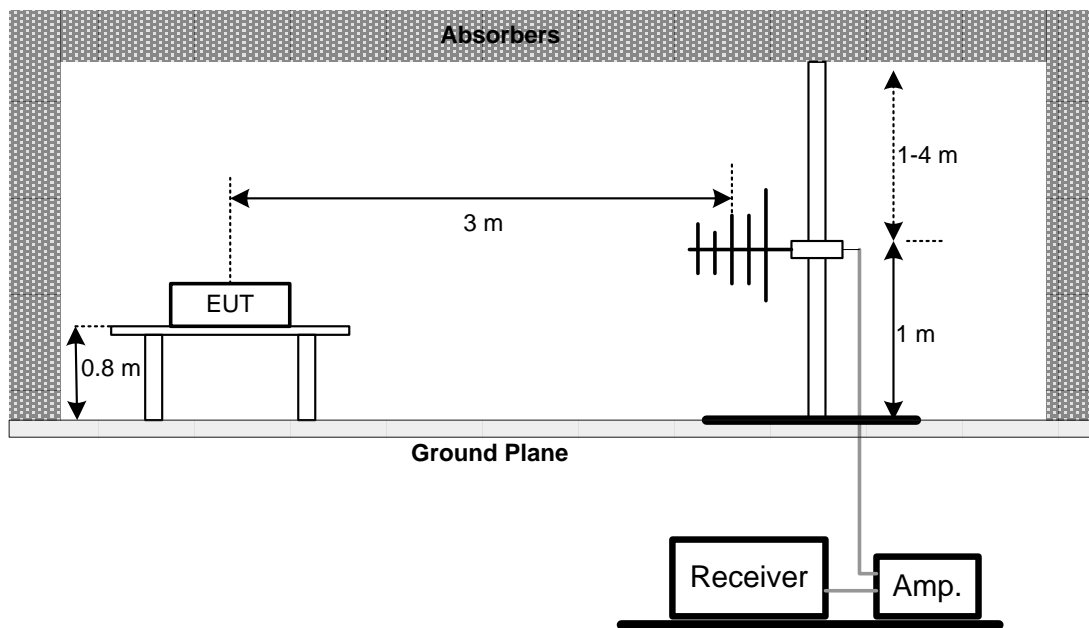
No deviation.

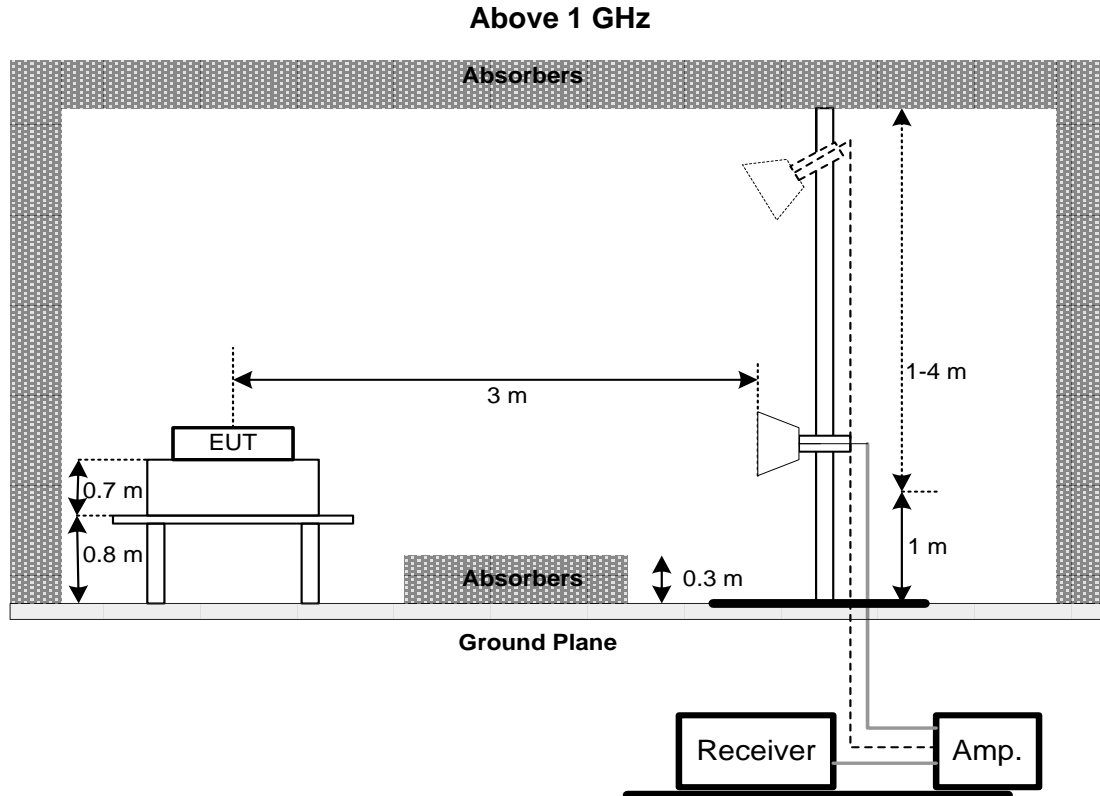
5.4 TEST SETUP

Below 30 MHz



30 MHz to 1 GHz





5.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULT – 9 KHZ TO 30 MHZ

Temperature: 23 °C Relative Humidity: 70 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX B.

NOTE:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

5.7 TEST RESULT – 30MHZ TO 1000 MHZ

Temperature: 23 °C Relative Humidity: 70 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX C.

5.8 TEST RESULT – ABOVE 1000 MHZ

Temperature: 23 °C Relative Humidity: 70 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX D.

NOTE:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

6 BANDWIDTH TEST

6.1 LIMIT

FCC Part15, Subpart C (§15.247)		
Section	Test Item	Limit
§15.247(a)	6 dB Bandwidth	500 kHz

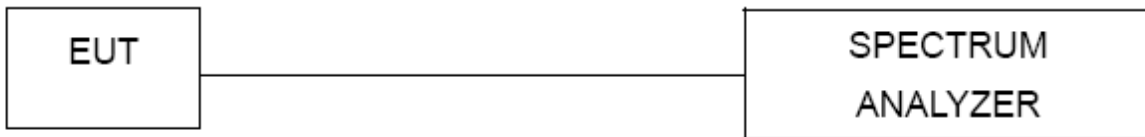
6.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

6.3 DEVIATION FROM TEST STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULT

Temperature: 25 °C Relative Humidity: 45 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX E.

7 PEAK OUTPUT POWER TEST

7.1 LIMIT

FCC Part15, Subpart C (§15.247)		
Section	Test Item	Limit
§15.247(b)	Maximum Output Power	1 Watt or 30dBm

7.2 TEST PROCEDURE

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.
- The maximum peak conducted output power was performed in accordance with method 9.1.2 of FCC KDB 558074 D01 DTS Meas Guidance.

7.3 DEVIATION FROM TEST STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULT

Temperature: 25 °C Relative Humidity: 45 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX F.

8 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST

8.1 LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits.

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW = 100 kHz, VBW=300 kHz, Sweep time = Auto.
- Offset = antenna gain + cable loss.

8.3 DEVIATION FROM TEST STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 TEST RESULT

Temperature: 25 °C Relative Humidity: 45 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX G.

9 POWER SPECTRAL DENSITY

9.1 LIMIT

FCC Part15, Subpart C (§15.247)		
Section	Test Item	Limit
§15.247(e)	Power Spectral Density	8 dBm (in any 3 kHz)

9.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW = 3 kHz, VBW = 10 kHz, Sweep time = Auto.

9.3 DEVIATION FROM TEST STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

9.6 TEST RESULT

Temperature: 25 °C Relative Humidity: 45 % Test Voltage: AC 120V/50Hz

Please refer to the APPENDIX H.

10 LIST OF MEASURING EQUIPMENTS

AC Power Line Conducted Emissions

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	2020/3/16
2	Test Cable	EMCI	EMCCFD300-BM -BMR-6000	170715	2019/8/7
3	EMI Test Receiver	R&S	ESR7	101433	2019/12/4
4	Measurement Software	EZ	EZ_EMG (Version NB-03A)	N/A	N/A

Radiated Emissions

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Preamplifier	EMCI	012645B	980267	2020/4/10
2	Preamplifier	EMCI	EMC02325	980217	2020/4/10
3	Preamplifier	EMCI	EMC2654045	980030	2020/4/10
4	Test Cable	EMCI	EMC104-SM-SM-8000	8m	2020/4/10
5	Test Cable	EMCI	EMC104-SM-SM-800	150207	2020/4/10
6	Test Cable	EMCI	EEMC104-SM-SM-3000	151205	2020/4/10
7	MXE EMI Receiver	Agilent	N9038A	MY55420127	2020/3/24
8	Signal Analyzer	Agilent	N9010A	MY52220990	2020/4/15
9	Loop Ant	EMCO	6502	274	2019/7/5
10	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2020/5/1
11	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	2020/3/20
12	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	2020/3/20

Bandwidth

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	2020/5/23

Peak Output Power

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2495A	1128008	2019/12/5
2	Power Sensor	Anritsu	MA2411B	1126001	2019/8/8

Antenna Conducted Spurious Emissions

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	2020/5/23

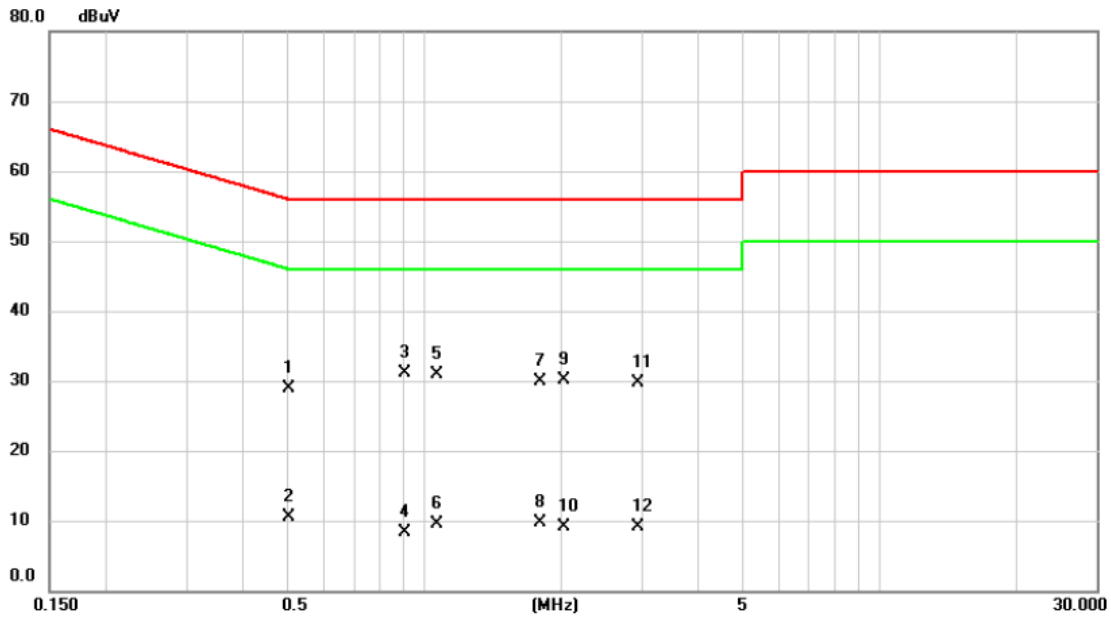
Power Spectral Density

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	R&S/FSP30	100854	2020/5/23

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

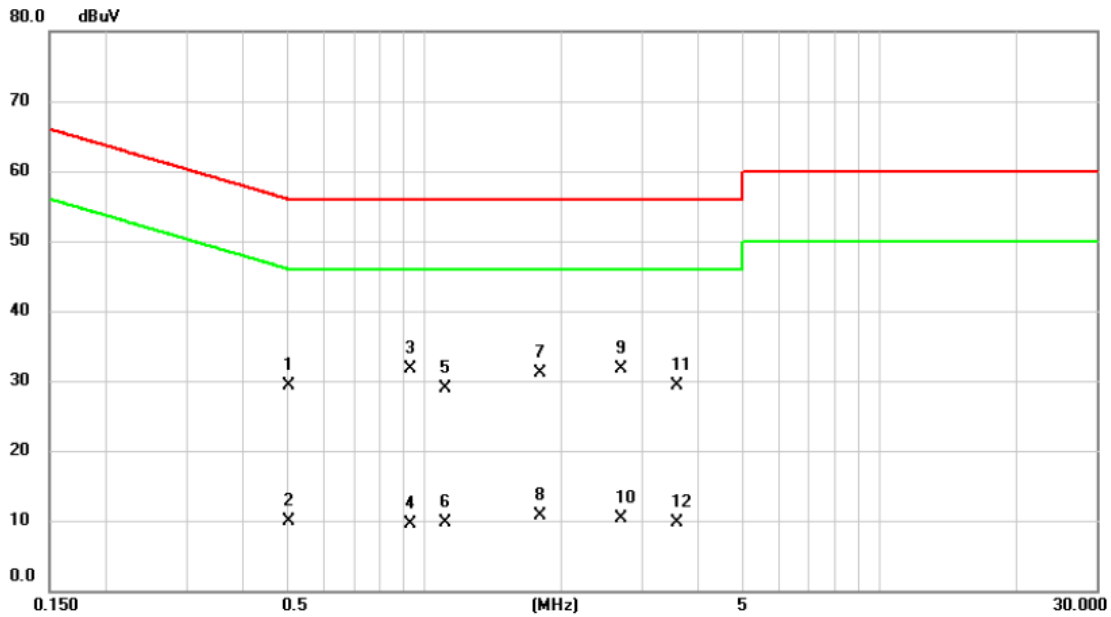
APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

Test Mode	TX N (HT20) Mode_2437MHz	Phase	Line
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.5032	19.31	9.58	28.89	56.00	-27.11	QP	
2		0.5032	0.91	9.58	10.49	46.00	-35.51	AVG	
3	*	0.9060	21.58	9.61	31.19	56.00	-24.81	QP	
4		0.9060	-1.32	9.61	8.29	46.00	-37.71	AVG	
5		1.0680	21.35	9.62	30.97	56.00	-25.03	QP	
6		1.0680	-0.21	9.62	9.41	46.00	-36.59	AVG	
7		1.7925	20.26	9.66	29.92	56.00	-26.08	QP	
8		1.7925	0.11	9.66	9.77	46.00	-36.23	AVG	
9		2.0310	20.42	9.67	30.09	56.00	-25.91	QP	
10		2.0310	-0.52	9.67	9.15	46.00	-36.85	AVG	
11		2.9445	19.95	9.71	29.66	56.00	-26.34	QP	
12		2.9445	-0.64	9.71	9.07	46.00	-36.93	AVG	

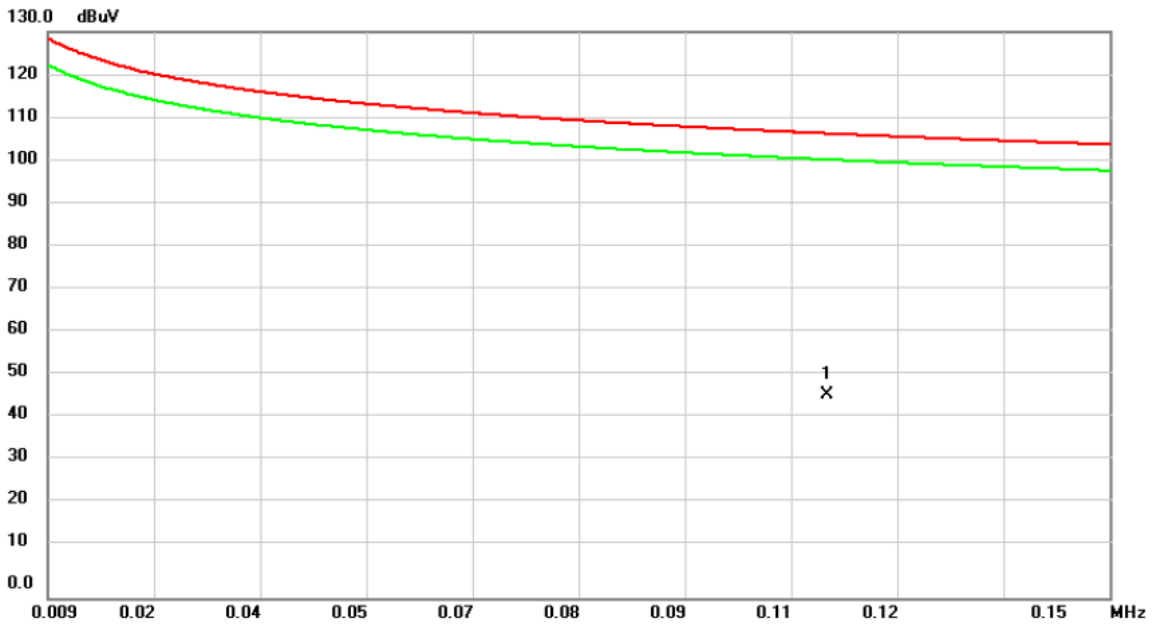
Test Mode	TX N (HT20) Mode_2437MHz	Phase	Neutral
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.5032	19.62	9.63	29.25	56.00	-26.75	QP	
2		0.5032	0.25	9.63	9.88	46.00	-36.12	AVG	
3	*	0.9307	22.09	9.66	31.75	56.00	-24.25	QP	
4		0.9307	-0.24	9.66	9.42	46.00	-36.58	AVG	
5		1.1130	19.17	9.66	28.83	56.00	-27.17	QP	
6		1.1130	0.09	9.66	9.75	46.00	-36.25	AVG	
7		1.7970	21.36	9.70	31.06	56.00	-24.94	QP	
8		1.7970	1.01	9.70	10.71	46.00	-35.29	AVG	
9		2.7015	21.97	9.74	31.71	56.00	-24.29	QP	
10		2.7015	0.53	9.74	10.27	46.00	-35.73	AVG	
11		3.5948	19.44	9.77	29.21	56.00	-26.79	QP	
12		3.5948	-0.12	9.77	9.65	46.00	-36.35	AVG	

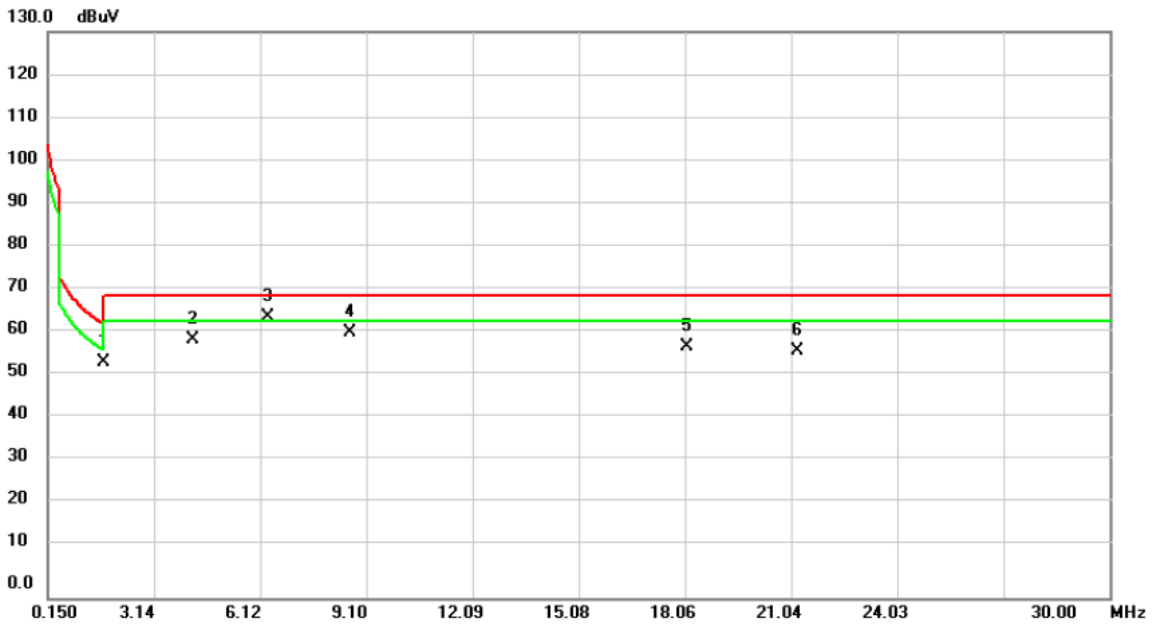
APPENDIX B RADIATED EMISSIONS - 9 KHZ TO 30 MHZ

Test Mode	TX N (HT20) Mode_2437MHz	Azimuth Angle	90°
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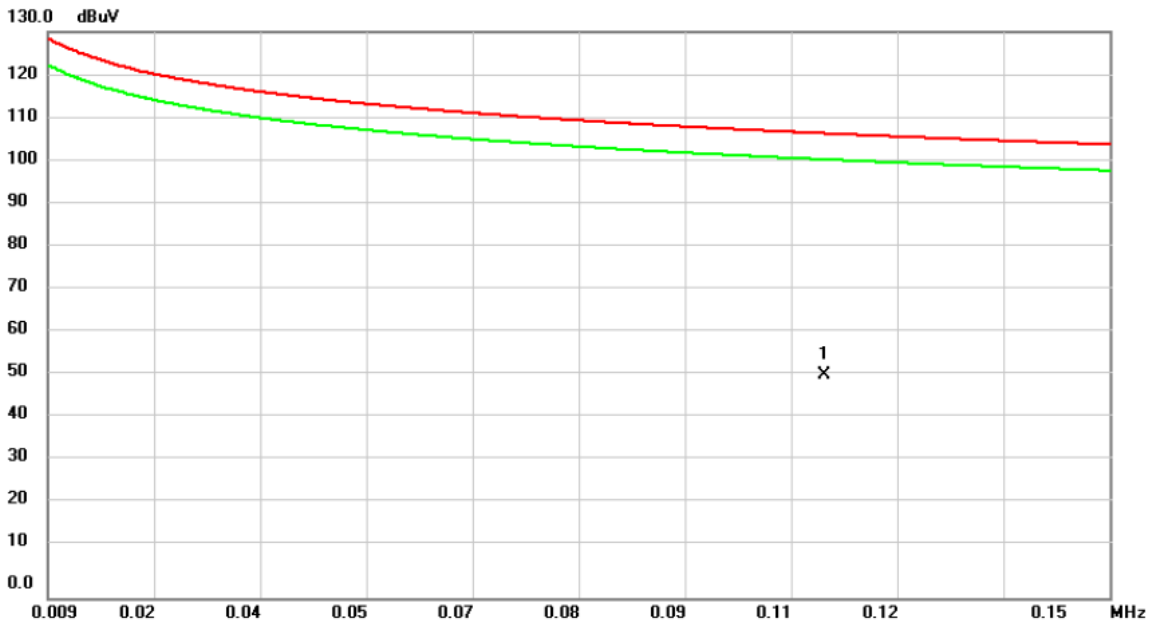
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1125	31.25	15.32	46.57	106.58	-60.01	AVG	

Test Mode TX N (HT20) Mode_2437MHz Azimuth Angle 90°



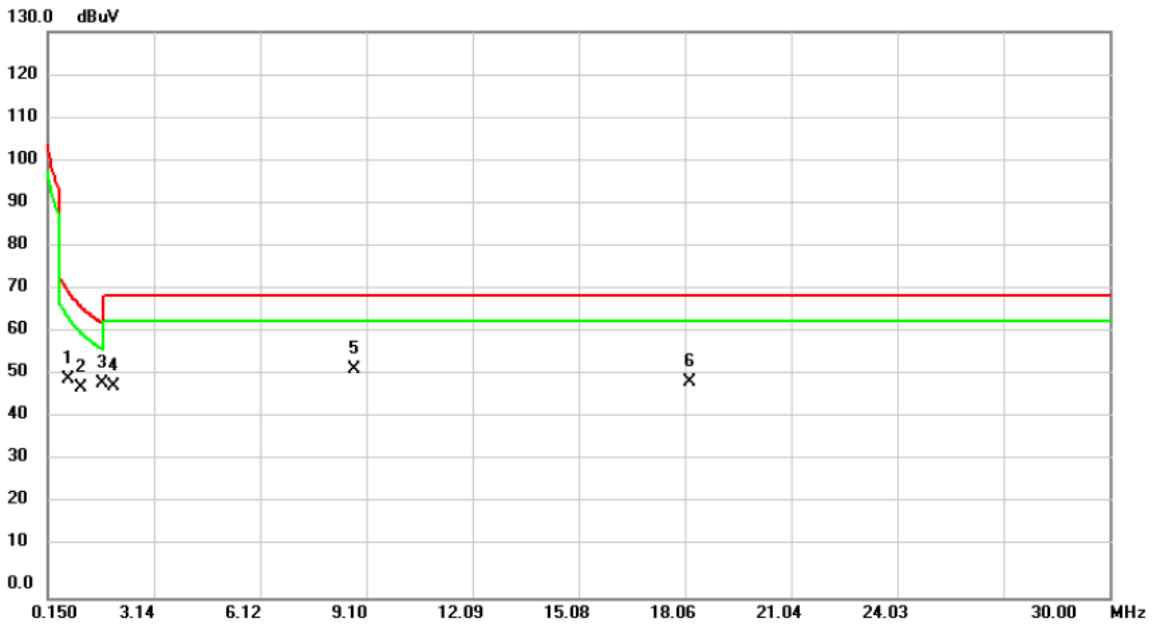
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		1.7022	56.19	-2.17	54.02	62.98	-8.96	QP	
2		4.2096	63.12	-3.82	59.30	69.54	-10.24	QP	
3	*	6.3290	68.57	-4.06	64.51	69.54	-5.03	QP	
4		8.6274	65.47	-4.57	60.90	69.54	-8.64	QP	
5		18.1197	63.78	-6.25	57.53	69.54	-12.01	QP	
6		21.2241	63.13	-6.56	56.57	69.54	-12.97	QP	

Test Mode	TX N (HT20) Mode_2437MHz	Azimuth Angle	0°
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No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1122	35.94	15.33	51.27	106.60	-55.33	AVG	

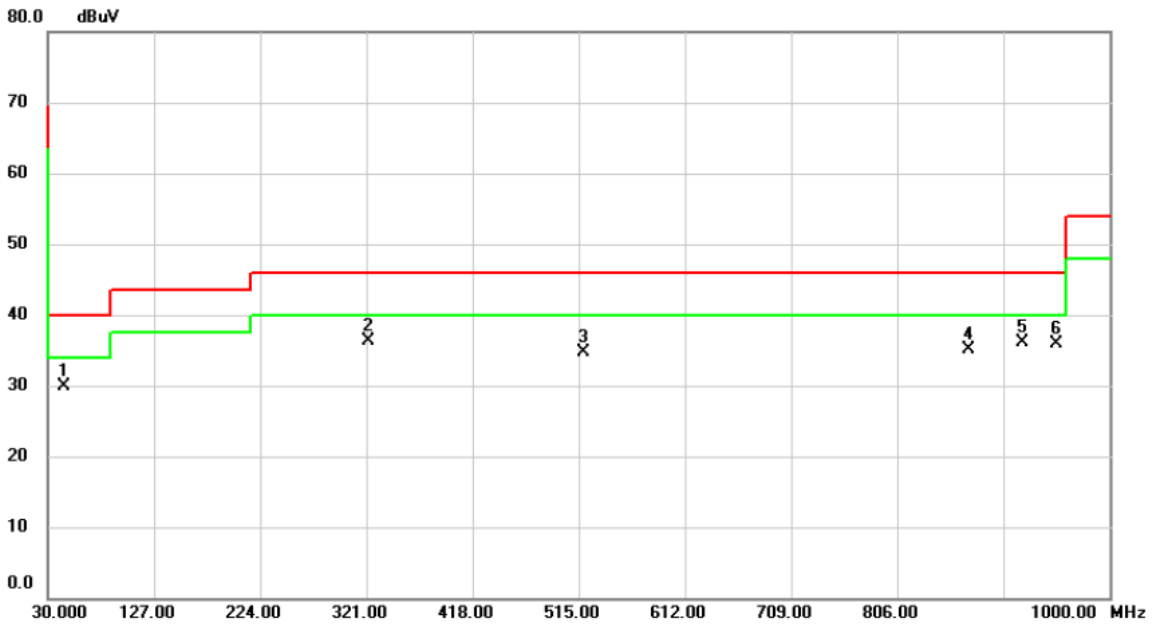
Test Mode TX N (HT20) Mode_2437MHz Azimuth Angle 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.7171	48.98	1.18	50.16	70.49	-20.33	QP	
2		1.0754	48.96	-0.54	48.42	66.97	-18.55	QP	
3	*	1.6724	51.49	-2.09	49.40	63.14	-13.74	QP	
4		2.0007	51.58	-2.94	48.64	69.54	-20.90	QP	
5		8.7767	56.99	-4.62	52.37	69.54	-17.17	QP	
6		18.1794	55.85	-6.27	49.58	69.54	-19.96	QP	

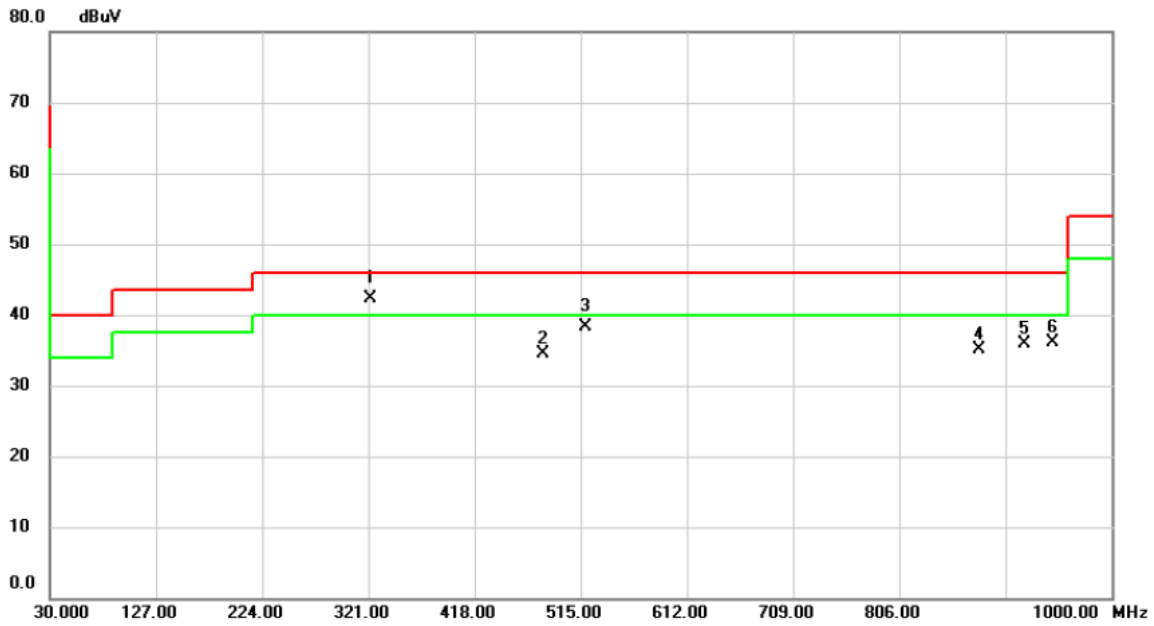
APPENDIX C RADIATED EMISSIONS - 30 MHZ TO 1000 MHZ

Test Mode	TX N (HT20) Mode_2437MHz	Polarization	Vertical
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		44.5500	38.19	-8.25	29.94	40.00	-10.06	peak	
2	*	322.9400	43.27	-6.91	36.36	46.00	-9.64	peak	
3		519.8500	37.35	-2.56	34.79	46.00	-11.21	peak	
4		870.9900	30.74	4.39	35.13	46.00	-10.87	peak	
5		920.4600	30.73	5.32	36.05	46.00	-9.95	peak	
6		951.5000	30.13	5.81	35.94	46.00	-10.06	peak	

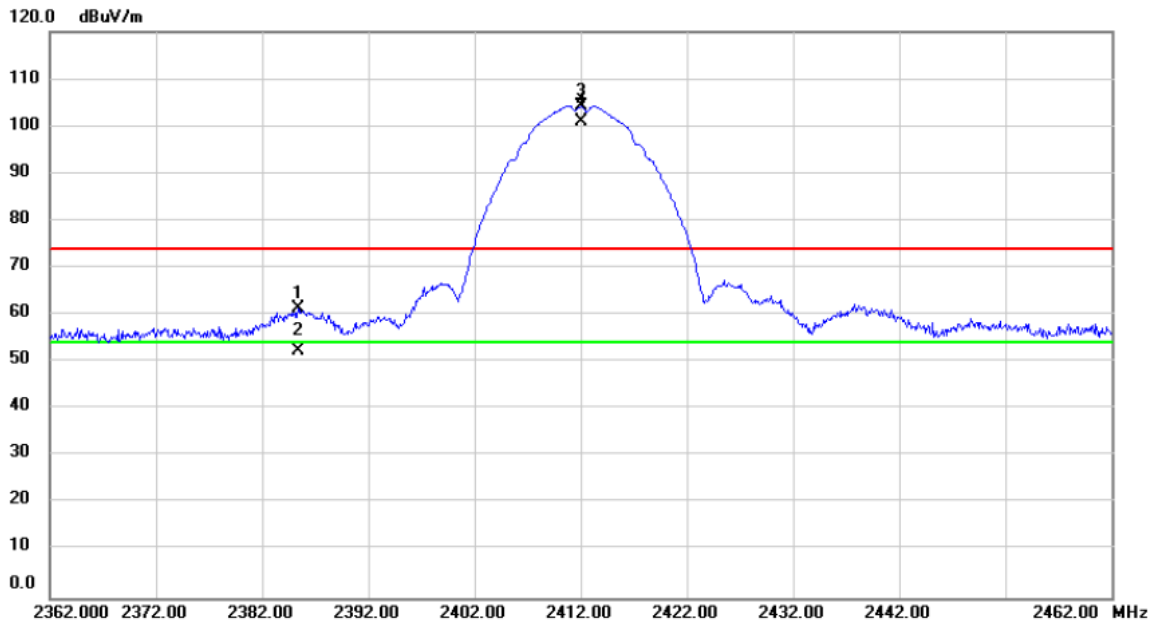
Test Mode	TX N (HT20) Mode_2437MHz	Polarization	Horizontal
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	322.9400	49.28	-6.91	42.37	46.00	-3.63	QP	
2		480.0800	37.82	-3.27	34.55	46.00	-11.45	peak	
3		519.8500	40.93	-2.56	38.37	46.00	-7.63	QP	
4		878.7500	30.64	4.55	35.19	46.00	-10.81	peak	
5		920.4600	30.53	5.32	35.85	46.00	-10.15	peak	
6		945.6800	30.28	5.73	36.01	46.00	-9.99	peak	

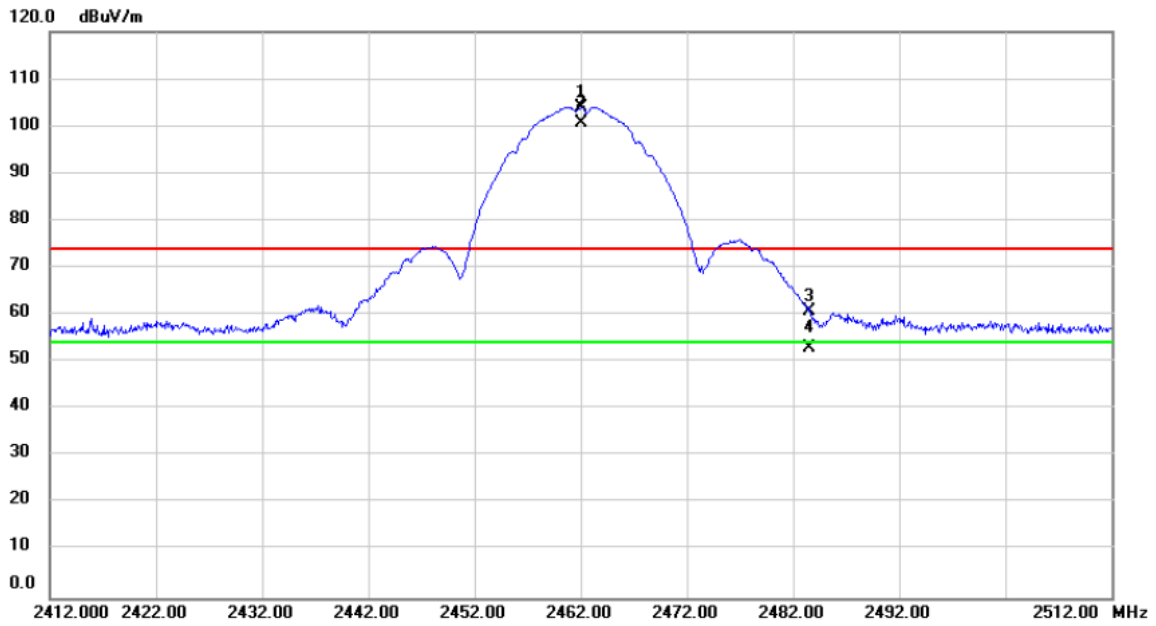
APPENDIX D RADIATED EMISSIONS - ABOVE 1000 MHZ

Test Mode	TX B Mode_2412MHz	Polarization	Horizontal
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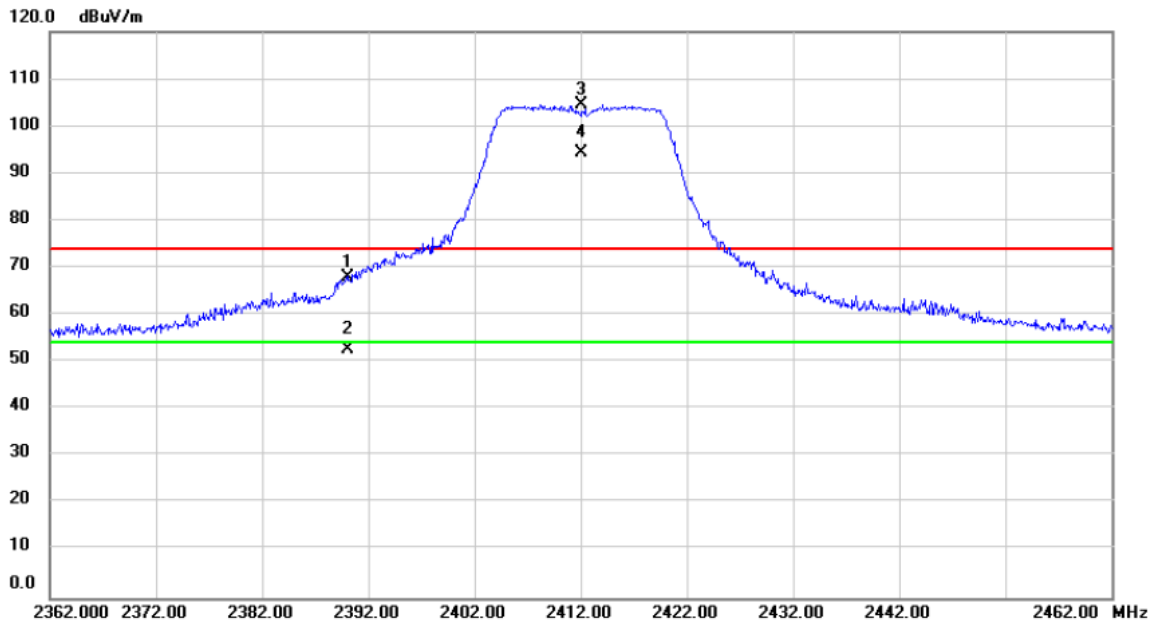
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2385.400	30.19	31.01	61.20	74.00	-12.80	peak	
2		2385.400	21.32	31.01	52.33	54.00	-1.67	AVG	
3	X	2412.000	73.09	31.14	104.23	74.00	30.23	peak	No Limit
4	*	2412.000	69.92	31.14	101.06	54.00	47.06	AVG	No Limit

Test Mode	TX B Mode_2462MHz	Polarization	Horizontal
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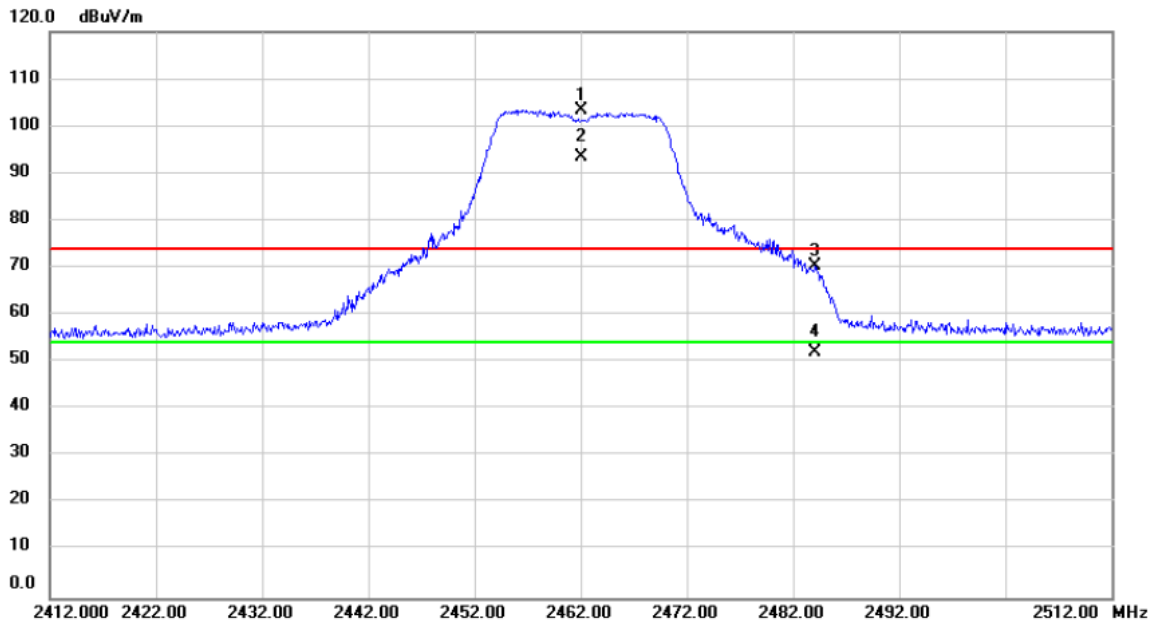
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	X	2462.000	72.69	31.36	104.05	74.00	30.05	peak	No Limit
2	*	2462.000	69.34	31.36	100.70	54.00	46.70	AVG	No Limit
3		2483.600	29.31	31.46	60.77	74.00	-13.23	peak	
4		2483.600	21.36	31.46	52.82	54.00	-1.18	AVG	

Test Mode	TX G Mode_2412MHz	Polarization	Horizontal
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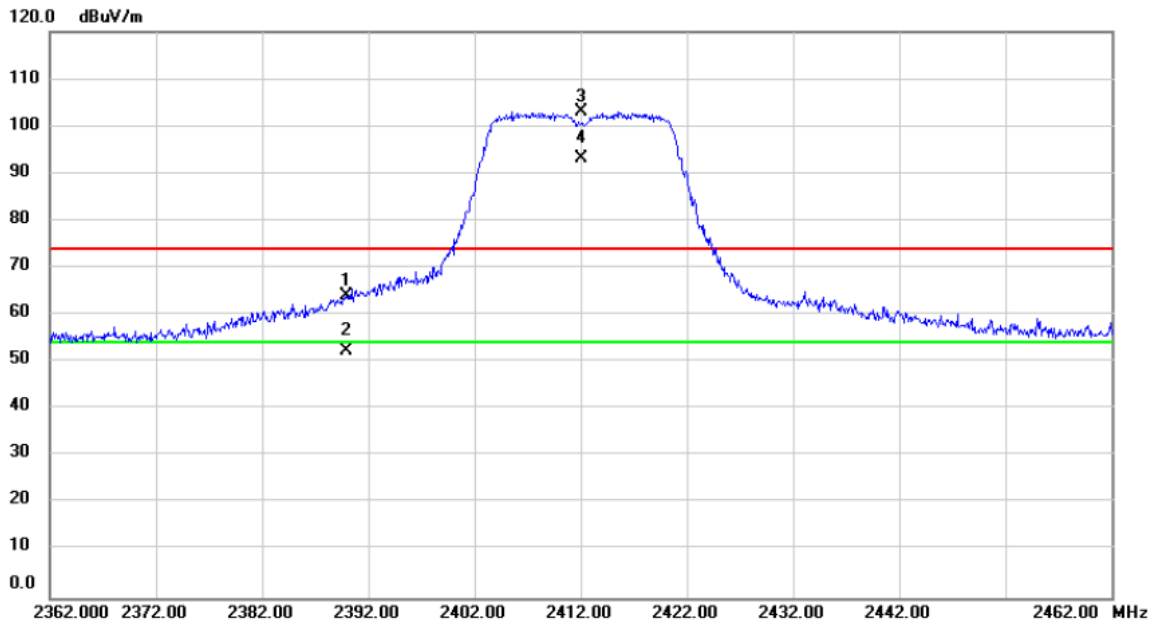
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2390.000	37.07	31.03	68.10	74.00	-5.90	peak	
2		2390.000	21.77	31.03	52.80	54.00	-1.20	AVG	
3	X	2412.000	73.30	31.14	104.44	74.00	30.44	peak	No Limit
4	*	2412.000	63.10	31.14	94.24	54.00	40.24	AVG	No Limit

Test Mode	TX G Mode_2462MHz	Polarization	Horizontal
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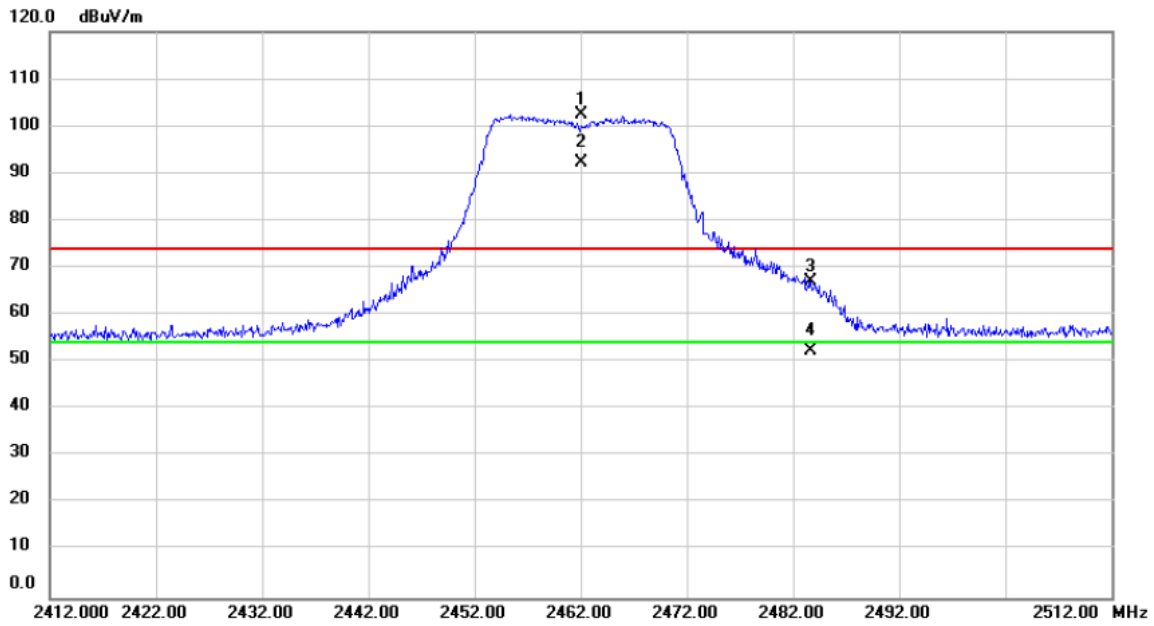
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	X	2462.000	72.05	31.36	103.41	74.00	29.41	peak	
2	*	2462.000	62.24	31.36	93.60	54.00	39.60	AVG	
3		2484.100	38.75	31.46	70.21	74.00	-3.79	peak	
4		2484.100	20.63	31.46	52.09	54.00	-1.91	AVG	

Test Mode	TX N (HT20) Mode_2412MHz	Polarization	Horizontal
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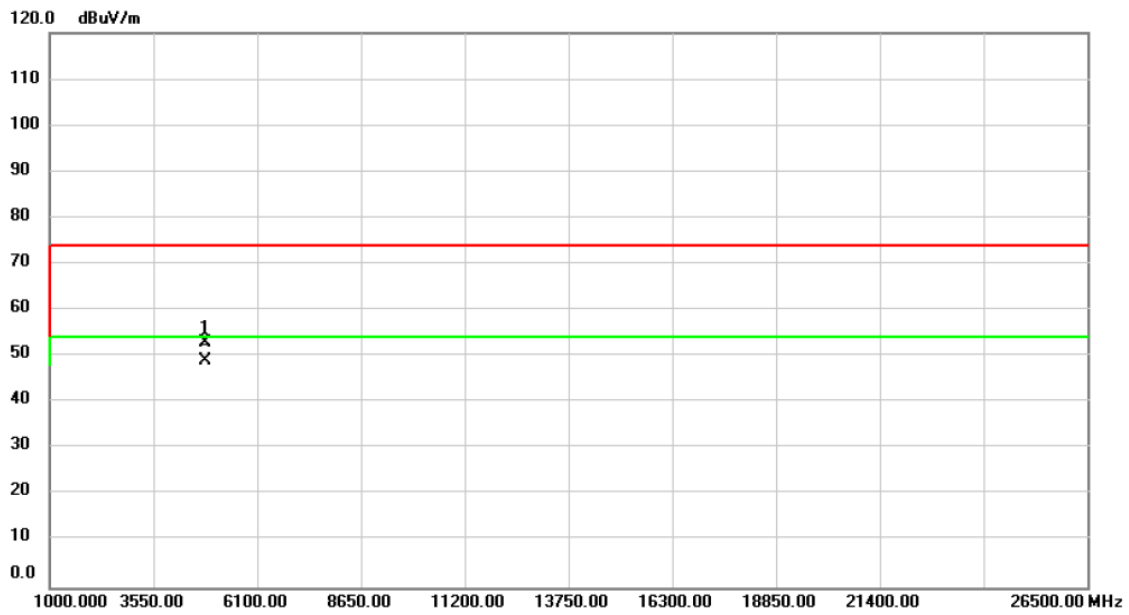
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2389.900	32.95	31.03	63.98	74.00	-10.02	peak	
2		2389.900	21.41	31.03	52.44	54.00	-1.56	AVG	
3	X	2412.000	72.04	31.14	103.18	74.00	29.18	peak	No Limit
4	*	2412.000	61.93	31.14	93.07	54.00	39.07	AVG	No Limit

Test Mode	TX N (HT20) Mode_2462MHz	Polarization	Horizontal
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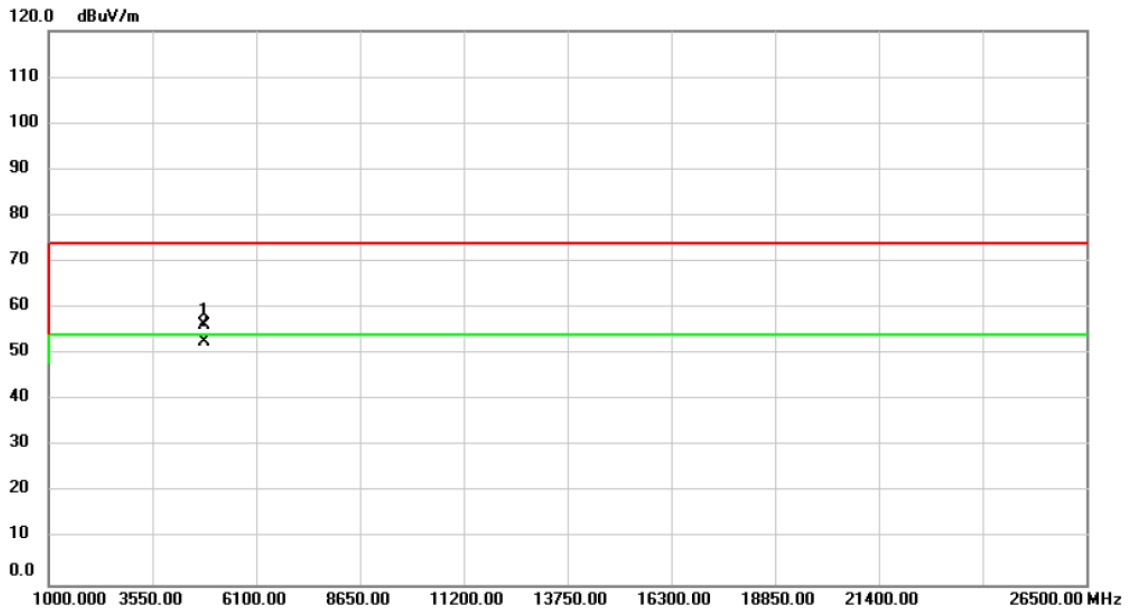
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	X	2462.000	71.20	31.36	102.56	74.00	28.56	peak	No Limit
2	*	2462.000	60.92	31.36	92.28	54.00	38.28	AVG	No Limit
3		2483.700	35.45	31.46	66.91	74.00	-7.09	peak	
4		2483.700	20.86	31.46	52.32	54.00	-1.68	AVG	

Test Mode	TX B MODE _2412 MHz	Polarization	Vertical
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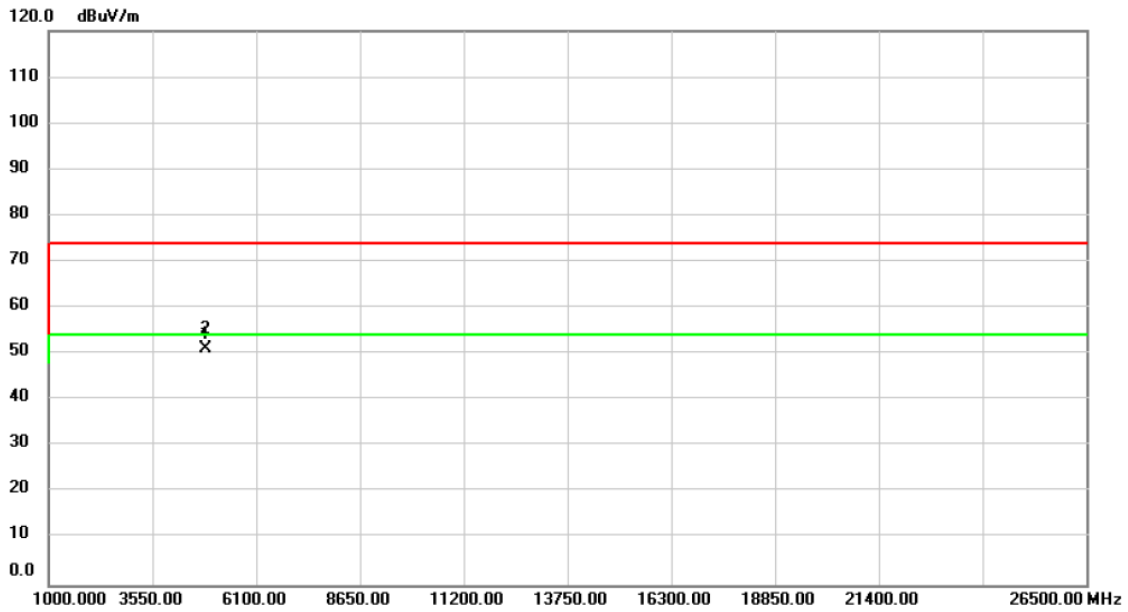
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4824.000	64.50	-11.48	53.02	74.00	-20.98	peak	
2 *	4824.000	60.61	-11.48	49.13	54.00	-4.87	AVG	

Test Mode	TX B MODE _2412 MHz	Polarization	Horizontal
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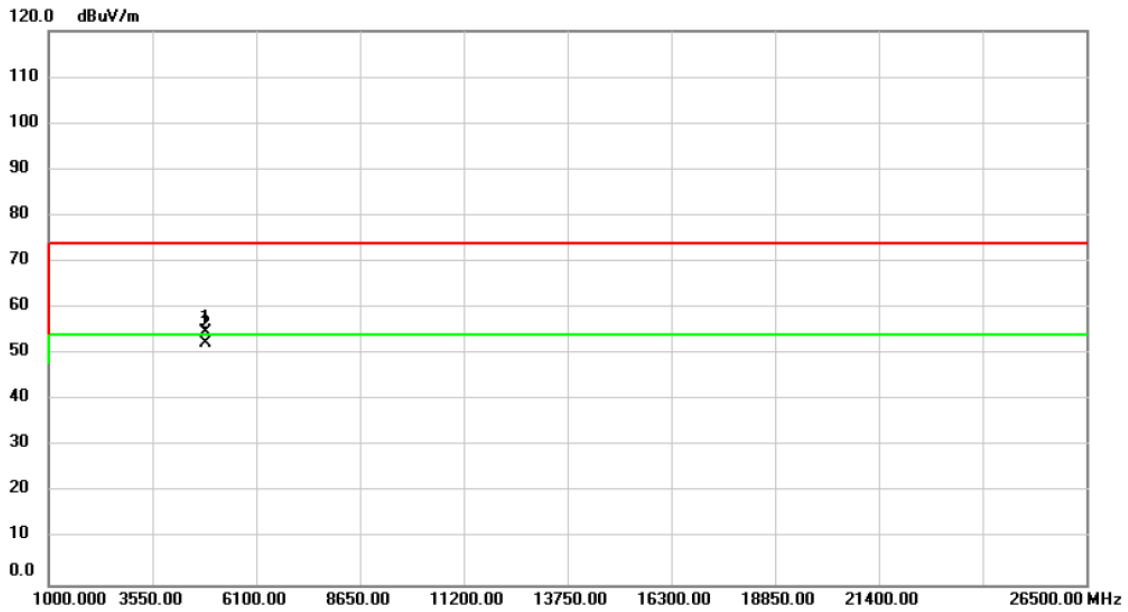
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4824.000	67.84	-11.48	56.36	74.00	-17.64	peak	
2 *	4824.000	64.13	-11.48	52.65	54.00	-1.35	AVG	

Test Mode	TX B MODE _2437 MHz	Polarization	Vertical
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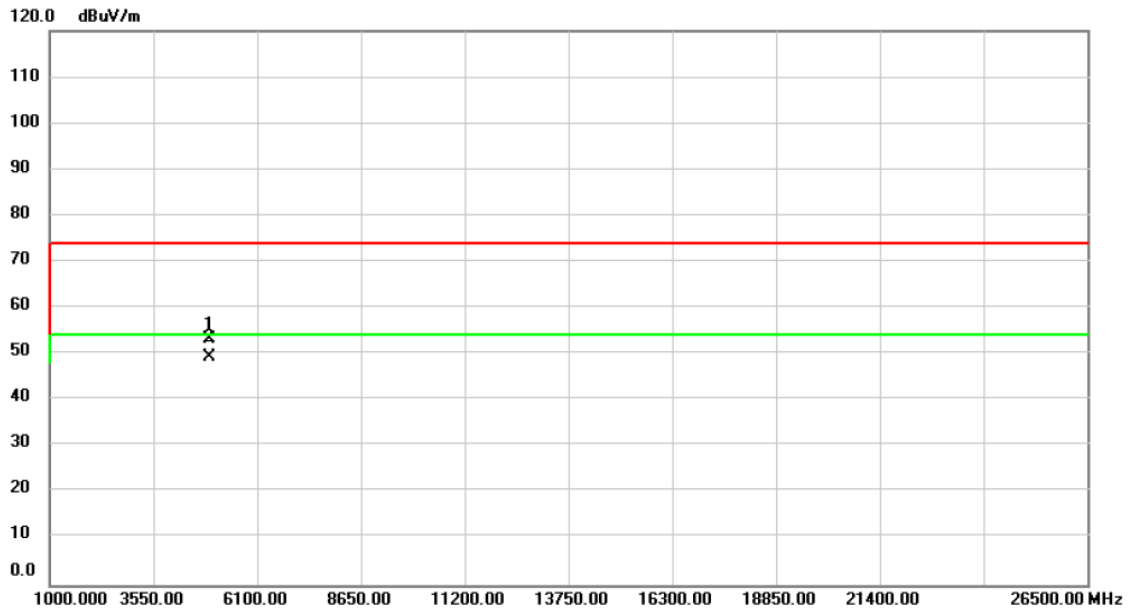
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	4874.000	62.55	-11.42	51.13	74.00	-22.87	peak	
2 *	4874.000	62.50	-11.42	51.08	54.00	-2.92	AVG	

Test Mode	TX B MODE _2437 MHz	Polarization	Horizontal
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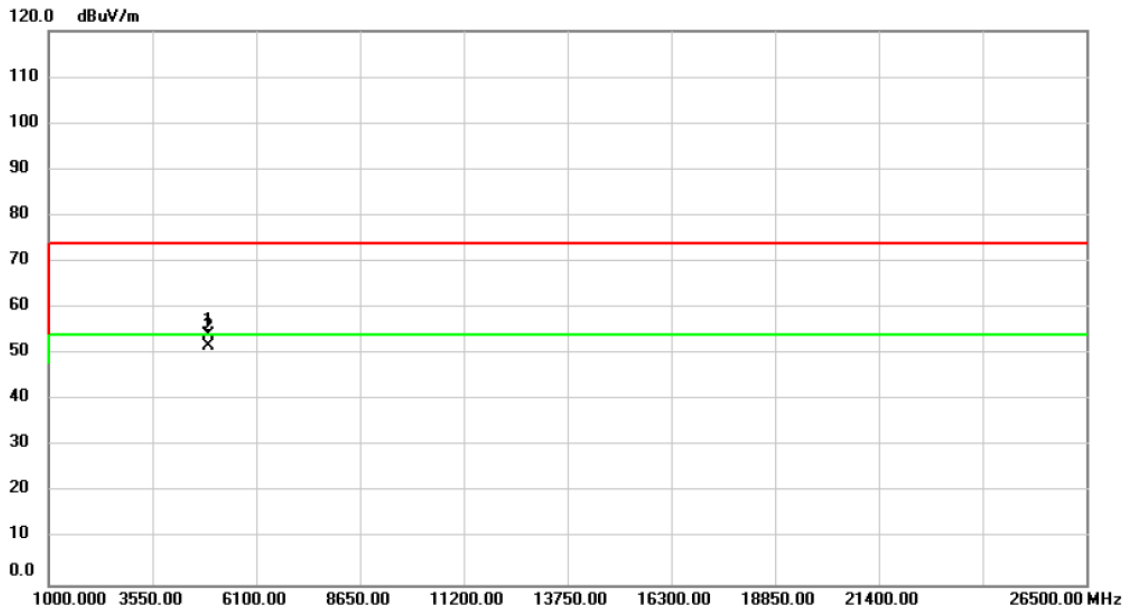
No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	4874.000	66.08	-11.42	54.66	74.00	-19.34	peak	
2 *	4874.000	63.72	-11.42	52.30	54.00	-1.70	AVG	

Test Mode	TX B MODE _2462 MHz	Polarization	Vertical
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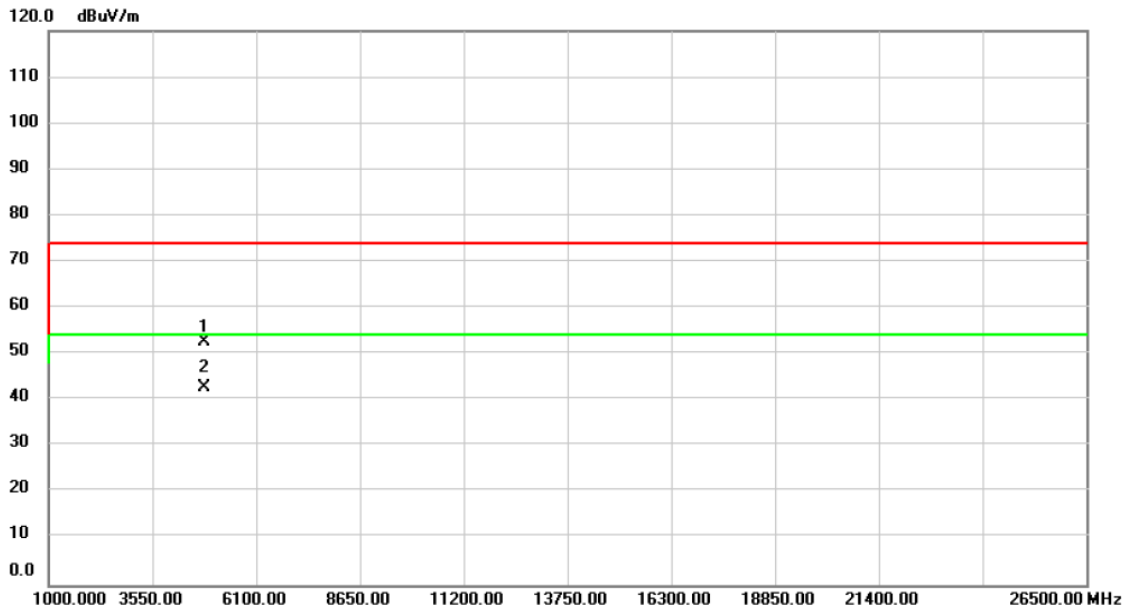
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4924.000	64.50	-11.37	53.13	74.00	-20.87	peak	
2 *	4924.000	60.81	-11.37	49.44	54.00	-4.56	AVG	

Test Mode	TX B MODE _2462 MHz	Polarization	Horizontal
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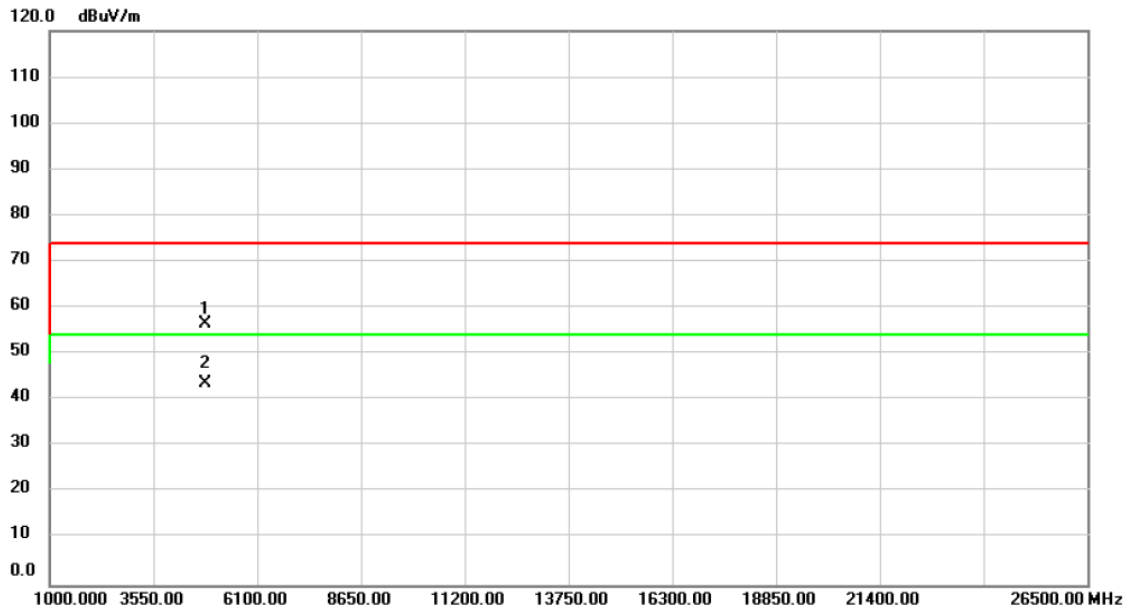
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4924.000	65.56	-11.37	54.19	74.00	-19.81	peak	
2 *	4924.000	63.15	-11.37	51.78	54.00	-2.22	AVG	

Test Mode	TX G MODE _2412 MHz	Polarization	Vertical
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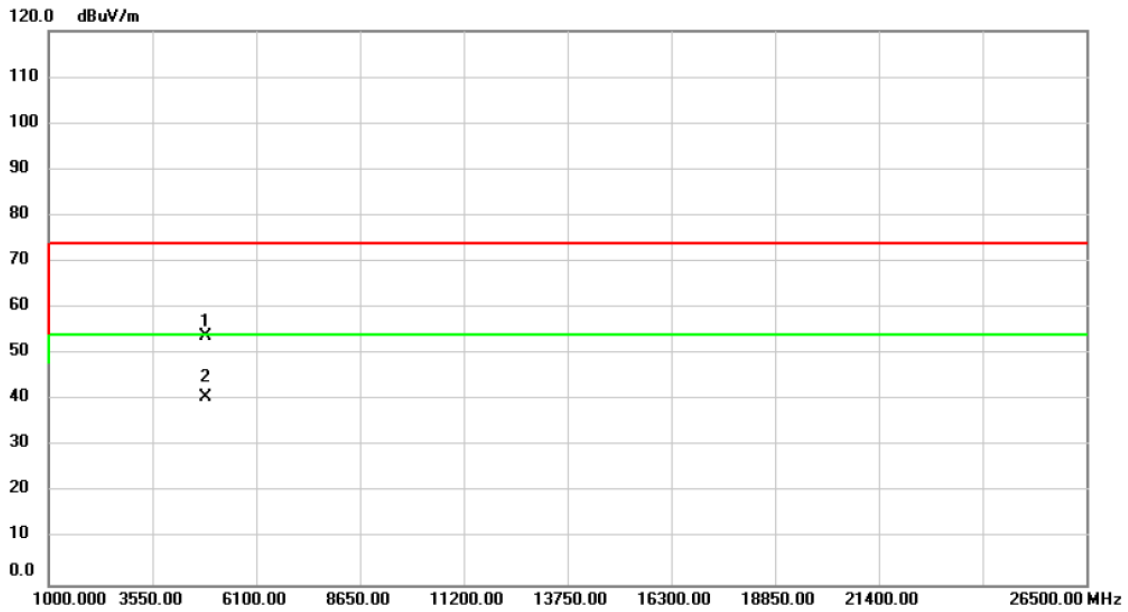
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4824.000	64.11	-11.48	52.63	74.00	-21.37	peak	
2 *	4824.000	54.17	-11.48	42.69	54.00	-11.31	AVG	

Test Mode	TX G MODE _2412 MHz	Polarization	Horizontal
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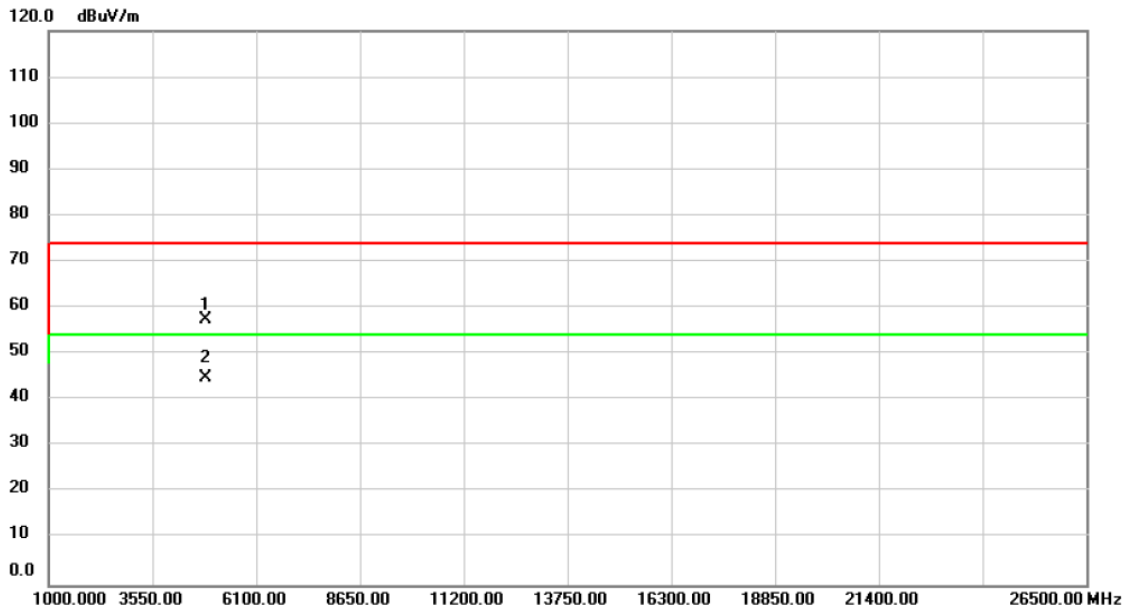
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4824.000	68.11	-11.48	56.63	74.00	-17.37	peak	
2 *	4824.000	55.17	-11.48	43.69	54.00	-10.31	AVG	

Test Mode	TX G MODE _2437 MHz	Polarization	Vertical
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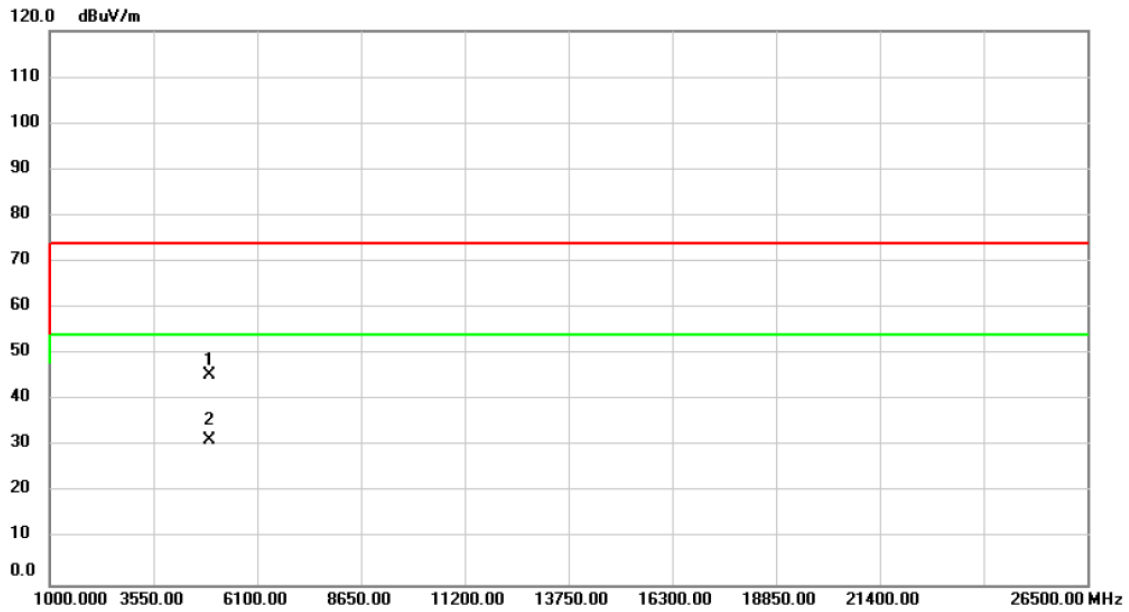
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4874.000	65.34	-11.42	53.92	74.00	-20.08	peak	
2 *	4874.000	52.17	-11.42	40.75	54.00	-13.25	AVG	

Test Mode	TX G MODE _2437 MHz	Polarization	Horizontal
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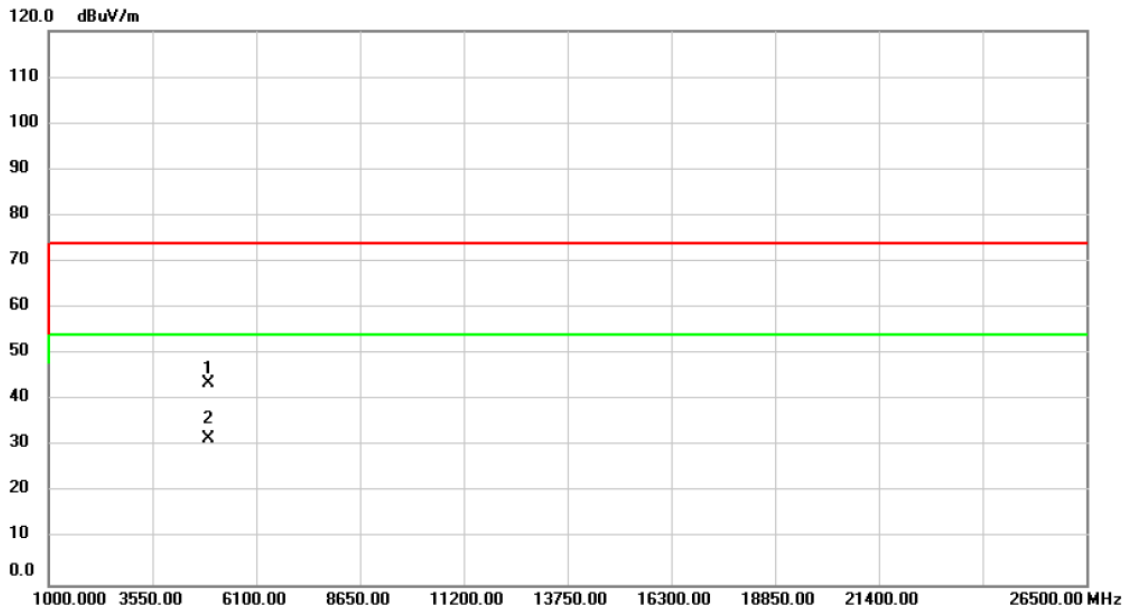
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4874.000	68.79	-11.42	57.37	74.00	-16.63	peak	
2 *	4874.000	56.15	-11.42	44.73	54.00	-9.27	AVG	

Test Mode	TX G MODE _2462 MHz	Polarization	Vertical
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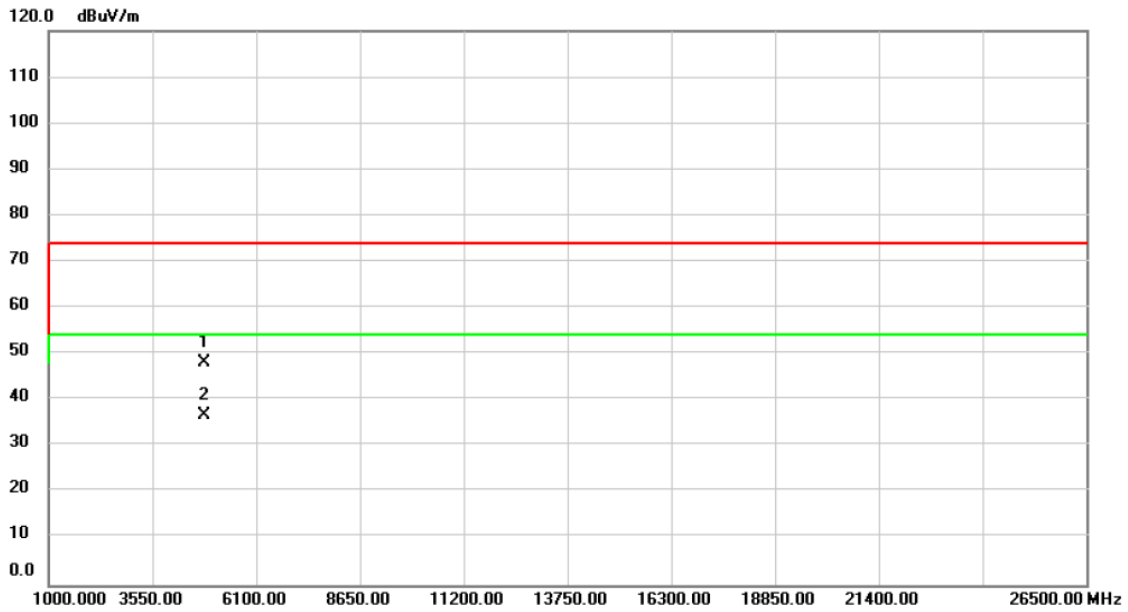
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4924.000	56.97	-11.37	45.60	74.00	-28.40	peak	
2 *	4924.000	42.66	-11.37	31.29	54.00	-22.71	AVG	

Test Mode	TX G MODE _2462 MHz	Polarization	Horizontal
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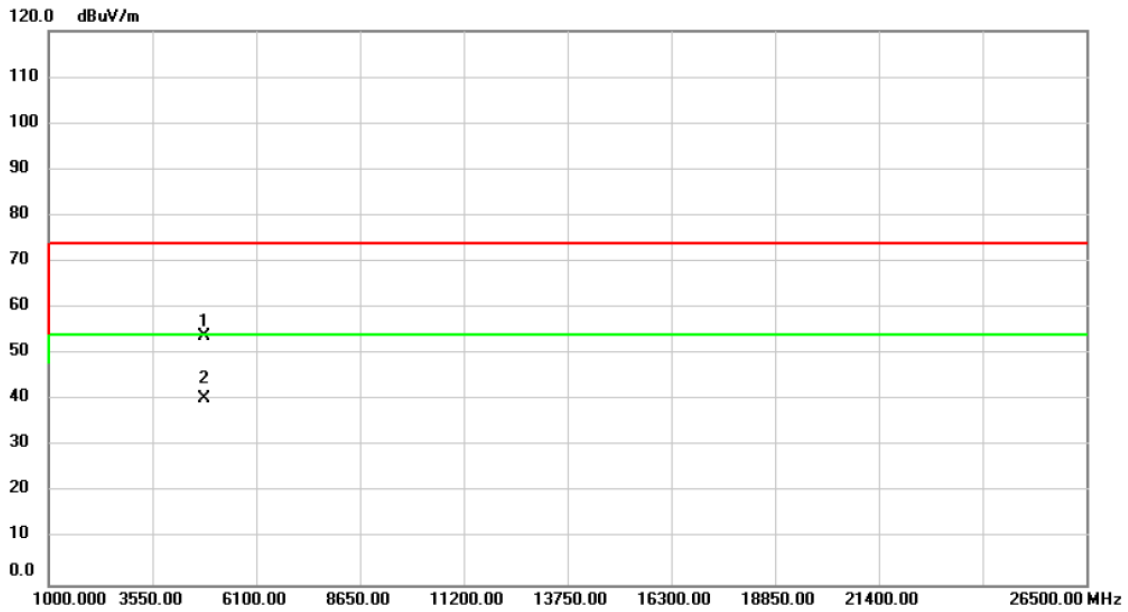
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4924.000	54.95	-11.37	43.58	74.00	-30.42	peak	
2 *	4924.000	42.94	-11.37	31.57	54.00	-22.43	AVG	

Test Mode	TX N (HT20) MODE 2412MHz	Polarization	Vertical
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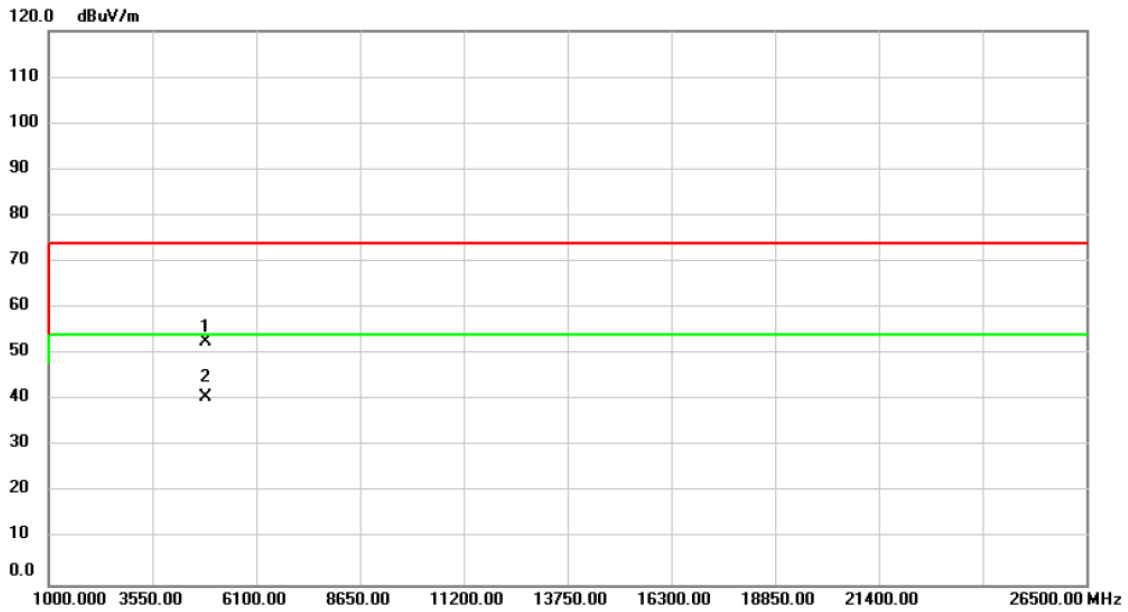
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4824.000	59.64	-11.48	48.16	74.00	-25.84	QP	
2 *	4824.000	48.33	-11.48	36.85	54.00	-17.15	AVG	

Test Mode	TX N (HT20) MODE 2412MHz	Polarization	Horizontal
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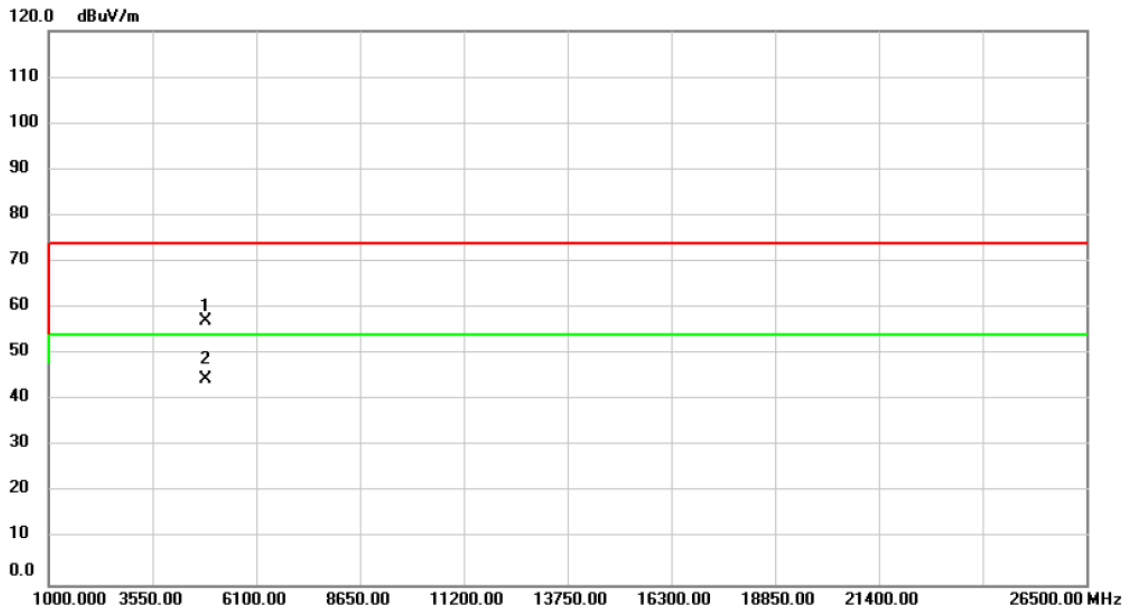
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4824.000	65.25	-11.48	53.77	74.00	-20.23	peak	
2 *	4824.000	51.93	-11.48	40.45	54.00	-13.55	AVG	

Test Mode	TX N (HT20) MODE 2437MHz	Polarization	Vertical
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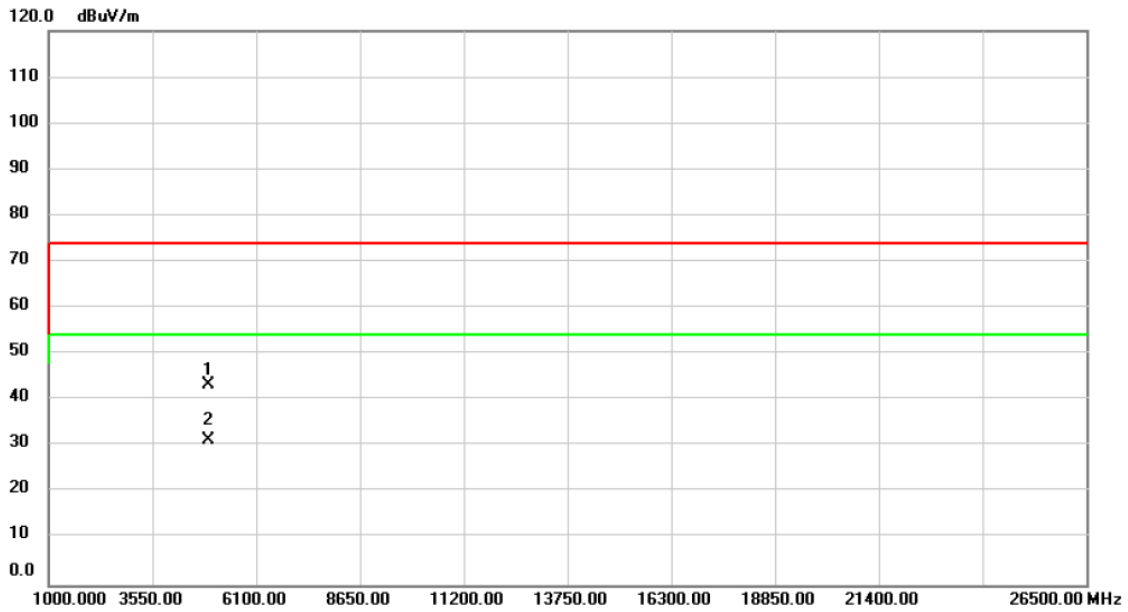
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4874.000	64.22	-11.42	52.80	74.00	-21.20	peak	
2 *	4874.000	52.05	-11.42	40.63	54.00	-13.37	AVG	

Test Mode	TX N (HT20) MODE 2437MHz	Polarization	Horizontal
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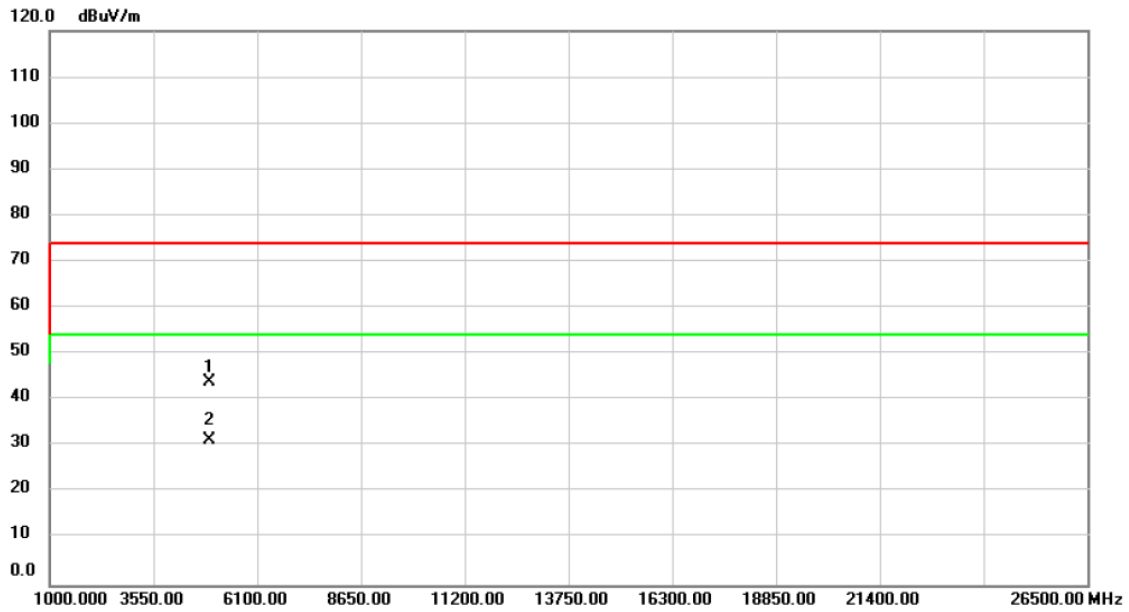
No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4874.000	68.66	-11.42	57.24	74.00	-16.76	peak	
2 *	4874.000	55.97	-11.42	44.55	54.00	-9.45	AVG	

Test Mode	TX N (HT20) MODE 2462MHz	Polarization	Vertical
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No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4924.000	54.71	-11.37	43.34	74.00	-30.66	peak	
2 *	4924.000	42.84	-11.37	31.47	54.00	-22.53	AVG	

Test Mode	TX N (HT20) MODE 2462MHz	Polarization	Horizontal
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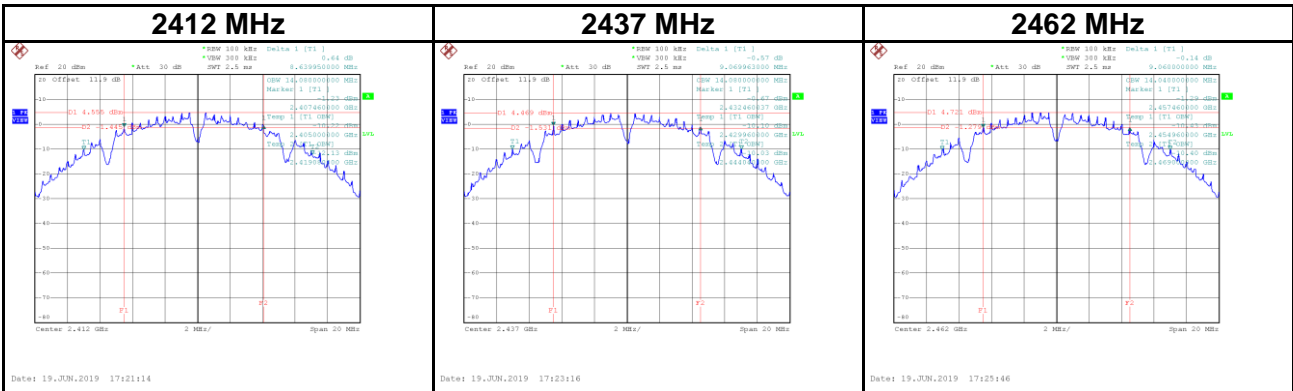


No. Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1	4924.000	55.26	-11.37	43.89	74.00	-30.11	peak	
2 *	4924.000	42.74	-11.37	31.37	54.00	-22.63	AVG	

APPENDIX E BANDWIDTH

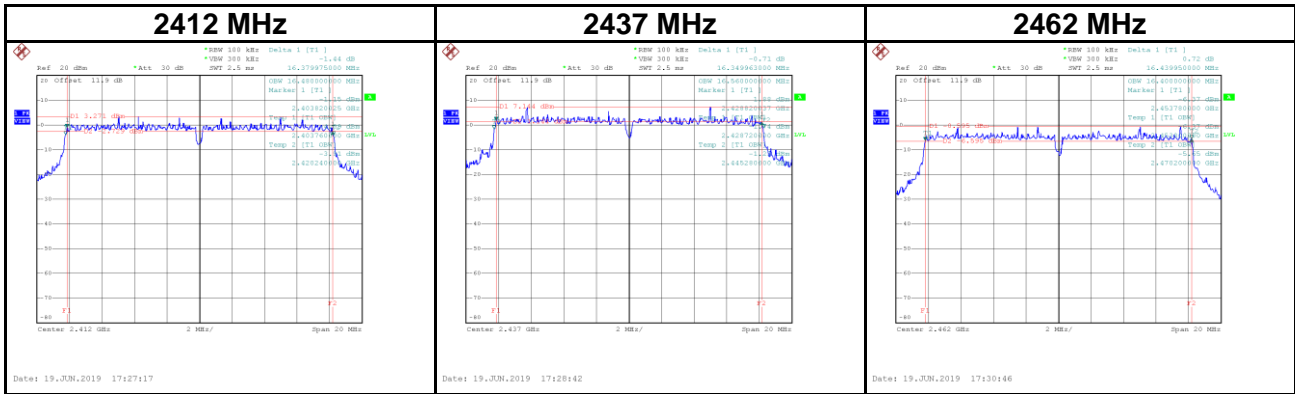
Test Mode	IEEE 802.11b
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Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Limit (kHz)	Result
2412	8.64	14.08	500.00	Complies
2437	9.07	14.08	500.00	Complies
2462	9.06	14.04	500.00	Complies



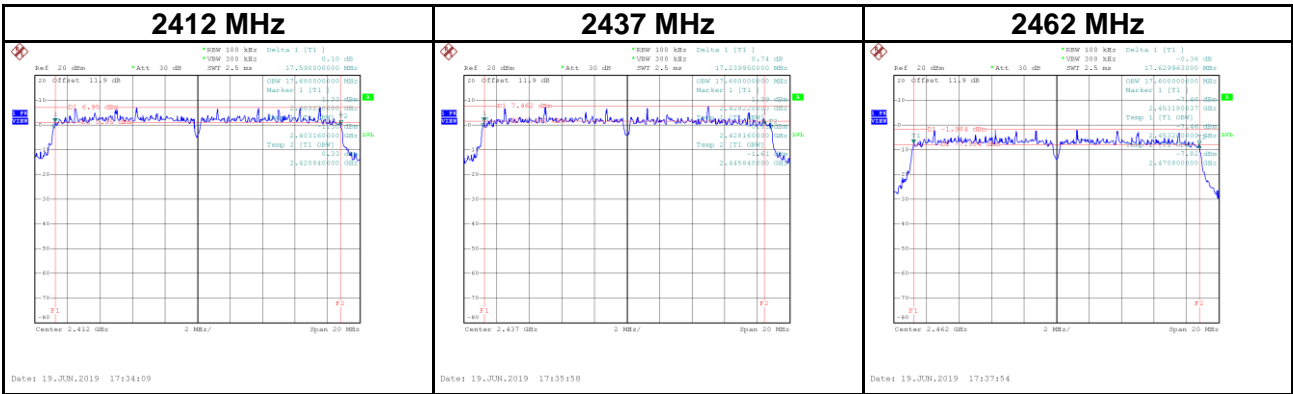
Test Mode	IEEE 802.11g
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Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Limit (kHz)	Result
2412	16.38	16.48	500.00	Complies
2437	16.35	16.56	500.00	Complies
2462	16.44	16.40	500.00	Complies



Test Mode	IEEE 802.11n (HT20)
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Frequency (MHz)	6 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Limit (kHz)	Result
2412	17.59	17.68	500.00	Complies
2437	17.24	17.68	500.00	Complies
2462	17.63	17.60	500.00	Complies



APPENDIX F PEAK OUTPUT POWER

Test Mode	IEEE 802.11b
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Limit (dBm)	Limit (W)	Result
2412	16.62	0.0459	30.00	1.0000	Complies
2437	16.43	0.0440	30.00	1.0000	Complies
2462	15.89	0.0388	30.00	1.0000	Complies

Test Mode	IEEE 802.11g
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Limit (dBm)	Limit (W)	Result
2412	20.21	0.1050	30.00	1.0000	Complies
2437	21.84	0.1528	30.00	1.0000	Complies
2462	16.93	0.0493	30.00	1.0000	Complies

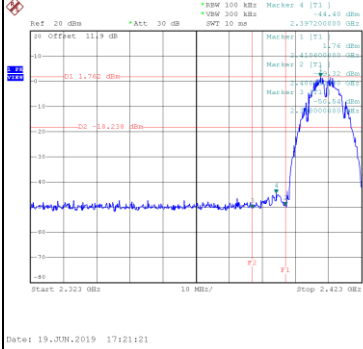
Test Mode	IEEE 802.11n (HT20)
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Limit (dBm)	Limit (W)	Result
2412	22.21	0.1663	30.00	1.0000	Complies
2437	21.76	0.1500	30.00	1.0000	Complies
2462	15.40	0.0347	30.00	1.0000	Complies

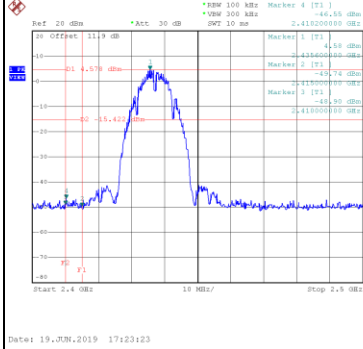
APPENDIX G ANTENNA CONDUCTED SPURIOUS EMISSIONS

Test Mode IEEE 802.11b

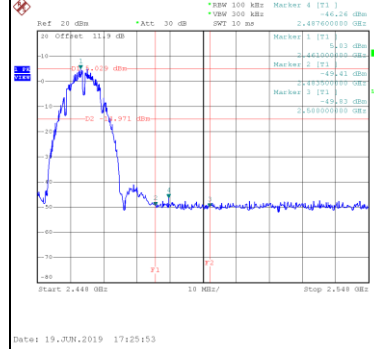
Bandedge-2412 MHz



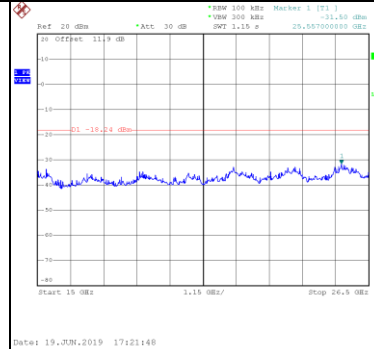
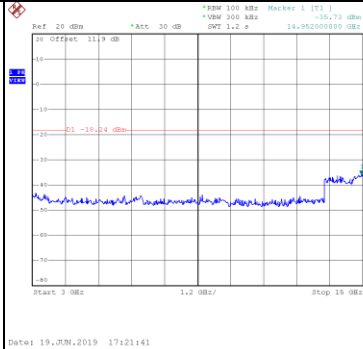
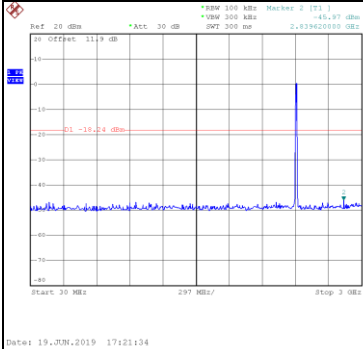
Bandedge-2437 MHz



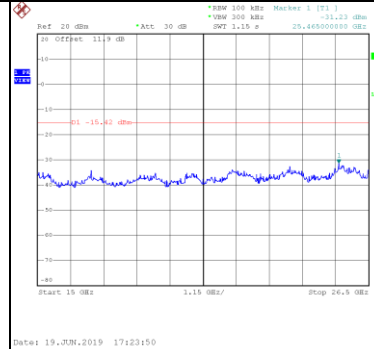
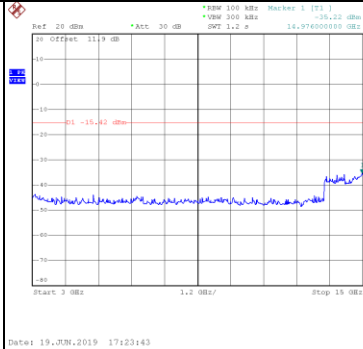
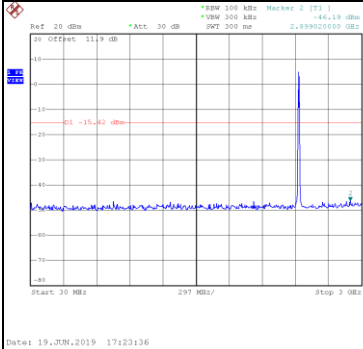
Bandedge-2462 MHz



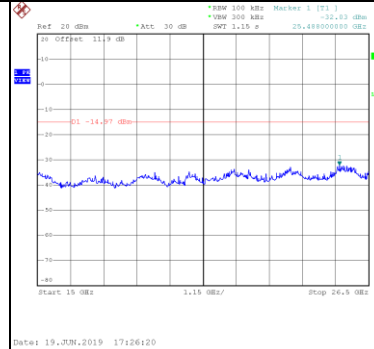
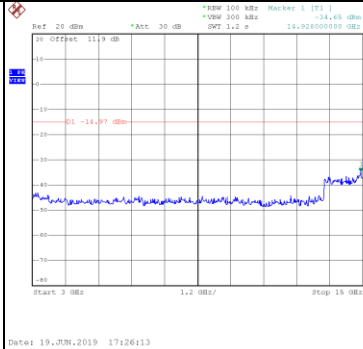
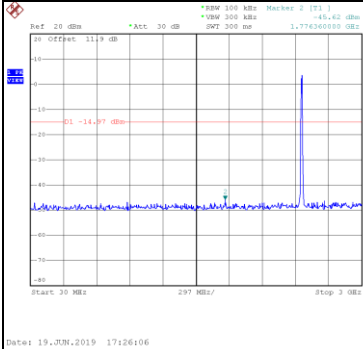
2412 MHz – 10 Harmonics



2437 MHz – 10 Harmonics

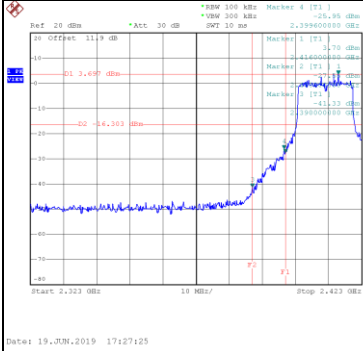


2462 MHz – 10 Harmonics

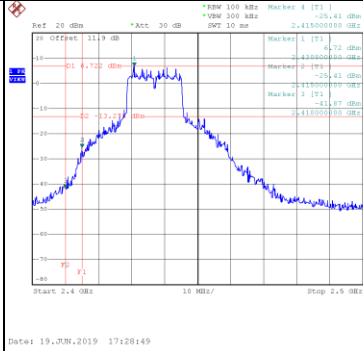


Test Mode IEEE 802.11g

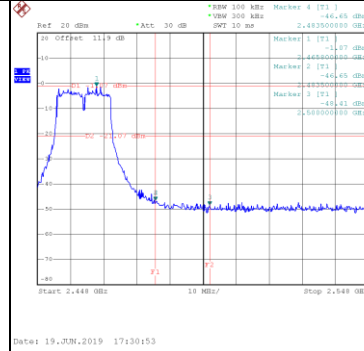
Bandedge-2412 MHz



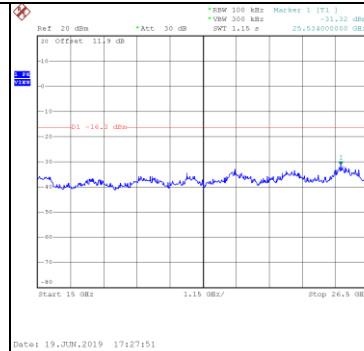
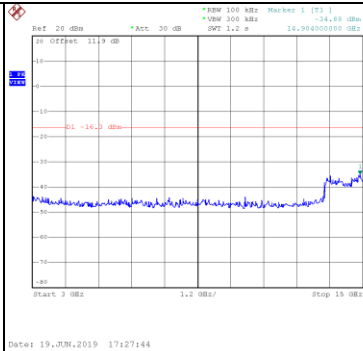
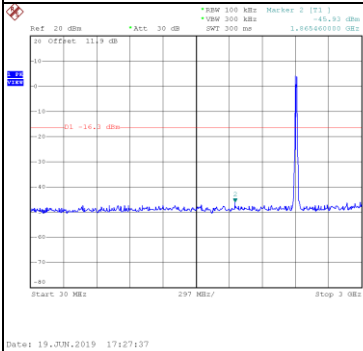
Bandedge-2437 MHz



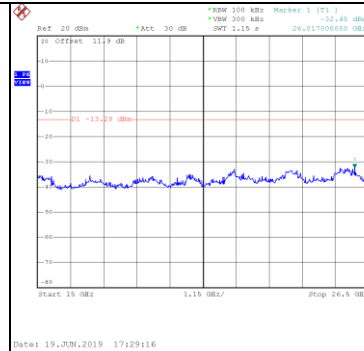
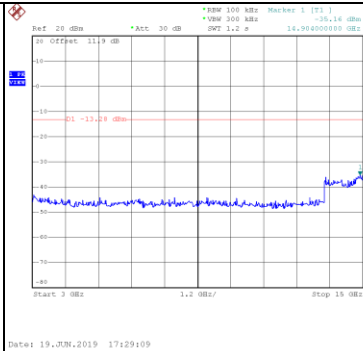
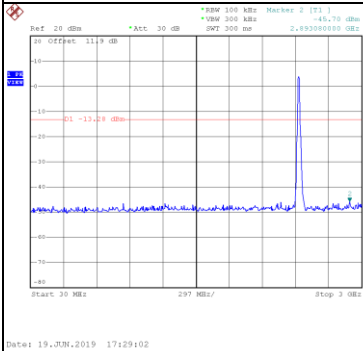
Bandedge-2462 MHz



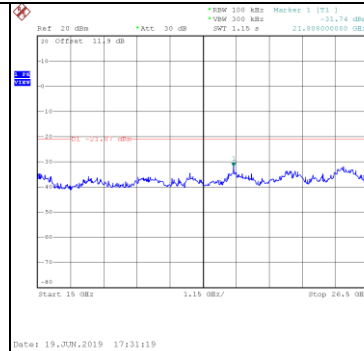
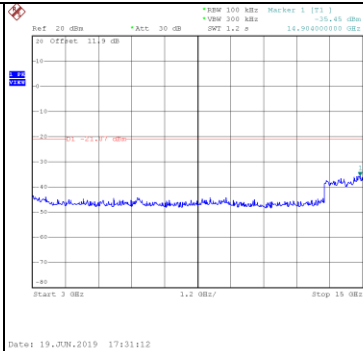
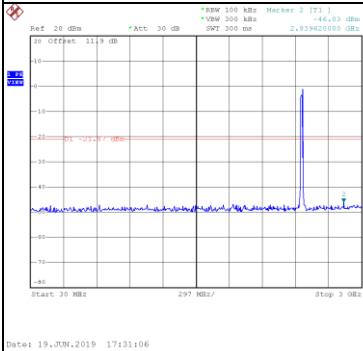
2412 MHz – 10 Harmonics



2437 MHz – 10 Harmonics

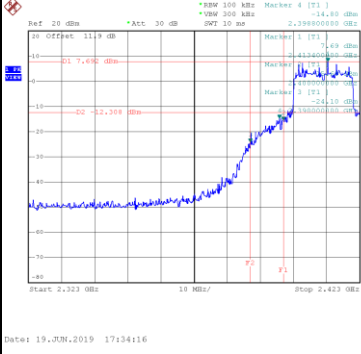


2462 MHz – 10 Harmonics

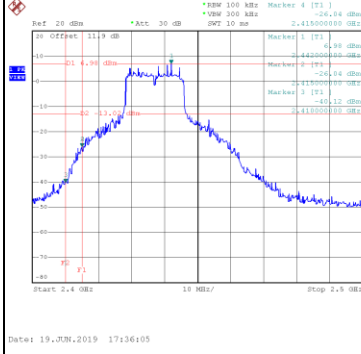


Test Mode IEEE 802.11n (HT20)

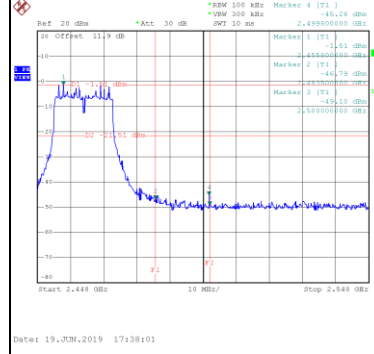
Bandedge-2412 MHz



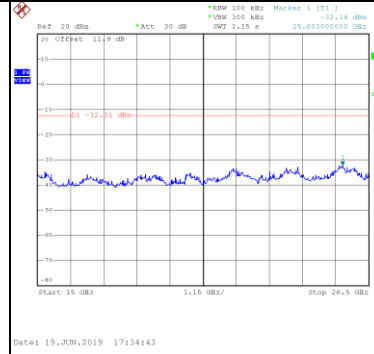
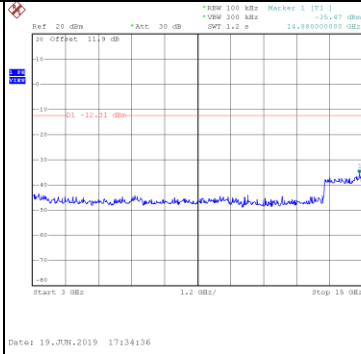
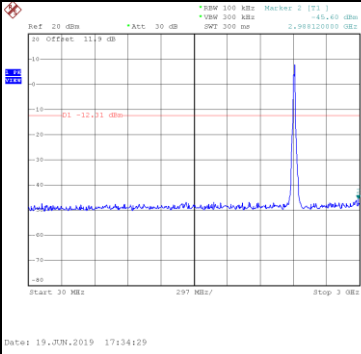
Bandedge-2437 MHz



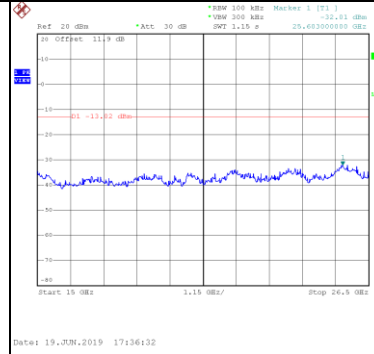
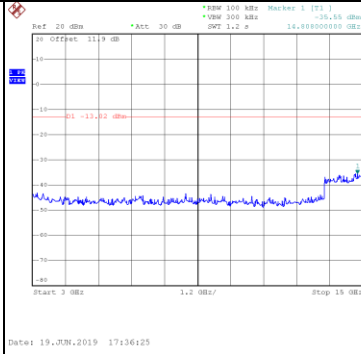
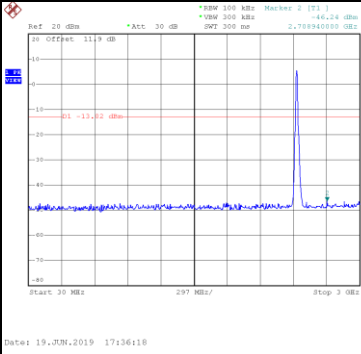
Bandedge-2462 MHz



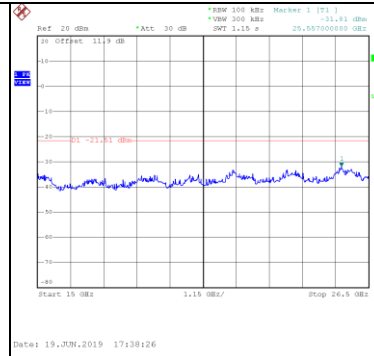
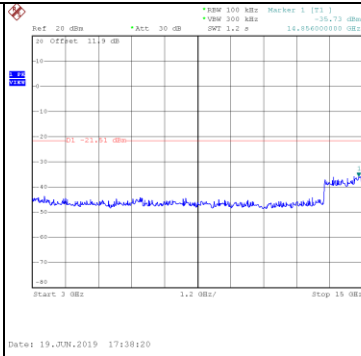
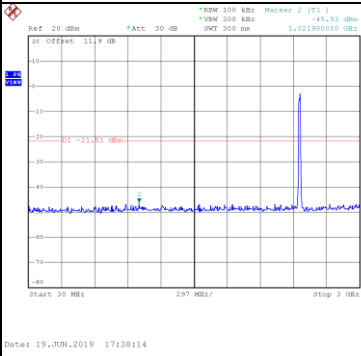
2412 MHz – 10 Harmonics



2437 MHz – 10 Harmonics



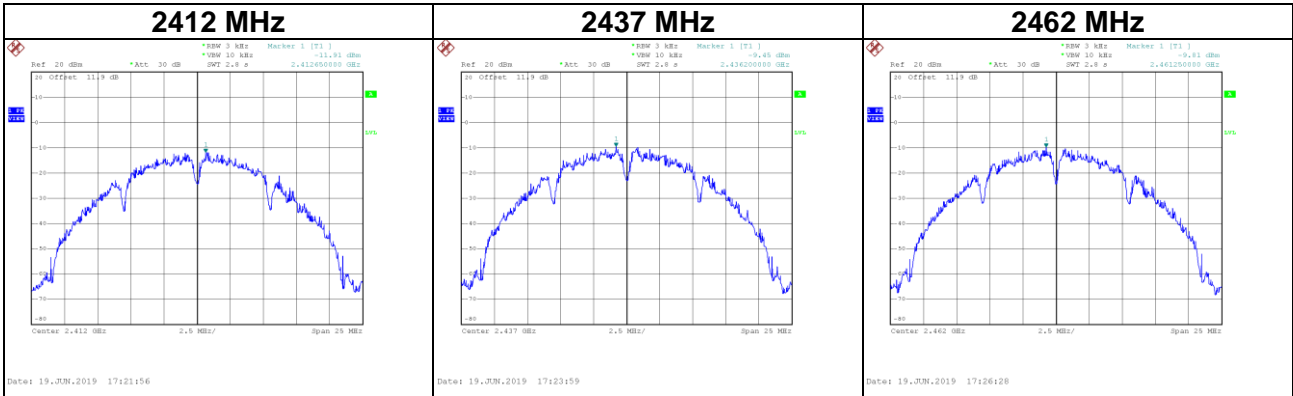
2462 MHz – 10 Harmonics



APPENDIX H POWER SPECTRAL DENSITY

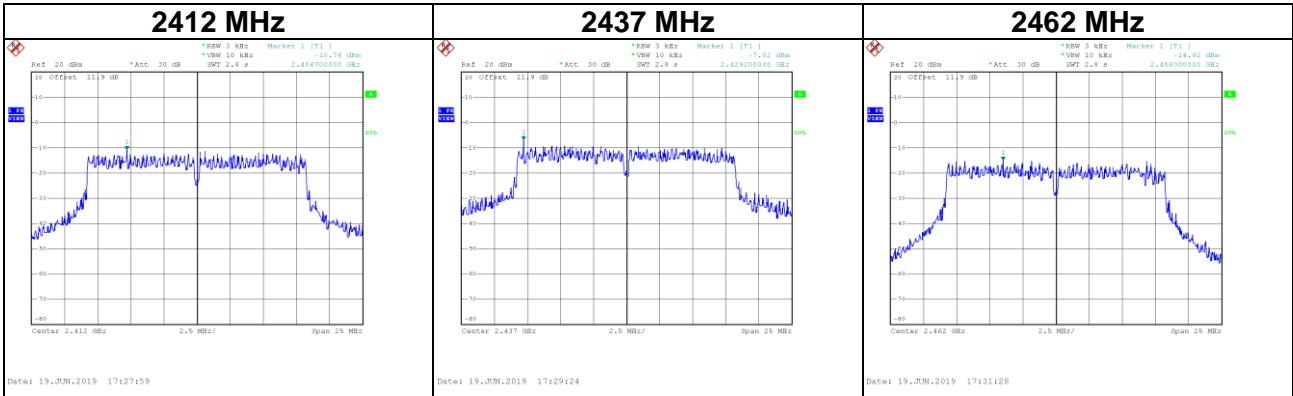
Test Mode	IEEE 802.11b
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Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
2412	-11.91	8.00	Complies
2437	-9.45	8.00	Complies
2462	-9.81	8.00	Complies



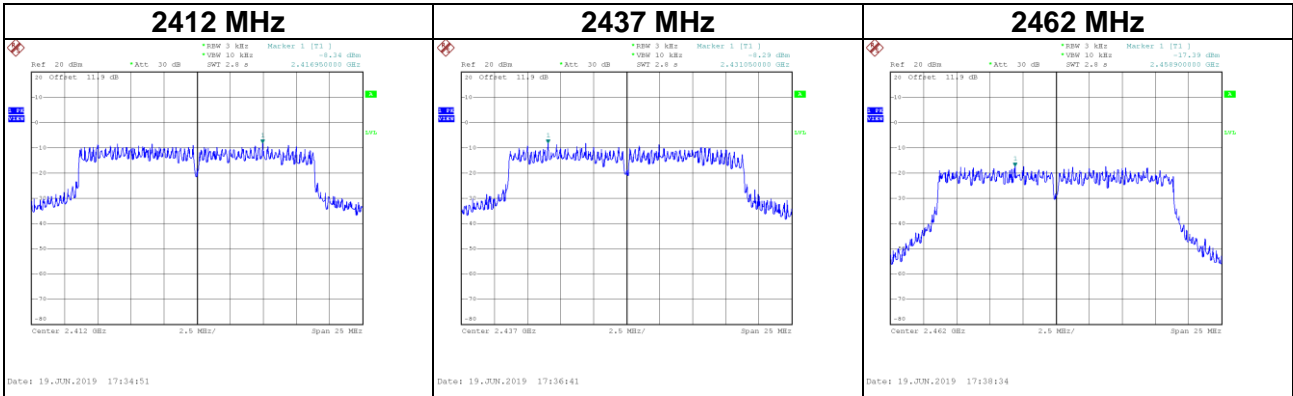
Test Mode	IEEE 802.11g
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Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
2412	-10.76	8.00	Complies
2437	-7.02	8.00	Complies
2462	-14.92	8.00	Complies



Test Mode	IEEE 802.11n (HT20)
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Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
2412	-8.34	8.00	Complies
2437	-8.29	8.00	Complies
2462	-17.39	8.00	Complies



End of Test Report