TEST REPORT

Applicant Name:	PACBRAKE COMPANY
Address:	26688 56 Ave,Langley BC Canada V4W 3X5
Report Number:	2401U80232E-RF-00B
FCC ID:	2BKZI-HP10660

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	WIRELESS AIR CONTROLS REMOTE
Model No.:	HP10660
Multiple Model(s) No.:	N/A
Trade Mark:	PACBRAKE
Date Received:	2024/06/18
Issue Date:	2024/10/24

Test Result:	Pass▲

▲ In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Ekko. Wu

Ekko Wu
RF Engineer

Approved By:

Nancy Wang

Nancy Wang
RF Supervisor

Note: The information marked# is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2401U80232E-RF-00B	Original Report	2024/10/24

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	WIRELESS AIR CONTROLS REMOTE
Tested Model	HP10660
Multiple Model(s)	N/A
Frequency Range	BLE: 2402-2480MHz Wi-Fi: 2412-2462MHz
Maximum Conducted Output Peak Power	BLE: 9.12dBm Wi-Fi: 19.34dBm
Modulation Technique	BLE: GFSK Wi-Fi: DSSS, OFDM
Antenna Specification#	1.2dBi (provided by the applicant)
Voltage Range	DC 3.8V from battery or DC 5V from USB Port
Sample serial number	2NB8-2 for Conducted and Radiated Emissions Test 2NB8-1 for RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		0.72 dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz~150 kHz	3.94dB(k=2, 95% level of confidence)
	150 kHz ~30MHz	3.84dB(k=2, 95% level of confidence)
Radiated Emissions	9kHz - 30MHz	3.30dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	4.48dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	4.55dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	4.85dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.05dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.35dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.44dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.16dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 715558, the FCC Designation No. : CN5045.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 2.4GHz Wi-Fi mode, total 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

802.11b, 802.11g and 802.11n-HT20 mode was tested with Channel 1, 6 and 11.
802.11n-HT40 mode was tested with Channel 3, 6 and 9.

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

EUT was testing in engineering mode.

The device was tested with the worst case was performed as below:

Mode	Data rate	Power Level#		
		Low Channel	Middle Channel	High Channel
802.11b	1Mbps	12	12	12
802.11g	6Mbps	15	15	15
802.11n20	MCS0	15	15	15
802.11n40	MCS0	12	12	12
BLE	1Mbps	Default	Default	Default

Note: the power level was provided by applicant.

Duty cycle

Please refer to the Appendix.

Support Equipment List and Details

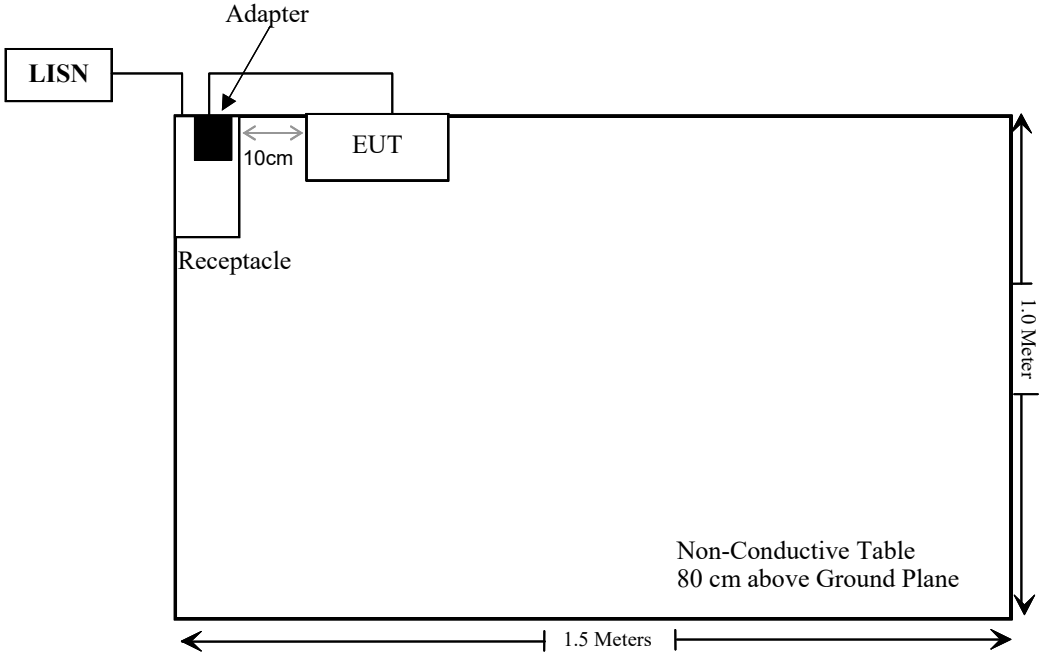
Manufacturer	Description	Model	Serial Number
XED	Adapter	XED-UL 050100CU	Unknown

External I/O Cable

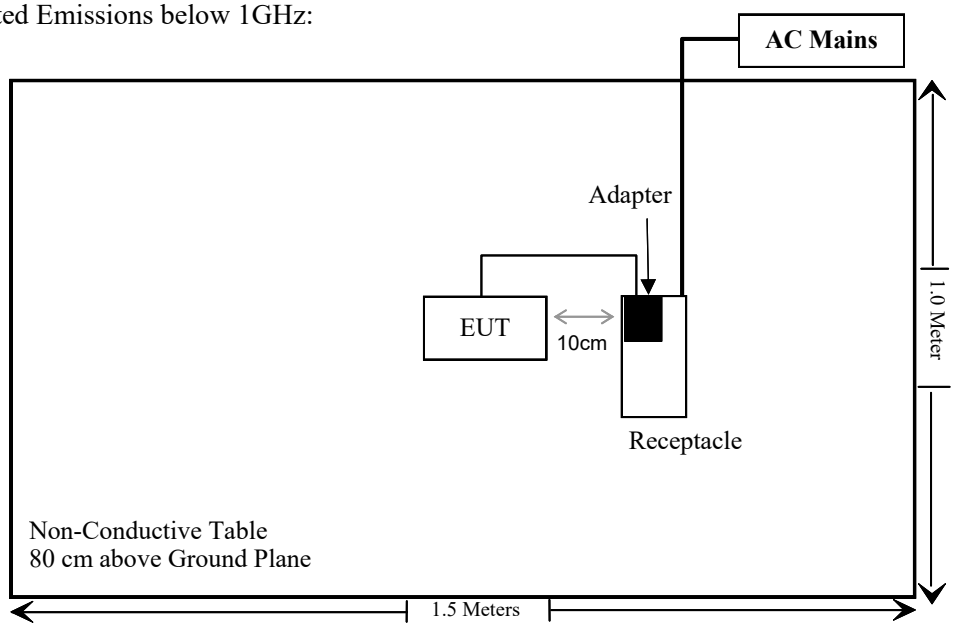
Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	1.0	EUT	Adapter

Block Diagram of Test Setup

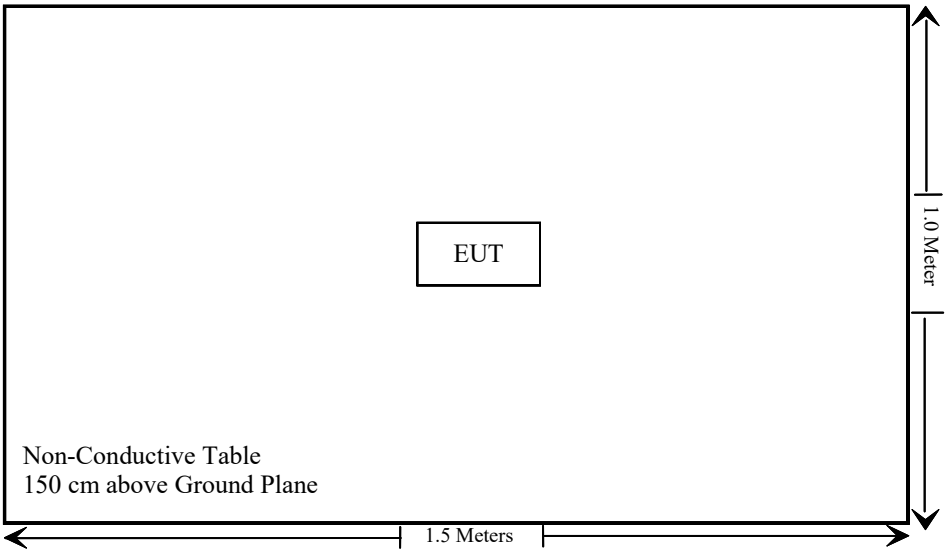
For Conducted Emission:



For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1) & §2.1093	RF Exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/01/16	2025/01/15
Rohde & Schwarz	LISN	ENV216	101613	2024/01/16	2025/01/15
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2024/05/21	2025/05/20
Unknown	CE Cable	Unknown	UF A210B-1-0720-504504	2024/05/21	2025/05/20
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/01/16	2025/01/15
Sonoma instrument	Pre-amplifier	310 N	186238	2024/05/21	2025/05/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber A Cable 1	N/A	2024/06/18	2025/06/17
Unknown	Cable	XH500C	J-10M-A	2024/06/18	2025/06/17
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/05/21	2025/05/20
Unknown	Cable	PNG214	1354	2024/05/21	2025/05/20
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40	101605	2024/03/27	2025/03/26
COM-POWER	Pre-amplifier	PA-122	181919	2024/06/18	2025/06/17
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	RF Cable	KMSE	735	2024/06/18	2025/06/17
Unknown	RF Cable	UFA147	219661	2024/06/18	2025/06/17
Unknown	RF Cable	XH750A-N	J-10M	2024/06/18	2025/06/17
JD	Multiplex Switch Test Control Set	DT7220FSU	DQ77926	2024/06/18	2025/06/17
A.H.System	Pre-amplifier	PAM-1840VH	190	2024/06/18	2025/06/17
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/06/18	2025/06/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Tonscend	RF control Unit	JS0806-2	19D8060154	2023/09/06	2024/09/05
ANRITSU	Microwave peak power sensor	MA24418A	12622	2024/05/21	2025/05/20
Rohde &Schwarz	Spectrum Analyzer	FSV40	101473	2024/01/16	2025/01/15
Unknown	10dB Attenuator	Unknown	F-03-EM190	2024/06/27	2025/06/26
Unknown	RF Cable	65475	01670515	2024/06/27	2025/06/26

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b) (1) & §2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

a) According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

For worst case:

For BLE:

Frequency (MHz)	Maximum Tune-up power#		Calculated Distance (mm)	Calculated Value	Threshold (1-g SAR)	SAR Test Exclusion
	(dBm)	(mW)				
2402-2480	9.5	8.91	5	2.8	3.0	**Yes**

Result: No Standalone SAR test is required

For Wi-Fi mode, please refer to SAR report: Please refer to SAR test report: 2401U80232E-SAA.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached, the antenna gain# is 1.2dBi, fulfill the requirement of this section. Please refer to the EUT photos.

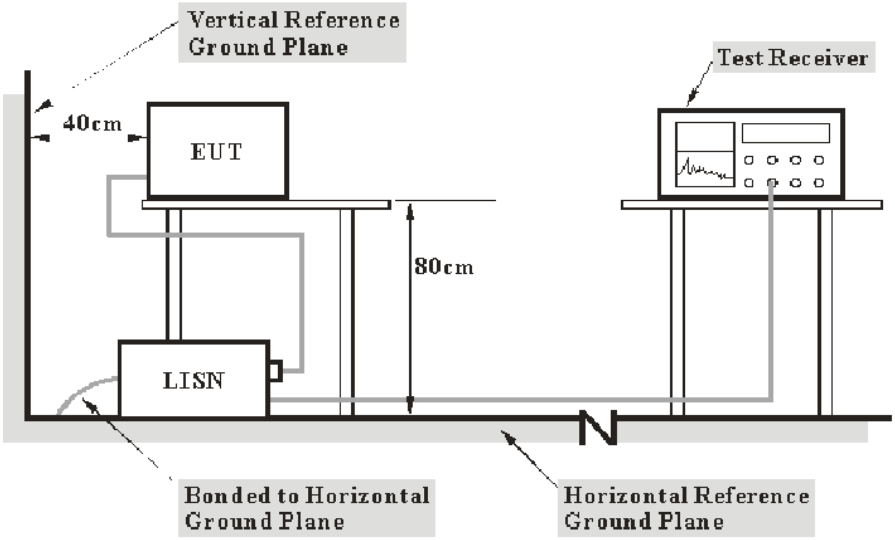
Result: Compliant

FCC §15.207 (a) - AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit
Level = Read Level + Factor

Note: The term "cable loss" refers to the combination of a cable and a 10dB transient limiter (attenuator).

Test Data

Environmental Conditions

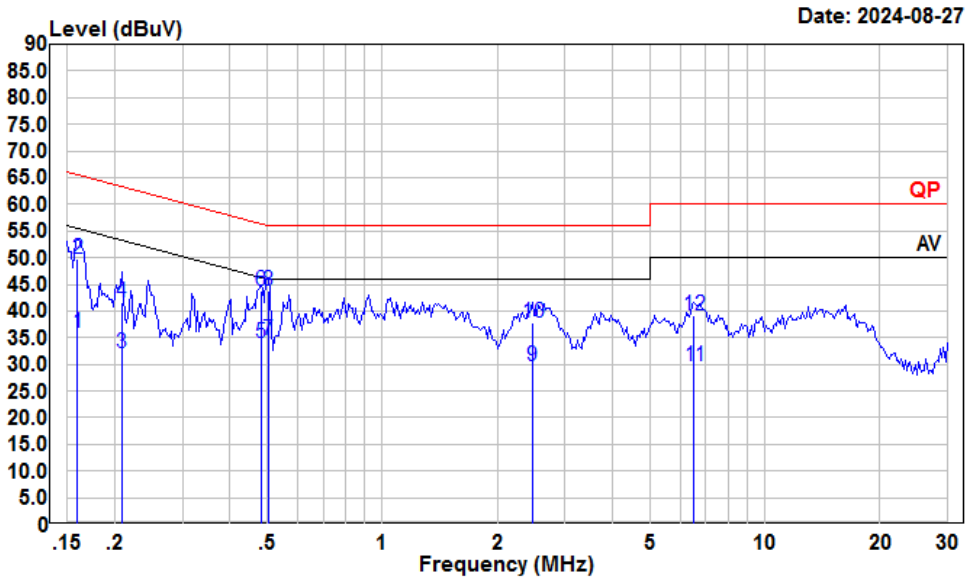
Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101 kPa

The testing was performed by Macy Shi on 2024-08-27.

EUT operation mode: Transmitting

BLE: *(Maximum output power mode, Low channel)*

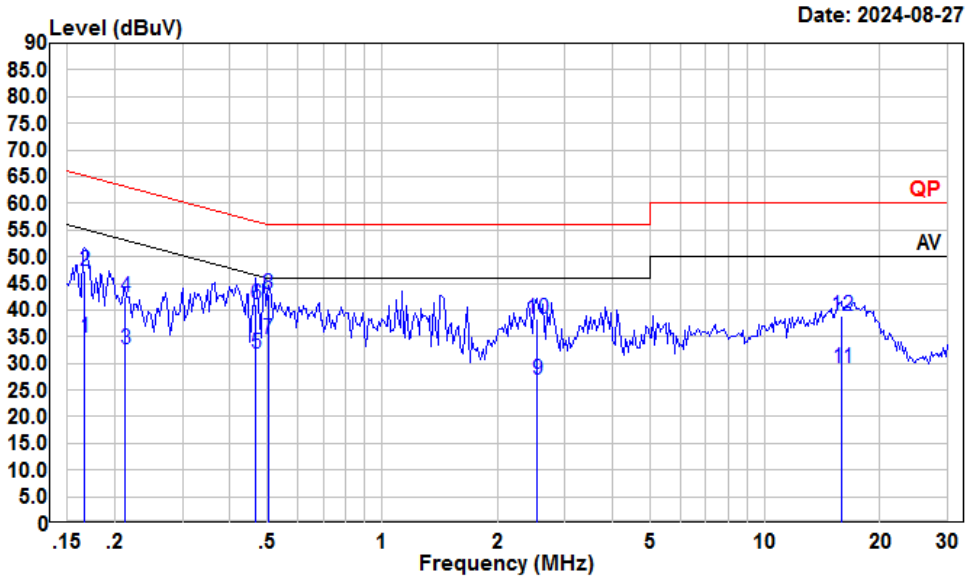
AC 120V/60 Hz, Line



Condition: Line
Project : 2401U80232E-RF
tester : Macy.shi
Note : Transmitting

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.160	14.90	35.90	10.88	10.12	55.47	-19.57	Average
2	0.160	28.84	49.84	10.88	10.12	65.47	-15.63	QP
3	0.208	11.19	32.07	10.79	10.09	53.27	-21.20	Average
4	0.208	20.73	41.61	10.79	10.09	63.27	-21.66	QP
5	0.481	13.41	34.05	10.51	10.13	46.32	-12.27	Average
6	0.481	23.11	43.75	10.51	10.13	56.32	-12.57	QP
7	0.502	13.79	34.43	10.50	10.14	46.00	-11.57	Average
8	0.502	23.21	43.85	10.50	10.14	56.00	-12.15	QP
9	2.461	8.95	29.63	10.51	10.17	46.00	-16.37	Average
10	2.461	17.05	37.73	10.51	10.17	56.00	-18.27	QP
11	6.523	9.00	29.66	10.47	10.19	50.00	-20.34	Average
12	6.523	18.63	39.29	10.47	10.19	60.00	-20.71	QP

AC 120V/60 Hz, Neutral

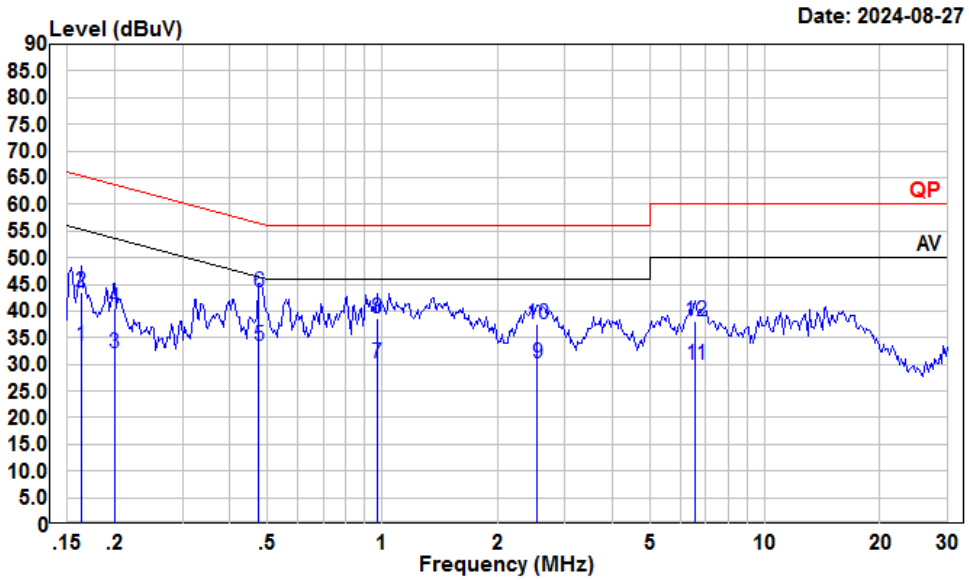


Condition: Neutral
Project : 2401U80232E-RF
tester : Macy.shi
Note : Transmitting

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.167	14.23	34.86	10.53	10.10	55.12	-20.26	Average
2	0.167	26.63	47.26	10.53	10.10	65.12	-17.86	QP
3	0.213	12.11	32.62	10.42	10.09	53.10	-20.48	Average
4	0.213	21.91	42.42	10.42	10.09	63.10	-20.68	QP
5	0.466	10.91	31.72	10.68	10.13	46.58	-14.86	Average
6	0.466	20.34	41.15	10.68	10.13	56.58	-15.43	QP
7	0.502	13.71	34.55	10.70	10.14	46.00	-11.45	Average
8	0.502	22.00	42.84	10.70	10.14	56.00	-13.16	QP
9	2.540	6.35	26.92	10.40	10.17	46.00	-19.08	Average
10	2.540	17.89	38.46	10.40	10.17	56.00	-17.54	QP
11	15.885	8.00	28.99	10.78	10.21	50.00	-21.01	Average
12	15.885	18.02	39.01	10.78	10.21	60.00	-20.99	QP

2.4G Wi-Fi: *(Maximum output power mode, 802.11n20 Low channel)*

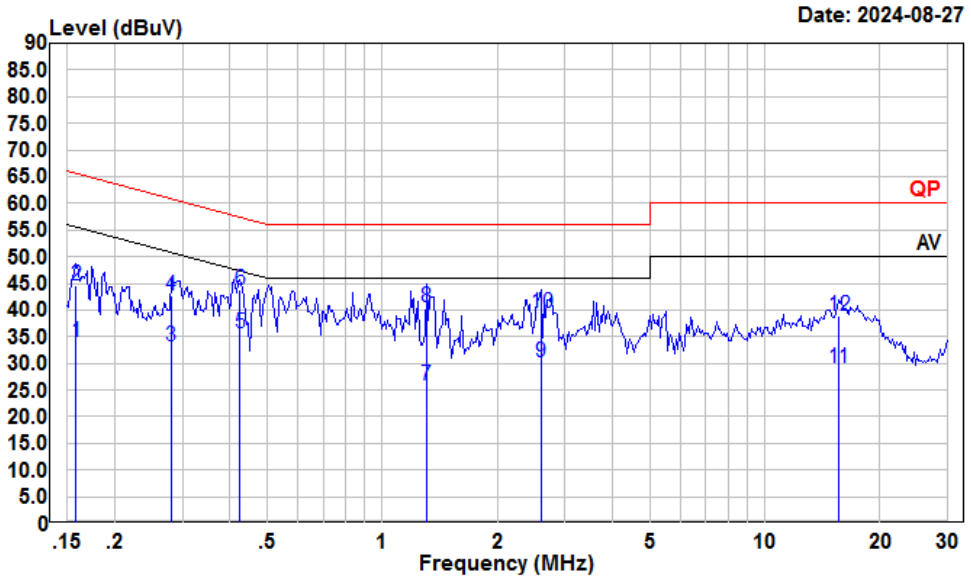
AC 120V/60 Hz, Line



Condition: Line
Project : 2401U80232E-RF
tester : Macy.shi
Note : Transmitting

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.163	12.46	33.44	10.87	10.11	55.30	-21.86	Average
2	0.163	22.58	43.56	10.87	10.11	65.30	-21.74	QP
3	0.200	11.12	32.01	10.80	10.09	53.62	-21.61	Average
4	0.200	19.52	40.41	10.80	10.09	63.62	-23.21	QP
5	0.476	12.76	33.41	10.52	10.13	46.41	-13.00	Average
6	0.476	22.76	43.41	10.52	10.13	56.41	-13.00	QP
7	0.968	9.70	30.22	10.41	10.11	46.00	-15.78	Average
8	0.968	18.09	38.61	10.41	10.11	56.00	-17.39	QP
9	2.540	9.63	30.30	10.50	10.17	46.00	-15.70	Average
10	2.540	16.98	37.65	10.50	10.17	56.00	-18.35	QP
11	6.592	9.24	29.91	10.48	10.19	50.00	-20.09	Average
12	6.592	17.47	38.14	10.48	10.19	60.00	-21.86	QP

AC 120V/60 Hz, Neutral



Condition: Neutral
Project : 2401U80232E-RF
tester : Macy.shi
Note : Transmitting

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.158	13.24	33.92	10.56	10.12	55.56	-21.64	Average
2	0.158	24.03	44.71	10.56	10.12	65.56	-20.85	QP
3	0.280	12.50	33.11	10.51	10.10	50.81	-17.70	Average
4	0.280	22.07	42.68	10.51	10.10	60.81	-18.13	QP
5	0.424	14.85	35.61	10.65	10.11	47.37	-11.76	Average
6	0.424	22.99	43.75	10.65	10.11	57.37	-13.62	QP
7	1.303	5.10	25.96	10.71	10.15	46.00	-20.04	Average
8	1.303	19.58	40.44	10.71	10.15	56.00	-15.56	QP
9	2.594	9.57	30.14	10.40	10.17	46.00	-15.86	Average
10	2.594	18.89	39.46	10.40	10.17	56.00	-16.54	QP
11	15.552	8.14	29.14	10.79	10.21	50.00	-20.86	Average
12	15.552	17.91	38.91	10.79	10.21	60.00	-21.09	QP

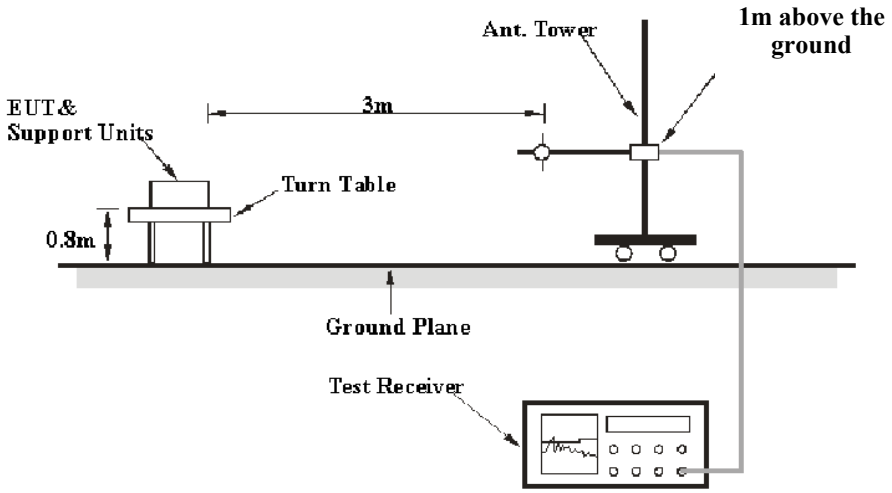
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

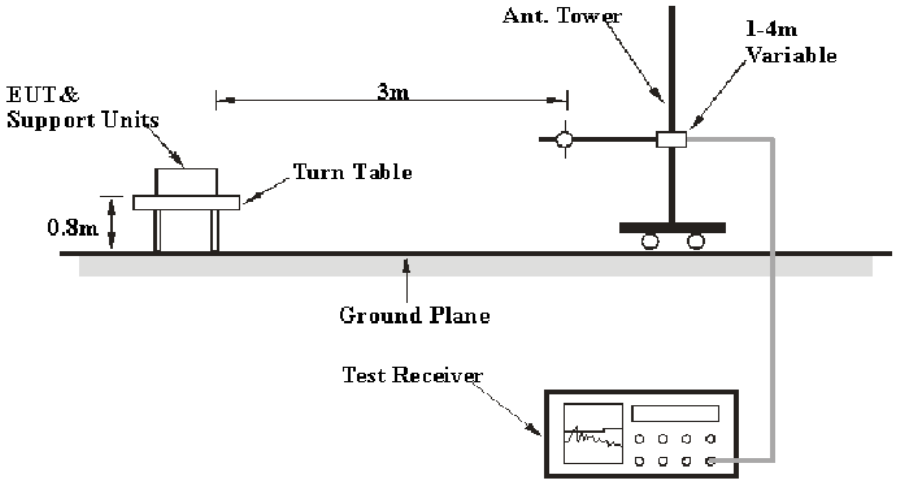
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

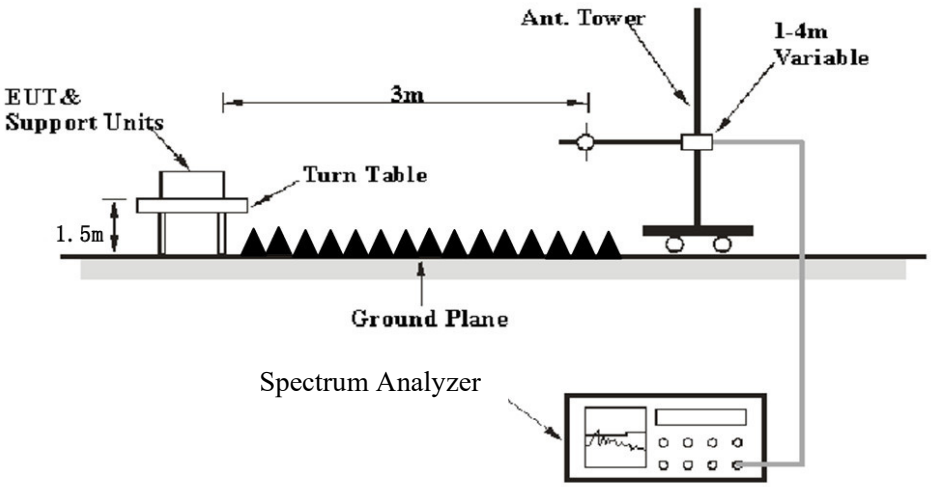
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

9 kHz-1GHz:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
9 kHz – 150 kHz	/	/	200 Hz	QP
	300 Hz	1 kHz	/	PK
150 kHz – 30 MHz	/	/	9 kHz	QP
	10 kHz	30 kHz	/	PK
30 MHz – 1000 MHz	/	/	120 kHz	QP
	100 kHz	300 kHz	/	PK

1-25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Average	>98%	1MHz	≥10 Hz Note 1
	<98%	1MHz	≥1/Ton Note 2
Note 1: The detail test parameters please refer to duty cycle section. Note 2: Ton is minimum transmission duration.			

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, average detection modes for frequency bands 9–90 kHz and 110–490 kHz, peak and average detection modes for frequencies above 1 GHz.

For 9 kHz-30MHz, the report shall list the six emissions with the smallest margin relative to the limit, for each of the three antenna orientations (parallel, perpendicular, and ground-parallel) unless the margin is greater than 20 dB.

All emissions under the average limit and under the noise floor have not recorded in the report.

Factor & Over Limit/Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit/Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

Over Limit/Margin = Level/Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	22~25 °C
Relative Humidity:	50~54 %
ATM Pressure:	101 kPa

The testing was performed by Anson Su on 2024-10-10 for below 1GHz, Zenos Qiao from 2024-08-25 to 2024-10-24 and Dylan Yang on 2024-10-23 for above 1GHz.

EUT operation mode: Transmitting

Note: Pre-scan in the X, Y and Z axes of orientation, the worst case Y-axis of orientation was recorded.

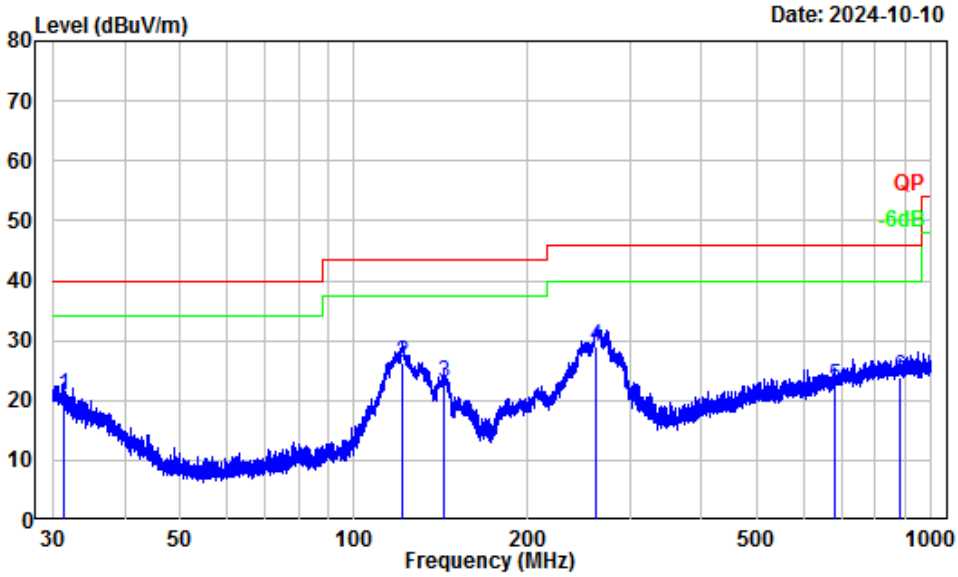
9 kHz-30MHz: *(Maximum output power mode, 802.11n20 Low channel)*

The amplitude of spurious emissions attenuated more than 20 dB below the limit was not recorded.

30MHz-1GHz:

BLE *(Maximum output power mode, Low channel)*

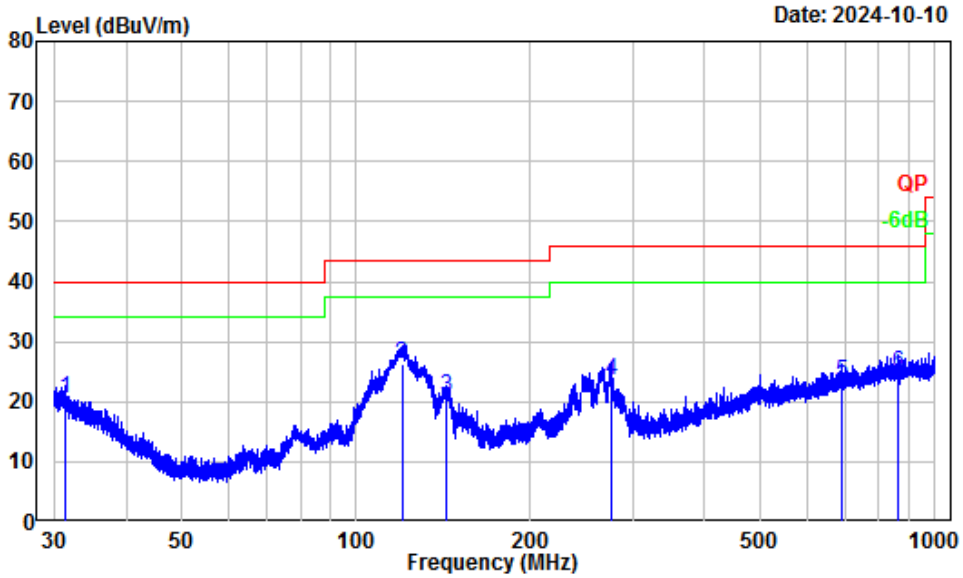
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401U80232E-RF
Test Mode : BLE Transmitting
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.39	-6.70	27.61	20.91	40.00	-19.09	QP
2	121.34	-11.32	37.62	26.30	43.50	-17.20	QP
3	142.70	-12.05	35.05	23.00	43.50	-20.50	QP
4	263.01	-12.47	41.56	29.09	46.00	-16.91	QP
5	679.66	-3.72	26.09	22.37	46.00	-23.63	QP
6	882.57	-1.46	25.27	23.81	46.00	-22.19	QP

Vertical

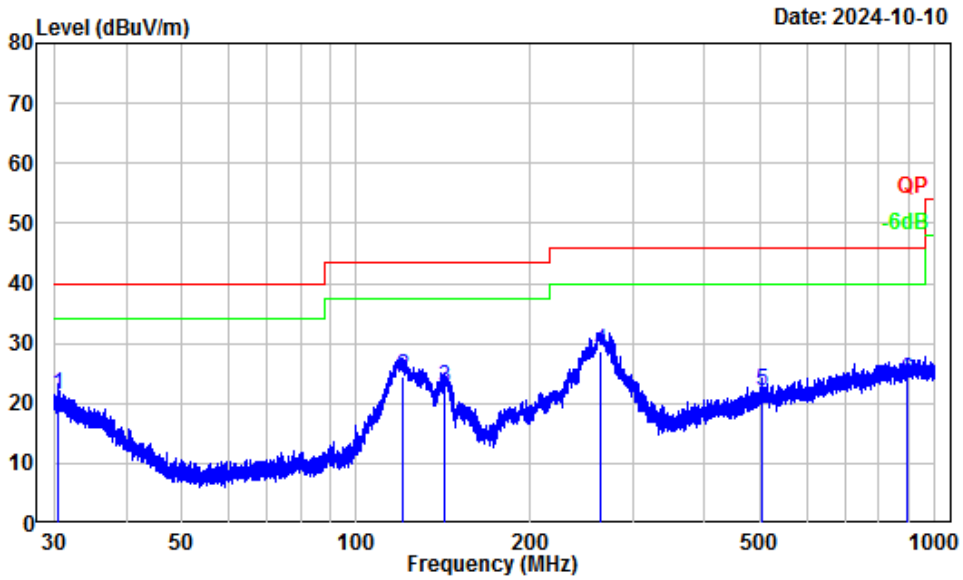


Site : Chamber A
Condition : 3m Vertical
Project Number: 2401U80232E-RF
Test Mode : BLE Transmitting
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.50	-6.77	27.32	20.55	40.00	-19.45	QP
2	119.86	-11.46	37.68	26.22	43.50	-17.28	QP
3	143.20	-12.10	32.81	20.71	43.50	-22.79	QP
4	275.88	-11.32	34.82	23.50	46.00	-22.50	QP
5	688.96	-3.67	26.98	23.31	46.00	-22.69	QP
6	866.09	-1.62	26.29	24.67	46.00	-21.33	QP

2.4G Wi-Fi *(Maximum output power mode, 802.11n20 Low channel)*

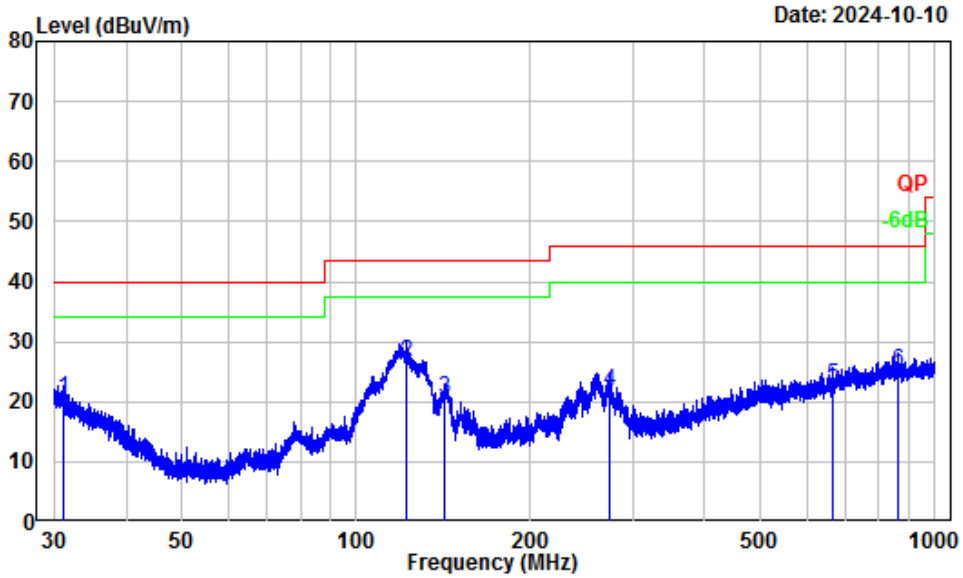
Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number: 2401U80232E-RF
Test Mode : 2.4G WIFI Transmitting
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.56	-6.25	27.62	21.37	40.00	-18.63	QP
2	120.01	-11.45	35.83	24.38	43.50	-19.12	QP
3	141.95	-11.98	34.71	22.73	43.50	-20.77	QP
4	265.21	-12.24	40.98	28.74	46.00	-17.26	QP
5	501.18	-5.76	27.93	22.17	46.00	-23.83	QP
6	893.86	-1.34	25.31	23.97	46.00	-22.03	QP

Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number: 2401U80232E-RF
Test Mode : 2.4G WIFI Transmitting
Tester : Anson Su

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	31.10	-6.53	27.11	20.58	40.00	-19.42	QP
2	122.14	-11.23	37.86	26.63	43.50	-16.87	QP
3	142.01	-11.98	32.62	20.64	43.50	-22.86	QP
4	273.23	-11.53	33.31	21.78	46.00	-24.22	QP
5	664.64	-3.88	26.63	22.75	46.00	-23.25	QP
6	863.06	-1.62	26.53	24.91	46.00	-21.09	QP

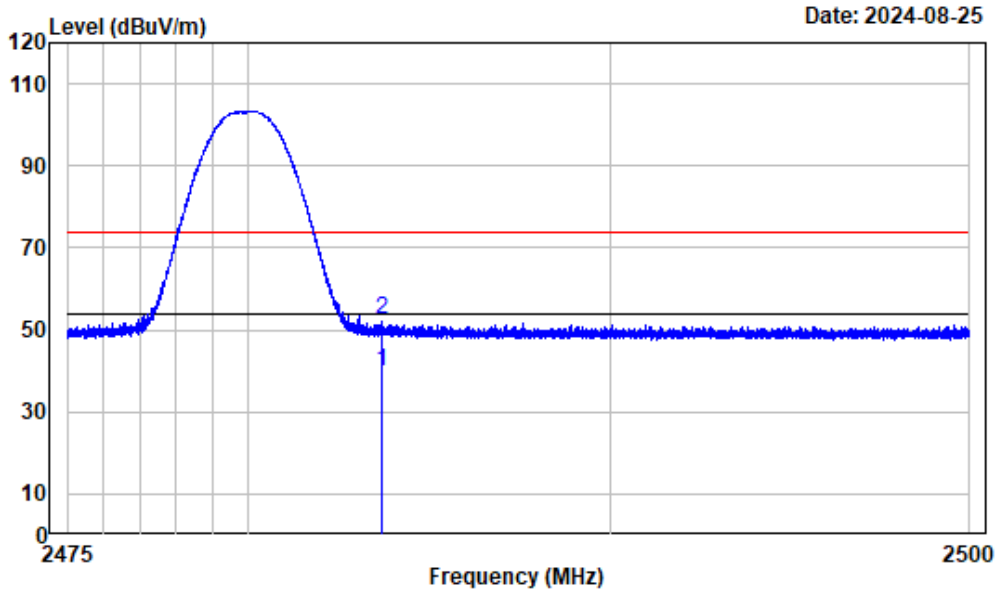
1-25 GHz:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/AV					
BLE 1M							
Low Channel 2402MHz							
2381.03	55.32	PK	H	-2.93	52.39	74	-21.61
2381.03	41.71	AV	H	-2.93	38.78	54	-15.22
2384.15	55.16	PK	V	-2.93	52.23	74	-21.77
2384.15	41.53	AV	V	-2.93	38.60	54	-15.40
4804.00	47.01	PK	H	2.42	49.43	74	-24.57
4804.00	32.78	AV	H	2.42	35.20	54	-18.80
4804.00	46.80	PK	V	2.42	49.22	74	-24.78
4804.00	32.55	AV	V	2.42	34.97	54	-19.03
Middle Channel 2440MHz							
4880.00	46.92	PK	H	2.58	49.50	74	-24.50
4880.00	32.69	AV	H	2.58	35.27	54	-18.73
4880.00	46.75	PK	V	2.58	49.33	74	-24.67
4880.00	32.51	AV	V	2.58	35.09	54	-18.91
High Channel 2480MHz							
2483.68	55.85	PK	H	-3.17	52.68	74	-21.32
2483.68	43.19	AV	H	-3.17	40.02	54	-13.98
2483.80	55.47	PK	V	-3.17	52.30	74	-21.70
2483.80	42.78	AV	V	-3.17	39.61	54	-14.39
4960.00	46.76	PK	H	2.68	49.44	74	-24.56
4960.00	32.57	AV	H	2.68	35.25	54	-18.75
4960.00	46.61	PK	V	2.68	49.29	74	-24.71
4960.00	32.44	AV	V	2.68	35.12	54	-18.88

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.

Test plots for worst Band Edge Measurements (Radiated):

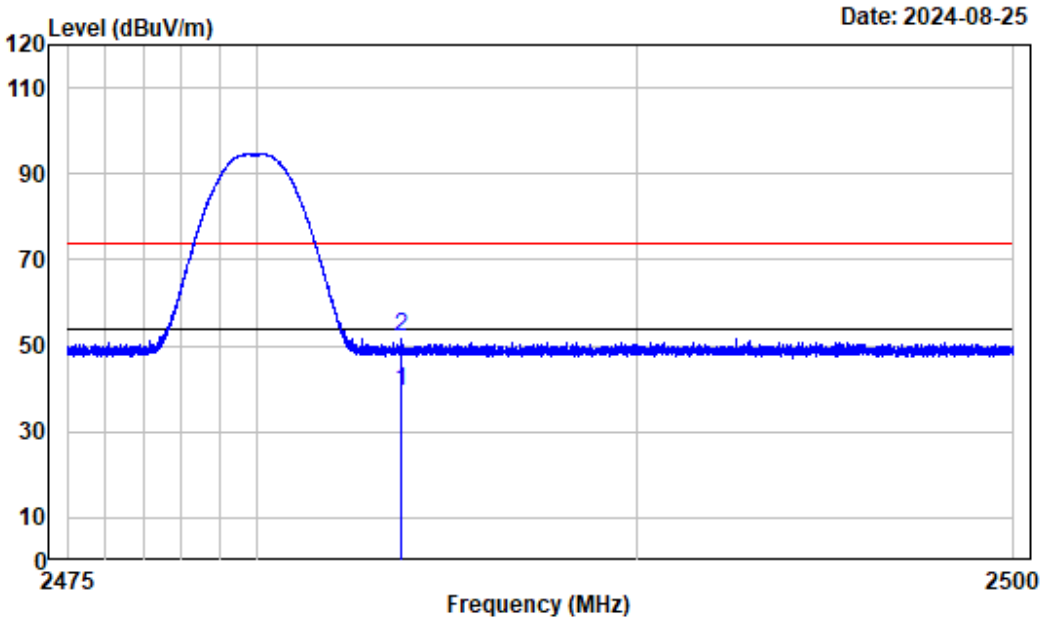
BLE 1M			
Test Channel:	**2480MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : BLE1M-2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.678	-3.17	43.19	40.02	54.00	-13.98	Average
2	2483.678	-3.17	55.85	52.68	74.00	-21.32	Peak

BLE 1M			
Test Channel:	**2480MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : BLE1M-2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.803	-3.17	42.78	39.61	54.00	-14.39	Average
2	2483.803	-3.17	55.47	52.30	74.00	-21.70	Peak

2.4G Wi-Fi

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/AV					
802.11b							
Low Channel 2412MHz							
2389.83	56.39	PK	H	-2.93	53.46	74	-20.54
2389.83	43.27	AV	H	-2.93	40.34	54	-13.66
2389.59	55.98	PK	V	-2.93	53.05	74	-20.95
2389.59	43.04	AV	V	-2.93	40.11	54	-13.89
4824.00	47.17	PK	H	2.45	49.62	74	-24.38
4824.00	31.28	AV	H	2.45	33.73	54	-20.27
4824.00	46.99	PK	V	2.45	49.44	74	-24.56
4824.00	31.05	AV	V	2.45	33.50	54	-20.50
Middle Channel 2437MHz							
4874.00	47.73	PK	H	2.56	50.29	74	-23.71
4874.00	32.48	AV	H	2.56	35.04	54	-18.96
4874.00	47.52	PK	V	2.56	50.08	74	-23.92
4874.00	32.21	AV	V	2.56	34.77	54	-19.23
High Channel 2462MHz							
2483.73	57.32	PK	H	-3.17	54.15	74	-19.85
2483.73	45.41	AV	H	-3.17	42.24	54	-11.76
2483.56	56.87	PK	V	-3.17	53.70	74	-20.30
2483.56	45.05	AV	V	-3.17	41.88	54	-12.12
4924.00	48.12	PK	H	2.63	50.75	74	-23.25
4924.00	32.77	AV	H	2.63	35.40	54	-18.60
4924.00	47.83	PK	V	2.63	50.46	74	-23.54
4924.00	32.49	AV	V	2.63	35.12	54	-18.88

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/AV					
802.11g							
Low Channel 2412MHz							
2389.25	67.27	PK	H	-2.93	64.34	74	-9.66
2389.25	49.59	AV	H	-2.93	46.66	54	-7.34
2389.40	65.84	PK	V	-2.93	62.91	74	-11.09
2389.40	48.73	AV	V	-2.93	45.80	54	-8.20
4824.00	46.86	PK	H	2.45	49.31	74	-24.69
4824.00	32.47	AV	H	2.45	34.92	54	-19.08
4824.00	46.58	PK	V	2.45	49.03	74	-24.97
4824.00	32.29	AV	V	2.45	34.74	54	-19.26
Middle Channel 2437MHz							
4874.00	47.51	PK	H	2.56	50.07	74	-23.93
4874.00	33.37	AV	H	2.56	35.93	54	-18.07
4874.00	47.24	PK	V	2.56	49.80	74	-24.20
4874.00	33.15	AV	V	2.56	35.71	54	-18.29
High Channel 2462MHz							
2483.56	71.15	PK	H	-3.17	67.98	74	-6.02
2483.56	52.32	AV	H	-3.17	49.15	54	-4.85
2483.70	69.78	PK	V	-3.17	66.61	74	-7.39
2483.70	51.57	AV	V	-3.17	48.40	54	-5.60
4924.00	47.28	PK	H	2.63	49.91	74	-24.09
4924.00	32.87	AV	H	2.63	35.50	54	-18.50
4924.00	47.03	PK	V	2.63	49.66	74	-24.34
4924.00	32.51	AV	V	2.63	35.14	54	-18.86

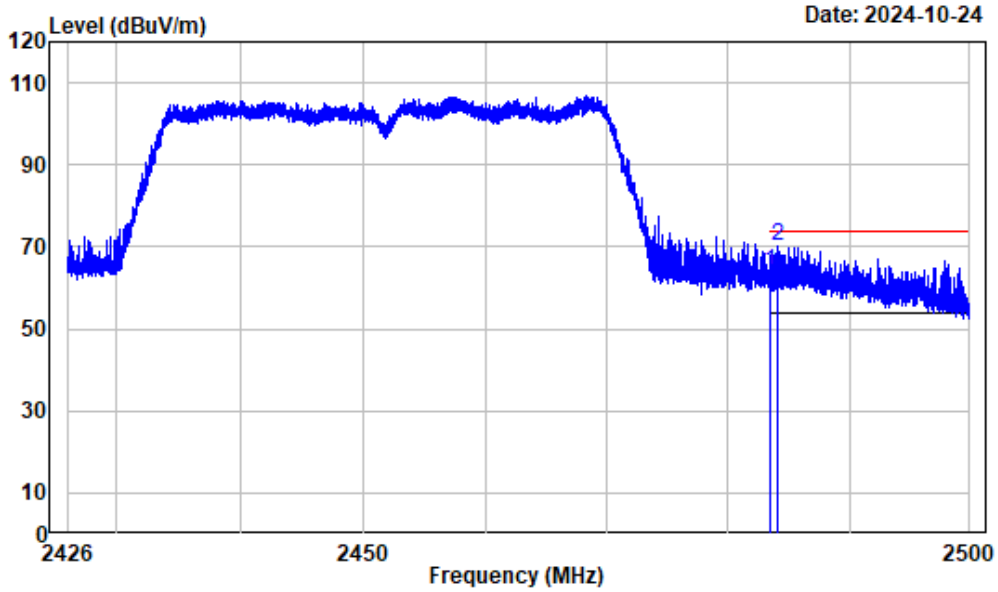
Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	PK/AV					
802.11n20							
Low Channel 2412MHz							
2389.48	71.64	PK	H	-2.93	68.71	74	-5.29
2389.48	52.25	AV	H	-2.93	49.32	54	-4.68
2389.71	70.03	PK	V	-2.93	67.10	74	-6.90
2389.71	51.39	AV	V	-2.93	48.46	54	-5.54
4824.00	47.04	PK	H	2.45	49.49	74	-24.51
4824.00	32.39	AV	H	2.45	34.84	54	-19.16
4824.00	46.81	PK	V	2.45	49.26	74	-24.74
4824.00	32.17	AV	V	2.45	34.62	54	-19.38
Middle Channel 2437MHz							
4874.00	47.17	PK	H	2.56	49.73	74	-24.27
4874.00	32.46	AV	H	2.56	35.02	54	-18.98
4874.00	46.94	PK	V	2.56	49.50	74	-24.50
4874.00	32.25	AV	V	2.56	34.81	54	-19.19
High Channel 2462MHz							
2483.65	70.21	PK	H	-3.17	67.04	74	-6.96
2483.65	52.36	AV	H	-3.17	49.19	54	-4.81
2483.54	69.35	PK	V	-3.17	66.18	74	-7.82
2483.54	51.26	AV	V	-3.17	48.09	54	-5.91
4924.00	47.44	PK	H	2.63	50.07	74	-23.93
4924.00	32.68	AV	H	2.63	35.31	54	-18.69
4924.00	47.19	PK	V	2.63	49.82	74	-24.18
4924.00	32.51	AV	V	2.63	35.14	54	-18.86

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/AV					
802.11n40							
Low Channel 2422MHz							
2389.67	73.07	PK	H	-2.93	70.14	74	-3.86
2389.67	51.09	AV	H	-2.93	48.16	54	-5.84
2389.46	72.25	PK	V	-2.93	69.32	74	-4.68
2389.46	50.16	AV	V	-2.93	47.23	54	-6.77
4844.00	46.72	PK	H	2.45	49.17	74	-24.83
4844.00	32.61	AV	H	2.45	35.06	54	-18.94
4844.00	46.54	PK	V	2.45	48.99	74	-25.01
4844.00	32.47	AV	V	2.45	34.92	54	-19.08
Middle Channel 2437MHz							
4874.00	46.80	PK	H	2.56	49.36	74	-24.64
4874.00	32.75	AV	H	2.56	35.31	54	-18.69
4874.00	46.63	PK	V	2.56	49.19	74	-24.81
4874.00	32.58	AV	V	2.56	35.14	54	-18.86
High Channel 2452MHz							
2484.07	73.37	PK	H	-3.17	70.20	74	-3.80
2485.54	50.90	AV	H	-3.17	47.73	54	-6.27
2486.58	66.53	PK	V	-3.17	63.36	74	-10.64
2485.80	49.33	AV	V	-3.17	46.16	54	-7.84
4904.00	47.29	PK	H	2.64	49.93	74	-24.07
4904.00	33.17	AV	H	2.64	35.81	54	-18.19
4904.00	47.06	PK	V	2.64	49.70	74	-24.30
4904.00	33.04	AV	V	2.64	35.68	54	-18.32

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.

Test plots for worst Band Edge Measurements (Radiated):

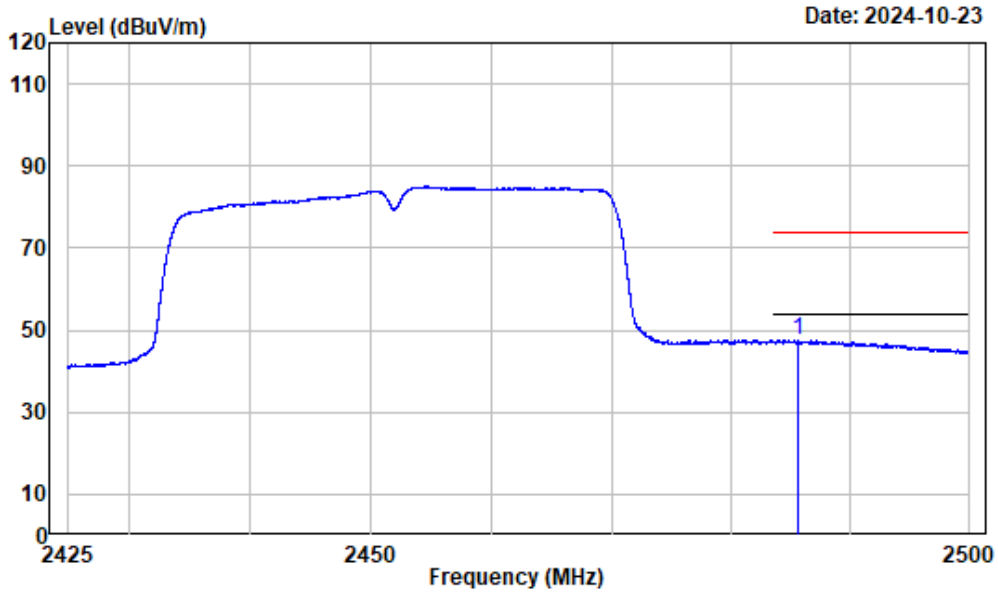
802.11n40-Peak			
Test Channel:	**2452MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-n40-2452

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-3.17	66.96	63.79	74.00	-10.21	Peak
2	2484.068	-3.17	73.37	70.20	74.00	-3.80	Peak

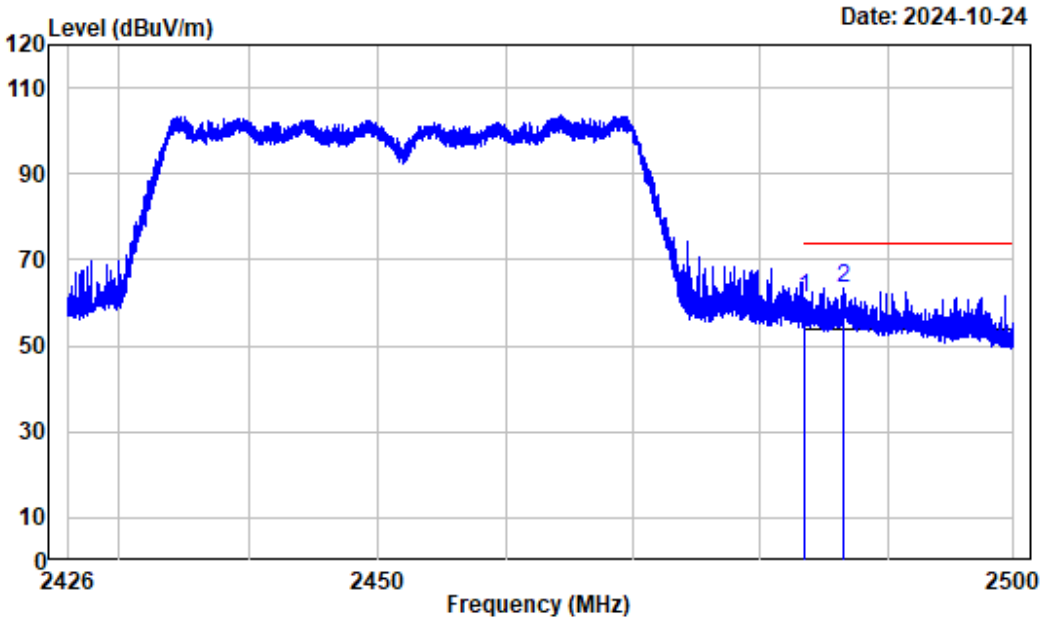
802.11n40-Average			
Test Channel:	**2452MHz**	**Ant. Polar. :**	**Horizontal**



Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Dylan.Yang
Note : 2.4GWiFi_n40_2452

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2485.542	-3.17	50.90	47.73	54.00	-6.27	Average

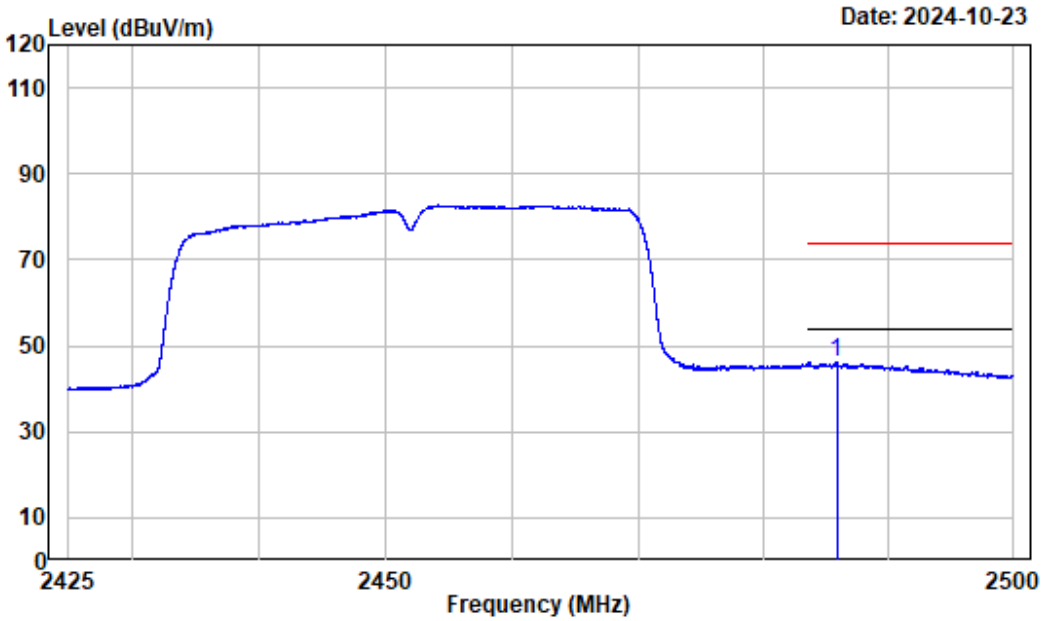
802.11n40-Peak			
Test Channel:	**2452MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-n40-2452

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-3.17	64.33	61.16	74.00	-12.84	Peak
2	2486.578	-3.17	66.53	63.36	74.00	-10.64	Peak

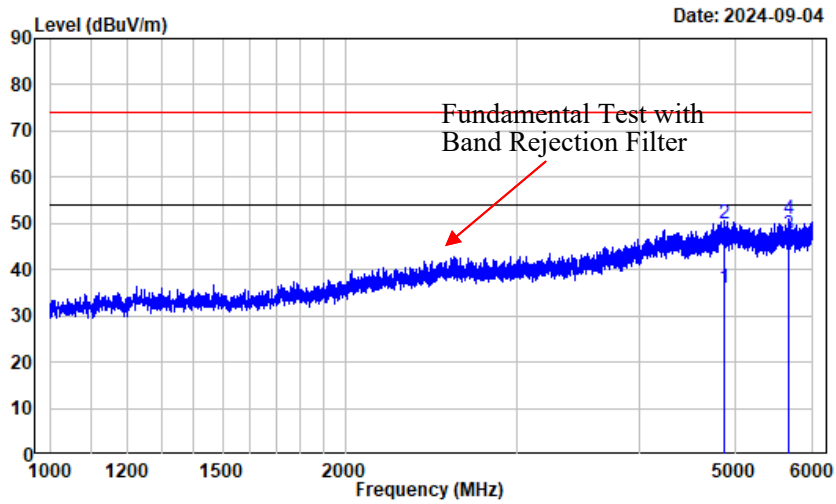
802.11n40-Average			
Test Channel:	**2452MHz**	**Ant. Polar. :**	**Vertical**



Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Dylan.Yang
Note : 2.4GWiFi_n40_2452

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2485.804	-3.17	49.33	46.16	54.00	-7.84	Average

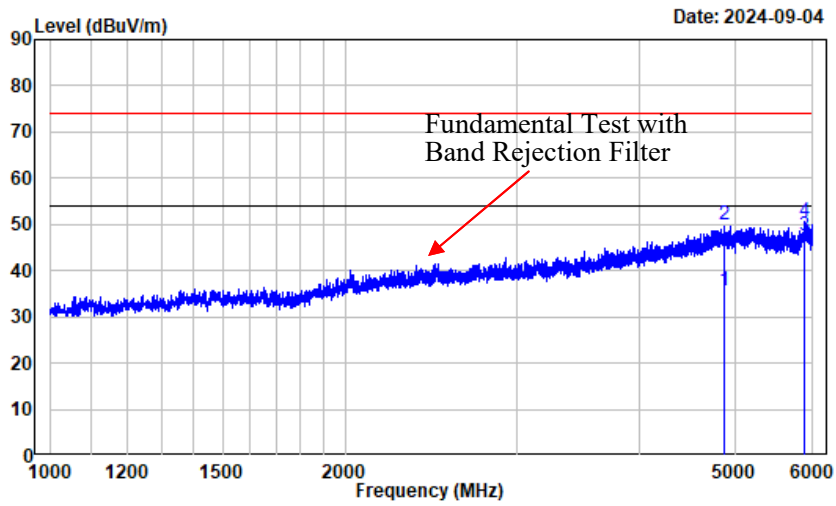
Listed with the worst harmonic margin test plot:

Horizontal	
1-6GHz	 Condition : Horizontal Project No.: 2401U80232E-RF Tester : Zenos Qiao Note : 2.4GWiFi-g-2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4874.000	2.56	33.37	35.93	54.00	-18.07	Average
2	4874.000	2.56	47.51	50.07	74.00	-23.93	Peak
3	5681.250	3.38	44.12	47.50	54.00	-6.50	Average
4	5681.250	3.38	47.44	50.82	74.00	-23.18	Peak

Vertical

1-6GHz

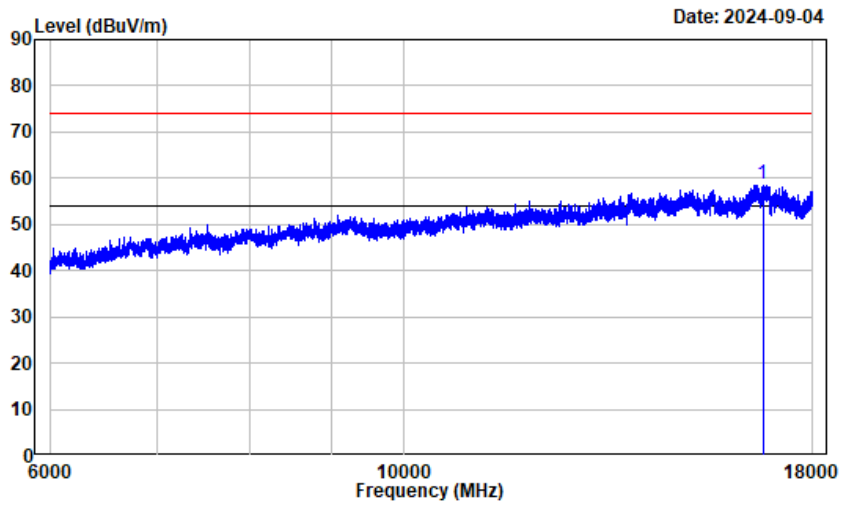


Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-g-2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4874.000	2.56	33.15	35.71	54.00	-18.29	Average
2	4874.000	2.56	47.24	49.80	74.00	-24.20	Peak
3	5883.750	3.81	43.58	47.39	54.00	-6.61	Average
4	5883.750	3.81	46.81	50.62	74.00	-23.38	Peak

Horizontal-Peak

6-18GHz

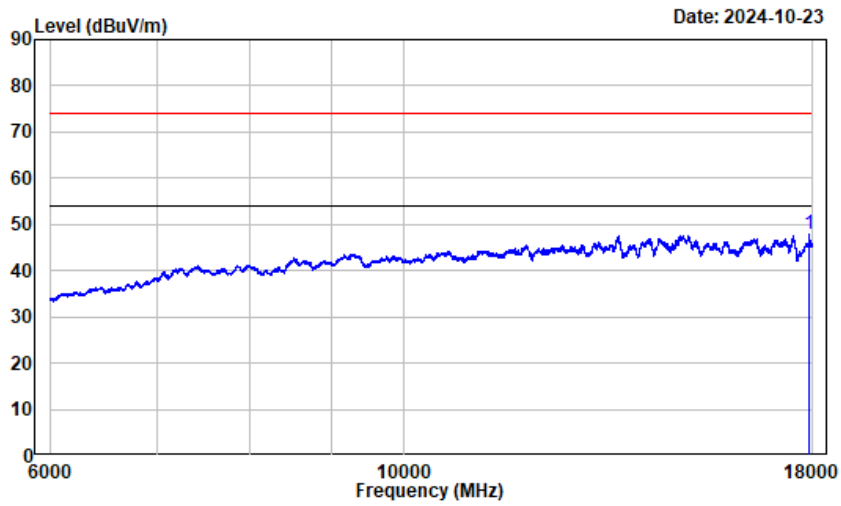


Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-g-2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	16752.000	17.12	41.56	58.68	74.00	-15.32	Peak

Horizontal-Average

6-18GHz



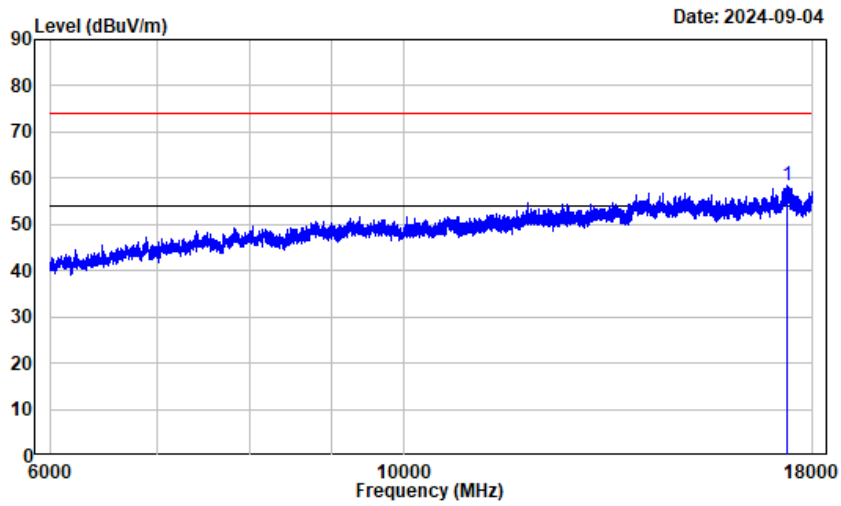
Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Dylan.Yang
Note : 2.4GWiFi_g_2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17921.990	24.07	23.90	47.97	54.00	-6.03	Average

Note: Spectrum Analyzer Setting: RBW=1MHz, VBW=5kHz

Vertical-Peak

6-18GHz

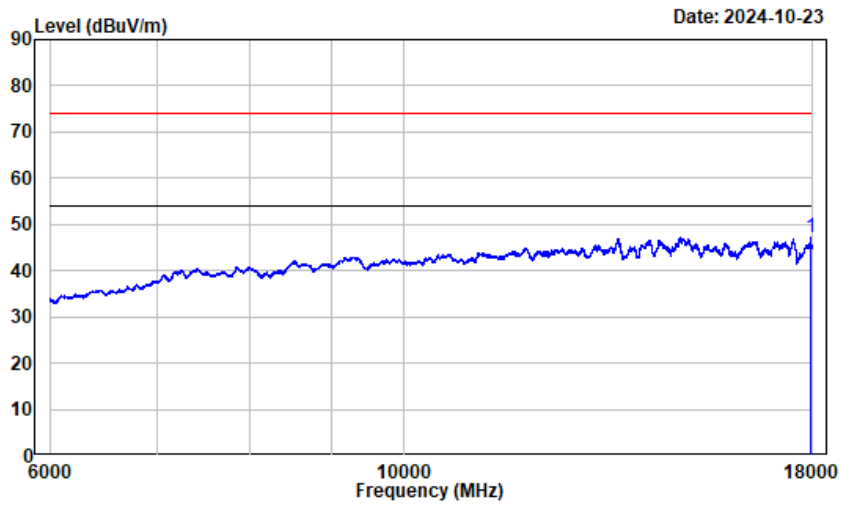


Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-g-2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17332.500	19.51	38.96	58.47	74.00	-15.53	Peak

Vertical-Average

6-18GHz



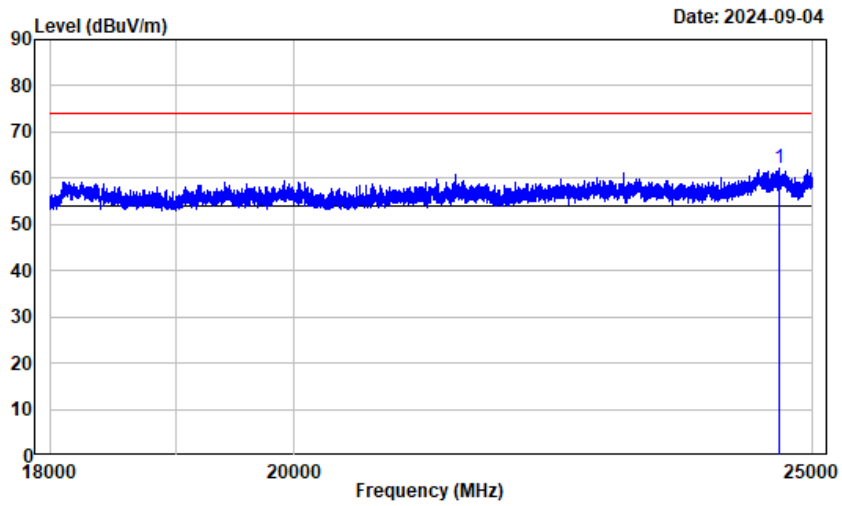
Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Dylan.Yang
Note : 2.4GWiFi_g_2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17959.490	24.34	22.87	47.21	54.00	-6.79	Average

Note: Spectrum Analyzer Setting: RBW=1MHz, VBW=5kHz

Horizontal-Peak

18-25GHz

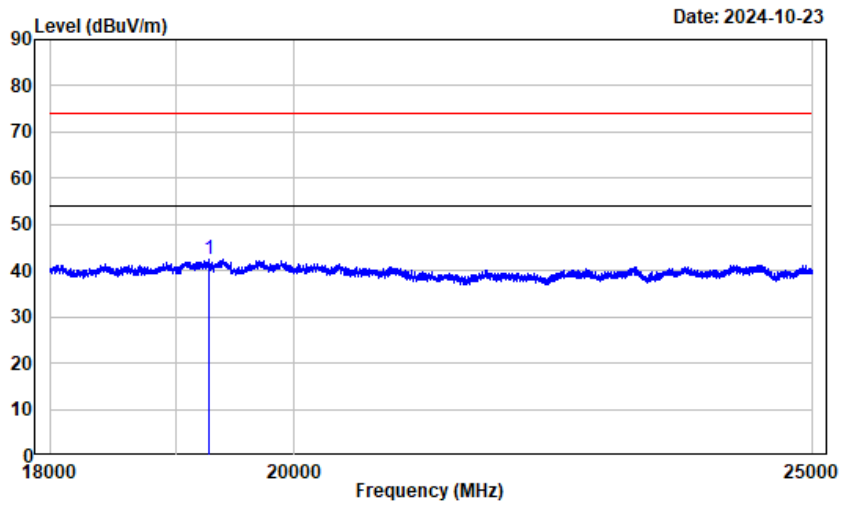


Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-g-2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	24636.880	18.83	43.21	62.04	74.00	-11.96	Peak

Horizontal-Average

18-25GHz



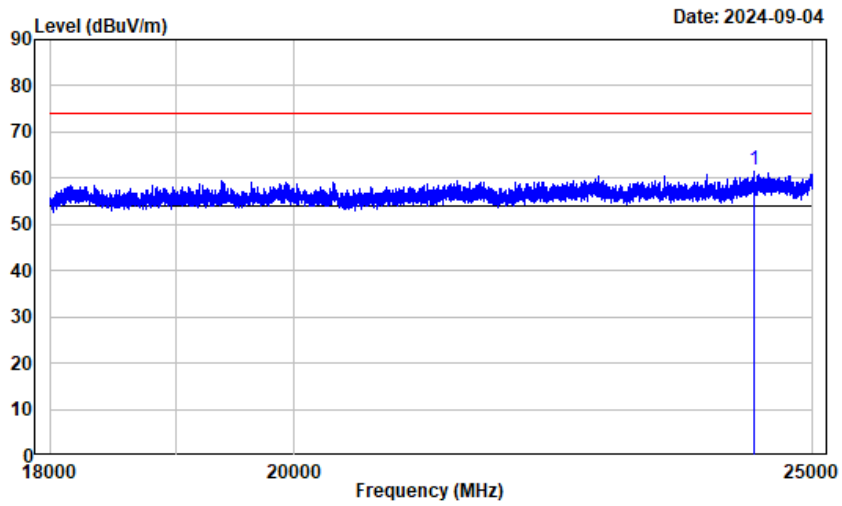
Condition : Horizontal
Project No.: 2401U80232E-RF
Tester : Dylan.Yang
Note : 2.4GWiFi_g_2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19272.410	15.23	27.22	42.45	74.00	-31.55	Average

Note: Spectrum Analyzer Setting: RBW=1MHz, VBW=5kHz

Vertical-Peak

18-25GHz

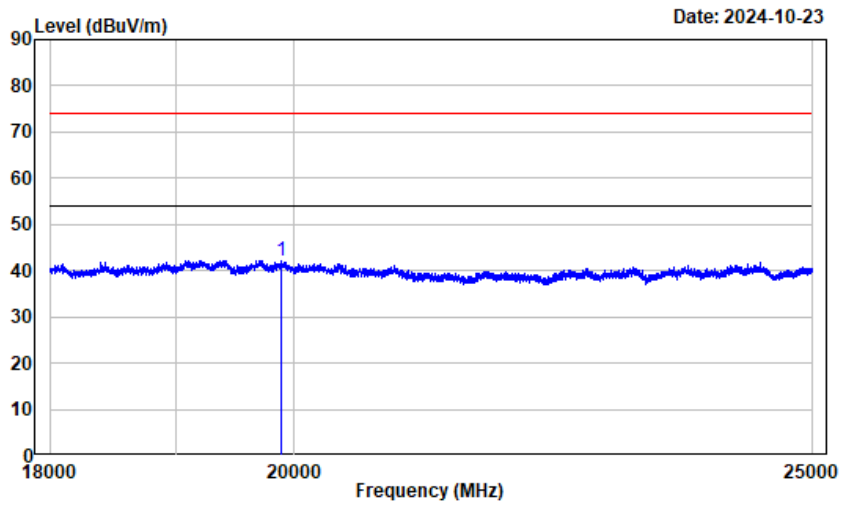


Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Zenos Qiao
Note : 2.4GWiFi-g-2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	24375.250	18.71	43.12	61.83	74.00	-12.17	Peak

Vertical-Average

18-25GHz



Condition : Vertical
Project No.: 2401U80232E-RF
Tester : Dylan.Yang
Note : 2.4GWiFi_g_2437

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19887.610	15.41	26.87	42.28	74.00	-31.72	Average

Note: Spectrum Analyzer Setting: RBW=1MHz, VBW=5kHz

FCC §15.247(a) (2) - 6 dB EMISSION BANDWIDTH

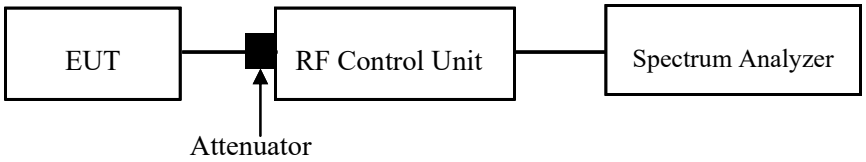
Applicable Standard

According to FCC §15.247(a) (2)
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.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.8.1 & Clause 6.9.3

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	54 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-08-27.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

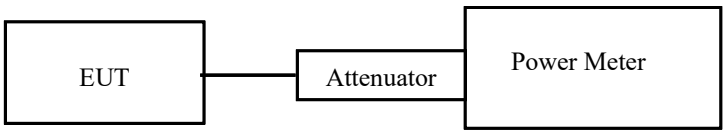
According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

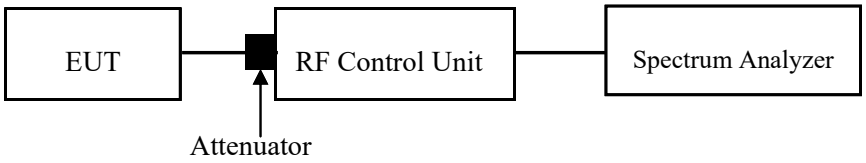
Test Method: ANSI C63.10-2013 Clause 11.9.1.1 for BLE & Clause 11.9.1.3 & 11.9.2.3.2 for Wi-Fi

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

For Wi-Fi mode:



For BLE mode:



Test Data

Environmental Conditions

Temperature:	25~27 °C
Relative Humidity:	45~54 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-08-27and 2024-08-30.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(d) - 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

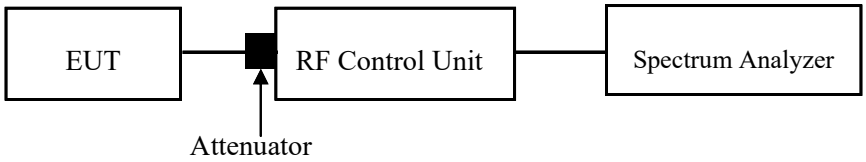
Applicable Standard

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 §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 Procedure

Test Method: ANSI C63.10-2013 Clause 11.11

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.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	54 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-08-27.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

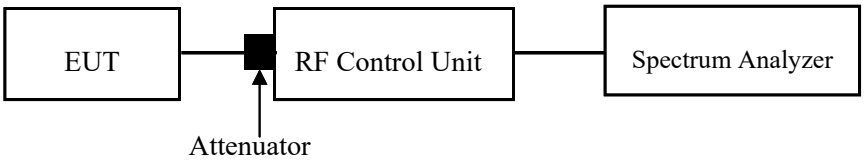
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 11.10.2

Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

1. Set the RBW to: 3kHz≤ RBW≤100 kHz.
2. Set the VBW ≥ 3×RBW.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level within the RBW.
9. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	54 %
ATM Pressure:	101 kPa

The testing was performed by Tom Tan on 2024-08-27.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

EUT PHOTOGRAPHS

Please refer to the attachment 2401U80232E-RF External photo and 2401U80232E-RF Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2401U80232E-RFATest Setup photo.

APPENDIX - BLE

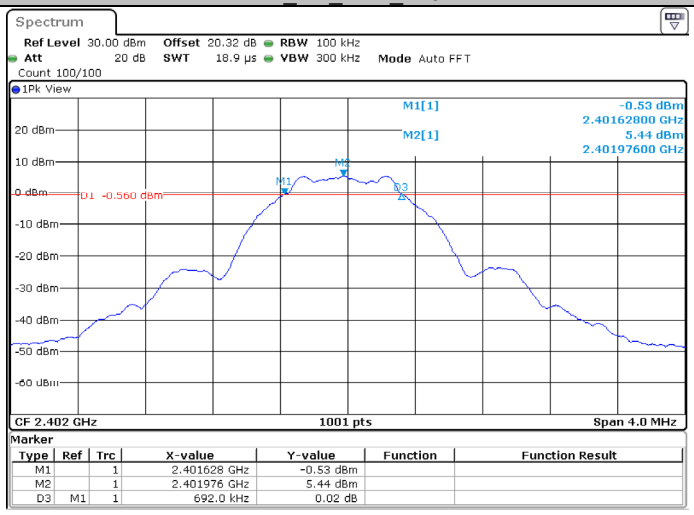
Appendix A: DTS Bandwidth

Test Result

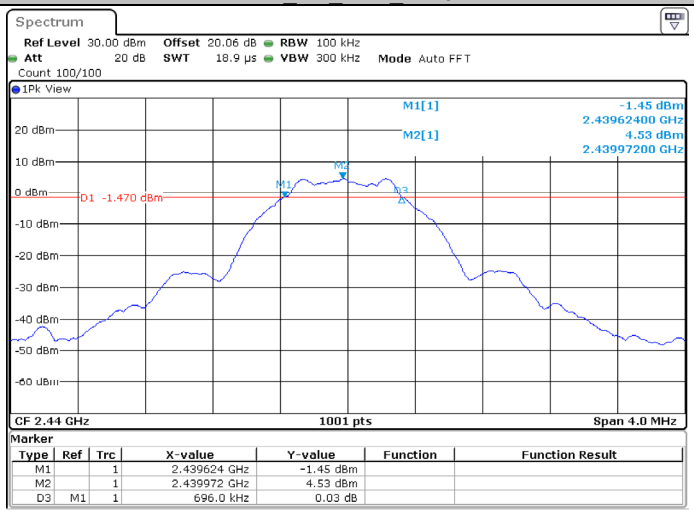
Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.69	2401.63	2402.32	0.5	PASS
		2440	0.70	2439.62	2440.32	0.5	PASS
		2480	0.70	2479.62	2480.32	0.5	PASS

Test Graphs

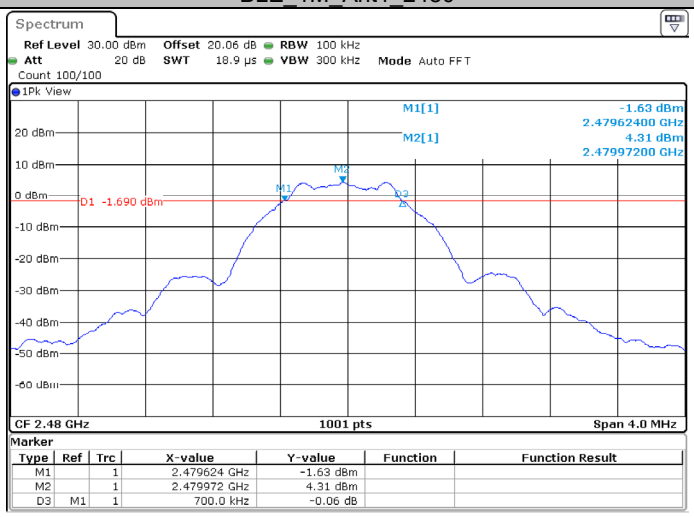
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



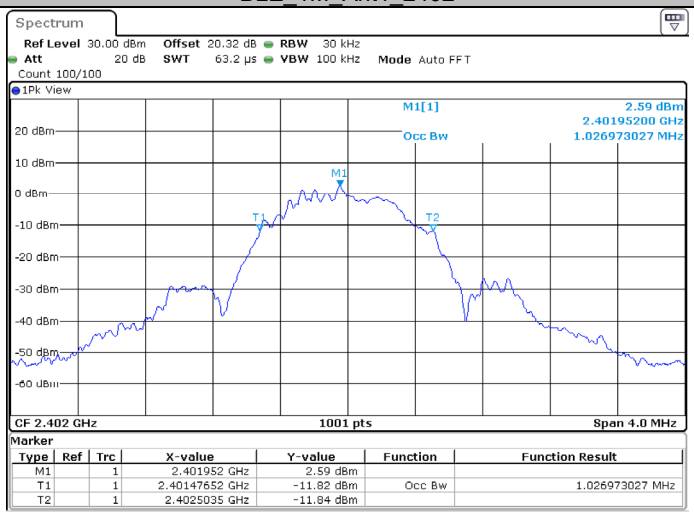
Appendix B: Occupied Channel Bandwidth

Test Result

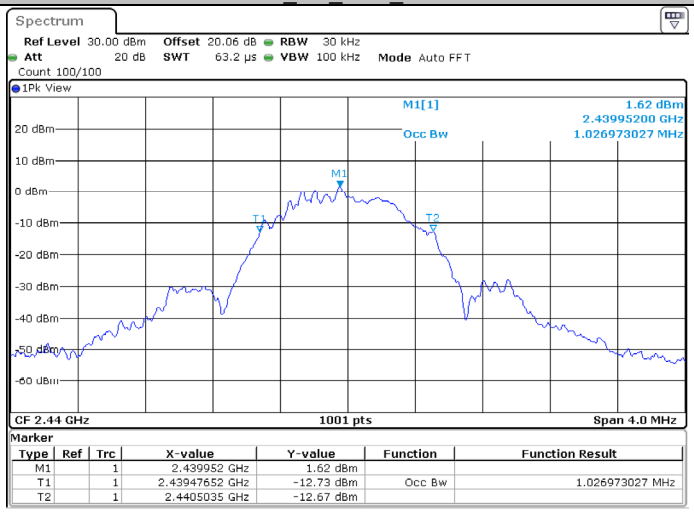
Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.027	2401.4765	2402.5035	---	---
		2440	1.027	2439.4765	2440.5035	---	---
		2480	1.027	2479.4765	2480.5035	---	---

Test Graphs

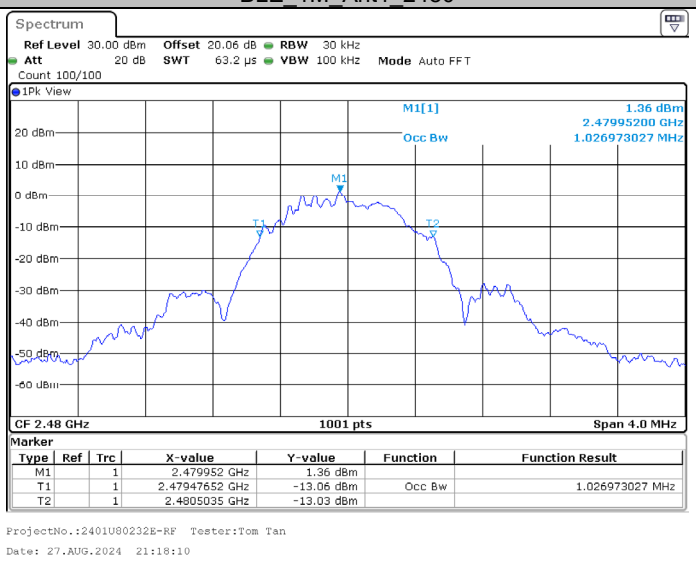
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



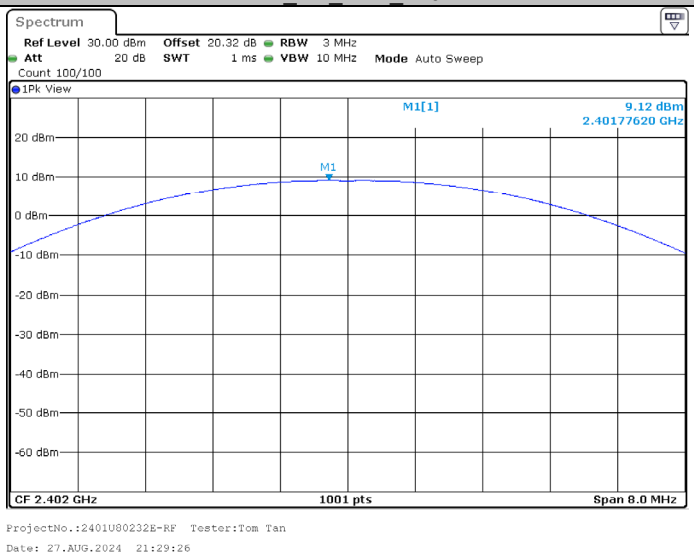
Appendix C: Maximum Conducted Output Power

Test Result

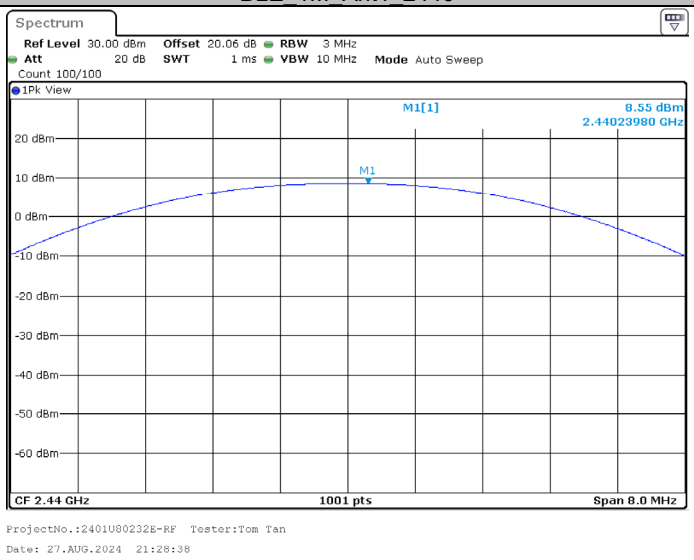
Test Mode	Antenna	Frequency[MHz]	Conducted Peak Power [dBm]	Conducted Limit [dBm]	Verdict
BLE_1M	Ant1	2402	9.12	≤30	PASS
		2440	8.55	≤30	PASS
		2480	8.45	≤30	PASS

Test Graphs Peak

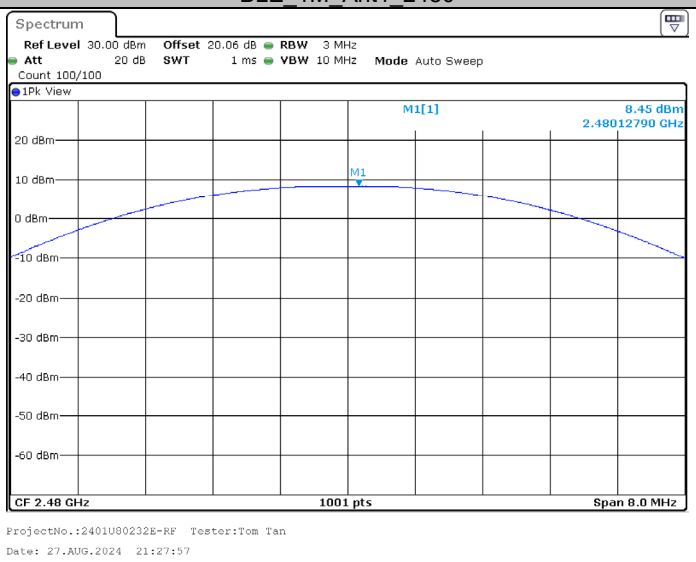
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



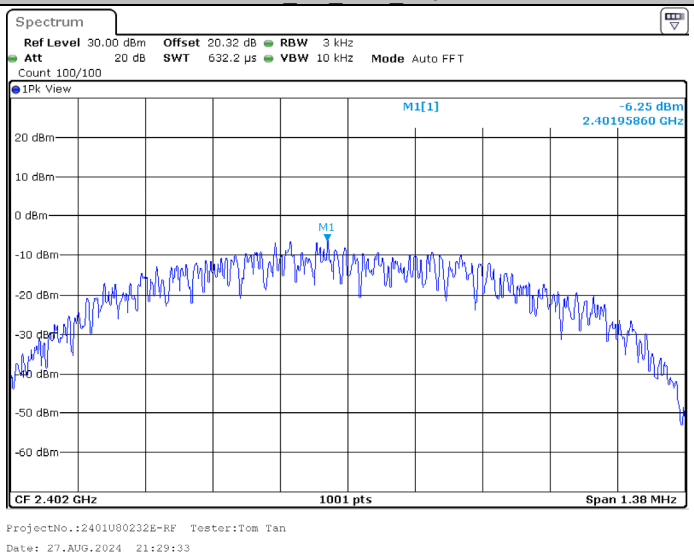
Appendix D: Maximum Power Spectral Density

Test Result

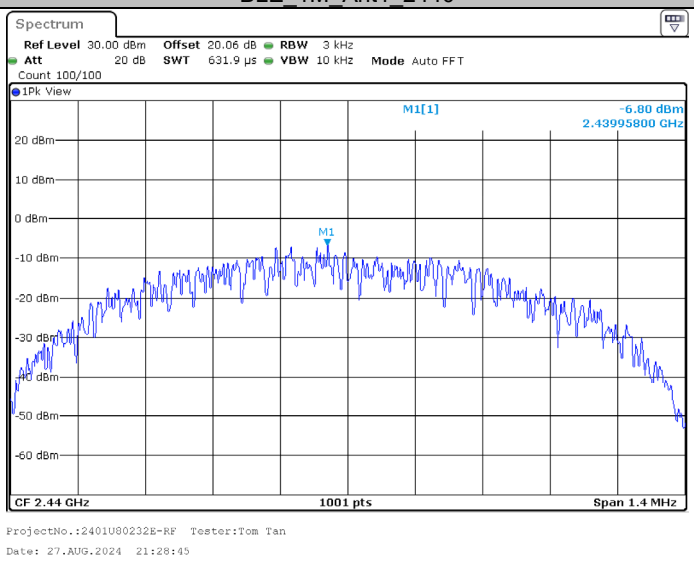
Test Mode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-6.25	≤8.00	PASS
		2440	-6.80	≤8.00	PASS
		2480	-6.90	≤8.00	PASS

Test Graphs

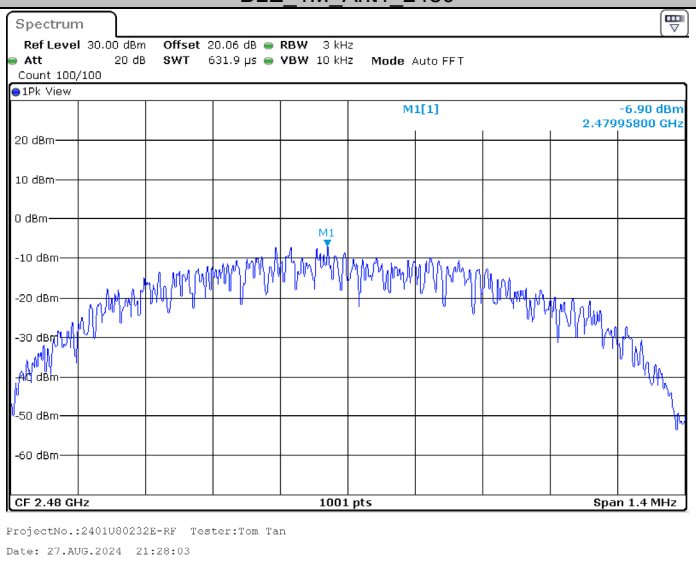
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



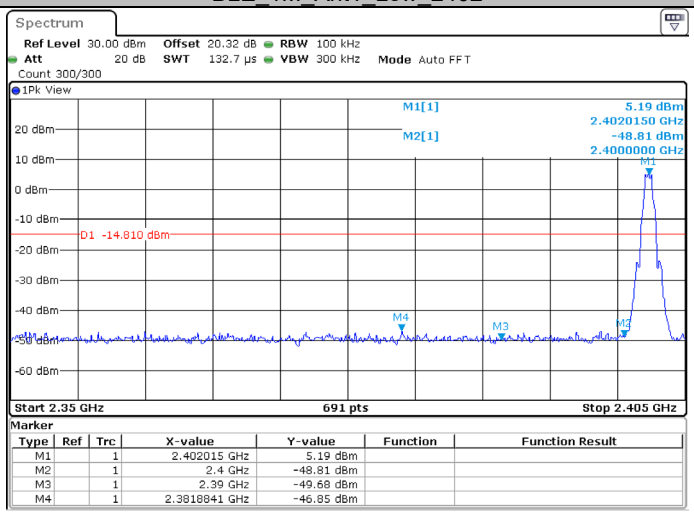
BLE_1M_Ant1_2480



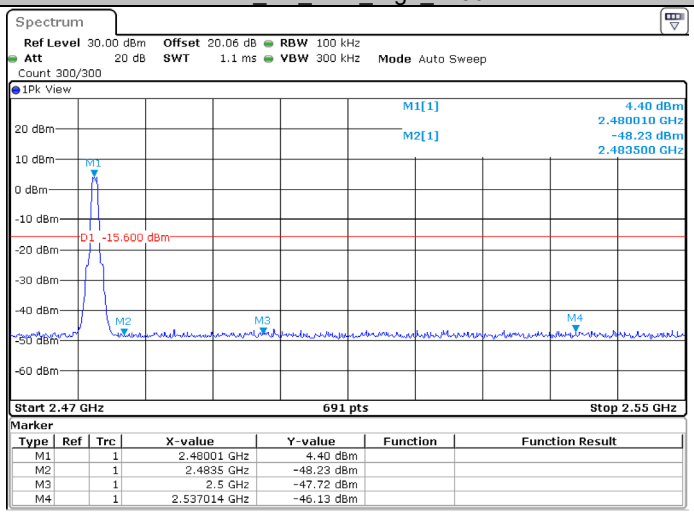
Appendix E: Band Edge Measurements

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



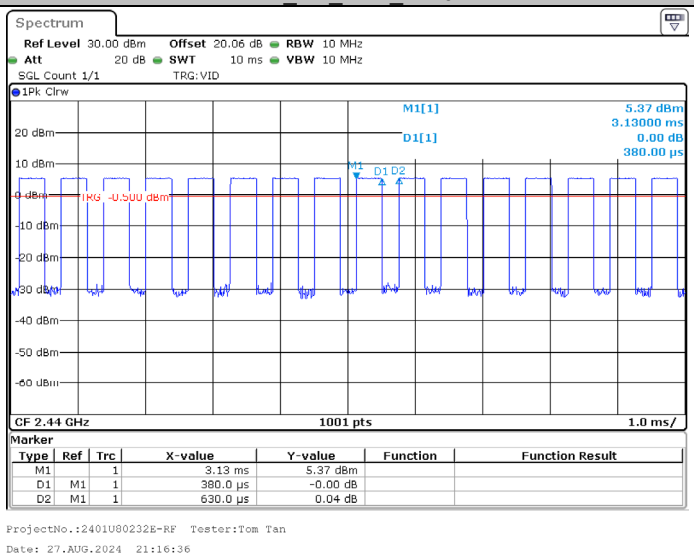
Appendix F: Duty Cycle

Test Result

Test Mode	Antenna	Frequency [MHz]	ON Time [ms]	Period [ms]	Duty Cycle [%]	1/T[Hz]	VBW Setting [Hz]
BLE_1M	Ant1	2440	0.38	0.63	60.32	2632	3000

Test Graphs

BLE_1M_Ant1_2440



APPENDIX – 2.4G Wi-Fi

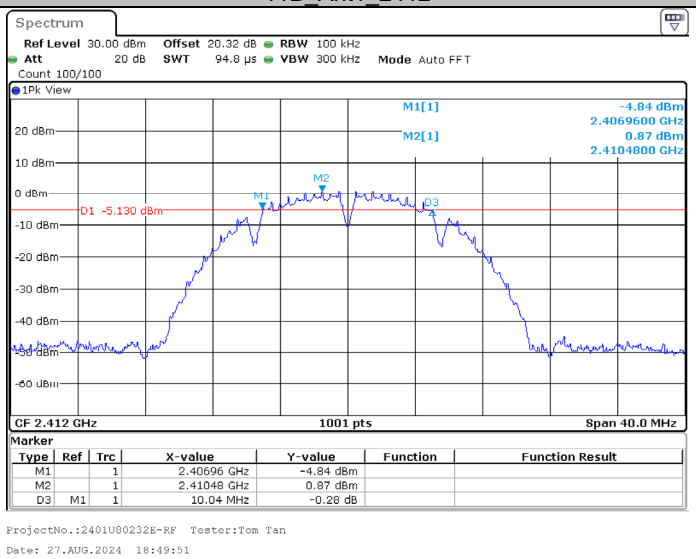
Appendix A: DTS Bandwidth

Test Result

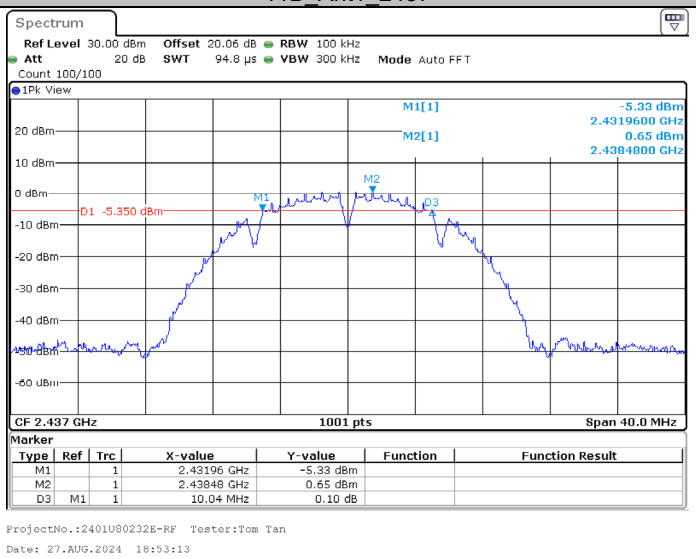
Test Mode	Antenna	Channel	DTS BW [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	10.04	0.5	PASS
		2437	10.04	0.5	PASS
		2462	10.04	0.5	PASS
11G	Ant1	2412	16.60	0.5	PASS
		2437	16.60	0.5	PASS
		2462	16.60	0.5	PASS
11N20SISO	Ant1	2412	17.80	0.5	PASS
		2437	17.80	0.5	PASS
		2462	17.80	0.5	PASS
11N40SISO	Ant1	2422	36.48	0.5	PASS
		2437	36.40	0.5	PASS
		2452	36.48	0.5	PASS

Test Graphs

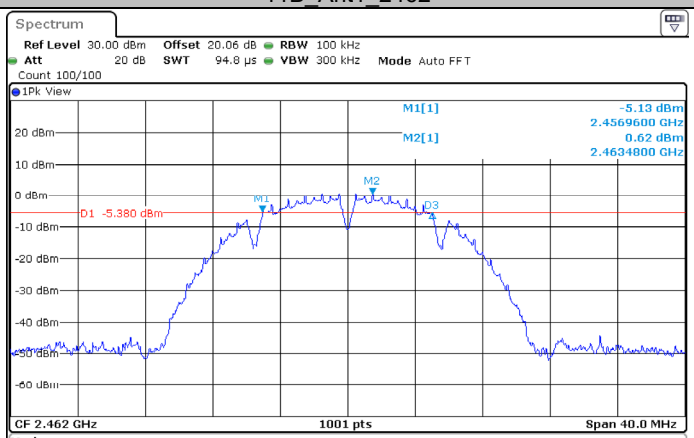
11B_Ant1_2412



11B_Ant1_2437



11B_Ant1_2462

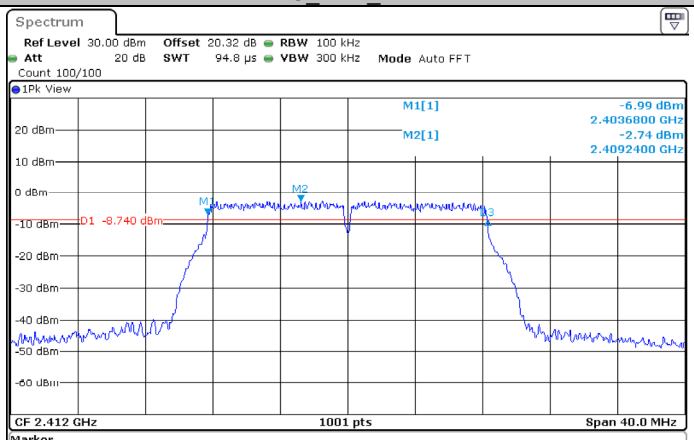


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45696 GHz	-5.13 dBm		
M2		1	2.46348 GHz	0.62 dBm		
D3	M1	1	10.04 MHz	-0.24 dB		

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:55:37

11G_Ant1_2412

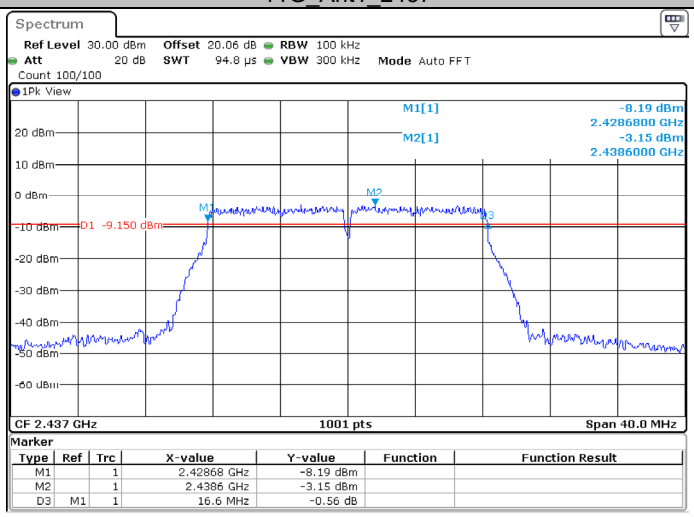


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40368 GHz	-6.99 dBm		
M2		1	2.40924 GHz	-2.74 dBm		
D3	M1	1	16.6 MHz	-1.63 dB		

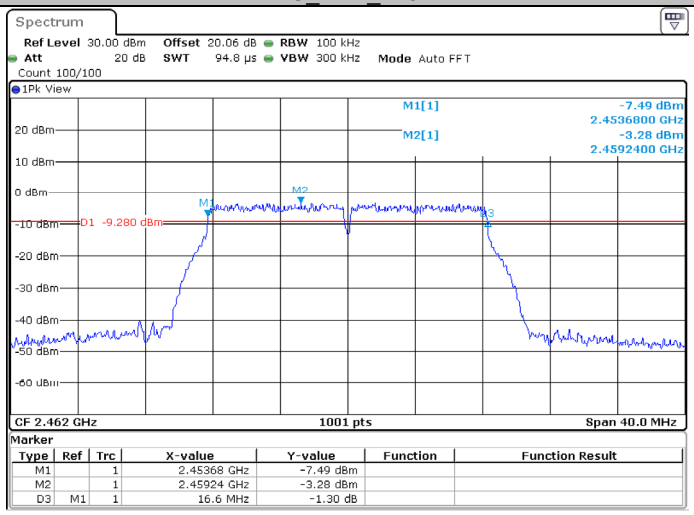
ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:58:36

11G_Ant1_2437



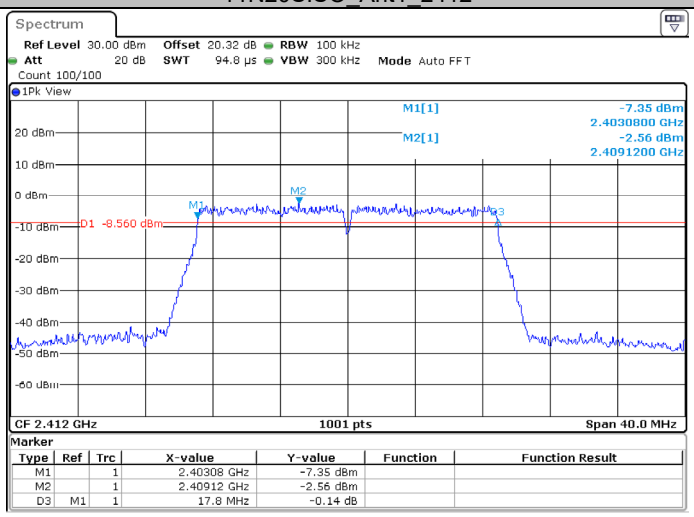
ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:59:51

11G_Ant1_2462



ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 19:07:13

11N20SISO_Ant1_2412



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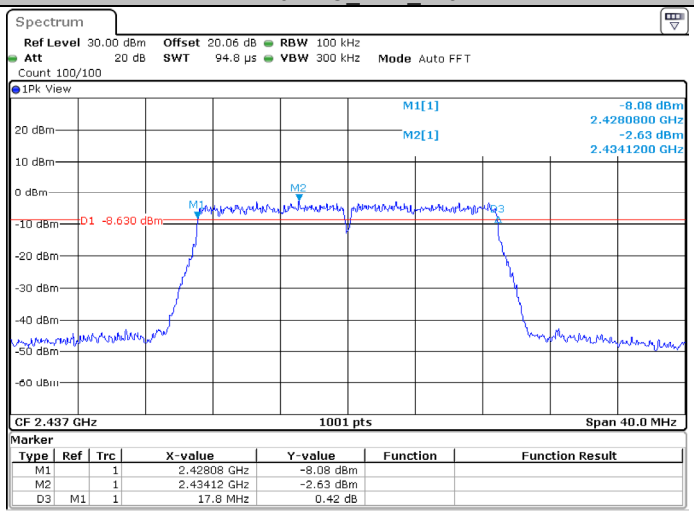

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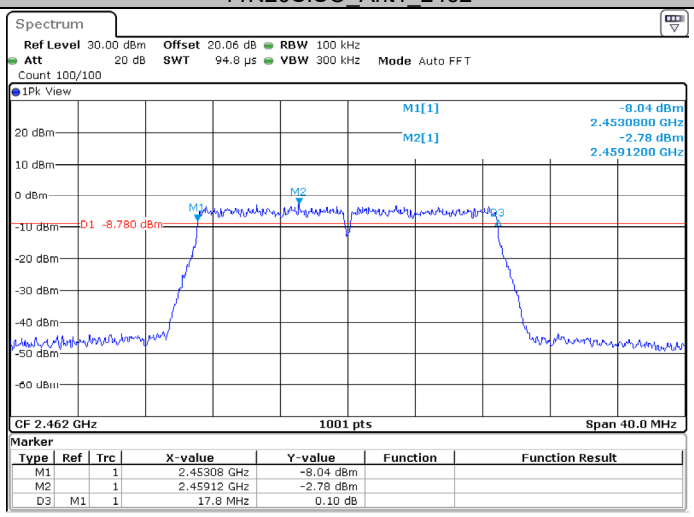
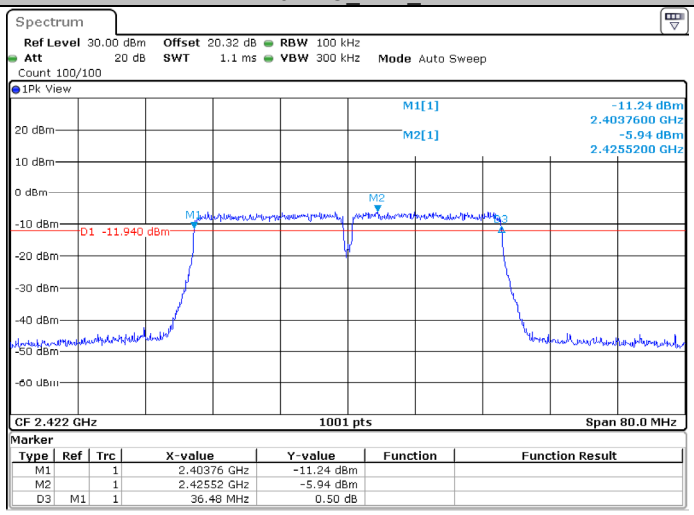
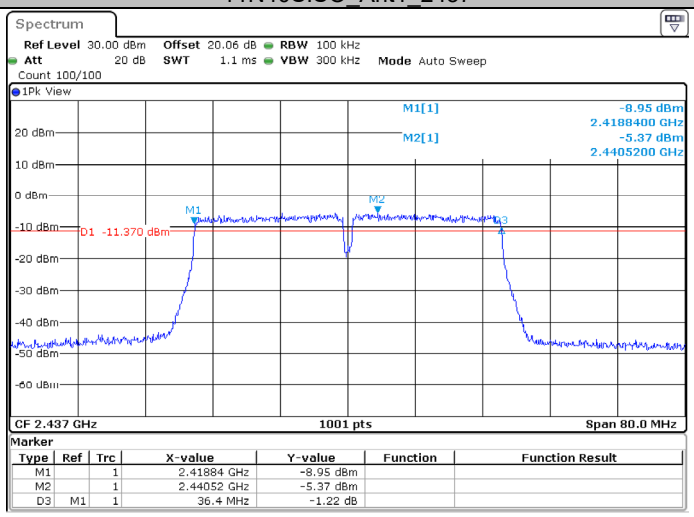


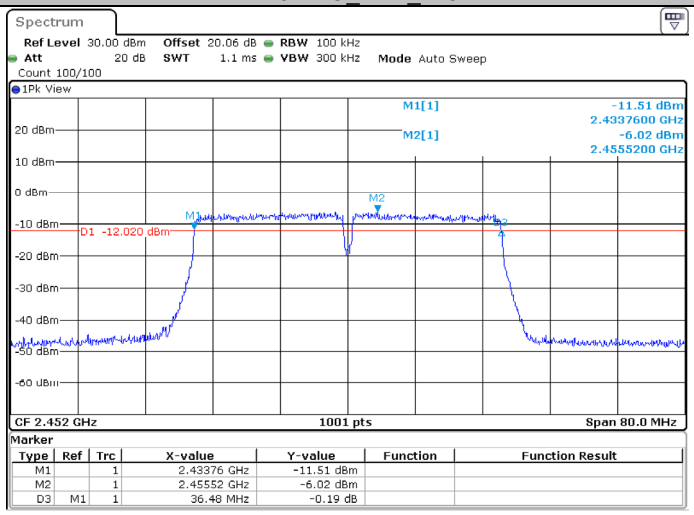
11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



11N40SISO_Ant1_2452



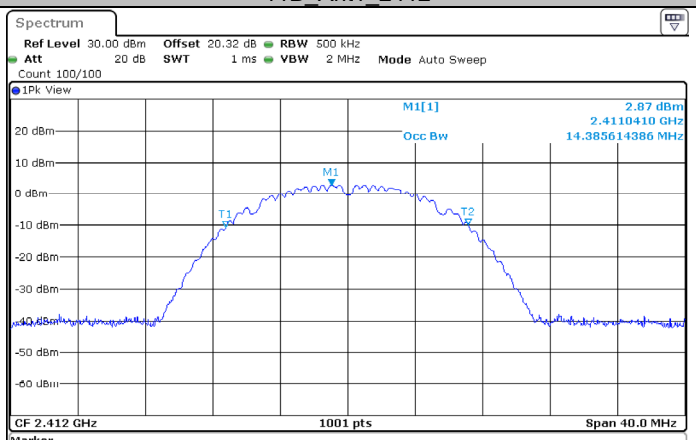
Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.386	---	---
		2437	14.306	---	---
		2462	14.346	---	---
11G	Ant1	2412	17.702	---	---
		2437	17.542	---	---
		2462	17.702	---	---
11N20SISO	Ant1	2412	18.062	---	---
		2437	18.022	---	---
		2462	18.102	---	---
11N40SISO	Ant1	2422	36.603	---	---
		2437	36.523	---	---
		2452	36.523	---	---

Test Graphs

11B_Ant1_2412

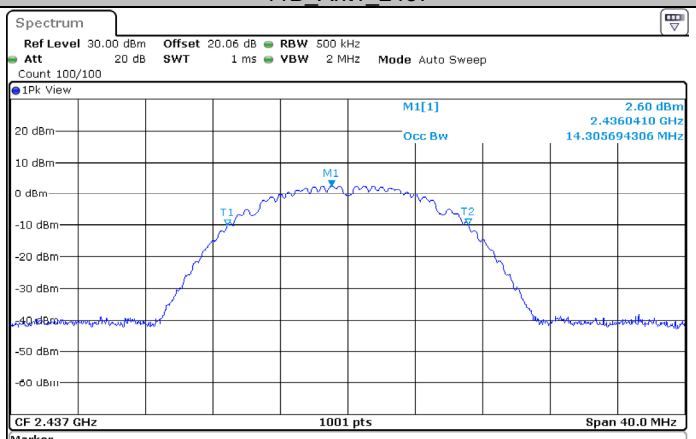


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.411041 GHz	2.87 dBm		
T1		1	2.4047672 GHz	-10.71 dBm	Occ Bw	14.385614386 MHz
T2		1	2.4191528 GHz	-9.85 dBm		

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:49:57

11B_Ant1_2437

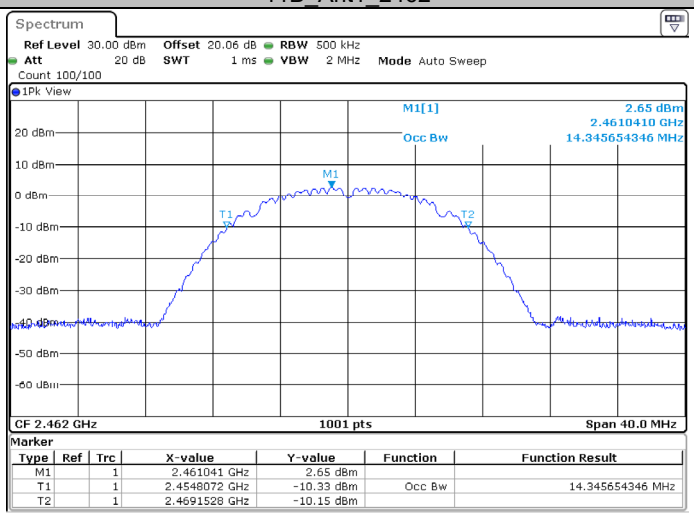


Marker

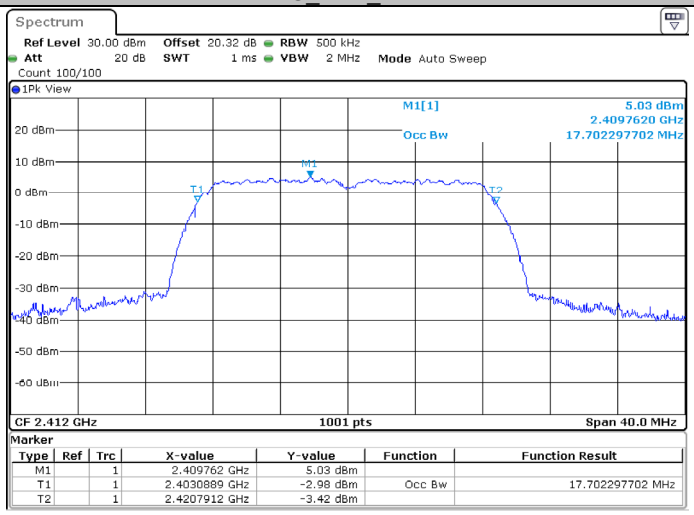
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.436041 GHz	2.60 dBm		
T1		1	2.4298472 GHz	-10.12 dBm	Occ Bw	14.305694306 MHz
T2		1	2.4441528 GHz	-9.94 dBm		

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:53:18

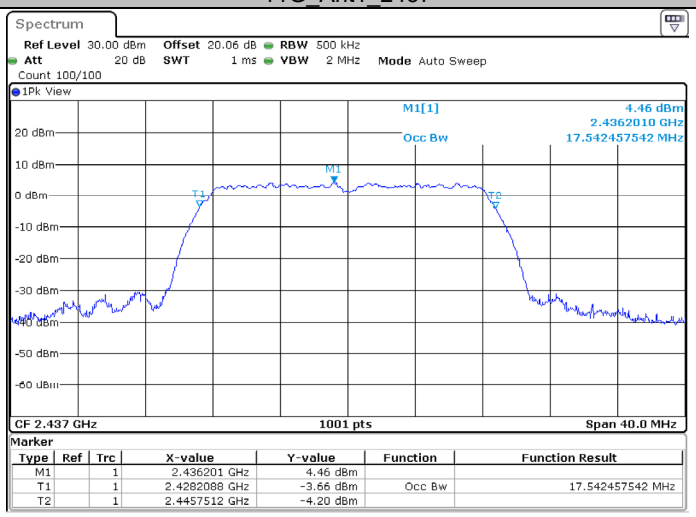
11B_Ant1_2462



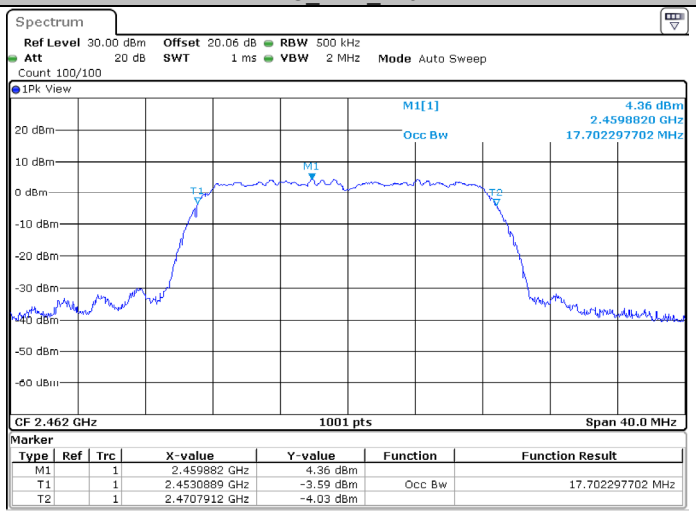
11G_Ant1_2412



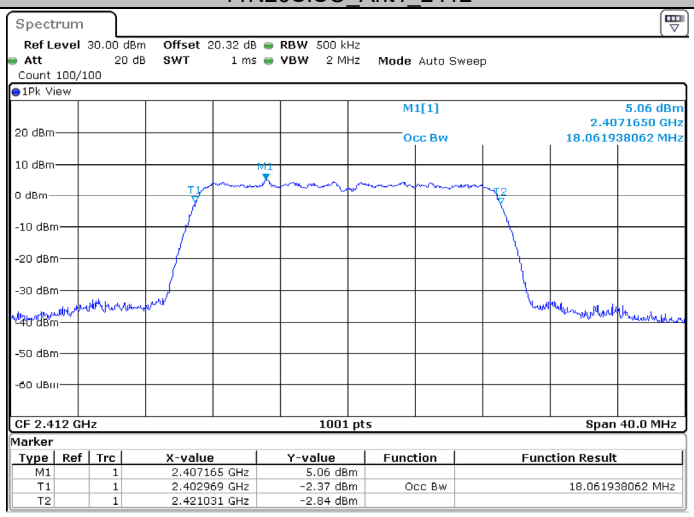
11G_Ant1_2437



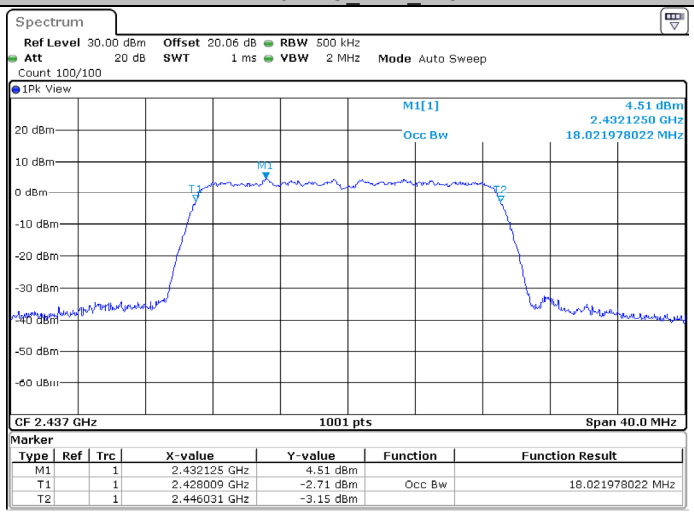
11G_Ant1_2462



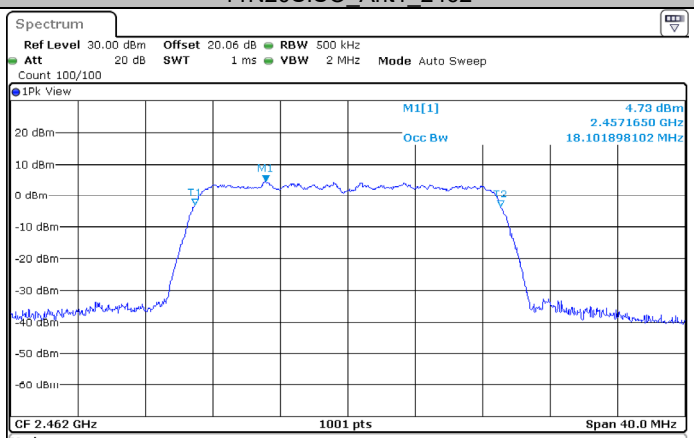
11N20SISO_Ant1_2412



11N20SISO_Ant1_2437



11N20SISO_Ant1_2462

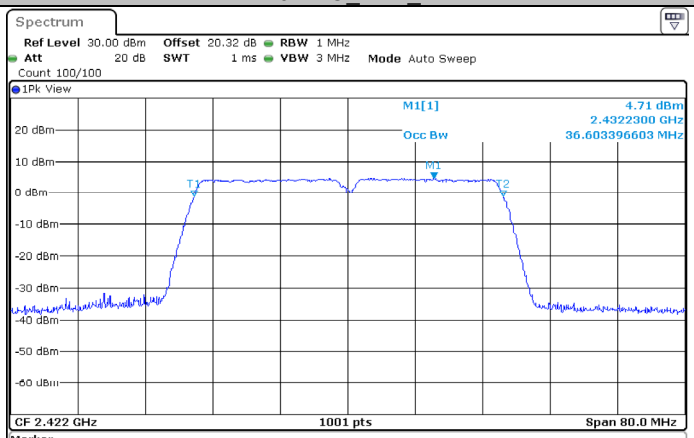


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.457165 GHz	4.73 dBm		
T1		1	2.4529291 GHz	-3.00 dBm	Occ Bw	18.101898102 MHz
T2		1	2.471031 GHz	-3.65 dBm		

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 19:15:31

11N40SISO_Ant1_2422

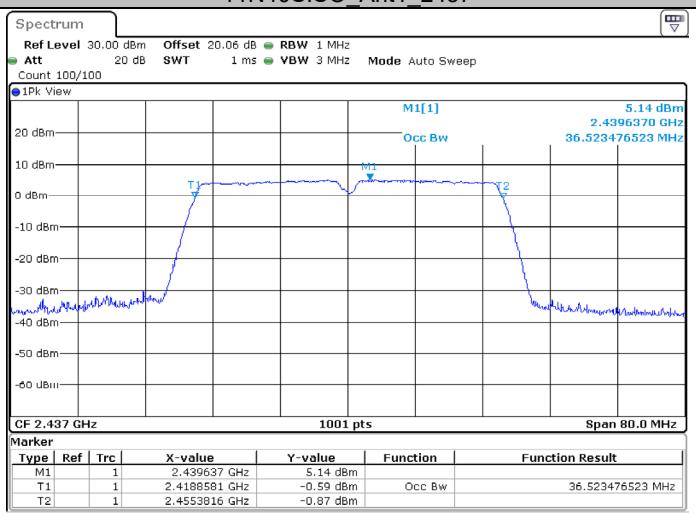


Marker

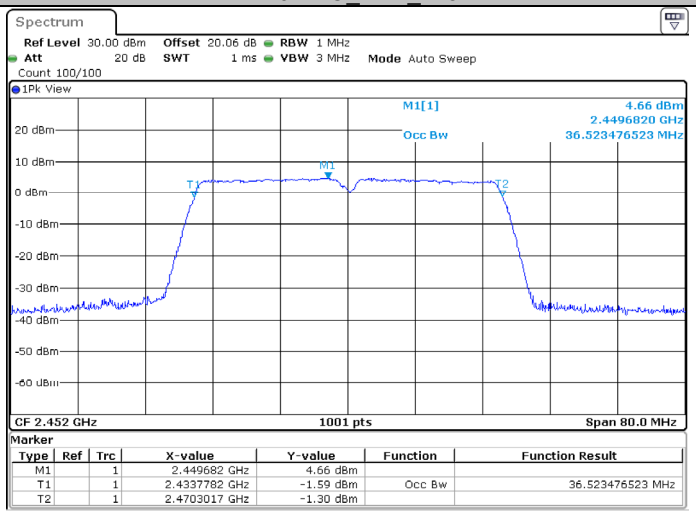
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43223 GHz	4.71 dBm		
T1		1	2.4037782 GHz	-1.32 dBm	Occ Bw	36.603396603 MHz
T2		1	2.4403816 GHz	-1.09 dBm		

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 19:17:55

11N40SISO_Ant1_2437



11N40SISO_Ant1_2452



Appendix C: Maximum Conducted Output Power

Test Result

Test Mode	Antenna	Channel	Average Power[dBm]	Peak Power [dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	11.36	14.58	≤30.00	PASS
		2437	11.53	14.32	≤30.00	PASS
		2462	11.52	14.35	≤30.00	PASS
11G	Ant1	2412	11.56	19.22	≤30.00	PASS
		2437	11.37	18.80	≤30.00	PASS
		2462	11.22	18.71	≤30.00	PASS
11N20SISO	Ant1	2412	11.38	19.34	≤30.00	PASS
		2437	11.34	19.07	≤30.00	PASS
		2462	11.37	18.92	≤30.00	PASS
11N40SISO	Ant1	2422	11.34	18.92	≤30.00	PASS
		2437	11.21	19.25	≤30.00	PASS
		2452	11.21	18.80	≤30.00	PASS

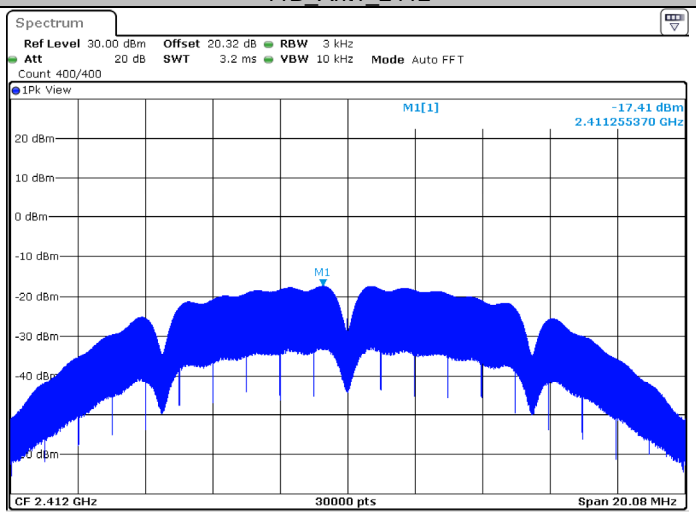
Appendix D: Maximum Power Spectral Density

Test Result

Test Mode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-17.41	≤8.00	PASS
		2437	-17.61	≤8.00	PASS
		2462	-17.63	≤8.00	PASS
11G	Ant1	2412	-17.15	≤8.00	PASS
		2437	-17.69	≤8.00	PASS
		2462	-17.78	≤8.00	PASS
11N20SISO	Ant1	2412	-16.15	≤8.00	PASS
		2437	-16.66	≤8.00	PASS
		2462	-16.60	≤8.00	PASS
11N40SISO	Ant1	2422	-18.81	≤8.00	PASS
		2437	-17.57	≤8.00	PASS
		2452	-17.39	≤8.00	PASS

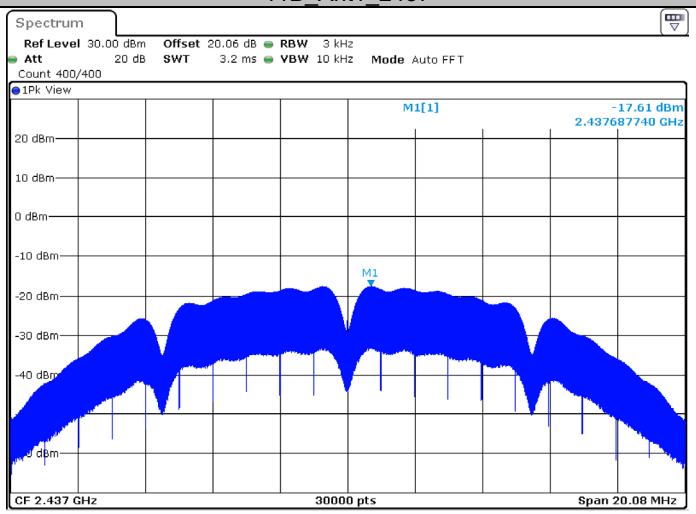
Test Graphs

11B_Ant1_2412



ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:50:17

11B_Ant1_2437



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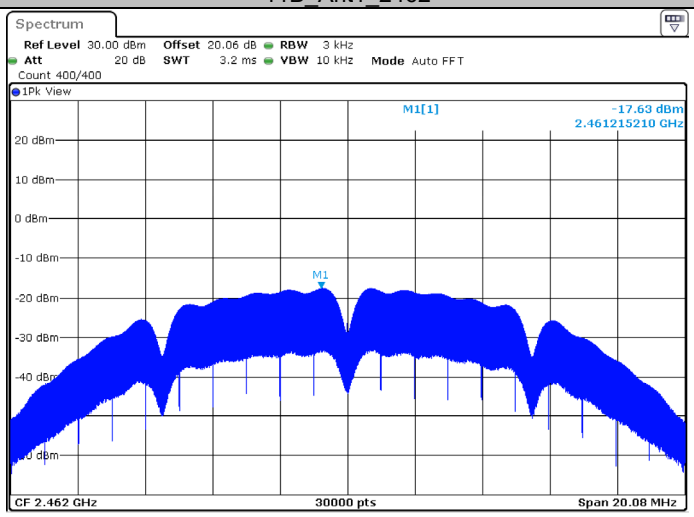
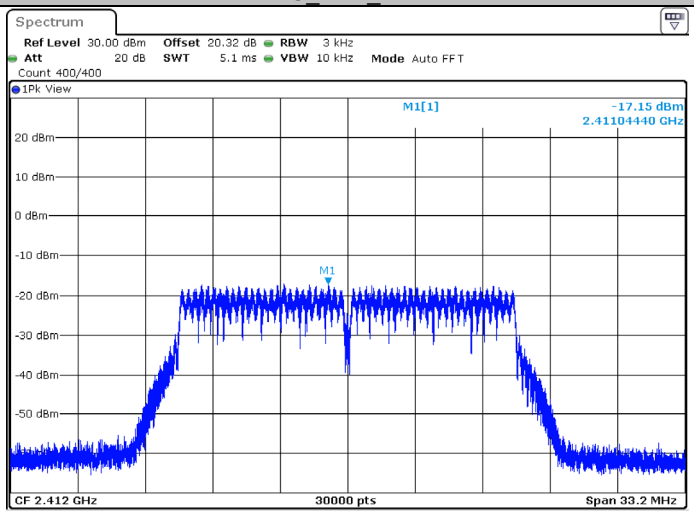
Date: 27.AUG.2024 18:53:39

11B_Ant1_2462



ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:56:03

11G_Ant1_2412



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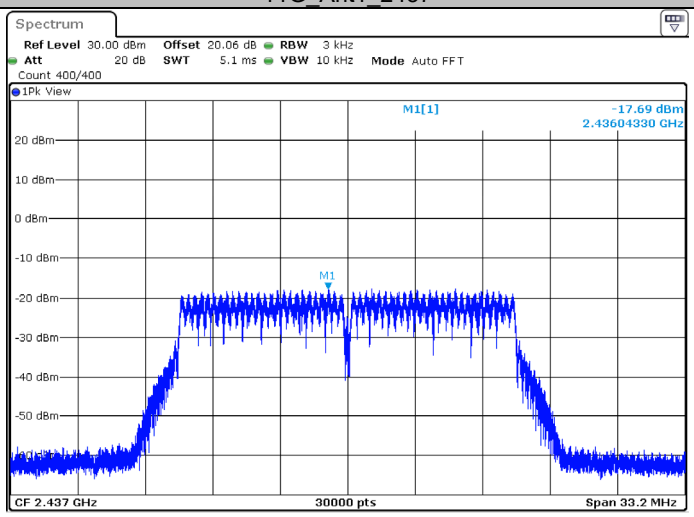
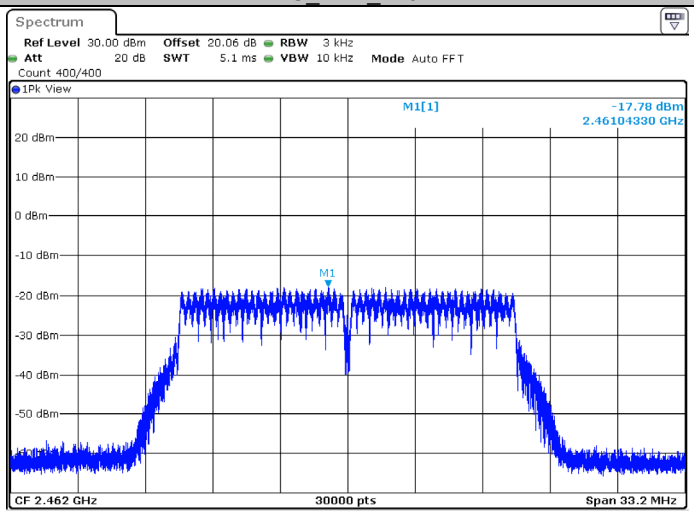
Date: 27.AUG.2024 18:59:02

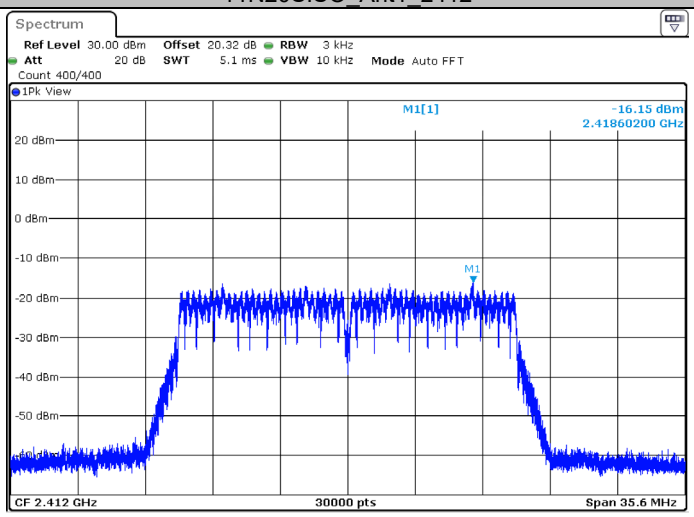
11G_Ant1_2437



11G_Ant1_2462



11N20SISO_Ant1_2412



ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 19:09:21

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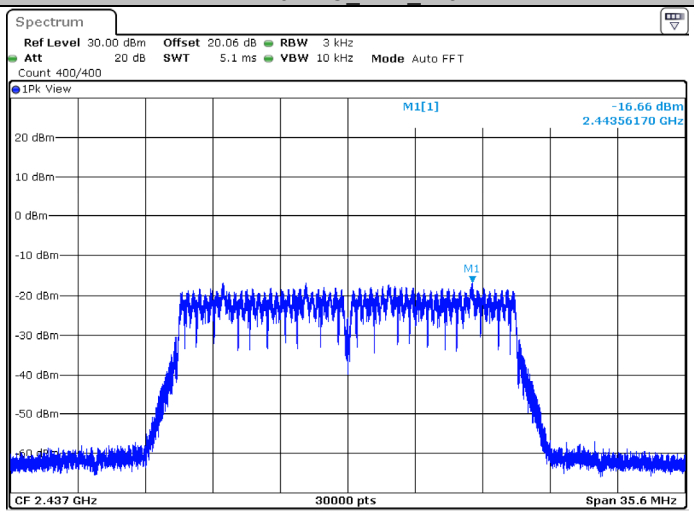

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Date: 27.AUG.2024 19:14:39

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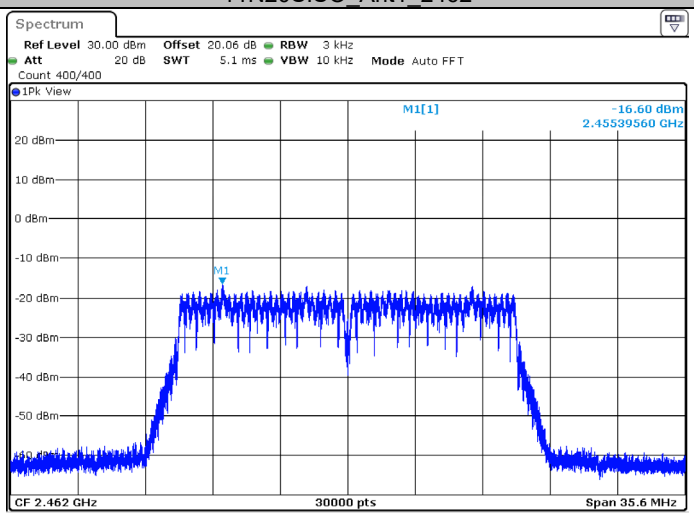

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Date: 27.AUG.2024 19:15:50

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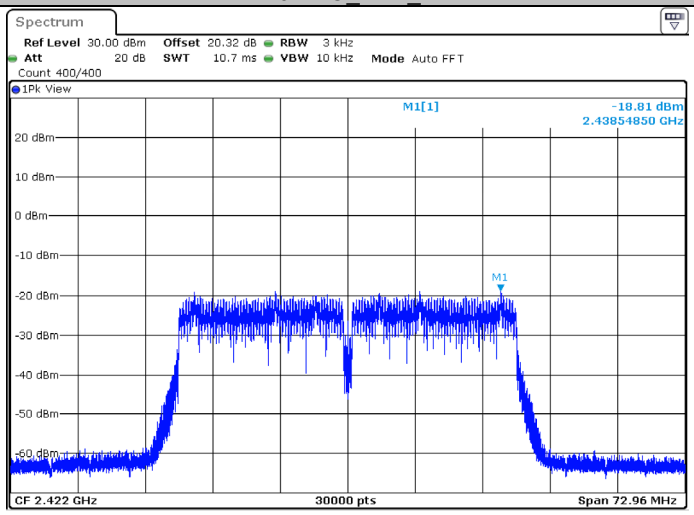

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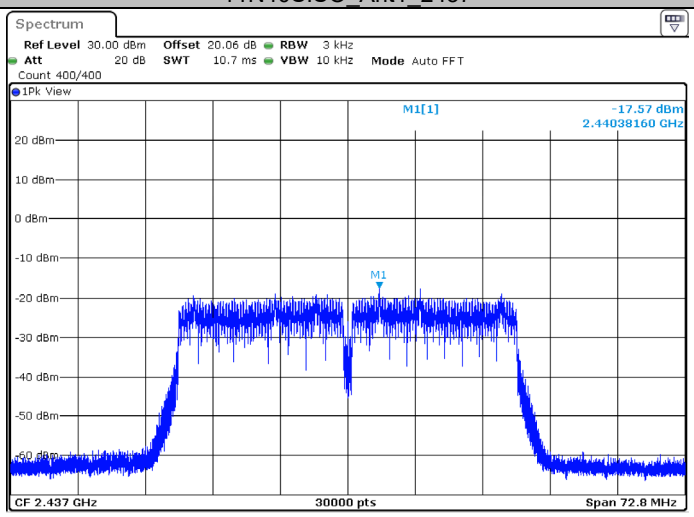
Date: 27.AUG.2024 19:18:20

11N40SISO_Ant1_2437



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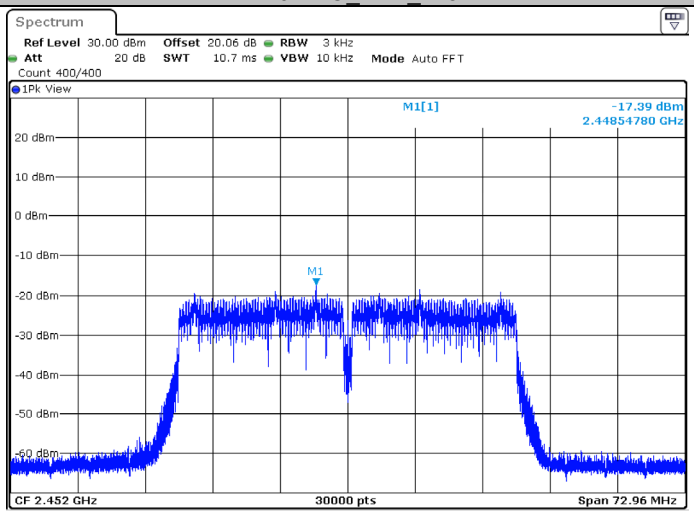
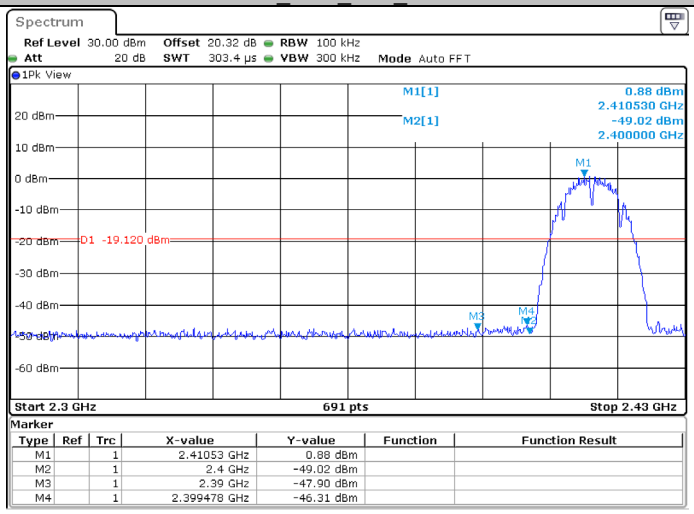


Appendix E: Band Edge Measurements

Test Graphs

11B_Ant1_Low_2412



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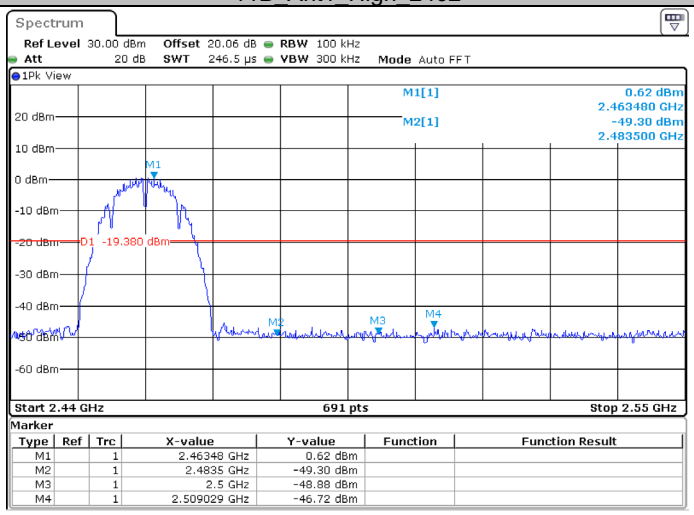
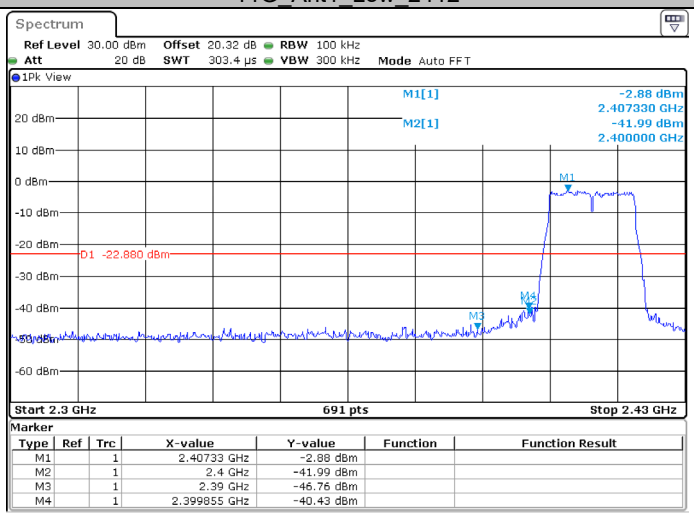


11G_Ant1_Low_2412



ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 18:59:11

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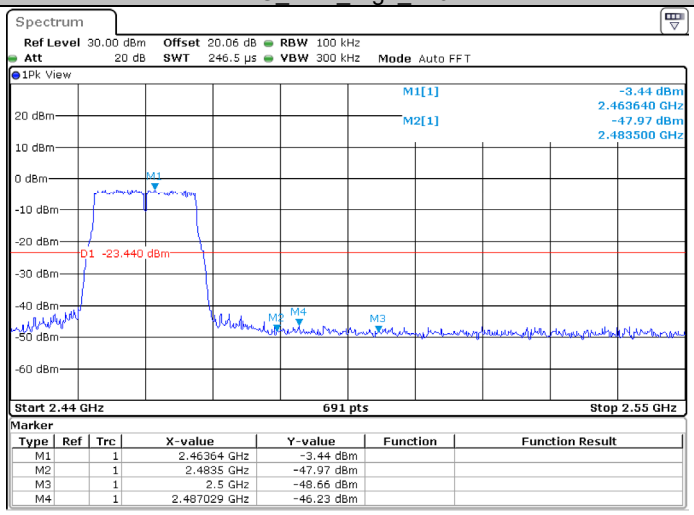

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 19:07:47

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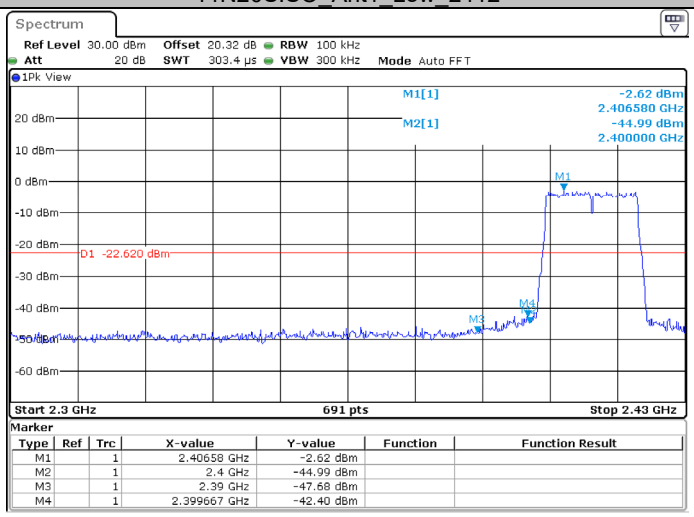

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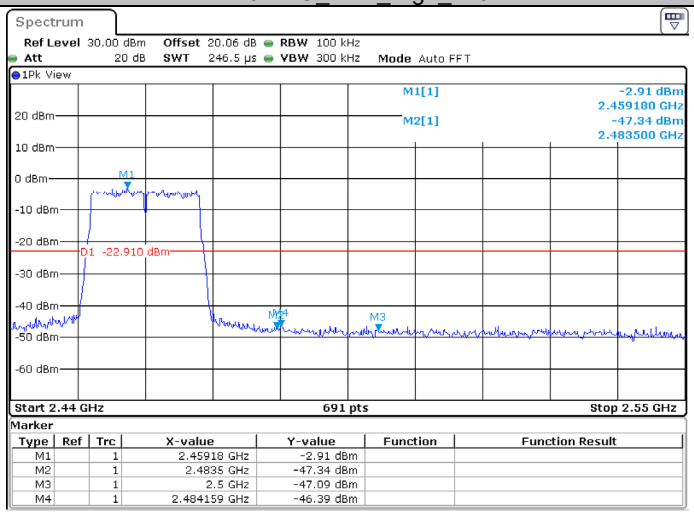
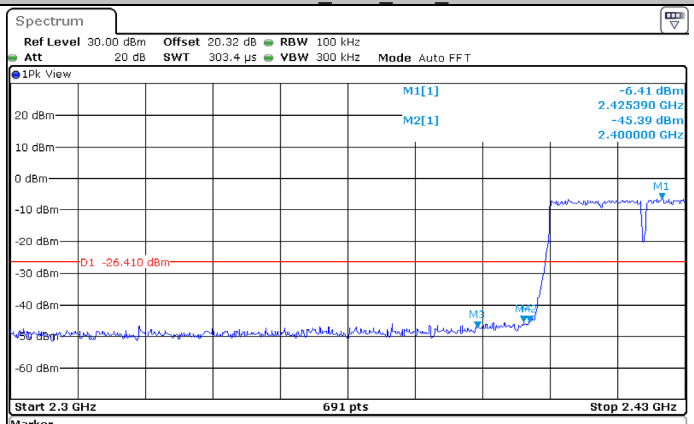


11N40SISO_Ant1_Low_2422



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.42539 GHz	-6.41 dBm		
M2		1	2.4 GHz	-45.39 dBm		
M3		1	2.39 GHz	-47.12 dBm		
M4		1	2.398913 GHz	-45.32 dBm		

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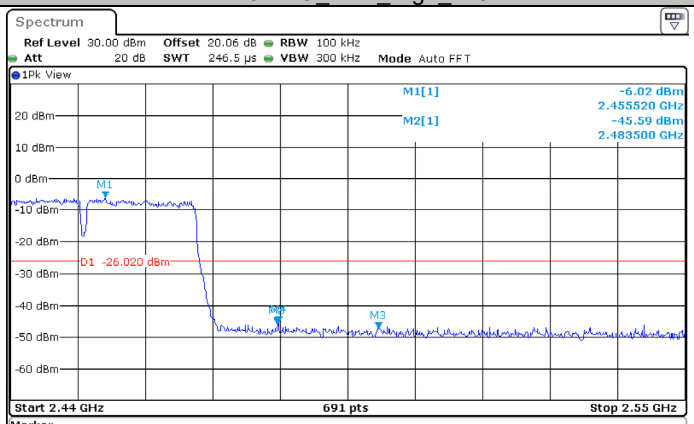
11N40SISO_Ant1_High_2452



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45552 GHz	-6.02 dBm		
M2		1	2.4835 GHz	-45.59 dBm		
M3		1	2.5 GHz	-47.33 dBm		
M4		1	2.483681 GHz	-45.33 dBm		

ProjectNo.:2401U80232E-RF Tester:Tom Tan
Date: 27.AUG.2024 19:21:28

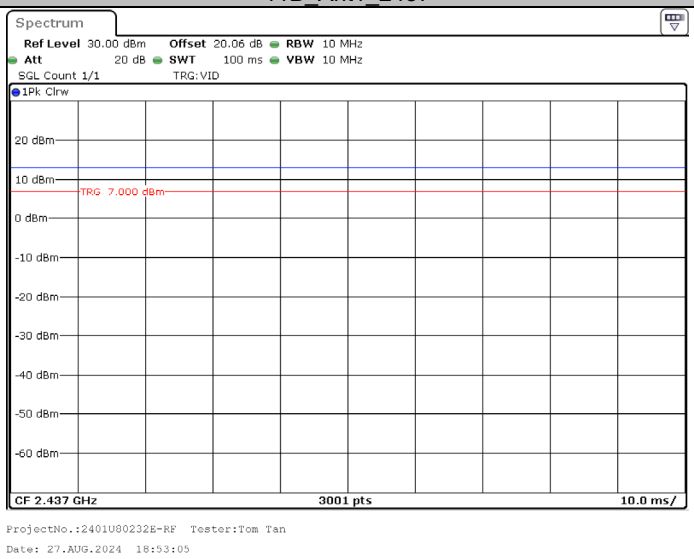
Appendix F: Duty Cycle

Test Result

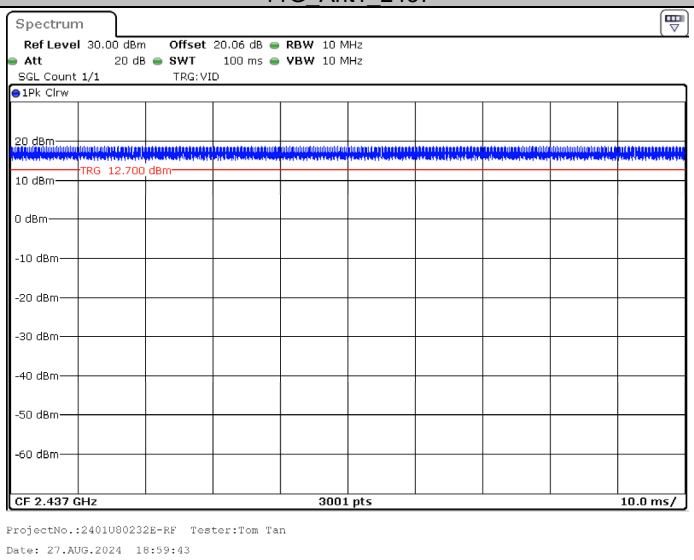
Test Mode	Antenna	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	1/T[Hz]	VBW Setting [Hz]
11B	Ant1	2437	100.00	100.00	100.00	/	10
11G	Ant1	2437	100.00	100.00	100.00	/	10
11N20SISO	Ant1	2437	100.00	100.00	100.00	/	10
11N40SISO	Ant1	2437	100.00	100.00	100.00	/	10

Test Graphs

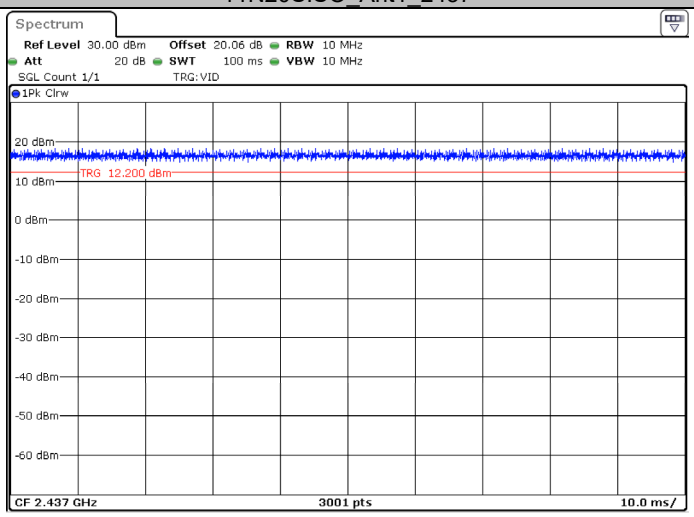
11B_Ant1_2437



11G_Ant1_2437



11N20SISO_Ant1_2437



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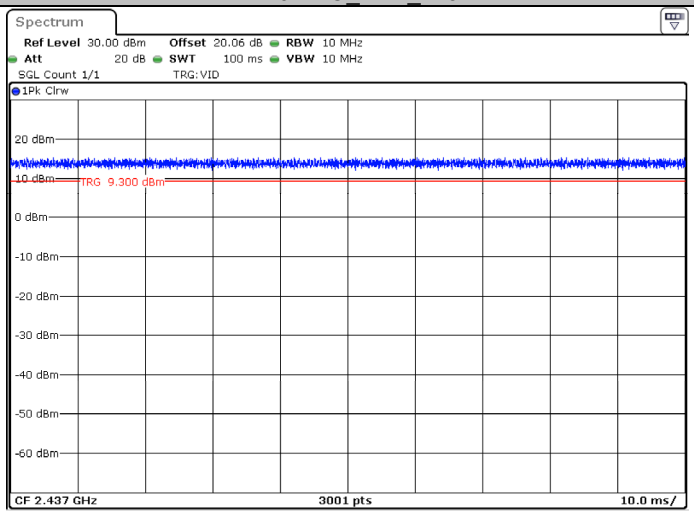

******* END OF REPORT *******