FCC - TEST REPORT

Report Number	:	**709502402457-00C**	Date of Issue:	July 1, 2024

Model	:	Refer to page 4
Product Type	:	Acoustic Thermal Imager
Applicant	:	FOTRIC INC.
Address	:	No. 14, Lane 2500, Xiupu Road, Pudong, 201201 Shanghai, PEOPLE'S REPUBLIC OF CHINA
Manufacturer	:	FOTRIC INC.
Address	:	No. 14, Lane 2500, Xiupu Road, Pudong, 201201 Shanghai, PEOPLE'S REPUBLIC OF CHINA
Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	44

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1 Table of Contents

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2 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
709502402457-00C	First Issue	07/01/2024

3 Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road,
Shanghai 201108,
P.R. China

Test Firm FCC Registration Number: 820234

Designation number: CN1183

IC Company Number: 31668

CAB identifier: CN0101

Telephone: +86 21 6141 0123
Fax: +86 21 6140 8600

4 Description of the Equipment under Test

Product: Acoustic Thermal Imager

Model no.:

Fotric P0MiX	Fotric 360MiX	Fotric 350MiX	Fotric 860MiX
Fotric P1MiX	Fotric 361MiX	Fotric 351MiX	Fotric 861MiX
Fotric P2MiX	Fotric 362MiX	Fotric 352MiX	Fotric 862MiX
Fotric P3MiX	Fotric 363MiX	Fotric 353MiX	Fotric 863MiX
Fotric P4MiX	Fotric 364MiX	Fotric 354MiX	Fotric 864MiX
Fotric P5MiX	Fotric 365MiX	Fotric 355MiX	Fotric 865MiX
Fotric P6MiX	Fotric 366MiX	Fotric 356MiX	Fotric 866MiX
Fotric P7MiX	Fotric 367MiX	Fotric 357MiX	Fotric 867MiX
Fotric P8MiX	Fotric 368MiX	Fotric 358MiX	Fotric 868MiX
Fotric P9MiX	Fotric 369MiX	Fotric 359MiX	Fotric 869MiX
Fotric P10MiX	Fotric 3610MiX	Fotric 3510MiX	Fotric 8610MiX

FCC ID: 2AZTCJGACF

Options and accessories: NA

Rating: DC 3.6V for Acoustic Thermal Imager
AC 100-240V, 50/60Hz for adapter

RF Transmission Frequency: For Bluetooth:2402~2480MHz
For 2.4G Wi-Fi:802.11b/g/n-HT20: 2412~2462 MHz
802.11n-HT40: 2422~2452 MHz
For 5G Wi-Fi:5180~5240 MHz (U-NII-1)
5260~5320 MHz (U-NII-2A)
5500~5720 MHz (U-NII-2C)
5745~5825 MHz (U-NII-3)

No. of Operated Channel: 79 channels for Bluetooth EDR

Ch	Fre (MH)	Ch	Fre (MH)	Ch	Fre (MH)	Ch	Fre (MH)	Ch	Fre (MHz)
1	2402	17	2418	33	2434	49	2450	65	2466
2	2403	18	2419	34	2435	50	2451	66	2467
3	2404	19	2420	35	2436	51	2452	67	2468
4	2405	20	2421	36	2437	52	2453	68	2469
5	2406	21	2422	37	2438	53	2454	69	2470
6	2407	22	2423	38	2439	54	2455	70	2471
7	2408	23	2424	39	2440	55	2456	71	2472
8	2409	24	2425	40	2441	56	2457	72	2473
9	2410	25	2426	41	2442	57	2458	73	2474
10	2411	26	2427	42	2443	58	2459	74	2475
11	2412	27	2428	43	2444	59	2460	75	2476
12	2413	28	2429	44	2445	60	2461	76	2477
13	2414	29	2430	45	2446	61	2462	77	2478
14	2415	30	2431	46	2447	62	2463	78	2479
15	2416	31	2432	47	2448	63	2464	79	2480
16	2417	32	2433	48	2449	64	2465		

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40 channels for Bluetooth 4.2 BLE

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

2.4GHz WIFI: 11 for 802.11b/802.11g/802.11(H20);
7 for 802.11n(HT40)

802.11b/g/n(HT20)					802.11n(HT40)		
Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)
1	2412	7	2442	3	2422	8	2447MHz
2	2417	8	2447	4	2427	9	2452MHz
3	2422	9	2452	5	2432		
4	2427	10	2457	6	2437		
5	2432	11	2462	7	2442		
6	2437						

5180~5240 MHz (U-NII-1):

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
42	5210

5260~5320 MHz (U-NII-2A)

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency （MHz）	Channel	Frequency （MHz）
52	5260	60	5300
56	5280	64	5320

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency （MHz）	Channel	Frequency （MHz）
54	5270	62	5310

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency （MHz）	Channel	Frequency （MHz）
58	5290		

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5500~5720 MHz (U-NII-2C)

12 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency (MHz)	Channel	Frequency(MHz)
100	5500	124	5620
104	5520	128	5640
108	5540	132	5660
112	5560	136	5680
116	5580	140	5700
120	5600	144	5720

6 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency (MHz)	Channel	Frequency(MHz)
102	5510	126	5630
110	5550	134	5670
118	5590	142	5710

3 channels are provided for 802.11ac (VHT80):

Channel	Frequency (MHz)	Channel	Frequency(MHz)
106	5530	138	5690
122	5610		

5745~5825 MHz (U-NII-3): Channel 149 – 165

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785		

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency (MHz)
155	5755

Modulation: Bluetooth EDR FHSS: GFSK, π/4 DQPSK, 8DPSK
Bluetooth 4.2+BLE DHSS: GFSK
For Wi-Fi: Direct Sequence Spread Spectrum (DSSS) for 802.11b
Orthogonal Frequency Division Multiplexing (OFDM) for 802.11a/b/g/n/ac

Hardware Version: V6.0.0

Software Version: V6.0.1

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Data speed:	1. Bluetooth EDR FHSS: 1Mbps, 2Mbps, 3Mbps 2. Bluetooth 4.2+BLE DHSS: 1Mbps 3. Wi-Fi: 11b 1 ~ 11Mbps, 11g/a 6 ~ 54Mbps, 11n HT20 6.5 ~ 72.2Mbps, 11n HT 40 13.5 ~ 150Mbps, 11ac VHT40 13.5 ~ 200Mbps, 11ac VHT80 29.3 ~ 433.3Mbps
Antenna Type:	PCB Antenna
Antenna Gain:	1.79dBi for 2.4GHz; 7.19dBi for 5GHz
Description of the EUT:	The Equipment Under Test (EUT) is an Acoustic Thermal Imager with Bluetooth and Wi-Fi Module. The EUT support Bluetooth EDR, BLE function, Wi-Fi 2.4GHz and Wi-Fi 5GHz. According to the client's declaration, all the models have the same schematic and hardware circuit, except pixel, lens size differences. Detail model list refer to page 4 and Fotric 860MiX is chosen to perform all the tests and listed the worst data in this report. Only 2.4GHz BLE RF testing results were included in this report.
Test sample no.:	SHA-801877-1 (RF Conducted); SHA-801877-2 (RF Radiated)

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

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5 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2023 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2020.

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6 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	15-19	Site 1	☒	☐	☐
§15.247 (b) (3)	Conducted peak output power	20-23	Site 1	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	6dB bandwidth	24-25	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	26-27	Site 1	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	28-31	Site 1	☒	☐	☐
§15.247(d)	Band edge	32-34	Site 1	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	35-41	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses a PIFA antenna, which gain is 1.79dBi for 2.4GHz. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

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7 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AZTCJGACF complies with Section 15.205,15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

This report in only for 2.4GHz BLE.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

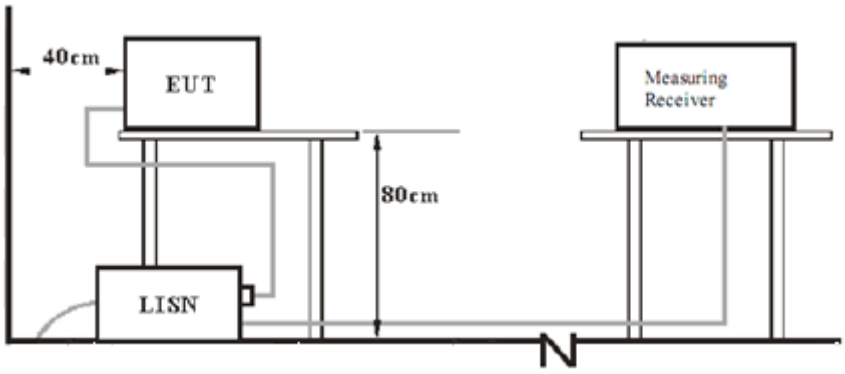
Sample Received Date:	April 1, 2024
Testing Start Date:	April 16, 2024
Testing End Date:	June 28, 2024

-TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:	Prepared by:	Tested by:
Hui TONG	Jiaxi XU	Cheng Huali
Review Engineer	Project Engineer	Test Engineer

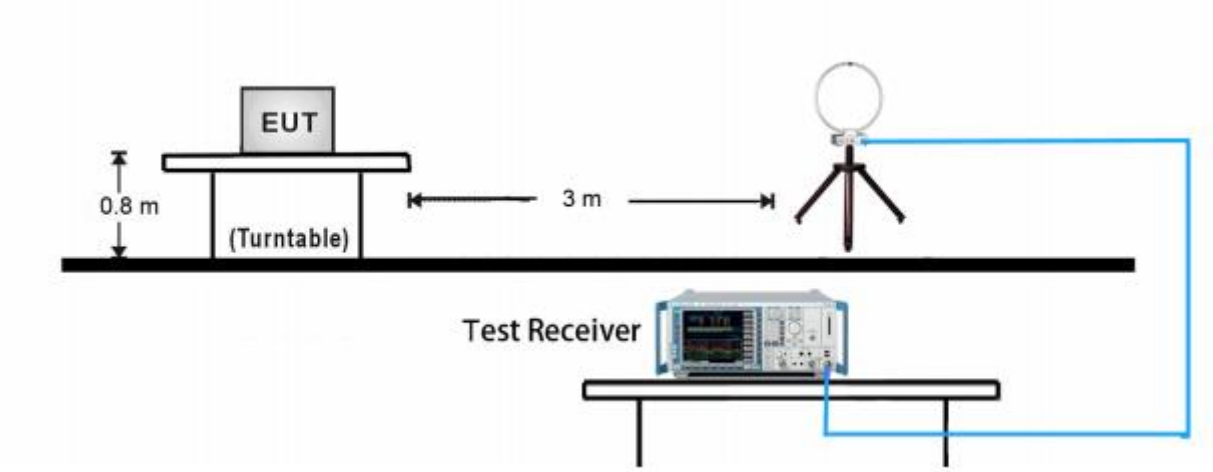
8 Test Setups

7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups

9kHz ~ 30MHz Test Setup:



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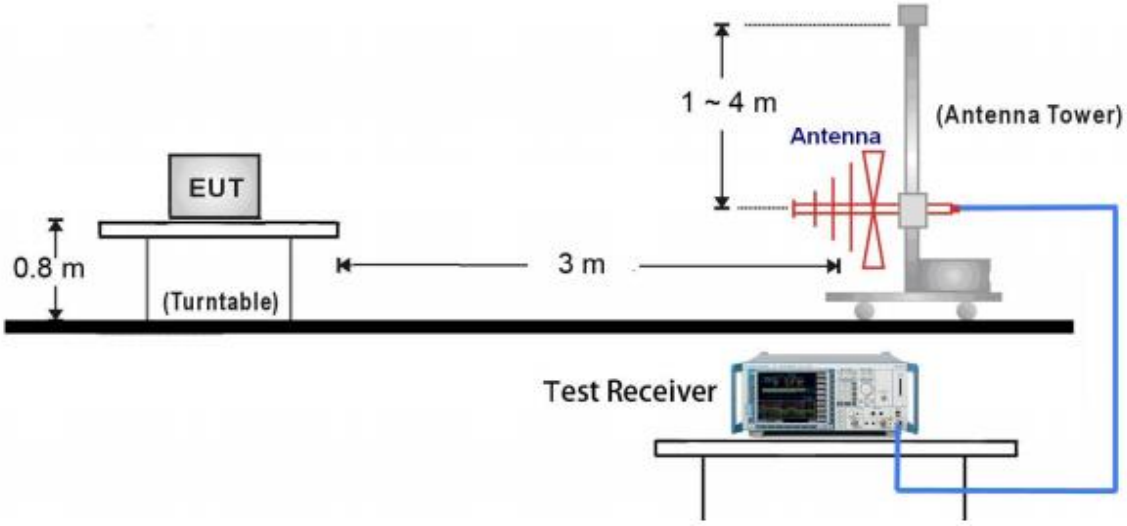
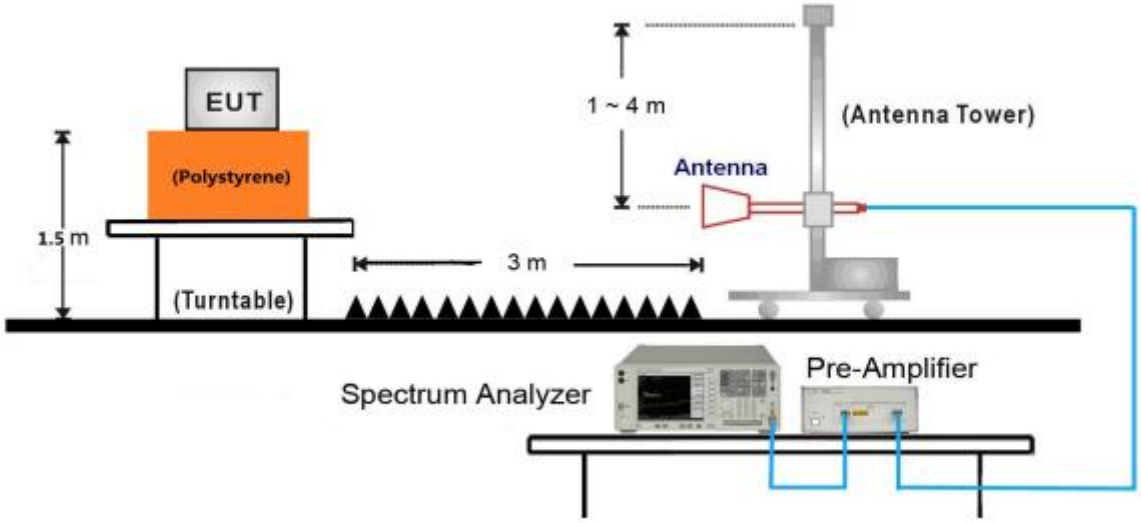
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



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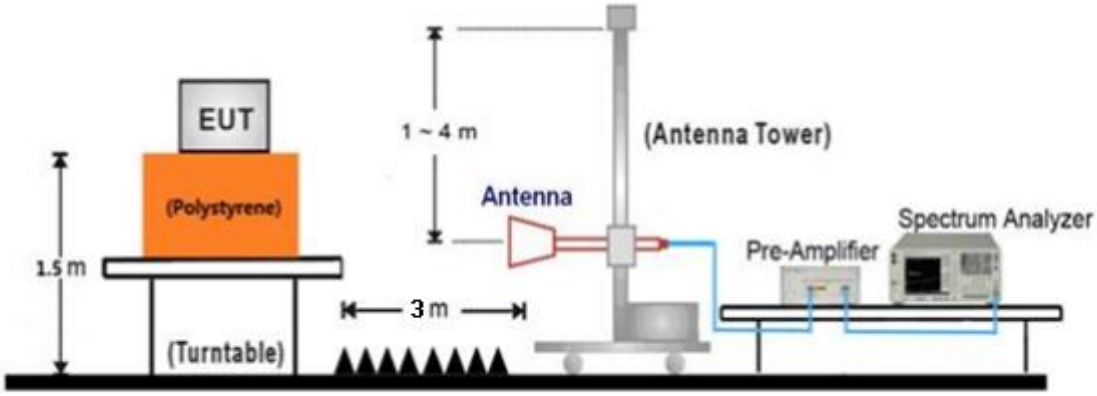
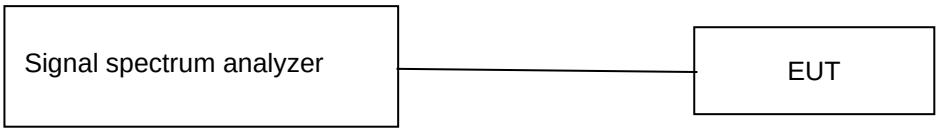
18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups



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9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenove	E470	PF-OU5TS7 17/09

Test software: QRCT.exe, which used to control the EUT in continues transmitting mode

The system was configured to channel 0, 19, and 39 for the test.

Test Mode Applicability and Tested Channel Detail:

Mode	Tested Channel	Data Rate (Mbps)	Modulation	Index Value (Power level setting)
BLE	1	1	GFSK	By manufacturer
	19	1	GFSK	By manufacturer
	39	1	GFSK	By manufacturer

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

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10 Technical Requirement

10.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

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Conducted Emission

150k-30MHz Conducted Emission Test

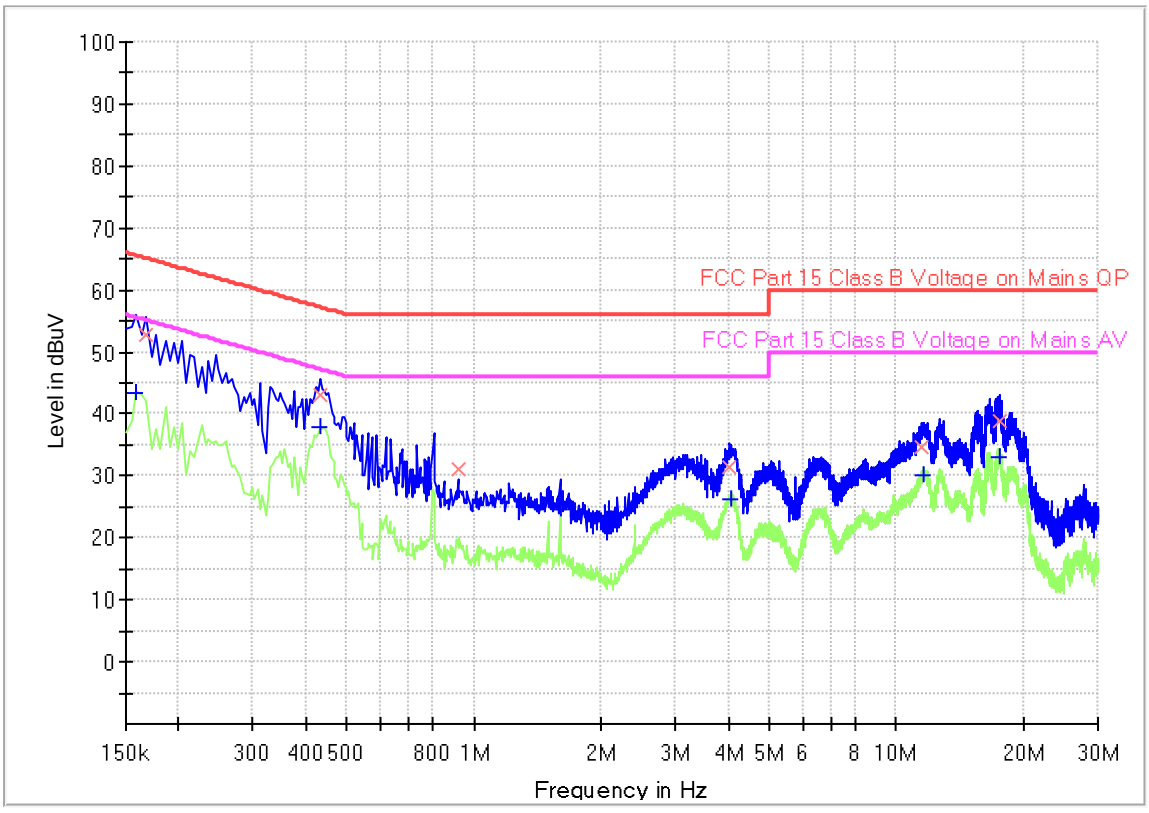
EUT Information

EUT Name:	Acoustic Thermal Imager
Model	Fotric 860MiX
Client:	FOTRIC INC
Op Cond	Power on, TX at 2480MHz, AC 120V/60Hz
Operator:	Huali CHENG
Standard	FCC Part 15.207(a)
Comment:	Phase L
Sample No.:	SHA-801877-2

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup:	Voltage with 2-Line-LISN
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



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Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.159000	---	43.31	55.52	12.21	1000.0	9.000	L1	19.4
0.168000	52.78	---	65.06	12.28	1000.0	9.000	L1	19.4
0.433500	---	37.76	47.19	9.43	1000.0	9.000	L1	19.5
0.433500	42.99	---	57.19	14.20	1000.0	9.000	L1	19.5
0.915000	31.00	---	56.00	25.00	1000.0	9.000	L1	19.5
1.599000	---	24.51	46.00	21.49	1000.0	9.000	L1	19.5
4.038000	31.57	---	56.00	24.43	1000.0	9.000	L1	19.6
4.083000	---	26.28	46.00	19.72	1000.0	9.000	L1	19.6
11.517000	34.78	---	60.00	25.22	1000.0	9.000	L1	19.9
11.589000	---	29.97	50.00	20.03	1000.0	9.000	L1	19.9
17.475000	38.77	---	60.00	21.23	1000.0	9.000	L1	20.2
17.556000	---	33.04	50.00	16.96	1000.0	9.000	L1	20.2

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

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150k-30MHz Conducted Emission Test

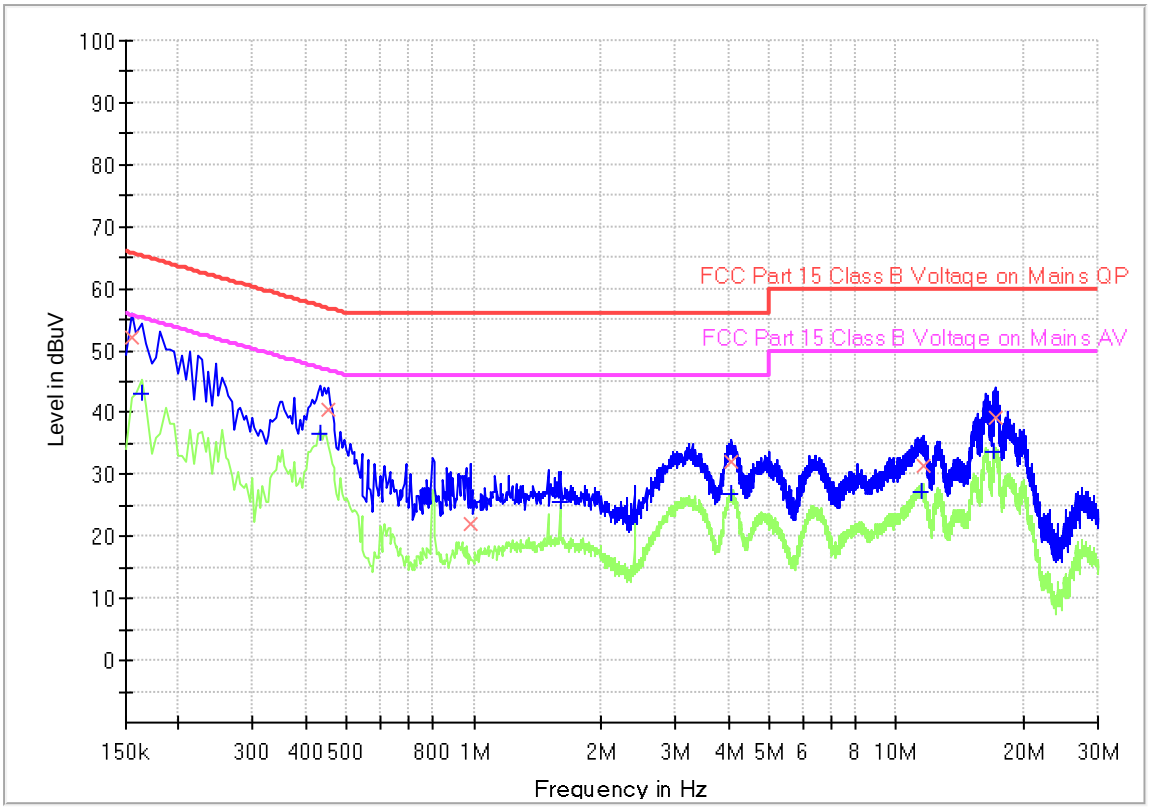
EUT Information

EUT Name:	Acoustic Thermal Imager
Model	Fotric 860MiX
Client:	FOTRIC INC
Op Cond	Power on, TX at 2480MHz, AC 120V/60Hz
Operator:	Huali CHENG
Standard	FCC Part 15.207(a)
Comment:	Phase N
Sample No.:	SHA-801877-2

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup:	Voltage with 2-Line-LISN
Receiver:	[ESR 3]
Level Unit:	dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



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Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	52.21	---	65.75	13.54	1000.0	9.000	N	19.4
0.163500	---	43.15	55.28	12.13	1000.0	9.000	N	19.4
0.433500	---	36.70	47.19	10.49	1000.0	9.000	N	19.5
0.451500	40.37	---	56.85	16.48	1000.0	9.000	N	19.5
0.982500	22.02	---	56.00	33.98	1000.0	9.000	N	19.5
1.599000	---	25.67	46.00	20.33	1000.0	9.000	N	19.5
4.069500	---	26.98	46.00	19.02	1000.0	9.000	N	19.6
4.078500	32.02	---	56.00	23.98	1000.0	9.000	N	19.6
11.413500	---	27.17	50.00	22.83	1000.0	9.000	N	19.8
11.557500	31.52	---	60.00	28.48	1000.0	9.000	N	19.8
17.025000	---	33.63	50.00	16.37	1000.0	9.000	N	20.0
17.101500	39.33	---	60.00	20.67	1000.0	9.000	N	20.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

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10.2 Conducted peak output power

Test Method (1)

1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Test Method (2)

1. Measure the duty cycle D of the transmitter output signal.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
4. Set VBW ≥ [3 × RBW].
5. Number of points in sweep ≥ [2 × span / RBW]. (This gives bin-to-bin spacing ≤ RBW / 2, so that narrowband signals are not lost between frequency bins.)
6. Sweep time = auto.
7. Detector = RMS (i.e., power averaging), if available. Otherwise, use the sample detector mode.
8. Do not use sweep triggering. Allow the sweep to “free run.”
9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.
10. Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
11. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission).

Limits

According to §15.247 (b) (3), conducted peak (average) output power limit as below:

Conducted peak output power

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

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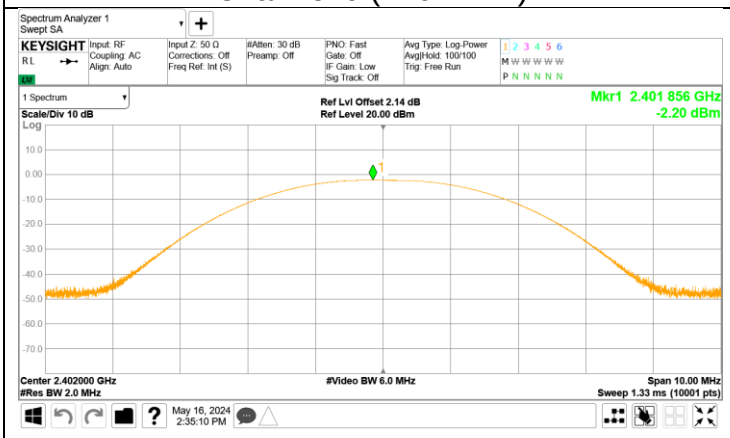
Test result (conducted peak) as below:

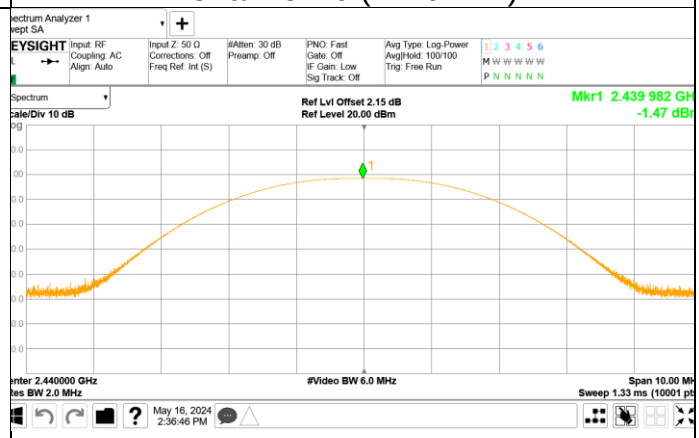
Data transmission rate:1Mbps		
Frequency	Conducted Peak Output Power	Result
MHz	dBm	
Low channel 2402MHz	-2.20	Pass
Middle channel 2440MHz	-1.47	Pass
High channel 2480MHz	-1.78	Pass

Peak output power

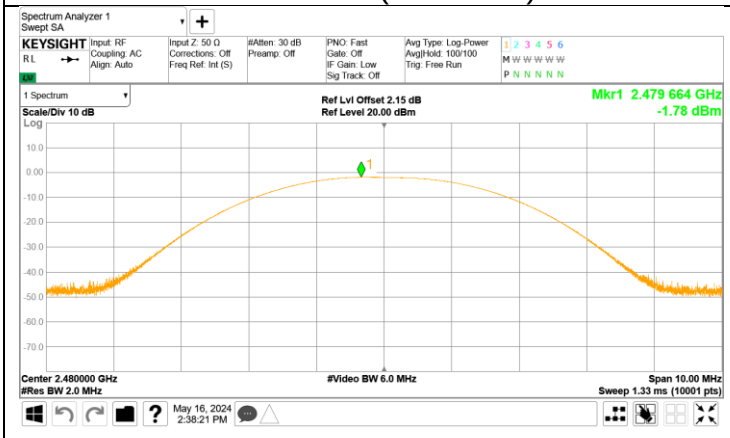
Channel 0 (2402MHz)



Channel 19 (2440MHz)



Channel 39 (2480MHz)



Test result (average power) as below table:

Frequency (MHz)	Duty cycle Factor (dB)	Conducted Power (dBm)	Total Power (dBm)	Result
2402MHz	2.01	-4.1	-2.09	Pass
2440MHz	2.01	-3.76	-1.75	Pass
2480MHz	2.02	-3.68	-1.66	Pass

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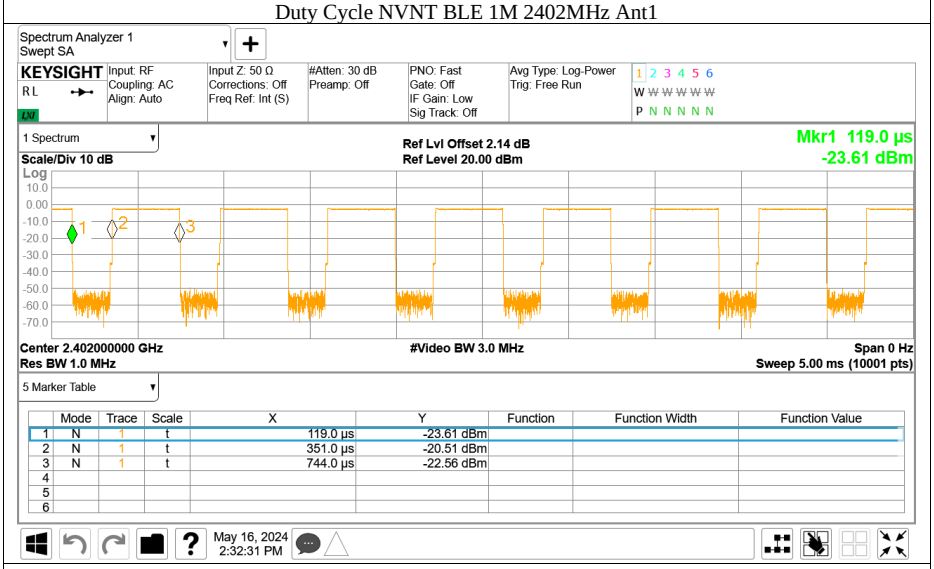
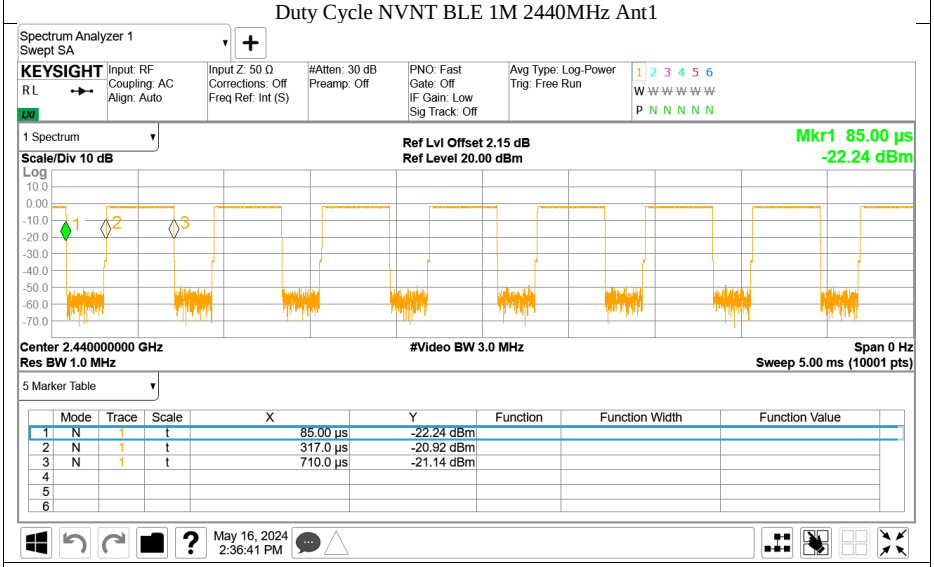
Duty cycle

Test Graphs

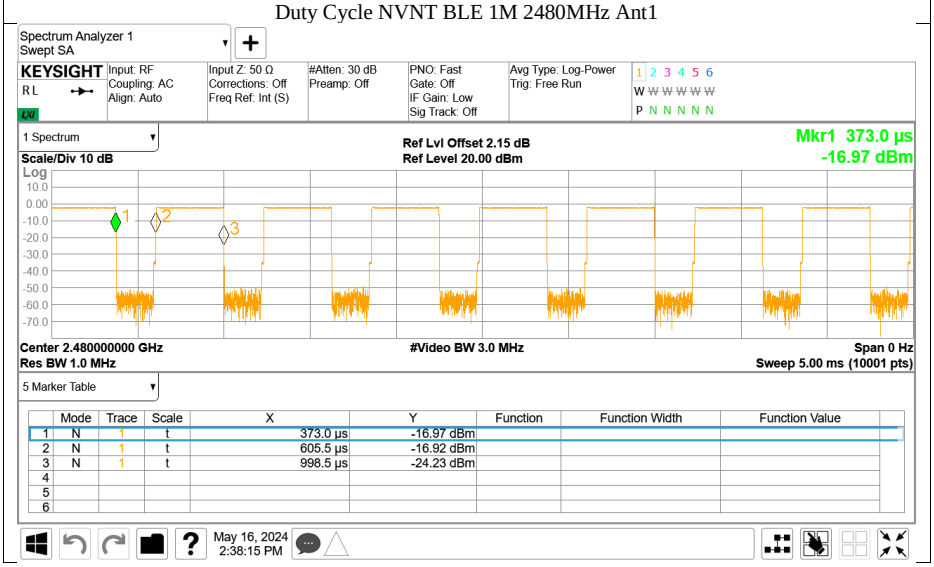
Duty Cycle NVNT BLE 1M 2402MHz Ant1



Duty Cycle NVNT BLE 1M 2440MHz Ant1



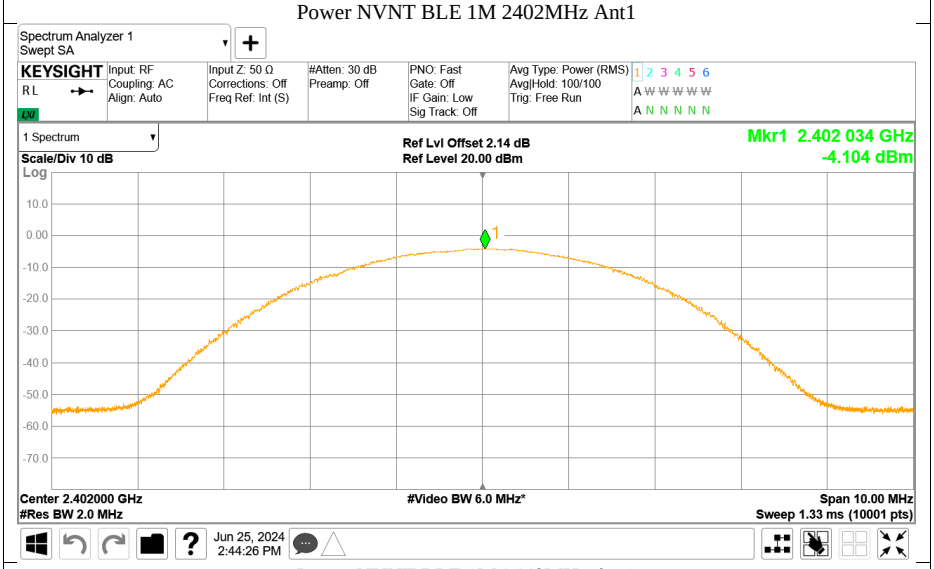
Duty Cycle NVNT BLE 1M 2480MHz Ant1



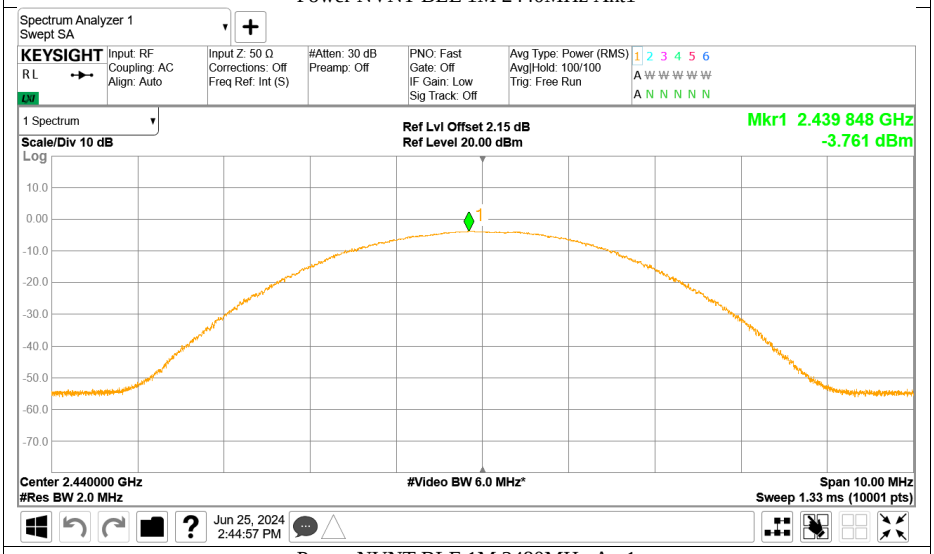
Conducted Output Power

Test Graphs

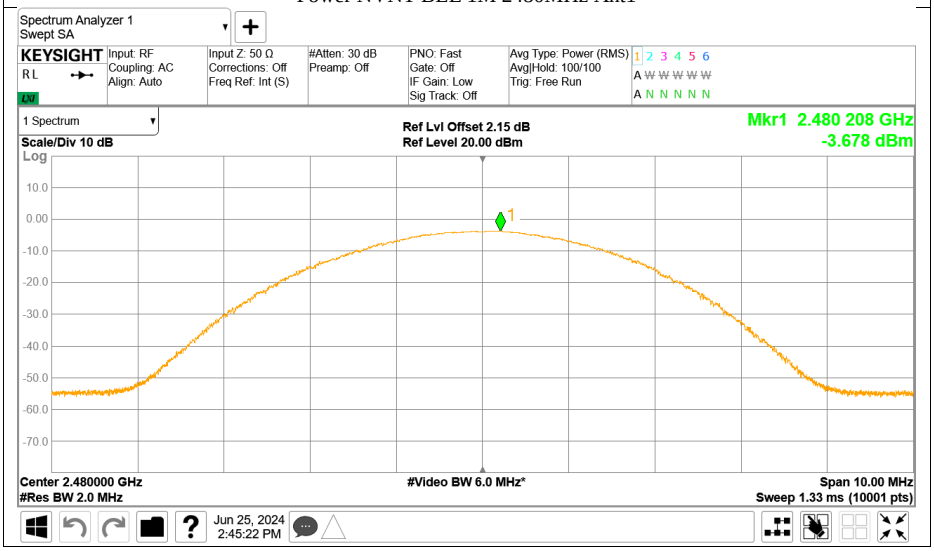
Power NVNT BLE 1M 2402MHz Ant1



Power NVNT BLE 1M 2440MHz Ant1



Power NVNT BLE 1M 2480MHz Ant1



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10.3 6dB bandwidth

Test Method for 6 dB Bandwidth

1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   RBW=100KHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Use the automatic bandwidth measurement capability of an instrument, use the X dB bandwidth mode with X set to 6 dB.
5. Allow the trace to stabilize, record the 6 dB Bandwidth value.

Limit

6dB bandwidth Limit [kHz]
≥500

Test result

Data transmission rate	Frequency MHz	6dB bandwidth (MHz)		Result
		result	limit	verdict
1Mbps	2402	0.660	≥0.5	Pass
	2440	0.660	≥0.5	Pass
	2480	0.657	≥0.5	Pass

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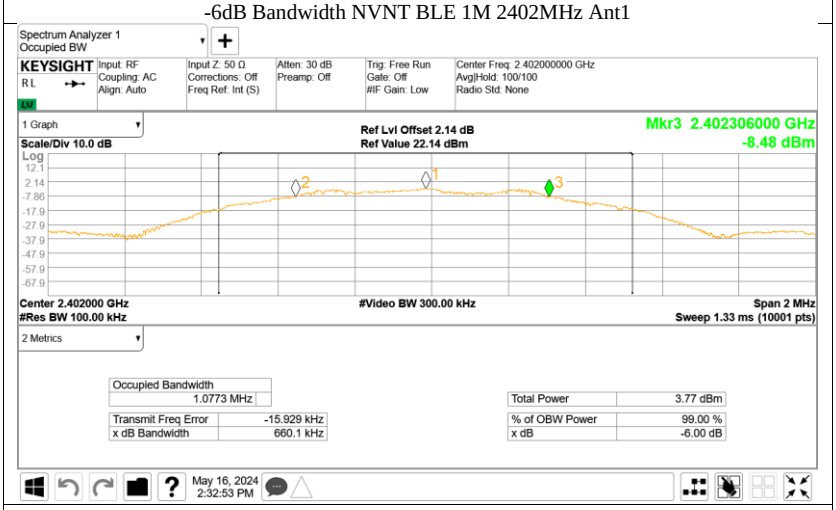
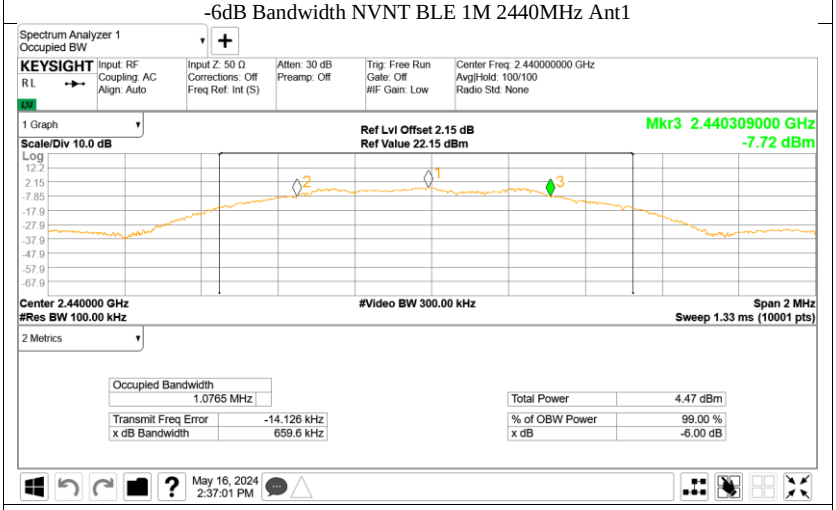
6dB Bandwidth

Test Graphs

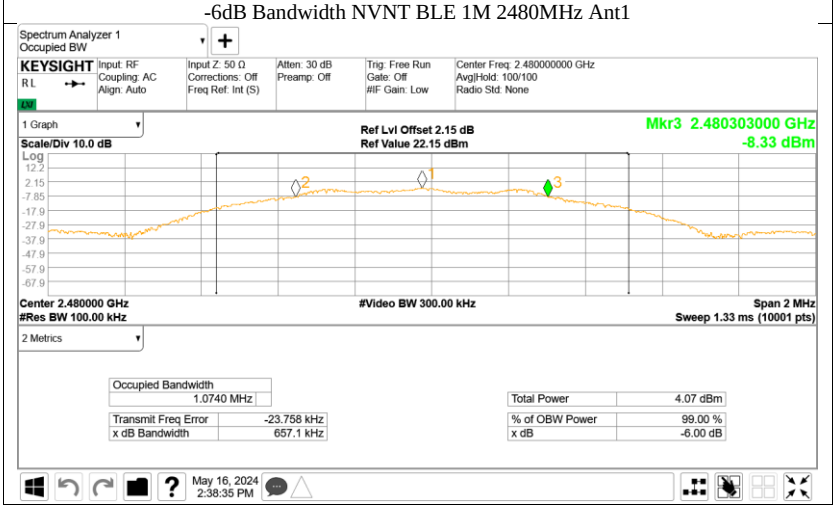
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2440MHz Ant1



-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



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10.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
4. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
5. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
6. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3kHz]
⩽8

Test result

Data transmission rate	Frequency	Power spectral density	Result
1Mbps	MHz	dBm/3kHz	
	Top channel 2402MHz	-17.3	Pass
	Middle channel 2440MHz	-16.16	Pass
	Bottom channel 2480MHz	-17.10	Pass

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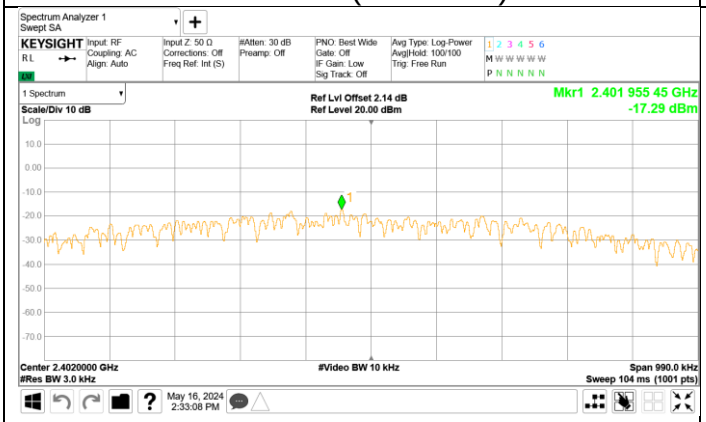
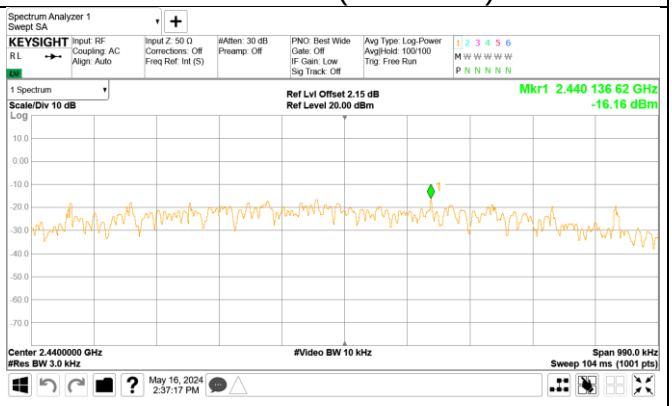
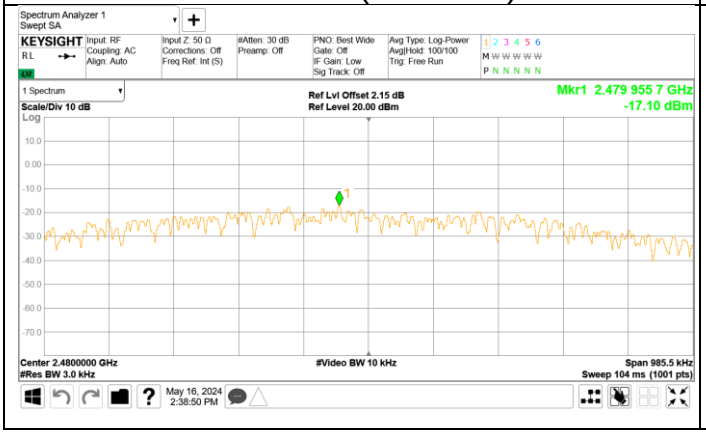
PK PSD (1Mbps)	
Channel 0 (2402MHz)	Channel 19 (2440MHz)
	
Channel 39 (2480MHz)	
	

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10.5 Spurious RF conducted emissions

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
5. The level displayed must comply with the limit specified in this Section. Submit these plots.
6. Repeat above procedures until all frequencies measured were complete.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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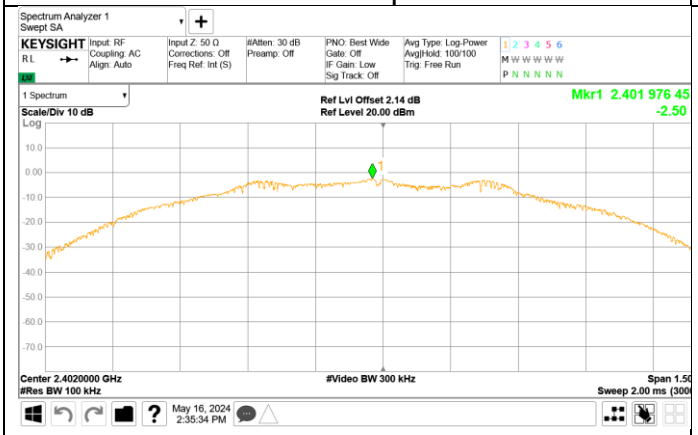
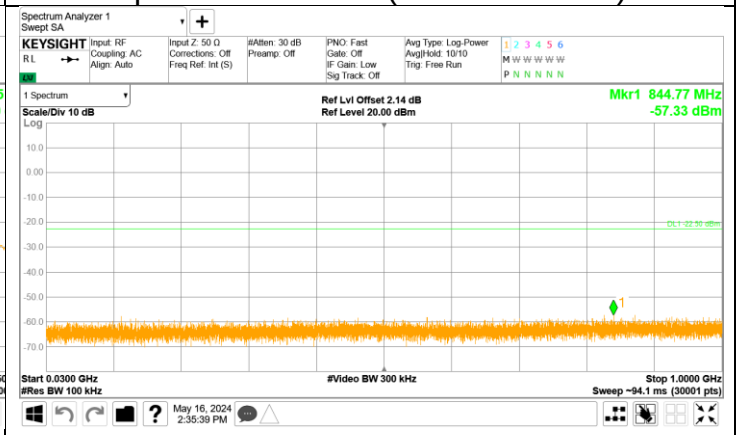
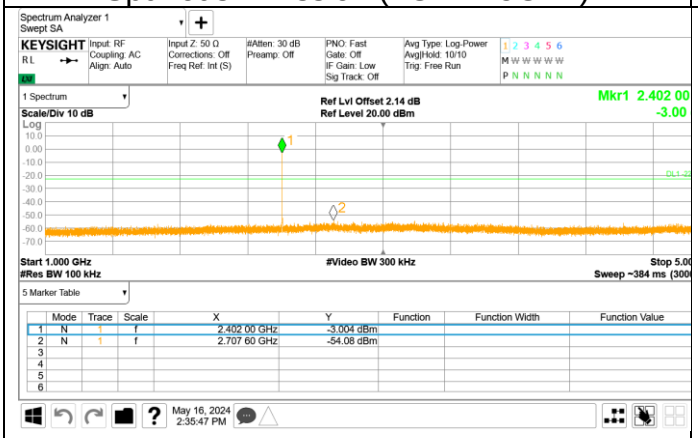
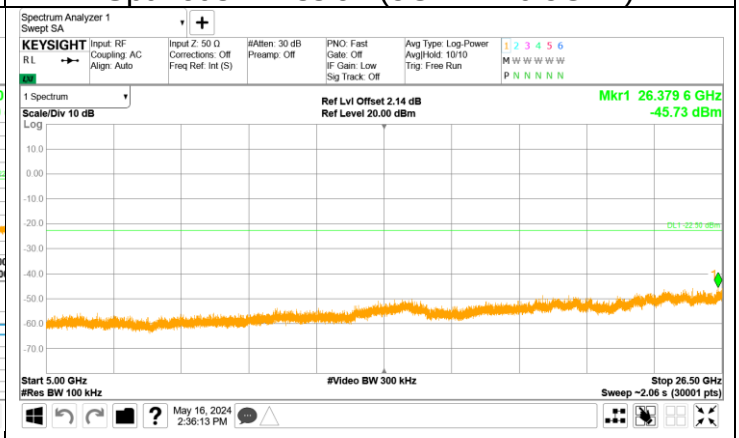
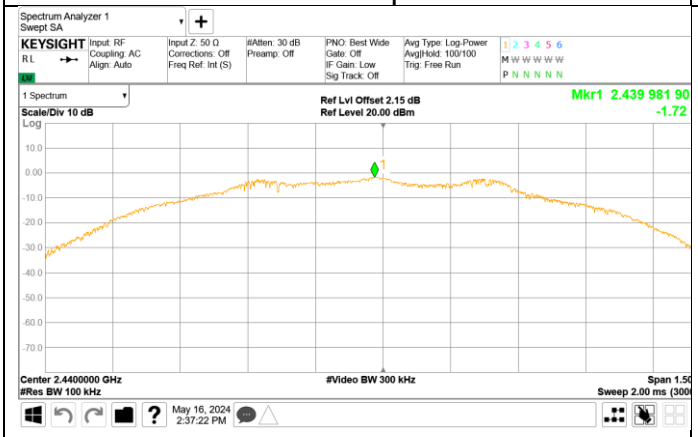
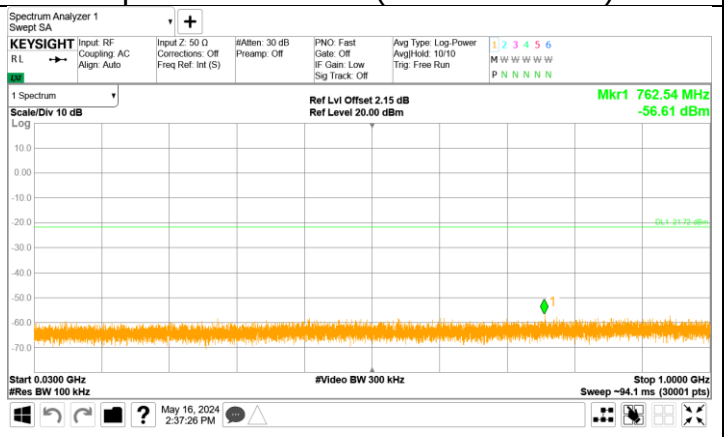
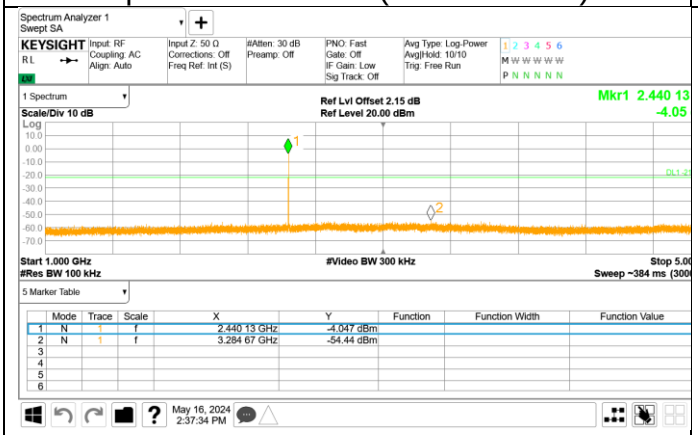
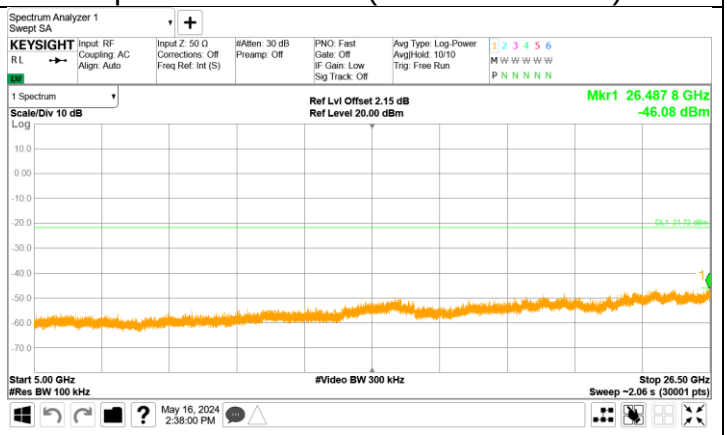
Spurious RF conducted emissions

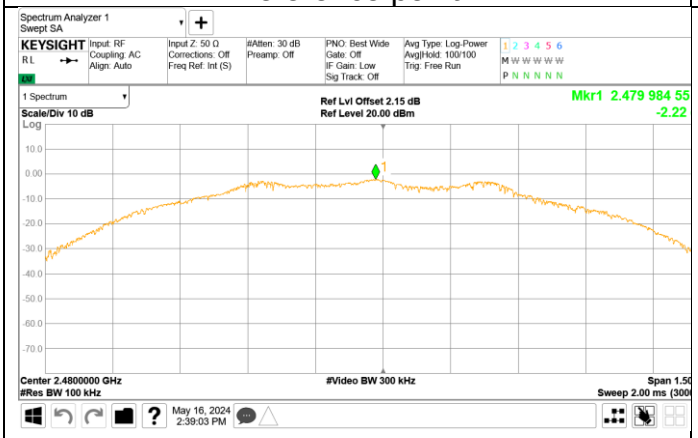
Out-of-Band Emissions	
Channel 0 (2402MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)
	
Spurious Emission (1GHz –5GHz)	Spurious Emission (5GHz –26.5GHz)
	

Out-of-Band Emissions	
Channel 19 (2440MHz)	
Reference point	Spurious Emission (30MHz – 1GHz)
	
Spurious Emission (1GHz –5GHz)	Spurious Emission (5GHz –26.5GHz)
	

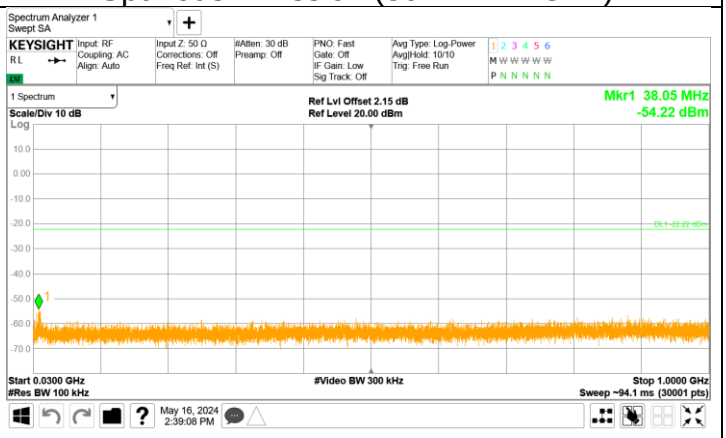
Out-of-Band Emissions

Channel 39 (2480MHz)

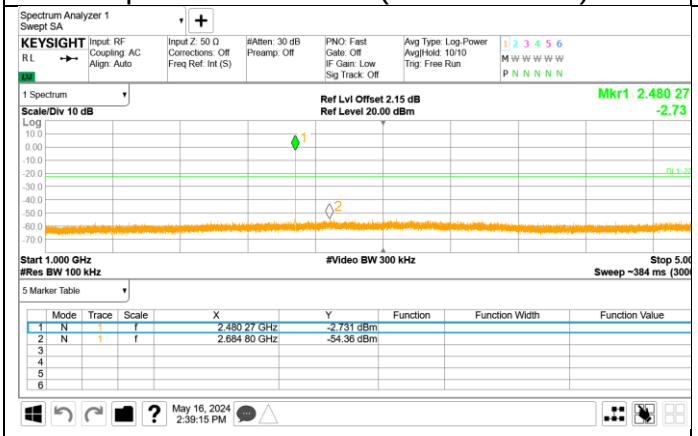
Reference point



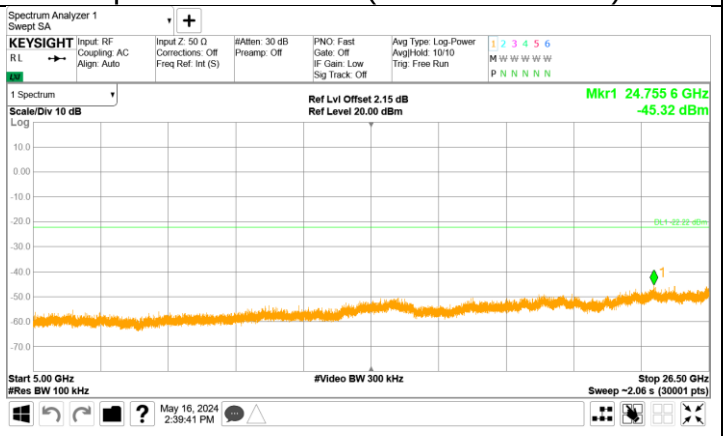
Spurious Emission (30MHz – 1GHz)



Spurious Emission (1GHz –5GHz)



Spurious Emission (5GHz –26.5GHz)



10.6 Band edge

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize, use the peak and delta measurement to record the result.
5. The level displayed must comply with the limit specified in this Section.
6. Repeat above procedures until all frequencies measured were complete and submit all the plots.

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3), the attenuation required shall be 30 dB instead of 20 dB.

Frequency Range MHz	Limit (dBc)
30-25000	-20

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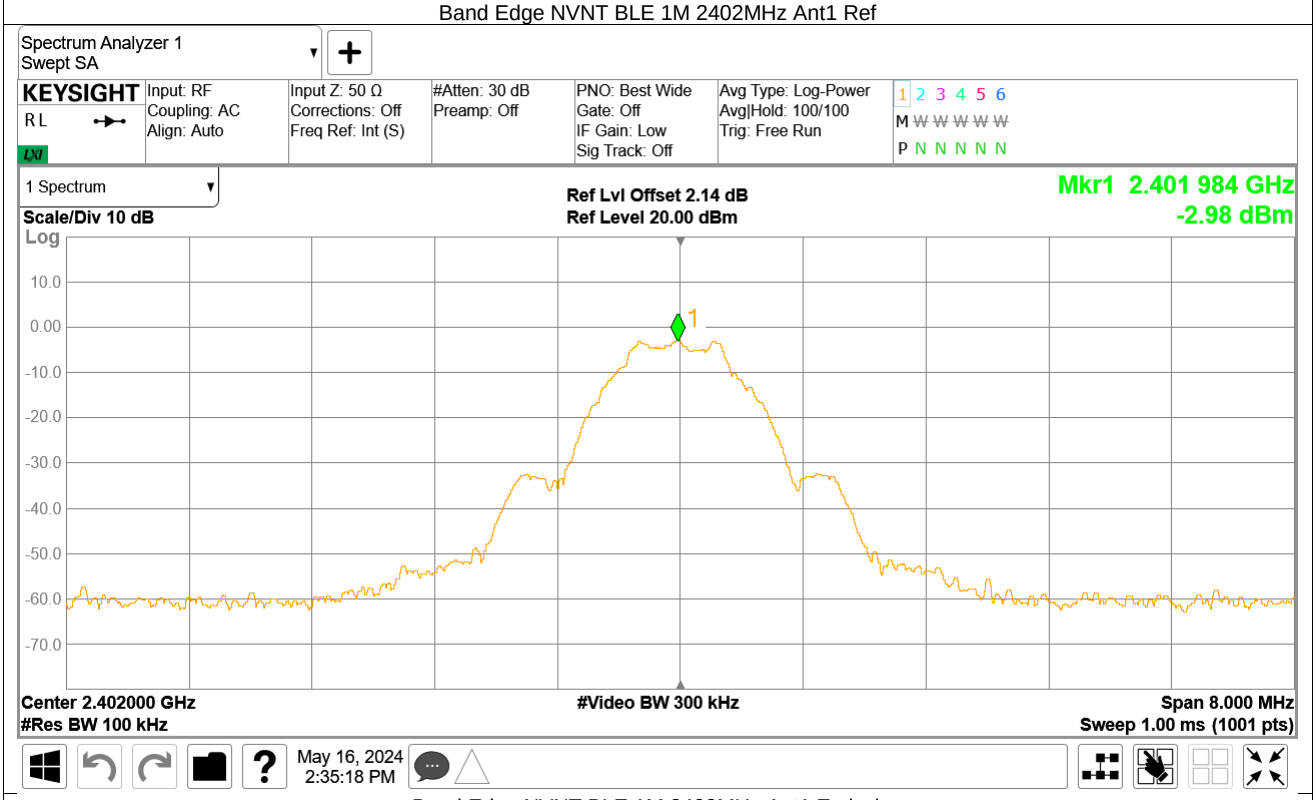
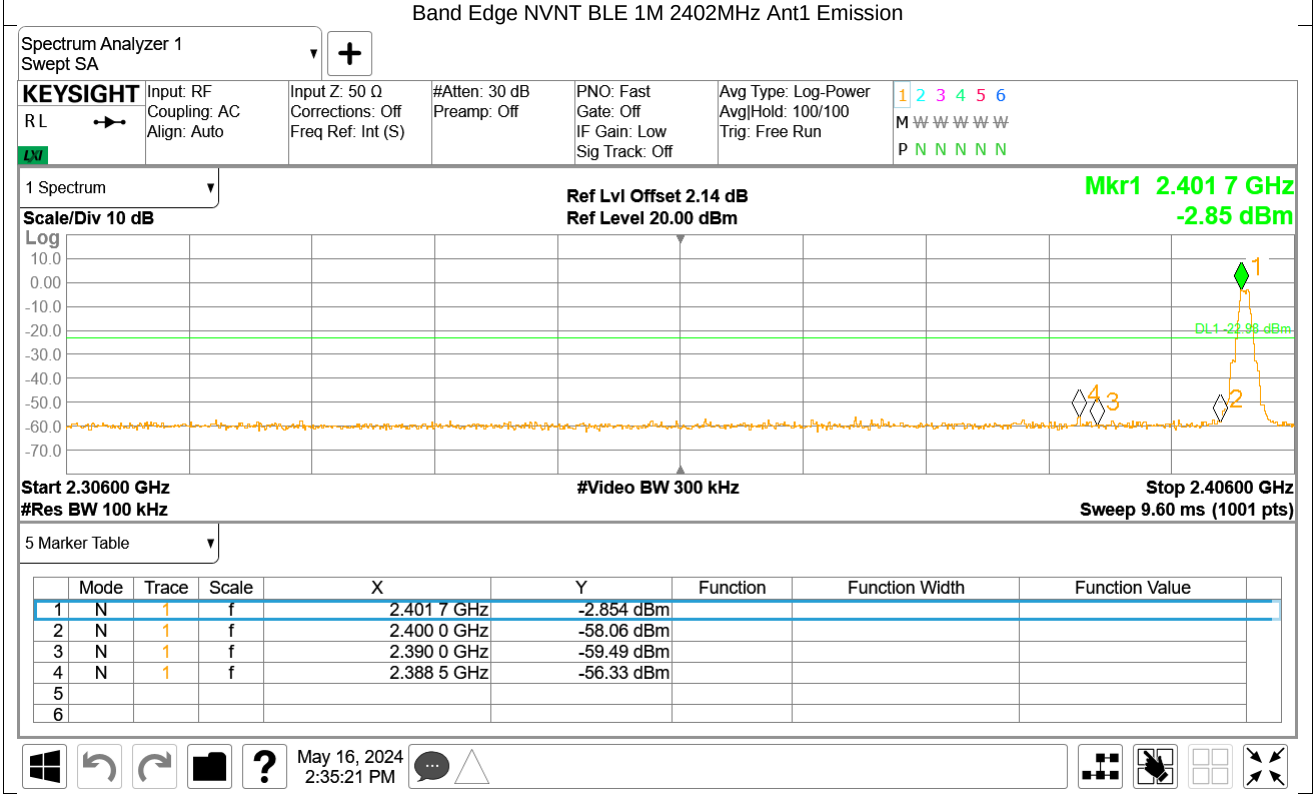
Test result

Test Graphs

Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.401 7 GHz	-2.854 dBm			
2	N	1	f	2.400 0 GHz	-58.06 dBm			
3	N	1	f	2.390 0 GHz	-59.49 dBm			
4	N	1	f	2.388 5 GHz	-56.33 dBm			
5								
6								

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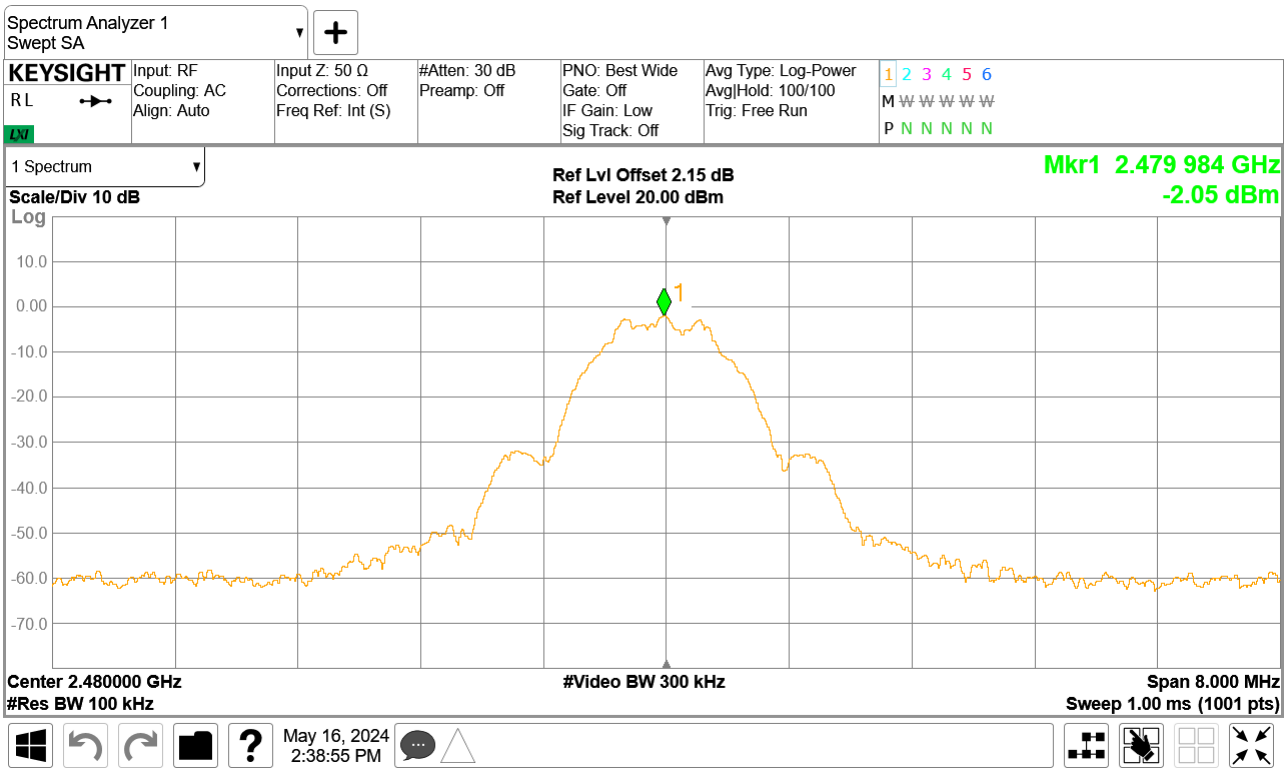
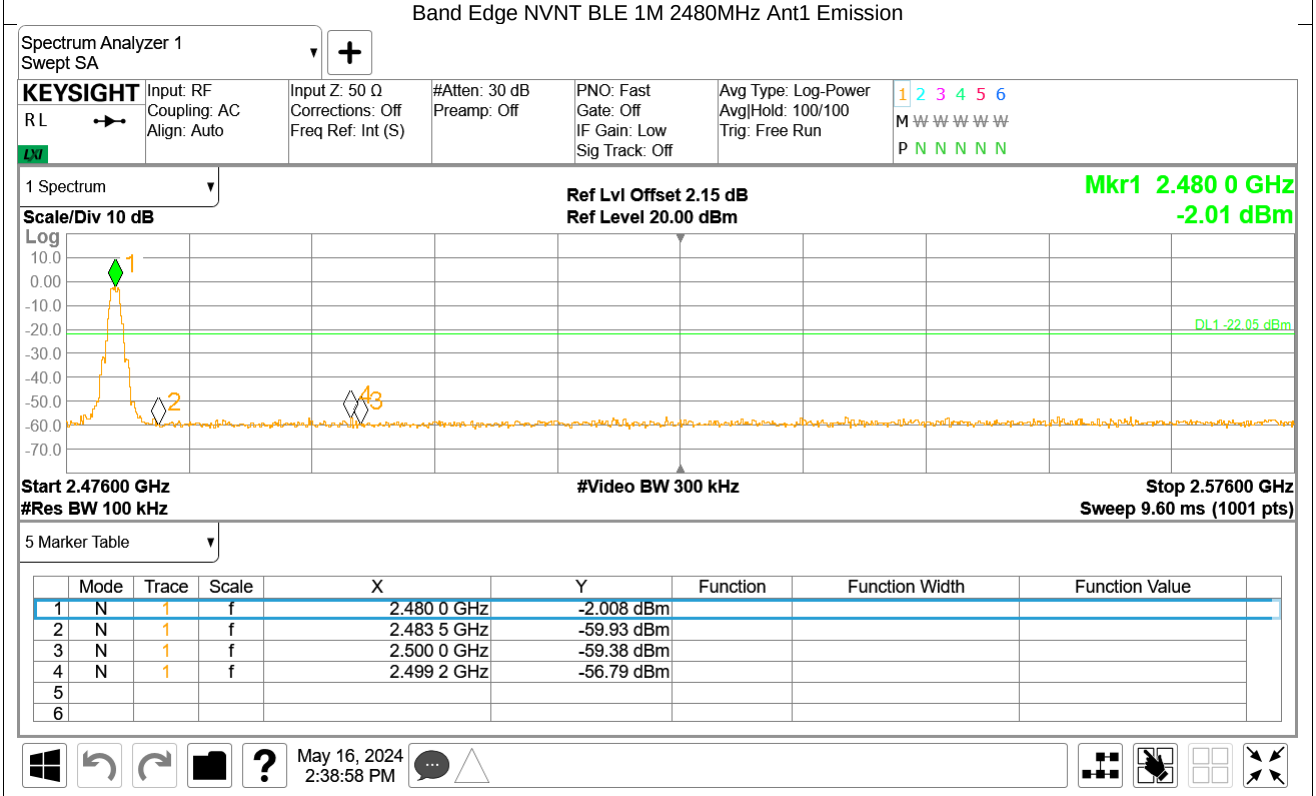
Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.480 0 GHz	-2.008 dBm			
2	N	1	f	2.483 5 GHz	-59.93 dBm			
3	N	1	f	2.500 0 GHz	-59.38 dBm			
4	N	1	f	2.499 2 GHz	-56.79 dBm			
5								
6								

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10.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Use the following spectrum analyzer settings According to C63.10

   1) Procedure for Unwanted Emissions Measurements Below 1000 MHz

   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 kHz to 120kHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

   2) For Peak unwanted emissions Above 1GHz:

   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

   Procedures for average unwanted emissions measurements above 1GHz

   a) RBW = 1MHz.
   b) VBW \ [3 × RBW].
   c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
   d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
   e) Sweep time = auto.
   f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
   g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
   1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

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2)If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission (AV) at frequency above 1GHz.

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength 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).

Frequency MHz	Field Strength μV/m	Field Strength dBμV/m	Detector	Measurement distance meters
0.009-0.490	2400/F(kHz)	48.5-13.8	AV	300
0.490-1.705	24000/F(kHz)	33.8-23.0	QP	30
1.705-30	30	29.5	QP	30
30-88	100	40	QP	3
88-216	150	43.5	QP	3
216-960	200	46	QP	3
960-1000	500	54	QP	3
Above 1000	500	54	AV	3
Above 1000	5000	74	PK	3

Note 1: Limit 3m(dBμV/m)=Limit 300m(dBμV/m)+40Log(300m/3m) (Below 30MHz)
Note 2: Limit 3m(dBμV/m)=Limit 30m(dBμV/m)+40Log(30m/3m) (Below 30MHz)

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.
Data of measurement within frequency range 9kHz-30MHz is the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.

Test result

Above 1GHz Transmitting spurious emission test result as below:

Test mode:GFSK 1Mbps (2402MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2351.84	43.05	74.00	30.95	PK	Horiznotal
4804.81	40.43	74.00	33.57	PK	Horiznotal
2352.01	43.90	74.00	30.10	PK	Vertical
4802.15	42.77	74.00	31.23	PK	Vertical

Test mode:GFSK 1Mbps (2440MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
4880.78	41.33	74.00	32.67	PK	Horiznotal
4880.78	41.43	74.00	32.57	PK	Vertical

Test mode:GFSK 1Mbps (2480MHz)					
Frequency MHz	Measure Level (dBuV/m)	Limit (dBuV/M	Margin (dB)	Detector	Polarization
2483.59	42.77	74.00	31.23	PK	Horiznotal
4960.43	41.52	74.00	32.48	PK	Horiznotal
2483.58	43.01	74.00	30.99	PK	Vertical
4957.28	41.08	74.00	32.92	PK	Vertical

Remark:
(1) Emission level= Original Receiver Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
(3) Margin = limit – Corrected Reading

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The worst case of Radiated Emission below 1GHz:

30-1000MHz Radiated Emission

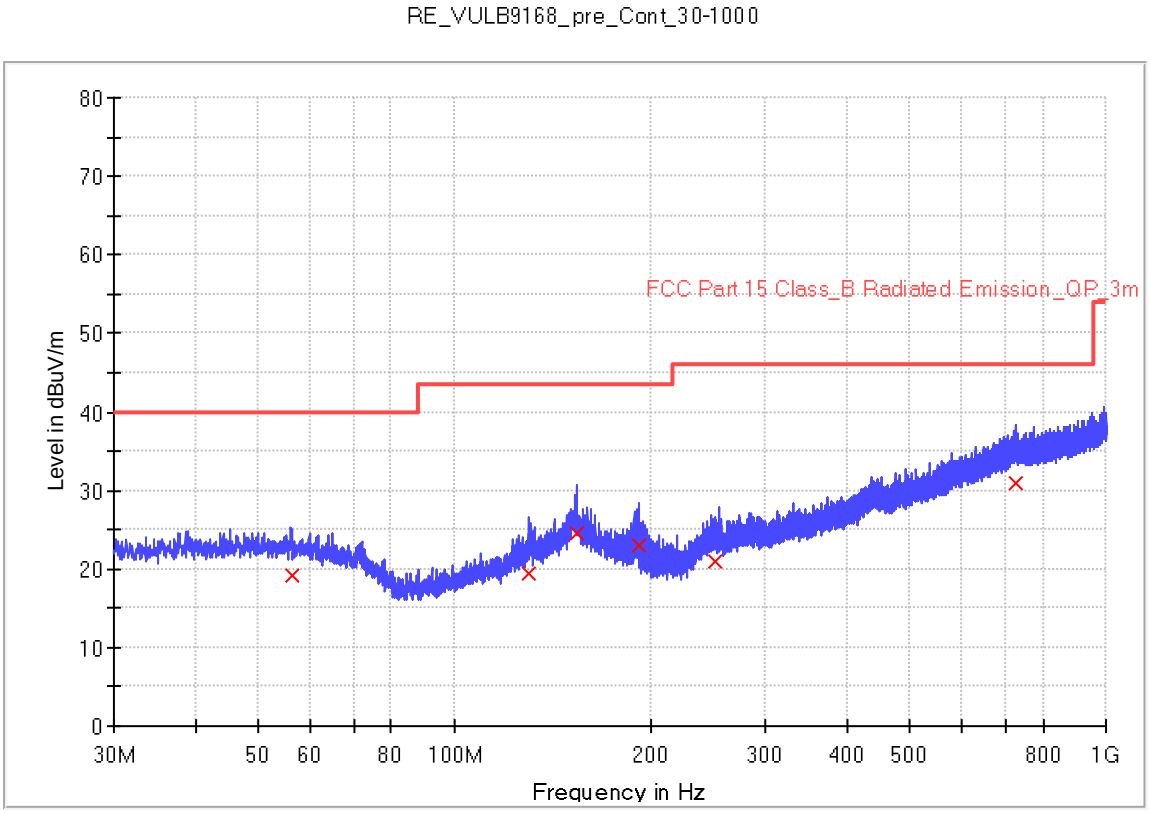
EUT Information

EUT Name:	Acoustic Thermal Imager
Model:	Fotric 860MiX
Client:	FOTRIC INC
Op Cond:	Power on, TX at 2480MHz, AC120V/60Hz
Operator:	Huali CHENG
Test Spec:	FCC Part 15.209(a)
Comment:	Horizontal
Sample No:	SHA-801877-2

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup:	RE_VULB9168
Receiver:	[ESR 3]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.2 s	20 dB



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Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)
56.160000	19.2	1000.0	120.000	136.0	H	198.0	20.4	20.8
129.800000	19.5	1000.0	120.000	193.0	H	16.0	19.3	24.0
154.160000	24.5	1000.0	120.000	185.0	H	152.0	21.0	19.0
191.600000	23.0	1000.0	120.000	169.0	H	39.0	18.4	20.5
251.600000	20.9	1000.0	120.000	189.0	H	320.0	19.9	25.1
724.920000	30.8	1000.0	120.000	158.0	H	206.0	31.2	15.2

(continuation of the "Limit and Margin" table from column 16 ...)

Frequency (MHz)	Limit - QPK (dBuV/m)	Comment
56.160000	40.0	
129.800000	43.5	
154.160000	43.5	
191.600000	43.5	
251.600000	46.0	
724.920000	46.0	

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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30-1000MHz Radiated Emission

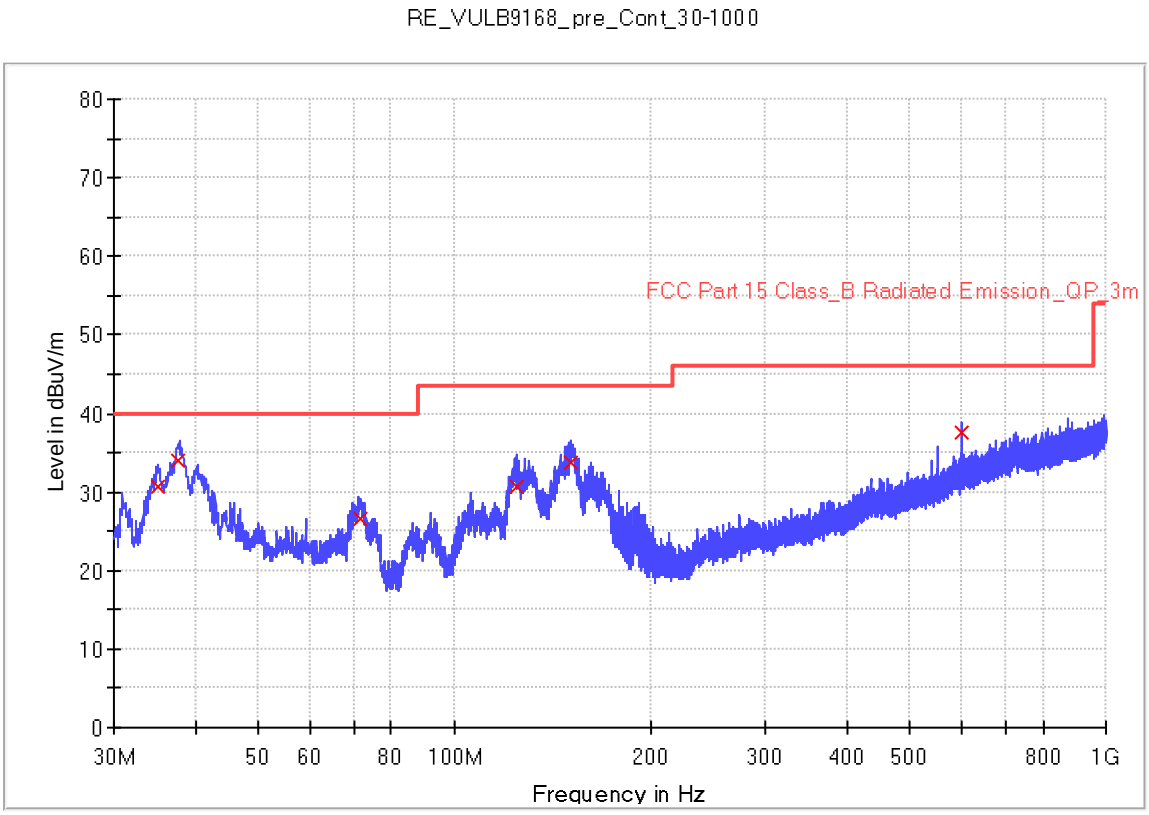
EUT Information

EUT Name:	Acoustic Thermal Imager
Model:	Fotric 860MiX
Client:	FOTRIC INC
Op Cond:	Power on, TX at 2480MHz, AC120V/60Hz
Operator:	Huali CHENG
Test Spec:	FCC Part 15.209(a)
Comment:	Vertical
Sample No:	SHA-801877-2

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup:	RE_VULB9168
Receiver:	[ESR 3]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.2 s	20 dB



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Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)
35.000000	30.6	1000.0	120.000	109.0	V	168.0	19.4	9.4
37.680000	33.9	1000.0	120.000	121.0	V	32.0	19.7	6.1
71.800000	26.5	1000.0	120.000	111.0	V	325.0	18.2	13.5
124.400000	30.6	1000.0	120.000	100.0	V	98.0	18.4	12.9
150.600000	33.8	1000.0	120.000	105.0	V	105.0	20.9	9.7
600.000000	37.5	1000.0	120.000	103.0	V	201.0	29.1	8.5

(continuation of the "Limit and Margin" table from column 16 ...)

Frequency (MHz)	Limit - QPK (dBuV/m)	Comment
35.000000	40.0	
37.680000	40.0	
71.800000	40.0	
124.400000	43.5	
150.600000	43.5	
600.000000	46.0	

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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11 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal spectrum analyzer	Agilent	N9020B	MY59050168	2024-2-19	2025-2-18
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2023-8-1	2024-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2023-8-1	2024-7-31
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2021-9-23	2024-9-22
	Horn Antenna	Rohde & Schwarz	HF907	102868	2021-4-14	2024-4-13
	Horn Antenna	Rohde & Schwarz	HF907	102393	2024-4-14	2027-4-13
	Pre-amplifier	Shenzhen HzEMC	HPA-081843	HYPA23026	2024-4-16	2025-4-15
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2023-6-26	2024-6-25
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2024-6-26	2025-6-25
	Double Ridged Horn Antenna	ETS-Lindgren	3116C	00246076	2023-7-7	2026-7-6
	3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-8	2024-5-7
	3m Semi-anechoic chamber	TDK	9X6X6	----	2024-5-8	2027-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2023-8-1	2024-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2023-8-1	2024-7-31

Measurement Software Information			
Test Item	Software	Manufacturer	Version
C	MTS 8310	MWRFtest	2.0.0.0
RE	EMC 32	Rohde & Schwarz	V10.50.40
CE	EMC 32	Rohde & Schwarz	V9.15.03

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

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12 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, 3.16dB
Radiated Disturbance	9kHz to 30MHz, 3.52dB 30MHz to 1GHz, 5.03dB (Horizontal) 5.12dB (Vertical) 1GHz to 18GHz, 5.49dB 18GHz to 40GHz, 5.63dB
RF Conducted Measurement	Power related： 1.16dB Frequency related： 6.00×10^{-8}

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.

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13 Photographs of Test Set-ups

Refer to the < Test Setup photos >.

14 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

----------End of Test Report----------

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