

FCC Test Report

Report No.: OKA-ESH-P24091985B-2

FCC ID: 2AYF8-YBEB80

Product: Electric Bicycle

Model: EB80

Received Date: Oct.11, 2024

Test Date: Oct.11 to Dec.16, 2024

Issued Date: Dec.20, 2024

Applicant: Zhejiang OKAI Vehicle CO.,LTD.

Address: No.9,Xinxing Road,Xinbi Town, Jinyun County,Zhejiang,China

Manufacturer: Zhejiang OKAI Vehicle CO.,LTD.

Address: No.9,Xinxing Road,Xinbi Town, Jinyun County,Zhejiang,China

Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

Lab Address: No. 829, Xinzhuang Road, Shanghai, P.R.China (201612)

**FCC Registration /
Designation Number:** 176467/ CN1213



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Release Control Record

Issue No.	Description	Date Issued
OKA-ESH-P24091985B-2	Original release	Dec.20, 2024



1 Certificate of Conformity

Product: Electric Bicycle

Brand: OKAI

Model: EB80

Applicant: Zhejiang OKAI Vehicle CO.,LTD.

Test Date: Oct.11 to Dec.16, 2024

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2020

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Yuan Zhang, **Date:** Dec.20, 2024
Yuan ZHANG

Project Engineer

Approved by : Sean YU, **Date:** Dec.20, 2024
Sean YU
RF Supervisor



2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.203	Antenna Requirement	PASS	No antenna connector is used.
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	Minimum 6dB Bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output Power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.247(d)	Conducted Band Edges Measurement	PASS	Meet the requirement of limit.
15.247(d)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
15.247(d)	Emissions in restricted frequency bands	PASS	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions Measurement	PASS	Meet the requirement of limit.

2.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Loop Antenna	ETS-LINDGREN	6502	E1A1039	Jul.30,24	Jul.29,26
Hybrid Antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1001	Mar.28,24	Mar.27,26
Horn Antenna(1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Jul.31,24	Jul.30,26
Double Ridge Horn Antenna(18G-40G)	COM-POWER	AH-840	E1A1040	Jul.31,24	Jul.30,26
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Feb.18,24	Feb.17,25
Pre-Amplifier(0.5GHz-18GHz)	EMCI	EMC184045SE	E1A2009	Jul.02,24	Jul.01,25
Pre-Amplifier(18GHz-40GHz)	EMCI	EMC051845SE	E1A2008	Aug.15,24	Aug.14,25
EMI test receiver	R&S	ESR26	E1R1009	Sep.03,24	Sep.02,25
Spectrum Analyzer	Keysight	N9030B	E1S1003	Aug.28,24	Aug.27,25
Spectrum Analyzer	Keysight	N9020A	E1S1004	Feb.19,24	Feb.18,25
EMI test receiver	R&S	ESR3	E1R1008	May.31,24	May.30,25
LISN	R&S	ENV216	E1L1013	Aug.12, 24	Aug.11, 25
Humidity&Temp Tester	ESPEC	SE TH-Z-042U	C1TH002	Jun.04,24	Jun.03,25
RF Control Unit	Toscend	JS0806-2	E1C5003	N/A	N/A
Test Software	Toscend	JS32-CE	N/A	N/A	N/A
Test Software	Toscend	JS32-RE	N/A	N/A	N/A
Test Software	Toscend	JS1120	N/A	N/A	N/A
Test Software	Toscend	JS1120-3	N/A	N/A	N/A

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Frequency	Expanded uncertainty ($k=2$) ($\pm$)
AC Power line conducted emissions	150kHz ~ 30MHz	2.56 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.86 dB
Radiated Emissions above 1 GHz	Above 1GHz	4.96 dB

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Electric Bicycle
Brand	OKAI
Model	EB80
Difference	--
Power Rating	DC 48V
Modulation Type	GFSK
Modulation Technology	Bluetooth Low Energy 5.0
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	-0.2 dBm
Antenna Type	PCB Antenna
Antenna Connector	--
Antenna Gain	0.2dBi

Note:

1. For more details, please refer to the User's manual of the EUT.

3.2 Description of Test Modes

40 channels are provided for Bluetooth LE.

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

3.2.1 Test Mode Applicability:

EUT Configure Mode	Applicable to				Description
	RE ≥ 1G	RE < 1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G**: Radiated Emission above 1GHz **RE< 1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0, 19, 39	GFSK

Radiated Emission Test (Below 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0	GFSK

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0	GFSK

Antenna Port Conducted Measurement

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
-	BLE	0 to 39	0, 19, 39	GFSK

3.2.2 Test Condition:

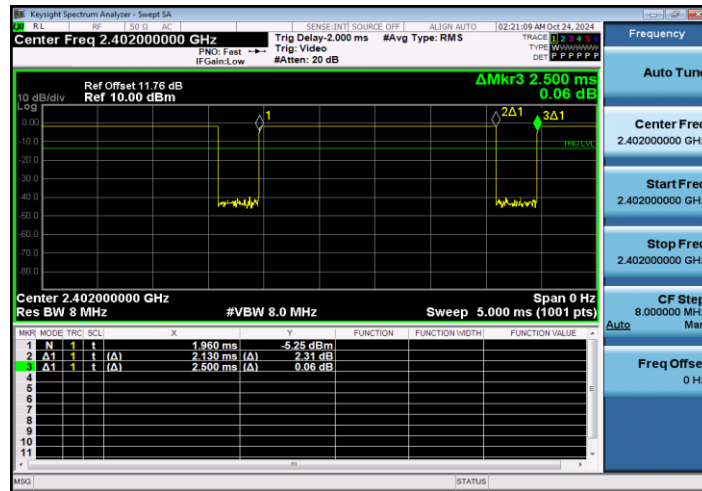
Applicable to	Normal Environmental Conditions	Normal Input Power
RE $\geq$ 1G	23deg. C, 58%RH	AC 120V 60Hz , Powered by battery
RE < 1G	23deg. C, 58%RH	AC 120V 60Hz , Powered by battery
PLC	23deg. C, 58%RH	AC 120V 60Hz , AC 230V 50Hz
APCM	25deg. C, 60%RH	Powered by battery

3.3 Duty Cycle of Test Signal

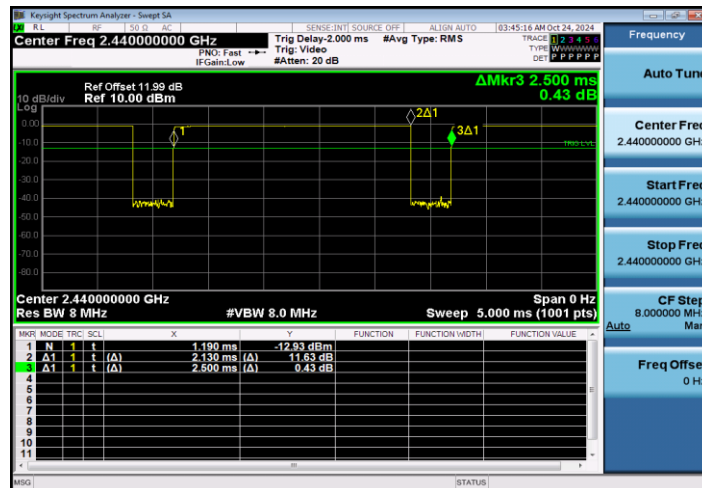
Test Mode	Antenna	Channel [MHz]	Duty Cycle [%]	10log(1/x) Factor[dB]
BLE_1M	Ant1	2402	85.20	0.70
		2440	85.20	0.70
		2480	85.20	0.70
BLE_2M	Ant1	2402	59.36	2.27
		2440	59.36	2.27
		2480	59.36	2.27

Note: Duty Cycle Factor=10* Log[1/Duty Cycle(%)*100], Duty Cycle= $T_{on}/T_{period} * 100\%$

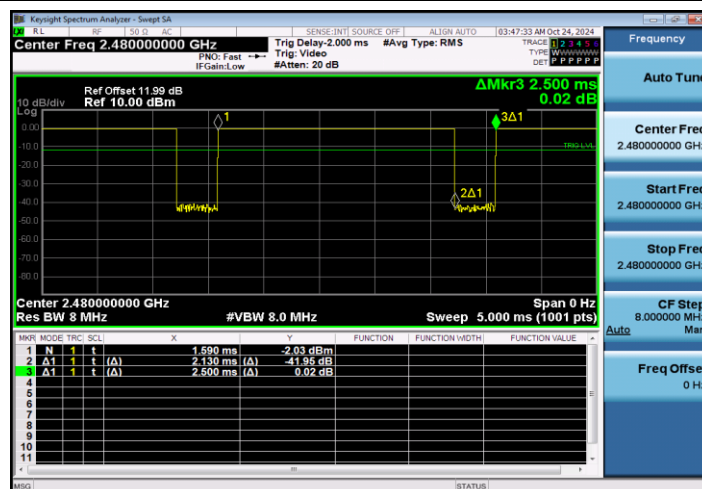
BLE_1M_Ant1_2402



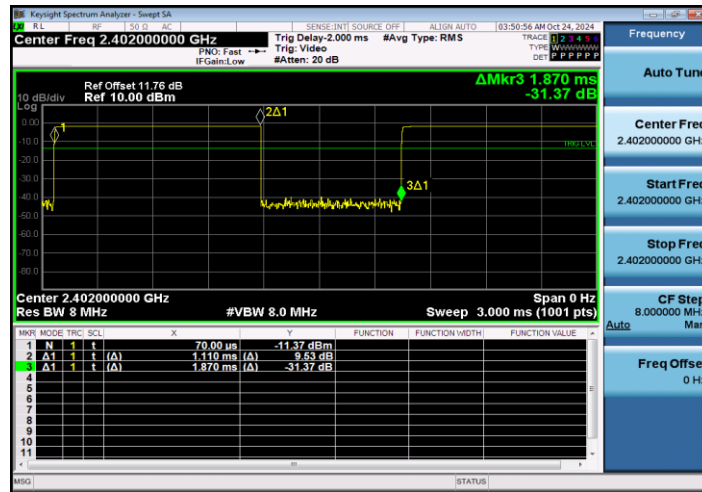
BLE_1M_Ant1_2440



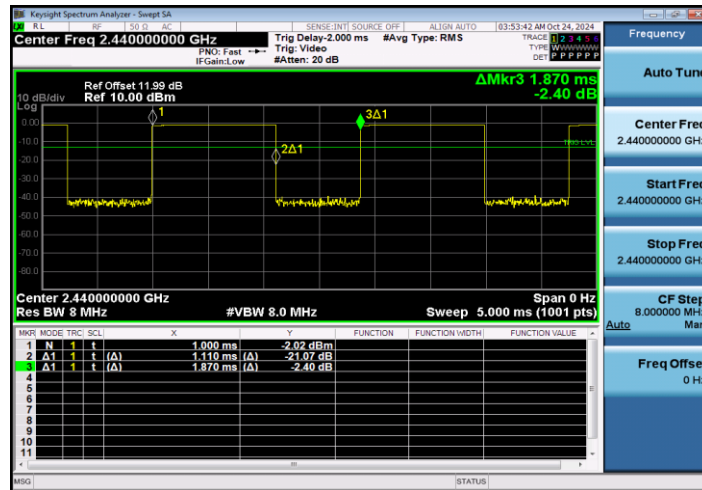
BLE_1M_Ant1_2480



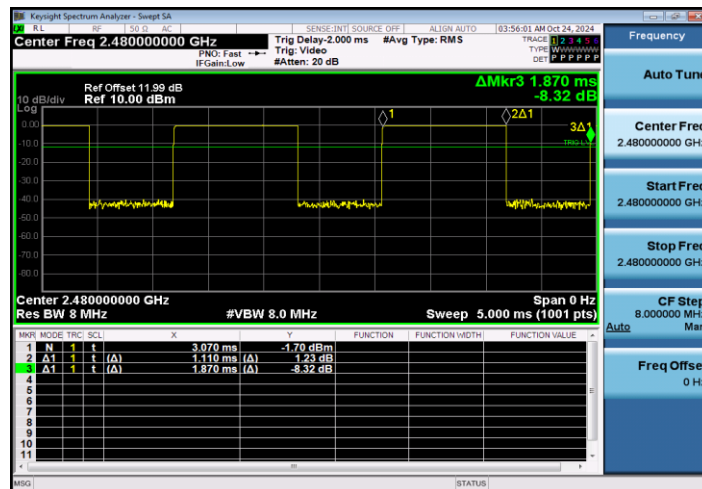
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

NO.	PRODUCT	BRAND/ Manufacturer	MODEL NO.
1.	Laptop	Lenovo	L470

3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 DTS Meas Guidance v05r02

ANSI C63.10:2020

All relaxed test items have been performed and recorded as per the above standard.

4 Test Procedure and Results

4.1 AC Power Conducted Emission

4.1.1 Limits

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 Test Procedures

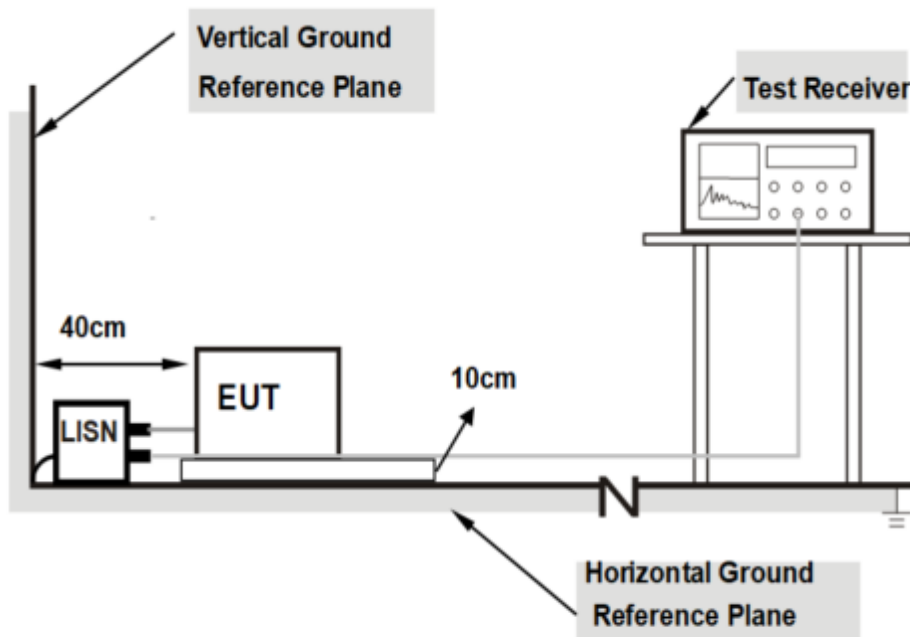
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.1.3 Deviation from Test Standard

No deviation.

4.1.4 Test Setup



Note: 1.Support units were connected to second LISN.

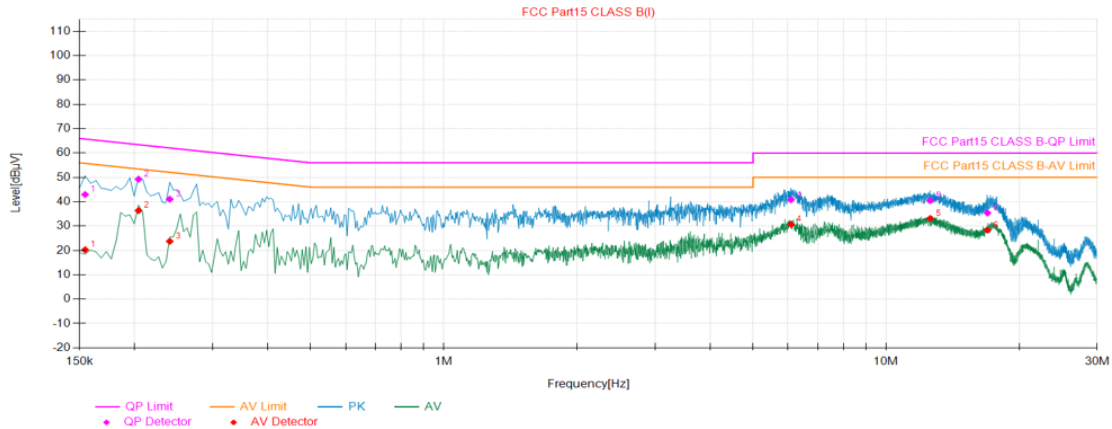
For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 EUT Operating Conditions

Same as 4.1.6.

4.1.6 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Power supply	AC 120V, 60Hz		
Test Mode	Charging		



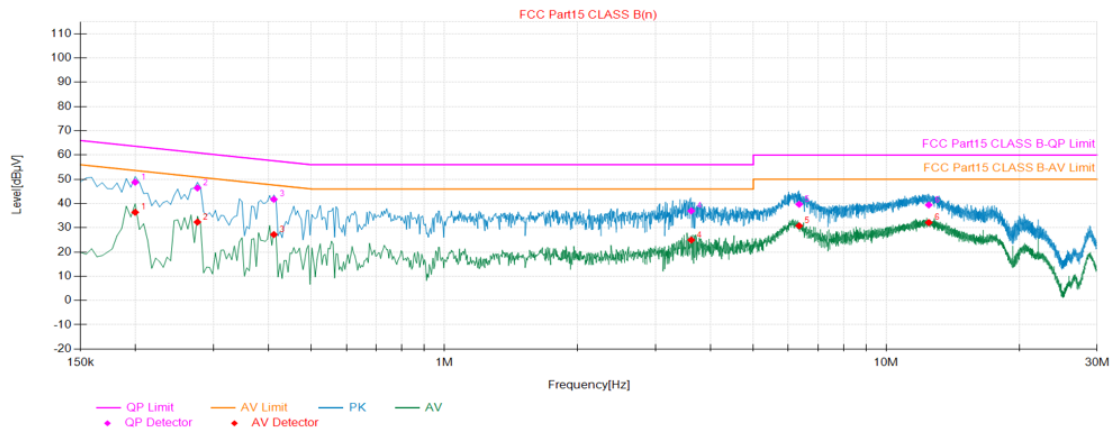
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.15	9.71	33.23	42.94	65.75	22.81	10.55	20.26	55.75	35.49
2	0.20	9.67	39.59	49.26	63.45	14.19	26.70	36.37	53.45	17.08
3	0.24	9.58	31.47	41.05	62.10	21.05	14.15	23.73	52.10	28.37
4	6.09	9.66	31.14	40.80	60.00	19.20	21.02	30.68	50.00	19.32
5	12.58	10.04	30.43	40.47	60.00	19.53	23.07	33.11	50.00	16.89
6	16.95	9.85	25.54	35.39	60.00	24.61	18.52	28.37	50.00	21.63

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Power supply	AC 120V, 60Hz		
Test Mode	Charging		



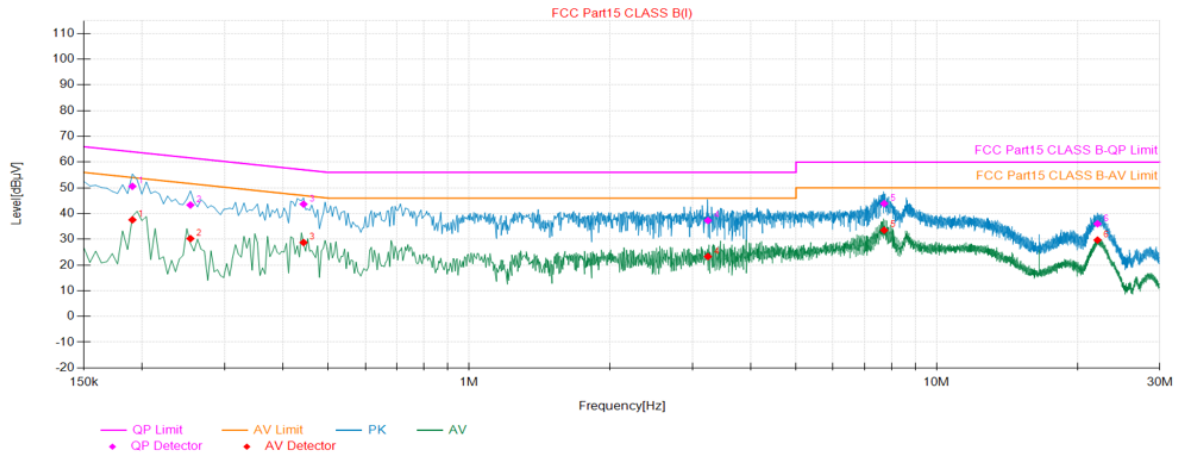
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.20	9.68	39.10	48.78	63.63	14.85	26.70	36.38	53.63	17.25
2	0.28	9.57	36.84	46.41	60.94	14.53	22.78	32.35	50.94	18.59
3	0.41	9.50	32.24	41.74	57.63	15.89	17.70	27.20	47.63	20.43
4	3.62	9.67	27.29	36.96	56.00	19.04	15.27	24.94	46.00	21.06
5	6.35	9.63	30.07	39.70	60.00	20.30	21.18	30.81	50.00	19.19
6	12.48	10.07	29.33	39.40	60.00	20.60	22.08	32.15	50.00	17.85

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Value level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Power supply	AC 230V, 50Hz		
Test Mode	Charging		



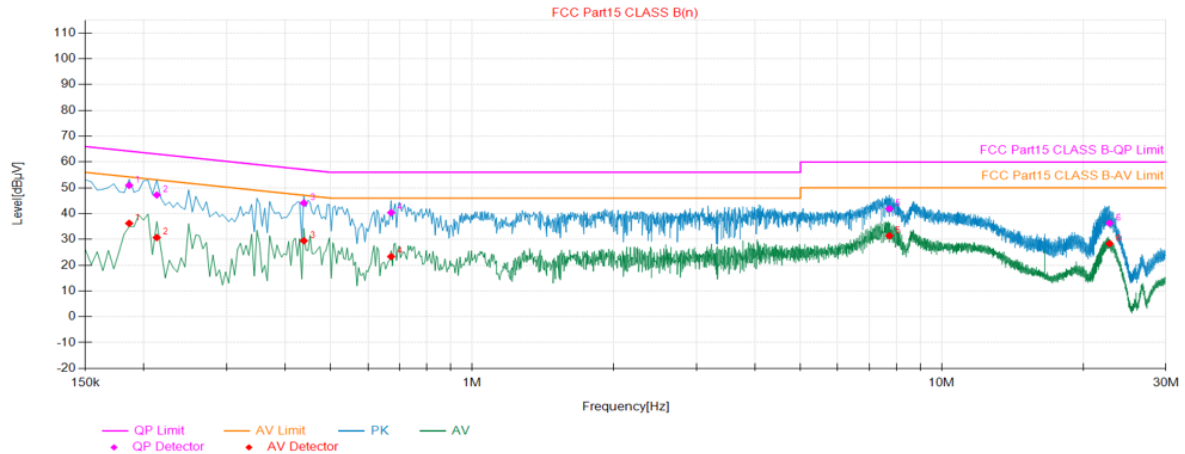
Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.19	9.69	40.90	50.59	64.01	13.42	27.86	37.55	54.01	16.46
2	0.25	9.55	33.77	43.32	61.64	18.32	20.71	30.26	51.64	21.38
3	0.44	9.49	34.18	43.67	57.01	13.34	19.26	28.75	47.01	18.26
4	3.24	9.65	27.64	37.29	56.00	18.71	13.64	23.29	46.00	22.71
5	7.72	9.71	34.17	43.88	60.00	16.12	23.81	33.52	50.00	16.48
6	22.07	9.89	26.12	36.01	60.00	23.99	19.81	29.70	50.00	20.30

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Power supply	AC 230V, 50Hz		
Test Mode	Charging		



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBμV]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.19	9.67	41.27	50.94	64.21	13.27	26.56	36.23	54.21	17.98
2	0.21	9.66	37.53	47.19	63.09	15.90	21.06	30.72	53.09	22.37
3	0.44	9.49	34.60	44.09	57.10	13.01	19.97	29.46	47.10	17.64
4	0.67	9.44	30.92	40.36	56.00	15.64	13.89	23.33	46.00	22.67
5	7.73	9.75	32.11	41.86	60.00	18.14	21.66	31.41	50.00	18.59
6	22.76	9.95	26.37	36.32	60.00	23.68	18.39	28.34	50.00	21.66

REMARKS:

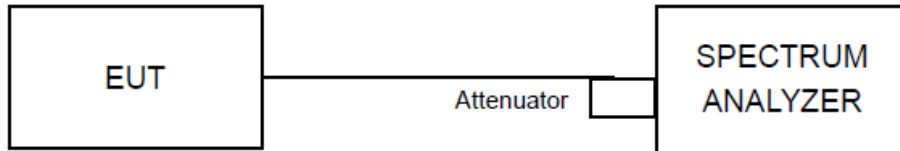
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

4.2 Minimum 6dB Bandwidth

4.2.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz

4.2.2 Test Setup



4.2.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 8.2).

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW $\geq 3 \cdot$ RBW, peak detector with maximum hold) is implemented by the instrumentation function.

4.2.4 Deviation of Test Standard

No deviation.

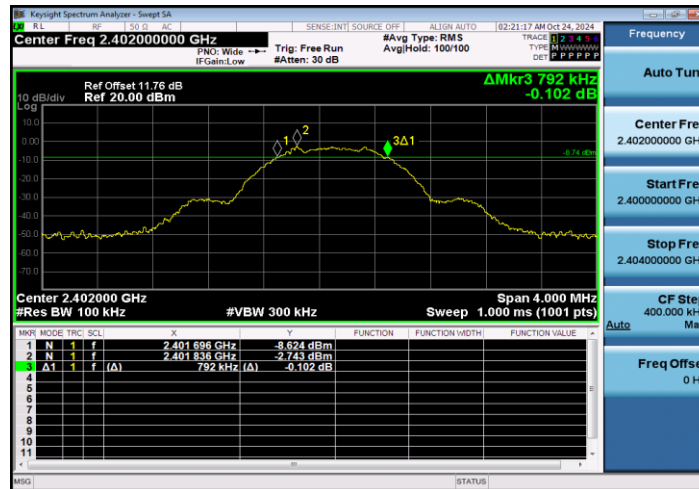
4.2.5 Test Results

Test Mode	Antenna	Channel [MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	0.792	2401.696	2402.488	≥ 0.5	PASS
		2440	0.768	2439.696	2440.464	≥ 0.5	PASS
		2480	0.764	2479.708	2480.472	≥ 0.5	PASS
BLE_2M	Ant1	2402	1.176	2401.552	2402.728	≥ 0.5	PASS
		2440	1.164	2439.560	2440.724	≥ 0.5	PASS
		2480	1.188	2479.540	2480.728	≥ 0.5	PASS

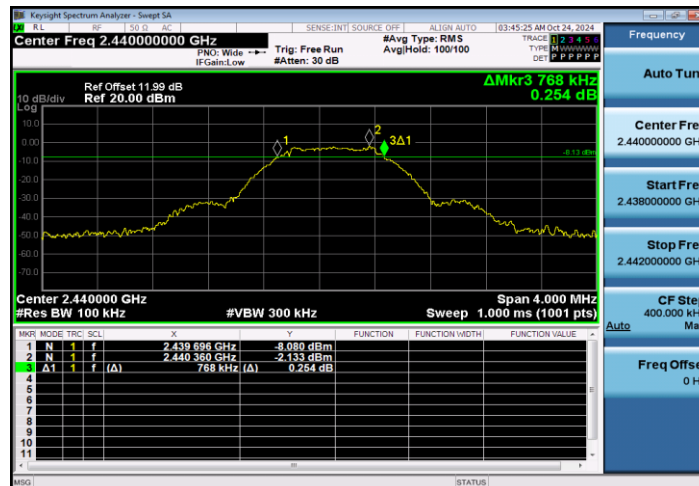
99% Occupied Channel Bandwidth

Test Mode	Antenna	Channel [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0776	2401.5485	2402.6261	---	PASS
		2440	1.0418	2439.5710	2440.6128	---	PASS
		2480	1.0442	2479.5698	2480.6140	---	PASS
BLE_2M	Ant1	2402	2.1431	2401.0202	2403.1633	---	PASS
		2440	2.1015	2439.0585	2441.1600	---	PASS
		2480	2.1638	2479.0233	2481.1871	---	PASS

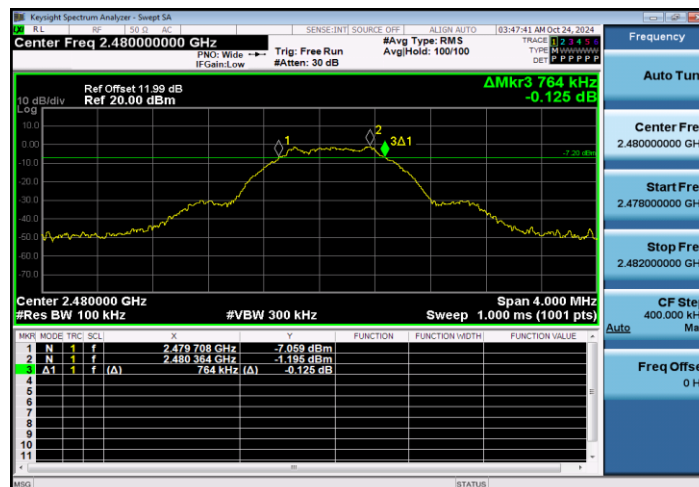
BLE_1M_Ant1_2402



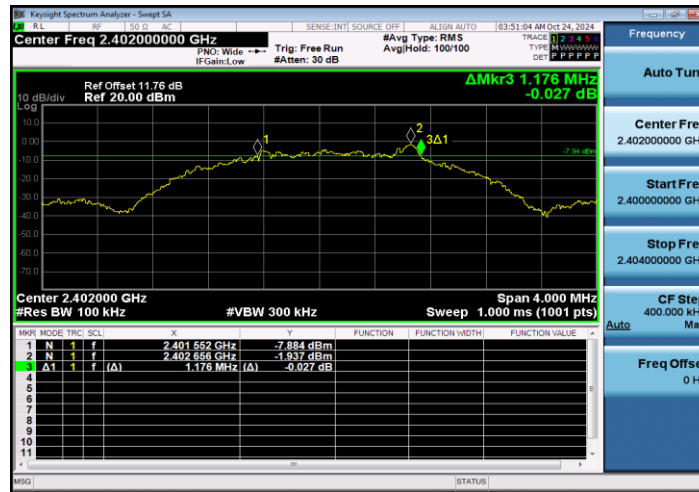
BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



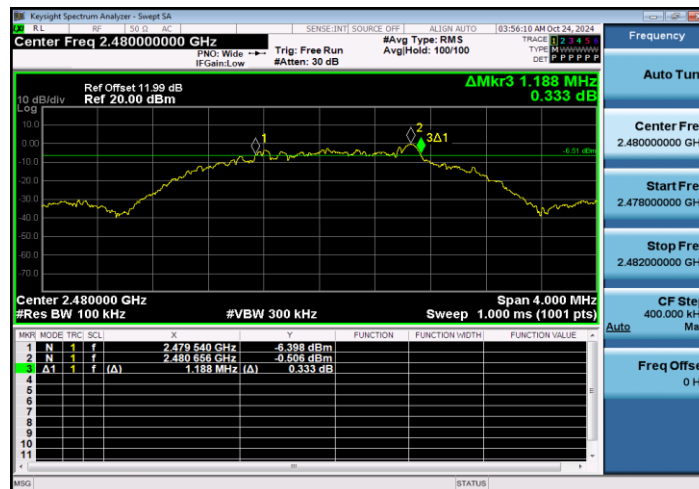
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440

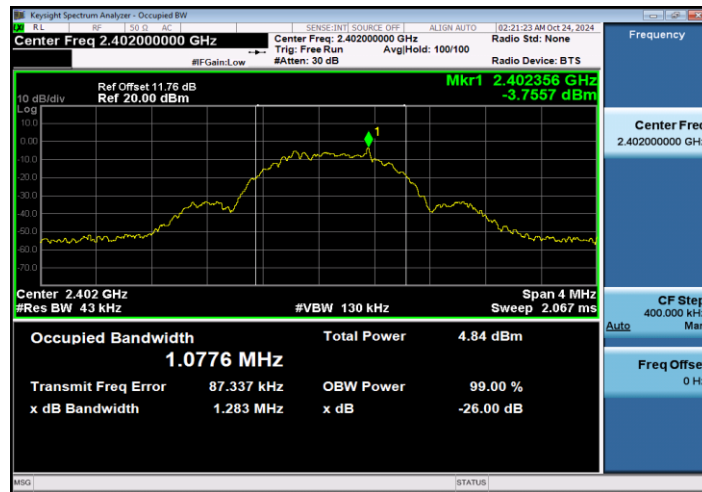


BLE_2M_Ant1_2480

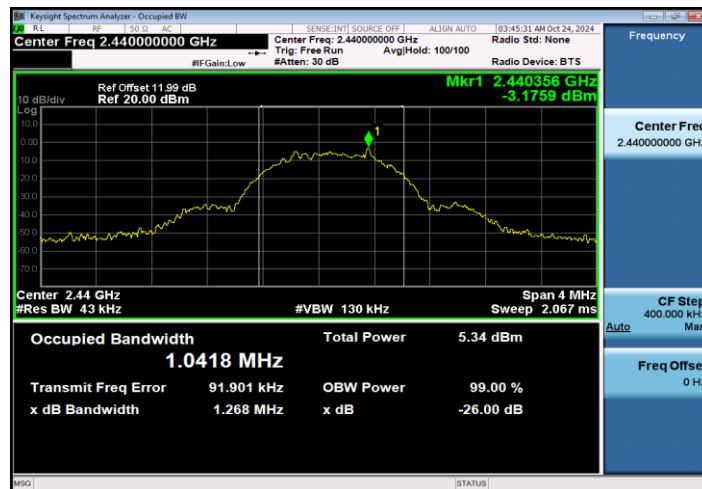


Occupied Channel Bandwidth

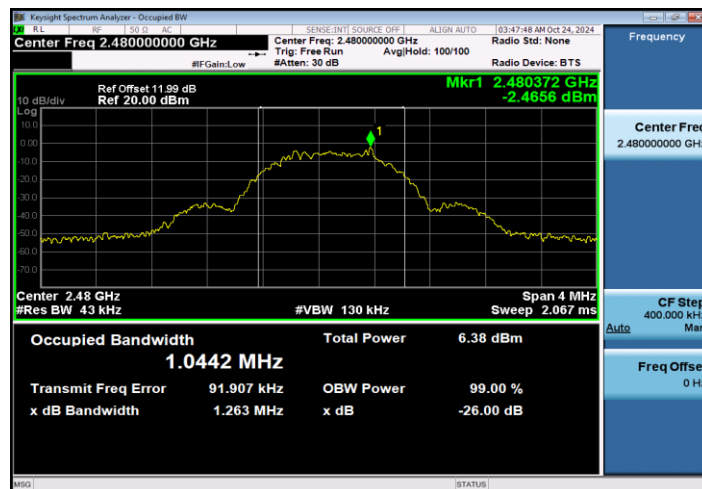
BLE_1M_Ant1_2402



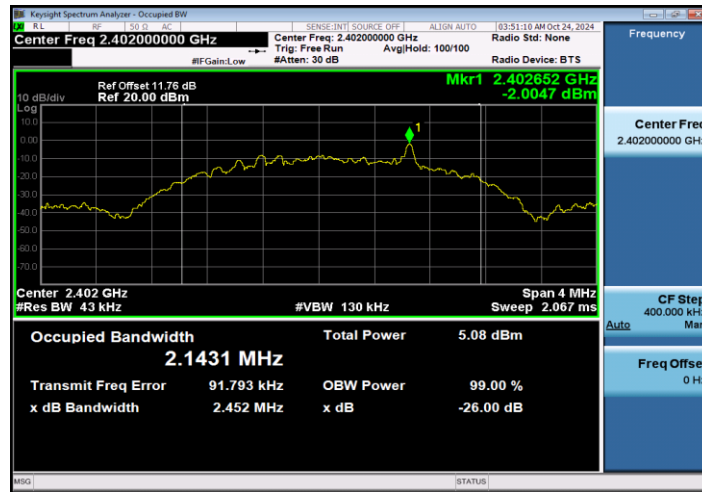
BLE_1M_Ant1_2440



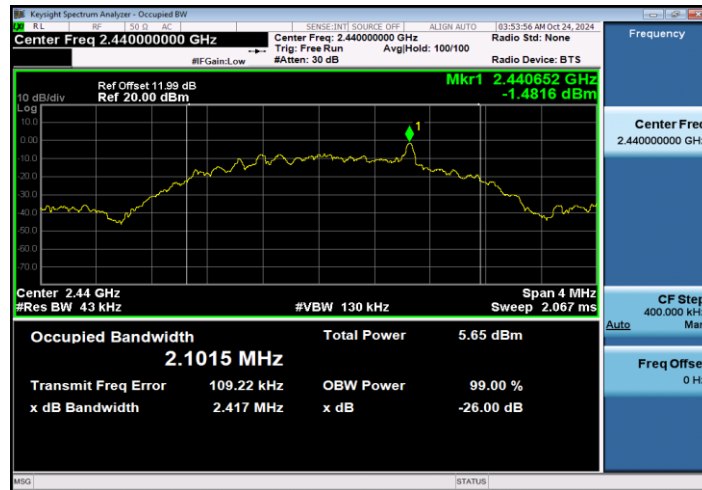
BLE_1M_Ant1_2480



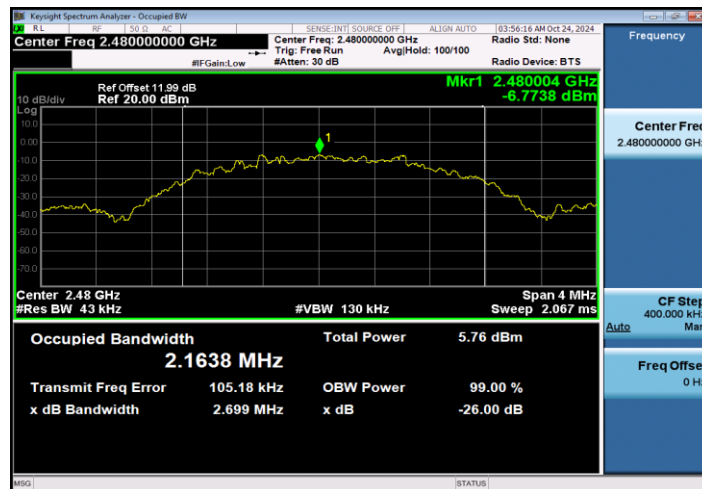
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480

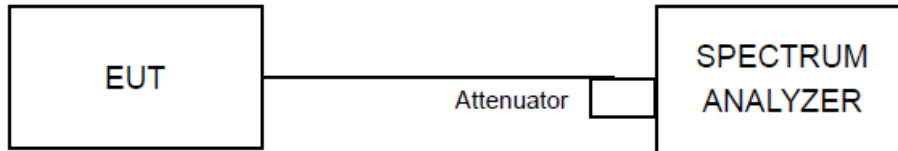


4.3 Conducted Output Power

4.3.1 Limit

For systems using digital modulation in the 2400 – 2483.5 MHz bands: 1 Watt (30 dBm)

4.3.2 Test Setup



4.3.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 9.2.2.4).

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

4.3.4 Deviation of Test Standard

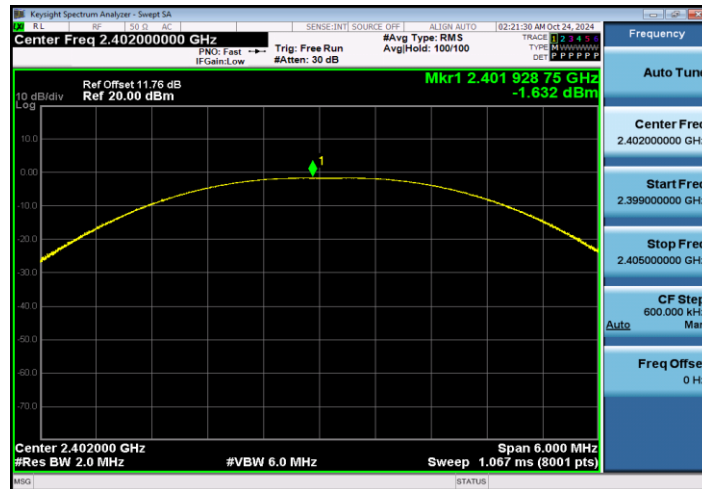
No deviation.

4.3.5 Test Results

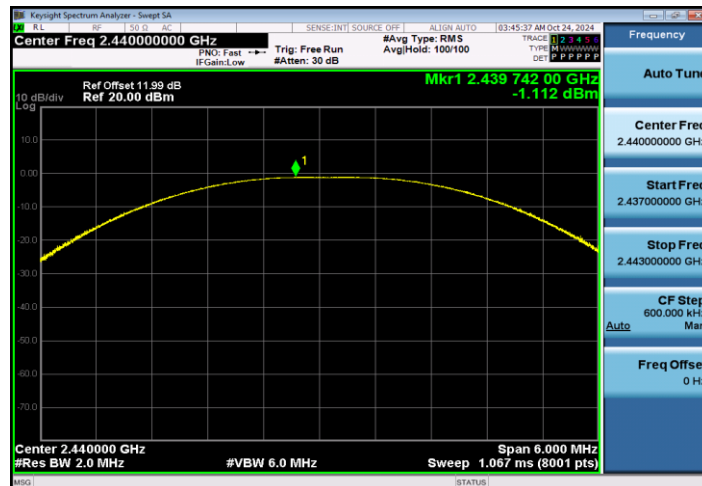
Test Mode	Antenna	Channel [MHz]	Power [dBm]	Limit [dBm]	Verdict
BLE_1M	Ant1	2402	-1.63	<=30	PASS
		2440	-1.11	<=30	PASS
		2480	-0.22	<=30	PASS
BLE_2M	Ant1	2402	-1.65	<=30	PASS
		2440	-1.11	<=30	PASS
		2480	-0.20	<=30	PASS

Test Mode	Antenna	Channel [MHz]	Power [dBm]	Gain [dBi]	EIRP [dBm]	Limit [dBm]	Verdict
BLE_1M	Ant1	2402	-1.63	0.2	-1.43	<=36	PASS
		2440	-1.11	0.2	-0.91	<=36	PASS
		2480	-0.22	0.2	-0.02	<=36	PASS
BLE_2M	Ant1	2402	-1.65	0.2	-1.45	<=36	PASS
		2440	-1.11	0.2	-0.91	<=36	PASS
		2402	-0.20	0.2	0	<=36	PASS

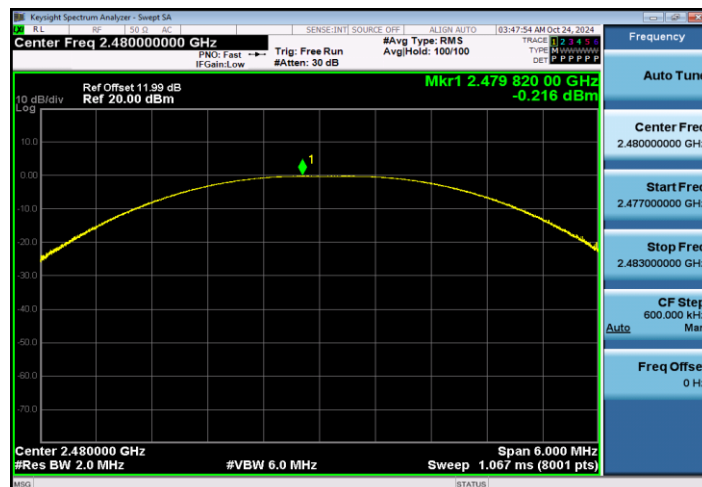
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



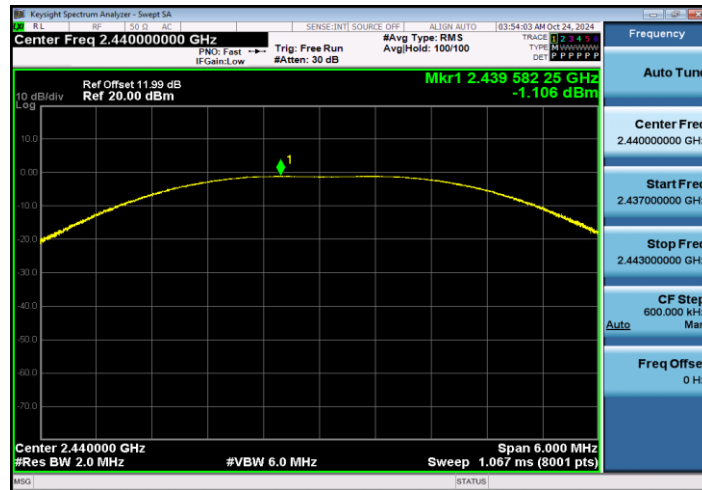
BLE_1M_Ant1_2480



BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480

