FCC Test Report

Report No.:	2405W90655EB
Applicant:	Shenzhen Jiutong zhichuang technology Co., Ltd
Address:	No.403, No.3 Building, Minqi Science Park, No. 65,Lishan Rd, Pingshan Community, Taoyuan Street, Nanshan District, Shenzhen,China
Product Name:	TV Backlight
Product Model:	L01 Pro
Multiple Models:	L02, L03, L04, L05, L06, L07, L08, L09, L10, L20, L30, L40, L50
Trade Mark:	N/A
FCC ID:	2A7JV-L01PRO
Standards:	FCC CFR Title 47 Part 15C (§15.247)
Test Date:	2024-08-10 to 2024-08-20
Test Result:	Complied
Report Date:	2024-09-06

Reviewed by: Frank Yin — Project Engineer

Approved by: Jacob Kong — Manager

Prepared by:

World Alliance Testing & Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China

NVLAP TESTING NVLAP LAB CODE 600335-0

ilac-MRA

This report may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk "★"

Announcement

1. This test report shall not be reproduced except in full, without the written approval of World Alliance Testing & Certification (Shenzhen) Co., Ltd

2. The results in this report apply only to the sample tested.

3. This sample tested is in compliance with the limits of the above regulation.

4. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

5. 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.

Revision History

Version No.	Issued Date	Description
00	*2024-09-06*	*Original*

Contents

1 General Information 4
1.1 Client Information 4
1.2 Product Description of EUT 4
1.3 Antenna information 4
1.4 Related Submittal(s)/Grant(s) 5
1.5 Measurement Uncertainty 5
1.6 Laboratory Location 5
1.7 Test Methodology 5
2 Description of Measurement 6
2.1 Test Configuration 6
2.2 Test Auxiliary Equipment 6
2.3 Interconnecting Cables 6
2.4 Block Diagram of Connection between EUT and AE 7
2.5 Test Setup 7
2.6 Test Procedure 9
2.7 Measurement Method 11
2.8 Measurement Equipment 12
3 Test Results 13
3.1 Test Summary 13
3.2 Limit 14
3.3 AC Line Conducted Emissions Test Data 15
3.4 Radiated emission Test Data 17
3.5 RF Conducted Test Data 33
3.5.1 6 dB Emission Bandwidth 33
3.5.2 99% Occupied Bandwidth 33
3.5.3 Maximum Conducted Peak Output Power 33
3.5.4 Power Spectral Density 34
3.5.5 100 kHz Bandwidth of Frequency Band Edge 34
3.5.6 Duty Cycle 34
4 Test Setup Photo 40
5 E.U.T Photo 41

1 General Information

1.1 Client Information

Applicant:	Shenzhen Jiutong zhichuang technology Co., Ltd
Address:	No.403, No.3 Building, Minqi Science Park, No. 65,Lishan Rd, Pingshan Community, Taoyuan Street, Nanshan District, Shenzhen,China
Manufacturer:	Shenzhen Jiutong zhichuang technology Co., Ltd
Address:	No.403, No.3 Building, Minqi Science Park, No. 65,Lishan Rd, Pingshan Community, Taoyuan Street, Nanshan District, Shenzhen,China

1.2 Product Description of EUT

The EUT is TV Backlight that contains BLE radio, this report covers the full testing of the BLE radio.

Sample Serial Number	2Q5E-1 for CE&RE test, 2Q5E-2 for RF conducted test (assigned by WATC)
Sample Received Date	2024-08-10
Sample Status	Good Condition
Frequency Range	2402MHz - 2480MHz(BLE1M)
Maximum Conducted Peak Output Power	7.08dBm
Modulation Technology	GFSK
Spatial Streams	SISO (1TX, 1RX)
Antenna Gain#	-1.3dBi
Power Supply	DC 12V from AC adapter
Adapter Information	Model: TPQ-228F120200UW01 Input: AC100-240V, 50/60Hz, 0.8A Output: DC 12.0V/2.0A,
Modification	Sample No Modification by the test lab
Note: The applicant require to list Multiple Models in the report, they declared all models are electrical identical, only different with the names of distribution chains, detail please refer to the declaration letter# which was provided by applicant. So only model L01 Pro was select to test in this report.	

1.3 Antenna information

15.203 requirement:

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, 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.

Device Antenna information:	

The BLE antenna is an internal antenna which cannot replace by end-user, please see product internal photos for details.

1.4 Related Submittal(s)/Grant(s)

No related submittal(s)/Grant(s)

1.5 Measurement Uncertainty

Parameter		Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
AC Power Lines Conducted Emissions		±3.14dB
Emissions, Radiated	Below 30MHz	±2.78dB
	Below 1GHz	±4.84dB
	Above 1GHz	±5.44dB
Emissions, Conducted		1.75dB
Conducted Power		0.74dB
Frequency Error		150Hz
Bandwidth		0.34%
Power Spectral Density		0.74dB

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.*

1.6 Laboratory Location

World Alliance Testing & Certification (Shenzhen) Co., Ltd

No. 1002, East Block, Laobing Building, Xingye Road 3012, Xixiang street, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Tel: +86-755-29691511, Email: qa@watc.com.cn

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. : 463912, the FCC Designation No. : CN5040.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0160.

1.7 Test Methodology

FCC CFR 47 Part 2

FCC CFR 47 Part 15

KDB 558074 D01 DTS Meas Guidance v05r02

ANSI C63.10-2020

2 Description of Measurement

2.1 Test Configuration

Operating channels:					
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	19	2440	38	2478
1	2404	20	2442	39	2480
…	…	…	…	/	/
18	2438	…	…	/	/
According to ANSI C63.10-2020 chapter 5.6.1 Table 11 requirement, select lowest channel, middle channel, and highest channel in the frequency range in which device operates for testing. The detailed frequency points are as follows:					
Lowest channel		Middle channel		Highest channel	
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	19	2440	39	2480

Test Mode:				
Transmitting mode:	Keep the EUT in continuous transmitting with modulation			
Exercise software#:	BK32xx RF Test_V2.0.0			
Mode	**Data rate**	**Power Level Setting#**		
		Low Channel	**Middle Channel**	**High Channel**
BLE 1M	1Mbps	7	7	7
The exercise software and the maximum power setting that provided by manufacturer.				

Worst-Case Configuration:
For radiated emissions, EUT was investigated in three orthogonal orientation, the worst-case orientation was recorded in report For AC power line conducted emission and radiated emission 9kHz-1GHz and above 18GHz were performed with the EUT transmits at the channel with highest output power as worst-case scenario.

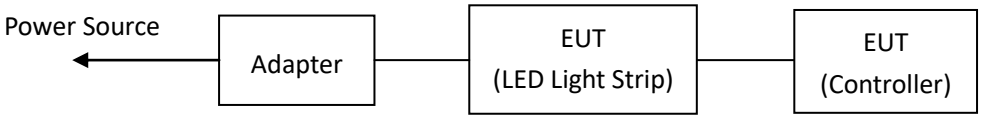
2.2 Test Auxiliary Equipment

Manufacturer	Description	Model	Serial Number
/	/	/	/

2.3 Interconnecting Cables

Manufacturer	Description	From	To
Unknown	DC Power Cable	Adapter	LED Light Strip
Unknown	USB Cable	LED Light Strip	Controller

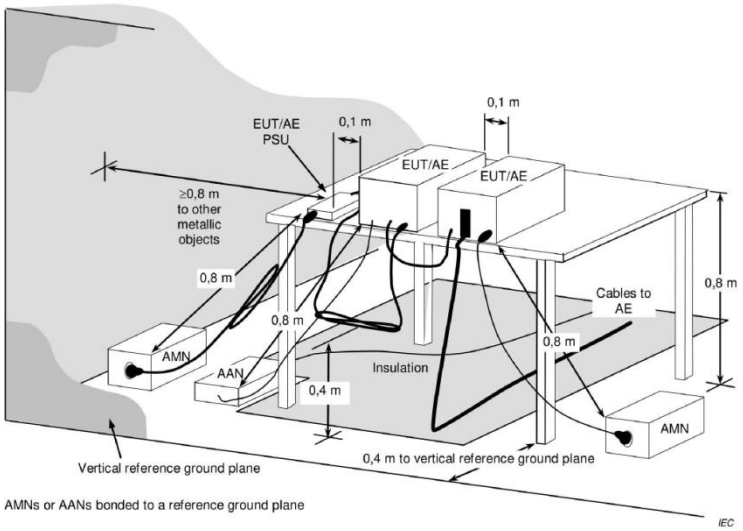
2.4 Block Diagram of Connection between EUT and AE



Note: above for reference only, the actual connection setup used for testing please refer to the test photos.

2.5 Test Setup

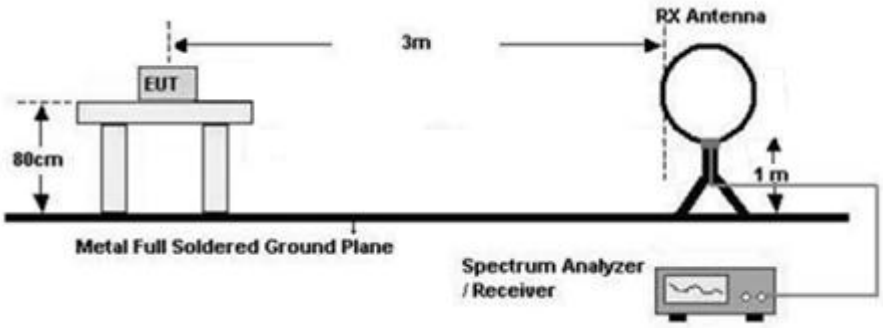
1) Conducted emission measurement:



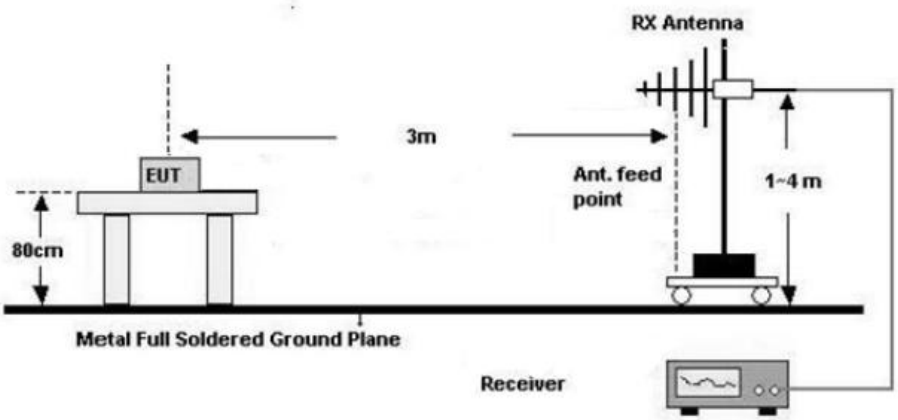
Note: The 0.8 m distance specified between EUT/AE/PSU and AMN/AAN, is applicable only to the EUT being measured. If the device is AE then it shall be >0.8 m.

2) Radiated emission measurement:

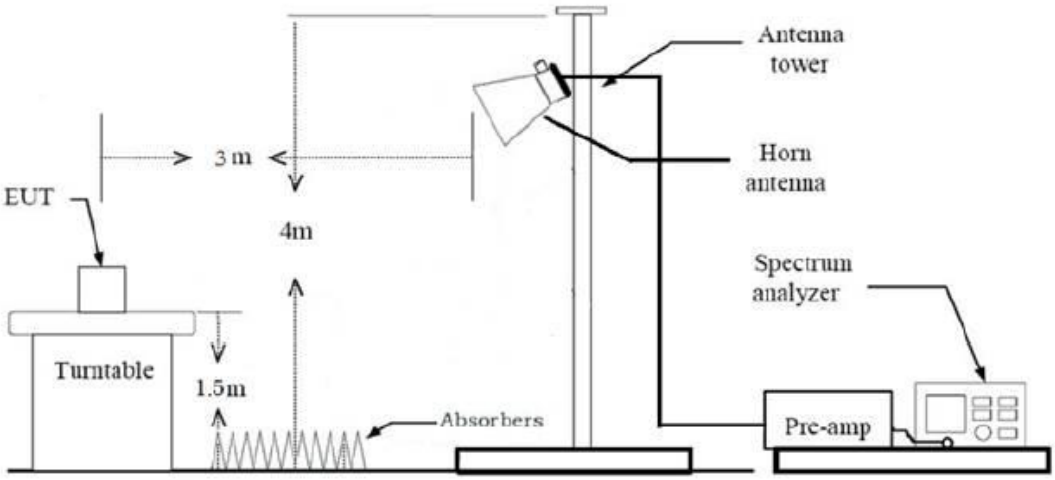
Below 30MHz (3m SAC)



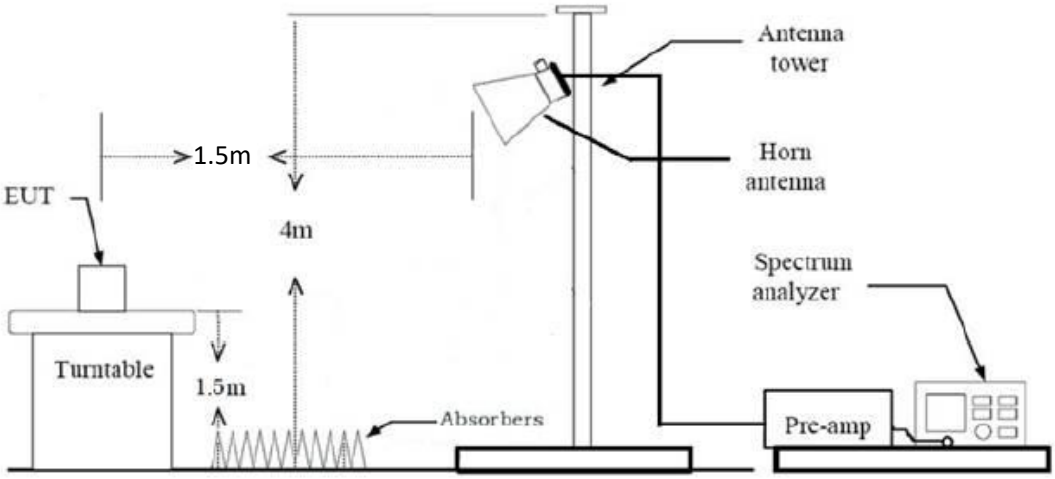
30MHz-1GHz (3m SAC)



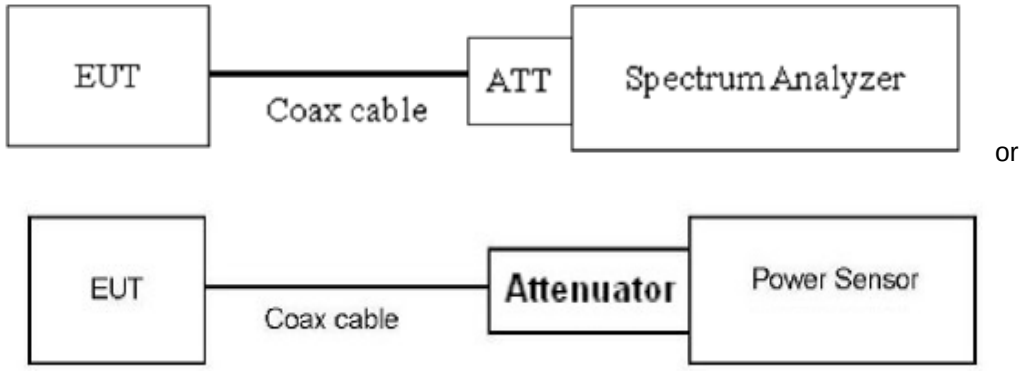
1GHz-18GHz(3m FAC)



Above 18GHz (3m FAC)



3) RF Conducted Test



2.6 Test Procedure

Conducted emission:

1. The E.U.T is placed on a non-conducting table 40cm from the vertical ground plane and 80cm above the horizontal ground plane (Please refer to the block diagram of the test setup and photographs).
2. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.
3. The receiver is set to 9kHz resolution bandwidth, final data was recorded in the Quasi-peak and average detection mode.
4. Line conducted data is recorded for both Line and Neutral

Radiated Emission Procedure:

a) For below 30MHz

1. All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz- 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).
2. Loop antenna use, investigation was done on the three antenna orientations (parallel, perpendicular, gound-parallel)
3. The RBW/VBW of receiver is set to 300Hz/1kHz for 9kHz to 150kHz range, to 10kHz/30kHz for 150kHz to 30MHz range for scan Peak emission, 200Hz/9kHz IF BW was used for final measurement in the Quasi-peak or average detection mode for frequency range 9~150kHz/150kHz~30MHz respectively.
4. If the Peak emission complies with the QP limit, then perform final measurement is optional.

b) For 30MHz-1GHz:

1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 3 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 3 m.

2. EUT works in each mode of operation that needs to be tested. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.
3. The RBW/VBW of receiver is set to 100kHz/300kHz for scan Peak emission, 120kHz IF BW was used for final measurement in the Quasi-peak detection mode.
4. If the Peak emission complies with the QP limit, then perform final measurement is optional.

c) For above 1GHz:

1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m (1-18GHz) and 1.5 m (above 18GHz).
2. EUT works in each mode of operation that needs to be tested，and having the EUT continuously working. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations.
3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
4. Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
5. The RBW/VBW of spectrum analyzer is set to 1MHz/3MHz for scan Peak emission, for measured average emission, reduce the VBW to 10Hz(for duty cycle≥98%), or ≥1/T(for duty cycle<98%). T is minimum transmission duration.
6. If the Peak emission complies with the Average limit, then perform average measurement is optional.

RF Conducted Test:

1. The antenna port of EUT was connected to the RF port of the test equipment (Power Meter or Spectrum analyzer) through Attenuator and RF cable.
2. The cable assembly insertion loss of 7.0dB (including 6.0 dB Attenuator and 1.0 dB cable) was entered as an offset in the power meter. Note: Actual cable loss was unavailable at the time of testing, therefore a loss of 1.0dB was assumed as worst case. This was later verified to be true by laboratory. (if the RF cable provided by client, the cable loss declared by client)
3. The EUT is keeping in continuous transmission mode and tested in all modulation modes.

2.7 Measurement Method

Description of Test	Measurement Method
AC Line Conducted Emissions	ANSI C63.10-2020 Section 6.2
Maximum Conducted Output Power	ANSI C63.10-2020 Section 11.9.1.1
Power Spectral Density	ANSI C63.10-2020 Section 11.10.2
6 dB Emission Bandwidth	ANSI C63.10-2020 Section 11.8.1
99% Occupied Bandwidth	ANSI C63.10-2020 Section 6.9.3
100kHz Bandwidth of Frequency Band Edge	ANSI C63.10-2020 Section 6.10
Radiated emission	ANSI C63.10-2020 Section 11.11&11.12.1
Duty Cycle	ANSI C63.10-2020 Section 11.6

2.8 Measurement Equipment

Manufacturer	Description	Model	Management No.	Calibration Date	Calibration Due Date
AC Line Conducted Emission Test					
ROHDE& SCHWARZ	EMI TEST RECEIVER	ESR	101817	2024/6/4	2025/6/3
R&S	LISN	ENV216	101748	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.12	N/A	2024/6/6	2025/6/5
Farad	Test Software	EZ-EMC	Ver. EMEC-3A1	/	/
Radiated Emission Test					
R&S	EMI test receiver	ESR3	102758	2024/6/4	2025/6/3
ROHDE& SCHWARZ	SPECTRUM ANALYZER	FSV40-N	101608	2024/6/4	2025/6/3
SONOMA INSTRUMENT	Low frequency amplifier	310	186014	2024/6/4	2025/6/3
COM-POWER	preamplifier	PAM-118A	18040152	2024/6/4	2025/6/3
COM-POWER	Amplifier	PAM-840A	461306	2024/8/7	2025/8/6
BACL	Loop Antenna	1313-1A	4010611	2024/2/7	2027/2/6
SCHWARZBECK	Log - periodic wideband antenna	VULB 9163	9163-872	2023/7/7	2026/7/6
Astro Antenna Ltd	Horn antenna	AHA-118S	3015	2023/7/6	2026/7/5
Ducommun technologies	Horn Antenna	ARH-4223-02	1007726-03	2023/7/10	2026/7/9
Oulitong	Band Reject Filter	OBSF-2400-248 3.5-50N	OE02103119	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.9	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.13	N/A	2024/8/7	2025/8/6
N/A	Coaxial Cable	NO.14	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.15	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.16	N/A	2024/6/4	2025/6/3
N/A	Coaxial Cable	NO.17	N/A	2024/6/4	2025/6/3
Audix	Test Software	E3	191218 V9	/	/
RF Conducted Test					
ROHDE& SCHWARZ	SPECTRUM ANALYZER	FSV40	101419	2024/6/4	2025/6/3
narda	6dB attenuator	603-06-1	N/A	2024/6/4	2025/6/3

Note: All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or International standards.

3 Test Results

3.1 Test Summary

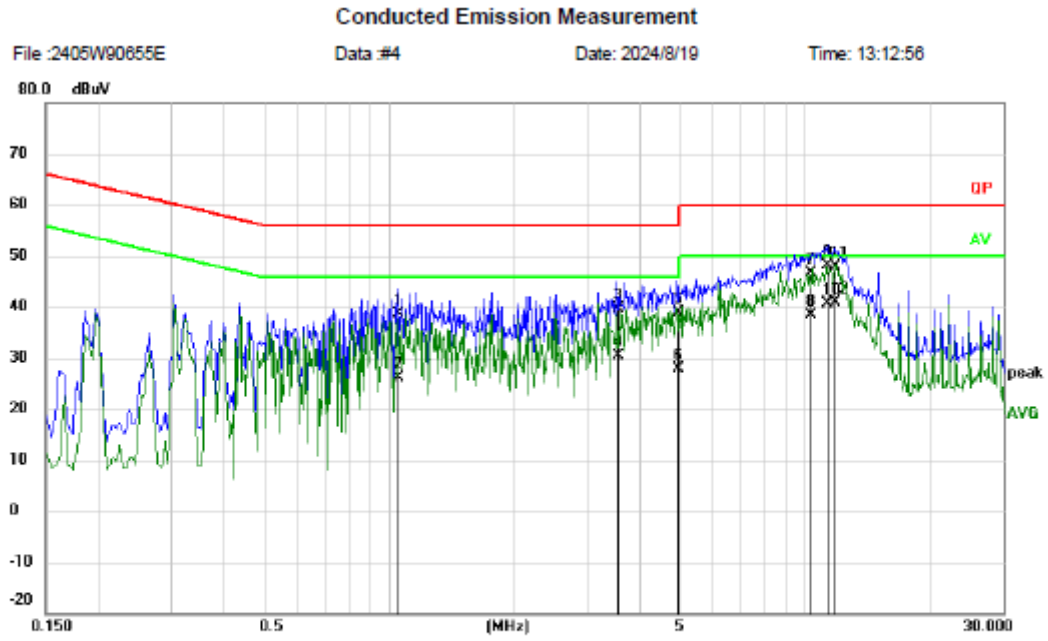
FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
-	99% Occupied Bandwidth	Report only
§15.247(d)	100kHz Bandwidth of Frequency Band Edge	Compliance
§15.205, §15.209, §15.247(d)	Radiated emission	Compliance
-	Duty Cycle	Report only

3.2 Limit

Test items	Limit
AC Line Conducted Emissions	See details §15.207 (a)
Conducted Output Power	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.
6dB Emission Bandwidth	The minimum 6 dB bandwidth shall be at least 500 kHz.
Power Spectral Density	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.
Spurious Emissions, 100kHz Bandwidth of Frequency Band Edge	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)).

3.3 AC Line Conducted Emissions Test Data

Test Date:	2024-08-19	Test By:	Lirou Li
Environment condition:	Temperature: 26.3°C; Relative Humidity:61%; ATM Pressure: 101kPa		



Limit: QP
Mode:transmitting
Note: BLE 1M L Channel

Phase: L1
Power: AC 120V/60Hz

Temperature: 26.3 ℃
Humidity: 61 %
Air Pressure: 1010 hpa

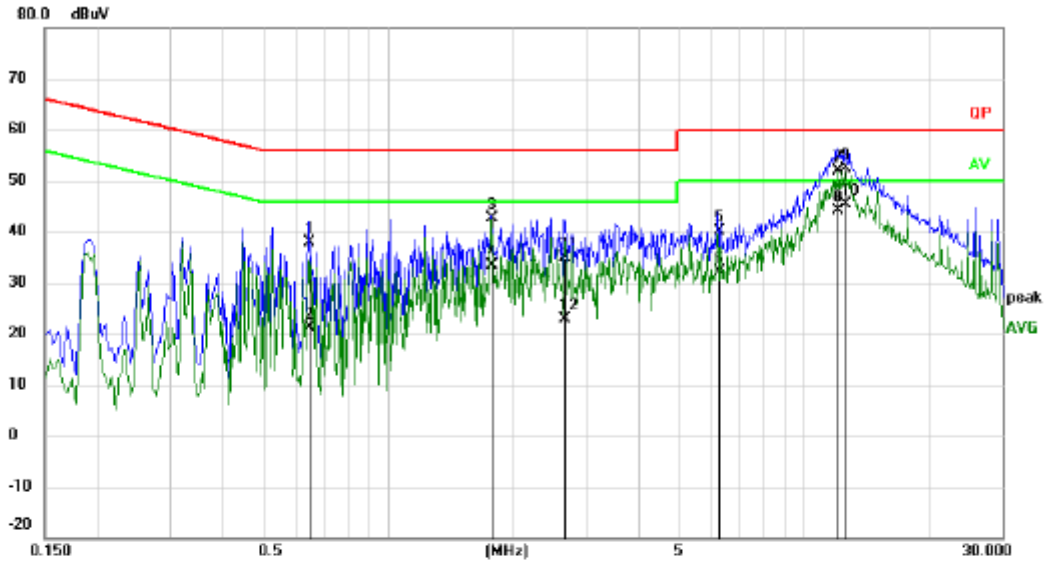
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		1.0500	27.64	11.03	38.67	56.00	-17.33	QP	
2		1.0500	15.18	11.03	26.21	46.00	-19.79	AVG	
3		3.5540	28.59	10.98	39.57	56.00	-16.43	QP	
4		3.5540	19.36	10.98	30.34	46.00	-15.66	AVG	
5		4.9500	27.79	11.14	38.93	56.00	-17.07	QP	
6		4.9500	16.77	11.14	27.91	46.00	-18.09	AVG	
7		10.3220	36.23	10.42	46.65	60.00	-13.35	QP	
8		10.3220	28.08	10.42	38.50	50.00	-11.50	AVG	
9		11.3700	37.80	10.45	48.25	60.00	-11.75	QP	
10		11.3700	30.24	10.45	40.69	50.00	-9.31	AVG	
11		11.8460	37.49	10.48	47.97	60.00	-12.03	QP	
12	*	11.8460	30.28	10.48	40.76	50.00	-9.24	AVG	

*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Conducted Emission Measurement

File :2405W90655E Data :#3 Date: 2024/8/19 Time: 11:46:12



Limit: QP
Mode:transmitting
Note: BLE 1M L Channel

Phase: N
Power: AC 120V/60Hz

Temperature: 26.3 ℃
Humidity: 61 %
Air Pressure: 1010 hpa

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over Limit		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.6460	27.37	10.60	37.97	56.00	-18.03	QP	
2		0.6460	10.60	10.60	21.20	46.00	-24.80	AVG	
3		1.7780	32.07	10.68	42.75	56.00	-13.25	QP	
4		1.7780	22.72	10.68	33.40	46.00	-12.60	AVG	
5		6.2259	29.52	10.65	40.17	60.00	-19.83	QP	
6		6.2259	21.44	10.65	32.09	50.00	-17.91	AVG	
7		12.0139	41.09	10.79	51.88	60.00	-8.12	QP	
8		12.0139	33.32	10.79	44.11	50.00	-5.89	AVG	
9		12.5179	41.69	10.80	52.49	60.00	-7.51	QP	
10	*	12.5179	34.48	10.80	45.28	50.00	-4.72	AVG	
11		2.6580	24.20	10.60	34.80	56.00	-21.20	QP	
12		2.6580	12.23	10.60	22.83	46.00	-23.17	AVG	

*:Maximum data x:Over limit !:over margin

Engineer Signature: Lirou

Remark:

Measurement (dBuV)= Reading Level (dBuV) + Correct Factor(dB)

Correct Factor(dB)= LISN Voltage Division Factor (dB)+ Cable loss(dB)

Over Limit = Measurement – Limit

3.4 Radiated emission Test Data

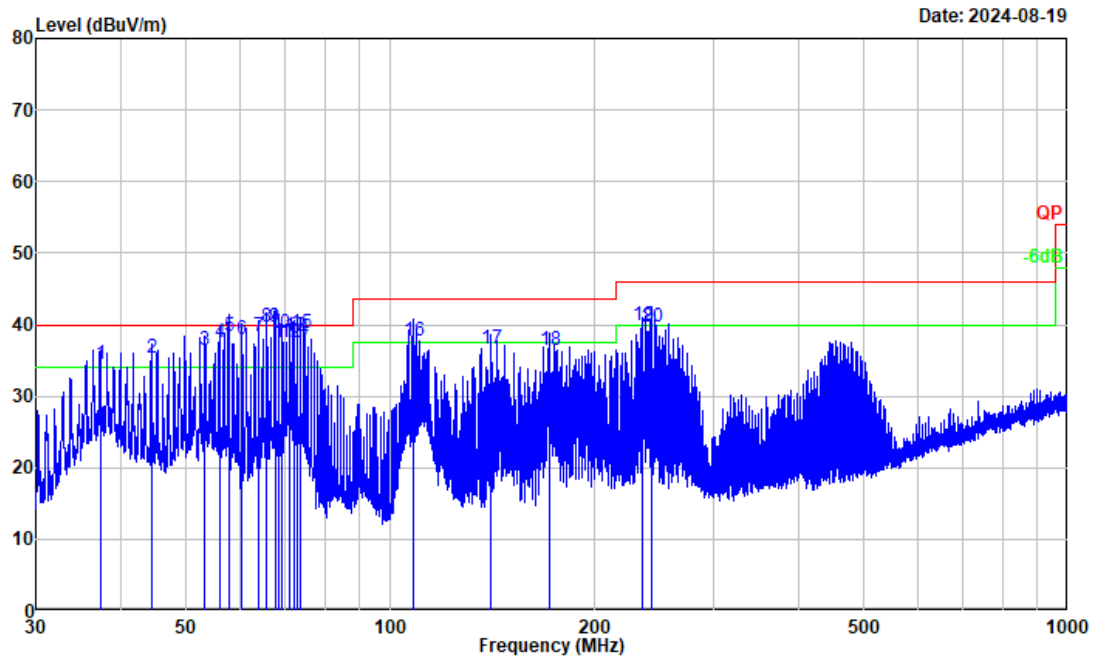
9 kHz-30MHz:

Test Date:	2024-08-19	**Test By:**	Bard Huang
Environment condition:	Temperature: 24°C; Relative Humidity:70%; ATM Pressure: 99.7kPa		

For radiated emissions below 30MHz, there were no emissions found within 20dB of limit.

30MHz-1GHz:

Test Date:	2024-08-19	Test By:	Bard Huang
Environment condition:	Temperature: 24°C; Relative Humidity:70%; ATM Pressure: 99.7kPa		



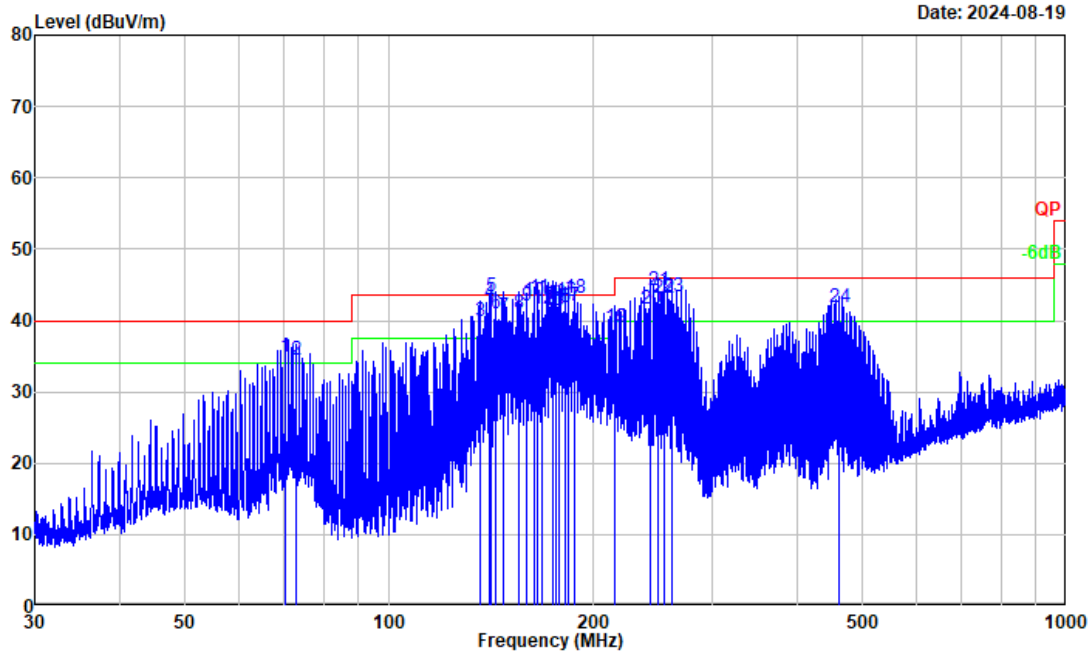
Project No. : 2405W90655E-RF
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.0℃/70%R.H./99.7kPa
Tested by : Bard Huang
Polarization : vertical
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Detector
1	37.352	48.65	-14.23	34.42	40.00	-5.58	QP
2	44.452	47.67	-12.40	35.27	40.00	-4.73	QP
3	53.322	48.60	-12.24	36.36	40.00	-3.64	QP
4	55.981	50.36	-12.82	37.54	40.00	-2.46	QP
5	57.776	51.56	-13.24	38.32	40.00	-1.68	QP
6	60.418	51.68	-13.66	38.02	40.00	-1.98	QP
7	63.989	52.46	-14.05	38.41	40.00	-1.59	QP
8	65.781	54.10	-14.34	39.76	40.00	-0.24	QP
9	67.593	54.54	-14.96	39.58	40.00	-0.42	QP
10	68.428	54.11	-15.29	38.82	40.00	-1.18	QP
11	69.303	53.10	-15.68	37.42	40.00	-2.58	QP
12	71.150	53.89	-16.40	37.49	40.00	-2.51	QP
13	72.029	55.12	-16.76	38.36	40.00	-1.64	QP
14	72.855	54.99	-17.01	37.98	40.00	-2.02	QP

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
15	73.787	56.18	-17.30	38.88	40.00	-1.12	QP
16	108.427	51.19	-13.54	37.65	43.50	-5.85	QP
17	140.431	53.76	-17.16	36.60	43.50	-6.90	QP
18	171.505	52.12	-15.80	36.32	43.50	-7.18	QP
19	235.567	52.03	-12.08	39.95	46.00	-6.05	QP
20	243.548	51.55	-11.83	39.72	46.00	-6.28	QP

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit



Project No. : 2405W90655E-RF
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 24.0℃/70%R.H./99.7kPa
Tested by : Bard Huang
Polarization : horizontal
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	70.190	50.86	-16.01	34.85	40.00	-5.15	QP
2	72.887	51.46	-17.02	34.44	40.00	-5.56	QP
3	136.068	56.98	-17.14	39.84	43.50	-3.66	QP
4	140.431	59.73	-17.16	42.57	43.50	-0.93	QP
5	141.357	60.53	-17.15	43.38	43.50	-0.12	QP
6	143.984	58.03	-17.13	40.90	43.50	-2.60	QP
7	147.562	57.59	-17.11	40.48	43.50	-3.02	QP
8	155.533	57.72	-16.75	40.97	43.50	-2.53	QP
9	160.028	58.64	-16.50	42.14	43.50	-1.36	QP
10	163.503	59.07	-16.25	42.82	43.50	-0.68	QP
11	165.885	59.22	-16.12	43.10	43.50	-0.40	QP
12	168.008	57.51	-15.99	41.52	43.50	-1.98	QP
13	174.233	56.97	-15.60	41.37	43.50	-2.13	QP
14	175.999	57.84	-15.50	42.34	43.50	-1.16	QP

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
15	178.720	56.95	-15.20	41.75	43.50	-1.75	QP
16	182.201	57.63	-14.91	42.72	43.50	-0.78	QP
17	183.966	56.84	-14.71	42.13	43.50	-1.37	QP
18	187.549	57.36	-14.31	43.05	43.50	-0.45	QP
19	215.983	52.10	-13.04	39.06	43.50	-4.44	QP
20	243.014	53.56	-11.85	41.71	46.00	-4.29	QP
21	249.272	55.98	-11.67	44.31	46.00	-1.69	QP
22	254.239	54.65	-11.54	43.11	46.00	-2.89	QP
23	262.161	54.59	-11.33	43.26	46.00	-2.74	QP
24	462.301	48.55	-6.81	41.74	46.00	-4.26	QP

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Above 1GHz:

Test Date:	2024-08-20	**Test By:**	Luke Li
Environment condition:	Temperature: 22°C; Relative Humidity:69%; ATM Pressure: 99.9kPa		

Frequency (MHz)	**Reading level (dBμV)**	**Polar**	**Corrected Factor (dB/m)**	**Corrected Amplitude (dBμV/m)**	**Limit (dBμV/m)**	**Margin (dB)**	**Remark**
BLE 1M							
Low Channel							
2390.000	36.68	horizontal	6.82	43.50	54.00	-10.50	Average
2390.000	47.77	horizontal	6.82	54.59	74.00	-19.41	Peak
2390.000	36.86	vertical	6.82	43.68	54.00	-10.32	Average
2390.000	48.33	vertical	6.82	55.15	74.00	-18.85	Peak
7206.000	51.09	horizontal	-1.98	49.11	54.00	-4.89	Average
7206.000	56.96	horizontal	-1.98	54.98	74.00	-19.02	Peak
7206.000	54.34	vertical	-1.98	52.36	74.00	-21.64	Peak
Middle Channel							
7320.000	55.44	horizontal	-2.24	53.20	74.00	-20.80	Peak
7320.000	53.45	vertical	-2.24	51.21	74.00	-22.79	Peak
High Channel							
2483.500	40.44	horizontal	7.02	47.46	54.00	-6.54	Average
2483.500	53.86	horizontal	7.02	60.88	74.00	-13.12	Peak
2483.500	36.86	vertical	7.02	43.88	54.00	-10.12	Average
2483.500	49.28	vertical	7.02	56.30	74.00	-17.70	Peak
7440.000	53.93	horizontal	-1.99	51.94	74.00	-22.06	Peak
7440.000	52.07	vertical	-1.99	50.08	74.00	-23.92	Peak

Remark:

Corrected Amplitude= Reading level + corrected Factor

Corrected Factor = Antenna factor + Cable loss – Amplifier gain

Margin = Corrected Amplitude – Limit

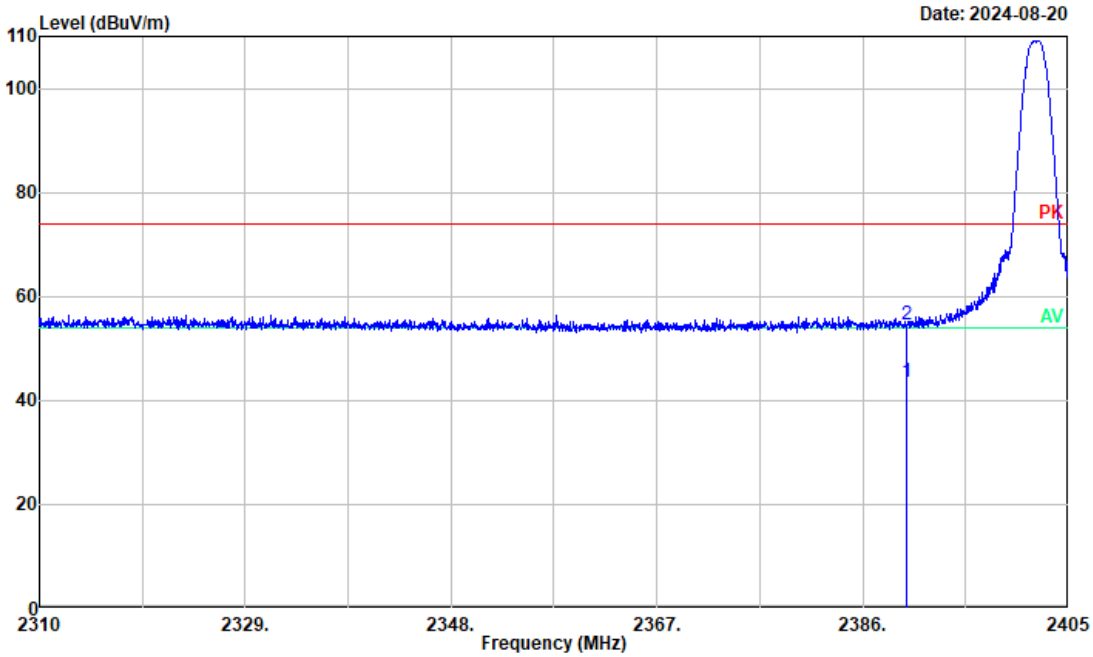
For the test result of Peak below the Peak limit more than 20dB, which can compliance with the average limit, just the Peak level was recorded.

The emission levels of other frequencies that were lower than the limit 20dB, not show in test report.

For emissions in 18GHz-25GHz range, all emissions were investigated and in the noise floor level.

Test plot for example as below:

Mode:	BLE 1M	Channel:	2402MHz

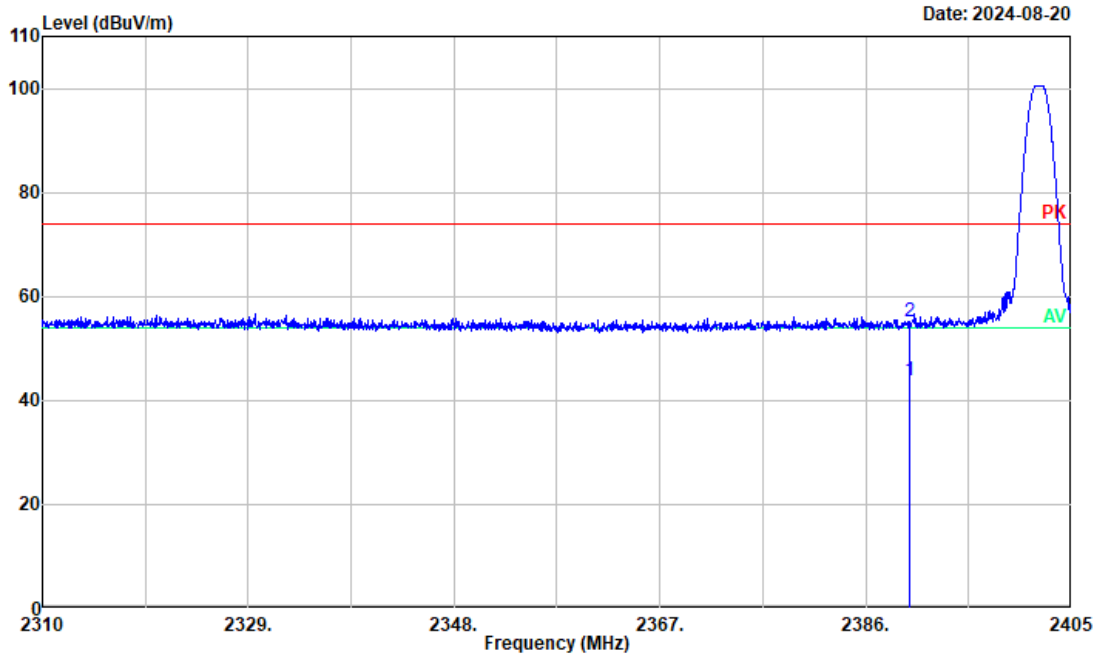


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : horizontal
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	2390.000	36.68	6.82	43.50	54.00	-10.50	Average
2	2390.000	47.77	6.82	54.59	74.00	-19.41	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz

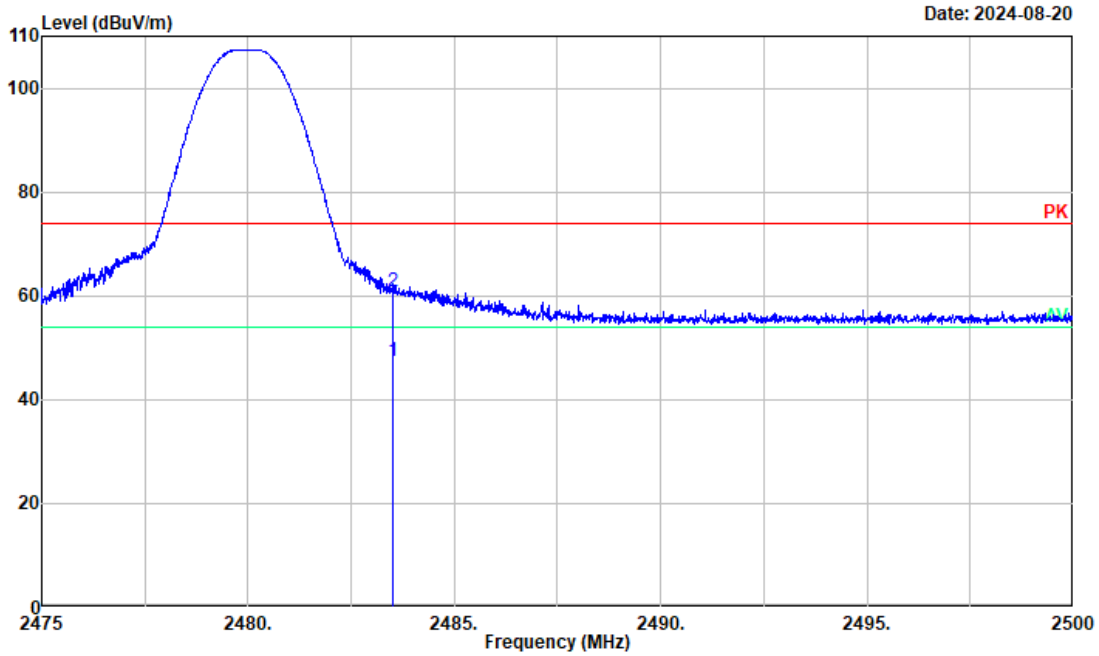


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : vertical
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	2390.000	36.86	6.82	43.68	54.00	-10.32	Average
2	2390.000	48.33	6.82	55.15	74.00	-18.85	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2480MHz

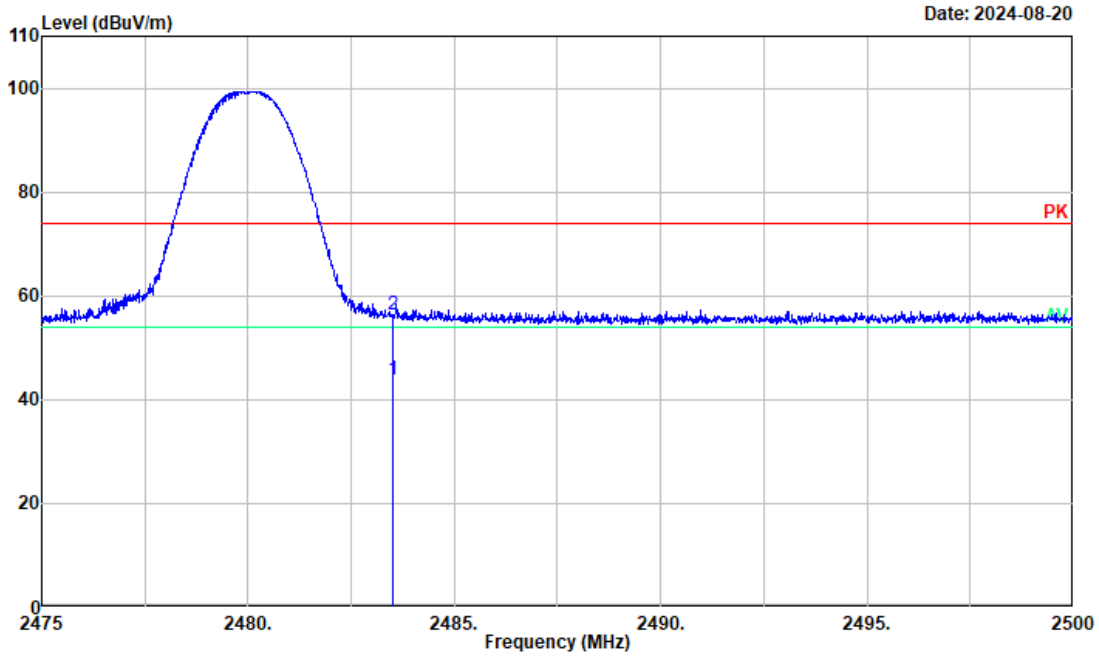


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : horizontal
Remark : BLE 1M high channel

--No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Detector
1	2483.500	40.44	7.02	47.46	54.00	-6.54	Average
2	2483.500	53.86	7.02	60.88	74.00	-13.12	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2480MHz

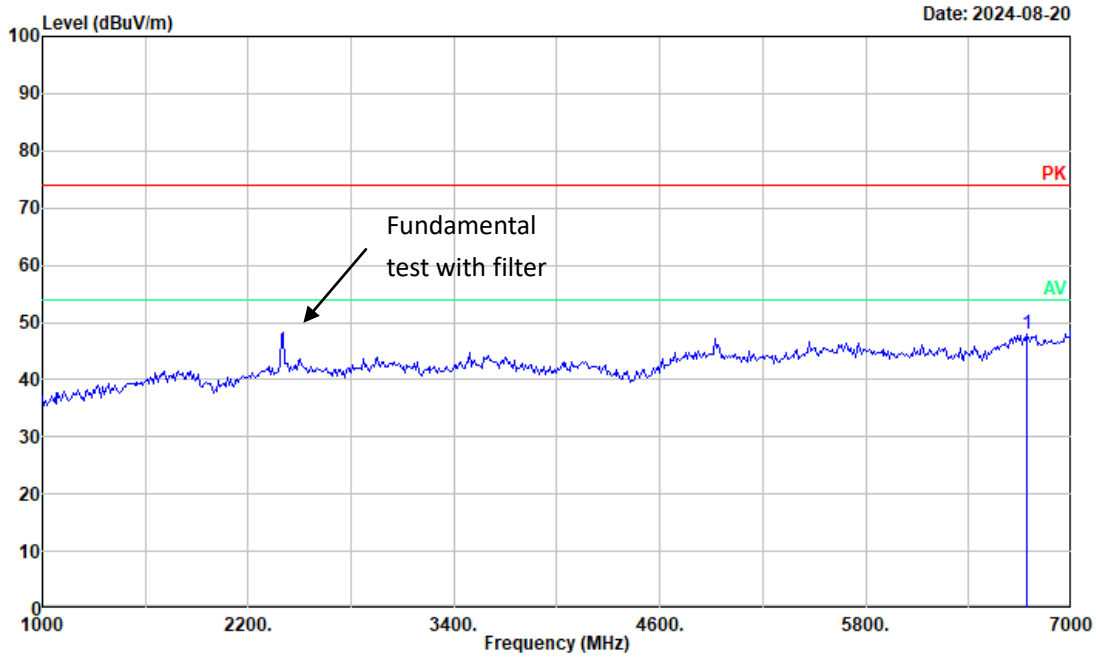


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : vertical
Remark : BLE 1M high channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	2483.500	36.86	7.02	43.88	54.00	-10.12	Average
2	2483.500	49.28	7.02	56.30	74.00	-17.70	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz

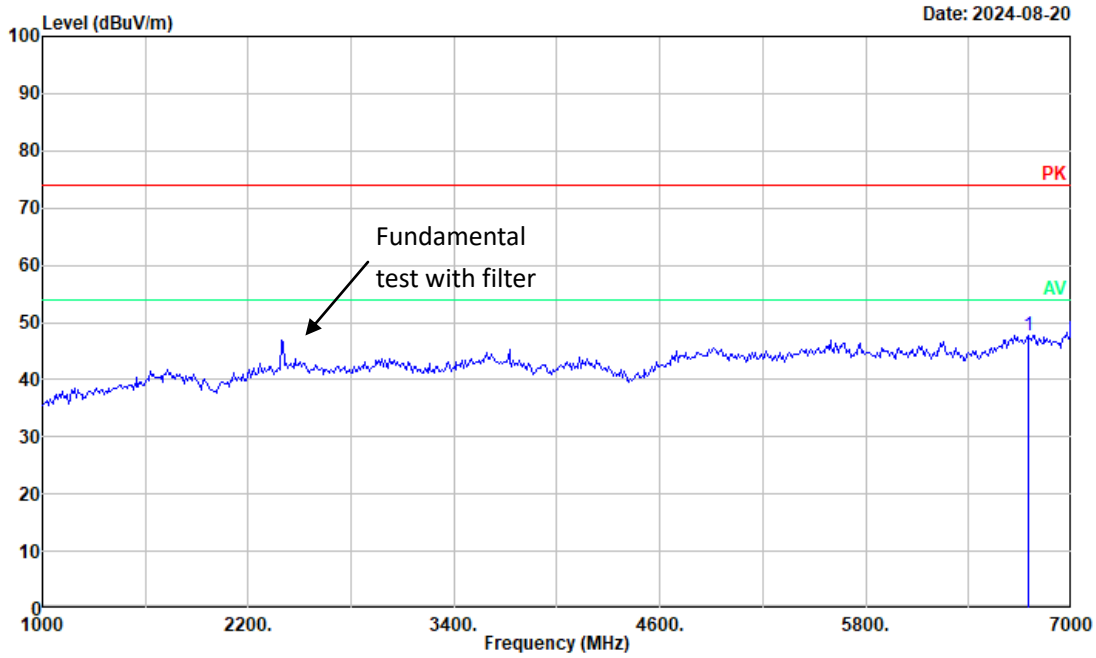


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : horizontal
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	6740.370	49.69	-1.76	47.93	74.00	-26.07	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz

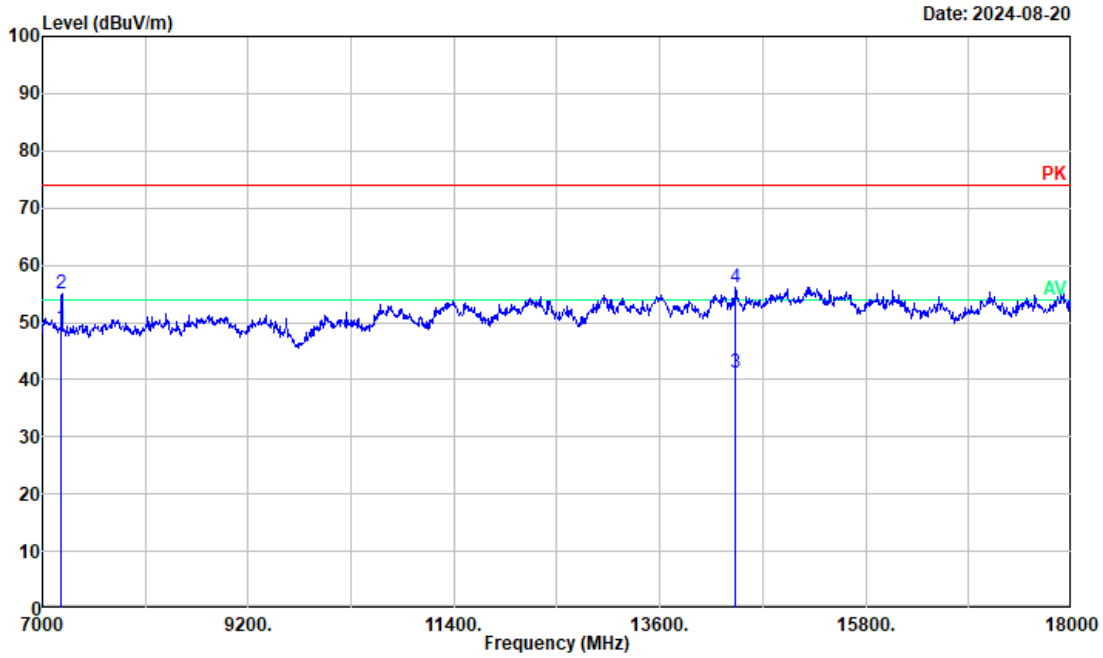


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : vertical
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	6748.875	49.54	-1.72	47.82	74.00	-26.18	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz

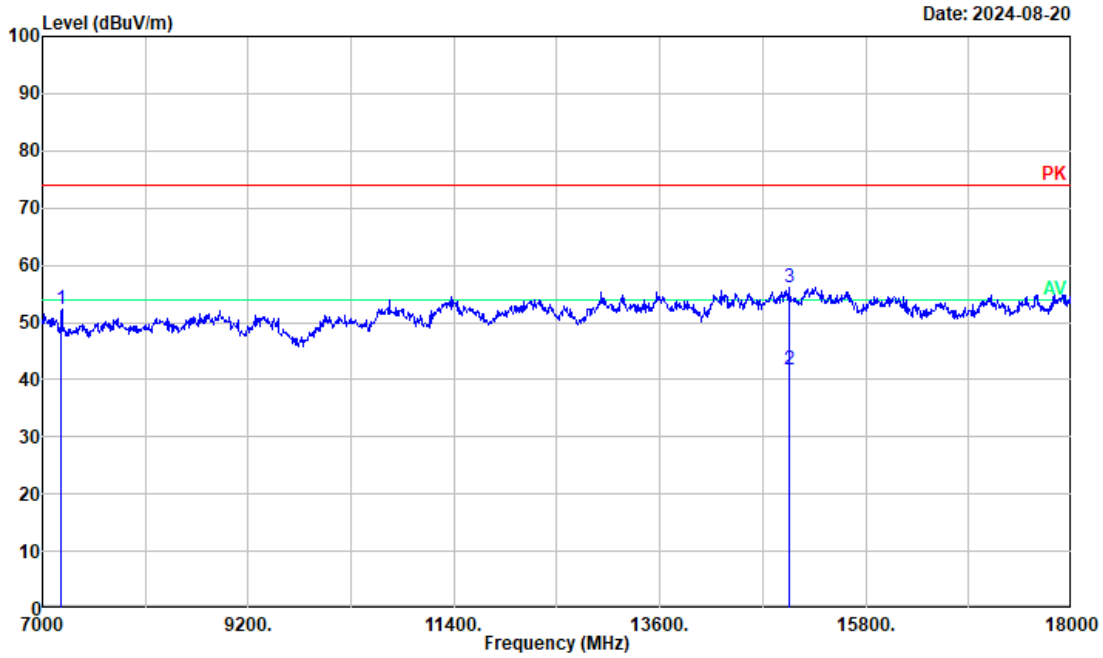


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : horizontal
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBμV)	Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Detector
1	7206.000	51.09	-1.98	49.11	54.00	-4.89	Average
2	7206.000	56.96	-1.98	54.98	74.00	-19.02	Peak
3	14411.210	35.92	5.21	41.13	54.00	-12.87	Average
4	14411.210	50.98	5.21	56.19	74.00	-17.81	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz

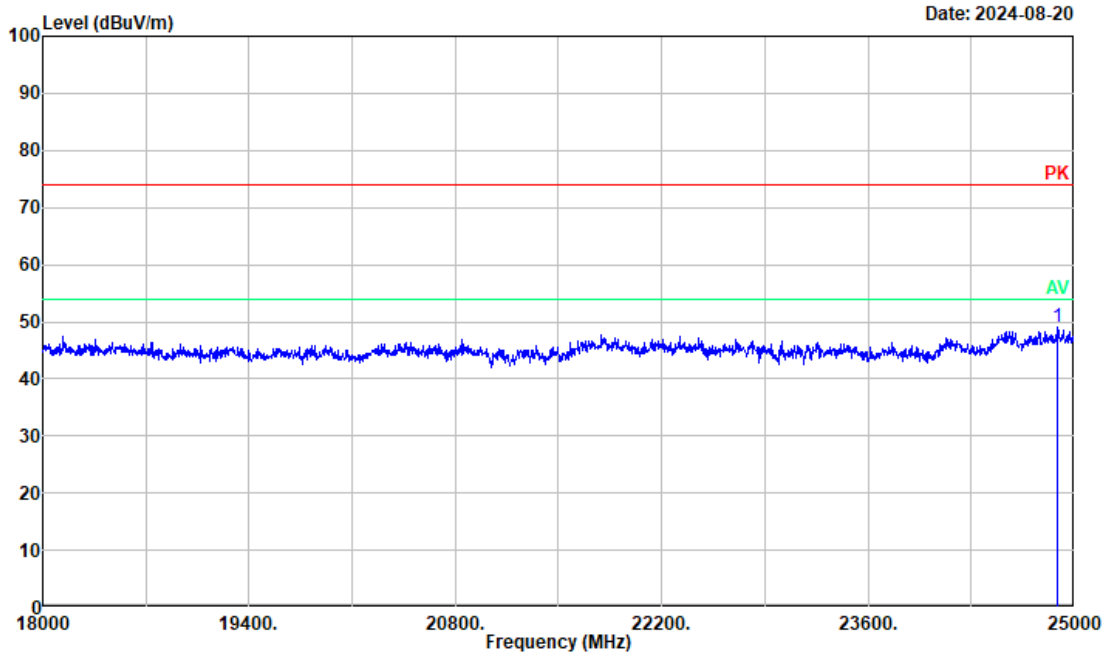


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : vertical
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	7206.000	54.34	-1.98	52.36	74.00	-21.64	Peak
2	14980.990	36.08	5.61	41.69	54.00	-12.31	Average
3	14980.990	50.55	5.61	56.16	74.00	-17.84	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz

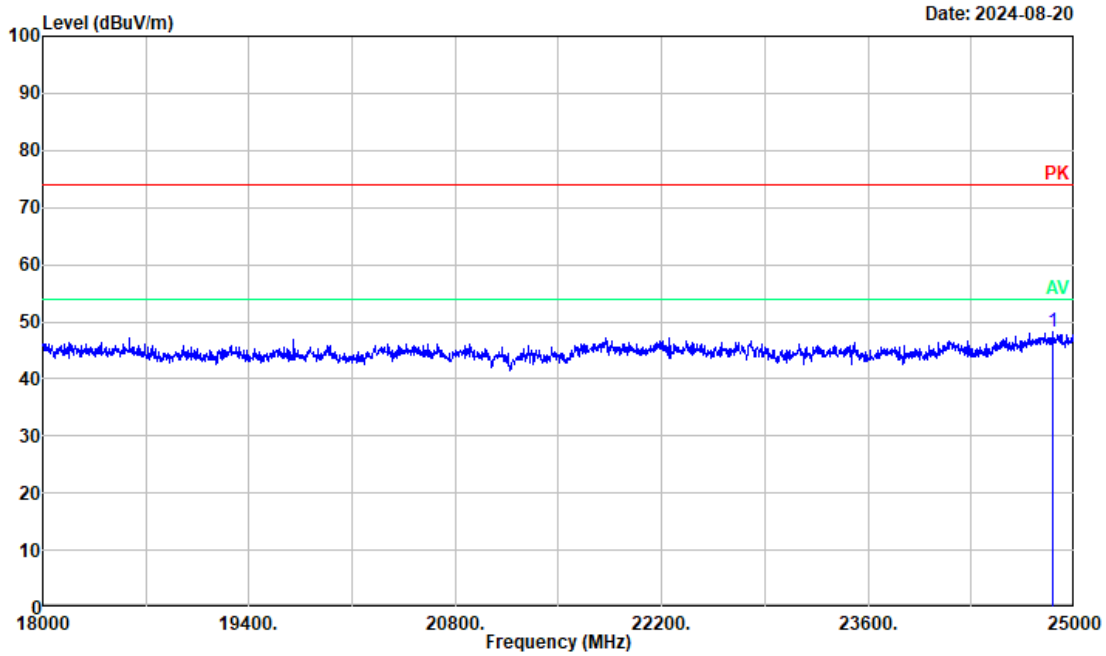


Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : horizontal
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	24887.940	52.63	-3.55	49.08	74.00	-24.92	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain - Distance extrapolate factor
Distance extrapolate factor = 20*log(specified distance/measured distance)
Specified distance = 3 meters, measured distance = 1.5 meters
Result = Reading + Factor
Over Limit = Result - Limit

Mode:	BLE 1M	Channel:	2402MHz



Project No. : 2405W90655E
Test Mode : Transmitting
Test Voltage : AC 120V/60Hz
Environment : 22.0℃/69%R.H./99.9kPa
Tested by : Luke Li
Polarization : vertical
Remark : BLE 1M low channel

--No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Over Limit (dB)	Detector
1	24856.430	52.10	-3.74	48.36	74.00	-25.64	Peak

Remarks: Factor = Antenna factor + Cable loss - Preamp gain - Distance extrapolate factor
Distance extrapolate factor = 20*log(specified distance/measured distance)
Specified distance = 3 meters, measured distance = 1.5 meters
Result = Reading + Factor
Over Limit = Result - Limit

3.5 RF Conducted Test Data

Test Date:	2024-08-10	Test By:	Ryan Zhang
Environment condition:	Temperature: 25.4°C; Relative Humidity:42%; ATM Pressure: 100.3kPa		

3.5.1 6 dB Emission Bandwidth

Mode	Value (MHz)	Limit (MHz)	Result
Low	0.677	≥0.5	Pass
Middle	0.677	≥0.5	Pass
High	0.701	≥0.5	Pass

3.5.2 99% Occupied Bandwidth

Mode	99% OBW (MHz)
Low	1.014
Middle	1.014
High	1.014

3.5.3 Maximum Conducted Peak Output Power

Mode	Value (dBm)	Limit (dBm)	Result
Low	7.08	30.00	Pass
Middle	6.94	30.00	Pass
High	6.83	30.00	Pass

3.5.4 Power Spectral Density

Mode	Value (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low	-7.21	8	Pass
Middle	-7.30	8	Pass
High	-7.18	8	Pass

3.5.5 100 kHz Bandwidth of Frequency Band Edge

Mode	Value (dB)	Limit (dB)	Result
Low	43.98	20	Pass
High	55.07	20	Pass

3.5.6 Duty Cycle

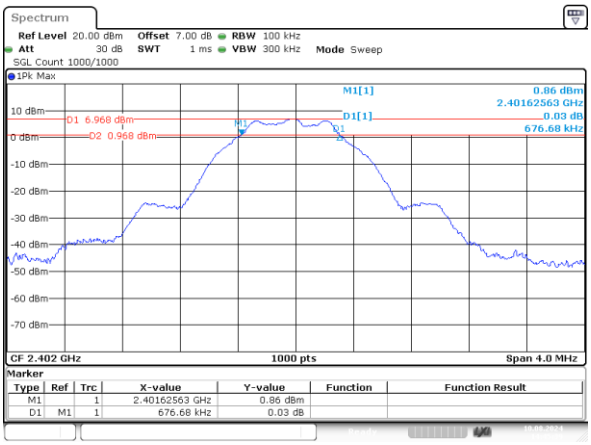
Mode	Ton (ms)	Ton+Toff (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/Ton (Hz)	VBW Setting (kHz)
Middle	0.412	0.625	65.92	1.81	2427	3

Duty Cycle = Ton/(Ton+Toff)*100%

Test Plots:

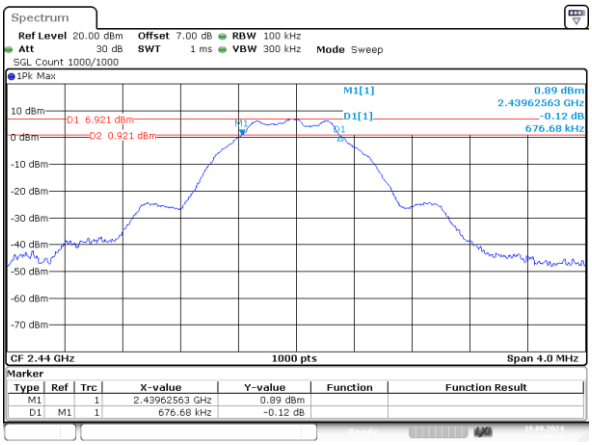
6 dB Emission Bandwidth:

Low 0.677MHz



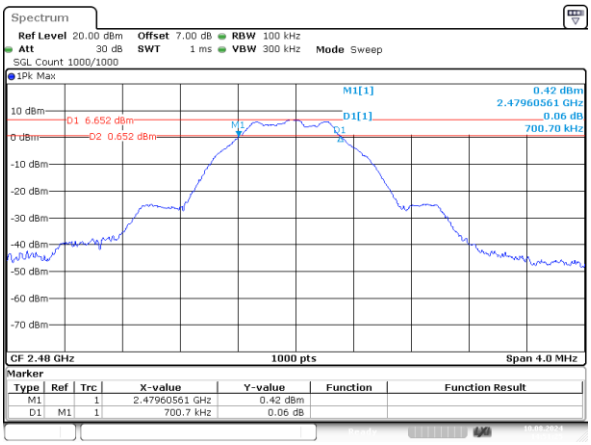
ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:45:39

Middle 0.677MHz



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:48:32

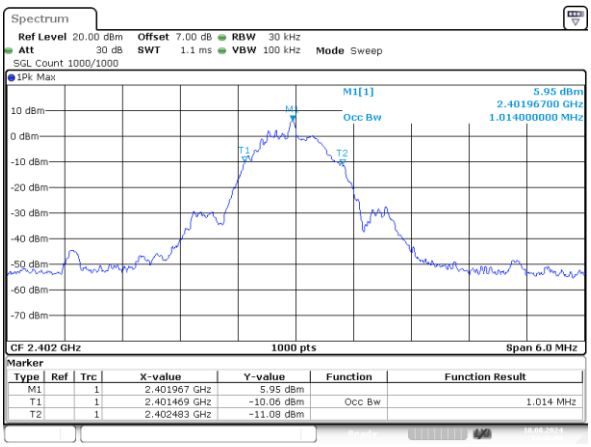
High 0.701MHz



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:51:25

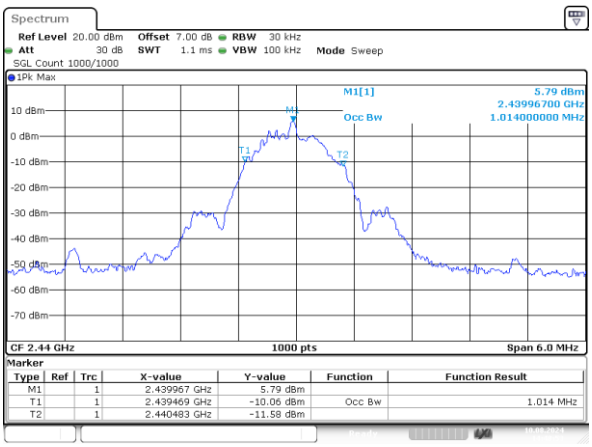
99% Occupied Bandwidth:

Low 1.014MHz



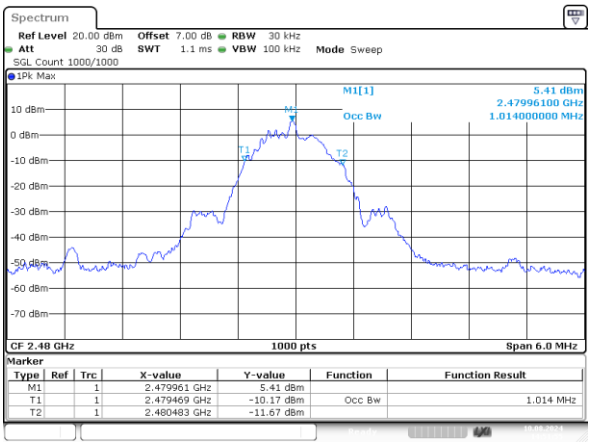
ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:45:59

Middle 1.014MHz



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:48:53

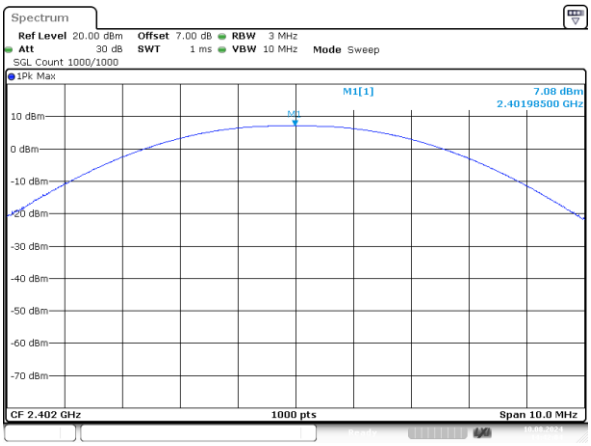
High 1.014MHz



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:51:55

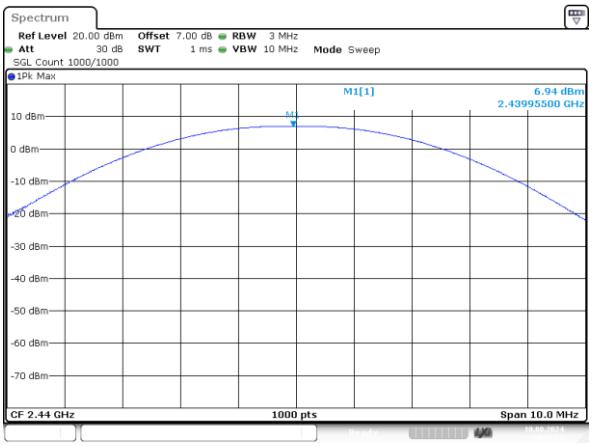
Maximum Conducted Peak Output Power:

Low 7.08dBm



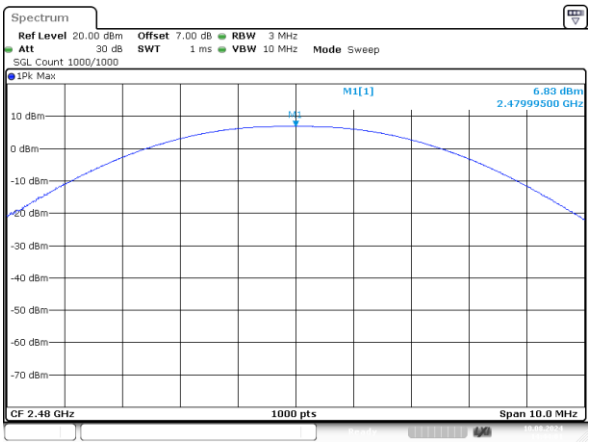
ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:42:04

Middle 6.94dBm



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:43:28

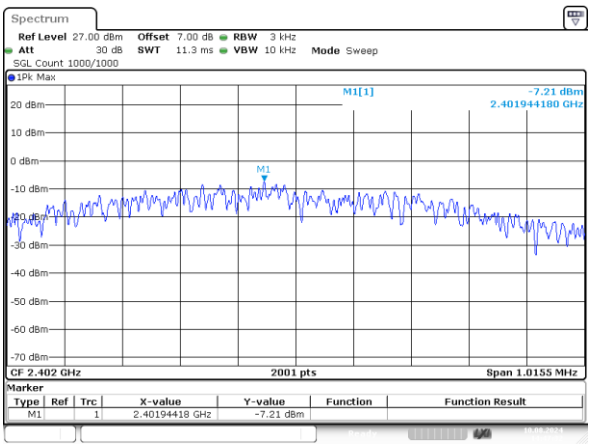
High 6.83dBm



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:44:01

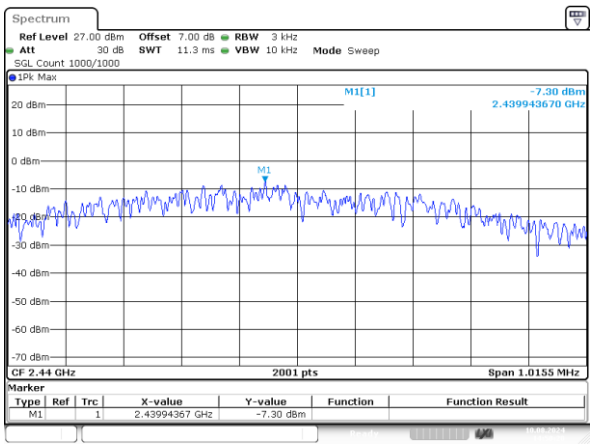
Power Spectral Density:

Low -7.21dBm/3kHz



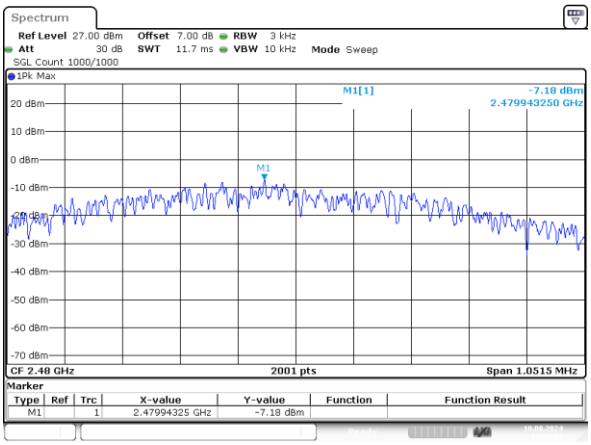
ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:47:32

Middle -7.30dBm/3kHz



ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:50:20

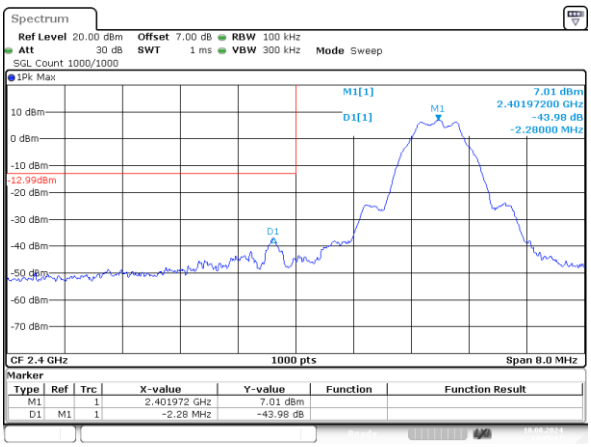
High -7.18dBm/3kHz



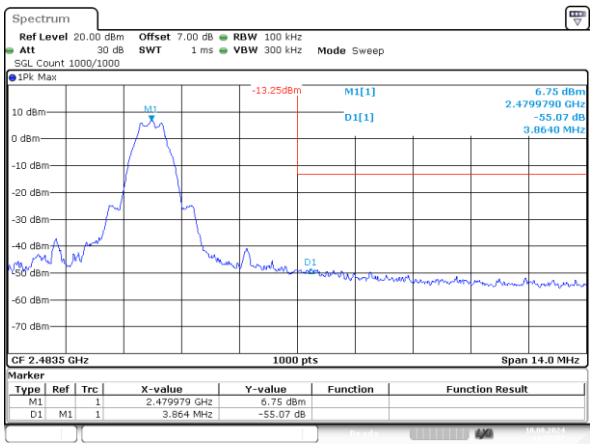
ProjectNo.:2405W90655E-RF Tester:Ryan Zhang
Date: 10.AUG.2024 14:54:08

100kHz Bandwidth of Frequency Band Edge:

Low 43.98dB

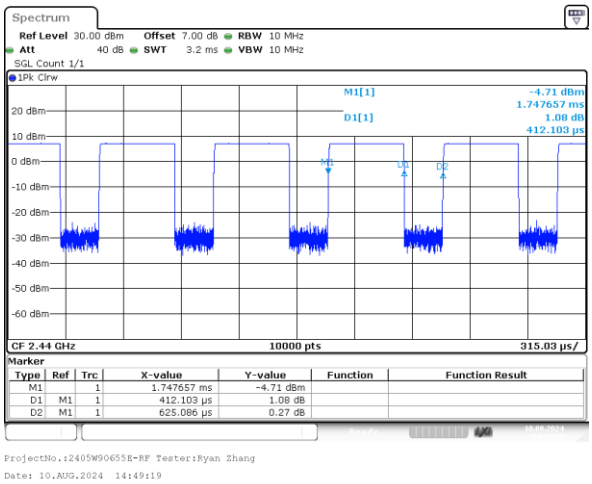


High 55.07dB



Duty cycle:

Middle



4 Test Setup Photo

Please refer to the attachment 2405W90655E Test Setup photo.

5 E.U.T Photo

Please refer to the attachment 2405W90655E External photo and 2405W90655E Internal photo.

---End of Report---