TEST REPORT

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Report Number:	2501X00782E-RF-00A
FCC ID:	2BTBP-XW010

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	Smart Door Lock
Model No.:	XW010
Multiple Model(s) No.:	N/A
Trade Mark:	N/A
Date Received:	2025/09/22
Issue Date:	2025/12/12

Test Result:	Pass▲

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

Prepared and Checked By:

Simon Zhong

Simon Zhong
RF Engineer

Approved By:

Nancy Wang

Nancy Wang
RF Supervisor

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

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	2501X00782E-RF-00A	Original Report	2025/12/12

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	2402~2480MHz
Maximum Conducted Output Peak Power	4.99dBm
Modulation Technique	GFSK
Antenna Specification#	1.84dBi(provided by the applicant)
Voltage Range	DC 5V from Type-C or DC 1.5V*4 AAA from Battery
Sample serial number	3AFH-1 for Conducted and Radiated Emissions Test 3AFH-2 RF Conducted Test (Assigned by BACL, Shenzhen)
Sample/EUT Status	Good condition
Adapter Information	N/A
Modification	Sample No Modification by the test lab

Objective

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

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

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

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

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		109.2kHz(k=2, 95% level of confidence)
RF output power, conducted		0.86dB(k=2, 95% level of confidence)
Power Spectral Density		0.90dB(k=2, 95% level of confidence)
AC Power Lines Conducted Emissions	9kHz~150 kHz	3.63dB(k=2, 95% level of confidence)
	150 kHz ~30MHz	3.66dB(k=2, 95% level of confidence)
Radiated Emissions	0.009MHz~30MHz	3.60dB(k=2, 95% level of confidence)
	30MHz~200MHz (Horizontal)	5.32dB(k=2, 95% level of confidence)
	30MHz~200MHz (Vertical)	5.43dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Horizontal)	5.77dB(k=2, 95% level of confidence)
	200MHz~1000MHz (Vertical)	5.73dB(k=2, 95% level of confidence)
	1GHz - 6GHz	5.34dB(k=2, 95% level of confidence)
	6GHz - 18GHz	5.40dB(k=2, 95% level of confidence)
	18GHz - 40GHz	5.64dB(k=2, 95% level of confidence)
Temperature		±1℃
Humidity		±1%
Supply voltages		±0.4%

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

Test Facility

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For BLE mode, 40 channels are provided to testing:

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

EUT was tested with Channel 0, 19 and 39.

EUT Exercise Software

Exercise Software#	BK32XX RF Test_v1.8.2.exe		
Power Level#			
Mode	Low Channel	Middle Channel	High Channel
BLE 1M	3	3	3

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

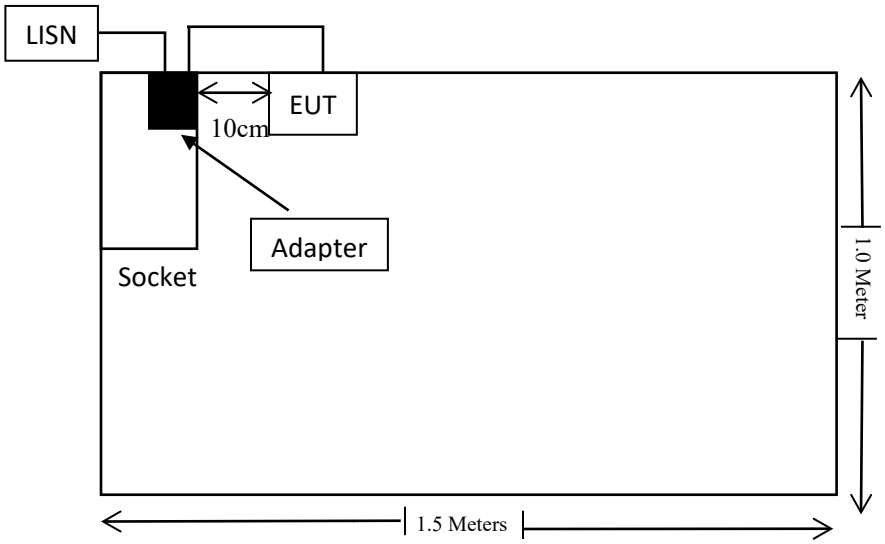
Manufacturer	Description	Model	Serial Number
YiBin HuafengCommunicationCo.,Ltd	Adapter	SW-0983	E310283

External I/O Cable

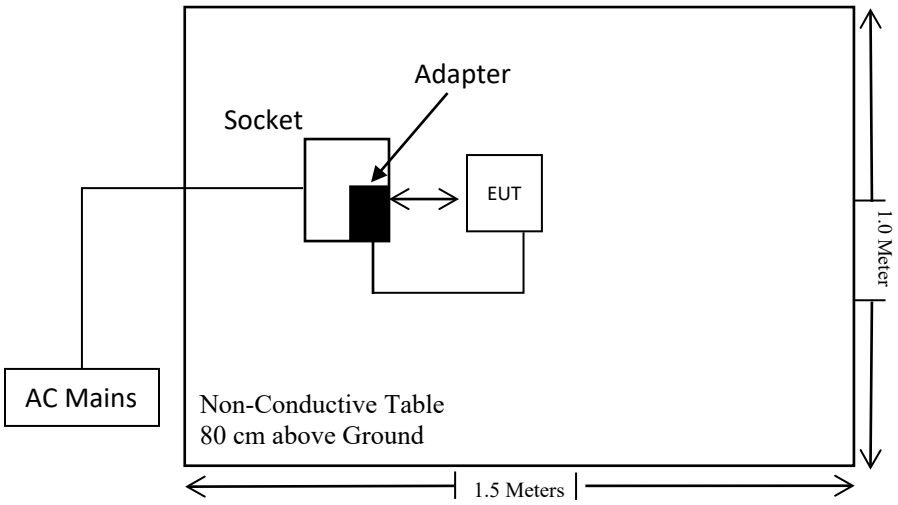
Cable Description	Length (m)	From Port	To
Unshielded Un-detachable AC Cable	1.2	Socket	LISN/AC Mains
shielded detachable DC Cable	0.8	EUT	Adapter

Block Diagram of Test Setup

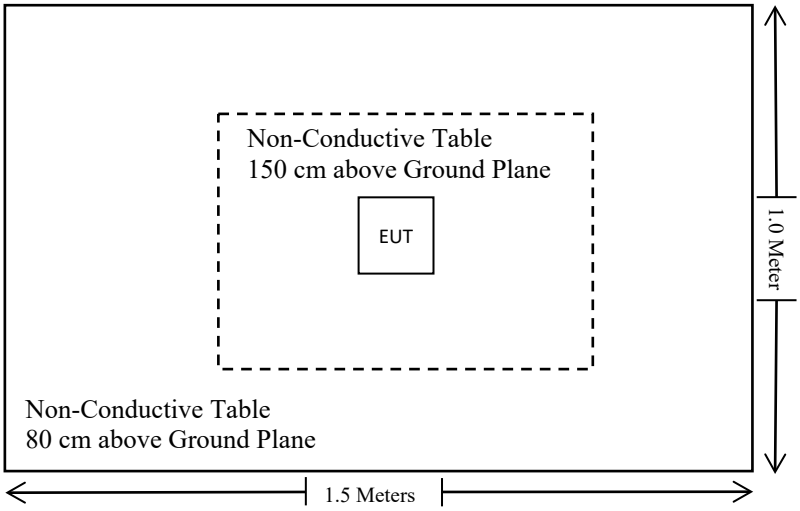
For Conducted Emissions:



For Radiated Emissions below 1GHz:



For Radiated Emissions above 1GHz:



SUMMARY OF TEST RESULTS

Test Rules	Description of Test	Result
§1.1307 (b) & §2.1091	MPE-Based Exemption	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(d)	Conducted Spurious Emission	Compliant
C63.10 §11.6	Duty Cycle	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission Test					
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2025/04/29	2026/04/28
Rohde & Schwarz	LISN	ENV216	101613	2024/12/04	2025/12/03
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2024/12/04	2025/12/03
Unknown	CE Cable	Unknown	UF A210B-1-0720-504504	2025/04/29	2026/04/28
Audix	EMI Test software	E3	191218(V9)	NCR	NCR
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESR3	102455	2024/12/04	2025/12/03
Sonoma instrument	Pre-amplifier	310N	186238	2025/04/29	2026/04/28
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2023/07/20	2026/07/19
Unknown	Cable	Chamber Cable 1	F-03-EM236	2025/04/29	2026/04/28
Unknown	Cable	XH500C	J-10M-A	2025/04/29	2026/04/28
BACL	Active Loop Antenna	1313-1A	4031911	2024/05/14	2027/05/13
Unknown	Cable	2Y194	0735	2024/12/04	2025/12/03
unknown	Cable	PNG214	1354	2024/12/04	2025/12/03
Audix	EMI Test software	E3	19821b(V9)	NCR	NCR
Rohde&Schwarz	Spectrum Analyzer	FSV40	101605	2025/03/26	2026/03/25
A.H.System	Preamplifier	PAM-0118P	489	2025/09/08	2026/09/07
Schwarzbeck	Horn Antenna	BBHA9120D(1201)	1143	2023/07/26	2026/07/25
Unknown	Chamber B Cable	Cable B1	Cable B1	2025/09/08	2026/09/07
Unknown	Chamber B Cable	Cable B2	Cable B2	2025/09/08	2026/09/07
Unknown	Chamber B Cable	Cable B3	Cable B3	2025/09/08	2026/09/07
JD	Filter Switch Unit	DT7220FSU	DS79906	2025/08/12	2026/08/11
JD	Multiplex Switch Test Control Set	DT7220SCU	DS79903	2025/08/12	2026/08/11
A.H.System	Pre-amplifier	PAM-1840VH	190	2025/04/29	2026/04/28
Electro-Mechanics Co	Horn Antenna	3116	9510-2270	2023/09/18	2026/09/17
UTIFLEX	RF Cable	NO. 13	232308-001	2024/12/18	2025/12/17
Audix	EMI Test software	E3	191218(V9)	NCR	NCR

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV40-N	102259	2024/12/04	2025/12/03
Unknown	10dB Attenuator	Unknown	F-03-EM065	2025/06/26	2026/06/25

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

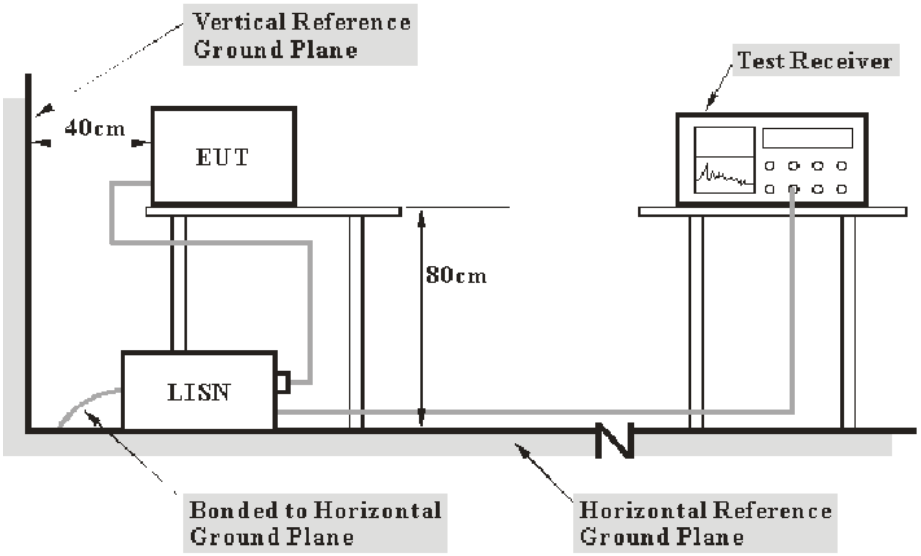
REQUIREMENTS AND TEST PROCEDURES

AC Line Conducted Emissions

Applicable Standard

FCC§15.207

EUT Setup



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

The setup of EUT is according with per ANSI C63.10-2020 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

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

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

Frequency Range	RBW
150 kHz – 30 MHz	9 kHz

Test Procedure

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

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

Factor & Over Limit Calculation

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

Factor = LISN VDF + Cable Loss

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

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

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

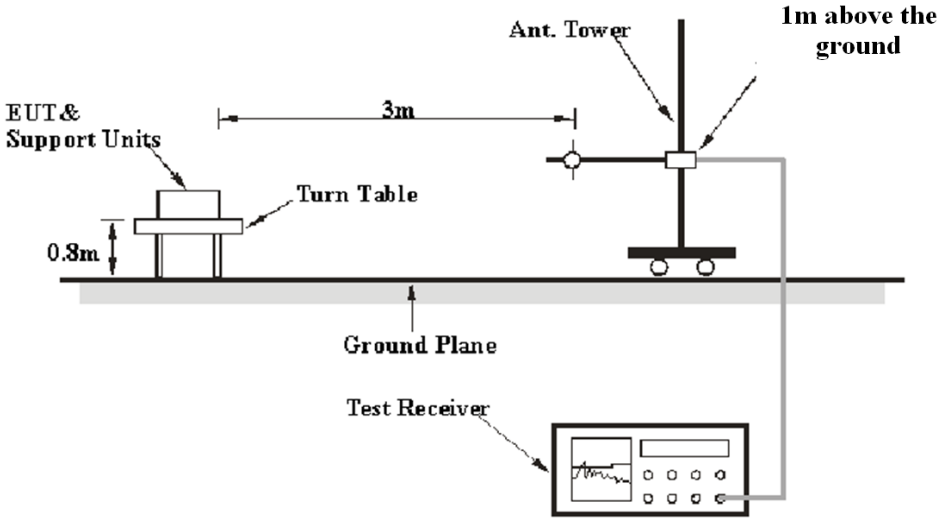
Unwanted Emission Frequencies and Restricted Bands

Applicable Standard

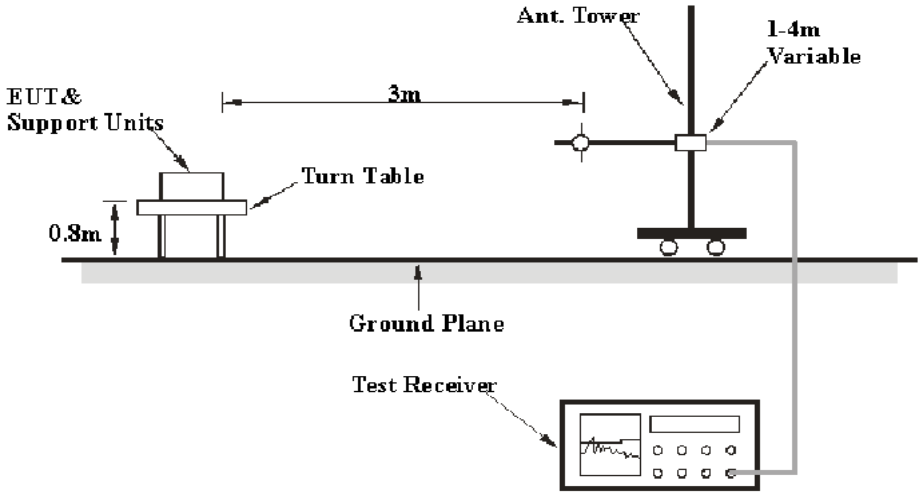
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

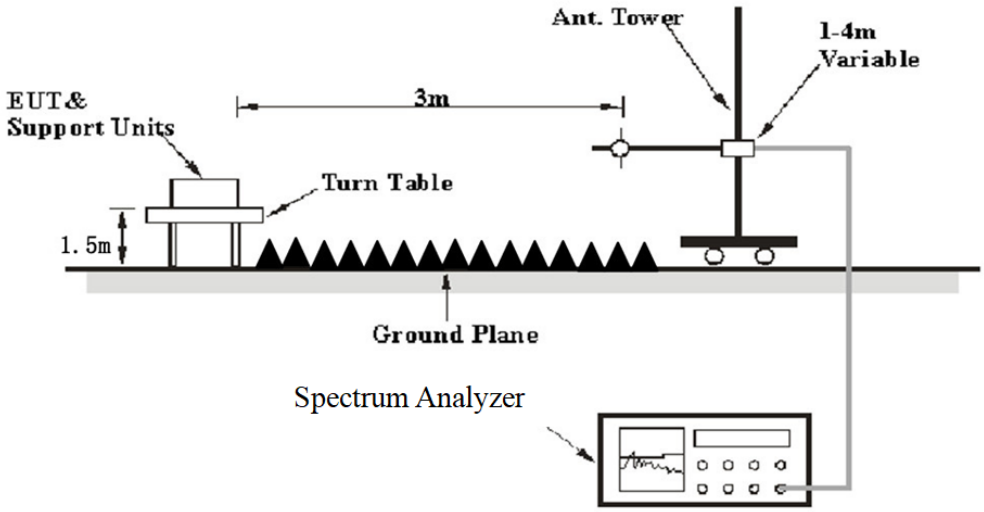
9 kHz-30MHz:



30MHz-1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3meters test site, using the setup accordance with the ANSI C63.10-2020. The specification used was the FCC 15.205, FCC 15.209, FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz to 25 GHz.

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

9 kHz-1GHz:

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

1-25GHz:
Pre-scan

Measurement	Duty cycle	RBW	Video B/W	Detector
PK	Any	1MHz	3 MHz	Peak
AV	>98%	1MHz	1 kHz	Peak
	<98%	1MHz	≥1/Ton	Peak

Final measurement for emission identified during pre-scan

Measurement	Duty cycle	RBW	Video B/W	Detector
PK	Any	1MHz	3 MHz	Peak
AV	>98%	1MHz	10 Hz	Peak
	<98%	1MHz	≥1/Ton	Peak

Note: Ton is minimum transmission duration

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

Test Procedure

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

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

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

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

Factor & Over Limit/Margin Calculation

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

Factor = Antenna Factor + Cable Loss - Amplifier Gain

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

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

6 dB Emission Bandwidth & 99% Occupied Bandwidth

Standard Applicable

According to FCC §15.247(a) (2)
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.8.1 & Clause 6.9.3

The steps for the first option are as follows:

a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.

b) Set the VBW ⩾ [3 × RBW].

c) Detector = peak.

d) Trace mode = max-hold.

e) Sweep = No faster than coupled (auto) time.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−6 dB down amplitude". If a marker is below this "−6 dB down amplitude" value, then it shall be as close as possible to this value.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be at least three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.6.2.

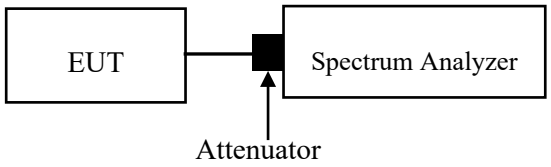
d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max-hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing spectral plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).



Note: Offset (10.5dB) = Attenuator (10dB) + Cable loss (0.5dB)

Peak Output Power Measurement

Applicable Standard

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

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.9.1.1

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW ⩾ DTS bandwidth.

b) Set VBW ⩾ [3 × RBW].

c) Set span ⩾ [3 × RBW].

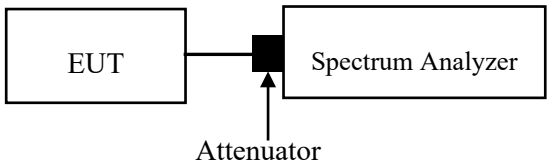
d) Sweep time = No faster than coupled (auto) time.

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.



Note 1: A short RF cable with low cable loss connected to the EUT antenna port, which was provided by client or lab, the cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable loss
Note 2: Offset (10.5dB) = Attenuator (10dB) + Cable loss (0.5dB)

Power Spectral Density

Applicable Standard

According to FCC §15.247(e):
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.10.2

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span >1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ⩽ RBW ⩽ 100 kHz.

d) Set the VBW ⩾ [3 × RBW].

e) Detector = peak.

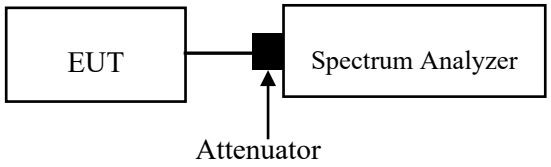
f) Sweep time = No faster than coupled (auto) time.

g) Trace mode = max-hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.



Note 1: A short RF cable with low cable loss connected to the EUT antenna port, which was provided by client or lab, the cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable loss
Note 2: Offset (10.5dB) = Attenuator (10dB) + Cable loss (0.5dB)

100 kHz Bandwidth of Frequency Band Edge

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.11.3

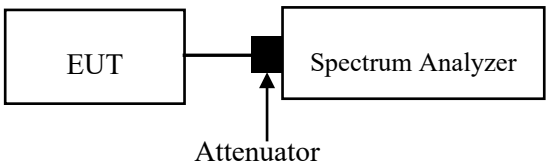
Establish an emission level by using the following procedure:

a) Set the center frequency and span to encompass frequency range to be measured. Note that the frequency range might need to be divided into multiple frequency ranges to retain frequency resolution.

NOTE—the number of points can also be increased for large spans to retain frequency resolution

b) Set the RBW = 100 kHz.
c) Set the VBW ⩾ [3 × RBW].
d) Detector = peak.
e) Sweep time = No faster than coupled (auto) time.
f) Trace mode = max-hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.



Note: Offset (10.5dB) = Attenuator (10dB) + Cable loss (0.5dB)

Conducted Spurious Emission

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

Test Method: ANSI C63.10-2020 Clause 11.11.3

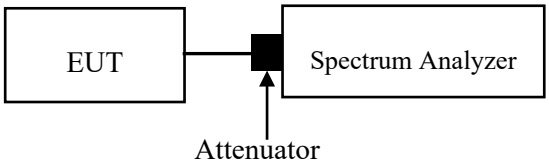
Establish an emission level by using the following procedure:

a) Set the center frequency and span to encompass frequency range to be measured. Note that the frequency range might need to be divided into multiple frequency ranges to retain frequency resolution.

NOTE—the number of points can also be increased for large spans to retain frequency resolution

b) Set the RBW = 100 kHz.
c) Set the VBW ≥ [3 × RBW].
d) Detector = peak.
e) Sweep time = No faster than coupled (auto) time.
f) Trace mode = max-hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.



Note 1: A short RF cable with low cable loss connected to the EUT antenna port, which was provided by client or lab, the worst case cable loss was add with offset into test equipment, the total offset consists of attenuator and/or RF cable and/or power splitter loss
Note 2: Offset (12.5dB) = Attenuator (10dB) + Cable loss (2.5dB)

Duty Cycle

Test Procedure

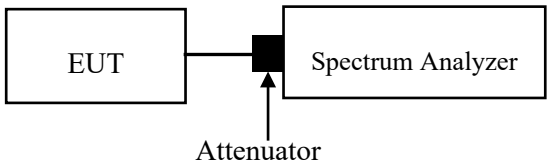
According to ANSI C63.10-2020 Section 11.6

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

1) Set the center frequency of the instrument to the center frequency of the transmission.
2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
3) Set VBW ≥ RBW. Set detector = peak or average.
4) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if T ≤ 16.7 μs.)



Note: Offset (10.5dB) = Attenuator (10dB) + Cable loss (0.5dB)

ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

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

Antenna Connector Construction

The EUT has an internal antenna arrangement, which was permanently attached, the antenna gain# is 1.84dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant

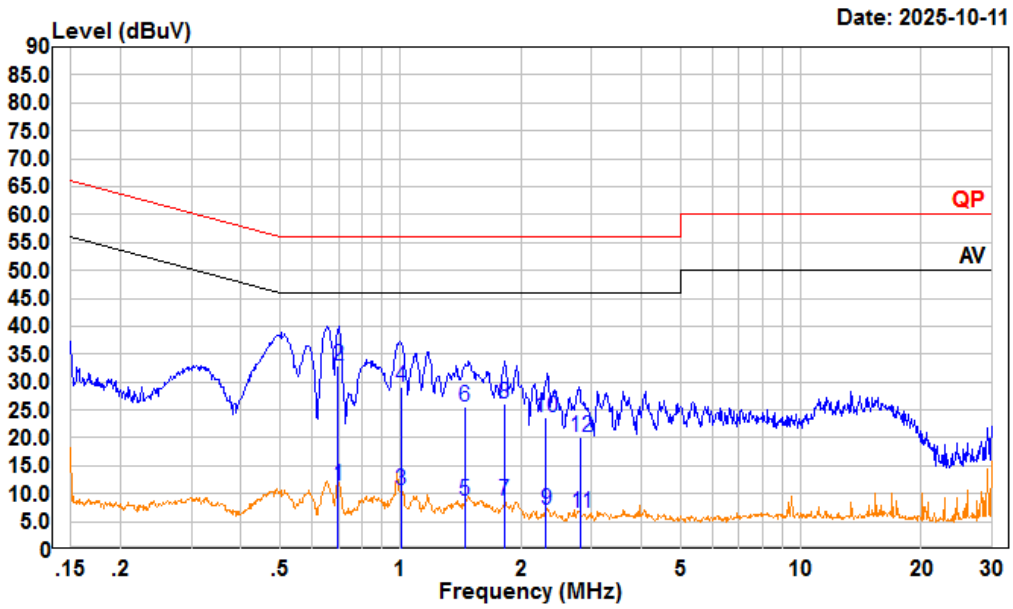
TEST DATA AND RESULTS

AC Line Conducted Emissions

Environmental Conditions

Temperature (°C)	26.5	**Relative Humidity (%)**	63
ATM Pressure (kPa)	100.6	**Test engineer**	Macy Shi
Test date	2025.10.11		
EUT operation mode	Transmitting(Maximum output power mode, BLE 1M Low Channel)		

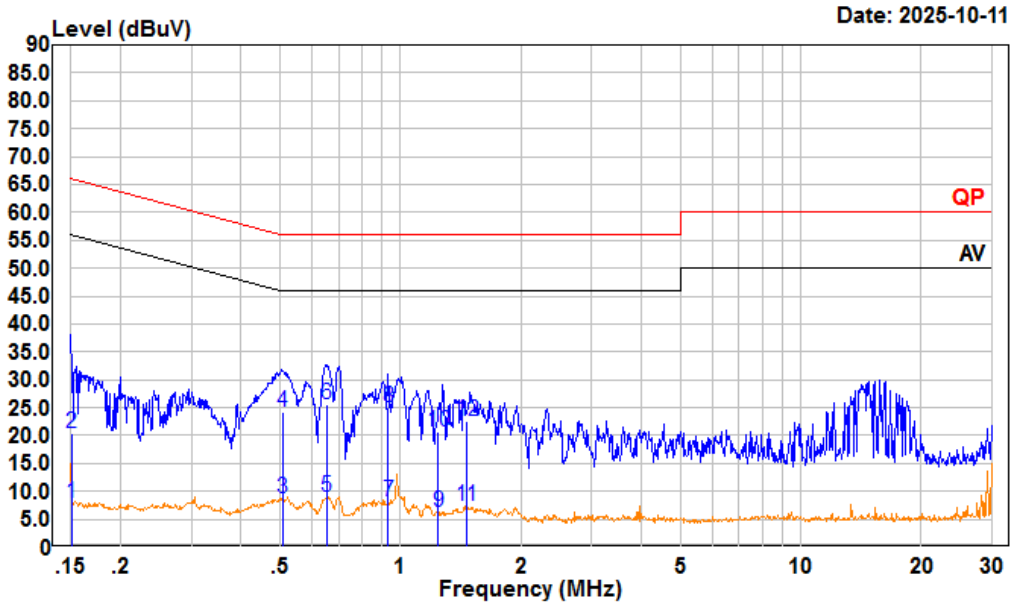
AC 120V 60 Hz, Line



Condition: Line
Project : 2501X00782E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.698	-8.32	11.52	9.80	10.04	46.00	-34.48	Average
2	0.698	13.15	32.99	9.80	10.04	56.00	-23.01	QP
3	1.001	-9.59	10.53	9.90	10.22	46.00	-35.47	Average
4	1.001	9.10	29.22	9.90	10.22	56.00	-26.78	QP
5	1.448	-11.27	8.84	9.90	10.21	46.00	-37.16	Average
6	1.448	5.45	25.56	9.90	10.21	56.00	-30.44	QP
7	1.814	-11.29	8.81	9.90	10.20	46.00	-37.19	Average
8	1.814	5.97	26.07	9.90	10.20	56.00	-29.93	QP
9	2.312	-13.01	7.09	9.90	10.20	46.00	-38.91	Average
10	2.312	3.51	23.61	9.90	10.20	56.00	-32.39	QP
11	2.826	-13.44	6.66	9.90	10.20	46.00	-39.34	Average
12	2.826	0.09	20.19	9.90	10.20	56.00	-35.81	QP

AC 120V 60 Hz, Neutral



Condition: neutral
Project : 2501X00782E-RF
tester : Macy.shi Note:Transmitting
Setting : RBW:9kHz

	Freq	Read Level	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.151	-11.74	7.88	9.60	10.02	55.95	-48.07	Average
2	0.151	0.68	20.30	9.60	10.02	65.95	-45.65	QP
3	0.507	-10.82	8.82	9.60	10.04	46.00	-37.18	Average
4	0.507	4.70	24.34	9.60	10.04	56.00	-31.66	QP
5	0.652	-10.64	9.00	9.60	10.04	46.00	-37.00	Average
6	0.652	6.01	25.65	9.60	10.04	56.00	-30.35	QP
7	0.932	-11.37	8.28	9.60	10.05	46.00	-37.72	Average
8	0.932	5.38	25.03	9.60	10.05	56.00	-30.97	QP
9	1.241	-13.49	6.33	9.60	10.22	46.00	-39.67	Average
10	1.241	0.84	20.66	9.60	10.22	56.00	-35.34	QP
11	1.457	-12.56	7.25	9.60	10.21	46.00	-38.75	Average
12	1.457	2.79	22.60	9.60	10.21	56.00	-33.40	QP

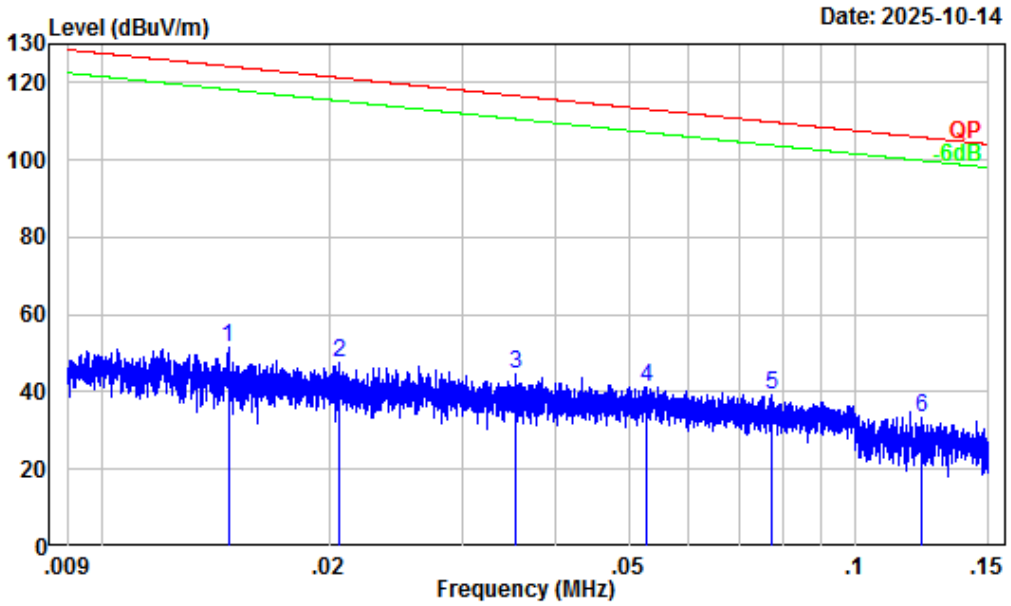
Unwanted Emission Frequencies and Restricted Bands

Environmental Conditions

Temperature (°C)	24.7-25.2&23.5	**Relative Humidity (%)**	50-54&49
ATM Pressure (kPa):	100.2&100.5	**Test engineer:**	Nico Wu & Leon Guo
Test date:	2025.10.04-2025.10.14&2025.10.5-2025.12.11		
EUT operation mode:	Below 1GHz: Transmitting (Maximum output power mode, BLE 1M Low Channel) Above 1GHz: Transmitting		
Note:	1. For the radiated spurious emission below 30MHz, only the worst case (parallel) was recorded. 2. For the radiated spurious emission below 1GHz, When the test result of peak was less than the limit of QP/Average more than 6dB, just peak value were recorded.		

Below 1GHz:

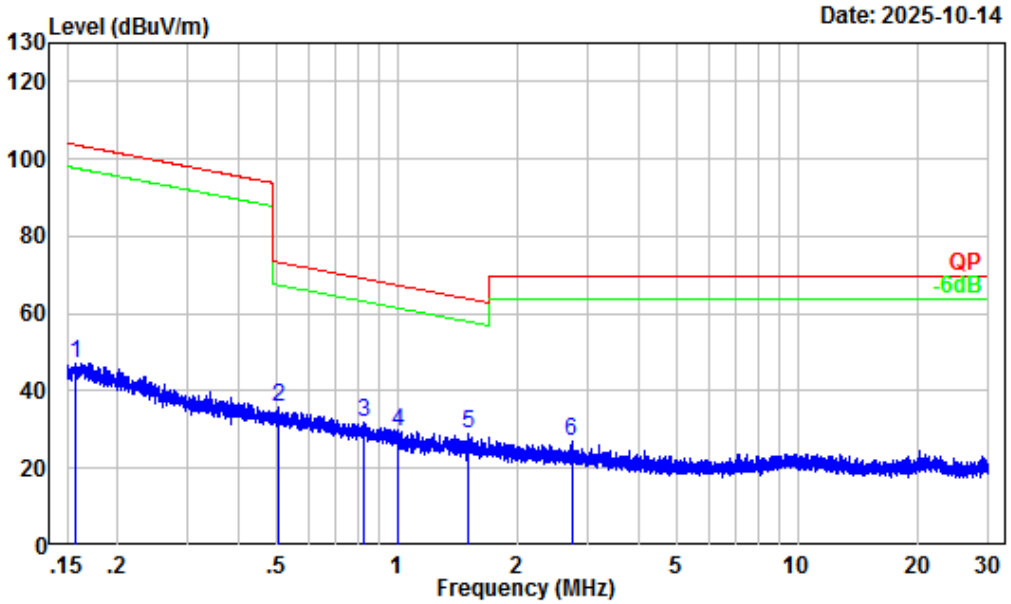
9kHz-150kHz



Site : Chamber A
Condition : 3m
Project Number : 2501X00782E-RF
Test Mode : BLE Transmitting
Detector: Peak RBW/VBW: 0.3/1kHz
Tester : Nico Wu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.015	31.41	19.93	51.34	124.25	-72.91	Peak
2	0.021	30.28	17.53	47.81	121.31	-73.50	Peak
3	0.035	27.93	16.53	44.46	116.61	-72.15	Peak
4	0.053	26.13	15.25	41.38	113.17	-71.79	Peak
5	0.077	23.67	15.35	39.02	109.84	-70.82	Peak
6	0.122	20.70	12.68	33.38	105.87	-72.49	Peak

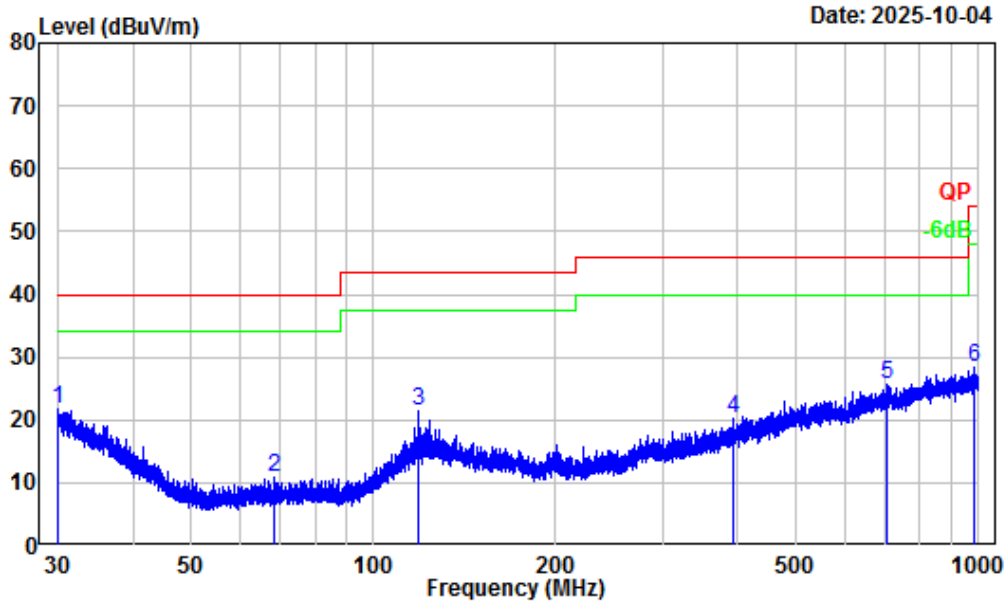
150kHz-30MHz



Site : Chamber A
Condition : 3m
Project Number : 2501X00782E-RF
Test Mode : BLE Transmitting
Detector: Peak RBW/VBW: 10/30kHz
Tester : Nico Wu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	0.157	18.66	28.32	46.98	103.71	-56.73	Peak
2	0.503	6.37	29.23	35.60	73.57	-37.97	Peak
3	0.823	2.53	29.20	31.73	69.20	-37.47	Peak
4	1.000	1.20	28.43	29.63	67.47	-37.84	Peak
5	1.504	-0.21	29.21	29.00	63.85	-34.85	Peak
6	2.727	-2.00	29.16	27.16	69.54	-42.38	Peak

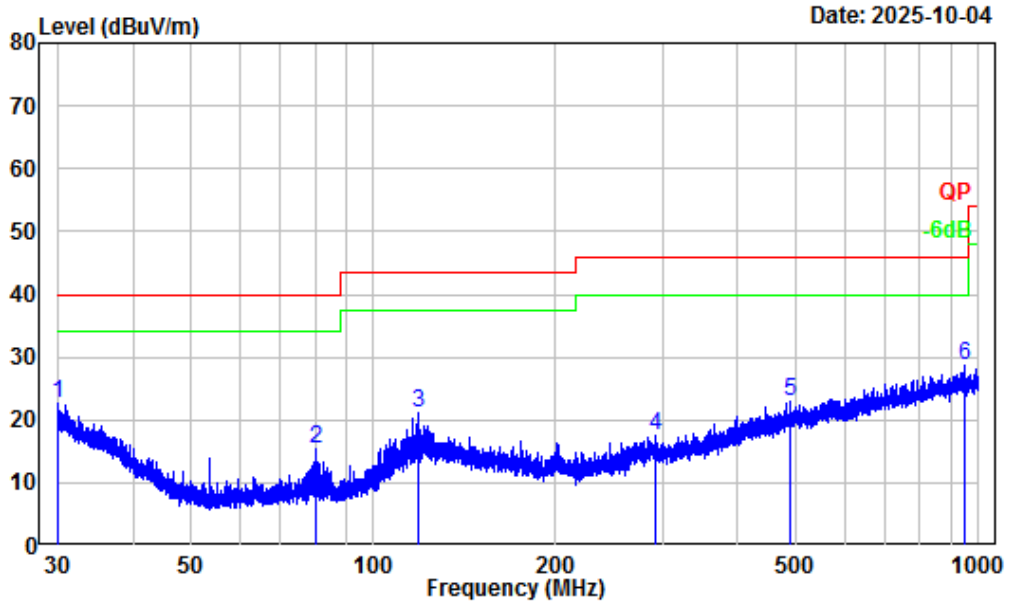
30MHz-1GHz_Horizontal



Site : Chamber A
Condition : 3m Horizontal
Project Number : 2501X00782E-RF
Test Mode : BLE Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Nico Wu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.11	-6.01	27.64	21.63	40.00	-18.37	Peak
2	68.36	-17.88	28.74	10.86	40.00	-29.14	Peak
3	118.97	-11.56	33.07	21.51	43.50	-21.99	Peak
4	391.92	-8.79	29.00	20.21	46.00	-25.79	Peak
5	706.70	-3.41	28.93	25.52	46.00	-20.48	Peak
6	982.19	-0.65	29.17	28.52	54.00	-25.48	Peak

30MHz-1GHz_Vertical



Site : Chamber A
Condition : 3m Vertical
Project Number : 2501X00782E-RF
Test Mode : BLE Transmitting
Detector: Peak RBW/VBW: 100/300kHz
Tester : Nico Wu

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.09	-6.01	28.53	22.52	40.00	-17.48	Peak
2	80.12	-17.91	33.30	15.39	40.00	-24.61	Peak
3	118.19	-11.66	32.72	21.06	43.50	-22.44	Peak
4	292.83	-11.21	28.57	17.36	46.00	-28.64	Peak
5	487.32	-6.08	29.14	23.06	46.00	-22.94	Peak
6	948.35	-0.98	29.61	28.63	46.00	-17.37	Peak

Above 1GHz:

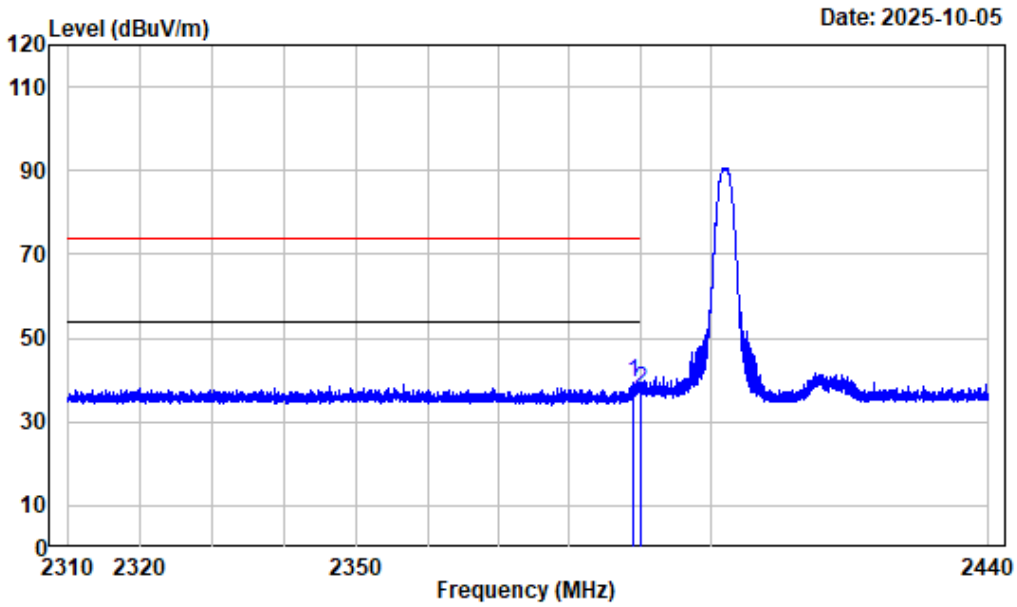
Frequency (MHz)	Reading (dBμV)	PK/Ave	Polar (H/V)	Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
BLE 1M							
Low Channel							
4804.00	52.55	PK	H	-7.83	44.72	74	-29.28
4804.00	52.34	PK	V	-7.83	44.51	74	-29.49
Middle Channel							
4880.00	51.64	PK	H	-7.67	43.97	74	-30.03
4880.00	51.94	PK	V	-7.67	44.27	74	-29.73
High Channel							
4960.00	51.62	PK	H	-7.57	44.05	74	-29.95
4960.00	51.85	PK	V	-7.57	44.28	74	-29.72

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
The other spurious emission which is in the noise floor level was not recorded.
The test result of peak was less than the limit of average, so just peak values were recorded.

Test plots

Band Edge

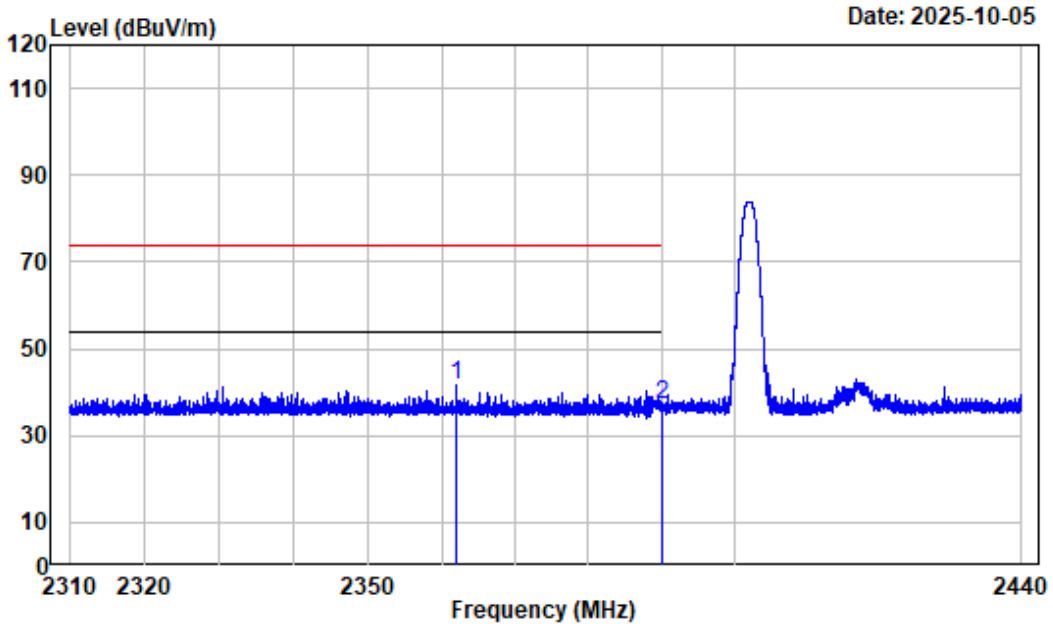
Left Band edge_Horizontal_BLE 1M



Condition : Horizontal
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2389.008	-10.98	50.57	39.59	74.00	-34.41	Peak
2	2390.000	-10.98	48.63	37.65	74.00	-36.35	Peak

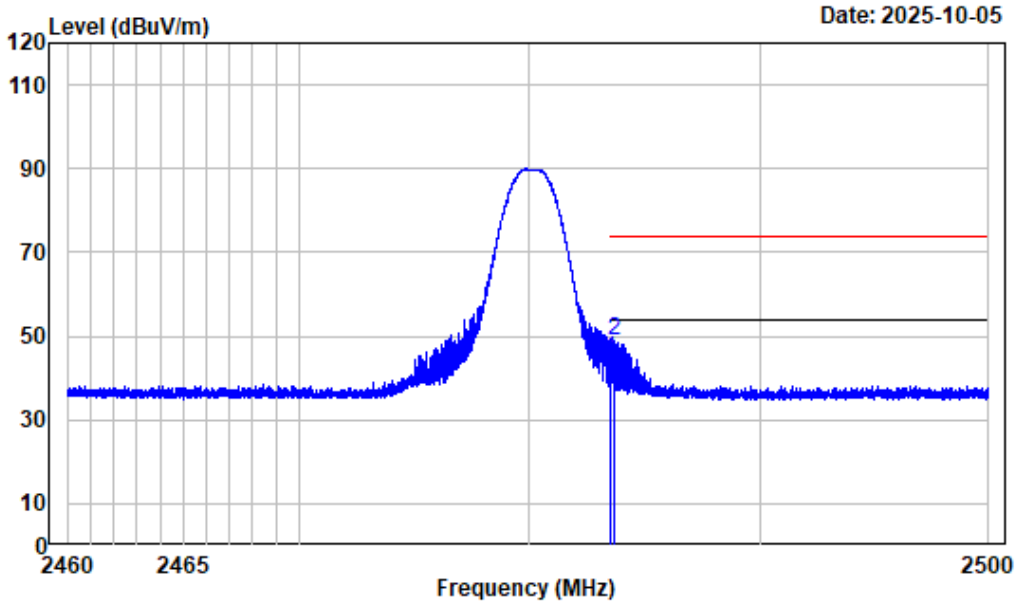
Left Band edge_Vertical_BLE 1M



Condition : Vertical
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2362.065	-10.91	52.60	41.69	74.00	-32.31	Peak
2	2390.000	-10.98	47.90	36.92	74.00	-37.08	Peak

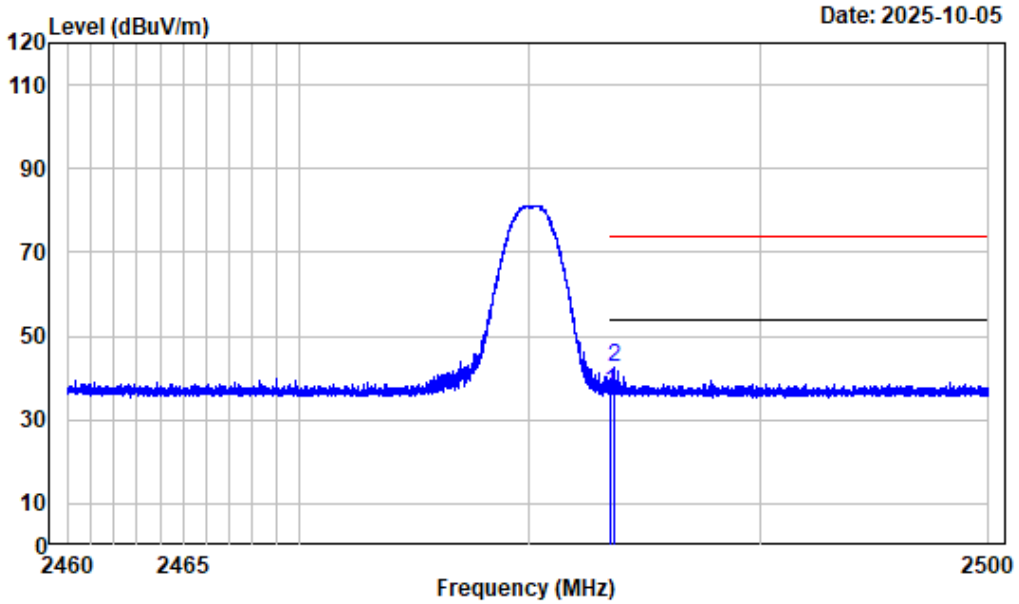
Right Band edge_Horizontal_BLE 1M



Condition : Horizontal
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	55.48	44.51	74.00	-29.49	Peak
2	2483.645	-10.97	59.99	49.02	74.00	-24.98	Peak

Right Band edge_Vertical_BLE 1M

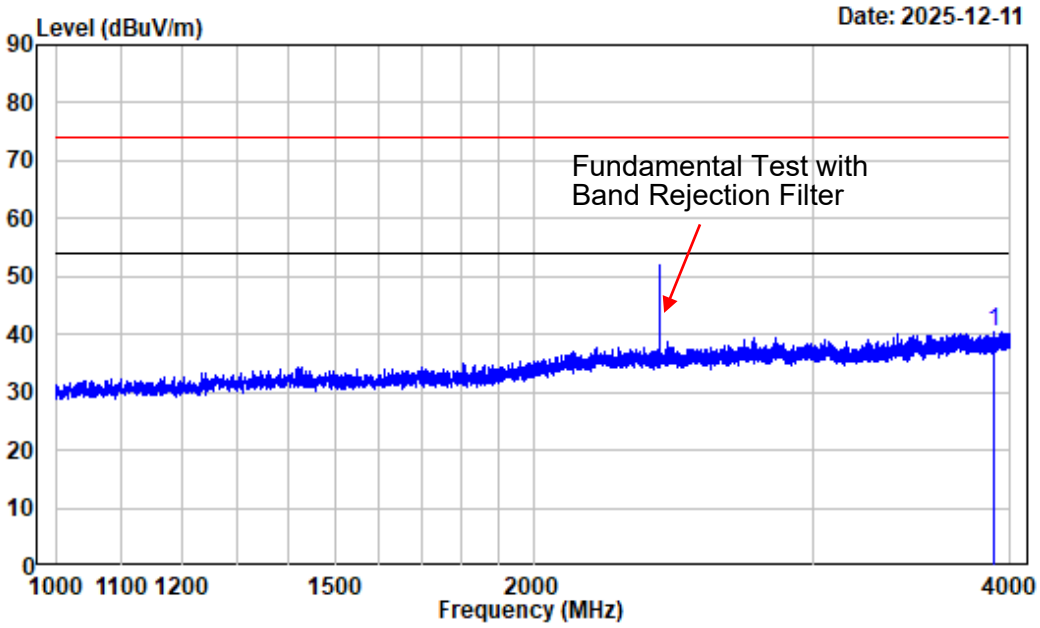


Condition : Vertical
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading: RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2480

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	2483.500	-10.97	47.75	36.78	74.00	-37.22	Peak
2	2483.680	-10.97	53.63	42.66	74.00	-31.34	Peak

1-25GHz (Listed with the worst margin test plot)

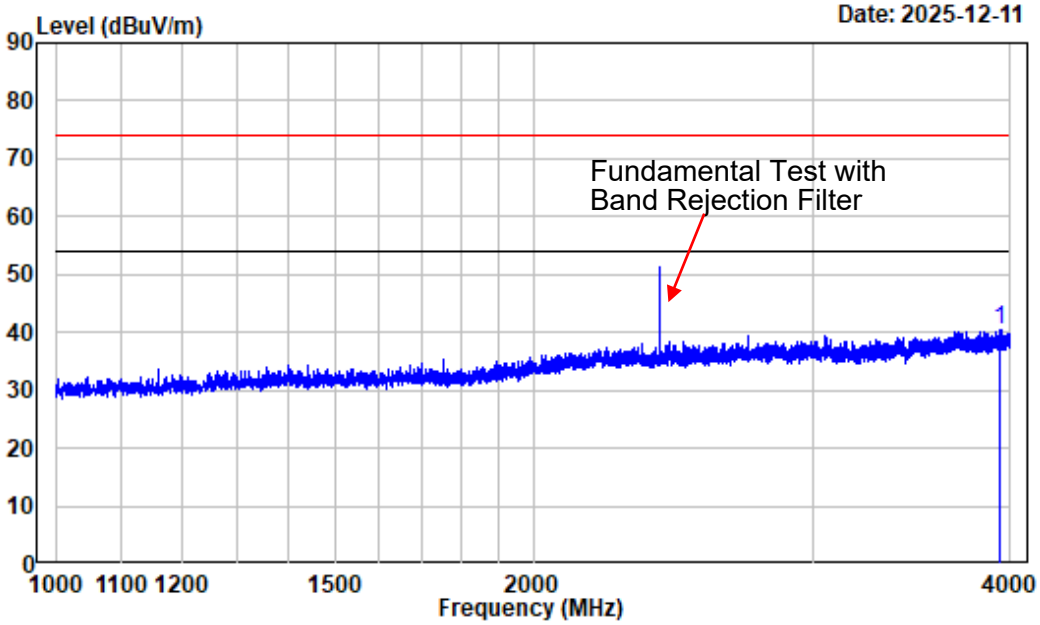
1-4GHz_Horizontal__BLE 1M_2402MHz




```
Condition        : Horizontal
Project No.      : 2501X00782E-RF
Tester           : Leon Guo
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note             : BLE_1M_2402
```

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3910.000	-8.72	49.04	40.32	74.00	-33.68	Peak

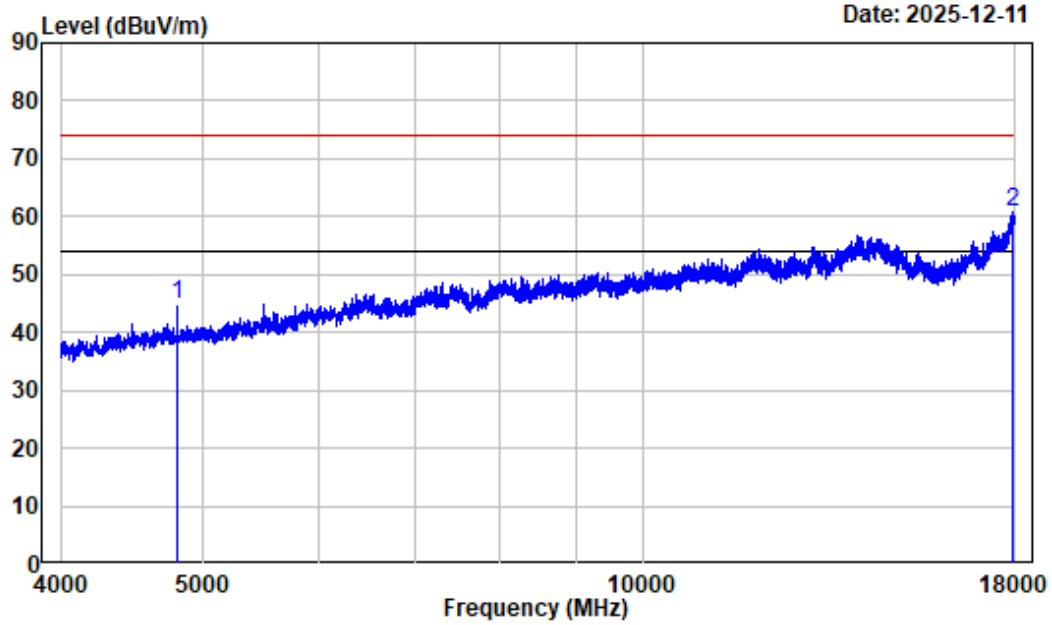
1-4GHz_Vertical__BLE 1M_2402MHz



Condition : Vertical
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	3937.750	-8.42	48.78	40.36	74.00	-33.64	Peak

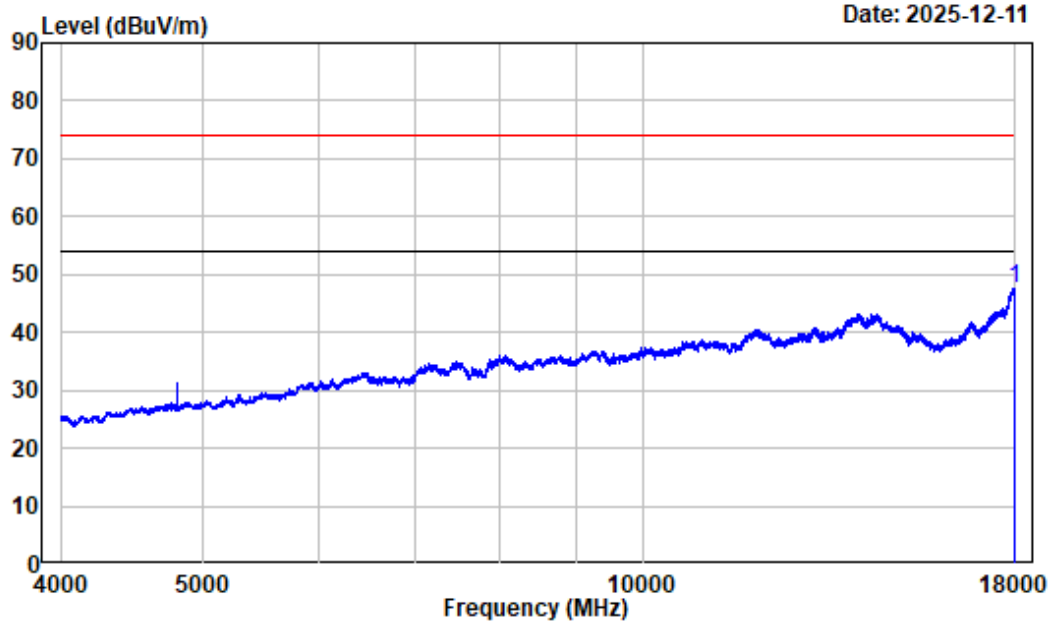
4-18GHz_Horizontal_Peak__BLE 1M_2402MHz



Condition : Horizontal
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4804.000	-7.83	52.55	44.72	74.00	-29.28	Peak
2	17931.750	11.91	49.02	60.93	74.00	-13.07	Peak

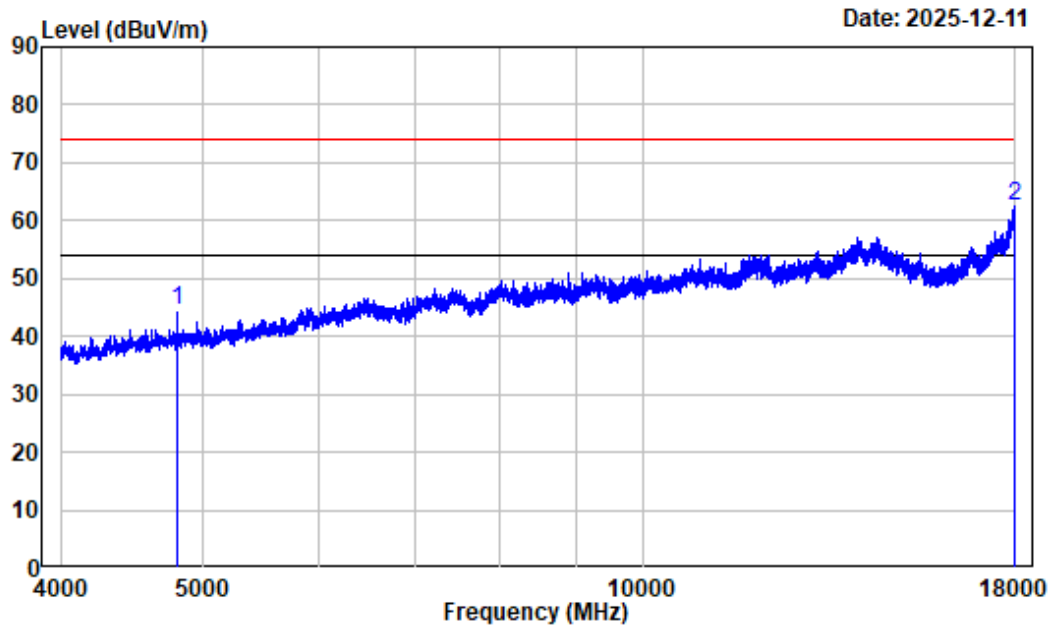
4-18GHz_Horizontal_Average__BLE 1M_2402Hz



Condition : Horizontal
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17984.250	12.18	35.31	47.49	54.00	-6.51	Average

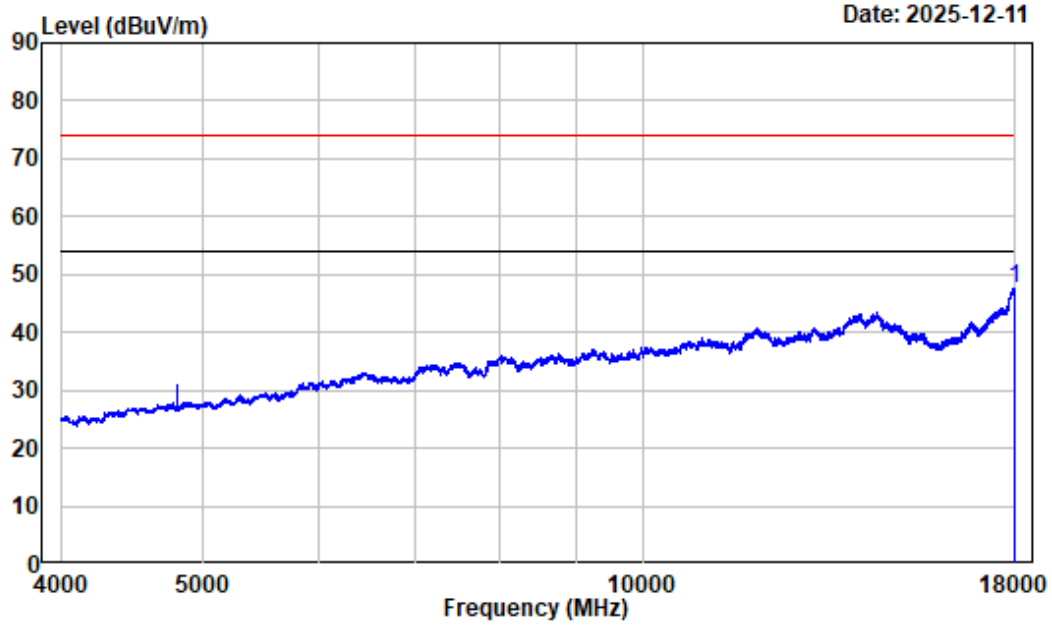
4-18GHz_Vertical_Peak__BLE 1M_2402MHz



Condition : Vertical
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	4804.000	-7.83	52.34	44.51	74.00	-29.49	Peak
2	17982.500	12.17	50.21	62.38	74.00	-11.62	Peak

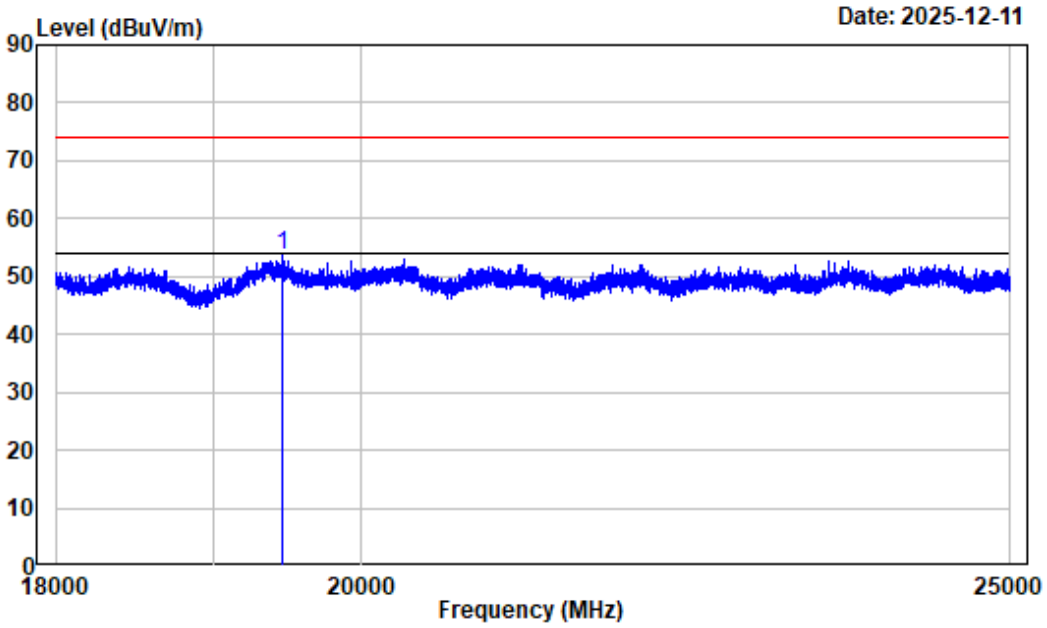
4-18GHz_Vertical_Average__BLE 1M_2402MHz



Condition : Vertical
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Average reading: RBW:1MHz VBW:1kHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	17977.250	12.14	35.53	47.67	54.00	-6.33	Average

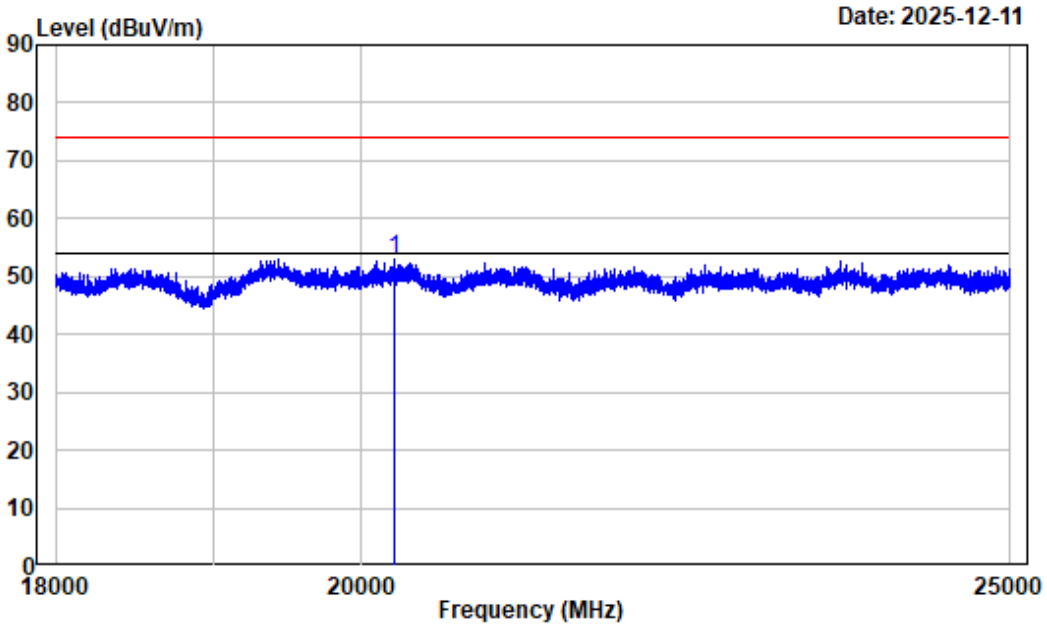
18-25GHz_Horizontal_BLE 1M_2402MHz



Condition : Horizontal
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	19454.830	15.45	38.09	53.54	74.00	-20.46	peak

18-25GHz_Vertical_BLE 1M_2402MHz



Condition : Vertical
Project No. : 2501X00782E-RF
Tester : Leon Guo
Spectrum setting: Peak reading:RBW:1MHz VBW:3MHz Detector:Peak
Note : BLE_1M_2402

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	20226.000	15.27	37.75	53.02	74.00	-20.98	peak

6dB Emission Bandwidth

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

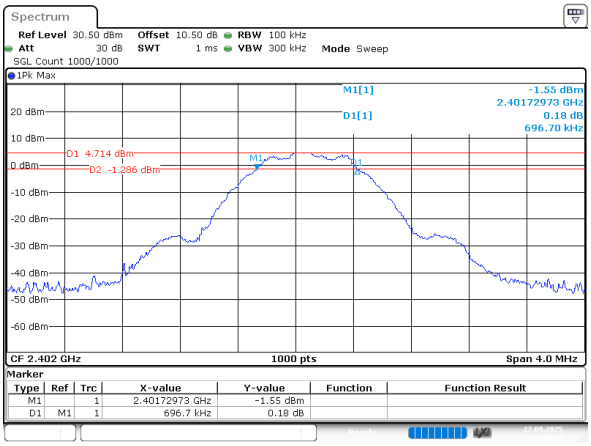
Test Data:

Chain 0, BLE 1M

Channel	Result (MHz)	Limit (MHz)	Verdict
Low Channel	0.697	≥0.5	Pass
Middle Channel	0.689	≥0.5	Pass
High Channel	**0.709**	≥0.5	Pass

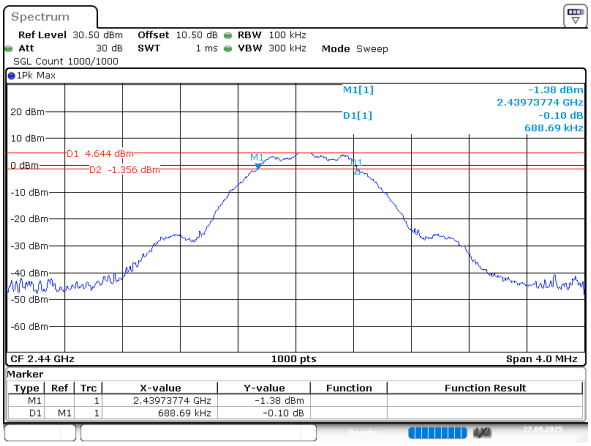
BLE 1M

BLE_1M_Low_Channel



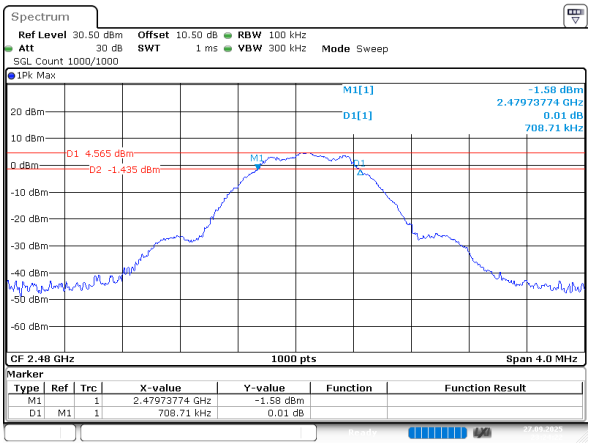
ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:18:58

BLE_1M_Middle_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:23:07

BLE_1M_High_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:24:22

99% Occupied Bandwidth

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	N/A

Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

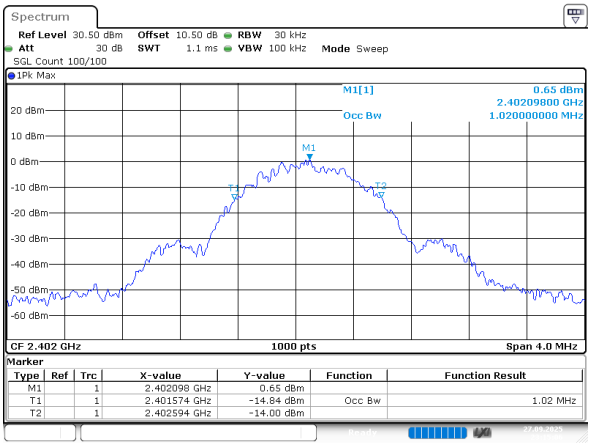
Test Data:

Chain 0, BLE 1M

Channel	99% OBW (MHz)
Low Channel	1.020
Middle Channel	**1.040**
High Channel	1.020

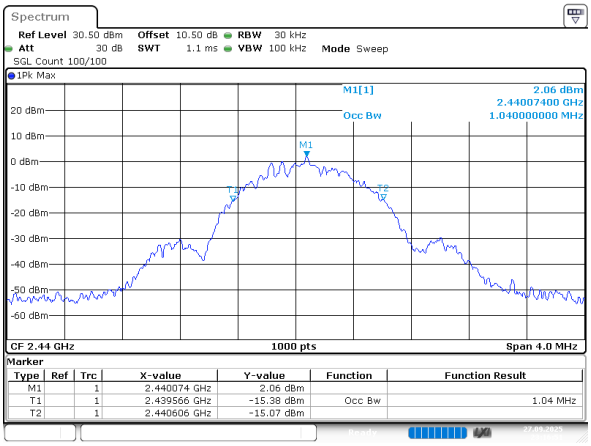
BLE 1M

BLE_1M_Low_Channel



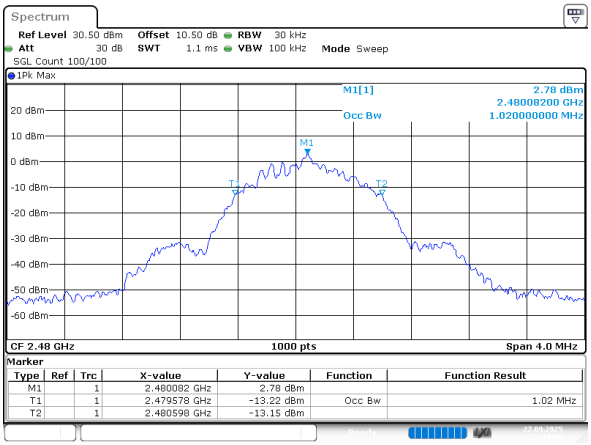
ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:15:06

BLE_1M_Middle_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:16:51

BLE_1M_High_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:18:00

Maximum Conducted Output Power

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

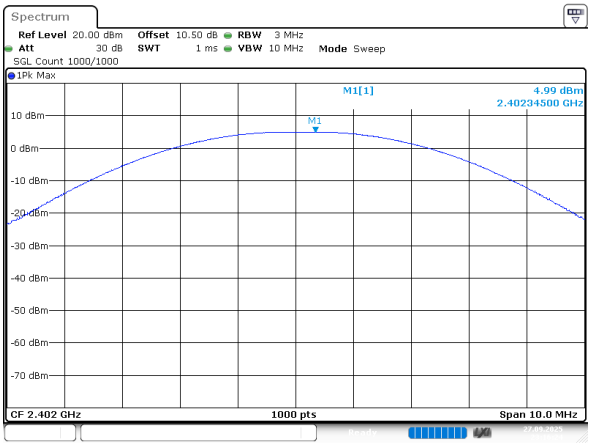
Test Data:

Chain 0, BLE 1M

Channel	Peak Output Power (dBm)	Limit (dBm)	Verdict
Low Channel	**4.99**	30.00	Pass
Middle Channel	4.98	30.00	Pass
High Channel	4.89	30.00	Pass

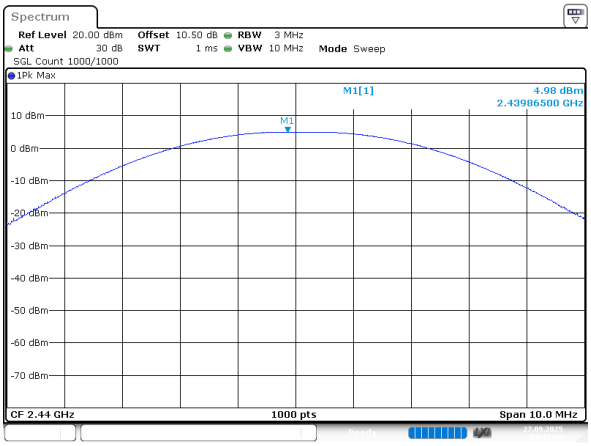
BLE 1M

BLE_1M_Low_Channel



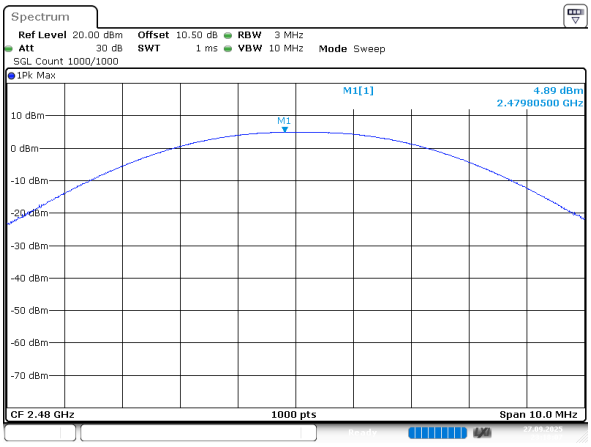
ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:16:24

BLE_1M_Middle_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:17:14

BLE_1M_High_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:18:08

Power Spectral Density

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

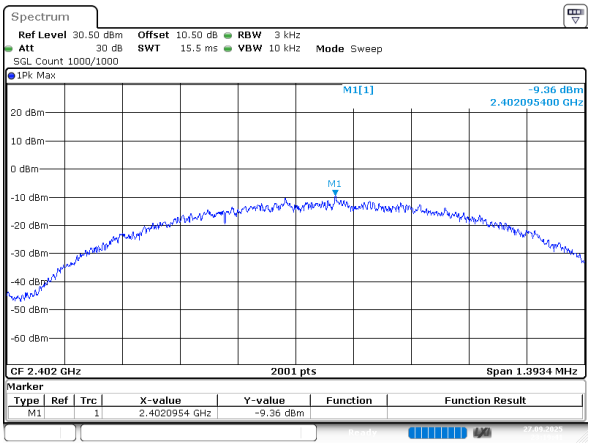
Test Data:

Chain 0, BLE 1M

Channel	Result (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
Low Channel	**-9.36**	8	Pass
Middle Channel	-10.10	8	Pass
High Channel	-10.04	8	Pass

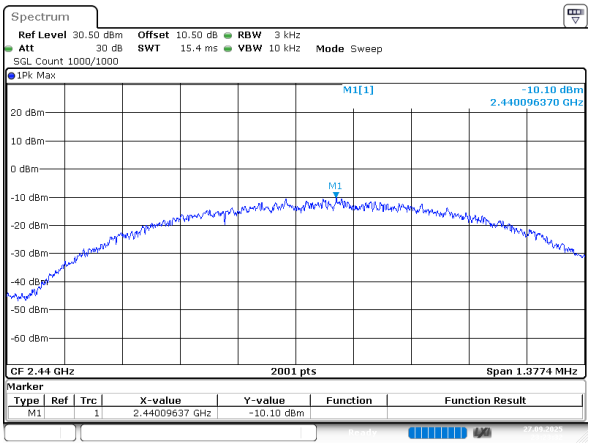
BLE 1M

BLE_1M_Low_Channel



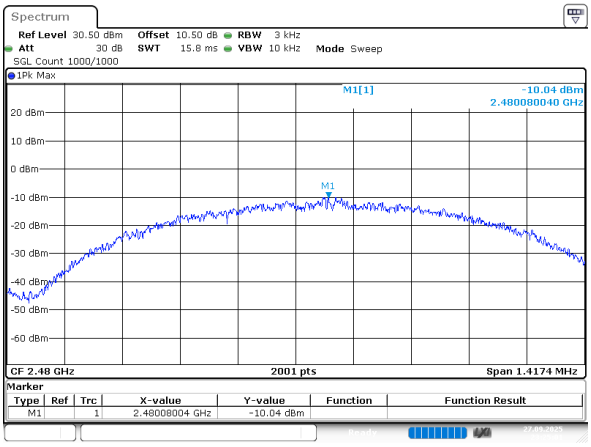
ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:19:42

BLE_1M_Middle_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:23:33

BLE_1M_High_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:25:01

100 kHz Bandwidth of Frequency Band Edge

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

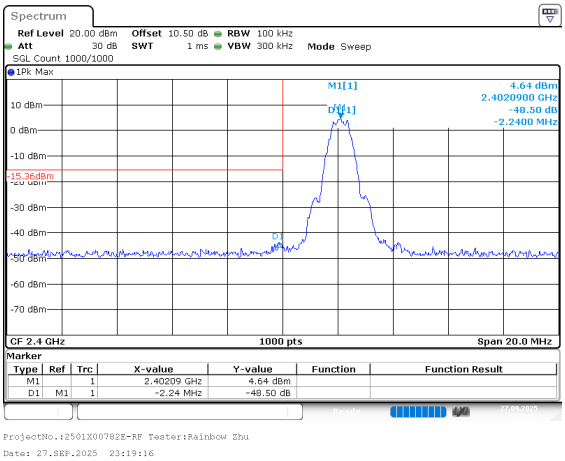
Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

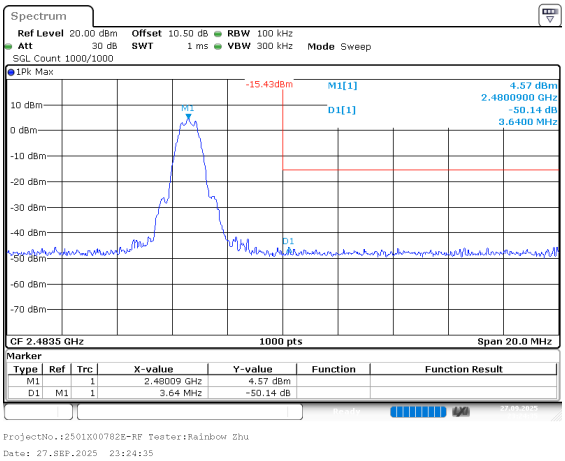
Test Data:

BLE 1M

BLE_1M_Low_Channel



BLE_1M_High_Channel



Duty Cycle

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	N/A

Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

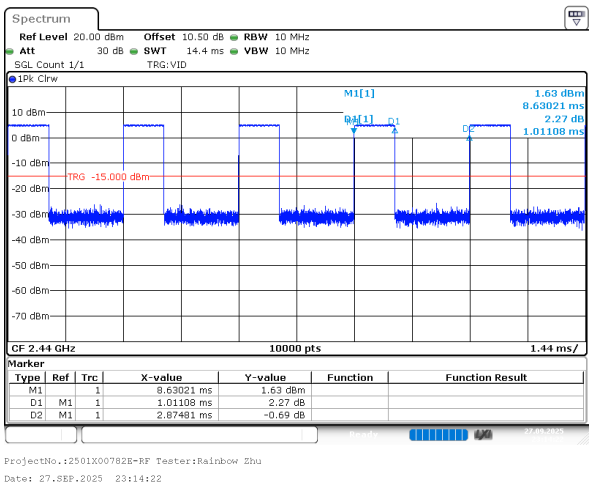
Test Data:

Chain 0, BLE 1M

Channel	Ton (ms)	Ton+Toff (ms)	Duty Cycle (%)	Duty Cycle Factor(dB)	1/Ton (Hz)	VBW Setting (kHz)
Middle Channel	**1.011**	2.875	35.17	4.54	989	1

BLE 1M

BLE_1M_Middle_Channel



Conducted Spurious Emission

Test Information:

Sample No.:	3AFH-2	**Test Date:**	2025/09/27
Test Site:	RF	**Test Mode:**	Transmitting
Tester:	Rainbow Zhu	**Test Result:**	Pass

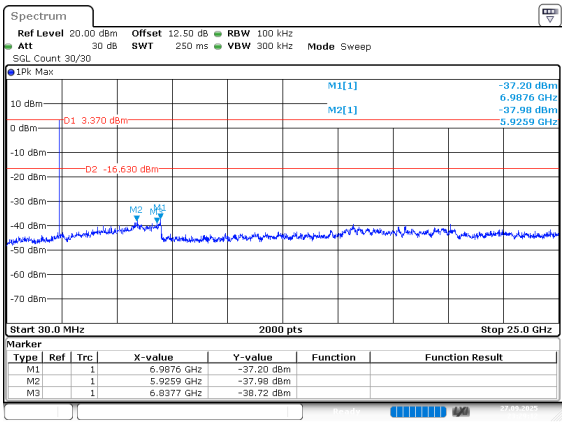
Environmental Conditions:

Temperature: (°C)	26.3	**Relative Humidity: (%)**	55	**ATM Pressure: (kPa)**	101.1

Test Data:

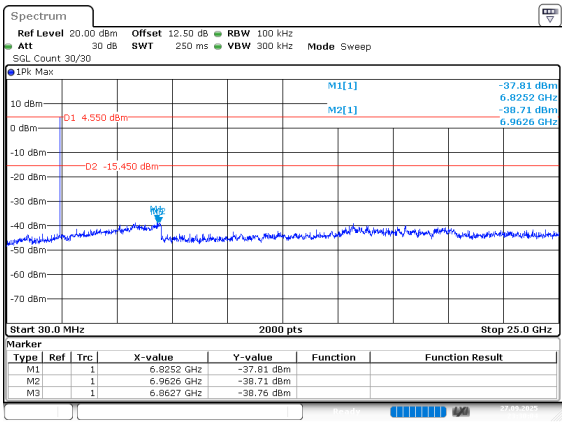
BLE 1M

BLE_1M_Low_Channel



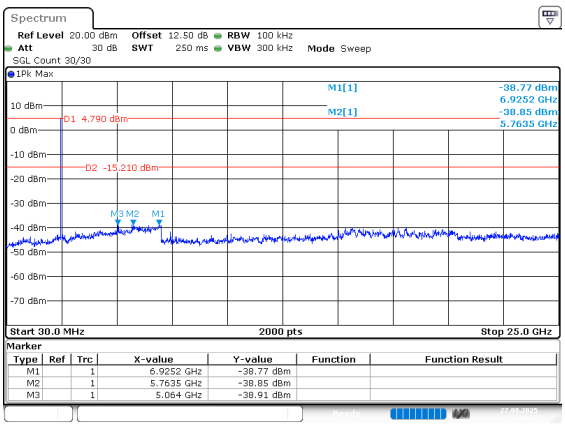
ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:29:12

BLE_1M_Middle_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:30:04

BLE_1M_High_Channel



ProjectNo.:2501X00782E-RF Tester:Rainbow Zhu
Date: 27.SEP.2025 23:31:28

RF EXPOSURE EVALUATION

MPE-Based Exemption

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 v01 Interim General RF Exposure Guidance

MPE-Based Exemption:
General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(3)(i)(C)] to support an exemptionfrom further evaluation from 300 kHz through 100 GHz.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

Ris the minimum separation distance in meters

f = frequency in MHz

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Result

Mode	Frequency (MHz)	Tune up conducted power# (dBm)	Antenna Gain#		ERP		Evaluation Distance (m)	ERP Limit (W)
			(dBi)	(dBd)	(dBm)	(W)		
BT	2402-2480	5	1.84	-0.31	4.69	0.0029	0.2	0.768

Note: The tune up conducted power and antenna gain was declared by the applicant.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant

EUT PHOTOGRAPHS

Please refer to the attachment 2501X00782E-RF-EXP External photo and 2501X00782E-RF-INP Internal photo.

TEST SETUP PHOTOGRAPHS

Please refer to the attachment 2501X00782E-RF-00A-TSP Test Setup photo.

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