



FCC - TEST REPORT

Report Number : **4842024420600B** Date of Issue: 2025.04.07

Model : THP23-ZB-X, THP23-ZB-P, THP23-ZB-X-Vx, THP23-ZB-Vx,
THP23-M-X, THP23-M-Vx ("x" represents 1, 2, 3.....)

Product Type : Smart M Gateway

Applicant : Zhejiang Lingzhu Technology Co., Ltd.

Address : Room 302, No 1 Building Huace Center, Xihu District 310000,
Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF
CHINA

Manufacturer : Zhejiang Lingzhu Technology Co., Ltd.

Address : Room 302, No 1 Building Huace Center, Xihu District 310000,
Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF
CHINA

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : 72



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2 Report Modification Record

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

Issue	Description of Change	Date of Issue
1	First Issue	2025.04.07



3 Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd.

Floor 1-4, Building B, No.37, Tuanjie Road(Middle), Xishan Economic and Technological Development Zone, Wuxi, Jiangsu. China

Test Firm FCC
Registration
Number: 571980

Designation
number: CN1405

Telephone: +86 510 8820 3737
Fax: +86 510 8820 3636

4 Description of the Equipment under Test

Product: Smart M Gateway

PMN / HVIN / Model no.: THP23-ZB-X

FCC ID: 2BEWXTHP23

Rating: Gateway Input: DC 5V, 2A (Type C Port); DC 48V, 0.35A (PoE Port)
Adapter Input: 100-240V~, 50/60Hz, 0.4A (for model KA12H-0502000US);
100-240V~, 50/60Hz, 0.3A (for model TPA-10D050200UU01)
Adapter Output: DC 5.0V, 2.0A, 10W

RF Transmission Frequency: Bluetooth Low Energy: 2402MHz-2480MHz

No. of Operated Channel: 40

Modulation: GFSK

Channel list:

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

Hardware Version: V1.3.0

Software Version: V1.0.4

Antenna Type: Plug-in antenna

Antenna Gain: 3.46dBi

Description of the EUT: The Equipment Under Test (EUT) is a Smart M Gateway which support 2.4GHz & 5GHz Wi-Fi, Low Energy Bluetooth (1Mbps data rate) and Zigbee function. We tested it and listed the worst data in this report. The gateway can normally be powered by two different models of adapters: KA12H-0502000US and TPA-10D050200UU01. Additionally, the gateway can also be powered via its PoE (Power over Ethernet) port. According to the client's declaration, all models of the gateway have the same wireless parameters and electrical structures. In this report, only model THP23-ZB-X was chosen to perform test.



Test sample no.: WUX-0877560-006

Remark: This report is only for BLE

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



5 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

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

6 Summary of Test Results

Technical Requirements						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	14-20	Site 1	☒	☐	☐
§15.247 (b) (3)	Conducted peak output power	21-22	Site 1	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	6dB bandwidth and 99% Occupied Bandwidth	23-26	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	27-28	Site 1	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	29-34	Site 1	☒	☐	☐
§15.247(d)	Band edge	35-37	Site 1	☒	☐	☐
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	38-68	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a Plug-in antenna, which gain is 3.46dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



7 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2BEWXTHP23, complies with Section 15.207,15.209,15.231,15.247 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 8 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

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

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

Sample Received Date: 2025.01.02

Testing Start Date: 2025.01.06

Testing End Date: 2025.02.25

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

Reviewed by:

Zhilan Xue
Project Manager

Prepared by:

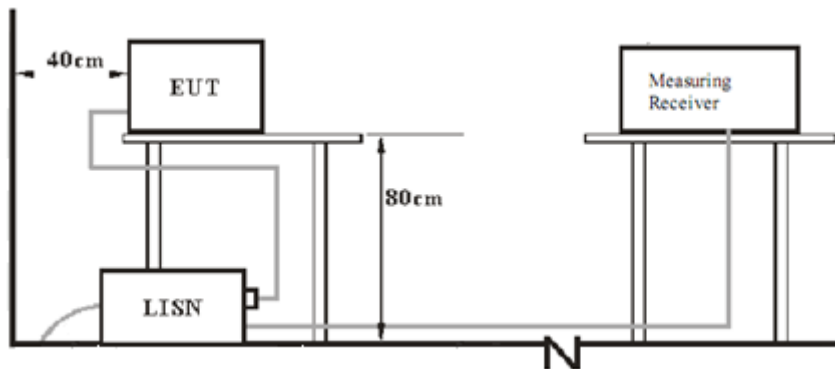
Xin Feng
Project Engineer

Tested by:

Xu Zheng
Test Engineer

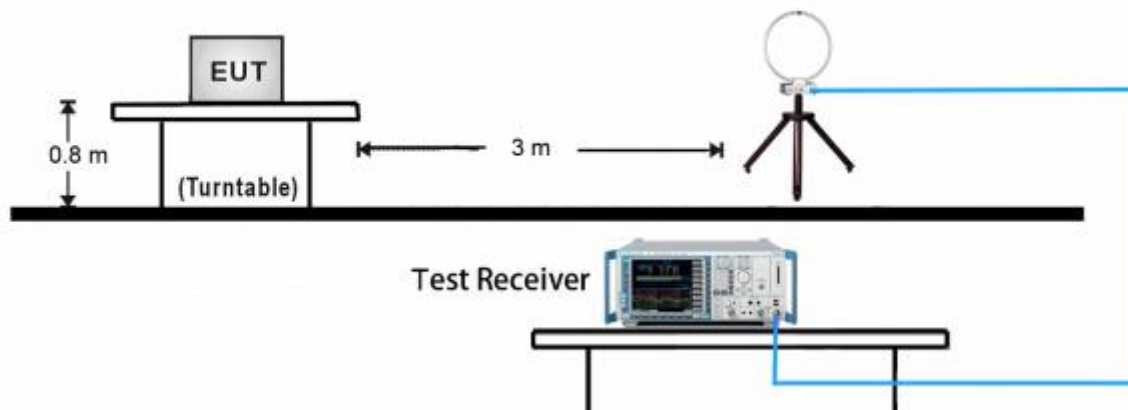
8 Test Setups

7.1 AC Power Line Conducted Emission test setups

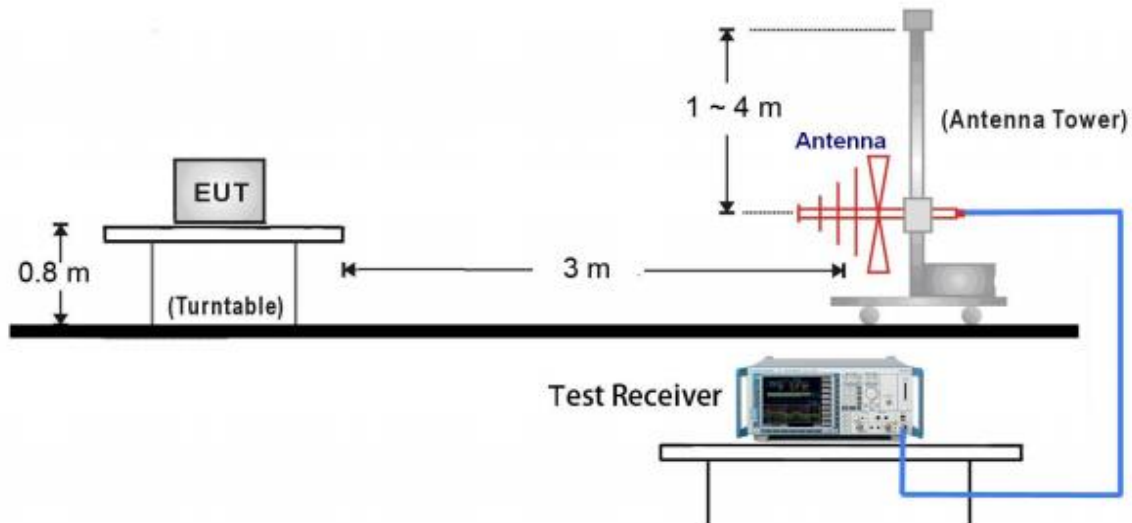


7.2 Radiated test setups

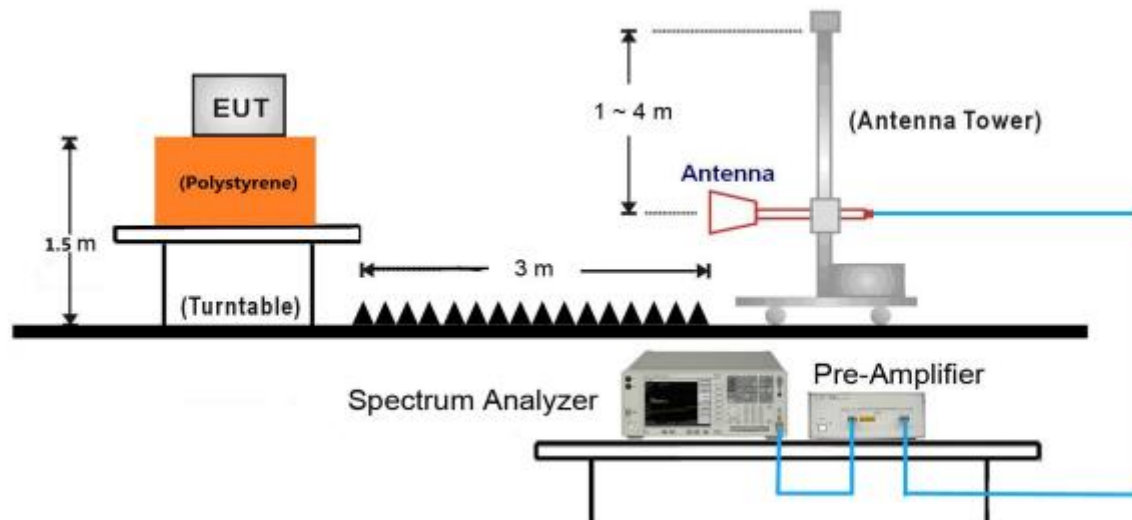
9kHz ~ 30MHz Test Setup:



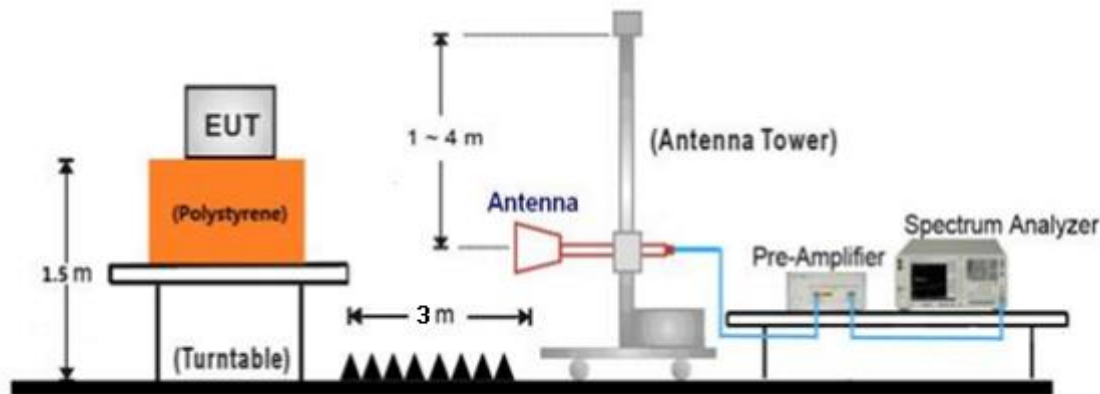
30MHz ~ 1GHz Test Setup:



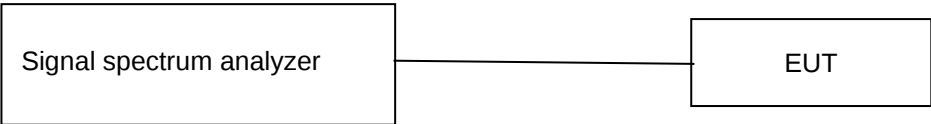
1GHz ~ 18GHz Test Setup:



18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups



9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Huawei	VLT-W50	2018AP1231

Test software: sscom5.13.1

Test Mode Applicability and Tested Channel Detail:

Mode	Tested Channel	Data Rate	Modulation	Power level setting (Index Value)
Bluetooth LE	0	1 Mbps	GFSK	74
	19			82
	39			82

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

10 Technical Requirement

10.1 Conducted Emission

Test Method

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

Limit

According to §15.207, conducted emissions limit as below:

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

Decreasing linearly with logarithm of the frequency

Conducted Emission

150k-30MHz Conducted Emission Test

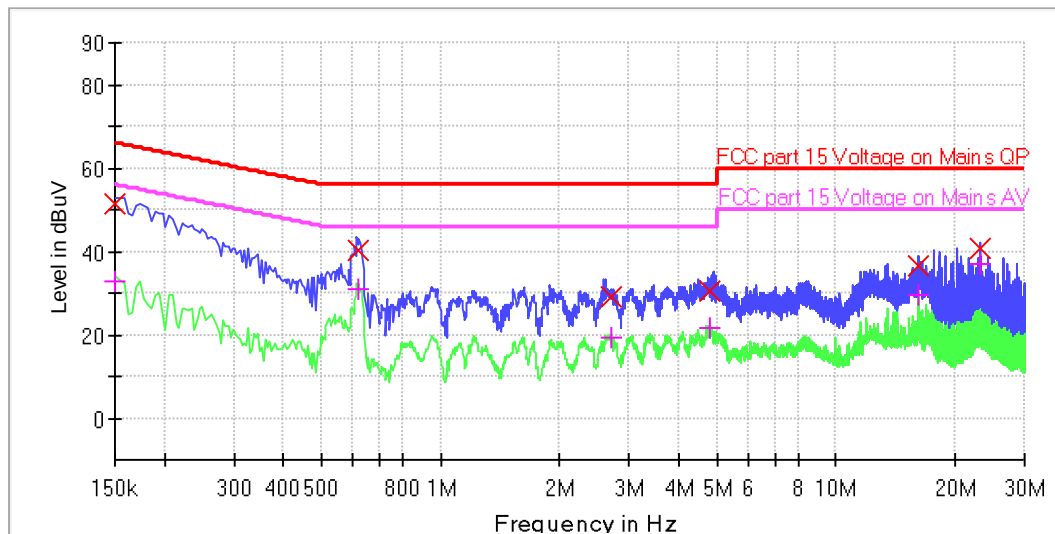
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator Name: Xu Zheng
Input: AC 120V 60Hz
Test Standard: FCC Part 15.207(a)
Comment: Phase L, Adapter Model: TPA-10D050200UU01
Sample No.: WUX-0877560-006

Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz_Fcc
Receiver: [ESW 8]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB

**Limit and Margin**

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.150000	51.4	32.9	1000.0	9.000	10.6	14.6	66.0	23.1	56.0
0.622000	40.1	30.9	1000.0	9.000	10.5	15.9	56.0	15.1	46.0
2.690000	29.0	19.3	1000.0	9.000	10.6	27.0	56.0	26.7	46.0
4.814000	30.6	21.7	1000.0	9.000	10.6	25.4	56.0	24.3	46.0
16.230000	36.5	29.6	1000.0	9.000	11.0	23.5	60.0	20.4	50.0
23.130000	40.7	37.0	1000.0	9.000	11.2	19.3	60.0	13.0	50.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

150k-30MHz Conducted Emission Test

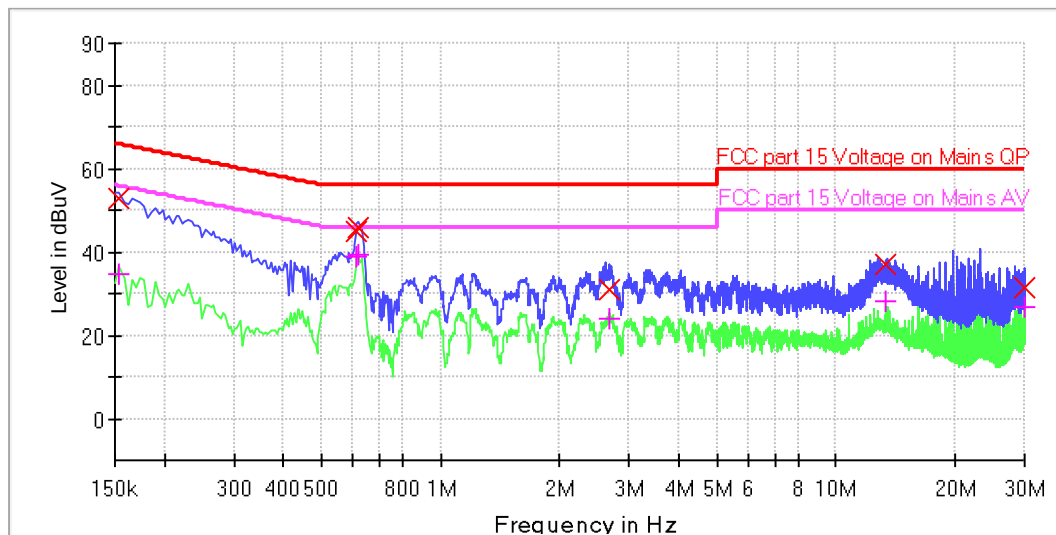
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator Name: Xu Zheng
Input: AC 120V 60Hz
Test Standard: FCC Part 15.207(a)
Comment: Phase N, Adapter Model: TPA-10D050200UU01
Sample No.: WUX-0877560-006

Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz_Fcc
Receiver: [ESW 8]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154000	52.6	34.9	1000.0	9.000	10.6	13.2	65.8	20.9	55.8
0.614000	45.1	38.8	1000.0	9.000	10.5	10.9	56.0	7.2	46.0
0.622000	45.6	39.3	1000.0	9.000	10.5	10.4	56.0	6.7	46.0
2.670000	30.8	24.1	1000.0	9.000	10.6	25.2	56.0	21.9	46.0
13.418000	36.9	28.3	1000.0	9.000	10.9	23.1	60.0	21.7	50.0
29.906000	31.6	26.7	1000.0	9.000	11.5	28.4	60.0	23.3	50.0

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

150k-30MHz Conducted Emission Test

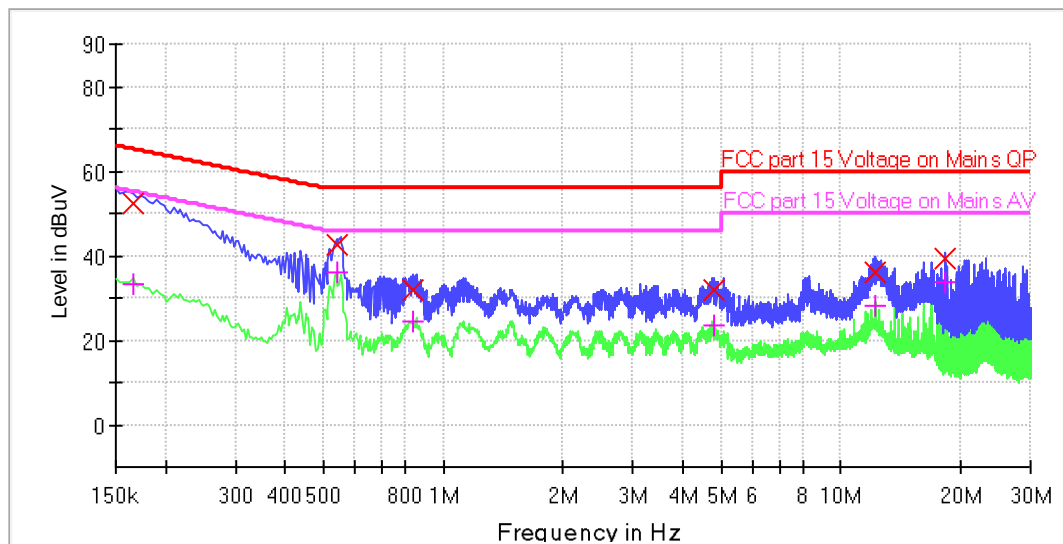
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator Name: Xu Zheng
Input: AC 120V 60Hz
Test Standard: FCC Part 15.207(a)
Comment: Phase L, Adapter Model: KA12H-0502000US
Sample No.: WUX-0877560-006

Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz_Fcc
Receiver: [ESW 8]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.166000	52.4	33.5	1000.0	9.000	10.6	12.8	65.2	21.7	55.2
0.538000	42.4	36.1	1000.0	9.000	10.5	13.6	56.0	9.9	46.0
0.838000	32.0	24.5	1000.0	9.000	10.5	24.1	56.0	21.5	46.0
4.782000	31.9	23.6	1000.0	9.000	10.6	24.1	56.0	22.5	46.0
12.198000	36.1	28.3	1000.0	9.000	10.9	23.9	60.0	21.7	50.0
18.242000	39.1	33.5	1000.0	9.000	11.0	20.9	60.0	16.5	50.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

150k-30MHz Conducted Emission Test

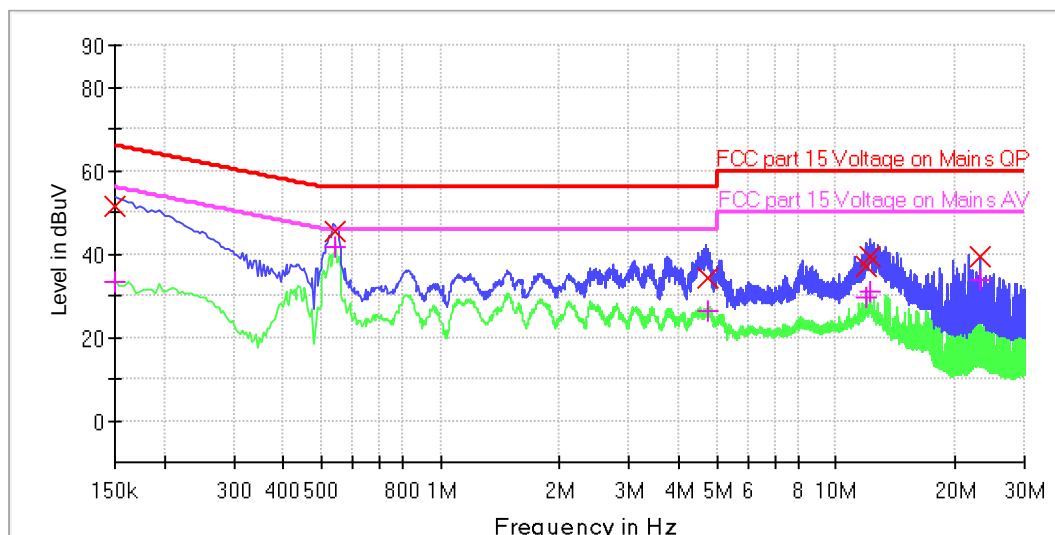
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator Name: Xu Zheng
Input: AC 120V 60Hz
Test Standard: FCC Part 15.207(a)
Comment: Phase N, Adapter Model: KA12H-0502000US
Sample No.: WUX-0877560-006

Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz_Fcc
Receiver: [ESW 8]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.150000	51.4	33.2	1000.0	9.000	10.6	14.6	66.0	22.8	56.0
0.542000	45.5	41.4	1000.0	9.000	10.5	10.5	56.0	4.6	46.0
4.734000	34.1	26.4	1000.0	9.000	10.6	21.9	56.0	19.6	46.0
11.954000	37.1	29.7	1000.0	9.000	10.9	22.9	60.0	20.3	50.0
12.198000	39.4	31.2	1000.0	9.000	10.9	20.6	60.0	18.8	50.0
23.130000	39.5	33.6	1000.0	9.000	11.2	20.5	60.0	16.4	50.0

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

150k-30MHz Conducted Emission Test

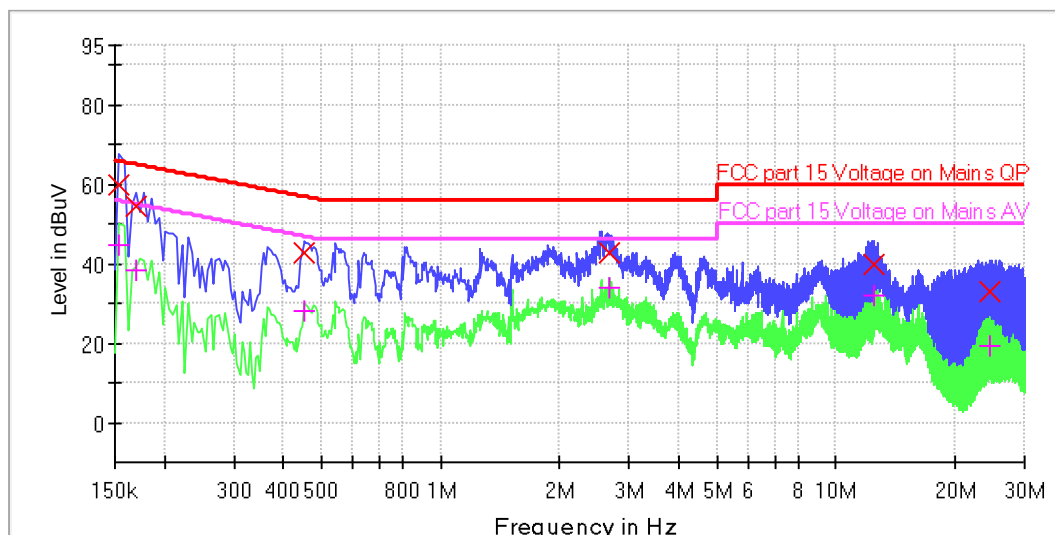
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator Name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Test Standard: FCC Part 15.207(a)
Comment: Phase L
Sample No.: WUX-0877560-006

Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz_Fcc
Receiver: [ESW 8]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154000	59.6	44.7	1000.0	9.000	10.1	6.2	65.8	11.1	55.8
0.170000	54.4	38.2	1000.0	9.000	10.1	10.6	65.0	16.8	55.0
0.454000	42.7	28.1	1000.0	9.000	10.1	14.1	56.8	18.7	46.8
2.678000	42.9	33.8	1000.0	9.000	10.2	13.1	56.0	12.2	46.0
12.502000	39.7	32.2	1000.0	9.000	10.5	20.3	60.0	17.9	50.0
24.430000	33.1	19.5	1000.0	9.000	10.7	26.9	60.0	30.5	50.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

150k-30MHz Conducted Emission Test

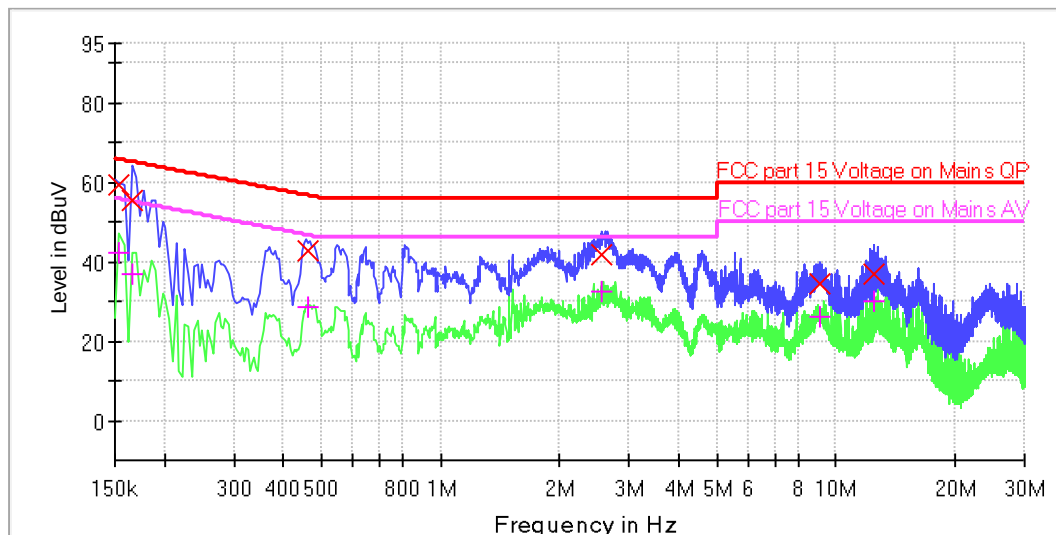
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator Name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Test Standard: FCC Part 15.207(a)
Comment: Phase N
Sample No.: WUX-0877560-006

Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz_Fcc
Receiver: [ESW 8]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
150 kHz - 30 MHz	4 kHz	PK+ ; AVG	9 kHz	0.01 s	0 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV)	Margin - CAV (dB)	Limit - CAV (dBuV)
0.154000	59.3	42.3	1000.0	9.000	10.1	6.5	65.8	13.5	55.8
0.166000	55.2	36.7	1000.0	9.000	10.1	10.0	65.2	18.5	55.2
0.462000	42.7	28.4	1000.0	9.000	10.1	13.9	56.7	18.3	46.7
2.566000	42.0	32.3	1000.0	9.000	10.2	14.0	56.0	13.7	46.0
9.090000	34.3	26.4	1000.0	9.000	10.4	25.7	60.0	23.6	50.0
12.506000	37.0	30.1	1000.0	9.000	10.5	23.0	60.0	19.9	50.0

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

10.2 Conducted peak output power

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
Span = approximately 5 times the 6dB bandwidth, centered on a channel need to test,
RBW > the 6dB bandwidth of the emission being measured, VBW $\geq$ 3RBW,
Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

Limits

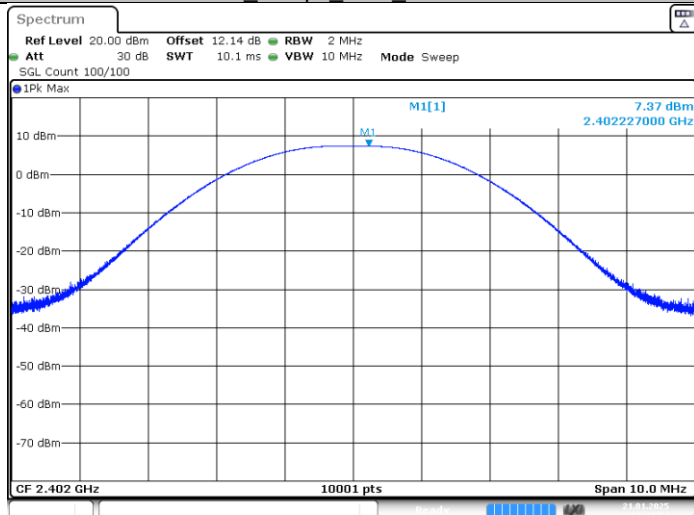
According to §15.247 (b) (3), conducted peak output power limit as below:

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

Test result as below table

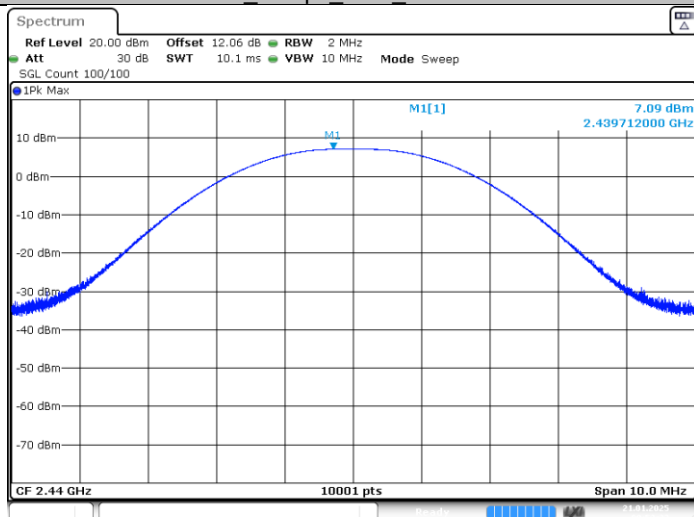
Bluetooth LE Test Result				
Data transmission Rate	Frequency (MHz)	Conducted Peak Output Power (dBm) §15.247 (b) (3)		
		Result	limit	Verdict
1Mbps	2402MHz	7.37	≤ 30	Pass
	2440MHz	7.09	≤ 30	Pass
	2480MHz	7.00	≤ 30	Pass

BLE_1Mbps_Ant1_2402MHz



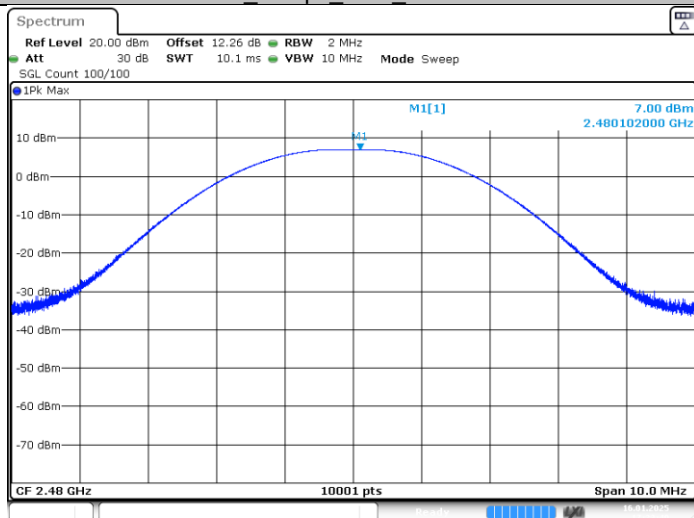
Date: 21 JAN 2025 09:49:54

BLE_1Mbps_Ant1_2440MHz



Date: 21 JAN 2025 09:53:22

BLE_1Mbps_Ant1_2480MHz



Date: 16 JAN 2025 17:23:40

10.36dB bandwidth and 99% Occupied Bandwidth

Test Method for 6 dB Bandwidth

1. Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
2. Set the VBW $\geq [3 \times \text{RBW}]$.
3. Detector = peak.
RBW=100KHz, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Trace mode = max-hold.
5. Sweep = No faster than coupled (auto) time.
6. Allow the trace to stabilize.
7. 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.

Test Method for 99 % Bandwidth

1. Use the following spectrum analyzer settings:
RBW=1% to 5% of the actual occupied, VBW $\geq$ 3RBW, Sweep = auto,
Detector function = peak, Trace = max hold
2. Use the occupied bandwidth measurement capability of test receiver.
3. Allow the trace to stabilize, record the occupied bandwidth value.

Limit

6dB bandwidth Limit [kHz]

99% bandwidth Limit [kHz]

≥ 500

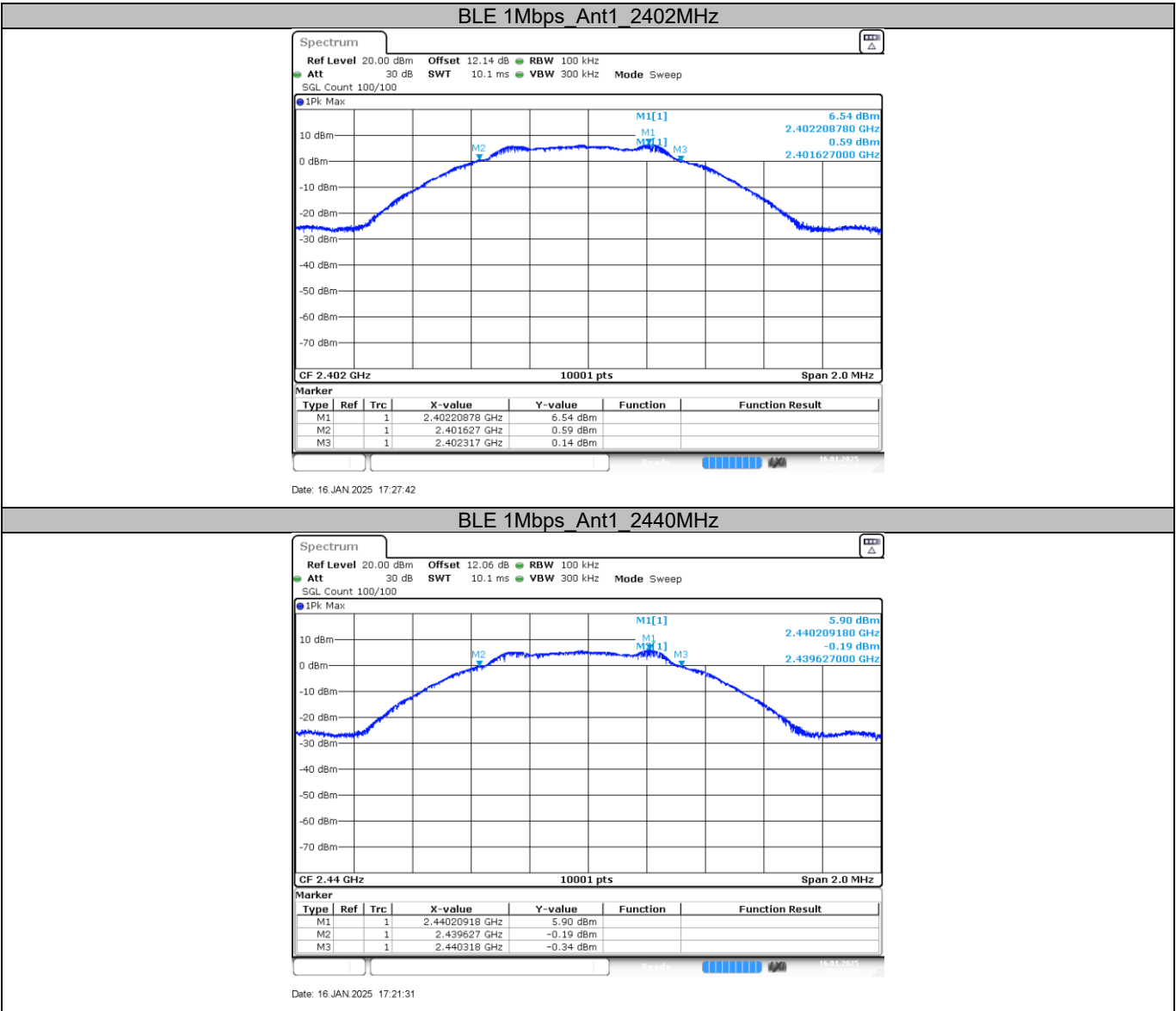
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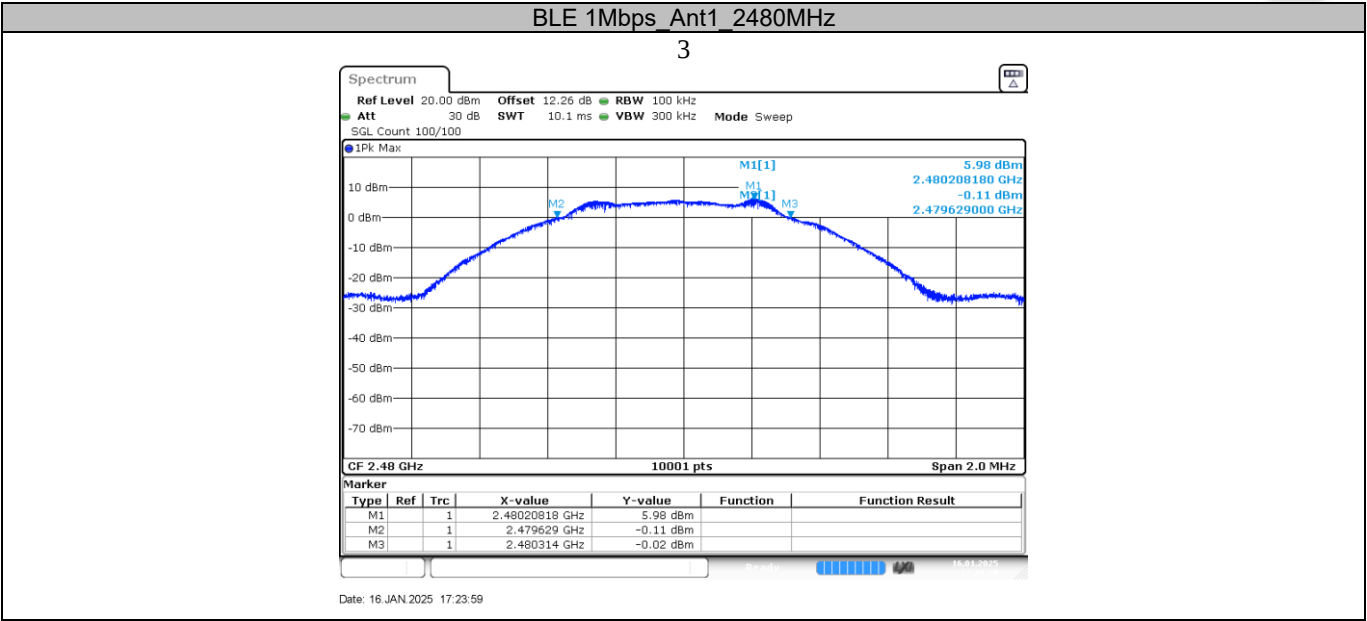
Test result

Data transmission rate	Frequency MHz	6dB bandwidth (MHz)		Result	99% occupied bandwidth MHz
		result	limit	verdict	
1Mbps	2402	0.690	≥ 0.5	Pass	1.035
	2440	0.690	≥ 0.5	Pass	1.035
	2480	0.685	≥ 0.5	Pass	1.036

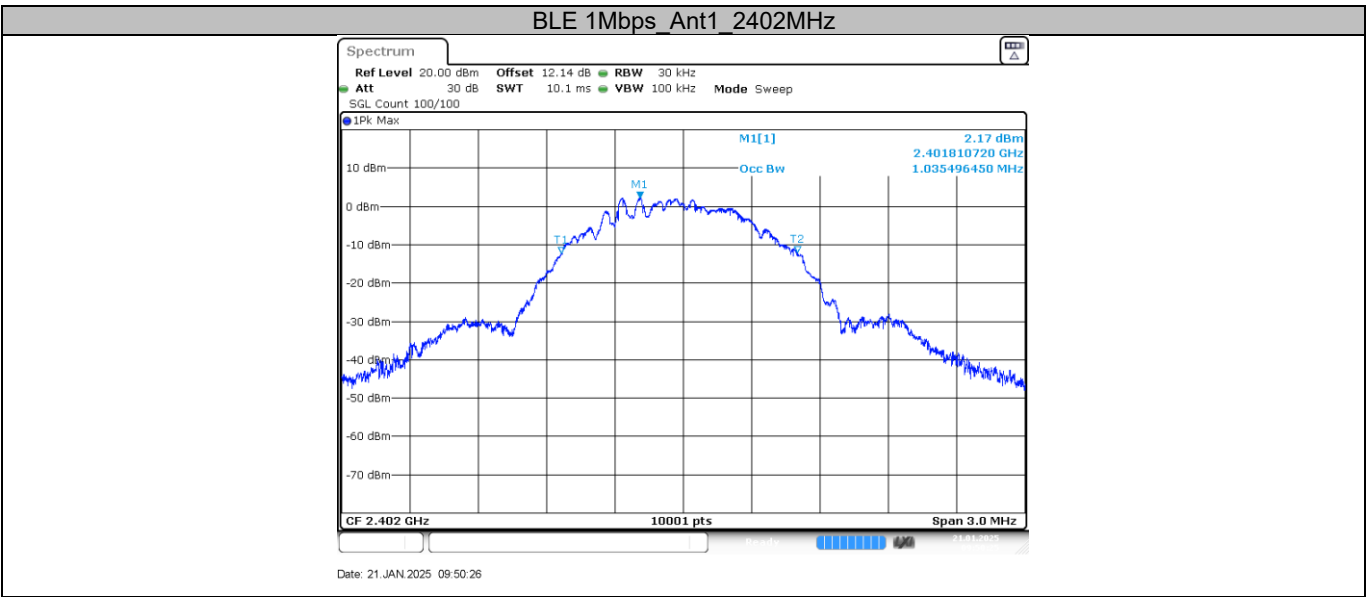


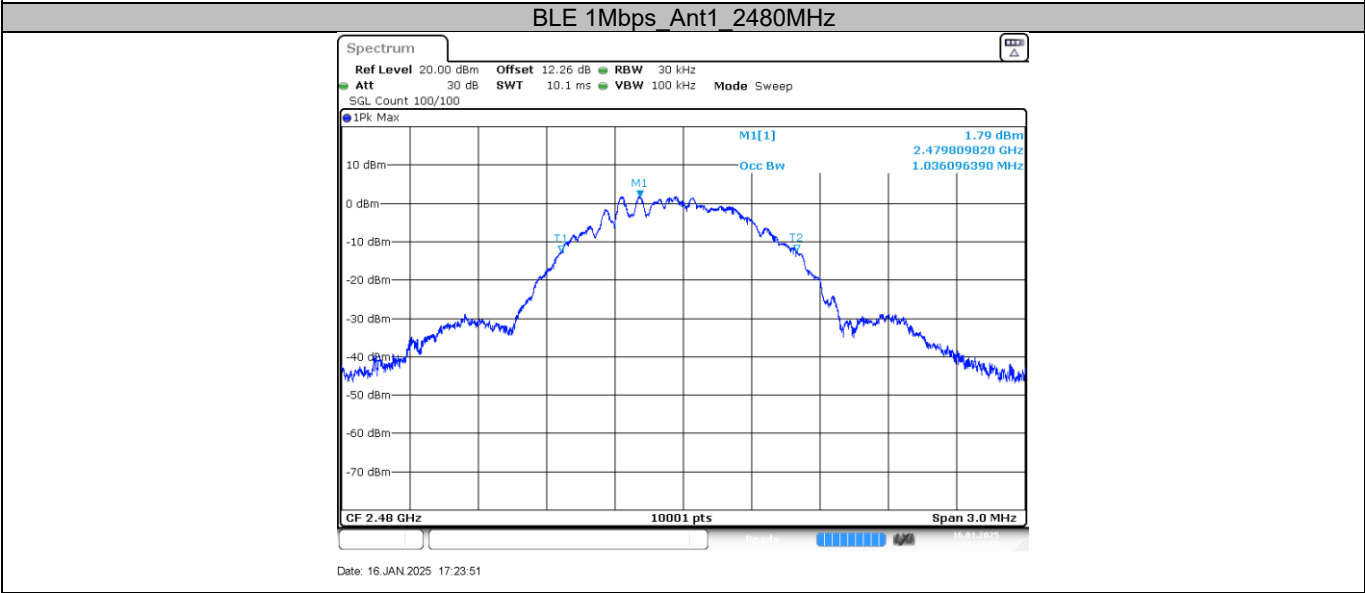
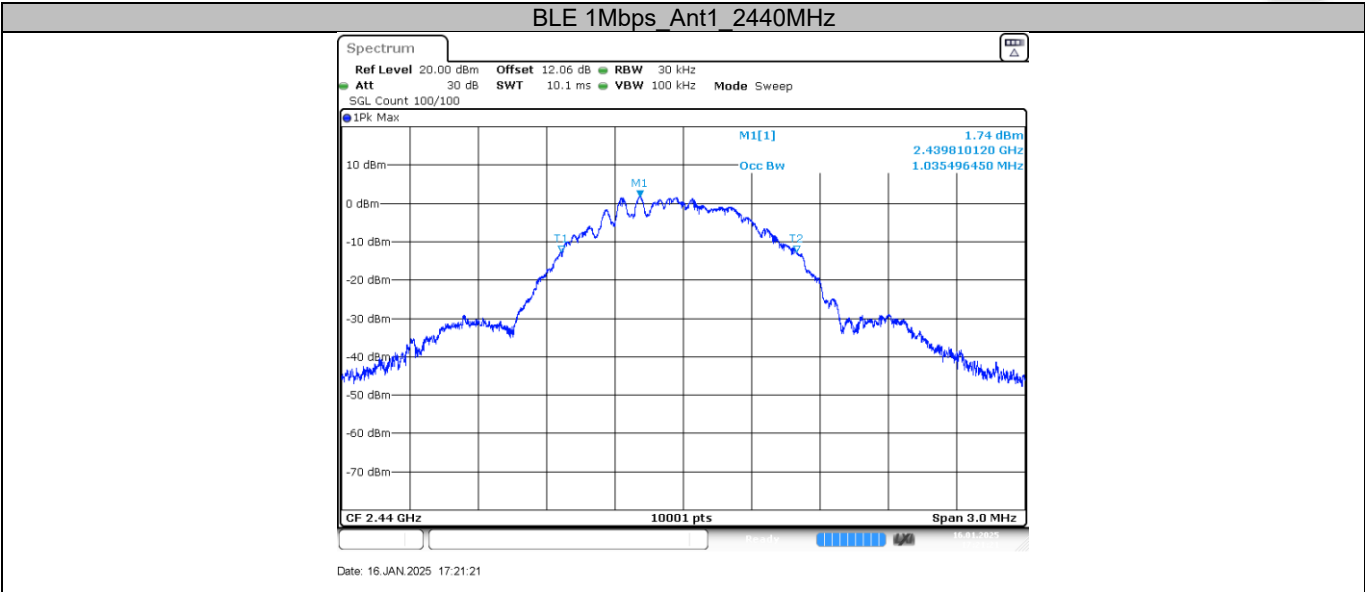
6dB Bandwidth





99% Bandwidth





10.4 Power spectral density

Test Method

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

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

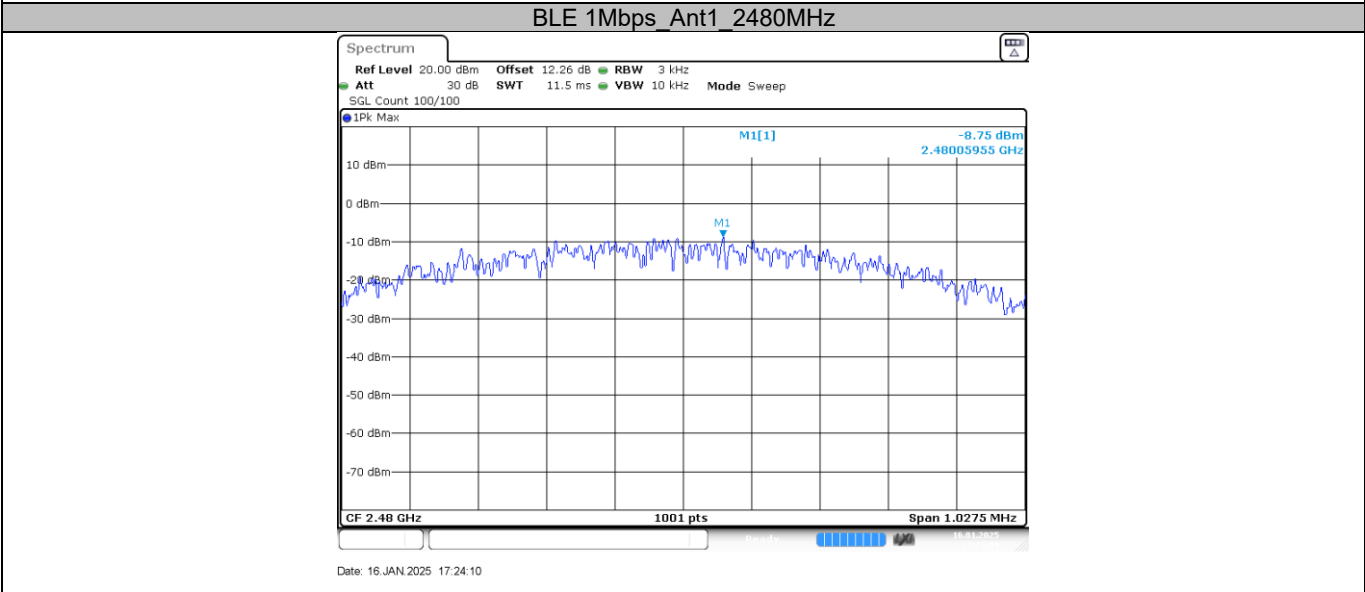
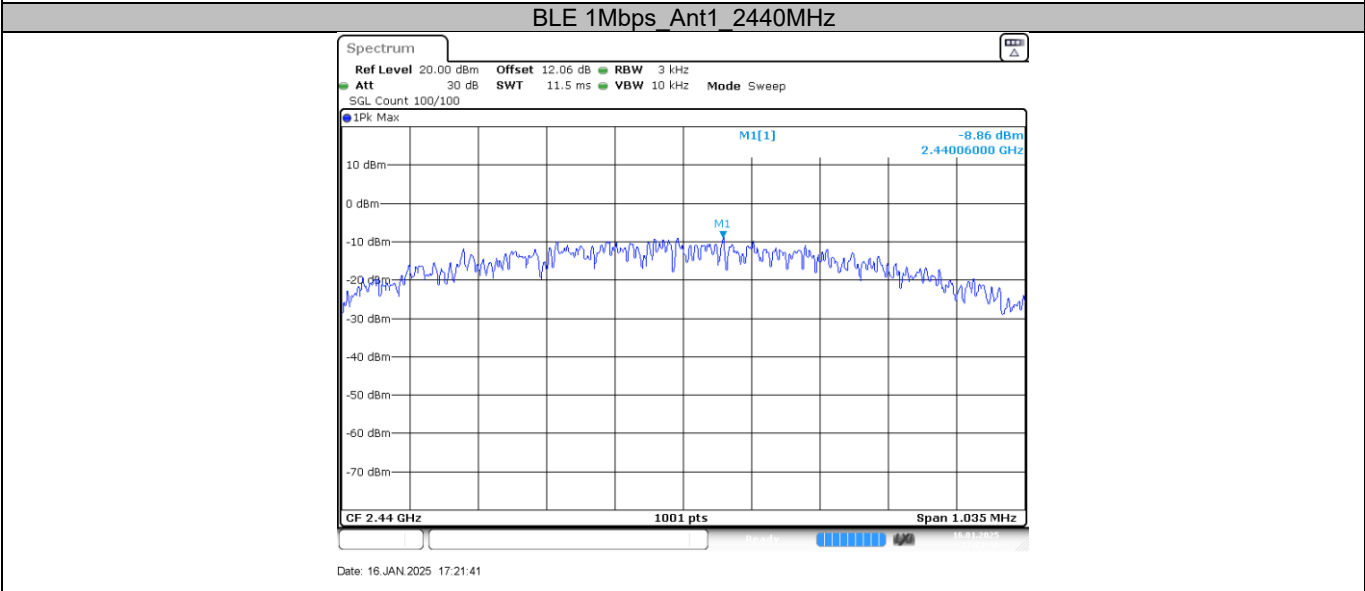
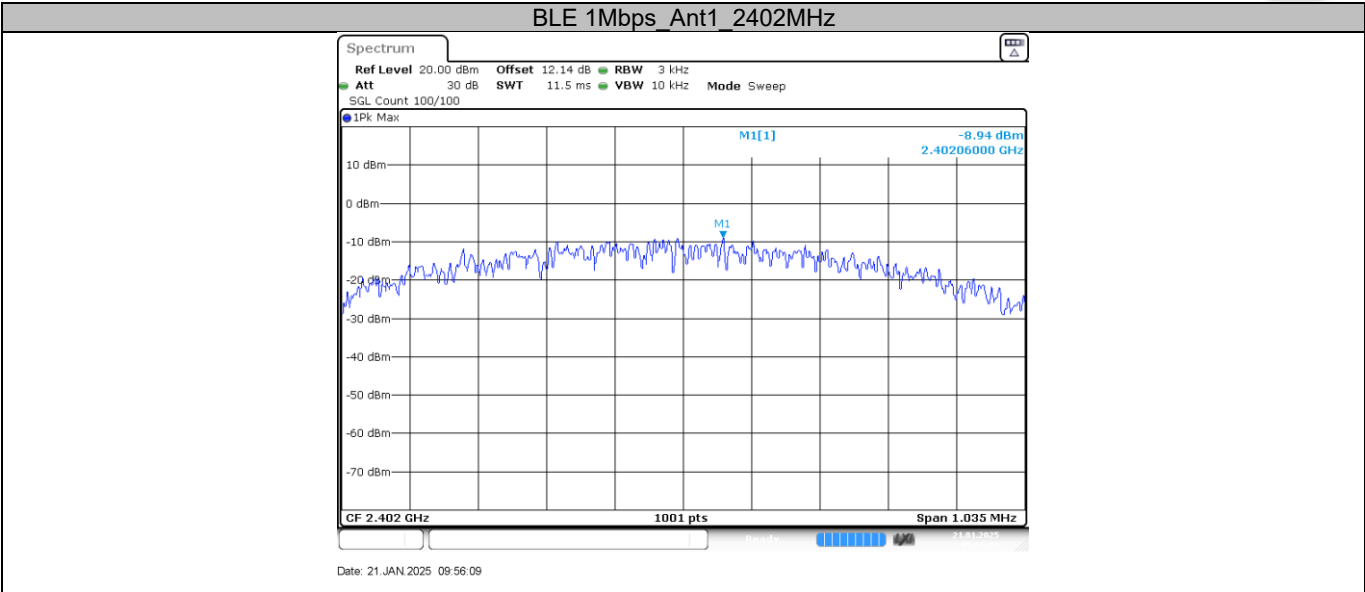
Limit

Limit [dBm/3kHz]

≤ 8

Test result

Data transmission rate	Frequency (MHz)	Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Result
1Mbps	2402MHz	-8.94	8	Pass
	2440MHz	-8.86	8	Pass
	2480MHz	-8.75	8	Pass



10.5 Spurious RF conducted emissions

Test Method

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

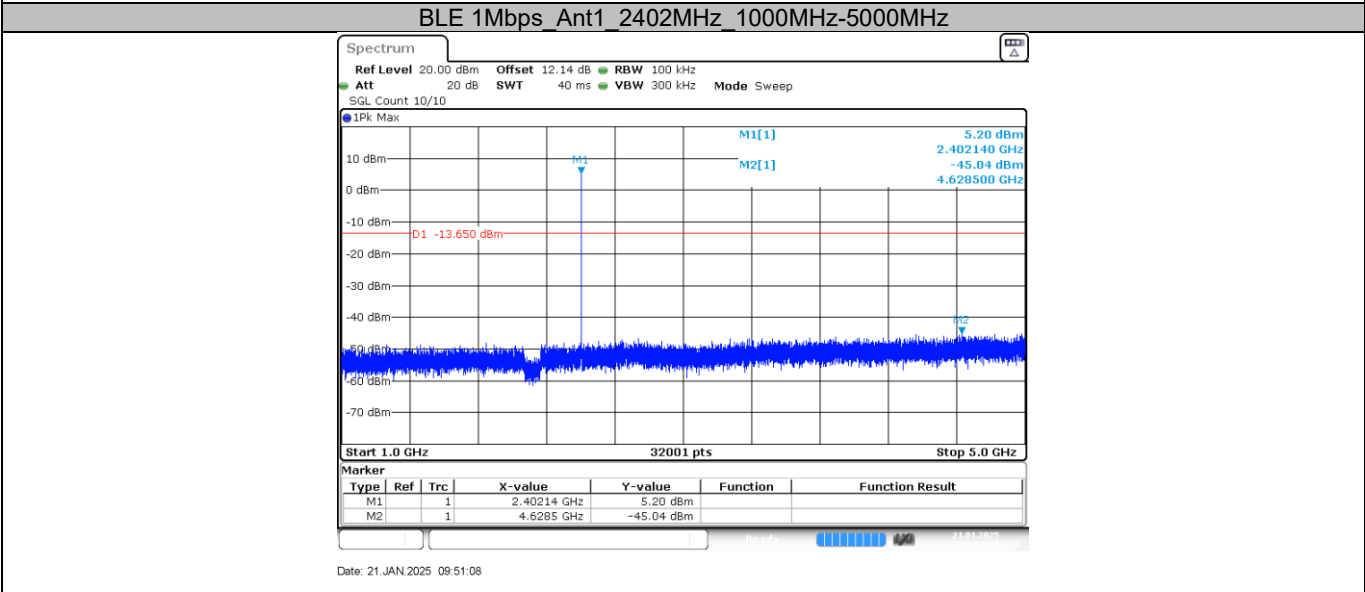
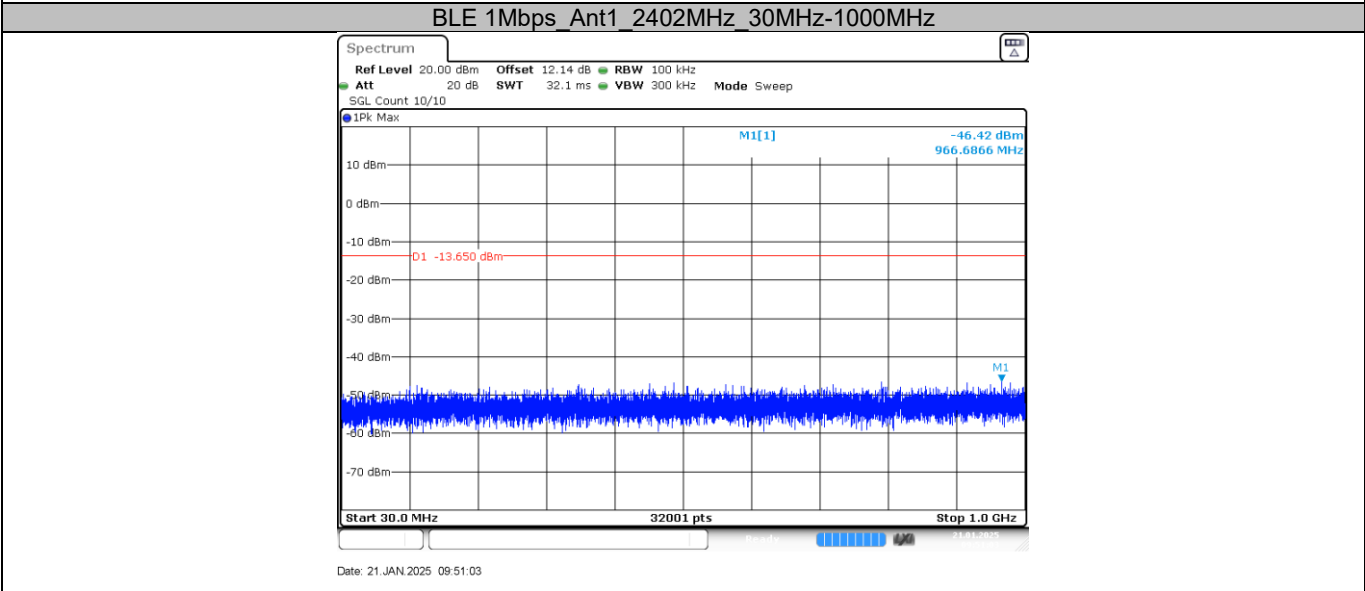
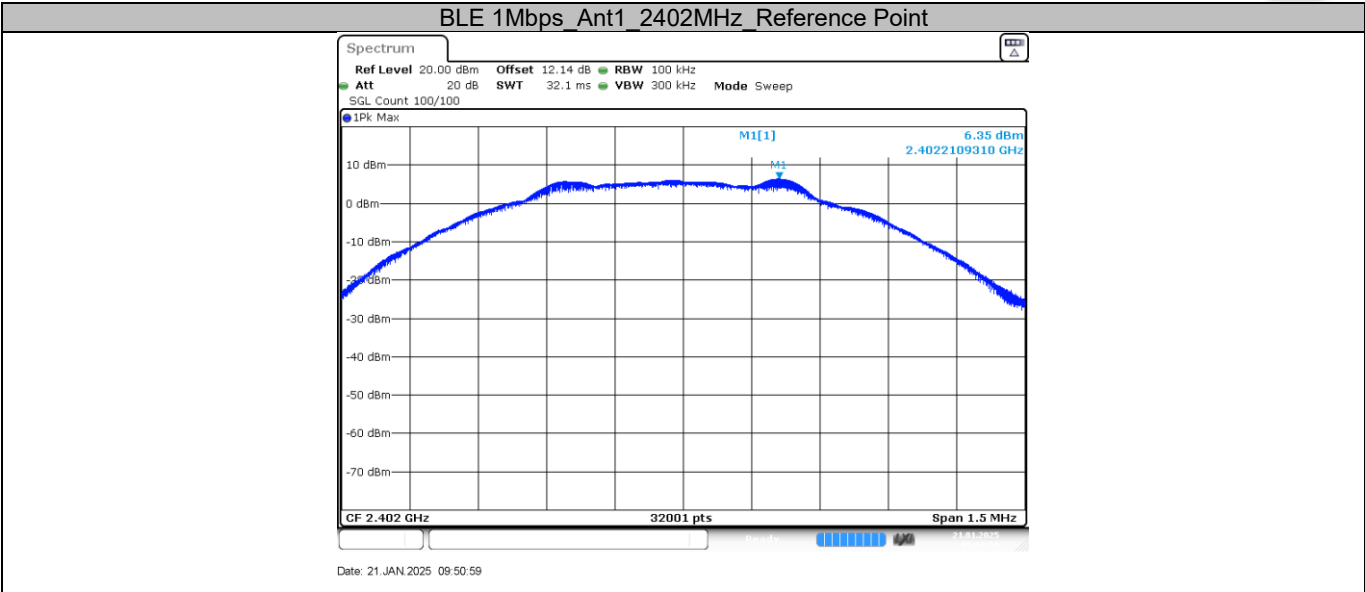
Limit

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

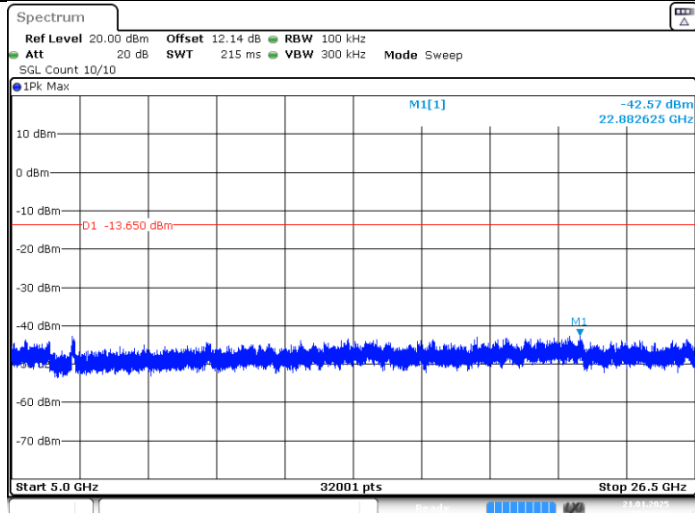


Spurious RF conducted emissions

Test Mode	Test Frequency (MHz)	Freq. Range (MHZ)	Result (dBm)	Limit (dBm)	Verdict
BLE_1Mbps	2402	Reference	6.35	---	PASS
		30~1000	-46.42	<=-13.65	PASS
		1000~26500	-42.57	<=-13.65	PASS
	2440	Reference	6.12	---	PASS
		30~1000	-47.11	<=-13.88	PASS
		1000~26500	-42.56	<=-13.88	PASS
	2480	Reference	6.30	---	PASS
		30~1000	-46.73	<=-13.70	PASS
		1000~26500	-42.14	<=-13.70	PASS

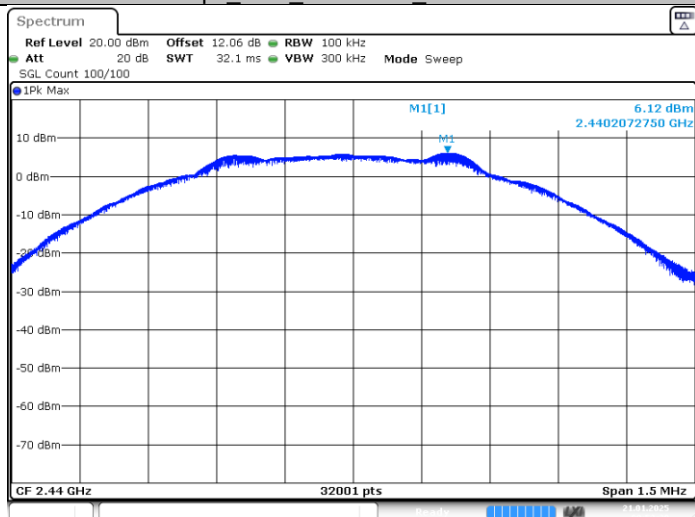


BLE 1Mbps_Ant1_2402MHz_5000MHz-26500MHz



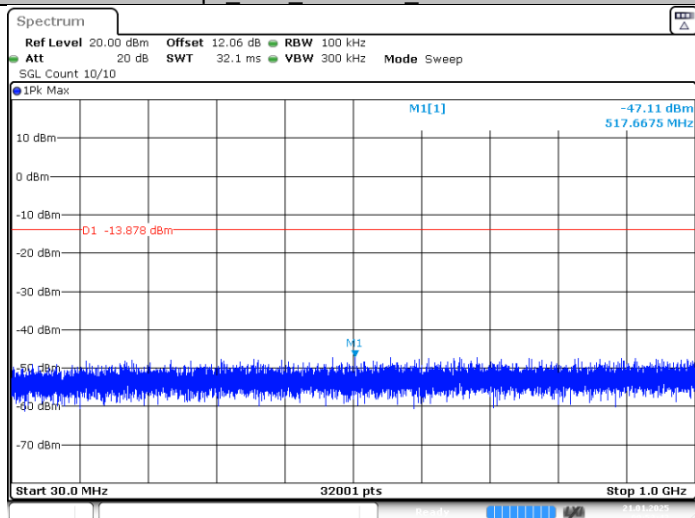
Date: 21 JAN 2025 09:51:21

BLE 1Mbps_Ant1_2440MHz_Reference Point

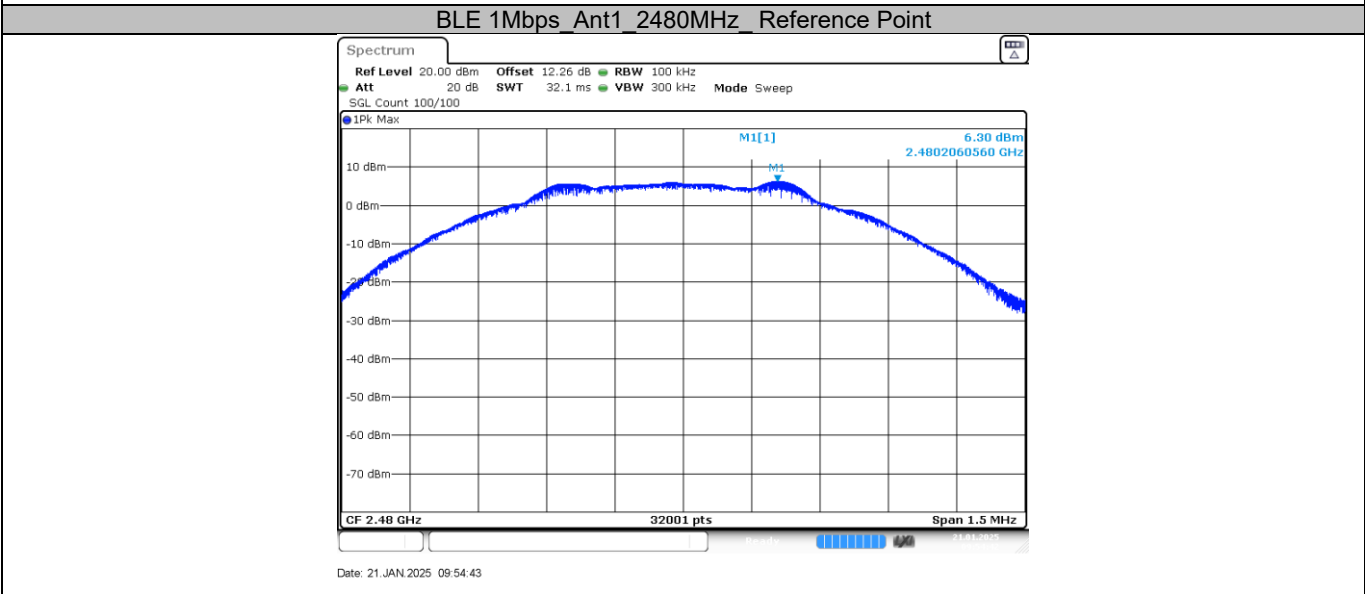
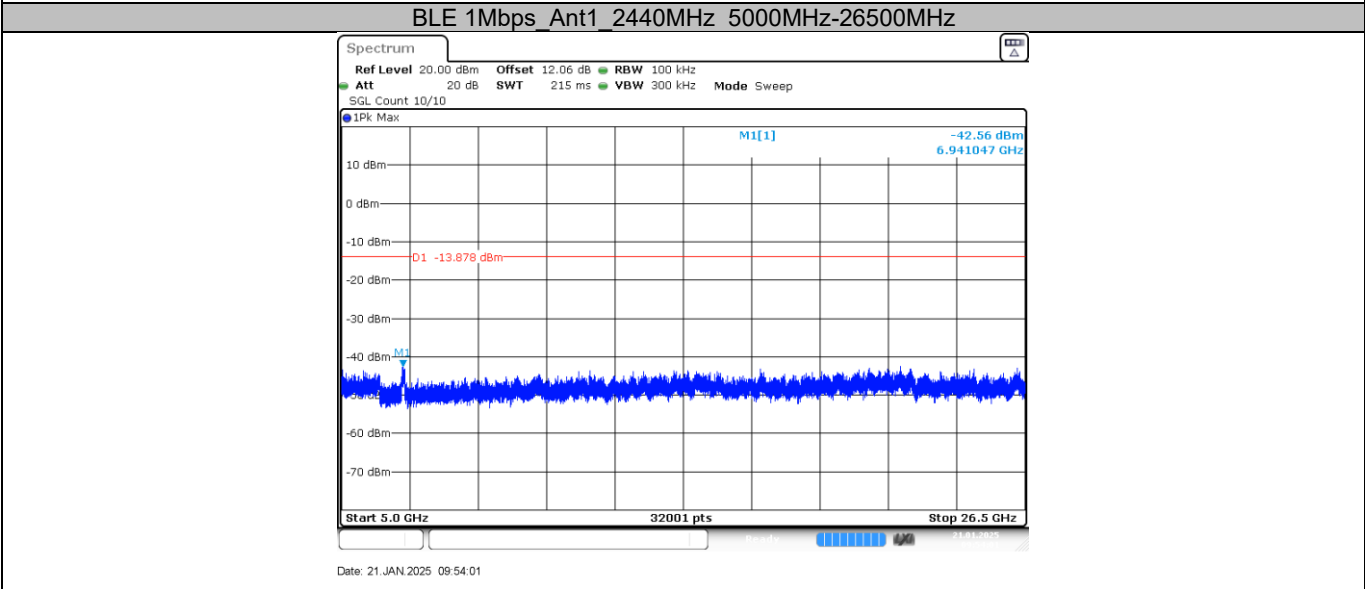
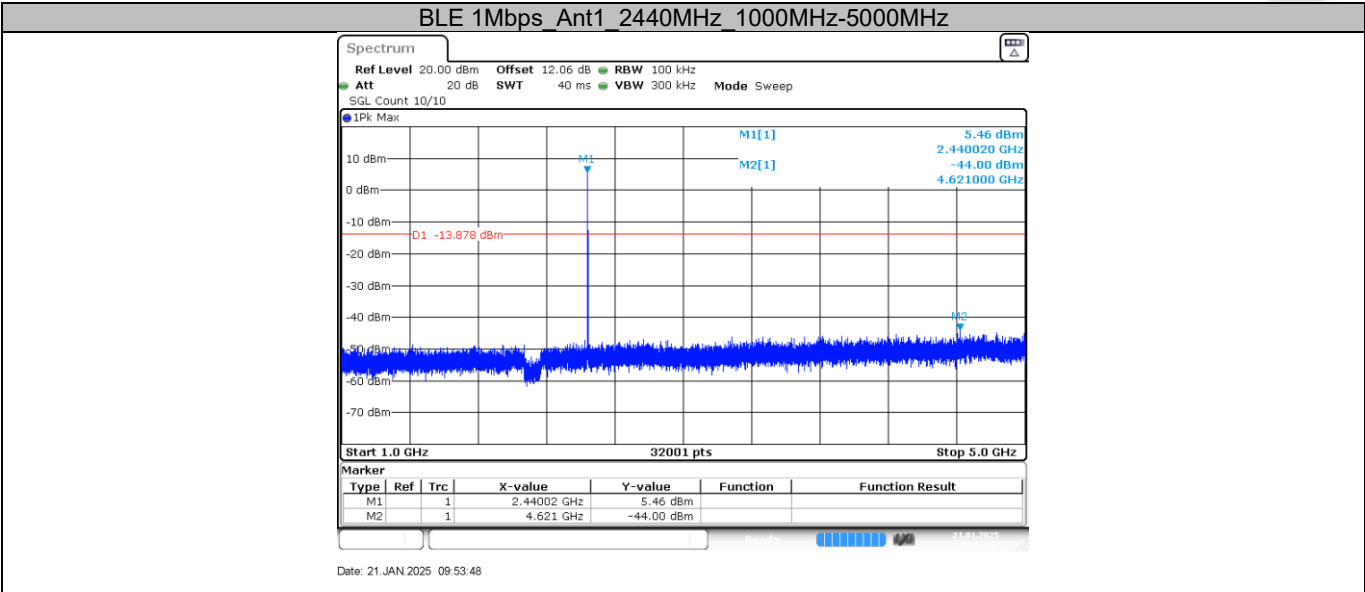


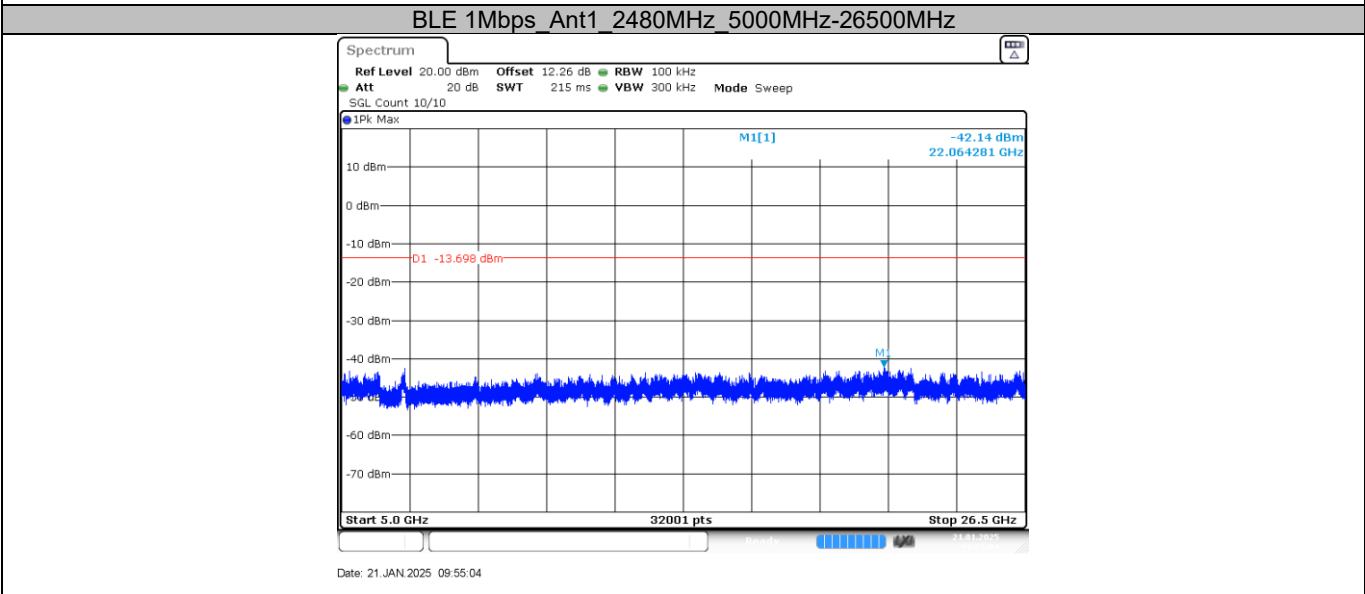
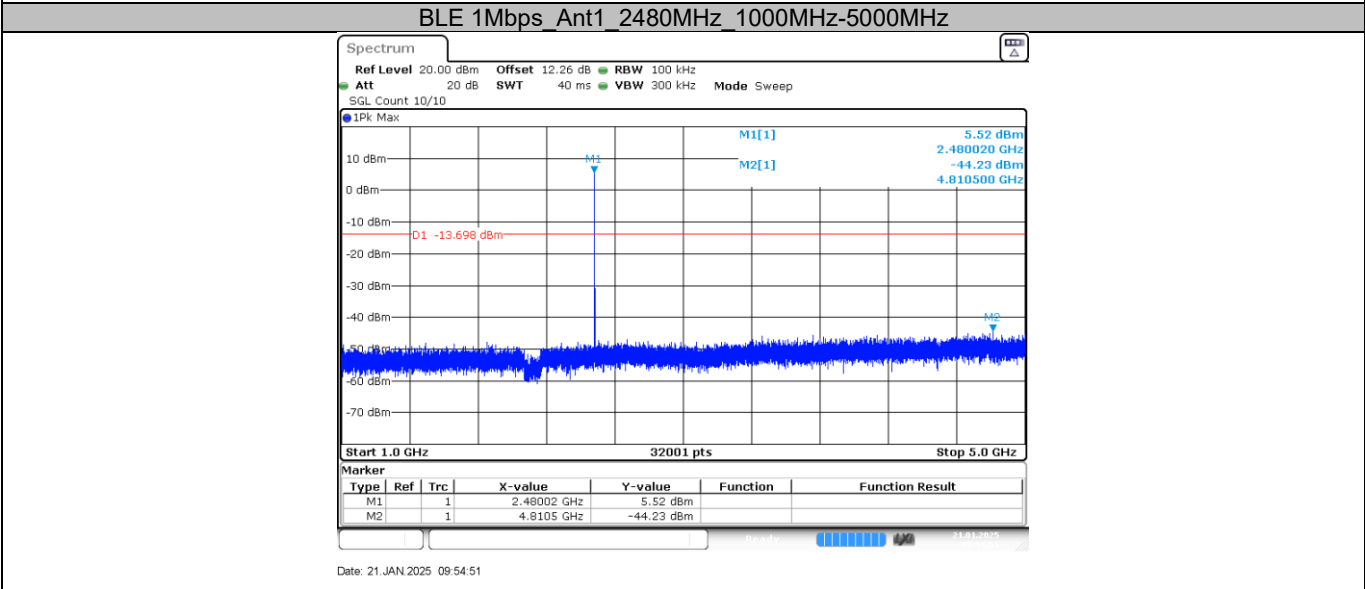
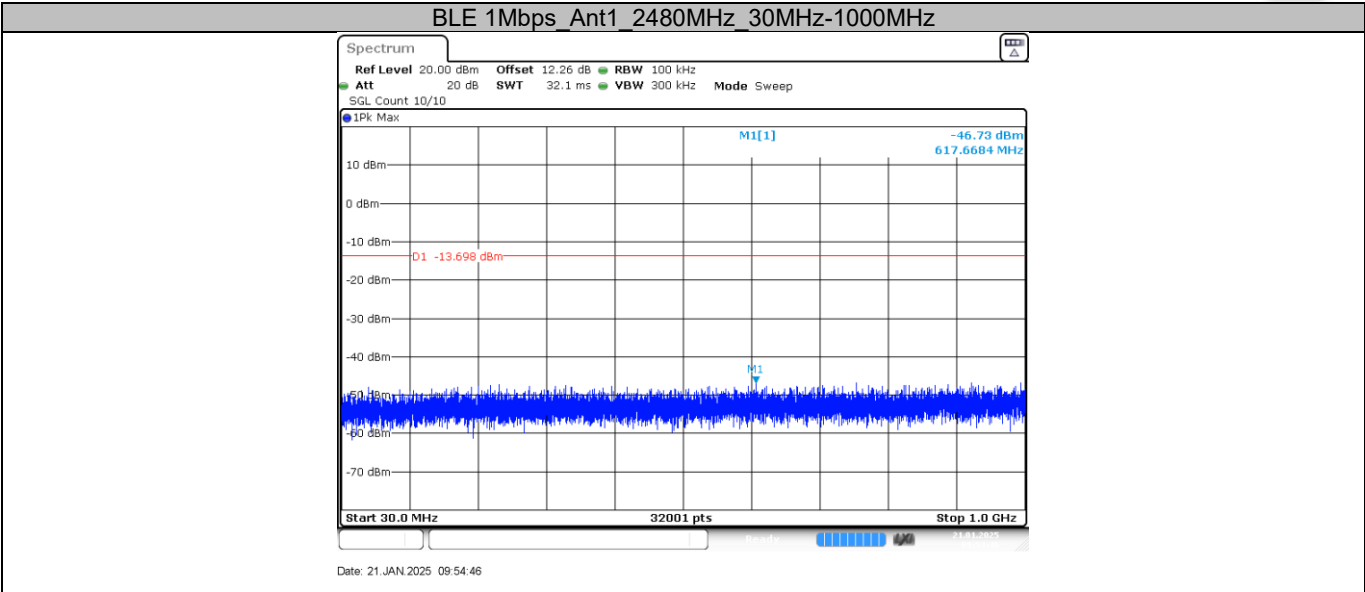
Date: 21 JAN 2025 09:53:40

BLE 1Mbps_Ant1_2440MHz_30MHz-1000MHz



Date: 21 JAN 2025 09:53:43





10.6 Band edge

Test Method

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

Limit:

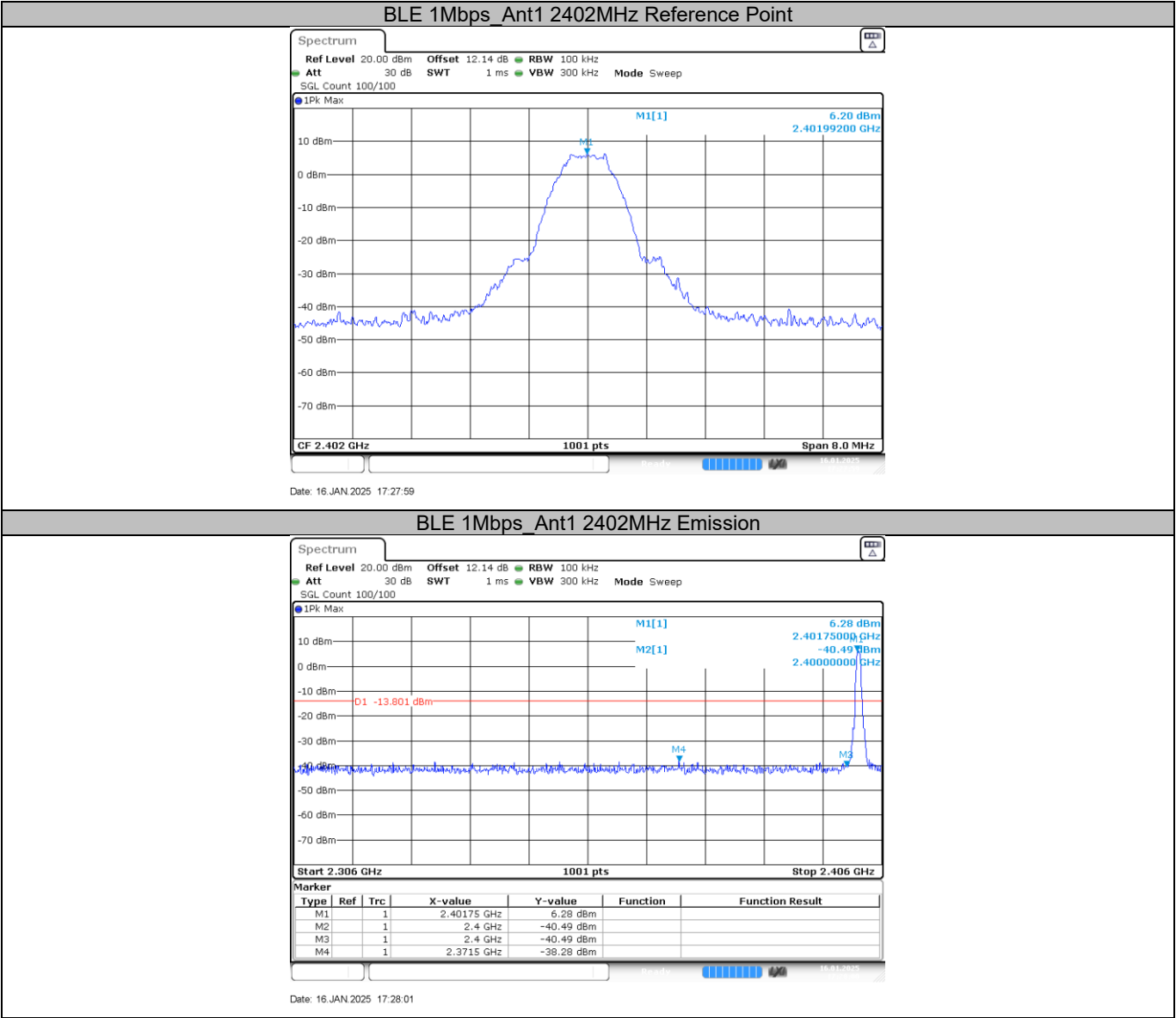
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3), the attenuation required shall be 30 dB instead of 20 dB.

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



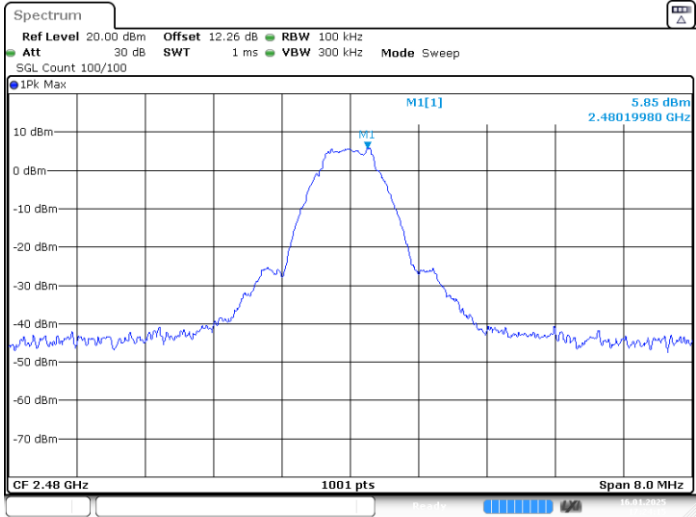
Test result

Test Mode	Channel (MHz)	Reference Level (dBm)	Result (dBm)	Limit (dBm)	Verdict
BLE_1Mbps	2402	6.20	-38.28	<=-13.80	PASS
	2480	5.85	-37.69	<=-14.15	PASS



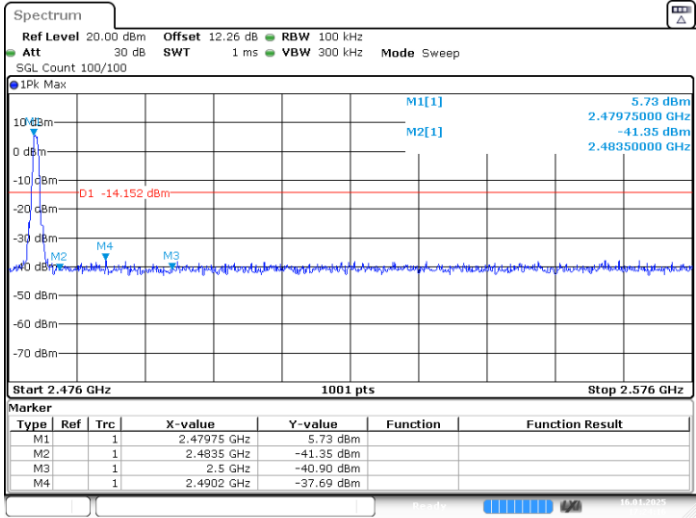


BLE 1Mbps_Ant1 2480MHz Reference Point



Date: 16 JAN 2025 17:24:15

BLE 1Mbps_Ant1 2480MHz Emission



Date: 16 JAN 2025 17:24:17

10.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Use the following spectrum analyzer settings According to C63.10
 - 1) Procedure for Unwanted Emissions Measurements Below 1000 MHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz to 120kHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
 - 2) For Peak unwanted emissions Above 1GHz:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
Procedures for average unwanted emissions measurements above 1GHz
 - a) RBW = 1MHz.
 - b) VBW \ [3 × RBW].
 - c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2.
Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
 - d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
 - e) Sweep time = auto.
 - f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
 - g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
 - 2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty

cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission (AV) at frequency above 1GHz.

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

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

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

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

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Test result

The worst case of Radiated Emission below 1GHz:

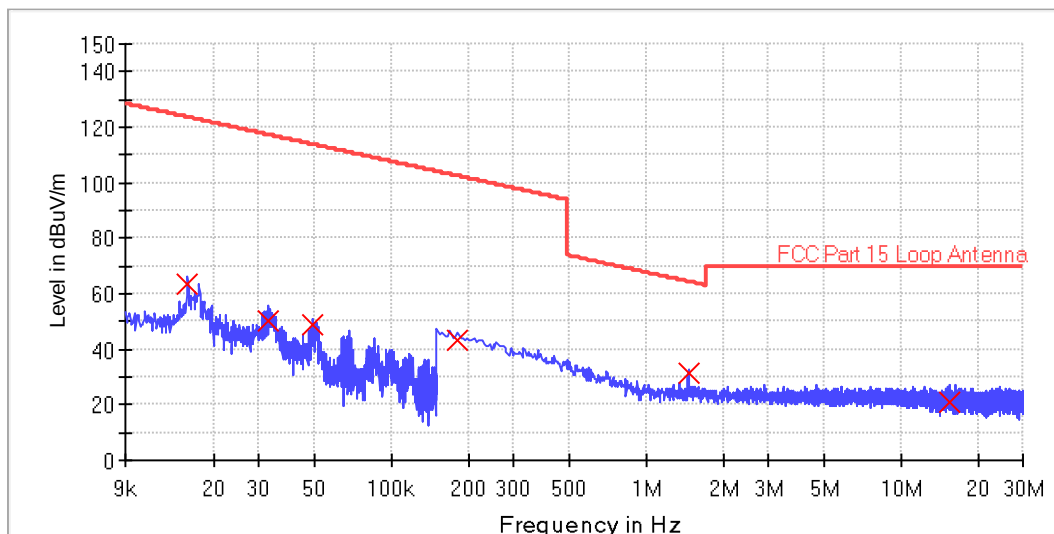
0.009-30MHz Radiated Emission**Common Information**

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: X-axial orientation, Adapter Model: TPA-10D050200UU01

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB

**Limit and Margin**

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015800	63.6	1000.0	0.200	100.0	105.0	19.8	60.1	123.6
0.032760	50.1	1000.0	0.200	100.0	263.0	19.6	67.2	117.3
0.049160	48.9	1000.0	0.200	100.0	220.0	19.5	64.9	113.8
0.182000	43.5	1000.0	9.000	100.0	132.0	19.3	58.9	102.4
1.458000	31.3	1000.0	9.000	100.0	88.0	19.3	33.0	64.4
15.502000	20.6	1000.0	9.000	100.0	179.0	18.7	48.9	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

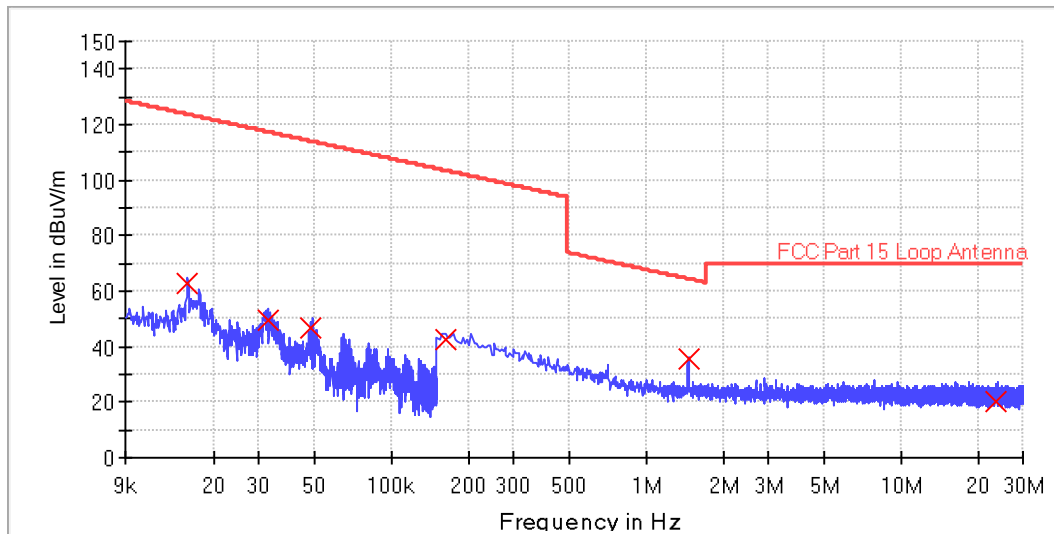
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Y-axis orientation, Adapter Model: TPA-10D050200UU01

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015800	62.9	1000.0	0.200	100.0	131.0	19.8	60.7	123.6
0.032520	49.4	1000.0	0.200	100.0	206.0	19.6	68.0	117.3
0.048120	46.4	1000.0	0.200	100.0	178.0	19.5	67.5	113.9
0.162000	42.5	1000.0	9.000	100.0	65.0	19.3	60.9	103.4
1.458000	35.3	1000.0	9.000	100.0	264.0	19.3	29.0	64.4
23.446000	20.5	1000.0	9.000	100.0	277.0	18.9	49.1	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

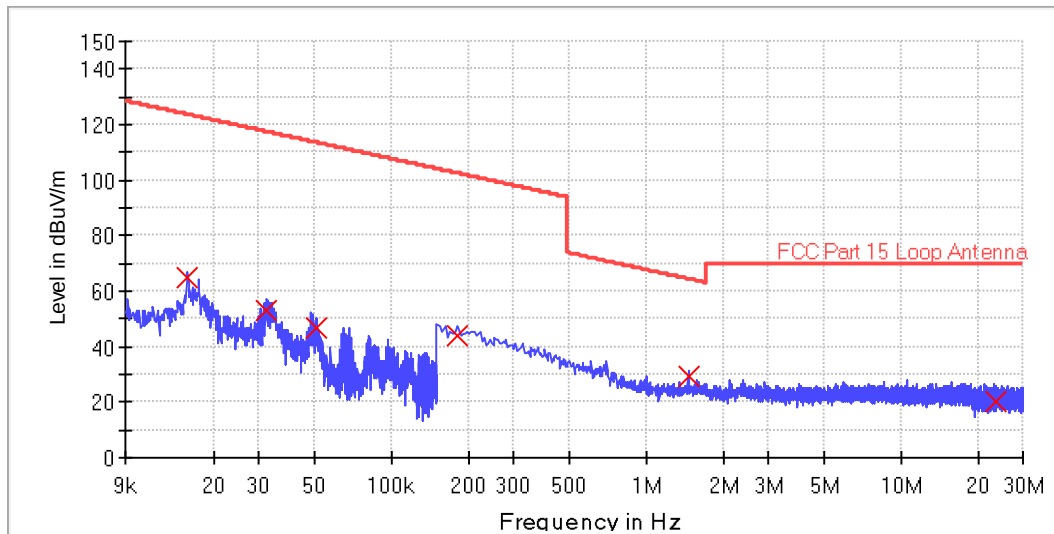
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Z-axial orientation, Adapter Model: TPA-10D050200UU01

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015720	65.1	1000.0	0.200	100.0	130.0	19.8	58.6	123.7
0.032440	53.2	1000.0	0.200	100.0	105.0	19.6	64.2	117.4
0.050280	46.6	1000.0	0.200	100.0	199.0	19.5	66.9	113.6
0.182000	44.1	1000.0	9.000	100.0	102.0	19.3	58.3	102.4
1.458000	29.4	1000.0	9.000	100.0	281.0	19.3	35.0	64.4
23.602000	20.4	1000.0	9.000	100.0	194.0	18.9	49.1	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

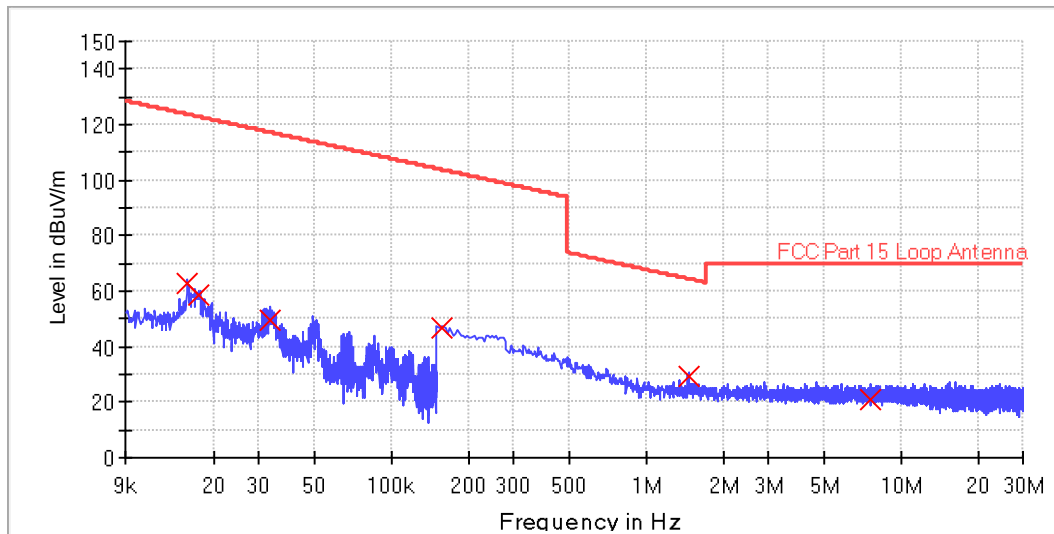
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: X-axial orientation, Adapter Model: KA12H-0502000US

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015800	62.9	1000.0	0.200	100.0	144.0	19.8	60.7	123.6
0.017400	58.9	1000.0	0.200	100.0	165.0	19.7	63.9	122.8
0.033480	49.2	1000.0	0.200	100.0	212.0	19.6	67.9	117.1
0.158000	46.8	1000.0	9.000	100.0	220.0	19.3	56.8	103.6
1.458000	29.6	1000.0	9.000	100.0	298.0	19.3	34.8	64.4
7.526000	20.8	1000.0	9.000	100.0	170.0	19.0	48.7	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

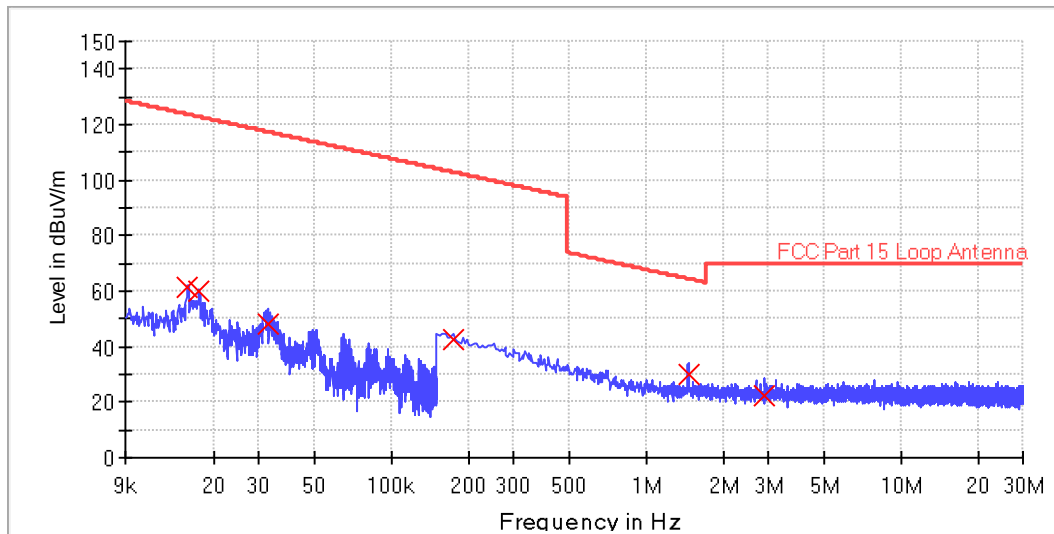
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Y-axis orientation, Adapter Model: KA12H-0502000US

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015800	61.1	1000.0	0.200	100.0	133.0	19.8	62.5	123.6
0.017560	60.2	1000.0	0.200	100.0	149.0	19.7	62.5	122.7
0.032520	47.9	1000.0	0.200	100.0	198.0	19.6	69.4	117.3
0.174000	42.4	1000.0	9.000	100.0	276.0	19.3	60.4	102.8
1.458000	30.1	1000.0	9.000	100.0	112.0	19.3	34.3	64.4
2.914000	22.3	1000.0	9.000	100.0	301.0	19.3	47.2	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

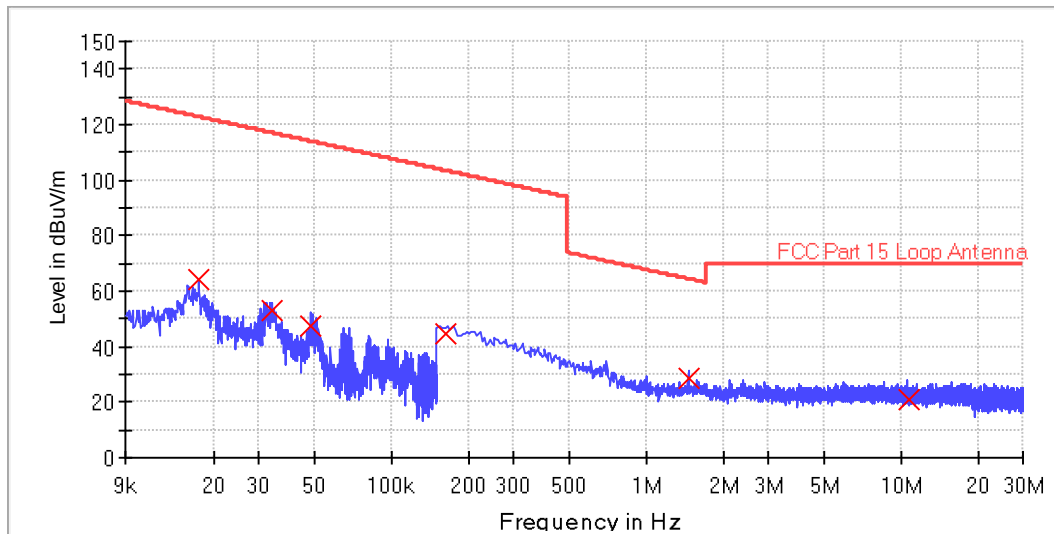
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Z-axis orientation, Adapter Model: KA12H-0502000US

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.017400	64.3	1000.0	0.200	100.0	121.0	19.7	58.5	122.8
0.033960	52.8	1000.0	0.200	100.0	94.0	19.6	64.2	117.0
0.048200	47.3	1000.0	0.200	100.0	188.0	19.5	66.6	113.9
0.162000	44.5	1000.0	9.000	100.0	247.0	19.3	58.9	103.4
1.458000	28.9	1000.0	9.000	100.0	293.0	19.3	35.5	64.4
10.718000	21.2	1000.0	9.000	100.0	205.0	18.8	48.3	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

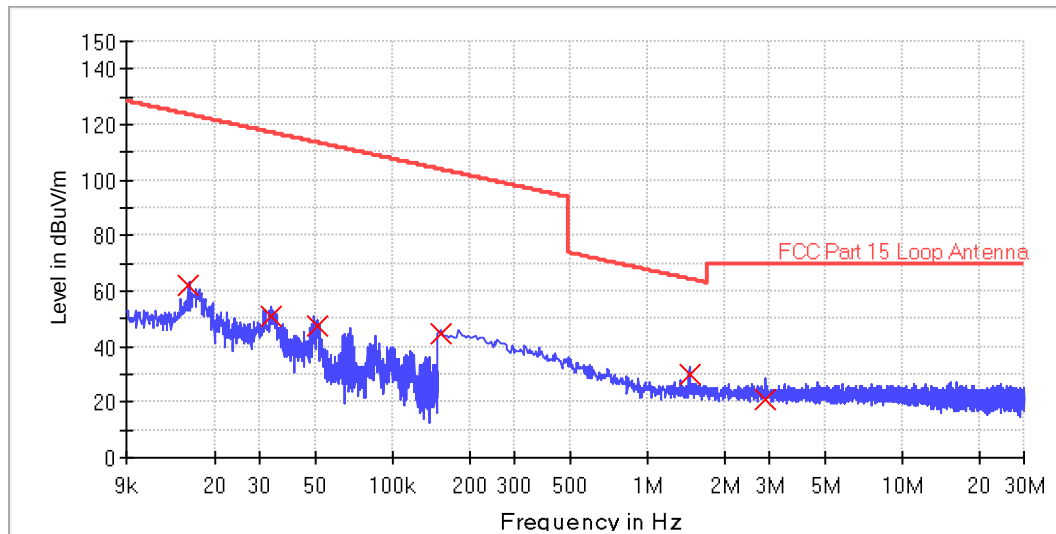
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: X-axial orientation

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015800	62.3	1000.0	0.200	100.0	161.0	19.8	61.3	123.6
0.033480	50.6	1000.0	0.200	100.0	230.0	19.6	66.5	117.1
0.050840	47.5	1000.0	0.200	100.0	155.0	19.5	66.0	113.5
0.154000	44.9	1000.0	9.000	100.0	206.0	19.3	58.9	103.8
1.458000	30.2	1000.0	9.000	100.0	281.0	19.3	34.2	64.4
2.918000	21.0	1000.0	9.000	100.0	160.0	19.3	48.5	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

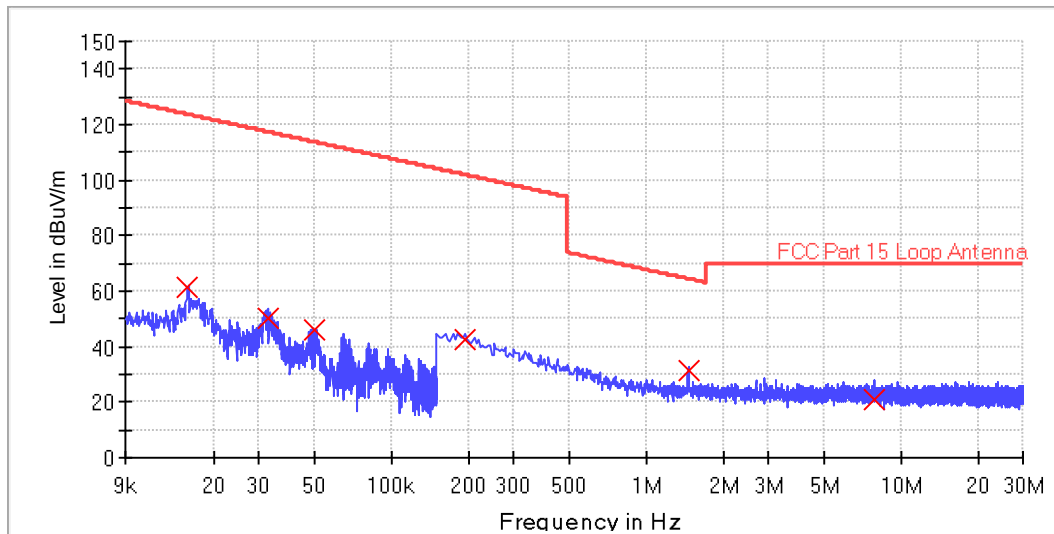
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Y-axis orientation

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015800	61.7	1000.0	0.200	100.0	253.0	19.8	61.9	123.6
0.032520	50.2	1000.0	0.200	100.0	139.0	19.6	67.1	117.3
0.049960	45.8	1000.0	0.200	100.0	195.0	19.5	67.8	113.6
0.194000	42.7	1000.0	9.000	100.0	282.0	19.3	59.1	101.8
1.458000	31.5	1000.0	9.000	100.0	296.0	19.3	32.9	64.4
7.810000	20.9	1000.0	9.000	100.0	102.0	19.0	48.6	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

0.009-30MHz Radiated Emission

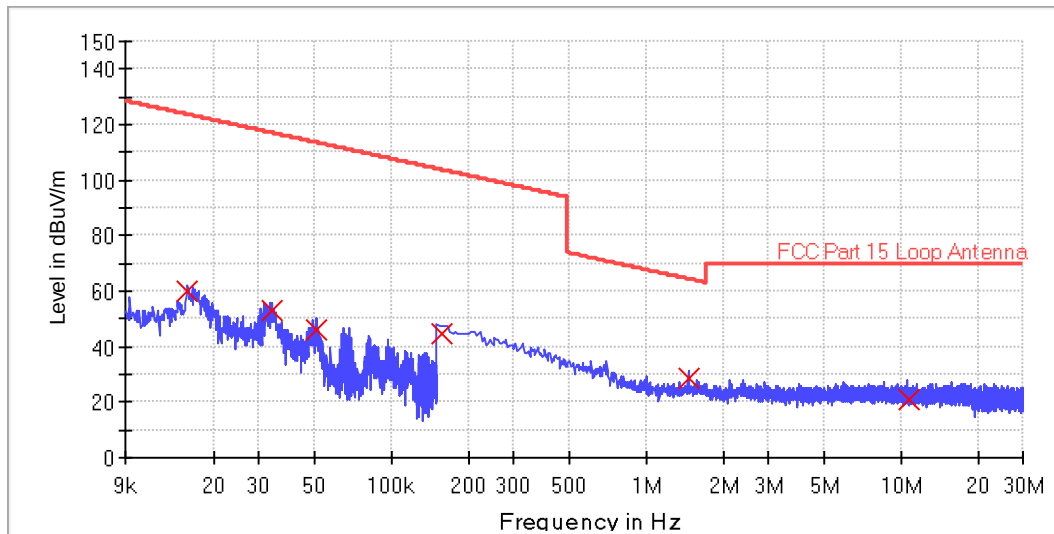
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Z-axis orientation

Scan Setup: FCC_RE_9K-30M_Max_3m [EMI radiated]

Hardware Setup: Radiated E Field 9K-30MHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	80 Hz	PK+	200 Hz	0.01 s	20 dB
150 kHz - 30 MHz	4 kHz	PK+	9 kHz	0.01 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
0.015720	60.2	1000.0	0.200	100.0	166.0	19.8	63.5	123.7
0.033640	53.3	1000.0	0.200	100.0	134.0	19.6	63.8	117.1
0.050680	45.8	1000.0	0.200	100.0	186.0	19.5	67.7	113.5
0.158000	44.6	1000.0	9.000	100.0	241.0	19.3	59.0	103.6
1.458000	28.9	1000.0	9.000	100.0	297.0	19.3	35.5	64.4
10.650000	20.9	1000.0	9.000	100.0	160.0	18.8	48.6	69.5

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)



30-1000MHz Radiated Emission

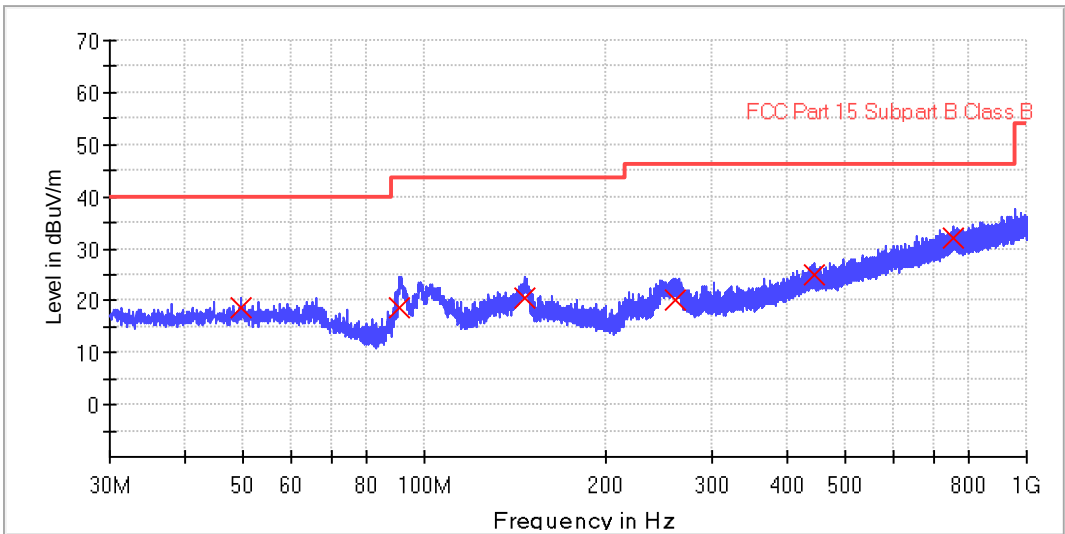
Common Information

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name:	Xu Zheng
Input:	AC 120V 60Hz
Sample No:	WUX-0877560-006
Test standard:	FCC Part 15.209(a)
Comment:	Horizontal, Adapter Model: TPA-10D050200UU01

Sweep Setup: RE_30M-1G_Sweep_3m [EMI radiated]

Hardware Setup:	Radiated E Field 30MHz-1GHz_3m
Receiver:	[ESR 7]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	40.417 kHz	PK+	120 kHz	1.5 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
49.440000	18.7	1000.0	120.000	200.0	H	321.0	20.9	21.3	40.0
90.960000	18.8	1000.0	120.000	210.0	H	215.0	15.3	24.7	43.5
146.640000	20.3	1000.0	120.000	220.0	H	222.0	21.3	23.2	43.5
261.160000	20.1	1000.0	120.000	200.0	H	87.0	20.9	25.9	46.0
443.680000	25.0	1000.0	120.000	190.0	H	69.0	26.7	21.0	46.0
754.800000	32.2	1000.0	120.000	200.0	H	173.0	33.2	13.9	46.0

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
 Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)



30-1000MHz Radiated Emission

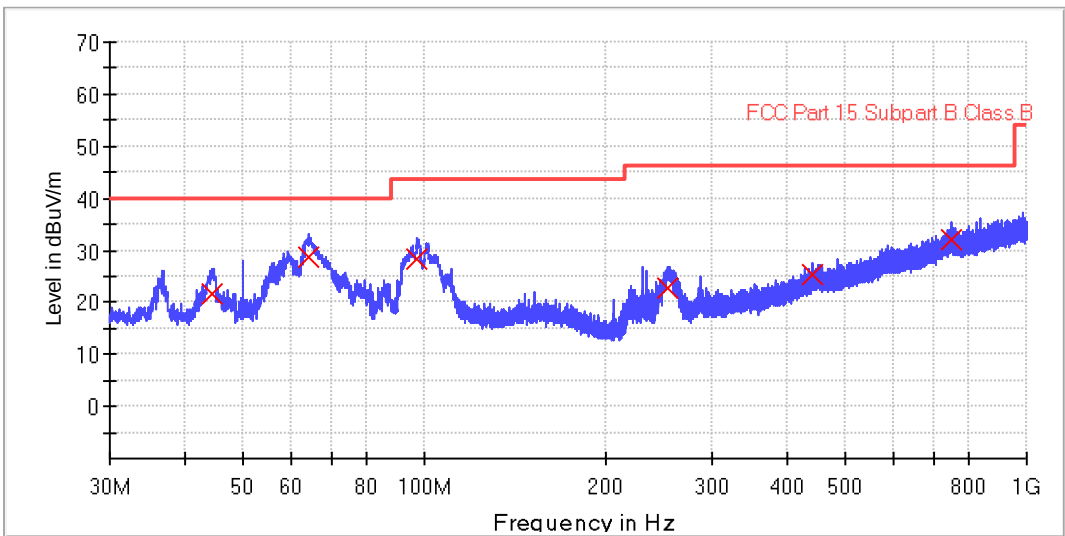
Common Information

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name:	Xu Zheng
Input:	AC 120V 60Hz
Sample No:	WUX-0877560-006
Test standard:	FCC Part 15.209(a)
Comment:	Vertical, Adapter Model: TPA-10D050200UU01

Sweep Setup: RE_30M-1G_Sweep_3m [EMI radiated]

Hardware Setup:	Radiated E Field 30MHz-1GHz_3m
Receiver:	[ESR 7]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	40.417 kHz	PK+	120 kHz	1.5 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
44.280000	21.7	1000.0	120.000	120.0	V	224.0	20.7	18.3	40.0
64.160000	28.8	1000.0	120.000	105.0	V	161.0	20.3	11.2	40.0
97.360000	28.4	1000.0	120.000	100.0	V	154.0	16.1	15.2	43.5
253.240000	22.6	1000.0	120.000	120.0	V	29.0	20.6	23.4	46.0
439.960000	25.5	1000.0	120.000	110.0	V	94.0	26.6	20.6	46.0
748.840000	32.0	1000.0	120.000	100.0	V	301.0	32.9	14.1	46.0

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

30-1000MHz Radiated Emission

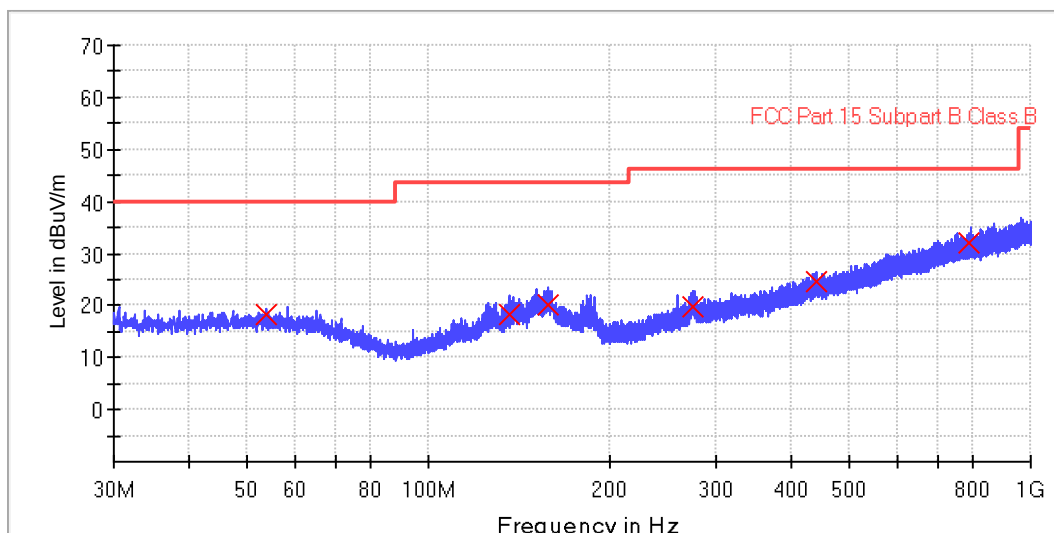
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Horizontal, Adapter Model: KA12H-0502000US

Sweep Setup: RE_30M-1G_Sweep_3m [EMI radiated]

Hardware Setup: Radiated E Field 30MHz-1GHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	40.417 kHz	PK+	120 kHz	1.5 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
53.680000	18.3	1000.0	120.000	200.0	H	250.0	20.9	21.7	40.0
135.760000	18.2	1000.0	120.000	195.0	H	162.0	20.5	25.4	43.5
157.680000	20.0	1000.0	120.000	170.0	H	257.0	21.6	23.5	43.5
275.360000	19.8	1000.0	120.000	220.0	H	76.0	21.7	26.2	46.0
440.400000	24.7	1000.0	120.000	180.0	H	317.0	26.6	21.3	46.0
791.000000	32.2	1000.0	120.000	210.0	H	195.0	33.4	13.8	46.0

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

30-1000MHz Radiated Emission

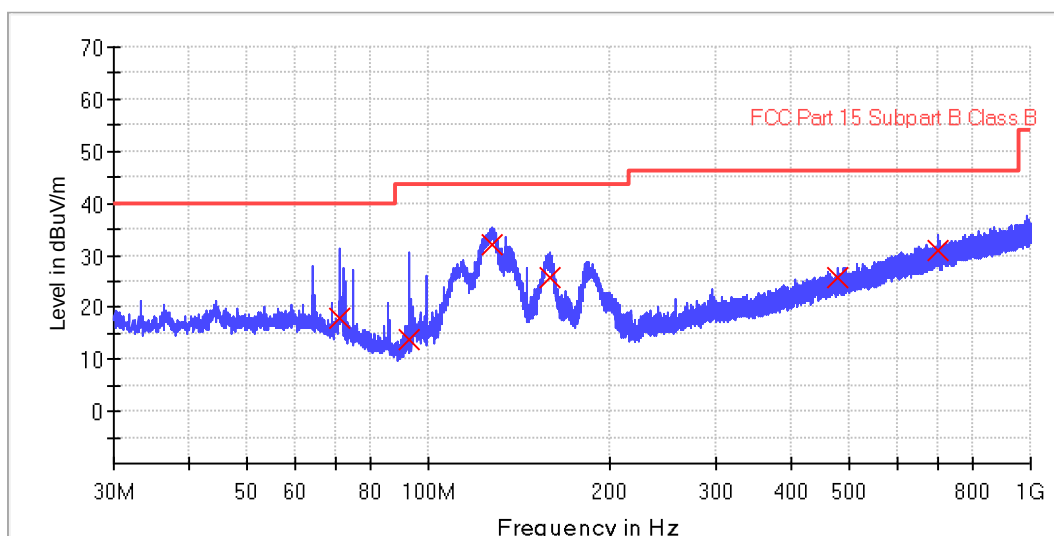
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Vertical, Adapter Model: KA12H-0502000US

Sweep Setup: RE_30M-1G_Sweep_3m [EMI radiated]

Hardware Setup: Radiated E Field 30MHz-1GHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	40.417 kHz	PK+	120 kHz	1.5 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
71.120000	17.9	1000.0	120.000	100.0	V	221.0	18.8	22.2	40.0
92.720000	14.0	1000.0	120.000	110.0	V	280.0	15.4	29.5	43.5
127.960000	31.9	1000.0	120.000	120.0	V	290.0	19.8	11.6	43.5
159.480000	25.7	1000.0	120.000	100.0	V	97.0	21.6	17.9	43.5
478.360000	25.6	1000.0	120.000	115.0	V	170.0	27.4	20.5	46.0
702.040000	31.0	1000.0	120.000	100.0	V	187.0	32.0	15.0	46.0

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

30-1000MHz Radiated Emission

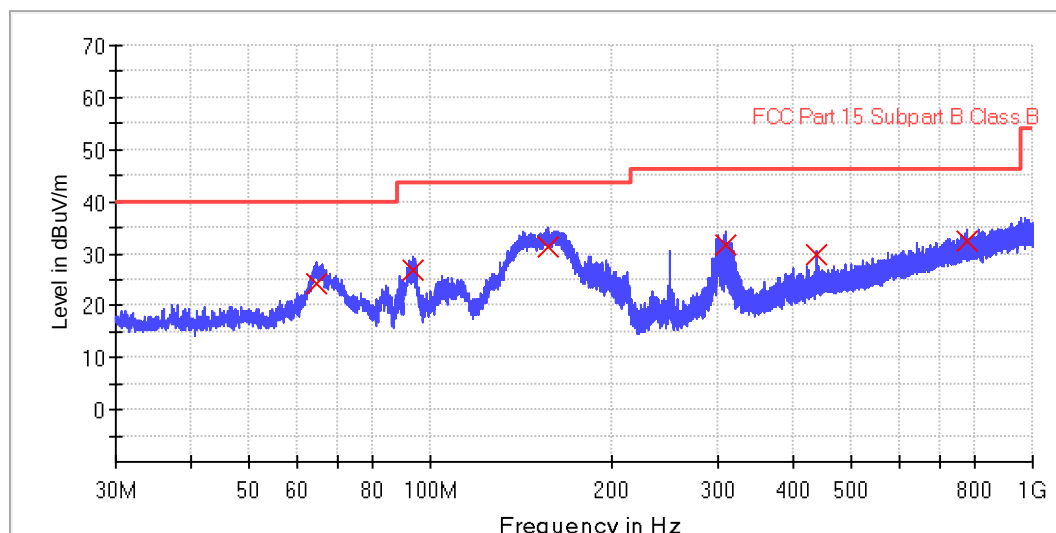
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Horizontal

Sweep Setup: RE_30M-1G_Sweep_3m [EMI radiated]

Hardware Setup: Radiated E Field 30MHz-1GHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	40.417 kHz	PK+	120 kHz	1.5 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
64.560000	24.1	1000.0	120.000	200.0	H	231.0	20.2	16.0	43.5
93.680000	26.7	1000.0	120.000	210.0	H	0.0	21.7	23.3	43.5
156.360000	31.2	1000.0	120.000	215.0	H	171.0	21.3	26.3	46.0
308.720000	31.8	1000.0	120.000	190.0	H	53.0	30.4	16.5	46.0
437.480000	29.7	1000.0	120.000	185.0	H	249.0	33.2	13.1	46.0
776.680000	32.3	1000.0	120.000	200.0	H	120.0	34.4	11.8	46.0

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

30-1000MHz Radiated Emission

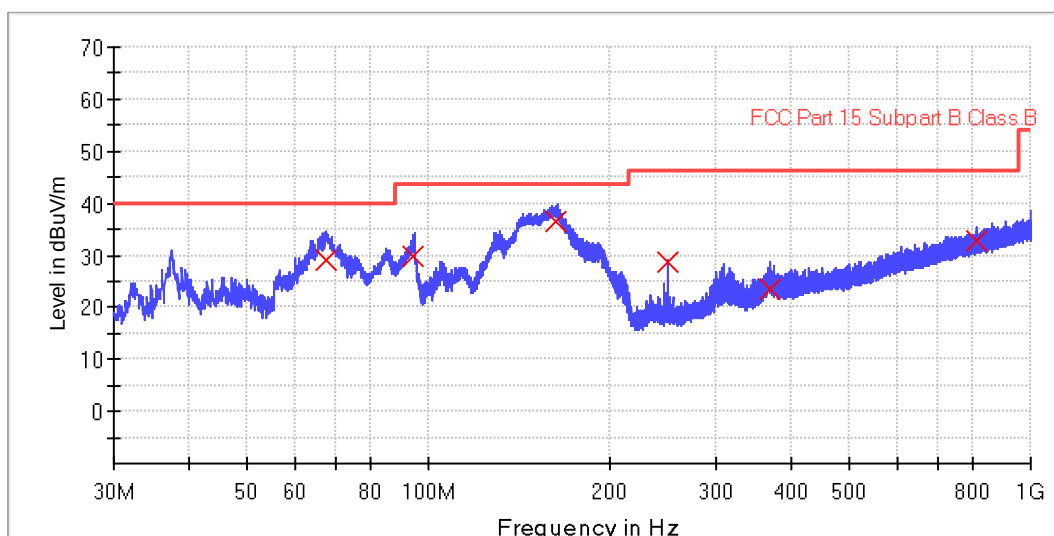
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Vertical

Sweep Setup: RE_30M-1G_Sweep_3m [EMI radiated]

Hardware Setup: Radiated E Field 30MHz-1GHz_3m
Receiver: [ESR 7]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	40.417 kHz	PK+	120 kHz	1.5 s	20 dB



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
67.360000	29.1	1000.0	120.000	110.0	V	294.0	19.6	10.9	40.0
94.120000	30.0	1000.0	120.000	120.0	V	149.0	15.6	13.6	43.5
162.480000	36.5	1000.0	120.000	110.0	V	179.0	21.5	7.0	43.5
250.000000	28.7	1000.0	120.000	100.0	V	98.0	20.6	17.3	46.0
370.200000	23.3	1000.0	120.000	110.0	V	245.0	24.4	22.7	46.0
815.760000	32.8	1000.0	120.000	100.0	V	128.0	33.6	13.2	46.0

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)



The worst case of Radiated Emission 1GHz-18GHz:

1-18G Radiated Emission Test

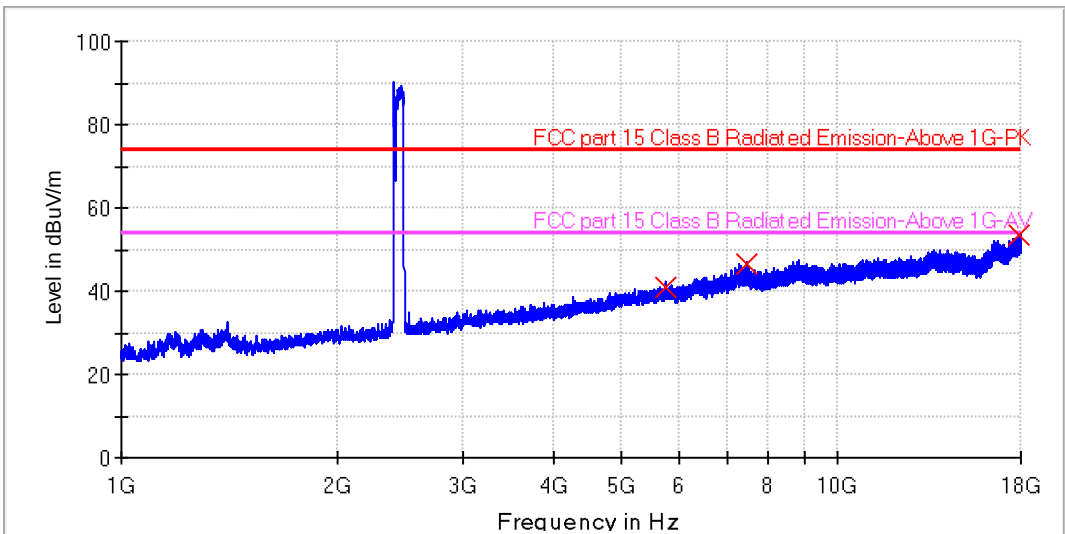
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
 Operator name: Xu Zheng
 Input: AC 120V 60Hz
 Sample No: WUX-0877560-006
 Test standard: FCC Part 15.209(a)
 Comment: Horizontal, Adapter Model: TPA-10D050200UU01

Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

Hardware Setup: FCC part15C Radiated E Field 1GHz-18GHz_3m_BONN
 Receiver: [FSV 40]
 Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6.3 GHz	441.667 kHz	PK+	1 MHz	1 s	0 dB
6.3 GHz - 18 GHz	487.5 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

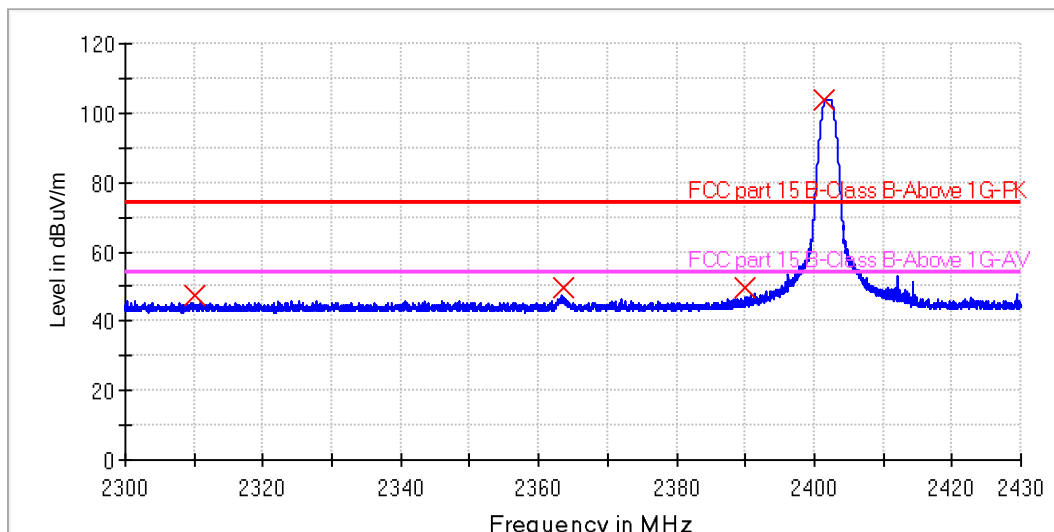
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
5753.500000	41.1	1000.0	210.0	H	181.0	1.8	32.9	74.0
7448.500000	46.7	1000.0	205.0	H	257.0	9.0	27.3	74.0
17840.500000	53.6	1000.0	195.0	H	138.0	22.1	20.4	74.0

Note: Emission level= Original Receiver Reading + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss -Amplifier gain

Sweep Setup: FCC_Band edge-2300-2430 Sweep 3m_without PA [EMI radiated]

Hardware Setup: 1-18G_3m_without PA
Receiver: [FSV 40]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
2.3 GHz - 2.43 GHz	26 kHz	PK+	1 MHz	1 s	20 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
2310.000000	47.2	1000.0	200.0	H	126.0	34.1	26.8	74.0
2363.500000	49.4	1000.0	210.0	H	187.0	34.3	24.6	74.0
2390.000000	49.8	1000.0	195.0	H	57.0	34.4	24.2	74.0

Note: Measure Level = Reading Level + Correct Factor
Correct Factor = Cable Loss + Antenna Factor



1-18G Radiated Emission Test

Common Information

EUT:Smart M Gateway

Model:THP23-ZB-X

Client:Zhejiang Lingzhu Technology Co., Ltd

Operating conditions:Power on, BLE transmitting, Data rate: 1Mbps, 2402M

Operator name:Xu Zheng

Input:AC 120V 60Hz

Sample No:WUX-0877560-006

Test standard:FCC Part 15.209(a)

Comment:Vertical, Adapter Model: TPA-10D050200UU01

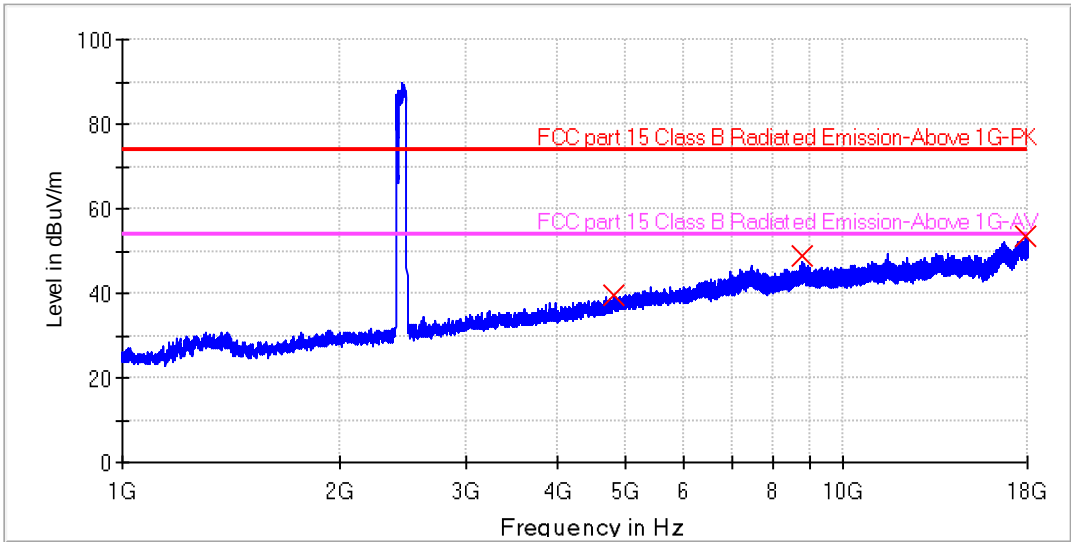
Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

Hardware Setup:FCC part15C Radiated E Field 1GHz-18GHz_3m_BONN

Receiver:[FSV 40]

Level Unit:dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6.3 GHz	441.667 kHz	PK+	1 MHz	1 s	0 dB
6.3 GHz - 18 GHz	487.5 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

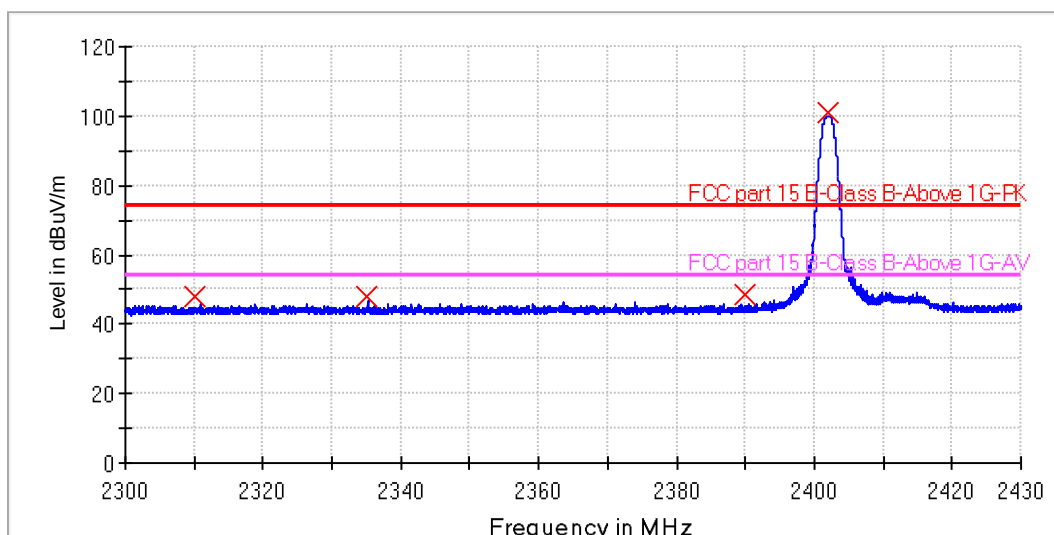
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
4803.500000	39.8	1000.0	130.0	V	102.0	-0.7	34.3	74.0
8783.000000	48.8	1000.0	125.0	V	97.0	11.7	25.2	74.0
17921.000000	53.6	1000.0	140.0	V	206.0	22.1	20.4	74.0

Note: Emission level= Original Receiver Reading + Correct Factor
Correct Factor = Antenna Factor + Cable Loss -Amplifier gain

Sweep Setup: FCC_Band edge-2300-2430 Sweep 3m_without PA [EMI radiated]

Hardware Setup: 1-18G_3m_without PA
Receiver: [FSV 40]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
2.3 GHz - 2.43 GHz	26 kHz	PK+	1 MHz	1 s	20 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
2310.000000	47.8	1000.0	125.0	V	268.0	34.1	26.2	74.0
2335.000000	47.8	1000.0	130.0	V	195.0	34.2	26.2	74.0
2390.000000	48.4	1000.0	145.0	V	303.0	34.4	25.6	74.0
2402.000000	101.3	1000.0	140.0	V	132.0	34.5	--	--

Note: Measure Level = Reading Level + Correct Factor
Correct Factor = Cable Loss + Antenna Factor



1-18G Radiated Emission Test

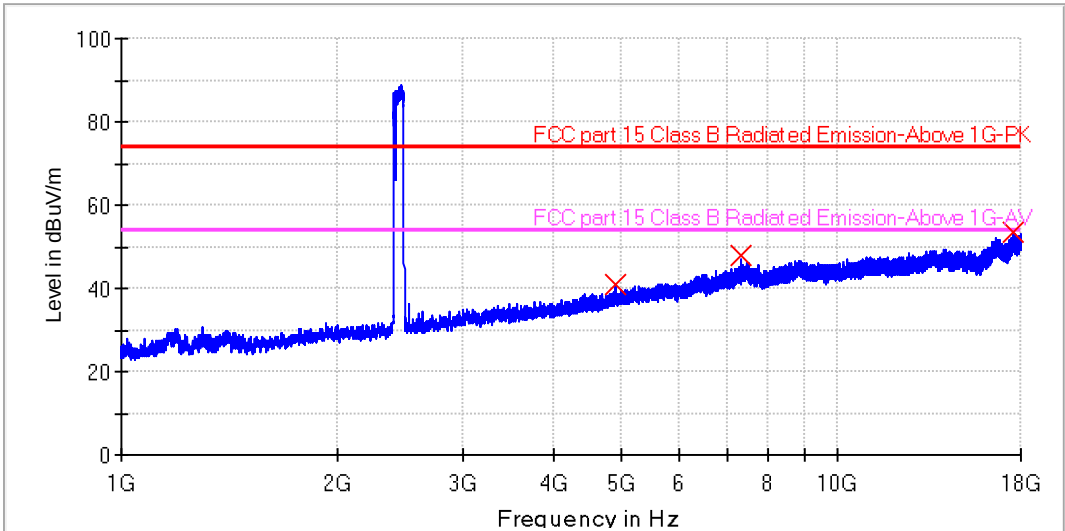
Common Information

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, BLE transmitting, Data rate: 1Mbps, 2440M
Operator name:	Xu Zheng
Input:	AC 120V 60Hz
Sample No:	WUX-0877560-006
Test standard:	FCC Part 15.209(a)
Comment:	Horizontal, Adapter Model: TPA-10D050200UU01

Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

Hardware Setup:	FCC part15C Radiated E Field 1GHz-18GHz_3m_BONN
Receiver:	[FSV 40]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6.3 GHz	441.667 kHz	PK+	1 MHz	1 s	0 dB
6.3 GHz - 18 GHz	487.5 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
4880.500000	41.0	1000.0	210.0	H	122.0	-0.4	33.0	74.0
7319.500000	47.9	1000.0	195.0	H	143.0	8.7	26.1	74.0
17598.500000	53.5	1000.0	200.0	H	282.0	22.0	20.5	74.0

Note: Emission level= Original Receiver Reading + Correct Factor
Correct Factor = Antenna Factor + Cable Loss -Amplifier gain

1-18G Radiated Emission Test

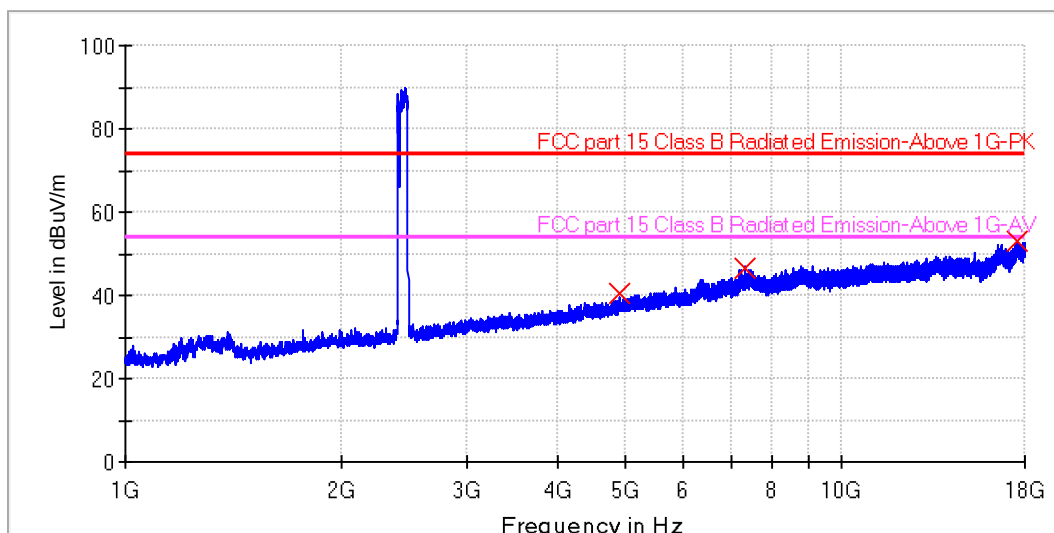
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2440M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Vertical, Adapter Model: TPA-10D050200UU01

Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

Hardware Setup: FCC part15C Radiated E Field 1GHz-18GHz_3m_BONN
Receiver: [FSV 40]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6.3 GHz	441.667 kHz	PK+	1 MHz	1 s	0 dB
6.3 GHz - 18 GHz	487.5 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
4879.500000	40.4	1000.0	140.0	V	133.0	-0.4	33.6	74.0
7319.000000	46.6	1000.0	150.0	V	145.0	8.7	27.5	74.0
17509.000000	53.1	1000.0	135.0	V	299.0	21.8	20.9	74.0

Note: Emission level= Original Receiver Reading + Correct Factor
Correct Factor = Antenna Factor + Cable Loss -Amplifier gain



1-18G Radiated Emission Test

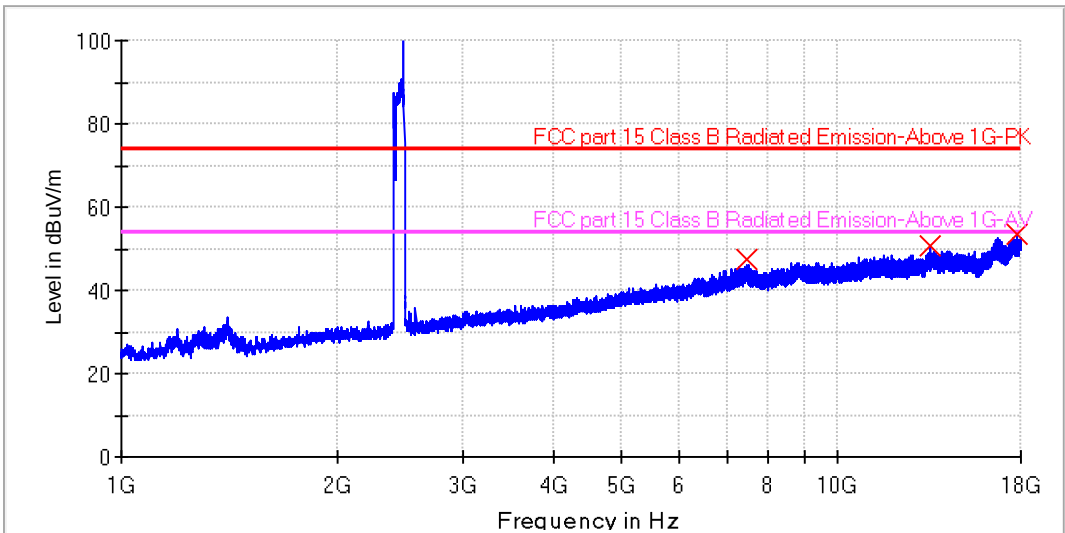
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2480M
 Operator name: Xu Zheng
 Input: AC 120V 60Hz
 Sample No: WUX-0877560-006
 Test standard: FCC Part 15.209(a)
 Comment: Horizontal, Adapter Model: TPA-10D050200UU01

Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

Hardware Setup: FCC part15C Radiated E Field 1GHz-18GHz_3m_BONN
 Receiver: [FSV 40]
 Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6.3 GHz	441.667 kHz	PK+	1 MHz	1 s	0 dB
6.3 GHz - 18 GHz	487.5 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

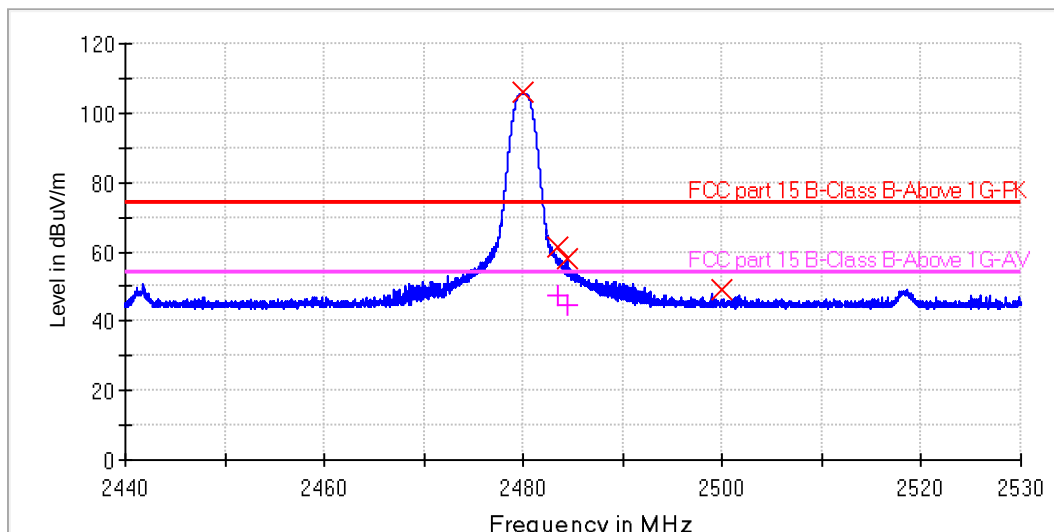
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
7440.000000	47.6	1000.0	220.0	H	96.0	8.9	26.4	74.0
13447.000000	50.5	1000.0	190.0	H	199.0	17.2	23.5	74.0
17774.500000	53.4	1000.0	200.0	H	140.0	22.1	20.6	74.0

Note: Emission level= Original Receiver Reading + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier gain

Sweep Setup: FCC_Band edge-2440-2530 Sweep 3m_without PA [EMI radiated]

Hardware Setup: 1-18G_3m_without PA
Receiver: [FSV 40]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
2.44 GHz - 2.53 GHz	18 kHz	PK+	1 MHz	1 s	20 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBm)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Limit - AVG (dBuV/m)
2480.000000	105.8	---	1000.0	205.0	H	195.0	34.8	---	---	---
2483.500000	61.5	47.6	1000.0	190.0	H	286.0	34.8	12.5	74.0	54.0
2484.500000	58.2	44.7	1000.0	200.0	H	203.0	34.8	15.8	74.0	54.0
2500.000000	49.1	---	1000.0	210.0	H	172.0	34.8	25.0	74.0	---

Note: Measure Level = Reading Level + Correct Factor
Correct Factor = Cable Loss + Antenna Factor



1-18G Radiated Emission Test

Common Information

EUT:Smart M Gateway

Model:THP23-ZB-X

Client:Zhejiang Lingzhu Technology Co., Ltd

Operating conditions:Power on, BLE transmitting, Data rate: 1Mbps, 2480M

Operator name:Xu Zheng

Input:AC 120V 60Hz

Sample No:WUX-0877560-006

Test standard:FCC Part 15.209(a)

Comment:Vertical, Adapter Model: TPA-10D050200UU01

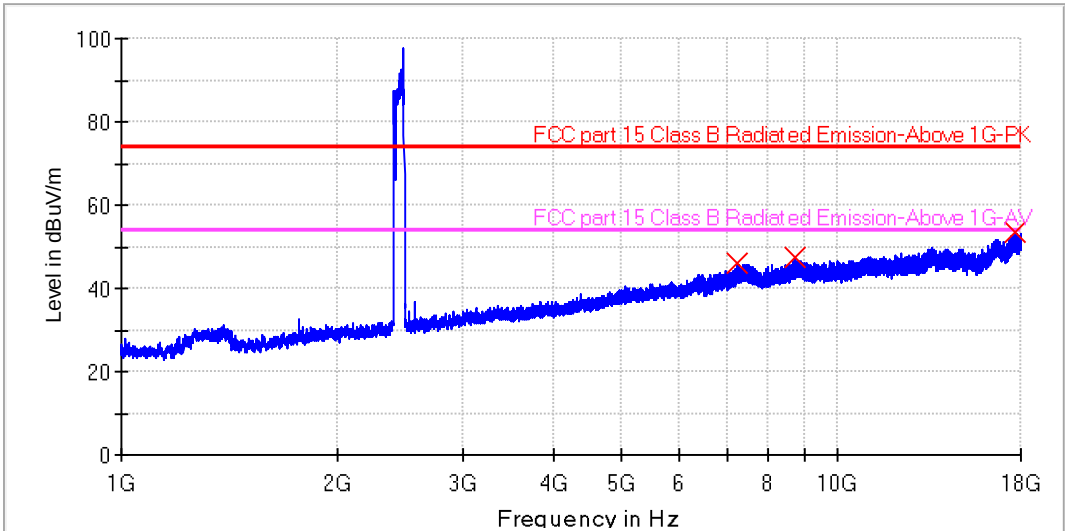
Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

Hardware Setup:FCC part15C Radiated E Field 1GHz-18GHz_3m_BONN

Receiver:[FSV 40]

Level Unit:dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
1 GHz - 6.3 GHz	441.667 kHz	PK+	1 MHz	1 s	0 dB
6.3 GHz - 18 GHz	487.5 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

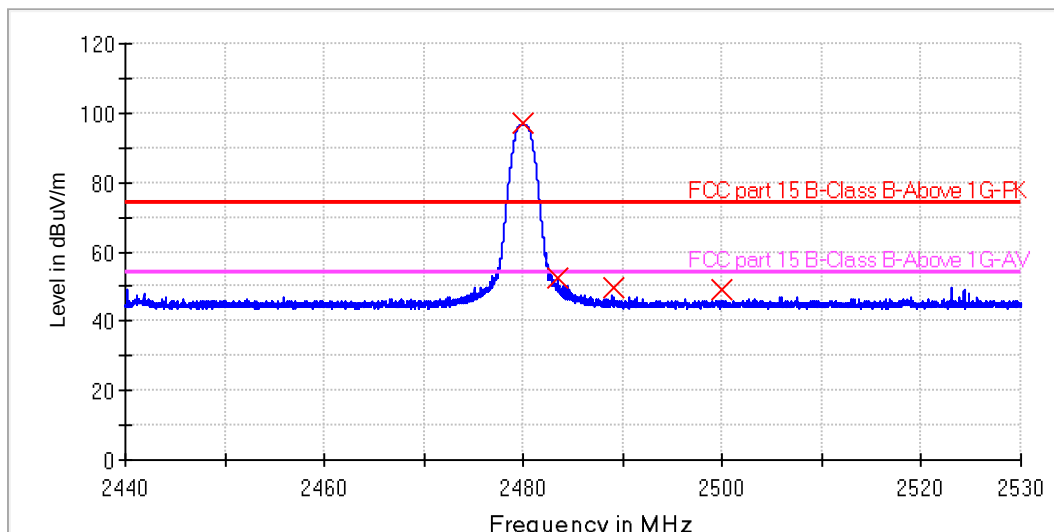
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
7247.000000	46.2	1000.0	125.0	V	192.0	8.8	27.8	74.0
8717.500000	47.4	1000.0	130.0	V	84.0	11.4	26.6	74.0
17659.500000	53.7	1000.0	130.0	V	126.0	22.0	20.3	74.0

Note: Emission level= Original Receiver Reading + Correct Factor
Correct Factor = Antenna Factor + Cable Loss -Amplifier gain

Sweep Setup: FCC_Band edge-2440-2530 Sweep 3m_without PA [EMI radiated]

Hardware Setup: 1-18G_3m_without PA
Receiver: [FSV 40]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
2.44 GHz - 2.53 GHz	18 kHz	PK+	1 MHz	1 s	20 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
2480.000000	97.0	1000.0	135.0	V	172.0	34.8	---	---
2483.500000	52.5	1000.0	140.0	V	165.0	34.8	21.5	74.0
2489.000000	49.4	1000.0	130.0	V	60.0	34.8	24.6	74.0
2500.000000	49.3	1000.0	125.0	V	118.0	34.8	24.7	74.0

Note: Measure Level = Reading Level + Correct Factor

Correct Factor = Cable Loss + Antenna Factor



The worst case of Radiated Emission 18GHz-25GHz:

18-25G Radiated Emission

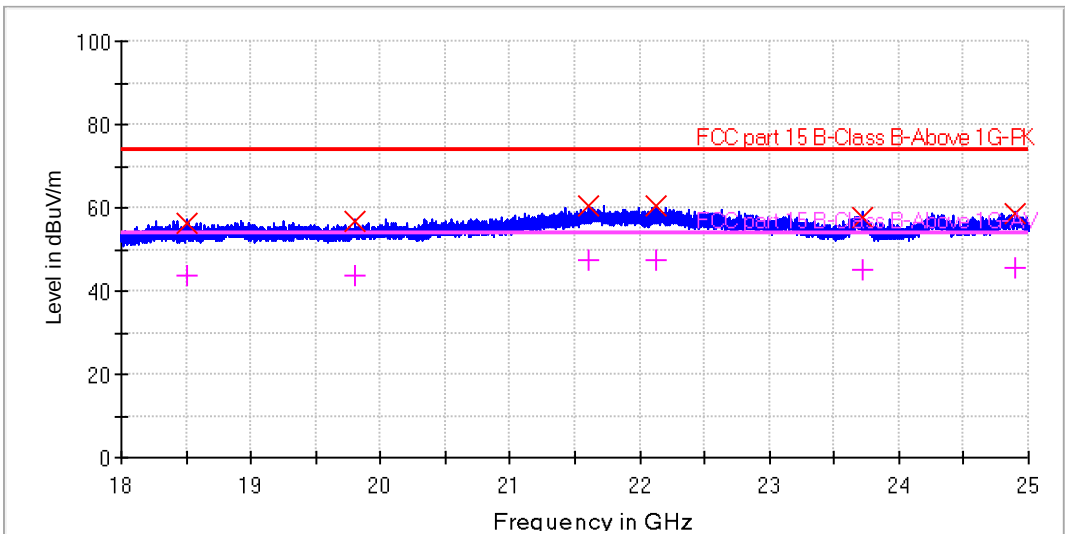
Common Information

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name:	Xu Zheng
Input:	AC 120V 60Hz
Sample No:	WUX-0877560-006
Test standard:	FCC Part 15.209(a)
Comment:	Horizontal, Adapter Model: TPA-10D050200UU01

Sweep Setup: FCC_RE_18-25G_Sweep_3m [EMI radiated]

Hardware Setup:	18-40GHz_3m
Receiver:	[FSV 40]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
18 GHz - 25 GHz	500 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - Average (dB)
18505.000000	56.3	43.7	1000.0	200.0	H	107.0	14.1	17.7	74.0	10.3
19795.500000	57.0	43.8	1000.0	200.0	H	312.0	14.8	17.0	74.0	10.2
21608.000000	60.4	47.6	1000.0	220.0	H	121.0	17.7	13.6	74.0	6.4
22125.500000	60.6	47.6	1000.0	210.0	H	159.0	18.1	13.5	74.0	6.4
23722.000000	57.6	45.1	1000.0	190.0	H	211.0	15.8	16.4	74.0	8.9
24894.000000	58.6	45.5	1000.0	200.0	H	307.0	16.1	15.4	74.0	8.5

(continuation of the "Limit and Margin" table from column 18 ...)

Frequency (MHz)	Limit - Average (dBuV/m)
18505.000000	54.0
19795.500000	54.0
21608.000000	54.0
22125.500000	54.0
23722.000000	54.0
24894.000000	54.0

Note: Emission level= Original Receiver Reading + Correct Factor
Correct Factor = Antenna Factor + Cable Loss -Amplifier gain

18-25G Radiated Emission

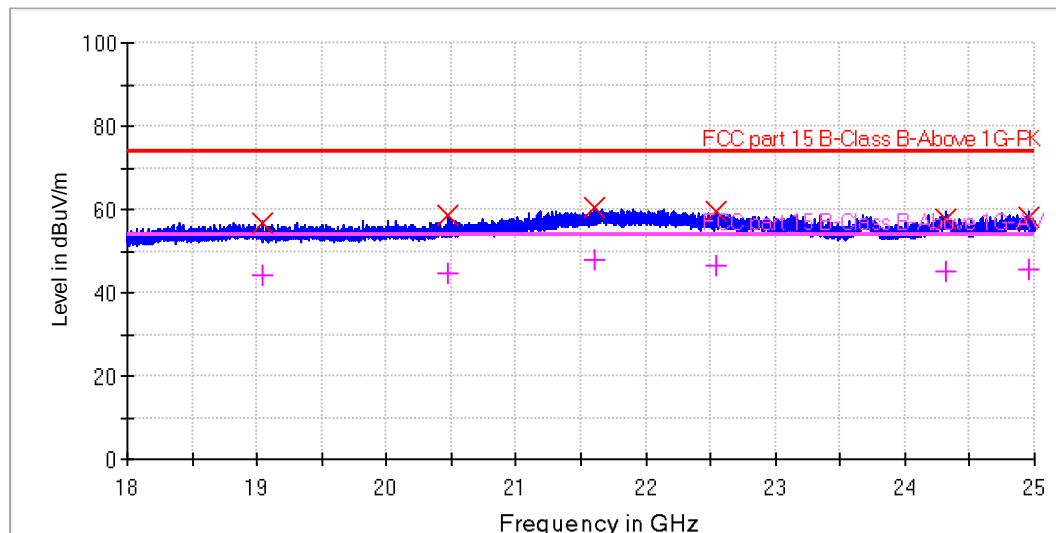
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, BLE transmitting, Data rate: 1Mbps, 2402M
Operator name: Xu Zheng
Input: AC 120V 60Hz
Sample No: WUX-0877560-006
Test standard: FCC Part 15.209(a)
Comment: Vertical, Adapter Model: TPA-10D050200UU01

Sweep Setup: FCC_RE_18-25G_Sweep_3m [EMI radiated]

Hardware Setup: 18-40GHz_3m
Receiver: [FSV 40]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
18 GHz - 25 GHz	500 kHz	PK+	1 MHz	1 s	0 dB



Limit and Margin

Frequency (MHz)	MaxPeak (dBuV/m)	Average (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - Average (dB)
19039.000000	56.8	44.3	1000.0	130.0	V	271.0	14.3	17.2	74.0	9.7
20478.000000	58.4	44.8	1000.0	120.0	V	117.0	15.1	15.6	74.0	9.2
21609.000000	60.5	47.7	1000.0	120.0	V	177.0	17.7	13.5	74.0	6.3
22545.500000	59.5	46.6	1000.0	150.0	V	186.0	17.8	14.5	74.0	7.4
24316.500000	57.9	45.2	1000.0	120.0	V	40.0	16.1	16.1	74.0	8.8
24951.500000	58.3	45.5	1000.0	135.0	V	261.0	16.0	15.7	74.0	8.5

(continuation of the "Limit and Margin" table from column 18 ...)

Frequency (MHz)	Limit - Average (dBuV/m)
19039.000000	54.0
20478.000000	54.0
21609.000000	54.0
22545.500000	54.0
24316.500000	54.0
24951.500000	54.0

Note: Emission level= Original Receiver Reading + Correct Factor
Correct Factor = Antenna Factor + Cable Loss -Amplifier gain

11 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	487/641405	2024-4-8	2025-4-7
	RF Test System	Rohde & Schwarz	TS8997	487/391835	2024-11-23	2025-11-22
	Coaxial Cable	Rohde & Schwarz	RF03	/	2024-7-27	2025-7-26
RE	EMI Test Receiver	Rohde & Schwarz	ESR7	487/632315	2024-4-8	2025-4-7
	EMI Test Receiver	Rohde & Schwarz	ESR7	487/632316	2024-4-8	2025-4-7
	Spectrum analyzer	Rohde & Schwarz	FSV3044	487/642307	2024-4-8	2025-4-7
	Broadband Test Antenna	Schwarzbeck	VULB 9168	487/622345	2024-3-15	2025-3-14
	Horn Antenna	Rohde & Schwarz	3115PB	487/622346	2024-1-9	2025-1-8
					2025-1-8	2026-1-7
	Pre-amplifier	Rohde & Schwarz	SCU-18F	487/402318	2024-4-8	2025-4-7
	Pre-amplifier	BONN	BLMA0118-1M	487/401411	2024-4-8	2025-4-7
	Loop antenna	Rohde & Schwarz	HFH2-Z2	487/621128	2024-11-23	2025-11-22
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	487/622347	2024-8-19	2025-8-18
	3m Semi anechoic chamber	TDK	9.2m×6.2m×6.2m	487/772307	2023-2-24	2026-2-23
	3m Fully anechoic chamber	TDK	9.2m×6.2m×6.2m	487/772304	2023-3-30	2026-3-29
CE	Coaxial Cable	Rohde & Schwarz	RF02	/	2024-7-27	2025-7-26
	EMI Test Receiver	Rohde & Schwarz	ESW8	487/631911	2024-4-8	2025-4-7
	LISN	Rohde & Schwarz	NSLK8127	487/601428	2024-9-2	2025-9-1

Measurement Software Information			
Test Item	Software	Manufacturer	Version
C	MTS 8310	MAXWELL	2.0.0.0
RE	EMC 32	Rohde & Schwarz	V10.60.20
CE	EMC 32	Rohde & Schwarz	V10.60.20

C - Conducted RF tests

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

12 System Measurement Uncertainty

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

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, 3.07dB
Uncertainty for Radiated Emission in 3m Semi anechoic chamber 9kHz-30MHz	4.38dB
Uncertainty for Radiated Emission in 3m Semi anechoic chamber 30MHz-1000MHz	Horizontal: 4.12dB Vertical: 4.30dB
Uncertainty for Radiated Emission in 3m Fully anechoic chamber 1000MHz-18000MHz	5.04dB
Uncertainty for Radiated Emission 18000MHz-40000MHz	5.42dB
Uncertainty for Conducted RF test	RF Power Conducted: 1.32dB Frequency test involved:1%

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2023, clause 4.3.3.



13 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



14 Photographs of EUT

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

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