



FCC - TEST REPORT

Report Number : 4842024420600C 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.

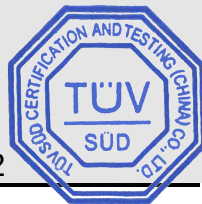
Address : Room 302, No 1 Building Huace Center, Xihu District 310000,
Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF
CHINA

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: Zigbee: 2405MHz-2480MHz

No. of Operated Channel: 16

Modulation: 16-ary orthogonal modulation, O-QPSK PHY

Channel list:

Zigbee					
Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)
11	2405	17	2435	23	2465
12	2410	18	2440	24	2470
13	2415	19	2445	25	2475
14	2420	20	2450	26	2480
15	2425	21	2455		
16	2430	22	2460		

Hardware Version: V1.3.0

Software Version: V1.0.4

Antenna Type: Plug-in antenna

Antenna Gain: 3.70dBi

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 Zigbee
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	13-19	Site 1	☒	☐	☐
§15.247 (b) (3)	Conducted peak output power	20-21	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	22-25	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	26-27	Site 1	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	28-33	Site 1	☒	☐	☐
§15.247(d)	Band edge	34-36	Site 1	☒	☐	☐
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	38-67	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 3.70dBi. 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 5 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:

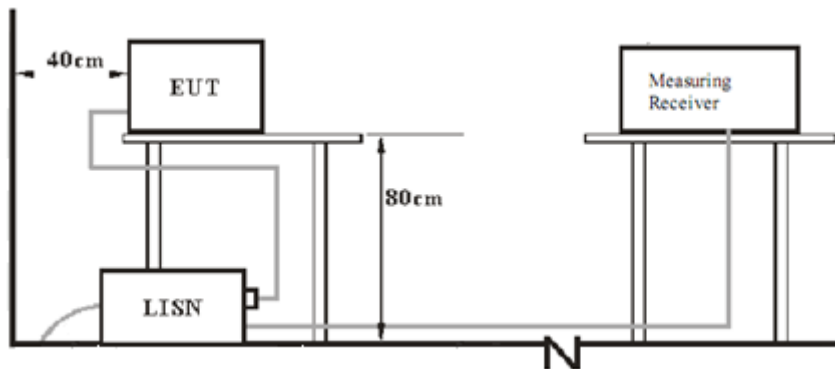
Xin Feng
Project Engineer

Tested by:

Xu Zheng
Test Engineer

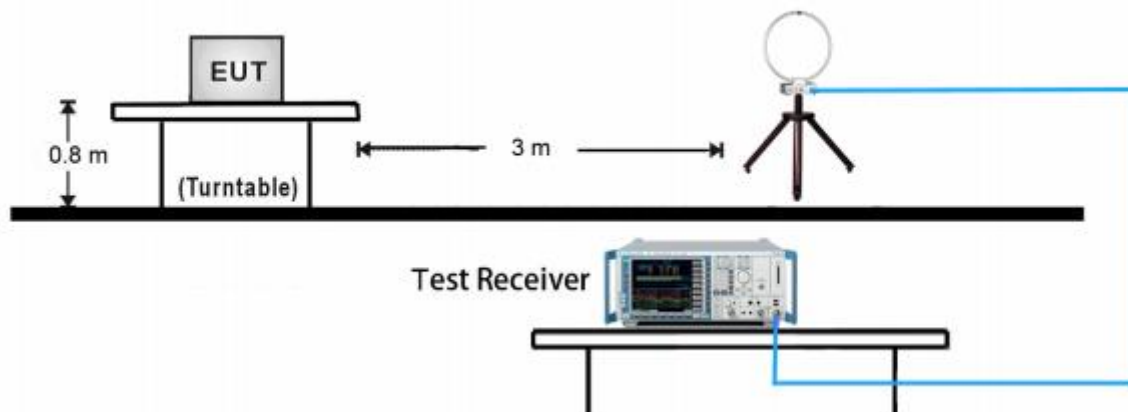
8 Test Setups

7.1 AC Power Line Conducted Emission test setups

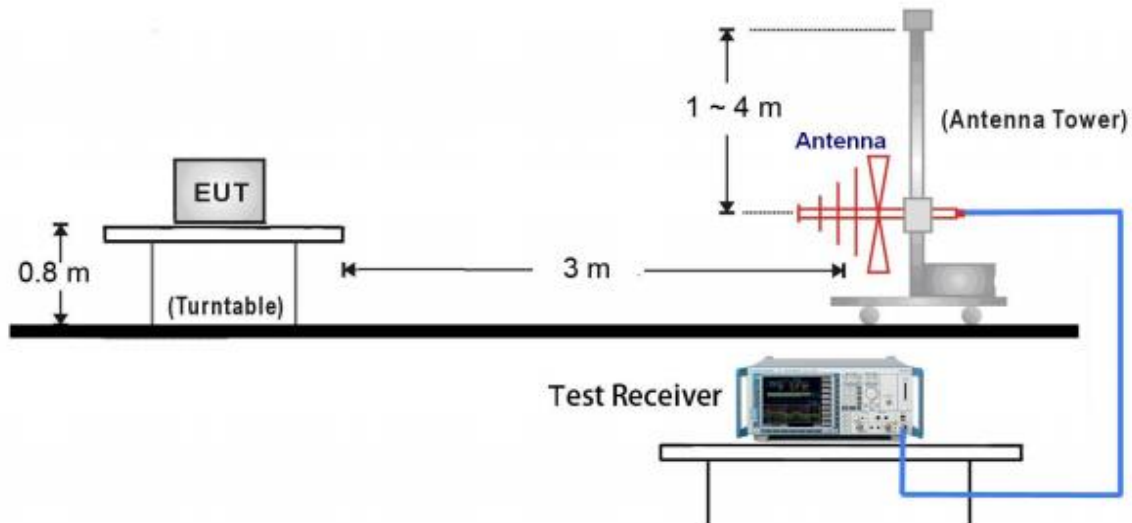


7.2 Radiated test setups

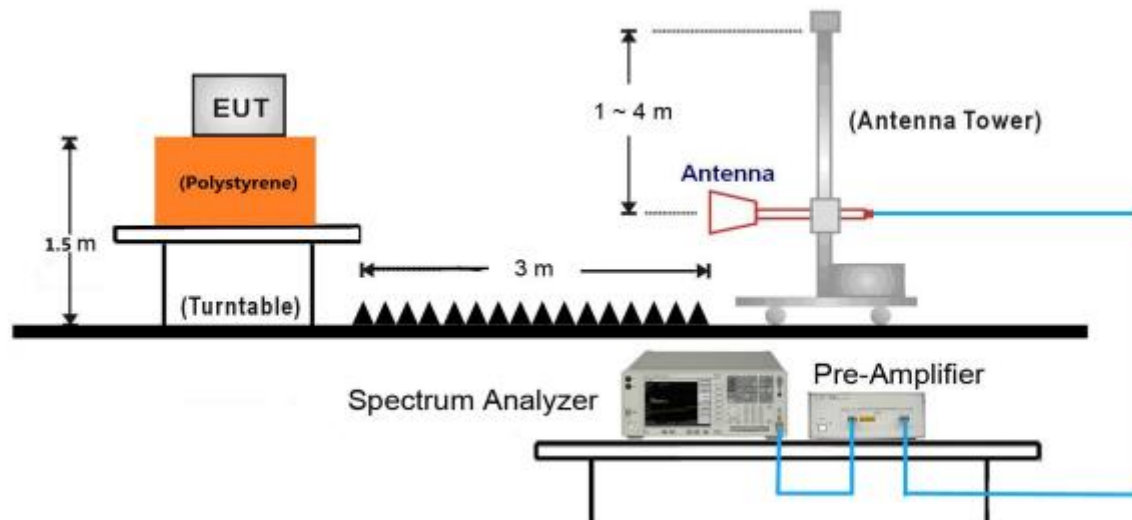
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:

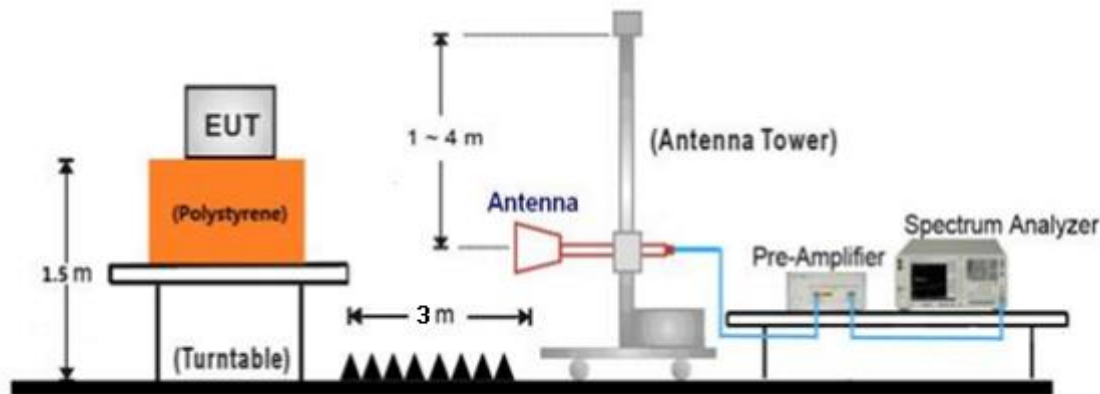


1GHz ~ 18GHz Test Setup:

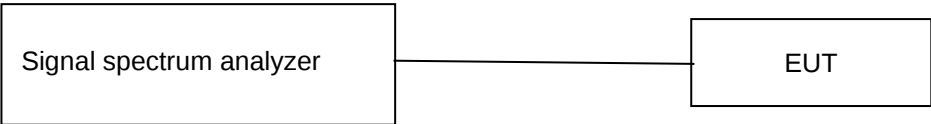




18GHz ~ 25GHz Test Setup:



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)
Zigbee	11	250kbps	O-QPSK	80
	18			80
	26			80

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

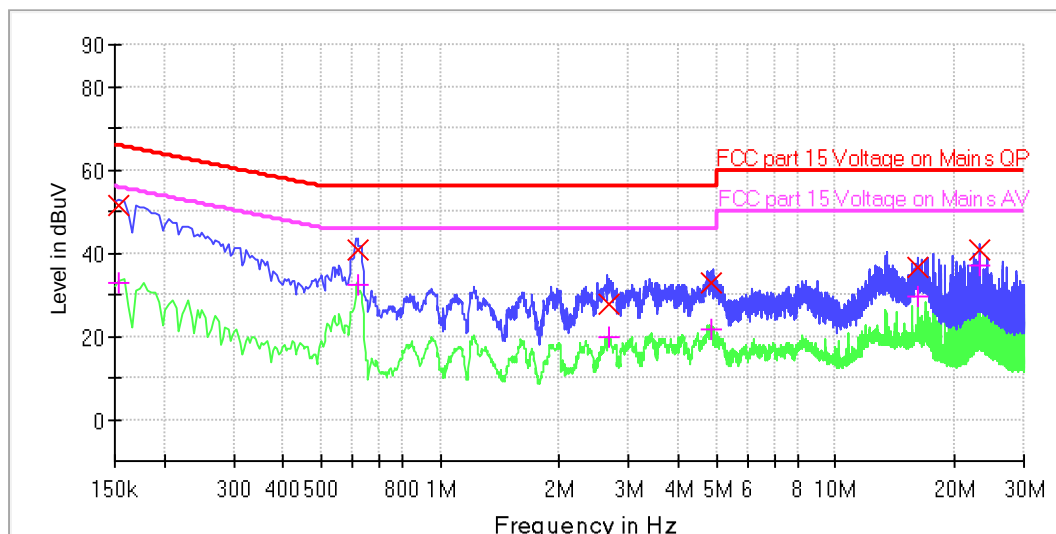
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.154000	51.4	32.6	1000.0	9.000	10.6	14.4	65.8	23.2	55.8
0.618000	40.9	32.1	1000.0	9.000	10.5	15.1	56.0	13.9	46.0
2.658000	27.8	19.6	1000.0	9.000	10.6	28.2	56.0	26.4	46.0
4.842000	32.8	21.6	1000.0	9.000	10.6	23.2	56.0	24.4	46.0
16.230000	36.6	29.4	1000.0	9.000	11.0	23.4	60.0	20.6	50.0
23.130000	40.6	36.9	1000.0	9.000	11.2	19.4	60.0	13.1	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

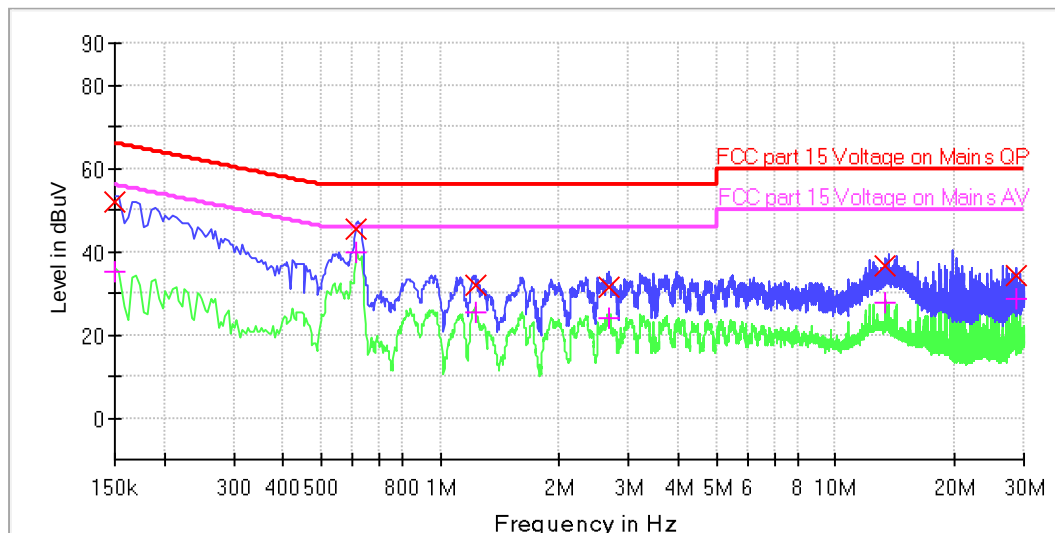
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.150000	52.0	34.9	1000.0	9.000	10.6	14.0	66.0	21.1	56.0
0.614000	45.5	39.7	1000.0	9.000	10.5	10.6	56.0	6.3	46.0
1.226000	31.9	25.6	1000.0	9.000	10.5	24.1	56.0	20.4	46.0
2.686000	31.5	23.8	1000.0	9.000	10.6	24.5	56.0	22.2	46.0
13.418000	36.5	27.6	1000.0	9.000	10.9	23.5	60.0	22.4	50.0
28.686000	34.3	28.8	1000.0	9.000	11.4	25.7	60.0	21.2	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

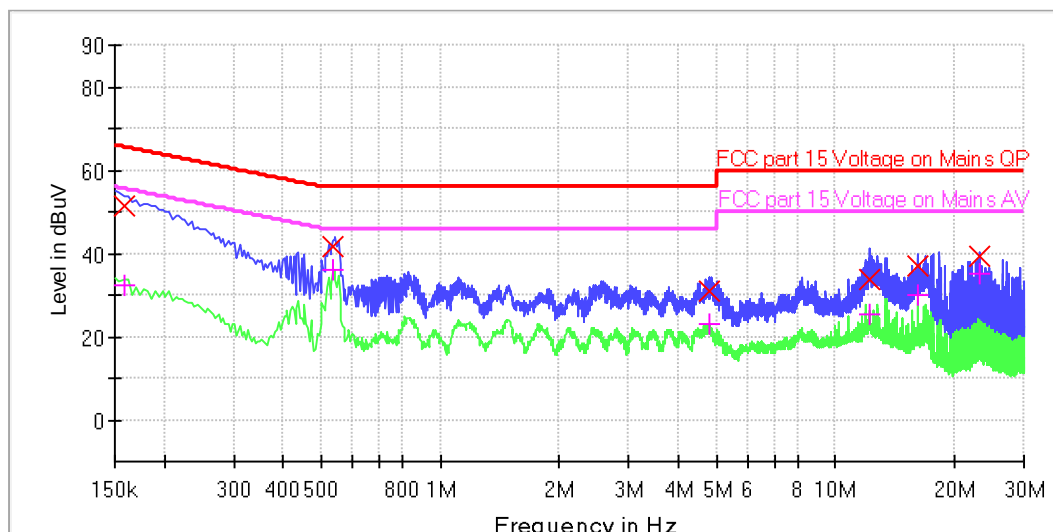
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.158000	51.2	32.3	1000.0	9.000	10.6	14.3	65.6	23.2	55.6
0.534000	41.8	36.1	1000.0	9.000	10.5	14.2	56.0	9.9	46.0
4.774000	31.0	23.1	1000.0	9.000	10.6	25.0	56.0	22.9	46.0
12.194000	33.5	25.4	1000.0	9.000	10.9	26.5	60.0	24.6	50.0
16.226000	36.9	30.1	1000.0	9.000	11.0	23.1	60.0	20.0	50.0
23.126000	39.5	35.0	1000.0	9.000	11.2	20.5	60.0	15.0	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

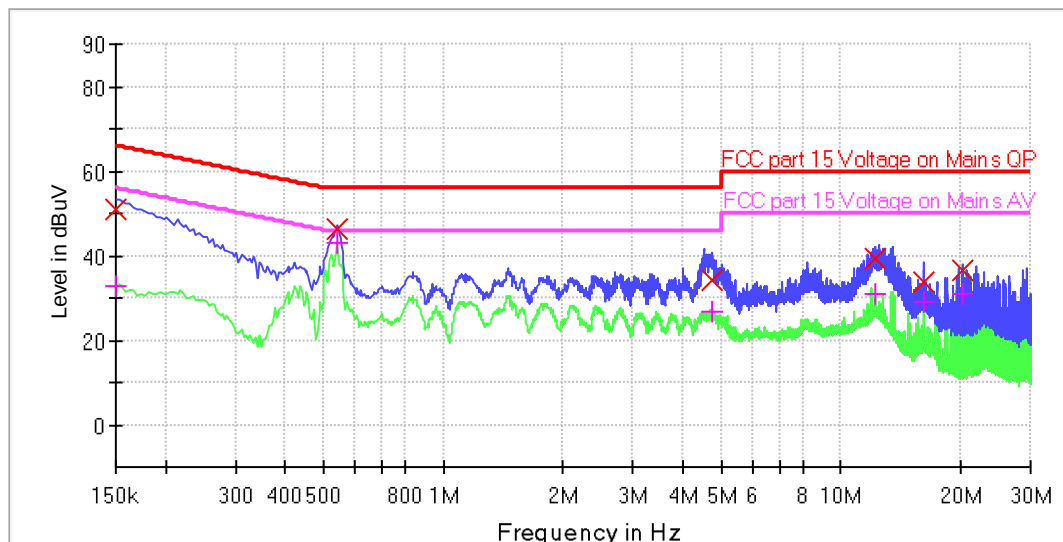
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, Zigbee transmitting, 2405MHz
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	51.0	32.9	1000.0	9.000	10.6	15.0	66.0	23.1	56.0
0.538000	46.1	42.9	1000.0	9.000	10.5	9.9	56.0	3.1	46.0
4.762000	34.4	26.8	1000.0	9.000	10.6	21.6	56.0	19.2	46.0
12.198000	39.4	31.1	1000.0	9.000	10.9	20.6	60.0	18.9	50.0
16.166000	33.6	29.0	1000.0	9.000	11.0	26.4	60.0	21.0	50.0
20.258000	36.4	30.9	1000.0	9.000	11.0	23.6	60.0	19.1	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

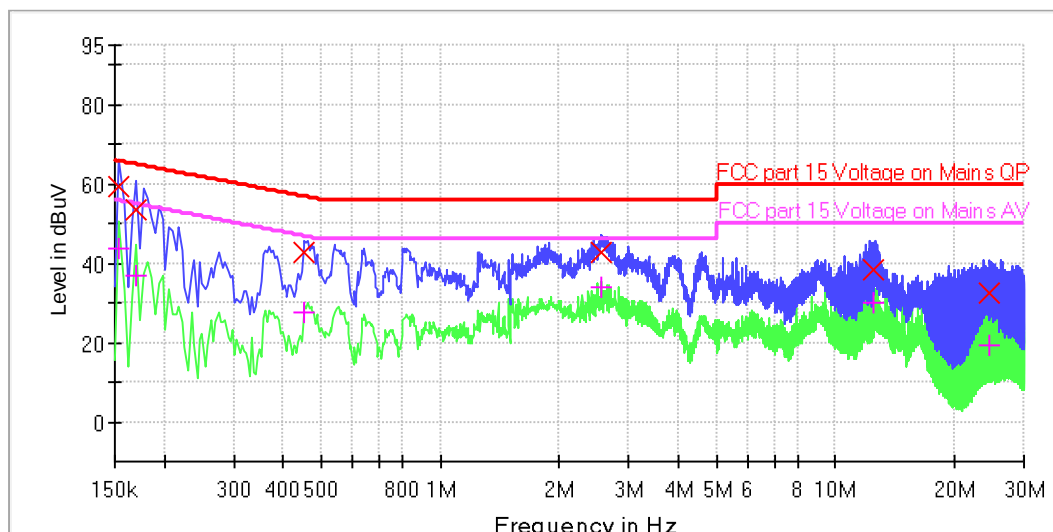
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, Zigbee transmitting, 2405MHz
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	59.4	43.9	1000.0	9.000	10.1	6.4	65.8	11.9	55.8
0.170000	53.7	36.8	1000.0	9.000	10.1	11.3	65.0	18.2	55.0
0.454000	42.6	27.8	1000.0	9.000	10.1	14.2	56.8	19.0	46.8
2.546000	42.7	33.7	1000.0	9.000	10.2	13.3	56.0	12.3	46.0
12.518000	38.3	30.1	1000.0	9.000	10.5	21.7	60.0	19.9	50.0
24.430000	32.7	19.4	1000.0	9.000	10.7	27.3	60.0	30.7	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

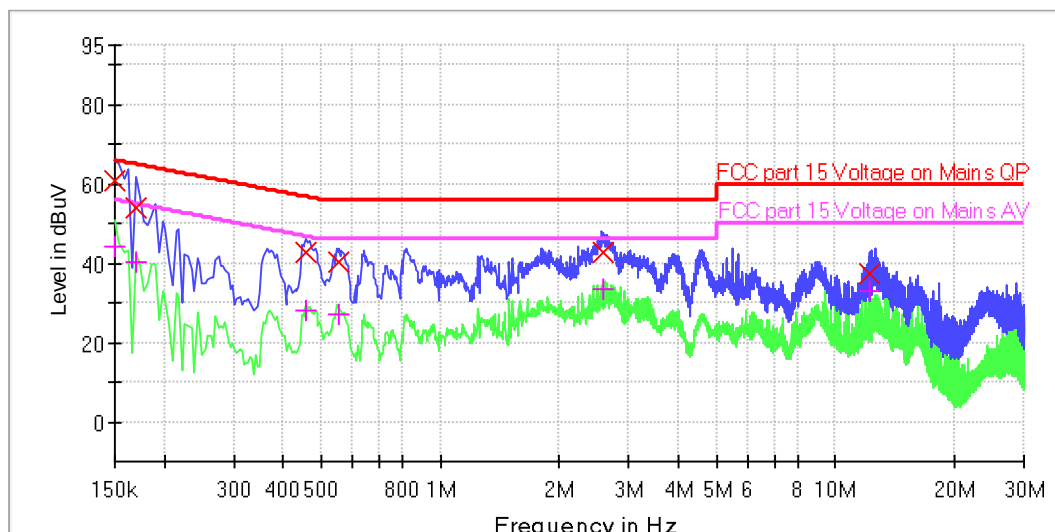
EUT Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating Conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.150000	61.0	44.2	1000.0	9.000	10.1	5.0	66.0	11.8	56.0
0.170000	53.8	40.1	1000.0	9.000	10.1	11.2	65.0	14.9	55.0
0.458000	42.7	28.1	1000.0	9.000	10.1	14.0	56.7	18.6	46.7
0.554000	40.4	27.3	1000.0	9.000	10.1	15.6	56.0	18.7	46.0
2.570000	42.8	33.7	1000.0	9.000	10.2	13.2	56.0	12.3	46.0
12.198000	37.3	32.8	1000.0	9.000	10.5	22.7	60.0	17.2	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:

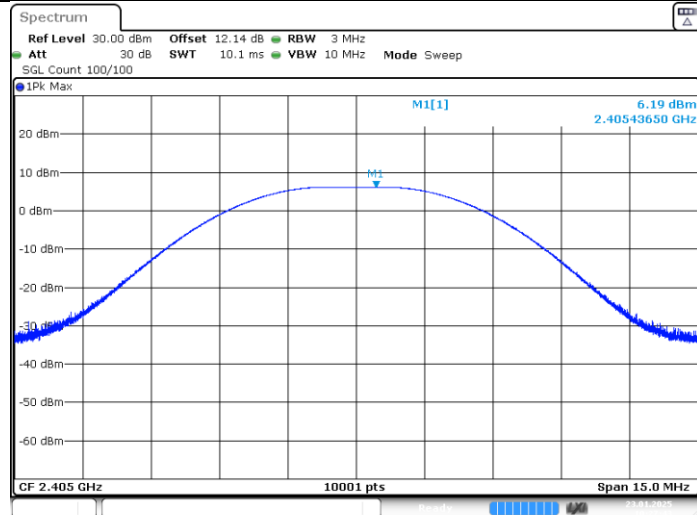
Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 1	≤ 30

Test result as below table

Bluetooth LE Test Result

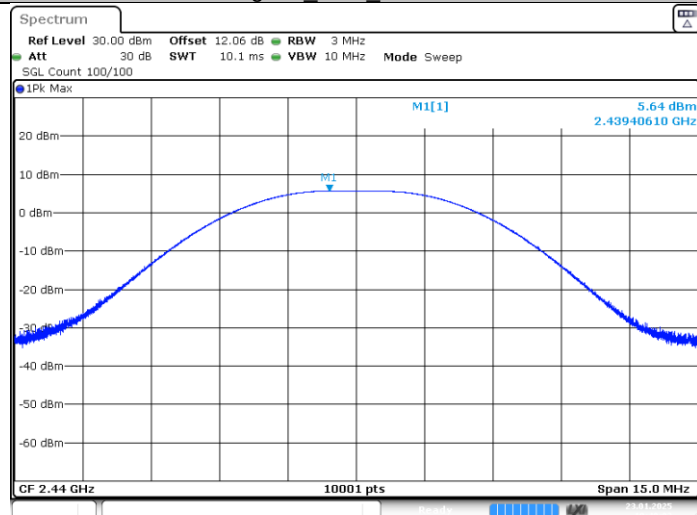
Test Mode	Frequency (MHz)	Conducted Peak Output Power (dBm) §15.247 (b) (3)		
		Result	limit	Verdict
Zigbee	2405MHz	6.19	≤ 30	Pass
	2440MHz	5.64	≤ 30	Pass
	2480MHz	5.76	≤ 30	Pass

Zigbee_Ant1_2405MHz



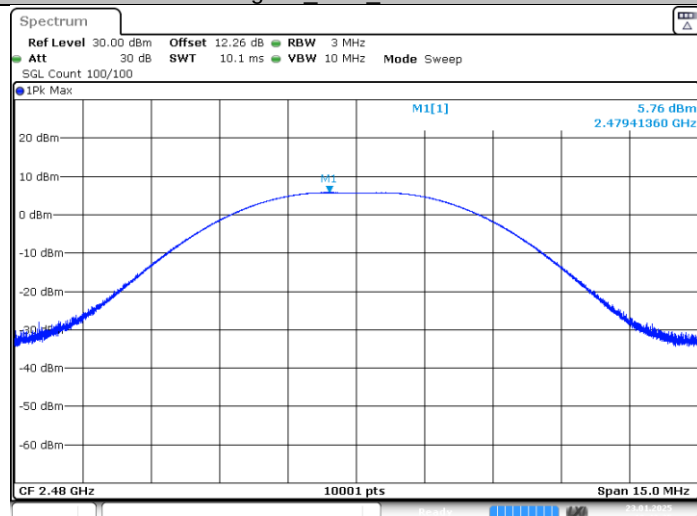
Date: 23. JAN. 2025 10:27:44

Zigbee_Ant1_2440MHz



Date: 23. JAN. 2025 10:40:03

Zigbee_Ant1_2480MHz



Date: 23. JAN. 2025 10:42:25

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]

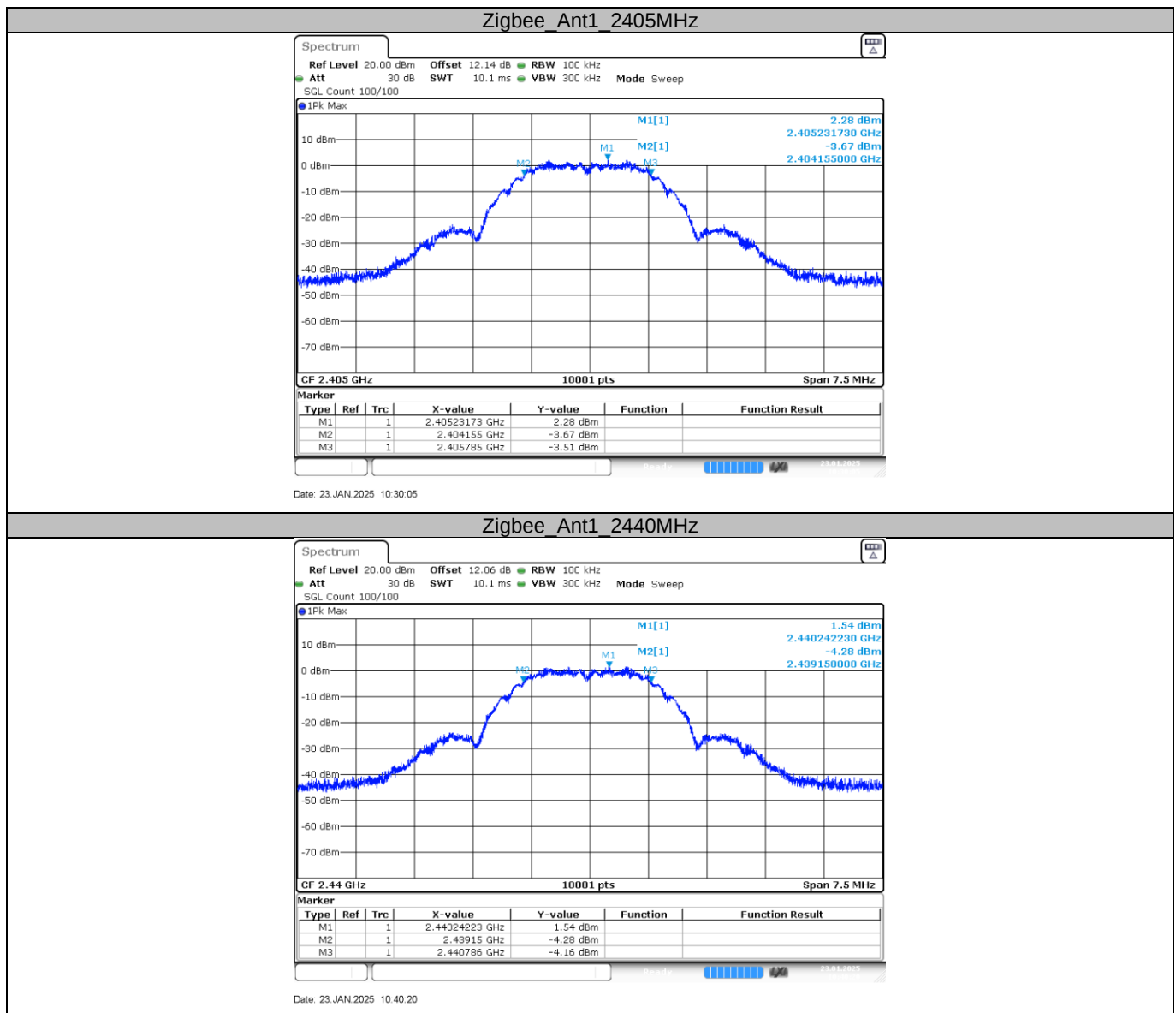
 ≥ 500

--

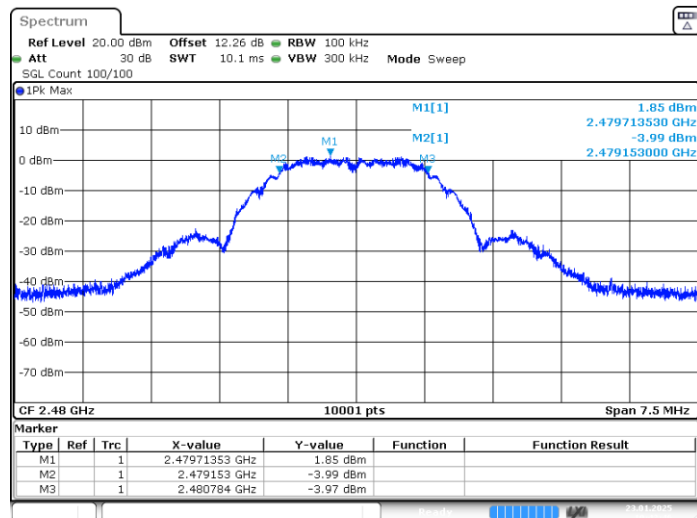
Test result

Test Mode	Frequency (MHz)	6dB bandwidth (MHz)		Result	99% occupied bandwidth MHz
		result	limit	verdict	
Zigbee	2405	1.631	≥ 0.5	Pass	2.248
	2440	1.637	≥ 0.5	Pass	2.248
	2480	1.631	≥ 0.5	Pass	2.254

6dB Bandwidth



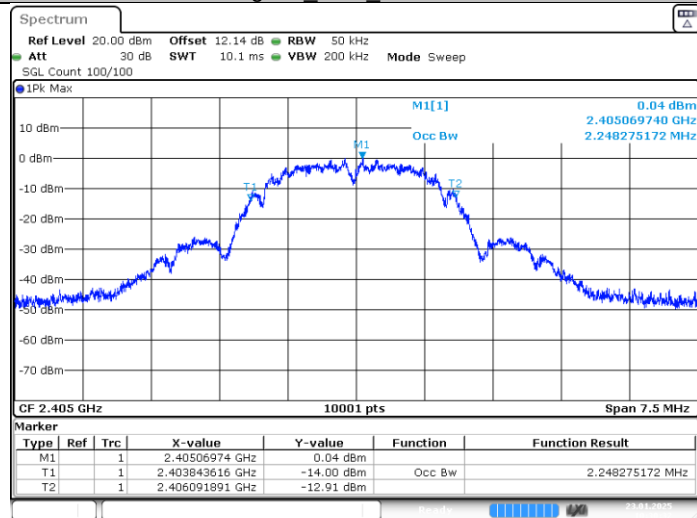
Zigbee_Ant1_2480MHz



Date: 23 JAN 2025 10:42:46

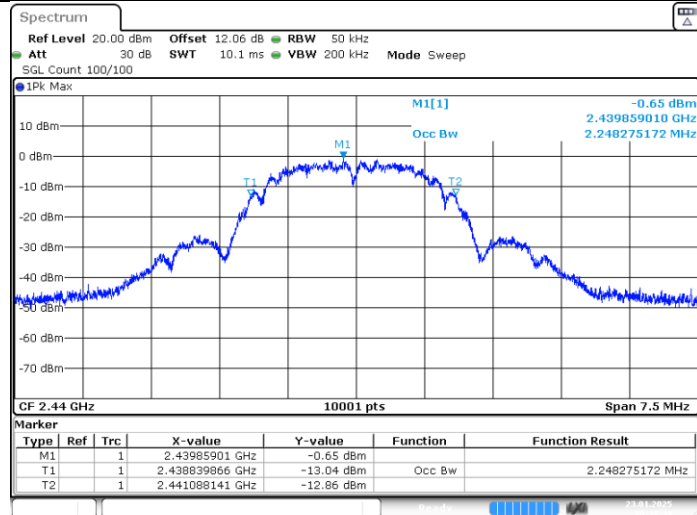
99% Bandwidth

Zigbee_Ant1_2405MHz



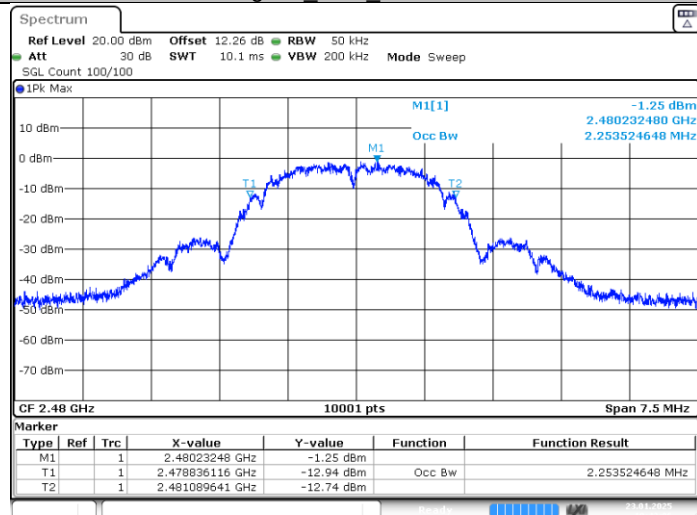
Date: 23 JAN 2025 10:30:32

Zigbee_Ant1_2440MHz



Date: 23 JAN 2025 10:39:49

Zigbee_Ant1_2480MHz



Date: 23 JAN 2025 10:42:07



10.4 Power spectral density

Test Method

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

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

Limit

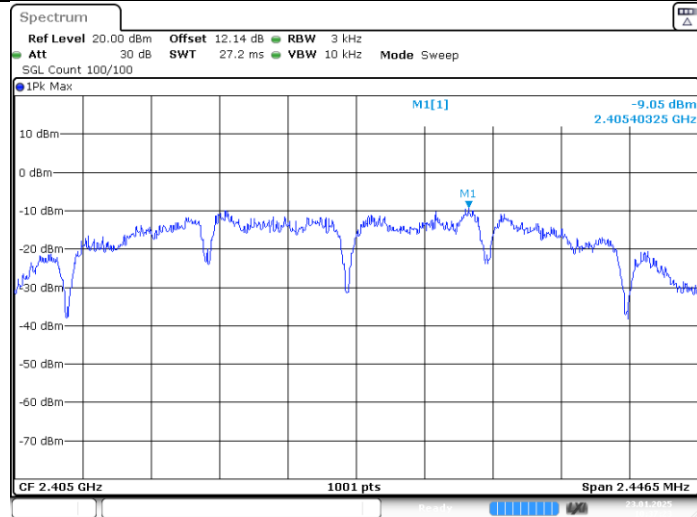
Limit [dBm/3kHz]

≤8

Test result

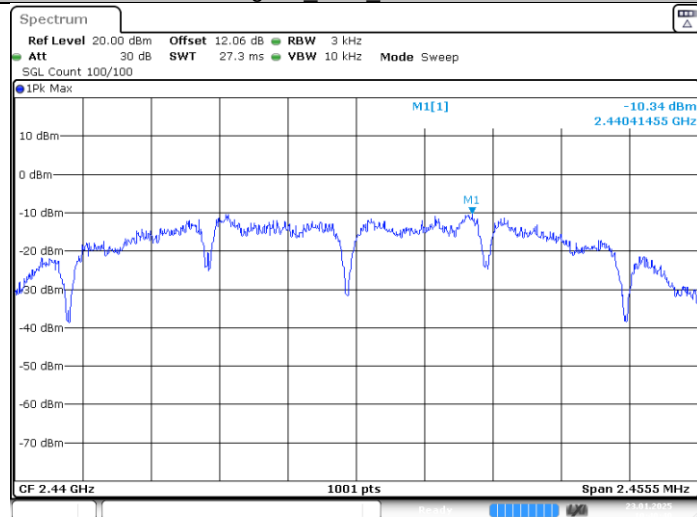
Data transmission rate	Frequency (MHz)	Power spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Result
1Mbps	2405MHz	-9.05	8	Pass
	2440MHz	-10.34	8	Pass
	2480MHz	-9.83	8	Pass

Zigbee_Ant1_2405MHz



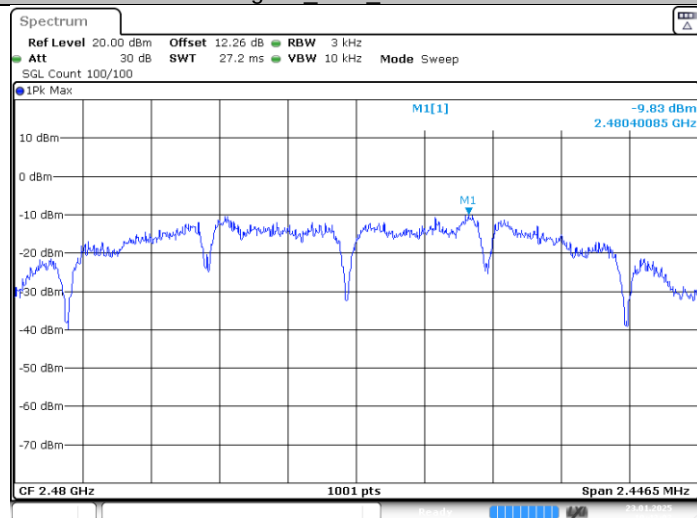
Date: 23. JAN. 2025 10:37:23

Zigbee_Ant1_2440MHz



Date: 23. JAN. 2025 10:40:41

Zigbee_Ant1_2480MHz



Date: 23. JAN. 2025 10:43:02

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

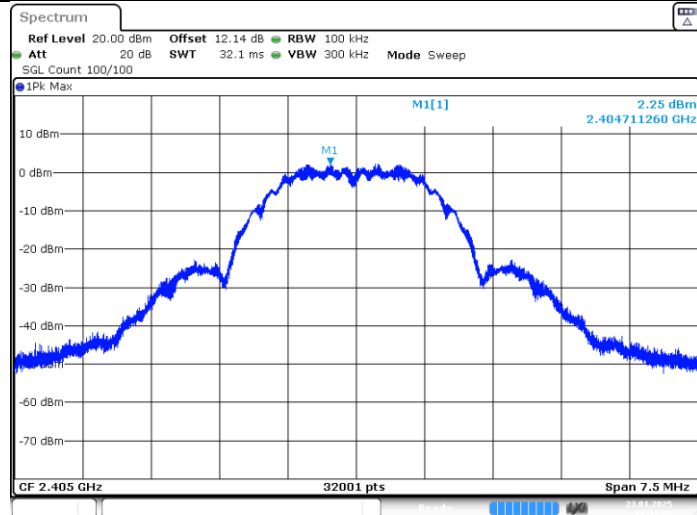
Frequency Range MHz	Limit (dBc)
30-25000	-20



Spurious RF conducted emissions

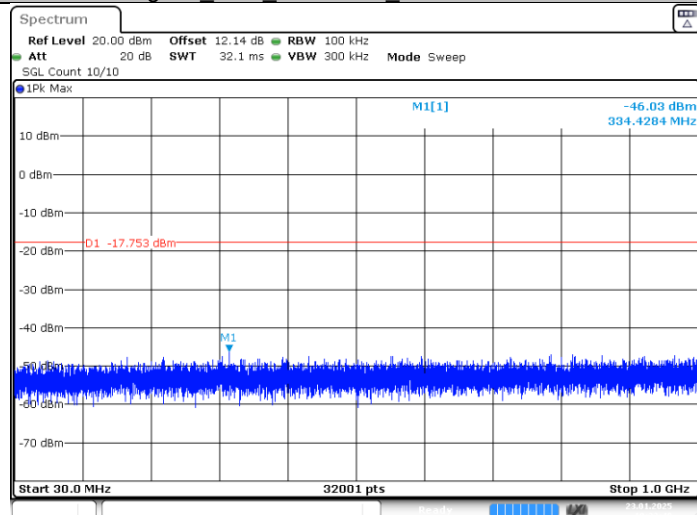
Test Mode	Test Frequency (MHz)	Freq. Range (MHZ)	Result (dBm)	Limit (dBm)	Verdict
Zigbee	2405	Reference	2.25	---	PASS
		30~1000	-46.03	<=-17.75	PASS
		1000~26500	-42.33	<=-17.75	PASS
	2440	Reference	1.79	---	PASS
		30~1000	-46.04	<=-18.21	PASS
		1000~26500	-42.79	<=-18.21	PASS
	2480	Reference	1.90	---	PASS
		30~1000	-46.34	<=-18.10	PASS
		1000~26500	-42.46	<=-18.10	PASS

Zigbee_Ant1_2405MHz_Reference Point



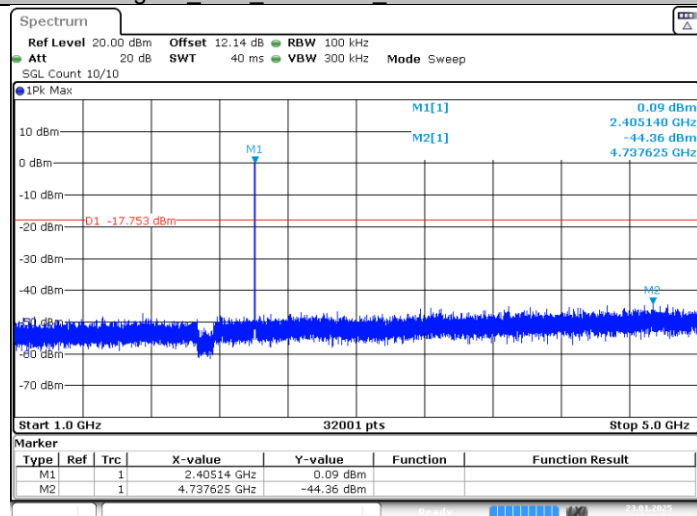
Date: 23 JAN 2025 10:33:45

Zigbee_Ant1_2405MHz_30MHz-1000MHz



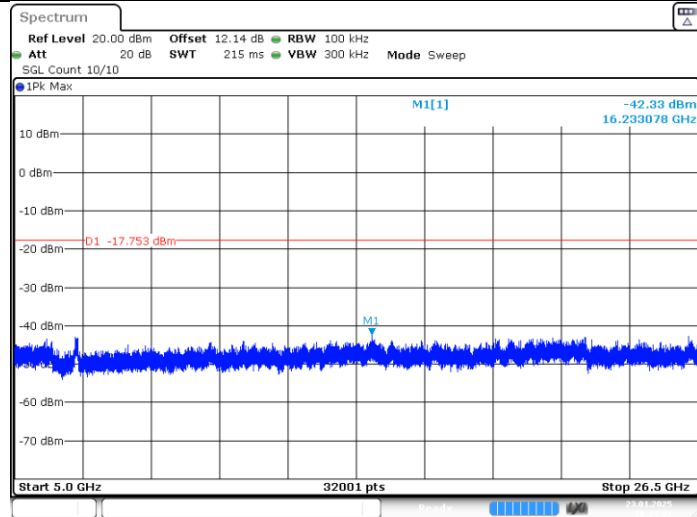
Date: 23 JAN 2025 10:33:49

Zigbee_Ant1_2405MHz_1000MHz-5000MHz



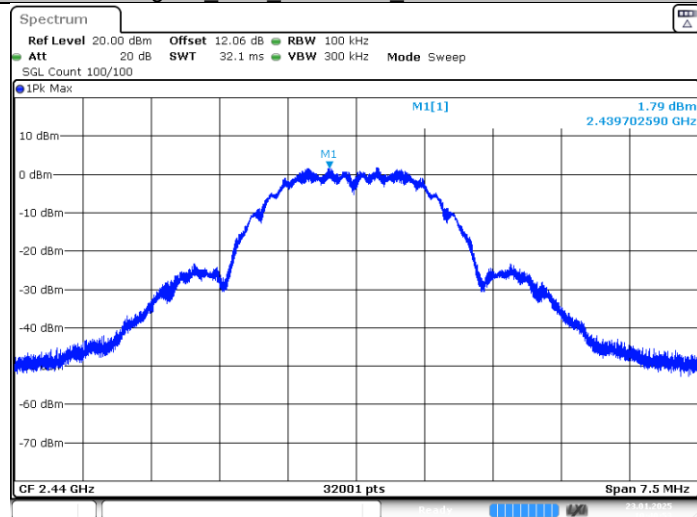
Date: 23 JAN 2025 10:33:53

Zigbee_Ant1_2405MHz_5000MHz-26500MHz



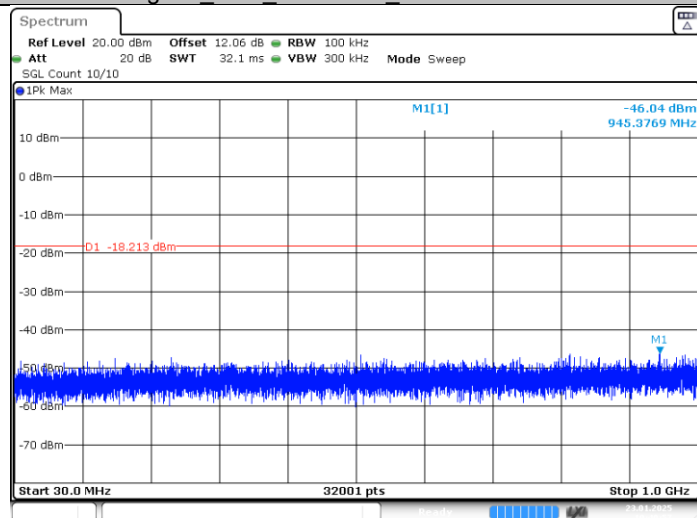
Date: 23. JAN. 2025 10:34:07

Zigbee_Ant1_2440MHz_Reference Point

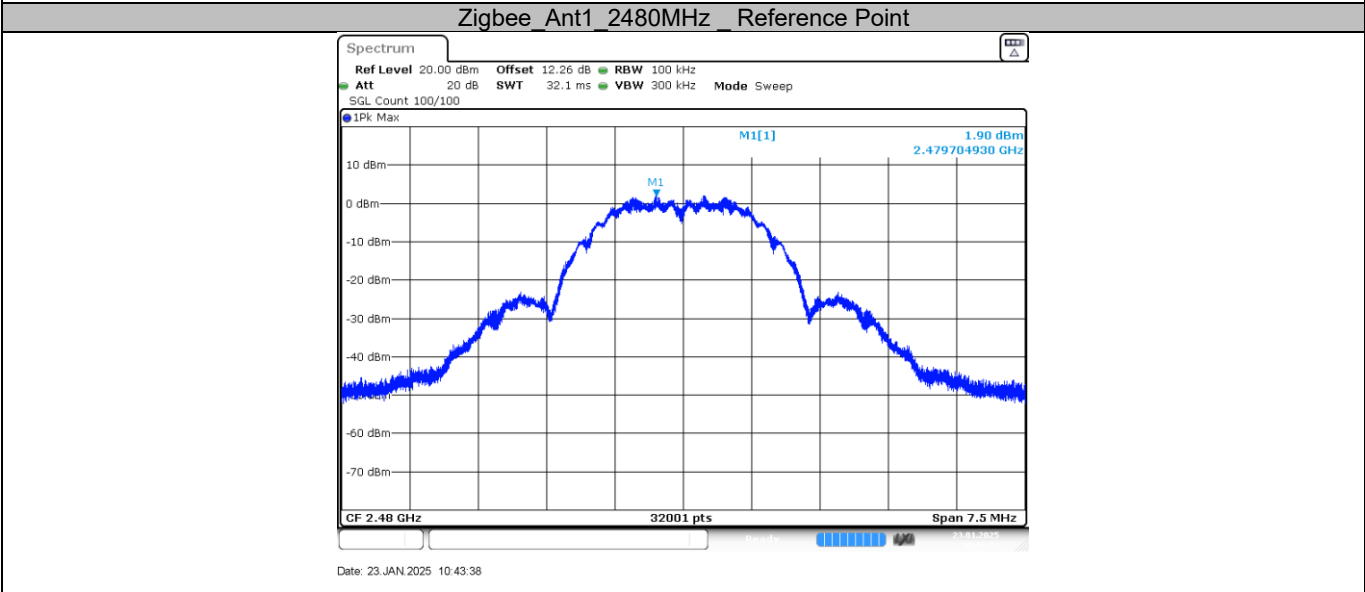
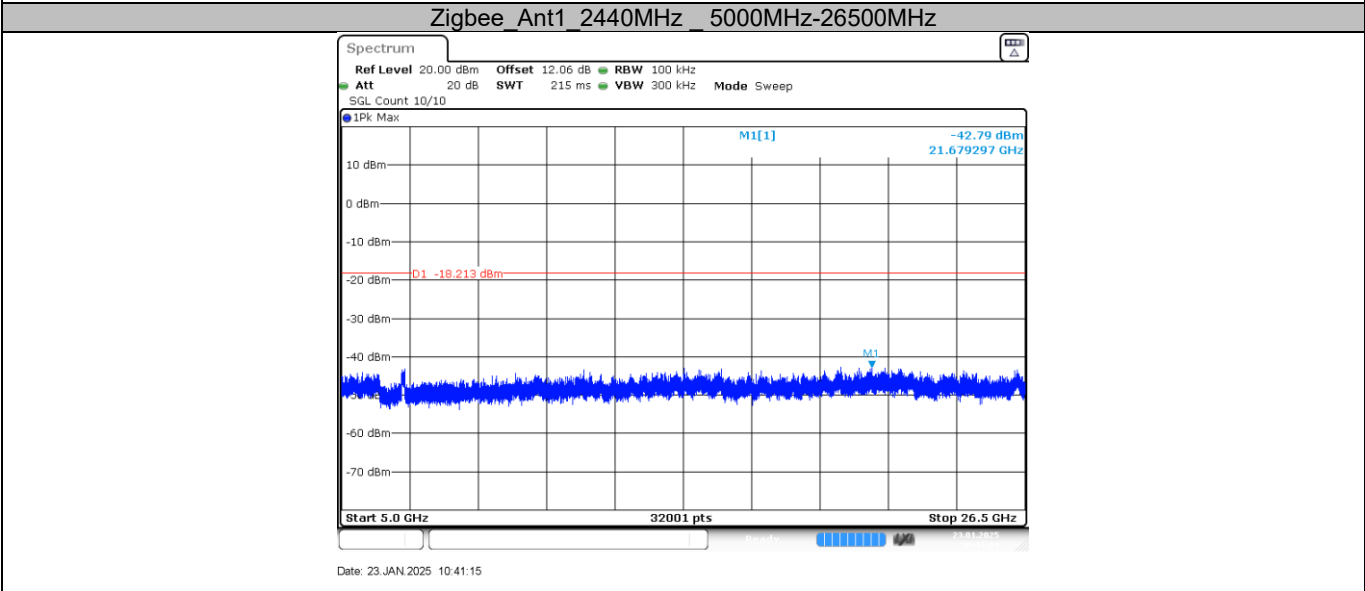
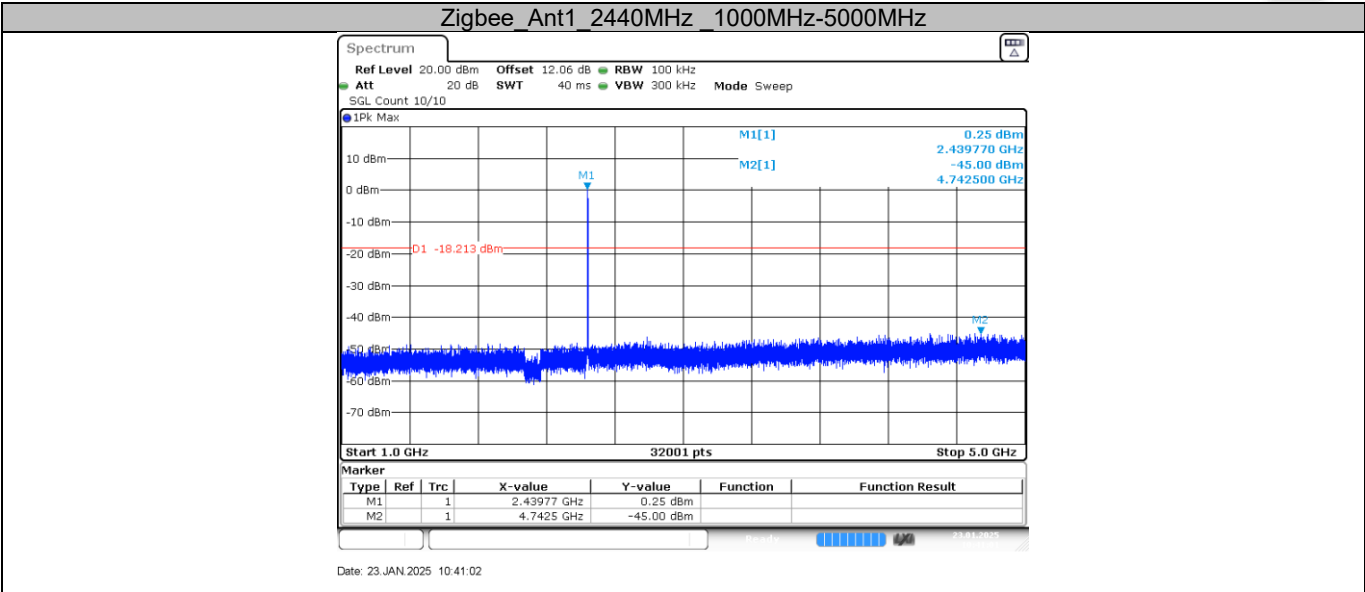


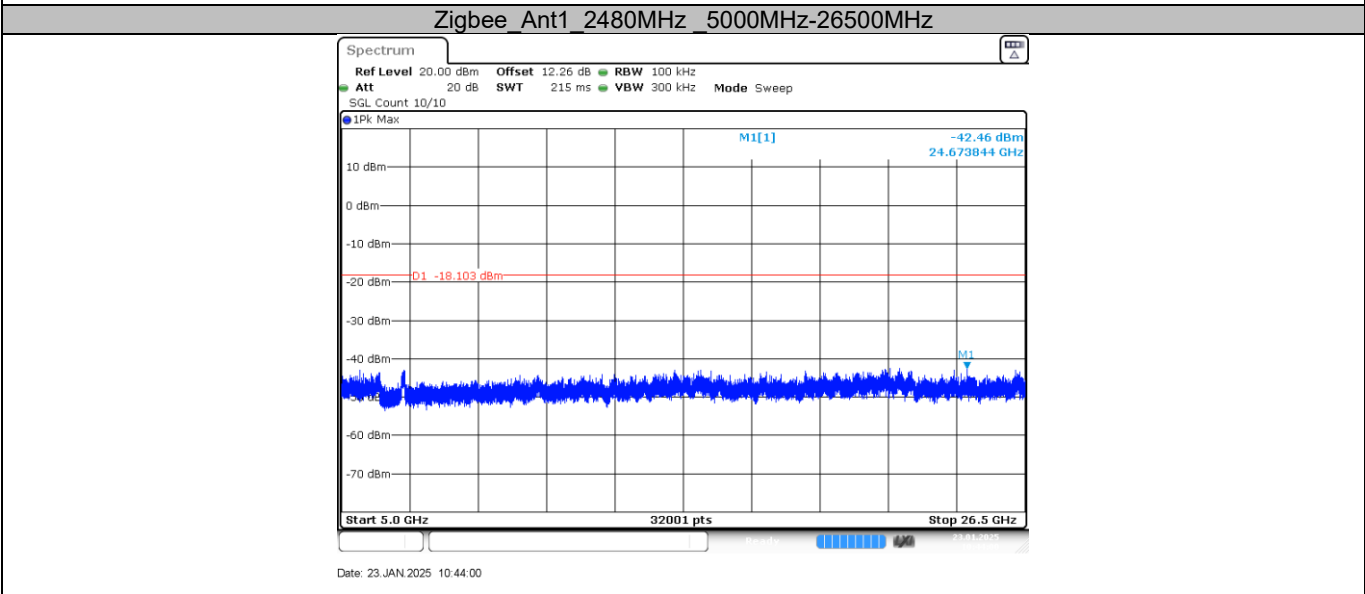
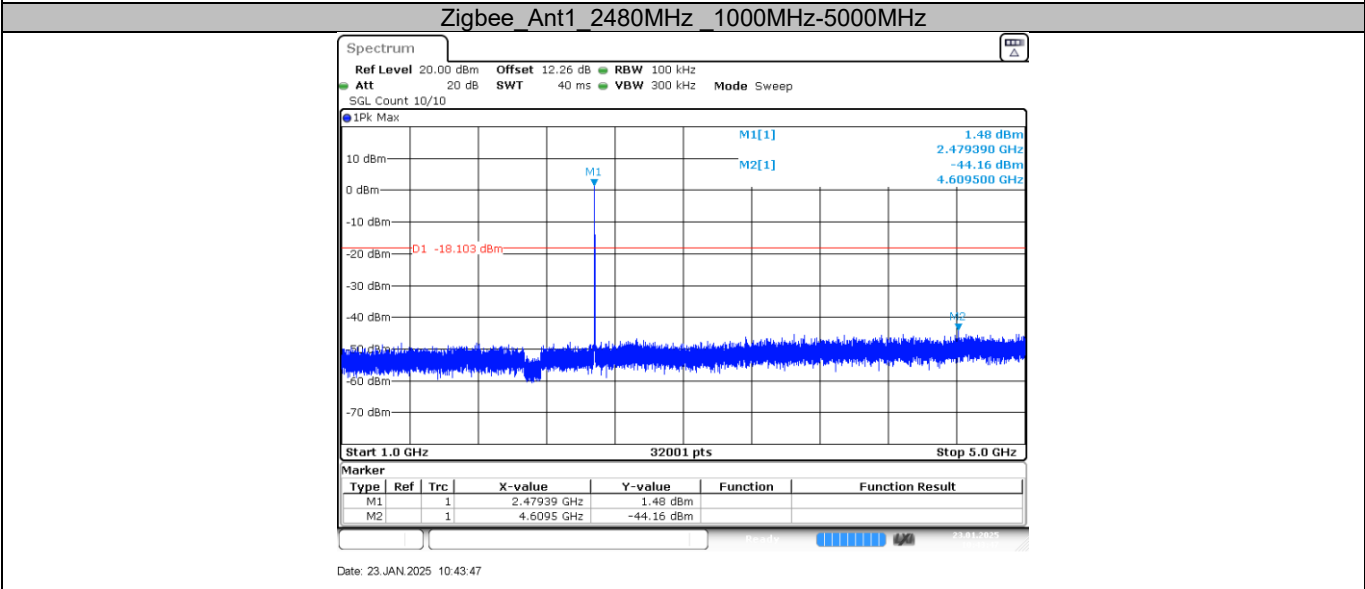
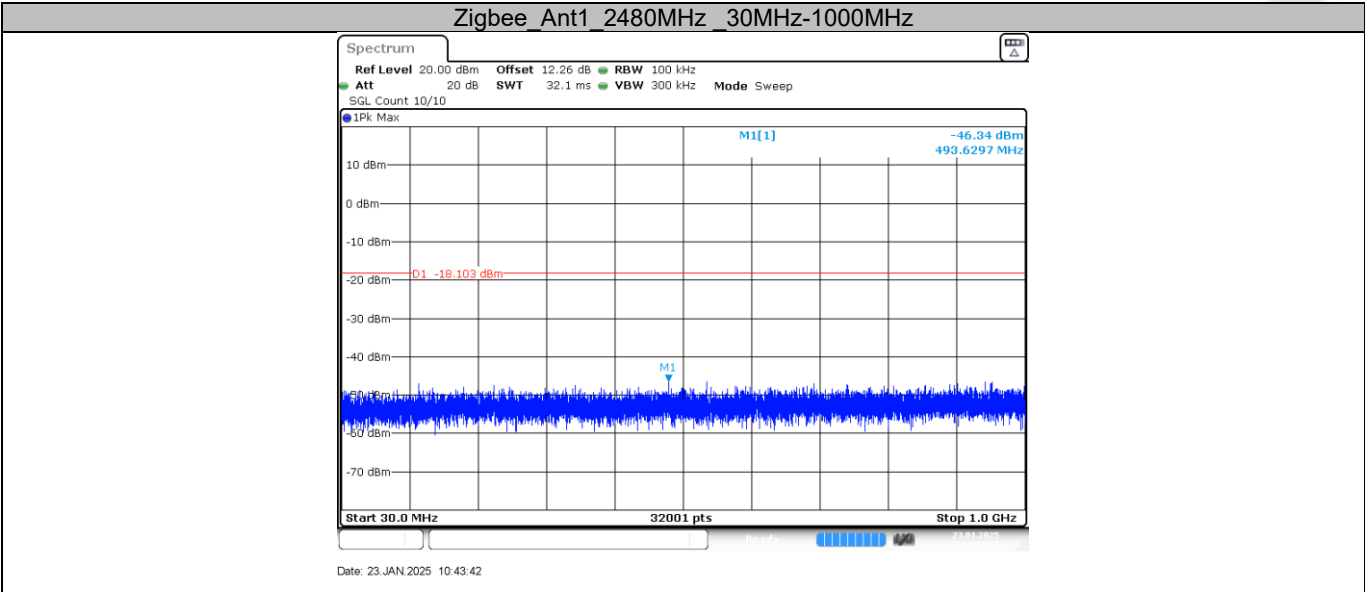
Date: 23. JAN. 2025 10:40:53

Zigbee_Ant1_2440MHz_30MHz-1000MHz



Date: 23. JAN. 2025 10:40:57





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:

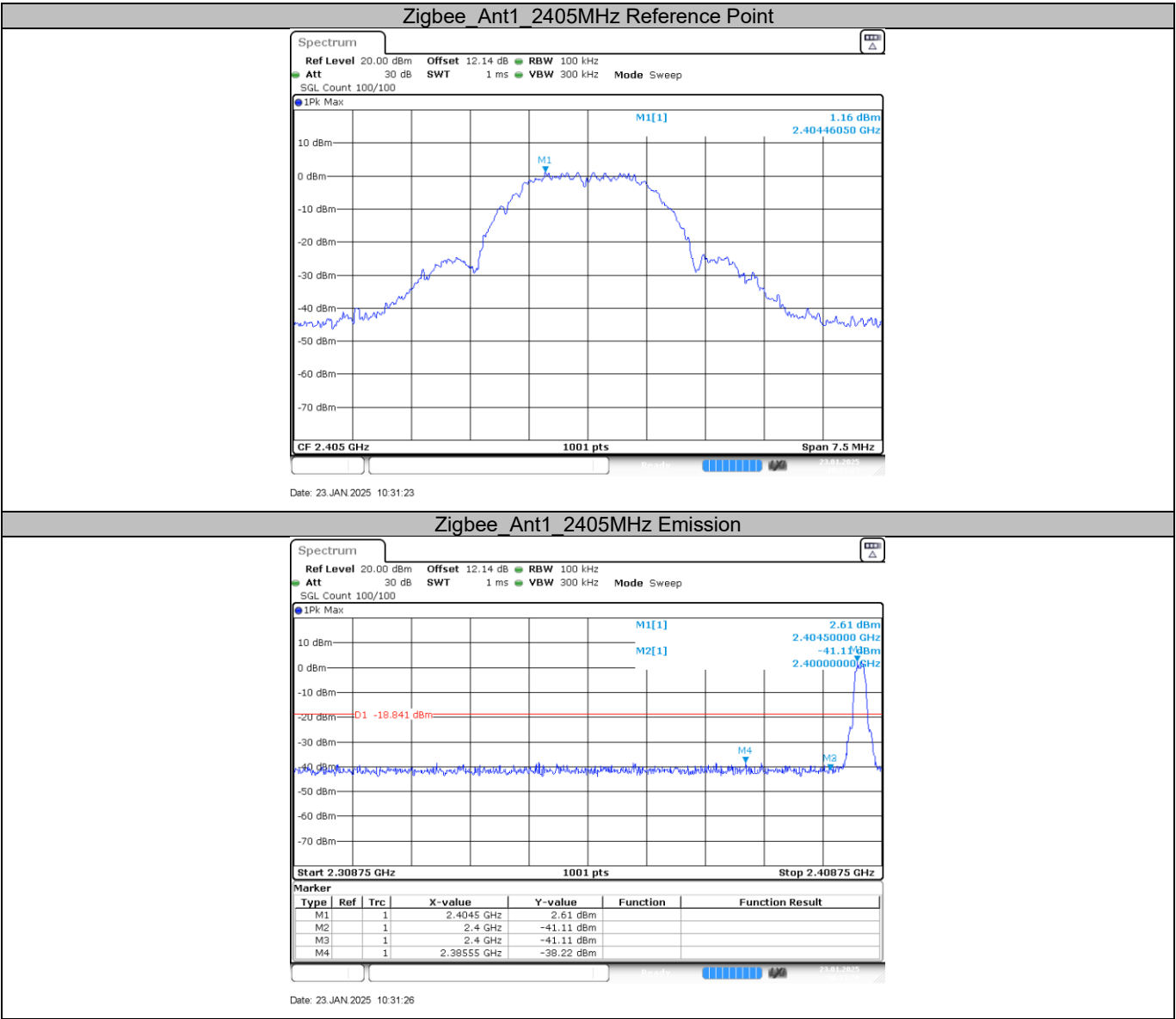
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either 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

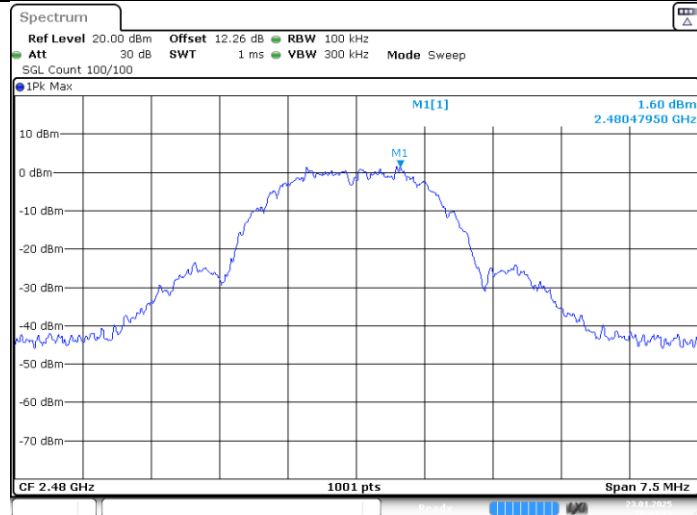


Test result

Test Mode	Channel (MHz)	Reference Level (dBm)	Result (dBm)	Limit (dBm)	Verdict
Zigbee	2405	1.16	-38.22	<=-18.84	PASS
	2480	1.60	-38.53	<=-18.40	PASS

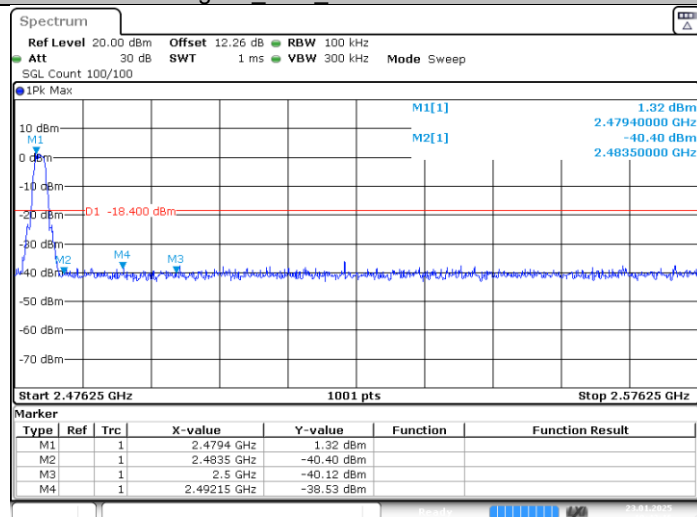


Zigbee_Ant1_2480MHz Reference Point



Date: 23 JAN 2025 10:43:14

Zigbee_Ant1_2480MHz Emission



Date: 23 JAN 2025 10:43:17

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:

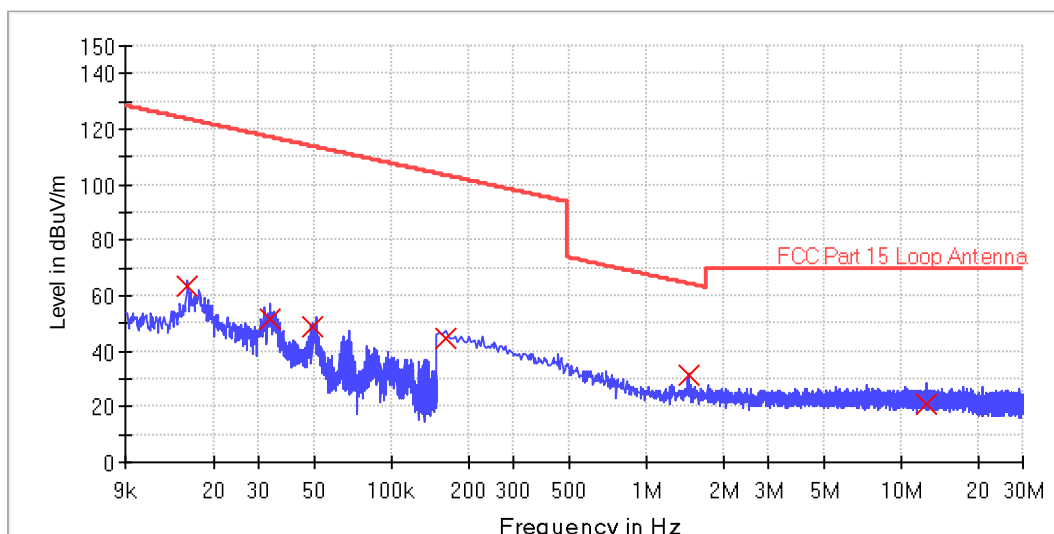
0.009-30MHz Radiated Emission**Common Information**

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, Zigbee transmitting, 2405MHz
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	126.0	19.8	60.0	123.6
0.033400	51.5	1000.0	0.200	100.0	208.0	19.6	65.6	117.1
0.049160	48.9	1000.0	0.200	100.0	217.0	19.5	64.9	113.8
0.162000	44.7	1000.0	9.000	100.0	146.0	19.3	58.7	103.4
1.458000	31.4	1000.0	9.000	100.0	265.0	19.3	33.0	64.4
12.558000	20.6	1000.0	9.000	100.0	182.0	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

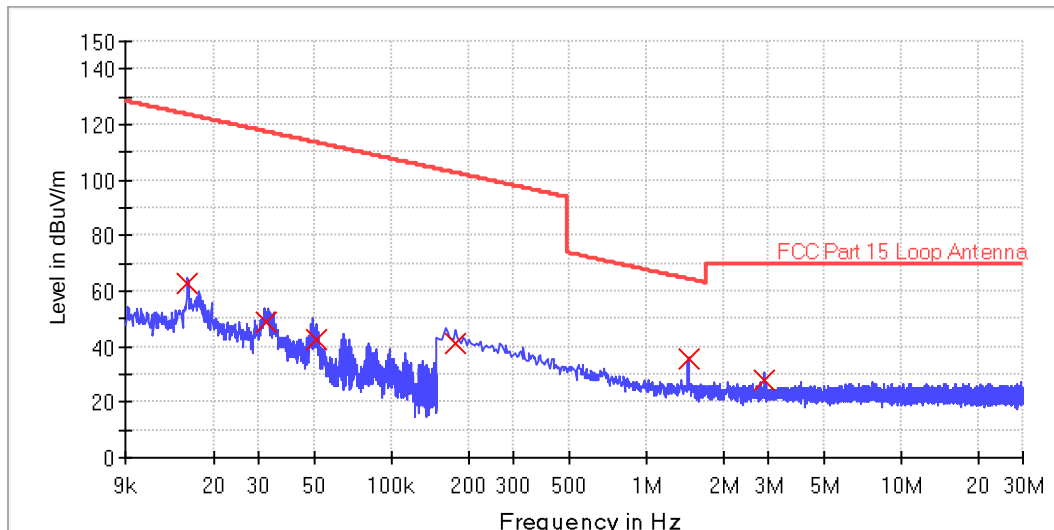
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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	144.0	19.8	60.7	123.6
0.032280	49.1	1000.0	0.200	100.0	125.0	19.6	68.4	117.4
0.050280	42.6	1000.0	0.200	100.0	191.0	19.5	71.0	113.6
0.178000	41.4	1000.0	9.000	100.0	77.0	19.3	61.2	102.6
1.458000	35.3	1000.0	9.000	100.0	254.0	19.3	29.0	64.4
2.914000	27.6	1000.0	9.000	100.0	270.0	19.3	41.9	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

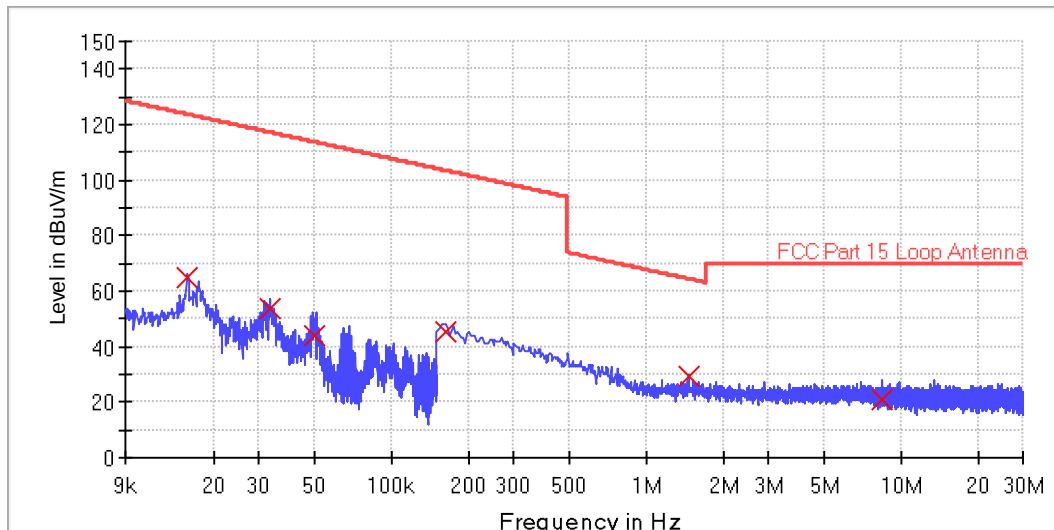
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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	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)
0.015720	64.7	1000.0	0.200	100.0	136.0	19.8	58.9	123.7
0.033400	53.4	1000.0	0.200	100.0	117.0	19.6	63.7	117.1
0.049320	43.7	1000.0	0.200	100.0	189.0	19.5	70.0	113.7
0.162000	45.3	1000.0	9.000	100.0	86.0	19.3	58.1	103.4
1.458000	29.5	1000.0	9.000	100.0	267.0	19.3	34.9	64.4
8.358000	20.9	1000.0	9.000	100.0	171.0	18.9	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

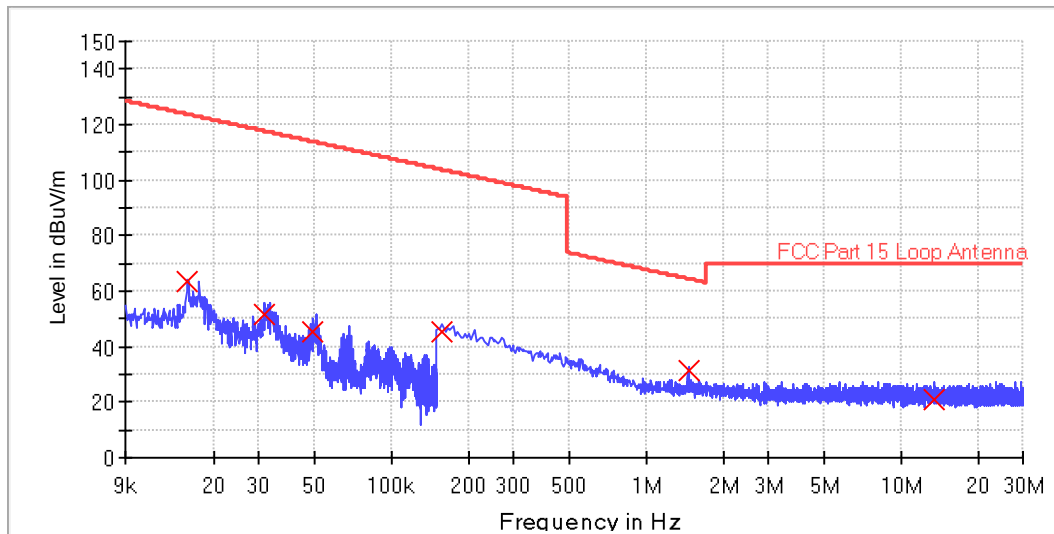
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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	63.3	1000.0	0.200	100.0	160.0	19.8	60.3	123.6
0.031560	51.5	1000.0	0.200	100.0	149.0	19.6	66.1	117.6
0.049240	45.4	1000.0	0.200	100.0	201.0	19.5	68.4	113.7
0.158000	45.4	1000.0	9.000	100.0	239.0	19.3	58.3	103.6
1.458000	31.3	1000.0	9.000	100.0	48.0	19.3	33.0	64.4
13.446000	20.6	1000.0	9.000	100.0	176.0	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

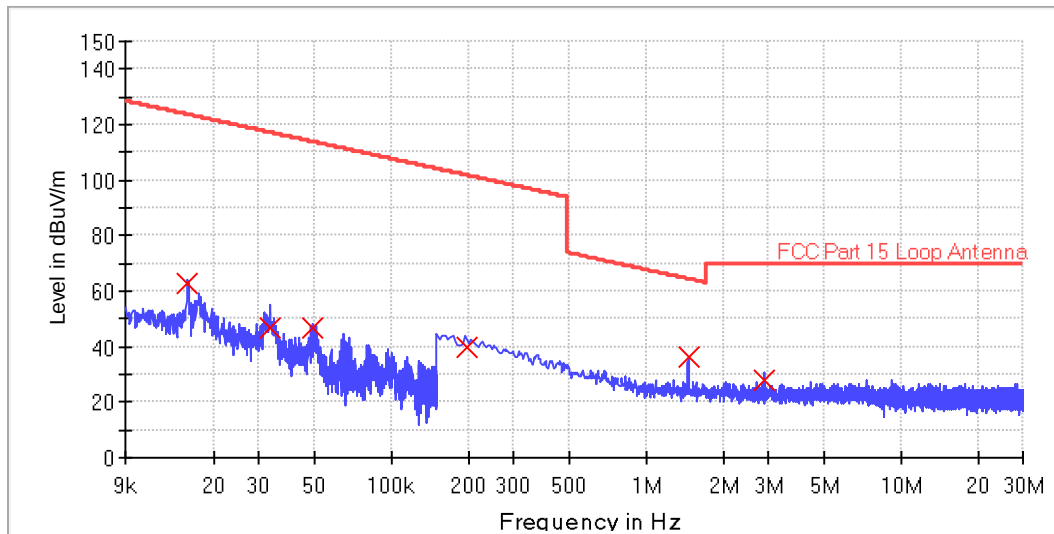
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.015720	62.7	1000.0	0.200	100.0	119.0	19.8	61.0	123.7
0.033080	47.1	1000.0	0.200	100.0	140.0	19.6	70.1	117.2
0.049080	46.7	1000.0	0.200	100.0	212.0	19.5	67.1	113.8
0.198000	40.1	1000.0	9.000	100.0	258.0	19.3	61.6	101.7
1.458000	36.3	1000.0	9.000	100.0	130.0	19.3	28.0	64.4
2.914000	27.7	1000.0	9.000	100.0	287.0	19.3	41.8	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

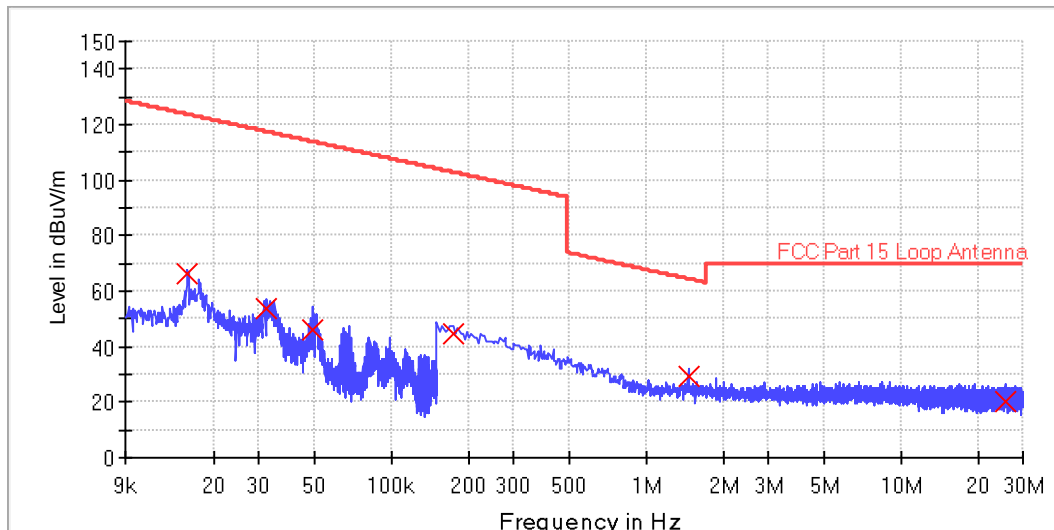
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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: 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	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	66.0	1000.0	0.200	100.0	142.0	19.8	57.6	123.6
0.032440	54.0	1000.0	0.200	100.0	108.0	19.6	63.4	117.4
0.049160	45.9	1000.0	0.200	100.0	165.0	19.5	67.9	113.8
0.174000	44.5	1000.0	9.000	100.0	229.0	19.3	58.3	102.8
1.458000	29.4	1000.0	9.000	100.0	306.0	19.3	34.9	64.4
25.558000	20.4	1000.0	9.000	100.0	194.0	19.0	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

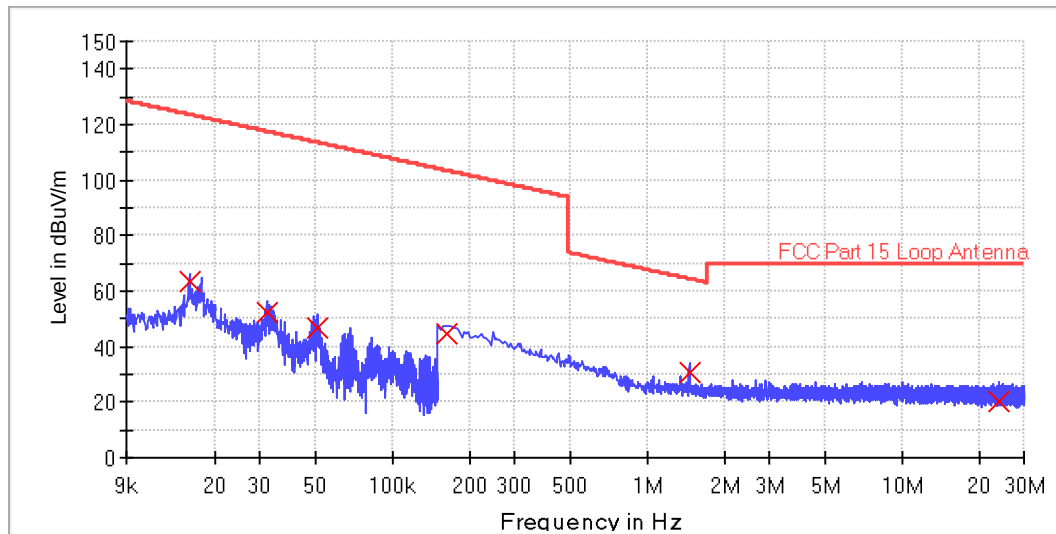
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.015880	63.7	1000.0	0.200	100.0	152.0	19.8	59.9	123.6
0.031880	52.6	1000.0	0.200	100.0	222.0	19.6	64.9	117.5
0.050520	47.0	1000.0	0.200	100.0	161.0	19.5	66.5	113.5
0.162000	44.8	1000.0	9.000	100.0	217.0	19.3	58.6	103.4
1.458000	31.0	1000.0	9.000	100.0	273.0	19.3	33.3	64.4
24.014000	20.5	1000.0	9.000	100.0	169.0	18.9	49.0	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

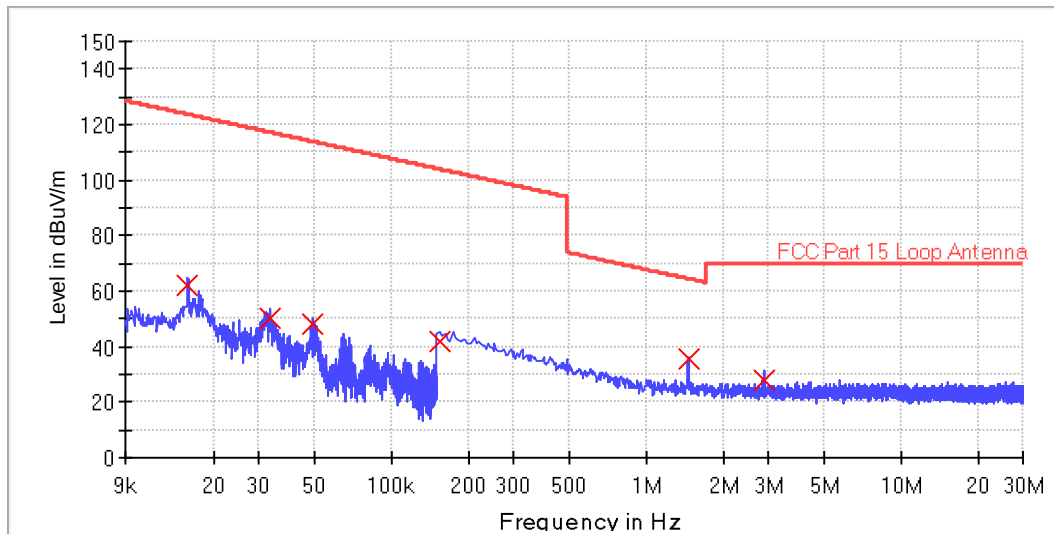
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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	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	62.0	1000.0	0.200	100.0	226.0	19.8	61.7	123.6
0.033240	50.2	1000.0	0.200	100.0	145.0	19.6	67.0	117.2
0.049080	48.2	1000.0	0.200	100.0	190.0	19.5	65.6	113.8
0.154000	42.1	1000.0	9.000	100.0	249.0	19.3	61.8	103.8
1.458000	35.5	1000.0	9.000	100.0	312.0	19.3	28.9	64.4
2.918000	27.8	1000.0	9.000	100.0	123.0	19.3	41.7	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

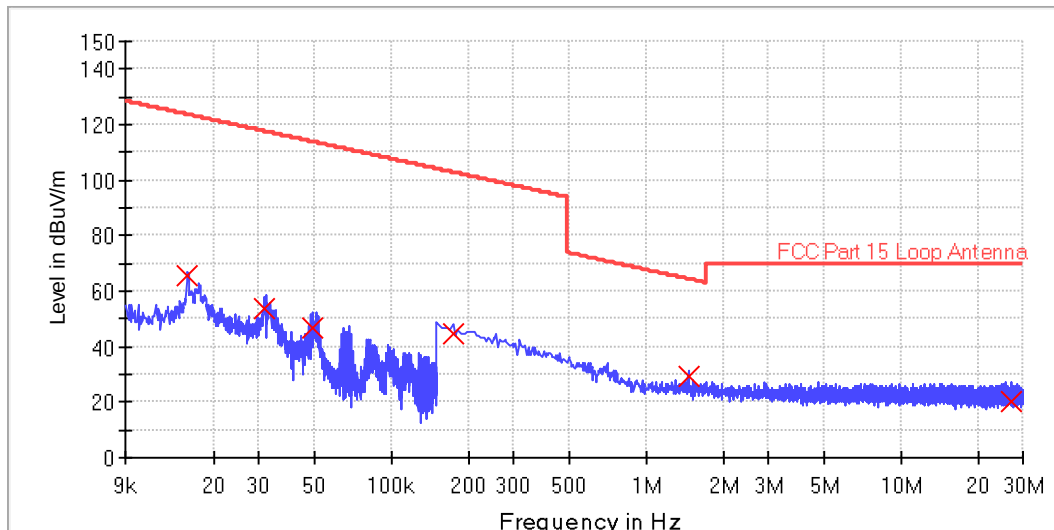
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
0.015800	65.6	1000.0	0.200	100.0	150.0	19.8	58.0	123.6
0.031560	53.9	1000.0	0.200	100.0	130.0	19.6	63.7	117.6
0.049000	46.8	1000.0	0.200	100.0	190.0	19.5	66.9	113.8
0.174000	44.5	1000.0	9.000	100.0	232.0	19.3	58.2	102.8
1.458000	29.4	1000.0	9.000	100.0	288.0	19.3	35.0	64.4
27.130000	20.1	1000.0	9.000	100.0	147.0	18.8	49.4	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

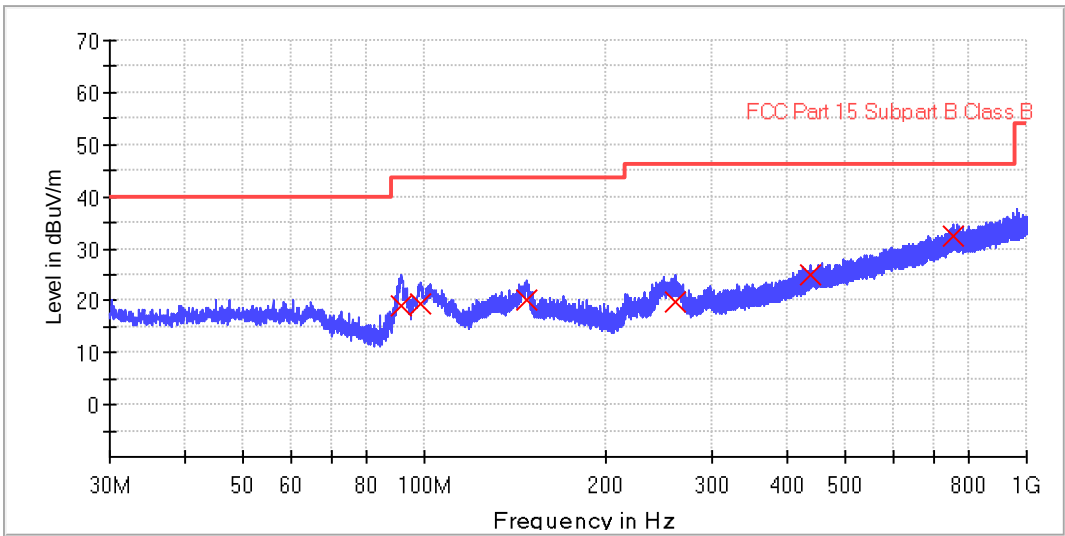
Common Information

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, Zigbee transmitting, 2405MHz
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)
91.200000	19.0	1000.0	120.000	200.0	H	107.0	15.3	24.6	43.5
98.200000	19.5	1000.0	120.000	210.0	H	331.0	16.2	24.0	43.5
147.840000	20.3	1000.0	120.000	205.0	H	96.0	21.4	23.2	43.5
260.280000	19.8	1000.0	120.000	190.0	H	149.0	20.8	26.2	46.0
438.320000	25.0	1000.0	120.000	185.0	H	168.0	26.5	21.0	46.0
757.000000	32.3	1000.0	120.000	200.0	H	307.0	33.2	13.7	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

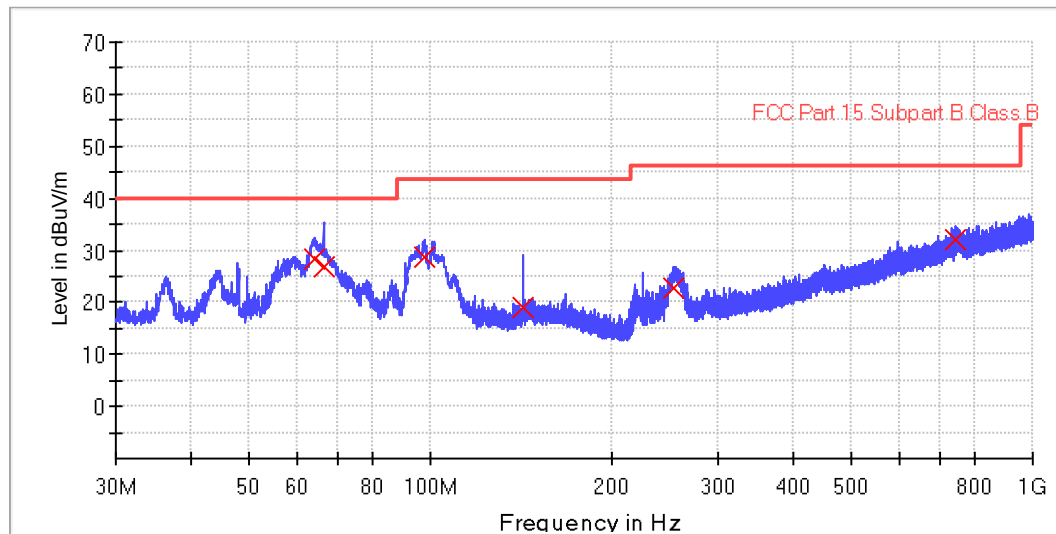
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
64.040000	28.4	1000.0	120.000	110.0	V	197.0	20.3	11.6	40.0
66.360000	26.8	1000.0	120.000	100.0	V	152.0	19.9	13.2	40.0
97.440000	28.8	1000.0	120.000	100.0	V	92.0	16.1	14.8	43.5
142.400000	19.1	1000.0	120.000	120.0	V	135.0	21.0	24.4	43.5
253.280000	22.8	1000.0	120.000	115.0	V	242.0	20.6	23.2	46.0
746.200000	32.0	1000.0	120.000	100.0	V	211.0	32.9	14.0	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

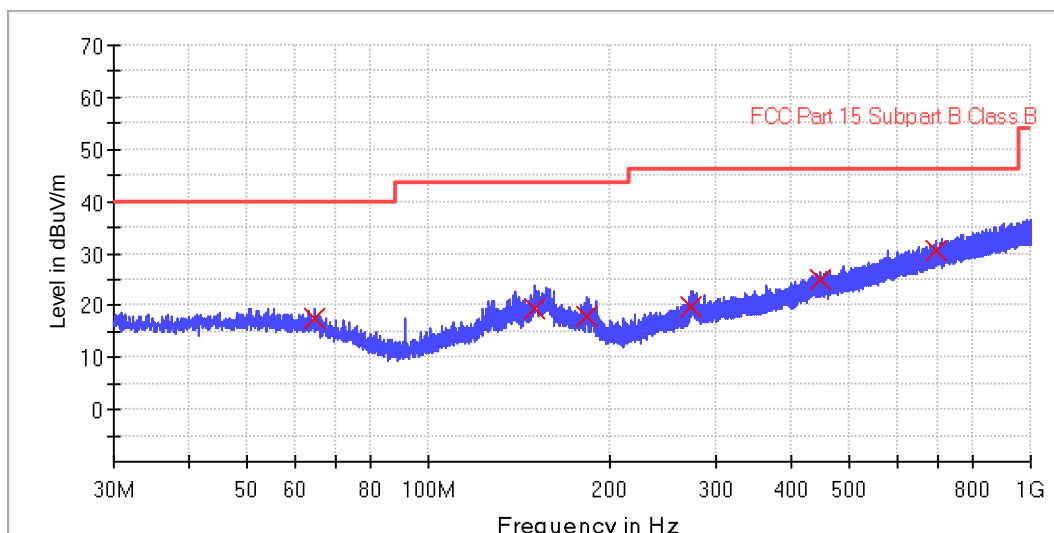
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
64.520000	17.7	1000.0	120.000	220.0	H	47.0	20.2	22.3	40.0
150.160000	19.4	1000.0	120.000	200.0	H	110.0	21.4	24.1	43.5
182.920000	17.9	1000.0	120.000	190.0	H	86.0	19.7	25.6	43.5
272.880000	19.7	1000.0	120.000	185.0	H	74.0	21.5	26.3	46.0
448.280000	24.9	1000.0	120.000	200.0	H	178.0	26.8	21.2	46.0
695.360000	30.7	1000.0	120.000	210.0	H	330.0	31.9	15.4	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

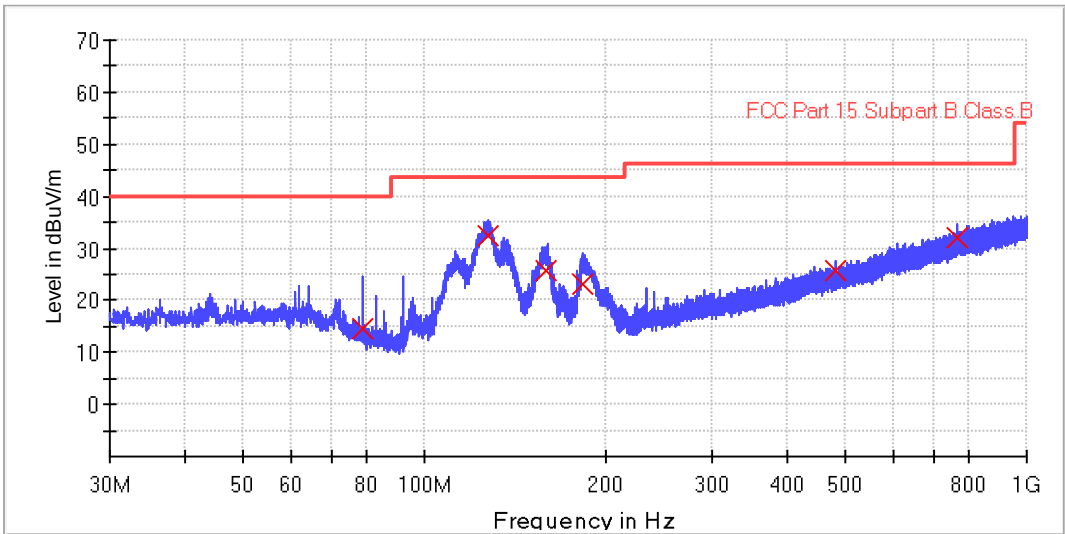
Common Information

EUT:	Smart M Gateway
Model:	THP23-ZB-X
Client:	Zhejiang Lingzhu Technology Co., Ltd
Operating conditions:	Power on, Zigbee transmitting, 2405MHz
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)
79.160000	14.4	1000.0	120.000	120.0	V	193.0	16.7	25.6	40.0
127.440000	32.4	1000.0	120.000	110.0	V	249.0	19.8	11.1	43.5
159.680000	25.6	1000.0	120.000	100.0	V	121.0	21.7	17.9	43.5
183.240000	23.1	1000.0	120.000	110.0	V	134.0	19.7	20.5	43.5
482.560000	25.6	1000.0	120.000	120.0	V	87.0	27.4	20.5	46.0
764.800000	32.2	1000.0	120.000	100.0	V	160.0	33.3	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

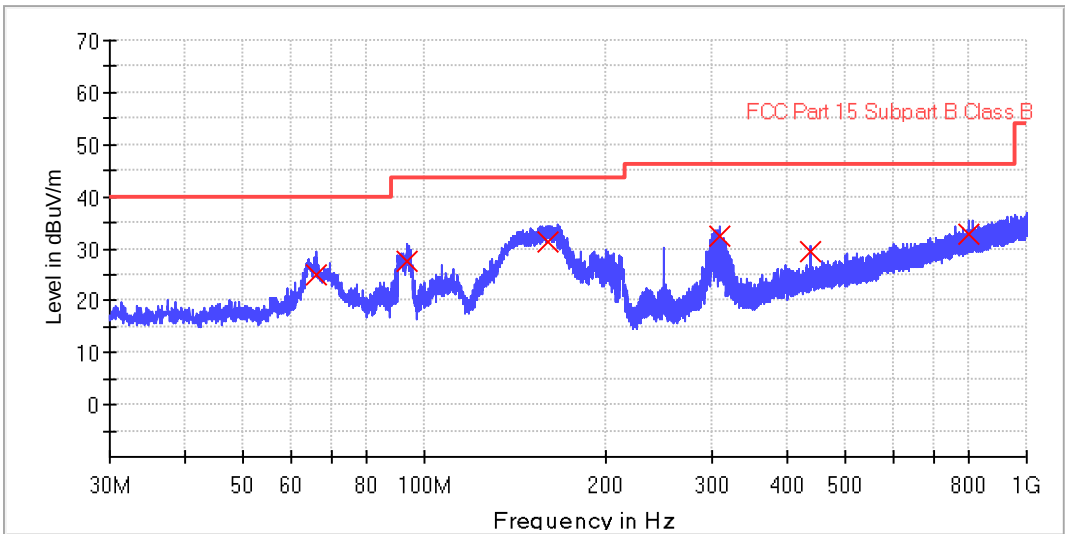
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, Zigbee transmitting, 2405MHz
 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)
66.200000	25.1	1000.0	120.000	190.0	H	242.0	19.9	14.9	40.0
93.520000	27.6	1000.0	120.000	200.0	H	166.0	15.5	16.0	43.5
159.720000	31.2	1000.0	120.000	220.0	H	110.0	21.7	12.3	43.5
308.720000	32.3	1000.0	120.000	200.0	H	292.0	22.8	13.7	46.0
437.480000	29.6	1000.0	120.000	200.0	H	288.0	26.5	16.4	46.0
803.480000	32.8	1000.0	120.000	185.0	H	144.0	33.5	13.2	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

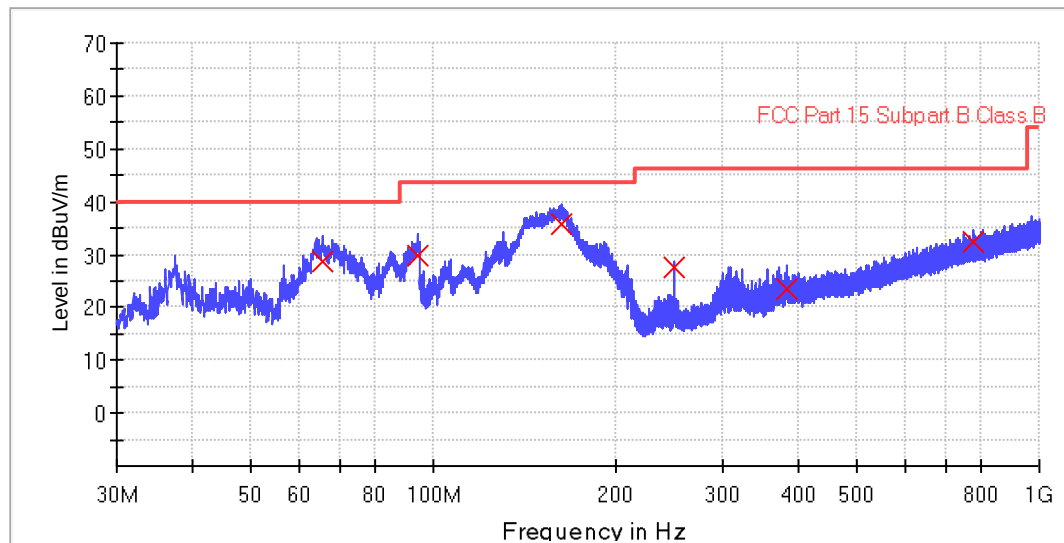
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
65.520000	28.6	1000.0	120.000	100.0	V	97.0	20.0	11.4	40.0
93.880000	29.7	1000.0	120.000	110.0	V	259.0	15.5	13.9	43.5
162.240000	35.9	1000.0	120.000	115.0	V	147.0	21.5	7.6	43.5
250.000000	27.7	1000.0	120.000	120.0	V	120.0	20.6	18.4	46.0
383.280000	23.4	1000.0	120.000	100.0	V	265.0	24.9	22.6	46.0
779.560000	32.3	1000.0	120.000	100.0	V	205.0	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)

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

1-18G Radiated Emission Test

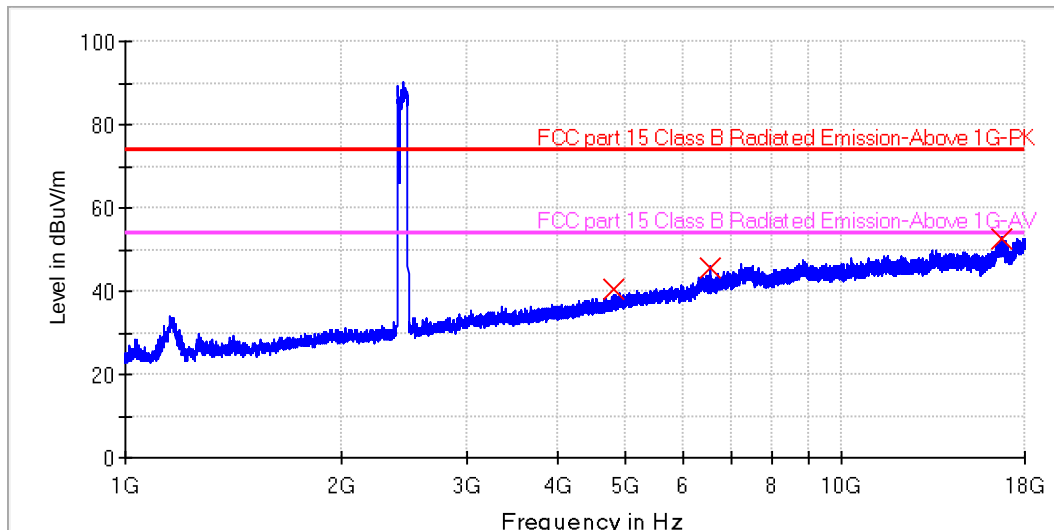
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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

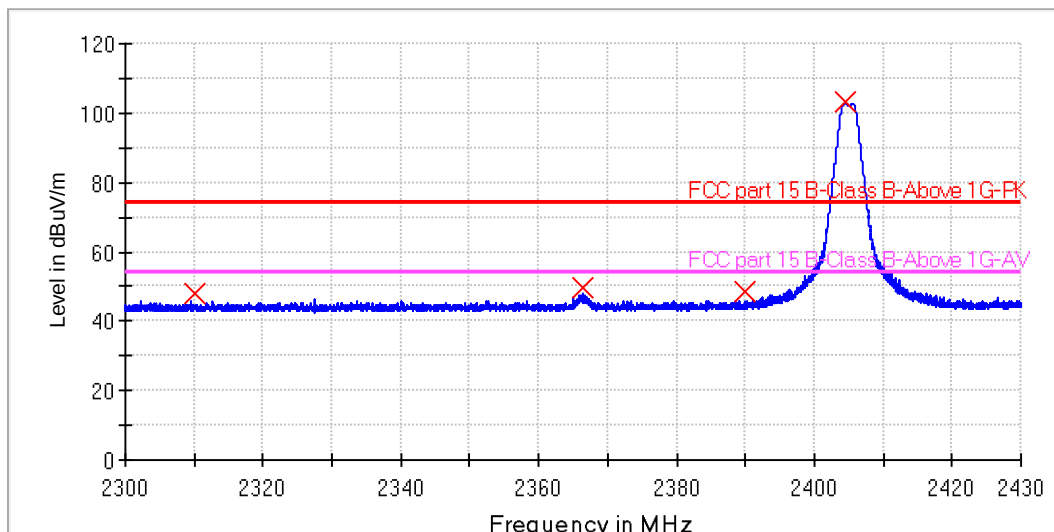
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
4809.000000	40.5	1000.0	220.0	H	260.0	-0.5	33.5	74.0
6564.500000	45.7	1000.0	210.0	H	97.0	6.9	28.3	74.0
16664.000000	52.4	1000.0	215.0	H	185.0	19.1	21.6	74.0

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	48.0	1000.0	210.0	H	245.0	34.1	26.0	74.0
2366.500000	49.7	1000.0	215.0	H	118.0	34.3	24.3	74.0
2390.000000	48.7	1000.0	200.0	H	105.0	34.4	25.3	74.0
2404.500000	103.4	1000.0	200.0	H	168.0	34.5	---	---

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



1-18G Radiated Emission Test

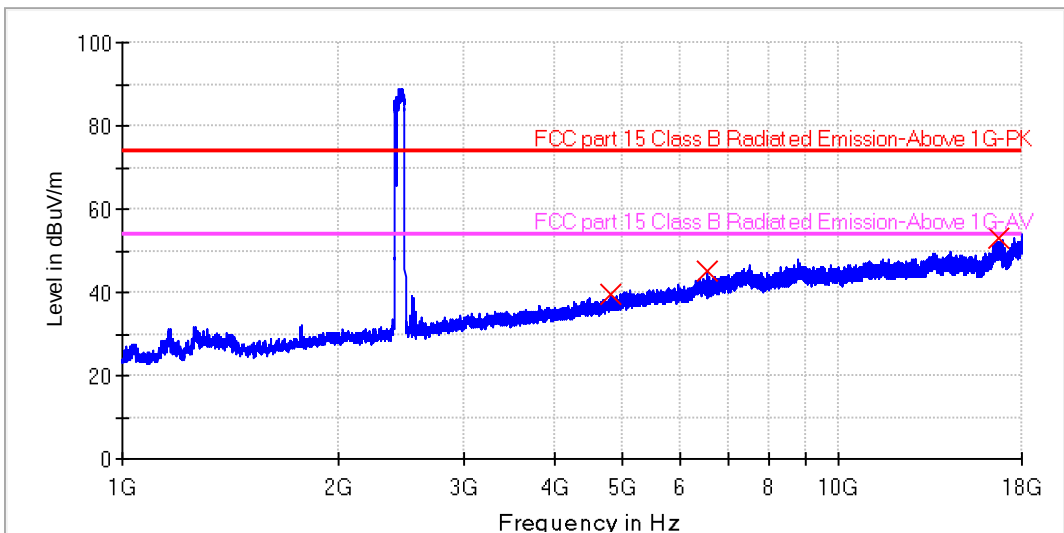
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, Zigbee transmitting, 2405MHz
 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

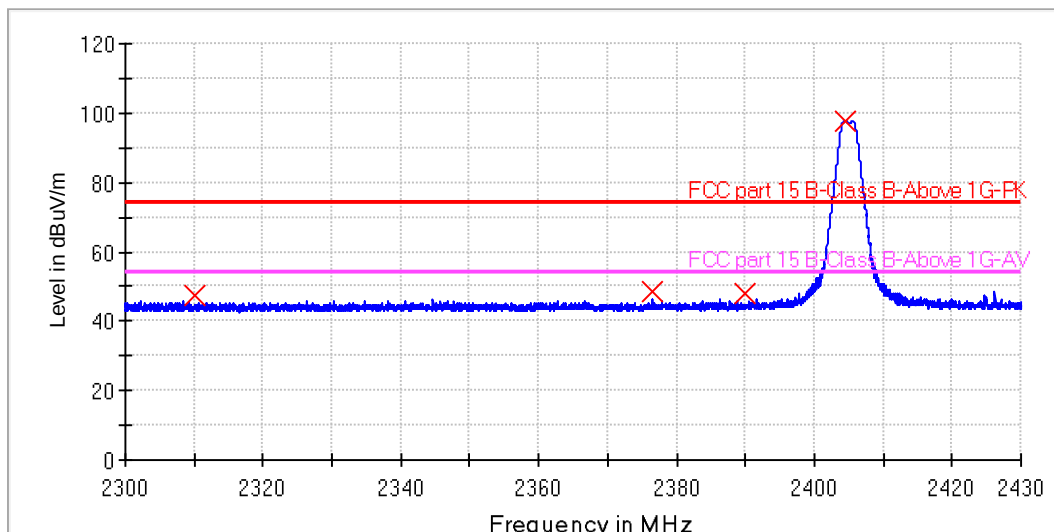
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
4808.000000	39.7	1000.0	130.0	V	295.0	-0.5	34.3	74.0
6564.500000	45.1	1000.0	140.0	V	119.0	6.9	28.9	74.0
16726.500000	52.8	1000.0	135.0	V	212.0	19.3	21.2	74.0

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	47.6	1000.0	120.0	V	102.0	34.1	26.4	74.0
2376.500000	48.5	1000.0	140.0	V	162.0	34.3	25.5	74.0
2390.000000	48.3	1000.0	145.0	V	25.0	34.4	25.8	74.0
2404.500000	97.9	1000.0	150.0	V	176.0	34.5	---	---

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



1-18G Radiated Emission Test

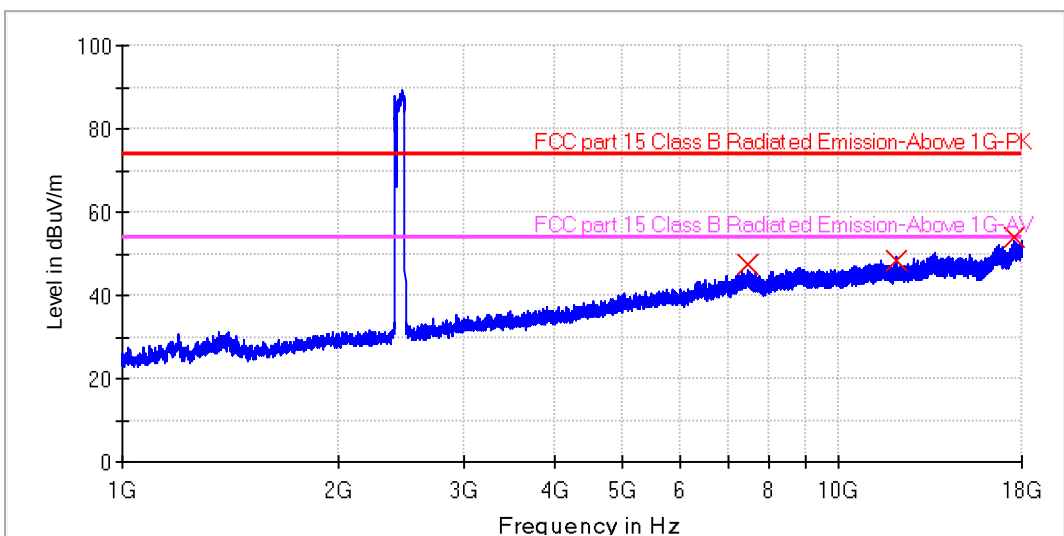
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, Zigbee transmitting, 2440MHz
 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)
7451.500000	47.3	1000.0	210.0	H	146.0	9.0	26.7	74.0
12046.000000	48.4	1000.0	205.0	H	90.0	14.4	25.6	74.0
17600.500000	53.8	1000.0	195.0	H	197.0	22.0	20.2	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, Zigbee transmitting, 2440MHz

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

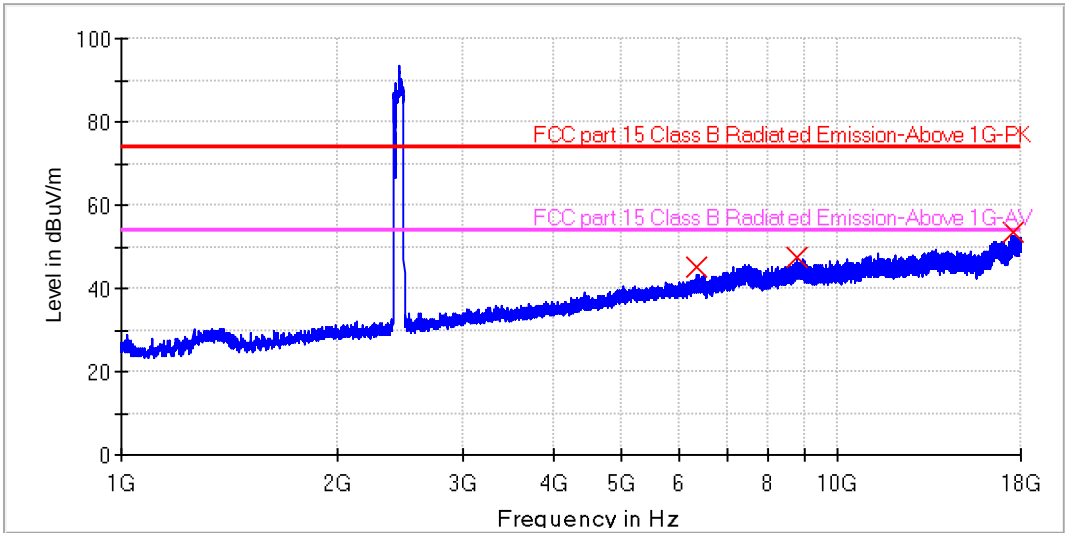
Sweep Setup: FCC_RE_1-18G Sweep 3m_bonn [EMI radiated]

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)
6366.000000	45.2	1000.0	140.0	V	230.0	7.0	28.8	74.0
8779.500000	47.4	1000.0	120.0	V	129.0	11.7	26.6	74.0
17513.500000	53.4	1000.0	125.0	V	153.0	21.8	20.6	74.0

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



1-18G Radiated Emission Test

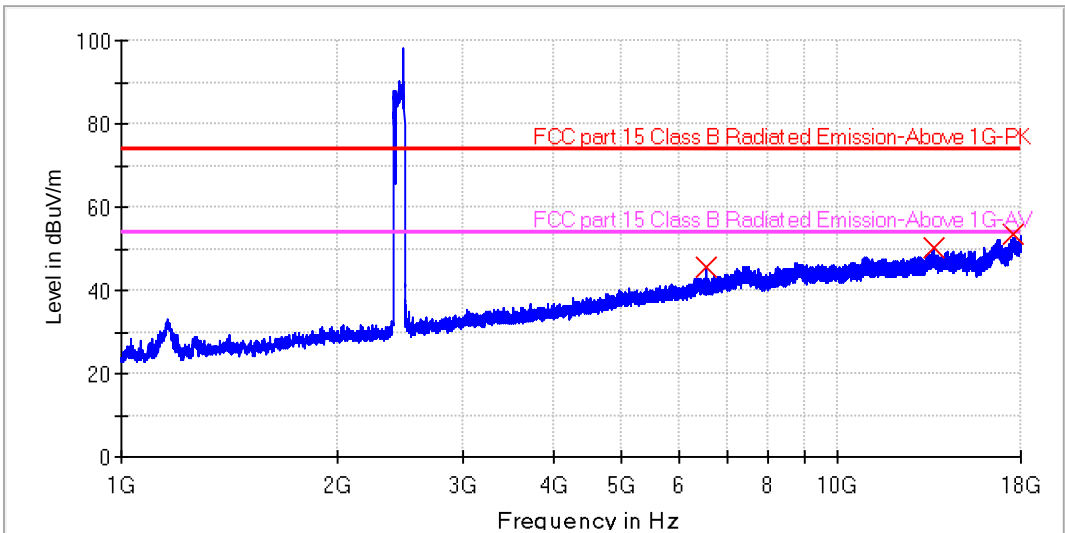
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, Zigbee transmitting, 2480MHz
 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

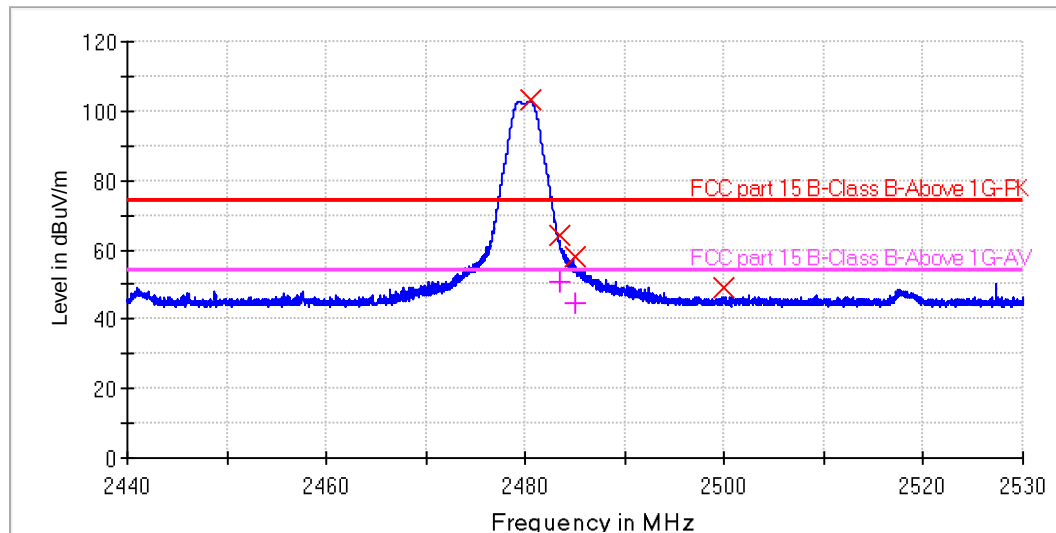
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
6565.000000	45.6	1000.0	215.0	H	166.0	6.9	28.4	74.0
13618.500000	50.2	1000.0	220.0	H	256.0	17.1	23.8	74.0
17603.000000	53.7	1000.0	210.0	H	82.0	22.0	20.3	74.0

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)	Average (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - AVG (dB)
2480.500000	103.1	---	1000.0	200.0	H	86.0	34.8	---	---	---
2483.500000	64.0	50.7	1000.0	190.0	H	127.0	34.8	10.0	74.0	3.3
2485.000000	58.1	44.6	1000.0	210.0	H	130.0	34.8	16.0	74.0	9.4
2500.000000	49.2	---	1000.0	215.0	H	262.0	34.8	24.8	74.0	---

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

Frequency (MHz)	Limit - AVG (dBuV/m)
2480.500000	---
2483.500000	54.0
2485.000000	54.0
2500.000000	---

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



1-18G Radiated Emission Test

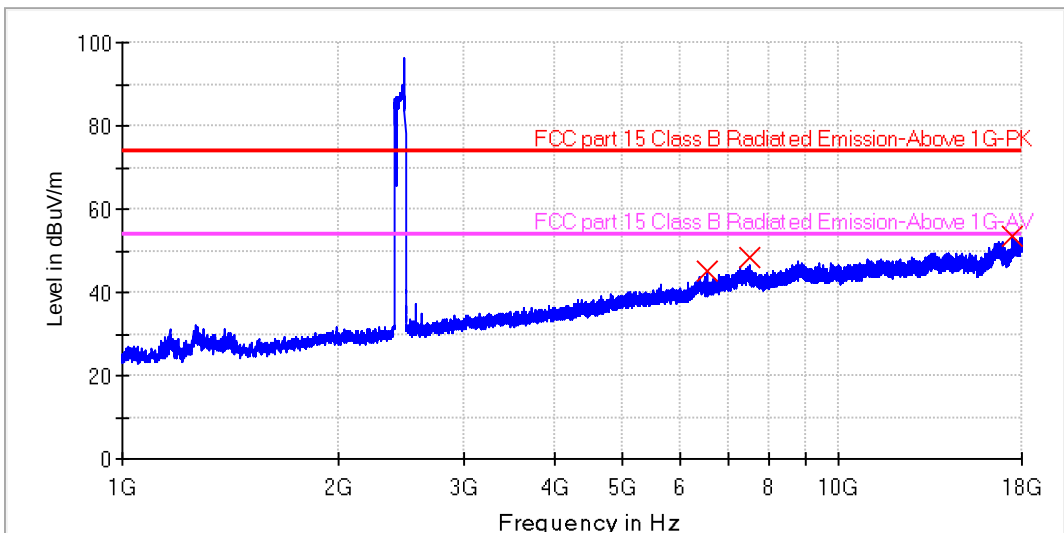
Common Information

EUT: Smart M Gateway
 Model: THP23-ZB-X
 Client: Zhejiang Lingzhu Technology Co., Ltd
 Operating conditions: Power on, Zigbee transmitting, 2480MHz
 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

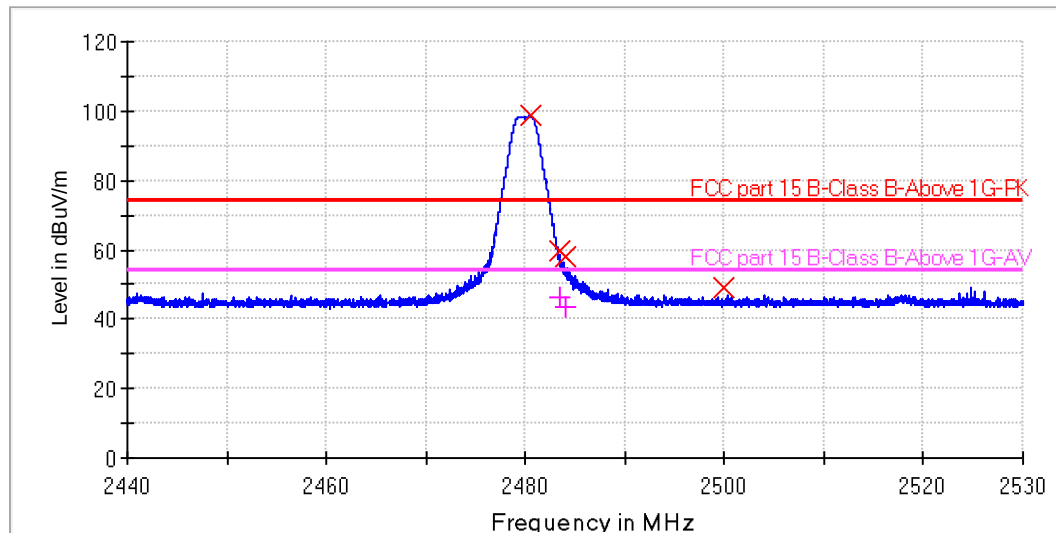
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)
6564.500000	45.0	1000.0	125.0	V	317.0	6.9	29.0	74.0
7499.000000	48.3	1000.0	115.0	V	224.0	9.3	25.7	74.0
17482.500000	53.6	1000.0	145.0	V	128.0	21.7	20.4	74.0

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

Sweep Setup: FCC_Band edge-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 (dBuV/m)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBuV/m)	Margin - AVG (dB)
2480.500000	98.8	---	1000.0	140.0	V	148.0	34.8	---	---	---
2483.500000	59.8	46.5	1000.0	125.0	V	241.0	34.8	14.2	74.0	7.5
2484.000000	57.8	43.7	1000.0	130.0	V	193.0	34.8	16.2	74.0	10.3
2500.000000	49.4	---	1000.0	140.0	V	23.0	34.8	24.7	74.0	---

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

Frequency (MHz)	Limit - AVG (dBuV/m)
2480.500000	---
2483.500000	54.0
2484.000000	54.0
2500.000000	---

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

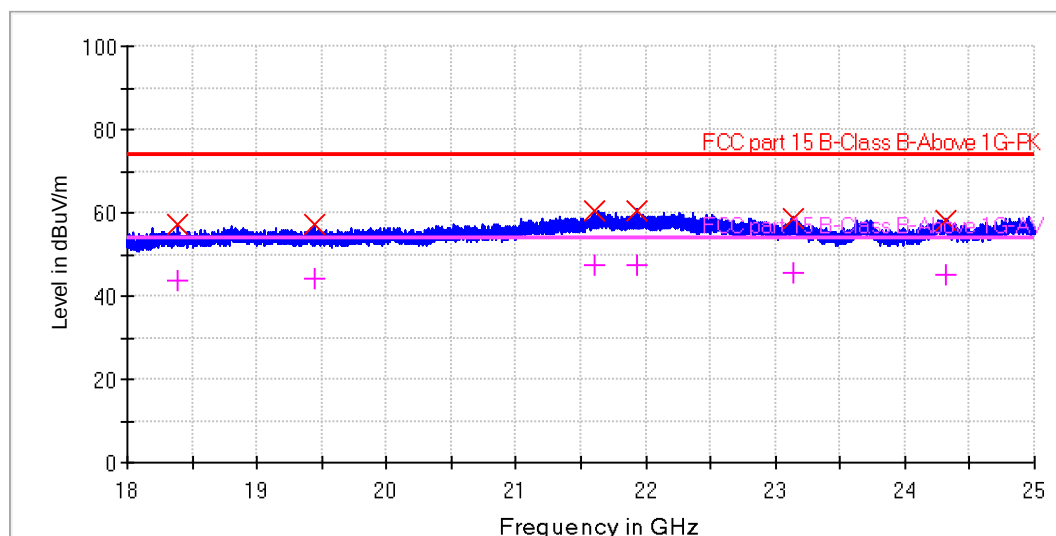
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
18383.000000	57.1	43.8	1000.0	200.0	H	156.0	13.9	16.9	74.0	10.2
19450.000000	57.1	44.2	1000.0	205.0	H	60.0	14.5	16.9	74.0	9.8
21608.500000	60.6	47.6	1000.0	185.0	H	210.0	17.7	13.4	74.0	6.4
21934.500000	60.4	47.7	1000.0	190.0	H	131.0	18.1	13.6	74.0	6.3
23134.000000	58.4	45.7	1000.0	220.0	H	240.0	16.4	15.6	74.0	8.3
24312.000000	58.3	45.2	1000.0	200.0	H	51.0	16.1	15.7	74.0	8.8



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

Frequency (MHz)	Limit - Average (dBuV/m)
18383.000000	54.0
19450.000000	54.0
21608.500000	54.0
21934.500000	54.0
23134.000000	54.0
24312.000000	54.0

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

18-25G Radiated Emission

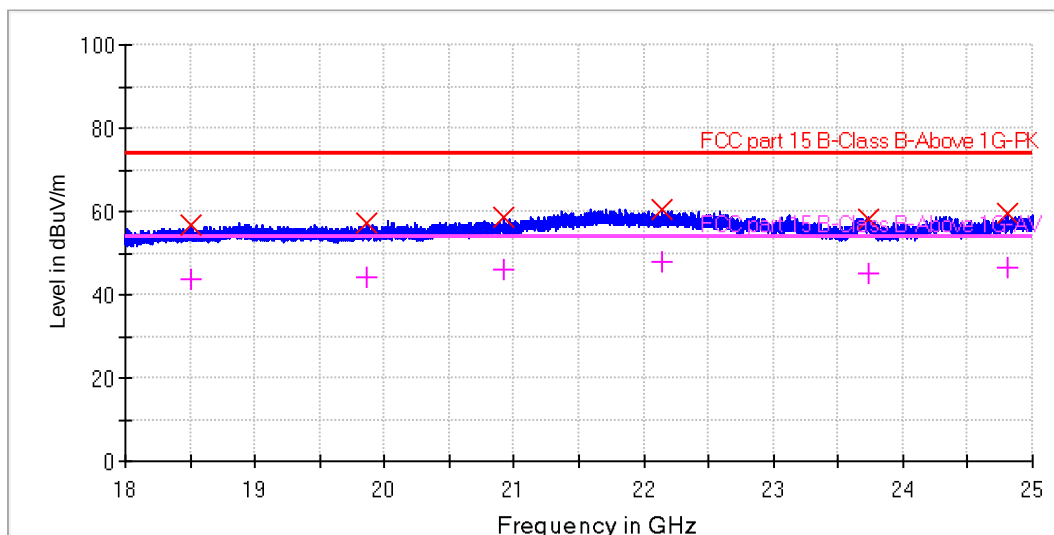
Common Information

EUT: Smart M Gateway
Model: THP23-ZB-X
Client: Zhejiang Lingzhu Technology Co., Ltd
Operating conditions: Power on, Zigbee transmitting, 2405MHz
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)
18511.500000	56.5	43.9	1000.0	130.0	V	88.0	14.1	17.5	74.0	10.1
19858.000000	57.3	44.3	1000.0	140.0	V	159.0	14.8	16.7	74.0	9.7
20917.000000	58.7	45.9	1000.0	120.0	V	91.0	15.8	15.3	74.0	8.1
22138.500000	60.6	47.8	1000.0	130.0	V	302.0	18.1	13.4	74.0	6.2
23738.000000	57.9	45.0	1000.0	115.0	V	135.0	15.8	16.1	74.0	9.0
24802.500000	59.3	46.4	1000.0	145.0	V	212.0	16.1	14.7	74.0	7.6

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

Frequency (MHz)	Limit - Average (dBuV/m)
18511.500000	54.0
19858.000000	54.0
20917.000000	54.0
22138.500000	54.0
23738.000000	54.0
24802.500000	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
	Coaxial Cable	Rohde & Schwarz	RF02	/	2024-7-27	2025-7-26
CE	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-----