China

FCC - TEST REPORT

Report Number	:	**709502204628-00A**	Date of Issue:	May 12, 2022

Model	:	ZPU
Product Type	:	Zigbee Module
Applicant	:	Hangzhou Tuya Information Technology Co.,Ltd
Address	:	Room701,Building3,More Center,No.87 GuDun Road,Hangzhou,Zhejiang China
Manufacturer	:	Hangzhou Tuya Information Technology Co.,Ltd
Address	:	Room701,Building3,More Center,No.87 GuDun Road,Hangzhou,Zhejiang China
Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	36

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1 Table of Contents

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2 Details about the Test Laboratory

Details about the Test Laboratory

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District Shenzhen 518052 P.R. China
Test Firm FCC Registration Number:	514049
Test Firm FCC Designation Number:	CN5009
Test Firm IC Registration Number:	10320A
Telephone:	86 755 8828 6998
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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Zigbee Module
Model no.:	ZPU
FCC ID:	2ANDL-ZPU
Options and accessories:	NA
Rating:	1.8V-3.6V DC
RF Transmission Frequency:	2405~2480MHz
No. of Operated Channel:	16
Modulation:	16-ary orthogonal modulation, O-QPSK PHY

Channel list:

Operation Frequency each of channel			
Channel	**Frequency**	**Channel**	**Frequency**
11	2405 MHz	19	2445 MHz
12	2410 MHz	20	2450 MHz
13	2415 MHz	21	2455 MHz
14	2420 MHz	22	2460 MHz
15	2425 MHz	23	2465 MHz
16	2430 MHz	24	2470 MHz
17	2435 MHz	25	2475 MHz
18	2440 MHz	26	2480 MHz

Antenna Type:	Onboard PCB antenna
Antenna Gain:	2.19dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Zigbee Module. We tested it and listed the worst data in this report.
Test sample no.:	68.950.22.0387.01

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, antenna gain or any information supplied.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2020 Edition	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 (2013).

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	12-14	Site 1	☒	☐	☐
§15.247 (b) (1)	Conducted peak output power	15-16	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	17-18	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	19-20	Site 1	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	21-24	Site 1	☒	☐	☐
§15.247(d)	Band edge	25-26	Site 1	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	27-31	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses an onboard PCB antenna, which gain is 2.19dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ANDL-ZPU, complies with Section 15.207, 15.209, 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:	April 22, 2022
Testing Start Date:	April 24, 2022
Testing End Date:	May 11, 2022

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Reviewed by:

Hui TONG
Review Engineer

Prepared by:

Jiaxi XU
Project Engineer

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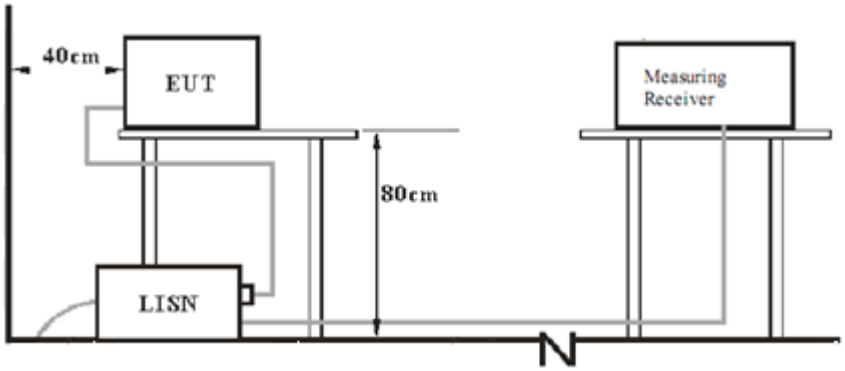
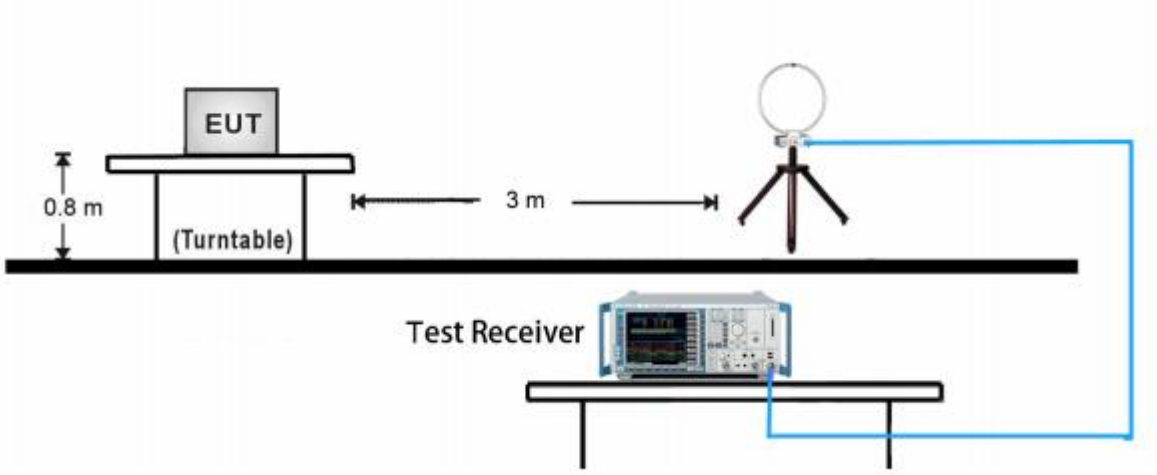
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

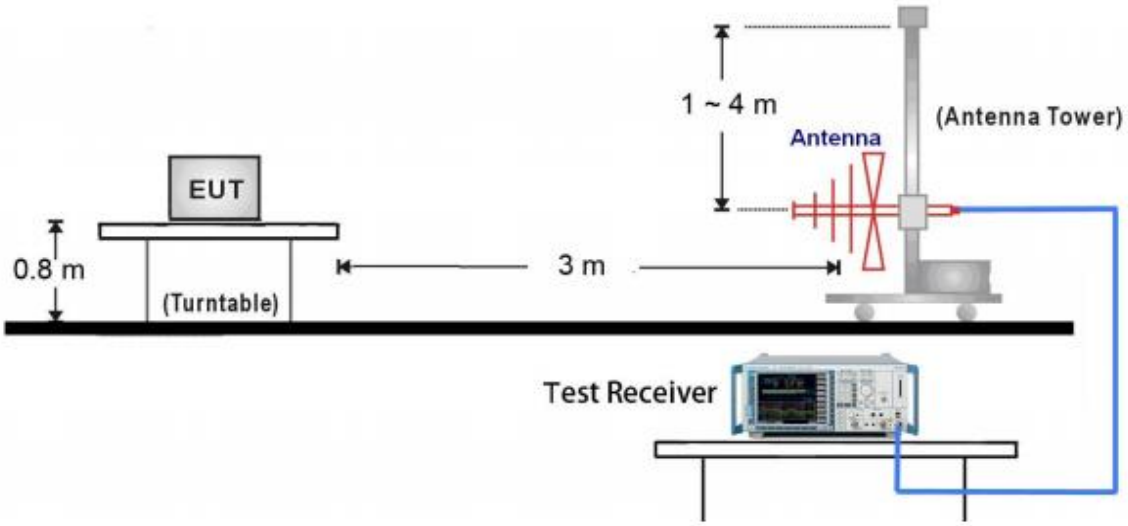


7.2 Radiated test setups

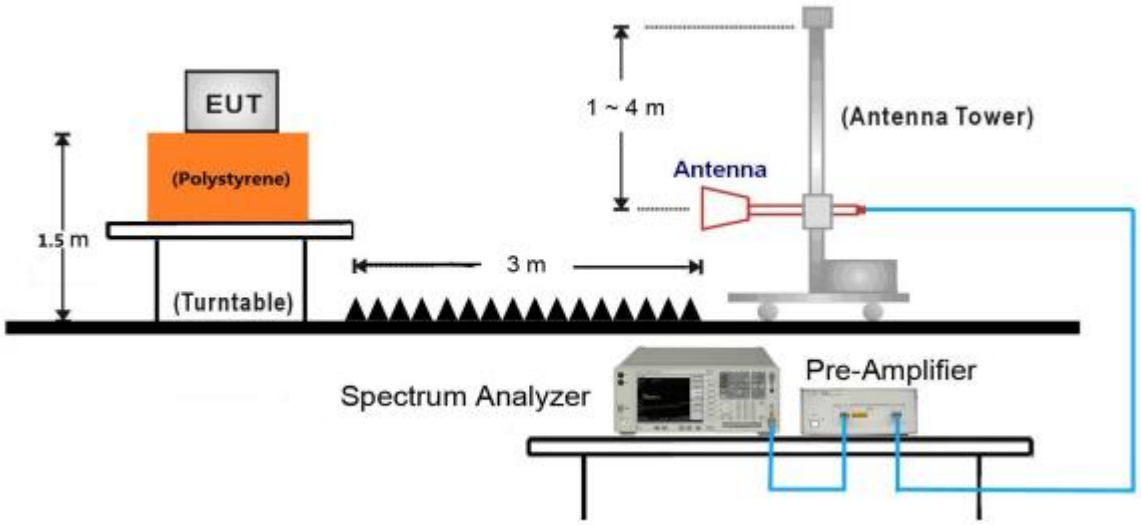
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



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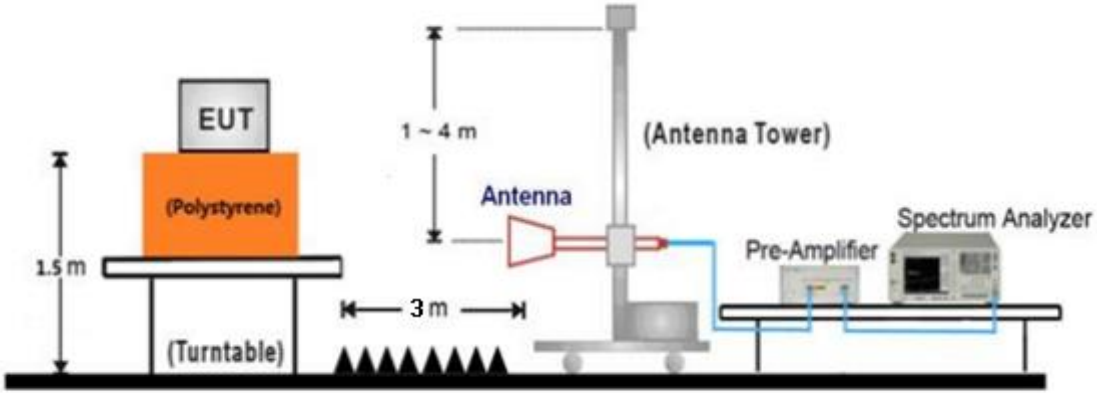
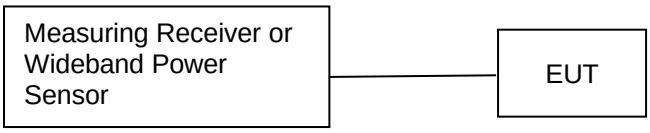
18GHz ~ 40GHz Test Setup:



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenove	X230	L34015285

Test software: PhyPlusKit

The system was configured to channel 11, 19, and 26 for the test.

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.

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9 Technical Requirement

9.1 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

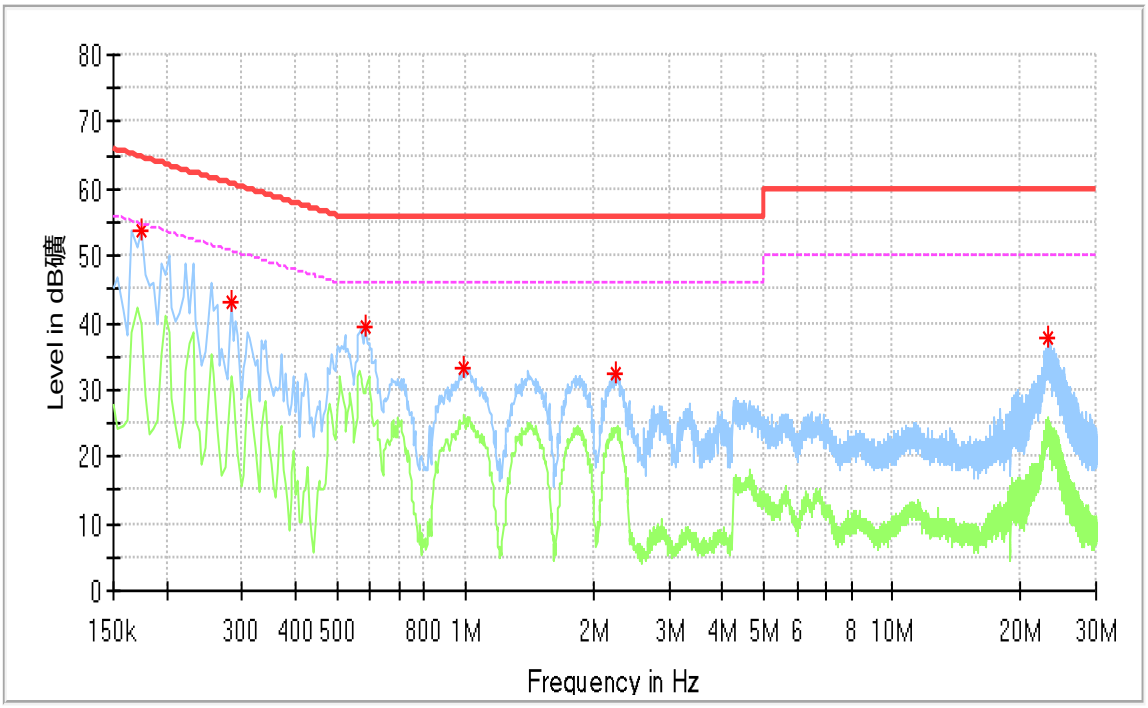
Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

China

Conducted Emission

Product Type	:	Zigbee module
M/N	:	ZPU
Operating Condition	:	Mode 1: Tx_2405MHz
Test Specification	:	L-line
Comment	:	AC 120V/60Hz (powered by notebook)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.174000	53.58	---	64.77	11.18	L1	9.25
0.282000	43.05	---	60.76	17.71	L1	9.22
0.582000	39.52	---	56.00	16.48	L1	9.20
0.994000	33.13	---	56.00	22.87	L1	9.20
2.250000	32.45	---	56.00	23.55	L1	9.23
23.158000	37.62	---	60.00	22.38	L1	9.51

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

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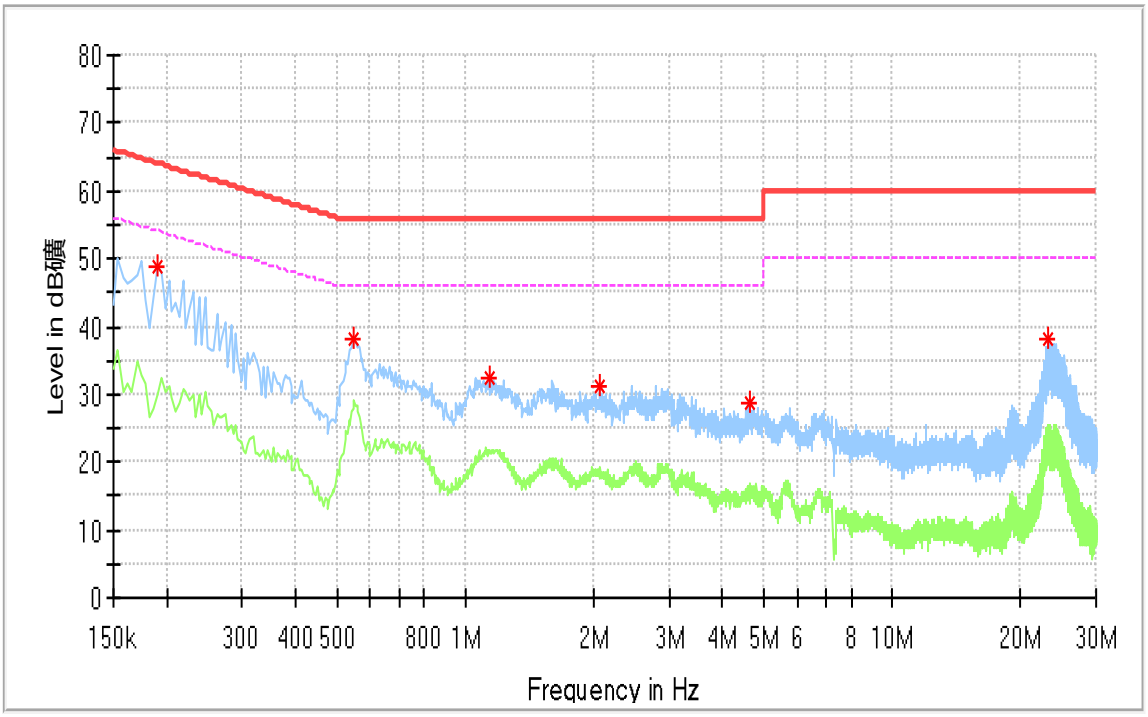
China

Product Type	:	Zigbee module
M/N	:	ZPU
Operating Condition	:	Mode 1: Tx_2405MHz
Test Specification	:	N-line
Comment	:	AC 120V/60Hz (powered by notebook)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.190000	48.78	---	64.04	15.26	N	9.40
0.546000	38.22	---	56.00	17.78	N	9.39
1.142000	32.49	---	56.00	23.51	N	9.40
2.062000	31.21	---	56.00	24.79	N	9.42
4.646000	28.91	---	56.00	27.09	N	9.49
23.170000	38.09	---	60.00	21.91	N	9.82

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

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9.2 Conducted peak output power

Test Method

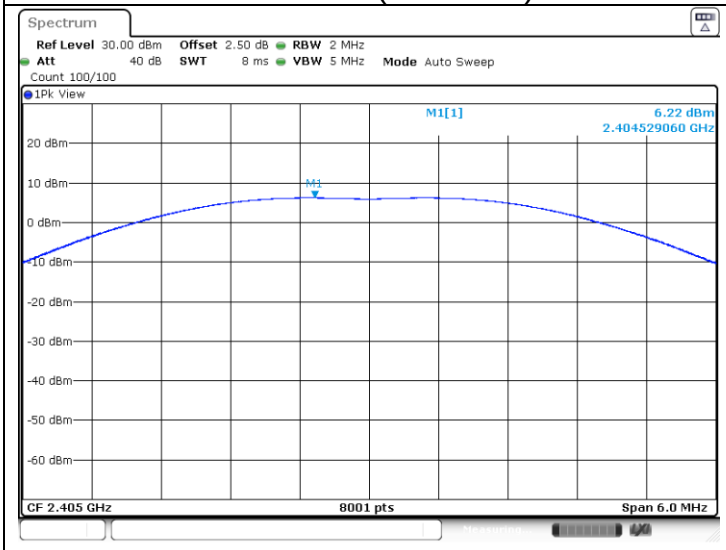
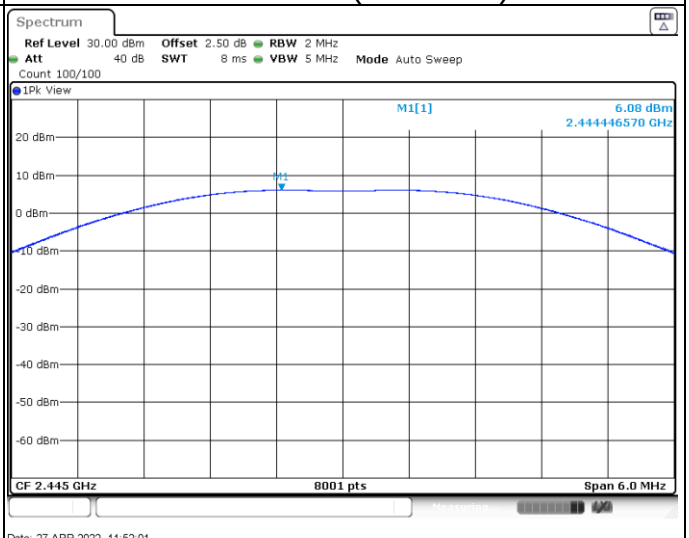
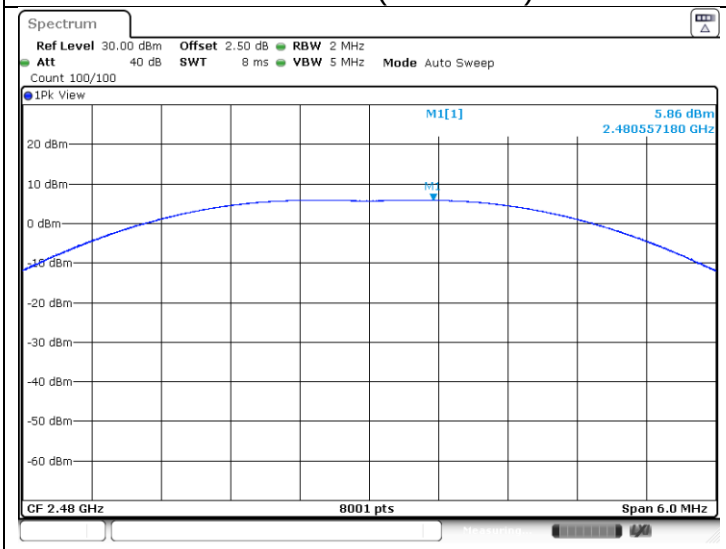
1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Use a power meter to measure the conducted peak output power.

Limits

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

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2405MHz	6.22	Pass
Middle channel 2445MHz	6.08	Pass
High channel 2480MHz	5.86	Pass

Peak output power	
Channel 11 (2405MHz)	Channel 18 (2445MHz)
	
Channel 26 (2480MHz)	
	

9.3 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]
≥500

Test result

Frequency MHz	6dB bandwidth kHz	Result
Top channel 2405MHz	1556	Pass
Middle channel 2445MHz	1556	Pass
Bottom channel 2480MHz	1416	Pass

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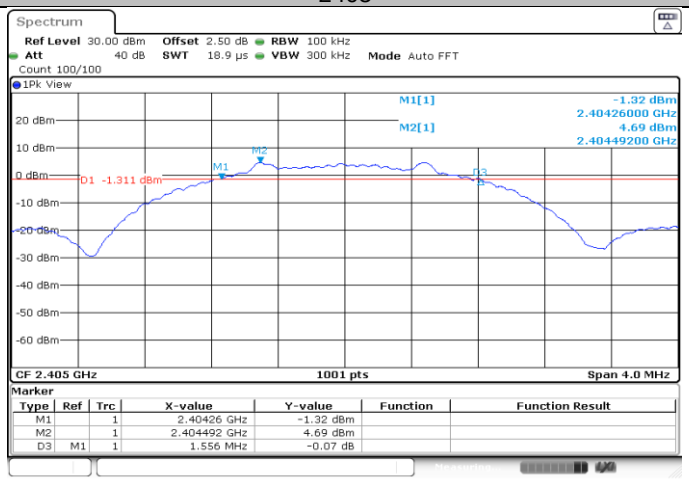
6dB Bandwidth

2405



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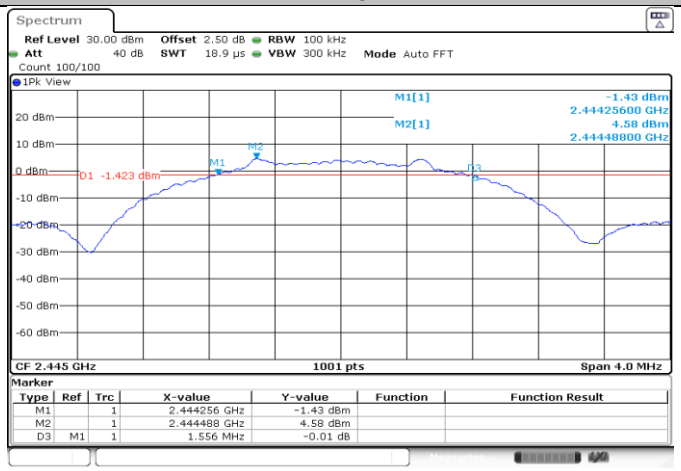
2445



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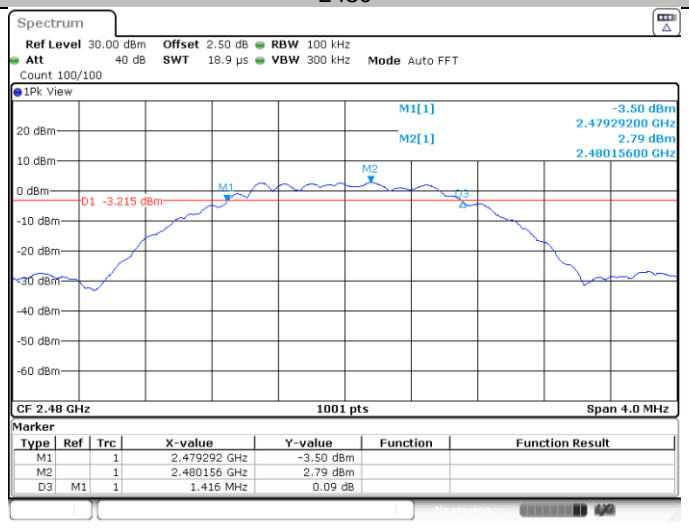
2480



Date: 27.APR.2022 11:53:54

9.4 Power spectral density

Test Method

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

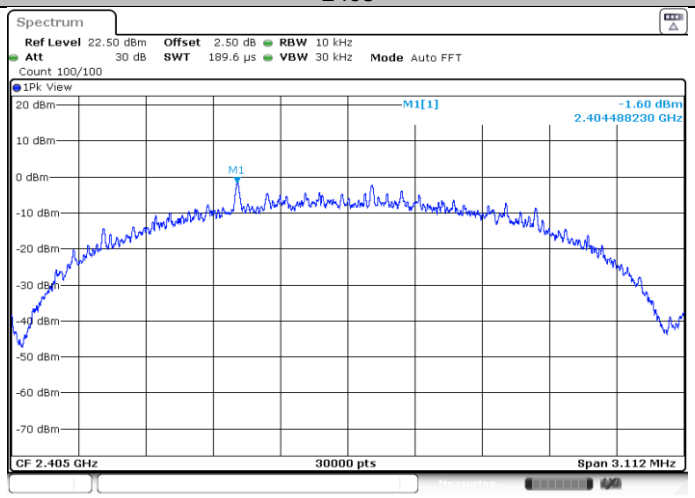
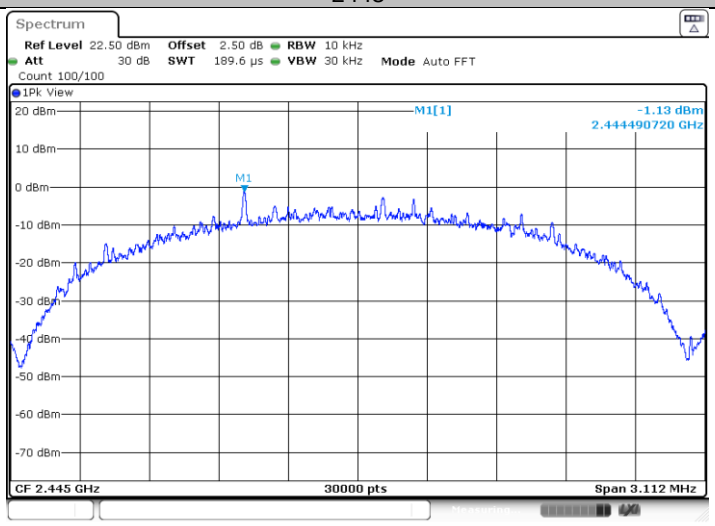
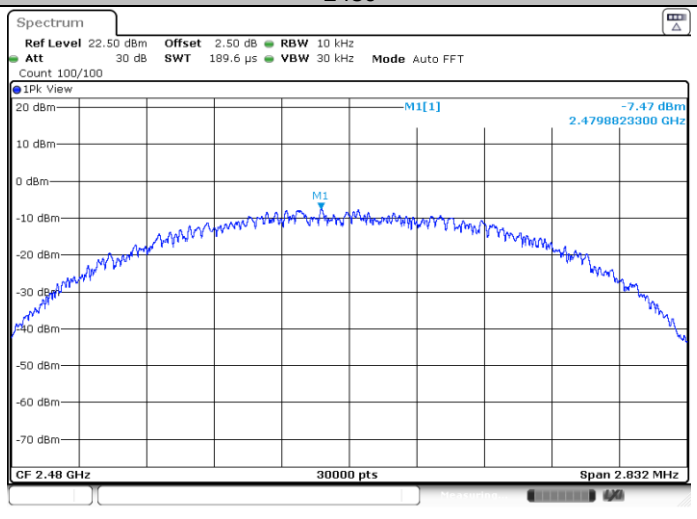
1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3kHz]
≤8

Test result

Frequency **MHz**	Power spectral density **dBm/10kHz**	Result
Top channel 2405MHz	-1.60	Pass
Middle channel 2445MHz	-1.13	Pass
Bottom channel 2480MHz	-7.47	Pass

2405

2445

2480


9.5 Spurious RF conducted emissions

Test Method

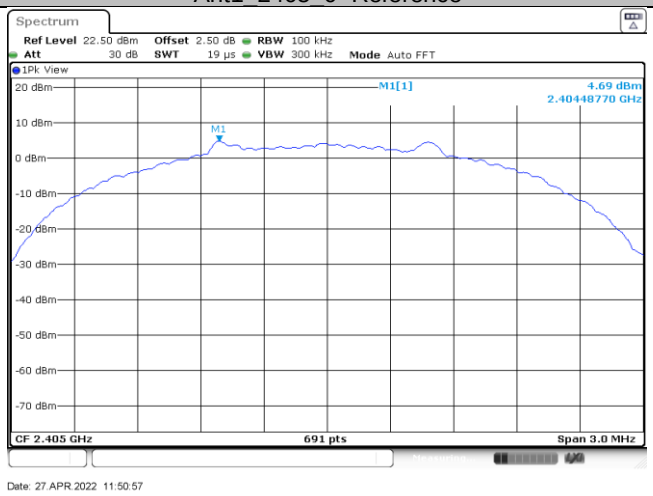
1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

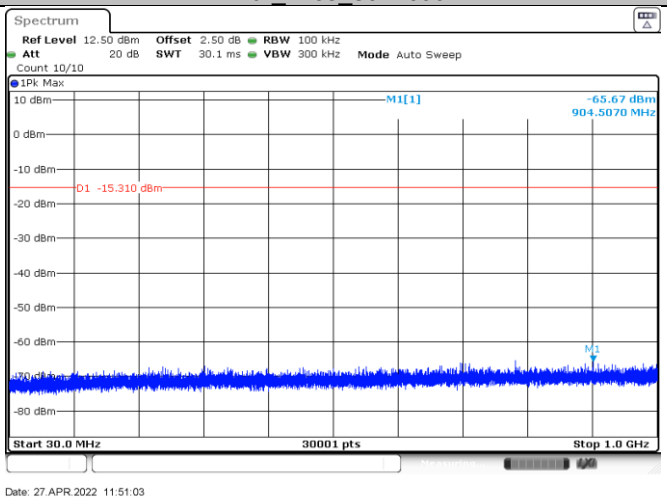
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

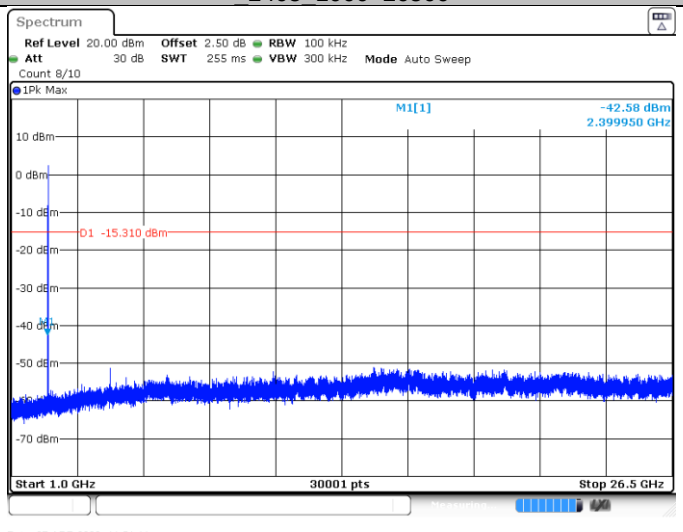
Ant1_2405_0~Reference



Ant1_2405_30~1000



2405_1000~26500



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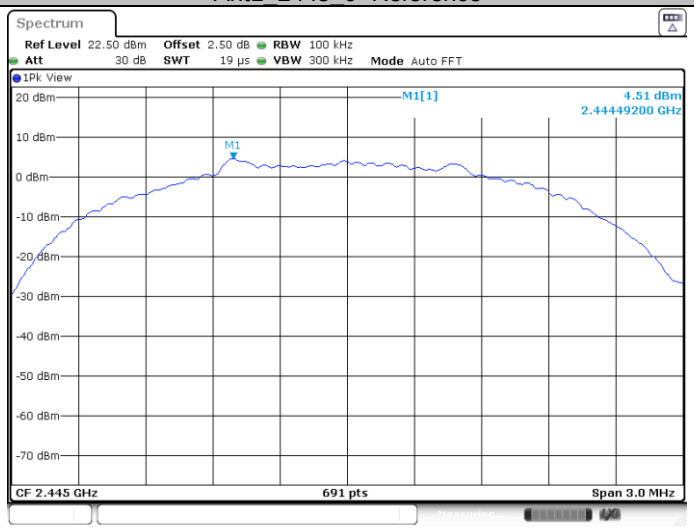
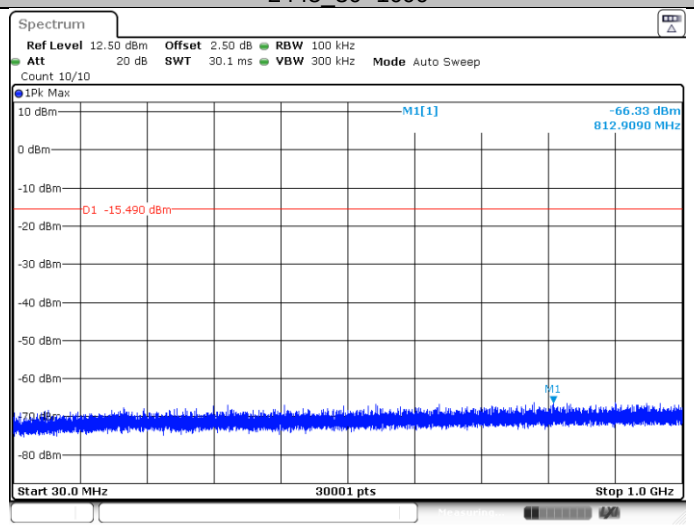
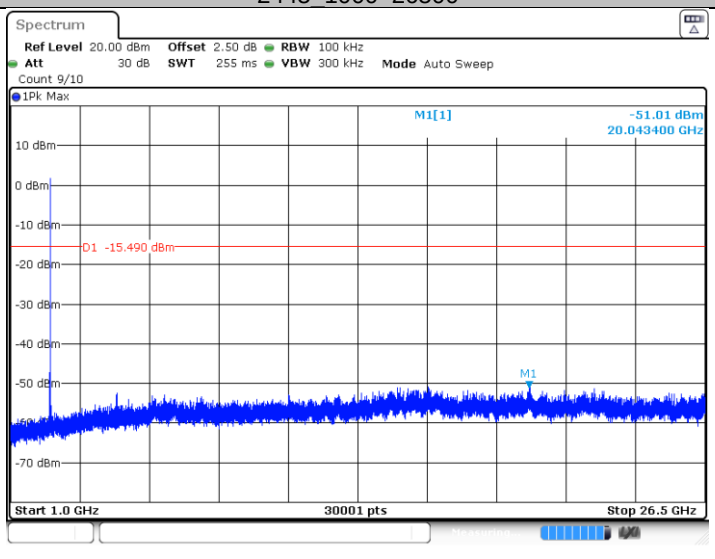
Ant1_2445_0~Reference


2445_30~1000


2445_1000~26500


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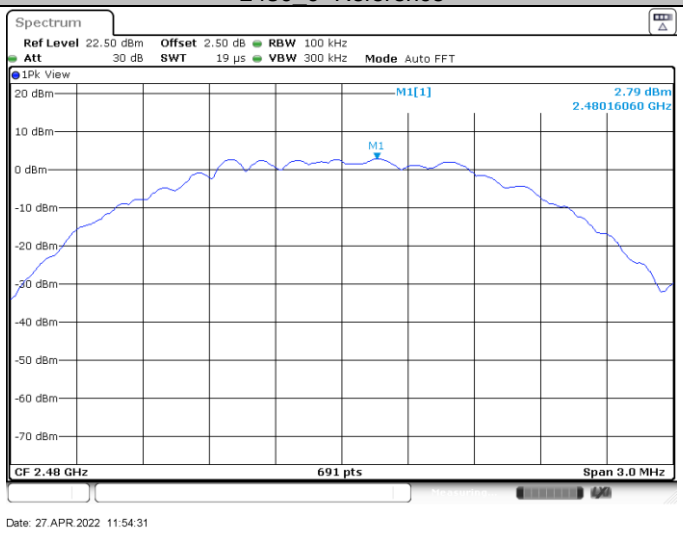
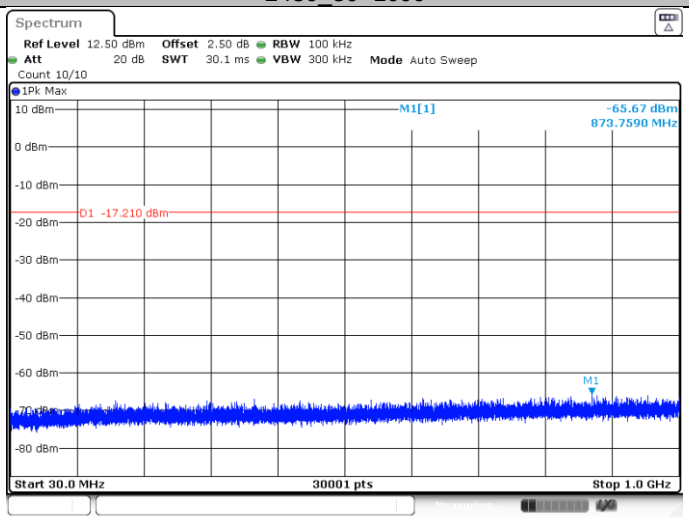
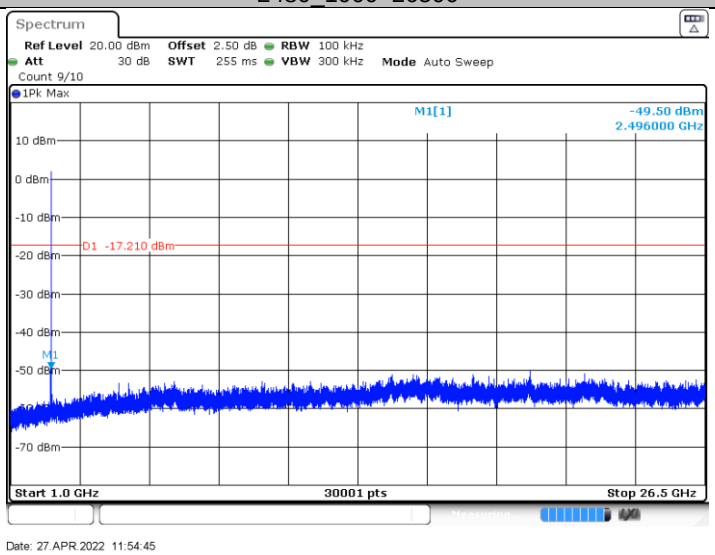
2480_0~Reference



2480_30~1000



2480_1000~26500



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9.6 Band edge

Test Method

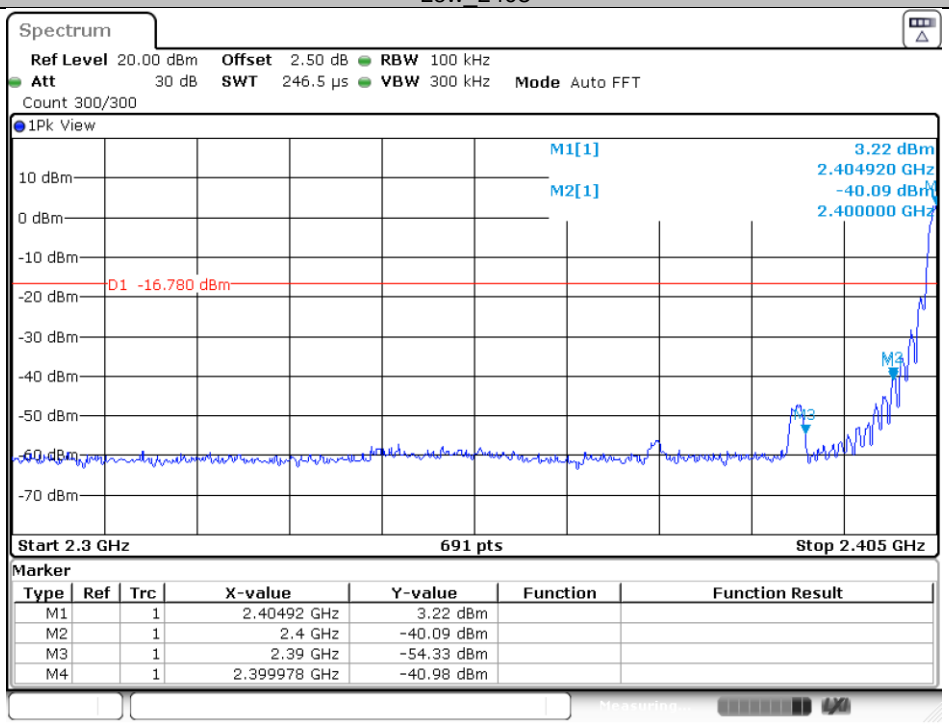
1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limit

According to §15.247(d) and RSS-247 5.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen 8.10, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

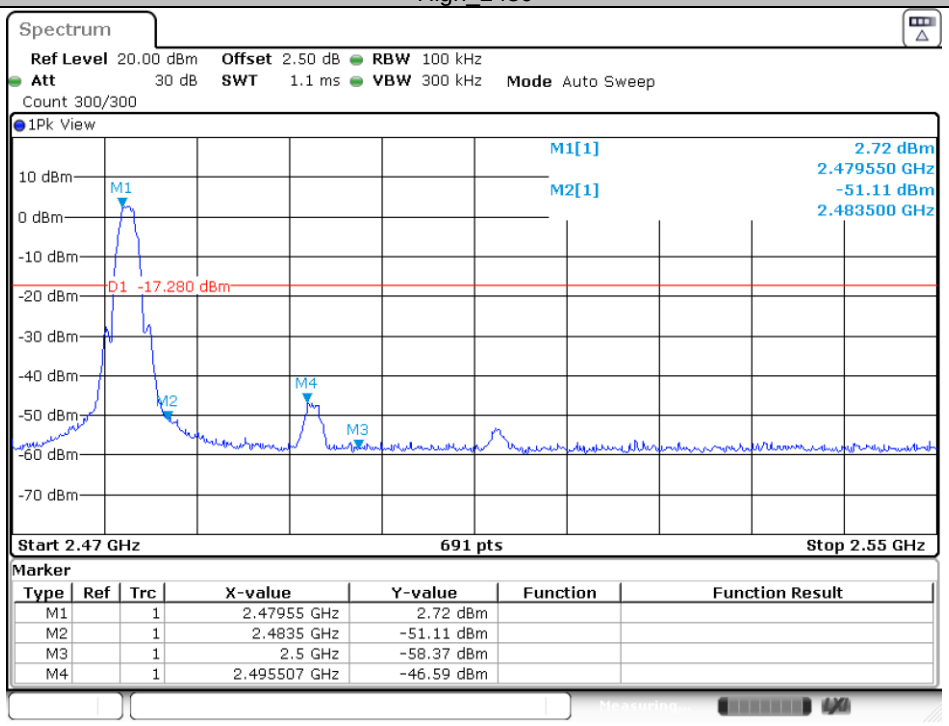
Test result

Low_2405



Date: 27.APR.2022 11:50:51

High_2480



Date: 27.APR.2022 11:54:26

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9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was place 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:

For Below 1GHz

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 to 120 kHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

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 1000 MHz

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.

Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205 and RSS-GEN 8.10 must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Measured Distance Meters
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30	30	30

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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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.
Pre-scan with three orthogonal axis and worst case as X axis. The only worse case test result is listed in the report.

Test result

Test mode: O-QPSK					
Channel 11 (2405MHz)					
Frequency (MHz)	**Measure Level (dBuV/m)**	**Limit (dBuV/M)**	**Margin (dB)**	**Detector**	**Polarization**
2389.7	44.21	74.0	29.79	Peak	Horizontal
4810.4	51.23	74.0	22.77	Peak	Horizontal
7213.5	42.52	74.0	31.48	Peak	Horizontal
2389.5	39.21	74.0	34.79	Peak	Vertical
4811.5	50.29	74.0	23.71	Peak	Vertical

Test mode: O-QPSK					
Channel 18 (2445MHz)					
Frequency (MHz)	**Measure Level (dBuV/m)**	**Limit (dBuV/M)**	**Margin (Db)**	**Detector**	**Polarization**
4892.0	51.70	74.0	22.30	Peak	Horizontal
7336.2	42.81	74.0	31.19	Peak	Horizontal
4892.0	46.28	74.0	27.72	Peak	Vertical

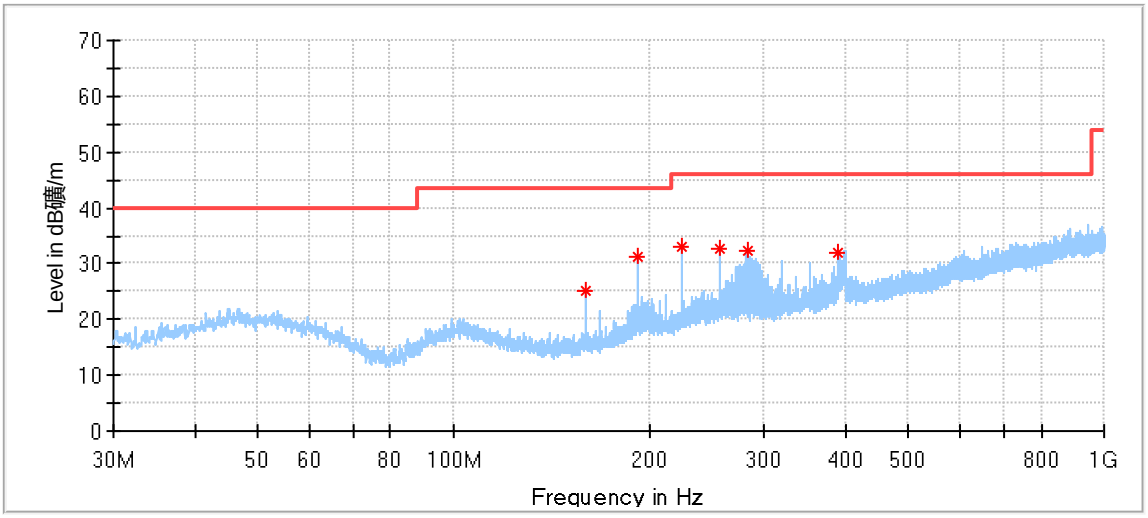
Test mode: O-QPSK					
Channel 26 (2480MHz)					
Frequency (MHz)	**Measure Level (dBuV/m)**	**Limit (dBuV/M)**	**Margin (dB)**	**Detector**	**Polarization**
2483.5	45.18	74.0	28.82	Peak	Horizontal
4961.0	50.66	74.0	23.34	Peak	Horizontal
2483.5	39.62	74.0	34.38	Peak	Vertical
4960.5	50.60	74.0	23.40	Peak	Vertical
7250.0	41.36	74.0	32.64	Peak	Vertical

Remark:

(1) Emission level= Original Receiver Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
(3) Margin = limit – Corrected Reading

The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2022/05/10 - 10:14
Limit: FCC_Part15.209_RE(3m)_ClassB	Engineer: Lonnie
Probe: VULB9168	Polarity: Horizontal
EUT: Zigbee Module, Model no: ZPU	Power: DC 3.3V by debug board for EUT, AC 120V,60Hz for notebook
Note: Transmit by at channel 2405MHz. Note: Pre-scan with three orthogonal axis and worst case as X axis	



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
159.980000	25.28	43.50	18.22	100.0	H	344.0	15.73
191.990000	31.22	43.50	12.28	100.0	H	155.0	18.05
224.000000	32.97	46.00	13.03	100.0	H	359.0	18.82
256.010000	32.67	46.00	13.33	100.0	H	155.0	20.29
284.140000	32.17	46.00	13.83	100.0	H	82.0	20.48
390.624444	32.10	46.00	13.90	100.0	H	139.0	23.35

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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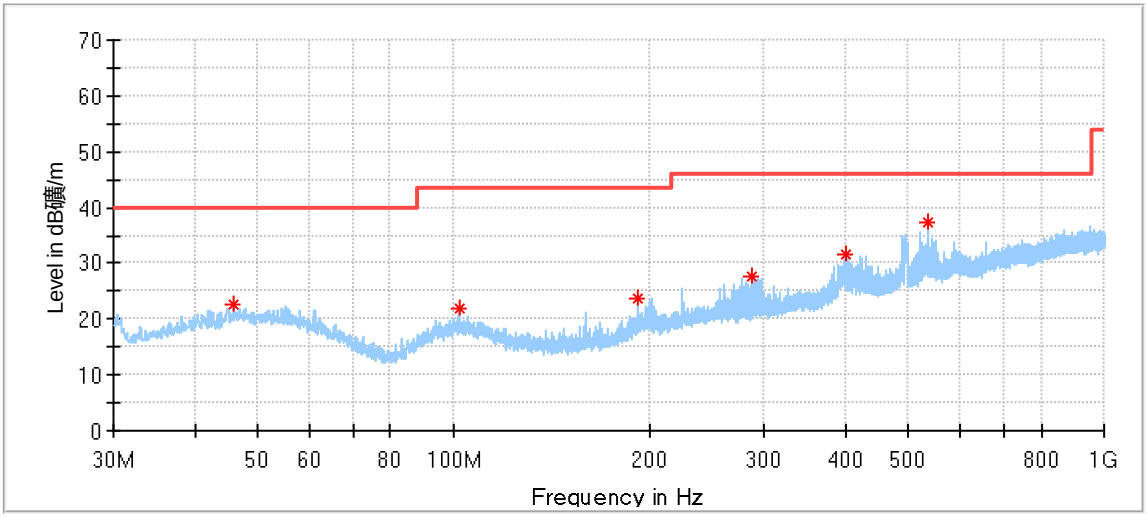
The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2022/05/10 - 10:34
Limit: FCC_Part15.209_RE(3m)_ClassB	Engineer: Lonnie
Probe: VULB9168	Polarity: Vertical
EUT: Zigbee Module, Model no: ZPU	Power: DC 3.3V by debug board for EUT, AC 120V,60Hz for notebook
Note: Transmit by at channel 2405MHz. Note: Pre-scan with three orthogonal axis and worst case as X axis	



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
45.843333	22.74	40.00	17.26	100.0	V	114.0	20.90
101.833889	21.94	43.50	21.56	200.0	V	0.0	18.62
191.990000	23.54	43.50	19.96	200.0	V	255.0	18.05
287.535000	27.59	46.00	18.41	200.0	V	215.0	20.56
399.623889	31.47	46.00	14.53	100.0	V	67.0	23.58
537.525556	37.45	46.00	8.55	100.0	V	67.0	25.87

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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10 Test Equipment List

List of Test Instruments

Radiated Emission Test 1# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2022-6-4
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-002	707	1	2022-7-23
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	1	2022-6-6
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-001	15542	1	2022-8-23
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	2	2023-5-28
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2022-8-25
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version10.35.02	N/A	N/A

Radiated Emission 2# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2022-6-4
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2022-5-24
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2022-10-10
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2022-10-10
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2022-7-21
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2022-7-27
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2022-8-23
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.02	N/A	N/A

Conducted Emission 2# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2022-6-4
LISN	Rohde & Schwarz	ENV216	68-4-87-19-001	102472	1	2022-6-5
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2022-6-3
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version10.35.02	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	3	2022-11-07

TS8997 Test System

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2022-6-3
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	68-4-93-14-003	101226/100851	1	2022-6-3
Power Splitter	Weinschel	1580	68-4-85-14-001	SC319	1	2022-6-3
10dB Attenuator	Weinschel	4M-10	68-4-81-14-003	43152	1	2022-6-3
10dB Attenuator	R&S	DNF	68-4-81-14-004	DNF-001	1	2022-6-3
10dB Attenuator	R&S	DNF	68-4-81-14-005	DNF-002	1	2022-6-3
10dB Attenuator	R&S	DNF	68-4-81-14-006	DNF-003	1	2022-6-3
10dB Attenuator	R&S	DNF	68-4-81-14-007	DNF-004	1	2022-6-3
Test software	Tonscend	System for BT/WIFI	68-4-74-14-006-A13	Version 2.6.77.0518	N/A	N/A
Shielding Room	TDK	TS8997	68-4-90-19-003	----	3	2022-11-07

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11 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
	Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 30MHz-1000MHz	Horizontal: 4.70dB; Vertical: 4.67dB;
	Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 4.65dB; Vertical: 4.63dB;
	Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.31dB Frequency test involved: 0.6×10^{-7} or 1%
	Uncertainty Evaluation for Power Spectral Density Conducted measurement	1.17dB
	Uncertainty Evaluation for Spurious emissions Conducted measurement	1.43dB
	Uncertainty Evaluation for ACS and Blocking of Radiated method	4.11dB
	Uncertainty Evaluation for ACS, ASS, Blocking and Overloadind of Conducted method	0.831dB
	Uncertainty Evaluation for Sensitivity and DR of Conducted method	0.816dB
	Uncertainty Evaluation for Sensitivity of Radiated method	2.29dB
	Uncertainty Evaluation for Humidity	0.936%
	Uncertainty Evaluation for Temperature	0.195 °C

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.

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13 Photographs of EUT

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

THE END

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