TEST REPORT

Reference No......	:	WTX26X04094639W003
FCC ID.....	:	2BDC6-EMGEN4
Applicant.....	:	Shelly Europe Ltd.
Address.....	:	51 Cherni Vrah Blvd., bldg.3,fl.2-3,Sofia 1407,Bulgaria
Manufacturer.....	:	The same as Applicant
Address.....	:	The same as Applicant
Product Name.....	:	Shelly EM Gen4
Model No......	:	S4EM-002CXCEU
Standards.....	:	FCC Part 15.247
Date of Receipt sample.....	:	2026-04-09
Date of Test.....	:	2026-04-11 to 2026-04-24
Date of Issue.....	:	2026-04-27
Test Report Form No......	:	WTX_Part 15_247W
Test Result.....	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:
Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road,
Block 70 Bao'an District, Shenzhen, Guangdong, China
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Email: sem@waltek.com.cn

Tested by:

Tris Li

Tris Li/Project Engineer

Approved by:

Silin Chen

Silin Chen/Manager

TABLE OF CONTENTS

1. GENERAL INFORMATION 4
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
1.2 TEST STANDARDS 5
1.3 TEST METHODOLOGY 5
1.4 TEST FACILITY 5
1.5 EUT SETUP AND TEST MODE 6
1.6 MEASUREMENT UNCERTAINTY 7
1.7 TEST EQUIPMENT LIST AND DETAILS 8
2. SUMMARY OF TEST RESULTS 12
3. ANTENNA REQUIREMENT 13
3.1 STANDARD APPLICABLE 13
3.2 EVALUATION INFORMATION 13
4. POWER SPECTRAL DENSITY 14
4.1 STANDARD APPLICABLE 14
4.2 TEST SETUP BLOCK DIAGRAM 14
4.3 TEST PROCEDURE 14
5.4 SUMMARY OF TEST RESULTS/PLOTS 14
5. 6DB BANDWIDTH 15
5.1 STANDARD APPLICABLE 15
5.2 TEST SETUP BLOCK DIAGRAM 15
5.3 TEST PROCEDURE 15
5.4 SUMMARY OF TEST RESULTS/PLOTS 15
6. RF OUTPUT POWER 16
6.1 STANDARD APPLICABLE 16
6.2 TEST SETUP BLOCK DIAGRAM 16
6.3 TEST PROCEDURE 16
6.4 SUMMARY OF TEST RESULTS/PLOTS 16
7. FIELD STRENGTH OF SPURIOUS EMISSIONS 17
7.1 STANDARD APPLICABLE 17
7.2 TEST PROCEDURE 17
7.3 CORRECTED AMPLITUDE & MARGIN CALCULATION 19
7.4 SUMMARY OF TEST RESULTS/PLOTS 19
8. OUT OF BAND EMISSIONS 28
8.1 STANDARD APPLICABLE 28
8.2 TEST PROCEDURE 28
8.3 SUMMARY OF TEST RESULTS/PLOTS 29
9. CONDUCTED EMISSIONS 31
9.1 TEST PROCEDURE 31
9.2 BASIC TEST SETUP BLOCK DIAGRAM 31
9.3 TEST RECEIVER SETUP 31
9.4 SUMMARY OF TEST RESULTS/PLOTS 31
APPENDIX SUMMARY 34
APPENDIX A 35
APPENDIX B 37
APPENDIX C 39
APPENDIX D 41
APPENDIX PHOTOGRAPHS 43

Report version

Version No.	Date of issue	Description
Rev.00	2026-04-27	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	Shelly EM Gen4
Trade Name:	Shelly
Model No.:	S4EM-002CXCEU
Adding Model(s):	/
Rated Voltage:	AC 110-240V 50/60Hz
Power Adapter:	/
Note: The sample information is provided by the customer.	

Technical Characteristics of EUT	
Support Standards:	IEEE802.15.4
Frequency Range:	2405-2480MHz
RF Output Power:	-0.377dBm (Conducted)
Type of Modulation:	QPSK
Quantity of Channels:	16
Channel Separation:	5MHz
Type of Antenna:	PCB Antenna
Antenna Gain:	3.73dBi
Note: 1: The Antenna Gain is provided by the customer and can affect the validity of results. *2: The data provided by the customer and can affect the validity of results.*	

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.
558074 D01 DTS Meas Guidance v05r02: Guidance for performing Compliance Measurement on Digital Transmission Systems operating under section 15.247.
ANSI C63.10-2020: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2020, KDB 558074 D01 DTS Meas Guidance v05r02.
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

Address of the test laboratory
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990
Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is mai ntained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A
The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A and the CAB identifier is CN0057.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low	2405MHz
TM2	Middle	2440MHz
TM3	High	2480MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	45~75 %
ATM Pressure:	1001 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
AC Cable	1	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.57dB
Occupied Bandwidth	Conducted	±0.015MHz
Power Spectral Density	Conducted	±1.8dB
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emission 1#	Conducted	@9kHz to 150kHz: ±3.74dB
		@150kHz to 30MHz: ±3.34dB
Conducted Emission 2#	Conducted	@9kHz to 150kHz: ±3.74dB
		@150kHz to 30MHz: ±3.34dB
Transmitter Spurious Emissions chamber A	Radiated	@9kHz to 30MHz: ±3.0dB
		@30MHz to 1GHz: ±5.70dB
		@1GHz to 6GHz: ±5.88dB
		@6GHz to 18GHz: ±5.96dB
		@18GHz to 40GHz: ±6.12dB
Transmitter Spurious Emissions chamber B	Radiated	@30MHz to 1GHz: ±5.36dB
Transmitter Spurious Emissions chamber C	Radiated	@9kHz to 30MHz: ±3.0dB
		@30MHz to 1GHz: ±5.28dB
		@1GHz to 6GHz: ±5.56dB
		@6GHz to 18GHz: ±5.72dB
		@18GHz to 40GHz: ±6.12dB

1.7 Test Equipment List and Details

Internal No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
WTXE1105A 1001	Communication Tester	Rohde & Schwarz	CMW500	1201.0002 k50-148650-FB	2026-03-25	2027-03-24
WTXE1022A 1002	GSM Tester	Rohde & Schwarz	CMU200	114403	2026-02-06	2027-02-05
WTXE1005A 1005	MXA Signal Analyzer	Agilent	N9020A	US47140102	2026-03-25	2027-03-24
WTXE1084A 1001	MXA Signal Analyzer	KEYSIGHT	N9020A	MY54320548	2026-02-06	2027-02-05
WTXE1044A 1001	Signal Generator	Agilent	83752A	3610A01453	2026-02-06	2027-02-05
WTXE1104A 1001	MXG Vector Signal Generator	Agilent	N5182A	MY47420108	2026-02-06	2027-02-05
WTXW1105A 1136	RF ATTENUATOR	FEIYANG	N-JK	/	2026-02-06	2027-02-05
WTXE1003A 1-005	Coaxial Cable	/	0M4RFC	/	2026-02-23	2027-02-22
☐ Chamber A: Below 1GHz						
WTXE1005A 1003	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2026-02-05	2027-02-04
WTXE1001A 1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2026-02-05	2027-02-04
WTXE1007A 1002	Amplifier	HP	8447F	2805A03475	2026-02-05	2027-02-04
WTXE1010A 1007	Loop Antenna	Schwarz beck	FMZB 1516	9773	2026-02-05	2027-02-04
WTXE1010A 1006	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2026-03-11	2029-03-10
WTXE1104A 1032-1	Coaxial Cable	/	RC_6G-N-M	/	2026-02-23	2027-02-22
WTXE1104A 1032-2	Coaxial Cable	/	RC_6G-N-M	/	2026-02-23	2027-02-22
WTXE1104A 1032-3	Coaxial Cable	/	RC_6G-N-M	/	2026-02-23	2027-02-22
☐ Chamber A: Above 1GHz						
WTXE1005A 1003	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2026-02-05	2027-02-04
WTXE1001A	EMI Test	Rohde &	ESPI	101611	2026-02-05	2027-02-04

1001	Receiver	Schwarz				
WTXE1065A 1001	Amplifier	C&D	PAP-1.0G18	14918	2026-02-05	2027-02-04
WTXE1010A 1005	Horn Antenna	ETS	3117	00086197	2026-02-05	2027-02-04
WTXE1010A 1010	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2026-02-10	2027-02-09
WTXE1003A 1001	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2026-02-05	2027-02-04
WTXE1104A 1033-1	Coaxial Cable	/	C16-07-07	/	2026-02-23	2027-02-22
WTXE1104A 1033-2	Coaxial Cable	/	C16-07-07	/	2026-02-23	2027-02-22
WTXE1104A 1033-3	Coaxial Cable	/	C16-07-07	/	2026-02-23	2027-02-22
☐ Chamber B:Below 1GHz						
WTXE1010A 1006	Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2024-03-17	2027-03-16
WTXE1038A 1001	Amplifier	Agilent	8447D	2944A104 57	2026-02-05	2027-02-04
WTXE1001A 1002	EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2026-02-05	2027-02-04
WTXE1104A 1031-1	Coaxial Cable	/	1.5MRFC-LWB3	/	2026-02-23	2027-02-22
WTXE1104A 1031-2	Coaxial Cable	/	RG 316	/	2026-02-23	2027-02-22
WTXE1104A 1031-3	Coaxial Cable	/	RG 316	/	2026-02-23	2027-02-22
☒ Chamber C:Below 1GHz						
WTXE1093A 1001	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2026-02-05	2027-02-04
WTXE1010A 1013-1	Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2024-04-18	2027-04-17
WTXE1007A 1003	Amplifier	HP	8447F	2944A038 69	2026-02-05	2027-02-04
WTXE1010A 1007	Loop Antenna	Schwarz beck	FMZB 1516	9773	2026-02-05	2027-02-04
WTXE1104A 1034-1	Coaxial Cable	/	RC_6G-N-M	/	2026-02-23	2027-02-22
WTXE1104A	Coaxial Cable	/	RC_6G-N-M	/	2026-02-23	2027-02-22

1034-2						
WTXE1104A 1034-3	Coaxial Cable	/	RC_6G-N-M	/	2026-02-23	2027-02-22
☒ Chamber C: Above 1GHz						
WTXE1093A 1001	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2026-02-05	2027-02-04
WTXE1103A 1005	Horn Antenna	POAM	RTF-118A	1820	2025-06-13	2027-06-12
WTXE1103A 1006	Amplifier	Tonscend	TAP01018050	AP22E806 235	2026-02-05	2027-02-04
WTXE1010A 1010	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2026-02-10	2027-02-09
WTXE1003A 1001	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2026-02-05	2027-02-04
WTXE1104A 1035-1	Coaxial Cable	/	RC-18G-N-M	/	2026-02-23	2027-02-22
WTXE1104A 1035-2	Coaxial Cable	/	RC-18G-N-M	/	2026-02-23	2027-02-22
WTXE1104A 1035-3	Coaxial Cable	/	RC-18G-N-M	/	2026-02-23	2027-02-22
☐ Conducted Room 1#						
WTXE1104A 1029	EMI Test Receiver	Rohde & Schwarz	ESCI	100525	2025-11-25	2026-11-24
WTXE1002A 1001	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2026-02-05	2027-02-04
WTXE1003A 1001	AC LISN	Schwarz beck	NSLK8126	8126-279	2026-02-05	2027-02-04
WTXE1104A 1036	Coaxial Cable	/	RG 316	/	2026-02-23	2027-02-22
WTXE1104A 1038	Coaxial Cable	/	6MRFC-DP	/	2026-02-23	2027-02-22
☒ Conducted Room 2#						
WTXE1001A 1004	EMI Test Receiver	Rohde & Schwarz	ESPI	101259	2026-02-05	2027-02-04
WTXE1003A 1003	LISN	Rohde & Schwarz	ENV 216	100097	2026-02-05	2027-02-04
WTXE1104A 1037	Coaxial Cable	/	RG 316	/	2026-02-23	2027-02-22

Software List			
Description	**Manufacturer**	**Model**	**Version**
EMI Test Software/EZ-EMC (Radiated Emission A)	Farad	RA-03A1	1.1.4.2
EMI Test Software/EZ-EMC (Radiated Emission B)	Farad	RA-03A1	1.1.4.2
EMI Test Software/EZ-EMC (Radiated Emission C)	Farad	RA-03A1-2	1.1.4.2
EMI Test Software/EZ-EMC (Conducted Emission Room 1#)	Farad	3A1*CE-RE	1.1.4.3
EMI Test Software/EZ-EMC (Conducted Emission Room 2#)	Farad	3A1*CE-RE	1.1.4.3

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203; §15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§15.207(a)	Conducted Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.247(a)(2)	6 dB Bandwidth	Compliant
§15.247(b)(3)	RF Output Power	Compliant
§15.209(a)	Radiated Emission	Compliant
§15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: Not applicable.

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Evaluation Information

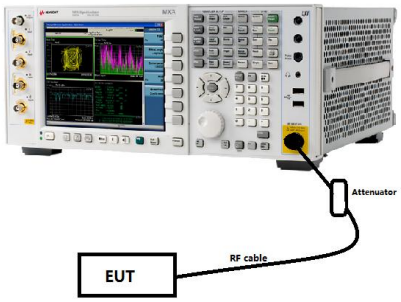
This product has a PCB antenna, fulfill the requirement of this section.

4. Power Spectral Density

4.1 Standard Applicable

According to 15.247(a)(1)(iii), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

4.2 Test Setup Block Diagram



4.3 Test Procedure

According to the KDB 558074, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3kHz ≤ RBW ≤ 100kHz.
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.4 Summary of Test Results/Plots

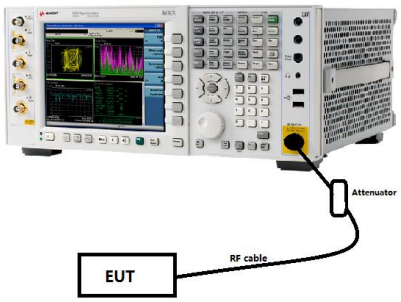
Please refer to Appendix A

5. 6dB Bandwidth

5.1 Standard Applicable

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

5.2 Test Setup Block Diagram



5.3 Test Procedure

a) Set RBW = 100kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

5.4 Summary of Test Results/Plots

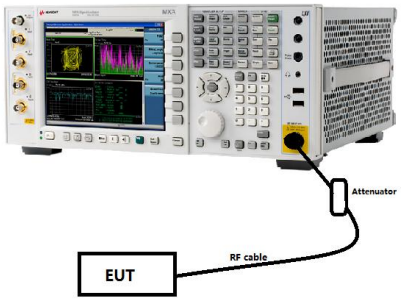
Please refer to Appendix B

6. RF Output Power

6.1 Standard Applicable

According to 15.247(b)(3), for systems using digital modulation in the 902–928MHz, 2400–2483.5MHz, and 5725–5850MHz bands: 1 Watt.

6.2 Test Setup Block Diagram



6.3 Test Procedure

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3RBW.
c) Set span ≥ 3RBW.
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

6.4 Summary of Test Results/Plots

Please refer to Appendix C

7. Field Strength of Spurious Emissions

7.1 Standard Applicable

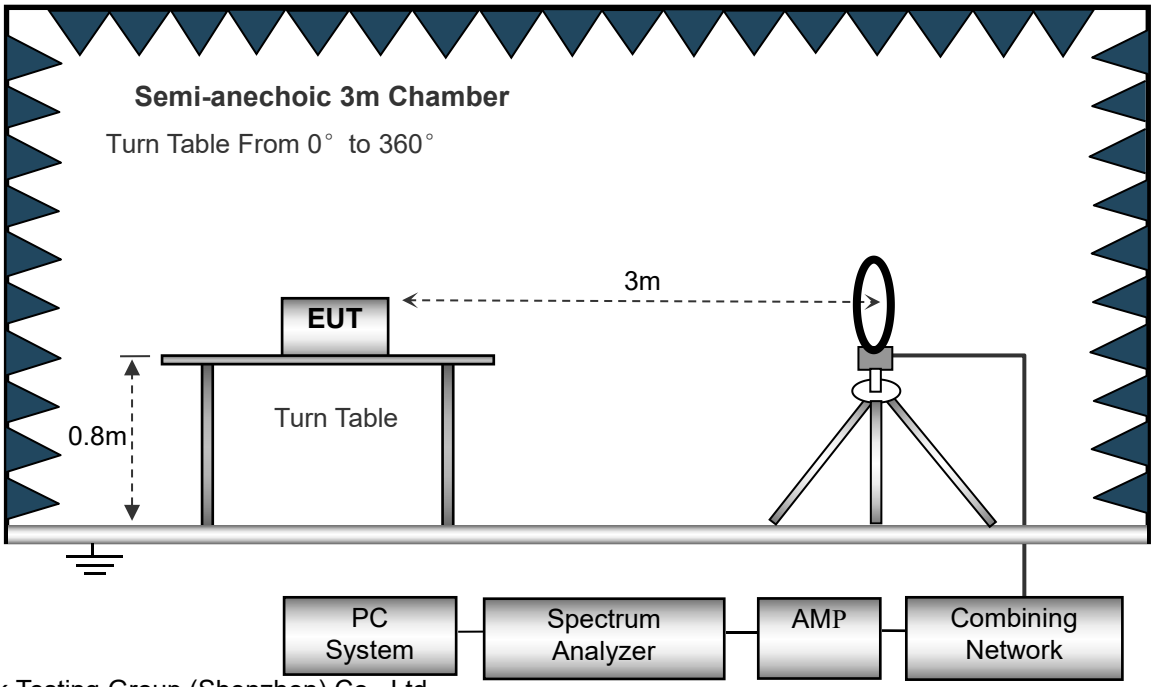
According to §15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the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

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

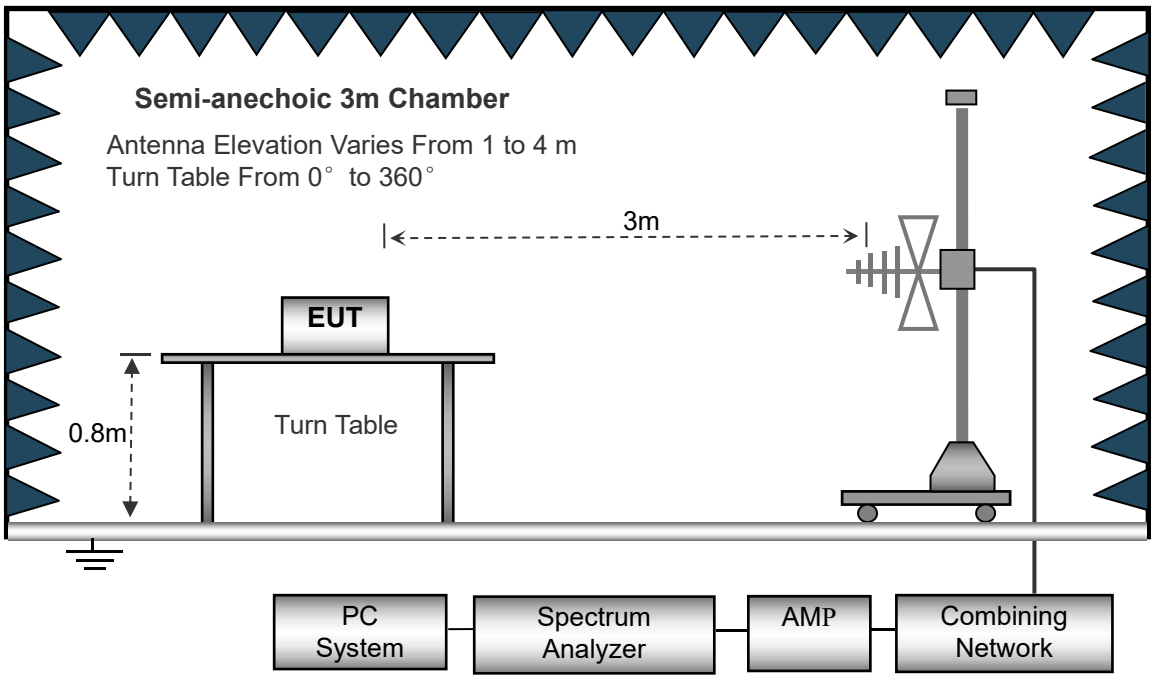
7.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2020 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10cm.

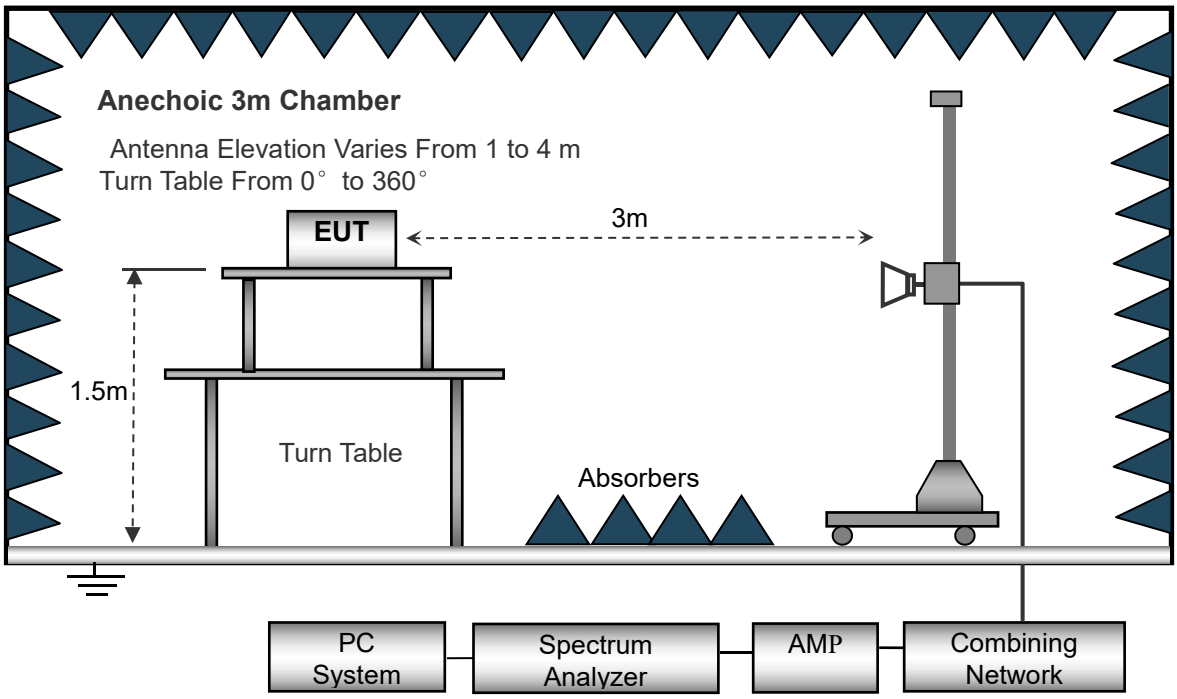
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1GHz.



Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10kHz,	RBW=120kHz,	RBW=1MHz,
VBW =30kHz	VBW=300kHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

7.3 Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

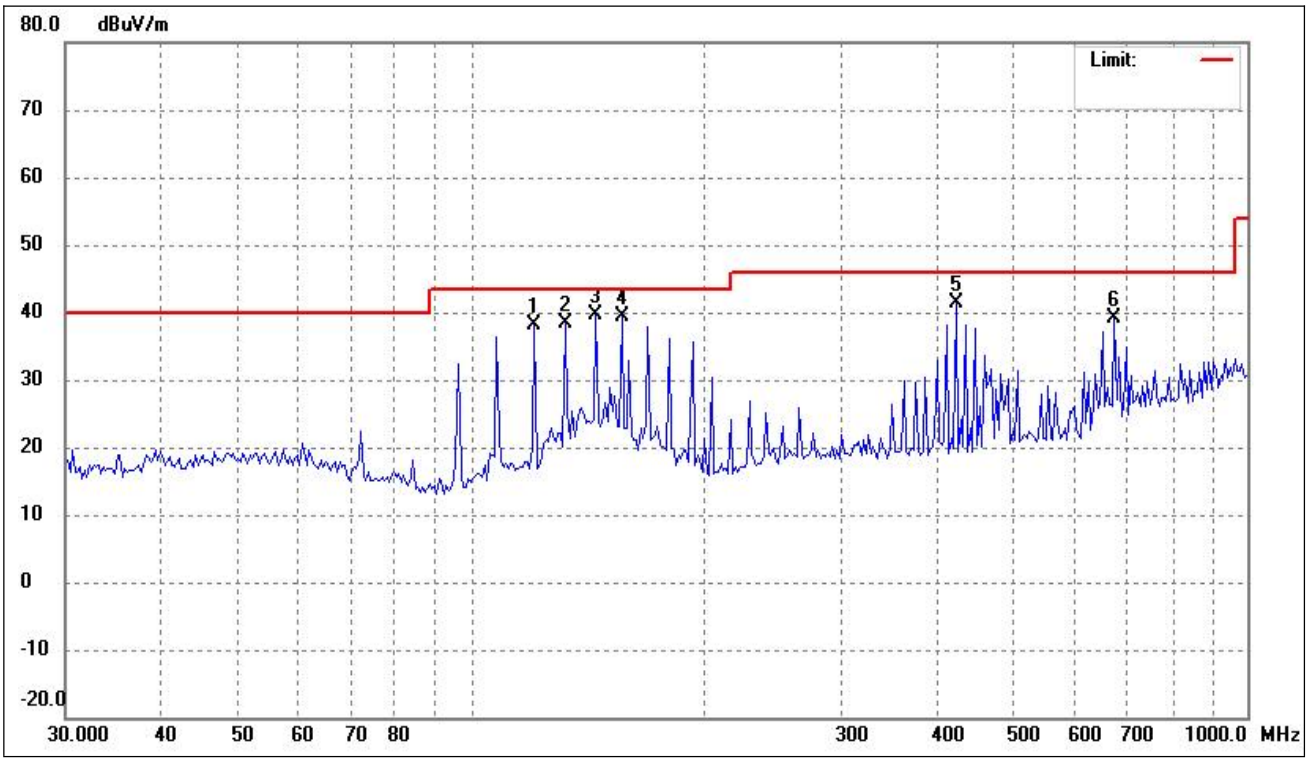
Margin = Corr. Ampl. – FCC Part 15 Limit

7.4 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

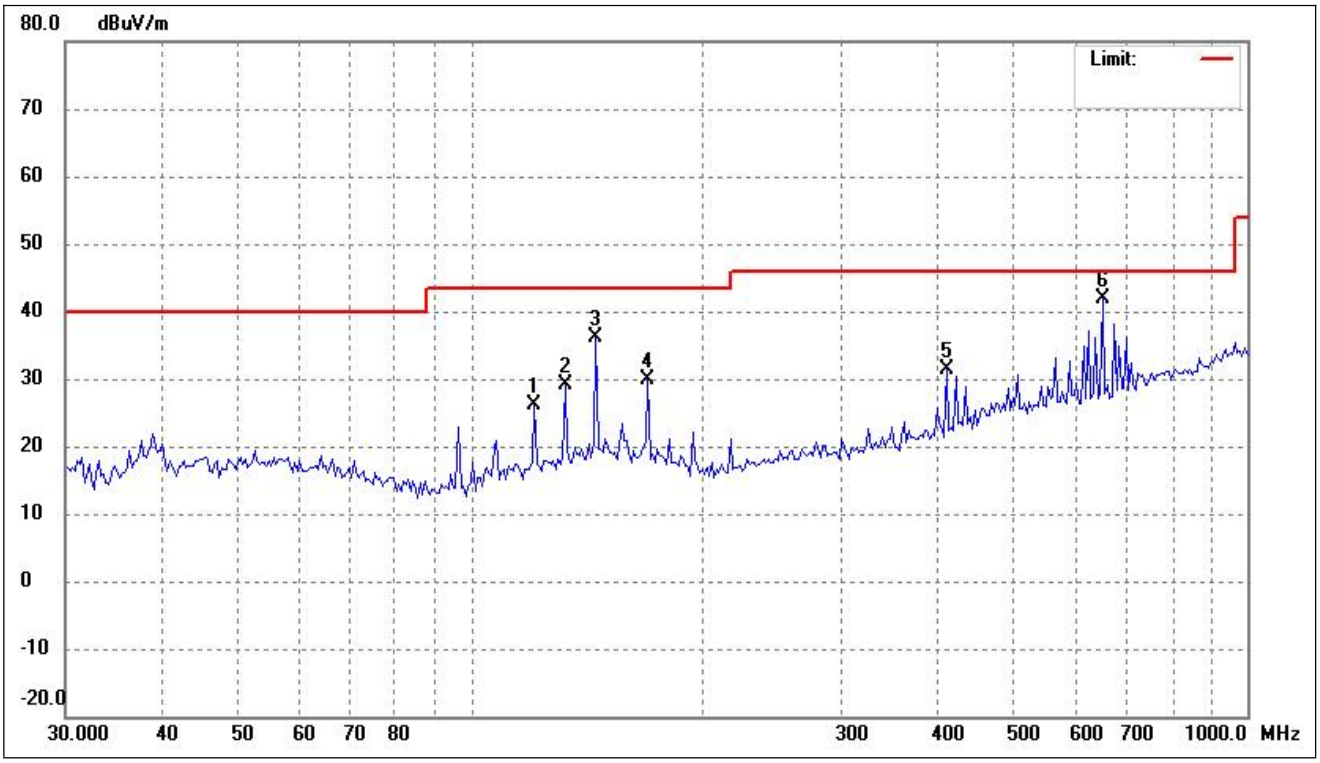
➢ Spurious Emissions Below 1GHz

Test Channel	Low(worst case)	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	120.6118	48.42	-10.25	38.17	43.50	-5.33	-	-	peak
2	132.1490	47.97	-9.47	38.50	43.50	-5.00	-	-	peak
3	144.7899	48.38	-8.76	39.62	43.50	-3.88	-	-	peak
4	156.4259	47.69	-8.31	39.38	43.50	-4.12	-	-	peak
5	421.3287	47.07	-5.78	41.29	46.00	-4.71	-	-	peak
6	674.6768	39.02	0.04	39.06	46.00	-6.94	-	-	peak

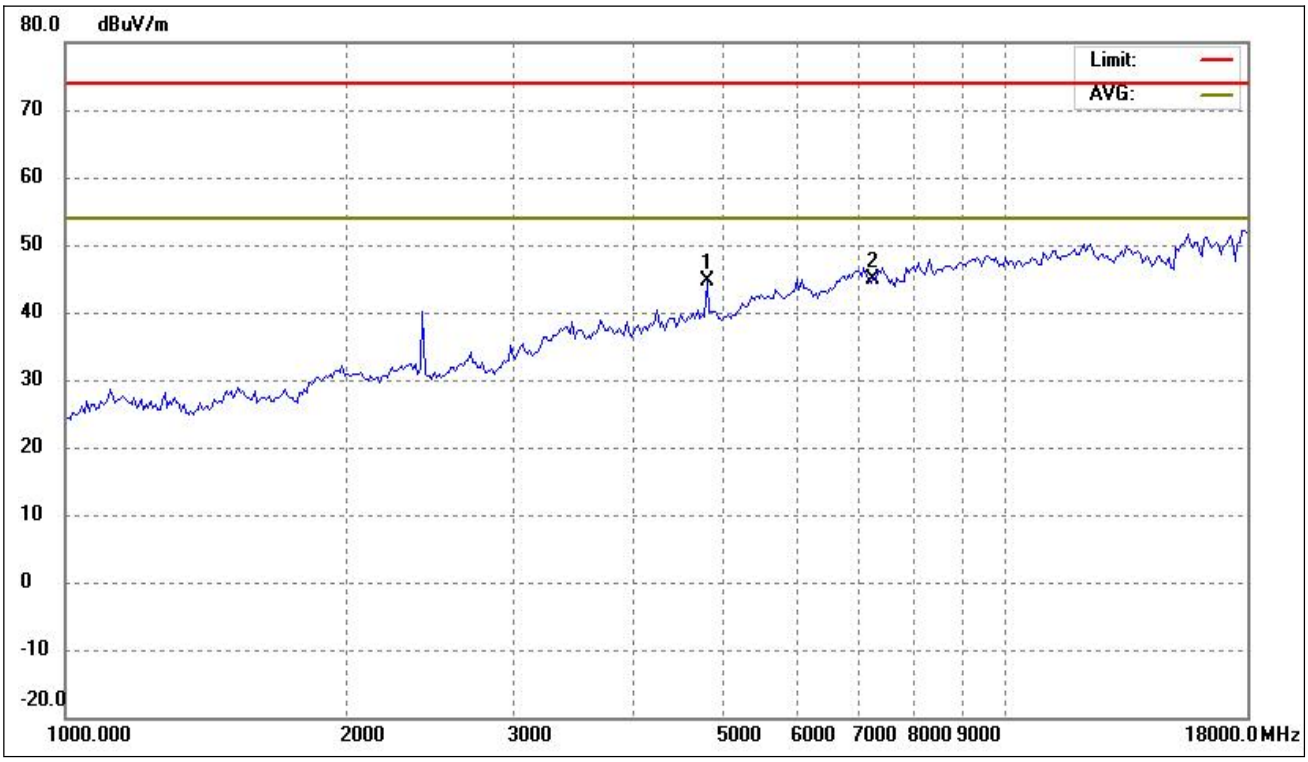
Test Channel	Low(worst case)	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	120.6118	36.33	-10.25	26.08	43.50	-17.42	-	-	peak
2	132.1490	38.56	-9.47	29.09	43.50	-14.41	-	-	peak
3	144.7899	44.91	-8.76	36.15	43.50	-7.35	-	-	peak
4	168.9970	38.50	-8.64	29.86	43.50	-13.64	-	-	peak
5	409.6506	37.31	-6.05	31.26	46.00	-14.74	-	-	peak
6	651.3831	41.92	-0.15	41.77	46.00	-4.23	-	-	peak

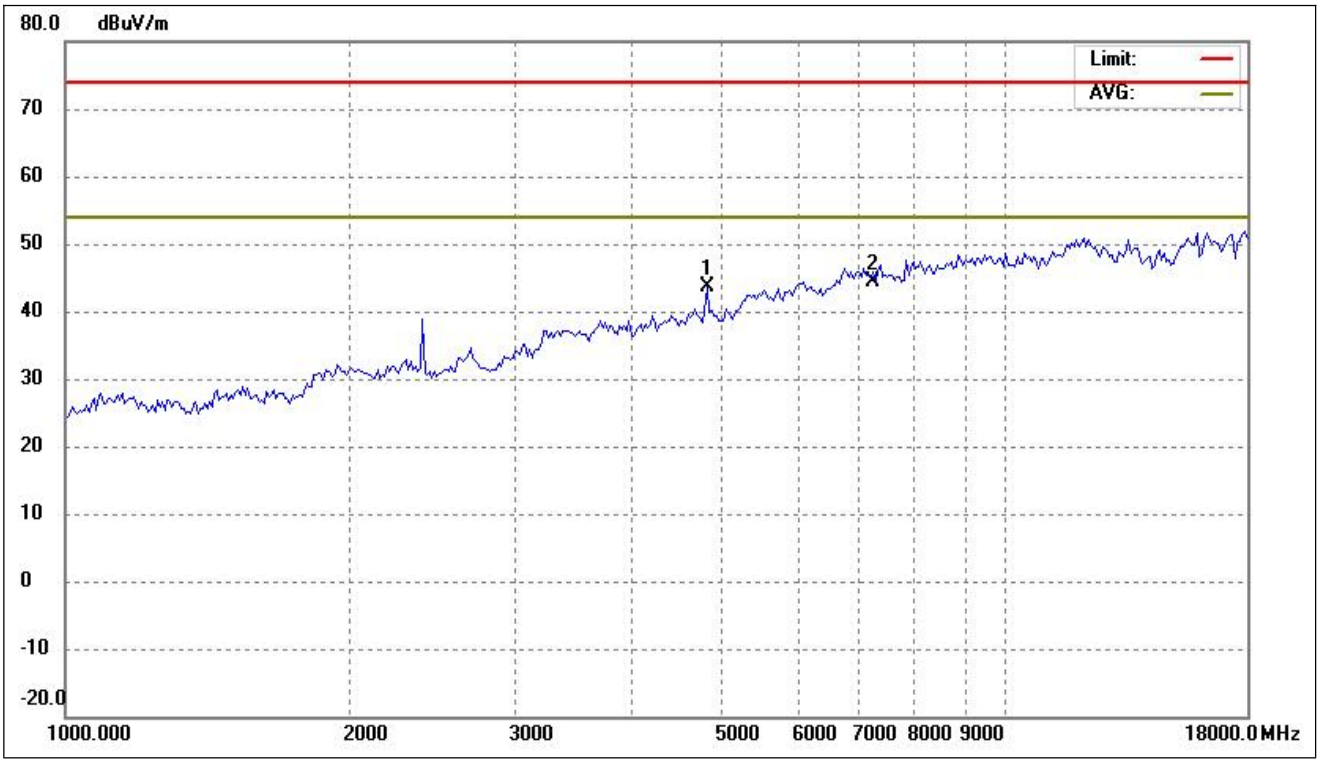
➢ Spurious Emissions Above 1GHz

Test Channel	Low	Polarity:	Horizontal



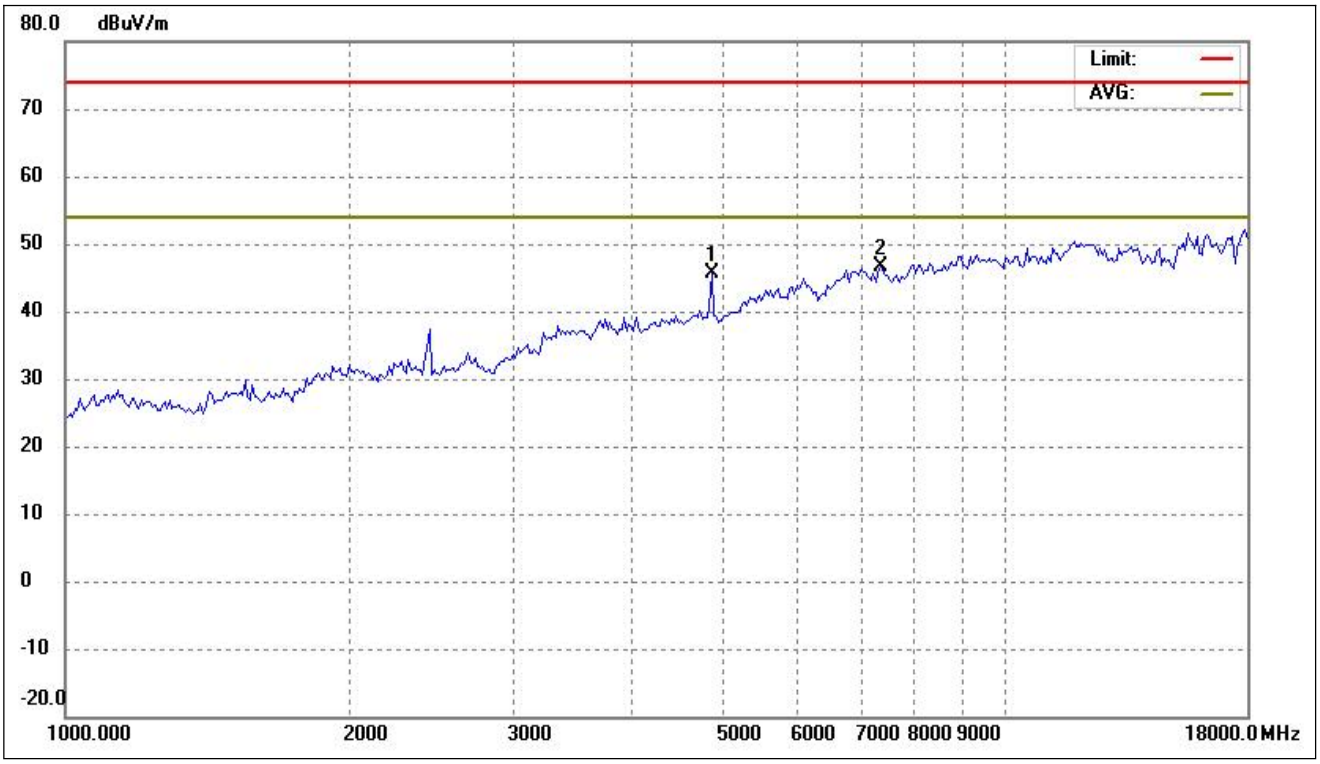
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	4805.307	56.76	-12.11	44.65	74.00	-29.35	-	-	peak
2	7215.000	50.89	-5.99	44.90	74.00	-29.10	-	-	peak

Test Channel	Low	Polarity:	Vertical



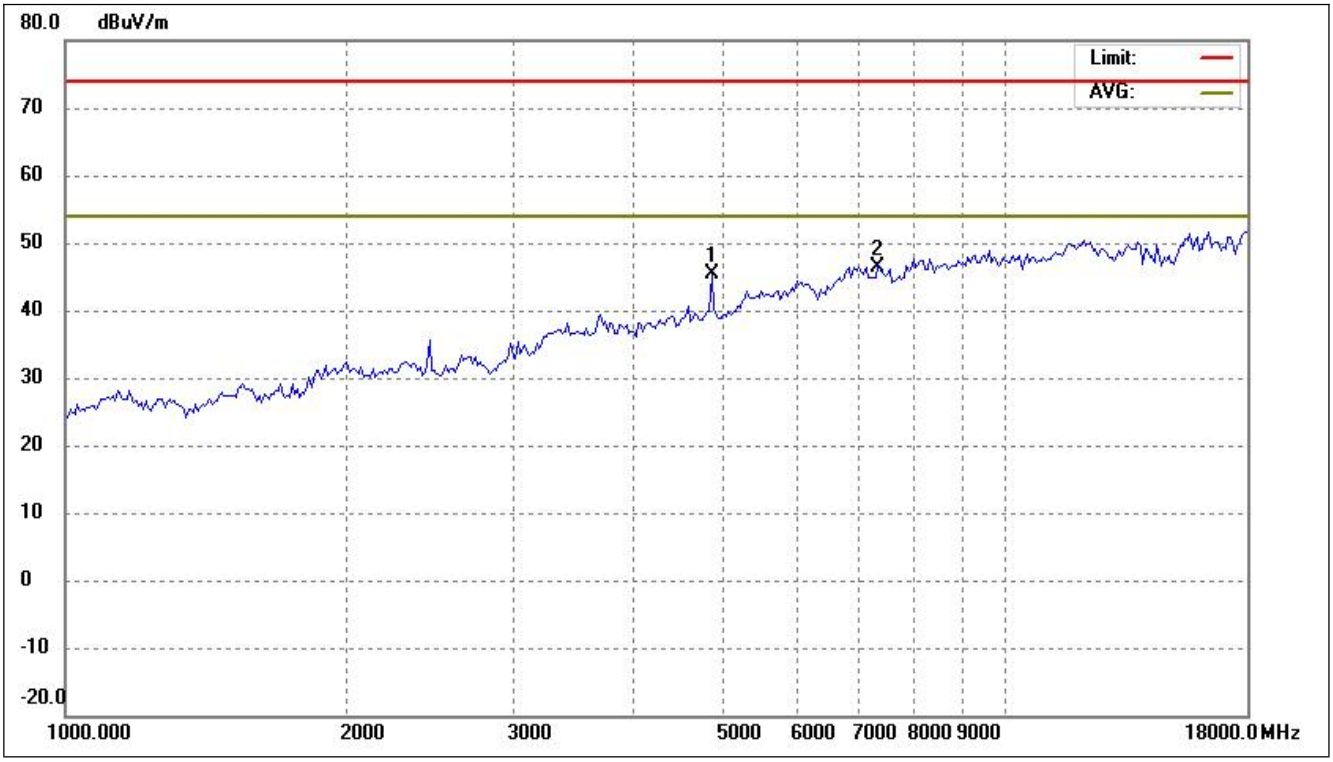
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	4805.307	55.69	-12.11	43.58	74.00	-30.42	-	-	peak
2	7215.000	50.30	-5.99	44.31	74.00	-29.69	-	-	peak

Test Channel	Middle	Polarity:	Horizontal



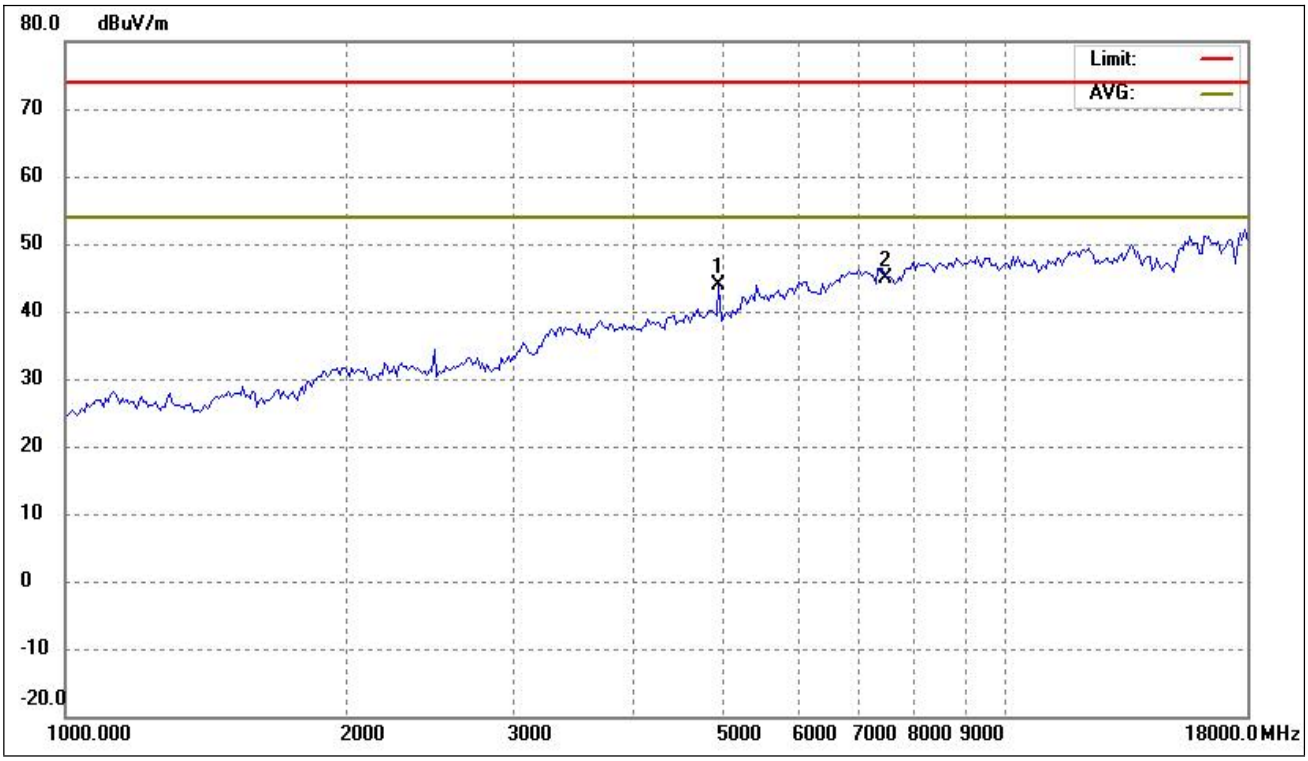
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	4861.299	57.23	-11.72	45.51	74.00	-28.49	-	-	peak
2	7320.000	51.61	-5.05	46.56	74.00	-27.44	-	-	peak

Test Channel	Middle	Polarity:	Vertical



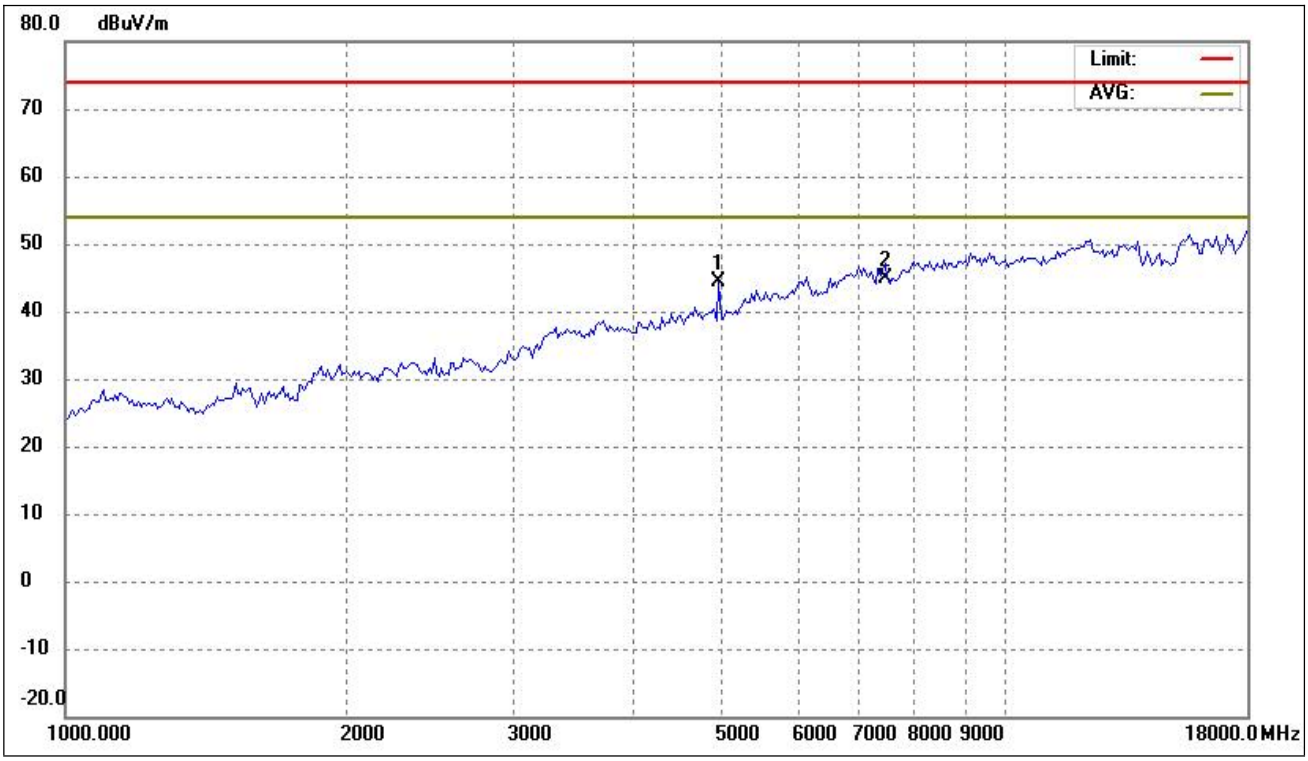
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	4861.299	56.99	-11.72	45.27	74.00	-28.73	-	-	peak
2	7320.000	51.37	-5.05	46.32	74.00	-27.68	-	-	peak

Test Channel	High	Polarity:	Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	4946.511	56.58	-12.69	43.89	74.00	-30.11	-	-	peak
2	7440.000	50.83	-5.97	44.86	74.00	-29.14	-	-	peak

Test Channel	High	Polarity:	Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(·)	(cm)	
1	4946.511	56.96	-12.69	44.27	74.00	-29.73	-	-	peak
2	7440.000	50.78	-5.97	44.81	74.00	-29.19	-	-	peak

Remark: '-'Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

8. Out of Band Emissions

8.1 Standard Applicable

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

8.2 Test Procedure

According to the KDB 558074, the band-edge radiated test method as follows:

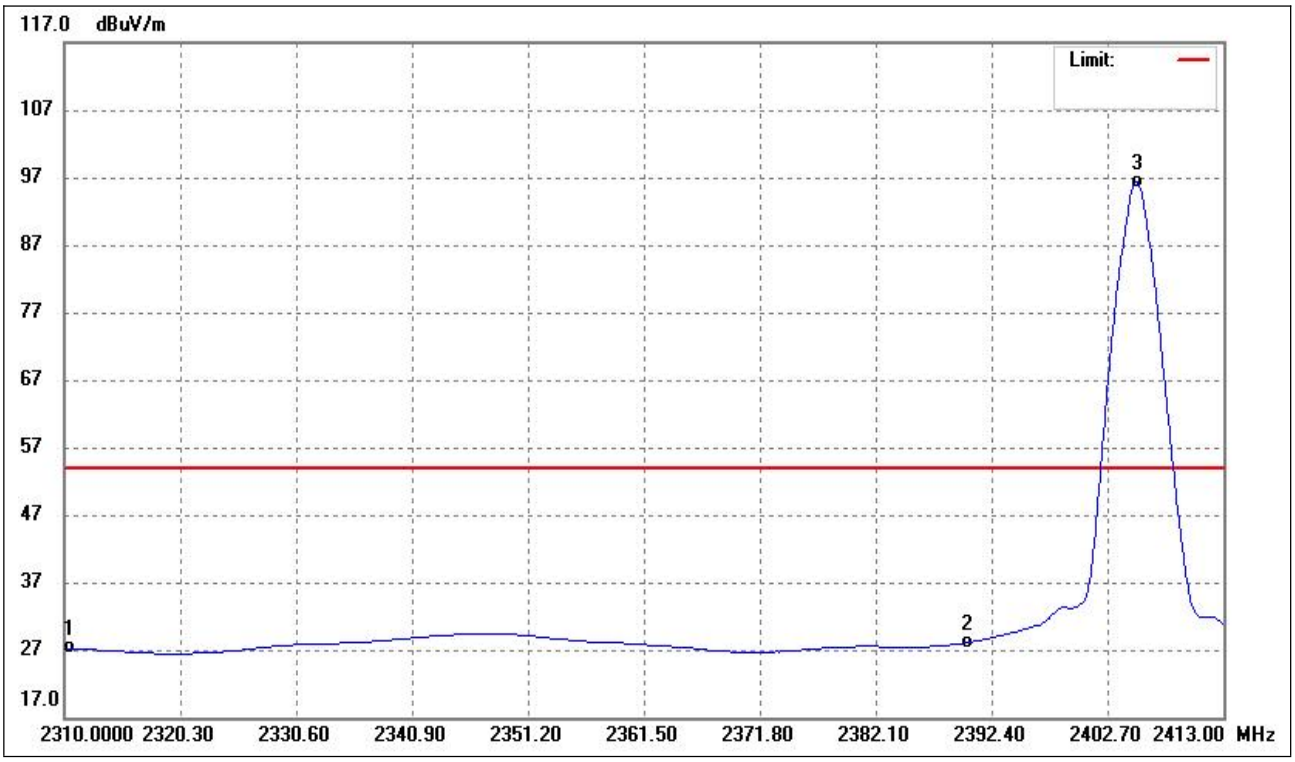
Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)
RBW = 1MHz, VBW = 1MHz for peak value measured
RBW = 1MHz, VBW = 10Hz for average value measured
Sweep = auto; Detector function = peak/average; Trace = max hold
All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074, the conducted spurious emissions test method as follows:
1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100kHz.
4. Set VBW ≥ 300kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100kHz bandwidth.

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 specified in section 8.1. Report the three highest emissions relative to the limit.

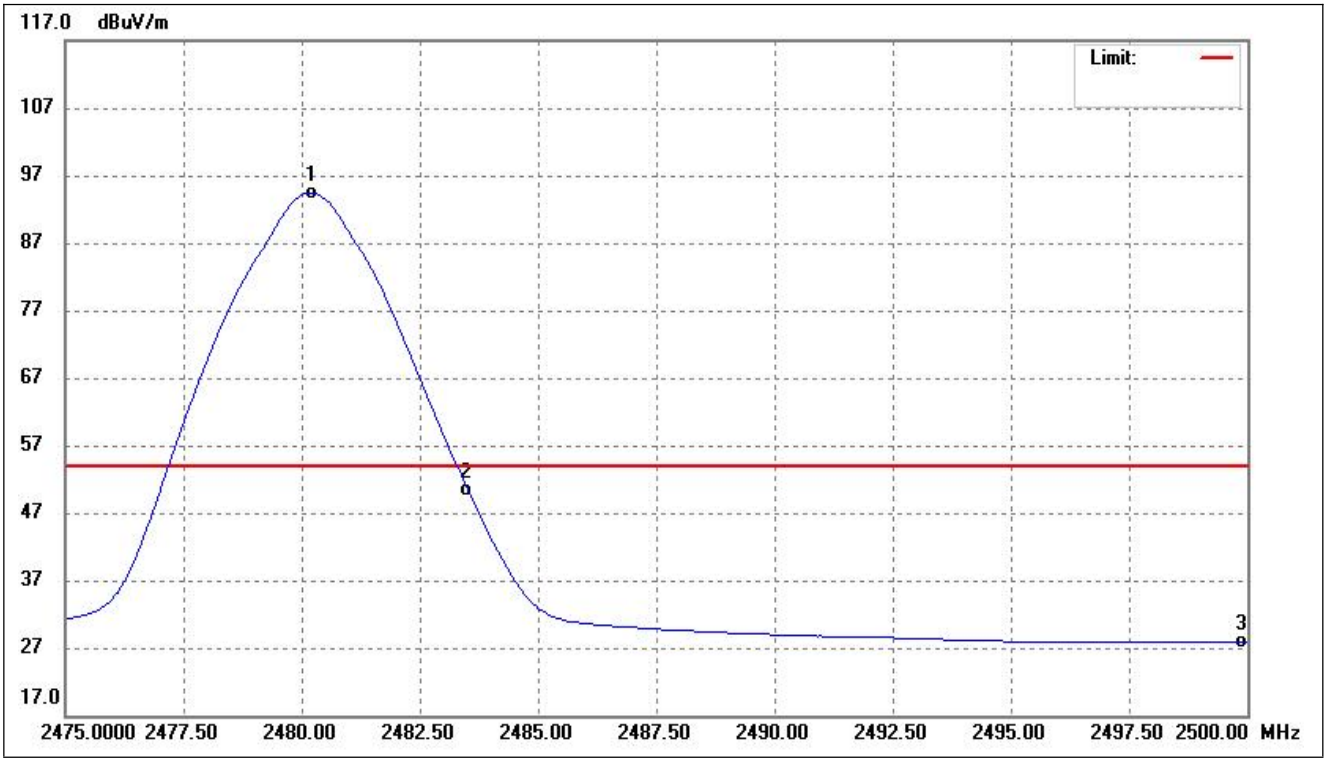
8.3 Summary of Test Results/Plots

Test Channel	Low	Polarity:	Horizontal(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	46.02	-18.74	27.28	54.00	-26.72	Average Detector
	2310.000	58.71	-18.74	39.97	74.00	-34.03	Peak Detector
2	2390.000	46.73	-18.68	28.05	54.00	-25.95	Average Detector
	2390.000	59.53	-18.68	40.85	74.00	-33.15	Peak Detector
3	2405.363	114.94	-18.68	96.26	/	/	Average Detector
	2404.743	117.65	-18.68	98.97	/	/	Peak Detector

Test Channel	High	Polarity:	Horizontal(worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.160	112.90	-18.52	94.38	/	/	Average Detector
	2480.461	116.36	-18.52	97.84	/	/	Peak Detector
2	2483.500	68.94	-18.54	50.40	54.00	-3.60	Average Detector
	2483.500	76.90	-18.54	58.36	74.00	-15.64	Peak Detector
3	2500.000	46.55	-18.64	27.91	54.00	-26.09	Average Detector
	2500.000	59.64	-18.64	41.00	74.00	-33.00	Peak Detector

- Conducted test

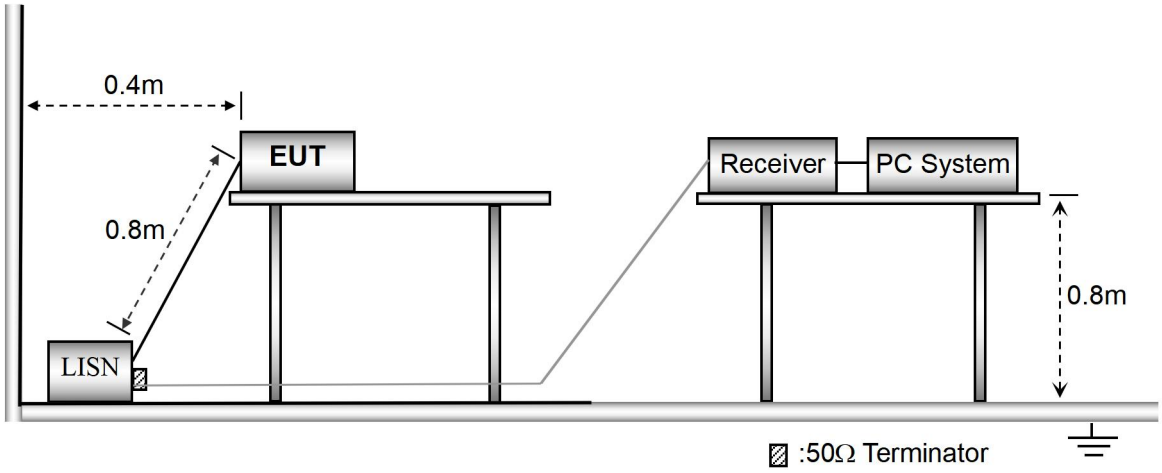
Please refer to Appendix D

9. Conducted Emissions

9.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2020 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

9.2 Basic Test Setup Block Diagram



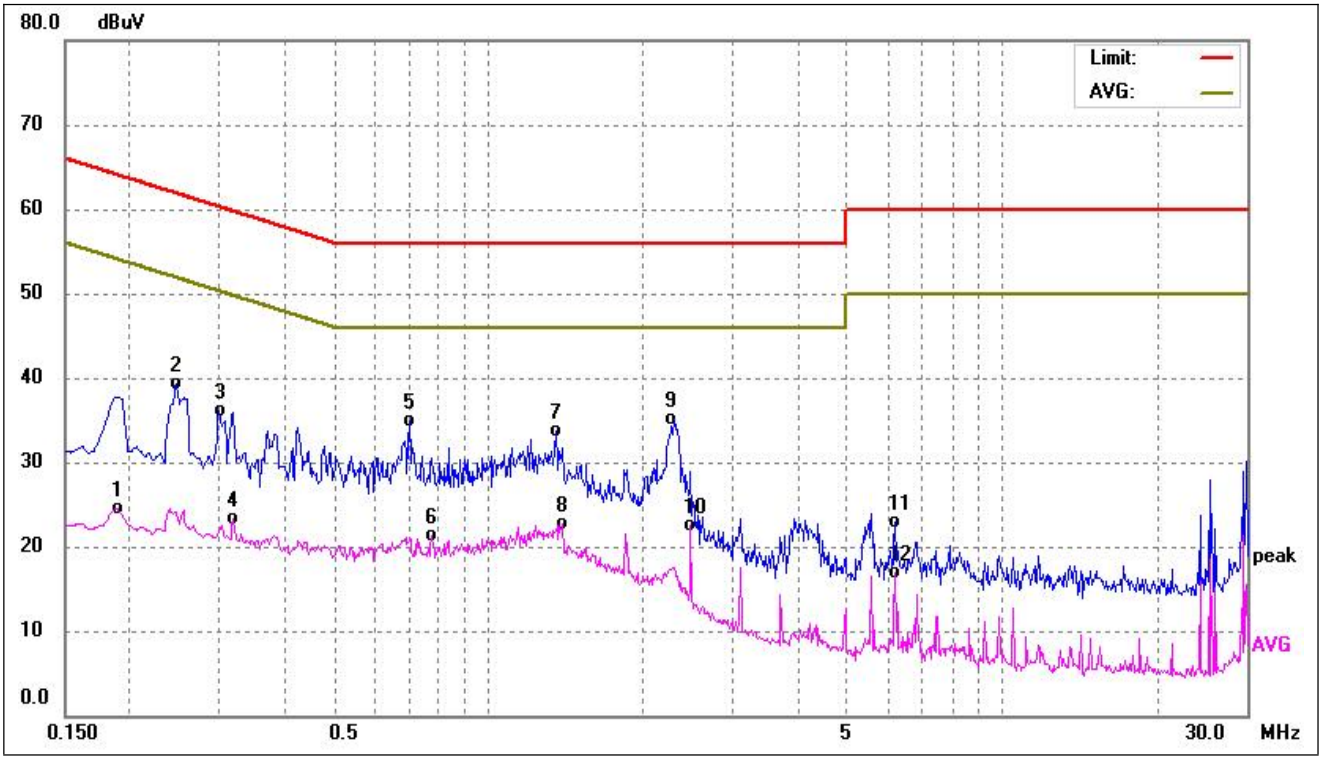
9.3 Test Receiver Setup

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

Start Frequency..... 150kHz
Stop Frequency..... 30MHz
Sweep Speed.....Auto
IF Bandwidth..... 10kHz
Quasi-Peak Adapter Bandwidth.....9kHz
Quasi-Peak Adapter Mode.....Normal

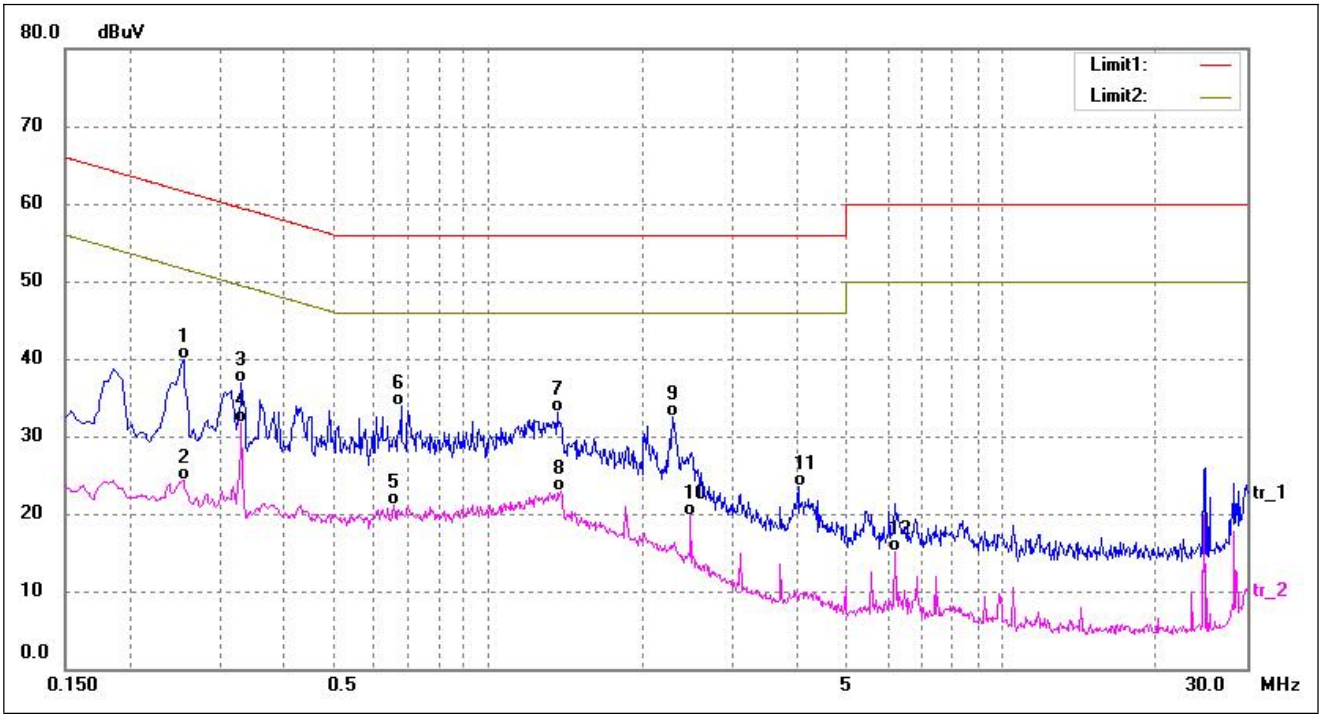
9.4 Summary of Test Results/Plots

Test Mode	Communication	AC120V 60Hz	Polarity:	Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1900	14.87	9.59	24.46	54.03	-29.57	AVG
2	0.2460	29.60	9.63	39.23	61.89	-22.66	QP
3	0.2980	26.43	9.63	36.06	60.30	-24.24	QP
4	0.3180	13.65	9.63	23.28	49.76	-26.48	AVG
5	0.7019	25.10	9.74	34.84	56.00	-21.16	QP
6	0.7780	11.50	9.75	21.25	46.00	-24.75	AVG
7	1.3580	24.05	9.62	33.67	56.00	-22.33	QP
8	1.3980	13.16	9.60	22.76	46.00	-23.24	AVG
9	2.2980	25.69	9.37	35.06	56.00	-20.94	QP
10	2.4780	13.21	9.38	22.59	46.00	-23.41	AVG
11	6.1940	13.28	9.70	22.98	60.00	-37.02	QP
12	6.1940	7.25	9.70	16.95	50.00	-33.05	AVG

Test Mode	Communication	AC120V 60Hz	Polarity:	Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.2540	30.26	9.63	39.89	61.63	-21.74	QP
2	0.2540	14.73	9.63	24.36	51.63	-27.27	AVG
3	0.3300	27.32	9.63	36.95	59.45	-22.50	QP
4*	0.3300	22.00	9.63	31.63	49.45	-17.82	AVG
5	0.6540	11.30	9.72	21.02	46.00	-24.98	AVG
6	0.6780	24.22	9.73	33.95	56.00	-22.05	QP
7	1.3660	23.56	9.61	33.17	56.00	-22.83	QP
8	1.3820	13.25	9.61	22.86	46.00	-23.14	AVG
9	2.2860	23.20	9.37	32.57	56.00	-23.43	QP
10	2.4780	10.28	9.38	19.66	46.00	-26.34	AVG
11	4.0260	13.97	9.46	23.43	56.00	-32.57	QP
12	6.1940	5.43	9.70	15.13	50.00	-34.87	AVG

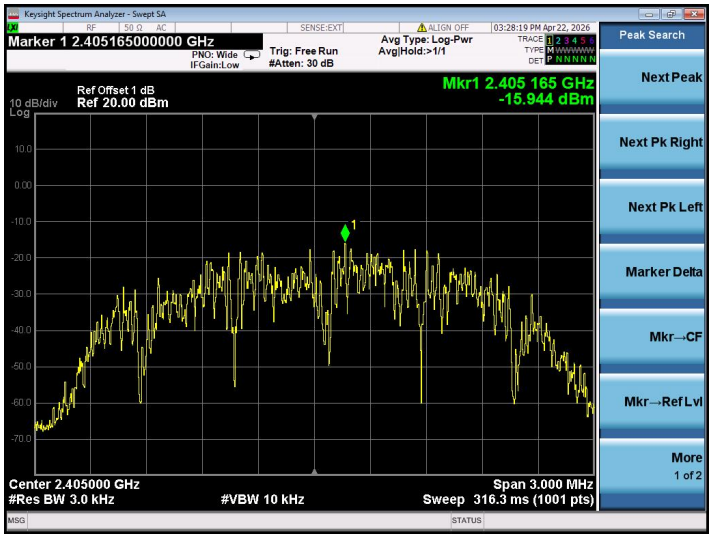
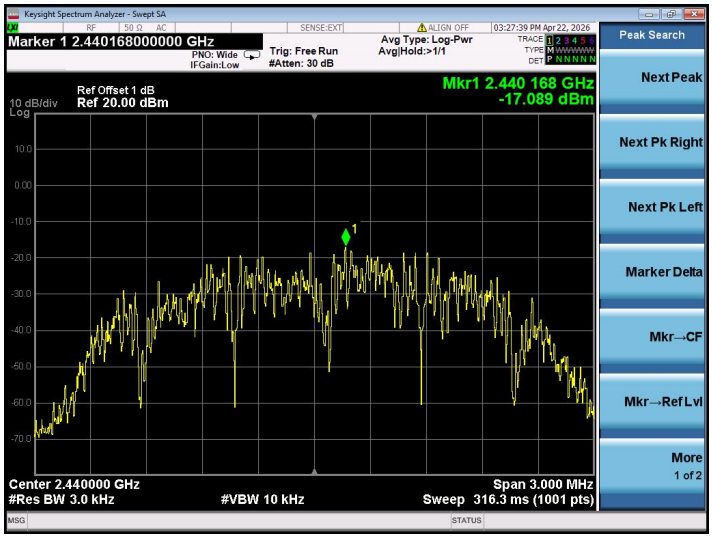
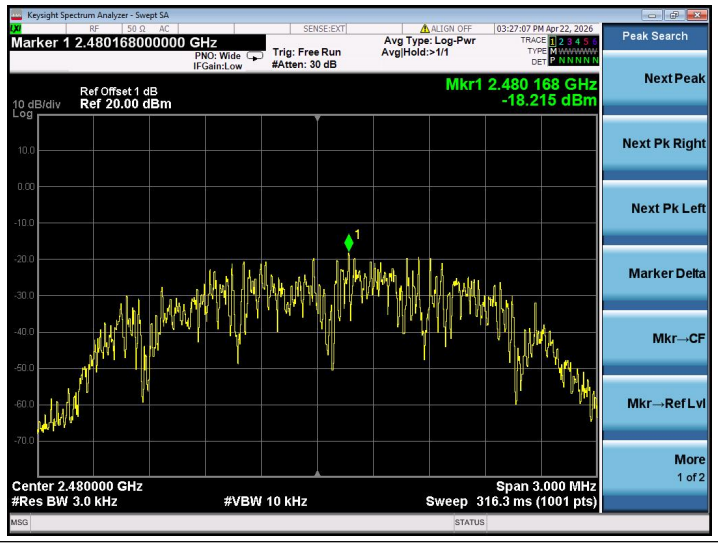
APPENDIX SUMMARY

Project No.	WTX26X04094639W003	Test Engineer	Baidi Zhong
Start date	2026/4/22	Finish date	2026/4/22
Temperature	22.6℃	Humidity	52%
RF specifications	Zigbee		

APPENDIX	Description of Test Item	Result
A	Power Spectral Density	Compliant
B	DTS Bandwidth 99% Bandwidth	Compliant
C	RF Output Power	Compliant
D	Conducted Out of Band Emissions	Compliant

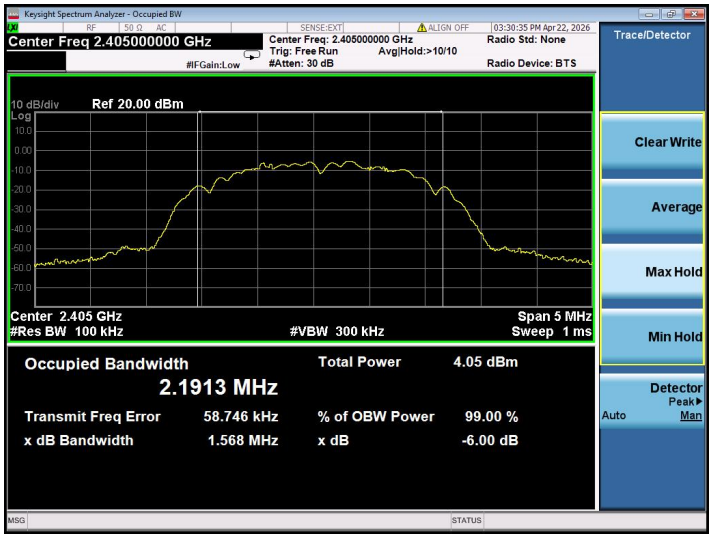
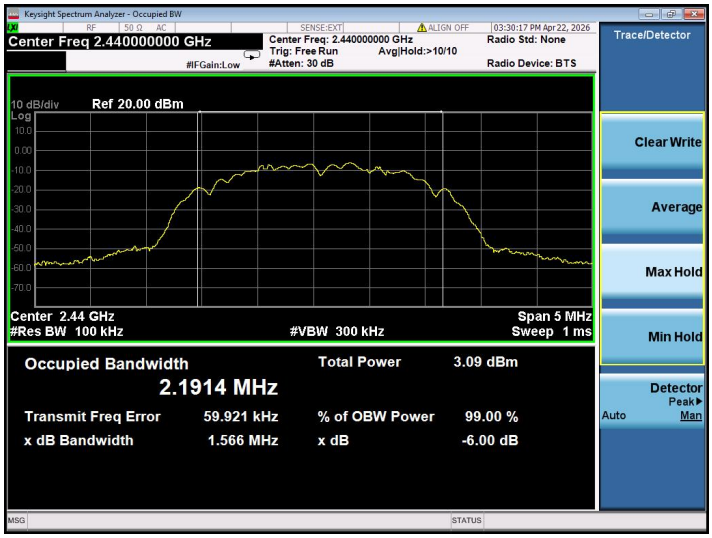
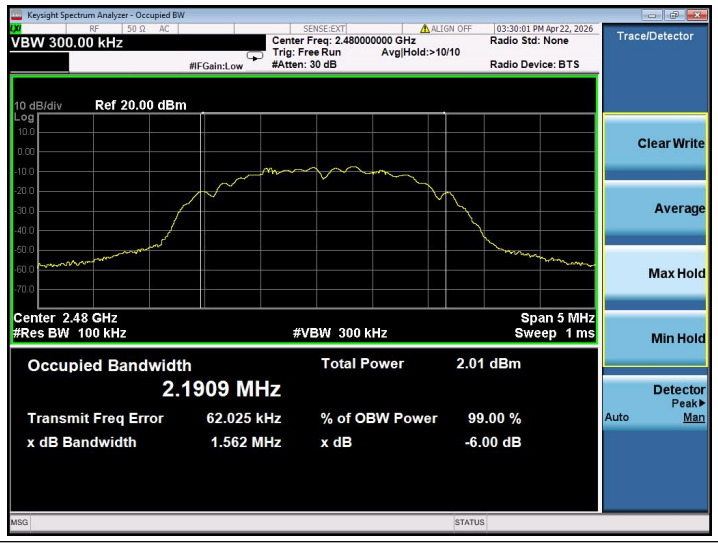
APPENDIX A

Power Spectral Density			
Test Mode	Test Channel	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
Zigbee	Low	-15.944	8
	Middle	-17.089	8
	High	-18.215	8

Low	
Middle	
High	

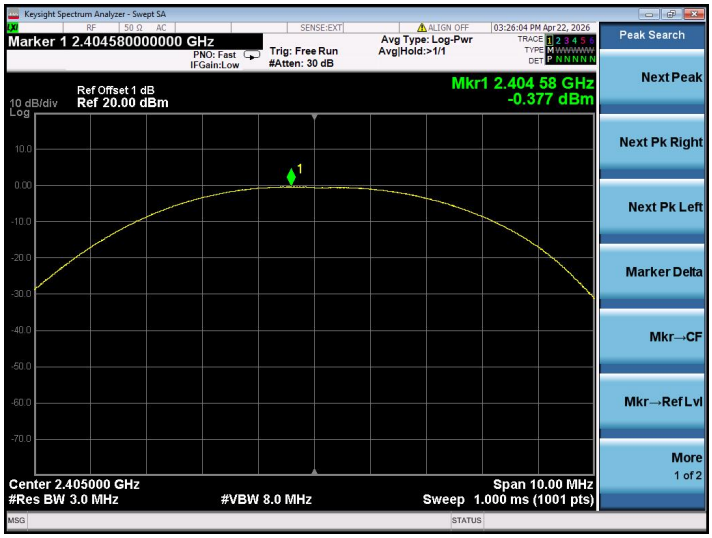
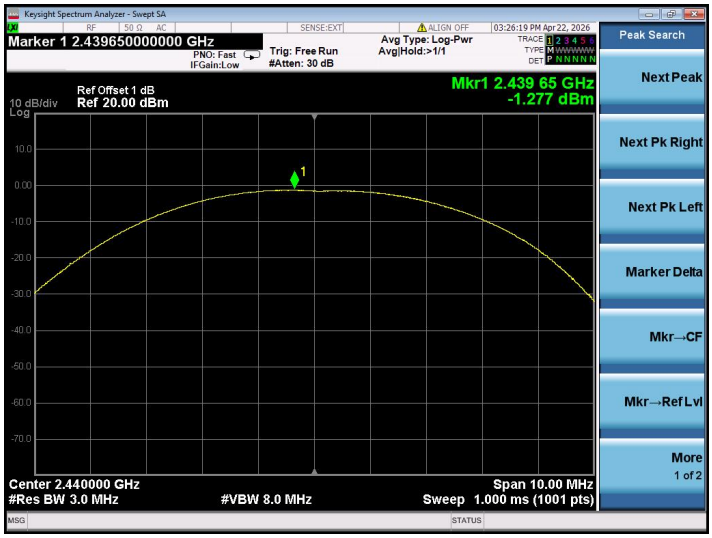
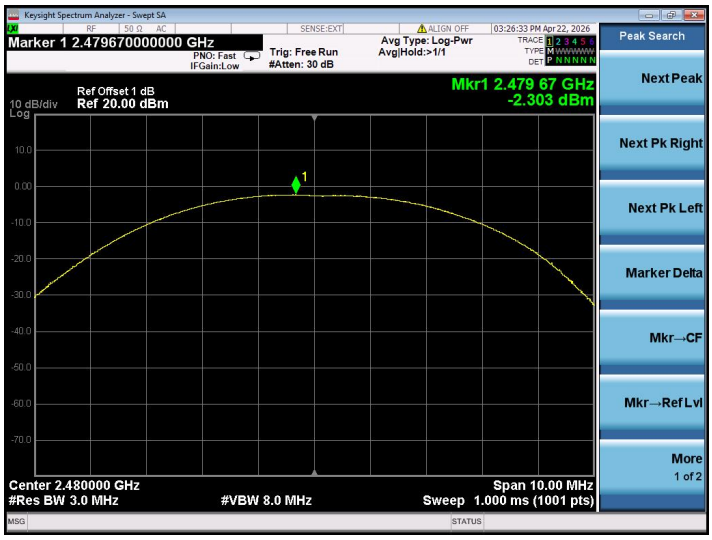
APPENDIX B

DTS Bandwidth			
Test Mode	Test Channel	6 dB Bandwidth kHz	Limit kHz
Zigbee	Low	1568	≥500
	Middle	1566	≥500
	High	1562	≥500

Low	
Middle	
High	

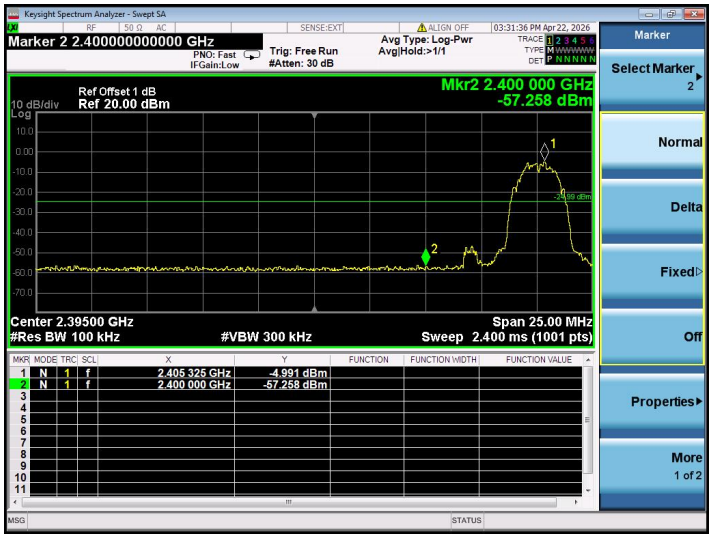
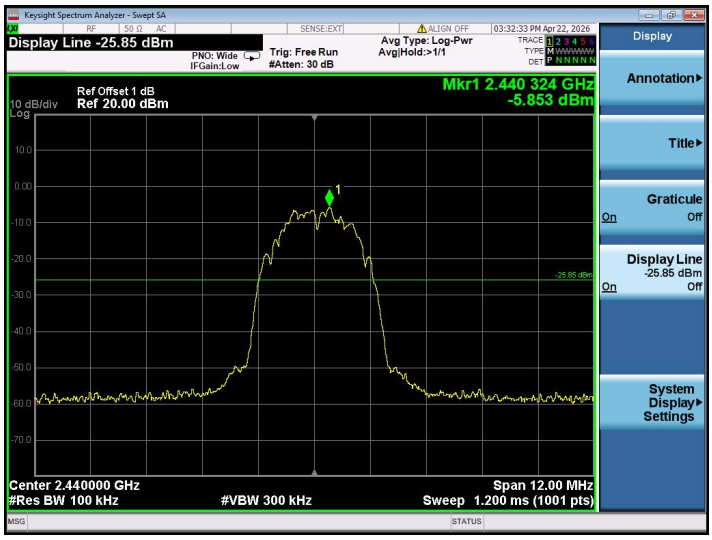
APPENDIX C

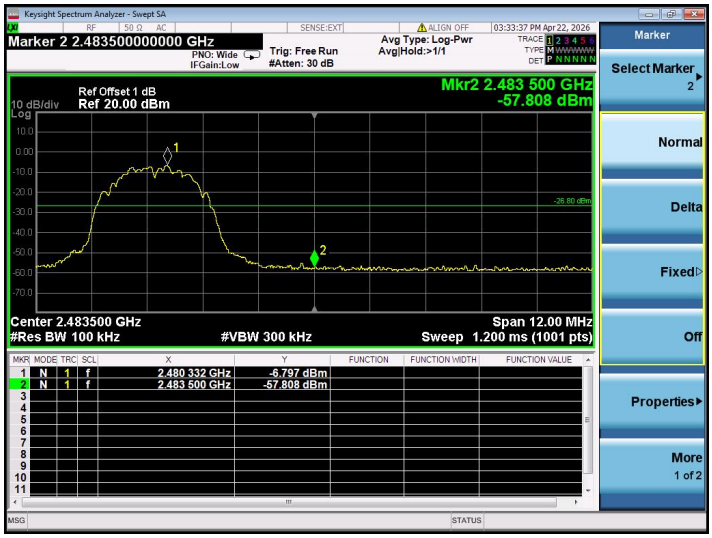
RF Output Power			
Test Mode	Test Channel	Reading dBm	Limit dBm
Zigbee	Low	-0.377	30.00
	Middle	-1.277	30.00
	High	-2.303	30.00

Low	
Middle	
High	

APPENDIX D

Conducted Out of Band Emissions

Low	
Middle	

	Keysight Spectrum Analyzer - Swept SA Marker 1 21.403310000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB Avg Type: Log-Pwr Avg|Hold:>1/1 03:32:48 PM Apr 22, 2026 Ref Offset 1 dB 10 dB/div Ref 20.00 dBm Mkr1 21.403 GHz -46.703 dBm Start 0.03 GHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.482 s (1001 pts) Peak Search Next Peak Next Pk Right Next Pk Left Marker Delta Mkr→CF Mkr→Ref Lvl More 1 of 2
High	 Keysight Spectrum Analyzer - Swept SA Marker 2 2.483500000000 GHz PNO: Wide IFGain:Low Trig: Free Run #Atten: 30 dB Avg Type: Log-Pwr Avg|Hold:>1/1 03:33:37 PM Apr 22, 2026 Ref Offset 1 dB 10 dB/div Ref 20.00 dBm Mkr2 2.483 500 GHz -57.808 dBm Center 2.483500 GHz #Res BW 100 kHz #VBW 300 kHz Span 12.00 MHz Sweep 1.200 ms (1001 pts) 1 N 1 f 2.480 332 GHz -6.797 dBm 2 N 1 f 2.483 500 GHz -57.808 dBm Marker Select Marker 2 Normal Delta Fixed Off Properties More 1 of 2
	Keysight Spectrum Analyzer - Swept SA Marker 1 24.026280000000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB Avg Type: Log-Pwr Avg|Hold:>1/1 03:34:02 PM Apr 22, 2026 Ref Offset 1 dB 10 dB/div Ref 20.00 dBm Mkr1 24.026 GHz -46.191 dBm Start 0.03 GHz #Res BW 100 kHz #VBW 300 kHz Stop 26.00 GHz Sweep 2.482 s (1001 pts) Peak Search Next Peak Next Pk Right Next Pk Left Marker Delta Mkr→CF Mkr→Ref Lvl More 1 of 2

APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

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