Testing Laboratory 3787

RADIO TEST REPORT

FCC ID	:	TVE-241003
Equipment	:	Secured Wireless Access Point
Brand Name	:	FORTINET
Model Name	:	FortiAP 231Kxxxxxxxxx, FAP-231Kxxxxxxxxx, FORTIAP-231Kxxxxxxxxx (Please refer to section 1.1.5 for detail information.)
Applicant	:	Fortinet, Inc. 909 Kifer Road, Sunnyvale, CA 94086, USA
Manufacturer	:	Fortinet, Inc. 909 Kifer Road, Sunnyvale, CA 94086, USA
Standard	:	47 CFR FCC Part 15.247

The product was received on Dec. 24, 2024, and testing was started from Jan. 09, 2025 and completed on Mar. 22, 2025. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Rex Liao

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Table of Contents

History of this test report **3**

Summary of Test Result **4**

1 General Description **5**

1.1 Information 5
1.2 Applicable Standards 9
1.3 Testing Location Information 9
1.4 Measurement Uncertainty 9

2 Test Configuration of EUT **10**

2.1 Test Channel Mode 10
2.2 The Worst Case Measurement Configuration 11
2.3 EUT Operation during Test 13
2.4 Accessories 13
2.5 Support Equipment 13
2.6 Test Setup Diagram 14

3 Transmitter Test Result **16**

3.1 AC Power-line Conducted Emissions 16
3.2 DTS Bandwidth 18
3.3 Maximum Conducted Output Power 19
3.4 Power Spectral Density 22
3.5 Emissions in Non-restricted Frequency Bands 24
3.6 Emissions in Restricted Frequency Bands 25

4 Test Equipment and Calibration Data **29**

Appendix A. Test Results of AC Power-line Conducted Emissions
Appendix B. Test Results of DTS Bandwidth
Appendix C. Test Results of Maximum Conducted Output Power
Appendix D. Test Results of Power Spectral Density
Appendix E. Test Results of Emissions in Non-restricted Frequency Bands
Appendix F. Test Results of Emissions in Restricted Frequency Bands
Appendix G. Test Photos
Photographs of EUT v01

History of this test report

Report No.	Version	Description	Issued Date
FR4D2406AB	01	Initial issue of report	May 19, 2025
FR4D2406AB	02	Add accessory	Jun. 02, 2025

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.207	AC Power-line Conducted Emissions	PASS	-
3.2	15.247(a)	DTS Bandwidth	PASS	-
3.3	15.247(b)	Maximum Conducted Output Power	PASS	-
3.4	15.247(e)	Power Spectral Density	PASS	-
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	-
3.6	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the chapter "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sam Chen
Report Producer: Wendy Pan

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std.	Ch. Frequency (MHz)	Channel Number
2400-2483.5	802.15.4	2405-2480	11-26 [16]

Band	Mode	BWch (MHz)	Nant
2400-2483.5	Zigbee	3	1

Note:
- Zigbee uses a O-QPSK (250kbps) modulation.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Port					Brand	Model Name	Antenna Type	Connector	Gain (dBi)
	WLAN 2.4GHz	WLAN 5GHz	WLAN 6GHz	Bluetooth / Zigbee	GNSS					
1	2	1	-	-	-	Grand-Tek	1034G00000500	PIFA	MHF I	Note 1
2	1	2	-	-	-	Grand-Tek	1034G00000510	PIFA	MHF I	
3	-	-	1	-	-	Grand-Tek	1033G00000220	PIFA	MHF I	
4	-	-	2	-	-	Grand-Tek	103CG00000560	Alford Loop	MHF I	
5	-	-	-	1	-	Grand-Tek	1039G00000050	PIFA	MHF I	
6	-	-	-	-	1	Grand-Tek	1031G00000330	PATCH	MHF I	

Note 1:

Antenna Gain (dBi)													
Ant.	WLAN 2.4GHz			WLAN 5GHz					WLAN 6GHz				
	2400 MHz	2450 MHz	2500 MHz	5150 MHz	5350 MHz	5500 MHz	5650 MHz	5850 MHz	5925 MHz	6350 MHz	6550 MHz	6950 MHz	7125 MHz
1	4.7	5	5	5	5.1	5.1	5.1	5.8	-	-	-	-	-
2	4.2	4.2	4.4	5.9	6.1	6.1	5.7	6	-	-	-	-	-
3	-	-	-	-	-	-	-	-	5.3	5.1	5.2	4.9	5.2
4	-	-	-	-	-	-	-	-	6	6	6.1	5.6	5.6

Ant.	Bluetooth /Zigbee			GNSS	
	2400 MHz	2450 MHz	2500 MHz	1575 MHz	1602 MHz
5	3.8	3.4	3.8	-	-
6	-	-	-	4.5	3.6

Note2: The above information was declared by manufacturer.

For 2.4GHz function
For IEEE 802.11 b/g/n/VHT/ax/be (2TX/2RX):
Port 1~2 can be used as transmitting/receiving antenna.
Port 1~2 could transmit/receive simultaneously.
For 5GHz function:
For IEEE 802.11 a/n/ac/ax/be (2TX/2RX):
Port 1~2 can be used as transmitting/receiving antenna.
Port 1~2 could transmit/receive simultaneously.
For 6GHz function:
For IEEE 802.11 ax/be (2TX/2RX):
Port 1~2 can be used as transmitting/receiving antenna.
Port 1~2 could transmit/receive simultaneously.
For Bluetooth/Zigbee function (1TX/1RX):
Only Port 1 can be used as transmitting antenna.

Note3: Directional gain information

Type	Maximum Output Power	Power Spectral Density
Non-BF	Directional gain = Max.gain + array gain. For power measurements on IEEE 802.11 devices Array Gain = 0 dB (i.e., no array gain) for N ANT ≤ 4	$Directional\ Gain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{ss}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ANT}}\right]$
BF	$Directional\ Gain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{ss}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ANT}}\right]$	$Directional\ Gain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{ss}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ANT}}\right]$

Ex.

Directional Gain (NSS1) formula :

$$Directional\ Gain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{ss}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ANT}}\right]$$

NSS1(g1,1) = $10^{G1/20}$; NSS1(g1,2)= $10^{G2/20}$; NSS1(g1,2)= $10^{G3/20}$; NSS1(g1,2)= $10^{G4/20}$

gj,k =(Nss1(g1,1) + Nss1(g1,2) + Nss1(g1,3) + Nss1(g1,4))^2

DG = 10 log[(Nss1(g1,1) + Nss1(g1,2) + Nss1(g1,3) + Nss1(g1,4))^2 / N_{ANT}] => 10 log[($10^{G1/20}$ + $10^{G2/20}$ + $10^{G3/20}$ + $10^{G4/20}$)^2 / N_{ANT}]

Where ;

For nonTXBF power :

2.4G G1= 5 dBi ;G2= 4.4 dBi ;DG= 5 dBi

5G UNII-1 G1= 5 dBi ;G2= 5.9 dBi ;DG= 5.9 dBi

5G UNII-2A G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 6.1 dBi

5G UNII-2C G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 6.1 dBi

5G UNII-3 G1= 5.8 dBi ;G2= 6 dBi ;DG= 6 dBi

5G UNII-4 G1= 5.8 dBi ;G2= 6 dBi ;DG= 6 dBi

For nonTXBF PSD / TXBF power :

2.4G G1= 5 dBi ;G2= 4.4 dBi ;DG= 7.72 dBi

5G UNII-1 G1= 5 dBi ;G2= 5.9 dBi ;DG= 8.47 dBi

5G UNII-2A G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 8.62 dBi

5G UNII-2C G1= 5.1 dBi ;G2= 6.1 dBi ;DG= 8.62 dBi

5G UNII-3 G1= 5.8 dBi ;G2= 6 dBi ;DG= 8.91 dBi

5G UNII-4 G1= 5.8 dBi ;G2= 6 dBi ;DG= 8.91 dBi

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF (dB)	T (s)	VBW (Hz)_1/T
Zigbee_Nss 1	0.454	3.43	913.438u	2k

Note:
- DC is Duty Cycle.
- DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	From AC Adapter or PoE			
Function	☒	Point-to-multipoint	☐	Point-to-point
Test Software Version	DOS [ver 6.1.7601]			

Note: The above information was declared by manufacturer.

1.1.5 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Model Name	Description
FortiAP 231Kxxxxxxxxx	All three model names are the same, no difference. The purpose for these three model names is for marketing sales.
FAP-231Kxxxxxxxxx	
FORTIAP-231Kxxxxxxxxx	
(Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)	

Note 1: From the above models, model: FAP-231K was selected as representative model for the test and its data was recorded in this report.

Note 2: The above information was declared by manufacturer.

1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15.247
- ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 558074 D01 v05r02
- FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) TEL: 886-3-656-9065 FAX: 886-3-656-9085 Test site Designation No. TW3787 with FCC. Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
RF Conducted	TH01-CB	Brian Sun	21.7~22.9 / 58~61	Jan. 10, 2025~ Feb. 12, 2025
Radiated below 1GHz	03CH03-CB	Gordon Hung	22.2-22.6 / 59-61	Jan. 10, 2025~ Mar. 22, 2025
Radiated above 1GHz	03CH06-CB	Gordon Hung	22.5-22.9 / 58-60	Jan. 10, 2025~ Mar. 22, 2025
AC Conduction	CO01-CB	Tim Chen	22~23 / 56~57	Jan. 09, 2025

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.8 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	4.1 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.0 dB	Confidence levels of 95%
Conducted Emission	3.1 dB	Confidence levels of 95%
Output Power Measurement	0.8 dB	Confidence levels of 95%
Power Density Measurement	3.1 dB	Confidence levels of 95%
Bandwidth Measurement	2.1 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode
Zigbee
2405MHz
2440MHz
2475MHz
2480MHz

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Normal Link
1	EUT Normal Link + WLAN 2.4GHz, 5GHz, 6GHz + GPS + Bluetooth + Adapter
2	EUT Normal Link + WLAN 2.4GHz, 5GHz, 6GHz + GPS + Zigbee + Adapter
Mode 2 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.	
3	EUT Normal Link + WLAN 2.4GHz, 5GHz, 6GHz + GPS + Zigbee + PoE
For operating mode 3 is the worst case and it was record in this test report.	

The Worst Case Mode for Following Conformance Tests	
Tests Item	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	CTX
	After evaluating, the worst case was found at Y axis. So the measurement will follow this same test configuration.
1	EUT in Y axis + WLAN 2.4GHz + Adapter
2	EUT in Y axis + WLAN 5GHz + Adapter
3	EUT in Y axis + WLAN 6GHz + Adapter
4	EUT in Y axis + Bluetooth + Adapter
5	EUT in Y axis + Zigbee + Adapter
Mode 1 has been evaluated to be the worst case among Mode 1~5, thus measurement for Mode 6 will follow this same test mode.	
6	EUT in Y axis + WLAN 2.4GHz + PoE
For operating mode 1 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
1	EUT in Y axis

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
Operating Mode	
1	WLAN 2.4GHz+WLAN 5GHz+WLAN 6GHz+Bluetooth
2	WLAN 2.4GHz+WLAN 5GHz+WLAN 6GHz+Zigbee
Refer to Sporton Test Report No.: FA4D2406 for Co-location RF Exposure Evaluation.	

Note1: The PoE and Adapter are for measurement only, would not be marketed. PoE and Adapter information as below:

Power	Brand	Model
PoE	Microsemi	PD-9501-10GC/AC
Adapter	APD	WA-48A12R

Note2: The end user can't use the console port.

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

2.4 Accessories

Wall Bracket*1

2.5 Support Equipment

For AC Conduction:

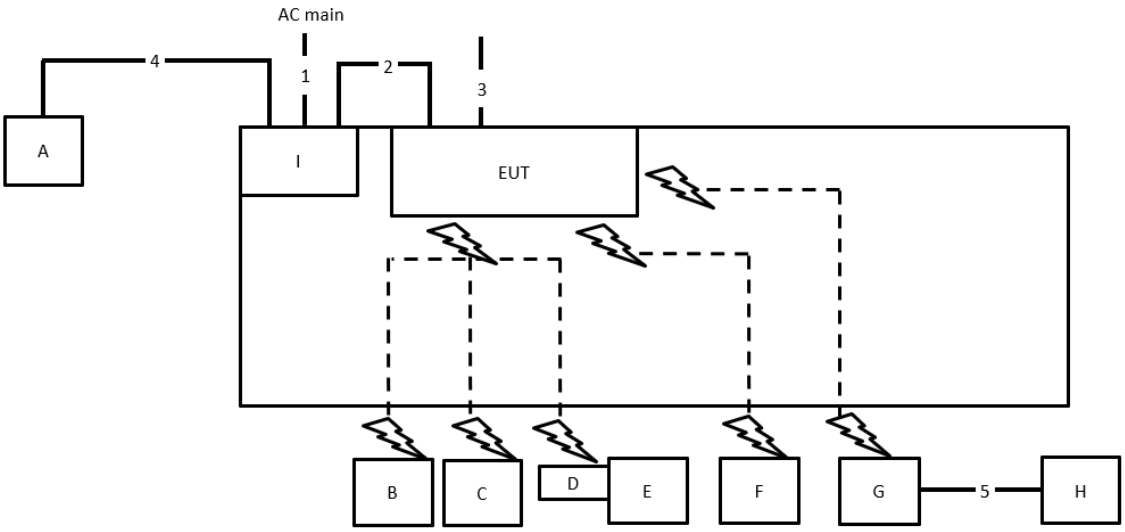
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	LAN PC	ASUS	S300TA	TX2-RTL8821CE
B	2.4G NB	DELL	E6430	N/A
C	5G NB	DELL	E6220	N/A
D	6G module	MTK	MT7927	N/A
E	6G NB	DELL	E6400	N/A
F	GPS Simulator	WELNAVIGATE	GS-100	N/A
G	Zigbee Device	FORTINET	FAP-231K	TVE-241003
H	Zigbee Device PC	ASUS	S300TA	TX2-RTL8821CE
I	PoE	Microsemi	PD-9501-10GC/AC	N/A

For Radiated and RF Conducted:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Notebook	DELL	E4300	N/A
B	AC Adapter	APD	WA-48A12R	N/A

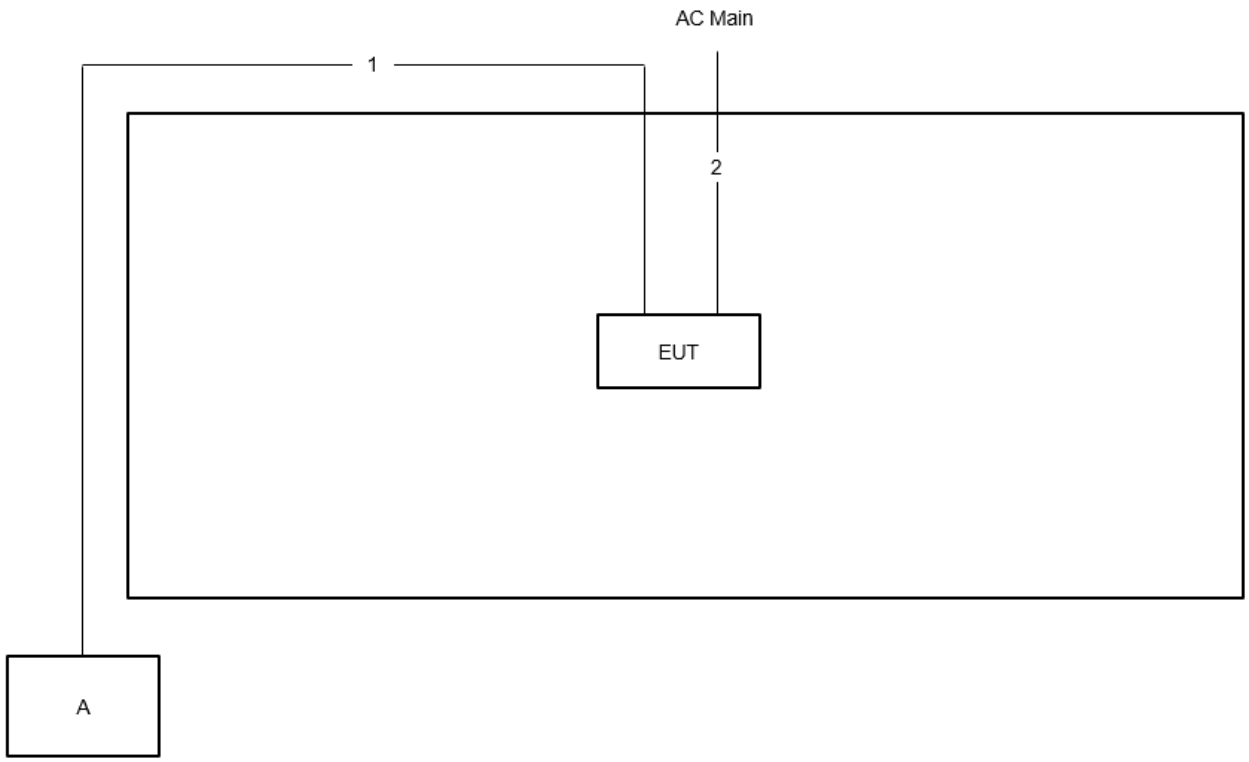
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 Cable	No	1.5m
3	RJ-45 Console cable	No	1.5m
4	RJ-45 Cable	No	10m
5	RJ-45 Cable	No	3m

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length
1	RJ-45 cable	No	10m
2	Power cable	No	1.5m

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

3.1.2 Measuring Instruments

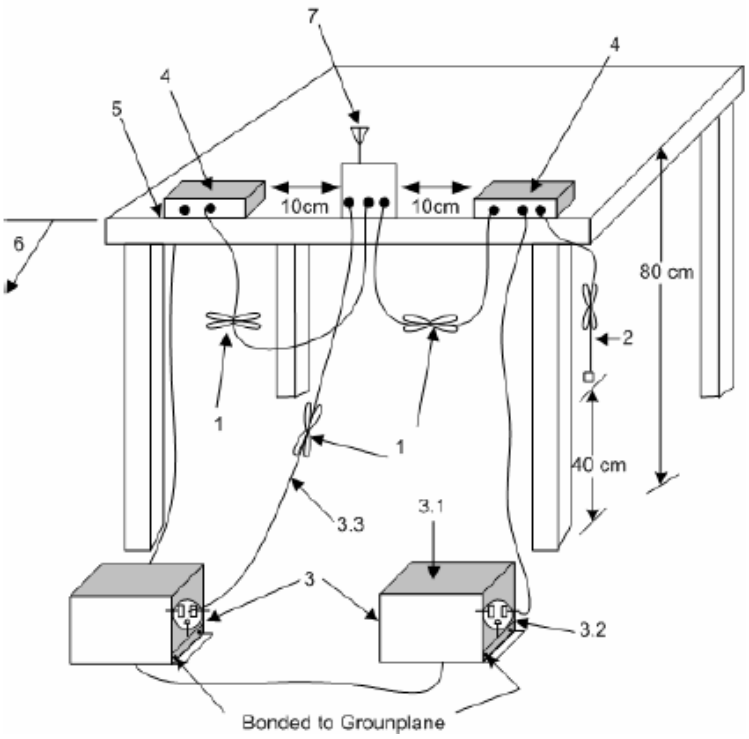
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

AC Power-line Conducted Emissions



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.5 Measurement Results Calculation

The measured Level is calculated using:

a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level

b. Margin = -Limit + Level

3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
▪ 6 dB bandwidth ≥ 500 kHz.

3.2.2 Measuring Instruments

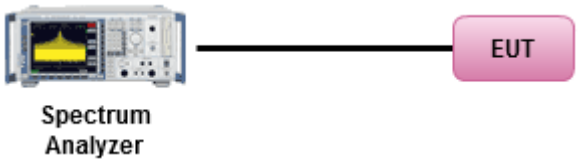
Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
▪ For the emission bandwidth shall be measured using one of the options below:	
	☒ Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.1 Option 1 for 6 dB bandwidth measurement.
	☐ Refer as FCC KDB 558074, clause 8.2 & C63.10 clause 11.8.2 Option 2 for 6 dB bandwidth measurement.
	☐ Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.

3.2.4 Test Setup

Emission Bandwidth



3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit			
	▪ If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)		
	▪ Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)$ dBm		
	▪ Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm		
	▪ Smart antenna system (SAS):		
		- Single beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm	
		- Overlap beam: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3$ dBm	
		- Aggregate power on all beams: If $G_{TX} > 6$ dBi, then $P_{Out} = 30 – (G_{TX} – 6)/3 + 8$dB dBm	
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, **G_{TX}** = the maximum transmitting antenna directional gain in dBi.			

3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method	
▪ Maximum Peak Conducted Output Power	
	☐ Refer as FCC KDB 558074, clause 8.3.1.1 & C63.10 clause 11.9.1.1 (RBW ≥ EBW method).
	☒ Refer as FCC KDB 558074, clause 8.3.1.3 & C63.10 clause 11.9.1.3 (peak power meter).
▪ Maximum Conducted Output Power	
	[duty cycle ≥ 98% or external video / power trigger]
	☐ Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.2 Method AVGSA-1.
	☐ Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.3 Method AVGSA-1A. (alternative)
	duty cycle < 98% and average over on/off periods with duty factor
	☐ Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.4 Method AVGSA-2.
	☐ Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.5 Method AVGSA-2A (alternative)
	☐ Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.6 Method AVGSA-3
	☐ Refer as FCC KDB 558074, clause 8.3.2.2 & C63.10 clause 11.9.2.2.7 Method AVGSA-3A (alternative)
	Measurement using a power meter (PM)
	☐ Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.1 Method AVGPM (using an RF average power meter).
	☒ Refer as FCC KDB 558074, clause 8.3.2.3 & C63.10 clause 11.9.2.3.2 Method AVGPM-G (using an gate RF average power meter).
▪ For conducted measurement.	
	▪ If the EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	▪ If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup

Maximum Conducted Output Power (Power Meter)

3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
▪ Power Spectral Density (PSD) ≤ 8 dBm/3kHz

3.4.2 Measuring Instruments

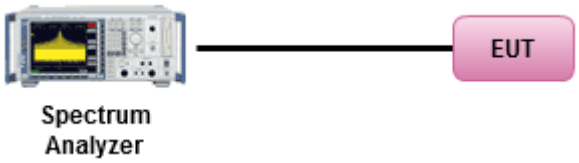
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method		
▪ Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).		
	☒ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10 Method Max. PSD.	
▪ For conducted measurement.		
	▪ If The EUT supports multiple transmit chains using options given below:	
		☒ Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
		☐ Option 2: Measure and sum spectral maxima across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,
		☐ Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

3.4.4 Test Setup

Power Spectral Density



3.4.5 Test Result of Power Spectral Density

Refer as Appendix D

3.5 Emissions in Non-restricted Frequency Bands

3.5.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit	
RF output power procedure	**Limit (dBc)**
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.5.2 Measuring Instruments

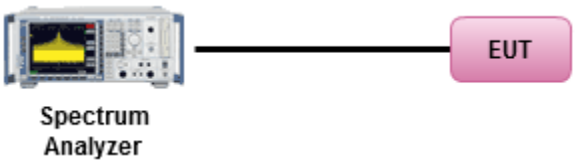
Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method
▪ Refer as FCC KDB 558074, clause 8.5 for unwanted emissions into non-restricted bands.

3.5.4 Test Setup

Emissions in Non-restricted Frequency Bands



3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

3.6 Emissions in Restricted Frequency Bands

3.6.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

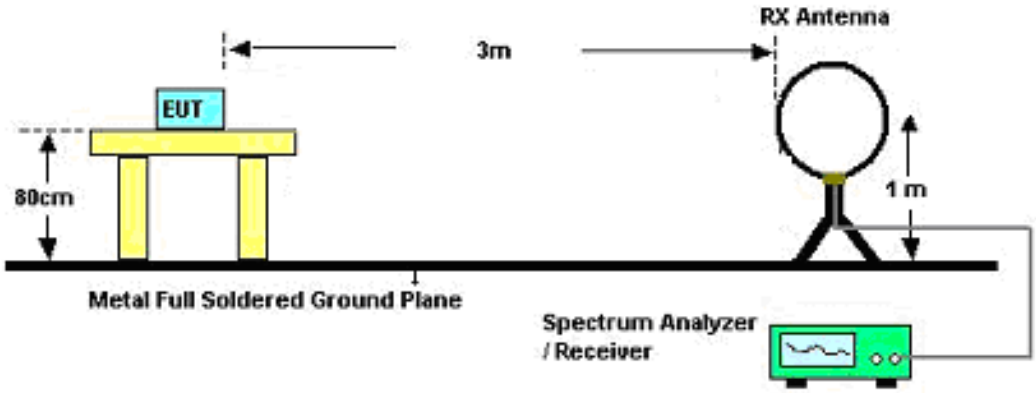
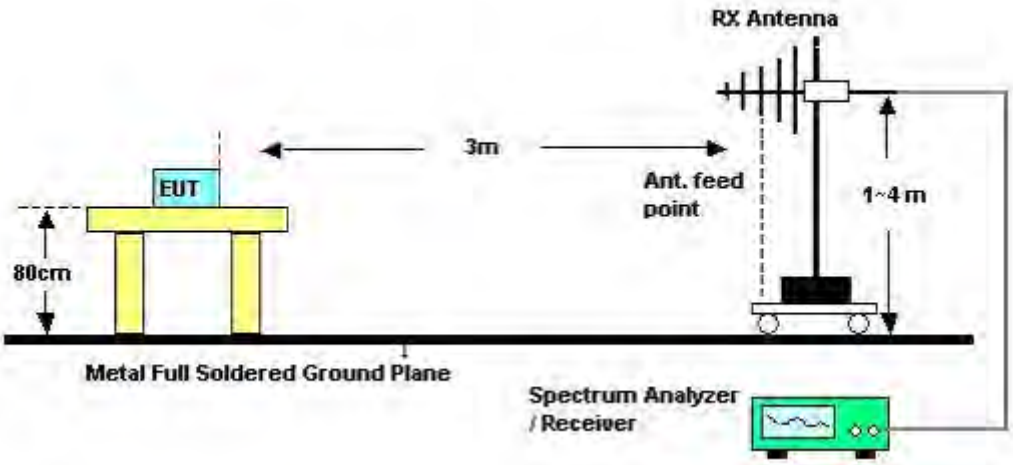
3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

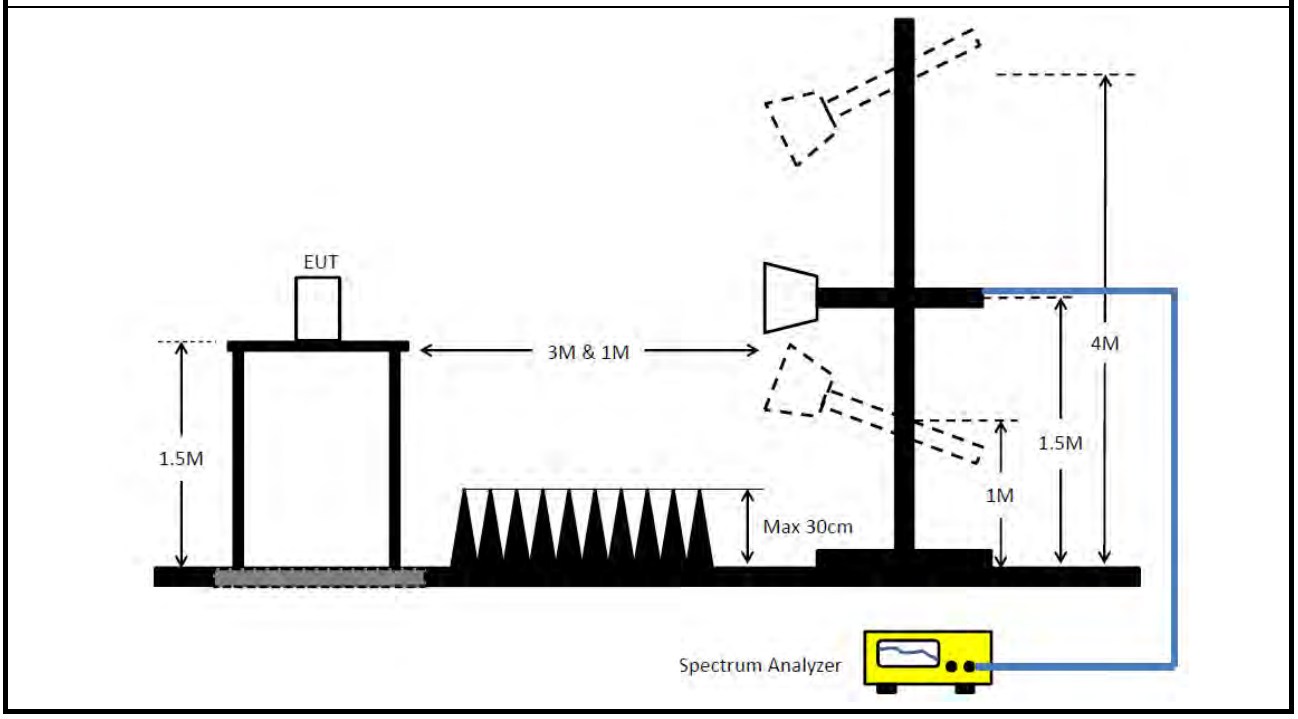
3.6.3 Test Procedures

Test Method			
▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].			
▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.			
▪ For the transmitter unwanted emissions shall be measured using following options below:			
	▪ Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.		
		☐	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%).
		☐	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
		☒	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).
		☐	Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☐	Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
		☒	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
▪ For the transmitter band-edge emissions shall be measured using following options below:			
	▪ Refer as FCC KDB 558074 clause 8.7 & c63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.		
	▪ Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.		
	▪ Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).		
	▪ For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB		
	▪ For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.		

3.6.4 Test Setup

Emissions in Restricted Frequency Bands
9kHz ~30MHz

30MHz~1GHz


Above 1GHz



3.6.5 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

3.6.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.6.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F

4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Mar. 01, 2024	Feb. 28, 2025	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Feb. 19, 2024	Feb. 18, 2025	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Apr. 24, 2024	Apr. 23, 2025	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	Oct. 16, 2024	Oct. 15, 2025	Conduction (CO01-CB)
Test Software	SPORTON	SENSE-EMI	V5.11	150kHz-30MHz	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6121	65417	9kHz - 30MHz	Oct. 16, 2024	Oct. 15, 2025	Radiation (03CH03-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH03-CB	30 MHz ~ 1 GHz	Jan. 18, 2024	Jan. 17, 2025	Radiation (03CH03-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH03-CB	30 MHz ~ 1 GHz	Jan. 17, 2025	Jan. 16, 2026	Radiation (03CH03-CB)
Bilog Antenna with 6dB Attenator	Schaffner & EMCI	CBL6112B&N-6-06	2888&AT-N0605	30MHz ~ 1GHz	Jan. 18, 2024	Jan. 17, 2025	Radiation (03CH03-CB)
Bilog Antenna with 6dB Attenator	Schaffner & EMCI	CBL6112B&N-6-06	2888&AT-N0605	30MHz ~ 1GHz	Jan. 17, 2025	Jan. 16, 2026	Radiation (03CH03-CB)
Amplifier	SGH	SGH301	20240606-1	30MHz ~ 1GHz	Jun. 04, 2024	Jun. 03, 2025	Radiation (03CH03-CB)
Spectrum Analyzer	R&S	FSP40	100019	9kHz ~ 40GHz	Jun. 11, 2024	Jun. 10, 2025	Radiation (03CH03-CB)
EMI Test Receiver	R&S	ESR7	102172	9kHz ~ 7GHz	Oct. 21, 2024	Oct. 20, 2025	Radiation (03CH03-CB)
RF Cable-low	Woken	RG402	Low Cable-02+29	30MHz ~ 1GHz	Oct. 01, 2024	Sep. 30, 2025	Radiation (03CH03-CB)
Test Software	SPORTON	SENSE-EMI	V5.11.8	30MHz-40GHz	N.C.R.	N.C.R.	Radiation (03CH03-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH06-CB	1GHz ~18GHz 3m	Oct. 08, 2024	Oct. 07, 2025	Radiation (03CH06-CB)
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120D-1292	1GHz~18GHz	Jul. 29, 2024	Jul. 28, 2025	Radiation (03CH06-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Sep. 23, 2024	Sep. 22, 2025	Radiation (03CH06-CB)
Pre-Amplifier	EMCI	EMC12630SE	980383	1GHz ~ 18GHz	Jul. 31, 2024	Jul. 30, 2025	Radiation (03CH06-CB)
Pre-Amplifier	SGH	SGH184	20221107-3	18GHz ~ 40GHz	Nov. 25, 2024	Nov. 24, 2025	Radiation (03CH06-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Signal analyzer	R&S	FSV3044	101667	9kHz~44GHz	Aug. 20, 2024	Aug. 19, 2025	Radiation (03CH06-CB)
RF Cable-high	Woken	RG402	High Cable-05+68	1GHz~18GHz	Oct. 01, 2024	Sep. 30, 2025	Radiation (03CH06-CB)
High Cable	Woken	WCA0929M	40G#5+6	1GHz ~ 40 GHz	Oct. 01, 2024	Sep. 30, 2025	Radiation (03CH06-CB)
Test Software	SPORTON	SENSE-15247 _DTS	V5.11.23	2.4GHz-2.4835G Hz	N.C.R.	N.C.R.	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	May 27, 2024	May 26, 2025	Conducted (TH01-CB)
Switch	SPTCB	SP-SWI	SWI-01	1~18 GHz	Oct. 02, 2024	Oct. 01, 2025	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 18 GHz	Oct. 01, 2024	Sep. 30, 2025	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz – 18 GHz	Oct. 01, 2024	Sep. 30, 2025	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz – 18 GHz	Oct. 01, 2024	Sep. 30, 2025	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz – 18 GHz	Oct. 01, 2024	Sep. 30, 2025	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 18 GHz	Oct. 01, 2024	Sep. 30, 2025	Conducted (TH01-CB)
Power Sensor	Agilent	E9327A	US40442088	50MHz~18GHz	Mar. 01, 2024	Feb. 28, 2025	Conducted (TH01-CB)
Power Meter	Agilent	E4416A	MY45100745	50MHz~18GHz	Jul. 12, 2024	Jul. 11, 2025	Conducted (TH01-CB)
Test Software	SPORTON	SENSE-15247 _DTS	V5.11.23	2.4GHz-2.4835G Hz	N.C.R.	N.C.R.	Conducted (TH01-CB)

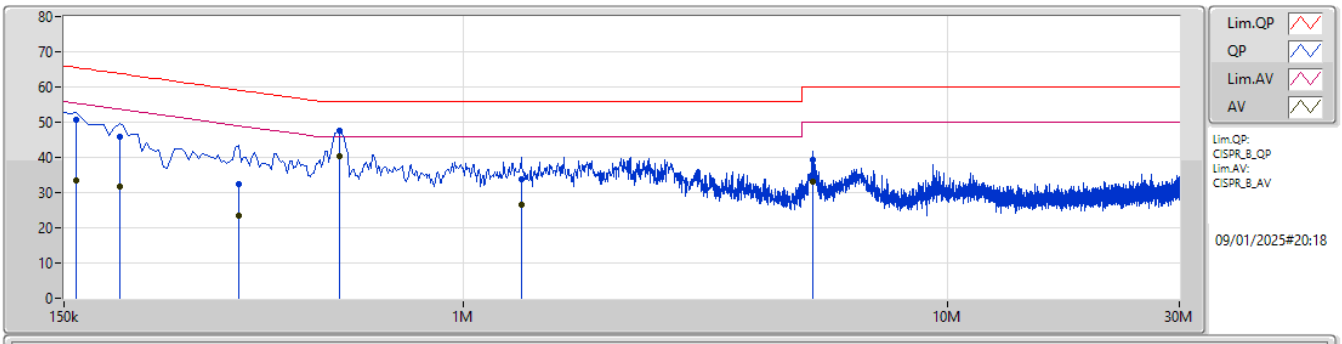
Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.

Summary

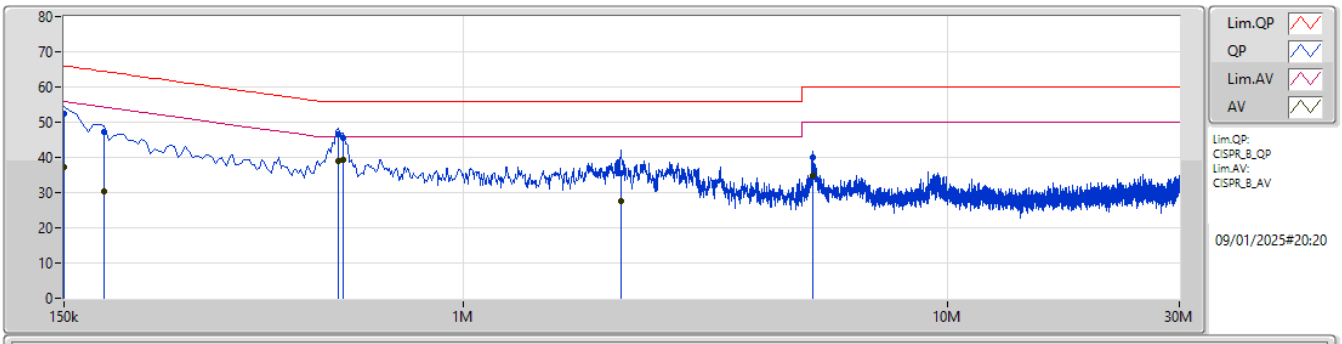
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 3	Pass	AV	555k	40.39	46.00	-5.61	Line

Mode 3



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	159k	50.58	65.52	-14.94	10.04	Line	-	40.54	0.04	0.08	9.92
AV	159k	33.39	55.52	-22.13	10.04	Line	-	23.35	0.04	0.08	9.92
QP	195k	45.83	63.82	-17.99	10.06	Line	-	35.77	0.04	0.07	9.95
AV	195k	31.59	53.82	-22.23	10.06	Line	-	21.53	0.04	0.07	9.95
QP	343.5k	32.57	59.12	-26.55	10.18	Line	-	22.39	0.05	0.09	10.04
AV	343.5k	23.53	49.12	-25.59	10.18	Line	-	13.35	0.05	0.09	10.04
QP	555k	47.47	56.00	-8.53	10.26	Line	-	37.21	0.06	0.10	10.10
AV	555k	40.39	46.00	-5.61	10.26	Line	"Worst"	30.13	0.06	0.10	10.10
QP	1.316M	33.91	56.00	-22.09	10.27	Line	-	23.64	0.08	0.11	10.08
AV	1.316M	26.64	46.00	-19.36	10.27	Line	-	16.37	0.08	0.11	10.08
QP	5.271M	39.21	60.00	-20.79	10.19	Line	-	29.02	0.16	0.15	9.88
AV	5.271M	33.04	50.00	-16.96	10.19	Line	-	22.85	0.16	0.15	9.88

Mode 3



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	52.40	66.00	-13.60	10.05	Neutral	-	42.35	0.06	0.08	9.91
AV	150k	37.24	56.00	-18.76	10.05	Neutral	-	27.19	0.06	0.08	9.91
QP	181.5k	47.25	64.41	-17.16	10.07	Neutral	-	37.18	0.06	0.07	9.94
AV	181.5k	30.42	54.41	-23.99	10.07	Neutral	-	20.35	0.06	0.07	9.94
QP	550.5k	46.53	56.00	-9.47	10.26	Neutral	-	36.27	0.07	0.10	10.09
AV	550.5k	39.10	46.00	-6.90	10.26	Neutral	-	28.84	0.07	0.10	10.09
QP	564k	45.56	56.00	-10.44	10.27	Neutral	-	35.29	0.07	0.10	10.10
AV	564k	39.35	46.00	-6.65	10.27	Neutral	"Worst"	29.08	0.07	0.10	10.10
QP	2.117M	35.57	56.00	-20.43	10.19	Neutral	-	25.38	0.10	0.14	9.95
AV	2.117M	27.56	46.00	-18.44	10.19	Neutral	-	17.37	0.10	0.14	9.95
QP	5.267M	40.15	60.00	-19.85	10.19	Neutral	-	29.96	0.16	0.15	9.88
AV	5.267M	34.99	50.00	-15.01	10.19	Neutral	-	24.80	0.16	0.15	9.88

Summary

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
2.4-2.4835GHz	-	-	-	-	-
Zigbee	1.099M	2.208M	2M21G1D	1.091M	2.174M

Max-N dB = Maximum 6dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

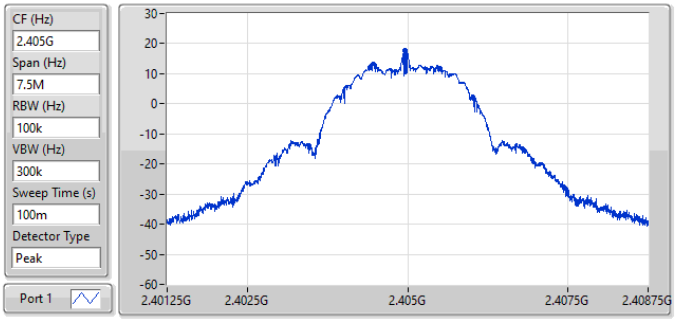
Mode	Result	Limit	Port 1-N dB	Port 1-OBW
		(Hz)	(Hz)	(Hz)
Zigbee	-	-	-	-
2405MHz	Pass	500k	1.095M	2.174M
2440MHz	Pass	500k	1.091M	2.178M
2480MHz	Pass	500k	1.099M	2.208M

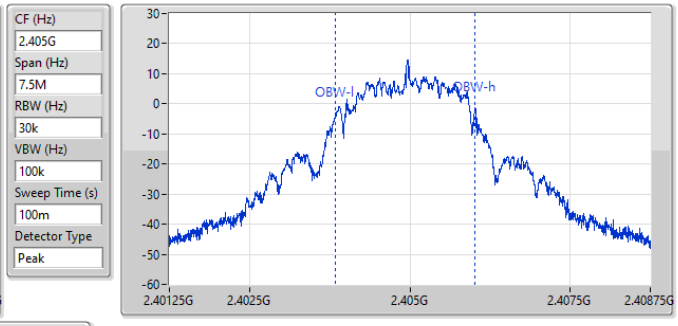
Port X-N dB = Port X 6dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth

2.4-2.4835GHz_Zigbee **EBW**

2405MHz

13/01/2025



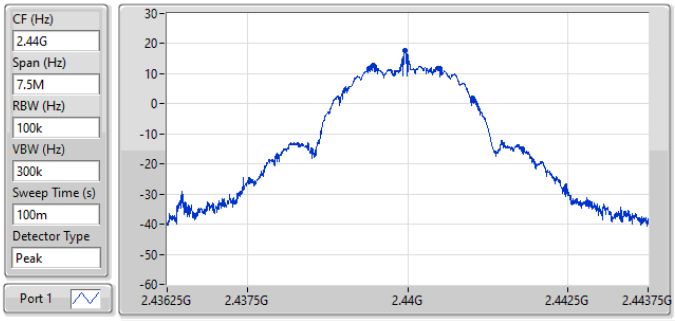


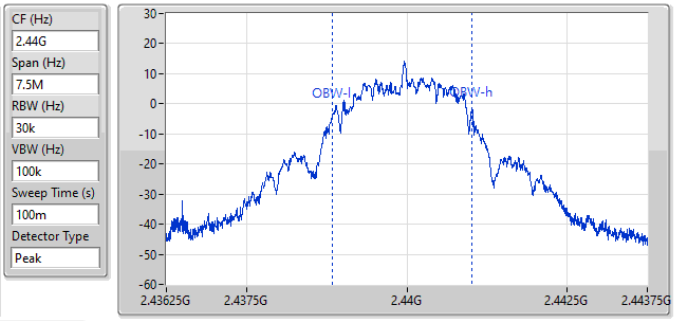
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.095M	2.404408G	2.405503G	2.174M	2.403846G	2.406019G	500k	1

2.4-2.4835GHz_Zigbee **EBW**

2440MHz

13/01/2025



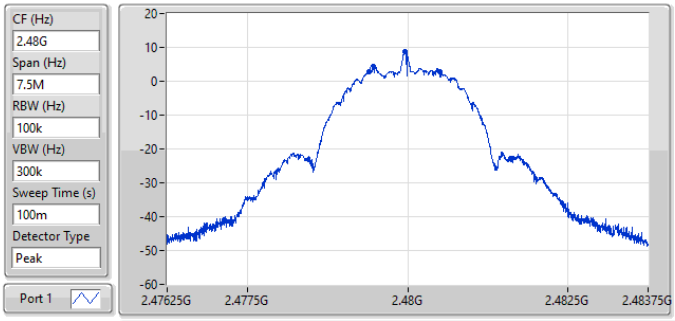


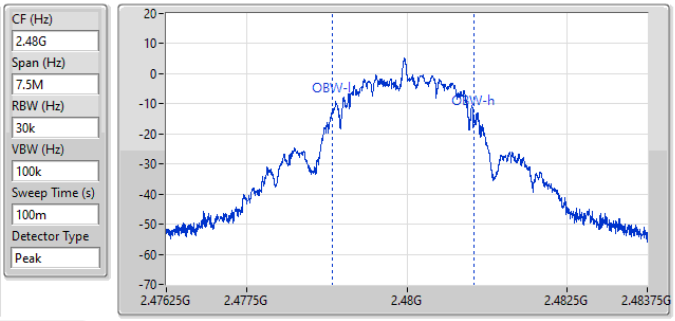
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.091M	2.439404G	2.440495G	2.178M	2.438842G	2.441019G	500k	1

2.4-2.4835GHz_Zigbee **EBW**

2480MHz

13/01/2025





6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.099M	2.4794G	2.480499G	2.208M	2.478846G	2.481053G	500k	1

Summary

Mode	Total Power	Total Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
Zigbee	17.55	0.05689

Result

Mode	Result	DG	Port 1	Total Power	Power Limit
		(dBi)	(dBm)	(dBm)	(dBm)
Zigbee	-	-	-	-	-
2405MHz	Pass	3.80	17.55	17.55	30.00
2440MHz	Pass	3.80	17.05	17.05	30.00
2475MHz	Pass	3.80	16.92	16.92	30.00
2480MHz	Pass	3.80	8.19	8.19	30.00

DG = Directional Gain; Port X = Port X output power;
Inf = There's no restriction for the limit.

Summary

Mode	PD
	(dBm/RBW)
2.4-2.4835GHz	-
Zigbee	3.10

RBW = 3kHz;

Result

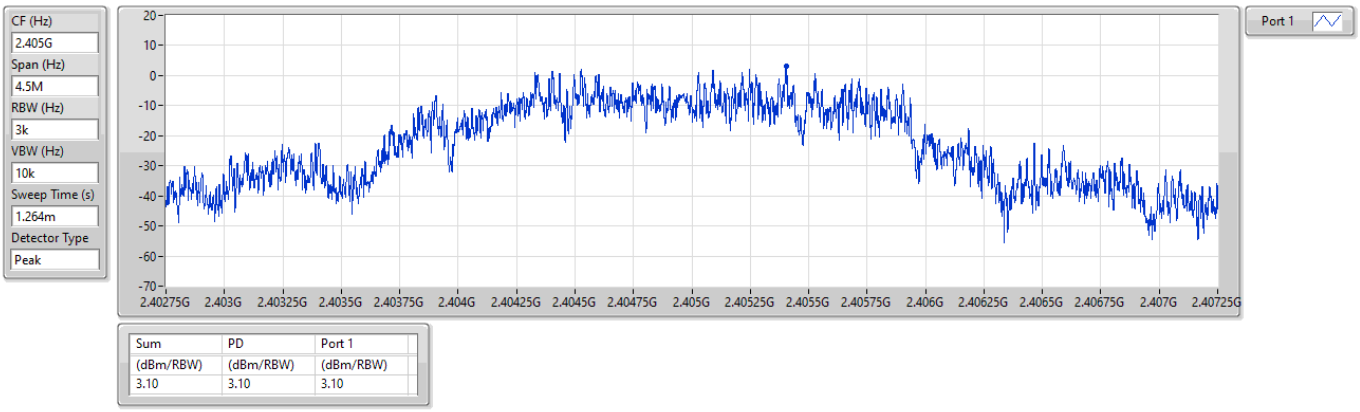
Mode	Result	DG	Port 1	PD	PD Limit
		(dBi)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
Zigbee	-	-	-	-	-
2405MHz	Pass	3.80	3.10	3.10	8.00
2440MHz	Pass	3.80	2.64	2.64	8.00
2480MHz	Pass	3.80	-6.39	-6.39	8.00

DG = Directional Gain; RBW = 3kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port X Power Density;
Inf = There's no restriction for the limit.

2.4-2.4835GHz_Zigbee **PSD**

2405MHz

13/01/2025

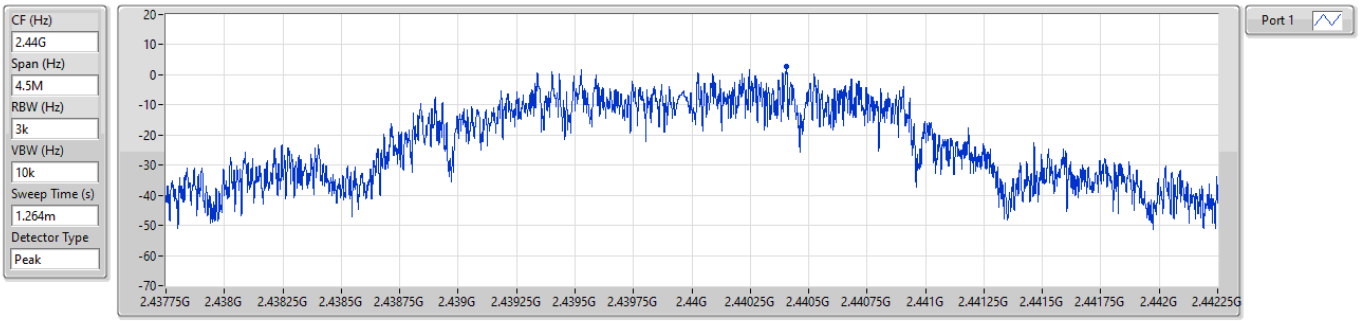


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
3.10	3.10	3.10

2.4-2.4835GHz_Zigbee **PSD**

2440MHz

13/01/2025

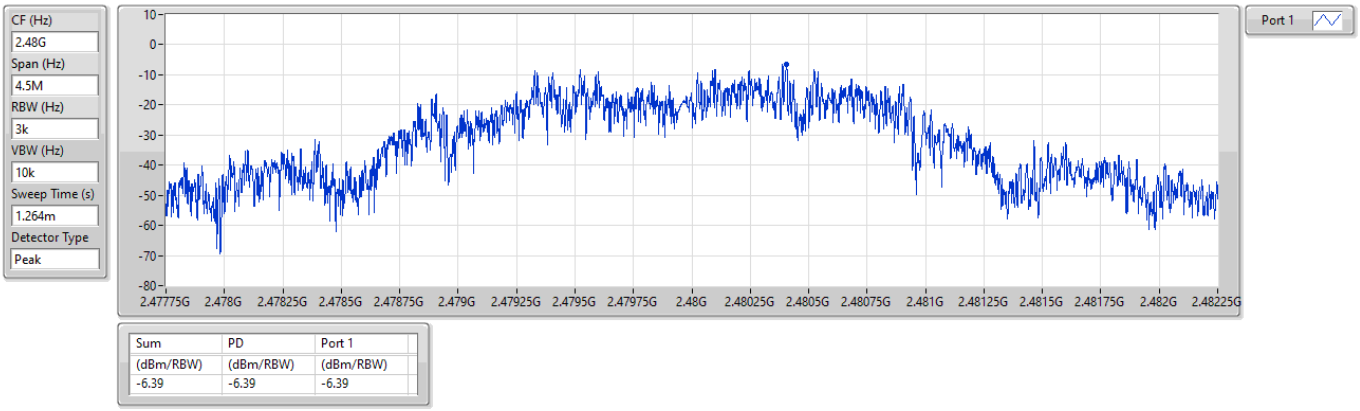


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
2.64	2.64	2.64

2.4-2.4835GHz_Zigbee **PSD**

2480MHz

13/01/2025



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.39	-6.39	-6.39

Summary

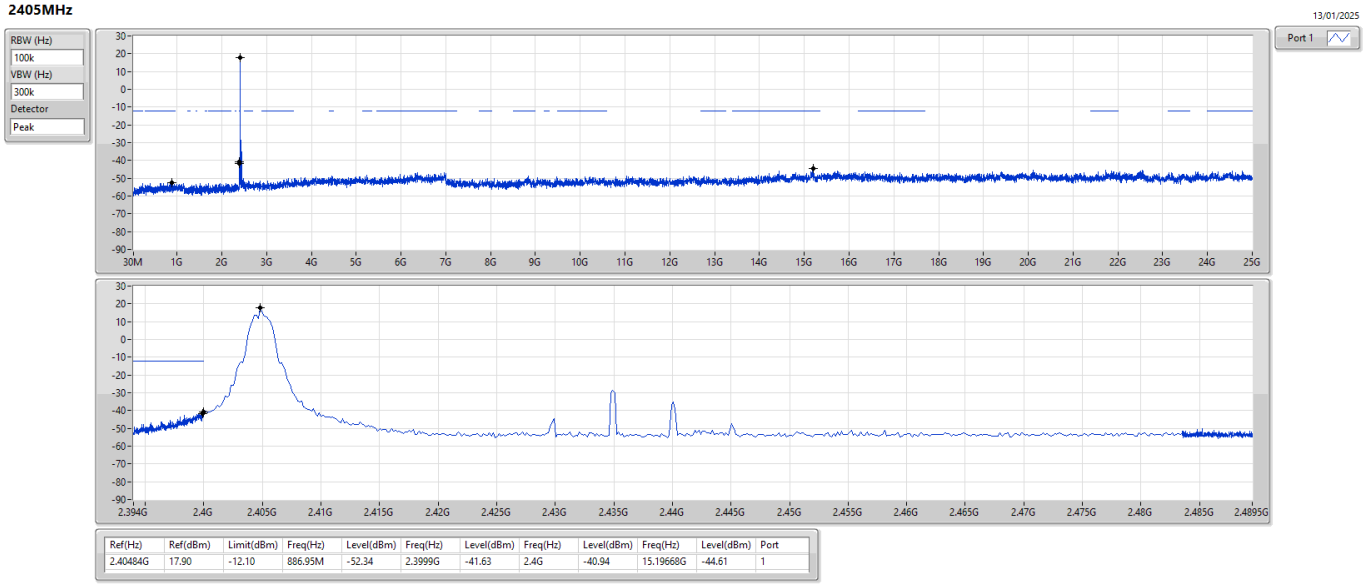
Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	2.40484G	17.90	-12.10	886.95M	-52.34	2.3999G	-41.63	2.4G	-40.94	15.19668G	-44.61	1

Result

Mode	Result	Ref	Ref	Limit	Freq	Level	Freq	Level	Freq	Level	Freq	Level	Port
		(Hz)	(dBm)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	(Hz)	(dBm)	
Zigbee	-	-	-	-	-	-	-	-	-	-	-	-	-
2405MHz	Pass	2.40484G	17.90	-12.10	886.95M	-52.34	2.3999G	-41.63	2.4G	-40.94	15.19668G	-44.61	1
2440MHz	Pass	2.40484G	17.90	-12.10	905.86M	-51.18	2.39447G	-51.18	2.4G	-53.53	21.87104G	-45.67	1
2480MHz	Pass	2.40484G	17.90	-12.10	555.99M	-52.30	2.39467G	-51.69	2.4G	-53.60	16.40099G	-45.51	1

2.4-2.4835GHz_Zigbee **CSENdB**

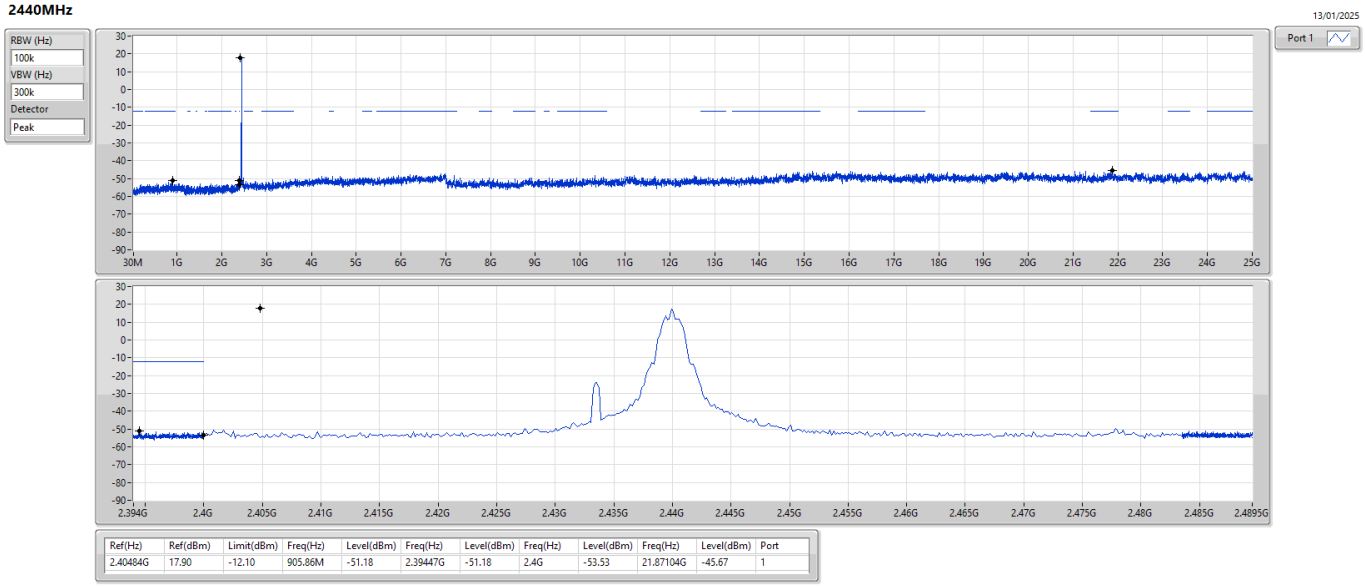
2405MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40484G	17.90	-12.10	886.95M	-52.34	2.3999G	-41.63	2.4G	-40.94	15.19668G	-44.61	1

2.4-2.4835GHz_Zigbee **CSENdB**

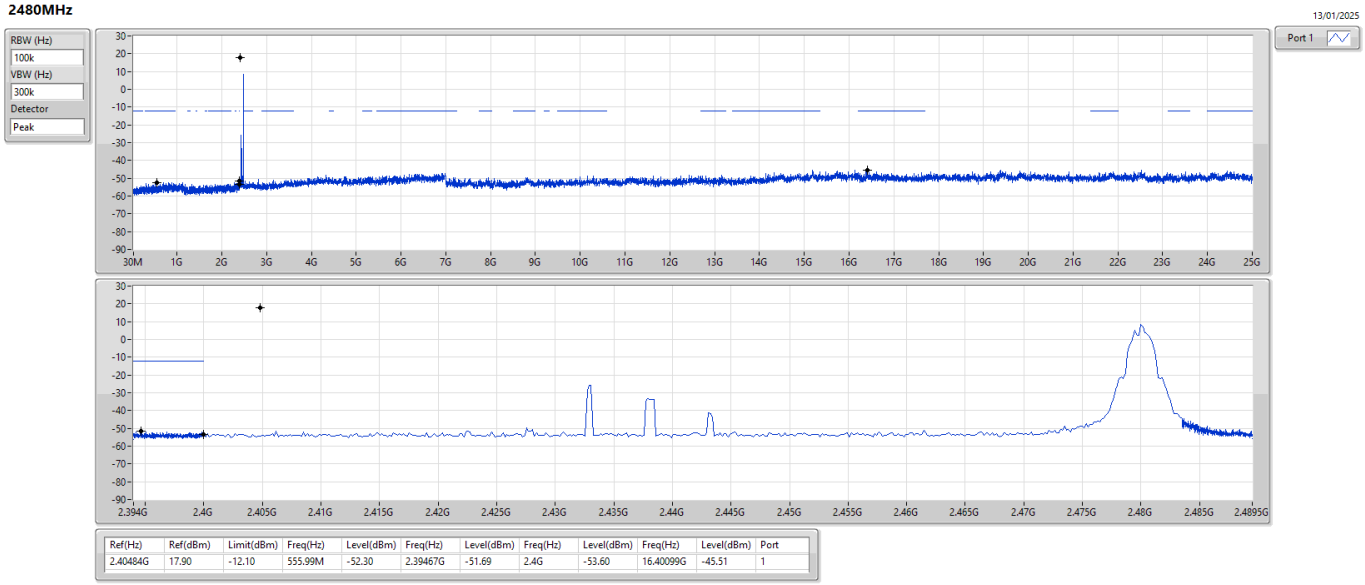
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40484G	17.90	-12.10	905.86M	-51.18	2.39447G	-51.18	2.4G	-53.53	21.87104G	-45.67	1

2.4-2.4835GHz_Zigbee **CSENdB**

2480MHz

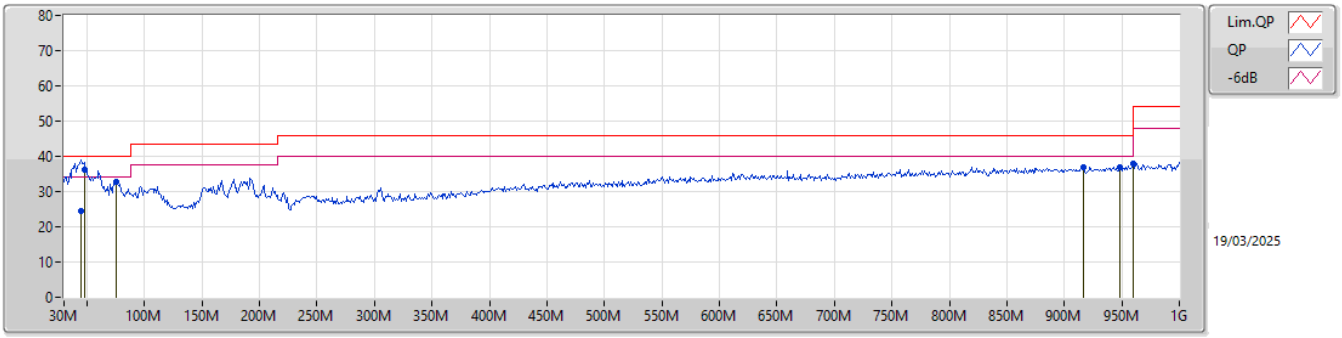


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40484G	17.90	-12.10	555.99M	-52.30	2.39467G	-51.69	2.4G	-53.60	16.40099G	-45.51	1

Summary

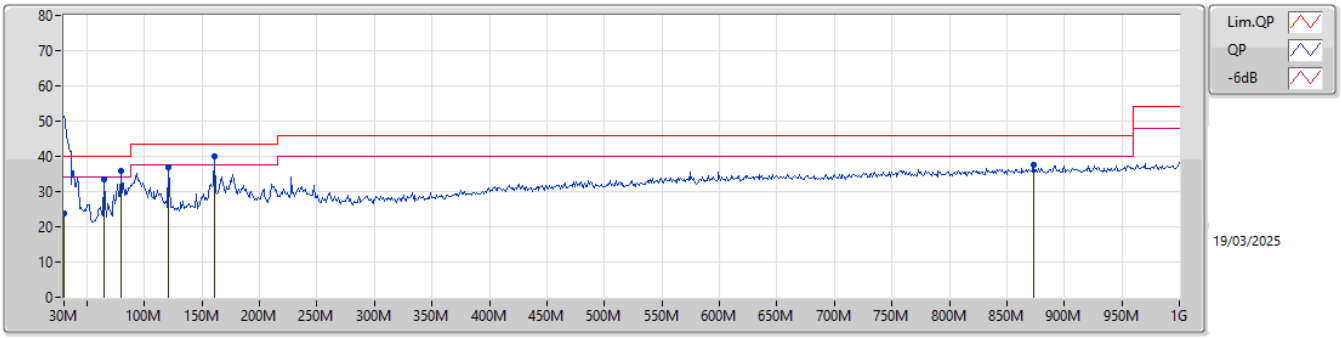
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	PK	160.95M	39.84	43.50	-3.66	Horizontal

Mode 1



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV)	(dB/m)	(dB)	(dB)
QP	44.55M	24.52	40.00	-15.48	-26.69	3	Vertical	29	1.00	-	51.21	16.42	1.29	44.40
PK	48.43M	36.06	40.00	-3.94	-28.24	3	Vertical	334	1.00	"Worst"	64.30	14.80	1.42	44.46
PK	75.59M	32.88	40.00	-7.12	-30.07	3	Vertical	73	1.00	-	62.95	12.69	1.71	44.47
PK	916.58M	37.02	46.00	-8.98	-10.32	3	Vertical	360	1.50	-	47.34	26.58	6.51	43.41
PK	948.59M	36.98	46.00	-9.02	-10.01	3	Vertical	164	1.50	-	46.99	26.85	6.59	43.45
PK	960M	37.95	54.00	-16.05	-9.81	3	Vertical	76	1.50	-	47.76	27.02	6.62	43.45

Mode 1



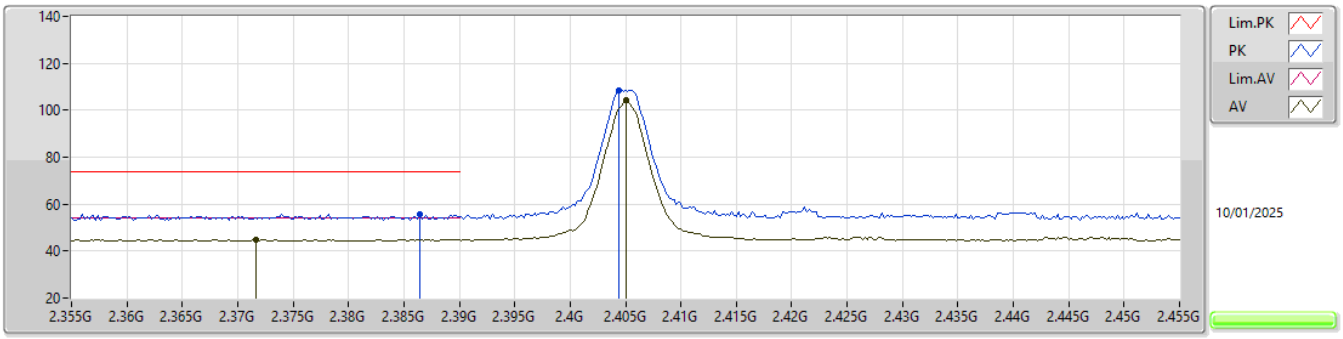
Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV)	(dB/m)	(dB)	(dB)
QP	30M	23.88	40.00	-16.12	-19.03	3	Horizontal	225	1.00	-	42.91	23.98	1.15	44.16
PK	64.92M	33.35	40.00	-6.65	-30.51	3	Horizontal	164	1.00	-	63.86	12.28	1.63	44.42
PK	79.47M	35.72	40.00	-4.28	-29.68	3	Horizontal	123	1.00	-	65.40	13.07	1.74	44.49
PK	121.18M	36.89	43.50	-6.61	-23.99	3	Horizontal	147	1.50	-	60.88	18.18	2.30	44.47
PK	160.95M	39.84	43.50	-3.66	-25.82	3	Horizontal	132	1.50	"Worst"	65.66	15.94	2.68	44.44
PK	872.93M	37.71	46.00	-8.29	-10.46	3	Horizontal	103	1.00	-	48.17	26.57	6.35	43.38

Summary

Mode	Result	Type	Freq	Level	Limit	Margin	Dist	Condition	Azimuth	Height	Comments
			(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(m)		(°)	(m)	
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	AV	2.4835G	52.45	54.00	-1.55	3	Horizontal	334	2.07	-

2.4-2.4835GHz_Zigbee

2405MHz_TX

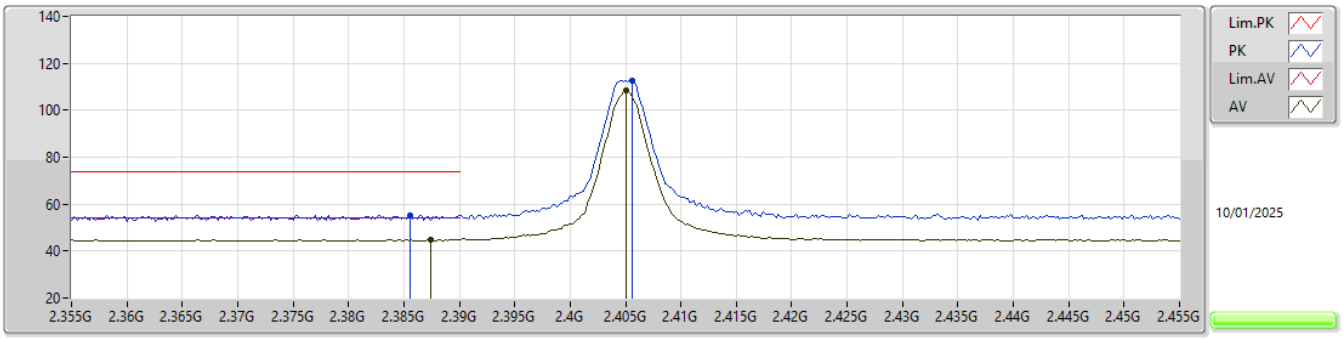


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.3864G	55.66	74.00	-18.34	23.44	3	Vertical	360	1.70	-	27.60	4.62	-
AV	2.3716G	44.80	54.00	-9.20	12.51	3	Vertical	360	1.70	-	27.68	4.61	-
PK	2.4044G	108.42	Inf	-Inf	76.18	3	Vertical	360	1.70	-	27.60	4.64	-
AV	2.405G	104.14	Inf	-Inf	71.90	3	Vertical	360	1.70	-	27.60	4.64	-

2.4-2.4835GHz_Zigbee

2405MHz_TX

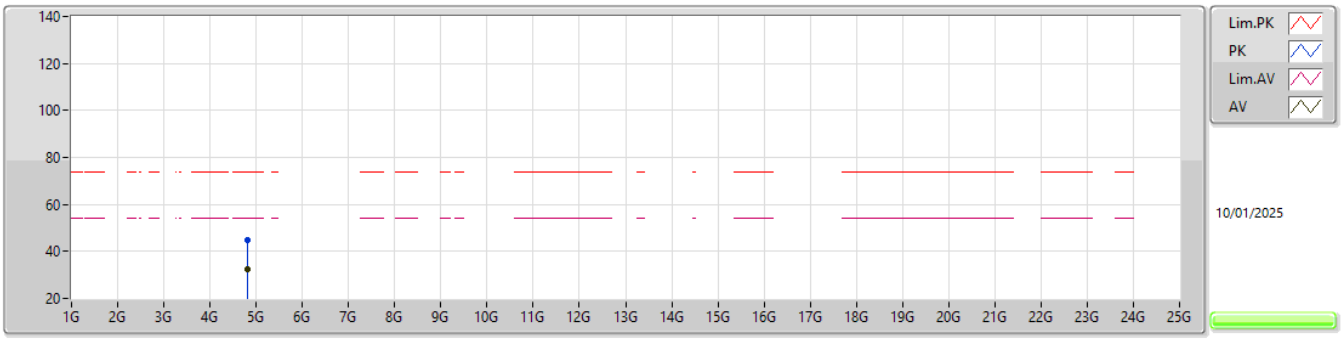


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.3856G	55.22	74.00	-18.78	23.00	3	Horizontal	46	2.80	-	27.60	4.62	-
AV	2.3874G	44.99	54.00	-9.01	12.77	3	Horizontal	46	2.80	-	27.60	4.62	-
PK	2.4056G	112.55	Inf	-Inf	80.31	3	Horizontal	46	2.80	-	27.60	4.64	-
AV	2.405G	108.44	Inf	-Inf	76.20	3	Horizontal	46	2.80	-	27.60	4.64	-

2.4-2.4835GHz_Zigbee

2405MHz_TX

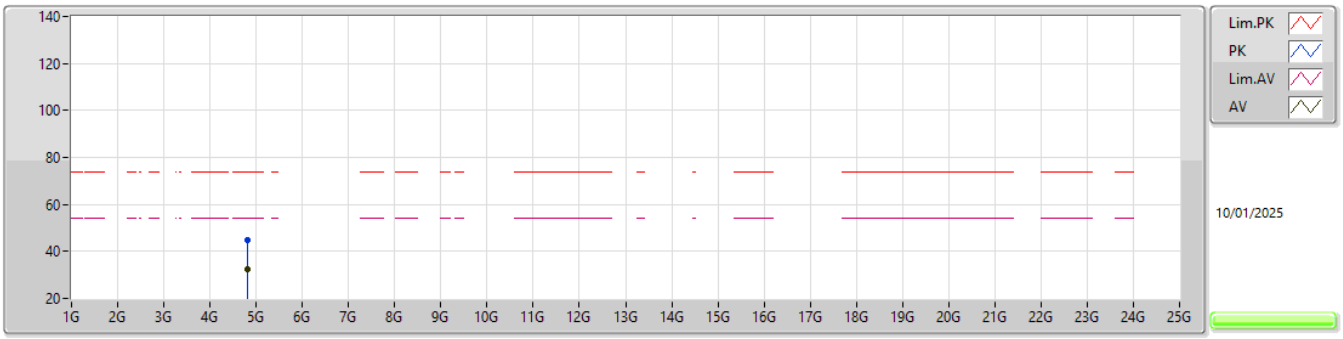


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	4.80692G	44.75	74.00	-29.25	40.77	3	Vertical	312	1.05	-	31.39	6.55	33.96
AV	4.8106G	32.38	54.00	-21.62	28.41	3	Vertical	312	1.05	-	31.38	6.55	33.96

2.4-2.4835GHz_Zigbee

2405MHz_TX

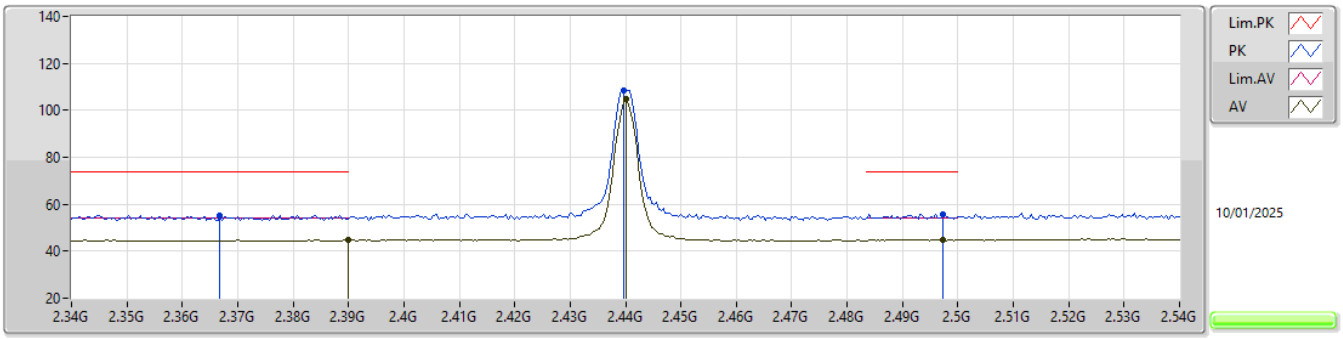


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	4.81044G	44.74	74.00	-29.26	40.77	3	Horizontal	289	2.59	-	31.38	6.55	33.96
AV	4.8135G	32.56	54.00	-21.44	28.60	3	Horizontal	289	2.59	-	31.37	6.55	33.96

2.4-2.4835GHz_Zigbee

2440MHz_TX

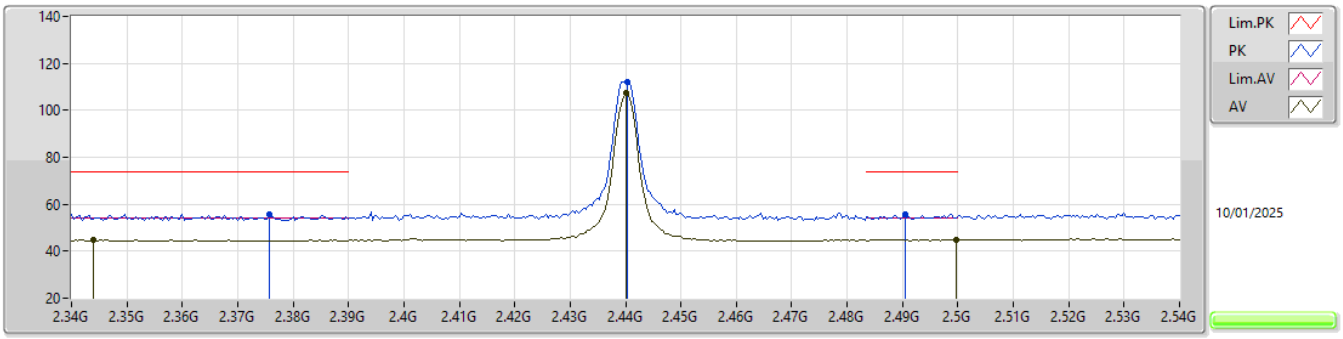


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.3668G	55.42	74.00	-18.58	23.08	3	Vertical	358	2.58	-	27.73	4.61	-
AV	2.39G	44.73	54.00	-9.27	12.51	3	Vertical	358	2.58	-	27.60	4.62	-
PK	2.4396G	108.63	Inf	-Inf	76.53	3	Vertical	358	2.58	-	27.40	4.70	-
AV	2.44G	104.62	Inf	-Inf	72.52	3	Vertical	358	2.58	-	27.40	4.70	-
PK	2.4972G	55.80	74.00	-18.20	23.57	3	Vertical	358	2.58	-	27.43	4.80	-
AV	2.4972G	44.98	54.00	-9.02	12.75	3	Vertical	358	2.58	-	27.43	4.80	-

2.4-2.4835GHz_Zigbee

2440MHz_TX

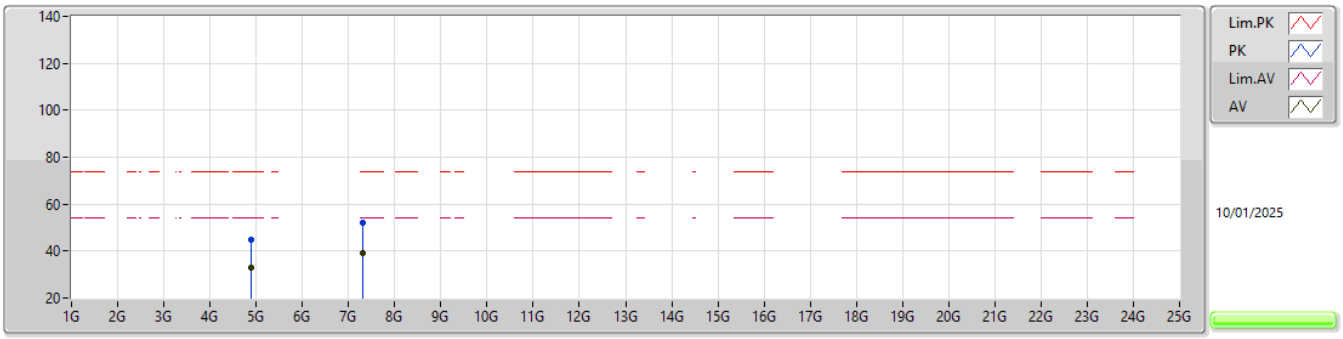


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.3756G	55.93	74.00	-18.07	23.68	3	Horizontal	332	1.08	-	27.64	4.61	-
AV	2.344G	44.66	54.00	-9.34	12.27	3	Horizontal	332	1.08	-	27.80	4.59	-
PK	2.4404G	112.20	Inf	-Inf	80.10	3	Horizontal	332	1.08	-	27.40	4.70	-
AV	2.44G	107.59	Inf	-Inf	75.49	3	Horizontal	332	1.08	-	27.40	4.70	-
PK	2.4904G	55.60	74.00	-18.40	23.32	3	Horizontal	332	1.08	-	27.50	4.78	-
AV	2.4996G	44.94	54.00	-9.06	12.74	3	Horizontal	332	1.08	-	27.40	4.80	-

2.4-2.4835GHz_Zigbee

2440MHz_TX

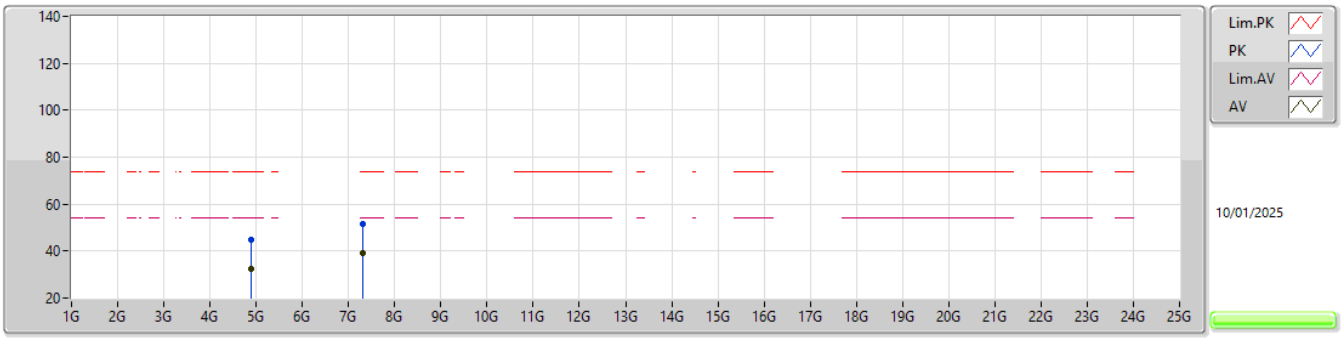


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	4.87762G	45.02	74.00	-28.98	41.14	3	Vertical	210	1.38	-	31.30	6.55	33.97
AV	4.87794G	32.72	54.00	-21.28	28.84	3	Vertical	210	1.38	-	31.30	6.55	33.97
PK	7.31856G	51.97	74.00	-22.03	40.98	3	Vertical	317	1.37	-	36.60	8.58	34.19
AV	7.32004G	39.19	54.00	-14.81	28.20	3	Vertical	317	1.37	-	36.60	8.58	34.19

2.4-2.4835GHz_Zigbee

2440MHz_TX

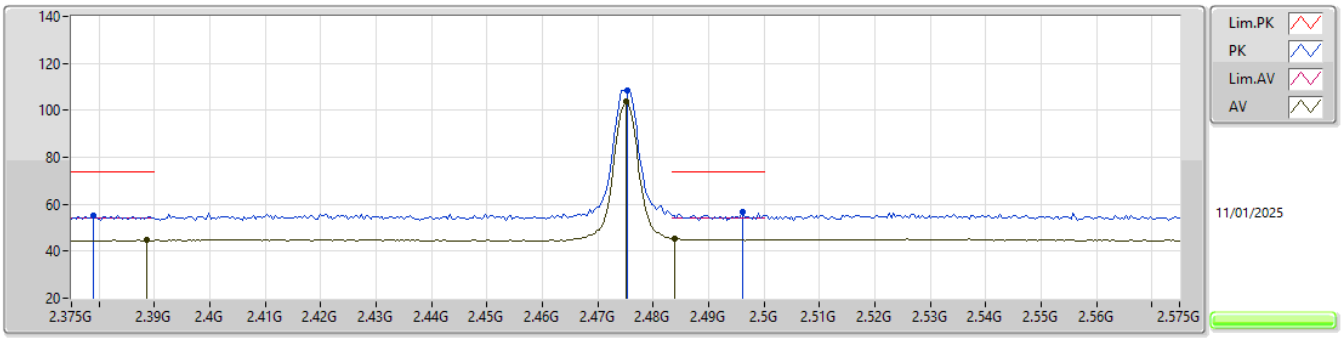


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	4.88144G	44.94	74.00	-29.06	41.06	3	Horizontal	341	1.91	-	31.30	6.55	33.97
AV	4.8822G	32.40	54.00	-21.60	28.52	3	Horizontal	341	1.91	-	31.30	6.55	33.97
PK	7.31506G	51.55	74.00	-22.45	40.56	3	Horizontal	55	1.45	-	36.60	8.58	34.19
AV	7.32054G	39.16	54.00	-14.84	28.17	3	Horizontal	55	1.45	-	36.60	8.58	34.19

2.4-2.4835GHz_Zigbee

2475MHz_TX

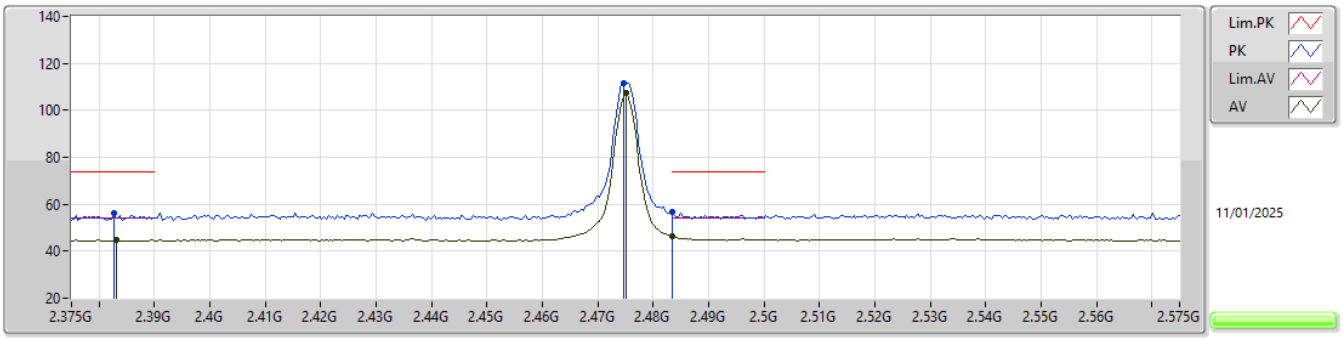


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.379G	55.13	74.00	-18.87	22.90	3	Vertical	23	2.81	-	27.61	4.62	-
AV	2.3886G	44.59	54.00	-9.41	12.37	3	Vertical	23	2.81	-	27.60	4.62	-
PK	2.4754G	108.64	Inf	-Inf	76.53	3	Vertical	23	2.81	-	27.35	4.76	-
AV	2.475G	104.02	Inf	-Inf	71.91	3	Vertical	23	2.81	-	27.35	4.76	-
PK	2.4962G	56.48	74.00	-17.52	24.25	3	Vertical	23	2.81	-	27.44	4.79	-
AV	2.4838G	45.32	54.00	-8.68	13.11	3	Vertical	23	2.81	-	27.44	4.77	-

2.4-2.4835GHz_Zigbee

2475MHz_TX

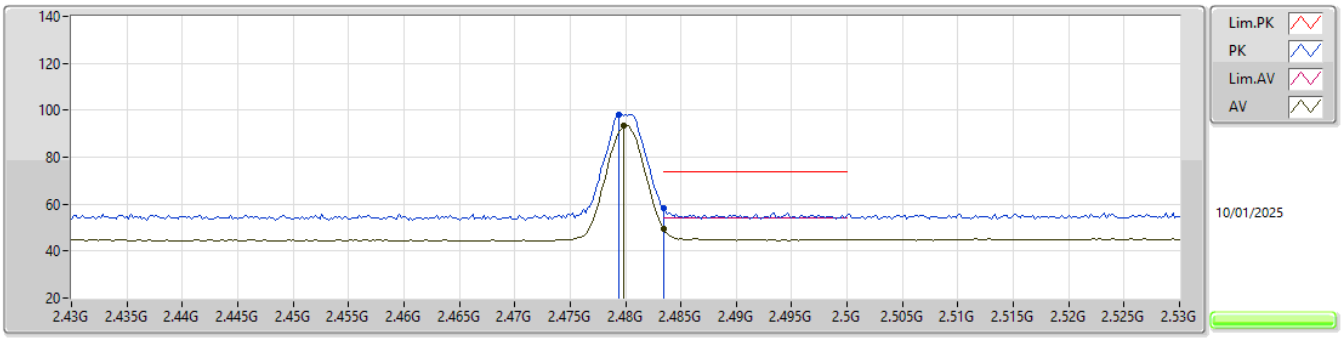


EUT Y_1TX
Setting 20
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.3826G	56.16	74.00	-17.84	23.94	3	Horizontal	332	2.07	-	27.60	4.62	-
AV	2.383G	44.66	54.00	-9.34	12.44	3	Horizontal	332	2.07	-	27.60	4.62	-
PK	2.4746G	111.68	Inf	-Inf	79.57	3	Horizontal	332	2.07	-	27.35	4.76	-
AV	2.475G	107.47	Inf	-Inf	75.36	3	Horizontal	332	2.07	-	27.35	4.76	-
PK	2.4835G	56.60	74.00	-17.40	24.39	3	Horizontal	332	2.07	-	27.44	4.77	-
AV	2.4835G	46.31	54.00	-7.69	14.10	3	Horizontal	332	2.07	-	27.44	4.77	-

2.4-2.4835GHz_Zigbee

2480MHz_TX

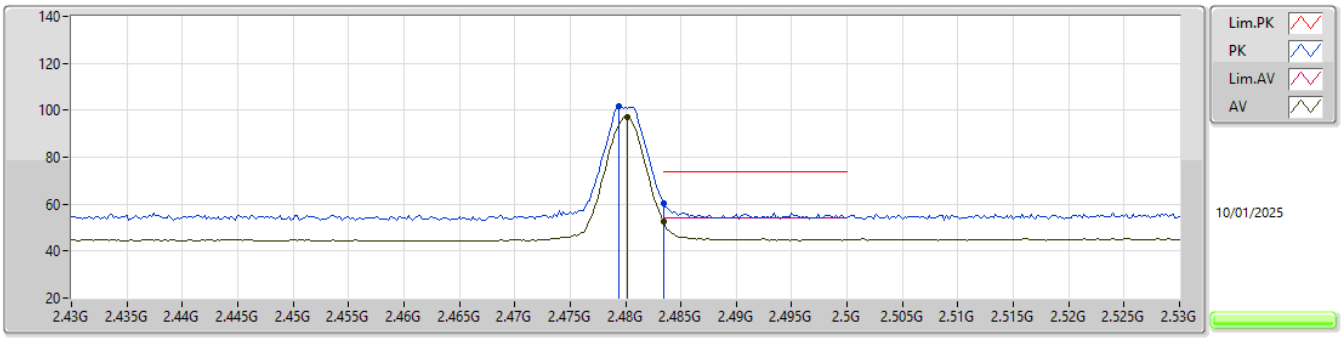


EUT Y_1TX
Setting 12
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.4794G	98.29	Inf	-Inf	66.14	3	Vertical	360	2.01	-	27.39	4.76	-
AV	2.4798G	93.55	Inf	-Inf	61.38	3	Vertical	360	2.01	-	27.40	4.77	-
PK	2.4835G	58.19	74.00	-15.81	25.98	3	Vertical	360	2.01	-	27.44	4.77	-
AV	2.4835G	49.27	54.00	-4.73	17.06	3	Vertical	360	2.01	-	27.44	4.77	-

2.4-2.4835GHz_Zigbee

2480MHz_TX

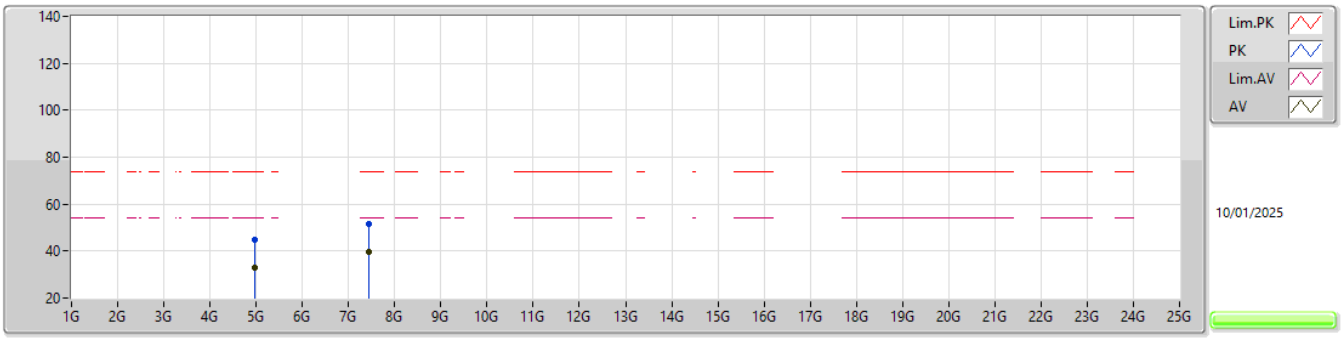


EUT Y_1TX
Setting 12
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.4794G	101.53	Inf	-Inf	69.38	3	Horizontal	334	2.07	-	27.39	4.76	-
AV	2.4802G	97.10	Inf	-Inf	64.93	3	Horizontal	334	2.07	-	27.40	4.77	-
PK	2.4835G	60.33	74.00	-13.67	28.12	3	Horizontal	334	2.07	-	27.44	4.77	-
AV	2.4835G	52.45	54.00	-1.55	20.24	3	Horizontal	334	2.07	-	27.44	4.77	-

2.4-2.4835GHz_Zigbee

2480MHz_TX

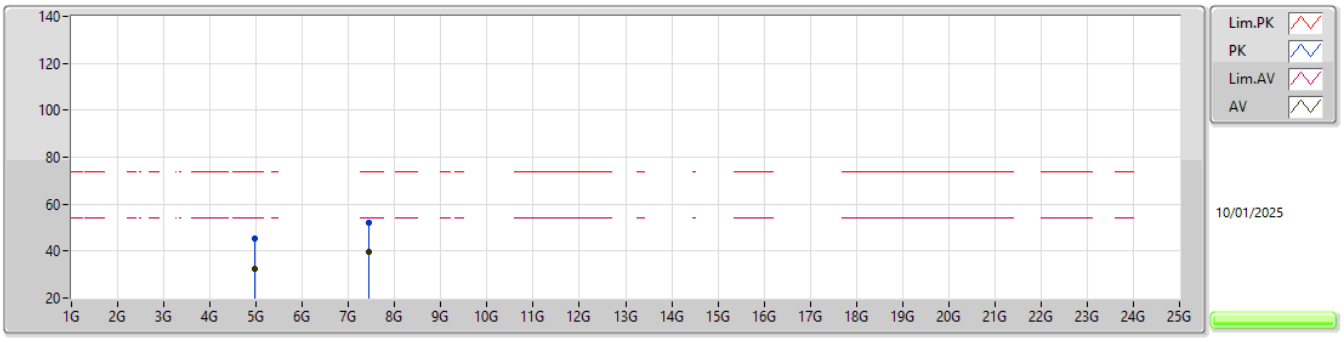


EUT Y_1TX
Setting 12
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	4.9631G	44.93	74.00	-29.07	40.82	3	Vertical	281	2.10	-	31.53	6.56	33.98
AV	4.96252G	32.71	54.00	-21.29	28.60	3	Vertical	281	2.10	-	31.53	6.56	33.98
PK	7.4376G	51.73	74.00	-22.27	40.74	3	Vertical	82	2.63	-	36.48	8.70	34.19
AV	7.43926G	39.86	54.00	-14.14	28.86	3	Vertical	82	2.63	-	36.48	8.71	34.19

2.4-2.4835GHz_Zigbee

2480MHz_TX



EUT Y_1TX
Setting 12
06-C-G-4

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	4.95788G	45.22	74.00	-28.78	41.12	3	Horizontal	108	2.66	-	31.52	6.56	33.98
AV	4.96158G	32.57	54.00	-21.43	28.47	3	Horizontal	108	2.66	-	31.52	6.56	33.98
PK	7.43728G	52.04	74.00	-21.96	41.06	3	Horizontal	15	2.17	-	36.47	8.70	34.19
AV	7.43922G	39.68	54.00	-14.32	28.68	3	Horizontal	15	2.17	-	36.48	8.71	34.19