Testing Laboratory 3785

FCC Radio Test Report

FCC ID	:	**TVE-240602**
Equipment	:	**Secured Wireless Access Point**
Brand Name	:	**FORTINET**
Model Name	:	**FortiAP 241Kxxxxxxxxx, FAP-241Kxxxxxxxxx, FORTIAP-241Kxxxxxxxxx (Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)**
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 Apr. 23, 2024, and testing was started from May 06, 2024 and completed on Jul. 03, 2024. We, SPORTON INTERNATIONAL INC. Hsinhua 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. Hsinhua Laboratory, the test report shall not be reproduced except in full.

Approved by: Jackson Tsai

SPORTON INTERNATIONAL INC. Hsinhua Laboratory

No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)

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PHOTOGRAPHS OF EUT V01

History of this test report

Report No.	Version	Description	Issued Date
FR411229AZ	01	Initial issue of report	Jul. 16, 2024

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	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and explanations:
None

Reviewed by: Barry Hsiao

Report Producer: Julie Tseng

1 General Description

1.1 Information

Radio 3 (Scan radio) is only RX function.

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
2.4-2.4835GHz	Zigbee	5	1TX

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

1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Support
1	1	EnRack	7102A1242000	PIFA	I-PEX	2.4G+5G+5.9G
2	2	EnRack	7102A1241000	PIFA	I-PEX	2.4G+5G+5.9G
3	1	EnRack	7102A1244000	PIFA	I-PEX	2.4G+5G+5.9G +6G
4	2	EnRack	7102A1243000	PIFA	I-PEX	2.4G+5G+5.9G +6G
5	1	AWAN	7102A1240000	Alford Loop	I-PEX	6G
6	2	AWAN	7102A1240000	Alford Loop	I-PEX	6G
7	1	AWAN	7102A1240000	Dipole	I-PEX	BT+Zigbee

Ant.	Port	Gain (dBi)						Remark	
		2.4G	5G	5.9G	6G	BT	Zigbee		
1	1	5.11	5.22	5.11	-	-	-	Radio1 2.4G only 2*2	Radio2 5G/5.9G 2*2
2	2	5.19	5.32	4.79	-	-	-		
3	1	4.97	5.35	5.40	5.48	-	-	Radio3 (Scan radio) 2.4G/5G/5.9G/6G 2*2	
4	2	4.69	5.43	5.13	5.37	-	-		
5	1	-	-	-	5.53	-	-	Radio2 6G 2*2	
6	2	-	-	-	5.58	-	-		
7	1	-	-	-	-	5.00	5.00	-	

Note 1: The EUT has seven antennas.
Note 2: Directional gain information

	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	$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{sts}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ant}}\right]$
BF	$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{sts}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ant}}\right]$	$DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{sts}}\left\{\sum_{k=1}^{N_{ant}} g_{j,k}\right\}^2}{N_{ant}}\right]$

For 2.4GHz function:
< Radio 1 >
For IEEE 802.11b/g/n/VHT/ax/be mode (2TX/2RX)
Ant.1 (port 1), Ant.2 (port 2) could transmit/receive simultaneously.
< Radio 3 > < Scan >
For IEEE 802.11b/g/n/VHT/ax mode (2RX)
Ant.3 (port 1), Ant.4 (port 2) can be used as receiving.

For 5GHz function:
< Radio 2 >
For IEEE 802.11a/n/ac/ax/be mode (2TX/2RX)
Ant.1 (port 1), Ant.2 (port 2) could transmit/receive simultaneously.
< Radio 3 > < Scan >
For IEEE 802.11a/n/ac/ax mode (2RX)
Ant.3 (port 1), Ant.4 (port 2) can be used as receiving.

For 6GHz function:
< Radio 2 >
For IEEE 802.11ax/be mode (2TX/2RX)
Ant.5 (port 1), Ant.6 (port 2) could transmit/receive simultaneously.
< Radio 3 > < Scan >
For IEEE 802.11ax mode (2RX)
Ant.3 (port 1), Ant.4 (port 2) can be used as receiving.

For Bluetooth / Zigbee function:
For Bluetooth mode (1TX/1RX)
Only Ant.7 can be used as transmitting/receiving.

1.1.3 EUT Information

Operational Condition				
EUT Power Type	From AC Adapter / PoE			
EUT Function	☒	Point-to-multipoint	☐	Point-to-point
Type of EUT				
☒	Stand-alone			
☐	Combined (EUT where the radio part is fully integrated within another device)			
	Combined Equipment - Brand Name / Model No.:	…		
☐	Plug-in radio (EUT intended for a variety of host systems)			
	Host System - Brand Name / Model No.:	…		
☐	Other:			

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF (dB)	T (s)	VBW (Hz)_1/T
Zigbee	1	0	n/a (DC>=0.98)	n/a (DC>=0.98)

Note. If DC < 0.98, the DCF was added while measuring Output power and PSD.

1.1.5 Table for Multiple Listing

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

Brand Name	Model Name	Description
FORTINET	FortiAP 241Kxxxxxxxxx, FAP-241Kxxxxxxxxx, FORTIAP-241Kxxxxxxxxx (Where "x" can be used as "A-Z", or "0-9", or “-", or blank for software changes or marketing purposes only)	All the models are identical, the difference model for difference brand served as marketing strategy.

From the above models, model: FAP-241K was selected as representative model for the test and its data was recorded in this report.

1.2 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2013

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

- KDB 558074 D01 v05r02
- KDB 414788 D01 v01r01

1.3 Testing Location Information

Test Lab.：Sporton International Inc. Hsinhua Laboratory				
☒ Hsinhua **(TAF:** 3785**)**	**ADD:** No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.)			
	TEL: 886-3-327-3456		**FAX:** 886-3-327-0973	
Test site Designation No. TW3785 with FCC.				
Test Condition	**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
AC Conduction	CO04-HY	Daniel Lin	23.8~24.9°C / 50~ 53%	03/Jul/2024
RF Conducted	TH07-HY	Xun Hsieh	22.8~23.9°C / 50~56%	06/May/2024~30/May/2024
☒ Wenhua 3rd. **(TAF:** 3785**)**	**ADD:** No. 58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Guishan Dist. Taoyuan City 333, Taiwan (R.O.C.)			
	TEL: 886-3-327-0868			
Test site Designation No. TW0036 with FCC.				
Test Condition	**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**
Radiated	03CH24-HY	Lego Lin	22.5~24.1°C / 52~57%	23/May/2024~25/May/2024
Radiated (Co-location)	03CH26-HY	Billy Wang	22.9~23.2°C / 59~60%	28/May/2024

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**
AC Power-line Conducted Emissions	4.53 dB	Confidence levels of 95%
Bandwidth	3 MHz	Confidence levels of 95%
Maximum Conducted Output Power	2 dB	Confidence levels of 95%
Power Spectral Density	2 dB	Confidence levels of 95%
Emissions in Non-restricted Frequency Bands	0.14 dB	Confidence levels of 95%
Emissions in Restricted Frequency Bands	4.8 dB	Confidence levels of 95%
Temperature	0.41 °C	Confidence levels of 95%
Humidity	3.4 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Test Software Version	PuTTY Release 0.62

Mode	Power Setting
Zigbee	-
2405MHz	200
2440MHz	200
2475MHz	200
2480MHz	164

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	CTX
1	Adapter Mode

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		
1	Adapter Mode		
Operating Mode > 1GHz	CTX		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
Worst Planes of EUT		V	

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Operating Mode	CTX
1	Radio 1_2.4G + Radio 2_5G + Radio 2_6E + Bluetooth
2	Radio 1_2.4G + Radio 2_5G + Radio 2_6E + Zigbee
Refer to Sporton Test Report No.: FA411229 for Co-location RF Exposure Evaluation and Appendix G for Radiated Emission Co-location.	

2.3 Accessories

Accessories				
BRACKET,METAL CLIP CEILING,RVAQ-AP43	Brand Name	WNC	Model Name	6B.SRVAQ.00N
BRACKET,CEILING RAIL 1	Brand Name	WNC	Model Name	3S.005AL.111
BRACKET,CEILING RAIL 2	Brand Name	WNC	Model Name	3S.005AK.111

Reminder: Regarding to more detail and other information, please refer to user manual.

2.4 Support Equipment

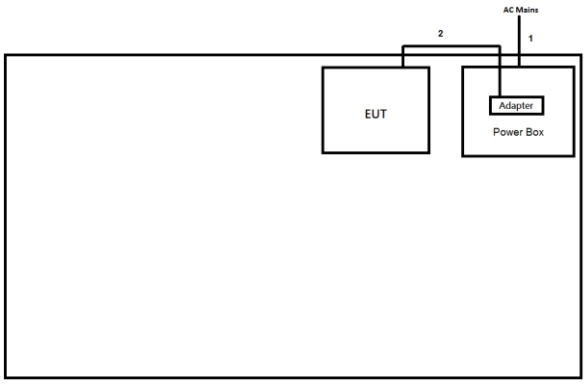
Support Equipment – AC Conduction					
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**	**Remark**
1	AC Adapter	ASIAN POWER DEVICES INC.	WA-48A12R	-	Provided by Customer

Support Equipment – Conducted					
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**	**Remark**
1	Notebook	DELL	E5410	-	-
2	Adapter for NB	DELL	HA65NM130	-	-
3	AC Adapter	ASIAN POWER DEVICES INC.	WA-48A12R	-	Provided by Customer

Support Equipment – Radiated					
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**	**Remark**
1	AC Adapter	ASIAN POWER DEVICES INC.	WA-48A12R	-	Provided by Customer
2	RJ45 Cable	Power sync	CAT-6E-10	-	-
3	Notebook	Dell	P28S	-	Remote
4	AC Adapter (for NB)	HP	HSTNN-CA40	-	Remote
5	AC Power cable	PowerSync	TPCMRN0018	-	Remote

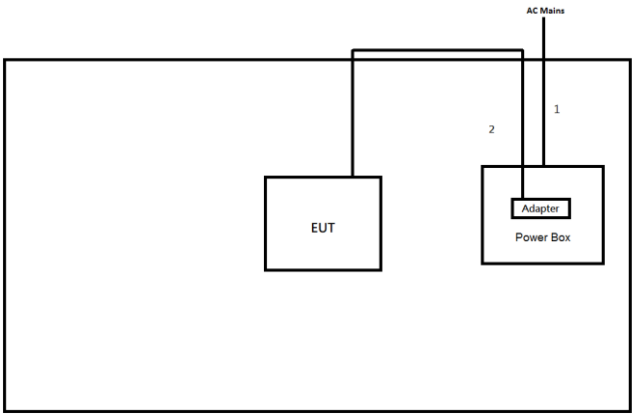
2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1	AC power cable	NO	1.0	-
2	DC power cable	NO	1.5	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC power cable	NO	1.8	-
2	DC power cable	NO	1.5	-

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

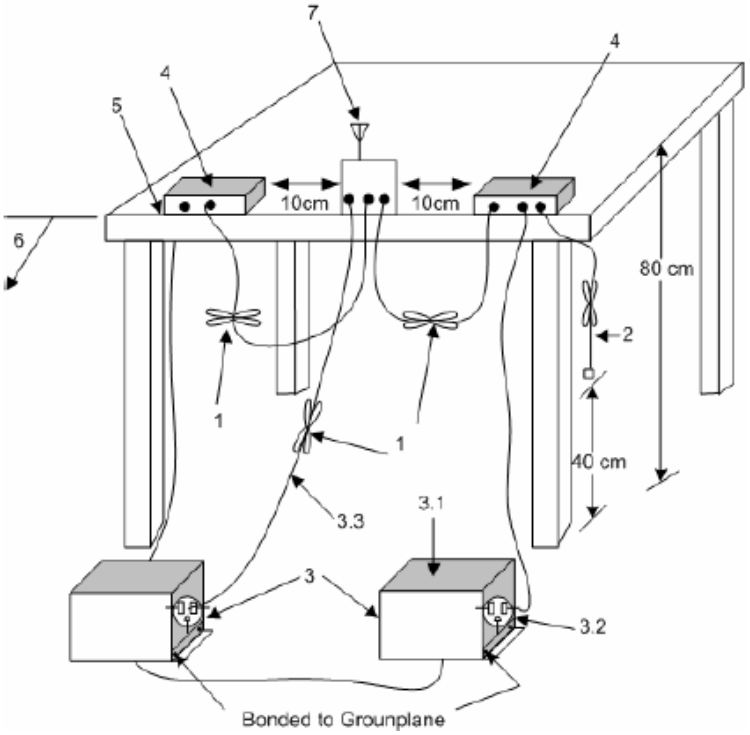
Test Method
☒ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Raw(Read Level) +LISN(LISN Factor) + CL(Cable Loss) + AT(Attenuator).

3.1.5 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 50Ω 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.

3.1.6 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

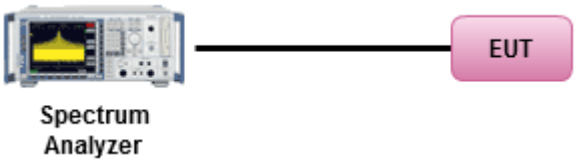
Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
▪ For the emission bandwidth shall be measured using one of the options below:	
	☒ Refer as KDB 558074, clause 8.2 (11.8 of ANSI C63.10) DTS bandwidth measurement.
	☐ Refer as RSS-Gen, clause 6.7 for for occupied bandwidth testing.
	☐ Refer as ANSI C63.10, clause 6.9.3 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} ≤ 6 dBi, then P_{Out} ≤ 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 + 8dB dBm	
e.i.r.p. Power Limit:			
▪ 2400-2483.5 MHz Band			
	▪ Point-to-multipoint systems (P2M): P_{eirp} ≤ 36 dBm (4 W)		
	▪ Point-to-point systems (P2P): P_{eirp} ≤ MAX(36, [P_{Out} + G_{TX}]) dBm		
	▪ Smart antenna system (SAS)		
		- Single beam: P_{eirp} ≤ MAX(36, P_{Out} + G_{TX}) dBm	
		- Overlap beam: P_{eirp} ≤ MAX(36, P_{Out} + G_{TX}) dBm	
		- Aggregate power on all beams: P_{eirp} ≤ MAX(36, [P_{Out} + G_{TX} + 8]) 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 KDB 558074, clause 8.3.1.1 (11.9.1.1 of ANSI C63.10) RBW ≥ EBW method.
	☐ Refer as KDB 558074, clause 8.3.1.2 (11.9.1.2 of ANSI C63.10) integrated band power method.
	☐ Refer as KDB 558074, clause 8.3.1.3 (11.9.1.3 of ANSI C63.10) peak power meter.
▪ Maximum Average Conducted Output Power	
	☐ Refer as KDB 558074, clause 8.3.2.2 (11.9.2.2 of ANSI C63.10) using a spectrum analyzer.
	☒ Refer as KDB 558074, clause 8.3.2.3 (11.9.2.3 of ANSI C63.10) using a power meter.
▪ For conducted measurement.	
	▪ If the EUT supports multiple transmit chains using options given below: Refer as 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

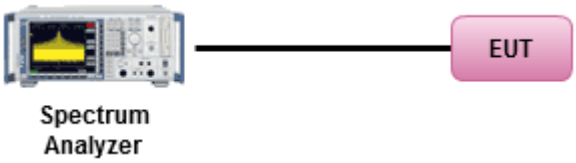
3.4.2 Measuring Instruments

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 KDB 558074, clause 8.4 (11.10 of ANSI C63.10) Max. PSD.	
▪ For conducted measurement.		
	▪ If The EUT supports multiple transmit chains using options given below:	
		▪ Measure and sum the spectra across the outputs. Refer as 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.

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 (dB)**
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 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 level.	

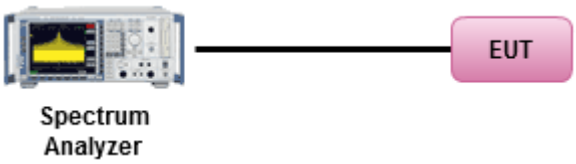
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method
▪ Refer as KDB 558074, clause 8.5 (11.11 of ANSI C63.10) for non-restricted frequency 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 KDB 558074, clause 8.6 (11.12 of ANSI C63.10) for restricted frequency bands.
▪ For the transmitter band-edge emissions shall be measured using following options below:	
	▪ Refer as KDB 558074 clause 8.7.1, 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 KDB 558074, clause 8.7.2 (6.10.6 of ANSI C63.10) for marker-delta method for band-edge measurements.
	▪ Refer as KDB 558074, clause 8.7.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
▪ Use the following spectrum analyzer settings:	
	▪ Set RBW=100 kHz for f < 1 GHz; VBW=3 * RBW; Sweep = auto; Detector function = peak; Trace = max hold.
	▪ Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement. For average measurement, refer as 1.1.4.
▪ KDB 414788 Open-Field Test Sites and Chamber Correlation Justification.	
	▪ Based on FCC 15.31(f)(2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
	▪ Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

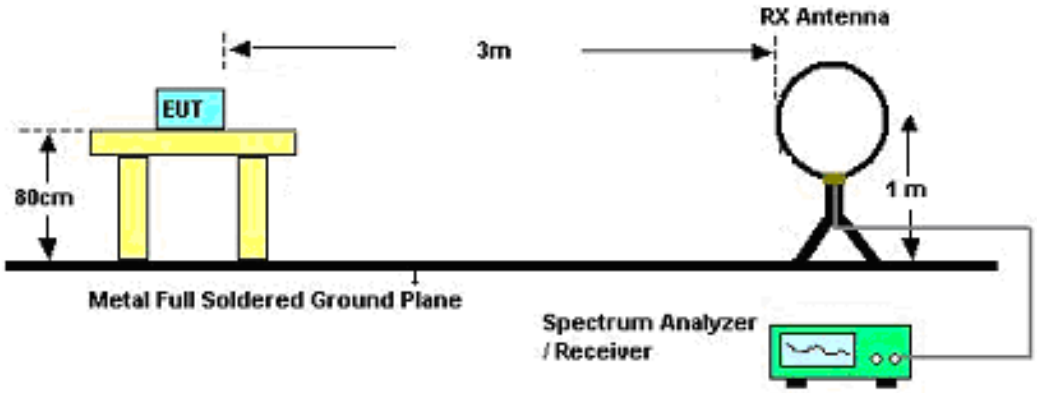
3.6.4 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamp Factor)

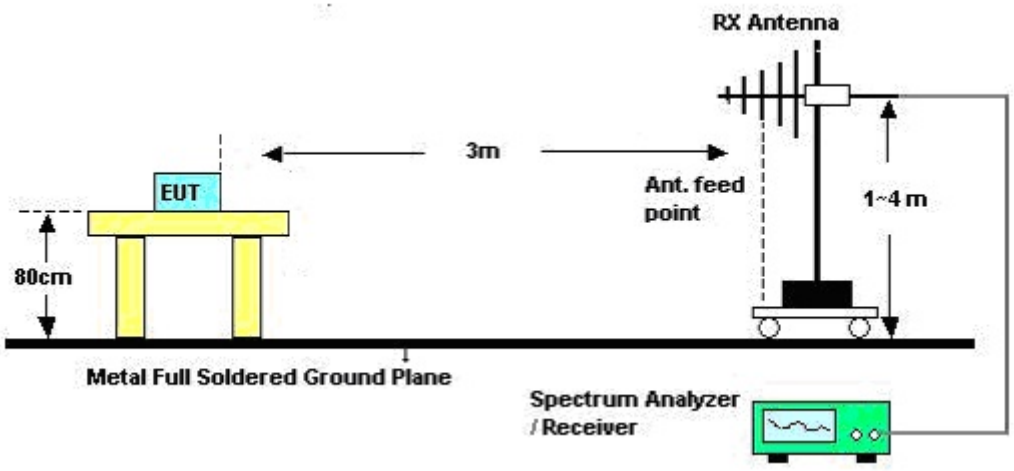
3.6.5 Test Setup

Emissions in Restricted Frequency Bands

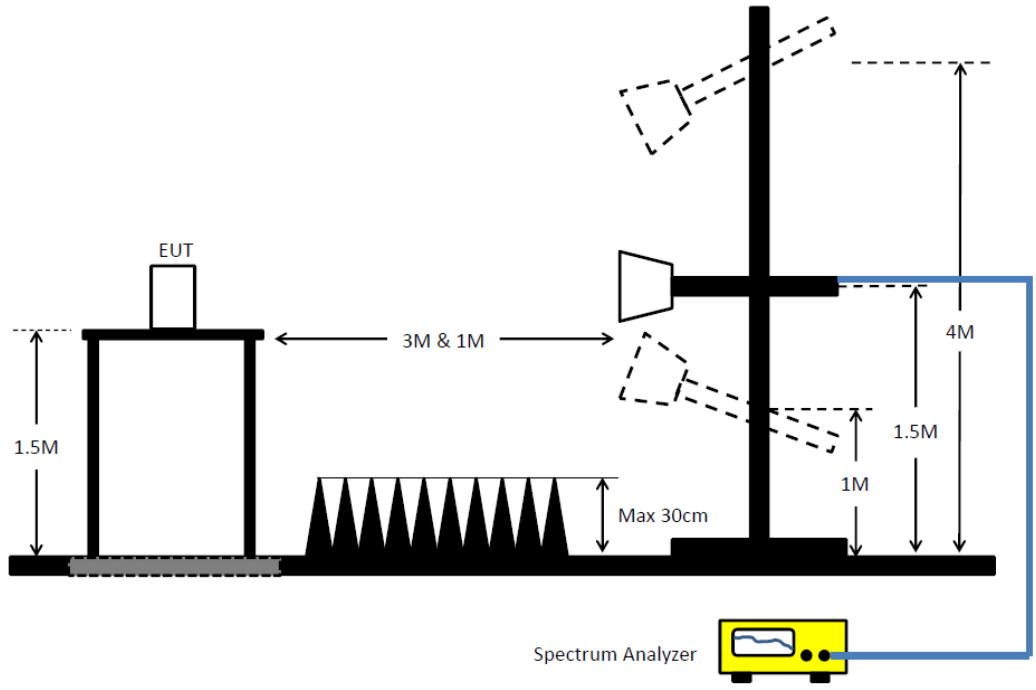
9kHz ~30MHz



30MHz~1GHz



Above 1GHz



3.6.6 Test Result of Emissions in Restricted Frequency Bands (Below 30MHz)

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

3.6.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
EMI Test Receiver	ROHDE & SCHWARZ	ESR	102318	9kHz ~ 3.6GHz	27/Dec/2023	26/Dec/2024
LISN(Artificial Mains Network)	SCHWARZBECK	NSLK 8127	8127477	9kHz ~ 30MHz	12/Apr/2024	11/Apr/2025
Two-Line V-Network	R&S	ENV 216	101274	9kHz ~ 30MHz	18/Jun/2024	17/Jun/2025
RF Cable 5m	TITAN	TITAN	CO04-cable-01	9 kHz~200MHz	27/Feb/2024	26/Feb/2025
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9kHz ~ 30MHz	18/Oct/2023	17/Oct/2024
Software	Sporton	SENSE-EMI	V5.11.3	-	NCR	NCR

NCR: No Calibration Required

Instrument for Conducted Test

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV 40	101515	9kHz~40GHz	02/Feb/2024	01/Feb/2025
SMB100A Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	20/Oct/2023	19/Oct/2024
Power Meter	Anritsu	ML2495A	1517010	300MHz~40GHz	15/Dec/2023	14/Dec/2024
Pulse Sensor	Anritsu	MA2411B	1339407	300MHz~40GHz	15/Dec/2023	14/Dec/2024
SENSE-15247_FS	Sporton	V5.11.18	N/A	N/A	N/A	N/A

Instrument for Radiated Test

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH24-HY	30MHz~1GHz 3m	17/Aug/2023	16/Aug/2024
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH24-HY	1GHz~18GHz 3m	03/Aug/2023	02/Aug/2024
EMI Test Receiver	ROHDE & SCHWARZ	ESR	102318	9kHz~3.6GHz	27/Dec/2023	26/Dec/2024
Signal Analyzer	ROHDE& SCHWARZ	FSV3044	101345	10Hz~44GHz	10/Aug/2023	09/Aug/2024
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	19/Mar/2024	18/Mar/2025
Bilog Antenna & 6dB Attenuator	TESEQ / Woken	CBL 6112D / 00800N1D01N -06	35376 / 02	30MHz~1GHz	14/Apr/2024	13/Apr/2025
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	02744	1GHz~18GHz	17/Aug/2023	16/Aug/2024
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	01248	18GHz~40GHz	21/Aug/2023	20/Aug/2024
RF Cable	HUBER+SUHNER	SUOFLEX 104	CB002	9kHz~1GHz	21/Jul/2023	20/Jul/2024
RF Cable	HUBER+SUHNER	SUOFLEX 102	CB001	1GHz~40GHz	21/Jul/2023	20/Jul/2024
Pre-Amplifier	Aglient	8447D	2944A06292	30MHz~1GHz	18/Apr/2024	17/Apr/2025
Amplifier	EM	EM01G18G	060870	1GHz ~18GHz	10/Aug/2023	09/Aug/2024
Amplifier	EM	EM18G40GA	060874	18GHz ~40GHz	15/Apr/2024	14/Apr/2025
SENSE-15247-DTS	Sporton	V5.11.18	NA	NA	NA	NA

Instrument for Radiated Test (Co-location)

Instrument	Manufacturer /Brand	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH26-HY	1GHz~18GHz 3m	08/Aug/2023	07/Aug/2024
Signal Analyzer	ROHDE&SCHWARZ	FSV3044	101411	10Hz~44GHz	06/Oct/2023	05/Oct/2024
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	02877	1GHz~18GHz	12/Jul/2023	11/Jul/2024
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	01248	18GHz~40GHz	21/Aug/2023	20/Aug/2024
RF Cable	HUBER+SUHNER	SUOFLEX 104	CB009	1GHz~40GHz	18/Oct/2023	17/Oct/2024
Preamplifier	SGH	PRAMP 118-H	20230515-4	1GHz ~18GHz	23/May/2024	22/May/2025
Amplifier	EM	EM18G40G	060874	18GHz ~ 40GHz	15/Apr/2024	14/Apr/2025
SENSE-EMI	Sporton	V5.11.3	NA	NA	NA	NA

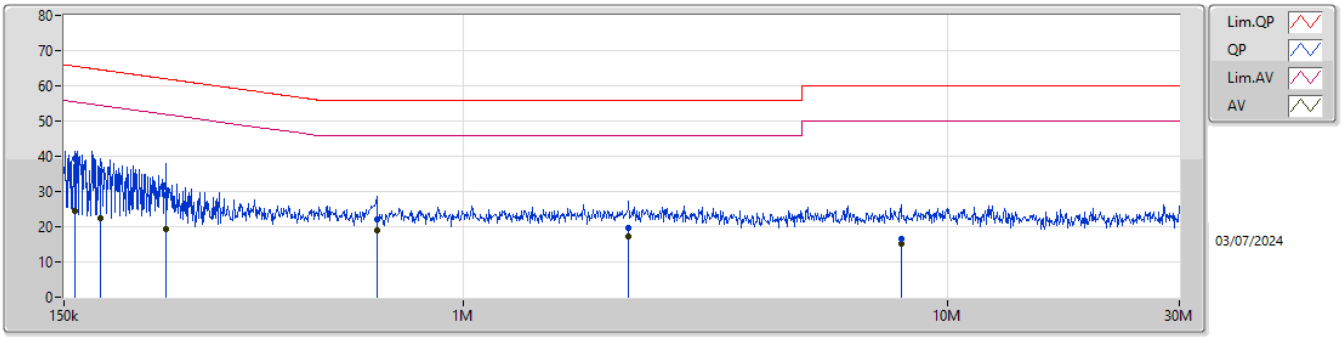
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	QP	157.99k	39.36	65.56	-26.20	Line

Result

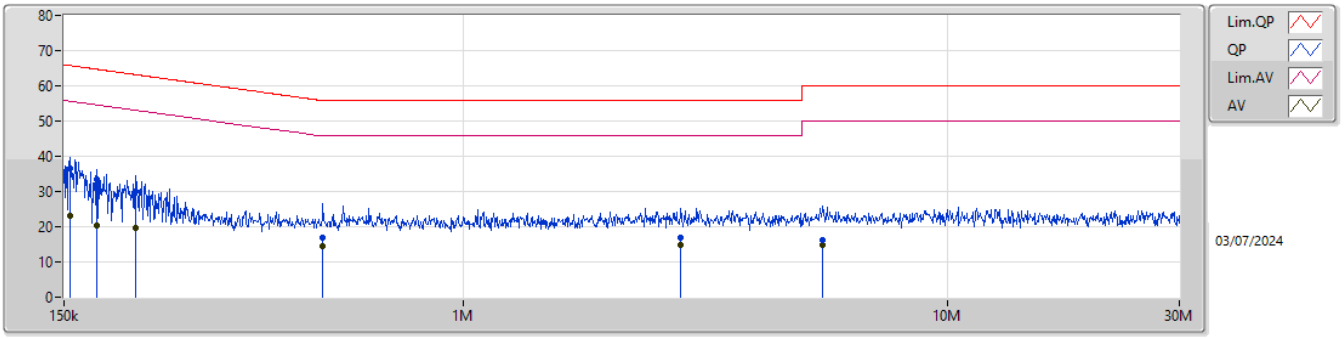
Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition	Comments
Mode 1	Pass	QP	157.99k	39.36	65.56	-26.20	Line	-
Mode 1	Pass	AV	157.99k	24.55	55.56	-31.01	Line	-
Mode 1	Pass	QP	178.803k	35.84	64.55	-28.71	Line	-
Mode 1	Pass	AV	178.803k	22.34	54.55	-32.21	Line	-
Mode 1	Pass	QP	244.12k	28.84	61.95	-33.11	Line	-
Mode 1	Pass	AV	244.12k	19.43	51.95	-32.52	Line	-
Mode 1	Pass	QP	662.266k	22.18	56.00	-33.82	Line	-
Mode 1	Pass	AV	662.266k	18.97	46.00	-27.03	Line	-
Mode 1	Pass	QP	2.194M	19.74	56.00	-36.26	Line	-
Mode 1	Pass	AV	2.194M	17.16	46.00	-28.84	Line	-
Mode 1	Pass	QP	7.996M	16.67	60.00	-43.33	Line	-
Mode 1	Pass	AV	7.996M	15.26	50.00	-34.74	Line	-
Mode 1	Pass	QP	154.251k	36.54	65.77	-29.23	Neutral	-
Mode 1	Pass	AV	154.251k	23.16	55.77	-32.61	Neutral	-
Mode 1	Pass	QP	175.269k	33.37	64.70	-31.33	Neutral	-
Mode 1	Pass	AV	175.269k	20.28	54.70	-34.42	Neutral	-
Mode 1	Pass	QP	210.599k	30.08	63.19	-33.11	Neutral	-
Mode 1	Pass	AV	210.599k	19.62	53.19	-33.57	Neutral	-
Mode 1	Pass	QP	512.95k	16.78	56.00	-39.22	Neutral	-
Mode 1	Pass	AV	512.95k	14.56	46.00	-31.44	Neutral	-
Mode 1	Pass	QP	2.81M	16.97	56.00	-39.03	Neutral	-
Mode 1	Pass	AV	2.81M	14.91	46.00	-31.09	Neutral	-
Mode 1	Pass	QP	5.516M	16.06	60.00	-43.94	Neutral	-
Mode 1	Pass	AV	5.516M	14.82	50.00	-35.18	Neutral	-

Conducted Emissions at Powerline_Mode 1



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	157.99k	39.36	65.56	-26.20	19.47	Line	-	19.89	9.66	0.07	9.74
AV	157.99k	24.55	55.56	-31.01	19.47	Line	-	5.08	9.66	0.07	9.74
QP	178.803k	35.84	64.55	-28.71	19.44	Line	-	16.40	9.65	0.08	9.71
AV	178.803k	22.34	54.55	-32.21	19.44	Line	-	2.90	9.65	0.08	9.71
QP	244.12k	28.84	61.95	-33.11	19.45	Line	-	9.39	9.65	0.10	9.70
AV	244.12k	19.43	51.95	-32.52	19.45	Line	-	-0.02	9.65	0.10	9.70
QP	662.266k	22.18	56.00	-33.82	19.54	Line	-	2.64	9.66	0.10	9.78
AV	662.266k	18.97	46.00	-27.03	19.54	Line	-	-0.57	9.66	0.10	9.78
QP	2.194M	19.74	56.00	-36.26	19.57	Line	-	0.17	9.67	0.10	9.80
AV	2.194M	17.16	46.00	-28.84	19.57	Line	-	-2.41	9.67	0.10	9.80
QP	7.996M	16.67	60.00	-43.33	19.55	Line	-	-2.88	9.71	0.05	9.79
AV	7.996M	15.26	50.00	-34.74	19.55	Line	-	-4.29	9.71	0.05	9.79

Conducted Emissions at Powerline_Mode 1



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	154.251k	36.54	65.77	-29.23	19.42	Neutral	-	17.12	9.60	0.07	9.75
AV	154.251k	23.16	55.77	-32.61	19.42	Neutral	-	3.74	9.60	0.07	9.75
QP	175.269k	33.37	64.70	-31.33	19.40	Neutral	-	13.97	9.60	0.08	9.72
AV	175.269k	20.28	54.70	-34.42	19.40	Neutral	-	0.88	9.60	0.08	9.72
QP	210.599k	30.08	63.19	-33.11	19.38	Neutral	-	10.70	9.60	0.09	9.69
AV	210.599k	19.62	53.19	-33.57	19.38	Neutral	-	0.24	9.60	0.09	9.69
QP	512.95k	16.78	56.00	-39.22	19.48	Neutral	-	-2.70	9.60	0.11	9.77
AV	512.95k	14.56	46.00	-31.44	19.48	Neutral	-	-4.92	9.60	0.11	9.77
QP	2.81M	16.97	56.00	-39.03	19.50	Neutral	-	-2.53	9.61	0.09	9.80
AV	2.81M	14.91	46.00	-31.09	19.50	Neutral	-	-4.59	9.61	0.09	9.80
QP	5.516M	16.06	60.00	-43.94	19.48	Neutral	-	-3.42	9.63	0.06	9.79
AV	5.516M	14.82	50.00	-35.18	19.48	Neutral	-	-4.66	9.63	0.06	9.79

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
Zigbee	1.638M	2.243M	2M24G1D	1.619M	2.23M

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

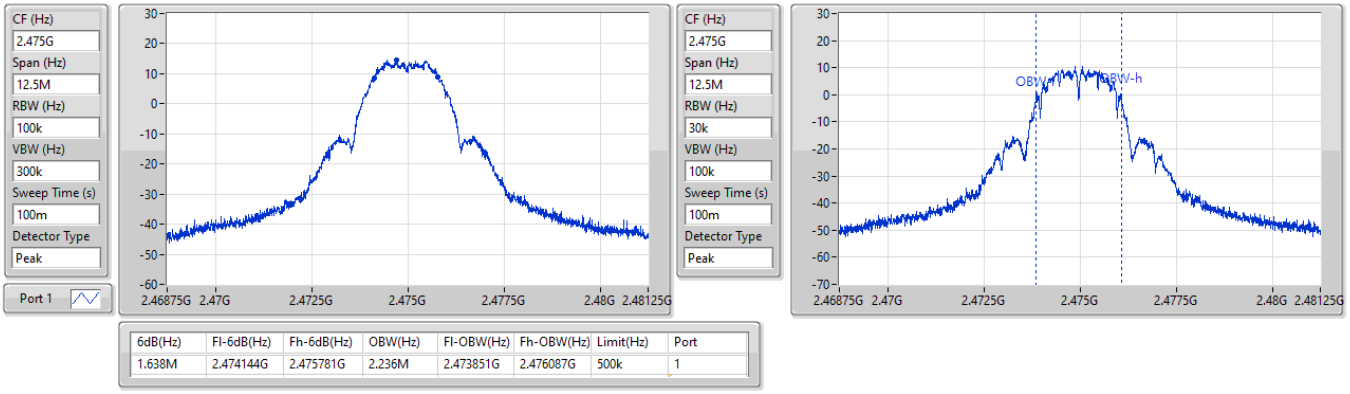
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
Zigbee	-	-	-	-
2405MHz	Pass	500k	1.619M	2.243M
2440MHz	Pass	500k	1.619M	2.23M
2475MHz	Pass	500k	1.638M	2.236M
2480MHz	Pass	500k	1.625M	2.242M

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

2.4-2.4835GHz_Zigbee **EBW-DTS**

2475MHz

06/05/2024



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.638M	2.474144G	2.475781G	2.236M	2.473851G	2.476087G	500k	1

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
Zigbee	18.42	0.06950

Result

Mode	Result	DG (dBi)	Total Power (dBm)	Power Limit (dBm)
Zigbee	-	-	-	-
2405MHz	Pass	5.00	18.35	30.00
2440MHz	Pass	5.00	18.42	30.00
2475MHz	Pass	5.00	18.31	30.00
2480MHz	Pass	5.00	14.79	30.00

DG = Directional Gain; Port X = Port X output power

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
Zigbee	1.90

RBW = 3kHz;

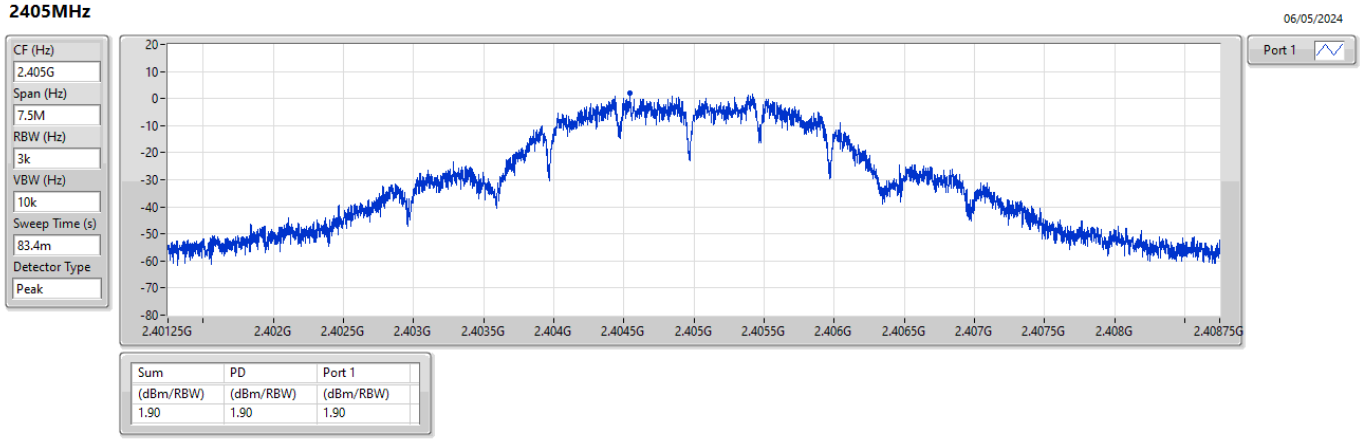
Result

Mode	Result	DG (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
Zigbee	-	-	-	-
2405MHz	Pass	5.00	1.90	8.00
2440MHz	Pass	5.00	1.90	8.00
2475MHz	Pass	5.00	1.86	8.00
2480MHz	Pass	5.00	-3.16	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;

2.4-2.4835GHz_Zigbee **PSD**

2405MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.90	1.90	1.90

Summary

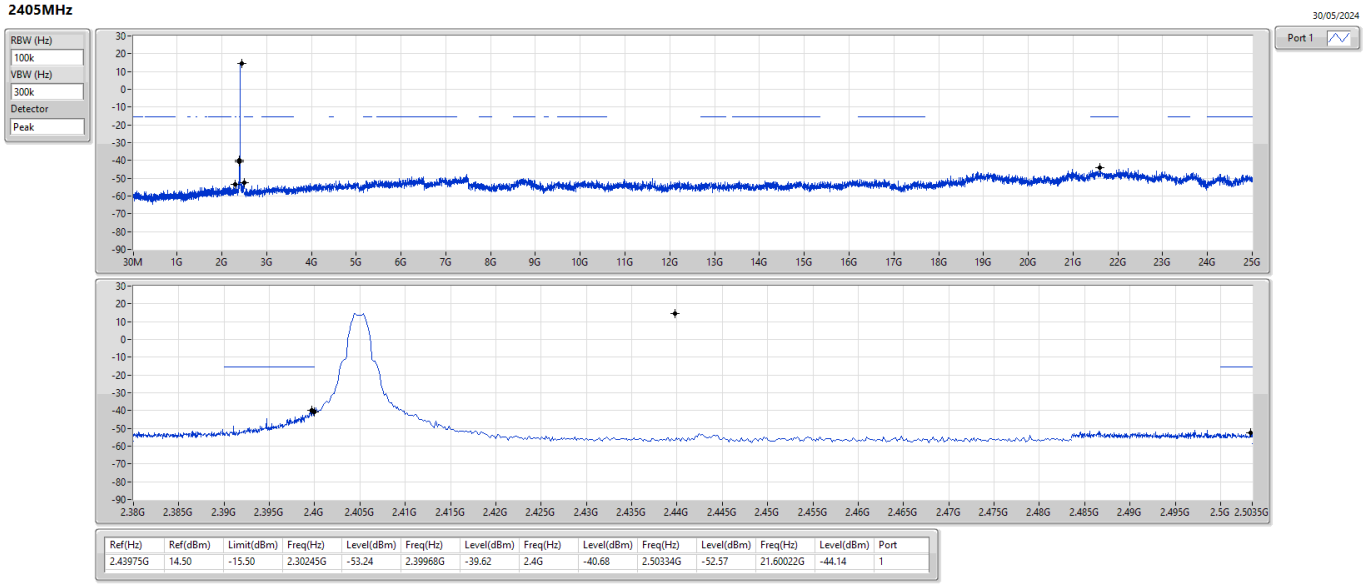
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	2.43975G	14.50	-15.50	2.30245G	-53.24	2.39968G	-39.62	2.4G	-40.68	2.50334G	-52.57	21.60022G	-44.14	1

Result

Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
Zigbee	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2405MHz	Pass	2.43975G	14.50	-15.50	2.30245G	-53.24	2.39968G	-39.62	2.4G	-40.68	2.50334G	-52.57	21.60022G	-44.14	1
2440MHz	Pass	2.43975G	14.50	-15.50	2.15793G	-55.12	2.39176G	-52.15	2.4G	-56.77	2.50018G	-51.70	21.60584G	-44.89	1
2475MHz	Pass	2.43975G	14.50	-15.50	1.79838G	-54.29	2.39976G	-51.69	2.4G	-56.73	2.50126G	-52.40	21.66489G	-44.99	1
2480MHz	Pass	2.43975G	14.50	-15.50	2.19553G	-53.91	2.39212G	-52.51	2.4G	-56.28	2.50286G	-52.04	21.58334G	-44.27	1

2.4-2.4835GHz_Zigbee CSENdB-DTS

2405MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.43975G	14.50	-15.50	2.30245G	-53.24	2.39968G	-39.62	2.4G	-40.68	2.50334G	-52.57	21.60022G	-44.14	1

Summary

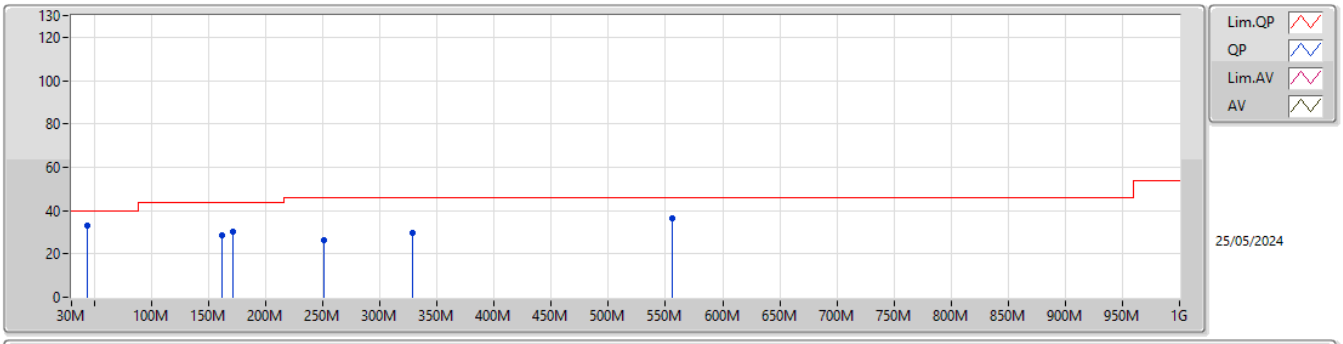
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	PK	43.58M	33.17	40.00	-6.83	3	Vertical	0	1.00

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
Zigbee	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	43.58M	33.17	40.00	-6.83	3	Vertical	0	1.00
2440MHz	Pass	PK	161.92M	28.65	43.50	-14.85	3	Vertical	0	1.00
2440MHz	Pass	PK	171.62M	30.06	43.50	-13.44	3	Vertical	0	1.00
2440MHz	Pass	PK	251.16M	26.07	46.00	-19.93	3	Vertical	0	1.00
2440MHz	Pass	PK	328.76M	29.59	46.00	-16.41	3	Vertical	0	1.00
2440MHz	Pass	PK	555.74M	36.22	46.00	-9.78	3	Vertical	0	1.00
2440MHz	Pass	PK	80.44M	29.20	40.00	-10.80	3	Horizontal	360	1.00
2440MHz	Pass	PK	163.86M	33.28	43.50	-10.22	3	Horizontal	360	1.00
2440MHz	Pass	PK	224M	30.68	46.00	-15.32	3	Horizontal	360	1.00
2440MHz	Pass	PK	348.16M	36.36	46.00	-9.64	3	Horizontal	360	1.00
2440MHz	Pass	PK	555.74M	30.31	46.00	-15.69	3	Horizontal	360	1.00
2440MHz	Pass	PK	646.92M	27.52	46.00	-18.48	3	Horizontal	360	1.00

2.4-2.4835GHz_Zigbee

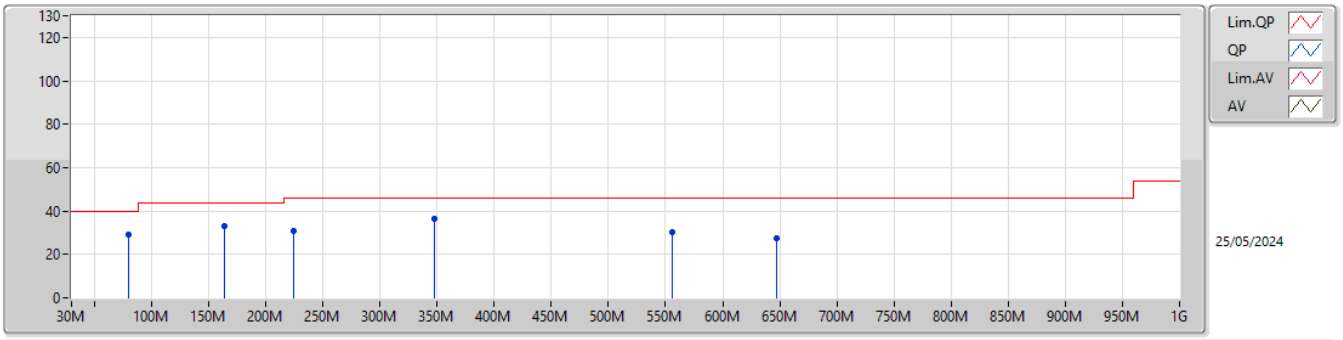
2440MHz_Adapter



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
PK	43.58M	33.17	40.00	-6.83	-10.62	3	Vertical	0	1.00	43.79	16.25	0.50	27.37
PK	161.92M	28.65	43.50	-14.85	-11.02	3	Vertical	0	1.00	39.67	15.05	0.94	27.01
PK	171.62M	30.06	43.50	-13.44	-11.24	3	Vertical	0	1.00	41.30	14.77	0.96	26.97
PK	251.16M	26.07	46.00	-19.93	-7.83	3	Vertical	0	1.00	33.90	17.65	1.16	26.64
PK	328.76M	29.59	46.00	-16.41	-6.80	3	Vertical	0	1.00	36.39	18.74	1.34	26.88
PK	555.74M	36.22	46.00	-9.78	-2.70	3	Vertical	0	1.00	38.92	23.96	1.73	28.39

2.4-2.4835GHz_Zigbee

2440MHz_Adapter



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
PK	80.44M	29.20	40.00	-10.80	-14.31	3	Horizontal	360	1.00	43.51	12.30	0.68	27.29
PK	163.86M	33.28	43.50	-10.22	-11.10	3	Horizontal	360	1.00	44.38	14.96	0.94	27.00
PK	224M	30.68	46.00	-15.32	-11.08	3	Horizontal	360	1.00	41.76	14.56	1.10	26.74
PK	348.16M	36.36	46.00	-9.64	-6.39	3	Horizontal	360	1.00	42.75	19.25	1.38	27.02
PK	555.74M	30.31	46.00	-15.69	-2.70	3	Horizontal	360	1.00	33.01	23.96	1.73	28.39
PK	646.92M	27.52	46.00	-18.48	-2.44	3	Horizontal	360	1.00	29.96	24.13	1.86	28.43

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-
Zigbee	Pass	AV	2.4835G	53.86	54.00	-0.14	3	Horizontal	351	2.54

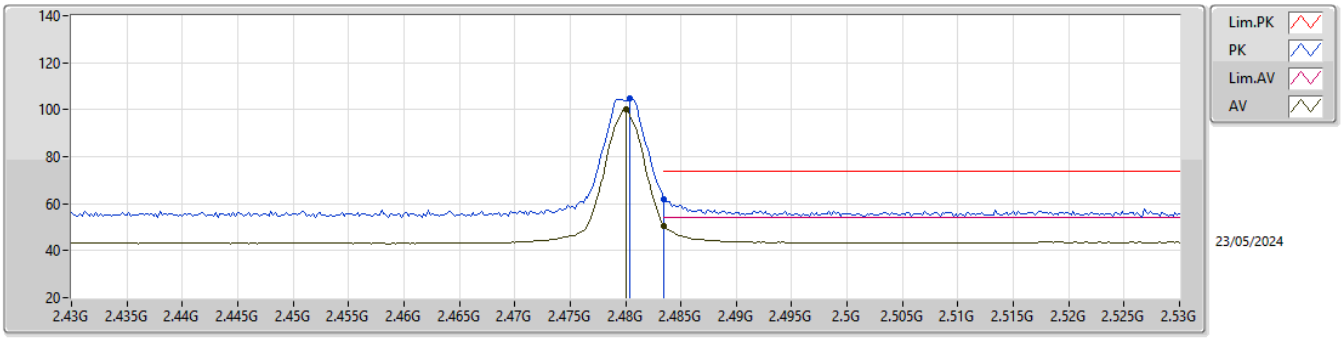
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
Zigbee	-	-	-	-	-	-	-	-	-	-
2405MHz	Pass	AV	2.3896G	43.16	54.00	-10.84	3	Vertical	43	1.12
2405MHz	Pass	AV	2.405G	105.26	Inf	-Inf	3	Vertical	43	1.12
2405MHz	Pass	PK	2.383G	56.69	74.00	-17.31	3	Vertical	43	1.12
2405MHz	Pass	PK	2.4056G	109.52	Inf	-Inf	3	Vertical	43	1.12
2405MHz	Pass	AV	2.3896G	43.41	54.00	-10.59	3	Horizontal	348	1.08
2405MHz	Pass	AV	2.405G	109.13	Inf	-Inf	3	Horizontal	348	1.08
2405MHz	Pass	PK	2.3848G	56.90	74.00	-17.10	3	Horizontal	348	1.08
2405MHz	Pass	PK	2.4054G	113.36	Inf	-Inf	3	Horizontal	348	1.08
2405MHz	Pass	AV	4.80874G	28.20	54.00	-25.80	3	Vertical	20	1.11
2405MHz	Pass	PK	4.80889G	41.90	74.00	-32.10	3	Vertical	20	1.11
2405MHz	Pass	AV	4.81094G	28.50	54.00	-25.50	3	Horizontal	72	1.95
2405MHz	Pass	PK	4.81167G	42.43	74.00	-31.57	3	Horizontal	72	1.95
2440MHz	Pass	AV	2.388G	43.01	54.00	-10.99	3	Vertical	46	1.00
2440MHz	Pass	AV	2.44G	105.24	Inf	-Inf	3	Vertical	46	1.00
2440MHz	Pass	AV	2.4852G	43.42	54.00	-10.58	3	Vertical	46	1.00
2440MHz	Pass	PK	2.3784G	56.06	74.00	-17.94	3	Vertical	46	1.00
2440MHz	Pass	PK	2.4396G	109.54	Inf	-Inf	3	Vertical	46	1.00
2440MHz	Pass	PK	2.4948G	56.67	74.00	-17.33	3	Vertical	46	1.00
2440MHz	Pass	AV	2.3824G	43.08	54.00	-10.92	3	Horizontal	349	2.36
2440MHz	Pass	AV	2.44G	109.62	Inf	-Inf	3	Horizontal	349	2.36
2440MHz	Pass	AV	2.4856G	43.41	54.00	-10.59	3	Horizontal	349	2.36
2440MHz	Pass	PK	2.3836G	56.30	74.00	-17.70	3	Horizontal	349	2.36
2440MHz	Pass	PK	2.4396G	113.92	Inf	-Inf	3	Horizontal	349	2.36
2440MHz	Pass	PK	2.4908G	56.78	74.00	-17.22	3	Horizontal	349	2.36
2440MHz	Pass	AV	4.87898G	30.60	54.00	-23.40	3	Vertical	43	1.00
2440MHz	Pass	AV	7.32138G	38.64	54.00	-15.36	3	Vertical	32	1.50
2440MHz	Pass	PK	4.88108G	45.64	74.00	-28.36	3	Vertical	43	1.00
2440MHz	Pass	PK	7.32137G	51.45	74.00	-22.55	3	Vertical	32	1.50
2440MHz	Pass	AV	4.88104G	31.10	54.00	-22.90	3	Horizontal	333	1.96
2440MHz	Pass	AV	7.32133G	39.85	54.00	-14.15	3	Horizontal	327	1.50
2440MHz	Pass	PK	4.87895G	45.29	74.00	-28.71	3	Horizontal	333	1.96
2440MHz	Pass	PK	7.31836G	52.09	74.00	-21.91	3	Horizontal	327	1.50
2475MHz	Pass	AV	2.475G	105.42	Inf	-Inf	3	Vertical	36	1.00
2475MHz	Pass	AV	2.4835G	45.67	54.00	-8.33	3	Vertical	36	1.00
2475MHz	Pass	PK	2.4744G	109.65	Inf	-Inf	3	Vertical	36	1.00
2475MHz	Pass	PK	2.4835G	58.16	74.00	-15.84	3	Vertical	36	1.00
2475MHz	Pass	AV	2.475G	108.66	Inf	-Inf	3	Horizontal	354	2.50
2475MHz	Pass	AV	2.4835G	46.55	54.00	-7.45	3	Horizontal	354	2.50
2475MHz	Pass	PK	2.4744G	112.80	Inf	-Inf	3	Horizontal	354	2.50
2475MHz	Pass	PK	2.4836G	59.14	74.00	-14.86	3	Horizontal	354	2.50
2475MHz	Pass	AV	4.94891G	29.45	54.00	-24.55	3	Vertical	360	1.50
2475MHz	Pass	AV	7.42632G	39.62	54.00	-14.38	3	Vertical	49	1.50
2475MHz	Pass	PK	4.94764G	43.12	74.00	-30.88	3	Vertical	360	1.50
2475MHz	Pass	PK	7.42318G	51.96	74.00	-22.04	3	Vertical	49	1.50
2475MHz	Pass	AV	4.94887G	29.94	54.00	-24.06	3	Horizontal	347	2.16
2475MHz	Pass	AV	7.4263G	42.06	54.00	-11.94	3	Horizontal	316	2.13
2475MHz	Pass	PK	4.94854G	43.69	74.00	-30.31	3	Horizontal	347	2.16
2475MHz	Pass	PK	7.42647G	51.46	74.00	-22.54	3	Horizontal	316	2.13
2480MHz	Pass	AV	2.48G	100.40	Inf	-Inf	3	Vertical	39	1.01
2480MHz	Pass	AV	2.4835G	50.61	54.00	-3.39	3	Vertical	39	1.01
2480MHz	Pass	PK	2.4804G	104.57	Inf	-Inf	3	Vertical	39	1.01
2480MHz	Pass	PK	2.4835G	62.11	74.00	-11.89	3	Vertical	39	1.01
2480MHz	Pass	AV	2.48G	104.22	Inf	-Inf	3	Horizontal	351	2.54
2480MHz	Pass	AV	2.4835G	53.86	54.00	-0.14	3	Horizontal	351	2.54
2480MHz	Pass	PK	2.4804G	108.44	Inf	-Inf	3	Horizontal	351	2.54
2480MHz	Pass	PK	2.4835G	65.64	74.00	-8.36	3	Horizontal	351	2.54
2480MHz	Pass	AV	4.95879G	29.64	54.00	-24.36	3	Vertical	347	1.93
2480MHz	Pass	AV	7.43847G	35.19	54.00	-18.81	3	Vertical	342	1.73
2480MHz	Pass	PK	4.96102G	43.60	74.00	-30.40	3	Vertical	347	1.93
2480MHz	Pass	PK	7.44158G	48.34	74.00	-25.66	3	Vertical	342	1.73

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2480MHz	Pass	AV	4.95893G	30.91	54.00	-23.09	3	Horizontal	332	1.88
2480MHz	Pass	AV	7.43834G	37.28	54.00	-16.72	3	Horizontal	332	1.27
2480MHz	Pass	PK	4.95905G	44.43	74.00	-29.57	3	Horizontal	332	1.88
2480MHz	Pass	PK	7.44135G	49.76	74.00	-24.24	3	Horizontal	332	1.27

2.4-2.4835GHz_Zigbee

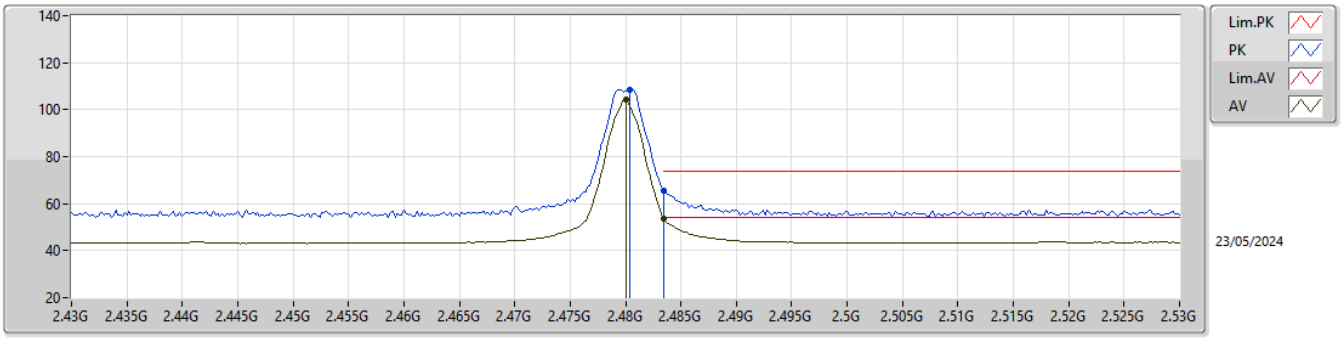
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	2.48G	100.40	Inf	-Inf	31.50	3	Vertical	39	1.01	68.90	27.80	3.70	-
AV	2.4835G	50.61	54.00	-3.39	31.51	3	Vertical	39	1.01	19.10	27.80	3.71	-
PK	2.4804G	104.57	Inf	-Inf	31.50	3	Vertical	39	1.01	73.07	27.80	3.70	-
PK	2.4835G	62.11	74.00	-11.89	31.51	3	Vertical	39	1.01	30.60	27.80	3.71	-

2.4-2.4835GHz_Zigbee

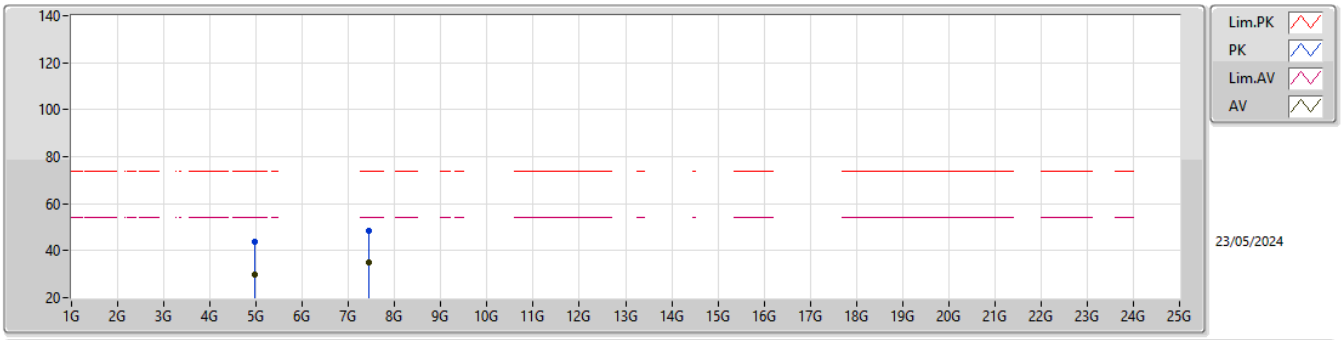
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	2.48G	104.22	Inf	-Inf	31.50	3	Horizontal	351	2.54	72.72	27.80	3.70	-
AV	2.4835G	53.86	54.00	-0.14	31.51	3	Horizontal	351	2.54	22.35	27.80	3.71	-
PK	2.4804G	108.44	Inf	-Inf	31.50	3	Horizontal	351	2.54	76.94	27.80	3.70	-
PK	2.4835G	65.64	74.00	-8.36	31.51	3	Horizontal	351	2.54	34.13	27.80	3.71	-

2.4-2.4835GHz_Zigbee

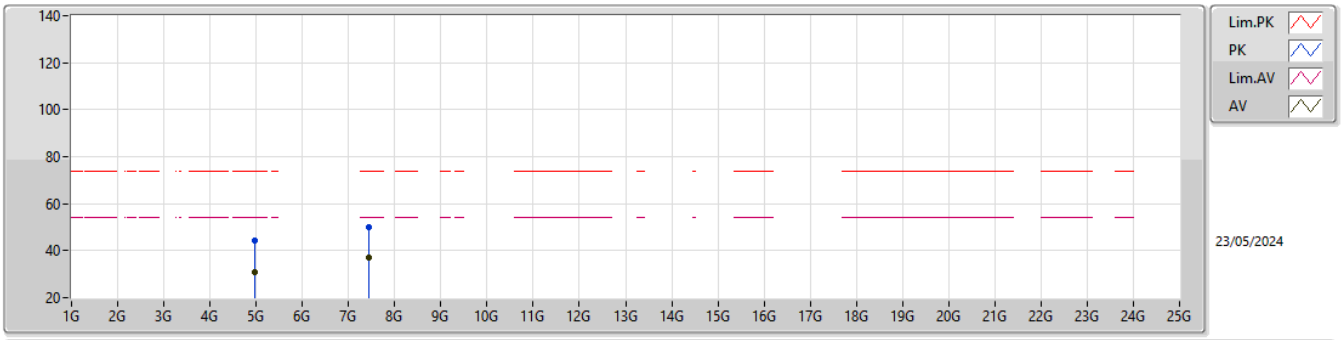
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	4.95879G	29.64	54.00	-24.36	1.26	3	Vertical	347	1.93	28.38	33.15	5.36	37.25
AV	7.43847G	35.19	54.00	-18.81	6.93	3	Vertical	342	1.73	28.26	36.72	6.72	36.51
PK	4.96102G	43.60	74.00	-30.40	1.29	3	Vertical	347	1.93	42.31	33.17	5.36	37.24
PK	7.44158G	48.34	74.00	-25.66	6.93	3	Vertical	342	1.73	41.41	36.72	6.72	36.51

2.4-2.4835GHz_Zigbee

2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	(dBuV)	(dB)	(dB)	(dB)
AV	4.95893G	30.91	54.00	-23.09	1.26	3	Horizontal	332	1.88	29.65	33.15	5.36	37.25
AV	7.43834G	37.28	54.00	-16.72	6.93	3	Horizontal	332	1.27	30.35	36.72	6.72	36.51
PK	4.95905G	44.43	74.00	-29.57	1.26	3	Horizontal	332	1.88	43.17	33.15	5.36	37.25
PK	7.44135G	49.76	74.00	-24.24	6.93	3	Horizontal	332	1.27	42.83	36.72	6.72	36.51

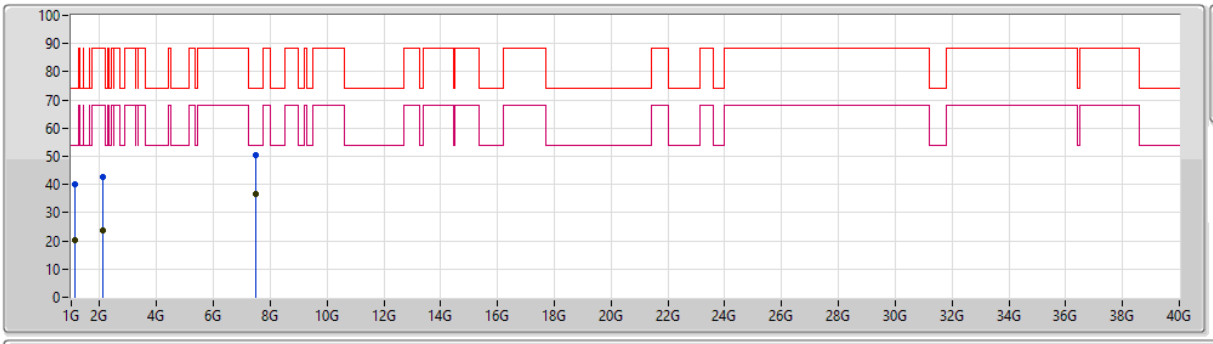
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	AV	7.47549G	36.43	54.00	-17.57	Vertical
Mode 2	Pass	AV	7.32021G	36.78	54.00	-17.22	Vertical

Result

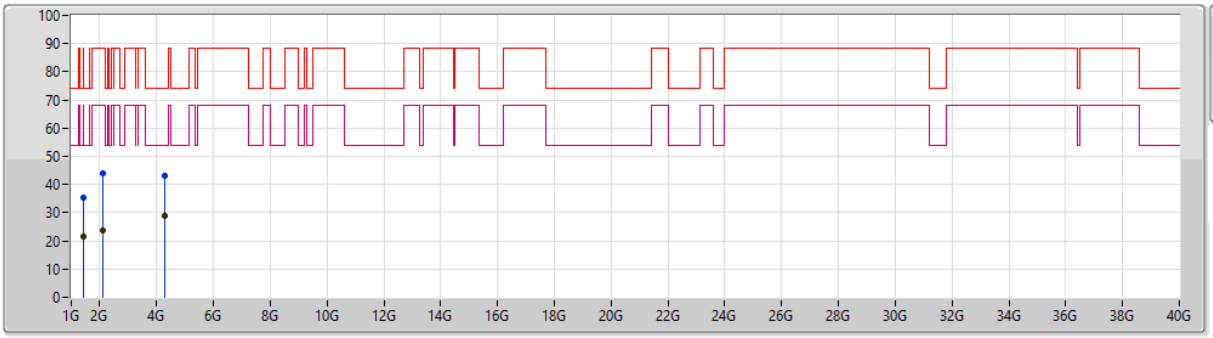
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
Mode 1	Pass	AV	1.12017G	20.28	54.00	-33.72	3	Vertical	34	1.16
Mode 1	Pass	AV	2.1295G	23.74	68.20	-44.46	3	Vertical	33	1.65
Mode 1	Pass	AV	7.47549G	36.43	54.00	-17.57	3	Vertical	35	2.20
Mode 1	Pass	PK	1.12017G	40.01	74.00	-33.99	3	Vertical	34	1.16
Mode 1	Pass	PK	2.1295G	42.72	88.20	-45.48	3	Vertical	33	1.65
Mode 1	Pass	PK	7.47549G	50.36	74.00	-23.64	3	Vertical	35	2.20
Mode 1	Pass	AV	1.41494G	21.63	54.00	-32.37	3	Horizontal	39	2.27
Mode 1	Pass	AV	2.12742G	23.59	68.20	-44.61	3	Horizontal	167	1.36
Mode 1	Pass	AV	4.27071G	29.03	54.00	-24.97	3	Horizontal	75	1.62
Mode 1	Pass	PK	1.41494G	35.48	74.00	-38.52	3	Horizontal	39	2.27
Mode 1	Pass	PK	2.12742G	43.97	88.20	-44.23	3	Horizontal	167	1.36
Mode 1	Pass	PK	4.27071G	42.94	74.00	-31.06	3	Horizontal	75	1.62
Mode 2	Pass	AV	1.11992G	20.09	54.00	-33.91	3	Vertical	18	1.07
Mode 2	Pass	AV	2.42724G	22.52	68.20	-45.68	3	Vertical	55	2.49
Mode 2	Pass	AV	7.32021G	36.78	54.00	-17.22	3	Vertical	16	1.58
Mode 2	Pass	PK	1.11992G	40.07	74.00	-33.93	3	Vertical	18	1.07
Mode 2	Pass	PK	2.42724G	43.03	88.20	-45.17	3	Vertical	55	2.49
Mode 2	Pass	PK	7.32021G	51.19	74.00	-22.81	3	Vertical	16	1.58
Mode 2	Pass	AV	2.79333G	25.26	54.00	-28.74	3	Horizontal	129	1.44
Mode 2	Pass	AV	3.88032G	28.09	54.00	-25.91	3	Horizontal	172	1.35
Mode 2	Pass	AV	4.85736G	31.09	54.00	-22.91	3	Horizontal	315	2.04
Mode 2	Pass	PK	2.79333G	39.39	74.00	-34.61	3	Horizontal	129	1.44
Mode 2	Pass	PK	3.88032G	42.46	74.00	-31.54	3	Horizontal	172	1.35
Mode 2	Pass	PK	4.85736G	45.83	74.00	-28.17	3	Horizontal	315	2.04

Radiated Emissions above 1GHz_Mode 1



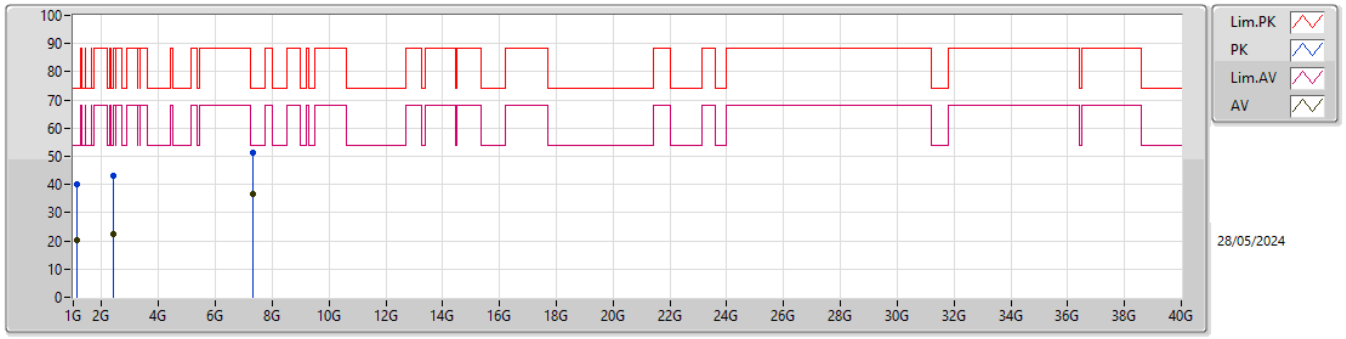
Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
AV	1.12017G	20.28	54.00	-33.72	-16.02	3	Vertical	34	1.16	-	36.30	25.60	3.10	44.72
AV	2.1295G	23.74	68.20	-44.46	-13.22	3	Vertical	33	1.65	-	36.96	27.40	4.27	44.89
AV	7.47549G	36.43	54.00	-17.57	-0.52	3	Vertical	35	2.20	-	36.95	36.40	8.13	45.05
PK	1.12017G	40.01	74.00	-33.99	-16.02	3	Vertical	34	1.16	-	56.03	25.60	3.10	44.72
PK	2.1295G	42.72	88.20	-45.48	-13.22	3	Vertical	33	1.65	-	55.94	27.40	4.27	44.89
PK	7.47549G	50.36	74.00	-23.64	-0.52	3	Vertical	35	2.20	-	50.88	36.40	8.13	45.05

Radiated Emissions above 1GHz_Mode 1



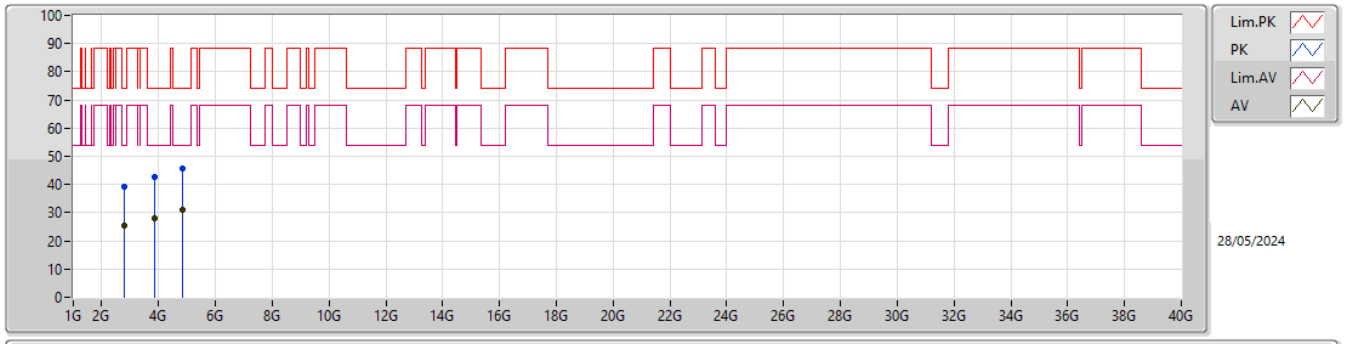
Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
AV	1.41494G	21.63	54.00	-32.37	-15.22	3	Horizontal	39	2.27	-	36.85	26.10	3.45	44.77
AV	2.12742G	23.59	68.20	-44.61	-13.19	3	Horizontal	167	1.36	-	36.78	27.43	4.27	44.89
AV	4.27071G	29.03	54.00	-24.97	-8.28	3	Horizontal	75	1.62	-	37.31	31.38	6.15	45.81
PK	1.41494G	35.48	74.00	-38.52	-15.22	3	Horizontal	39	2.27	-	50.70	26.10	3.45	44.77
PK	2.12742G	43.97	88.20	-44.23	-13.19	3	Horizontal	167	1.36	-	57.16	27.43	4.27	44.89
PK	4.27071G	42.94	74.00	-31.06	-8.28	3	Horizontal	75	1.62	-	51.22	31.38	6.15	45.81

Radiated Emissions above 1GHz_Mode 2



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/m)	(dB/m)	(dB)	(dB)
AV	1.11992G	20.09	54.00	-33.91	-16.02	3	Vertical	18	1.07	-	36.11	25.60	3.10	44.72
AV	2.42724G	22.52	68.20	-45.68	-12.77	3	Vertical	55	2.49	-	35.29	27.57	4.62	44.96
AV	7.32021G	36.78	54.00	-17.22	-0.14	3	Vertical	16	1.58	-	36.92	37.08	8.05	45.27
PK	1.11992G	40.07	74.00	-33.93	-16.02	3	Vertical	18	1.07	-	56.09	25.60	3.10	44.72
PK	2.42724G	43.03	88.20	-45.17	-12.77	3	Vertical	55	2.49	-	55.80	27.57	4.62	44.96
PK	7.32021G	51.19	74.00	-22.81	-0.14	3	Vertical	16	1.58	-	51.33	37.08	8.05	45.27

Radiated Emissions above 1GHz_Mode 2



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/m)	(dB/m)	(dB)	(dB)
AV	2.79333G	25.26	54.00	-28.74	-11.65	3	Horizontal	129	1.44	-	36.91	28.53	4.91	45.09
AV	3.88032G	28.09	54.00	-25.91	-8.94	3	Horizontal	172	1.35	-	37.03	30.88	5.86	45.68
AV	4.85736G	31.09	54.00	-22.91	-6.22	3	Horizontal	315	2.04	-	37.31	32.61	6.94	45.77
PK	2.79333G	39.39	74.00	-34.61	-11.65	3	Horizontal	129	1.44	-	51.04	28.53	4.91	45.09
PK	3.88032G	42.46	74.00	-31.54	-8.94	3	Horizontal	172	1.35	-	51.40	30.88	5.86	45.68
PK	4.85736G	45.83	74.00	-28.17	-6.22	3	Horizontal	315	2.04	-	52.05	32.61	6.94	45.77