

FCC Radio Test Report

FCC ID : VUIM2U350
Equipment : 5G FR2 ODU
Brand Name : PEGATRON
Model Name : M2U350, M2U300, M2UXXX-XXX(where X can be a combination of alphanumeric, none or blank)
Applicant : PEGATRON CORPORATION
5F., No.76, LIGONG ST., BEITOU DISTRICT,
TAIPEI CITY, Taiwan, 11259
Manufacturer : PEGATRON CORPORATION
5F., No.76, LIGONG ST., BEITOU DISTRICT,
TAIPEI CITY, Taiwan, 11259
Standard : 47 CFR FCC Part 15.247

The product was received on Oct. 01, 2024, and testing was started from Oct. 14, 2024 and completed on Oct. 24, 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 variant 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



TEL : 886-3-3273456
FAX : 886-3-3270973
Report Template No.: HE1-C10 Ver4.3
FCC ID: VUIM2U350

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: Ben Tseng

Report Producer: Amber Chiu

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number
2400-2483.5	LE	2402-2480	0-39 [40]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	BT-LE(1Mbps)	1.0	1TX

Note:

- ♦ Bluetooth LE uses a GFSK (1Mbps) modulation.
- ♦ BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	INPAQ	WA-P-LA-11-004(1415-0AQ4000)	PIFA	I-PEX

Ant.	Port	2.4G/BT Gain (dBi)						
		2300 MHz	2350 MHz	2400 MHz	2450 MHz	2500 MHz	2550 MHz	2600 MHz
1	1	3.83	3.19	2.84	4.45	4.46	4.81	4.73

Note 1: The EUT has one antenna.

For 2.4GHz function:

For IEEE 802.11 b/g/n mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive.

For BT function:

For IEEE 802.15.1 Bluetooth mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive.

1.1.3 EUT Information

Operational Condition			
EUT Power Type	From 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
BT-LE(1Mbps)	0.63	2.01	393.75u	3k

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

1.1.5 Table for Multiple Listing

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

Model Name	Description
M2U350	All the models are identical, the different model served as marketing strategy.
M2U300	
M2UXXX-XXX(where X can be a combination of alphanumeric, none or blank)	

From the above models, model: M2U350 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	Rian Chung	21.5~23.7℃ / 54~58%	23/Oct/2024~24/Oct/2024
RF Conducted	TH01-HY	Sonic Li	23.4~23.9℃ / 52~55%	22/Oct/2024
☒ Wen 33rd.St. (TAF: 3785)	ADD: No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)			
	TEL: 886-3-318-0787		FAX: 886-3-318-0287	
Test site Designation No. TW0008 with FCC.				
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
Radiated	03CH09-HY	Henry Ho	21.7~22.6℃ / 51~56%	14/Oct/2024~15/Oct/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	Dos 6.1
------------------------------	---------

Mode	Power Setting
BT-LE(1Mbps)	-
2402MHz	30
2440MHz	30
2480MHz	30

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	PoE 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	PoE Mode
Operating Mode > 1GHz	CTX
Orthogonal Planes of EUT	Y Plane
	

2.3 Accessories

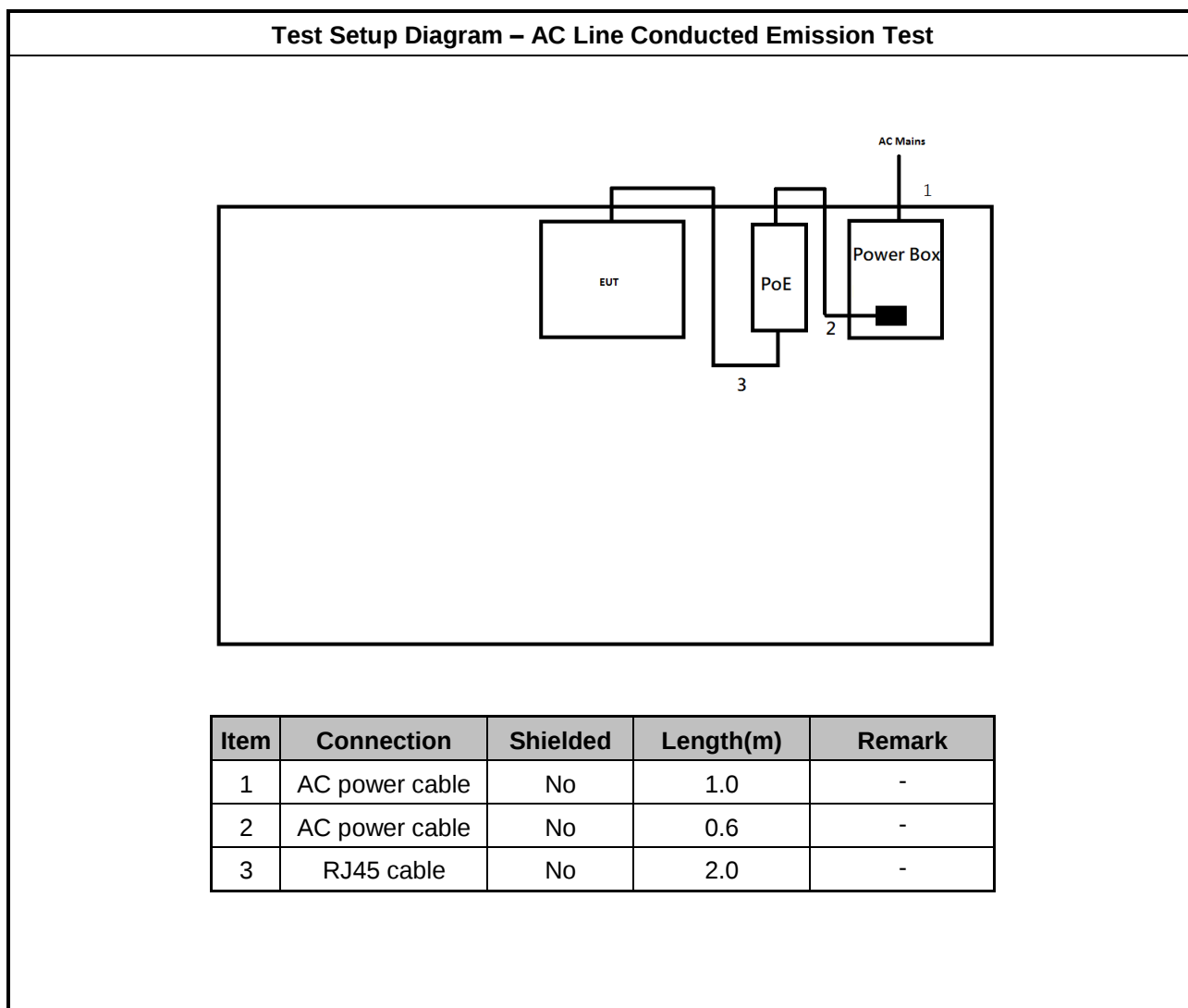
Accessories				
PoE injector	Brand Name	RISUNIC	Model Name	RP029-5601080YX
	Power Rating	I/P: 100- 240Vac, 1.5 A, O/P: 56Vdc, 1.08 A, 60.48W		
AC power cord	Brand Name	HONGLIN	Model Name	200-18511
	Power Cord	0.6m cable		
Bottom port cover with flat Ethernet cable	Brand Name	TUNG-LI	Model Name	CT041-046
RJ45 ethernet cable	Brand Name	TUNG-LI	Model Name	6F424-003

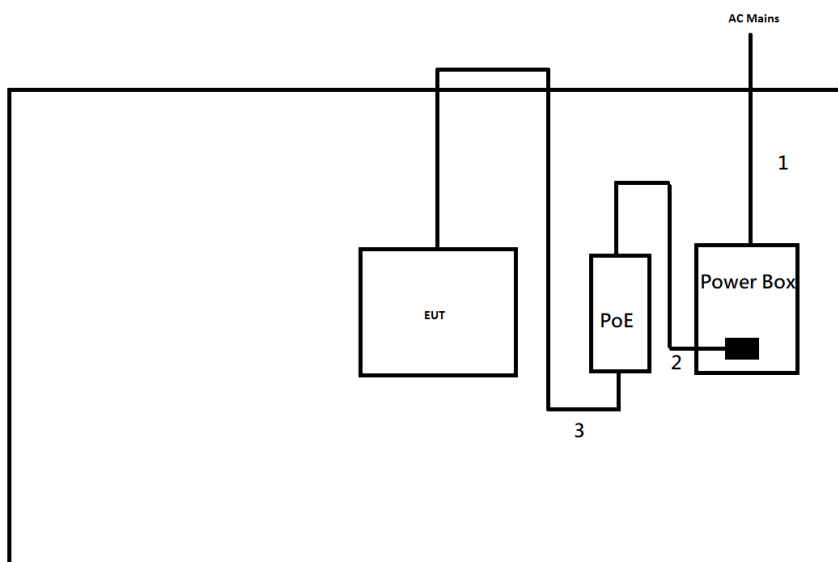
Reminder: Regarding to more detail and other information, please refer to user manual.

2.4 Support Equipment

Support Equipment – Conducted					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
1	Notebook	DELL	E5410	-	-
2	Adapter for NB	DELL	HA65NM130	-	-

2.5 Test Setup Diagram



Test Setup Diagram - Radiated Test


Item	Connection	Shielded	Length(m)	Remark
1	AC power cable	No	1.8	-
2	AC power cable	No	0.6	-
3	RJ45 cable	No	2.0	-

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

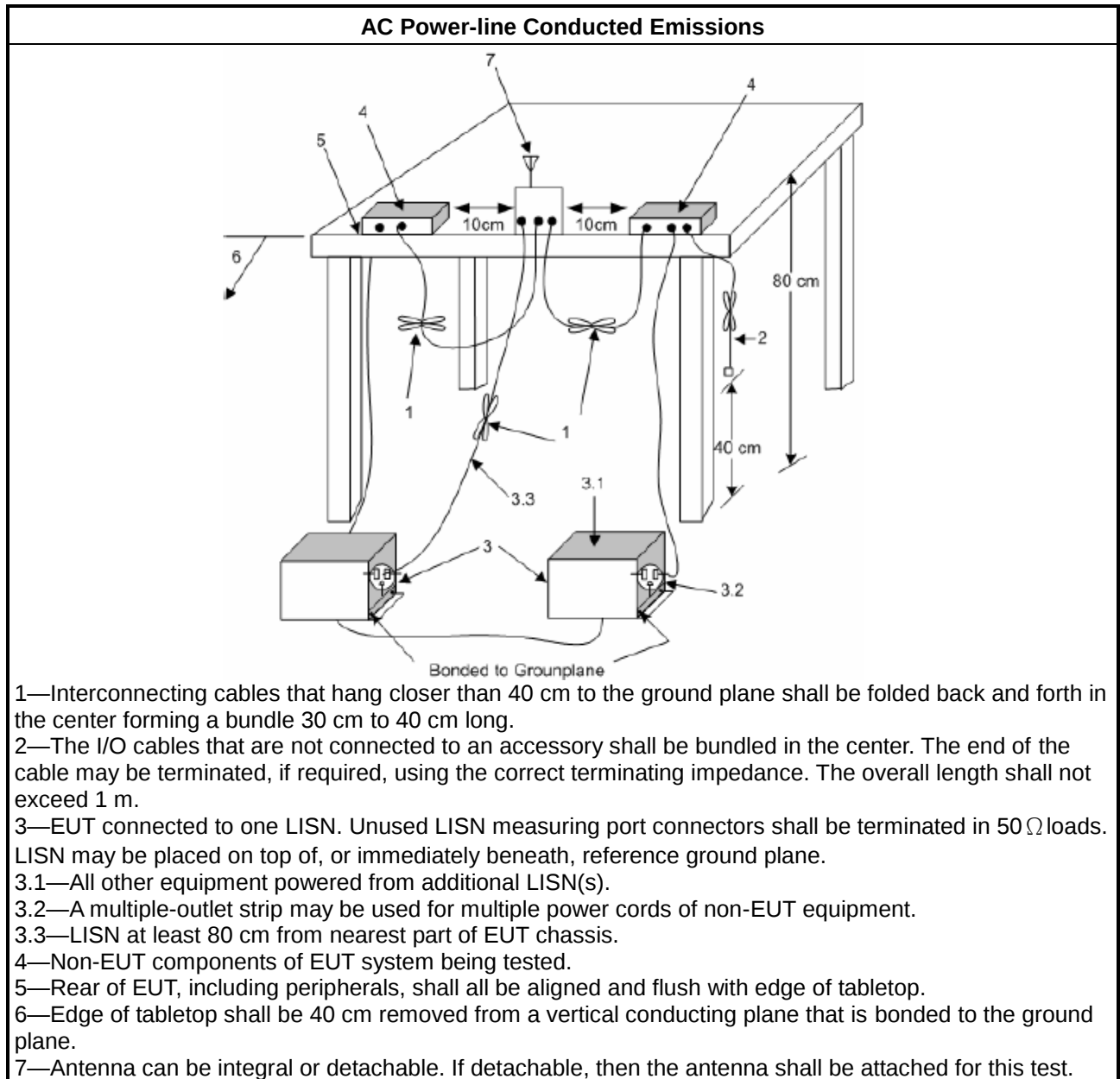
Test Method
▪ Refer as ANSI C63.10-2013, clause 6.2 foray power-line conducted emissions.

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



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 $\geq$ 500 kHz.

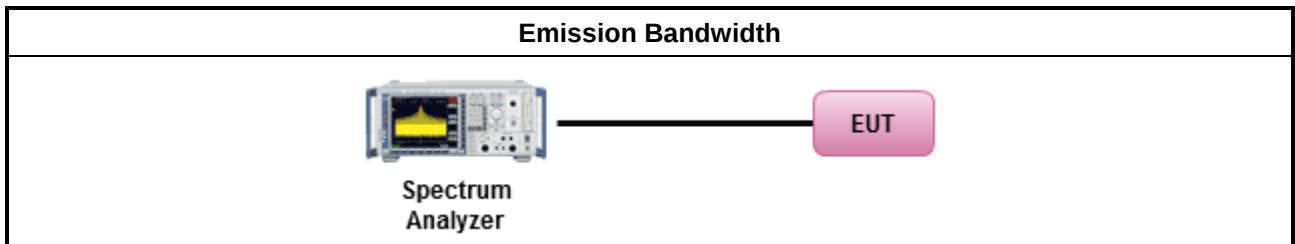
3.2.2 Measuring Instruments

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 occupied bandwidth testing.
☐	Refer as ANSI C63.10, clause 6.9.3 for occupied bandwidth testing.

3.2.4 Test Setup



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
e.i.r.p. Power Limit:	
	2400-2483.5 MHz Band
	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
	Point-to-point systems (P2P): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm
	Smart antenna system (SAS)
	- Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	- Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm
	- Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ 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.	

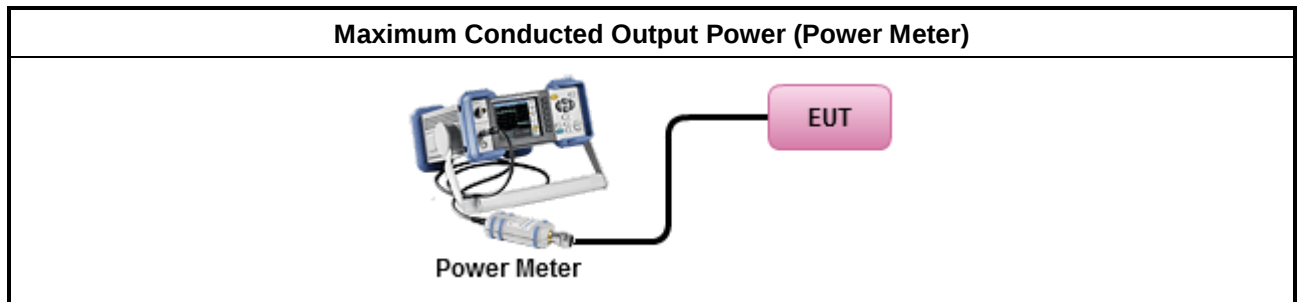
3.3.2 Measuring Instruments

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: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$	

3.3.4 Test Setup



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

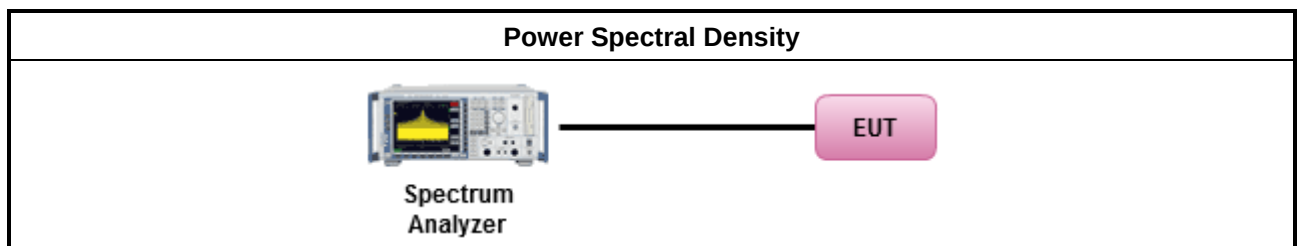
3.4.2 Measuring Instruments

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



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.	

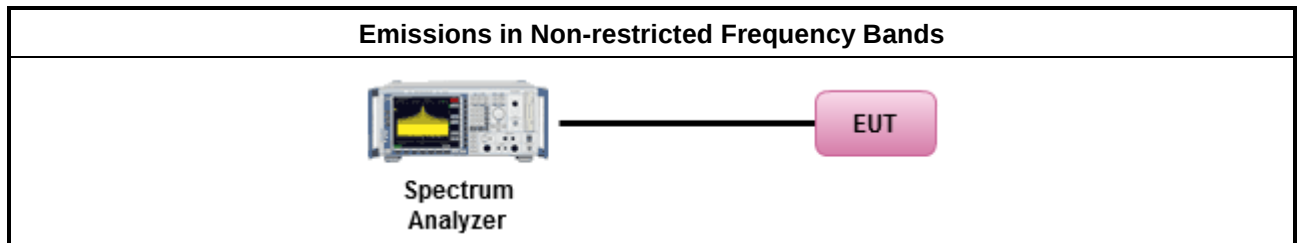
3.5.2 Measuring Instruments

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



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

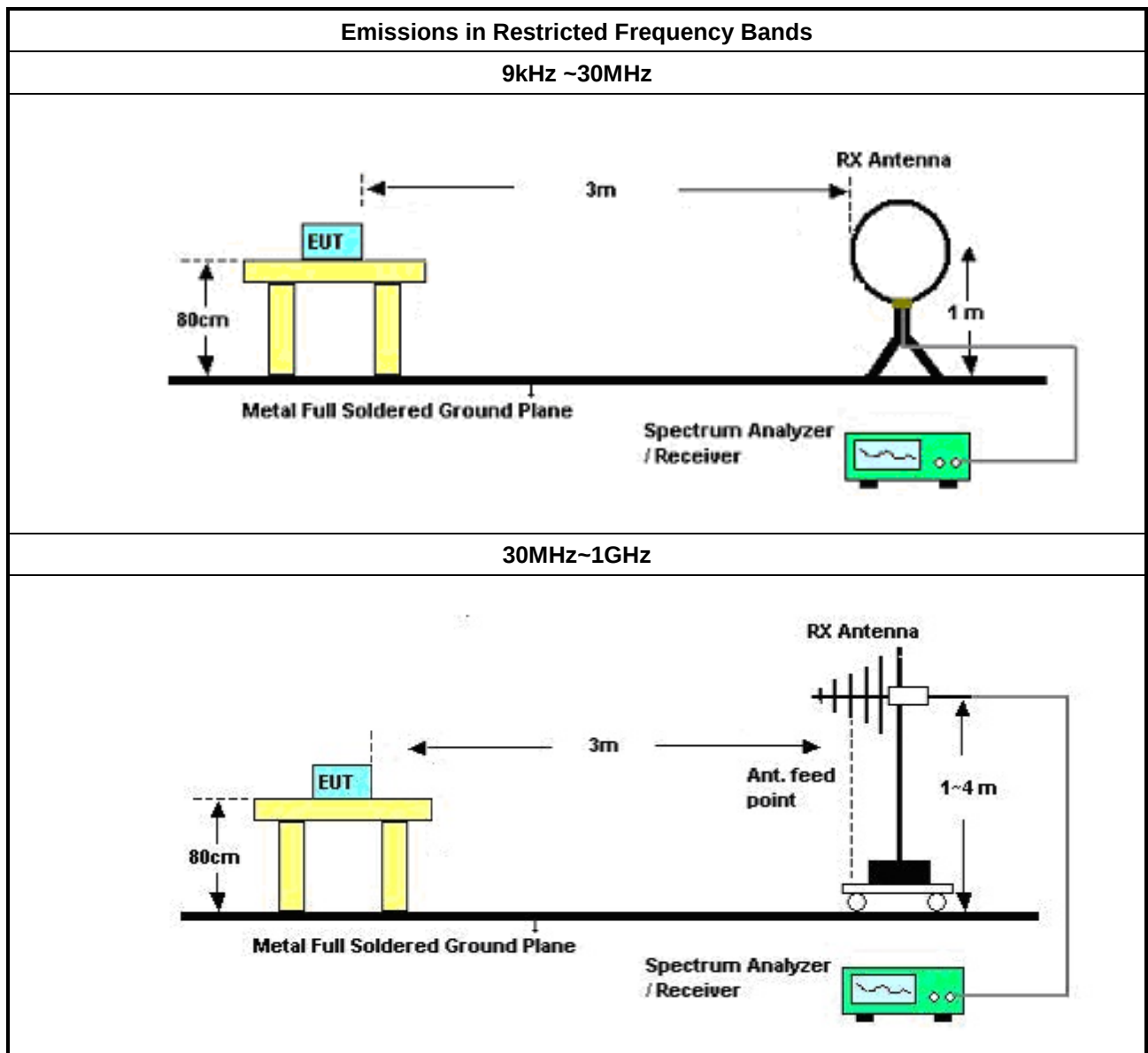
Test Method	
	The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].
	Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
	For the transmitter unwanted 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.
	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 $f \geq 1$ 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.

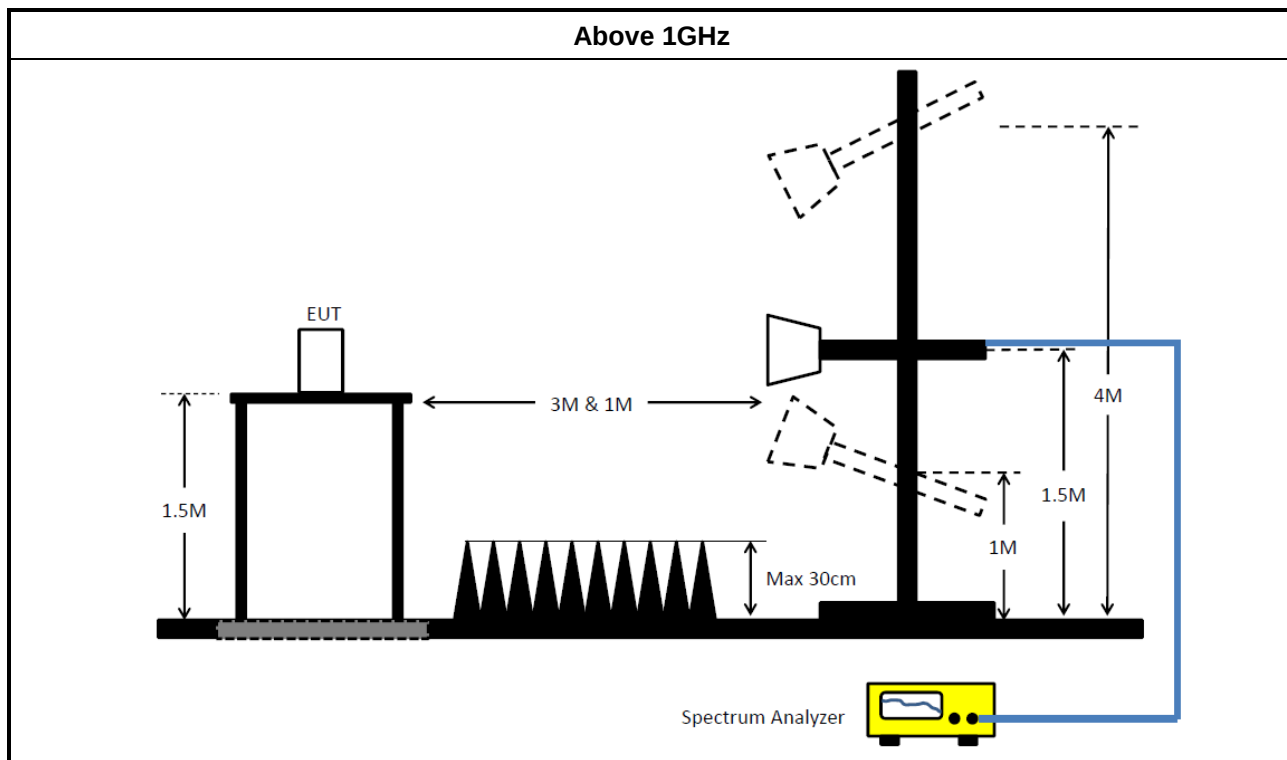
3.6.4 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Raw(Read Level) + AF(Antenna Factor) + CL(Cable Loss) - PA(Preamplifier Factor)

3.6.5 Test Setup





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	ESR3	102051	9kHz ~ 3.6GHz	17/May/2024	16/May/2025
Two-Line V-Network	ROHDE & SCHWARZ	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	17/Oct/2024	16/Oct/2025
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	101013	10Hz~40GHz	09/Apr/2024	08/Apr/2025
SMB100A Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	16/Oct/2024	15/Oct/2025
Power Meter	Anritsu	ML2495A	0949003	300MHz~40GHz	17/Feb/2024	16/Feb/2025
Pulse Sensor	Anritsu	MA2411B	0917017	300MHz~40GHz	17/Feb/2024	16/Feb/2025
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	03CH09-HY	30MHz~1GHz 3m	08/Mar/2024	07/Mar/2025
Site V.S.W.R	TDK	SAC-3M	03CH09-HY	1GHz~18GHz 3m	07/Mar/2024	06/Mar/2025
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200885	10Hz~44GHz	15/Aug/2024	14/Aug/2025
Amplifier	EMC	EMC9135	980232	9kHz~1GHz	08/Apr/2024	07/Apr/2025
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1531	1GHz ~ 18GHz	20/Dec/2023	19/Dec/2024
Microwave Preamplifier	Agilent	8449B	3008A02096	1GHz~26.5GHz	19/Jul/2024	18/Jul/2025
Bilog Antenna & 5dB Attenuator	TESEQ & MTJ	CBL6111D&MT J6102-05	35418 & 3	30MHz~1GHz	26/Aug/2024	25/Aug/2025
RF Cable-R03m	Jye Bao	RG142	03CH09-cable-01	9kHz~1GHz	20/Feb/2024	19/Feb/2025
RF CABLE 5m+3m+1m	HUBER+SUHNER	SUCOFLEX104	03CH09-cable-02	1GHz~40GHz	07/Oct/2024	06/Oct/2025
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	1248	18GHz~40GHz	04/Oct/2024	03/Oct/2025
Amplifier	EMC INSTRUMENTS	EM18G40G	60604	18GHz~40GHz	19/Apr/2024	18/Apr/2025
Loop Antenna	TESEQ	HLA 6120	31244	9kHz~30MHz	19/Mar/2024	18/Mar/2025
EMI Test Receiver	R&S	ESR3	102052	9kHz~3.6GHz	03/May/2024	02/May/2025
SENSE-15247_FS	Sporton	V5.11.20	NA	NA	NA	NA



Conducted Emissions at Powerline

Appendix A

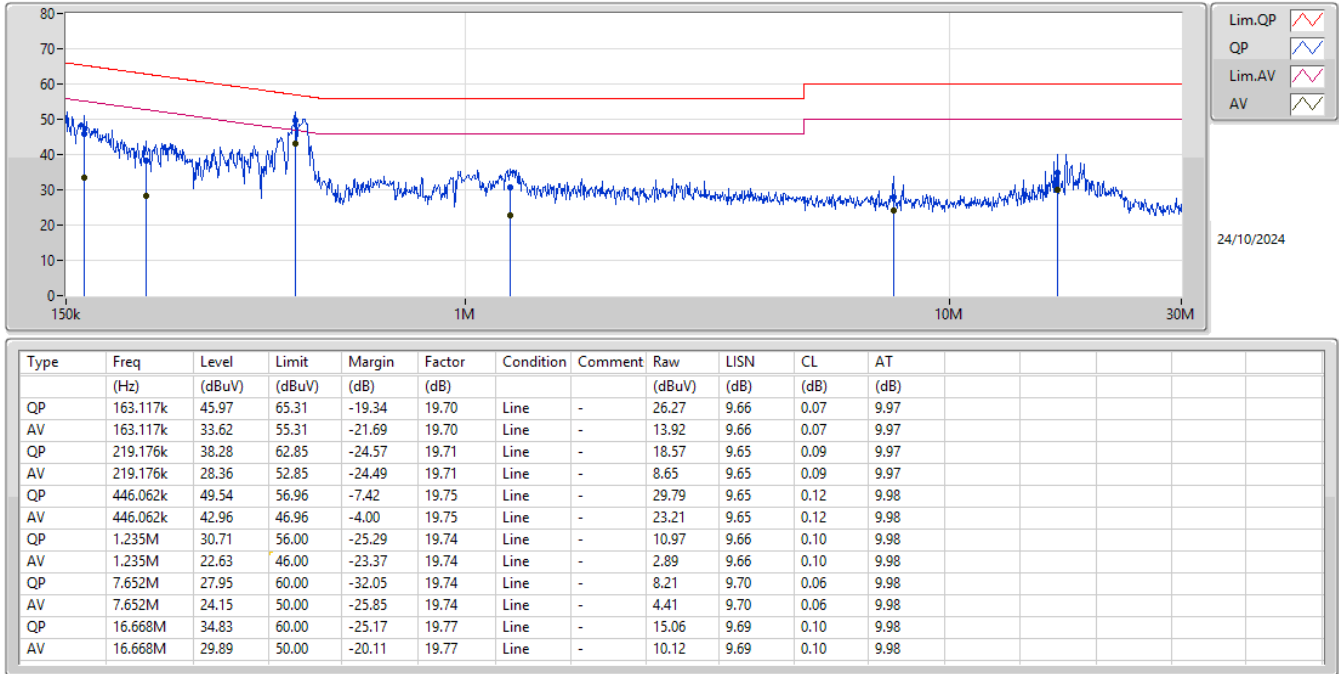
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	446.062k	42.96	46.96	-4.00	Line

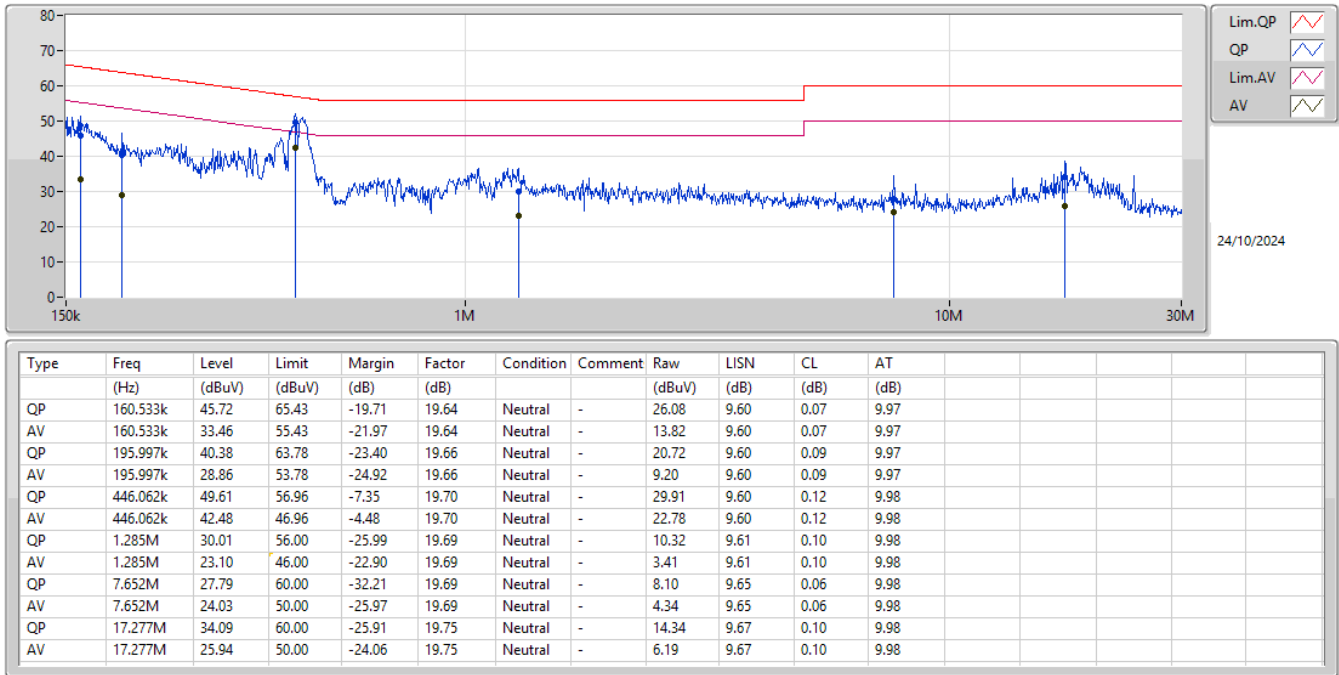
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	QP	163.117k	45.97	65.31	-19.34	Line
Mode 1	Pass	AV	163.117k	33.62	55.31	-21.69	Line
Mode 1	Pass	QP	219.176k	38.28	62.85	-24.57	Line
Mode 1	Pass	AV	219.176k	28.36	52.85	-24.49	Line
Mode 1	Pass	QP	446.062k	49.54	56.96	-7.42	Line
Mode 1	Pass	AV	446.062k	42.96	46.96	-4.00	Line
Mode 1	Pass	QP	1.235M	30.71	56.00	-25.29	Line
Mode 1	Pass	AV	1.235M	22.63	46.00	-23.37	Line
Mode 1	Pass	QP	7.652M	27.95	60.00	-32.05	Line
Mode 1	Pass	AV	7.652M	24.15	50.00	-25.85	Line
Mode 1	Pass	QP	16.668M	34.83	60.00	-25.17	Line
Mode 1	Pass	AV	16.668M	29.89	50.00	-20.11	Line
Mode 1	Pass	QP	160.533k	45.72	65.43	-19.71	Neutral
Mode 1	Pass	AV	160.533k	33.46	55.43	-21.97	Neutral
Mode 1	Pass	QP	195.997k	40.38	63.78	-23.40	Neutral
Mode 1	Pass	AV	195.997k	28.86	53.78	-24.92	Neutral
Mode 1	Pass	QP	446.062k	49.61	56.96	-7.35	Neutral
Mode 1	Pass	AV	446.062k	42.48	46.96	-4.48	Neutral
Mode 1	Pass	QP	1.285M	30.01	56.00	-25.99	Neutral
Mode 1	Pass	AV	1.285M	23.10	46.00	-22.90	Neutral
Mode 1	Pass	QP	7.652M	27.79	60.00	-32.21	Neutral
Mode 1	Pass	AV	7.652M	24.03	50.00	-25.97	Neutral
Mode 1	Pass	QP	17.277M	34.09	60.00	-25.91	Neutral
Mode 1	Pass	AV	17.277M	25.94	50.00	-24.06	Neutral

Conducted Emissions at Powerline_Mode 1



Conducted Emissions at Powerline_Mode 1





Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	737.5k	1.051M	1M05F1D	691.25k	1.028M

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)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	705k	1.031M
2440MHz	Pass	500k	737.5k	1.028M
2480MHz	Pass	500k	691.25k	1.051M

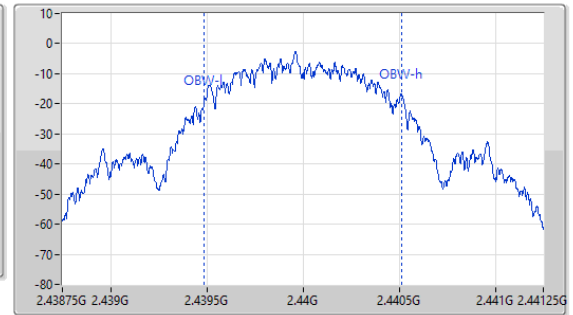
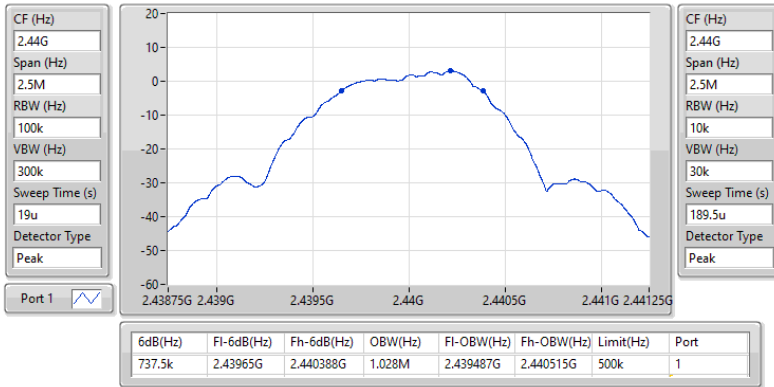
Port X-N dB = Port X 6dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth

2.4-2.4835GHz_BT-LE(1Mbps)

EBW-DTS

2440MHz

22/10/2024





Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	5.25	0.00335



Result

Mode	Result	DG (dBi)	Total Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.84	4.56	30.00
2440MHz	Pass	4.45	5.25	30.00
2480MHz	Pass	4.46	4.84	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	-
BT-LE(1Mbps)	-9.67

RBW = 3kHz;



Result

Mode	Result	DG (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.84	-10.35	8.00
2440MHz	Pass	4.45	-10.54	8.00
2480MHz	Pass	4.46	-9.67	8.00

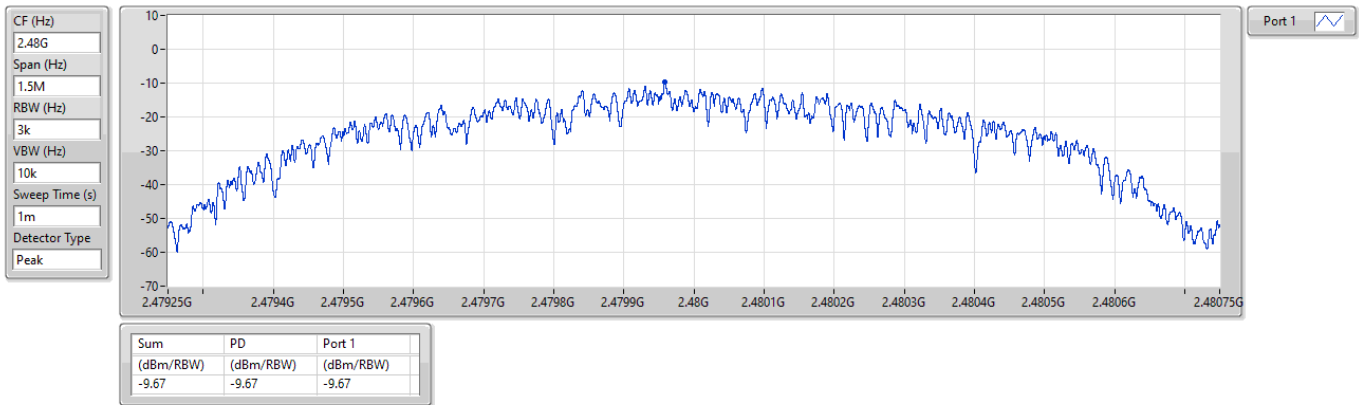
DG = Directional Gain; RBW = 3kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port X Power Density;
Inf = There's no restriction for the limit.

2.4-2.4835GHz_BT-LE(1Mbps)

PSD

2480MHz

22/10/2024





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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.43991G	4.91	-25.09	2.19083G	-54.98	2.399G	-52.42	2.4G	-52.17	2.50262G	-52.83	24.15919G	-40.26	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
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.43991G	4.91	-25.09	2.19083G	-54.98	2.399G	-52.42	2.4G	-52.17	2.50262G	-52.83	24.15919G	-40.26	1
2440MHz	Pass	2.43991G	4.91	-25.09	2.16145G	-53.76	2.39152G	-52.71	2.4G	-56.36	2.50134G	-53.03	24.46852G	-40.93	1
2480MHz	Pass	2.43991G	4.91	-25.09	2.10858G	-54.25	2.39196G	-53.27	2.4G	-54.36	2.50074G	-52.57	24.14795G	-41.28	1

2.4-2.4835GHz_BT-LE(1Mbps)

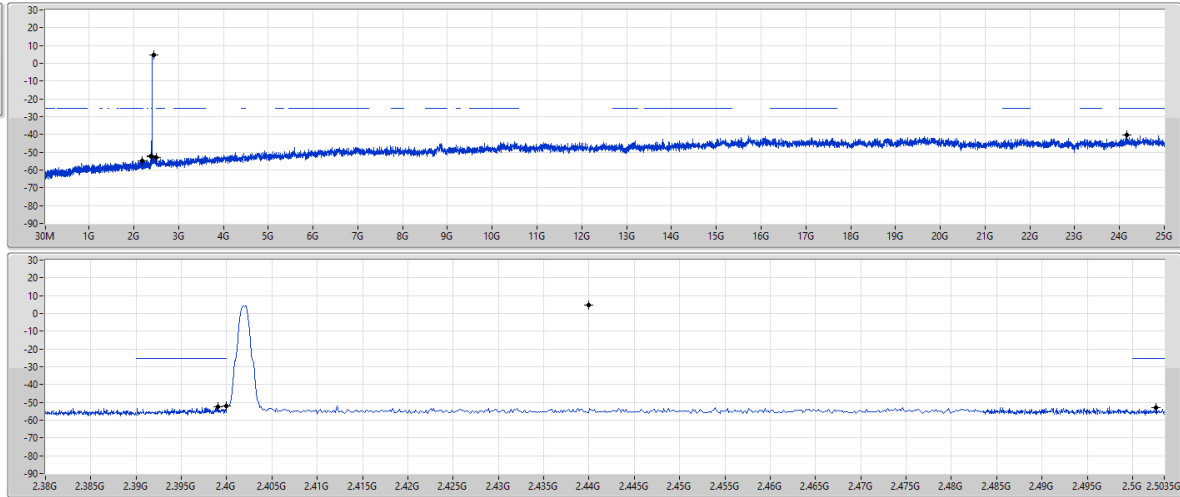
CSEndB-DTS

2402MHz

22/10/2024

RBW (Hz)
100k
VBW (Hz)
300k
Detector
Peak

Port 1



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
2.43991G	4.91	-25.09	2.19083G	-54.98	2.399G	-52.42	2.4G	-52.17	2.50262G	-52.83	24.15919G	-40.26	1



Summary

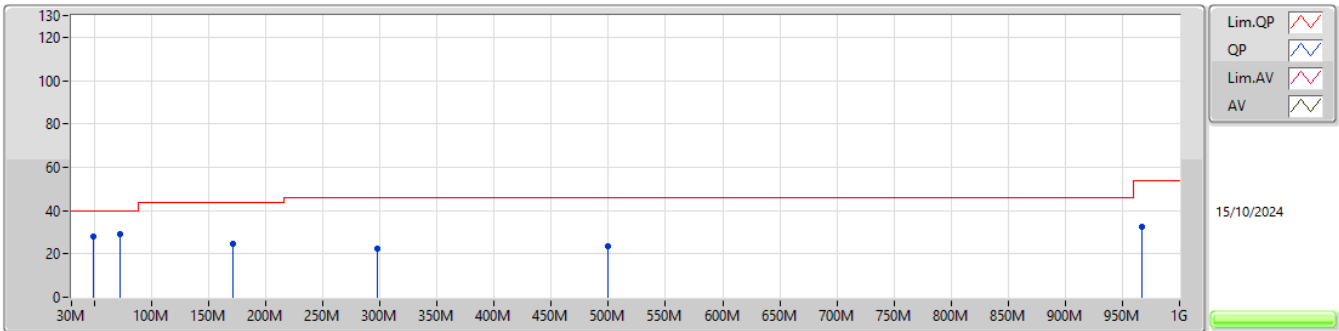
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	PK	72.68M	28.91	40.00	-11.09	3	Vertical	0	1.00

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	49.4M	28.03	40.00	-11.97	3	Vertical	0	1.00
2440MHz	Pass	PK	72.68M	28.91	40.00	-11.09	3	Vertical	0	1.00
2440MHz	Pass	PK	171.62M	24.55	43.50	-18.95	3	Vertical	0	1.00
2440MHz	Pass	PK	297.72M	22.52	46.00	-23.48	3	Vertical	0	1.00
2440MHz	Pass	PK	499.48M	23.69	46.00	-22.31	3	Vertical	0	1.00
2440MHz	Pass	PK	967.02M	32.27	54.00	-21.73	3	Vertical	0	1.00
2440MHz	Pass	PK	70.74M	24.98	40.00	-15.02	3	Horizontal	360	1.00
2440MHz	Pass	PK	113.42M	27.09	43.50	-16.41	3	Horizontal	360	1.00
2440MHz	Pass	PK	229.82M	23.71	46.00	-22.29	3	Horizontal	360	1.00
2440MHz	Pass	PK	266.68M	24.95	46.00	-21.05	3	Horizontal	360	1.00
2440MHz	Pass	PK	499.48M	23.70	46.00	-22.30	3	Horizontal	360	1.00
2440MHz	Pass	PK	941.8M	30.58	46.00	-15.42	3	Horizontal	360	1.00

2.4-2.4835GHz_BT-LE(1Mbps)

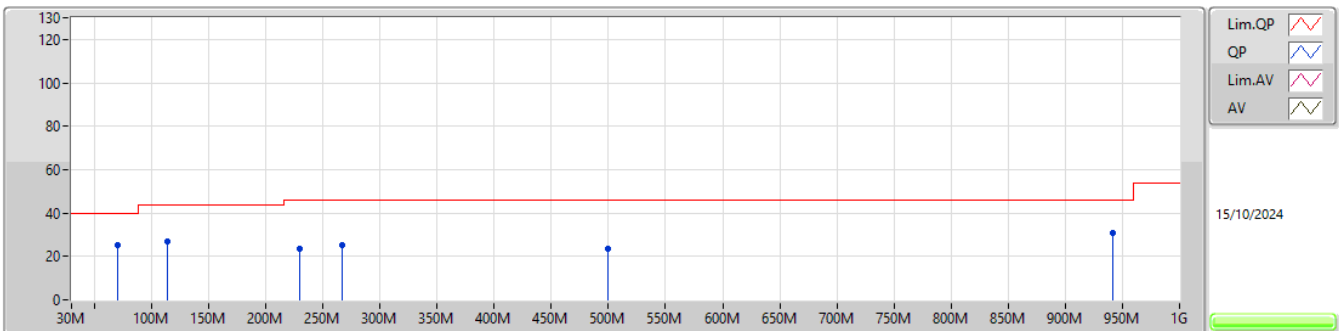
2440MHz_PoE



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	49.4M	28.03	40.00	-11.97	-23.18	3	Vertical	0	1.00	51.21	13.58	0.69	37.45
PK	72.68M	28.91	40.00	-11.09	-24.93	3	Vertical	0	1.00	53.84	11.52	0.86	37.31
PK	171.62M	24.55	43.50	-18.95	-20.76	3	Vertical	0	1.00	45.31	14.61	1.37	36.74
PK	297.72M	22.52	46.00	-23.48	-16.73	3	Vertical	0	1.00	39.25	18.10	1.90	36.73
PK	499.48M	23.69	46.00	-22.31	-11.83	3	Vertical	0	1.00	35.52	22.83	2.55	37.21
PK	967.02M	32.27	54.00	-21.73	-4.13	3	Vertical	0	1.00	36.40	29.75	3.71	37.59

2.4-2.4835GHz_BT-LE(1Mbps)

2440MHz_PoE



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	70.74M	24.98	40.00	-15.02	-25.20	3	Horizontal	360	1.00	50.18	11.27	0.85	37.32
PK	113.42M	27.09	43.50	-16.41	-19.77	3	Horizontal	360	1.00	46.86	16.15	1.09	37.01
PK	229.82M	23.71	46.00	-22.29	-19.81	3	Horizontal	360	1.00	43.52	15.24	1.62	36.67
PK	266.68M	24.95	46.00	-21.05	-16.51	3	Horizontal	360	1.00	41.46	18.42	1.77	36.70
PK	499.48M	23.70	46.00	-22.30	-11.83	3	Horizontal	360	1.00	35.53	22.83	2.55	37.21
PK	941.8M	30.58	46.00	-15.42	-4.51	3	Horizontal	360	1.00	35.09	29.44	3.65	37.60



Summary

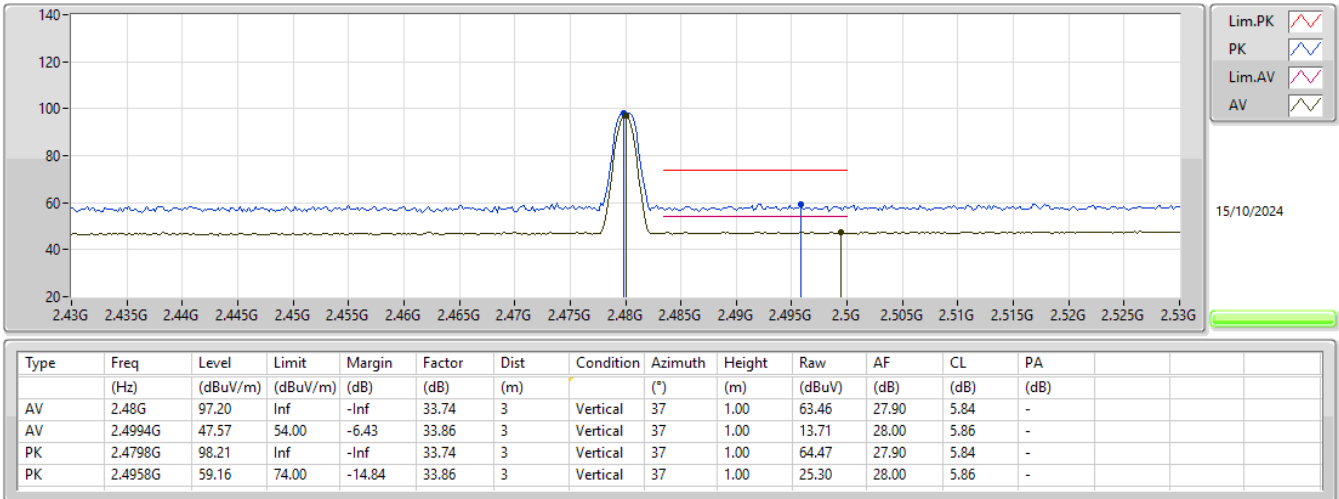
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	2.4866G	48.00	54.00	-6.00	3	Horizontal	360	1.50

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.3576G	46.84	54.00	-7.16	3	Vertical	43	1.50
2402MHz	Pass	AV	2.402G	93.21	Inf	-Inf	3	Vertical	43	1.50
2402MHz	Pass	PK	2.39G	58.68	74.00	-15.32	3	Vertical	43	1.50
2402MHz	Pass	PK	2.4018G	94.31	Inf	-Inf	3	Vertical	43	1.50
2402MHz	Pass	AV	2.359G	46.72	54.00	-7.28	3	Horizontal	41	1.50
2402MHz	Pass	AV	2.402G	100.00	Inf	-Inf	3	Horizontal	41	1.50
2402MHz	Pass	PK	2.371G	58.81	74.00	-15.19	3	Horizontal	41	1.50
2402MHz	Pass	PK	2.4022G	100.92	Inf	-Inf	3	Horizontal	41	1.50
2402MHz	Pass	AV	4.81798G	34.84	54.00	-19.16	3	Vertical	201	1.50
2402MHz	Pass	PK	4.81084G	47.54	74.00	-26.46	3	Vertical	201	1.50
2402MHz	Pass	AV	4.81132G	34.92	54.00	-19.08	3	Horizontal	164	2.38
2402MHz	Pass	PK	4.78978G	47.11	74.00	-26.89	3	Horizontal	164	2.38
2440MHz	Pass	AV	2.3588G	46.78	54.00	-7.22	3	Vertical	16	3.00
2440MHz	Pass	AV	2.44G	99.12	Inf	-Inf	3	Vertical	16	3.00
2440MHz	Pass	AV	2.4984G	47.43	54.00	-6.57	3	Vertical	16	3.00
2440MHz	Pass	PK	2.3436G	58.49	74.00	-15.51	3	Vertical	16	3.00
2440MHz	Pass	PK	2.4404G	100.23	Inf	-Inf	3	Vertical	16	3.00
2440MHz	Pass	PK	2.5G	58.96	74.00	-15.04	3	Vertical	16	3.00
2440MHz	Pass	AV	2.3556G	46.90	54.00	-7.10	3	Horizontal	360	1.50
2440MHz	Pass	AV	2.44G	106.66	Inf	-Inf	3	Horizontal	360	1.50
2440MHz	Pass	AV	2.4908G	47.83	54.00	-6.17	3	Horizontal	360	1.50
2440MHz	Pass	PK	2.3668G	59.82	74.00	-14.18	3	Horizontal	360	1.50
2440MHz	Pass	PK	2.4404G	107.76	Inf	-Inf	3	Horizontal	360	1.50
2440MHz	Pass	PK	2.4848G	59.68	74.00	-14.32	3	Horizontal	360	1.50
2440MHz	Pass	AV	4.89266G	35.05	54.00	-18.95	3	Vertical	211	1.96
2440MHz	Pass	PK	4.8857G	47.72	74.00	-26.28	3	Vertical	211	1.96
2440MHz	Pass	AV	4.87532G	34.88	54.00	-19.12	3	Horizontal	92	2.40
2440MHz	Pass	PK	4.87766G	47.51	74.00	-26.49	3	Horizontal	92	2.40
2480MHz	Pass	AV	2.48G	97.20	Inf	-Inf	3	Vertical	37	1.00
2480MHz	Pass	AV	2.4994G	47.57	54.00	-6.43	3	Vertical	37	1.00
2480MHz	Pass	PK	2.4798G	98.21	Inf	-Inf	3	Vertical	37	1.00
2480MHz	Pass	PK	2.4958G	59.16	74.00	-14.84	3	Vertical	37	1.00
2480MHz	Pass	AV	2.48G	105.36	Inf	-Inf	3	Horizontal	360	1.50
2480MHz	Pass	AV	2.4866G	48.00	54.00	-6.00	3	Horizontal	360	1.50
2480MHz	Pass	PK	2.4798G	106.37	Inf	-Inf	3	Horizontal	360	1.50
2480MHz	Pass	PK	2.493G	59.36	74.00	-14.64	3	Horizontal	360	1.50
2480MHz	Pass	AV	4.94902G	35.97	54.00	-18.03	3	Vertical	78	2.20
2480MHz	Pass	PK	4.95904G	49.36	74.00	-24.64	3	Vertical	78	2.20
2480MHz	Pass	AV	4.9519G	35.66	54.00	-18.34	3	Horizontal	162	2.47
2480MHz	Pass	PK	4.96G	47.85	74.00	-26.15	3	Horizontal	162	2.47

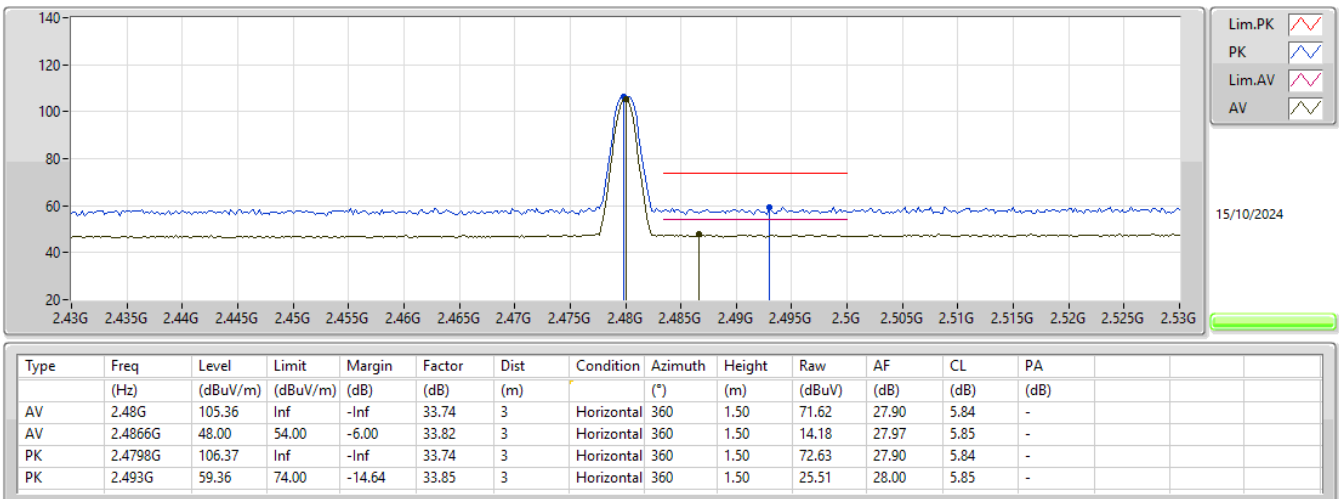
2.4-2.4835GHz_BT-LE(1Mbps)

2480MHz_TX



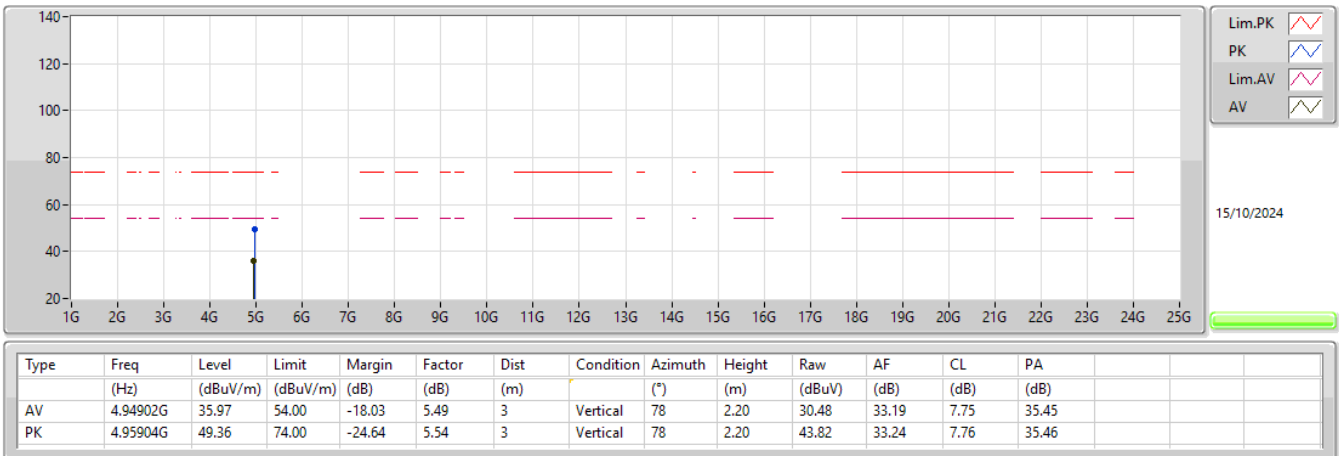
2.4-2.4835GHz_BT-LE(1Mbps)

2480MHz_TX



2.4-2.4835GHz_BT-LE(1Mbps)

2480MHz_TX



2.4-2.4835GHz_BT-LE(1Mbps)

2480MHz_TX

