Testing Laboratory 3787

RADIO TEST REPORT

FCC ID	:	Z8H89FT0072
Equipment	:	XE5-8
Brand Name	:	Cambium Networks
Model Name	:	XE5-8
Applicant	:	Cambium Networks Inc. 3800 Golf Road, Suite 360 Rolling Meadows, IL 60008, USA
Manufacturer	:	Cambium Networks, Ltd. Ashburton, TQ13 7UP, UK
Standard	:	47 CFR FCC Part 15.247

The product was received on Dec. 07, 2021, and testing was started from Dec. 21, 2021 and completed on Apr. 14, 2022. 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: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR142255-01AD	01	Initial issue of report	Apr. 29, 2022
FR142255-01AD	02	Revising AC Power-line Conducted Emissions, Emissions in Non-restricted Frequency Bands below 1GHz, and Simultaneous Transmission test mode, because Radio 2 and 3 can't work simultaneously.	Jun. 16, 2022
FR142255-01AD	03	Revising AC Power-line Conducted Emissions, Emissions in Non-restricted Frequency Bands below 1GHz, and Simultaneous Transmission test mode, because Radio 2 and 3 can work simultaneously.	Jul. 22, 2022

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:

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer.
2. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen
Report Producer: Viola Huang

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	1

Note:
- Bluetooth LE uses a GFSK modulation.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Radio	Ant.	2.4GHz port	5GHz port	5GHz port	6E port	Bluetooth	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	4	4 (High band)	4 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
	2	3	3 (High band)	3 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
	3	2	2 (High band)	2 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
	4	1	1 (High band)	1 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
1	5	-	4 (Low band)	8 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
	6	-	3 (Low band)	7 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
	7	-	2 (Low band)	6 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
	8	-	1 (Low band)	5 (Full band)	-	-	ACCTON	EAP9819A-6E-1120-CAM	PCB antenna	I-PEX	
2	9	-	4		4	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	Note 1
	10	-	2		2	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
	11	-	3		3	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
	12	-	1		1	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
3	13	-	4		4	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
	14	-	2		2	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
	15	-	3		3	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
	16	-	1		1	-	ACCTON	EAP9819A-6E-1120-CAM	Metal antenna	I-PEX	
4	17	-	-	-	-	1	ACCTON	GT128V007S-001	Chip antenna	N/A	

Note 1:

Radio 1 and Radio 4

Ant.	Antenna Gain (dBi)					
	WLAN 2.4GHz	WLAN 5GHz				Bluetooth
		UNII 1	UNII 2A	UNII 2C	UNII 3	
1	4.51	4.09	3.06	3.82	3.60	-
2	4.97	4.40	5.70	3.79	2.99	-
3	4.66	5.17	5.99	4.38	3.52	-
4	5.95	4.64	4.09	4.19	3.36	-
5	-	3.39	3.58	3.34	2.01	-
6	-	3.70	3.39	2.52	3.03	-
7	-	3.10	3.68	2.83	2.84	-
8	-	2.82	3.13	2.19	2.61	-
17	-	-	-	-	-	3.24

Mode 1: 2.4GHz 4TX and 5GHz UNII 1~UNII 3 8TX

Ant.	Directional Gain (dBi)																	
	WLAN 2.4GHz			WLAN 5GHz														
				UNII 1				UNII 2A				UNII 2C				UNII 3			
	4T1S	4T2S	4T4S	8T1S	8T2S	8T4S	8T8S	8T1S	8T2S	8T4S	8T8S	8T1S	8T2S	8T4S	8T8S	8T1S	8T2S	8T4S	8T8S
1	9.91	6.91	3.96	8.39	5.39	5.17	0.57	8.65	5.99	5.99	0.76	7.37	4.38	4.38	0.01	7.13	4.13	3.60	-0.40
2																			
3																			
4																			
5	-	-	-																
6	-	-	-																
7	-	-	-																
8	-	-	-																

Mode 2: 2.4GHz, 5GHz UNII 1~UNII 2A and 5GHz UNII 2C~UNII 3 4TX

Ant.	Directional Gain (dBi)														
	WLAN 2.4GHz			WLAN 5GHz											
				UNII 1			UNII 2A			UNII 2C			UNII 3		
	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S
1	9.91	6.91	3.96	-	-	-	-	-	-	8.67	5.67	2.75	8.15	5.15	2.27
2															
3															
4															
5	-	-	-	7.35	4.35	1.38	7.38	4.38	1.47	-	-	-	-	-	-
6	-	-	-												
7	-	-	-												
8	-	-	-												

For Radio 2~Radio 3

Ant.	Antenna Gain (dBi)							
	WLAN 5GHz				WLAN 6E			
	UNII 1	UNII 2A	UNII 2C	UNII 3	UNII 5	UNII 6	UNII 7	UNII 8
9	3.56	4.37	3.82	4.70	4.96	3.57	3.72	4.44
10	1.25	3.18	3.45	1.86	4.40	3.52	3.12	3.31
11	4.27	4.24	2.25	3.64	4.14	2.03	3.08	4.86
12	1.94	2.59	2.08	3.11	4.85	2.60	3.43	3.41
13	3.25	3.68	3.74	2.90	4.16	2.52	0.71	2.03
14	2.35	4.20	2.48	3.96	4.72	2.06	1.91	2.03
15	3.07	3.84	2.89	2.61	2.24	1.61	2.74	2.45
16	3.41	3.65	1.81	3.31	3.43	3.56	2.35	1.93

For 5GHz UNII 1~UNII 3

Ant.	Directional Gain (dBi)											
	WLAN 5GHz											
	UNII 1			UNII 2A			UNII 2C			UNII 3		
	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S
9	6.84	4.27	0.94	7.38	4.38	1.63	5.12	3.82	-0.67	5.70	4.70	0.08
10												
11												
12												
13	6.79	3.79	0.92	6.16	4.20	0.76	4.51	3.74	-0.79	5.60	3.96	0.29
14												
15												
16												

For 6GHz UNII 5~8

Ant.	Directional Gain (dBi)											
	WLAN 6E											
	UNII 5			UNII 6			UNII 7			UNII 8		
	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S	4T1S	4T2S	4T4S
9	7.11	4.96	1.27	6.27	3.57	0.39	6.05	3.72	0.36	7.06	4.86	1.54
10												
11												
12												
13	7.06	4.72	1.39	6.25	3.56	0.34	4.86	2.74	-0.72	5.56	2.56	-0.38
14												
15												
16												

Note 2: The EUT has seventeen antennas.
Note 3: The brand/model/antenna type information was declared by manufacturer.
Note 4: Maximum Directional Gain following KDB662911 D03.
The antenna report is provided in the operational description for this application.
Note 5: Because radio 2 and radio 3 are the same radio, the Directional Gain of radio 2 is higher than radio 3. Thus, radio 2 was tested and recorded in the report.
Note 6: The EUT doesn't enable the DFS band.

For Radio 1
For 2.4GHz:
For IEEE 802.11b/g/n/VHT/ax mode (4TX/4RX):
Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.
For 5GHz UNII 1 and UNII 3 (SBS Mode):
For IEEE 802.11a/n/ac/ax mode (4TX/4RX):
Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.
For 5GHz UNII 1 and UNII 3 (DBS Mode):
For IEEE 802.11a/n/ac/ax mode (8TX/8RX):
Port 1, Port 2, Port 3, Port 4, Port 5, Port 6, Port 7, Port 8 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3, Port 4, Port 5, Port 6, Port 7, Port 8 could transmit/receive simultaneously.
For Radio 2 and Radio 3
For 5GHz UNII 1 and UNII 3:
For IEEE 802.11a/n/ac/ax mode (4TX/4RX):
Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.
For 6GHz UNII 5~8:
For IEEE 802.11ax mode (4TX/4RX):
Port 1, Port 2, Port 3 and Port 4 can be used as transmitting/receiving antenna.
Port 1, Port 2, Port 3 and Port 4 could transmit/receive simultaneously.
For Radio 4
For Bluetooth:
Only Port 1 can be used as transmitting/receiving antenna.

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.634	1.98	405.25u	3k

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

1.1.4 EUT Operational Condition

EUT Power Type	From PoE			
Function	☒	Point-to-multipoint	☐	Point-to-point
Test Software Version	QRCT Version 4.0.00182.0			
Support Mode	☒	LE 1M PHY: 1 Mb/s		
	☐	LE Coded PHY (S=2): 500 Kb/s		
	☐	LE Coded PHY (S=8): 125 Kb/s		
	☐	LE 2M PHY: 2 Mb/s		

Note: The above information was declared by manufacturer.

1.1.5 Table of Radio Function

Radio (R)	2.4GHz	5GHz	6E	Bluetooth
1	V	V	-	-
2 (Pine 1)	-	V	V	-
3 (Pine 2)	-	V	V	-
4	-	-	-	V

1.1.6 Table for EUT Operation Function

Mode	Operation Function
1	DBS Mode: R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3/6GHz+R3: 5GHz UNII 1,UNII 3/6GHz+R4: BT
2	SBS Mode: R1: 2.4GHz/5GHz UNII 1,UNII 3 in 4TX +R2: 5GHz UNII 1,UNII 3/6GHz+R3: 5GHz UNII 1,UNII 3/6GHz+R4: BT

Note1: Only the 5GHz mode of radio 2, and 3 has been performed in the testing, because the output power is larger than 6GHz.
Note2: Radio 2 and Radio 3 can transmit simultaneously but they can't be configured to the same frequency.

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	Serway Lee	23.6-24.3 / 63-65	Jan. 03, 2022~Apr. 08, 2022
Radiated below 1GHz	03CH03-CB	Kevin Huang	24-25.1 / 56-59	Dec. 21, 2021
Radiated above 1GHz	03CH01-CB	Bruce Yang	24.2-26.1 / 55-58	Dec. 25, 2021~Apr. 14, 2022
AC Conduction	CO01-CB	Peter Wu	21-22 / 50-51	Jan. 07, 2022

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)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Conducted Emission	2.5 dB	Confidence levels of 95%
Output Power Measurement	1.3 dB	Confidence levels of 95%
Power Density Measurement	2.5 dB	Confidence levels of 95%
Bandwidth Measurement	0.9%	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	Power Setting
BT-LE(1Mbps)	-
2402MHz	8
2440MHz	8
2480MHz	7

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	DBS Mode:R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3 +R4: BT
2	SBS Mode:R1: 2.4GHz/5GHz UNII 1,UNII 3 in 4TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3+R4: BT
For operating mode 1 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	Normal Link
1	DBS Mode: EUT in Z axis- R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3 +R4: BT
2	DBS Mode: EUT in Y axis- R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3 +R4: BT
3	DBS Mode: EUT in X axis- R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3 +R4: BT
Mode 2 has been evaluated to be the worst case among Mode 1~3, thus measurement for Mode 4 will follow this same test mode.	
4	SBS Mode: EUT in Y axis- R1: 2.4GHz/5GHz UNII 1,UNII 3 in 4TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3+R4: BT
For operating mode 2 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
	The EUT was performed at X axis, Y axis and Z axis position for Emissions in Restricted Frequency Bands, and the worst case was found at Y axis. So the measurement will follow this same test configuration.
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	DBS Mode:R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3 +R4: BT
2	DBS Mode:R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 5GHz UNII 1,UNII 3+R3: 6GHz UNII 5~UNII 8 +R4: BT
3	DBS Mode:R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 6GHz UNII 5~UNII 8+R3: 5GHz UNII 1,UNII 3 +R4: BT
4	DBS Mode:R1: 2.4GHz/5GHz UNII 1,UNII 3 in 8TX +R2: 6GHz UNII 5~UNII 8+R3: 6GHz UNII 5~UNII 8 +R4: BT
5	DBS Mode:R1: 2.4GHz/ SBS Mode:5GHz UNII 1+UNII 3 in 4TX +R2: 5GHz UNII 1,UNII 3+R3: 5GHz UNII 1,UNII 3 +R4: BT
6	DBS Mode:R1: 2.4GHz/ SBS Mode:5GHz UNII 1+UNII 3 in 4TX +R2: 5GHz UNII 1,UNII 3+R3: 6GHz UNII 5~UNII 8 +R4: BT
7	DBS Mode:R1: 2.4GHz/ SBS Mode:5GHz UNII 1+UNII 3 in 4TX +R2: 6GHz UNII 5~UNII 8+R3: 5GHz UNII 1, UNII 3 +R4: BT
8	DBS Mode:R1: 2.4GHz/ SBS Mode:5GHz UNII 1+UNII 3 in 4TX +R2: 6GHz UNII 5~UNII 8+R3: 6GHz UNII 5~UNII 8 +R4: BT
Refer to Sporton Test Report No.: FA142255-01 for Co-location RF Exposure Evaluation.	

Note: The PoE is for measurement only, would not be marketed.
The PoE information is below:

Support Unit	Brand	Model
PoE	Cambium	NET-P60-56IN

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link Mode:
During the test, the EUT operation to normal function.

2.4 Accessories

Accessories
Cradle*1

2.5 Support Equipment

For AC Conduction:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	PoE	Cambium	NET-P60-56IN	N/A
B	PoE PC	DELL	T3400	N/A
C	Smart Phone	Apple	Iphone 12	BCG-E3544A
D	2.4G NB	DELL	E6430	N/A
E	5G LOW NB	DELL	E6430	N/A
F	5G HIGH NB	DELL	E6430	N/A
G	5G NB	DELL	E6430	N/A
H	Flash disk3.0	Transcend	JetFlash-700	N/A

For Radiated (below 1GHz):

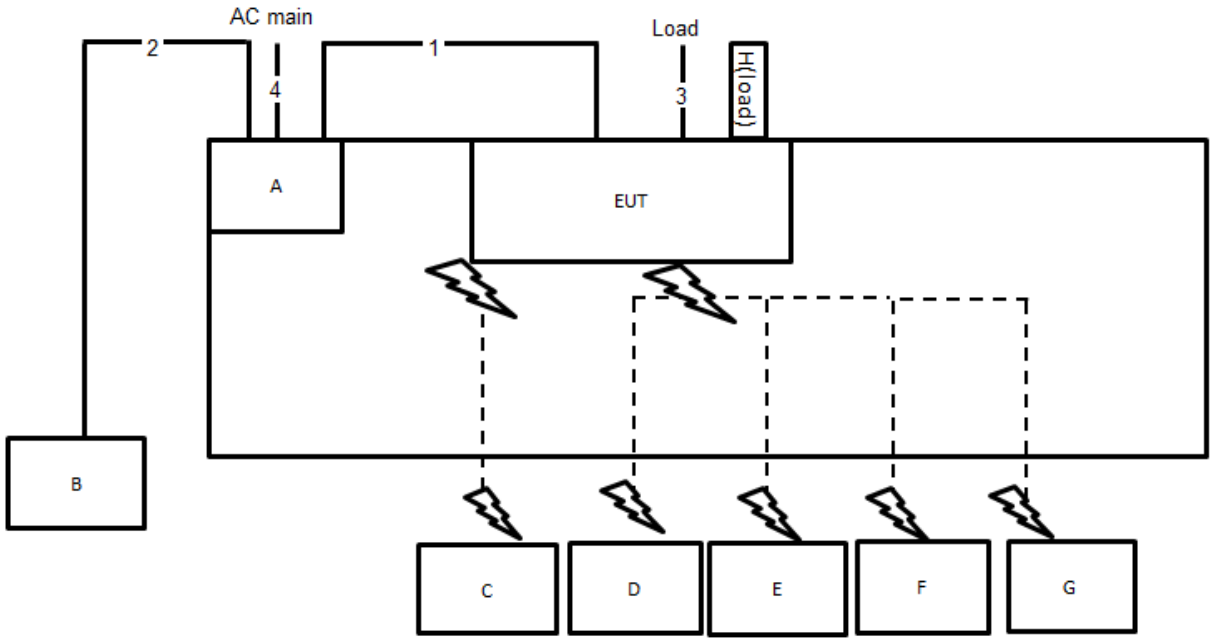
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	PoE	Cambium	NET-P60-56IN	N/A
B	PC	HP	SGH8190LP1	N/A
C	Smart Phone	Apple	Iphone 12	BCG-E3544A
D	Notebook(2.4G)	DELL	E4300	N/A
E	Notebook(5G)	DELL	E4300	N/A
F	Notebook(5G)	DELL	E4300	N/A
G	Notebook(5G)	DELL	E4300	N/A
H	Flash disk3.0	Transcend	JetFlash-700	N/A

For Radiated (above 1GHz) and RF Conducted:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Notebook	DELL	E4300	N/A
B	PoE	Cambium	NET-P60-56IN	N/A

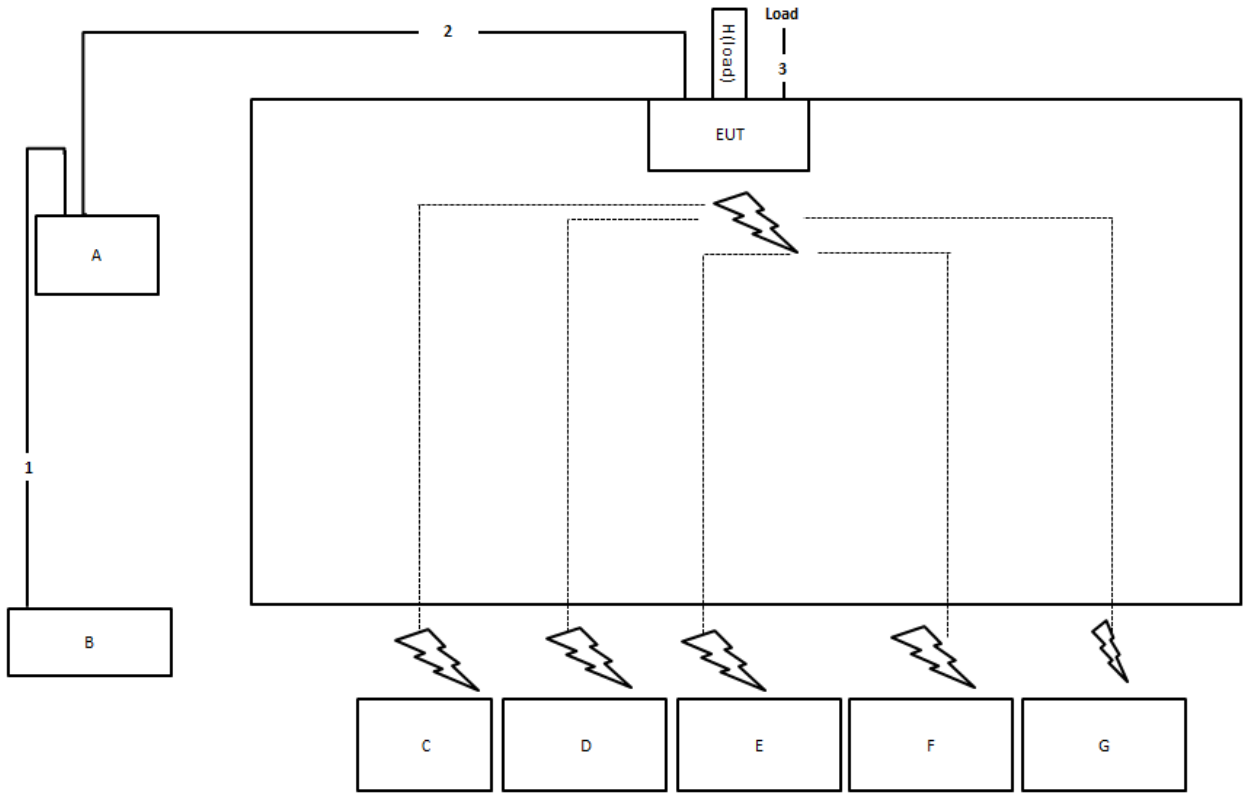
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



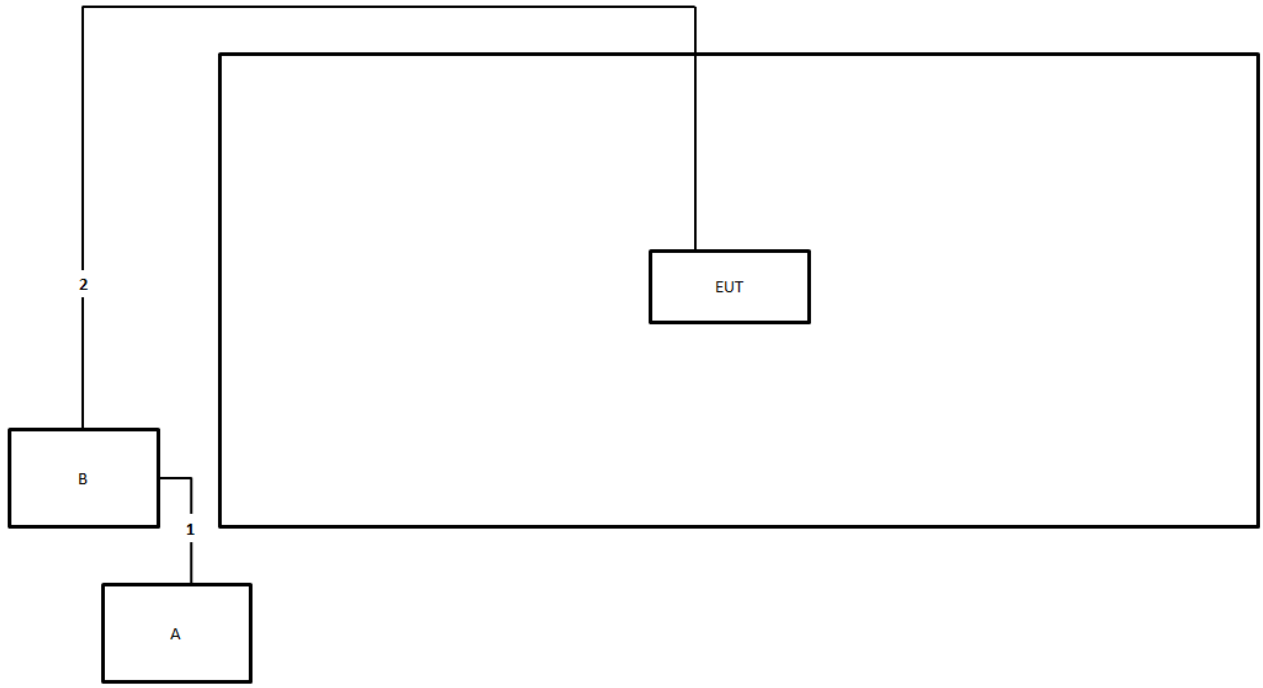
Item	Connection	Shielded	Length
1	RJ-45 cable	No	1.5m
2	RJ-45 cable	No	10m
3	RJ-45 cable	No	1.5m
4	Power cable	No	0.8m

Test Setup Diagram - Radiated Test < 1GHz



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

Test Setup Diagram - Radiated Test > 1GHz



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

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

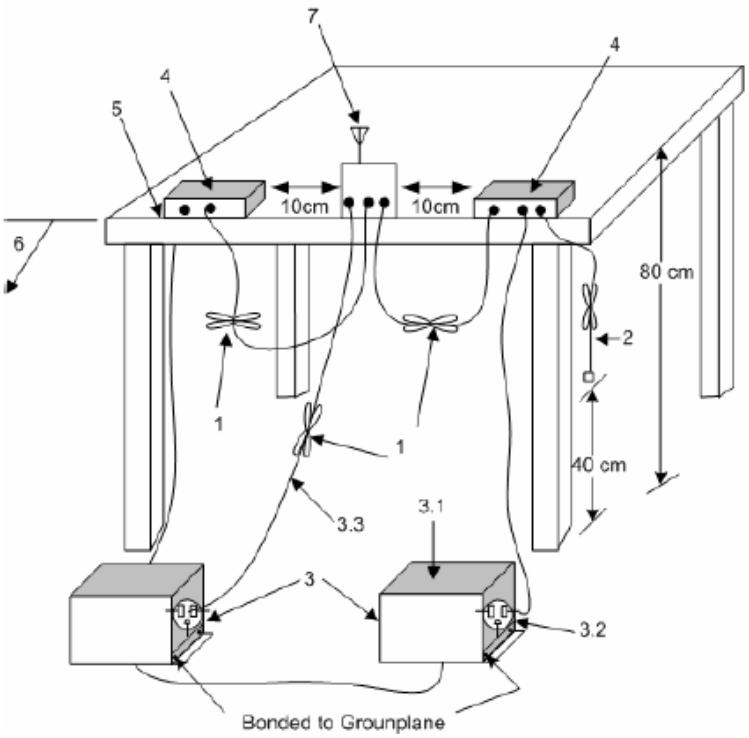
Refer a test equipment and calibration data table in this test report.

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.

1.1.1. 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

3.1.5 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.

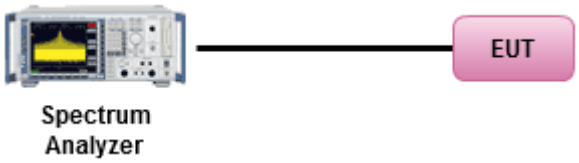
3.2.2 Measuring Instruments

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.		

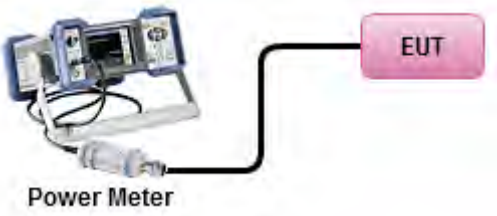
3.3.2 Measuring Instruments

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

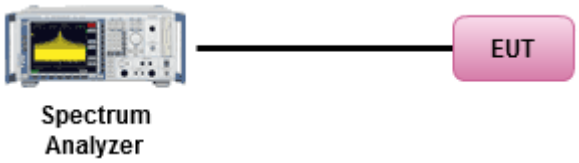
3.4.2 Measuring Instruments

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.	
	[duty cycle ≥ 98% or external video / power trigger]	
▪ 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.	

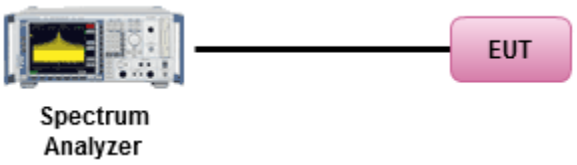
3.5.2 Measuring Instruments

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 below30 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.

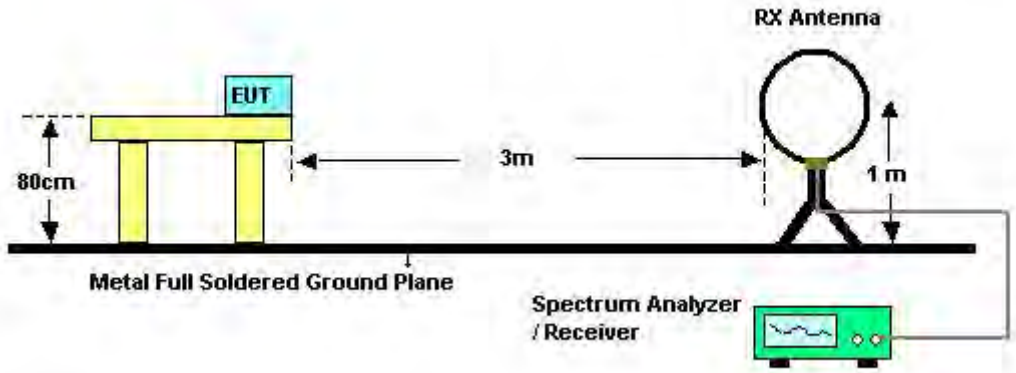
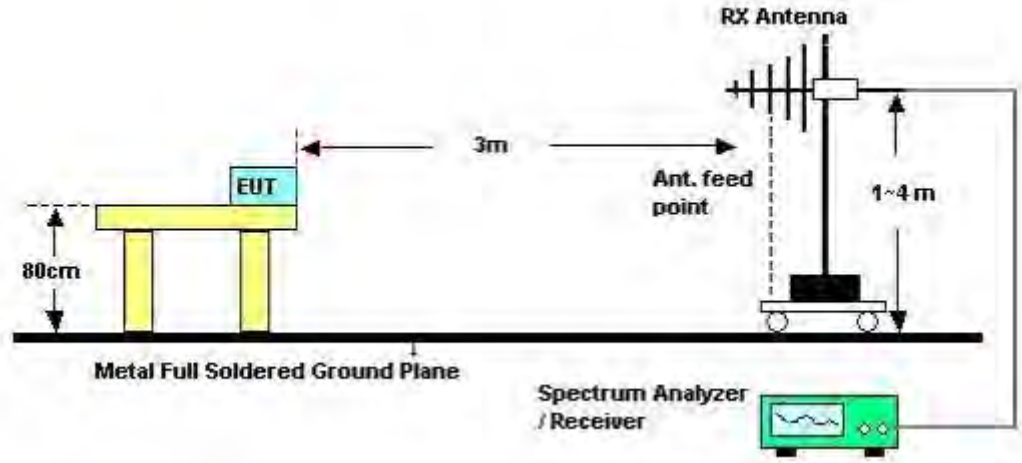
3.6.2 Measuring Instruments

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

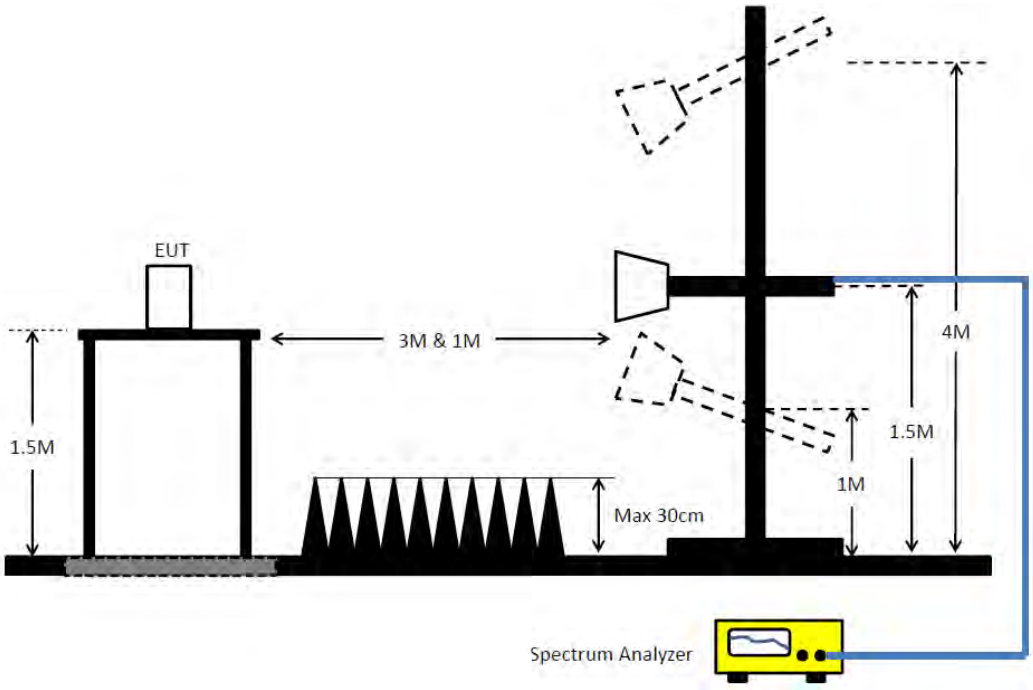
3.6.3 Test Procedures

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. 03, 2021	Mar. 02, 2022	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Dec. 22, 2021	Dec. 21, 2022	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Mar. 07, 2021	Mar. 06, 2022	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 30, 2021	Jan. 29, 2022	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 19, 2021	May 18, 2022	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (03CH03-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH03-CB	30 MHz ~ 1 GHz	Jan. 27, 2021	Jan. 26, 2022	Radiation (03CH03-CB)
Bilog Antenna with 6 dB attenuator	Schaffner & EMCI	CBL6112B & N-6-06	2928 & AT-N0608	20MHz ~ 2GHz	Feb. 22, 2021	Feb. 21, 2022	Radiation (03CH03-CB)
Pre-Amplifier	Agilent	8447D	2944A10259	9kHz ~ 1.3GHz	Jan. 11, 2021	Jan. 10, 2022	Radiation (03CH03-CB)
Spectrum Analyzer	R&S	FSP40	100019	9kHz ~ 40GHz	Jun. 04, 2021	Jun. 03, 2022	Radiation (03CH03-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH03-CB)
RF Cable-low	Woken	RG402	Low Cable-02+29	30MHz ~ 1GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH03-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH01-CB	1GHz ~18GHz 3m	May 07, 2021	May 06, 2022	Radiation (03CH01-CB)
Horn Antenna	ETS-LINDGREN	3115	00075790	750MHz ~ 18GHz	Nov. 06, 2021	Nov. 05, 2022	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02121	1GHz ~ 26.5GHz	May 20, 2021	May 19, 2022	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	May 03, 2021	May 02, 2022	Radiation (03CH01-CB)

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-16	1 GHz ~ 18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH01-CB)
RF Cable-high	Woken	RG402	High Cable-16+17	1 GHz ~ 18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH01-CB)
High Cable	Woken	WCA0929M	40G#5+7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH01-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz	Dec. 08, 2021	Dec. 07, 2022	Radiation (03CH01-CB)
High Cable	Woken	WCA0929M	40G#7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	May 21, 2021	May 20, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-30	1 GHz –26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Conducted (TH01-CB)
Switch	SPTCB	SP-SWI	SWI-01	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P1	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P2	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P3	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P4	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	SWI-01-P5	1 GHz –26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	1339408	300MHz~40GHz	Sep. 06, 2021	Sep. 05, 2022	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1517009	300MHz~40GHz	Sep. 06, 2021	Sep. 05, 2022	Conducted (TH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH01-CB)

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

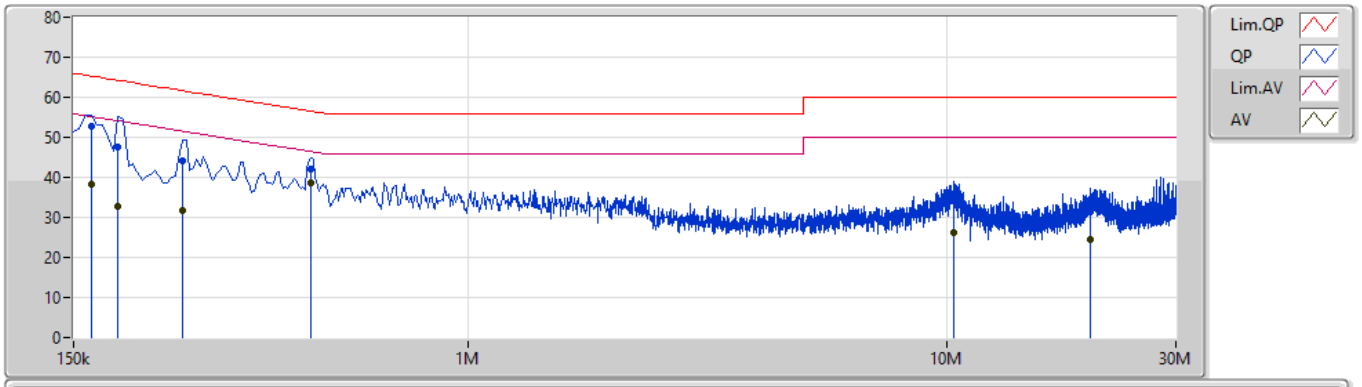
N.C.R. means Non-Calibration required.

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	AV	469.5k	38.59	46.52	-7.93	Line

Mode 1

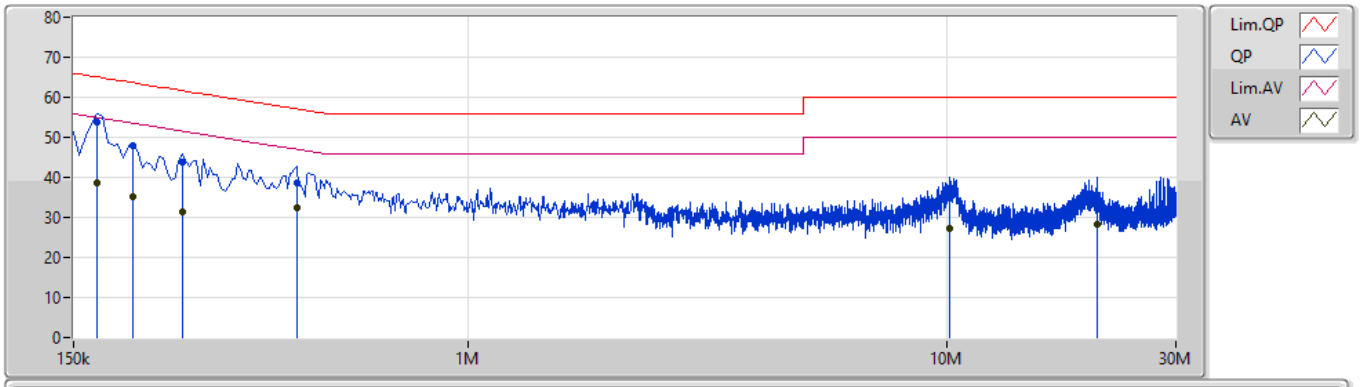
07/01/2022



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	163.5k	52.84	65.27	-12.43	9.89	Line	-	42.95	0.04	0.04	9.81
AV	163.5k	38.22	55.27	-17.05	9.89	Line	-	28.33	0.04	0.04	9.81
QP	186k	47.73	64.20	-16.47	9.89	Line	-	37.84	0.04	0.04	9.81
AV	186k	32.61	54.20	-21.59	9.89	Line	-	22.72	0.04	0.04	9.81
QP	253.5k	44.30	61.64	-17.34	9.89	Line	-	34.41	0.04	0.04	9.81
AV	253.5k	31.57	51.64	-20.07	9.89	Line	-	21.68	0.04	0.04	9.81
QP	469.5k	42.01	56.52	-14.51	9.90	Line	-	32.11	0.04	0.04	9.82
AV	469.5k	38.59	46.52	-7.93	9.90	Line	"Worst"	28.69	0.04	0.04	9.82
QP	10.302M	34.26	60.00	-25.74	10.28	Line	-	23.98	0.22	0.16	9.90
AV	10.302M	26.20	50.00	-23.80	10.28	Line	-	15.92	0.22	0.16	9.90
QP	19.86M	31.31	60.00	-28.69	10.54	Line	-	20.77	0.32	0.22	10.00
AV	19.86M	24.38	50.00	-25.62	10.54	Line	-	13.84	0.32	0.22	10.00

Mode 1

07/01/2022



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	168k	53.88	65.06	-11.18	9.88	Neutral	"Worst"	44.00	0.03	0.04	9.81
AV	168k	38.72	55.06	-16.34	9.88	Neutral	-	28.84	0.03	0.04	9.81
QP	199.5k	47.79	63.63	-15.84	9.88	Neutral	-	37.91	0.03	0.04	9.81
AV	199.5k	35.03	53.63	-18.60	9.88	Neutral	-	25.15	0.03	0.04	9.81
QP	253.5k	43.77	61.64	-17.87	9.88	Neutral	-	33.89	0.03	0.04	9.81
AV	253.5k	31.44	51.64	-20.20	9.88	Neutral	-	21.56	0.03	0.04	9.81
QP	438k	38.51	57.11	-18.60	9.89	Neutral	-	28.62	0.03	0.04	9.82
AV	438k	32.50	47.11	-14.61	9.89	Neutral	-	22.61	0.03	0.04	9.82
QP	10.104M	35.16	60.00	-24.84	10.26	Neutral	-	24.90	0.20	0.16	9.90
AV	10.104M	27.08	50.00	-22.92	10.26	Neutral	-	16.82	0.20	0.16	9.90
QP	20.589M	34.03	60.00	-25.97	10.53	Neutral	-	23.50	0.30	0.23	10.00
AV	20.589M	28.32	50.00	-21.68	10.53	Neutral	-	17.79	0.30	0.23	10.00

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)	696.25k	1.026M	1M03F1D	691.25k	1.024M

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

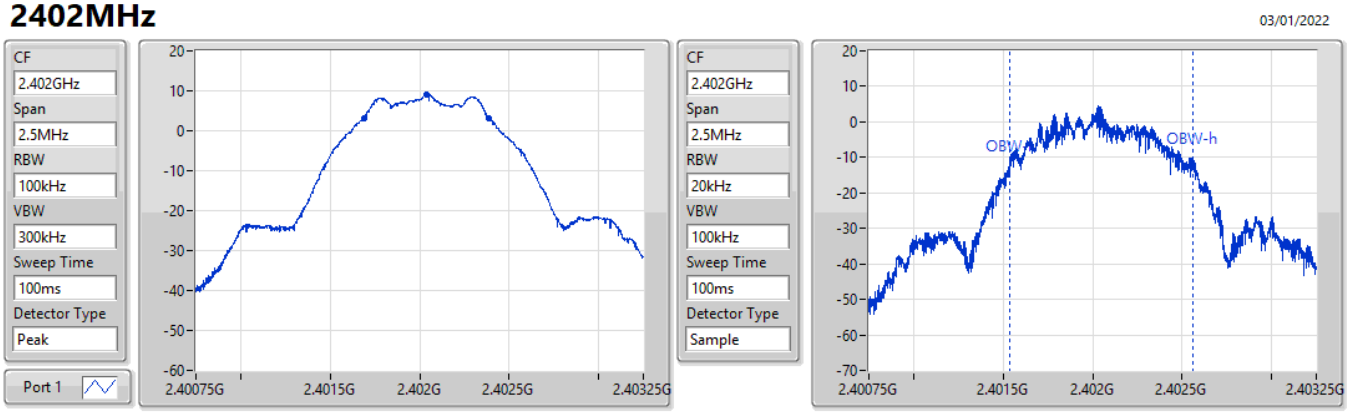
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	696.25k	1.024M
2440MHz	Pass	500k	696.25k	1.024M
2480MHz	Pass	500k	691.25k	1.026M

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

BT-LE(1Mbps) EBW-DTS

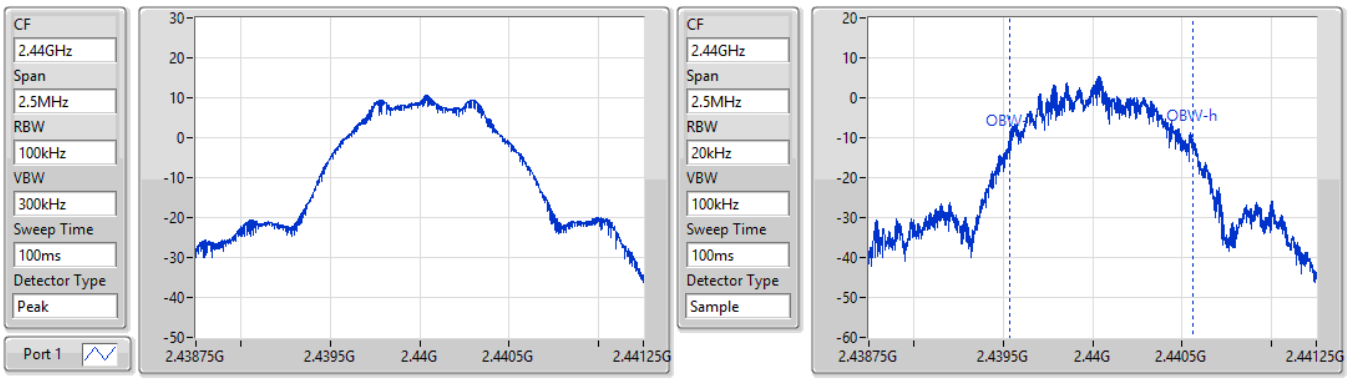
2402MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
696.25k	2.401691G	2.402388G	1.024M	2.401539G	2.402563G	500k	1

BT-LE(1Mbps) EBW-DTS

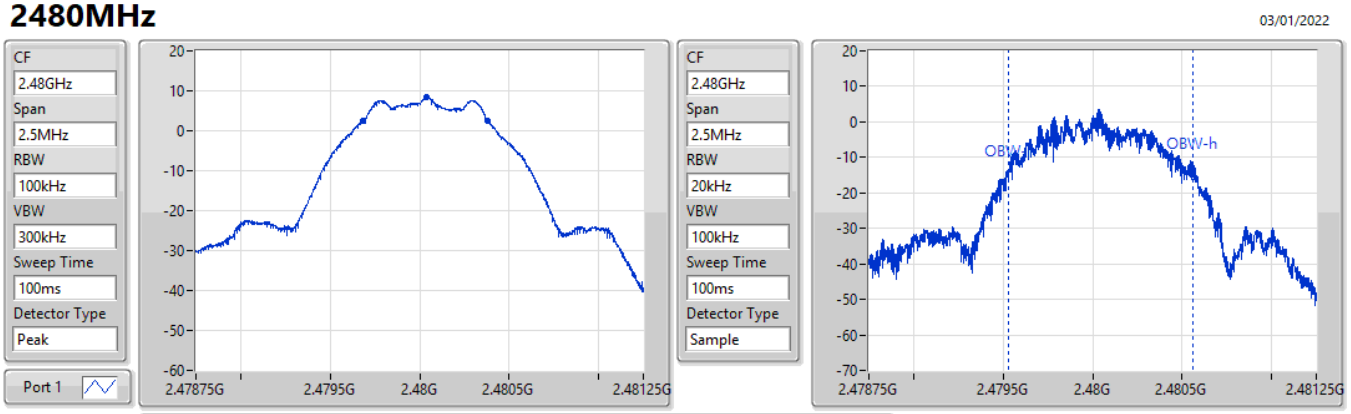
2440MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
696.25k	2.439688G	2.440384G	1.024M	2.439535G	2.44056G	500k	1

BT-LE(1Mbps) **EBW-DTS**

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
691.25k	2.479685G	2.480376G	1.026M	2.479533G	2.480558G	500k	1

Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	10.09	0.01021

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	3.24	9.23	30.00
2440MHz	Pass	3.24	10.09	30.00
2480MHz	Pass	3.24	8.20	30.00

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

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-5.45

RBW = 3kHz;

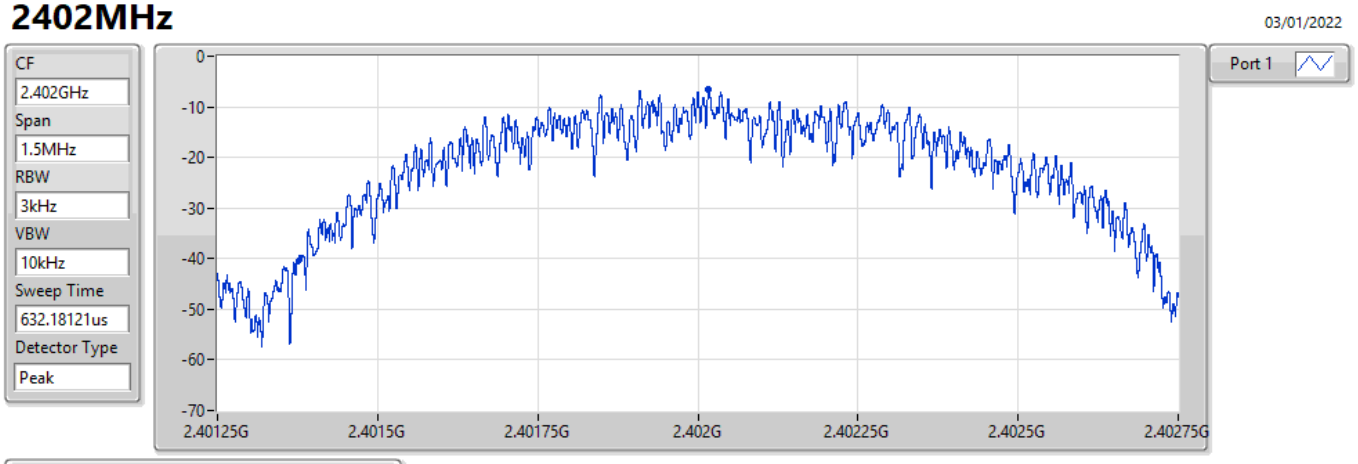
Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	3.24	-6.43	8.00
2440MHz	Pass	3.24	-5.45	8.00
2480MHz	Pass	3.24	-7.45	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;

BT-LE(1Mbps) PSD

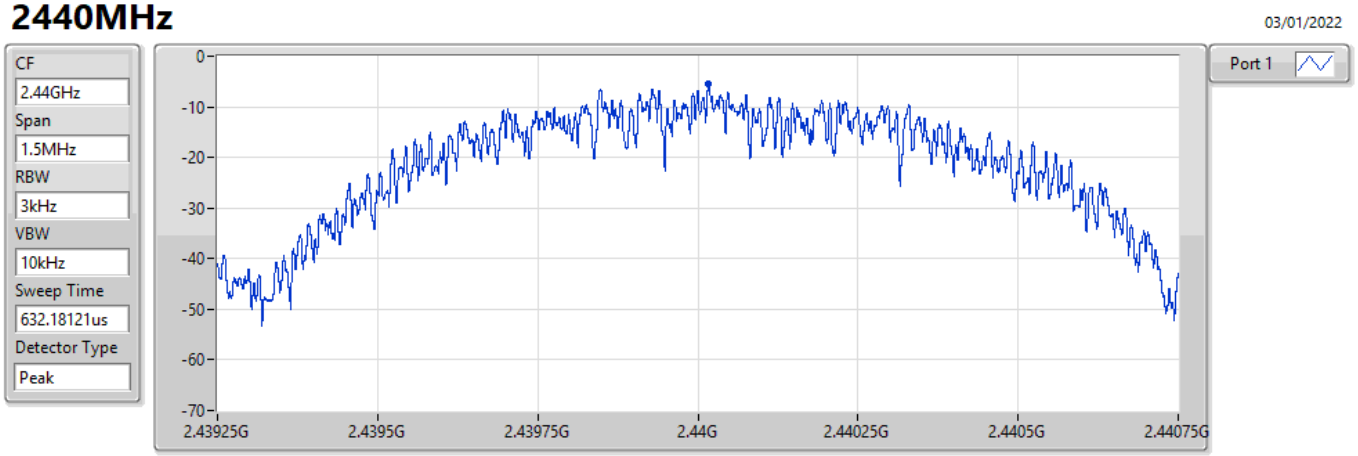
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.43	-6.43	-6.43

BT-LE(1Mbps) PSD

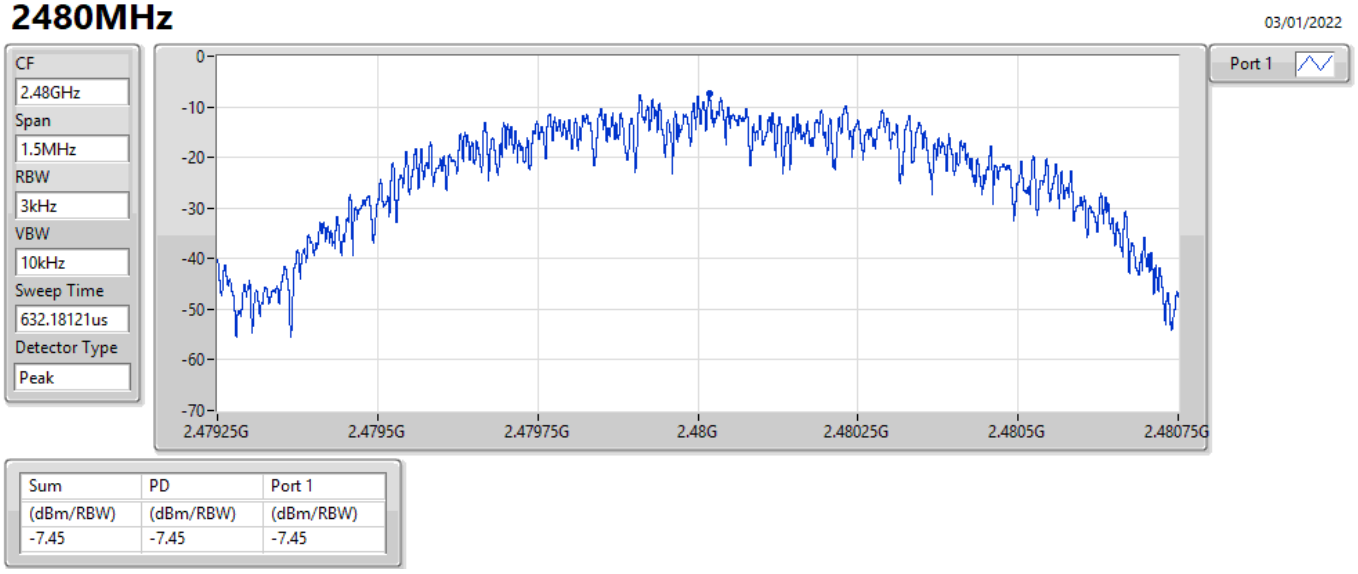
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.45	-5.45	-5.45

BT-LE(1Mbps) **PSD**

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.45	-7.45	-7.45

Summary

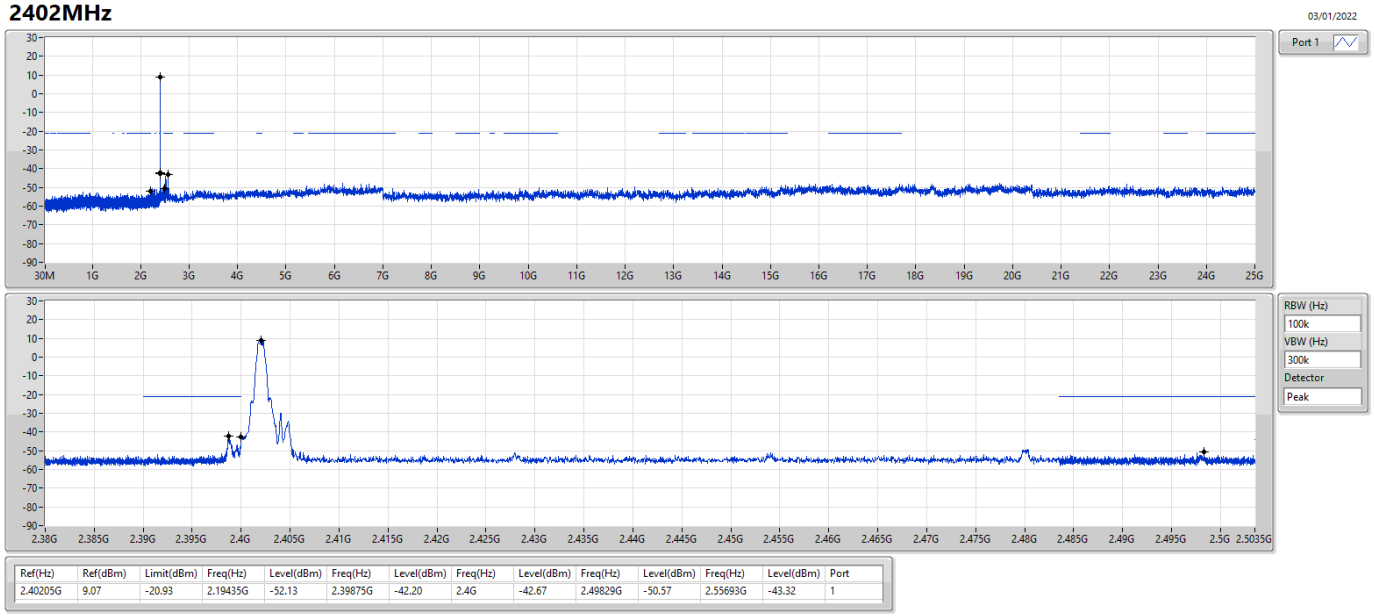
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.40205G	9.07	-20.93	2.19435G	-52.13	2.39875G	-42.20	2.4G	-42.67	2.49829G	-50.57	2.55693G	-43.32	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	2.40205G	9.07	-20.93	2.19435G	-52.13	2.39875G	-42.20	2.4G	-42.67	2.49829G	-50.57	2.55693G	-43.32	1
2440MHz															
2480MHz	Pass	2.40205G	9.07	-20.93	841.63M	-52.16	2.39269G	-52.21	2.4835G	-53.88	2.49118G	-51.88	2.63567G	-47.57	1

BT-LE(1Mbps) **CSENdB-DTS**

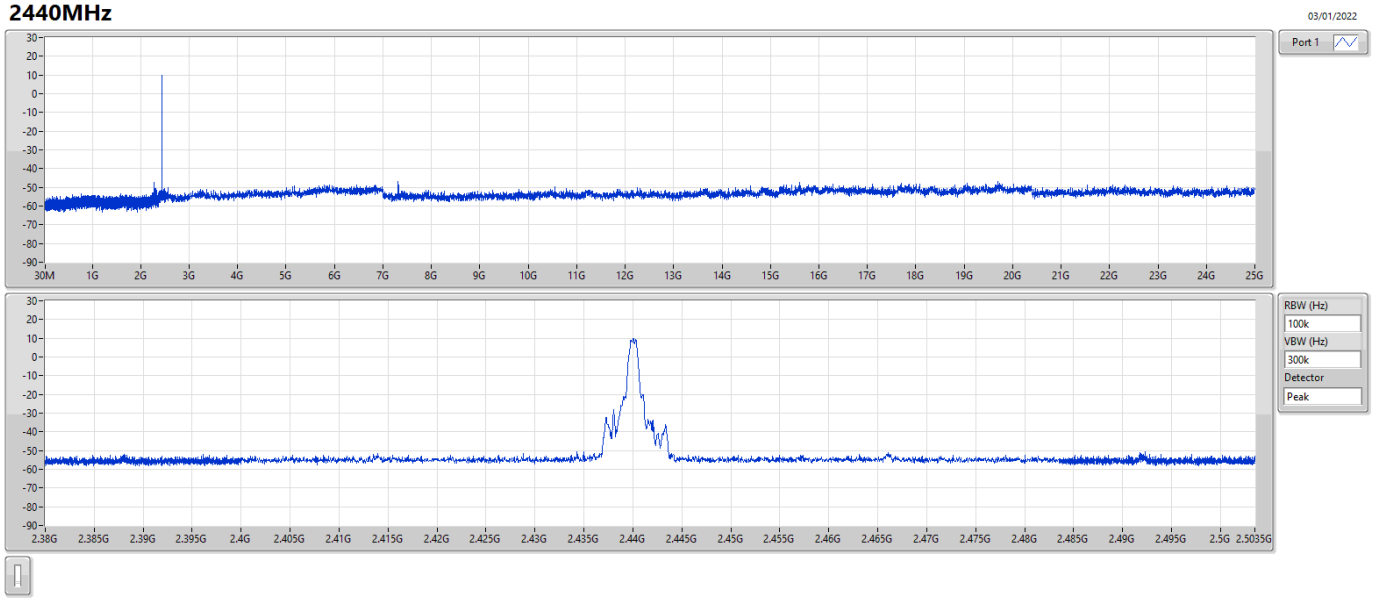
2402MHz



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
2.40205G	9.07	-20.93	2.19435G	-52.13	2.39875G	-42.20	2.4G	-42.67	2.49829G	-50.57	2.55693G	-43.32	1

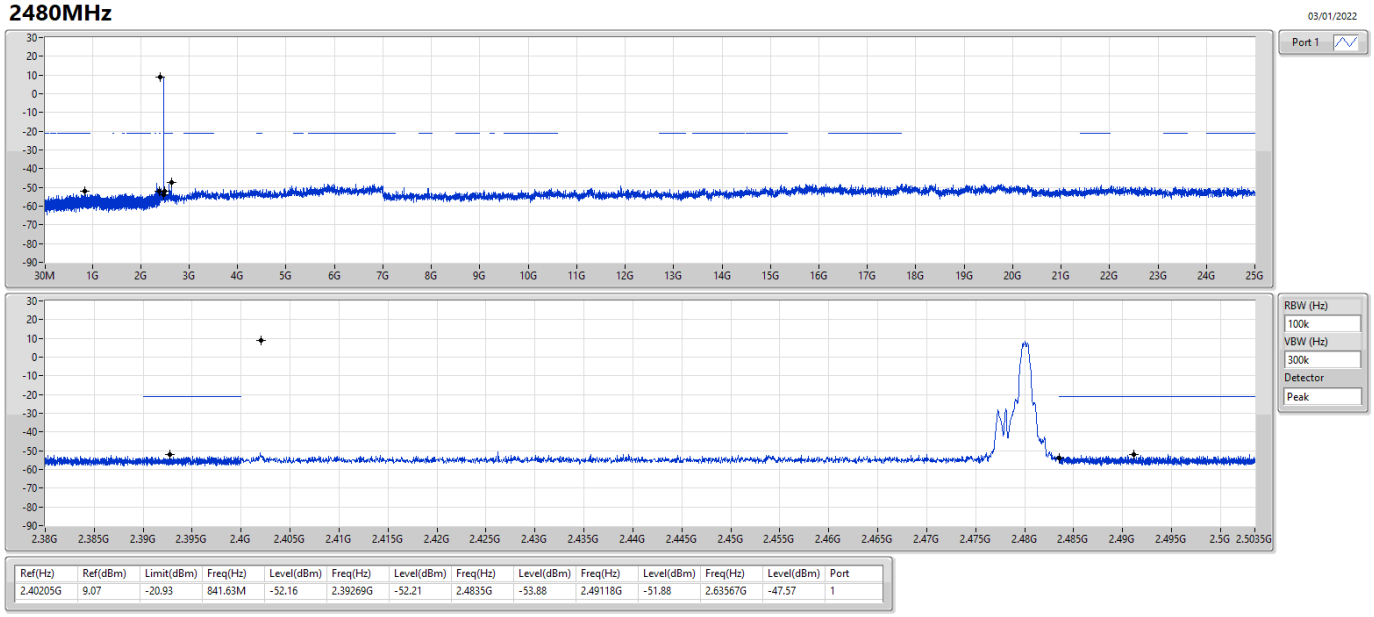
BT-LE(1Mbps) **CSENdB-DTS**

2440MHz



BT-LE(1Mbps) **CSENdB-DTS**

2480MHz

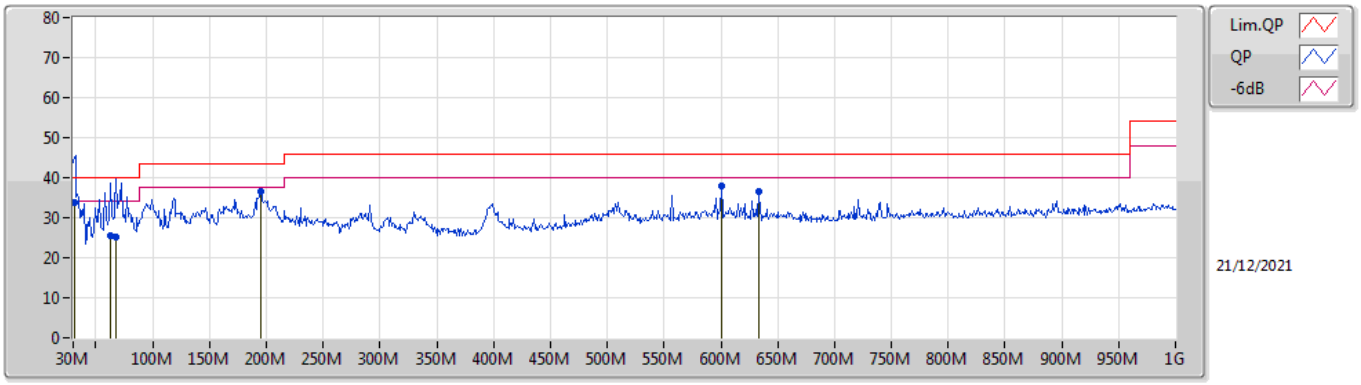


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40205G	9.07	-20.93	841.63M	-52.16	2.39269G	-52.21	2.4835G	-53.88	2.49118G	-51.88	2.63567G	-47.57	1

Summary

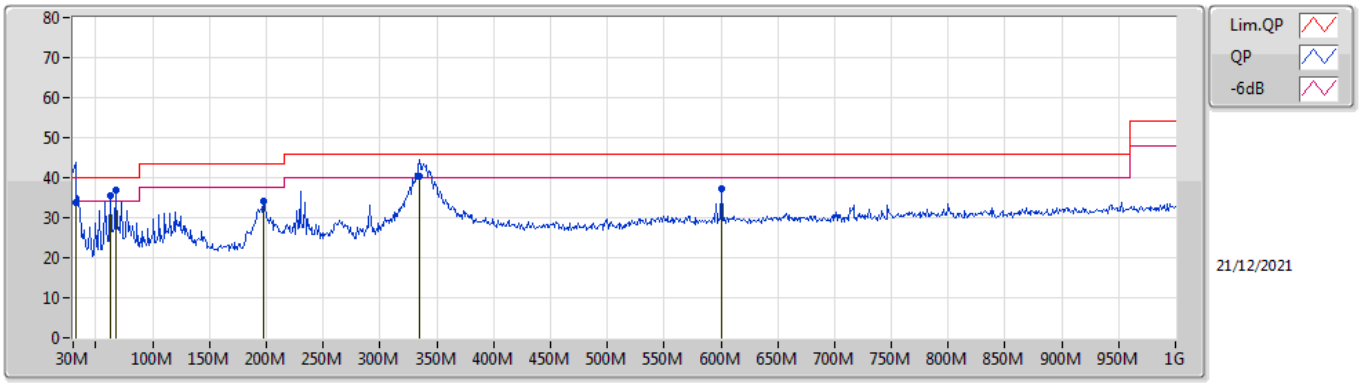
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 2	Pass	PK	67.83M	36.84	40.00	-3.16	Horizontal

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)
QP	30.90M	33.65	40.00	-6.35	-3.85	3	Vertical	252	2.00	"Worst"	37.50	23.42	1.22	28.49
QP	62.98M	25.46	40.00	-14.54	-15.04	3	Vertical	236	1.00	-	40.50	12.00	1.44	28.48
QP	67.83M	25.20	40.00	-14.80	-15.10	3	Vertical	360	1.00	-	40.30	11.98	1.40	28.48
PK	194.9M	36.43	43.50	-7.07	-11.19	3	Vertical	202	2.00	-	47.62	14.83	2.00	28.02
PK	600.36M	37.87	46.00	-8.13	-2.11	3	Vertical	3	1.25	-	39.98	24.01	3.20	29.32
PK	633.34M	36.55	46.00	-9.45	-1.54	3	Vertical	5	1.25	-	38.09	24.47	3.33	29.34

Mode 2



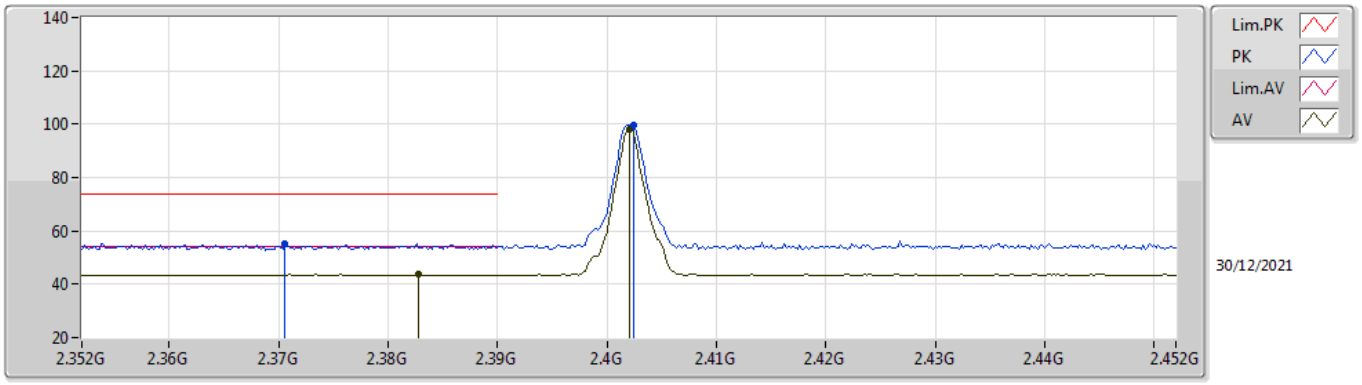
Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB/m)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
QP	31.94M	33.93	40.00	-6.07	-4.27	3	Horizontal	210	2.00	-	38.20	22.98	1.24	28.49
PK	62.98M	35.62	40.00	-4.38	-15.04	3	Horizontal	345	3.00	-	50.66	12.00	1.44	28.48
PK	67.83M	36.84	40.00	-3.16	-15.10	3	Horizontal	61	3.00	"Worst"	51.94	11.98	1.40	28.48
PK	197.81M	34.09	43.50	-9.41	-11.08	3	Horizontal	281	2.00	-	45.17	14.92	2.00	28.00
QP	334.58M	40.51	46.00	-5.49	-6.09	3	Horizontal	0	1.00	-	46.60	19.43	2.50	28.02
PK	600.36M	37.27	46.00	-8.73	-2.11	3	Horizontal	225	1.25	-	39.38	24.01	3.20	29.32

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	2.4835G	52.05	54.00	-1.95	3	Horizontal	36	1.49	-

BT-LE(1Mbps)

2402MHz_TX

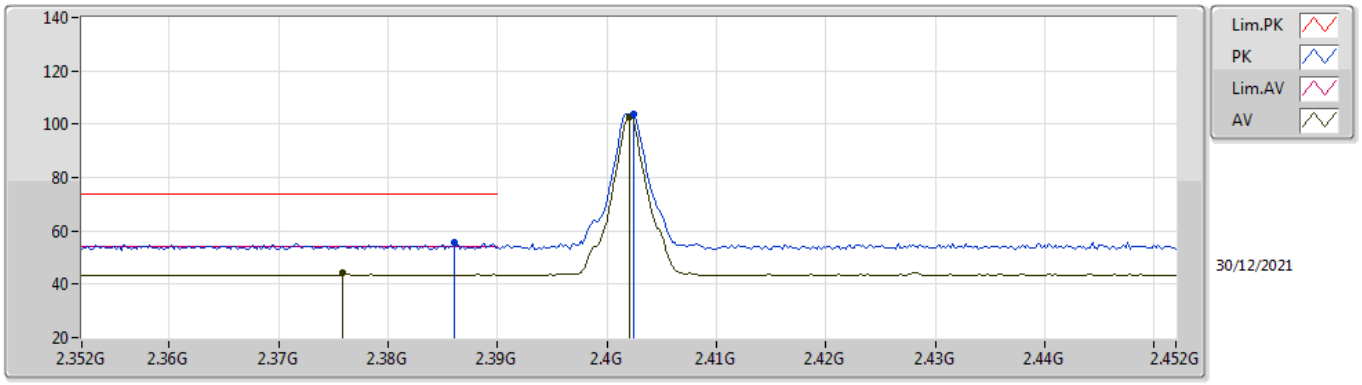


EUT Y_1TX
Setting 8
01-A-B-4

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	2.3706G	55.36	74.00	-18.64	24.08	3	Vertical	36	1.37	-	27.48	3.80	-
AV	2.3828G	43.71	54.00	-10.29	12.38	3	Vertical	36	1.37	-	27.53	3.80	-
PK	2.4024G	99.59	Inf	-Inf	68.19	3	Vertical	36	1.37	-	27.60	3.80	-
AV	2.402G	98.18	Inf	-Inf	66.78	3	Vertical	36	1.37	-	27.60	3.80	-

BT-LE(1Mbps)

2402MHz_TX

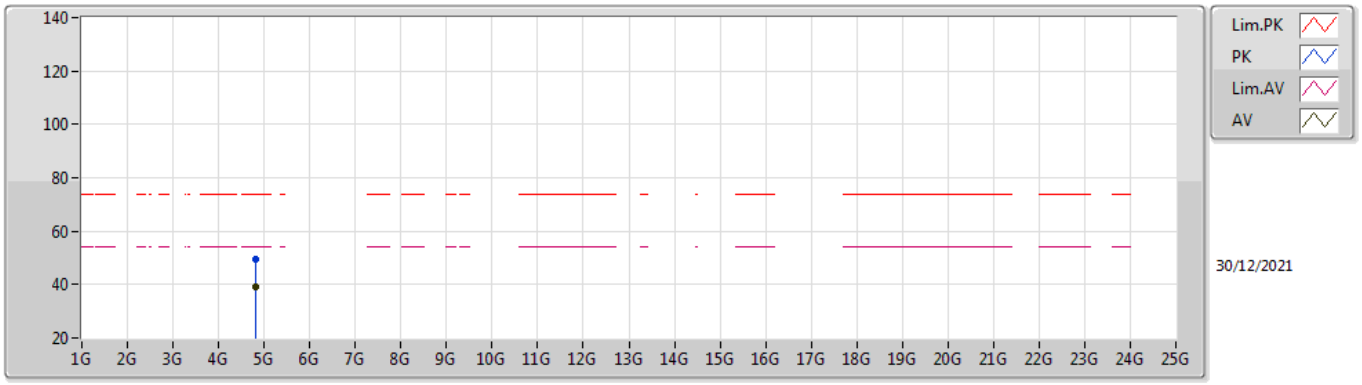


EUT Y_1TX
Setting 8
01-A-B-4

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	2.386G	55.85	74.00	-18.15	24.51	3	Horizontal	331	2.38	-	27.54	3.80	-
AV	2.3758G	44.06	54.00	-9.94	12.76	3	Horizontal	331	2.38	-	27.50	3.80	-
PK	2.4024G	103.98	Inf	-Inf	72.58	3	Horizontal	331	2.38	-	27.60	3.80	-
AV	2.402G	102.52	Inf	-Inf	71.12	3	Horizontal	331	2.38	-	27.60	3.80	-

BT-LE(1Mbps)

2402MHz_TX

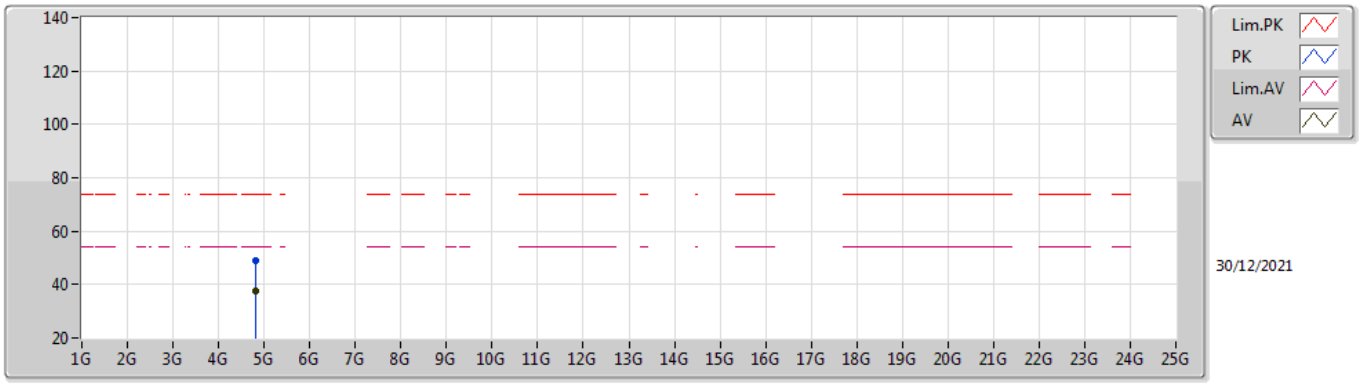


EUT Y_1TX
Setting 8
01-A-B-4

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	4.80476G	49.34	74.00	-24.66	43.62	3	Vertical	322	1.00	-	32.41	6.30	32.99
AV	4.80382G	39.25	54.00	-14.75	33.53	3	Vertical	322	1.00	-	32.41	6.30	32.99

BT-LE(1Mbps)

2402MHz_TX

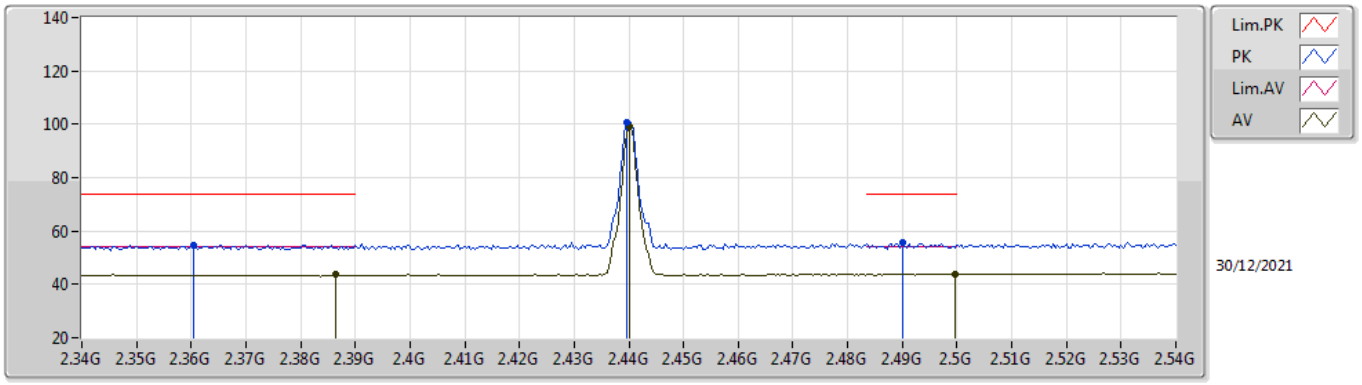


EUT Y_1TX
Setting 8
01-A-B-4

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	4.80364G	48.82	74.00	-25.18	43.10	3	Horizontal	6	2.95	-	32.41	6.30	32.99
AV	4.80376G	37.82	54.00	-16.18	32.10	3	Horizontal	6	2.95	-	32.41	6.30	32.99

BT-LE(1Mbps)

2440MHz_TX

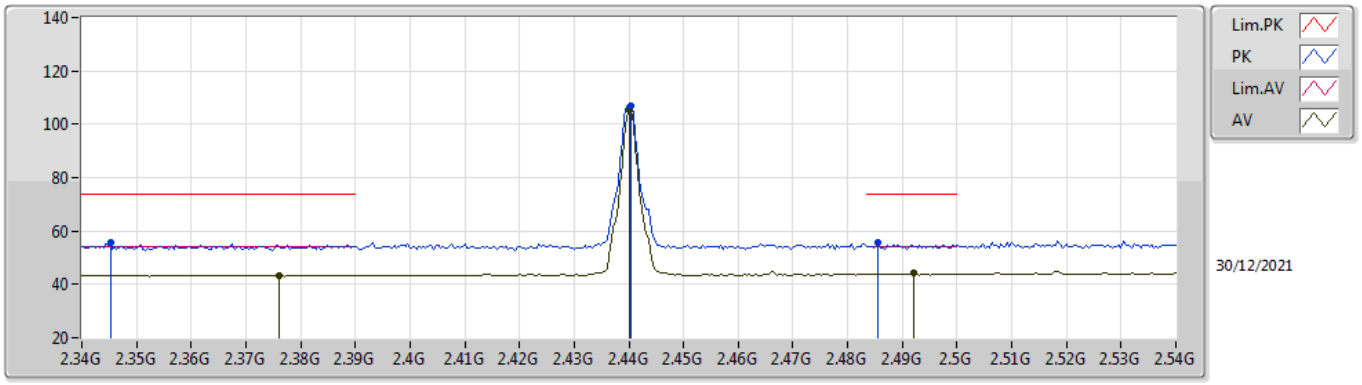


EUT Y_1TX
Setting 8
01-A-B-4

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	2.3604G	54.82	74.00	-19.18	23.58	3	Vertical	36	1.98	-	27.44	3.80	-
AV	2.3864G	43.72	54.00	-10.28	12.37	3	Vertical	36	1.98	-	27.55	3.80	-
PK	2.4396G	100.74	Inf	-Inf	69.40	3	Vertical	36	1.98	-	27.52	3.82	-
AV	2.44G	99.33	Inf	-Inf	67.99	3	Vertical	36	1.98	-	27.52	3.82	-
PK	2.49G	55.49	74.00	-18.51	23.91	3	Vertical	36	1.98	-	27.74	3.84	-
AV	2.4996G	44.04	54.00	-9.96	12.39	3	Vertical	36	1.98	-	27.80	3.85	-

BT-LE(1Mbps)

2440MHz_TX

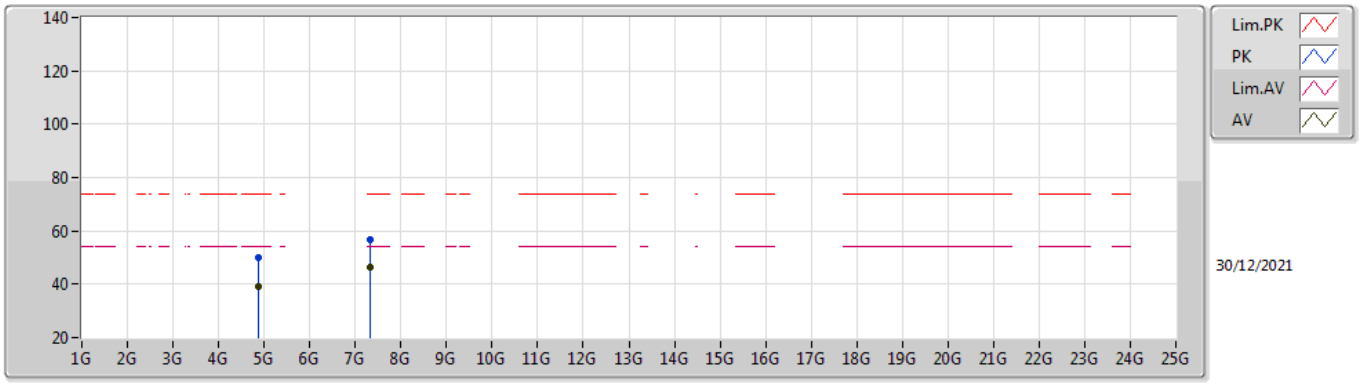


EUT Y_1TX
Setting 8
01-A-B-4

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	2.3452G	55.51	74.00	-18.49	24.31	3	Horizontal	1	1.18	-	27.40	3.80	-
AV	2.376G	43.46	54.00	-10.54	12.16	3	Horizontal	1	1.18	-	27.50	3.80	-
PK	2.4404G	106.80	Inf	-Inf	75.46	3	Horizontal	1	1.18	-	27.52	3.82	-
AV	2.44G	105.39	Inf	-Inf	74.05	3	Horizontal	1	1.18	-	27.52	3.82	-
PK	2.4856G	55.52	74.00	-18.48	23.97	3	Horizontal	1	1.18	-	27.71	3.84	-
AV	2.492G	44.29	54.00	-9.71	12.69	3	Horizontal	1	1.18	-	27.75	3.85	-

BT-LE(1Mbps)

2440MHz_TX

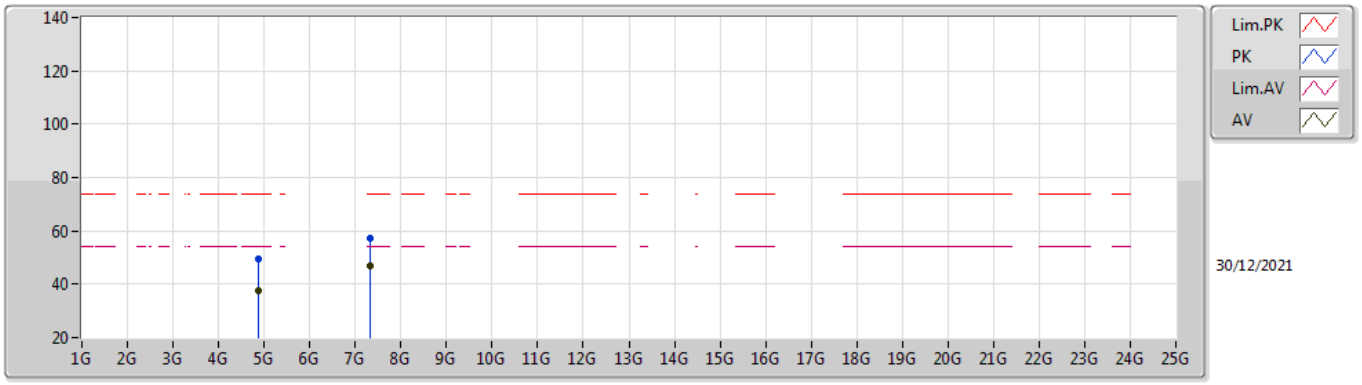


EUT Y_1TX
Setting 8
01-A-B-4

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	4.88072G	50.05	74.00	-23.95	44.17	3	Vertical	319	1.00	-	32.56	6.30	32.98
AV	4.88018G	39.33	54.00	-14.67	33.45	3	Vertical	319	1.00	-	32.56	6.30	32.98
PK	7.31946G	56.88	74.00	-17.12	45.37	3	Vertical	330	1.98	-	37.26	7.32	33.07
AV	7.31956G	46.61	54.00	-7.39	35.10	3	Vertical	330	1.98	-	37.26	7.32	33.07

BT-LE(1Mbps)

2440MHz_TX

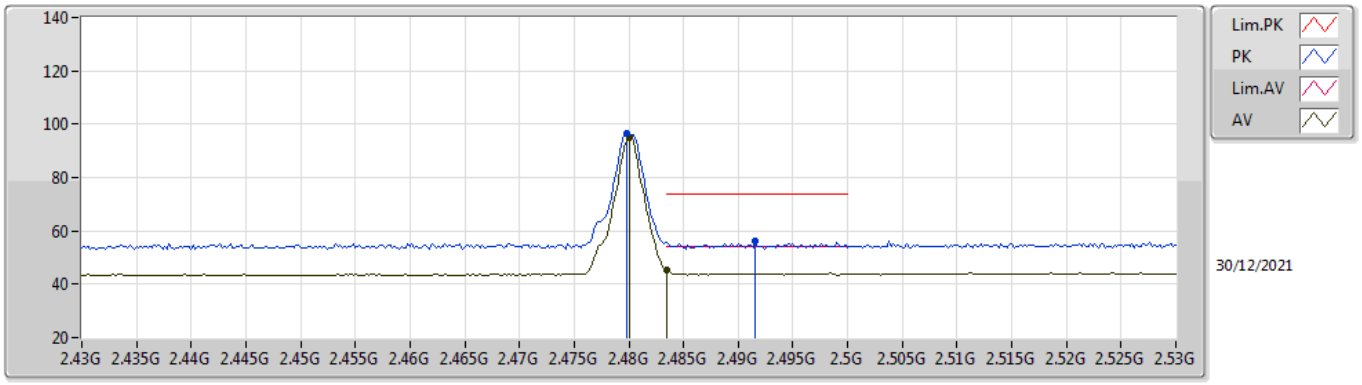


EUT Y_1TX
Setting 8
01-A-B-4

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	4.88056G	49.24	74.00	-24.76	43.36	3	Horizontal	41	1.62	-	32.56	6.30	32.98
AV	4.87952G	37.73	54.00	-16.27	31.85	3	Horizontal	41	1.62	-	32.56	6.30	32.98
PK	7.3194G	57.17	74.00	-16.83	45.67	3	Horizontal	304	2.69	-	37.26	7.32	33.08
AV	7.3195G	47.13	54.00	-6.87	35.62	3	Horizontal	304	2.69	-	37.26	7.32	33.07

BT-LE(1Mbps)

2480MHz_TX

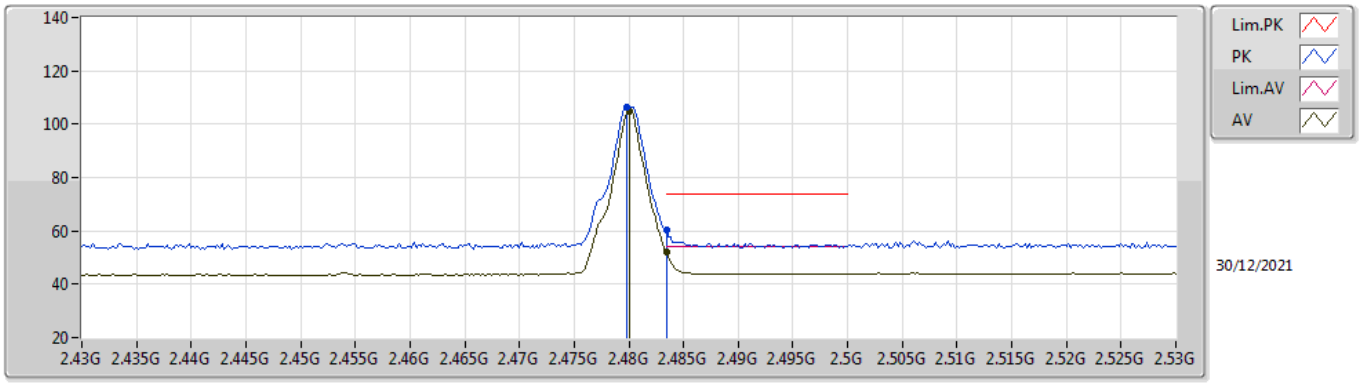


EUT Y_1TX
Setting 7
01-A-B-4

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	2.4798G	96.56	Inf	-Inf	65.04	3	Vertical	32	1.80	-	27.68	3.84	-
AV	2.48G	94.92	Inf	-Inf	63.40	3	Vertical	32	1.80	-	27.68	3.84	-
PK	2.4916G	56.09	74.00	-17.91	24.49	3	Vertical	32	1.80	-	27.75	3.85	-
AV	2.4835G	45.25	54.00	-8.75	13.71	3	Vertical	32	1.80	-	27.70	3.84	-

BT-LE(1Mbps)

2480MHz_TX

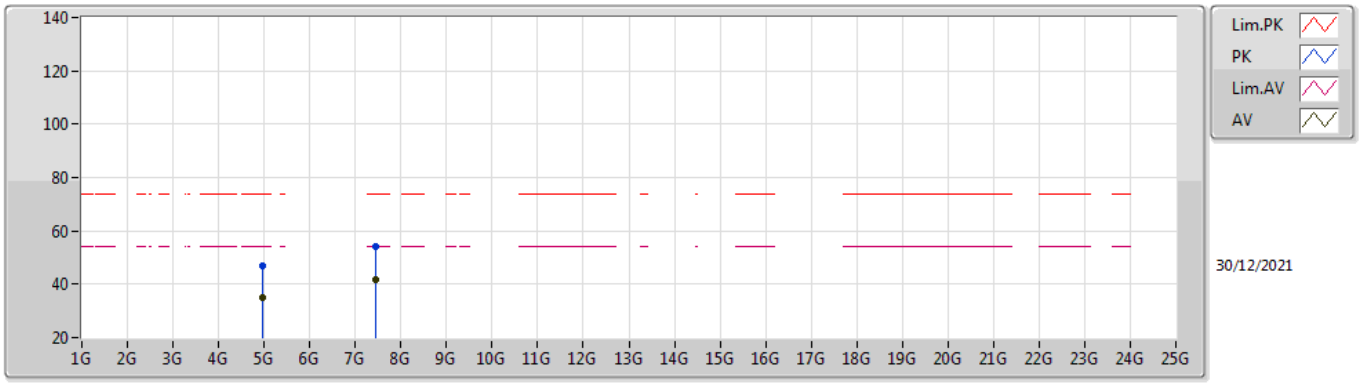


EUT Y_1TX
Setting 7
01-A-B-4

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	2.4798G	106.40	Inf	-Inf	74.88	3	Horizontal	36	1.49	-	27.68	3.84	-
AV	2.48G	104.82	Inf	-Inf	73.30	3	Horizontal	36	1.49	-	27.68	3.84	-
PK	2.4835G	60.45	74.00	-13.55	28.91	3	Horizontal	36	1.49	-	27.70	3.84	-
AV	2.4835G	52.05	54.00	-1.95	20.51	3	Horizontal	36	1.49	-	27.70	3.84	-

BT-LE(1Mbps)

2480MHz_TX

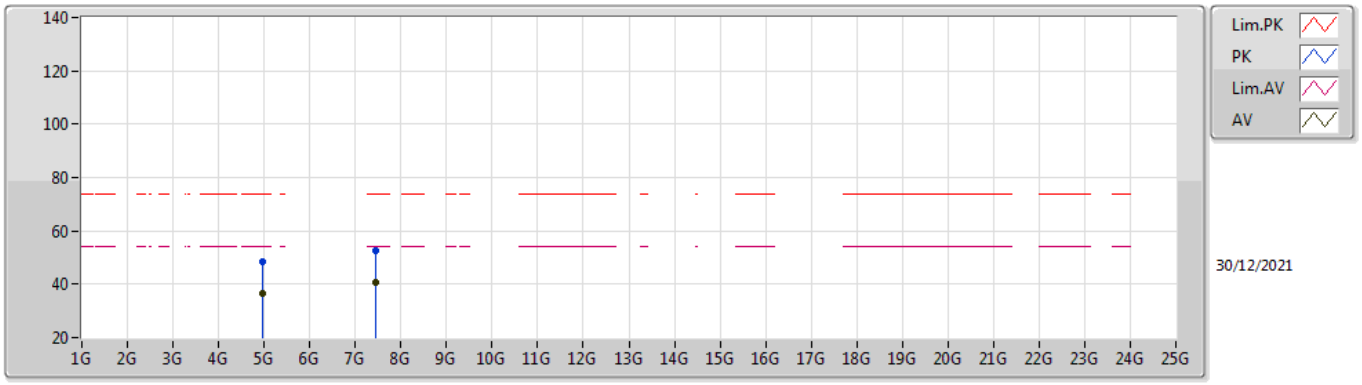


EUT Y_1TX
Setting 7
01-A-B-4

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	4.9608G	47.04	74.00	-26.96	40.95	3	Vertical	184	2.97	-	32.76	6.30	32.97
AV	4.96964G	35.07	54.00	-18.93	28.91	3	Vertical	184	2.97	-	32.82	6.30	32.96
PK	7.43912G	53.98	74.00	-20.02	42.43	3	Vertical	351	1.80	-	37.20	7.38	33.03
AV	7.43952G	41.91	54.00	-12.09	30.36	3	Vertical	351	1.80	-	37.20	7.38	33.03

BT-LE(1Mbps)

2480MHz_TX



EUT Y_1TX
Setting 7
01-A-B-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	4.95948G	48.44	74.00	-25.56	42.35	3	Horizontal	31	1.00	-	32.76	6.30	32.97
AV	4.96024G	36.73	54.00	-17.27	30.64	3	Horizontal	31	1.00	-	32.76	6.30	32.97
PK	7.44672G	52.75	74.00	-21.25	41.20	3	Horizontal	70	2.25	-	37.20	7.38	33.03
AV	7.44668G	40.62	54.00	-13.38	29.07	3	Horizontal	70	2.25	-	37.20	7.38	33.03