FCC RADIO TEST REPORT

FCC ID	:	2AXI2-ATM2-MOD-A-00
Equipment	:	Bluetooth 5.0 Module
Brand Name	:	Atmosic
Model Name	:	ATM2-MOD-A
Applicant	:	Atmosic Technologies 910 E Hamilton Ave, Suite 550 Campbell, CA 95008, USA
Manufacturer	:	Atmosic Technologies 910 E Hamilton Ave, Suite 550 Campbell, CA 95008, USA
Standard	:	47 CFR FCC Part 15.247

The product was received on Jul. 15, 2020, and testing was started from Jul. 15, 2020 and completed on Aug. 26, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications 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. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR073107	01	Initial issue of report	Sep. 29, 2020

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:

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: Sandy Chuang

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
2.4-2.4835GHz	BT-LE(500Kb/s)	1	1
2.4-2.4835GHz	BT-LE(125Kb/s)	1	1
2.4-2.4835GHz	BT-LE(2Mbps)	2	1

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

1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	1	Atmosic	BT 001	Printed	N/A	4.42	TX/RX
2	1	Airgian	AIR24002	Dipole	SMA	2	RX

Note: The above information was declared by manufacturer.

For Bluetooth Function <1TX/1RX>

Ant. 1 can be use as transmitting/receiving antenna.

For Wakeup Function<1RX>

Ant. 2 can be use as receiving antenna.

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.852	0.7	2.13m	1k
BT-LE(2Mbps)	0.408	3.89	2.249m	1k

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

1.1.4 EUT Operational Condition

EUT Power Type	From host system			
Function	☐	Point-to-multipoint	☒	Point-to-point
Test Software Version	Atmosic RF Tool_V1.3			
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.

1.2 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
- 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			
☐	HWA YA	ADD :	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)
		TEL :	886-3-327-3456 FAX : 886-3-327-0973
☒	JHUBEI	ADD :	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
		TEL :	886-3-656-9065 FAX : 886-3-656-9085

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH03-CB	Lance Huang	24.5-25.7°C / 54-57%	Aug. 19, 2020~ Aug. 20, 2020
Radiated <Below 1GHz>	03CH05-CB	Eason Chen	24.8-26.2°C / 50~53%	Aug. 21, 2020~ Aug. 22, 2020
Radiated <Above 1GHz>	03CH04-CB	Paul Chen	23.6-25.3 °C / 54-57%	Jul. 15, 2020
AC Conduction	CO01-CB	GN Hou	22~24°C / 56~59%	Aug. 26, 2020

Test site Designation No. TW0006 with FCC.
Test site registered number IC 4086D with Industry Canada.

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)	2.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.9 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.6 dB	Confidence levels of 95%
Conducted Emission	2.8 dB	Confidence levels of 95%
Output Power Measurement	1.4 dB	Confidence levels of 95%
Power Density Measurement	2.8 dB	Confidence levels of 95%
Bandwidth Measurement	0.39%	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	Power Setting
BT-LE(1Mbps)	-
2402MHz	7
2440MHz	7
2480MHz	7
BT-LE(2Mbps)	-
2402MHz	7
2440MHz	7
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
Operating Mode	Normal Link
1	EUT_Bluetooth
2	EUT_Wakeup Receiver
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	EUT_Bluetooth in Z-axis
2	EUT_Wakeup Receiver in Z-axis
For operating mode 1 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
The EUT can be placed in X-axis, Y-axis and Z-axis. After evaluating, Z-axis was the worst case, so the test will follow this same test configuration.	

2.3 EUT Operation during Test

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

For Normal Link:

During the test, the EUT operation to normal function.

2.4 Accessories

N/A

2.5 Support Equipment

For AC Conduction:

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	NB	DELL	E6430	N/A
B	Earphone	e-Power	S90W	N/A
C	Mouse	HP	FM100	N/A
D	Fixture B	ATMOSIC	INTERFACE BOARD V2.1	N/A
E	Fixture A	ATMOSIC	ATM2202 M2L4A	N/A
F	Smart phone	Samsung	Galaxy J2	A3LSMJ200F

For Radiated (below 1GHz):

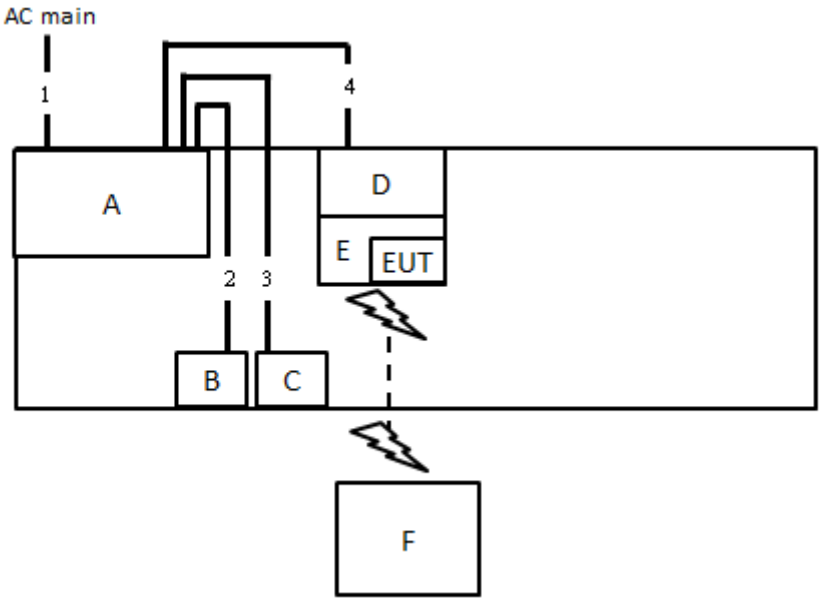
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	NB	DELL	E4300	N/A
B	Smart phone	Samsung	Galaxy J2	A3LSMJ200F
C	Earphone	SHYARO CHI	MIC-04	N/A
D	Mouse	Logitech	M-U0026	N/A
E	Fixture B	ATMOSIC	INTERFACE BOARD V2.1	N/A
F	Fixture A	ATMOSIC	ATM2202 M2L4A	N/A

For Radiated (above 1GHz) and RF Conducted:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	NB	DELL	E4300	N/A
B	Fixture	ATMOSIC	ATM2202 M2L4A	N/A
C	Fixture	ATMOSIC	INTERFACE BOARD V2.1	N/A

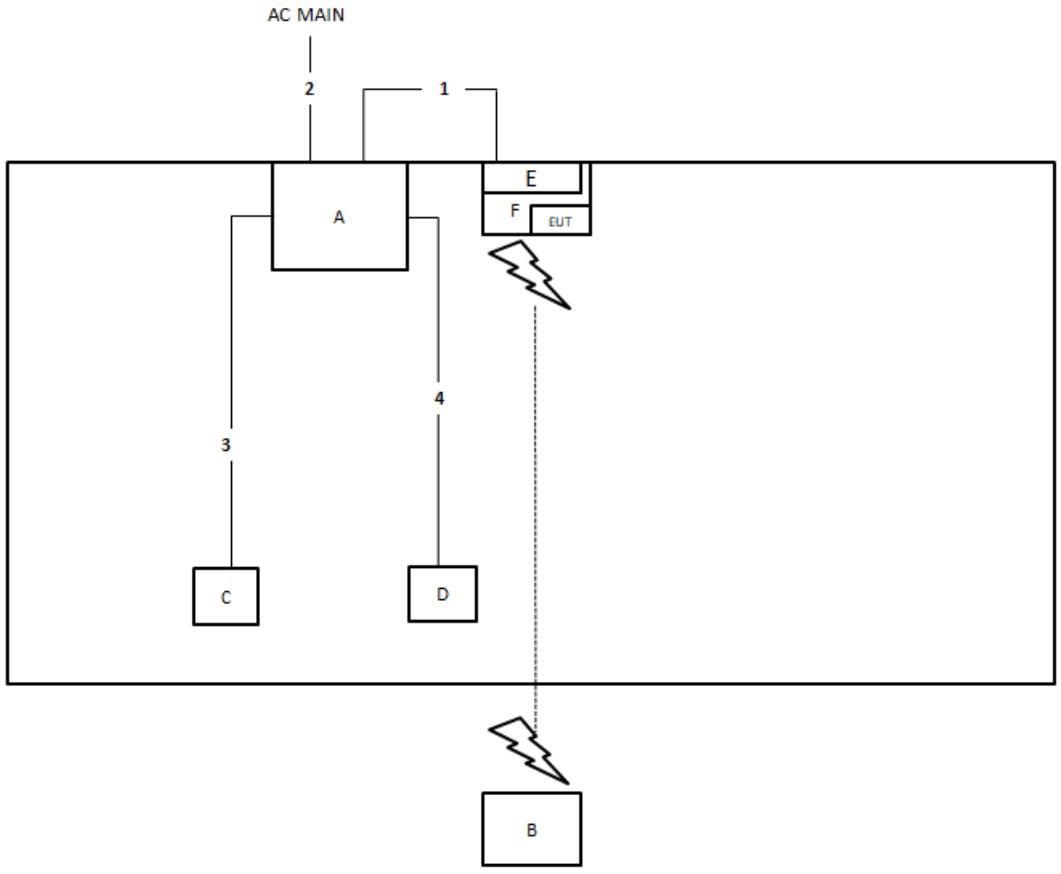
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



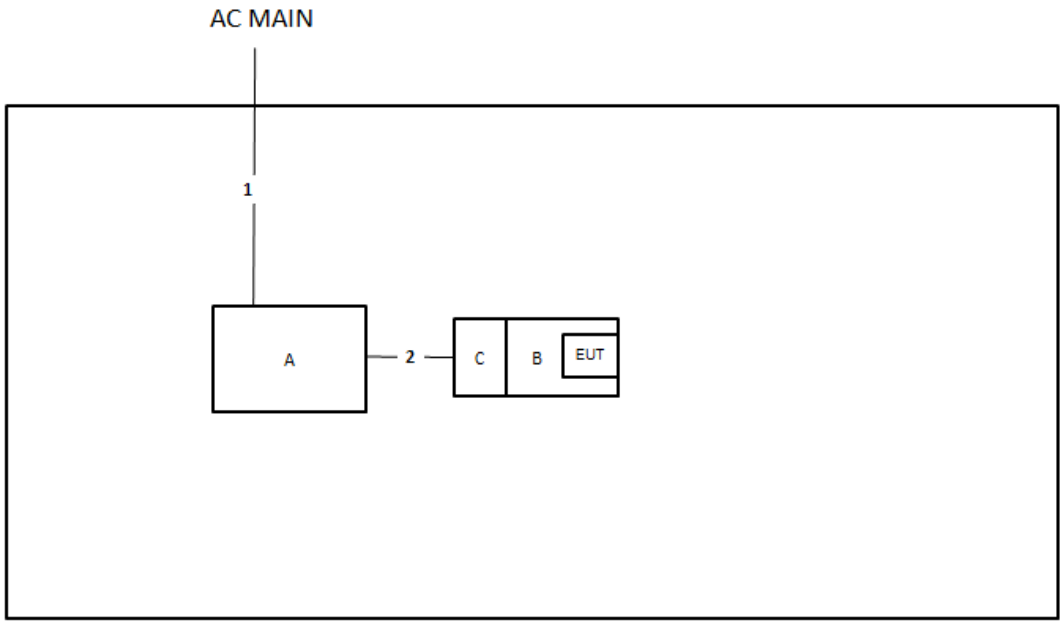
Item	Connection	Shielded	Length
1	Power cable	No	3.1m
2	Audio cable	No	1.8m
3	USB cable	Yes	1.8m
4	USB cable	Yes	1m

Test Setup Diagram - Radiated Test < 1GHz



Item	Connection	Shielded	Length
1	USB cable	Yes	1m
2	Power cable	No	3.1m
3	Audio cable	No	1.1m
4	USB cable	Yes	1.8m

Test Setup Diagram - Radiated Test > 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	3.1m
2	USB cable	Yes	1m

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

3.1.2 Measuring Instruments

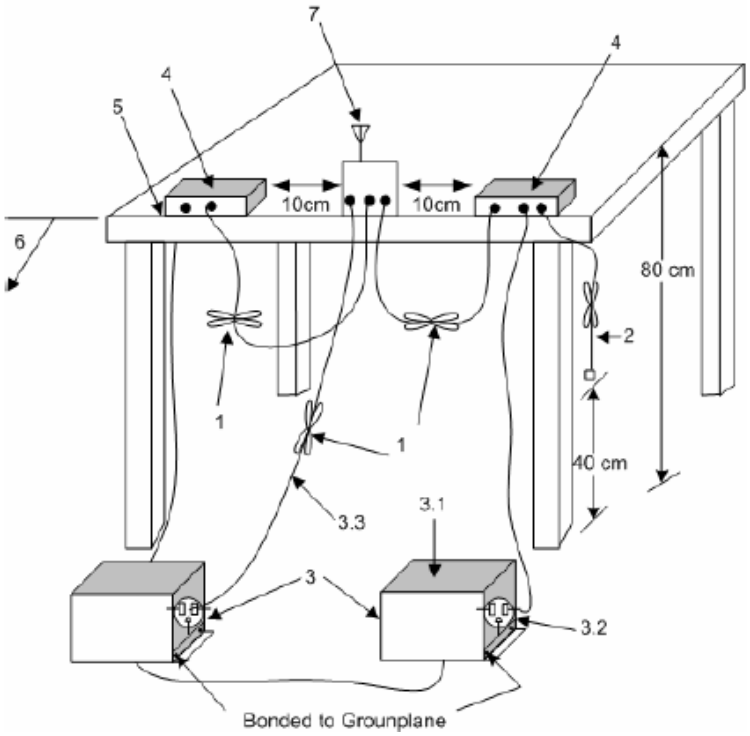
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

3.1.4 Test Setup

AC Power-line Conducted Emissions



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

3.1.5 Measurement Results Calculation

The measured Level is calculated using:

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

b. Margin = -Limit + Level

3.1.6 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

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

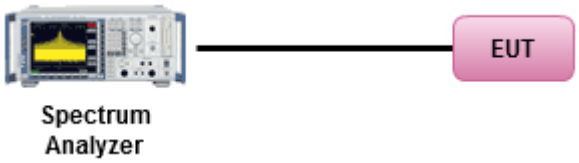
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

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

3.2.4 Test Setup

Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

Refer as Appendix B

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

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

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

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

3.3.4 Test Setup

Maximum Conducted Output Power (Power Meter)


3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

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

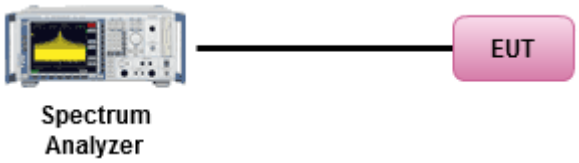
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method		
▪ Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).		
	☒ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10 Method Max. PSD.	
	[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.	

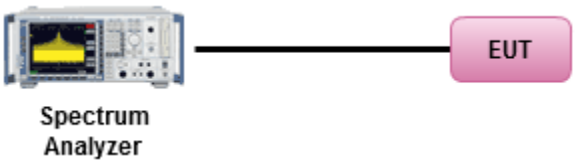
3.5.2 Measuring Instruments

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.

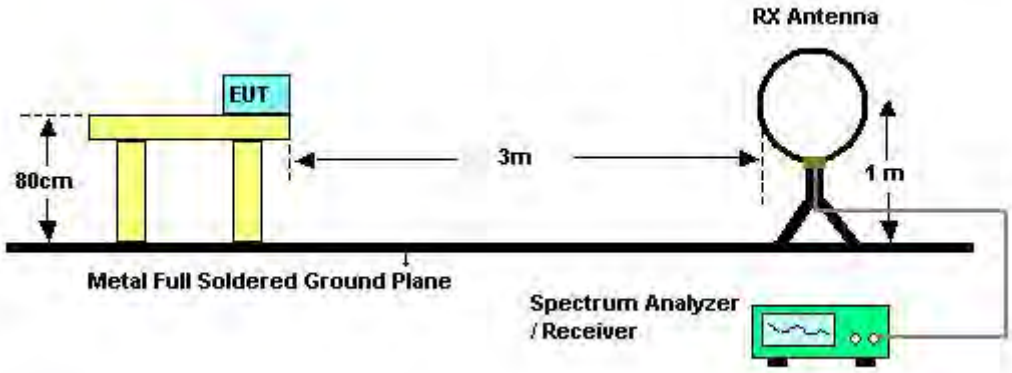
3.6.3 Test Procedures

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.		

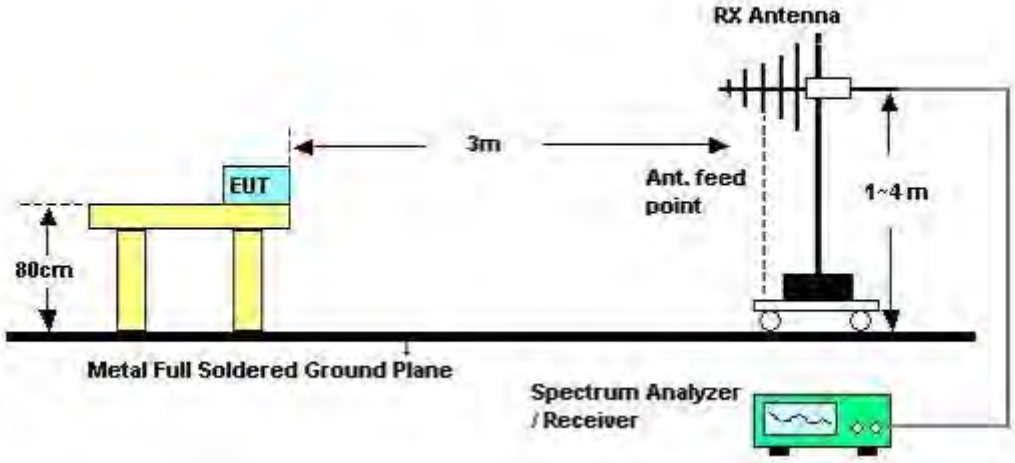
3.6.4 Test Setup

Emissions in Restricted Frequency Bands

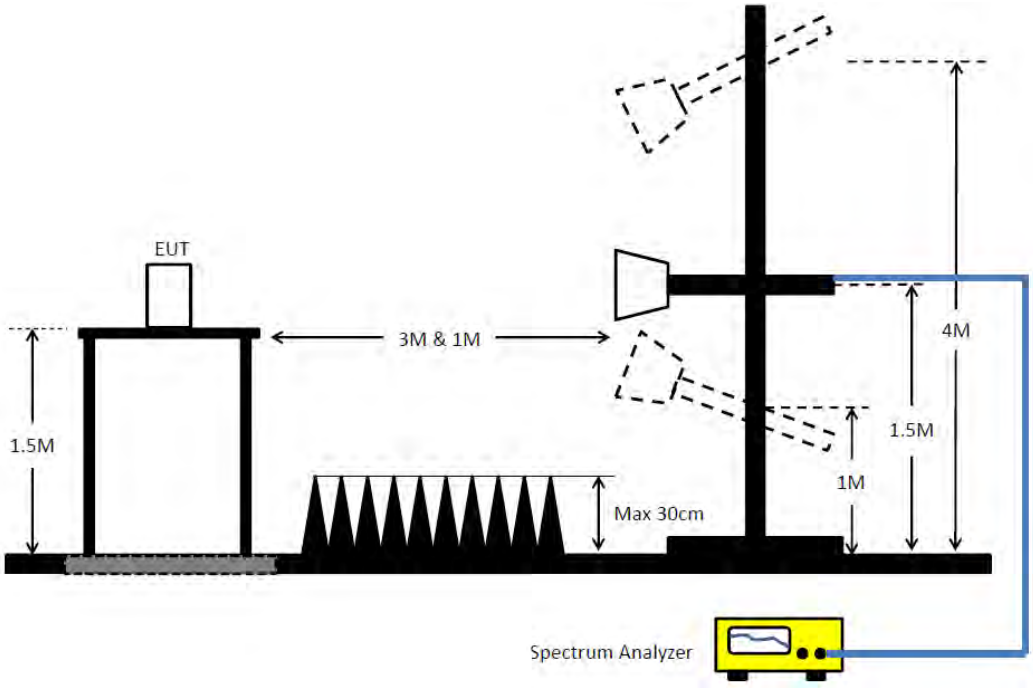
9kHz ~30MHz



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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Feb. 26, 2020	Feb. 25, 2021	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 25, 2019	Dec. 24, 2020	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Feb. 25, 2020	Feb. 24, 2021	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 31, 2020	Jan. 30, 2021	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 20, 2020	May 19, 2021	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 27, 2020	Mar. 26, 2021	Radiation (03CH05-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 13, 2020	Apr. 12, 2021	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 28, 2020	Apr. 27, 2021	Radiation (03CH05-CB)
Signal Analyzer	R&S	FSV40	101904	9kHz ~ 40GHz	May 12, 2020	May 11, 2021	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 13, 2020	May 12, 2021	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	LOW Cable-04+23	30MHz~1GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)
Horn Antenna	ETS・Lindgren	3115	00143147	750MHz~18GHz	Oct. 22, 2019	Oct. 21, 2020	Radiation (03CH04-CB)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 11, 2020	Jun. 10, 2021	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Jul. 14, 2020	Jul. 13, 2021	Radiation (03CH04-CB)
Amplifier	-	-	TF-130N-R1	18GHz ~ 40GHz	Jun. 19, 2020	Jun. 18, 2021	Radiation (03CH04-CB)
Spectrum Analyzer	R&S	FSP40	100142	9kHz~40GHz	Dec. 18, 2019	Dec. 17, 2020	Radiation (03CH04-CB

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-21	1GHz - 18GHz	Feb. 01, 2020	Jan. 31, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21	1GHz - 18GHz	Jul. 07, 2020	Jul. 06, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-21+22	1GHz - 18GHz	Feb. 01, 2020	Jan. 31, 2021	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 24, 2019	Jul. 23, 2020	Radiation (03CH04-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH04-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Nov. 01, 2019	Oct. 31, 2020	Conducted (TH03-CB)
Power Sensor	Anritsu	MA2411B	1531343	300MHz~40GHz	Aug. 04, 2020	Aug. 03, 2021	Conducted (TH03-CB)
Power Meter	Anritsu	ML2495A	1728001	300MHz~40GHz	Aug. 04, 2020	Aug. 03, 2021	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-11	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-12	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-13	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-14	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-15	1 GHz – 26.5 GHz	Oct. 07, 2019	Oct. 06, 2020	Conducted (TH03-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conducted (TH03-CB)

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

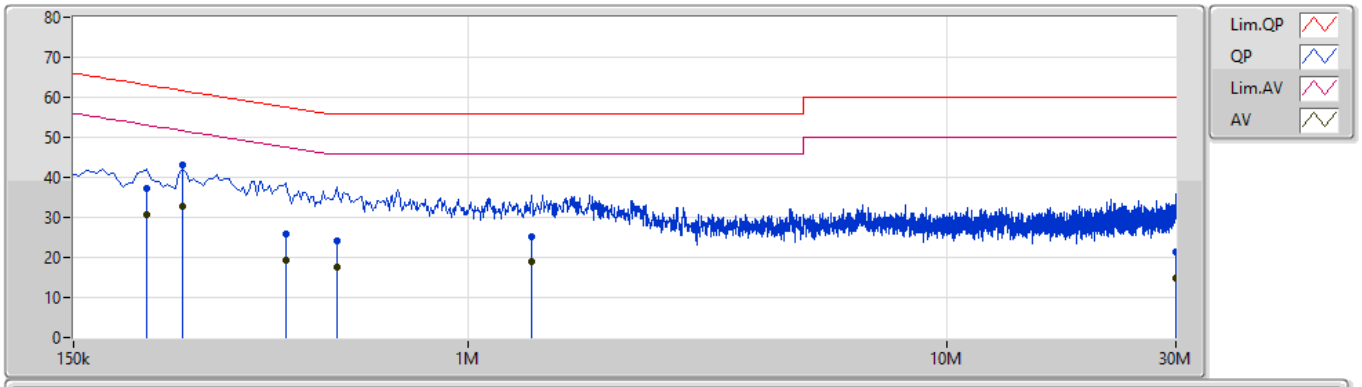
NCR means Non-Calibration required.

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Condition
Mode 1	Pass	QP	253.5k	45.27	61.64	-16.37	Neutral

Mode 1

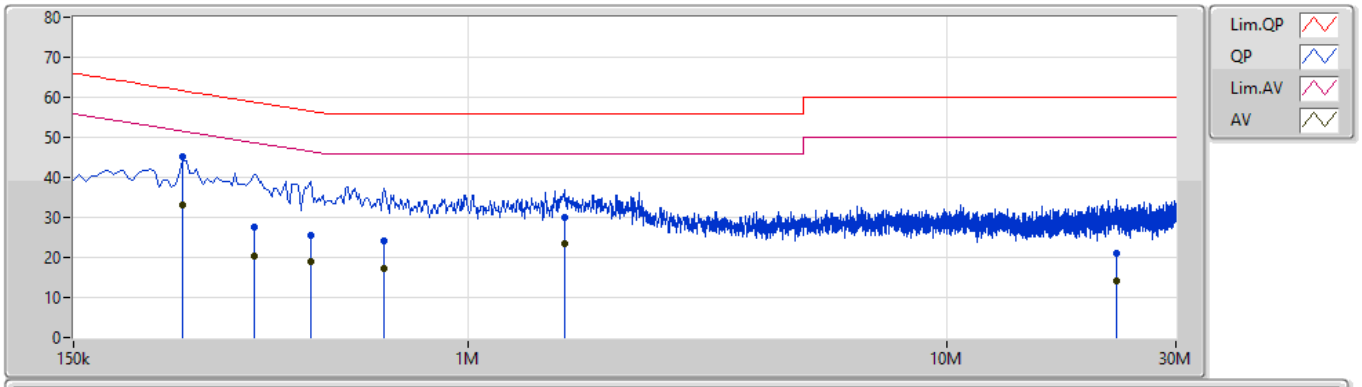
26/08/2020



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	AF	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	213k	37.16	63.09	-25.93	9.86	Line	-	27.30	0.04	0.03	9.79
AV	213k	30.56	53.09	-22.53	9.86	Line	-	20.70	0.04	0.03	9.79
QP	253.5k	43.21	61.64	-17.43	9.87	Line	"Worst"	34.34	0.04	0.03	9.80
AV	253.5k	32.91	51.64	-18.73	9.87	Line	-	23.04	0.04	0.03	9.80
QP	415.5k	26.02	57.53	-31.51	9.88	Line	-	16.14	0.04	0.03	9.81
AV	415.5k	19.42	47.53	-28.11	9.88	Line	-	9.54	0.04	0.03	9.81
QP	532.5k	24.29	56.00	-31.71	9.88	Line	-	14.41	0.04	0.03	9.81
AV	532.5k	17.49	46.00	-28.51	9.88	Line	-	7.61	0.04	0.03	9.81
QP	1.352M	25.23	56.00	-30.77	9.92	Line	-	15.31	0.05	0.05	9.82
AV	1.352M	19.06	46.00	-26.94	9.92	Line	-	9.14	0.05	0.05	9.82
QP	29.954M	21.42	60.00	-38.58	10.65	Line	-	10.77	0.30	0.30	10.05
AV	29.954M	14.74	50.00	-35.26	10.65	Line	-	4.09	0.30	0.30	10.05

Mode 1

26/08/2020



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	AF	CL	AT			
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)			
QP	253.5k	45.27	61.64	-16.37	9.87	Neutral	"Worst"	35.40	0.04	0.03	9.80			
AV	253.5k	32.98	51.64	-18.66	9.87	Neutral	-	23.11	0.04	0.03	9.80			
QP	357k	27.42	58.79	-31.37	9.88	Neutral	-	17.54	0.04	0.03	9.81			
AV	357k	20.51	48.79	-28.28	9.88	Neutral	-	10.63	0.04	0.03	9.81			
QP	469.5k	25.57	56.52	-30.95	9.88	Neutral	-	15.69	0.04	0.03	9.81			
AV	469.5k	18.90	46.52	-27.62	9.88	Neutral	-	9.02	0.04	0.03	9.81			
QP	667.5k	24.18	56.00	-31.82	9.91	Neutral	-	14.27	0.05	0.04	9.82			
AV	667.5k	17.39	46.00	-28.61	9.91	Neutral	-	7.48	0.05	0.04	9.82			
QP	1.586M	30.12	56.00	-25.88	9.96	Neutral	-	20.16	0.07	0.06	9.83			
AV	1.586M	23.61	46.00	-22.39	9.96	Neutral	-	13.65	0.07	0.06	9.83			
QP	22.574M	20.94	60.00	-39.06	10.59	Neutral	-	10.35	0.25	0.33	10.01			
AV	22.574M	14.11	50.00	-35.89	10.59	Neutral	-	3.52	0.25	0.33	10.01			

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)	720k	1.037M	1M04F1D	705k	1.028M
BT-LE(2Mbps)	1.37M	2.016M	2M02F1D	1.361M	2.004M

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

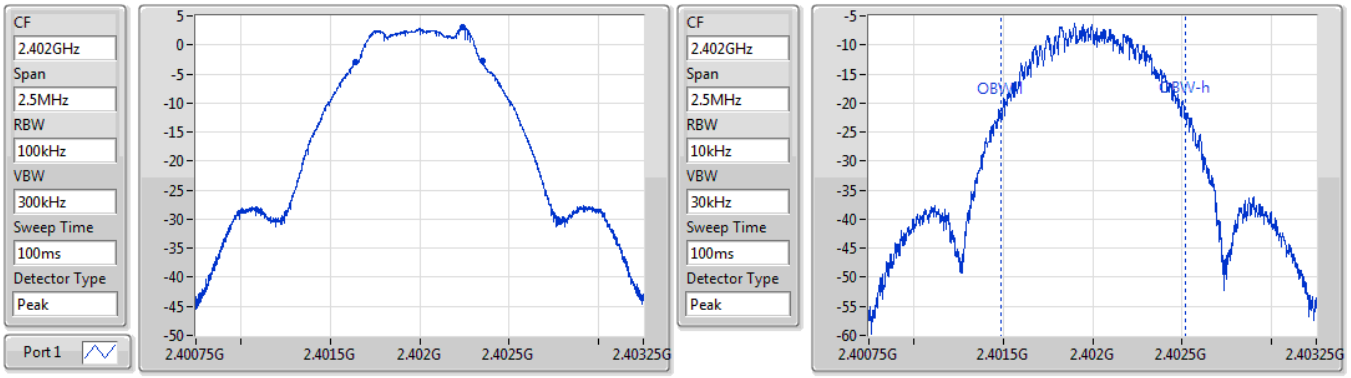
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	707.5k	1.028M
2440MHz	Pass	500k	705k	1.031M
2480MHz	Pass	500k	720k	1.037M
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	500k	1.361M	2.004M
2440MHz	Pass	500k	1.365M	2.009M
2480MHz	Pass	500k	1.37M	2.016M

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

BT-LE(1Mbps) EBW

2402MHz

20/08/2020

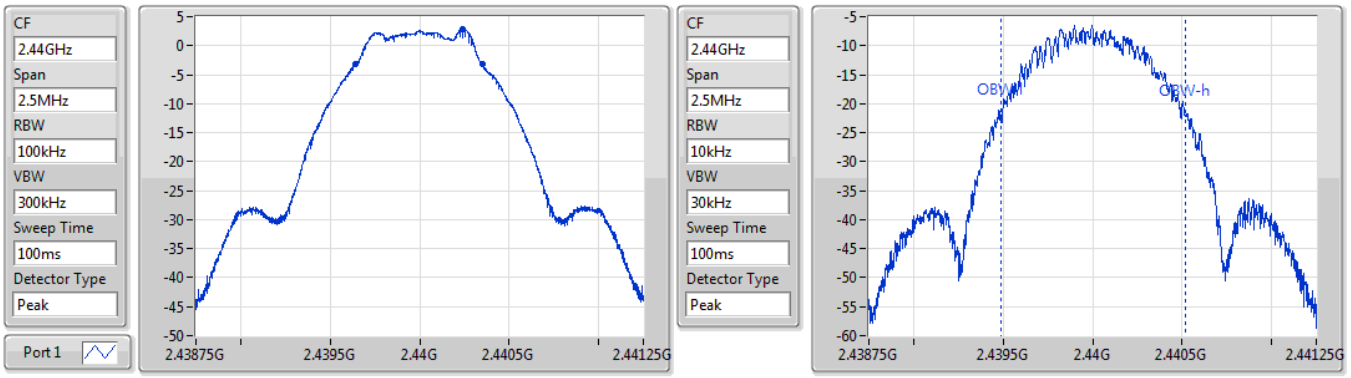


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
707.5k	2.401643G	2.40235G	1.028M	2.401488G	2.402516G	500k	1

BT-LE(1Mbps) EBW

2440MHz

20/08/2020



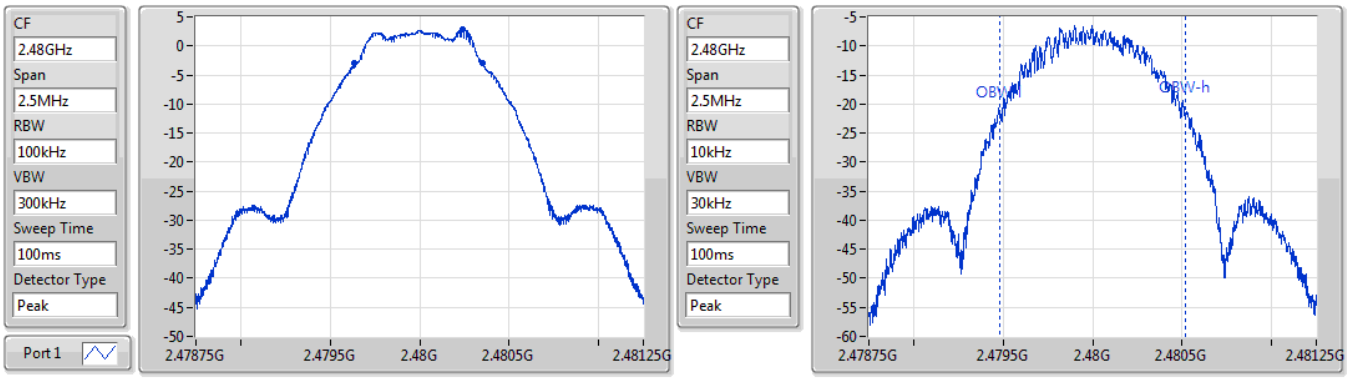
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
705k	2.439644G	2.440349G	1.031M	2.439487G	2.440517G	500k	1

BT-LE(1Mbps)

EBW

2480MHz

20/08/2020



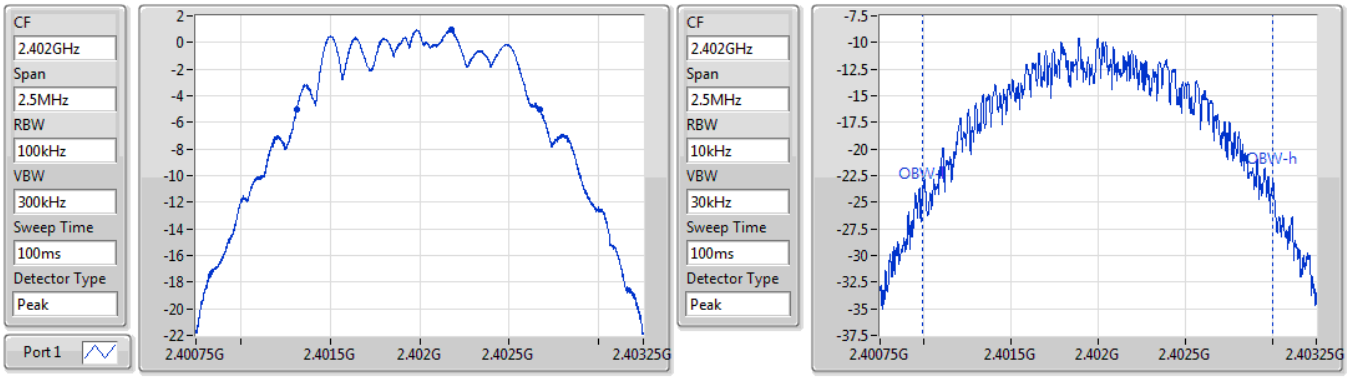
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
720k	2.479634G	2.480354G	1.037M	2.479484G	2.480521G	500k	1

BT-LE(2Mbps)

EBW

2402MHz

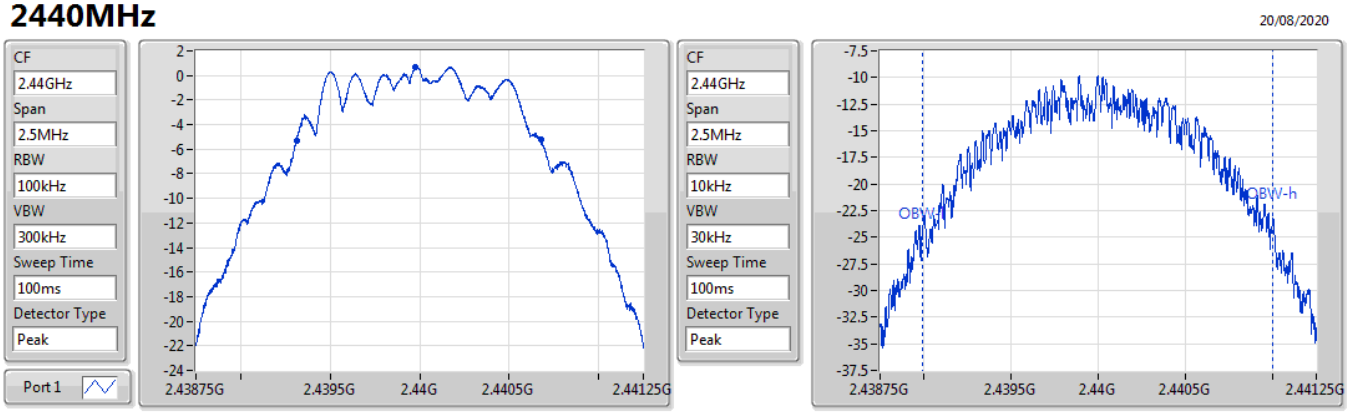
20/08/2020



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.361M	2.401313G	2.402674G	2.004M	2.400994G	2.402998G	500k	1

BT-LE(2Mbps) EBW

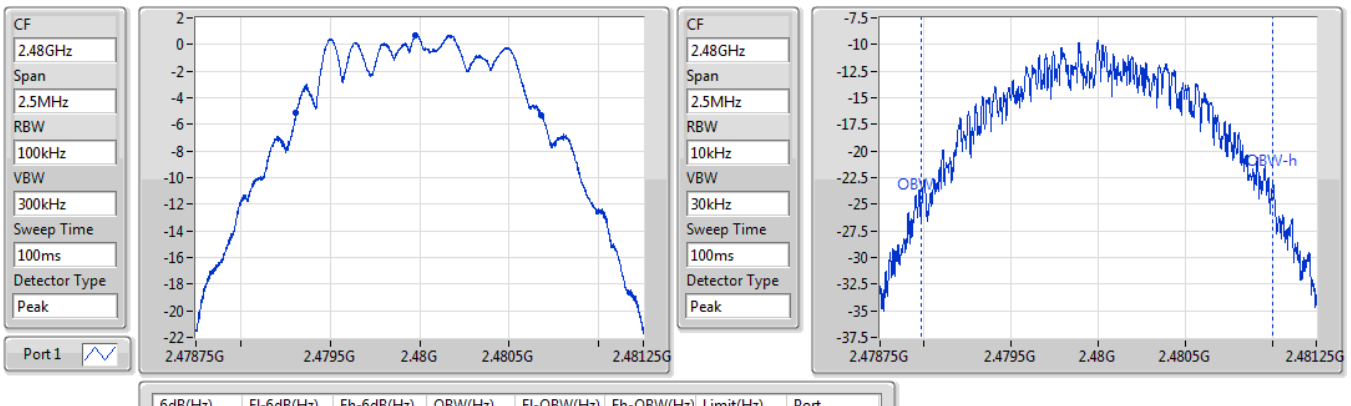
2440MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.365M	2.439311G	2.440676G	2.009M	2.438992G	2.441001G	500k	1

BT-LE(2Mbps) EBW

2480MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.37M	2.47931G	2.48068G	2.016M	2.478987G	2.481003G	500k	1

Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	3.67	0.00233
BT-LE(2Mbps)	3.68	0.00233

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.42	3.67	30.00
2440MHz	Pass	4.42	3.50	30.00
2480MHz	Pass	4.42	3.57	30.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	4.42	3.68	30.00
2440MHz	Pass	4.42	3.51	30.00
2480MHz	Pass	4.42	3.58	30.00

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

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-13.28
BT-LE(2Mbps)	-18.50

RBW=3 kHz.

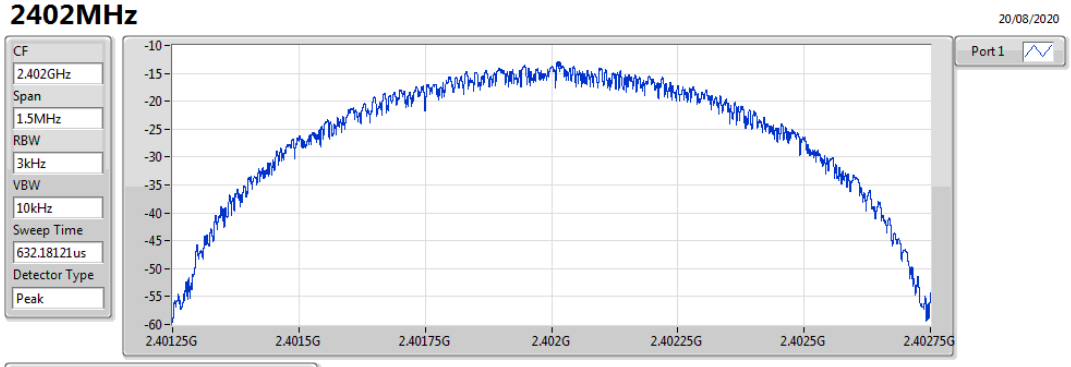
Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.42	-13.28	8.00
2440MHz	Pass	4.42	-13.63	8.00
2480MHz	Pass	4.42	-13.75	8.00
BT-LE(2Mbps)	-	-	-	-
2402MHz	Pass	4.42	-18.50	8.00
2440MHz	Pass	4.42	-18.91	8.00
2480MHz	Pass	4.42	-18.80	8.00

DG = Directional Gain; RBW=3 kHz;
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**

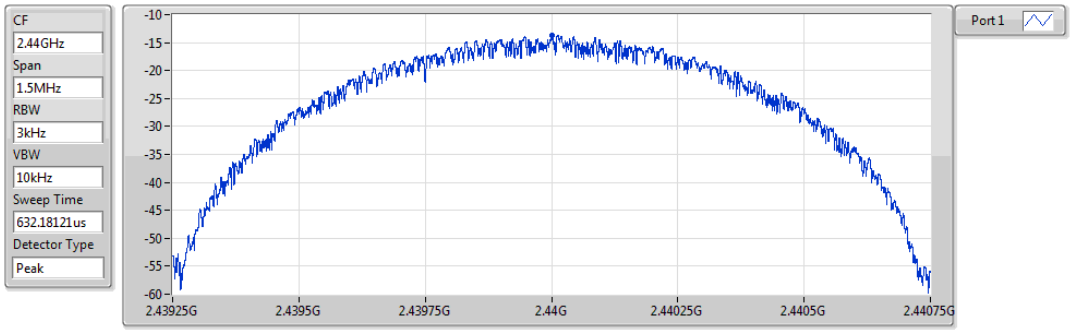
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.28	-13.28	-13.28

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

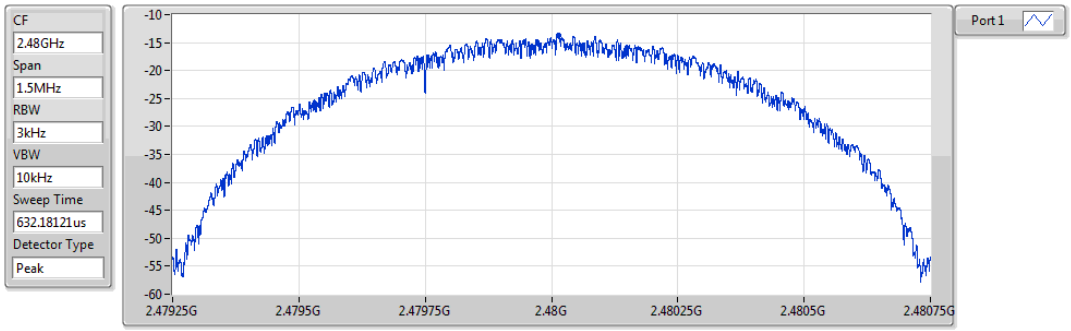
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.63	-13.63	-13.63

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

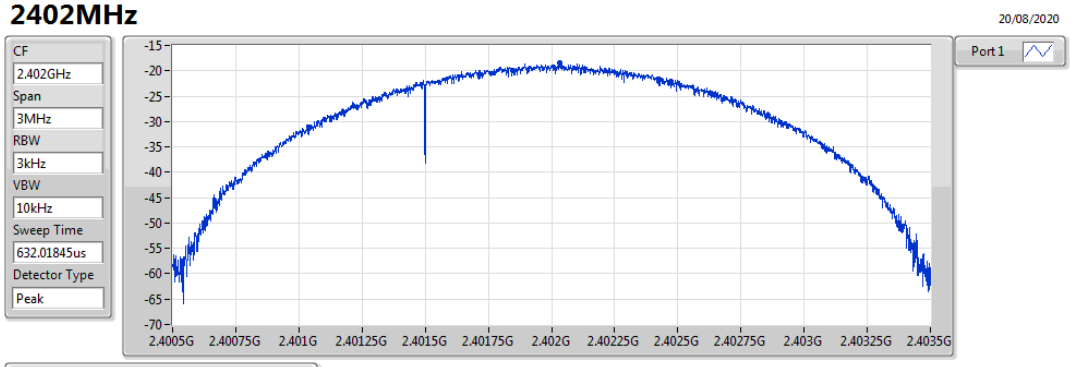
2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.75	-13.75	-13.75

BT-LE(2Mbps) **PSD**

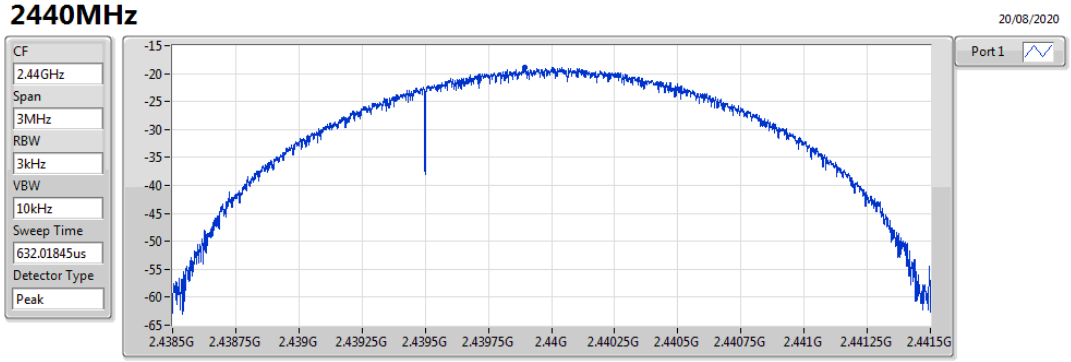
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-18.50	-18.50	-18.50

BT-LE(2Mbps) **PSD**

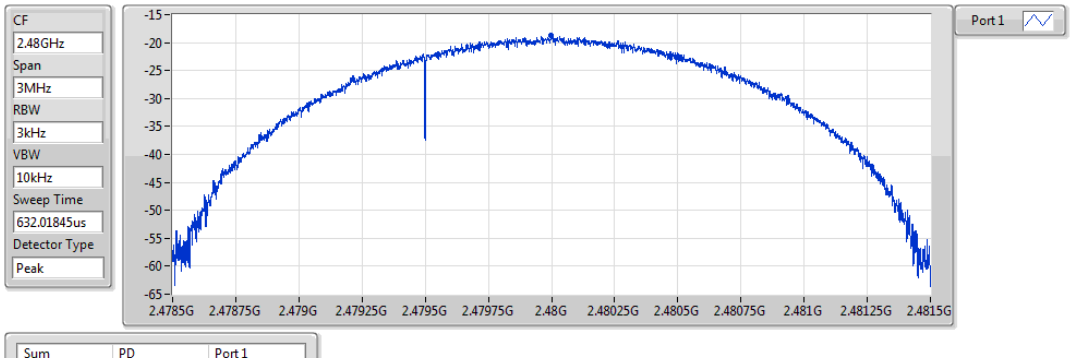
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-18.91	-18.91	-18.91

BT-LE(2Mbps) **PSD**

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-18.80	-18.80	-18.80

Summary

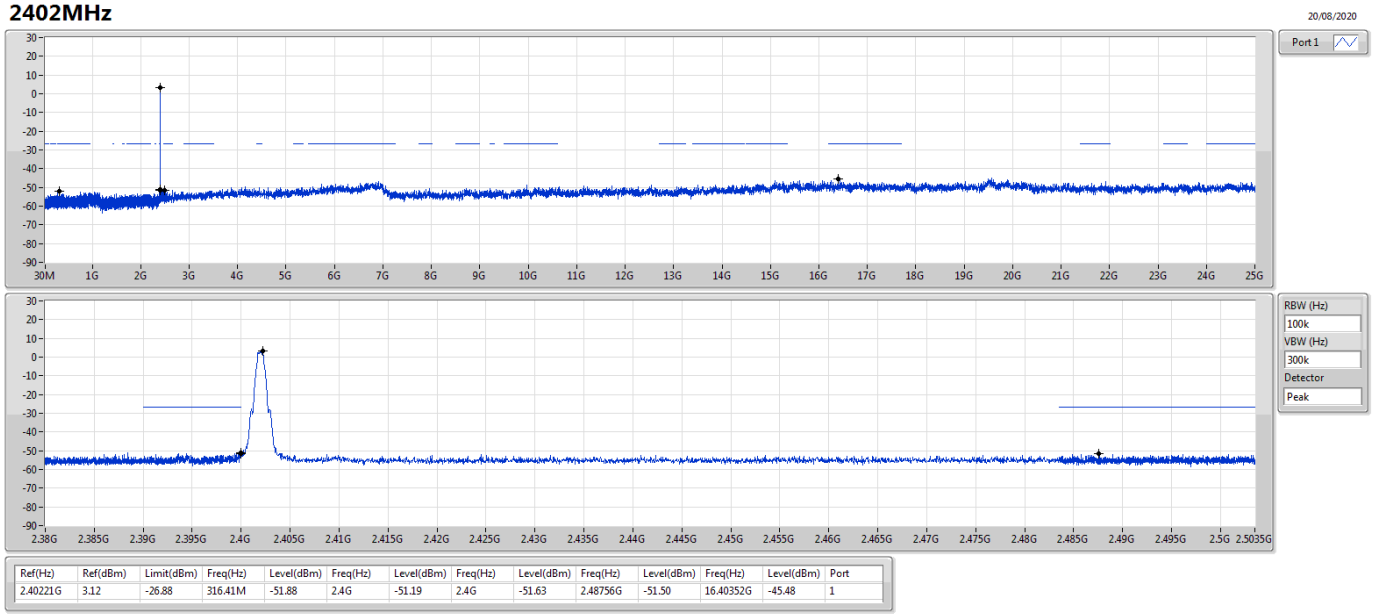
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.40221G	3.12	-26.88	316.41M	-51.88	2.4G	-51.19	2.4G	-51.63	2.48756G	-51.50	16.40352G	-45.48	1
BT-LE(2Mbps)	Pass	2.40196G	0.88	-29.12	2.08889G	-52.60	2.39999G	-31.20	2.4G	-31.80	2.50235G	-51.57	16.96031G	-45.94	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	2.40221G	3.12	-26.88	316.41M	-51.88	2.4G	-51.19	2.4G	-51.63	2.48756G	-51.50	16.40352G	-45.48	1
2440MHz	Pass	2.40221G	3.12	-26.88	943.86M	-51.57	2.39903G	-52.15	2.4G	-54.54	2.49245G	-51.44	16.3276G	-46.31	1
2480MHz	Pass	2.40221G	3.12	-26.88	829.29M	-52.62	2.39425G	-52.57	2.4835G	-53.95	2.48746G	-51.53	15.33494G	-45.98	1
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.40196G	0.88	-29.12	2.08889G	-52.60	2.39999G	-31.20	2.4G	-31.80	2.50235G	-51.57	16.96031G	-45.94	1
2440MHz	Pass	2.40196G	0.88	-29.12	2.19611G	-52.61	2.39791G	-51.69	2.4835G	-54.34	2.50334G	-51.38	6.74409G	-46.25	1
2480MHz	Pass	2.40196G	0.88	-29.12	1.85184G	-52.03	2.39531G	-51.77	2.4835G	-50.86	2.48383G	-48.56	16.85345G	-45.56	1

BT-LE(1Mbps) **CSE NdB**

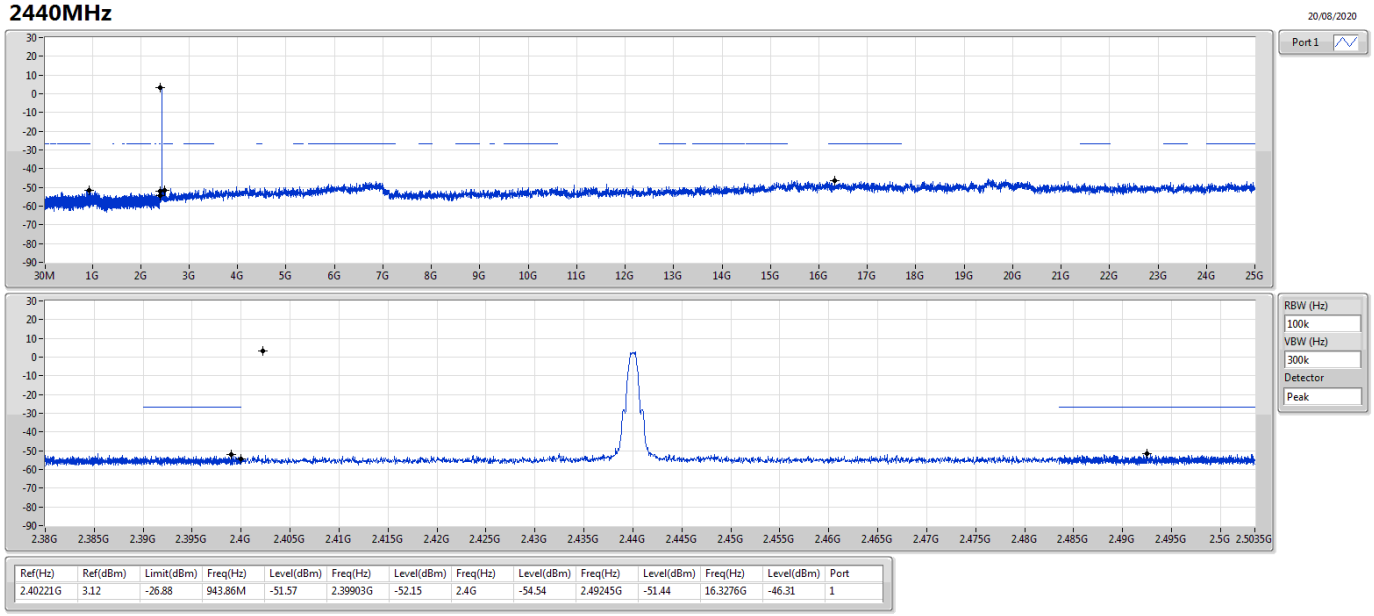
2402MHz



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
2.40221G	3.12	-26.88	316.41M	-51.88	2.4G	-51.19	2.4G	-51.63	2.48756G	-51.50	16.40352G	-45.48	1

BT-LE(1Mbps) **CSE NdB**

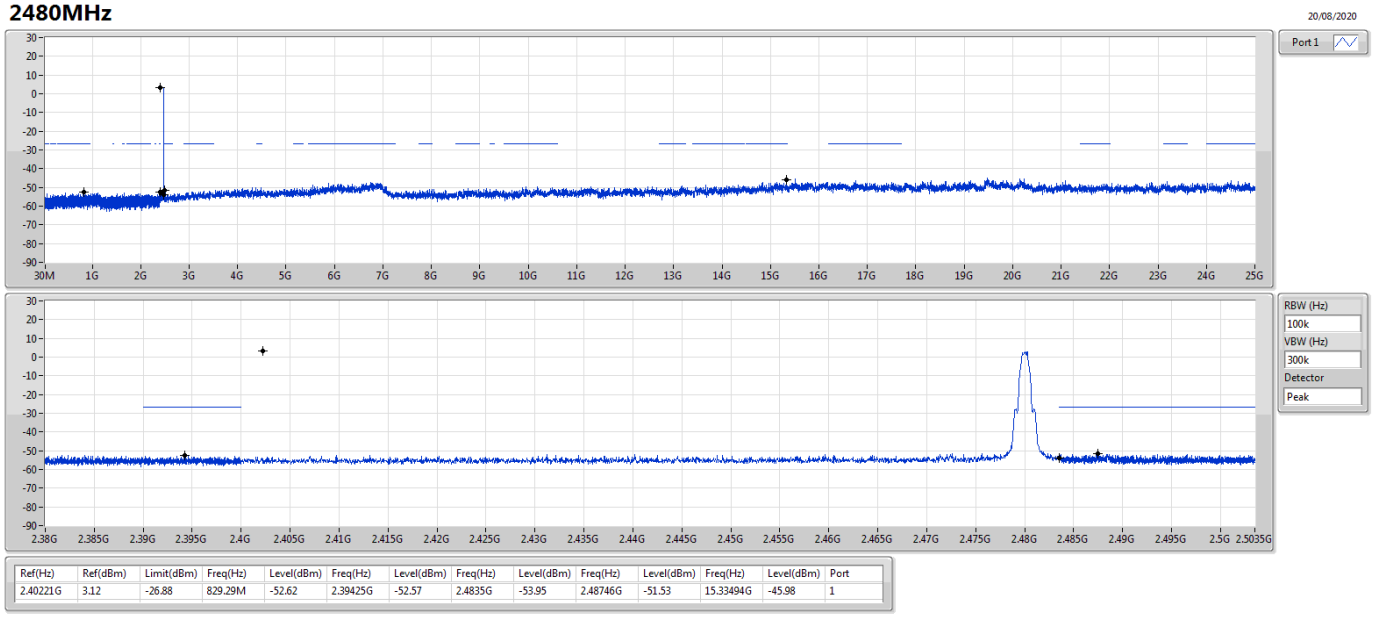
2440MHz



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
2.40221G	3.12	-26.88	943.86M	-51.57	2.39903G	-52.15	2.4G	-54.54	2.49245G	-51.44	16.3276G	-46.31	1

BT-LE(1Mbps) **CSE NdB**

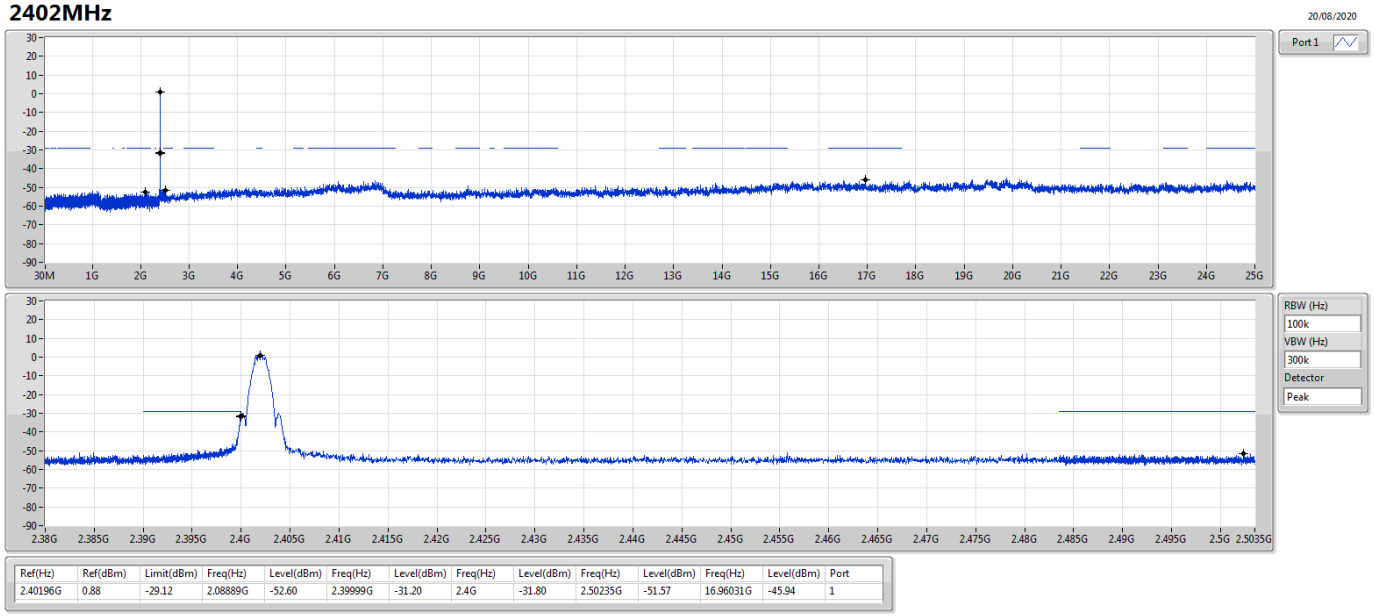
2480MHz



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
2.40221G	3.12	-26.88	829.29M	-52.62	2.39425G	-52.57	2.4835G	-53.95	2.48746G	-51.53	15.33494G	-45.98	1

BT-LE(2Mbps) **CSE NdB**

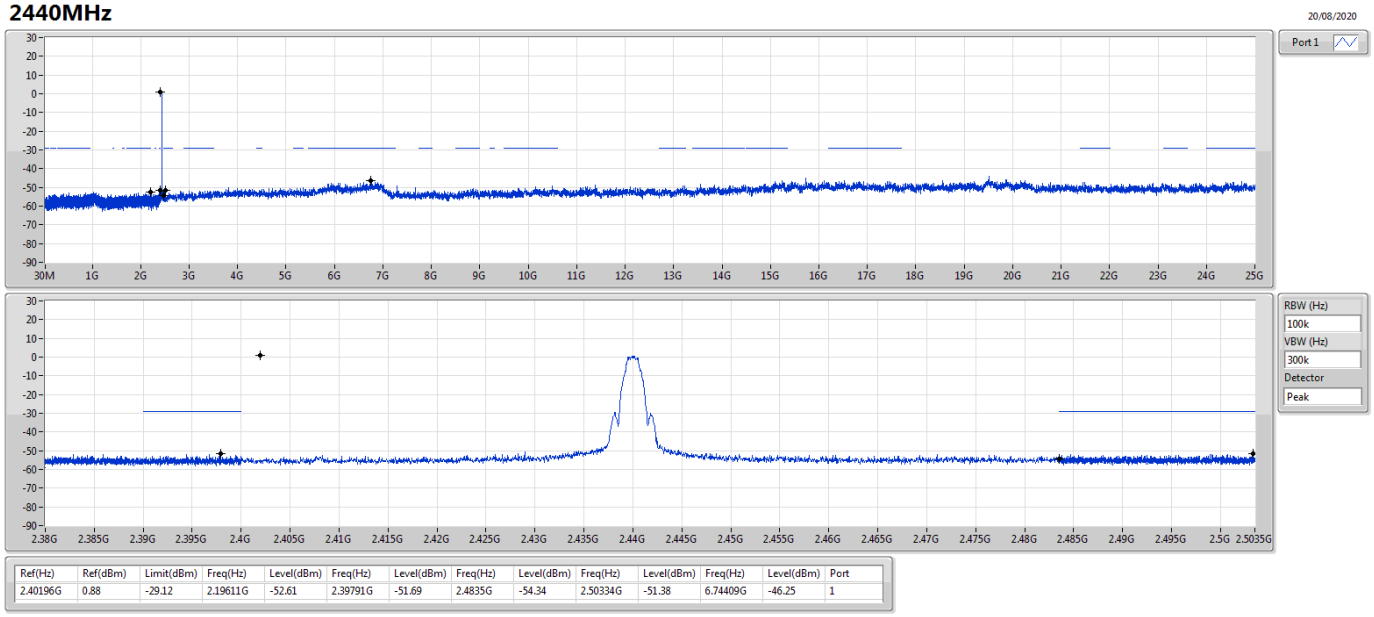
2402MHz



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
2.40196G	0.88	-29.12	2.08889G	-52.60	2.39999G	-31.20	2.4G	-31.80	2.50235G	-51.57	16.96031G	-45.94	1

BT-LE(2Mbps) **CSE NdB**

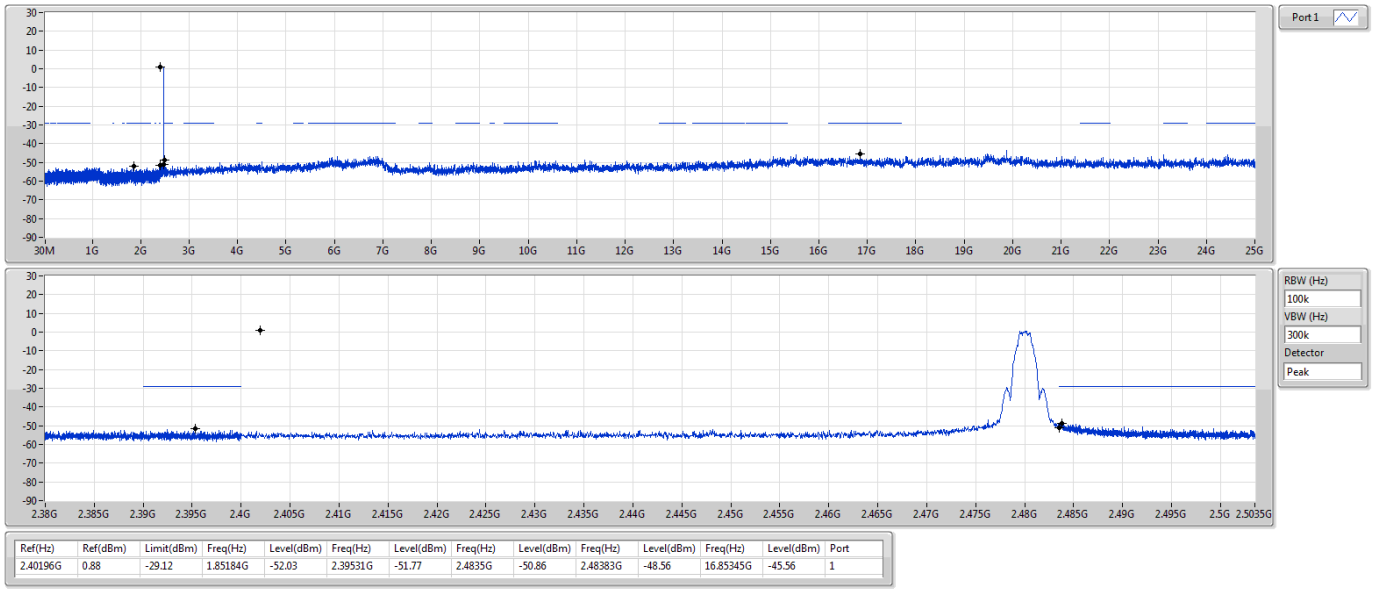
2440MHz



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
2.40196G	0.88	-29.12	2.19611G	-52.61	2.39791G	-51.69	2.4835G	-54.34	2.50334G	-51.38	6.74409G	-46.25	1

BT-LE(2Mbps) **CSE NdB**

2480MHz



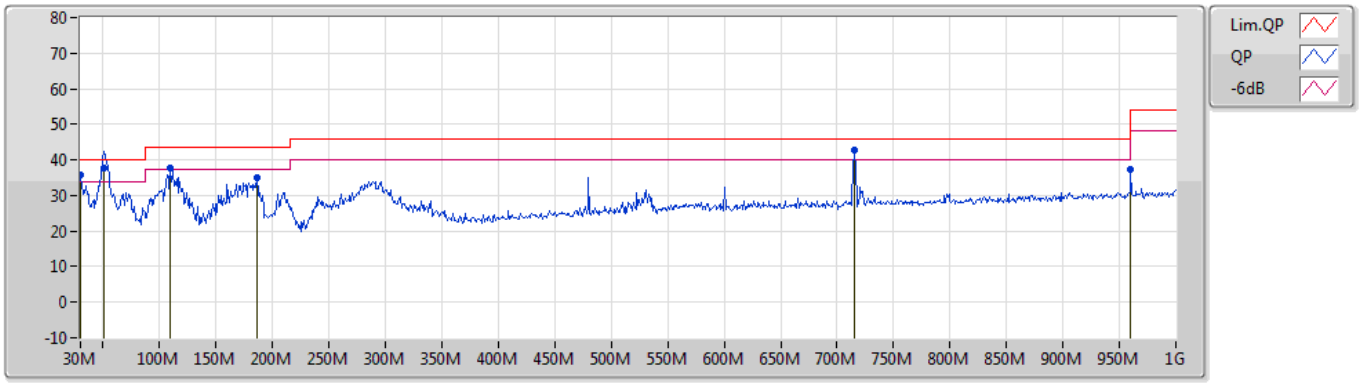
Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40196G	0.88	-29.12	1.85184G	-52.03	2.39531G	-51.77	2.4835G	-50.86	2.48383G	-48.56	16.85345G	-45.56	1

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Condition
Mode 1	Pass	QP	480.08M	44.87	46.00	-1.13	Horizontal

Mode 1

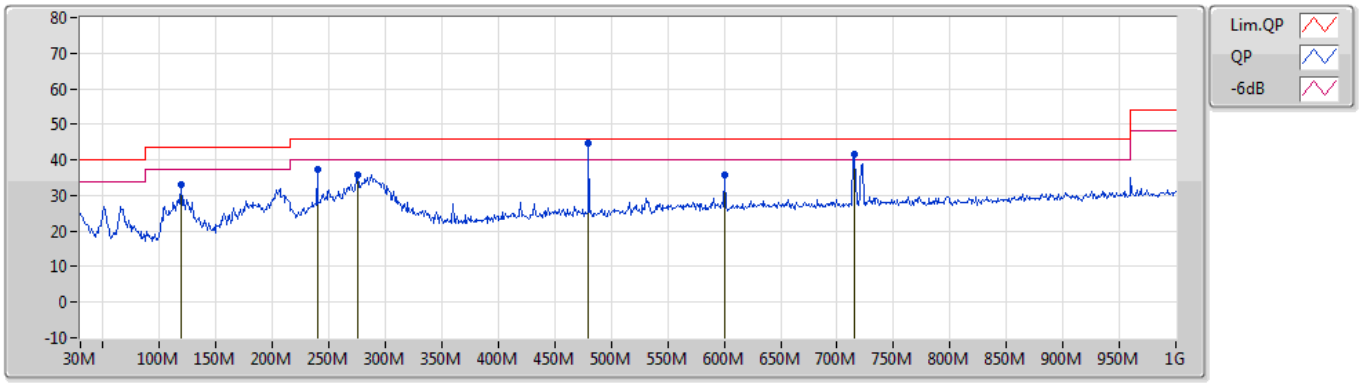
21/08/2020



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	30M	35.72	40.00	-4.28	-6.17	3	Vertical	281	1.00	-	41.89	24.19	1.20	31.56
QP	51.34M	37.65	40.00	-2.35	-16.35	3	Vertical	325	1.25	"Worst"	54.00	14.13	1.17	31.65
PK	109.54M	37.58	43.50	-5.92	-12.36	3	Vertical	308	1.00	-	49.94	17.83	1.60	31.79
PK	186.17M	34.90	43.50	-8.60	-14.95	3	Vertical	239	1.00	-	49.85	15.03	1.93	31.91
PK	714.82M	42.66	46.00	-3.34	-4.04	3	Vertical	3	1.00	-	46.70	24.50	3.86	32.40
PK	960M	37.45	54.00	-16.55	-1.25	3	Vertical	176	1.00	-	38.70	26.36	4.50	32.11

Mode 1

21/08/2020



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
PK	119.24M	33.03	43.50	-10.47	-11.93	3	Horizontal	350	3.00	-	44.96	18.08	1.69	31.70
PK	240M	37.15	46.00	-8.85	-13.07	3	Horizontal	193	1.25	-	50.22	16.69	2.16	31.92
PK	275.41M	35.77	46.00	-10.23	-11.37	3	Horizontal	316	1.25	-	47.14	18.26	2.36	31.99
QP	480.08M	44.87	46.00	-1.13	-6.50	3	Horizontal	24	1.00	"Worst"	51.37	22.79	3.03	32.32
PK	600.36M	35.93	46.00	-10.07	-4.68	3	Horizontal	22	1.00	-	40.61	24.11	3.50	32.29
PK	714.82M	41.62	46.00	-4.38	-4.04	3	Horizontal	250	1.25	-	45.66	24.50	3.86	32.40

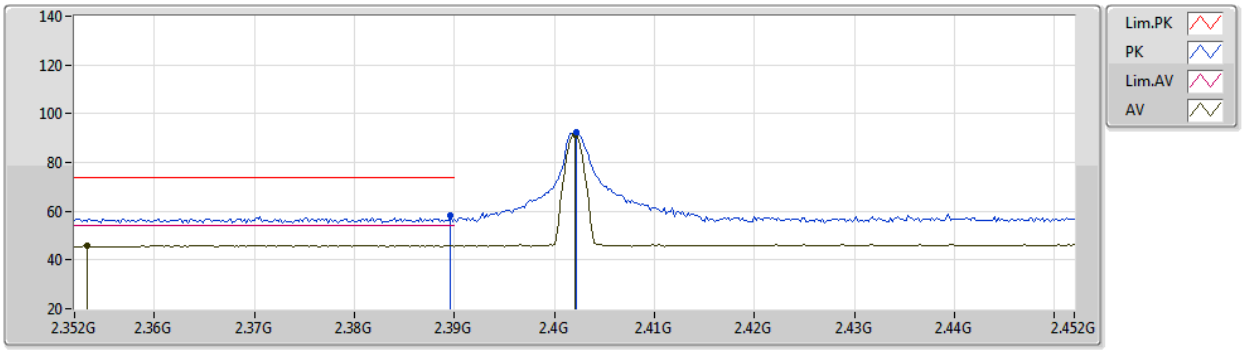
Summary

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	PK	2.4835G	73.89	74.00	-0.11	3	Horizontal	35	1.08	-

BT-LE(1Mbps)

15/07/2020

2402MHz_TX



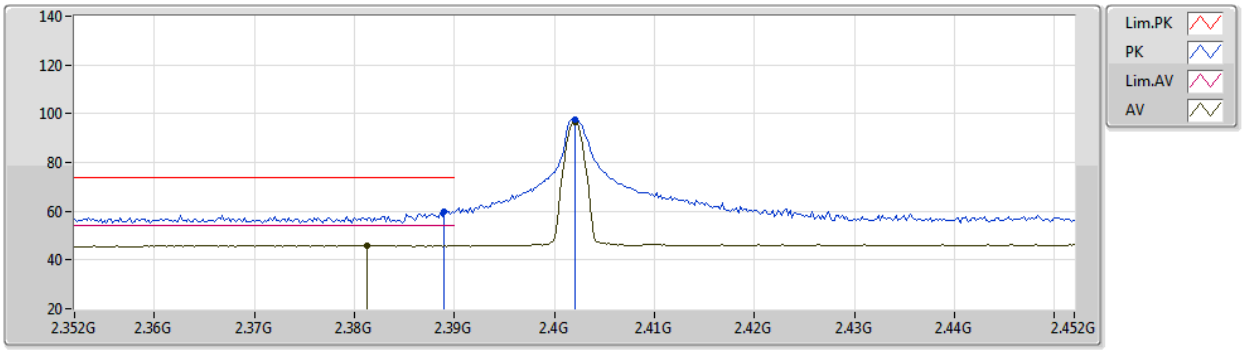
EUT Z_1TX
Setting 7
04-E-N-2

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	2.3896G	58.19	74.00	-15.81	27.83	3	Vertical	177	2.68	-	27.51	2.85	-
AV	2.3532G	46.11	54.00	-7.89	15.73	3	Vertical	177	2.68	-	27.55	2.83	-
PK	2.4022G	92.18	Inf	-Inf	61.81	3	Vertical	177	2.68	-	27.51	2.86	-
AV	2.402G	91.18	Inf	-Inf	60.81	3	Vertical	177	2.68	-	27.51	2.86	-

BT-LE(1Mbps)

2402MHz_TX

15/07/2020



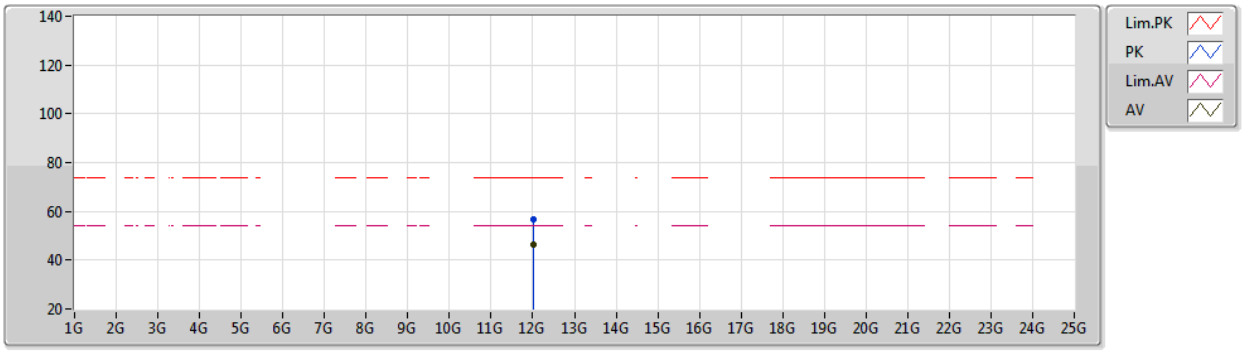
EUT Z_1TX
Setting 7
04-E-N-2

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	2.389G	59.99	74.00	-14.01	29.63	3	Horizontal	37	1.30	-	27.51	2.85	-
AV	2.3812G	45.97	54.00	-8.03	15.60	3	Horizontal	37	1.30	-	27.52	2.85	-
PK	2.402G	97.44	Inf	-Inf	67.07	3	Horizontal	37	1.30	-	27.51	2.86	-
AV	2.402G	96.41	Inf	-Inf	66.04	3	Horizontal	37	1.30	-	27.51	2.86	-

BT-LE(1Mbps)

2402MHz_TX

15/07/2020



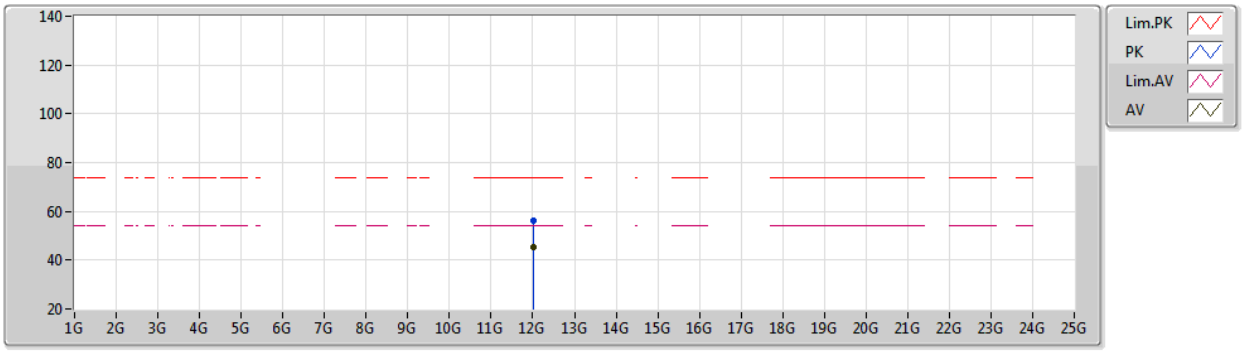
EUT Z_1TX
Setting 7
04-E-N-2

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	12.01118G	56.78	74.00	-17.22	45.73	3	Vertical	273	2.39	-	38.91	6.52	34.38
AV	12.0112G	46.26	54.00	-7.74	35.21	3	Vertical	273	2.39	-	38.91	6.52	34.38

BT-LE(1Mbps)

2402MHz_TX

15/07/2020



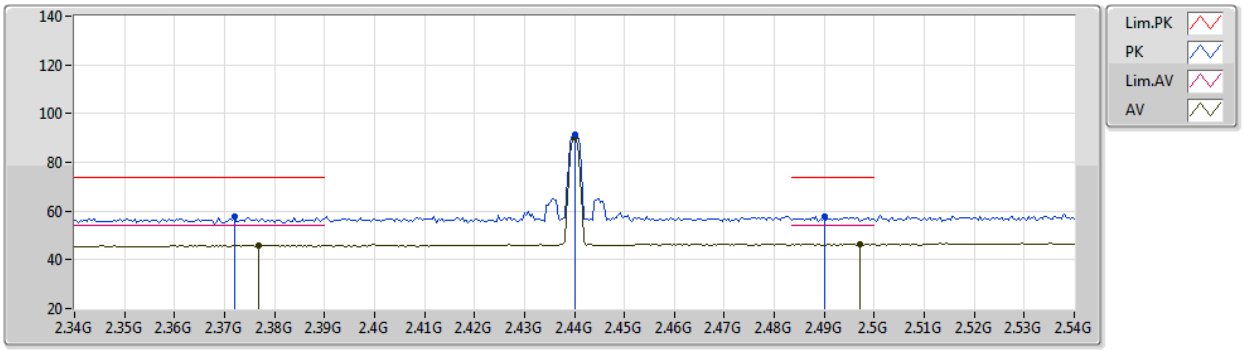
EUT Z_1TX
Setting 7
04-E-N-2

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	12.00878G	56.37	74.00	-17.63	45.32	3	Horizontal	315	2.74	-	38.91	6.52	34.38
AV	12.00908G	45.30	54.00	-8.70	34.25	3	Horizontal	315	2.74	-	38.91	6.52	34.38

BT-LE(1Mbps)

2440MHz_TX

15/07/2020



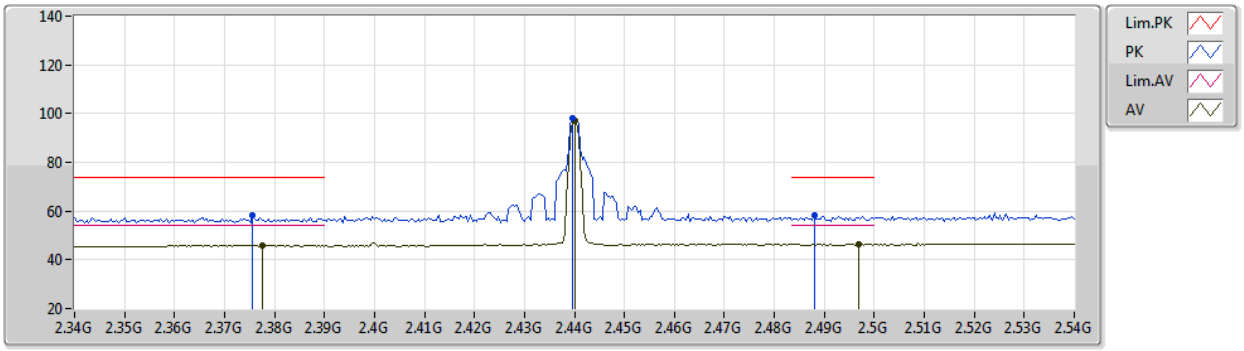
EUT Z_1TX
Setting 7
04-E-N-2

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	2.372G	57.80	74.00	-16.20	27.43	3	Vertical	183	2.95	-	27.53	2.84	-
AV	2.3768G	45.95	54.00	-8.05	15.58	3	Vertical	183	2.95	-	27.52	2.85	-
PK	2.44G	91.33	Inf	-Inf	60.79	3	Vertical	183	2.95	-	27.66	2.88	-
AV	2.44G	90.35	Inf	-Inf	59.81	3	Vertical	183	2.95	-	27.66	2.88	-
PK	2.49G	57.67	74.00	-16.33	26.90	3	Vertical	183	2.95	-	27.86	2.91	-
AV	2.4972G	46.34	54.00	-7.66	15.53	3	Vertical	183	2.95	-	27.89	2.92	-

BT-LE(1Mbps)

2440MHz_TX

15/07/2020



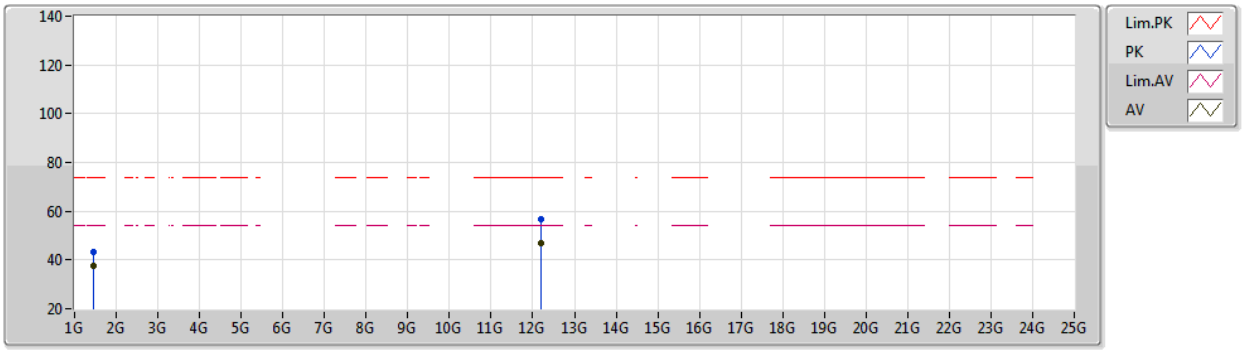
EUT Z_1TX
Setting 7
04-E-N-2

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	2.3756G	58.14	74.00	-15.86	27.77	3	Horizontal	84	1.54	-	27.52	2.85	-
AV	2.3776G	45.95	54.00	-8.05	15.58	3	Horizontal	84	1.54	-	27.52	2.85	-
PK	2.4396G	98.18	Inf	-Inf	67.64	3	Horizontal	84	1.54	-	27.66	2.88	-
AV	2.44G	97.28	Inf	-Inf	66.74	3	Horizontal	84	1.54	-	27.66	2.88	-
PK	2.488G	58.29	74.00	-15.71	27.53	3	Horizontal	84	1.54	-	27.85	2.91	-
AV	2.4968G	46.34	54.00	-7.66	15.53	3	Horizontal	84	1.54	-	27.89	2.92	-

BT-LE(1Mbps)

2440MHz_TX

15/07/2020



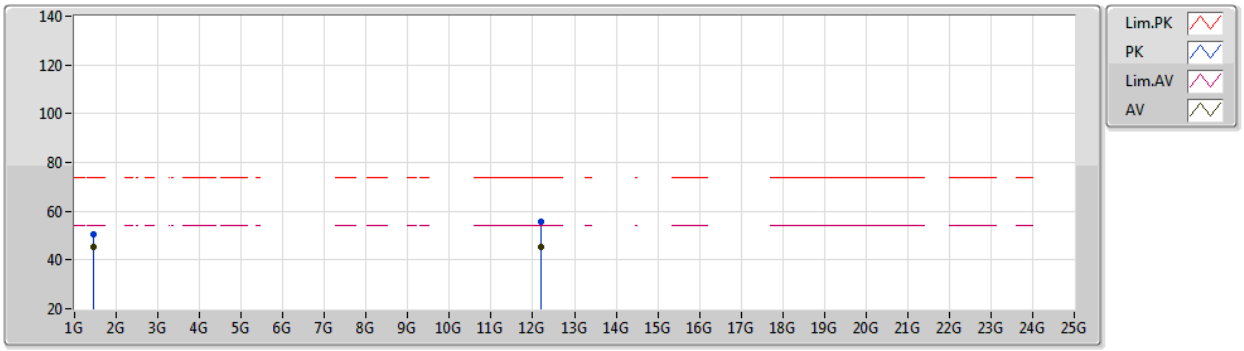
EUT Z_1TX
Setting 7
04-E-N-2

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	1.44018G	43.51	74.00	-30.49	51.46	3	Vertical	217	1.80	-	25.60	2.21	35.76
AV	1.43998G	37.55	54.00	-16.45	45.50	3	Vertical	217	1.80	-	25.60	2.21	35.76
PK	12.20128G	56.61	74.00	-17.39	45.30	3	Vertical	271	2.64	-	39.06	6.56	34.31
AV	12.20106G	46.66	54.00	-7.34	35.35	3	Vertical	271	2.64	-	39.06	6.56	34.31

BT-LE(1Mbps)

2440MHz_TX

15/07/2020



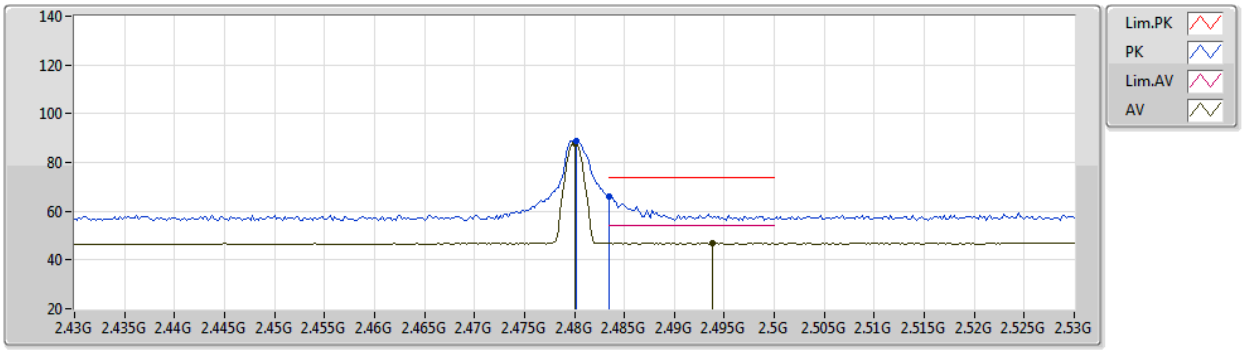
EUT Z_1TX
Setting 7
04-E-N-2

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	1.4397G	50.48	74.00	-23.52	58.43	3	Horizontal	226	1.80	-	25.60	2.21	35.76
AV	1.43998G	45.16	54.00	-8.84	53.11	3	Horizontal	226	1.80	-	25.60	2.21	35.76
PK	12.19884G	55.89	74.00	-18.11	44.58	3	Horizontal	313	2.72	-	39.06	6.56	34.31
AV	12.19886G	45.32	54.00	-8.68	34.01	3	Horizontal	313	2.72	-	39.06	6.56	34.31

BT-LE(1Mbps)

2480MHz_TX

15/07/2020



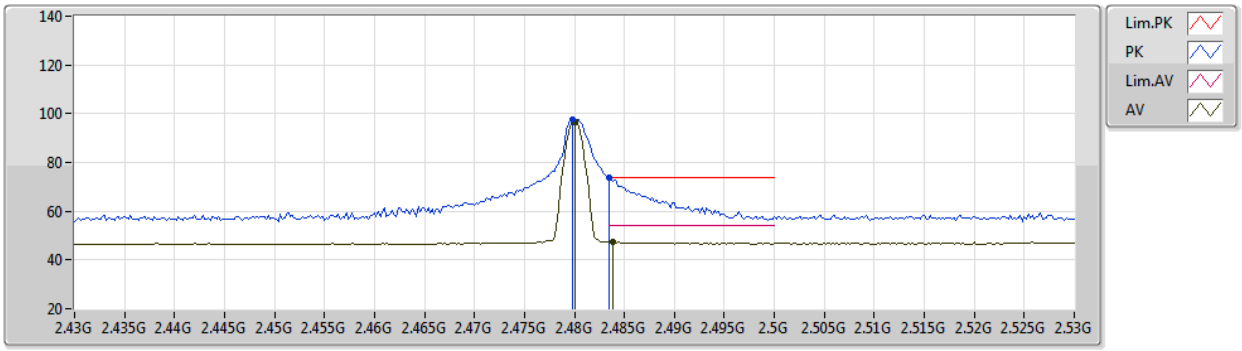
EUT Z_1TX
Setting 7
04-P-N-2

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	2.4802G	88.85	Inf	-Inf	57.69	3	Vertical	180	2.87	-	27.82	3.34	-
AV	2.48G	87.78	Inf	-Inf	56.62	3	Vertical	180	2.87	-	27.82	3.34	-
PK	2.4835G	65.87	74.00	-8.13	34.70	3	Vertical	180	2.87	-	27.83	3.34	-
AV	2.4938G	47.02	54.00	-6.98	15.79	3	Vertical	180	2.87	-	27.88	3.35	-

BT-LE(1Mbps)

2480MHz_TX

15/07/2020



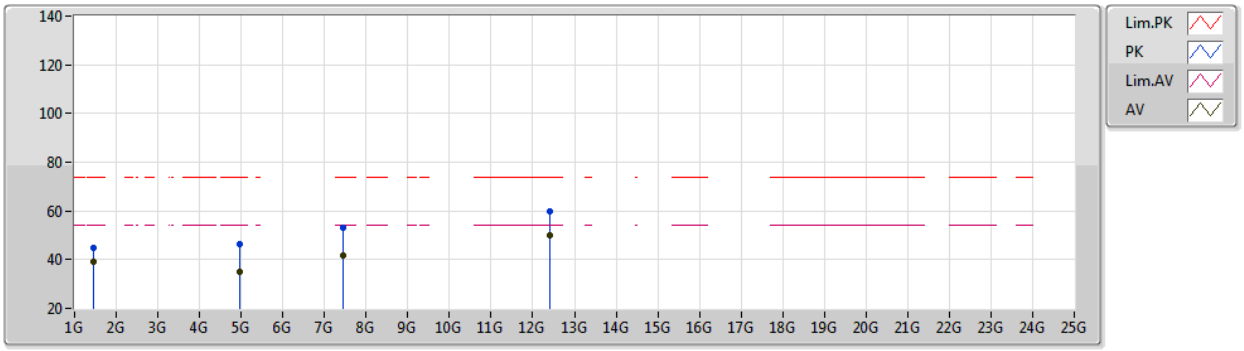
EUT Z_1TX
Setting 7
04-P-N-2

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	97.61	Inf	-Inf	66.45	3	Horizontal	35	1.08	-	27.82	3.34	-
AV	2.48G	96.64	Inf	-Inf	65.48	3	Horizontal	35	1.08	-	27.82	3.34	-
PK	2.4835G	73.89	74.00	-0.11	42.72	3	Horizontal	35	1.08	-	27.83	3.34	-
AV	2.4838G	47.24	54.00	-6.76	16.06	3	Horizontal	35	1.08	-	27.84	3.34	-

BT-LE(1Mbps)

2480MHz_TX

15/07/2020



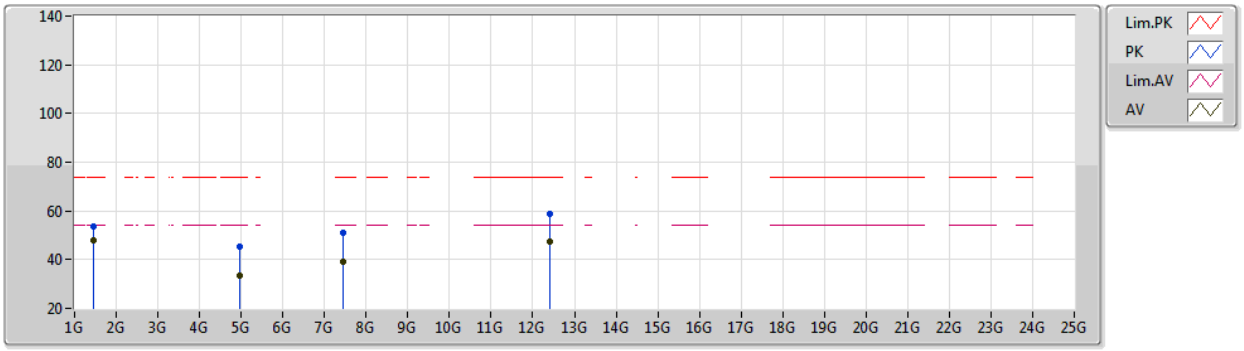
EUT Z_1TX
Setting 7
04-P-N-2

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	1.4406G	44.84	74.00	-29.16	52.33	3	Vertical	237	1.36	-	25.60	2.66	35.75
AV	1.43998G	39.23	54.00	-14.77	46.73	3	Vertical	237	1.36	-	25.60	2.66	35.76
PK	4.9605G	46.23	74.00	-27.77	41.16	3	Vertical	273	1.54	-	33.02	4.91	32.86
AV	4.95998G	35.01	54.00	-18.99	29.94	3	Vertical	273	1.54	-	33.02	4.91	32.86
PK	7.44073G	52.92	74.00	-21.08	42.83	3	Vertical	331	2.38	-	37.60	5.93	33.44
AV	7.4406G	41.97	54.00	-12.03	31.88	3	Vertical	331	2.38	-	37.60	5.93	33.44
PK	12.39888G	60.08	74.00	-13.92	47.08	3	Vertical	269	2.37	-	39.22	8.03	34.25
AV	12.3989G	49.77	54.00	-4.23	36.77	3	Vertical	269	2.37	-	39.22	8.03	34.25

BT-LE(1Mbps)

2480MHz_TX

15/07/2020



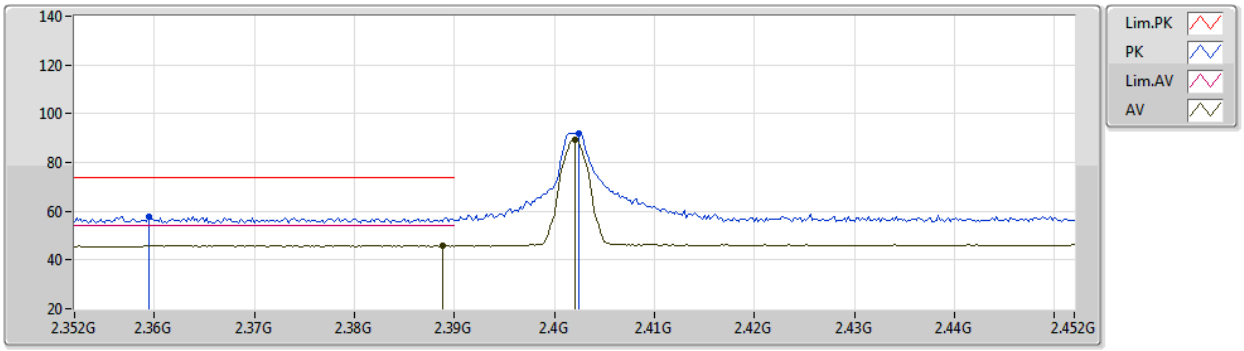
EUT Z_1TX
Setting 7
04-P-N-2

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	1.44005G	53.40	74.00	-20.60	60.90	3	Horizontal	238	1.19	-	25.60	2.66	35.76
AV	1.43997G	47.80	54.00	-6.20	55.30	3	Horizontal	238	1.19	-	25.60	2.66	35.76
PK	4.96082G	45.56	74.00	-28.44	40.49	3	Horizontal	294	1.15	-	33.02	4.91	32.86
AV	4.96022G	33.70	54.00	-20.30	28.63	3	Horizontal	294	1.15	-	33.02	4.91	32.86
PK	7.43858G	51.14	74.00	-22.86	41.05	3	Horizontal	54	1.00	-	37.60	5.93	33.44
AV	7.44078G	39.01	54.00	-14.99	28.92	3	Horizontal	54	1.00	-	37.60	5.93	33.44
PK	12.39888G	58.84	74.00	-15.16	45.84	3	Horizontal	305	2.72	-	39.22	8.03	34.25
AV	12.40114G	47.59	54.00	-6.41	34.59	3	Horizontal	305	2.72	-	39.22	8.03	34.25

BT-LE(2Mbps)

15/07/2020

2402MHz_TX



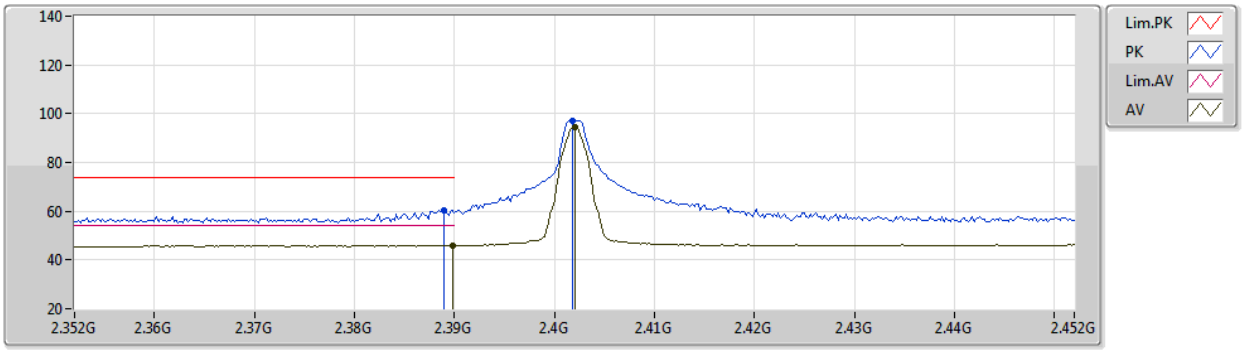
EUT Z_1TX
Setting 7
04-E-N-2

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	2.3594G	57.94	74.00	-16.06	27.56	3	Vertical	178	2.68	-	27.54	2.84	-
AV	2.3888G	45.99	54.00	-8.01	15.63	3	Vertical	178	2.68	-	27.51	2.85	-
PK	2.4024G	92.02	Inf	-Inf	61.65	3	Vertical	178	2.68	-	27.51	2.86	-
AV	2.402G	89.43	Inf	-Inf	59.06	3	Vertical	178	2.68	-	27.51	2.86	-

BT-LE(2Mbps)

2402MHz_TX

15/07/2020



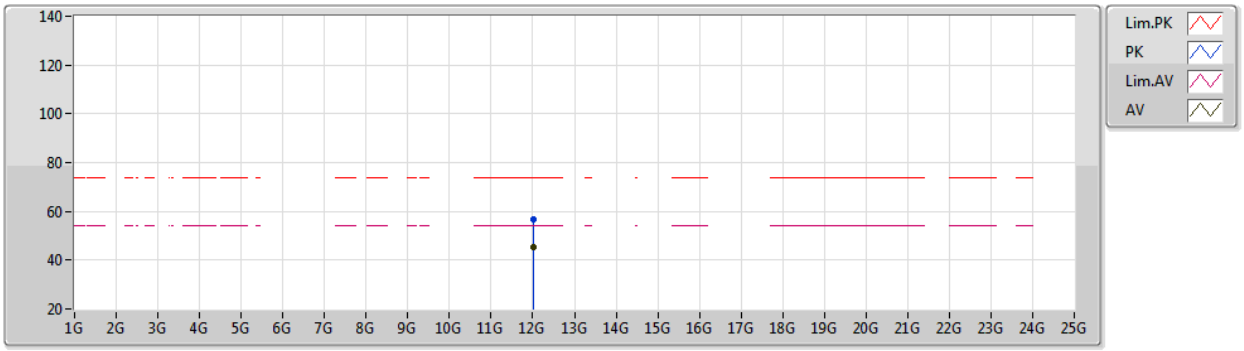
EUT Z_1TX
Setting 7
04-E-N-2

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	2.389G	60.50	74.00	-13.50	30.14	3	Horizontal	33	1.73	-	27.51	2.85	-
AV	2.3898G	46.00	54.00	-8.00	15.64	3	Horizontal	33	1.73	-	27.51	2.85	-
PK	2.4018G	97.17	Inf	-Inf	66.80	3	Horizontal	33	1.73	-	27.51	2.86	-
AV	2.402G	94.53	Inf	-Inf	64.16	3	Horizontal	33	1.73	-	27.51	2.86	-

BT-LE(2Mbps)

2402MHz_TX

15/07/2020



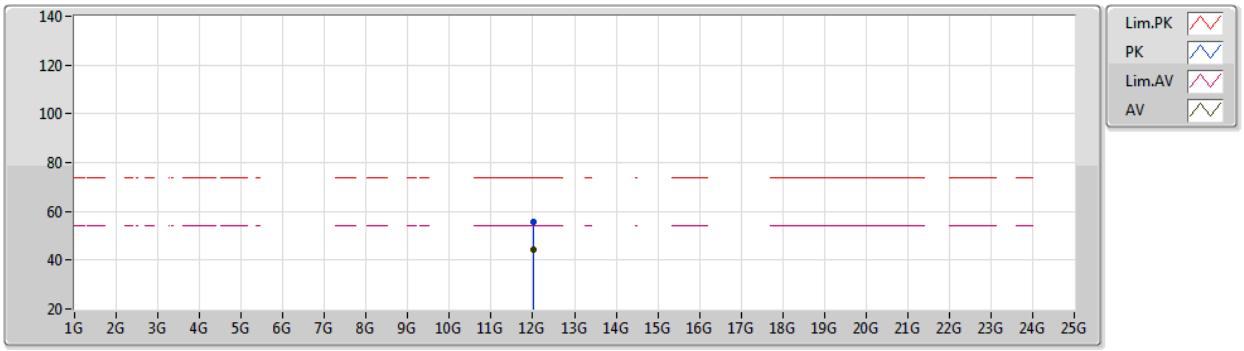
EUT Z_1TX
Setting 7
04-E-N-2

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	12.00766G	56.67	74.00	-17.33	45.62	3	Vertical	278	2.41	-	38.91	6.52	34.38
AV	12.00774G	45.54	54.00	-8.46	34.49	3	Vertical	278	2.41	-	38.91	6.52	34.38

BT-LE(2Mbps)

2402MHz_TX

15/07/2020



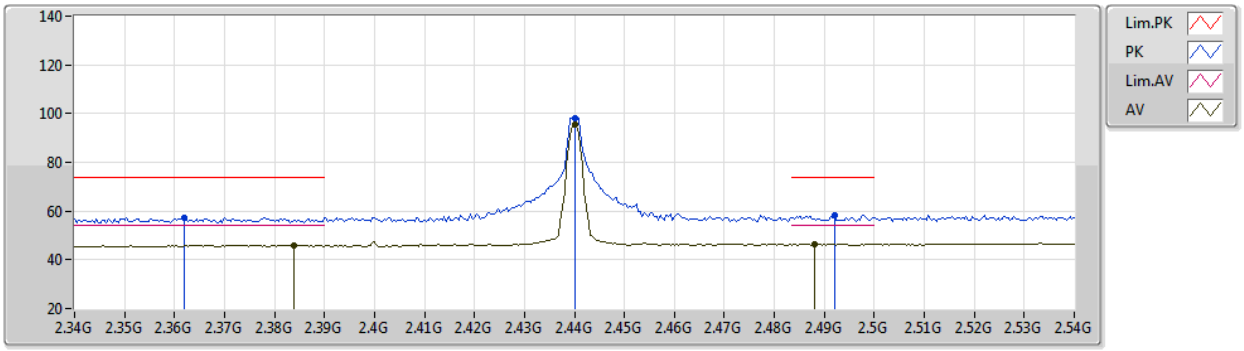
EUT Z_1TX
Setting 7
04-E-N-2

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	12.00926G	55.59	74.00	-18.41	44.54	3	Horizontal	318	2.76	-	38.91	6.52	34.38
AV	12.00772G	44.09	54.00	-9.91	33.04	3	Horizontal	318	2.76	-	38.91	6.52	34.38

BT-LE(2Mbps)

2440MHz_TX

15/07/2020



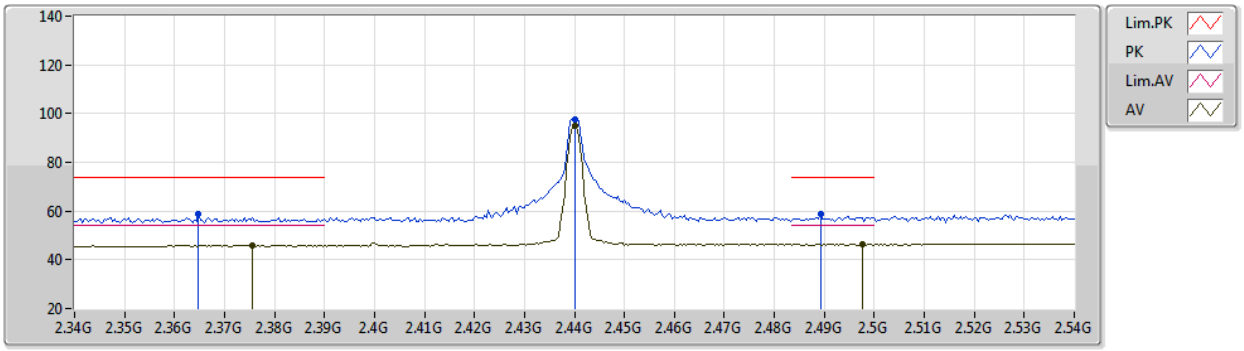
EUT Z_1TX
Setting 7
04-E-N-2

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	2.362G	57.49	74.00	-16.51	27.11	3	Vertical	85	1.54	-	27.54	2.84	-
AV	2.384G	45.98	54.00	-8.02	15.61	3	Vertical	85	1.54	-	27.52	2.85	-
PK	2.44G	98.28	Inf	-Inf	67.74	3	Vertical	85	1.54	-	27.66	2.88	-
AV	2.44G	95.75	Inf	-Inf	65.21	3	Vertical	85	1.54	-	27.66	2.88	-
PK	2.492G	58.12	74.00	-15.88	27.33	3	Vertical	85	1.54	-	27.87	2.92	-
AV	2.488G	46.56	54.00	-7.44	15.80	3	Vertical	85	1.54	-	27.85	2.91	-

BT-LE(2Mbps)

2440MHz_TX

15/07/2020



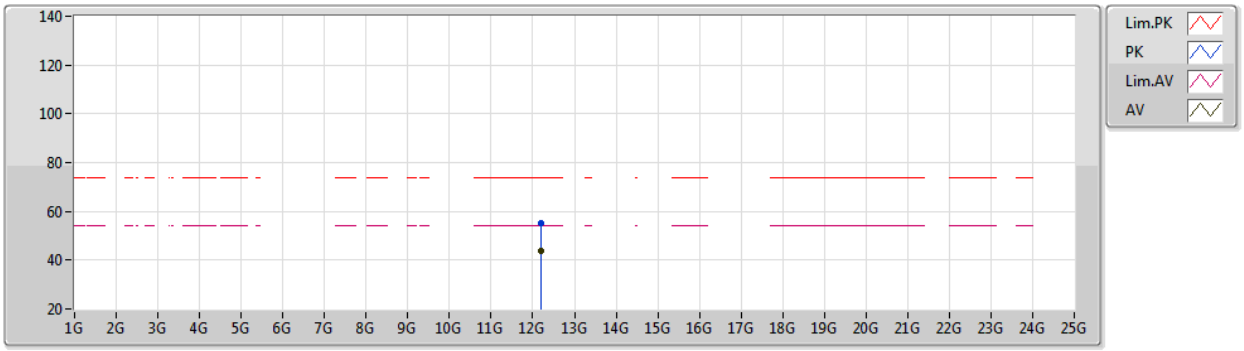
EUT Z_1TX
Setting 7
04-E-N-2

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	2.3648G	58.72	74.00	-15.28	28.34	3	Horizontal	99	1.00	-	27.54	2.84	-
AV	2.3756G	45.94	54.00	-8.06	15.57	3	Horizontal	99	1.00	-	27.52	2.85	-
PK	2.44G	97.50	Inf	-Inf	66.96	3	Horizontal	99	1.00	-	27.66	2.88	-
AV	2.44G	94.93	Inf	-Inf	64.39	3	Horizontal	99	1.00	-	27.66	2.88	-
PK	2.4892G	59.02	74.00	-14.98	28.25	3	Horizontal	99	1.00	-	27.86	2.91	-
AV	2.4976G	46.60	54.00	-7.40	15.79	3	Horizontal	99	1.00	-	27.89	2.92	-

BT-LE(2Mbps)

2440MHz_TX

15/07/2020



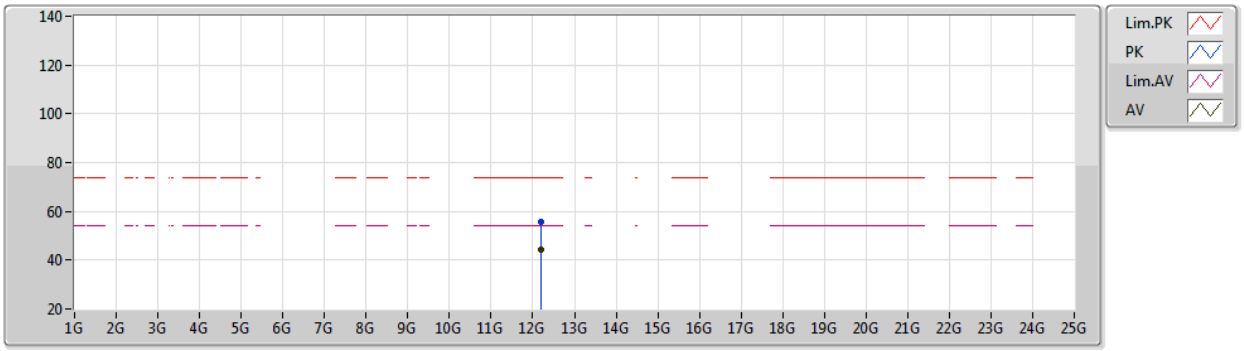
EUT Z_1TX
Setting 7
04-E-N-2

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	12.20268G	55.33	74.00	-18.67	44.02	3	Vertical	194	2.94	-	39.06	6.56	34.31
AV	12.20222G	44.00	54.00	-10.00	32.69	3	Vertical	194	2.94	-	39.06	6.56	34.31

BT-LE(2Mbps)

2440MHz_TX

15/07/2020



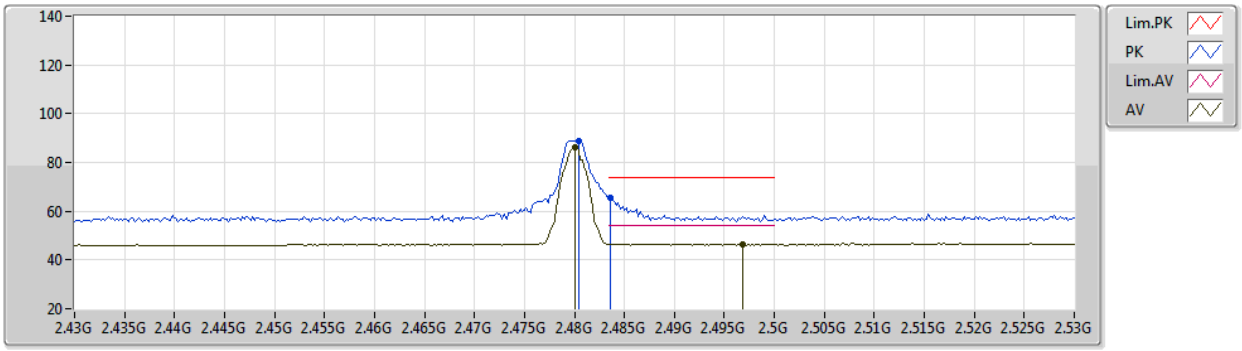
EUT Z_1TX
Setting 7
04-E-N-2

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	12.2024G	55.52	74.00	-18.48	44.21	3	Horizontal	183	2.97	-	39.06	6.56	34.31
AV	12.20252G	44.48	54.00	-9.52	33.17	3	Horizontal	183	2.97	-	39.06	6.56	34.31

BT-LE(2Mbps)

2480MHz_TX

15/07/2020



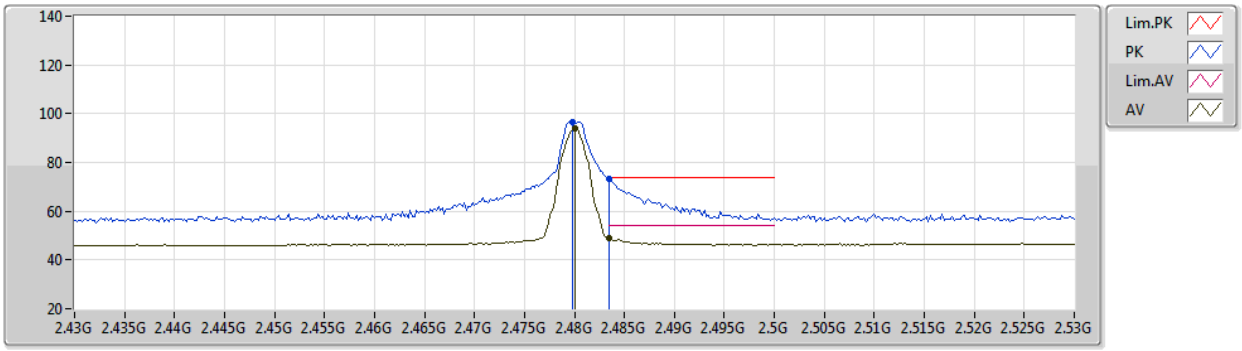
EUT Z_1TX
Setting 7
04-E-N-2

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	2.4804G	88.73	Inf	-Inf	58.00	3	Vertical	172	1.84	-	27.82	2.91	-
AV	2.48G	85.98	Inf	-Inf	55.25	3	Vertical	172	1.84	-	27.82	2.91	-
PK	2.4836G	65.50	74.00	-8.50	34.76	3	Vertical	172	1.84	-	27.83	2.91	-
AV	2.4968G	46.60	54.00	-7.40	15.79	3	Vertical	172	1.84	-	27.89	2.92	-

BT-LE(2Mbps)

15/07/2020

2480MHz_TX



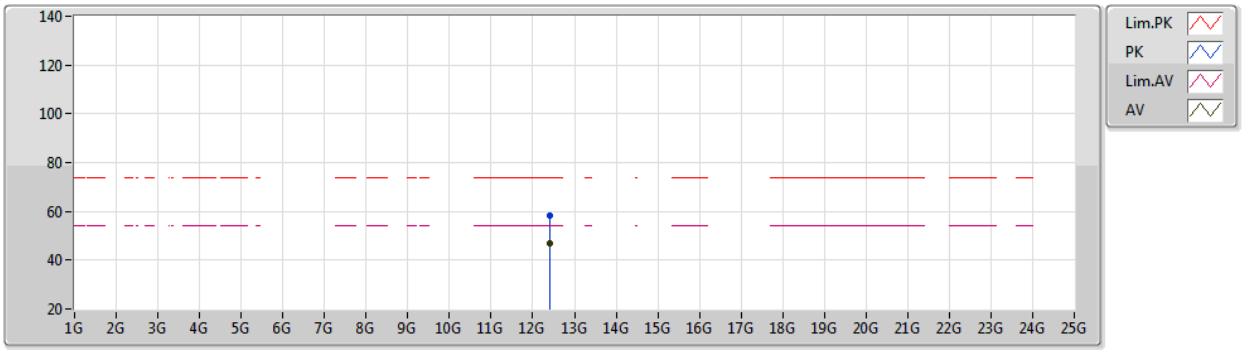
EUT Z_1TX
Setting 7
04-E-N-2

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	96.54	Inf	-Inf	65.81	3	Horizontal	111	2.28	-	27.82	2.91	-
AV	2.48G	93.91	Inf	-Inf	63.18	3	Horizontal	111	2.28	-	27.82	2.91	-
PK	2.4835G	73.05	74.00	-0.95	42.31	3	Horizontal	111	2.28	-	27.83	2.91	-
AV	2.4835G	48.84	54.00	-5.16	18.10	3	Horizontal	111	2.28	-	27.83	2.91	-

BT-LE(2Mbps)

2480MHz_TX

15/07/2020



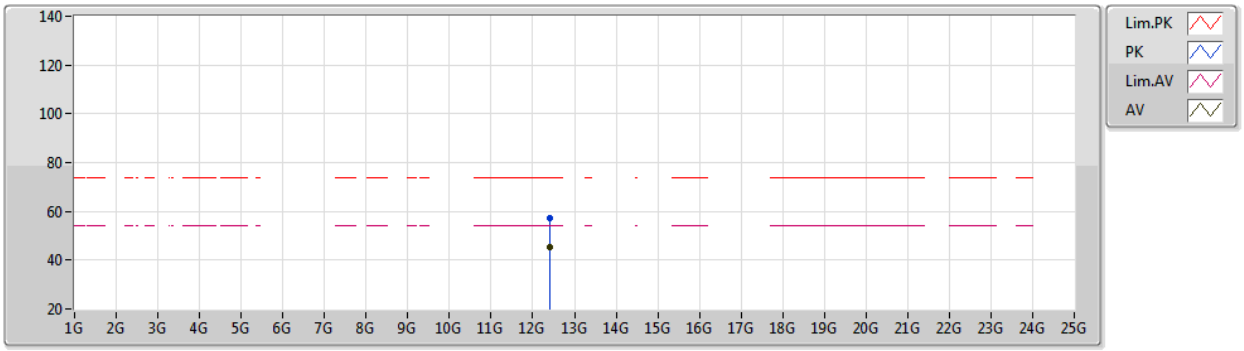
EUT Z_1TX
Setting 7
04-E-N-2

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	12.3978G	58.19	74.00	-15.81	46.62	3	Vertical	269	1.13	-	39.22	6.60	34.25
AV	12.40236G	47.12	54.00	-6.88	35.55	3	Vertical	269	1.13	-	39.22	6.60	34.25

BT-LE(2Mbps)

2480MHz_TX

15/07/2020



EUT Z_1TX
Setting 7
04-E-N-2

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	12.40272G	57.01	74.00	-16.99	45.44	3	Horizontal	310	2.70	-	39.22	6.60	34.25
AV	12.40224G	45.43	54.00	-8.57	33.86	3	Horizontal	310	2.70	-	39.22	6.60	34.25