FCC RADIO TEST REPORT

FCC ID	:	NKR-RAAME1
Equipment	:	Madesafe Gateway, Madesafe/IOT Gateway
Brand Name	:	Catapult TECH
Model Name	:	815-00027, 815-00028, 815-00029
Applicant	:	Wistron NeWeb Corporation 20 Park Avenue II Hsinchu Science Park Hsinchu Taiwan 308
Manufacturer	:	Wistron NeWeb Corporation 20 Park Avenue II Hsinchu Science Park Hsinchu Taiwan 308
Standard	:	47 CFR FCC Part 15.247

The product was received on Jan. 28, 2019, and testing was started from Jun. 05, 2019 and completed on Jun. 19, 2019. 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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
FR912811AD	01	Initial issue of report	Jul. 03, 2019

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:
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
2.4G	BT-LE	1	1

Note:
- 2.4G is the 2.4GHz Band (2.4-2.4835GHz).
- Bluetooth LE uses a GFSK modulation.
- BWch is the nominal channel bandwidth.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2, 3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.
- EUT contains a certified RF module (FCC ID: W7Z-WD907102) for EUT 2.

1.1.2 Antenna Information

Ant.	Port			Brand		P/N		
	WLAN 2.4GHz	WLAN 5GHz	Bluetooth	WLAN 2.4GHz、5GHz / Bluetooth (Internal)	Bluetooth (External)	WLAN 2.4GHz、5GHz	Bluetooth (Internal)	Bluetooth (External)
1	1	1	-	WNC	-	3ADHUBW69S1-111	-	-
2	2	2	-	WNC	-	3ADHUBW69S1-111	-	-
3	-	-	1	WNC	-	-	95XKAJ15.G04	-
4	-	-	1	-	RFlink	-	-	08.22100.007

Ant.	Antenna Type			Antenna Connector	Gain (dBi)					
	WLAN 2.4GHz、5GHz	Bluetooth (Internal)	Bluetooth (External)		WLAN 2.4GHz	WLAN 5GHz	Bluetooth (Internal)	Bluetooth (External)		
								Antenna Gain	Cable loss (dB)	True Gain
1	PIFA	-	-	N/A	1.20	4.01	-	-	-	-
2	PIFA	-	-	N/A	0.66	4.02	-	-	-	-
3	-	PCB	-	N/A	-	-	1.25	-	-	-
4	-	-	Dipole	SMA	-	-	-	2.70	3.31	-0.61

Note 1: The above information was declared by manufacturer.

<For 2.4GHz Band>

For IEEE 802.11b/g/n mode (2TX/2RX)

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

<For 5GHz Band>

For IEEE 802.11a/n/ac mode (2TX/2RX)

Port 1 and Port 2 can be used as transmitting/receiving antenna.

Port 1 and Port 2 could transmit/receive simultaneously.

<For Bluetooth> (1TX/1RX)

Only Port 1 can be used as transmitting/receiving antenna.

1.1.3 Mode Test Duty Cycle

Mode 1: EUT 1 <Internal>

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE	0.628	2.02	392.5u	3k

Mode 2: EUT 3 <External>

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE	0.628	2.02	392.5u	3k

1.1.4 EUT Operational Condition

EUT Power Type	From Power Adapter or PoE			
Function	☒	Point-to-multipoint	☐	Point-to-point
Test Software Version	DutApiMimoBt.exe			
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 for Multiple Listing

The difference for each equipment name/model name is shown as below:

EUT	1	2	3
Equipment Name	Madesafe Gateway	Madesafe/IOT Gateway	Madesafe Gateway
Model Name	815-00027	815-00028	815-00029
Contain certified Module (Zigbee function only)	-	V (FCC ID: W7Z-WD907102)	-
Bluetooth Antenna	Internal	Internal	External
WIFI / Bluetooth Function	V	V	V

Note: From the above models, EUT 1 and EUT 3 were selected as representative model for the test and its data was recorded in this report.

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
- FCC KDB 558074 D01 v05r02

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	TH02-CB	Eddie Weng	25~27°C / 52~56%	Jun. 11, 2019~ Jun. 12, 2019
Radiated (Below 1GHz)	03CH04-CB	KJ Chang	21~23°C / 45~52%	Jun. 05, 2019~ Jun. 17, 2019
Radiated (Above 1GHz)	03CH06-CB	KJ Chang	22~24°C / 50~60%	Jun. 05, 2019~ Jun. 17, 2019
AC Conduction	CO02-CB	Peter Wu	24.3~24.5°C / 59~63%	Jun. 05, 2019~ Jun. 19, 2019

Test site Designation No. TW0006 with FCC.
Test site registered number IC 4086B 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)	3.9 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.9 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.7 dB	Confidence levels of 95%
Conducted Emission	2.4 dB	Confidence levels of 95%
Output Power Measurement	1.5 dB	Confidence levels of 95%
Power Density Measurement	2.4 dB	Confidence levels of 95%
Bandwidth Measurement	10.0×10^{-5}	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode 1: EUT 1 <Internal>

Mode	PowerSetting
BT-LE_Nss1_1TX	-
2402MHz	12
2440MHz	12
2480MHz	12

Mode 2: EUT 3 <External>

Mode	PowerSetting
BT-LE_Nss1_1TX	-
2402MHz	12
2440MHz	12
2480MHz	12

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	CTX
The EUT was perform with PoE and Adapter. After evaluating, the worst case was found as PoE, thus the measurement will follow this same test configuration.	
1	EUT 1 + Bluetooth LE + PoE
2	EUT 3 + Bluetooth LE + PoE
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
1	EUT 1
2	EUT 3

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.
The EUT was perform with PoE and Adapter. After evaluating, the worst case was found as Adapter, thus the measurement will follow this same test configuration. The EUT was performed at Y-axis and Z-axis position. Internal (EUT 1) in Y axis and External (EUT 3) in Z axis here been evaluated to be the worst case at Emissions in Emissions in Restricted Frequency Bands <Above 1GHz>; thus, the measurement will follow this same test configuration.	
1	EUT 1 in Y axis + Bluetooth LE + Adapter
2	EUT 3 in Z axis + Bluetooth LE + Adapter
For operating mode 1 is the worst case and it was record in this test report.	
Operating Mode > 1GHz	CTX
The EUT was performed at Y-axis and Z-axis position. Internal (EUT 1) in Y axis and External (EUT 3) in Z axis, thus the measurement will follow this same test configuration.	
1	EUT 1 in Y axis + Bluetooth LE
2	EUT 3 in Z axis + Bluetooth LE

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation
Operating Mode	
1	WLAN 2.4GHz + WLAN 5GHz + Bluetooth
2	WLAN 2.4GHz + WLAN 5GHz + Bluetooth + Zigbee (FCC ID: W7Z-WD907102)
Refer to Sporton Test Report No.: FA912811 for Co-location RF Exposure Evaluation.	

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

The PoE information as below:

Support Unit	Brand Name	Model Name
PoE	Microsemi	PD-9001GR/AT/AC

2.3 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4 Accessories

Accessories				
No.	**Equipment Name**	**Brand Holder**	**Model Name**	**Rating**
1	Adapter	JIANGSU CHENYANG ELECTRON Co.,LTD	CYSF12G-050200U	INPUT: 100-240V~50/60Hz, 0.35A Max OUTPUT: 5V, 2.0A
Other				
Bluetooth Antenna*1 (For EUT 3 use)				

2.5 Support Equipment

For AC Conduction:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	LAN NB	DELL	E6430	N/A
B	Flash disk3.0	Transcend	B06	N/A
C	PoE	Microsemi	PD-9001GR/AT/AC	N/A

For Radiated:

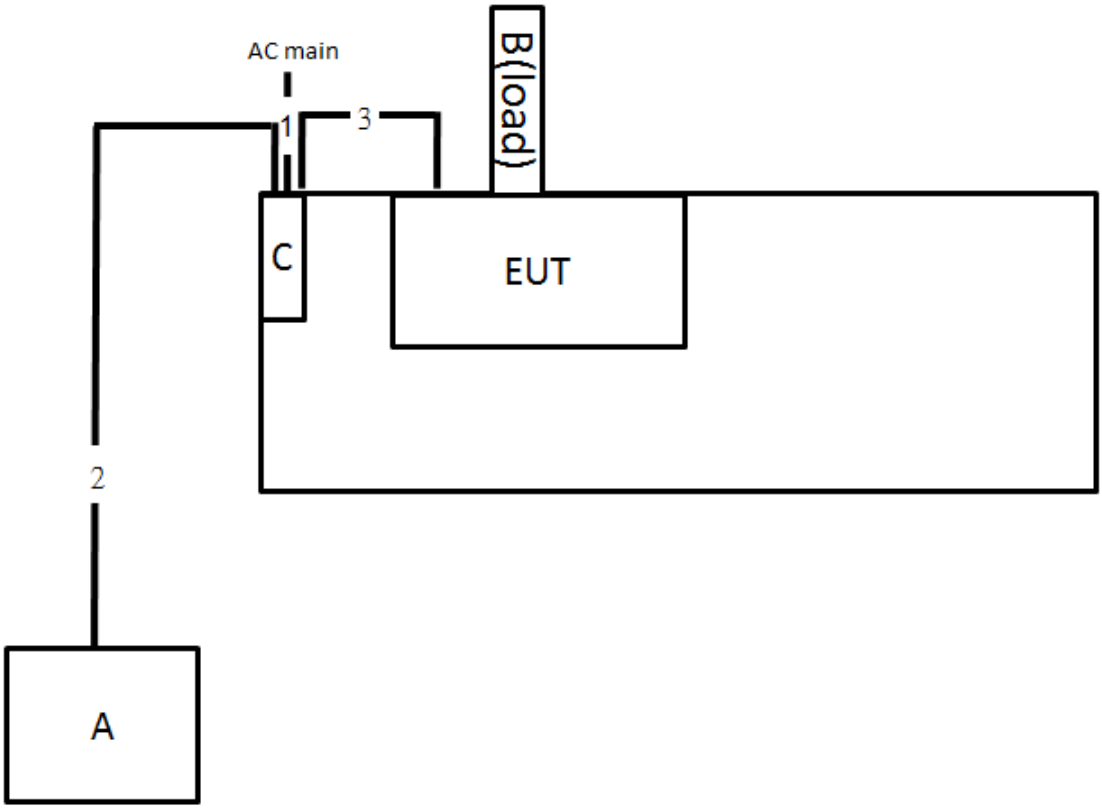
Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Notebook	DELL	E4300	N/A

For RF Conducted:

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
A	Notebook	DELL	E4300	N/A

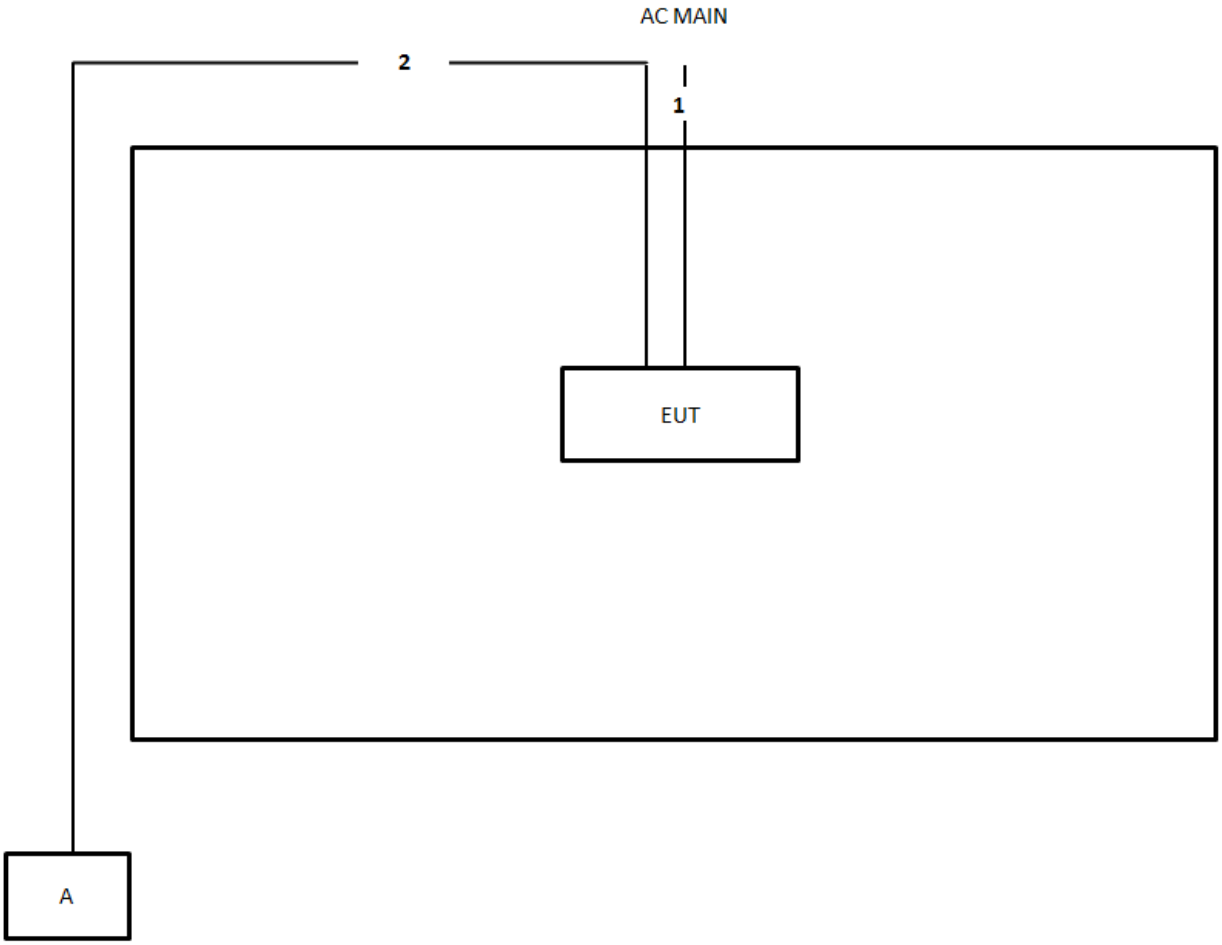
2.6 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



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

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length
1	Power cable	No	1.6m
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

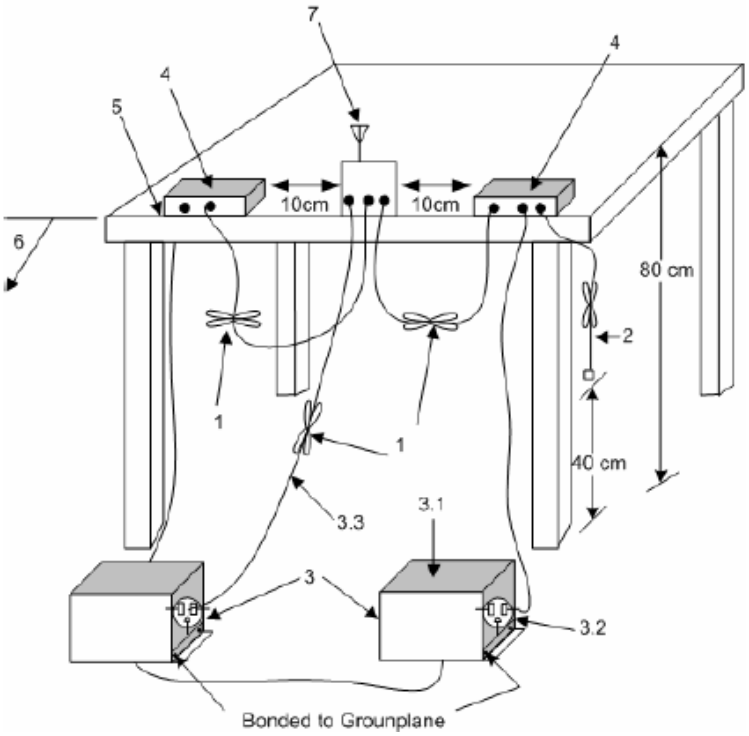
Refer a test equipment and calibration data table in this test report.

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.

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.

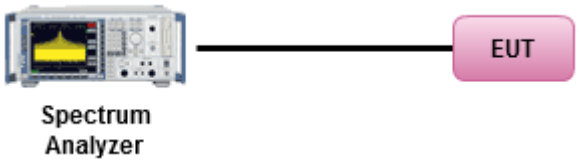
3.2.2 Measuring Instruments

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.		

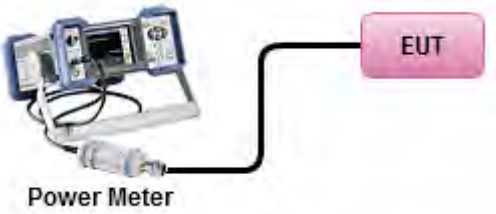
3.3.2 Measuring Instruments

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

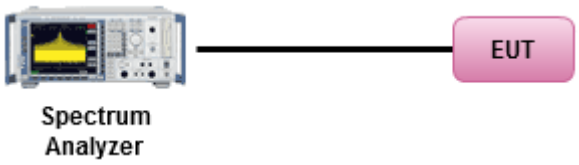
Refer a test equipment and calibration data table in this test report.

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 11.10.2 Method PKPSD.
	[duty cycle ≥ 98% or external video / power trigger]
	☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.3 Method AVGPSD-1.
	☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.5 Method AVGPSD-2.
	☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.7 Method AVGPSD-3.
	duty cycle < 98% and average over on/off periods with duty factor
	☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.4 Method AVGPSD-1A. (alternative).
	☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPSD-2A. (alternative)
	☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.8 Method AVGPSD-3A. (alternative)
▪ 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.	

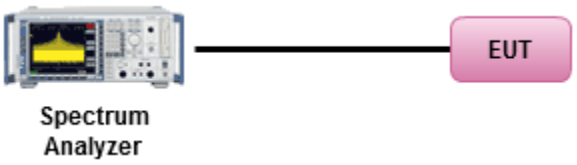
3.5.2 Measuring Instruments

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.

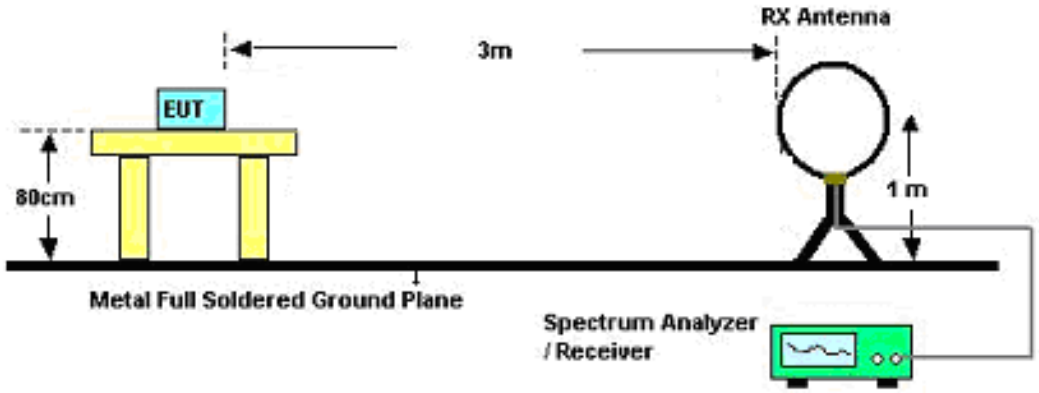
3.6.3 Test Procedures

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.	

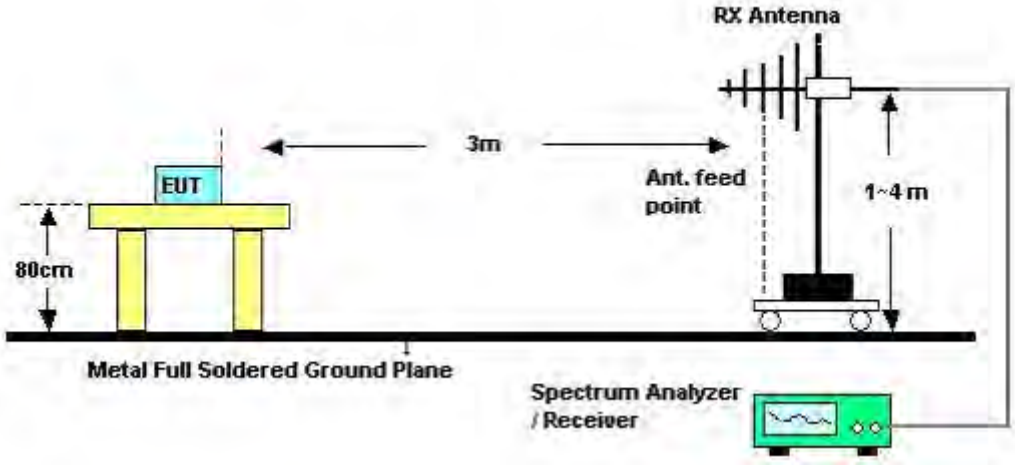
3.6.4 Test Setup

Emissions in Restricted Frequency Bands

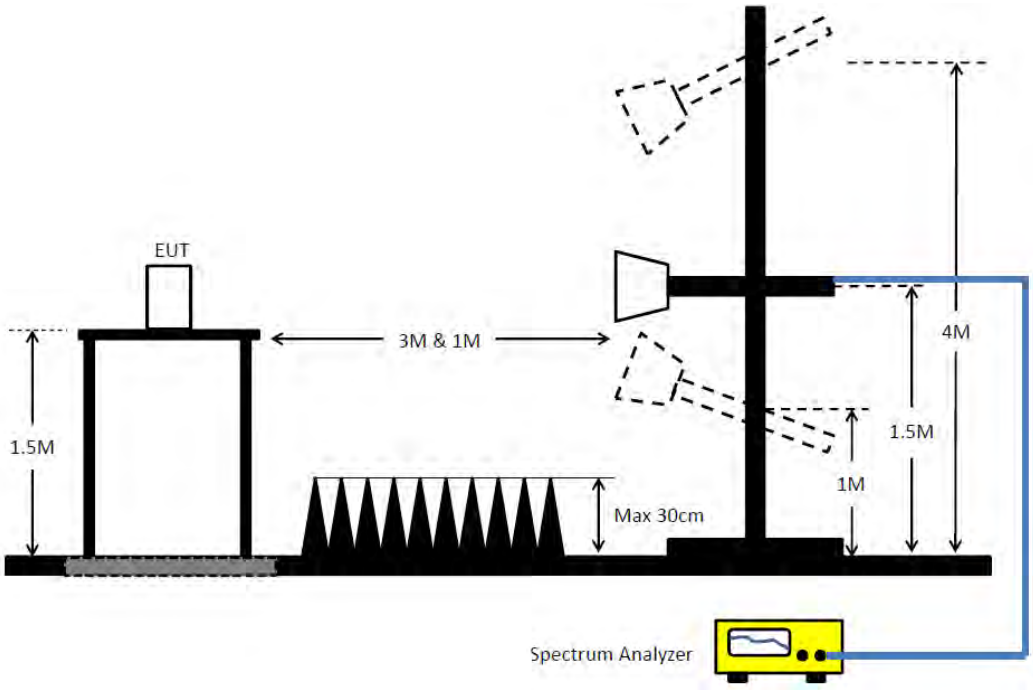
9kHz ~30MHz



30MHz~1GHz



Above 1GHz



3.6.5 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.6.6 Emissions in Restricted Frequency Bands (Below 30MHz)

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 10 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

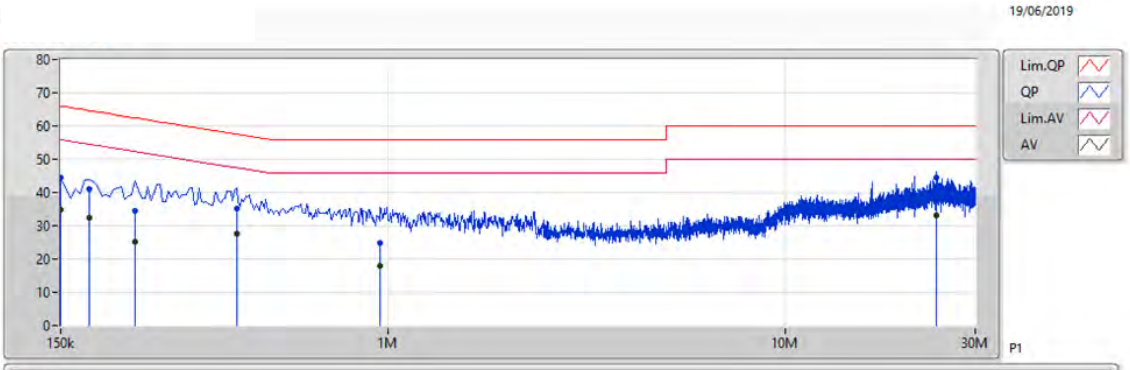
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 21, 2018	Nov. 20, 2019	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 05, 2018	Nov. 04, 2019	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	Jan. 16, 2019	Jan. 15, 2020	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz ~ 30MHz	Nov. 06, 2018	Nov. 05, 2019	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 29, 2019	Mar. 28, 2020	Radiation (03CH04-CB)
Horn Antenna	ETS・Lindgren	3115	00143147	750MHz~18GHz	Oct. 26, 2018	Oct. 25, 2019	Radiation (03CH04-CB)
BILOG ANTENNA	Schaffner	CBL6112B & N-6-06-06	22021&AT-N0607	30MHz ~ 1GHz	Oct. 12, 2018	Oct. 11, 2019	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz ~ 26.5GHz	Mar. 19, 2019	Mar. 18, 2020	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	310N	187291	0.1MHz ~ 1GHz	Mar. 19, 2019	Mar. 18, 2020	Radiation (03CH04-CB)
Spectrum Analyzer	R&S	FSP40	100142	9kHz~40GHz	Dec. 26, 2018	Dec. 25, 2019	Radiation (03CH04-CB
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	Jul. 03, 2018	Jul. 02, 2019	Radiation (03CH04-CB)
RF Cable	Woken	Low Cable-03+22	N/A	30MHz – 1GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH04-CB)
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1292	1GHz~18GHz	Jul. 20, 2018	Jul. 19, 2019	Radiation (03CH06-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH06-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 08, 2019	Jan. 07, 2020	Radiation (03CH06-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH06-CB)
RF Cable	HUBER+SUHNER	RG402	High Cable-05	1GHz~18GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH06-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable	HUBER+SUHNER	RG402	High Cable-05+24	1GHz~18GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH06-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH06-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH06-CB)
Spectrum analyzer	R&S	FSV40	101027	9kHz~40GHz	Jun. 22, 2018	Jun. 21, 2019	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-01	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-02	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-3	1 GHz – 26.5 GHz	Oct. 24, 2018	Oct. 23, 2019	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-04	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH02-CB)
RF Cable-high	Woken	RG402	High Cable-05	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH02-CB)
Power Sensor	Anritsu	MA2411B	1126203	300MHz~40GHz	Sep. 03, 2018	Sep. 02, 2019	Conducted (TH02-CB)
Power Meter	Anritsu	ML2495A	1210004	300MHz~40GHz	Sep. 03, 2018	Sep. 02, 2019	Conducted (TH02-CB)

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

NCR means Non-Calibration required.

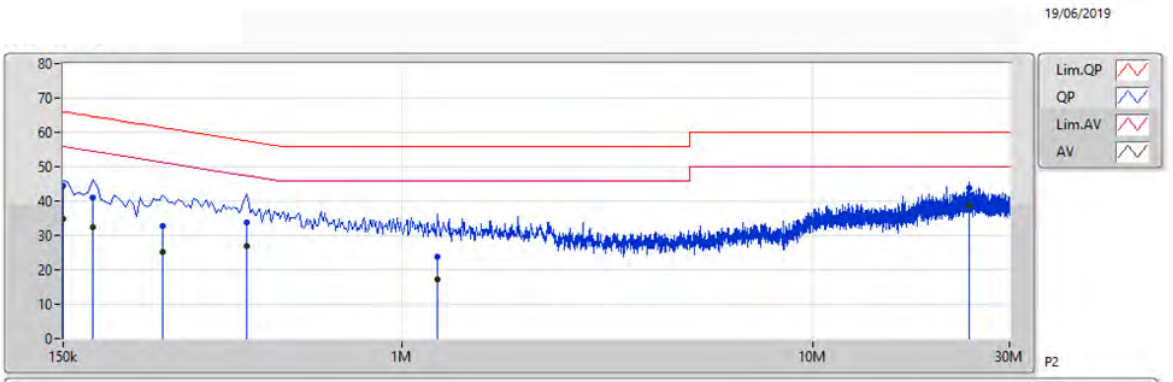
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	CTX		



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	AF	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	44.61	66.00	-21.39	9.90	Line	-	34.71	0.05	0.06	9.79
AV	150k	34.68	56.00	-21.32	9.90	Line	-	24.78	0.05	0.06	9.79
QP	177k	41.13	64.62	-23.49	9.91	Line	-	31.22	0.06	0.06	9.79
AV	177k	32.41	54.62	-22.21	9.91	Line	-	22.50	0.06	0.06	9.79
QP	231k	34.61	62.41	-27.80	9.91	Line	-	24.70	0.06	0.06	9.79
AV	231k	25.33	52.41	-27.08	9.91	Line	-	15.42	0.06	0.06	9.79
QP	415.5k	35.28	57.53	-22.25	9.93	Line	-	25.35	0.06	0.06	9.81
AV	415.5k	27.74	47.53	-19.79	9.93	Line	-	17.81	0.06	0.06	9.81
QP	955.5k	24.97	56.00	-31.03	9.98	Line	-	14.99	0.07	0.09	9.82
AV	955.5k	17.81	46.00	-28.19	9.98	Line	-	7.83	0.07	0.09	9.82
QP	24.005M	44.40	60.00	-15.60	10.67	Line	-	33.73	0.32	0.34	10.01
AV	24.005M	33.13	50.00	-16.87	10.67	Line	"Worst"	22.46	0.32	0.34	10.01

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	CTX		



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	AF	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	44.62	66.00	-21.38	9.89	Neutral	-	34.73	0.04	0.06	9.79
AV	150k	34.75	56.00	-21.25	9.89	Neutral	-	24.86	0.04	0.06	9.79
QP	177k	41.11	64.62	-23.51	9.89	Neutral	-	31.22	0.04	0.06	9.79
AV	177k	32.36	54.62	-22.26	9.89	Neutral	-	22.47	0.04	0.06	9.79
QP	262.5k	32.93	61.35	-28.42	9.90	Neutral	-	23.03	0.04	0.06	9.80
AV	262.5k	25.03	51.35	-26.32	9.90	Neutral	-	15.13	0.04	0.06	9.80
QP	420k	33.93	57.45	-23.52	9.91	Neutral	-	24.02	0.04	0.06	9.81
AV	420k	26.75	47.45	-20.70	9.91	Neutral	-	16.84	0.04	0.06	9.81
QP	1.221M	23.91	56.00	-32.09	9.98	Neutral	-	13.93	0.06	0.10	9.82
AV	1.221M	17.08	46.00	-28.92	9.98	Neutral	-	7.10	0.06	0.10	9.82
QP	24.009M	43.83	60.00	-16.17	10.66	Neutral	-	33.17	0.31	0.34	10.01
AV	24.009M	38.54	50.00	-11.46	10.66	Neutral	"Worst"	27.88	0.31	0.34	10.01

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

Mode 1: EUT 1 <Internal>

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE_Nss1_1TX	675k	1.033M	1M03F1D	671.25k	1.032M

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_Nss1_1TX	-	-	-	-
2402MHz	Pass	500k	671.25k	1.033M
2440MHz	Pass	500k	675k	1.032M
2480MHz	Pass	500k	673.75k	1.032M

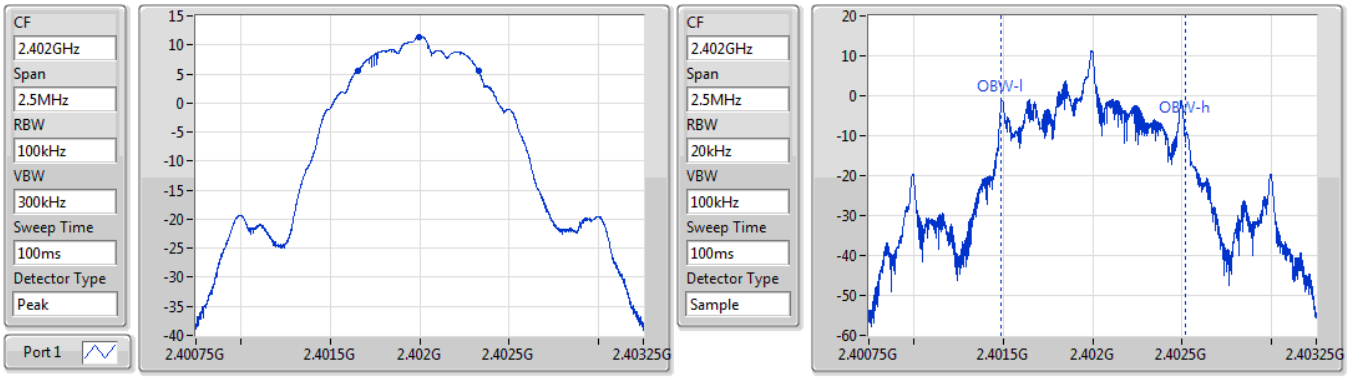
Port X-N dB = Port **X** 6dB down bandwidth; **Port X-OBW** = Port **X** 99% occupied bandwidth;

BT-LE_Nss1_1TX

EBW

2402MHz

12/06/2019



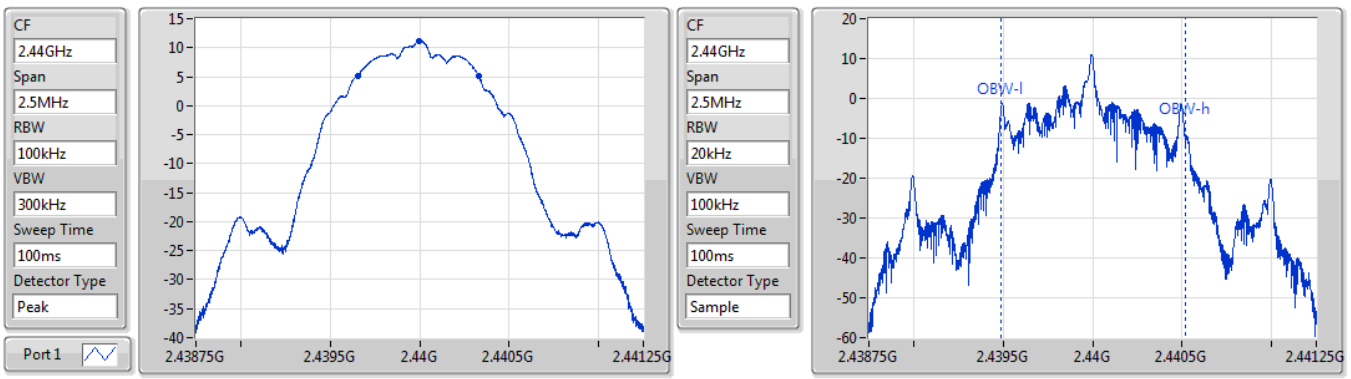
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
671.25k	2.401656G	2.402328G	1.033M	2.401485G	2.402518G	500k	1

BT-LE_Nss1_1TX

EBW

2440MHz

12/06/2019

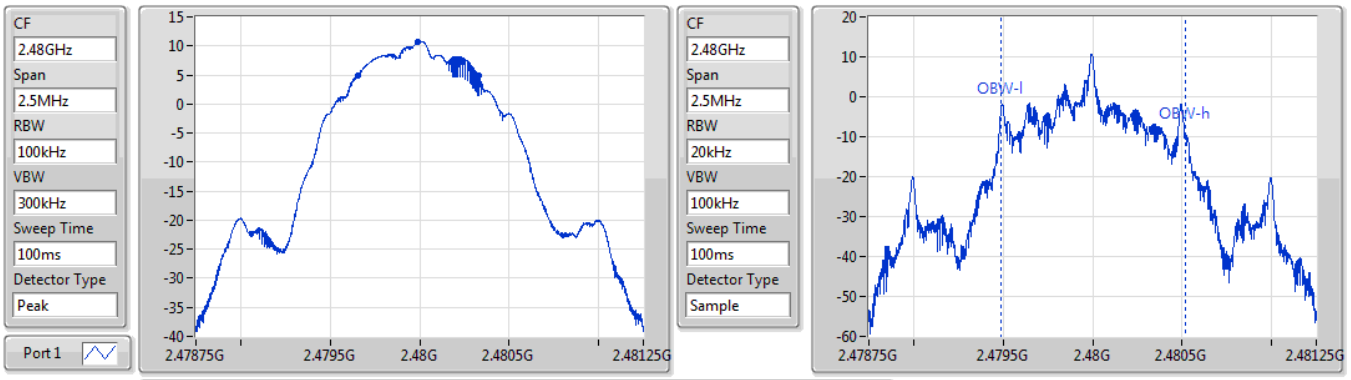


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
675k	2.439653G	2.440328G	1.032M	2.439485G	2.440517G	500k	1

BT-LE_Nss1_1TX **EBW**

2480MHz

12/06/2019



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
673.75k	2.479654G	2.480328G	1.032M	2.479485G	2.480517G	500k	1

Mode 2: EUT 3 <External>

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE_Nss1_1TX	678.75k	1.033M	1M03F1D	672.5k	1.031M

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

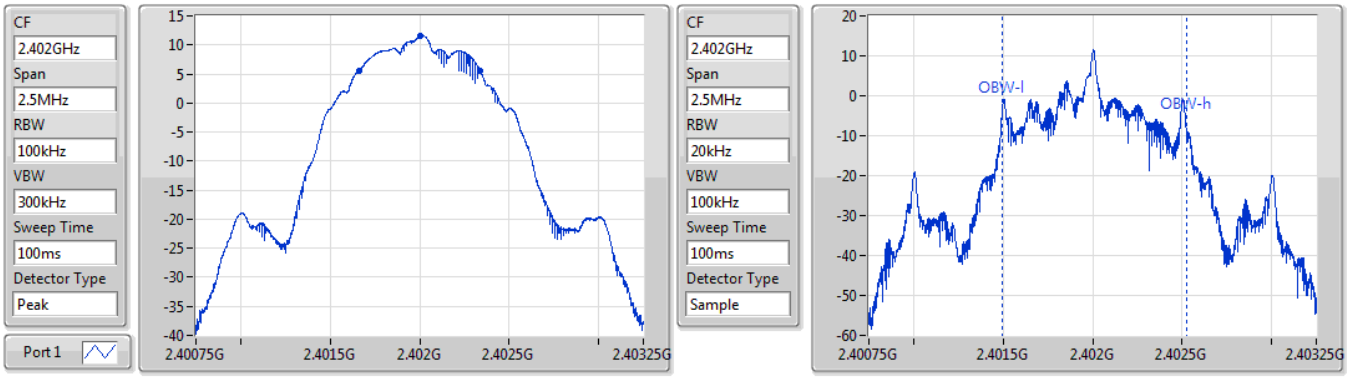
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE_Nss1_1TX	-	-	-	-
2402MHz	Pass	500k	673.75k	1.031M
2440MHz	Pass	500k	672.5k	1.033M
2480MHz	Pass	500k	678.75k	1.033M

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

BT-LE_Nss1_1TX **EBW**

2402MHz

12/06/2019

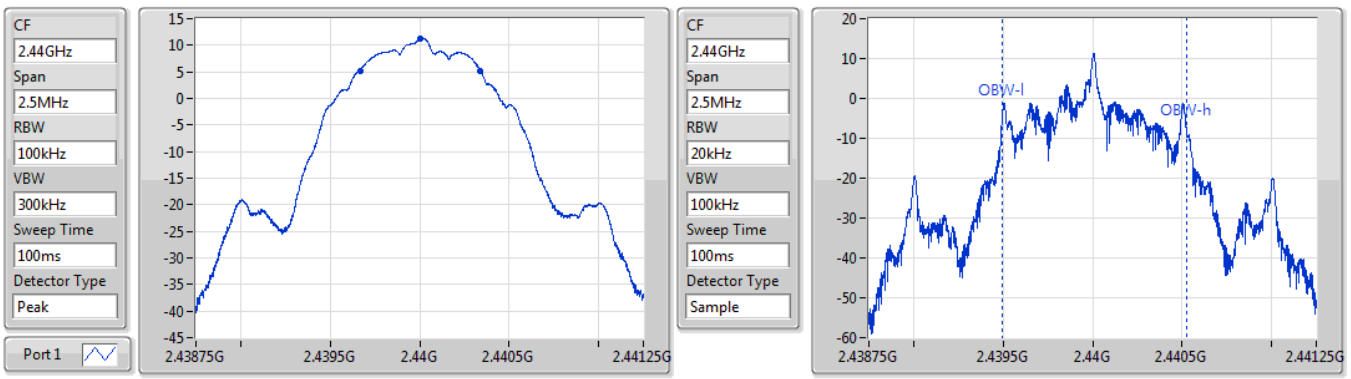


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
673.75k	2.401664G	2.402338G	1.031M	2.401494G	2.402525G	500k	1

BT-LE_Nss1_1TX **EBW**

2440MHz

12/06/2019

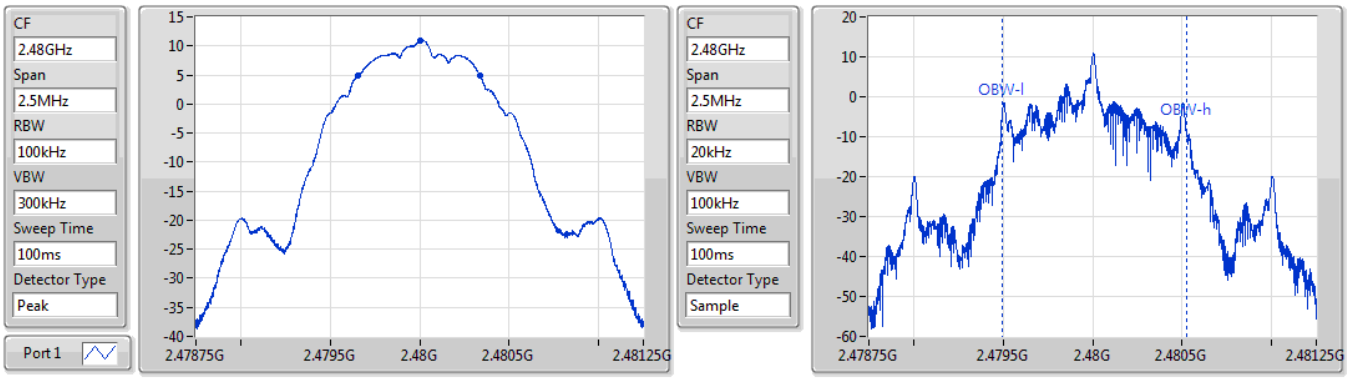


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
672.5k	2.439666G	2.440339G	1.033M	2.439495G	2.440528G	500k	1

BT-LE_Nss1_1TX **EBW**

2480MHz

12/06/2019



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
678.75k	2.479659G	2.480338G	1.033M	2.479494G	2.480527G	500k	1

Mode 1: EUT 1 <Internal>

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
BT-LE_Nss1_1TX	11.87	0.01538

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)
BT-LE_Nss1_1TX	-	-	-	-	-
2402MHz	Pass	1.25	11.87	11.87	30.00
2440MHz	Pass	1.25	11.67	11.67	30.00
2480MHz	Pass	1.25	11.30	11.30	30.00

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

Mode 2: EUT 3 <External>

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
BT-LE_Nss1_1TX	11.85	0.01531

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)
BT-LE_Nss1_1TX	-	-	-	-	-
2402MHz	Pass	-0.61	11.82	11.82	30.00
2440MHz	Pass	-0.61	11.85	11.85	30.00
2480MHz	Pass	-0.61	11.43	11.43	30.00

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

Mode 1: EUT 1 <Internal>

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE_Nss1_1TX	5.64

RBW=3 kHz.

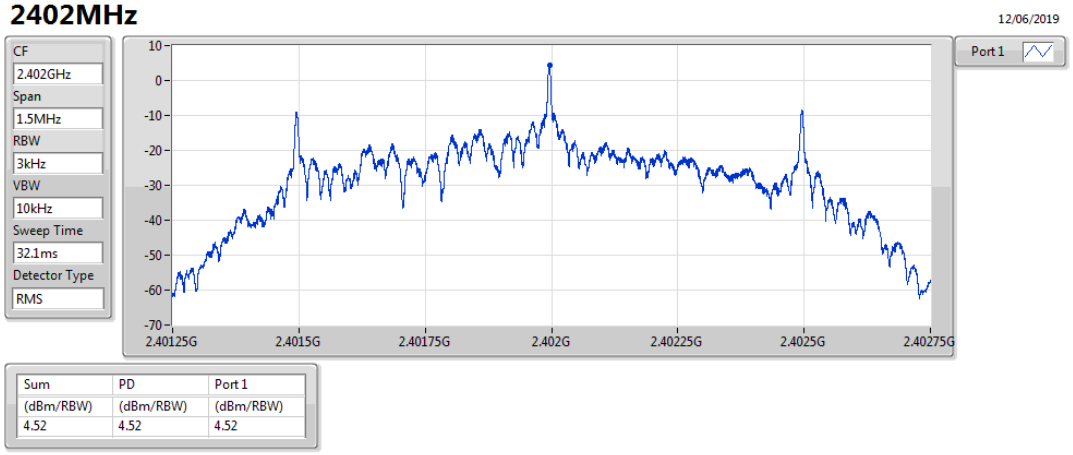
Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE_Nss1_1TX	-	-	-	-	-
2402MHz	Pass	1.25	4.52	4.52	8.00
2440MHz	Pass	1.25	5.64	5.64	8.00
2480MHz	Pass	1.25	4.17	4.17	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_Nss1_1TX **PSD**

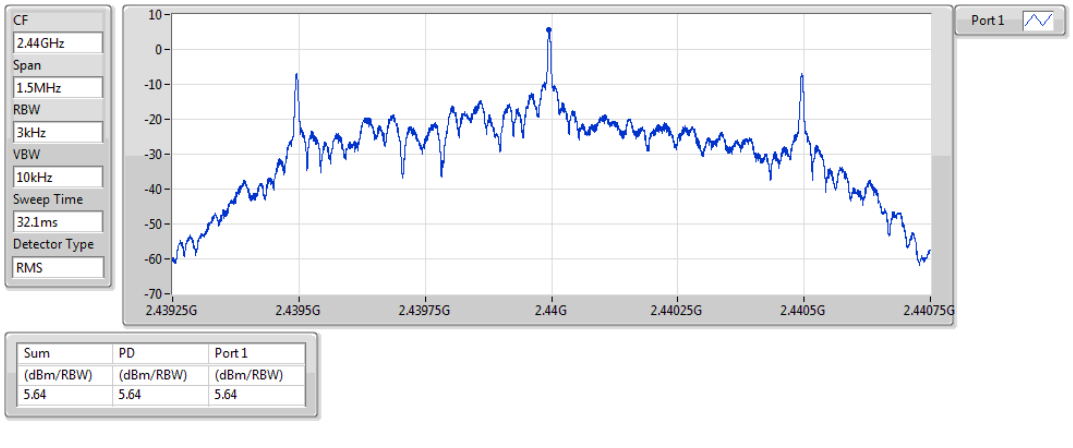
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
4.52	4.52	4.52

BT-LE_Nss1_1TX **PSD**

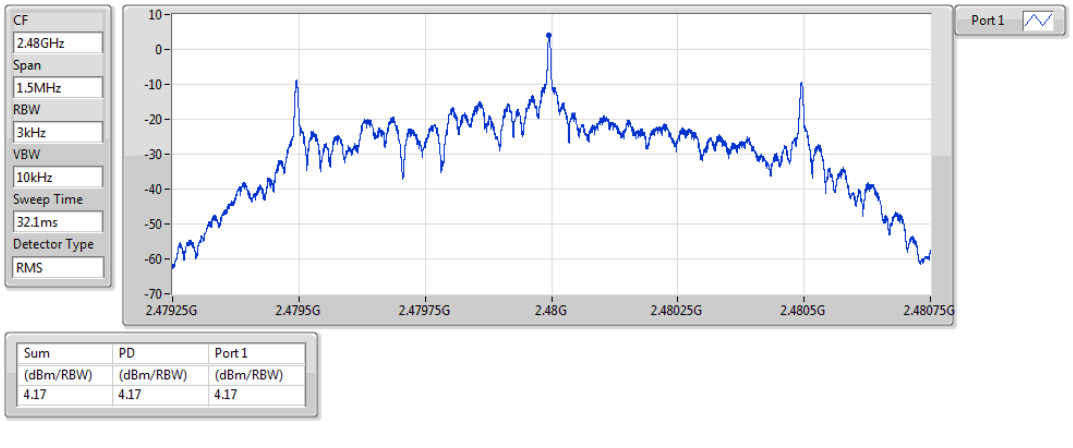
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
5.64	5.64	5.64

BT-LE_Nss1_1TX **PSD**

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
4.17	4.17	4.17

Mode 2: EUT 3 <External>

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE_Nss1_1TX	4.24

RBW=3 kHz.

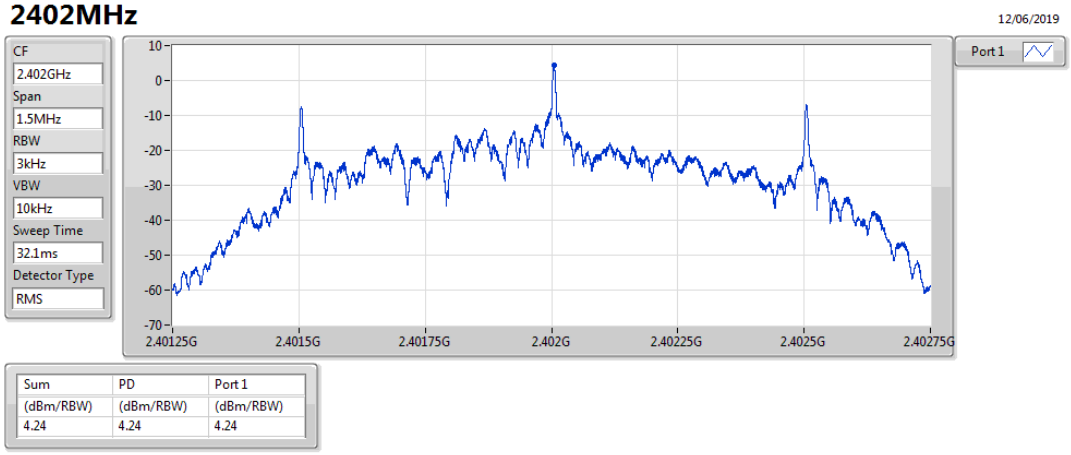
Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE_Nss1_1TX	-	-	-	-	-
2402MHz	Pass	-0.61	4.24	4.24	8.00
2440MHz	Pass	-0.61	3.27	3.27	8.00
2480MHz	Pass	-0.61	3.43	3.43	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_Nss1_1TX **PSD**

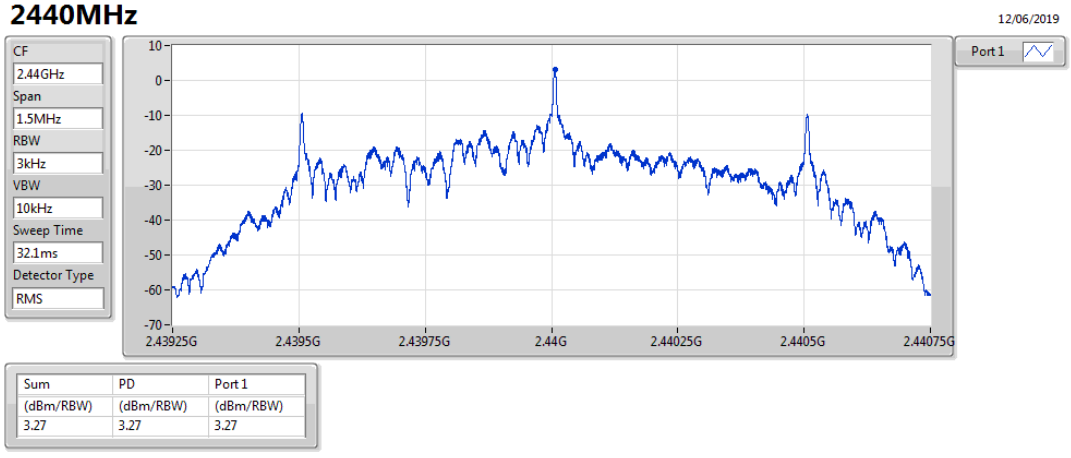
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
4.24	4.24	4.24

BT-LE_Nss1_1TX **PSD**

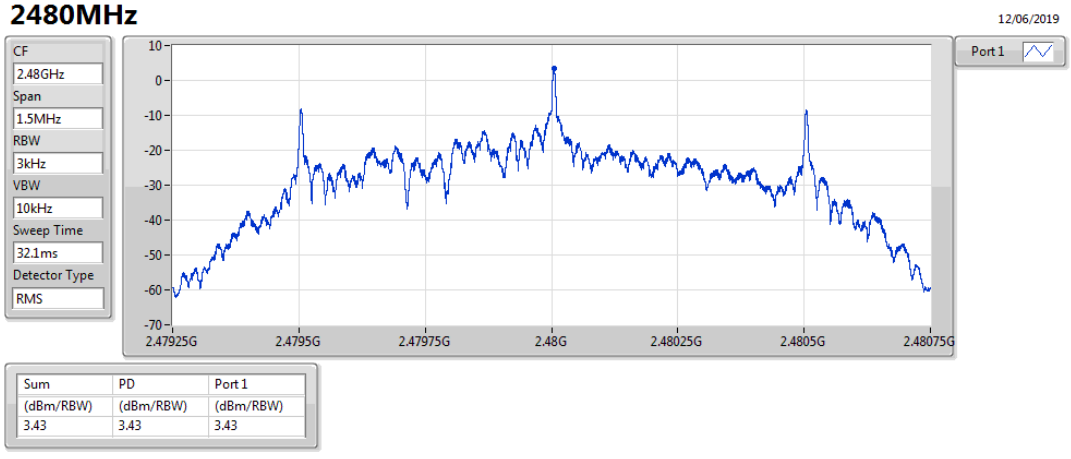
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
3.27	3.27	3.27

BT-LE_Nss1_1TX **PSD**

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
3.43	3.43	3.43

Mode 1: EUT 1 <Internal>

Summary

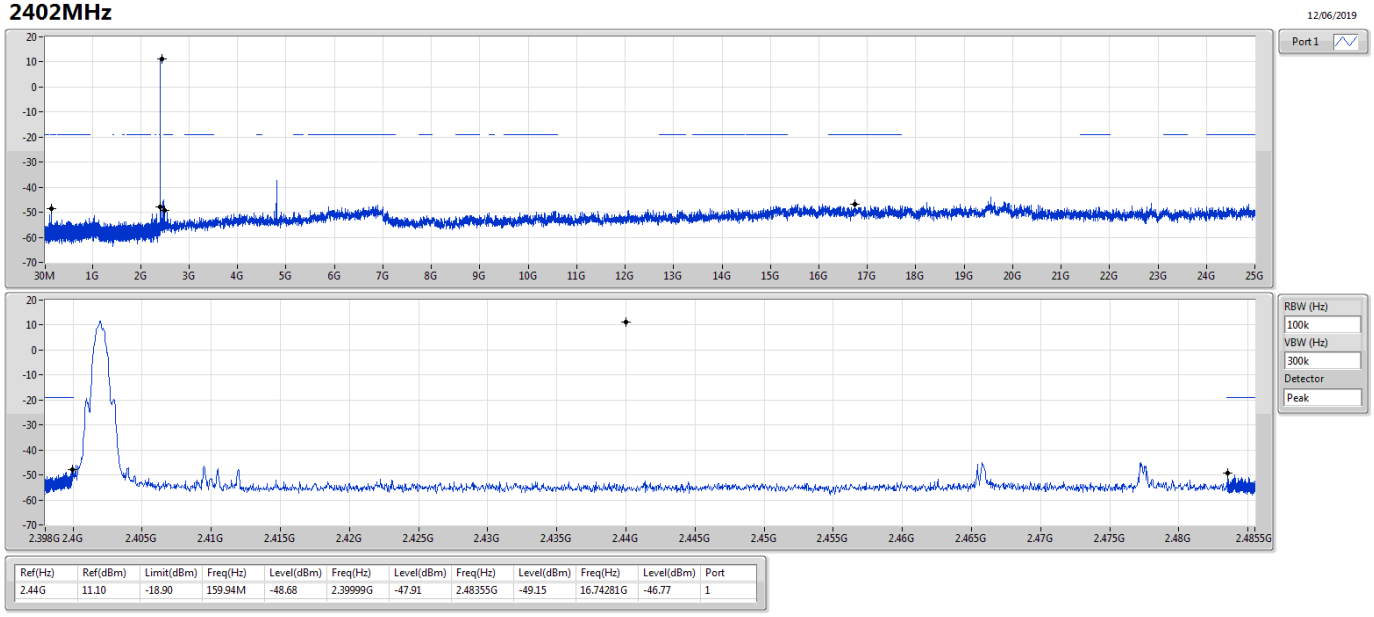
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE_Nss1_1TX	Pass	2.44G	11.10	-18.90	159.94M	-51.40	2.39867G	-43.57	2.48414G	-50.86	6.80828G	-46.74	1

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)	Port
BT-LE_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.44G	11.10	-18.90	159.94M	-48.68	2.39999G	-47.91	2.48355G	-49.15	16.74281G	-46.77	1
2440MHz	Pass	2.44G	11.10	-18.90	543.86M	-49.69	2.39839G	-51.11	2.48492G	-50.83	6.76888G	-46.60	1
2480MHz	Pass	2.44G	11.10	-18.90	159.94M	-51.40	2.39867G	-43.57	2.48414G	-50.86	6.80828G	-46.74	1

BT-LE_Nss1_1TX **CSE NdB**

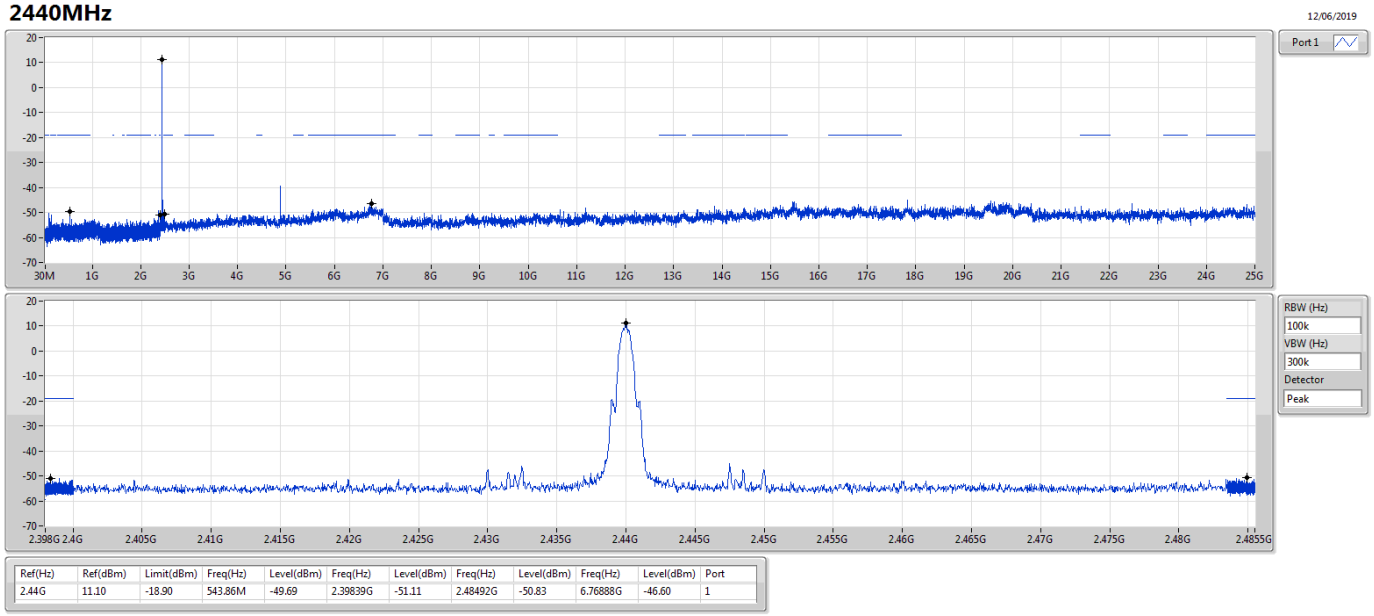
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44G	11.10	-18.90	159.94M	-48.68	2.39999G	-47.91	2.48355G	-49.15	16.74281G	-46.77	1

BT-LE_Nss1_1TX **CSE NdB**

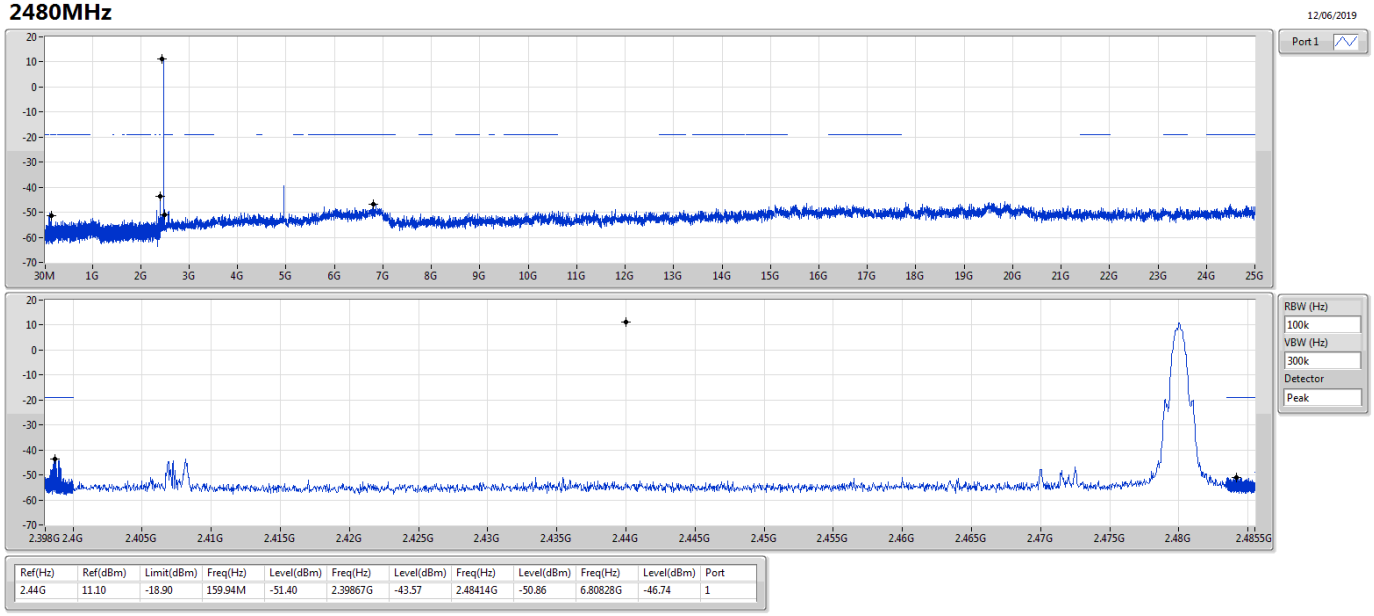
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44G	11.10	-18.90	543.86M	-49.69	2.39839G	-51.11	2.48492G	-50.83	6.76888G	-46.60	1

BT-LE_Nss1_1TX **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)	Port
2.44G	11.10	-18.90	159.94M	-51.40	2.39867G	-43.57	2.48414G	-50.86	6.80828G	-46.74	1

Mode 2: EUT 3 <External>

Summary

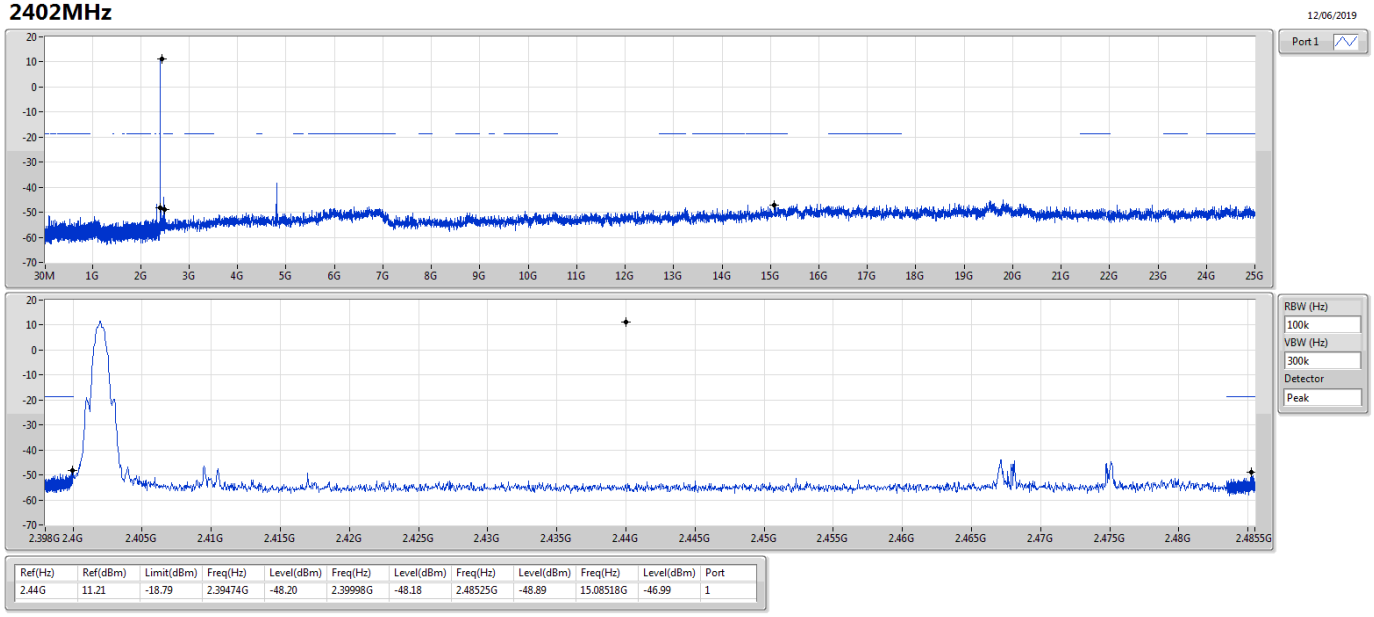
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE_Nss1_1TX	Pass	2.44G	11.21	-18.79	95.71M	-50.38	2.39992G	-43.17	2.48497G	-45.58	24.63414G	-45.86	1

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)	Port
BT-LE_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.44G	11.21	-18.79	2.39474G	-48.20	2.39998G	-48.18	2.48525G	-48.89	15.08518G	-46.99	1
2440MHz	Pass	2.44G	11.21	-18.79	96.01M	-52.97	2.39953G	-51.25	2.48365G	-51.26	15.13021G	-46.49	1
2480MHz	Pass	2.44G	11.21	-18.79	95.71M	-50.38	2.39992G	-43.17	2.48497G	-45.58	24.63414G	-45.86	1

BT-LE_Nss1_1TX **CSE NdB**

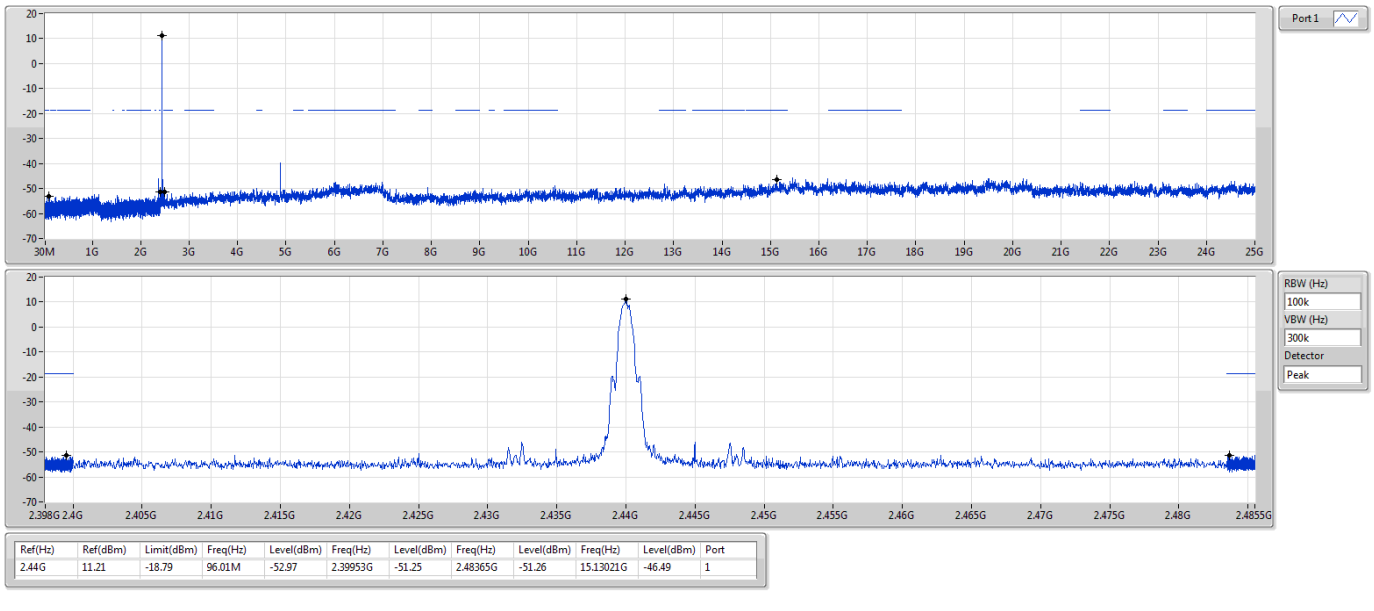
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44G	11.21	-18.79	2.39474G	-48.20	2.39998G	-48.18	2.48525G	-48.89	15.08518G	-46.99	1

BT-LE_Nss1_1TX **CSE NdB**

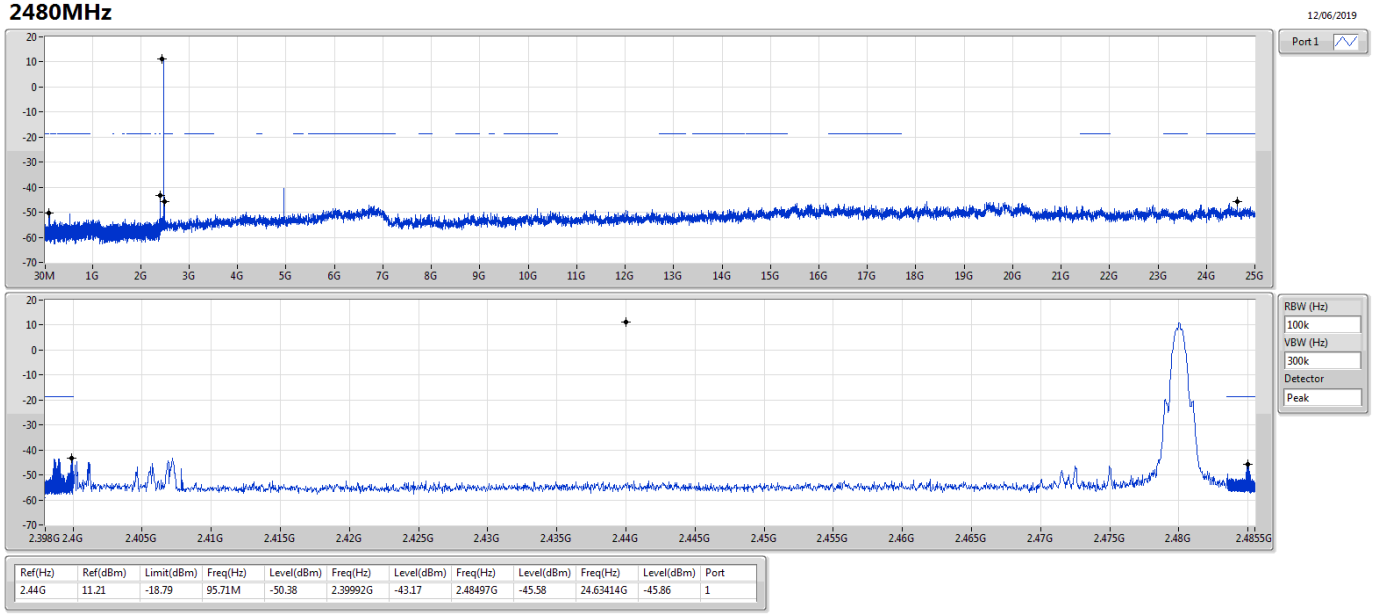
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44G	11.21	-18.79	96.01M	-52.97	2.39953G	-51.25	2.48365G	-51.26	15.13021G	-46.49	1

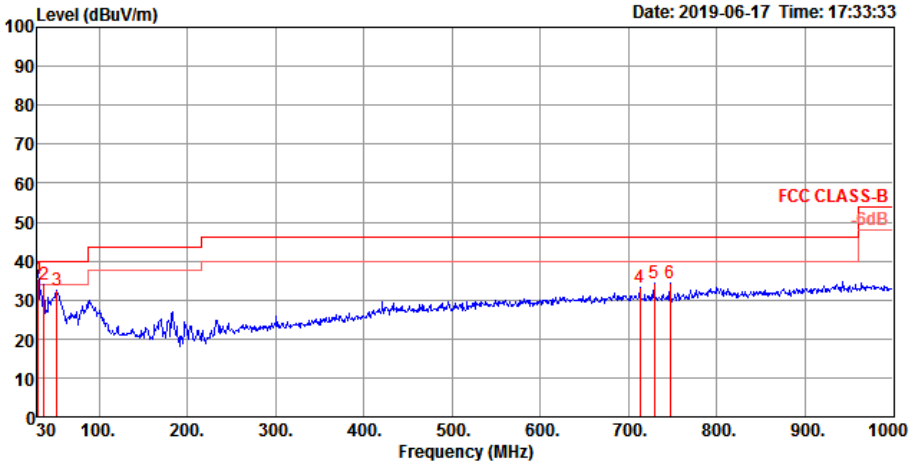
BT-LE_Nss1_1TX **CSE NdB**

2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44G	11.21	-18.79	95.71M	-50.38	2.39992G	-43.17	2.48497G	-45.58	24.63414G	-45.86	1

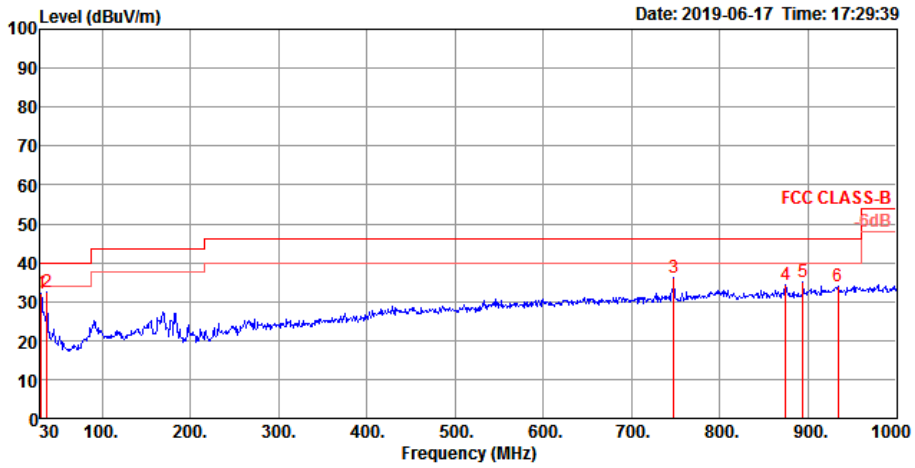
RSE below 1GHz Result			
Operating Mode	1	**Polarization**	Vertical
Operating Function	CTX		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.97	35.33	40.00	-4.67	43.50	0.51	23.51	32.19	100	8	QP	VERTICAL
2	37.76	33.89	40.00	-6.11	46.01	0.59	19.51	32.22	200	211	Peak	VERTICAL
3	52.31	32.53	40.00	-7.47	50.89	0.74	13.08	32.18	150	9	Peak	VERTICAL
4	712.88	33.30	46.00	-12.70	37.06	2.87	25.31	31.94	200	266	Peak	VERTICAL
5	729.37	34.44	46.00	-11.56	38.04	2.89	25.53	32.02	150	101	Peak	VERTICAL
6	746.83	34.44	46.00	-11.56	37.98	2.91	25.64	32.09	150	321	Peak	VERTICAL

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

RSE below 1GHz Result			
Operating Mode	1	**Polarization**	Horizontal
Operating Function	CTX		



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.97	32.12	40.00	-7.88	40.29	0.51	23.51	32.19	125	75	Peak	HORIZONTAL
2	37.76	32.65	40.00	-7.35	44.77	0.59	19.51	32.22	200	360	Peak	HORIZONTAL
3	747.80	36.02	46.00	-9.98	39.56	2.91	25.64	32.09	125	259	Peak	HORIZONTAL
4	874.87	34.15	46.00	-11.85	36.29	3.09	26.19	31.42	100	228	Peak	HORIZONTAL
5	894.27	35.18	46.00	-10.82	36.76	3.09	26.61	31.28	300	340	Peak	HORIZONTAL
6	934.04	34.11	46.00	-11.89	35.08	3.25	26.65	30.87	200	312	Peak	HORIZONTAL

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

Mode 1: EUT 1 <Internal>

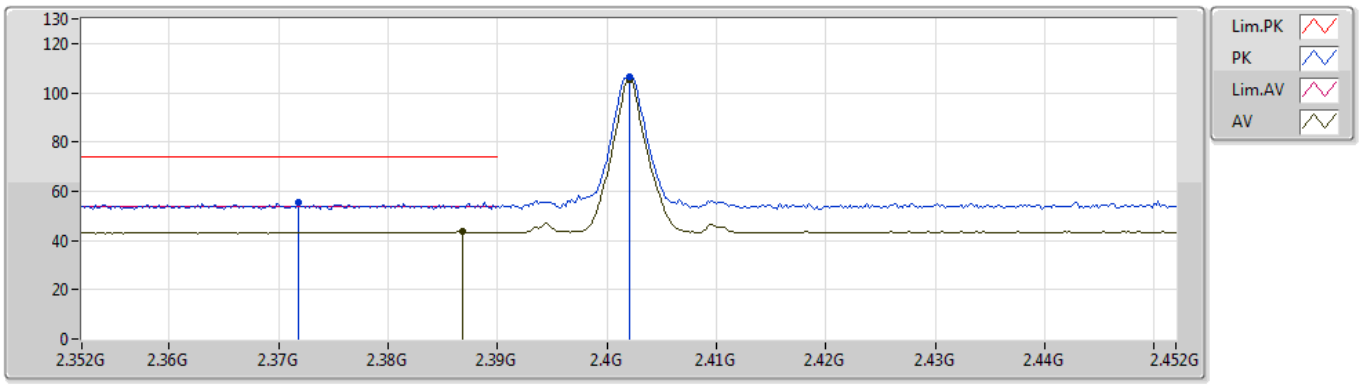
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	2.4835G	49.98	54.00	-4.02	30.96	3	Vertical	360	1.06	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



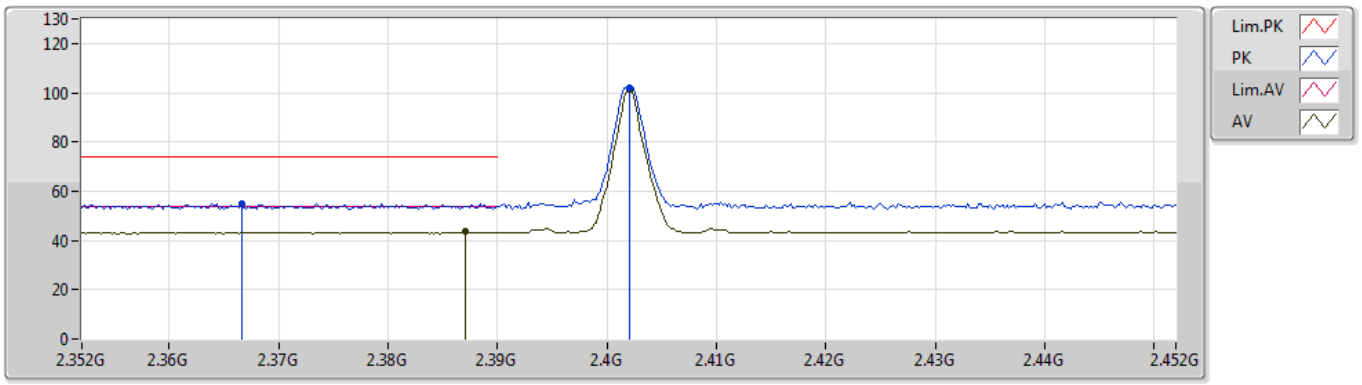
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.3718G	55.37	74.00	-18.63	30.74	3	Vertical	14	1.48	-
AV	2.3868G	43.47	54.00	-10.53	30.79	3	Vertical	14	1.48	-
PK	2.402G	106.19	Inf	-Inf	30.84	3	Vertical	14	1.48	-
AV	2.402G	105.33	Inf	-Inf	30.84	3	Vertical	14	1.48	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



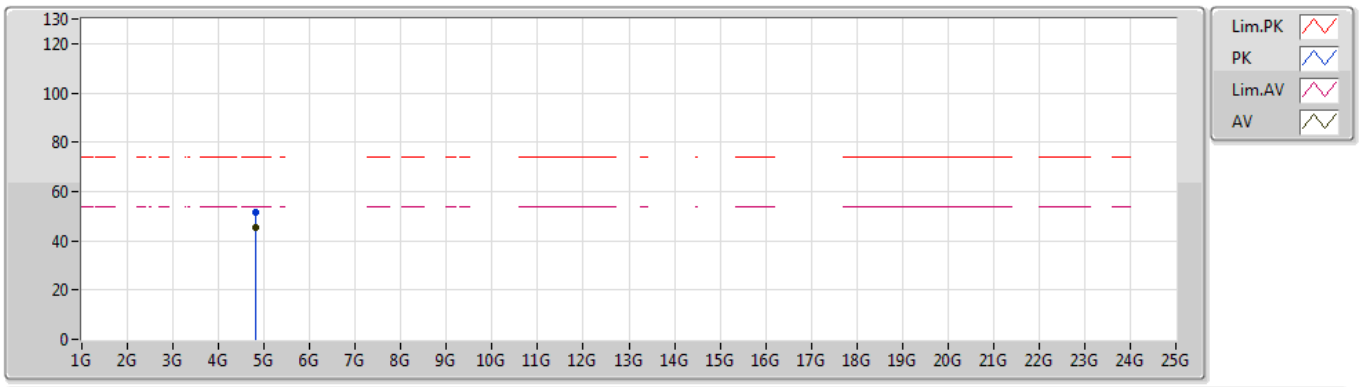
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.3666G	55.02	74.00	-18.98	30.71	3	Horizontal	294	2.08	-
AV	2.387G	43.44	54.00	-10.56	30.79	3	Horizontal	294	2.08	-
PK	2.402G	102.02	Inf	-Inf	30.84	3	Horizontal	294	2.08	-
AV	2.402G	101.17	Inf	-Inf	30.84	3	Horizontal	294	2.08	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



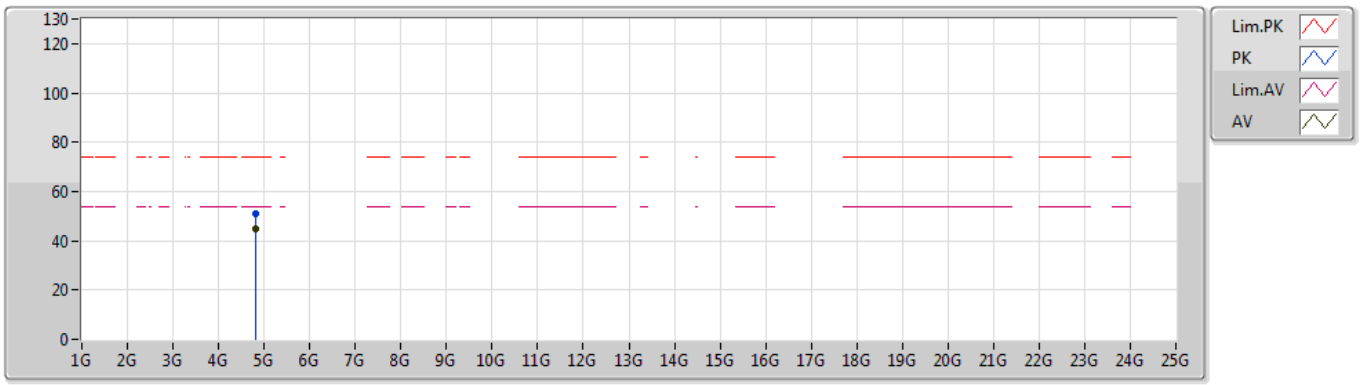
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.80404G	51.39	74.00	-22.61	3.49	3	Vertical	32	1.53	-
AV	4.80402G	45.36	54.00	-8.64	3.49	3	Vertical	32	1.53	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



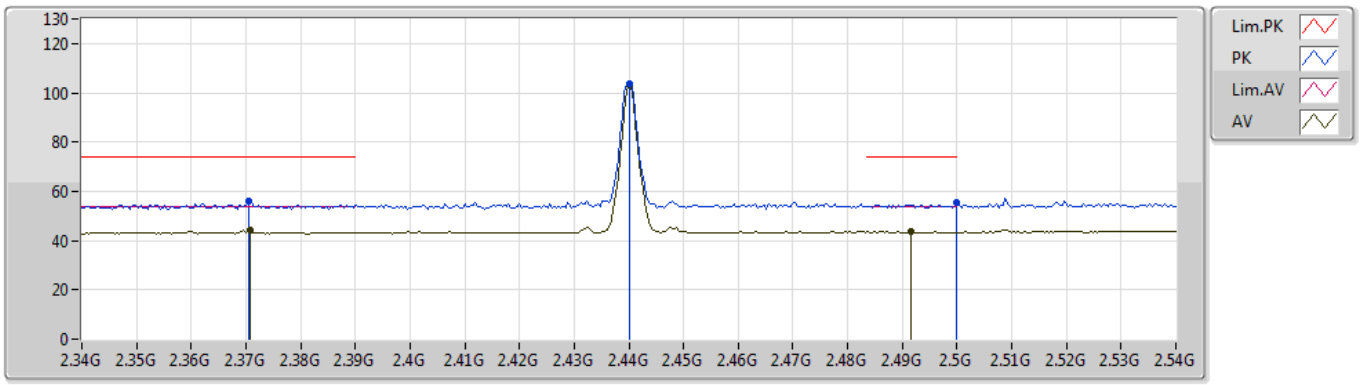
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.8042G	50.79	74.00	-23.21	3.50	3	Horizontal	96	1.76	-
AV	4.80398G	45.02	54.00	-8.98	3.49	3	Horizontal	96	1.76	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



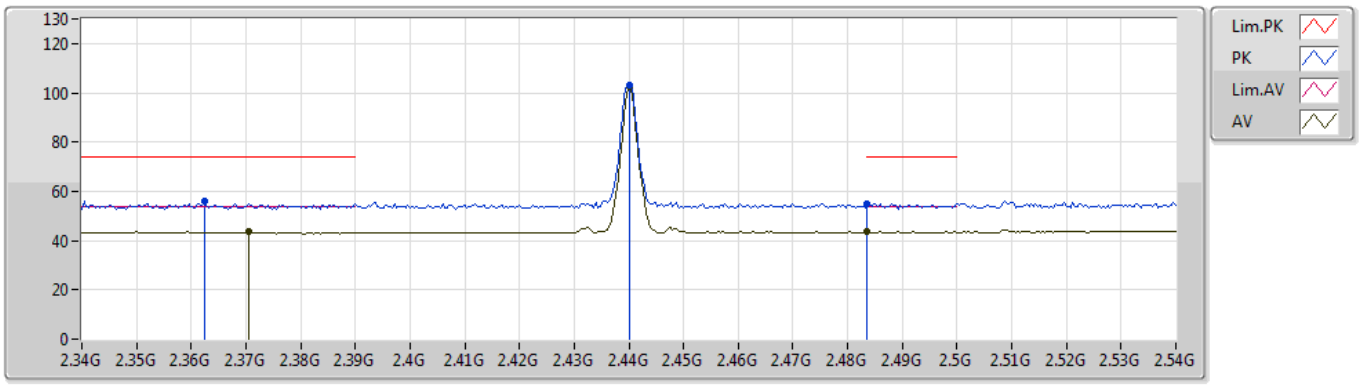
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.3704G	56.19	74.00	-17.81	30.73	3	Vertical	310	1.09	-
AV	2.3708G	44.12	54.00	-9.88	30.73	3	Vertical	310	1.09	-
PK	2.44G	103.93	Inf	-Inf	30.90	3	Vertical	310	1.09	-
AV	2.44G	103.06	Inf	-Inf	30.90	3	Vertical	310	1.09	-
PK	2.5G	55.29	74.00	-18.71	30.99	3	Vertical	310	1.09	-
AV	2.4916G	43.64	54.00	-10.36	30.98	3	Vertical	310	1.09	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



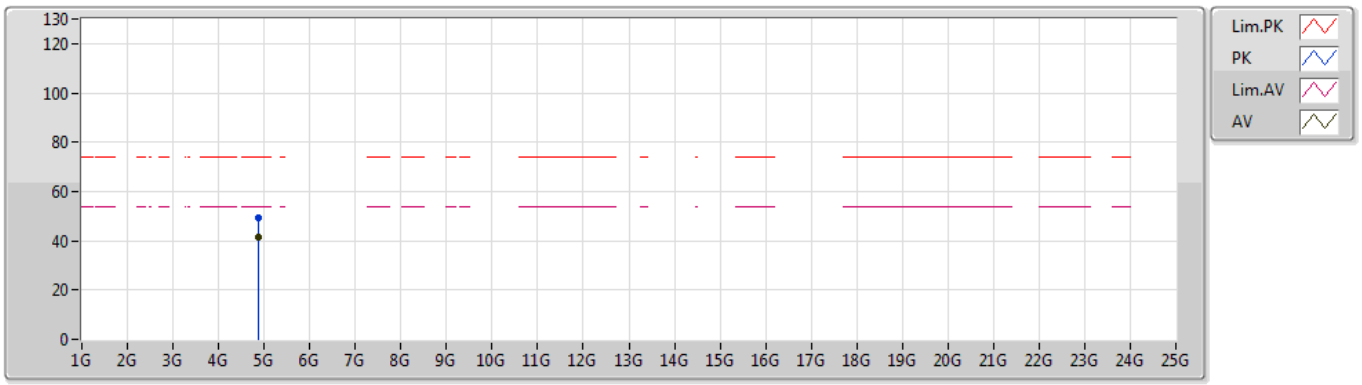
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.3624G	56.13	74.00	-17.87	30.70	3	Horizontal	182	1.04	-
AV	2.3704G	43.61	54.00	-10.39	30.73	3	Horizontal	182	1.04	-
PK	2.44G	103.14	Inf	-Inf	30.90	3	Horizontal	182	1.04	-
AV	2.44G	102.30	Inf	-Inf	30.90	3	Horizontal	182	1.04	-
PK	2.4835G	54.91	74.00	-19.09	30.96	3	Horizontal	182	1.04	-
AV	2.4835G	43.64	54.00	-10.36	30.96	3	Horizontal	182	1.04	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



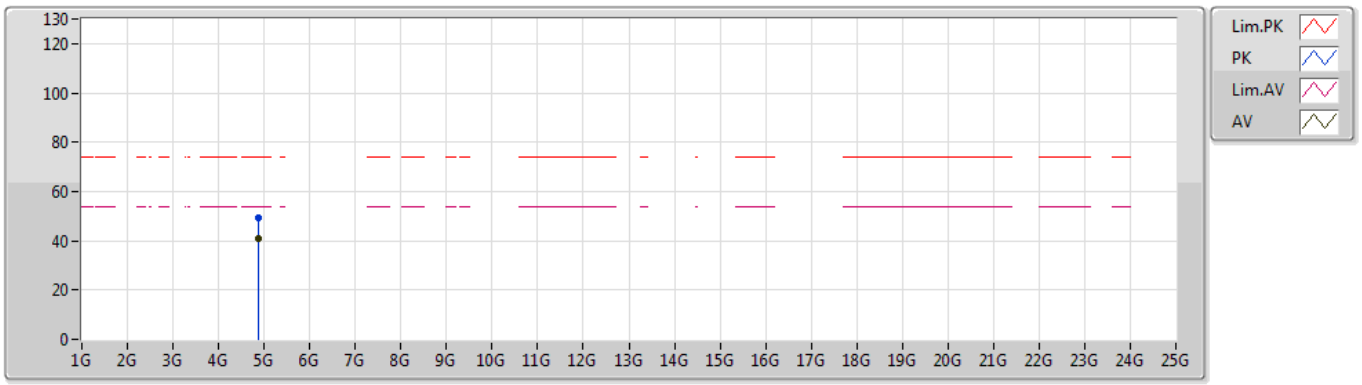
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.88038G	49.53	74.00	-24.47	3.84	3	Vertical	315	1.68	-
AV	4.88G	41.70	54.00	-12.30	3.84	3	Vertical	315	1.68	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



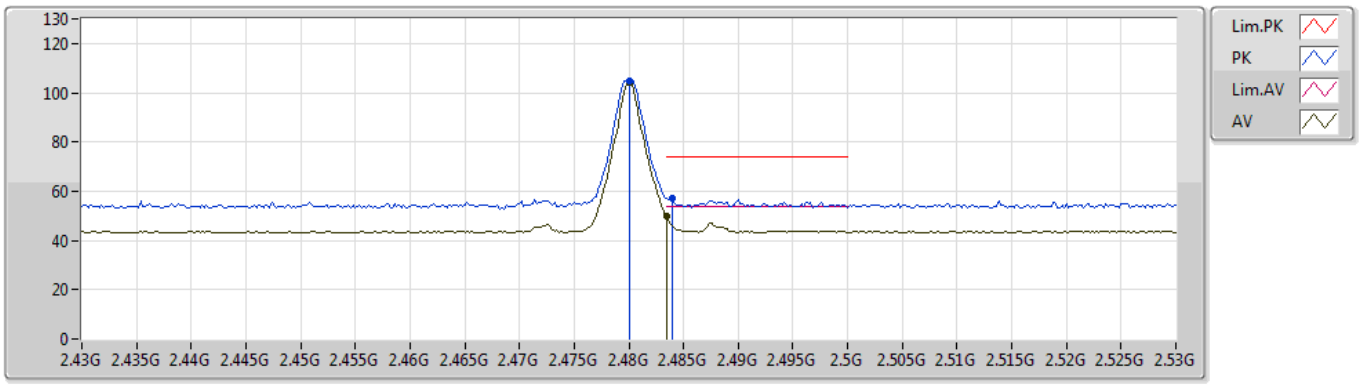
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.88004G	49.22	74.00	-24.78	3.84	3	Horizontal	49	1.74	-
AV	4.87996G	41.11	54.00	-12.89	3.84	3	Horizontal	49	1.74	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



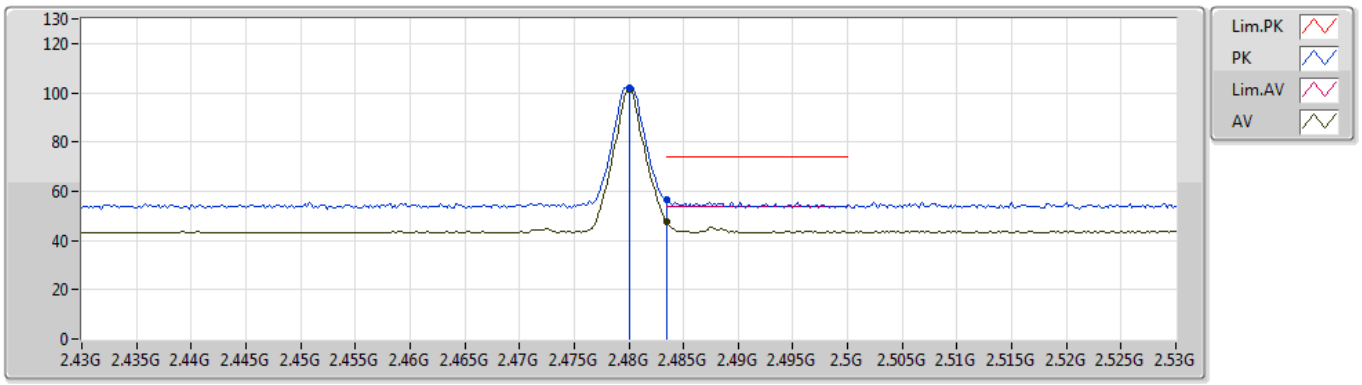
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.48G	104.86	Inf	-Inf	30.96	3	Vertical	360	1.06	-
AV	2.48G	103.98	Inf	-Inf	30.96	3	Vertical	360	1.06	-
PK	2.484G	57.10	74.00	-16.90	30.96	3	Vertical	360	1.06	-
AV	2.4835G	49.98	54.00	-4.02	30.96	3	Vertical	360	1.06	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



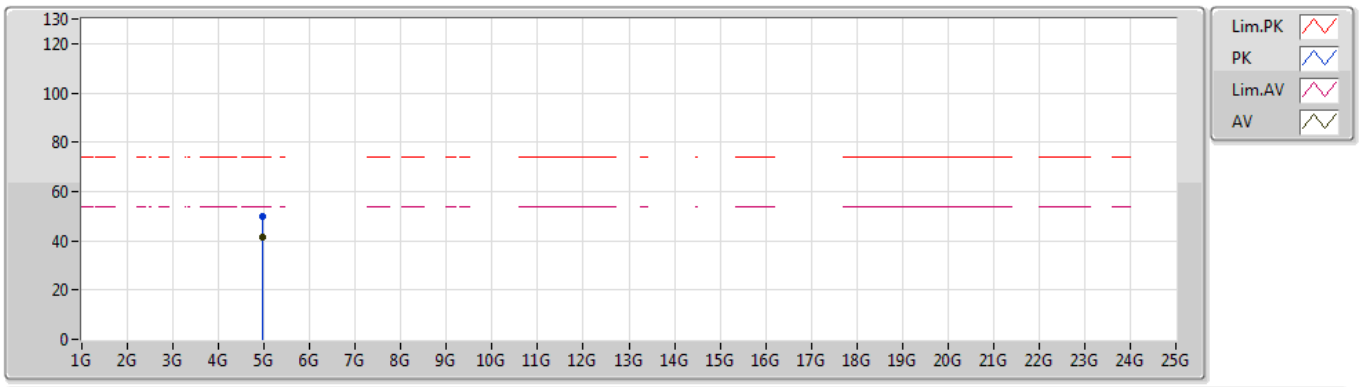
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.48G	102.22	Inf	-Inf	30.96	3	Horizontal	34	1.50	-
AV	2.48G	101.34	Inf	-Inf	30.96	3	Horizontal	34	1.50	-
PK	2.4835G	56.53	74.00	-17.47	30.96	3	Horizontal	34	1.50	-
AV	2.4835G	47.77	54.00	-6.23	30.96	3	Horizontal	34	1.50	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



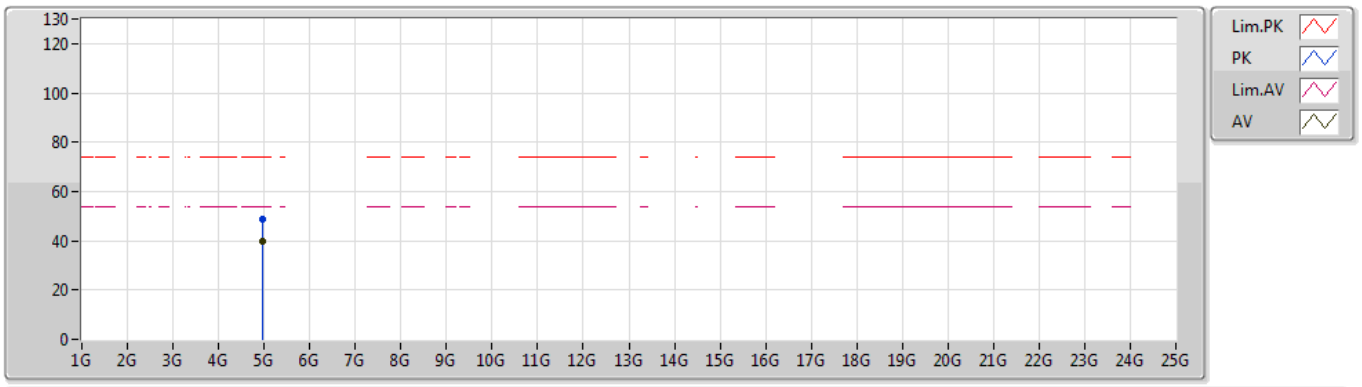
EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.95994G	49.82	74.00	-24.18	4.20	3	Vertical	312	1.70	-
AV	4.95994G	41.24	54.00	-12.76	4.20	3	Vertical	312	1.70	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



EUT Y_1TX
Setting 12
01-M-1
FSP

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.9595G	48.67	74.00	-25.33	4.20	3	Horizontal	100	1.50	-
AV	4.96002G	39.52	54.00	-14.48	4.20	3	Horizontal	100	1.50	-

Mode 2: EUT 3 <External>

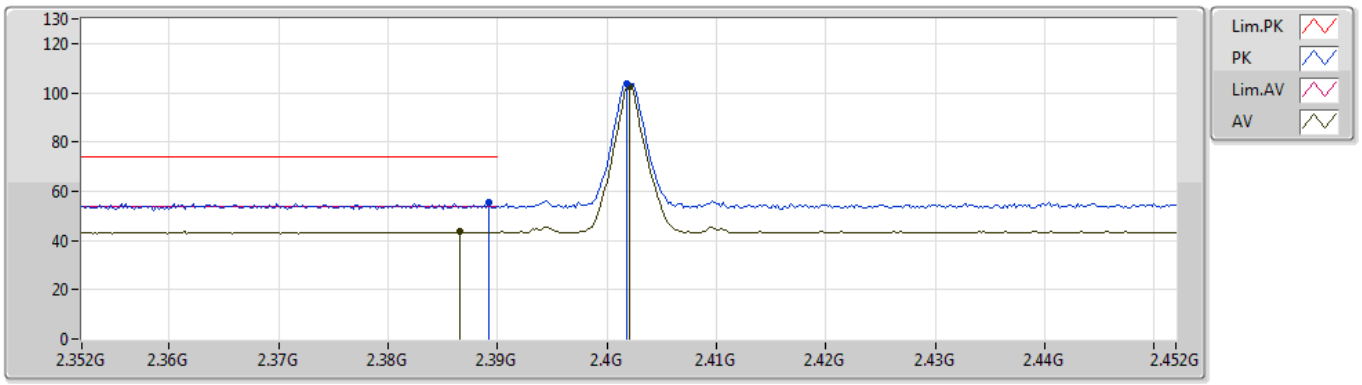
Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	4.804G	51.11	54.00	-2.89	3.49	3	Vertical	120	1.06	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



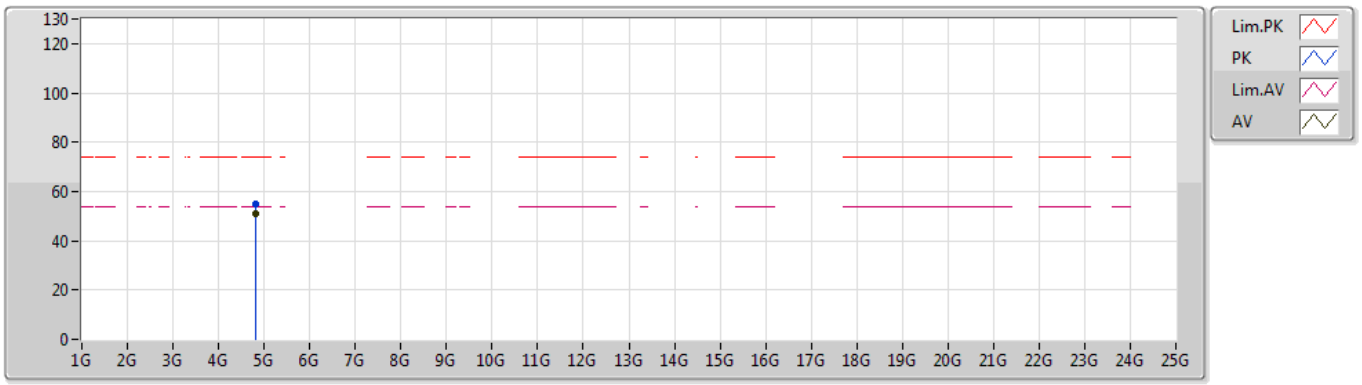
EUT Z_1TX
Setting 12
01-J-5
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.3892G	55.70	74.00	-18.30	30.80	3	Vertical	91	1.25	-
AV	2.3866G	43.60	54.00	-10.40	30.79	3	Vertical	91	1.25	-
PK	2.4018G	103.63	Inf	-Inf	30.84	3	Vertical	91	1.25	-
AV	2.402G	102.75	Inf	-Inf	30.84	3	Vertical	91	1.25	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



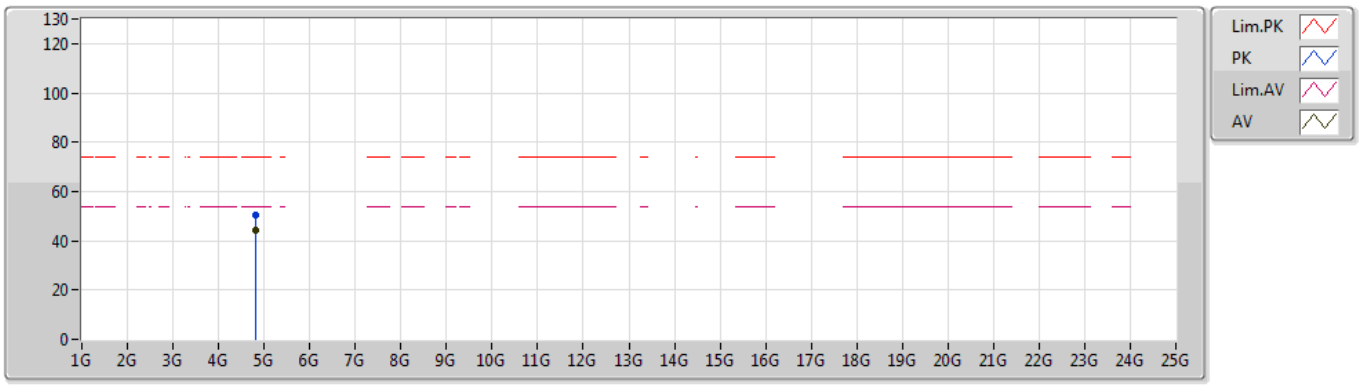
EUT Z_1TX
Setting 12
01-J-5
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.80418G	54.71	74.00	-19.29	3.50	3	Vertical	120	1.06	-
AV	4.804G	51.11	54.00	-2.89	3.49	3	Vertical	120	1.06	-

BT-LE(1Mbps)

11/06/2019

2402MHz_TX



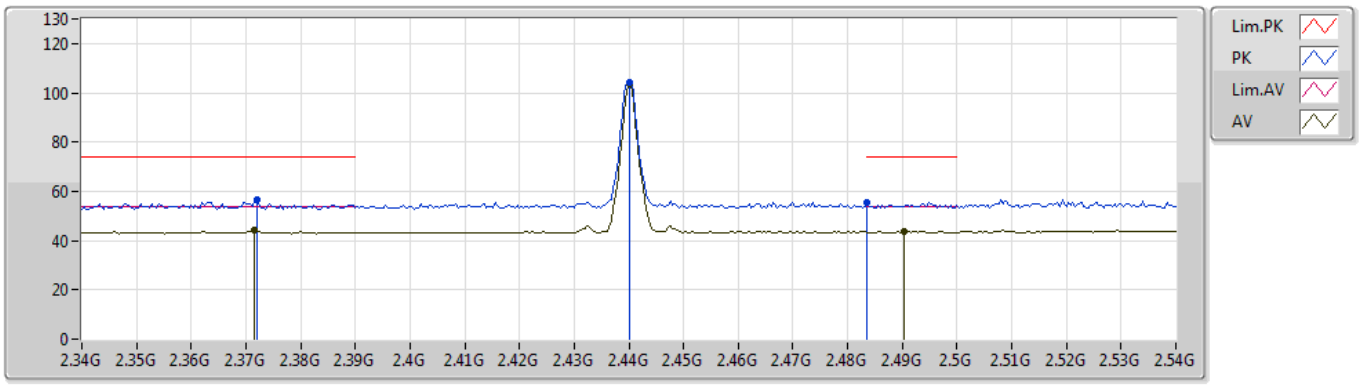
EUT Z_1TX
Setting 12
01-J-5
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.80414G	50.65	74.00	-23.35	3.49	3	Horizontal	45	1.28	-
AV	4.804G	44.48	54.00	-9.52	3.49	3	Horizontal	45	1.28	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



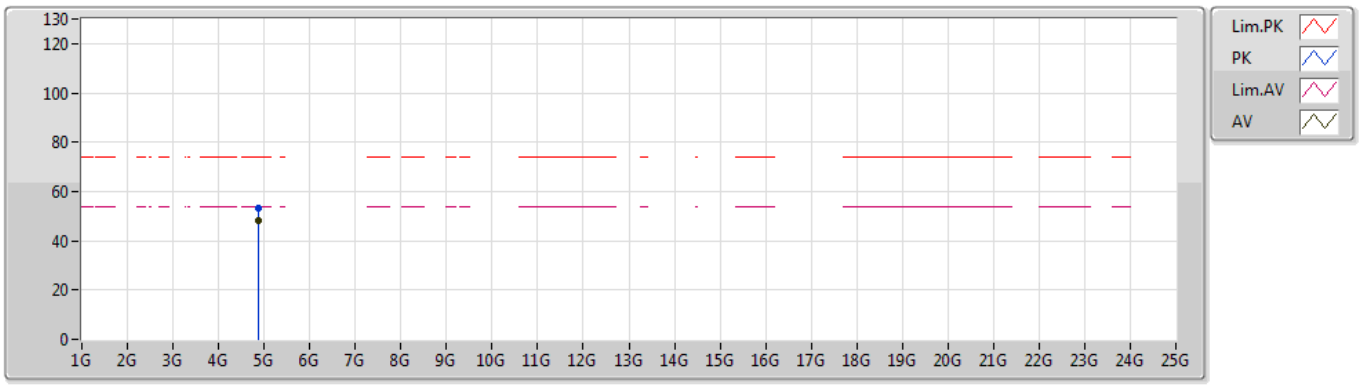
EUT Z_1TX
Setting 12
01-J-5
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.372G	56.58	74.00	-17.42	30.74	3	Vertical	10	1.15	-
AV	2.3716G	44.20	54.00	-9.80	30.73	3	Vertical	10	1.15	-
PK	2.44G	104.34	Inf	-Inf	30.90	3	Vertical	10	1.15	-
AV	2.44G	103.50	Inf	-Inf	30.90	3	Vertical	10	1.15	-
PK	2.4835G	55.40	74.00	-18.60	30.96	3	Vertical	10	1.15	-
AV	2.4904G	43.70	54.00	-10.30	30.98	3	Vertical	10	1.15	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



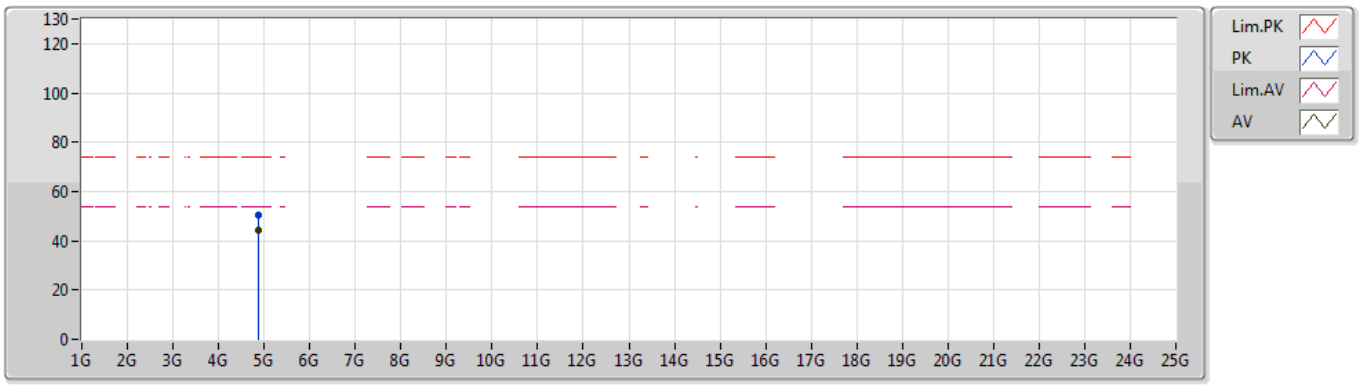
EUT Z_1TX
Setting 12
01-J-5
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.88008G	53.39	74.00	-20.61	3.84	3	Vertical	78	1.17	-
AV	4.88002G	48.36	54.00	-5.64	3.84	3	Vertical	78	1.17	-

BT-LE(1Mbps)

11/06/2019

2440MHz_TX



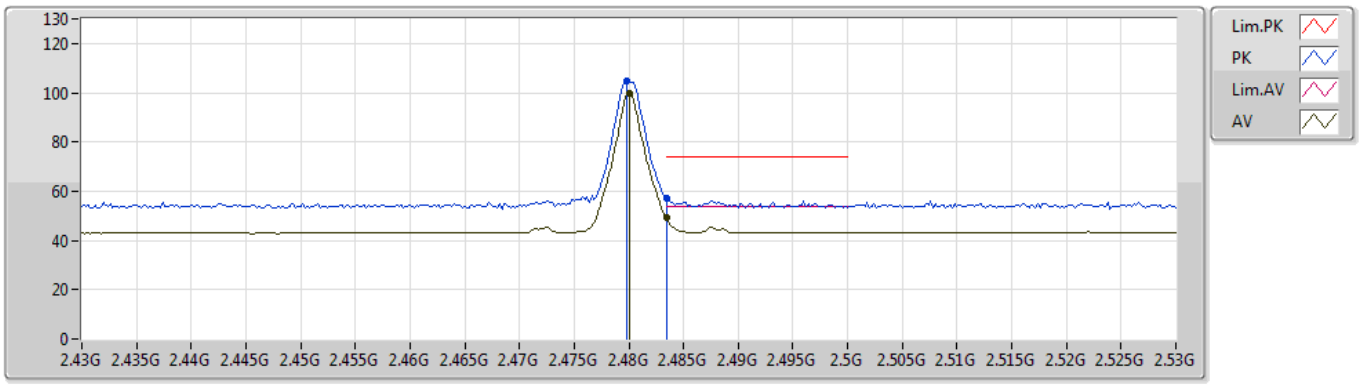
EUT Z_1TX
Setting 12
01-J-5
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.87992G	50.60	74.00	-23.40	3.84	3	Horizontal	317	1.02	-
AV	4.88002G	44.19	54.00	-9.81	3.84	3	Horizontal	317	1.02	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



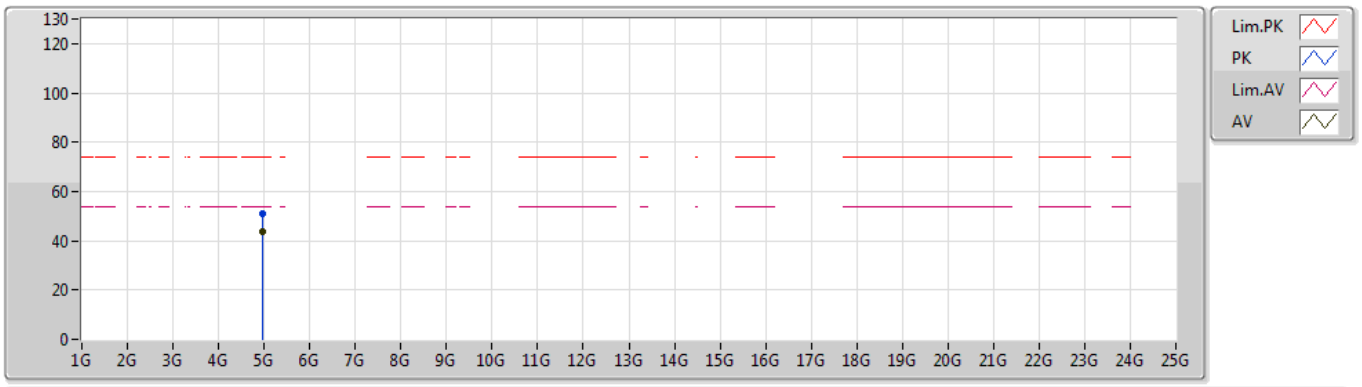
EUT Z_1TX
Setting 12
01-M-1
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	2.4798G	104.55	Inf	-Inf	30.96	3	Vertical	300	1.00	-
AV	2.48G	99.93	Inf	-Inf	30.96	3	Vertical	300	1.00	-
PK	2.4835G	56.99	74.00	-17.01	30.96	3	Vertical	300	1.00	-
AV	2.4835G	49.15	54.00	-4.85	30.96	3	Vertical	300	1.00	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



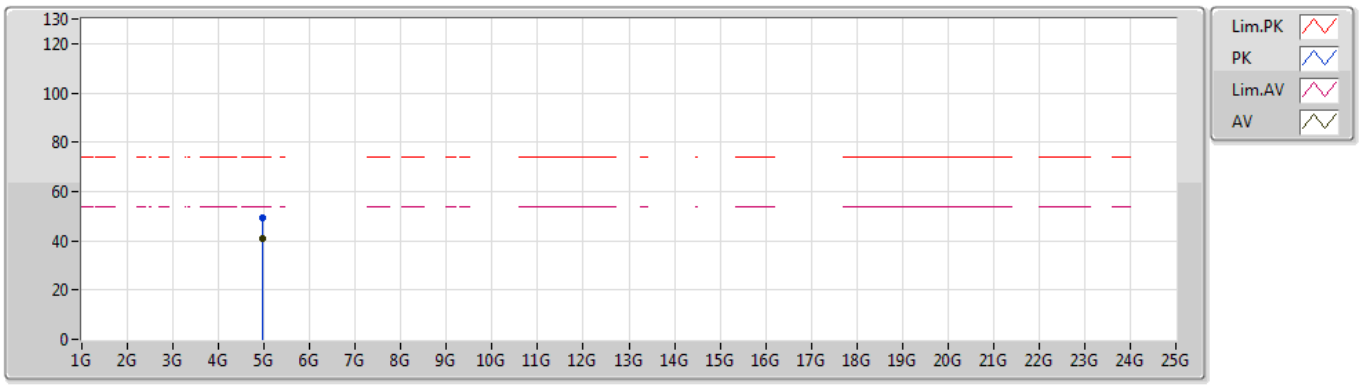
EUT Z_1TX
Setting 12
01-M-1
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.95968G	51.12	74.00	-22.88	4.20	3	Vertical	101	1.15	-
AV	4.95994G	43.74	54.00	-10.26	4.20	3	Vertical	101	1.15	-

BT-LE(1Mbps)

11/06/2019

2480MHz_TX



EUT Z_1TX
Setting 12
01-M-1
FSP(100056)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.96002G	49.48	74.00	-24.52	4.20	3	Horizontal	305	1.06	-
AV	4.96G	40.65	54.00	-13.35	4.20	3	Horizontal	305	1.06	-