



NCC RADIO TEST REPORT

Equipment : 無線接入點
Brand Name : Extreme Networks
Model Name : AP560i
Applicant : 香港商極進網路有限公司台灣分公司
臺北市松山區復勢里南京東路 4 段 126 號 5 樓
Manufacturer : 啟碁科技股份有限公司
新竹科學工業園區新竹縣園區二路 20 號
Standard : LP0002 Section 3.10.1 (2018-01-10)

The product was received on Nov. 14, 2018 , and testing was started from Nov. 14, 2018 and completed on Apr. 15, 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 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: Cliff Chang

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



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History of this test report

TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A10_10 Ver1.0

Page Number : 3 of 36
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Report Version : 01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	3.10.1.4	Antenna Requirement	PASS	-
3.1	2.3	AC Power-line Conducted Emissions	PASS	-
3.2	3.10.1.6	DTS Bandwidth	PASS	-
3.3	3.10.1.2	Maximum Conducted Output Power	PASS	-
3.4	3.10.1.6	Power Spectral Density	PASS	-
3.5	3.10.1.5	Emissions in Non-restricted Frequency Bands	PASS	-
3.6	3.10.1.5	Emissions in Restricted Frequency Bands	PASS	-
Note: Reference to Sporton Project No.: 8O1739-01 and 8O1739-07.				

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: Cliff Chang

Report Producer: Wendy Pan



1 General Description

1.1 Information

1.1.1 RF General Information

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

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

Note:

- ♦ Bluetooth LE uses a GFSK modulation for DSSS.
- ♦ 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.

1.1.2 Antenna Information

Ant.	Port			Brand	Model Name	Antenna Type	Connector	Radio	Antenna Gain(dBi)
	1TX	2TX	4TX						
1	1	1	1	WNC	Starlord 510i	PIFA	I-PEX	R1-5GHz	Note 1
2	-	2	2	WNC	Starlord 510i	PIFA	I-PEX	R1-5GHz	Note 1
3	-	-	3	WNC	Starlord 510i	PIFA	I-PEX	R1-5GHz	Note 1
4	-	-	4	WNC	Starlord 510i	PIFA	I-PEX	R1-5GHz	Note 1
5	R2-1	R2-1	R1-4 R2-1	WNC	Starlord 510i	PIFA	I-PEX	R1-2.4GHz R2-5GHz	Note 1
6	-	R2-2	R1-3 R2-2	WNC	Starlord 510i	PIFA	I-PEX	R1-2.4GHz R2-5GHz	Note 1
7	-	R1-2	R1-2 R2-3	WNC	Starlord 510i	PIFA	I-PEX	R1-2.4GHz R2-5GHz	Note 1
8	R1-1	R1-1	R1-1 R2-4	WNC	Starlord 510i	PIFA	I-PEX	R1-2.4GHz R2-5GHz	Note 1
9	1	-	-	WNC	Starlord 510i	PIFA	I-PEX	R3	Note 1

Note1:

Ant.	Antenna Gain(dBi)			
	WLAN 2.4GHz	WLAN 5GHz	Bluetooth	Thread
1	-	5.89	-	-
2	-	5.36	-	-
3	-	5.67	-	-
4	-	5.36	-	-
5	3.48	4.57	-	-
6	3.80	4.40	-	-
7	3.84	4.98	-	-
8	3.90	5.18	-	-
9	-	-	4.40	4.40

Note2: The above information was declared by manufacturer.

Note3:

For 2.4GHz function:

For IEEE 802.11b/g/n/ax mode (1TX, 2TX, 4TX/4RX):

For 1TX

Only Port 1 can be use as transmitting antenna.

For 2TX

Port 1 and Port 2 can be use as transmitting antenna.

Port 1 and Port 2 could transmit simultaneously.

For 4TX

Port 1, Port 2, Port 3 and Port 4 can be use as transmitting antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit simultaneously.

For 4RX

Port 1, Port 2, Port 3 and Port 4 can be used as receiving antennas.

Port 1, Port 2, Port 3 and Port 4 could receive simultaneously.

For 5GHz function:

For IEEE 802.11a/n/ac/ax mode (1TX, 2TX, 4TX/4RX):

For 1TX

Only Port 1 can be use as transmitting antenna.

For 2TX

Port 1 and Port 2 can be use as transmitting antenna.

Port 1 and Port 2 could transmit simultaneously.

For 4TX

Port 1, Port 2, Port 3 and Port 4 can be use as transmitting antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit simultaneously.

For 4RX

Port 1, Port 2, Port 3 and Port 4 can be used as receiving antennas.

Port 1, Port 2, Port 3 and Port 4 could receive simultaneously.

For Bluetooth and Thread mode (1TX/1RX):

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

1.1.3 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.648	1.884	405.797u	3k

Note:

- ♦ DC is Duty Cycle.
- ♦ DCF is Duty Cycle Factor.

1.1.4 EUT Operational Condition

EUT Power Type	From PoE			
Function	☒	Point-to-multipoint	☐	Point-to-point
Test Software Version	Telnet			
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 EUT has three radios, the information as following table:

Radio	Function		
	WLAN 2.4GHz	WLAN 5GHz	Bluetooth/Thread
1	V	V	-
2	-	V	-
3	-	-	V

Note: The above information was declared by manufacturer.



1.2 Testing Applied Standards

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

- ♦ NCC LP0002 (2018-01-10)
- ♦ ANSI C63.10-2013
- ♦ 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	TH01-CB	Eddie Weng	21~23°C / 58~61%	Nov. 14, 2018 ~ Dec. 17, 2018
Radiated below 1GHz (Intentional)	03CH05-CB	Stim Sung	21.9~23.1°C / 52~55 %	Apr. 14, 2020 ~ Apr. 15, 2020
Radiated (Unintentional)	03CH01-CB	KJ Chang	22~25°C / 54~61%	Feb. 19, 2019 ~ Feb. 20, 2019
Radiated above 1GHz (Intentional)	03CH01-CB	Stim Sung	21~24°C / 53~55%	Nov. 14, 2018 ~ Dec. 18, 2018
AC Conduction	CO02-CB	Peter Wu	23.6~23.8°C / 61~62.3%	Feb. 22, 2019

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))

For Others test:

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%
Output Power Measurement	1.33 dB	Confidence levels of 95%
Power Density Measurement	1.27 dB	Confidence levels of 95%
Bandwidth Measurement	9.74×10^{-8}	Confidence levels of 95%

For Radiated below 1GHz (Intentional) test:

Test Items	Uncertainty	Remark
Radiated Emission (30MHz ~ 1,000MHz)	4.3 dB	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Channel Mode

Mode	PowerSetting
BT-LE(1Mbps)	-
2402MHz	Default
2440MHz	Default
2480MHz	Default

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	Unintentional - Normal Link								
	Radio 1 with 2.4GHz function	Radio 1 with 5GHz function	Radio 2 with 5GHz function	Radio 3 with Bluetooth	Radio 3 with Thread	EUT GE1	EUT GE2	PoE connect with EUT GE1	PoE connect with EUT GE2
1	●	-	●	●	-	●	●	●	-
2	-	●	●	●	-	●	●	●	-
3	●	-	●	-	●	●	●	●	-
4	-	●	●	-	●	●	●	●	-
Mode 3 has been evaluated to be the worst case among Mode 1~4, thus measurement for Mode 5 will follow this same test mode.									
5	●	-	●	-	●	●	●	-	●
Mode 3 generated the worst test result, so it was recorded in this 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	Intentional - CTX									
	The EUT was performed Y axis and Z axis position for Emissions in Restricted Frequency Bands (Intentional) above 1GHz test, and the worst case was found at Y axis. So the measurement will follow this same test configuration.									
	EUT at Y-axis	Radio 1 with 2.4GHz function	Radio 1 with 5GHz function	Radio 2 with 5GHz function	Radio 3 with Bluetooth	Radio 3 with Thread	EUT GE1	EUT GE2	PoE connect with EUT GE1	PoE connect with EUT GE2
	1	●	●	-	-	-	●	●	●	-
	2	●	-	●	-	-	●	●	●	-
	3	●	-	-	●	-	●	●	●	-
	4	●	-	-	-	●	●	●	●	-
	5	●	-	-	-	●	●	●	●	-
Mode 5 has been evaluated to be the worst case among Mode 1~5, thus measurement for Mode 6 will follow this same test mode.										
6	●	-	-	-	-	●	●	●	-	●
Mode 5 generated the worst test result, so it was recorded in this report.										

Operating Mode < 1GHz	Unintentional - Normal Link										
	EUT at Z-axis	EUT at Y-axis	Radio 1 with 2.4GHz function	Radio 1 with 5GHz function	Radio 2 with 5GHz function	Radio 3 with Bluetooth	Radio 3 with Thread	EUT GE1	EUT GE2	PoE connect with EUT GE1	PoE connect with EUT GE2
	1	●	-	●	-	●	●	-	●	●	●
2	-	●	●	-	●	●	-	●	●	●	-
Mode 1 has been evaluated to be the worst case between Mode 1~2, thus measurement for Mode 3 ~ 5 will follow this same test mode.											
3	●	-	-	●	●	●	-	●	●	●	-
4	●	-	●	-	●	-	●	●	●	●	-
5	●	-	-	●	●	-	●	●	●	●	-
Mode 4 has been evaluated to be the worst case among Mode 1~5, thus measurement for Mode 6 will follow this same test mode.											
6	●	-	●	-	●	-	●	●	●	-	●
Mode 6 generated the worst test result, so it was recorded in this report.											
Operating Mode > 1GHz (1GHz~5 th Harmonic)	Unintentional - Normal Link										
	Mode 6 generated the worst test result for Emissions in Restricted Frequency Bands unintentional below 1GHz test, thus the measurement for Emissions in Restricted Frequency Bands unintentional 1GHz~5 th Harmonic test will follow this same test configuration.										
	EUT at Z-axis	Radio 1 with 2.4GHz function	Radio 1 with 5GHz function	Radio 2 with 5GHz function	Radio 3 with Bluetooth	Radio 3 with Thread	EUT GE1	EUT GE2	PoE connect with EUT GE1	PoE connect with EUT GE2	
1	●	●	-	●	-	●	●	●	-	●	
Operating Mode > 1GHz (1GHz~10 th Harmonic)	CTX										
The EUT was performed at Y axis and Z axis position and the worst case was found at Y axis. So the measurement will follow this same test configuration.											
1	EUT in Y axis										

Note: 1. The applicant declared that the accessories of this case were for measurement only and it would not be marketed. The accessories will be provided and inspected by the laboratory (or the applicant).

2. The PoE is for measurement only, would not be marketed.

PoE information as below:

Power	Brand	Model
PoE	Microsemi	PD-9001GR/AT/AC



2.3 EUT Operation during Test

For Normal Link:

During the test, the EUT operation to normal function.

For CTX Mode:

The EUT was programmed to be in continuously transmitting mode.

2.4 Accessories

N/A

2.5 Support Equipment

For AC power-line conducted emissions test:

Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	PoE	Microsemi	PD-9001GR/AT/AC	N/A	Provided by applicant.
B	GE1 PC	DELL	T3400	N/A	Provided by Lab.
C	GE2 NB	DELL	E6430	N/A	Provided by Lab.
D	Notebook	DELL	E6430	N/A	Provided by Lab.
E	Notebook	DELL	E6430	N/A	Provided by Lab.
F	802.11ax Access Point (Device)	Extreme Networks	AP505i	QXO-AP505I	Provided by applicant.
G	Device NB	DELL	E6430	N/A	Provided by Lab.

For Radiated Intentional Below 1GHz test:

Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	PoE	Microsemi	PD-9001GR/AT/AC	N/A	Provided by applicant.
B	Notebook	DELL	E4300	N/A	Provided by Lab.

For Radiated Unintentional Below 1GHz and Above 1GHz test:

Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	GE1 PC	ASUS	N/A	N/A	Provided by Lab.
B	GE2 NB	DELL	E4300	N/A	Provided by Lab.
C	Notebook	DELL	E4300	N/A	Provided by Lab.
D	Notebook	DELL	E4300	N/A	Provided by Lab.
E	802.11ax Access Point (Device)	Extreme Networks	AP505i	QXO-AP505I	Provided by applicant.
F	Device NB	DELL	E4300	N/A	Provided by Lab.
G	PoE	Microsemi	PD-9001GR/AT/AC	N/A	Provided by applicant.

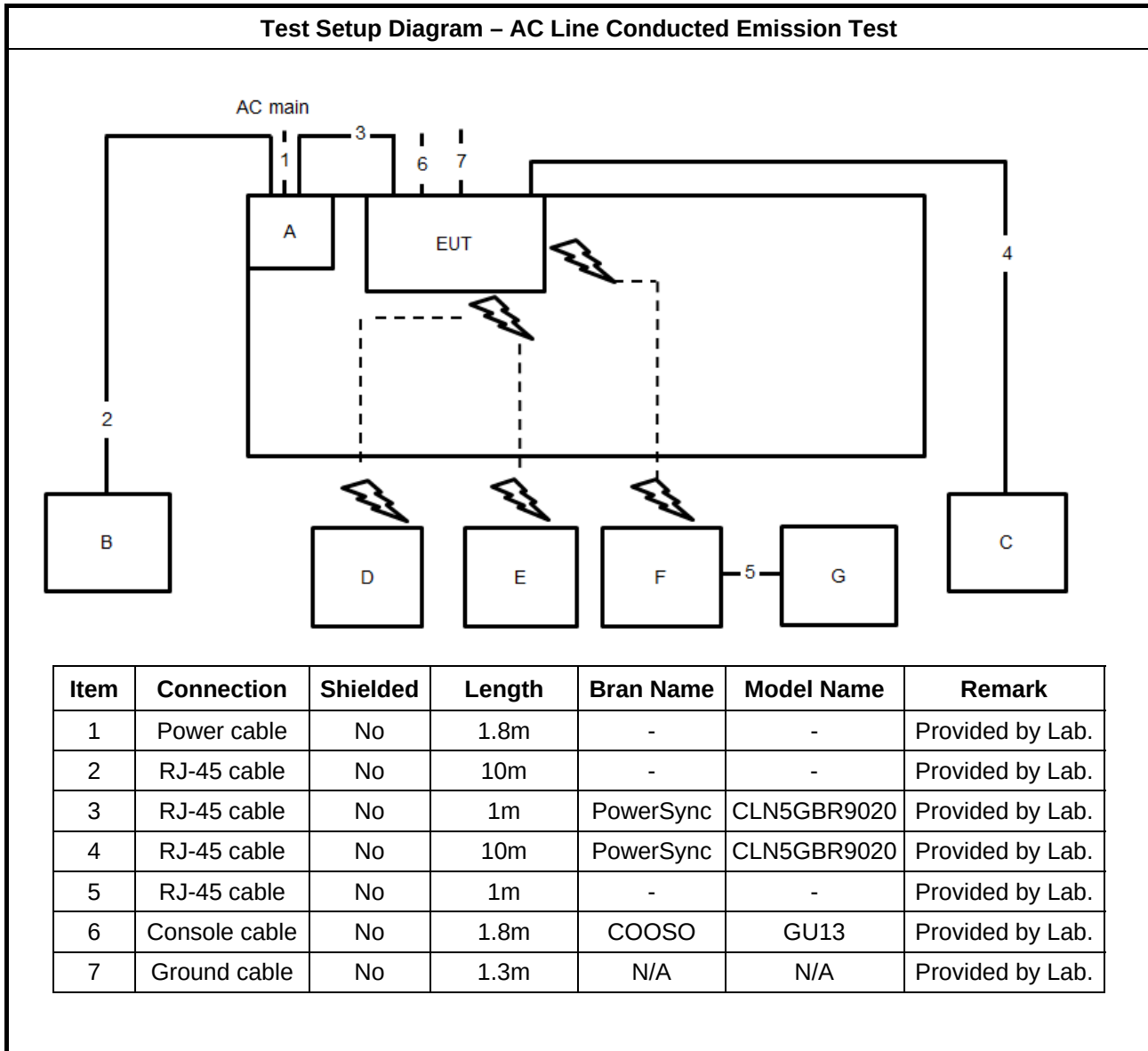
**For Radiated Intentional Above 1GHz test:**

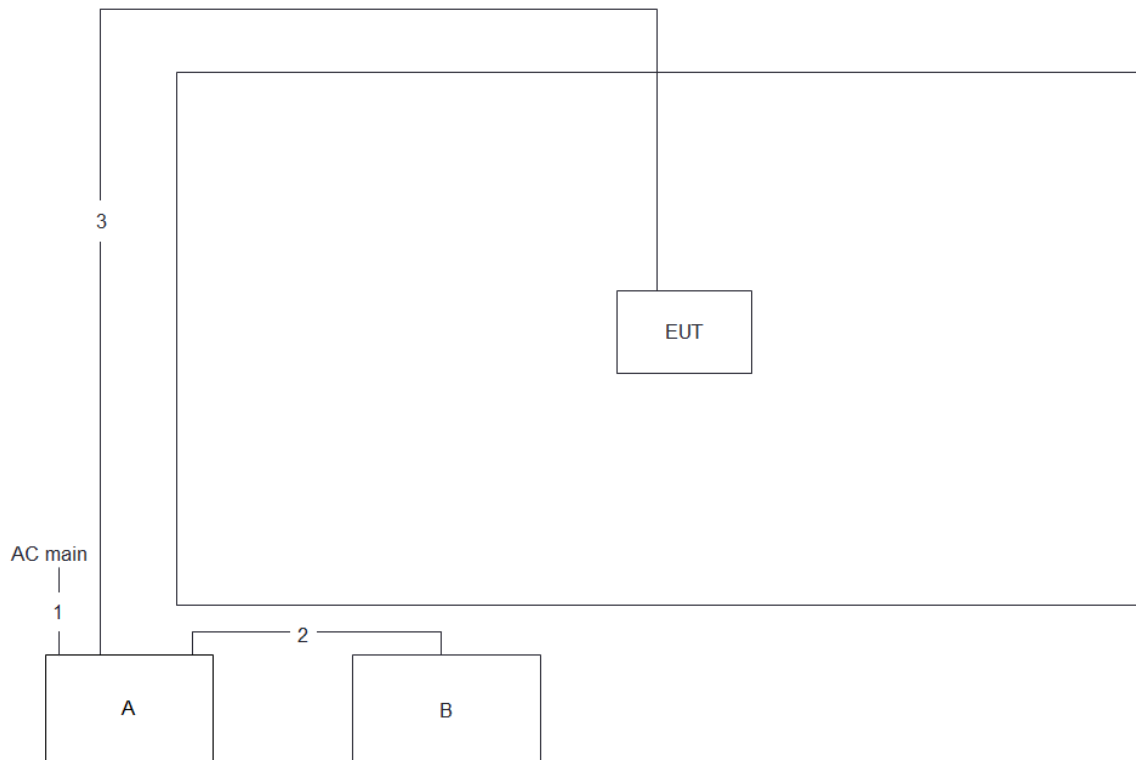
Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	Notebook	DELL	E4300	N/A	Provided by Lab.
E	PoE	Microsemi	PD-9001GR/AT/AC	N/A	Provided by applicant.

For RF Conducted:

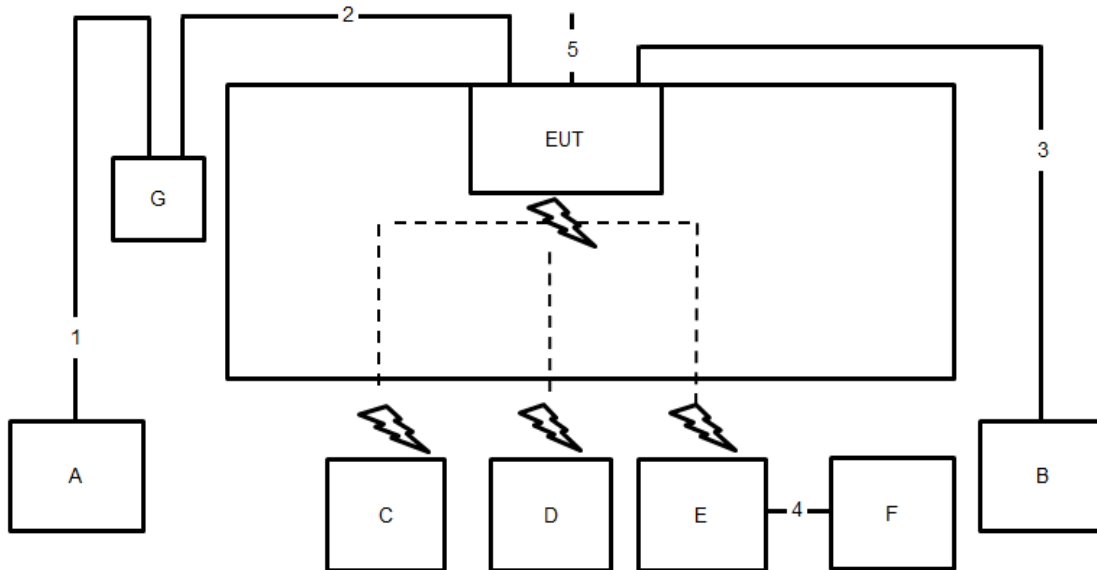
Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	Notebook	DELL	E4300	N/A	Provided by Lab.
B	PoE	Microsemi	PD-9001GR/AT/AC	N/A	Provided by applicant.

2.6 Test Setup Diagram

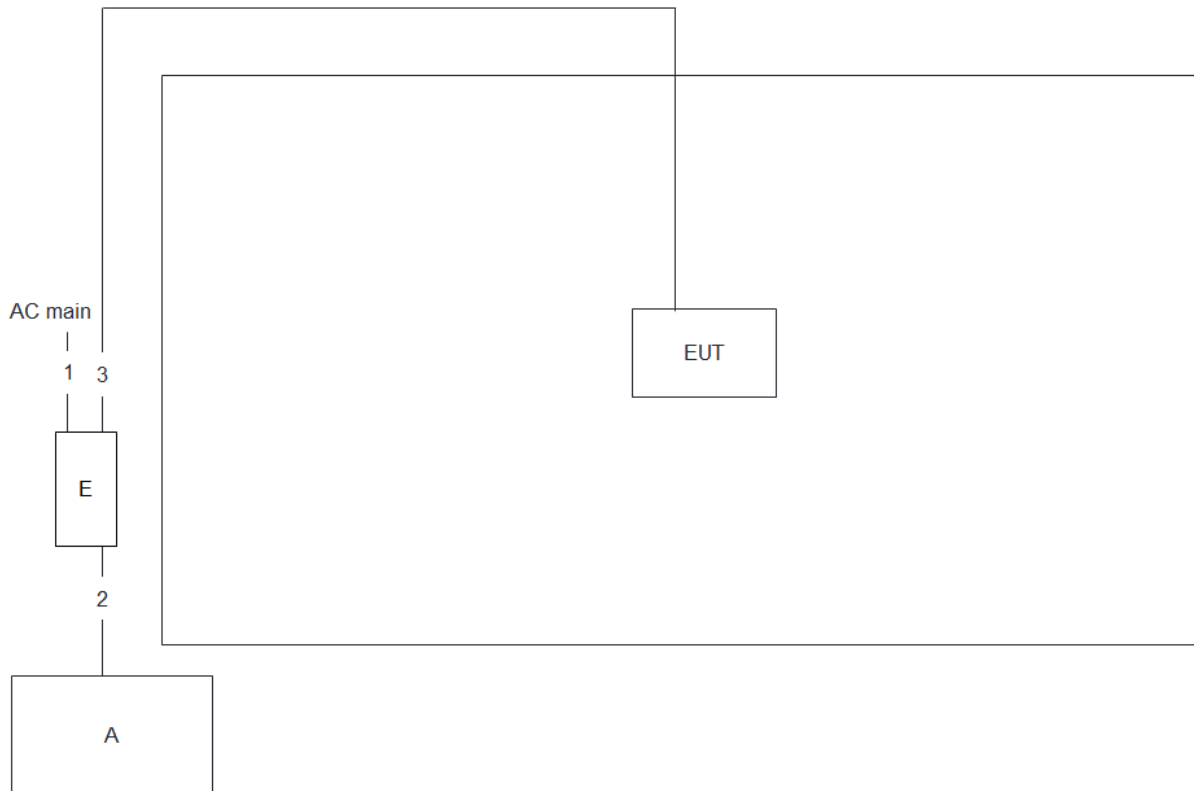


Test Setup Diagram - Radiated Intentional Below 1GHz


Item	Connection	Shielded	Length	Bran Name	Model Name	Remark
1	Power cable	No	1.5m	-	-	Provided by Lab.
2	RJ-45 cable	No	1.5m	-	-	Provided by Lab.
3	RJ-45 cable	No	10m	PowerSync	CLN5GBR9020	Provided by Lab.

Test Setup Diagram - Radiated Unintentional Below 1GHz and Above 1GHz


Item	Connection	Shielded	Length	Bran Name	Model Name	Remark
1	RJ-45 cable	No	1.5m	-	-	Provided by Lab.
2	RJ-45 cable	No	10m	PowerSync	CLN5GBR9020	Provided by Lab.
3	RJ-45 cable	No	10m	PowerSync	CLN5GBR9020	Provided by Lab.
4	RJ-45 cable	No	10m	-	-	Provided by Lab.
5	Console cable	No	1.8m	COOSO	GU13	Provided by Lab.

Test Setup Diagram - Radiated Intentional Above 1GHz


Item	Connection	Shielded	Length	Bran Name	Model Name	Remark
1	Power cable	No	1.5m	-	-	Provided by Lab.
2	RJ-45 cable	No	1.5m	-	-	Provided by Lab.
3	RJ-45 cable	No	10m	PowerSync	CLN5GBR9020	Provided by Lab.



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.

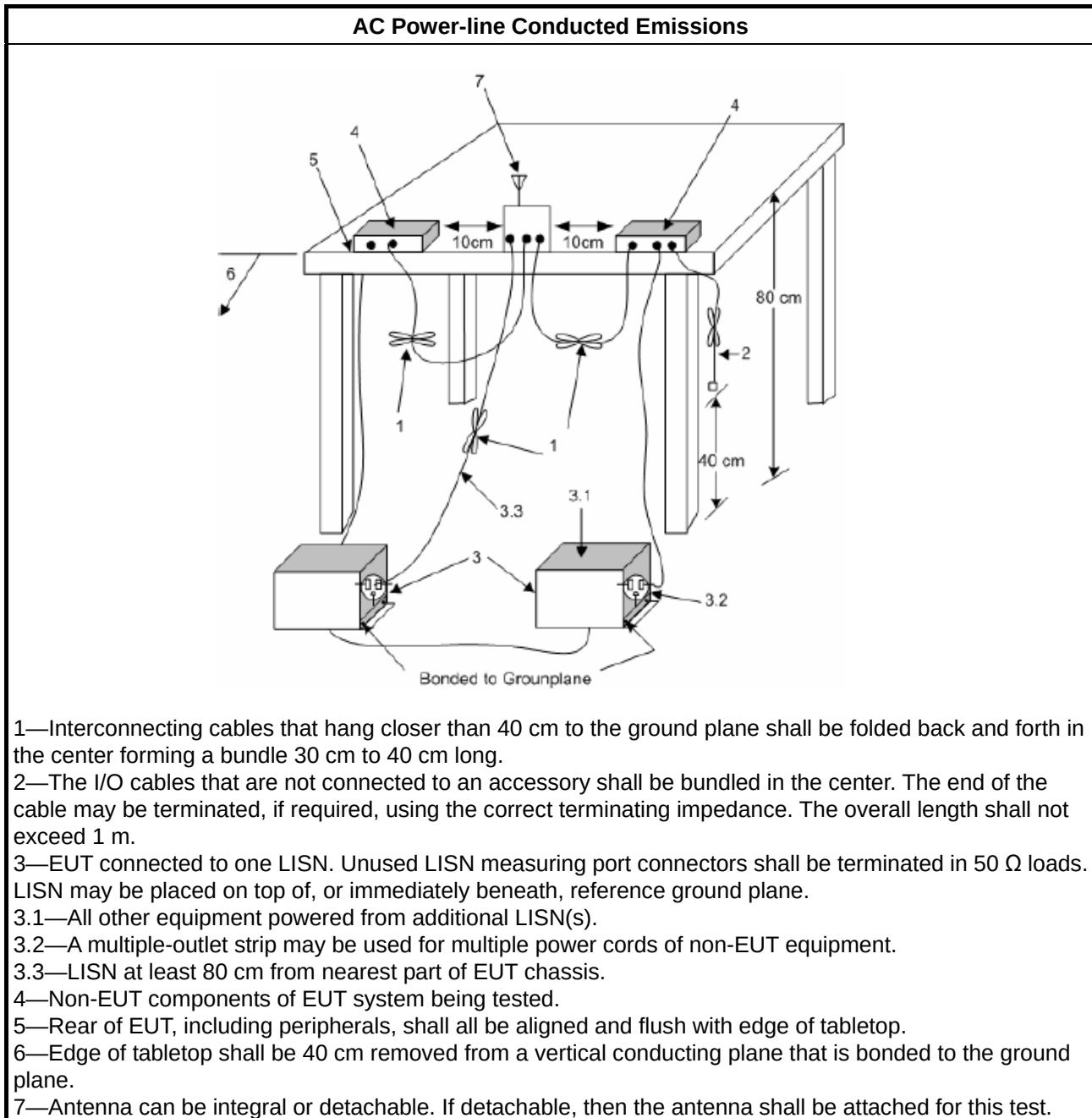
3.1.2 Measuring Instruments

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



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 $\geq$ 500 kHz.

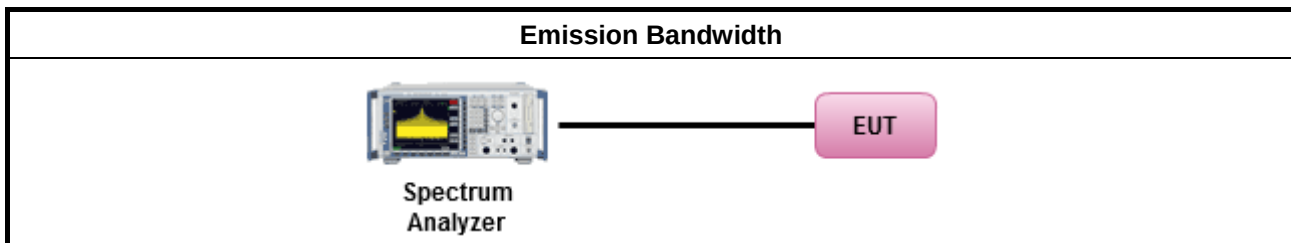
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
▪	For the emission bandwidth shall be measured using one of the options below:
☒	Refer as 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



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.	

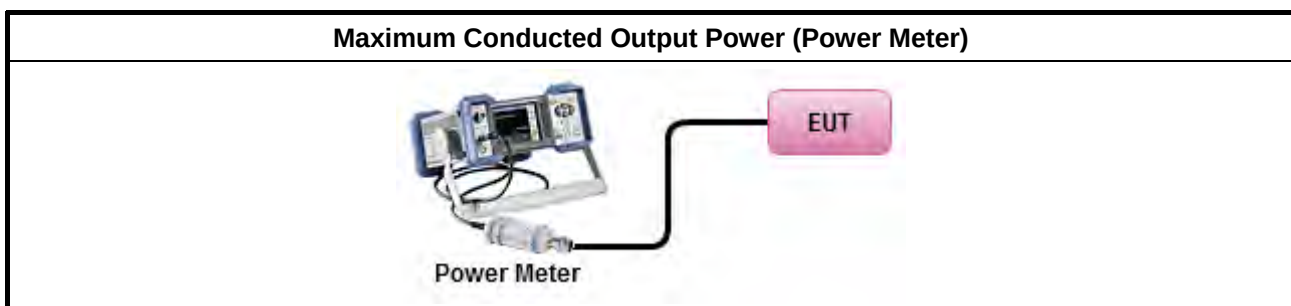
3.3.2 Measuring Instruments

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

3.3.4 Test Setup





3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix C

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

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

3.4.2 Measuring Instruments

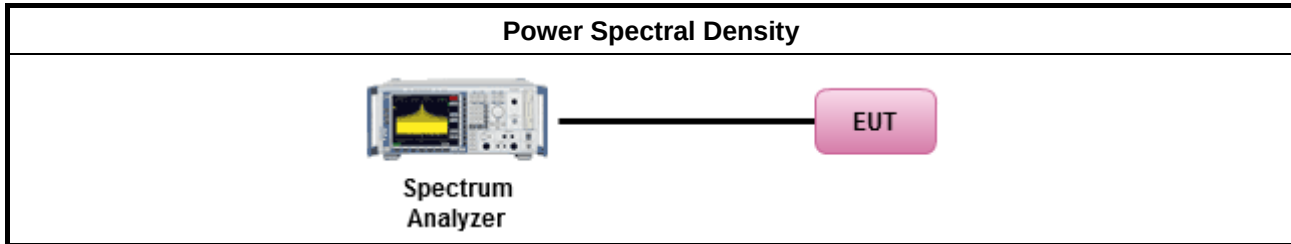
Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

Test Method
Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).
☒ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.2 Method PKPSD. [duty cycle $\geq 98\%$ or external video / power trigger]
☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.3 Method AVGPS-1.
☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.5 Method AVGPS-2.
☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.7 Method AVGPS-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 AVGPS-1A. (alternative).
☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.6 Method AVGPS-2A. (alternative)
☐ Refer as FCC KDB 558074, clause 8.4 & C63.10 clause 11.10.8 Method AVGPS-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



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.	

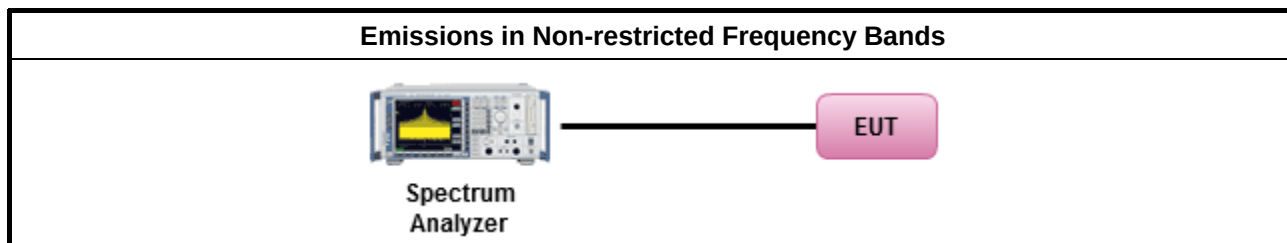
3.5.2 Measuring Instruments

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



3.5.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

3.6 Emissions in Restricted Frequency Bands

3.6.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB / decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

3.6.2 Measuring Instruments

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

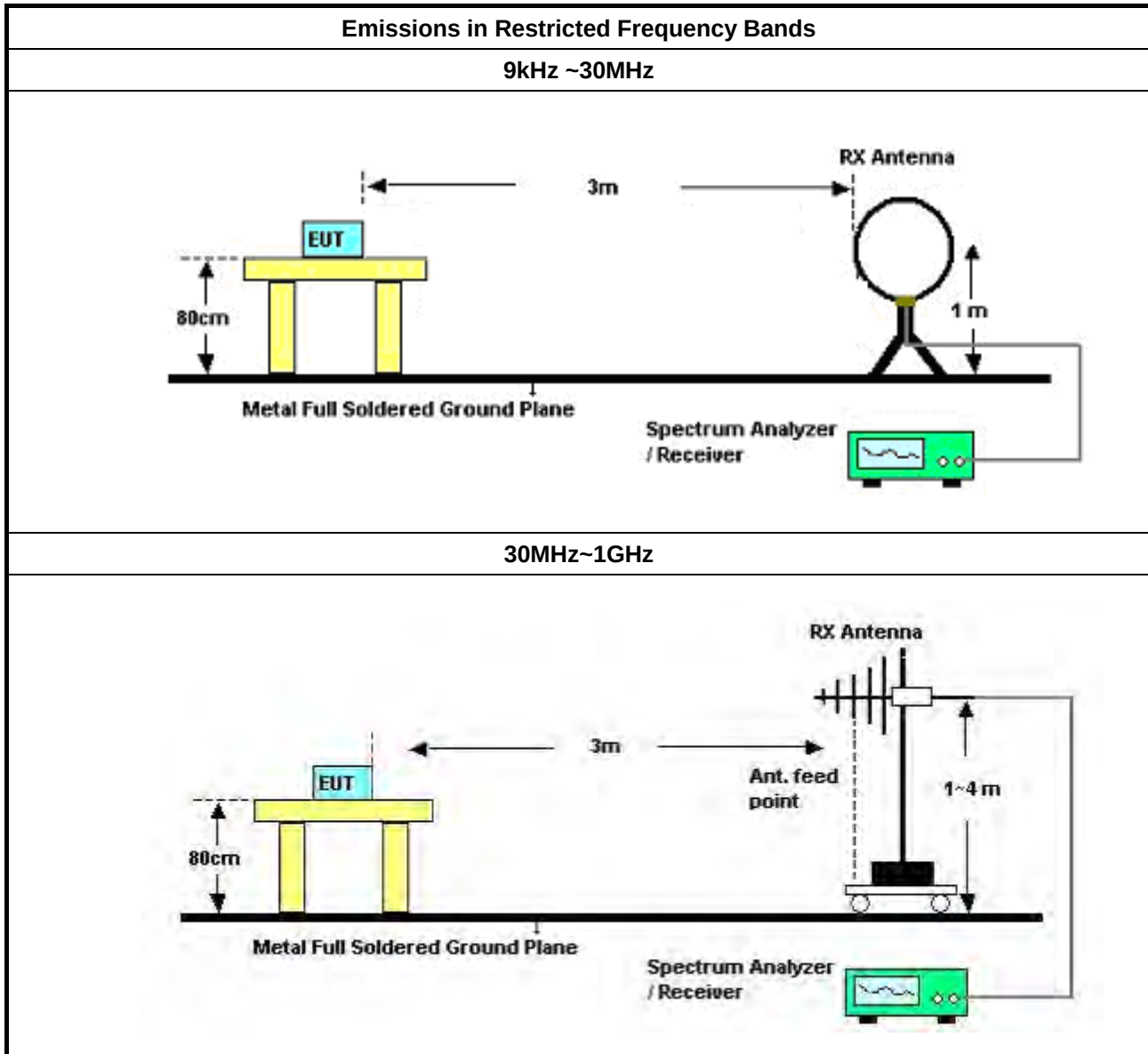


3.6.3 Test Procedures

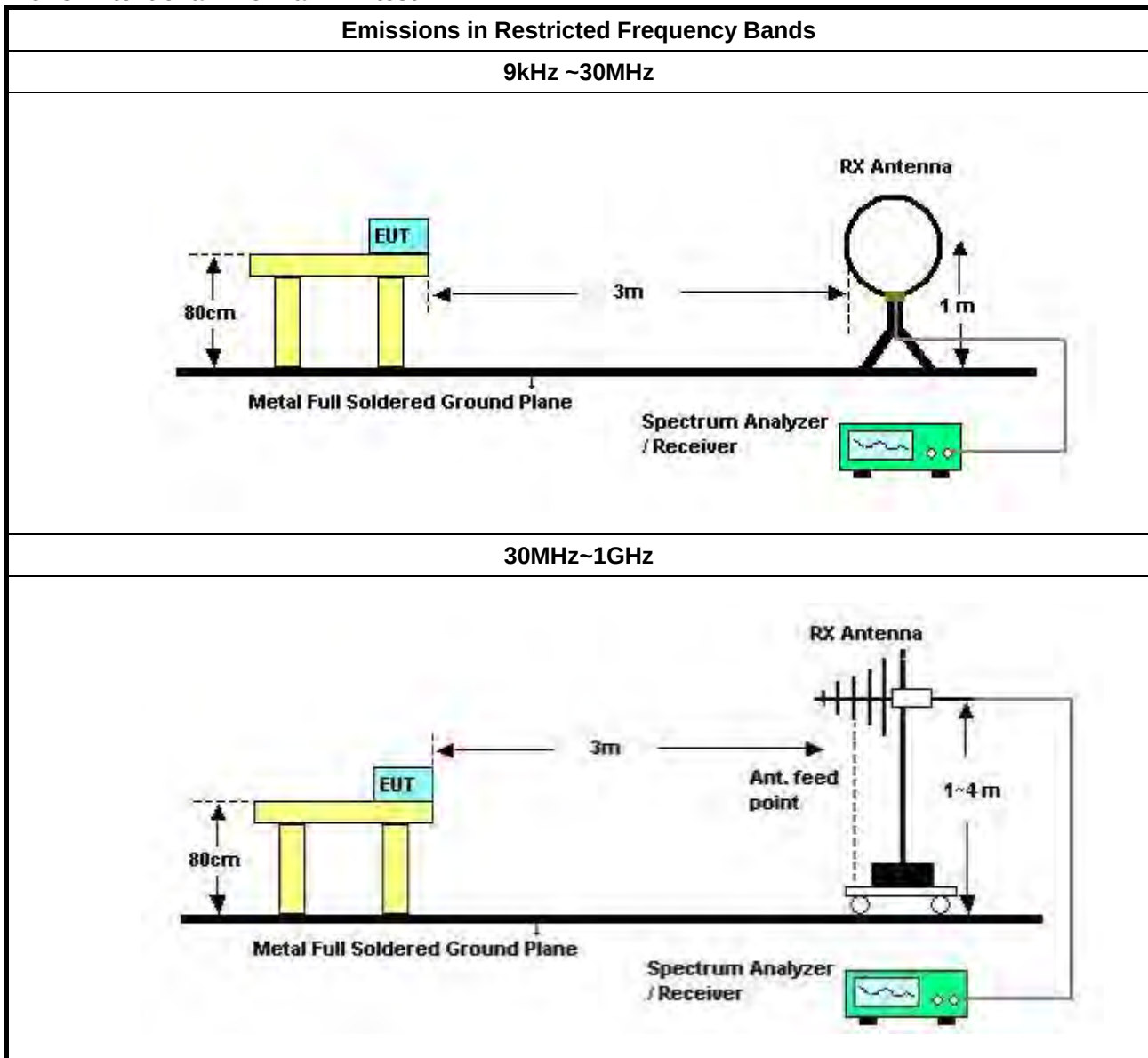
Test Method	
The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].	
Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.	
For the transmitter unwanted emissions shall be measured using following options below:	
	Refer as 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 $\geq 98\%$).
☐	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 $\geq 1/T$).
☐	Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW $\geq 1/T$, 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.

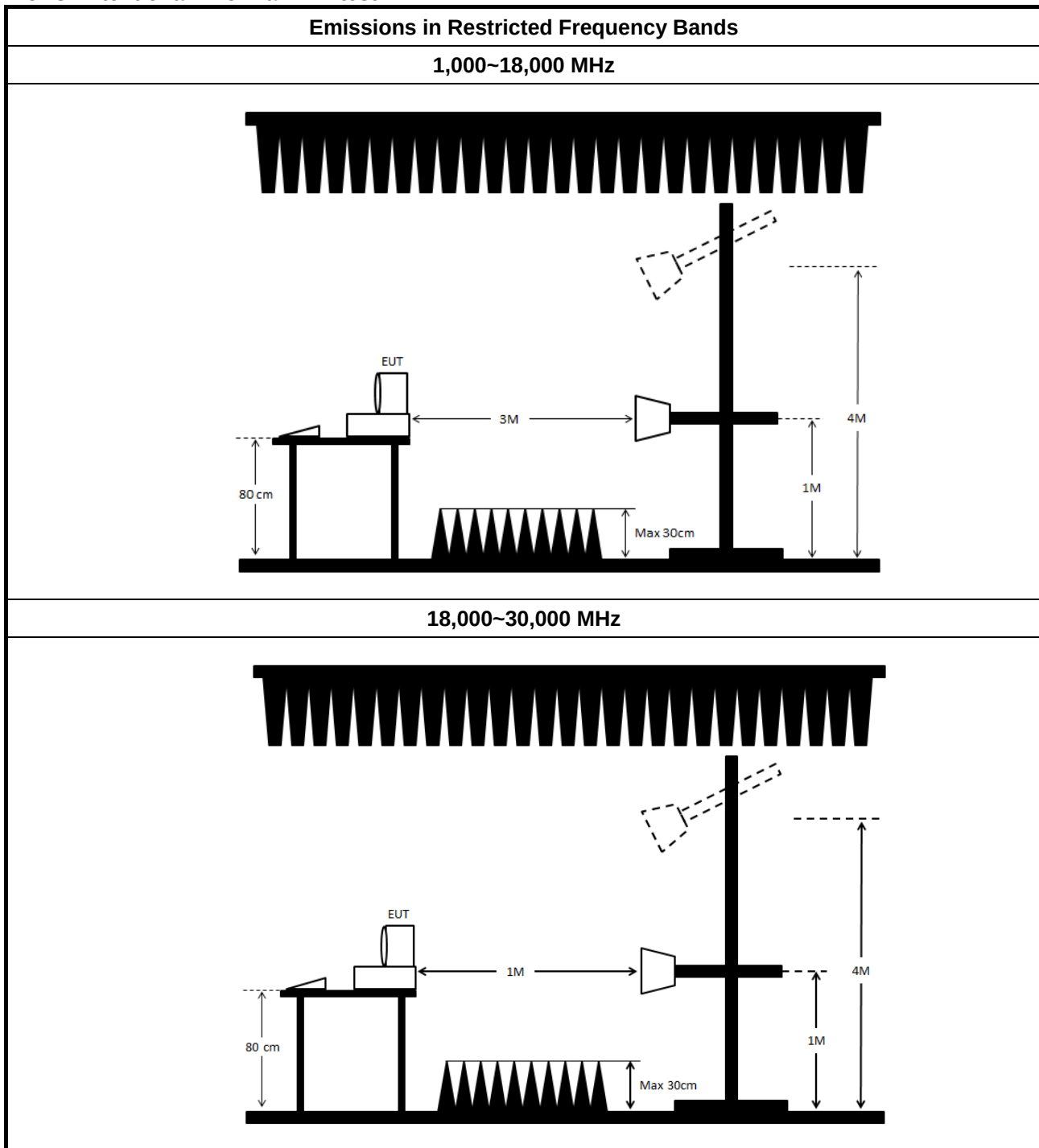
3.6.4 Test Setup

For Intentional - CTX test:

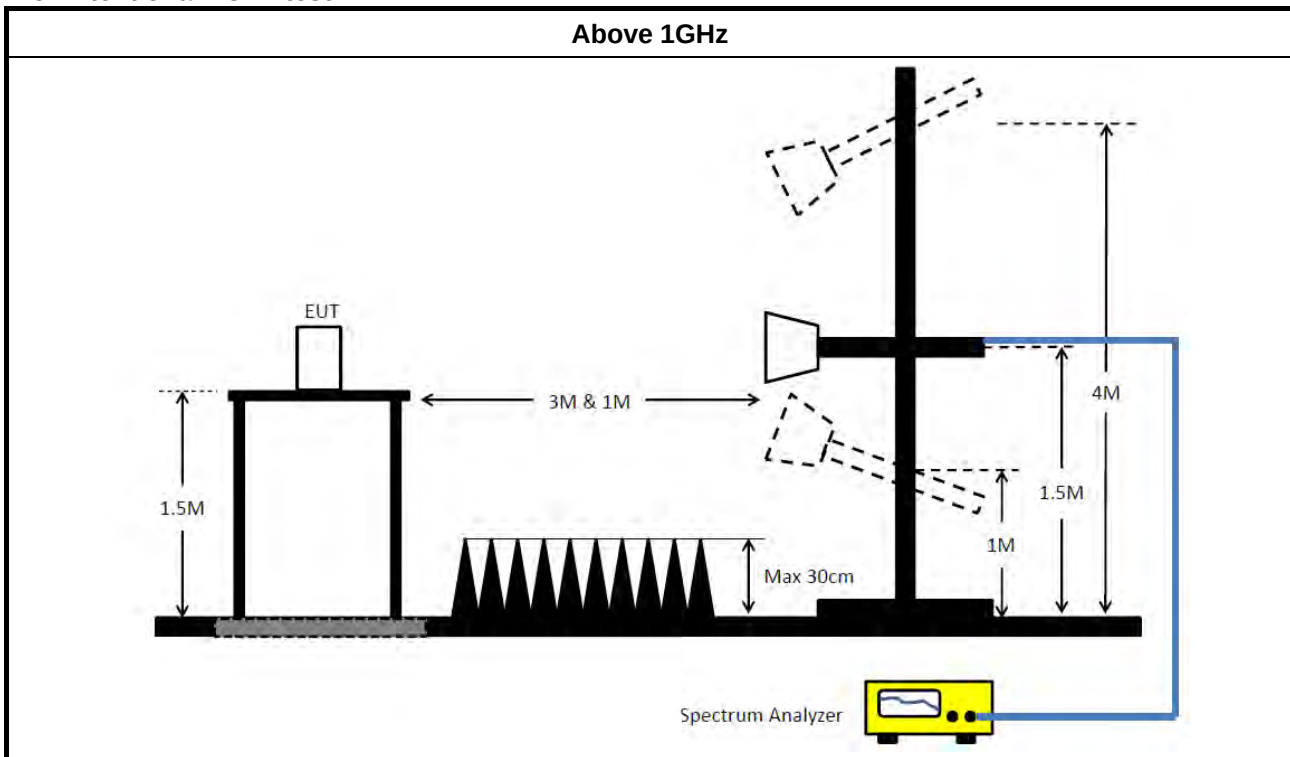


For Unintentional - Normal Link test:



For Unintentional - Normal Link test:


For Intentional - CTX test:



3.6.5 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 10 harmonic or 40 GHz, whichever is appropriate.

3.6.6 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)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 13, 2018	Nov. 12, 2019	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 08, 2019	Jan. 07, 2020	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Jan. 31, 2019	Jan. 30, 2020	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	Jul. 03, 2018	Jul. 02, 2019	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
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	May 01, 2019	Apr. 30, 2020	Radiation (03CH05-CB)
Spectrum Analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Aug. 15, 2019	Aug. 14, 2020	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 15, 2019	May 14, 2020	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	LOW Cable-04+23	30MHz~1GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH05-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 21, 2017	Dec. 20, 2018	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-06	1 GHz – 26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-07	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-08	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-09	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-10	1 GHz –26.5 GHz	Oct. 08, 2018	Oct. 07, 2019	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 05, 2018	Nov. 04, 2019	Conducted (TH01-CB)

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

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



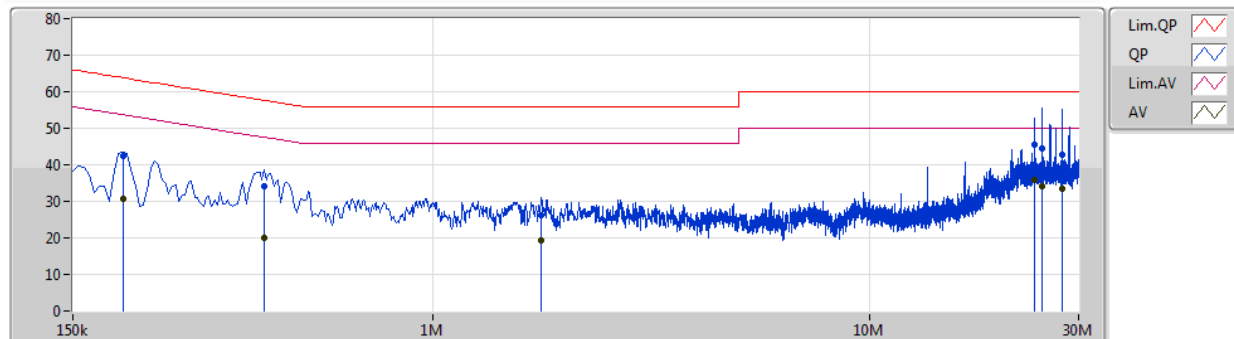
AC Power Port Conducted Emission Result

Appendix A

Test Mode	Mode 3	Frequency Range	0.15 MHz to 30 MHz
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Mode 3

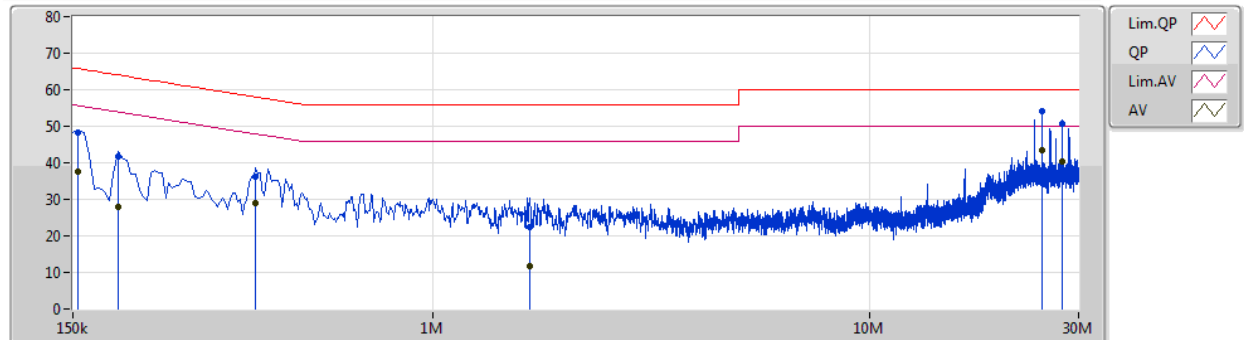
22/02/2019



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	AF (dB)	CL (dB)	AT (dB)			
QP	195k	42.48	63.82	-21.34	10.17	Line	-	32.31	0.05	0.02	10.10			
AV	195k	30.83	53.82	-22.99	10.17	Line	-	20.66	0.05	0.02	10.10			
QP	411k	34.12	57.63	-23.51	10.18	Line	-	23.94	0.06	0.02	10.10			
AV	411k	20.14	47.63	-27.49	10.18	Line	-	9.96	0.06	0.02	10.10			
QP	1.77M	26.25	56.00	-29.75	10.23	Line	-	16.02	0.09	0.04	10.10			
AV	1.77M	19.24	46.00	-26.76	10.23	Line	-	9.01	0.09	0.04	10.10			
QP	23.784M	45.60	60.00	-14.40	10.62	Line	-	34.98	0.32	0.18	10.12			
AV	23.784M	35.85	50.00	-14.15	10.62	Line	"Worst"	25.23	0.32	0.18	10.12			
QP	24.738M	44.35	60.00	-15.65	10.65	Line	-	33.70	0.33	0.20	10.12			
AV	24.738M	34.28	50.00	-15.72	10.65	Line	-	23.63	0.33	0.20	10.12			
QP	27.591M	42.61	60.00	-17.39	10.72	Line	-	31.89	0.37	0.22	10.13			
AV	27.591M	33.31	50.00	-16.69	10.72	Line	-	22.59	0.37	0.22	10.13			

Mode 3

22/02/2019



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	AF (dB)	CL (dB)	AT (dB)			
QP	154.5k	48.13	65.75	-17.62	10.15	Neutral	-	37.98	0.03	0.02	10.10			
AV	154.5k	37.44	55.75	-18.31	10.15	Neutral	-	27.29	0.03	0.02	10.10			
QP	190.5k	41.79	64.01	-22.22	10.15	Neutral	-	31.64	0.03	0.02	10.10			
AV	190.5k	27.88	54.01	-26.13	10.15	Neutral	-	17.73	0.03	0.02	10.10			
QP	393k	36.32	58.01	-21.69	10.16	Neutral	-	26.16	0.04	0.02	10.10			
AV	393k	29.12	48.01	-18.89	10.16	Neutral	-	18.96	0.04	0.02	10.10			
QP	1.662M	22.33	56.00	-33.67	10.19	Neutral	-	12.14	0.05	0.04	10.10			
AV	1.662M	11.63	46.00	-34.37	10.19	Neutral	-	1.44	0.05	0.04	10.10			
QP	24.729M	54.29	60.00	-5.71	10.59	Neutral	"Worst"	43.70	0.27	0.20	10.12			
AV	24.729M	43.28	50.00	-6.72	10.59	Neutral	-	32.69	0.27	0.20	10.12			
QP	27.587M	50.63	60.00	-9.37	10.65	Neutral	-	39.98	0.30	0.22	10.13			
AV	27.587M	40.25	50.00	-9.75	10.65	Neutral	-	29.60	0.30	0.22	10.13			

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)	682.5k	1.031M	1M03F1D	667.5k	1.026M

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;

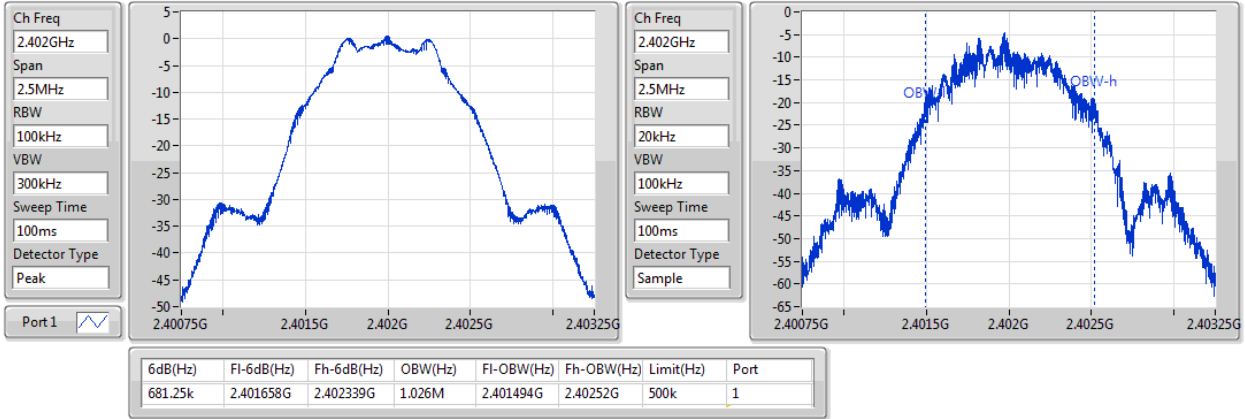
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	681.25k	1.026M
2440MHz	Pass	500k	682.5k	1.031M
2480MHz	Pass	500k	667.5k	1.031M

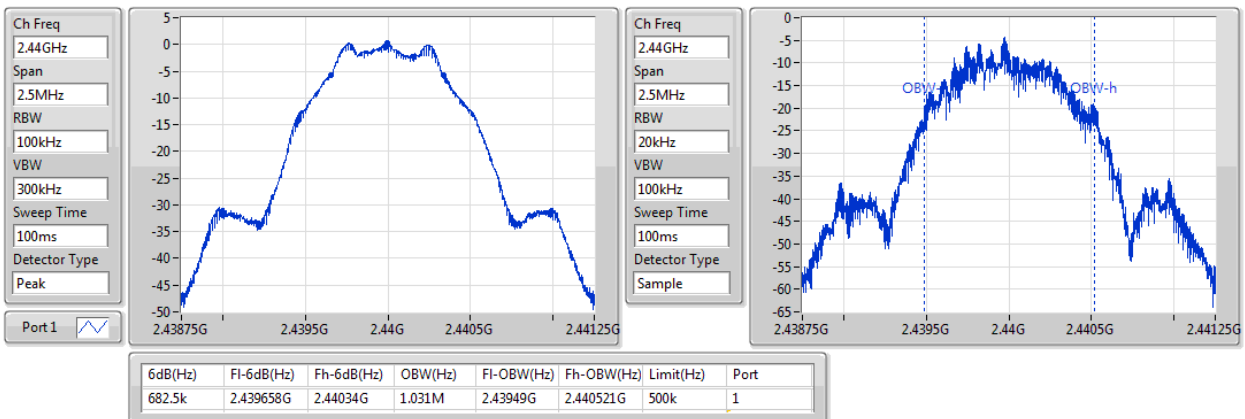
Port X-N dB = Port X 6dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

BT-LE(1Mbps)
EBW
2402MHz

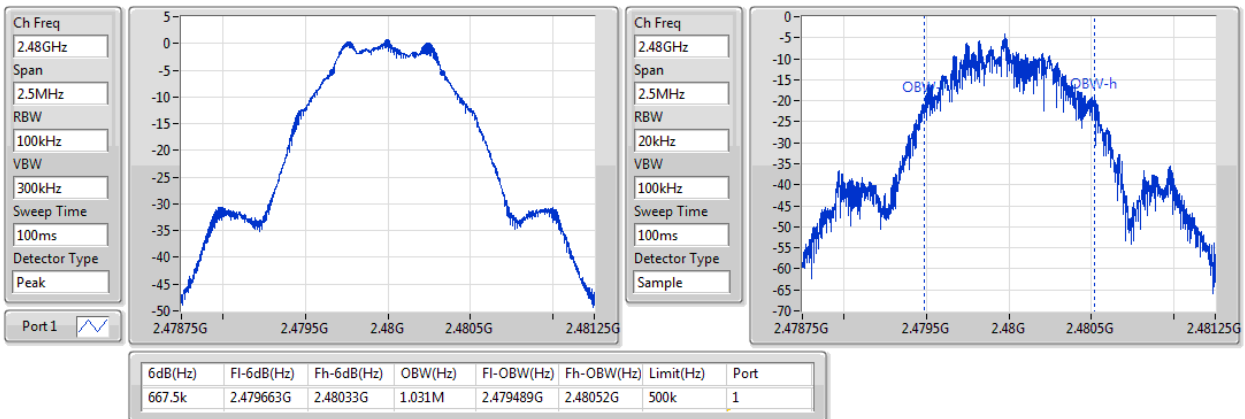
14/11/2018


BT-LE(1Mbps)
EBW
2440MHz

14/11/2018


BT-LE(1Mbps)
EBW
2480MHz

14/11/2018



**Summary**

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	1.67	0.00147

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.40	1.38	30.00
2440MHz	Pass	4.40	1.67	30.00
2480MHz	Pass	4.40	1.65	30.00

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-13.36

RBW=3kHz.

Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.40	-15.20	8.00
2440MHz	Pass	4.40	-13.36	8.00
2480MHz	Pass	4.40	-14.88	8.00

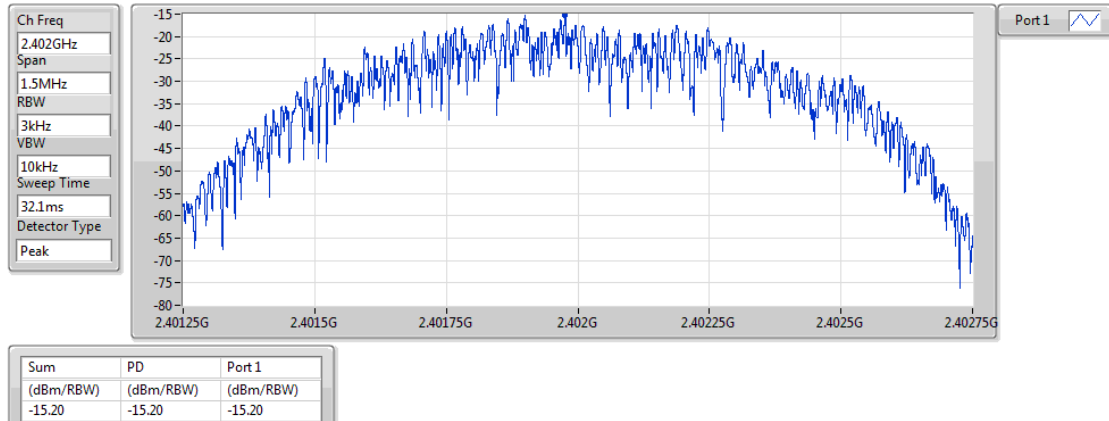
RBW=3kHz.

BT-LE(1Mbps)

2402MHz

PSD

14/11/2018

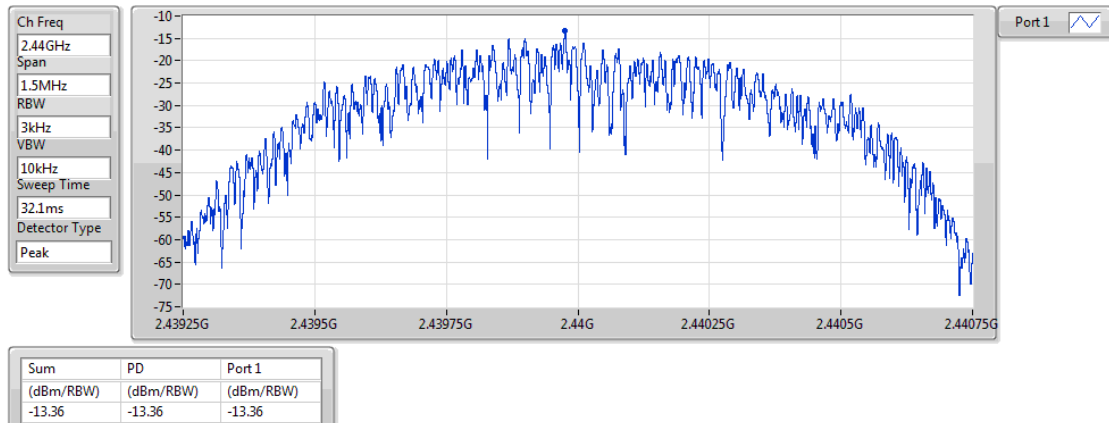


BT-LE(1Mbps)

2440MHz

PSD

14/11/2018

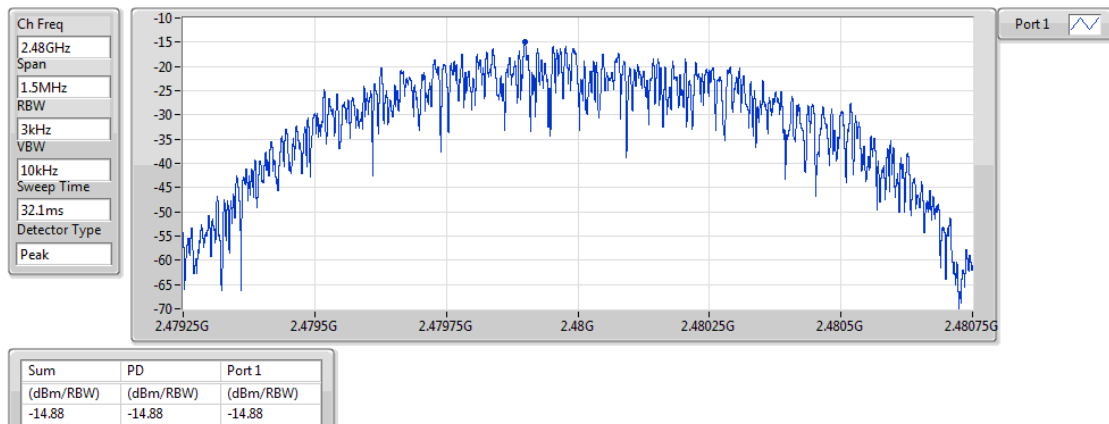


BT-LE(1Mbps)

2480MHz

PSD

14/11/2018



**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(1Mbps)	Pass	2.440247G	0.20	-29.80	846.96M	-63.16	2.399852G	-62.52	2.483744G	-43.58	2.547415G	-52.28	1

Result

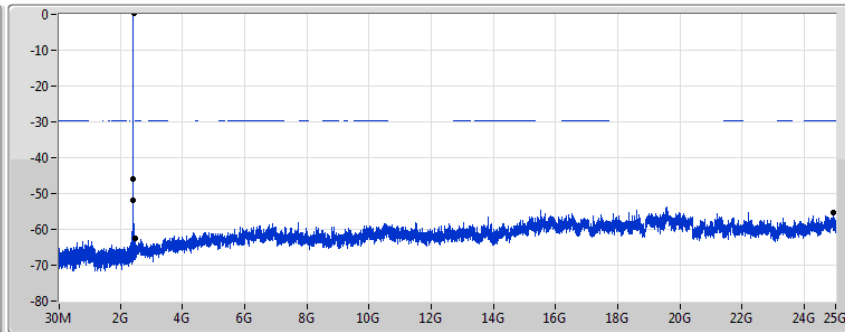
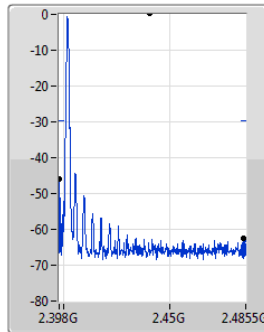
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.440247G	0.20	-29.80	2.394448G	-51.88	2.398008G	-46.01	2.484216G	-62.43	24.924014G	-55.39	1
2440MHz	Pass	2.440247G	0.20	-29.80	733.296M	-63.41	2.399872G	-60.70	2.483604G	-61.46	21.690369G	-54.70	1
2480MHz	Pass	2.440247G	0.20	-29.80	846.96M	-63.16	2.399852G	-62.52	2.483744G	-43.58	2.547415G	-52.28	1

BT-LE(1Mbps)

CSE NdB

2402MHz

14/11/2018



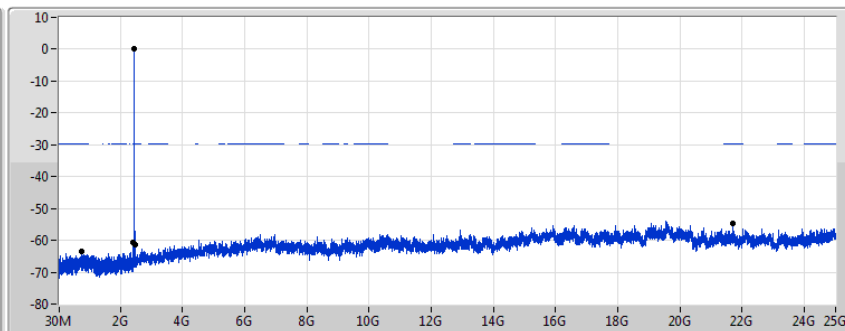
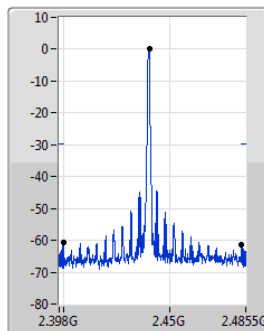
Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.440247G	0.20	-29.80	2.394448G	-51.88	2.398008G	-46.01	2.484216G	-62.43	24.924014G	-55.39	1

BT-LE(1Mbps)

CSE NdB

2440MHz

14/11/2018



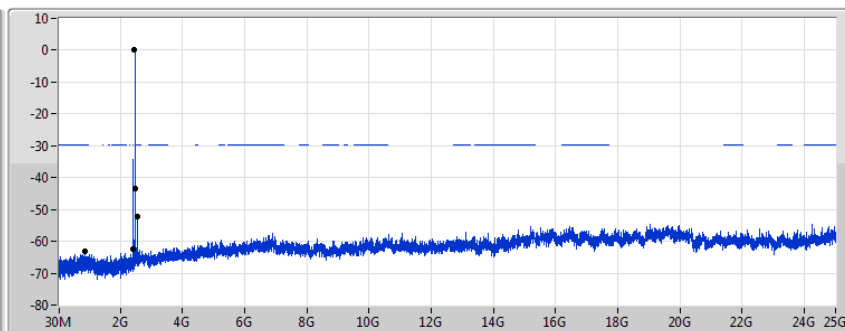
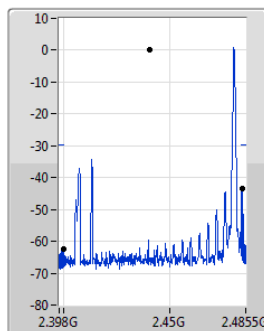
Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.440247G	0.20	-29.80	733.296M	-63.41	2.399872G	-60.70	2.483604G	-61.46	21.690369G	-54.70	1

BT-LE(1Mbps)

CSE NdB

2480MHz

14/11/2018



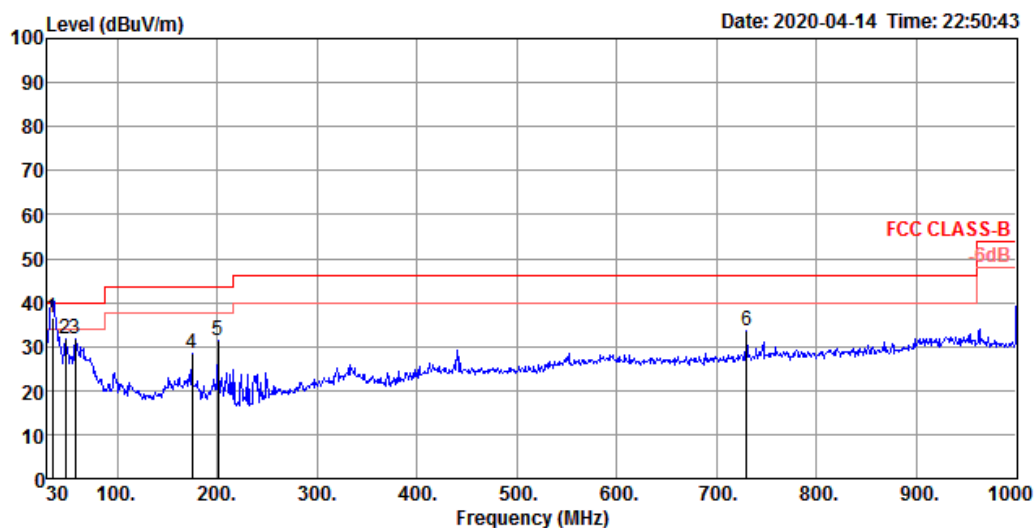
Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.440247G	0.20	-29.80	846.96M	-63.16	2.399852G	-62.52	2.483744G	-43.58	2.547415G	-52.28	1



RSE below 1GHz and RSE Unintentional above 1GHz Result Appendix F.1

Test Mode	Mode 5 / Intentional - CTX	Frequency Range	30 MHz to 1,000 MHz
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Vertical 30 MHz to 1,000 MHz

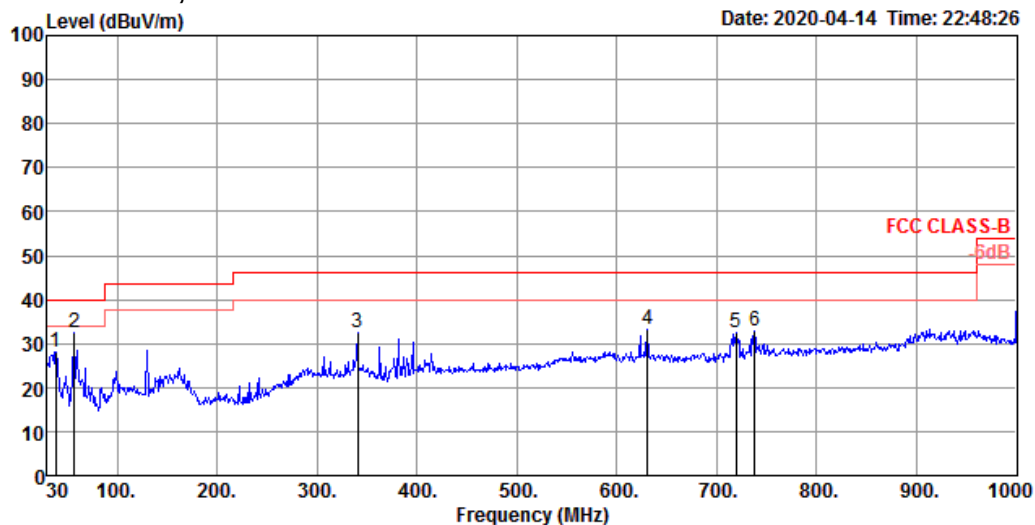


	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	34.85	36.42	40.00	-3.58	44.85	1.30	21.75	31.48	100	313 QP	VERTICAL
2	48.43	31.84	40.00	-8.16	47.22	1.20	15.12	31.70	150	325 Peak	VERTICAL
3	58.13	31.58	40.00	-8.42	49.44	1.16	12.81	31.83	100	22 Peak	VERTICAL
4	174.53	28.32	43.50	-15.18	42.97	1.87	15.42	31.94	125	13 Peak	VERTICAL
5	200.72	31.53	43.50	-11.97	46.32	2.00	15.15	31.94	200	0 Peak	VERTICAL
6	730.34	33.42	46.00	-12.58	37.07	3.92	24.82	32.39	150	83 Peak	VERTICAL



RSE below 1GHz and RSE Unintentional above 1GHz Result Appendix F.1

Horizontal 30 MHz to 1,000 MHz



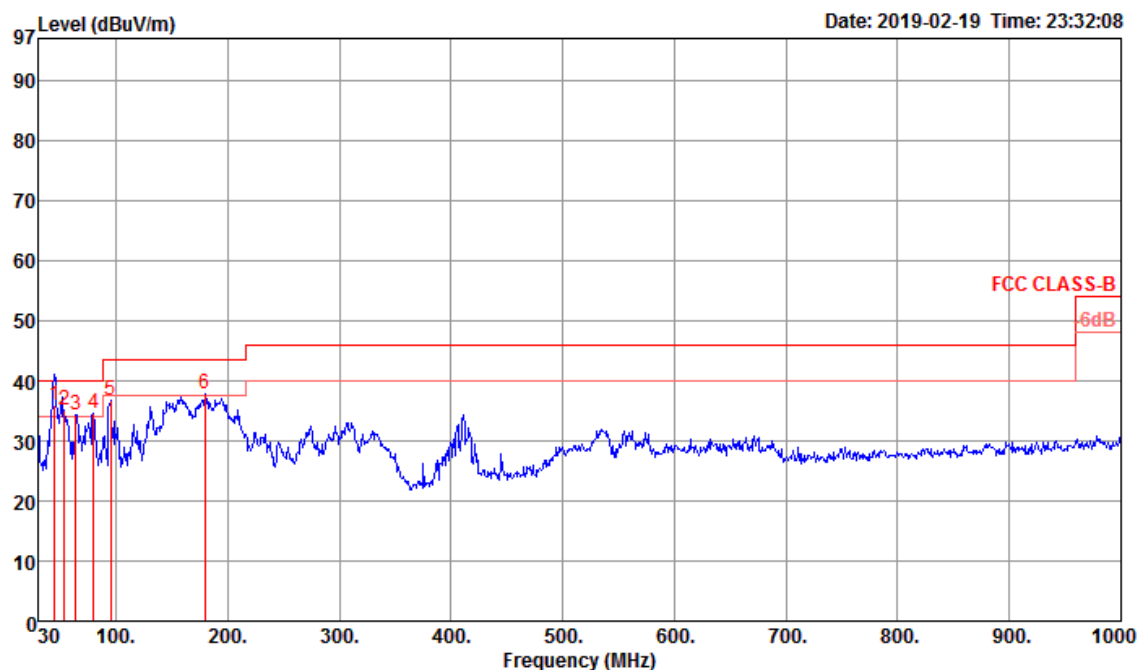
	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	38.73	28.18	40.00	-11.82	38.66	1.38	19.64	31.50	125	44	Peak
2	57.16	32.33	40.00	-7.67	50.22	1.14	12.79	31.82	150	60	Peak
3	340.40	32.42	46.00	-13.58	42.60	2.58	19.37	32.13	100	266	Peak
4	630.43	33.13	46.00	-12.87	37.50	3.56	24.52	32.45	200	25	Peak
5	719.67	32.46	46.00	-13.54	36.42	3.88	24.59	32.43	100	108	Peak
6	738.10	32.78	46.00	-13.22	36.27	3.95	24.93	32.37	100	243	Peak



RSE below 1GHz and RSE Unintentional above 1GHz Result Appendix F.1

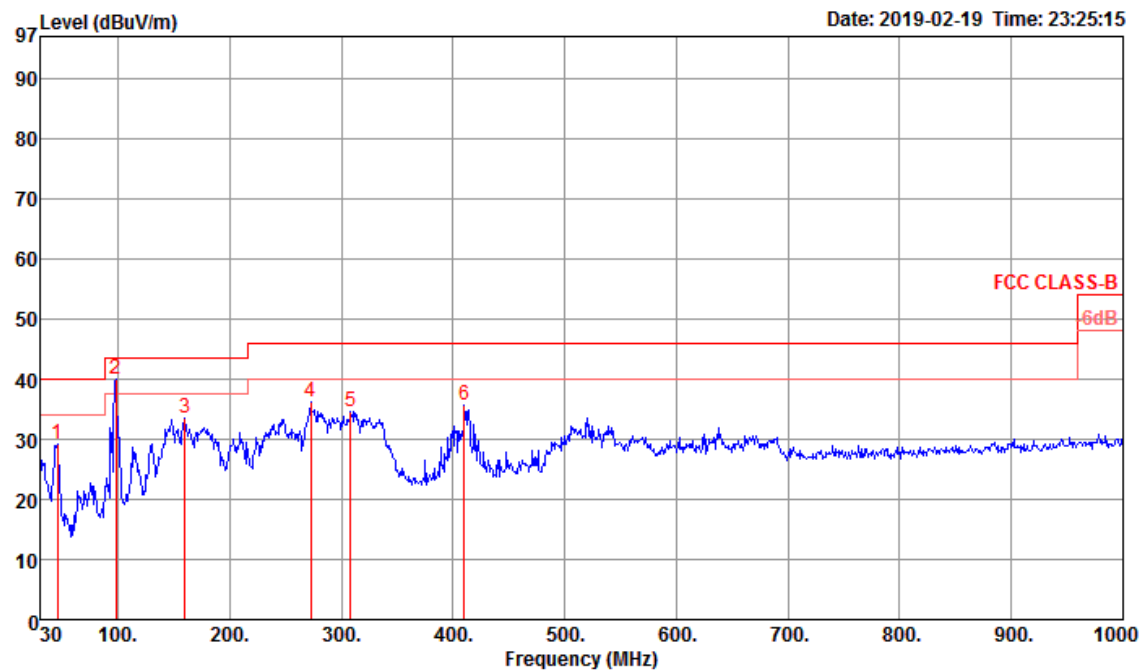
Test Mode	Mode 6 / Unintentional - Normal Link	Frequency Range	30 MHz to 1,000 MHz
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Vertical 30 MHz to 1,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	44.55	35.97	40.00	-4.03	49.16	0.85	17.54	31.58	125	287 QP	VERTICAL
2	53.28	35.12	40.00	-4.88	52.06	0.97	13.70	31.61	300	360 Peak	VERTICAL
3	63.95	34.36	40.00	-5.64	52.53	0.99	12.50	31.66	300	360 Peak	VERTICAL
4	79.47	34.62	40.00	-5.38	51.60	1.13	13.60	31.71	300	360 Peak	VERTICAL
5	94.99	36.81	43.50	-6.69	50.99	1.23	16.30	31.71	300	360 Peak	VERTICAL
6	179.38	37.83	43.50	-5.67	52.38	1.67	15.55	31.77	300	360 Peak	VERTICAL

Horizontal 30 MHz to 1,000 MHz



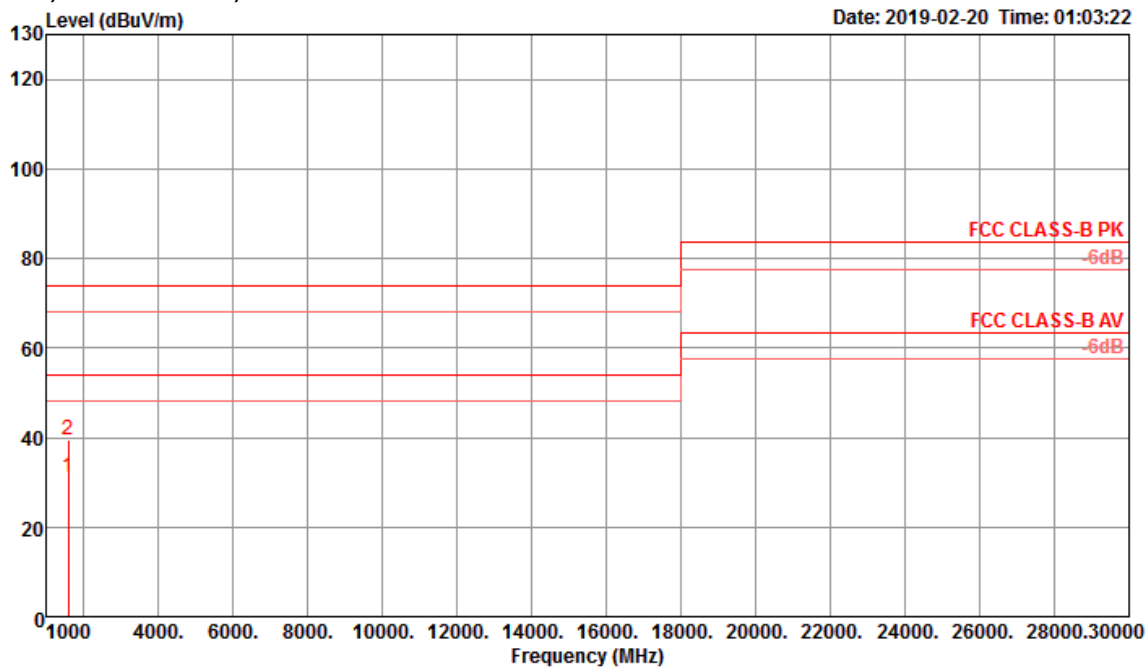
	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	45.52	29.12	40.00	-10.88	42.89	0.86	16.95	31.58	100	0 Peak	HORIZONTAL
2	97.90	40.05	43.50	-3.45	53.69	1.23	16.83	31.70	100	0 Peak	HORIZONTAL
3	159.98	33.50	43.50	-10.00	47.06	1.60	16.60	31.76	100	0 Peak	HORIZONTAL
4	272.50	36.17	46.00	-9.83	46.60	2.02	19.36	31.81	100	0 Peak	HORIZONTAL
5	308.39	34.59	46.00	-11.41	44.51	2.15	19.78	31.85	100	0 Peak	HORIZONTAL
6	410.24	35.71	46.00	-10.29	42.25	2.52	22.90	31.96	100	0 Peak	HORIZONTAL



RSE below 1GHz and RSE Unintentional above 1GHz Result Appendix F.1

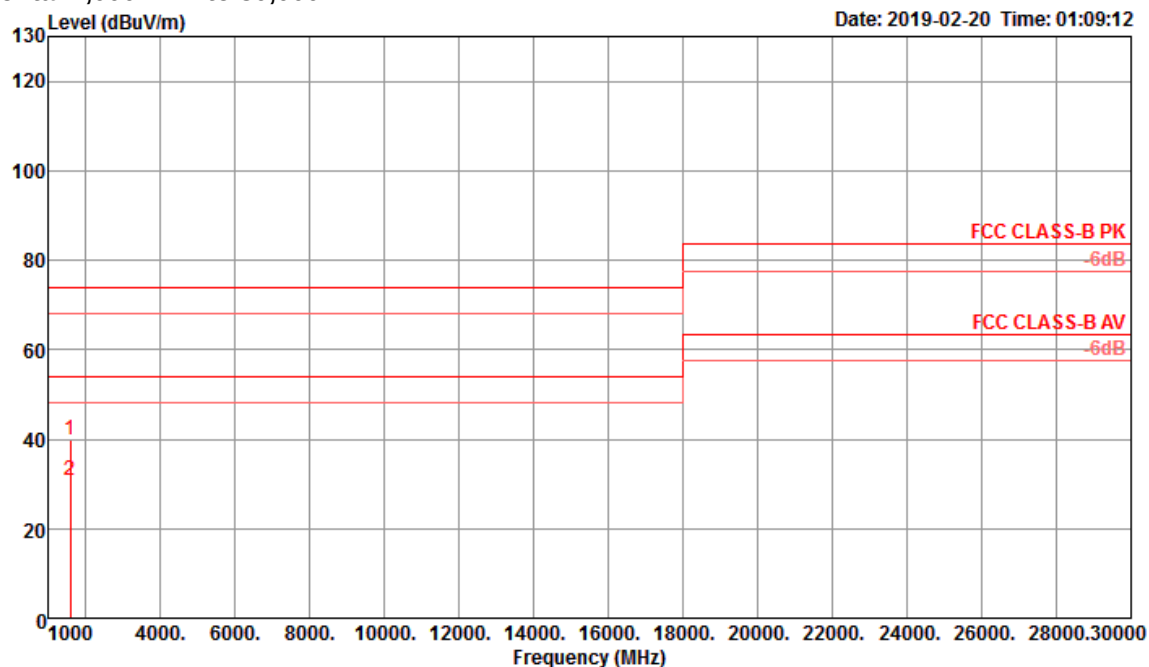
Test Mode	Mode 1 / Unintentional - Normal Link	Frequency Range	1,000 MHz to 30,000 MHz
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Vertical 1,000 MHz to 30,000 MHz



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	1600.02	31.00	54.00	-23.00	37.30	3.18	25.30	34.78	190	183	Average
2	1600.13	39.46	74.00	-34.54	45.76	3.18	25.30	34.78	190	183	Peak

Horizontal 1,000 MHz to 30,000 MHz



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	1599.71	39.66	74.00	-34.34	45.96	3.18	25.30	34.78	264	130 Peak	HORIZONTAL
2	1599.95	30.94	54.00	-23.06	37.24	3.18	25.30	34.78	264	130 Average	HORIZONTAL



RSE TX above 1GHz Result

Appendix F.2

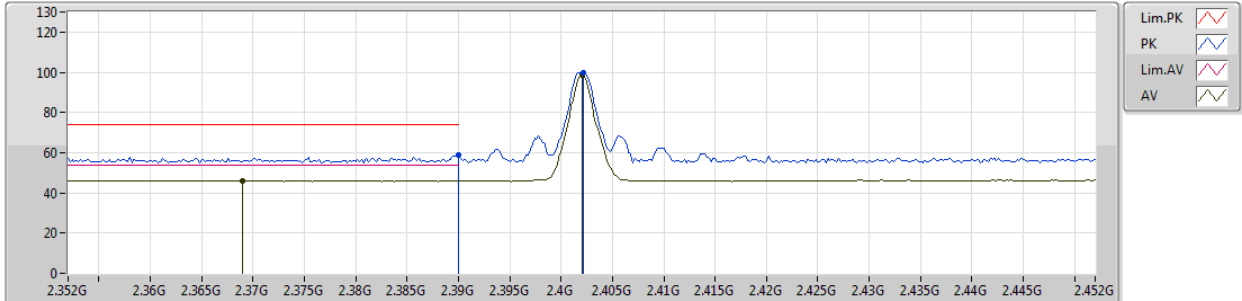
Summary

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	PK	2.4836G	69.14	74.00	-4.86	33.36	3	Vertical	144	2.75	-

BT-LE(1Mbps)

2402MHz_TX

07/12/2018



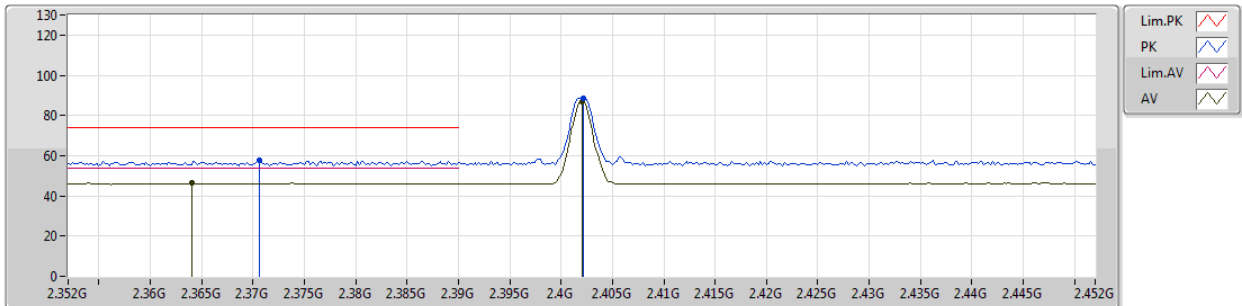
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments						
PK	2.39G	58.98	74.00	-15.02	33.08	3	Vertical	137	2.79	-						
AV	2.369G	46.21	54.00	-7.79	33.06	3	Vertical	137	2.79	-						
PK	2.4022G	99.77	Inf	-Inf	33.09	3	Vertical	137	2.79	-						
AV	2.402G	98.42	Inf	-Inf	33.09	3	Vertical	137	2.79	-						

BT-LE(1Mbps)

2402MHz_TX

07/12/2018



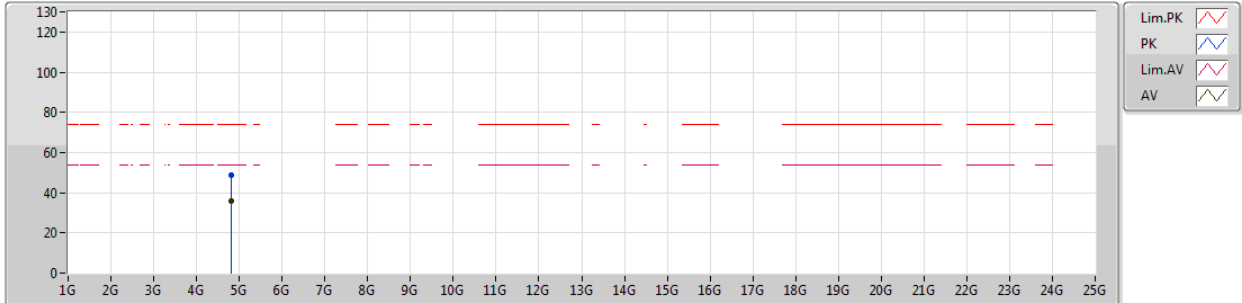
EUT V_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3706G	57.80	74.00	-16.20	33.06	3	Horizontal	167	2.90	-
AV	2.364G	46.41	54.00	-7.59	33.06	3	Horizontal	167	2.90	-
PK	2.4022G	88.63	Inf	-Inf	33.09	3	Horizontal	167	2.90	-
AV	2.402G	86.98	Inf	-Inf	33.09	3	Horizontal	167	2.90	-

BT-LE(1Mbps)

07/12/2018

2402MHz_TX



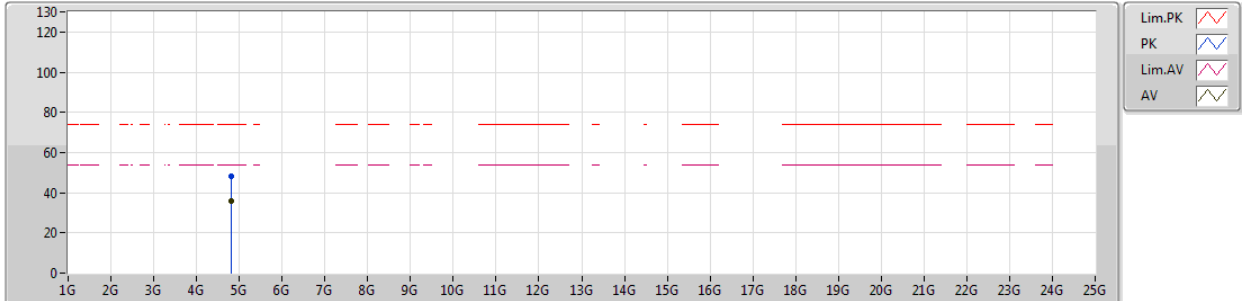
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments						
PK	4.8035G	48.47	74.00	-25.53	7.06	3	Vertical	100	2.39	-						
AV	4.8032G	35.74	54.00	-18.26	7.06	3	Vertical	100	2.39	-						

BT-LE(1Mbps)

07/12/2018

2402MHz_TX



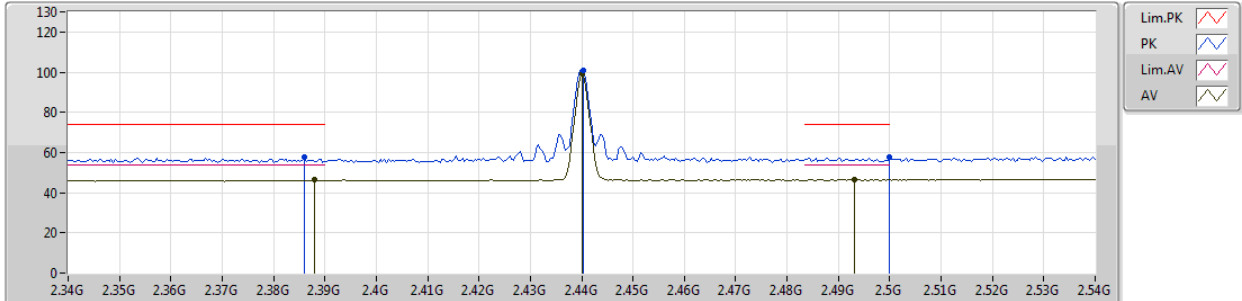
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments						
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)							
PK	4.8037G	48.31	74.00	-25.69	7.06	3	Horizontal	85	1.50	-						
AV	4.80453G	35.71	54.00	-18.29	7.06	3	Horizontal	85	1.50	-						

BT-LE(1Mbps)

07/12/2018

2440MHz_TX



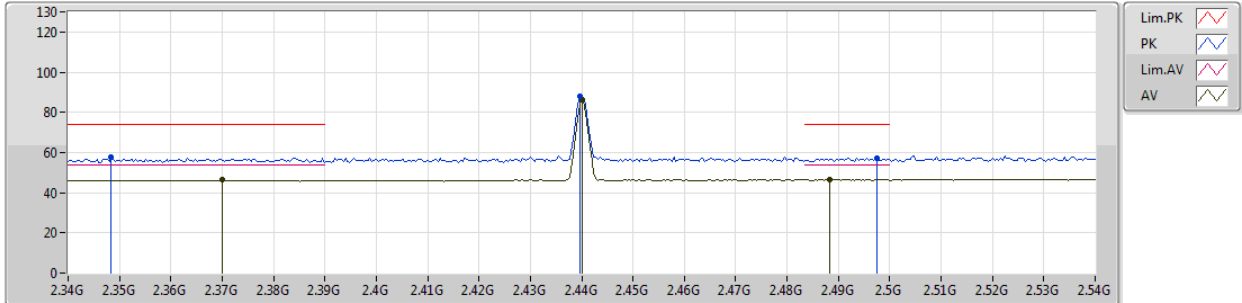
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.386G	57.54	74.00	-16.46	33.07	3	Vertical	148	2.99	-
AV	2.388G	46.24	54.00	-7.76	33.08	3	Vertical	148	2.99	-
PK	2.4404G	100.71	Inf	-Inf	33.22	3	Vertical	148	2.99	-
AV	2.44G	98.94	Inf	-Inf	33.22	3	Vertical	148	2.99	-
PK	2.5G	57.72	74.00	-16.28	33.41	3	Vertical	148	2.99	-
AV	2.4932G	46.68	54.00	-7.32	33.39	3	Vertical	148	2.99	-

BT-LE(1Mbps)

07/12/2018

2440MHz_TX



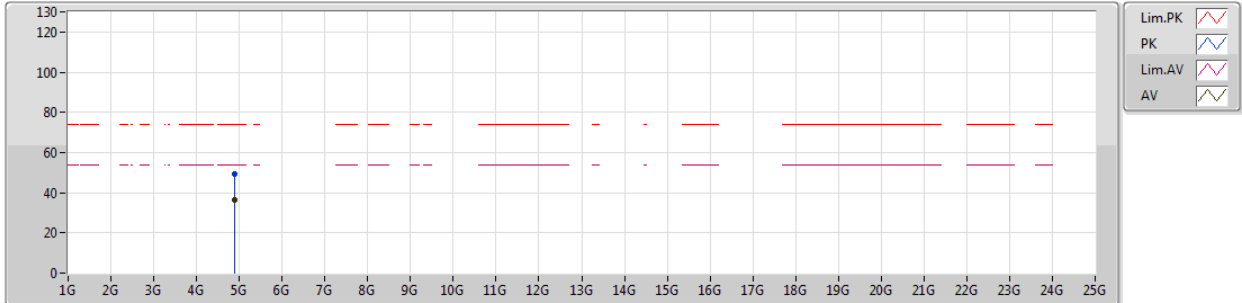
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	2.3484G	57.87	74.00	-16.13	33.04	3	Horizontal	162	1.36	-
AV	2.37G	46.26	54.00	-7.74	33.06	3	Horizontal	162	1.36	-
PK	2.4396G	87.75	Inf	-Inf	33.22	3	Horizontal	162	1.36	-
AV	2.44G	86.32	Inf	-Inf	33.22	3	Horizontal	162	1.36	-
PK	2.4976G	57.38	74.00	-16.62	33.41	3	Horizontal	162	1.36	-
AV	2.4884G	46.55	54.00	-7.45	33.38	3	Horizontal	162	1.36	-

BT-LE(1Mbps)

07/12/2018

2440MHz_TX



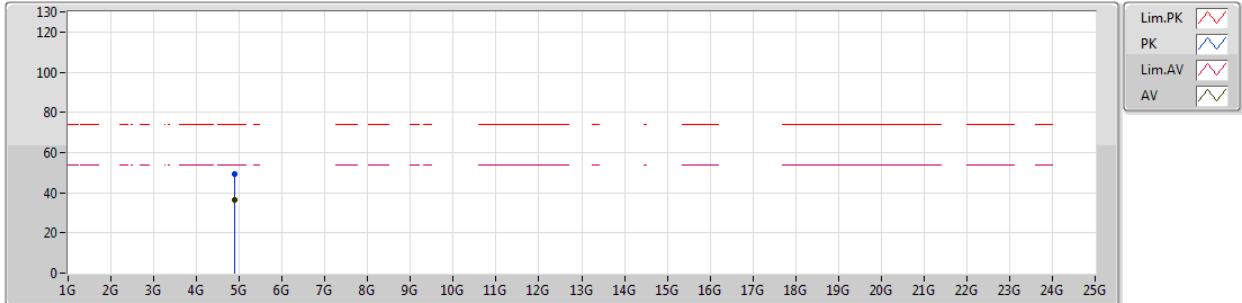
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments						
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)							
PK	4.8799G	49.30	74.00	-24.70	7.40	3	Vertical	68	2.16	-						
AV	4.88072G	36.56	54.00	-17.44	7.40	3	Vertical	68	2.16	-						

BT-LE(1Mbps)

07/12/2018

2440MHz_TX



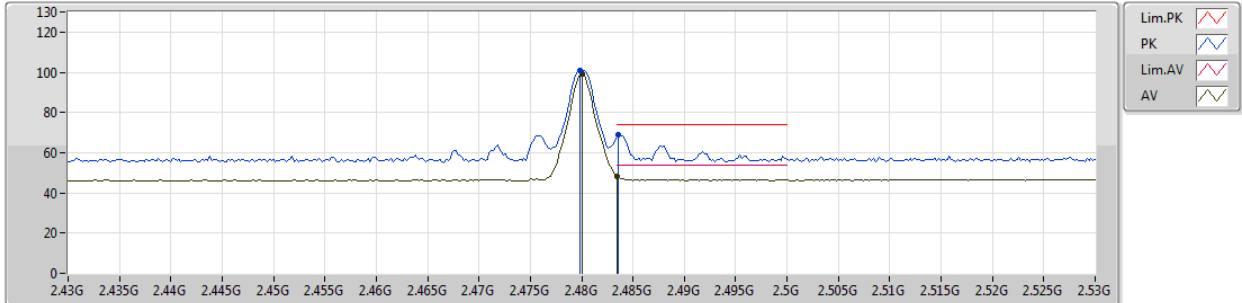
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments						
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)							
PK	4.88042G	49.53	74.00	-24.47	7.40	3	Horizontal	156	2.10	-						
AV	4.88049G	36.65	54.00	-17.35	7.40	3	Horizontal	156	2.10	-						

BT-LE(1Mbps)

07/12/2018

2480MHz_TX



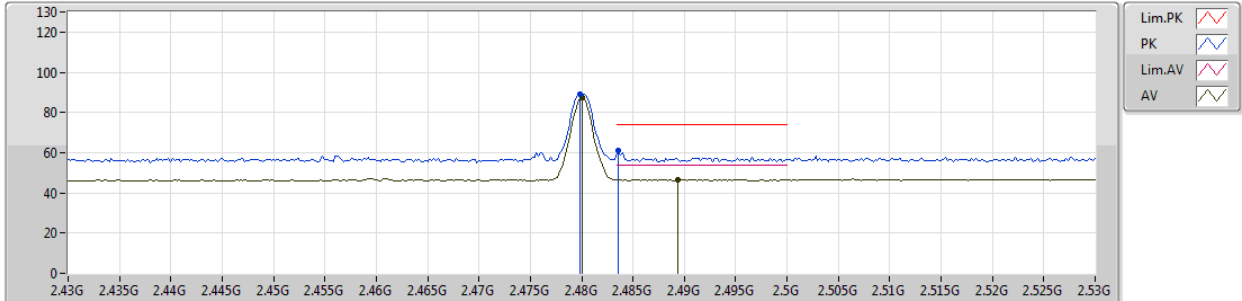
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments						
PK	2.4798G	100.63	Inf	-Inf	33.35	3	Vertical	144	2.75	-						
AV	2.48G	99.33	Inf	-Inf	33.35	3	Vertical	144	2.75	-						
PK	2.4836G	69.14	74.00	-4.86	33.36	3	Vertical	144	2.75	-						
AV	2.4835G	48.42	54.00	-5.58	33.36	3	Vertical	144	2.75	-						

BT-LE(1Mbps)

07/12/2018

2480MHz_TX



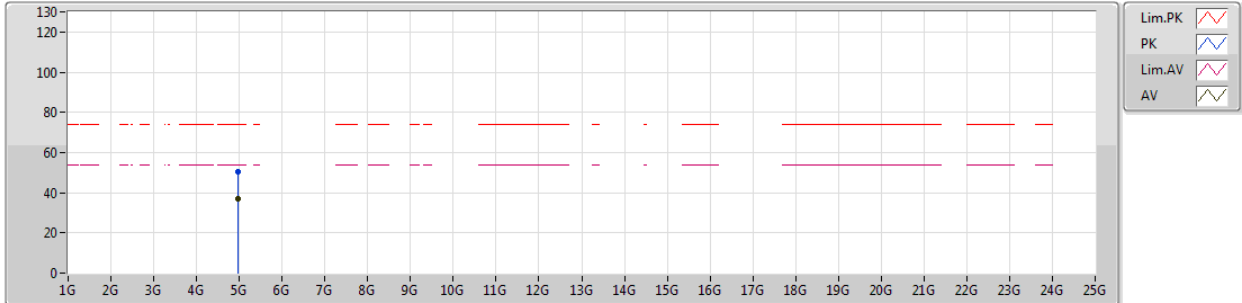
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments						
PK	2.4798G	88.91	Inf	-Inf	33.35	3	Horizontal	121	1.10	-						
AV	2.48G	87.53	Inf	-Inf	33.35	3	Horizontal	121	1.10	-						
PK	2.4836G	61.29	74.00	-12.71	33.36	3	Horizontal	121	1.10	-						
AV	2.4894G	46.63	54.00	-7.37	33.38	3	Horizontal	121	1.10	-						

BT-LE(1Mbps)

07/12/2018

2480MHz_TX



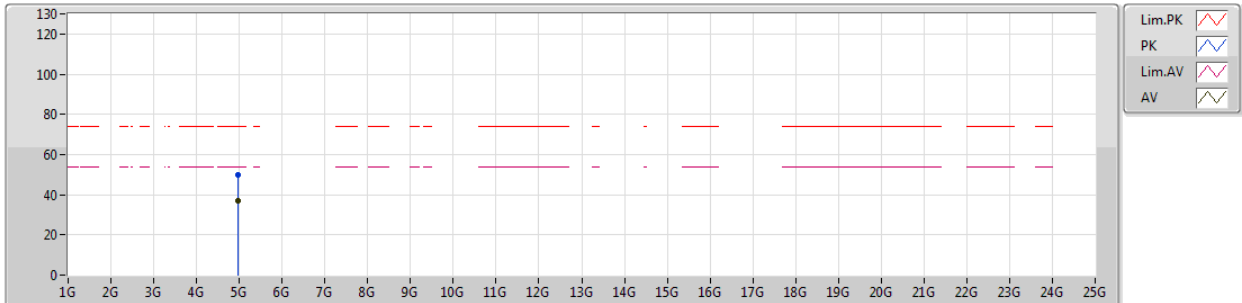
EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments						
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)							
PK	4.95914G	50.53	74.00	-23.47	7.70	3	Vertical	69	1.88	-						
AV	4.96022G	37.11	54.00	-16.89	7.70	3	Vertical	69	1.88	-						

BT-LE(1Mbps)

07/12/2018

2480MHz_TX



EUT Y_1TX
Setting Default
04-W-3
FSP(100080)

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments						
PK	4.95902G	49.76	74.00	-24.24	7.69	3	Horizontal	254	1.87	-						
AV	4.9594G	37.12	54.00	-16.88	7.70	3	Horizontal	254	1.87	-						