FCC Test Report

FCC ID	:	**SK6-XH2240**
Equipment	:	**Wireless Access Point**
Brand Name	:	**riverbed**
Model Name	:	**XH2240**
Applicant	:	**RIVERBED TECHNOLOGY, INC.** **680 Folsom Street San Francisco, California United States 94107**
Manufacturer	:	**1) Lite-On Network Communication (Dongguan) Limited** **30#Keji Rd.,Yin Hu Industrial Area, Qingxi Town, DongGuan City, Guangdong, China** **2) LiteOn Technology Corporation ZhuBei Plant** **1F, No.20-1, Taiyuan St., Zhubei City, Hsinchu County 30288, Taiwan** **3) LiteOn Technology Corporation** **No.37, Chung Yang Road, N.E.P.Z., Kaohsiung 81170, Taiwan**
Standard	:	**47 CFR FCC Part 15.247**

The product was received on Jul. 13, 2018, and testing was started from Jul. 30, 2018 and completed on Aug. 30, 2018. 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.

Allen Lin

Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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PHOTOGRAPHS OF EUT V01

History of this test report

Report No.	Version	Description	Issued Date
FR870620AL	01	Initial issue of report	Sep. 25, 2018

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	FCC 15.203
3.1	15.207	AC Power-line Conducted Emissions	PASS	FCC 15.207
3.2	15.247(a)	DTS Bandwidth	PASS	≥500kHz
3.3	15.247(b)	Maximum Conducted Output Power	PASS	Power [dBm]:30
3.4	15.247(e)	Power Spectral Density	PASS	PSD [dBm/3kHz]:8
3.5	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	Non-Restricted Bands: >30 dBc
3.6	15.247(d)	Emissions in Restricted Frequency Bands	PASS	Restricted Bands: FCC 15.209

Reviewed by: Sam Tsai

Report Producer: Debby Hung

1 General Description

1.1 Information

1.1.1 RF General Information

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

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

Note:
- Bluetooth LE uses a GFSK (1Mbps) modulation for DSSS.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Radio	Brand	Model Name	Antenna Type	Connector
1~4	1~2	EAhison	EHS1GA260A	Omni-directional Antenna	N-Type
5~8	1~2	MTI	MT – 953019/NVHD	Dual Band & Quad Polarization Subscriber Antenna	N-Type
9	3	Walsin	RFDPA161300SBAB801	Omni-directional Antenna	MMCX
10		Yetnorson	TLB-2400-3800B	Omni-directional Antenna	MMCX

Ant.	Gain (dBi)		
	2.4G	5G	BT
1~4	2	2	-
5~8	10.23	12.14	-
9	-	-	2.3
10	-	-	2

Note 1: Radio 1 and Radio 2 has two antenna configurations.

Note 2: Ant. 9 was declared to be tested by customer at Bluetooth function.

For 2.4GHz function:

For IEEE 802.11 b/g/n mode (4TX/4RX)

Configurations 1: Ant. 1 to Ant. 4 could transmit/receive simultaneously.

Configurations 2: Ant. 5 to Ant. 8 could transmit/receive simultaneously.

For 5GHz function:

For IEEE 802.11 a/n/ac mode (4TX/4RX)

Configurations 1: Ant. 1 to Ant. 4 could transmit/receive simultaneously.

Configurations 2: Ant. 5 to Ant. 8 could transmit/receive simultaneously.

For Bluetooth function:

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

Ant. 9 could transmit/receive simultaneously.

1.1.3 EUT Information

Operational Condition				
EUT Power Type	From PoE			
EUT Function	☒	Point-to-multipoint	☐	Point-to-point

Type of EUT		
☒	Stand-alone	
☐	Combined (EUT where the radio part is fully integrated within another device)	
	Combined Equipment - Brand Name / Model No.:	…
☐	Plug-in radio (EUT intended for a variety of host systems)	
	Host System - Brand Name / Model No.:	…
☐	Other:	

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.156	8.069	97.5u	10k

1.2 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- KDB 558074 D01 v05

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
Test site Designation No. TW1190 with FCC.					
☐	JHUBEI	ADD :	No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)		
		TEL :	886-3-656-9065	FAX :	886-3-656-9085
Test site Designation No. TW0006 with FCC.					

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO04-HY	Jerry	24.5°C / 55%	30/Aug/2018
RF Conducted	TH01-HY	Andy	24.9°C / 63.7%	27/Jul/2018
Radiated	03CH02-HY	Jeremy	23.1°C / 60%	30/Jul/2018

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	3.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.9 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.3 dB	Confidence levels of 95%
Temperature	0.7 °C	Confidence levels of 95%
Humidity	4 %	Confidence levels of 95%

2 Test Configuration of EUT

2.1 Test Condition

RF Conducted	Abbreviation	Remark
TnomVnom	Tnom	20°C
-	Vnom	120V

2.2 Test Channel Mode

Test Software Version	bluetool1.8.7.2

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

2.3 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
1	PoE mode

The Worst Case Mode for Following Conformance Tests	
Tests Item	DTS Bandwidth Maximum Conducted Output Power Power Spectral Density Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at transmit chains

The Worst Case Mode for Following Conformance Tests			
Tests Item	Emissions in Restricted Frequency Bands		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
Operating Mode < 1GHz	CTX		
1	PoE mode		
Operating Mode > 1GHz	CTX		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
Worst Planes of EUT		V	

The Worst Case Mode for Following Conformance Tests	
Tests Item	Simultaneous Transmission Analysis
Operating Mode	CTX
1	Radio 1 (2.4G)+ Radio 2(5G)+ Radio 3(BT)
2	Radio 1 (5G)+ Radio 2(5G)+ Radio 3(BT)
Refer to Sporton Test Report No.: FA870620 for Co-location RF Exposure Evaluation.	

2.4 Accessories and Support Equipment

Accessories		
Ground Wire	Signal Line	0.22 meter, non-shielded cable,w/o ferrite core

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

Support Equipment – AC Conduction				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	PoE	XIRRUS	XP1-MSI-75	-

Note.Support equipment No.1,2 was provided by customer.

Support Equipment – RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	R33002 / DOC
2	Adapter for NB	DELL	HA65NM130	R35737 / DOC
3	AC Power Source	GW	APS-9102	-
4	PoE	XIRRUS	XP1-MSI-75	-

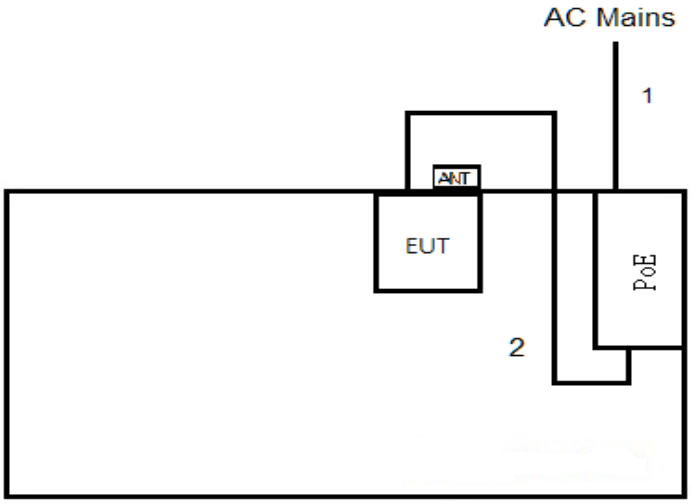
Note.Support equipment No.4 was provided by customer.

Support Equipment – Radiated Emission				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	PoE(remote)	XIRRUS	XP1-MSI-75	-

Note.Support equipment No.1 was provided by customer.

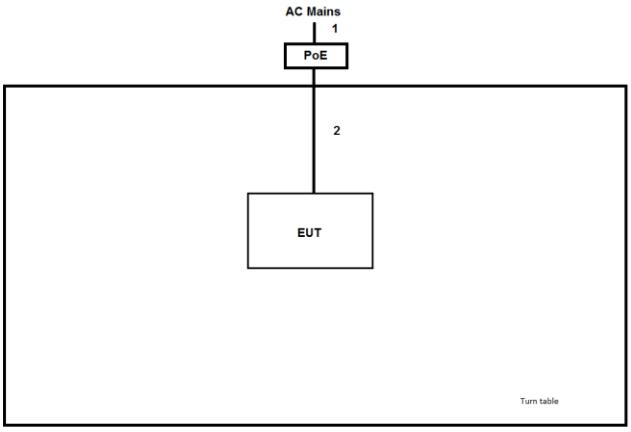
2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power line	No	1.5	-
2	RJ45	No	1.0	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power line	No	1.5	-
2	Lan cable	No	10	-

3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

3.1.2 Measuring Instruments

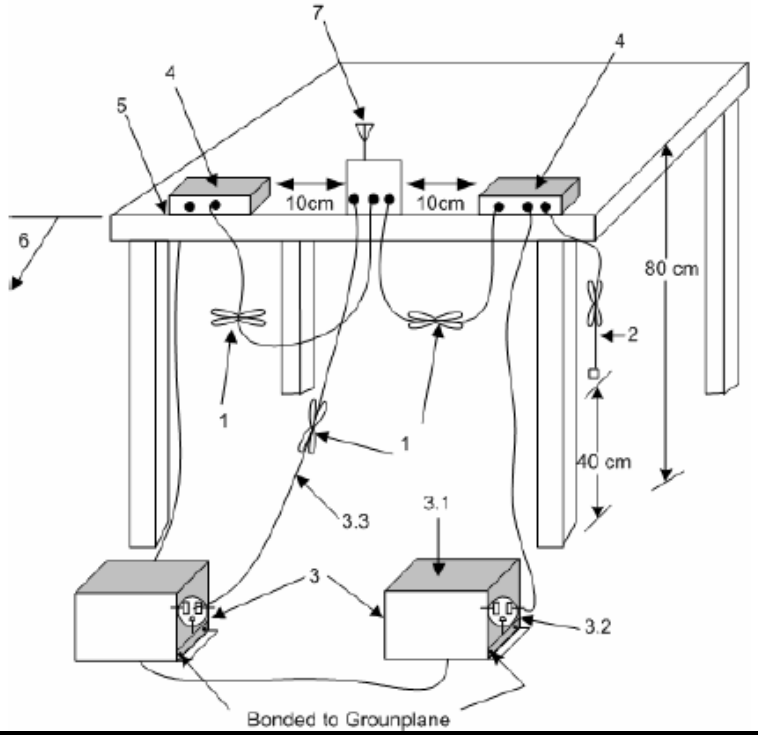
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

3.1.4 Test Setup

AC Power-line Conducted Emissions



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

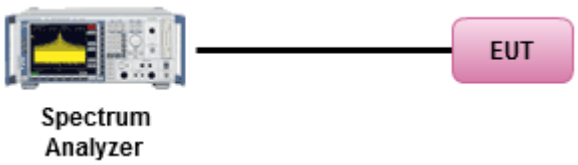
Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
▪ For the emission bandwidth shall be measured using one of the options below:	
	☒ Refer as KDB 558074, clause 8.2 (11.9.2.2 of ANSI C63.10) DTS bandwidth measurement.
	☐ Refer as RSS-Gen, clause 6.7 for for occupied bandwidth testing.
	☐ Refer as ANSI C63.10, clause 6.9.3 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	
e.i.r.p. Power Limit:			
▪ 2400-2483.5 MHz Band			
	▪ Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)		
	▪ Point-to-point systems (P2P): $P_{eirp} \leq MAX(36, [P_{Out} + G_{TX}])$ dBm		
	▪ Smart antenna system (SAS)		
		- Single beam: $P_{eirp} \leq MAX(36, P_{Out} + G_{TX})$ dBm	
		- Overlap beam: $P_{eirp} \leq MAX(36, P_{Out} + G_{TX})$ dBm	
		- Aggregate power on all beams: $P_{eirp} \leq MAX(36, [P_{Out} + G_{TX} + 8])$ dBm	
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, **G_{TX}** = the maximum transmitting antenna directional gain in dBi.			

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
▪ Maximum Peak Conducted Output Power	
	☐ Refer as KDB 558074, clause 8.3.1.1 (11.9.1.1 of ANSI C63.10) RBW ≥ EBW method.
	☐ Refer as KDB 558074, clause 8.3.1.2 (11.9.1.2 of ANSI C63.10) integrated band power method.
	☐ Refer as KDB 558074, clause 8.3.1.3 (11.9.1.3 of ANSI C63.10) peak power meter.
▪ Maximum Average Conducted Output Power	
	☐ Refer as KDB 558074, clause 8.3.2.2 (11.9.2.2 of ANSI C63.10) using a spectrum analyzer.
	☒ Refer as KDB 558074, clause 8.3.2.3 (11.9.2.3 of ANSI C63.10) using a power meter.
▪ For conducted measurement.	
	▪ If the EUT supports multiple transmit chains using options given below: Refer as KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	▪ If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \ldots + P_n$ (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

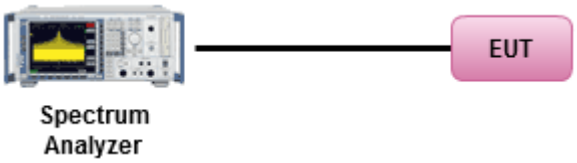
3.4.2 Measuring Instruments

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 KDB 558074, clause 8.4 (11.10 of ANSI C63.10) Method PKPSD.	
▪ For conducted measurement.		
	▪ If The EUT supports multiple transmit chains using options given below:	
		▪ Measure and sum the spectra across the outputs. Refer as KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.

3.4.4 Test Setup

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 (dB)**
Peak output power procedure	20
Average output power procedure	30
Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak 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

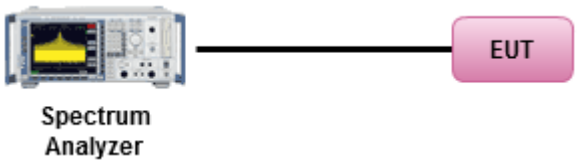
Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method
▪ Refer as KDB 558074, clause 8.5 (11.11 of ANSI C63.10) for non-restricted frequency 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.

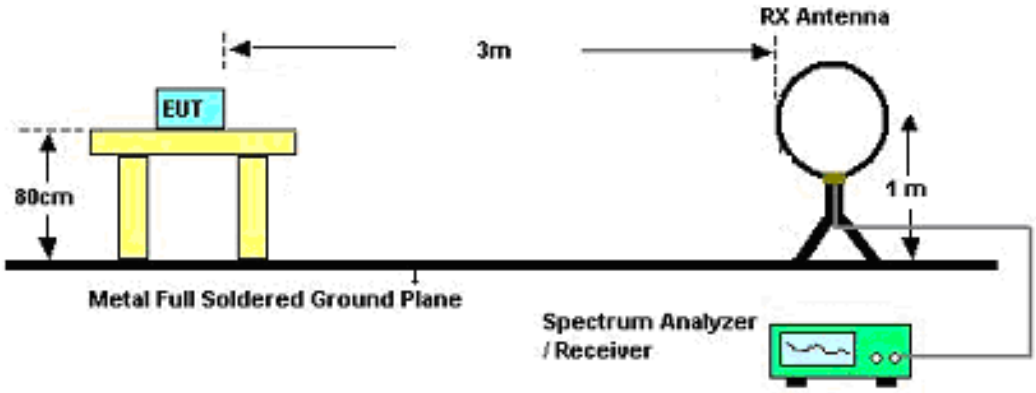
3.6.2 Measuring Instruments

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

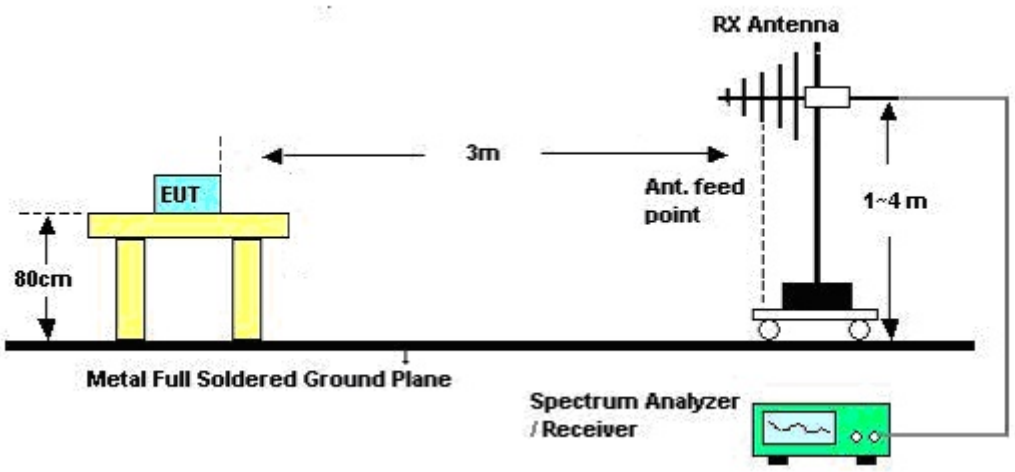
3.6.3 Test Procedures

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 KDB 558074, clause 8.6 (11.12 of ANSI C63.10) for restricted frequency bands.
▪ For the transmitter band-edge emissions shall be measured using following options below:	
	▪ Refer as KDB 558074 clause 8.7.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.
	▪ Refer as KDB 558074, clause 8.7.2 (6.10.6 of ANSI C63.10) for marker-delta method for band-edge measurements.
	▪ Refer as KDB 558074, clause 8.7.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).

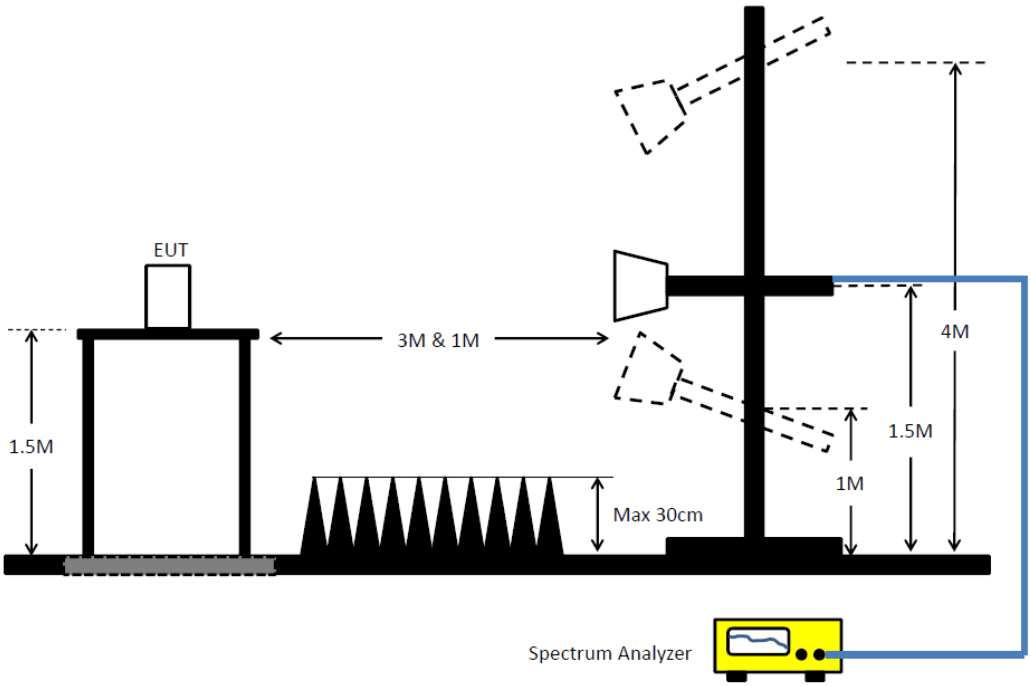
3.6.4 Test Setup

Emissions in Restricted Frequency Bands
9kHz ~30MHz


30MHz~1GHz



Above 1GHz



3.6.5 Test Result of Emissions in Restricted Frequency Bands (Below 30MHz)

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

3.6.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix F

4 Test Equipment and Calibration Data

Instrument for AC Conduction

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
EMC Receiver	R&S	ESR	102051	9KHz ~ 3.6GHz	03/May/2018	02/May/2019
LISN	R&S	ENV216	101295	9kHz ~ 30MHz	17/Nov/2017	16/Nov/2018
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	06/Oct/2017	05/Oct/2018
AC POWER	APC	AFC-11005G	F310050055	47Hz~63Hz 5~300V	NCR	NCR
Impuls Begrenzer Pulse Limiter	SCHWARZBECK	VTSD 9561-F	9561-F041	9 kHz ~ 30 MHz	12/Oct/2017	11/Oct/2018

NCR : Non-Calibration Require

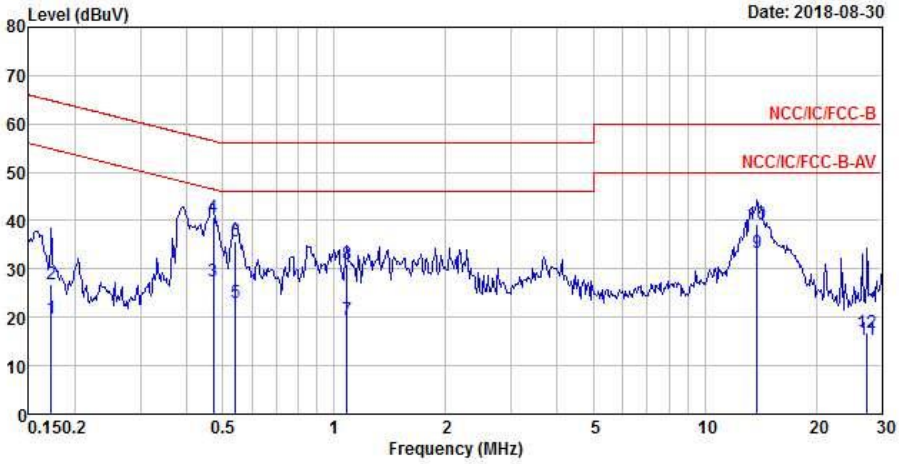
Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
Power Sensor	Anritsu	MA2411B	1339407	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
Power Meter	Anritsu	ML2495A	1517010	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10710/4	30MHz ~ 26.5GHz	25/Aug/2017	24/Aug/2018
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10709/4	30MHz ~ 26.5GHz	25/Aug/2017	24/Aug/2018
RF Cable-1m	HUBER+SUHNER	SUCOFLEX_104	MY37332/4	30MHz ~ 26.5GHz	26/Jan/2018	25/Jan/2019
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	26/Jul/2018	25/Jul/2019

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	20/Oct/2017	19/Oct/2018
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	1GHz ~ 18GHz 3m	27/Oct/2017	26/Oct/2018
Amplifier	Agilent	8447D	2944A08290	100kHz ~ 1.3GHz	30Aug/2017	29Aug/2018
Microwave Preamplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	28/Sep/2017	27/Sep/2018
Spectrum Analyzer	Rohde & Schwarz	FSP40	100593	9KHz - 40GHz	12/Dec/2017	11/Dec/2018
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100354	9kHz ~ 2.75GHz	08/Dec/2017	07/Dec/2018
RF Cable-R03m	Jye Bao	RG142	CB017	9kHz ~ 1GHz	19/Jan/2018	18/Jan/2019
RF Cable-high	SUHNER	SUCOFLEX104	MY34918/4	1GHz ~ 40GHz	19/Jan/2018	18/Jan/2019
Bilog Antenna	SCHAFFNER	CBL 6112B	2723	30MHz ~ 1GHz	09/Sep/2017	08/Sep/2018
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170154	18GHz ~ 40GHz	06/Feb/2018	05/Feb/2019
Preamplifier	MITEQ	TTA1840-35-HG	1864481	18GHz ~ 40GHz	31/Aug/2017	30/Aug/2018
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA 9120 D 1543	1GHz ~ 18GHz	11/May/ 2018	10/May/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA 9120 D 1531	1GHz ~ 18GHz	18/Apr/ 2018	17/Apr/2019
Loop Antenna	TESEQ	HLA 6120	31244	9k-30MHz	29/Mar/2018	28/Mar/2019

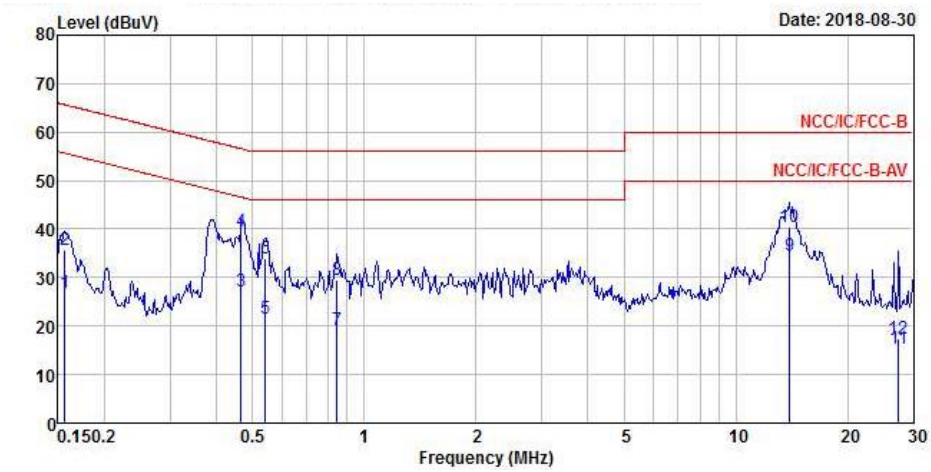
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	PoE mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.17	19.68	-35.18	54.86	10.03	9.63	0.02	Average
2	0.17	26.75	-38.11	64.86	17.10	9.63	0.02	QP
3	0.47	27.37	-19.12	46.49	17.68	9.61	0.08	Average
4 MAX	0.47	40.74	-15.75	56.49	31.05	9.61	0.08	QP
5	0.54	22.89	-23.11	46.00	13.21	9.61	0.07	Average
6	0.54	35.68	-20.32	56.00	26.00	9.61	0.07	QP
7	1.08	19.57	-26.43	46.00	9.95	9.62	0.00	Average
8	1.08	30.91	-25.09	56.00	21.29	9.62	0.00	QP
9	13.84	33.25	-16.75	50.00	23.51	9.70	0.04	Average
10	13.84	39.12	-20.88	60.00	29.38	9.70	0.04	QP
11	27.42	15.30	-34.70	50.00	5.46	9.69	0.15	Average
12	27.42	16.79	-43.21	60.00	6.95	9.69	0.15	QP

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**	Line
Operating Function	PoE mode		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	26.84	-28.81	55.65	17.18	9.62	0.04	Average
2	0.16	35.83	-29.82	65.65	26.17	9.62	0.04	QP
3	0.47	27.15	-19.43	46.58	17.46	9.61	0.08	Average
4	0.47	39.50	-17.08	56.58	29.81	9.61	0.08	QP
5	0.54	21.58	-24.42	46.00	11.90	9.61	0.07	Average
6	0.54	34.02	-21.98	56.00	24.34	9.61	0.07	QP
7	0.84	19.12	-26.88	46.00	9.49	9.61	0.02	Average
8	0.84	29.42	-26.58	56.00	19.79	9.61	0.02	QP
9 MAX	13.99	34.68	-15.32	50.00	25.01	9.64	0.03	Average
10	13.99	40.53	-19.47	60.00	30.86	9.64	0.03	QP
11	27.42	15.49	-34.51	50.00	5.81	9.53	0.15	Average
12	27.42	17.42	-42.58	60.00	7.74	9.53	0.15	QP

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.)

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)	510k	1.047M	1M05F1D	505k	1.043M

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

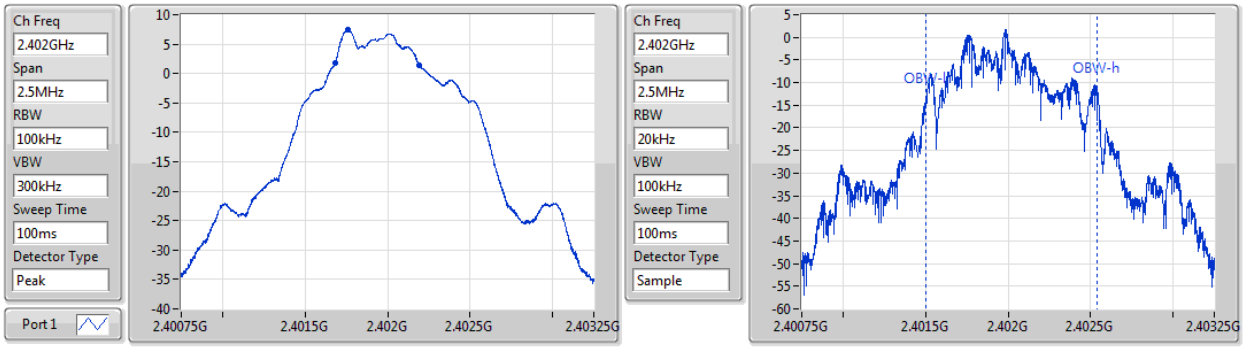
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	500k	505k	1.043M
2440MHz_TnomVnom	Pass	500k	505k	1.047M
2480MHz_TnomVnom	Pass	500k	510k	1.044M

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

BT-LE(1Mbps) EBW

2402MHz

27/07/2018

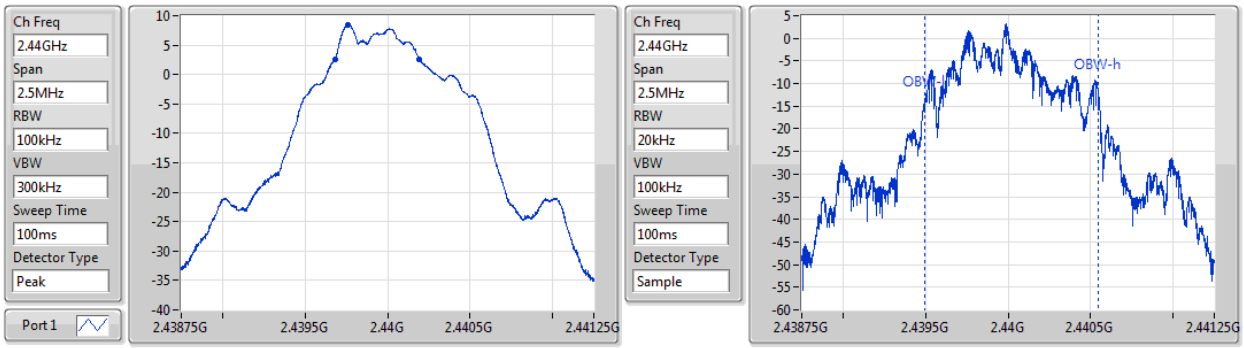


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
505k	2.401684G	2.402189G	1.043M	2.401499G	2.402542G	500k	1

BT-LE(1Mbps) EBW

2440MHz

27/07/2018

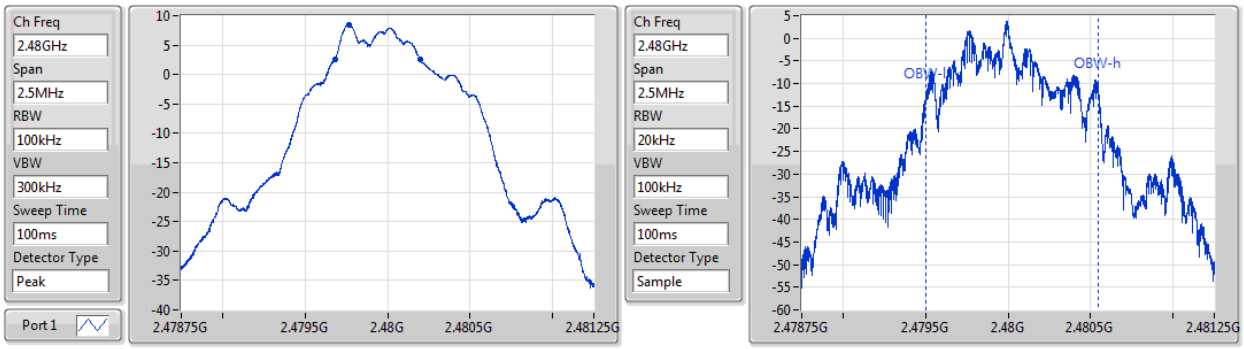


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
505k	2.439685G	2.44019G	1.047M	2.439498G	2.440545G	500k	1

BT-LE(1Mbps) EBW

2480MHz

27/07/2018



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
510k	2.479685G	2.480195G	1.044M	2.479501G	2.480546G	500k	1

Summary

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	6.65	0.00462

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	2.30	5.47	30.00
2440MHz_TnomVnom	Pass	2.30	6.29	30.00
2480MHz_TnomVnom	Pass	2.30	6.65	30.00

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-8.99

RBW=3kHz.

Result

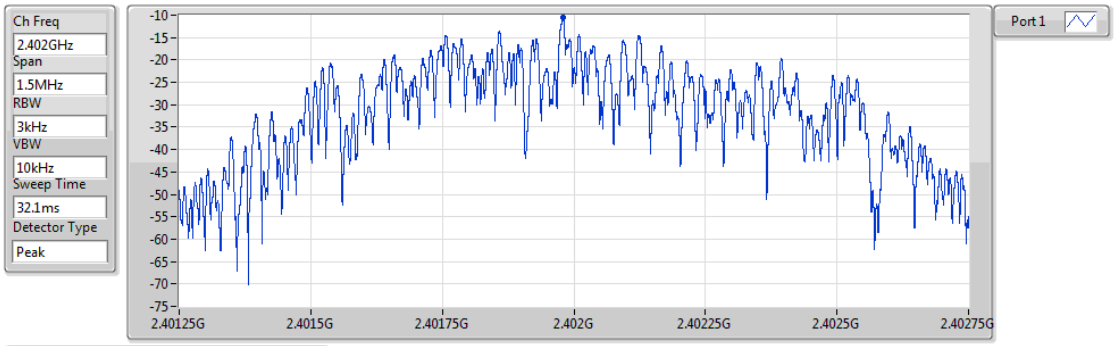
Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	2.30	-10.53	8.00
2440MHz_TnomVnom	Pass	2.30	-9.09	8.00
2480MHz_TnomVnom	Pass	2.30	-8.99	8.00

RBW=3kHz.

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

2402MHz

27/07/2018

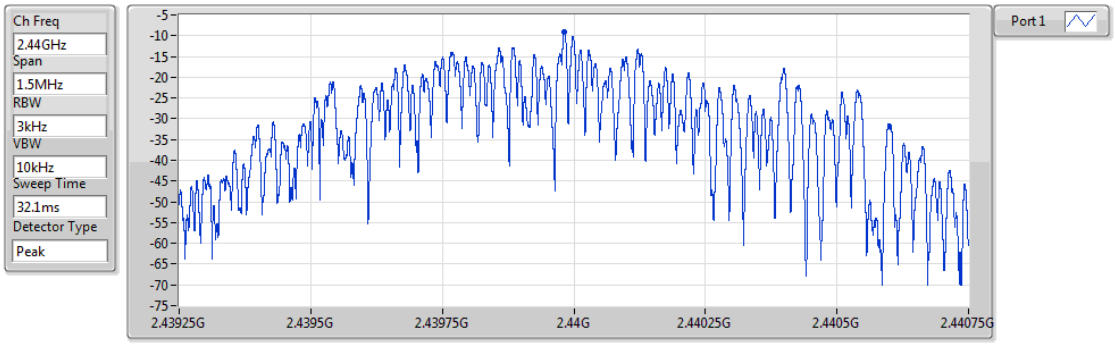


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-10.53	-10.53	-10.53

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

2440MHz

27/07/2018

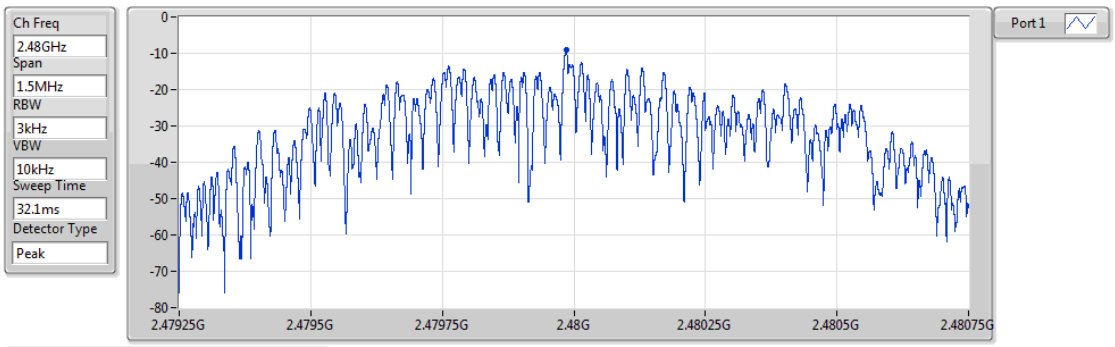


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-9.09	-9.09	-9.09

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

2480MHz

27/07/2018



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-8.99	-8.99	-8.99

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	2.48016G	6.49	-23.51	2.148176G	-58.55	2.398296G	-58.12	2.483876G	-57.60	9.757684G	-49.24	1

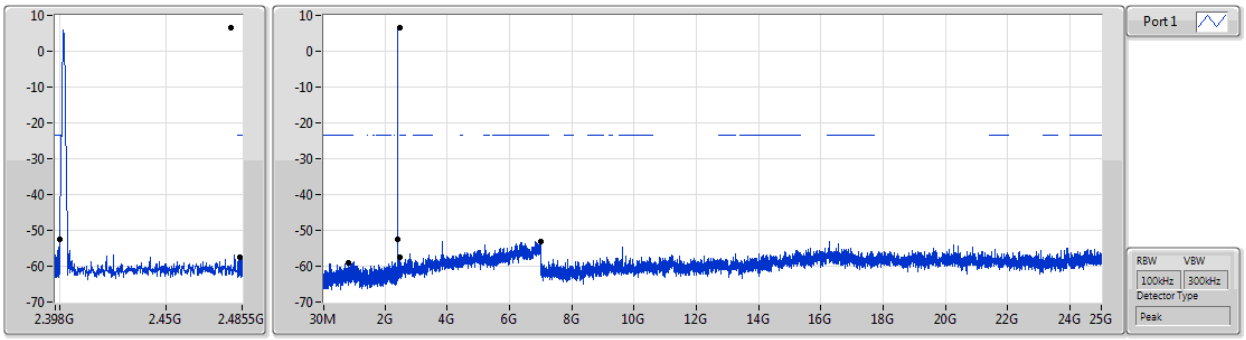
Result

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_TnomVnom	Pass	2.48016G	6.49	-23.51	836.304M	-59.10	2.39996G	-52.37	2.4844G	-57.61	6.985586G	-53.02	1
2440MHz_TnomVnom	Pass	2.48016G	6.49	-23.51	2.148176G	-58.55	2.398296G	-58.12	2.483876G	-57.60	9.757684G	-49.24	1
2480MHz_TnomVnom	Pass	2.48016G	6.49	-23.51	668.176M	-58.68	2.399936G	-57.41	2.483836G	-54.68	9.920914G	-50.50	1

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

2402MHz

27/07/2018

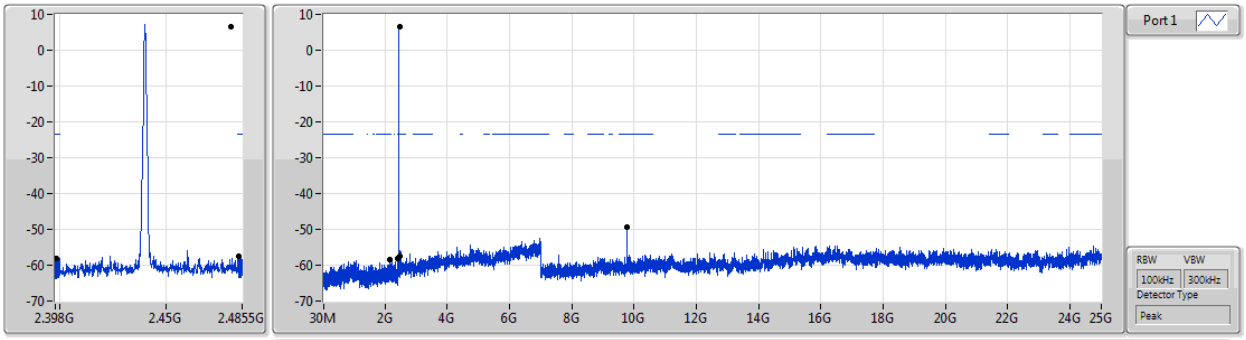


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48016G	6.49	-23.51	836.304M	-59.10	2.39996G	-52.37	2.4844G	-57.61	6.985586G	-53.02	1

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

2440MHz

27/07/2018

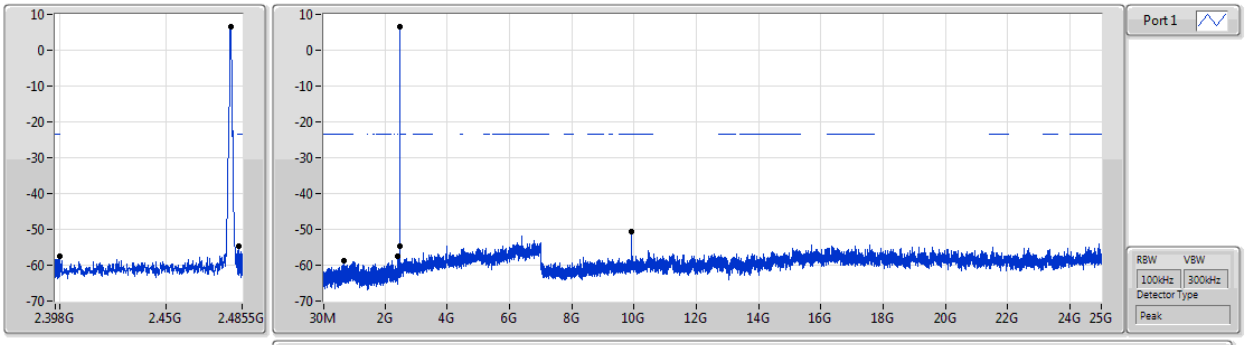


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48016G	6.49	-23.51	2.148176G	-58.55	2.398296G	-58.12	2.483876G	-57.60	9.757684G	-49.24	1

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

2480MHz

27/07/2018



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.48016G	6.49	-23.51	668.176M	-58.68	2.399936G	-57.41	2.483836G	-54.68	9.920914G	-50.50	1

Summary

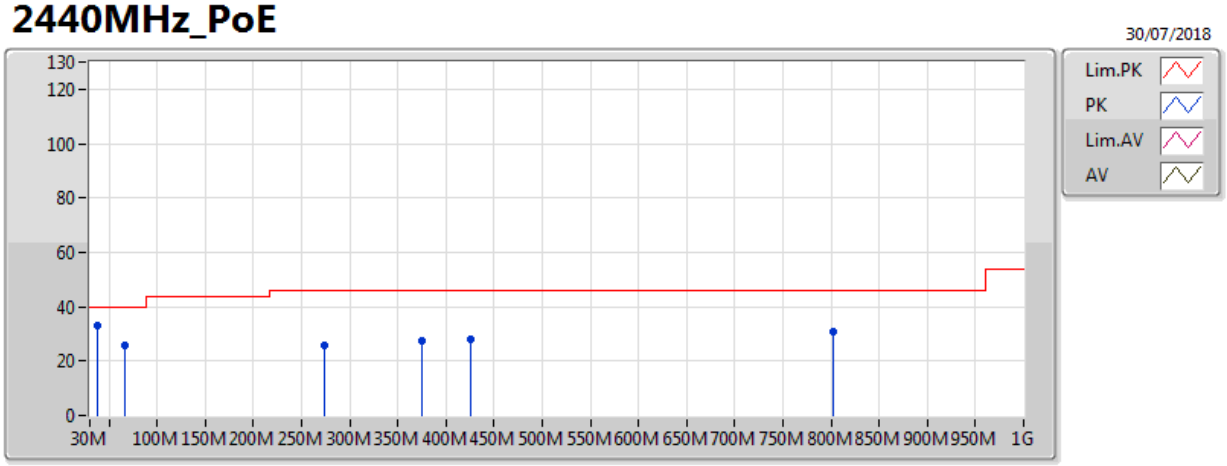
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	PK	39.7M	34.66	40.00	-5.34	-9.61	3	Horizontal	0	1.00	-

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	37.76M	32.95	40.00	-7.05	-8.49	3	Vertical	360	1.00	-
2440MHz	Pass	PK	66.86M	25.50	40.00	-14.50	-15.76	3	Vertical	360	1.00	-
2440MHz	Pass	PK	274.44M	26.00	46.00	-20.00	-7.84	3	Vertical	360	1.00	-
2440MHz	Pass	PK	375.32M	27.27	46.00	-18.73	-6.12	3	Vertical	360	1.00	-
2440MHz	Pass	PK	425.76M	28.18	46.00	-17.82	-4.62	3	Vertical	360	1.00	-
2440MHz	Pass	PK	802.12M	30.57	46.00	-15.43	-0.84	3	Vertical	360	1.00	-
2440MHz	Pass	PK	39.7M	34.66	40.00	-5.34	-9.61	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	66.86M	21.56	40.00	-18.44	-15.76	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	274.44M	28.51	46.00	-17.49	-7.84	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	375.32M	30.00	46.00	-16.00	-6.12	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	425.76M	25.92	46.00	-20.08	-4.62	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	897.18M	32.48	46.00	-13.52	0.35	3	Horizontal	0	1.00	-

BT-LE(1Mbps)

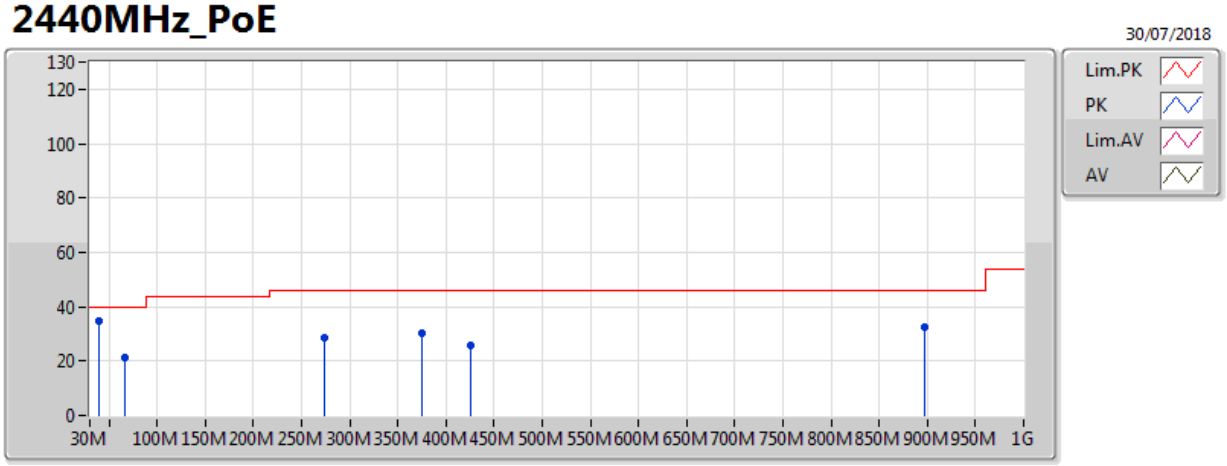
2440MHz_PoE



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	37.76M	32.95	40.00	-7.05	-8.49	3	Vertical	360	1.00	-
PK	66.86M	25.50	40.00	-14.50	-15.76	3	Vertical	360	1.00	-
PK	274.44M	26.00	46.00	-20.00	-7.84	3	Vertical	360	1.00	-
PK	375.32M	27.27	46.00	-18.73	-6.12	3	Vertical	360	1.00	-
PK	425.76M	28.18	46.00	-17.82	-4.62	3	Vertical	360	1.00	-
PK	802.12M	30.57	46.00	-15.43	-0.84	3	Vertical	360	1.00	-

BT-LE(1Mbps)

2440MHz_PoE



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	39.7M	34.66	40.00	-5.34	-9.61	3	Horizontal	0	1.00	-
PK	66.86M	21.56	40.00	-18.44	-15.76	3	Horizontal	0	1.00	-
PK	274.44M	28.51	46.00	-17.49	-7.84	3	Horizontal	0	1.00	-
PK	375.32M	30.00	46.00	-16.00	-6.12	3	Horizontal	0	1.00	-
PK	425.76M	25.92	46.00	-20.08	-4.62	3	Horizontal	0	1.00	-
PK	897.18M	32.48	46.00	-13.52	0.35	3	Horizontal	0	1.00	-

Summary

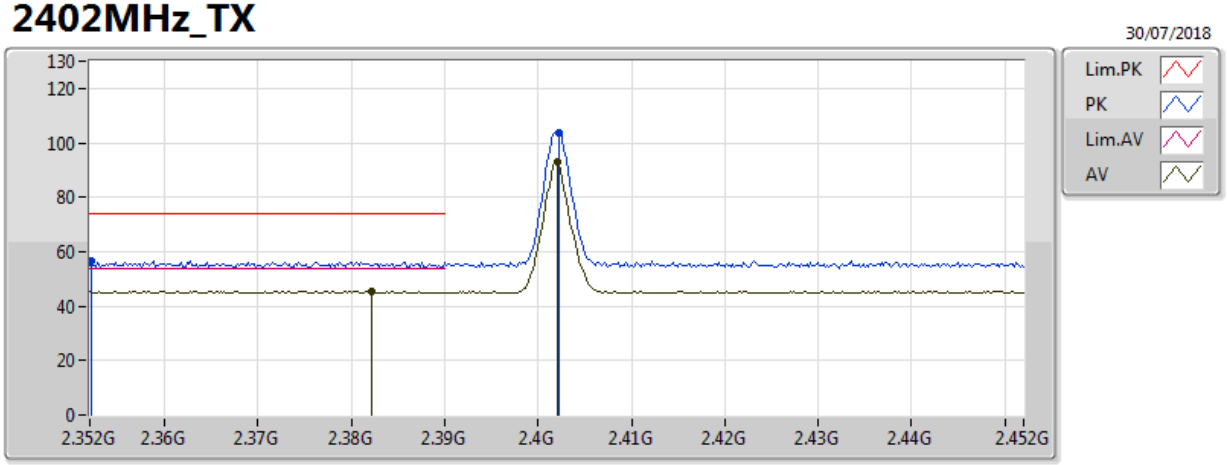
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	AV	2.483502G	48.69	54.00	-5.31	32.61	3	Vertical	360	2.75	-

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.3822G	45.36	54.00	-8.64	32.25	3	Vertical	117	2.84	-
2402MHz	Pass	AV	2.402G	93.14	Inf	-Inf	32.31	3	Vertical	117	2.84	-
2402MHz	Pass	PK	2.3522G	56.45	74.00	-17.55	32.14	3	Vertical	117	2.84	-
2402MHz	Pass	PK	2.4022G	103.49	Inf	-Inf	32.32	3	Vertical	117	2.84	-
2402MHz	Pass	AV	4.79506G	31.71	54.00	-22.29	2.97	3	Vertical	218	2.34	-
2402MHz	Pass	PK	4.79236G	46.75	74.00	-27.25	2.97	3	Vertical	218	2.34	-
2402MHz	Pass	AV	4.7917G	31.70	54.00	-22.30	2.97	3	Horizontal	34	1.63	-
2402MHz	Pass	PK	4.78912G	46.24	74.00	-27.76	2.96	3	Horizontal	34	1.63	-
2440MHz	Pass	AV	2.3616G	45.50	54.00	-8.50	32.17	3	Vertical	38	2.81	-
2440MHz	Pass	AV	2.44G	93.89	Inf	-Inf	32.46	3	Vertical	38	2.81	-
2440MHz	Pass	AV	2.4944G	45.56	54.00	-8.44	32.65	3	Vertical	38	2.81	-
2440MHz	Pass	PK	2.3488G	57.26	74.00	-16.74	32.13	3	Vertical	38	2.81	-
2440MHz	Pass	PK	2.4404G	104.37	Inf	-Inf	32.46	3	Vertical	38	2.81	-
2440MHz	Pass	PK	2.4908G	56.85	74.00	-17.15	32.64	3	Vertical	38	2.81	-
2440MHz	Pass	AV	4.87982G	30.80	54.00	-23.20	3.16	3	Vertical	202	1.51	-
2440MHz	Pass	PK	4.89188G	45.28	74.00	-28.72	3.19	3	Vertical	202	1.51	-
2440MHz	Pass	AV	4.8836G	31.25	54.00	-22.75	3.17	3	Horizontal	46	1.41	-
2440MHz	Pass	PK	4.87454G	45.06	74.00	-28.94	3.13	3	Horizontal	46	1.41	-
2480MHz	Pass	AV	2.48G	93.91	Inf	-Inf	32.60	3	Vertical	360	2.75	-
2480MHz	Pass	AV	2.483502G	48.69	54.00	-5.31	32.61	3	Vertical	360	2.75	-
2480MHz	Pass	PK	2.4798G	104.38	Inf	-Inf	32.60	3	Vertical	360	2.75	-
2480MHz	Pass	PK	2.483502G	57.81	74.00	-16.19	32.61	3	Vertical	360	2.75	-
2480MHz	Pass	AV	4.96204G	31.51	54.00	-22.49	3.33	3	Vertical	111	1.47	-
2480MHz	Pass	PK	4.95178G	45.91	74.00	-28.09	3.31	3	Vertical	111	1.47	-
2480MHz	Pass	AV	4.97236G	31.59	54.00	-22.41	3.35	3	Horizontal	344	1.41	-
2480MHz	Pass	PK	4.97068G	45.52	74.00	-28.48	3.35	3	Horizontal	344	1.41	-

BT-LE(1Mbps)

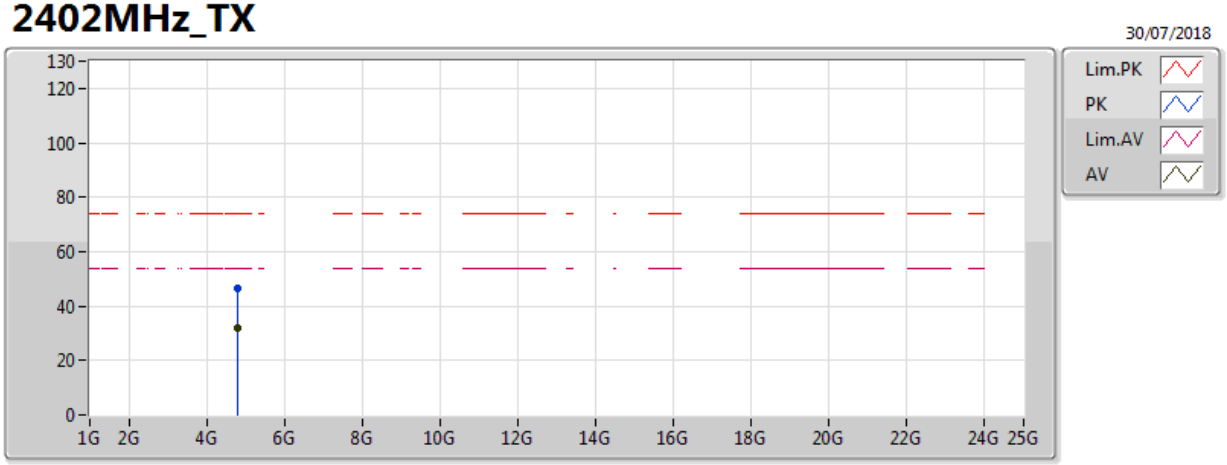
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3822G	45.36	54.00	-8.64	32.25	3	Vertical	117	2.84	-
AV	2.402G	93.14	Inf	-Inf	32.31	3	Vertical	117	2.84	-
PK	2.3522G	56.45	74.00	-17.55	32.14	3	Vertical	117	2.84	-
PK	2.4022G	103.49	Inf	-Inf	32.32	3	Vertical	117	2.84	-

BT-LE(1Mbps)

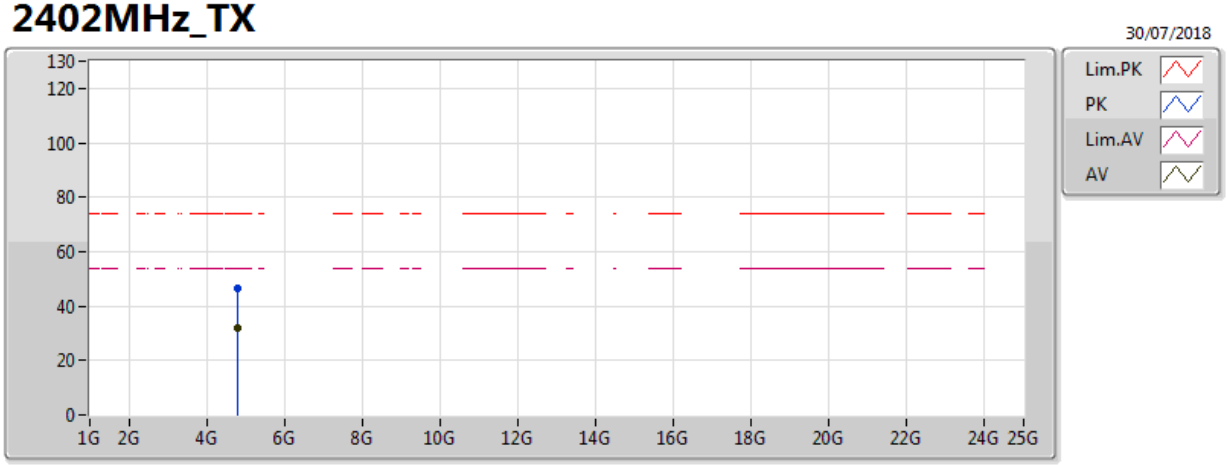
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.79506G	31.71	54.00	-22.29	2.97	3	Vertical	218	2.34	-
PK	4.79236G	46.75	74.00	-27.25	2.97	3	Vertical	218	2.34	-

BT-LE(1Mbps)

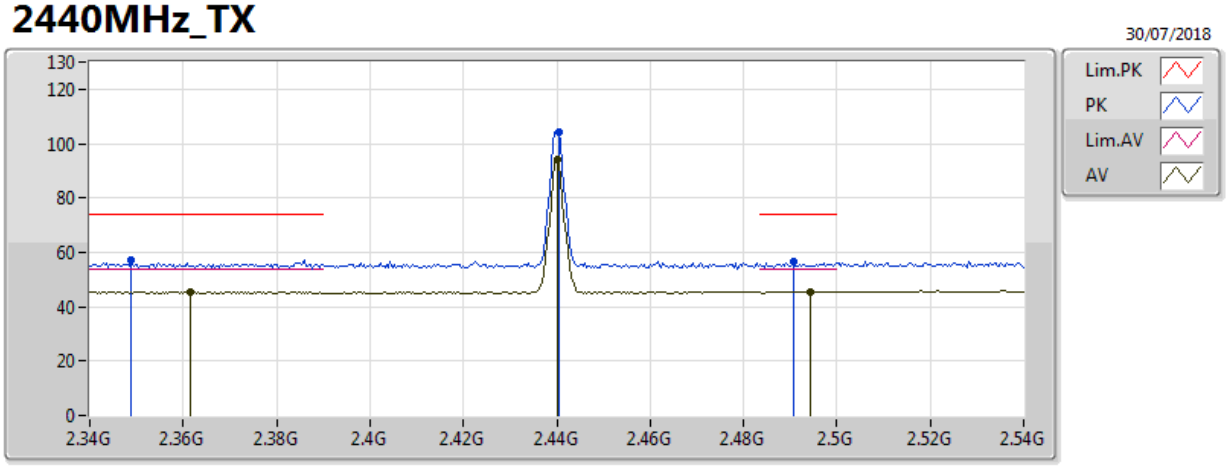
2402MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.7917G	31.70	54.00	-22.30	2.97	3	Horizontal	34	1.63	-
PK	4.78912G	46.24	74.00	-27.76	2.96	3	Horizontal	34	1.63	-

BT-LE(1Mbps)

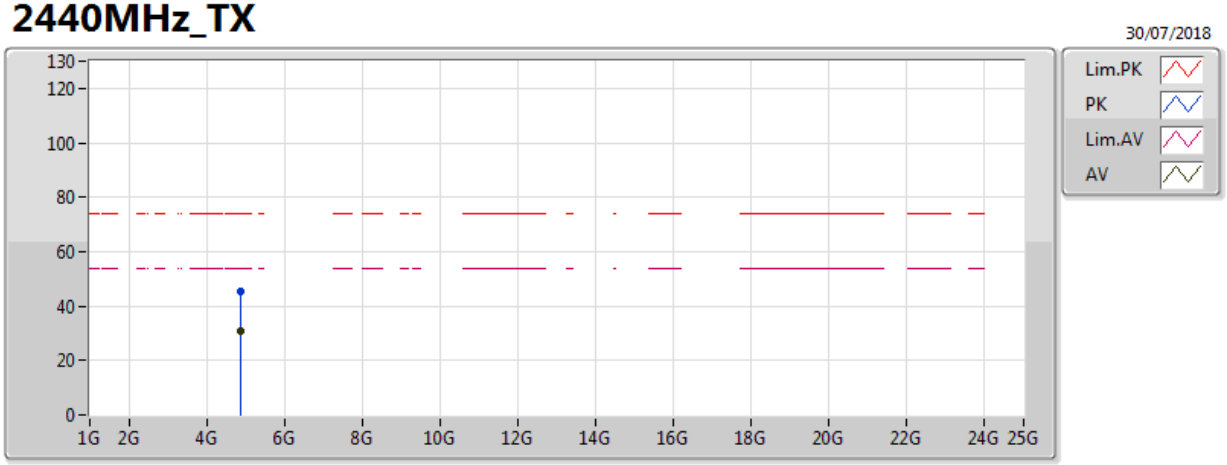
2440MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3616G	45.50	54.00	-8.50	32.17	3	Vertical	38	2.81	-
AV	2.44G	93.89	Inf	-Inf	32.46	3	Vertical	38	2.81	-
AV	2.4944G	45.56	54.00	-8.44	32.65	3	Vertical	38	2.81	-
PK	2.3488G	57.26	74.00	-16.74	32.13	3	Vertical	38	2.81	-
PK	2.4404G	104.37	Inf	-Inf	32.46	3	Vertical	38	2.81	-
PK	2.4908G	56.85	74.00	-17.15	32.64	3	Vertical	38	2.81	-

BT-LE(1Mbps)

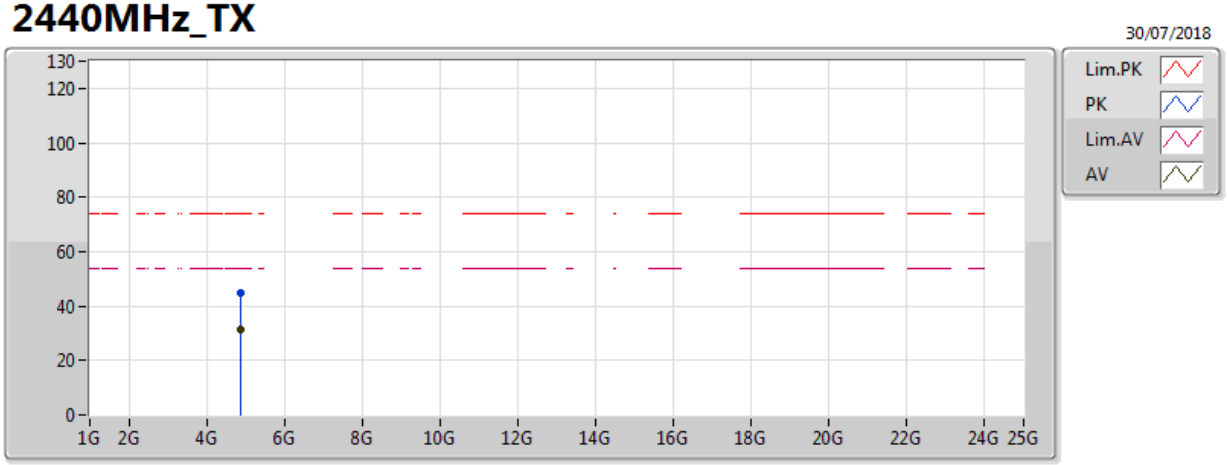
2440MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.87982G	30.80	54.00	-23.20	3.16	3	Vertical	202	1.51	-
PK	4.89188G	45.28	74.00	-28.72	3.19	3	Vertical	202	1.51	-

BT-LE(1Mbps)

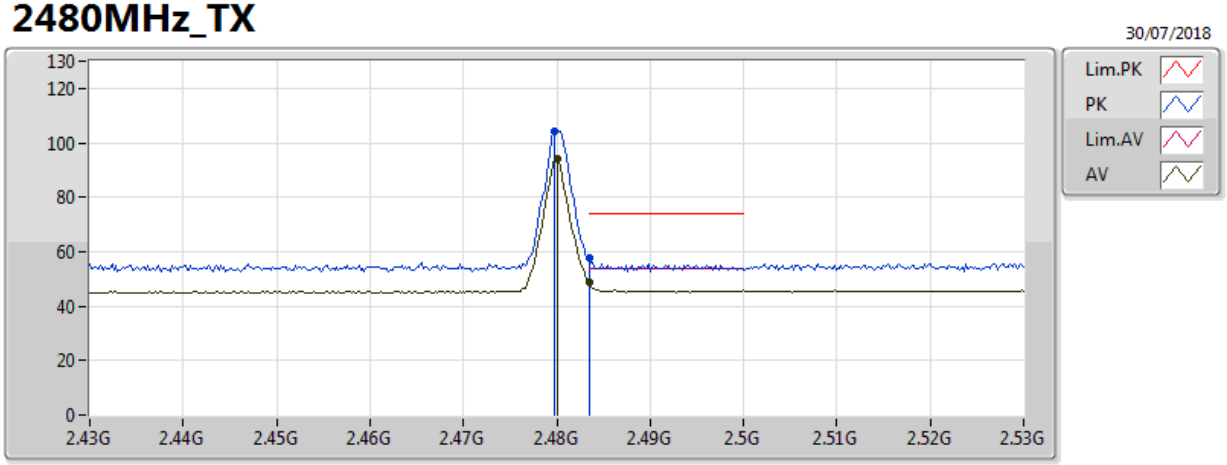
2440MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.8836G	31.25	54.00	-22.75	3.17	3	Horizontal	46	1.41	-
PK	4.87454G	45.06	74.00	-28.94	3.13	3	Horizontal	46	1.41	-

BT-LE(1Mbps)

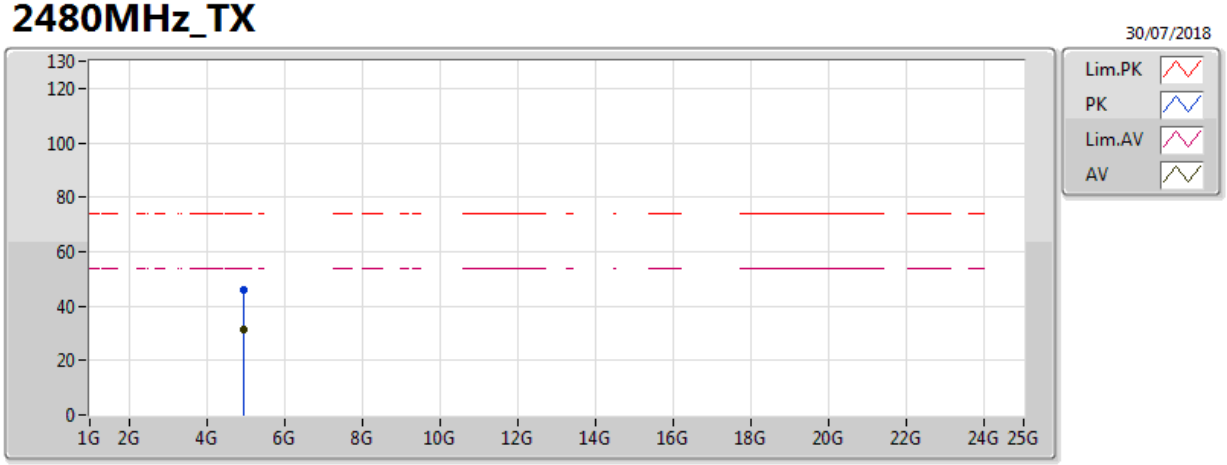
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.48G	93.91	Inf	-Inf	32.60	3	Vertical	360	2.75	-
AV	2.483502G	48.69	54.00	-5.31	32.61	3	Vertical	360	2.75	-
PK	2.4798G	104.38	Inf	-Inf	32.60	3	Vertical	360	2.75	-
PK	2.483502G	57.81	74.00	-16.19	32.61	3	Vertical	360	2.75	-

BT-LE(1Mbps)

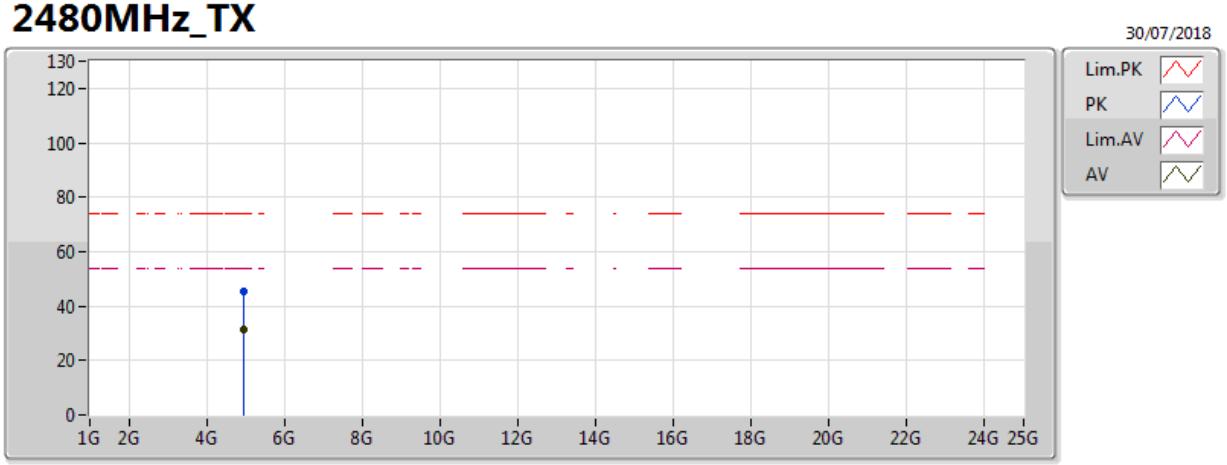
2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.96204G	31.51	54.00	-22.49	3.33	3	Vertical	111	1.47	-
PK	4.95178G	45.91	74.00	-28.09	3.31	3	Vertical	111	1.47	-

BT-LE(1Mbps)

2480MHz_TX



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.97236G	31.59	54.00	-22.41	3.35	3	Horizontal	344	1.41	-
PK	4.97068G	45.52	74.00	-28.48	3.35	3	Horizontal	344	1.41	-