



FCC Test Report

FCC ID : SWX-ULEDACR
Equipment : UniFi LED
Brand Name : UBIQUITI
Model Name : ULED-AC
Applicant : Ubiquiti Networks, Inc.
685 Third Avenue, 27th Floor New York,
New York 10017 USA
Manufacturer : Ubiquiti Networks, Inc.
685 Third Avenue, 27th Floor New York,
New York 10017 USA
Standard : 47 CFR FCC Part 15.247

The product was received on Sep. 18, 2018, and testing was started from Sep. 20, 2018 and completed on Oct. 16, 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.



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	

[illegible]

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: Jackson Tsai

Report Producer: Ann Hou

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.	Brand	Model Name	Antenna Type	Connector
1	-	-	internal antenna	I-PEX
2	-	-	internal antenna	I-PEX

Ant.	Port	Gain (dBi)	
		2.4G	BT
1	1	4	-
2	2	-	3.5

Note 1: The EUT has two antennas.

For 2.4GHz function:

For IEEE 802.11 b/g mode (1TX/1RX)

Ant. 1 (port 1) could transmit/receive simultaneously.

For BT function:

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

Ant. 1 (port 1) could transmit/receive simultaneously.

1.1.3 EUT Information

Operational Condition			
EUT Power Type	From AC power supply		
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) $\geq 1/T$
BT-LE(1Mbps)	0.621	2.069	405u	3k

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
RF Conducted	TH01-HY	Andy	25.5°C / 63.6%	16/Oct/2018
Radiated	03CH03-HY	Andy	22.8°C / 59%	20/Sep/2018
AC Conduction	CO04-HY	Daniel	23.13°C / 52%	25/Sep/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	277V

2.2 Test Channel Mode

Test Software	Dos
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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	AC 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

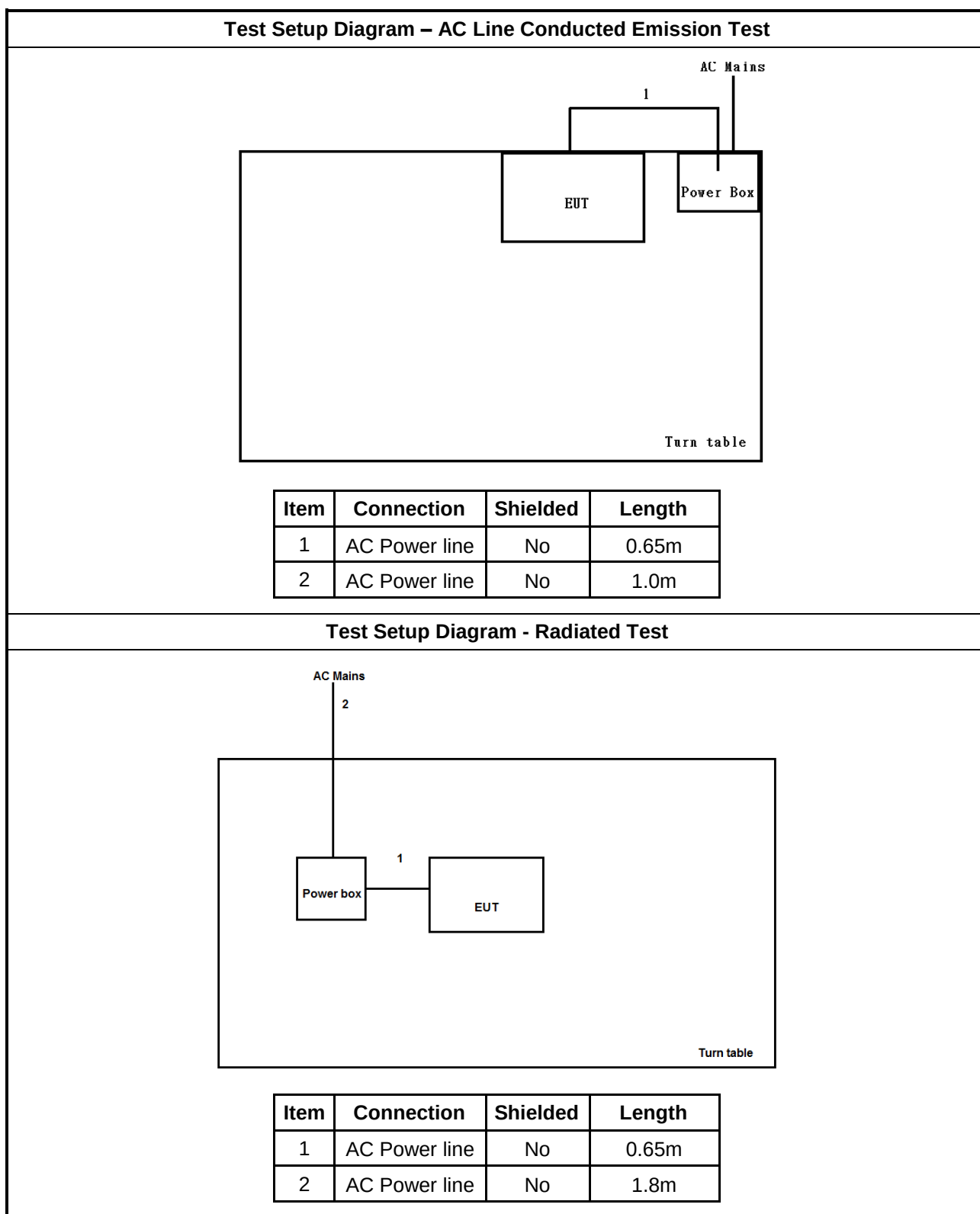
The Worst Case Mode for Following Conformance Tests			
Tests Item	Emissions in Restricted Frequency Bands		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
Operating Mode < 1GHz	CTX		
1	AC 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	Bluetooth+WLAN 2.4GHz
Refer to Sporton Test Report No.: FA7N0734-08 for Co-location RF Exposure Evaluation.	

2.4 Support Equipment

Support Equipment - RF Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5410	DoC
2	Adapter for NB	DELL	HA65NM130	DoC
3	AC Power Source	GW	APS-9102	-

2.5 Test Setup Diagram



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.

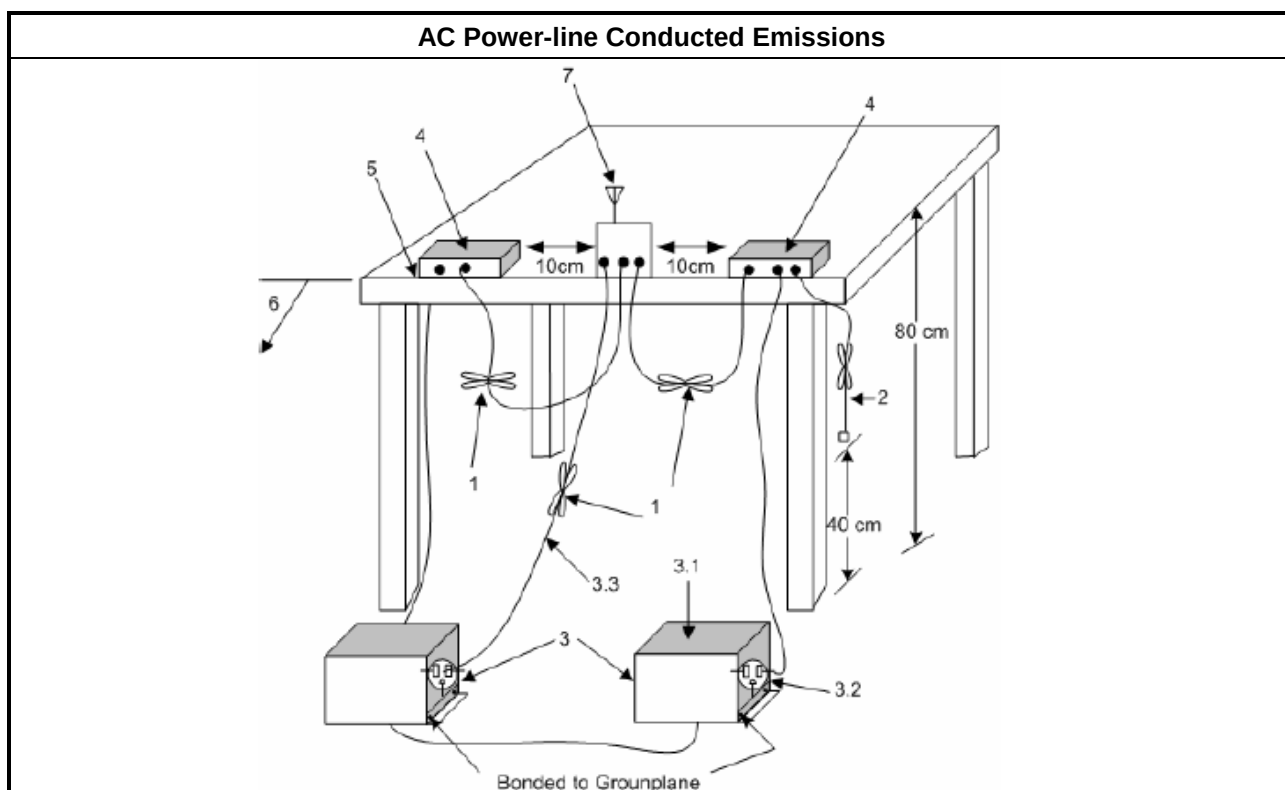
3.1.2 Measuring Instruments

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



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.

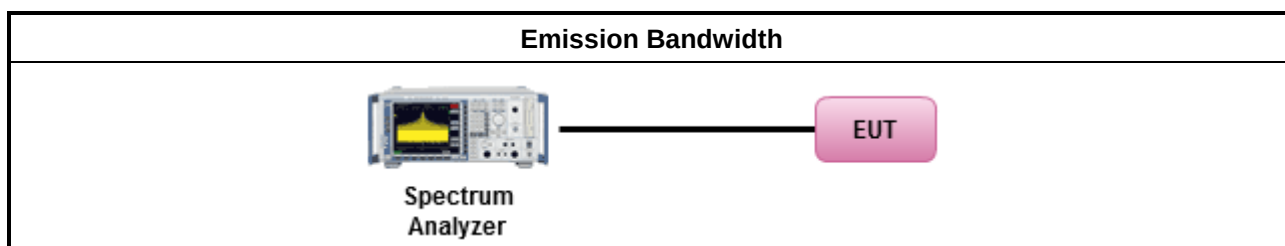
3.2.2 Measuring Instruments

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 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



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): $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX}])$ dBm - Smart antenna system (SAS) - Single beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm - Overlap beam: $P_{eirp} \leq \text{MAX}(36, P_{Out} + G_{TX})$ dBm - Aggregate power on all beams: $P_{eirp} \leq \text{MAX}(36, [P_{Out} + G_{TX} + 8])$ 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.	

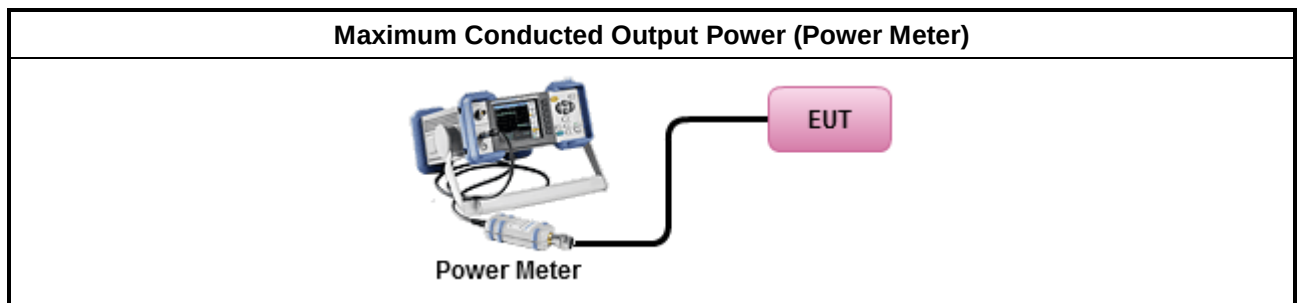
3.3.2 Measuring Instruments

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: $P_{total} = P_1 + P_2 + \dots + P_n$ (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

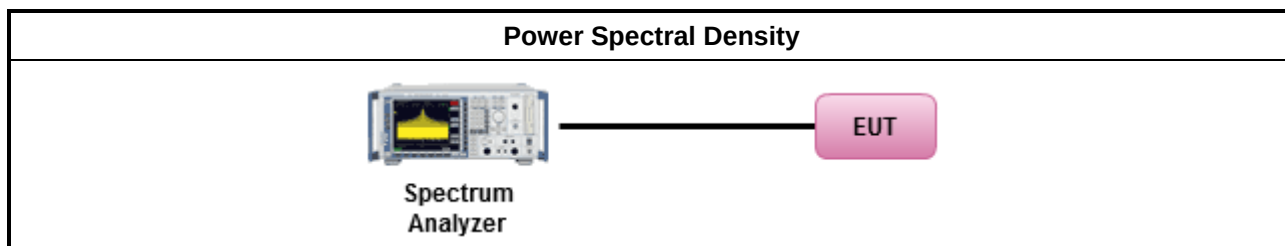
3.4.2 Measuring Instruments

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 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



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.	

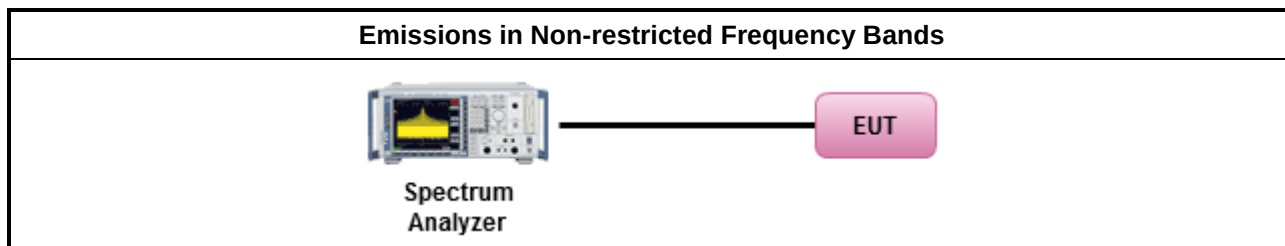
3.5.2 Measuring Instruments

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



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.

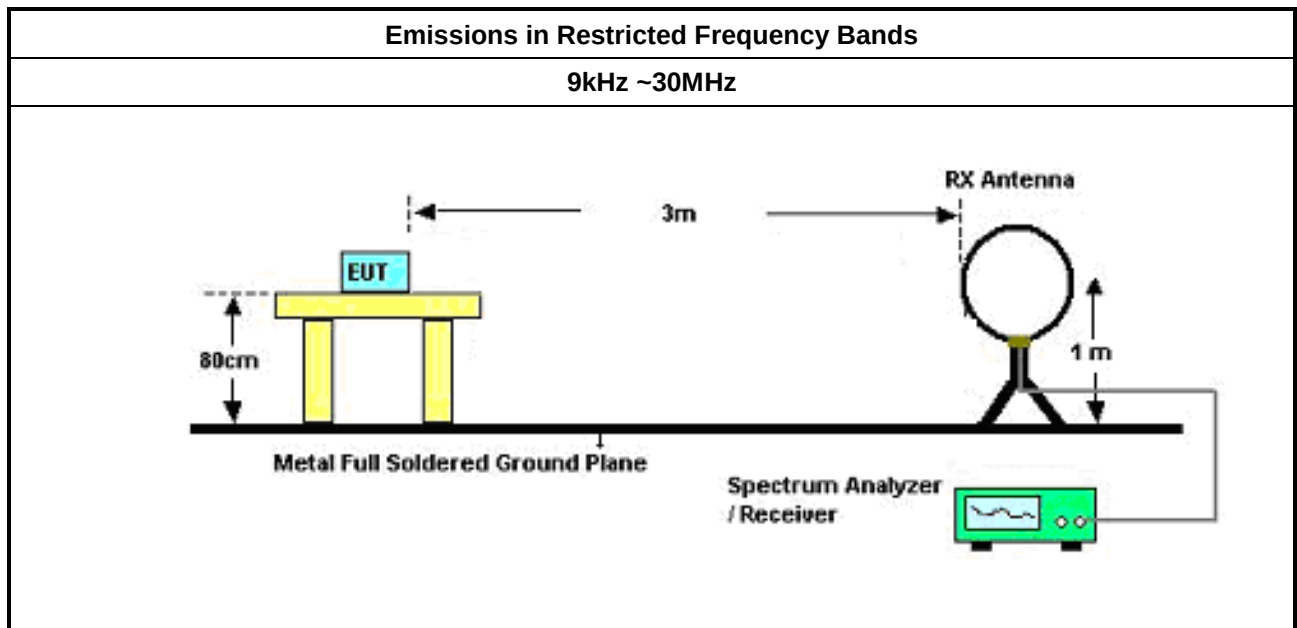
3.6.2 Measuring Instruments

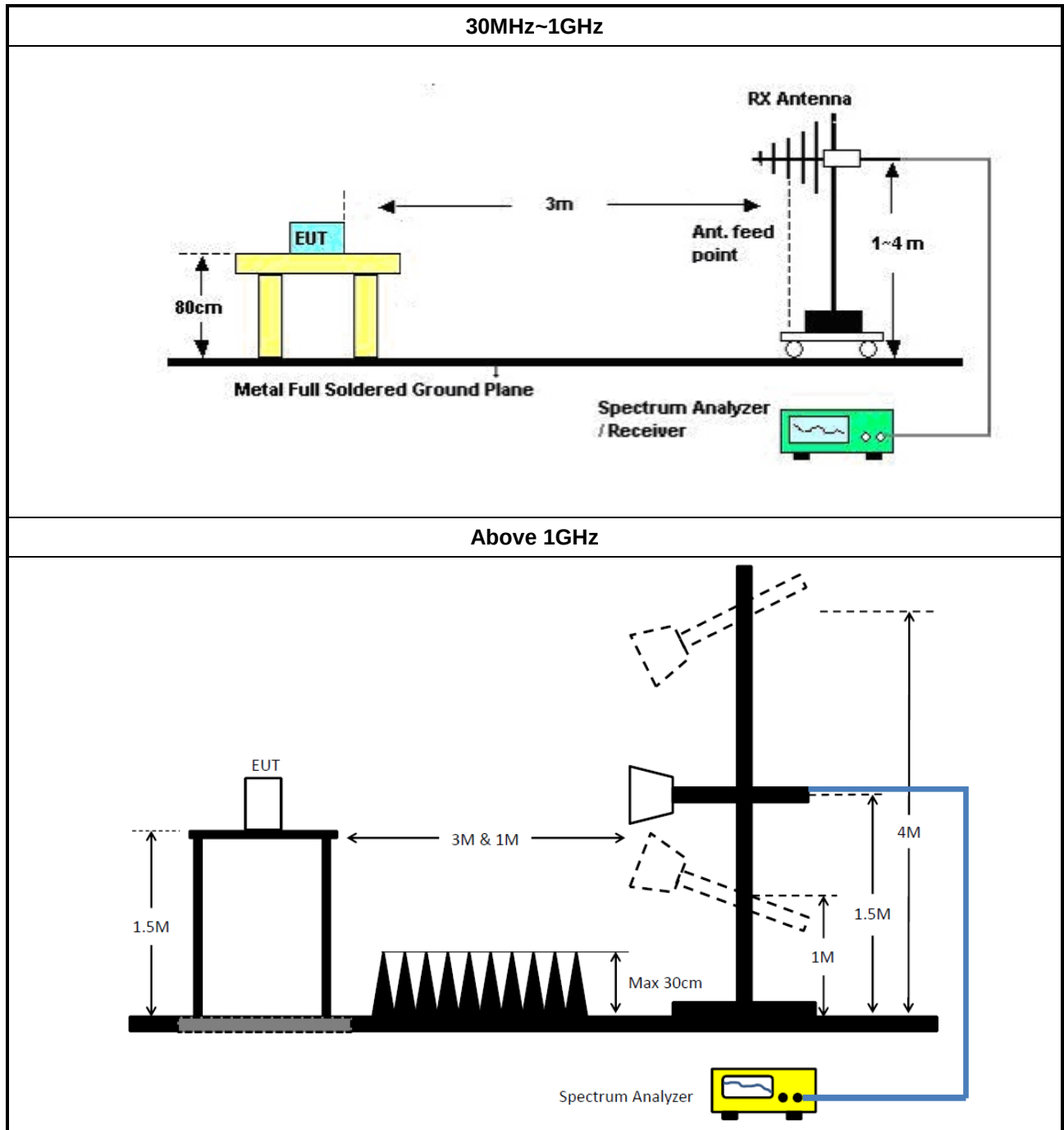
Refer a test equipment and calibration data table in this test report.

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 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





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	07611832020 001	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

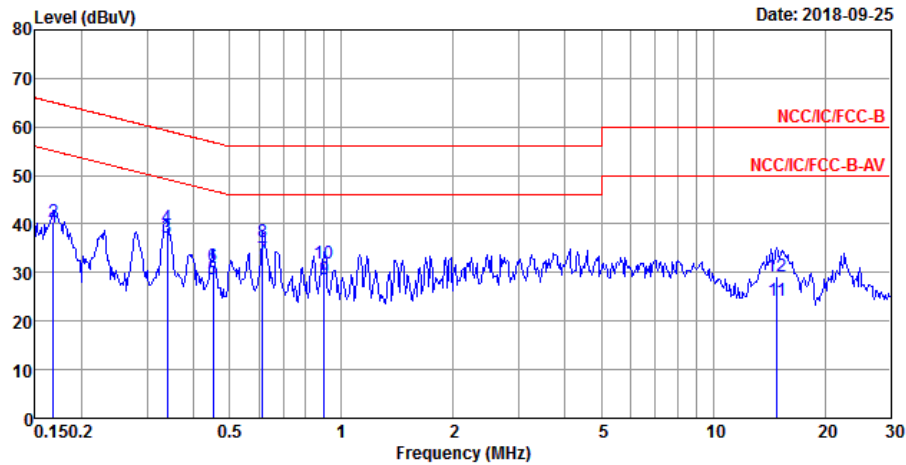
Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
Power Sensor	Anritsu	MA2411B	1339407	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
Power Meter	Anritsu	ML2495A	1517010	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
RF Cable-1.5m	HUBER+SUHNER	SUCOFLEX_104	MY12585/4	30MHz~26.5GHz	26/Jan/2018	25/Jan/2019
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10710/4	30MHz~26.5GHz	26/Jan/2018	25/Jan/2019
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10709/4	30MHz~26.5GHz	26/Jan/2018	25/Jan/2019
Signal Generator	R&S	SMB100A	175727	100kHz~40GHz	26/Oct/2017	25/Oct/2018

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	31/Oct/2017	30/Oct/2018
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 18GHz 3m	01/Nov/2017	31/Oct/2018
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	23/Apr/2018	19/Apr/2019
Microwave System Preamplifier	KEYSIGHT	83017A	MY53270196	1GHz ~ 26.5GHz	05/Sep/2018	04/Sep/2019
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100354	9kHz ~ 2.75GHz	08/Dec/2017	07/Dec/2018
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	29/Jan/2018	28/Jan/2019
RF Cable-high	SUHNER	SUCOFLEX 106	CB222	1GHz ~ 40GHz	29/Jan/2018	28/Jan/2019
Bilog Antenna & 5db Attenuator	SCHAFFNER/MTJ	CBL6112D / MTJ6102-05	2678 / 001	30MHz ~ 2GHz	07/Jul/2018	06/Jul/2019
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170154	18GHz ~ 40GHz	06/Feb/ 2018	05/Feb/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1531	1GHz ~ 18GHz	18/Apr/ 2018	17/Apr/2019
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	28/Mar/2018	27/Mar/2019

AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Neutral
Operating Function	AC mode		

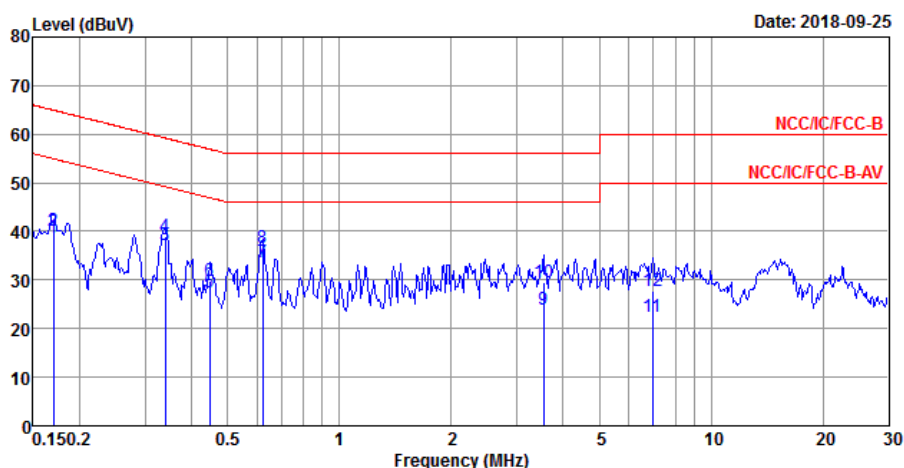


	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.17	39.23	-15.85	55.08	29.57	9.63	0.03	Average
2	0.17	40.42	-24.66	65.08	30.76	9.63	0.03	QP
3 MAX	0.34	37.16	-12.06	49.22	27.47	9.61	0.08	Average
4	0.34	39.17	-20.05	59.22	29.48	9.61	0.08	QP
5	0.45	28.59	-18.26	46.85	18.89	9.61	0.09	Average
6	0.45	31.28	-25.57	56.85	21.58	9.61	0.09	QP
7	0.61	32.77	-13.23	46.00	23.11	9.61	0.05	Average
8	0.61	36.44	-19.56	56.00	26.78	9.61	0.05	QP
9	0.90	28.77	-17.23	46.00	19.14	9.62	0.01	Average
10	0.90	31.85	-24.15	56.00	22.22	9.62	0.01	QP
11	14.83	24.21	-25.79	50.00	14.50	9.70	0.01	Average
12	14.83	29.08	-30.92	60.00	19.37	9.70	0.01	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	AC mode		



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.17	38.69	-16.25	54.94	29.05	9.62	0.02	Average
2	0.17	40.20	-24.74	64.94	30.56	9.62	0.02	QP
3 MAX	0.34	37.09	-12.13	49.22	27.40	9.61	0.08	Average
4	0.34	38.86	-20.36	59.22	29.17	9.61	0.08	QP
5	0.45	27.40	-19.53	46.93	17.70	9.61	0.09	Average
6	0.45	29.91	-27.02	56.93	20.21	9.61	0.09	QP
7	0.62	33.54	-12.46	46.00	23.88	9.61	0.05	Average
8	0.62	36.54	-19.46	56.00	26.88	9.61	0.05	QP
9	3.55	24.00	-22.00	46.00	14.30	9.63	0.07	Average
10	3.55	29.61	-26.39	56.00	19.91	9.63	0.07	QP
11	6.95	22.35	-27.65	50.00	12.54	9.65	0.16	Average
12	6.95	27.61	-32.39	60.00	17.80	9.65	0.16	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)	641.25k	999.5k	1M00F1D	640k	992.004k

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;

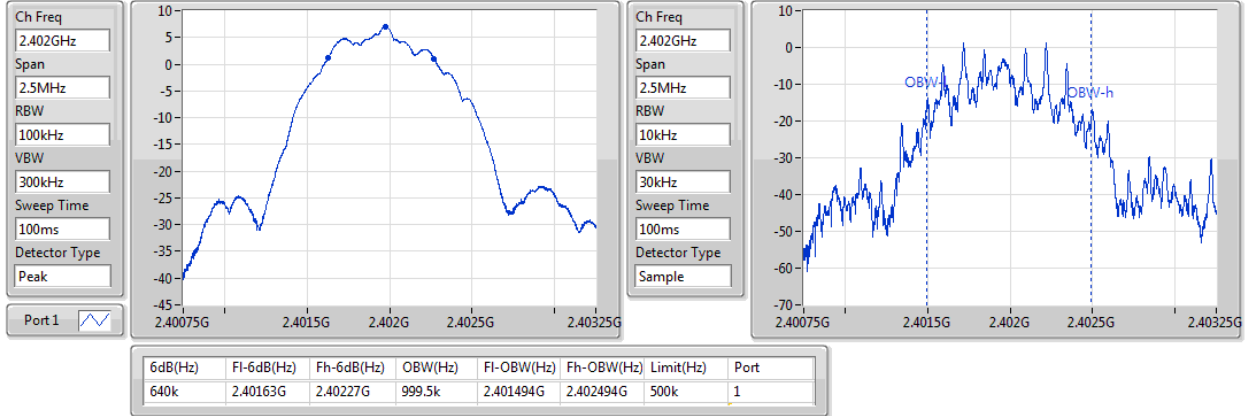
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	500k	640k	999.5k
2440MHz_TnomVnom	Pass	500k	640k	993.253k
2480MHz_TnomVnom	Pass	500k	641.25k	992.004k

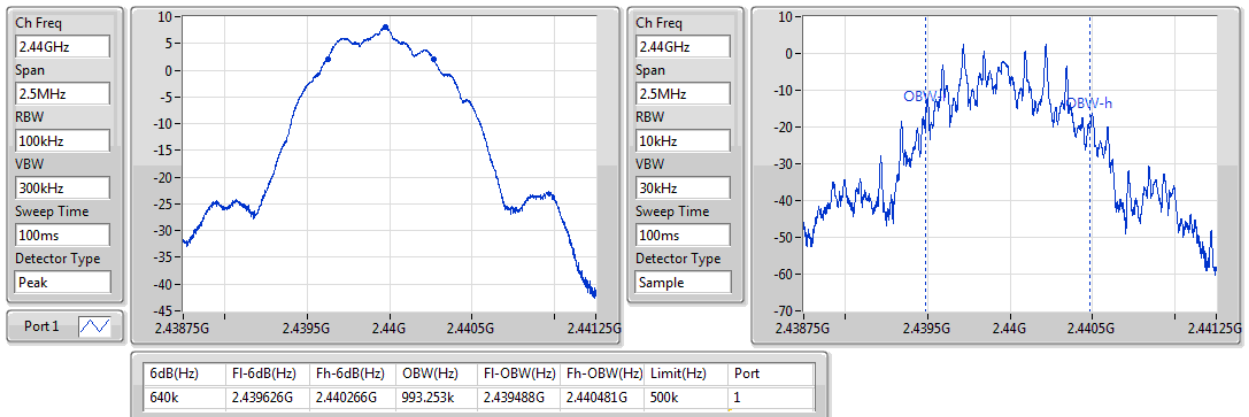
Port X-N dB = Port X 6dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

BT-LE(1Mbps)
EBW
2402MHz

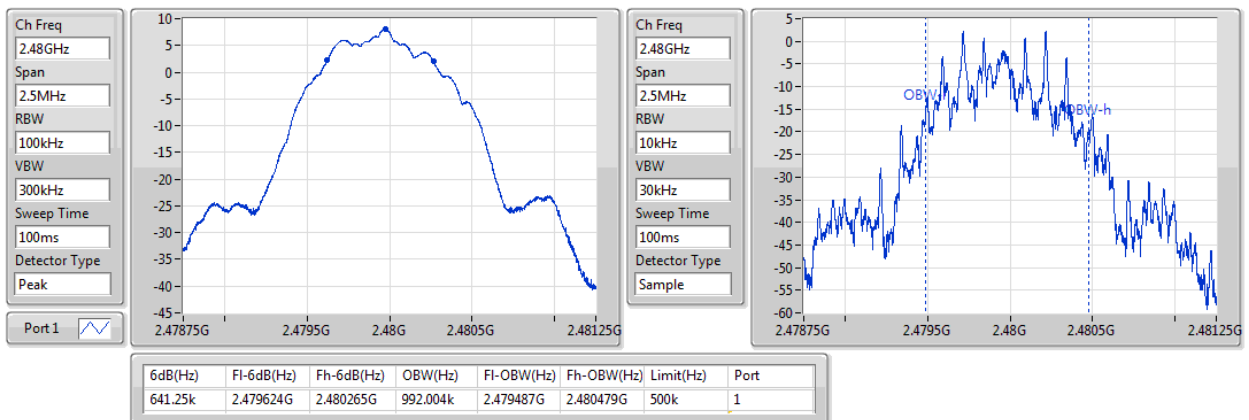
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BT-LE(1Mbps)
EBW
2440MHz

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BT-LE(1Mbps)
EBW
2480MHz

21/09/2018



**Summary**

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	7.75	0.00596

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	3.50	6.43	30.00
2440MHz_TnomVnom	Pass	3.50	7.31	30.00
2480MHz_TnomVnom	Pass	3.50	7.75	30.00

**Summary**

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	1.27

RBW=3kHz.

Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz_TnomVnom	Pass	3.50	0.08	8.00
2440MHz_TnomVnom	Pass	3.50	-0.63	8.00
2480MHz_TnomVnom	Pass	3.50	1.27	8.00

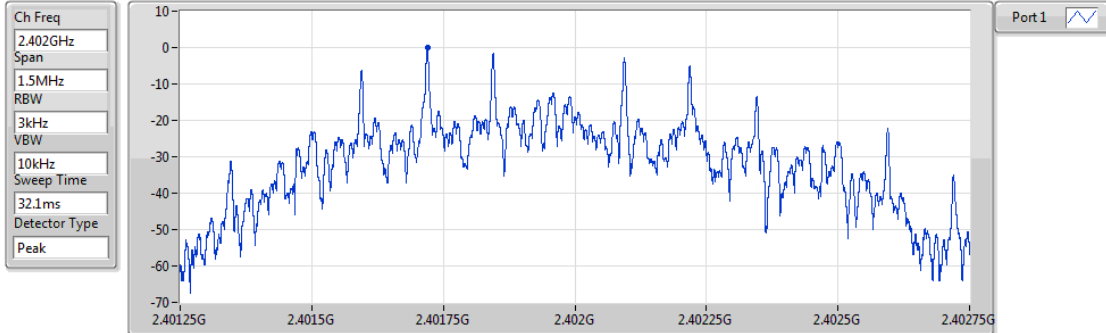
RBW=3kHz.

BT-LE(1Mbps)

2402MHz

PSD

21/09/2018



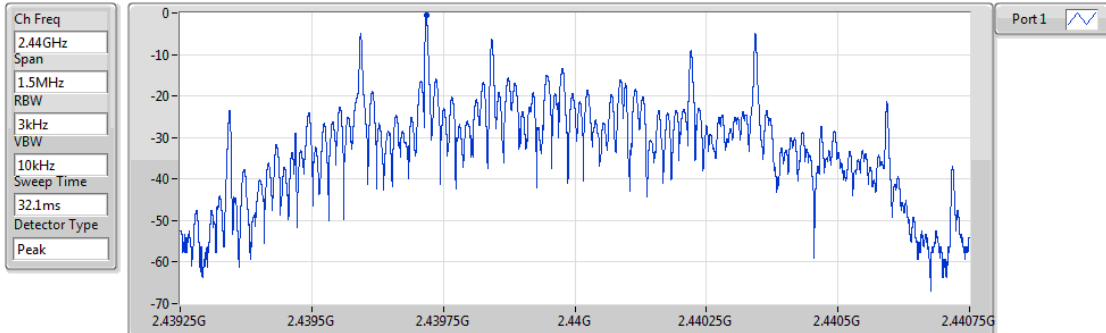
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
0.08	0.08	0.08

BT-LE(1Mbps)

2440MHz

PSD

21/09/2018



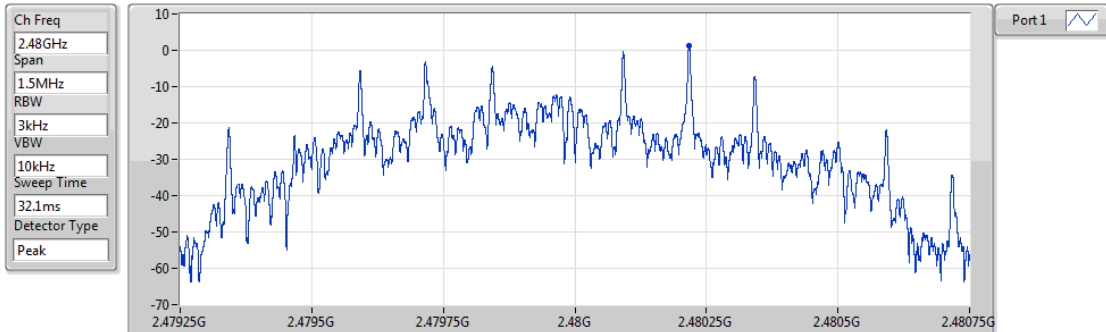
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-0.63	-0.63	-0.63

BT-LE(1Mbps)

2480MHz

PSD

21/09/2018



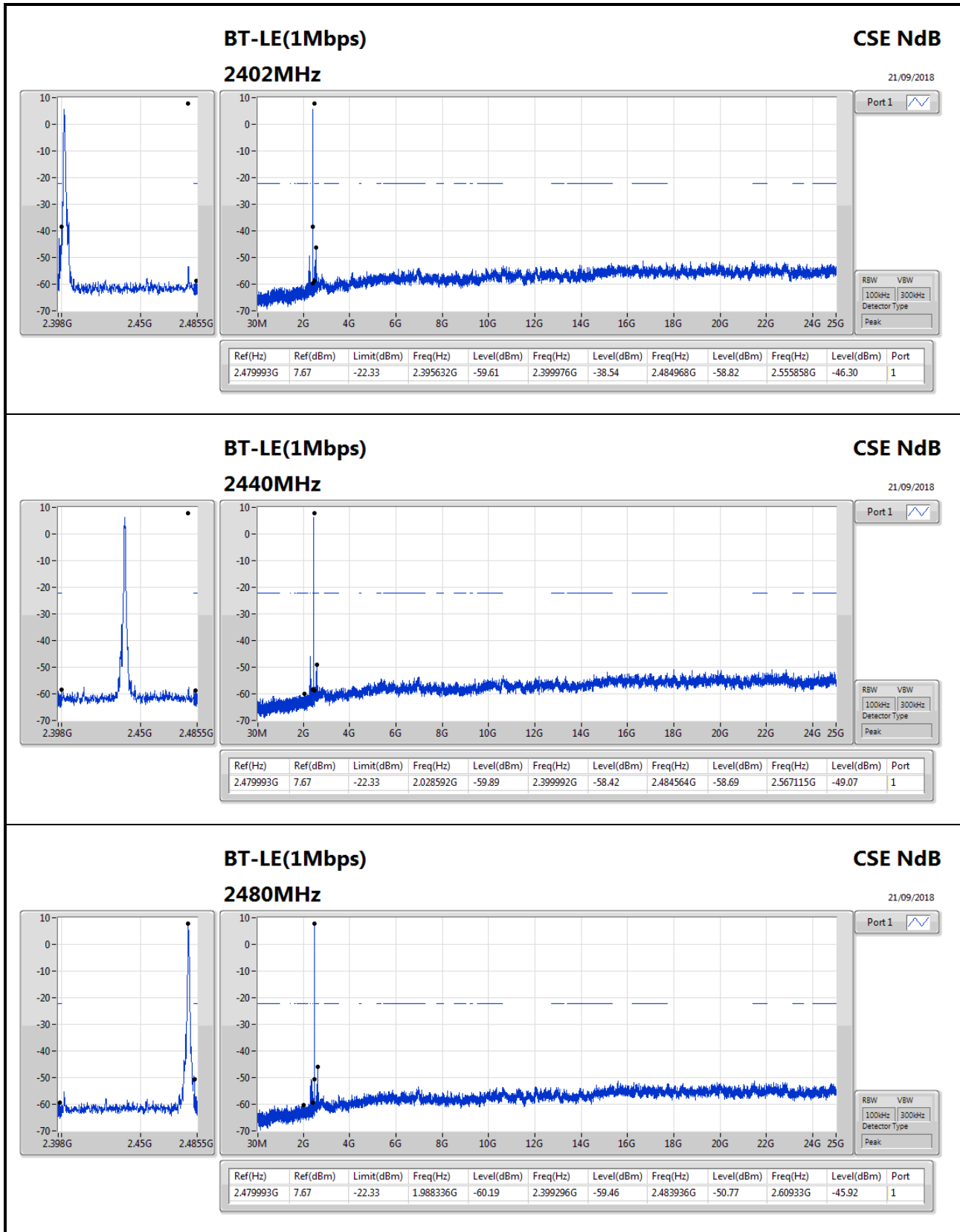
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.27	1.27	1.27

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	2.479993G	7.67	-22.33	2.395632G	-59.61	2.399976G	-38.54	2.484968G	-58.82	2.555858G	-46.30	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	2.479993G	7.67	-22.33	2.395632G	-59.61	2.399976G	-38.54	2.484968G	-58.82	2.555858G	-46.30	1
2440MHz_TnomVnom	Pass	2.479993G	7.67	-22.33	2.028592G	-59.89	2.399992G	-58.42	2.484564G	-58.69	2.567115G	-49.07	1
2480MHz_TnomVnom	Pass	2.479993G	7.67	-22.33	1.988336G	-60.19	2.399296G	-59.46	2.483936G	-50.77	2.60933G	-45.92	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	94.02M	37.49	43.50	-6.01	-21.90	3	Vertical	0	1.00	-

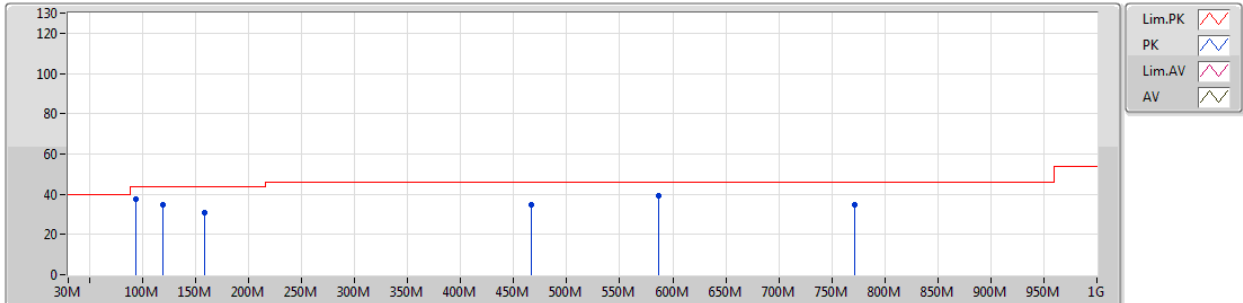
Result

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	94.02M	37.49	43.50	-6.01	-21.90	3	Vertical	0	1.00	-
2440MHz	Pass	PK	119.24M	34.78	43.50	-8.72	-19.33	3	Vertical	0	1.00	-
2440MHz	Pass	PK	158.04M	30.61	43.50	-12.89	-19.88	3	Vertical	0	1.00	-
2440MHz	Pass	PK	466.5M	34.54	46.00	-11.46	-12.60	3	Vertical	0	1.00	-
2440MHz	Pass	PK	586.78M	39.06	46.00	-6.94	-10.97	3	Vertical	0	1.00	-
2440MHz	Pass	PK	771.08M	34.81	46.00	-11.19	-8.18	3	Vertical	0	1.00	-
2440MHz	Pass	PK	94.02M	32.39	43.50	-11.11	-21.90	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	158.04M	37.45	43.50	-6.05	-19.88	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	206.54M	31.52	43.50	-11.98	-20.99	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	464.56M	35.42	46.00	-10.58	-12.63	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	551.86M	33.66	46.00	-12.34	-11.00	3	Horizontal	360	1.00	-
2440MHz	Pass	PK	771.08M	35.02	46.00	-10.98	-8.18	3	Horizontal	360	1.00	-

BT-LE(1Mbps)

2440MHz_Switching Power Supply

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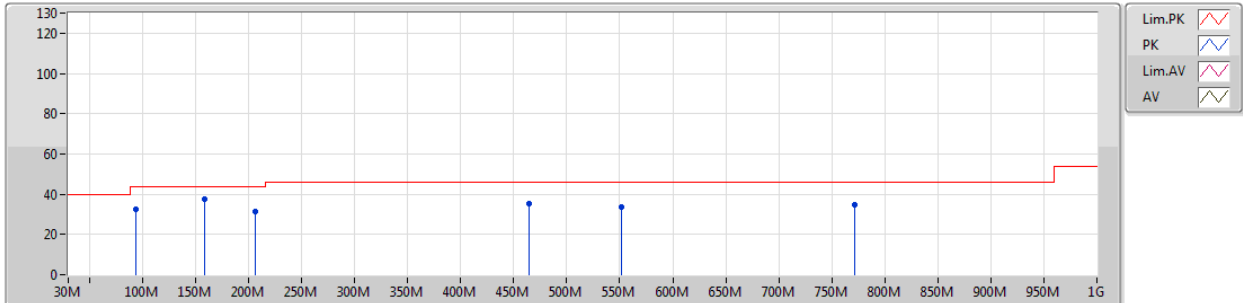


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments								
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)									
PK	94.02M	37.49	43.50	-6.01	-21.90	3	Vertical	0	1.00	-								
PK	119.24M	34.78	43.50	-8.72	-19.33	3	Vertical	0	1.00	-								
PK	158.04M	30.61	43.50	-12.89	-19.88	3	Vertical	0	1.00	-								
PK	466.5M	34.54	46.00	-11.46	-12.60	3	Vertical	0	1.00	-								
PK	586.78M	39.06	46.00	-6.94	-10.97	3	Vertical	0	1.00	-								
PK	771.08M	34.81	46.00	-11.19	-8.18	3	Vertical	0	1.00	-								

BT-LE(1Mbps)

2440MHz_Switching Power Supply

21/09/2018



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	94.02M	32.39	43.50	-11.11	-21.90	3	Horizontal	360	1.00	-
PK	158.04M	37.45	43.50	-6.05	-19.88	3	Horizontal	360	1.00	-
PK	206.54M	31.52	43.50	-11.98	-20.99	3	Horizontal	360	1.00	-
PK	464.56M	35.42	46.00	-10.58	-12.63	3	Horizontal	360	1.00	-
PK	551.86M	33.66	46.00	-12.34	-11.00	3	Horizontal	360	1.00	-
PK	771.08M	35.02	46.00	-10.98	-8.18	3	Horizontal	360	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	2.4835G	47.48	54.00	-6.52	31.11	3	Vertical	226	2.29	-

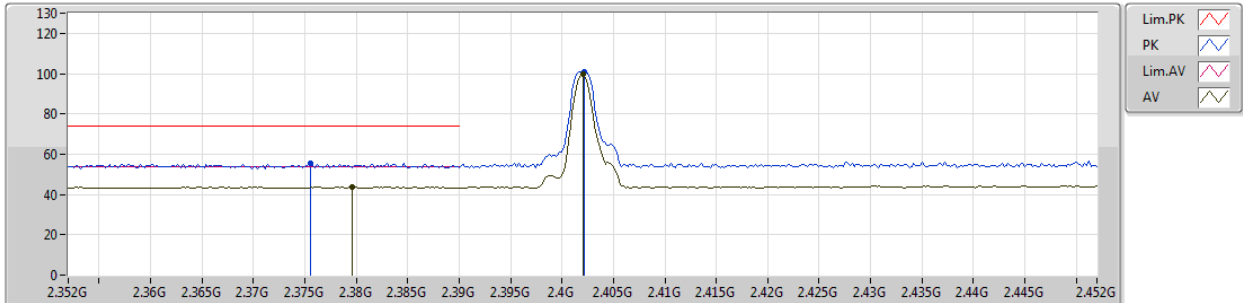
Result

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	2.3796G	43.78	54.00	-10.22	30.74	3	Vertical	130	3.14	-
2402MHz	Pass	AV	2.402G	99.59	Inf	-Inf	30.82	3	Vertical	130	3.14	-
2402MHz	Pass	PK	2.3756G	55.42	74.00	-18.58	30.72	3	Vertical	130	3.14	-
2402MHz	Pass	PK	2.4022G	101.06	Inf	-Inf	30.82	3	Vertical	130	3.14	-
2402MHz	Pass	AV	2.3714G	43.91	54.00	-10.09	30.71	3	Horizontal	201	1.01	-
2402MHz	Pass	AV	2.402G	88.04	Inf	-Inf	30.82	3	Horizontal	201	1.01	-
2402MHz	Pass	PK	2.3748G	55.52	74.00	-18.48	30.72	3	Horizontal	201	1.01	-
2402MHz	Pass	PK	2.4022G	89.56	Inf	-Inf	30.82	3	Horizontal	201	1.01	-
2402MHz	Pass	AV	4.80366G	26.99	54.00	-27.01	2.08	3	Vertical	209	2.50	-
2402MHz	Pass	PK	4.8057G	39.52	74.00	-34.48	2.08	3	Vertical	209	2.50	-
2402MHz	Pass	AV	4.80104G	26.87	54.00	-27.13	2.07	3	Horizontal	312	1.78	-
2402MHz	Pass	PK	4.80616G	39.40	74.00	-34.60	2.08	3	Horizontal	312	1.78	-
2440MHz	Pass	AV	2.3708G	43.65	54.00	-10.35	30.71	3	Vertical	61	3.19	-
2440MHz	Pass	AV	2.44G	97.17	Inf	-Inf	30.95	3	Vertical	61	3.19	-
2440MHz	Pass	AV	2.4976G	44.43	54.00	-9.57	31.16	3	Vertical	61	3.19	-
2440MHz	Pass	PK	2.3556G	55.33	74.00	-18.67	30.66	3	Vertical	61	3.19	-
2440MHz	Pass	PK	2.4396G	98.60	Inf	-Inf	30.95	3	Vertical	61	3.19	-
2440MHz	Pass	PK	2.4952G	56.18	74.00	-17.82	31.16	3	Vertical	61	3.19	-
2440MHz	Pass	AV	2.3556G	43.78	54.00	-10.22	30.66	3	Horizontal	126	2.13	-
2440MHz	Pass	AV	2.44G	85.28	Inf	-Inf	30.95	3	Horizontal	126	2.13	-
2440MHz	Pass	AV	2.4868G	44.44	54.00	-9.56	31.12	3	Horizontal	126	2.13	-
2440MHz	Pass	PK	2.3868G	55.85	74.00	-18.15	30.76	3	Horizontal	126	2.13	-
2440MHz	Pass	PK	2.4396G	86.84	Inf	-Inf	30.95	3	Horizontal	126	2.13	-
2440MHz	Pass	PK	2.4964G	56.21	74.00	-17.79	31.16	3	Horizontal	126	2.13	-
2440MHz	Pass	AV	4.8797G	29.54	54.00	-24.46	2.27	3	Vertical	23	3.19	-
2440MHz	Pass	PK	4.88048G	40.20	74.00	-33.80	2.27	3	Vertical	23	3.19	-
2440MHz	Pass	AV	4.88048G	29.00	54.00	-25.00	2.27	3	Horizontal	154	1.96	-
2440MHz	Pass	PK	4.87952G	39.43	74.00	-34.57	2.27	3	Horizontal	154	1.96	-
2480MHz	Pass	AV	2.48G	95.48	Inf	-Inf	31.09	3	Vertical	226	2.29	-
2480MHz	Pass	AV	2.4835G	47.48	54.00	-6.52	31.11	3	Vertical	226	2.29	-
2480MHz	Pass	PK	2.4798G	96.92	Inf	-Inf	31.09	3	Vertical	226	2.29	-
2480MHz	Pass	PK	2.4835G	57.78	74.00	-16.22	31.11	3	Vertical	226	2.29	-
2480MHz	Pass	AV	2.48G	85.98	Inf	-Inf	31.09	3	Horizontal	128	1.43	-
2480MHz	Pass	AV	2.4874G	44.56	54.00	-9.44	31.12	3	Horizontal	128	1.43	-
2480MHz	Pass	PK	2.4796G	87.50	Inf	-Inf	31.09	3	Horizontal	128	1.43	-
2480MHz	Pass	PK	2.4902G	57.02	74.00	-16.98	31.13	3	Horizontal	128	1.43	-
2480MHz	Pass	AV	4.95986G	27.62	54.00	-26.38	2.47	3	Vertical	111	1.48	-
2480MHz	Pass	PK	4.96356G	39.91	74.00	-34.09	2.47	3	Vertical	111	1.48	-
2480MHz	Pass	AV	4.96156G	27.51	54.00	-26.49	2.47	3	Horizontal	203	1.78	-
2480MHz	Pass	PK	4.96158G	39.78	74.00	-34.22	2.47	3	Horizontal	203	1.78	-

BT-LE(1Mbps)

2402MHz_TX

20/09/2018

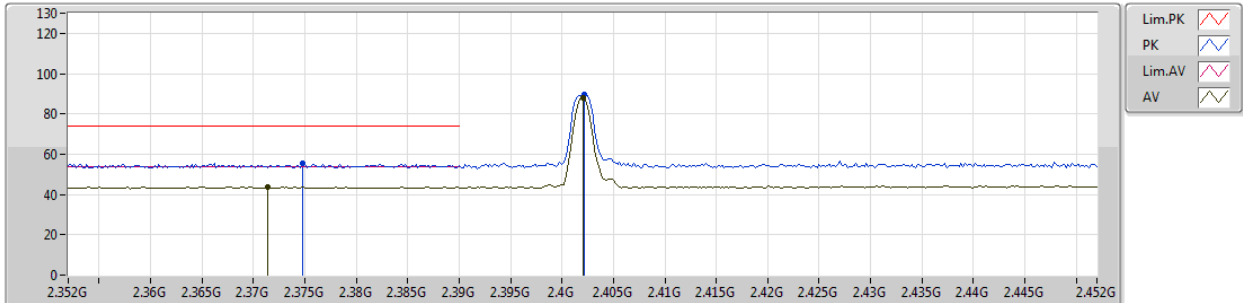


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments							
AV	2.3796G	43.78	54.00	-10.22	30.74	3	Vertical	130	3.14	-							
AV	2.402G	99.59	Inf	-Inf	30.82	3	Vertical	130	3.14	-							
PK	2.3756G	55.42	74.00	-18.58	30.72	3	Vertical	130	3.14	-							
PK	2.4022G	101.06	Inf	-Inf	30.82	3	Vertical	130	3.14	-							

BT-LE(1Mbps)

2402MHz_TX

20/09/2018

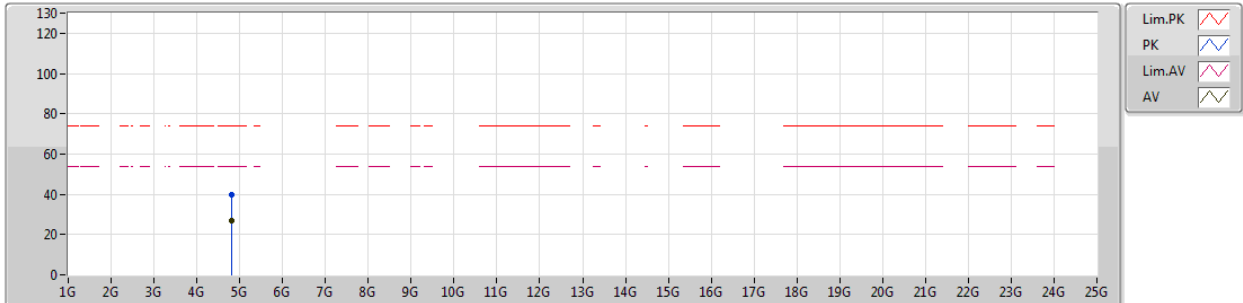


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3714G	43.91	54.00	-10.09	30.71	3	Horizontal	201	1.01	-
AV	2.402G	88.04	Inf	-Inf	30.82	3	Horizontal	201	1.01	-
PK	2.3748G	55.52	74.00	-18.48	30.72	3	Horizontal	201	1.01	-
PK	2.4022G	89.56	Inf	-Inf	30.82	3	Horizontal	201	1.01	-

BT-LE(1Mbps)

2402MHz_TX

20/09/2018

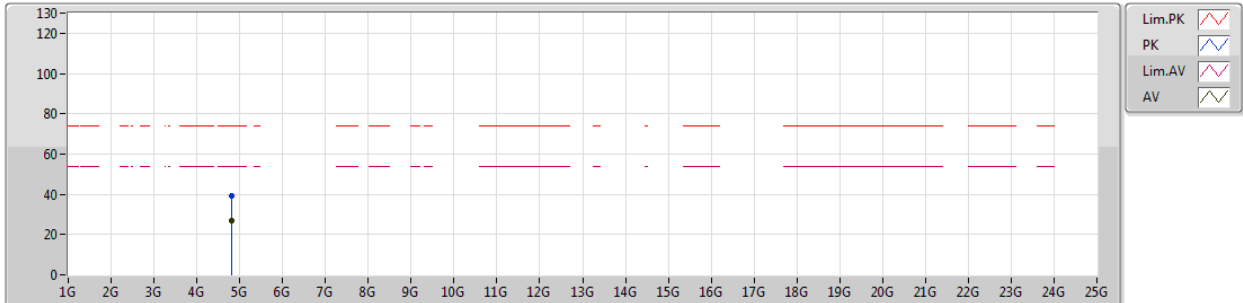


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments								
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)									
AV	4.80366G	26.99	54.00	-27.01	2.08	3	Vertical	209	2.50	-								
PK	4.8057G	39.52	74.00	-34.48	2.08	3	Vertical	209	2.50	-								

BT-LE(1Mbps)

2402MHz_TX

20/09/2018

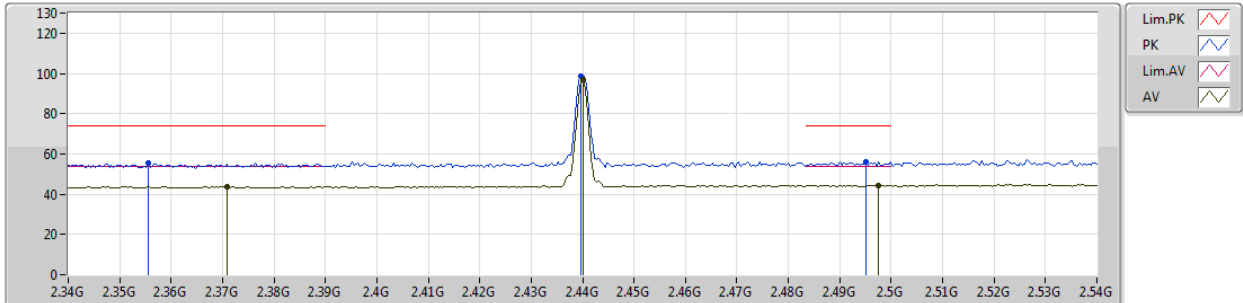


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.80104G	26.87	54.00	-27.13	2.07	3	Horizontal	312	1.78	-
PK	4.80616G	39.40	74.00	-34.60	2.08	3	Horizontal	312	1.78	-

BT-LE(1Mbps)

2440MHz_TX

20/09/2018

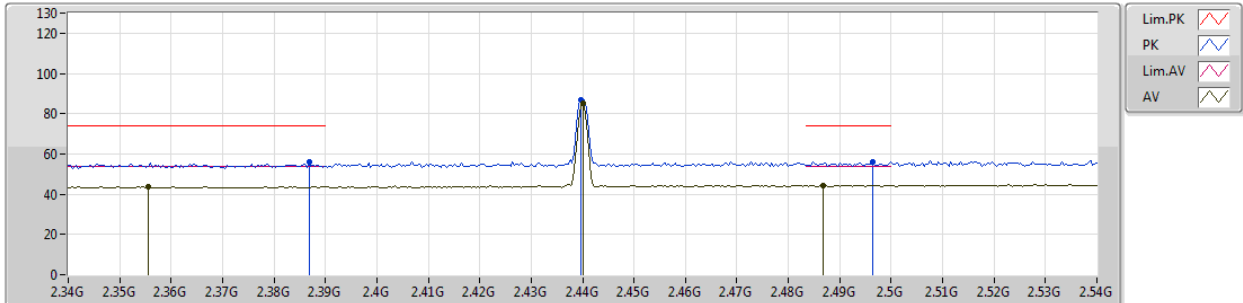


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3708G	43.65	54.00	-10.35	30.71	3	Vertical	61	3.19	-
AV	2.44G	97.17	Inf	-Inf	30.95	3	Vertical	61	3.19	-
AV	2.4976G	44.43	54.00	-9.57	31.16	3	Vertical	61	3.19	-
PK	2.3556G	55.33	74.00	-18.67	30.66	3	Vertical	61	3.19	-
PK	2.4396G	98.60	Inf	-Inf	30.95	3	Vertical	61	3.19	-
PK	2.4952G	56.18	74.00	-17.82	31.16	3	Vertical	61	3.19	-

BT-LE(1Mbps)

2440MHz_TX

20/09/2018

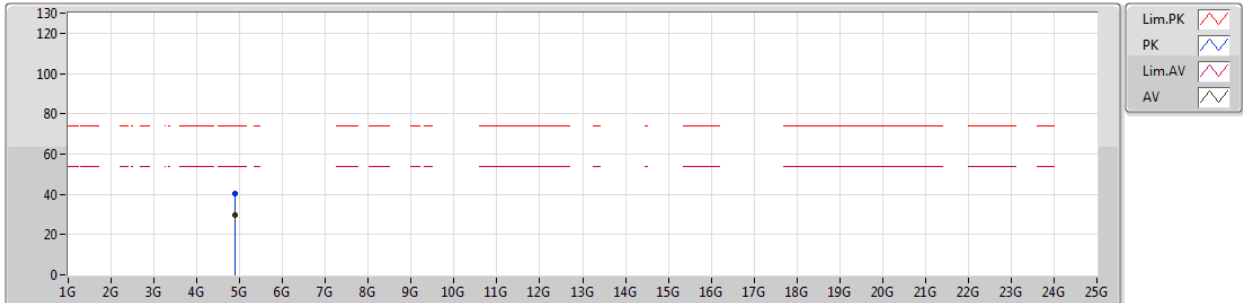


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3556G	43.78	54.00	-10.22	30.66	3	Horizontal	126	2.13	-
AV	2.44G	85.28	Inf	-Inf	30.95	3	Horizontal	126	2.13	-
AV	2.4868G	44.44	54.00	-9.56	31.12	3	Horizontal	126	2.13	-
PK	2.3868G	55.85	74.00	-18.15	30.76	3	Horizontal	126	2.13	-
PK	2.4396G	86.84	Inf	-Inf	30.95	3	Horizontal	126	2.13	-
PK	2.4964G	56.21	74.00	-17.79	31.16	3	Horizontal	126	2.13	-

BT-LE(1Mbps)

2440MHz_TX

20/09/2018

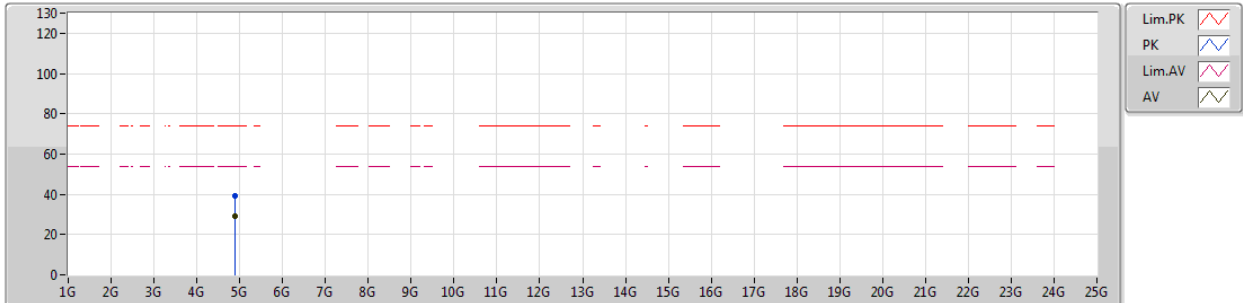


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments								
AV	4.8797G	29.54	54.00	-24.46	2.27	3	Vertical	23	3.19	-								
PK	4.88048G	40.20	74.00	-33.80	2.27	3	Vertical	23	3.19	-								

BT-LE(1Mbps)

2440MHz_TX

20/09/2018

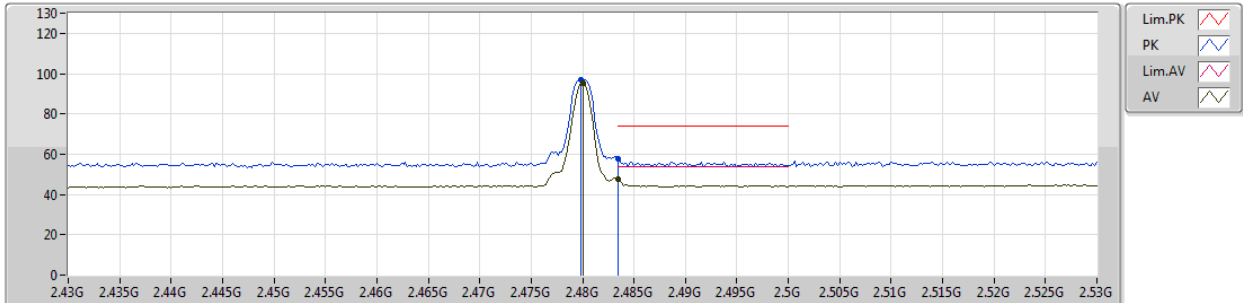


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments								
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)									
AV	4.88048G	29.00	54.00	-25.00	2.27	3	Horizontal	154	1.96	-								
PK	4.87952G	39.43	74.00	-34.57	2.27	3	Horizontal	154	1.96	-								

BT-LE(1Mbps)

2480MHz_TX

20/09/2018

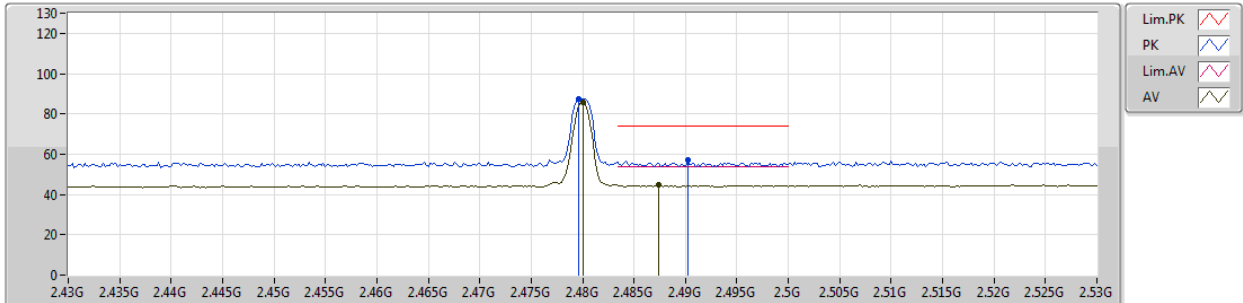


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.48G	95.48	Inf	-Inf	31.09	3	Vertical	226	2.29	-
AV	2.4835G	47.48	54.00	-6.52	31.11	3	Vertical	226	2.29	-
PK	2.4798G	96.92	Inf	-Inf	31.09	3	Vertical	226	2.29	-
PK	2.4835G	57.78	74.00	-16.22	31.11	3	Vertical	226	2.29	-

BT-LE(1Mbps)

2480MHz_TX

20/09/2018

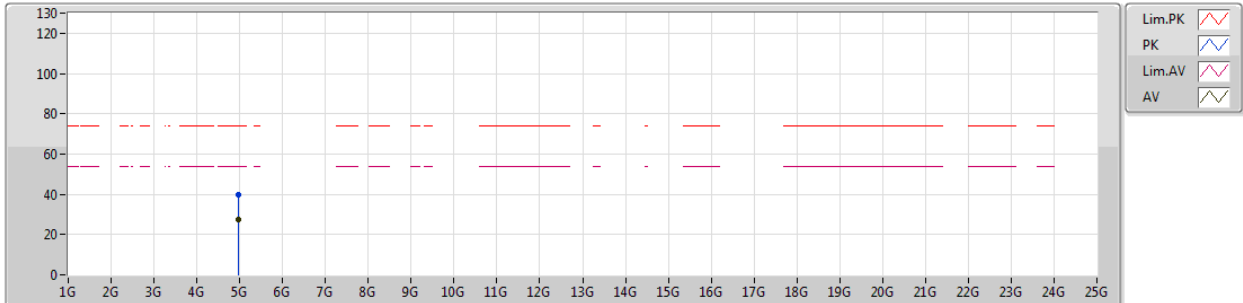


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.48G	85.98	Inf	-Inf	31.09	3	Horizontal	128	1.43	-
AV	2.4874G	44.56	54.00	-9.44	31.12	3	Horizontal	128	1.43	-
PK	2.4796G	87.50	Inf	-Inf	31.09	3	Horizontal	128	1.43	-
PK	2.4902G	57.02	74.00	-16.98	31.13	3	Horizontal	128	1.43	-

BT-LE(1Mbps)

2480MHz_TX

20/09/2018

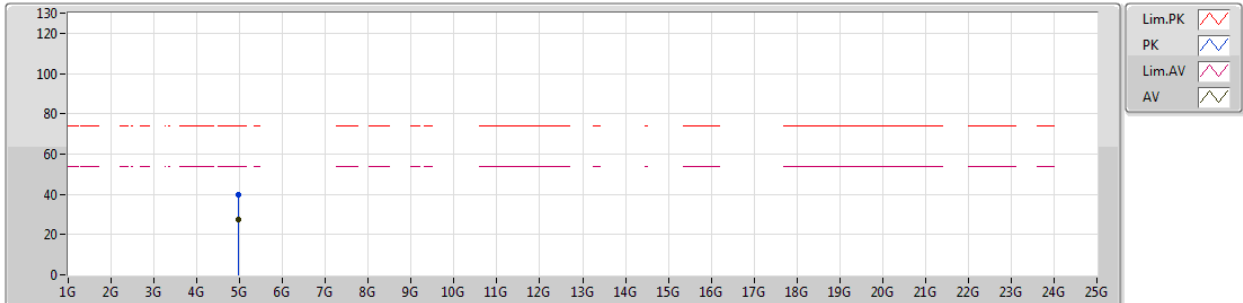


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.95986G	27.62	54.00	-26.38	2.47	3	Vertical	111	1.48	-
PK	4.96356G	39.91	74.00	-34.09	2.47	3	Vertical	111	1.48	-

BT-LE(1Mbps)

2480MHz_TX

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Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments							
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)								
AV	4.96156G	27.51	54.00	-26.49	2.47	3	Horizontal	203	1.78	-							
PK	4.96158G	39.78	74.00	-34.22	2.47	3	Horizontal	203	1.78	-							