FCC Test Report

FCC ID	:	**PPQ-WCBN3516A**
Equipment	:	**802.11 a/b/g/n 1x1 + BT5.0 + Zigbee(15.4) IoT Module**
Brand Name	:	**LITE-ON**
Model Name	:	**WCBN3516A**
Applicant	:	**LITE-ON Technology Corp. Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C**
Manufacturer	:	**LITE-ON TECHNOLOGY (Changzhou) CO., LTD A9 Building,No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone ,Changzhou City,Jiangsu Province 213100 China**
Standard	:	**47 CFR FCC Part 15.247**

The product was received on Jan. 31, 2019, and testing was started from Feb. 21, 2019 and completed on Mar. 05, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

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
FR912411AL	01	Initial issue of report	Mar. 29, 2019

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

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:
None

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	BT-LE(1Mbps)	2402-2480	0-39 [40]
2400-2483.5	BT-LE(2Mbps)	2404-2474	0-35[36]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	BT-LE(1Mbps)	1.0	1TX
2.4-2.4835GHz	BT-LE(2Mbps)	2.0	1TX

Channel list							
BT-LE (1Mbps)				BT-LE (2Mbps)			
Channel				Freq (MHz)			
0	2402	20	2442	0	2404	20	2444
1	2404	21	2444	1	2406	21	2446
2	2406	22	2446	2	2408	22	2448
3	2408	23	2448	3	2410	23	2450
4	2410	24	2450	4	2412	24	2452
5	2412	25	2452	5	2414	25	2454
6	2414	26	2454	6	2416	26	2456
7	2416	27	2456	7	2418	27	2458
8	2418	28	2458	8	2420	28	2460
9	2420	29	2460	9	2422	29	2462
10	2422	30	2462	10	2424	30	2464
11	2424	31	2464	11	2426	31	2466
12	2426	32	2466	12	2428	32	2468
13	2428	33	2468	13	2430	33	2470
14	2430	34	2470	14	2432	34	2472
15	2432	35	2472	15	2434	35	2474
16	2434	36	2474	16	2436	-	-
17	2436	37	2476	17	2438	-	-
18	2438	38	2478	18	2440	-	-
19	2440	39	2480	19	2442	-	-

Note:
- Bluetooth LE uses a GFSK (1Mbps/2Mbps) modulation for DSSS.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector
1	LITE-ON	-	Printed Antenna	N/A
2	LITE-ON	-	Printed Antenna	N/A

Ant.	Port	Gain (dBi)			
		2.4G	5G	Zigbee	BT
1	1	4.6	4.3	-	-
2	2	-	-	4.7	4.7

For 2.4GHz function:

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

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

For 5GHz function:

For IEEE 802.11 a/n mode (1TX/1RX)

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

For Zigbee function:

For IEEE 802.11 Zigbee mode (1TX/1RX)

Ant. 2 (port 2) could transmit/receive simultaneously.

For BT function:

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

Only Ant. 2 (port 2) could transmit/receive simultaneously.

1.1.3 EUT Information

Operational Condition				
EUT Power Type	From Host system			
EUT Function	☒	Point-to-multipoint	☐	Point-to-point
Beamforming Function	☐	With beamforming	☒	Without beamforming

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)	0.683	1.656	426.875u	3k
BT-LE(2Mbps)	0.387	4.123	241.875u	10k

Note. If DC < 0.98, the DCF was added while measuring Output power and PSD.

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 v05r01

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	Barry	24.1~24.9°C / 61~69%	25/Feb/2019
Radiated	03CH03-HY	Terry	23.1~25.7°C / 55.9~57.8%	21/Feb/2019~24/Feb/2019
AC Conduction	CO04-HY	Lego	22.6~23.4°C / 56~60%	05/Mar/2019

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)	3.54 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	1.6 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	5V

2.2 Test Channel Mode

Test Software Version	QSPR 5.0-00163

Mode	PowerSetting
BT-LE(1Mbps)	-
2402MHz	default
2440MHz	default
2480MHz	default
BT-LE(2Mbps)	-
2404MHz	default
2440MHz	default
2474MHz	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	USB 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	CTX		
1	USB mode		
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
2	Bluetooth+WLAN 5GHz
3	Zigbee+WLAN 2.4GHz
4	Zigbee +WLAN 5GHz
Refer to Sporton Test Report No.: FA912411 for Co-location RF Exposure Evaluation.	

2.4 Support Equipment

Support Equipment – AC Conduction				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	-
2	Adapter	DELL	LA90PS0-00	-
3	Test Fixture	-	-	-

Note.Support equipment No.3 was provided by customer.

Support Equipment – RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	-
2	Adapter	DELL	LA90PS0-00	-
3	Test Fixture	-	-	-

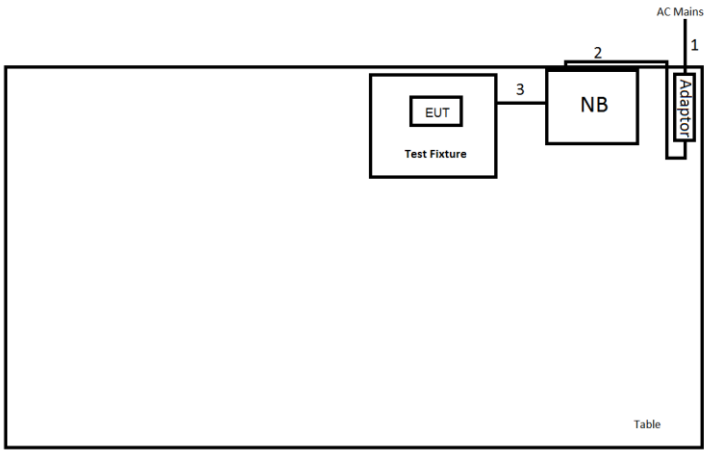
Note.Support equipment No.3 was provided by customer.

Support Equipment – Radiated Emission				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	-
2	Adapter	DELL	LA90PS0-00	-
3	Test Fixture	-	-	-

Note.Support equipment No.3 was provided by customer.

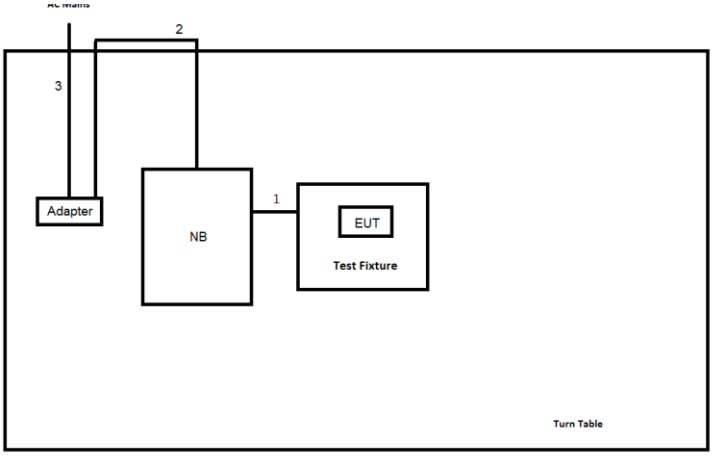
2.5 Test Setup Diagram

Test Setup Diagram – AC Line Conducted Emission Test



Item	Connection	Shielded	Length(m)	Remark
1	AC Power line	No	1.8	-
2	DC Power line	No	1.5	-
3	USB cable	No	0.2	-

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length(m)	Remark
1	USB cable	No	0.2	-
2	DC Power line	No	1.5	-
3	AC Power line	No	1.8	-

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

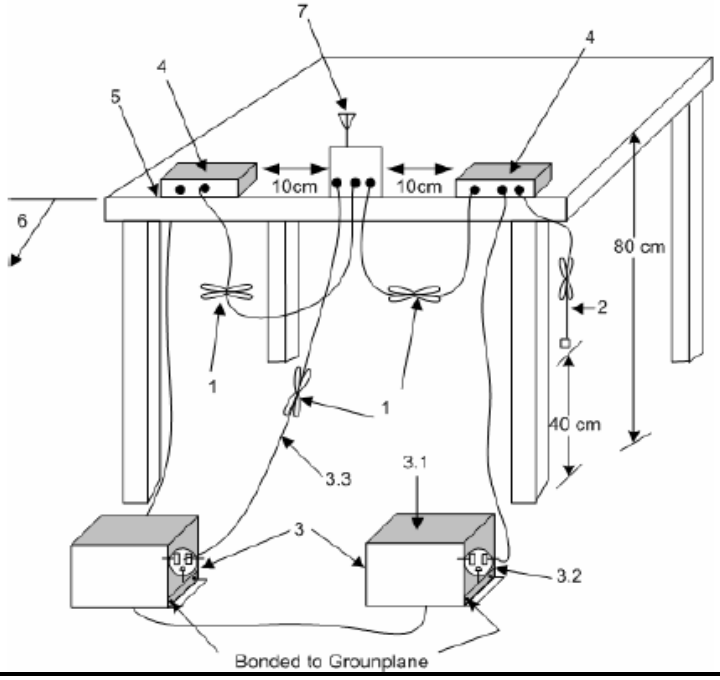
Refer a test equipment and calibration data table in this test report.

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

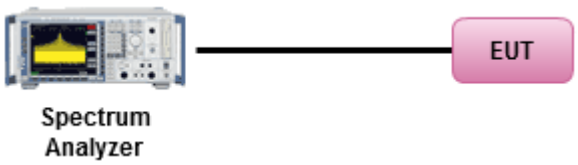
Refer a test equipment and calibration data table in this test report.

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 (11.8 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

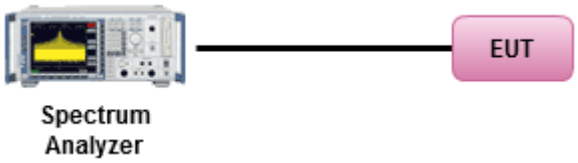
3.4.2 Measuring Instruments

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

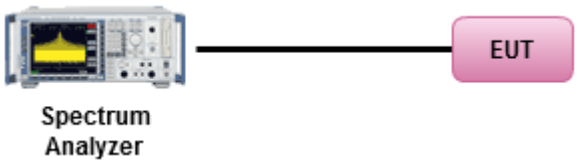
Refer a test equipment and calibration data table in this test report.

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.

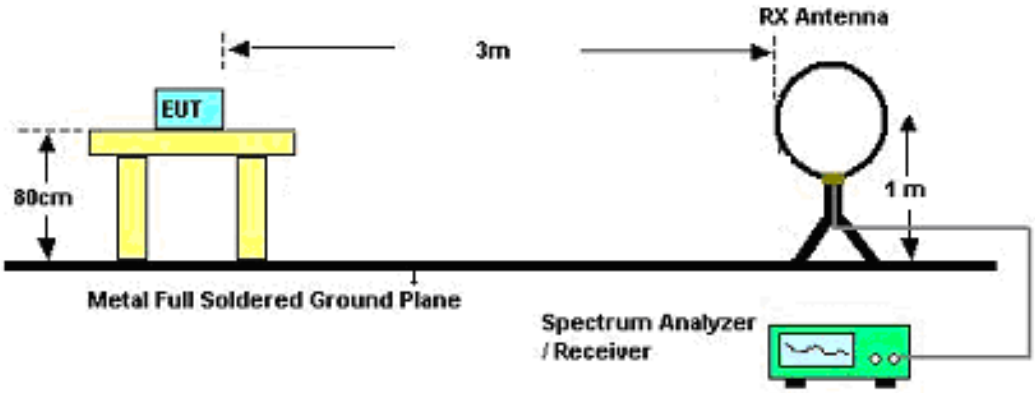
3.6.3 Test Procedures

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).
▪ Use the following spectrum analyzer settings:	
	▪ Set RBW=100 kHz for f < 1 GHz; VBW=3 * RBW; Sweep = auto; Detector function = peak; Trace = max hold.
	▪ Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement. For average measurement, refer as 1.1.4.

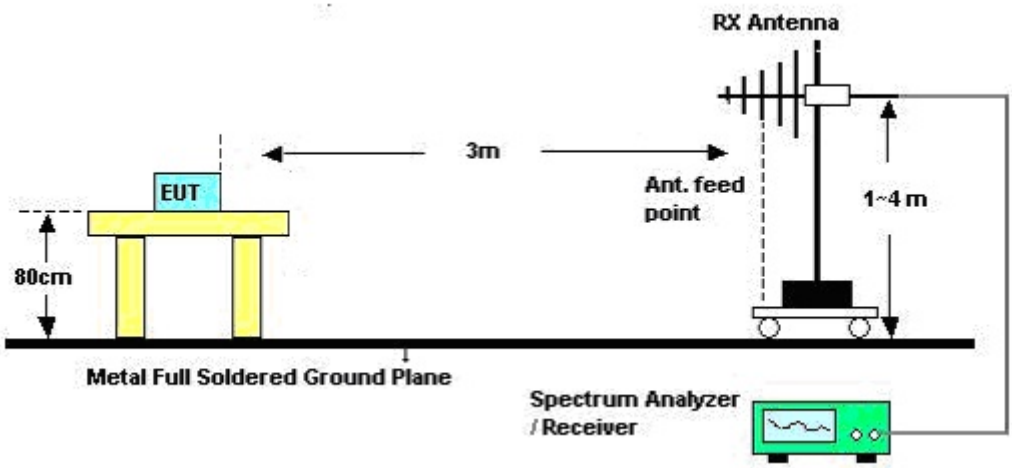
3.6.4 Test Setup

Emissions in Restricted Frequency Bands

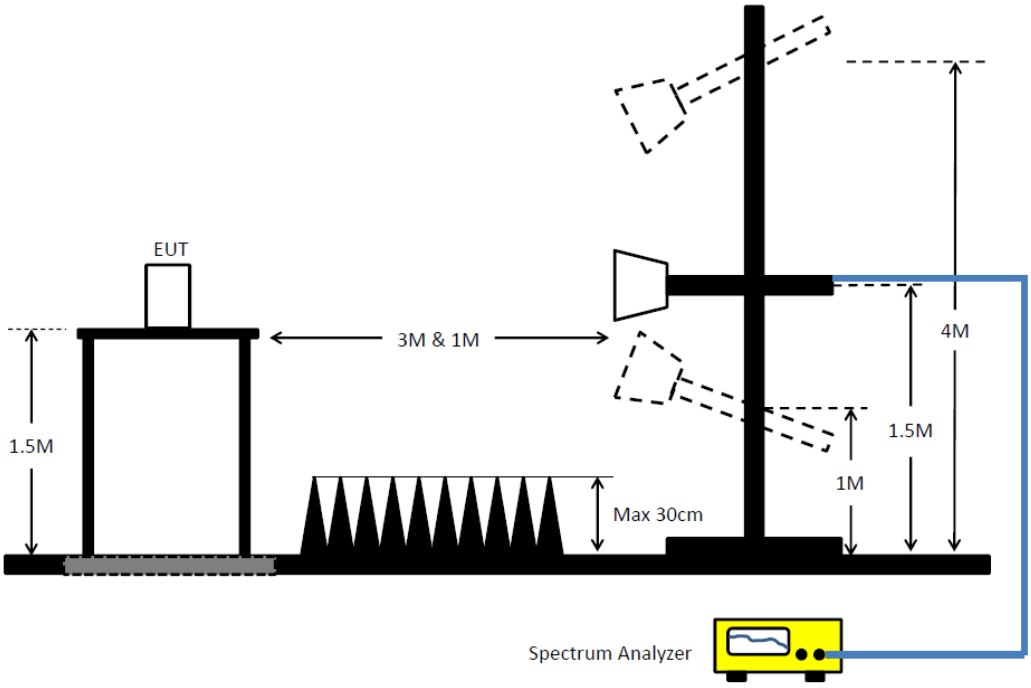
9kHz ~30MHz



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	08/Nov/2018	07/Nov/2019
RF Cable-CON	MTJ	RG142	CB002-CO	9kHz ~ 200MHz	17/Sep/2018	16/Sep/2019
AC POWER	APC	AFC-11005G	F310050055	47Hz~63Hz 5~300V	NCR	NCR
Impuls Begrenzer Puls e Limiter	SCHWARZBEC K	VTSD 9561-F	9561-F041	9 kHz ~ 30 MHz	12/Oct/2018	11/Oct/2019

NCR : Non-Calibration Require

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	30/Oct/2018	29/Oct/2019
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 18GHz 3m	30/Oct/2018	29/Oct/2019
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	23/Apr/2018	19/Apr/2019
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	10/Apr/2018	09/Apr/2019
Bilog Antenna with 5dB Pad	ETS	3142B & MTJ6102-05	00022055	26 MHz - 3 GHz	19/Nov/2018	18/Nov/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
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	28/Jan/2019	27/Jan/2020
RF Cable-high	SUHNER	SUCOFLEX 106	CB222	1GHz ~ 40GHz	28/Jan/2019	27/Jan/2020
Broadband Horn Antenna	SCHWARZBEC K	BBHA 9170	BBHA 9170221	15GHz ~ 40GHz	12/Mar/2018	11/Mar/2019
Double Ridged Guide Horn Antenna	SCHWARZBEC K	BBHA 9120 D	BBHA 9120 D 1531	1GHz ~ 18GHz	18/Apr/ 2018	17/Apr/2019
Preamplifier	MITEQ	TTA1840-35-HG	1864481	18GHz ~ 40GHz	24/Aug/2018	23/Aug/2019
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	28/Mar/2018	27/Mar/2019

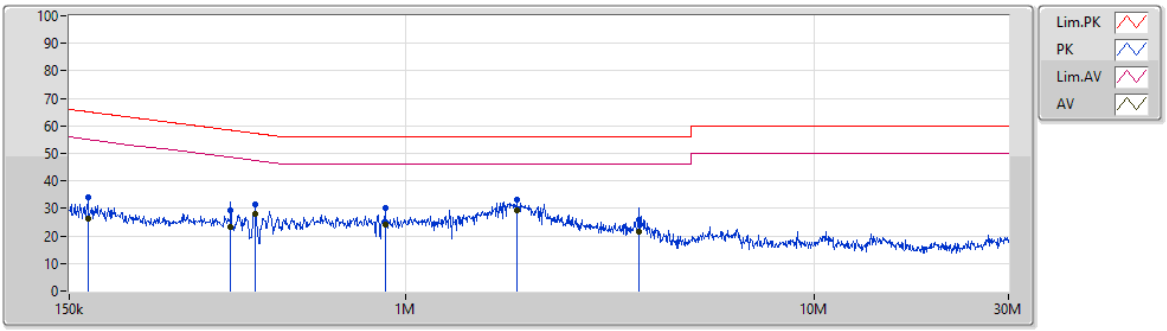
Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101029	10Hz~40GHz	11/Sep/2018	10/Sep/2019
SMB100A Signal Generator	R&S	SMB100A03	181147	100kHz~40GHz	12/Nov/2018	10/Nov/2020
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	19/Feb/2019	18/Feb/2020
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	19/Feb/2019	18/Feb/2020
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	30MHz~1G	11/Jan/2019	10/Jan/2020
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	1G~18G	11/Jan/2019	10/Jan/2020
Cable 0.5m	HUBER	MY10714/4	RF Cable – 05	30MHz~1G	11/Jan/2019	10/Jan/2020

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

AC Conduction

05/03/2019

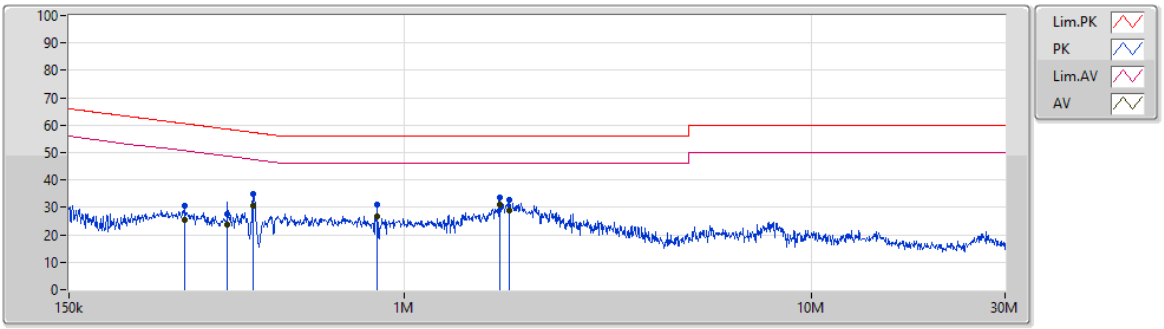


Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	166.406k	33.86	65.14	-31.28	19.48	Neutral	-	14.38	9.60	0.01	9.87
AV	166.406k	26.40	55.14	-28.74	19.48	Neutral	-	6.92	9.60	0.01	9.87
QP	372.716k	29.38	58.45	-29.07	19.48	Neutral	-	9.90	9.59	0.01	9.88
AV	372.716k	23.48	48.45	-24.97	19.48	Neutral	-	4.00	9.59	0.01	9.88
QP	428.605k	31.59	57.28	-25.69	19.48	Neutral	-	12.11	9.59	0.01	9.88
AV	428.605k	27.92	47.28	-19.36	19.48	Neutral	-	8.44	9.59	0.01	9.88
QP	893.431k	30.25	56.00	-25.75	19.49	Neutral	-	10.76	9.59	0.02	9.88
AV	893.431k	24.20	46.00	-21.80	19.49	Neutral	-	4.71	9.59	0.02	9.88
QP	1.87M	33.07	56.00	-22.93	19.53	Neutral	-	13.54	9.61	0.03	9.89
AV	1.87M	29.33	46.00	-16.67	19.53	Neutral	"Worst"	9.80	9.61	0.03	9.89
QP	3.73M	26.06	56.00	-29.94	19.54	Neutral	-	6.52	9.61	0.04	9.89
AV	3.73M	21.69	46.00	-24.31	19.54	Neutral	-	2.15	9.61	0.04	9.89

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

AC Conduction

05/03/2019



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	288.682k	30.43	60.57	-30.14	19.48	Line	-	10.95	9.59	0.01	9.88
AV	288.682k	25.43	50.57	-25.14	19.48	Line	-	5.95	9.59	0.01	9.88
QP	368.279k	27.62	58.54	-30.92	19.48	Line	-	8.14	9.59	0.01	9.88
AV	368.279k	23.77	48.54	-24.77	19.48	Line	-	4.29	9.59	0.01	9.88
QP	425.197k	34.90	57.34	-22.44	19.48	Line	-	15.42	9.59	0.01	9.88
AV	425.197k	30.80	47.34	-16.54	19.48	Line	-	11.32	9.59	0.01	9.88
QP	855.047k	30.90	56.00	-25.10	19.50	Line	-	11.40	9.60	0.02	9.88
AV	855.047k	26.64	46.00	-19.36	19.50	Line	-	7.14	9.60	0.02	9.88
QP	1.713M	33.51	56.00	-22.49	19.54	Line	-	13.97	9.62	0.03	9.89
AV	1.713M	31.05	46.00	-14.95	19.54	Line	"Worst"	11.51	9.62	0.03	9.89
QP	1.818M	32.81	56.00	-23.19	19.54	Line	-	13.27	9.62	0.03	9.89
AV	1.818M	28.98	46.00	-17.02	19.54	Line	-	9.44	9.62	0.03	9.89

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)	736.25k	1.097M	1M10F1D	687.5k	1.072M
BT-LE(2Mbps)	1.17M	2.089M	2M09F1D	1.128M	2.069M

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

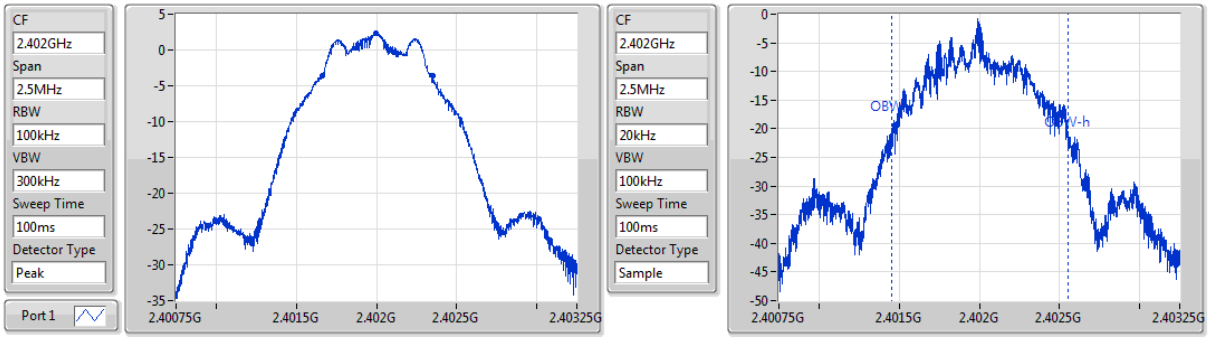
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	687.5k	1.097M
2440MHz	Pass	500k	736.25k	1.072M
2480MHz	Pass	500k	728.75k	1.077M
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	500k	1.128M	2.086M
2440MHz	Pass	500k	1.17M	2.069M
2474MHz	Pass	500k	1.14M	2.089M

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

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

2402MHz

25/02/2019

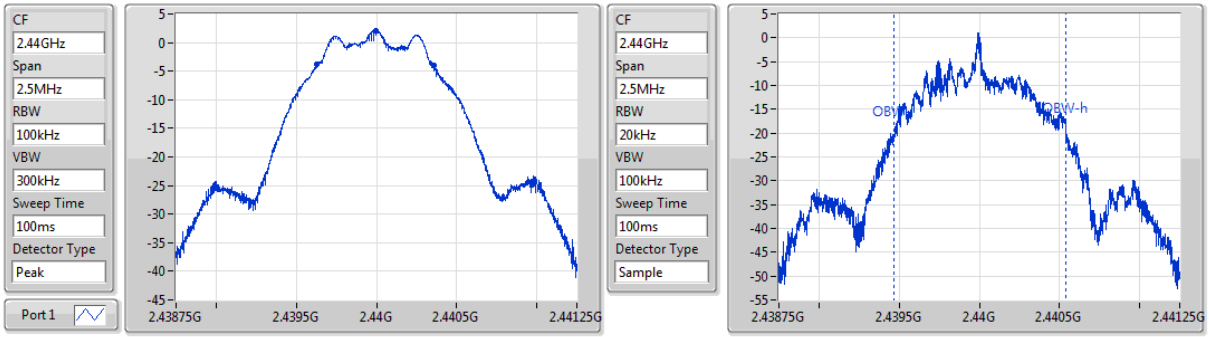


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
687.5k	2.401663G	2.40235G	1.097M	2.401455G	2.402552G	500k	1

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

2440MHz

25/02/2019

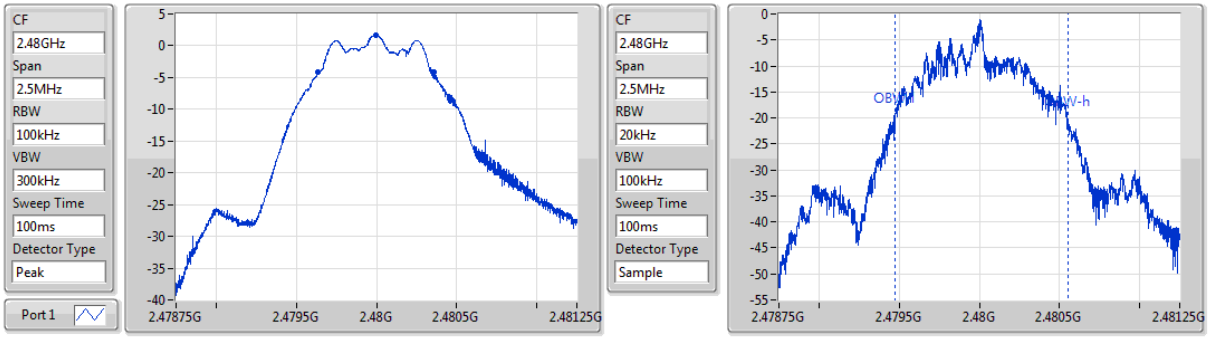


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
736.25k	2.439625G	2.440361G	1.072M	2.439469G	2.440541G	500k	1

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

2480MHz

25/02/2019

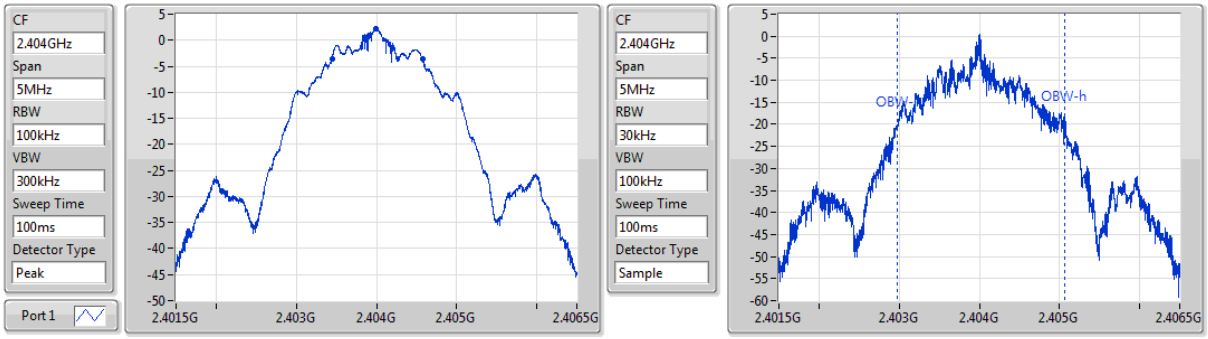


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
728.75k	2.479633G	2.480361G	1.077M	2.479474G	2.480551G	500k	1

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

2404MHz

25/02/2019

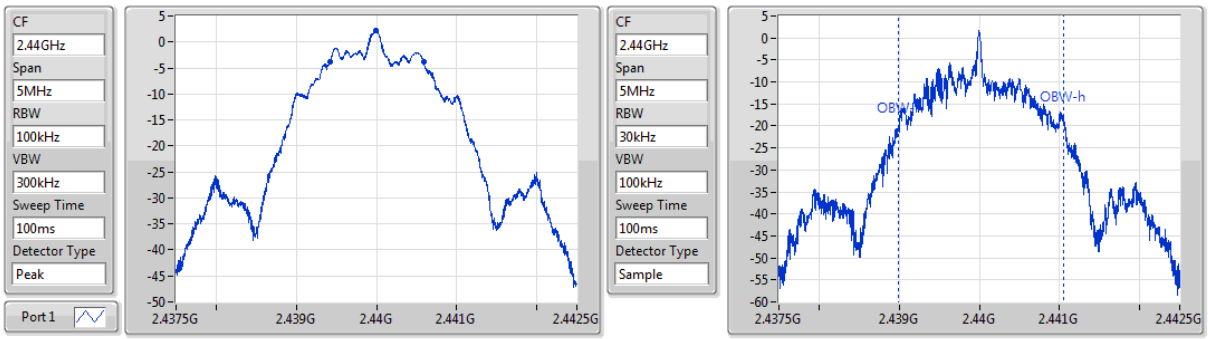


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.128M	2.403448G	2.404575G	2.086M	2.402976G	2.405062G	500k	1

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

2440MHz

25/02/2019

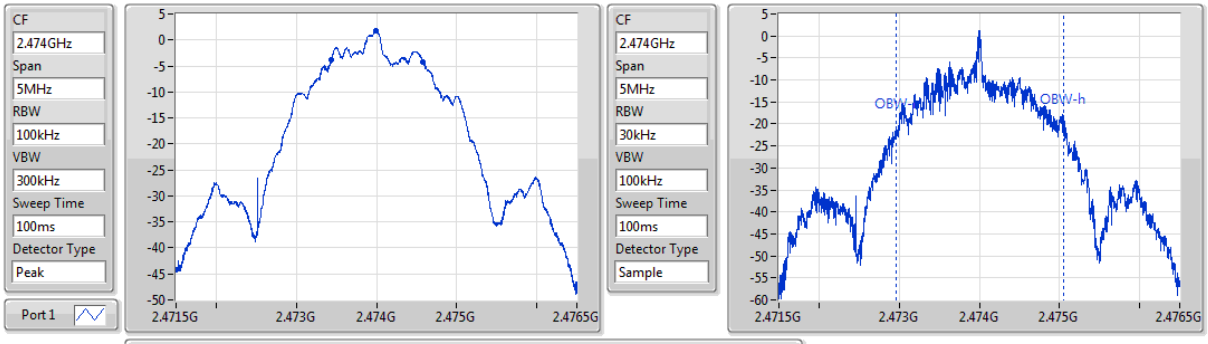


6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.17M	2.439418G	2.440588G	2.069M	2.438986G	2.441054G	500k	1

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

2474MHz

25/02/2019



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
1.14M	2.473435G	2.474575G	2.089M	2.472968G	2.475057G	500k	1

Summary

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	1.74	0.00149
BT-LE(2Mbps)	1.43	0.00139

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.70	1.74	30.00
2440MHz	Pass	4.70	1.46	30.00
2480MHz	Pass	4.70	1.16	30.00
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	4.70	1.43	30.00
2440MHz	Pass	4.70	1.12	30.00
2474MHz	Pass	4.70	0.81	30.00

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-10.95
BT-LE(2Mbps)	-11.72

RBW=3kHz.

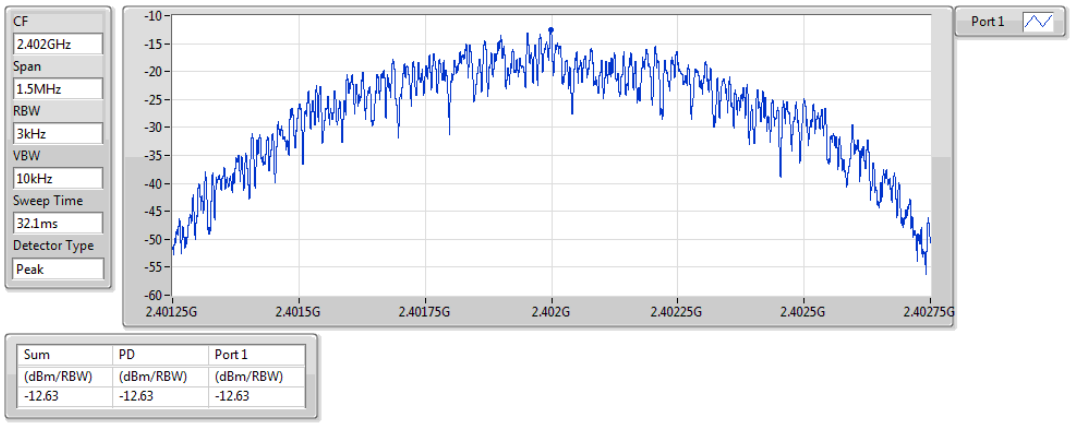
Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	4.70	-12.63	8.00
2440MHz	Pass	4.70	-10.95	8.00
2480MHz	Pass	4.70	-12.58	8.00
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	4.70	-12.86	8.00
2440MHz	Pass	4.70	-11.72	8.00
2474MHz	Pass	4.70	-13.16	8.00

RBW=3kHz.

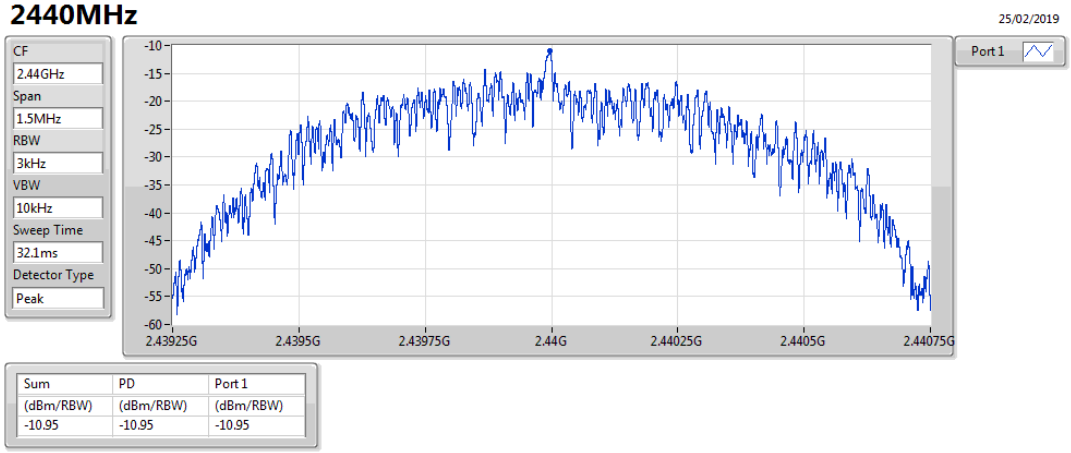
BT-LE(1Mbps) **PSD**

2402MHz



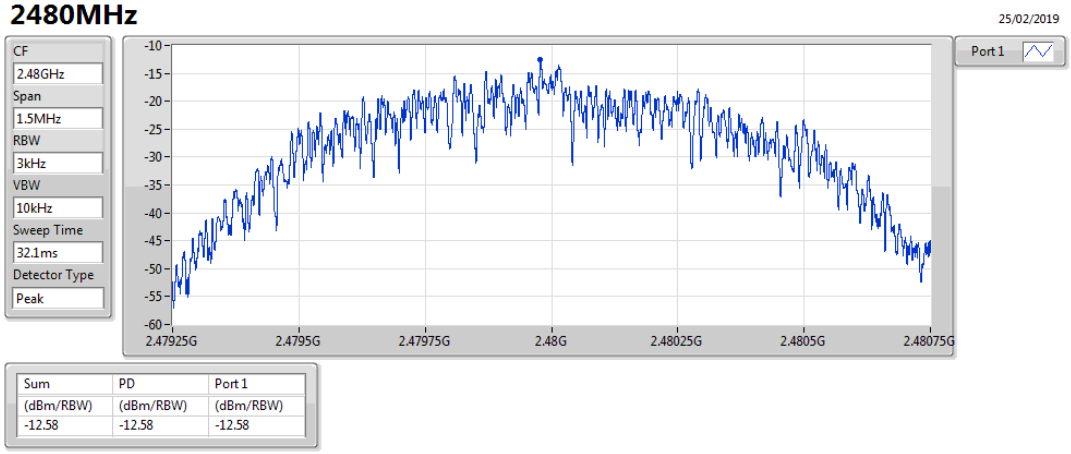
BT-LE(1Mbps) **PSD**

2440MHz



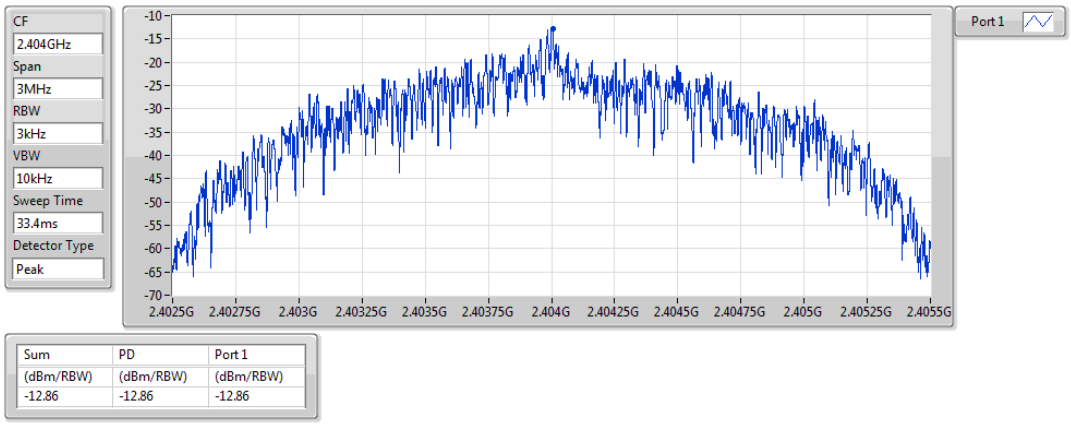
BT-LE(1Mbps) **PSD**

2480MHz



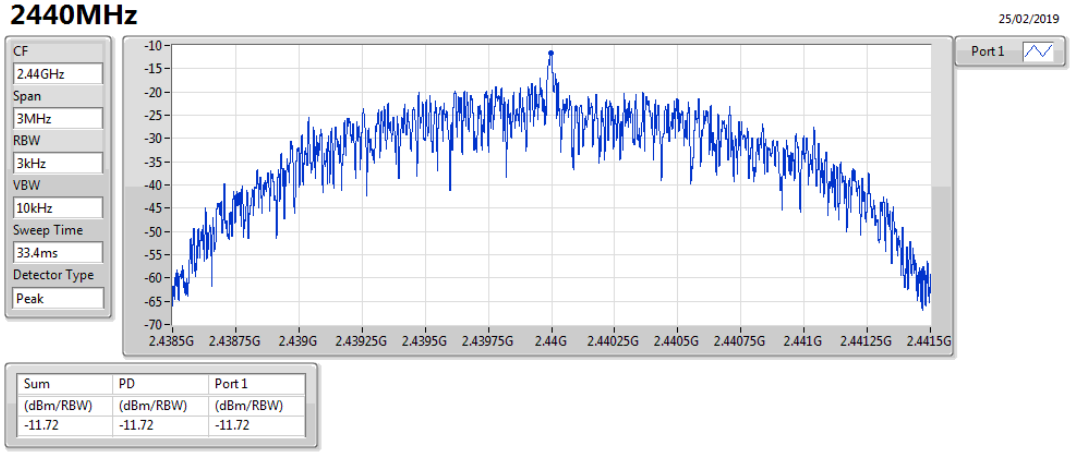
BT-LE(2Mbps) **PSD**

2404MHz



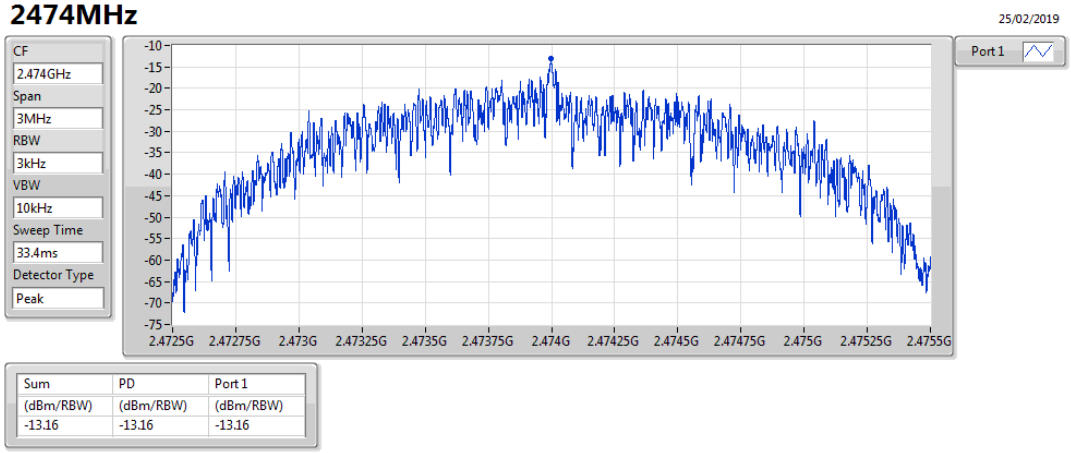
BT-LE(2Mbps) **PSD**

2440MHz



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

2474MHz



Summary

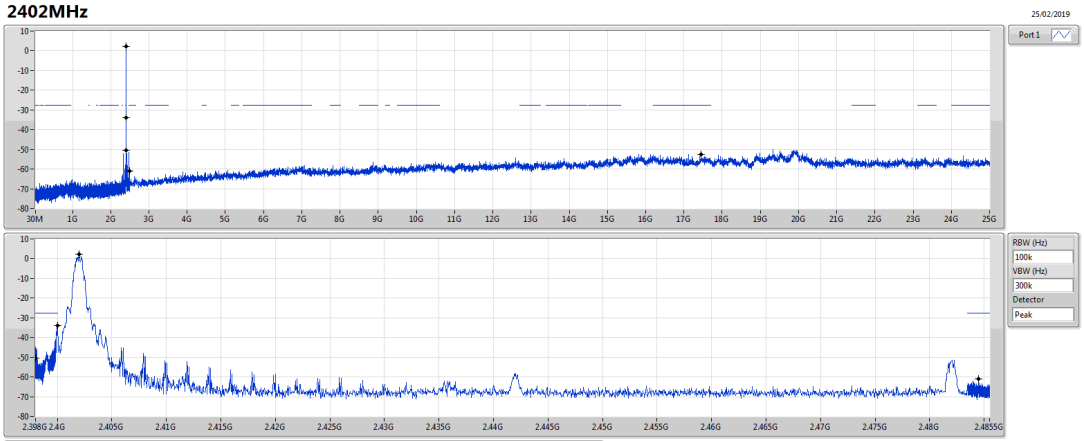
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.402G	2.30	-27.70	2.398G	-50.52	2.4G	-33.89	2.48448G	-61.08	17.45201G	-52.48	1
BT-LE(2Mbps)	Pass	2.40397G	2.35	-27.65	2.396G	-51.88	2.39999G	-39.97	2.48402G	-49.98	17.55962G	-52.99	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	2.402G	2.30	-27.70	2.398G	-50.52	2.4G	-33.89	2.48448G	-61.08	17.45201G	-52.48	1
2440MHz	Pass	2.402G	2.30	-27.70	1.62662G	-55.88	2.4G	-56.17	2.48402G	-62.02	16.86382G	-52.45	1
2480MHz	Pass	2.402G	2.30	-27.70	1.65356G	-55.99	2.39999G	-51.54	2.48399G	-45.51	23.59566G	-53.11	1
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2404MHz	Pass	2.40397G	2.35	-27.65	2.396G	-51.88	2.39999G	-39.97	2.48402G	-49.98	17.55962G	-52.99	1
2440MHz	Pass	2.40397G	2.35	-27.65	1.62675G	-57.13	2.39997G	-56.27	2.484G	-61.90	15.20988G	-52.35	1
2474MHz	Pass	2.40397G	2.35	-27.65	2.39423G	-50.47	2.39999G	-59.36	2.48406G	-53.35	2.55222G	-52.14	1

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

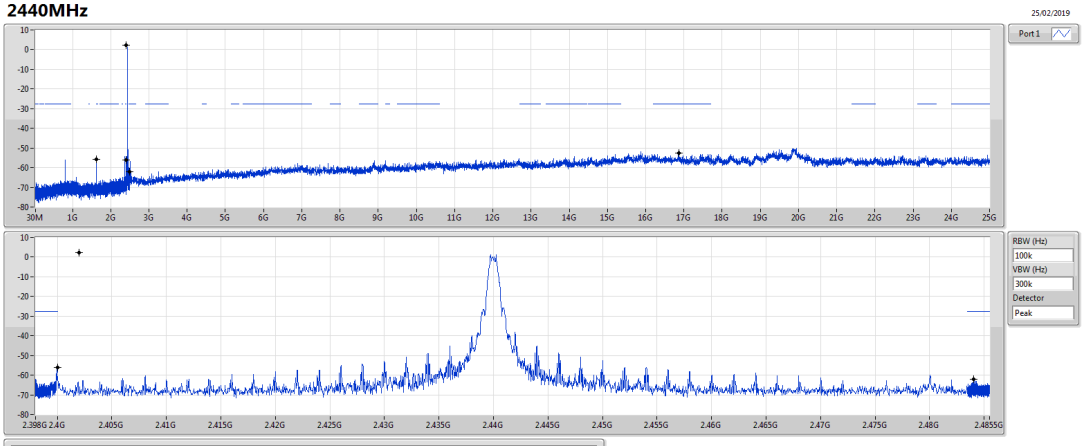
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.402G	2.30	-27.70	2.398G	-50.52	2.4G	-33.89	2.48448G	-61.08	17.45201G	-52.48	1

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

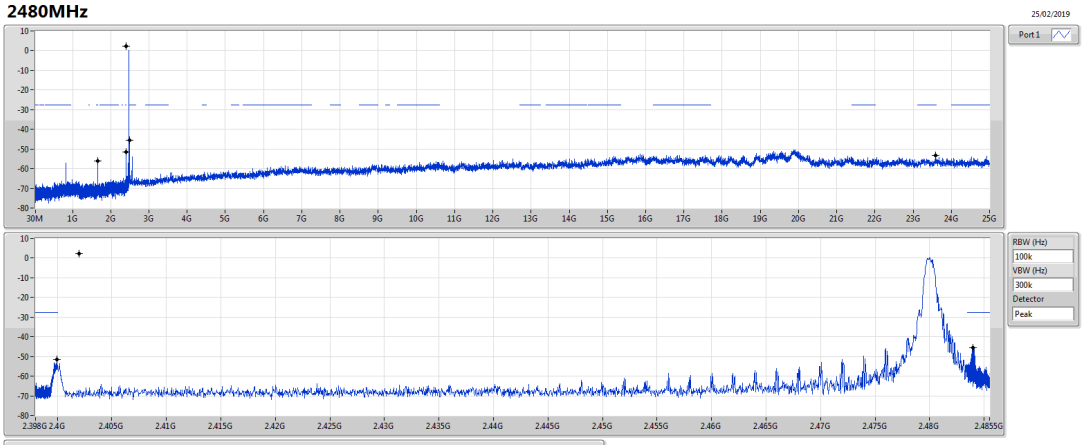
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.402G	2.30	-27.70	1.62662G	-55.88	2.4G	-56.17	2.48402G	-62.02	16.86382G	-52.45	1

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

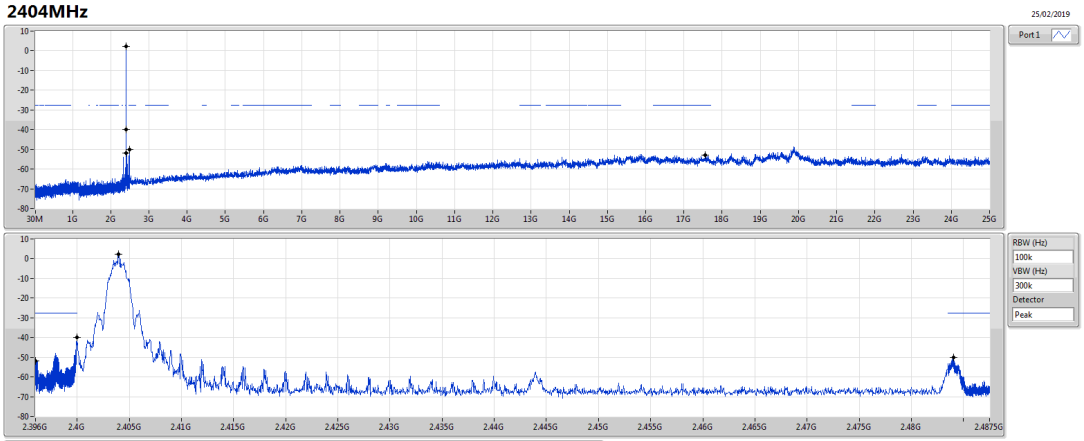
2480MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.402G	2.30	-27.70	1.65356G	-55.99	2.39999G	-51.54	2.48399G	-45.51	23.59566G	-53.11	1

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

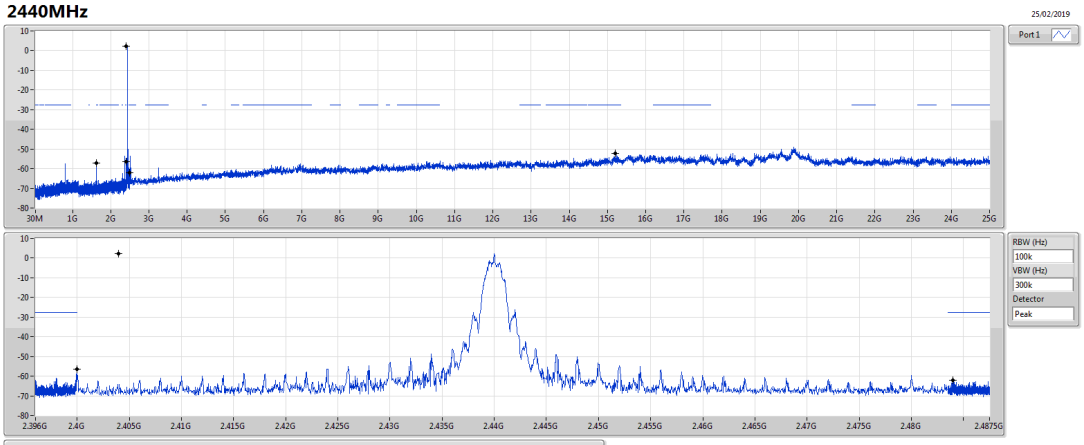
2404MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40397G	2.35	-27.65	2.396G	-51.88	2.39999G	-39.97	2.48402G	-49.98	17.55962G	-52.99	1

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

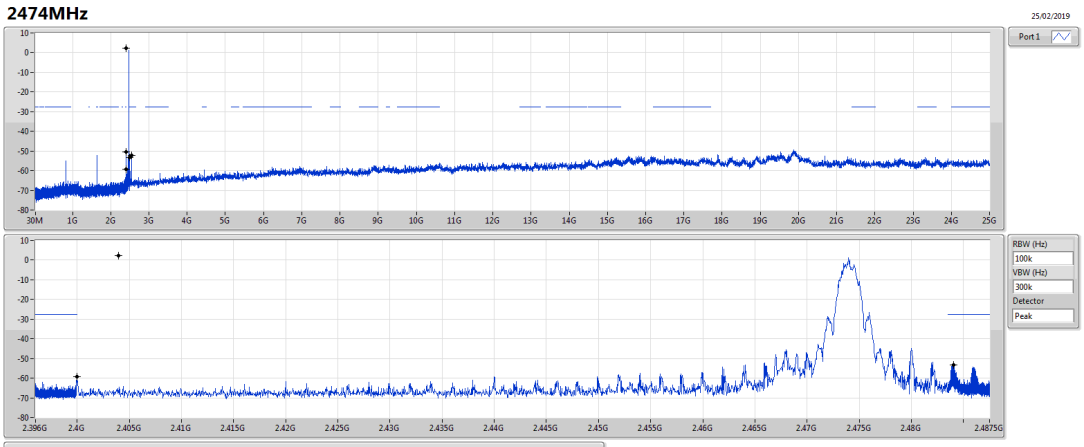
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40397G	2.35	-27.65	1.62675G	-57.13	2.39997G	-56.27	2.484G	-61.90	15.20988G	-52.35	1

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

2474MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40397G	2.35	-27.65	2.39423G	-50.47	2.39999G	-59.36	2.48406G	-53.35	2.55222G	-52.14	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(2Mbps)	Pass	PK	264.74M	40.15	46.00	-5.85	-5.97	3	Horizontal	360	2.00	-

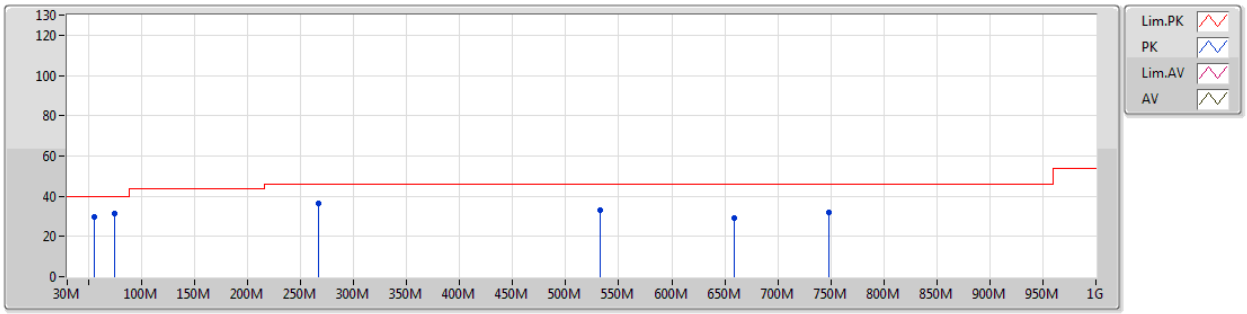
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	55.22M	29.83	40.00	-10.17	-13.97	3	Vertical	0	1.00	-
2440MHz	Pass	PK	74.62M	31.53	40.00	-8.47	-14.28	3	Vertical	0	1.00	-
2440MHz	Pass	PK	266.68M	36.28	46.00	-9.72	-6.07	3	Vertical	0	1.00	-
2440MHz	Pass	PK	532.46M	32.96	46.00	-13.04	-1.33	3	Vertical	0	1.00	-
2440MHz	Pass	PK	658.56M	29.22	46.00	-16.78	0.48	3	Vertical	0	1.00	-
2440MHz	Pass	PK	747.8M	31.87	46.00	-14.13	1.47	3	Vertical	0	1.00	-
2440MHz	Pass	PK	115.36M	33.94	43.50	-9.56	-8.19	3	Horizontal	360	2.00	-
2440MHz	Pass	PK	198.78M	34.31	43.50	-9.19	-10.00	3	Horizontal	360	2.00	-
2440MHz	Pass	PK	264.74M	40.15	46.00	-5.85	-5.97	3	Horizontal	360	2.00	-
2440MHz	Pass	PK	431.58M	31.57	46.00	-14.43	-2.35	3	Horizontal	360	2.00	-
2440MHz	Pass	PK	532.46M	35.79	46.00	-10.21	-1.33	3	Horizontal	360	2.00	-
2440MHz	Pass	PK	893.3M	31.31	46.00	-14.69	2.84	3	Horizontal	360	2.00	-

BT-LE(2Mbps)

2440MHz_USB

24/02/2019

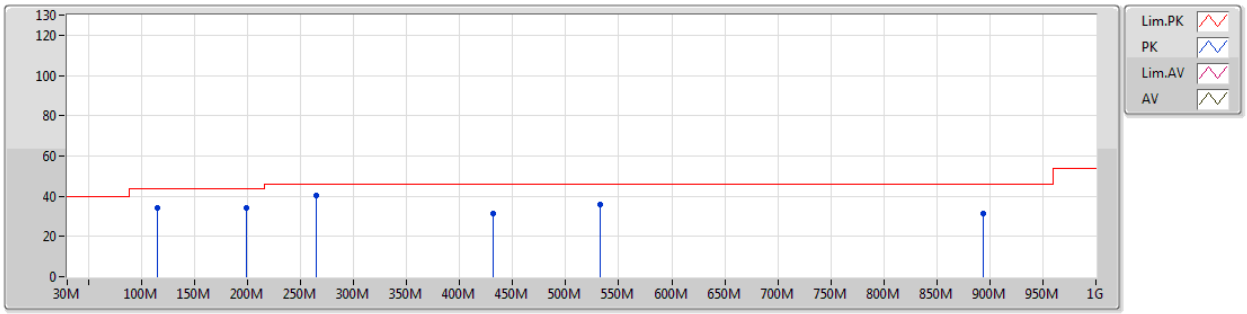


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	55.22M	29.83	40.00	-10.17	-13.97	3	Vertical	0	1.00	-
PK	74.62M	31.53	40.00	-8.47	-14.28	3	Vertical	0	1.00	-
PK	266.68M	36.28	46.00	-9.72	-6.07	3	Vertical	0	1.00	-
PK	532.46M	32.96	46.00	-13.04	-1.33	3	Vertical	0	1.00	-
PK	658.56M	29.22	46.00	-16.78	0.48	3	Vertical	0	1.00	-
PK	747.8M	31.87	46.00	-14.13	1.47	3	Vertical	0	1.00	-

BT-LE(2Mbps)

2440MHz_USB

24/02/2019



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	115.36M	33.94	43.50	-9.56	-8.19	3	Horizontal	360	2.00	-
PK	198.78M	34.31	43.50	-9.19	-10.00	3	Horizontal	360	2.00	-
PK	264.74M	40.15	46.00	-5.85	-5.97	3	Horizontal	360	2.00	-
PK	431.58M	31.57	46.00	-14.43	-2.35	3	Horizontal	360	2.00	-
PK	532.46M	35.79	46.00	-10.21	-1.33	3	Horizontal	360	2.00	-
PK	893.3M	31.31	46.00	-14.69	2.84	3	Horizontal	360	2.00	-

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	2.4838G	48.75	54.00	-5.25	30.97	3	Vertical	277	2.66	-
BT-LE(2Mbps)	Pass	AV	2.4892G	50.06	54.00	-3.94	30.98	3	Vertical	276	2.67	-

Result

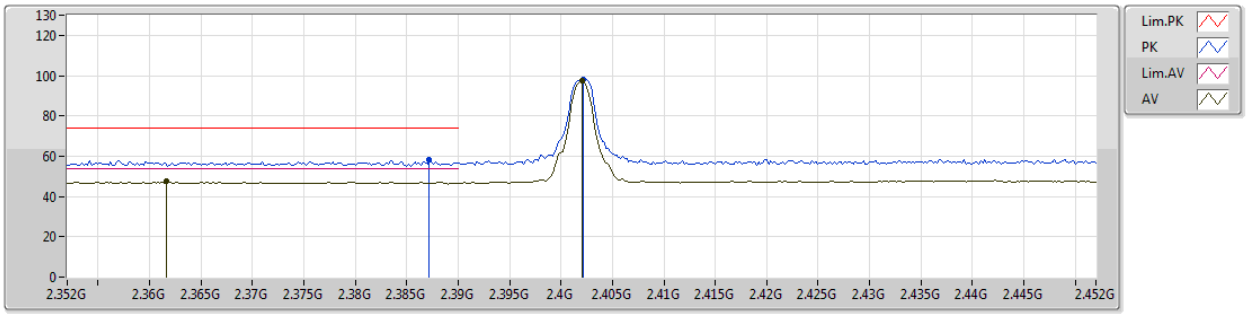
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.3616G	47.35	54.00	-6.65	30.60	3	Vertical	267	1.01	-
2402MHz	Pass	AV	2.402G	97.24	Inf	-Inf	30.72	3	Vertical	267	1.01	-
2402MHz	Pass	PK	2.3872G	58.12	74.00	-15.88	30.68	3	Vertical	267	1.01	-
2402MHz	Pass	PK	2.4022G	97.86	Inf	-Inf	30.73	3	Vertical	267	1.01	-
2402MHz	Pass	AV	2.3822G	47.18	54.00	-6.82	30.67	3	Horizontal	326	3.08	-
2402MHz	Pass	AV	2.402G	91.36	Inf	-Inf	30.72	3	Horizontal	326	3.08	-
2402MHz	Pass	PK	2.3756G	57.71	74.00	-16.29	30.64	3	Horizontal	326	3.08	-
2402MHz	Pass	PK	2.4022G	91.97	Inf	-Inf	30.73	3	Horizontal	326	3.08	-
2402MHz	Pass	PK	4.80348G	45.96	74.00	-28.04	5.85	3	Vertical	267	1.00	-
2402MHz	Pass	AV	4.80366G	35.45	54.00	-18.55	5.86	3	Vertical	267	1.00	-
2402MHz	Pass	AV	4.80358G	35.46	54.00	-18.54	5.86	3	Horizontal	321	1.01	-
2402MHz	Pass	PK	4.80406G	45.89	74.00	-28.11	5.86	3	Horizontal	321	1.01	-
2440MHz	Pass	AV	2.36G	47.34	54.00	-6.66	30.59	3	Vertical	277	2.46	-
2440MHz	Pass	AV	2.44G	97.95	Inf	-Inf	30.84	3	Vertical	277	2.46	-
2440MHz	Pass	AV	2.5G	48.07	54.00	-5.93	31.02	3	Vertical	277	2.46	-
2440MHz	Pass	PK	2.3748G	57.92	74.00	-16.08	30.64	3	Vertical	277	2.46	-
2440MHz	Pass	PK	2.4396G	98.57	Inf	-Inf	30.84	3	Vertical	277	2.46	-
2440MHz	Pass	PK	2.4968G	59.01	74.00	-14.99	31.00	3	Vertical	277	2.46	-
2440MHz	Pass	AV	2.3828G	47.18	54.00	-6.82	30.67	3	Horizontal	206	1.08	-
2440MHz	Pass	AV	2.44G	91.74	Inf	-Inf	30.84	3	Horizontal	206	1.08	-
2440MHz	Pass	AV	2.4888G	48.28	54.00	-5.72	30.98	3	Horizontal	206	1.08	-
2440MHz	Pass	PK	2.3428G	57.83	74.00	-16.17	30.54	3	Horizontal	206	1.08	-
2440MHz	Pass	PK	2.4396G	92.40	Inf	-Inf	30.84	3	Horizontal	206	1.08	-
2440MHz	Pass	PK	2.4972G	58.37	74.00	-15.63	31.00	3	Horizontal	206	1.08	-
2440MHz	Pass	AV	4.88222G	34.36	54.00	-19.64	6.02	3	Vertical	200	1.10	-
2440MHz	Pass	PK	4.8779G	45.98	74.00	-28.02	6.01	3	Vertical	200	1.10	-
2440MHz	Pass	AV	4.88016G	34.44	54.00	-19.56	6.01	3	Horizontal	146	1.51	-
2440MHz	Pass	PK	4.88084G	45.42	74.00	-28.58	6.01	3	Horizontal	146	1.51	-
2480MHz	Pass	AV	2.48G	97.76	Inf	-Inf	30.95	3	Vertical	277	2.66	-
2480MHz	Pass	AV	2.4838G	48.75	54.00	-5.25	30.97	3	Vertical	277	2.66	-
2480MHz	Pass	PK	2.4798G	98.37	Inf	-Inf	30.95	3	Vertical	277	2.66	-
2480MHz	Pass	PK	2.4836G	61.93	74.00	-12.07	30.97	3	Vertical	277	2.66	-
2480MHz	Pass	AV	2.48G	89.19	Inf	-Inf	30.95	3	Horizontal	68	1.16	-
2480MHz	Pass	AV	2.488G	48.52	54.00	-5.48	30.98	3	Horizontal	68	1.16	-
2480MHz	Pass	PK	2.48G	89.91	Inf	-Inf	30.95	3	Horizontal	68	1.16	-
2480MHz	Pass	PK	2.5G	58.96	74.00	-15.04	31.02	3	Horizontal	68	1.16	-
2480MHz	Pass	AV	4.95706G	34.92	54.00	-19.08	6.17	3	Vertical	272	2.14	-
2480MHz	Pass	PK	4.9584G	46.87	74.00	-27.13	6.17	3	Vertical	272	2.14	-
2480MHz	Pass	AV	4.95604G	34.91	54.00	-19.09	6.17	3	Horizontal	312	1.14	-
2480MHz	Pass	PK	4.95846G	45.85	74.00	-28.15	6.17	3	Horizontal	312	1.14	-
BT-LE(2Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2404MHz	Pass	AV	2.3786G	48.74	54.00	-5.26	30.66	3	Vertical	255	1.12	-
2404MHz	Pass	AV	2.404G	97.58	Inf	-Inf	30.73	3	Vertical	255	1.12	-
2404MHz	Pass	PK	2.3784G	57.80	74.00	-16.20	30.65	3	Vertical	255	1.12	-
2404MHz	Pass	PK	2.4034G	98.09	Inf	-Inf	30.73	3	Vertical	255	1.12	-
2404MHz	Pass	AV	2.38G	48.54	54.00	-5.46	30.66	3	Horizontal	326	2.78	-
2404MHz	Pass	AV	2.404G	92.26	Inf	-Inf	30.73	3	Horizontal	326	2.78	-

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2404MHz	Pass	PK	2.3892G	58.08	74.00	-15.92	30.68	3	Horizontal	326	2.78	-
2404MHz	Pass	PK	2.404G	92.67	Inf	-Inf	30.73	3	Horizontal	326	2.78	-
2404MHz	Pass	AV	4.80328G	36.18	54.00	-17.82	5.85	3	Vertical	79	1.13	-
2404MHz	Pass	PK	4.80616G	45.58	74.00	-28.42	5.86	3	Vertical	79	1.13	-
2404MHz	Pass	AV	4.80472G	36.02	54.00	-17.98	5.86	3	Horizontal	323	1.02	-
2404MHz	Pass	PK	4.80734G	45.34	74.00	-28.66	5.86	3	Horizontal	323	1.02	-
2440MHz	Pass	AV	2.356G	48.90	54.00	-5.10	30.58	3	Vertical	278	2.46	-
2440MHz	Pass	AV	2.44G	98.33	Inf	-Inf	30.84	3	Vertical	278	2.46	-
2440MHz	Pass	AV	2.4964G	49.67	54.00	-4.33	31.00	3	Vertical	278	2.46	-
2440MHz	Pass	PK	2.3632G	57.53	74.00	-16.47	30.60	3	Vertical	278	2.46	-
2440MHz	Pass	PK	2.4396G	98.81	Inf	-Inf	30.84	3	Vertical	278	2.46	-
2440MHz	Pass	PK	2.4848G	58.48	74.00	-15.52	30.97	3	Vertical	278	2.46	-
2440MHz	Pass	AV	2.3876G	48.37	54.00	-5.63	30.68	3	Horizontal	204	1.08	-
2440MHz	Pass	AV	2.44G	91.72	Inf	-Inf	30.84	3	Horizontal	204	1.08	-
2440MHz	Pass	AV	2.4872G	49.65	54.00	-4.35	30.98	3	Horizontal	204	1.08	-
2440MHz	Pass	PK	2.3864G	57.63	74.00	-16.37	30.68	3	Horizontal	204	1.08	-
2440MHz	Pass	PK	2.4396G	92.26	Inf	-Inf	30.84	3	Horizontal	204	1.08	-
2440MHz	Pass	PK	2.484G	58.69	74.00	-15.31	30.97	3	Horizontal	204	1.08	-
2440MHz	Pass	AV	4.80362G	36.26	54.00	-17.74	5.86	3	Vertical	17	1.64	-
2440MHz	Pass	PK	4.80338G	45.91	74.00	-28.09	5.85	3	Vertical	17	1.64	-
2440MHz	Pass	AV	4.8129G	36.50	54.00	-17.50	5.88	3	Horizontal	261	1.45	-
2440MHz	Pass	PK	4.81144G	45.42	74.00	-28.58	5.88	3	Horizontal	261	1.45	-
2474MHz	Pass	AV	2.474G	98.21	Inf	-Inf	30.94	3	Vertical	276	2.67	-
2474MHz	Pass	AV	2.4892G	50.06	54.00	-3.94	30.98	3	Vertical	276	2.67	-
2474MHz	Pass	PK	2.474G	98.64	Inf	-Inf	30.94	3	Vertical	276	2.67	-
2474MHz	Pass	PK	2.4856G	58.92	74.00	-15.08	30.98	3	Vertical	276	2.67	-
2474MHz	Pass	AV	2.474G	90.79	Inf	-Inf	30.94	3	Horizontal	312	2.65	-
2474MHz	Pass	AV	2.4964G	49.67	54.00	-4.33	31.00	3	Horizontal	312	2.65	-
2474MHz	Pass	PK	2.4734G	91.27	Inf	-Inf	30.94	3	Horizontal	312	2.65	-
2474MHz	Pass	PK	2.4876G	58.56	74.00	-15.44	30.98	3	Horizontal	312	2.65	-
2474MHz	Pass	AV	4.94794G	36.62	54.00	-17.38	6.14	3	Vertical	255	1.89	-
2474MHz	Pass	PK	4.94512G	46.20	74.00	-27.80	6.13	3	Vertical	255	1.89	-
2474MHz	Pass	AV	4.95202G	36.52	54.00	-17.48	6.16	3	Horizontal	175	1.31	-
2474MHz	Pass	PK	4.94388G	45.68	74.00	-28.32	6.13	3	Horizontal	175	1.31	-

BT-LE(1Mbps)

2402MHz_TX

23/02/2019

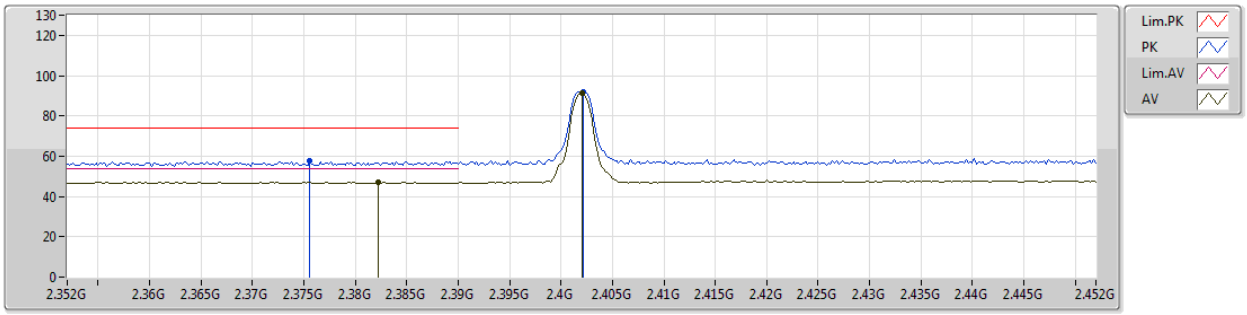


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3616G	47.35	54.00	-6.65	30.60	3	Vertical	267	1.01	-
AV	2.402G	97.24	Inf	-Inf	30.72	3	Vertical	267	1.01	-
PK	2.3872G	58.12	74.00	-15.88	30.68	3	Vertical	267	1.01	-
PK	2.4022G	97.86	Inf	-Inf	30.73	3	Vertical	267	1.01	-

BT-LE(1Mbps)

2402MHz_TX

23/02/2019

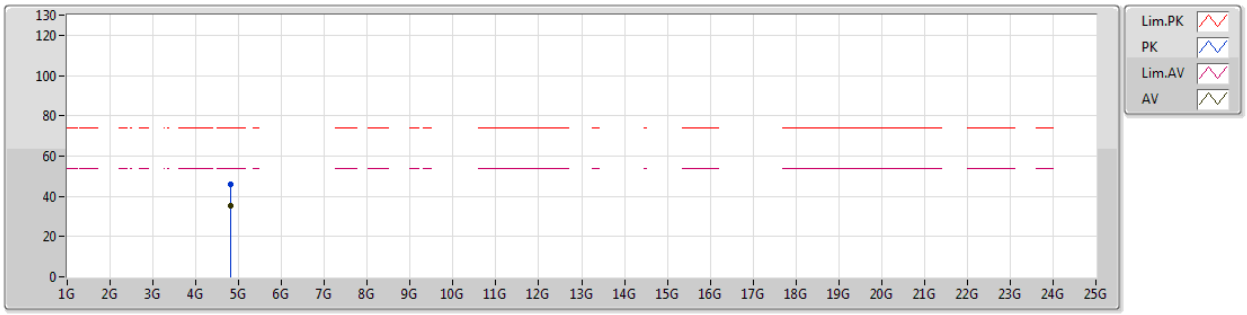


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3822G	47.18	54.00	-6.82	30.67	3	Horizontal	326	3.08	-
AV	2.402G	91.36	Inf	-Inf	30.72	3	Horizontal	326	3.08	-
PK	2.3756G	57.71	74.00	-16.29	30.64	3	Horizontal	326	3.08	-
PK	2.4022G	91.97	Inf	-Inf	30.73	3	Horizontal	326	3.08	-

BT-LE(1Mbps)

2402MHz_TX

23/02/2019

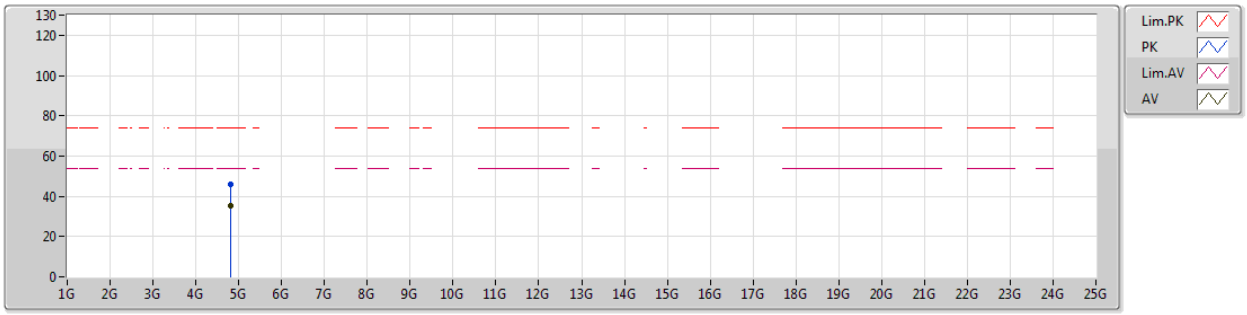


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	4.80348G	45.96	74.00	-28.04	5.85	3	Vertical	267	1.00	-
AV	4.80366G	35.45	54.00	-18.55	5.86	3	Vertical	267	1.00	-

BT-LE(1Mbps)

2402MHz_TX

23/02/2019

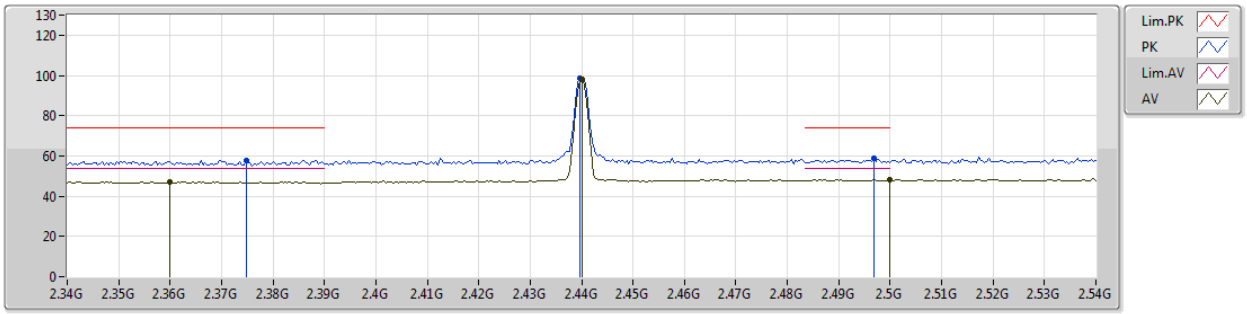


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.80358G	35.46	54.00	-18.54	5.86	3	Horizontal	321	1.01	-
PK	4.80406G	45.89	74.00	-28.11	5.86	3	Horizontal	321	1.01	-

BT-LE(1Mbps)

2440MHz_TX

23/02/2019

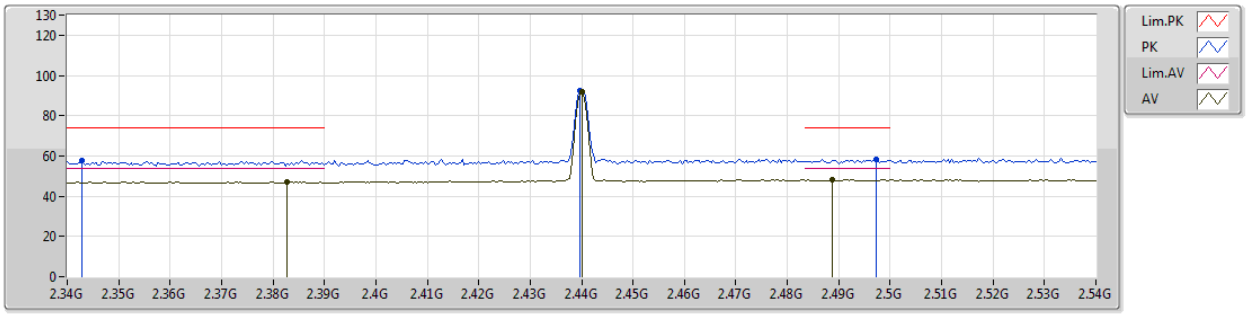


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.36G	47.34	54.00	-6.66	30.59	3	Vertical	277	2.46	-
AV	2.44G	97.95	Inf	-Inf	30.84	3	Vertical	277	2.46	-
AV	2.5G	48.07	54.00	-5.93	31.02	3	Vertical	277	2.46	-
PK	2.3748G	57.92	74.00	-16.08	30.64	3	Vertical	277	2.46	-
PK	2.4396G	98.57	Inf	-Inf	30.84	3	Vertical	277	2.46	-
PK	2.4968G	59.01	74.00	-14.99	31.00	3	Vertical	277	2.46	-

BT-LE(1Mbps)

2440MHz_TX

23/02/2019

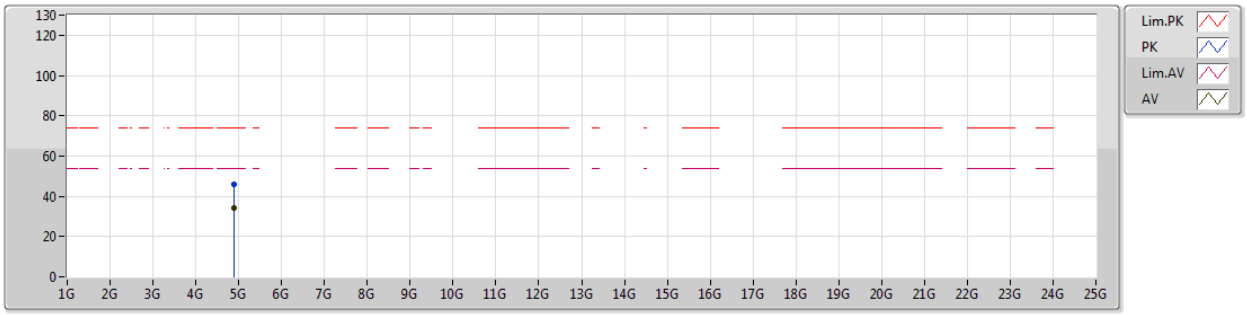


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3828G	47.18	54.00	-6.82	30.67	3	Horizontal	206	1.08	-
AV	2.44G	91.74	Inf	-Inf	30.84	3	Horizontal	206	1.08	-
AV	2.4888G	48.28	54.00	-5.72	30.98	3	Horizontal	206	1.08	-
PK	2.3428G	57.83	74.00	-16.17	30.54	3	Horizontal	206	1.08	-
PK	2.4396G	92.40	Inf	-Inf	30.84	3	Horizontal	206	1.08	-
PK	2.4972G	58.37	74.00	-15.63	31.00	3	Horizontal	206	1.08	-

BT-LE(1Mbps)

2440MHz_TX

23/02/2019

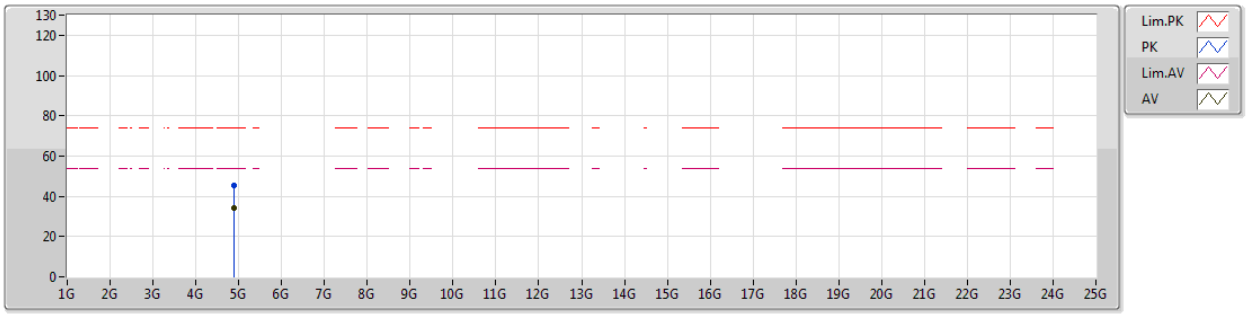


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.88222G	34.36	54.00	-19.64	6.02	3	Vertical	200	1.10	-
PK	4.8779G	45.98	74.00	-28.02	6.01	3	Vertical	200	1.10	-

BT-LE(1Mbps)

2440MHz_TX

23/02/2019

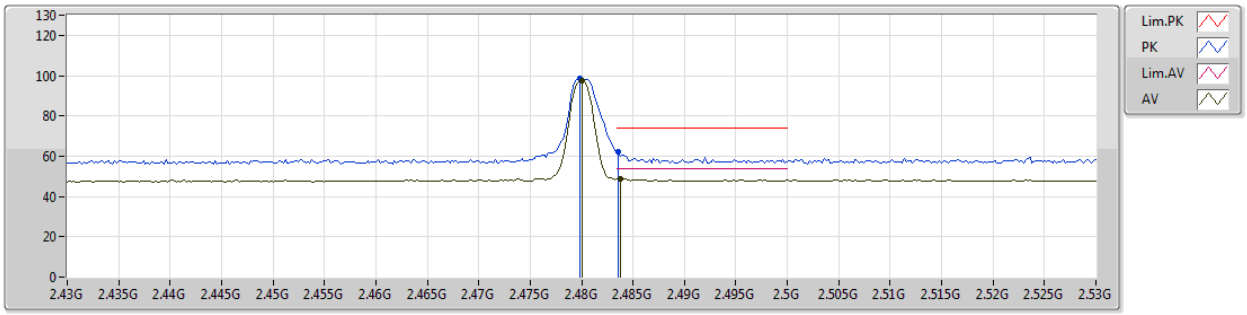


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.88016G	34.44	54.00	-19.56	6.01	3	Horizontal	146	1.51	-
PK	4.88084G	45.42	74.00	-28.58	6.01	3	Horizontal	146	1.51	-

BT-LE(1Mbps)

2480MHz_TX

23/02/2019

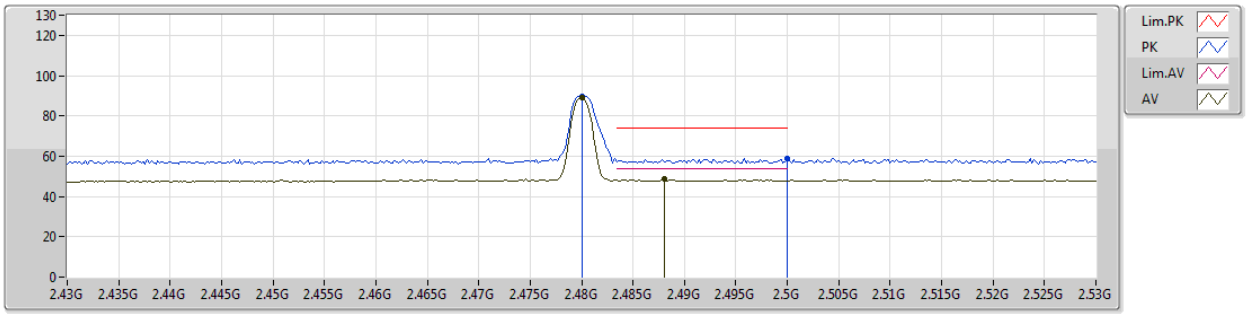


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.48G	97.76	Inf	-Inf	30.95	3	Vertical	277	2.66	-
AV	2.4838G	48.75	54.00	-5.25	30.97	3	Vertical	277	2.66	-
PK	2.4798G	98.37	Inf	-Inf	30.95	3	Vertical	277	2.66	-
PK	2.4836G	61.93	74.00	-12.07	30.97	3	Vertical	277	2.66	-

BT-LE(1Mbps)

2480MHz_TX

23/02/2019

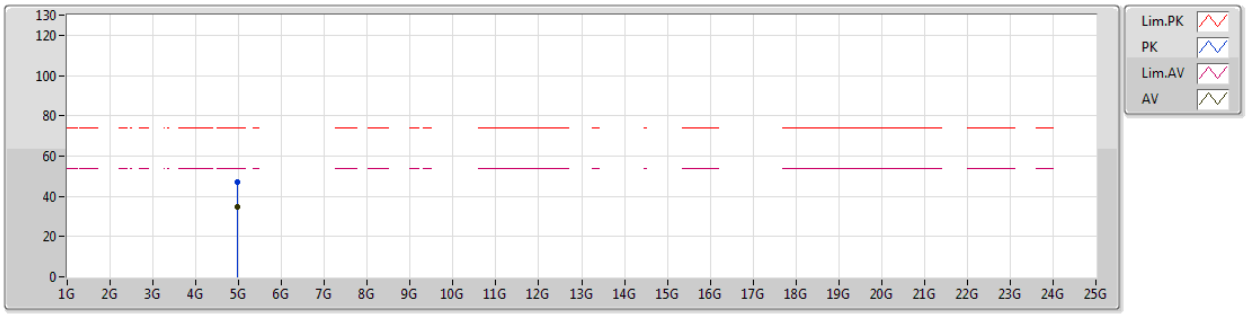


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.48G	89.19	Inf	-Inf	30.95	3	Horizontal	68	1.16	-
AV	2.488G	48.52	54.00	-5.48	30.98	3	Horizontal	68	1.16	-
PK	2.48G	89.91	Inf	-Inf	30.95	3	Horizontal	68	1.16	-
PK	2.5G	58.96	74.00	-15.04	31.02	3	Horizontal	68	1.16	-

BT-LE(1Mbps)

2480MHz_TX

23/02/2019

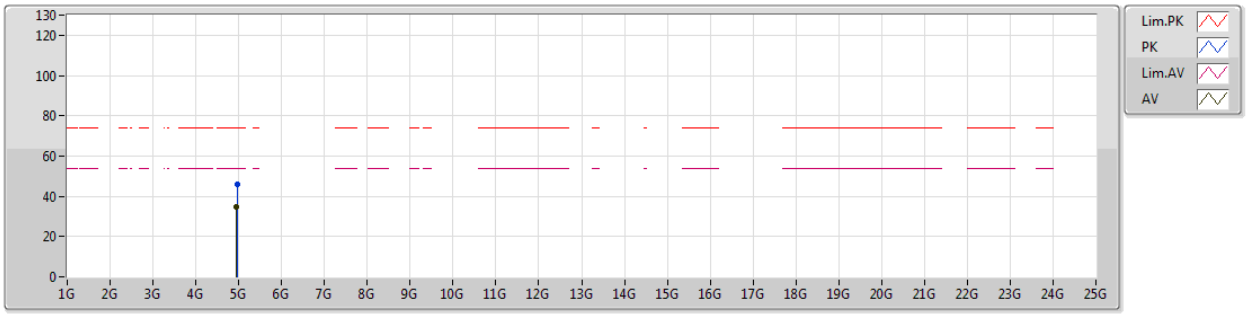


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.95706G	34.92	54.00	-19.08	6.17	3	Vertical	272	2.14	-
PK	4.9584G	46.87	74.00	-27.13	6.17	3	Vertical	272	2.14	-

BT-LE(1Mbps)

2480MHz_TX

23/02/2019

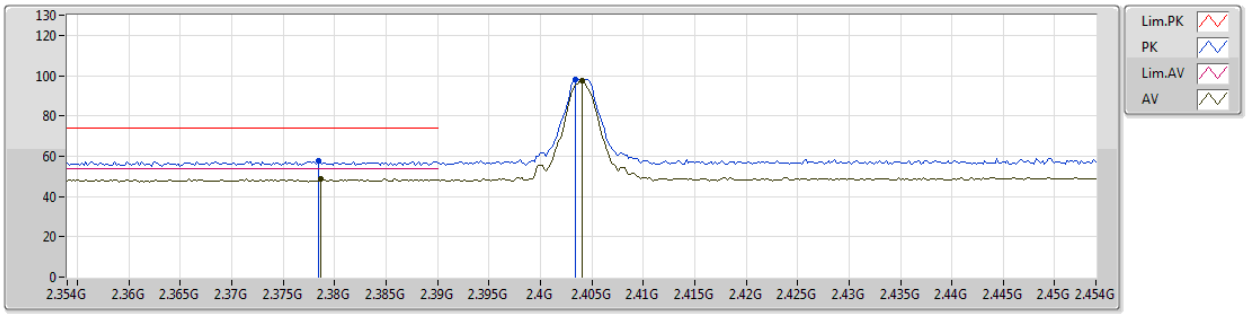


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.95604G	34.91	54.00	-19.09	6.17	3	Horizontal	312	1.14	-
PK	4.95846G	45.85	74.00	-28.15	6.17	3	Horizontal	312	1.14	-

BT-LE(2Mbps)

2404MHz_TX

23/02/2019

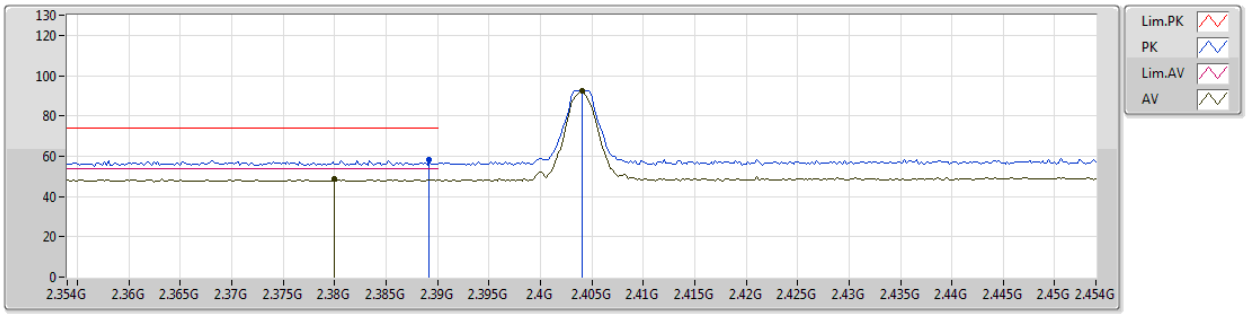


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3786G	48.74	54.00	-5.26	30.66	3	Vertical	255	1.12	-
AV	2.404G	97.58	Inf	-Inf	30.73	3	Vertical	255	1.12	-
PK	2.3784G	57.80	74.00	-16.20	30.65	3	Vertical	255	1.12	-
PK	2.4034G	98.09	Inf	-Inf	30.73	3	Vertical	255	1.12	-

BT-LE(2Mbps)

2404MHz_TX

23/02/2019

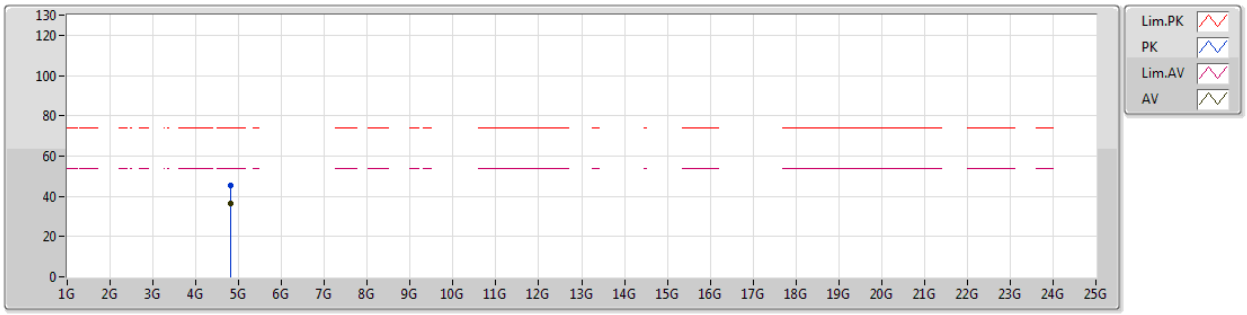


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.38G	48.54	54.00	-5.46	30.66	3	Horizontal	326	2.78	-
AV	2.404G	92.26	Inf	-Inf	30.73	3	Horizontal	326	2.78	-
PK	2.3892G	58.08	74.00	-15.92	30.68	3	Horizontal	326	2.78	-
PK	2.404G	92.67	Inf	-Inf	30.73	3	Horizontal	326	2.78	-

BT-LE(2Mbps)

2404MHz_TX

23/02/2019

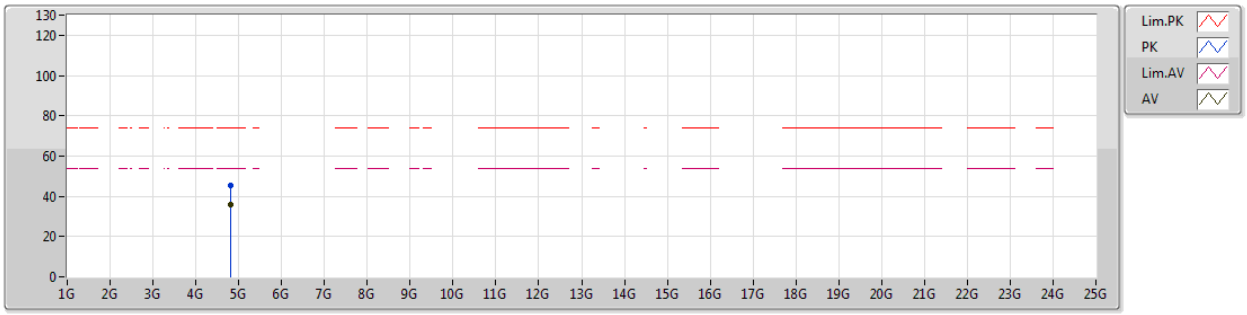


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.80328G	36.18	54.00	-17.82	5.85	3	Vertical	79	1.13	-
PK	4.80616G	45.58	74.00	-28.42	5.86	3	Vertical	79	1.13	-

BT-LE(2Mbps)

2404MHz_TX

23/02/2019

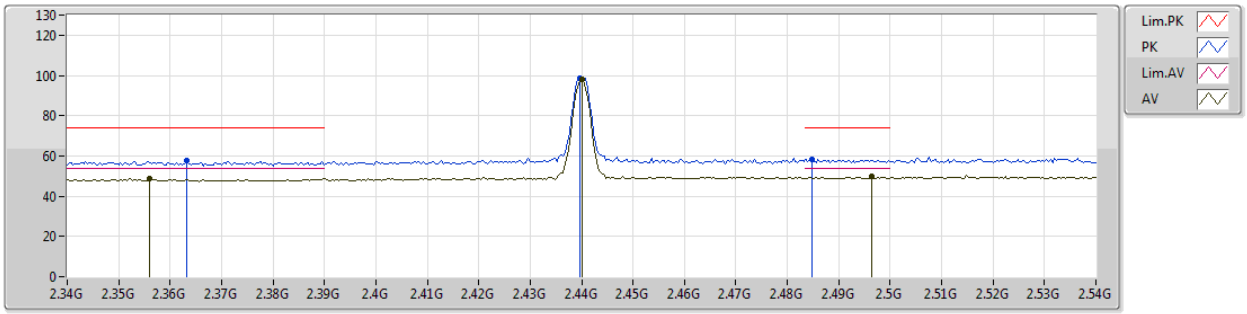


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.80472G	36.02	54.00	-17.98	5.86	3	Horizontal	323	1.02	-
PK	4.80734G	45.34	74.00	-28.66	5.86	3	Horizontal	323	1.02	-

BT-LE(2Mbps)

2440MHz_TX

23/02/2019

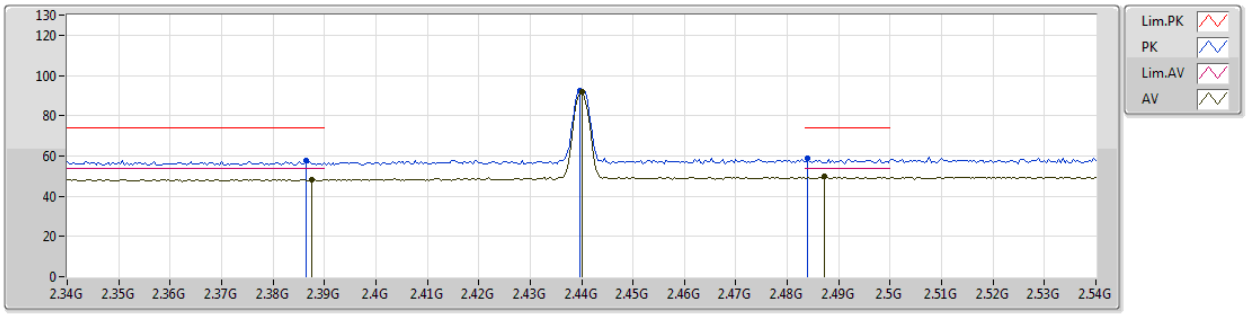


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.356G	48.90	54.00	-5.10	30.58	3	Vertical	278	2.46	-
AV	2.44G	98.33	Inf	-Inf	30.84	3	Vertical	278	2.46	-
AV	2.4964G	49.67	54.00	-4.33	31.00	3	Vertical	278	2.46	-
PK	2.3632G	57.53	74.00	-16.47	30.60	3	Vertical	278	2.46	-
PK	2.4396G	98.81	Inf	-Inf	30.84	3	Vertical	278	2.46	-
PK	2.4848G	58.48	74.00	-15.52	30.97	3	Vertical	278	2.46	-

BT-LE(2Mbps)

2440MHz_TX

23/02/2019

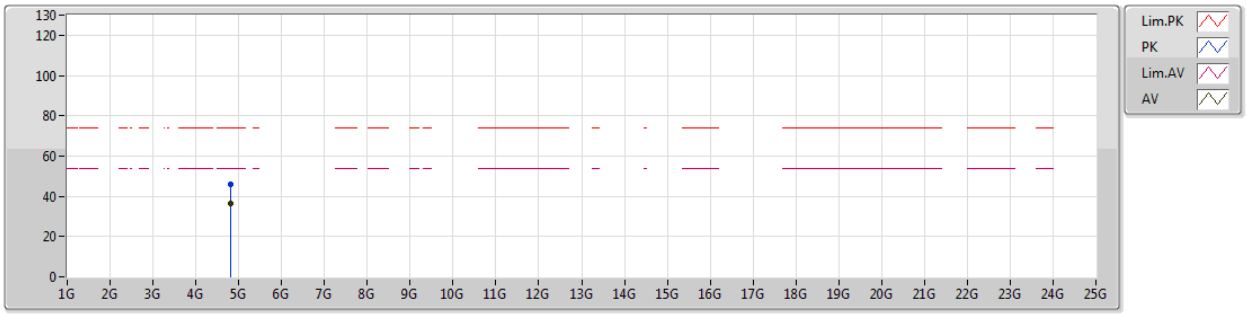


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.3876G	48.37	54.00	-5.63	30.68	3	Horizontal	204	1.08	-
AV	2.44G	91.72	Inf	-Inf	30.84	3	Horizontal	204	1.08	-
AV	2.4872G	49.65	54.00	-4.35	30.98	3	Horizontal	204	1.08	-
PK	2.3864G	57.63	74.00	-16.37	30.68	3	Horizontal	204	1.08	-
PK	2.4396G	92.26	Inf	-Inf	30.84	3	Horizontal	204	1.08	-
PK	2.484G	58.69	74.00	-15.31	30.97	3	Horizontal	204	1.08	-

BT-LE(2Mbps)

2440MHz_TX

23/02/2019

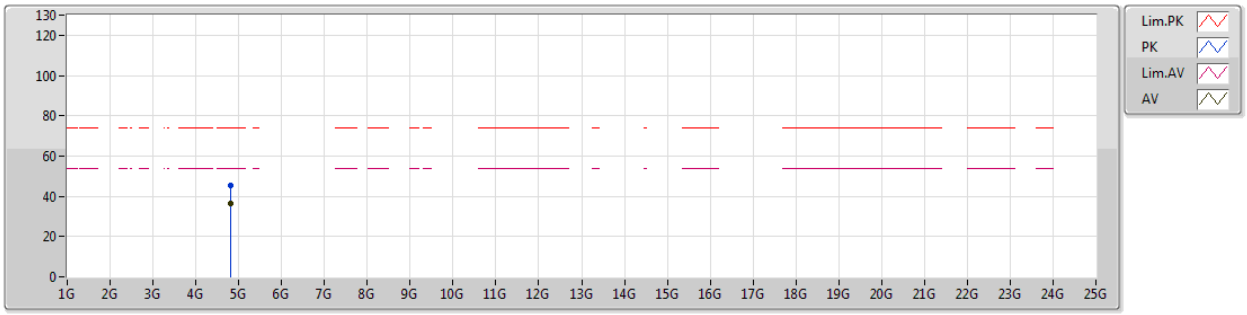


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.80362G	36.26	54.00	-17.74	5.86	3	Vertical	17	1.64	-
PK	4.80338G	45.91	74.00	-28.09	5.85	3	Vertical	17	1.64	-

BT-LE(2Mbps)

2440MHz_TX

23/02/2019

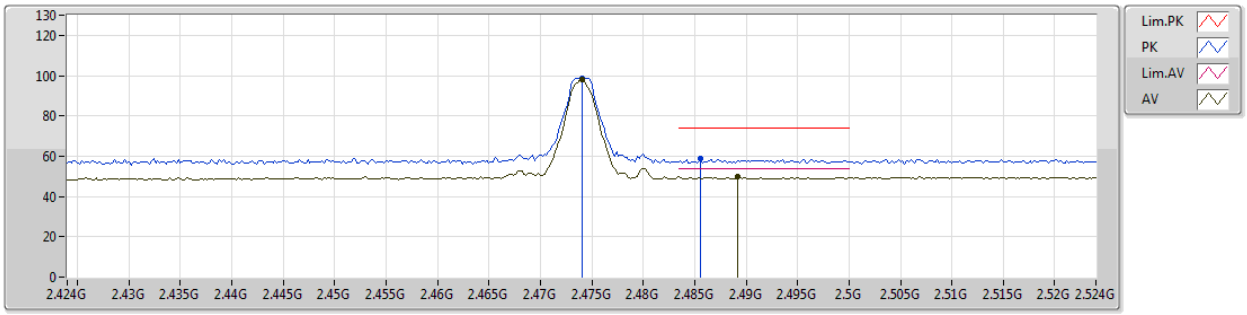


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.8129G	36.50	54.00	-17.50	5.88	3	Horizontal	261	1.45	-
PK	4.81144G	45.42	74.00	-28.58	5.88	3	Horizontal	261	1.45	-

BT-LE(2Mbps)

2474MHz_TX

23/02/2019

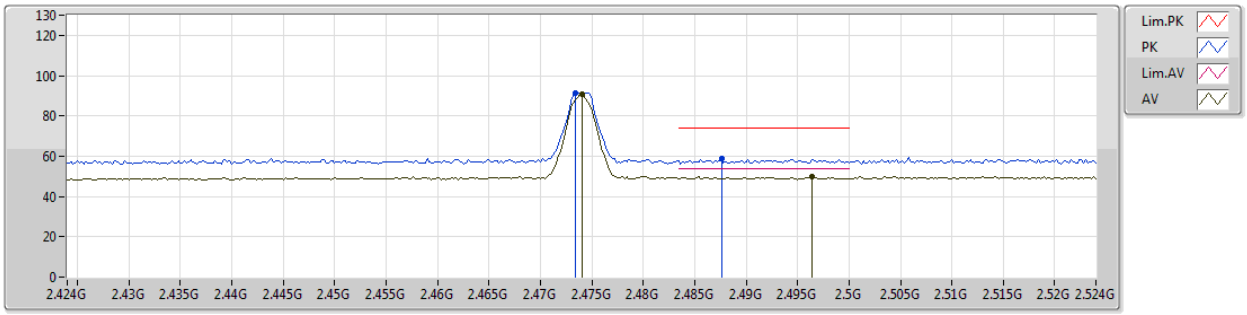


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.474G	98.21	Inf	-Inf	30.94	3	Vertical	276	2.67	-
AV	2.4892G	50.06	54.00	-3.94	30.98	3	Vertical	276	2.67	-
PK	2.474G	98.64	Inf	-Inf	30.94	3	Vertical	276	2.67	-
PK	2.4856G	58.92	74.00	-15.08	30.98	3	Vertical	276	2.67	-

BT-LE(2Mbps)

2474MHz_TX

23/02/2019

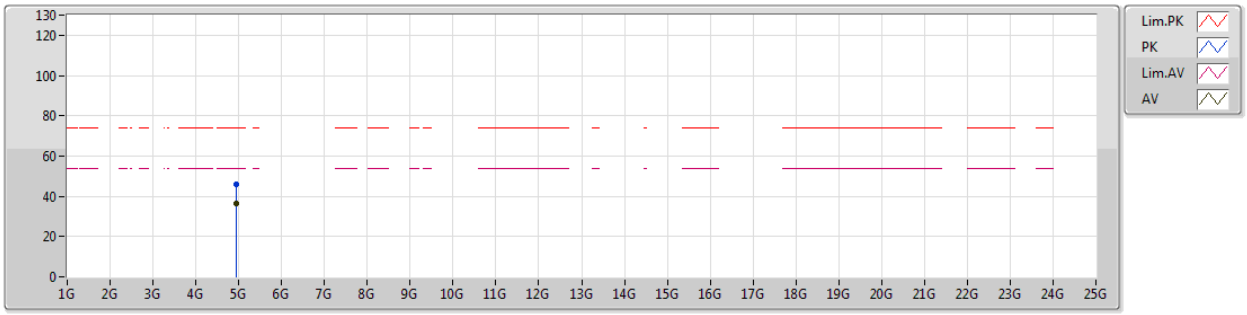


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.474G	90.79	Inf	-Inf	30.94	3	Horizontal	312	2.65	-
AV	2.4964G	49.67	54.00	-4.33	31.00	3	Horizontal	312	2.65	-
PK	2.4734G	91.27	Inf	-Inf	30.94	3	Horizontal	312	2.65	-
PK	2.4876G	58.56	74.00	-15.44	30.98	3	Horizontal	312	2.65	-

BT-LE(2Mbps)

2474MHz_TX

23/02/2019

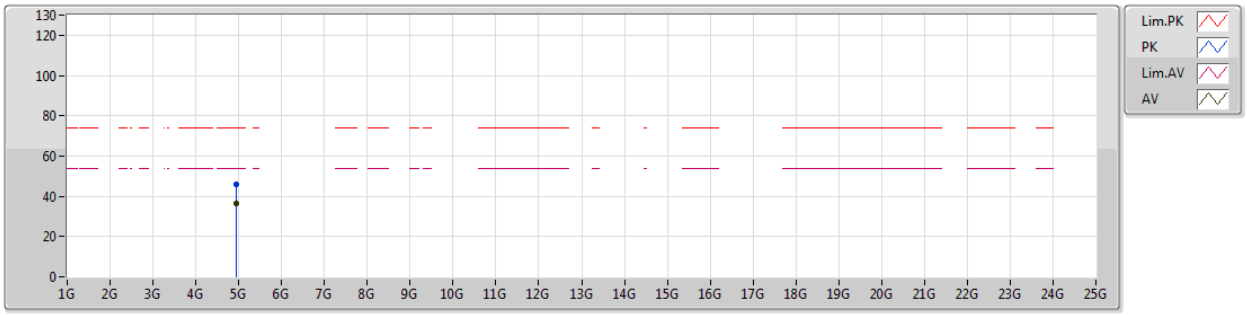


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.94794G	36.62	54.00	-17.38	6.14	3	Vertical	255	1.89	-
PK	4.94512G	46.20	74.00	-27.80	6.13	3	Vertical	255	1.89	-

BT-LE(2Mbps)

2474MHz_TX

23/02/2019



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.95202G	36.52	54.00	-17.48	6.16	3	Horizontal	175	1.31	-
PK	4.94388G	45.68	74.00	-28.32	6.13	3	Horizontal	175	1.31	-