NCC Test Report

Equipment	:	**Wireless Transceiver**
Brand Name	:	**Tile**
Model Name	:	**T7001**
Applicant	:	**Tile, Inc. 2121 S. El Camino Real Suite 900 San Mateo, CA 94403 USA**
Manufacturer	:	**Tile, Inc. 2121 S. El Camino Real Suite 900 San Mateo, CA 94403 USA**
Standard	:	**LP0002 Section 3.10 (2018-01-10)**

The product was received on Jun. 24, 2019, and testing was started from Jun. 28, 2019 and completed on Jun. 28, 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
TR961924AL	01	Initial issue of report	Jul. 05, 2019

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	3.10.1.4	Antenna Requirement	PASS	LP0002-2.2
3.1	2.3	AC Power-line Conducted Emissions	Not Required	LP0002-2.3
3.2	3.10.1.6	DTS Bandwidth	PASS	≥500kHz
3.3	3.10.1.2	Maximum Conducted Output Power	PASS	Power [dBm]:30
3.4	3.10.1.6	Power Spectral Density	PASS	PSD [dBm/3kHz]:8
3.5	3.10.1.5	Emissions in Non-restricted Frequency Bands	PASS	Non-Restricted Bands: >30 dBc
3.6	3.10.1.5	Emissions in Restricted Frequency Bands	PASS	Restricted Bands: LP0002-2.8
3.7	2.11	Receiver Radiated Unwanted Emissions	PASS	Restricted Bands: LP0002-2.8

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: Jenny Yang

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	Gain (dBi)
1	Tile	-	PCB Trace antenna	-	0.86

Note 1: The EUT has one antenna.

For BT function:

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

Only Ant. 1 (port 1) can be used as transmitting/receiving antenna.

1.1.3 EUT Information

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

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
BT-LE(1Mbps)	0.634	1.98	396.875u	3k

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:

- LP0002 (2018-01-10)
- ANSI C63.10-2013
- KDB 558074 D01 v05r02
- ANSI C63.4-2014

1.3 Testing Location Information

Testing Location						
☒	HWA YA	ADD	:	No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)		
		TEL	:	886-3-327-3456	FAX :	886-3-327-0973
☐	JHUBEI	ADD	:	No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)		
		TEL	:	886-3-656-9065	FAX :	886-3-656-9085

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Barry	24.2~24.7°C / 58.9~62.6%	28/Jun/2019
Radiated	03CH03-HY	Justin	18.9~22.2°C /51.5~52.3%	28/Jun/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	3V

2.2 Test Channel Mode

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

2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	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 Receiver Radiated Unwanted Emissions		
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/CRX		
1	Battery Mode		
Operating Mode > 1GHz	CTX/CRX		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
Worst Planes of EUT			V

2.4 Accessories and Support Equipment

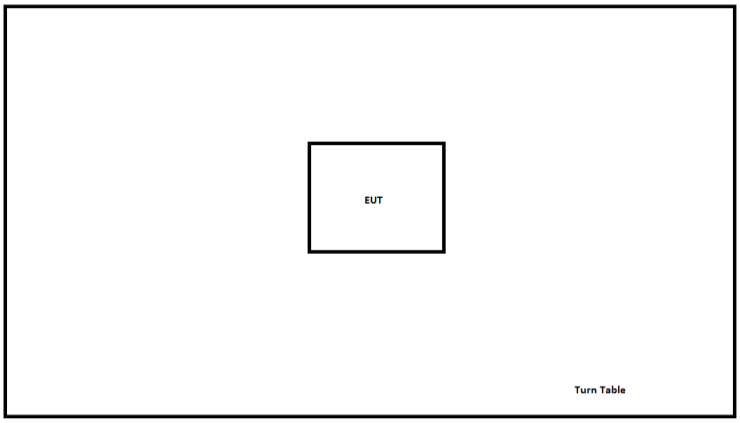
Accessories				
Battery	Brand Name	ULTRALIFE	Model Name	CP114951
	Power Rating	3.1Vdc, 380 mAh	Type	Coin Cell

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

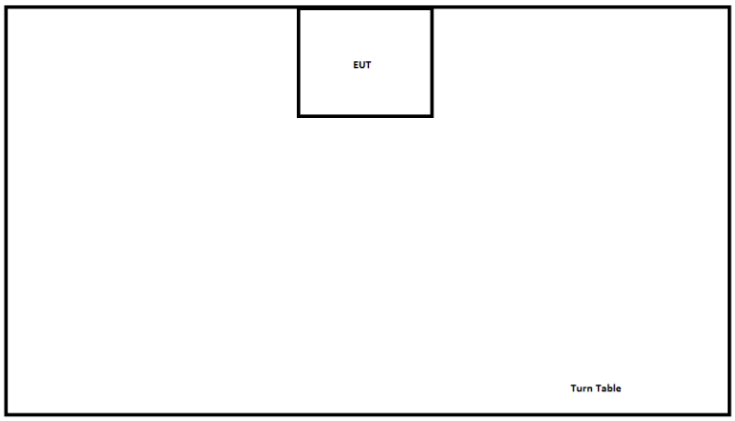
Support Equipment – RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	DC Power Supply	GW	GPR-351HD	-

2.5 Test Setup Diagram

Test Setup Diagram - Radiated Test - TX



Test Setup Diagram - Radiated Test - RX



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

3.1.2 Measuring Instruments

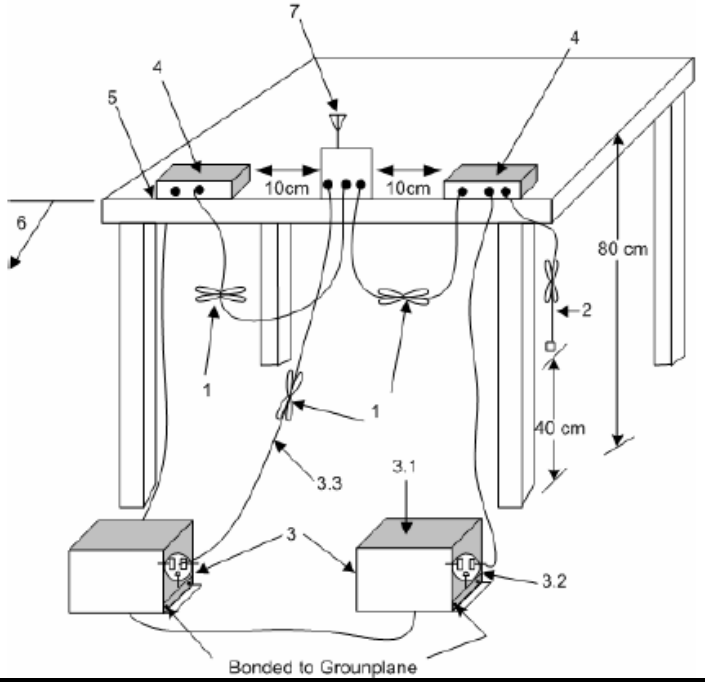
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

Please refer to LP0002-2.3 which states, “Measurements to demonstrate compliance with the conducted limits are not required for devices employ Battery for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines”.
Therefore, for this device, AC Power Line Conducted Emissions investigation is not required.

3.2 DTS Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
▪ 6 dB bandwidth ≥ 500 kHz.

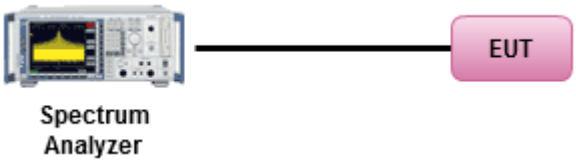
3.2.2 Measuring Instruments

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 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 A

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 B

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

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

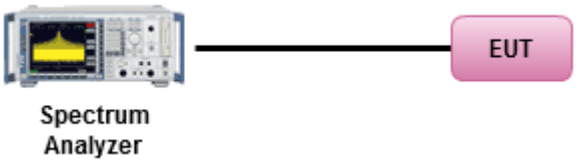
3.4.2 Measuring Instruments

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 C

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 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 level.	

3.5.2 Measuring Instruments

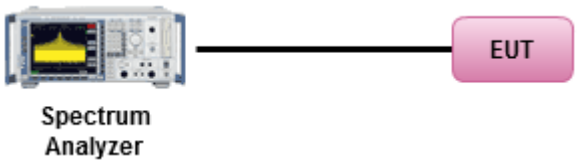
Refer a test equipment and calibration data table in this test report.

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 D

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.

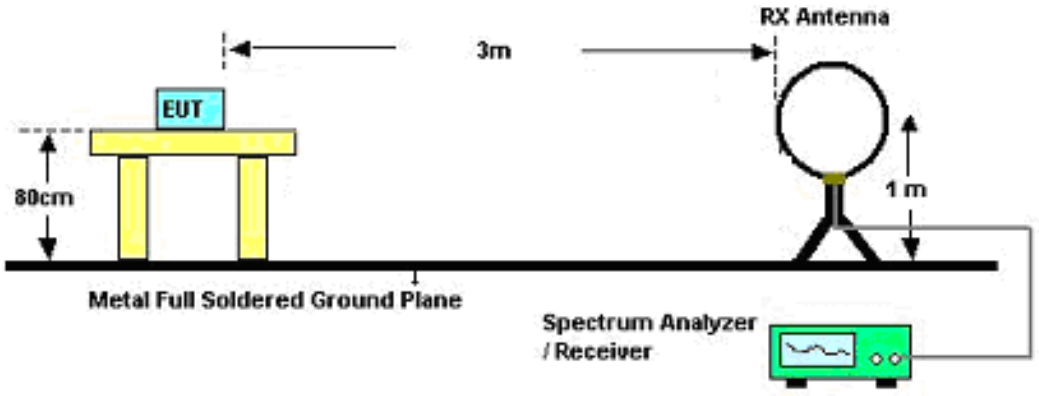
3.6.3 Test Procedures

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.
▪ 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.

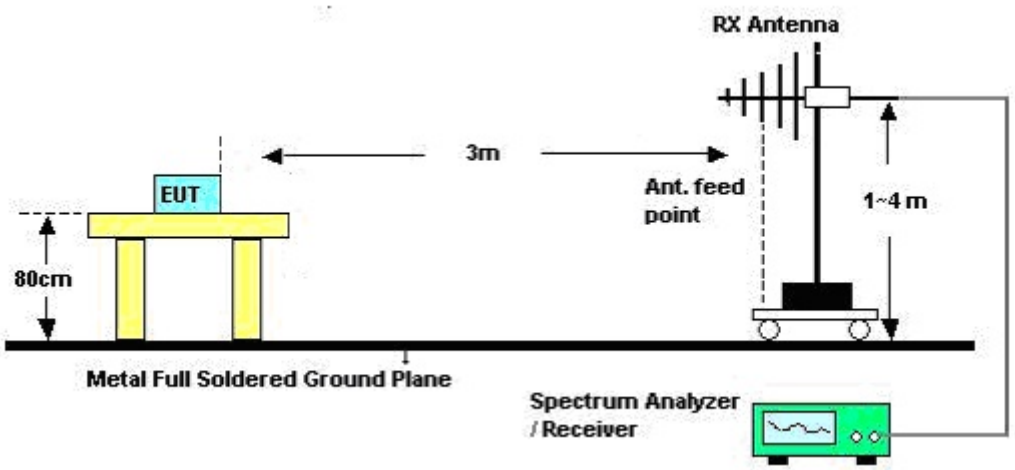
3.6.4 Test Setup

Emissions in Restricted Frequency Bands

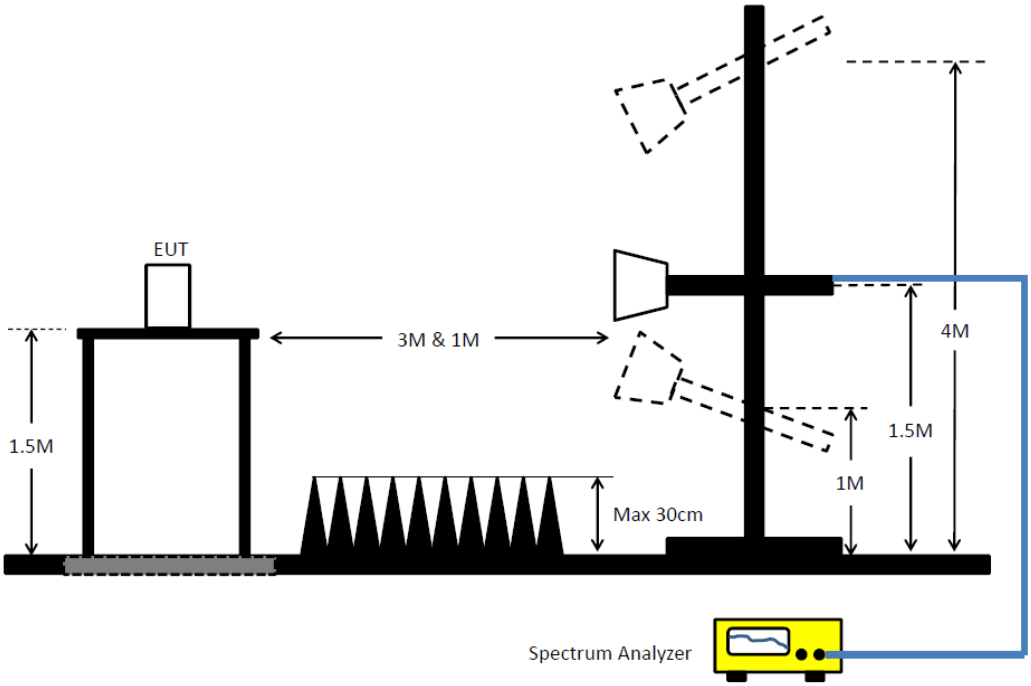
9kHz ~30MHz



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 E

3.7 Receiver Radiated Spurious Emissions

3.7.1 Receiver in Radiated Spurious Emissions Limit

Restricted Spurious 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.

3.7.2 Measuring Instruments

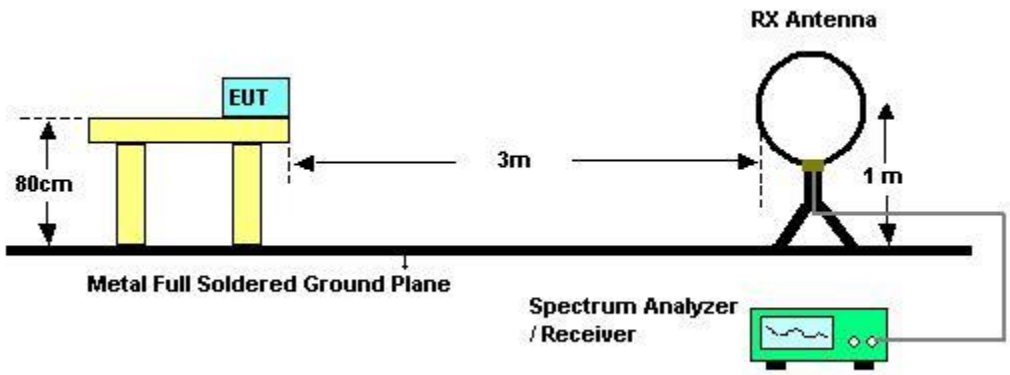
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

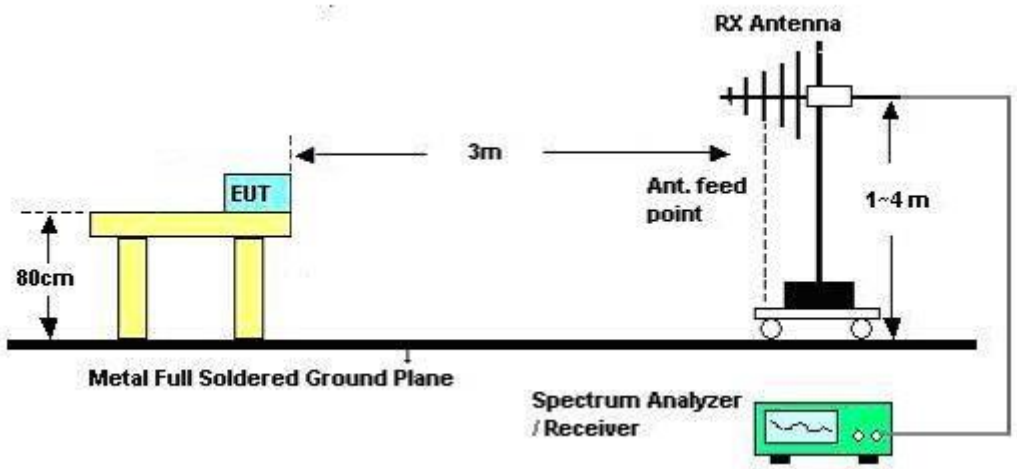
Test Method	
☒	The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.
☒	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).
☒	For radiated measurement, refer as ANSI C63.4, clause 8.3.
☒	Refer as ANSI C63.4, clause 8.3.1.1 and 8.3.2.1 for radiated emissions from below 30 MHz.
☒	Refer as ANSI C63.4, clause 8.3.1.1 and 8.3.2.1 for radiated emissions from 30 MHz-1 GHz. For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the QP-Limit so that the QP level does not need to be reported in addition.
☒	Refer as ANSI C63.4, clause 8.3.1.2 and 8.3.2.2 for radiated emissions from above 1 GHz. For the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
☒	All amplitude of spurious emissions that are attenuated by more than 30 dB below the permissible value has no need to be reported.

3.7.4 Test Setup

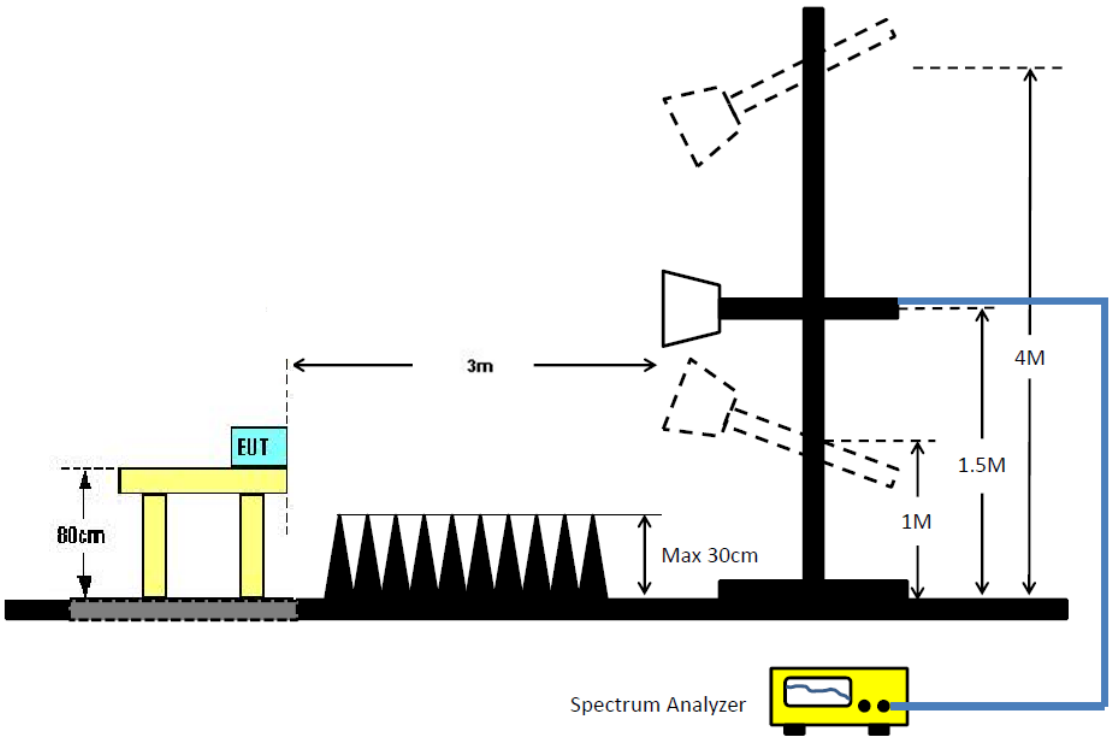
Receiver Spurious and Out of Band Emissions (9 kHz - 30 MHz)



Receiver Radiated Unwanted Emissions (below 1GHz)



Receiver Radiated Unwanted Emissions (above 1GHz)



3.7.5 Receiver Radiated Unwanted Emissions (Below 30MHz)

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

3.7.6 Test Result of Receiver Radiated Unwanted Emissions

Refer as Appendix F

4 Test Equipment and Calibration Data

Instrument for Conducted Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101013	10Hz~40GHz	13/Mar/2019	12/Mar/2020
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~18G	21/Mar/2019	20/Mar/2020
Cable 0.2m	HUBER	MY10711/4	RF Cable - 02	30MHz ~18G	21/Mar/2019	20/Mar/2020
Cable 0.5m	HUBER	MY10714/4	RF Cable – 05	30MHz~18G	21/Mar/2019	20/Mar/2020

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	22/Apr/2019	21/Apr/2020
EMI Test Receiver	R&S	ESR3	102052	9kHz ~ 3.6GHz	09/Apr/2019	08/Apr/2020
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
Spectrum Analyzer	Rohde & Schwarz	FSP40	100593	9KHz - 40GHz	27/Dec/2018	26/Dec/2019
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	22/Mar/2019	21/Mar/2020
RF CABLE 6m	HUBER+ SUHNER	SUOFLEX 104	SN 805801/4	1GHz ~ 40GHz	21/Mar/2019	20/Mar/2020
RF CABLE 7m	HUBER+ SUHNER	SUOFLEX 104	SN 805805/4	1GHz ~ 40GHz	01/May/2019	30/Apr/2020
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170221	15GHz ~ 40GHz	22/Mar/2019	21/Mar/2020
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1531	1GHz ~ 18GHz	09/Mar/ 2019	08/Mar/2020
Preamplifier	MITEQ	TTA1840-35-HG	1864481	18GHz ~ 40GHz	24/Aug/2018	23/Aug/2019

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)	743.75k	1.058M	1M06F1D	695k	1.048M

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

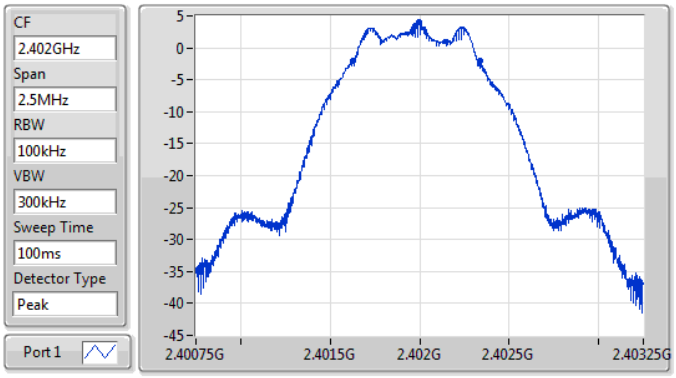
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	708.75k	1.049M
2440MHz	Pass	500k	743.75k	1.058M
2480MHz	Pass	500k	695k	1.048M

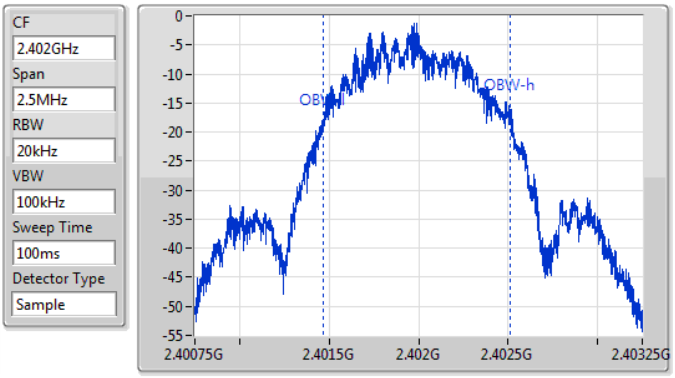
Port X-N dB = Port **X** 6dB down bandwidth; **Port X-OBW** = Port **X** 99% occupied bandwidth;

BT-LE(1Mbps) EBW

2402MHz

28/06/2019



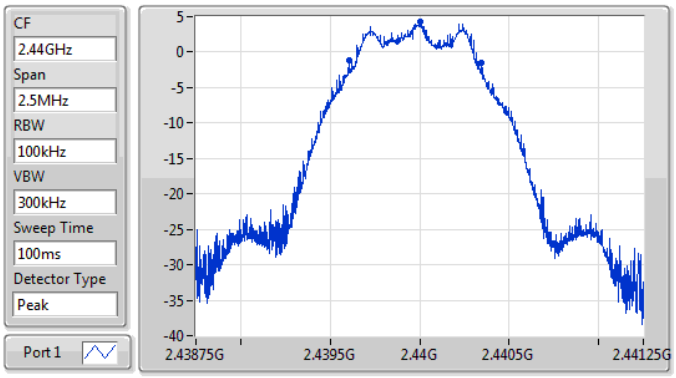


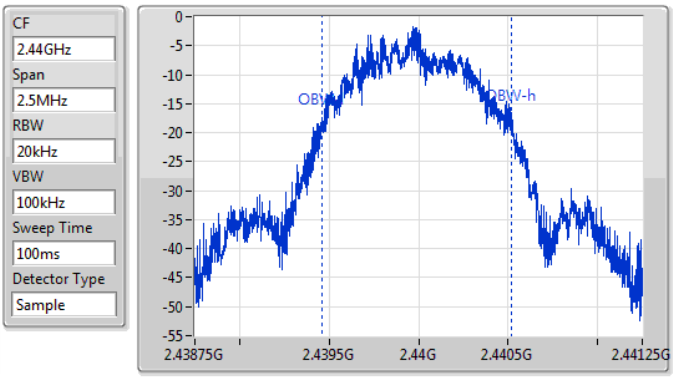
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
708.75k	2.401626G	2.402335G	1.049M	2.401465G	2.402515G	500k	1

BT-LE(1Mbps) EBW

2440MHz

28/06/2019



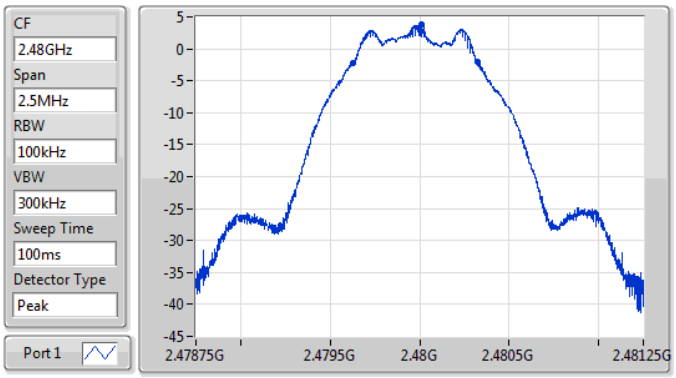


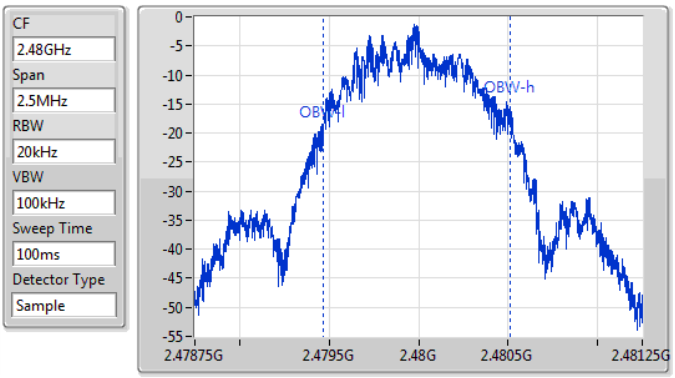
6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
743.75k	2.439604G	2.440348G	1.058M	2.439458G	2.440516G	500k	1

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

2480MHz

28/06/2019





6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
695k	2.47963G	2.480325G	1.048M	2.479467G	2.480515G	500k	1

Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	4.92	0.00310

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.86	4.92	30.00
2440MHz	Pass	0.86	4.92	30.00
2480MHz	Pass	0.86	4.79	30.00

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

Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	4.09	0.00256

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.86	3.98	30.00
2440MHz	Pass	0.86	4.09	30.00
2480MHz	Pass	0.86	3.77	30.00

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

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-12.73

RBW=3 kHz.

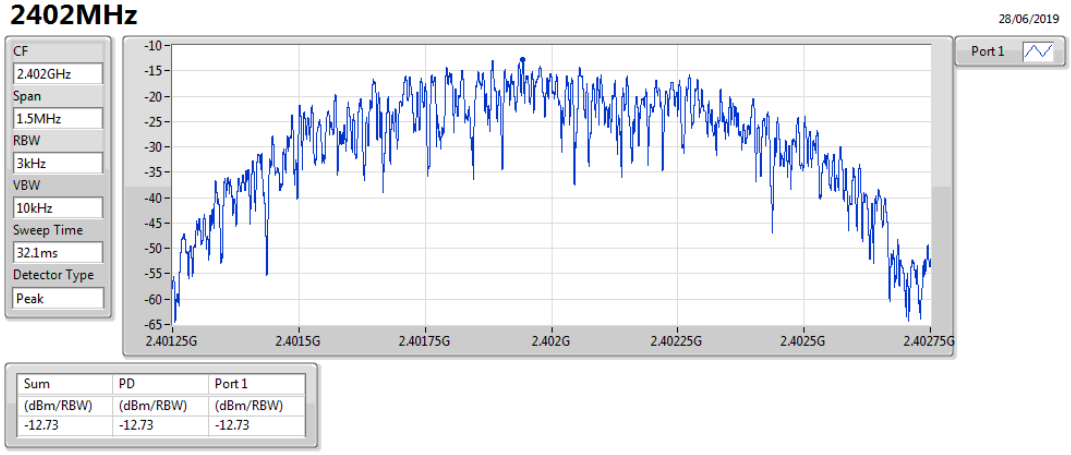
Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	0.86	-12.73	8.00
2440MHz	Pass	0.86	-12.74	8.00
2480MHz	Pass	0.86	-12.98	8.00

DG = Directional Gain; RBW=3 kHz;
PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

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

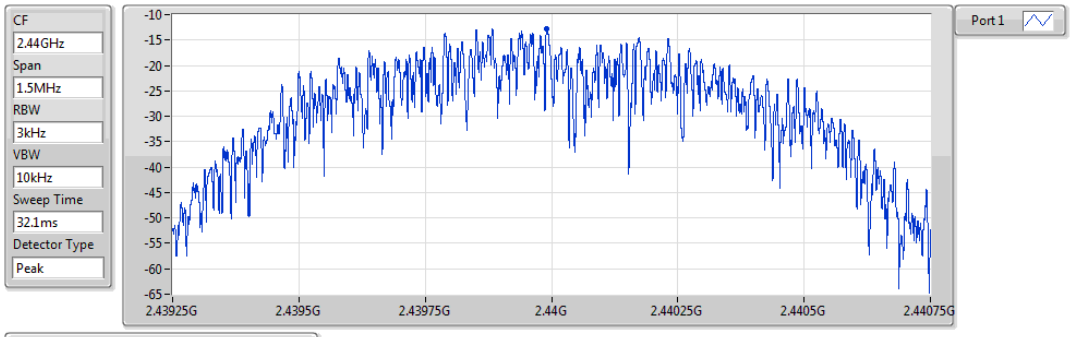
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.73	-12.73	-12.73

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

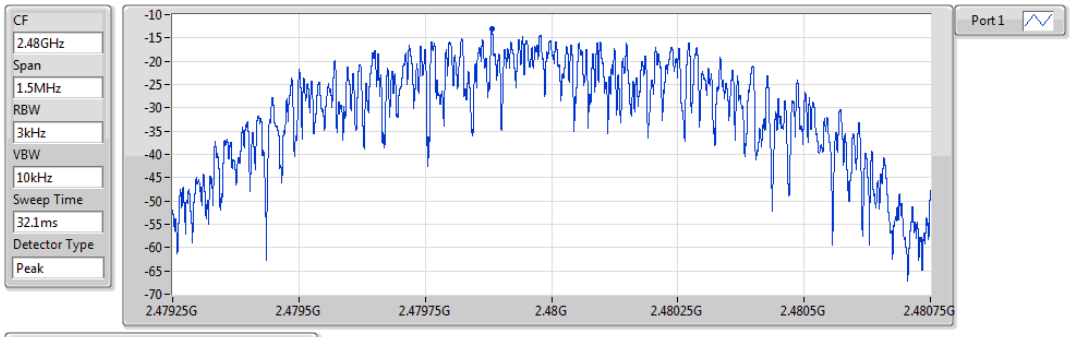
2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.74	-12.74	-12.74

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

2480MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-12.98	-12.98	-12.98

Summary

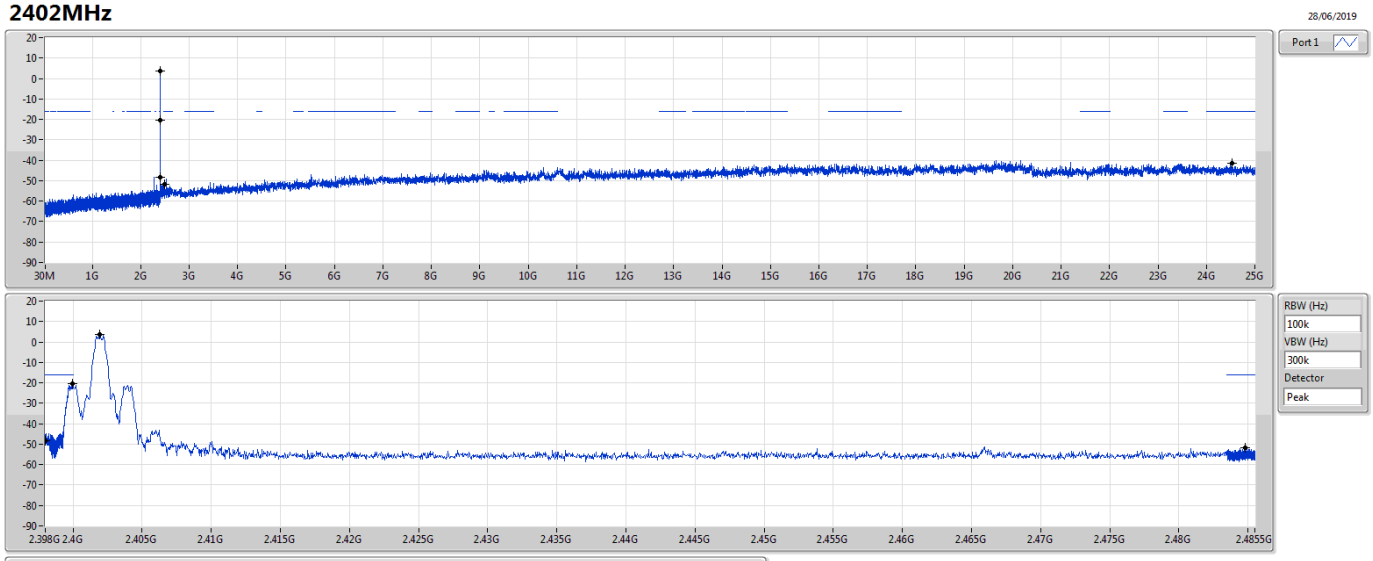
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
BT-LE(1Mbps)	Pass	2.40196G	3.77	-16.23	2.398G	-48.20	2.39999G	-20.36	2.48481G	-51.63	24.52157G	-41.62	1

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	2.40196G	3.77	-16.23	2.398G	-48.20	2.39999G	-20.36	2.48481G	-51.63	24.52157G	-41.62	1
2440MHz	Pass	2.44G	3.83	-16.17	2.11088G	-54.36	2.39911G	-53.00	2.48386G	-51.87	24.11349G	-41.07	1
2480MHz	Pass	2.47999G	3.67	-16.33	1.94364G	-54.42	2.39881G	-52.40	2.484G	-41.33	24.00092G	-40.90	1

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

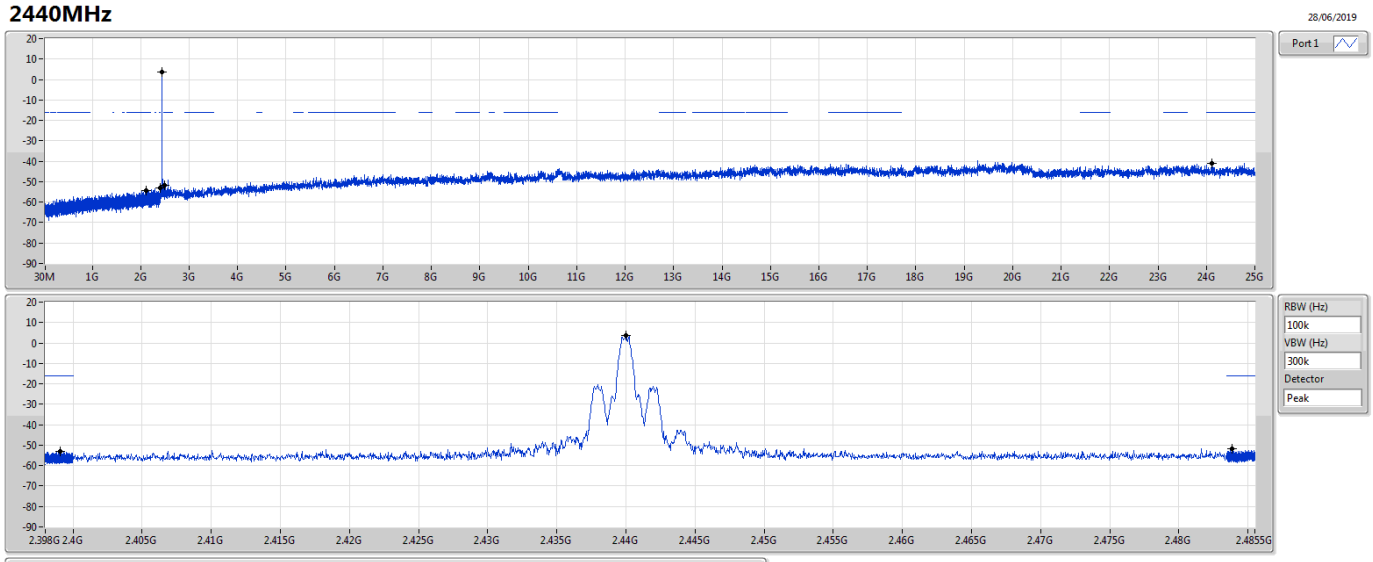
2402MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.40196G	3.77	-16.23	2.398G	-48.20	2.39999G	-20.36	2.48481G	-51.63	24.52157G	-41.62	1

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

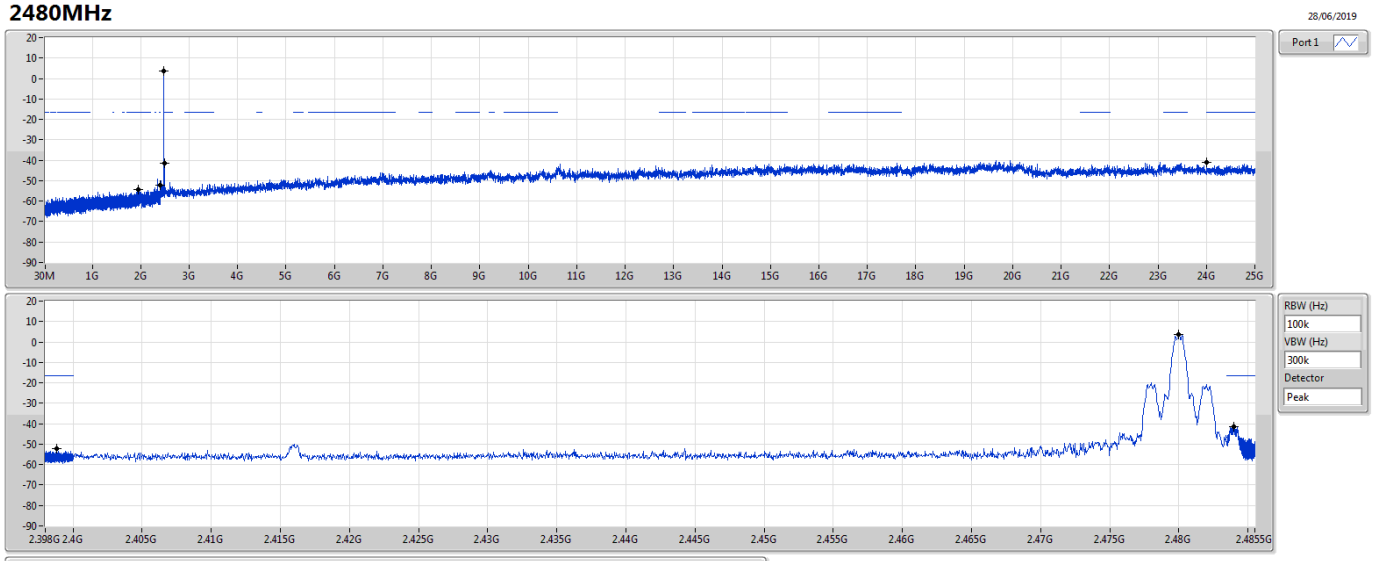
2440MHz



Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.44G	3.83	-16.17	2.11088G	-54.36	2.39911G	-53.00	2.48386G	-51.87	24.11349G	-41.07	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
2.47999G	3.67	-16.33	1.94364G	-54.42	2.39881G	-52.40	2.484G	-41.33	24.00092G	-40.90	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	668.26M	28.97	46.00	-17.03	0.50	3	Horizontal	0	1.00	-

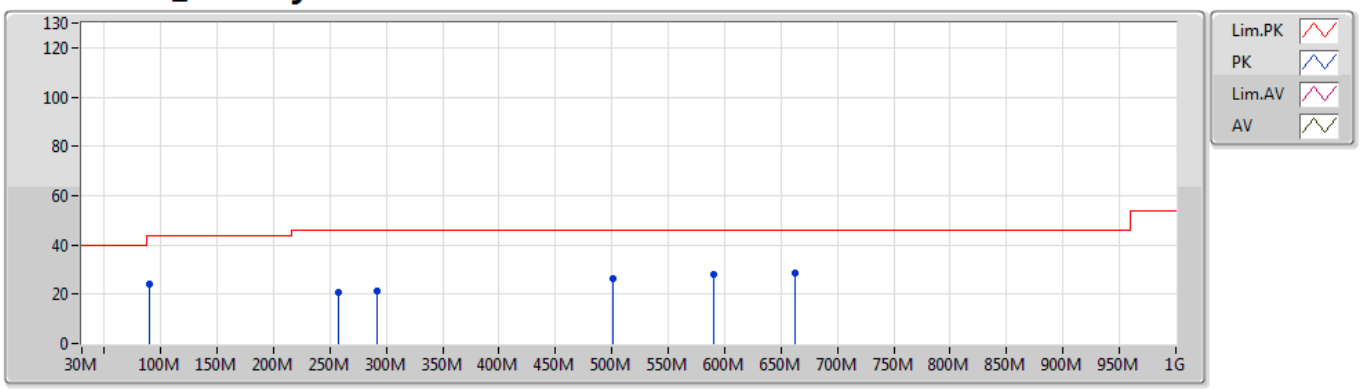
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2440MHz_Battery	Pass	PK	90.14M	24.11	43.50	-19.39	-12.12	3	Vertical	360	1.00	-
2440MHz_Battery	Pass	PK	256.98M	20.96	46.00	-25.04	-5.93	3	Vertical	360	1.00	-
2440MHz_Battery	Pass	PK	291.9M	21.35	46.00	-24.65	-5.82	3	Vertical	360	1.00	-
2440MHz_Battery	Pass	PK	501.42M	26.53	46.00	-19.47	-1.52	3	Vertical	360	1.00	-
2440MHz_Battery	Pass	PK	590.66M	28.25	46.00	-17.75	-0.21	3	Vertical	360	1.00	-
2440MHz_Battery	Pass	PK	662.44M	28.74	46.00	-17.26	0.53	3	Vertical	360	1.00	-
2440MHz_Battery	Pass	PK	90.14M	19.99	43.50	-23.51	-12.12	3	Horizontal	0	1.00	-
2440MHz_Battery	Pass	PK	107.6M	19.18	43.50	-24.32	-9.02	3	Horizontal	0	1.00	-
2440MHz_Battery	Pass	PK	264.74M	21.01	46.00	-24.99	-5.81	3	Horizontal	0	1.00	-
2440MHz_Battery	Pass	PK	418M	24.98	46.00	-21.02	-2.30	3	Horizontal	0	1.00	-
2440MHz_Battery	Pass	PK	592.6M	27.95	46.00	-18.05	-0.18	3	Horizontal	0	1.00	-
2440MHz_Battery	Pass	PK	668.26M	28.97	46.00	-17.03	0.50	3	Horizontal	0	1.00	-

BT-LE(1Mbps)

28/06/2019

2440MHz_Battery

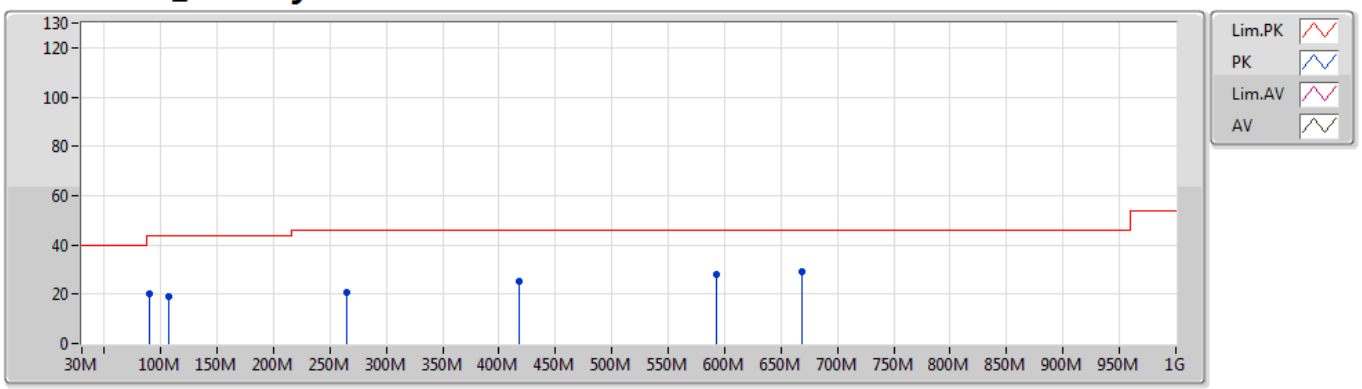


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	90.14M	24.11	43.50	-19.39	-12.12	3	Vertical	360	1.00	-	36.23	13.84	1.43	27.39
PK	256.98M	20.96	46.00	-25.04	-5.93	3	Vertical	360	1.00	-	26.89	18.31	2.51	26.75
PK	291.9M	21.35	46.00	-24.65	-5.82	3	Vertical	360	1.00	-	27.17	18.13	2.71	26.66
PK	501.42M	26.53	46.00	-19.47	-1.52	3	Vertical	360	1.00	-	28.05	22.68	3.61	27.81
PK	590.66M	28.25	46.00	-17.75	-0.21	3	Vertical	360	1.00	-	28.46	23.71	4.02	27.94
PK	662.44M	28.74	46.00	-17.26	0.53	3	Vertical	360	1.00	-	28.21	24.21	4.23	27.91

BT-LE(1Mbps)

28/06/2019

2440MHz_Battery



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	90.14M	19.99	43.50	-23.51	-12.12	3	Horizontal	0	1.00	-	32.11	13.84	1.43	27.39
PK	107.6M	19.18	43.50	-24.32	-9.02	3	Horizontal	0	1.00	-	28.20	16.72	1.58	27.32
PK	264.74M	21.01	46.00	-24.99	-5.81	3	Horizontal	0	1.00	-	26.82	18.36	2.56	26.73
PK	418M	24.98	46.00	-21.02	-2.30	3	Horizontal	0	1.00	-	27.28	21.83	3.25	27.38
PK	592.6M	27.95	46.00	-18.05	-0.18	3	Horizontal	0	1.00	-	28.13	23.72	4.04	27.94
PK	668.26M	28.97	46.00	-17.03	0.50	3	Horizontal	0	1.00	-	28.47	24.17	4.24	27.91

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	52.92	54.00	-1.08	31.41	3	Horizontal	59	1.08	-

Result

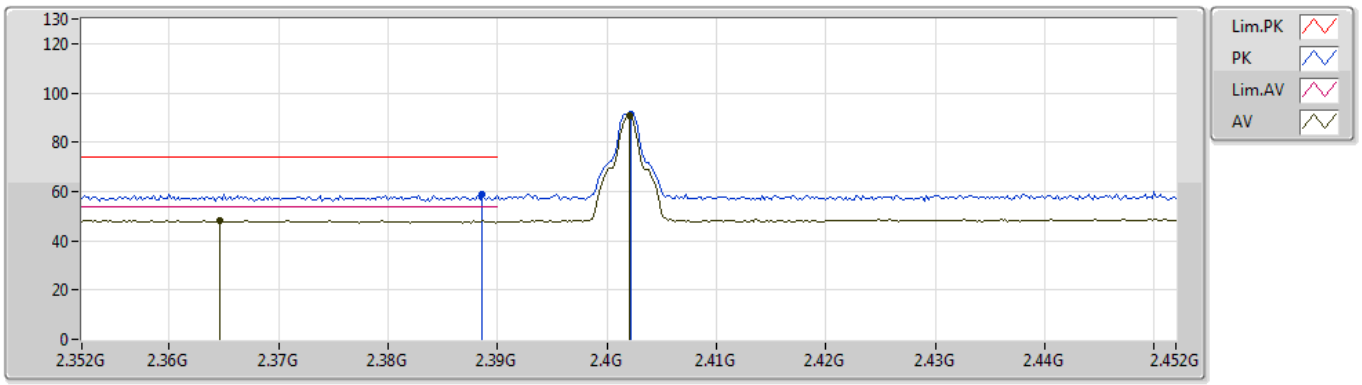
Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz_TX	Pass	AV	2.3646G	48.41	54.00	-5.59	31.61	3	Vertical	102	2.97	-
2402MHz_TX	Pass	AV	2.402G	90.62	Inf	-Inf	31.51	3	Vertical	102	2.97	-
2402MHz_TX	Pass	PK	2.3886G	58.75	74.00	-15.25	31.55	3	Vertical	102	2.97	-
2402MHz_TX	Pass	PK	2.4022G	91.24	Inf	-Inf	31.51	3	Vertical	102	2.97	-
2402MHz_TX	Pass	AV	2.3616G	48.42	54.00	-5.58	31.62	3	Horizontal	61	1.31	-
2402MHz_TX	Pass	AV	2.402G	99.60	Inf	-Inf	31.51	3	Horizontal	61	1.31	-
2402MHz_TX	Pass	PK	2.3706G	59.24	74.00	-14.76	31.60	3	Horizontal	61	1.31	-
2402MHz_TX	Pass	PK	2.4022G	100.24	Inf	-Inf	31.51	3	Horizontal	61	1.31	-
2402MHz_TX	Pass	AV	4.80388G	31.84	54.00	-22.16	2.76	3	Vertical	317	2.95	-
2402MHz_TX	Pass	PK	4.7896G	41.52	74.00	-32.48	2.75	3	Vertical	317	2.95	-
2402MHz_TX	Pass	AV	4.80424G	35.58	54.00	-18.42	2.76	3	Horizontal	333	1.03	-
2402MHz_TX	Pass	PK	4.80364G	44.23	74.00	-29.77	2.76	3	Horizontal	333	1.03	-
2440MHz_TX	Pass	AV	2.34G	48.40	54.00	-5.60	31.69	3	Vertical	267	2.94	-
2440MHz_TX	Pass	AV	2.44G	92.99	Inf	-Inf	31.46	3	Vertical	267	2.94	-
2440MHz_TX	Pass	AV	2.4976G	48.74	54.00	-5.26	31.40	3	Vertical	267	2.94	-
2440MHz_TX	Pass	PK	2.36G	58.85	74.00	-15.15	31.63	3	Vertical	267	2.94	-
2440MHz_TX	Pass	PK	2.4396G	93.62	Inf	-Inf	31.46	3	Vertical	267	2.94	-
2440MHz_TX	Pass	PK	2.4944G	59.13	74.00	-14.87	31.40	3	Vertical	267	2.94	-
2440MHz_TX	Pass	AV	2.3756G	48.62	54.00	-5.38	31.58	3	Horizontal	54	1.07	-
2440MHz_TX	Pass	AV	2.44G	99.27	Inf	-Inf	31.46	3	Horizontal	54	1.07	-
2440MHz_TX	Pass	AV	2.4852G	48.76	54.00	-5.24	31.42	3	Horizontal	54	1.07	-
2440MHz_TX	Pass	PK	2.3616G	59.26	74.00	-14.74	31.62	3	Horizontal	54	1.07	-
2440MHz_TX	Pass	PK	2.4396G	99.88	Inf	-Inf	31.46	3	Horizontal	54	1.07	-
2440MHz_TX	Pass	PK	2.4904G	58.69	74.00	-15.31	31.41	3	Horizontal	54	1.07	-
2440MHz_TX	Pass	AV	4.87982G	32.15	54.00	-21.85	2.89	3	Vertical	360	2.55	-
2440MHz_TX	Pass	AV	7.3191G	38.71	54.00	-15.29	9.37	3	Vertical	280	2.69	-
2440MHz_TX	Pass	PK	4.89398G	42.30	74.00	-31.70	2.91	3	Vertical	360	2.55	-
2440MHz_TX	Pass	PK	7.32018G	48.61	74.00	-25.39	9.36	3	Vertical	280	2.69	-
2440MHz_TX	Pass	AV	4.87964G	35.25	54.00	-18.75	2.89	3	Horizontal	154	1.25	-
2440MHz_TX	Pass	AV	7.3194G	41.13	54.00	-12.87	9.37	3	Horizontal	169	1.19	-
2440MHz_TX	Pass	PK	4.87928G	43.30	74.00	-30.70	2.89	3	Horizontal	154	1.25	-
2440MHz_TX	Pass	PK	7.3194G	49.22	74.00	-24.78	9.37	3	Horizontal	169	1.19	-
2480MHz_TX	Pass	AV	2.48G	88.44	Inf	-Inf	31.42	3	Vertical	128	2.87	-
2480MHz_TX	Pass	AV	2.4835G	48.75	54.00	-5.25	31.41	3	Vertical	128	2.87	-
2480MHz_TX	Pass	PK	2.4796G	89.42	Inf	-Inf	31.42	3	Vertical	128	2.87	-
2480MHz_TX	Pass	PK	2.4844G	59.36	74.00	-14.64	31.42	3	Vertical	128	2.87	-
2480MHz_TX	Pass	AV	2.4798G	98.35	Inf	-Inf	31.42	3	Horizontal	59	1.08	-
2480MHz_TX	Pass	AV	2.4835G	52.92	54.00	-1.08	31.41	3	Horizontal	59	1.08	-
2480MHz_TX	Pass	PK	2.4802G	99.20	Inf	-Inf	31.42	3	Horizontal	59	1.08	-
2480MHz_TX	Pass	PK	2.4835G	64.39	74.00	-9.61	31.41	3	Horizontal	59	1.08	-
2480MHz_TX	Pass	AV	4.96012G	31.83	54.00	-22.17	3.15	3	Vertical	0	2.84	-
2480MHz_TX	Pass	AV	7.43928G	37.52	54.00	-16.48	9.06	3	Vertical	279	2.60	-
2480MHz_TX	Pass	PK	4.951G	42.07	74.00	-31.93	3.11	3	Vertical	0	2.84	-
2480MHz_TX	Pass	PK	7.43922G	47.57	74.00	-26.43	9.06	3	Vertical	279	2.60	-
2480MHz_TX	Pass	AV	4.95946G	33.66	54.00	-20.34	3.15	3	Horizontal	142	1.14	-
2480MHz_TX	Pass	AV	7.4391G	42.13	54.00	-11.87	9.06	3	Horizontal	157	1.05	-
2480MHz_TX	Pass	PK	4.96G	44.11	74.00	-29.89	3.15	3	Horizontal	142	1.14	-

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2480MHz_TX	Pass	PK	7.4406G	50.44	74.00	-23.56	9.06	3	Horizontal	157	1.05	-

BT-LE(1Mbps)

2402MHz_TX

28/06/2019

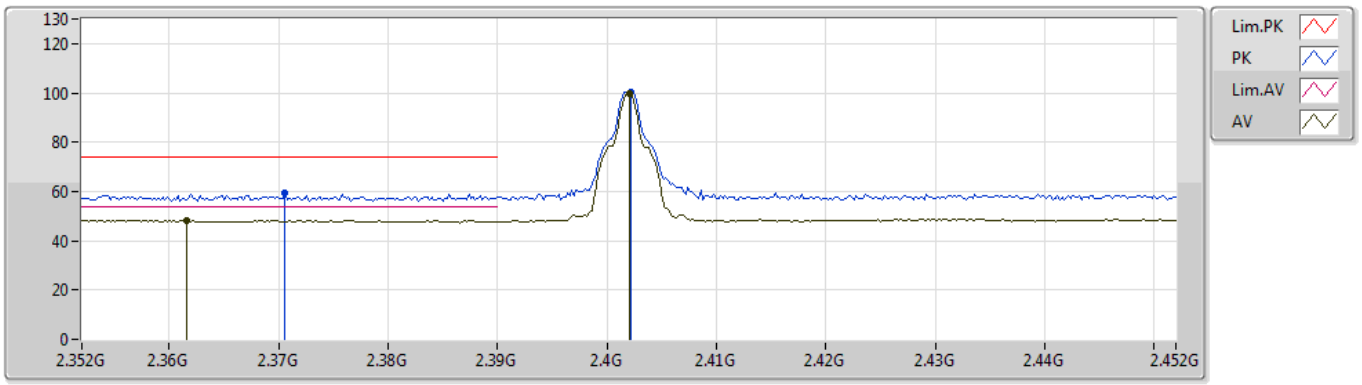


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	2.3646G	48.41	54.00	-5.59	31.61	3	Vertical	102	2.97	-	16.80	27.64	3.97	-
AV	2.402G	90.62	Inf	-Inf	31.51	3	Vertical	102	2.97	-	59.11	27.50	4.01	-
PK	2.3886G	58.75	74.00	-15.25	31.55	3	Vertical	102	2.97	-	27.20	27.55	4.00	-
PK	2.4022G	91.24	Inf	-Inf	31.51	3	Vertical	102	2.97	-	59.73	27.50	4.01	-

BT-LE(1Mbps)

2402MHz_TX

28/06/2019

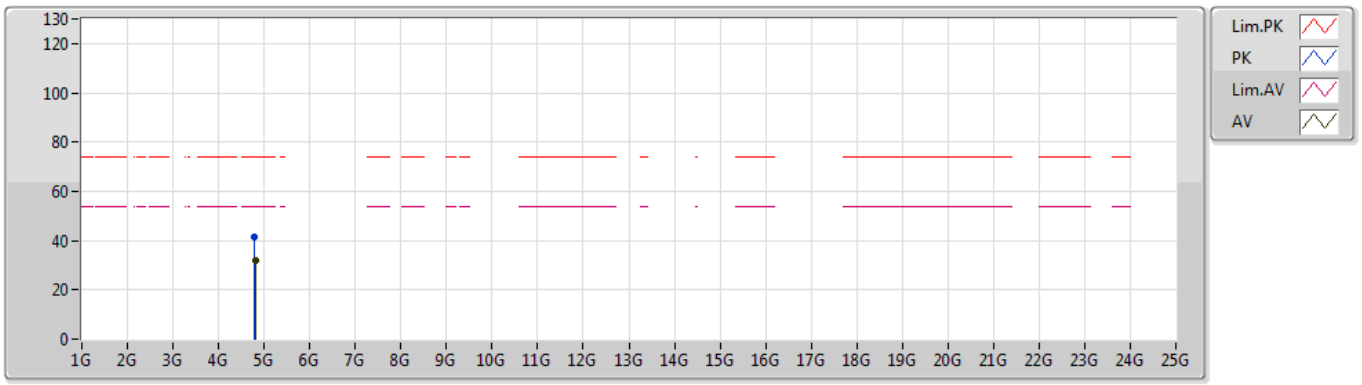


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	2.3616G	48.42	54.00	-5.58	31.62	3	Horizontal	61	1.31	-	16.80	27.65	3.97	-
AV	2.402G	99.60	Inf	-Inf	31.51	3	Horizontal	61	1.31	-	68.09	27.50	4.01	-
PK	2.3706G	59.24	74.00	-14.76	31.60	3	Horizontal	61	1.31	-	27.64	27.62	3.98	-
PK	2.4022G	100.24	Inf	-Inf	31.51	3	Horizontal	61	1.31	-	68.73	27.50	4.01	-

BT-LE(1Mbps)

2402MHz_TX

28/06/2019

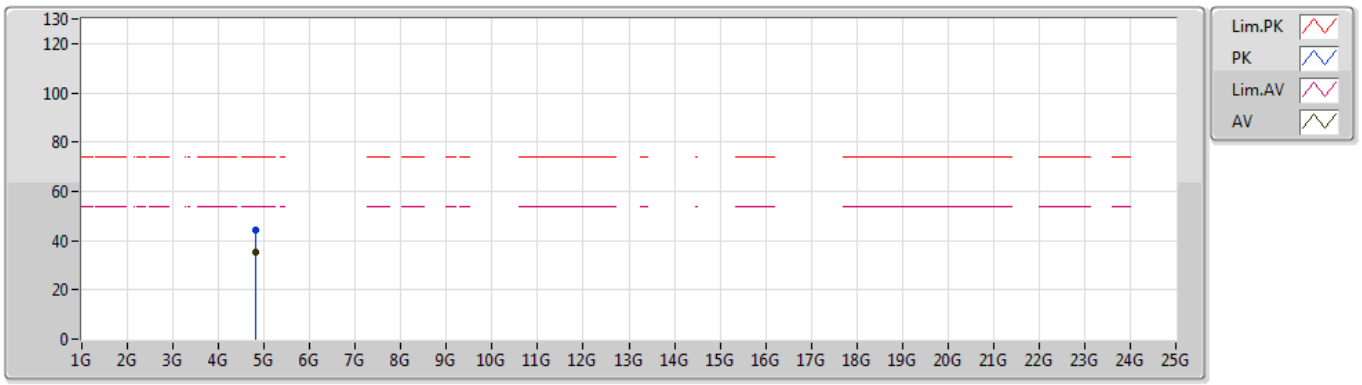


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.80388G	31.84	54.00	-22.16	2.76	3	Vertical	317	2.95	-	29.08	31.10	5.78	34.12
PK	4.7896G	41.52	74.00	-32.48	2.75	3	Vertical	317	2.95	-	38.77	31.10	5.77	34.12

BT-LE(1Mbps)

2402MHz_TX

28/06/2019

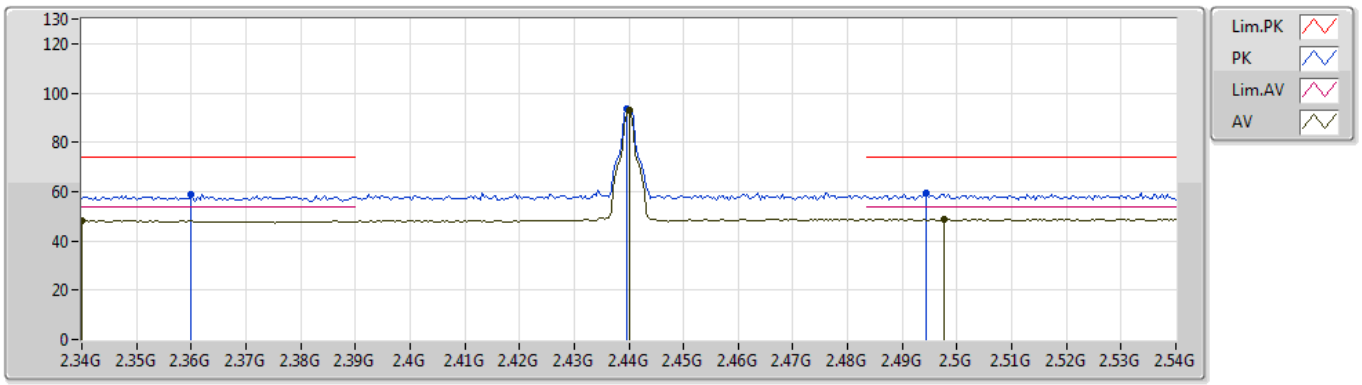


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.80424G	35.58	54.00	-18.42	2.76	3	Horizontal	333	1.03	-	32.82	31.10	5.78	34.12
PK	4.80364G	44.23	74.00	-29.77	2.76	3	Horizontal	333	1.03	-	41.47	31.10	5.78	34.12

BT-LE(1Mbps)

2440MHz_TX

28/06/2019

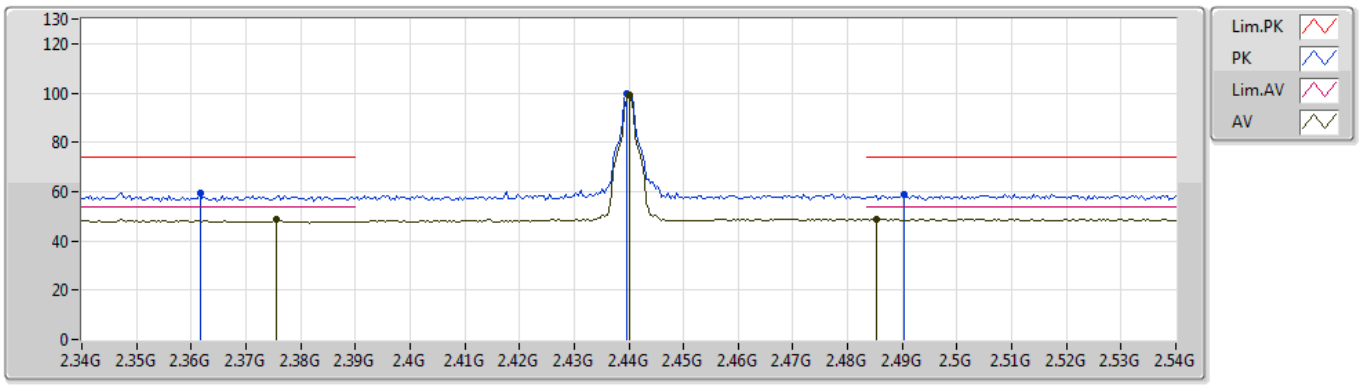


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	2.34G	48.40	54.00	-5.60	31.69	3	Vertical	267	2.94	-	16.71	27.74	3.95	-
AV	2.44G	92.99	Inf	-Inf	31.46	3	Vertical	267	2.94	-	61.53	27.42	4.04	-
AV	2.4976G	48.74	54.00	-5.26	31.40	3	Vertical	267	2.94	-	17.34	27.30	4.10	-
PK	2.36G	58.85	74.00	-15.15	31.63	3	Vertical	267	2.94	-	27.22	27.66	3.97	-
PK	2.4396G	93.62	Inf	-Inf	31.46	3	Vertical	267	2.94	-	62.16	27.42	4.04	-
PK	2.4944G	59.13	74.00	-14.87	31.40	3	Vertical	267	2.94	-	27.73	27.31	4.09	-

BT-LE(1Mbps)

2440MHz_TX

28/06/2019

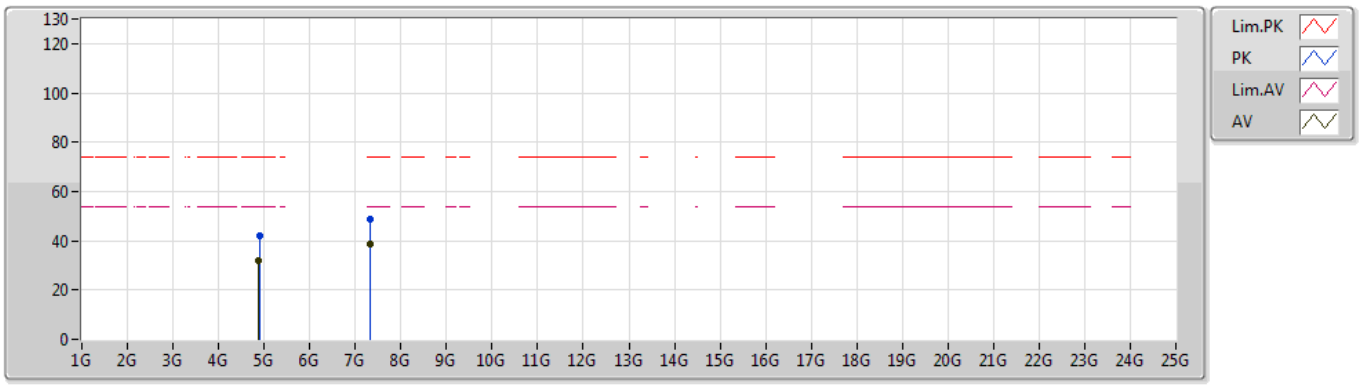


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	2.3756G	48.62	54.00	-5.38	31.58	3	Horizontal	54	1.07	-	17.04	27.60	3.98	-
AV	2.44G	99.27	Inf	-Inf	31.46	3	Horizontal	54	1.07	-	67.81	27.42	4.04	-
AV	2.4852G	48.76	54.00	-5.24	31.42	3	Horizontal	54	1.07	-	17.34	27.33	4.09	-
PK	2.3616G	59.26	74.00	-14.74	31.62	3	Horizontal	54	1.07	-	27.64	27.65	3.97	-
PK	2.4396G	99.88	Inf	-Inf	31.46	3	Horizontal	54	1.07	-	68.42	27.42	4.04	-
PK	2.4904G	58.69	74.00	-15.31	31.41	3	Horizontal	54	1.07	-	27.28	27.32	4.09	-

BT-LE(1Mbps)

2440MHz_TX

28/06/2019

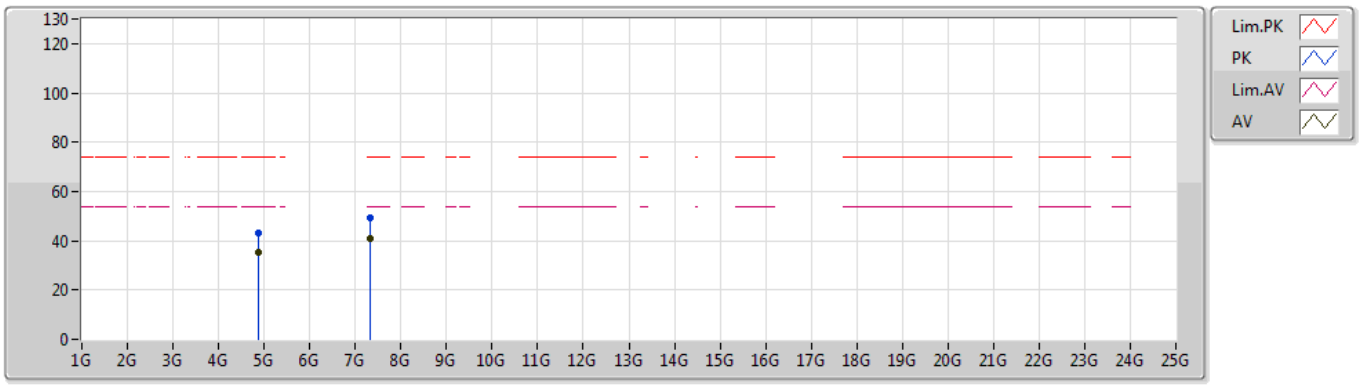


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.87982G	32.15	54.00	-21.85	2.89	3	Vertical	360	2.55	-	29.26	31.18	5.83	34.12
AV	7.3191G	38.71	54.00	-15.29	9.37	3	Vertical	280	2.69	-	29.34	36.28	7.46	34.37
PK	4.89398G	42.30	74.00	-31.70	2.91	3	Vertical	360	2.55	-	39.39	31.19	5.84	34.12
PK	7.32018G	48.61	74.00	-25.39	9.36	3	Vertical	280	2.69	-	39.25	36.28	7.46	34.38

BT-LE(1Mbps)

2440MHz_TX

28/06/2019

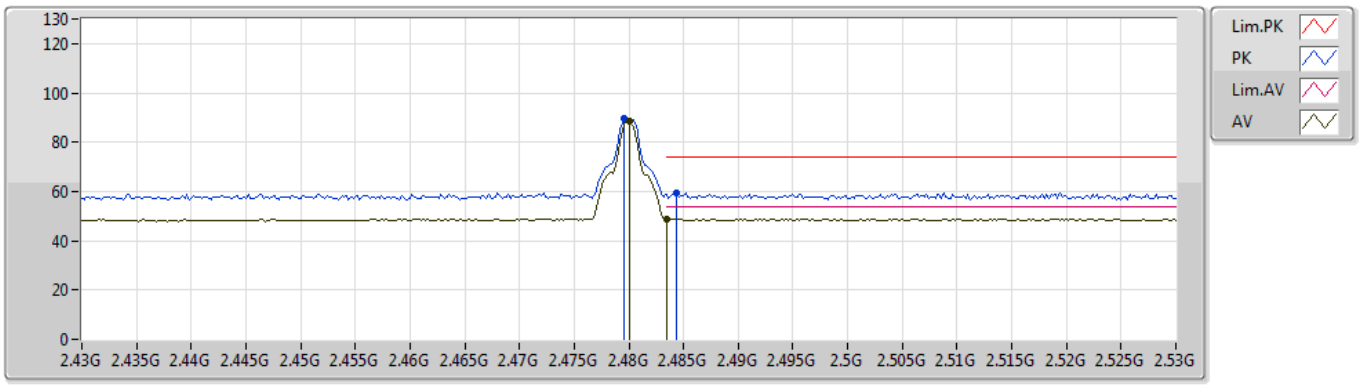


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.87964G	35.25	54.00	-18.75	2.89	3	Horizontal	154	1.25	-	32.36	31.18	5.83	34.12
AV	7.3194G	41.13	54.00	-12.87	9.37	3	Horizontal	169	1.19	-	31.76	36.28	7.46	34.37
PK	4.87928G	43.30	74.00	-30.70	2.89	3	Horizontal	154	1.25	-	40.41	31.18	5.83	34.12
PK	7.3194G	49.22	74.00	-24.78	9.37	3	Horizontal	169	1.19	-	39.85	36.28	7.46	34.37

BT-LE(1Mbps)

2480MHz_TX

28/06/2019

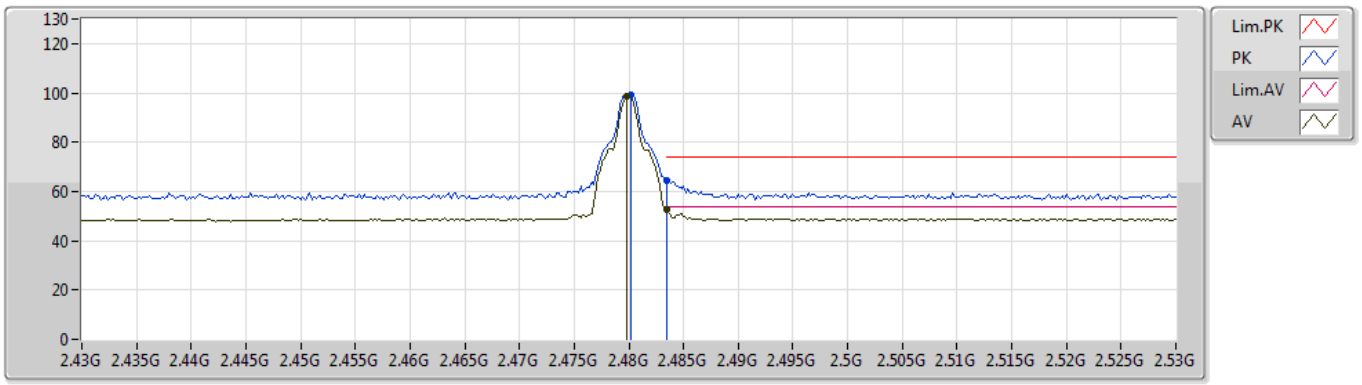


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	2.48G	88.44	Inf	-Inf	31.42	3	Vertical	128	2.87	-	57.02	27.34	4.08	-
AV	2.4835G	48.75	54.00	-5.25	31.41	3	Vertical	128	2.87	-	17.34	27.33	4.08	-
PK	2.4796G	89.42	Inf	-Inf	31.42	3	Vertical	128	2.87	-	58.00	27.34	4.08	-
PK	2.4844G	59.36	74.00	-14.64	31.42	3	Vertical	128	2.87	-	27.94	27.33	4.09	-

BT-LE(1Mbps)

2480MHz_TX

28/06/2019

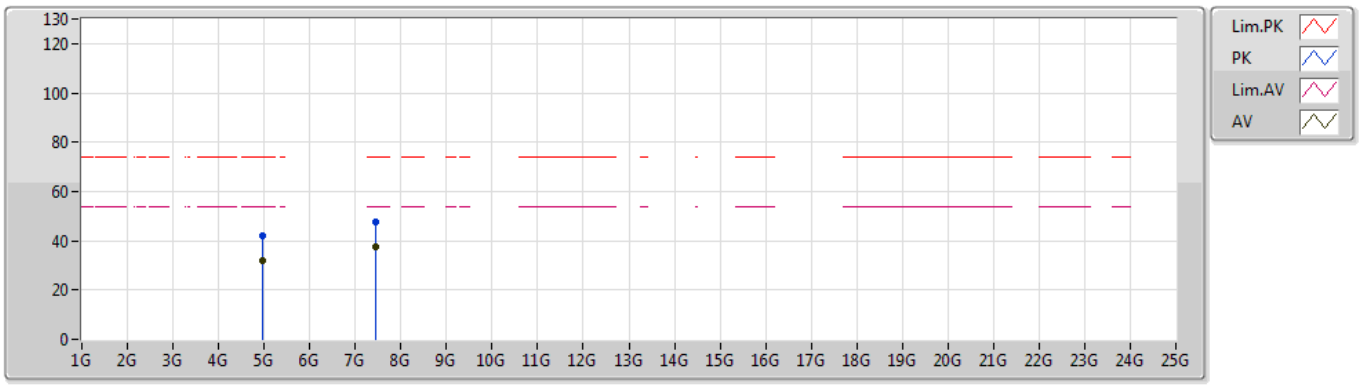


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	2.4798G	98.35	Inf	-Inf	31.42	3	Horizontal	59	1.08	-	66.93	27.34	4.08	-
AV	2.4835G	52.92	54.00	-1.08	31.41	3	Horizontal	59	1.08	-	21.51	27.33	4.08	-
PK	2.4802G	99.20	Inf	-Inf	31.42	3	Horizontal	59	1.08	-	67.78	27.34	4.08	-
PK	2.4835G	64.39	74.00	-9.61	31.41	3	Horizontal	59	1.08	-	32.98	27.33	4.08	-

BT-LE(1Mbps)

2480MHz_TX

28/06/2019

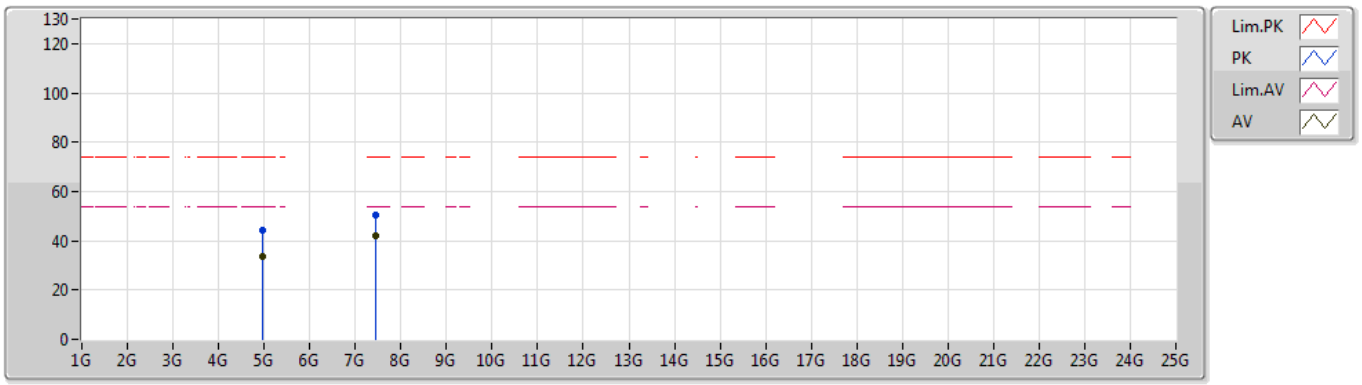


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.96012G	31.83	54.00	-22.17	3.15	3	Vertical	0	2.84	-	28.68	31.38	5.89	34.12
AV	7.43928G	37.52	54.00	-16.48	9.06	3	Vertical	279	2.60	-	28.46	36.24	7.24	34.42
PK	4.951G	42.07	74.00	-31.93	3.11	3	Vertical	0	2.84	-	38.96	31.35	5.88	34.12
PK	7.43922G	47.57	74.00	-26.43	9.06	3	Vertical	279	2.60	-	38.51	36.24	7.24	34.42

BT-LE(1Mbps)

2480MHz_TX

28/06/2019



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.95946G	33.66	54.00	-20.34	3.15	3	Horizontal	142	1.14	-	30.51	31.38	5.89	34.12
AV	7.4391G	42.13	54.00	-11.87	9.06	3	Horizontal	157	1.05	-	33.07	36.24	7.24	34.42
PK	4.96G	44.11	74.00	-29.89	3.15	3	Horizontal	142	1.14	-	40.96	31.38	5.89	34.12
PK	7.4406G	50.44	74.00	-23.56	9.06	3	Horizontal	157	1.05	-	41.38	36.24	7.24	34.42

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	677.96M	28.86	46.00	-17.14	0.48	3	Horizontal	360	1.00	-

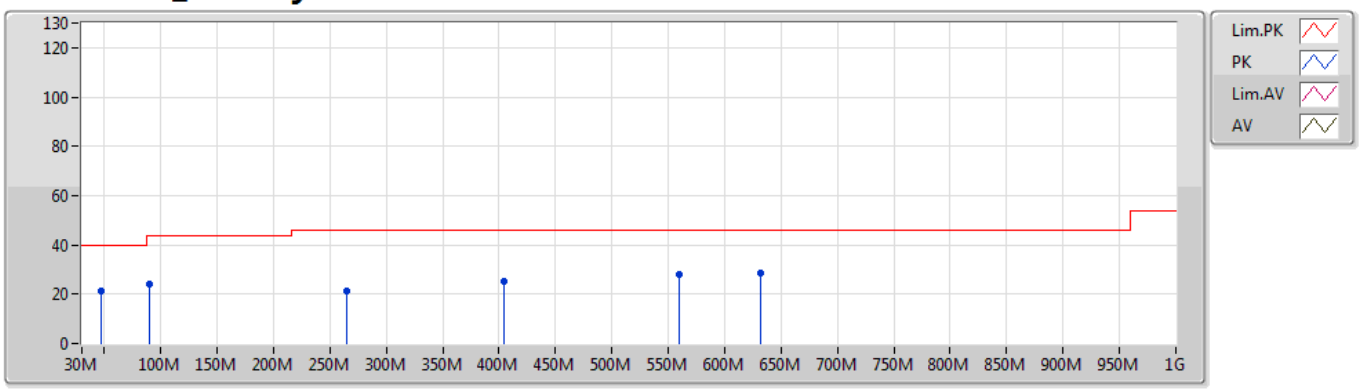
Result

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_Battery	Pass	PK	47.46M	21.44	40.00	-18.56	-12.39	3	Vertical	0	1.00	-
2440MHz_Battery	Pass	PK	90.14M	23.82	43.50	-19.68	-12.12	3	Vertical	0	1.00	-
2440MHz_Battery	Pass	PK	264.74M	21.41	46.00	-24.59	-5.81	3	Vertical	0	1.00	-
2440MHz_Battery	Pass	PK	404.42M	24.95	46.00	-21.05	-2.97	3	Vertical	0	1.00	-
2440MHz_Battery	Pass	PK	559.62M	27.91	46.00	-18.09	-0.15	3	Vertical	0	1.00	-
2440MHz_Battery	Pass	PK	631.4M	28.78	46.00	-17.22	0.50	3	Vertical	0	1.00	-
2440MHz_Battery	Pass	PK	35.82M	20.84	40.00	-19.16	-6.95	3	Horizontal	360	1.00	-
2440MHz_Battery	Pass	PK	245.34M	20.12	46.00	-25.88	-7.36	3	Horizontal	360	1.00	-
2440MHz_Battery	Pass	PK	264.74M	20.86	46.00	-25.14	-5.81	3	Horizontal	360	1.00	-
2440MHz_Battery	Pass	PK	551.86M	27.79	46.00	-18.21	-0.13	3	Horizontal	360	1.00	-
2440MHz_Battery	Pass	PK	629.46M	28.63	46.00	-17.37	0.50	3	Horizontal	360	1.00	-
2440MHz_Battery	Pass	PK	677.96M	28.86	46.00	-17.14	0.48	3	Horizontal	360	1.00	-

BT-LE(1Mbps)RX

2440MHz_Battery

28/06/2019

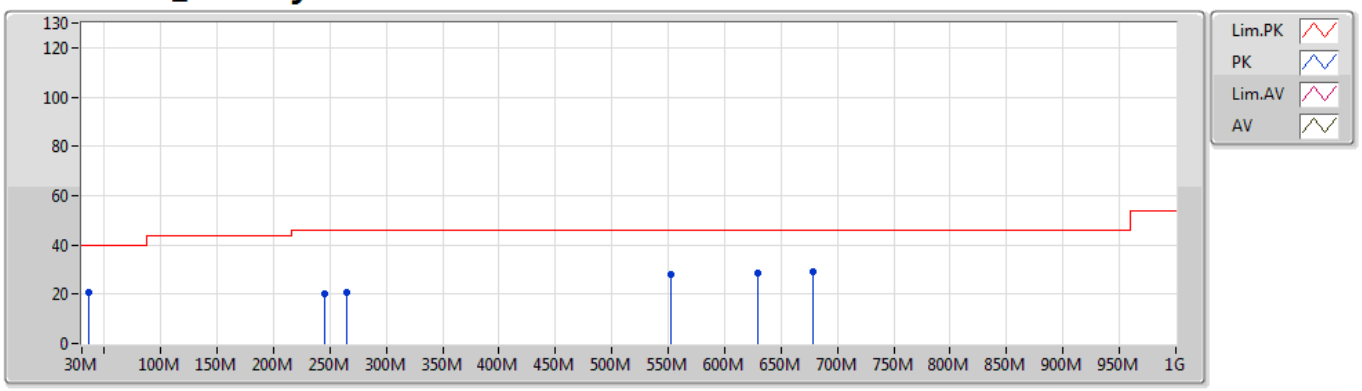


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	47.46M	21.44	40.00	-18.56	-12.39	3	Vertical	0	1.00	-	33.83	14.11	1.02	27.52
PK	90.14M	23.82	43.50	-19.68	-12.12	3	Vertical	0	1.00	-	35.94	13.84	1.43	27.39
PK	264.74M	21.41	46.00	-24.59	-5.81	3	Vertical	0	1.00	-	27.22	18.36	2.56	26.73
PK	404.42M	24.95	46.00	-21.05	-2.97	3	Vertical	0	1.00	-	27.92	21.13	3.20	27.30
PK	559.62M	27.91	46.00	-18.09	-0.15	3	Vertical	0	1.00	-	28.06	23.91	3.83	27.89
PK	631.4M	28.78	46.00	-17.22	0.50	3	Vertical	0	1.00	-	28.28	24.29	4.14	27.93

BT-LE(1Mbps)RX

2440MHz_Battery

28/06/2019



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	35.82M	20.84	40.00	-19.16	-6.95	3	Horizontal	360	1.00	-	27.79	19.71	0.89	27.55
PK	245.34M	20.12	46.00	-25.88	-7.36	3	Horizontal	360	1.00	-	27.48	16.96	2.46	26.78
PK	264.74M	20.86	46.00	-25.14	-5.81	3	Horizontal	360	1.00	-	26.67	18.36	2.56	26.73
PK	551.86M	27.79	46.00	-18.21	-0.13	3	Horizontal	360	1.00	-	27.92	23.97	3.78	27.88
PK	629.46M	28.63	46.00	-17.37	0.50	3	Horizontal	360	1.00	-	28.13	24.29	4.14	27.93
PK	677.96M	28.86	46.00	-17.14	0.48	3	Horizontal	360	1.00	-	28.38	24.10	4.28	27.90

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	6.976G	36.55	54.00	-17.45	8.74	3	Horizontal	86	2.22	-

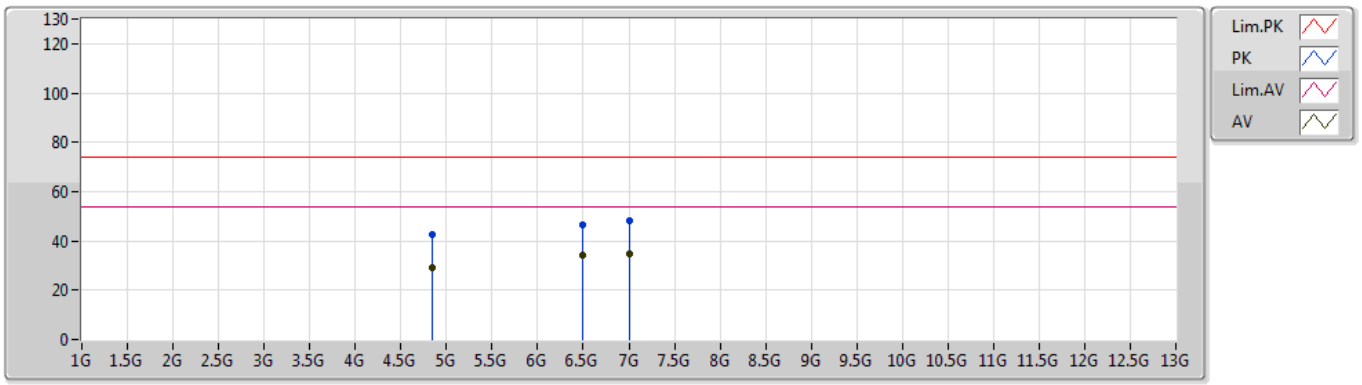
Result

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_RX	Pass	AV	4.84G	29.26	54.00	-24.74	2.82	3	Vertical	272	1.18	-
2440MHz_RX	Pass	AV	6.496G	34.30	54.00	-19.70	6.48	3	Vertical	103	2.27	-
2440MHz_RX	Pass	AV	7G	34.79	54.00	-19.21	8.89	3	Vertical	200	1.57	-
2440MHz_RX	Pass	PK	4.84G	42.69	74.00	-31.31	2.82	3	Vertical	272	1.18	-
2440MHz_RX	Pass	PK	6.496G	46.35	74.00	-27.65	6.48	3	Vertical	103	2.27	-
2440MHz_RX	Pass	PK	7G	48.45	74.00	-25.55	8.89	3	Vertical	200	1.57	-
2440MHz_RX	Pass	AV	1.7188G	27.13	54.00	-26.87	-4.86	3	Horizontal	311	2.03	-
2440MHz_RX	Pass	AV	4.912G	29.55	54.00	-24.45	2.98	3	Horizontal	223	2.38	-
2440MHz_RX	Pass	AV	6.976G	36.55	54.00	-17.45	8.74	3	Horizontal	86	2.22	-
2440MHz_RX	Pass	PK	1.7188G	43.76	74.00	-30.24	-4.86	3	Horizontal	311	2.03	-
2440MHz_RX	Pass	PK	4.912G	43.81	74.00	-30.19	2.98	3	Horizontal	223	2.38	-
2440MHz_RX	Pass	PK	6.976G	49.16	74.00	-24.84	8.74	3	Horizontal	86	2.22	-

BT-LE(1Mbps)RX

2440MHz_RX

28/06/2019

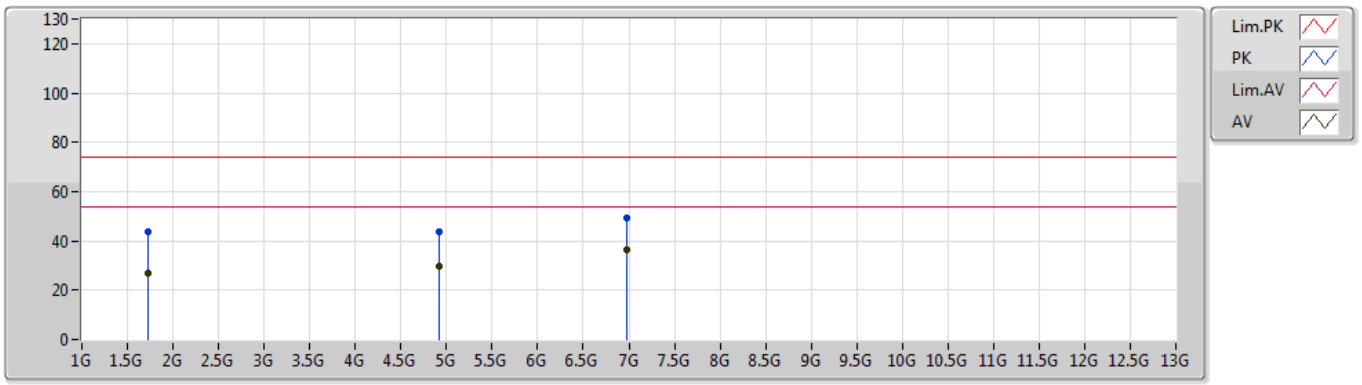


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	4.84G	29.26	54.00	-24.74	2.82	3	Vertical	272	1.18	-	26.44	31.14	5.80	34.12
AV	6.496G	34.30	54.00	-19.70	6.48	3	Vertical	103	2.27	-	27.82	33.88	6.94	34.34
AV	7G	34.79	54.00	-19.21	8.89	3	Vertical	200	1.57	-	25.90	35.10	8.05	34.26
PK	4.84G	42.69	74.00	-31.31	2.82	3	Vertical	272	1.18	-	39.87	31.14	5.80	34.12
PK	6.496G	46.35	74.00	-27.65	6.48	3	Vertical	103	2.27	-	39.87	33.88	6.94	34.34
PK	7G	48.45	74.00	-25.55	8.89	3	Vertical	200	1.57	-	39.56	35.10	8.05	34.26

BT-LE(1Mbps)RX

2440MHz_RX

28/06/2019



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
AV	1.7188G	27.13	54.00	-26.87	-4.86	3	Horizontal	311	2.03	-	31.99	25.04	3.31	33.21
AV	4.912G	29.55	54.00	-24.45	2.98	3	Horizontal	223	2.38	-	26.57	31.24	5.86	34.12
AV	6.976G	36.55	54.00	-17.45	8.74	3	Horizontal	86	2.22	-	27.81	35.00	8.00	34.26
PK	1.7188G	43.76	74.00	-30.24	-4.86	3	Horizontal	311	2.03	-	48.62	25.04	3.31	33.21
PK	4.912G	43.81	74.00	-30.19	2.98	3	Horizontal	223	2.38	-	40.83	31.24	5.86	34.12
PK	6.976G	49.16	74.00	-24.84	8.74	3	Horizontal	86	2.22	-	40.42	35.00	8.00	34.26