FCC Test Report

FCC ID	:	**2AGOZ-XH02**
Equipment	:	**Oculus Touch Controller**
Brand Name	:	**oculus**
Model Name	:	**MI-BL**
Applicant	:	**Facebook Technologies, LLC** **1 Hacker Way, Menlo Park, CA 94025, USA**
Manufacturer	:	**Facebook Technologies, LLC** **1 Hacker Way, Menlo Park, CA 94025, USA**
Standard	:	**47 CFR FCC Part 15.247**

The product was received on Dec. 10, 2018, and testing was started from Dec. 12, 2018 and completed on Dec. 13, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

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

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

Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

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PHOTOGRAPHS OF EUT V01

History of this test report

Report No.	Version	Description	Issued Date
FR8O0801-01AG	01	Initial issue of report	Dec. 18, 2018
FR8O0801-01AG	02	Revised table (This report is the latest version replacing for the report issued on Dec. 18, 2018.)	Dec. 21, 2018

Summary of Test Result

Report Clause	Ref. Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	FCC 15.203
3.1	15.207	AC Power-line Conducted Emissions	Not Required	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: Michelle Tsai

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Mode	Ch. Frequency (MHz)
2400-2483.5	GFSK	2402-2478

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	GFSK	1	1TX

Note:
- Mode uses a combination of GFSK modulation.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Port	Antenna Type	Connector	Gain (dBi)
1	1	Dipole	I-Pex	3

Note 1: The EUT has one antenna.

For GFSK function:

For GFSK mode (1TX/1RX)

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

1.1.3 EUT Information

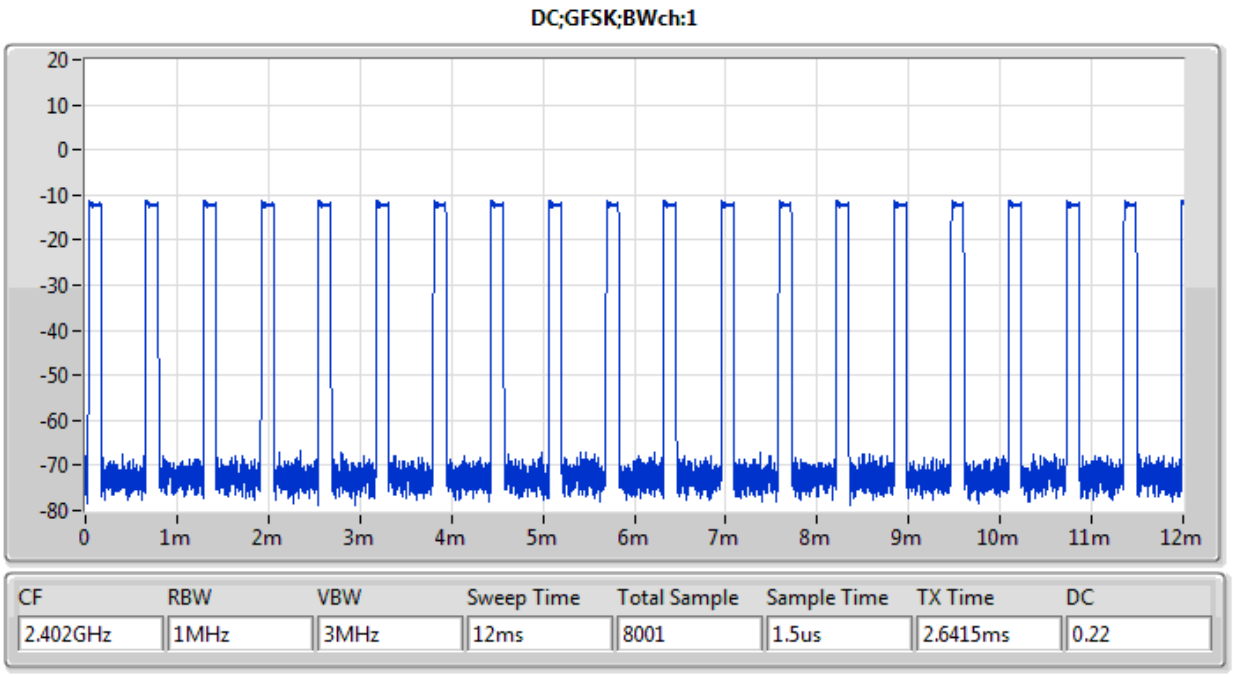
Operational Condition				
EUT Power Type	From Battery			
EUT Function	☐	Point-to-multipoint	☒	Point-to-point
Beamforming Function	☐	With beamforming	☒	Without beamforming

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
GFSK	0.22	6.576	138u	10k

GFSK



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

1.2 Testing Applied Standards

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

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

1.3 Testing Location Information

Testing Location			
☒	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
Test site Designation No. TW1190 with FCC.			
☐	JHUBEI	ADD : No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085
Test site Designation No. TW0006 with FCC.			

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Barry	23.2°C / 61%	12/Dec/2018
Radiated	03CH03-HY	Patrick	20.5°C / 56%	13/Dec/2018

1.4 Measurement Uncertainty

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

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.54 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 ℃	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	1.5V

2.2 Test Channel Mode

Test Software	DOS

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		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
Operating Mode < 1GHz	CTX		
1	Battery Mode		
Operating Mode > 1GHz	CTX		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			
Worst Planes of EUT			V

2.4 Accessories

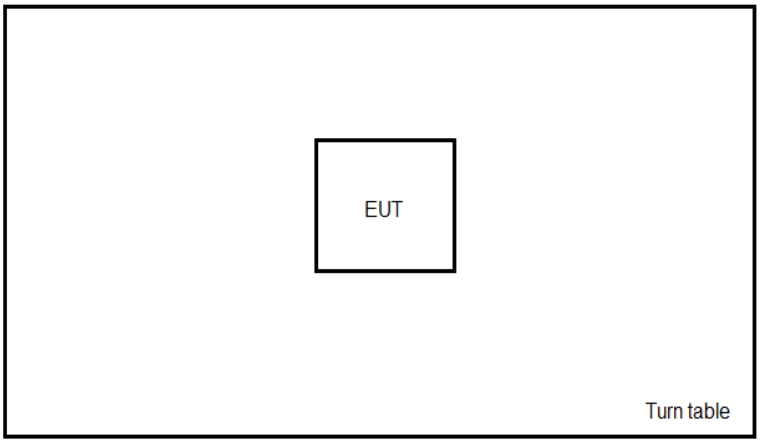
Reminder: Regarding to more detail and other information, please refer to user manual.

2.5 Support Equipment

Support Equipment – RF Conducted				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E5410	DoC
2	Adapter for NB	DELL	HA65NM130	DoC
3	DC Power Supply	GW	GPS-3030DD	N/A
4	Fixture (Client Provide)	N/A	N/A	N/A

2.6 Test Setup Diagram

Test Setup Diagram - Radiated Test



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

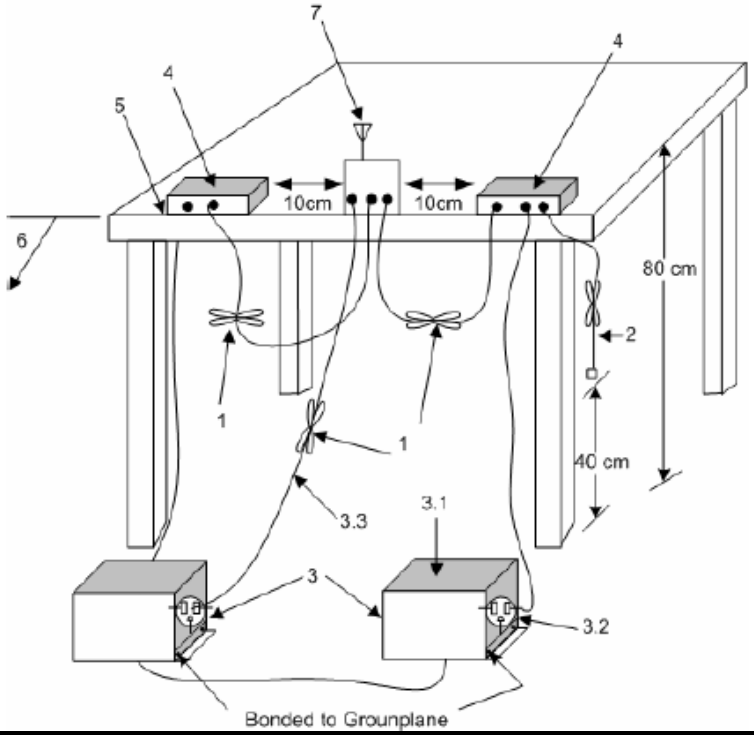
Refer a test equipment and calibration data table in this test report.

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 FCC 15.207 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.

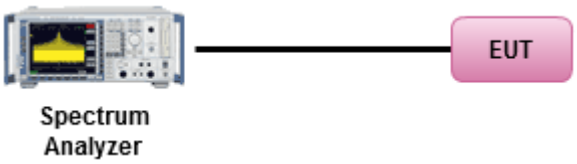
3.2.2 Measuring Instruments

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 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 (11.9.2.3.1 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

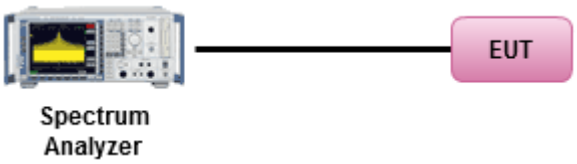
3.4.2 Measuring Instruments

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 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.	

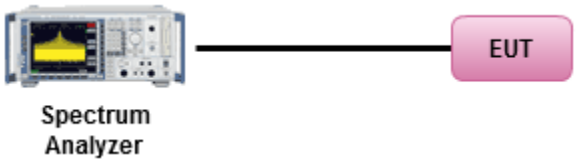
3.5.2 Measuring Instruments

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 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 below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

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

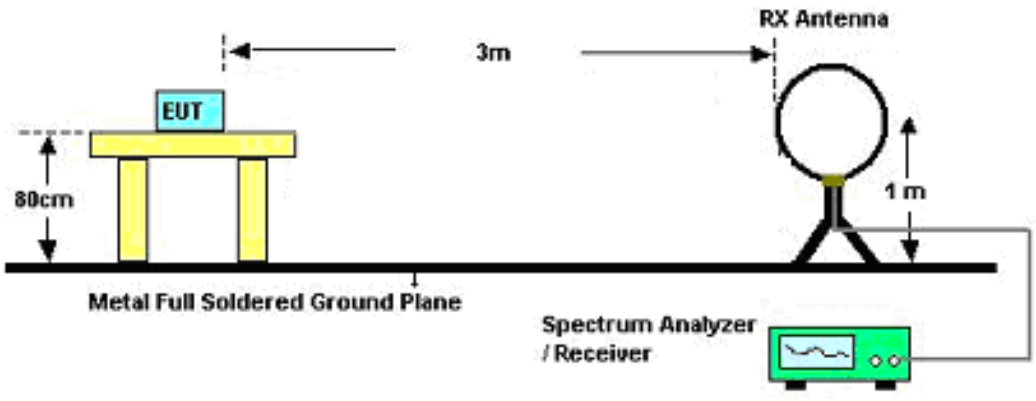
3.6.2 Measuring Instruments

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

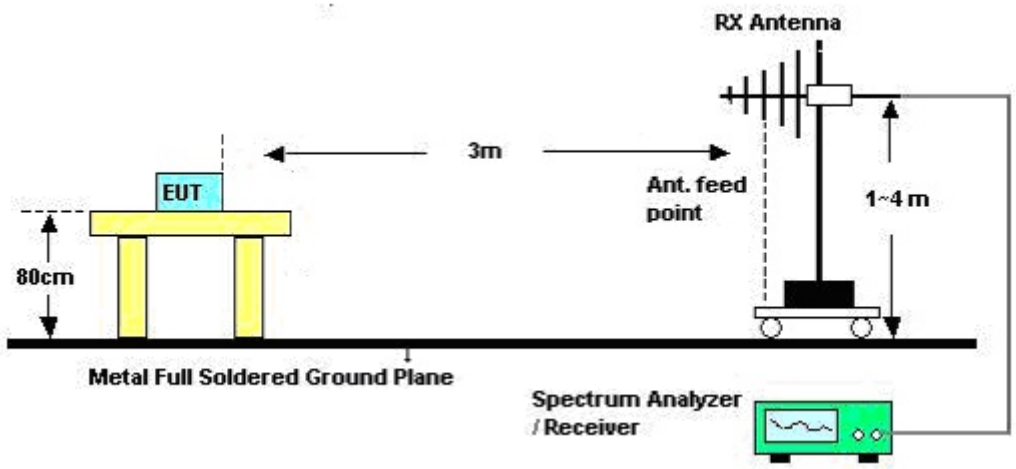
3.6.3 Test Procedures

Test Method
▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
▪ For the transmitter unwanted emissions shall be measured using following options below:
▪ Refer as KDB 558074, clause 8.6 (11.12 of ANSI C63.10) for restricted frequency bands.
▪ For the transmitter band-edge emissions shall be measured using following options below:
▪ Refer as KDB 558074 clause 8.7.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.
▪ Refer as KDB 558074, clause 8.7.2 (6.10.6 of ANSI C63.10) for marker-delta method for band-edge measurements.
▪ Refer as KDB 558074, clause 8.7.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
▪ 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.

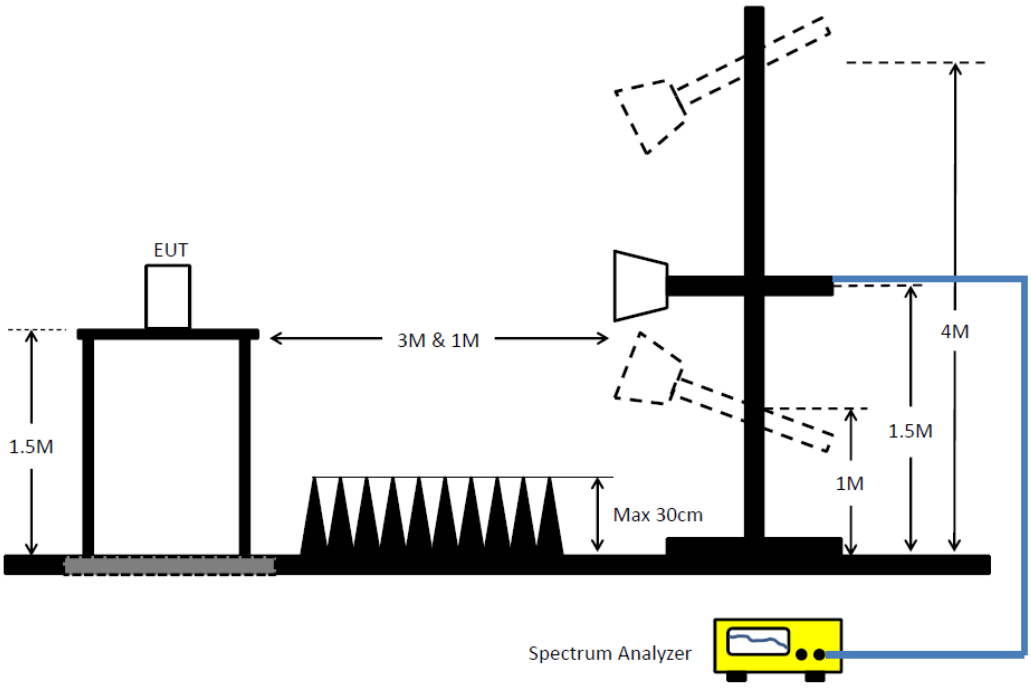
3.6.4 Test Setup

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

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	05/Feb/2018	04/Feb/2019
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	05/Feb/2018	04/Feb/2019
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	05/Feb/2018	04/Feb/2019
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	30MHz~1G	11/Jan/2018	10/Jan/2019
Cable 0.2m	HUBER	MY10710/4	RF Cable - 01	1G~18G	11/Jan/2018	10/Jan/2019
Signal Generator	R&S	SMB100A	181147	100kHz~40GHz	12/Nov/2018	10/Nov/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	23/Apr/2018	19/Apr/2019
Microwave System Preamplifier	KEYSIGHT	83017A	MY53270196	1GHz ~ 26.5GHz	05/Sep/2018	04/Sep/2019
Signal Analyzer	R&S	FSV40	101500	10Hz ~ 40GHz	18/Jul/2018	17/Jul/2019
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	29/Jan/2018	28/Jan/2019
RF Cable-high	SUHNER	SUCOFLEX 106	CB222	1GHz ~ 40GHz	29/Jan/2018	28/Jan/2019
Bilog Antenna & 5db Attenuator	SCHAFFNER/MTJ	CBL6112D / MTJ6102-05	2678 / 001	30MHz ~ 2GHz	07/Jul/2018	06/Jul/2019
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170154	18GHz ~ 40GHz	06/Feb/ 2018	05/Feb/2019
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1531	1GHz ~ 18GHz	18/Apr/ 2018	17/Apr/2019

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
GFSK	642.5k	1.638M	1M64F1D	640k	1.635M

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;

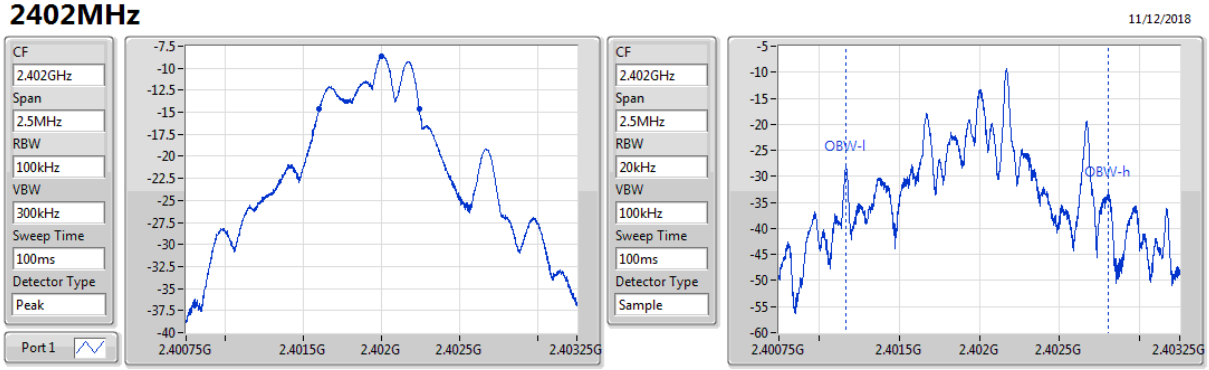
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
GFSK	-	-	-	-
2402MHz	Pass	500k	640k	1.635M
2438MHz	Pass	500k	642.5k	1.638M
2478MHz	Pass	500k	640k	1.638M

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

GFSK **EBW**

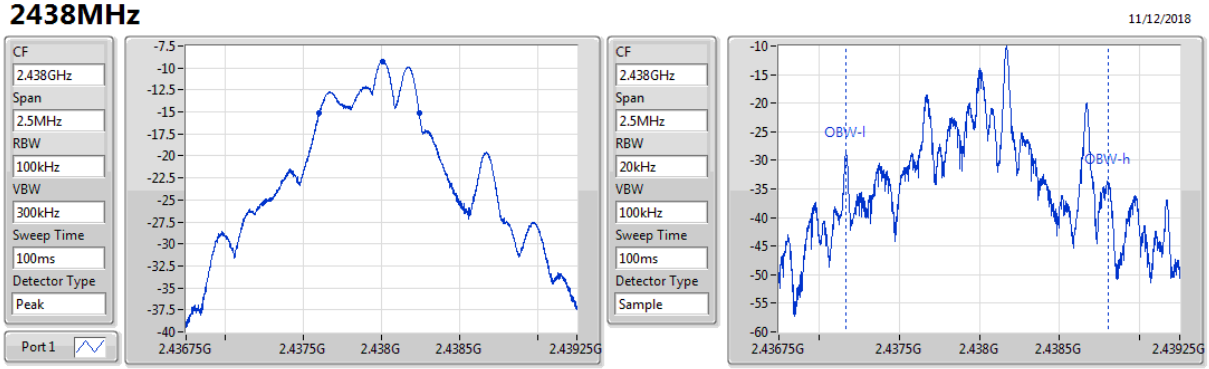
2402MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
640k	2.401601G	2.402241G	1.635M	2.401165G	2.402801G	500k	1

GFSK **EBW**

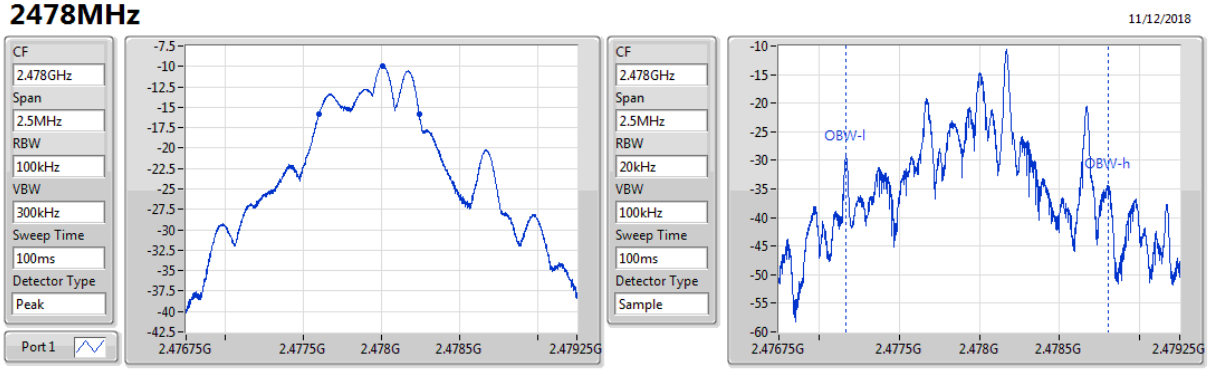
2438MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
642.5k	2.437599G	2.438241G	1.638M	2.437165G	2.438803G	500k	1

GFSK **EBW**

2478MHz



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
640k	2.477601G	2.478241G	1.638M	2.477165G	2.478803G	500k	1

Summary

Mode	Power	Power
	(dBm)	(W)
2.4-2.4835GHz	-	-
GFSK	2.19	0.00166

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
GFSK	-	-	-	-
2402MHz	Pass	3.00	2.19	30.00
2438MHz	Pass	3.00	1.99	30.00
2478MHz	Pass	3.00	1.51	30.00

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
GFSK	-6.27

RBW=3kHz.

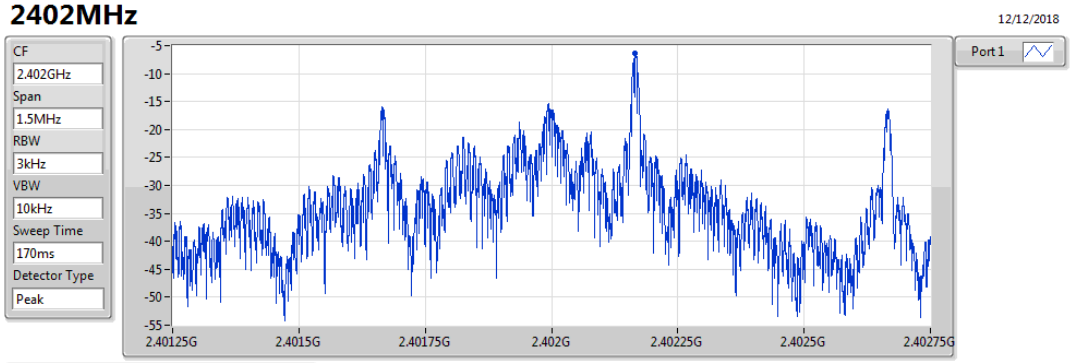
Result

Mode	Result	Gain (dBi)	PD (dBm/RBW)	PD Limit (dBm/RBW)
GFSK	-	-	-	-
2402MHz	Pass	3.00	-6.27	8.00
2438MHz	Pass	3.00	-6.75	8.00
2478MHz	Pass	3.00	-7.08	8.00

RBW=3kHz.

GFSK **PSD**

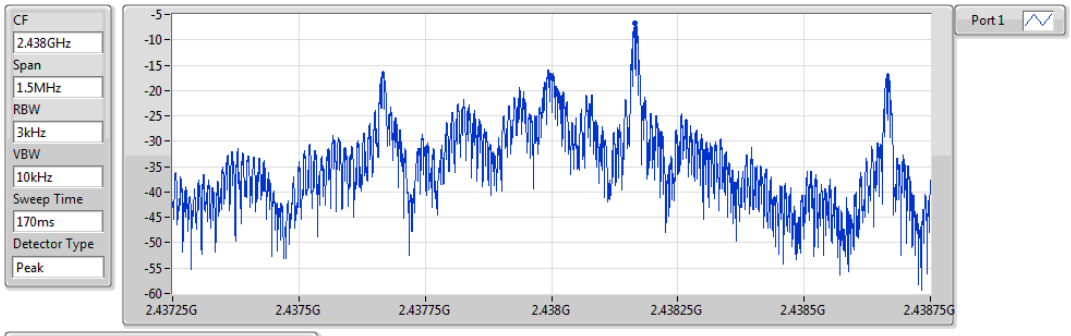
2402MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.27	-6.27	-6.27

GFSK **PSD**

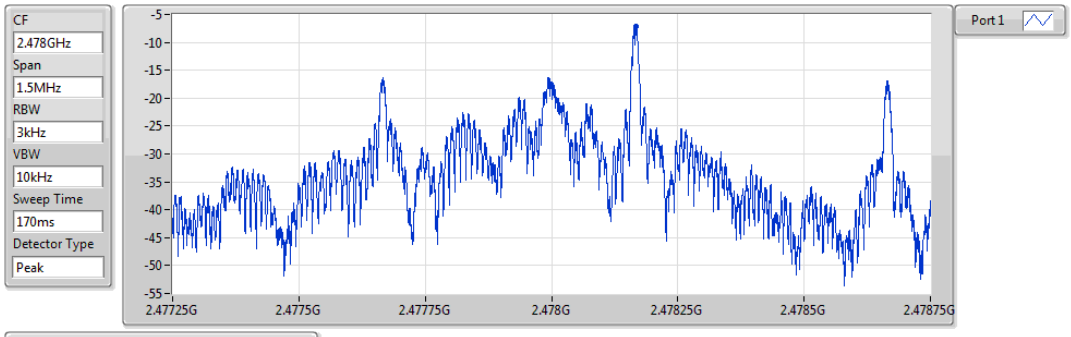
2438MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.75	-6.75	-6.75

GFSK **PSD**

2478MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.08	-7.08	-7.08

Summary

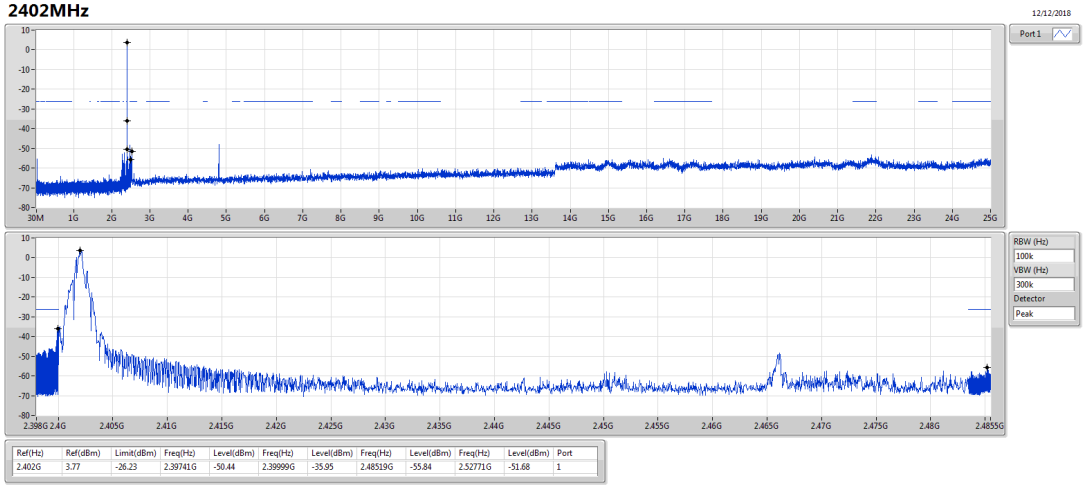
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-	-
GFSK	Pass	2.402G	3.77	-26.23	2.39741G	-50.44	2.39999G	-35.95	2.48519G	-55.84	2.52771G	-51.68	1

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
GFSK	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	2.402G	3.77	-26.23	2.39741G	-50.44	2.39999G	-35.95	2.48519G	-55.84	2.52771G	-51.68	1
2438MHz	Pass	2.402G	3.77	-26.23	49.83M	-58.07	2.39817G	-58.98	2.4855G	-58.87	2.50239G	-52.50	1
2478MHz	Pass	2.402G	3.77	-26.23	2.39149G	-60.25	2.39894G	-56.38	2.48353G	-49.86	2.54179G	-50.81	1

GFSK **CSE NdB**

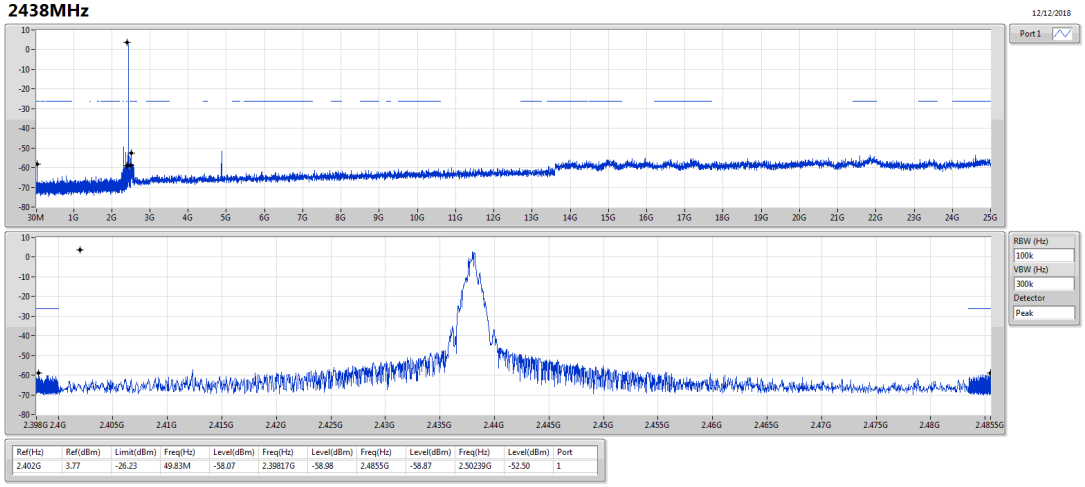
2402MHz



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	3.77	-26.23	2.39741G	-50.44	2.39999G	-35.95	2.48519G	-55.84	2.52771G	-51.68	1

GFSK **CSE NdB**

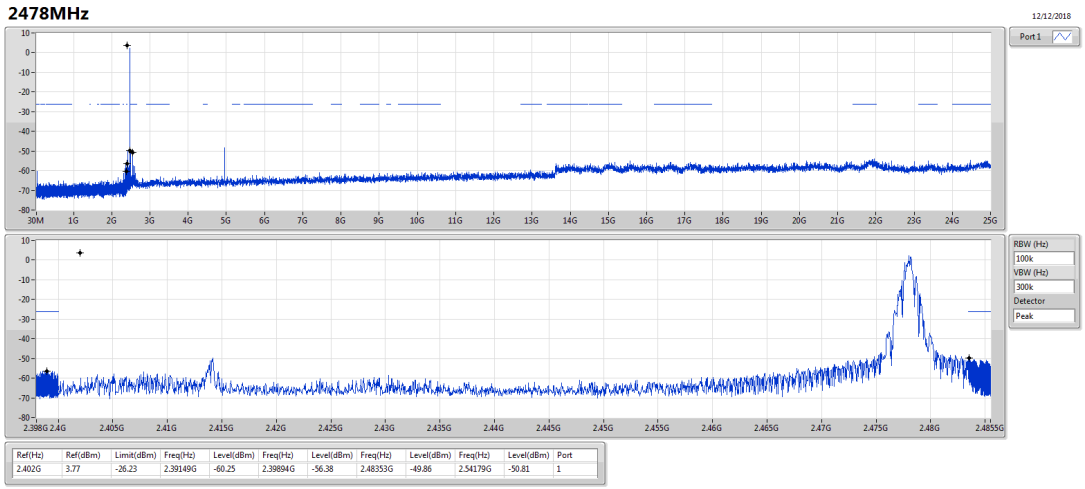
2438MHz



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	3.77	-26.23	49.83M	-58.07	2.39817G	-58.98	2.4855G	-58.87	2.50239G	-52.50	1

GFSK **CSE NdB**

2478MHz



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	3.77	-26.23	2.39149G	-60.25	2.39894G	-56.38	2.48353G	-49.86	2.54179G	-50.81	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	-	-	-	-	-	-	-	-	-	-	-	-
GFSK	Pass	PK	144.46M	31.14	43.50	-12.36	-8.55	3	Horizontal	360	1.00	-

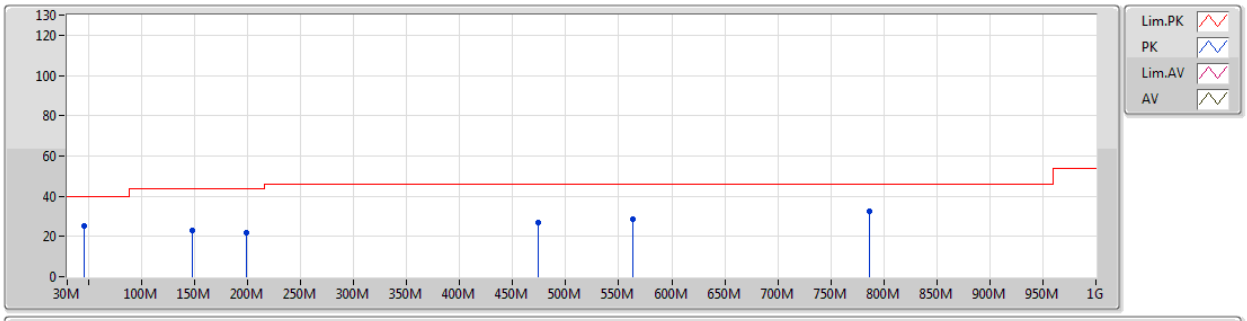
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
GFSK	-	-	-	-	-	-	-	-	-	-	-	-
2438MHz	Pass	PK	45.52M	25.46	40.00	-14.54	-8.08	3	Vertical	0	1.00	-
2438MHz	Pass	PK	148.34M	22.72	43.50	-20.78	-8.39	3	Vertical	0	1.00	-
2438MHz	Pass	PK	198.78M	21.71	43.50	-21.79	-11.00	3	Vertical	0	1.00	-
2438MHz	Pass	PK	474.26M	26.91	46.00	-19.09	-3.23	3	Vertical	0	1.00	-
2438MHz	Pass	PK	563.5M	28.30	46.00	-17.70	-1.40	3	Vertical	0	1.00	-
2438MHz	Pass	PK	786.6M	32.46	46.00	-13.54	3.12	3	Vertical	0	1.00	-
2438MHz	Pass	PK	88M	23.80	40.00	-16.20	-14.16	3	Horizontal	360	1.00	-
2438MHz	Pass	PK	144.46M	31.14	43.50	-12.36	-8.55	3	Horizontal	360	1.00	-
2438MHz	Pass	PK	260.86M	25.90	46.00	-20.10	-9.00	3	Horizontal	360	1.00	-
2438MHz	Pass	PK	429.64M	26.31	46.00	-19.69	-4.15	3	Horizontal	360	1.00	-
2438MHz	Pass	PK	582.9M	30.02	46.00	-15.98	-0.81	3	Horizontal	360	1.00	-
2438MHz	Pass	PK	815.7M	32.70	46.00	-13.30	3.52	3	Horizontal	360	1.00	-

GFSK

12/12/2018

2438MHz_Battery

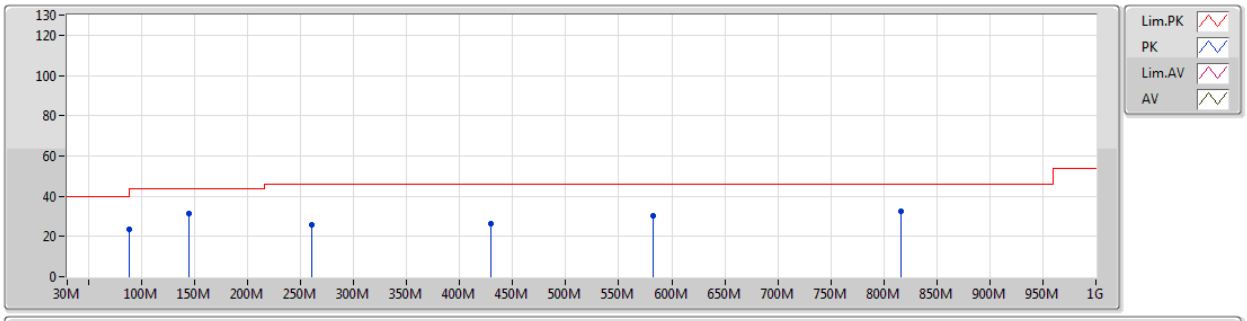


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	45.52M	25.46	40.00	-14.54	-8.08	3	Vertical	0	1.00	-
PK	148.34M	22.72	43.50	-20.78	-8.39	3	Vertical	0	1.00	-
PK	198.78M	21.71	43.50	-21.79	-11.00	3	Vertical	0	1.00	-
PK	474.26M	26.91	46.00	-19.09	-3.23	3	Vertical	0	1.00	-
PK	563.5M	28.30	46.00	-17.70	-1.40	3	Vertical	0	1.00	-
PK	786.6M	32.46	46.00	-13.54	3.12	3	Vertical	0	1.00	-

GFSK

12/12/2018

2438MHz_Battery



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
PK	88M	23.80	40.00	-16.20	-14.16	3	Horizontal	360	1.00	-
PK	144.46M	31.14	43.50	-12.36	-8.55	3	Horizontal	360	1.00	-
PK	260.86M	25.90	46.00	-20.10	-9.00	3	Horizontal	360	1.00	-
PK	429.64M	26.31	46.00	-19.69	-4.15	3	Horizontal	360	1.00	-
PK	582.9M	30.02	46.00	-15.98	-0.81	3	Horizontal	360	1.00	-
PK	815.7M	32.70	46.00	-13.30	3.52	3	Horizontal	360	1.00	-

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
GFSK	Pass	AV	2.37394G	44.80	54.00	-9.20	-1.65	3	Horizontal	43	1.14	-

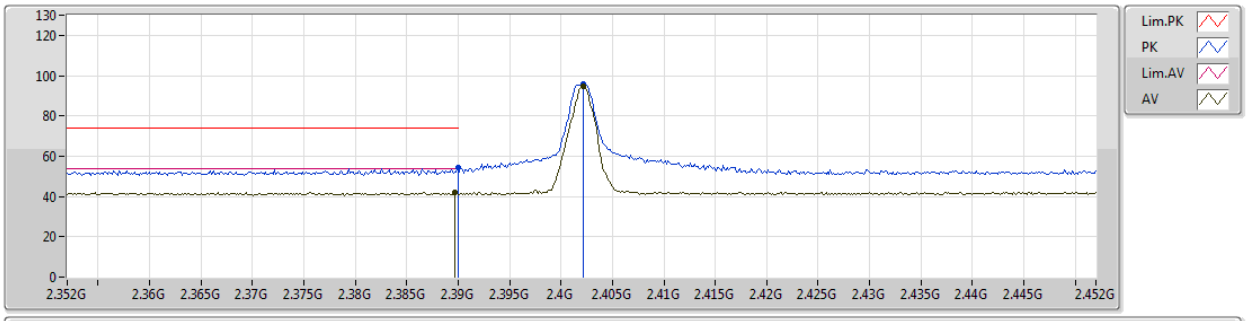
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
GFSK	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz	Pass	AV	2.38968G	42.08	54.00	-11.92	-1.59	3	Vertical	341	1.26	-
2402MHz	Pass	AV	2.40214G	94.69	Inf	-Inf	-1.54	3	Vertical	341	1.26	-
2402MHz	Pass	PK	2.38997G	54.24	74.00	-19.76	-1.59	3	Vertical	341	1.26	-
2402MHz	Pass	PK	2.40214G	95.56	Inf	-Inf	-1.54	3	Vertical	341	1.26	-
2402MHz	Pass	AV	2.38562G	42.27	54.00	-11.73	-1.61	3	Horizontal	34	1.26	-
2402MHz	Pass	AV	2.40214G	95.08	Inf	-Inf	-1.54	3	Horizontal	34	1.26	-
2402MHz	Pass	PK	2.38954G	54.94	74.00	-19.06	-1.59	3	Horizontal	34	1.26	-
2402MHz	Pass	PK	2.402G	95.70	Inf	-Inf	-1.54	3	Horizontal	34	1.26	-
2402MHz	Pass	AV	4.80429G	36.95	54.00	-17.05	4.94	3	Vertical	156	1.27	-
2402MHz	Pass	PK	4.80464G	55.04	74.00	-18.96	4.94	3	Vertical	156	1.27	-
2402MHz	Pass	AV	4.80425G	37.40	54.00	-16.60	4.94	3	Horizontal	249	1.24	-
2402MHz	Pass	PK	4.80403G	55.26	74.00	-18.74	4.94	3	Horizontal	249	1.24	-
2438MHz	Pass	AV	2.37423G	42.14	54.00	-11.86	-1.65	3	Vertical	338	1.06	-
2438MHz	Pass	AV	2.43829G	92.61	Inf	-Inf	-1.40	3	Vertical	338	1.06	-
2438MHz	Pass	AV	2.4893G	42.26	54.00	-11.74	-1.22	3	Vertical	338	1.06	-
2438MHz	Pass	PK	2.37597G	53.05	74.00	-20.95	-1.64	3	Vertical	338	1.06	-
2438MHz	Pass	PK	2.438G	93.26	Inf	-Inf	-1.40	3	Vertical	338	1.06	-
2438MHz	Pass	PK	2.48409G	52.45	74.00	-21.55	-1.23	3	Vertical	338	1.06	-
2438MHz	Pass	AV	2.37394G	44.80	54.00	-9.20	-1.65	3	Horizontal	43	1.14	-
2438MHz	Pass	AV	2.43829G	96.13	Inf	-Inf	-1.40	3	Horizontal	43	1.14	-
2438MHz	Pass	AV	2.49336G	42.67	54.00	-11.33	-1.19	3	Horizontal	43	1.14	-
2438MHz	Pass	PK	2.38814G	53.01	74.00	-20.99	-1.59	3	Horizontal	43	1.14	-
2438MHz	Pass	PK	2.43771G	96.74	Inf	-Inf	-1.40	3	Horizontal	43	1.14	-
2438MHz	Pass	PK	2.49394G	52.91	74.00	-21.09	-1.19	3	Horizontal	43	1.14	-
2438MHz	Pass	AV	4.87617G	36.67	54.00	-17.33	5.15	3	Vertical	263	1.25	-
2438MHz	Pass	PK	4.87585G	52.65	74.00	-21.35	5.15	3	Vertical	263	1.25	-
2438MHz	Pass	AV	4.87626G	37.12	54.00	-16.88	5.15	3	Horizontal	253	1.20	-
2438MHz	Pass	PK	4.87609G	54.29	74.00	-19.71	5.15	3	Horizontal	253	1.20	-
2478MHz	Pass	AV	2.47814G	92.14	Inf	-Inf	-1.26	3	Vertical	350	1.19	-
2478MHz	Pass	AV	2.49365G	42.46	54.00	-11.54	-1.19	3	Vertical	350	1.19	-
2478MHz	Pass	PK	2.478G	92.80	Inf	-Inf	-1.26	3	Vertical	350	1.19	-
2478MHz	Pass	PK	2.48467G	57.13	74.00	-16.87	-1.23	3	Vertical	350	1.19	-
2478MHz	Pass	AV	2.47814G	94.92	Inf	-Inf	-1.26	3	Horizontal	349	1.01	-
2478MHz	Pass	AV	2.48525G	42.85	54.00	-11.15	-1.23	3	Horizontal	349	1.01	-
2478MHz	Pass	PK	2.478G	95.56	Inf	-Inf	-1.26	3	Horizontal	349	1.01	-
2478MHz	Pass	PK	2.48365G	58.85	74.00	-15.15	-1.23	3	Horizontal	349	1.01	-
2478MHz	Pass	AV	4.95633G	35.14	54.00	-18.86	5.37	3	Vertical	162	1.30	-
2478MHz	Pass	PK	4.95602G	50.56	74.00	-23.44	5.36	3	Vertical	162	1.30	-
2478MHz	Pass	AV	4.9563G	35.90	54.00	-18.10	5.37	3	Horizontal	112	1.67	-
2478MHz	Pass	PK	4.9561G	51.36	74.00	-22.64	5.36	3	Horizontal	112	1.67	-

GFSK

2402MHz_TX

12/12/2018

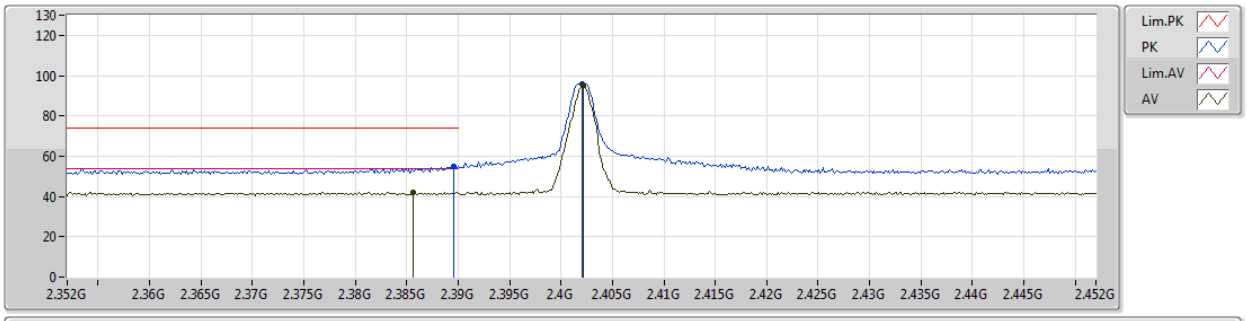


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.38968G	42.08	54.00	-11.92	-1.59	3	Vertical	341	1.26	-
AV	2.40214G	94.69	Inf	-Inf	-1.54	3	Vertical	341	1.26	-
PK	2.38997G	54.24	74.00	-19.76	-1.59	3	Vertical	341	1.26	-
PK	2.40214G	95.56	Inf	-Inf	-1.54	3	Vertical	341	1.26	-

GFSK

2402MHz_TX

12/12/2018

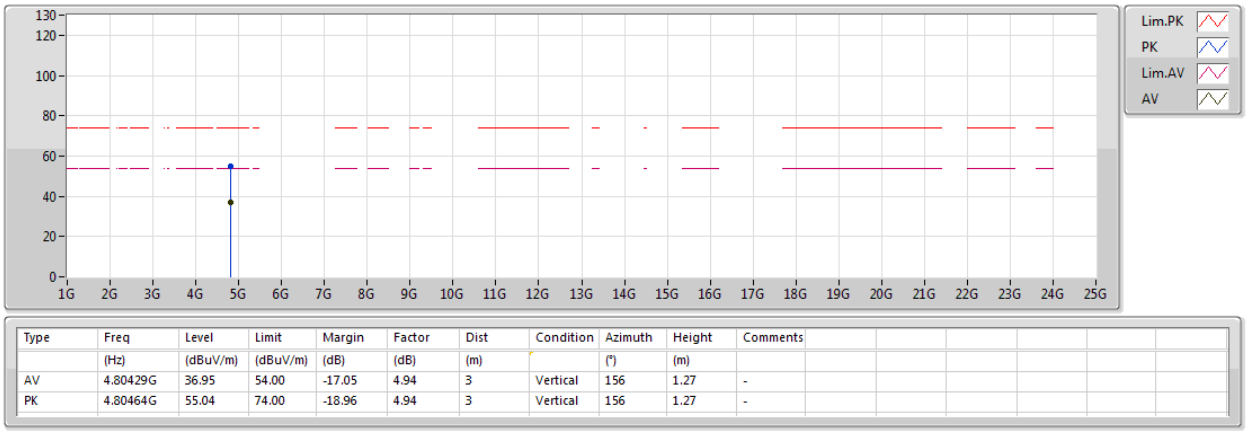


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.38562G	42.27	54.00	-11.73	-1.61	3	Horizontal	34	1.26	-
AV	2.40214G	95.08	Inf	-Inf	-1.54	3	Horizontal	34	1.26	-
PK	2.38954G	54.94	74.00	-19.06	-1.59	3	Horizontal	34	1.26	-
PK	2.402G	95.70	Inf	-Inf	-1.54	3	Horizontal	34	1.26	-

GFSK

2402MHz_TX

12/12/2018

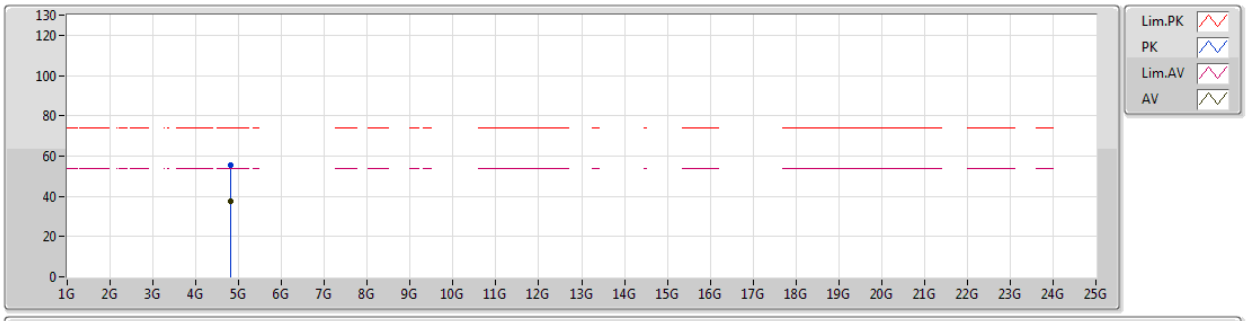


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.80429G	36.95	54.00	-17.05	4.94	3	Vertical	156	1.27	-
PK	4.80464G	55.04	74.00	-18.96	4.94	3	Vertical	156	1.27	-

GFSK

2402MHz_TX

12/12/2018

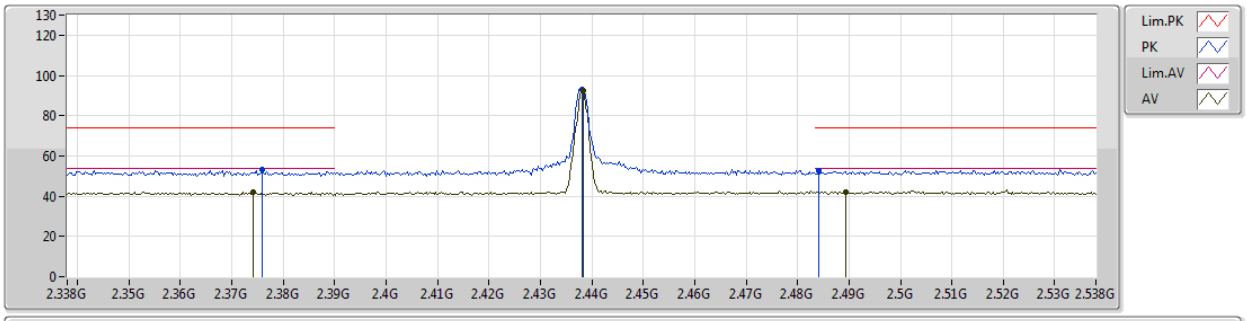


Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.80425G	37.40	54.00	-16.60	4.94	3	Horizontal	249	1.24	-
PK	4.80403G	55.26	74.00	-18.74	4.94	3	Horizontal	249	1.24	-

GFSK

2438MHz_TX

12/12/2018



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.37423G	42.14	54.00	-11.86	-1.65	3	Vertical	338	1.06	-
AV	2.43829G	92.61	Inf	-Inf	-1.40	3	Vertical	338	1.06	-
AV	2.4893G	42.26	54.00	-11.74	-1.22	3	Vertical	338	1.06	-
PK	2.37597G	53.05	74.00	-20.95	-1.64	3	Vertical	338	1.06	-
PK	2.438G	93.26	Inf	-Inf	-1.40	3	Vertical	338	1.06	-
PK	2.48409G	52.45	74.00	-21.55	-1.23	3	Vertical	338	1.06	-

GFSK

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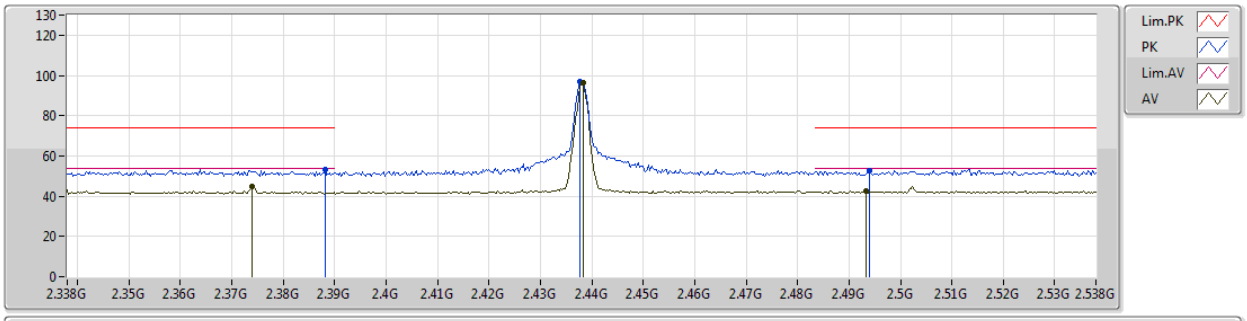

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.37394G	44.80	54.00	-9.20	-1.65	3	Horizontal	43	1.14	-
AV	2.43829G	96.13	Inf	-Inf	-1.40	3	Horizontal	43	1.14	-
AV	2.49336G	42.67	54.00	-11.33	-1.19	3	Horizontal	43	1.14	-
PK	2.38814G	53.01	74.00	-20.99	-1.59	3	Horizontal	43	1.14	-
PK	2.43771G	96.74	Inf	-Inf	-1.40	3	Horizontal	43	1.14	-
PK	2.49394G	52.91	74.00	-21.09	-1.19	3	Horizontal	43	1.14	-

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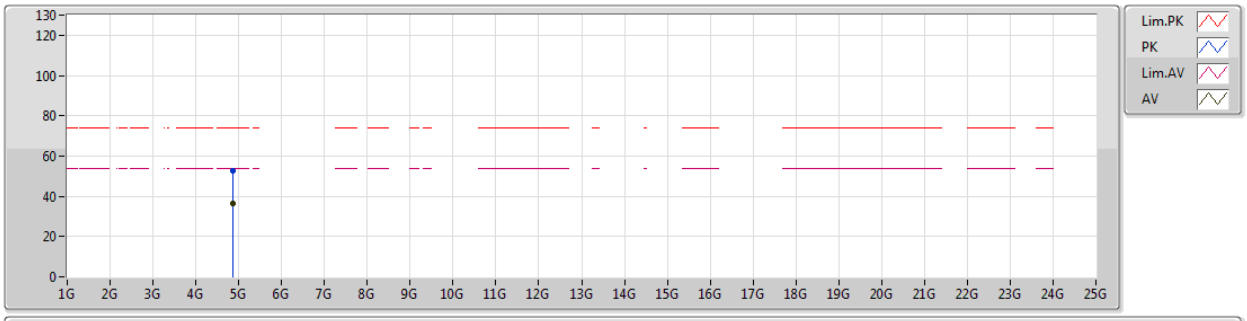
12/12/2018



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.87617G	36.67	54.00	-17.33	5.15	3	Vertical	263	1.25	-
PK	4.87585G	52.65	74.00	-21.35	5.15	3	Vertical	263	1.25	-

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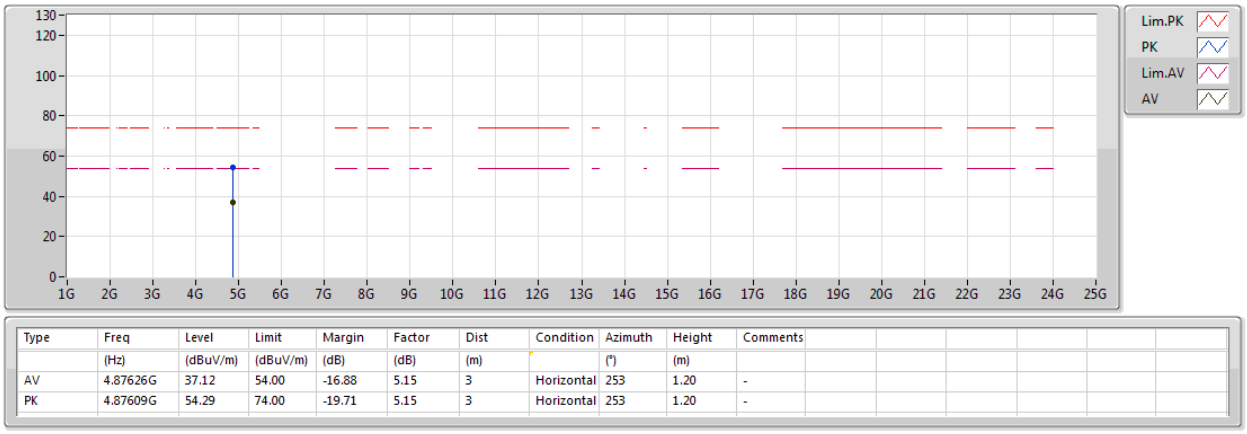
12/12/2018



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.87626G	37.12	54.00	-16.88	5.15	3	Horizontal	253	1.20	-
PK	4.87609G	54.29	74.00	-19.71	5.15	3	Horizontal	253	1.20	-

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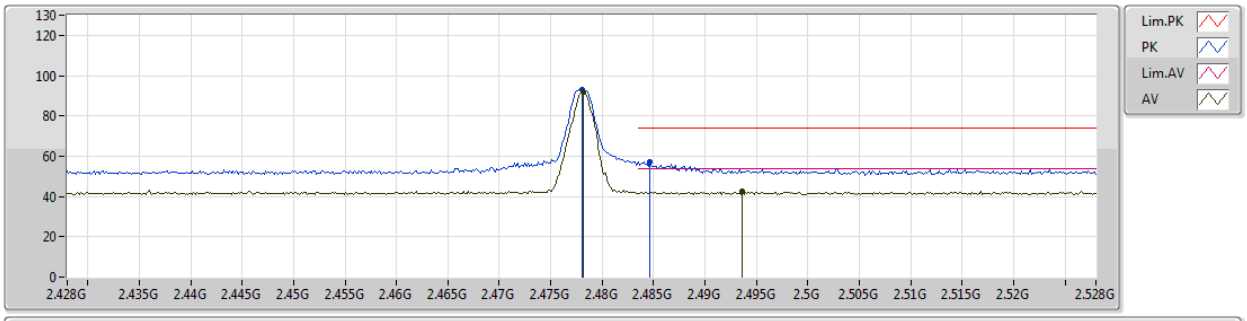

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.47814G	92.14	Inf	-Inf	-1.26	3	Vertical	350	1.19	-
AV	2.49365G	42.46	54.00	-11.54	-1.19	3	Vertical	350	1.19	-
PK	2.478G	92.80	Inf	-Inf	-1.26	3	Vertical	350	1.19	-
PK	2.48467G	57.13	74.00	-16.87	-1.23	3	Vertical	350	1.19	-

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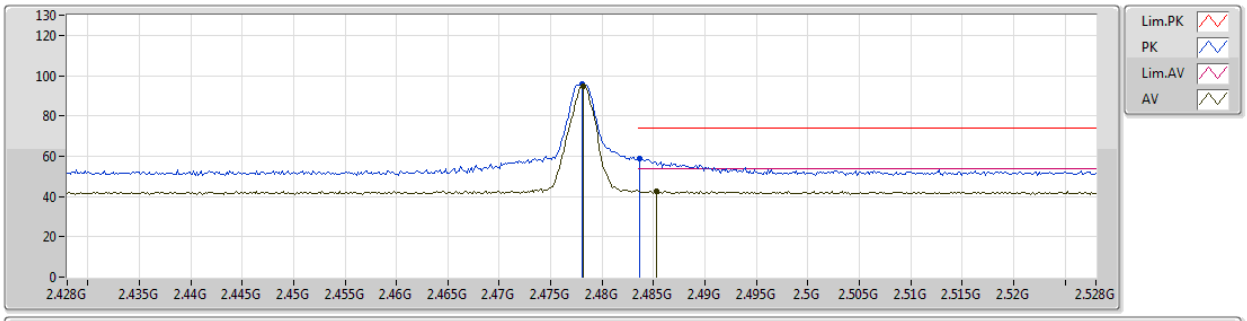

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	2.47814G	94.92	Inf	-Inf	-1.26	3	Horizontal	349	1.01	-
AV	2.48525G	42.85	54.00	-11.15	-1.23	3	Horizontal	349	1.01	-
PK	2.478G	95.56	Inf	-Inf	-1.26	3	Horizontal	349	1.01	-
PK	2.48365G	58.85	74.00	-15.15	-1.23	3	Horizontal	349	1.01	-

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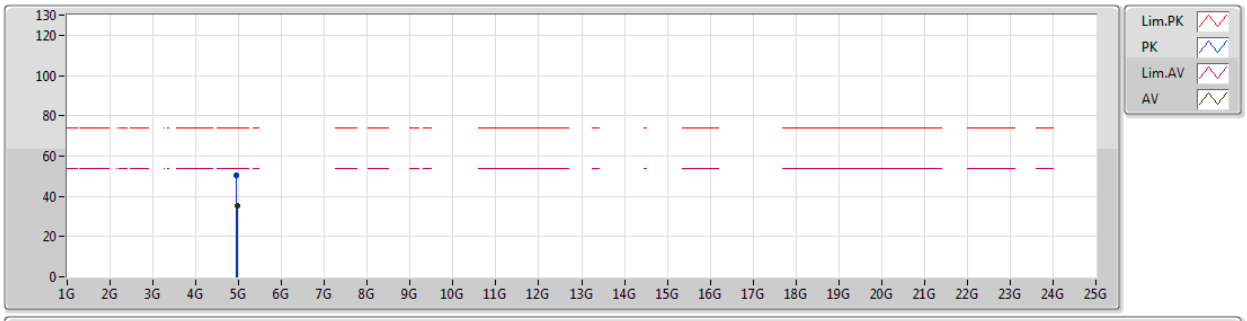
12/12/2018



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.95633G	35.14	54.00	-18.86	5.37	3	Vertical	162	1.30	-
PK	4.95602G	50.56	74.00	-23.44	5.36	3	Vertical	162	1.30	-

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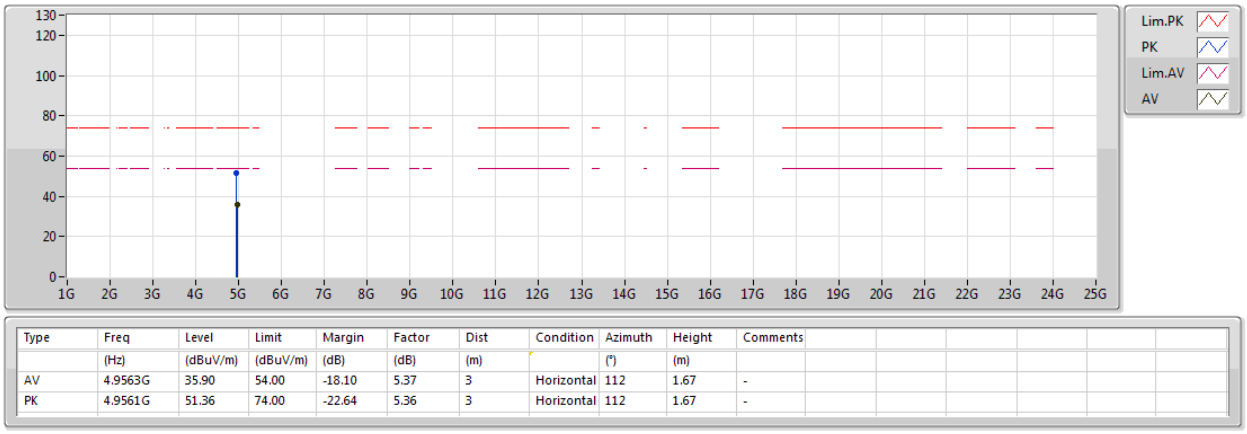

Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comments
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)	
AV	4.9563G	35.90	54.00	-18.10	5.37	3	Horizontal	112	1.67	-
PK	4.9561G	51.36	74.00	-22.64	5.36	3	Horizontal	112	1.67	-