

FCC Test Report

FCC ID : UJ9IRM22R
Equipment : Wireless Mouse
Brand Name : i-rocks
Model Name : IRM22R
Applicant : i-Rocks Technology Co., Ltd.
12F, No. 190, Chung-hsin Rd., Sec. 2, Hsin-tien City,
Taipei, Taiwan R.O.C.
Manufacturer : G. TECH TECHNOLOGY LTD.
No. 8, Jinyuan 1st Road, High-tech Zone, Zhuhai City,
Guangdong, China 519085
Standard : 47 CFR FCC Part 15.247

The product was received on May 28, 2018, and testing was started from Jun. 08, 2018 and completed on Jun. 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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TEL : 886-3-3273456
FAX : 886-3-3270973
Report Template No.: HE1-C9 Ver2.0
FCC ID: UJ9IRM22R

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)	20dB Bandwidth	PASS	15.247(a)
3.2	15.247(a)	Carrier Frequency Separation	PASS	15.247(a)
3.3	15.247(b)	Maximum Conducted Output Power	PASS	15.247(b)
3.4	15.247(a)	Number of Hopping Frequencies and Hopping Bandedge	PASS	15.247(a)
3.5	15.247(a)	Time of Occupancy (Dwell Time)	PASS	15.247(a)
3.6	15.247(d)	Emissions in Non-restricted Frequency Bands	PASS	15.247(d)
3.7	15.247(d)	Emissions in Restricted Frequency Bands	PASS	Restricted Bands: FCC 15.209

Reviewed by: Sam Tsai

Report Producer: Amber Chiu

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	Mode	Ch. Frequency (MHz)	Channel Number
2400-2483.5	Wireless devices	2408-2474	0-33 [34]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	FHSS	1.9	1TX

Note:

- ♦ System using FHSS modulation.
- ♦ BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Ant.	Port	Brand	Model Name	Antenna Type	Connector
1	1	-	PCB	fixed on board	2.15

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

1.1.4 Mode Test Duty Cycle

Mode	DC	DCF(dB)	T(s)	VBW(Hz) $\geq$ 1/T
FHSS	0.118	9.281	7.85m	300

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
- ♦ Public Notice DA 00-705
- ♦ ANSI C63.10-2013

1.3 Testing Location Information

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

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Andy	24.5°C / 63%	13/Jun/2018
Radiated	03CH09-HY	Andy	23.4°C / 58%	08/Jun/2018

1.4 Measurement Uncertainty

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

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

2 Test Configuration of EUT

2.1 Test Condition

RF Conducted	Abbreviation	Remark
RF Conducted-FS	Abbreviation	Remark
TnomVnom	Tnom	20°C
-	Vnom	3V

2.2 Test Channel Mode

Mode	PowerSetting
FHSS_Nss1_1TX	-
2408MHz	Default
2440MHz	Default
2474MHz	Default

2.3 The Worst Case Measurement Configuration

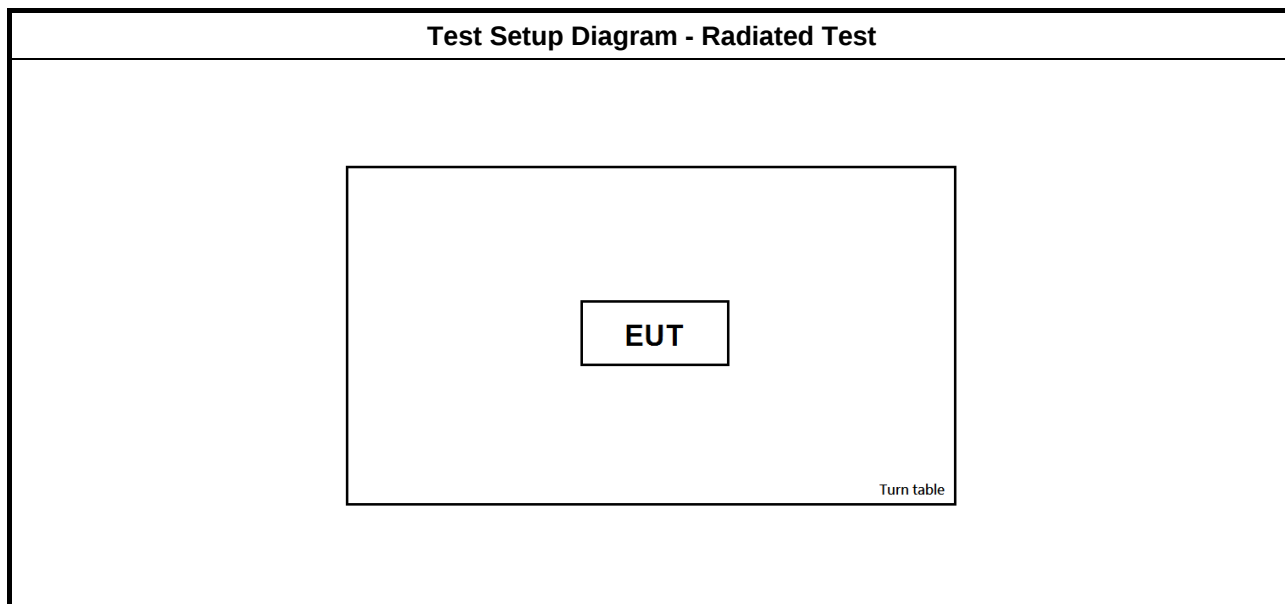
The Worst Case Mode for Following Conformance Tests	
Tests Item	20dB Bandwidth Carrier Frequency Separation Maximum Conducted Output Power Number of Hopping Frequencies Hopping Bandedge Time of Occupancy (Dwell Time) Emissions in Non-restricted Frequency Bands
Test Condition	Conducted measurement at 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	Z Plane
	
Worst Planes of EUT	V

2.4 Support Equipment

Support Equipment – Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Battery	-	-	-

2.5 Test Setup Diagram



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

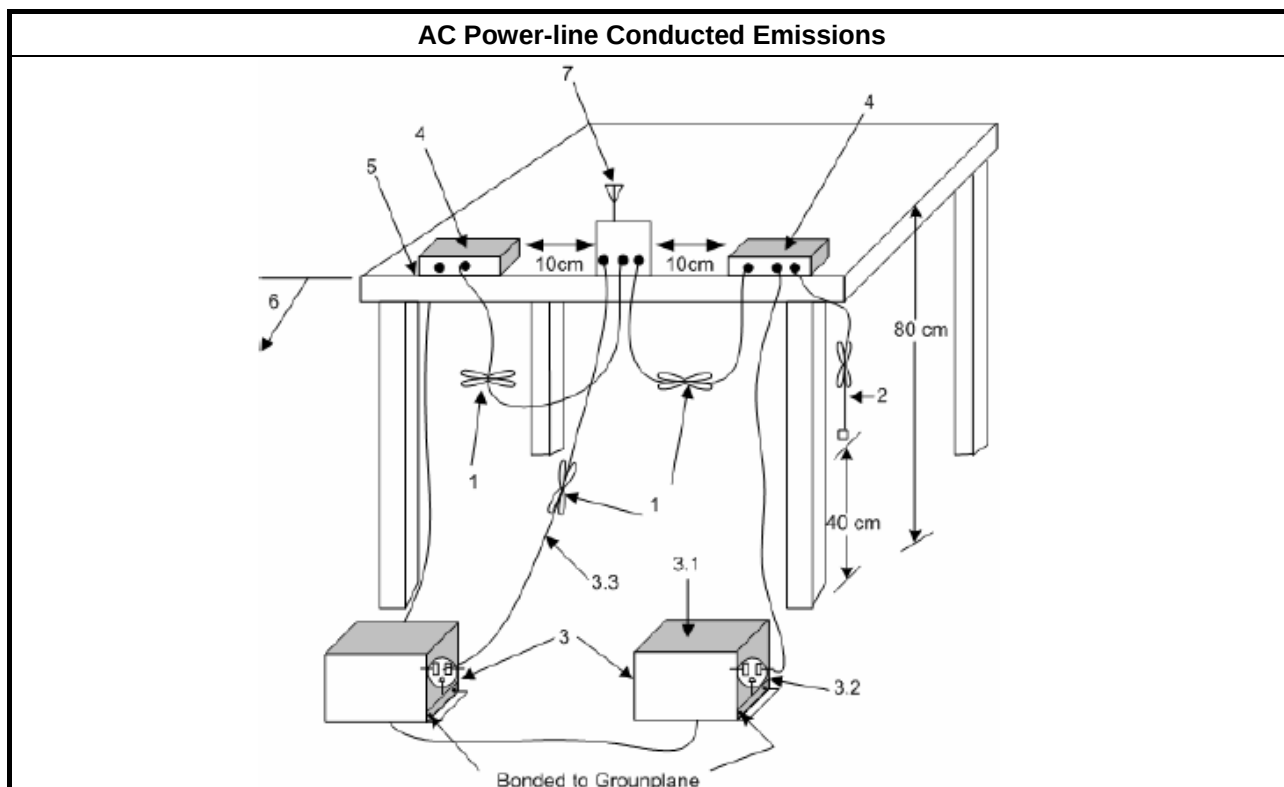
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

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

3.1.4 Test Setup





3.1.5 Test Result of AC Power-line Conducted Emissions

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 20dB Bandwidth and Carrier Frequency Separation

3.2.1 20dB Bandwidth and Carrier Frequency Separation Limit

20dB Bandwidth and Carrier Frequency Separation Limit for Frequency Hopping Systems	
2400-2483.5 MHz Band:	
	$N \geq 75$ and $ChS \geq MAX$ (20 dB bandwidth, 25 kHz).
	$75 > N \geq 15$ and $ChS \geq MAX$ (20 dB bandwidth 2/3, 25 kHz).
N: Number of Hopping Frequencies; ChS: Hopping Channel Separation	

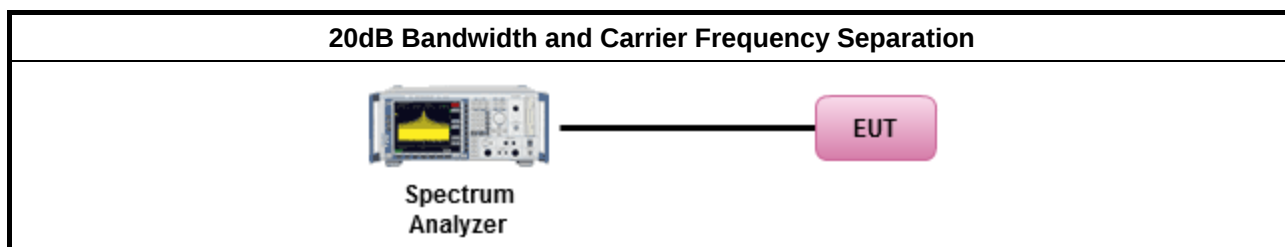
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method
Refer as ANSI C63.10-2013, clause 6.9.2 for 20 dB bandwidth measurement.
Refer as ANSI C63.10-2013, clause 7.8.2 for carrier frequency separation measurement.

3.2.4 Test Setup



3.2.5 Test Result of 20dB Bandwidth

Refer as Appendix A

3.2.6 Test Result of Carrier Frequency Separation

Refer as Appendix A

3.3 Maximum Conducted Output Power

3.3.1 Maximum Conducted Output Power Limit

Maximum Conducted Output Power Limit	
2400-2483.5 MHz Band:	
	$N \geq 75$; Power 30dBm; EIRP 36dBm
	$75 > N \geq 15$; Power 21dBm; EIRP 27dBm
N: Number of Hopping Frequencies	

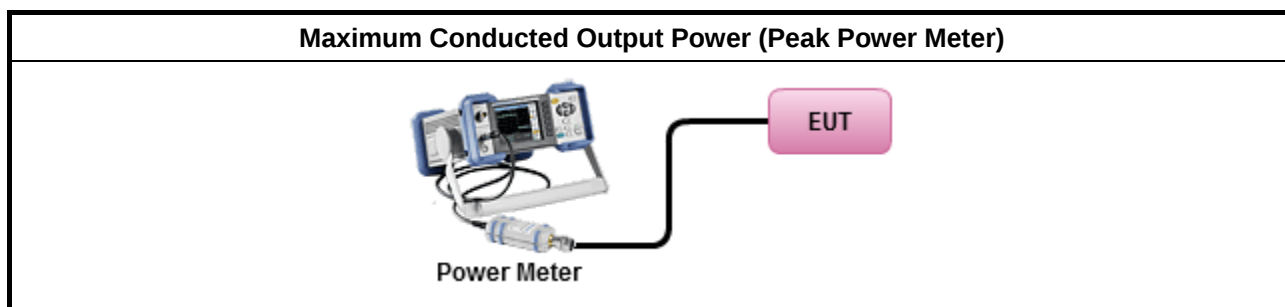
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method
Refer as ANSI C63.10-2013, clause 7.8.5 for output power measurement.

3.3.4 Test Setup



3.3.5 Test Result of Maximum Conducted Output Power

Refer as Appendix B

3.4 Number of Hopping Frequencies and Hopping Bandedge

3.4.1 Number of Hopping Frequencies Limit

Number of Hopping Frequencies Limit	
2400-2483.5 MHz Band:	
	$N \geq 75$ and $ChS \geq MAX$ (20 dB bandwidth, 25 kHz).
	$75 > N \geq 15$ and $ChS \geq MAX$ (20 dB bandwidth 2/3, 25 kHz).
N: Number of Hopping Frequencies; ChS : Hopping Channel Separation	

3.4.2 Hopping Bandedge Limit

Refer clause 3.6.1 and clause 3.7.1

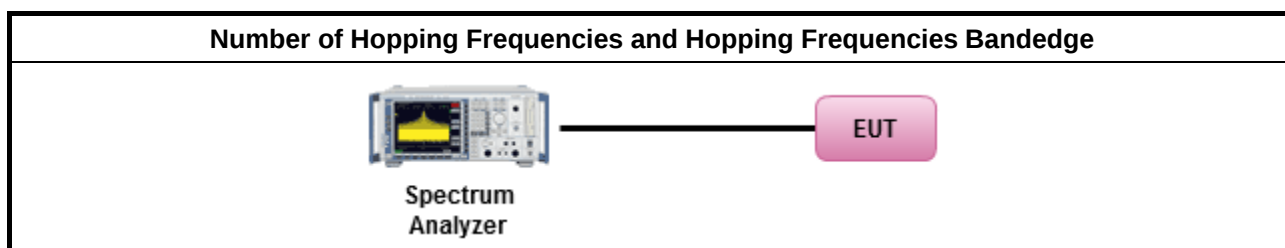
3.4.3 Measuring Instruments

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

3.4.4 Test Procedures

Test Method
Refer as ANSI C63.10-2013, clause 7.8.3 for number of hopping frequencies measurement.
Refer as ANSI C63.10-2013, clause 7.8.6 for hopping frequencies Bandedge measurement.

3.4.5 Test Setup



3.4.6 Test Result of Number of Hopping Frequencies

Refer as Appendix C

3.4.7 Test Result of Number of Hopping Frequencies Bandedge

Refer as Appendix C

3.5 Time of Occupancy (Dwell Time)

3.5.1 Time of Occupancy (Dwell Time) Limit

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems	
2400-2483.5 MHz Band:	
	$N \geq 75$; 0.4s in $N \times 0.4$ period
	$75 > N \geq 15$; 0.4s in $N \times 0.4$ period
N: Number of Hopping Frequencies	

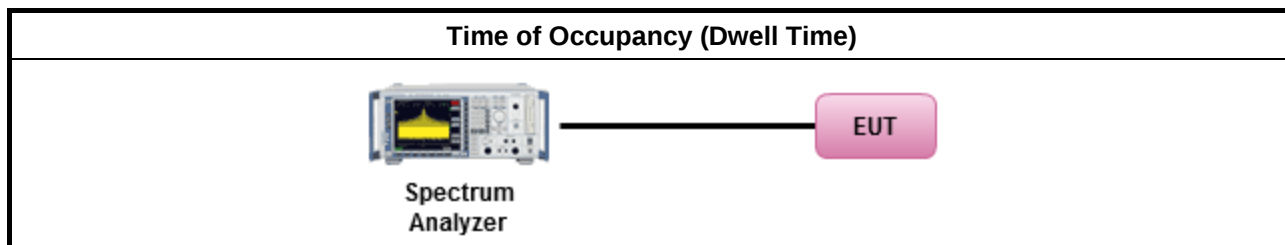
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
Refer as ANSI C63.10-2013, clause 7.8.4 for dwell time measurement.	
Bluetooth ACL packets can be 1, 3, or 5 time slots. Following as dwell time. Operate DH5 at maximum dwell time and maximum duty cycle.	
	The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is $5/1600$ seconds, or 3.125ms. DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel.

3.5.4 Test Setup



3.5.5 Test Result of Time of Occupancy (Dwell Time)

Refer as Appendix D

3.6 Emissions in Non-restricted Frequency Bands

3.6.1 Emissions in Non-restricted Frequency Bands Limit

Un-restricted Band Emissions Limit	
RF output power procedure	Limit (dB)
Peak output power procedure	20
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.	

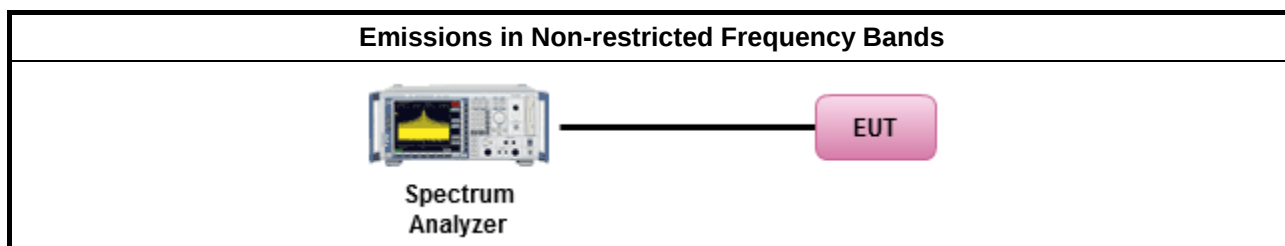
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

Test Method
Refer as ANSI C63.10-2013, clause 7.8.8 for unwanted emissions into non-restricted bands.

3.6.4 Test Setup



3.6.5 Test Result of Emissions in Non-restricted Frequency Bands

Refer as Appendix E

3.7 Emissions in Restricted Frequency Bands

3.7.1 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.

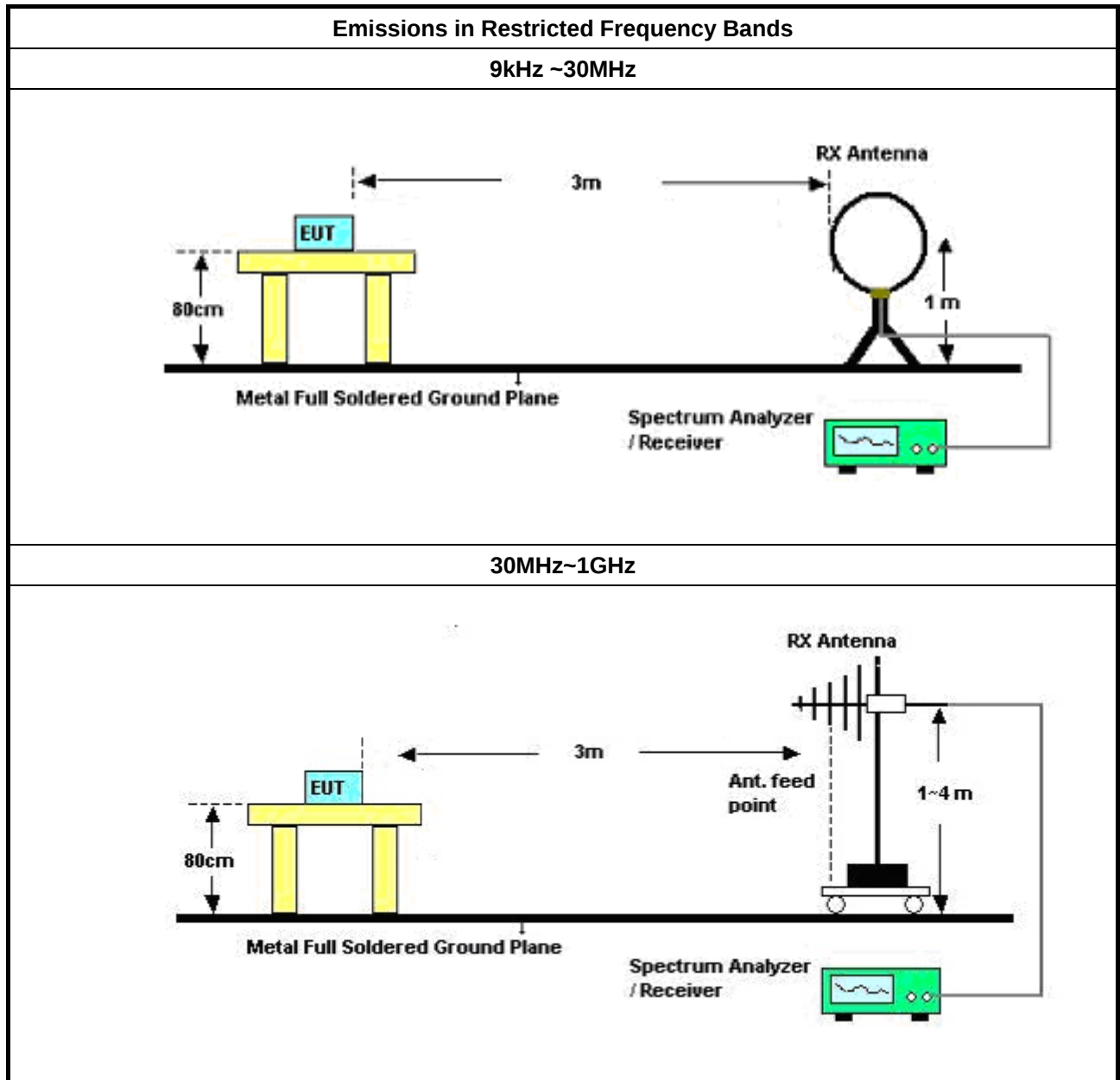
3.7.2 Measuring Instruments

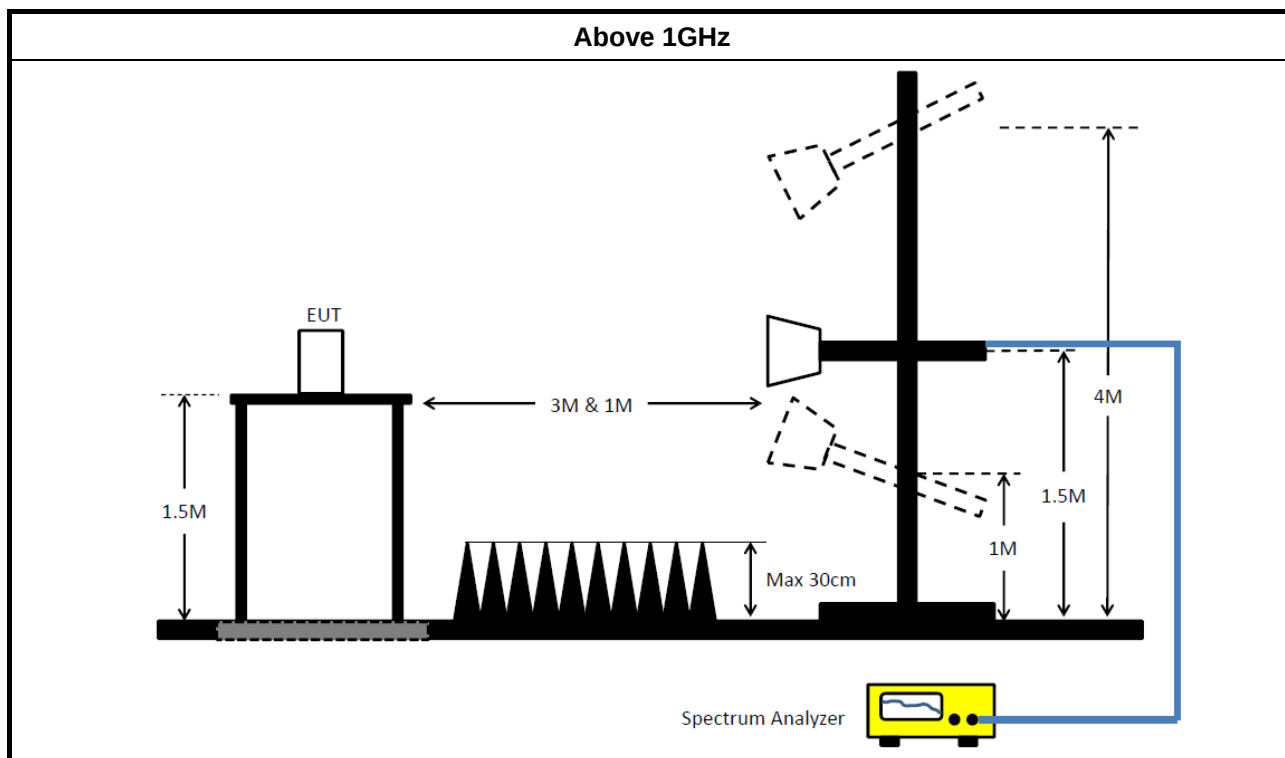
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

Test Method	
▪ The average emission levels shall be measured in [hopping duty factor].	
▪ Refer as ANSI C63.10; clause 6.9.2.2 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 ANSI C63.10, clause 4.1.4.2.1 QP value.
	▪ Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak.
	▪ Refer as ANSI C63.10, clause 4.1.4.2.4 average value of hopping pulsed emissions.

3.7.4 Test Setup





3.7.5 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.

3.7.6 Test Result of Emissions in Restricted Frequency Bands

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	101515	9kHz~40GHz	08/Dec/2017	07/Dec/2018
Power Sensor	Anritsu	MA2411B	1339407	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
Power Meter	Anritsu	ML2495A	1517010	300MHz ~ 40GHz	06/Nov/2017	05/Nov/2018
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10710/4	30MHz ~ 26.5GHz	25/Aug/2017	24/Aug/2018
RF Cable-0.2m	HUBER+SUHNER	SUCOFLEX_104	MY10709/4	30MHz ~ 26.5GHz	25/Aug/2017	24/Aug/2018
RF Cable-1m	HUBER+SUHNER	SUCOFLEX_104	MY37332/4	30MHz ~ 26.5GHz	26/Jan/2018	25/Jan/2019
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	27/Jul/2017	26/Jul/2018

Instrument for Radiated Test

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Due Date
N.S.A. Measurement	TDK	SAC-3M	03CH09-HY	30MHz ~ 1GHz	29/Apr/2018	28/Apr/2019
3m Semi Anechoic Chamber	TDK	SAC-3M	03CH09-HY	1GHz ~ 18GHz	28/Jun/2017	27/Jun/2018
Amplifier	Agilent	8449B	3008A02326	1GHz ~ 26.5GHz	17/Jul/2017	16/Jul/2018
Amplifier	EMC	EMC9135	980209	9KHz~1GHz	03/Jan/2018	02/Jan/2019
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200885	10Hz ~ 44GHz	20/Jul/2017	19/Jul/2018
Bilog Antenna & 5dB Attenuator	TESEQ	CBL 6111D	35418	30MHz~1GHz	09/Sep/2017	08/Sep/2018
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120D	BBHA9120D 1534	1GHz~18GHz	30/Apr/2018	29/Apr/2019
Loop Antenna	TESEQ	HLA 6120	31244	9kHz ~ 30MHz	28/Mar/2018	27/Mar/2019
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	02/Feb/2018	01/Feb/2019
RF Cable-high	SUHNER	SUCOFLEX104	MY34918/4	1GHz ~ 40GHz	02/Feb/2018	01/Feb/2019

Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
FHSS_Nss1_1TX	2.166M	2.153M	2M15D1D	2.073M	2.094M

Max-N dB = Maximum 20dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;

Min-N dB = Minimum 20dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
FHSS_Nss1_1TX	-	-	-	-
2408MHz_TnomVnom	Pass	Inf	2.073M	2.094M
2440MHz_TnomVnom	Pass	Inf	2.073M	2.094M
2474MHz_TnomVnom	Pass	Inf	2.166M	2.153M

Port X-N dB = Port X 20dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

FHSS_Nss1_1TX
EBW
2408MHz

13/06/2018

Ch Freq
2.408GHz

Span
4.75MHz

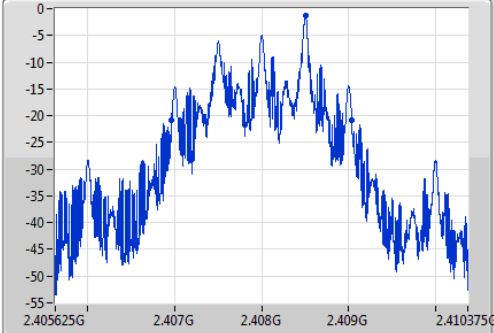
RBW
30kHz

VBW
100kHz

Sweep Time
100ms

Detector Type
Peak

Port1 



Ch Freq
2.408GHz

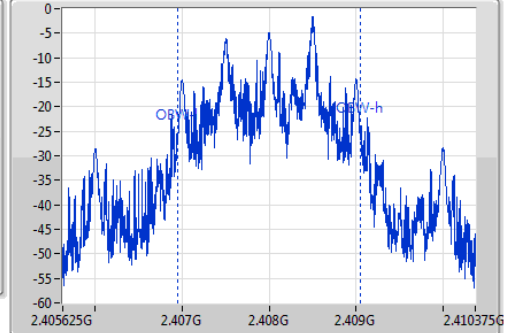
Span
4.75MHz

RBW
30kHz

VBW
100kHz

Sweep Time
100ms

Detector Type
Sample



20dB(Hz)	FI-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
2.073M	2.406965G	2.409038G	2.094M	2.406953G	2.409047G	Inf	1

FHSS_Nss1_1TX
EBW
2440MHz

13/06/2018

Ch Freq
2.44GHz

Span
4.75MHz

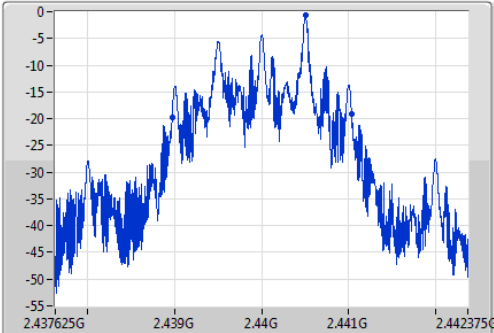
RBW
30kHz

VBW
100kHz

Sweep Time
100ms

Detector Type
Peak

Port1 



Ch Freq
2.44GHz

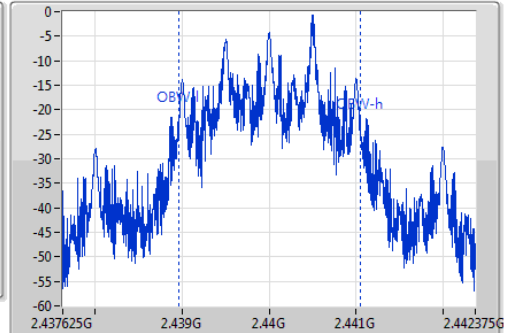
Span
4.75MHz

RBW
30kHz

VBW
100kHz

Sweep Time
100ms

Detector Type
Sample



20dB(Hz)	FI-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
2.073M	2.438969G	2.441043G	2.094M	2.438958G	2.441052G	Inf	1

FHSS_Nss1_1TX
EBW
2474MHz

13/06/2018

Ch Freq
2.474GHz

Span
4.75MHz

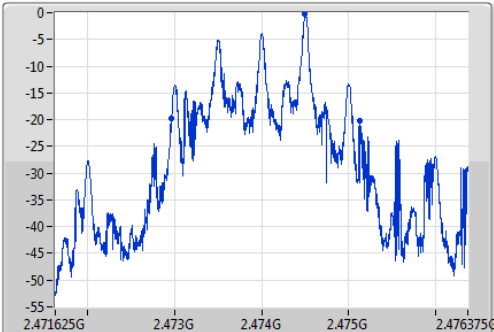
RBW
30kHz

VBW
100kHz

Sweep Time
100ms

Detector Type
Peak

Port1 



Ch Freq
2.474GHz

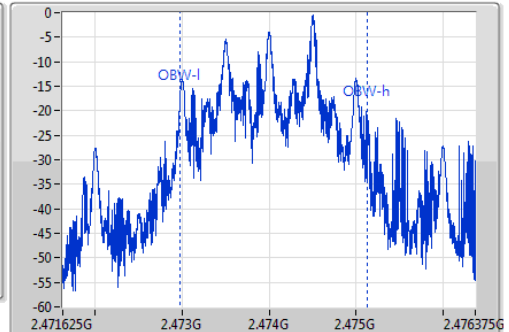
Span
4.75MHz

RBW
30kHz

VBW
100kHz

Sweep Time
100ms

Detector Type
Sample



20dB(Hz)	FI-20dB(Hz)	Fh-20dB(Hz)	OBW(Hz)	FI-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
2.166M	2.472965G	2.475131G	2.153M	2.472977G	2.47513G	Inf	1

Summary

Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
FHSS_Nss1_1TX	2.00925M	1.995M

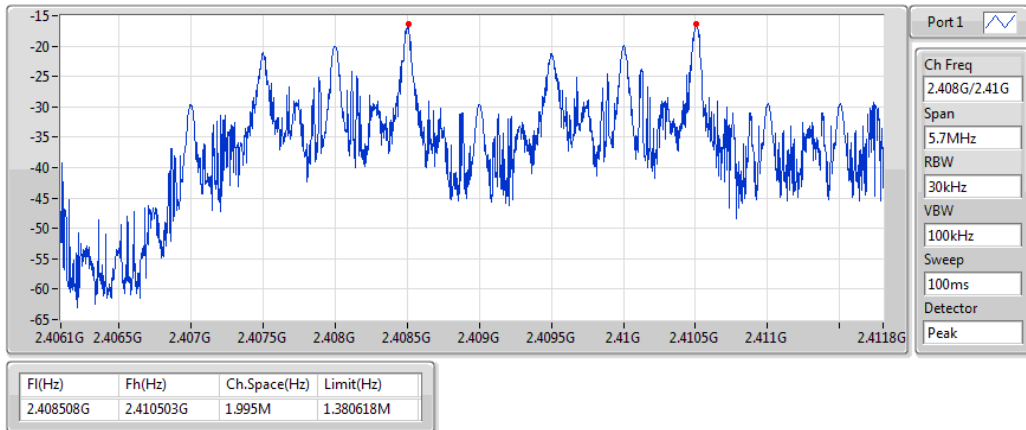
Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
FHSS_Nss1_1TX	-	-	-	-	-
2408MHz_TnomVnom	Pass	2.408508G	2.410503G	1.995M	1.380618M
2440MHz_TnomVnom	Pass	2.4405G	2.442509G	2.00925M	1.380618M
2474MHz_TnomVnom	Pass	2.472506G	2.474506G	1.99975M	1.442556M

FHSS_Nss1_1TX

Channel Separation

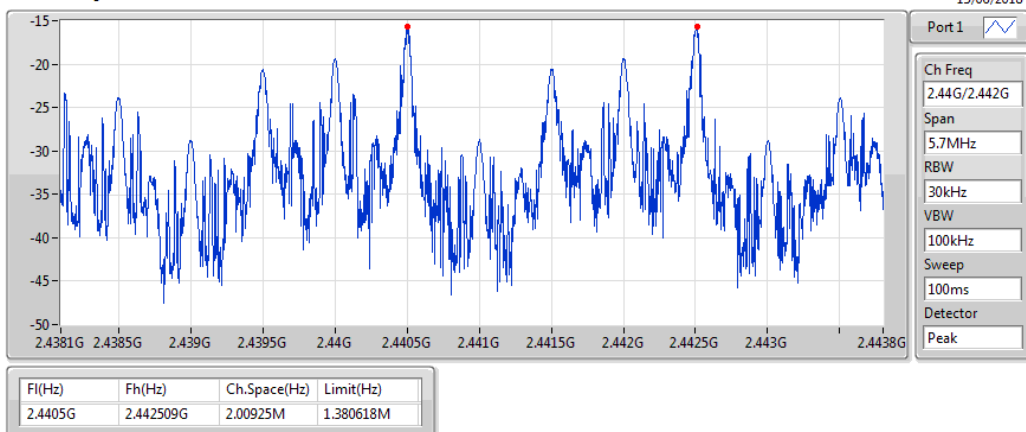
2.408G/2.41GHz



FHSS_Nss1_1TX

Channel Separation

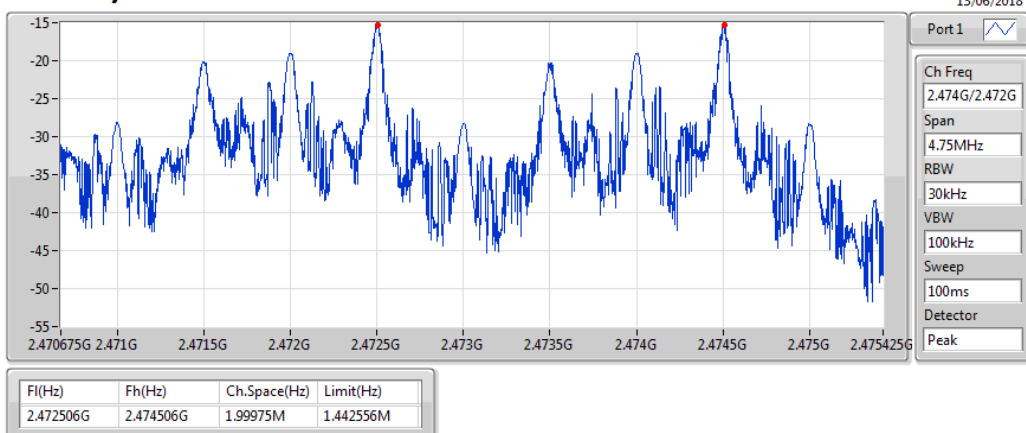
2.44G/2.442GHz



FHSS_Nss1_1TX

Channel Separation

2.474G/2.472GHz



Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
FHSS_Nss1_1TX	1.37	0.00137

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
FHSS_Nss1_1TX	-	-	-	-
2408MHz_TnomVnom	Pass	2.15	0.28	21.00
2440MHz_TnomVnom	Pass	2.15	0.91	21.00
2474MHz_TnomVnom	Pass	2.15	1.37	21.00

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
FHSS	-0.46	0.00090

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)
FHSS	-	-	-	-	-
2408MHz_TnomVnom	Pass	2.15	-0.92	-0.92	21.00
2440MHz_TnomVnom	Pass	2.15	-0.69	-0.69	21.00
2474MHz_TnomVnom	Pass	2.15	-0.46	-0.46	21.00

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

Note : Conducted average output power is for reference only

Summary

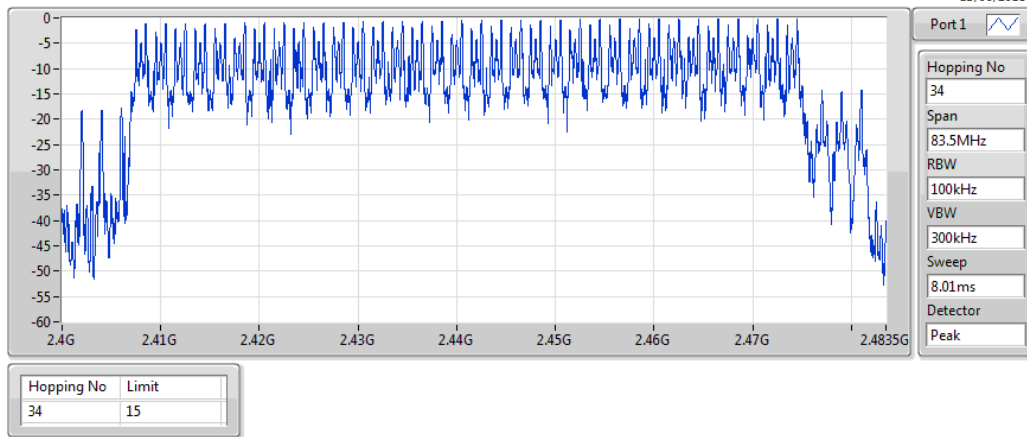
Mode	Max-Hop No
2.4-2.4835GHz	-
FHSS_Nss1_1TX	34

Result

Mode	Result	Hopping No	Limit
FHSS_Nss1_1TX	-	-	-
2440MHz_TnomVnom	Pass	34	15

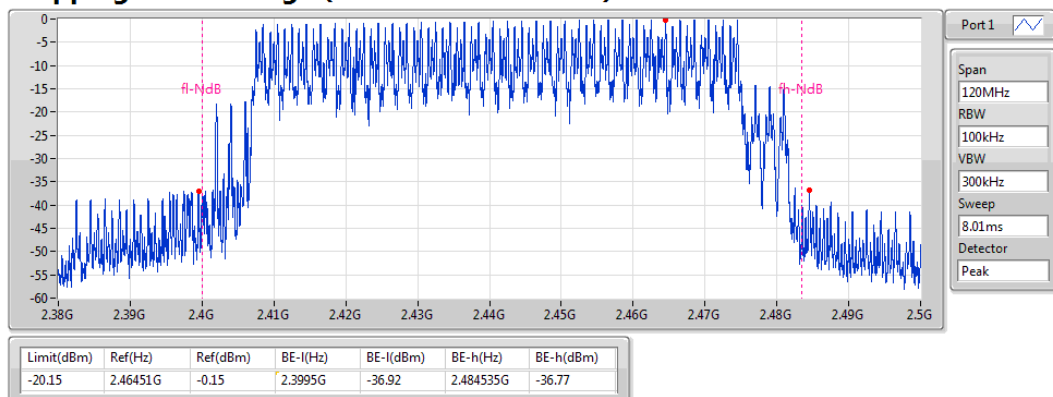
FHSS_Nss1_1TX 2440MHz

Hopping Ch



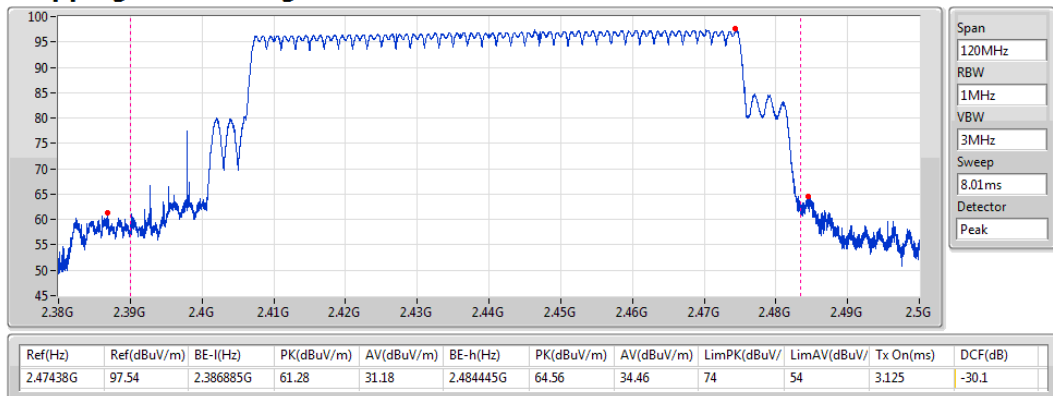
FHSS_Nss1_1TX 2440MHz

Hopping Ch Bandedge (Non-restricted Band)



FHSS_Nss1_1TX 2440MHz

Hopping Ch Bandedge (Restricted Band)



Summary

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
FHSS_Nss1_1TX	8.5408m

Result

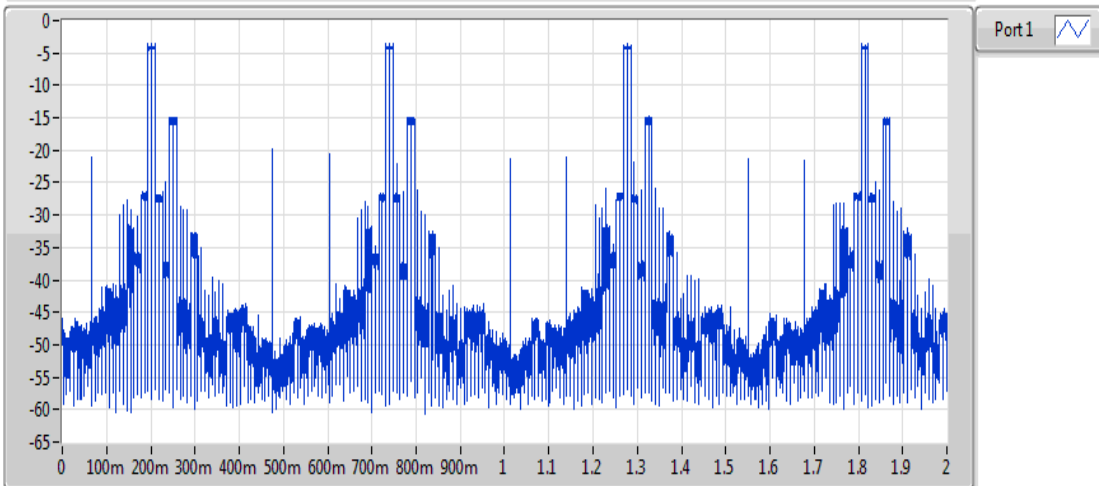
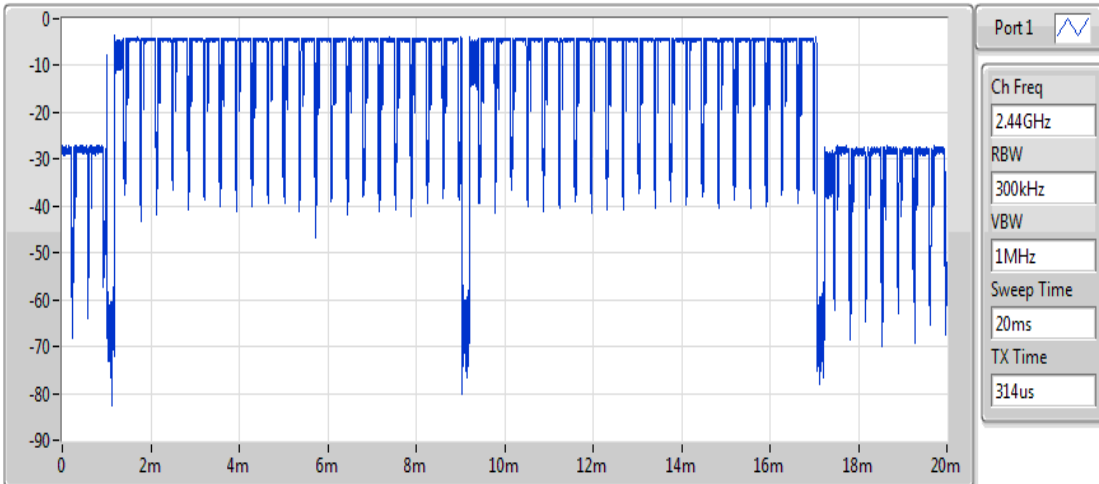
Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (s)
FHSS_Nss1_1TX	-	-	-	-	-
2440MHz_TnomVnom	Pass	13.6	8.5408m	400m	314u

FHSS_Nss1_1TX

Dwell

2440MHz

13/06/2018



Period(s)	Dwell(s)	Limit(s)	Tx On(s)
13.6	8.5408m	400m	314u

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	-	-	-	-	-	-	-	-	-	-	-	-	-
FHSS_Nss1_1TX	Pass	2.40835G	-1.88	-21.88	2.3962G	-38.12	2.396466G	-37.08	2.483546G	-57.30	7.223409G	-32.88	1

Result

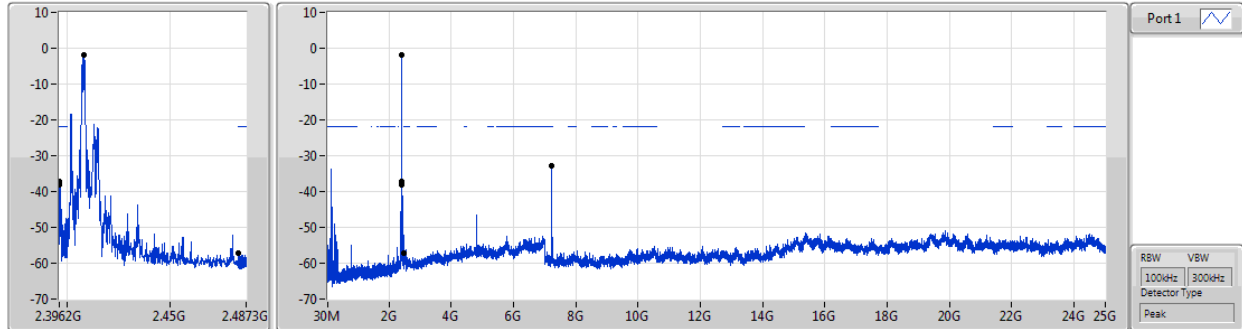
Mode	Result	Ref (Hz)	Ref (dBm)	Limit (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Freq (Hz)	Level (dBm)	Port
FHSS_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-	-
2408MHz_TnomVnom	Pass	2.40835G	-1.88	-21.88	2.3962G	-38.12	2.396466G	-37.08	2.483546G	-57.30	7.223409G	-32.88	1
2440MHz_TnomVnom	Pass	2.440581G	-0.34	-20.34	147.1269M	-39.00	2.399552G	-54.57	2.486494G	-53.70	24.617284G	-51.13	1
2474MHz_TnomVnom	Pass	2.474649G	0.04	-19.96	147.1269M	-38.99	2.399278G	-57.67	2.485582G	-33.56	2.4873G	-45.33	1

FHSS_Nss1_1TX

CSE NdB

2408MHz

13/06/2018

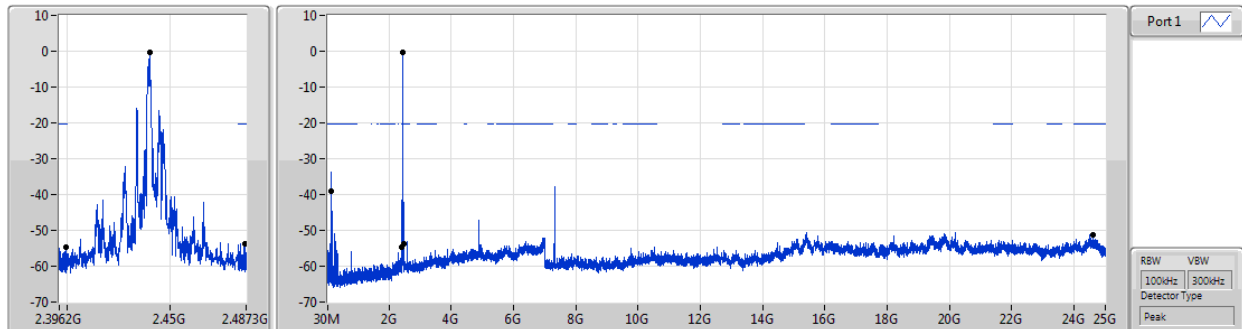


FHSS_Nss1_1TX

CSE NdB

2440MHz

13/06/2018

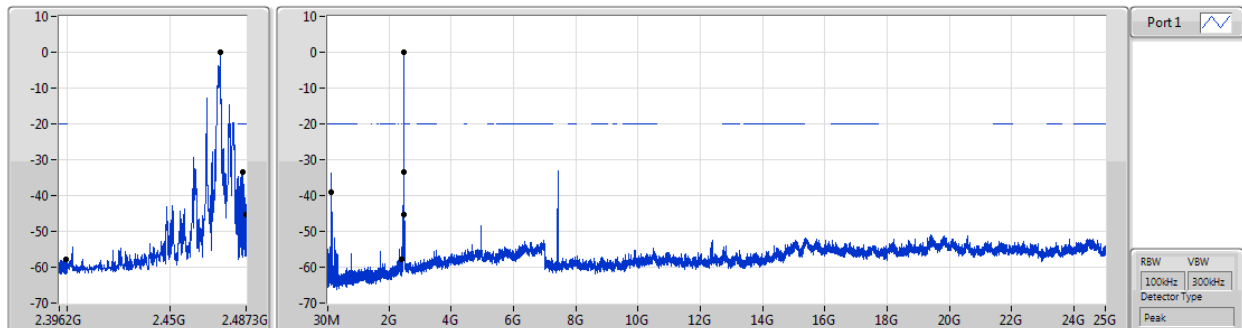


FHSS_Nss1_1TX

CSE NdB

2474MHz

13/06/2018



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	-	-	-	-	-	-	-	-	-	-	-	-
FHSS_Nss1_1TX	Pass	PK	953.44M	36.01	46.00	-9.99	-4.71	3	Horizontal	0	1.00	-

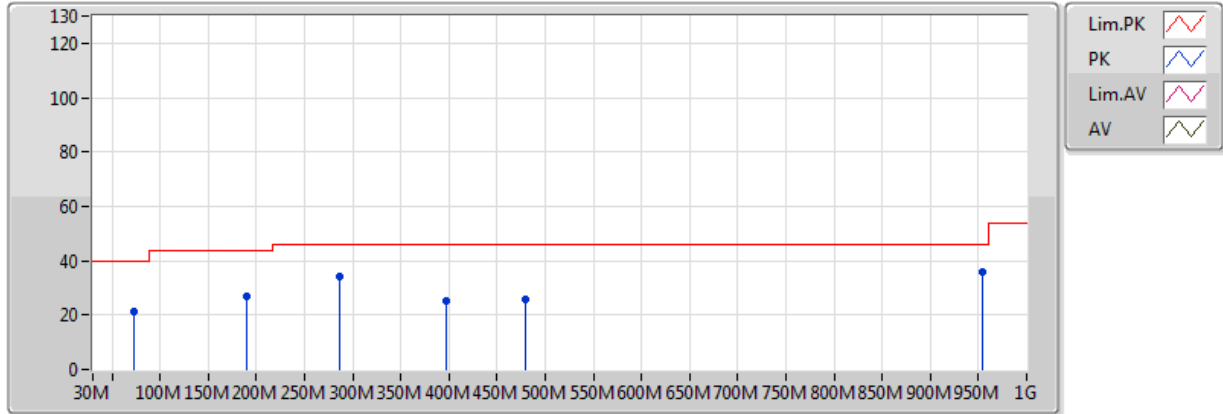
Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
FHSS_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2440MHz	Pass	PK	72.68M	21.13	40.00	-18.87	-24.92	3	Vertical	360	1.00	-
2440MHz	Pass	PK	189.08M	26.63	43.50	-16.87	-21.38	3	Vertical	360	1.00	-
2440MHz	Pass	PK	286.08M	34.33	46.00	-11.67	-16.97	3	Vertical	360	1.00	-
2440MHz	Pass	PK	396.66M	25.06	46.00	-20.94	-14.16	3	Vertical	360	1.00	-
2440MHz	Pass	PK	480.08M	26.03	46.00	-19.97	-12.38	3	Vertical	360	1.00	-
2440MHz	Pass	PK	953.44M	35.78	46.00	-10.22	-4.71	3	Vertical	360	1.00	-
2440MHz	Pass	PK	70.74M	22.58	40.00	-17.42	-25.07	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	119.24M	27.60	43.50	-15.90	-19.33	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	239.52M	28.28	46.00	-17.72	-18.69	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	303.54M	31.13	46.00	-14.87	-16.60	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	485.9M	32.10	46.00	-13.90	-12.30	3	Horizontal	0	1.00	-
2440MHz	Pass	PK	953.44M	36.01	46.00	-9.99	-4.71	3	Horizontal	0	1.00	-

FHSS_Nss1_1TX

2440MHz_Battery

08/06/2018

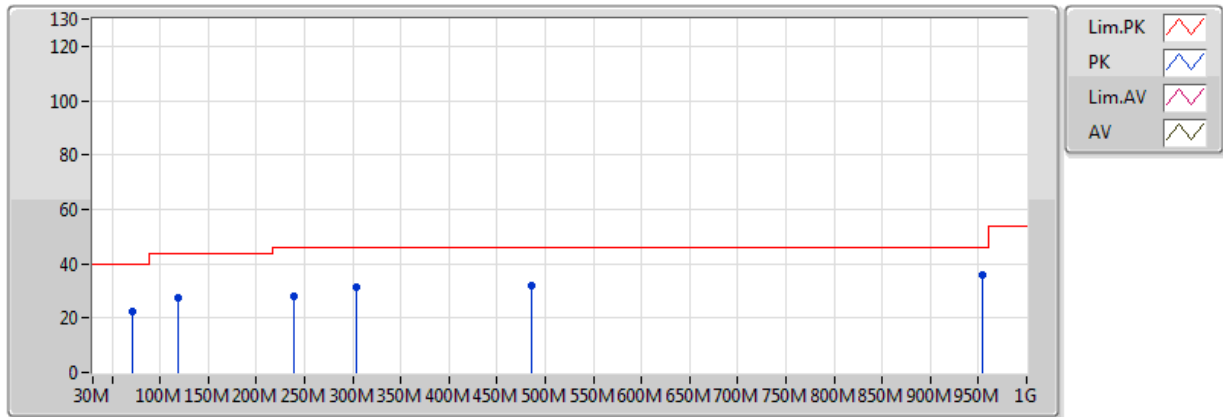


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	72.68M	21.13	40.00	-18.87	-24.92	3	Vertical	360	1.00	-
PK	189.08M	26.63	43.50	-16.87	-21.38	3	Vertical	360	1.00	-
PK	286.08M	34.33	46.00	-11.67	-16.97	3	Vertical	360	1.00	-
PK	396.66M	25.06	46.00	-20.94	-14.16	3	Vertical	360	1.00	-
PK	480.08M	26.03	46.00	-19.97	-12.38	3	Vertical	360	1.00	-
PK	953.44M	35.78	46.00	-10.22	-4.71	3	Vertical	360	1.00	-

FHSS_Nss1_1TX

2440MHz_Battery

08/06/2018



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
PK	70.74M	22.58	40.00	-17.42	-25.07	3	Horizontal	0	1.00	-
PK	119.24M	27.60	43.50	-15.90	-19.33	3	Horizontal	0	1.00	-
PK	239.52M	28.28	46.00	-17.72	-18.69	3	Horizontal	0	1.00	-
PK	303.54M	31.13	46.00	-14.87	-16.60	3	Horizontal	0	1.00	-
PK	485.9M	32.10	46.00	-13.90	-12.30	3	Horizontal	0	1.00	-
PK	953.44M	36.01	46.00	-9.99	-4.71	3	Horizontal	0	1.00	-

Summary

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2.4-2.4835GHz	-	-	-	-	-	-	-	-	-	-	-	-
FHSS_Nss1_1TX	Pass	AV	7.31834G	53.74	54.00	-0.26	7.74	3	Horizontal	90	3.10	-

Result

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
FHSS_Nss1_1TX	-	-	-	-	-	-	-	-	-	-	-	-
2408MHz	Pass	AV	2.3628G	39.82	54.00	-14.18	30.68	3	Vertical	165	2.57	-
2408MHz	Pass	AV	2.4086G	72.51	Inf	-Inf	30.84	3	Vertical	165	2.57	-
2408MHz	Pass	PK	2.3628G	55.95	74.00	-18.05	30.68	3	Vertical	165	2.57	-
2408MHz	Pass	PK	2.4086G	88.64	Inf	-Inf	30.84	3	Vertical	165	2.57	-
2408MHz	Pass	AV	2.3858G	41.19	54.00	-12.81	30.76	3	Horizontal	143	1.53	-
2408MHz	Pass	AV	2.4086G	77.86	Inf	-Inf	30.84	3	Horizontal	143	1.53	-
2408MHz	Pass	PK	2.3858G	57.32	74.00	-16.68	30.76	3	Horizontal	143	1.53	-
2408MHz	Pass	PK	2.4086G	93.99	Inf	-Inf	30.84	3	Horizontal	143	1.53	-
2408MHz	Pass	AV	4.817G	43.89	54.00	-10.11	2.07	3	Vertical	181	1.08	-
2408MHz	Pass	PK	4.817G	60.02	74.00	-13.98	2.07	3	Vertical	181	1.08	-
2408MHz	Pass	AV	4.81498G	40.40	54.00	-13.60	2.07	3	Horizontal	164	1.23	-
2408MHz	Pass	PK	4.81498G	56.53	74.00	-17.47	2.07	3	Horizontal	164	1.23	-
2440MHz	Pass	AV	2.3564G	39.49	54.00	-14.51	30.66	3	Vertical	190	3.19	-
2440MHz	Pass	AV	2.4404G	77.08	Inf	-Inf	30.96	3	Vertical	190	3.19	-
2440MHz	Pass	AV	2.4908G	39.96	54.00	-14.04	31.14	3	Vertical	190	3.19	-
2440MHz	Pass	PK	2.3564G	55.62	74.00	-18.38	30.66	3	Vertical	190	3.19	-
2440MHz	Pass	PK	2.4404G	93.21	Inf	-Inf	30.96	3	Vertical	190	3.19	-
2440MHz	Pass	PK	2.4908G	56.09	74.00	-17.91	31.14	3	Vertical	190	3.19	-
2440MHz	Pass	AV	2.389998G	39.56	54.00	-14.44	30.77	3	Horizontal	144	1.13	-
2440MHz	Pass	AV	2.4404G	79.59	Inf	-Inf	30.96	3	Horizontal	144	1.13	-
2440MHz	Pass	AV	2.4848G	39.99	54.00	-14.01	31.12	3	Horizontal	144	1.13	-
2440MHz	Pass	PK	2.389998G	55.69	74.00	-18.31	30.77	3	Horizontal	144	1.13	-
2440MHz	Pass	PK	2.4404G	95.72	Inf	-Inf	30.96	3	Horizontal	144	1.13	-
2440MHz	Pass	PK	2.4848G	56.12	74.00	-17.88	31.12	3	Horizontal	144	1.13	-
2440MHz	Pass	AV	4.87908G	41.97	54.00	-12.03	2.20	3	Vertical	191	1.04	-
2440MHz	Pass	AV	7.31847G	45.19	54.00	-8.81	7.74	3	Vertical	35	1.08	-
2440MHz	Pass	PK	4.87908G	58.10	74.00	-15.90	2.20	3	Vertical	191	1.04	-
2440MHz	Pass	PK	7.31847G	61.32	74.00	-12.68	7.74	3	Vertical	35	1.08	-
2440MHz	Pass	AV	4.87904G	42.37	54.00	-11.63	2.20	3	Horizontal	158	1.00	-
2440MHz	Pass	AV	7.31834G	53.74	54.00	-0.26	7.74	3	Horizontal	90	3.10	-
2440MHz	Pass	PK	4.87904G	58.50	74.00	-15.50	2.20	3	Horizontal	158	1.00	-
2440MHz	Pass	PK	7.31834G	69.87	74.00	-4.13	7.74	3	Horizontal	90	3.10	-
2474MHz	Pass	AV	2.4734G	78.21	Inf	-Inf	31.07	3	Vertical	201	3.16	-
2474MHz	Pass	AV	2.4874G	43.47	54.00	-10.53	31.12	3	Vertical	201	3.16	-
2474MHz	Pass	PK	2.4734G	94.34	Inf	-Inf	31.07	3	Vertical	201	3.16	-
2474MHz	Pass	PK	2.4874G	59.60	74.00	-14.40	31.12	3	Vertical	201	3.16	-
2474MHz	Pass	AV	2.4736G	80.57	Inf	-Inf	31.07	3	Horizontal	150	1.28	-
2474MHz	Pass	AV	2.486G	43.58	54.00	-10.42	31.12	3	Horizontal	150	1.28	-
2474MHz	Pass	PK	2.4736G	96.70	Inf	-Inf	31.07	3	Horizontal	150	1.28	-
2474MHz	Pass	PK	2.486G	59.71	74.00	-14.29	31.12	3	Horizontal	150	1.28	-
2474MHz	Pass	AV	4.94686G	40.85	54.00	-13.15	2.35	3	Vertical	189	1.12	-
2474MHz	Pass	AV	7.42049G	43.90	54.00	-10.10	8.02	3	Vertical	30	1.01	-
2474MHz	Pass	PK	4.94686G	56.98	74.00	-17.02	2.35	3	Vertical	189	1.12	-
2474MHz	Pass	PK	7.42049G	60.03	74.00	-13.97	8.02	3	Vertical	30	1.01	-
2474MHz	Pass	AV	4.9489G	42.09	54.00	-11.91	2.36	3	Horizontal	165	1.05	-
2474MHz	Pass	AV	7.42042G	52.32	54.00	-1.68	8.02	3	Horizontal	97	1.00	-
2474MHz	Pass	PK	4.9489G	58.22	74.00	-15.78	2.36	3	Horizontal	165	1.05	-



RSE TX above 1GHz Result

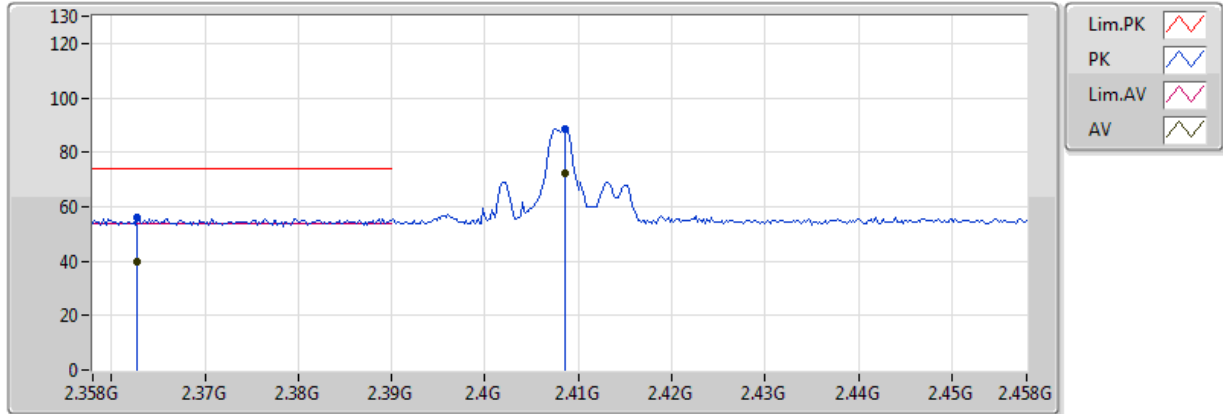
Appendix F.2

Mode	Result	Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
2474MHz	Pass	PK	7.42042G	68.45	74.00	-5.55	8.02	3	Horizontal	97	1.00	-

FHSS_Nss1_1TX

2408MHz_TX

08/06/2018

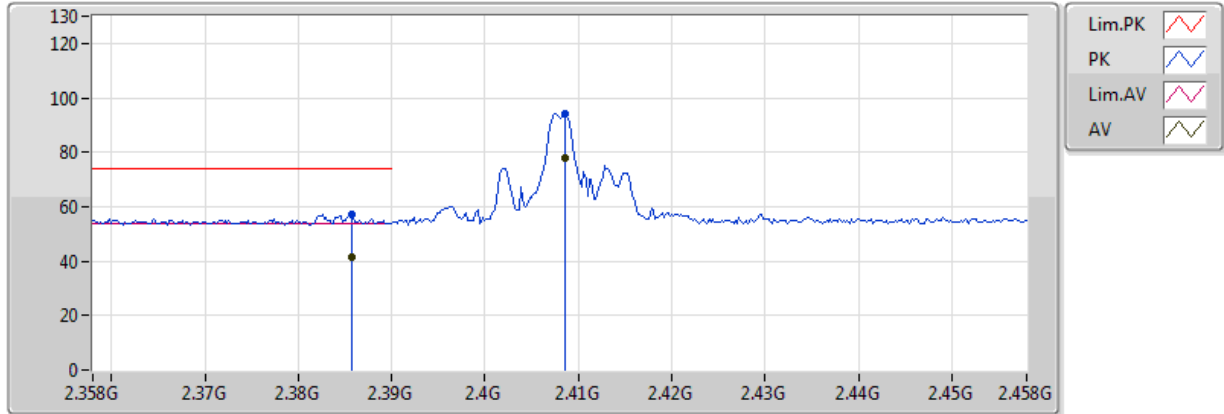


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3628G	39.82	54.00	-14.18	30.68	3	Vertical	165	2.57	-
AV	2.4086G	72.51	Inf	-Inf	30.84	3	Vertical	165	2.57	-
PK	2.3628G	55.95	74.00	-18.05	30.68	3	Vertical	165	2.57	-
PK	2.4086G	88.64	Inf	-Inf	30.84	3	Vertical	165	2.57	-

FHSS_Nss1_1TX

2408MHz_TX

08/06/2018

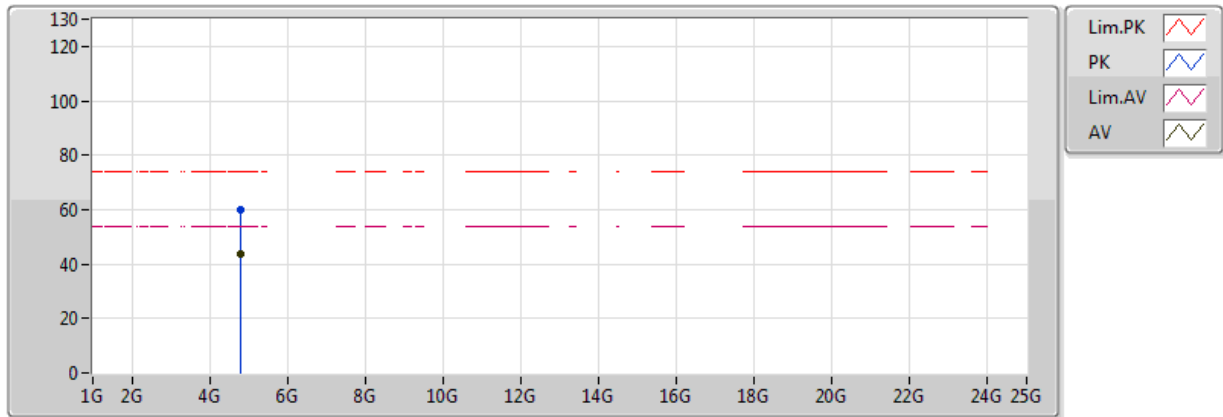


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3858G	41.19	54.00	-12.81	30.76	3	Horizontal	143	1.53	-
AV	2.4086G	77.86	Inf	-Inf	30.84	3	Horizontal	143	1.53	-
PK	2.3858G	57.32	74.00	-16.68	30.76	3	Horizontal	143	1.53	-
PK	2.4086G	93.99	Inf	-Inf	30.84	3	Horizontal	143	1.53	-

FHSS_Nss1_1TX

2408MHz_TX

08/06/2018

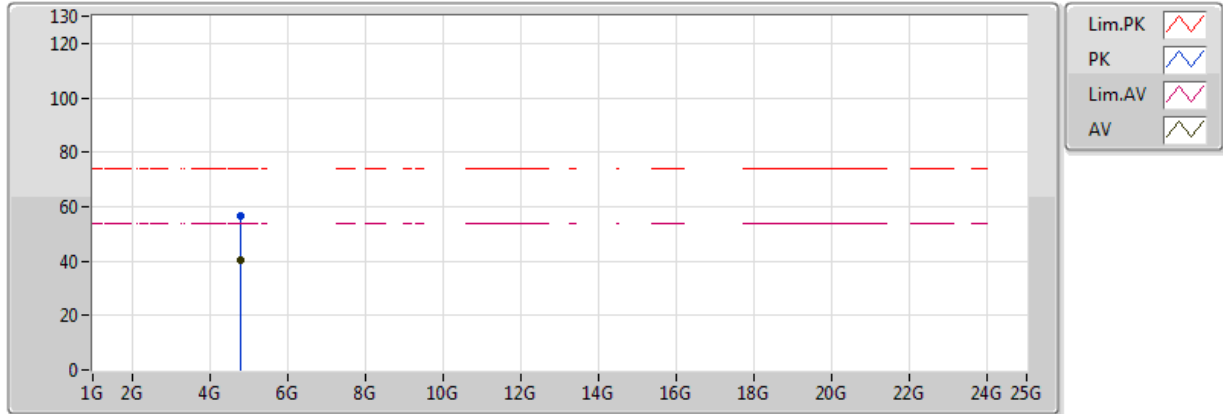


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.817G	43.89	54.00	-10.11	2.07	3	Vertical	181	1.08	-
PK	4.817G	60.02	74.00	-13.98	2.07	3	Vertical	181	1.08	-

FHSS_Nss1_1TX

2408MHz_TX

08/06/2018

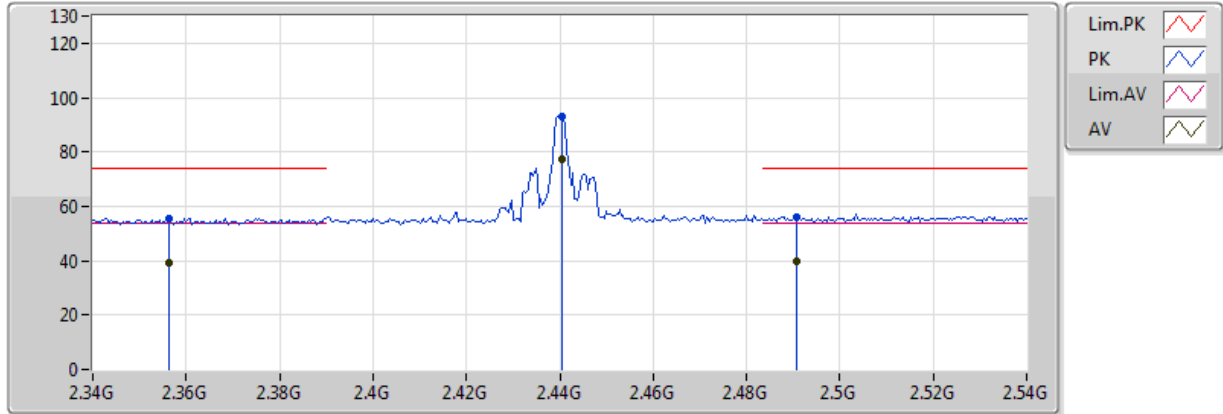


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.81498G	40.40	54.00	-13.60	2.07	3	Horizontal	164	1.23	-
PK	4.81498G	56.53	74.00	-17.47	2.07	3	Horizontal	164	1.23	-

FHSS_Nss1_1TX

2440MHz_TX

08/06/2018

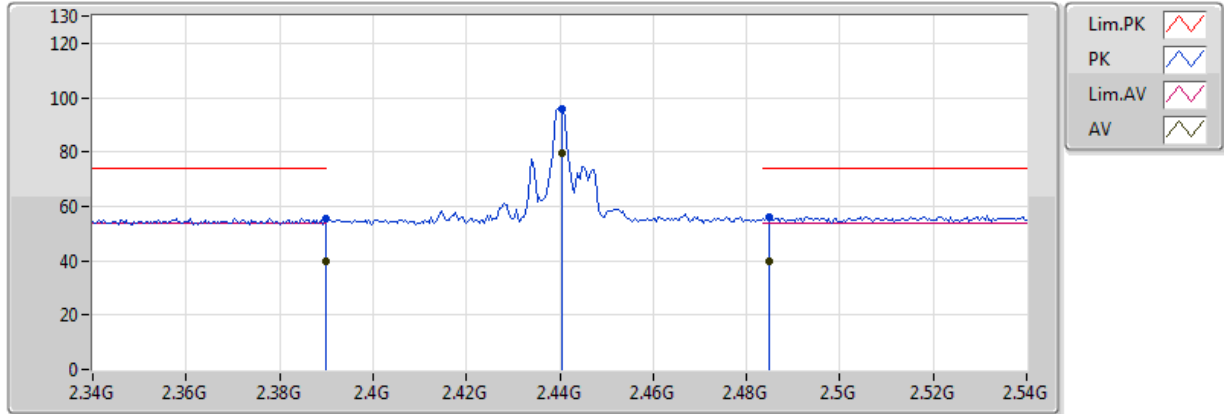


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.3564G	39.49	54.00	-14.51	30.66	3	Vertical	190	3.19	-
AV	2.4404G	77.08	Inf	-Inf	30.96	3	Vertical	190	3.19	-
AV	2.4908G	39.96	54.00	-14.04	31.14	3	Vertical	190	3.19	-
PK	2.3564G	55.62	74.00	-18.38	30.66	3	Vertical	190	3.19	-
PK	2.4404G	93.21	Inf	-Inf	30.96	3	Vertical	190	3.19	-
PK	2.4908G	56.09	74.00	-17.91	31.14	3	Vertical	190	3.19	-

FHSS_Nss1_1TX

2440MHz_TX

08/06/2018

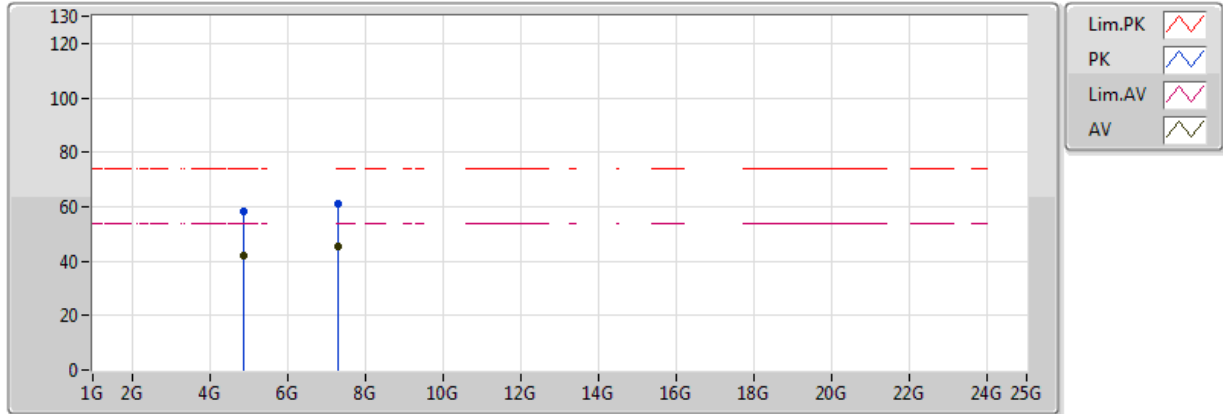


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.389998G	39.56	54.00	-14.44	30.77	3	Horizontal	144	1.13	-
AV	2.4404G	79.59	Inf	-Inf	30.96	3	Horizontal	144	1.13	-
AV	2.4848G	39.99	54.00	-14.01	31.12	3	Horizontal	144	1.13	-
PK	2.389998G	55.69	74.00	-18.31	30.77	3	Horizontal	144	1.13	-
PK	2.4404G	95.72	Inf	-Inf	30.96	3	Horizontal	144	1.13	-
PK	2.4848G	56.12	74.00	-17.88	31.12	3	Horizontal	144	1.13	-

FHSS_Nss1_1TX

2440MHz_TX

08/06/2018

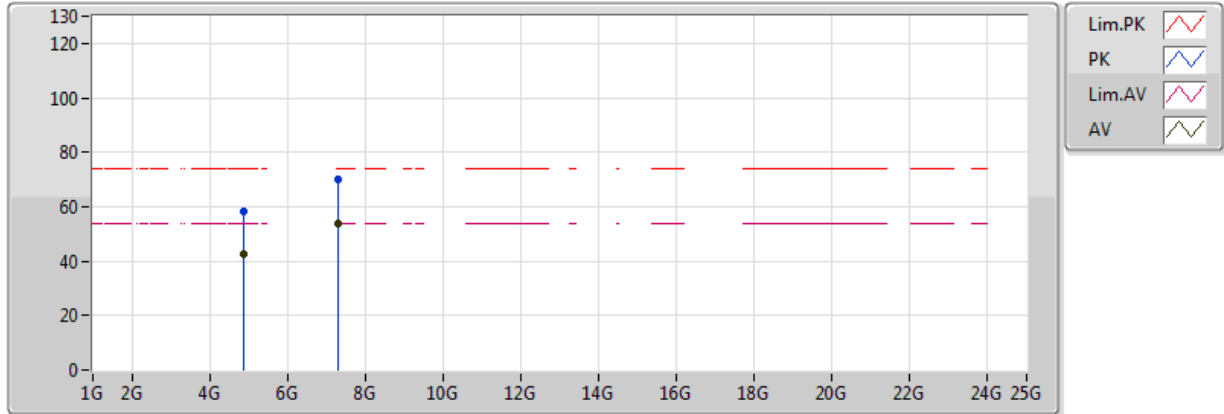


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.87908G	41.97	54.00	-12.03	2.20	3	Vertical	191	1.04	-
AV	7.31847G	45.19	54.00	-8.81	7.74	3	Vertical	35	1.08	-
PK	4.87908G	58.10	74.00	-15.90	2.20	3	Vertical	191	1.04	-
PK	7.31847G	61.32	74.00	-12.68	7.74	3	Vertical	35	1.08	-

FHSS_Nss1_1TX

2440MHz_TX

08/06/2018

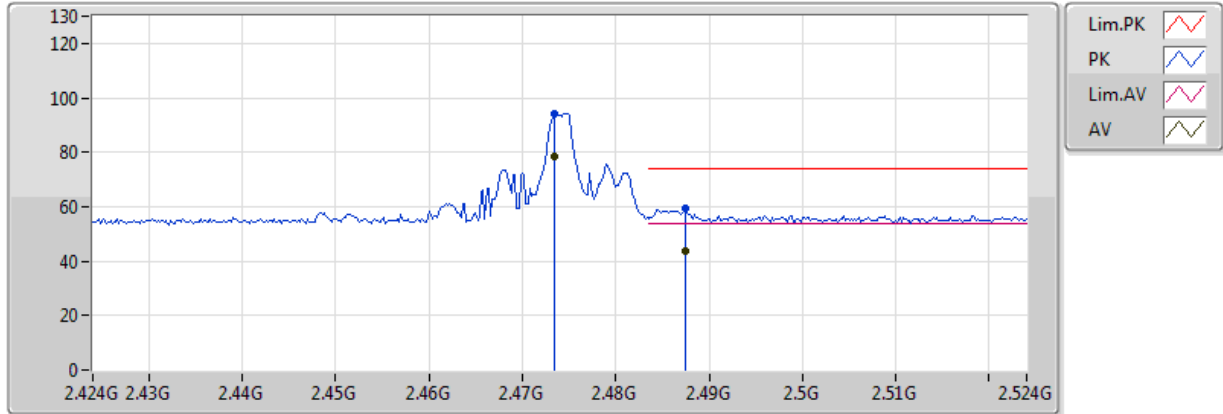


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.87904G	42.37	54.00	-11.63	2.20	3	Horizontal	158	1.00	-
AV	7.31834G	53.74	54.00	-0.26	7.74	3	Horizontal	90	3.10	-
PK	4.87904G	58.50	74.00	-15.50	2.20	3	Horizontal	158	1.00	-
PK	7.31834G	69.87	74.00	-4.13	7.74	3	Horizontal	90	3.10	-

FHSS_Nss1_1TX

2474MHz_TX

08/06/2018

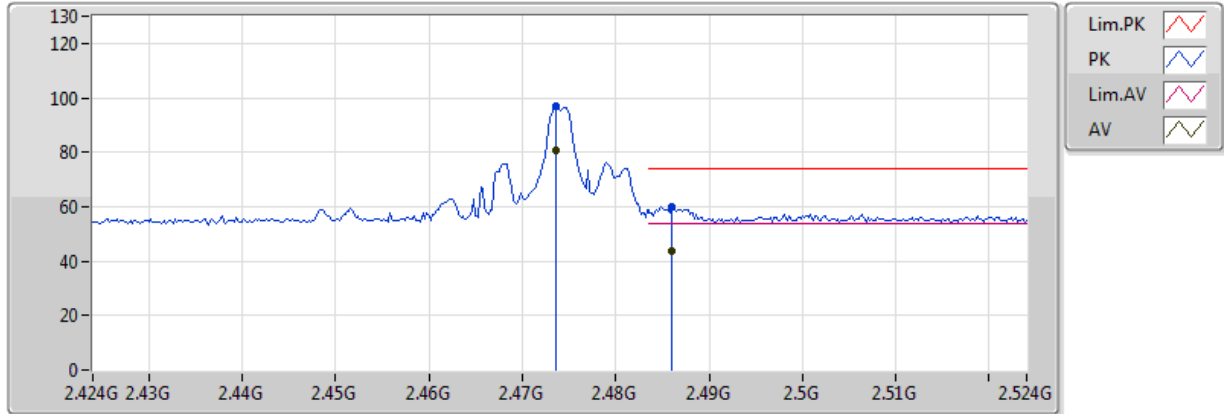


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.4734G	78.21	Inf	-Inf	31.07	3	Vertical	201	3.16	-
AV	2.4874G	43.47	54.00	-10.53	31.12	3	Vertical	201	3.16	-
PK	2.4734G	94.34	Inf	-Inf	31.07	3	Vertical	201	3.16	-
PK	2.4874G	59.60	74.00	-14.40	31.12	3	Vertical	201	3.16	-

FHSS_Nss1_1TX

2474MHz_TX

08/06/2018

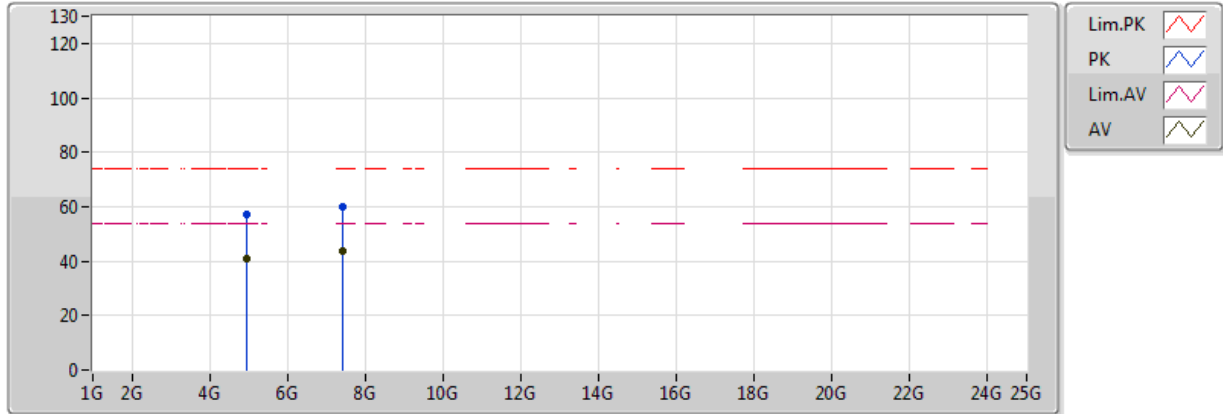


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	2.4736G	80.57	Inf	-Inf	31.07	3	Horizontal	150	1.28	-
AV	2.486G	43.58	54.00	-10.42	31.12	3	Horizontal	150	1.28	-
PK	2.4736G	96.70	Inf	-Inf	31.07	3	Horizontal	150	1.28	-
PK	2.486G	59.71	74.00	-14.29	31.12	3	Horizontal	150	1.28	-

FHSS_Nss1_1TX

2474MHz_TX

08/06/2018

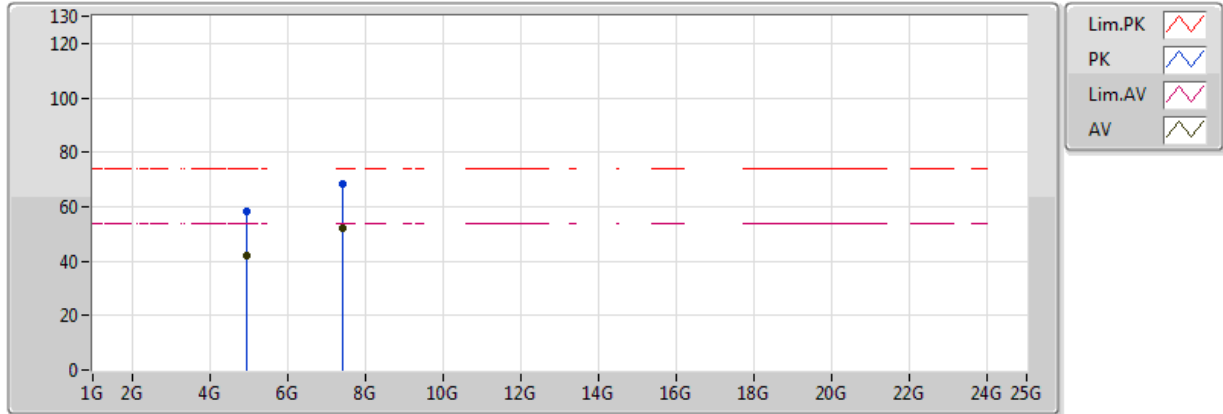


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.94686G	40.85	54.00	-13.15	2.35	3	Vertical	189	1.12	-
AV	7.42049G	43.90	54.00	-10.10	8.02	3	Vertical	30	1.01	-
PK	4.94686G	56.98	74.00	-17.02	2.35	3	Vertical	189	1.12	-
PK	7.42049G	60.03	74.00	-13.97	8.02	3	Vertical	30	1.01	-

FHSS_Nss1_1TX

2474MHz_TX

08/06/2018



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comments
AV	4.9489G	42.09	54.00	-11.91	2.36	3	Horizontal	165	1.05	-
AV	7.42042G	52.32	54.00	-1.68	8.02	3	Horizontal	97	1.00	-
PK	4.9489G	58.22	74.00	-15.78	2.36	3	Horizontal	165	1.05	-
PK	7.42042G	68.45	74.00	-5.55	8.02	3	Horizontal	97	1.00	-