Audix Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244,Taiwan
Tel: +886 2 26099301
Fax: +886 2 26099303

FCC 15.247 & RSS-247
2.4GHz Test Report

for

FUTABA Corporation

1080 Yabutsuka Chosei-mura Chosei-gun
Chiba-ken, 299-4395 Japan.

Product Name	**:**	**Radio Control**
Model Name	**:**	**T32MZ**
Brand	**:**	**Futaba**
FCC ID	**:**	**AZP-T32MZ-24G**
IC	**:**	**2914D-T32MZ**

Prepared by: **:** **AUDIX Technology Corporation,**
EMC Department

TESTING
NVLAP LAB CODE 200077-0

The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

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Tel: +886 2 26099301
Fax: +886 2 26099303

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TEST REPORT CERTIFICATION

Applicant	:	FUTABA Corporation
Manufacture	:	FUTABA Corporation
EUT Description		
(1) Product	:	Radio Control
(2) Model	:	T32MZ
(3) Brand	:	Futaba
(4) Power Rating	:	(1)DC 5V (USB) (2)DC 3.6 ~ 4.2V (Battery)

Applicable Standards:

47 CFR FCC Part 15 Subpart C
RSS-Gen (Issue 4), November 2014
RSS-247 (Issue 2), February 2017
ANSI C63.10:2013

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.
Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2019. 08. 13

Reviewed by: (Tina Huang/Administrator)

Approved by: (Ben Cheng/Manager)

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2019. 08. 13	Original Report.	EM-F190260

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2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	**IC**		
15.207	RSS-Gen §8.8	Conducted Emission	**PASS**
15.247(d)/15.205	RSS-Gen §8.9 RSS-247 §5.5	Radiated Band Edge and Radiated Spurious Emission	**PASS**
15.247(a)(1)	RSS-247 §5.1(a)	20dB/Occupied Bandwidth	**PASS**
15.247(a)(1)	RSS-247 §5.1(b)	Carrier Frequency Separation	**PASS**
15.247(a)(1)(iii)	RSS-247 §5.1(d)	Time of Occupancy	**PASS**
15.247(a)(1)(iii)	RSS-247 §5.1(d)	Number of Hopping Channels	**PASS**
15.247(b)(1)	RSS-247 §5.1(b)	Maximum Peak Output Power	**PASS**
15.247(d)	RSS-247 §5.5	Conducted Band Edges and Conducted Spurious Emission	**PASS**
15.203	RSS-Gen §6.8	Antenna Requirement	**Compliance**
Note: The uncertainties value is not used in determining the result.			

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3. GENERAL INFORMATION

3.1. Description of Application

Applicant	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken, 299-4395 Japan.
Manufacturer	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken, 299-4395 Japan.
Product	Radio Control
Model	T32MZ
Brand	Futaba

3.2. Description of Application

Test Model	T32MZ
Serial Number	N/A
Power Rating	(1)DC 5V (USB) (2)DC 3.6 ~ 4.2V (Battery)
Firmware Version	N/A
RF Features	DSSS: FASSTest, FASST FHSS: S-FHSS, T-FHSS, BT
Transmit Type	1T1R
Sample Status	Production
Date of Receipt	2019. 06. 04
Date of Test	2019. 07. 26 ~ 08. 12
Interface Ports of EUT	• Connector for trainer function (TRAINER) x1 • S.BUS Connector (S.I/F) x2 • Connector for Battery Charger (CHG) x1 • Audio Plug (PHONE) x1 • Micro SD Card Slot x1
Accessories Supplied	AC Adapter (Wall-mount, 2C)

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3.3. Antenna Information

No.	Antenna Part Number	Manufacture/Brand	Antenna Type	Frequency	Max Gain
For FASSTest, FASST, S-FHSS, T-FHSS Mode					
1	ANTB24-094A0	SANSEI ELECTRIC CO., LTD	1/2λ Pencil type antenna	2400 ~ 2500MHz	1.48dBi
For BT Mode					
2.	ANT016008LCD 2442MA1	TDK	built-in chip	2400 ~ 2484MHz	2.3dBi

3.4. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (kbps)
S-FHSS	2403.25 to 2447.50	60	FHSS	128
T-FHSS	2407.50 to 2467.50	31	FHSS	128

S-FHSS					
Channel List					
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2403.25	21	2418.25	41	2433.25
2	2404.00	22	2419.00	42	2434.00
3	2404.75	23	2419.75	43	2434.75
4	2405.50	24	2420.50	44	2435.50
5	2406.25	25	2421.25	45	2436.25
6	2407.00	26	2422.00	46	2437.00
7	2407.75	27	2422.75	47	2437.75
8	2408.50	28	2423.50	48	2438.50
9	2409.25	29	2424.25	49	2439.25
10	2410.00	30	2425.00	50	2440.00
11	2410.75	31	2425.75	51	2440.75
12	2411.50	32	2426.50	52	2441.50
13	2412.25	33	2427.25	53	2442.25
14	2413.00	34	2428.00	54	2443.00
15	2413.75	35	2428.75	55	2443.75
16	2414.50	36	2429.50	56	2444.50
17	2415.25	37	2430.25	57	2445.25
18	2416.00	38	2431.00	58	2446.00
19	2416.75	39	2431.75	59	2446.75
20	2417.50	40	2432.50	60	2447.50

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T-FHSS			
Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2407.50	17	2439.50
2	2409.50	18	2441.50
3	2411.50	19	2443.50
4	2413.50	20	2445.50
5	2415.50	21	2447.50
6	2417.50	22	2449.50
7	2419.50	23	2451.50
8	2421.50	24	2453.50
9	2423.50	25	2455.50
10	2425.50	26	2457.50
11	2427.50	27	2459.50
12	2429.50	28	2461.50
13	2431.50	29	2463.50
14	2433.50	30	2465.50
15	2435.50	31	2467.50
16	2437.50		

3.5. Descriptions of Key Components

Item	Supplier/Brand	Model	Specification
GPS Module	Position	GPS-86A-093	GPS
Wireless Module	Texas Instruments	WL18MODGB	BT FCC ID: Z64-WL18SBMOD IC: 451I-WL18SBMOD
Wireless Module	Futaba	TC23A	FASSTest, FASST, S-FHSS, T-FHSS
Lithium-polymer Battery	Futaba	LT1F6600B	DC 3.8A, 6600mA, 25.08Wh
AC Adapter (Wall-mount, 2C)	APD	WB-10G05R	I/P: 100-240Vac, 50-60Hz, 0.4A Max. O/P: 5Vdc, 2A DC(USB) Cable: Shielded, Detachable, 1.1m

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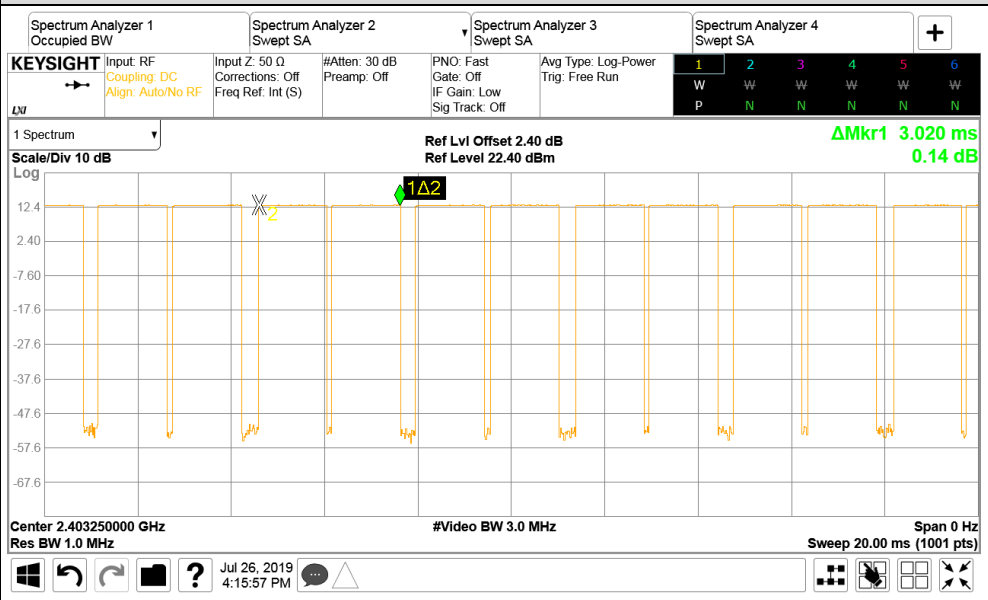
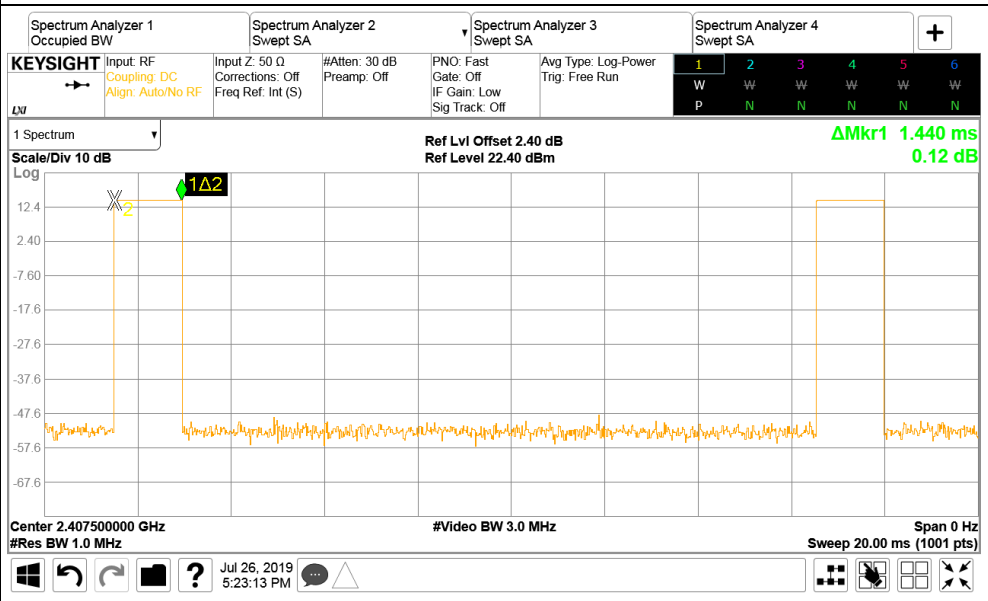
3.6. Test Configuration

Mode	TX_{on} (ms)	TX_{on+off} (ms)	$1/TX_{on}$ (kHz)	Duty Cycle Correction Factor (DCCF) (dB)
S-FHSS	3.020	100	0.33	N/A
T-FHSS	1.440	100	0.69	N/A

Note: Duty Cycle Correction Factor (DCCF)= 20log (TX_{on}/100ms)
"TX_{on+off}" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms

Mode	TX_{on}
S-FHSS	
T-FHSS	

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AC Conduction	
Test Case	Charge Mode

Item		Modulation	Test Channel
Radiated Test Case	Radiated Spurious Emission	Charge	---
	Radiated Band Edge Note1	S-FHSS	1/60
		T-FHSS	1/31
	Radiated Spurious Emission Note1	S-FHSS	1/30/60
		T-FHSS	1/16/31
Conducted Test Case	20dB Bandwidth	S-FHSS	1/30/60
		T-FHSS	1/16/31
	Carrier Frequency Separation	S-FHSS	1/30/60
		T-FHSS	1/16/31
	Time of Occupancy	S-FHSS	1/30/60
		T-FHSS	1/16/31
	Number of Hopping Channels	S-FHSS	1/30/60
		T-FHSS	1/16/31
	Maximum Peak Output Power	S-FHSS	1/30/60
		T-FHSS	1/16/31
	Band Edges	S-FHSS	1/60
		T-FHSS	1/31
	Spurious Emission	S-FHSS	1/30/60
		T-FHSS	1/16/31

Note 1:□Mobile Device

■Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: □Lie □Side ■Stand

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3.7. Tested Supporting System List

3.7.1. Support Peripheral Unit

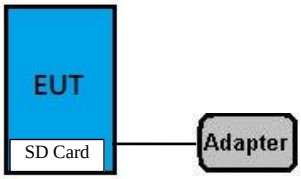
No.	Product	Brand	Model No.	Serial No.	Approval
1.	Micro SD Card (4GB)	Transcend	N/A	N/A	N/A
2.	Power Socket	N/A	N/A	N/A	N/A

3.7.2. Cable Lists

No.	Cable Description Of The Above Support Units
1.	----
2.	AC Power Cord: Unshielded, Detachable, 1.0m

3.8. Setup Configuration

3.8.1. EUT Configuration for Power Line & Radiated Emission (Charge mode)



3.8.2. EUT Configuration for Radiated Emission

3.8.3. EUT Configuration for RF Conducted Test Items

3.9. Operating Condition of EUT

- Charge Mode: The EUT connects the AC adapter on charge mode.
- Transmit Mode: Press the button of the EUT is used for enabling EUT RF function under continues transmitting and choosing mode/channel. (The test program was installed in SD card)

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3.10.Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.7 Shielded Room (2) No.1 3m Semi Anechoic Chamber

3.11.Measurement Uncertainty

Test Item	FrequencyRange	Uncertainty
Conduction Test	150kHz~30MHz	±3.50dB
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	±5.82dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
20dB Bandwidth	±0.2kHz
Carrier Frequency Separation	±0.2kHz
Time of Occupancy	±0.03sec
Maximum peak Output power	± 0.52dB
Conducted Emission Limitations	± 0.13dB

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4. MEASUREMENT EQUIPMENTLIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR	101774	2019. 01. 23	1 Year
2.	A.M.N.	R&S	ENV4200	100169	2018. 11. 14	1 Year
3.	Pulse Limiter	R&S	ESH3-Z2	100354	2019. 01. 12	1 Year
4.	Coaxial Cable	Yeida	RG/58AU	CE-08	2018. 09. 21	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2019. 04. 20	1 Year
6.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2018. 09. 12	1 Year
2.	Test Receiver	R & S	ESCS30	100338	2019. 06. 12	1 Year
3.	Amplifier	HP	8447D	2944A06305	2019. 01. 30	1 Year
4.	Amplifier	HP	8449B	3008A00529	2019. 01. 23	1 Year
5.	Bilog Antenna	CHASE	CBL6112D	33821	2019. 01. 19	1 Year
6.	HornAntenna	EMCO	3115	9609-4927	2019. 06. 24	1 Year
7.	Horn Antenna	COM-POWER	AH-840	101092	2019. 05. 14	1 Year
8.	Notch Filter	K&L	7NSL10-2441.5/E130.5-O/O	1	2019. 07. 24	1 Year
9.	High-Pass Filter	Microwave	H3G018G1	484796	2018. 08. 22	1 Year
10.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2019. 02. 01	1 Year
11.	Coaxial Cable	HUBER+ SUHNER	SUCOFLEX 106	54602/6	2019. 02. 01	1 Year
12.	Digital Thermo-Hygro Meter	IMax	HTC-1	No.1 3m A/C	2019. 04. 20	1 Year
13.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2019. 05. 06	1 Year
2.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2019. 04. 20	1 Year

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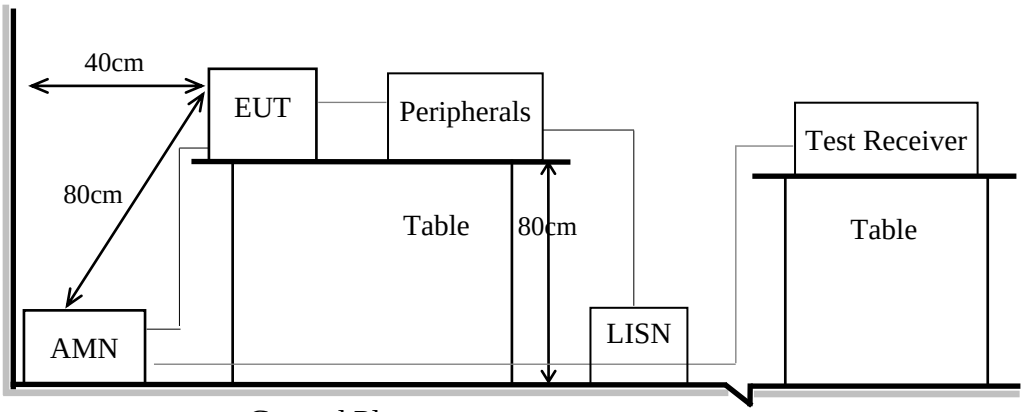
5. CONDUCTED EMISSION MEASUREMET

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.8.

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dBμV	56 ~ 46 dBμV
500kHz ~ 5MHz	56 dBμV	46 dBμV
5MHz ~ 30MHz	60 dBμV	50 dBμV

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.
2.: The lower limit applies to the band edges.

5.3. Test Procedure

5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
5.3.4. Checking frequency range from 150kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

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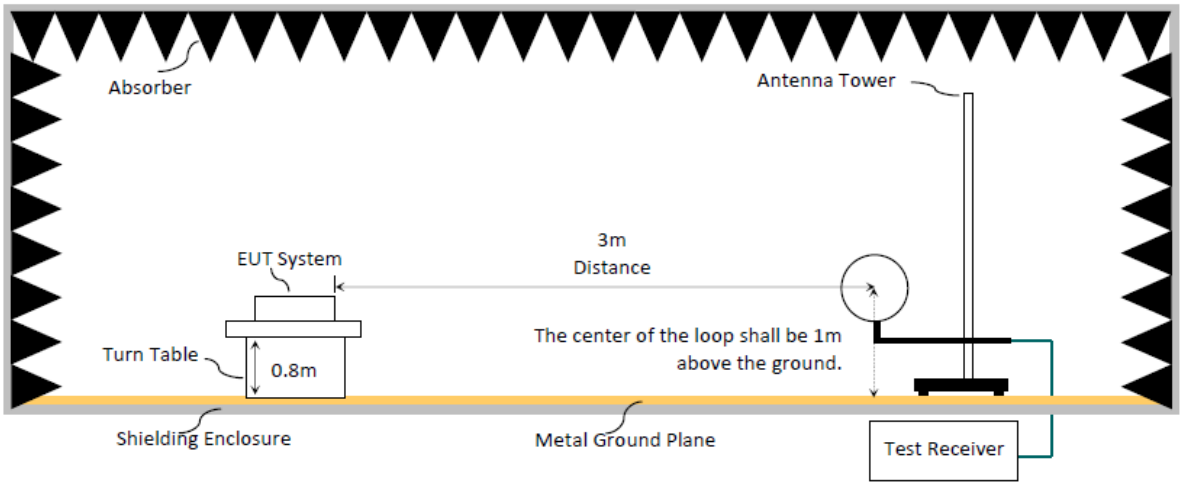
6. RADIATED EMISSION MEASUREMENT

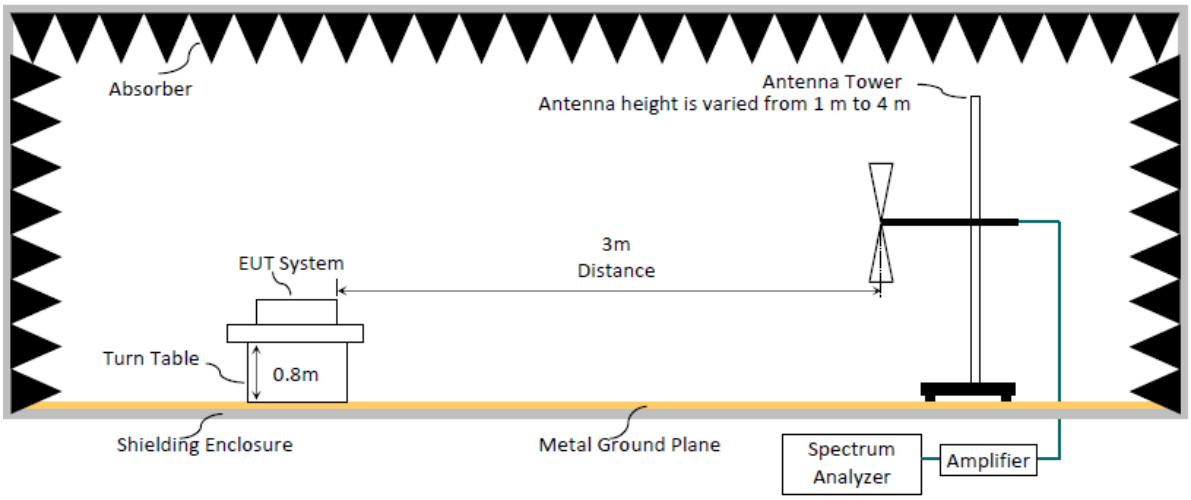
6.1. Block Diagram of Test Setup

6.1.1. Block Diagram of connection between EUT and simulators
Indicated as section 3.8

6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



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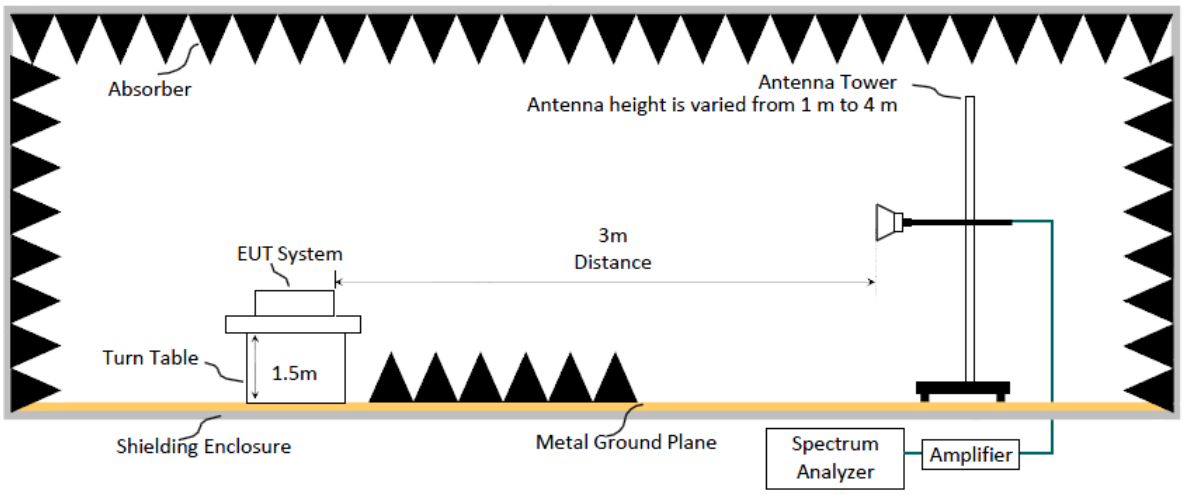
6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/m)

(2) The tighter limit applies to the edge between two frequency bands.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(4) Fundamental and emission fall within operation band are exempted from this section.

(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement

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6.3. Test Procedure

Frequency Range 9kHz~30MHz:
The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level.
In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

(1) RBW = 9kHz with peak and average detector.
(2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:
The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1GHz:
Spectrum Analyzer is used for pre-testing with following setting:

(1) RBW = 120KHz
(2) VBW ≥ 3 x RBW.
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 2: When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Frequency above 1GHz to 10th harmonic:

Peak Measurement:

(1) RBW = 1 MHz
(2) VBW ≥ 3 x RBW.
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

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Average Measurement:

■**Option 1:**

(1) RBW = 1 MHz
(2) VBW ≥1/T
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.

□**Option 2:**

Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

■Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading

■Average Emission Level l=Antenna Factor + Cable Loss + Meter Reading

□Average Emission Level= Peak Emission Level+ DCCF

Duty Cycle Correction Factor (DCCF)= 20log (TX_{on}/100ms) presented in section 3.6

□ERP= Peak Emission Level-95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

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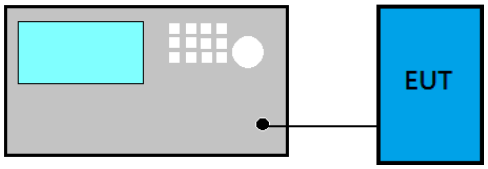
7. 20dB BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Specification Limits

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

7.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10-2013:

(1) Set RBW close to1 ~ 5% of OBW.
(2) Set VBW= 3 three times RBW.
(3) Detector = Peak.
(4) Trace mode = max hold.
(5) Sweep = auto couple.
(6) Allow the trace to stabilize.
(7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

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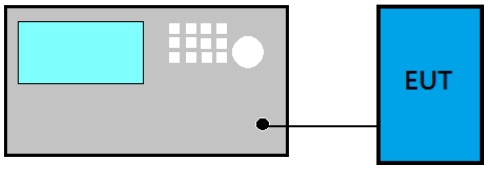
8. CARRIER FREQUENCY SEPARATION MEASUREMENT

8.1. Block Diagram of Test Setup



8.2. Specification Limits

Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

8.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10-2013:

(1) Span = Wide enough to capture the peaks of two adjacent channels.
(2) RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
(3) VBW≥ RBW
(4) Sweep = Auto
(5) Detector function = peak
(6) Trace = max hold
(7) Allow the trace to stabilize

8.4. Test Results

Please refer to Appendix A

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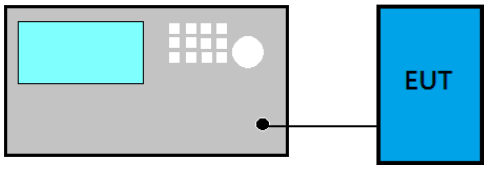
9. TIME OF OCCUPANCY MEASUREMENT

9.1. Block Diagram of Test Setup



9.2. Specification Limits

Frequency hopping systems in the 2400-2483.5MHz shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by number of hopping channels employed.

9.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10-2013:

(1) Span = Zero span, centered on a hopping channel.
(2) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1/ T, where T is the expected dwell time per channel.
(3) Sweep= As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
(4) Detector function= Peak
(5) Trace = max hold

9.4. Test Results

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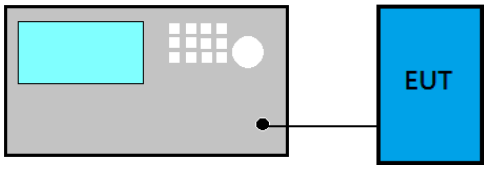
10. NUMBER OF HOPPING CHANNELS MEASUREMENT

10.1. Block Diagram of Test Setup



10.2. Specification Limits

Frequency hopping systems which use fewer than 20 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels.

10.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10-2013:

(1) Span = The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
(2) RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
(3) VBW ≥ RBW
(4) Sweep = Auto
(5) Detector function = Peak
(6) Trace = max hold
(7) Allow the trace to stabilize.

10.4. Test Results

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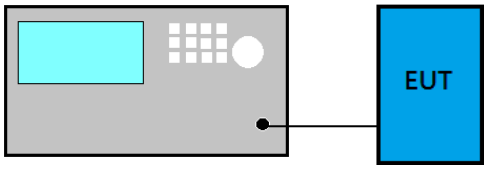
11. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

11.1. Block Diagram of Test Setup



11.2. Specification Limits

The Limits of maximum Peak Output Power for frequency hopping systems in 2400-2483.5MHz is: 0.125Watt. (21dBm)

11.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10-2013:

(1) Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
(2) RBW ≥ 1% of the span
(3) VBW ≥ RBW
(4) Sweep = auto
(5) Detector function = peak
(6) Trace = max hold

11.4. Test Results

Please refer to Appendix A

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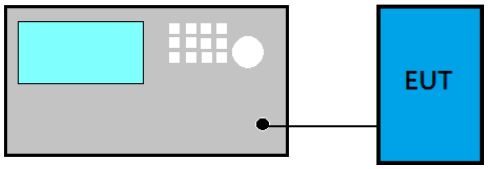
12. EMISSION LIMITATIONS MEASUREMENT

12.1. Block Diagram of Test Setup



12.2. Specification Limits

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in FCC Section 15.209(a) and RSS-Gen Section 8.9 table 4 is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a) and RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in Section 15.209(a) and RSS-Gen Section 8.9 table 4 (See Section 15.205(c)).

12.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10-2013:

(1) Set span wide enough to capture the peak level of the in-band emission and all spurious emissions; up to 10^{th} harmonic.
(2) RBW = 100 kHz
(3) VBW ≥ RBW
(4) Sweep = auto
(5) Detector function = peak
(6) Trace = max hold

12.4. Test Results

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13. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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APPENDIX A

TEST DATA AND PLOTS

(Model: T32MZ)

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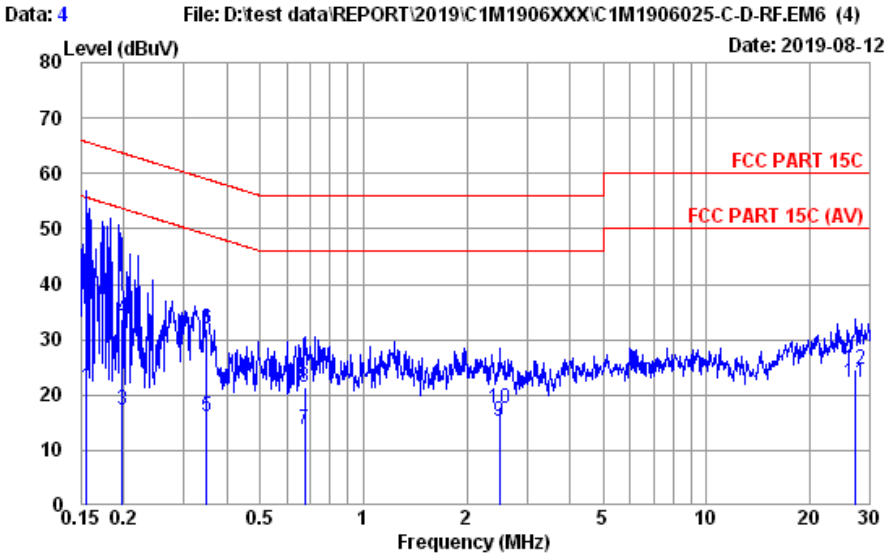
A.1 CONDUCTED EMISSION

Test Date	2019/08/12	Temp./Hum.	26℃/62%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Mode	Charge



Site no. : No.8 Shielded Room
Condition : ENV4200 100169
Limit : FCC PART 15C
Env. / Ins. : 26°C / 62% ESR3 (1774)
EUT : T32MZ
Power Rating : 120Vac/60Hz
Test Mode : Charge

Data no. : 4
LISN Phase : NEUTRAL
Engineer : Chucky Chiu

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.156	10.69	0.03	9.86	0.84	21.42	55.69	34.27	Average
2	0.156	10.69	0.03	9.86	20.53	41.11	65.69	24.58	QP
3	0.198	10.62	0.03	9.86	-3.10	17.41	53.71	36.30	Average
4	0.198	10.62	0.03	9.86	13.32	33.83	63.71	29.88	QP
5	0.348	10.52	0.04	9.86	-4.30	16.12	49.00	32.88	Average
6	0.348	10.52	0.04	9.86	11.43	31.85	59.00	27.15	QP
7	0.675	10.48	0.05	9.86	-6.49	13.90	46.00	32.10	Average
8	0.675	10.48	0.05	9.86	0.98	21.37	56.00	34.63	QP
9	2.487	10.55	0.09	9.87	-5.29	15.22	46.00	30.78	Average
10	2.487	10.55	0.09	9.87	-2.81	17.70	56.00	38.30	QP
11	27.127	15.58	0.32	9.99	-3.58	22.31	50.00	27.69	Average
12	27.127	15.58	0.32	9.99	-1.25	24.64	60.00	35.36	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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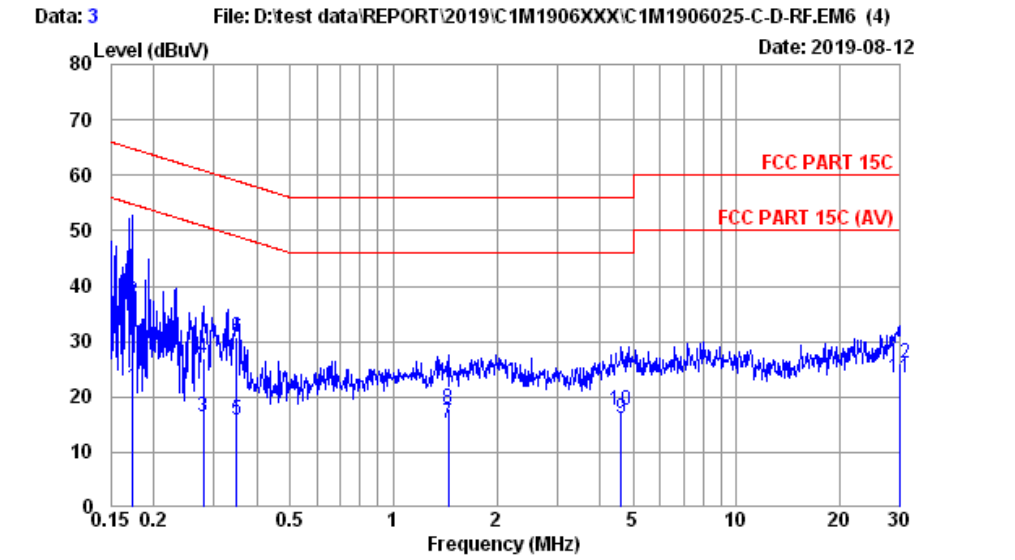
Test Date	2019/08/12	Temp./Hum.	26℃/62%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Mode	Charge



Site no. : No.8 Shielded Room
Data no. : 3
Condition : ENV4200 100169
LISN Phase : LINE
Limit : FCC PART 15C
Env. / Ins. : 26°C / 62% ESR3 (1774)
Engineer : Chucky Chiu
EUT : T32MZ
Power Rating : 120Vac/60Hz
Test Mode : Charge

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.174	10.58	0.03	9.86	1.12	21.59	54.77	33.18	Average
2	0.174	10.58	0.03	9.86	16.72	37.19	64.77	27.58	QP
3	0.279	10.50	0.03	9.86	-4.00	16.39	50.85	34.46	Average
4	0.279	10.50	0.03	9.86	6.60	26.99	60.85	33.86	QP
5	0.348	10.47	0.04	9.86	-4.51	15.86	49.00	33.14	Average
6	0.348	10.47	0.04	9.86	10.26	30.63	59.00	28.37	QP
7	1.449	10.44	0.06	9.86	-5.10	15.26	46.00	30.74	Average
8	1.449	10.44	0.06	9.86	-2.40	17.96	56.00	38.04	QP
9	4.598	10.64	0.12	9.87	-4.45	16.18	46.00	29.82	Average
10	4.598	10.64	0.12	9.87	-3.17	17.46	56.00	38.54	QP
11	29.841	15.74	0.34	10.01	-2.67	23.42	50.00	26.58	Average
12	29.841	15.74	0.34	10.01	0.07	26.16	60.00	33.84	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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A.2 RADIATED EMISSION

Test Date	2019/08/01~05	Temp./Hum.	22~24℃/50~54%
Test Voltage	(1) Charge Mode: AC 120V 60Hz (Via AC Adapter) (2) TX Mode: DC 3.8V (Via Battery)		

A.2.1 Emissions within Restricted Frequency Bands

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1 GHz

Mode	Charge	Frequency	----

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
71.71	12.67	1.91	20.72	35.30	40.00	4.70	Peak
127.00	18.24	2.62	17.49	38.35	43.50	5.15	Peak
163.86	16.27	3.05	18.24	37.56	43.50	5.94	QP
391.81	22.20	5.77	6.63	34.60	46.00	11.40	Peak
521.79	23.94	6.78	2.56	33.28	46.00	12.72	Peak
984.48	27.97	8.95	1.00	37.92	54.00	16.08	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
58.13	12.87	1.70	18.67	33.24	40.00	6.76	Peak
127.97	18.19	2.63	18.89	39.71	43.50	3.79	QP
185.20	15.63	3.28	20.34	39.25	43.50	4.25	QP
195.87	16.10	3.38	20.38	39.86	43.50	3.64	QP
818.61	26.65	8.01	3.31	37.97	46.00	8.03	Peak
971.87	27.87	8.88	1.73	38.48	54.00	15.52	Peak

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Mode	S-FHSS	Frequency	TX 2425.00MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
34.85	22.43	1.29	4.76	28.48	40.00	11.52	Peak
114.39	18.33	2.47	12.83	33.63	43.50	9.87	Peak
337.49	20.79	5.02	7.93	33.74	46.00	12.26	Peak
821.52	26.68	8.02	2.38	37.08	46.00	8.92	Peak
961.20	27.79	8.82	2.47	39.08	54.00	14.92	Peak
992.24	28.02	9.00	1.64	38.66	54.00	15.34	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
40.67	19.30	1.40	14.22	34.92	40.00	5.08	Peak
93.05	16.05	2.20	14.12	32.37	43.50	11.13	Peak
391.81	22.20	5.77	7.71	35.68	46.00	10.32	Peak
544.10	24.19	6.81	6.18	37.18	46.00	8.82	Peak
923.37	27.49	8.59	3.04	39.12	46.00	6.88	Peak
973.81	27.87	8.89	1.61	38.37	54.00	15.63	Peak

Remark: The TX 2423.5MHz is a worst mode of S-FHSS mode.

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Fax: +886 2 26099303

Mode	T-FHSS	Frequency	TX 2407.50MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
36.79	21.37	1.33	1.78	24.48	40.00	15.52	Peak
128.94	18.14	2.64	13.12	33.90	43.50	9.60	Peak
399.57	22.37	5.86	6.87	35.10	46.00	10.90	Peak
694.45	25.41	7.34	1.18	33.93	46.00	12.07	Peak
930.16	27.54	8.63	2.57	38.74	46.00	7.26	Peak
973.81	27.87	8.89	1.93	38.69	54.00	15.31	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
35.82	21.86	1.31	1.24	24.41	40.00	15.59	Peak
130.88	18.04	2.67	5.88	26.59	43.50	16.91	Peak
228.85	17.78	3.73	5.67	27.18	46.00	18.82	Peak
513.06	23.86	6.77	3.60	34.23	46.00	11.77	Peak
912.70	27.41	8.53	2.24	38.18	46.00	7.82	Peak
995.15	28.04	9.01	1.37	38.42	54.00	15.58	Peak

Remark: The TX 2407.5MHz is a worst mode for T-FHSS modulation.

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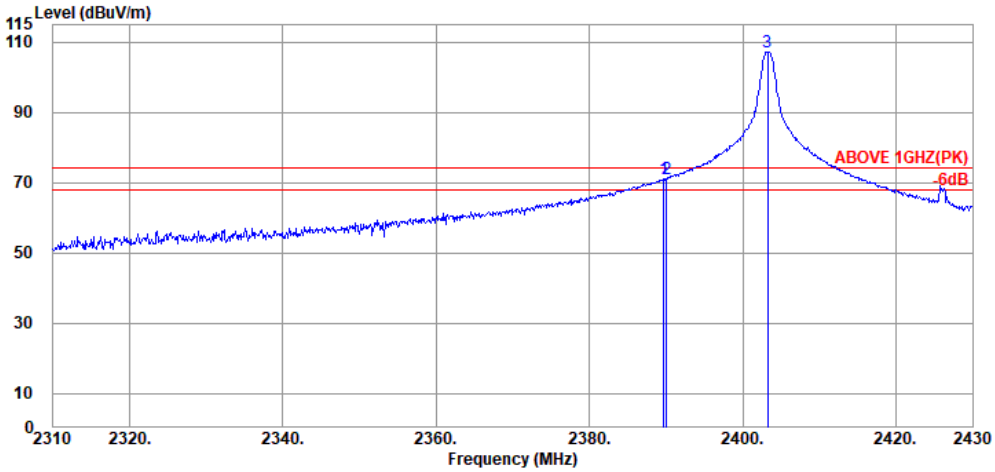
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

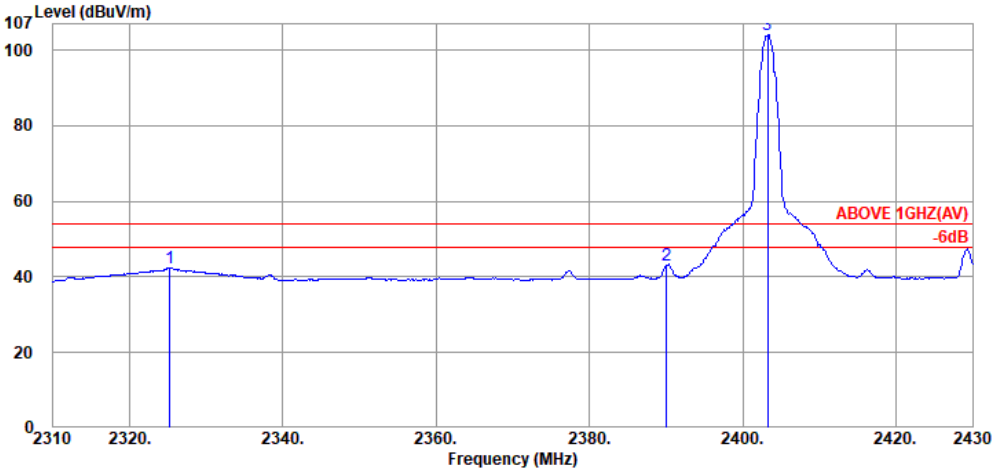
Band Edge:

Mode	S-FHSS	Frequency	TX 2403.25MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.68	28.28	6.01	36.70	70.99	74.00	3.01	Peak
2390.04	28.28	6.01	36.81	71.10	74.00	2.90	Peak
2403.24	28.29	6.03	72.96	107.28	---	---	Peak



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2325.24	28.21	5.94	8.32	42.47	54.00	11.53	Average
2390.04	28.28	6.01	8.63	42.92	54.00	11.08	Average
2403.24	28.29	6.03	69.94	104.26	---	---	Average

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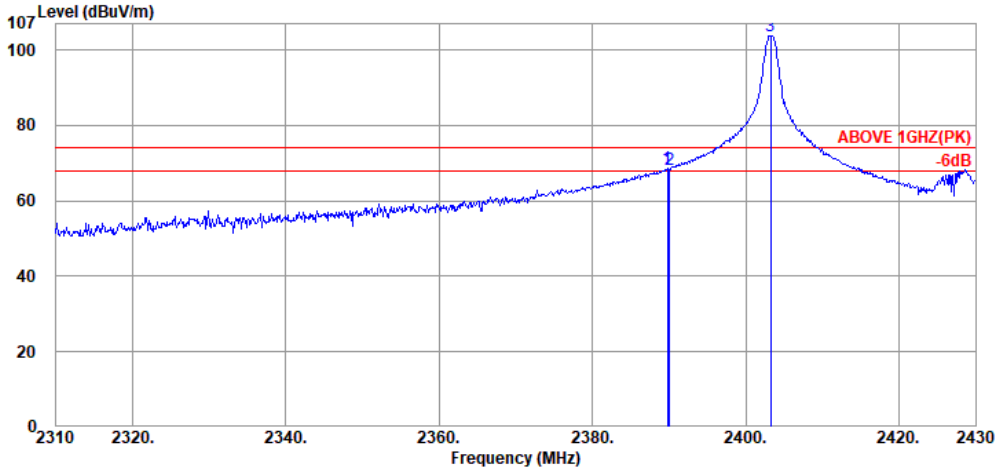
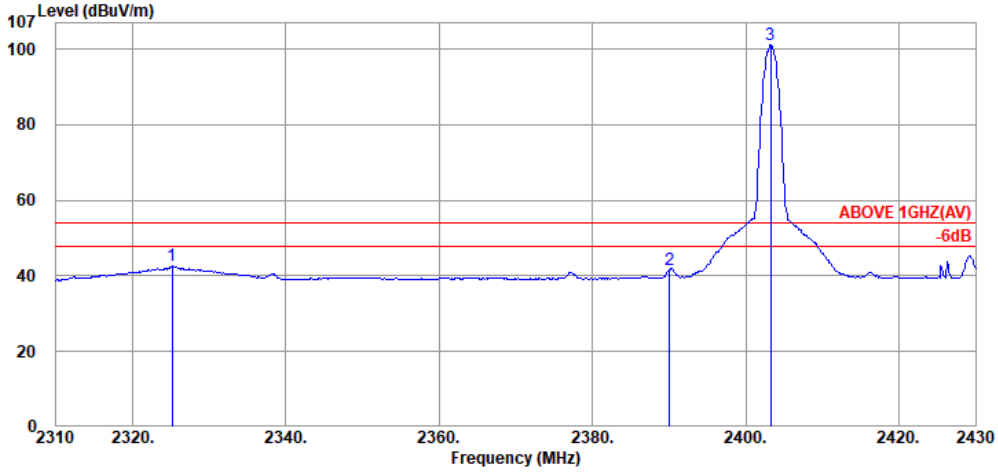
Mode	S-FHSS	Frequency	TX 2403.25MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.80	28.28	6.01	34.27	68.56	74.00	5.44	Peak
2390.04	28.28	6.01	34.08	68.37	74.00	5.63	Peak
2403.24	28.29	6.03	69.56	103.88	---	---	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2325.12	28.21	5.94	8.44	42.59	54.00	11.41	Average
2390.04	28.28	6.01	7.40	41.69	54.00	12.31	Average
2403.24	28.29	6.03	66.94	101.26	---	---	Average

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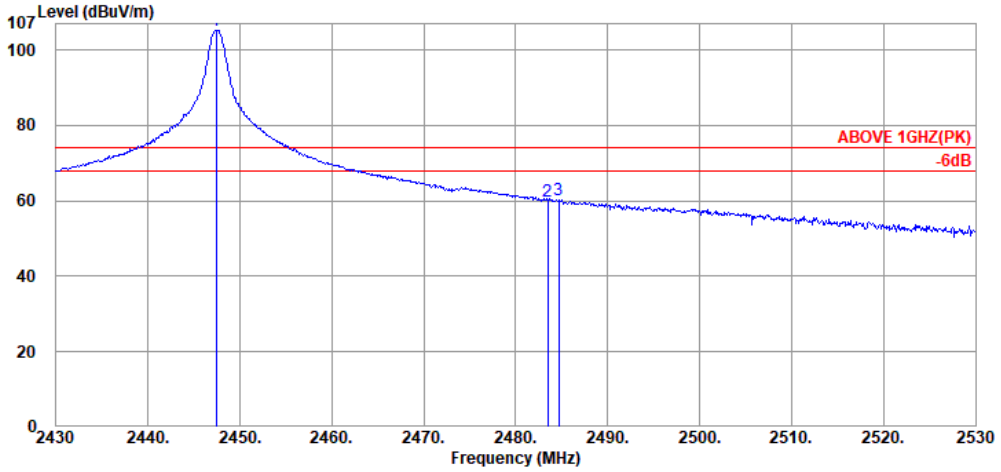
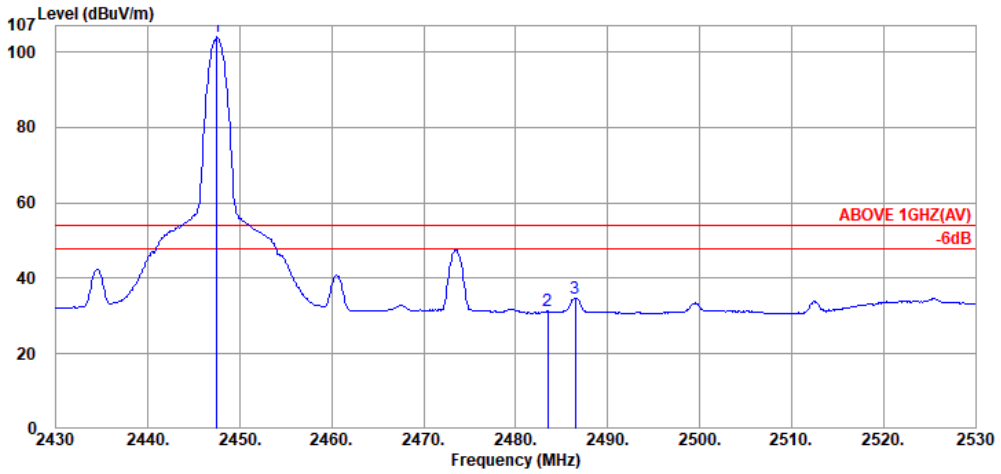
Mode	S-FHSS	Frequency	TX 2447.50MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2447.40	28.35	6.08	70.74	105.17	---	---	Peak
2483.50	28.38	6.13	25.42	59.93	74.00	14.07	Peak
2484.70	28.38	6.13	25.85	60.36	74.00	13.64	Peak



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2447.50	28.35	6.08	69.63	104.06	---	---	Average
2483.50	28.38	6.13	-3.21	31.30	54.00	22.70	Average
2486.50	28.38	6.13	0.32	34.83	54.00	19.17	Average

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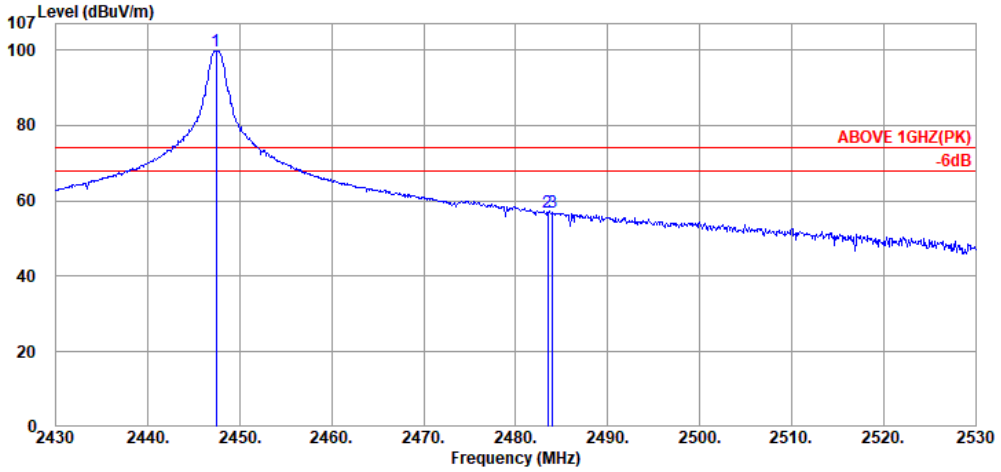
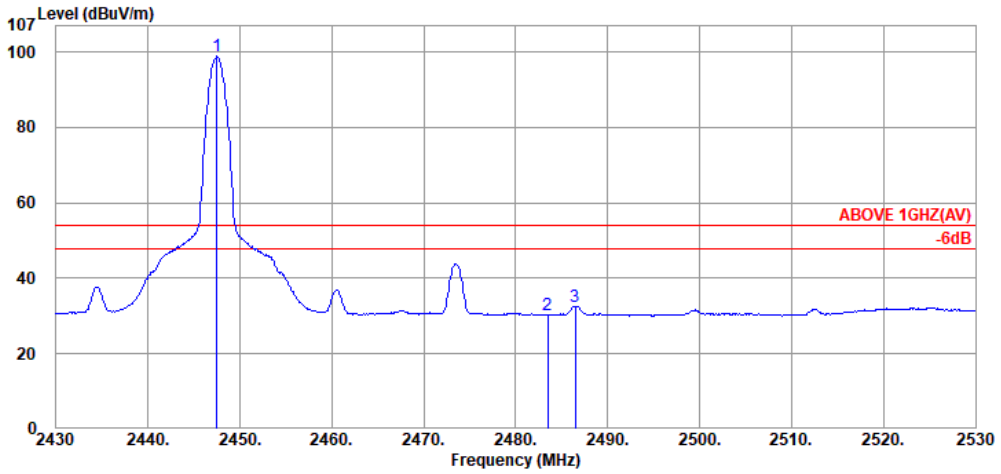
Mode	S-FHSS	Frequency	TX 2447.50MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2447.40	28.35	6.08	65.29	99.72	---	---	Peak
2483.50	28.38	6.13	22.40	56.91	74.00	17.09	Peak
2484.00	28.38	6.13	22.37	56.88	74.00	17.12	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2447.50	28.35	6.08	64.36	98.79	---	---	Average
2483.50	28.38	6.13	-4.34	30.17	54.00	23.83	Average
2486.50	28.38	6.13	-1.86	32.65	54.00	21.35	Average

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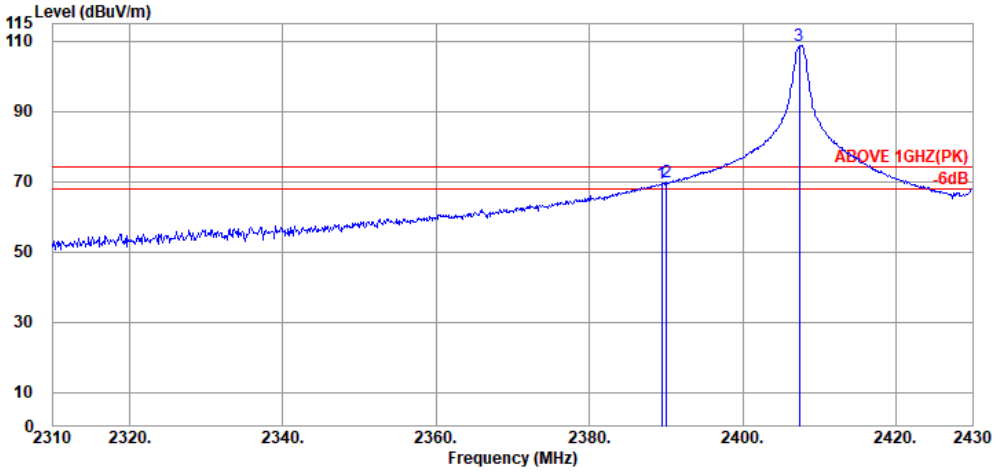
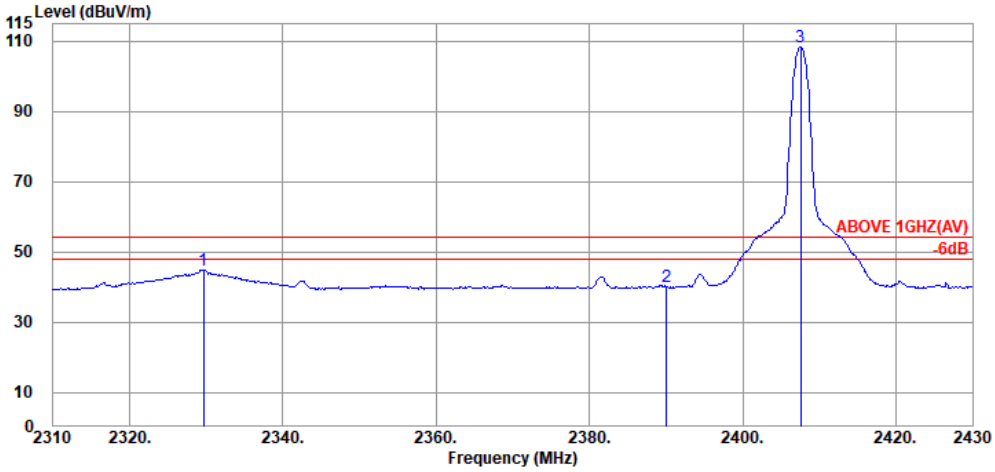
Mode	T-FHSS	Frequency	TX 2407.50MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.44	28.28	6.01	35.37	69.66	74.00	4.34	Peak
2390.04	28.28	6.01	35.43	69.72	74.00	4.28	Peak
2407.44	28.30	6.03	74.44	108.77	---	---	Peak



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2329.68	28.21	5.94	10.72	44.87	54.00	9.13	Average
2390.04	28.28	6.01	5.90	40.19	54.00	13.81	Average
2407.56	28.30	6.03	74.11	108.44	---	---	Average

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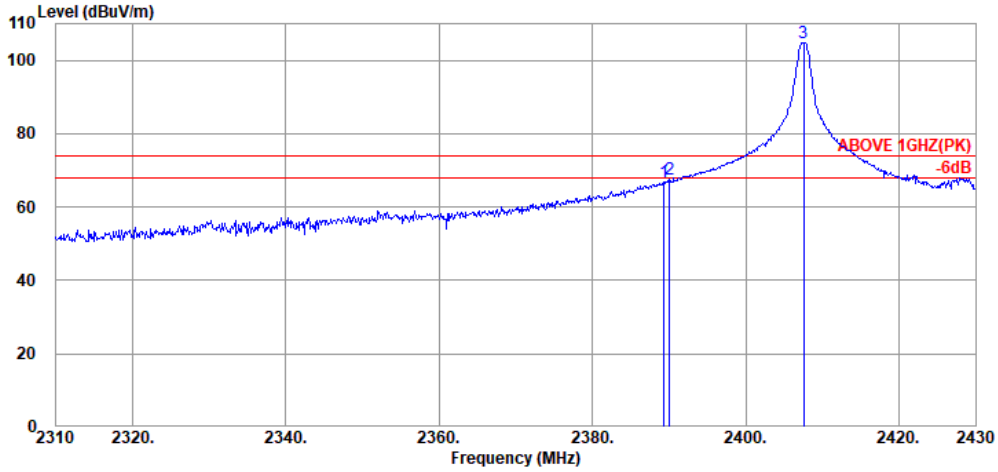
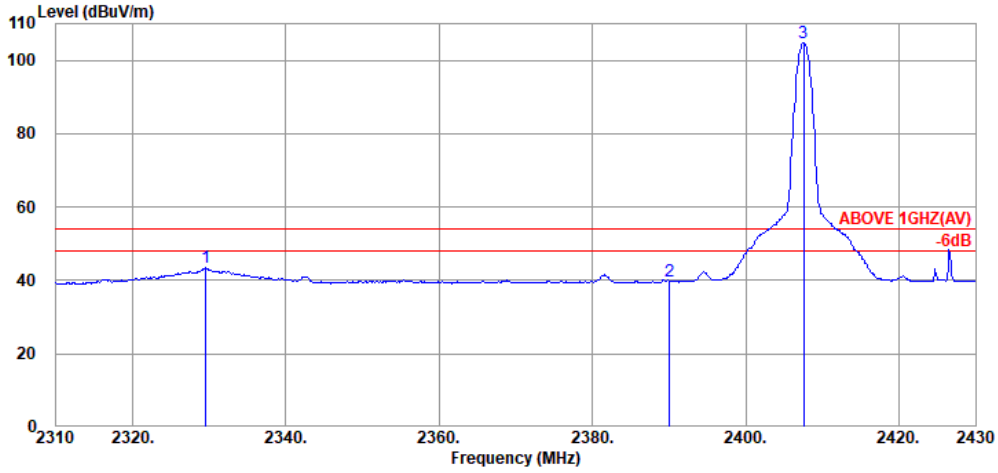
Mode	T-FHSS	Frequency	TX 2407.50MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.32	28.28	6.01	32.44	66.73	74.00	7.27	Peak
2390.04	28.28	6.01	33.31	67.60	74.00	6.40	Peak
2407.56	28.30	6.03	70.60	104.93	---	---	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2329.56	28.21	5.94	9.26	43.41	54.00	10.59	Average
2390.04	28.28	6.01	5.46	39.75	54.00	14.25	Average
2407.56	28.30	6.03	70.37	104.70	---	---	Average

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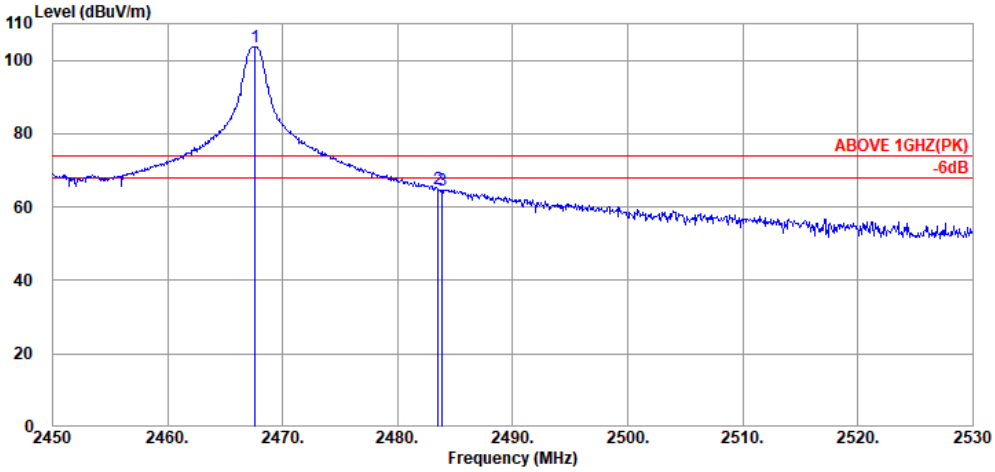
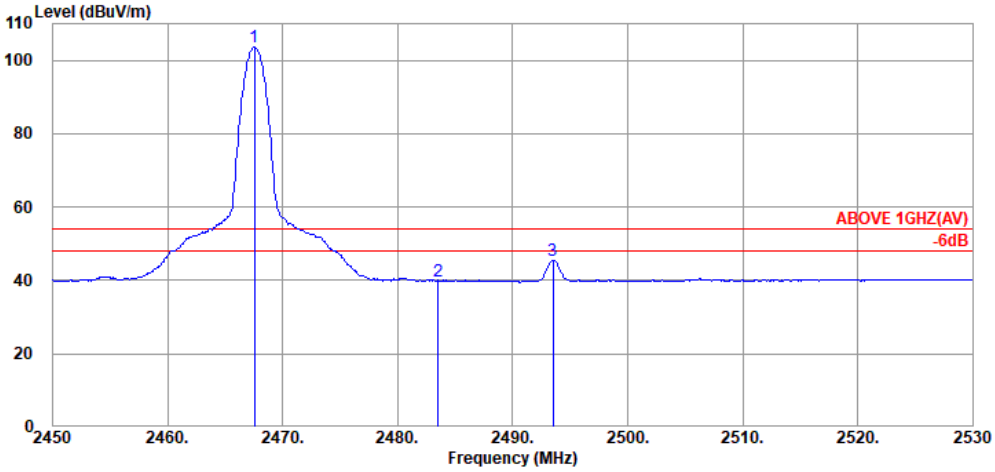
Mode	T-FHSS	Frequency	TX 2467.50MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.60	28.37	6.10	69.27	103.74	---	---	Peak
2483.52	28.38	6.13	30.47	64.98	74.00	9.02	Peak
2483.84	28.38	6.13	30.24	64.75	74.00	9.25	Peak



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	28.36	6.10	69.10	103.56	---	---	Average
2483.52	28.38	6.13	5.37	39.88	54.00	14.12	Average
2493.52	28.39	6.15	10.92	45.46	54.00	8.54	Average

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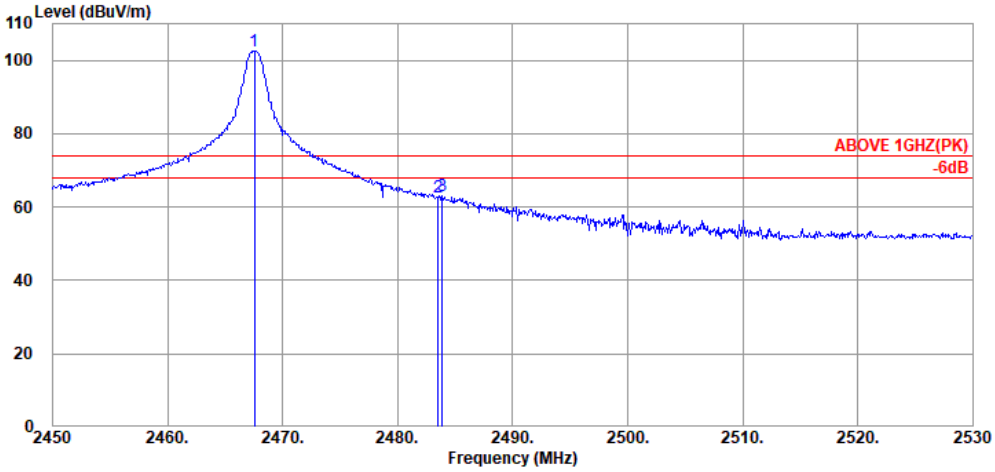
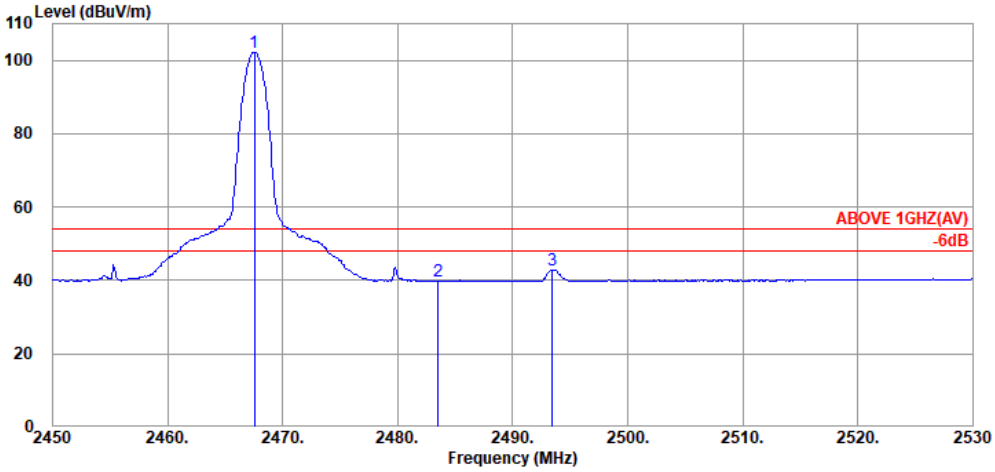
Mode	T-FHSS	Frequency	TX 2467.50MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	28.36	6.10	68.04	102.50	---	---	Peak
2483.52	28.38	6.13	28.16	62.67	74.00	11.33	Peak
2483.84	28.38	6.13	28.40	62.91	74.00	11.09	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2467.52	28.36	6.10	67.77	102.23	---	---	Average
2483.52	28.38	6.13	5.25	39.76	54.00	14.24	Average
2493.44	28.39	6.15	8.42	42.96	54.00	11.04	Average

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A.2.2 Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Mode	S-FHSS	Frequency	TX 2403.25MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4806.00	32.82	8.42	7.35	48.59	54.00	5.41	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4806.00	32.82	8.42	10.04	51.28	54.00	2.72	Peak

Mode	S-FHSS	Frequency	TX 2425.00MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4850.00	32.90	8.48	8.67	50.05	54.00	3.95	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4850.00	32.90	8.48	9.28	50.66	54.00	3.34	Peak

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Mode	S-FHSS	Frequency	TX 2447.500MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4894.00	32.98	8.52	7.28	48.78	54.00	5.22	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4894.00	32.98	8.52	8.14	49.64	54.00	4.36	Peak

Mode	T-FHSS	Frequency	TX 2407.50MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4816.00	32.85	8.44	7.89	49.18	54.00	4.82	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4816.00	32.85	8.44	9.94	51.23	54.00	2.77	Peak

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Tel: +886 2 26099301
Fax: +886 2 26099303

Mode	T-FHSS	Frequency	TX 2437.50MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4876.00	32.96	8.50	7.53	48.99	54.00	5.01	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4876.00	32.96	8.50	8.67	50.13	54.00	3.87	Peak

Mode	T-FHSS	Frequency	TX 2467.500MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4936.00	33.06	8.56	8.98	50.60	54.00	3.40	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4936.00	33.06	8.56	8.74	50.36	54.00	3.64	Peak

A.2.3 Emissions in Non-restricted Frequency Bands:

All emission levels below the FCC 15.209(a)/RSS-Gen Section 8.9 table 4 general radiated emissions limits is not required.

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A.4 20dB/Occupied Bandwidth

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

A.4.1 20dB Bandwidth Result

Mode	Centre Frequency (MHz)	20 dB Bandwidth (MHz)	Occupied (99%) Bandwidth (MHz)	Limit 2/3 (20dB Bandwidth)
S-FHSS	2403.25	0.2626	0.25800	0.175
	2425.00	0.2622	0.25950	0.175
	2447.50	0.2618	0.26605	0.175

Remark: The maximum two-thirds of the 20dB bandwidth shall be at maximum 0.175MHz.

Mode	Centre Frequency (MHz)	20 dB Bandwidth (MHz)	Occupied (99%) Bandwidth (MHz)	Limit 2/3 (20dB Bandwidth)
T-FHSS	2407.50	0.2591	0.26267	0.173
	2437.50	0.2616	0.26161	0.174
	2467.50	0.2615	0.25849	0.174

Remark: The maximum two-thirds of the 20dB bandwidth shall be at maximum 0.174MHz.

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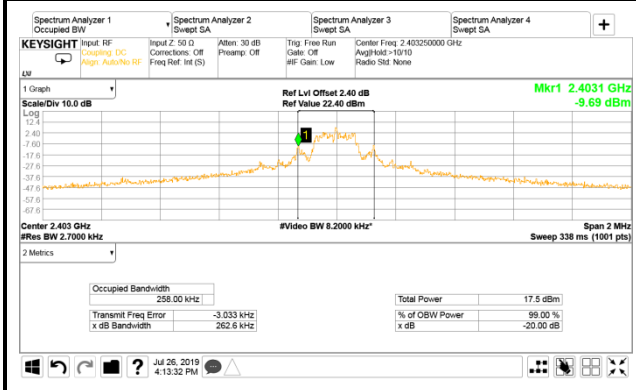
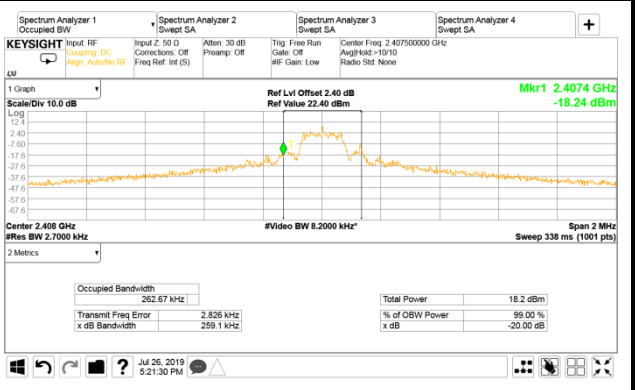
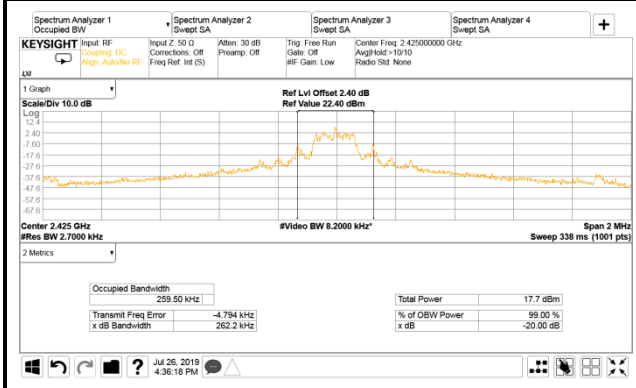
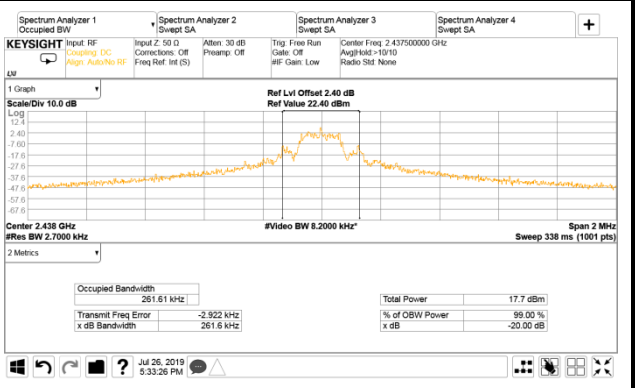
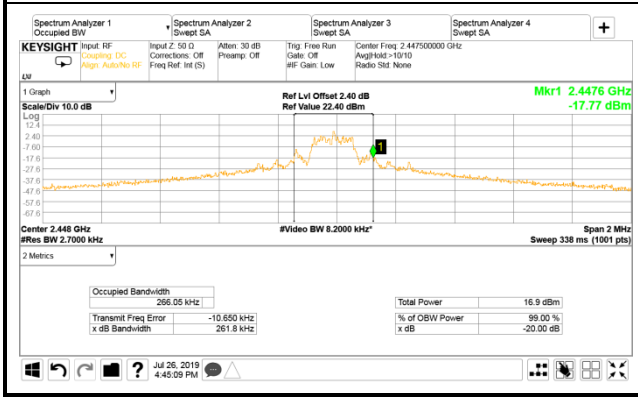
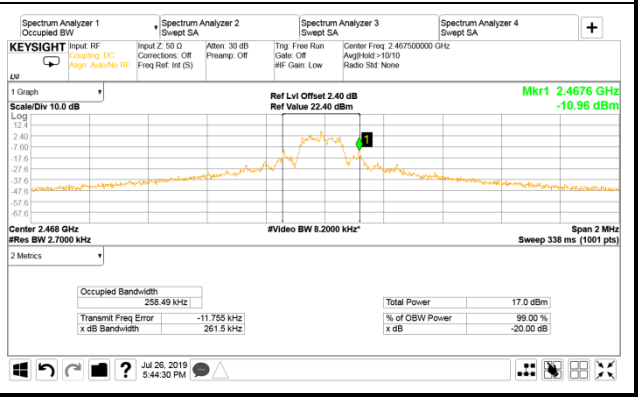
A.4.2 Measurement Plots

S-FHSS	T-FHSS
	
	
	

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A.6 CARRIER FREQUENCY SEPARATION MEASUREMENT

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

A.6.1 Carrier Frequency Separation Result

Mode	Centre Frequency (MHz)		Carrier Frequency Separation (MHz)	Limit (MHz) 2/3 (20dB Bandwidth)
S-FHSS	2403.25		0.748	＞0.175
	2425.00	adjacent channel of right carrier frequency	0.750	
	2425.00	adjacent channel of left carrier frequency	0.750	
	2447.50		0.748	

Mode	Centre Frequency (MHz)		Carrier Frequency Separation (MHz)	Limit (MHz) 2/3 (20dB Bandwidth)
T-FHSS	2407.50		1.925	＞0.174
	2437.50	adjacent channel of right carrier frequency	2.000	
	2437.50	adjacent channel of left carrier frequency	2.075	
	2467.50		1.920	

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A.6.2 Measurement Plots

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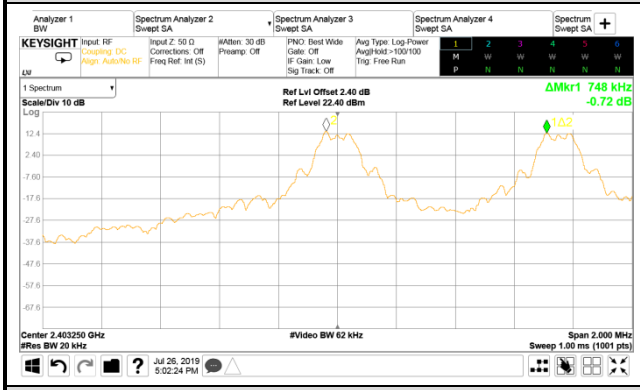
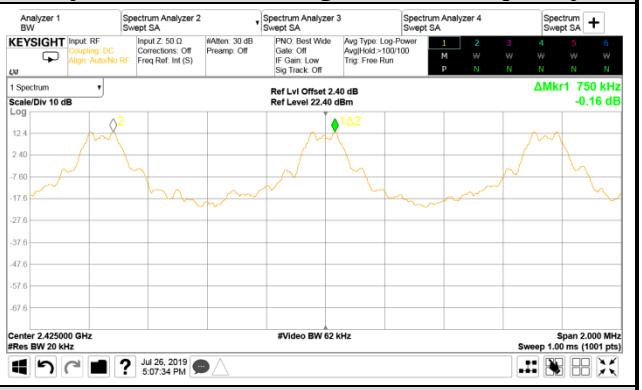
adjacent channel of right carrier frequency</td></tr>
<tr><td>
</td><td>
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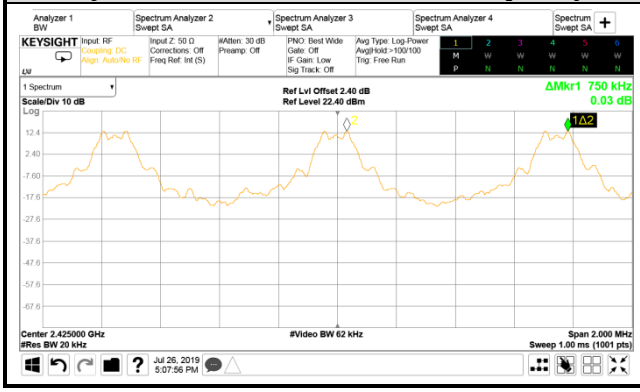
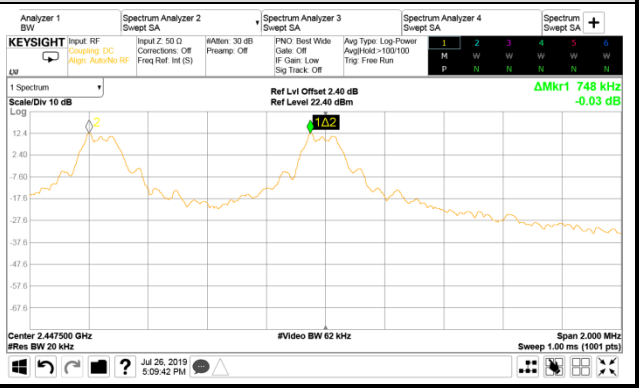
<tr><td>
</td><td>
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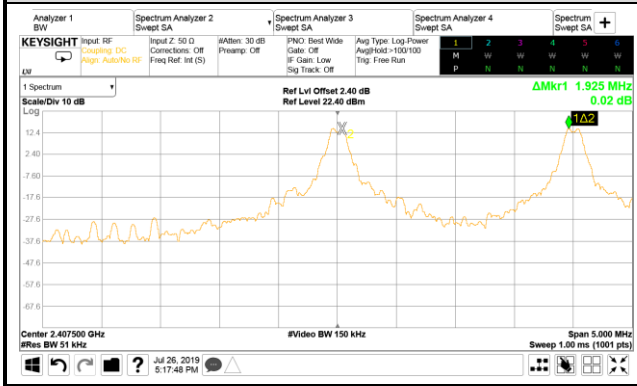
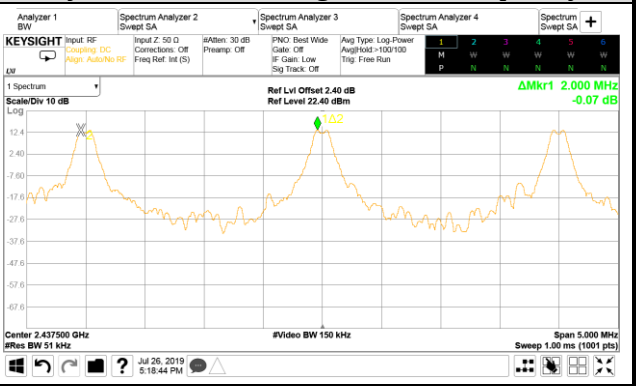
adjacent channel of right carrier frequency</td></tr>
<tr><td>
</td><td>
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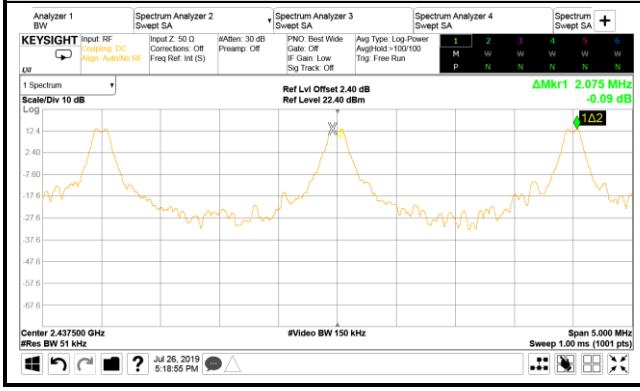
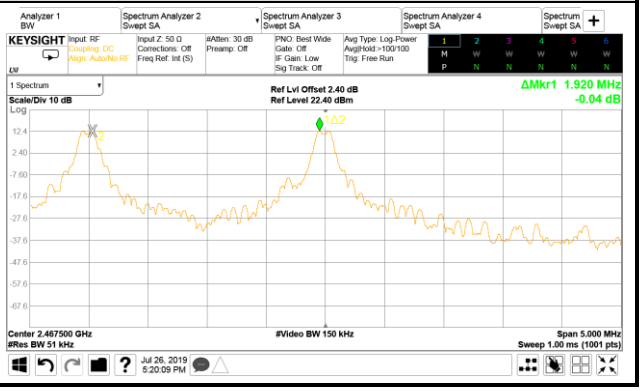
<tr><td>2437.50MHz
adjacent channel of left carrier frequency</td><td>2467.50MHz</td></tr>
<tr><td>
</td><td>
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A.7 TIME OF OCCUPANCY MEASUREMENT

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

A.7.1 Time of Occupancy

Mode	Centre Frequency (MHz)	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
S-FHSS	2403.25	5	3.020	362.400	<400
	2425.00	5	3.000	360.000	<400
	2447.50	5	3.020	362.400	<400

Observation Period:
60 channels* **0.4** seconds= **24.0** seconds
Centre Frequency: 2403.25MHz
For each second of **5** transmission appearance,the longest time of occupancy is
5 channels* **24.0** /1* **3.020** ms= **362.400** ms (<400ms)
Centre Frequency: 2425.00MHz
For each second of **5** transmission appearance,the longest time of occupancy is
5 channels* **24.0** /1* **3.000** ms= **360.000** ms (<400ms)
Centre Frequency: 2447.50MHz
For each second of **5** transmission appearance,the longest time of occupancy is
5 channels* **24.0** /1* **3.020** ms= **362.400** ms (<400ms)

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- Measurement Plots

S-FHSS	
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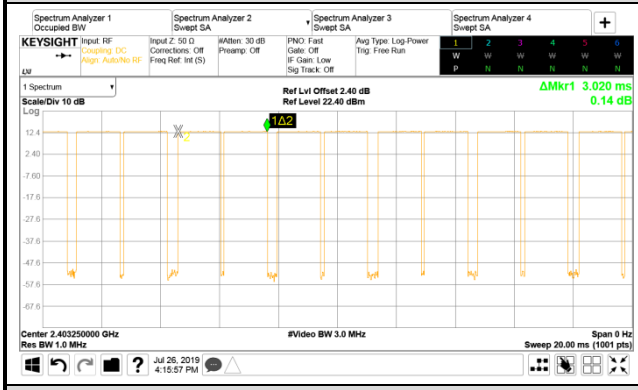	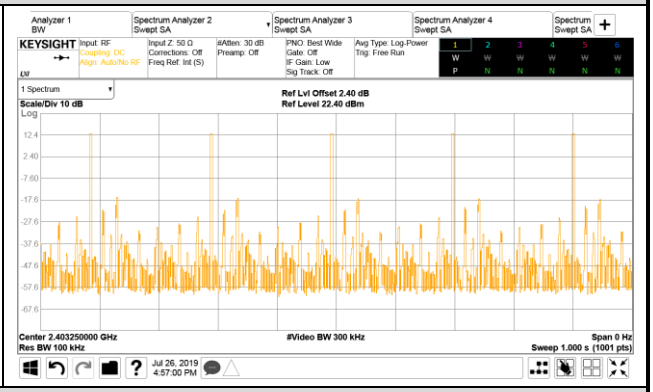
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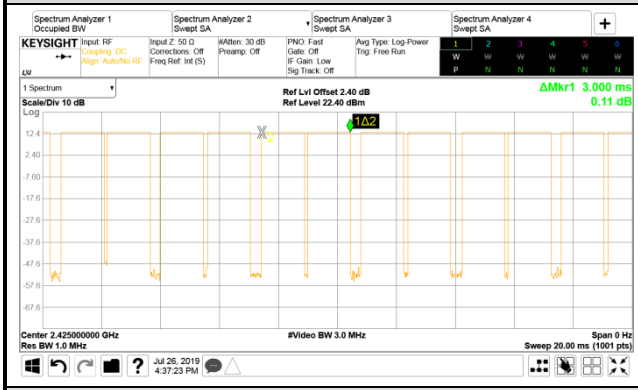
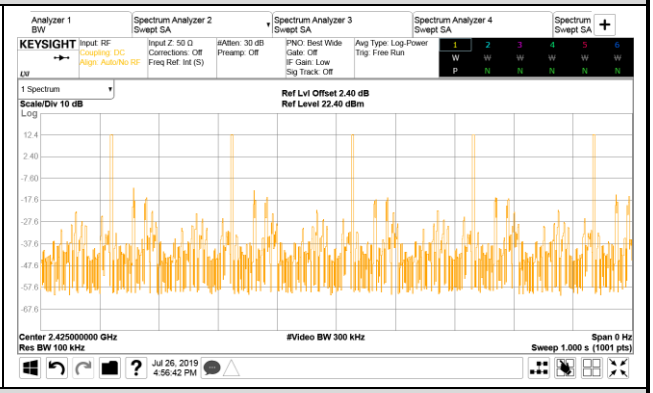
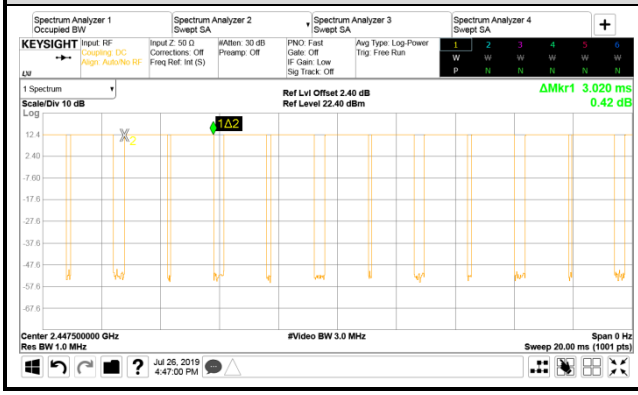
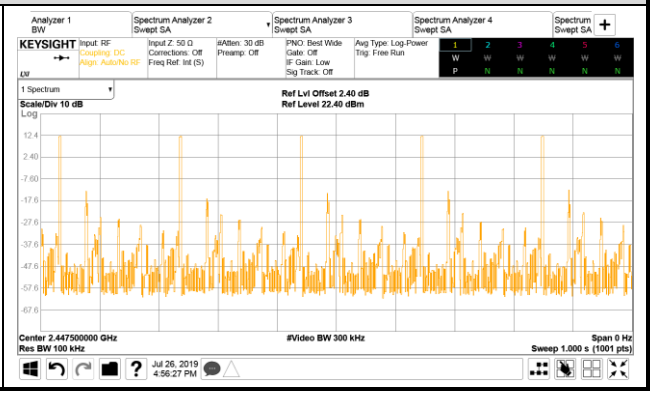
	
2447.50MHz	
	

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Mode	Centre Frequency (MHz)	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
T-FHSS	2407.50	2	1.440	35.7120	<400
	2437.50	2	1.440	35.7120	<400
	2467.50	2	1.440	35.7120	<400

Observation Period:
31 channels* **0.4** seconds= **12.4** seconds
Centre Frequency: 2407.50MHz
For each second of **2** transmission appearance,the longest time of occupancy is
2 channels* **12.4** /1* **1.4400** ms= **35.7120** ms (<400ms)
Centre Frequency: 2437.50MHz
For each second of **2** transmission appearance,the longest time of occupancy is
2 channels* **12.4** /1* **1.4400** ms= **35.7120** ms (<400ms)
Centre Frequency: 2467.50MHz
For each second of **2** transmission appearance,the longest time of occupancy is
2 channels* **12.4** /1* **1.4400** ms= **35.7120** ms (<400ms)

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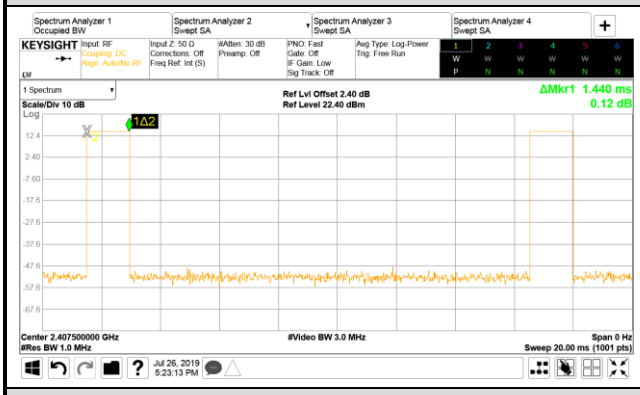
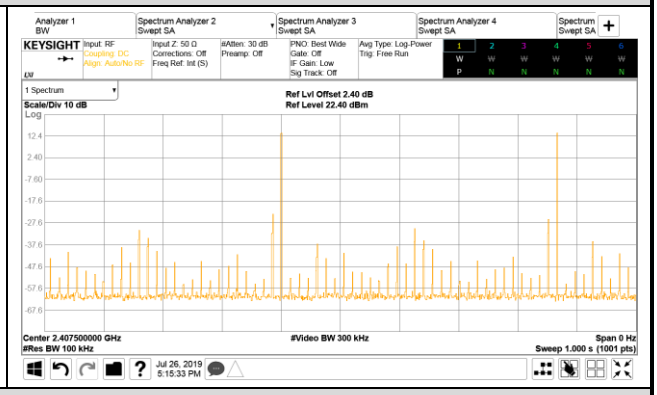
- Measurement Plots

T-FHSS	
2407.50MHz	
	
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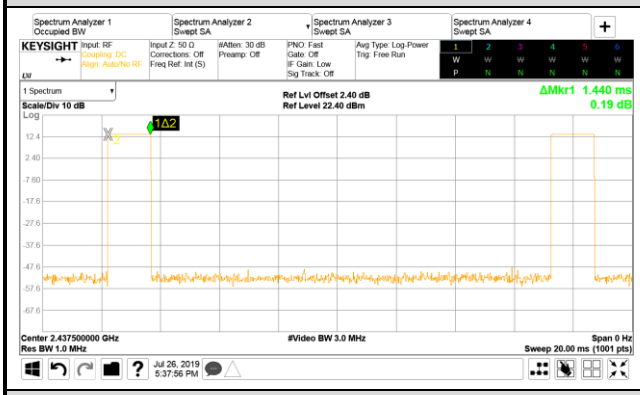	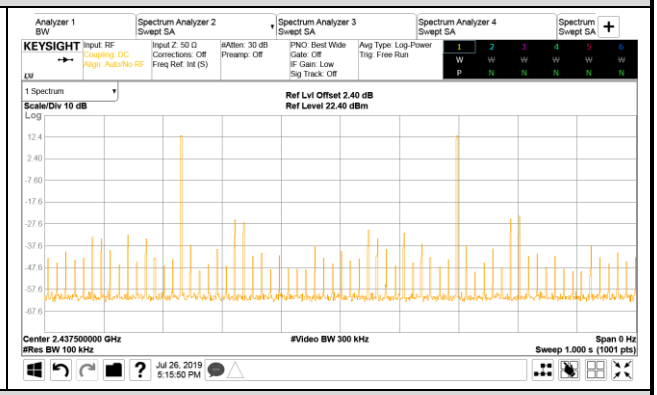
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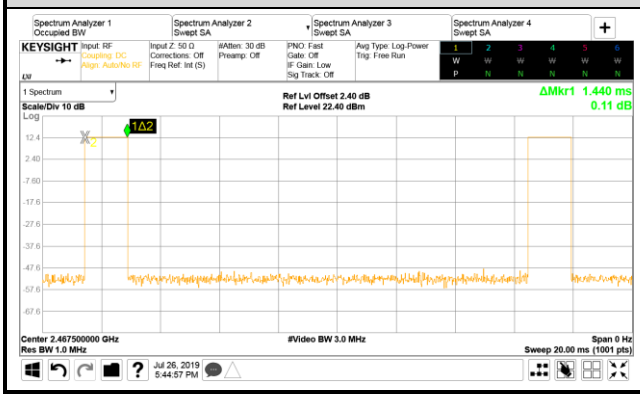	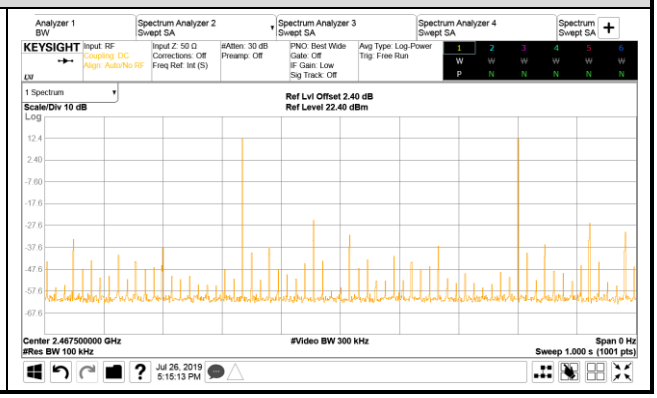

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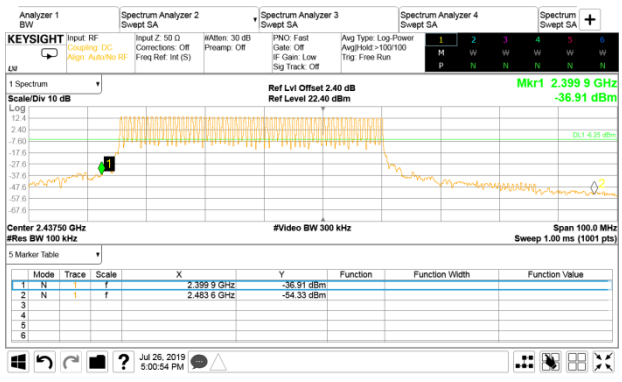
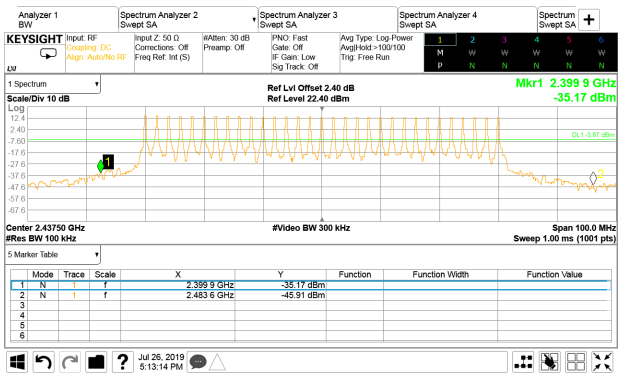
A.8 NUMBER OF HOPPING CHANNELS MEASUREMENT

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

A.8.1 Measurement Plots

S-FHSS	T-FHSS
	
The number hopping channel is 60.	The number hopping channel is 31.

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A.9 MAXIMUM PEAK OUTPUT POWER MEASUREMENT

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

Mode	Centre Frequency (MHz)	Peak Output Power		Limit
		dBm	W	
S-FHSS	2403.25	13.06	0.020230	21dBm (0.125W)
	2425.00	13.16	0.020701	
	2447.50	12.47	0.017660	

Mode	Centre Frequency (MHz)	Peak Output Power		Limit
		dBm	W	
T-FHSS	2407.50	14.49	0.028119	21dBm (0.125W)
	2437.50	13.58	0.022803	
	2467.50	12.81	0.019099	

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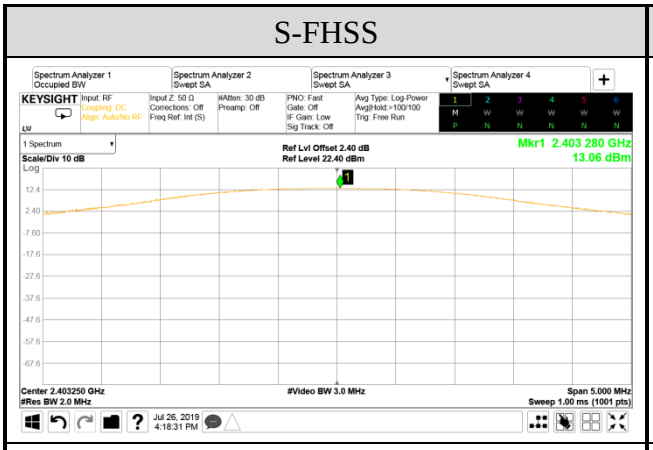
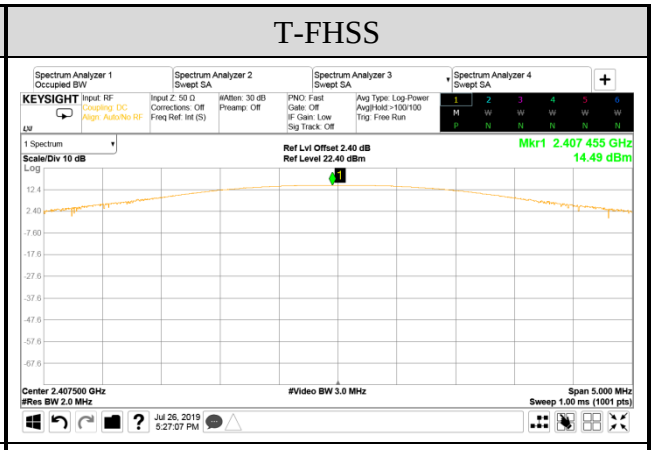
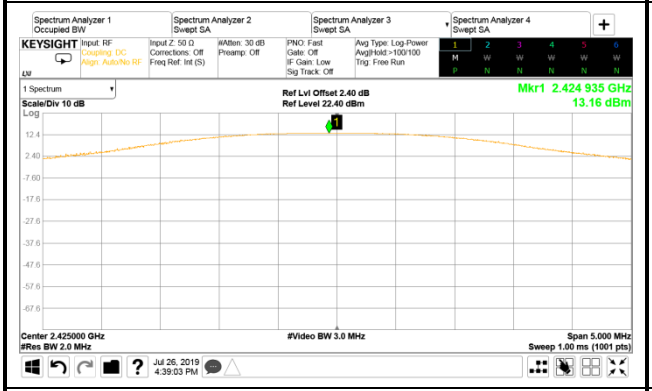
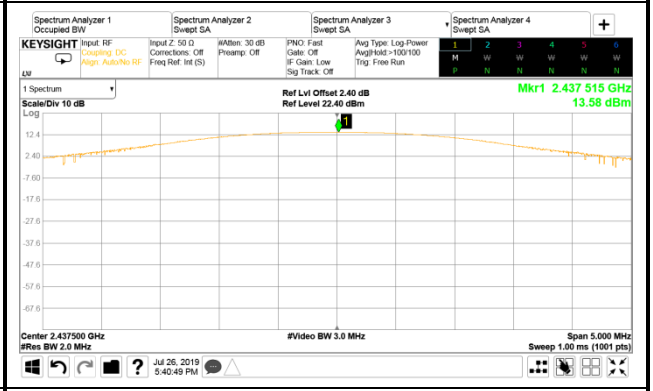
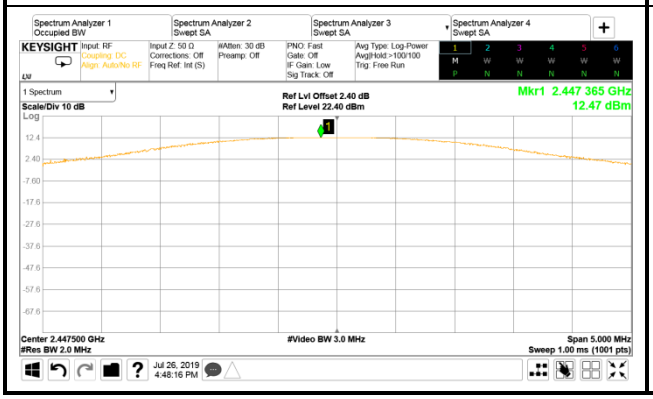
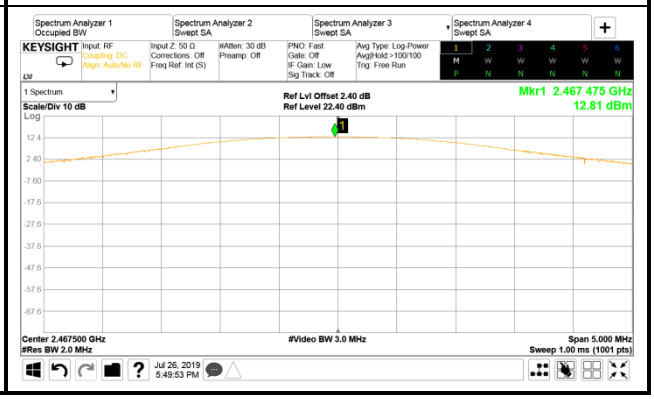
A.9.1 Measurement Plots

S-FHSS	T-FHSS
	
	
	

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New Taipei City244, Taiwan

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Fax: +886 2 26099303

A.10 EMISSION LIMITATIONS MEASUREMENT

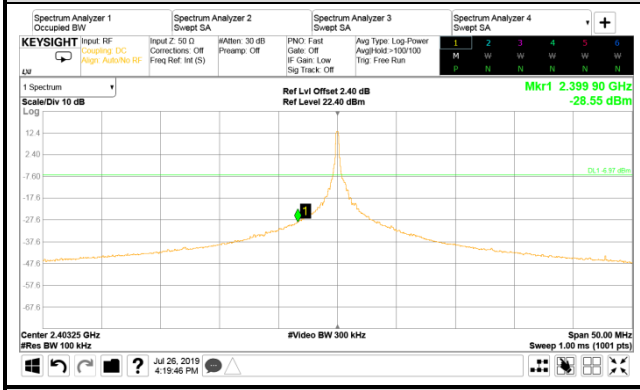
A.10.1 Band Edge

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

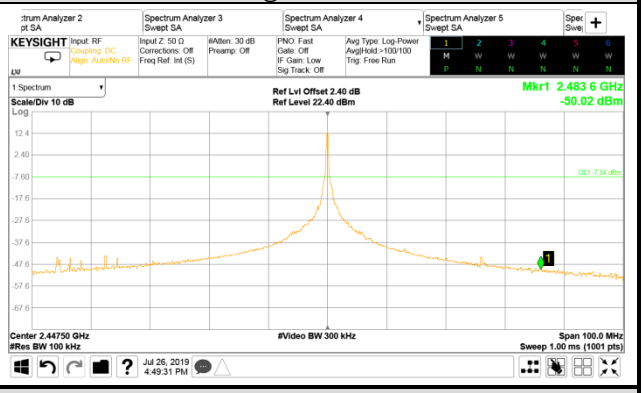
S-FHSS

Single Channel

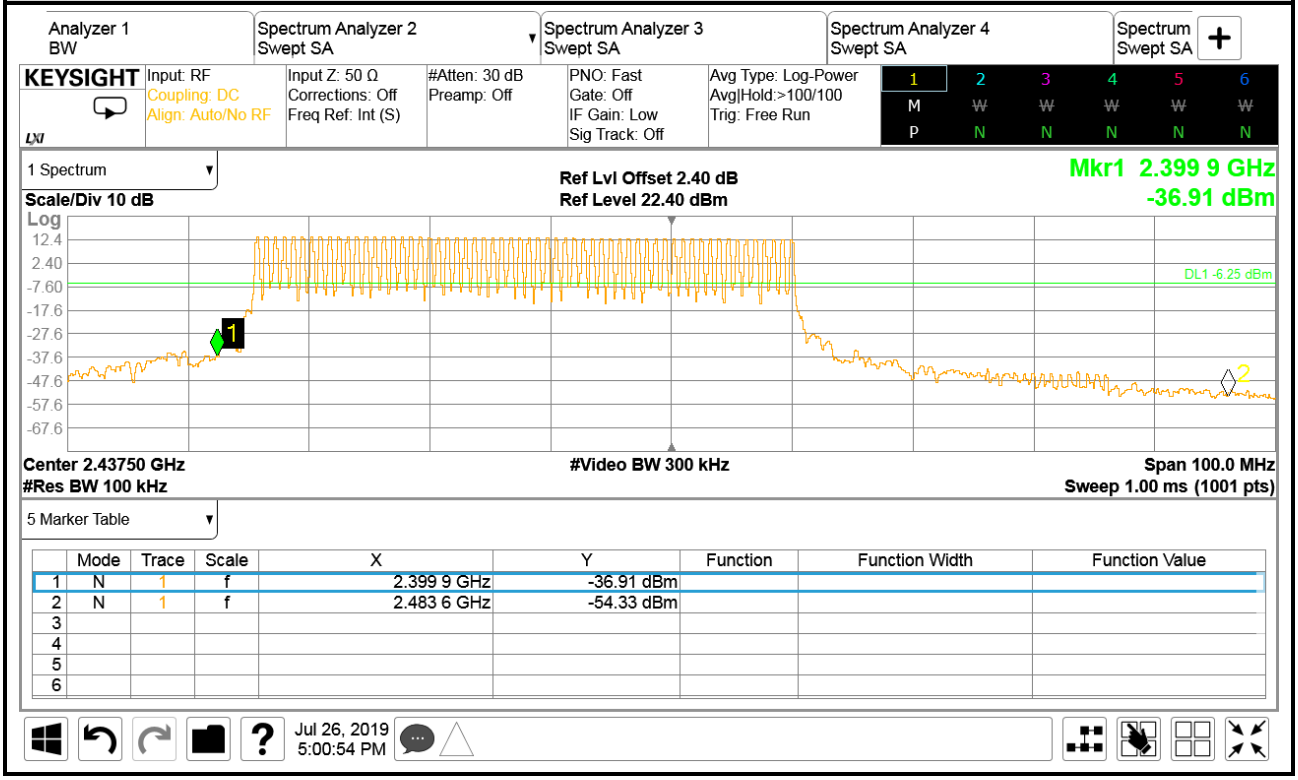
Low channel



High channel



Hopping Mode



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.399 9 GHz	-36.91 dBm			
2	N	1	f	2.483 6 GHz	-54.33 dBm			
3								
4								
5								
6								

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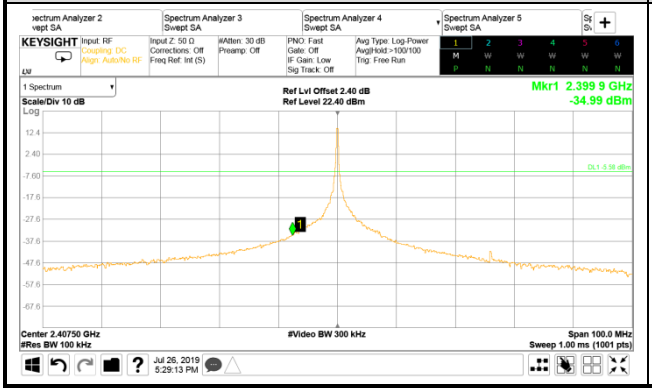
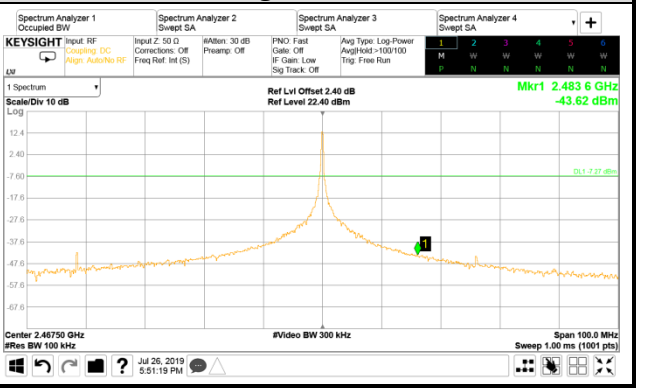
T-FHSS

Single Channel

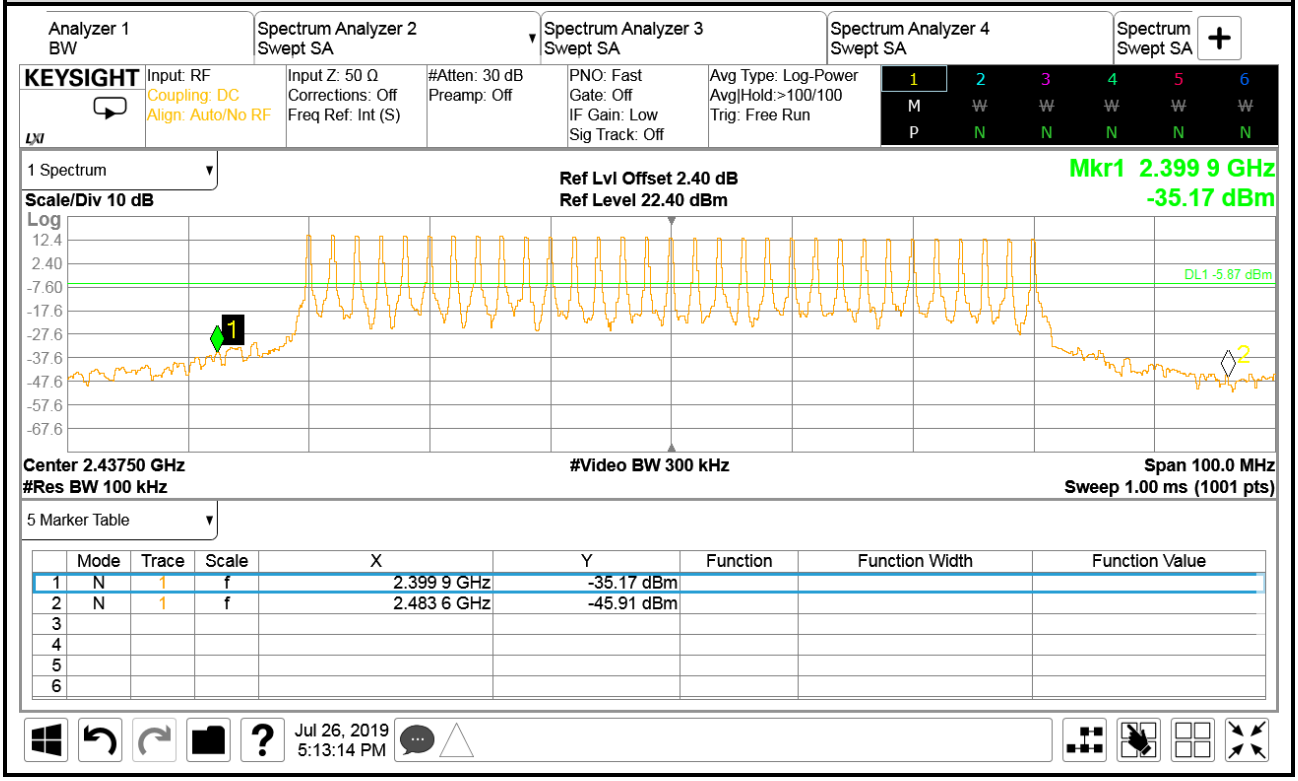
Low channel



High channel



Hopping Mode



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.399 9 GHz	-35.17 dBm			
2	N	1	f	2.483 6 GHz	-45.91 dBm			
3								
4								
5								
6								

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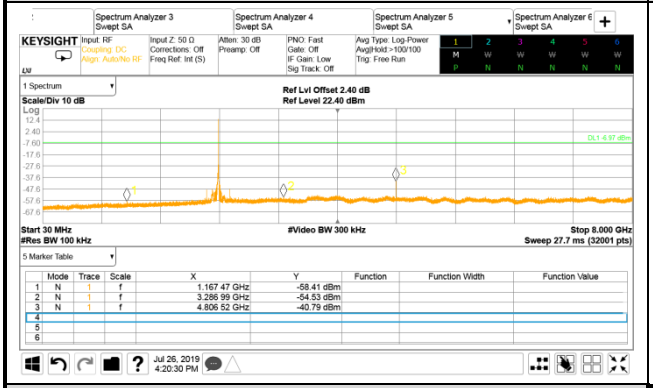
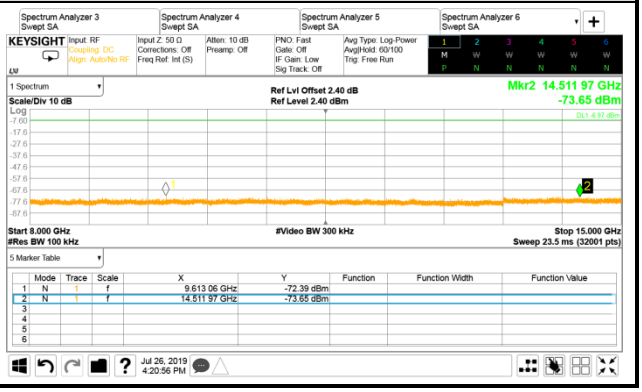
A.10.2 Spurious Emission

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Mode	S-FHSS	Frequency	TX 2403.25MHz
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

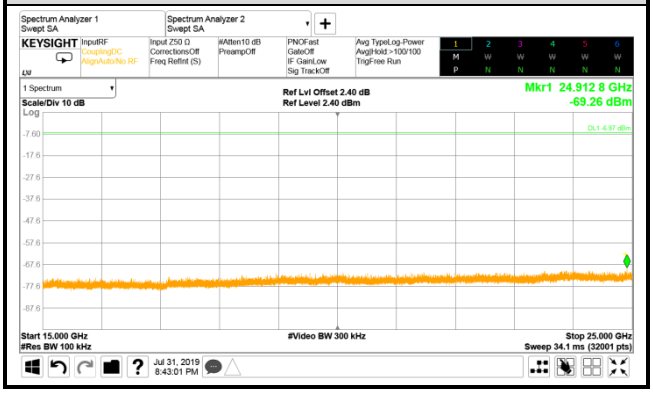
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss and simultaneous factor.

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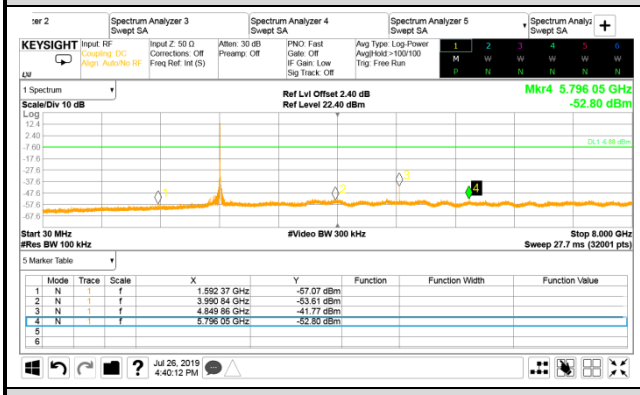
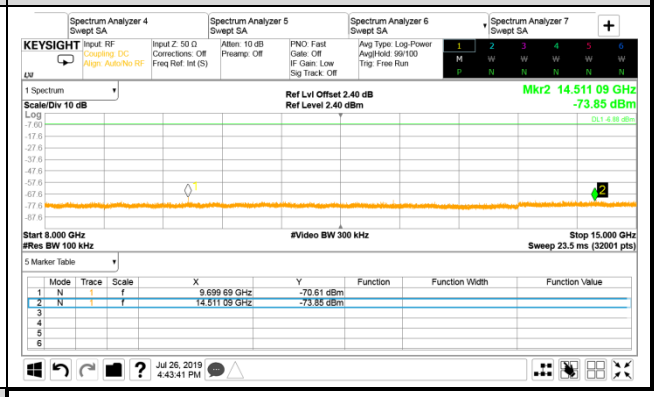
Test Date	2019/07/26	Temp./Hum.	22℃/54%
Mode	S-FHSS	Frequency	TX 2425.00MHz
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

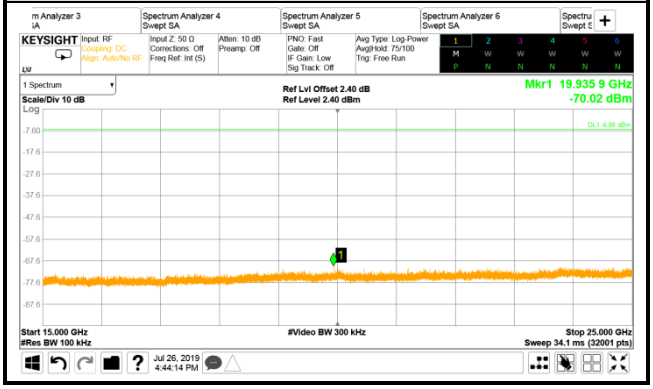
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



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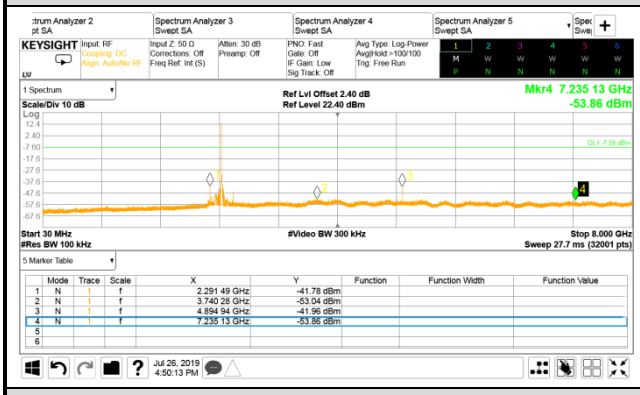
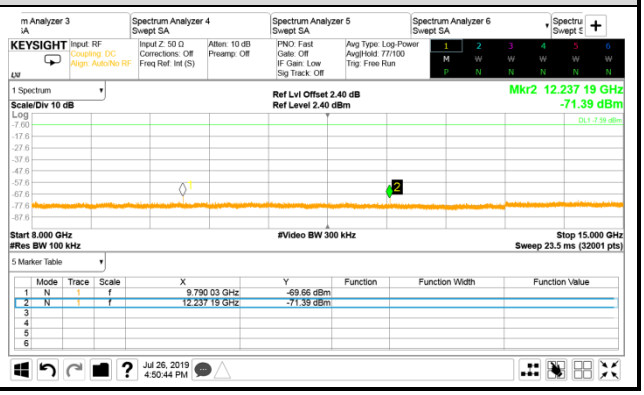
Test Date	2019/07/26	Temp./Hum.	22℃/54%
Mode	S-FHSS	Frequency	TX 2447.50MHz
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

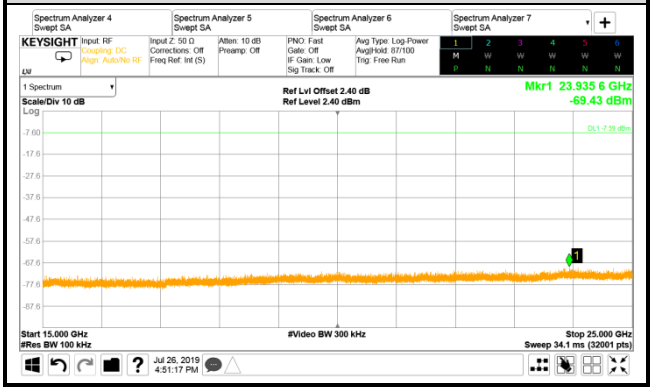
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



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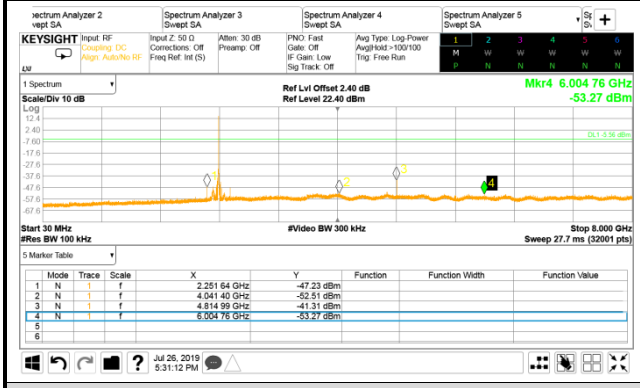
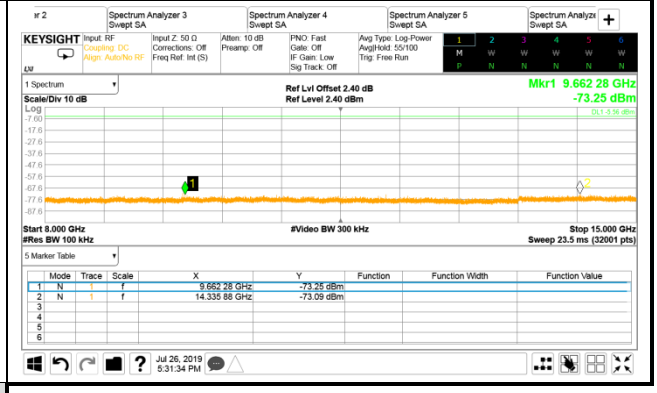
Test Date	2019/07/26	Temp./Hum.	22℃/54%
Mode	T-FHSS	Frequency	2407.50MHz
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

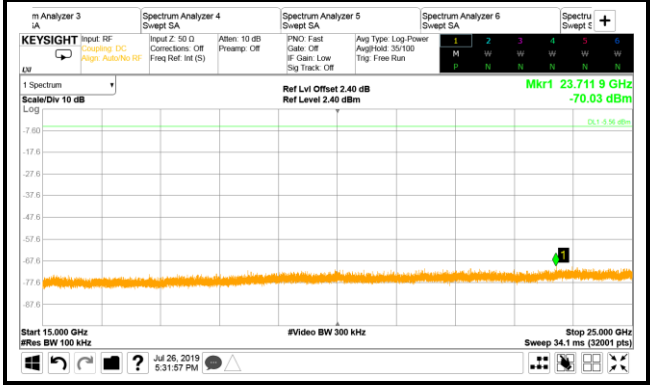
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



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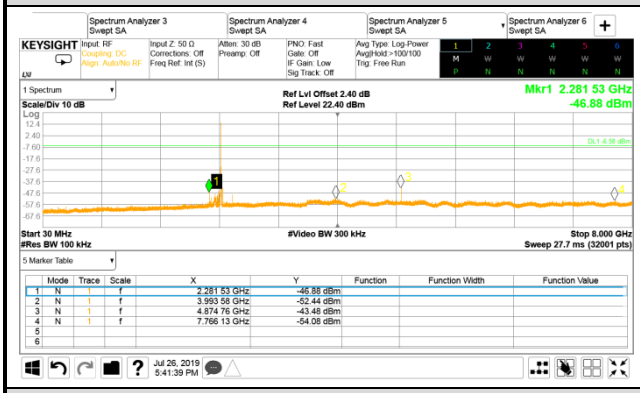
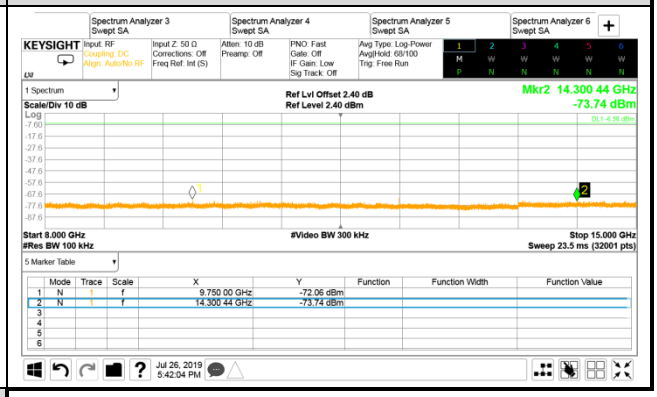
Test Date	2019/07/26	Temp./Hum.	22℃/54%
Mode	T-FHSS	Frequency	2437.50MHz
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

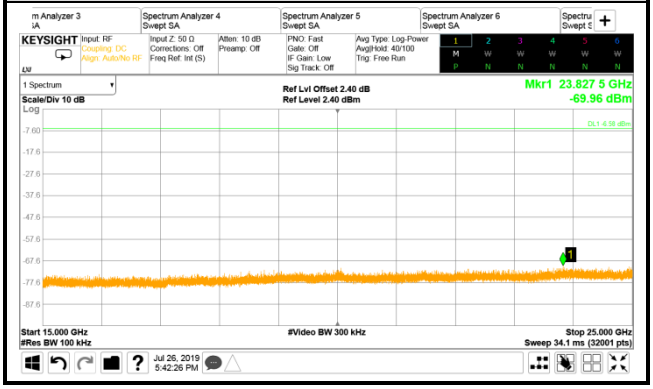
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



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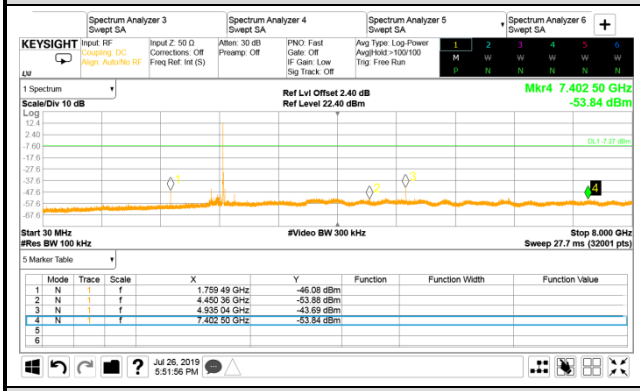
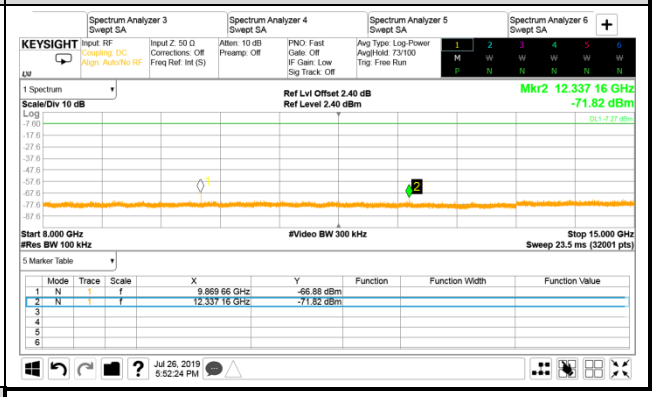
Fax: +886 2 26099303

Test Date	2019/07/26	Temp./Hum.	22℃/54%
Mode	T-FHSS	Frequency	2467.50MHz
Cable Loss	2.4dB	Test Voltage	DC 3.8V (Via Battery)

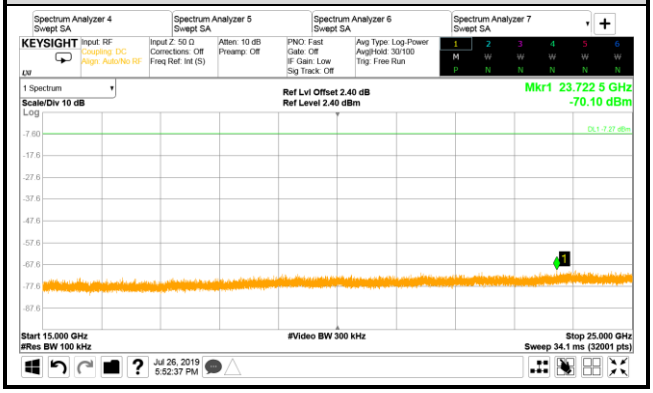
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



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APPENDIX B

TEST PHOTOGRAPHS

(Model: T32MZ)

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