Audix Technology Corp.
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New Taipei City244,Taiwan

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FCC 15.247& RSS-247
2.4 GHz Test Report

for

LG Electronics Inc.

222, LG-ro Jinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea

Product Name	:	**Notebook Computer**
Model Name	:	**(1)14Z990 (2)14ZD990 (3)14ZB990 (4)14ZG990 (5)LG14Z99**
Brand		**LG**
FCC ID	:	**BEJNT-14Z990**
IC	:	**2703H-14Z990**

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

Testing Laboratory
1724

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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TEST REPORT CERTIFICATION

Applicant	:	LG Electronics Inc.
Factory	:	LG Electronics Nanjing New Technology Co., Ltd.
EUT Description		
(1) Product	:	Notebook Computer
(2) Model	:	(1)14Z990 (2)14ZD990 (3)14ZB990 (4)14ZG990 (5)LG14Z99
(3) Brand	:	LG
(4) Power Rating	:	DC 19V, 2.53A

Applicable Standards:

47CFRFCC Part 15 Subpart C
RSS-Gen (Issue 5), April 2018
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: 2018. 11. 02

Reviewed by: Sabrina Wang (Sabrina Wang/Administrator)

Approved by: Ben Cheng (Ben Cheng/Manager)

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2018. 11. 02	Original Report	EM-F180457

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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(2)	20dB Bandwidth	**PASS**
15.247(a)(1)	RSS-247 §5.1(2)	Carrier Frequency Separation	**PASS**
15.247(a)(1)(iii)	RSS-247 §5.1(4)	Time of Occupancy	**PASS**
15.247(a)(1)(iii)	RSS-247 §5.1(4)	Number of Hopping Channels	**PASS**
15.247(b)(1)	RSS-247 §5.1(2)	Maximum Peak Output Power	**PASS**
15.247(d)	RSS-247 §5.5	Conducted Band Edges and Conducted Spurious Emission	**PASS**
15.203	RSS-Gen §8.3	Antenna Requirement	**Compliance**

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3. GENERAL INFORMATION

3.1. Description of Application

Applicant	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713 Korea.
Factory	LG Electronics Nanjing New Technology Co., Ltd. No.346,Yaoxin Road, Economic & Technical Development Zone, Nanjing, China.
Product	Notebook Computer
Brand	LG
Model	(1)14Z990 (2)14ZD990 (3)14ZB990 (4)14ZG990 (5)LG14Z99 The difference between all models is different in the sales customers.

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3.2. Description of EUT

<table>
<tr><td>Test Model</td><td>14Z990</td></tr>
<tr><td>Serial Number</td><td>N/A</td></tr>
<tr><td>Power Rating</td><td>DC 19V, 2.53A</td></tr>
<tr><td>RF Features</td><td>WLAN:802.11a/b/g/n/ac
Bluetooth: BT and BLE</td></tr>
<tr><td>Transmit Type</td><td>
<table>
<tr><th colspan="2">2.4 GHz</th></tr>
<tr><td>802.11b</td><td>1T1R</td></tr>
<tr><td>802.11g</td><td>1T1R</td></tr>
<tr><td>802.11n-HT20</td><td>2T2R</td></tr>
<tr><td>802.11n-HT40</td><td>2T2R</td></tr>
<tr><td>BT/BLE</td><td>1T1R</td></tr>
<tr><th colspan="2">UNII Bands</th></tr>
<tr><td>802.11a</td><td>1T1R</td></tr>
<tr><td>802.11n-HT20/
802.11ac-VHT20</td><td>2T2R</td></tr>
<tr><td>802.11n-HT40/
802.11ac-VHT40</td><td>2T2R</td></tr>
<tr><td>802.11ac-VHT80</td><td>2T2R</td></tr>
<tr><td>802.11ac-VHT160</td><td>2T2R</td></tr>
</table>
</td></tr>
<tr><td>Sample Status</td><td>Production</td></tr>
<tr><td>Date of Receipt</td><td>2018. 10. 15</td></tr>
<tr><td>Date of Test</td><td>2018. 10. 22 ~ 30</td></tr>
<tr><td>Interface Ports of EUT</td><td>• One Micro SD Card Slot
• One Earphone Port
• Two USB 3.0 Ports
• One USB Type C Port
• One HDMI Port
• One DC Input Port</td></tr>
<tr><td>Accessories Supplied</td><td>• AC Adapter
• LAN Gender</td></tr>
</table>

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3.3. Antenna Information

2.4G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	WA-F-LBLB-04-058 (Main)	INPAQ	FPCB	2400	1.94
				2450	2.72
				2500	1.20
2	WA-F-LBLB-04-058 (AUX)	INPAQ	FPCB	2400	2.79
				2450	2.29
				2500	1.90

5G Antenna					
No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	WA-F-LBLB-04-058 (Main)	INPAQ	FPCB	5100	1.35
				5400	3.06
				5800	2.10
2	WA-F-LBLB-04-058 (AUX)	INPAQ	FPCB	5100	2.82
				5400	1.12
				5800	0.58

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3.4. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (Mbps)
Bluetooth	2402-2480	79	FHSS (GFSK, π/4 DQPSK, 8-DPSK)	1/2/3

Channel List							
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

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3.5. Description of Key Components

3.5.1. For the All Component Lists

Item	Supplier	Model / Type	Character
System	Microsoft	Win10 Home	---
		Win10 Pro	---
Main Board	LG	14/15Z990 Main B/D PCB	(without Thunderbolt) Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp., Ltd. #2 Elec & Eltek Company (MCO) Limited
	LG	14/15Z990 Main B/D PCB	(with Thunderbolt) Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp., Ltd. #2 Elec & Eltek Company (MCO) Limited
SUB Board	LG	14Z990 WLAN SUB B/D	(without Finger Print) Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp., Ltd. #2 Elec & Eltek Company (MCO) Limited
	LG	14Z990 WLAN SUB B/D	(with Finger Print) Manufacturer: #1 Hannstar Board Tech (Jiang Yin) Corp., Ltd. #2 Elec & Eltek Company (MCO) Limited
CPU (Socket: BGA1528)	Intel	i5-8265U	1.6GHz, up to 3.9GHz
		i7-8565U	1.8GHz, up to 4.6GHz
14” LCD Panel	LG Display	LP140WF7-SPG1	Resolution: 1920 x 1080, 60Hz FHD IPS (Normal Non touch)
		LP140WF5-SPG2	Resolution: 1920 x 1080, 60Hz FHD IPSW/ Touch (AIT Including touch)
Storage (SSD)	Samsung	MZ-VLB5120 (P/N MZVLB512HAJQ-0000)	512GB (NVMe)
		MZ-NLN128C (P/N MZNLN128HAHQ-0000)	128GB (SATA)
	SK hynix	P/N HFS256G39TNF	256GB (SATA)
Memory (RAM)	Samsung	K4AAG16 5WB MCRC	8GB DDR4 (On Board).
		K4A8G16 5WB-BCTD	4GB DDR4 (On Board).
	SK hynix	H5ANAG6NAMR	8GB DDR4 (On Board).
		H5AN8G6NAFR	4GB DDR4 (On Board).
	Samsung	M471A5244CB0-CRC	4GB DDR4 SODIMM (On Card)
		M471A5244CB0-CTD	4GB DDR4 SODIMM (On Card)
		M471A1K43CB1-CRC	8GB DDR4 SODIMM (On Card)
		M471A1K43CB1-CTD	8GB DDR4 SODIMM (On Card)
	SK hynix	HMA851S6AFR6N-UH	4GB DDR4 SODIMM (On Card)
		HMA81GS6AFR8N-UH	8GB DDR4 SODIMM (On Card)
Battery Pack	LG	LBS1224E	DC 7.7V, 72Wh, Typ 9450mAh

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Item	Supplier	Model / Type	Character
WLAN Combo Card	Intel	9560D2W	802.11a/b/g/n/ac 2.4GHz/5GHz+BT 5.0 BLE
WLAN Combo Antenna	LG (INPAQ)	WA-F-LBLB-04-058	FPCB Type, Main: Black, Aux: Gray
Web Camera	Chicony	CKFIH2821005290LH	With two microphones
		CKFIH28-121005290LH	With one microphone
	Luxvisions	7BF109N2DC	With two microphones
		7BF109N2DD	With one microphone
Keyboard	LG	SN3871BL1 (White)	---
		SN3871BL (Black)	---
		Above model have the same circuit and hardware. The model SN3871BL1 (White) is tested in this report.	
Finger Print	SUNTEL	SFPA-L002STA (White)	---
		SFPA-L002STB (Black)	---
		Above model have the same circuit and hardware. The model SFPA-L002STA (White) is tested in this report.	
LAN Gender (Type C to LAN)	SUZHOU MEC ELECTRONICS	80-5946-111 (White)	10/100 Megabit Ethernet
		80-5946-101 (Black)	
		Above model have the same circuit and hardware. The model 80-5946-111 (White) is tested in this report.	
	ARIN TECH CO. LTD	GD-08MF-36-WH-LP05 (White)	10/100 Megabit Ethernet
		GD-08MF-36-BK-LP06 (Black)	
		Above model have the same circuit and hardware. The model GD-08MF-36-WH-LP05 (White) is tested in this report.	
	Type C to LAN: Shielded, Undetached, 0.12m		
AC Adapter (48W)	LG (HONOR)	ADS-48MS-19-2 19048E	BSMI ID: R3C189 I/P: AC 100-240V, 50-60Hz, 1.5A, O/P: DC 19V, Max. 2.53A
	DC Power Cord: Non-Shielded, Undetached, 1.8m AC Power Cord: Non-Shielded, Detached, 1.0m (2C) (For Other Countries) AC Power Cord: Non-Shielded, Detached, 1.55m (2C) (For US, Canada, Mexico)		

Remark: For more detailed features description, please refer to the manufacturer's specifications or the user manual.

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3.5.2. The EUT collocates with following worst components, which are used to establish a basic configuration of system during test:

SKU	
Main Board	LG, 14/15Z990 Main B/D PCB (with Thunderbolt)
SUB Board	LG, 14Z990 WLAN SUB B/D (with Finger Print)
CPU	Intel, i7-8565U
14” LCD Panel	LG Display, LP140WF5-SPG2 (AIT Including touch)
Storage (SSD)	Samsung, 512GB (NVMe)
	Samsung, 128GB (SATA)
Memory (RAM)	8GB (On Board)
	8GB (On Card)
Battery Pack	LG, LBS1224E
WLAN Combo Card	Intel, 8265D2W
WLAN Combo Antenna	LG (INPAQ), WA-F-LBLB-04-058
Web Camera	Chicony, CKFIH2821005290LH (With two microphones)
Keyboard	LG,SN3871BL1(White)
Finger Print	SUNTEL, SFPA-L002STA(White)
LAN Gender (Type C to LAN)	MEC, 80-5946-111 (White)
AC Adapter	HONOR, ADS-48MS-19-2 19048E
Display	HDMI, 1920 x 1080, 60Hz (“H” Pattern)

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3.6. Test Configuration

Mode	Duty Cycle (x)	T (ms)	Duty Cycle Factor (dB)
BT	N/A	2.890	N/A

AC Conduction	
Test Case	Normal operation

Item		Modulation	Data Rate	Test Channel
Radiated Test Case	Radiated Band Edge Note1	GFSK	1Mbps	00/78
		8-DPSK	3Mbps	00/78
	Radiated Spurious Emission Note1	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/78
Conducted Test Case Note2	20dB Bandwidth	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Carrier Frequency Separation	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Time of Occupancy	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Number of Hopping Channels	GFSK	1Mbps	39
		8-DPSK	3Mbps	39
	Maximum Peak Output Power	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78
	Band Edges	GFSK	1Mbps	00/78
		8-DPSK	3Mbps	00/78
	Spurious Emission	GFSK	1Mbps	00/39/78
		8-DPSK	3Mbps	00/39/78

Note 1:■Mobile Device

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

Note 2: We performed testing of the highest and lowest data rate.

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3.7. Tested Supporting System List

3.7.1. Support Peripheral Unit

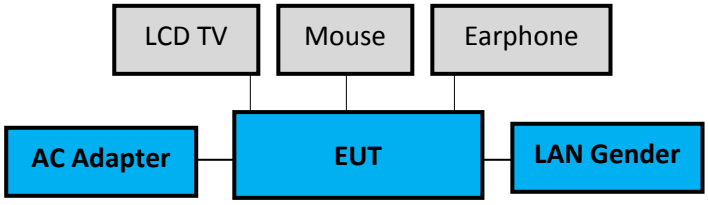
No.	Product	Brand	Model No.	Serial No.	Approval
1.	LCD TV	LG	22LK330-DB	N/A	N/A
2.	USB Mouse	DELL	MS111-L	CN-09RRC7-48723-2B7-0H3M	FCC By DoC
3.	Earphone	SAMPO	EK-Y1251MP	N/A	N/A

3.7.2. Cable Lists

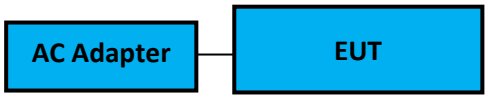
No.	Cable Description Of The Above Support Units
1.	HDMI Cable: Shielded, Detachable, 1.8m AC Power Cord: Unshielded, Detachable, 1.8m
2.	USB Cable: Unshielded, Undetachable, 1.8m
3.	Earphone Cable: Unshielded, Undetachable, 2.0m

3.8. Setup Configuration

3.8.1. EUT Configuration for Power Line & Radiated Emission



3.8.2. EUT Configuration for RF Conducted Test Items



3.9. Operating Condition of EUT

Test program “DRTU” is used for enabling EUT BT function under continues transmitting and choosing data rate/ channel.

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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 17025:2005 (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 (1) No. 8 Shielding Room (2) Semi-Anechoic Chamber (IC Test Site Registration No.:5183B-1)

3.11.Measurement Uncertainty

Test Item	Frequency Range	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	ESR3	101774	2018. 01. 24	1 Year
2.	A.M.N.	R&S	ENV4200	100169	2017. 11. 12	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2017. 12. 14	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2018. 01. 16	1 Year
5.	Signal Cable	Yeida	RG/58AU	CE-08	2018. 09. 21	1 Year
6.	Digital Thermo- Hygro Meter	iMax	HTC-1	No.8 S/R	2018. 04. 20	1 Year

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	2018. 06. 20	1 Year
3.	Amplifier	HP	8447D	2944A06305	2018. 01. 30	1 Year
4.	Amplifier	HP	8449B	3008A00529	2018. 01. 24	1 Year
5.	Loop Antenna	R&S	HFH2-Z2	891847/27	2017. 12. 18	1 Year
6.	Bilog Antenna	CHASE	CBL6112D	33821	2018. 01. 21	1 Year
7.	Horn Antenna	COM-POWER	AH-840	101092	2018 .05. 07	1 Year
8.	Horn Antenna	EMCO	3115	9609-4927	2018. 06. 22	1 Year
9.	2.4GHz Notch Filter	K&L	7NSL10-2441. 5E130.5-00	1	2018. 07. 24	1 Year
10.	High-Pass Filter	Microwave	H3G018G1	484796	2018. 08. 22	1 Year
11.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2018. 04. 20	1 Year
12.	Test Software	Audix	e3	V.6.110601	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	2018. 04. 26	1 Year
2.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2018. 04. 20	1 Year

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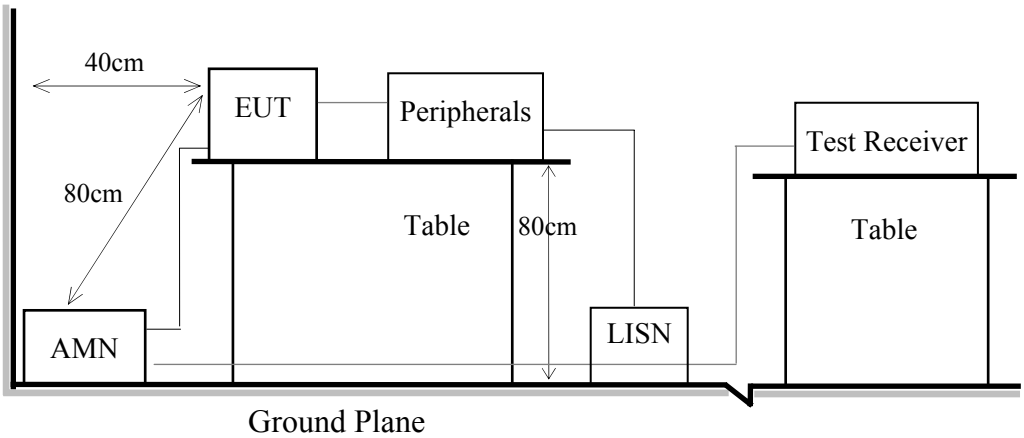
5. CONDUCTED EMISSION

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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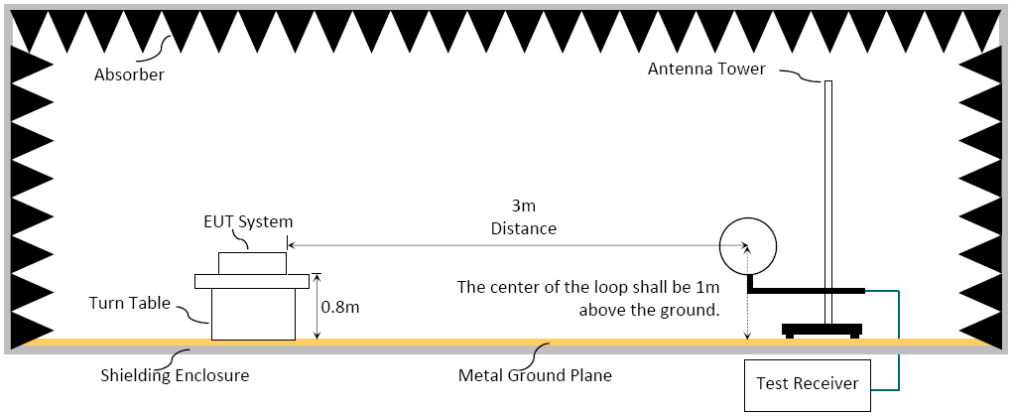
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

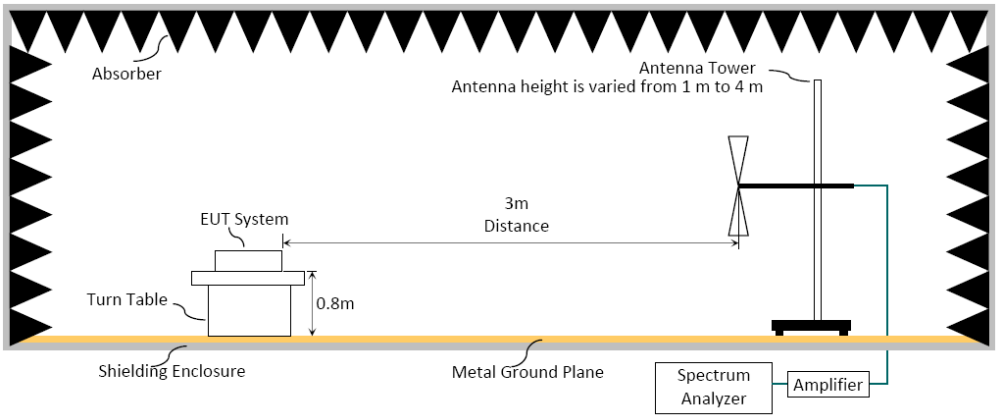
6.1.1. Block Diagram of EUT

Indicated as section 3.8

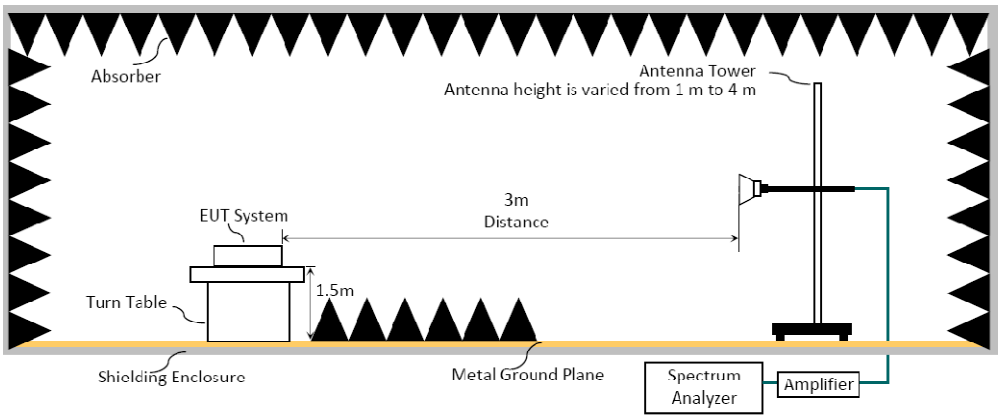
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



6.1.4. Setup Diagram for above 1GHz



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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 turntable 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 C63.10-2013regulation.

(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 30-1000MHz) 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 tofind 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 C63.10-2013regulation.

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.
(7)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.

Frequency above 1GHz to 10th harmonic(up to 25 GHz):
Peak Detector:
(1)RBW = 1MHz
(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.
(7)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 Detector:

■**Option 1:**

(1)RBW = 1MHz
(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}/TX_{on+off}) 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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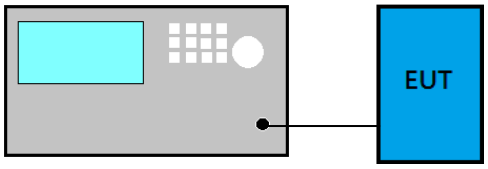
7. 20dB BANDWIDTH

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% to 5% of OBW.
(2) Set VBW≥3RBW.
(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

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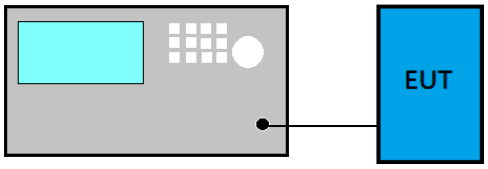
8. CARRIER FREQUENCY SEPARATION

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 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

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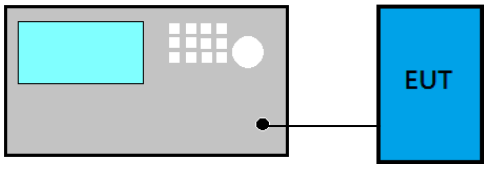
9. TIME OF OCCUPANCY

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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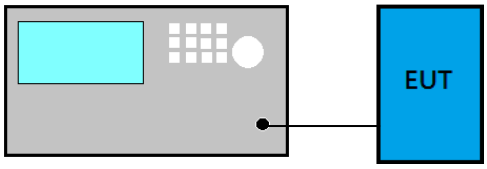
10. NUMBER OF HOPPING CHANNELS

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 = m=Max hold
(7) Allow the trace to stabilize.

10.4. Test Results

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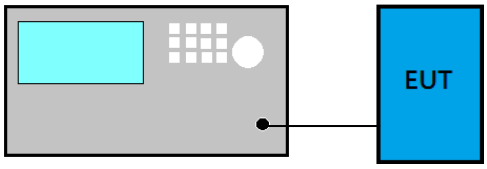
11. MAXIMUM PEAK OUTPUT POWER

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:

(a) Use the following spectrum analyzer settings

(1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
(2) RBW > 20 dB bandwidth of the emission being measured.
(3) VBW ≥ RBW
(4) Sweep: Auto
(5) Detector function: Peak
(6) Trace: Max hold

(b) Allow trace to stabilize.

(c) Use the marker-to-peak function to set the marker to the peak of the emission.

11.4. Test Results

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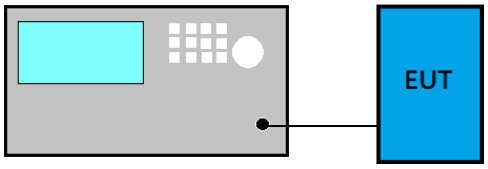
12. EMISSION LIMITATIONS

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 Section 15.209(a)/RSS-Gen Section 8.9table 4is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a)/RSS-Gen Section 8.10 table 6,, must also comply with the radiated emission limits specified in Section 15.209(a)/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 10th 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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APPDNDIX A

TEST DATA AND PLOTS

(Model: 14Z990)

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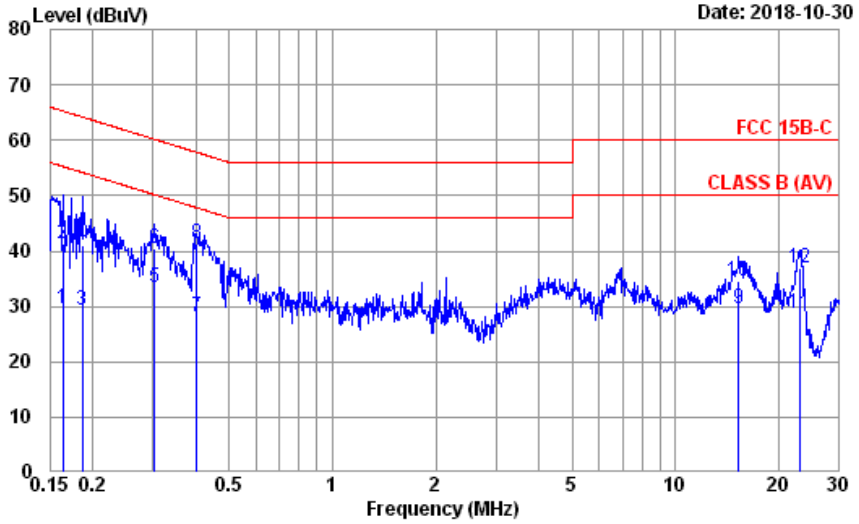
A.1 CONDUCTED EMISSION

Test Date	2018/10/30	Temp./Hum.	24℃/49%
Test Voltage	AC 120V 60Hz (Via AC Adapter)		



Site no. : No.8 Shielded Room Data no. : 4
Condition : ENV4200 100169 LISN Phase : NEUTRAL
Limit : FCC 15B-C
Env. / Ins. : 24*C / 49% ESR3(1774) Engineer : Nick Du
EUT : 14Z990
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.163	10.56	0.03	9.98	8.99	29.56	55.30	25.74	Average
2	0.163	10.56	0.03	9.98	20.75	41.32	65.30	23.98	QP
3	0.186	10.53	0.03	9.98	8.77	29.31	54.20	24.89	Average
4	0.186	10.53	0.03	9.98	20.54	41.08	64.20	23.12	QP
5	0.303	10.47	0.04	9.98	12.97	33.46	50.15	16.69	Average
6	0.303	10.47	0.04	9.98	20.02	40.51	60.15	19.64	QP
7	0.402	10.43	0.04	9.98	7.60	28.05	47.81	19.76	Average
8	0.402	10.43	0.04	9.98	20.77	41.22	57.81	16.59	QP
9	15.307	12.65	0.23	10.05	6.60	29.53	50.00	20.47	Average
10	15.307	12.65	0.23	10.05	11.62	34.55	60.00	25.45	QP
11	23.018	14.47	0.29	10.08	3.85	28.69	50.00	21.31	Average
12	23.018	14.47	0.29	10.08	12.15	36.99	60.00	23.01	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

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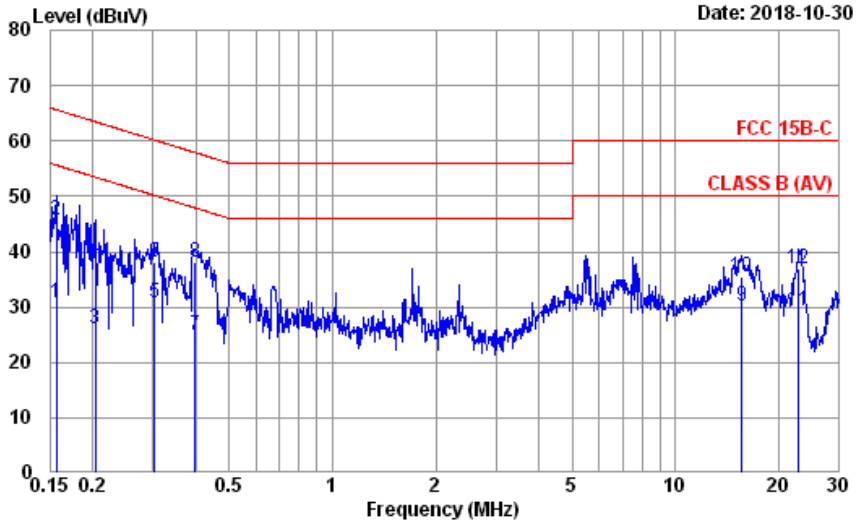
Test Date	2018/10/30	Temp./Hum.	24℃/49%
Test Voltage	AC 120V 60Hz (Via AC Adapter)		



Site no. : No.8 Shielded Room Data no. : 3
Condition : ENV4200 100169 LISN Phase : LINE
Limit : FCC 15B-C
Env. / Ins. : 24°C / 49% ESR3(1774) Engineer : Nick Du
EUT : 14Z990
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.156	10.62	0.03	9.98	10.20	30.83	55.65	24.82	Average
2	0.156	10.62	0.03	9.98	25.14	45.77	65.65	19.88	QP
3	0.204	10.56	0.03	9.98	5.64	26.21	53.45	27.24	Average
4	0.204	10.56	0.03	9.98	18.00	38.57	63.45	24.88	QP
5	0.303	10.49	0.04	9.98	10.32	30.83	50.15	19.32	Average
6	0.303	10.49	0.04	9.98	17.67	38.18	60.15	21.97	QP
7	0.398	10.45	0.04	9.98	4.34	24.81	47.90	23.09	Average
8	0.398	10.45	0.04	9.98	17.64	38.11	57.90	19.79	QP
9	15.635	12.75	0.24	10.05	7.07	30.11	50.00	19.89	Average
10	15.635	12.75	0.24	10.05	12.36	35.40	60.00	24.60	QP
11	22.896	14.50	0.29	10.08	4.46	29.33	50.00	20.67	Average
12	22.896	14.50	0.29	10.08	11.93	36.80	60.00	23.20	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

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A.2 RADIATED EMISSION

Test Date	2018/10/30	Temp./Hum.	24℃/51%
Test Voltage	AC 120V, 60Hz (via AC Adapter)		

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	GFSK	Frequency	TX 2480MHz

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
30.9700	24.27	1.22	3.73	29.22	40.00	10.78	Peak
101.7800	17.60	2.29	9.03	28.92	43.50	14.58	Peak
210.4200	16.55	3.45	7.78	27.78	43.50	15.72	Peak
400.5400	22.07	5.56	2.42	30.05	46.00	15.95	Peak
532.4600	23.66	6.53	3.17	33.36	46.00	12.64	Peak
698.3300	24.87	7.08	2.73	34.68	46.00	11.32	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
30.9700	24.27	1.22	12.61	38.10	40.00	1.90	Peak
94.0200	16.36	2.20	12.19	30.75	43.50	12.75	Peak
145.4300	17.40	2.78	7.81	27.99	43.50	15.51	Peak
322.9400	20.15	4.63	8.10	32.88	46.00	13.12	Peak
578.0500	24.35	6.69	2.66	33.70	46.00	12.30	Peak
953.4400	27.35	8.52	2.89	38.76	46.00	7.24	Peak

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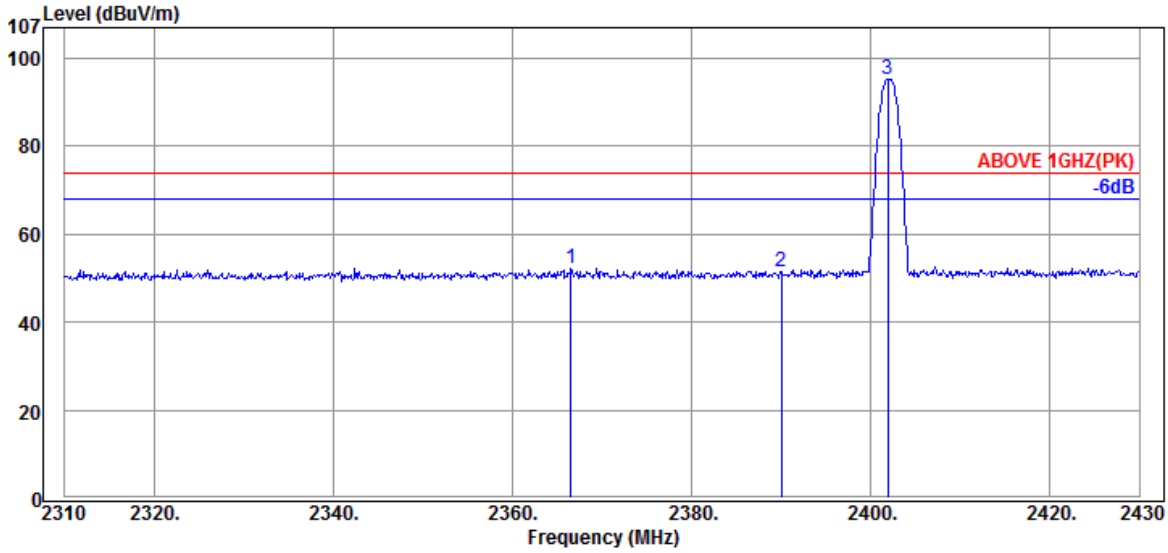
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

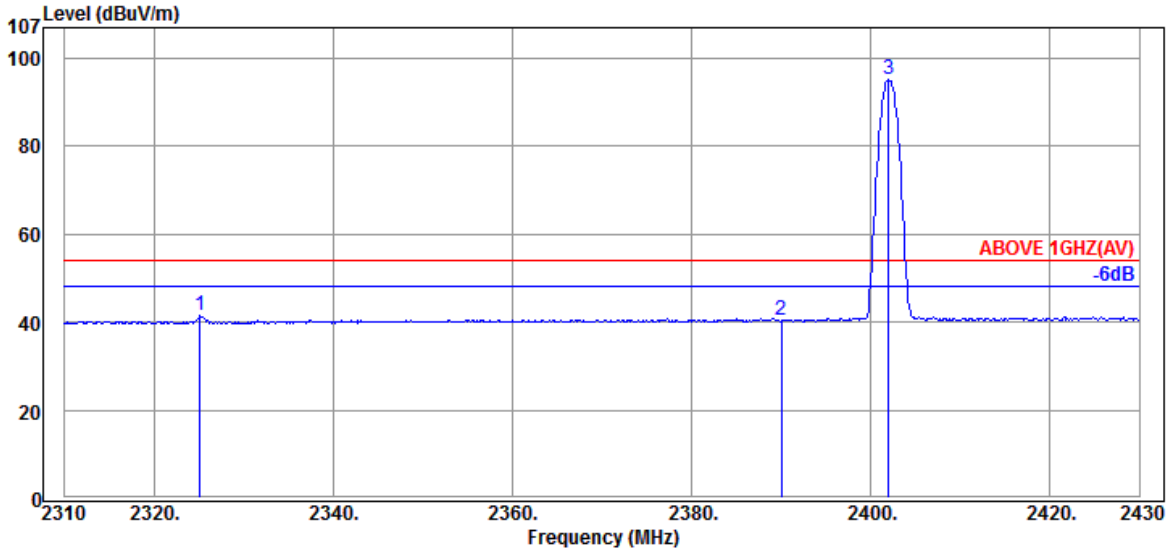
Band Edge:

Mode	GFSK	Frequency	TX 2402MHz



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
2366.52	28.25	5.22	18.71	52.18	74.00	21.82	Peak
2390.04	28.28	5.24	17.94	51.46	74.00	22.54	Peak
2401.92	28.29	5.25	61.77	95.31	---	---	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
2325.12	28.21	5.19	8.17	41.57	54.00	12.43	Average
2390.04	28.28	5.24	6.81	40.33	54.00	13.67	Average
2402.04	28.29	5.25	61.56	95.10	---	---	Average

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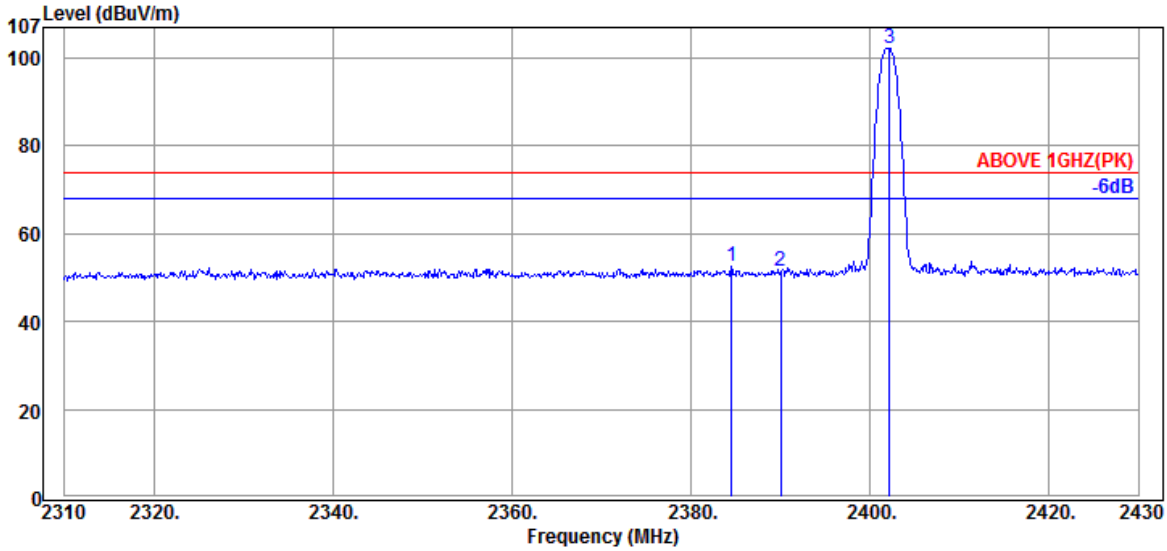
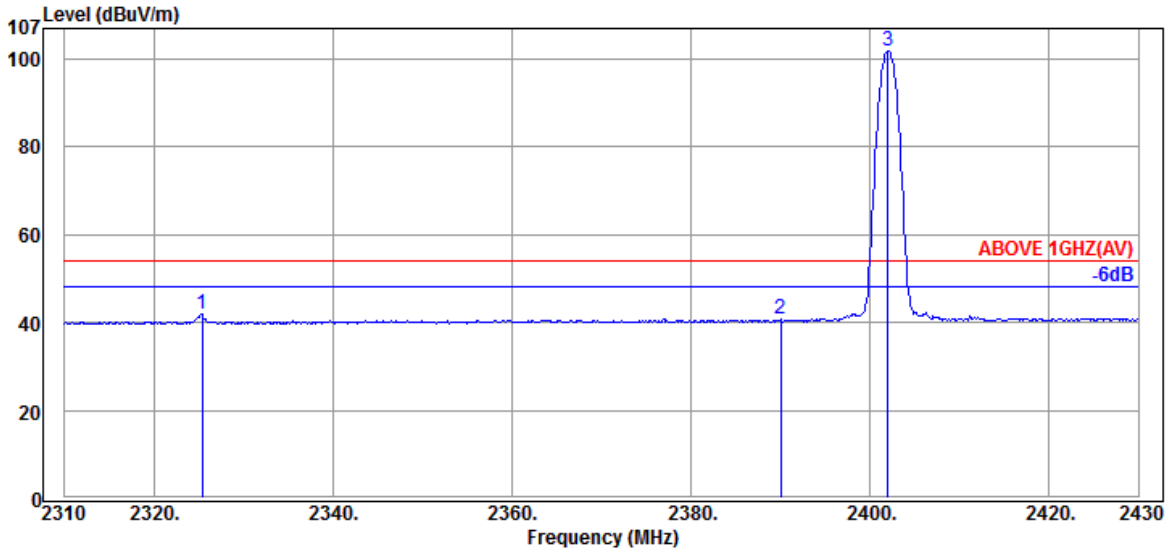
Mode	GFSK	Frequency	TX 2402MHz



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
2384.52	28.28	5.23	18.95	52.46	74.00	21.54	Peak
2390.04	28.28	5.24	18.11	51.63	74.00	22.37	Peak
2402.16	28.29	5.25	68.55	102.09	---	---	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
2325.36	28.21	5.19	8.47	41.87	54.00	12.13	Average
2390.04	28.28	5.24	7.17	40.69	54.00	13.31	Average
2402.04	28.29	5.25	68.37	101.91	---	---	Average

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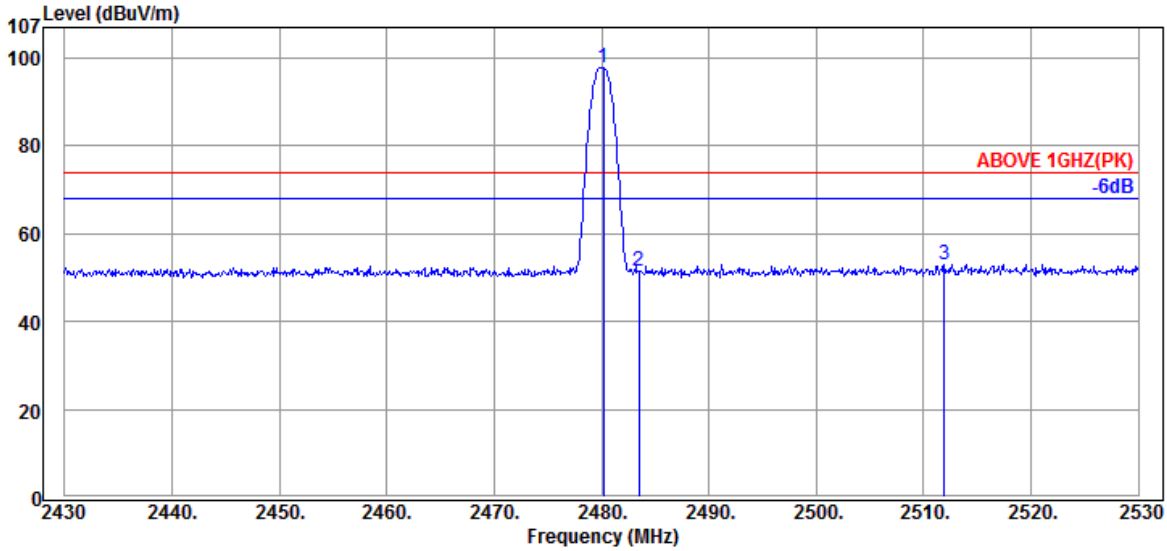
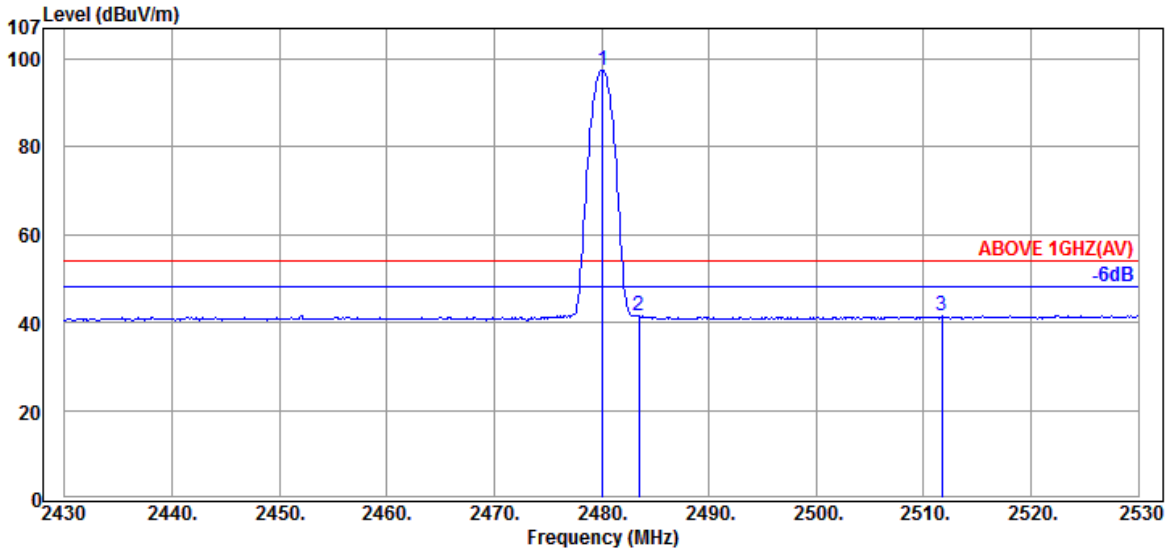
Mode	GFSK	Frequency	TX 2480MHz



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
2480.20	28.38	5.30	64.12	97.80	---	---	Peak
2483.50	28.38	5.31	17.67	51.36	74.00	22.64	Peak
2511.90	28.45	5.33	19.25	53.03	74.00	20.97	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
2480.10	28.38	5.30	63.93	97.61	---	---	Average
2483.50	28.38	5.31	7.81	41.50	54.00	12.50	Average
2511.70	28.45	5.33	7.77	41.55	54.00	12.45	Average

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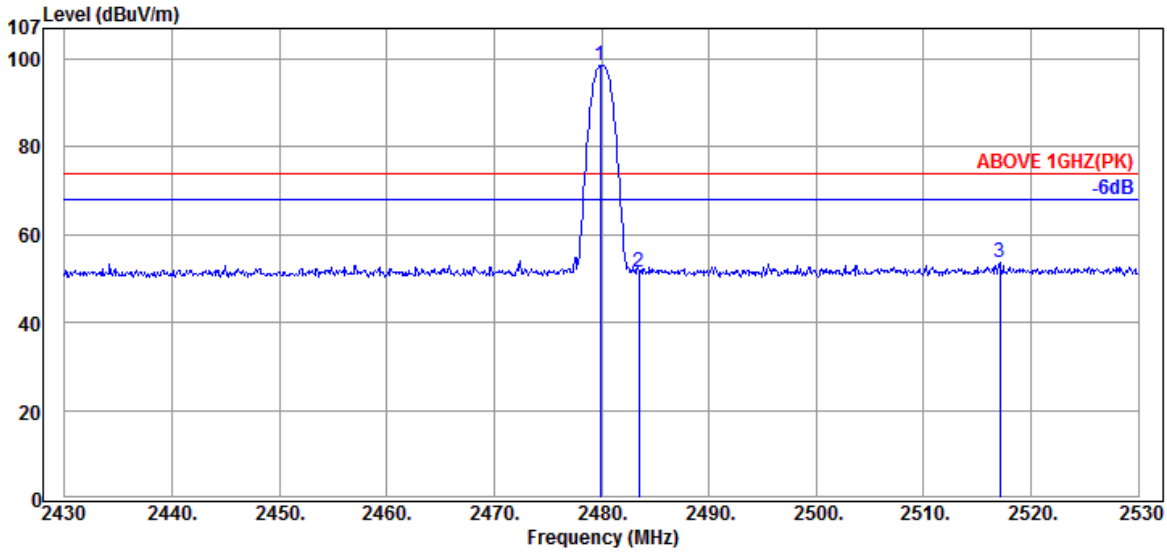
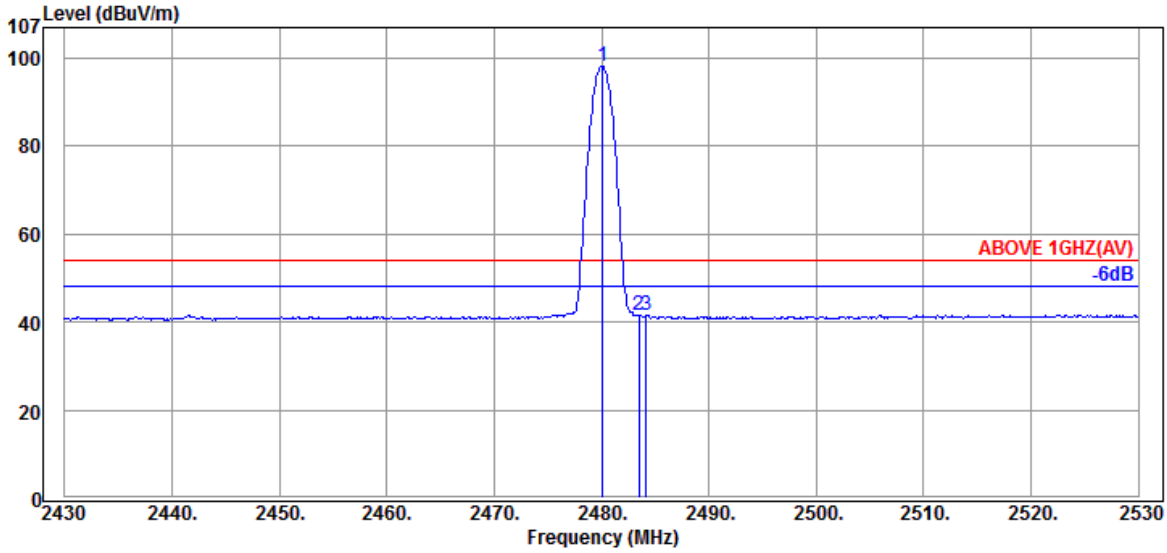
Mode	GFSK	Frequency	TX 2480MHz



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
2479.90	28.38	5.30	64.78	98.46	---	---	Peak
2483.50	28.38	5.31	17.67	51.36	74.00	22.64	Peak
2517.10	28.45	5.33	19.72	53.50	74.00	20.50	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
2480.10	28.38	5.30	64.59	98.27	---	---	Average
2483.50	28.38	5.31	7.91	41.60	54.00	12.40	Average
2484.20	28.38	5.31	7.89	41.58	54.00	12.42	Average

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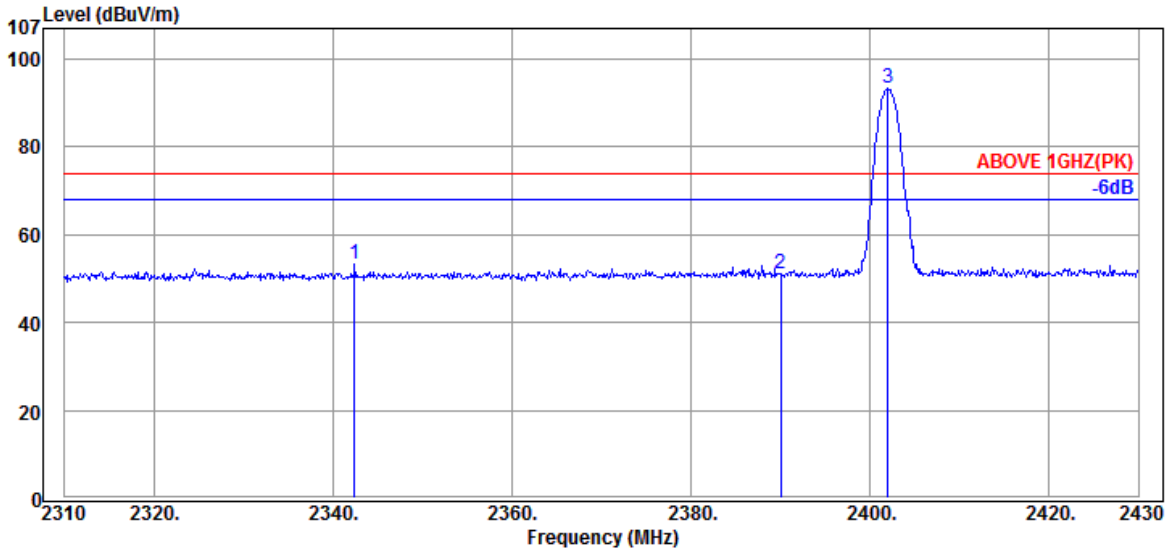
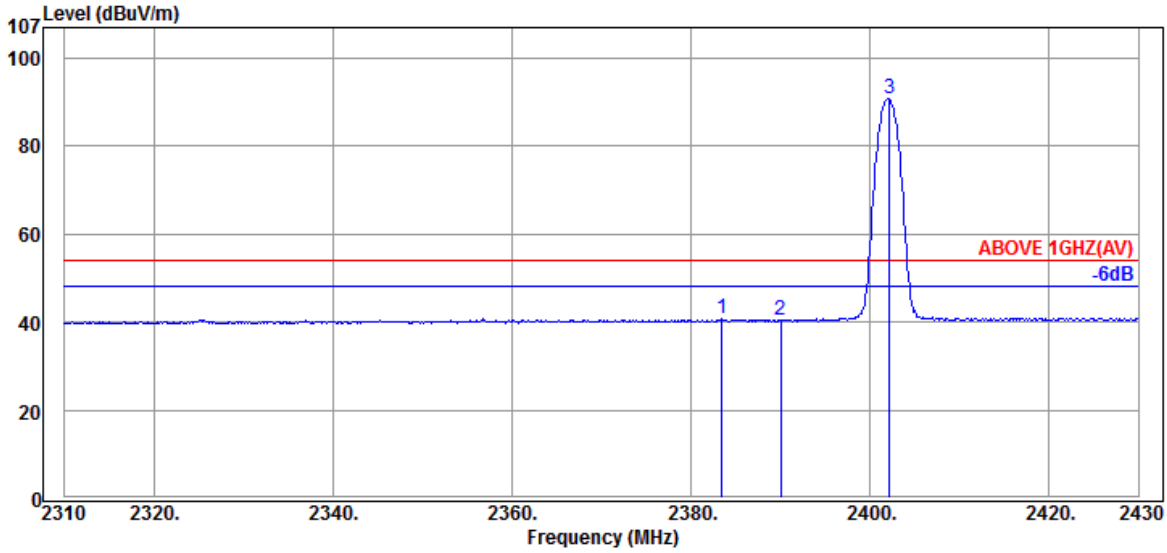
Mode	8-DPSK	Frequency	TX 2402MHz



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
2342.40	28.22	5.20	19.84	53.26	74.00	20.74	Peak
2390.04	28.28	5.24	17.54	51.06	74.00	22.94	Peak
2402.04	28.29	5.25	59.68	93.22	---	---	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
2383.44	28.27	5.23	7.24	40.74	54.00	13.26	Average
2390.04	28.28	5.24	6.79	40.31	54.00	13.69	Average
2402.16	28.29	5.25	57.30	90.84	---	---	Average

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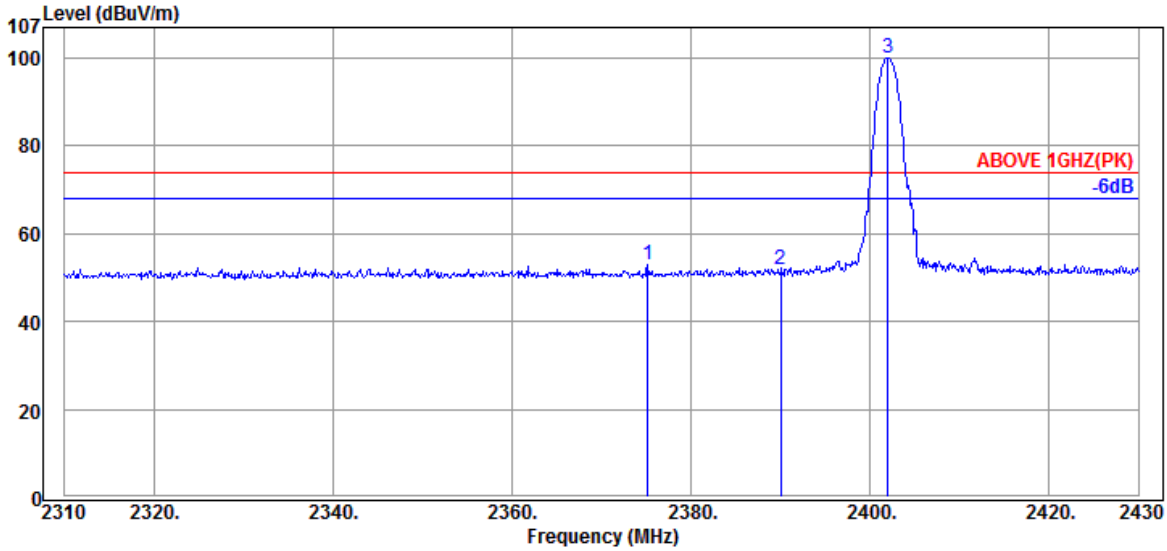
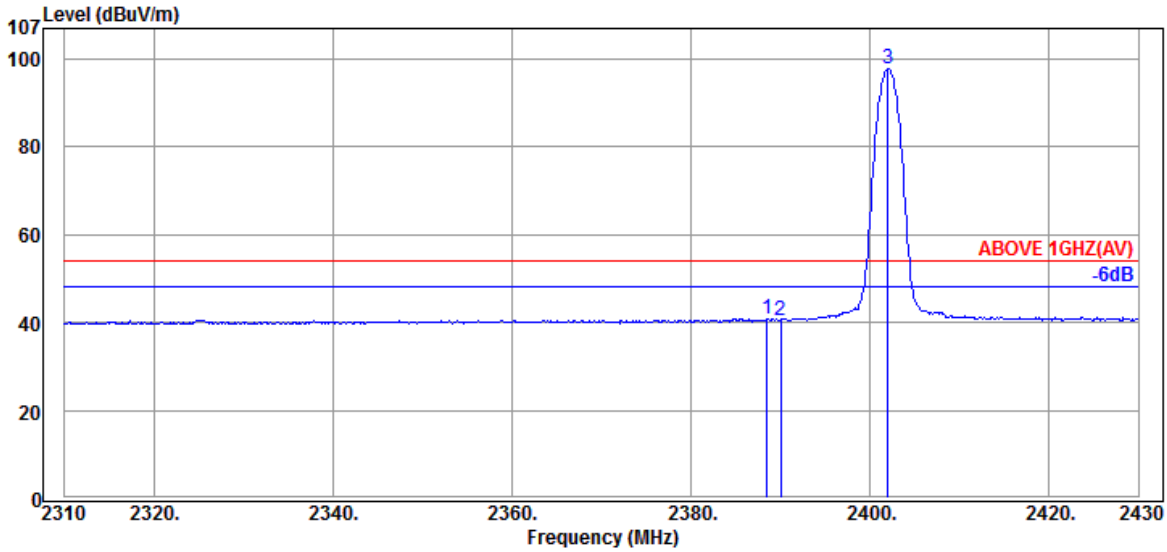
Mode	8-DPSK	Frequency	TX 2402MHz



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
2375.16	28.26	5.23	19.54	53.03	74.00	20.97	Peak
2390.04	28.28	5.24	18.33	51.85	74.00	22.15	Peak
2402.04	28.29	5.25	66.58	100.12	---	---	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
2388.48	28.28	5.24	7.42	40.94	54.00	13.06	Average
2390.04	28.28	5.24	6.84	40.36	54.00	13.64	Average
2402.04	28.29	5.25	64.19	97.73	---	---	Average

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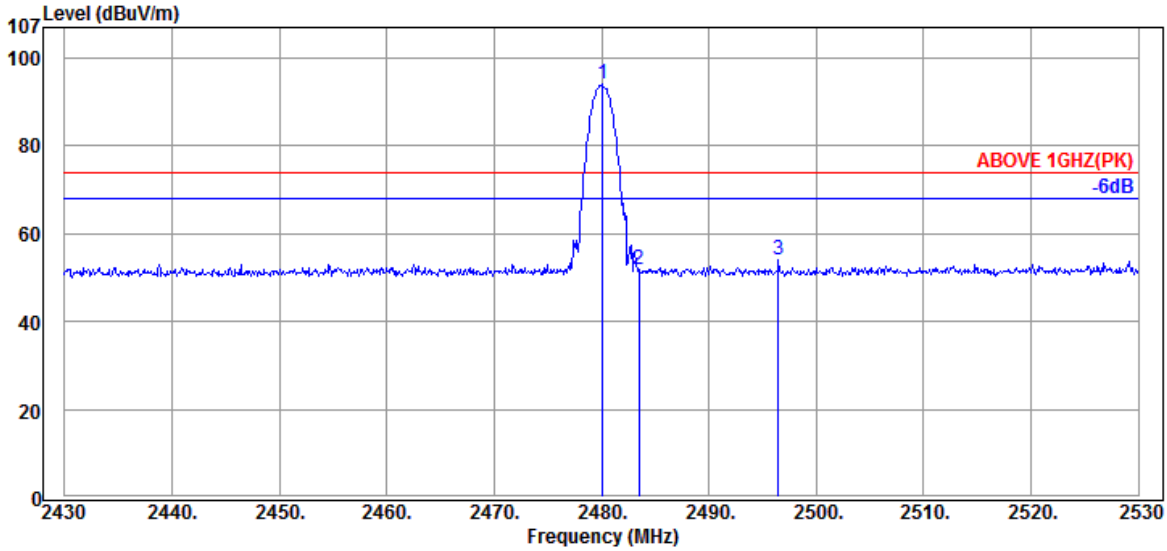
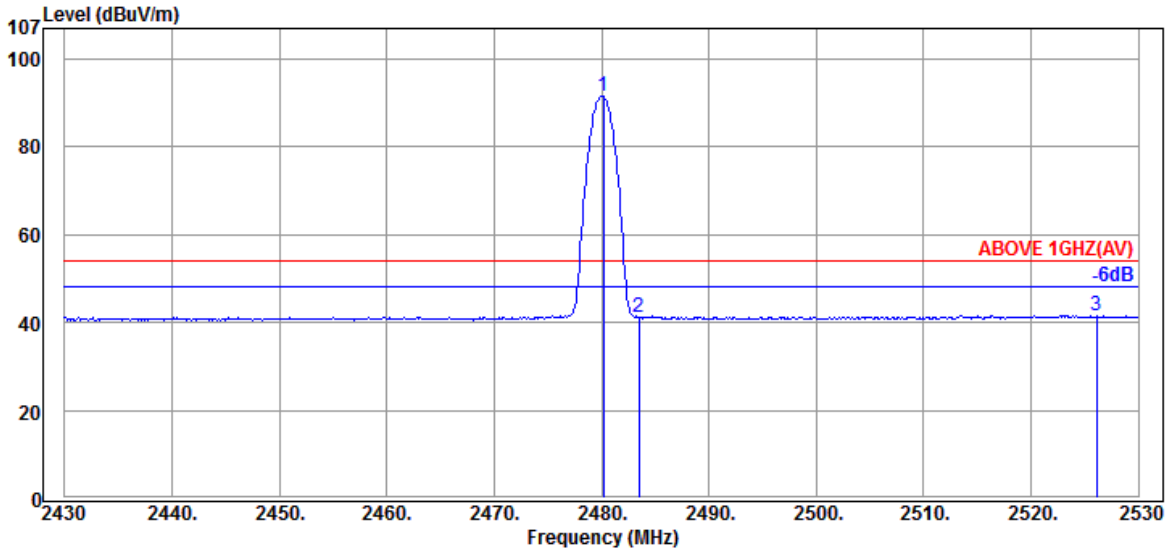
Mode	8-DPSK	Frequency	TX 2480MHz



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
2480.10	28.38	5.30	60.33	94.01	---	---	Peak
2483.50	28.38	5.31	18.31	52.00	74.00	22.00	Peak
2496.50	28.40	5.31	20.22	53.93	74.00	20.07	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
2480.20	28.38	5.30	57.90	91.58	---	---	Average
2483.50	28.38	5.31	7.53	41.22	54.00	12.78	Average
2526.10	28.51	5.34	7.72	41.57	54.00	12.43	Average

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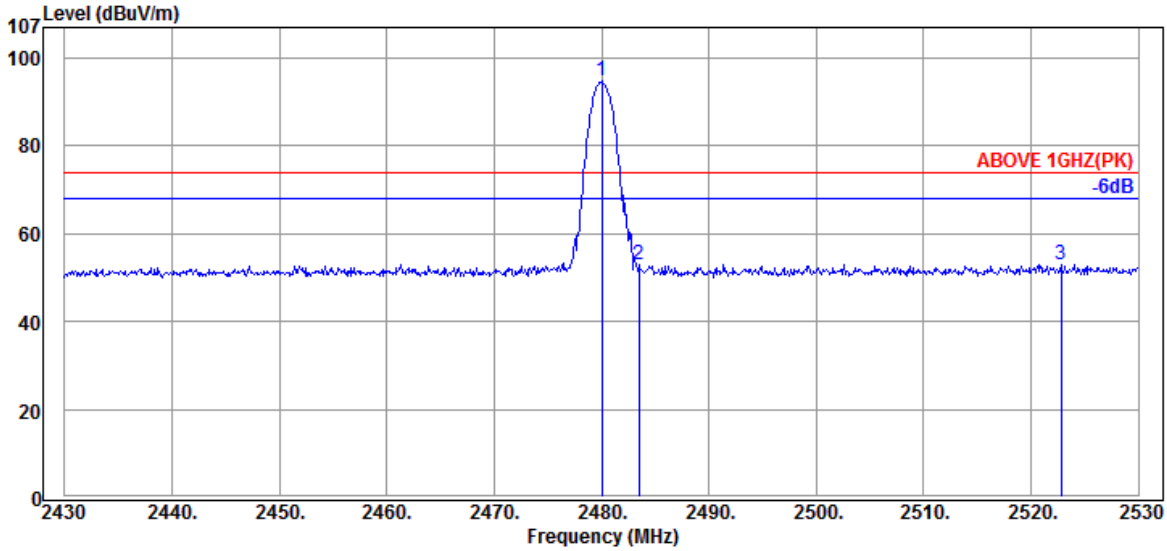
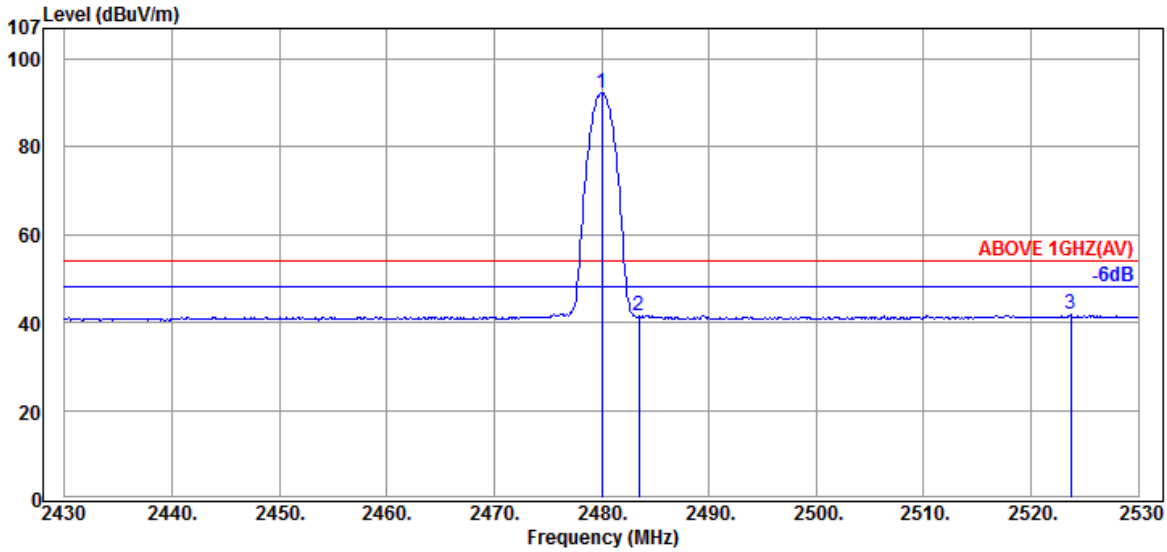
Mode	8-DPSK	Frequency	TX 2480MHz



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
2480.00	28.38	5.30	61.02	94.70	---	---	Peak
2483.50	28.38	5.31	19.16	52.85	74.00	21.15	Peak
2522.80	28.48	5.34	19.10	52.92	74.00	21.08	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
2480.00	28.38	5.30	58.70	92.38	---	---	Average
2483.50	28.38	5.31	7.89	41.58	54.00	12.42	Average
2523.70	28.48	5.34	7.99	41.81	54.00	12.19	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	GFSK			Frequency	TX 2402MHz		
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
4804.00	32.82	8.98	5.41	47.21	54.00	6.79	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
4804.00	32.82	8.98	5.14	46.94	54.00	7.06	Peak

Mode	GFSK			Frequency	TX 2441MHz		
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
4882.00	32.98	9.08	4.97	47.03	54.00	6.97	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
4882.00	32.98	9.08	4.90	46.96	54.00	7.04	Peak

Mode	GFSK			Frequency	TX 2480MHz		
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
4960.00	33.12	9.20	4.96	47.28	54.00	6.72	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
4960.00	33.12	9.20	4.87	47.19	54.00	6.81	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.3 20dB BANDWIDTH

Test Date	2018/10/22 ~ 23	Temp./Hum.	23~24℃/52~55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

A.3.1 6dB Bandwidth Result

Mode	Centre Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz) (Reference only)	2/3 (20dB Bandwidth)
GFSK	2402	0.9185	0.87174	0.612
	2441	0.8828	0.86941	0.589
	2480	0.8827	0.86877	0.588
8-DPSK	2402	1.388	1.3537	0.925
	2441	1.388	1.3547	0.925
	2480	1.386	1.3539	0.924

Remark: The maximum two-thirds of the 20dB bandwidth is the limit for carrier frequency separation presented.

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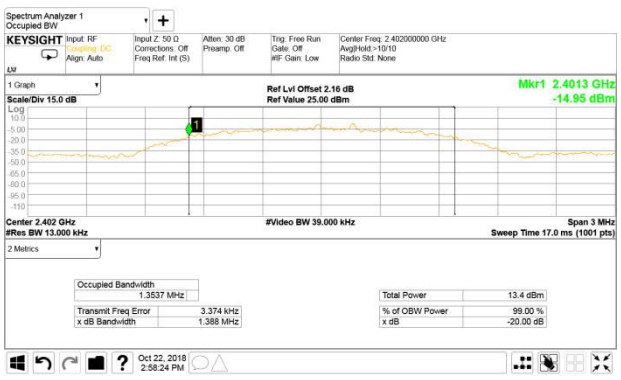
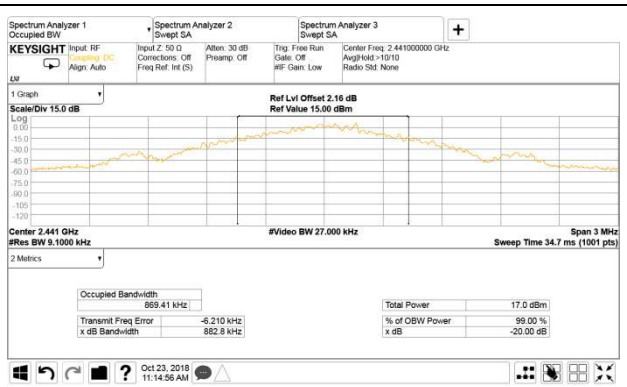
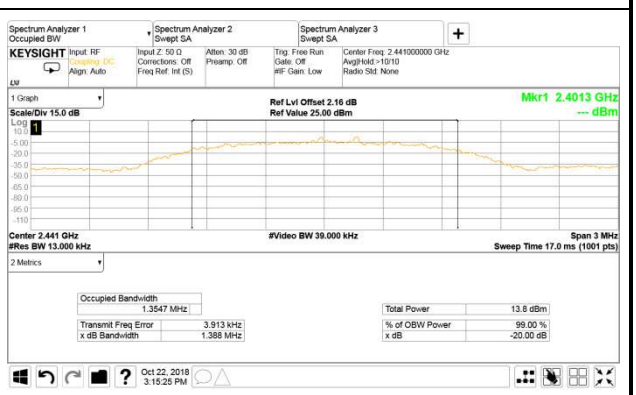
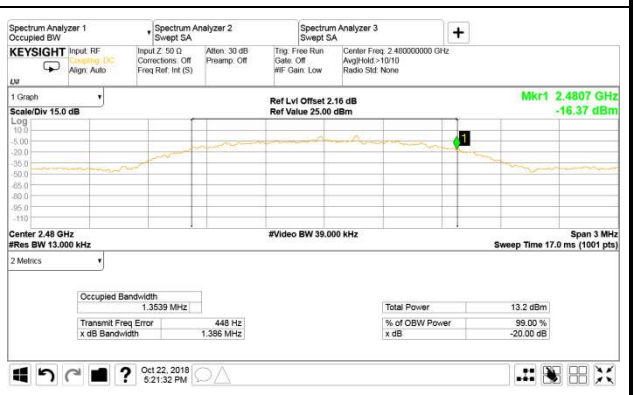
A.3.2 Measurement Plots

Mode: GFSK	Mode: 8-DPSK
	
	
	

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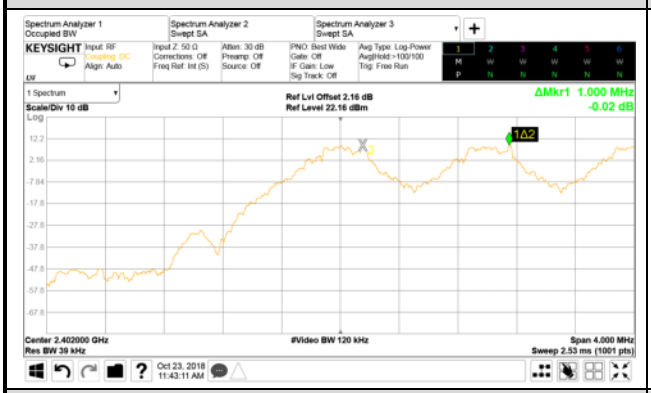
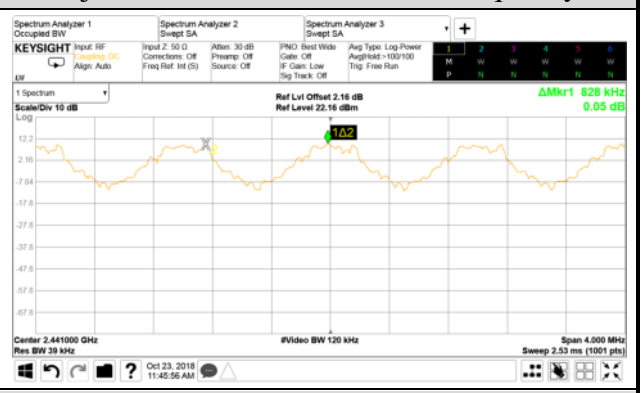
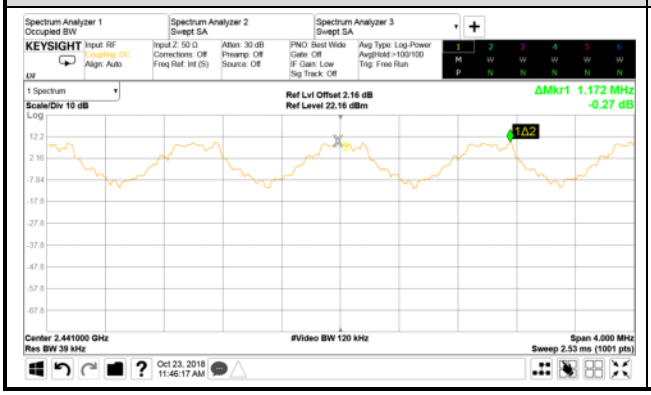
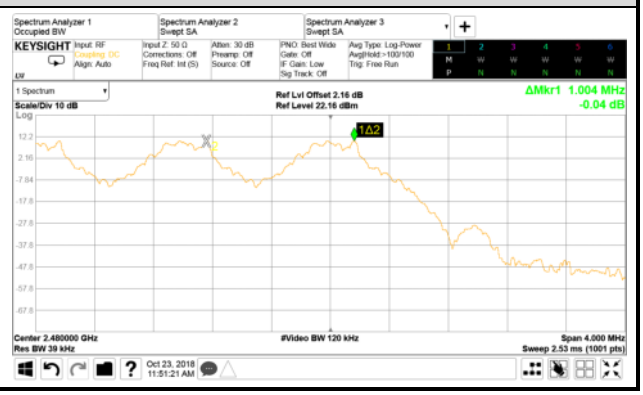
A.4 CARRIER FREQUENCY SEPARATION

Test Date	2018/10/22 ~ 23	Temp./Hum.	23~24℃/52~55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

Mode: GFSK	
2402MHz	2441MHz adjacent channel of left carrier frequency
	
2441MHz adjacent channel of right carrier frequency	2480MHz
	

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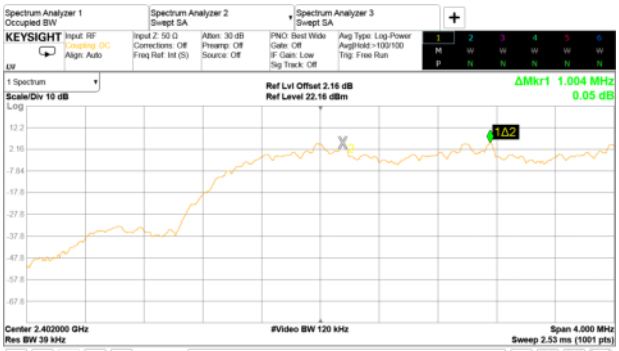
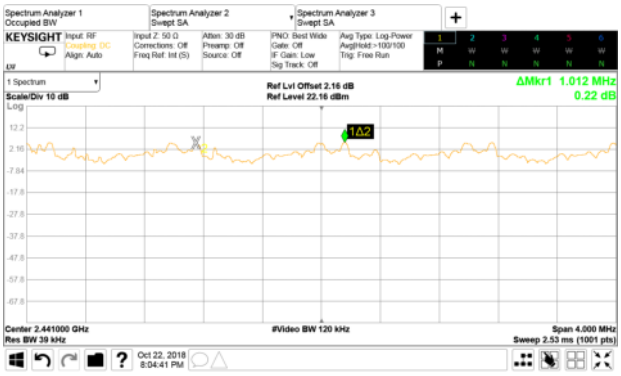
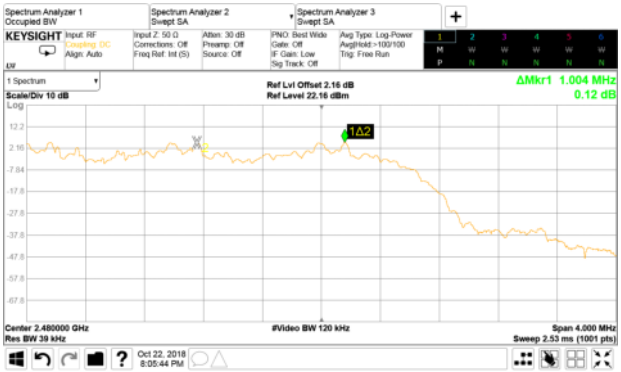
Mode: 8-DPSK	
2402MHz	2441MHz adjacent channel of left carrier frequency
	
2441MHz adjacent channel of right carrier frequency	2480MHz
	

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A.5 TIME OF OCCUPANCY

Test Date	2018/10/22 ~ 23	Temp./Hum.	23~24℃/52~55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

A.5.1 Time of Occupancy

Mode	Centre Frequency (MHz)	Mode	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
GFSK	2402	DH1	10	0.385	121.660	<400
		DH3	4	1.635	206.664	<400
		DH5	3	2.885	273.498	<400

Observation Period:

79 channels* **0.4** seconds= **31.6** seconds

DH1 Mode

For each second of **10** transmission appearance,the longest time of occupancy is
10 transmission* **31.6** seconds* **0.385** ms= **121.660** ms (<400ms)

DH3 Mode

For each second of **4** transmission appearance,the longest time of occupancy is
4 transmission* **31.6** seconds* **1.635** ms= **206.664** ms (<400ms)

DH5 Mode

For each second of **3** transmission appearance,the longest time of occupancy is
3 transmission* **31.6** seconds* **2.885** ms= **273.498** ms (<400ms)

Mode	Centre Frequency (MHz)	Mode	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
GFSK	2440	DH1	10	0.380	120.080	<400
		DH3	4	1.640	207.296	<400
		DH5	3	2.885	273.498	<400

Observation Period:

79 channels* **0.4** seconds= **31.6** seconds

DH1 Mode

For each second of **10** transmission appearance,the longest time of occupancy is
10 transmission* **31.6** seconds* **0.380** ms= **120.080** ms (<400ms)

DH3 Mode

For each second of **4** transmission appearance,the longest time of occupancy is
4 transmission* **31.6** seconds* **1.640** ms= **207.296** ms (<400ms)

DH5 Mode

For each second of **3** transmission appearance,the longest time of occupancy is
3 transmission* **31.6** seconds* **2.885** ms= **273.498** ms (<400ms)

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Mode	Centre Frequency (MHz)	Mode	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
GFSK	2480	DH1	10	0.380	120.080	<400
		DH3	5	1.635	258.330	<400
		DH5	2	2.885	182.332	<400

Observation Period:

79 channels* **0.4** seconds= **31.6** seconds

DH1 Mode

For each second of **10** transmission appearance,the longest time of occupancy is
10 transmission* **31.6** seconds* **0.380** ms= **120.080** ms (<400ms)

DH3 Mode

For each second of **5** transmission appearance,the longest time of occupancy is
5 transmission* **31.6** seconds* **1.635** ms= **258.330** ms (<400ms)

DH5 Mode

For each second of **2** transmission appearance,the longest time of occupancy is
2 transmission* **31.6** seconds* **2.885** ms= **182.332** ms (<400ms)

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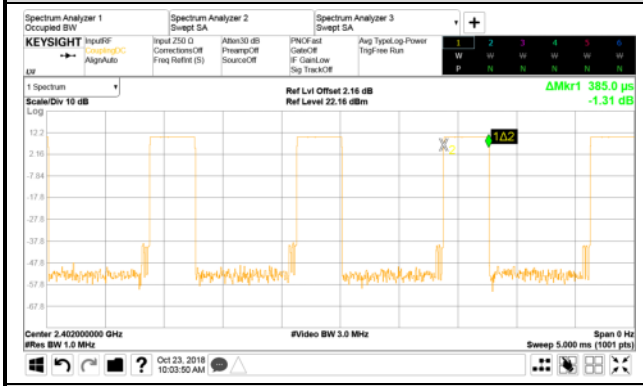
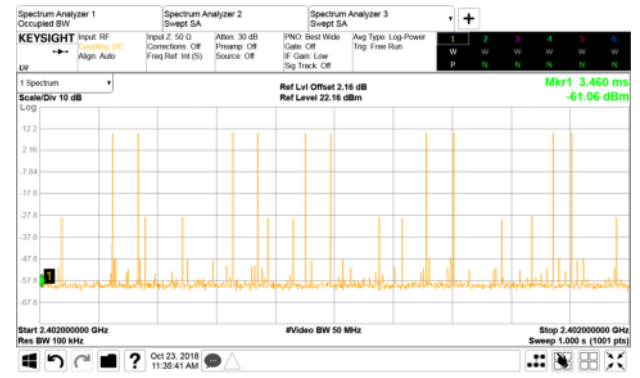
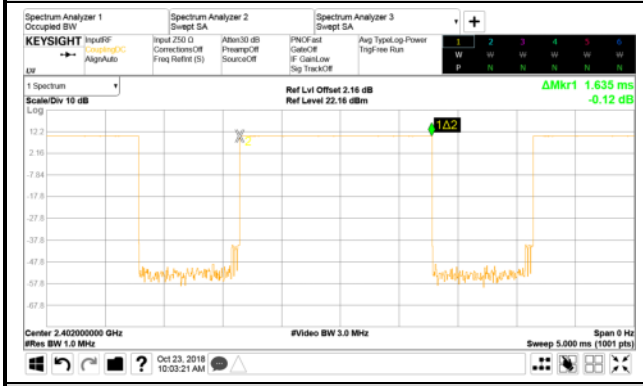
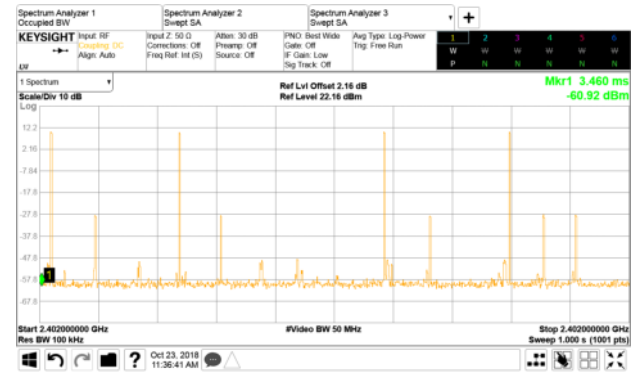
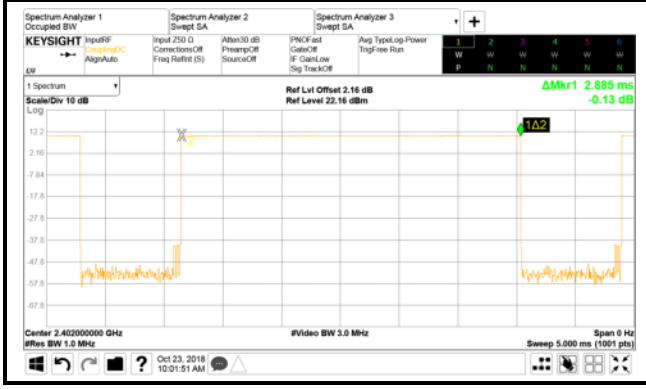
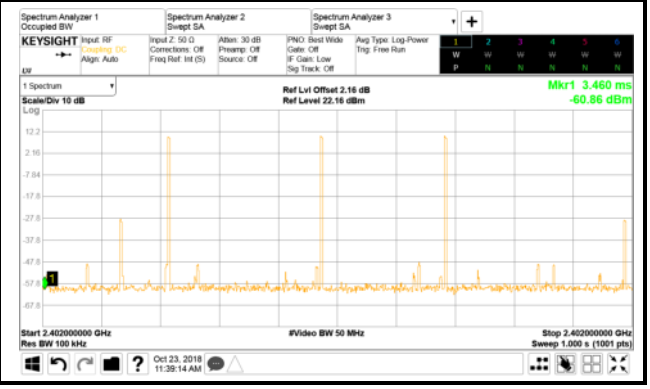
- Measurement Plots

Mode: GFSK	
Centre Frequency: 2402MHz	
DH1	
	
DH3	
	
DH5	
	

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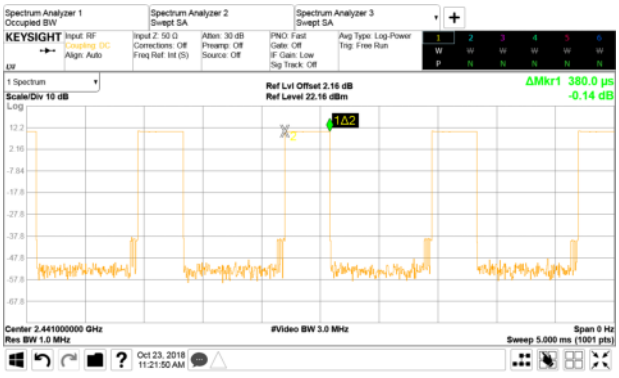
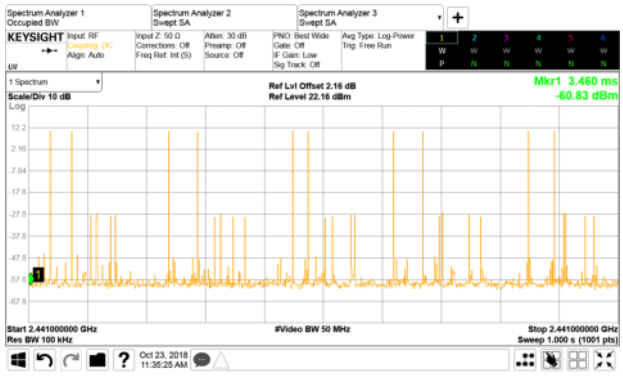
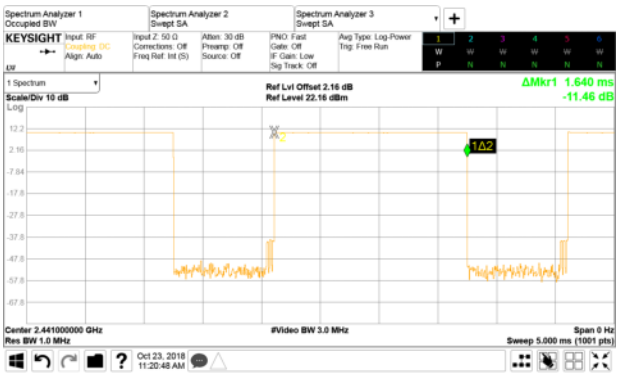
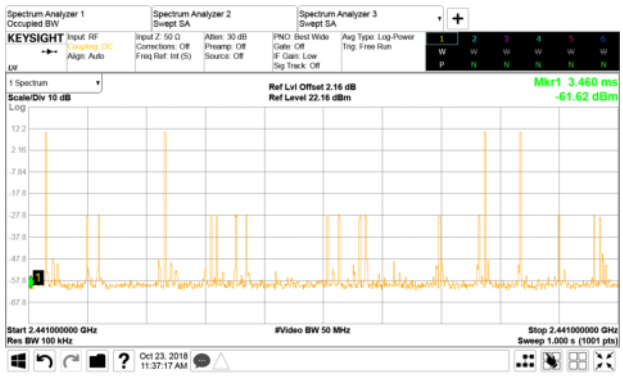
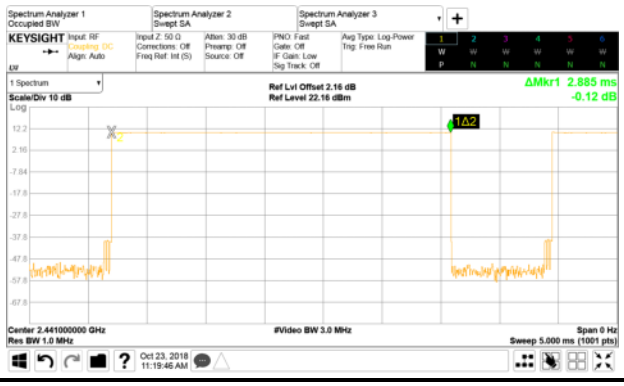
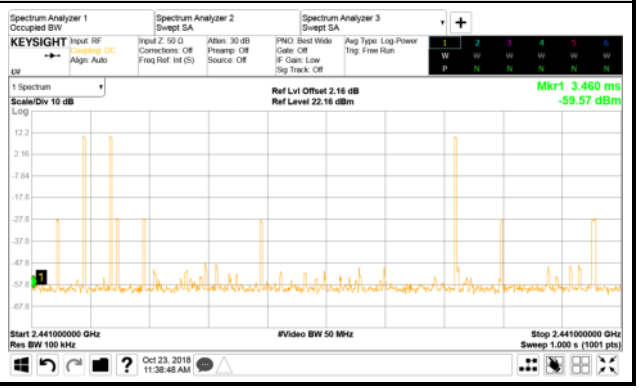
Mode: GFSK	
Centre Frequency: 2441MHz	
DH1	
	
DH3	
	
DH5	
	

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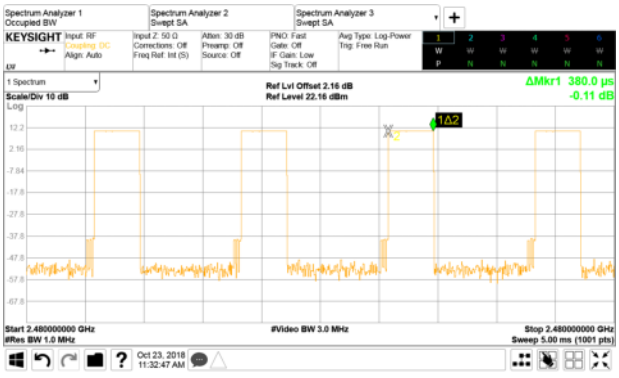
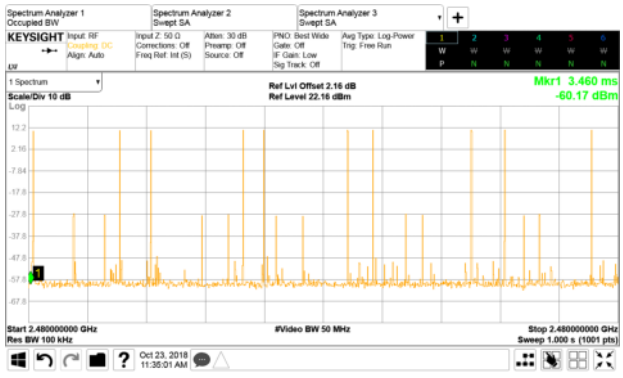
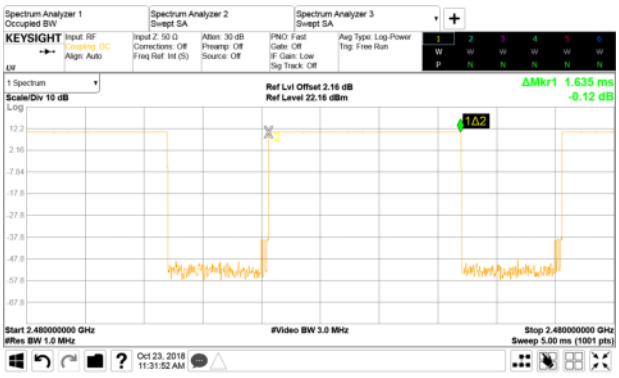
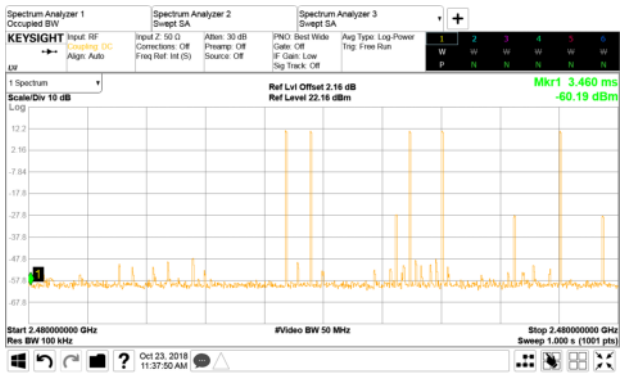
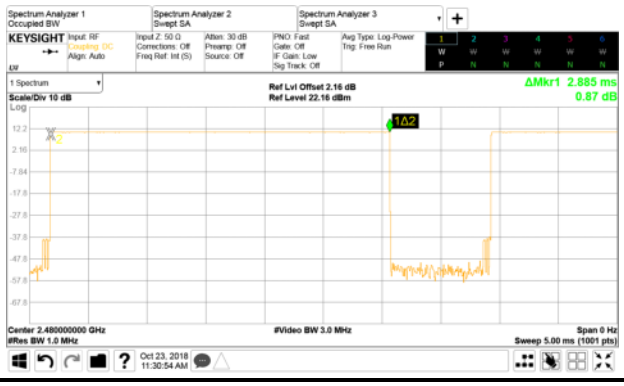
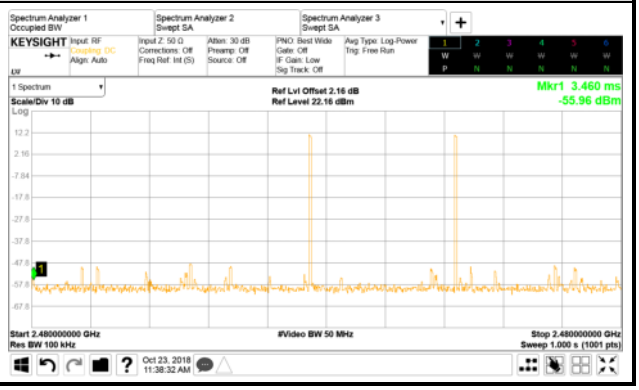
Mode: GFSK	
Centre Frequency: 2480MHz	
DH1	
	
DH3	
	
DH5	
	

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Mode	Centre Frequency (MHz)	Mode	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
8-DPSK	2402	3DH1	10	0.390	123.240	<400
		3DH3	6	1.640	310.944	<400
		3DH5	3	2.890	273.972	<400

Observation Period:

79 channels* **0.4** seconds= **31.6** seconds

3DH1 Mode

For each second of **10** transmission appearance,the longest time of occupancy is

10 transmission* **31.6** seconds* **0.390** ms= **123.240** ms (<400ms)

3DH3 Mode

For each second of **6** transmission appearance,the longest time of occupancy is

6 transmission* **31.6** seconds* **1.640** ms= **310.944** ms (<400ms)

3DH5 Mode

For each second of **3** transmission appearance,the longest time of occupancy is

3 transmission* **31.6** seconds* **2.890** ms= **273.972** ms (<400ms)

Mode	Centre Frequency (MHz)	Mode	Each second appearance transmission	Time of Occupancy (ms)	Maximum accumulated Time of Occupancy (ms)	Limit (ms)
8-DPSK	2441	3DH1	10	0.390	123.240	<400
		3DH3	5	1.640	259.120	<400
		3DH5	3	2.890	273.972	<400

Observation Period:

79 channels* **0.4** seconds= **31.6** seconds

3DH1 Mode

For each second of **10** transmission appearance,the longest time of occupancy is

10 transmission* **31.6** seconds* **0.390** ms= **123.240** ms (<400ms)

3DH3 Mode

For each second of **5** transmission appearance,the longest time of occupancy is

5 transmission* **31.6** seconds* **1.640** ms= **259.120** ms (<400ms)

3DH5 Mode

For each second of **3** transmission appearance,the longest time of occupancy is

3 transmission* **31.6** seconds* **2.890** ms= **273.972** ms (<400ms)

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8-DPSK	2480	3DH1	10	0.390	123.240	<400
		3DH3	5	1.640	259.120	<400
		3DH5	3	2.890	273.972	<400

Observation Period:

79 channels* **0.4** seconds= **31.6** seconds

3DH1 Mode

For each second of **10** transmission appearance,the longest time of occupancy is
10 transmission* **31.6** seconds* **0.390** ms= **123.240** ms (<400ms)

3DH3 Mode

For each second of **5** transmission appearance,the longest time of occupancy is
5 transmission* **31.6** seconds* **1.640** ms= **259.120** ms (<400ms)

3DH5 Mode

For each second of **3** transmission appearance,the longest time of occupancy is
3 transmission* **31.6** seconds* **2.890** ms= **273.972** ms (<400ms)

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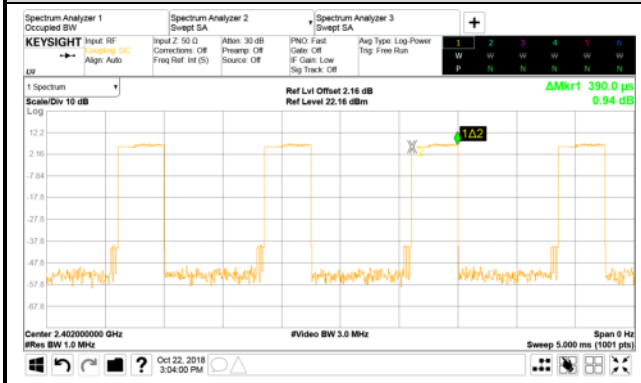
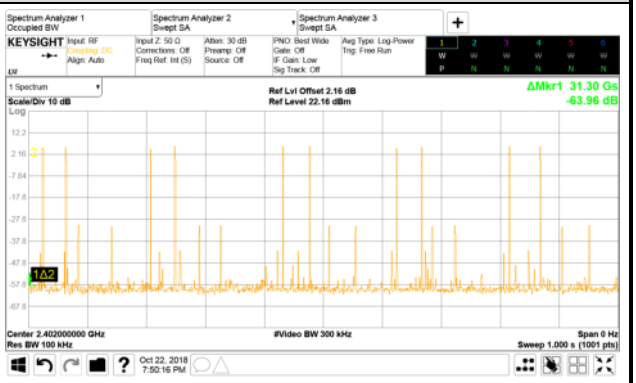
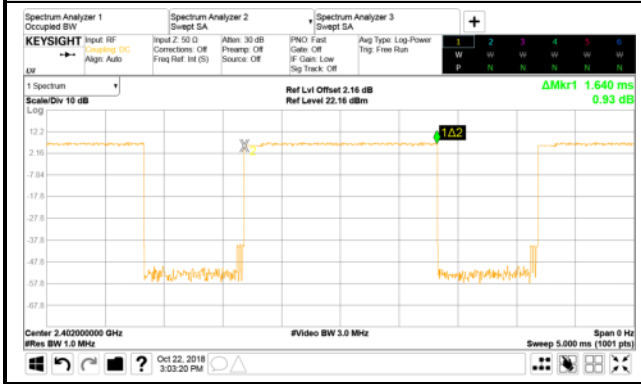
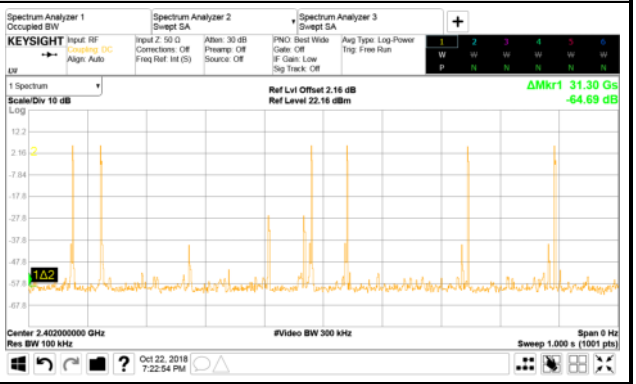
- Measurement Plots

Mode: 8-DPSK	
Centre Frequency: 2402MHz	
3DH1	
	
3DH3	
	
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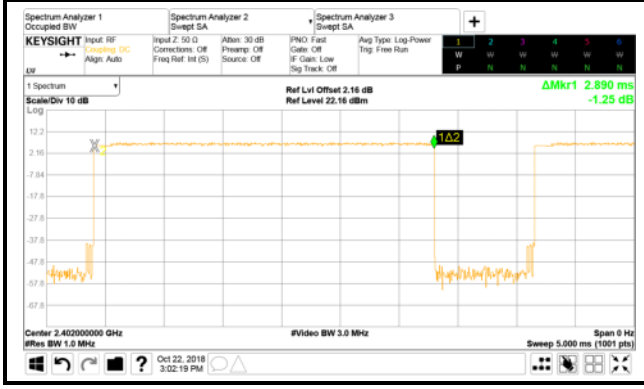	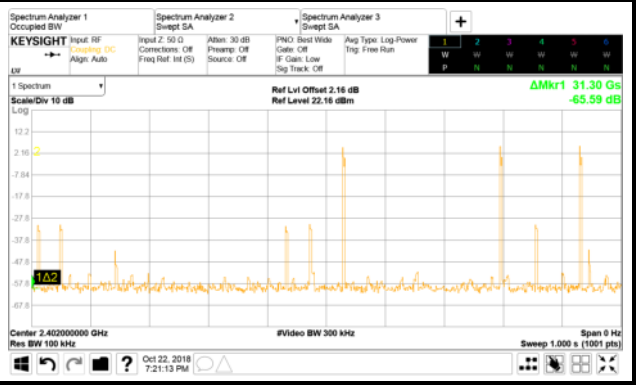

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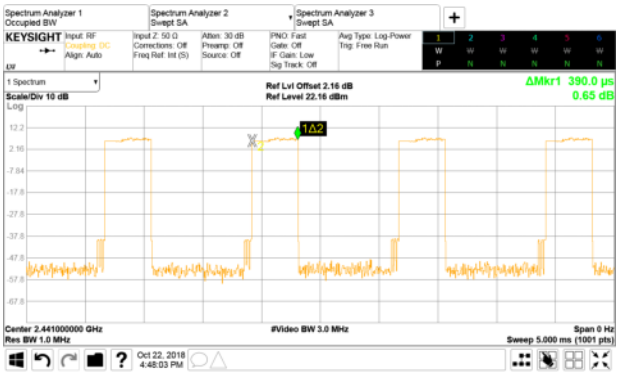
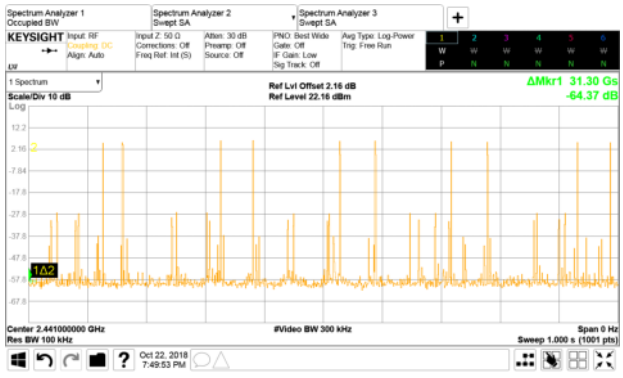
Mode: 8-DPSK	
Centre Frequency: 2441MHz	
3DH1	
	
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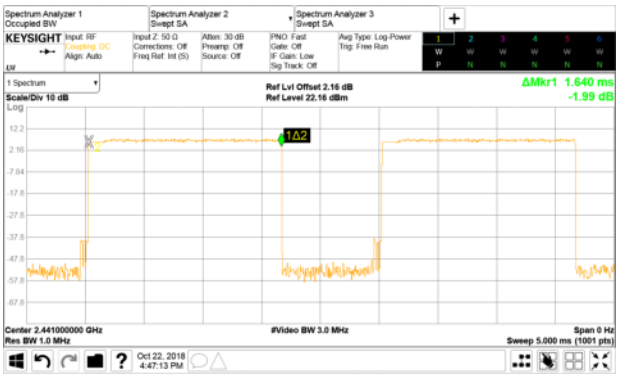	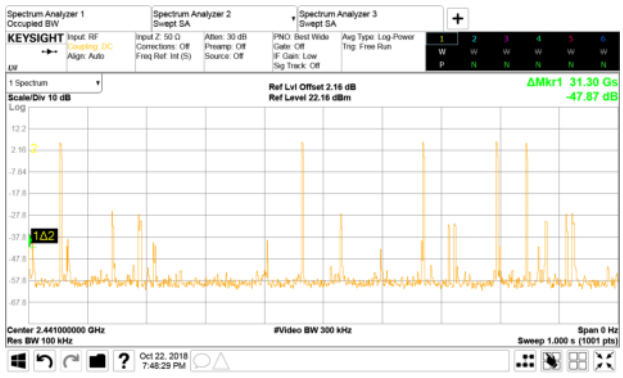
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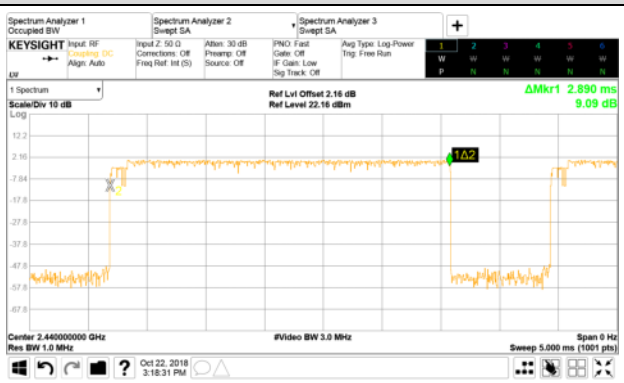	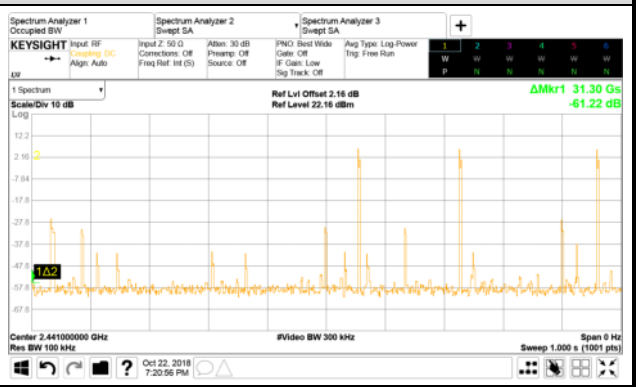

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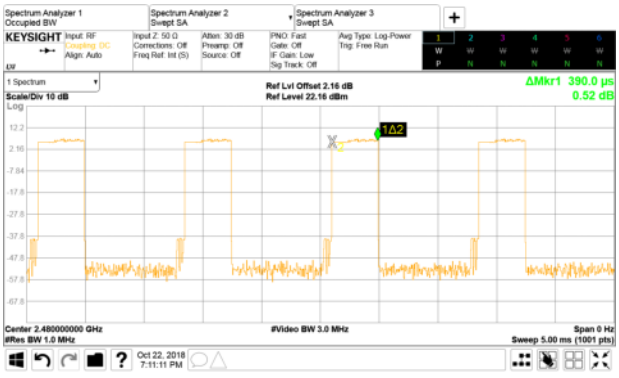
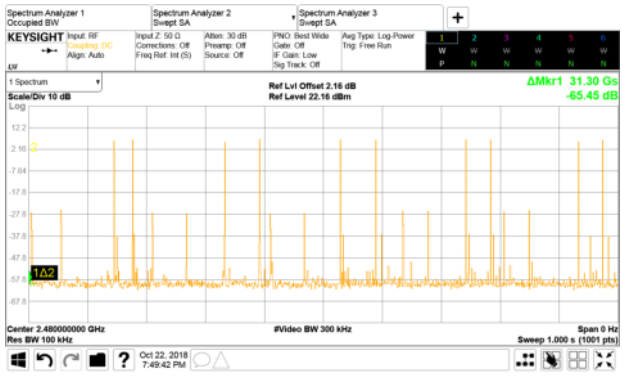
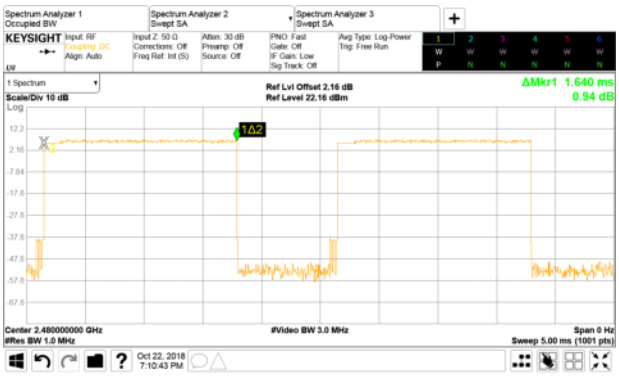
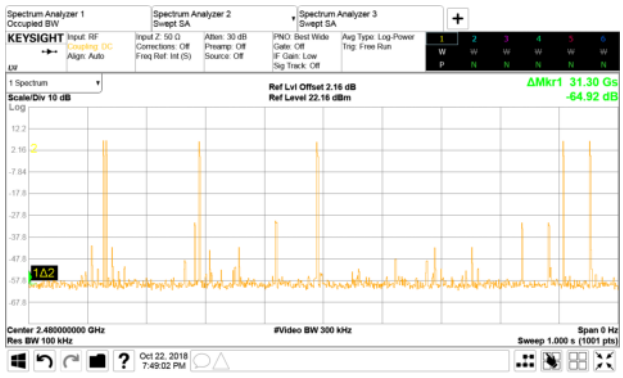
Mode: 8-DPSK	
Centre Frequency: 2480MHz	
3DH1	
	
3DH3	
	
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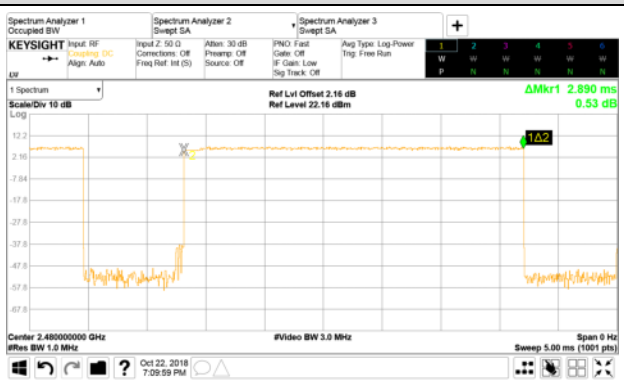	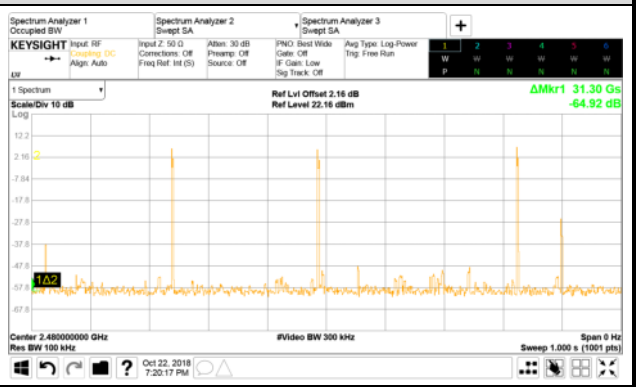

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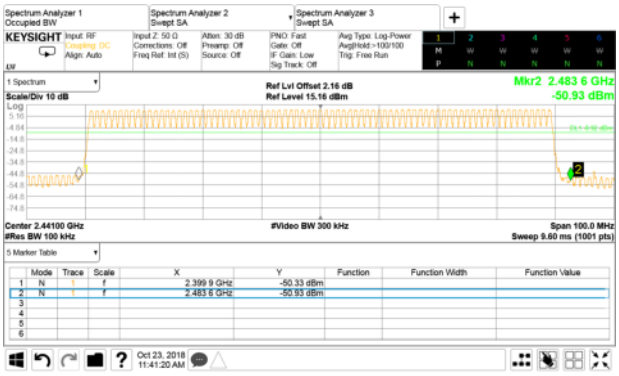
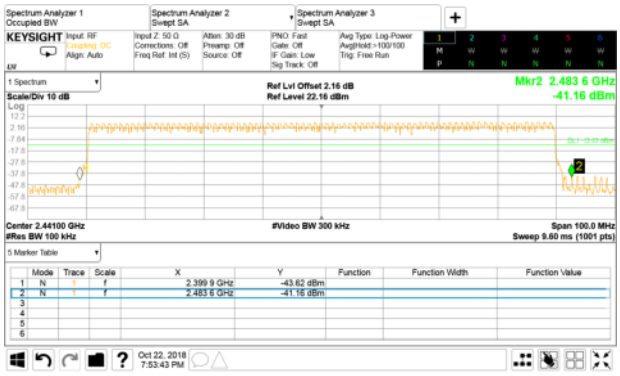
A.6 NUMBER OF HOPPING CHANNELS

Test Date	2018/10/22 ~ 23	Temp./Hum.	23~24℃/52~55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

Mode: GFSK	Mode: 8-DPSK
	
The number hopping channel is 79.	The number hopping channel is 79.

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A.7 MAXIMUM PEAK OUTPUT POWER

Test Date	2018/10/22 ~ 23	Temp./Hum.	23~24℃/52~55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

A.7.1 Maximum Peak Output Power

Mode	Centre Frequency (MHz)	Maximum Peak Output Power		Limit
		dBm	W	
GFSK	2402	10.33	0.011	21dBm (0.125W)
	2441	10.60	0.011	
	2480	10.67	0.012	
8-DPSK	2402	7.76	0.006	
	2441	8.07	0.006	
	2480	7.59	0.006	

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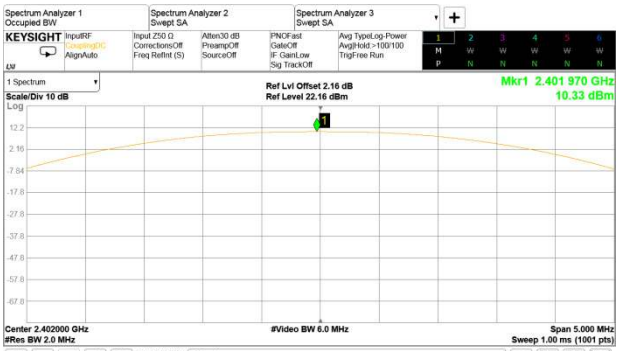
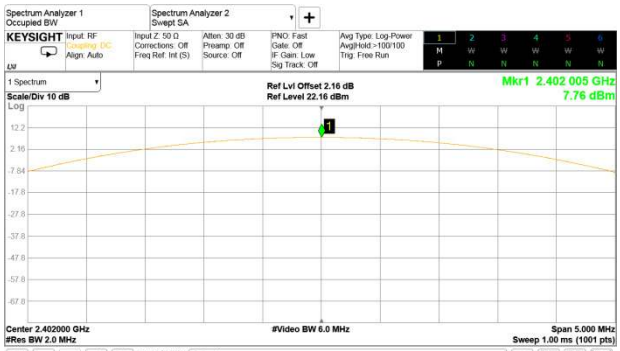
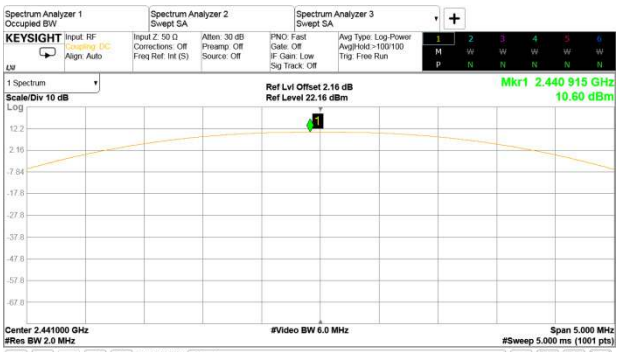
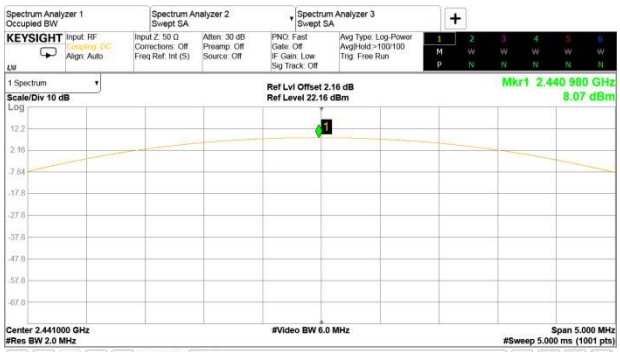
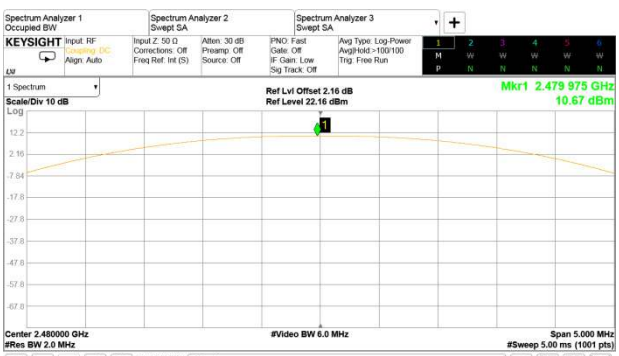
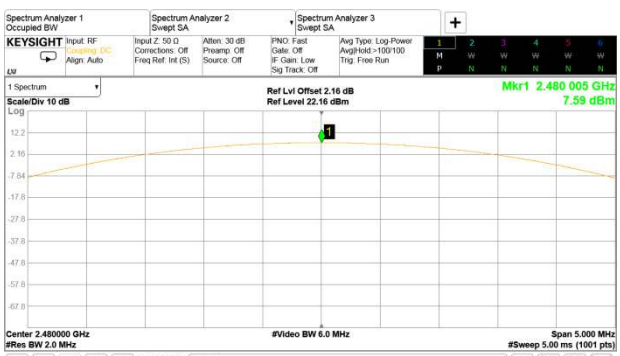
A.7.2 Measurement Plots

Mode: GFSK	Mode: 8-DPSK
	
	
	

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A.8 EMISSION LIMITATIONS MEASUREMENT

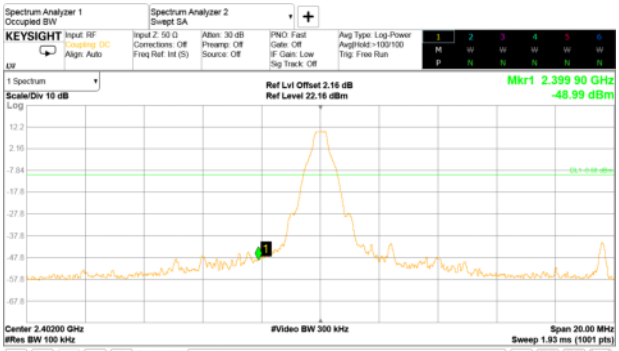
Test Date	2018/10/22 ~ 23	Temp./Hum.	23~24℃/52~55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

A.8.1 Band Edge

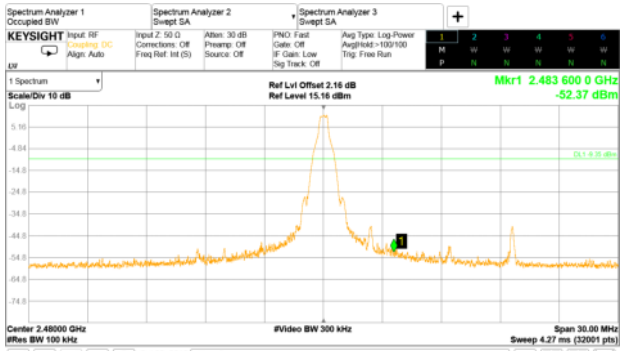
Mode: GFSK

Single Channel

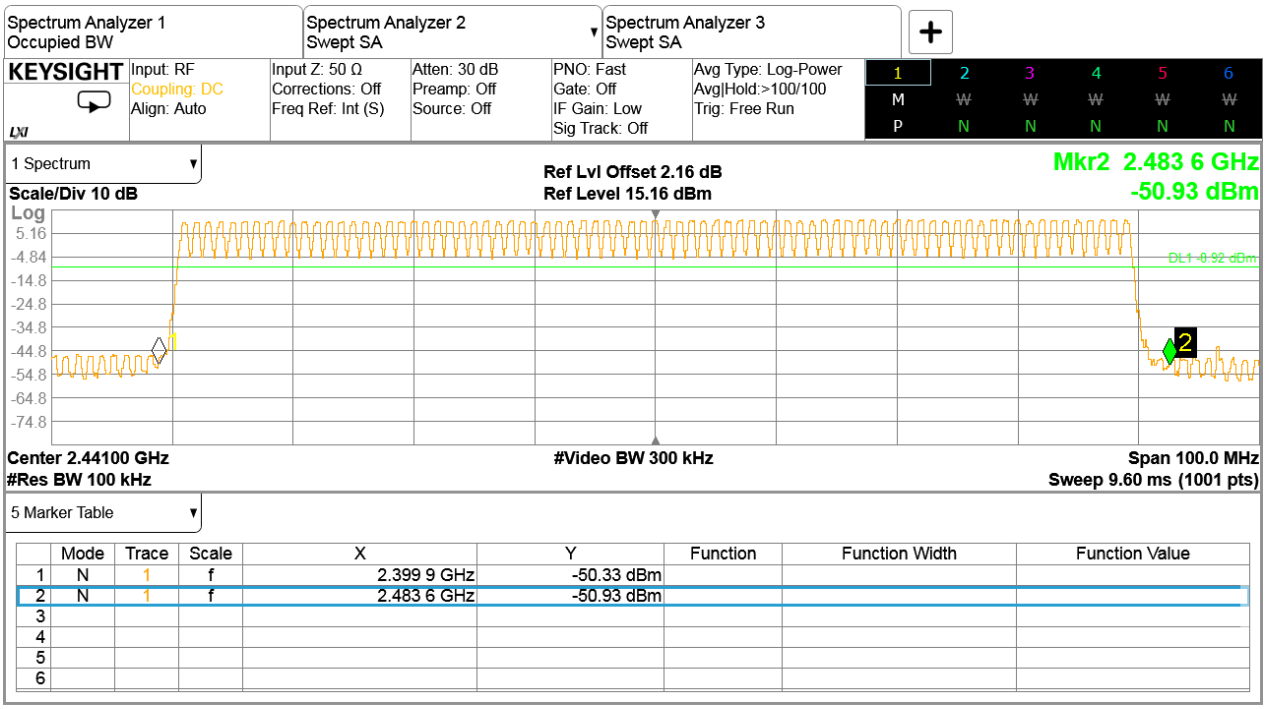
Low channel



High channel



Hopping Mode



	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.399 9 GHz	-50.33 dBm			
2	N	1	f	2.483 6 GHz	-50.93 dBm			
3								
4								
5								
6								

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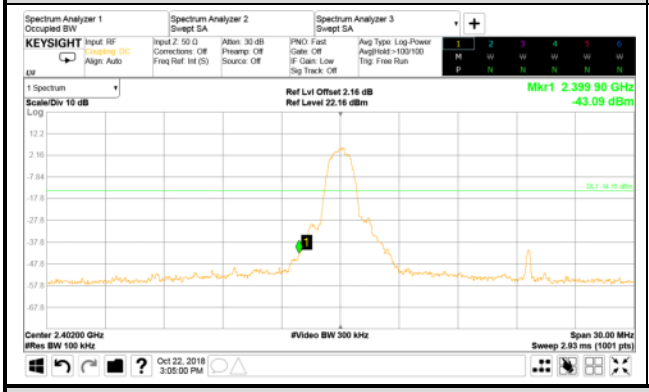
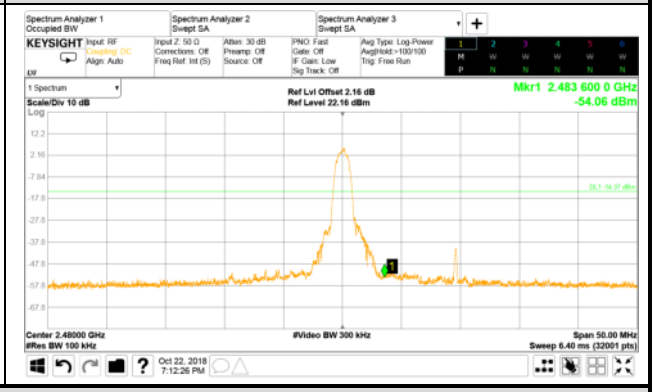
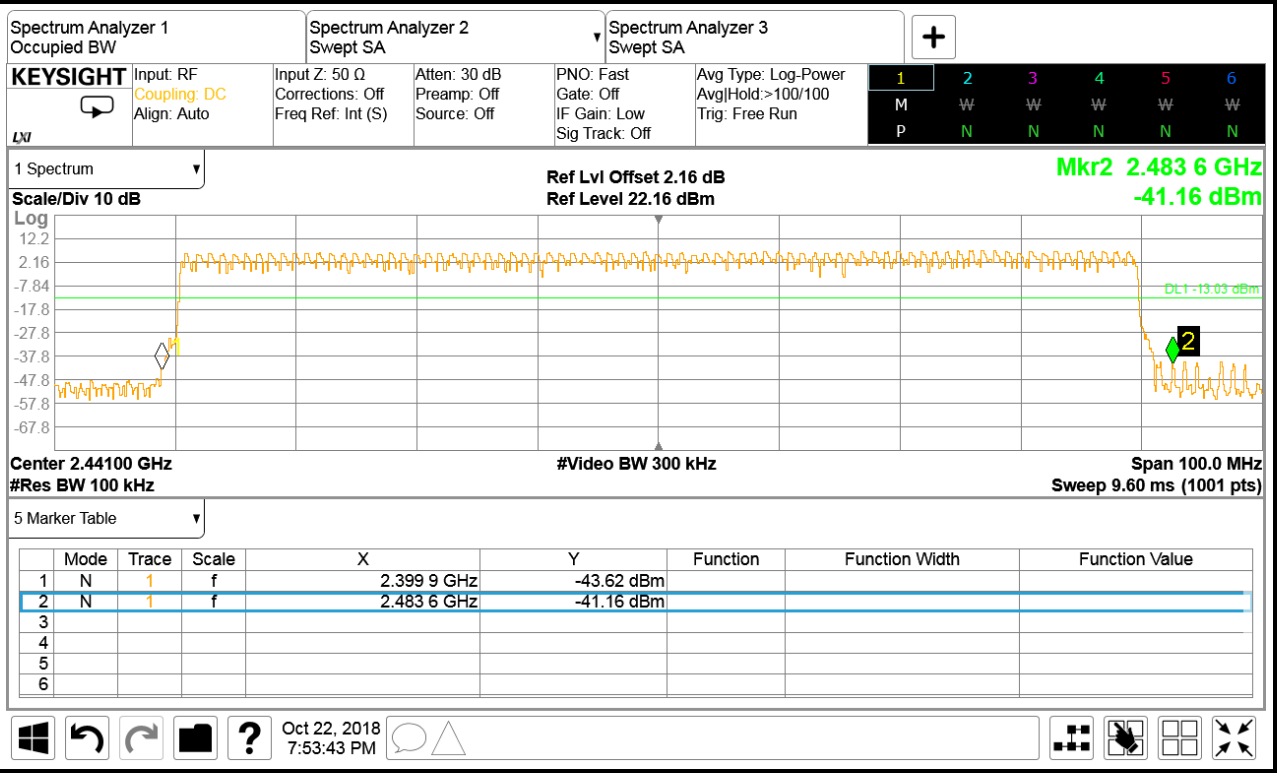
Mode: 8-DPSK

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	-43.62 dBm			
2	N	1	f	2.483 6 GHz	-41.16 dBm			
3								
4								
5								
6								

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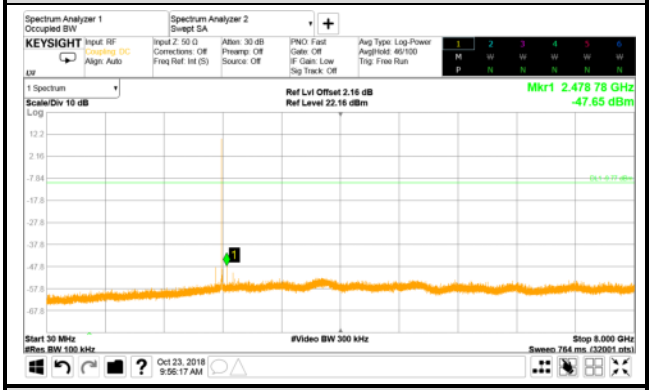
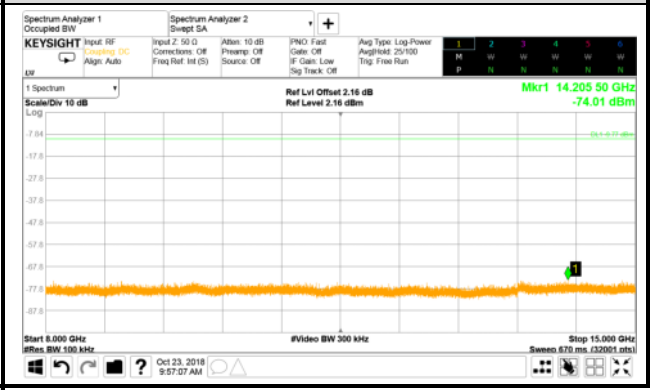
A.8.2 Spurious Emission

Test Date	2018/10/23	Temp./Hum.	23℃/55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	GFSK	Frequency	2402MHz

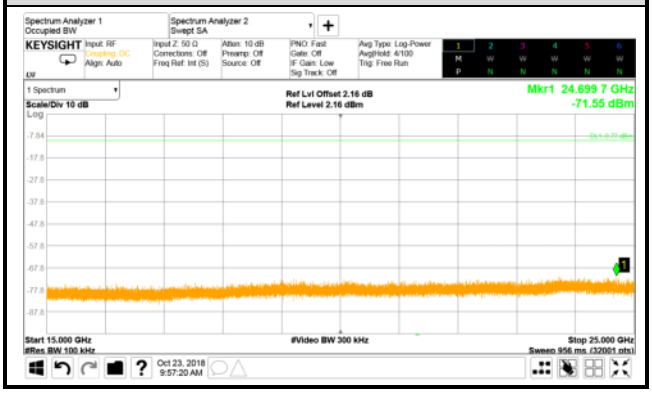
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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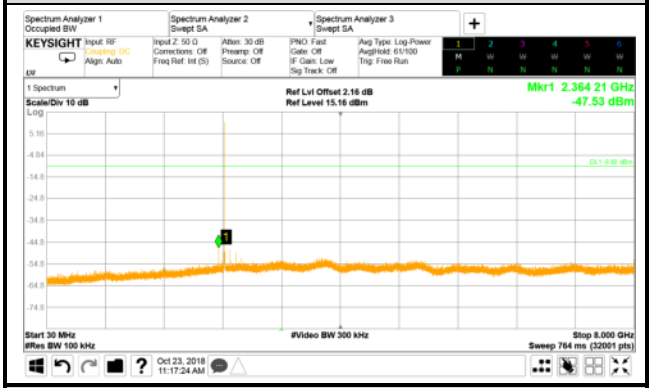
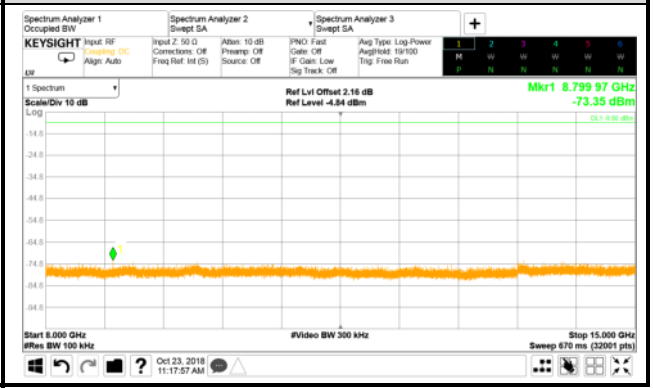
Test Date	2018/10/23	Temp./Hum.	23℃/55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	GFSK	Frequency	2441MHz

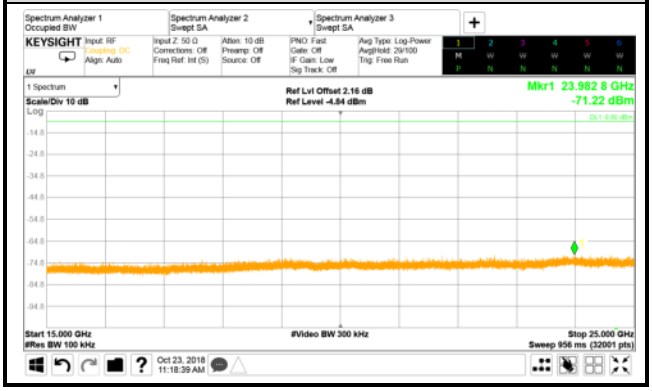
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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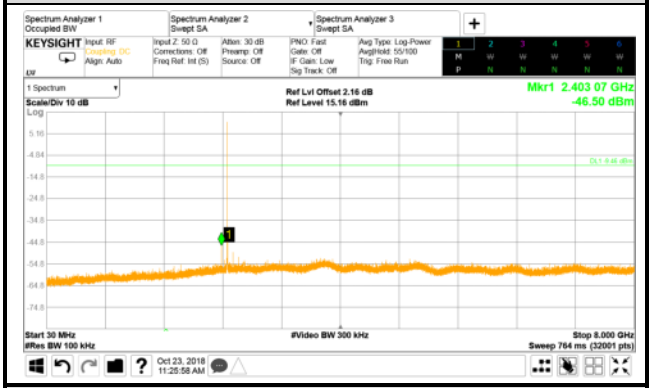
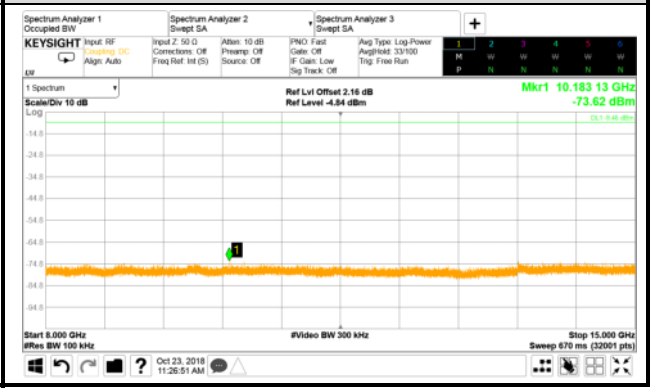
Test Date	2018/10/23	Temp./Hum.	23℃/55%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	GFSK	Frequency	2480MHz

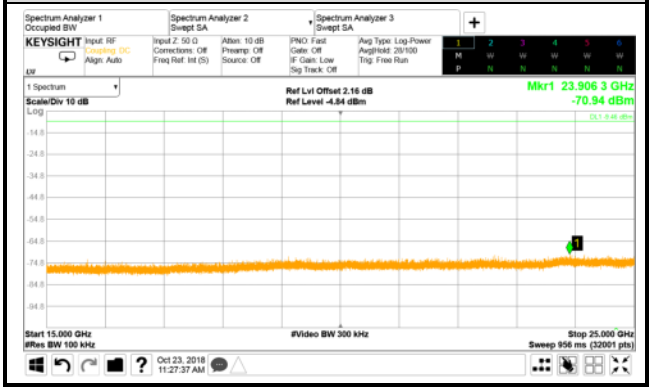
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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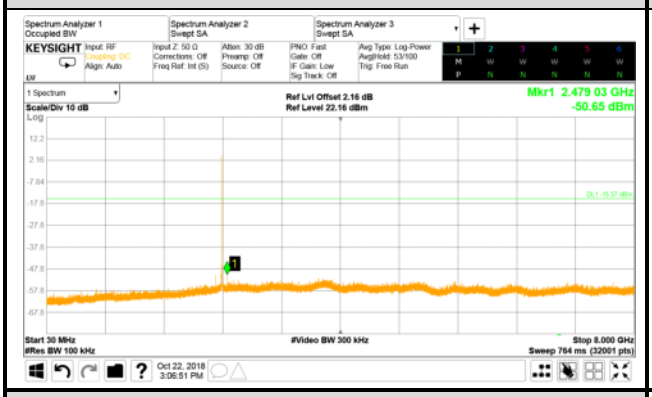
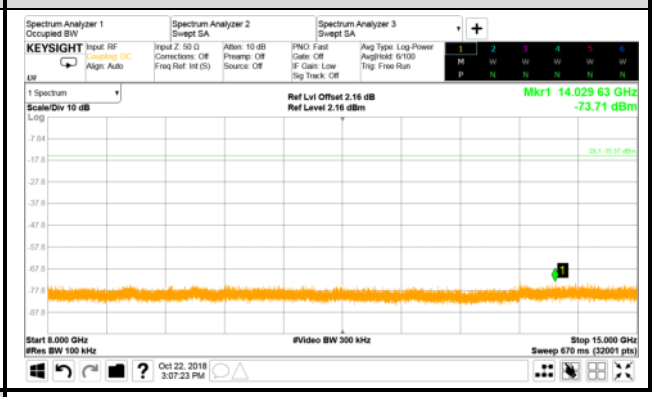
Test Date	2018/10/22	Temp./Hum.	24℃/52%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	8-DPSK	Frequency	2402MHz

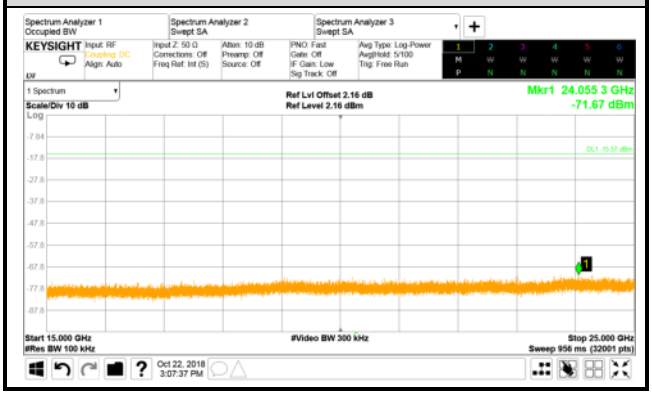
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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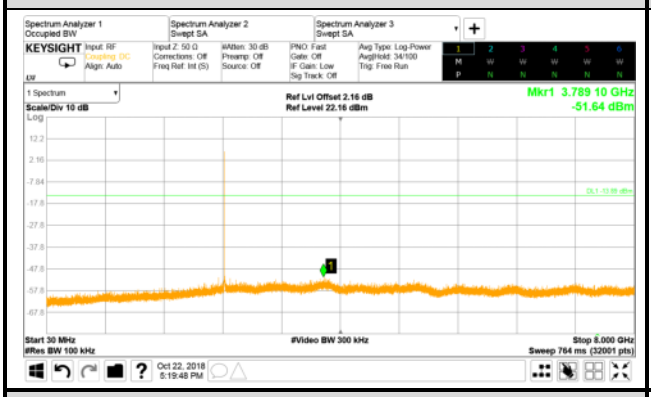
AUDIX Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244, Taiwan

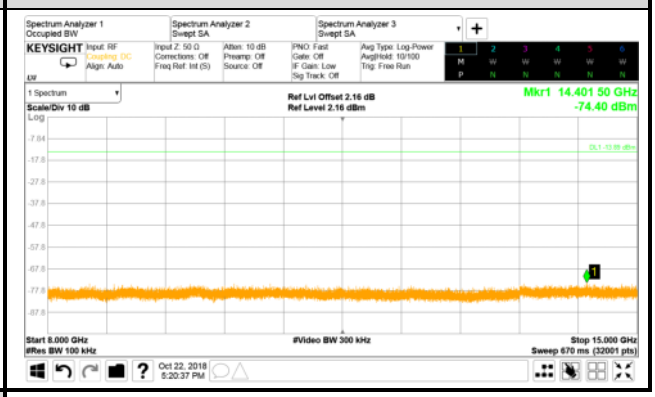
Tel: +886 2 26099301
Fax: +886 2 26099303

Test Date	2018/10/22	Temp./Hum.	24℃/52%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	8-DPSK	Frequency	2441MHz

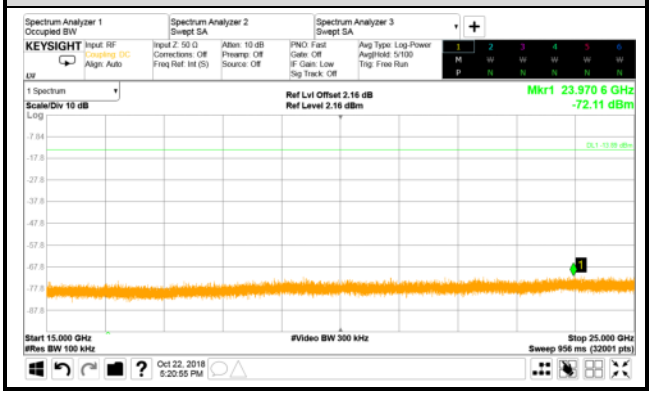
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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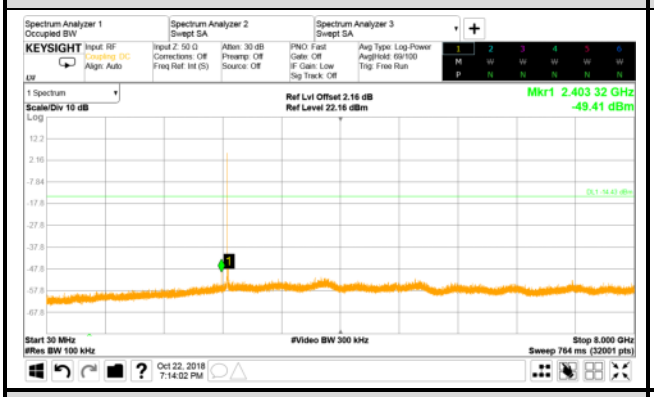
AUDIX Technology Corp.
No. 53-11, Dingfu, Linkou, Dist.,
New Taipei City244, Taiwan

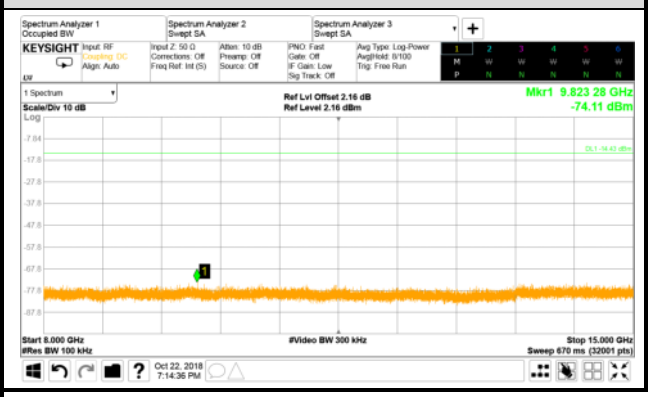
Tel: +886 2 26099301
Fax: +886 2 26099303

Test Date	2018/10/22	Temp./Hum.	24℃/52%
Cable Loss	2.16dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	8-DPSK	Frequency	2480MHz

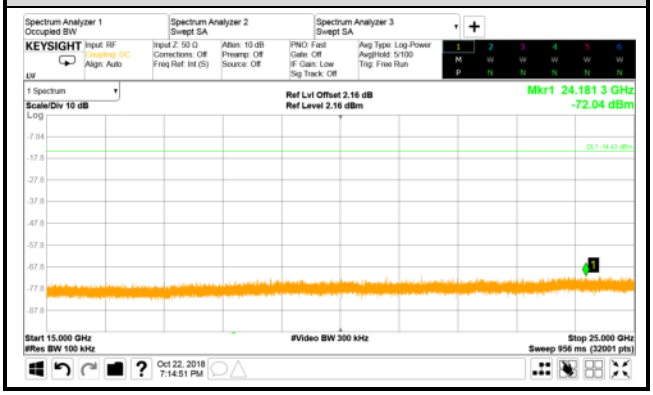
30MHz – 8GHz



8GHz – 15GHz



15GHz – 25GHz



Note: All results have been included cable loss.

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APPDNDIX B

TEST PHOTOGRAPHS

(Model: 14Z990)

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