



FCC RADIO TEST REPORT

Applicant : ELO TOUCH SOLUTIONS, INC.
Address : 670 N Mccarthy Blvd, Suite 100, MILPITAS,
CA 95035, United States
Equipment : Computer Box
Model No. : ELO-KIT-EloView-Engine
Trade Name : ELO
FCC ID. : RBWENGINE

I HEREBY CERTIFY THAT :

The sample was received on Nov. 11, 2017 and the testing was carried out on Nov. 16, 2017 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Assistant Manager

Tested by:

Spree Yei / Engineer

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory





Contents

- 1. **Summary of Test Procedure and Test Results**..... 5
 - 1.1 Applicable Standards 5
- 2. **Test Configuration of Equipment under Test** 6
 - 2.1 Feature of Equipment under Test..... 6
 - 2.2 Carrier Frequency of Channels 6
 - 2.3 Test Mode & Test Software 7
 - 2.4 Description of Test System..... 7
 - 2.5 General Information of Test..... 8
- 3. **Test Equipment and Ancillaries Used for Tests**..... 9
- 4. **Antenna Requirements**..... 10
 - 4.1 Standard Applicable 10
 - 4.2 Antenna Construction and Directional Gain..... 10
- 5. **Test of AC Power Line Conducted Emission** 11
 - 5.1 Test Limit 11
 - 5.2 Test Procedures 11
 - 5.3 Typical Test Setup 12
 - 5.4 Test Result and Data 13
 - 5.5 Test Photographs 15
- 6. **Test of Radiated Spurious Emission**..... 16
 - 6.1 Test Limit 16
 - 6.2 Test Procedures 16
 - 6.3 Typical Test Setup 17
 - 6.4 Test Result and Data (9kHz ~ 30MHz)..... 18
 - 6.5 Test Result and Data (30MHz ~ 1GHz)..... 18
 - 6.6 Test Result and Data (1GHz ~ 25GHz)..... 20
 - 6.7 Restricted Bands of Operation 32
 - 6.8 Test Photographs (30MHz ~ 1GHz) 33
 - 6.9 Test Photographs (1GHz ~ 25GHz) 34
- 7. **Test of Conducted Spurious Emission** 35
 - 7.1 Test Limit 35
 - 7.2 Test Procedure 35
 - 7.3 Test Setup Layout 35
 - 7.4 Test Result and Data 35
- 8. **20dB Bandwidth Measurement Data**..... 43
 - 8.1 Test Limit 43
 - 8.2 Test Procedures 43
 - 8.3 Test Setup Layout 43
 - 8.4 Test Result and Data 43
- 9. **Frequencies Separation** 46
 - 9.1 Test Limit 46
 - 9.2 Test Procedures 46
 - 9.3 Test Setup Layout 46
 - 9.4 Test Result and Data 46



- 10. Dwell Time on each channel49**
 - 10.1 Test Limit 49
 - 10.2 Test Procedures 49
 - 10.3 Test Setup Layout 49
 - 10.4 Test Result and Data 49
- 11. Number of Hopping Channels 52**
 - 11.1 Test Limit 52
 - 11.2 Test Procedures 52
 - 11.3 Test Setup Layout 52
 - 11.4 Test Result and Data 52
- 12. Maximum Peak Output Power 54**
 - 12.1 Test Limit 54
 - 12.2 Test Procedures 54
 - 12.3 Test Setup Layout 54
 - 12.4 Test Result and Data 55
- 13. Radio Frequency Exposure 56**
 - 13.1 Applicable Standards 56
 - 13.2 EUT Specification 56
 - 13.3 Test Results 57
 - 13.4 Calculation 57
 - 13.5 Maximum Permissible Exposure 57



1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.4:2014

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart C §15.247

FCC Rule	Description of Test	Result
15.203	. Antenna Requirement	Pass
15.207	. AC Power Line Conducted Emission	Pass
15.209 15.205	. Radiated Spurious Emission	Pass
15.247(d)	. Conducted Spurious Emission	Pass
15.247(a)(1)	. Channel Carrier Frequencies Separation	Pass
15.247(a)(1)	. 20dB Bandwidth	Pass
15.247(a)(1)	. Dwell Time	Pass
15.247(b)	. Number of Hopping Channels	Pass
15.247(b)	. Peak Output Power Measurement Data	Pass

This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report.



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Modulation Type	DSSS, OFDM, FHSS, GFSK, 8DPSK
Frequency Range	802.11b/g/n: 2412-2462MHz 802.11a/an: 5150-5250MHz, 5725-5850MHz BT: 2402~2480MHz BLE: 2402~2480MHz
Data Rate	WLAN: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS7, HT20 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11ac: MCS0 – MCS7, VHT20/40/80 BT: GFSK: 1Mbps $\pi/4$ -DQPSK: 2Mbps 8DPSK: 3Mbps BLE: GFSK: 1Mbps
Antenna Type/gain	2.4G: PCB Antenna / 3.68dBi 5G: PCB Antenna / 3.69dBi BT / BLE: PCB Antenna / 3.68dBi

Note:

1. For a more detailed features please refer to the User's Manual.

2.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	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	---	---

Note: Channels remarked * are selected to perform test.



2.3 Test Mode & Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4
- b. An executive program, "QRCT:3.0.230.0" under WIN 7 was executed to transmit and receive data via WLAN.
- c. The following test modes were performed for the test:
 - Test Mode 1: GFSK (1Mbps)
 - Test Mode 2: $\pi/4$ -DQPSK (2Mbps)
 - Test Mode 3: 8DPSK (3Mbps)For conduction test, caused "Test Mode 3" generated the worst case, it was reported as the final data.
For radiation test (below 1GHz), caused "Test Mode 3" generated the worst case, it was reported as the final data.
For radiation test (above 1GHz), caused "Test Mode 1, 3" generated the worst case, they were reported as the final data.

2.4 Description of Test System

The EUT was tested alone. No support devices are needed for testing.



2.5 General Information of Test

Test Site	CerpPASS Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582	
	FCC	TW1079, TW1061, TW1439
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-4218, R-4399 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	



3. Test Equipment and Ancillaries Used for Tests

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESCI3	100443	2017/03/07	2018/03/06
LISN	Schwarzbeck	NSLK 8127	8127-568	2017/02/15	2018/02/14
Pulse Limiter	R&S	ESH3-Z2	101934	2017/02/14	2018/02/13
Bilog Antenna	Schwarzbeck	VULB9168	369	2017/03/15	2018/03/14
Active Loop Antenna	EMCO	6507	40855	2017/05/15	2018/05/14
Horn Antenna	EMCO	3115	31589	2017/02/18	2018/02/17
Horn Antenna	EMCO	3116	31970	2017/03/29	2018/03/28
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2017/03/17	2018/03/16
Preamplifier	EM	EM330	60660	2017/02/25	2018/02/24
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2017/09/20	2018/09/19
Preamplifier	Agilent	8449B	3008A01954	2017/02/09	2018/02/08
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2017/11/10	2018/11/09
MXG MW Analog Signal Generator	KEYSIGHT	N5183A	MY50142931	2017/03/17	2018/03/16
Spectrum Analyzer	R&S	FSP40	100219	2017/07/01	2018/06/30
Bluetooth Tester	R&S	CBT	101133	2017/03/10	2018/03/09
Attenuator	KEYSIGHT	8491B	MY39250703	2017/03/07	2018/03/06
Rotary Attenuator	Agilent	8495B	MY42146680	2017/03/13	2018/03/12
Temp & Humi chamber	T-MACHINE	TMJ-9712	T-12-040111	2017/09/04	2018/09/03
Series Power Meter	Anritsu	ML2495A	1224005	2017/03/01	2018/02/28
Power Sensor	Anritsu	MA2411B	1207295	2017/03/01	2018/02/28
Cable	HUBER SUHNER	SUCOFLEX 102	28422/2	2017/02/25	2018/02/24
Cable	HUBER SUHNER	SUCOFLEX 102	28418/2	2017/02/25	2018/02/24
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A
Software	AUDIX	E3	V8.2014-8-6	N/A	N/A
Software	Keysight	N7607B Signal Studio	v2.0.0.1	N/A	N/A
Software	Keysight	Inservice MonitorUtility	N/A	N/A	N/A



4. Antenna Requirements

4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Antenna Construction and Directional Gain

Antenna Type	PCB Antenna
Antenna Gain	3.68 dBi



5. Test of AC Power Line Conducted Emission

5.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

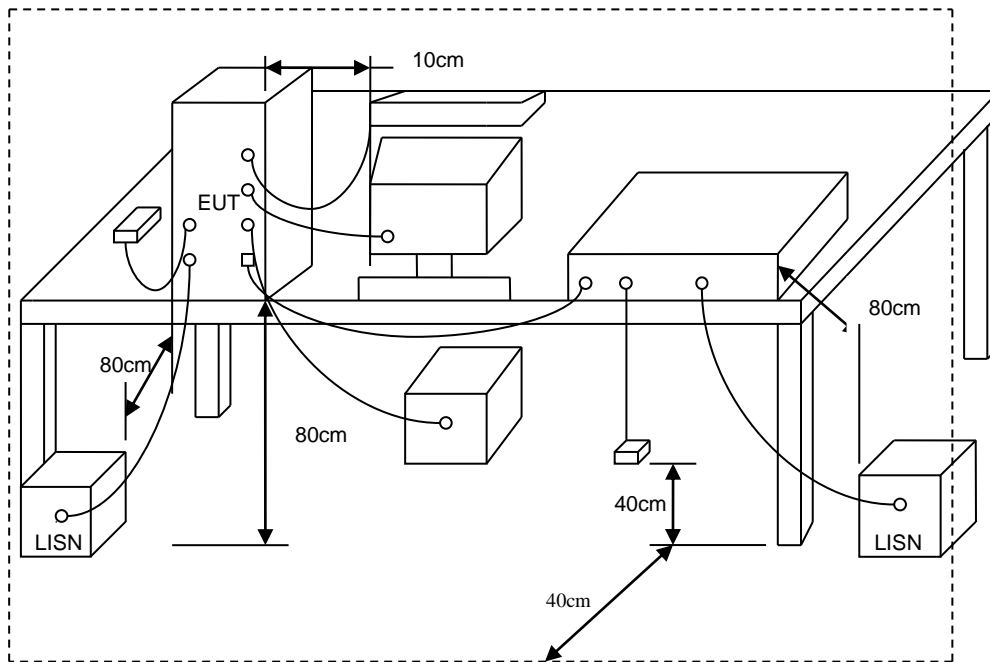
*Decreases with the logarithm of the frequency.

5.2 Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



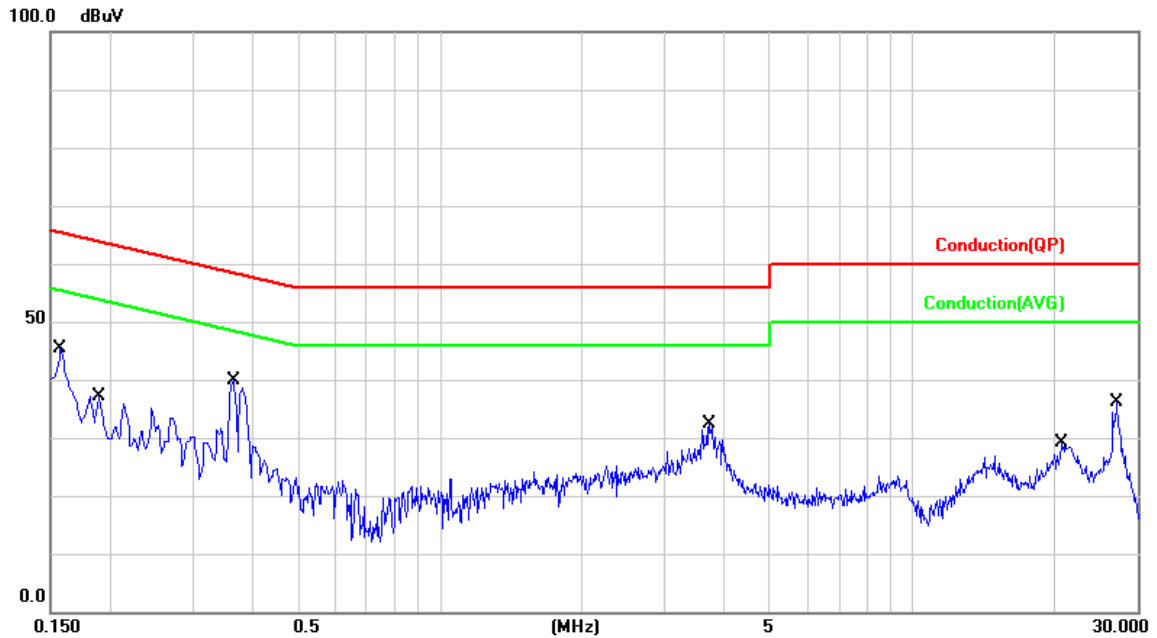
5.3 Typical Test Setup





5.4 Test Result and Data

Power	: AC 120V	Pol/Phase	: LINE
Test Mode	: Mode 3	Temperature	: 20 °C
Test date	: Nov. 16, 2017	Humidity	: 58 %

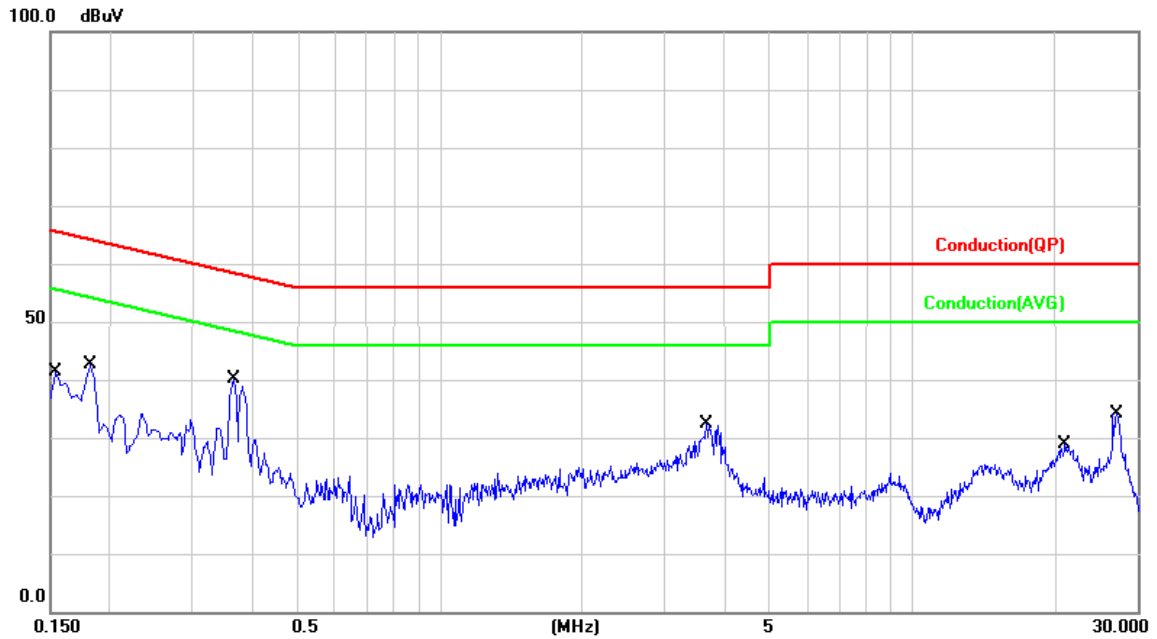


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1580	9.91	31.38	41.29	65.56	-24.27	QP	P
2	0.1580	9.91	22.98	32.89	55.56	-22.67	AVG	P
3	0.1900	9.91	25.95	35.86	64.03	-28.17	QP	P
4	0.1900	9.91	17.32	27.23	54.03	-26.80	AVG	P
5	0.3660	9.93	29.03	38.96	58.59	-19.63	QP	P
6	0.3660	9.93	24.46	34.39	48.59	-14.20	AVG	P
7	3.7340	10.07	16.54	26.61	56.00	-29.39	QP	P
8	3.7340	10.07	8.08	18.15	46.00	-27.85	AVG	P
9	20.7180	10.46	12.47	22.93	60.00	-37.07	QP	P
10	20.7180	10.46	6.75	17.21	50.00	-32.79	AVG	P
11	27.2620	10.57	18.16	28.73	60.00	-31.27	QP	P
12	27.2620	10.57	10.77	21.34	50.00	-28.66	AVG	P

Note: Level = Reading + Factor
Margin = Level – Limit
Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator



Power	: AC 120V	Pol/Phase	: NEUTRAL
Test Mode	: Mode 3	Temperature	: 20 °C
Test date	: Nov. 16, 2017	Humidity	: 58 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1539	9.91	31.11	41.02	65.78	-24.76	QP	P
2	0.1539	9.91	24.78	34.69	55.78	-21.09	AVG	P
3	0.1819	9.91	27.15	37.06	64.39	-27.33	QP	P
4	0.1819	9.91	17.87	27.78	54.39	-26.61	AVG	P
5	0.3660	9.93	29.02	38.95	58.59	-19.64	QP	P
6	0.3660	9.93	24.45	34.38	48.59	-14.21	AVG	P
7	3.6620	10.07	18.34	28.41	56.00	-27.59	QP	P
8	3.6620	10.07	9.40	19.47	46.00	-26.53	AVG	P
9	21.0660	10.46	12.77	23.23	60.00	-36.77	QP	P
10	21.0660	10.46	7.21	17.67	50.00	-32.33	AVG	P
11	27.0260	10.57	19.60	30.17	60.00	-29.83	QP	P
12	27.0260	10.57	12.04	22.61	50.00	-27.39	AVG	P

Note: Level = Reading + Factor
 Margin = Level – Limit
 Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss+ Attenuator



6. Test of Radiated Spurious Emission

6.1 Test Limit

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2014. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance Meters	Radiated (μ V / M)	Radiated (dB μ V / M)
30-88	3	100	40.0
88-216	3	150	43.5
216-960	3	200	46.0
Above 960	3	500	54.0

For unintentional device, according to CISPR PUB.22, for Class B digital devices, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 10 meters shall not exceed the above table.

Frequency (MHz)	Distance Meters	Radiated (dB μ V / M)
30-230	10	30
230-1000	10	37

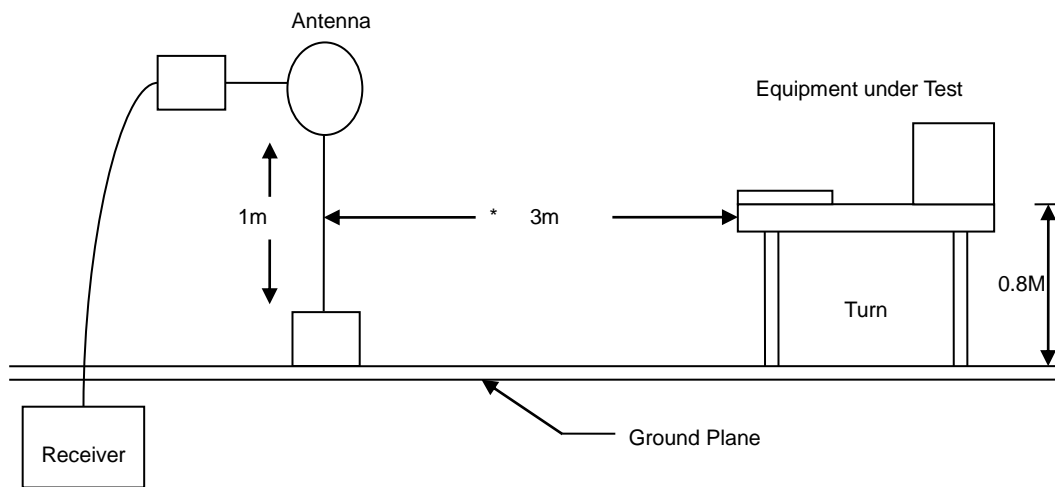
6.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

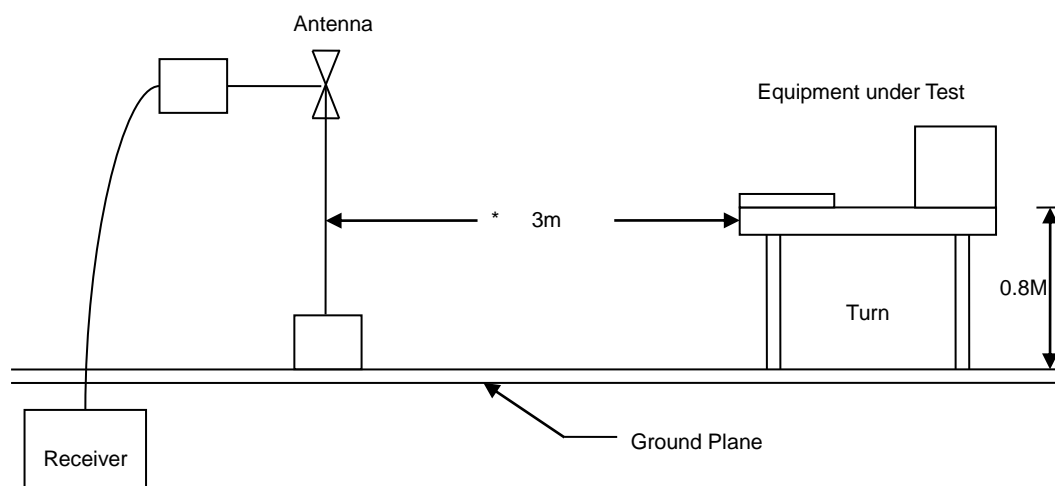


6.3 Typical Test Setup

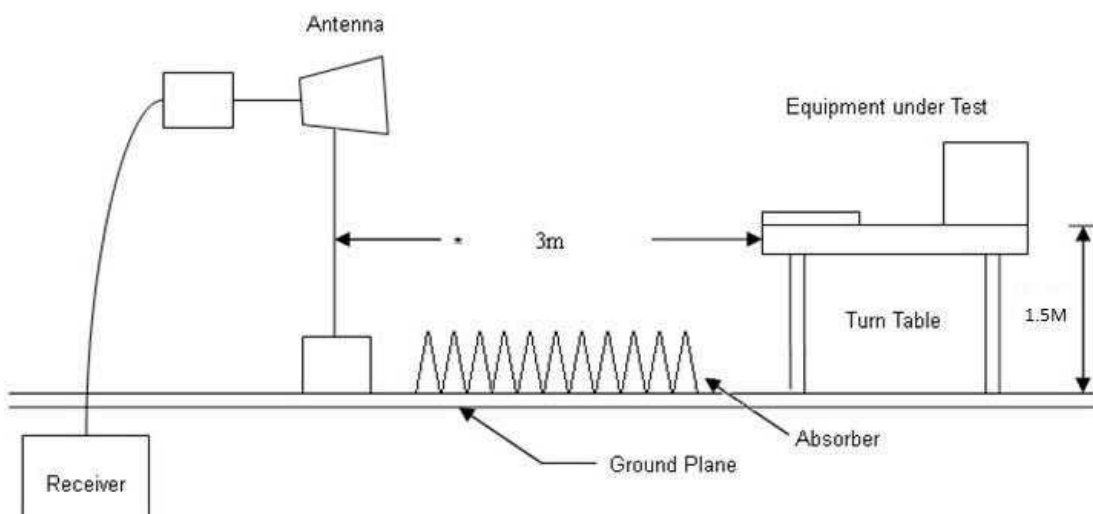
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



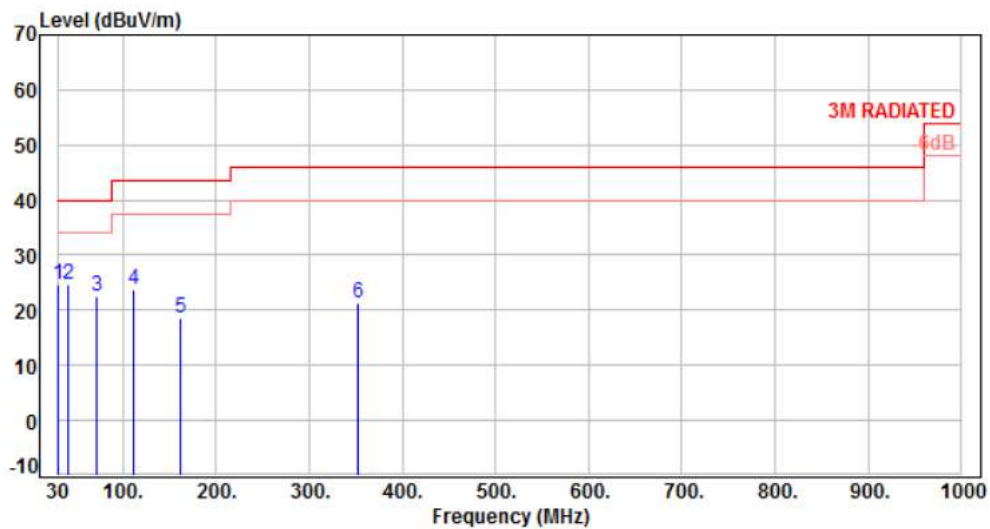


6.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz-30MHz spurious emission is under limit 20dB more.

6.5 Test Result and Data (30MHz ~ 1GHz)

Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 3	Temperature	: 23 °C
Test date	: Nov. 11, 2017	Humidity	: 65 %

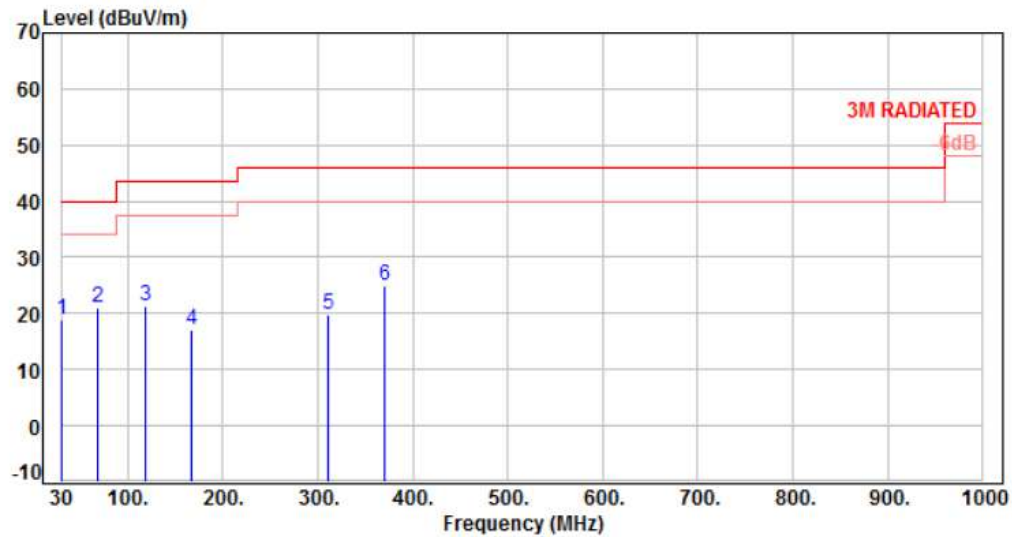


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-10.92	35.48	24.56	40.00	-15.44	Peak	400	0	P
2	40.67	-10.30	34.95	24.65	40.00	-15.35	Peak	400	0	P
3	71.71	-12.37	34.77	22.40	40.00	-17.60	Peak	400	0	P
4	110.51	-13.26	36.93	23.67	43.50	-19.83	Peak	400	0	P
5	160.95	-9.86	28.60	18.74	43.50	-24.76	Peak	400	0	P
6	353.01	-7.40	28.60	21.20	46.00	-24.80	Peak	400	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %



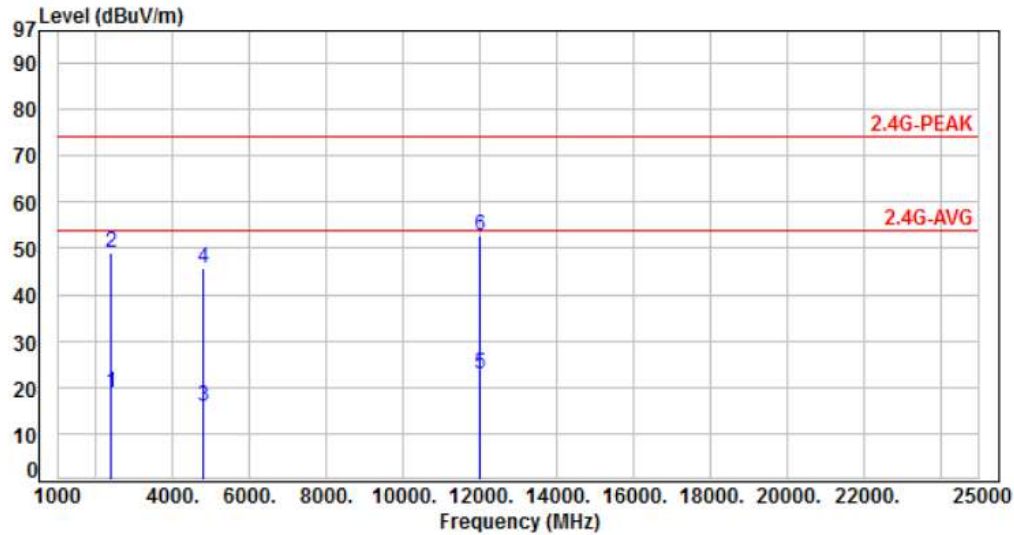
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-10.92	29.94	19.02	40.00	-20.98	Peak	100	0	P
2	67.83	-11.62	32.55	20.93	40.00	-19.07	Peak	100	0	P
3	118.27	-12.58	33.79	21.21	43.50	-22.29	Peak	100	0	P
4	166.77	-10.00	27.18	17.18	43.50	-26.32	Peak	100	0	P
5	310.33	-8.53	28.43	19.90	46.00	-26.10	Peak	100	0	P
6	370.47	-6.88	31.71	24.83	46.00	-21.17	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor



6.6 Test Result and Data (1GHz ~ 25GHz)

Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH00	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

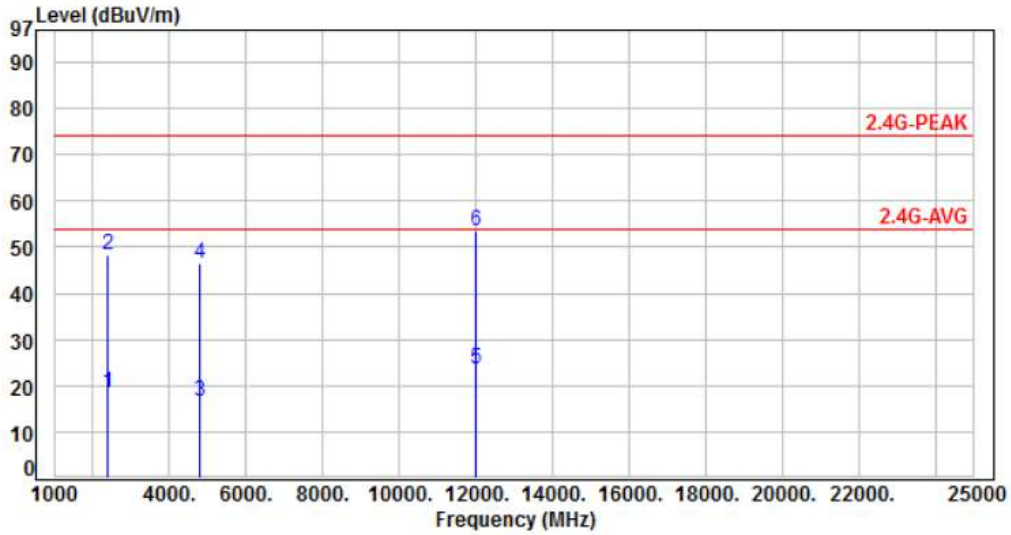


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	37.80	18.85	54.00	-35.15	Average	279	0	P
2	2390.00	-18.95	67.90	48.95	74.00	-25.05	Peak	279	0	P
3	4804.00	-13.28	29.10	15.82	54.00	-38.18	Average	383	310	P
4	4804.00	-13.28	59.20	45.92	74.00	-28.08	Peak	383	310	P
5	12010.00	-5.98	28.79	22.81	54.00	-31.19	Average	371	15	P
6	12010.00	-5.98	58.89	52.91	74.00	-21.09	Peak	371	15	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH00	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

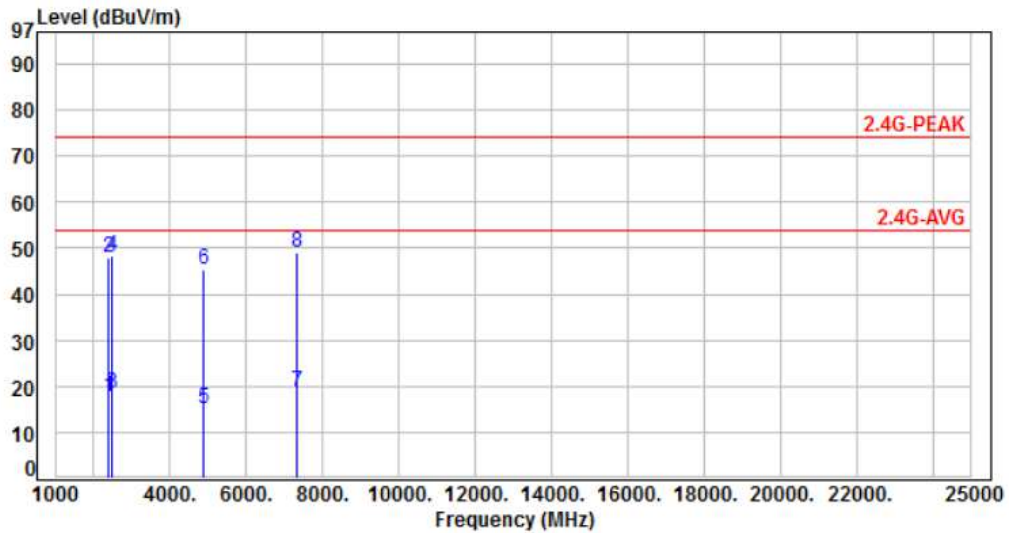


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	37.35	18.40	54.00	-35.60	Average	380	360	P
2	2390.00	-18.95	67.45	48.50	74.00	-25.50	Peak	380	360	P
3	4804.00	-13.28	29.70	16.42	54.00	-37.58	Average	369	314	P
4	4804.00	-13.28	59.80	46.52	74.00	-27.48	Peak	369	314	P
5	12010.00	-5.98	29.54	23.56	54.00	-30.44	Average	335	0	P
6	12010.00	-5.98	59.64	53.66	74.00	-20.34	Peak	335	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH39	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

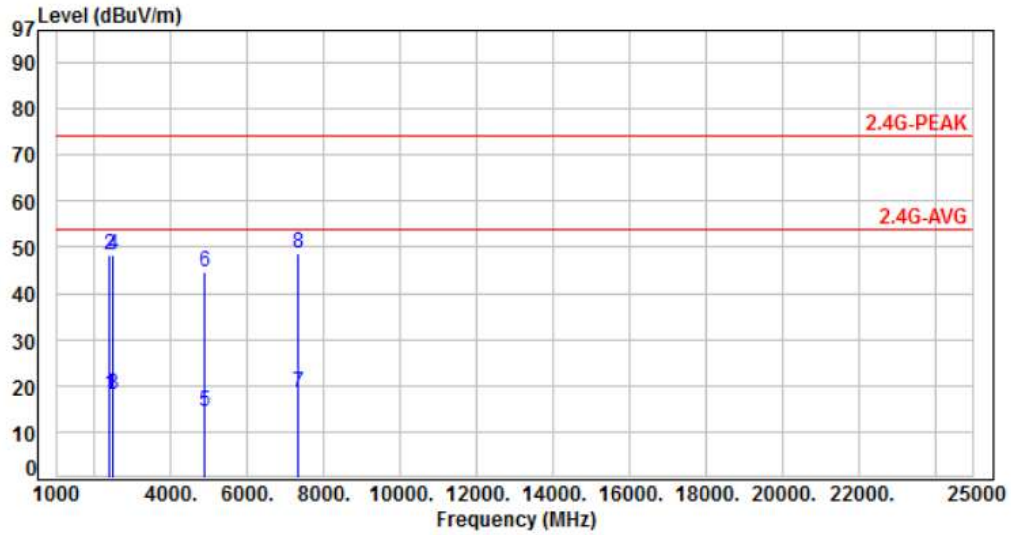


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	36.75	17.80	54.00	-36.20	Average	310	18	P
2	2390.00	-18.95	66.85	47.90	74.00	-26.10	Peak	310	18	P
3	2483.50	-18.71	37.10	18.39	54.00	-35.61	Average	310	18	P
4	2483.50	-18.71	67.20	48.49	74.00	-25.51	Peak	310	18	P
5	4882.00	-13.09	28.20	15.11	54.00	-38.89	Average	355	0	P
6	4882.00	-13.09	58.30	45.21	74.00	-28.79	Peak	355	0	P
7	7323.00	-10.16	29.00	18.84	54.00	-35.16	Average	326	22	P
8	7323.00	-10.16	59.10	48.94	74.00	-25.06	Peak	326	22	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH39	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

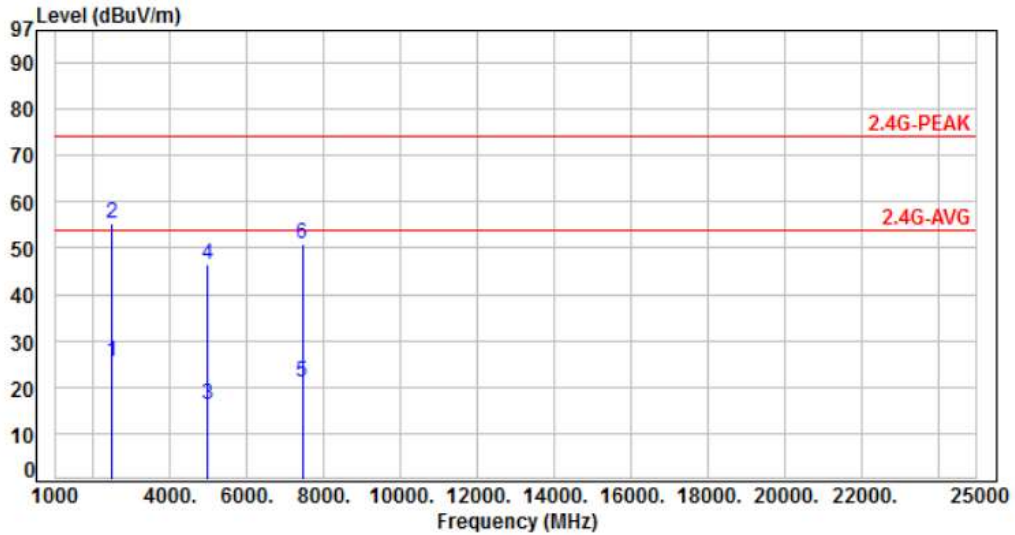


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	37.20	18.25	54.00	-35.75	Average	190	329	P
2	2390.00	-18.95	67.30	48.35	74.00	-25.65	Peak	190	329	P
3	2483.50	-18.71	36.80	18.09	54.00	-35.91	Average	190	329	P
4	2483.50	-18.71	66.90	48.19	74.00	-25.81	Peak	190	329	P
5	4882.00	-13.09	27.59	14.50	54.00	-39.50	Average	355	360	P
6	4882.00	-13.09	57.69	44.60	74.00	-29.40	Peak	355	360	P
7	7323.00	-10.16	28.60	18.44	54.00	-35.56	Average	320	2	P
8	7323.00	-10.16	58.70	48.54	74.00	-25.46	Peak	320	2	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH78	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

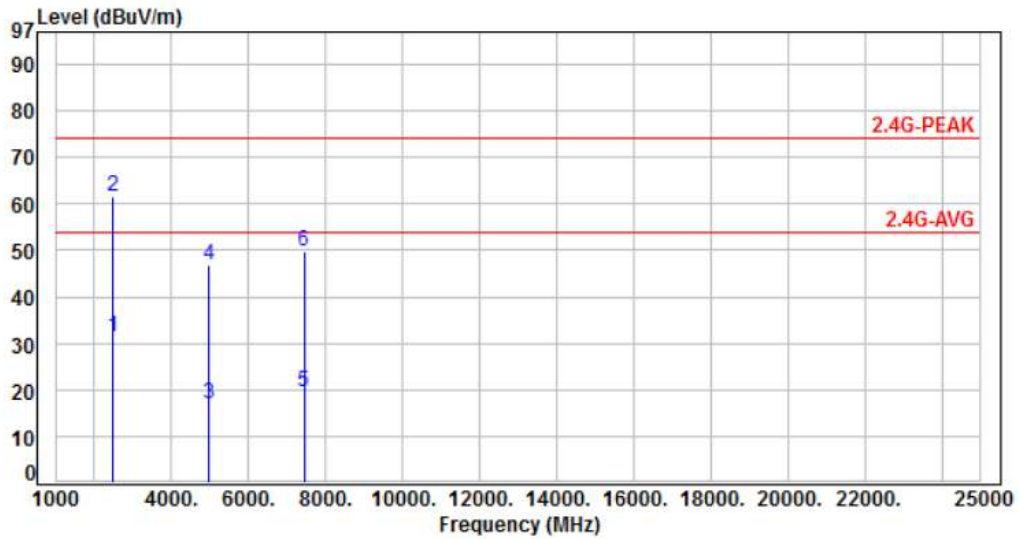


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	44.10	25.39	54.00	-28.61	Average	382	22	P
2	2483.50	-18.71	74.20	55.49	74.00	-18.51	Peak	382	22	P
3	4960.00	-12.89	29.10	16.21	54.00	-37.79	Average	349	294	P
4	4960.00	-12.89	59.20	46.31	74.00	-27.69	Peak	349	294	P
5	7440.00	-9.88	30.75	20.87	54.00	-33.13	Average	272	150	P
6	7440.00	-9.88	60.85	50.97	74.00	-23.03	Peak	272	150	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH78	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

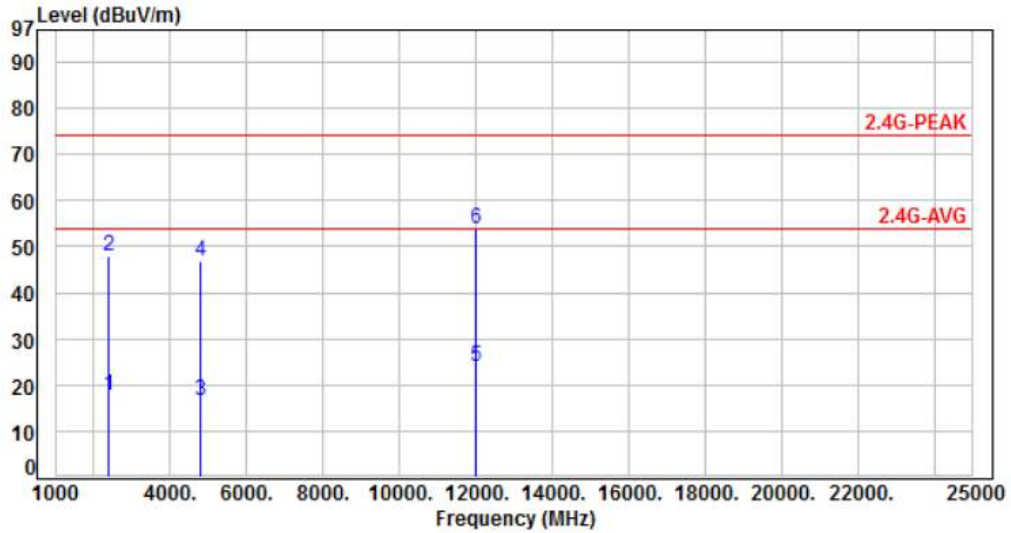


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	50.20	31.49	54.00	-22.51	Average	381	334	P
2	2483.50	-18.71	80.30	61.59	74.00	-12.41	Peak	381	334	P
3	4960.00	-12.89	29.70	16.81	54.00	-37.19	Average	300	310	P
4	4960.00	-12.89	59.80	46.91	74.00	-27.09	Peak	300	310	P
5	7440.00	-9.88	29.53	19.65	54.00	-34.35	Average	100	275	P
6	7440.00	-9.88	59.63	49.75	74.00	-24.25	Peak	100	275	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 3, CH00	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

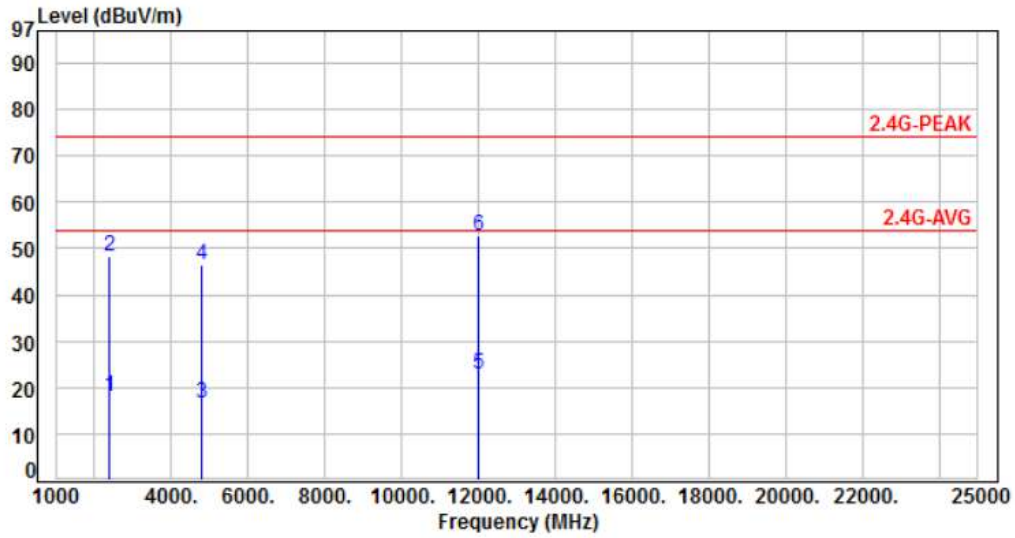


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	36.70	17.75	54.00	-36.25	Average	280	10	P
2	2390.00	-18.95	66.80	47.85	74.00	-26.15	Peak	280	10	P
3	4804.00	-13.28	30.00	16.72	54.00	-37.28	Average	376	325	P
4	4804.00	-13.28	60.10	46.82	74.00	-27.18	Peak	376	325	P
5	12010.00	-5.98	29.79	23.81	54.00	-30.19	Average	344	0	P
6	12010.00	-5.98	59.89	53.91	74.00	-20.09	Peak	344	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3, CH00	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

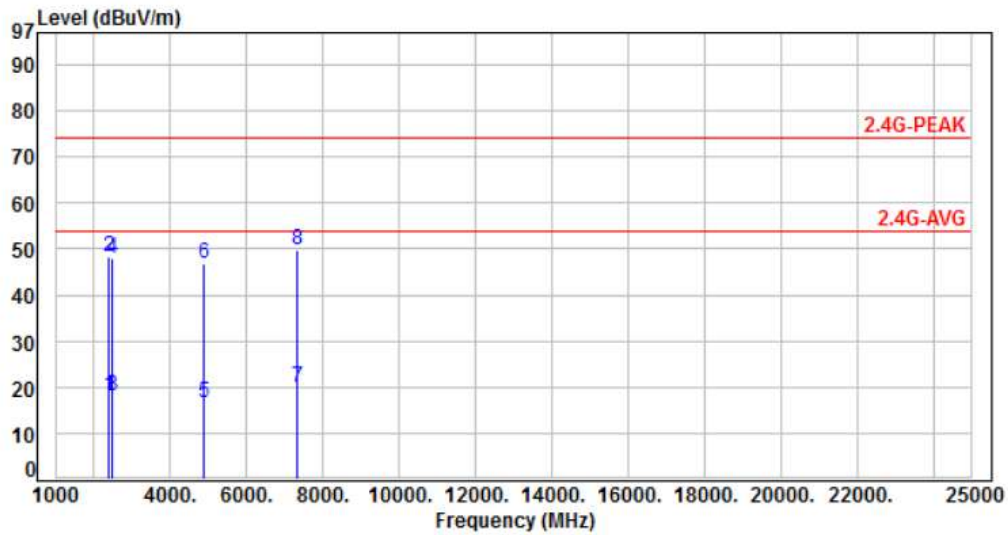


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	37.10	18.15	54.00	-35.85	Average	377	360	P
2	2390.00	-18.95	67.20	48.25	74.00	-25.75	Peak	377	360	P
3	4804.00	-13.28	29.70	16.42	54.00	-37.58	Average	352	320	P
4	4804.00	-13.28	59.80	46.52	74.00	-27.48	Peak	352	320	P
5	12010.00	-5.98	28.67	22.69	54.00	-31.31	Average	334	25	P
6	12010.00	-5.98	58.77	52.79	74.00	-21.21	Peak	334	25	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 3, CH39	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

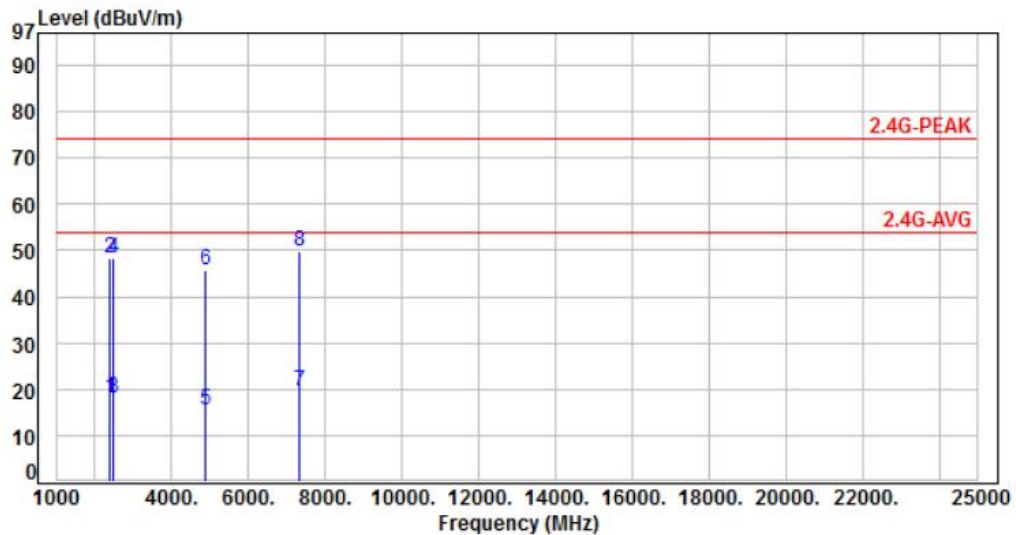


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	37.01	18.06	54.00	-35.94	Average	309	16	P
2	2390.00	-18.95	67.11	48.16	74.00	-25.84	Peak	309	16	P
3	2483.50	-18.71	36.70	17.99	54.00	-36.01	Average	309	16	P
4	2483.50	-18.71	66.80	48.09	74.00	-25.91	Peak	309	16	P
5	4882.00	-13.09	29.78	16.69	54.00	-37.31	Average	321	200	P
6	4882.00	-13.09	59.88	46.79	74.00	-27.21	Peak	321	200	P
7	7323.00	-10.16	30.02	19.86	54.00	-34.14	Average	155	299	P
8	7323.00	-10.16	60.12	49.96	74.00	-24.04	Peak	155	299	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3, CH39	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

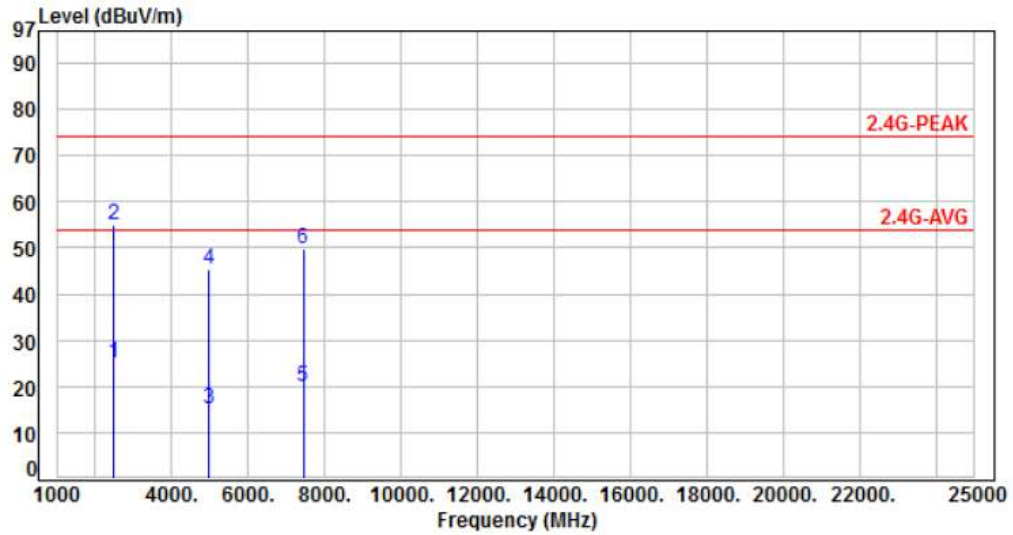


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	37.10	18.15	54.00	-35.85	Average	212	329	P
2	2390.00	-18.95	67.20	48.25	74.00	-25.75	Peak	212	329	P
3	2483.50	-18.71	36.80	18.09	54.00	-35.91	Average	212	329	P
4	2483.50	-18.71	66.90	48.19	74.00	-25.81	Peak	212	329	P
5	4882.00	-13.09	28.57	15.48	54.00	-38.52	Average	315	322	P
6	4882.00	-13.09	58.67	45.58	74.00	-28.42	Peak	315	322	P
7	7323.00	-10.16	29.70	19.54	54.00	-34.46	Average	322	112	P
8	7323.00	-10.16	59.80	49.64	74.00	-24.36	Peak	322	112	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: VERTICAL
Test Mode	: Mode 3, CH78	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %

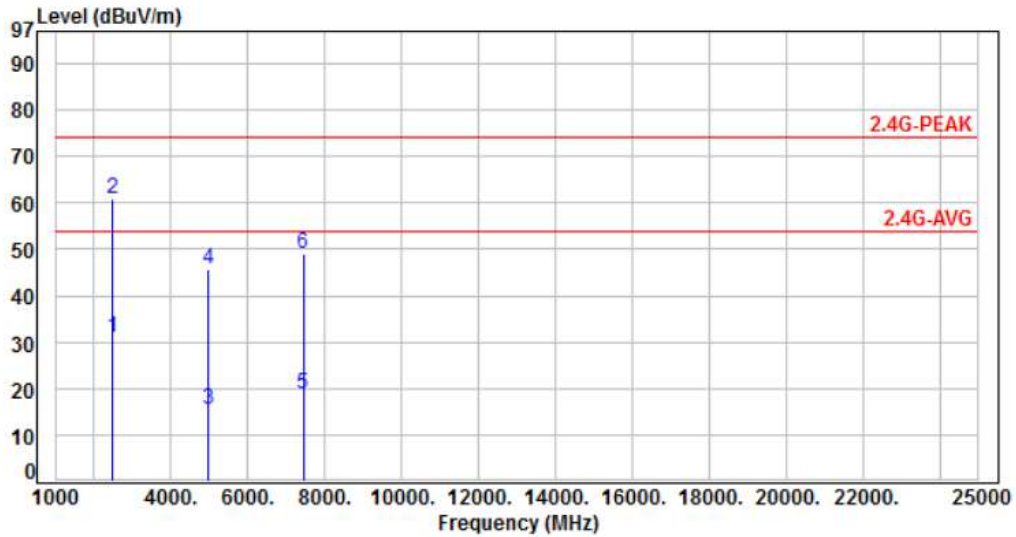


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	43.70	24.99	54.00	-29.01	Average	384	20	P
2	2483.50	-18.71	73.80	55.09	74.00	-18.91	Peak	384	20	P
3	4960.00	-12.89	28.00	15.11	54.00	-38.89	Average	300	327	P
4	4960.00	-12.89	58.10	45.21	74.00	-28.79	Peak	300	327	P
5	7440.00	-9.88	29.72	19.84	54.00	-34.16	Average	327	153	P
6	7440.00	-9.88	59.82	49.94	74.00	-24.06	Peak	327	153	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3, CH78	Temperature	: 23 °C
Test Date	: Nov. 11, 2017	Humidity	: 65 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	49.60	30.89	54.00	-23.11	Average	383	337	P
2	2483.50	-18.71	79.70	60.99	74.00	-13.01	Peak	383	337	P
3	4960.00	-12.89	28.40	15.51	54.00	-38.49	Average	311	310	P
4	4960.00	-12.89	58.50	45.61	74.00	-28.39	Peak	311	310	P
5	7440.00	-9.88	28.86	18.98	54.00	-35.02	Average	331	25	P
6	7440.00	-9.88	58.96	49.08	74.00	-24.92	Peak	331	25	P

Note: Level=Reading+Factor
 Margin=Level-Limit
 Factor=Antenna Factor + cable loss - Amplifier Factor



6.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz



7. Test of Conducted Spurious Emission

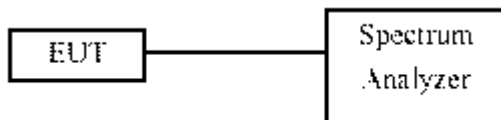
7.1 Test Limit

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

7.2 Test Procedure

- a. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- b. Set both RBW and VBW of spectrum analyzer to 100 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- c. The band edges was measured and recorded.

7.3 Test Setup Layout



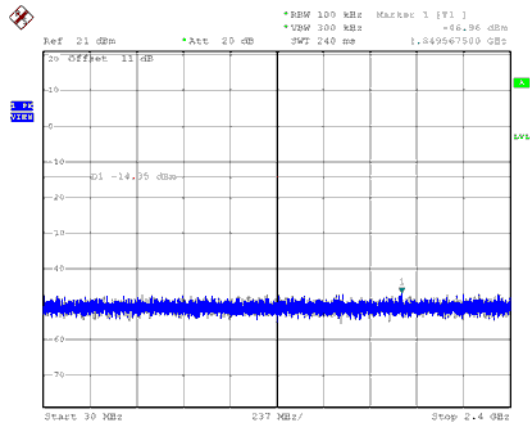
7.4 Test Result and Data

Test Result	: PASS	Temperature	: 22°C
Test Date	: Nov. 16, 2017	Humidity	: 67%

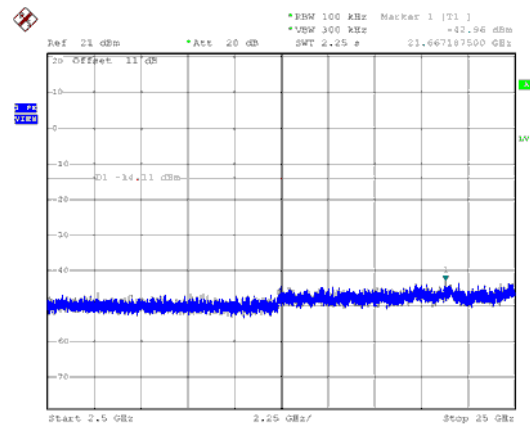
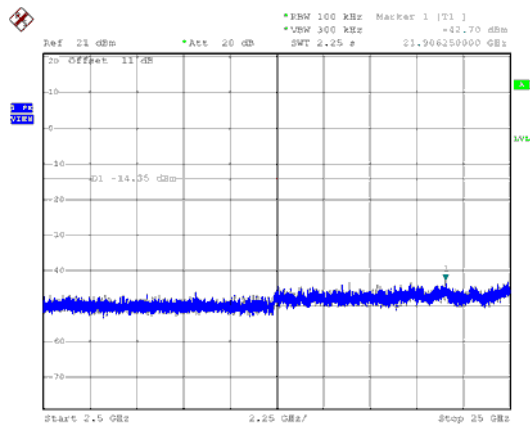
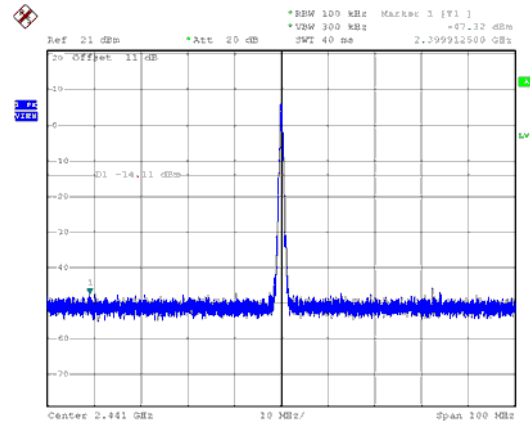
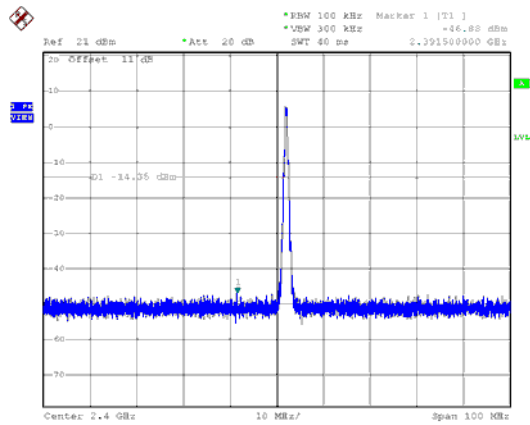
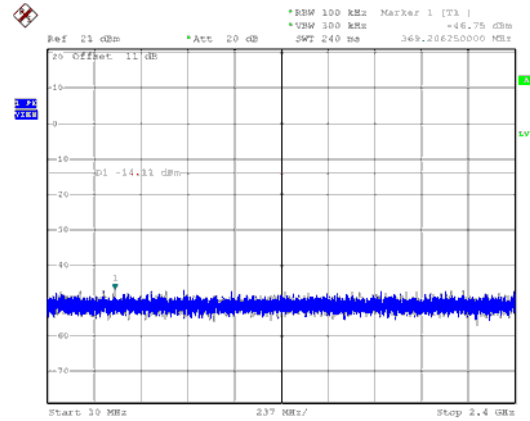
Note: Test plots refer to the following pages.



Modulation Type: GFSK, CH00

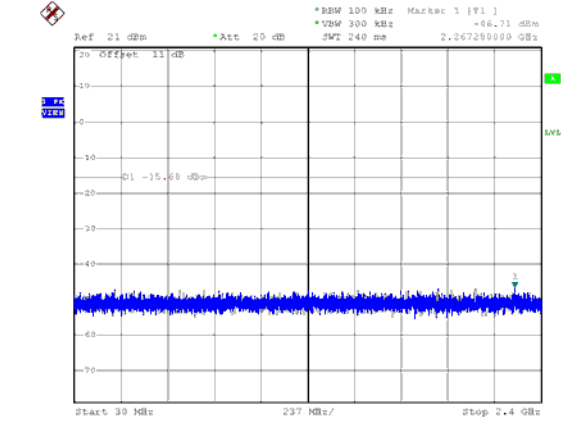


Modulation Type: GFSK, CH39

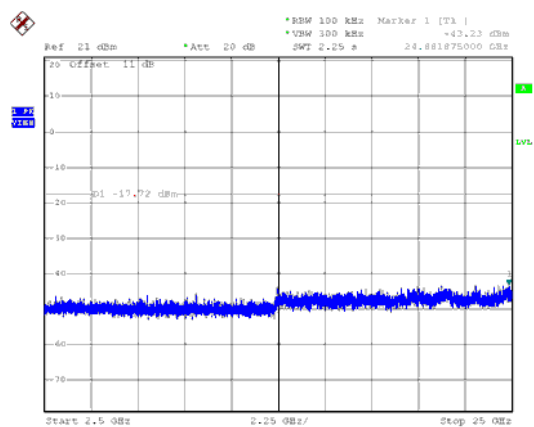
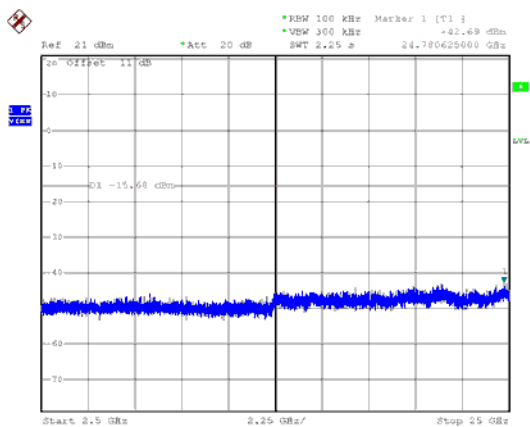
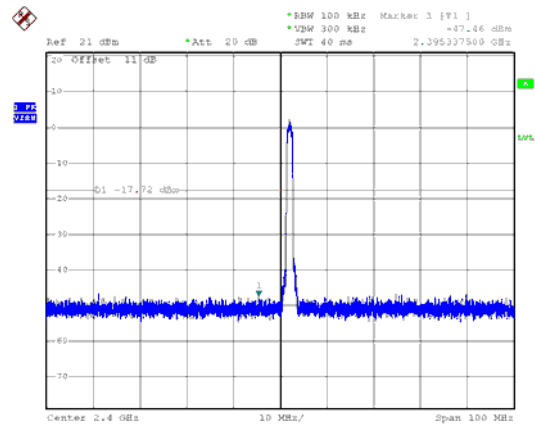
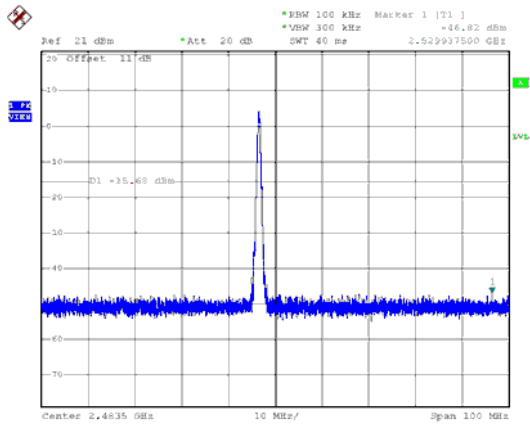
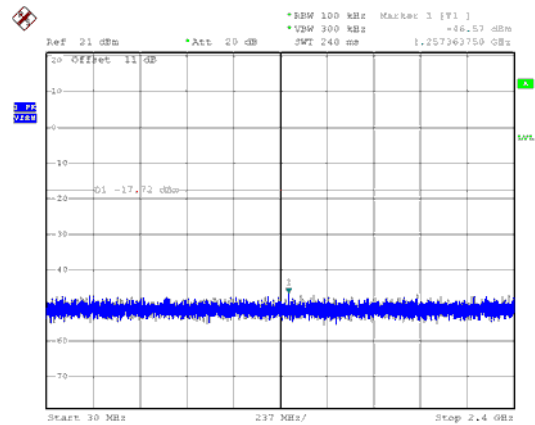




Modulation Type: GFSK, CH78

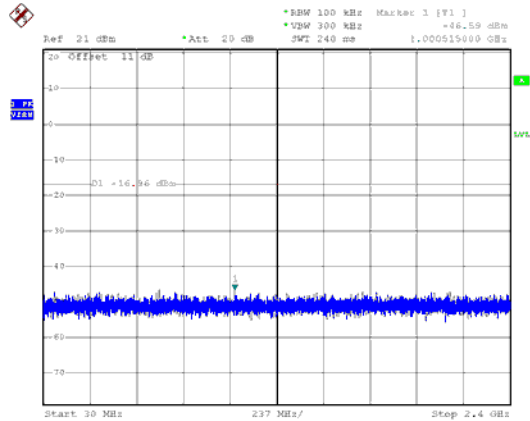


Modulation Type: $\pi/4$ -DQPSK, CH00

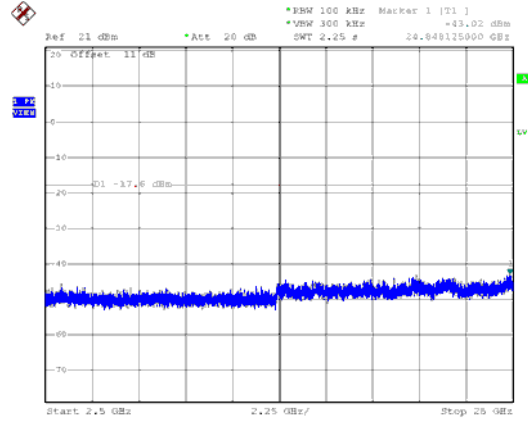
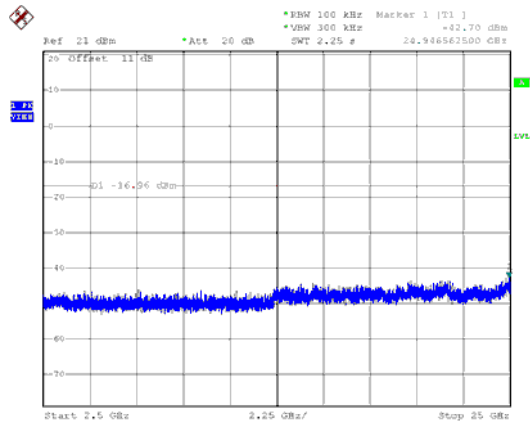
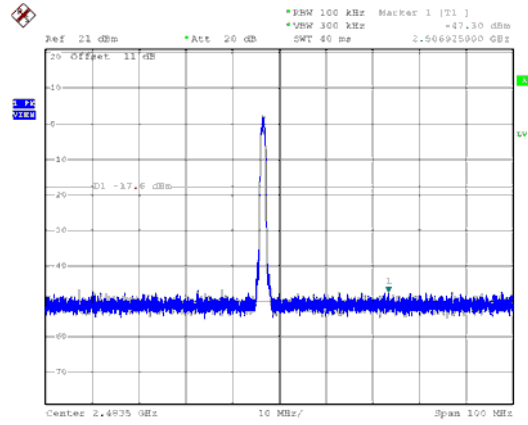
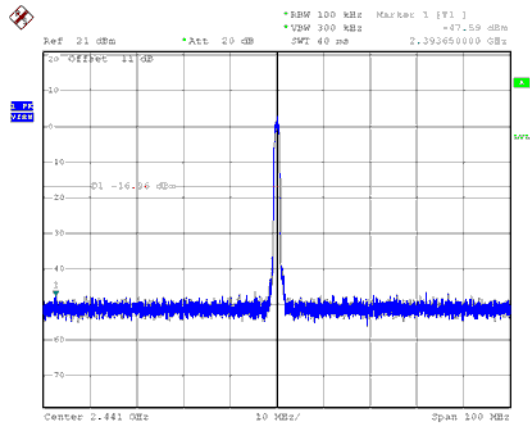
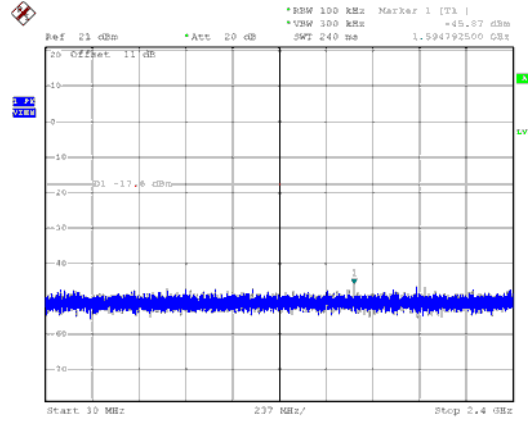




Modulation Type: $\pi/4$ -DQPSK, CH39

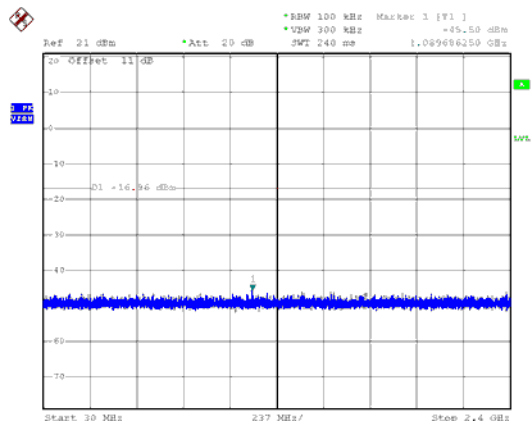


Modulation Type: $\pi/4$ -DQPSK, CH78

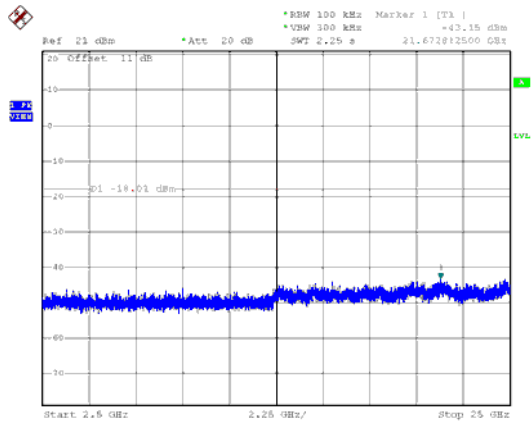
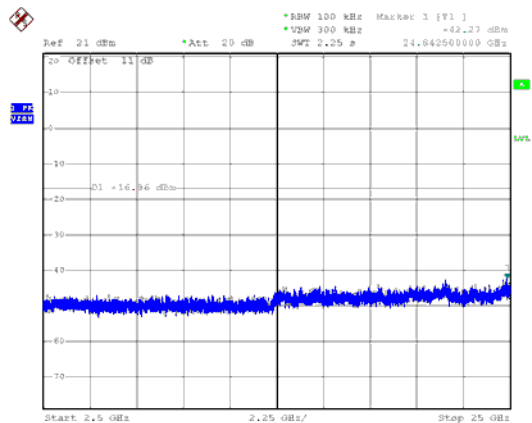
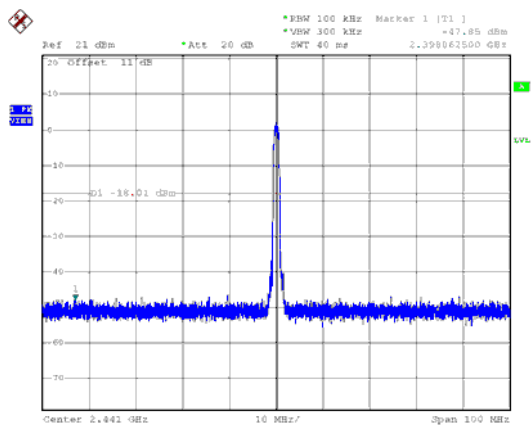
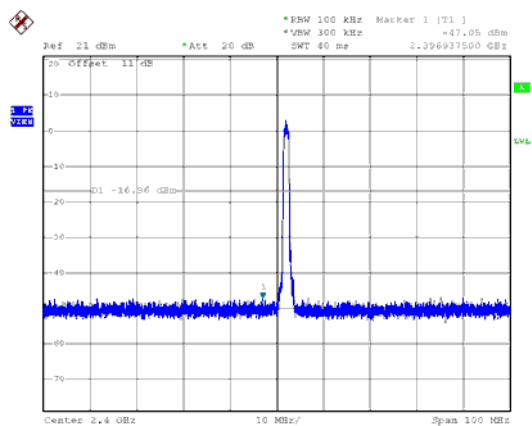
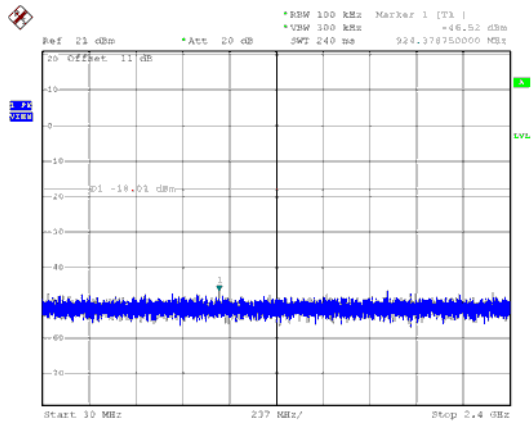




Modulation Type: 8DPSK, CH00

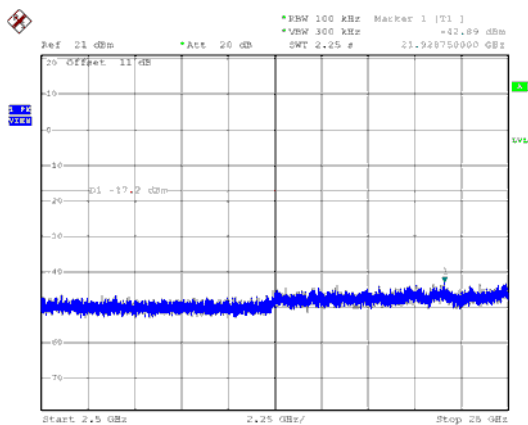
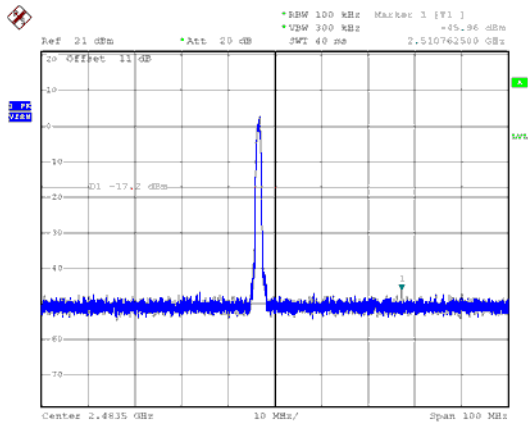
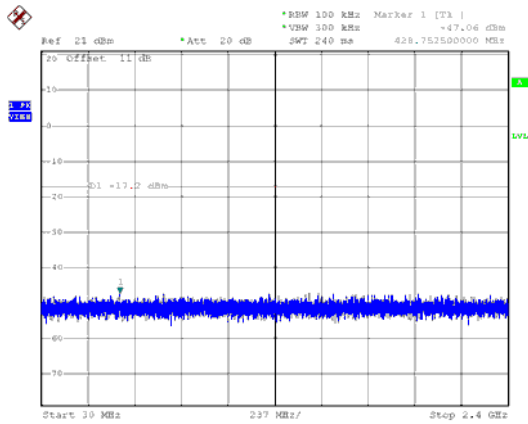


Modulation Type: 8DPSK, CH39





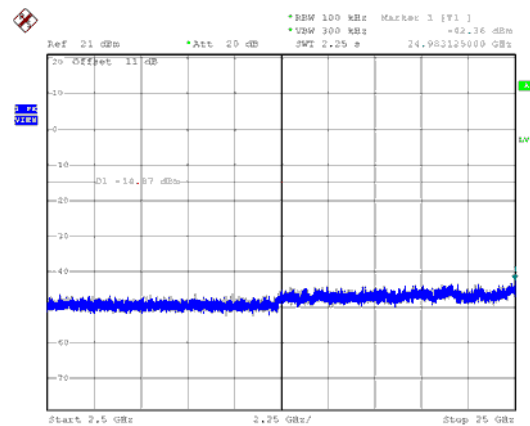
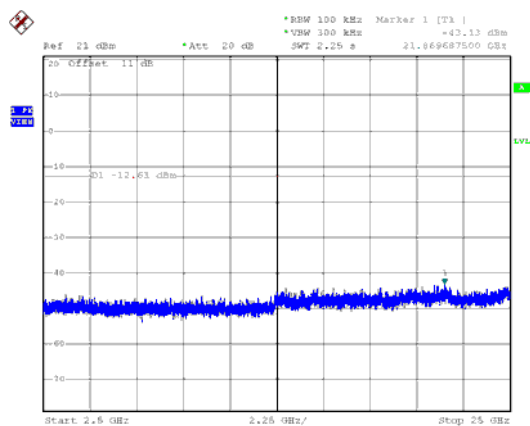
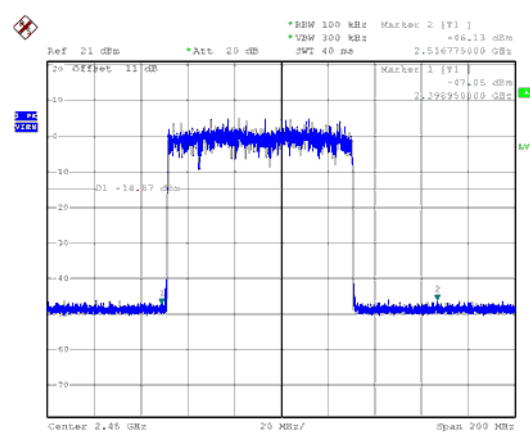
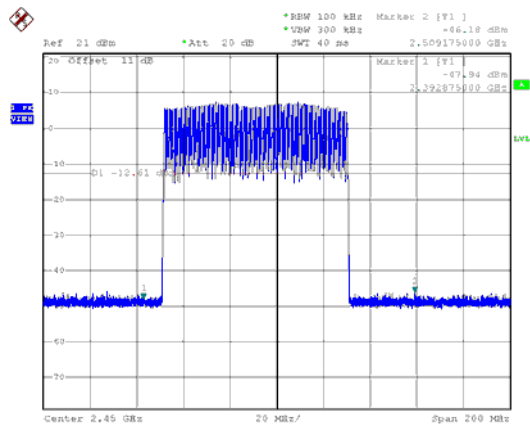
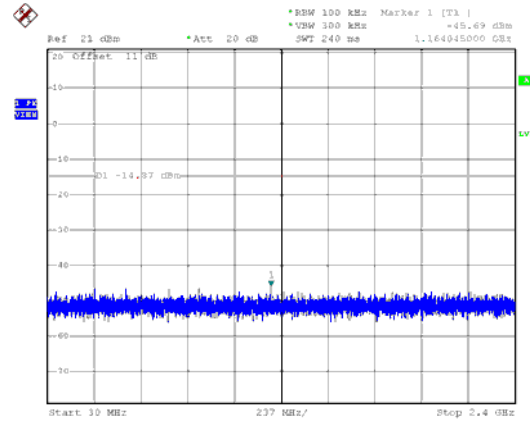
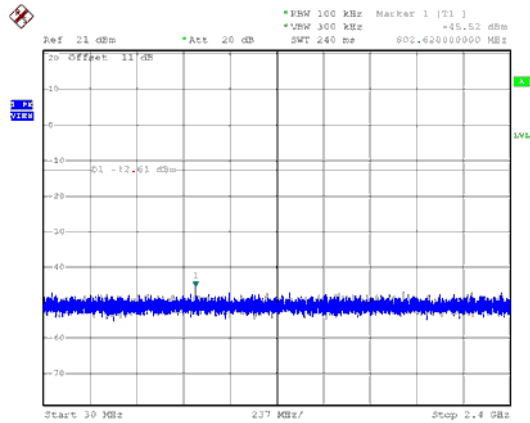
Modulation Type: 8DPSK, CH78





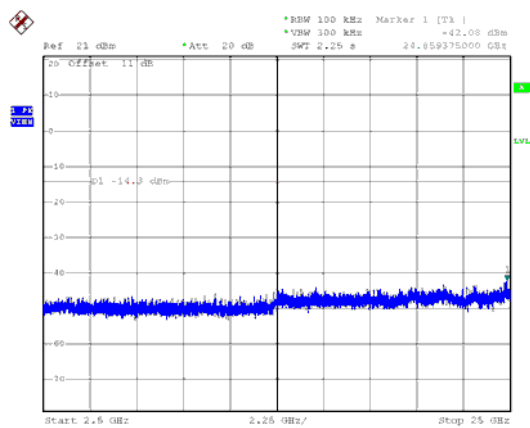
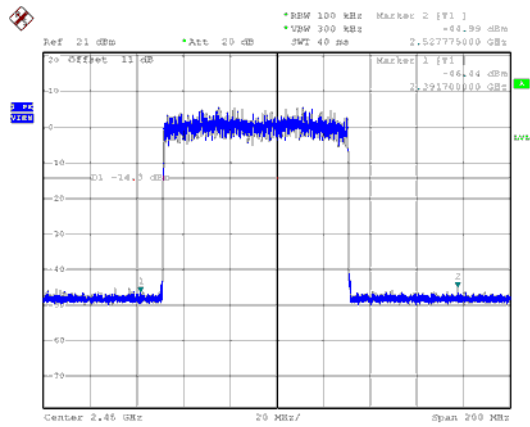
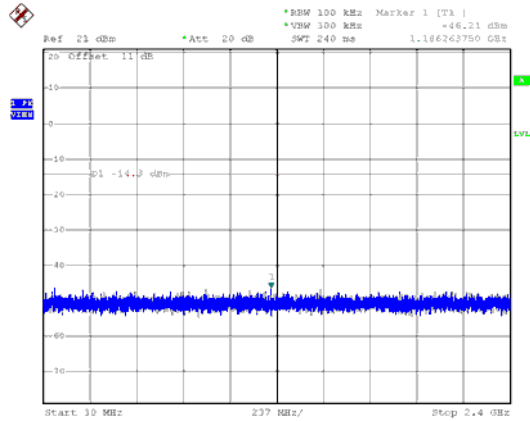
Hopping Mode:
Modulation Type: GFSK

Modulation Type: $\pi/4$ -DQPSK



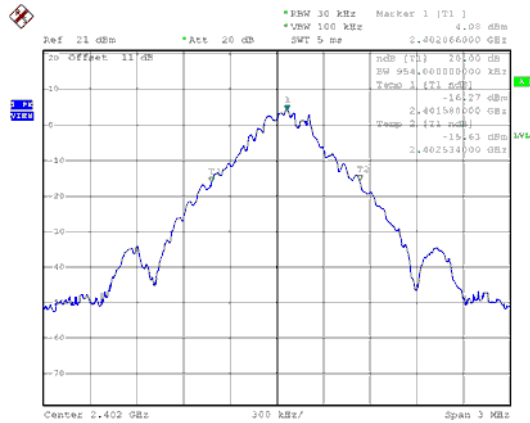


Modulation Type: 8DPSK

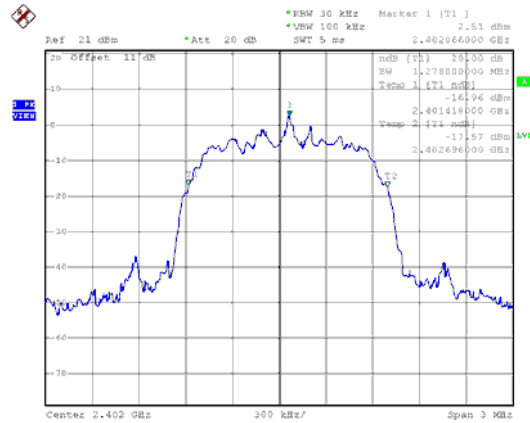




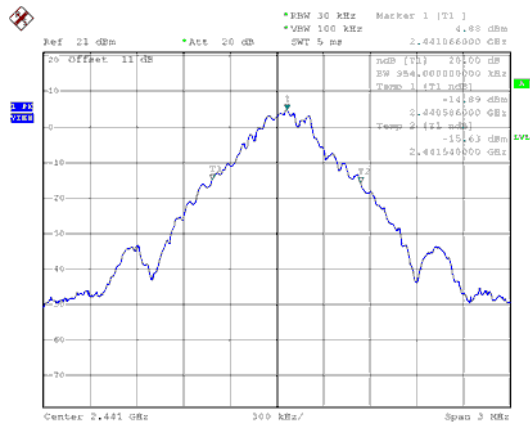
Modulation Type: GFSK
CH00



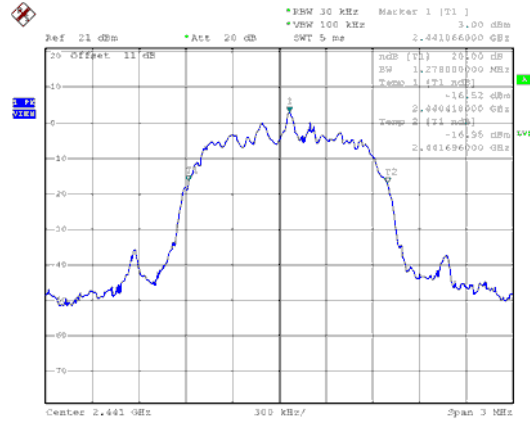
Modulation Type: $\pi/4$ -DQPSK
CH00



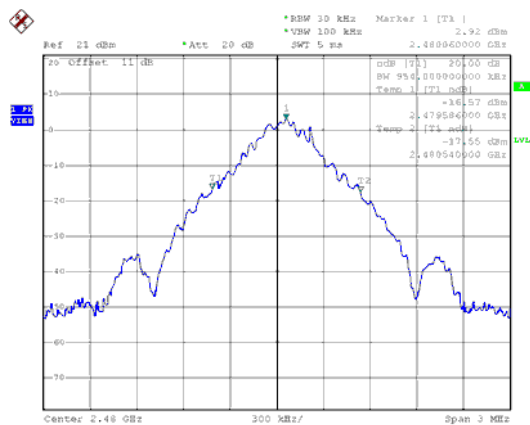
CH39



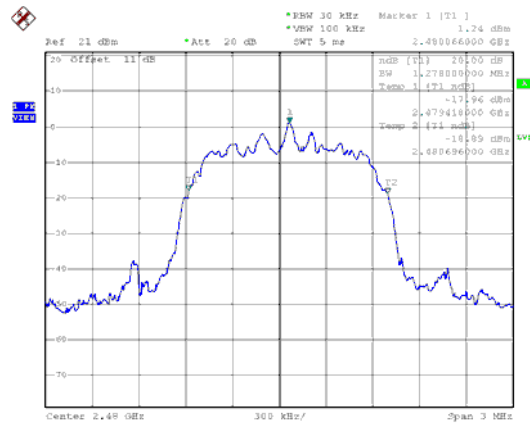
CH39



CH78

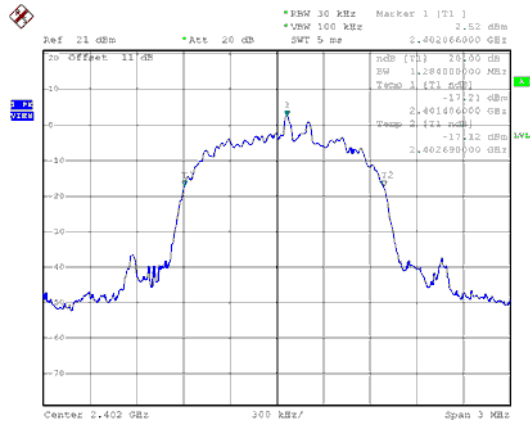


CH78

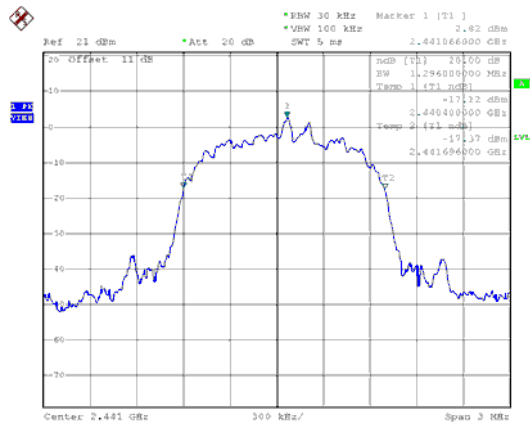




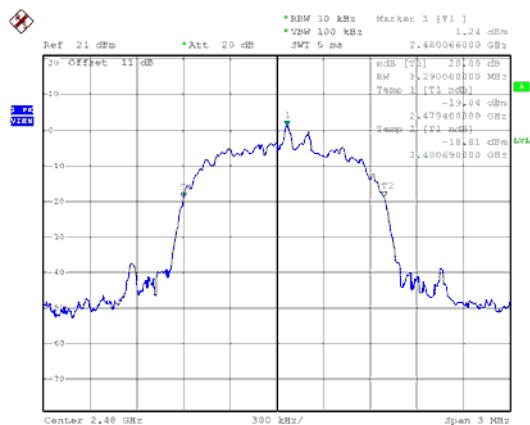
Modulation Type: 8DSPK
CH00



CH39

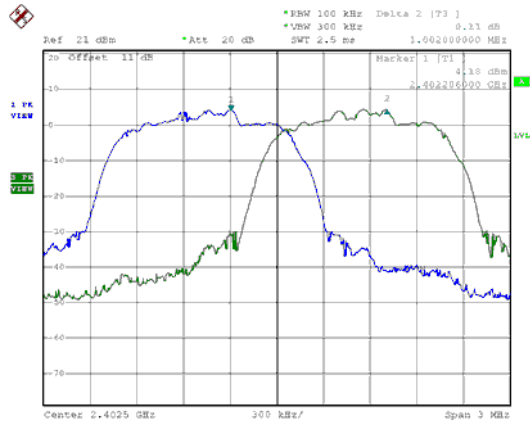


CH78

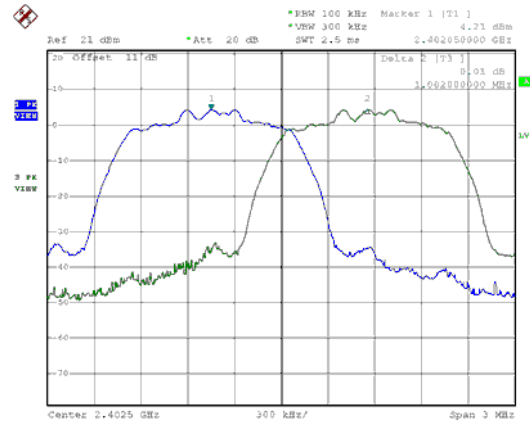




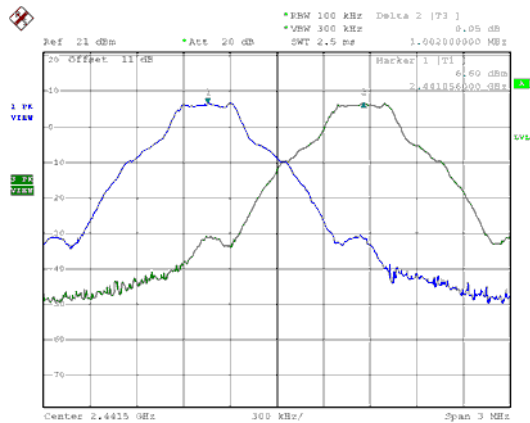
Modulation Type: GFSK
CH00



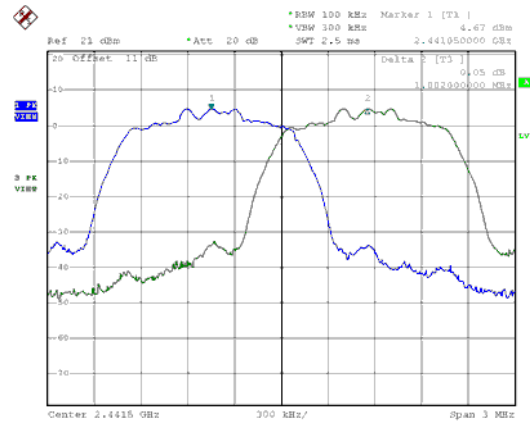
Modulation Type: $\pi/4$ -DQPSK
CH00



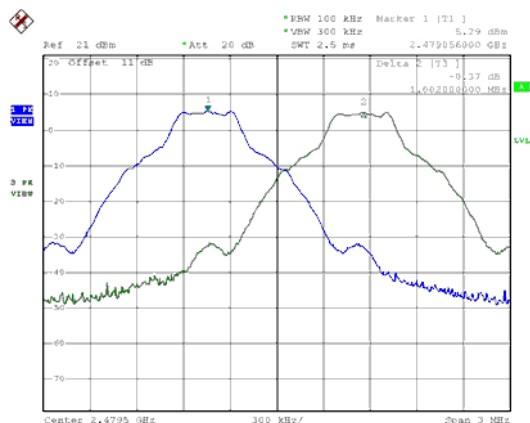
CH39



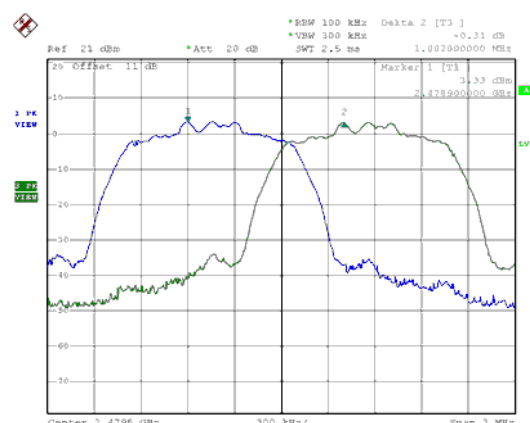
CH39



CH78

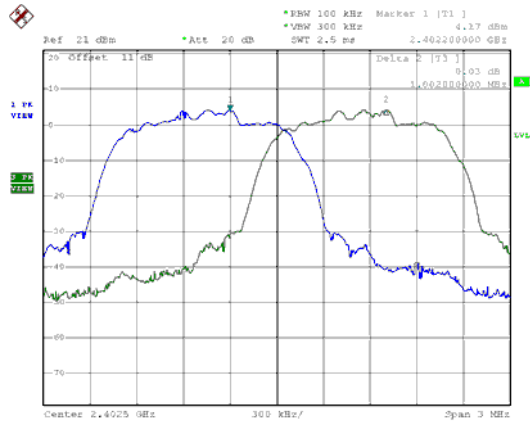


CH78

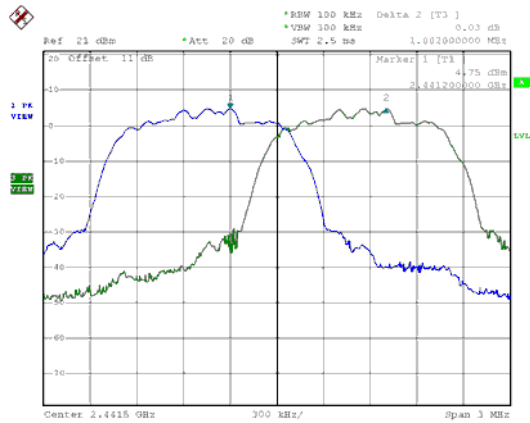




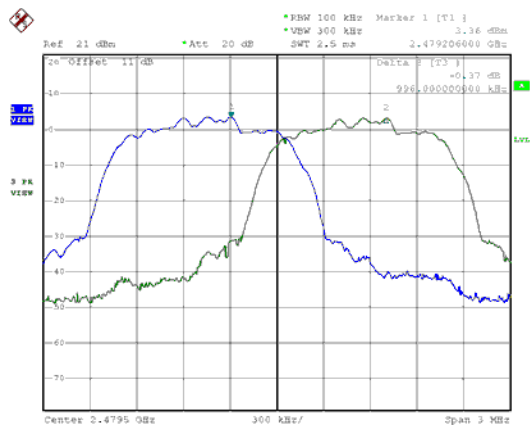
Modulation Type: 8DSPK
CH00



CH39



CH78





10. Dwell Time on each channel

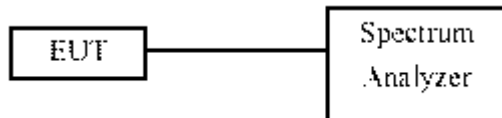
10.1 Test Limit

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 the number of hopping channels employed.

10.2 Test Procedures

1. The transmitter output was connected to the spectrum analyzer.
2. Adjust the center frequency to measure frequency, then set zero span mode.
2. Set RBW of spectrum analyzer to 1 MHz and VBW to 1 MHz.
4. Measure the time duration of one transmission on the measured frequency.

10.3 Test Setup Layout



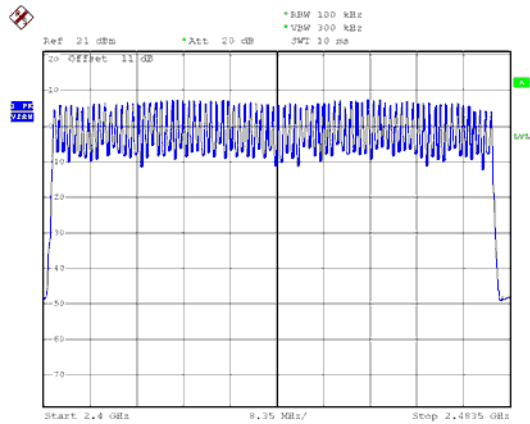
10.4 Test Result and Data

Test Result : PASS Temperature : 22°C
 Test Date : Nov. 16, 2017 Humidity : 67%
 Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec

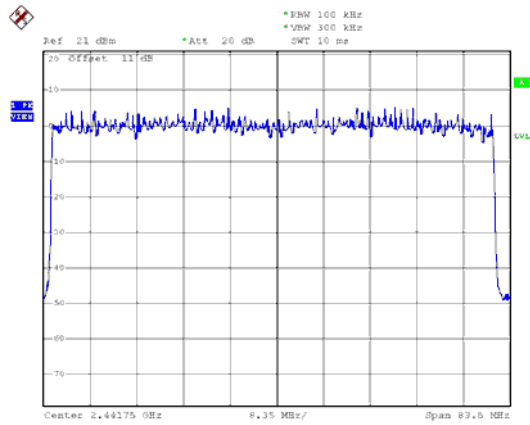
Modulation Type	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 31.6 (79 Hopping*0.4)	Dwell Time (ms)	Limit (ms)
GFSK (DH1)	2402	0.408	320.10	130.60	400
GFSK (DH3)	2402	1.680	159.90	268.63	400
GFSK (DH5)	2402	2.940	106.81	314.02	400
$\pi/4$ -DQPSK (DH1)	2402	0.416	320.10	133.16	400
$\pi/4$ -DQPSK (DH3)	2402	1.690	159.90	270.23	400
$\pi/4$ -DQPSK (DH5)	2402	2.930	106.81	312.95	400
8DPSK (DH1)	2402	0.416	320.10	133.16	400
8DPSK (DH3)	2402	1.680	159.90	268.63	400
8DPSK (DH5)	2402	2.930	106.81	312.95	400



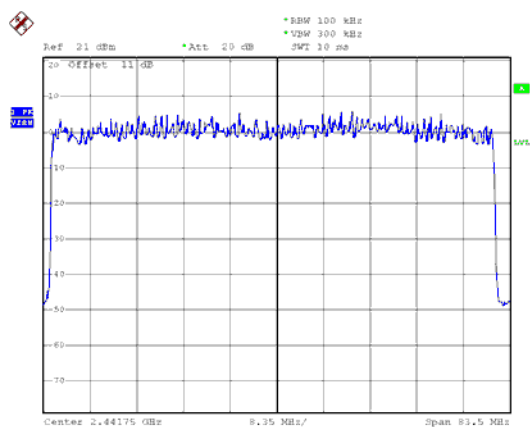
Modulation Type: GFSK



Modulation Type: $\pi/4$ -DQPSK



Modulation Type: 8DPSK





12. Maximum Peak Output Power

12.1 Test Limit

The Maximum Peak Output Power Measurement is 21dBm.

12.2 Test Procedures

The antenna port(RF output)of the EUT was connected to the input(RF input)of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

12.3 Test Setup Layout



