



# FCC RADIO TEST REPORT

Applicant : Argox Information Co. Ltd.  
Address : 7F, No. 126, Lane. 235, Baoqiao Rd., Xindian  
Dist., New Taipei City 231, Taiwan, (R.O.C.)  
Equipment : Handheld Barcode Scanner  
Model No. : AR-3101, AR-3201, AR-3121  
Trade Name : ARGOX  
FCC ID. : NBF-AR-3XXX

## I HEREBY CERTIFY THAT :

The sample was received on Nov. 07, 2018 and the testing was carried out on Feb. 14, 2019 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 / Supervisor

Tested by:

Spree Yeh / Engineer

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory





## Contents

<b>1. Summary of Test Procedure and Test Results</b>	<b>5</b>
1.1 Applicable Standards	5
<b>2. Test Configuration of Equipment under Test</b>	<b>6</b>
2.1 Feature of Equipment under Test	6
2.2 The Difference of Model No.	6
2.3 Carrier Frequency of Channes	7
2.4 Test Mode & Test Software	8
2.5 Description of Test System	8
2.6 General Information of Test	9
2.7 Measurement Uncertainty	9
<b>3. Test Equipment and Ancillaries Used for Tests</b>	<b>10</b>
<b>4. Antenna Requirements</b>	<b>11</b>
4.1 Standard Applicable	11
4.2 Antenna Construction and Directional Gain	11
<b>5. Test of AC Power Line Conducted Emission</b>	<b>12</b>
5.1 Test Limit	12
5.2 Test Procedures	12
5.3 Typical Test Setup	13
5.4 Test Result and Data	14
5.5 Test Photographs	22
<b>6. Test of Radiated Spurious Emission</b>	<b>26</b>
6.1 Test Limit	26
6.2 Test Procedures	26
6.3 Typical Test Setup	27
6.4 Test Result and Data (9kHz ~ 30MHz)	28
6.5 Test Result and Data (30MHz ~ 1GHz)	28
6.6 Test Result and Data (1GHz ~ 25GHz)	38
6.7 Restricted Bands of Operation	50
6.8 Test Photographs (30MHz ~ 1GHz)	51
6.9 Test Photographs (1GHz ~ 25GHz)	56
<b>7. Test of Conducted Spurious Emission</b>	<b>57</b>
7.1 Test Limit	57
7.2 Test Procedure	57
7.3 Test Setup Layout	57
7.4 Test Result and Data	57
<b>8. 20dB Bandwidth Measurement Data</b>	<b>65</b>
8.1 Test Limit	65
8.2 Test Procedures	65
8.3 Test Setup Layout	65
8.4 Test Result and Data	65
<b>9. Frequencies Separation</b>	<b>68</b>
9.1 Test Limit	68



9.2 Test Procedures ..... 68

9.3 Test Setup Layout ..... 68

9.4 Test Result and Data ..... 68

**10. Dwell Time on each channel ..... 71**

10.1 Test Limit ..... 71

10.2 Test Procedures ..... 71

10.3 Test Setup Layout ..... 71

10.4 Test Result and Data ..... 72

**11. Number of Hopping Channels ..... 77**

11.1 Test Limit ..... 77

11.2 Test Procedures ..... 77

11.3 Test Setup Layout ..... 77

11.4 Test Result and Data ..... 77

**12. Maximum Peak Output Power ..... 79**

12.1 Test Limit ..... 79

12.2 Test Procedures ..... 79

12.3 Test Setup Layout ..... 79

12.4 Test Result and Data ..... 80

**13. Radio Frequency Exposure ..... 81**

13.1 EUT Specification ..... 81

13.2 Test Results ..... 82





# 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

Model No	AR-3101, AR-3201, AR-3121
Frequency Range	2400-2483.5MHz
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Data Rate	GFSK: 1Mbps, $\pi/4$ -DQPSK: 2Mbps, 8DPSK: 3Mbps
Antenna Type	Dipole Antenna
Antenna Gain	2.07dBi
Cradle	CRD-3101, CRD-3201, CRD-3121
Cable	KBW Cable Model: MD 6P(F)+ MD 6P(M)/SR/10P10C USB Cable Model: USB A TYPE 4M/10P10C RS-232 Cable Model: DB 9F + DCJACK/SR + 10P10C CMIM1704

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

### 2.2 The Difference of Model No.

The difference between all models is the different scanning modules, and the circuit design and layout are the same for all models.

Model No.	Difference	Cradle
AR-3101	Scanning module CCD short distance.	CRD-3101
AR-3201	Scanning module CCD long distance.	CRD-3201
AR-3121	Scanning module 2D	CRD-3121



### 2.3 Carrier Frequency of Channes

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
<b>*00</b>	<b>2402</b>	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	<b>*78</b>	<b>2480</b>
19	2421	<b>*39</b>	<b>2441</b>	59	2461	---	---

Note: Channels remarked \* are selected to perform test.



## 2.4 Test Mode & Test Software

- During testing, the interface cables and equipment positions were varied according to ANSI C63.10
- The complete test system included Notebook and EUT for RF test.
- An executive program, "BlueSuit: 2.5.8" under WIN 7 was executed to transmit and receive data via Bluetooth.
- The following test modes were performed for the test:

AC Power Line Conducted Emission	
Test Mode	Operating Description
1	GFSK (1Mbps) RS232 from Adapter Mode
2	$\pi/4$ -DQPSK (2Mbps) RS232 from Adapter Mode
3	8DPSK (3Mbps) RS232 from Adapter Mode
4	GFSK (1Mbps) from PS2 Mode
5	GFSK (1Mbps) RS232 from USB Mode
6	GFSK (1Mbps) from USB Mode
Test Mode 1, 4, 5, 6 generates the worst case; it was reported as final result.	
Radiated Emissions (below 1GHz)	
Test Mode	Operating Description
1	GFSK (1Mbps) from Battery Mode
2	$\pi/4$ -DQPSK (2Mbps) from Battery Mode
3	8DPSK (3Mbps) from Battery Mode
4	GFSK (1Mbps) from PS2 Mode
5	GFSK (1Mbps) RS232 from Adapter Mode
6	GFSK (1Mbps) RS232 from USB Mode
7	GFSK (1Mbps) from USB Mode
Test Mode 1, 4, 5, 6, 7 generates the worst case; it was reported as final result.	
Radiated Emissions (above 1GHz)	
Test Mode	Operating Description
1	GFSK (1Mbps)
2	$\pi/4$ -DQPSK (2Mbps)
3	8DPSK (3Mbps)
Test Mode 1 & 3 generates the worst case; it was reported as final result.	
Maximum Peak Output Power	
Test Mode	Operating Description
1	GFSK (1Mbps)
2	$\pi/4$ -DQPSK (2Mbps)
3	8DPSK (3Mbps)

## 2.5 Description of Test System

Device	Manufacturer	Model No.	Description
Notebook	ASUS	P2430U	Power Cable, Non-shielded, 1.8m





## 2.6 General Information of Test

Test Site	<b>Cerpass Technology Corporation Test Laboratory</b> 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-812, G-813 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.	

## 2.7 Measurement Uncertainty

Measurement Item	Uncertainty
Radiated Spurious Emission(9KHz~30MHz)	±5.007dB
Radiated Spurious Emission(30MHz~1GHz)	±5.157dB
Radiated Spurious Emission(1GHz~18GHz)	±6.383dB
Radiated Spurious Emission(18GHz~40GHz)	±6.648dB
Conducted Spurious Emission	±1.253dB
6dB Bandwidth	±6.89%
Power Spectral Density	±0.630dB
26 dB Occupied Bandwidth	±6.10%
Frequency Stability	±375KHz
Channel Frequencies Separation	±6.10%
20dB Bandwidth	±6.12%
Dwell Time	±1.34%
Peak Output Power(Conducted Power Meter)	±0.86dB
Temperature	±1.2°C
Humidity	±2.7%
Channel Move Time	±4.53%
Channel Closing Transmission Time	±6.61%
Threshold	±0.631dB
Non occupancy period	±1.17%



### 3. Test Equipment and Ancillaries Used for Tests

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	275	2018/09/17	2019/09/16
Active Loop Antenna	EMCO	6507	40855	2018/05/22	2019/05/21
Horn Antenna	EMCO	3115	31589	2018/04/02	2019/04/01
Horn Antenna	EMCO	3116	31974	2018/09/07	2019/09/06
EMI Receiver	ROHDE & SCHWARZ	ESCI 3	101402	2018/02/23	2019/02/22
Spectrum Analyzer	ROHDE & SCHWARZ	FSP40	100047	2018/03/20	2019/03/19
Preamplifier	EM Electronics corp.	EM330	60660	2018/03/08	2019/03/07
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2018/09/18	2019/09/17
BLUETOOTH TESTER	ROHDE & SCHWARZ	CBT	101133	2018/04/02	2019/04/01
Cable-3in1-(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2018/04/20	2019/04/19
Cable-0.5m-(1G-40G)	Rapidtek	40GHZ 50CM	38MS-38MS 50314	2018/03/27	2019/03/26
Cable-1m-(1G-40G)	Rapidtek	40GHZ 300CM	38MS-38MS 300314	2018/03/27	2019/03/26
Cable-6m-(1G-40G)	Rapidtek	40GHZ 800CM	38MS-38MS 800314	2018/03/27	2019/03/26
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA
Spectrum Analyzer	ROHDE & SCHWARZ	FSP40	100219	2018/07/03	2019/07/02
BLUETOOTH TESTER	ROHDE & SCHWARZ	CBT	101133	2018/04/02	2019/04/01
Attenuator	KEYSIGHT	8491B	MY39250705	2018/09/04	2019/09/03
TEMP & HUMI CHAMBER	T-MACHINE	TMJ-9712	T-12-040111	2018/08/30	2019/08/29
Power Sensor	Anritsu	MA2411B	1207295	2018/03/23	2019/03/22
EMI Receiver	ROHDE & SCHWARZ	ESCI 3	100443	2018/3/15	2019/3/14
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-740	2018/6/13	2019/6/12
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	101933	2018/9/4	2019/9/3
E3	AUDIX	v8.2014-8-6	RK-000531	NA	NA
EMI Receiver	ROHDE & SCHWARZ	ESCI 3	100443	2018/3/15	2019/3/14
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-740	2018/6/13	2019/6/12
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	101933	2018/9/4	2019/9/3
E3	AUDIX	v8.2014-8-6	RK-000531	NA	NA



## 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	Dipole Antenna
Antenna Gain	2.07dBi



## 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 $\mu$ V)	Average (dB $\mu$ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

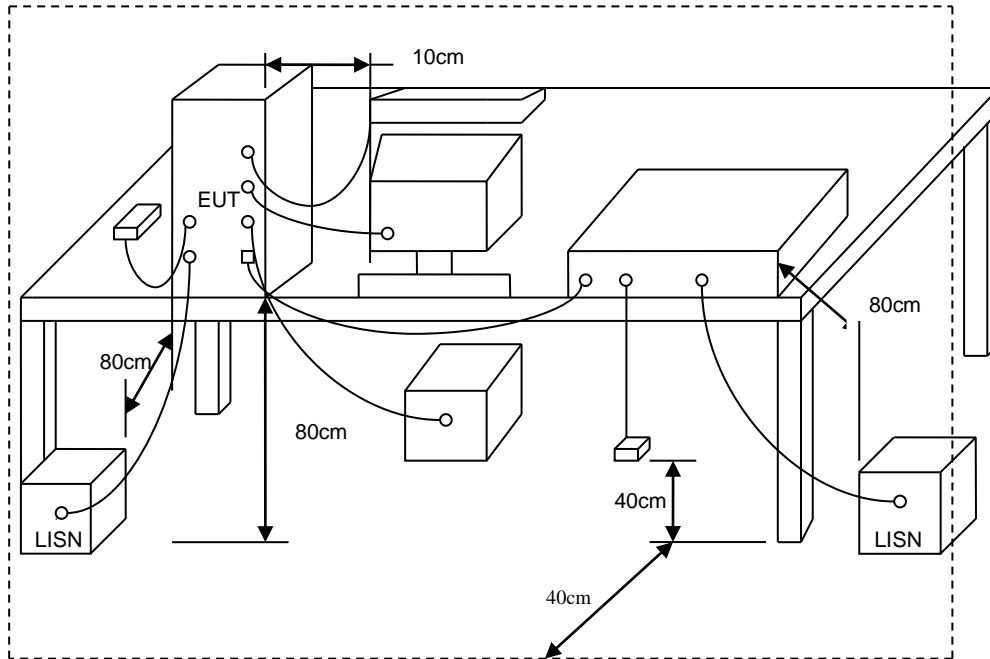
\*Decreases with the logarithm of the frequency.

### 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.



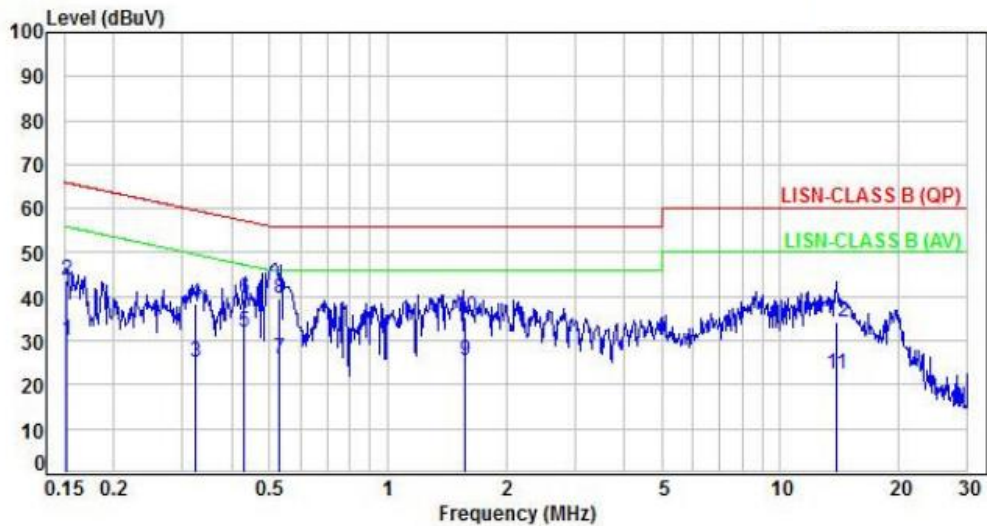
### 5.3 Typical Test Setup





### 5.4 Test Result and Data

Power	: From System	Pol/Phase	: LINE
Test Mode	: Mode 1	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

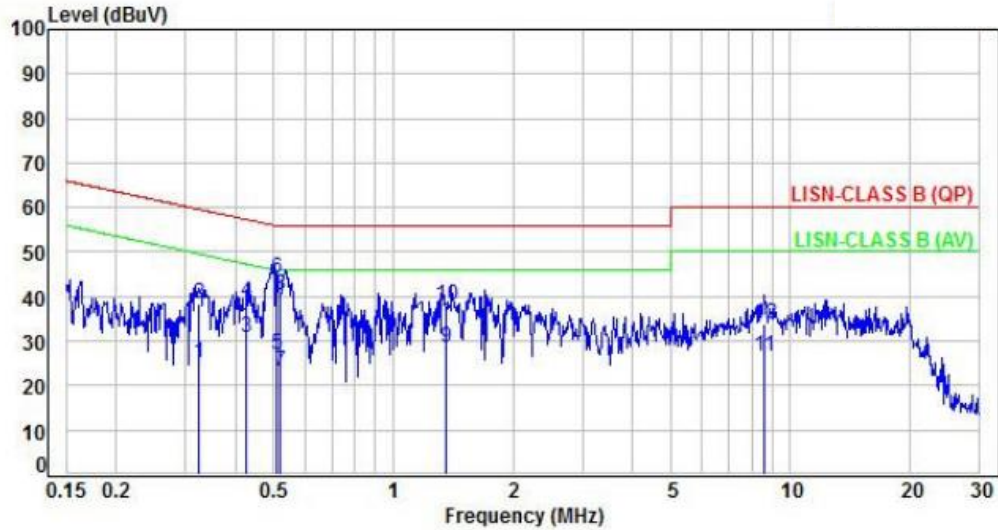


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.70	20.50	30.20	55.92	-25.72	Average	P
2	0.15	9.70	33.92	43.62	65.92	-22.30	QP	P
3	0.32	9.70	15.33	25.03	49.65	-24.62	Average	P
4	0.32	9.70	28.68	38.38	59.65	-21.27	QP	P
5	0.43	9.70	22.13	31.83	47.27	-15.44	Average	P
6	0.43	9.70	30.02	39.72	57.27	-17.55	QP	P
7	0.53	9.70	16.32	26.02	46.00	-19.98	Average	P
8	0.53	9.70	29.84	39.54	56.00	-16.46	QP	P
9	1.57	9.77	15.58	25.35	46.00	-20.65	Average	P
10	1.57	9.77	25.49	35.26	56.00	-20.74	QP	P
11	13.87	9.97	12.60	22.57	50.00	-27.43	Average	P
12	13.87	9.97	24.19	34.16	60.00	-25.84	QP	P

Note: Level=Reading+Factor  
Margin=Level-Limit  
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: From System	Pol/Phase	: NEUTRAL
Test Mode	: Mode 1	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

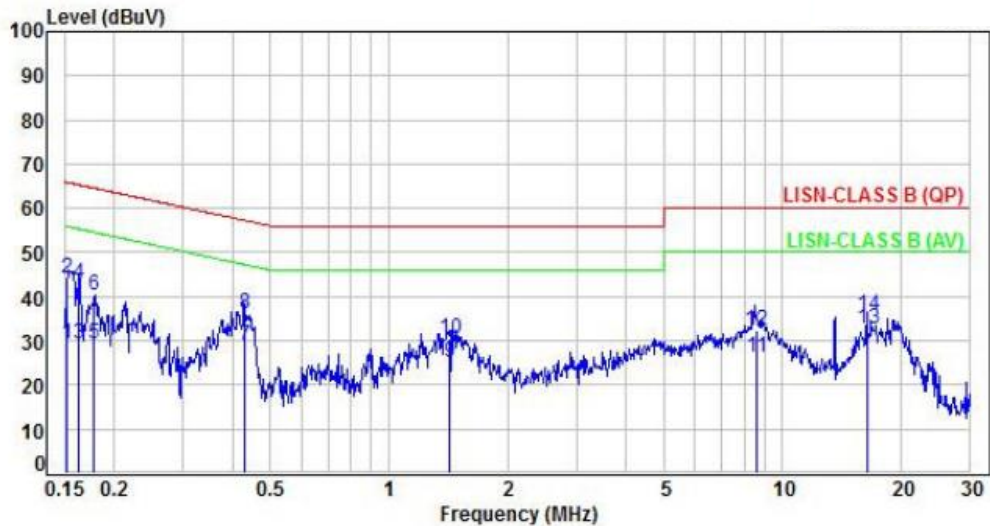


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.32	9.70	15.22	24.92	49.61	-24.69	Average	P
2	0.32	9.70	28.61	38.31	59.61	-21.30	QP	P
3	0.43	9.70	21.09	30.79	47.33	-16.54	Average	P
4	0.43	9.70	29.24	38.94	57.33	-18.39	QP	P
5	0.51	9.70	17.12	26.82	46.00	-19.18	Average	P
6	0.51	9.70	34.33	44.03	56.00	-11.97	QP	P
7	0.52	9.70	13.50	23.20	46.00	-22.80	Average	P
8	0.52	9.70	30.63	40.33	56.00	-15.67	QP	P
9	1.36	9.76	18.66	28.42	46.00	-17.58	Average	P
10	1.36	9.76	28.21	37.97	56.00	-18.03	QP	P
11	8.59	9.94	16.58	26.52	50.00	-23.48	Average	P
12	8.59	9.94	24.04	33.98	60.00	-26.02	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: From System	Pol/Phase	: LINE
Test Mode	: Mode 4	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%



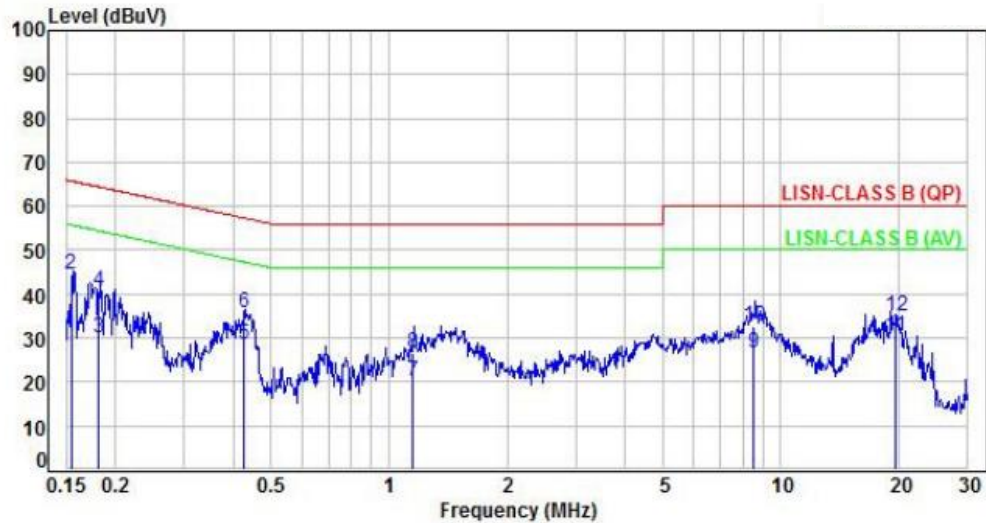
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.70	19.76	29.46	55.93	-26.47	Average	P
2	0.15	9.70	34.59	44.29	65.93	-21.64	QP	P
3	0.16	9.70	19.70	29.40	55.35	-25.95	Average	P
4	0.16	9.70	33.41	43.11	65.35	-22.24	QP	P
5	0.18	9.69	19.50	29.19	54.61	-25.42	Average	P
6	0.18	9.69	30.52	40.21	64.61	-24.40	QP	P
7	0.43	9.70	19.03	28.73	47.28	-18.55	Average	P
8	0.43	9.70	26.58	36.28	57.28	-21.00	QP	P
9	1.43	9.77	15.46	25.23	46.00	-20.77	Average	P
10	1.43	9.77	20.83	30.60	56.00	-25.40	QP	P
11	8.56	9.92	16.35	26.27	50.00	-23.73	Average	P
12	8.56	9.92	22.36	32.28	60.00	-27.72	QP	P
13	16.38	9.99	22.80	32.79	50.00	-17.21	Average	P
14	16.38	9.99	25.62	35.61	60.00	-24.39	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss





Power	: From System	Pol/Phase	: NEUTRAL
Test Mode	: Mode 4	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

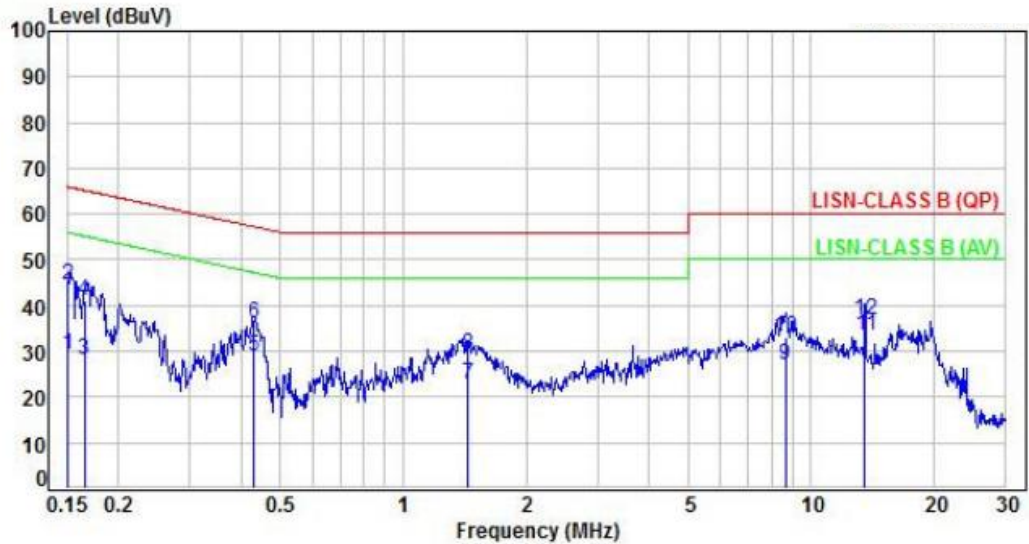


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.70	20.81	30.51	55.78	-25.27	Average	P
2	0.15	9.70	34.85	44.55	65.78	-21.23	QP	P
3	0.18	9.70	20.22	29.92	54.45	-24.53	Average	P
4	0.18	9.70	30.99	40.69	64.45	-23.76	QP	P
5	0.42	9.70	18.73	28.43	47.36	-18.93	Average	P
6	0.42	9.70	25.94	35.64	57.36	-21.72	QP	P
7	1.15	9.75	10.47	20.22	46.00	-25.78	Average	P
8	1.15	9.75	16.89	26.64	56.00	-29.36	QP	P
9	8.55	9.94	16.55	26.49	50.00	-23.51	Average	P
10	8.55	9.94	22.67	32.61	60.00	-27.39	QP	P
11	19.59	10.07	20.22	30.29	50.00	-19.71	Average	P
12	19.59	10.07	24.92	34.99	60.00	-25.01	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: From System	Pol/Phase	: LINE
Test Mode	: Mode 5	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

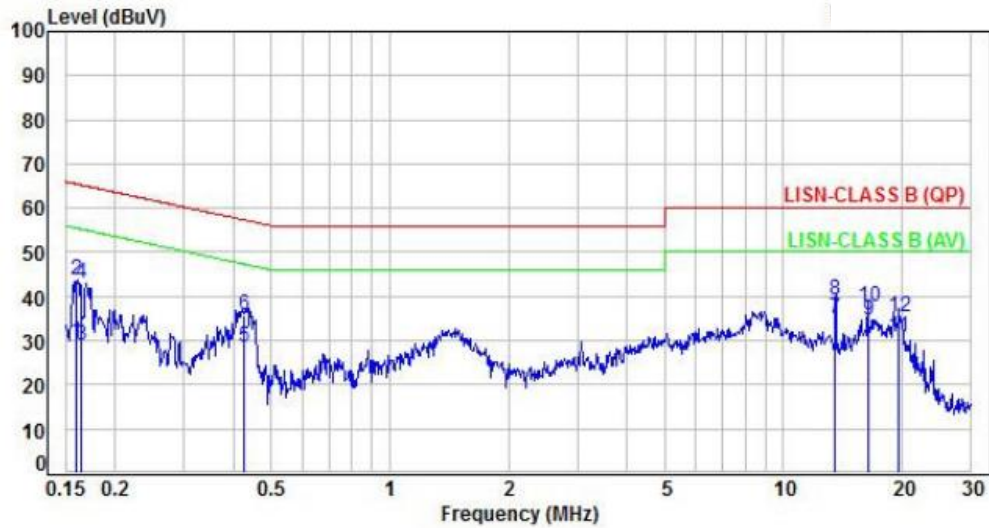


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.70	19.46	29.16	55.96	-26.80	Average	P
2	0.15	9.70	34.61	44.31	65.96	-21.65	QP	P
3	0.17	9.70	18.58	28.28	55.21	-26.93	Average	P
4	0.17	9.70	31.36	41.06	65.21	-24.15	QP	P
5	0.43	9.70	19.01	28.71	47.28	-18.57	Average	P
6	0.43	9.70	26.49	36.19	57.28	-21.09	QP	P
7	1.43	9.77	12.94	22.71	46.00	-23.29	Average	P
8	1.43	9.77	19.43	29.20	56.00	-26.80	QP	P
9	8.64	9.92	16.89	26.81	50.00	-23.19	Average	P
10	8.64	9.92	23.31	33.23	60.00	-26.77	QP	P
11	13.56	9.97	23.47	33.44	50.00	-16.56	Average	P
12	13.56	9.97	26.90	36.87	60.00	-23.13	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: From System	Pol/Phase	: NEUTRAL
Test Mode	: Mode 5	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

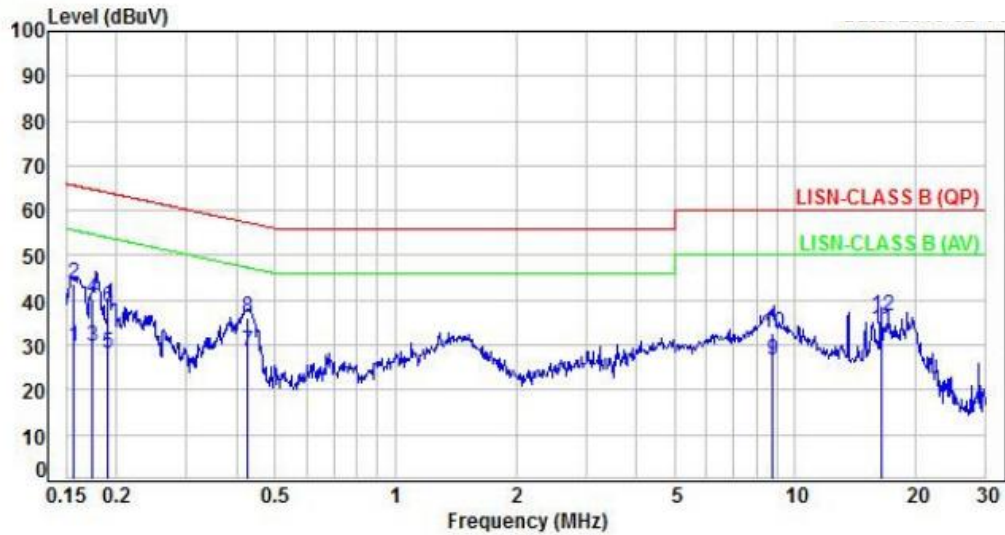


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.16	9.70	20.00	29.70	55.51	-25.81	Average	P
2	0.16	9.70	34.12	43.82	65.51	-21.69	QP	P
3	0.16	9.70	19.35	29.05	55.28	-26.23	Average	P
4	0.16	9.70	33.38	43.08	65.28	-22.20	QP	P
5	0.42	9.70	18.93	28.63	47.35	-18.72	Average	P
6	0.42	9.70	26.04	35.74	57.35	-21.61	QP	P
7	13.56	10.01	24.80	34.81	50.00	-15.19	Average	P
8	13.56	10.01	28.99	39.00	60.00	-21.00	QP	P
9	16.38	10.04	24.46	34.50	50.00	-15.50	Average	P
10	16.38	10.04	27.48	37.52	60.00	-22.48	QP	P
11	19.59	10.07	20.56	30.63	50.00	-19.37	Average	P
12	19.59	10.07	25.13	35.20	60.00	-24.80	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: From System	Pol/Phase	: LINE
Test Mode	: Mode 6	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

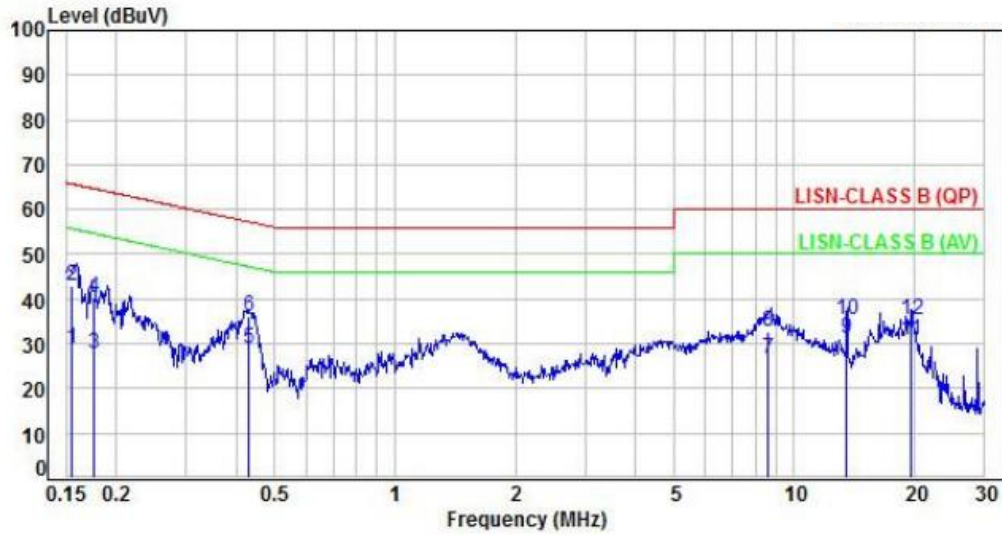


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.16	9.70	19.90	29.60	55.63	-26.03	Average	P
2	0.16	9.70	33.97	43.67	65.63	-21.96	QP	P
3	0.17	9.69	20.10	29.79	54.79	-25.00	Average	P
4	0.17	9.69	30.63	40.32	64.79	-24.47	QP	P
5	0.19	9.69	18.49	28.18	54.04	-25.86	Average	P
6	0.19	9.69	28.67	38.36	64.04	-25.68	QP	P
7	0.43	9.70	18.83	28.53	47.33	-18.80	Average	P
8	0.43	9.70	26.44	36.14	57.33	-21.19	QP	P
9	8.75	9.92	16.58	26.50	50.00	-23.50	Average	P
10	8.75	9.92	22.87	32.79	60.00	-27.21	QP	P
11	16.38	9.99	23.46	33.45	50.00	-16.55	Average	P
12	16.38	9.99	26.37	36.36	60.00	-23.64	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: From System	Pol/Phase	: NEUTRAL
Test Mode	: Mode 6	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.16	9.70	19.04	28.74	55.72	-26.98	Average	P
2	0.16	9.70	33.18	42.88	65.72	-22.84	QP	P
3	0.18	9.70	17.99	27.69	54.69	-27.00	Average	P
4	0.18	9.70	30.45	40.15	64.69	-24.54	QP	P
5	0.43	9.70	19.21	28.91	47.28	-18.37	Average	P
6	0.43	9.70	26.61	36.31	57.28	-20.97	QP	P
7	8.57	9.94	16.78	26.72	50.00	-23.28	Average	P
8	8.57	9.94	22.90	32.84	60.00	-27.16	QP	P
9	13.56	10.01	21.27	31.28	50.00	-18.72	Average	P
10	13.56	10.01	25.29	35.30	60.00	-24.70	QP	P
11	19.59	10.07	20.76	30.83	50.00	-19.17	Average	P
12	19.59	10.07	25.29	35.36	60.00	-24.64	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



## 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 ( $\mu$ V / M)	Radiated (dB $\mu$ 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 $\mu$ V / M)
30-230	10	30
230-1000	10	37

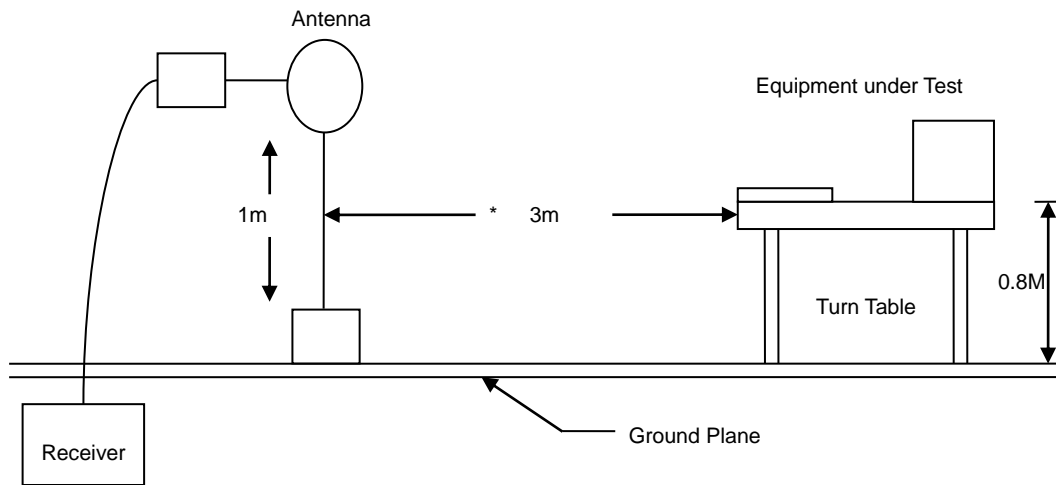
### 6.2 Test Procedures

- 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.

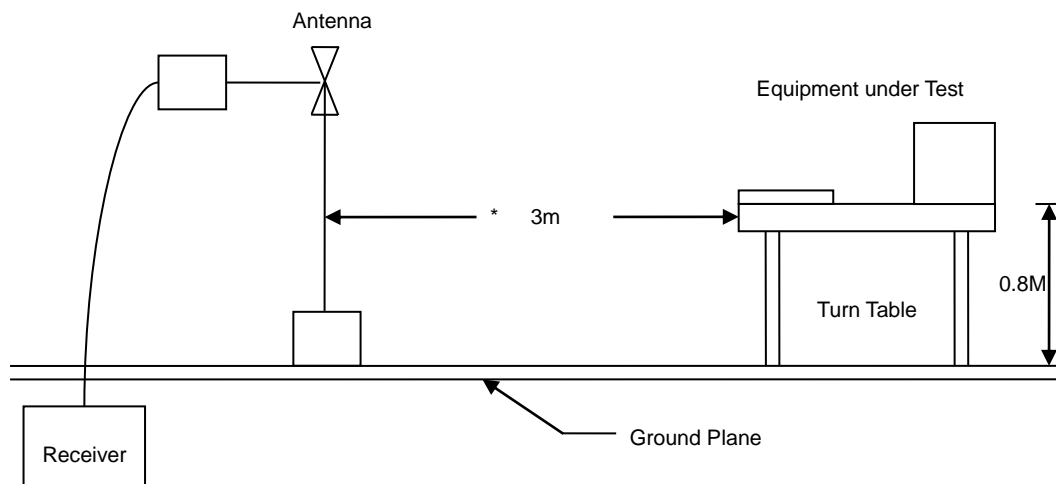


### 6.3 Typical Test Setup

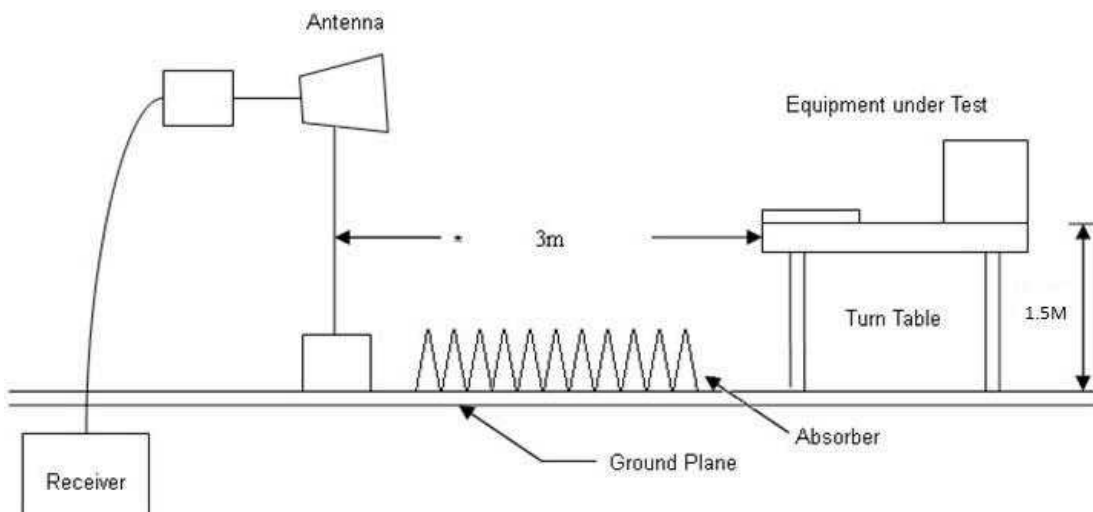
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



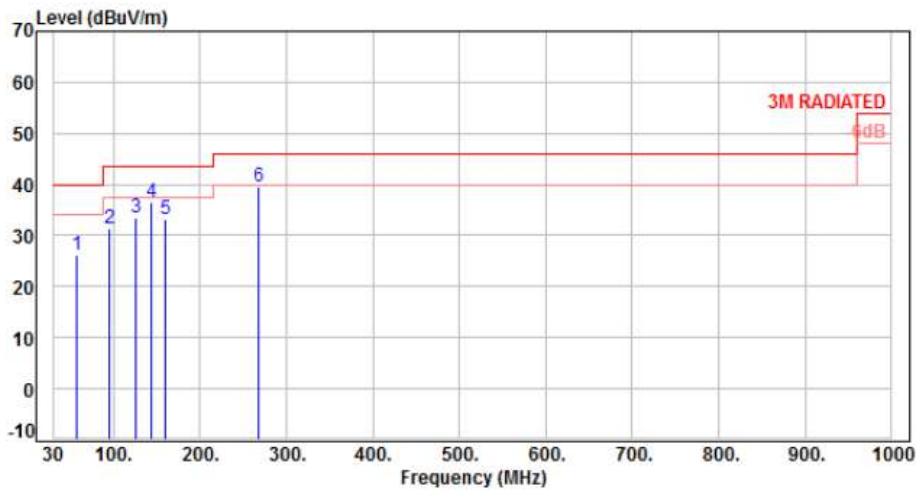


### 6.4 Test Result and Data (9kHz ~ 30MHz)

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

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

Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%



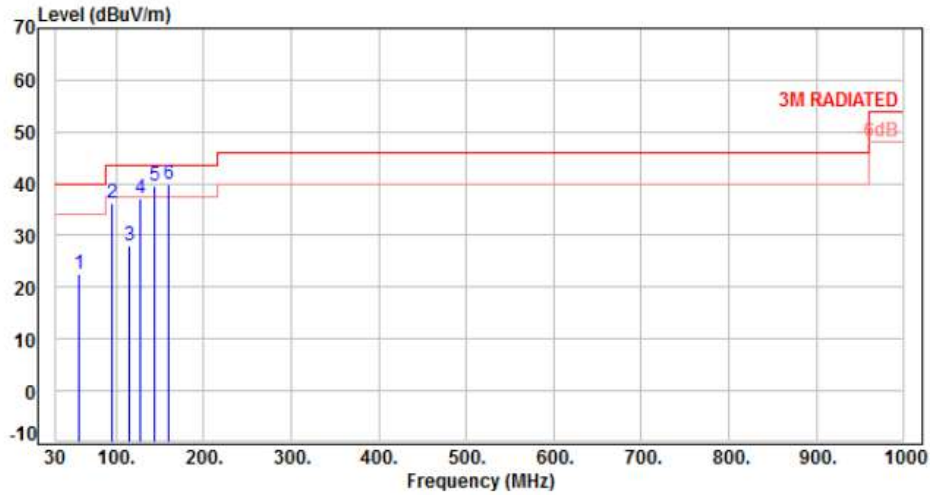
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	57.16	-9.75	35.87	26.12	40.00	-13.88	QP	100	76	P
2	95.90	-15.28	46.50	31.22	43.50	-12.28	QP	100	233	P
3	126.03	-11.15	44.70	33.55	43.50	-9.95	QP	100	211	P
4	144.00	-9.61	46.20	36.59	43.50	-6.91	QP	100	98	P
5	159.66	-9.24	42.56	33.32	43.50	-10.18	QP	100	317	P
6	268.62	-9.53	49.19	39.66	46.00	-6.34	Peak	100	0	P

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





Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

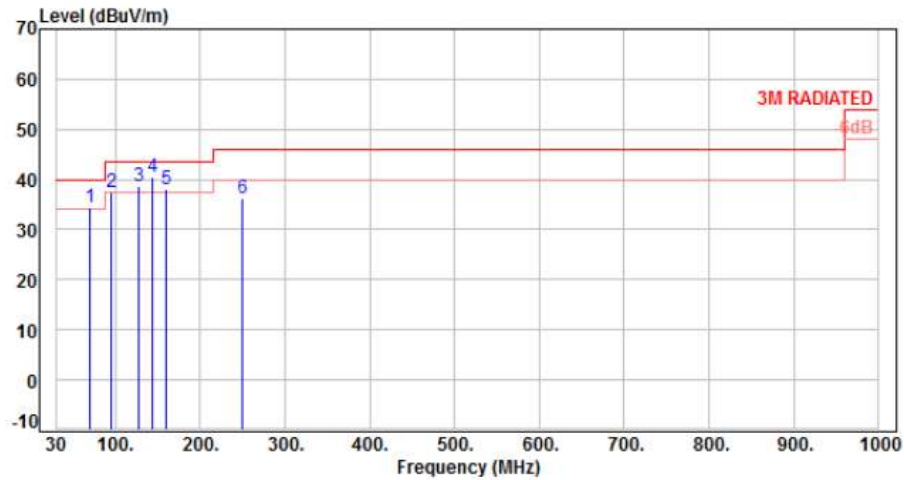


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	58.13	-9.91	32.44	22.53	40.00	-17.47	QP	100	311	P
2	96.00	-15.27	51.50	36.23	43.50	-7.27	QP	211	110	P
3	114.39	-12.28	40.25	27.97	43.50	-15.53	QP	111	85	P
4	127.00	-11.05	48.33	37.28	43.50	-6.22	QP	100	46	P
5	144.00	-9.61	49.20	39.59	43.50	-3.91	QP	211	139	P
6	160.00	-9.24	49.00	39.76	43.50	-3.74	QP	153	320	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 4	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

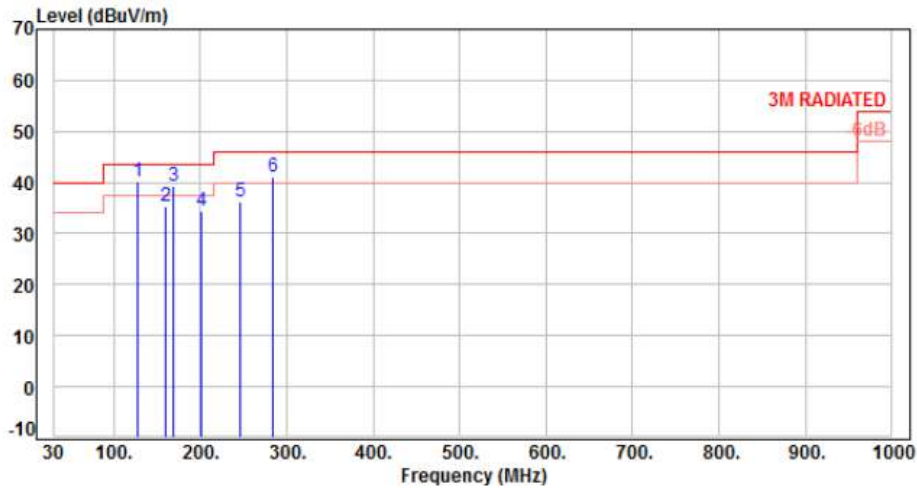


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	70.74	-11.62	46.02	34.40	40.00	-5.60	Peak	400	0	P
2	95.96	-15.27	52.58	37.31	43.50	-6.19	Peak	400	0	P
3	127.97	-10.95	49.60	38.65	43.50	-4.85	QP	100	233	P
4	143.49	-9.60	49.99	40.39	43.50	-3.11	QP	115	51	P
5	159.98	-9.24	47.20	37.96	43.50	-5.54	QP	100	44	P
6	249.22	-10.26	46.49	36.23	46.00	-9.77	Peak	400	0	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 4	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

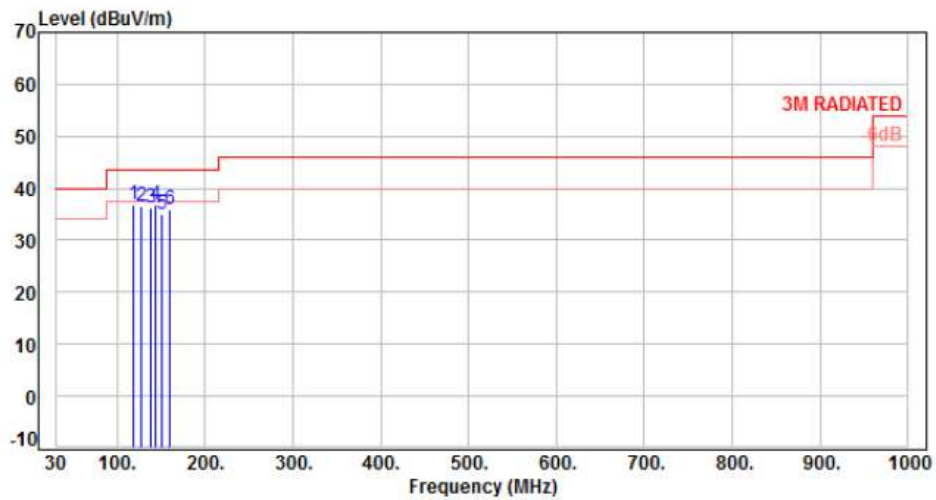


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	127.97	-10.95	51.00	40.05	43.50	-3.45	QP	100	100	P
2	159.98	-9.24	44.50	35.26	43.50	-8.24	QP	100	351	P
3	169.68	-9.51	48.81	39.30	43.50	-4.20	Peak	100	0	P
4	200.72	-11.99	46.50	34.51	43.50	-8.99	QP	142	290	P
5	246.31	-10.32	46.63	36.31	46.00	-9.69	QP	106	163	P
6	283.17	-8.98	50.11	41.13	46.00	-4.87	Peak	100	0	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 5	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

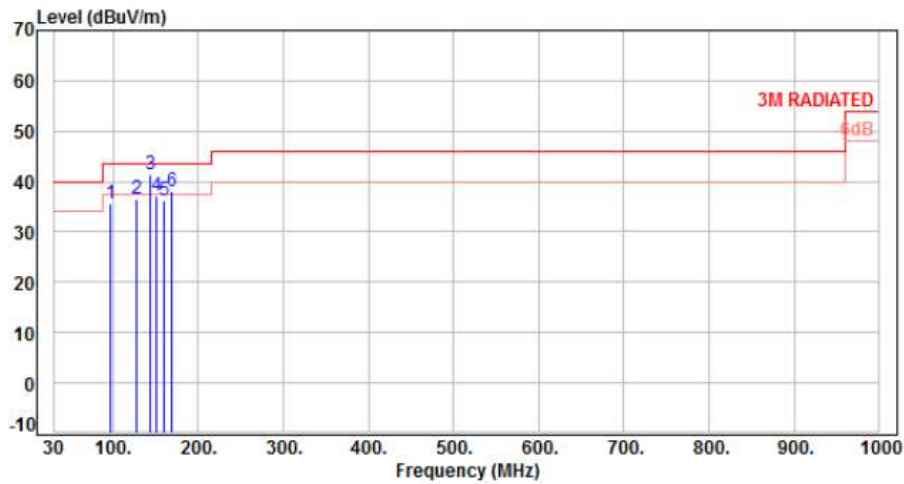


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	119.30	-11.82	48.65	36.83	43.50	-6.67	Peak	400	0	P
2	128.10	-10.94	47.52	36.58	43.50	-6.92	Peak	400	0	P
3	138.36	-9.87	46.22	36.35	43.50	-7.15	Peak	400	0	P
4	143.49	-9.60	46.39	36.79	43.50	-6.71	QP	249	230	P
5	151.50	-9.51	44.59	35.08	43.50	-8.42	Peak	400	0	P
6	159.90	-9.24	45.20	35.96	43.50	-7.54	QP	100	122	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 5	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

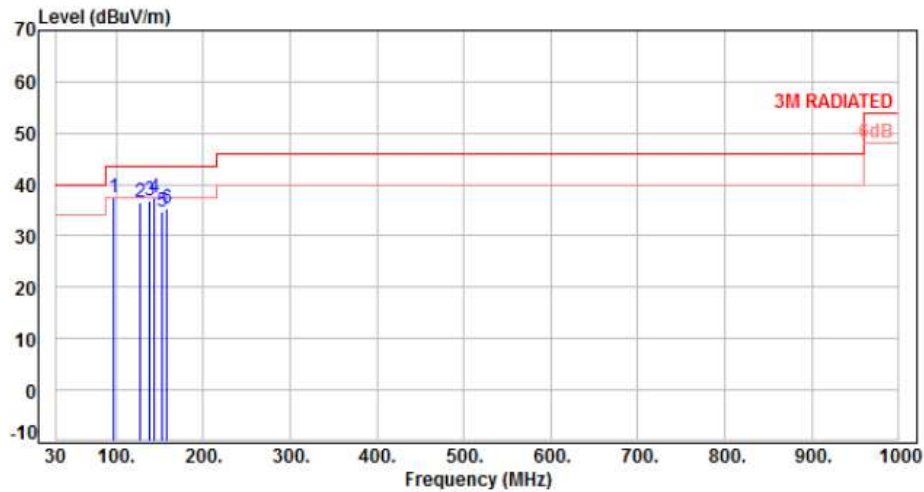


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	96.11	-15.25	50.88	35.63	43.50	-7.87	Peak	100	0	P
2	127.45	-11.00	47.65	36.65	43.50	-6.85	Peak	100	0	P
3	144.00	-9.61	51.00	41.39	43.50	-2.11	QP	208	142	P
4	151.52	-9.51	46.68	37.17	43.50	-6.33	Peak	100	0	P
5	160.00	-9.24	45.60	36.36	43.50	-7.14	QP	182	170	P
6	168.11	-9.37	47.55	38.18	43.50	-5.32	Peak	100	0	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 6	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

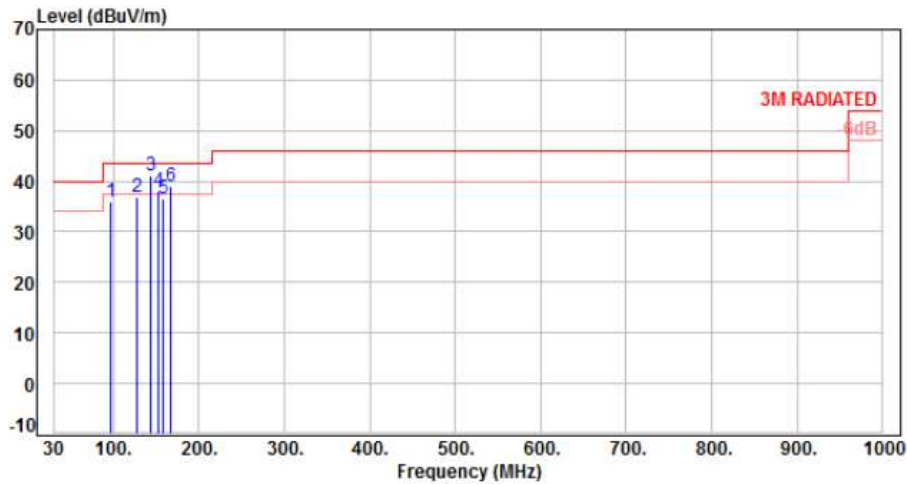


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	96.22	-15.23	52.70	37.47	43.50	-6.03	Peak	400	0	P
2	127.49	-11.00	47.53	36.53	43.50	-6.97	Peak	400	0	P
3	137.99	-9.91	46.80	36.89	43.50	-6.61	Peak	400	0	P
4	143.50	-9.60	47.11	37.51	43.50	-5.99	QP	233	241	P
5	152.00	-9.50	44.20	34.70	43.50	-8.80	Peak	400	0	P
6	158.69	-9.28	44.67	35.39	43.50	-8.11	QP	100	143	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 6	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

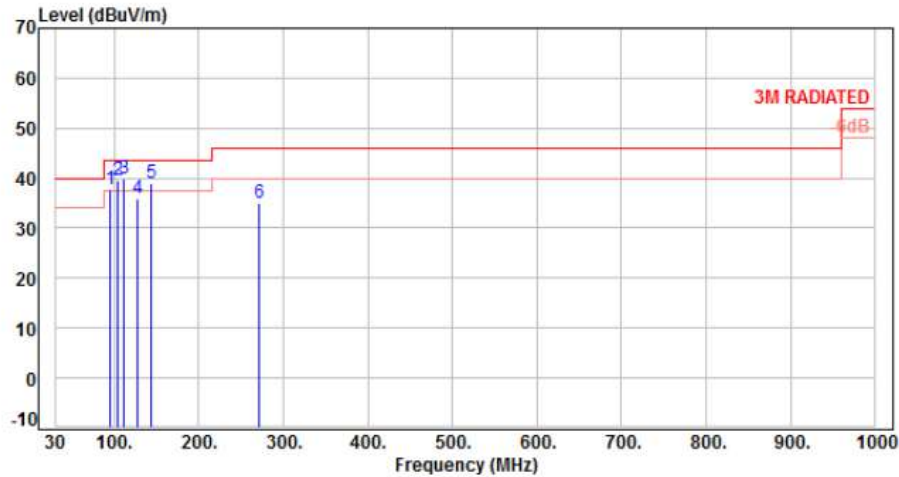


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	96.53	-15.16	50.97	35.81	43.50	-7.69	Peak	100	0	P
2	128.24	-10.93	47.77	36.84	43.50	-6.66	Peak	100	0	P
3	143.95	-9.61	50.86	41.25	43.50	-2.25	QP	212	151	P
4	152.33	-9.50	47.58	38.08	43.50	-5.42	Peak	100	0	P
5	157.69	-9.36	45.83	36.47	43.50	-7.03	QP	178	125	P
6	166.50	-9.28	48.10	38.82	43.50	-4.68	Peak	100	0	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 7	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%



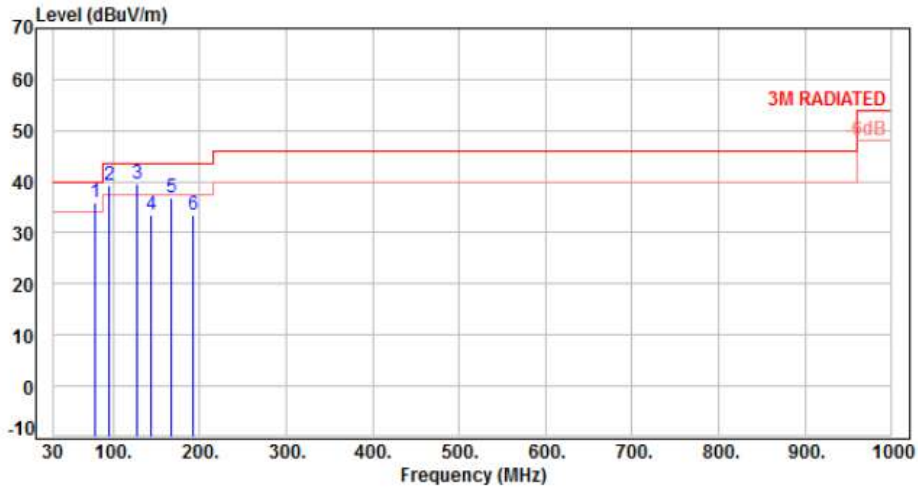
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	95.96	-15.27	53.04	37.77	43.50	-5.73	Peak	400	0	P
2	103.72	-13.81	53.26	39.45	43.50	-4.05	Peak	400	0	P
3	111.48	-12.64	52.44	39.80	43.50	-3.70	Peak	400	0	P
4	127.97	-10.95	47.00	36.05	43.50	-7.45	Peak	106	130	P
5	143.49	-9.60	48.64	39.04	43.50	-4.46	QP	133	27	P
6	271.53	-9.38	44.49	35.11	46.00	-10.89	Peak	400	0	P

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





Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 7	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%



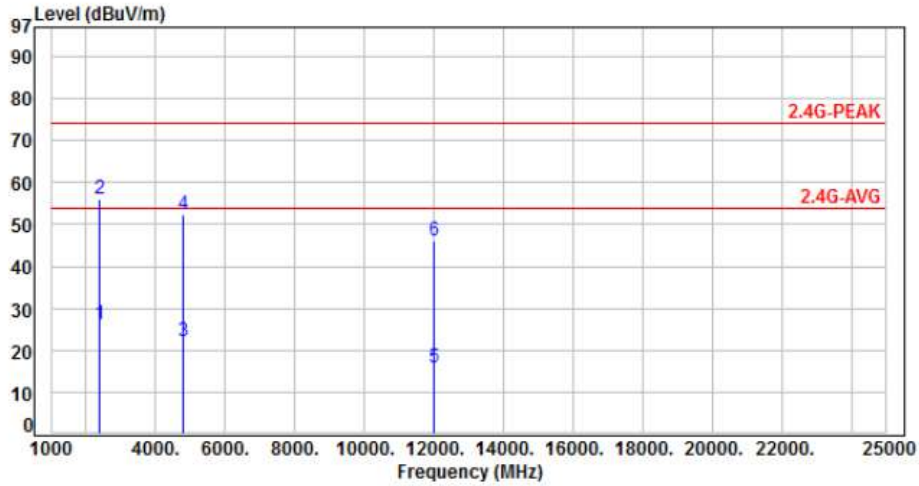
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	79.47	-13.47	49.35	35.88	40.00	-4.12	Peak	100	0	P
2	95.96	-15.27	54.48	39.21	43.50	-4.29	Peak	100	0	P
3	127.97	-10.95	50.40	39.45	43.50	-4.05	QP	100	55	P
4	143.49	-9.60	43.20	33.60	43.50	-9.90	QP	100	352	P
5	167.74	-9.33	46.21	36.88	43.50	-6.62	QP	100	253	P
6	191.99	-11.92	45.30	33.38	43.50	-10.12	QP	118	271	P

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



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

Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH00	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

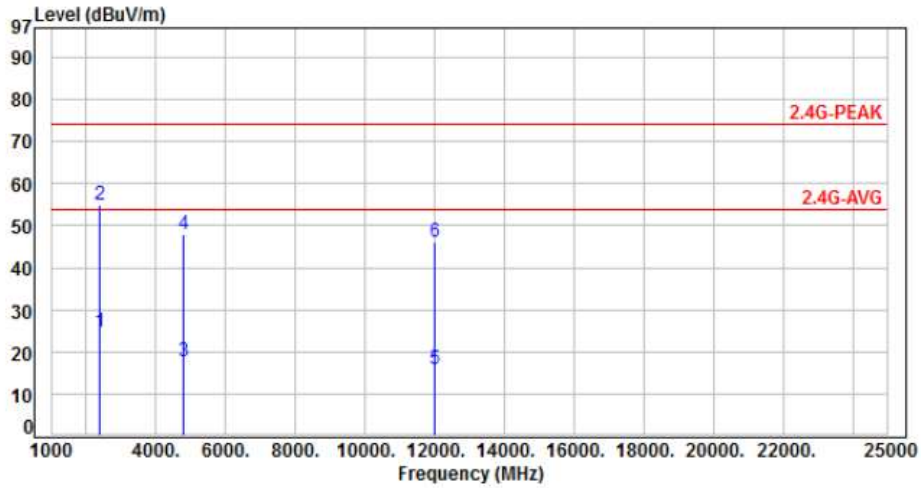


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2386.00	-15.69	41.70	26.01	54.00	-27.99	Average	105	47	P
2	2386.00	-15.69	71.80	56.11	74.00	-17.89	Peak	105	47	P
3	4804.00	-8.53	30.70	22.17	54.00	-31.83	Average	211	79	P
4	4804.00	-8.53	60.80	52.27	74.00	-21.73	Peak	211	79	P
5	12010.00	1.77	14.10	15.87	54.00	-38.13	Average	100	148	P
6	12010.00	1.77	44.20	45.97	74.00	-28.03	Peak	100	148	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH00	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

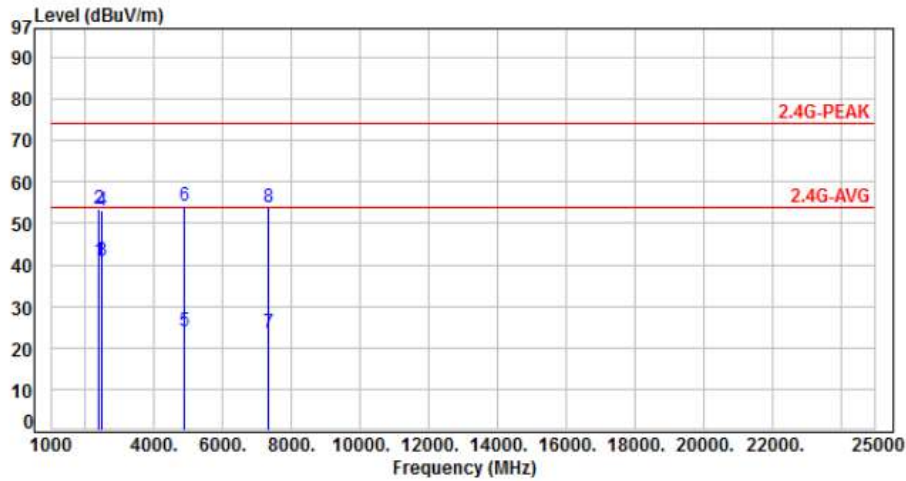


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2386.00	-15.69	40.40	24.71	54.00	-29.29	Average	100	308	P
2	2386.00	-15.69	70.50	54.81	74.00	-19.19	Peak	100	308	P
3	4804.00	-8.53	26.40	17.87	54.00	-36.13	Average	100	158	P
4	4804.00	-8.53	56.50	47.97	74.00	-26.03	Peak	100	158	P
5	12010.00	1.77	14.10	15.87	54.00	-38.13	Average	400	130	P
6	12010.00	1.77	44.20	45.97	74.00	-28.03	Peak	400	130	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH39	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

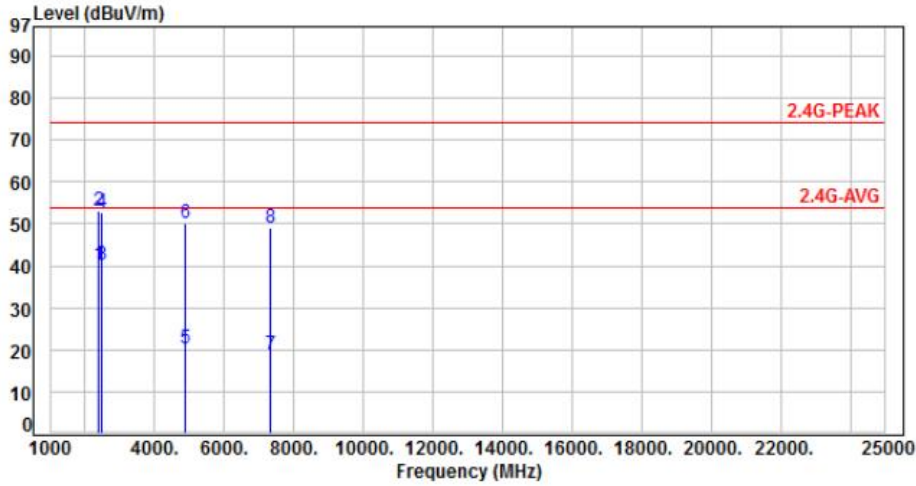


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-15.68	56.50	40.82	54.00	-13.18	Average	100	0	P
2	2390.00	-15.68	69.20	53.52	74.00	-20.48	Peak	100	0	P
3	2483.50	-15.36	56.20	40.84	54.00	-13.16	Average	100	0	P
4	2483.50	-15.36	68.40	53.04	74.00	-20.96	Peak	100	0	P
5	4882.00	-8.30	32.40	24.10	54.00	-29.90	Average	100	72	P
6	4882.00	-8.30	62.50	54.20	74.00	-19.80	Peak	100	72	P
7	7323.00	-3.83	27.60	23.77	54.00	-30.23	Average	290	162	P
8	7323.00	-3.83	57.70	53.87	74.00	-20.13	Peak	290	162	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH39	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

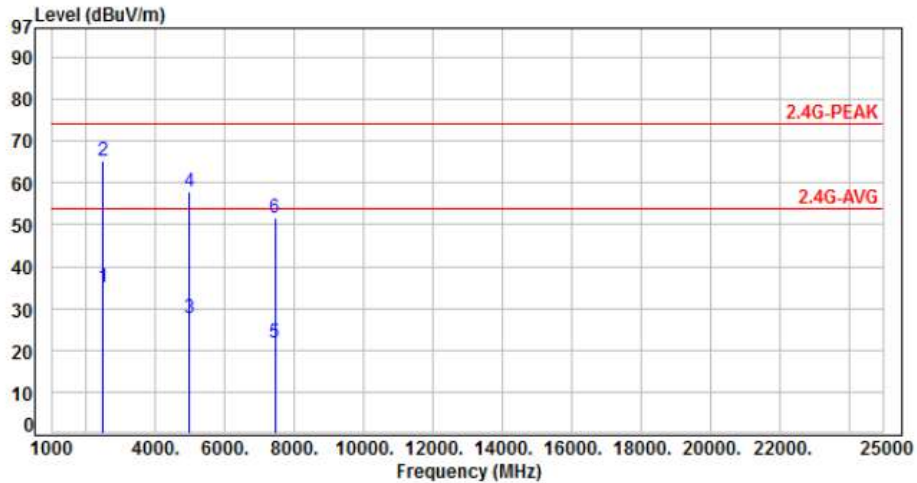


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-15.68	55.80	40.12	54.00	-13.88	Average	330	295	P
2	2390.00	-15.68	68.90	53.22	74.00	-20.78	Peak	330	295	P
3	2483.50	-15.36	55.40	40.04	54.00	-13.96	Average	330	295	P
4	2483.50	-15.36	68.20	52.84	74.00	-21.16	Peak	330	295	P
5	4882.00	-8.30	28.50	20.20	54.00	-33.80	Average	100	160	P
6	4882.00	-8.30	58.60	50.30	74.00	-23.70	Peak	100	160	P
7	7323.00	-3.83	22.70	18.87	54.00	-35.13	Average	400	177	P
8	7323.00	-3.83	52.80	48.97	74.00	-25.03	Peak	400	177	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH78	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

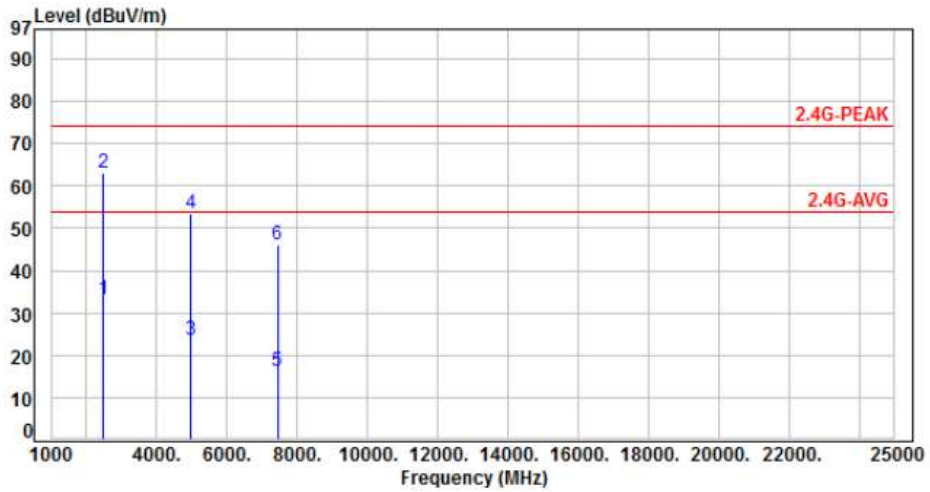


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-15.36	50.40	35.04	54.00	-18.96	Average	100	90	P
2	2483.50	-15.36	80.50	65.14	74.00	-8.86	Peak	100	90	P
3	4960.00	-8.07	35.79	27.72	54.00	-26.28	Average	198	123	P
4	4960.00	-8.07	65.89	57.82	74.00	-16.18	Peak	198	123	P
5	7440.00	-3.52	25.20	21.68	54.00	-32.32	Average	100	155	P
6	7440.00	-3.52	55.30	51.78	74.00	-22.22	Peak	100	155	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH78	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

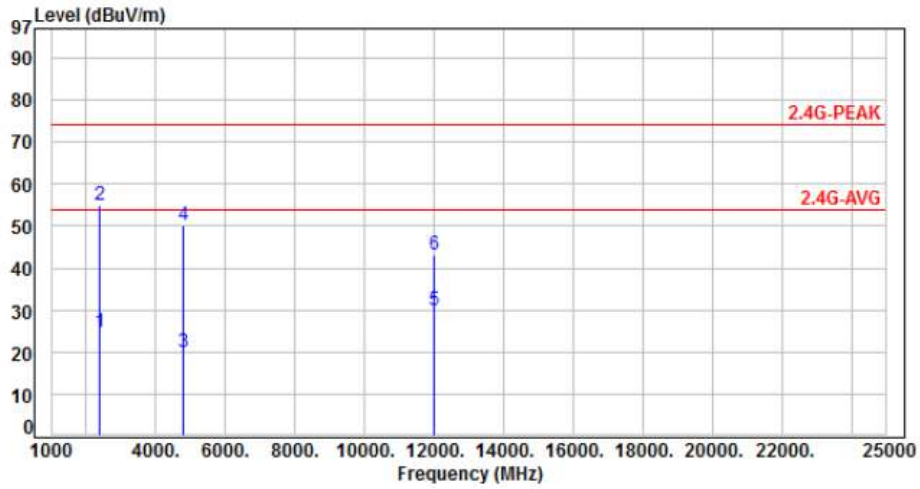


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-15.36	48.40	33.04	54.00	-20.96	Average	220	257	P
2	2483.50	-15.36	78.50	63.14	74.00	-10.86	Peak	220	257	P
3	4960.00	-8.07	31.49	23.42	54.00	-30.58	Average	110	167	P
4	4960.00	-8.07	61.59	53.52	74.00	-20.48	Peak	110	167	P
5	7440.00	-3.52	19.60	16.08	54.00	-37.92	Average	100	178	P
6	7440.00	-3.52	49.70	46.18	74.00	-27.82	Peak	100	178	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 3, CH00	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%



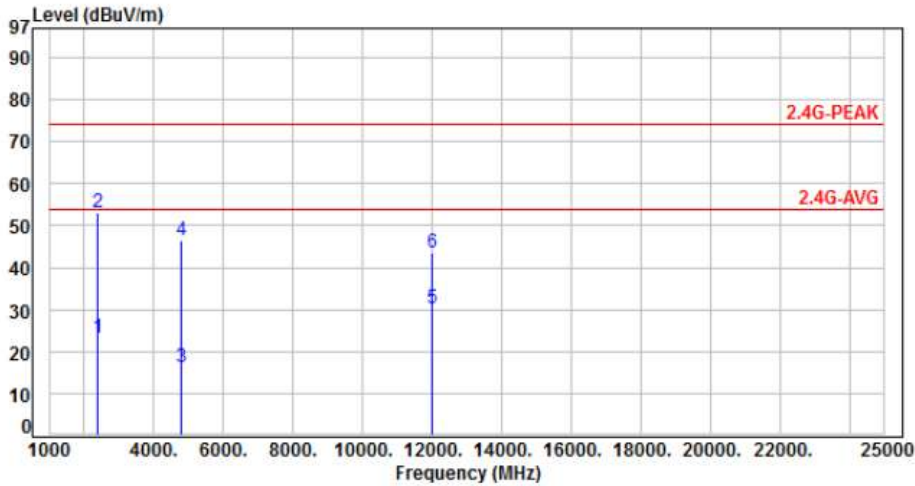
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2386.00	-15.69	40.40	24.71	54.00	-29.29	Average	100	355	P
2	2386.00	-15.69	70.50	54.81	74.00	-19.19	Peak	100	355	P
3	4804.00	-8.53	28.60	20.07	54.00	-33.93	Average	180	100	P
4	4804.00	-8.53	58.70	50.17	74.00	-23.83	Peak	180	100	P
5	12010.00	1.77	28.20	29.97	54.00	-24.03	Average	100	88	P
6	12010.00	1.77	41.50	43.27	74.00	-30.73	Peak	100	88	P

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





Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3, CH00	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

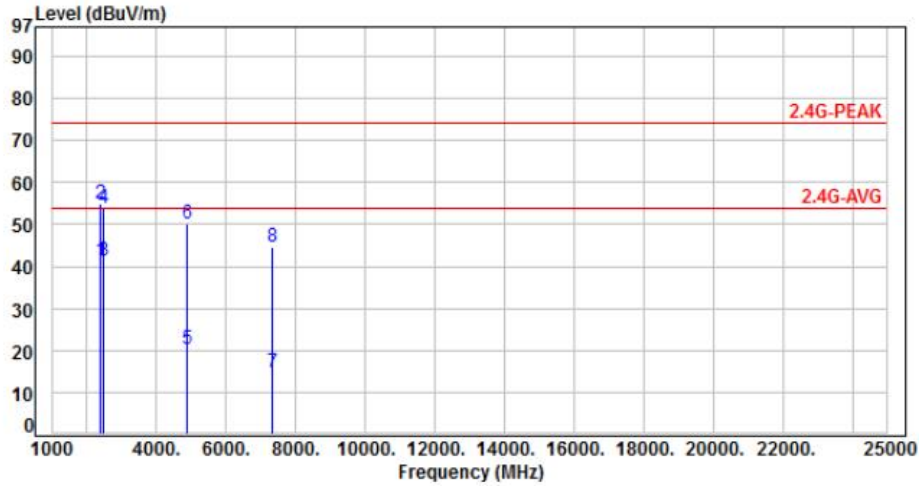


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2386.00	-15.69	38.80	23.11	54.00	-30.89	Average	105	90	P
2	2386.00	-15.69	68.90	53.21	74.00	-20.79	Peak	105	90	P
3	4804.00	-8.53	24.80	16.27	54.00	-37.73	Average	120	163	P
4	4804.00	-8.53	54.90	46.37	74.00	-27.63	Peak	120	163	P
5	12010.00	1.77	28.49	30.26	54.00	-23.74	Average	100	352	P
6	12010.00	1.77	41.87	43.64	74.00	-30.36	Peak	100	352	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 3, CH39	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

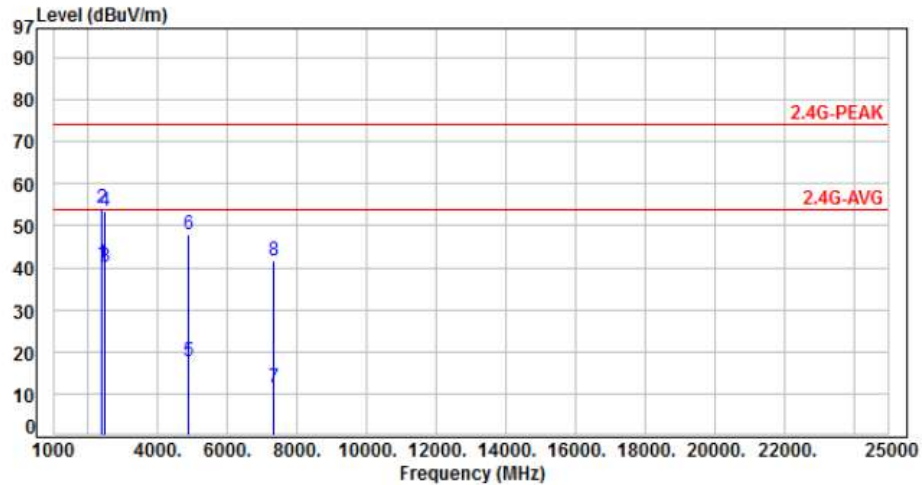


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-15.68	56.80	41.12	54.00	-12.88	Average	100	106	P
2	2390.00	-15.68	70.45	54.77	74.00	-19.23	Peak	100	106	P
3	2483.50	-15.36	56.55	41.19	54.00	-12.81	Average	100	106	P
4	2483.50	-15.36	69.20	53.84	74.00	-20.16	Peak	100	106	P
5	4882.00	-8.30	28.46	20.16	54.00	-33.84	Average	100	74	P
6	4882.00	-8.30	58.56	50.26	74.00	-23.74	Peak	100	74	P
7	7323.00	-3.83	18.40	14.57	54.00	-39.43	Average	290	150	P
8	7323.00	-3.83	48.50	44.67	74.00	-29.33	Peak	290	150	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3, CH39	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

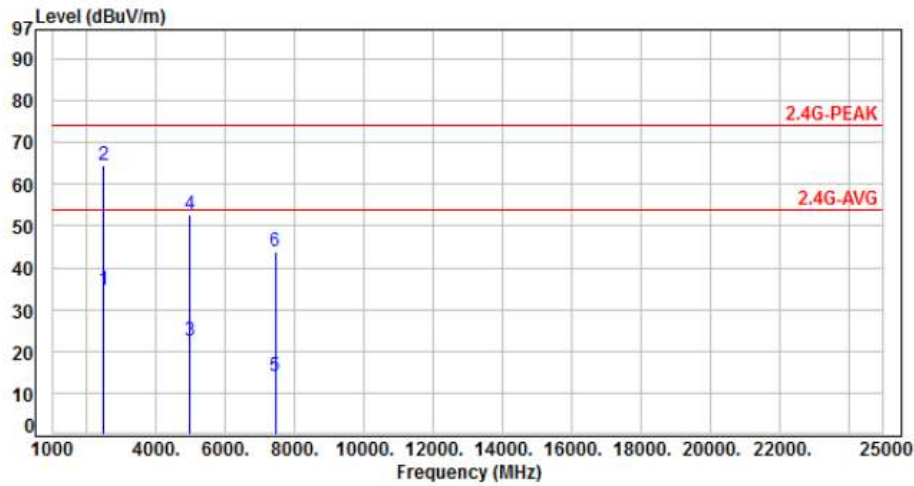


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-15.68	56.60	40.92	54.00	-13.08	Average	291	293	P
2	2390.00	-15.68	69.80	54.12	74.00	-19.88	Peak	291	293	P
3	2483.50	-15.36	55.45	40.09	54.00	-13.91	Average	291	293	P
4	2483.50	-15.36	68.80	53.44	74.00	-20.56	Peak	291	293	P
5	4882.00	-8.30	26.00	17.70	54.00	-36.30	Average	112	164	P
6	4882.00	-8.30	56.10	47.80	74.00	-26.20	Peak	112	164	P
7	7323.00	-3.83	15.42	11.59	54.00	-42.41	Average	100	246	P
8	7323.00	-3.83	45.52	41.69	74.00	-32.31	Peak	100	246	P

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



Power	: DC 5V From System	Pol/Phase	: VERTICAL
Test Mode	: Mode 3, CH78	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%

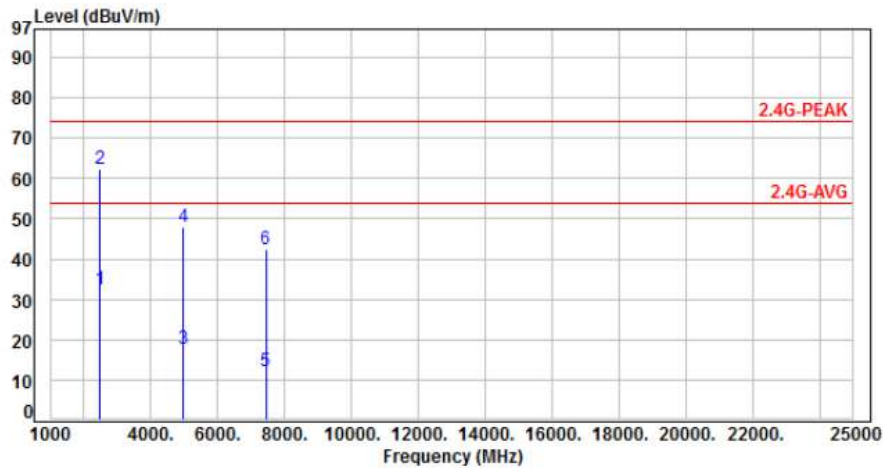


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-15.36	49.95	34.59	54.00	-19.41	Average	100	110	P
2	2483.50	-15.36	80.05	64.69	74.00	-9.31	Peak	100	110	P
3	4960.00	-8.07	30.59	22.52	54.00	-31.48	Average	180	120	P
4	4960.00	-8.07	60.69	52.62	74.00	-21.38	Peak	180	120	P
5	7440.00	-3.52	17.40	13.88	54.00	-40.12	Average	100	163	P
6	7440.00	-3.52	47.50	43.98	74.00	-30.02	Peak	100	163	P

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



Power	: DC 5V From System	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3, CH78	Temperature	: 20°C
Test Date	: Jan. 23, 2019	Humidity	: 60%



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-15.36	47.70	32.34	54.00	-21.66	Average	314	290	P
2	2483.50	-15.36	77.80	62.44	74.00	-11.56	Peak	314	290	P
3	4960.00	-8.07	25.79	17.72	54.00	-36.28	Average	112	168	P
4	4960.00	-8.07	55.89	47.82	74.00	-26.18	Peak	112	168	P
5	7440.00	-3.52	15.72	12.20	54.00	-41.80	Average	100	263	P
6	7440.00	-3.52	45.82	42.30	74.00	-31.70	Peak	100	263	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

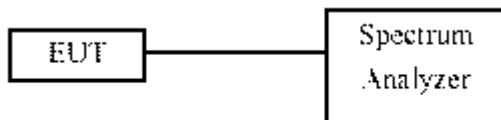
### 7.1 Test Limit

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 loss 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



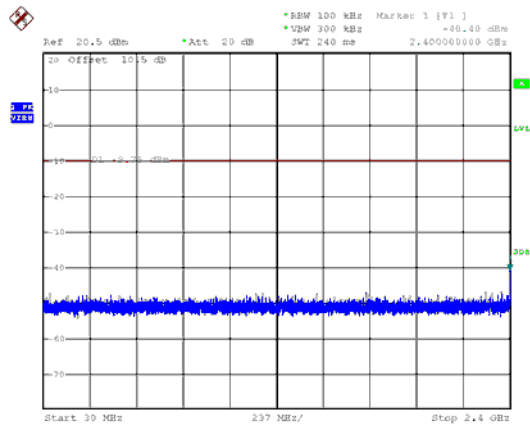
### 7.4 Test Result and Data

Test Result	: PASS	Temperature	: 20°C
Test Date	: Feb. 14, 2019	Humidity	: 40%

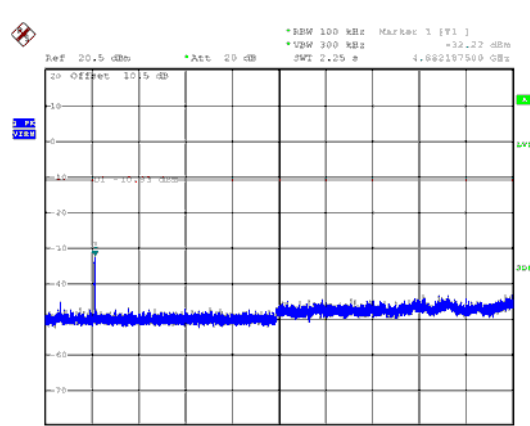
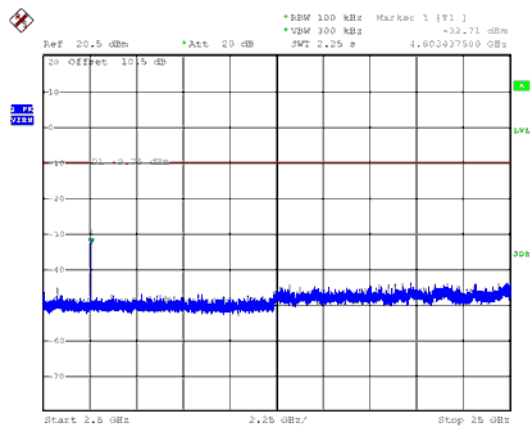
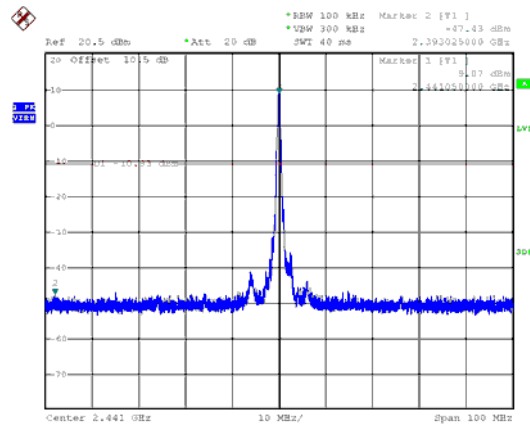
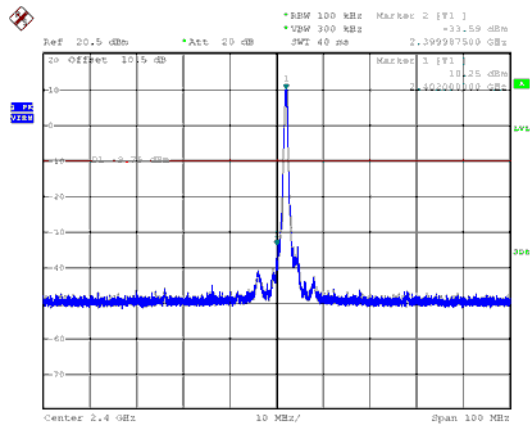
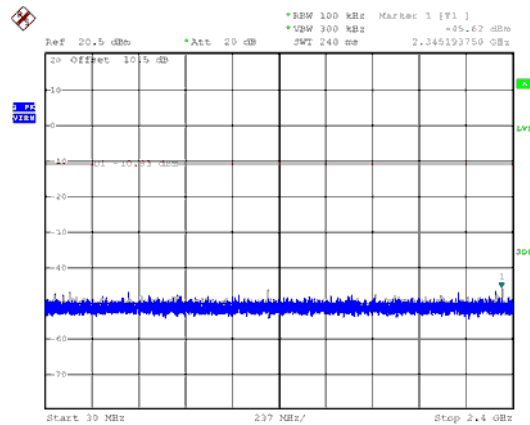
Note: Test plots refer to the following pages.



Modulation Type: GFSK, CH00



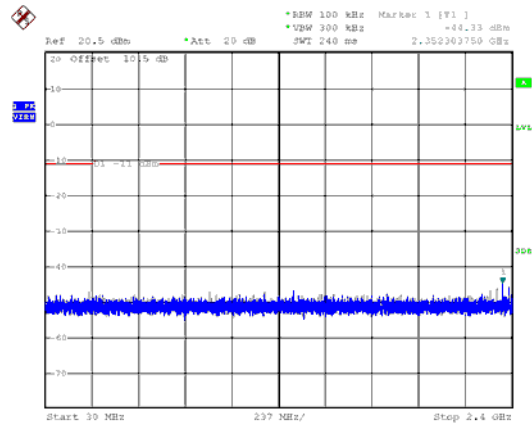
Modulation Type: GFSK, CH39



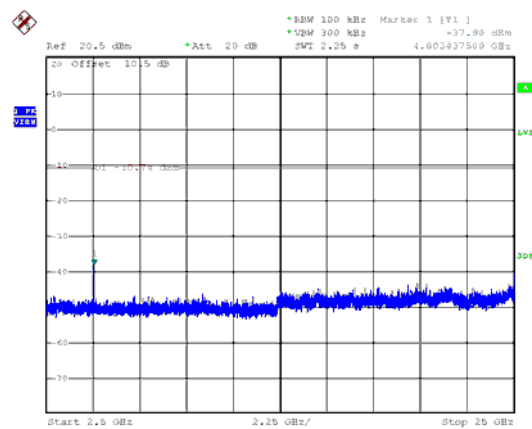
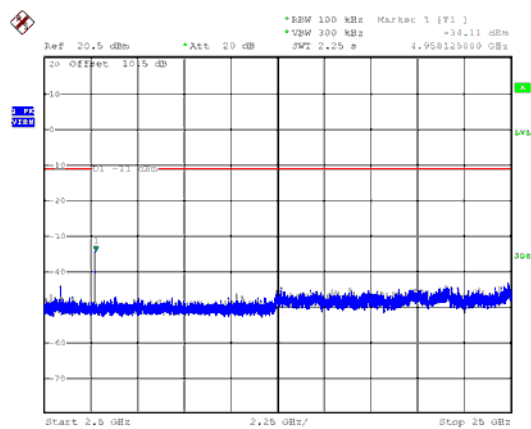
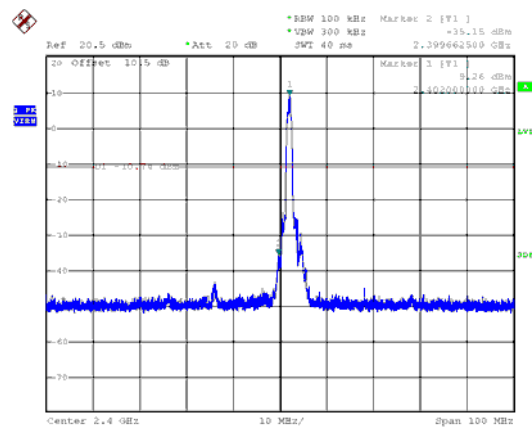
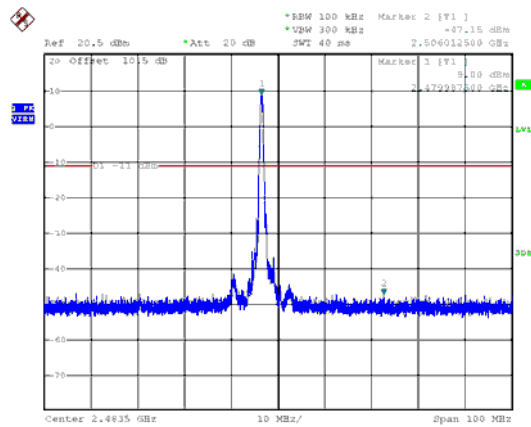
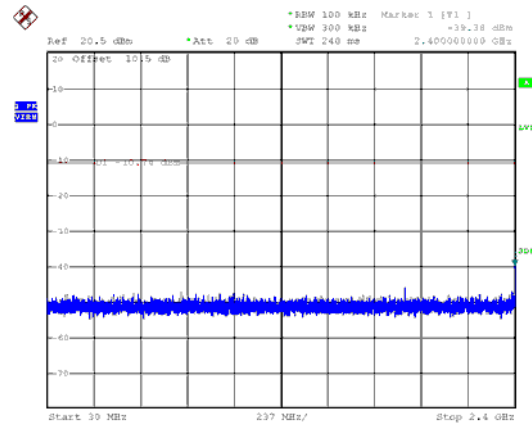




Modulation Type: GFSK, CH78

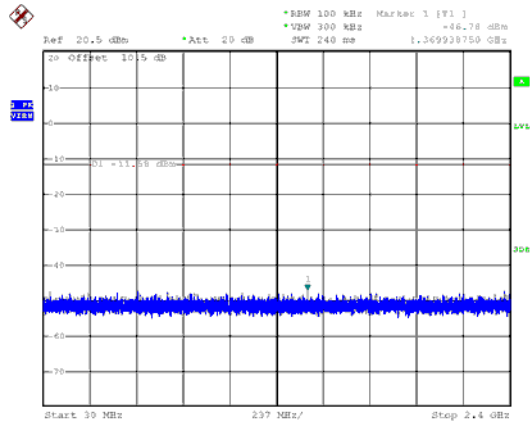


Modulation Type:  $\pi/4$ -DQPSK, CH00

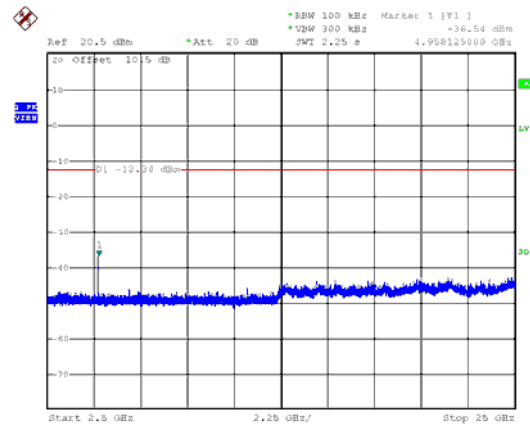
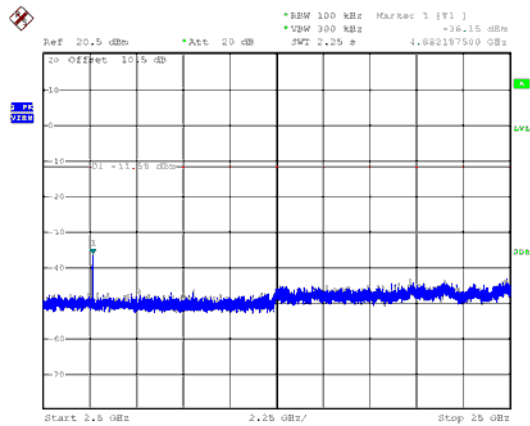
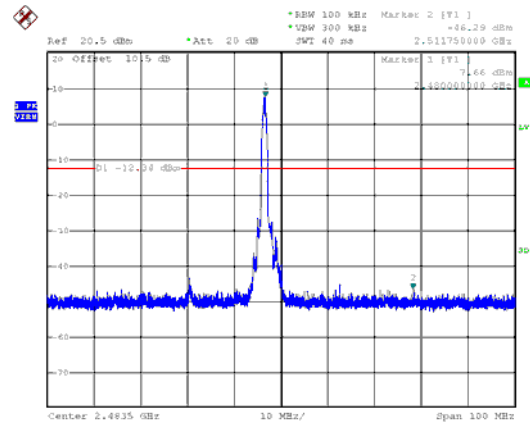
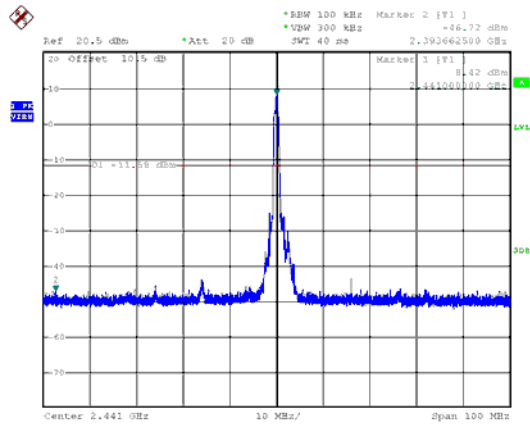
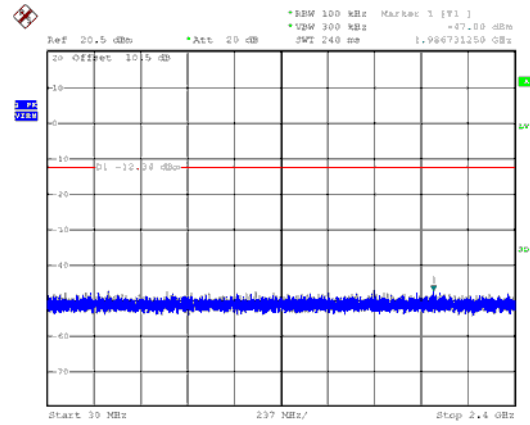




Modulation Type:  $\pi/4$ -DQPSK, CH39

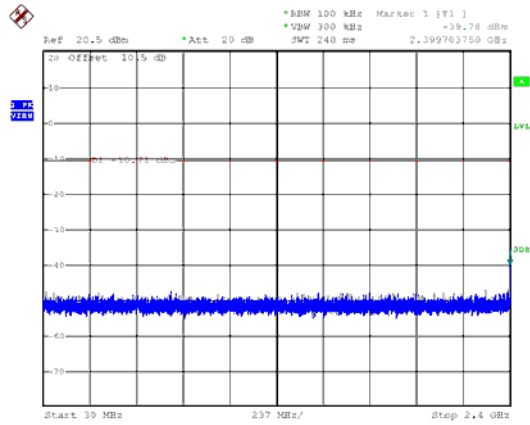


Modulation Type:  $\pi/4$ -DQPSK, CH78

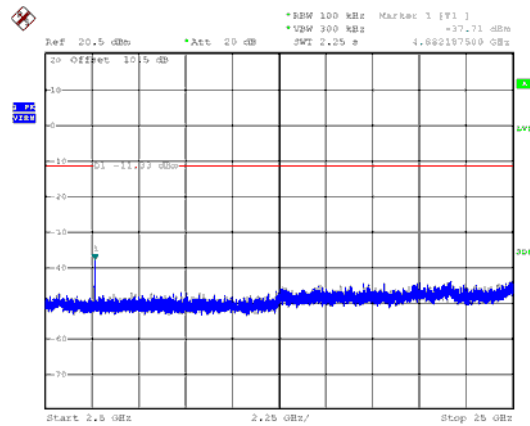
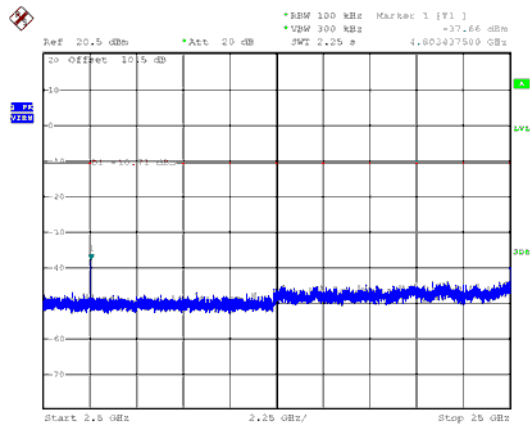
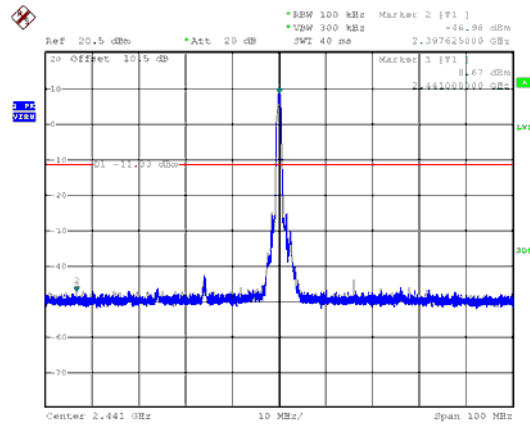
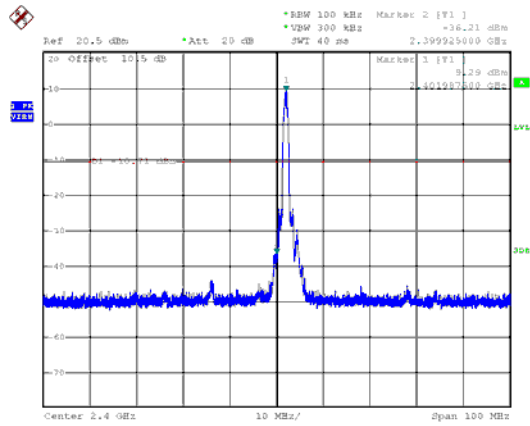
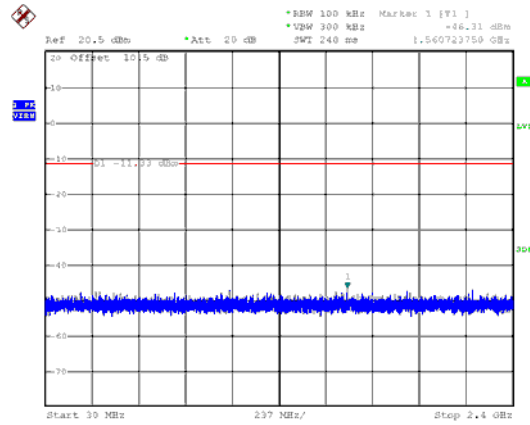




Modulation Type: 8DPSK, CH00

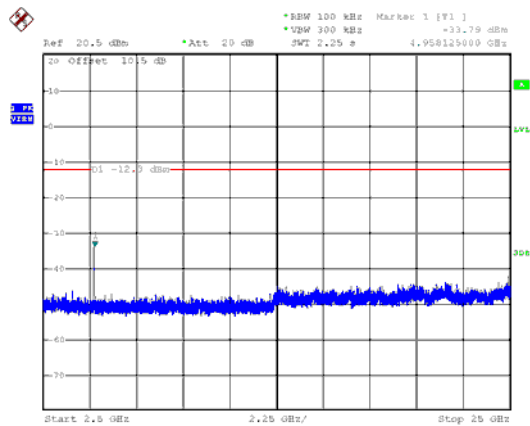
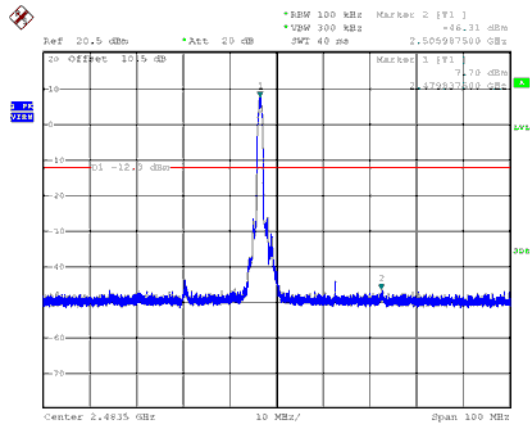
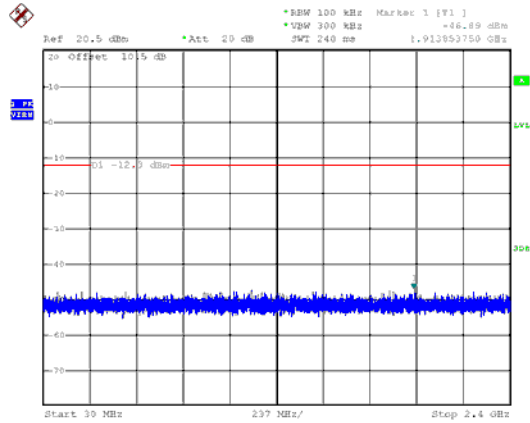


Modulation Type: 8DPSK, CH39





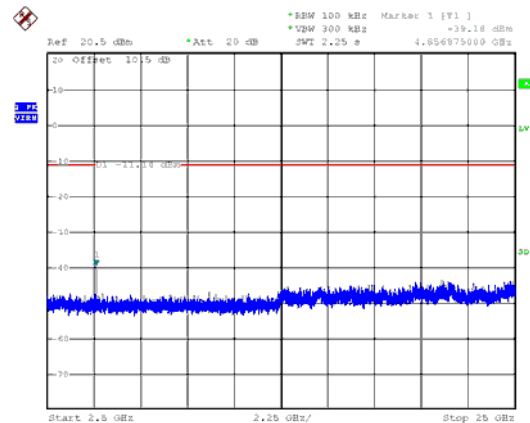
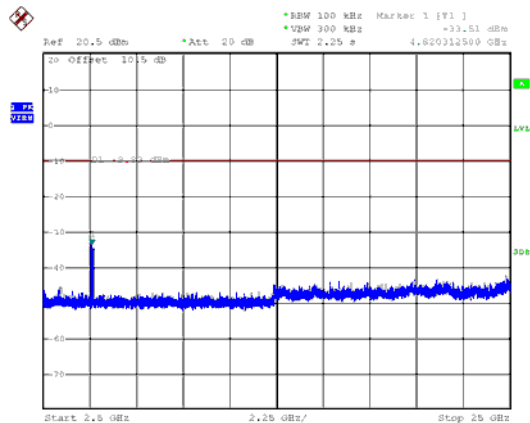
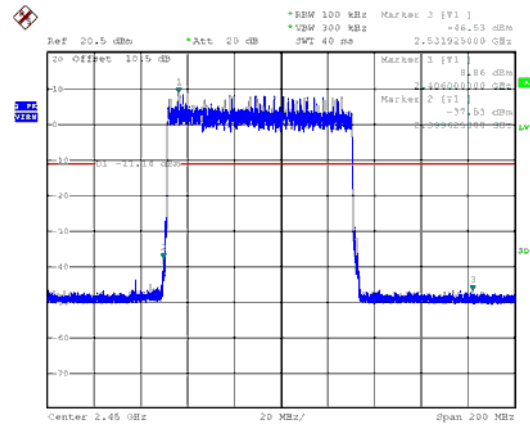
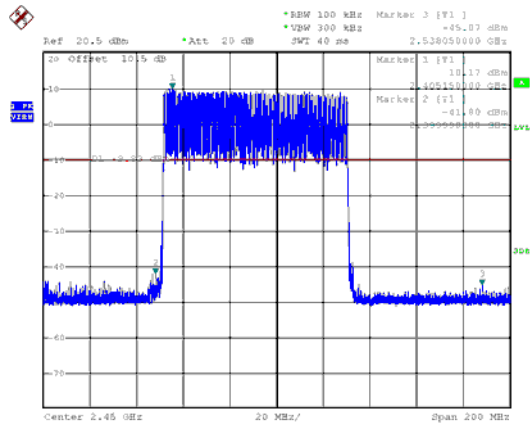
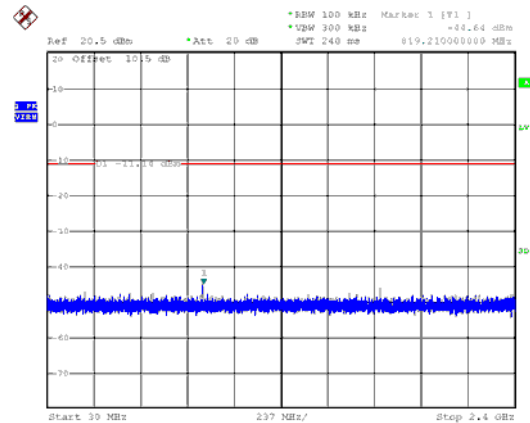
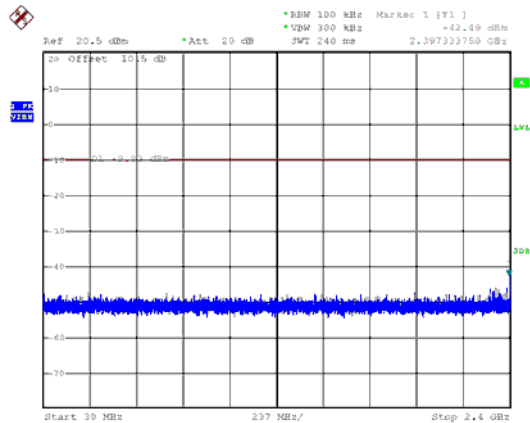
Modulation Type: 8DPSK, CH78





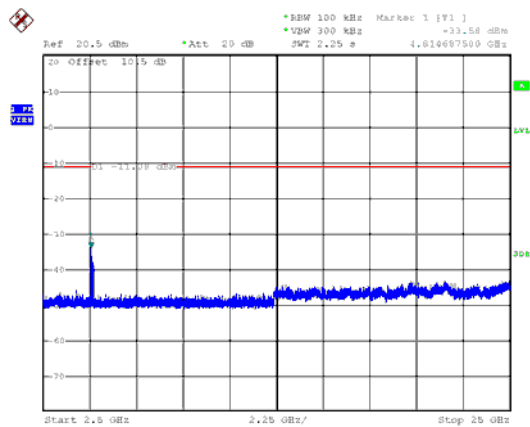
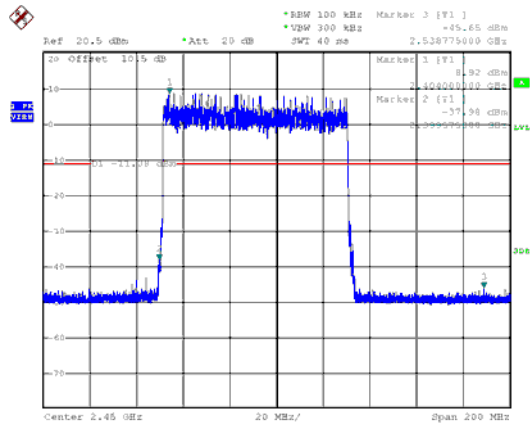
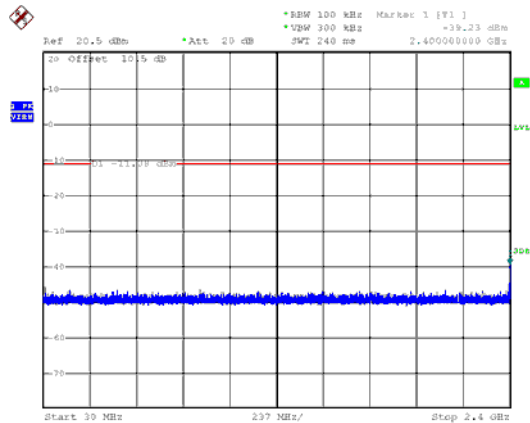
Hopping Mode:  
Modulation Type: GFSK

Modulation Type:  $\pi/4$ -DQPSK





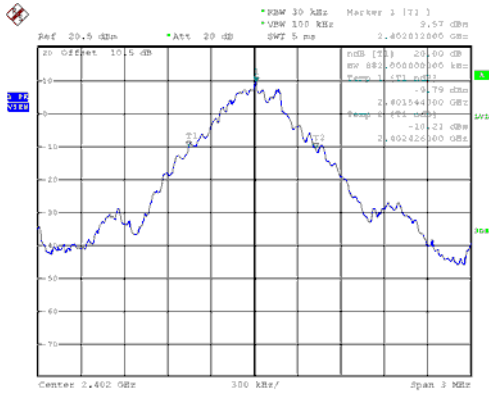
Modulation Type: 8DPSK



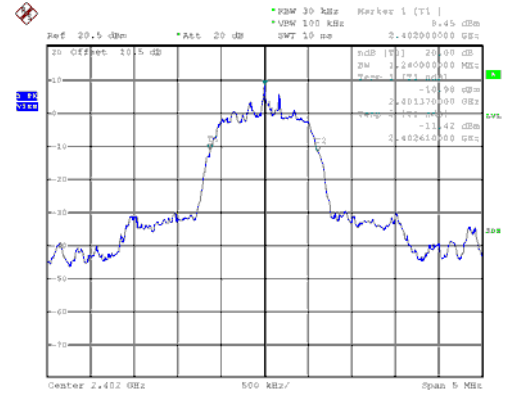




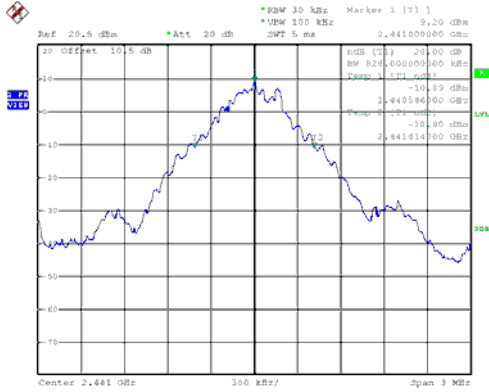
Modulation Standard: GFSK (1Mbps)  
Channel: 00



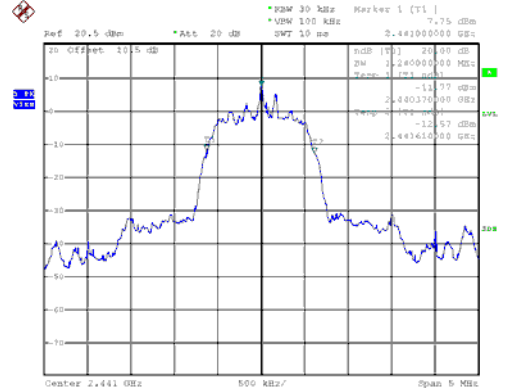
Modulation Standard:  $\pi/4$ -DQPSK (2Mbps)  
Channel: 00



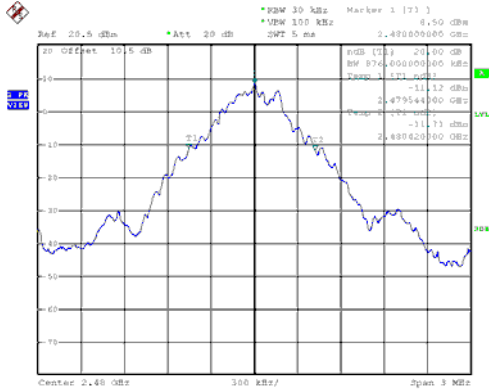
CH39



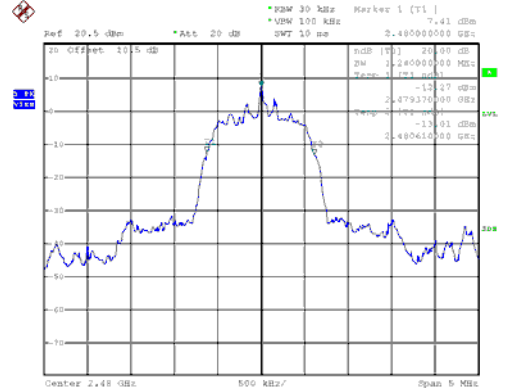
CH39



CH78



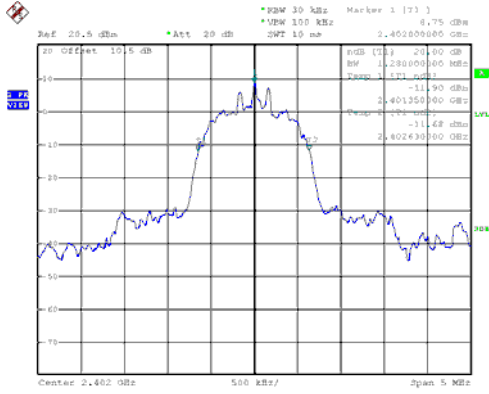
CH78



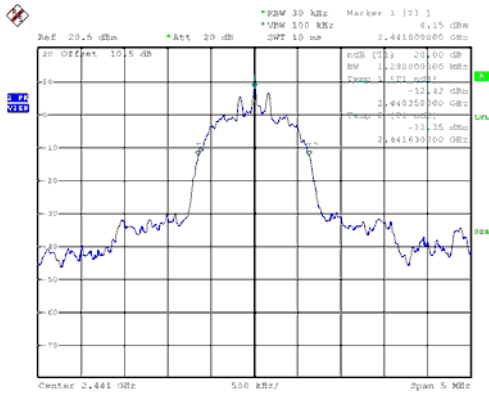




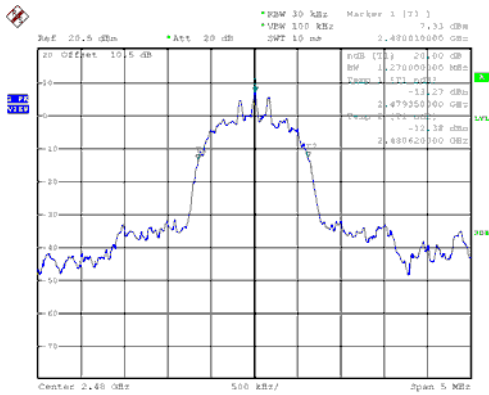
Modulation Standard: 8DPSK (3Mbps)  
Channel: 00



CH39



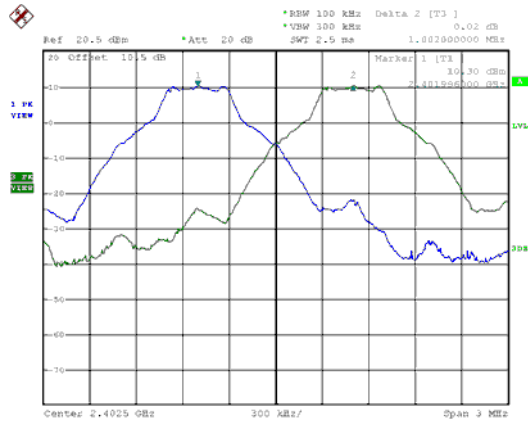
CH78



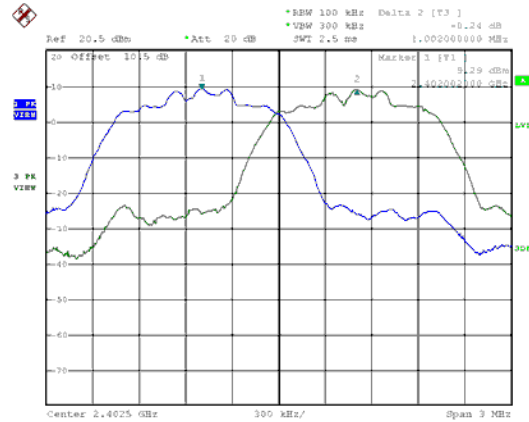




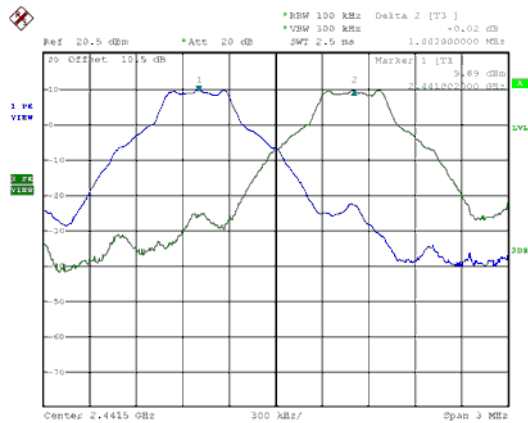
Modulation Standard: GFSK (1Mbps)  
Channel: 00



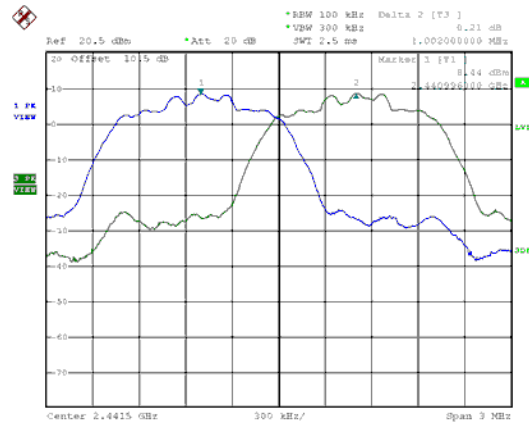
Modulation Standard:  $\pi/4$ -DQPSK (2Mbps)  
Channel: 00



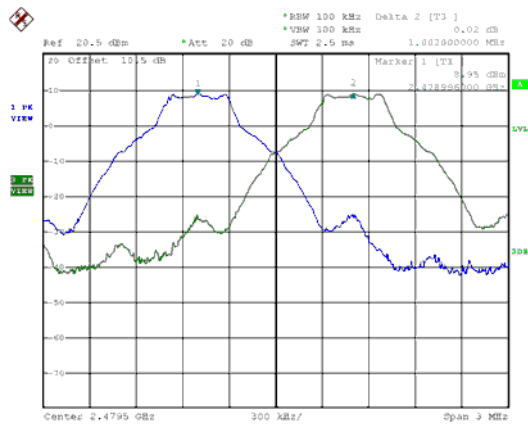
CH39



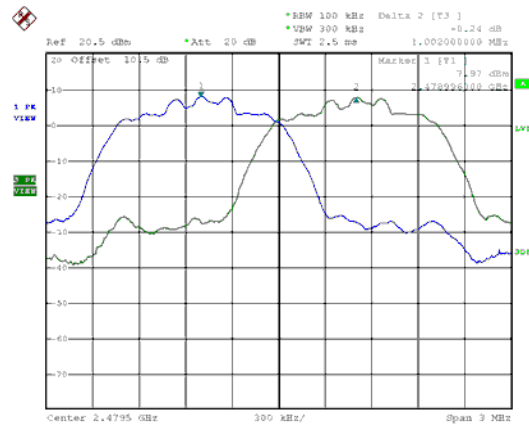
CH39



CH78

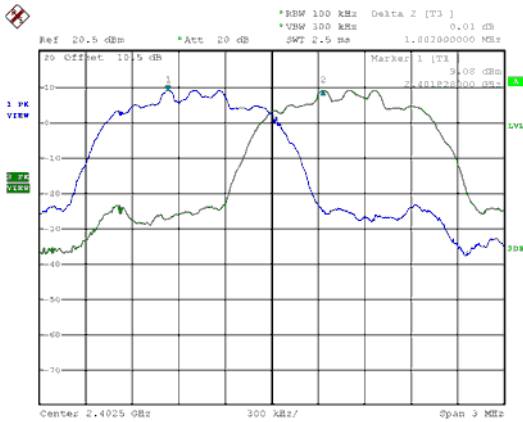


CH78

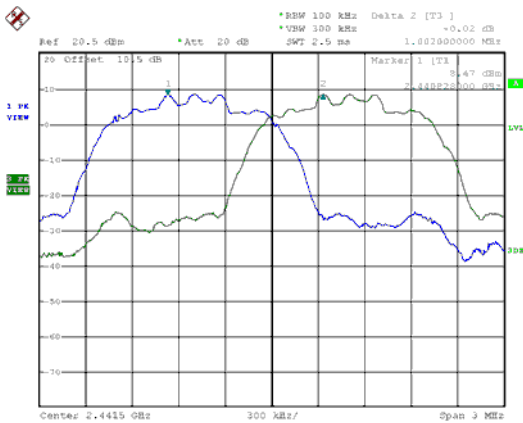




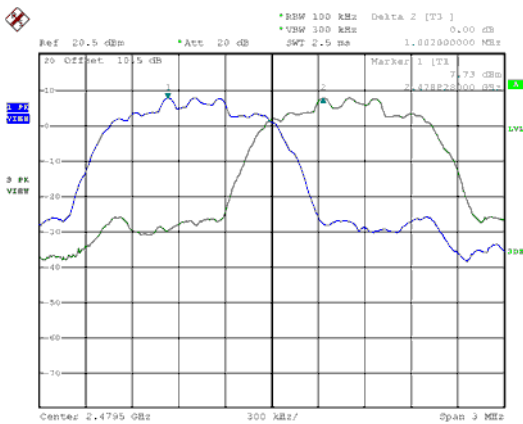
Modulation Standard: 8DPSK (3Mbps)  
Channel: 00



CH39



CH78





## 10. Dwell Time on each channel

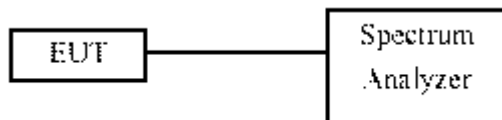
### 10.1 Test Limit

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 : 20°C  
 Test Date : Feb. 14, 2019 Humidity : 40%  
 Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec

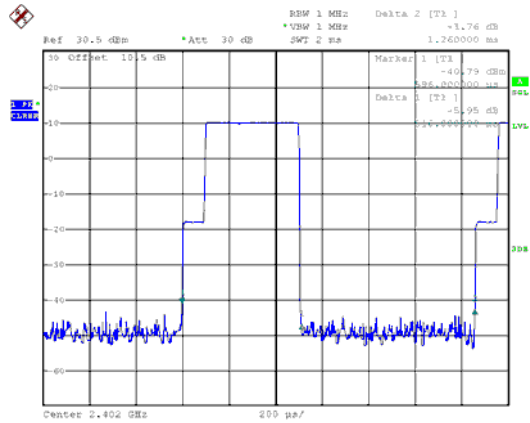
Modulation Type	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 31.6 (79 Hopping*0.4)	Dwell Time (ms)	Limit (ms)
GFSK (DH1)	2402	0.516	320.10	165.17	400
GFSK (DH3)	2402	1.786	159.90	285.58	400
GFSK (DH5)	2402	3.046	106.81	325.34	400
$\pi/4$ -DQPSK (DH1)	2402	0.540	320.10	172.85	400
$\pi/4$ -DQPSK (DH3)	2402	1.810	159.90	289.42	400
$\pi/4$ -DQPSK (DH5)	2402	3.070	106.81	327.91	400
8DPSK (DH1)	2402	0.552	320.10	176.70	400
8DPSK (DH3)	2402	1.810	159.90	289.42	400
8DPSK (DH5)	2402	3.070	106.81	327.91	400

Test Period = 0.4 (second/ channel) x 20 Channel = 8 sec

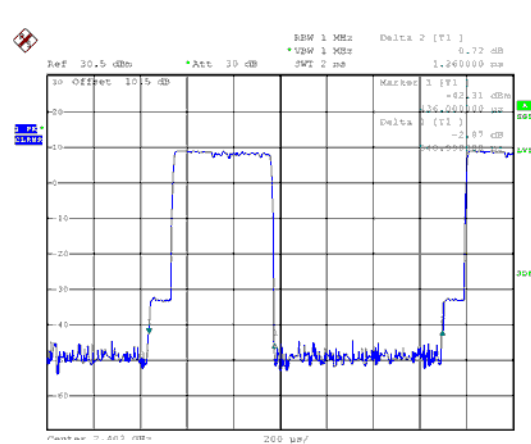
Modulation Type	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 31.6 (79 Hopping*0.4)	Dwell Time (ms)	Limit (ms)
AFH-DH1	2402-2421	0.516	160.00	82.56	400
AFH-DH3	2402-2421	1.786	80.00	142.88	400
AFH-DH5	2402-2421	3.046	53.33	162.44	400



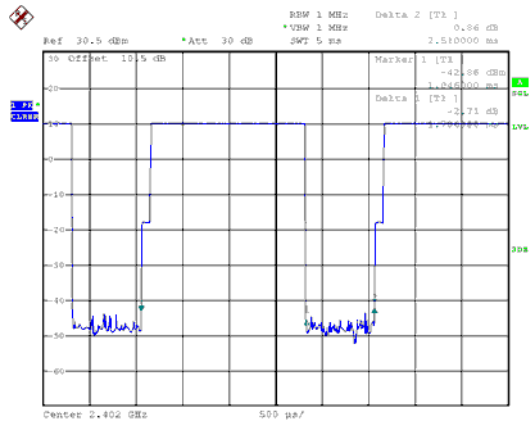
Modulation Standard: GFSK (DH1)  
Channel: 00



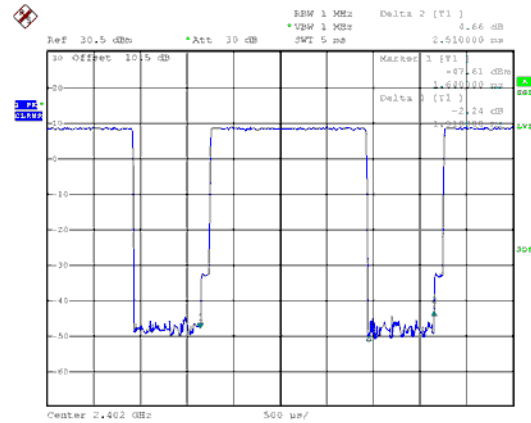
Modulation Standard:  $\pi/4$ -DQPSK (DH1)  
Channel: 00



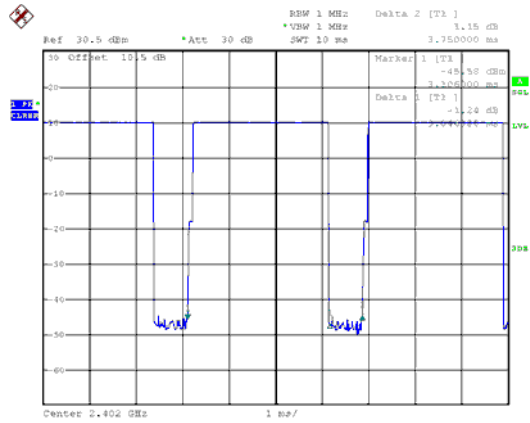
Modulation Standard: GFSK (DH3)  
Channel: 39



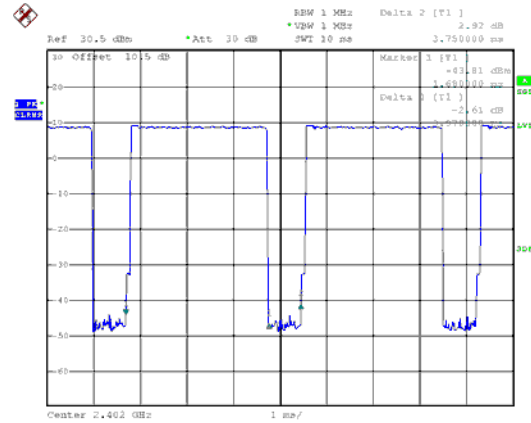
Modulation Standard:  $\pi/4$ -DQPSK (DH3)  
Channel: 39



Modulation Standard: GFSK (DH5)  
Channel: 78

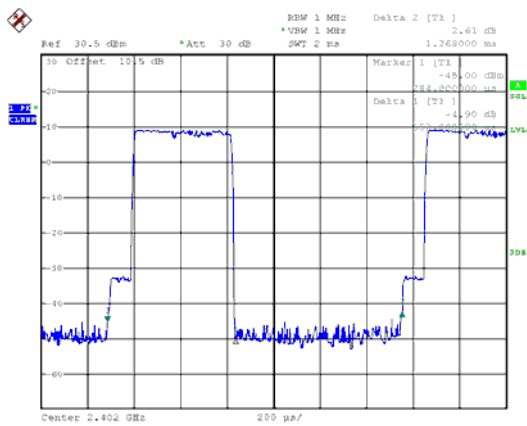


Modulation Standard:  $\pi/4$ -DQPSK (DH5)  
Channel: 78

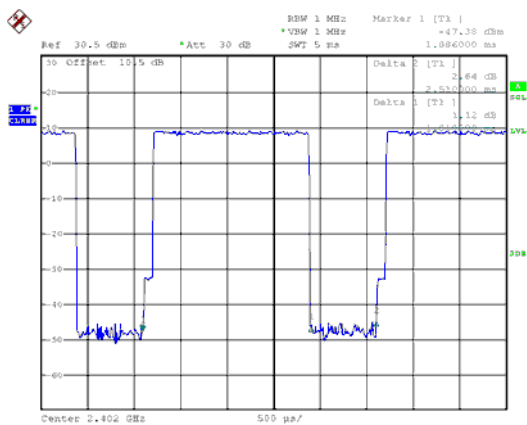




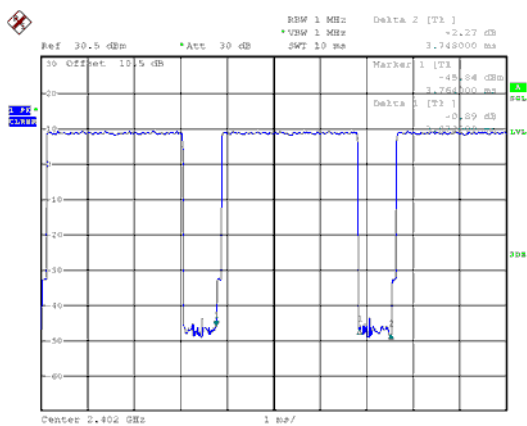
Modulation Standard: 8DPSK (DH1)  
Channel: 00



Modulation Standard: 8DPSK (DH3)  
Channel: 39



Modulation Standard: 8DPSK (DH5)  
Channel: 78

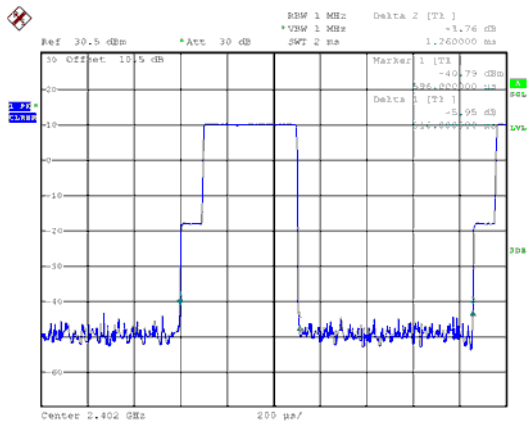




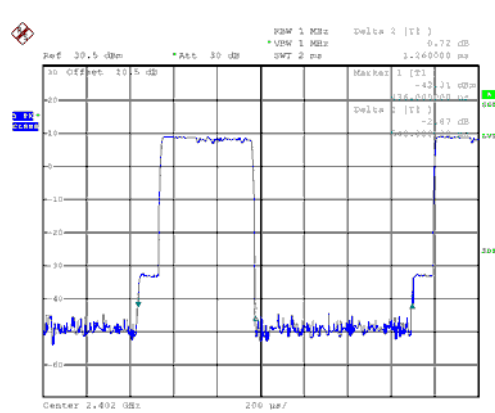


AFH

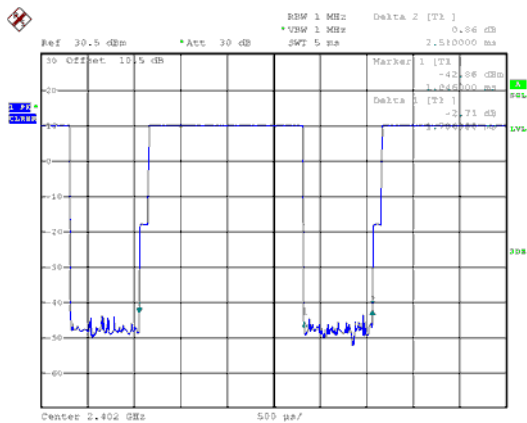
Modulation Standard: GFSK (DH1)  
Channel: 00



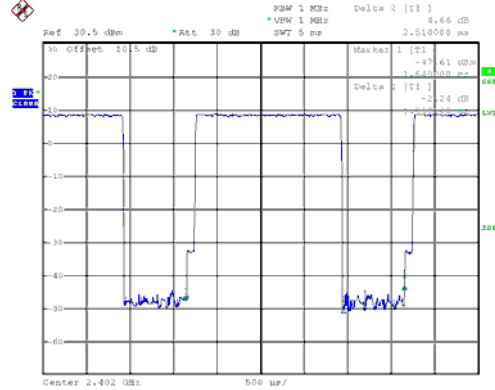
Modulation Standard:  $\pi/4$ -DQPSK (DH1)  
Channel: 00



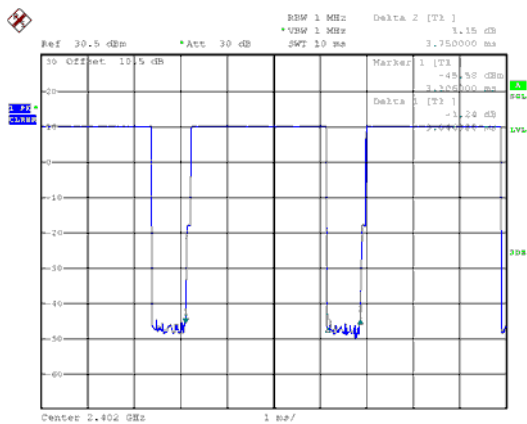
Modulation Standard: GFSK (DH3)  
Channel: 39



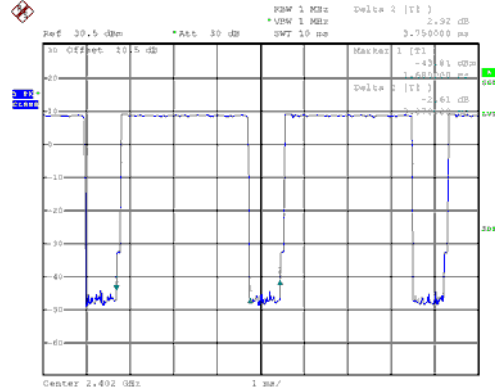
Modulation Standard:  $\pi/4$ -DQPSK (DH3)  
Channel: 39



Modulation Standard: GFSK (DH5)  
Channel: 78

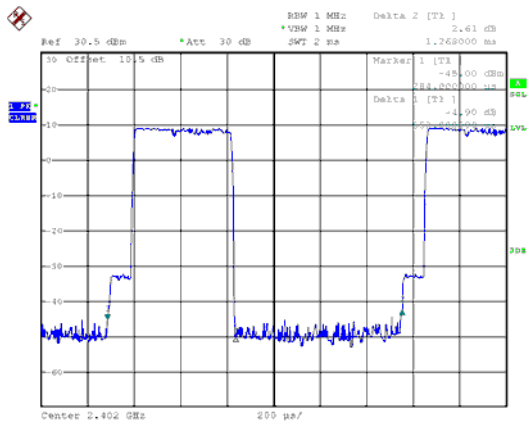


Modulation Standard:  $\pi/4$ -DQPSK (DH5)  
Channel: 78

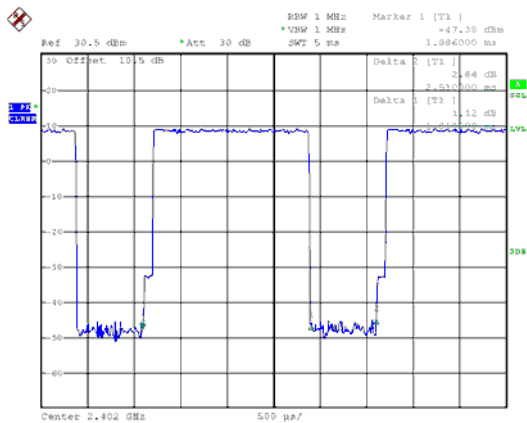




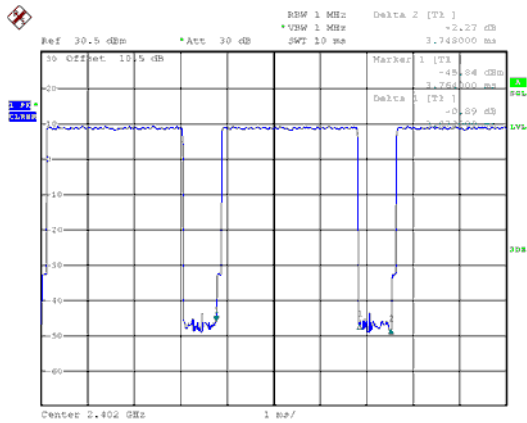
Modulation Standard: 8DPSK (DH1)  
Channel: 00



Modulation Standard: 8DPSK (DH3)  
Channel: 39



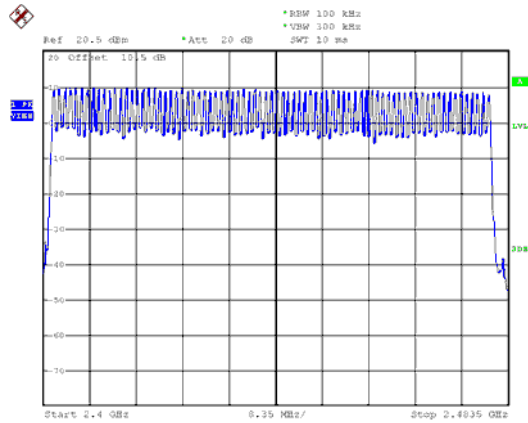
Modulation Standard: 8DPSK (DH5)  
Channel: 78



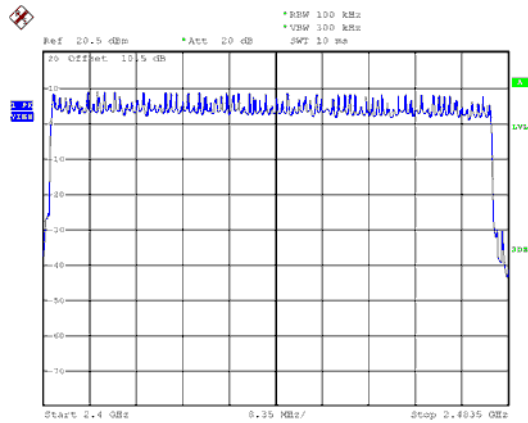




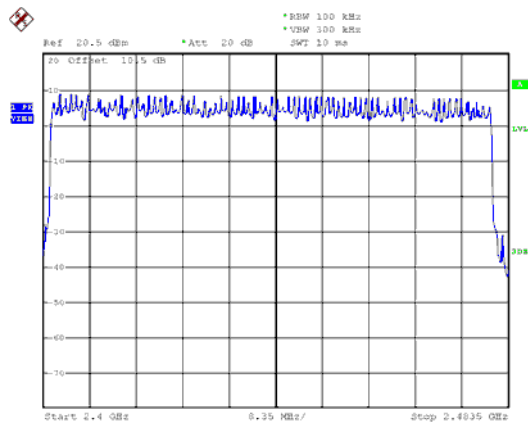
Modulation Standard: GFSK (1Mbps)



Modulation Standard:  $\pi/4$ -DQPSK (2Mbps)



Modulation Standard: 8DPSK (3Mbps)





## 12. Maximum Peak Output Power

### 12.1 Test Limit

The Maximum Peak Output Power Measurement is 30dBm.

### 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



**12.4 Test Result and Data**

Test Result : PASS

Temperature : 20°C

Test Date : Feb. 14, 2019

Humidity : 40%

Modulation Type	Channel	Frequency (MHz)	PK Output Power (dBm)	PK Output Power (mW)	e.i.r.p. Power (dBm)	e.i.r.p. Power (mW)
GFSK	0	2402	9.91	9.795	11.980	15.776
	39	2441	9.28	8.472	11.350	13.646
	78	2480	8.66	7.345	10.730	11.830
$\pi/4$ -DQPSK	0	2402	9.34	8.590	11.410	13.836
	39	2441	8.74	7.482	10.810	12.050
	78	2480	8.07	6.412	10.140	10.328
8DPSK	0	2402	9.47	8.851	11.540	14.256
	39	2441	8.83	7.638	10.900	12.303
	78	2480	8.23	6.653	10.300	10.715

Modulation Type	Channel	Frequency (MHz)	AV Output Power (dBm)	AV Output Power (mW)	e.i.r.p. Power (dBm)	e.i.r.p. Power (mW)
GFSK	0	2402	9.73	9.397	11.800	15.136
	39	2441	9.10	8.128	11.170	13.092
	78	2480	8.47	7.031	10.540	11.324
$\pi/4$ -DQPSK	0	2402	7.20	5.248	9.270	8.453
	39	2441	6.53	4.498	8.600	7.244
	78	2480	5.85	3.846	7.920	6.194
8DPSK	0	2402	7.20	5.248	9.270	8.453
	39	2441	6.51	4.477	8.580	7.211
	78	2480	5.84	3.837	7.910	6.180

AFH:

Modulation Type	Channel	Frequency (MHz)	PK Output Power (dBm)	PK Output Power (mW)	e.i.r.p. Power (dBm)	e.i.r.p. Power (mW)
GFSK	0-19	2402-2421	9.88	9.727	11.950	15.668
$\pi/4$ -DQPSK	0-19	2402-2421	9.31	8.531	11.380	13.740
8DPSK	0-19	2402-2421	9.44	8.790	11.510	14.158

Modulation Type	Channel	Frequency (MHz)	AV Output Power (dBm)	AV Output Power (mW)	e.i.r.p. Power (dBm)	e.i.r.p. Power (mW)
GFSK	0-19	2402-2421	9.70	9.333	11.770	15.031
$\pi/4$ -DQPSK	0-19	2402-2421	7.16	5.200	9.230	8.375
8DPSK	0-19	2402-2421	7.15	5.188	9.220	8.356



### 13. Radio Frequency Exposure

The measurements shown in this test report were made in accordance with the procedures given in FCC Part 2 (Section 2.1093)  
 KDB 447498  
 IEEE C95.1

**LIMIT**

KDB 447498 D01 § 4.3(a)

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- \*f(GHz) is the RF channel transmit frequency in GHz
- \* Power and distance are rounded to the nearest mW and mm before calculation
- \*The result is rounded to one decimal place for comparison
- \*The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion

#### 13.1 EUT Specification

<b>Frequency band (Operating)</b>	<input type="checkbox"/> WLAN: 2412MHz ~ 2462MHz <input checked="" type="checkbox"/> Bluetooth: 2402MHz ~ 2480MHz
<b>Device category</b>	<input checked="" type="checkbox"/> Portable (<20cm separation) <input type="checkbox"/> Mobile (>20cm separation)
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure <input checked="" type="checkbox"/> General Population/Uncontrolled exposure
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Evaluation applied</b>	<input type="checkbox"/> MPE Evaluation* <input checked="" type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

**Remark:**

1. The maximum conducted output power is 9.91dBm (9.79mW) at 2402MHz (with 2.07dBi antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied.

\*Note: Simultaneous transmission is not applicable for this EUT.



### 13.2 Test Results

According to the KDB447498:

The SAR test exclusion thresholds Level:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * \text{sqrt}(\text{freq. in GHz}) < 3$

Calculation

Modulation Mode	Channel Frequency (MHz)	Max. Conducted output power(dBm)	Max. Conducted output power(mW)	Distance (mm)	SAR test exclusion thresholds (mW)
GFSK	2402-2480	9.91	9.79	5	10.0000
$\pi/4$ -DQPS	2402-2480	9.34	8.59	5	10.0000
8DPSK	2402-2480	9.47	8.85	5	10.0000

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing