FCC TEST REPORT

According to

CFR47 §15.247

Applicant	:	SACKit ApS
Address	:	Lyngvej 1, DK-9000 Aalborg
Equipment	:	Bluetooth Speaker
Model No.	:	WOOFit Go XQ，WOOFit Go Qi, WOOFit Go xx(x=A-Z,a-z or blank)
Trademark	:	CVTE ，SACKit，MUVIT，Symfoni，Sandstrom
FCC ID	:	2AO5W-WOOFITGOXQ

I HEREBY CERTIFY THAT :

The sample was received on Apr. 15, 2020 and the testing was completed on Apr. 23, 2020 at Cerpass Technology (Suzhou) Co., Ltd. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology (Suzhou) Co., Ltd., the test report shall not be reproduced except in full.

Approved by:

Miro Chueh
EMC/RF Manager

Laboratory Accreditation:
Cerpass Technology Corporation Test Laboratory

☐ **TAF LAB Code: 1439**

Cerpass Technology (SuZhou) Co., Ltd.

☒ **A2LA LAB Code: 4981.01**

Contents

1. Report of Measurements and Examinations 5
1.1 List of Measurements and Examinations 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
2.6 Measurement Uncertainty 9
3. Test Equipment and Ancillaries Used for Tests 10
4. Antenna Requirements 11
4.1 Standard Applicable 11
4.2 Antenna Construction and Directional Gain 11
5. Test of Conducted Emission 12
5.1 Test Limit 12
5.2 Test Procedures 12
5.3 Typical Test Setup 13
5.4 Test Result and Data 14
6. Test of Radiated Emission 16
6.1 Test Limit 16
6.2 Test Procedures 17
6.3 Typical Test Setup 18
7. 20dB Bandwidth Measurement Data 33
7.1 Test Limit 33
7.2 Test Procedures 33
7.3 Test Setup Layout 33
7.4 Test Result and Data 33
8. Frequencies Separation 37
8.1 Test Limit 37
8.2 Test Procedures 37
8.3 Test Setup Layout 37
8.4 Test Result and Data 37
9. Dwell Time on each channel 39
9.1 Test Limit 39
9.2 Test Procedures 39
9.3 Test Setup Layout 39
9.4 Test Result and Data 40
10. Number of Hopping Channels 45
10.1 Test Limit 45
10.2 Test Procedures 45
10.3 Test Setup Layout 45
10.4 Test Result and Data 45

11. Maximum Peak Output Power 47
11.1 Test Limit 47
11.2 Test Procedures 47
11.3 Test Setup Layout 47
11.4 Test Result and Data 47
12. Band Edges Measurement 51
12.1 Test Limit 51
12.2 Test Procedure 51
12.3 Test Setup Layout 51
12.4 Test Result and Data 52
12.5 Restrict band emission Measurement Data 55
13. Restricted Bands of Operation 63

History of this test report

☐ Original

■ Additional attachment as following record:

Attachment No.	Issue Date	Description
SEFB2004098	Apr. 23, 2020	Initial Issue

Report Type		Description
■	Original report	NA
☐	Derivative Report	NA

1. Report of Measurements and Examinations

1.1 List of Measurements and Examinations

ANSI C63.10: 2013

KDB 558074 D01 DTS Meas Guidance v05r02

FCC Rules and Regulations Part 15 Subpart C §15.247

FCC Rule	. Description of Test	Result
§ 15.203	. Antenna Requirement	Pass
§ 15.207(a)	. Conducted Emission	Pass
§ 15.209(a)	. Radiated Emission	Pass
§ 15.247(a)(1)	. Channel Carrier Frequencies Separation	Pass
§ 15.247(a)(1)	. 20dB Bandwidth Measurement	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
§ 15.247(d)	. Band Edges Measurement Data	Pass

2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Equipment	Bluetooth Speaker
Model Name	WOOFit Go XQ，WOOFit Go Qi, WOOFit Go xx(x=A-Z,a-z or blank) Model WOOFit Go XQ is the representative for final test.
Model Discrepancy	All models are electrically identical, different model names are for marketing purpose.
Frequency Range	2402~2480MHz
Number of Channels	79
Modulation	GFSK (1Mbps), Π/4 DQPSK (2Mbps)
Data Rates	Bluetooth: 1, 2Mbps
Antenna Type	PCB Antenna / 1.5dBi
Power Source	3.7V 3.5Wh Li-ion Battery (build-in) DC 5V charged by USB port

Note: for more details, please refer to the User's manual of the EUT.

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	---	---

2.3 Test Mode & Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.10

b. The complete test system included support units and EUT for RF test.

c. Run the test software "**FCC_assist.exe**".

d. The following test mode was performed for conduction and radiation test:

Test Mode 1: GFSK: CH 00: 2402MHz, CH 39: 2441MHz, CH 78: 2480MHz.

Test Mode 2: π/4 DQPSK：CH 00: 2402MHz, CH 39: 2441MHz, CH 78: 2480MHz.

2.4 Description of Test System

Device	Manufacturer	Model No.	Description
Notebook	Sony	PCG-71811P	R33021

Used cable

Cable	Quantity	Description
Type-C Cable	1	0.3m Non Shielding

2.5 General Information of Test

☐	Test Site	**Cerpass 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
	TAF	1439
	FCC	TW1079, TW1061
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-4399, R-4218 for Radiated emission test G-812, G-813 for radiated disturbance above 1GHz
☒	Test Site	Cerpass Technology (Suzhou) Co.,Ltd Address: No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China Tel: +86-512-6917-5888 Fax: +86-512-6917-5666
	CNAS	L5515
	FCC	CN1243
	A2LA	4981.01
	IC	7290A
	VCCI	T-11945 for Telecommunication Test C-12919 for Conducted emission test R-12670 for Radiated emission test G-10227 for radiated disturbance above 1GHz

2.6 Measurement Uncertainty

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

RF Conducted Measurement

Test Item		Uncertainty	Limit
Radio Frequency		$\pm 8.7X10^{-7}$	$\pm 1X10^{-5}$
RF output power, conducted		±0.63dB	±1.5dB
Power density, conducted		±1.21dB	±3dB
Unwanted emissions, conducted	30-1000MHz	±0.51dB	±3dB
	1-12.75GHz	±0.67dB	±3dB
All emissions, radiated	30-1000MHz	±2.28dB	±6dB
	1-12.75GHz	±2.59dB	±6dB
Temperature		±0.8℃	±1℃
Humidity		±3%	±5%
DC and low frequency voltages		±3%	±3%

AC Conducted Measurement

Measurement	Frequency	Uncertainty
Conducted emissions(LINE)	9KHz-30MHz	+/- 0.7738 dB
Conducted emissions(NEUTRAL)	9KHz-30MHz	+/- 0.7886 dB
Conducted emissions(10Mbps)	150KHz-30MHz	+/- 1.3013dB
Conducted emissions(100Mbps)	150KHz-30MHz	+/- 1.3197 dB
Conducted emissions(1000Mbps)	150KHz-30MHz	+/- 1.2987 dB

Radiated Measurement

Measurement	Polarity	Frequency	Uncertainty
Radiated emissions	Horizontal	below 1GHz	+/- 3.8936 dB
	Vertical	below 1GHz	+/- 3.8928 dB
	Horizontal	above 1GHz	+/- 5.18858dB
	Vertical	above 1GHz	+/- 5.18928 dB

3. Test Equipment and Ancillaries Used for Tests

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
EMI Receiver	R&S	ESCI3	100563	2019.06.21	2020.06.20
LISN	Schwarzbeck	NSLK 8127	8127-920	2019.09.25	2020.09.24
Pulse Limiter	R&S	ESH3-Z2	100529	2020.03.11	2021.03.10
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
Bilog Antenna	Sunol	JB1	A072414-2 -2	2019.07.13	2020.07.13
EMI Receiver	R&S	ESCI3	101183	2019.06.28	2020.06.27
EMI Receiver	R&S	ESCI7	100968	2019.07.28	2020.07.27
Preamplifier	EM Electronics corp.	EM330	60618	2020.03.11	2021.03.10
Horn Antenna	Schwarzbeck	BBHA9120 D	9120D-619	2019.07.13	2020.07.13
Horn Antenna	Schwarzbeck	BBHA9170	9170-348	2019.06.23	2020.06.22
Spectrum Analyzer	R&S	FSP40	100324	2019.07.13	2020.07.12
Preamplifier	EMCI	EMCI 030-00-3230	SN016723	2020.03.11	2021.03.10
Preamplifier	EM Electronics corp.	EM01G18G	SN060714	2020.03.23	2021.03.22
Spectrum Analyzer	KEYSIGHT	N9010A	MY53400169	2019.08.25	2020.08.24
Software	E3	AUDIX	Version: 8.14.806b	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	Peak Gain
PCB Antenna	1.5dBi

5. Test of Conducted Emission

5.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.10-2013. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 6.2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions

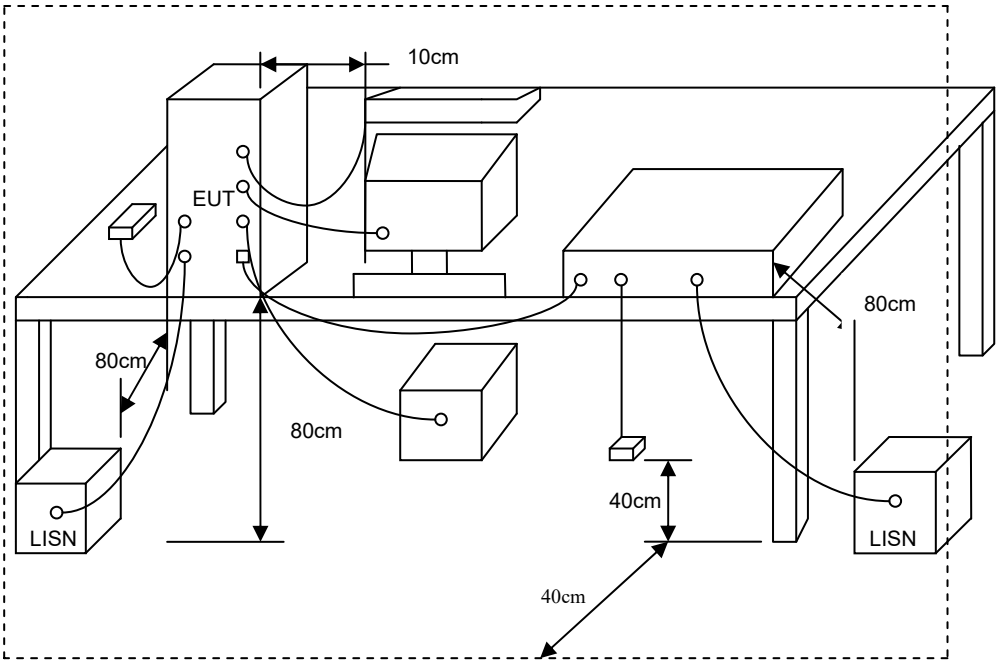
Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

5.2 Test Procedures

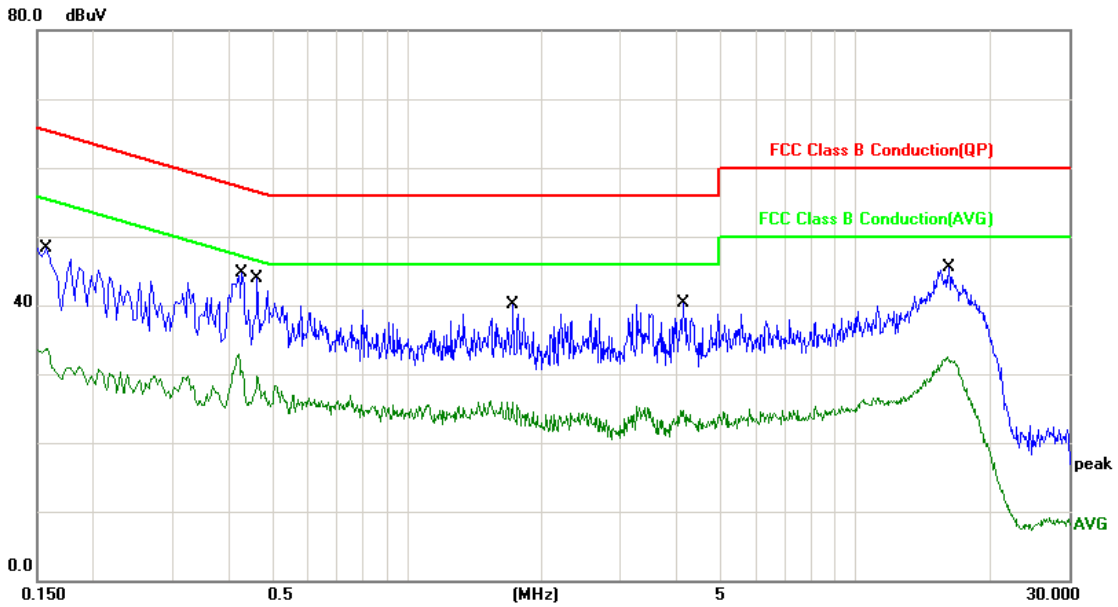
a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. 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/60Hz	Pol/Phase:	LINE
Test Mode:	Mode 1		

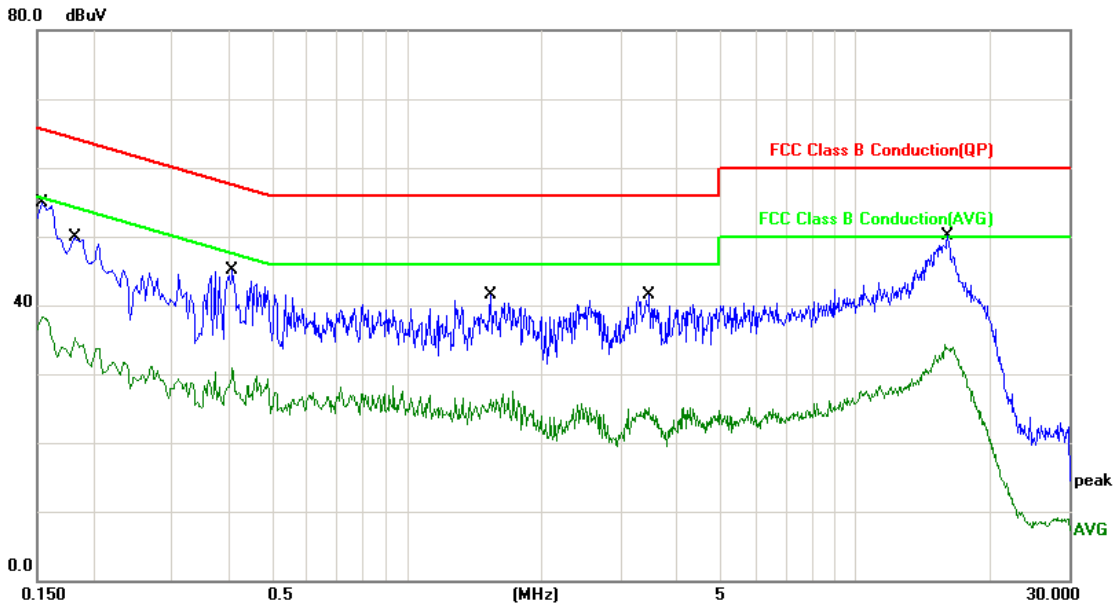


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1580	10.06	30.77	40.83	65.56	-24.73	QP
2	0.1580	10.06	21.08	31.14	55.56	-24.42	AVG
3	0.4300	9.93	30.93	40.86	57.25	-16.39	QP
4	0.4300	9.93	19.84	29.77	47.25	-17.48	AVG
5	0.4660	9.91	27.35	37.26	56.58	-19.32	QP
6	0.4660	9.91	18.52	28.43	46.58	-18.15	AVG
7	1.7300	10.81	20.01	30.82	56.00	-25.18	QP
8	1.7300	10.81	13.61	24.42	46.00	-21.58	AVG
9	4.1420	10.48	20.00	30.48	56.00	-25.52	QP
10	4.1420	10.48	12.82	23.30	46.00	-22.70	AVG
11	16.1900	10.41	26.74	37.15	60.00	-22.85	QP
12	16.1900	10.41	20.40	30.81	50.00	-19.19	AVG

Note: Level = Reading + Factor

Margin = Level – Limit

Power:	AC 120V/60Hz	Pol/Phase:	NEUTRAL
Test Mode:	Mode 1		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1539	10.06	38.29	48.35	65.78	-17.43	QP
2	0.1539	10.06	25.28	35.34	55.78	-20.44	AVG
3	0.1819	10.06	34.68	44.74	64.39	-19.65	QP
4	0.1819	10.06	22.22	32.28	54.39	-22.11	AVG
5	0.4100	9.94	32.27	42.21	57.65	-15.44	QP
6	0.4100	9.94	19.45	29.39	47.65	-18.26	AVG
7	1.5420	10.15	21.38	31.53	56.00	-24.47	QP
8	1.5420	10.15	14.70	24.85	46.00	-21.15	AVG
9	3.4780	10.21	25.67	35.88	56.00	-20.12	QP
10	3.4780	10.21	13.32	23.53	46.00	-22.47	AVG
11	16.1060	10.41	30.97	41.38	60.00	-18.62	QP
12	16.1060	10.41	22.03	32.44	50.00	-17.56	AVG

Note: Level = Reading + Factor

Margin = Level – Limit

6. Test of Radiated Emission

6.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

FREQUENCIES(MHz)	FIELD STRENGTH(microvolts/meter)	MEASUREMENT DISTANCE(meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

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

a. The EUT was placed on a rotatable table top 0.8 meter above ground; above 1GHz, the height was 1.5m.

b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.

c. The table was rotated 360 degrees to determine the position of the highest radiation.

d. 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.

e. 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.

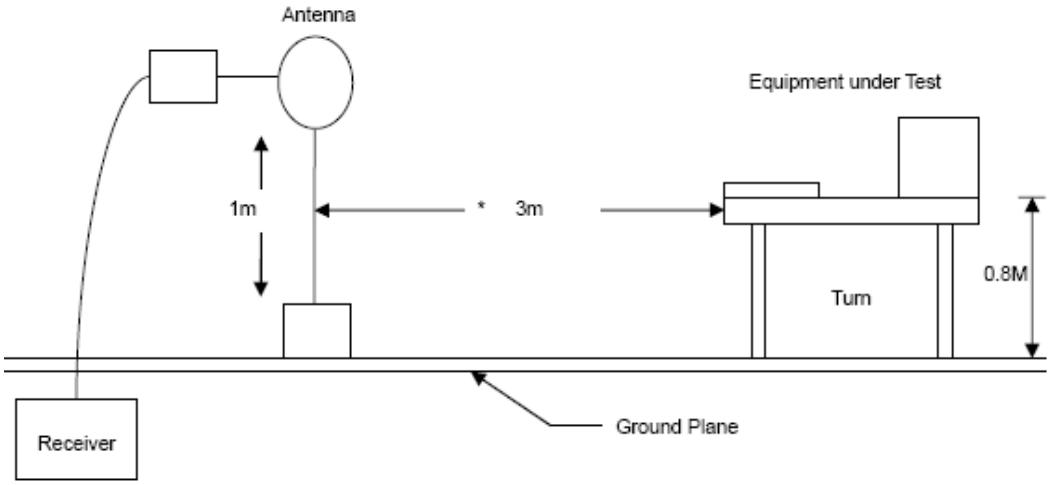
f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.

g. 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.

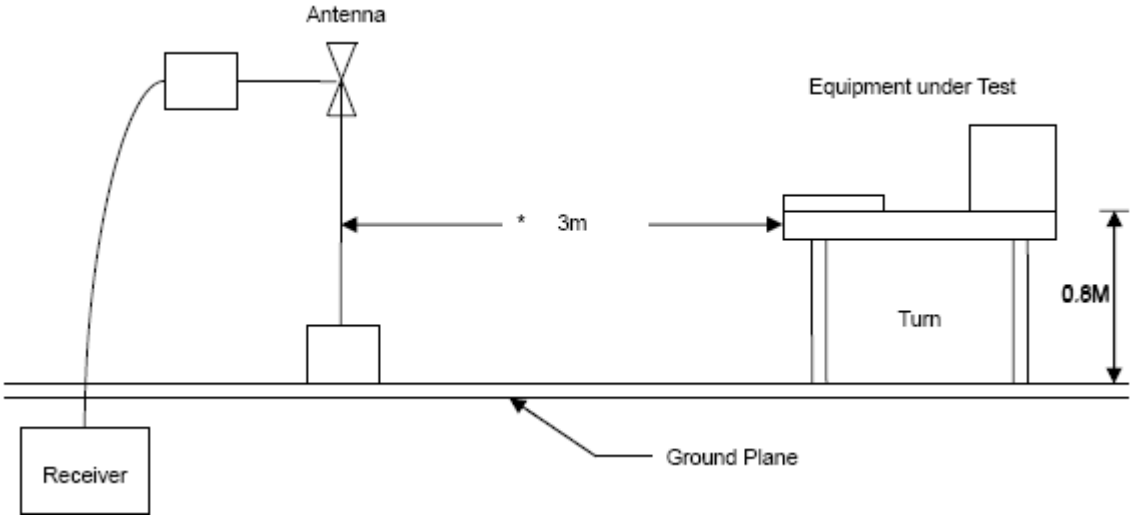
h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

6.3 Typical Test Setup

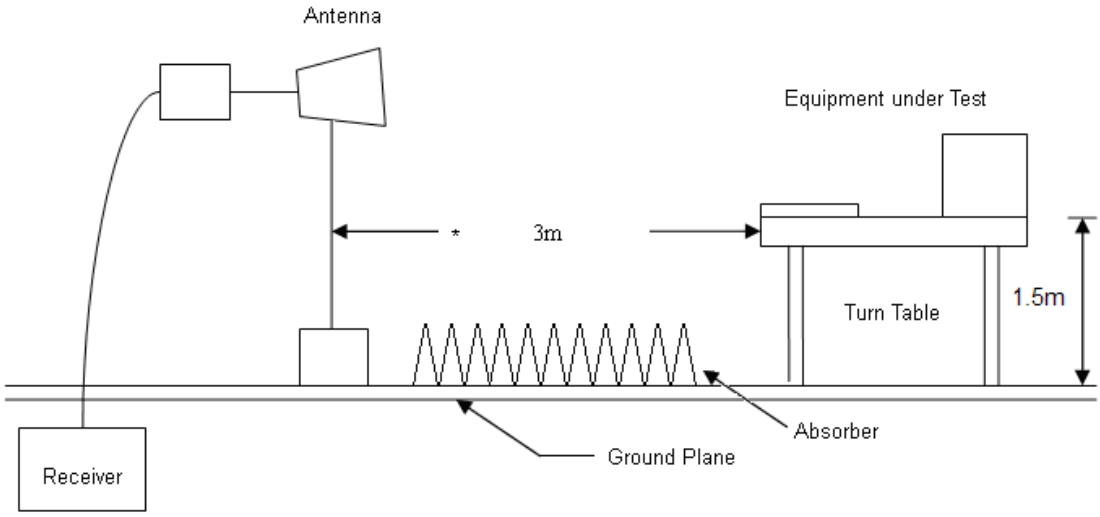
Below 30MHz Test Setup



30M - 1GHz Test Setup



Above 1GHz Test Setup

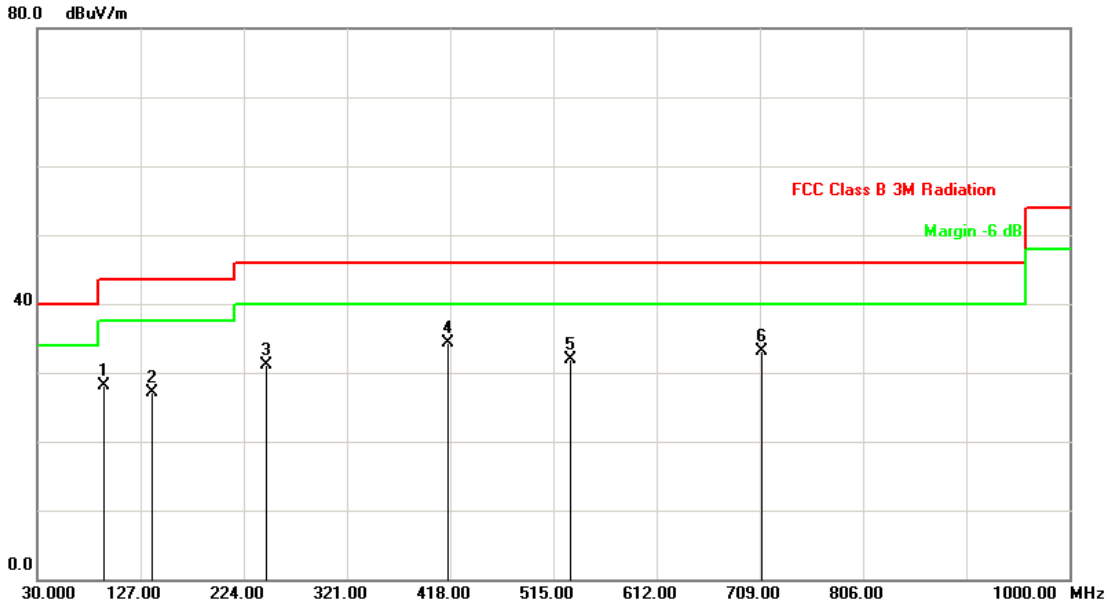


6.3.1 Test Result and Data

Below 1GHz

Power	AC 120V/60Hz	Pol/Phase	VERTICAL
Test Mode	Mode 1		

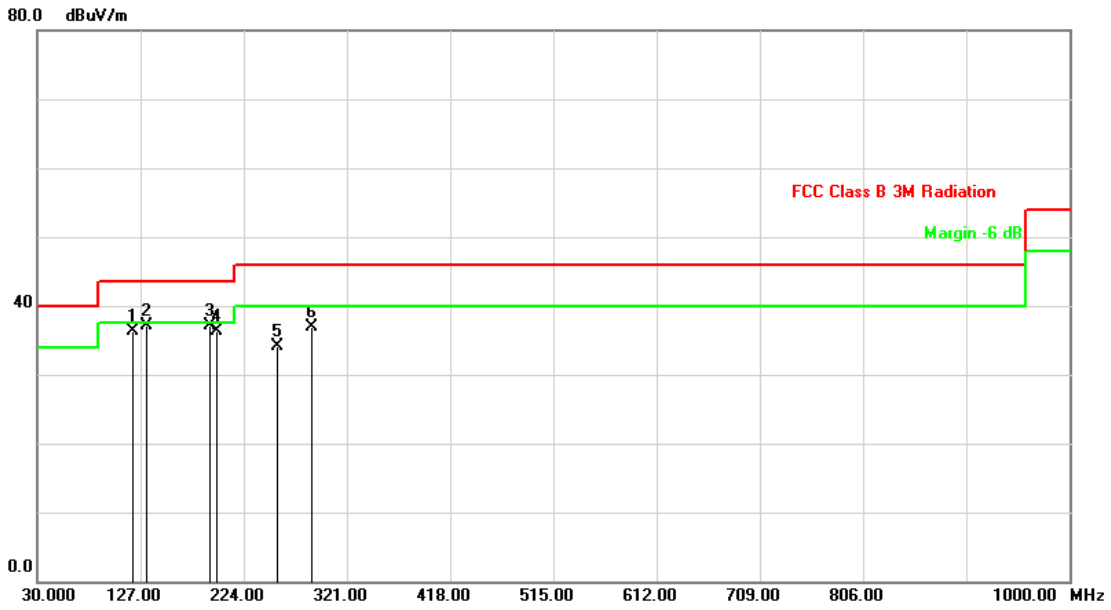
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 9KHz -30MHz spurious emission is under limit 20dB more



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	93.0500	-13.00	41.20	28.20	43.50	-15.30	peak	100	75
2	137.6699	-12.24	39.40	27.16	43.50	-16.34	peak	100	116
3	245.3400	-10.72	41.78	31.06	46.00	-14.94	peak	100	9
4	416.0600	-6.08	40.31	34.23	46.00	-11.77	peak	100	311
5	531.4900	-3.21	35.07	31.86	46.00	-14.14	peak	100	245
6	710.9400	-2.05	35.23	33.18	46.00	-12.82	peak	100	89

Power	AC 120V/60Hz	Pol/Phase	HORIZONTAL
Test Mode	Mode 1		

Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 9KHz -30MHz spurious emission is under limit 20dB more

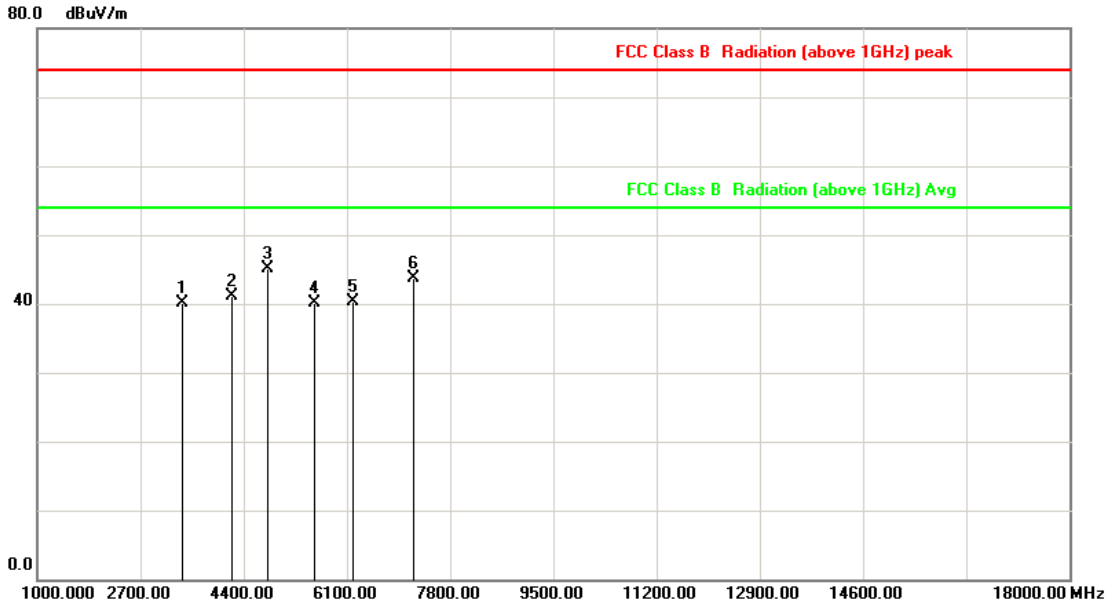


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	119.2400	-10.36	46.75	36.39	43.50	-7.11	peak	100	132
2	132.8199	-11.46	48.66	37.20	43.50	-6.30	peak	100	15
3	191.9900	-12.31	49.51	37.20	43.50	-6.30	peak	100	337
4	198.7800	-11.86	48.26	36.40	43.50	-7.10	peak	100	159
5	256.0099	-10.03	44.12	34.09	46.00	-11.91	peak	200	8
6	288.0200	-9.69	46.57	36.88	46.00	-9.12	peak	100	0

Above 1GHz

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	Mode 1, CH 00	Operation mode	TX

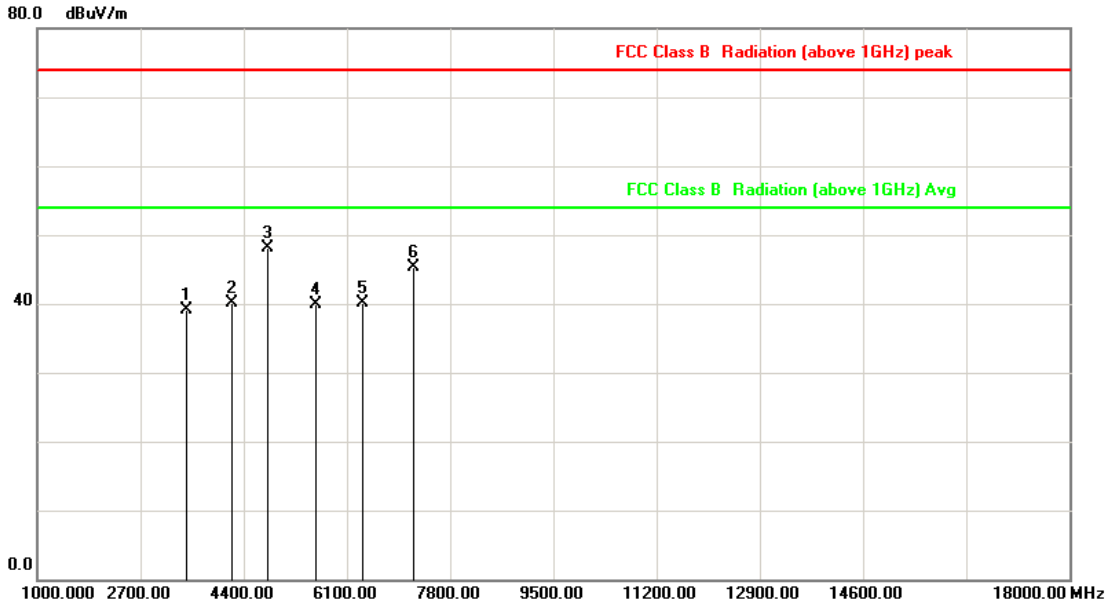
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3380.000	-4.23	44.36	40.13	74.00	-33.87	peak
2	4201.667	-0.86	41.95	41.09	74.00	-32.91	peak
3	4804.000	1.23	43.87	45.10	74.00	-28.90	peak
4	5561.667	2.17	37.92	40.09	74.00	-33.91	peak
5	6213.333	3.35	37.04	40.39	74.00	-33.61	peak
6	7206.000	5.88	37.89	43.77	74.00	-30.23	peak

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	Mode 1, CH 00	Operation mode	TX

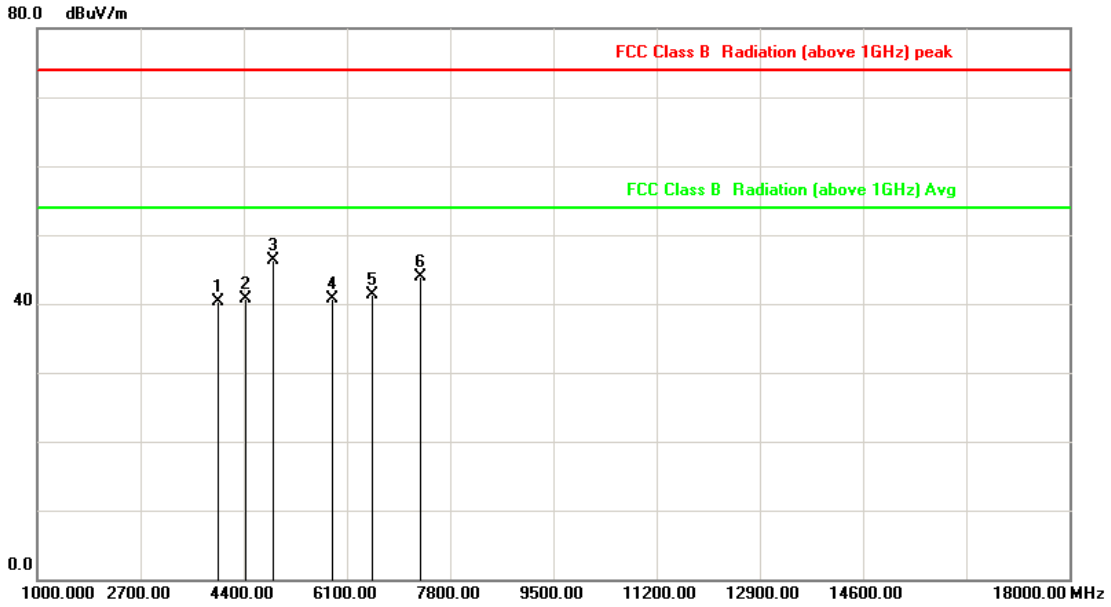
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3465.000	-3.78	42.93	39.15	74.00	-34.85	peak
2	4201.667	-0.86	40.94	40.08	74.00	-33.92	peak
3	4804.000	1.23	46.83	48.06	74.00	-25.94	peak
4	5590.000	2.24	37.63	39.87	74.00	-34.13	peak
5	6355.000	3.40	36.69	40.09	74.00	-33.91	peak
6	7206.000	5.88	39.47	45.35	74.00	-28.65	peak

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	Mode 1, CH 39	Operation mode	TX

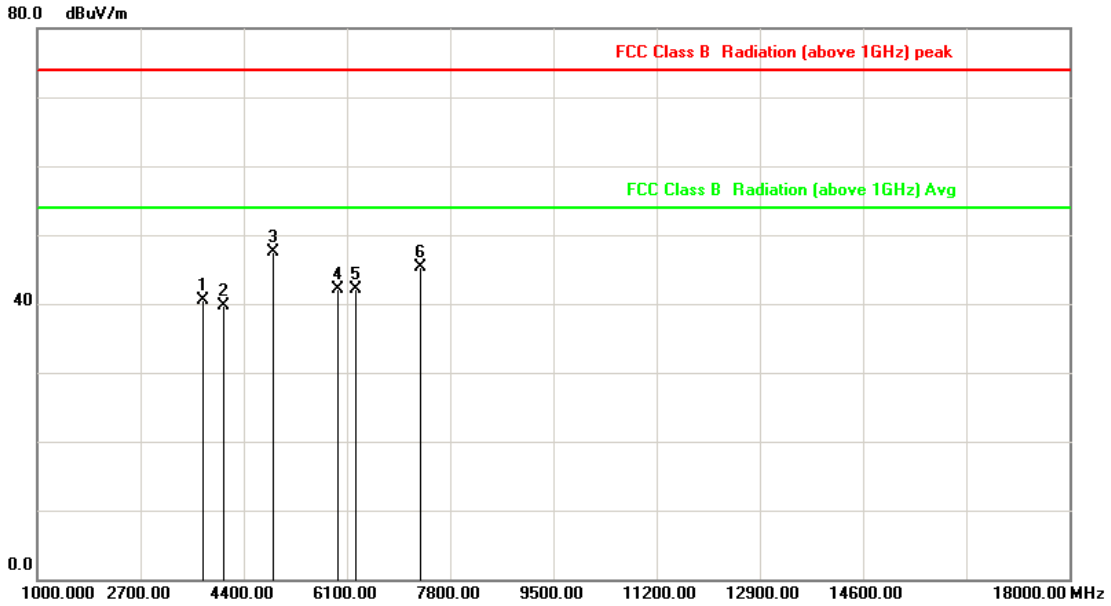
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3975.000	-1.98	42.20	40.22	74.00	-33.78	peak
2	4428.333	0.29	40.44	40.73	74.00	-33.27	peak
3	4882.000	1.38	44.89	46.27	74.00	-27.73	peak
4	5873.333	2.95	37.70	40.65	74.00	-33.35	peak
5	6525.000	3.54	37.72	41.26	74.00	-32.74	peak
6	7323.000	6.34	37.52	43.86	74.00	-30.14	peak

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	Mode 1, CH 39	Operation mode	TX

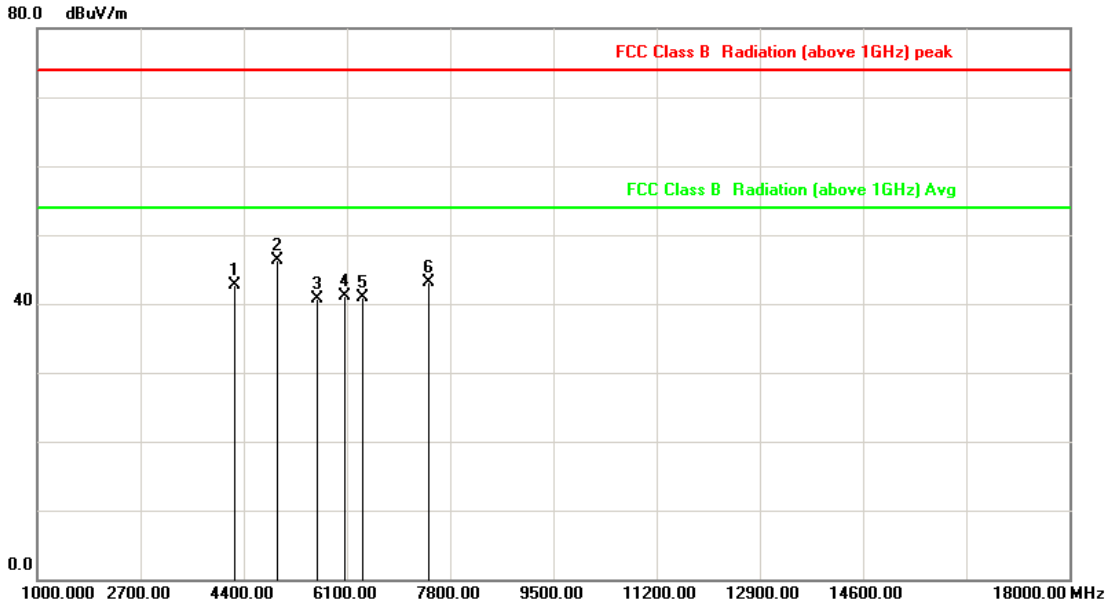
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3720.000	-2.85	43.45	40.60	74.00	-33.40	peak
2	4060.000	-1.58	41.27	39.69	74.00	-34.31	peak
3	4882.000	1.38	46.12	47.50	74.00	-26.50	peak
4	5958.333	3.16	38.89	42.05	74.00	-31.95	peak
5	6241.667	3.36	38.77	42.13	74.00	-31.87	peak
6	7323.000	6.34	38.95	45.29	74.00	-28.71	peak

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	Mode 1, CH 78	Operation mode	TX

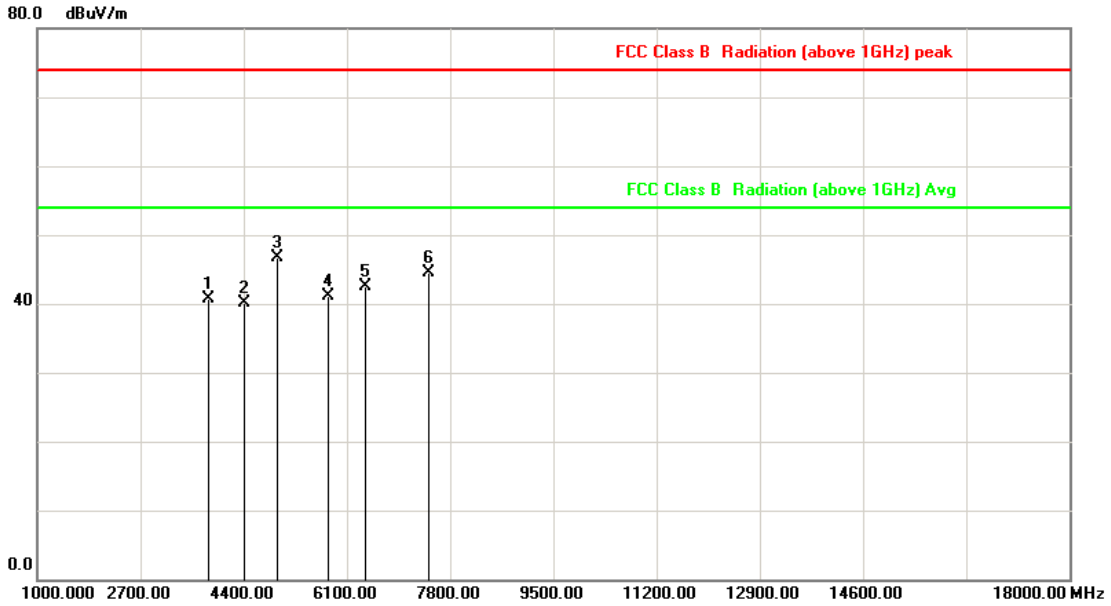
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	4258.333	-0.57	43.36	42.79	74.00	-31.21	peak
2	4960.000	1.52	44.75	46.27	74.00	-27.73	peak
3	5618.333	2.31	38.36	40.67	74.00	-33.33	peak
4	6071.667	3.29	37.91	41.20	74.00	-32.80	peak
5	6355.000	3.40	37.58	40.98	74.00	-33.02	peak
6	7440.000	6.80	36.36	43.16	74.00	-30.84	peak

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	Mode 1, CH 78	Operation mode	TX

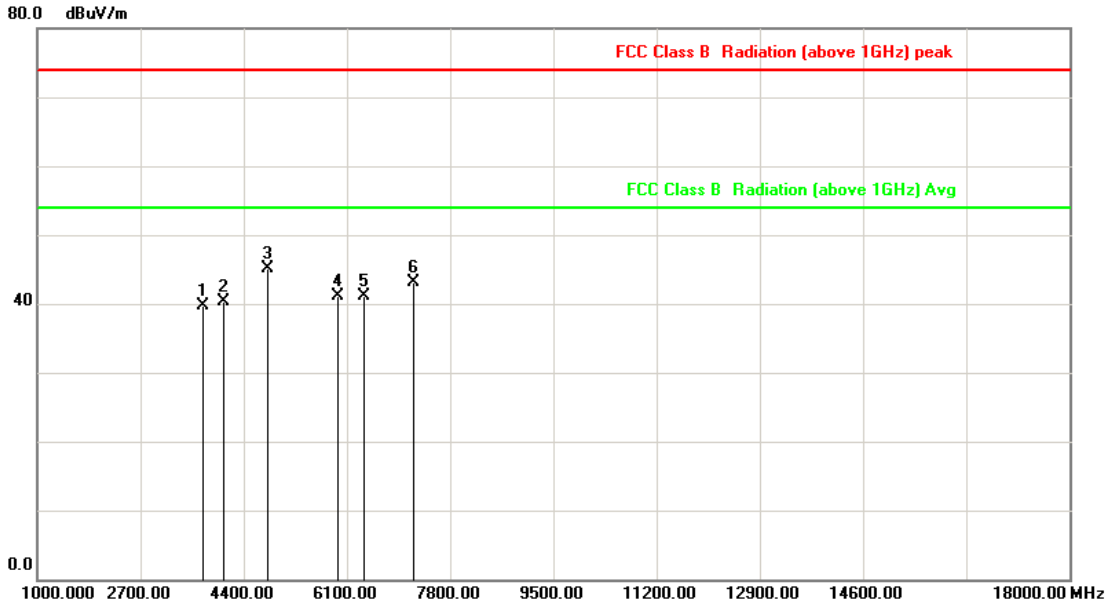
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3833.333	-2.46	43.16	40.70	74.00	-33.30	peak
2	4400.000	0.15	40.05	40.20	74.00	-33.80	peak
3	4960.000	1.52	45.23	46.75	74.00	-27.25	peak
4	5788.333	2.74	38.46	41.20	74.00	-32.80	peak
5	6411.667	3.42	39.09	42.51	74.00	-31.49	peak
6	7440.000	6.80	37.66	44.46	74.00	-29.54	peak

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	Mode 2, CH 00	Operation mode	TX

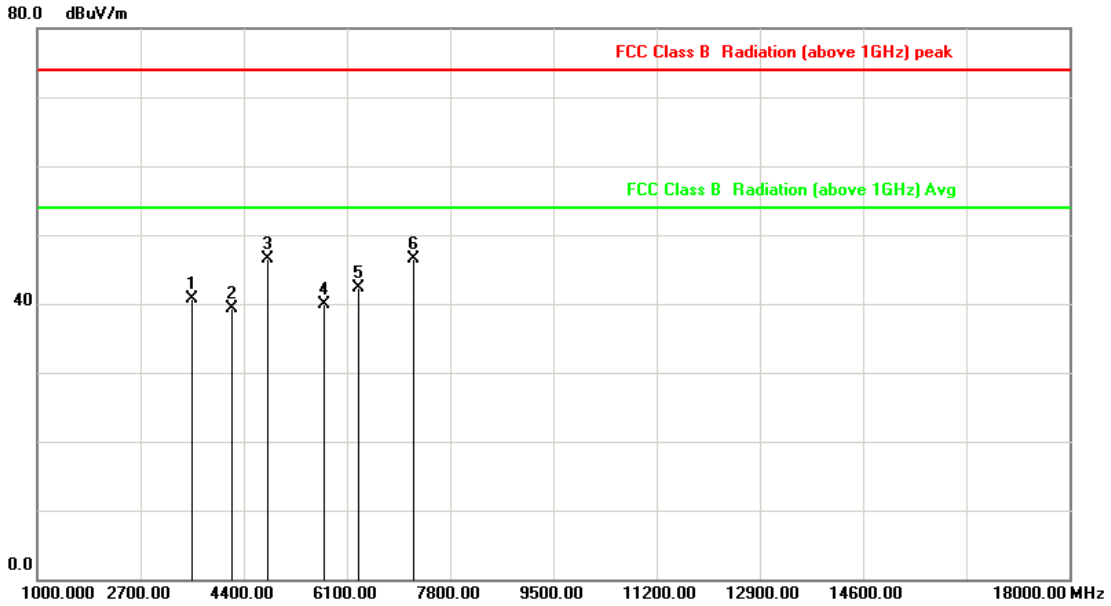
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3720.000	-2.85	42.48	39.63	74.00	-34.37	peak
2	4060.000	-1.58	41.81	40.23	74.00	-33.77	peak
3	4804.000	1.23	43.96	45.19	74.00	-28.81	peak
4	5958.333	3.16	37.92	41.08	74.00	-32.92	peak
5	6383.333	3.41	37.63	41.04	74.00	-32.96	peak
6	7206.000	5.88	37.26	43.14	74.00	-30.86	peak

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	Mode 2, CH 00	Operation mode	TX

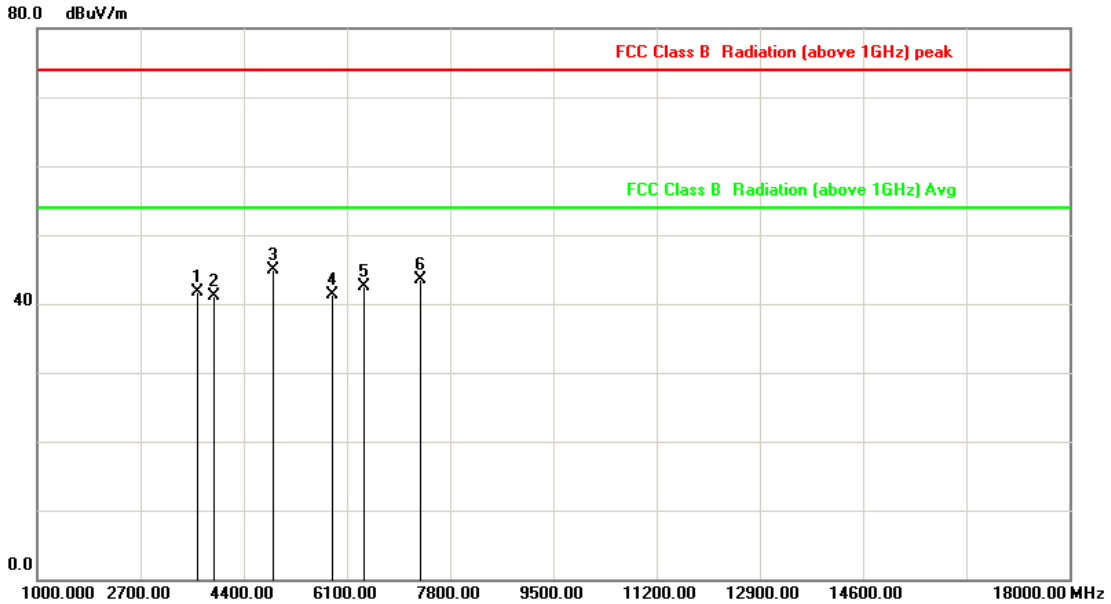
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3550.000	-3.43	44.05	40.62	74.00	-33.38	peak
2	4201.667	-0.86	40.19	39.33	74.00	-34.67	peak
3	4804.000	1.23	45.34	46.57	74.00	-27.43	peak
4	5731.667	2.59	37.29	39.88	74.00	-34.12	peak
5	6298.333	3.38	38.85	42.23	74.00	-31.77	peak
6	7206.000	5.88	40.56	46.44	74.00	-27.56	peak

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	Mode 2, CH 39	Operation mode	TX

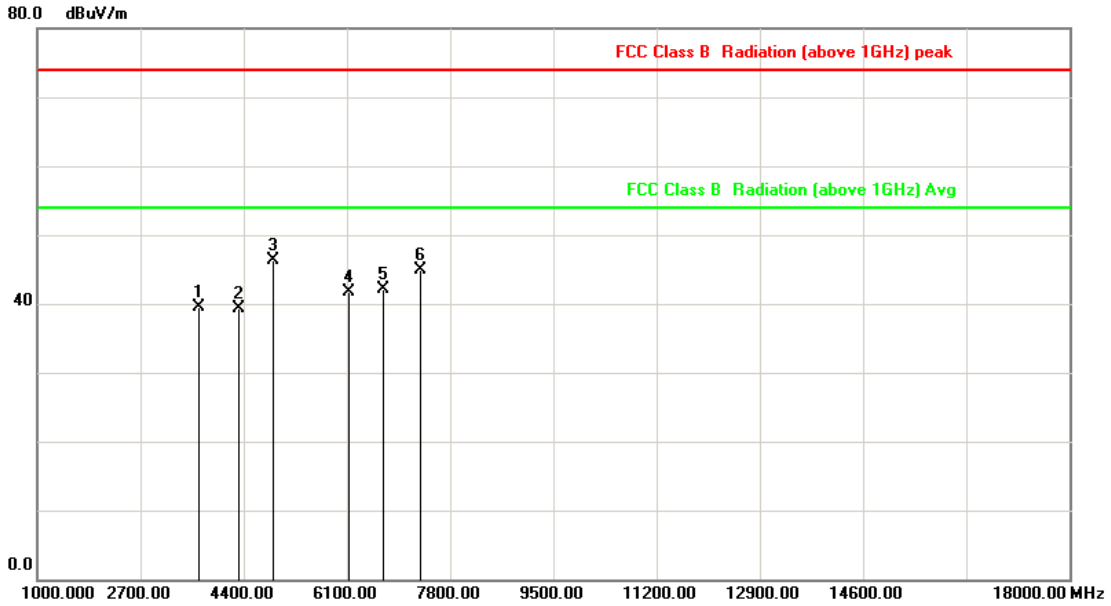
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3635.000	-3.14	44.88	41.74	74.00	-32.26	peak
2	3918.333	-2.17	43.22	41.05	74.00	-32.95	peak
3	4882.000	1.38	43.56	44.94	74.00	-29.06	peak
4	5873.333	2.95	38.41	41.36	74.00	-32.64	peak
5	6383.333	3.41	39.13	42.54	74.00	-31.46	peak
6	7323.000	6.34	37.22	43.56	74.00	-30.44	peak

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	Mode 2, CH 39	Operation mode	TX

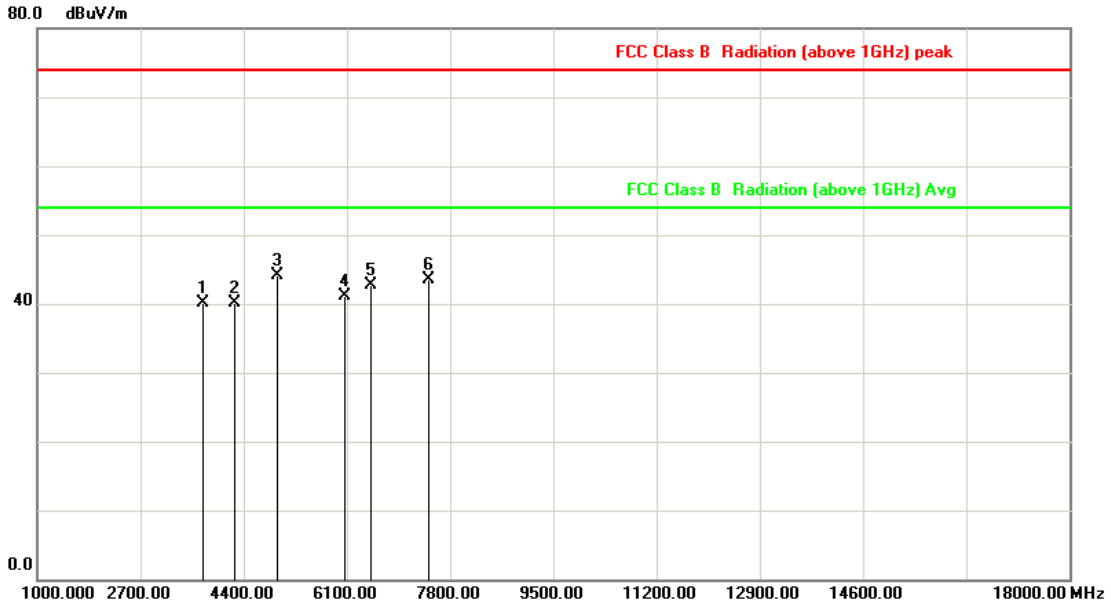
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3663.333	-3.04	42.45	39.41	74.00	-34.59	peak
2	4315.000	-0.28	39.53	39.25	74.00	-34.75	peak
3	4882.000	1.38	44.96	46.34	74.00	-27.66	peak
4	6128.333	3.31	38.32	41.63	74.00	-32.37	peak
5	6695.000	4.09	38.09	42.18	74.00	-31.82	peak
6	7323.000	6.34	38.62	44.96	74.00	-29.04	peak

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	Mode 2, CH 78		

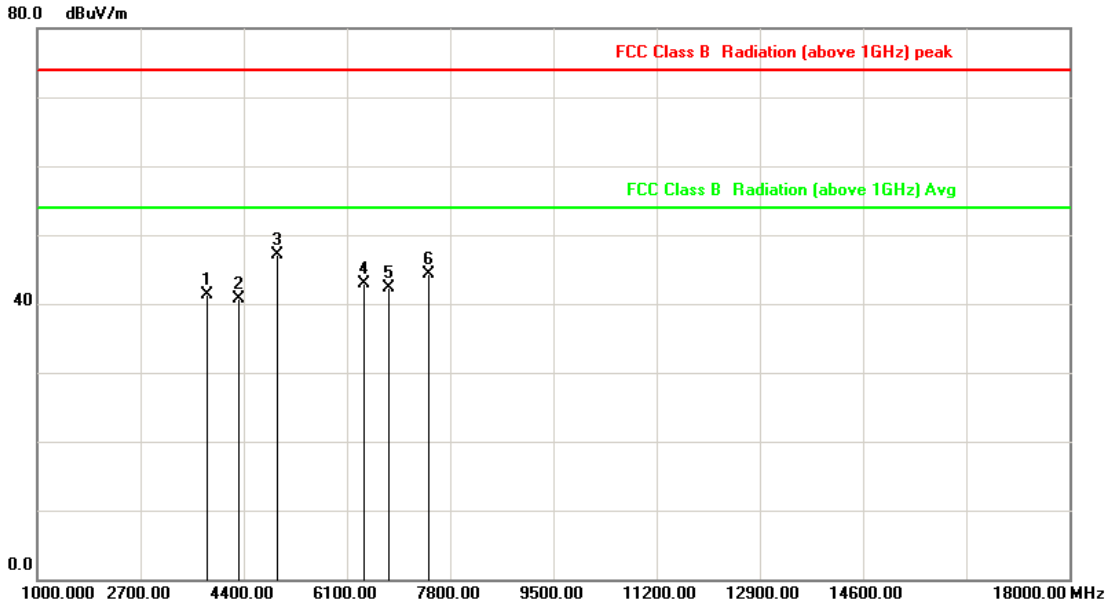
Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3720.000	-2.85	42.98	40.13	74.00	-33.87	peak
2	4258.333	-0.57	40.76	40.19	74.00	-33.81	peak
3	4960.000	1.52	42.51	44.03	74.00	-29.97	peak
4	6071.667	3.29	37.86	41.15	74.00	-32.85	peak
5	6496.667	3.46	39.22	42.68	74.00	-31.32	peak
6	7440.000	6.80	36.75	43.55	74.00	-30.45	peak

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	Mode 2, CH 78	Operation mode	TX

Note : Level = Reading + Factor
Margin = Level – Limit
Factor = Antenna Factor + Cable Loss – Amplifier Factor
The 18000MHz - 25000MHz spurious emission is under limit 20dB more.



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	3805.000	-2.56	43.86	41.30	74.00	-32.70	peak
2	4315.000	-0.28	41.03	40.75	74.00	-33.25	peak
3	4960.000	1.52	45.63	47.15	74.00	-26.85	peak
4	6383.333	3.41	39.54	42.95	74.00	-31.05	peak
5	6780.000	4.37	37.99	42.36	74.00	-31.64	peak
6	7440.000	6.80	37.48	44.28	74.00	-29.72	peak

7. 20dB Bandwidth Measurement Data

7.1 Test Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than125 mW.

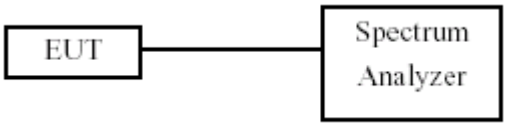
7.2 Test Procedures

a. The transmitter output was connected to the spectrum analyzer.

b. Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.

c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

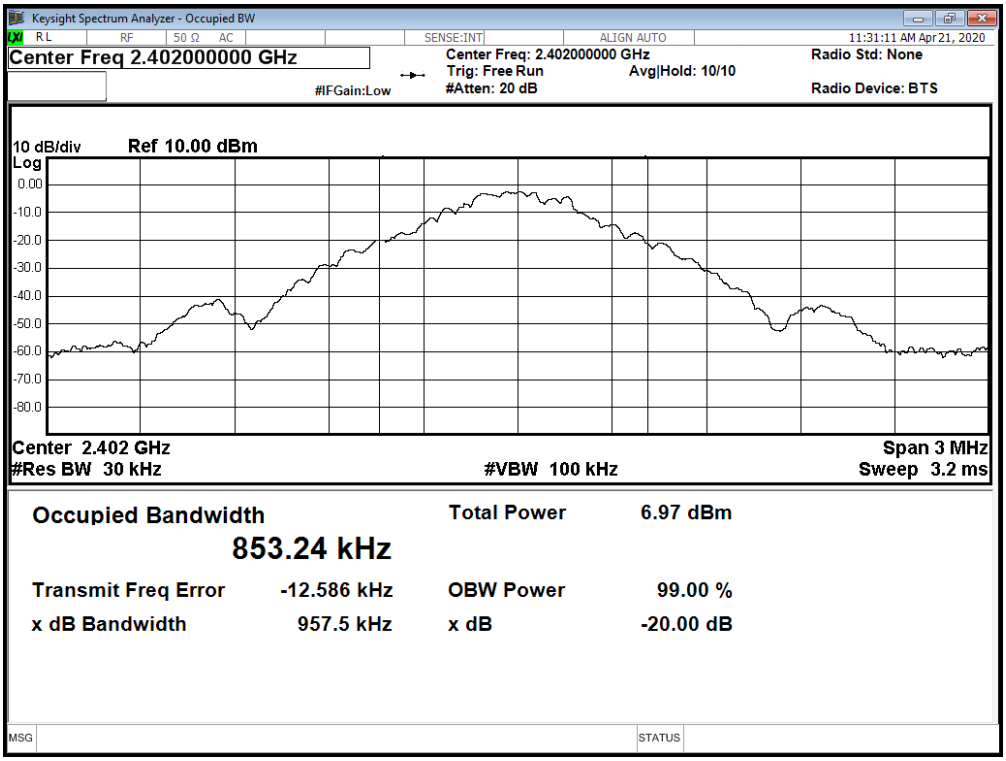
7.3 Test Setup Layout



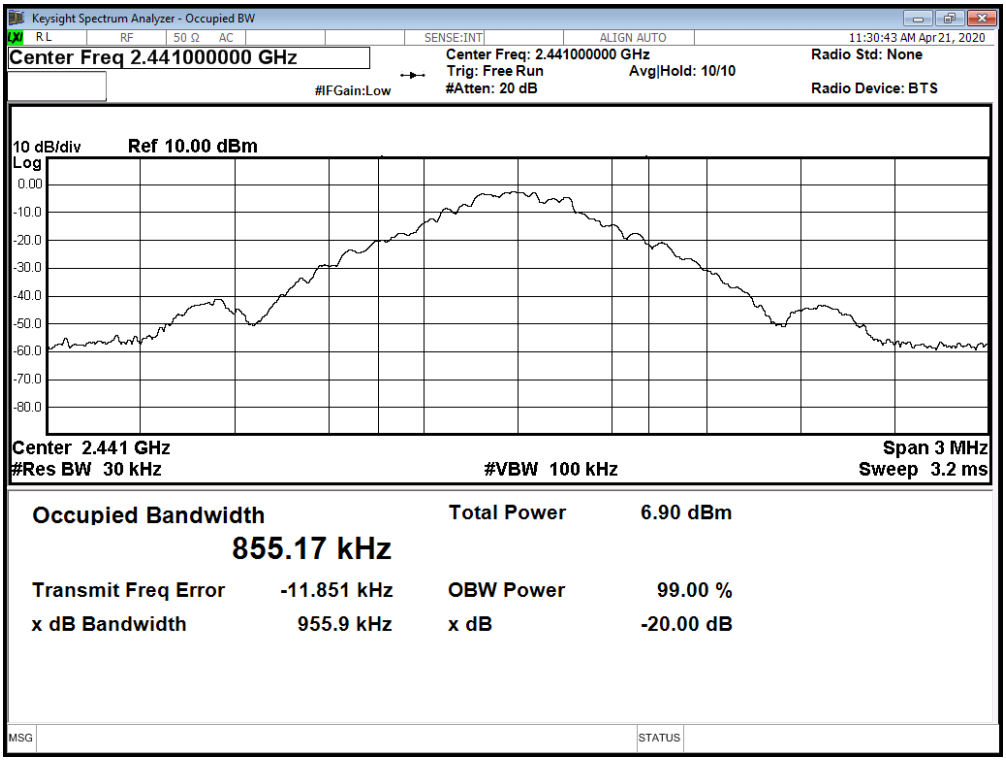
7.4 Test Result and Data

Modulation Type	Channel	Frequency (MHz)	20dB Bandwidth (MHz)	2/3 20dB Bandwidth(KHz)
GFSK (1Mbps)	00	2402	0.958	639
	39	2441	0.956	637
	78	2480	0.954	636
π/4-DQPSK (2Mbps)	00	2402	1.313	875
	39	2441	1.313	875
	78	2480	1.313	875
Note	2/3*20dB Bandwidth=20dB Bandwidth x 2/3			

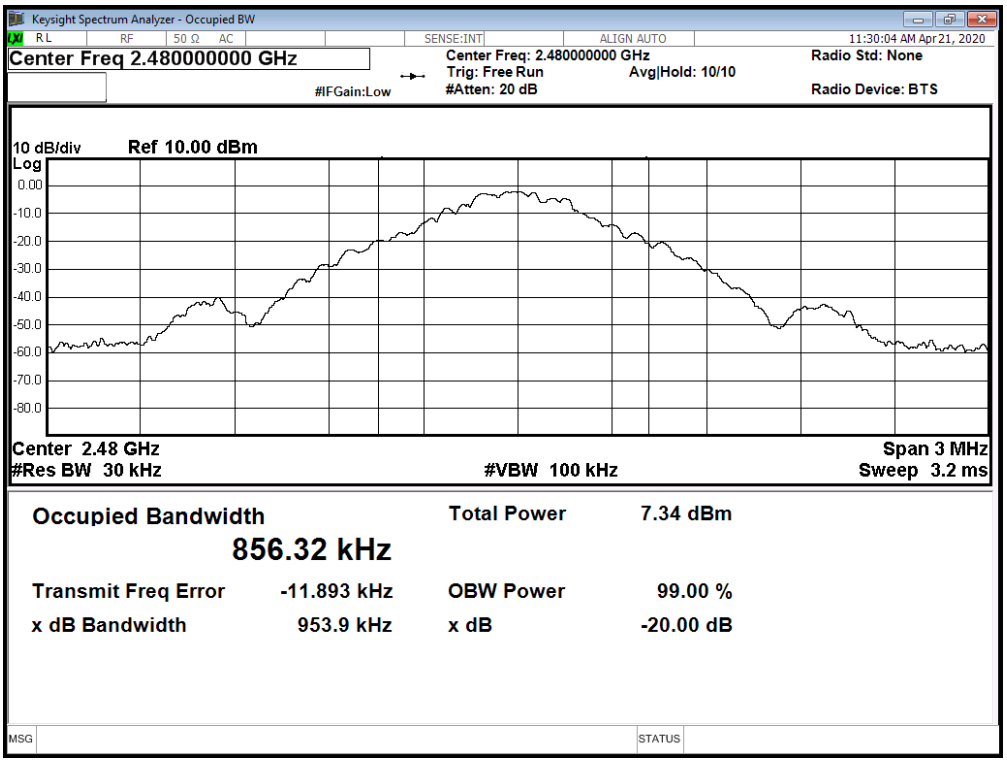
Modulation Standard: GFSK (1Mbps)
Channel: 00



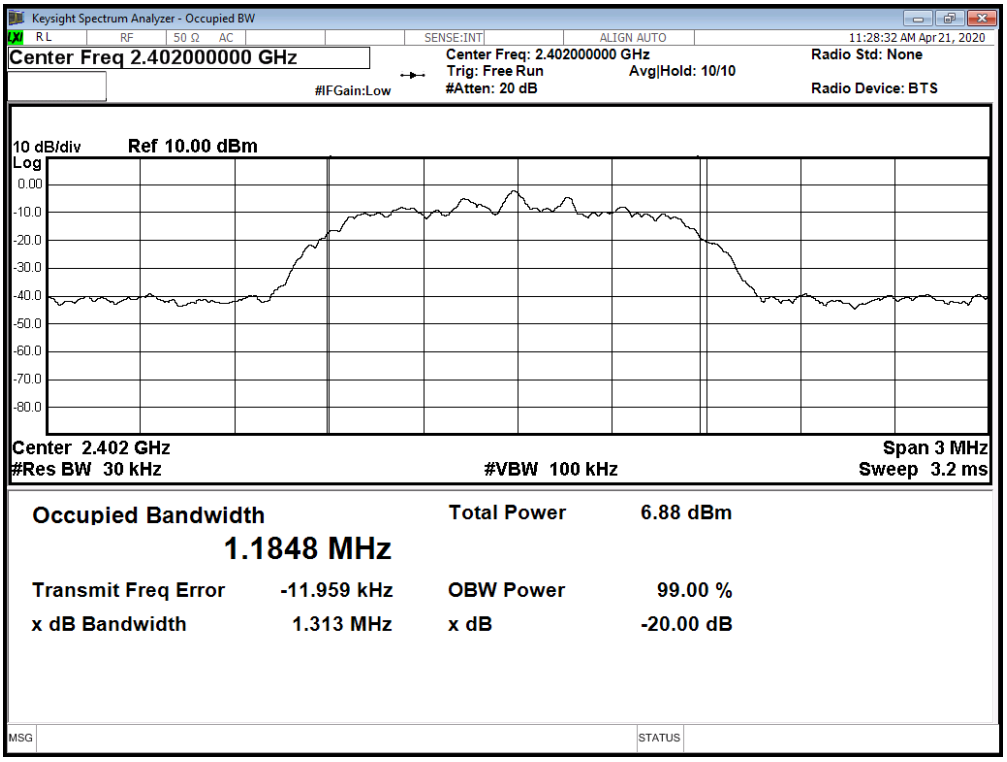
Modulation Standard: GFSK (1Mbps)
Channel: 39



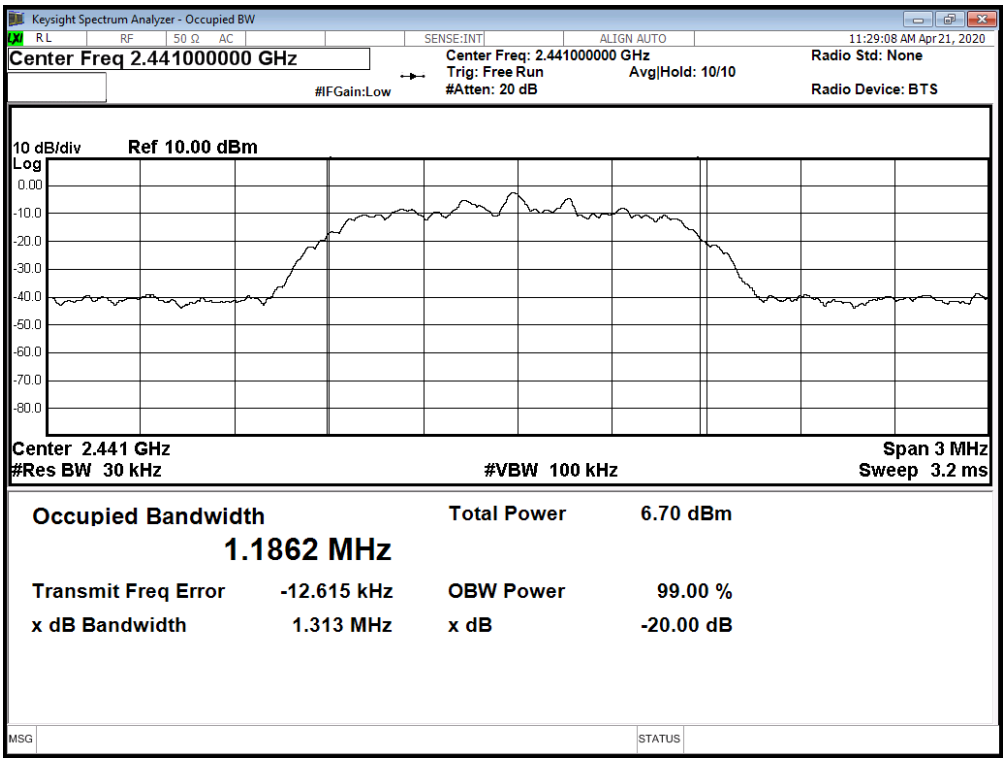
Modulation Standard: GFSK (1Mbps)
Channel: 78



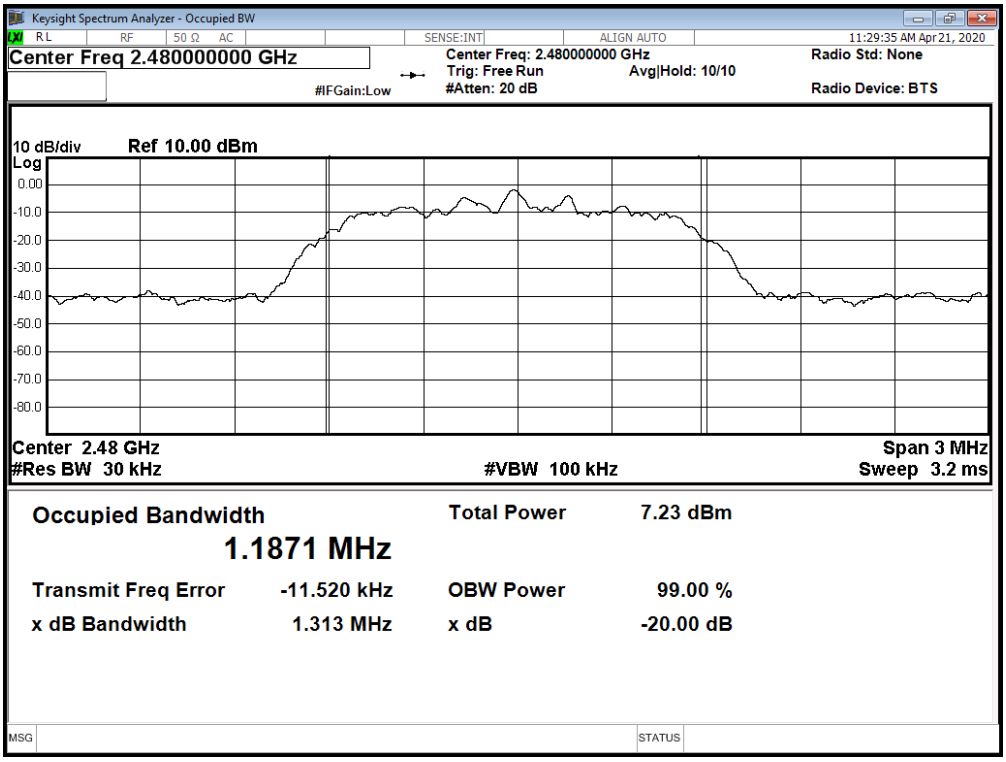
Modulation Standard: π/4 DQPSK (2Mbps)
Channel: 00



Modulation Standard: π/4 DQPSK (2Mbps)
Channel: 39



Modulation Standard: π/4 DQPSK (2Mbps)
Channel: 78



8. Frequencies Separation

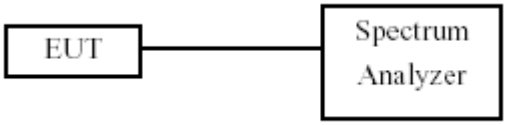
8.1 Test Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

8.2 Test Procedures

a. The transmitter output was connected to the spectrum analyzer.
b. Set RBW of spectrum analyzer to 30 KHz and VBW to 100 KHz.
c. By using the MaxHold function record the separation of two adjacent channels.
d. Measure the frequency difference of these two adjacent channels.

8.3 Test Setup Layout



8.4 Test Result and Data

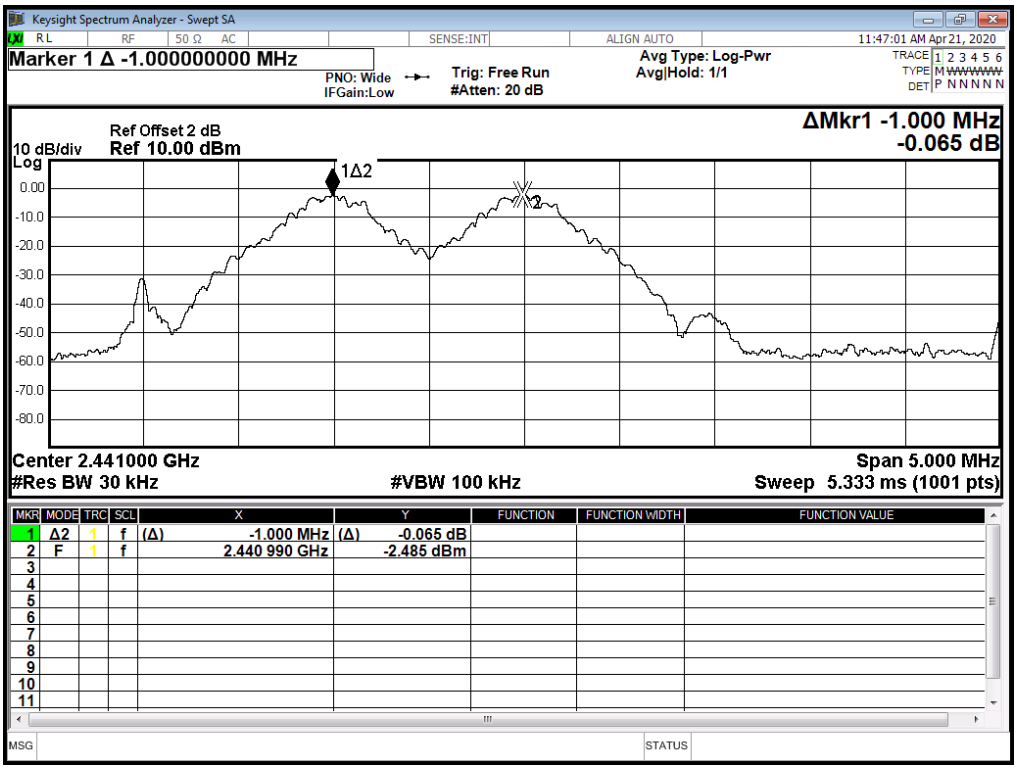
1M

Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	2/3 of 20dB Bandwidth (MHz)
2402	1.000	≥ 2/3 of 20dB Bandwidth	0.639
2441	1.000	≥ 2/3 of 20dB Bandwidth	0.637
2480	1.000	≥ 2/3 of 20dB Bandwidth	0.636

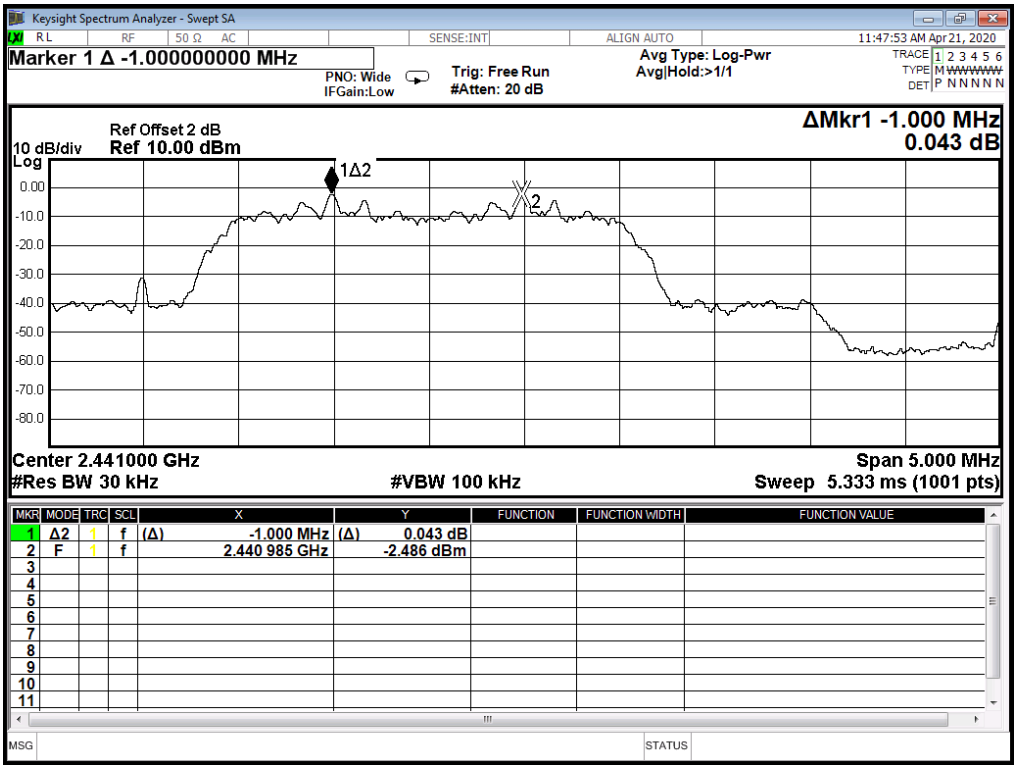
2M

Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	2/3 of 20dB Bandwidth (MHz)
2402	1.000	≥ 2/3 of 20dB Bandwidth	0.875
2441	1.000	≥ 2/3 of 20dB Bandwidth	0.875
2480	1.000	≥ 2/3 of 20dB Bandwidth	0.875

Modulation Standard: GFSK (1Mbps)



Modulation Standard: π/4 DQPSK (2Mbps)



9. Dwell Time on each channel

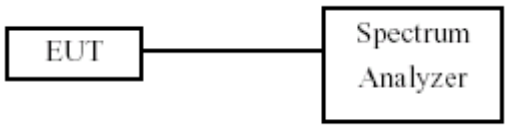
9.1 Test Limit

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.

9.2 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.

9.3 Test Setup Layout



9.4 Test Result and Data

Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec

Modulation Standard: GFSK(1Mbps)

DH 1

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
0.382	122.24	31.6	400	PASS

Remark:Total of Dwell =pulse Time*(1600/2)/79*Period Time

DH 3

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
1.644	263.04	31.6	400	PASS

Remark:Total of Dwell =pulse Time*(1600/4)/79*Period Time

DH 5

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2.99	318.93	31.6	400	PASS

Remark:Total of Dwell =pulse Time*(1600/6)/79*Period Time

Modulation Standard: π/4 DQPSK(2Mbps)

DH 1

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
0.392	125.44	31.6	400	PASS

Remark:Total of Dwell =pulse Time*(1600/2)/79*Period Time

DH 3

Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
1.653	264.48	31.6	400	PASS

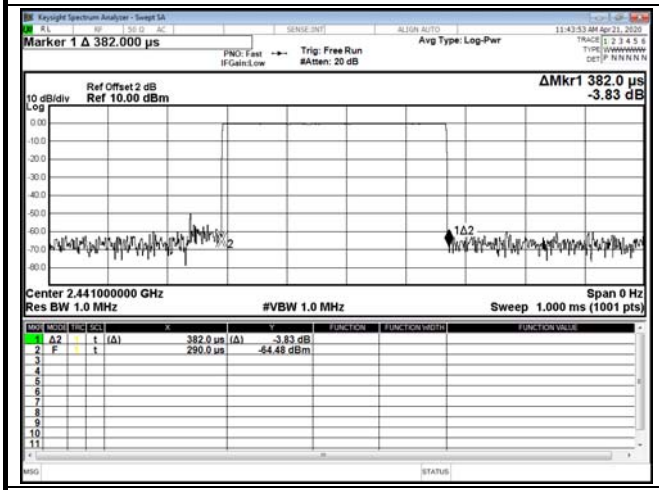
Remark:Total of Dwell =pulse Time*(1600/4)/79*Period Time

DH 5

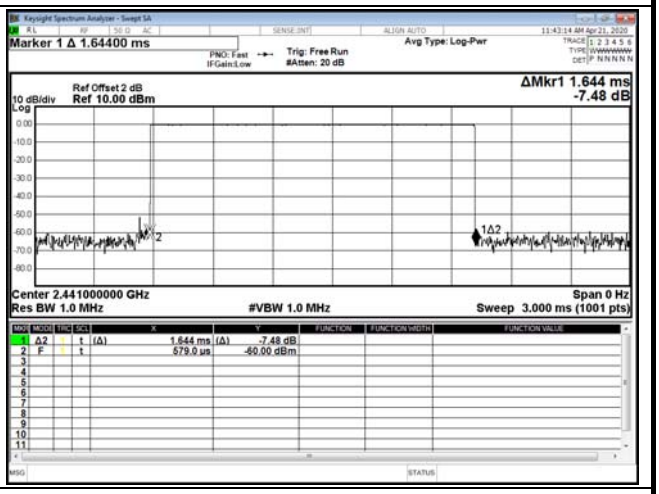
Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
2.895	308.80	31.6	400	PASS

Remark:Total of Dwell =pulse Time*(1600/6)/79*Period Time

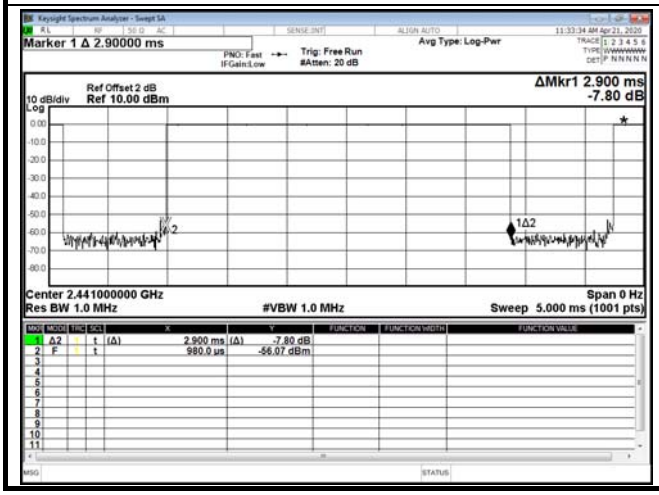
Modulation Standard: GFSK (1Mbps)
DH1



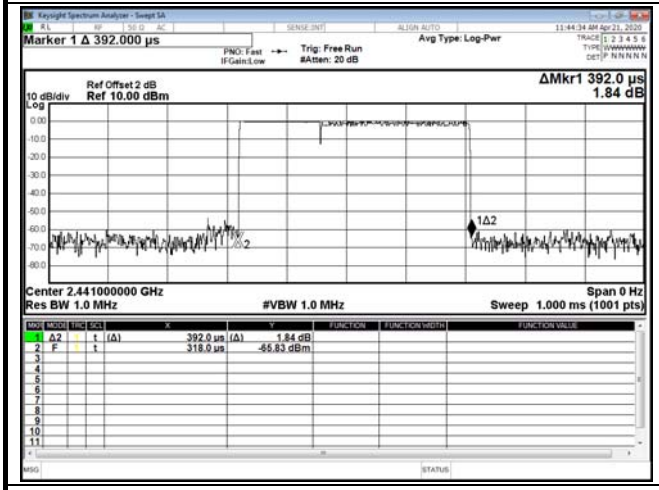
Modulation Standard: GFSK (1Mbps)
DH3



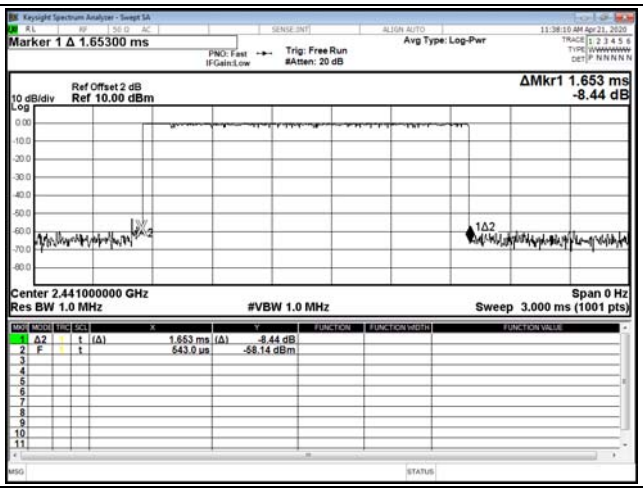
Modulation Standard: GFSK (1Mbps)
DH5



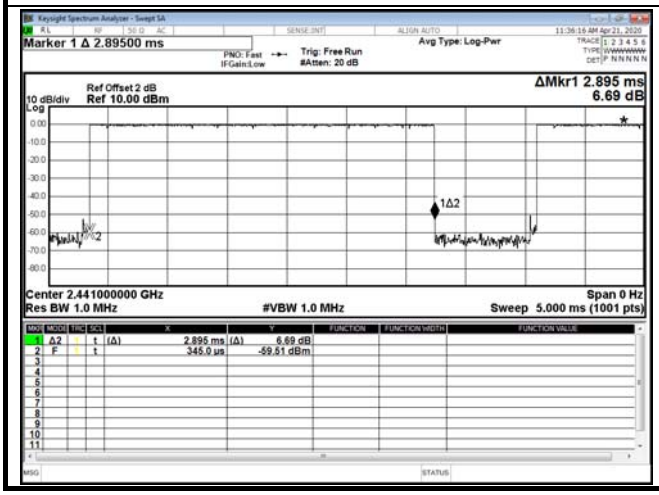
Modulation Standard: π/4-DQPSK(2Mbps)
DH1

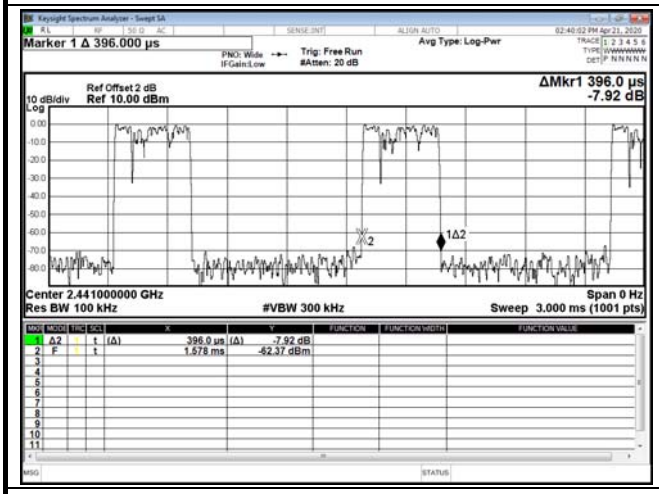
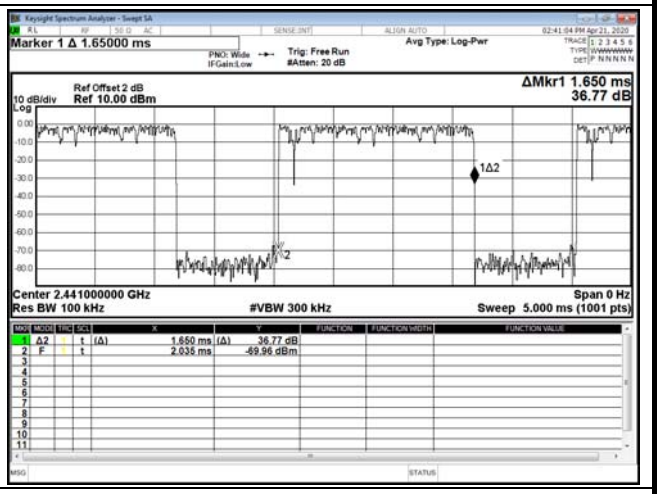
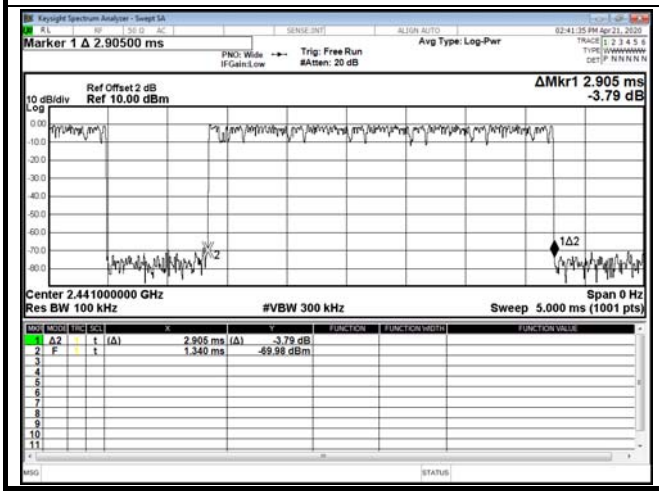


Modulation Standard: π/4-DQPSK(2Mbps)
DH3



Modulation Standard: π/4-DQPSK(2Mbps)
DH5

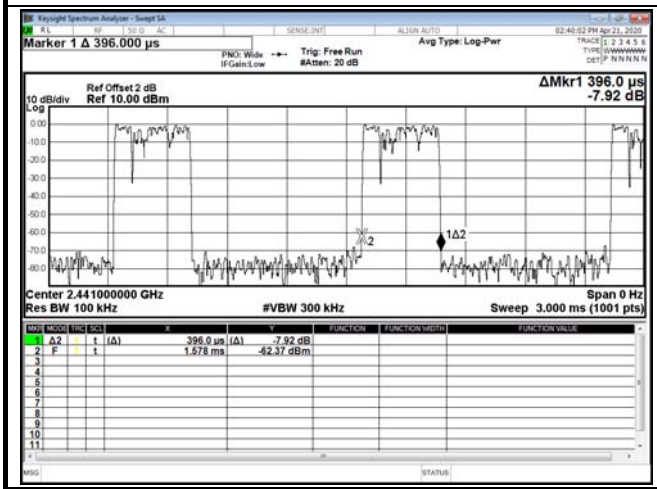


Modulation Type: AFH (DH1)	Modulation Type: AFH (DH3)
	
Modulation Type: AFH (DH5)	
	

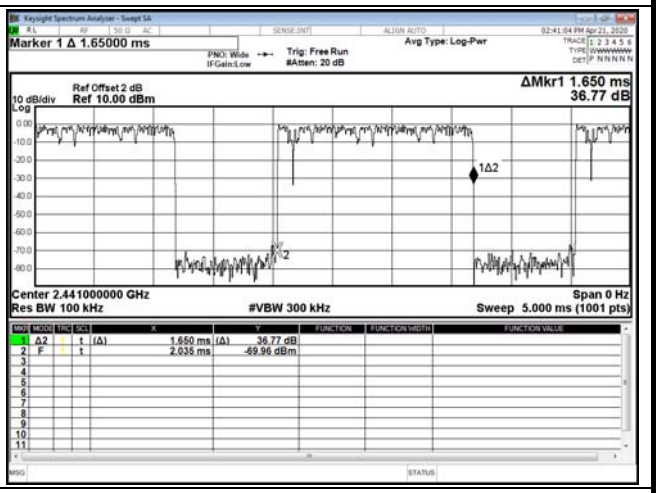
Test Period = 0.4 (second/ channel) x 20 Channel = 8 sec

Modulation Type	Frequency (MHz)	Length of transmission time (ms)	Number of transmission in a 8 (20 Hopping*0.4)	Dwell Time (ms)	Limit (ms)
AFH (DH1)	2402-2421	0.396	160	63.36	400
AFH (DH3)	2402-2421	1.650	80	132.00	400
AFH (DH5)	2402-2421	2.905	53.33	154.92	400

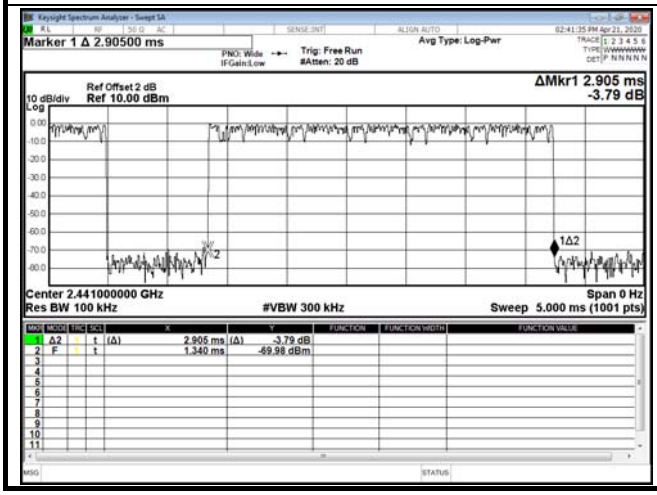
Modulation Type: AFH (DH1)



Modulation Type: AFH (DH3)



Modulation Type: AFH (DH5)



10. Number of Hopping Channels

10.1 Test Limit

Frequency hopping systems in the 2400 ~ 2483.5 MHz band shall use at least 15 channels.

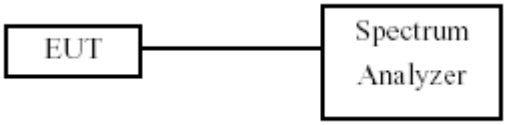
10.2 Test Procedures

a. The transmitter output was connected to the spectrum analyzer.

b. 2. Set RBW of spectrum analyzer to 300 KHz and VBW to 300 KHz.

c. 3. Set the MaxHold function, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been record.

10.3 Test Setup Layout



10.4 Test Result and Data

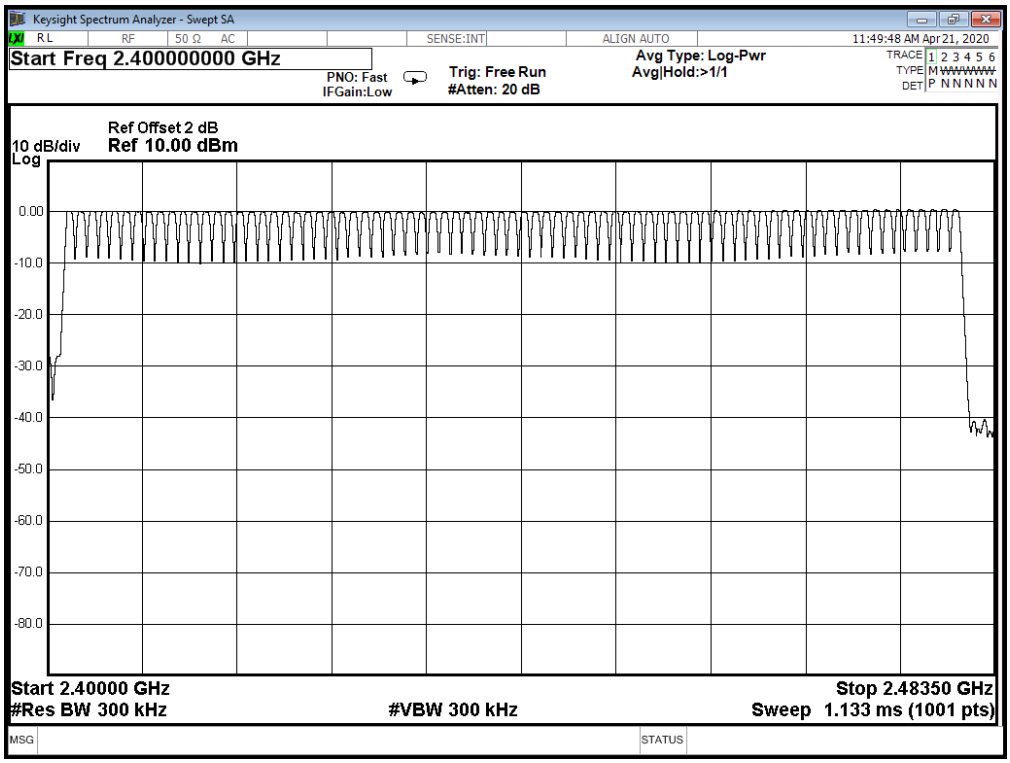
Modulation Standard: GFSK (1Mbps)

Number of hopping channels:	79	Channels

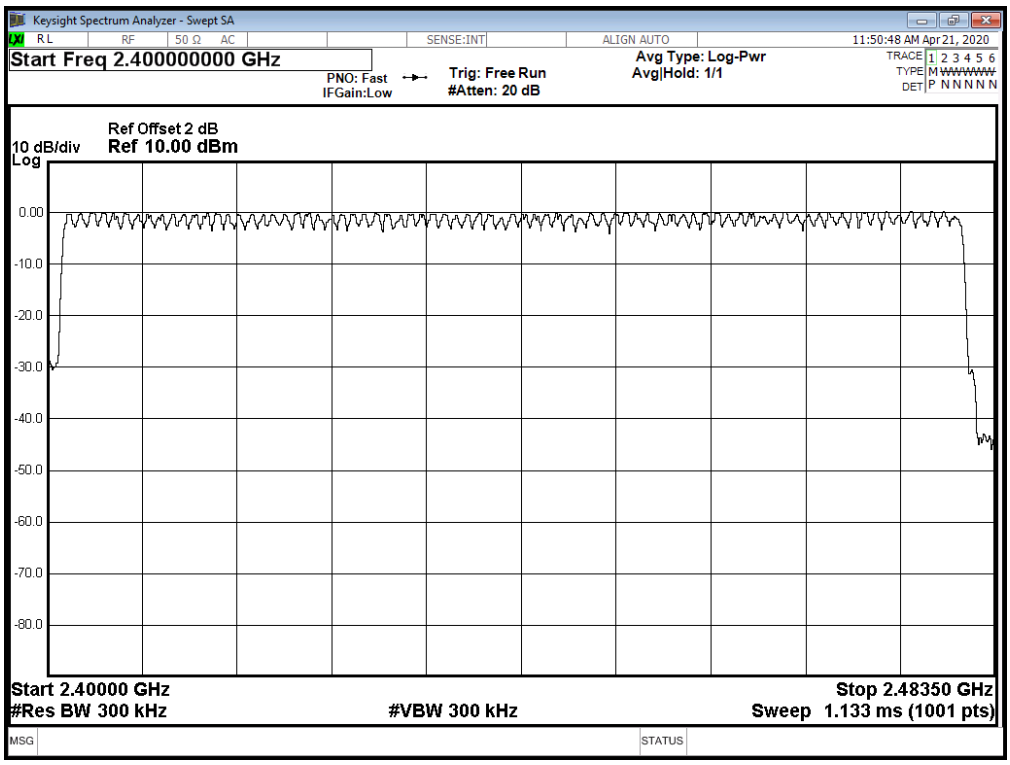
Modulation Standard: π/4 DQPSK (2Mbps)

Number of hopping channels:	79	Channels

Modulation Standard: GFSK (1Mbps)



Modulation Standard: π/4 DQPSK (2Mbps)



11. Maximum Peak Output Power

11.1 Test Limit

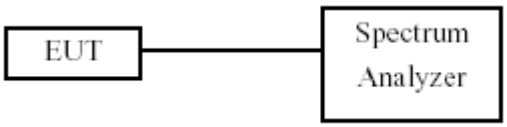
The Maximum Peak Output Power Measurement is 21dBm.

11.2 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.

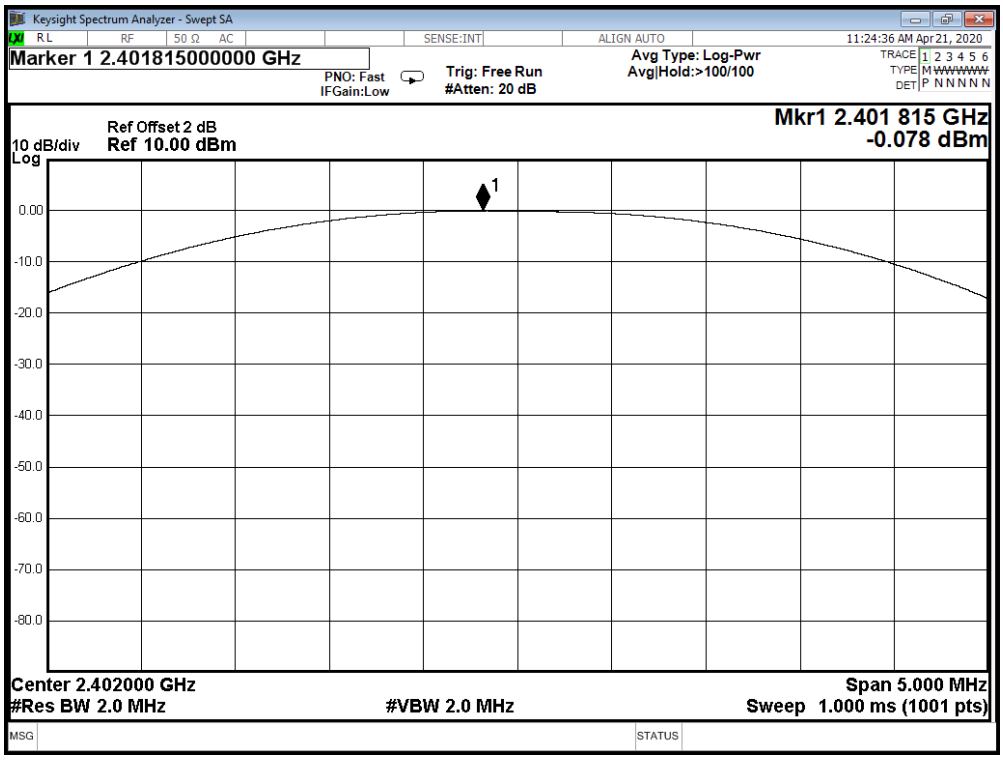
11.3 Test Setup Layout



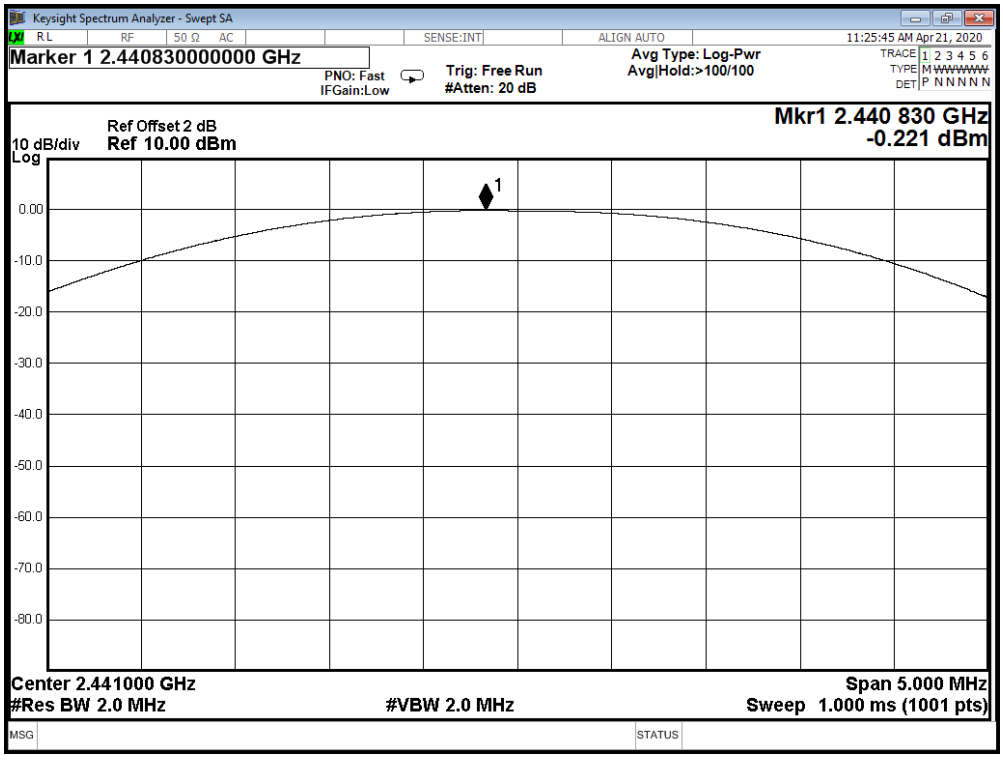
11.4 Test Result and Data

Modulation Type	Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
GFSK (1Mbps)	00	2402	-0.078	0.982
	39	2441	-0.221	0.950
	78	2480	0.278	1.066
π/4 DQPSK (2Mbps)	00	2402	0.587	1.145
	39	2441	0.414	1.100
	78	2480	0.91	1.233

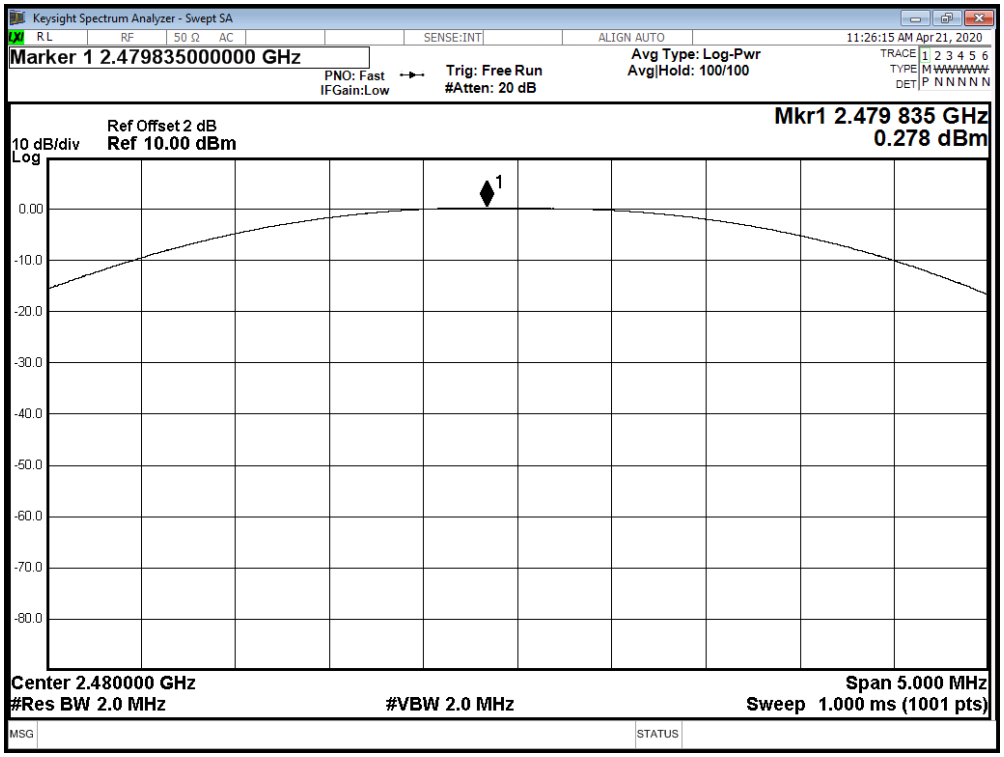
Modulation Standard: GFSK (1Mbps)
Channel: 00



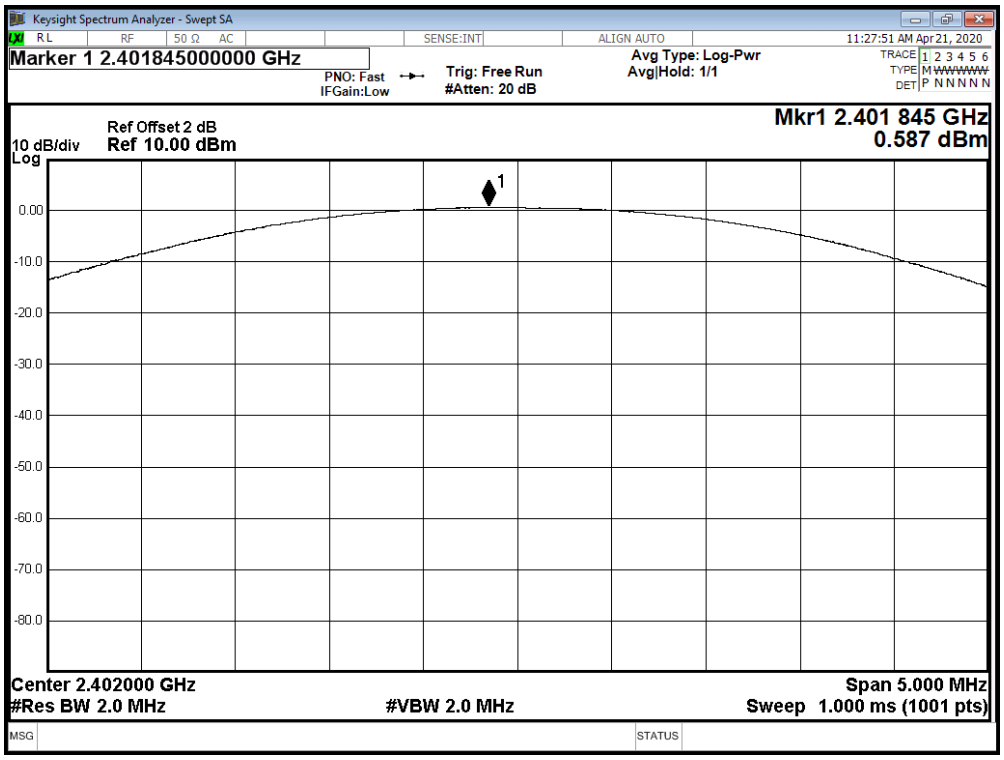
Modulation Standard: GFSK (1Mbps)
Channel: 39



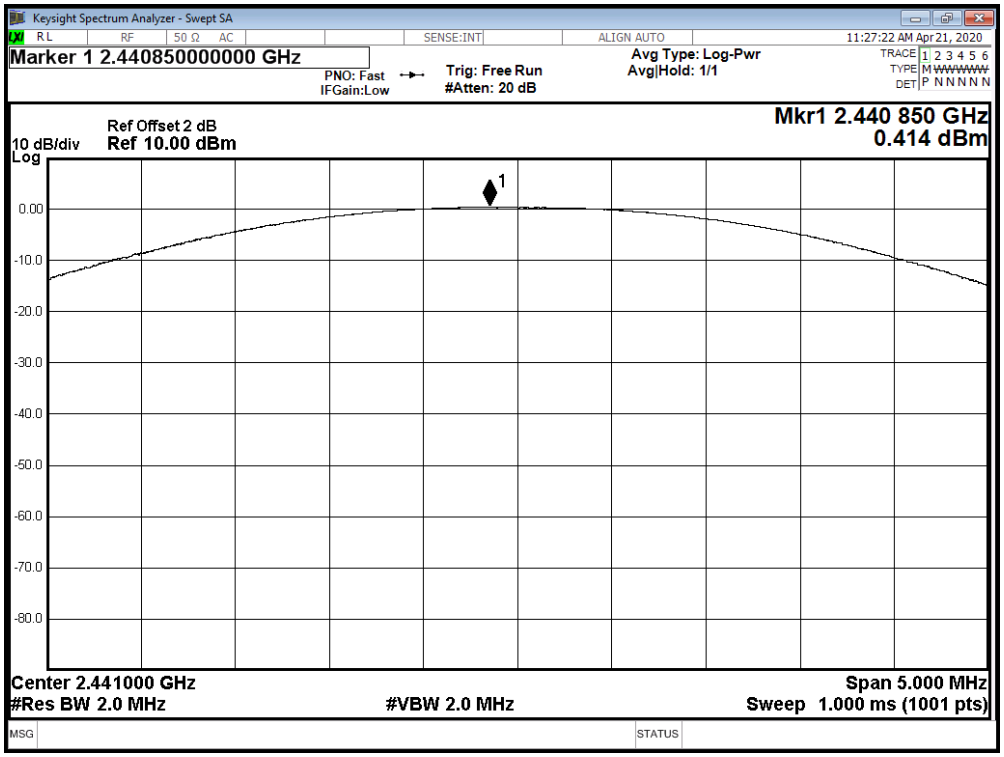
Modulation Standard: GFSK (1Mbps)
Channel: 78



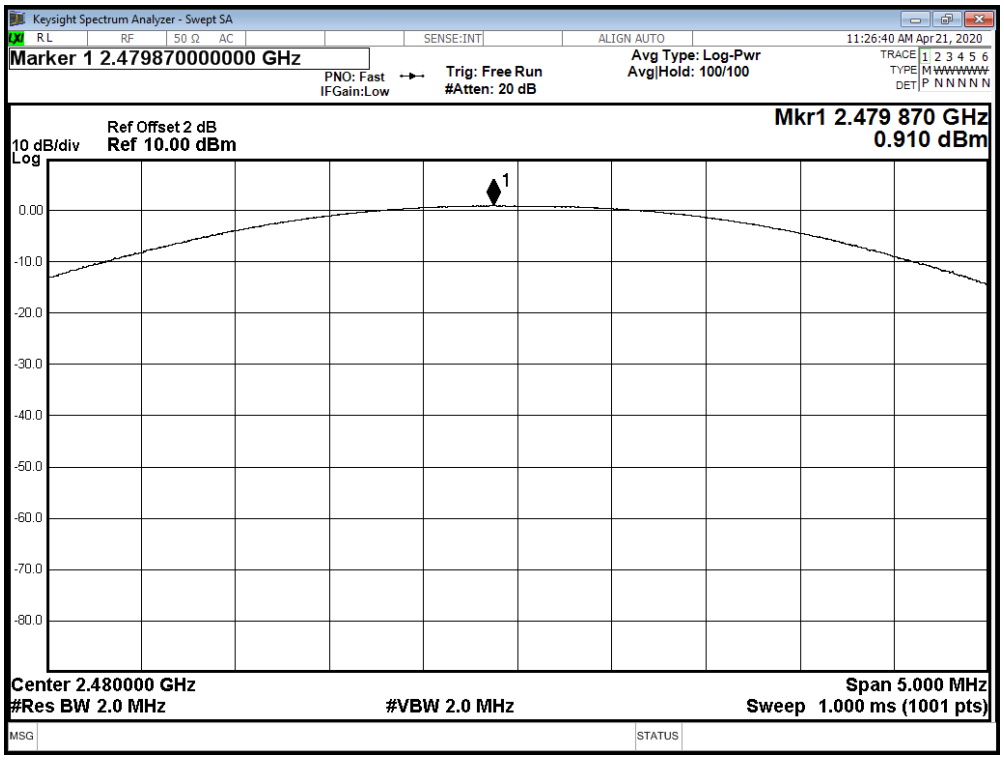
Modulation Standard: π/4 DQPSK (2Mbps)
Channel: 00



Modulation Standard: π/4 DQPSK (2Mbps)
Channel: 39



Modulation Standard: π/4 DQPSK (2Mbps)
Channel: 78



12. Band Edges Measurement

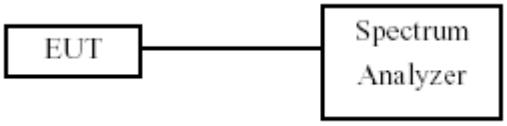
12.1 Test Limit

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

12.2 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.

12.3 Test Setup Layout

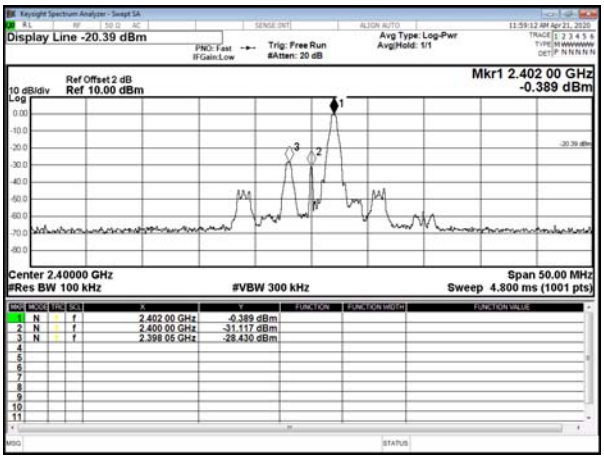


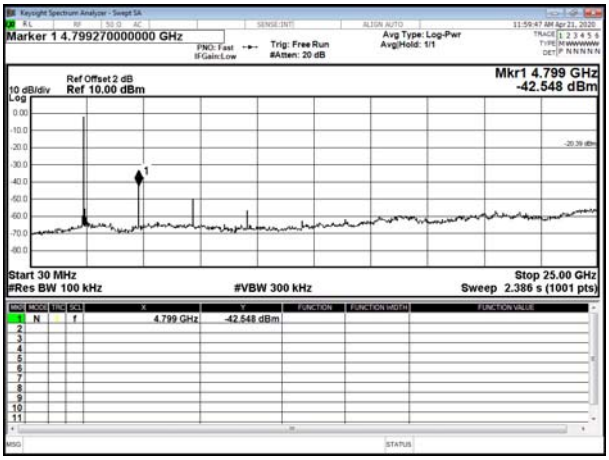
12.4 Test Result and Data

Single test

Modulation Standard: GFSK (1Mbps)

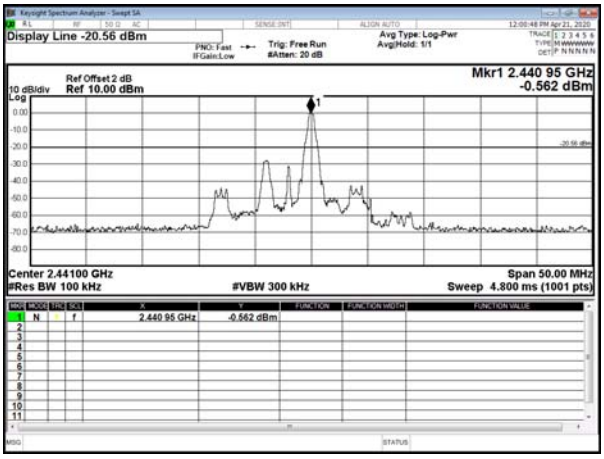
Channel: 00

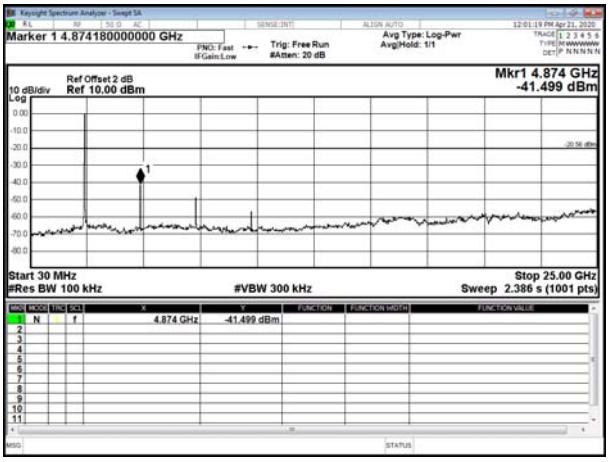




Modulation Standard: GFSK (1Mbps)

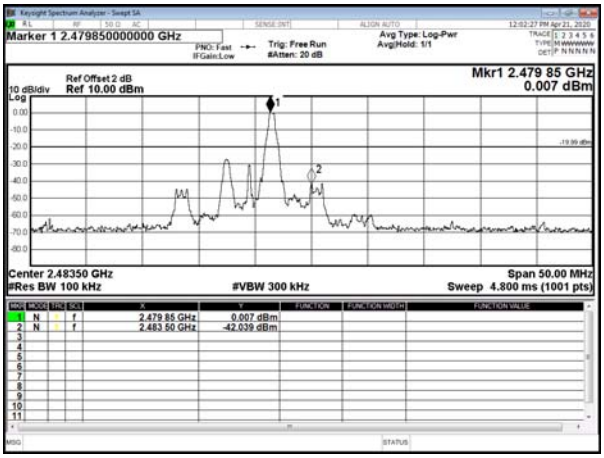
Channel: 39

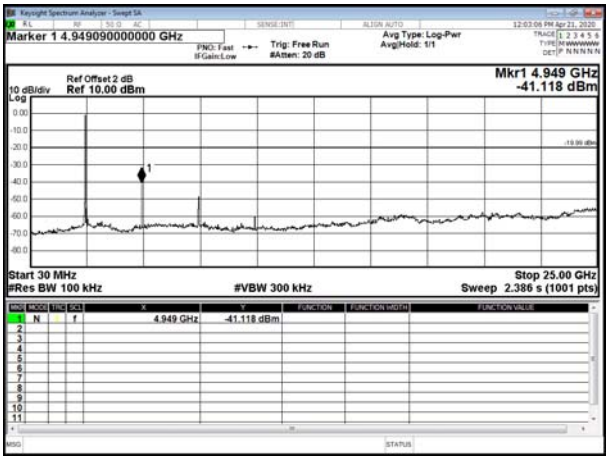




Modulation Standard: GFSK (1Mbps)

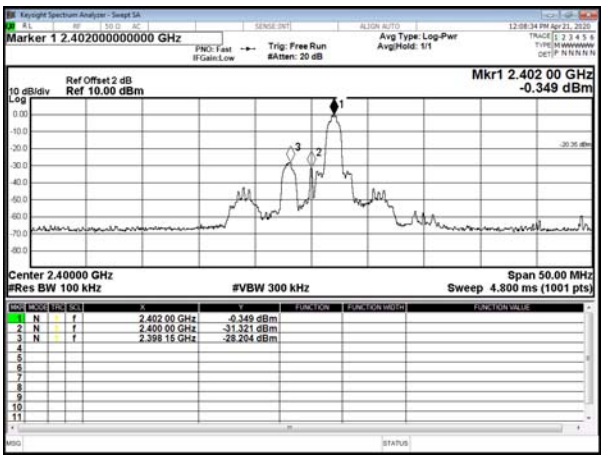
Channel: 78

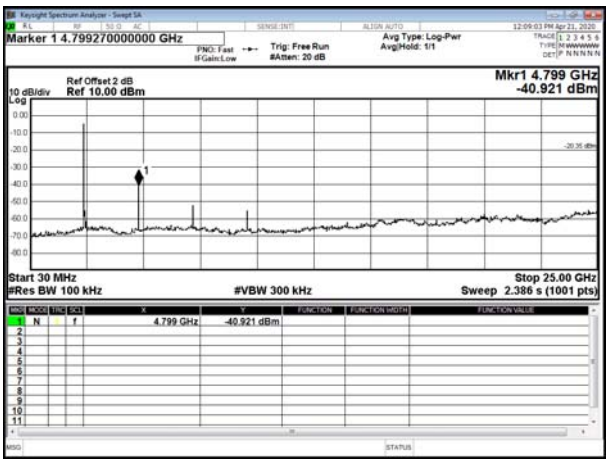




Modulation Standard: π/4 DQPSK (2Mbps)

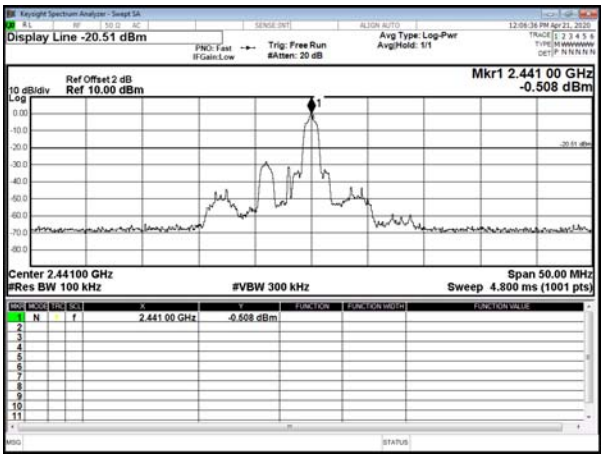
Channel: 00

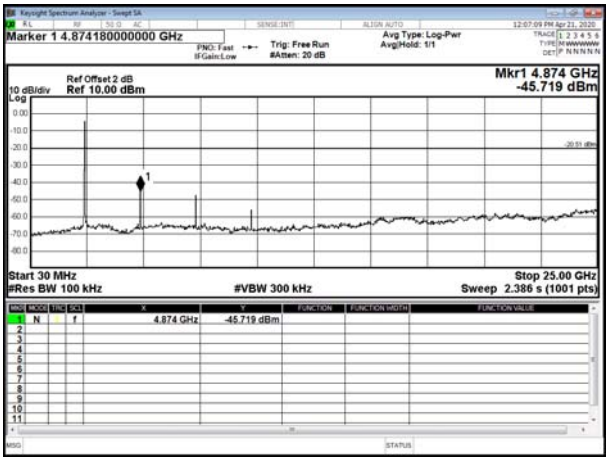




Modulation Standard: π/4 DQPSK (2Mbps)

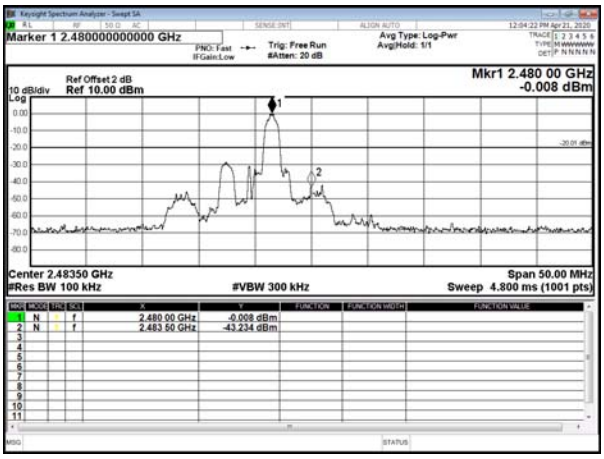
Channel: 39

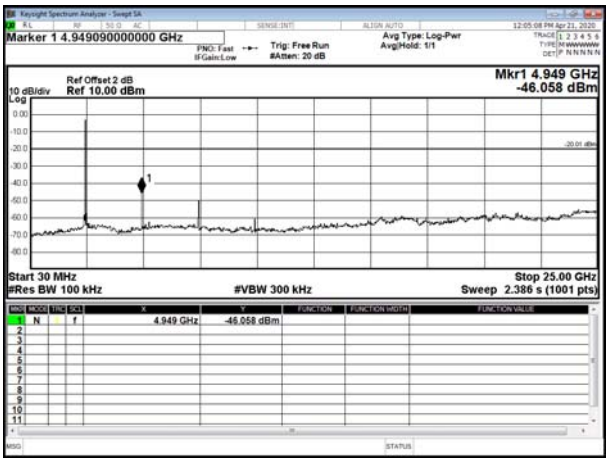




Modulation Standard: π/4 DQPSK (2Mbps)

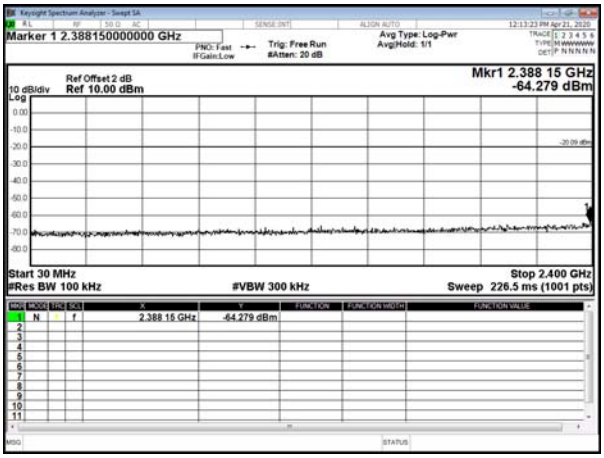
Channel: 78



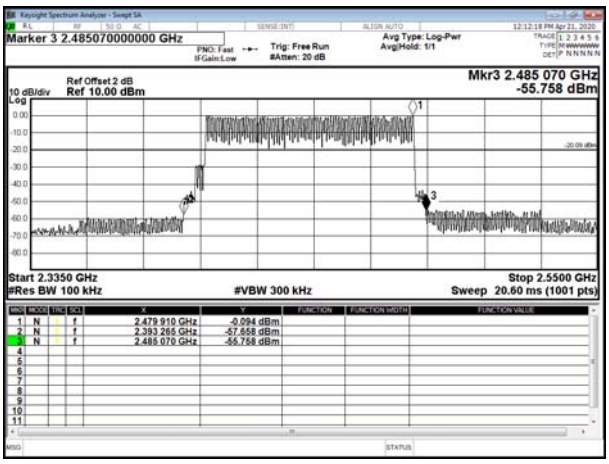


Hopping test

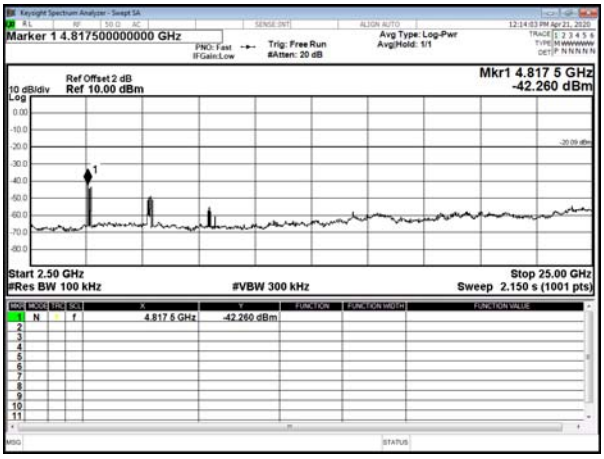
Modulation Standard: GFSK (1Mbps)



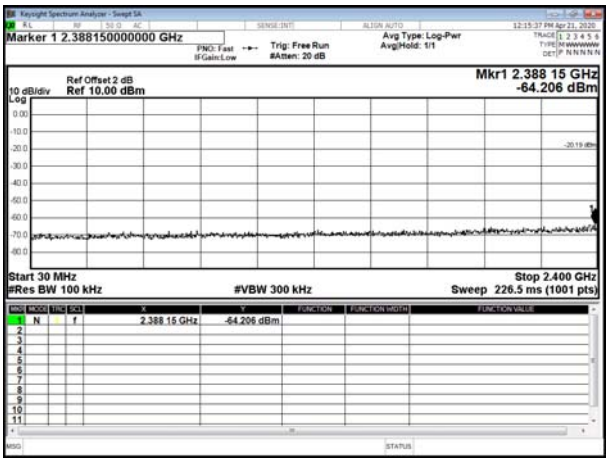
Modulation Standard: GFSK (1Mbps)



Modulation Standard: GFSK (1Mbps)

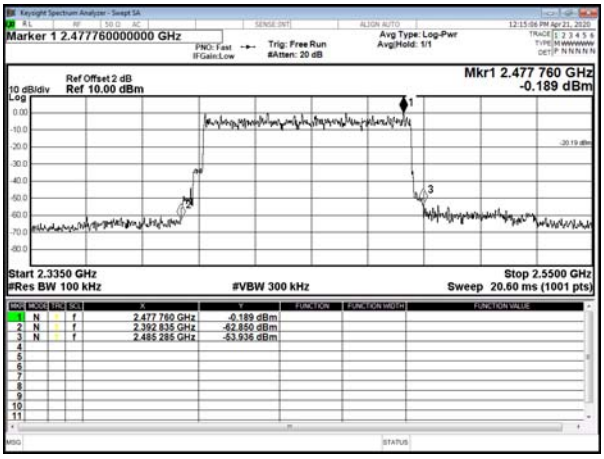


Modulation Standard: π/4 DQPSK (2Mbps)



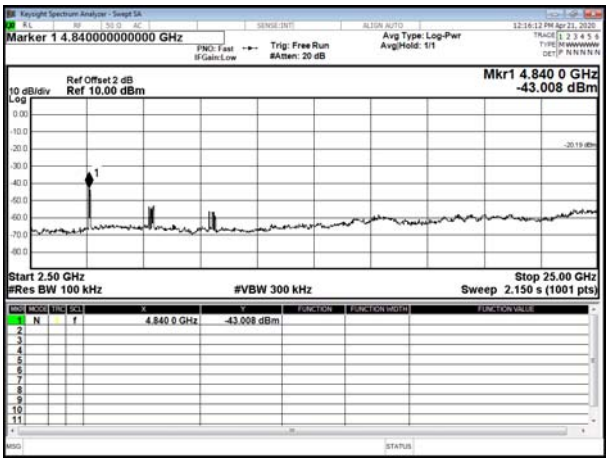
Modulation Standard: π/4 DQPSK (2Mbps)

Channel: 39



Modulation Standard: π/4 DQPSK (2Mbps)

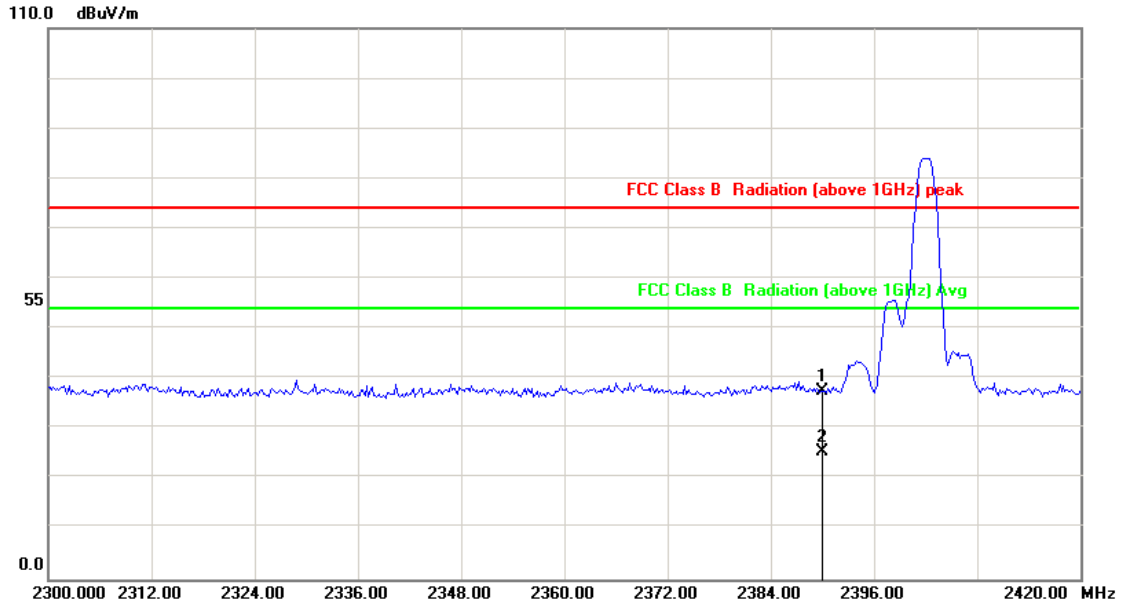
Channel: 78



12.5 Restrict band emission Measurement Data

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	GFSK, CH00		

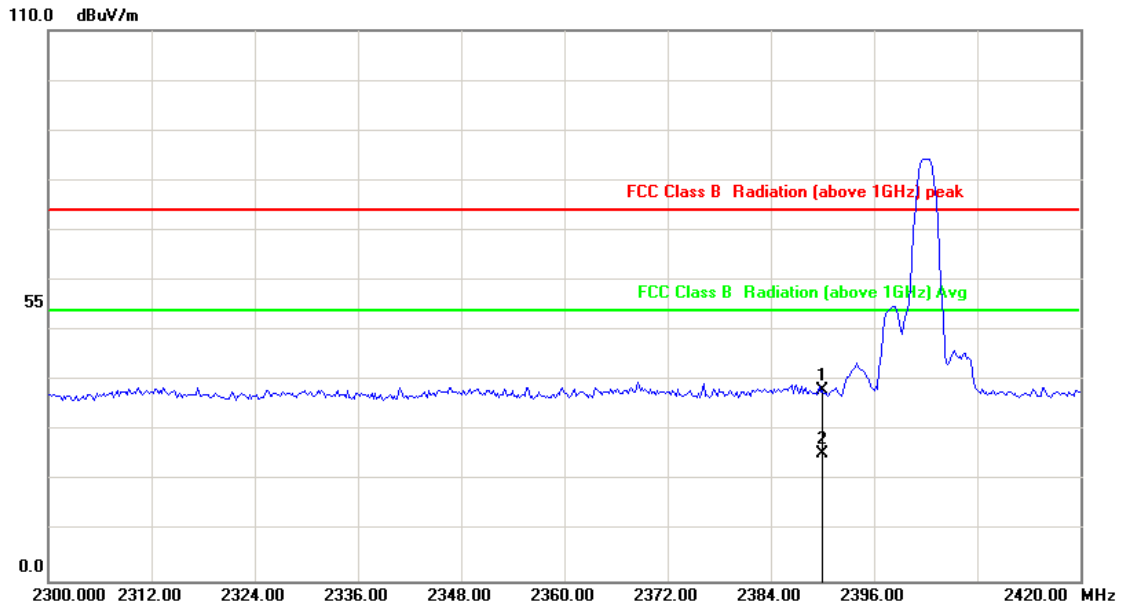
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2390.000	-10.05	47.68	37.63	74.00	-36.37	peak
2	2390.000	-10.05	35.50	25.45	54.00	-28.55	AVG

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	GFSK, CH00		

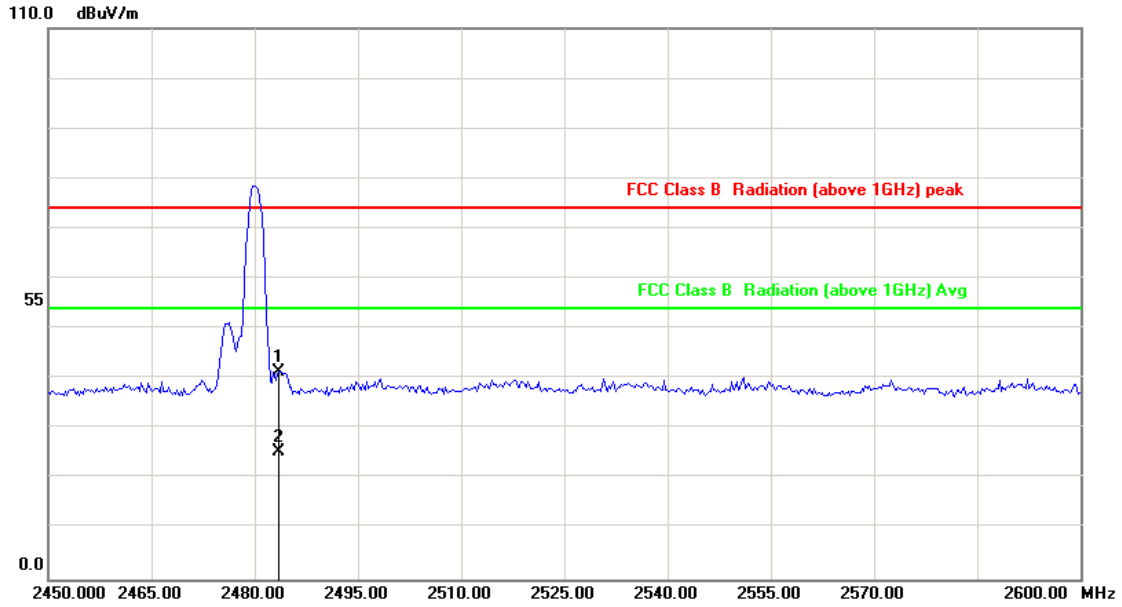
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2390.000	-10.05	48.14	38.09	74.00	-35.91	peak
2	2390.000	-10.05	35.37	25.32	54.00	-28.68	AVG

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	GFSK, CH78		

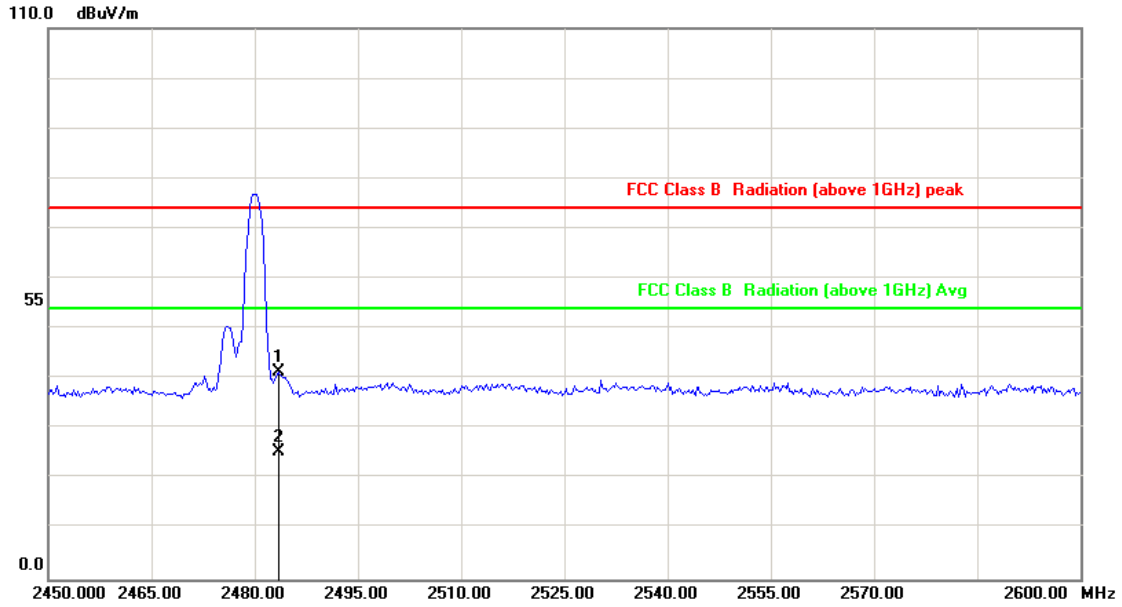
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2483.500	-9.65	51.03	41.38	74.00	-32.62	peak
2	2483.500	-9.65	35.02	25.37	54.00	-28.63	AVG

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	GFSK, CH78		

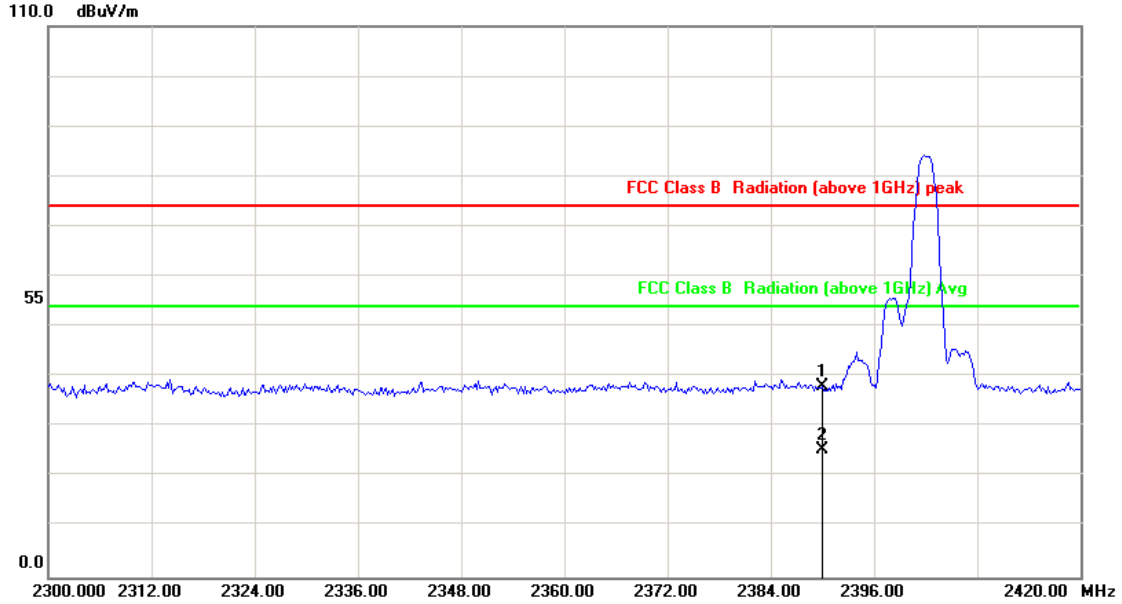
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2483.500	-9.65	50.95	41.30	74.00	-32.70	peak
2	2483.500	-9.65	35.10	25.45	54.00	-28.55	AVG

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	π/4-DQPSK , CH00		

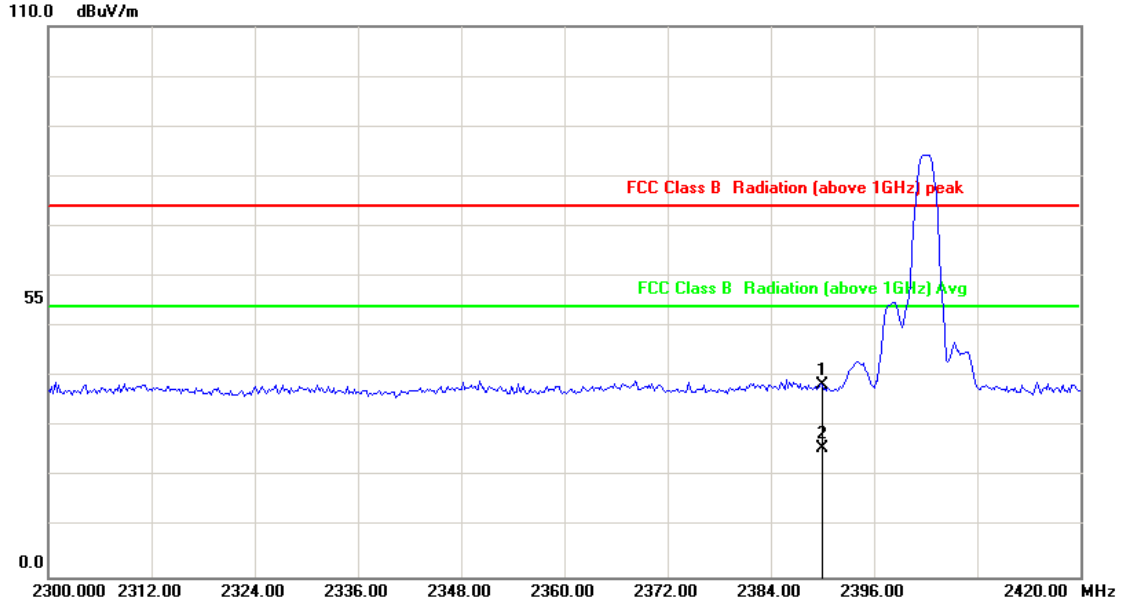
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2390.000	-10.05	48.10	38.05	74.00	-35.95	peak
2	2390.000	-10.05	35.41	25.36	54.00	-28.64	AVG

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	π/4-DQPSK , CH00		

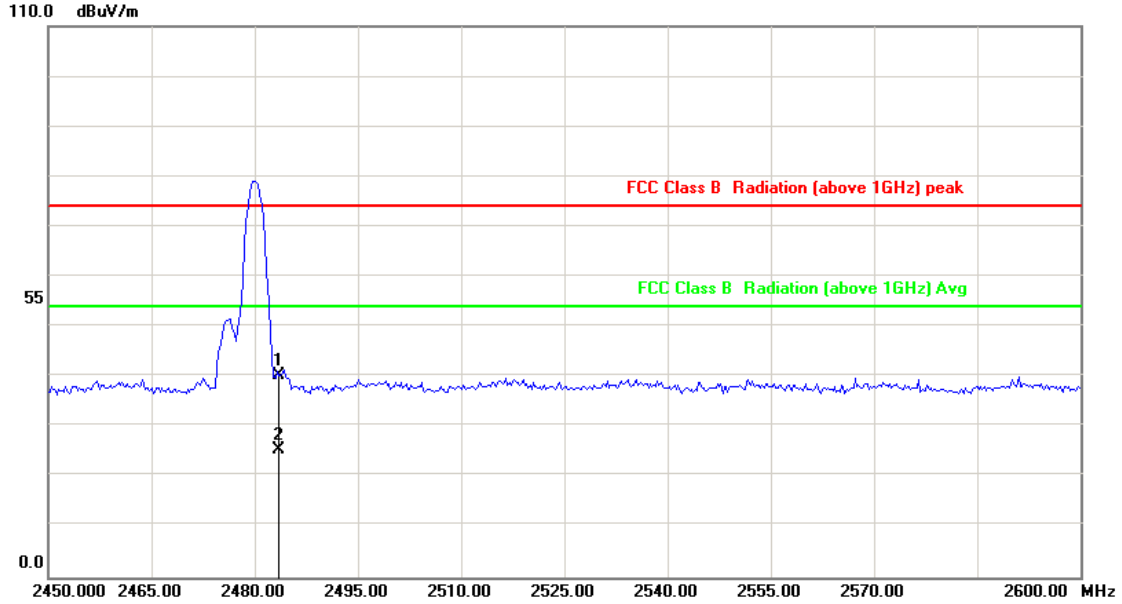
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2390.000	-10.05	48.30	38.25	74.00	-35.75	peak
2	2390.000	-10.05	35.68	25.63	54.00	-28.37	AVG

Power	DC 3.7V	Pol/Phase	VERTICAL
Test Mode	π/4-DQPSK , CH78		

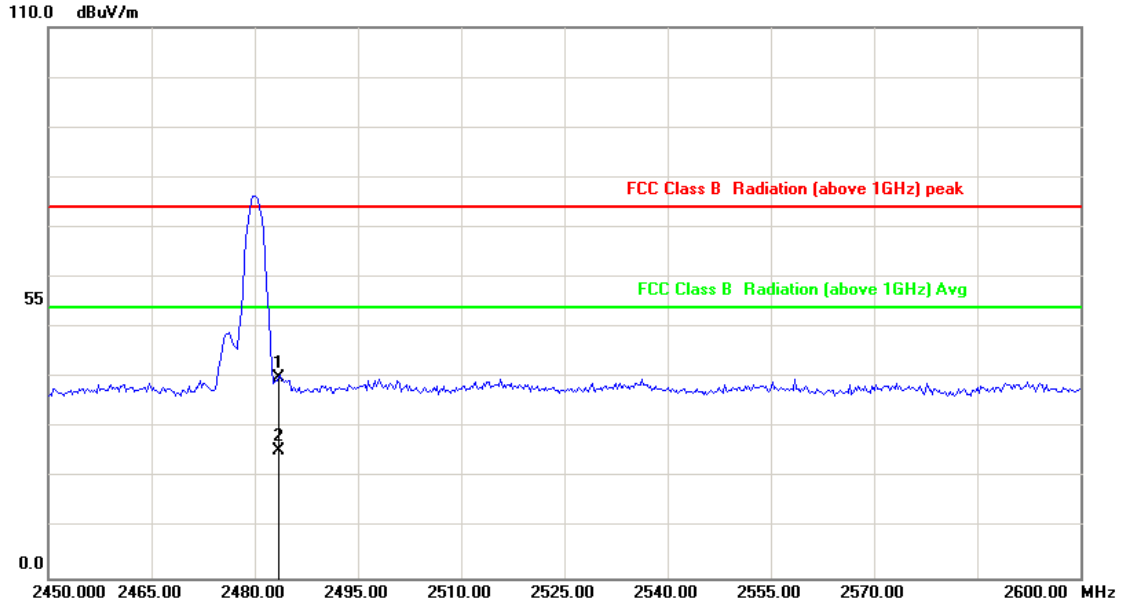
Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2483.500	-9.65	49.97	40.32	74.00	-33.68	peak
2	2483.500	-9.65	35.02	25.37	54.00	-28.63	AVG

Power	DC 3.7V	Pol/Phase	HORIZONTAL
Test Mode	π/4-DQPSK , CH78		

Note : Level = Reading + Factor
Margin = Level – Limit



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2483.500	-9.65	49.58	39.93	74.00	-34.07	peak
2	2483.500	-9.65	35.08	25.43	54.00	-28.57	AVG

13. 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

---------- End of the report ----------