

FCC/IC

RF

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
Portable Tablet Computer

ISSUED TO
LENOVO (SHANGHAI) ELECTRONICS TECHNOLOGY CO
LTD

NO 68 BUILDING 199 FENJU RD, CHINA (SHANGHAI) PILOT FREE
TRADE ZONE, SHANGHAI, 200131 CHINA



Tested by: Cao Shaocong
Cao Shaocong
(Engineer)

Date: Mar. 2, 2016

Approved by: Liao Jianming
Liao Jianming
(Technical Director)

Date: Mar. 2, 2016

Report No.: BL-SZ1610062-601
EUT Type: Portable Tablet Computer
Model Name: Lenovo TB3-X70F
Brand Name: Lenovo
Test Standard: 47 CFR Part 15 Subpart C
IC RSS-Gen (Issue 4, November 2014)
IC RSS-247 (Issue 1, May 2015)
FCC ID: O57TB3X70F
IC Number: 10407A-TB3X70F
Test conclusion: Pass
Test Date: Jan. 7, 2016 ~ Jan. 15, 2016
Date of Issue: Mar. 2, 2016

NOTE: This test report can be duplicated completely for the legal use with the approval of the applicant; it shall not be reproduced except in full, without the written approval of Shenzhen BALUN Technology Co., Ltd. BALUN Laboratory. Any objections should be raised within thirty days from the date of issue. To validate the report, please visit BALUN website.

Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>Feb. 25, 2016</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Mar. 2, 2016</u>	<u>The Second Issue</u>

TABLE OF CONTENTS

s1	ADMINISTRATIVE DATA (GENERAL INFORMATION)	6
1.1	Identification of the Testing Laboratory	6
1.2	Identification of the Responsible Testing Location	6
1.3	Laboratory Condition	6
1.4	Announce	6
2	PRODUCT INFORMATION	8
2.1	Applicant Information	8
2.2	Manufacturer Information.....	8
2.3	Factory Information.....	8
2.4	General Description for Equipment under Test (EUT).....	8
2.5	Ancillary Equipment.....	9
2.6	Technical Information	10
3	SUMMARY OF TEST RESULTS	11
3.1	Test Standards	11
3.2	Verdict	12
4	GENERAL TEST CONFIGURATIONS	13
4.1	Test Environments.....	13
4.2	Test Equipment List.....	13
4.3	Description of Test Setup	14
4.3.1	For Antenna Port Test	14
4.3.2	For AC Power Supply Port Test.....	14
4.3.3	For Radiated Test (Below 30 MHz).....	15
4.3.4	For Radiated Test (30 MHz-1 GHz)	15
4.3.5	For Radiated Test (Above 1 GHz)	16

4.4	Measurement Results Explanation Example.....	17
4.4.1	For conducted test items:	17
4.4.2	For radiated band edges and spurious emission test:.....	17
5	TEST ITEMS	18
5.1	Antenna Requirements.....	18
5.1.1	Standard Applicable	18
5.1.2	Antenna Anti-Replacement Construction	18
5.1.3	Antenna Gain	19
5.2	Number of Hopping Frequencies	20
5.2.1	Limit.....	20
5.2.2	Test Setup.....	20
5.2.3	Test Procedure.....	20
5.2.4	Test Result	20
5.3	Peak Output Power and E.I.R.P	21
5.3.1	Test Limit.....	21
5.3.2	Test Setup.....	21
5.3.3	Test Procedure.....	21
5.3.4	Test Result	21
5.4	Occupied Bandwidth.....	22
5.4.1	Limit.....	22
5.4.2	Test Setup.....	22
5.4.3	Test Procedure.....	22
5.4.4	Test Result	22
5.5	Carrier Frequency Separation.....	23
5.5.1	Limit.....	23
5.5.2	Test Setup.....	23
5.5.3	Test Procedure.....	23
5.5.4	Test Result	23
5.6	Time of Occupancy (Dwell time)	24
5.6.1	Limit.....	24

5.6.2	Test Setup	24
5.6.3	Test Procedure	24
5.6.4	Test Result	24
5.7	Conducted Spurious Emission	25
5.7.1	Limit	25
5.7.2	Test Setup	25
5.7.3	Test Procedure	25
5.7.4	Test Result	25
5.8	Conducted Emission	26
5.8.1	Limit	26
5.8.2	Test Setup	26
5.8.3	Test Procedure	26
5.8.4	Test Result	26
5.9	Radiated Spurious Emission	27
5.9.1	Limit	27
5.9.2	Test Setup	27
5.9.3	Test Procedure	27
5.9.4	Test Result	28
5.10	Receiver Spurious Emissions	29
5.10.1	Limit	29
5.10.2	Test Setup	29
5.10.3	Test Procedure	29
5.10.4	Test Result	30
ANNEX A	TEST RESULT	31
A.1	Number of Hopping Frequency	31
A.2	Peak Output Power and E.I.R.P	33
A.3	20 dB and 99% bandwidth	36
A.4	Hopping Frequency Separation	39
A.5	Average Time of Occupancy	40
A.6	Conducted Spurious Emissions	43

A.7	Conducted Emissions	51
A.8	Radiated Spurious Emission	57
A.9	Receiver Spurious Emissions	89
ANNEX B	TEST SETUP PHOTOS	93
ANNEX C	EUT EXTERNAL PHOTOS	93
ANNEX D	EUT INTERNAL PHOTOS.....	93

1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20 to 25°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v1.0.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly

noted in the revisions section.

- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	LENOVO (SHANGHAI) ELECTRONICS TECHNOLOGY CO LTD
Address	NO 68 BUILDING 199 FENJU RD, CHINA (SHANGHAI) PILOT FREE TRADE ZONE, SHANGHAI, 200131 CHINA

2.2 Manufacturer Information

Manufacturer	Lenovo PC HK Limited.
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

2.3 Factory Information

Factory 1	BYD Precision Manufacture Co., Ltd.
Address 1	No.3001, Baohe Road, Baolong Industrial, Longgang, Shenzhen, P.R. China
Factory 2	Motorola (Wuhan) Mobility Technologies Communication Co., Ltd
Address 2	No.19, Gaoxin 4th Road, Wuhan East Lake High-tech Zone, Wuhan, China
Factory 3	Dong Guan Huabel Electronic Technology Co., Ltd
Address 3	No.9 Industrial Northern Road, National High-Tech Industrial Development Zone, Songshan Lake, Dong Guan City, China

2.4 General Description for Equipment under Test (EUT)

EUT Type	Portable Tablet Computer	
Model Name Under Test	Lenovo TB3-X70F	
Series Model Name	N/A	
Description of Model name differentiation	N/A	
Hardware Version	A6604_MB_PCB_V2.0	
Software Version	TB3-X70F_160108	
Dimensions (Approx.)	247.4 mm × 171.5 mm × 9.4 mm	
Weight (Approx.)	500 g(with battery)	
Network and Wireless connectivity	Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE), WIFI 802.11a,802.11b, 802.11g and 802.11n (HT20/40), 802.11ac, GPS, GLONASS, NFC	
EUT	Hardware	Manufacturer
Configuration A	LCD display	BOE TECHNOLOGY GROUP CO., LTD.
	Battery	Sunwoda Electronic Co.,Ltd.
Configuration B	LCD display	Innolux corporation
	Battery	SCUD (Fujian) Electronics Co.,Ltd.

Note: The EUT have two sample which Configuration A is OF display with XWD battery and Configuration B is AUO display with ATL battery), the internal structure and circuit electrical parameters are the same; but the LCD display and battery are different. All of them were tested in this report, the Configuration A sample as the main for tested and the Configuration B sample as confirmatory test. In Spurious Emissions test, only the Configuration A + C-P35 (HUNTKEY) and Configuration B + C-P35 (Acbel) were shown in this report.

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery 1	
	Brand Name	Lenovo
	Model No.	L14D2P31
	Serial No.	N/A
	Capacitance	7000 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	4.35 V
	Manufacturer	Sunwoda Electronic Co. Ltd
Ancillary Equipment 2	Battery 2	
	Brand Name	Lenovo
	Model No.	L14D2P31
	Serial No.	N/A
	Capacitance	7000 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	SCUD (Fujian) Electronics Co., Ltd.
Ancillary Equipment 3	Charger 1	
	Brand Name	Lenovo
	Model Name	C-P35
	Rated Input	100-240 V ~, 50/60 Hz, 0.5 A
	Rated Output	5.2 V =, 2.0 A
	Manufacturer	SHENZHEN HUNTKEY ELECTRIC CO LTD
Ancillary Equipment 4	Charger 2	
	Brand Name	Lenovo
	Model Name	C-P35
	Rated Input	100-240 V ~, 50/60 Hz, 0.3 A
	Rated Output	5.2 V =, 2.0 A
	Manufacturer	Acbel Polytech Inc.
Ancillary Equipment 5	USB Cable 1 ^{Note 1}	
	Length(Approx.)	102 cm
	Manufacturer	SHIN AN WIRE&CABLE CO., LTD.
Ancillary Equipment 6	USB Cable 2 ^{Note 1}	
	Length(Approx.)	102 cm
	Manufacturer	SAIBO ELECTRON TECHNOLOGY (HK) CO., LTD.

Note 1: There tow USB cable only the manufacturer is different. All the USB cable were tested, but only the USB

cable 1 was shown in this report.

2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	FHSS
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Product Type	Mobile and portable
Transfer Rate	DH5: 1 Mbps 2DH5: 2 Mbps 3DH5: 3 Mbps
Frequency Range	The frequency range used is 2400 MHz to 2483.5 MHz.
Number of channel	79 (at intervals of 1 MHz)
Tested Channel	0 (2402 MHz), 39 (2441 MHz), 78 (2480 MHz)
Antenna Type	Ceramic Antenna
Antenna Gain	0.49 dBi (All involve the antenna gain test item, has been included in the final results)
Antenna System(MIMO Smart Antenna)	N/A
About the Product	Only the Bluetooth 3.0 was tested in this report.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-14 Edition)	Miscellaneous Wireless Communications Services
2	FCC PUBLIC NOTICE DA 00-705 (Mar. 30, 2000)	Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
3	ANSI C63.4-2014	American National Standard for Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
5	IC RSS-Gen (Issue 4, Nov. 2014)	General Requirements for Compliance of Radio Apparatus
6	IC RSS-247 (Issue 1, May 2015)	Digital Transmission Systems (DTSS), Frequency Hopping Systems(FHSS) and Licence-Exemp Local Area Network (LE-LAN) Devices

3.2 Verdict

No.	Description	FCC Part No.	IC Part No.	Channel (BT for V3.0)	Test Result	Verdict	Remark
1	Antenna Requirement	15.203	RSS-247, 5.4 (6)	N/A	--	Pass	Note 1
2	Number of Hopping Frequencies	15.247(a)	RSS-247, 5.1 (4)	Hopping Mode	ANNEX A.1	Pass	
3	Peak Output Power and E.I.R.P	15.247(b)	RSS-247, 5.4 (2)	Low/Middle/H igh	ANNEX A.2	Pass	
4	Occupied Bandwidth	15.247(a)	RSS-247, 5.1 (1)	Low/Middle/H igh	ANNEX A.3	Pass	
5	Carrier Frequency Separation	15.247(a)	RSS-247, 5.1 (2)	Hopping Mode	ANNEX A.4	Pass	
6	Time of Occupancy (Dwell time)	15.247(a)	RSS-247, 5.1 (4)	Hopping Mode	ANNEX A.5	Pass	
7	Conducted Spurious Emission	15.247(d)	RSS-247, 5.5	Low/Middle/H igh	ANNEX A.6	Pass	
8	Conducted Emission	15.207	RSS-GEN, 8.8	Low/Middle/H igh	ANNEX A.7	Pass	
9	Radiated Spurious Emission	15.209 15.247(d)	RSS-247, 5.5	Hopping Mode, Low/Middle/H igh	ANNEX A.8	Pass	
10	Receiver Spurious Emissions	--	RSS-Gen, 7.1.2	Low/Middle/H igh	ANNEX A.9	Pass	

Note 1: Please refer to section 5.1

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

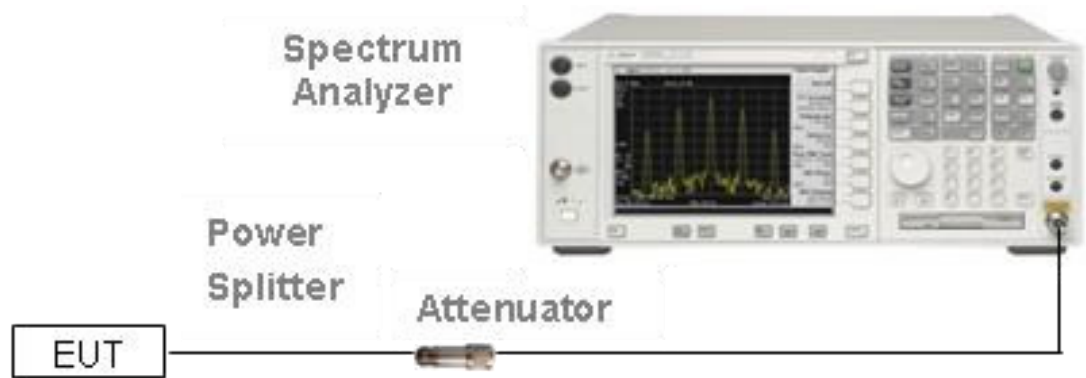
Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa - 102 kPa	
Temperature	NT (Normal Temperature)	20°C to +25°C
Working Voltage of the EUT	NV (Normal Voltage)	3.8 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2015.07.16	2016.07.15
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2015.07.16	2016.07.15
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2015.07.01	2016.06.30
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2015.07.16	2016.07.15
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2015.10.15	2016.10.14
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2015.07.14	2016.07.13
LISN	SCHWARZBECK	NSLK 8127	8127-687	2015.07.14	2016.07.13
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2015.07.16	2016.07.15
Power Splitter	KMW	DCPD-LDC	1305003215	2015.07.01	2016.06.30
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2015.07.21	2016.07.20
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	18141664	2015.07.17	2016.07.16
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2015.08.07	2016.08.06
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2015.07.22	2017.07.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21
Test Antenna-Horn(15-26.5 GHz)	SCHWARZBECK	BBHA 9170	9170-305	2015.07.22	2017.07.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2015.02.28	2016.02.27
Shielded Enclosure	ChangNing	CN-130701	130703	--	--

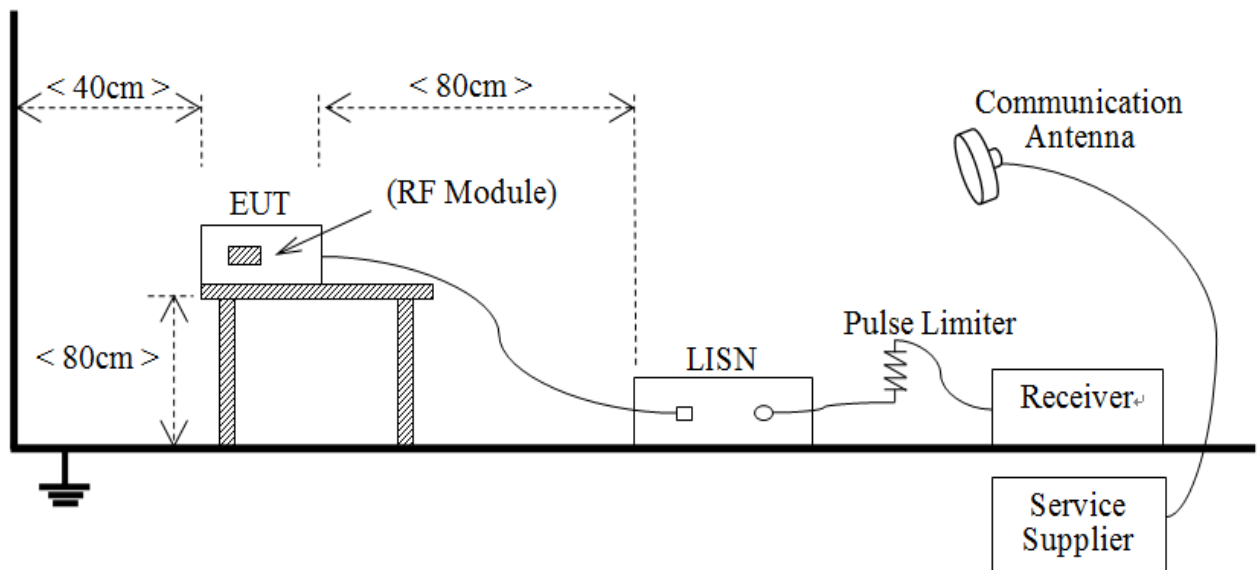
4.3 Description of Test Setup

4.3.1 For Antenna Port Test



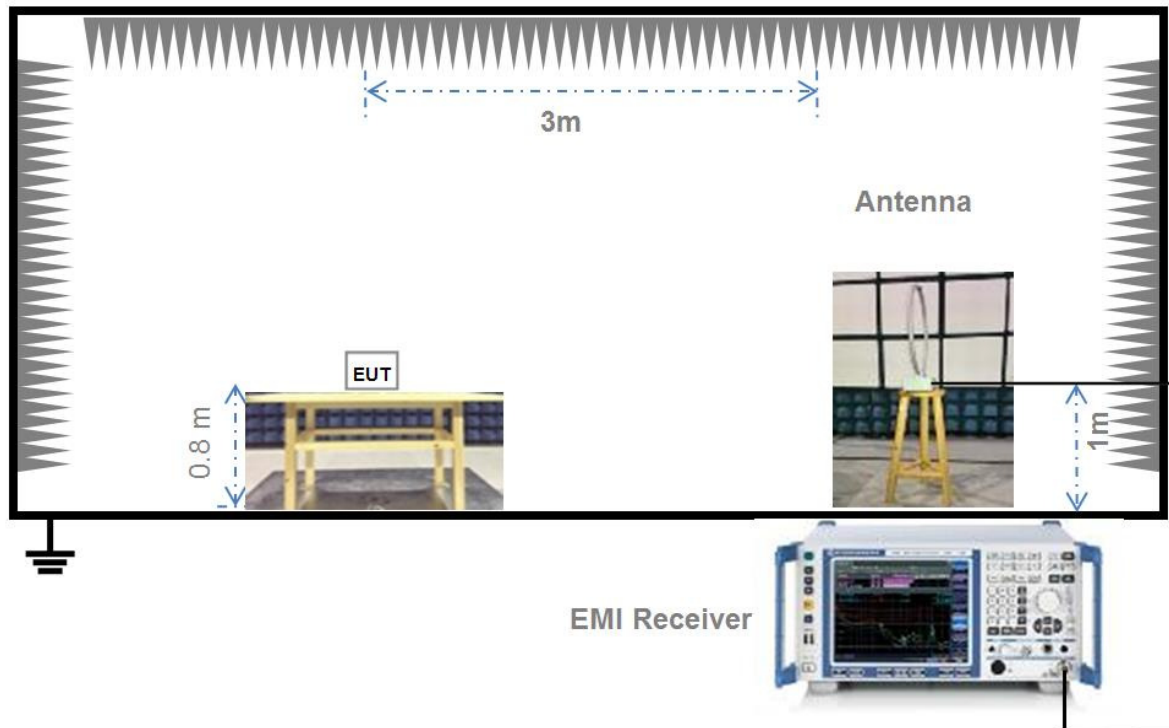
(Diagram 1)

4.3.2 For AC Power Supply Port Test



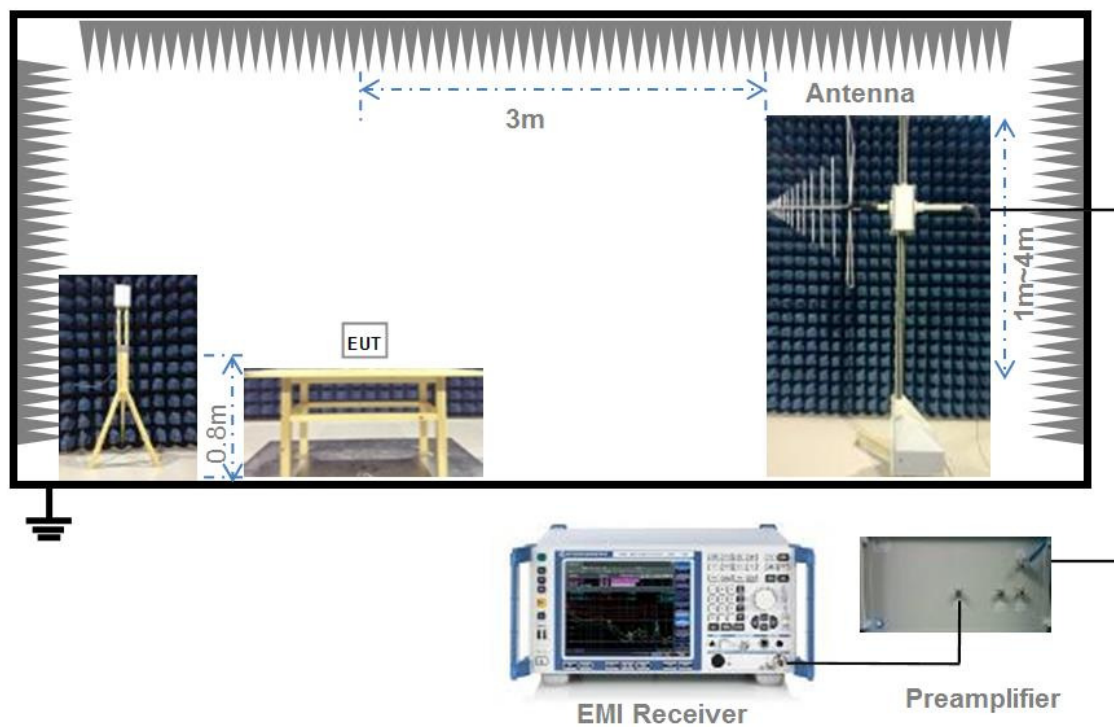
(Diagram 2)

4.3.3 For Radiated Test (Below 30 MHz)



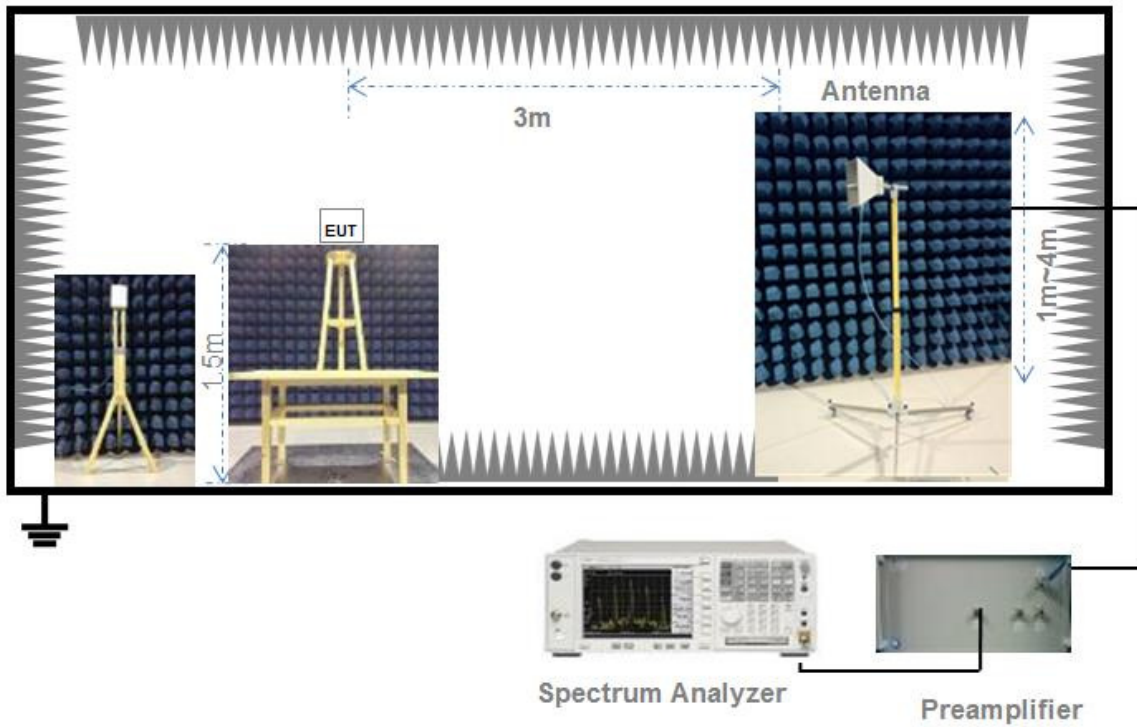
(Diagram 3)

4.3.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.3.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.4 Measurement Results Explanation Example

4.4.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

4.4.2 For radiated band edges and spurious emission test:

Per part 15.35(c), the EUT Bluetooth average emission level could be determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.

The average level is derived from the peak level corrected with "Duty cycle correction factor".

Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + Duty cycle correction factor (dB)

Duty cycle correction factor (dB) = $20 * \log (\text{Duty cycle})$.

Duty cycle = on time / 100 milliseconds

On time = dwell time * hopping number in 100 ms

For example: bluetooth with dwell time 2.9 ms and 3 hops in 100 ms, then

Duty cycle correction factor (dB) = $20 * \log ((2.9 * 3) / 100) = -21.21 \text{ dB}$

Following shows an average computation example with duty cycle correction factor = -21.21 dB, and the peak emission level is 45.61 dBuV/m.

Example:

Average Emission Level (dBuV/m) = Peak Emission Level (dBuV/m) + duty cycle correction factor (dB)
= $45.61 + (-21.21) = 24.4 \text{ (dBuV/m)}$

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Standard Applicable

FCC §15.203 & 15.247(b); RSS-247, 5.4 (6)

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

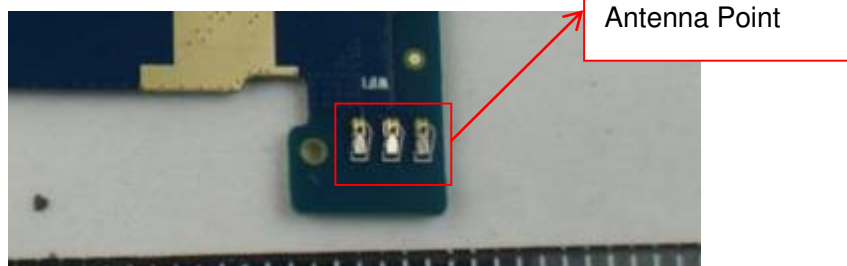
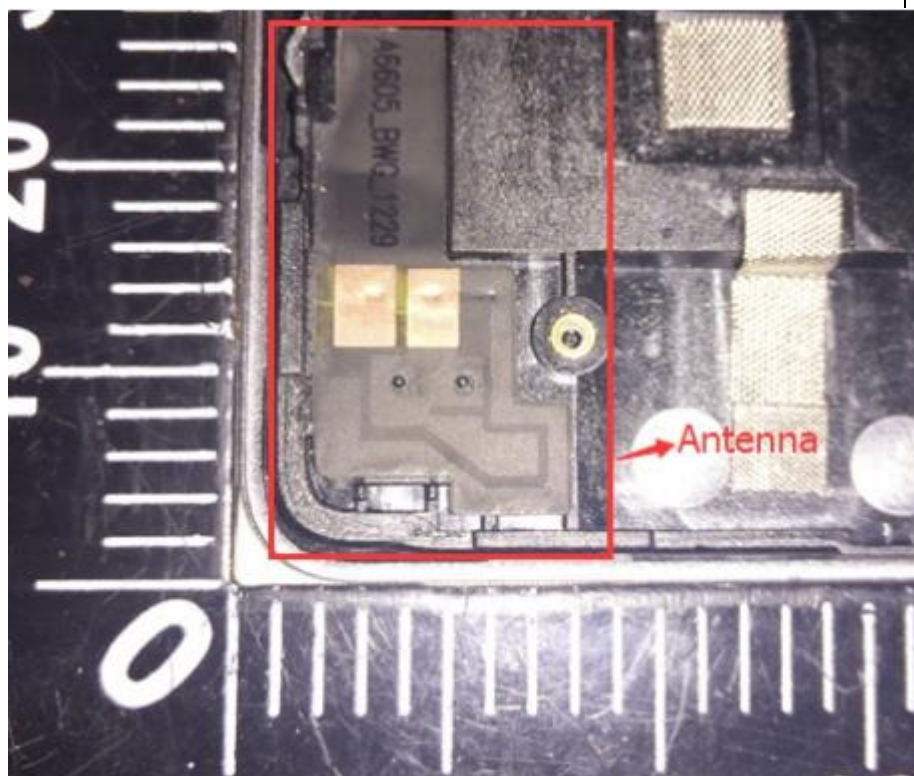
If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is An embedded-in	The antenna is welded on the mainboard, can't be replaced by the consumer

Reference Documents	Item
Photo	



5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Number of Hopping Frequencies

5.2.1 Limit

FCC §15.247(a) (1) (iii); RSS-247, 5.1 (4)

Frequency hopping systems operating in the 2400 MHz to 2483.5 MHz bands shall use at least 15 hopping frequencies.

5.2.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 Peak Output Power and E.I.R.P

5.3.1 Test Limit

FCC § 15.247(b)

For frequency hopping systems that operates in the 2400 MHz to 2483.5 MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1 Watt.

RSS-247, 5.4 (2)

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

5.3.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Occupied Bandwidth

5.4.1 Limit

FCC §15.247(a); RSS-247, 5.1 (1)

The 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth ($10 \cdot \log 1\% = 20$ dB) taking the total RF output power.

5.4.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW $\geq$ 1% of the 20 dB bandwidth

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Carrier Frequency Separation

5.5.1 Limit

FCC §15.247(a); RSS-247, 5.1 (2)

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

5.5.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

5.5.4 Test Result

Please refer to ANNEX A.4.

5.6 Time of Occupancy (Dwell time)

5.6.1 Limit

FCC §15.247(a); RSS-247, 5.1 (4)

Frequency hopping systems in the 2400 MHz - 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.6.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The average time of occupancy on any channel within the Period can be calculated with formulas:

For DH1 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 2) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH3 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 4) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

For DH5 package type

$$\{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4 \text{ s} * \{\text{Number of Hopping Frequency}\}$$

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

5.6.4 Test Result

Please refer to ANNEX A.5

5.7 Conducted Spurious Emission

5.7.1 Limit

FCC §15.247(d); RSS-247, 5.5

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.7.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.7.4 Test Result

Please refer to ANNEX A.6.

5.8 Conducted Emission

5.8.1 Limit

FCC §15.207; RSS-GEN, 8.8

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.8.2 Test Setup

See section 4.4.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

5.8.4 Test Result

Please refer to ANNEX A.7.

5.9 Radiated Spurious Emission

5.9.1 Limit

FCC §15.209&15.247(d); RSS-247, 5.5

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: $54\text{dB}\mu\text{V/m}@3\text{m}$ (AV) and $74\text{dB}\mu\text{V/m}@3\text{m}$ (PK).

5.9.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.9.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360° , and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.9.4 Test Result

Please refer to ANNEX A.8.

5.10 Receiver Spurious Emissions

5.10.1 Limit

RSS-Gen, 7.1.2

Radiated spurious emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. Spurious emissions from receivers shall not exceed the radiated limits shown in the table below:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

1. Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54 $\text{dB}\mu\text{V/m}@3\text{m}$ (AV) and 74 $\text{dB}\mu\text{V/m}@3\text{m}$ (PK).

5.10.2 Test Setup

See section 4.4.3-4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.10.3 Test Procedure

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360° , and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

Test Plots for the Whole Measurement Frequency Range:

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold Test Result

5.10.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

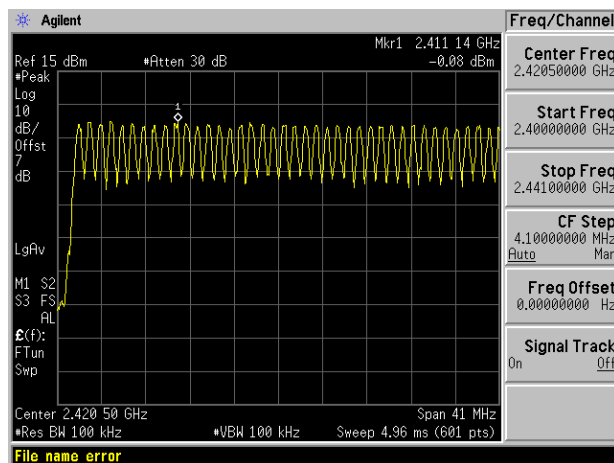
A.1 Number of Hopping Frequency

Test Data

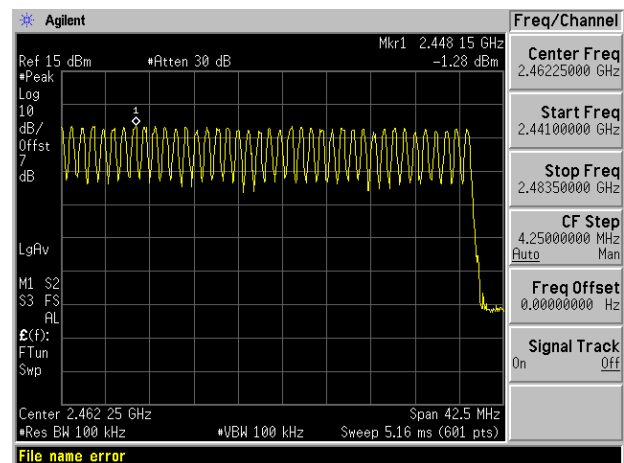
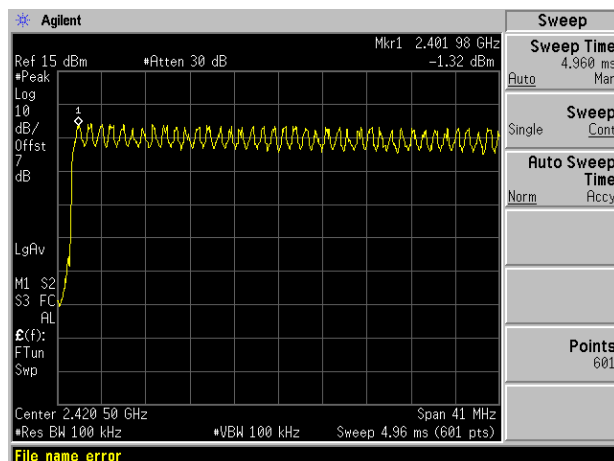
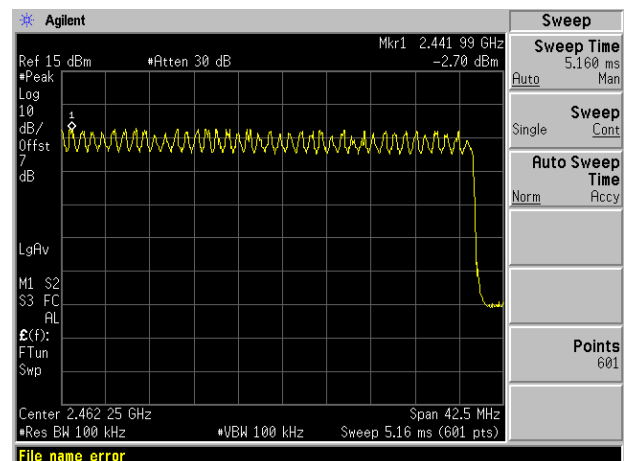
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	Pass
$\Pi/4$ -DQPSK	2400 - 2483.5	79	15	Pass
8-DPSK	2400 - 2483.5	79	15	Pass

Test plots

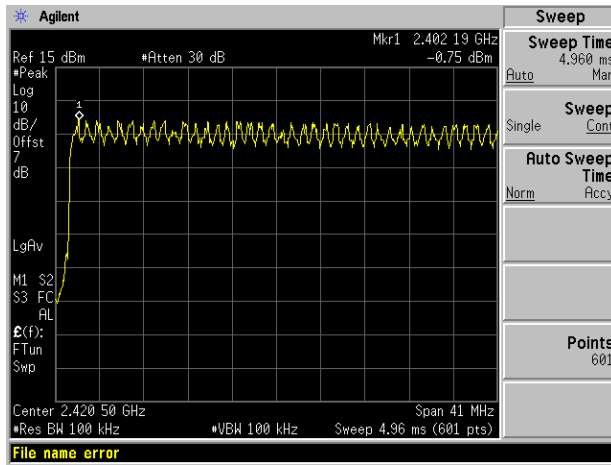
GFSK 2.4 GHz ~ 2.4415 GHz



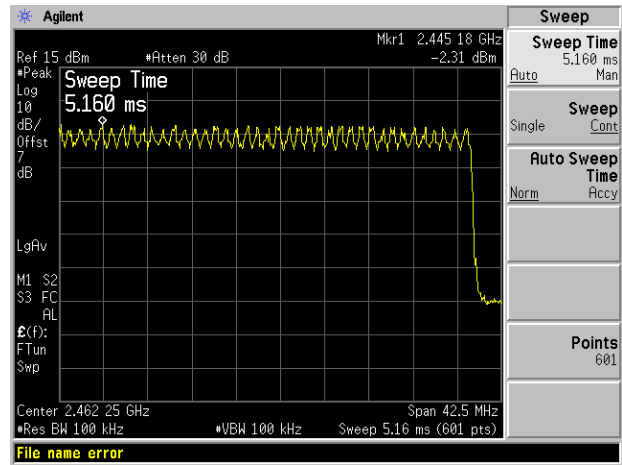
GFSK 2.4415 GHz ~ 2.4835 GHz


 $\Pi/4$ -DQPSK 2.4 GHz ~ 2.4415 GHz

 $\Pi/4$ -DQPSK GHz ~ 2.4835 GHz


8-DPSK 2.4 GHz ~ 2.4415 GHz



8-DPSK 2.4415 GHz ~ 2.4835 GHz



A.2 Peak Output Power and E.I.R.P

Peak Power Test Data

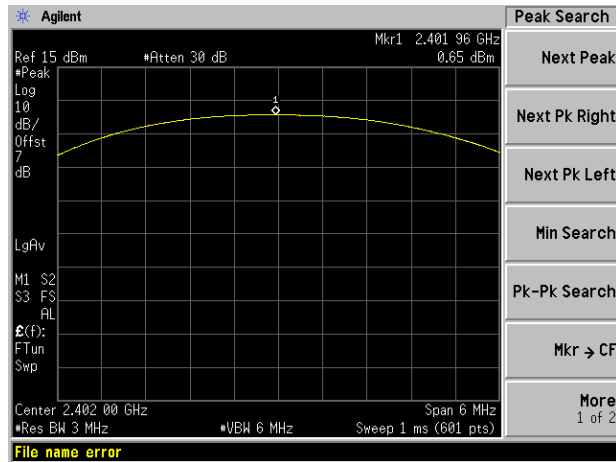
Channel	Measured Output Peak Power						Limit		Verdict
	GFSK		π/4-DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	0.65	1.16	0.39	1.09	0.64	1.16	30	1000	Pass
Middle	-0.83	0.83	-1.05	0.79	-0.78	0.84			Pass
High	-1.65	0.68	-1.92	0.64	-1.69	0.68			Pass

E.I.R.P Test Data

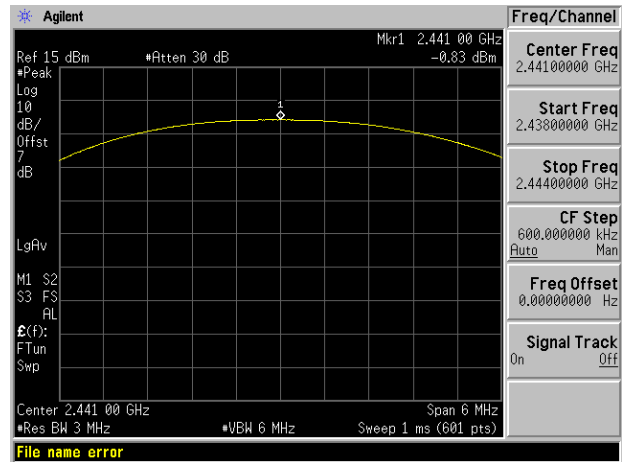
Channel	E.I.R.P						Limit		Verdict
	GFSK		π/4-DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	1.14	1.30	0.88	1.22	1.13	1.30	36	4000	Pass
Middle	-0.34	0.92	-0.56	0.88	-0.29	0.94			Pass
High	-1.16	0.77	-1.43	0.72	-1.2	0.76			Pass

Test plots

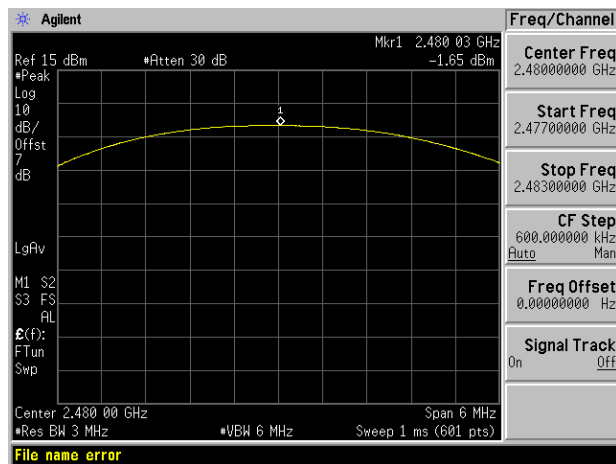
GFSK LOW CHANNEL



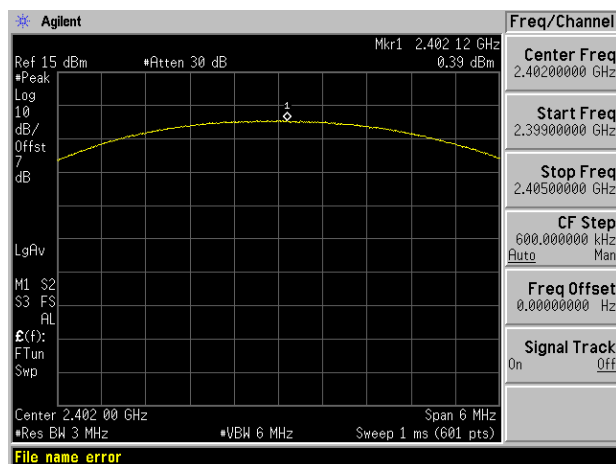
GFSK MIDDLE CHANNEL



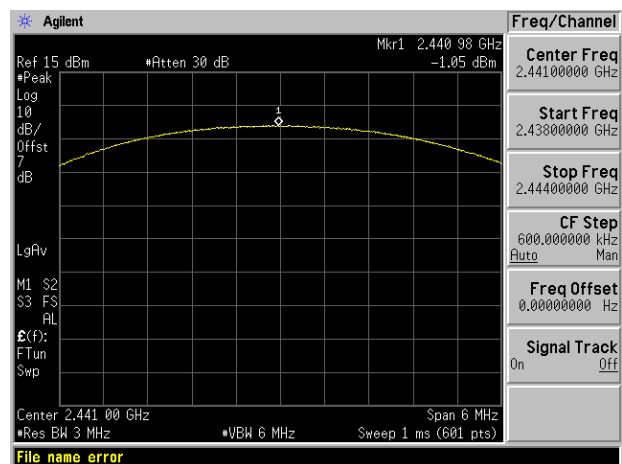
GFSK HIGH CHANNEL



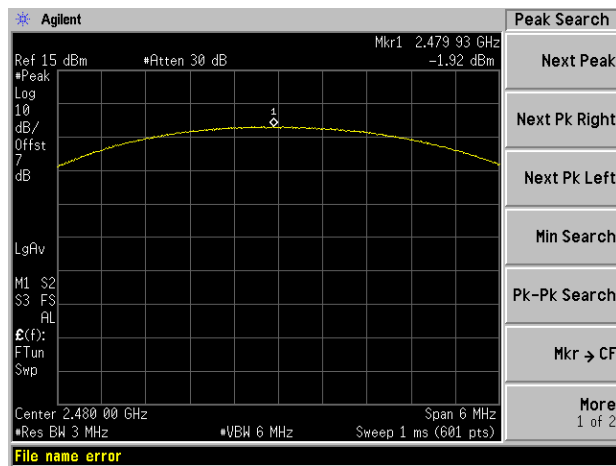
II/4-DQPSK LOW CHANNEL



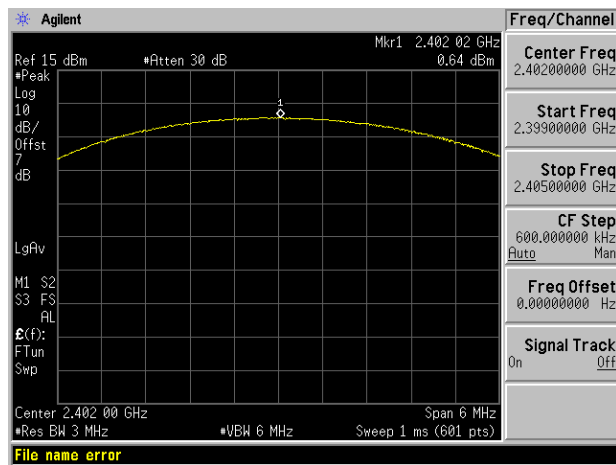
II/4-DQPSK MIDDLE CHANNEL



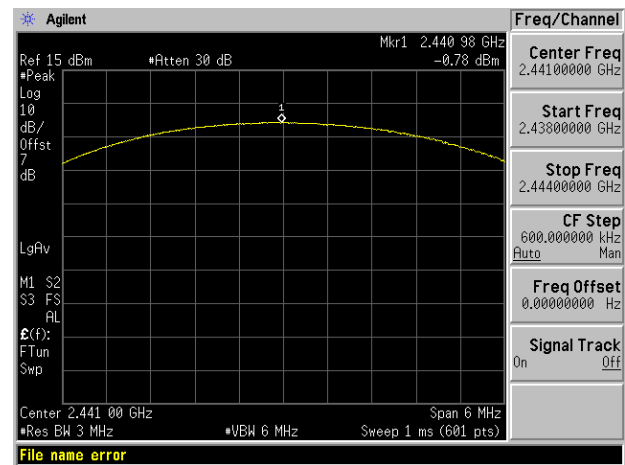
II/4-DQPSK HIGH CHANNEL



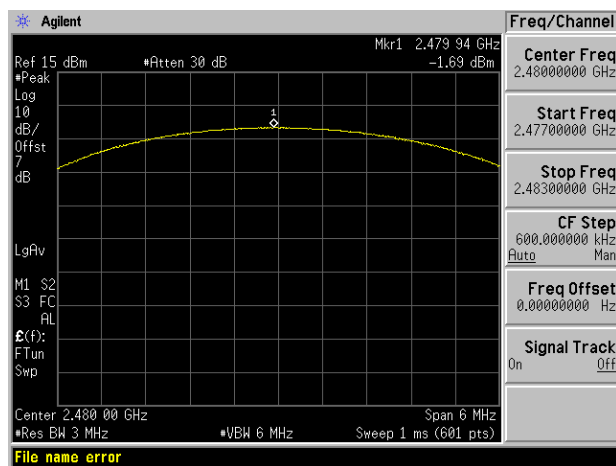
8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



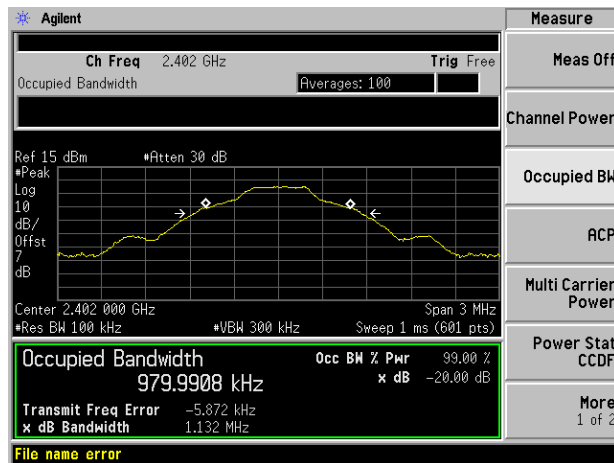
A.3 20 dB and 99% bandwidth

Test Data

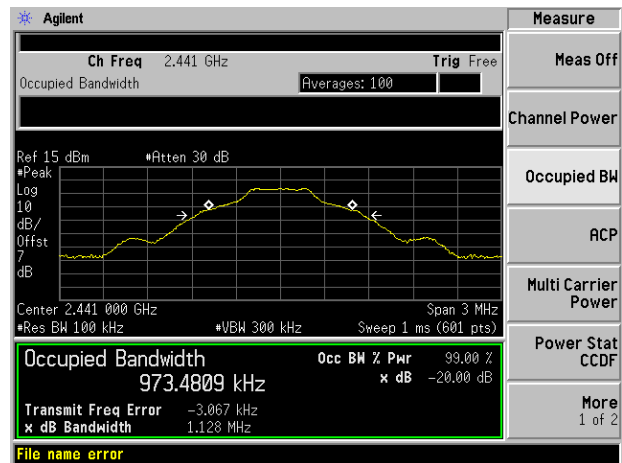
GFSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (kHz)
Low	1.132	979.9908
Middle	1.128	973.4809
High	1.120	970.1501
π/4-DQPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.351	1.1948
Middle	1.350	1.1987
High	1.350	1.1920
8-DPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.367	1.2074
Middle	1.372	1.2111
High	1.368	1.2082

Test plots

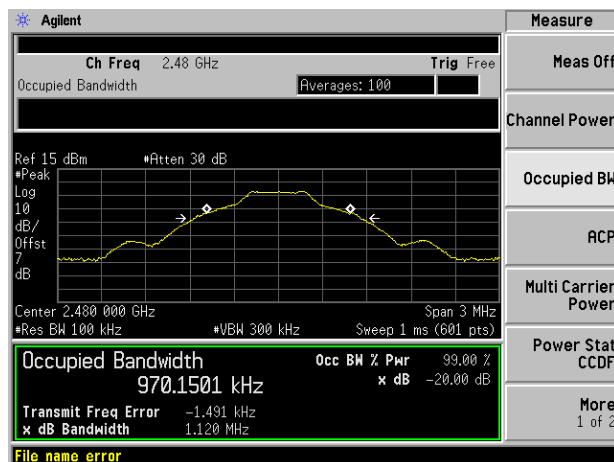
GFSK LOW CHANNEL



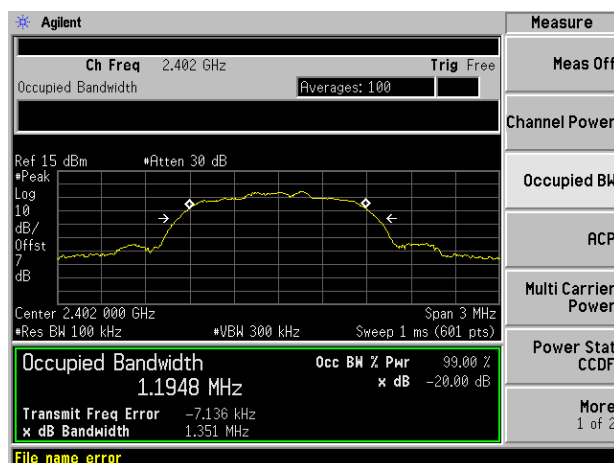
GFSK MIDDLE CHANNEL



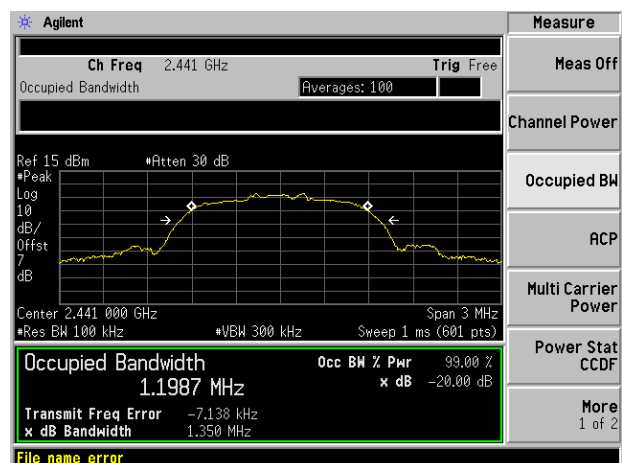
GFSK HIGH CHANNEL



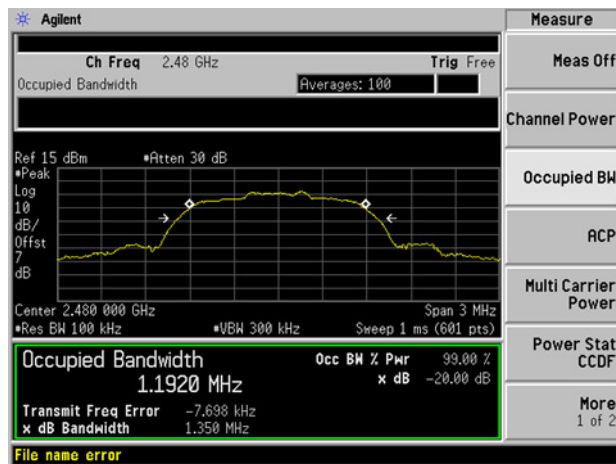
II/4-DQPSK LOW CHANNEL



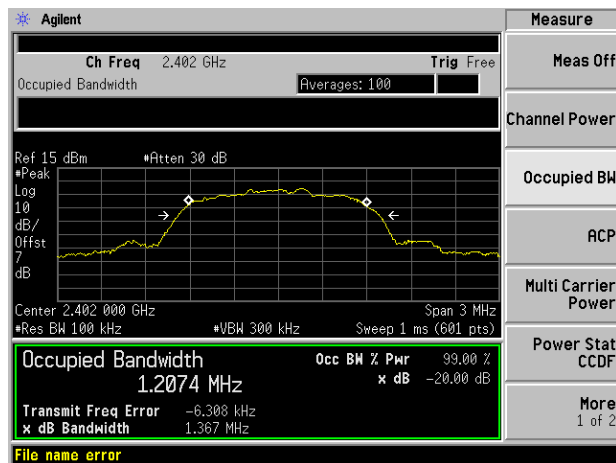
II/4-DQPSK MIDDLE CHANNEL



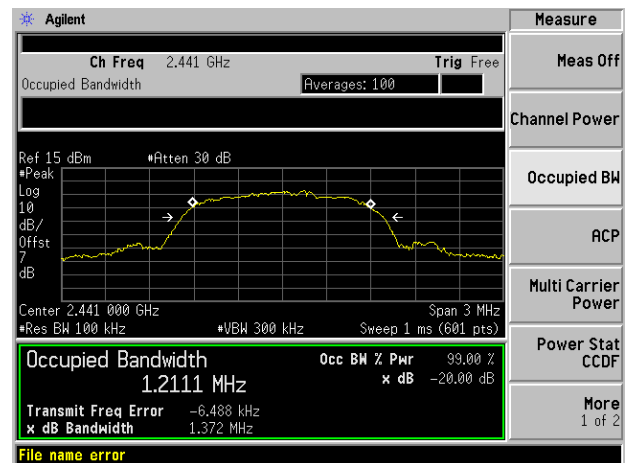
II/4-DQPSK HIGH CHANNEL



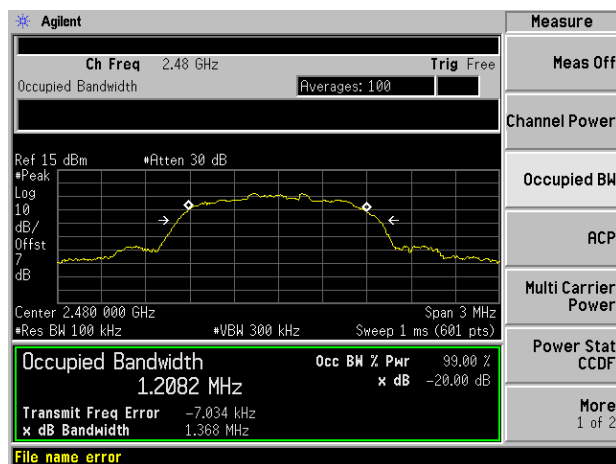
8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



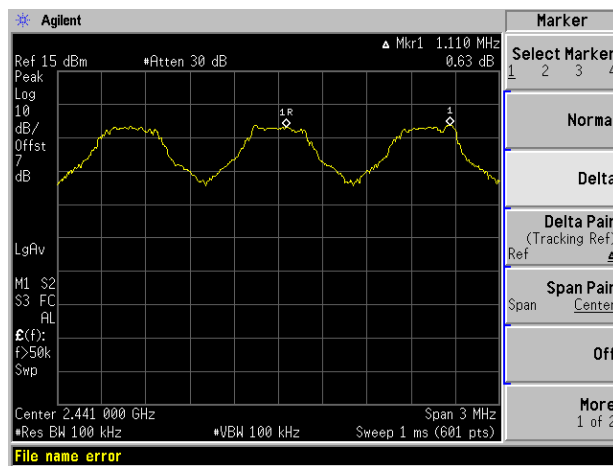
A.4 Hopping Frequency Separation

Test Data

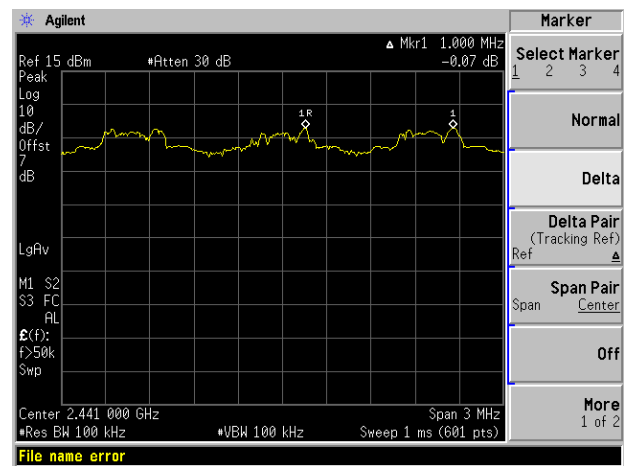
Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Verdict
GFSK	1.110	1.132	0.755	Pass
$\Pi/4$ -DQPSK	1.000	1.351	0.901	Pass
8-DPSK	1.000	1.372	0.915	Pass

Test Plots

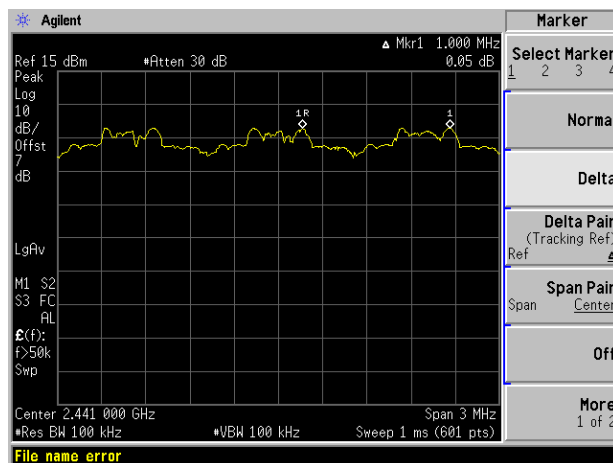
GFSK



$\Pi/4$ -DQPSK



8-DPSK



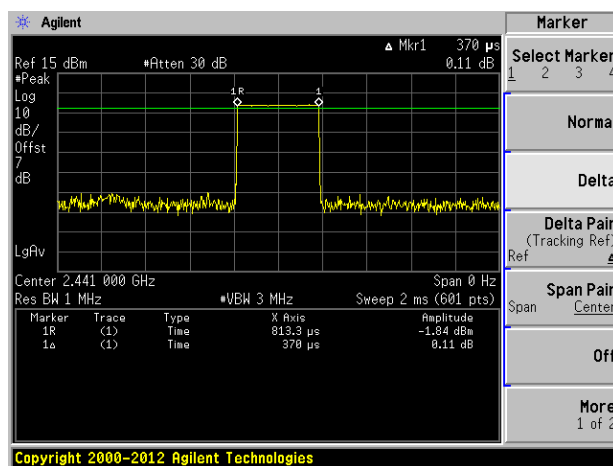
A.5 Average Time of Occupancy

Test Data

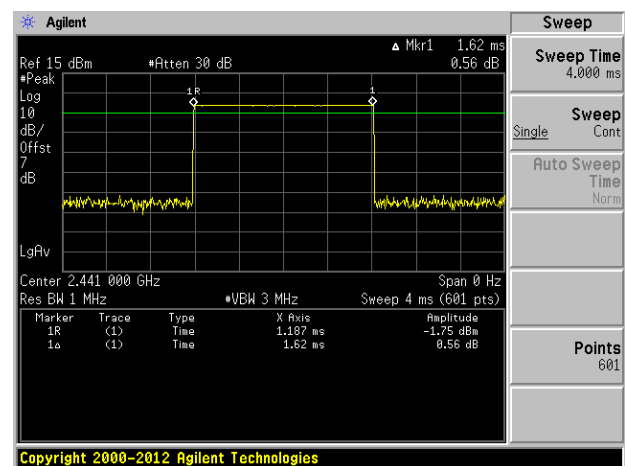
GFSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.370	118.404	0.4	Pass
DH 3	1.620	259.208	0.4	Pass
DH 5	2.873	306.463	0.4	Pass
π/4-DQPSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.373	119.460	0.4	Pass
DH 3	1.613	258.088	0.4	Pass
DH 5	2.873	306.463	0.4	Pass
8-DPSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.373	119.460	0.4	Pass
DH 3	1.620	172.805	0.4	Pass
DH 5	2.873	306.463	0.4	Pass

Test Plots

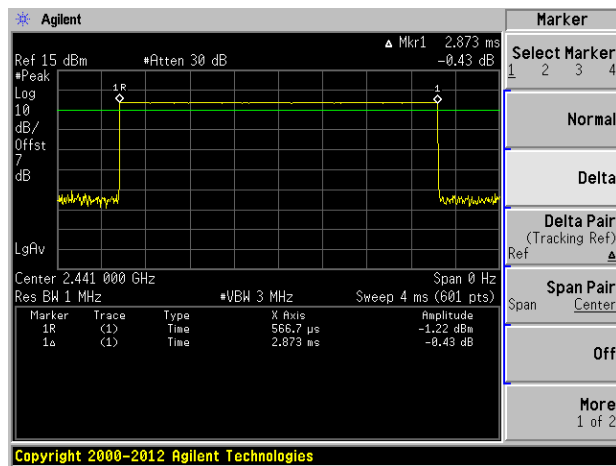
GFSK DH1



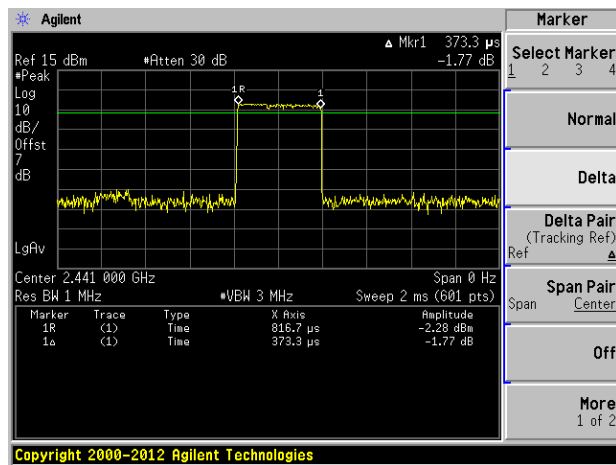
GFSK DH3



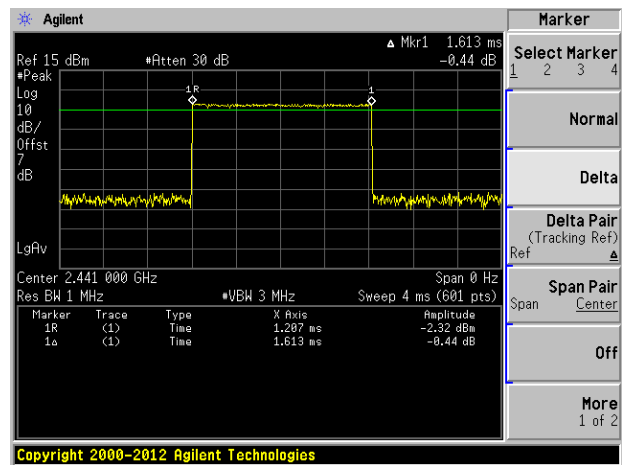
GFSK DH5



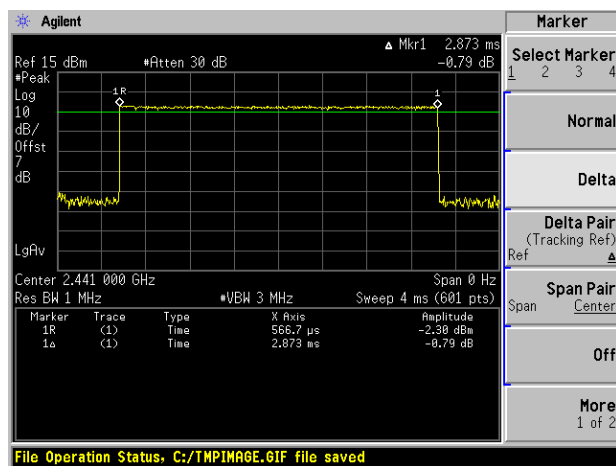
II/4-DQPSK DH1



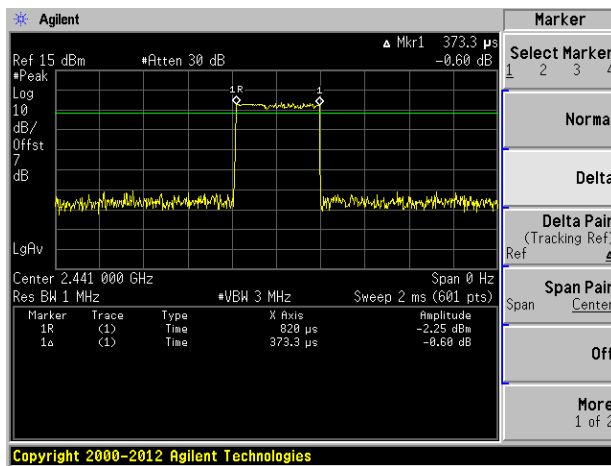
II/4-DQPSK DH3



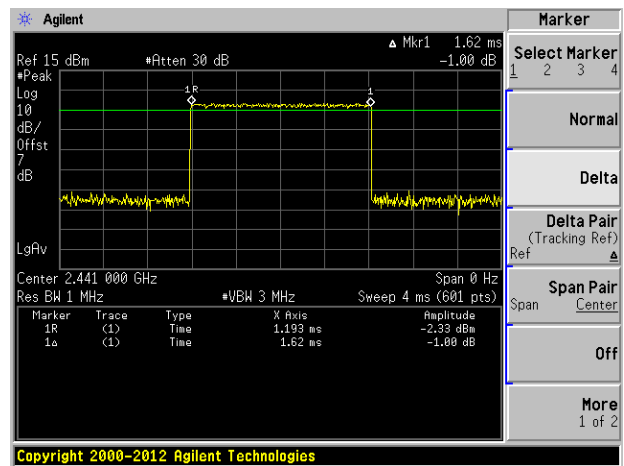
II/4-DQPSK DH5



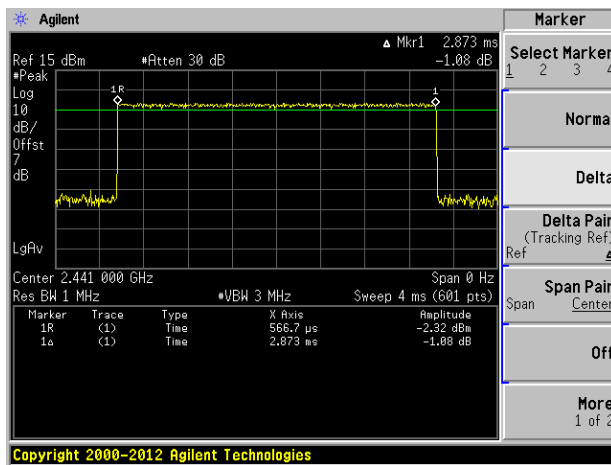
8-DPSK DH1



8-DPSK DH3



8-DPSK DH5



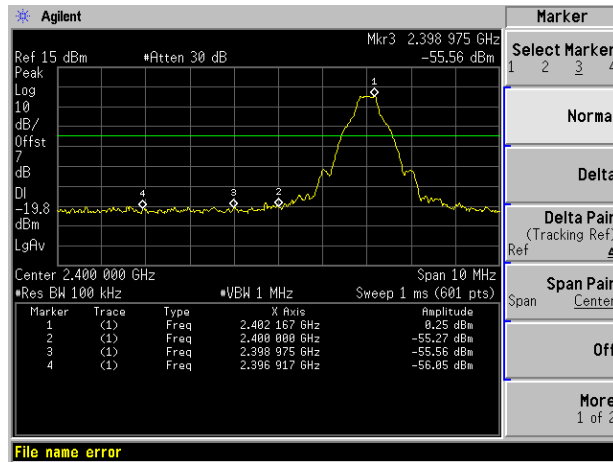
A.6 Conducted Spurious Emissions

Test Data

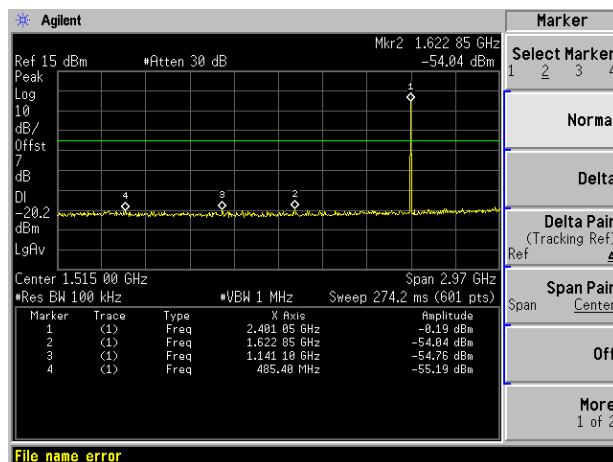
GFSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-49.10	-0.19	-20.19	Pass
Middle	-49.17	-1.42	-21.42	Pass
High	-48.15	-2.42	-22.42	Pass
II/4-DQPSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-49.01	-4.59	-24.59	Pass
Middle	-48.93	-5.70	-25.70	Pass
High	-47.01	-6.80	-26.80	Pass
8-DPSK				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-49.02	-2.73	-22.73	Pass
Middle	-48.40	-5.46	-25.46	Pass
High	-48.60	-4.30	-24.30	Pass

Test Plots

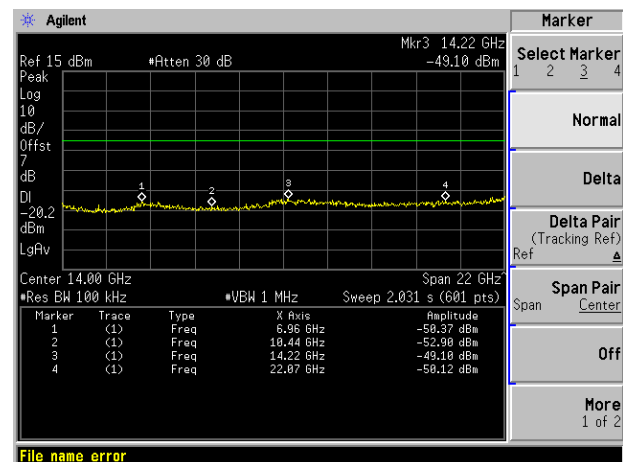
GFSK LOW CHANNEL , BAND EDGE



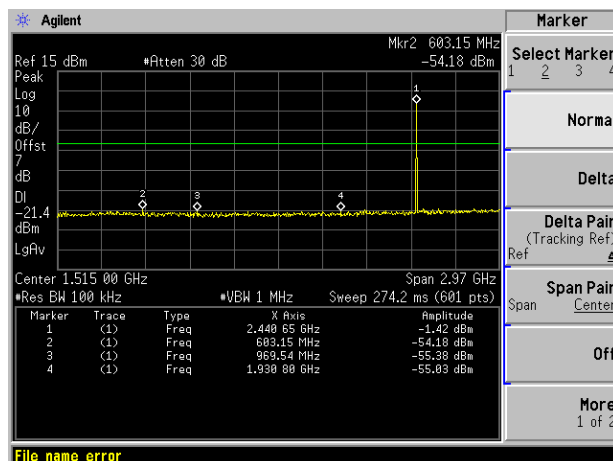
GFSK LOW CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



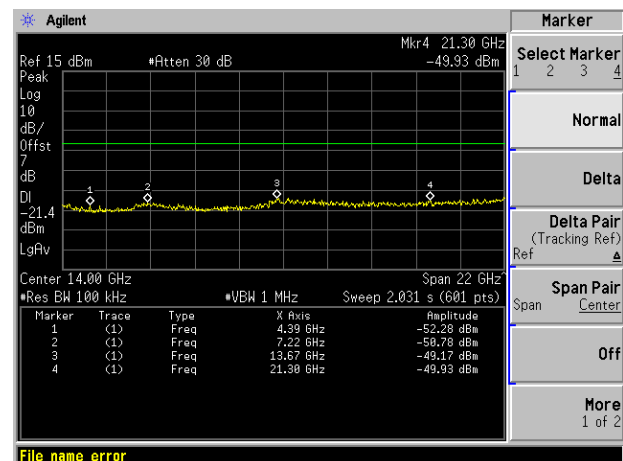
GFSK LOW CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



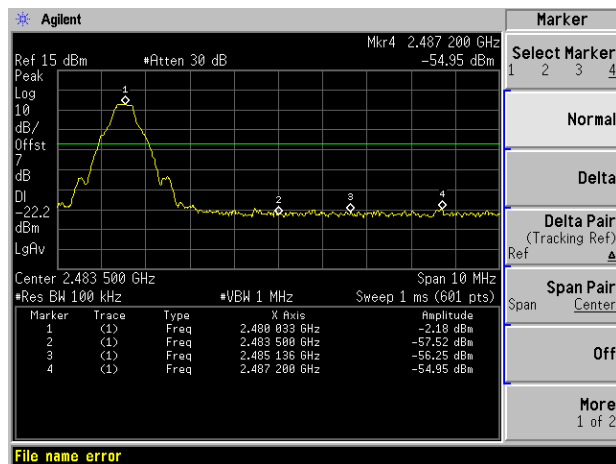
GFSK MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



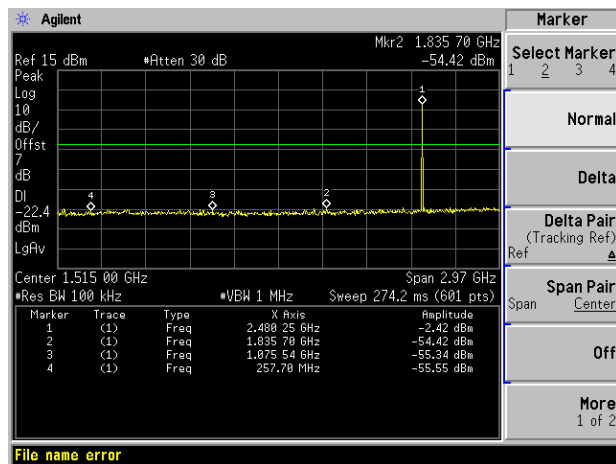
GFSK MIDDLE CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



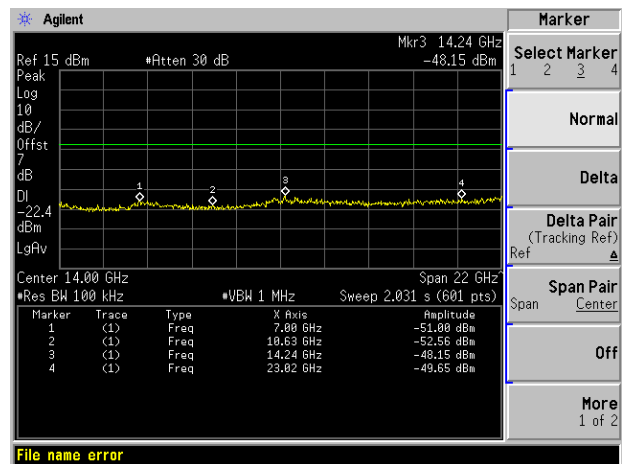
GFSK High CHANNEL , BAND EDGE



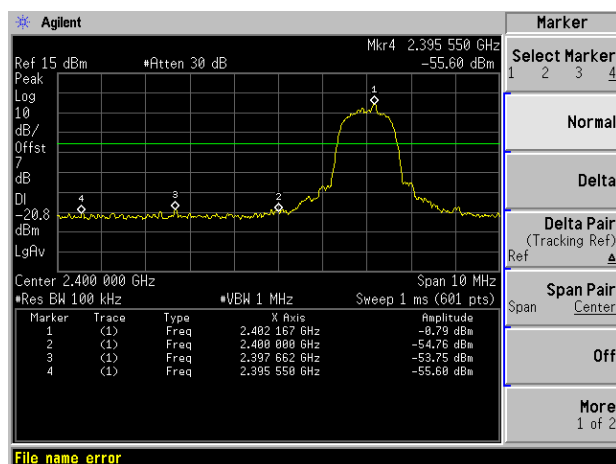
GFSK High CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



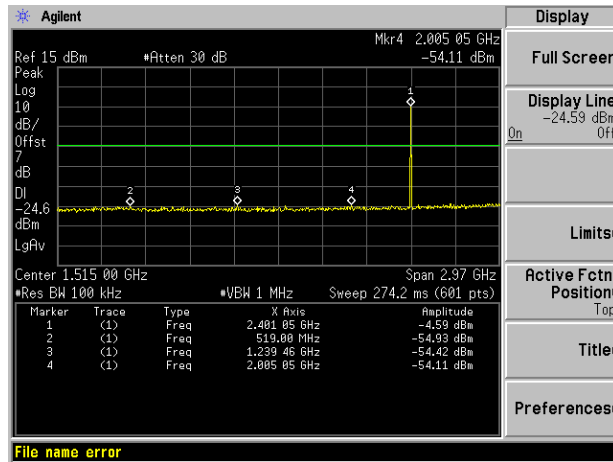
GFSK High CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



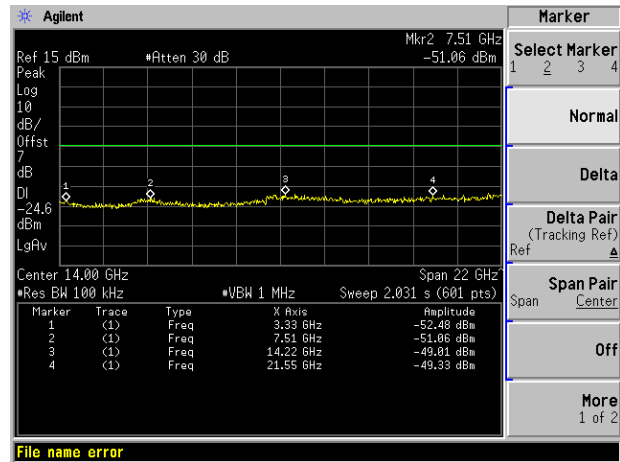
II/4-DQPSK LOW CHANNEL , BAND EDGE



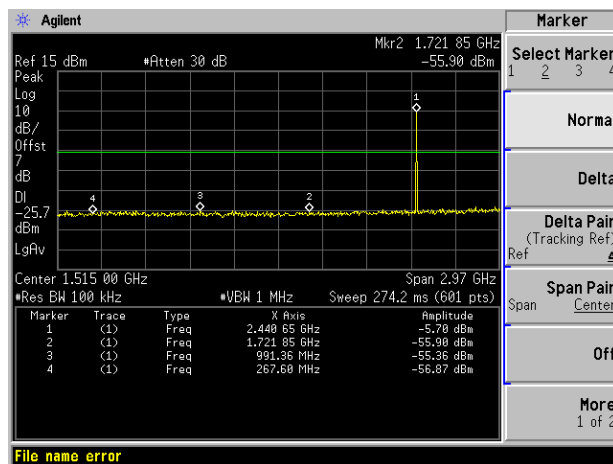
II/4-DQPSK LOW CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



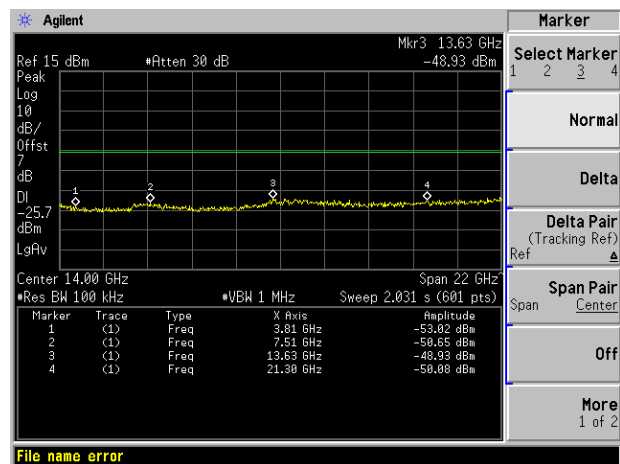
II/4-DQPSK LOW CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



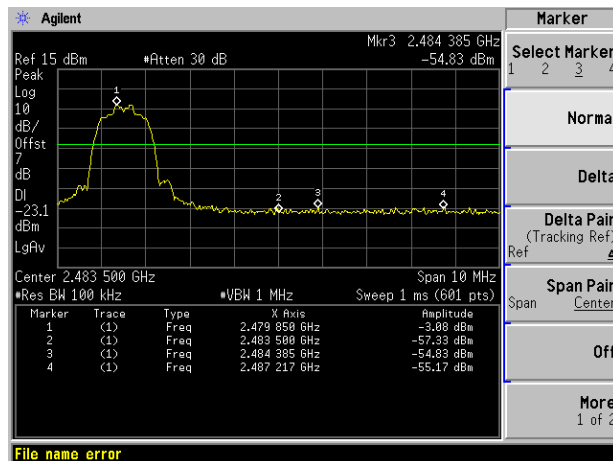
II/4-DQPSK MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



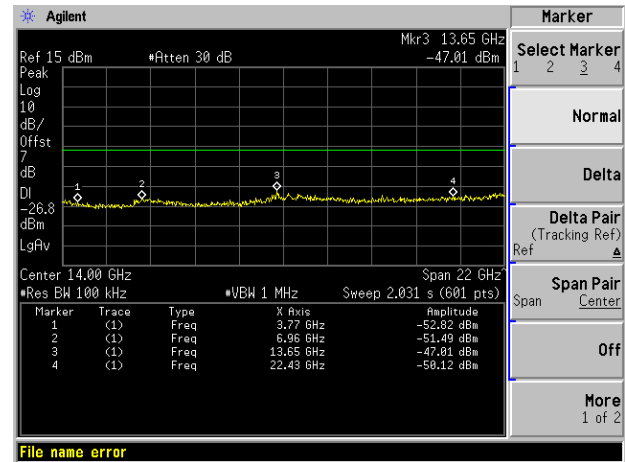
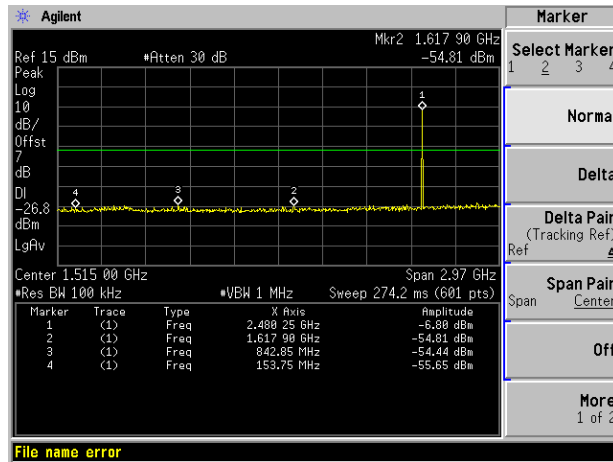
II/4-DQPSK MIDDLE CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



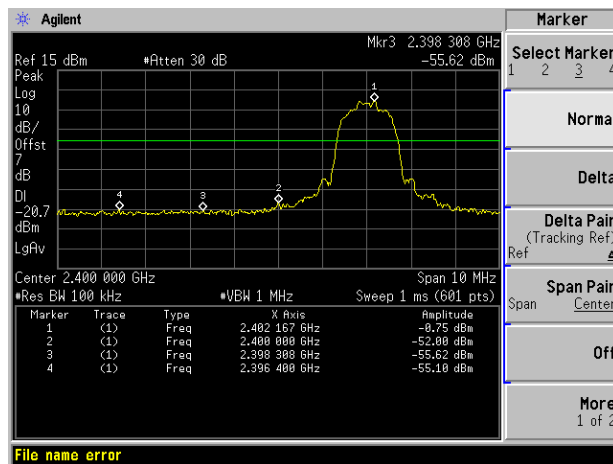
II/4-DQPSK High CHANNEL , BAND EDGE



II/4-DQPSK High CHANNEL , SPURIOUS 30 MHz
~ 3 GHz

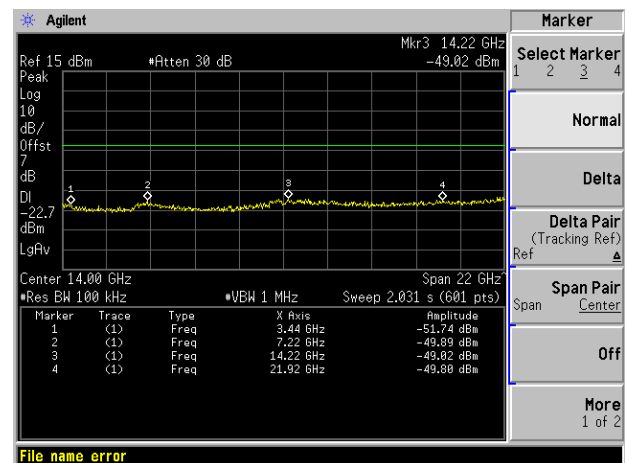
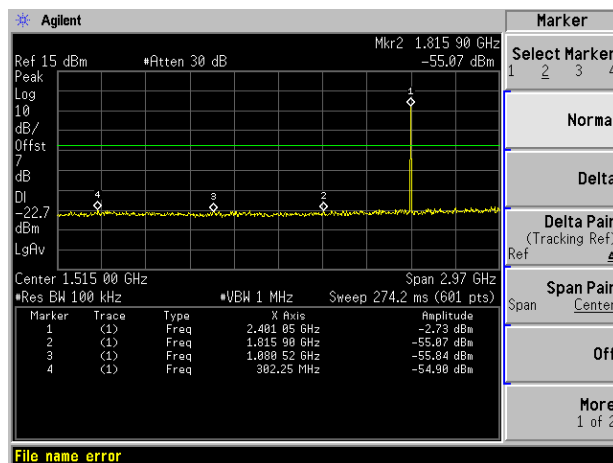
II/4-DQPSK High CHANNEL , SPURIOUS 3 GHz
~ 25 GHz


8-DPSK LOW CHANNEL , BAND EDGE

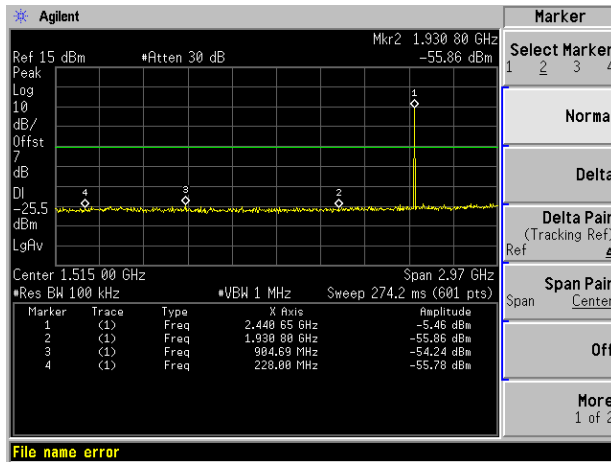


8-DPSK LOW CHANNEL , SPURIOUS 30 MHz ~ 3 GHz

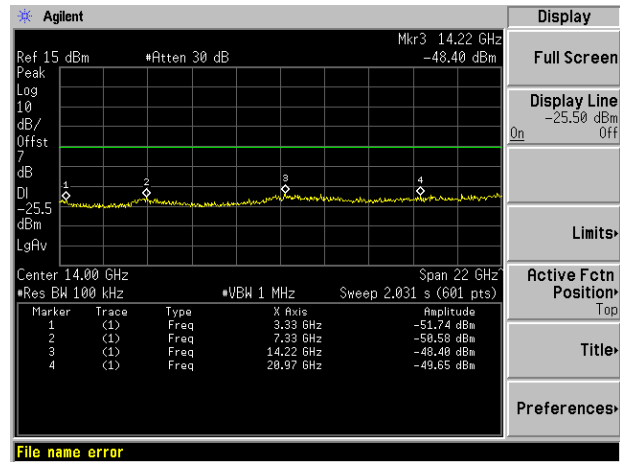
8-DPSK LOW CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



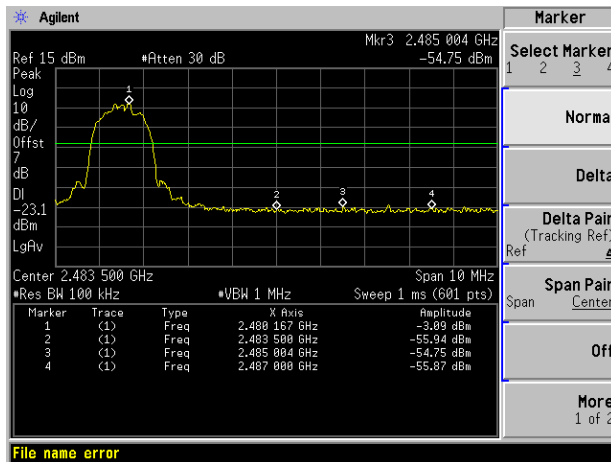
8-DPSK MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



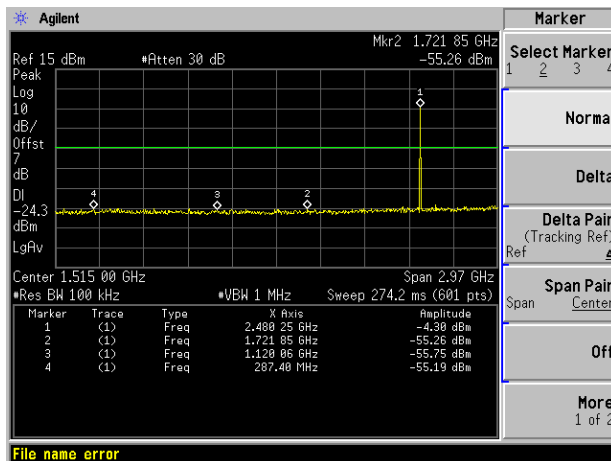
8-DPSK MIDDLE CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



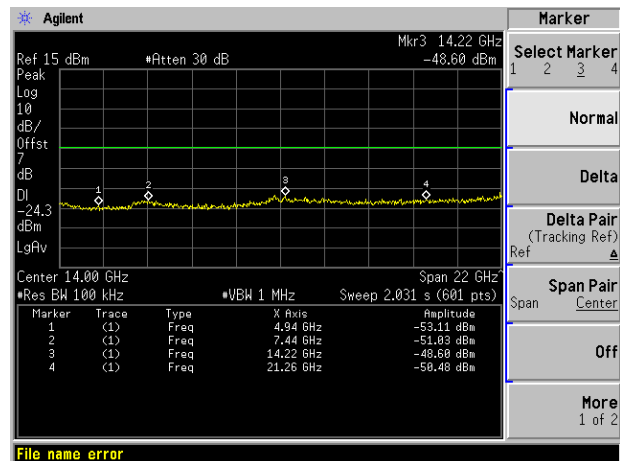
8-DPSK High CHANNEL , BAND EDGE



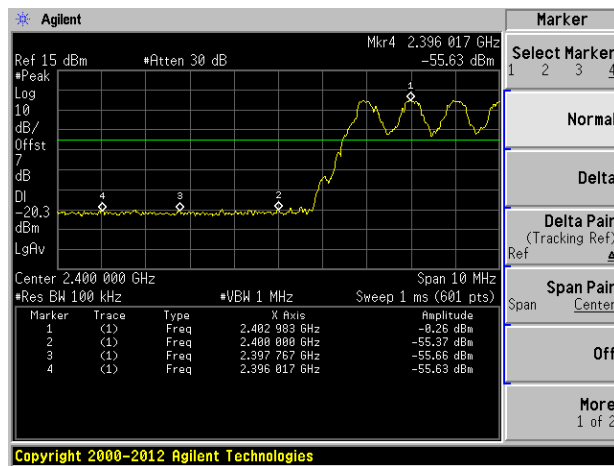
8-DPSK High CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



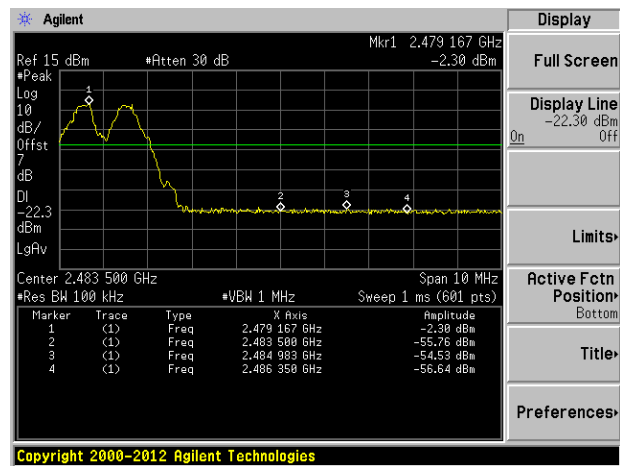
8-DPSK High CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



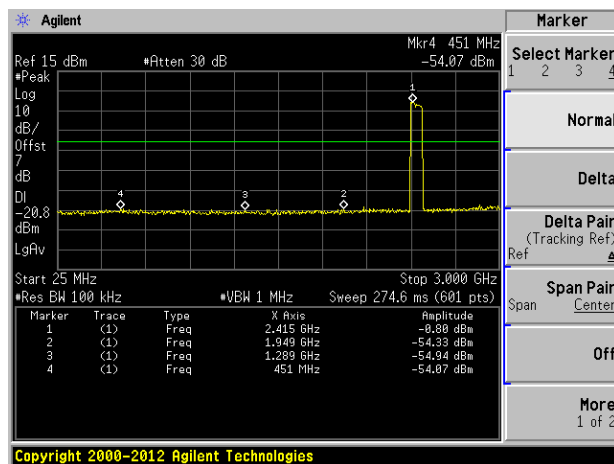
GFSK Hopping BAND EDGE (LOW)



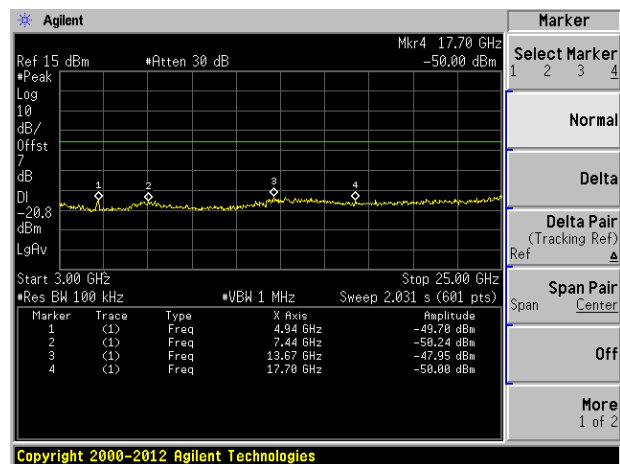
GFSK Hopping BAND EDGE (HIGH)



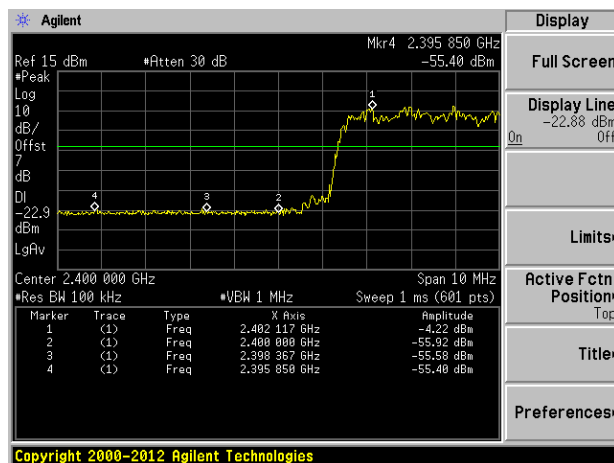
GFSK Hopping Mode, SPURIOUS 30 MHz ~ 3 GHz



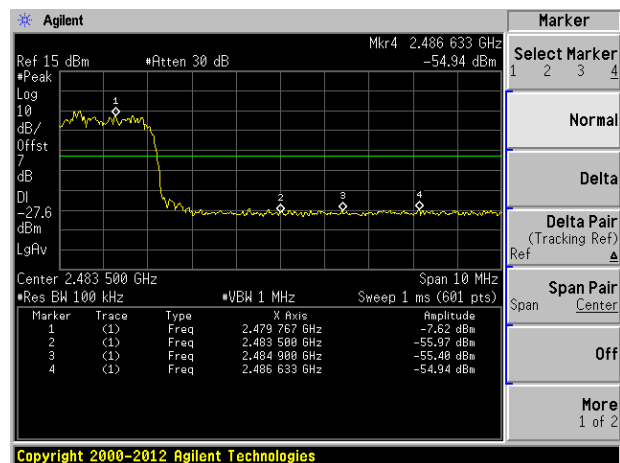
GFSK Hopping Mode, SPURIOUS 30 3GHz ~ 25 GHz



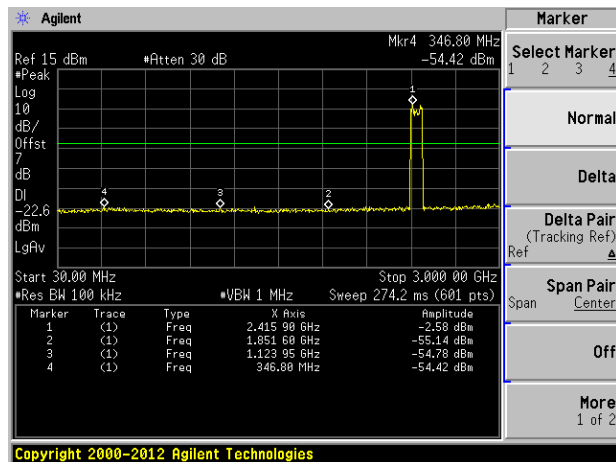
II/4-DQPSK Hopping BAND EDGE (LOW)



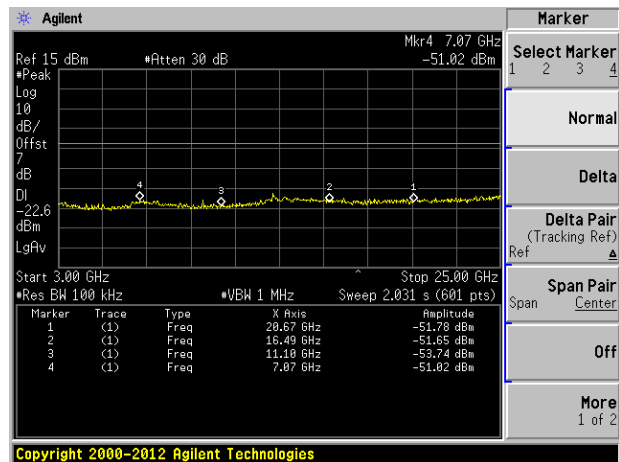
II/4-DQPSK Hopping BAND EDGE (HIGH)



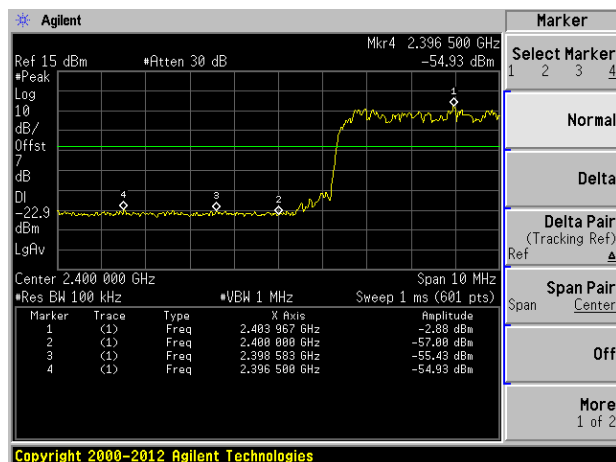
II/4-DQPSK Hopping Mode, SPURIOUS 30 MHz ~ 3 GHz



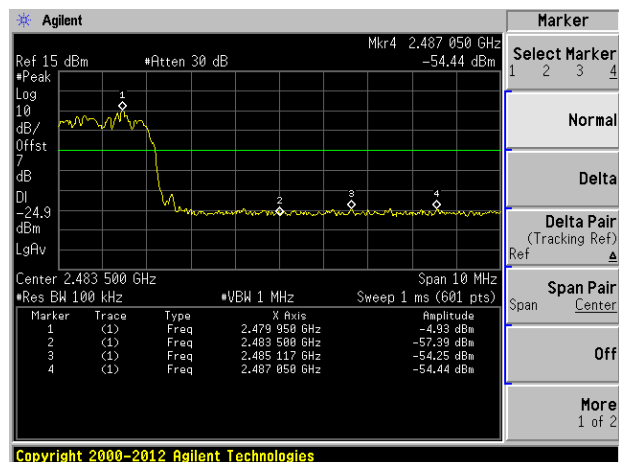
II/4-DQPSK Hopping Mode, SPURIOUS 30 3GHz ~ 25 GHz



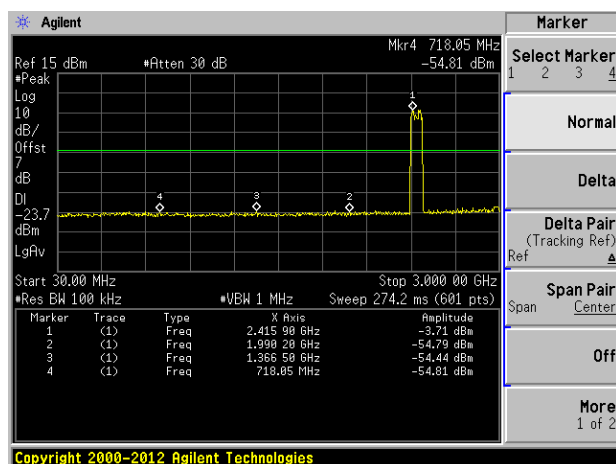
8-DPSK Hopping BAND EDGE (LOW)



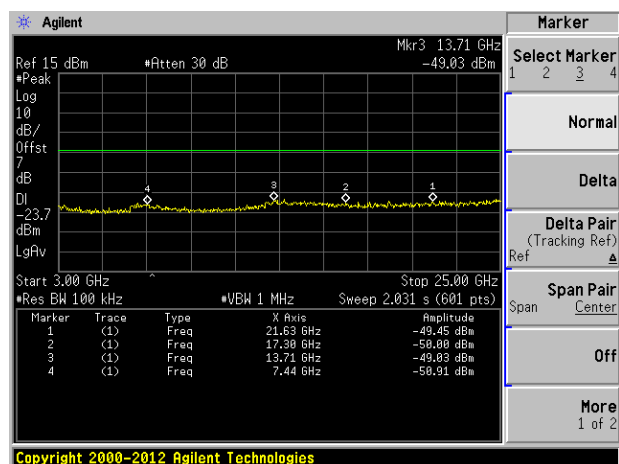
8-DPSK Hopping BAND EDGE (HIGH)



8-DPSK Hopping Mode, SPURIOUS 30 MHz ~ 3 GHz



8-DPSK Hopping Mode, SPURIOUS 30 3GHz ~ 25 GHz



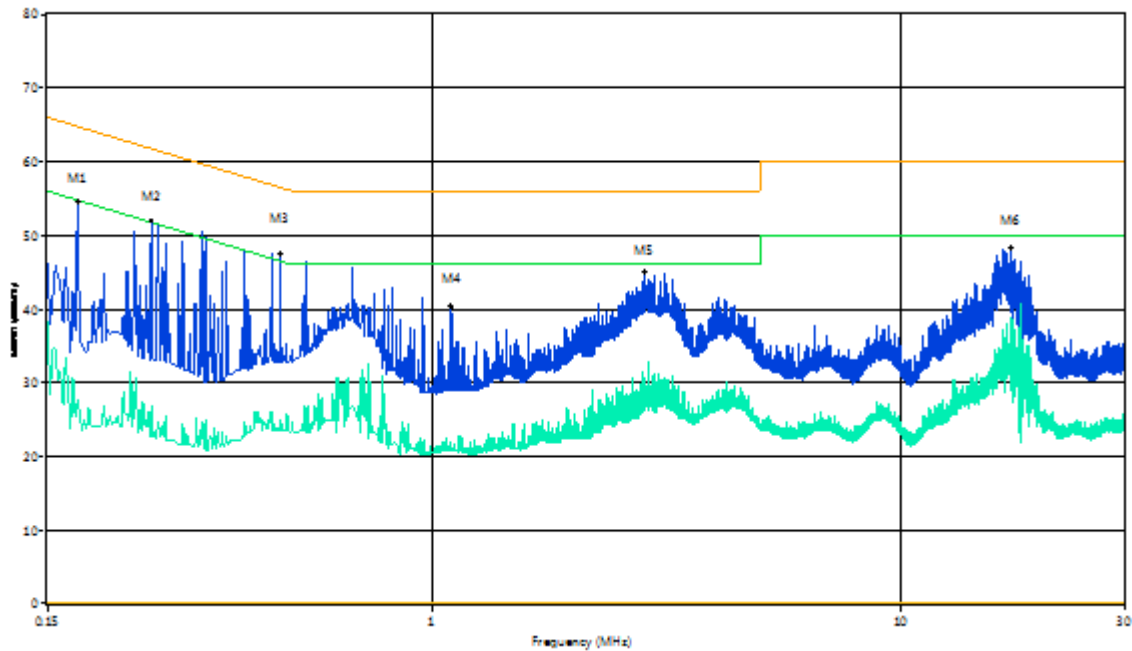
A.7 Conducted Emissions

Note: All configurations have been tested, only the worst configuration (GFSK High Channel) shown here.

Test Data and Plots

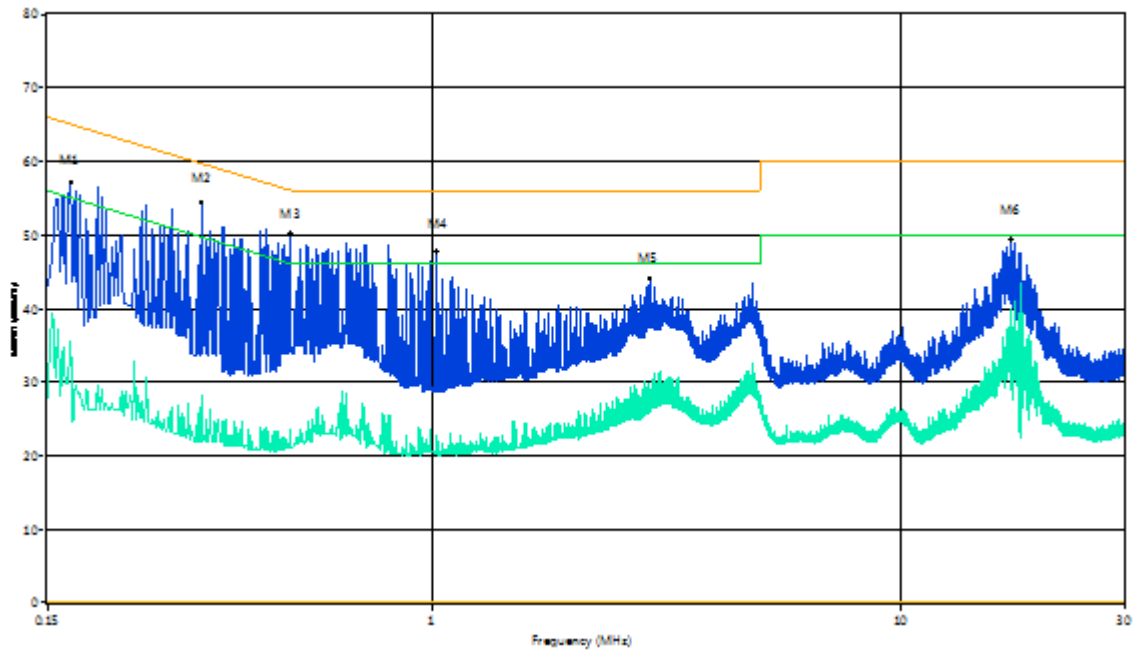
CONFIGURATION A+ C-P35 (Huntkey)

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	54.6	13.00	65.3	10.70	Peak	L Line	Pass
1**	0.17	27.7	13.00	55.3	27.60	AV	L Line	Pass
2	0.25	52.0	13.00	63.1	11.10	Peak	L Line	Pass
2**	0.25	26.8	13.00	53.1	26.30	AV	L Line	Pass
3	0.47	47.5	13.00	56.8	9.30	Peak	L Line	Pass
3**	0.47	25.1	13.00	46.8	21.70	AV	L Line	Pass
4	1.09	40.4	13.00	56.0	15.60	Peak	L Line	Pass
4**	1.09	21.9	13.00	46.0	24.10	AV	L Line	Pass
5	2.82	45.1	13.00	56.0	10.90	Peak	L Line	Pass
5**	2.82	28.1	13.00	46.0	17.90	AV	L Line	Pass
6	17.12	48.3	13.00	60.0	11.70	Peak	L Line	Pass
6**	17.12	36.5	13.00	50.0	13.50	AV	L Line	Pass

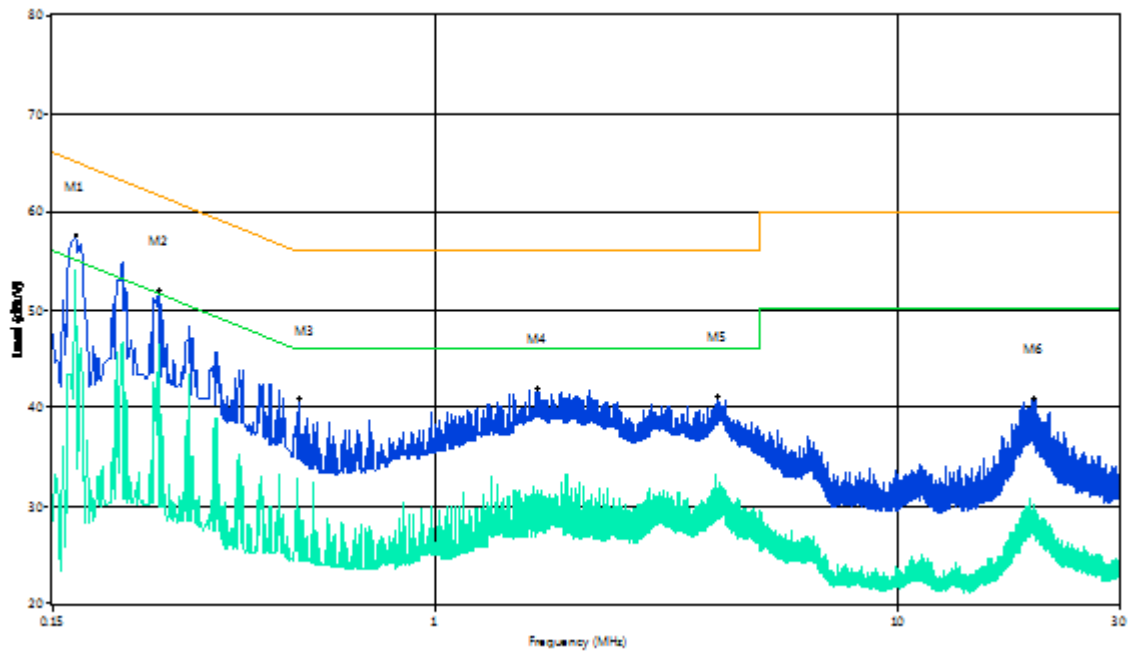
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	57.1	13.00	65.5	8.40	Peak	N Line	Pass
1**	0.17	35.7	13.00	55.5	19.80	AV	N Line	Pass
2	0.32	54.3	13.00	61.1	6.80	Peak	N Line	Pass
2**	0.32	28.3	13.00	51.1	22.80	AV	N Line	Pass
3	0.49	50.3	13.00	56.2	5.90	Peak	N Line	Pass
3**	0.49	23.5	13.00	46.2	22.70	AV	N Line	Pass
4	1.01	47.7	13.00	56.0	8.30	Peak	N Line	Pass
4**	1.01	22.7	13.00	46.0	23.30	AV	N Line	Pass
5	2.90	44.1	13.00	56.0	11.90	Peak	N Line	Pass
5**	2.90	29.2	13.00	46.0	16.80	AV	N Line	Pass
6	17.12	49.5	13.00	60.0	10.50	Peak	N Line	Pass
6**	17.12	37.7	13.00	50.0	12.30	AV	N Line	Pass

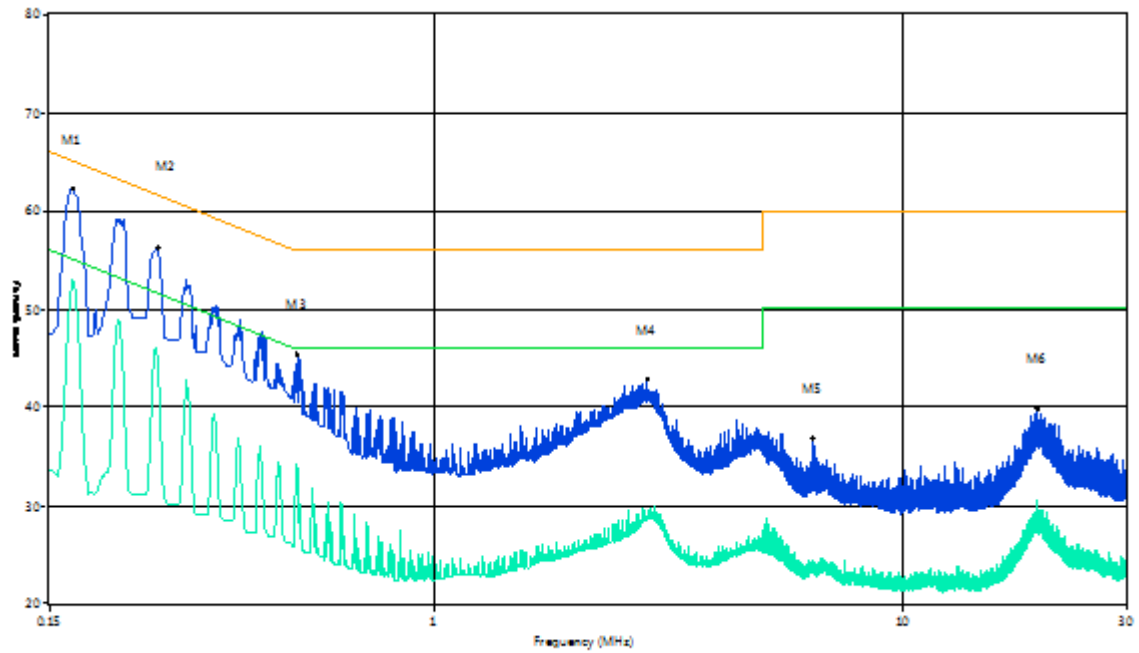
CONFIGURATION A+ C-P35 (Acbel)

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	57.5	13.00	65.5	8.00	Peak	L Line	Pass
1**	0.17	52.0	13.00	55.5	3.50	AV	L Line	Pass
2	0.25	52.0	13.00	63.0	11.00	Peak	L Line	Pass
2**	0.25	46.4	13.00	53.0	6.60	AV	L Line	Pass
3	0.51	41.0	13.00	56.0	15.00	Peak	L Line	Pass
3**	0.51	27.3	13.00	46.0	18.70	AV	L Line	Pass
4	1.66	41.9	13.00	56.0	14.10	Peak	L Line	Pass
4**	1.66	31.6	13.00	46.0	14.40	AV	L Line	Pass
5	4.06	41.1	13.00	56.0	14.90	Peak	L Line	Pass
5**	4.06	31.1	13.00	46.0	14.90	AV	L Line	Pass
6	19.54	40.9	13.00	60.0	19.10	Peak	L Line	Pass
6**	19.54	30.1	13.00	50.0	19.90	AV	L Line	Pass

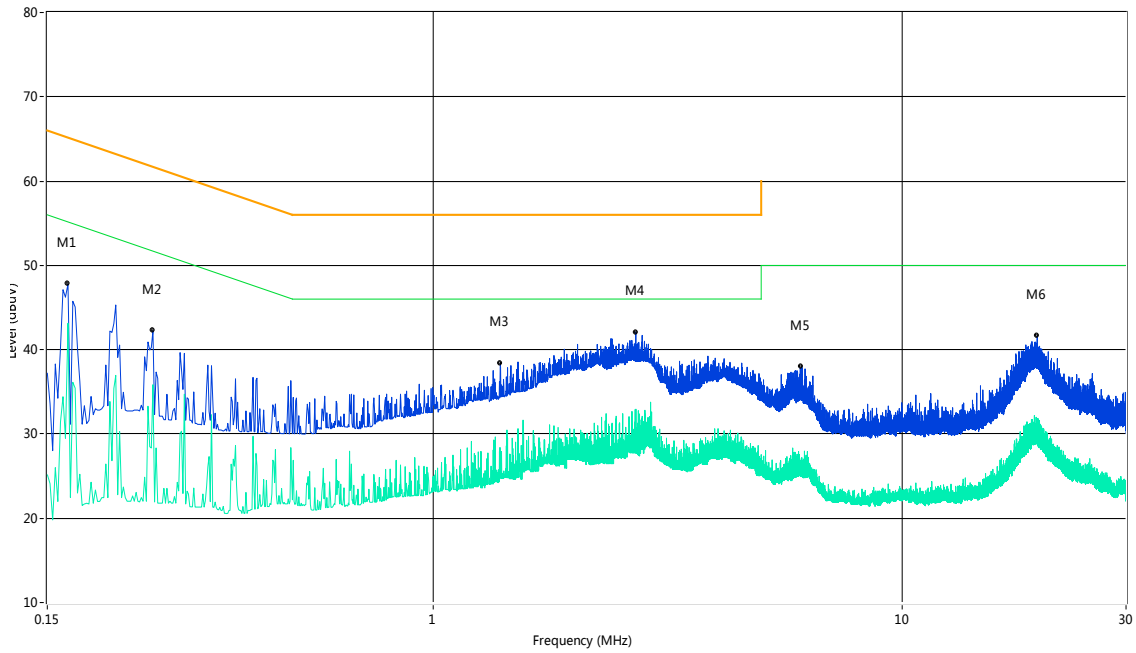
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	58.9	13.00	65.5	6.60	Peak	N Line	Pass
1**	0.17	50.5	13.00	55.5	4.50	AV	N Line	Pass
2	0.26	56.2	13.00	63.0	6.80	Peak	N Line	Pass
2**	0.26	44.3	13.00	53.0	8.70	AV	N Line	Pass
3	0.51	45.4	13.00	56.0	10.60	Peak	N Line	Pass
3**	0.51	33.8	13.00	46.0	12.20	AV	N Line	Pass
4	2.83	42.8	13.00	56.0	13.20	Peak	N Line	Pass
4**	2.83	28.6	13.00	46.0	17.40	AV	N Line	Pass
5	6.42	36.9	13.00	60.0	23.10	Peak	N Line	Pass
5**	6.42	23.0	13.00	50.0	27.00	AV	N Line	Pass
6	19.32	39.9	13.00	60.0	20.10	Peak	N Line	Pass
6**	19.32	30.5	13.00	50.0	19.50	AV	N Line	Pass

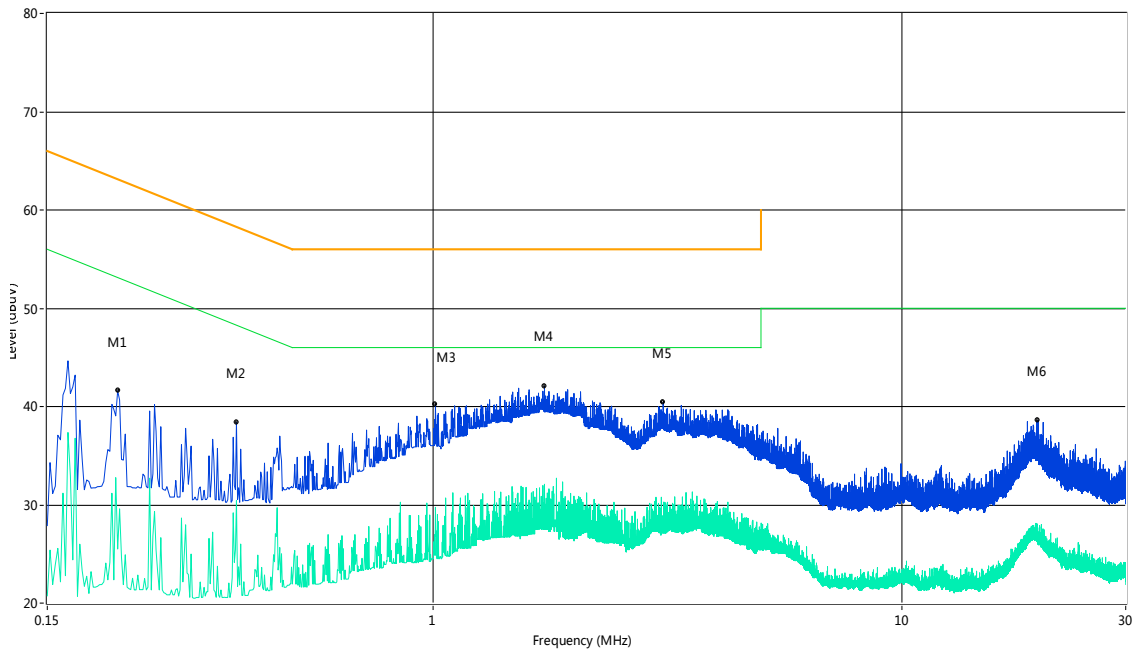
CONFIGURATION B+ C-P35 (Acbel)

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	47.8	13.00	65.5	17.70	Peak	L Line	Pass
1**	0.17	43.1	13.00	55.5	12.40	AV	L Line	Pass
2	0.25	42.2	13.00	63.1	20.90	Peak	L Line	Pass
2**	0.25	35.8	13.00	53.1	17.30	AV	L Line	Pass
3	1.39	38.4	13.00	56.0	17.60	Peak	L Line	Pass
3**	1.39	24.8	13.00	46.0	21.20	AV	L Line	Pass
4	2.70	42.1	13.00	56.0	13.90	Peak	L Line	Pass
4**	2.70	27.1	13.00	46.0	18.90	AV	L Line	Pass
5	6.09	38.0	13.00	60.0	22.00	Peak	L Line	Pass
5**	6.09	25.7	13.00	50.0	24.30	AV	L Line	Pass
6	19.39	41.7	13.00	60.0	18.30	Peak	L Line	Pass
6**	19.39	30.7	13.00	50.0	19.30	AV	L Line	Pass

PHASE N

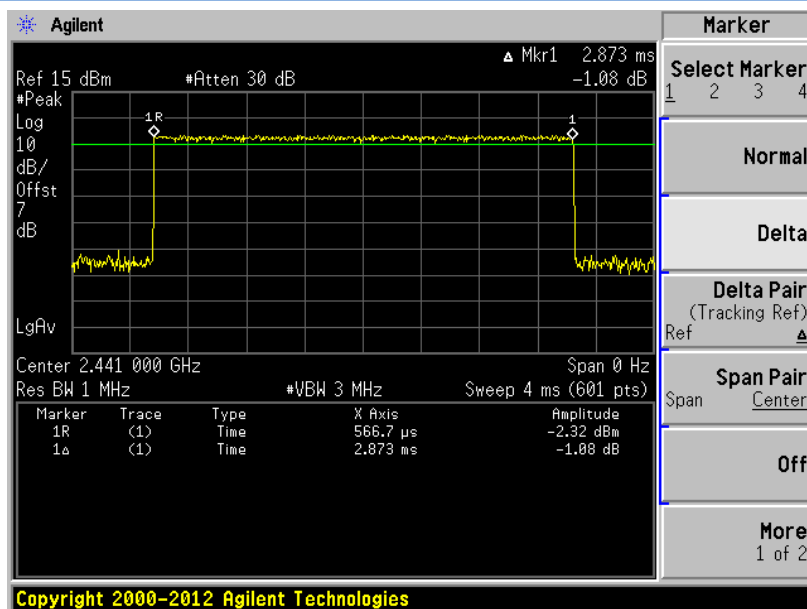


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.21	41.6	13.00	64.2	22.60	Peak	N Line	Pass
1**	0.21	25.5	13.00	54.2	28.70	AV	N Line	Pass
2	0.38	38.4	13.00	59.4	21.00	Peak	N Line	Pass
2**	0.38	30.4	13.00	49.4	19.00	AV	N Line	Pass
3	1.01	40.2	13.00	56.0	15.80	Peak	N Line	Pass
3**	1.01	29.8	13.00	46.0	16.20	AV	N Line	Pass
4	1.73	42.1	13.00	56.0	13.90	Peak	N Line	Pass
4**	1.73	32.1	13.00	46.0	13.90	AV	N Line	Pass
5	3.09	40.4	13.00	56.0	15.60	Peak	N Line	Pass
5**	3.09	28.7	13.00	46.0	17.30	AV	N Line	Pass
6	19.50	38.6	13.00	60.0	21.40	Peak	N Line	Pass
6**	19.50	26.7	13.00	50.0	23.30	AV	N Line	Pass

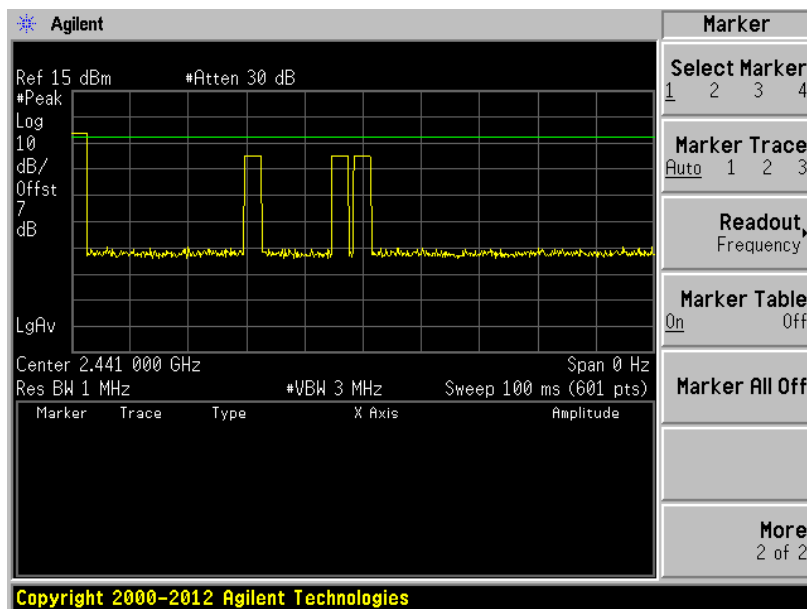
A.8 Radiated Spurious Emission

Duty cycle correction factor for average measurement.

DH5 on time/100 ms (One Pulse) Plot on Channel 39



DH5 on time/100 ms (Count Pulses) Plot on Channel 39



Note:

1. Duty cycle = on time/100 milliseconds = $4 \times 2.873 / 100 = 11.49 \%$
2. Duty cycle correction factor = $20 \times \log(\text{Duty cycle}) = -18.79 \text{ dB}$
3. DH5 has the highest duty cycle and is reported.

Note 1: The symbol of “--” in the table which means not application.

Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: All configurations have been tested, only the worst configuration (GFSK High Channel) shown here.

Note 4: Both model of the charger were tested in this report. The C-P35 (Huntkey) is the main test model, and the C-P35 (Acbel) only retest the below 1GHz in this report which choose the low test channel in the GFSK mode.

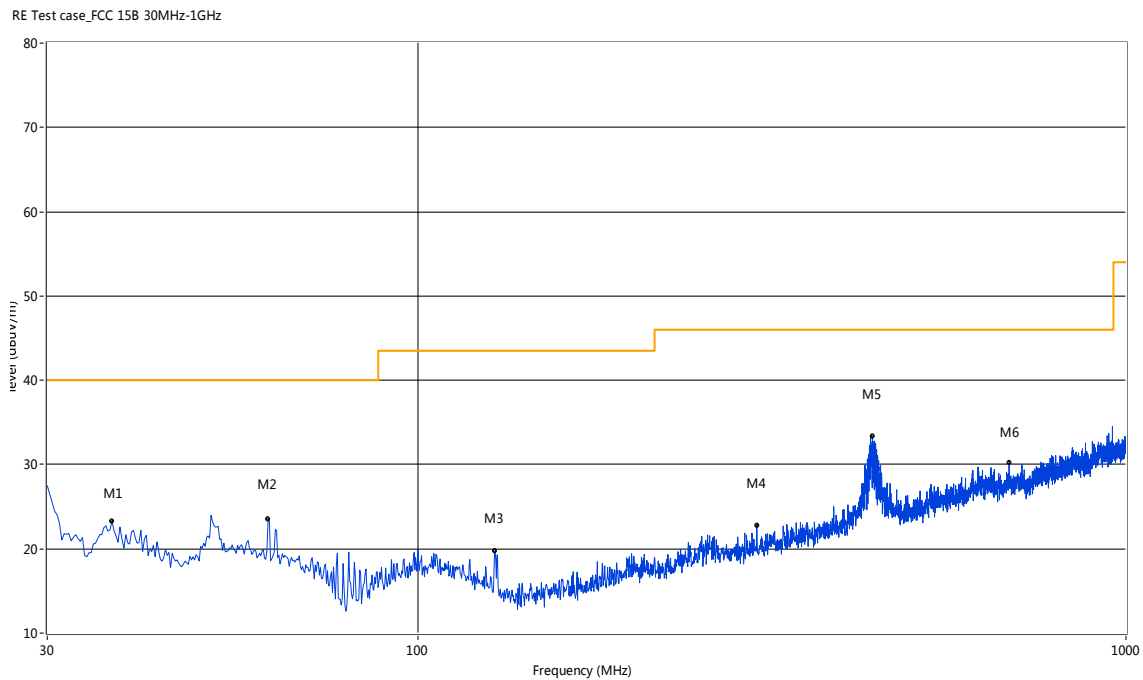
Test Data and Plots

CONFIGURATION A+ C-P35 (Huntkey)

Note 1: All configure were tested but only the worst data (GFSK) was reported in this report.

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

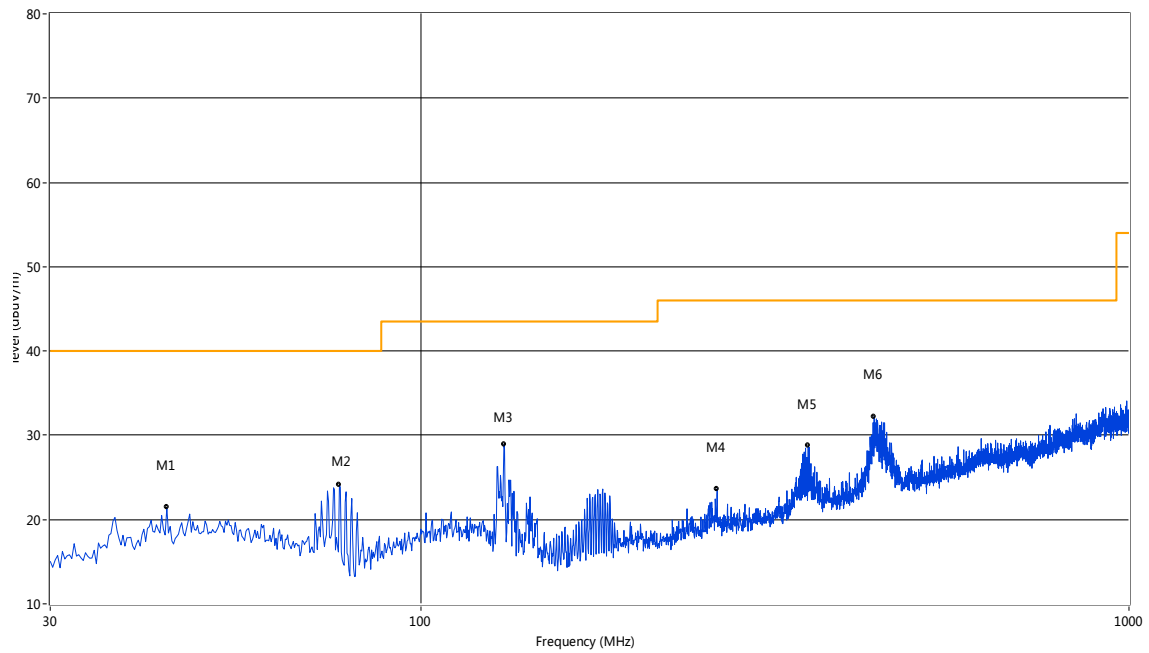
30 MHz to 1 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	37.03	23.29	-20.64	40.0	16.71	Peak	50.80	100	Vertical	Pass
2	61.52	23.55	-20.23	40.0	16.45	Peak	46.00	100	Vertical	Pass
3	128.43	19.66	-23.04	43.5	23.84	Peak	114.90	100	Vertical	Pass
4	301.29	22.78	-17.63	46.0	23.22	Peak	2.10	100	Vertical	Pass
5	438.51	33.29	-14.57	46.0	12.71	Peak	35.70	100	Vertical	Pass
6	683.86	30.12	-9.42	46.0	15.88	Peak	104.60	100	Vertical	Pass

30 MHz to 1 GHz, ANT H

RE Test case_FCC 15B 30MHz-1GHz



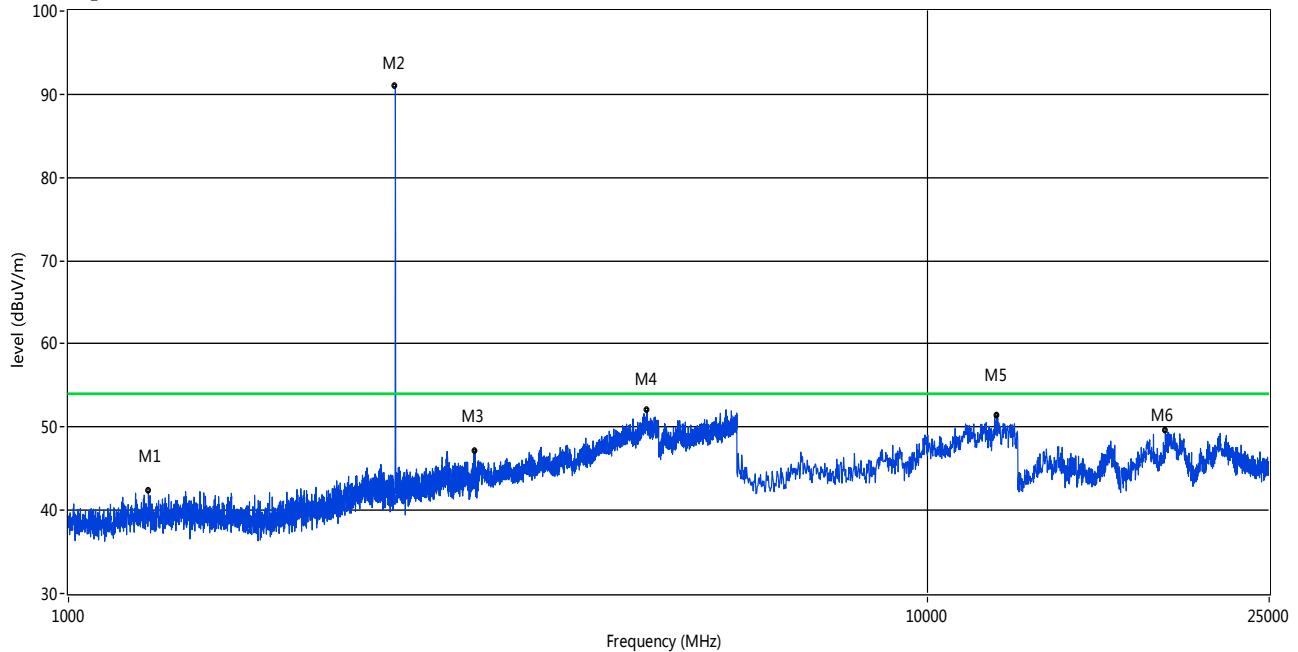
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	43.82	21.42	-18.92	40.0	18.58	Peak	53.00	100	Horizontal	Pass
2	76.79	24.09	-24.65	40.0	15.91	Peak	350.80	100	Horizontal	Pass
3	131.10	28.90	-23.27	43.5	14.60	Peak	249.50	100	Horizontal	Pass
4	262.26	23.66	-18.59	46.0	22.34	Peak	128.90	100	Horizontal	Pass
5	352.44	28.73	-16.20	46.0	17.27	Peak	98.40	100	Horizontal	Pass
6	436.81	32.22	-14.53	46.0	13.78	Peak	93.20	100	Horizontal	Pass

Note: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Test Data and Plots (1 GHz ~ 10th Harmonic)

GFSK LOW CHANNEL 1 GHz to 25 GHz, ANT V

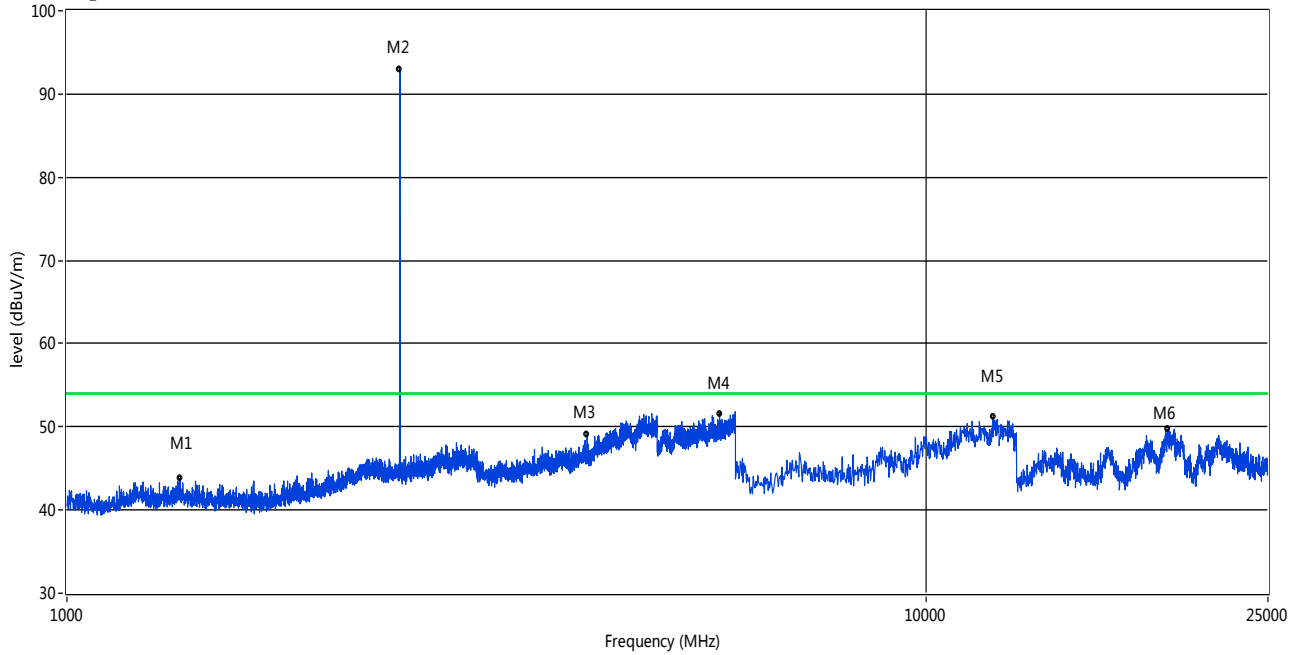
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1238.94	42.25	-5.26	74.0	31.75	Peak	37.00	100	Vertical	Pass
2	2402.15	90.98	-0.34	74.0	-16.98	Peak	226.00	100	Vertical	N/A
3	2973.01	47.16	2.31	74.0	26.84	Peak	218.00	100	Vertical	Pass
4	4714.82	51.99	13.45	74.0	22.01	Peak	219.00	100	Vertical	Pass
5	12042.43	51.40	20.83	74.0	22.60	Peak	101.00	100	Vertical	Pass
6	18927.21	49.54	12.83	74.0	24.46	Peak	64.00	100	Vertical	Pass

GFSK LOW CHANNEL 1 GHz to 25 GHz, ANT H

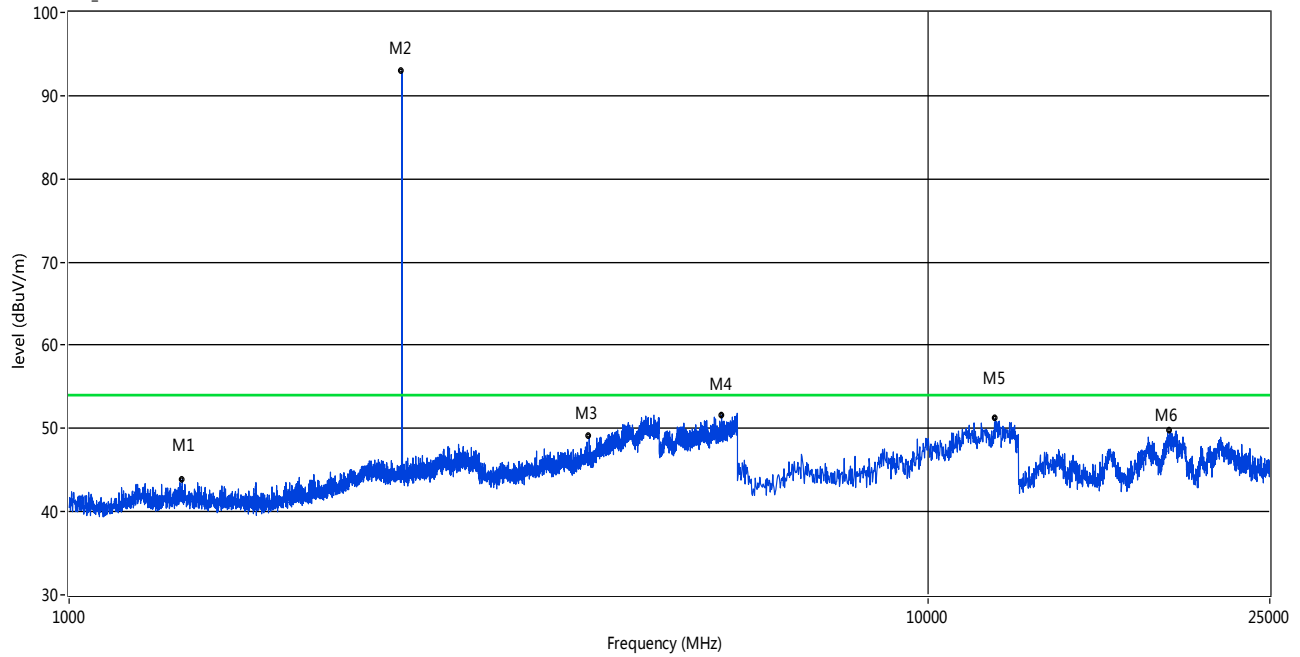
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1183.95	42.57	-5.55	74.0	31.43	Peak	111.00	100	Horizontal	Pass
2	2402.15	92.98	-0.34	74.0	-18.98	Peak	6.00	100	Horizontal	N/A
3	4498.87	51.98	12.70	74.0	22.02	Peak	209.00	100	Horizontal	Pass
4	5822.29	53.20	15.47	74.0	20.80	Peak	203.00	100	Horizontal	Pass
5	12289.52	51.75	20.65	74.0	22.25	Peak	105.00	100	Horizontal	Pass
6	19449.25	50.09	12.80	74.0	23.91	Peak	48.00	100	Horizontal	Pass

GFSK MIDDLE CHANNEL 1 GHz to 25 GHz, ANT V

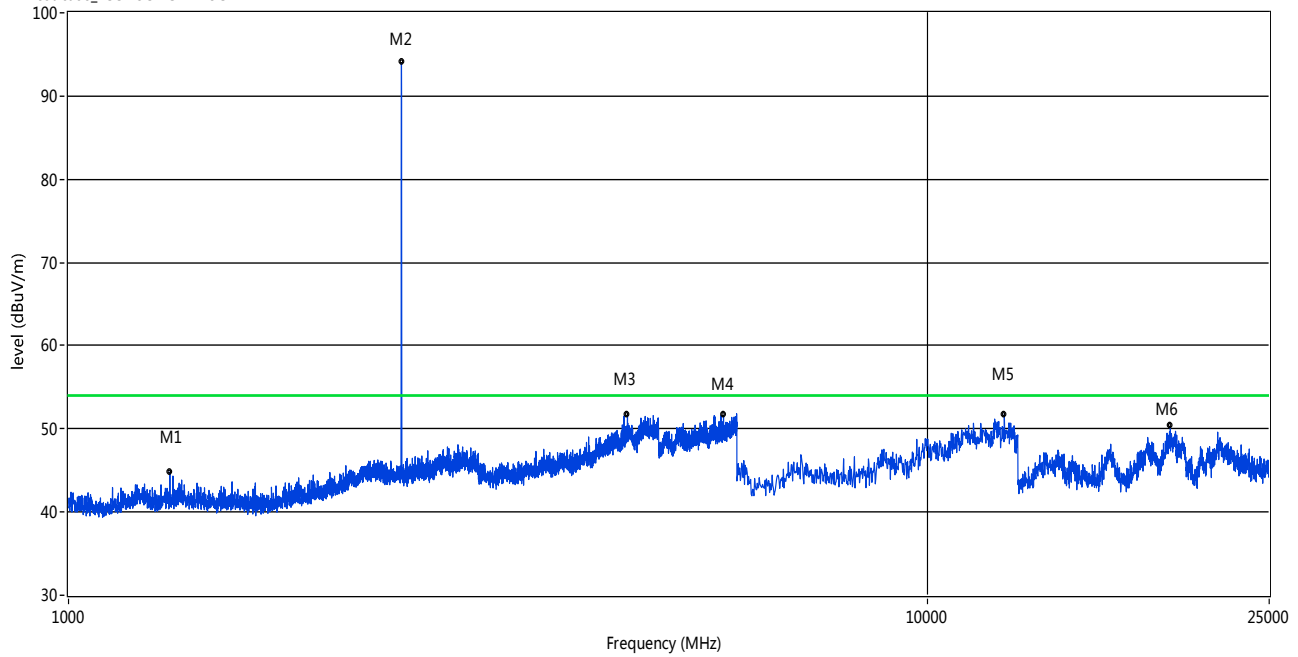
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1354.41	43.85	-4.45	74.0	30.15	Peak	336.00	100	Vertical	Pass
2	2440.64	92.97	-0.41	74.0	-18.97	Peak	53.00	100	Vertical	N/A
3	4031.74	49.03	11.54	74.0	24.97	Peak	138.00	100	Vertical	Pass
4	5749.56	51.59	15.49	74.0	22.41	Peak	284.00	100	Vertical	Pass
5	11975.04	51.17	20.76	74.0	22.83	Peak	56.00	100	Vertical	Pass
6	19139.77	49.65	13.90	74.0	24.35	Peak	299.00	100	Vertical	Pass

GFSK MIDDLE CHANNEL 1 GHz to 25 GHz, ANT H

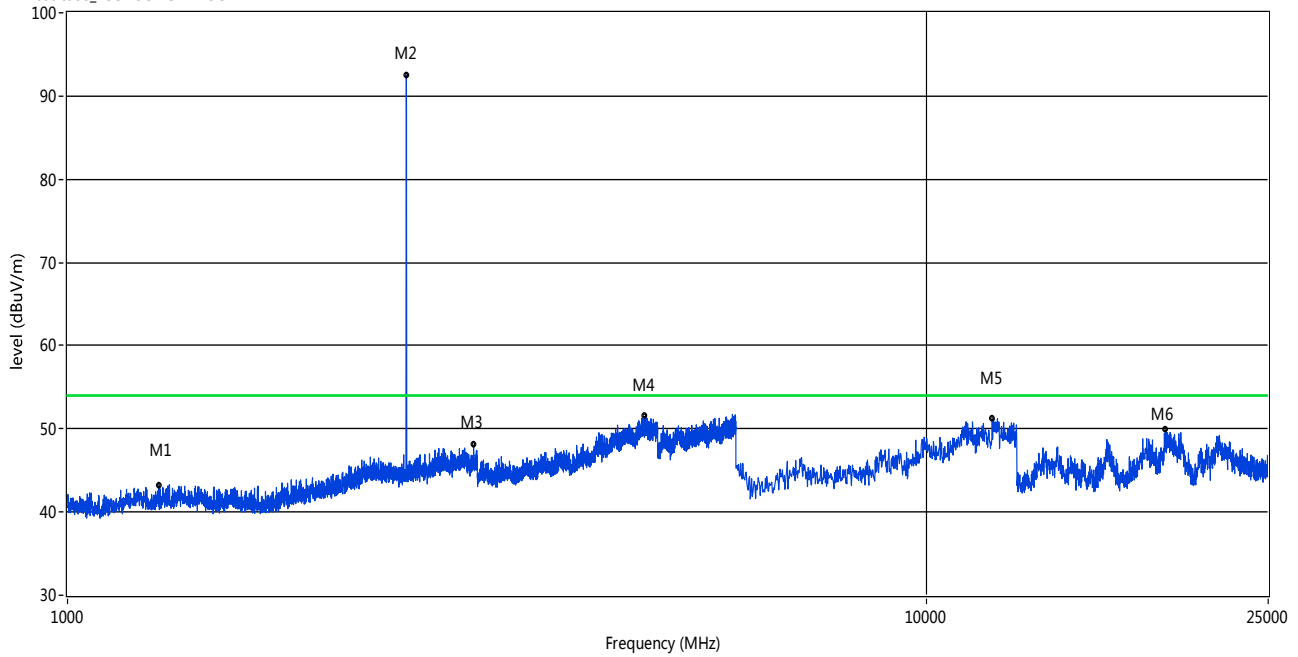
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1311.92	44.80	-4.80	74.0	29.20	Peak	347.00	100	Horizontal	Pass
2	2441.14	94.01	-0.38	74.0	-20.01	Peak	104.00	100	Horizontal	N/A
3	4474.88	51.72	12.63	74.0	22.28	Peak	2.00	100	Horizontal	Pass
4	5788.55	51.62	15.44	74.0	22.38	Peak	90.00	100	Horizontal	Pass
5	12289.52	51.73	20.65	74.0	22.27	Peak	60.00	100	Horizontal	Pass
6	19179.70	50.32	14.04	74.0	23.68	Peak	196.00	100	Horizontal	Pass

GFSK HIGH CHANNEL 1 GHz to 25 GHz, ANT V

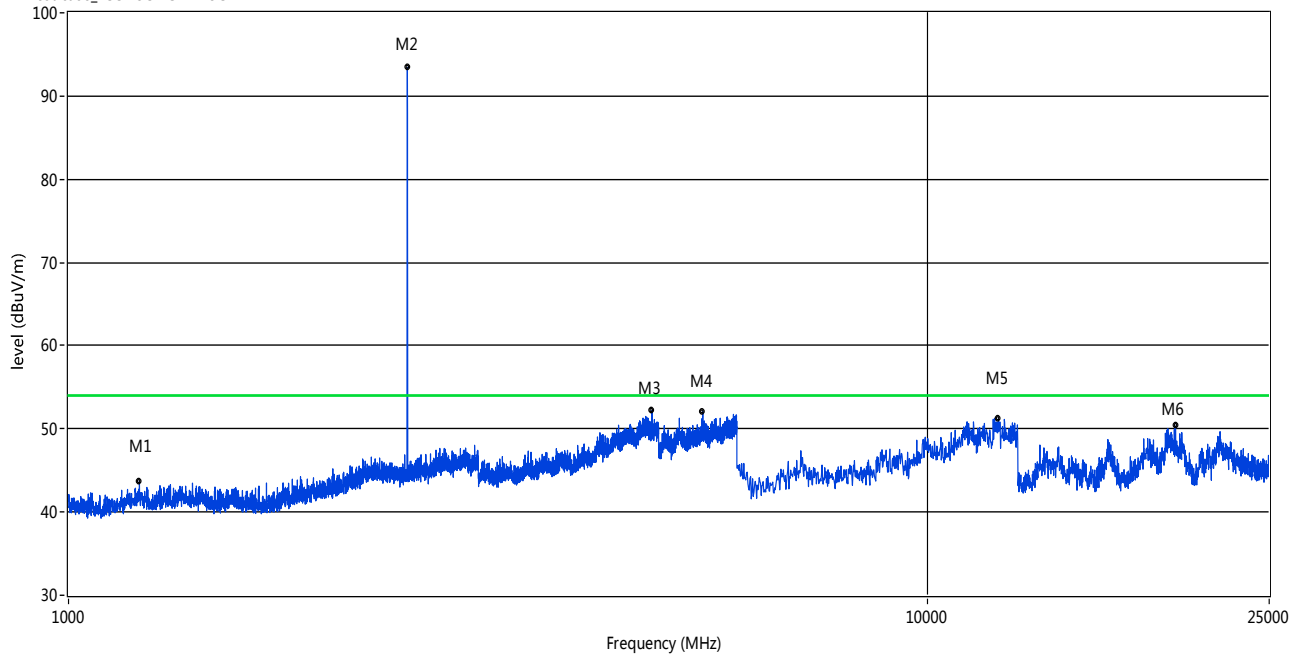
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1277.93	43.17	-4.85	74.0	30.83	Peak	181.00	100	Vertical	Pass
2	2480.13	92.44	-0.60	74.0	-18.44	Peak	179.00	100	Vertical	N/A
3	2970.01	48.03	2.48	74.0	25.97	Peak	99.00	100	Vertical	Pass
4	4699.82	51.49	13.28	74.0	22.51	Peak	153.00	100	Vertical	Pass
5	11930.12	51.15	20.55	74.0	22.85	Peak	188.00	100	Vertical	Pass
6	19009.98	49.86	13.42	74.0	24.14	Peak	124.00	100	Vertical	Pass

GFSK HIGH CHANNEL 1 GHz to 25 GHz, ANT H

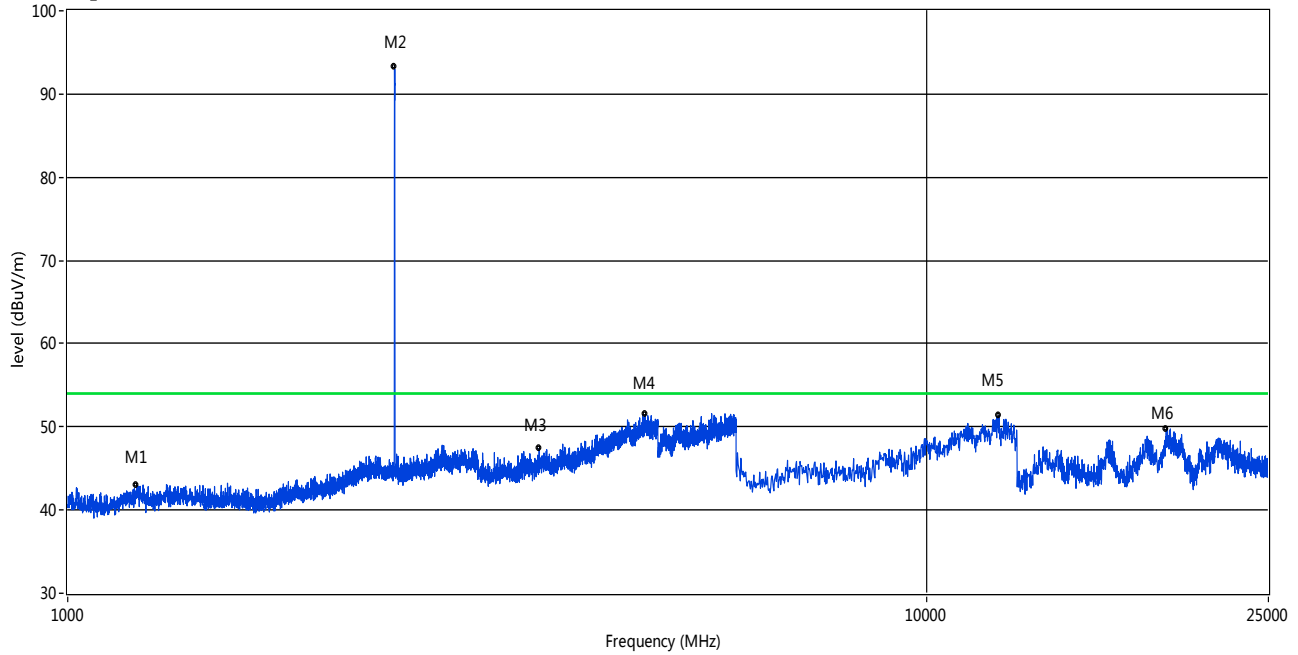
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1209.45	43.70	-5.15	74.0	30.30	Peak	10.00	100	Horizontal	Pass
2	2480.13	93.44	-0.60	74.0	-19.44	Peak	197.00	100	Horizontal	N/A
3	4778.56	52.21	13.62	74.0	21.79	Peak	319.00	100	Horizontal	Pass
4	5475.88	52.06	14.87	74.0	21.94	Peak	70.00	100	Horizontal	Pass
5	12098.59	51.21	20.77	74.0	22.79	Peak	8.00	100	Horizontal	Pass
6	19449.25	50.33	12.80	74.0	23.67	Peak	341.00	100	Horizontal	Pass

Π/4-DQPSK LOW CHANNEL 1 GHz to 25 GHz, ANT V

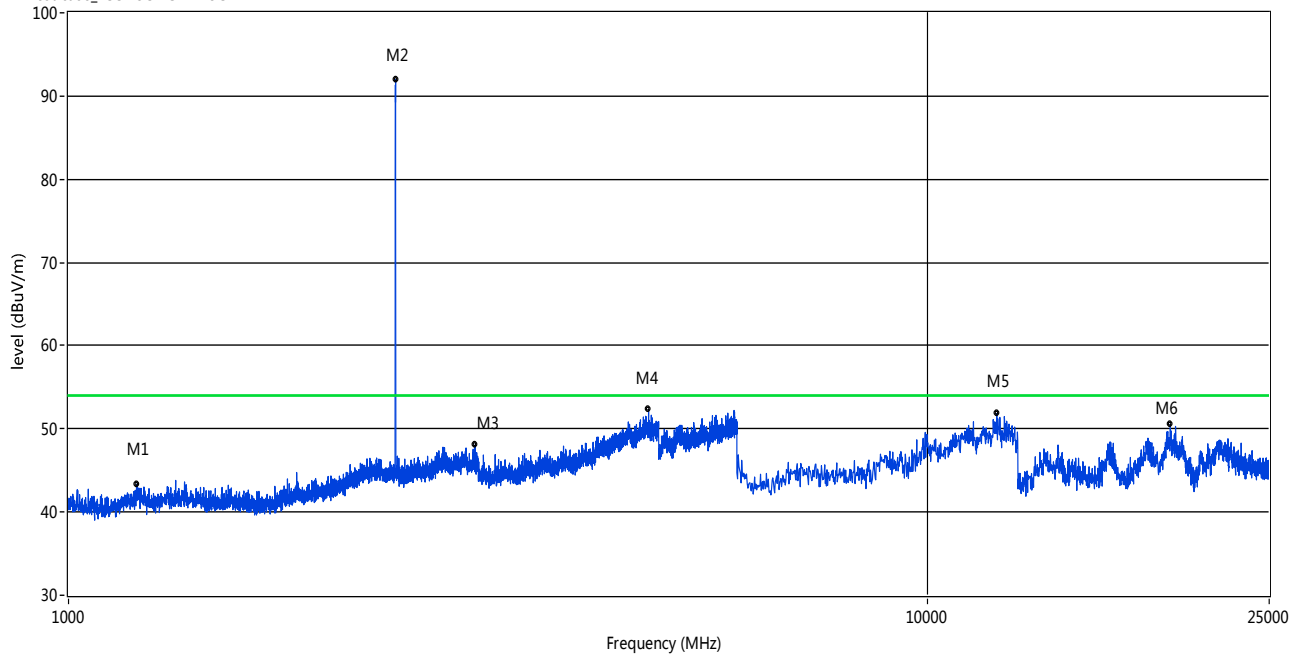
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1202.95	43.01	-5.28	74.0	30.99	Peak	87.00	100	Vertical	Pass
2	2401.15	93.32	-0.23	74.0	-19.32	Peak	43.00	100	Vertical	N/A
3	3539.11	47.42	9.86	74.0	26.58	Peak	196.00	100	Vertical	Pass
4	4701.32	51.47	13.33	74.0	22.53	Peak	155.00	100	Vertical	Pass
5	12143.51	51.37	20.72	74.0	22.63	Peak	128.00	100	Vertical	Pass
6	19009.98	49.65	13.42	74.0	24.35	Peak	349.00	100	Vertical	Pass

□/4-DQPSK LOW CHANNEL 1 GHz to 25 GHz, ANT H

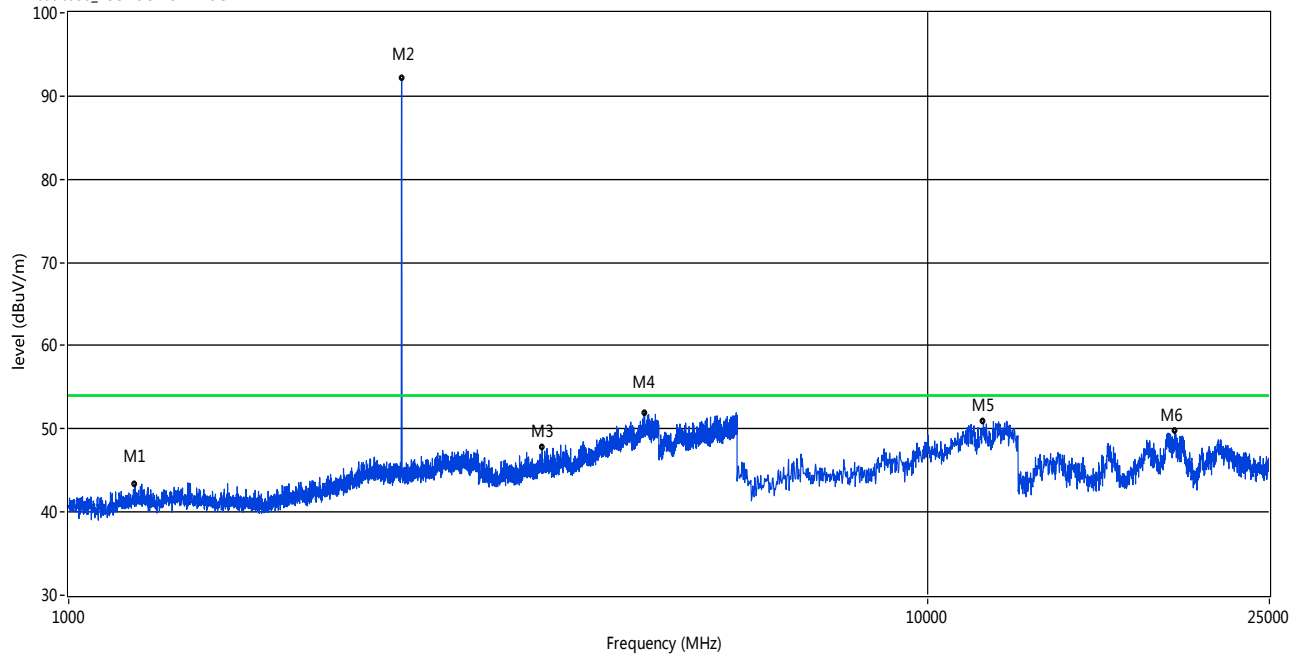
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1200.45	43.30	-5.27	74.0	30.70	Peak	284.00	100	Horizontal	Pass
2	2403.15	92.00	-0.20	74.0	-18.00	Peak	243.00	100	Horizontal	N/A
3	2973.01	48.05	2.31	74.0	25.95	Peak	212.00	100	Horizontal	Pass
4	4735.07	52.35	13.58	74.0	21.65	Peak	341.00	100	Horizontal	Pass
5	12042.43	51.83	20.83	74.0	22.17	Peak	38.00	100	Horizontal	Pass
6	19179.70	50.58	14.04	74.0	23.42	Peak	267.00	100	Horizontal	Pass

Π/4-DQPSK MIDDLE CHANNEL 1 GHz to 25 GHz, ANT V

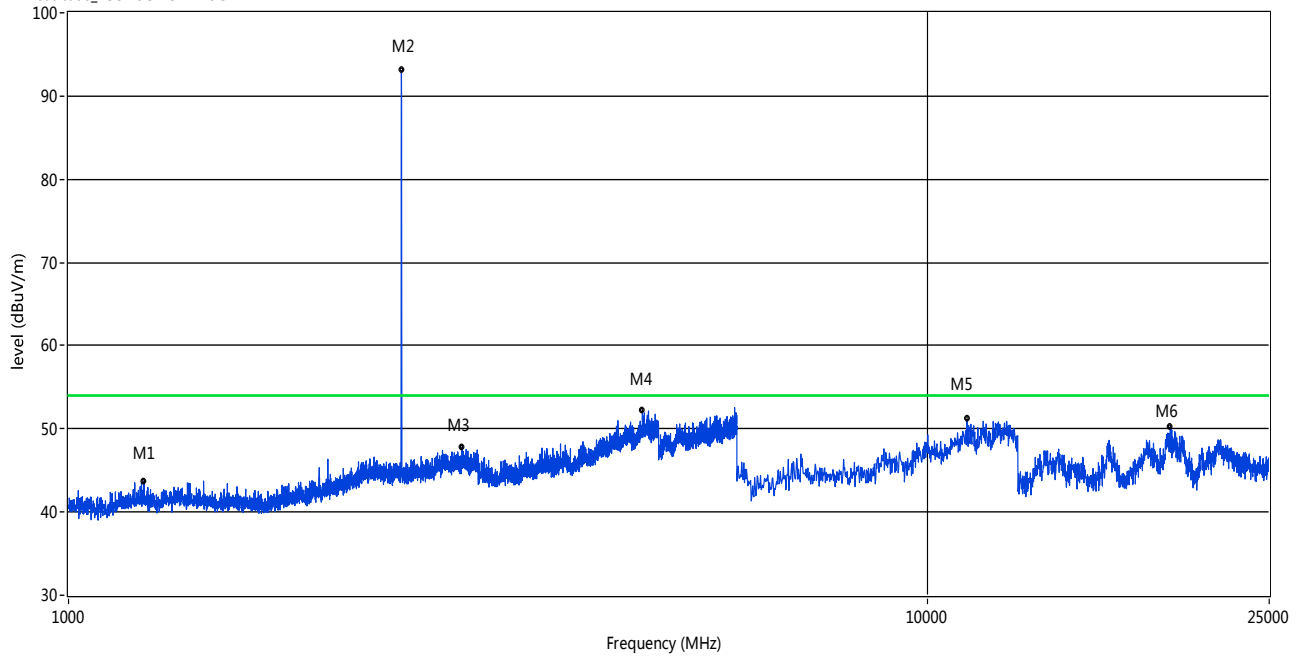
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1194.45	43.32	-5.37	74.0	30.68	Peak	114.00	100	Vertical	Pass
2	2441.14	92.07	-0.38	74.0	-18.07	Peak	261.00	100	Vertical	N/A
3	3557.86	47.70	9.81	74.0	26.30	Peak	303.00	100	Vertical	Pass
4	4682.58	51.91	13.17	74.0	22.09	Peak	49.00	100	Vertical	Pass
5	11615.64	50.91	20.33	74.0	23.09	Peak	253.00	100	Vertical	Pass
6	19409.32	49.68	12.89	74.0	24.32	Peak	160.00	100	Vertical	Pass

π/4-DQPSK MIDDLE CHANNEL 1 GHz to 25 GHz, ANT H

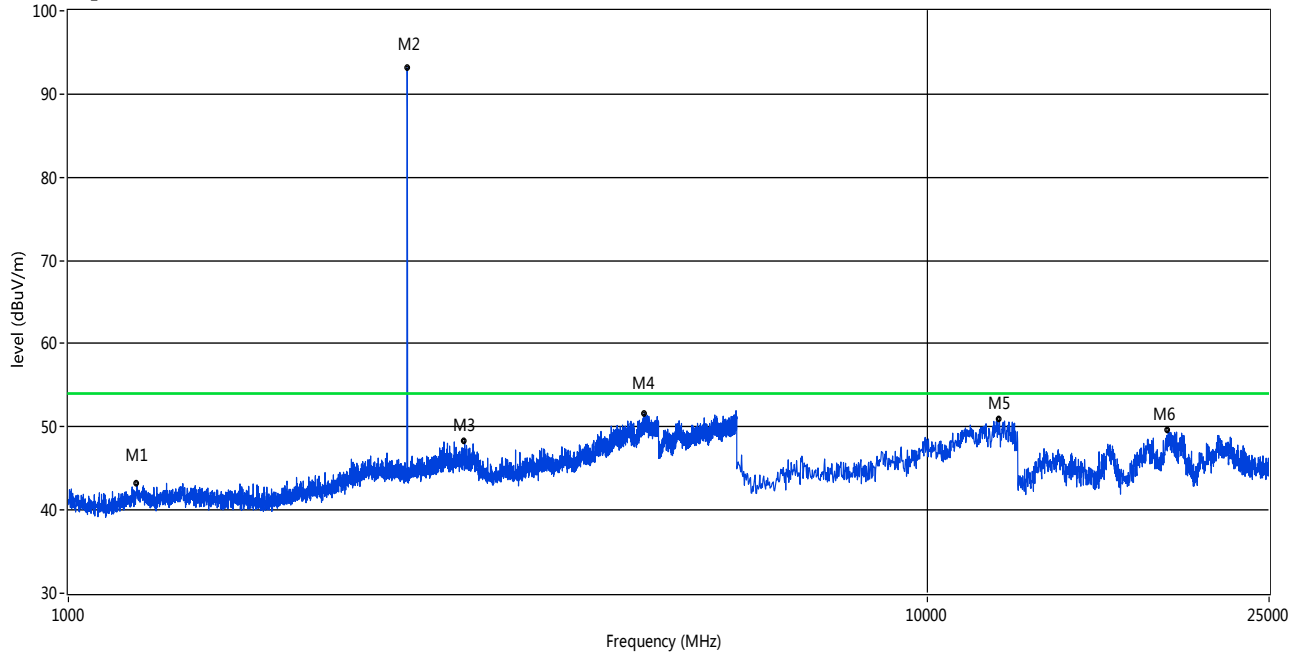
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1223.94	43.70	-5.23	74.0	30.30	Peak	262.00	100	Horizontal	Pass
2	2441.14	93.07	-0.38	74.0	-19.07	Peak	49.00	100	Horizontal	N/A
3	2872.53	47.82	2.20	74.0	26.18	Peak	277.00	100	Horizontal	Pass
4	4657.84	52.20	13.06	74.0	21.80	Peak	135.00	100	Horizontal	Pass
5	11121.46	51.15	20.22	74.0	22.85	Peak	270.00	100	Horizontal	Pass
6	19179.70	50.28	14.04	74.0	23.72	Peak	80.00	100	Horizontal	Pass

□/4-DQPSK HIGH CHANNEL 1 GHz to 25 GHz, ANT V

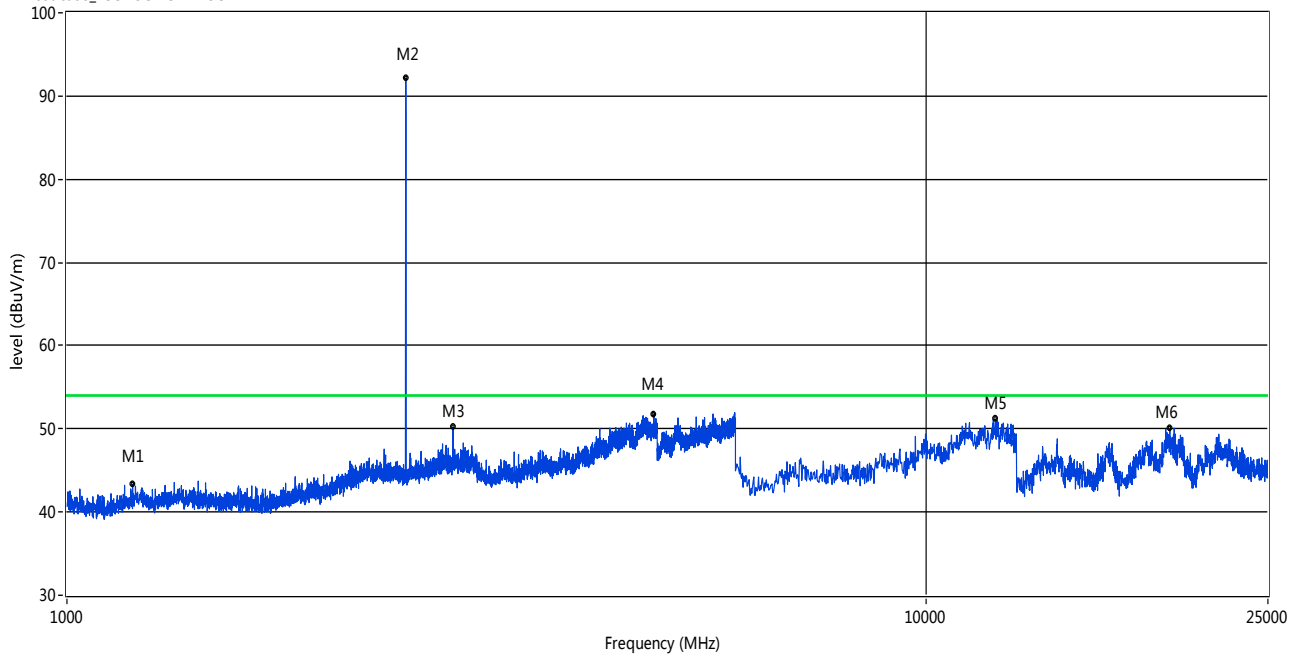
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1201.45	43.12	-5.30	74.0	30.88	Peak	282.00	100	Vertical	Pass
2	2480.13	93.17	-0.60	74.0	-19.17	Peak	99.00	100	Vertical	N/A
3	2893.53	48.30	2.33	74.0	25.70	Peak	309.00	100	Vertical	Pass
4	4681.83	51.56	13.19	74.0	22.44	Peak	287.00	100	Vertical	Pass
5	12132.28	50.81	20.73	74.0	23.19	Peak	345.00	100	Vertical	Pass
6	19079.87	49.54	13.68	74.0	24.46	Peak	333.00	100	Vertical	Pass

Π/4-DQPSK HIGH CHANNEL 1 GHz to 25 GHz, ANT H

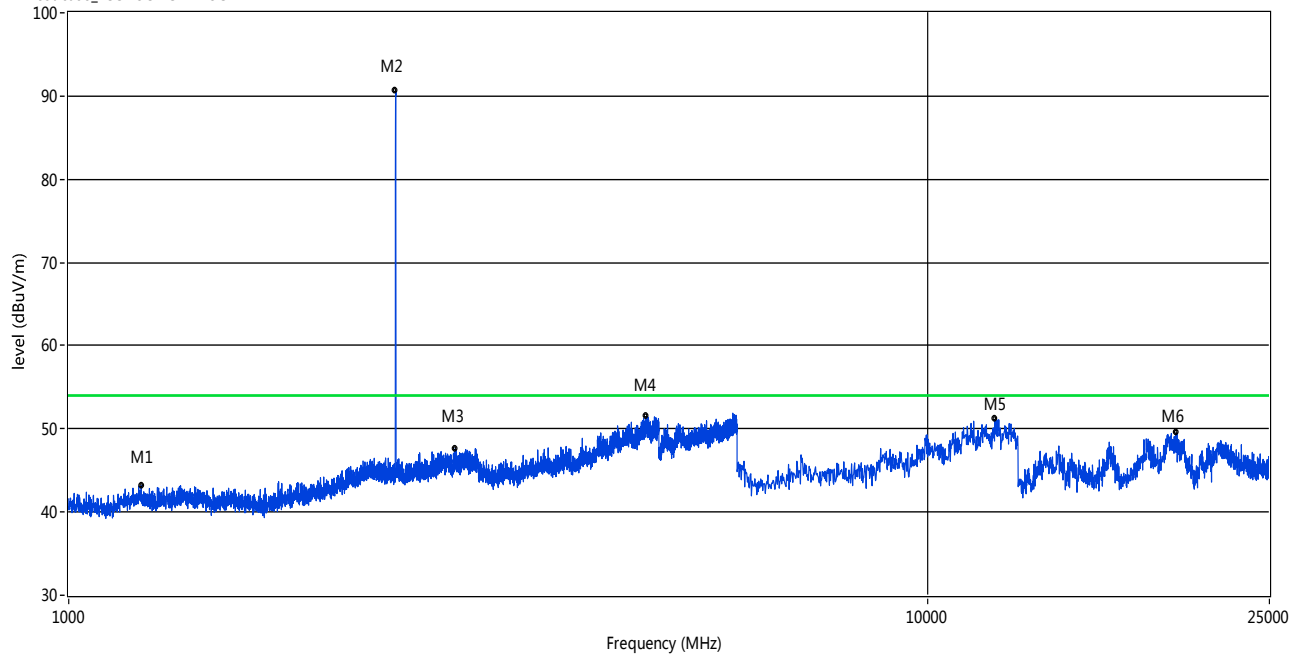
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1192.45	43.34	-5.42	74.0	30.66	Peak	326.00	100	Horizontal	Pass
2	2480.13	92.17	-0.60	74.0	-18.17	Peak	249.00	100	Horizontal	N/A
3	2814.05	50.19	2.05	74.0	23.81	Peak	229.00	100	Horizontal	Pass
4	4821.30	51.76	13.84	74.0	22.24	Peak	134.00	100	Horizontal	Pass
5	12042.43	51.12	20.83	74.0	22.88	Peak	299.00	100	Horizontal	Pass
6	19219.63	50.05	14.00	74.0	23.95	Peak	301.00	100	Horizontal	Pass

8-DPSK LOW CHANNEL 1 GHz to 25 GHz, ANT V

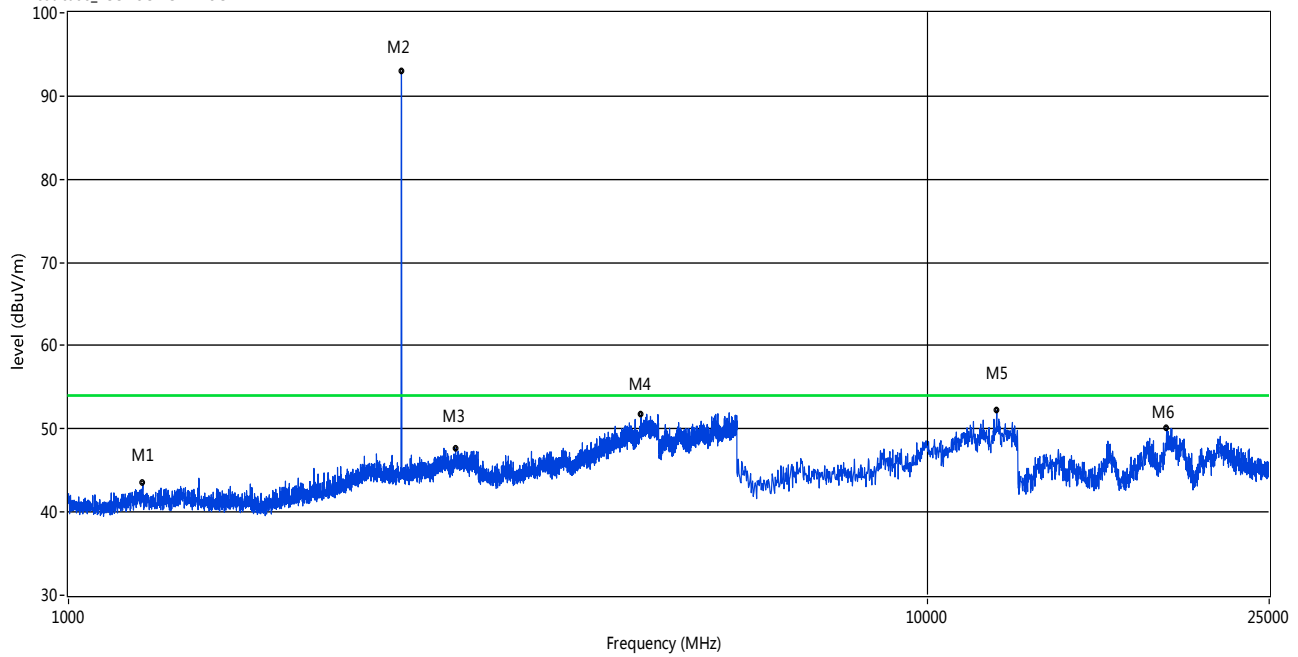
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1214.45	43.17	-5.17	74.0	30.83	Peak	91.00	100	Vertical	Pass
2	2402.15	90.64	-0.34	74.0	-16.64	Peak	286.00	100	Vertical	N/A
3	2819.55	47.65	2.15	74.0	26.35	Peak	333.00	100	Vertical	Pass
4	4701.32	51.48	13.33	74.0	22.52	Peak	42.00	100	Vertical	Pass
5	11975.04	51.12	20.76	74.0	22.88	Peak	344.00	100	Vertical	Pass
6	19509.15	49.51	12.70	74.0	24.49	Peak	239.00	100	Vertical	Pass

8-DPSK LOW CHANNEL 1 GHz to 25 GHz, ANT H

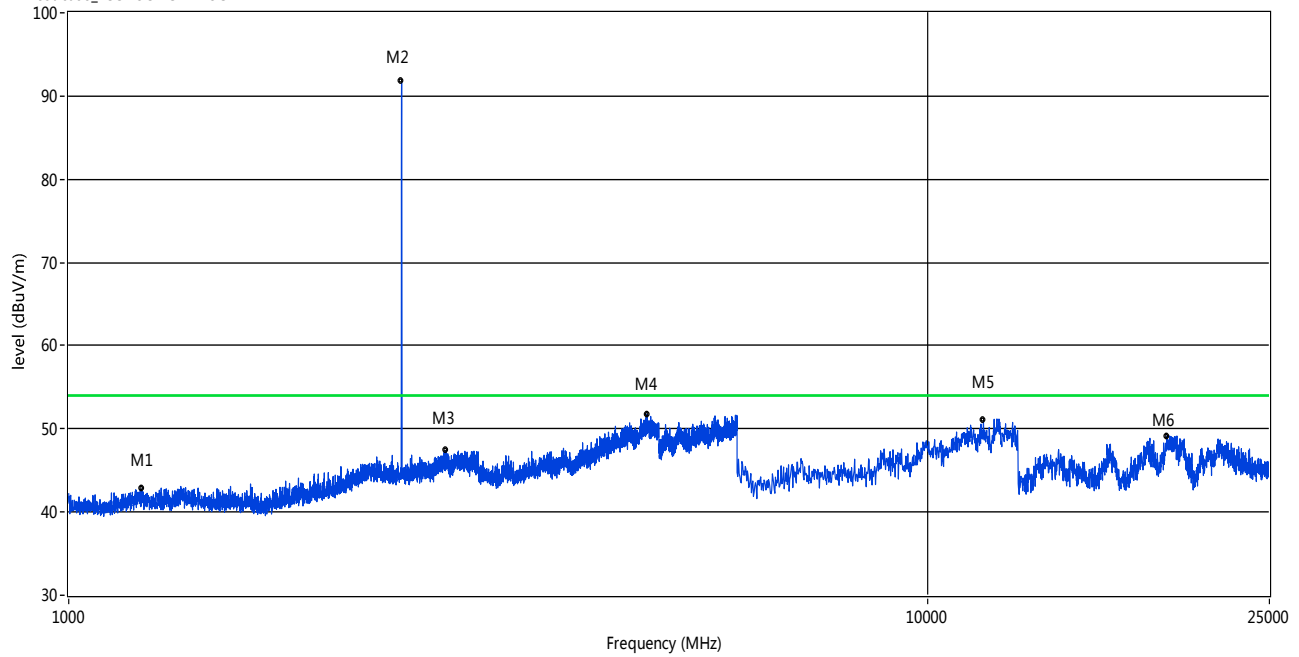
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1187.95	43.87	-5.45	74.0	30.13	Peak	125.00	100	Horizontal	Pass
2	2402.15	90.64	-0.34	74.0	-16.64	Peak	219.00	100	Horizontal	N/A
3	2851.04	48.11	1.95	74.0	25.89	Peak	117.00	100	Horizontal	Pass
4	4789.05	51.97	13.58	74.0	22.03	Peak	51.00	100	Horizontal	Pass
5	12289.52	51.73	20.65	74.0	22.27	Peak	55.00	100	Horizontal	Pass
6	19409.32	50.04	12.89	74.0	23.96	Peak	276.00	100	Horizontal	Pass

8-DPSK MIDDLE CHANNEL 1 GHz to 25 GHz, ANT V

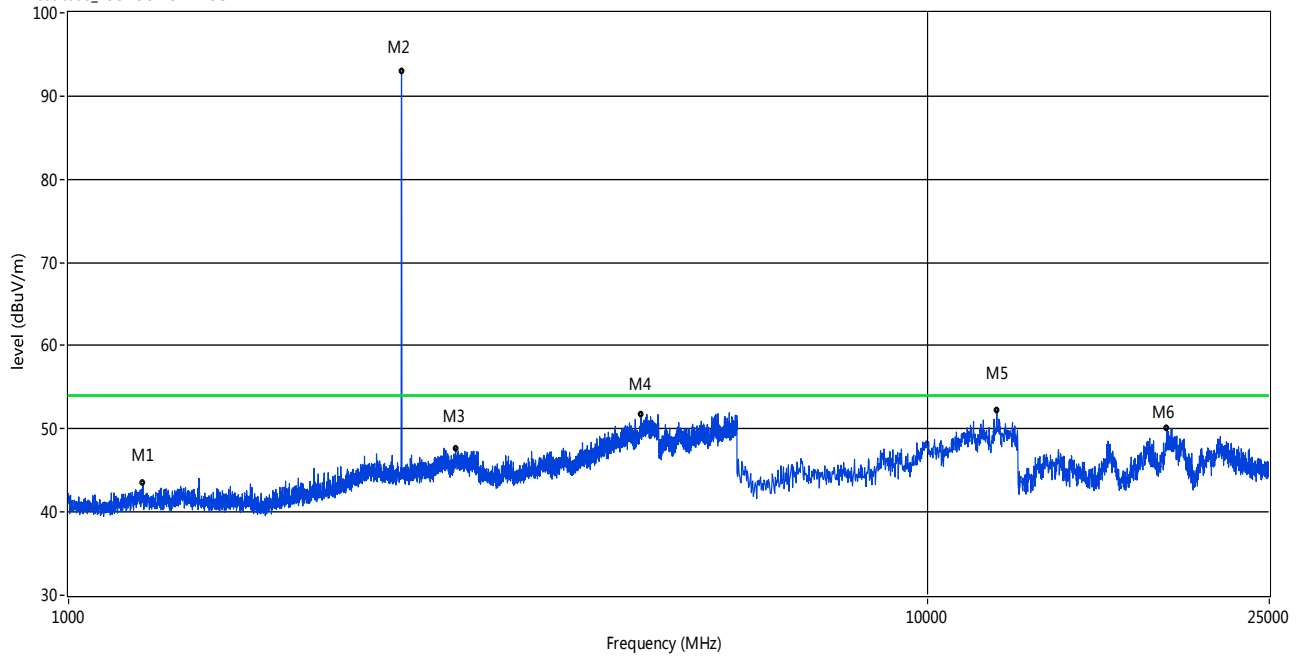
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1215.45	42.74	-5.07	74.0	31.26	Peak	246.00	100	Vertical	Pass
2	2440.64	91.82	-0.41	74.0	-17.82	Peak	167.00	100	Vertical	N/A
3	2749.56	47.40	1.65	74.0	26.60	Peak	52.00	100	Vertical	Pass
4	4711.82	51.76	13.40	74.0	22.24	Peak	295.00	100	Vertical	Pass
5	11615.64	51.05	20.33	74.0	22.95	Peak	243.00	100	Vertical	Pass
6	18979.20	49.12	13.22	74.0	24.88	Peak	59.00	100	Vertical	Pass

8-DPSK MIDDLE CHANNEL 1 GHz to 25 GHz, ANT H

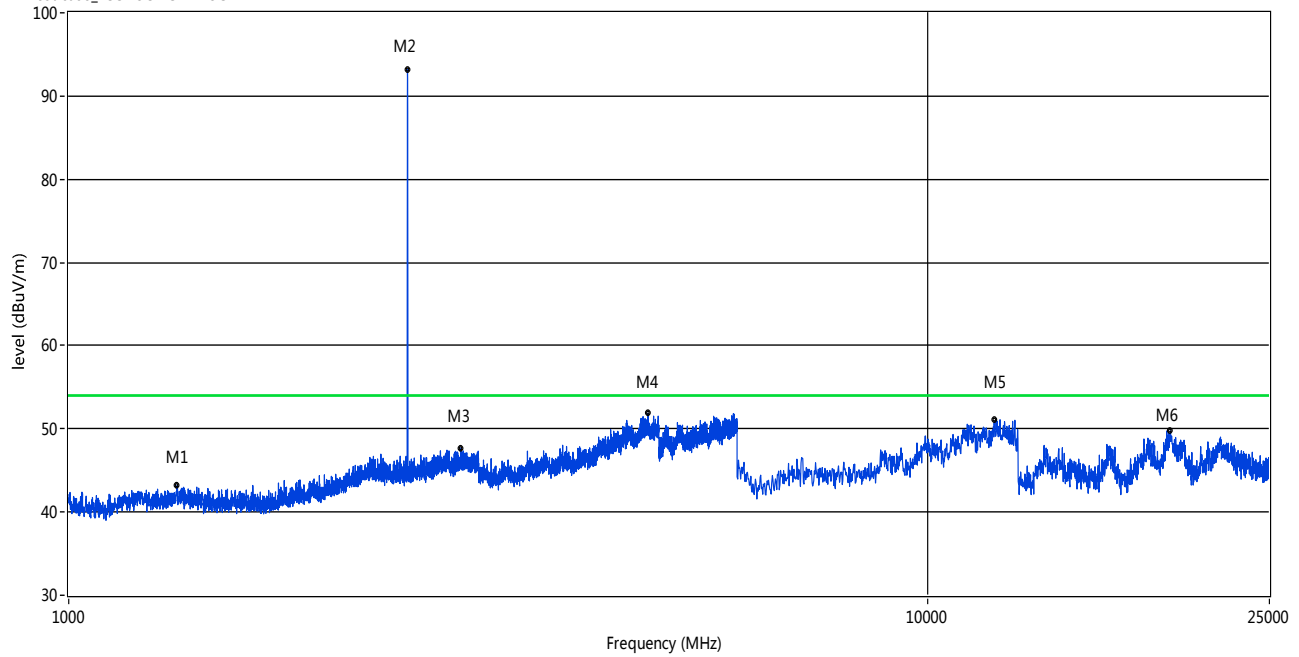
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1220.44	43.42	-5.19	74.0	30.58	Peak	210.00	100	Horizontal	Pass
2	2441.14	92.86	-0.38	74.0	-18.86	Peak	232.00	100	Horizontal	N/A
3	2823.04	47.62	2.07	74.0	26.38	Peak	2.00	100	Horizontal	Pass
4	4643.59	51.70	13.07	74.0	22.30	Peak	117.00	100	Horizontal	Pass
5	12042.43	52.19	20.83	74.0	21.81	Peak	85.00	100	Horizontal	Pass
6	19009.98	50.12	13.42	74.0	23.88	Peak	348.00	100	Horizontal	Pass

8-DPSK HIGH CHANNEL 1 GHz to 25 GHz, ANT V

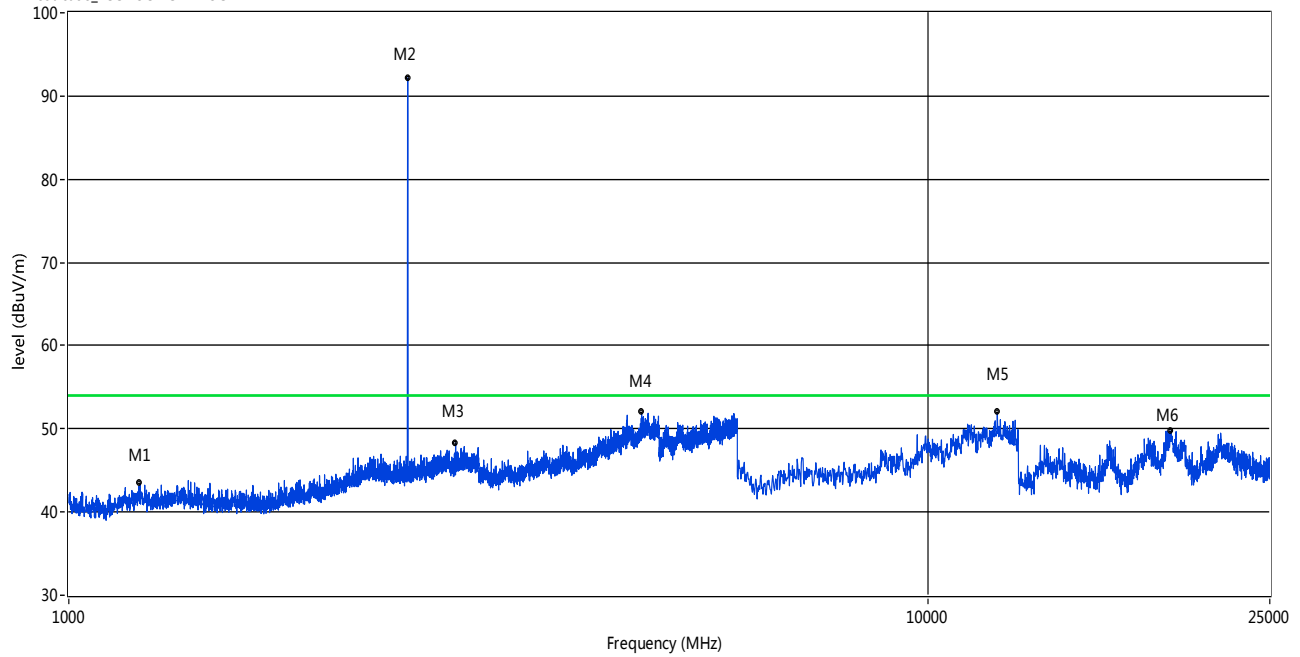
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1336.92	43.18	-4.69	74.0	30.82	Peak	221.00	100	Vertical	Pass
2	2480.13	93.17	-0.60	74.0	-19.17	Peak	7.00	100	Vertical	N/A
3	2861.53	47.65	2.02	74.0	26.35	Peak	145.00	100	Vertical	Pass
4	4723.82	51.86	13.63	74.0	22.14	Peak	17.00	100	Vertical	Pass
5	11975.04	50.96	20.76	74.0	23.04	Peak	34.00	100	Vertical	Pass
6	19179.70	49.76	14.04	74.0	24.24	Peak	48.00	100	Vertical	Pass

8-DPSK HIGH CHANNEL 1 GHz to 25 GHz, ANT H

RE Test case_FCC 15C 1GHz-25GHz

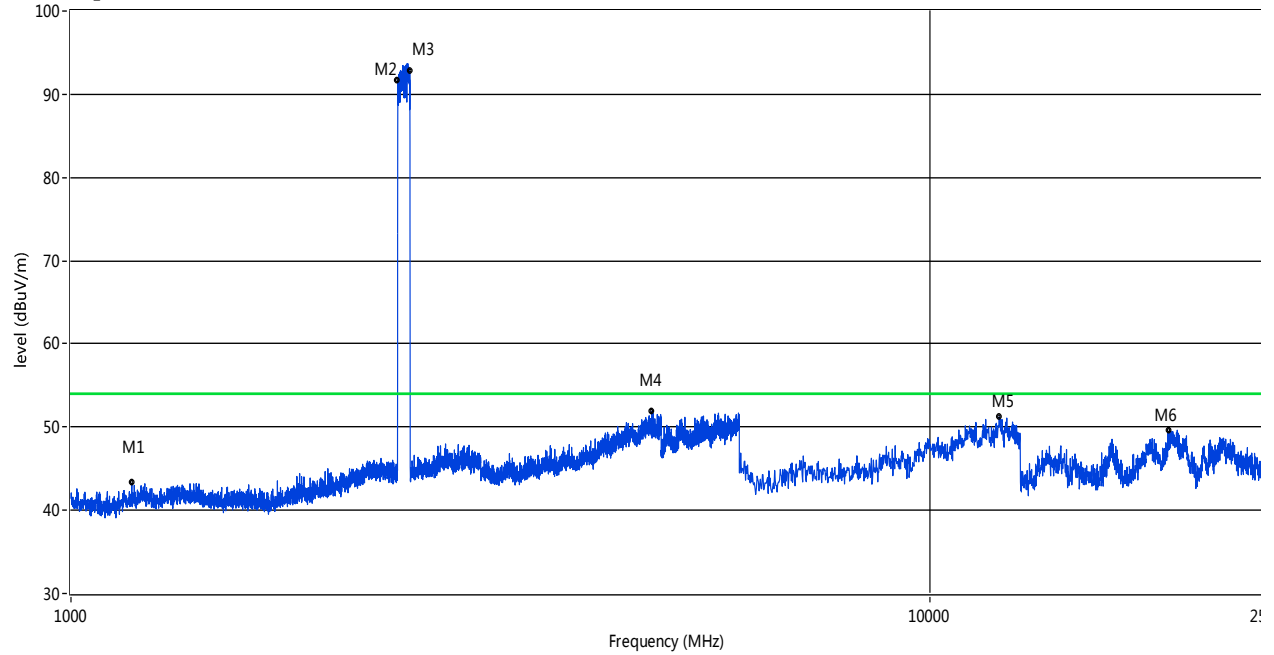


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1210.45	43.42	-5.13	74.0	30.58	Peak	182.00	100	Horizontal	Pass
2	2480.13	92.17	-0.60	74.0	-18.17	Peak	149.00	100	Horizontal	N/A
3	2820.05	48.31	2.11	74.0	25.69	Peak	297.00	100	Horizontal	Pass
4	4642.09	51.95	13.09	74.0	22.05	Peak	305.00	100	Horizontal	Pass
5	12042.43	51.94	20.83	74.0	22.06	Peak	247.00	100	Horizontal	Pass
6	19179.70	49.76	14.04	74.0	24.24	Peak	165.00	100	Horizontal	Pass

Hopping Mode:

GFSK MODE 1 GHz to 25 GHz, ANT V

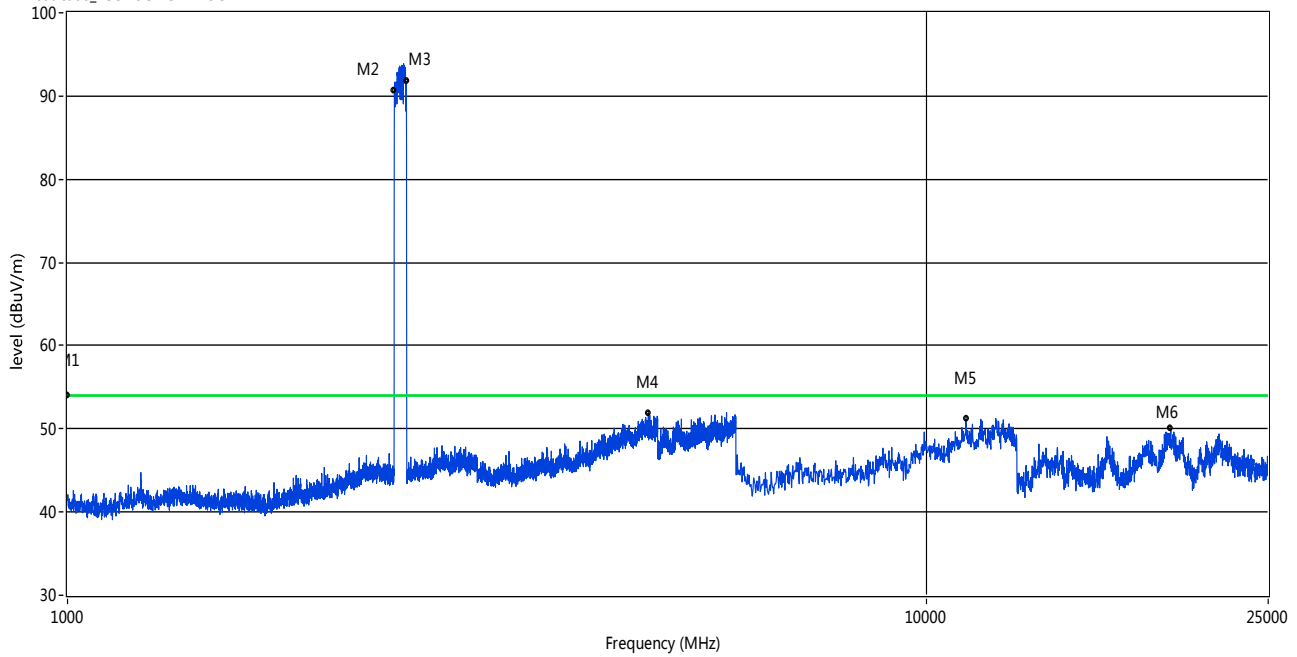
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1176.96	43.24	-5.48	74.0	30.76	Peak	138.00	100	Vertical	Pass
2	2402.65	91.70	-0.26	74.0	-17.70	Peak	186.00	100	Vertical	N/A
3	2480.13	92.74	-0.60	74.0	-18.74	Peak	121.00	100	Vertical	N/A
4	4745.56	51.91	13.51	74.0	22.09	Peak	173.00	100	Vertical	Pass
5	12042.43	51.23	20.83	74.0	22.77	Peak	356.00	100	Vertical	Pass
6	19009.98	49.61	13.42	74.0	24.39	Peak	175.00	100	Vertical	Pass

GFSK MODE 1 GHz to 25 GHz, ANT H

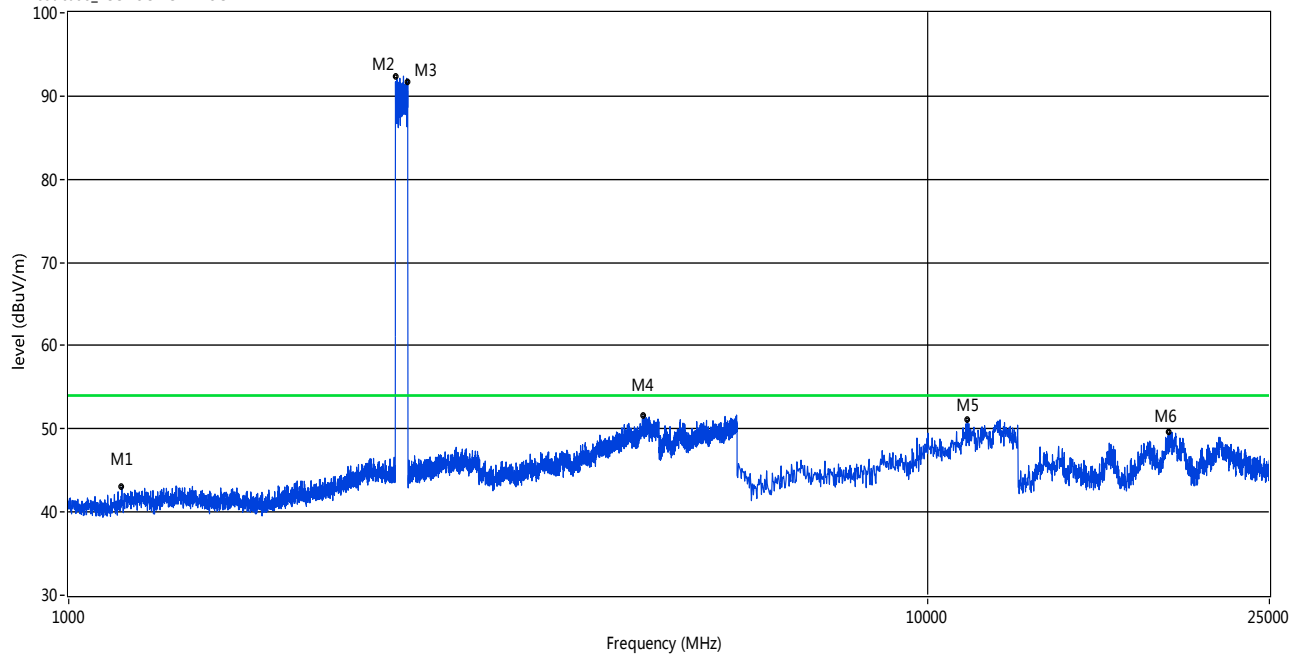
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBUV/m)	Factor (dB)	Limit (dBUV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1000.00	41.38	-5.90	74.0	32.62	Peak	248.00	100	Horizontal	Pass
2	2402.65	90.70	-0.26	74.0	-16.70	Peak	176.00	100	Horizontal	N/A
3	2480.13	91.74	-0.60	74.0	-17.74	Peak	293.00	100	Horizontal	N/A
4	4744.81	51.80	13.52	74.0	22.20	Peak	18.00	100	Horizontal	Pass
5	11121.46	51.13	20.22	74.0	22.87	Peak	43.00	100	Horizontal	Pass
6	19249.58	50.02	13.82	74.0	23.98	Peak	165.00	100	Horizontal	Pass

Π/4-DQPSK MODE 1 GHz to 25 GHz, ANT V

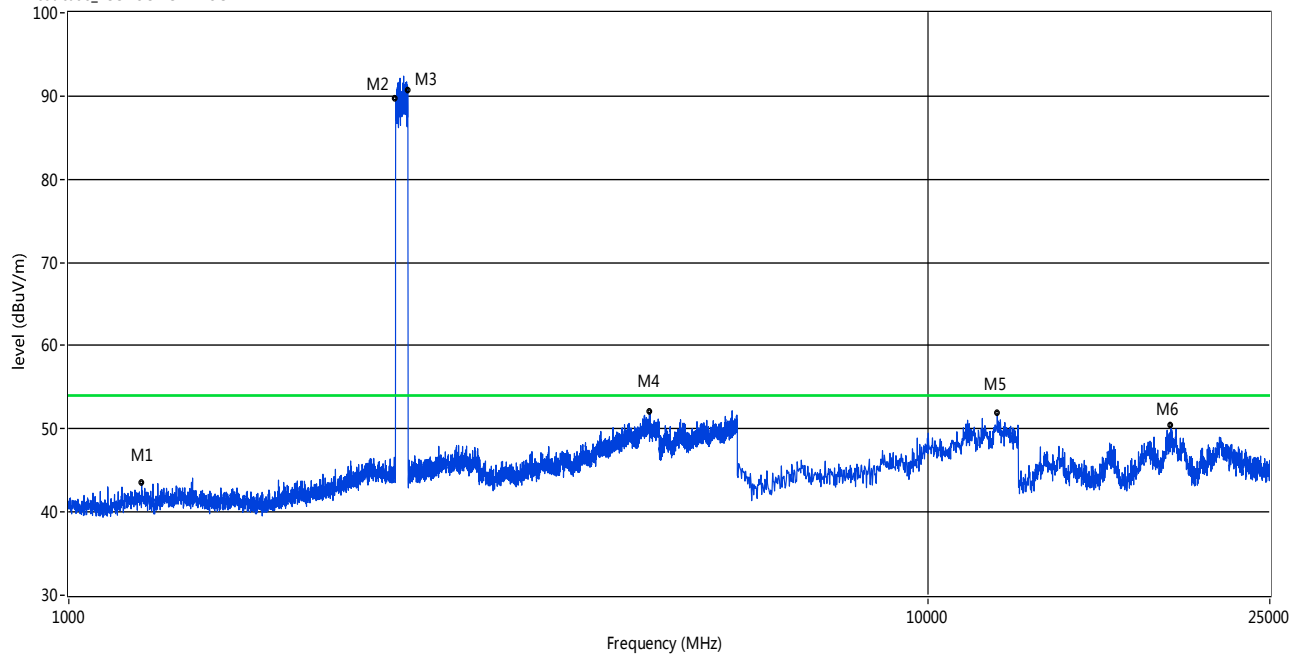
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1152.96	42.99	-5.82	74.0	31.01	Peak	141.00	100	Vertical	Pass
2	2409.65	92.20	-0.15	74.0	-18.20	Peak	55.00	100	Vertical	N/A
3	2481.13	91.69	-0.61	74.0	-17.69	Peak	130.00	100	Vertical	N/A
4	4675.83	51.57	13.10	74.0	22.43	Peak	262.00	100	Vertical	Pass
5	11121.46	51.04	20.22	74.0	22.96	Peak	174.00	100	Vertical	Pass
6	19139.77	49.58	13.90	74.0	24.42	Peak	250.00	100	Vertical	Pass

Π/4-DQPSK MODE 1 GHz to 25 GHz, ANT H

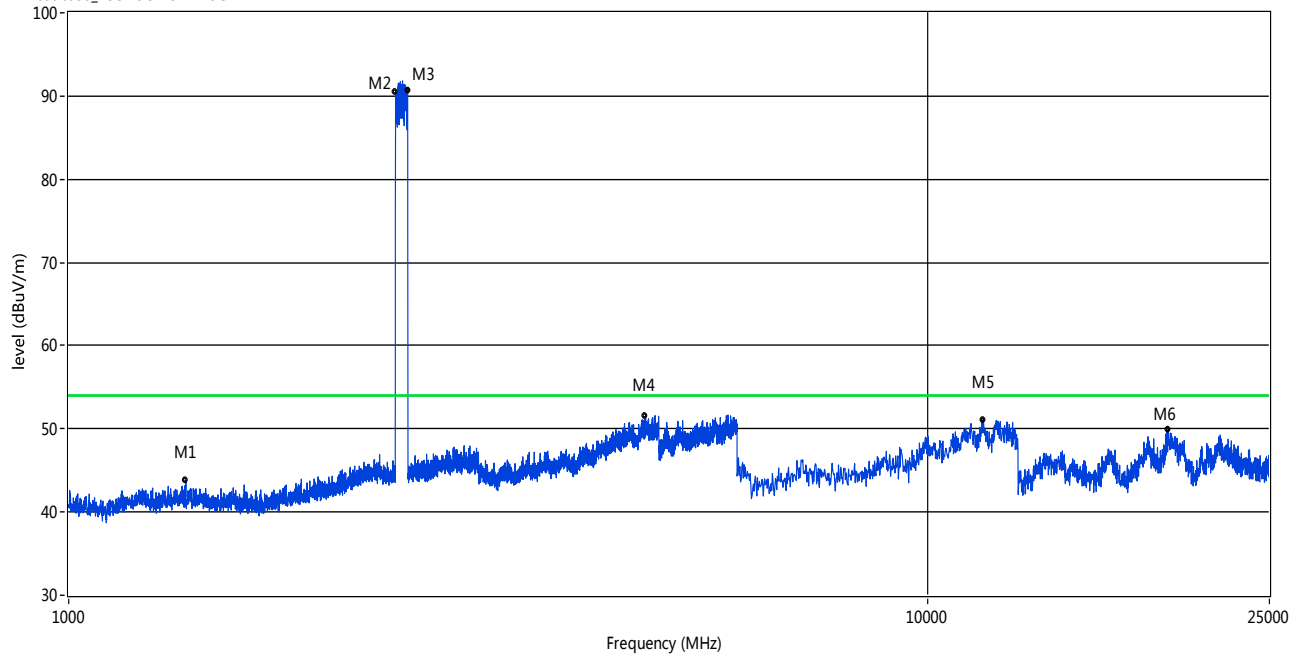
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1215.45	43.44	-5.07	74.0	30.56	Peak	188.00	100	Horizontal	Pass
2	2402.65	89.63	-0.26	74.0	-15.63	Peak	321.00	100	Horizontal	N/A
3	2480.13	90.64	-0.60	74.0	-16.64	Peak	201.00	100	Horizontal	N/A
4	4740.31	51.98	13.53	74.0	22.02	Peak	129.00	100	Horizontal	Pass
5	12042.43	51.80	20.83	74.0	22.20	Peak	43.00	100	Horizontal	Pass
6	19179.70	50.33	14.04	74.0	23.67	Peak	36.00	100	Horizontal	Pass

8-DPSK MODE 1 GHz to 25 GHz, ANT V

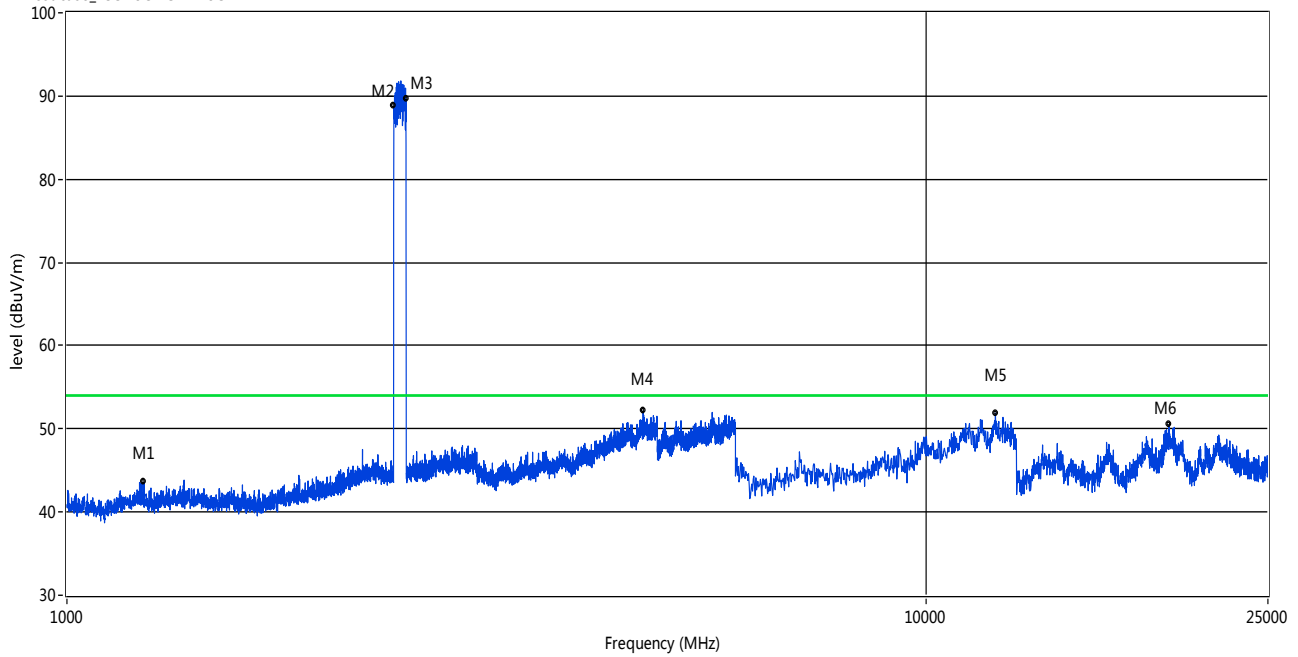
RE Test case_FCC 15C 1GHz-25GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1368.91	43.84	-4.57	74.0	30.16	Peak	208.00	100	Vertical	Pass
2	2402.15	90.50	-0.34	74.0	-16.50	Peak	186.00	100	Vertical	N/A
3	2480.63	90.56	-0.60	74.0	-16.56	Peak	295.00	100	Vertical	N/A
4	4691.58	51.45	13.20	74.0	22.55	Peak	265.00	100	Vertical	Pass
5	11615.64	51.06	20.33	74.0	22.94	Peak	336.00	100	Vertical	Pass
6	19049.92	49.90	13.57	74.0	24.10	Peak	341.00	100	Vertical	Pass

8-DPSK MODE 1 GHz to 25 GHz, ANT H

RE Test case_FCC 15C 1GHz-25GHz

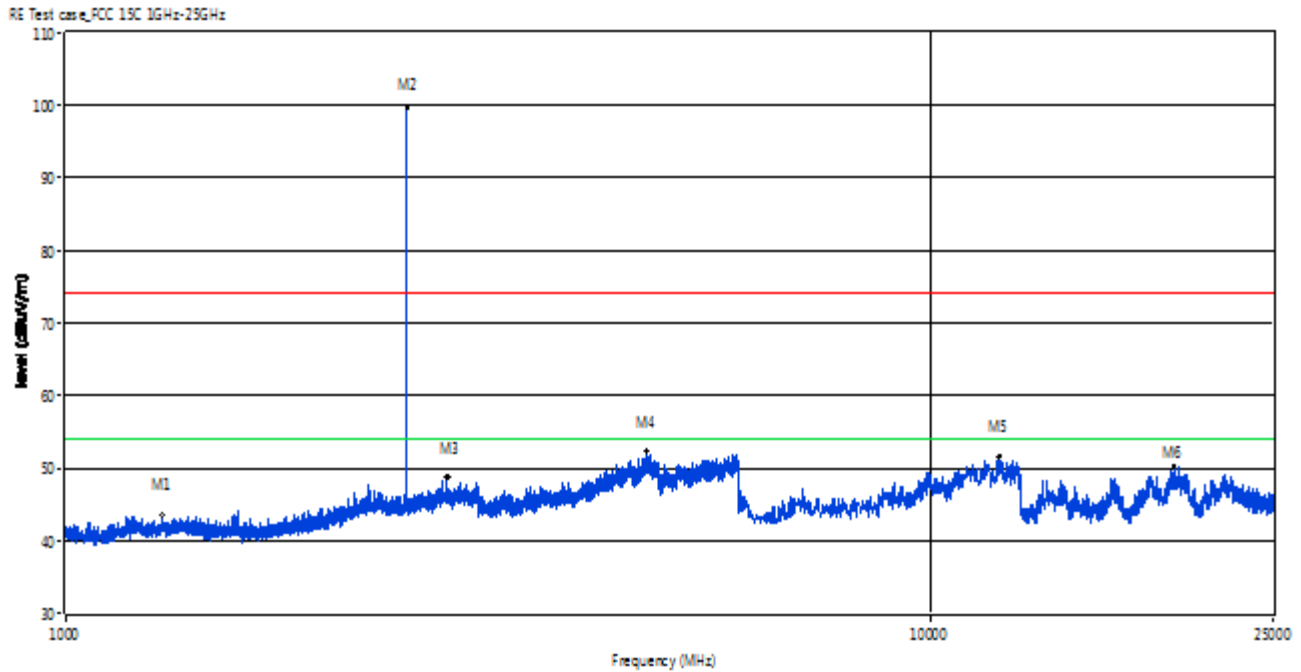


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1229.44	43.60	-5.21	74.0	30.40	Peak	357.00	100	Horizontal	Pass
2	2401.65	88.77	-0.27	74.0	-14.77	Peak	61.00	100	Horizontal	N/A
3	2480.13	89.64	-0.60	74.0	-15.64	Peak	228.00	100	Horizontal	N/A
4	4685.58	52.13	13.22	74.0	21.87	Peak	201.00	100	Horizontal	Pass
5	12042.43	51.88	20.83	74.0	22.12	Peak	236.00	100	Horizontal	Pass
6	19179.70	50.49	14.04	74.0	23.51	Peak	85.00	100	Horizontal	Pass

CONFIGURATION B+ C-P35 (Acbel)

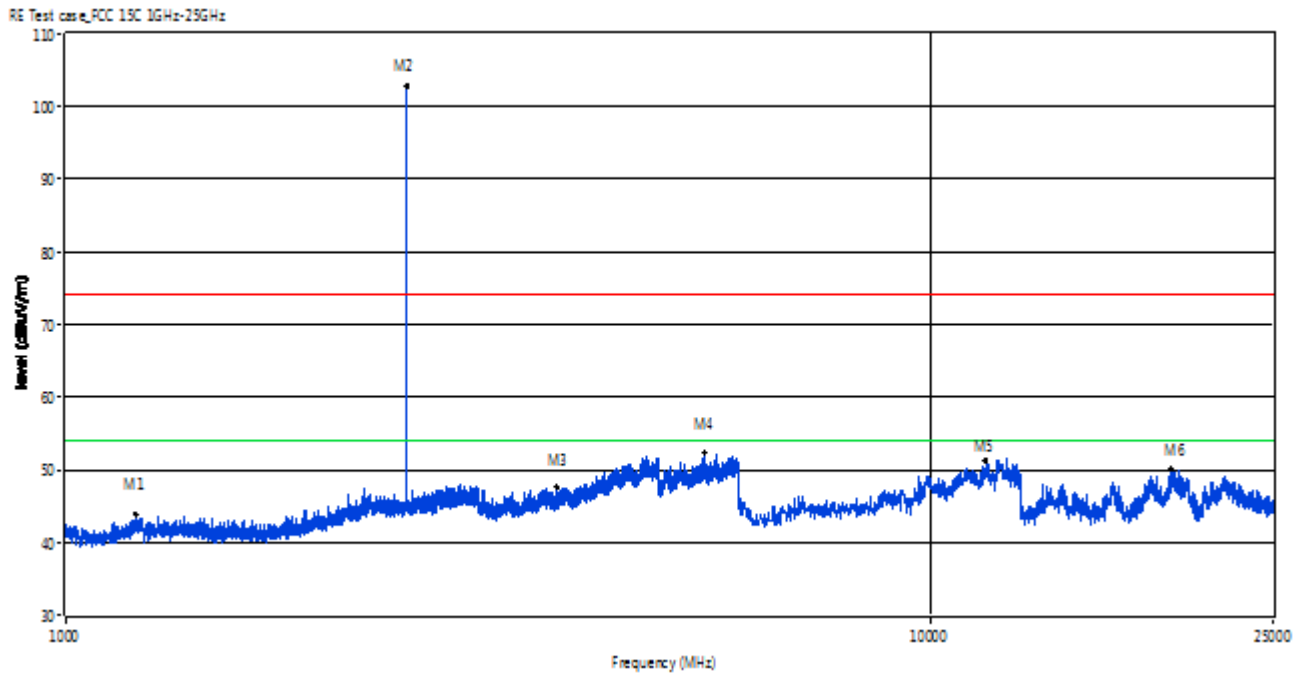
Note: Based on the test result of EUT 1, the EUT 2 only retest the worst mode (8-DPSK HIGH CHANNEL) in this report.

8-DPSK HIGH CHANNEL 1 GHz to 25 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1295.43	43.44	-4.79	74.0	30.56	Peak	331.20	100	Vertical	PASS
2	2480.13	99.59	-0.60	74.0	-25.59	Peak	77.50	100	Vertical	N/A
3	2764.06	48.71	1.87	74.0	25.29	Peak	180.50	100	Vertical	PASS
4	4699.82	52.27	13.28	74.0	21.73	Peak	172.70	100	Vertical	PASS
5	12042.43	51.52	20.83	74.0	22.48	Peak	0.30	100	Vertical	PASS
6	19179.70	50.28	14.04	74.0	23.72	Peak	66.70	100	Vertical	PASS

8-DPSK HIGH CHANNEL 1 GHz to 25 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1204.95	43.95	-5.25	74.0	30.05	Peak	149.10	100	Horizontal	PASS
2	2480.13	102.79	-0.60	74.0	-28.79	Peak	-0.00	100	Horizontal	N/A
3	3698.07	47.65	10.36	74.0	26.35	Peak	358.90	100	Horizontal	PASS
4	5483.38	52.34	14.94	74.0	21.66	Peak	336.10	100	Horizontal	PASS
5	11615.64	51.16	20.33	74.0	22.84	Peak	312.80	100	Horizontal	PASS
6	19009.98	50.04	13.42	74.0	23.96	Peak	189.80	100	Horizontal	PASS

Restricted-band band-edge (Bluetooth 3.0)

Note 1: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

Note 2: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.

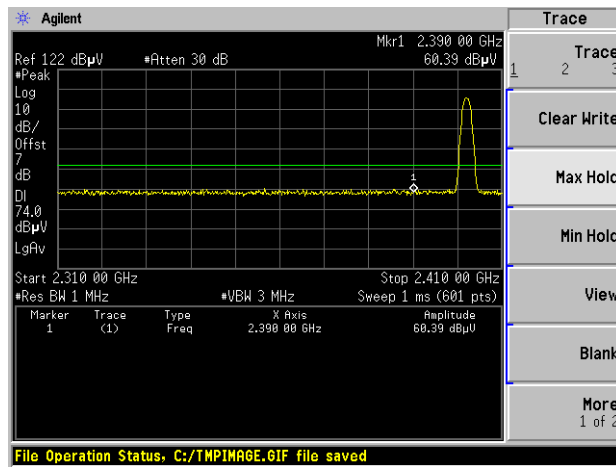
Note 3: The average levels were calculated from the peak level corrected with duty cycle correction factor (-18.79 dB) derived from $20\log(\text{dwell time}/100 \text{ ms})$.

For example: Average level = 60.39dBuV/m – 18.79 (dB) = 41.60 dBuV/m.

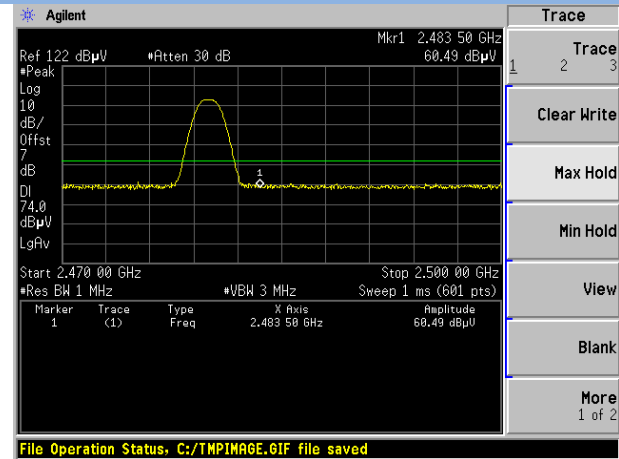
Test Mode	Test Channel	Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark	Verdict
GFSK	Low	2390.00	60.39	74	13.61	PEAK	Pass
		2390.00	41.60	54	12.40	AVERAGE	Pass
GFSK	HIGH	2483.50	60.49	74	13.51	PEAK	Pass
		2483.50	41.70	54	12.30	AVERAGE	Pass
π/4DQPSK	Low	2390.00	60.00	74	14.00	PEAK	Pass
		2390.00	41.21	54	12.79	AVERAGE	Pass
π/4DQPSK	HIGH	2483.50	61.09	74	12.91	PEAK	Pass
		2483.50	42.30	54	11.70	AVERAGE	Pass
8-DPSK	Low	2390.00	60.25	74	13.75	PEAK	Pass
		2390.00	41.46	54	12.54	AVERAGE	Pass
8-DPSK	HIGH	2483.50	61.06	74	12.94	PEAK	Pass
		2483.50	42.27	54	11.73	AVERAGE	Pass
GFSK(Hopping)	Low	2390.00	61.38	74	12.62	PEAK	Pass
		2390.00	42.59	54	11.41	AVERAGE	Pass
GFSK(Hopping)	HIGH	2483.50	61.23	74	12.77	PEAK	Pass
		2483.50	42.44	54	11.56	AVERAGE	Pass
π/4DQPSK (Hopping)	Low	2390.00	60.32	74	13.68	PEAK	Pass
		2390.00	41.53	54	12.47	AVERAGE	Pass
π/4DQPSK (Hopping)	HIGH	2483.50	60.72	74	13.28	PEAK	Pass
		2483.50	41.93	54	12.07	AVERAGE	Pass
8-DPSK (Hopping)	Low	2390.00	59.32	74	14.68	PEAK	Pass
		2390.00	40.53	54	13.47	AVERAGE	Pass
8-DPSK (Hopping)	HIGH	2483.50	62.13	74	11.87	PEAK	Pass
		2483.50	43.34	54	10.66	AVERAGE	Pass

Test Plots

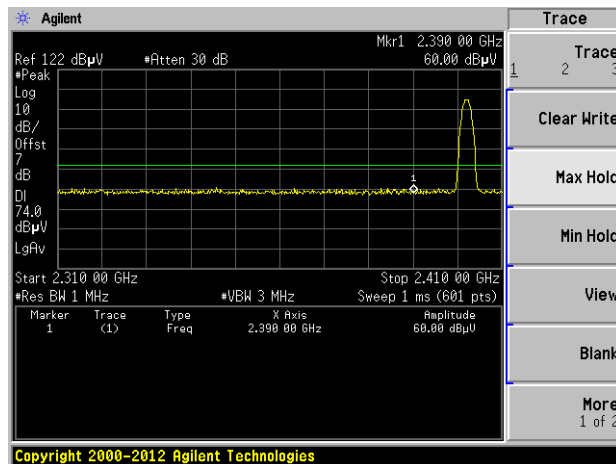
GFSK LOW CHANNEL , PEAK



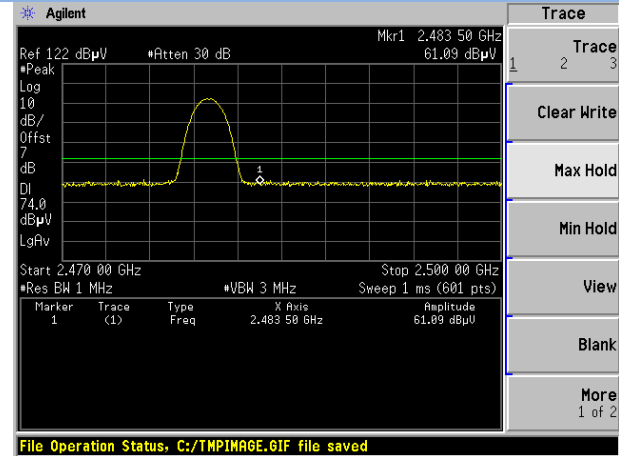
GFSK HIGH CHANNEL , PEAK



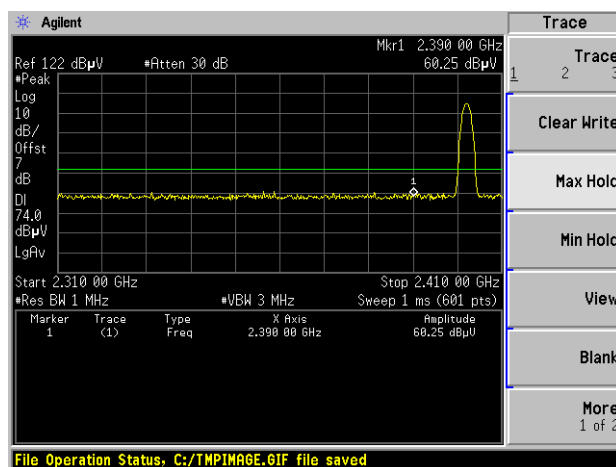
Π/4-DQPSK LOW CHANNEL , PEAK



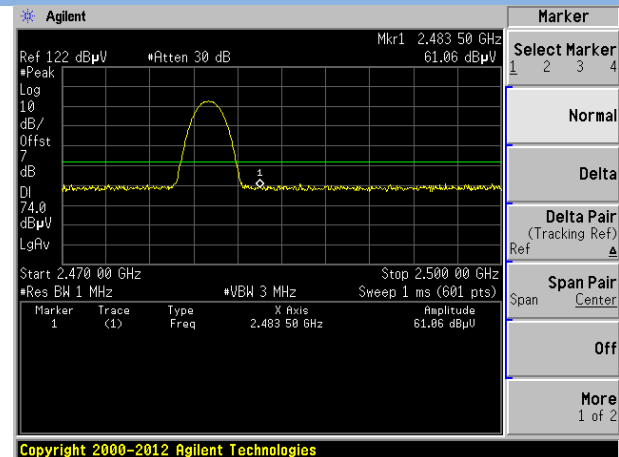
Π/4-DQPSK HIGH CHANNEL , PEAK



8-DPSK LOW CHANNEL , PEAK

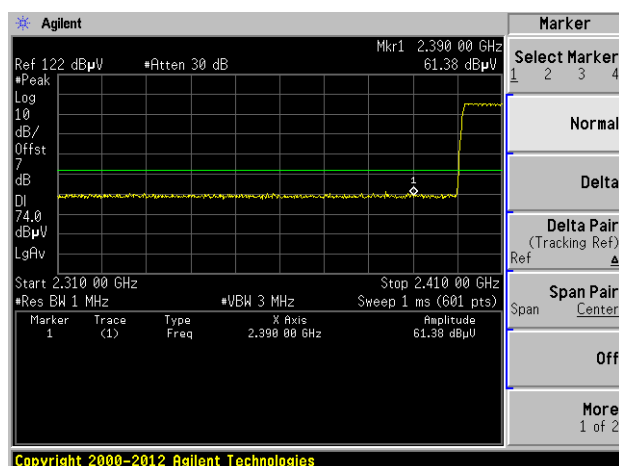


8-DPSK HIGH CHANNEL , PEAK

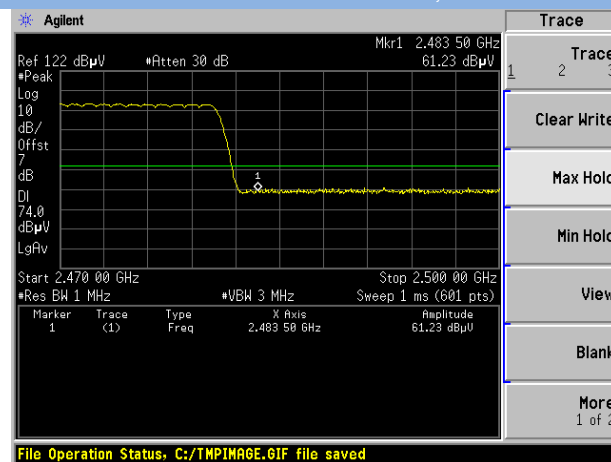


Hopping Mode:

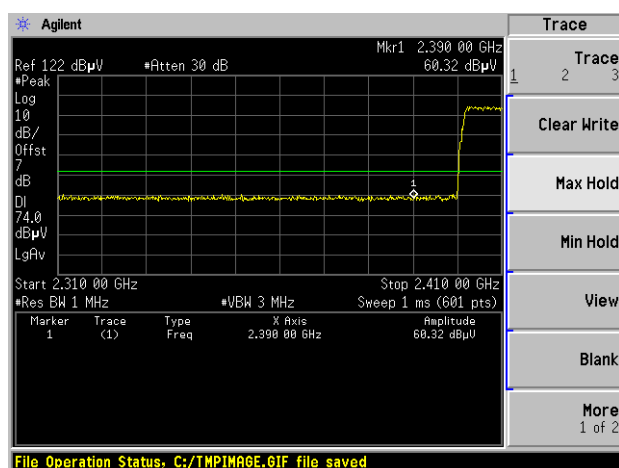
GFSK LOW FREQUENCY BAND, PEAK



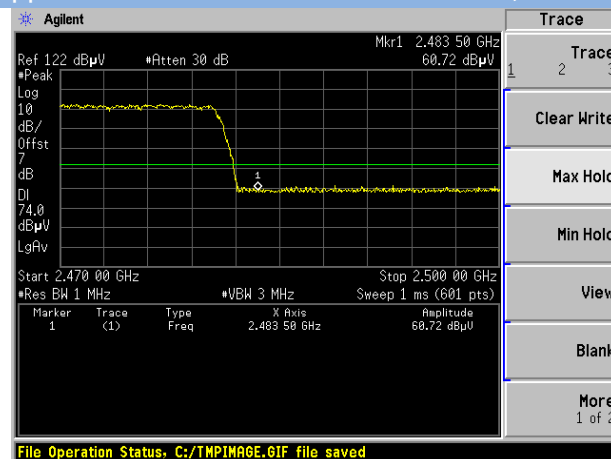
GFSK HIGH FREQUENCY BAND, PEAK



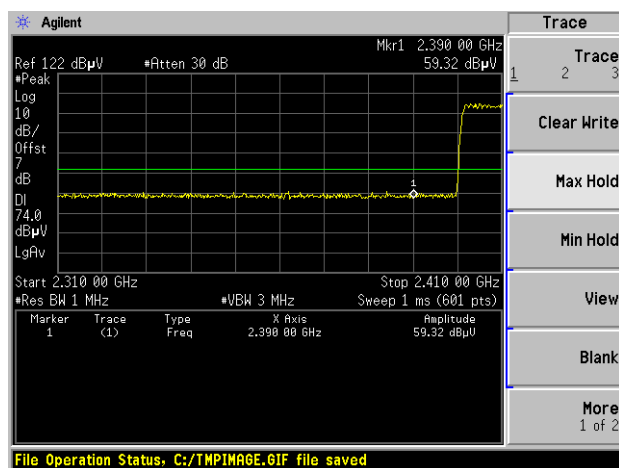
Π/4-DQPSK LOW FREQUENCY BAND, PEAK



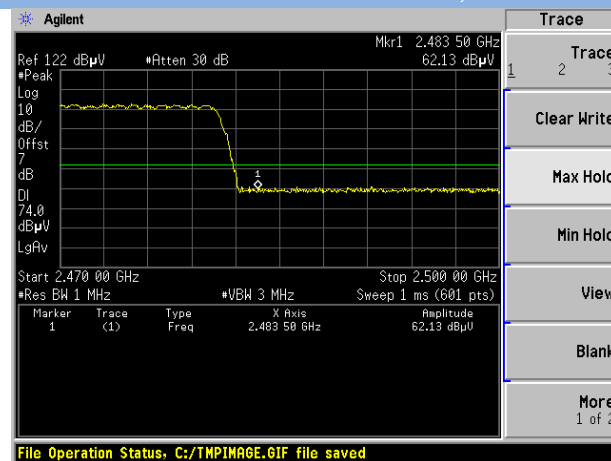
Π/4-DQPSK HIGH FREQUENCY BAND, PEAK



8-DPSK LOW FREQUENCY BAND, PEAK



8-DPSK HIGH FREQUENCY BAND, PEAK



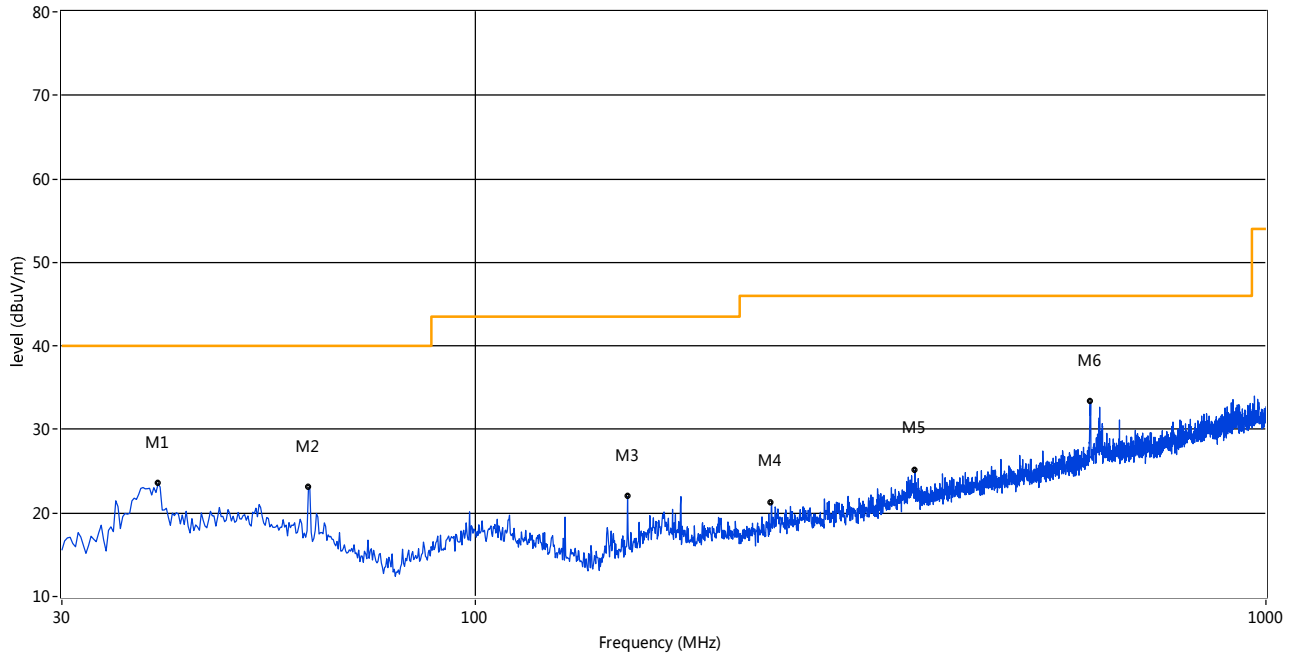
A.9 Receiver Spurious Emissions

Note: Based on the worst test results of CONFIGURATION A and CONFIGURATION B, the CONFIGURATION A (GFSK Model) were recorded in this report.

Test Data and Plots

30 MHz to 1 GHz, ANT V

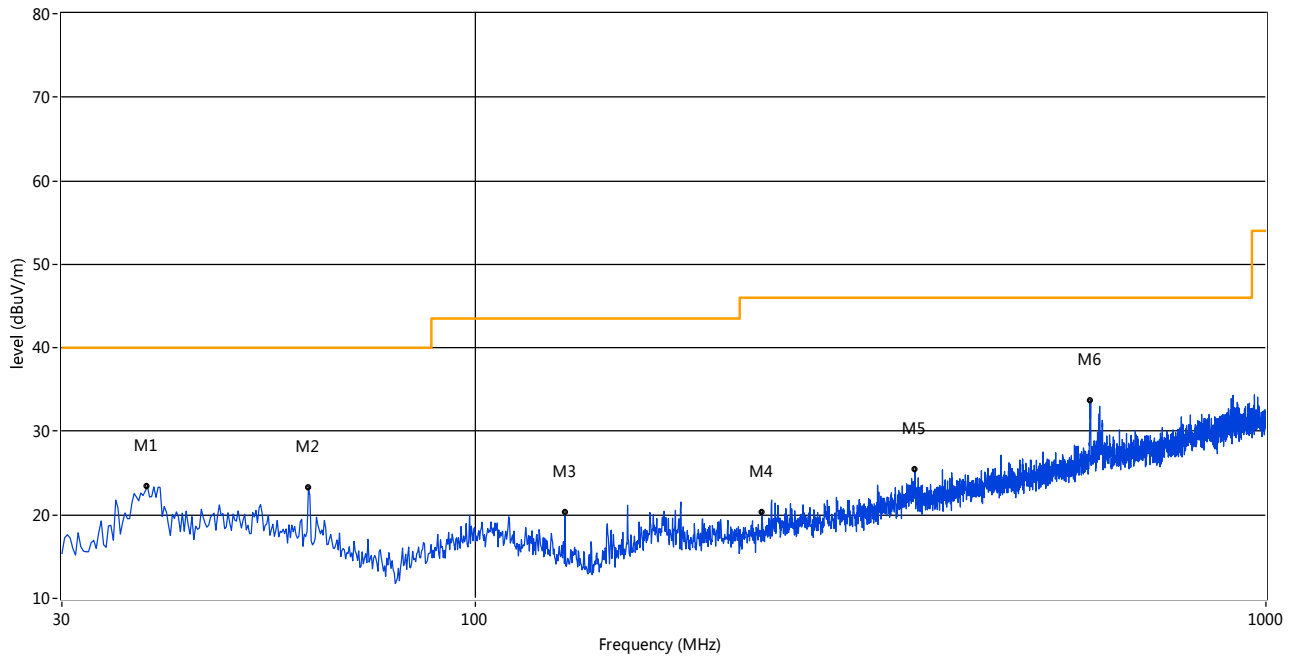
RE Test case_FCC 15C 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	39.70	23.49	-19.83	40.0	16.51	Peak	137.70	100	Vertical	PASS
2	61.52	23.00	-20.23	40.0	17.00	Peak	289.00	100	Vertical	PASS
3	155.83	21.95	-23.23	43.5	21.55	Peak	67.30	100	Vertical	PASS
4	237.04	21.27	-19.29	46.0	24.73	Peak	142.90	100	Vertical	PASS
5	359.96	25.15	-16.15	46.0	20.85	Peak	127.80	100	Vertical	PASS
6	599.49	33.26	-10.79	46.0	12.74	Peak	334.00	100	Vertical	PASS

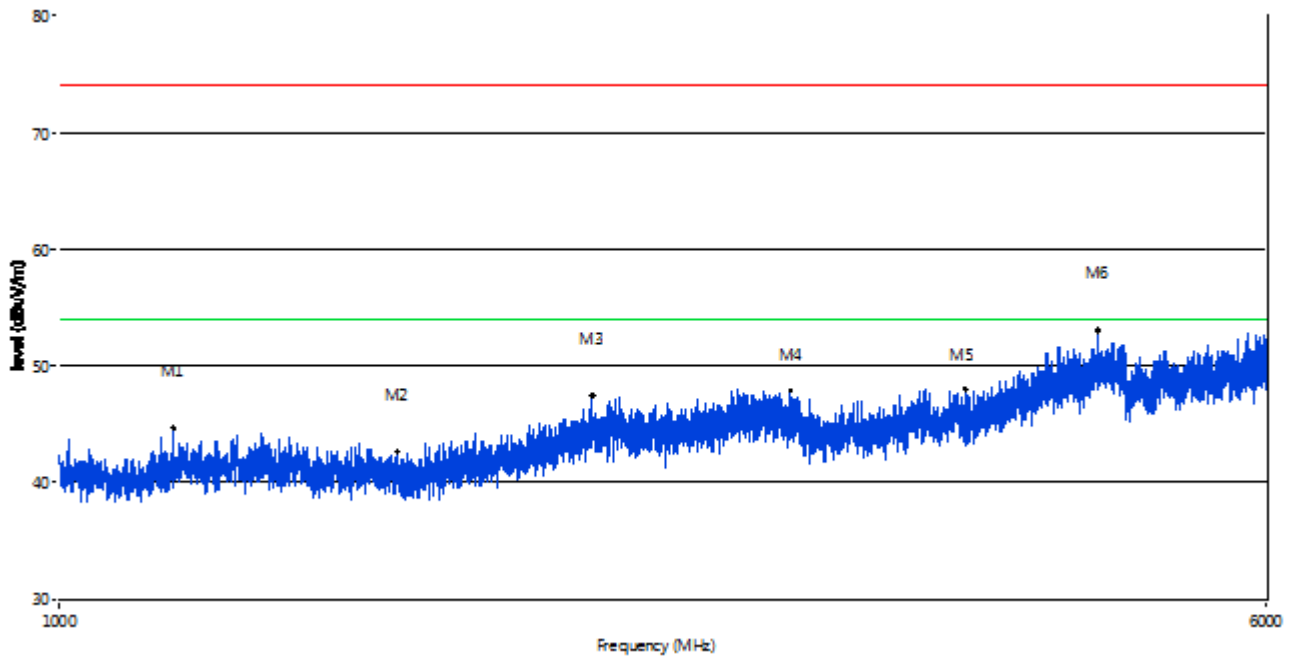
30 MHz to 1 GHz, ANT H

RE Test case_FCC 15C 30MHz-1GHz



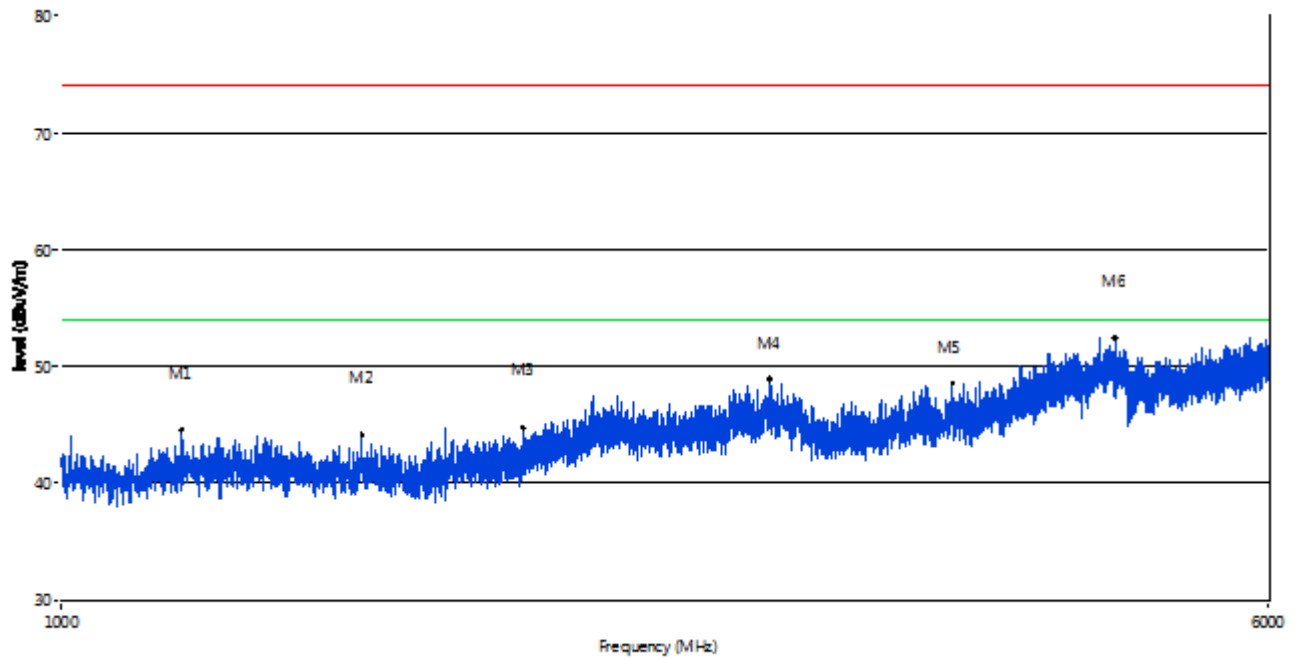
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	38.48	23.42	-20.09	40.0	16.58	Peak	258.30	100	Horizontal	PASS
2	61.52	23.25	-20.23	40.0	16.75	Peak	289.00	100	Horizontal	PASS
3	129.88	20.20	-23.25	43.5	23.30	Peak	248.40	100	Horizontal	PASS
4	230.50	20.29	-19.67	46.0	25.71	Peak	0.30	100	Horizontal	PASS
5	359.96	25.36	-16.15	46.0	20.64	Peak	127.80	100	Horizontal	PASS
6	599.25	33.60	-10.78	46.0	12.40	Peak	334.00	100	Horizontal	PASS

1 GHz to 6 GHz, ANT V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1183.95	44.66	-5.55	74.0	29.34	Peak	124.70	100	Vertical	Pass
2	1649.84	42.69	-4.05	74.0	31.31	Peak	143.90	100	Vertical	Pass
3	2203.70	47.50	-0.40	74.0	26.50	Peak	169.30	100	Vertical	Pass
4	2958.51	47.85	2.44	74.0	26.15	Peak	16.70	100	Vertical	Pass
5	3836.04	47.96	10.95	74.0	26.04	Peak	352.20	100	Vertical	Pass
6	4670.58	53.01	13.09	74.0	20.99	Peak	107.20	100	Vertical	Pass

1 GHz to 6 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1195.45	44.52	-5.46	74.0	29.48	Peak	251.80	100	Horizontal	Pass
2	1560.36	44.10	-4.00	74.0	29.90	Peak	54.70	100	Horizontal	Pass
3	1983.75	44.74	-2.52	74.0	29.26	Peak	99.30	100	Horizontal	Pass
4	2859.03	48.94	1.99	74.0	25.06	Peak	2.00	100	Horizontal	Pass
5	3752.06	48.54	10.57	74.0	25.46	Peak	205.00	100	Horizontal	Pass
6	4779.31	52.42	13.60	74.0	21.58	Peak	1.30	100	Horizontal	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1610062-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL- SZ1610062-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL- SZ1610062-AI.PDF”.

--END OF REPORT--