FCC RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

smart phone

ISSUED TO
Shenzhen Huadoo Bright Group Limited

Room 13E, jinsong Buiding, Tai ran 4th Rood, chegong miao, Futian Distrct, Shenzhen

Prepared by: Li Hongmei
(Reporting Specialist)
Date: Dec 31, 2014

Approved by: Wei Yanquan
(Chief Engineer)
Date: Dec 31, 2014

Report No.:	BL-SZ14C0012-601
EUT Type:	smart phone
Model Name:	Huadoo V4
Brand Name:	Huadoo
Test Standard:	47 CFR Part 15 Subpart C
FCC ID:	2ACXS-V4
Test conclusion:	PASS
Test Date:	Nov 25 2014 ~ Dec 28, 2014
Date of Issue:	Dec 31, 2014

Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
TEL: +86-755-66850100, FAX: +86-755-61824271
Email: info@baluntek.com
www.baluntek.com

Revision History

Version	Issue Date	Revisions
Rev. 01	Dec 31, 2014	Initial Issue

TABLE OF CONTENTS

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 6683 3402
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 has met the requirements of the IAS Accreditation Criteria for Testing Laboratories (AC89), has demonstrated compliance with ISO/IEC Standard 17025:2005. The accreditation certificate number is TL-588. 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 Announce

(1) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(2) The test report is invalid if there is any evidence and/or falsification.

(3) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(4) 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.

(5) 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

Applicant	Shenzhen Huadoo Bright Group Limited
Address	Room 13E, jinsong Buiding, Tai ran 4th Rood, chegong miao, Futian Distrct, Shenzhen

2.2 Manufacturer

Manufacturer	Shenzhen Huadoo Bright Group Limited
Address	Room 13E, jinsong Buiding, Tai ran 4th Rood, chegong miao, Futian Distrct, Shenzhen

2.3 General Description for Equipment under Test (EUT)

EUT Type	smart phone
Model Name	Huadoo V4
Hardware Version	MOLY.WR8.W1315.MD.MG.MP.V39
Software Version	V4_overseas_V5_20141105
Network and Wireless connectivity	Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE) WIFI 802.11b, 802.11g and 802.11n (HT20/40)
About the Product	The equipment is smart phone, it contains Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE) and Wifi which operating at 2.4GHz ISM band. Only the Bluetooth 3.0 was tested in this report.

2.4 Technical Information

TX/ RX Operating Range	2400~2483.5MHz band f_c = 2402 MHz + N*1 MHz, where - f_c = “Operating Frequency” in MHz, - N = “Channel Number” with the range from 0 to 78.	
Modulation Type	Carrier	Frequency Hopping Spread Spectrum
	Digital	GFSK, π/4-DQPSK, 8DPSK
Antenna Type	PIFA Antenna	
Antenna Gain	0dBi	

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No	V4
	Serial No	N/A
	Capacitance	3600mAh
	Rated Voltage	3.7V
	Extreme Voltage	Low: 3.3V / High:4.2V
Ancillary Equipment 2	Charger	
	Brand Name	N/A
	Model No	HJ-0501000
	Serial No	N/A
	Rated Input	~ 100-240V, 0.15A, 50/60Hz
	Rated Output	⎓ 5V, 1000mA
Ancillary Equipment 3	Earphone	
	Length	1.0m
Ancillary Equipment 4	USB Data Cable	
	Length	1.0m

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-13 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

3.2 Verdict

No.	Description	FCC/IC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	PASS Note 1
2	Number of Hopping Frequency	15.247(a)	ANNEX A.1	PASS
3	Peak Output Power	15.247(b)	ANNEX A.2	PASS
4	Occupied Bandwidth	15.247(a)	ANNEX A.3	PASS
5	Carrier Frequency Separation	15.247(a)	ANNEX A.4	PASS
6	Time of Occupancy (Dwell time)	15.247(a)	ANNEX A.5	PASS
7	Conducted Spurious Emission	15.247(d)	ANNEX A.6	PASS
8	Conducted Emission	15.207	ANNEX A.7	PASS
9	Radiated Spurious Emission	15.209 15.247(d)	ANNEX A.8	PASS
10	Band Edge	15.209 15.247(d)	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 (kPa)	100 - 102	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	3.7V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2014.07.07	2015.07.06
Spectrum Analyzer	ROHDE&SCHWARZ	FSL3	103640/003	2014.07.07	2015.07.06
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2014.07.07	2015.07.06
Power Splitter	KMW	DCPD-LDC	1305003215	2014.07.07	2015.07.06
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2014.07.07	2015.07.06
Attenuator (20dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2014.07.07	2015.07.06
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2014.07.07	2015.07.06
Test Antenna-Loop(9kHz-30MHz)	SCHWARZBECK	FMZB 1519	1519-037	2013.07.03	2015.07.02
Test Antenna-Bi-Log(30MHz-3GHz)	SCHWARZBECK	VULB 9163	9163-624	2013.07.02	2015.07.01
Test Antenna-Horn(1-18GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2013.07.02	2015.07.01
Test Antenna-Horn(15-26.5GHz)	SCHWARZBECK	BBHA 9170	9170-305	2013.07.02	2015.07.01
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2014.10.07	2015.10.06

4.3 Test Configurations

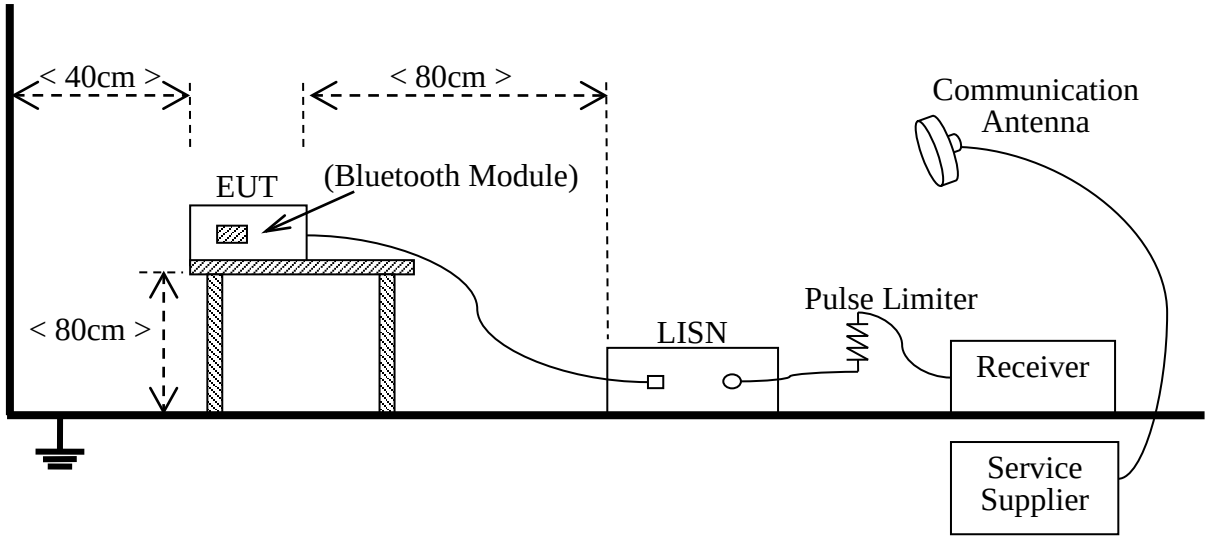
Test Configurations (TC) NO.	Description	
	Signal Description	Operating Frequency
Transmitter		
TC01	GFSK modulation, package type DH5, hopping on	--
TC02	GFSK modulation, package type DH5, hopping off	Ch No. 0/ 2402MHz
TC03	GFSK modulation, package type DH5, hopping off	Ch No. 39/ 2441MHz
TC04	GFSK modulation, package type DH5, hopping off	Ch No. 78/ 2480MHz
TC05	π/4-DQPSK modulation, package type DH5, hopping on	--
TC06	π/4-DQPSK modulation, package type DH5, hopping off	Ch No. 0/ 2402MHz
TC07	π/4-DQPSK modulation, package type DH5, hopping off	Ch No. 39/ 2441MHz
TC08	π/4-DQPSK modulation, package type DH5, hopping off	Ch No. 78/ 2480MHz
TC09	8DPSK modulation, package type DH5, hopping on	--
TC10	8DPSK modulation, package type DH5, hopping off	Ch No. 0/ 2402MHz
TC11	8DPSK modulation, package type DH5, hopping off	Ch No. 39/ 2441MHz
TC12	8DPSK modulation, package type DH5, hopping off	Ch No. 78/ 2480MHz

4.4 Description of Test Setup

4.4.1 For Antenna Port Test

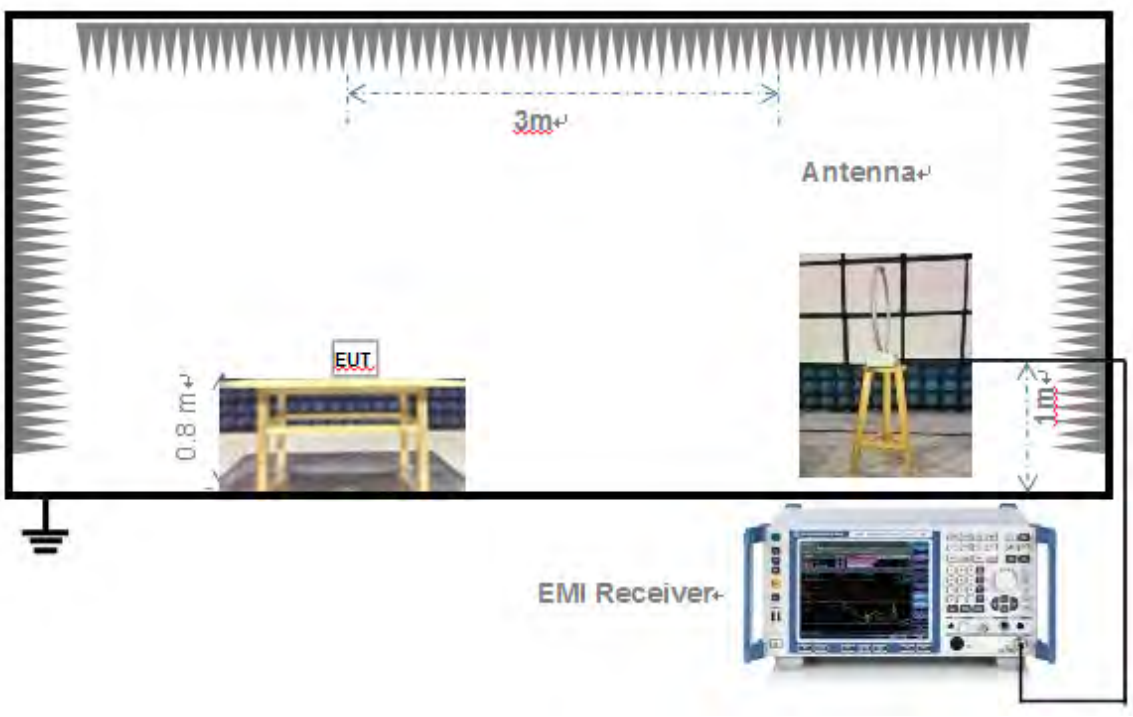
(Diagram 1)

4.4.2 For AC Power Supply Port Test



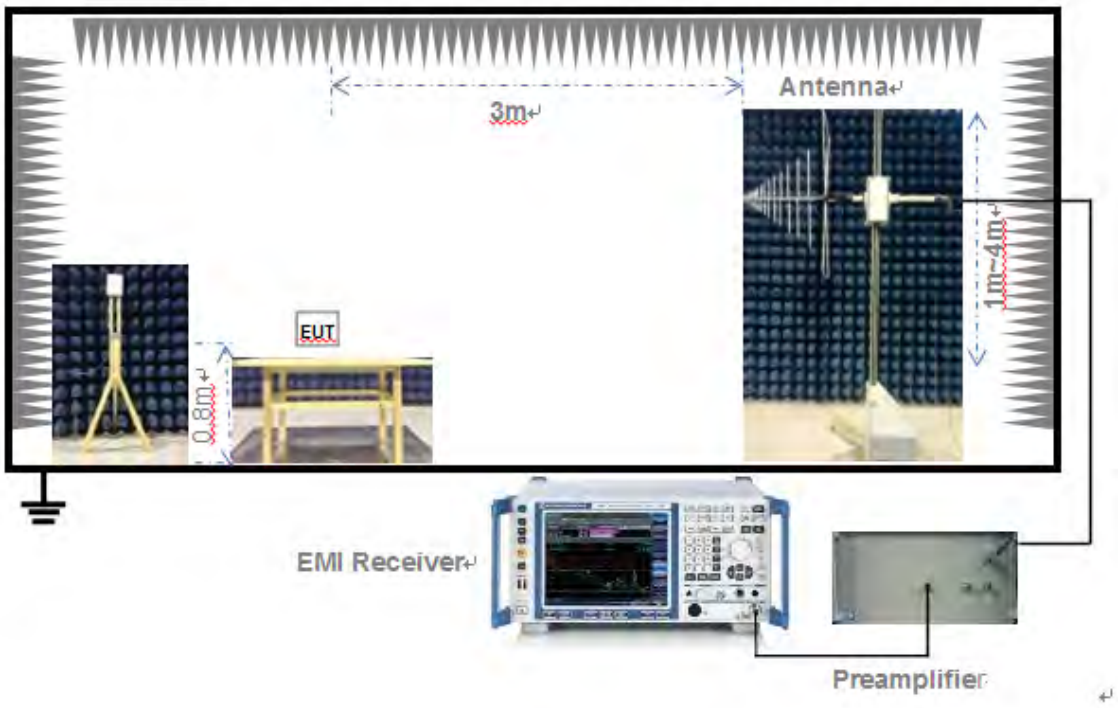
(Diagram 2)

4.4.3 For Radiated Test (Below 30MHz)



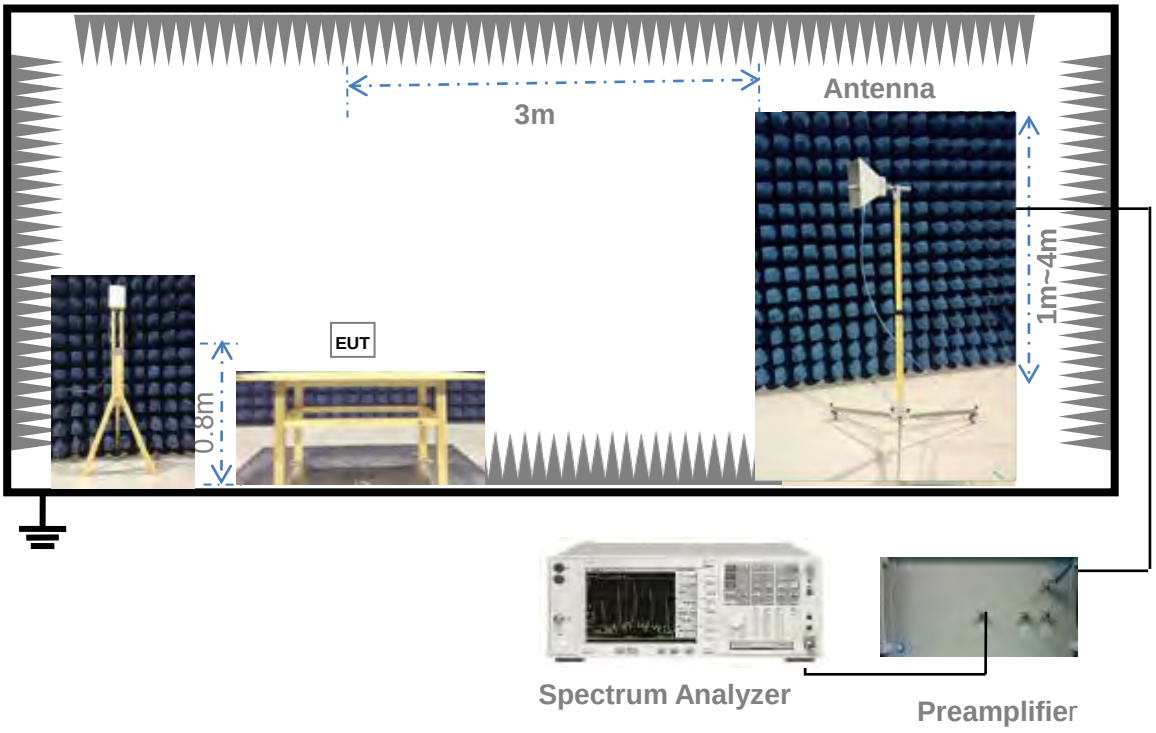
(Diagram 3)

4.4.4 For Radiated Test (30MHz-1GHz)



(Diagram 4)

4.4.5 For Radiated Test (Above 1GHz)



(Diagram 5)

4.5 Test Conditions

Test Case	Test Conditions		
	Test Env.	Test Setup Note 1	Test Configuration Note 2
Number of Hopping Frequency	NTNV	Test Setup 1	TC01, TC05, TC09
Peak Output Power	NTNV	Test Setup 1	TC02, TC03, TC04, TC06, TC07, TC08, TC10, TC11, TC12
Occupied Bandwidth	NTNV	Test Setup 1	TC03, TC07, TC011
Carrier Frequency Separation	NTNV	Test Setup 1	TC01, TC05, TC09
Time of Occupancy (Dwell time)	NTNV	Test Setup 1	TC01, TC05, TC09
Conducted Spurious Emission	NTNV	Test Setup 1	TC02, TC03, TC04, TC06, TC07, TC08, TC10, TC11, TC12
Conducted Emission	NTNV	Test Setup 2	TC02, TC03, TC04, TC06, TC07, TC08, TC10, TC11, TC12
Radiated Emission	NTNV	Test Setup 3 Test Setup 4 Test Setup 5	TC01, TC02, TC03, TC04, TC05, TC06, TC07, TC08, TC09, TC10, TC11, TC12
Band Edge	NTNV	Test Setup 5	TC01, TC02, TC04, TC05, TC06, TC08, TC09, TC10, TC12

Note:
1. Please refer to section 4.4 for test setup details.
2. Please refer to section 4.3 for test setup details.

4.6 Measurement Results Explanation Example

4.6.1 For conducted test items:

Following table shows an offset computation example with cable loss 0.5 dB.

4.6.2 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 (Duty cycle).
Duty cycle = on time / 100 milliseconds
On time = dwell time * hopping number in 100 ms
For example: bluetooth with dwell time 2.897ms and 3 hops in 100 ms, then
Duty cycle correction factor (dB) = 20 * log ((2.897 * 3) / 100) = -21.22 dB
Following shows an average computation example with duty cycle correction factor = -21.22dB, 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 + (-21.22) = 24.39 (dBuV/m)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Standard Applicable

FCC §15.203 & 15.247(b)

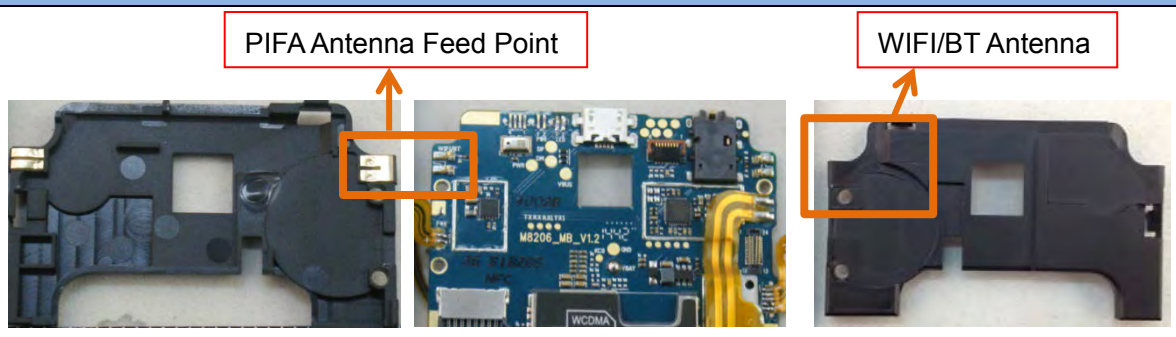
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply 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 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 Frequency

5.2.1 Limit

FCC §15.247(a) (1) (iii)

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

5.2.2 Test Procedure

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

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.3 Peak Output Power

5.3.1 Test Limit

FCC § 15.247(b)

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

5.3.2 Test Procedure

The Bluetooth 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 ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.4 Occupied Bandwidth

5.4.1 Limit

FCC §15.247(a)

The 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1%=20dB) taking the total RF output power.

5.4.2 Test Procedure

Use the following spectrum analyzer settings:

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

RBW ≥ 1% of the 20 dB bandwidth

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.5 Carrier Frequency Separation

5.5.1 Limit

FCC §15.247(a)

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

5.5.2 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) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ 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.

5.6 Time of Occupancy (Dwell time)

5.6.1 Limit

FCC §15.247(a)

Frequency hopping systems in the 2400 - 2483.5MHz 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 Procedure

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

For DH1 package type

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

{Period} = 0.4s * {Number of Hopping Frequency}

For DH3 package type

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

{Period} = 0.4s * {Number of Hopping Frequency}

For DH5 package type

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

{Period} = 0.4s * {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.

5.7 Conducted Spurious Emission

5.7.1 Limit

FCC §15.247(d)

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.

5.7.2 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 ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.8 Conducted Emission

5.8.1 Limit

FCC §15.207

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 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	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 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.

5.9 Radiated Spurious Emission

5.9.1 Limit

FCC §15.209&15.247(d)

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 (μV/m)	Measurement Distance (m)
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

Note:

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000MHz, 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 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.9.2 Test Procedure

The measurement frequency range is from 30MHz 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 ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ 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 3dB 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.

5.10 Band Edge

5.10.1 Limit

FCC §15.209&15.247(e)

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.

5.10.2 Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak /AV

Trace = max hold

Allow the trace to stabilize.

E [dBμV/m] =UR + AT + AFactor [dB]; AT =LCable loss [dB]-Gpreamp [dB]

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

AFactor: Antenna Factor at 3m

ANNEX A TEST RESULT

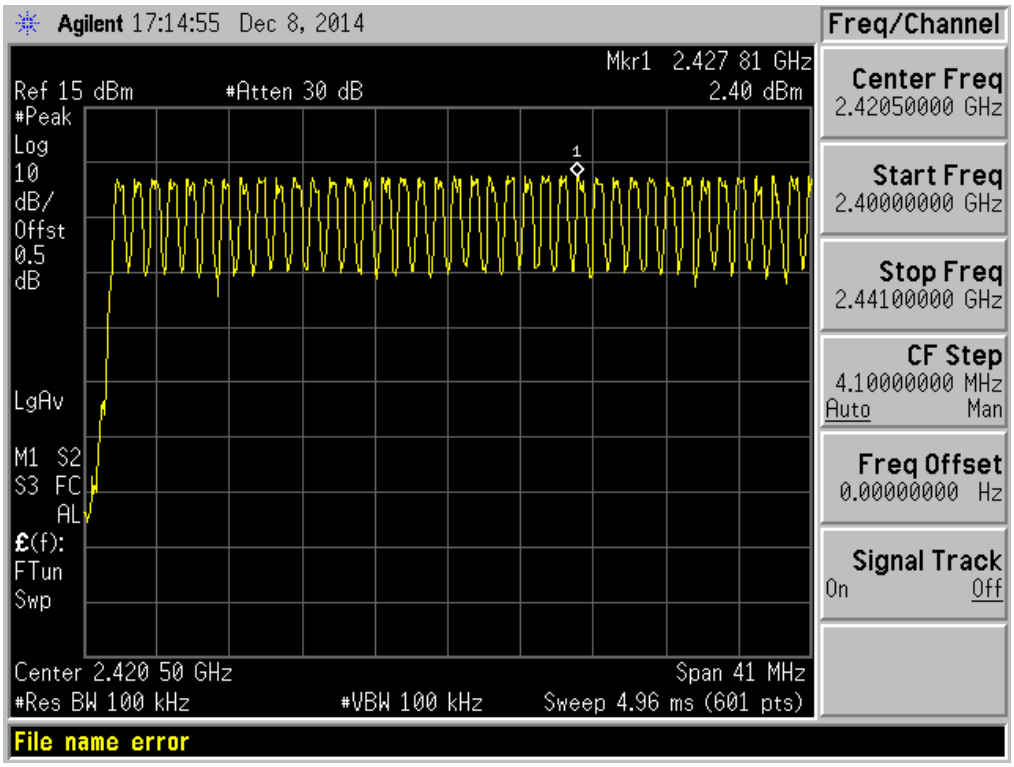
A.1 Number of Hopping Frequency

Test Data

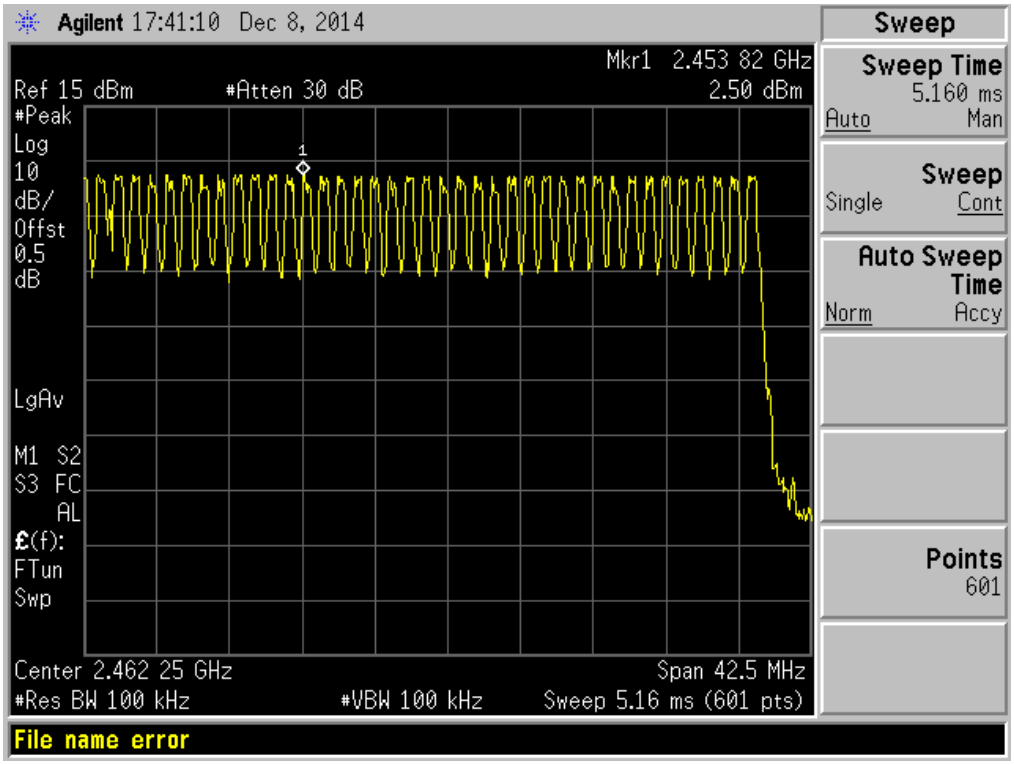
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	PASS
∏/4-DQPSK	2400 - 2483.5	79	15	PASS
8-DPSK	2400 - 2483.5	79	15	PASS

Test plots

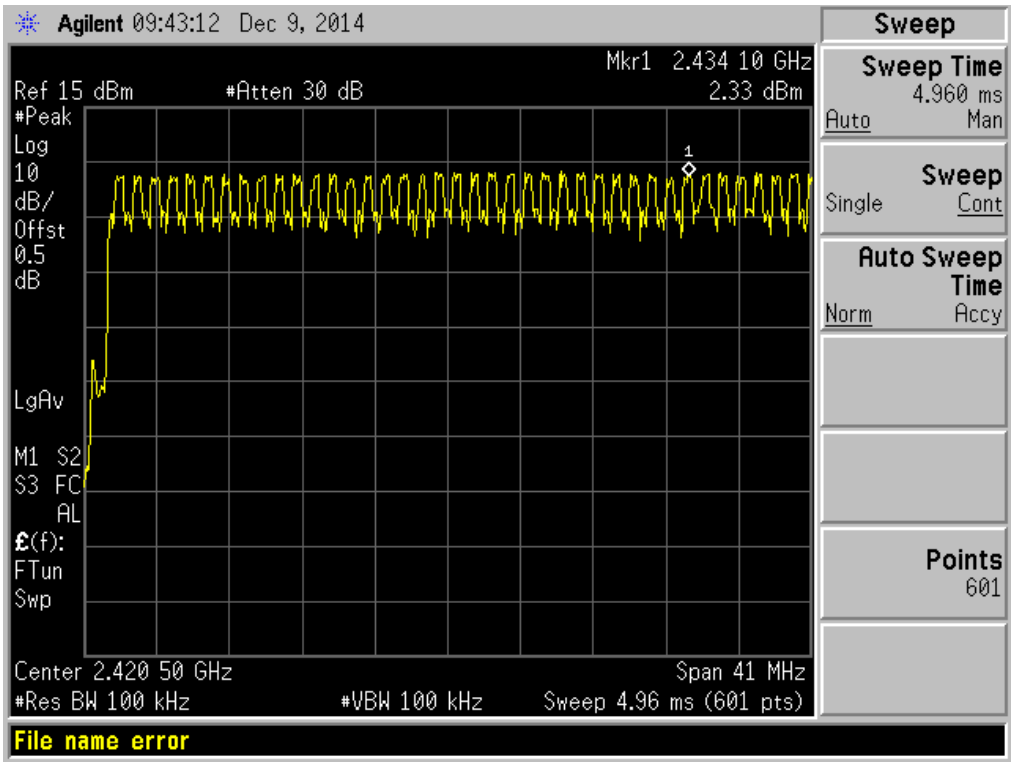
GFSK 2.4GHz~2.4415GHz



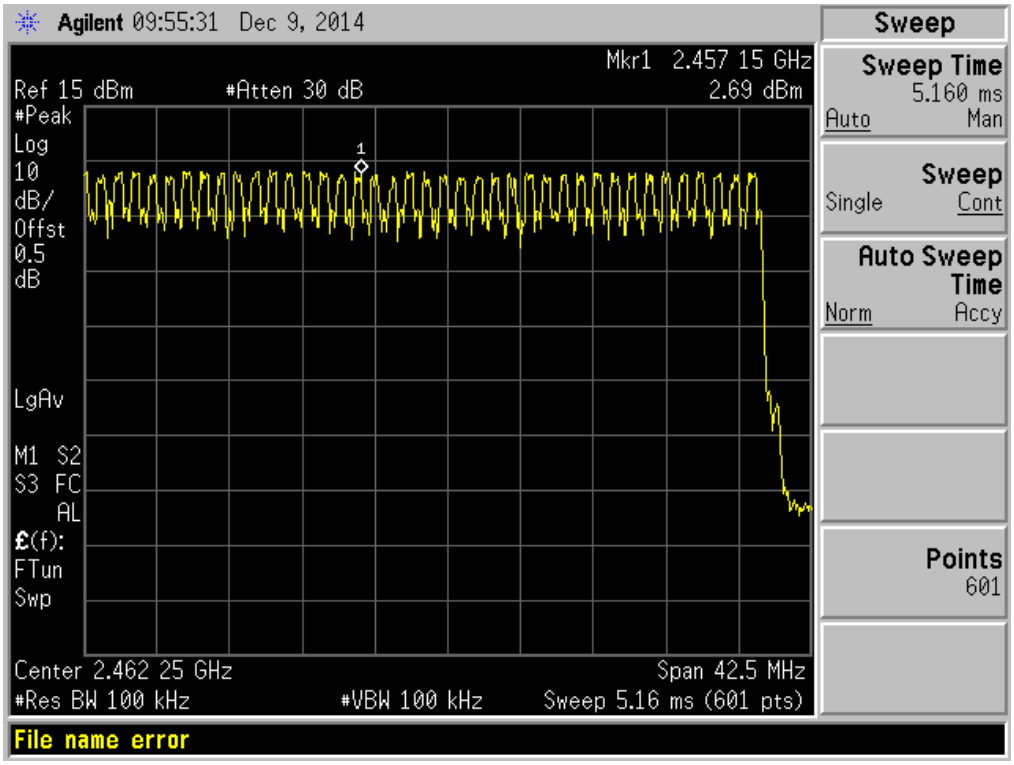
GFSK 2.4415GHz~2.4835GHz



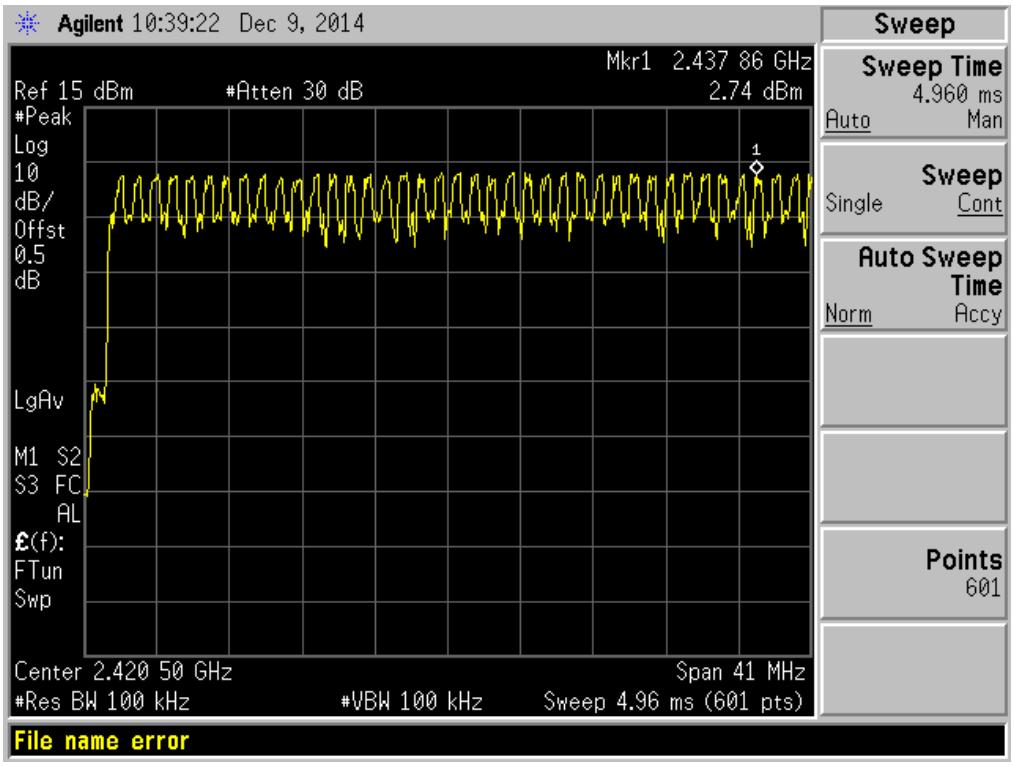
Π/4-DQPSK 2.4GHz~2.4415GHz



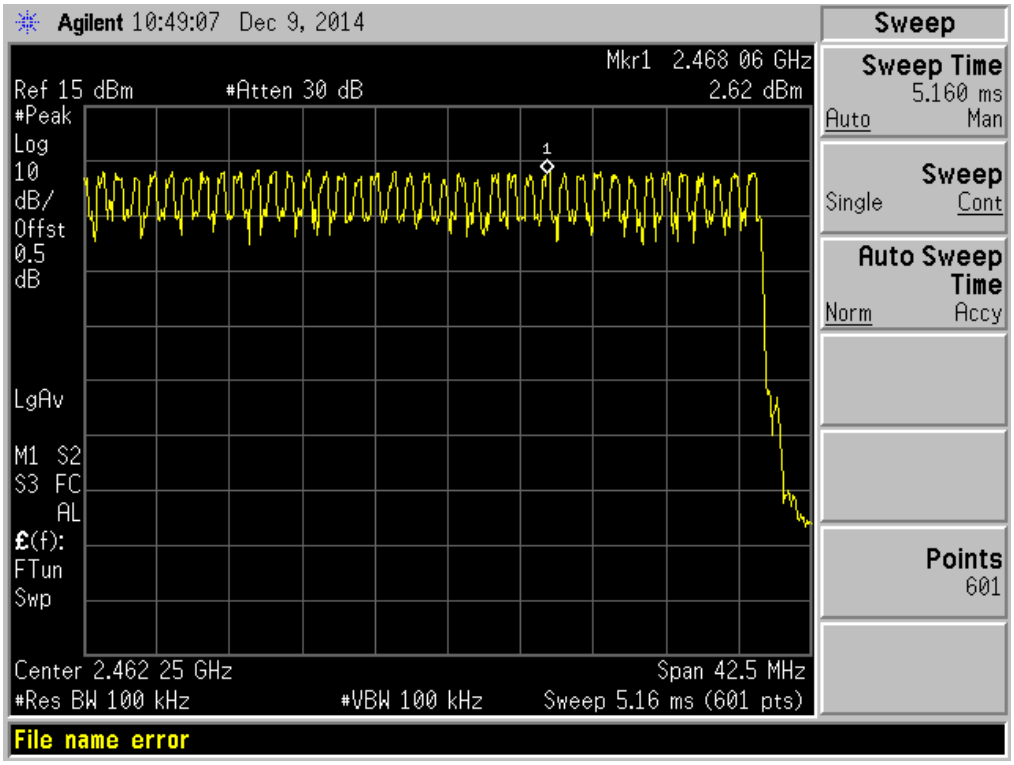
Π/4-DQPSK 2.4415GHz~2.4835GHz



8-DPSK 2.4GHz~2.4415GHz



8-DPSK 2.4415GHz~2.4835GHz



A.2 Peak Output Power

Test Data

GFSK Mode:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	mW	dBm	mW	
Low	2402	2.02	1.59	30	1000	PASS
Middle	2441	2.56	1.80			PASS
High	2480	2.34	1.71			PASS

∏/4-DQPSK Mode:

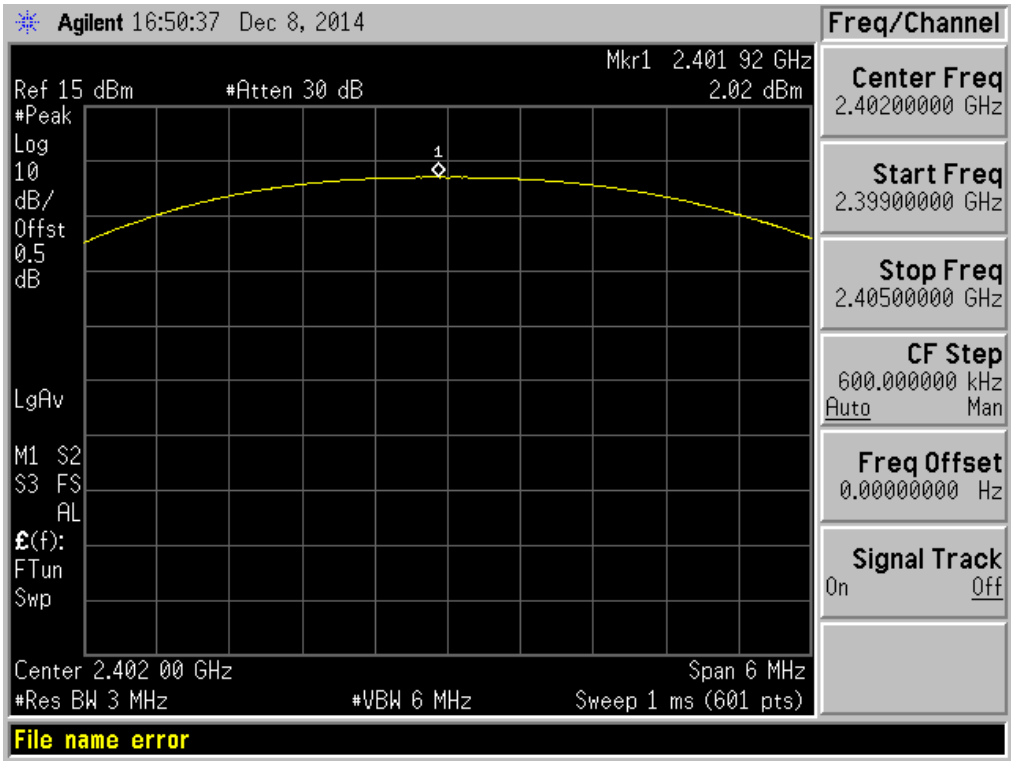
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	mW	dBm	mW	
Low	2402	3.03	2.01	30	1000	PASS
Middle	2441	3.59	2.29			PASS
High	2480	3.65	2.32			PASS

8-DPSK Mode:

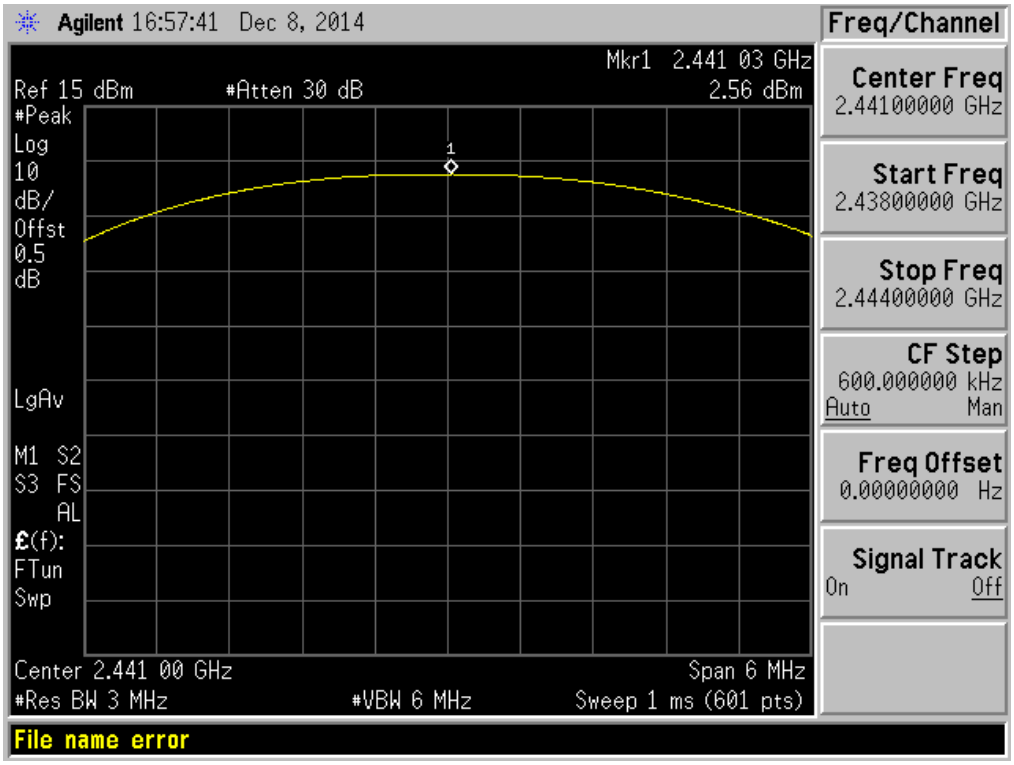
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	mW	dBm	mW	
Low	2402	2.99	1.99	30	1000	PASS
Middle	2441	3.56	2.27			PASS
High	2480	3.60	2.29			PASS

Test plots

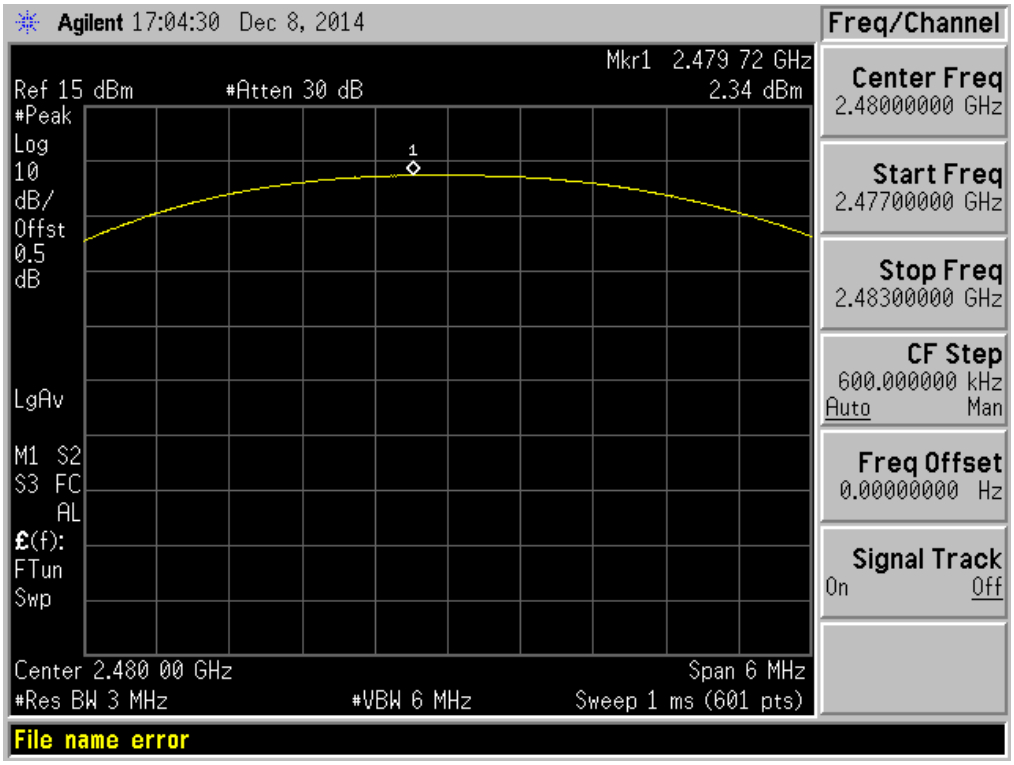
GFSK LOW CHANNEL



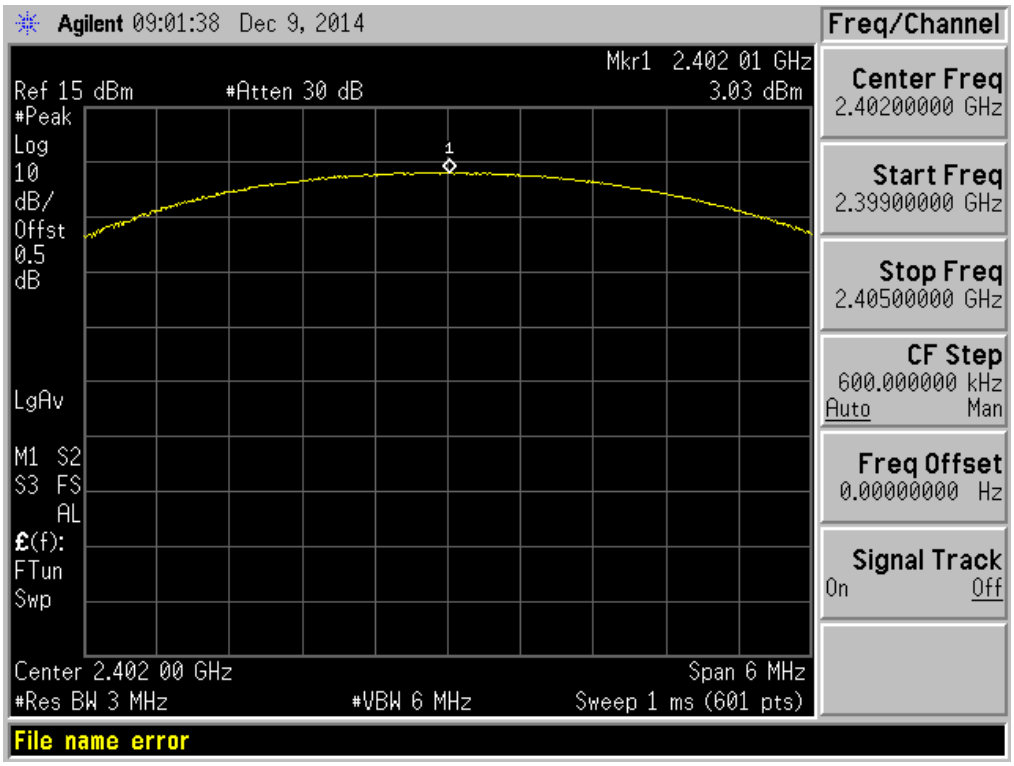
GFSK MID CHANAEL



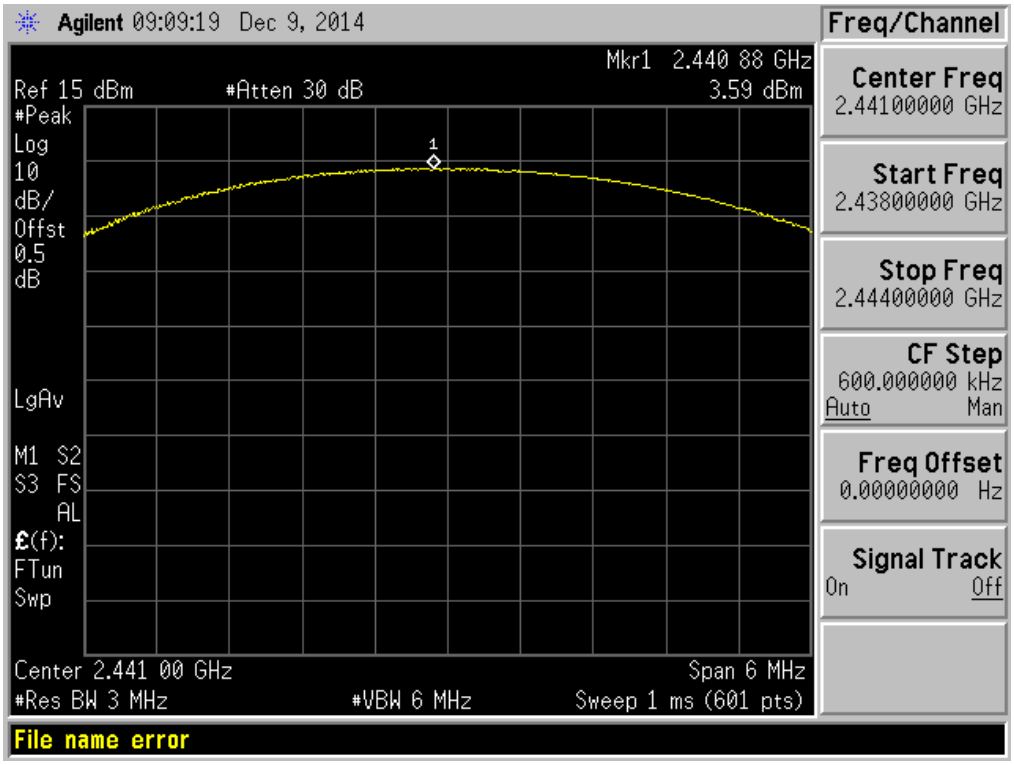
GFSK HIGH CHANNEL



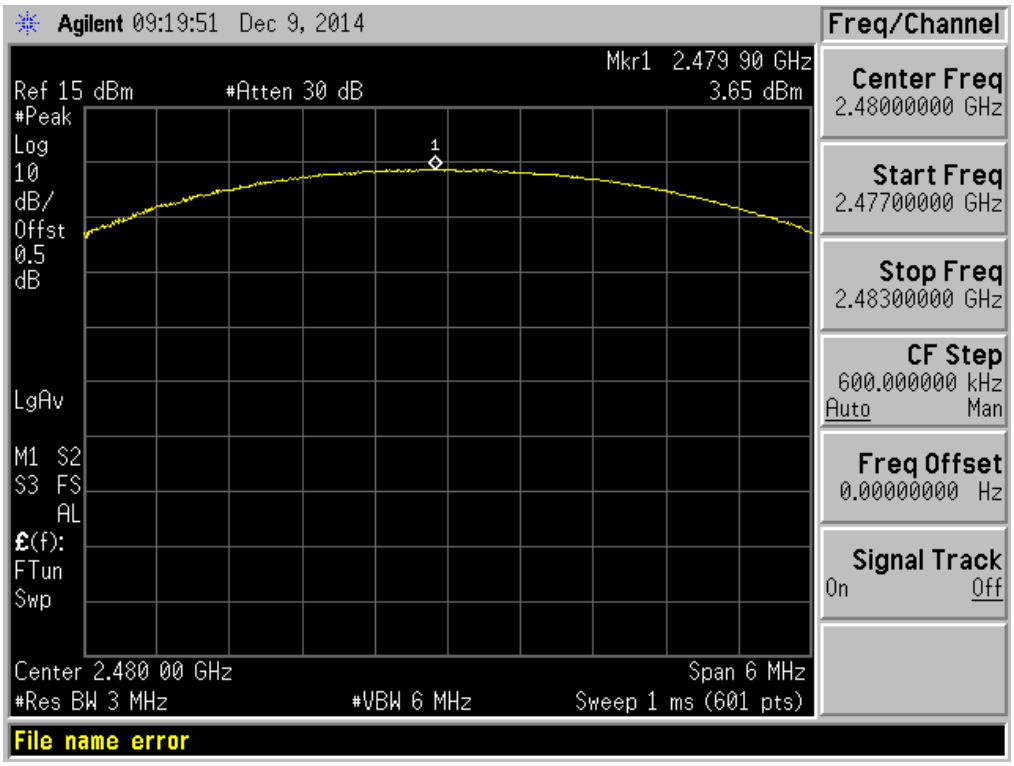
Π/4-DQPSK LOW CHANNEL



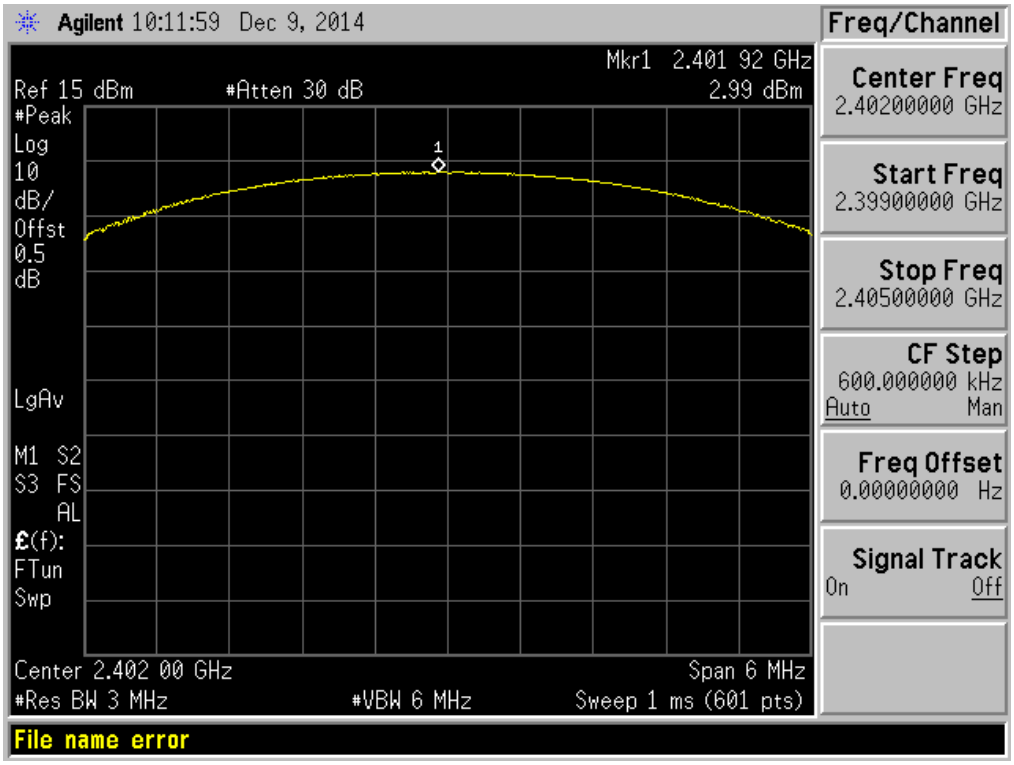
Π/4-DQPSK MID CHANAEL



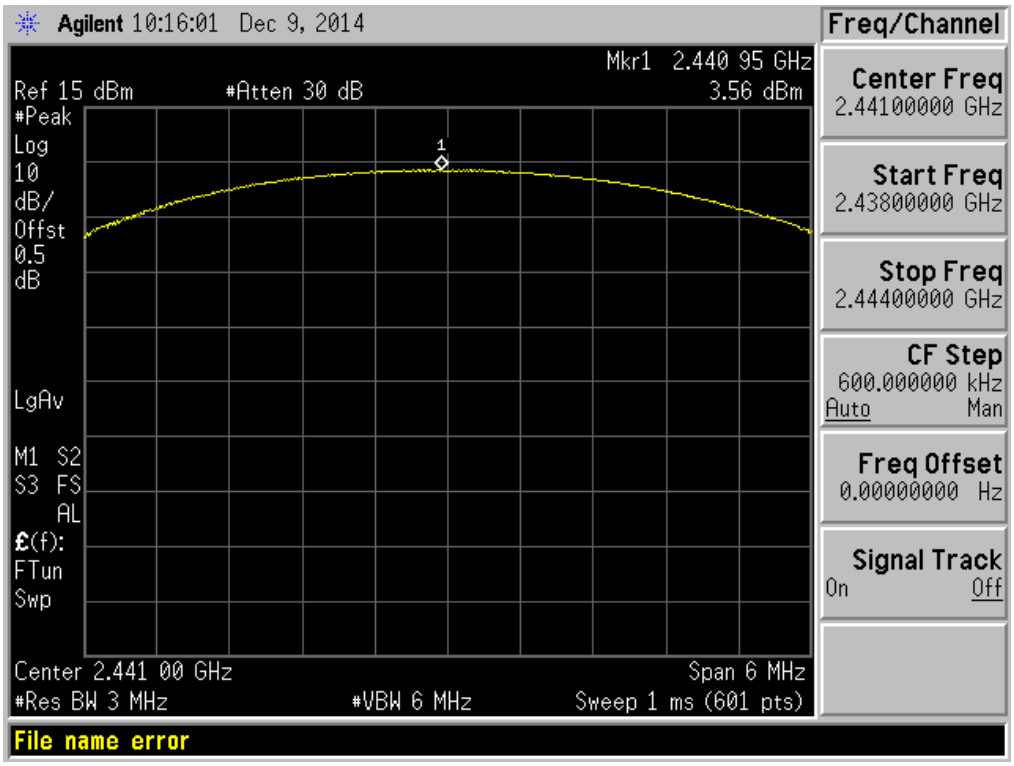
Π/4-DQPSK HIGH CHANNEL



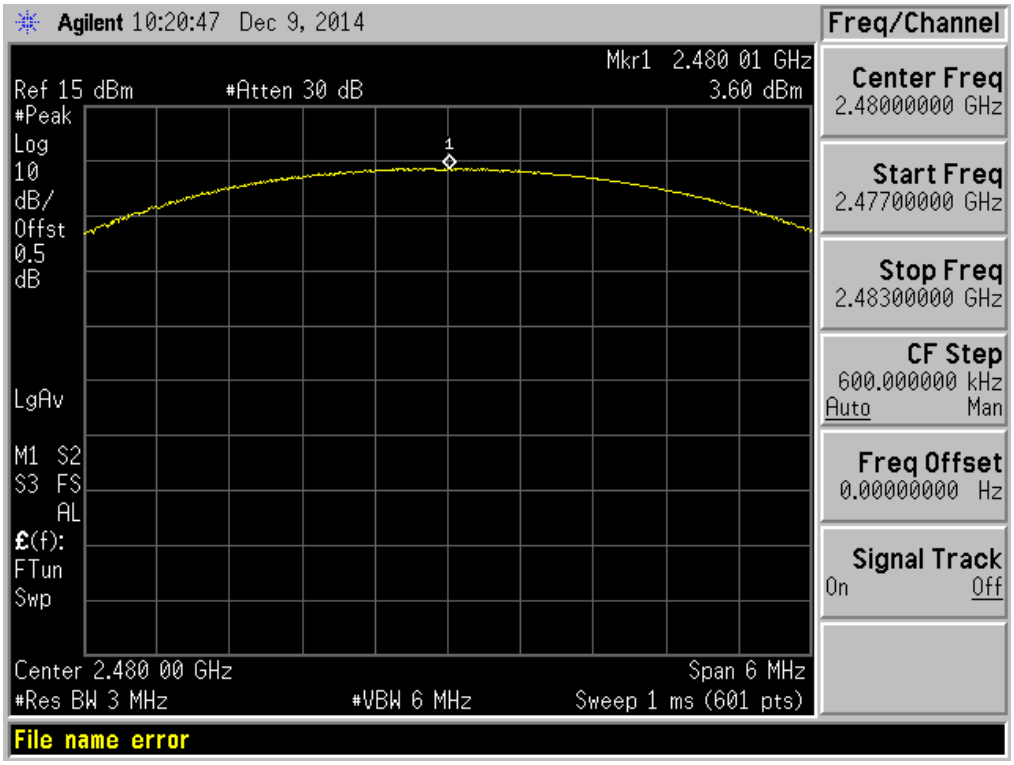
8-DPSK LOW CHANNEL



8-DPSK MID CHANAEL



8-DPSK HIGH CHANNEL



A.3 20dB and 99% bandwidth

Test Data

GFSK Mode:

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (kHz)
Low	2402	1.094	952.0641
Middle	2441	1.114	952.9870
High	2480	1.101	940.9805

∏/4-DQPSK Mode:

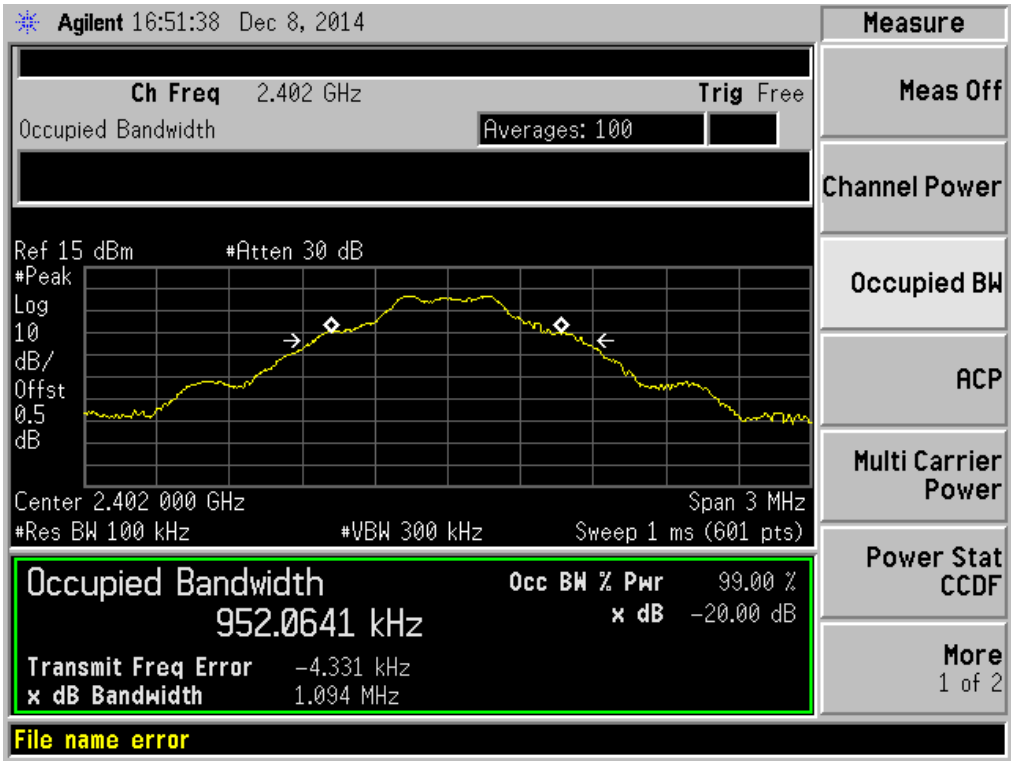
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.285	1.1677
Middle	2441	1.292	1.1647
High	2480	1.293	1.1688

8-DPSK Mode:

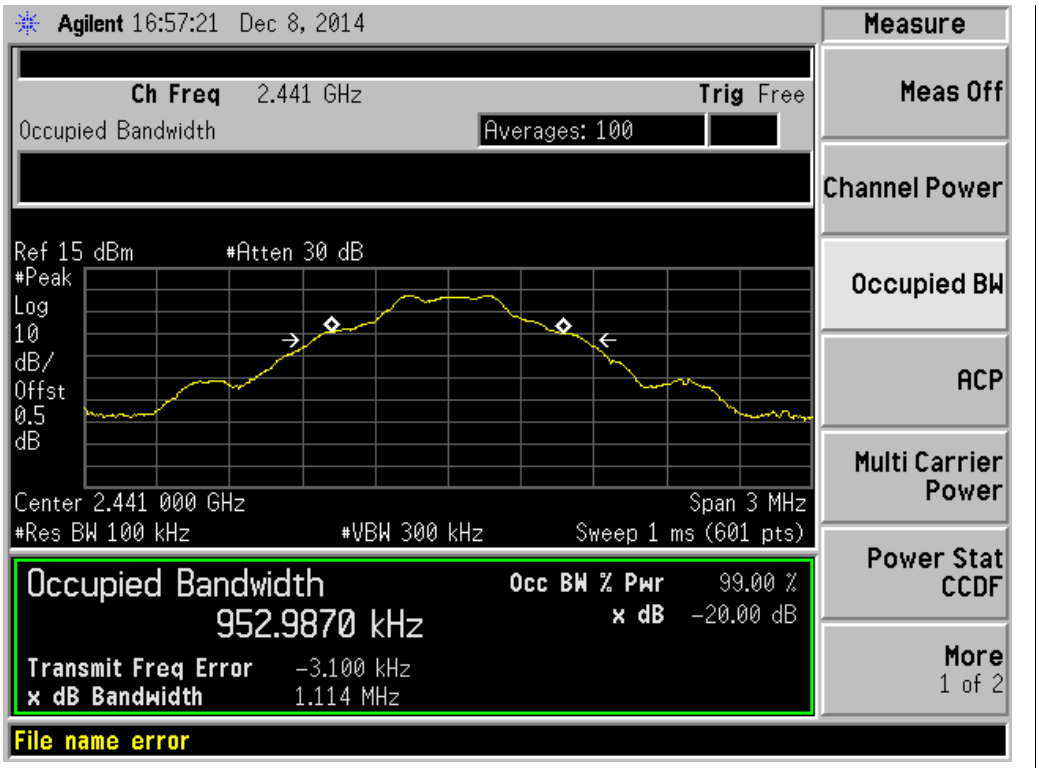
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.270	1.1584
Middle	2441	1.284	1.1567
High	2480	1.280	1.1574

Test plots

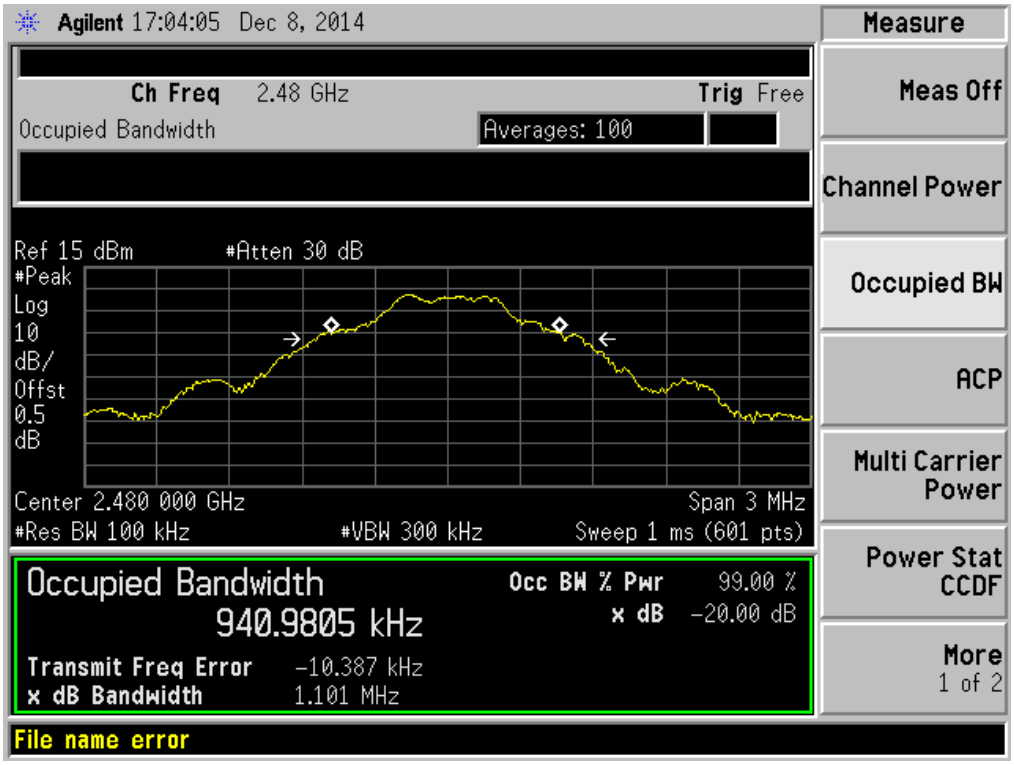
GFSK LOW CHANNEL



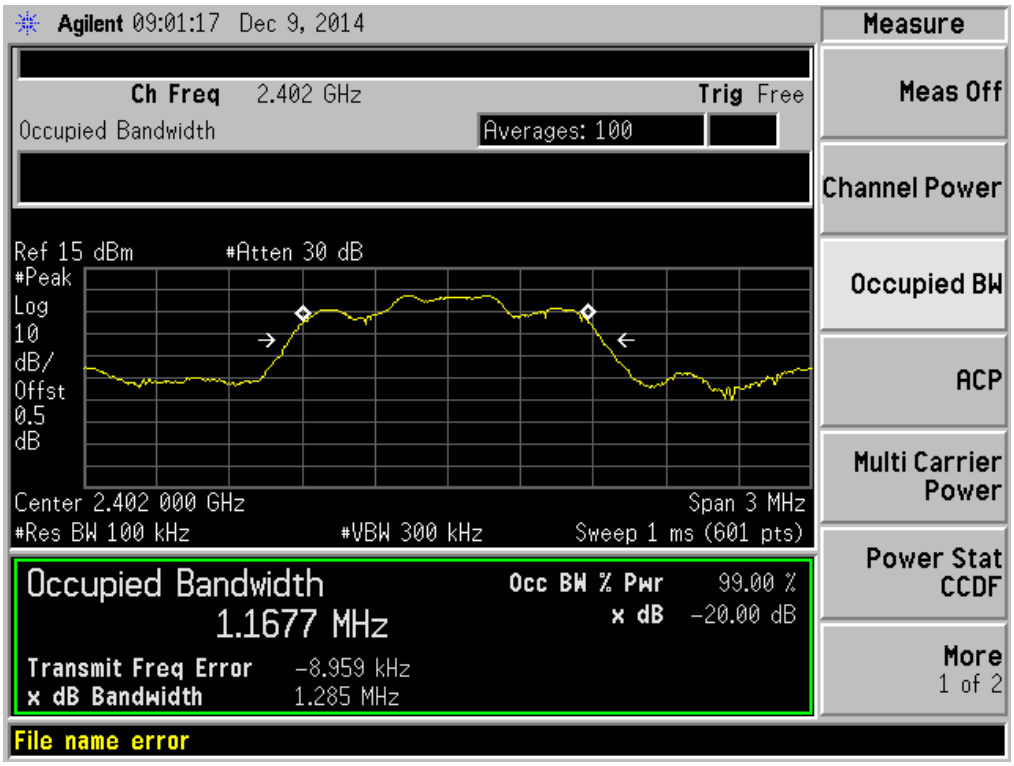
GFSK MID CHANAEL



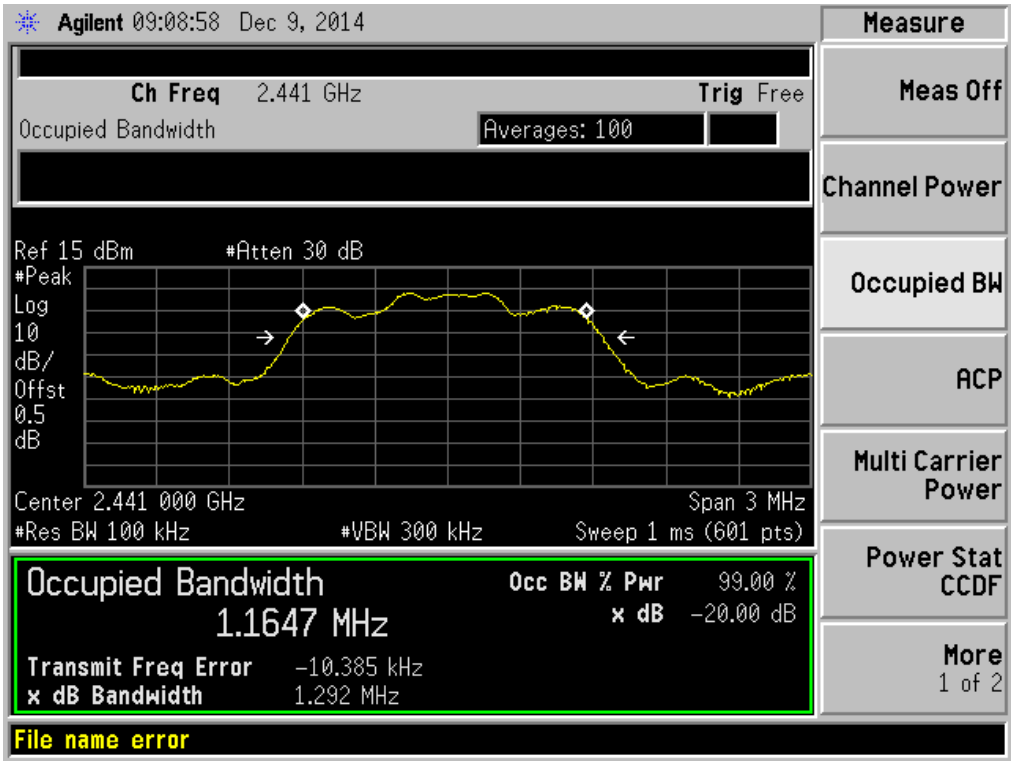
GFSK HIGH CHANNEL



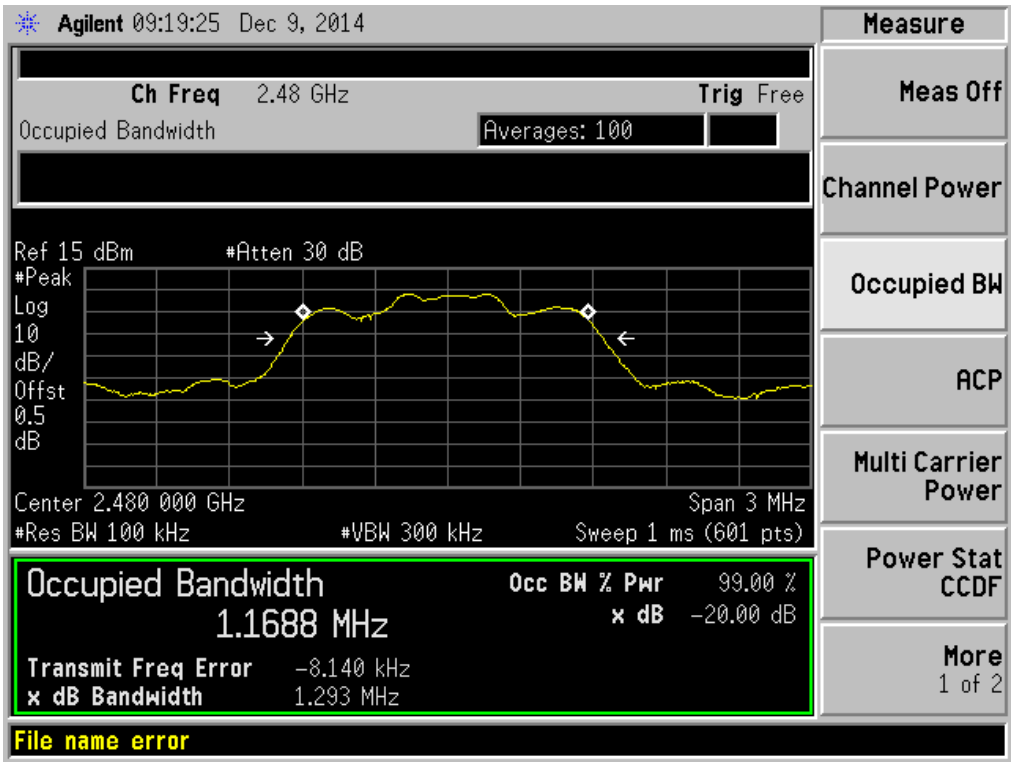
Π/4-DQPSK LOW CHANNEL



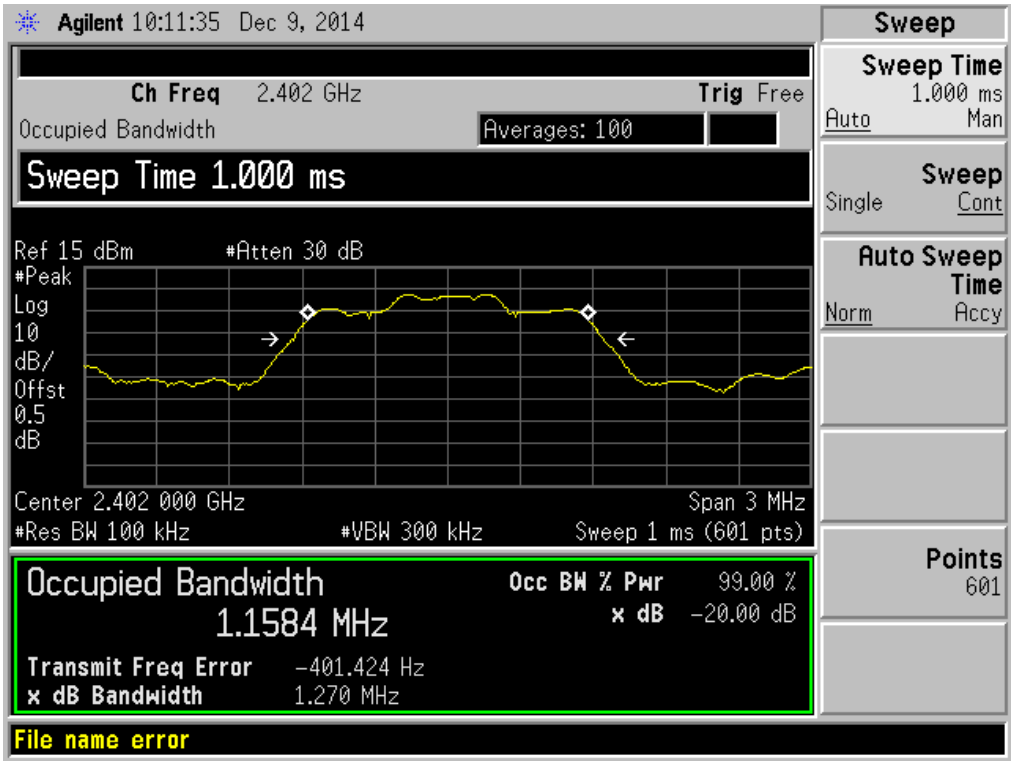
Π/4-DQPSK MID CHANAEL



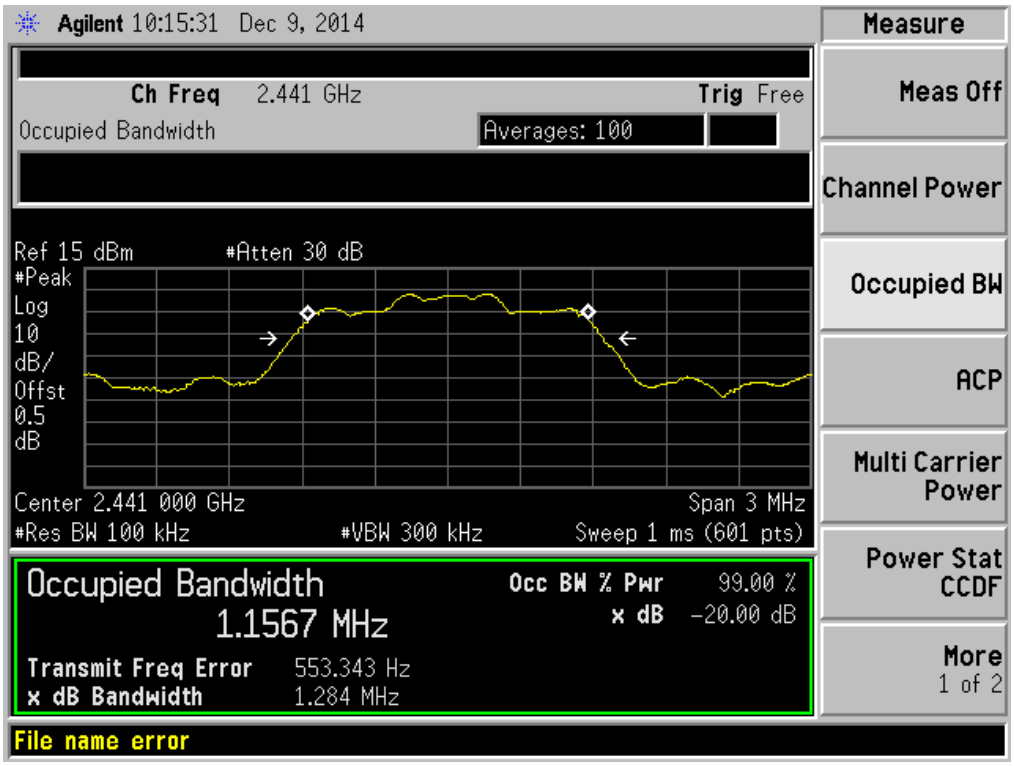
Π/4-DQPSK HIGH CHANNEL



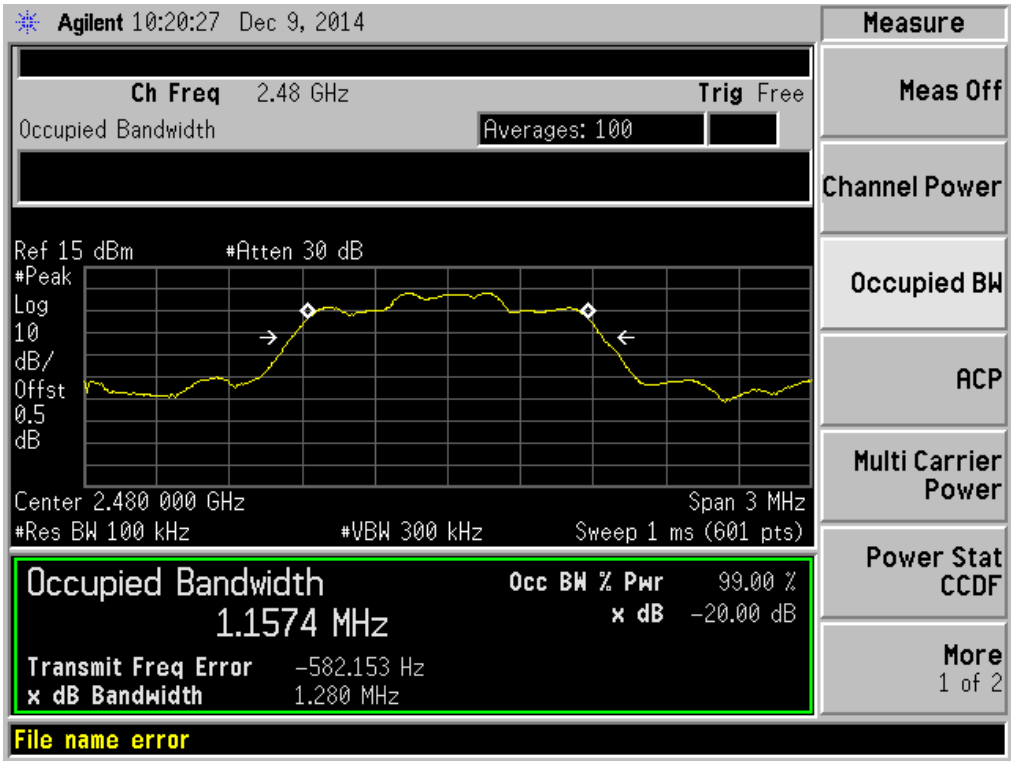
8-DPSK LOW CHANNEL



8-DPSK MID CHANAEL



8-DPSK HIGH CHANNEL



A.4 Average Time of Occupancy

Test Data

GFSK Mode:

DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.373	119.460	0.4	PASS
DH 3	1.617	258.728	0.4	PASS
DH 5	2.840	302.943	0.4	PASS

∏/4-DQPSK Mode:

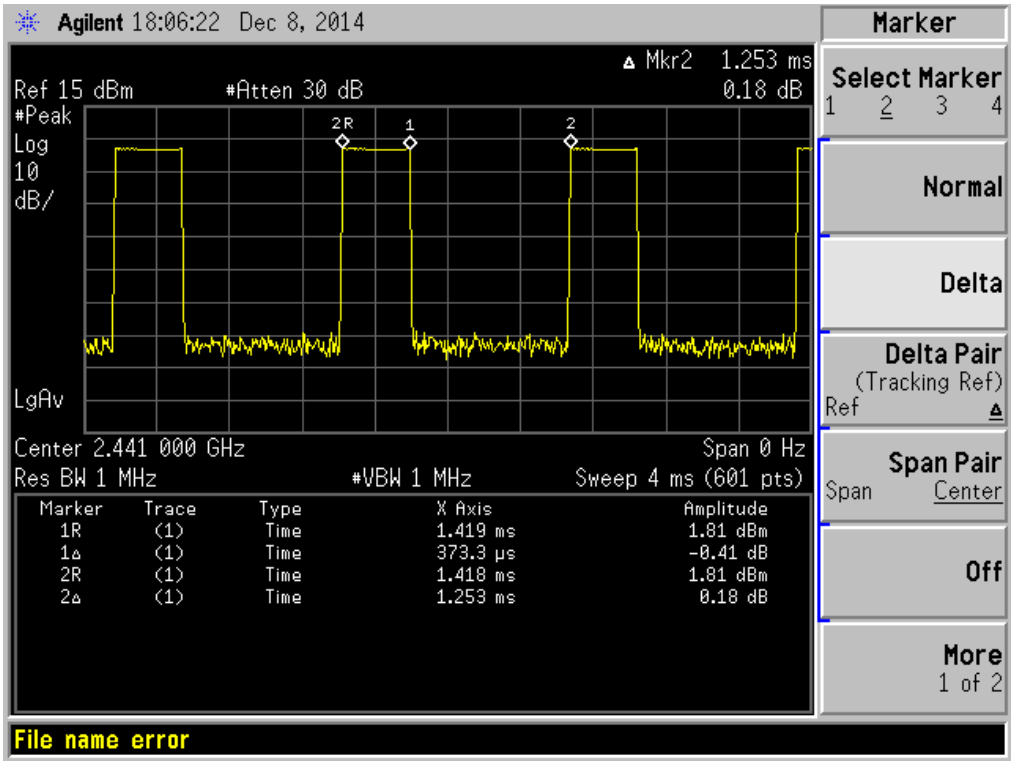
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.379	121.284	0.4	PASS
DH 3	1.630	260.808	0.4	PASS
DH 5	2.860	305.076	0.4	PASS

8-DPSK Mode:

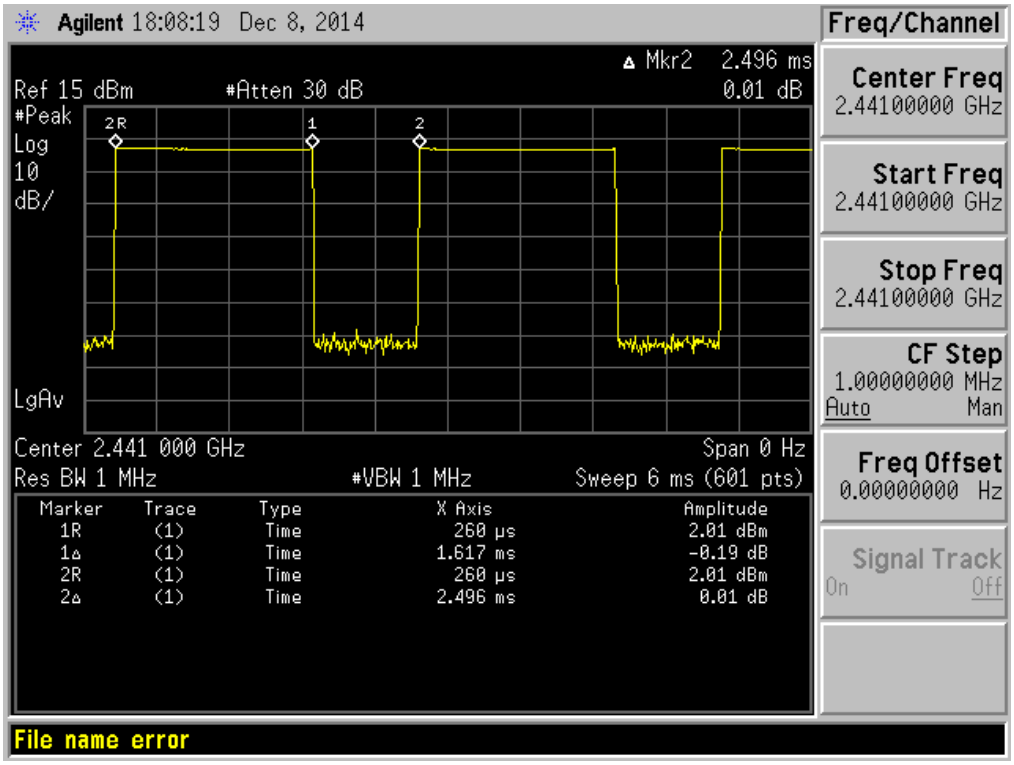
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.373	119.364	0.4	PASS
DH 3	1.620	259.208	0.4	PASS
DH 5	2.867	305.823	0.4	PASS

Test Plots

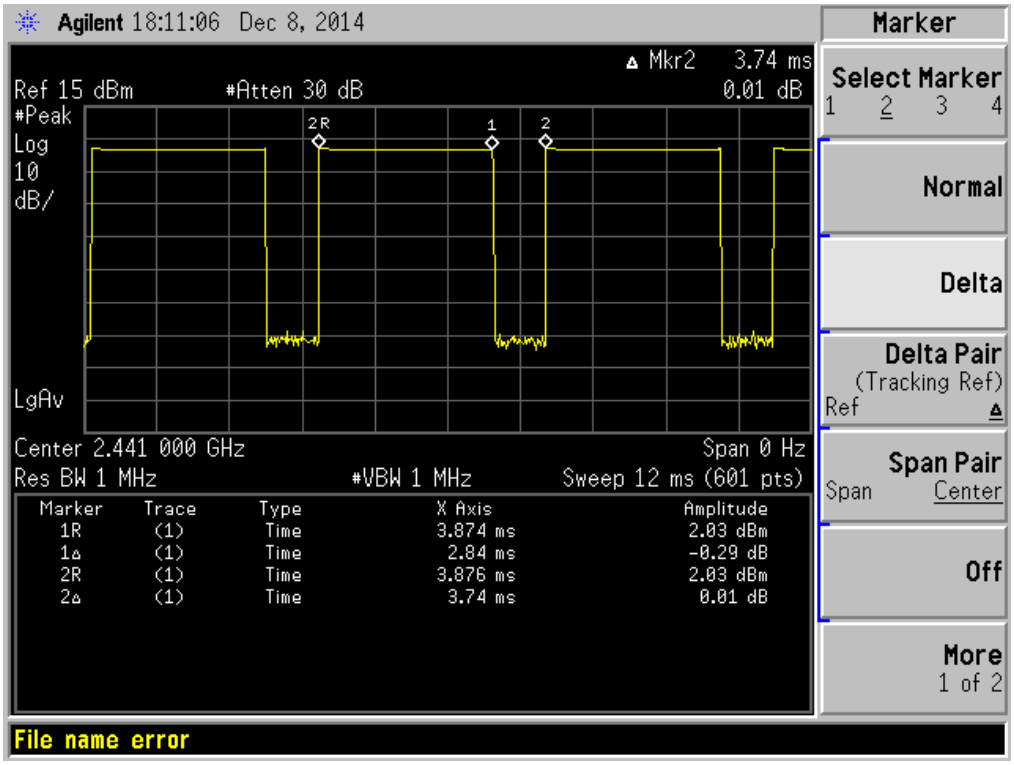
GFSK DH1



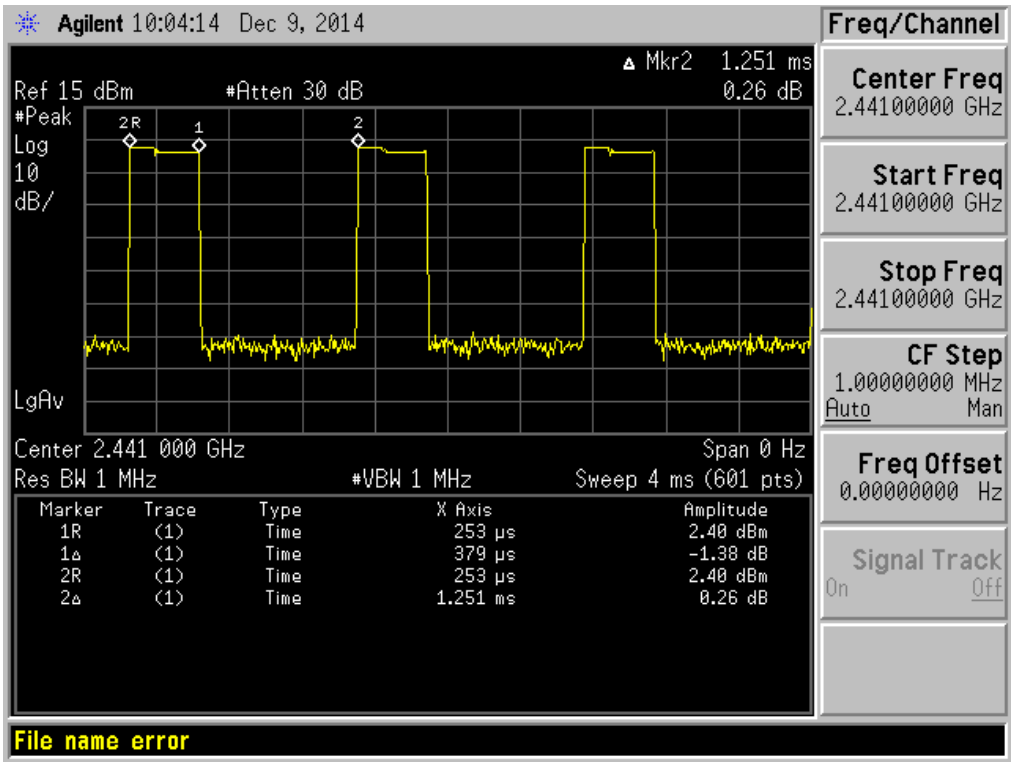
GFSK DH3



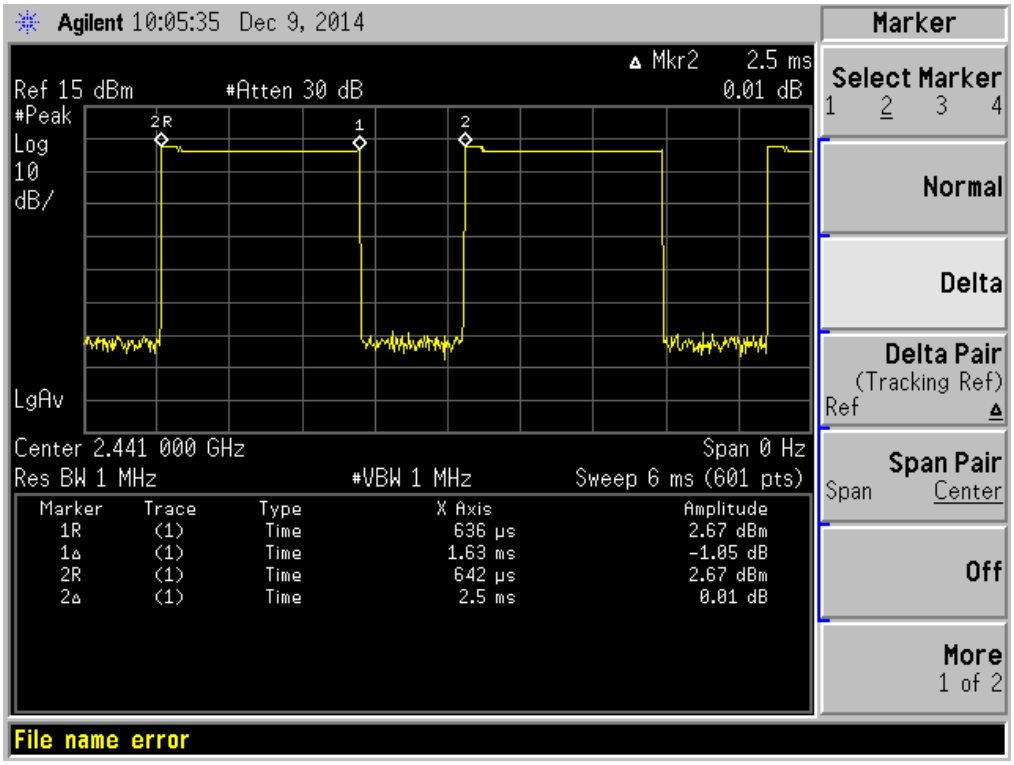
GFSK DH5



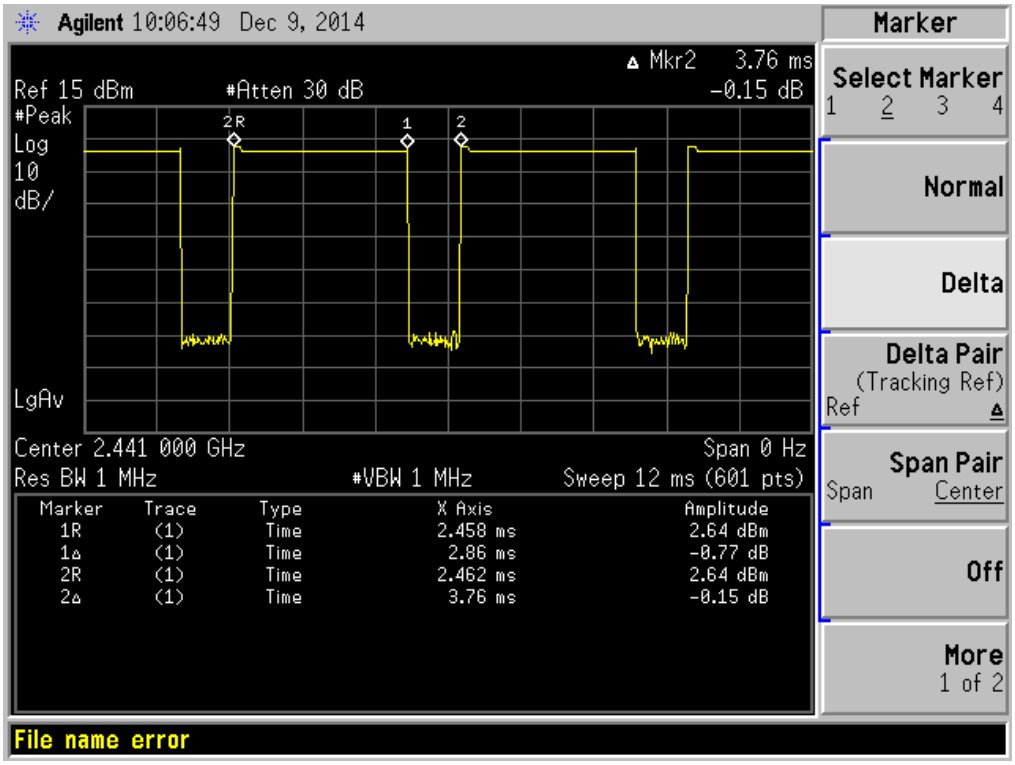
Π/4-DQPSK DH1



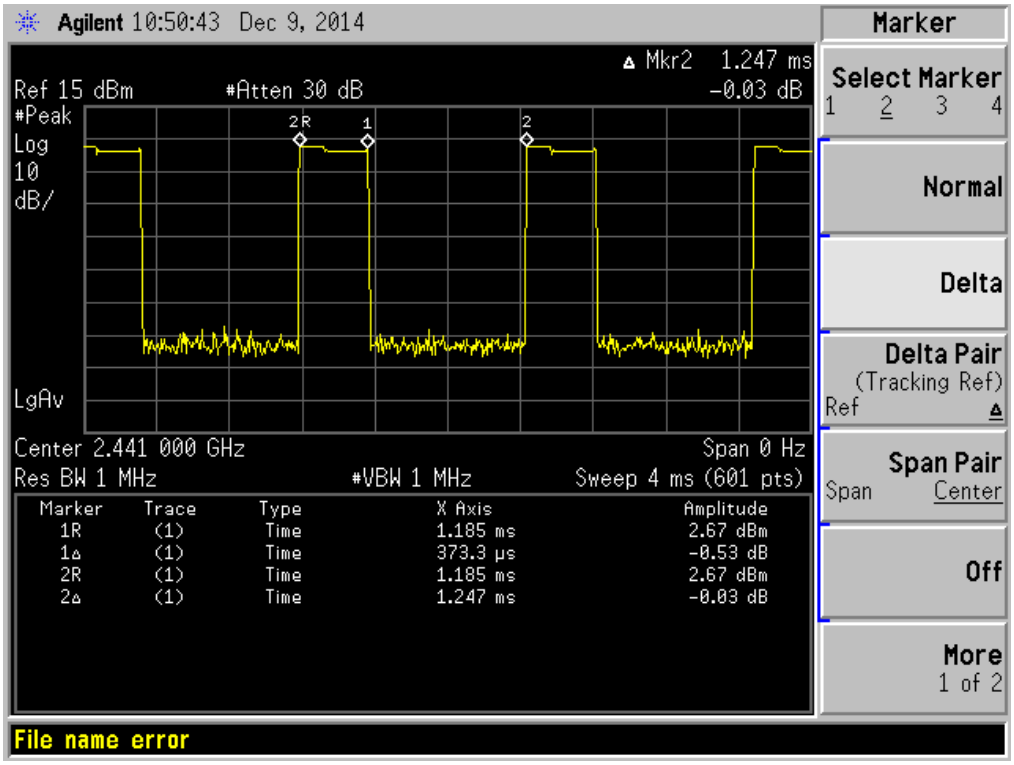
Π/4-DQPSK DH3



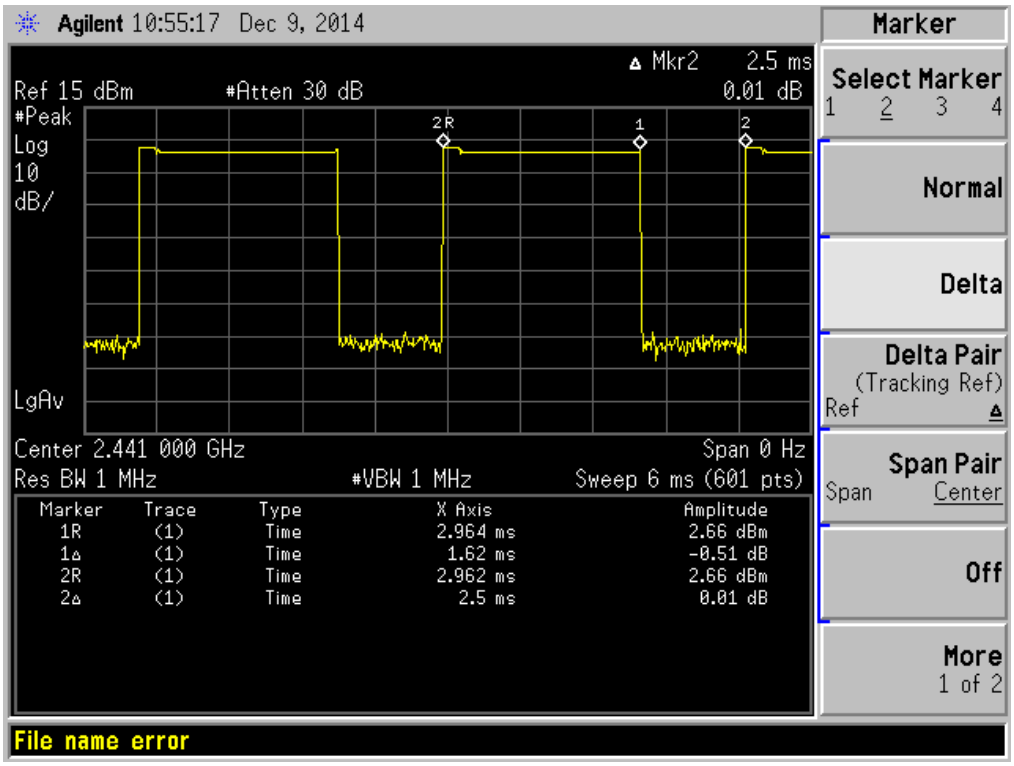
Π/4-DQPSK DH5



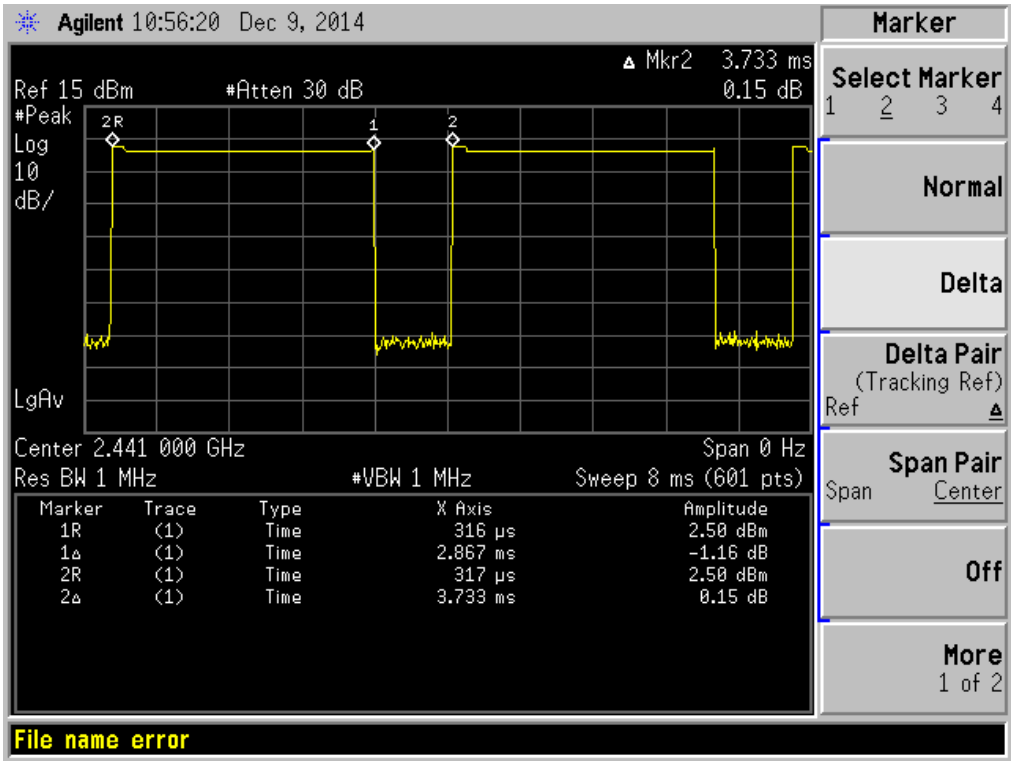
8-DPSK DH1



8-DPSK DH3



8-DPSK DH5


Agilent 10:56:20 Dec 9, 2014
Marker
Mkr2 3.733 ms
Ref 15 dBm
#Atten 30 dB
0.15 dB
#Peak
Log
10
dB/
2R
1
2
LgAv
Center 2.441 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 8 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 316 µs 2.50 dBm
1Δ (1) Time 2.867 ms -1.16 dB
2R (1) Time 317 µs 2.50 dBm
2Δ (1) Time 3.733 ms 0.15 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File name error

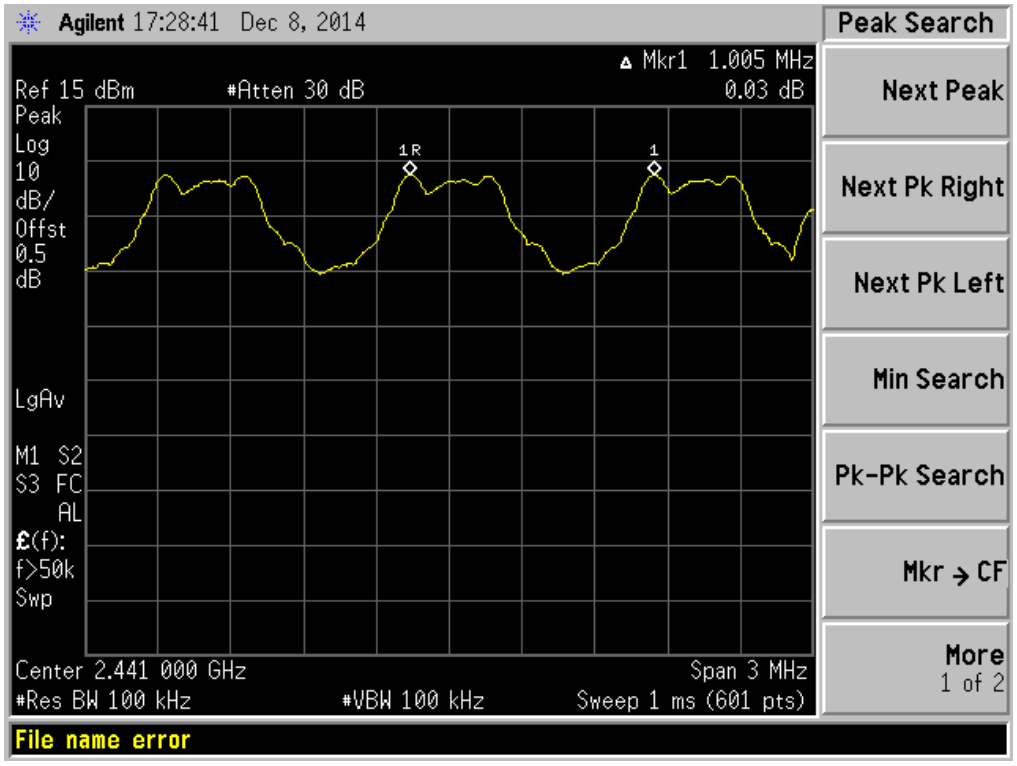
A.5 Hopping Frequency Separation

Test Data

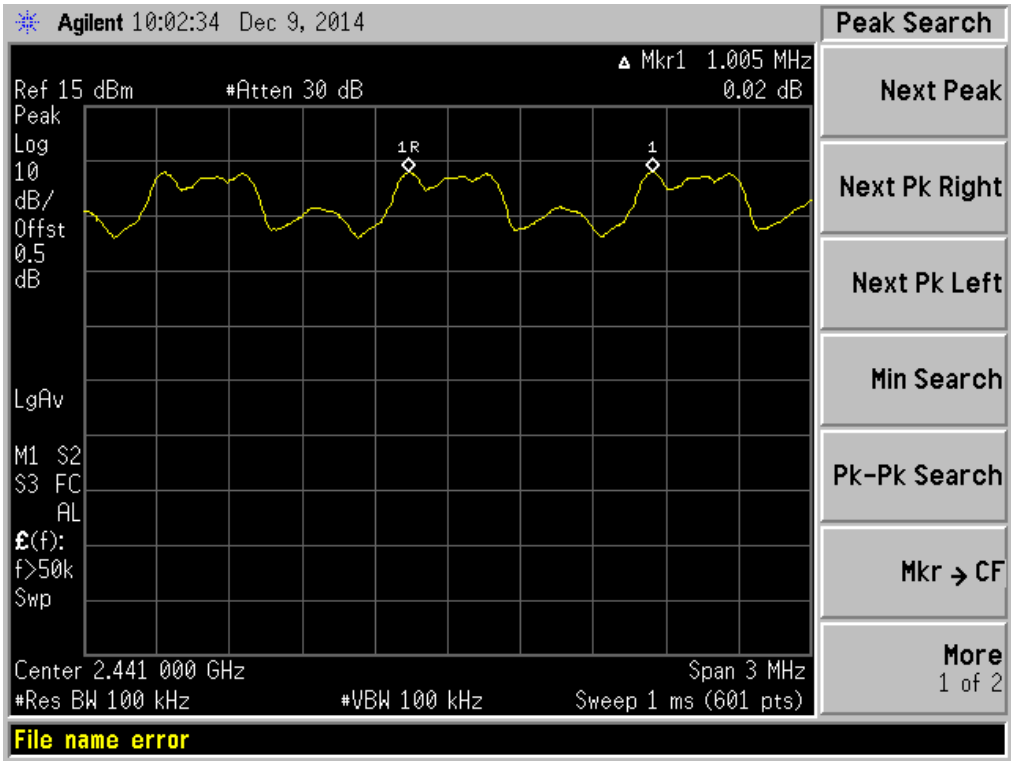
Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Two-thirds of the 20dB bandwidth (MHz)	Verdict
GFSK	1.005	1.114	0.743	PASS
Π/4-DQPSK Mode	1.005	1.293	0.862	PASS
8-DPSK Mode	1.005	1.284	0.856	PASS

Test plots

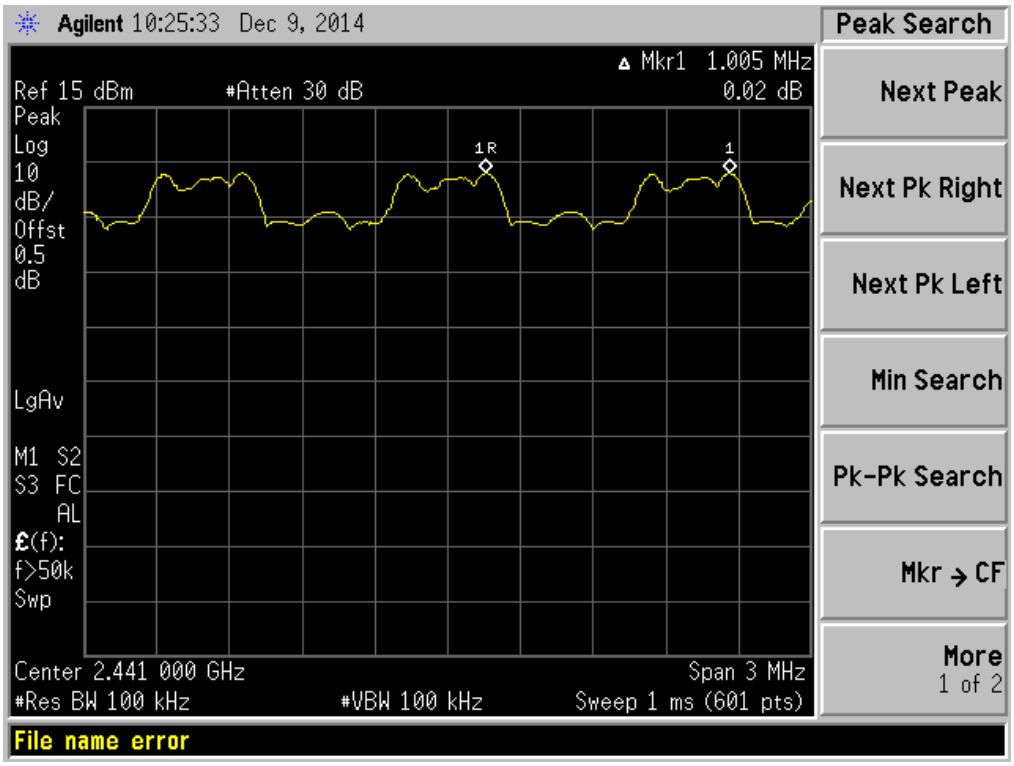
GFSK



Π/4-DQPSK



8-DPSK



A.6 Conducted Spurious Emissions

Test Data

GFSK Mode:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated 20 dBc Limit	
Low	2402	-51.84	1.78	-18.2	PASS
Middle	2441	-47.73	2.28	-17.7	PASS
High	2480	-49.47	2.10	-17.9	PASS

∏/4-DQPSK Mode:

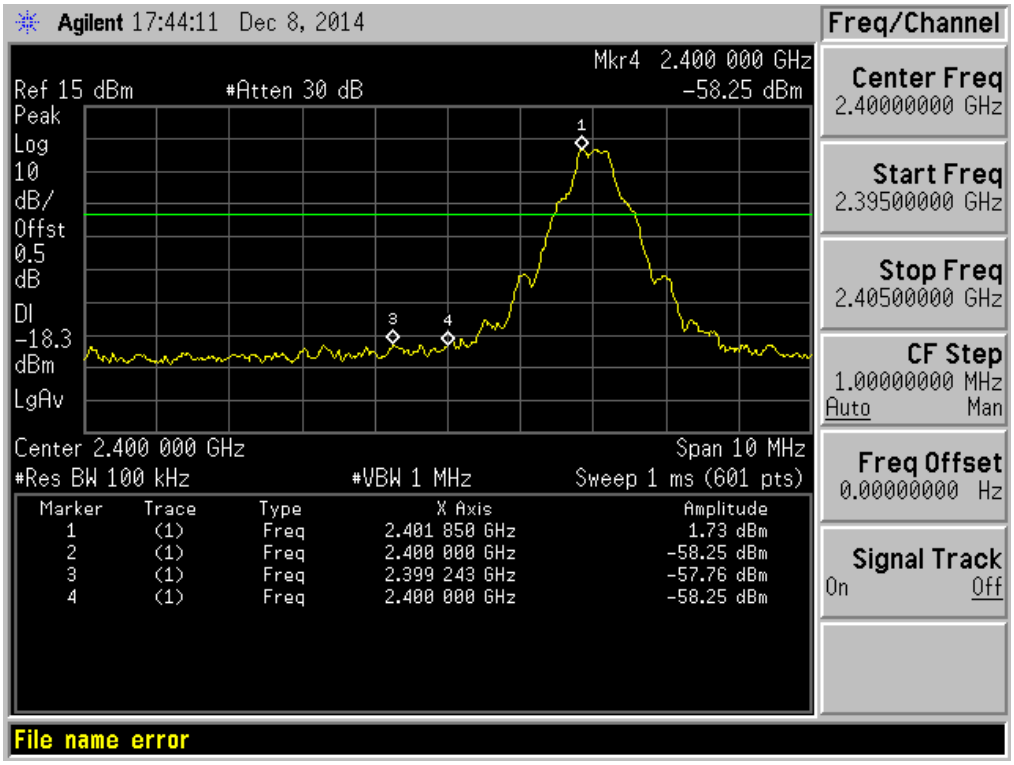
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated 20 dBc Limit	
Low	2402	-53.82	2.25	-18.7	PASS
Middle	2441	-51.95	1.74	-18.3	PASS
High	2480	-53.95	1.61	-18.4	PASS

8-DPSK Mode:

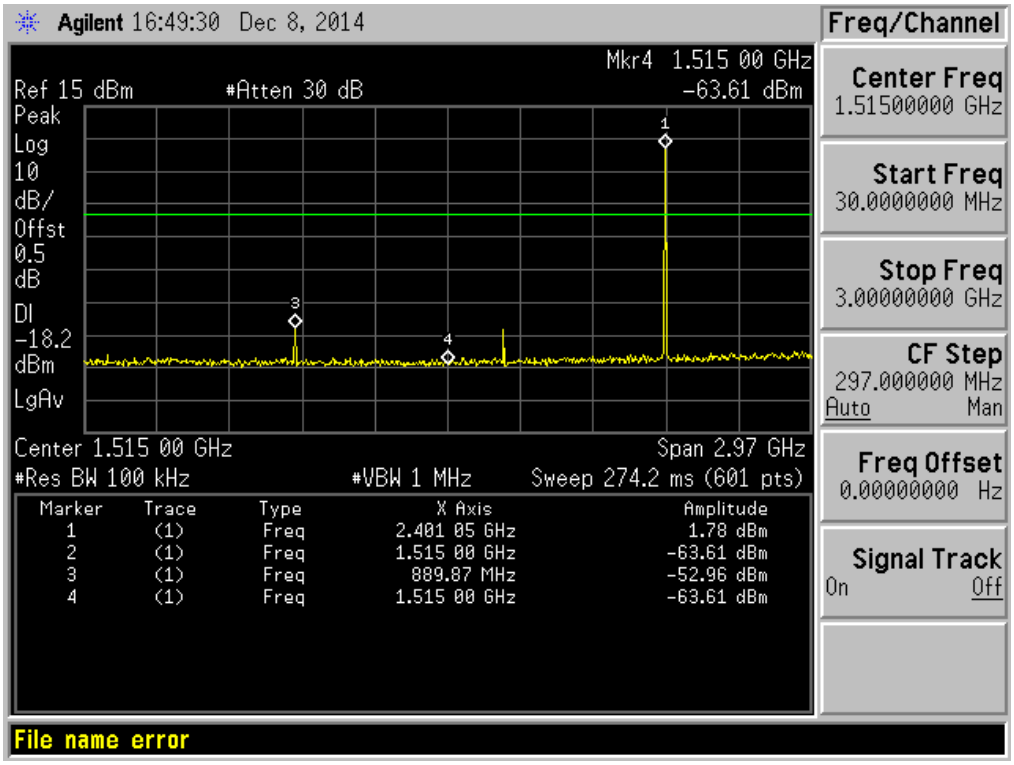
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated 20 dBc Limit	
Low	2402	-52.28	1.28	-18.7	PASS
Middle	2441	-51.37	1.70	-18.3	PASS
High	2480	-51.84	1.49	-18.5	PASS

Test Plots

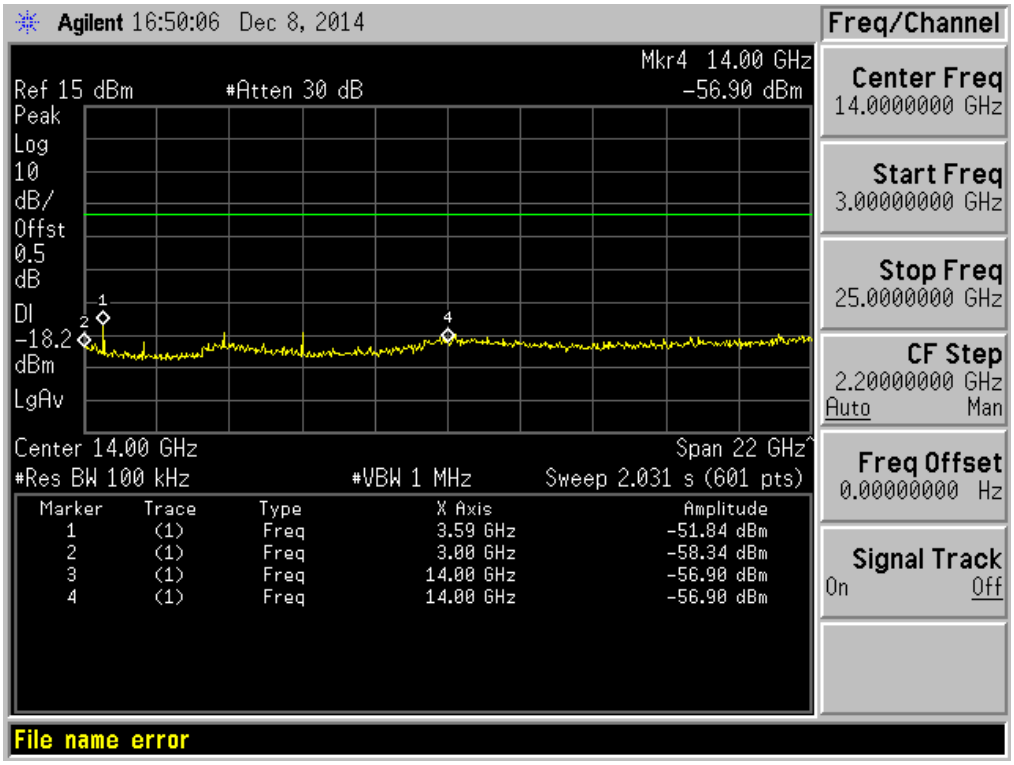
GFSK LOW CHANNEL , BANDEDGE



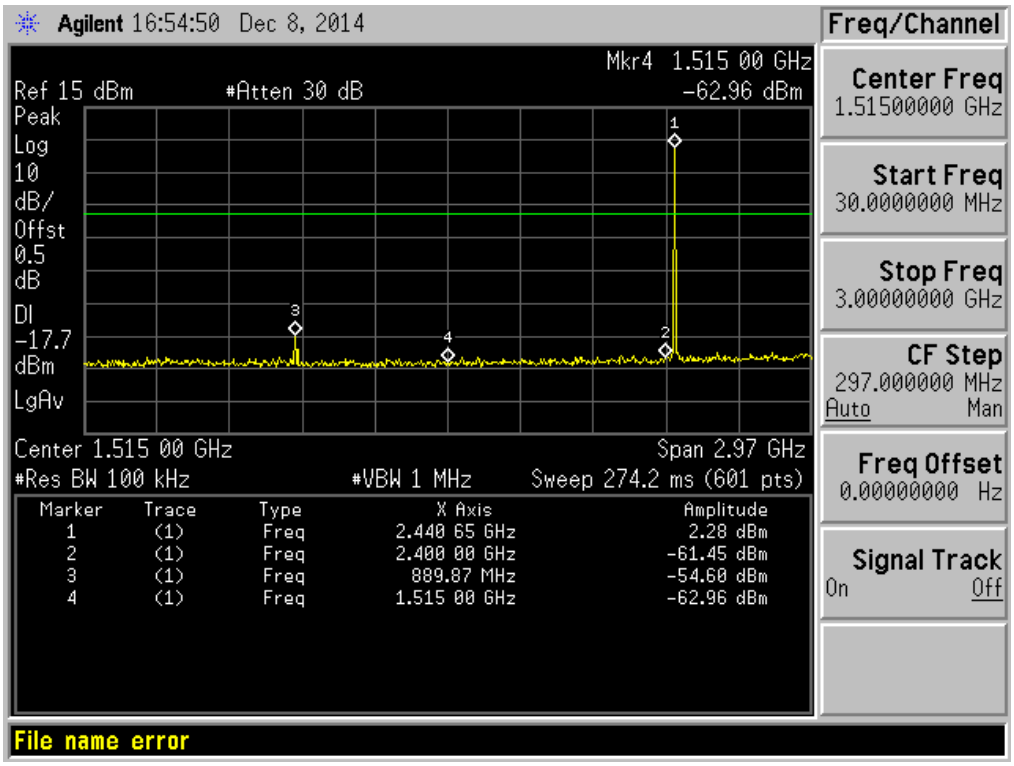
GFSK LOW CHANNEL , SPURIOUS 30MHz~3GHz



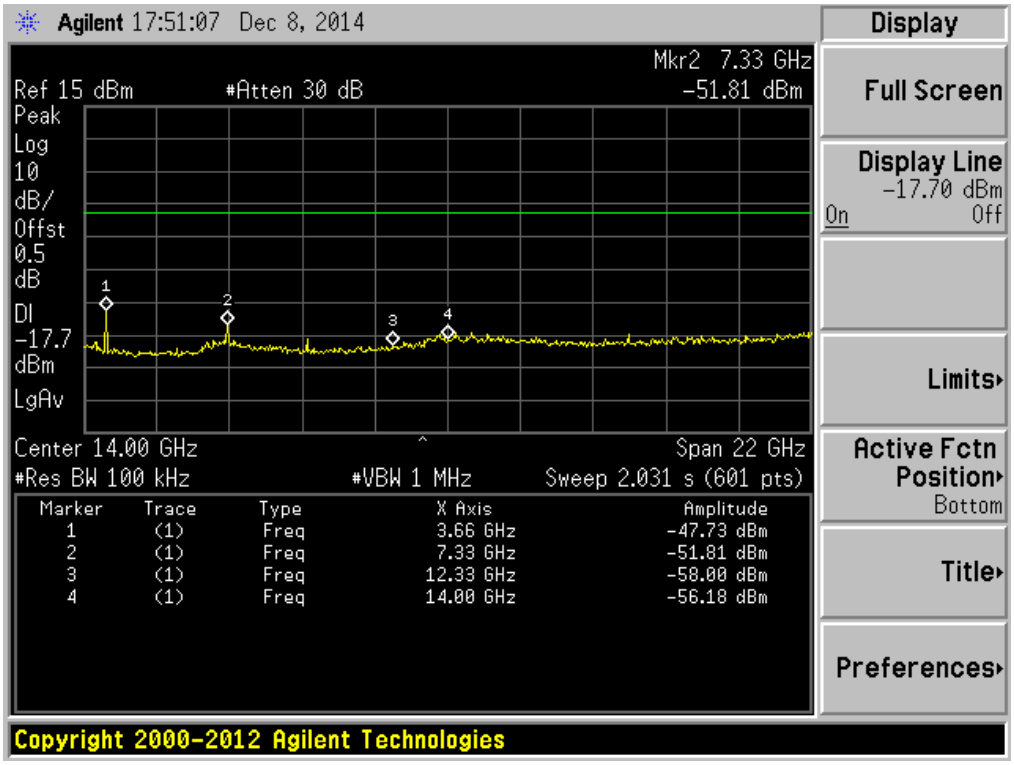
GFSK LOW CHANNEL , SPURIOUS 3GHz~25GHz



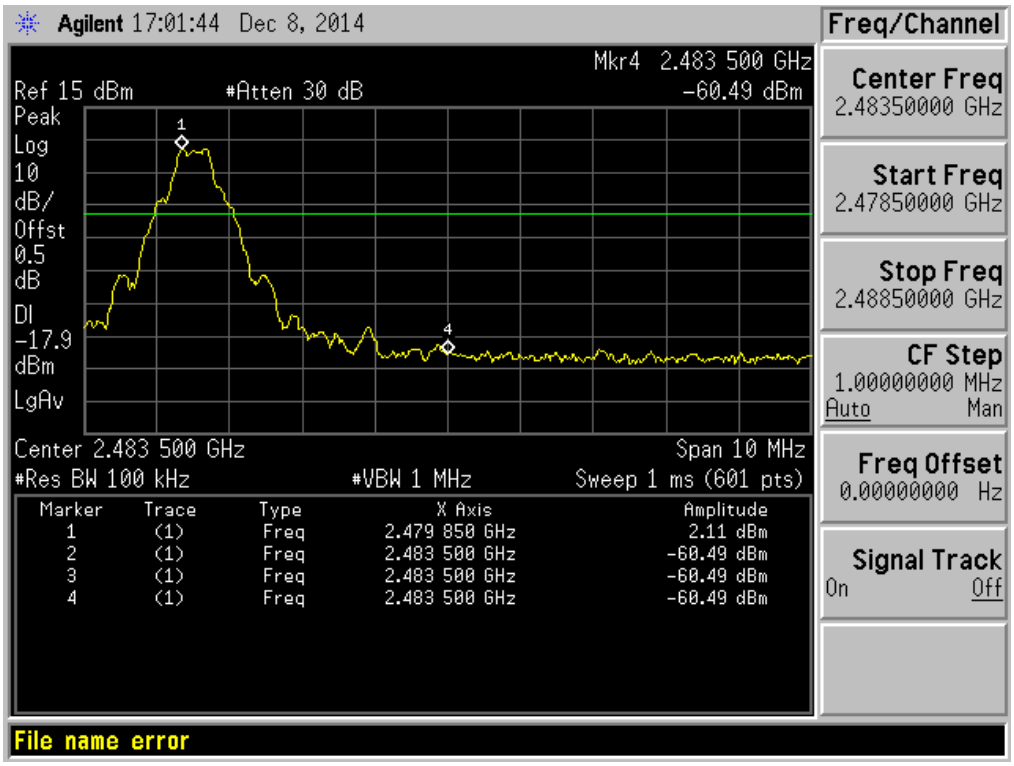
GFSK MID CHANNEL , SPURIOUS 30MHz~3GHz



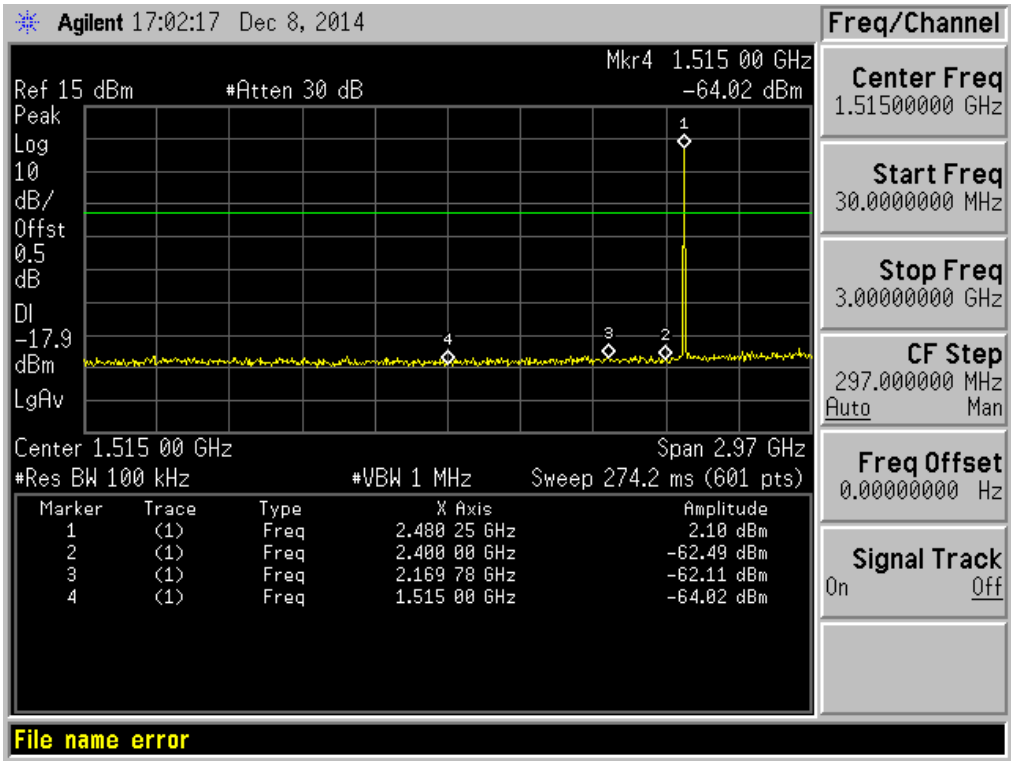
GFSK MID CHANNEL , SPURIOUS 3GHz~25GHz



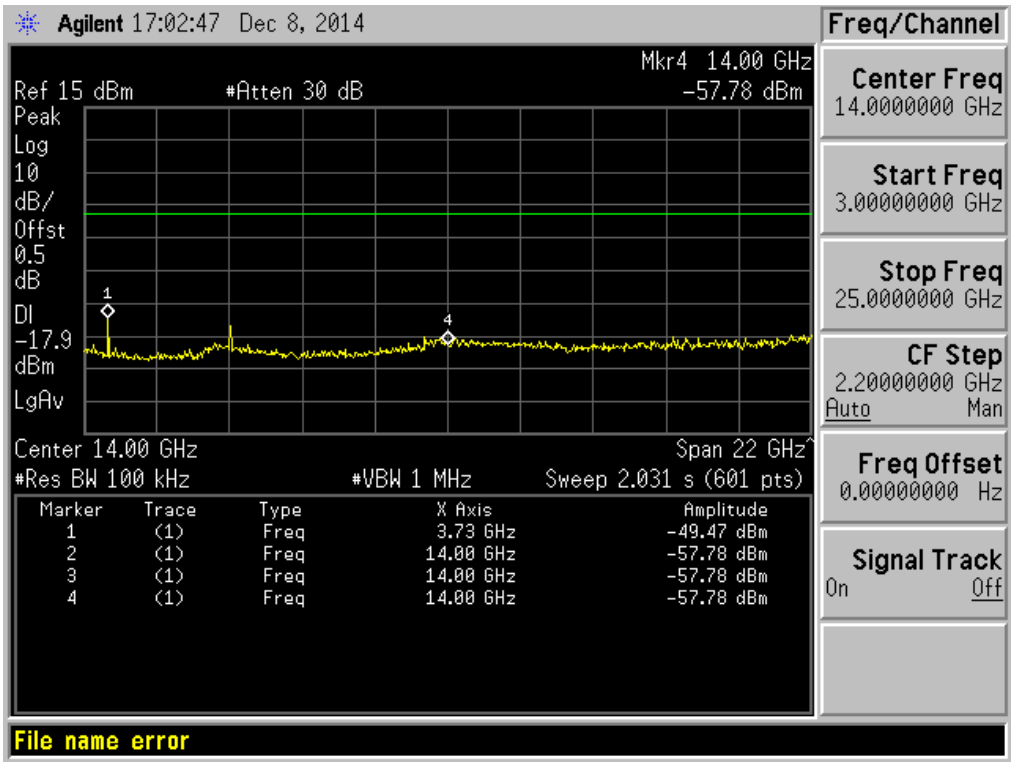
GFSK HIGH CHANNEL , BANDEDGE



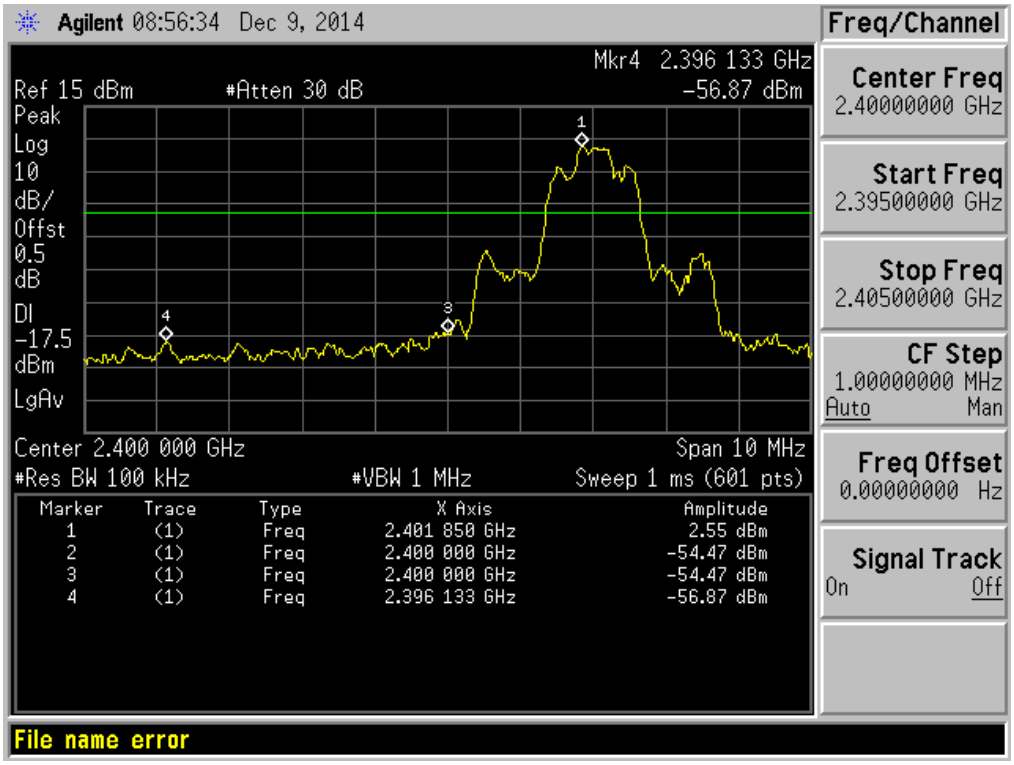
GFSK HIGH CHANNEL , SPURIOUS 30MHz~3GHz



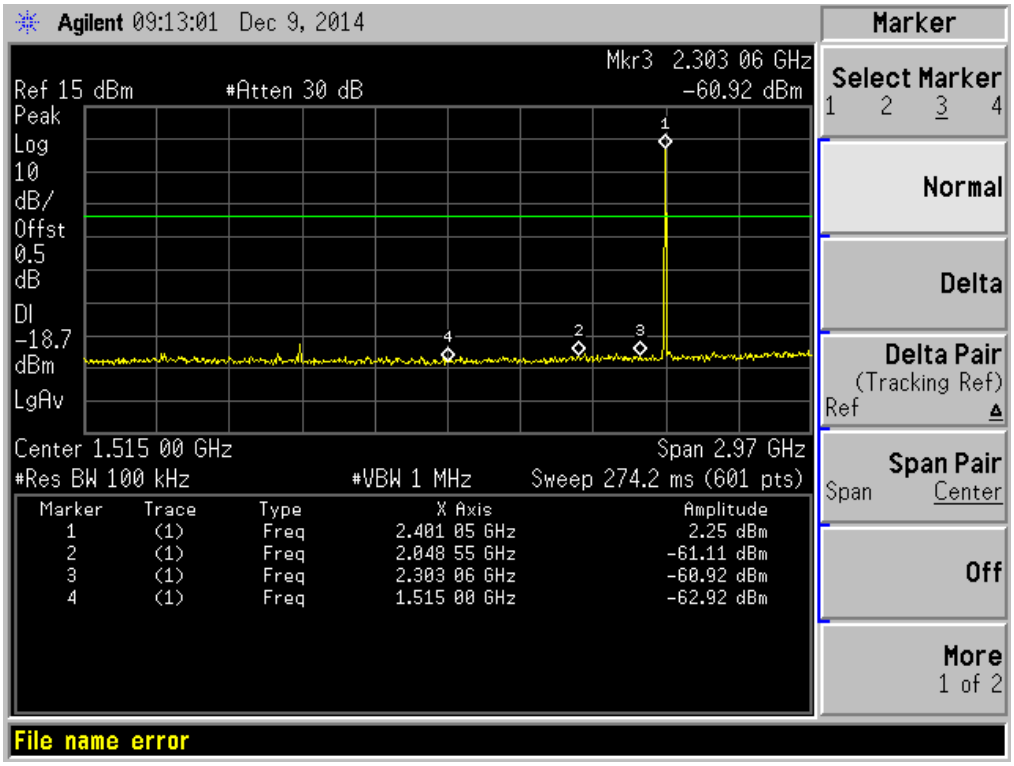
GFSK HIGH CHANNEL , SPURIOUS 3GHz~25GHz



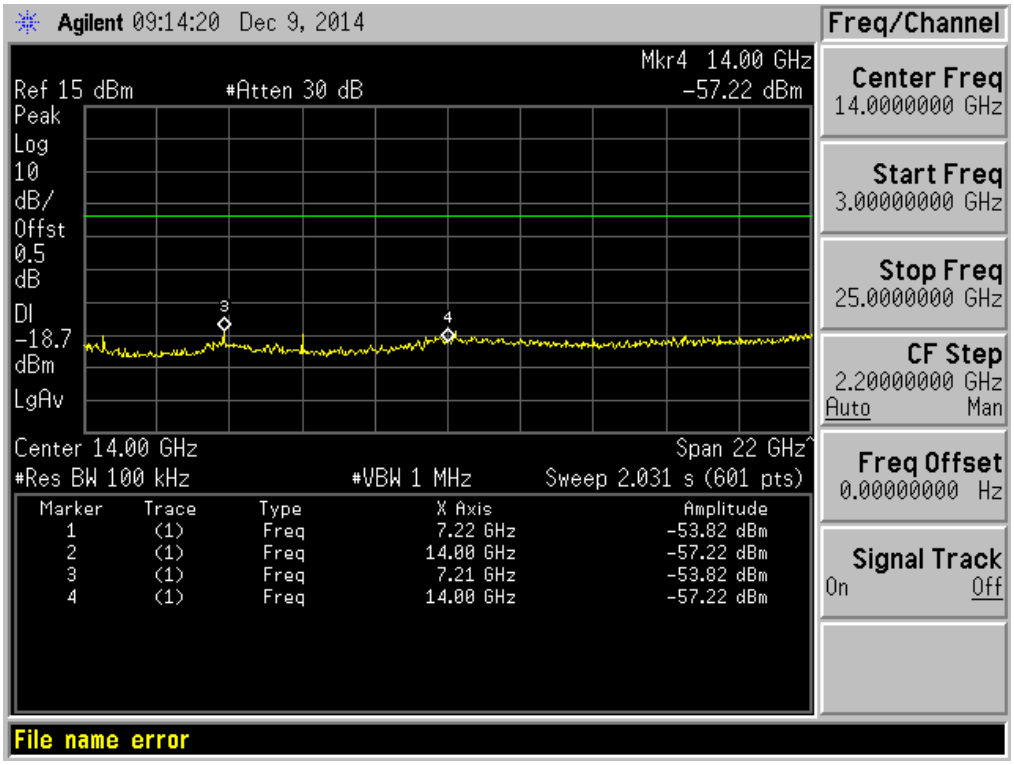
Π/4-DQPSK LOW CHANNEL , BANDEDGE



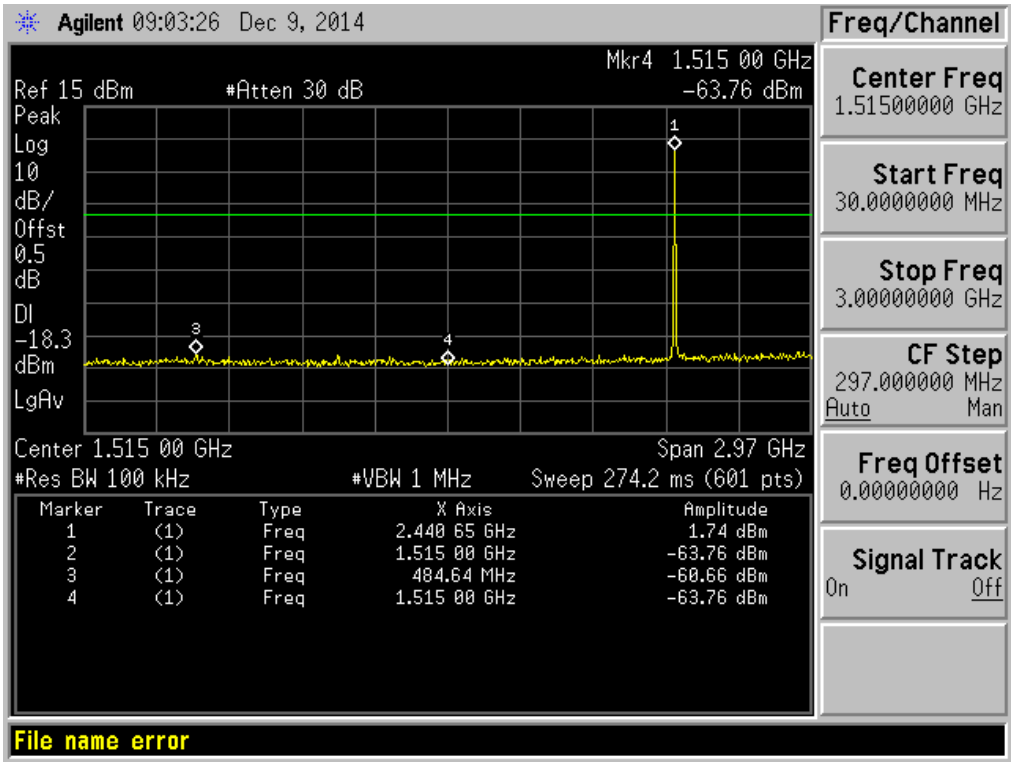
Π/4-DQPSK LOW CHANNEL , SPURIOUS 30MHz~3GHz



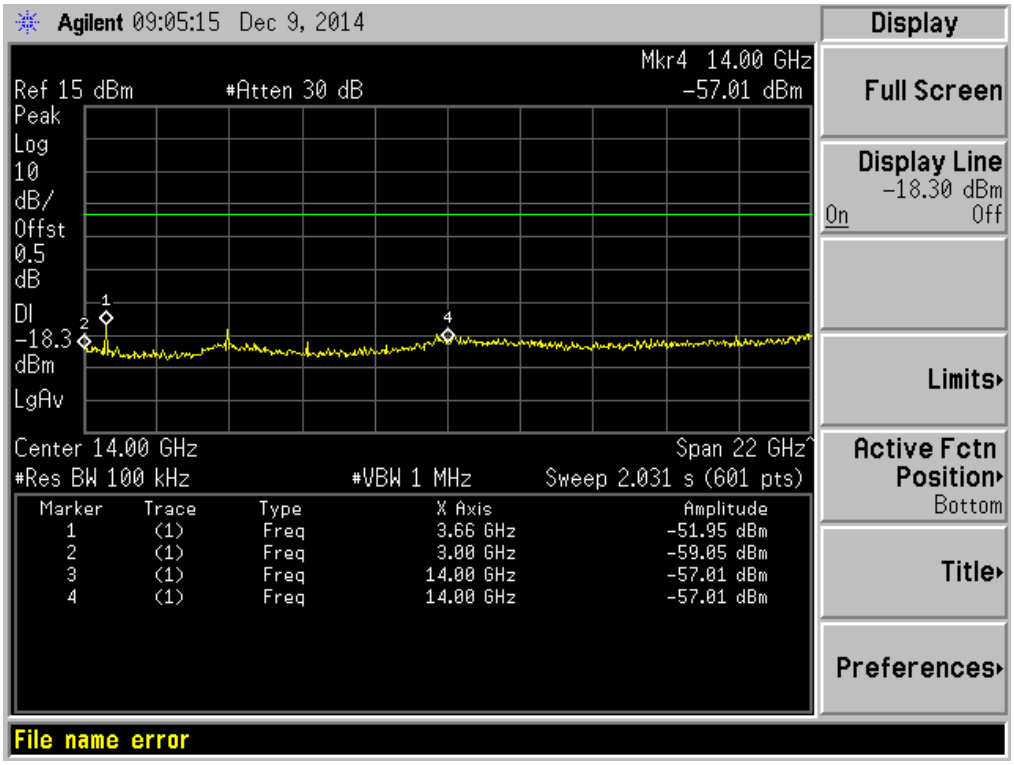
Π/4-DQPSK LOW CHANNEL , SPURIOUS 3GHz~25GHz



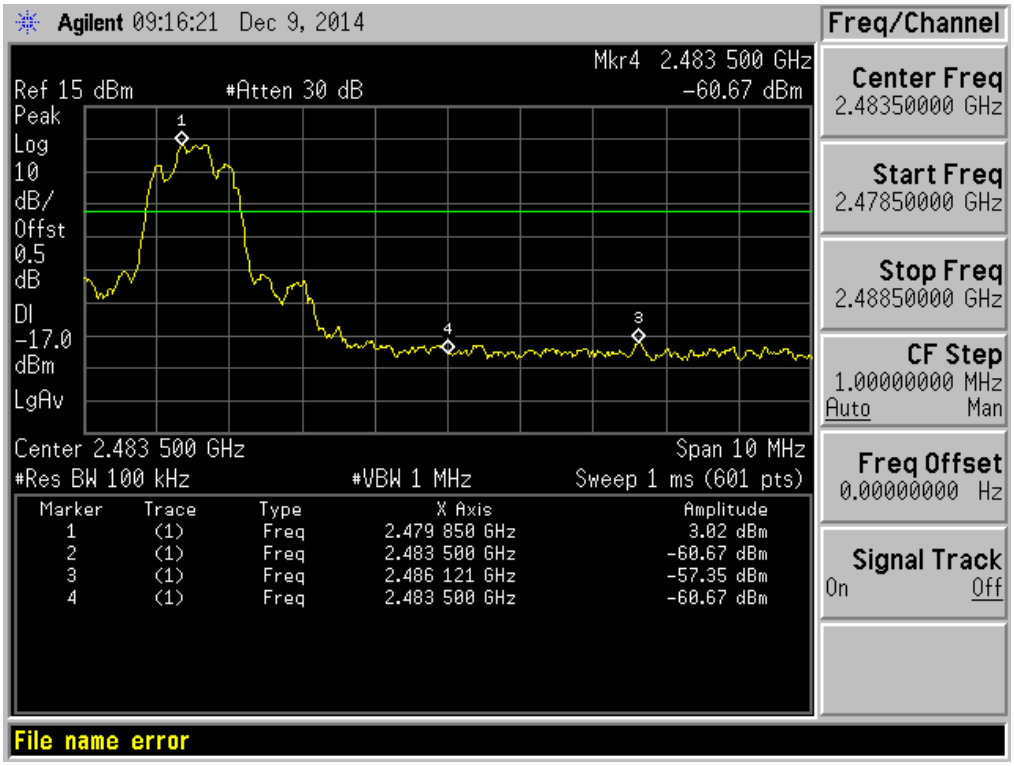
Π/4-DQPSK MID CHANNEL , SPURIOUS 30MHz~3GHz



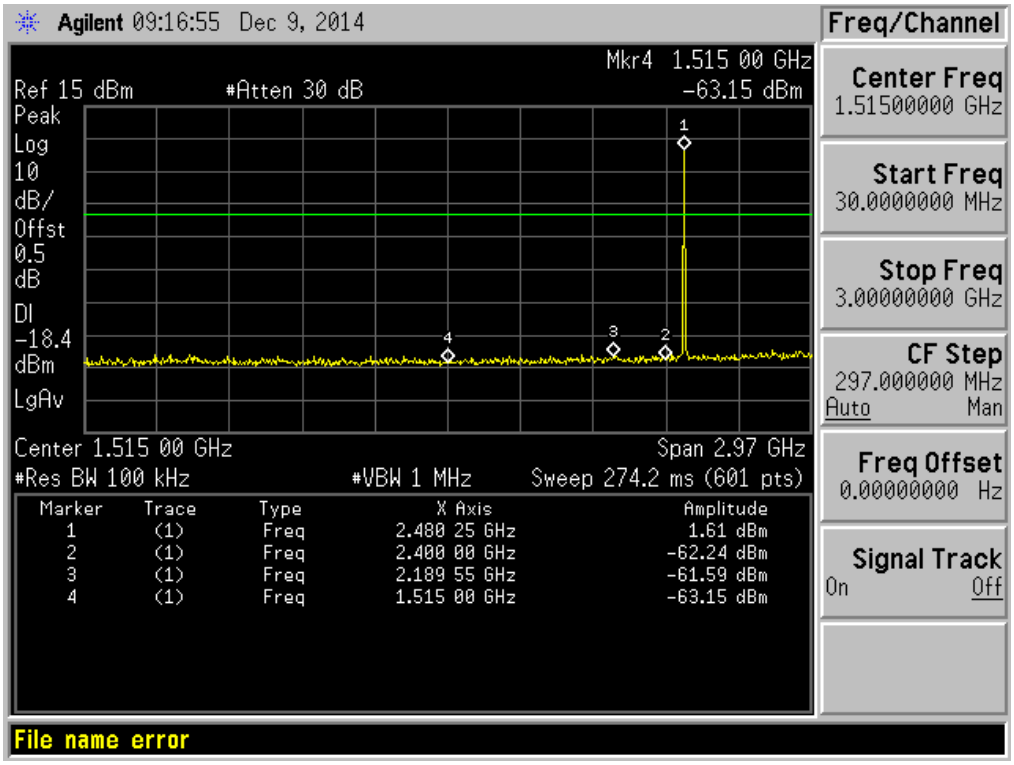
Π/4-DQPSK MID CHANNEL , SPURIOUS 3GHz~25GHz



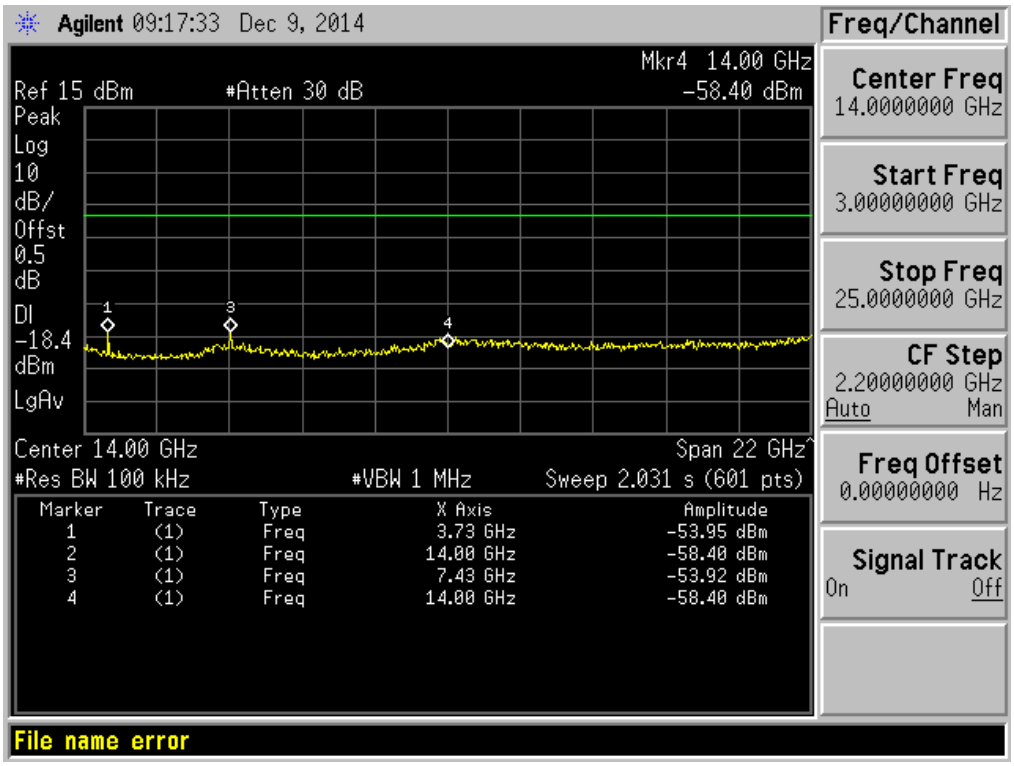
Π/4-DQPSK HIGH CHANNEL , BANDEDGE



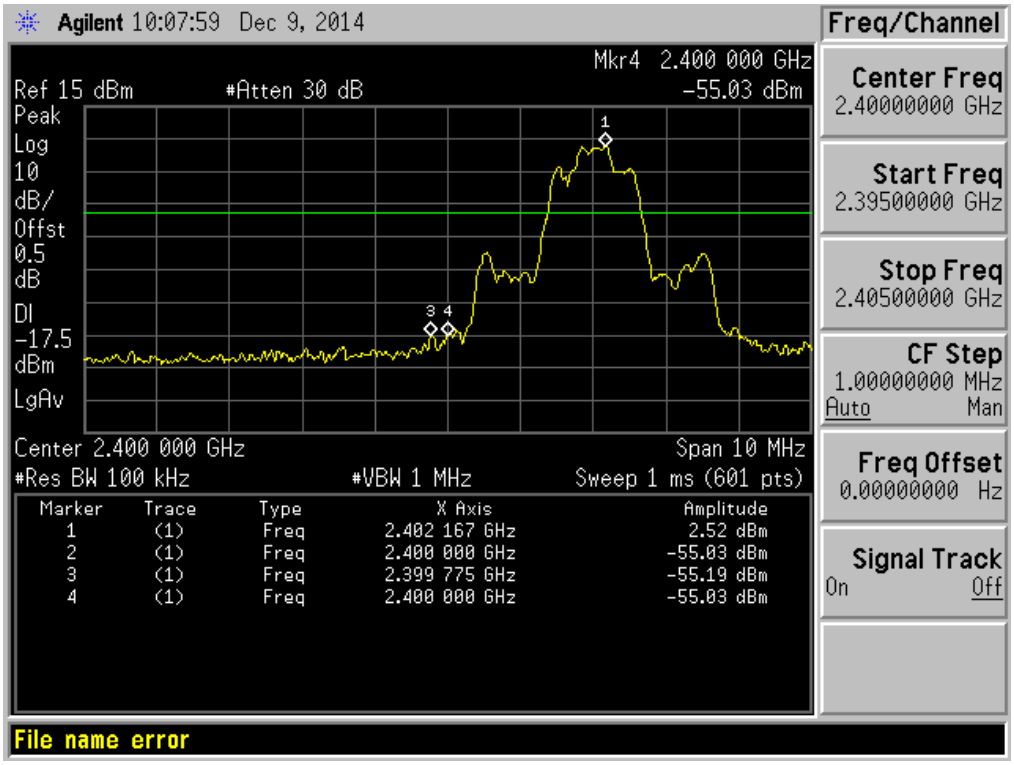
Π/4-DQPSK HIGH CHANNEL , SPURIOUS 30MHz~3GHz



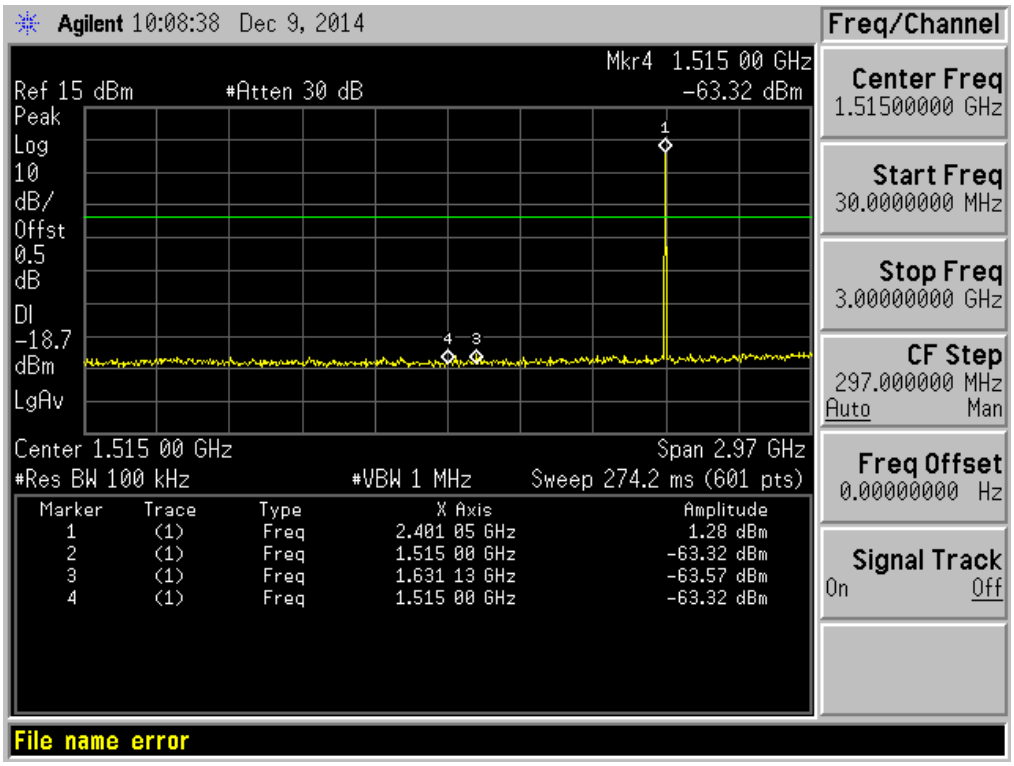
Π/4-DQPSK HIGH CHANNEL , SPURIOUS 3GHz~25GHz



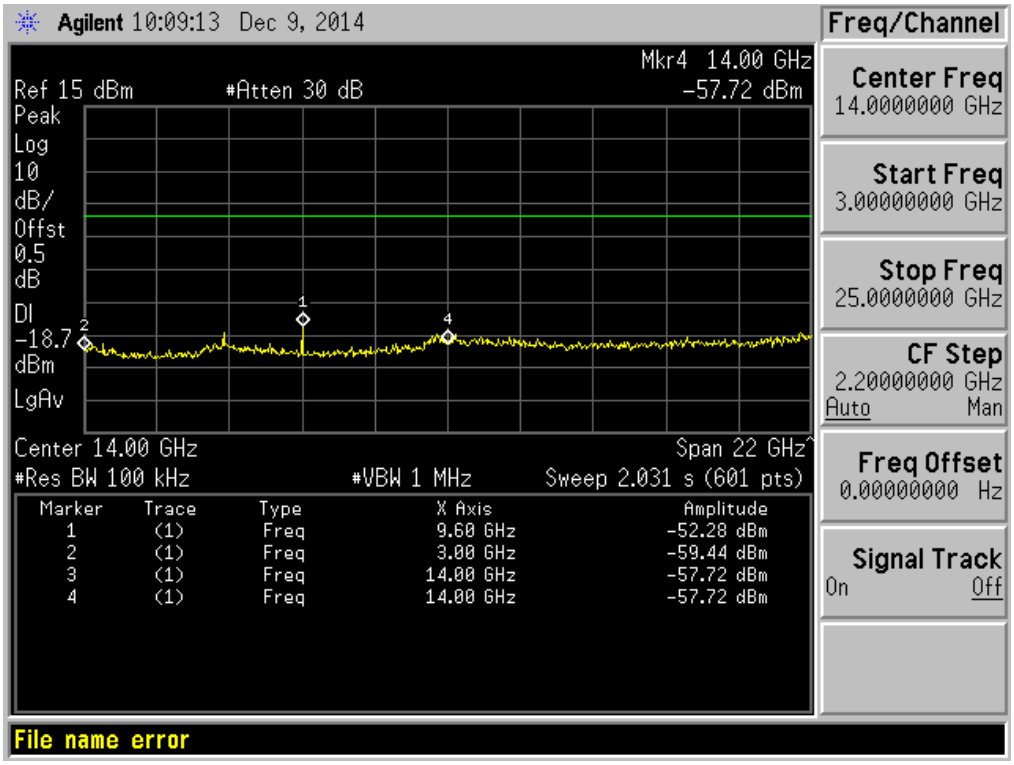
8-DPSK LOW CHANNEL , BANDEDGE



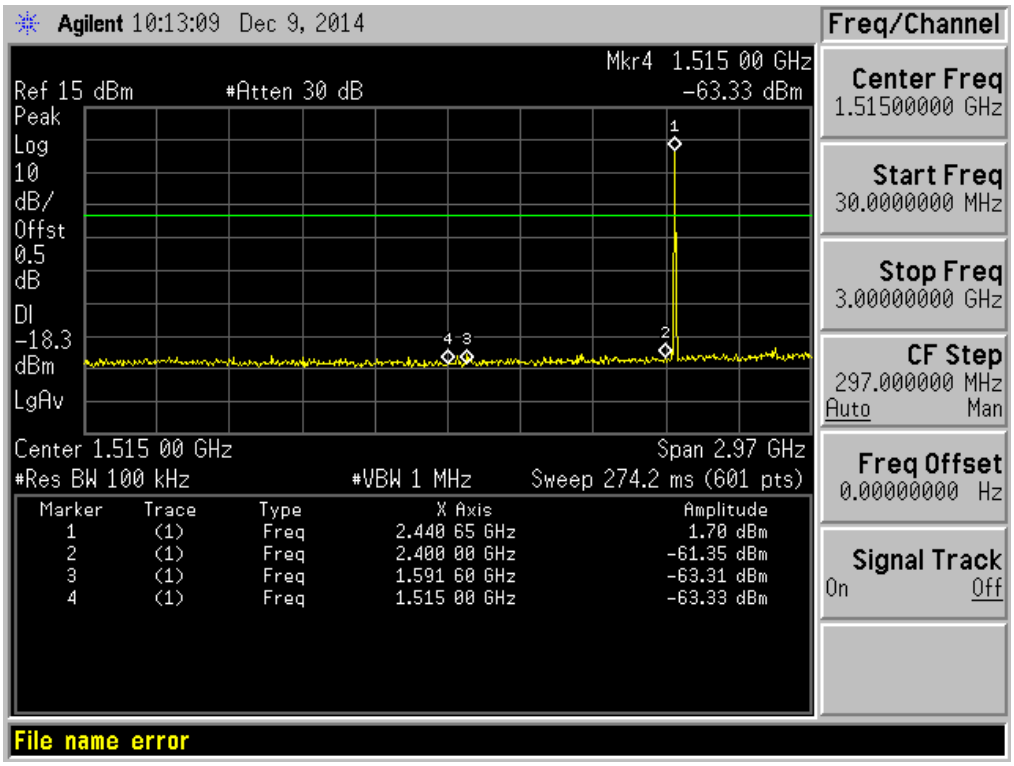
8-DPSK LOW CHANNEL , SPURIOUS 30MHz~3GHz



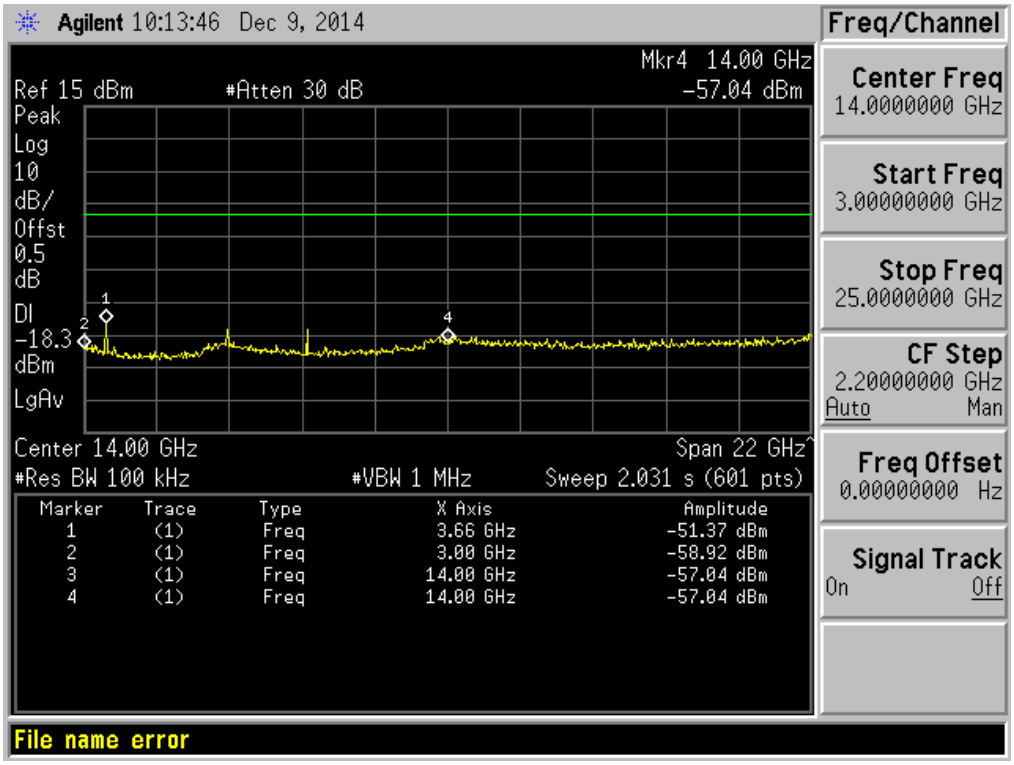
8-DPSK LOW CHANNEL , SPURIOUS 3GHz~25GHz



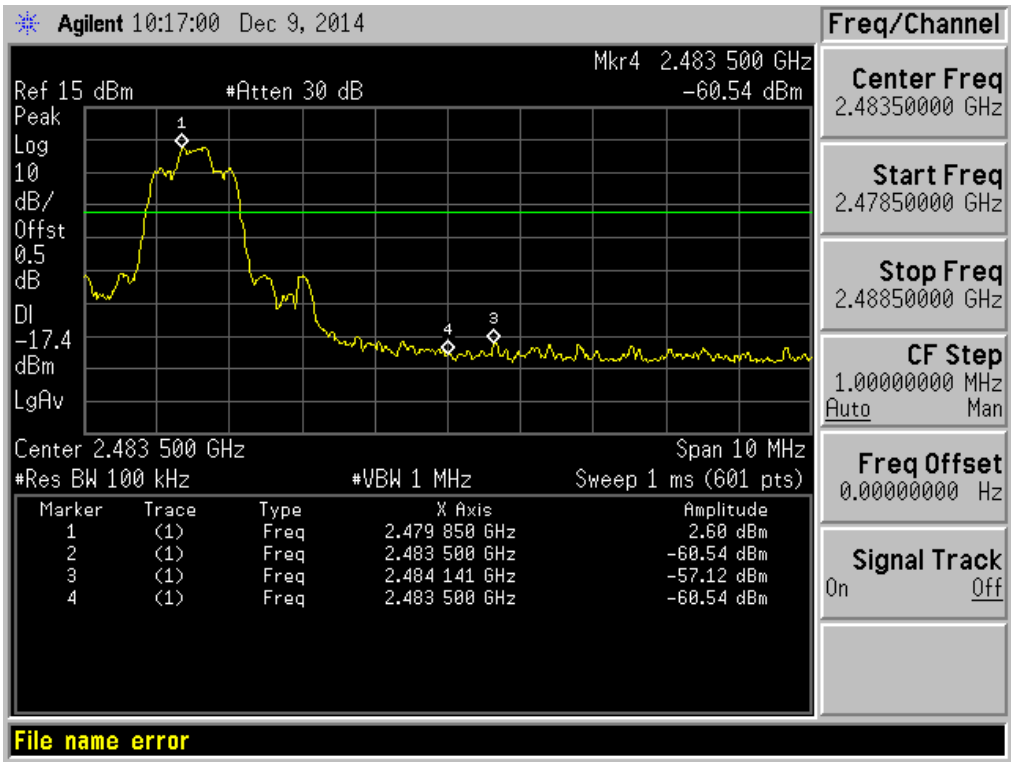
8-DPSK MID CHANNEL , SPURIOUS 30MHz~3GHz



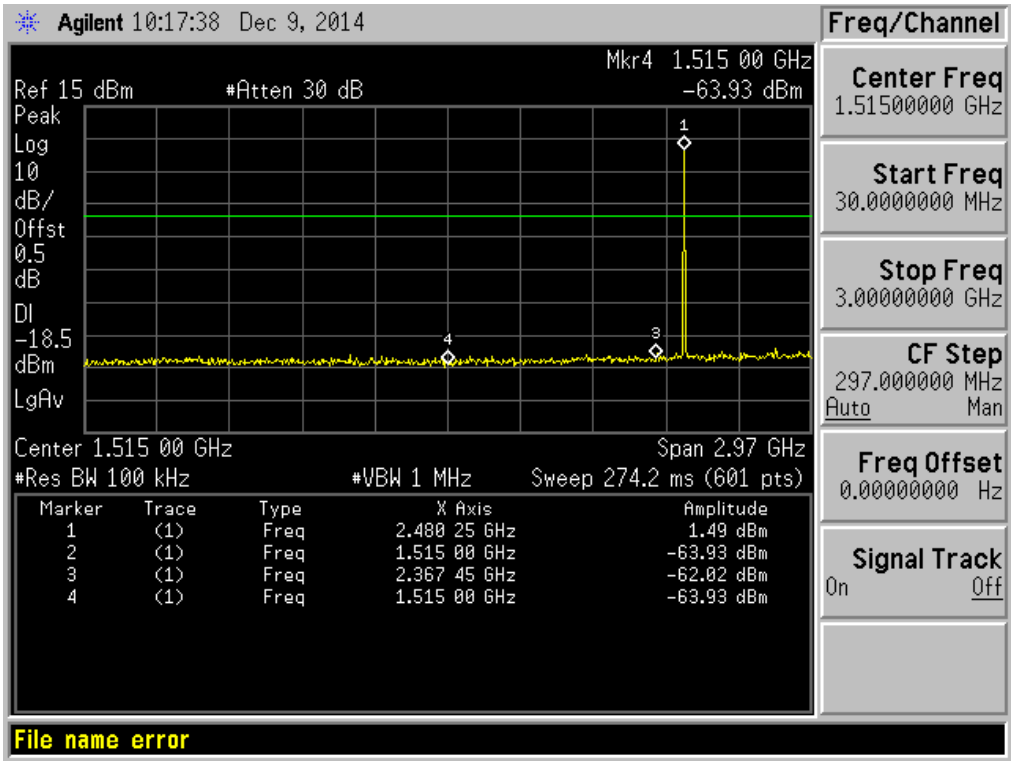
8-DPSK MID CHANNEL , SPURIOUS 3GHz~25GHz



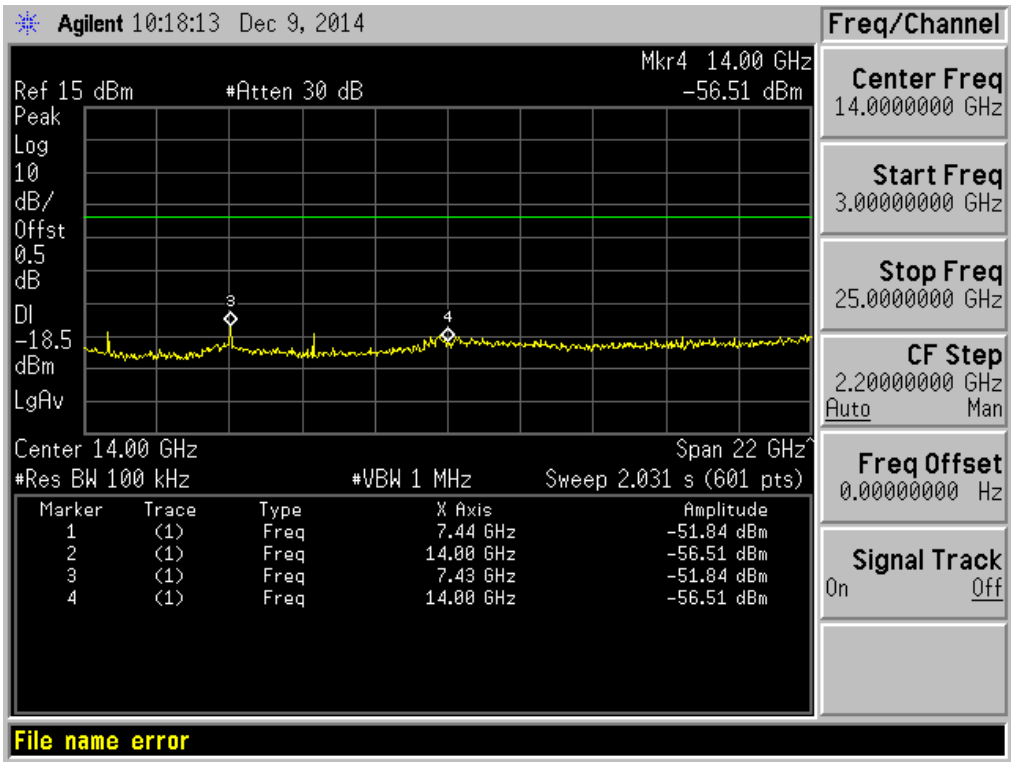
8-DPSK HIGH CHANNEL , BANDEDGE



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



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

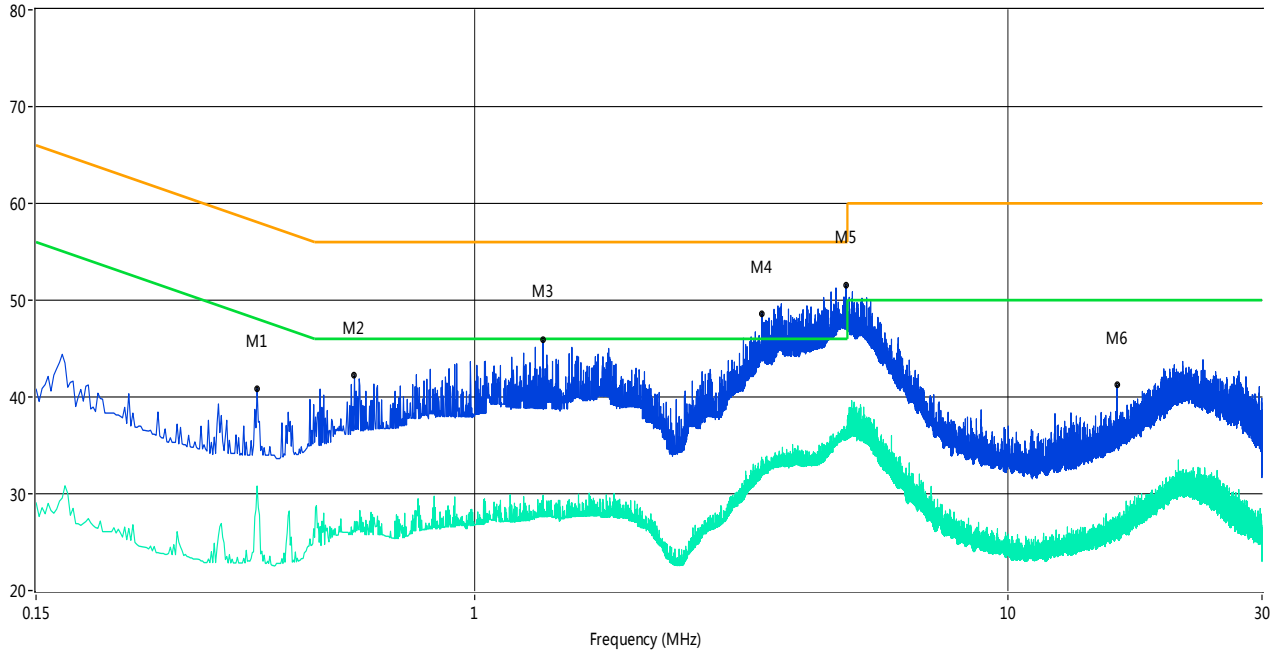


A.7 Conducted Emissions

Test Data and Plots

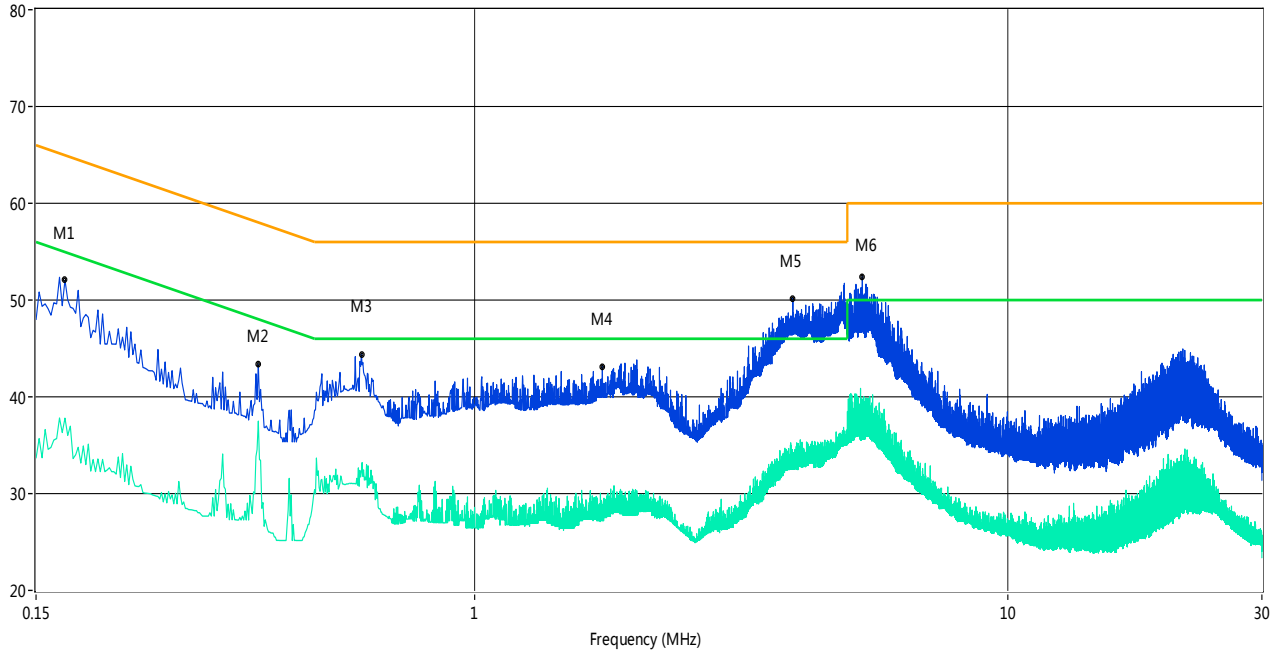
Note: All configurations have been tested, only the worst configuration (GFSK Middle Channel) shown here.

GFSK MIDDLE CHANNEL PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.39	40.9	13.00	59.1	18.20	Peak	L Line	PASS
1**	0.39	30.8	13.00	49.1	18.30	AV	L Line	PASS
2	0.59	42.2	13.00	56.0	13.80	Peak	L Line	PASS
2**	0.59	27.1	13.00	46.0	18.90	AV	L Line	PASS
3	1.34	45.9	13.00	56.0	10.10	Peak	L Line	PASS
3**	1.34	29.8	13.00	46.0	16.20	AV	L Line	PASS
4	3.46	48.6	13.00	56.0	7.40	Peak	L Line	PASS
4**	3.46	33.1	13.00	46.0	12.90	AV	L Line	PASS
5	4.97	51.6	13.00	56.0	4.40	Peak	L Line	PASS
5**	4.97	36.3	13.00	46.0	9.70	AV	L Line	PASS
6	16.03	41.2	13.00	60.0	18.80	Peak	L Line	PASS
6**	16.03	25.4	13.00	50.0	24.60	AV	L Line	PASS

GFSK MIDDLE CHANNEL PHASE N

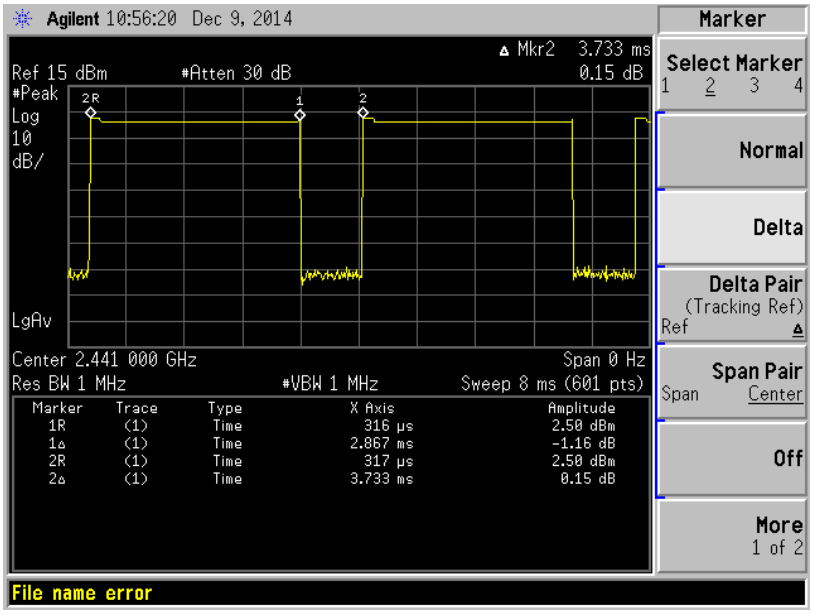


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.17	52.1	13.00	65.4	13.30	Peak	N Line	PASS
1**	0.17	37.8	13.00	55.4	17.60	AV	N Line	PASS
2	0.39	43.4	13.00	59.1	15.70	Peak	N Line	PASS
2**	0.39	37.5	13.00	49.1	11.60	AV	N Line	PASS
3	0.61	44.4	13.00	56.0	11.60	Peak	N Line	PASS
3**	0.61	32.2	13.00	46.0	13.80	AV	N Line	PASS
4	1.73	43.1	13.00	56.0	12.90	Peak	N Line	PASS
4**	1.73	28.8	13.00	46.0	17.20	AV	N Line	PASS
5	3.95	50.2	13.00	56.0	5.80	Peak	N Line	PASS
5**	3.95	33.5	13.00	46.0	12.50	AV	N Line	PASS
6	5.33	52.4	13.00	60.0	7.60	Peak	N Line	PASS
6**	5.33	35.5	13.00	50.0	14.50	AV	N Line	PASS

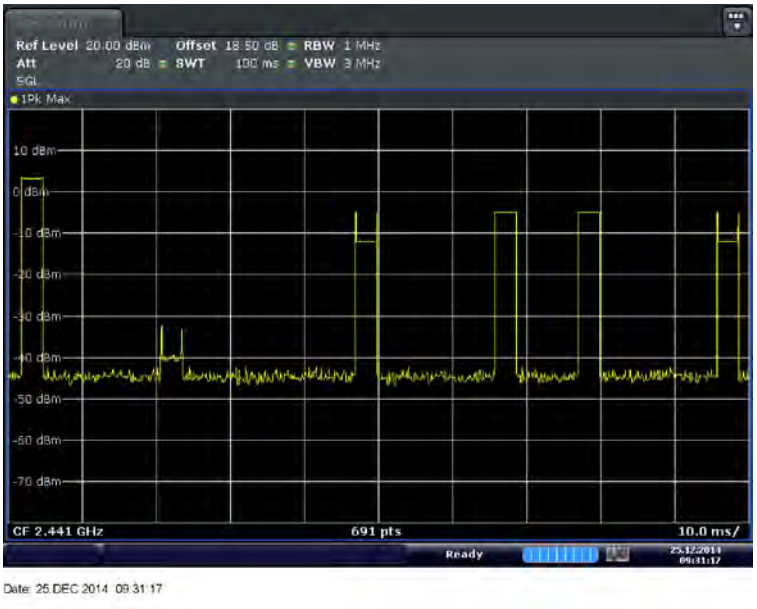
A.8 Radiated Emission

Duty cycle correction factor for average measurement.

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



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



Note:

1. Duty cycle = on time/100 milliseconds = 5* 2.87 / 100 = 14.35 %
2. Duty cycle correction factor = 20*log (Duty cycle) = -16.86 dB
3. DH5 has the highest duty cycle and is reported.

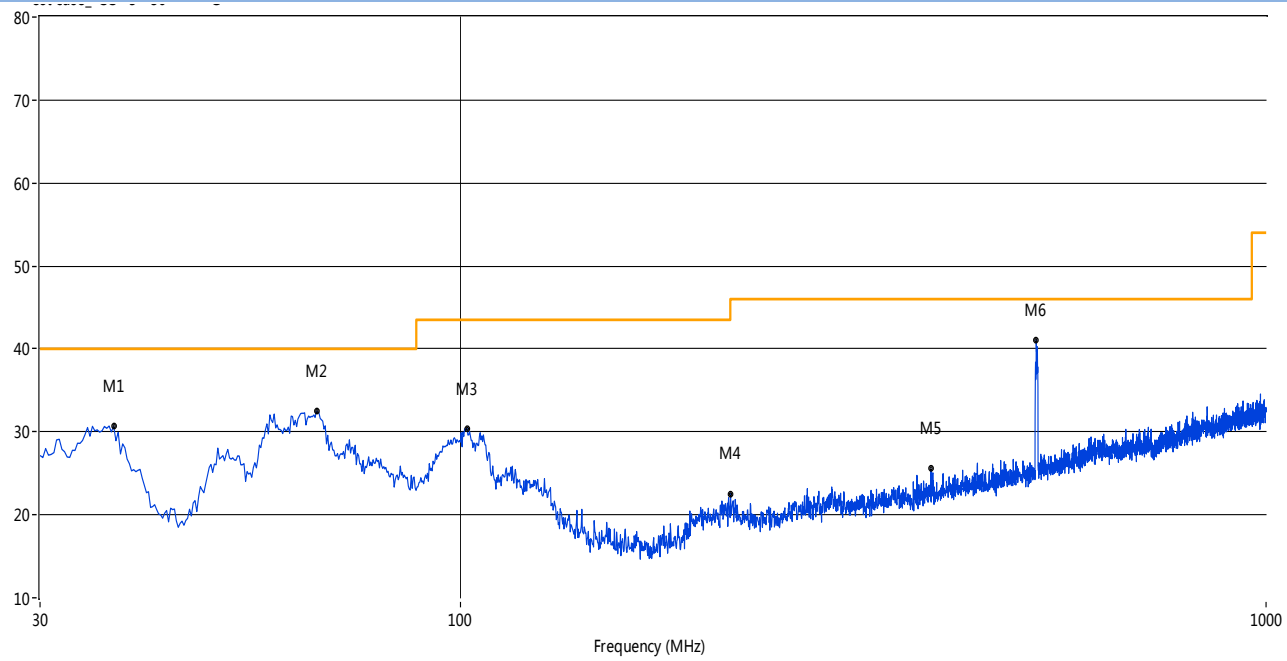
Note 1: The symbol of “--” in the table which means not application.

Note 2: For the test data above 1GHz，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: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

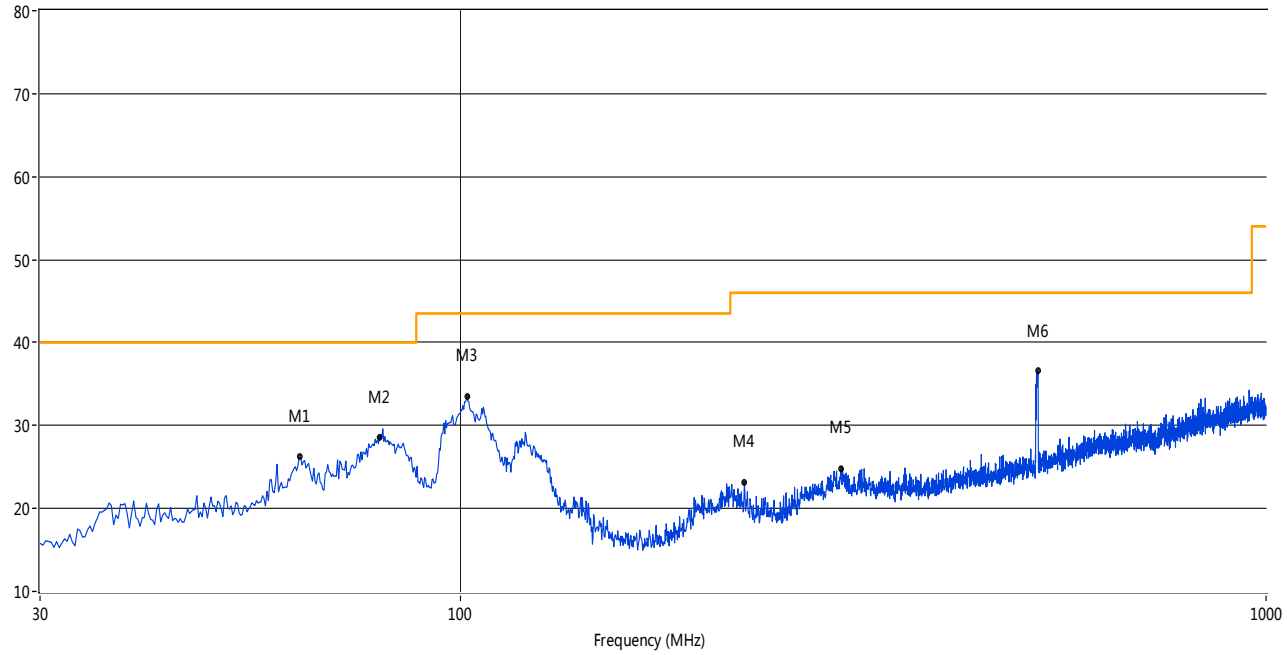
Note 4: All configurations have been tested, only the worst configuration (GFSK High Channel) shown here.

GFSK HIGH CHANNEL 30MHz to 1GHz, 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	30.71	-20.64	40.0	9.29	Peak	22.30	100	Vertical	PASS
2	66.12	32.49	-21.03	40.0	7.51	Peak	6.80	100	Vertical	PASS
3	101.76	30.43	-20.13	43.5	13.07	Peak	286.60	100	Vertical	PASS
4	216.19	22.53	-20.03	46.0	23.47	Peak	173.80	100	Vertical	PASS
5	383.48	25.53	-15.64	46.0	20.47	Peak	128.50	100	Vertical	PASS
6	518.27	41.12	-12.90	46.0	4.88	Peak	122.90	100	Vertical	PASS

GFSK HIGH CHANNEL 30MHz to 1GHz, ANT H

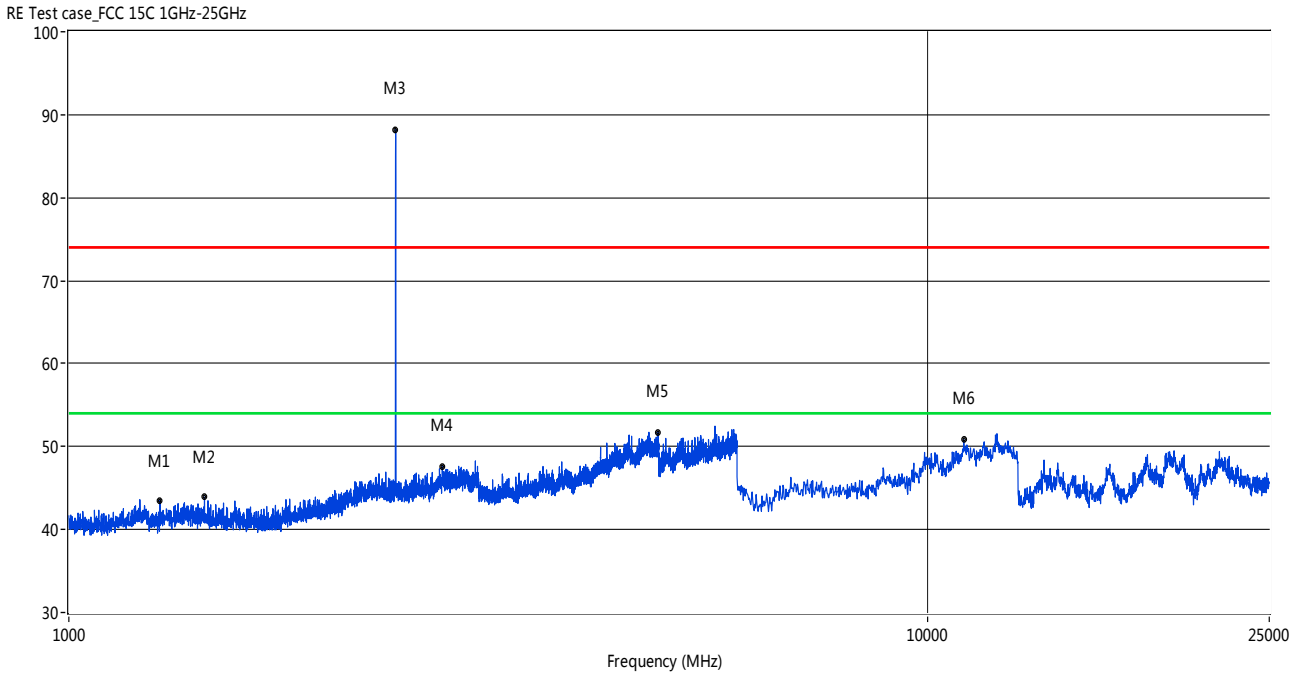


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	62.97	26.20	-20.40	40.0	13.80	Peak	7.90	100	Horizontal	PASS
2	79.22	28.57	-24.63	40.0	11.43	Peak	355.60	100	Horizontal	PASS
3	101.76	33.50	-20.13	43.5	10.00	Peak	4.60	100	Horizontal	PASS
4	224.92	23.21	-19.86	46.0	22.79	Peak	46.50	100	Horizontal	PASS
5	296.44	24.77	-17.70	46.0	21.23	Peak	315.20	100	Horizontal	PASS
6	520.70	36.56	-12.78	46.0	9.44	Peak	153.40	100	Horizontal	PASS

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

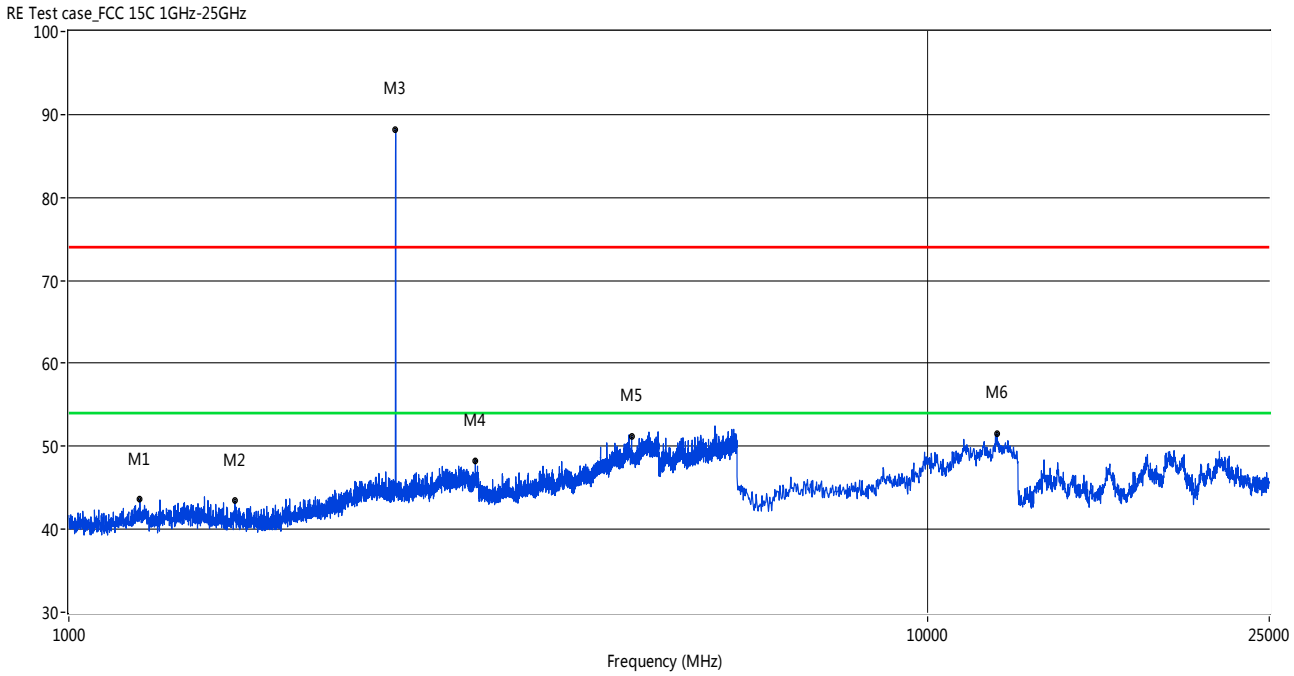
Test Data and Plots (1GHz ~ 10th Harmonic)

GFSK LOW CHANNEL 1GHz to 25GHz, ANT V



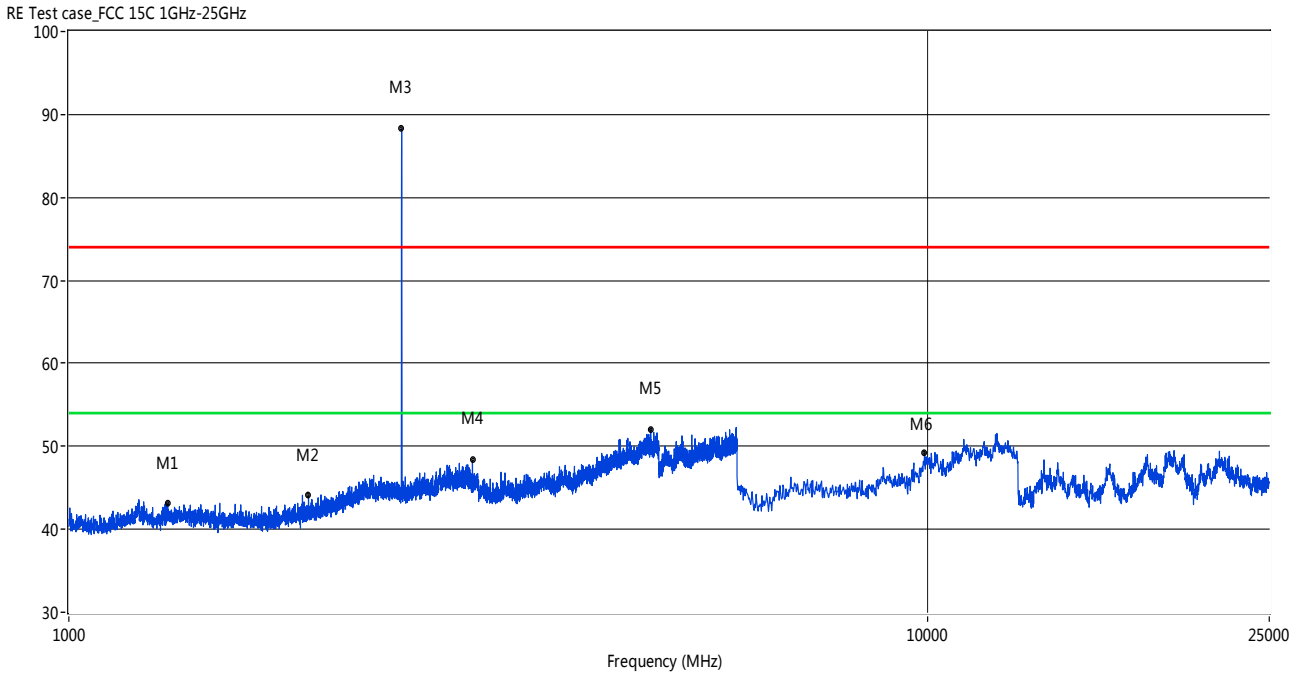
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1276.43	43.55	-4.88	74.0	30.45	Peak	0.60	100	Vertical	PASS
2	1438.39	43.91	-4.63	74.0	30.09	Peak	266.70	100	Vertical	PASS
3	2401.65	88.21	-0.27	74.0	-14.21	Peak	68.20	100	Vertical	N/A
4	2721.57	47.58	1.49	74.0	26.42	Peak	234.80	100	Vertical	PASS
5	4855.79	51.76	13.57	74.0	22.24	Peak	165.30	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

GFSK LOW CHANNEL 1GHz to 25GHz, ANT H



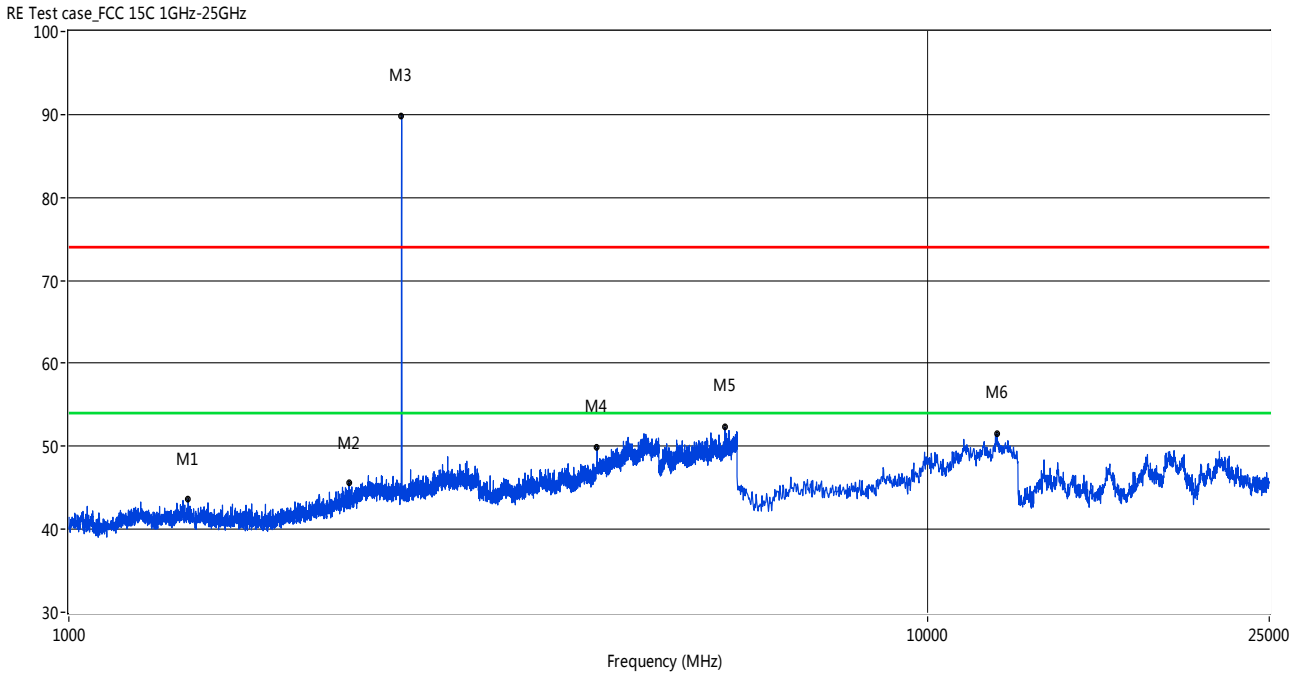
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1209.45	43.60	-5.15	74.0	30.40	Peak	314.10	100	Horizontal	PASS
2	1560.86	43.44	-3.96	74.0	30.56	Peak	155.60	100	Horizontal	PASS
3	2401.65	88.21	-0.27	74.0	-14.21	Peak	68.20	100	Horizontal	N/A
4	2974.51	48.27	2.30	74.0	25.73	Peak	358.60	100	Horizontal	PASS
5	4522.12	51.24	12.74	74.0	22.76	Peak	359.10	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

GFSK MID CHANNEL 1GHz to 25GHz, ANT V



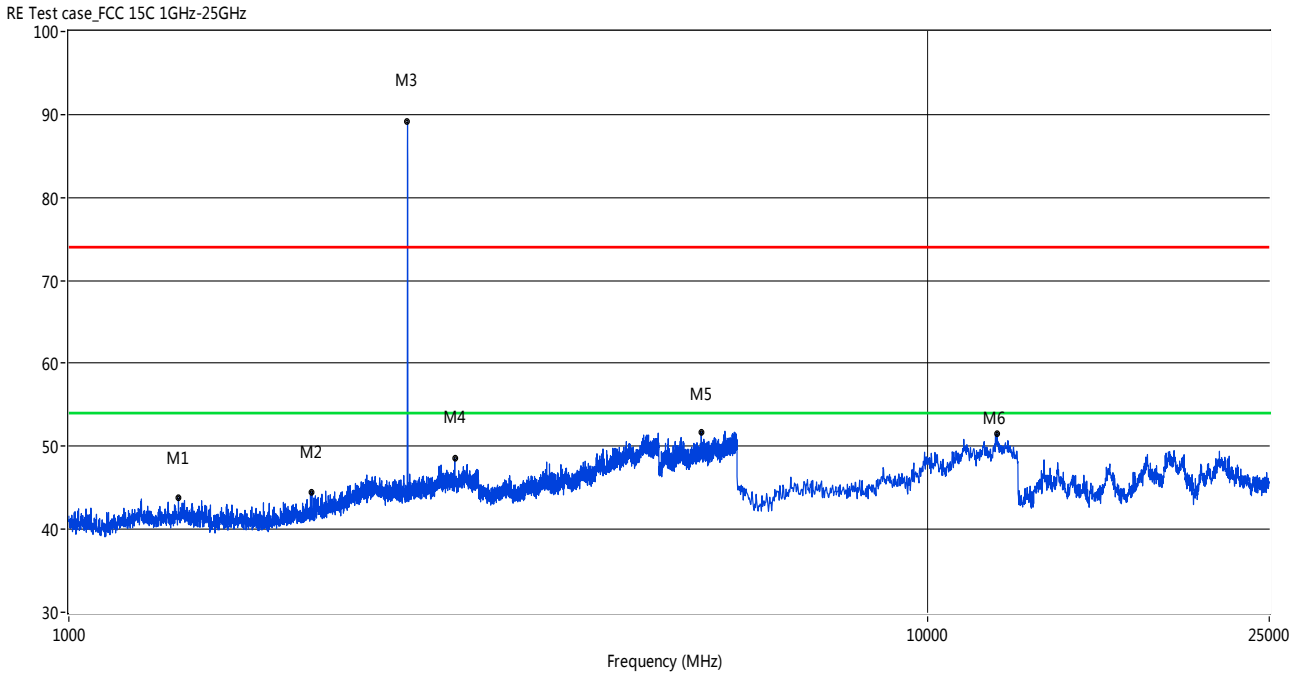
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1303.42	43.14	-4.73	74.0	30.86	Peak	20.40	100	Vertical	PASS
2	1901.28	44.06	-2.82	74.0	29.94	Peak	108.20	100	Vertical	PASS
3	2440.64	88.27	-0.41	74.0	-14.27	Peak	76.40	100	Vertical	N/A
4	2951.51	48.34	2.40	74.0	25.66	Peak	164.20	100	Vertical	PASS
5	4759.81	52.06	13.59	74.0	21.94	Peak	253.90	100	Vertical	PASS
6	9919.72	49.29	19.09	74.0	24.71	Peak	307.10	100	Vertical	PASS

GFSK MID CHANNEL 1GHz to 25GHz, ANT H



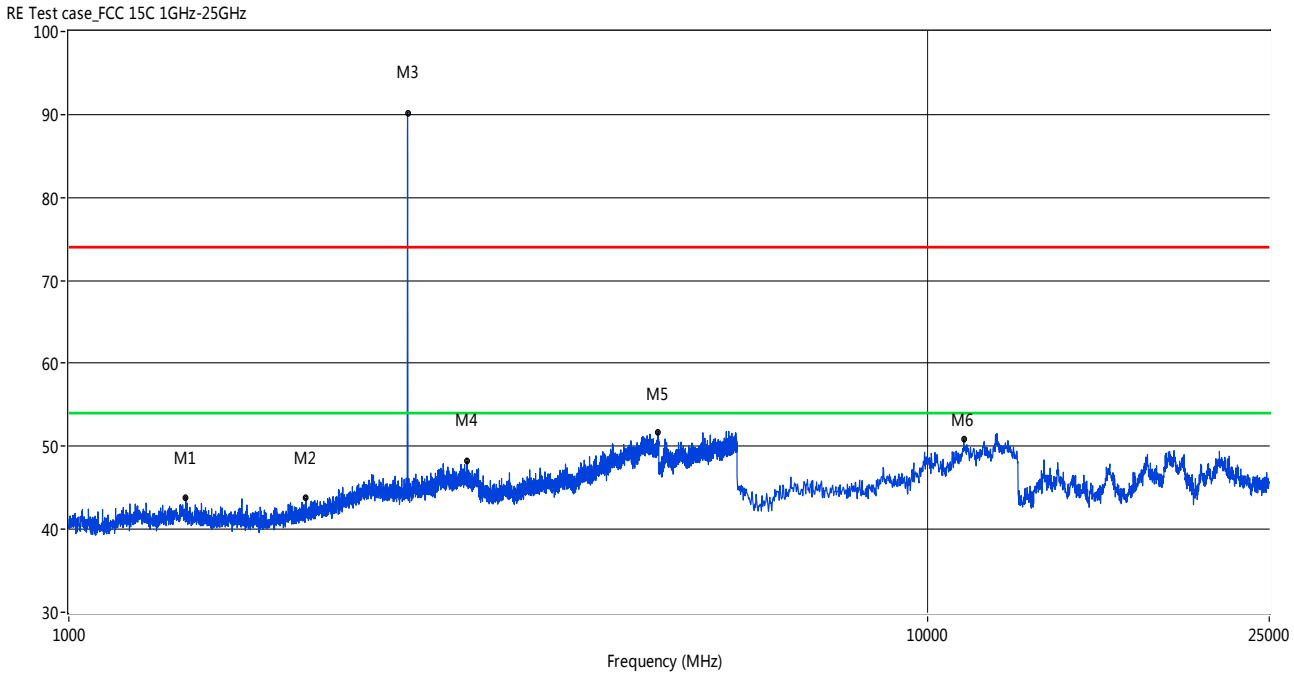
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1376.91	43.68	-4.57	74.0	30.32	Peak	359.60	100	Horizontal	PASS
2	2120.22	45.64	-1.12	74.0	28.36	Peak	99.70	100	Horizontal	PASS
3	2440.64	89.89	-0.41	74.0	-15.89	Peak	346.00	100	Horizontal	N/A
4	4123.22	49.88	11.62	74.0	24.12	Peak	359.90	100	Horizontal	PASS
5	5807.30	52.30	15.48	74.0	21.70	Peak	153.50	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

GFSK HIGH CHANNEL 1GHz to 25GHz, ANT V



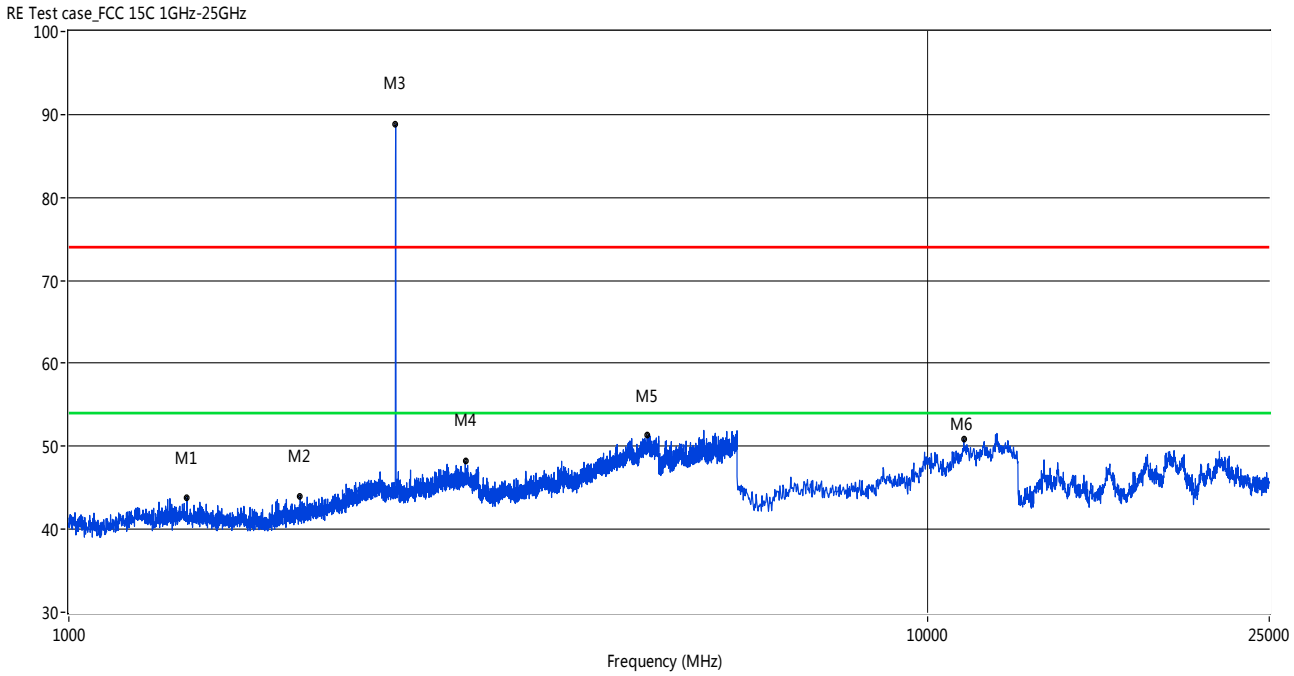
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1341.41	43.77	-4.61	74.0	30.23	Peak	67.60	100	Vertical	PASS
2	1918.77	44.45	-2.51	74.0	29.55	Peak	360.00	100	Vertical	PASS
3	2479.63	89.08	-0.63	74.0	-15.08	Peak	83.60	100	Vertical	N/A
4	2814.55	48.55	2.10	74.0	25.45	Peak	306.10	100	Vertical	PASS
5	5451.14	51.72	14.81	74.0	22.28	Peak	144.10	100	Vertical	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Vertical	PASS

GFSK HIGH CHANNEL 1GHz to 25GHz, ANT H



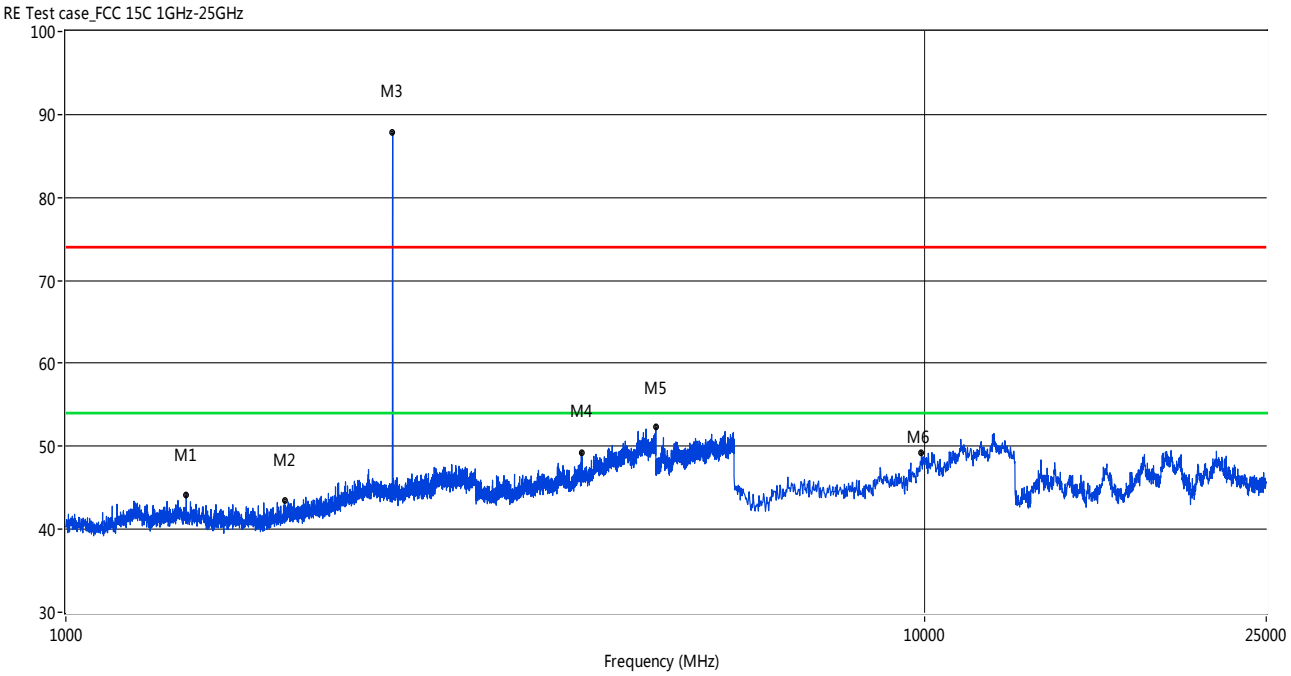
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1368.41	43.86	-4.50	74.0	30.14	Peak	143.80	100	Horizontal	PASS
2	1888.28	43.74	-3.01	74.0	30.26	Peak	120.00	100	Horizontal	PASS
3	2480.13	90.21	-0.60	74.0	-16.21	Peak	342.50	100	Horizontal	N/A
4	2908.02	48.19	2.61	74.0	25.81	Peak	40.00	100	Horizontal	PASS
5	4857.29	51.76	13.54	74.0	22.24	Peak	346.00	100	Horizontal	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Horizontal	PASS

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



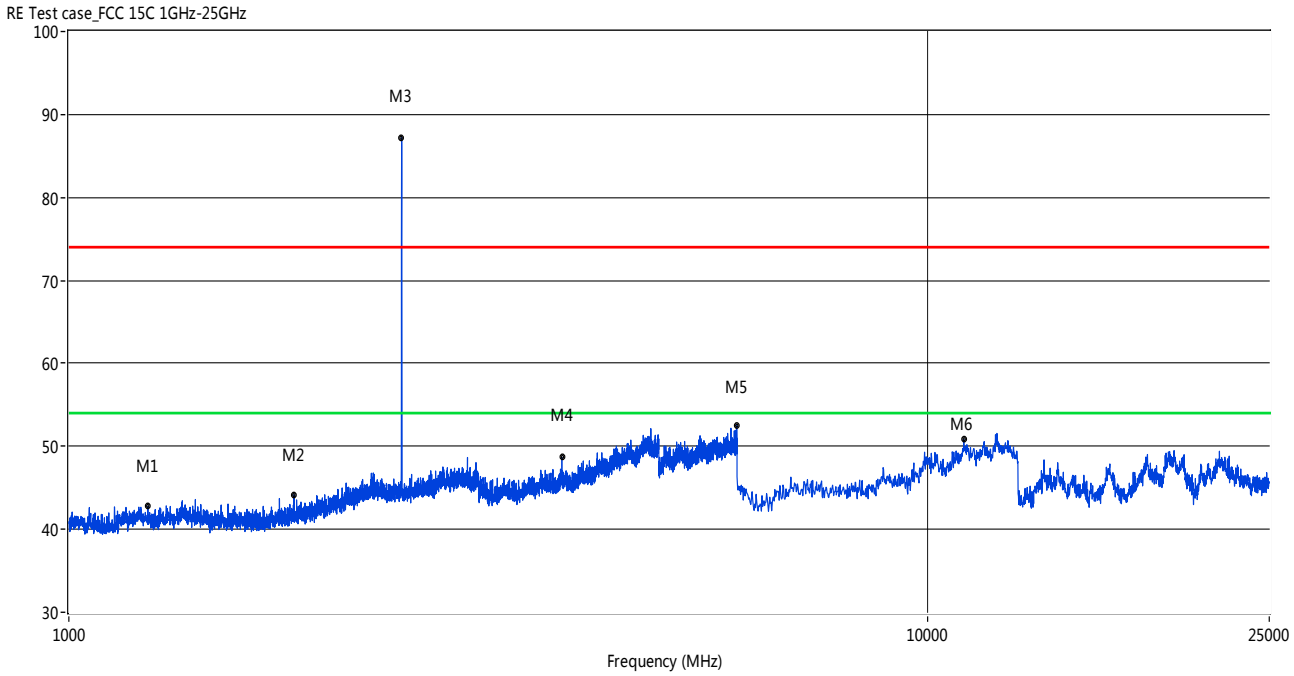
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1372.91	43.84	-4.59	74.0	30.16	Peak	96.00	100	Vertical	PASS
2	1859.79	44.05	-3.09	74.0	29.95	Peak	231.70	100	Vertical	PASS
3	2402.15	88.77	-0.34	74.0	-14.77	Peak	80.00	100	Vertical	N/A
4	2895.03	48.20	2.44	74.0	25.80	Peak	72.20	100	Vertical	PASS
5	4717.07	51.33	13.53	74.0	22.67	Peak	355.90	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

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



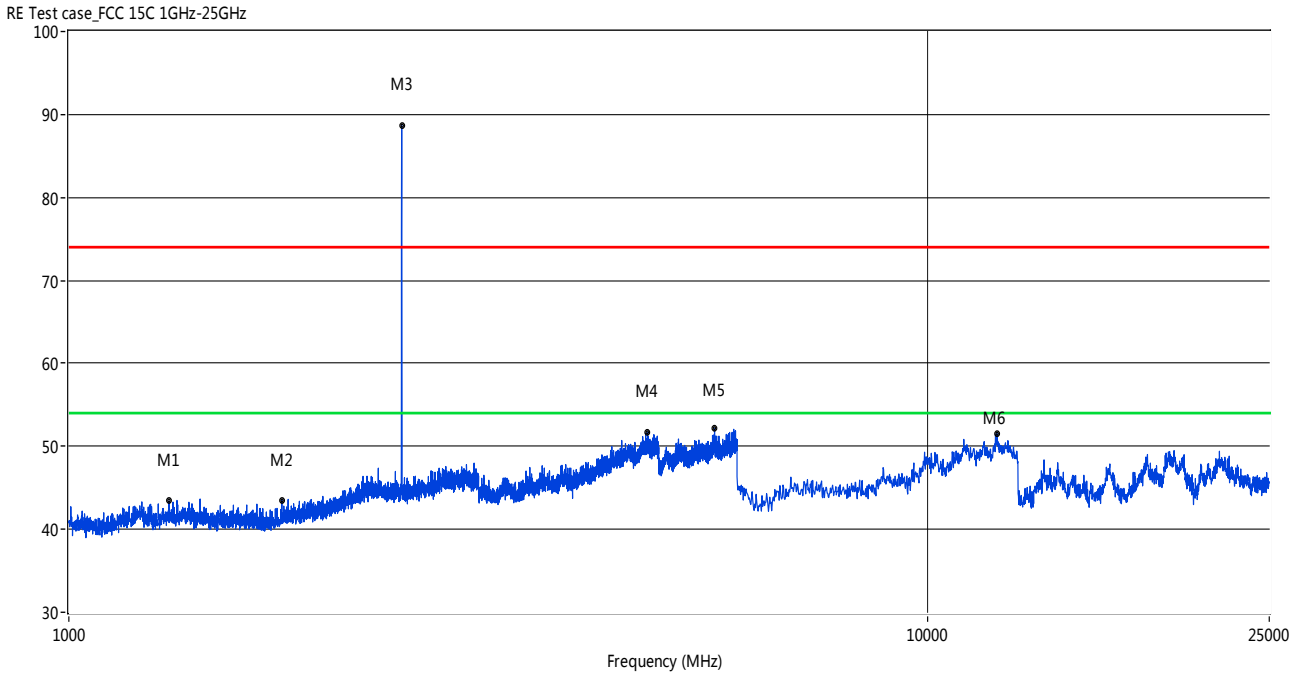
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1380.90	44.15	-4.55	74.0	29.85	Peak	0.60	100	Horizontal	PASS
2	1797.30	43.39	-3.69	74.0	30.61	Peak	36.60	100	Horizontal	PASS
3	2402.15	87.78	-0.34	74.0	-13.78	Peak	68.20	100	Horizontal	N/A
4	3983.75	49.23	11.12	74.0	24.77	Peak	6.90	100	Horizontal	PASS
5	4864.03	52.32	13.57	74.0	21.68	Peak	355.80	100	Horizontal	PASS
6	9919.72	49.29	19.09	74.0	24.71	Peak	307.10	100	Horizontal	PASS

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



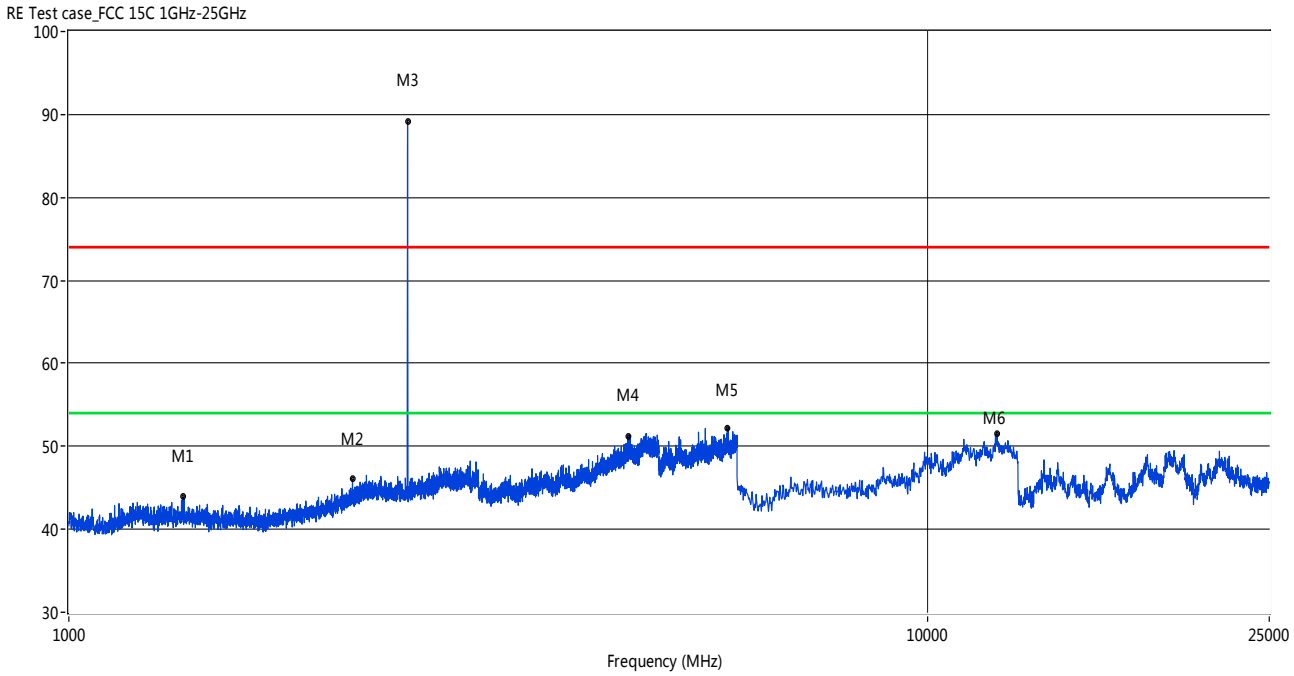
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1236.44	42.76	-5.18	74.0	31.24	Peak	35.90	100	Vertical	PASS
2	1828.29	44.17	-3.37	74.0	29.83	Peak	360.00	100	Vertical	PASS
3	2440.64	87.15	-0.41	74.0	-13.15	Peak	75.50	100	Vertical	N/A
4	3751.31	48.73	10.65	74.0	25.27	Peak	307.90	100	Vertical	PASS
5	5994.75	52.59	15.72	74.0	21.41	Peak	327.10	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

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



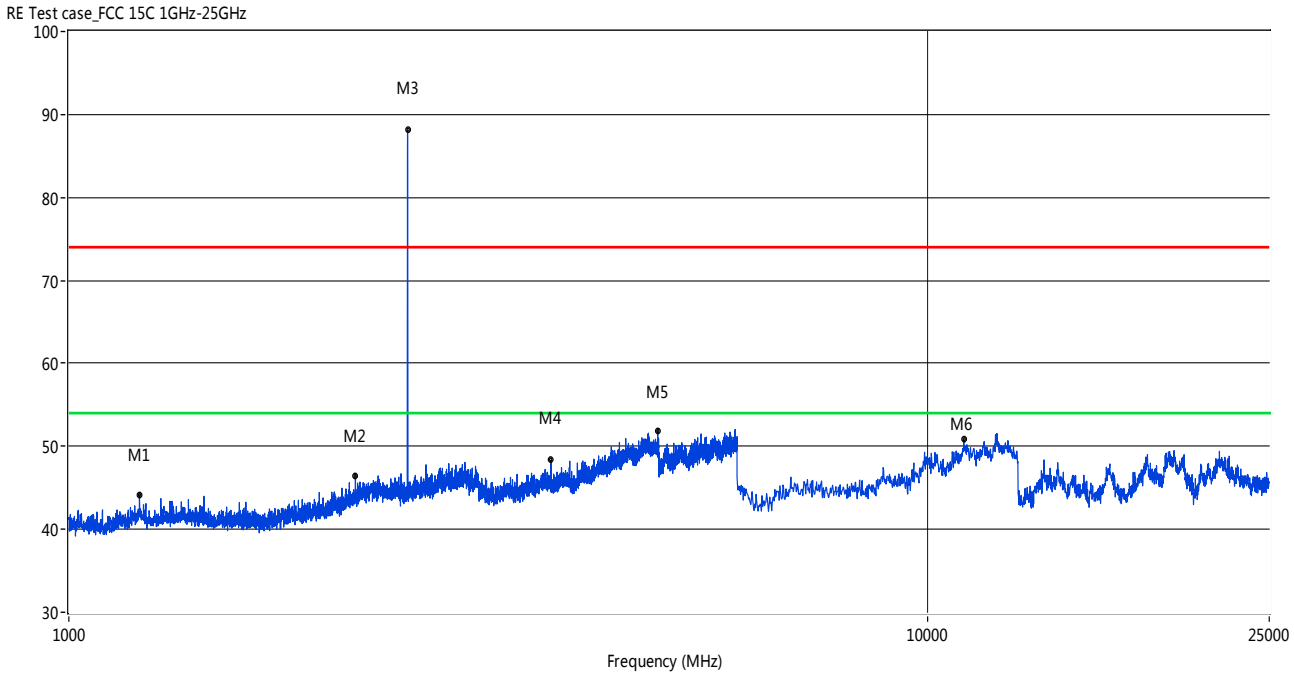
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1307.92	43.42	-4.74	74.0	30.58	Peak	28.60	100	Horizontal	PASS
2	1770.31	43.53	-3.73	74.0	30.47	Peak	268.10	100	Horizontal	PASS
3	2441.14	88.73	-0.38	74.0	-14.73	Peak	76.10	100	Horizontal	N/A
4	4719.32	51.70	13.53	74.0	22.30	Peak	185.40	100	Horizontal	PASS
5	5649.09	52.14	15.66	74.0	21.86	Peak	160.90	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

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



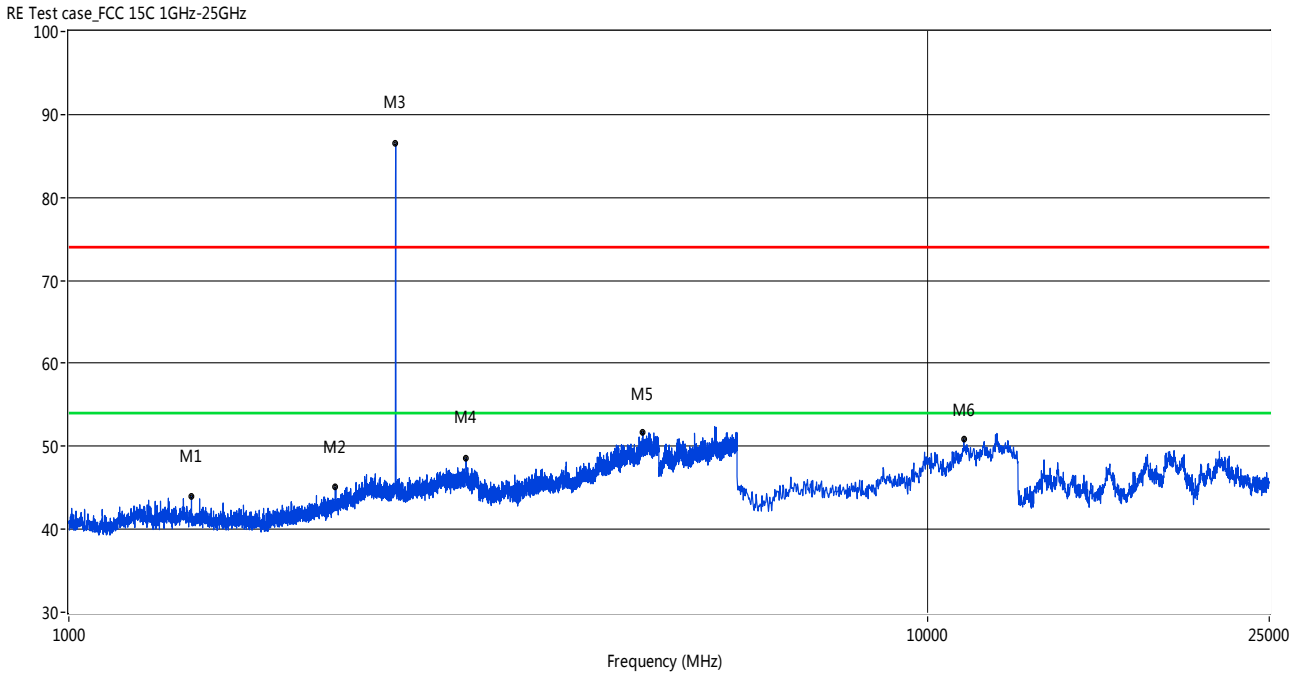
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1358.41	43.94	-4.42	74.0	30.06	Peak	71.90	100	Vertical	PASS
2	2139.72	46.05	-1.21	74.0	27.95	Peak	174.60	100	Vertical	PASS
3	2480.13	89.16	-0.60	74.0	-15.16	Peak	79.70	100	Vertical	N/A
4	4489.13	51.13	12.75	74.0	22.87	Peak	156.70	100	Vertical	PASS
5	5852.29	52.23	15.67	74.0	21.77	Peak	59.30	100	Vertical	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Vertical	PASS

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



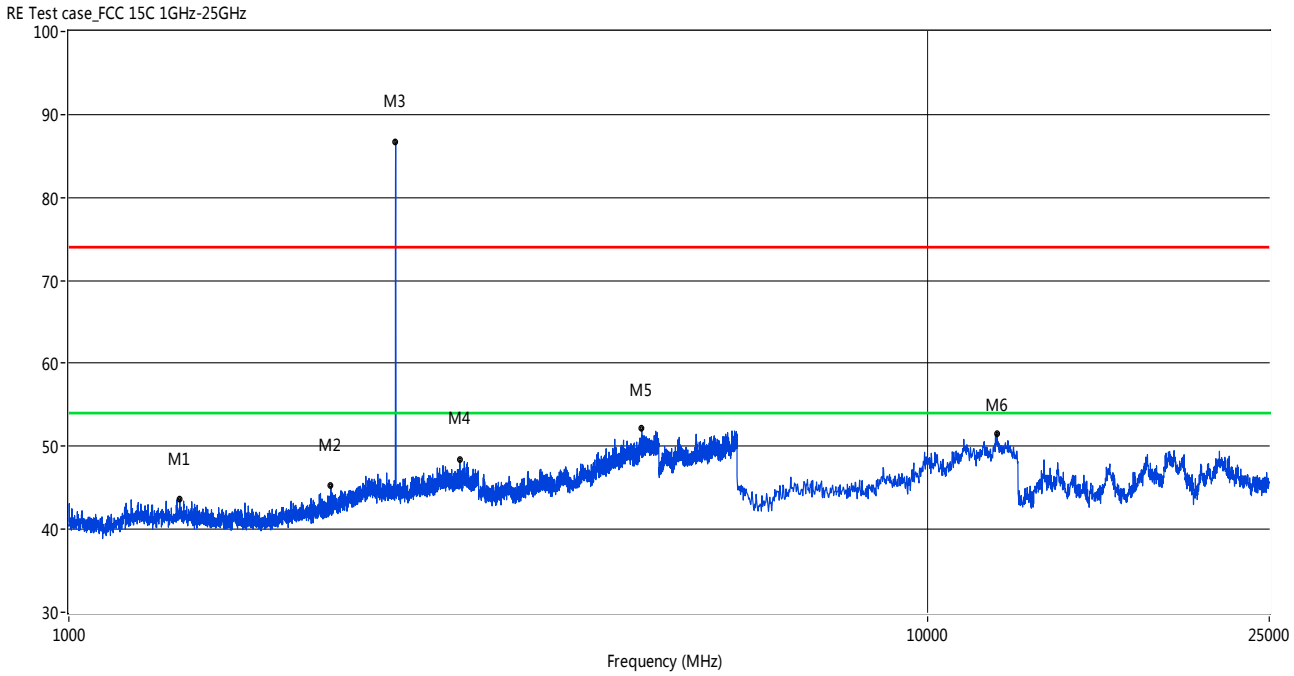
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1208.45	44.18	-5.11	74.0	29.82	Peak	274.70	100	Horizontal	PASS
2	2156.21	46.45	-1.0	74.0	27.55	Peak	75.60	100	Horizontal	PASS
3	2480.13	88.12	-0.60	74.0	-14.12	Peak	83.80	100	Horizontal	N/A
4	3643.34	48.34	10.14	74.0	25.66	Peak	171.90	100	Horizontal	PASS
5	4849.79	51.94	13.60	74.0	22.06	Peak	45.70	100	Horizontal	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Horizontal	PASS

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



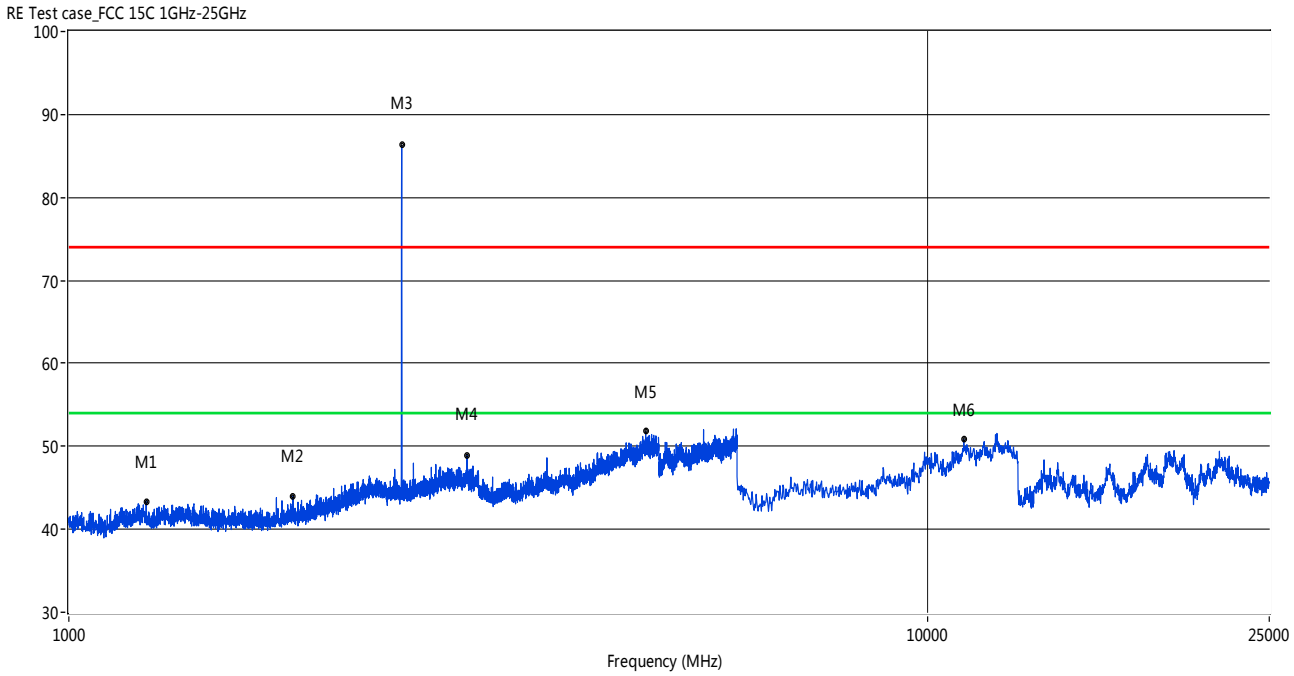
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1389.40	43.94	-4.45	74.0	30.06	Peak	300.40	100	Vertical	PASS
2	2043.24	45.09	-1.95	74.0	28.91	Peak	156.40	100	Vertical	PASS
3	2402.15	86.45	-0.34	74.0	-12.45	Peak	36.80	100	Vertical	N/A
4	2901.53	48.57	2.61	74.0	25.43	Peak	124.50	100	Vertical	PASS
5	4660.09	51.66	13.11	74.0	22.34	Peak	208.80	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

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



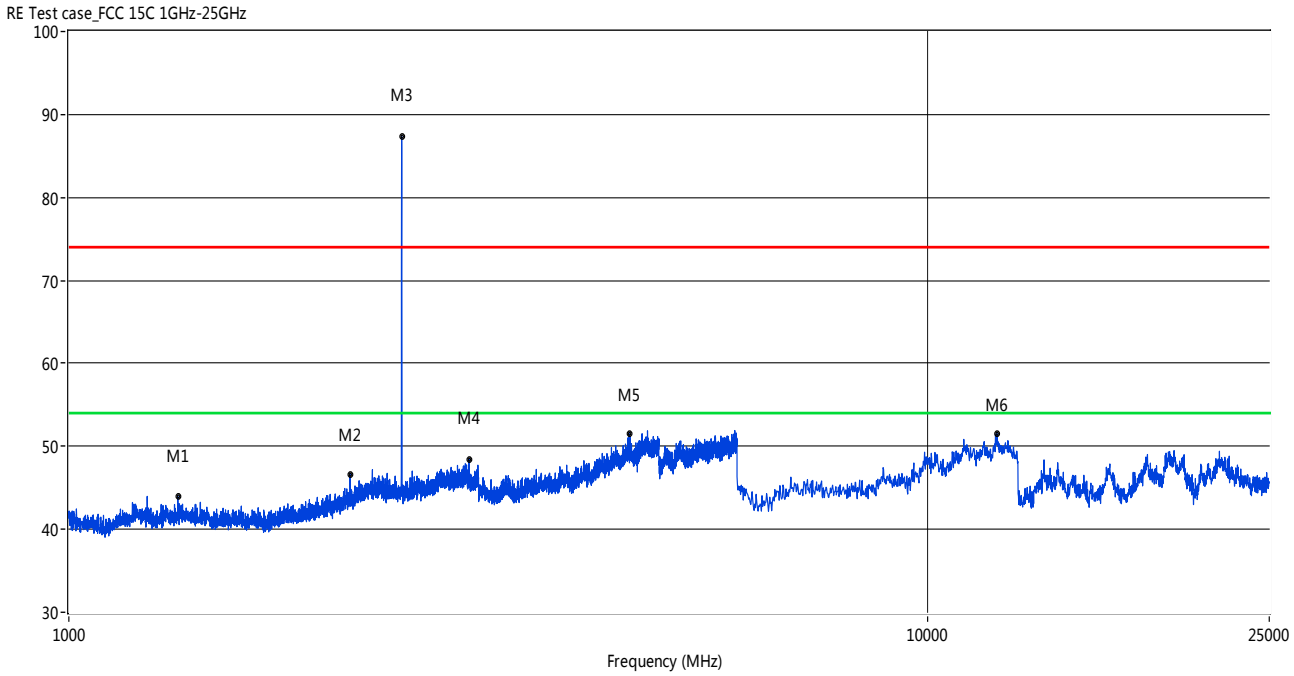
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1346.41	43.62	-4.64	74.0	30.38	Peak	39.60	100	Horizontal	PASS
2	2018.74	45.22	-2.19	74.0	28.78	Peak	174.70	100	Horizontal	PASS
3	2402.15	86.68	-0.34	74.0	-12.68	Peak	71.50	100	Horizontal	N/A
4	2853.54	48.35	1.97	74.0	25.65	Peak	262.10	100	Horizontal	PASS
5	4648.84	52.12	13.08	74.0	21.88	Peak	331.90	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

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



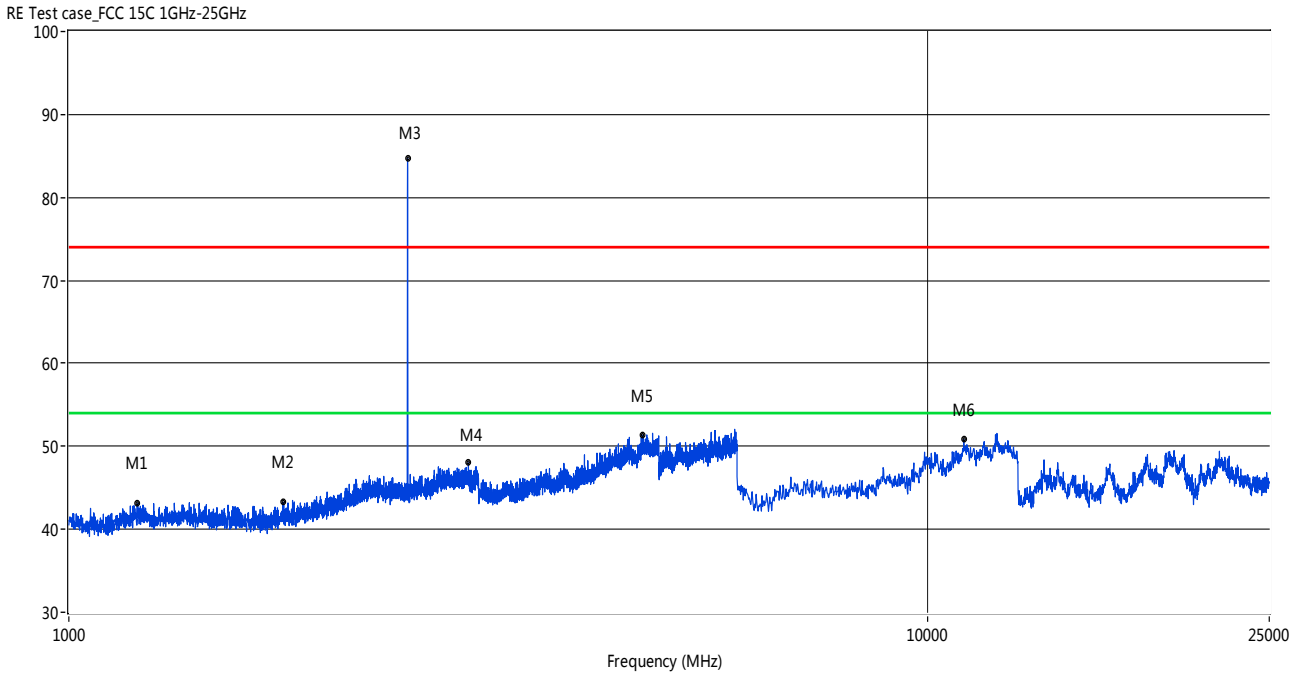
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1230.44	43.34	-5.23	74.0	30.66	Peak	213.00	100	Vertical	PASS
2	1823.79	44.00	-3.42	74.0	30.00	Peak	117.50	100	Vertical	PASS
3	2441.14	86.30	-0.38	74.0	-12.30	Peak	38.00	100	Vertical	N/A
4	2908.52	48.96	2.58	74.0	25.04	Peak	70.20	100	Vertical	PASS
5	4696.08	51.82	13.22	74.0	22.18	Peak	51.90	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

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



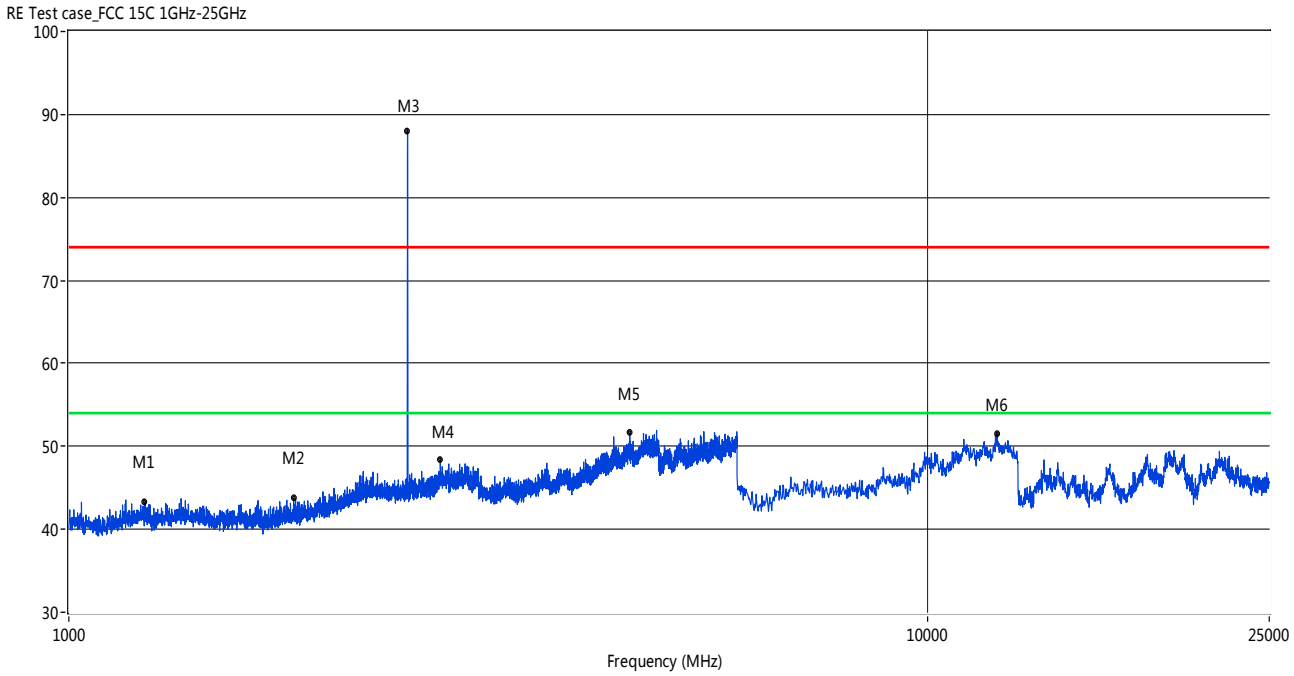
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1339.41	43.98	-4.75	74.0	30.02	Peak	126.80	100	Horizontal	PASS
2	2125.72	46.63	-1.04	74.0	27.37	Peak	31.50	100	Horizontal	PASS
3	2441.14	87.40	-0.38	74.0	-13.40	Peak	79.00	100	Horizontal	N/A
4	2924.02	48.37	2.09	74.0	25.63	Peak	198.10	100	Horizontal	PASS
5	4493.63	51.53	12.70	74.0	22.47	Peak	0.80	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

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



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1202.45	43.12	-5.30	74.0	30.88	Peak	122.80	100	Vertical	PASS
2	1775.81	43.26	-3.75	74.0	30.74	Peak	130.50	100	Vertical	PASS
3	2480.13	84.77	-0.60	74.0	-10.77	Peak	35.00	100	Vertical	N/A
4	2919.52	48.01	2.09	74.0	25.99	Peak	323.80	100	Vertical	PASS
5	4655.59	51.35	13.06	74.0	22.65	Peak	179.50	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

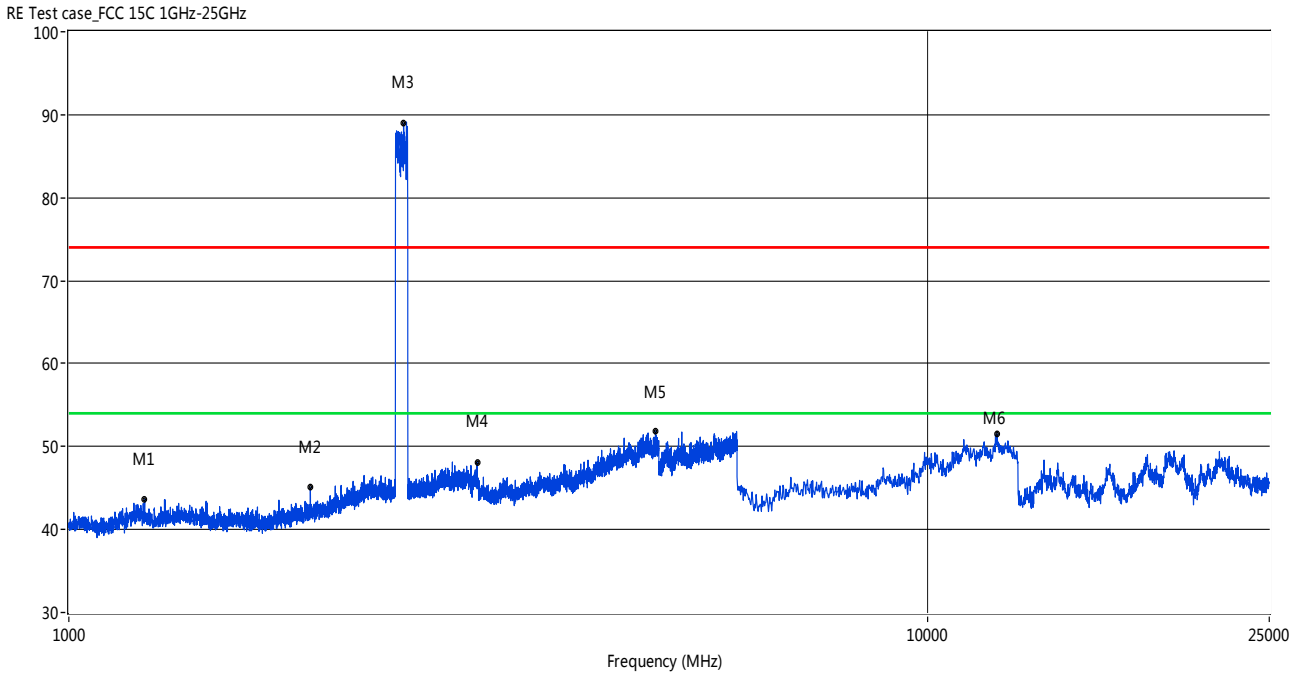
8-DPSK HIGH CHANNEL 1GHz to 25GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1224.94	43.30	-5.21	74.0	30.70	Peak	79.70	100	Horizontal	PASS
2	1827.29	43.73	-3.46	74.0	30.27	Peak	24.10	100	Horizontal	PASS
3	2479.63	88.01	-0.63	74.0	-14.01	Peak	350.30	100	Horizontal	N/A
4	2707.57	48.43	1.66	74.0	25.57	Peak	206.80	100	Horizontal	PASS
5	4499.62	51.62	12.69	74.0	22.38	Peak	55.90	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

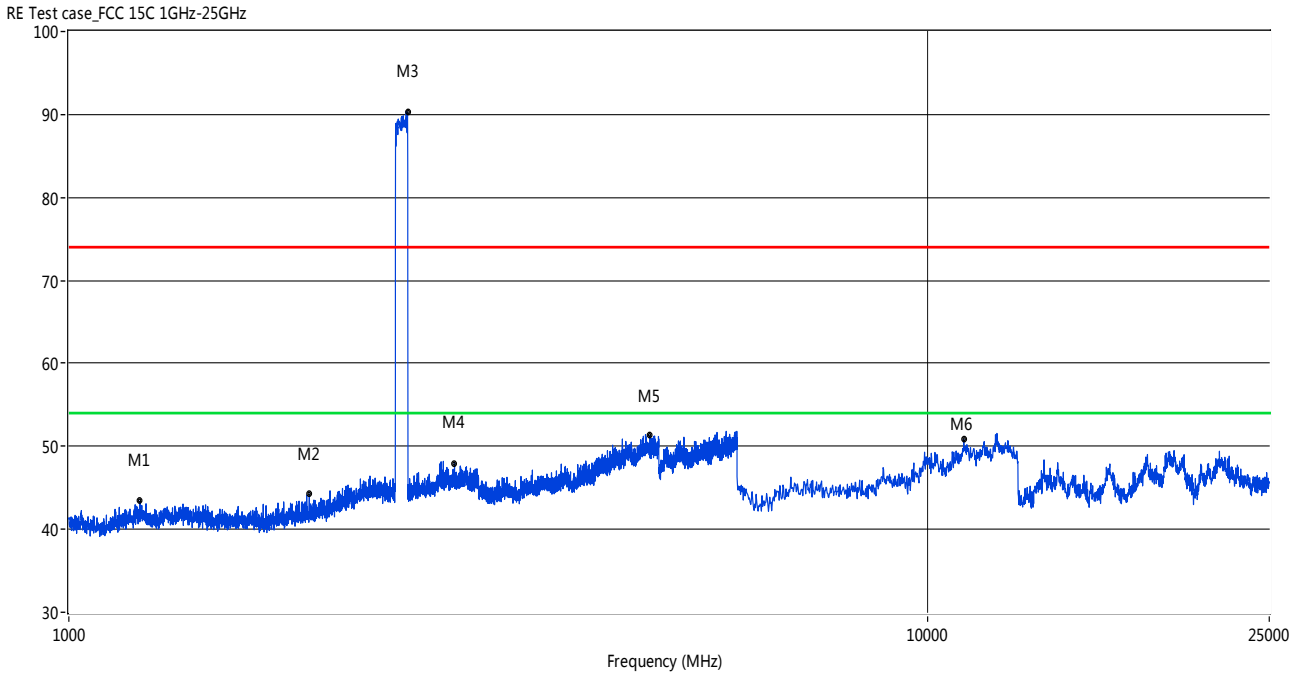
Hopping Mode:

GFSK MODE 1GHz to 25GHz, ANT V



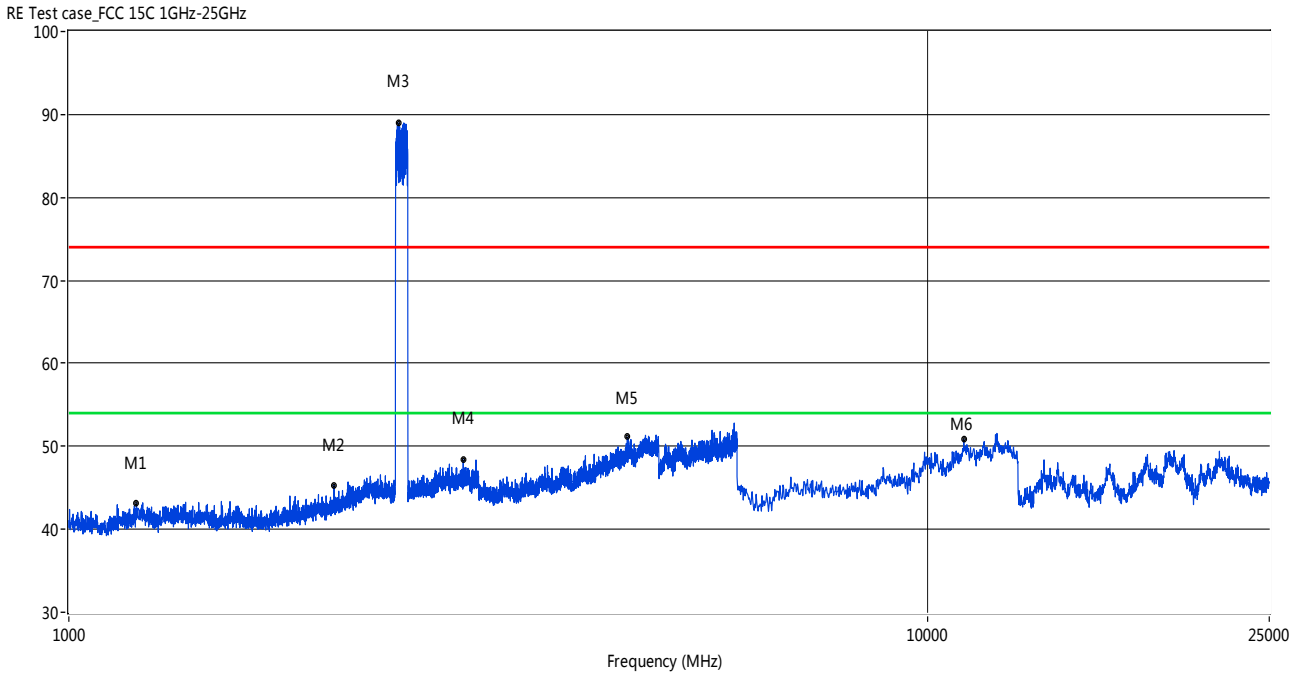
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1225.44	43.67	-5.25	74.0	30.33	Peak	234.90	100	Vertical	PASS
2	1910.77	45.05	-2.68	74.0	28.95	Peak	290.50	100	Vertical	PASS
3	2454.14	88.95	-0.52	74.0	-14.95	Peak	83.60	100	Vertical	N/A
4	2990.00	48.13	2.41	74.0	25.87	Peak	59.80	100	Vertical	PASS
5	4821.30	51.88	13.84	74.0	22.12	Peak	326.70	100	Vertical	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Vertical	PASS

GFSK MODE 1GHz to 25GHz, ANT H



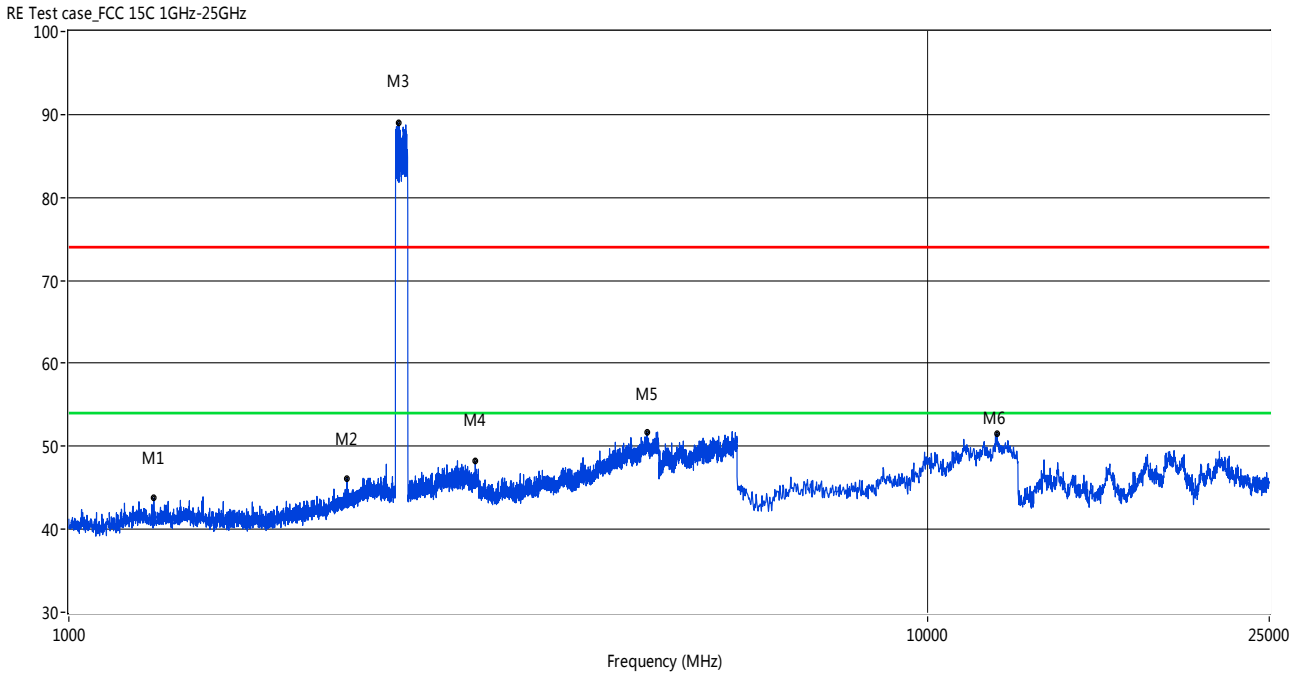
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1208.95	43.41	-5.16	74.0	30.59	Peak	0.00	100	Horizontal	PASS
2	1905.77	44.27	-2.80	74.0	29.73	Peak	59.30	100	Horizontal	PASS
3	2480.13	90.29	-0.60	74.0	-16.29	Peak	346.30	100	Horizontal	N/A
4	2812.55	47.93	2.01	74.0	26.07	Peak	107.50	100	Horizontal	PASS
5	4748.56	51.31	13.54	74.0	22.69	Peak	149.20	100	Horizontal	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Horizontal	PASS

Π/4-DQPSK MODE 1GHz to 25GHz, ANT V



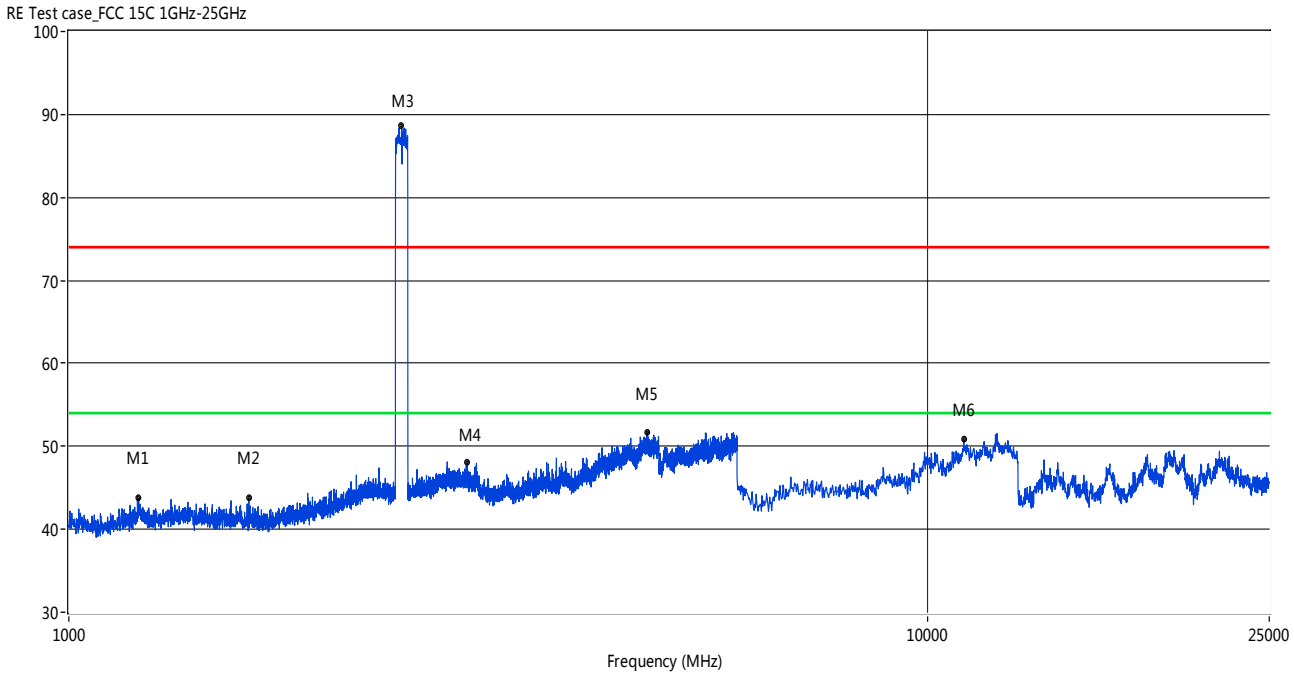
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1198.45	43.16	-5.32	74.0	30.84	Peak	3.10	100	Vertical	PASS
2	2035.74	45.34	-1.99	74.0	28.66	Peak	357.20	100	Vertical	PASS
3	2421.14	88.97	-0.14	74.0	-14.97	Peak	76.10	100	Vertical	N/A
4	2879.03	48.36	2.24	74.0	25.64	Peak	251.20	100	Vertical	PASS
5	4470.38	51.12	12.52	74.0	22.88	Peak	358.40	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

Π/4-DQPSK MODE 1GHz to 25GHz, ANT H



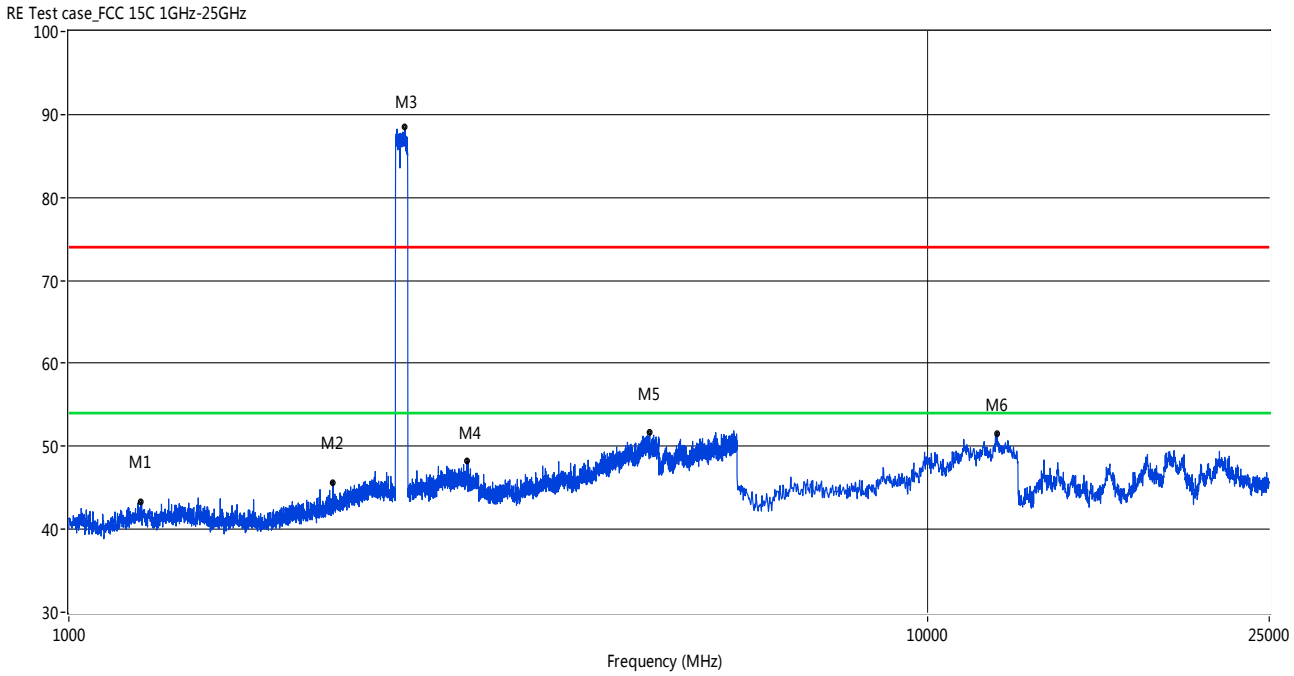
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1255.94	43.78	-5.20	74.0	30.22	Peak	221.80	100	Horizontal	PASS
2	2108.22	46.15	-1.45	74.0	27.85	Peak	357.90	100	Horizontal	PASS
3	2418.14	89.00	-0.05	74.0	-15.00	Peak	76.80	100	Horizontal	N/A
4	2973.51	48.21	2.33	74.0	25.79	Peak	261.80	100	Horizontal	PASS
5	4711.07	51.70	13.38	74.0	22.30	Peak	35.10	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

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



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1205.45	43.73	-5.21	74.0	30.27	Peak	258.90	100	Vertical	PASS
2	1619.85	43.77	-4.28	74.0	30.23	Peak	274.50	100	Vertical	PASS
3	2440.14	88.62	-0.39	74.0	-14.62	Peak	60.20	100	Vertical	N/A
4	2911.52	48.10	2.43	74.0	25.90	Peak	60.20	100	Vertical	PASS
5	4711.07	51.76	13.38	74.0	22.24	Peak	94.00	100	Vertical	PASS
6	11020.38	50.83	20.14	74.0	23.17	Peak	285.90	100	Vertical	PASS

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



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1212.45	43.24	-5.16	74.0	30.76	Peak	203.40	100	Horizontal	PASS
2	2030.24	45.66	-2.15	74.0	28.34	Peak	68.70	100	Horizontal	PASS
3	2464.13	88.42	-0.57	74.0	-14.42	Peak	359.60	100	Horizontal	N/A
4	2906.52	48.21	2.58	74.0	25.79	Peak	330.90	100	Horizontal	PASS
5	4747.81	51.63	13.53	74.0	22.37	Peak	336.40	100	Horizontal	PASS
6	12042.43	51.55	20.83	74.0	22.45	Peak	216.60	100	Horizontal	PASS

A.9 Band Edge

Test Data

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 (-16.86dB) derived from 20log (dwell time/100ms).

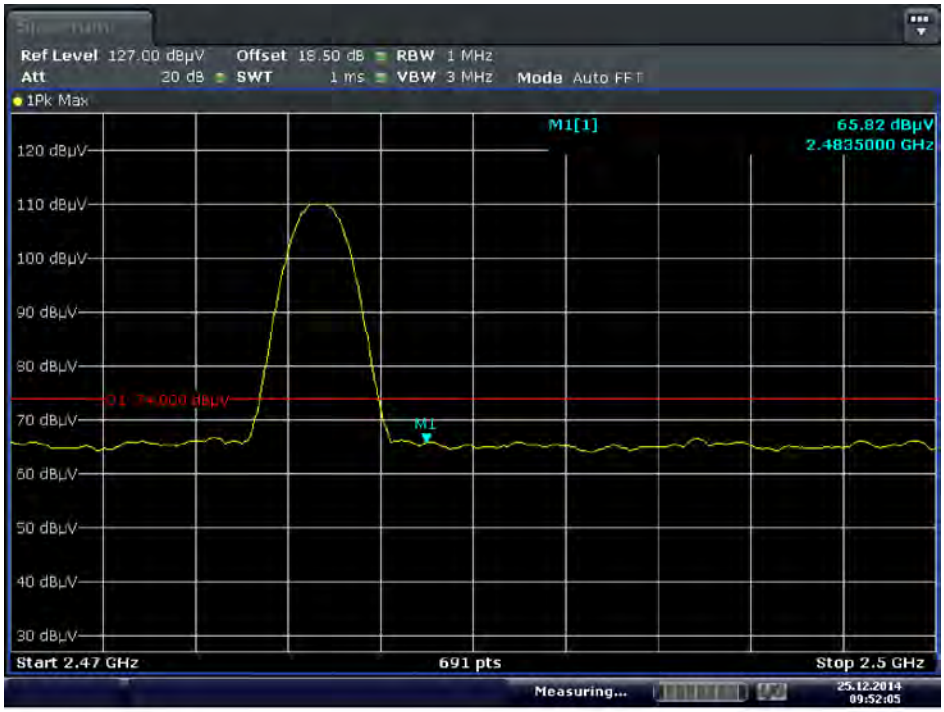
For example: Average level = 50.8dBuV/m – 16.86(dB) = 33.94dBuV/m.

Test Mode	Test Channel	Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark	Verdict
GFSK	Low	2390.00	64.93	74	9.07	PEAK	PASS
		2390.00	48.07	54	5.93	AVERAGE	PASS
GFSK	HIGH	2483.50	65.82	74	8.18	PEAK	PASS
		2483.50	48.96	54	5.04	AVERAGE	PASS
π/4DQPSK	Low	2390.00	63.57	74	10.43	PEAK	PASS
		2390.00	46.71	54	7.29	AVERAGE	PASS
π/4DQPSK	HIGH	2483.50	65.34	74	8.66	PEAK	PASS
		2483.50	48.48	54	5.52	AVERAGE	PASS
8-DPSK	Low	2390.00	62.88	74	11.12	PEAK	PASS
		2390.00	46.02	54	7.98	AVERAGE	PASS
8-DPSK	HIGH	2483.50	65.61	74	8.39	PEAK	PASS
		2483.50	48.75	54	5.25	AVERAGE	PASS
GFSK(Hopping)	Low	2390.00	63.07	74	10.93	PEAK	PASS
		2390.00	46.21	54	7.79	AVERAGE	PASS
GFSK(Hopping)	HIGH	2483.50	65.35	74	8.65	PEAK	PASS
		2483.50	48.49	54	5.51	AVERAGE	PASS
π/4DQPSK (Hopping)	Low	2390.00	64.03	74	9.97	PEAK	PASS
		2390.00	47.17	54	6.83	AVERAGE	PASS
π/4DQPSK (Hopping)	HIGH	2483.50	65.26	74	8.74	PEAK	PASS
		2483.50	48.40	54	5.60	AVERAGE	PASS
8-DPSK (Hopping)	Low	2390.00	62.59	74	11.41	PEAK	PASS
		2390.00	45.73	54	8.27	AVERAGE	PASS
8-DPSK (Hopping)	HIGH	2483.50	65.30	74	8.70	PEAK	PASS
		2483.50	48.44	54	5.56	AVERAGE	PASS

GFSK LOW CHANNEL , PEAK

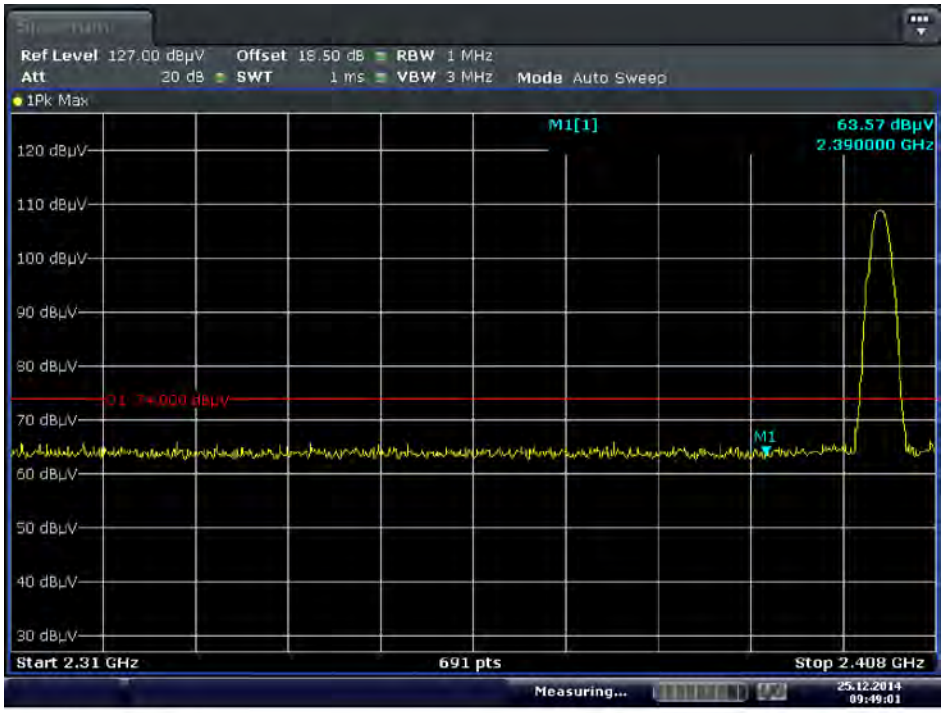
Date: 25.DEC.2014 09:47:55

GFSK HIGH CHANNEL , PEAK



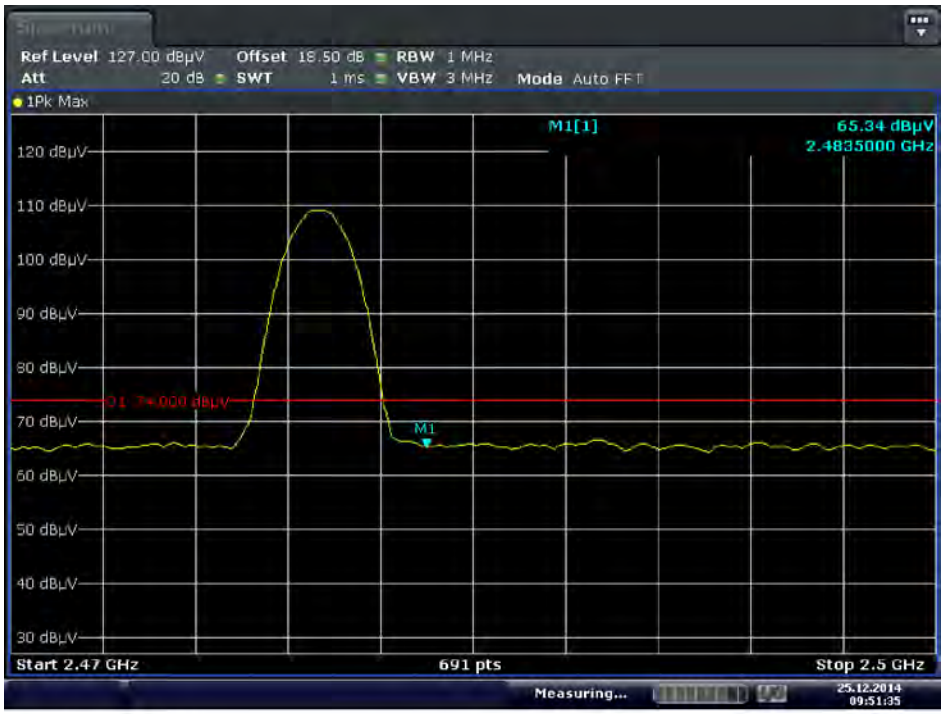
Date: 25.DEC.2014 09:52:05

π/4DQPSK LOW CHANNEL , PEAK



Date: 25.DEC.2014 09:49:02

π/4DQPSK HIGH CHANNEL , PEAK

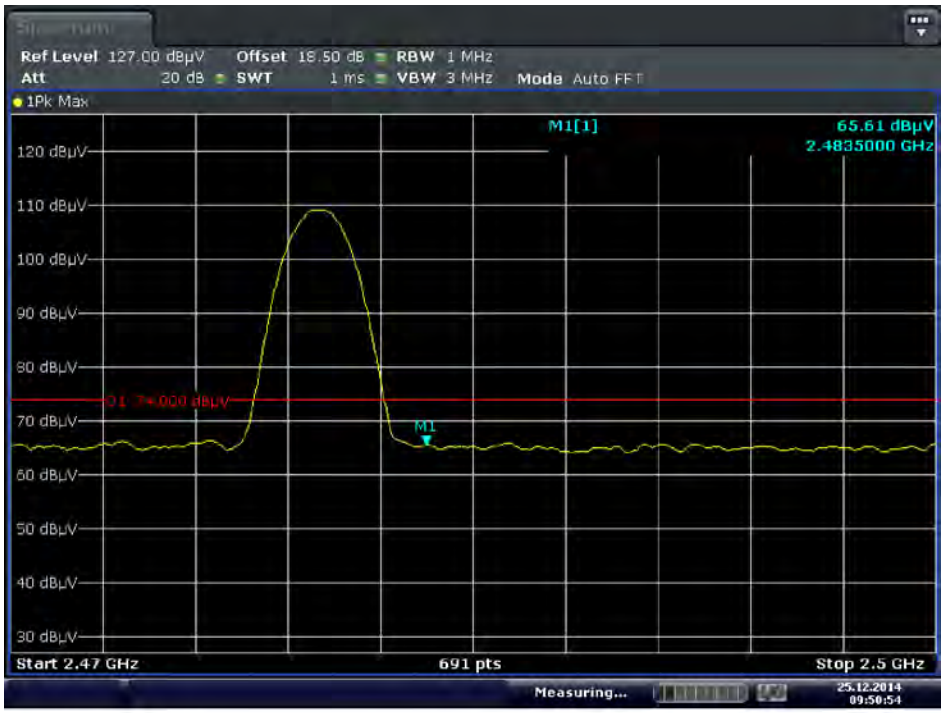


Date: 25.DEC.2014 09:51:35

8-DPSK LOW CHANNEL , PEAK

Date: 25.DEC.2014 09:49:40

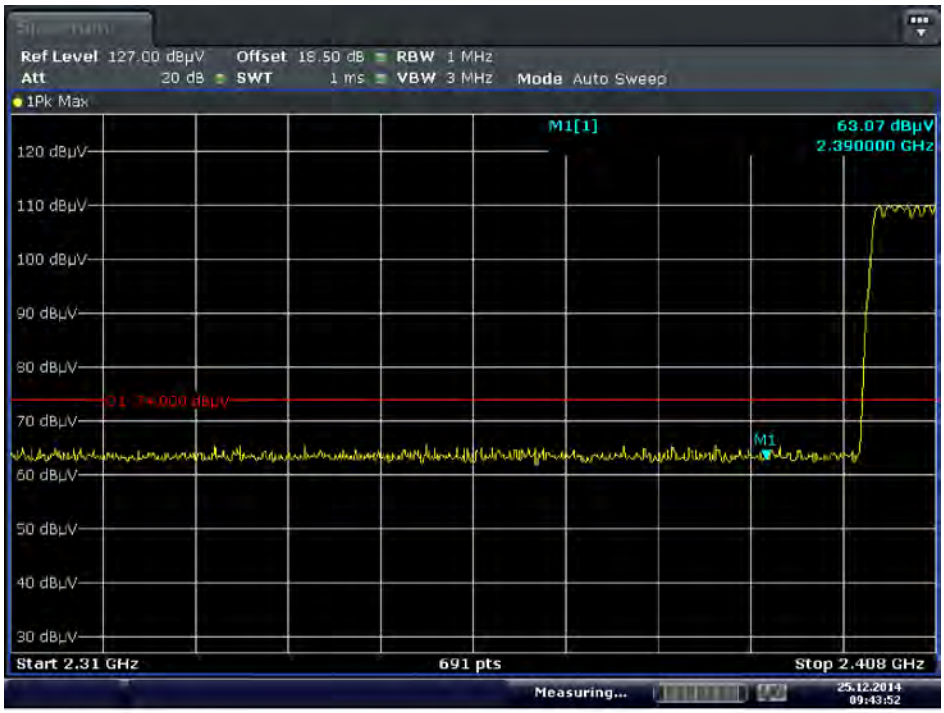
8-DPSK HIGH CHANNEL , PEAK



Date: 25.DEC.2014 09:50:54

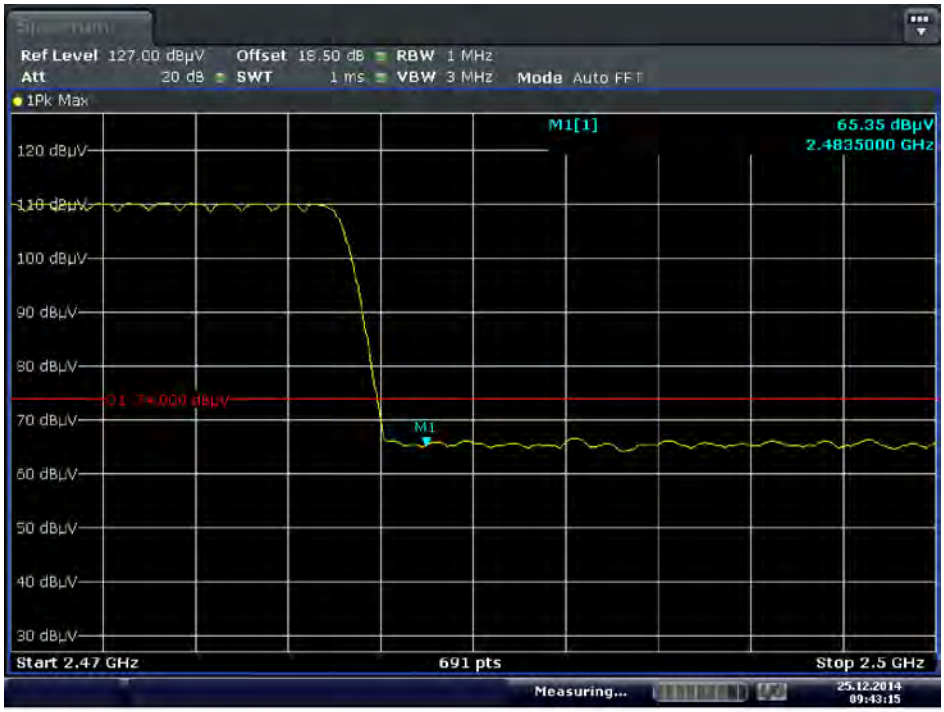
Hopping Mode:

GFSK LOW FREQUENCY BAND, PEAK



Date: 25.DEC.2014 09:43:53

GFSK HIGH FREQUENCY BAND, PEAK

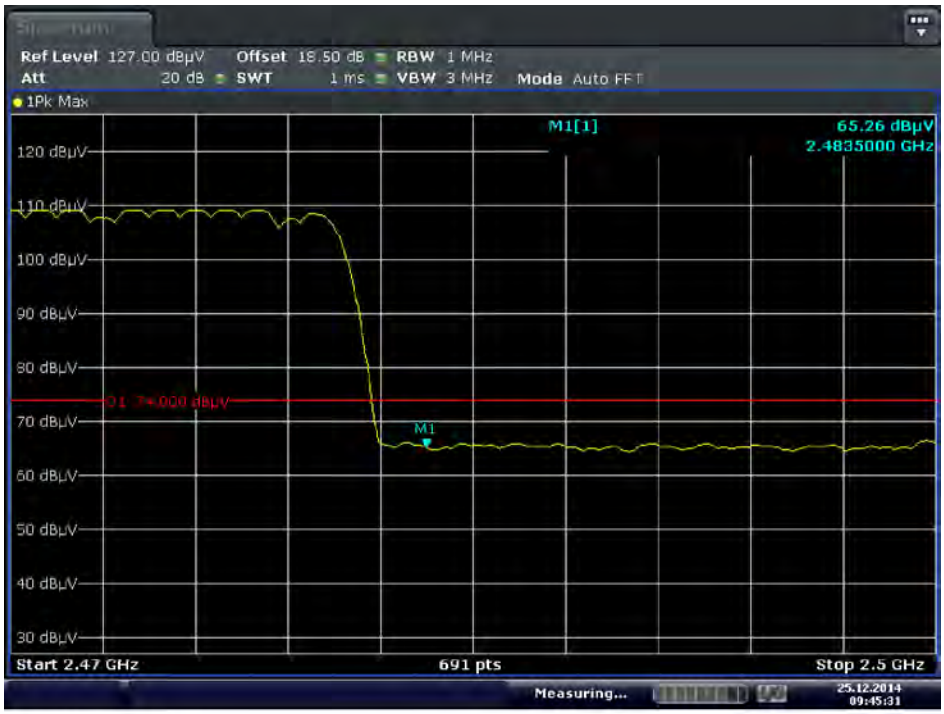


Date: 25.DEC.2014 09:43:15

π/4DQPSK LOW FREQUENCY BAND, PEAK

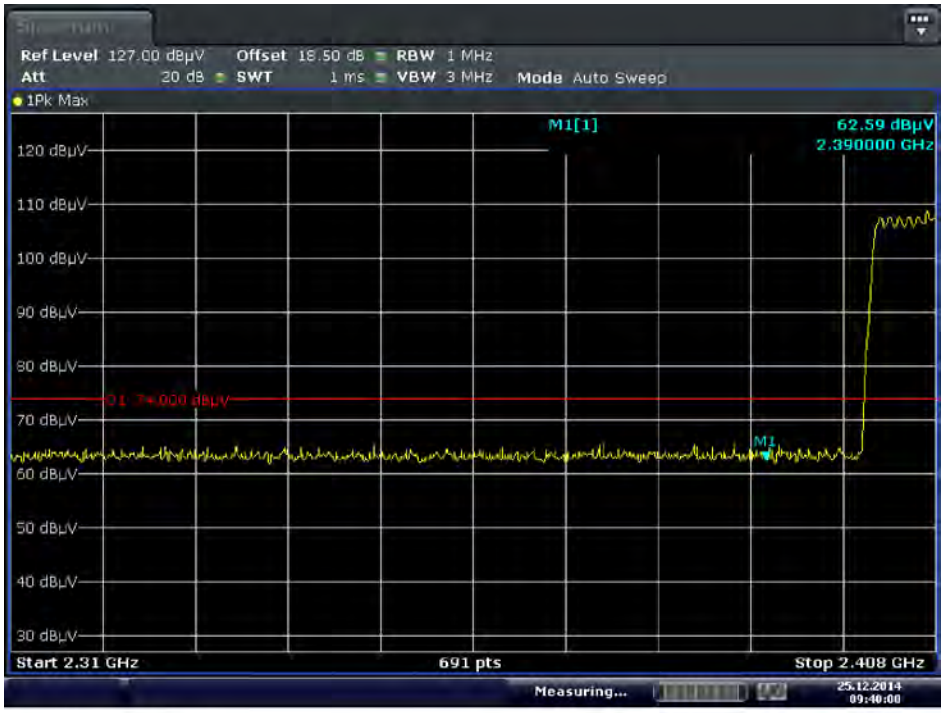
Date: 25.DEC.2014 09:44:33

π/4DQPSK HIGH FREQUENCY BAND, PEAK



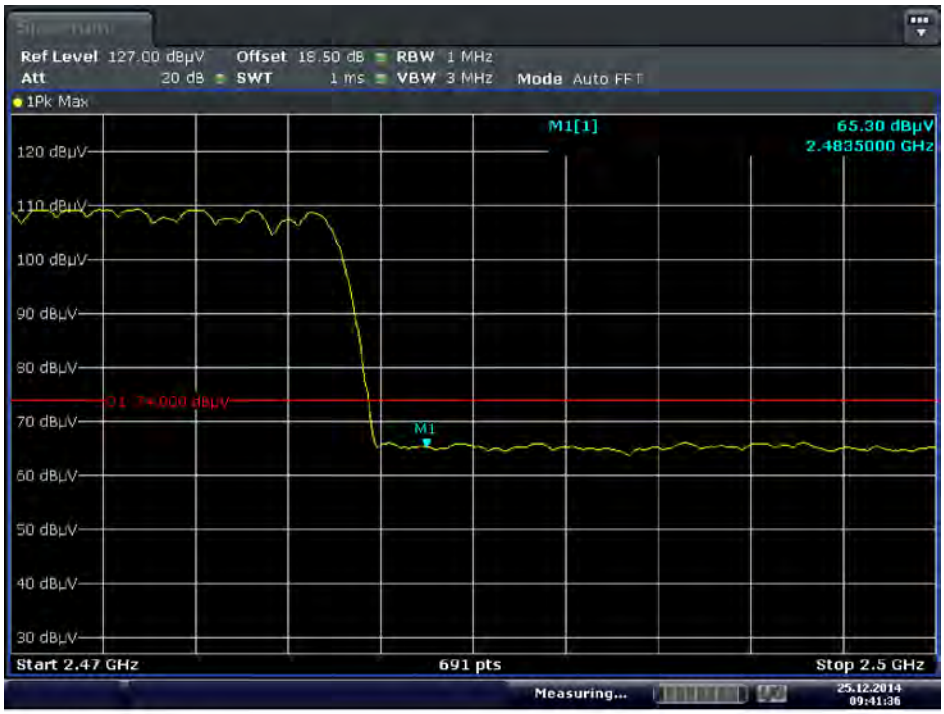
Date: 25.DEC.2014 09:45:31

8-DPSK LOW FREQUENCY BAND, PEAK



Date: 25.DEC.2014 09:40:01

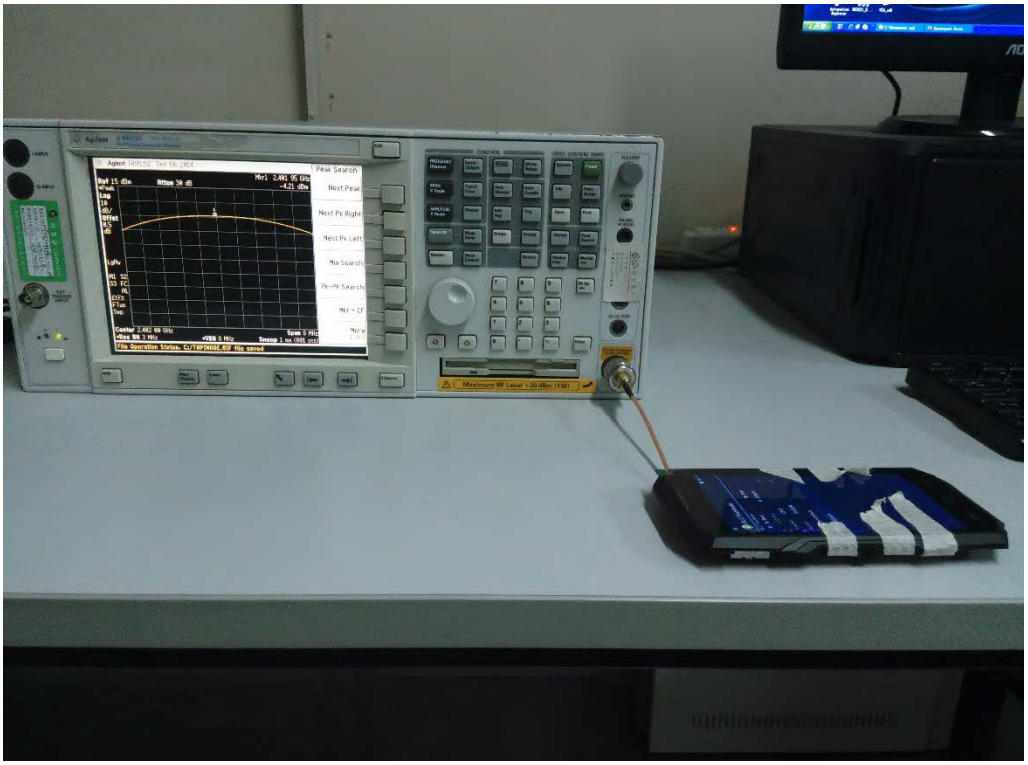
8-DPSK HIGH FREQUENCY BAND, PEAK



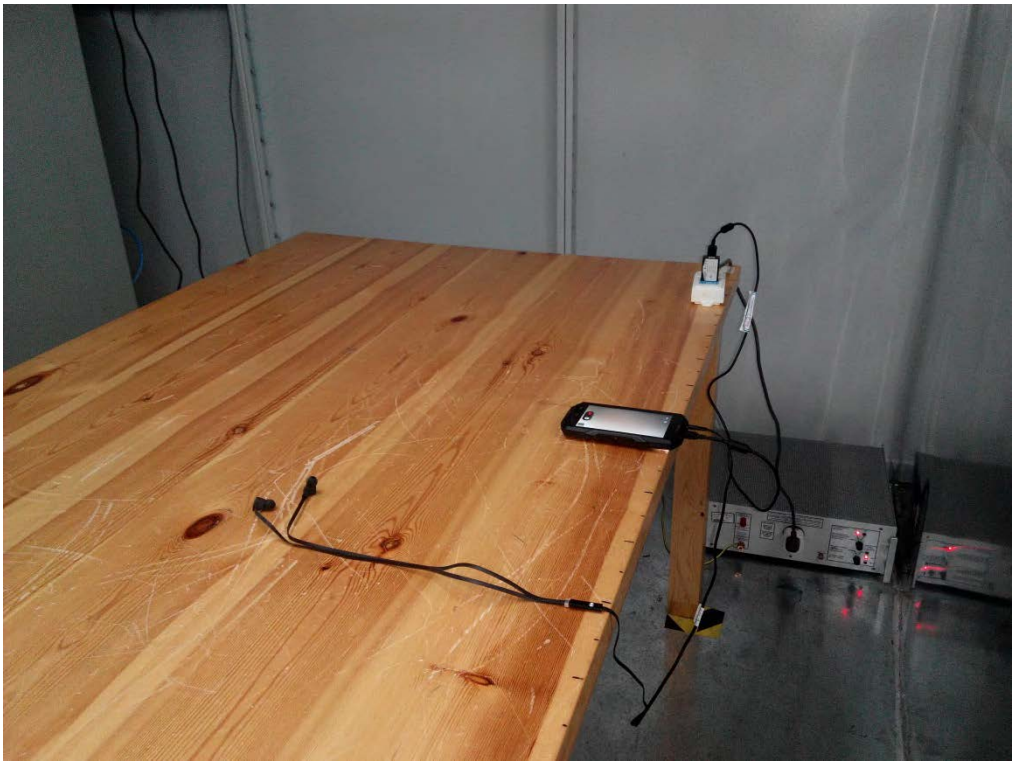
Date: 25.DEC.2014 09:41:36

ANNEX B TEST SETUP PHOTOS

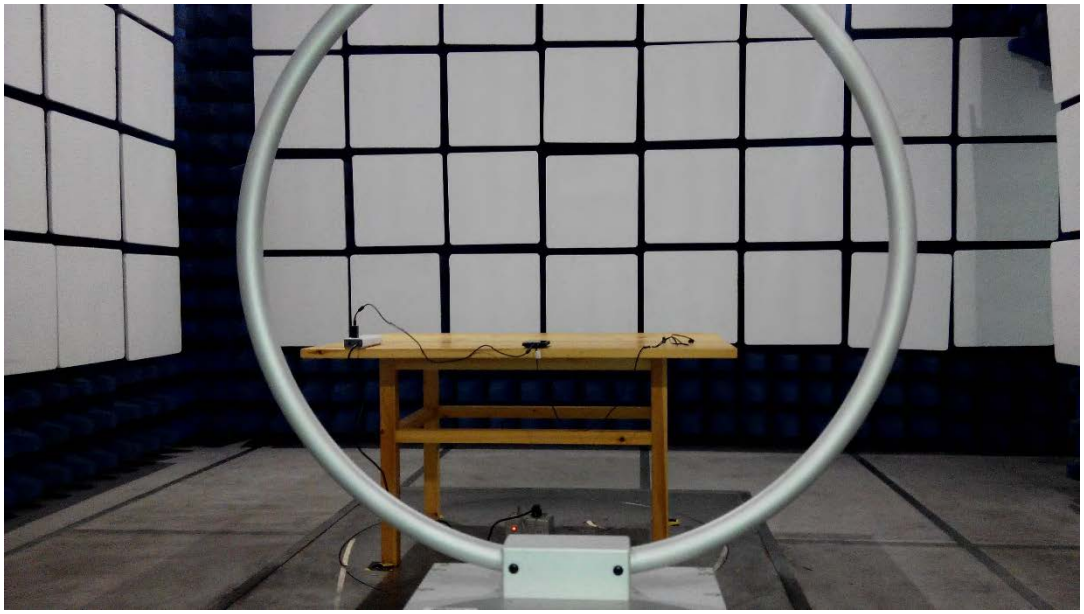
B.1 Conducted Test Photo



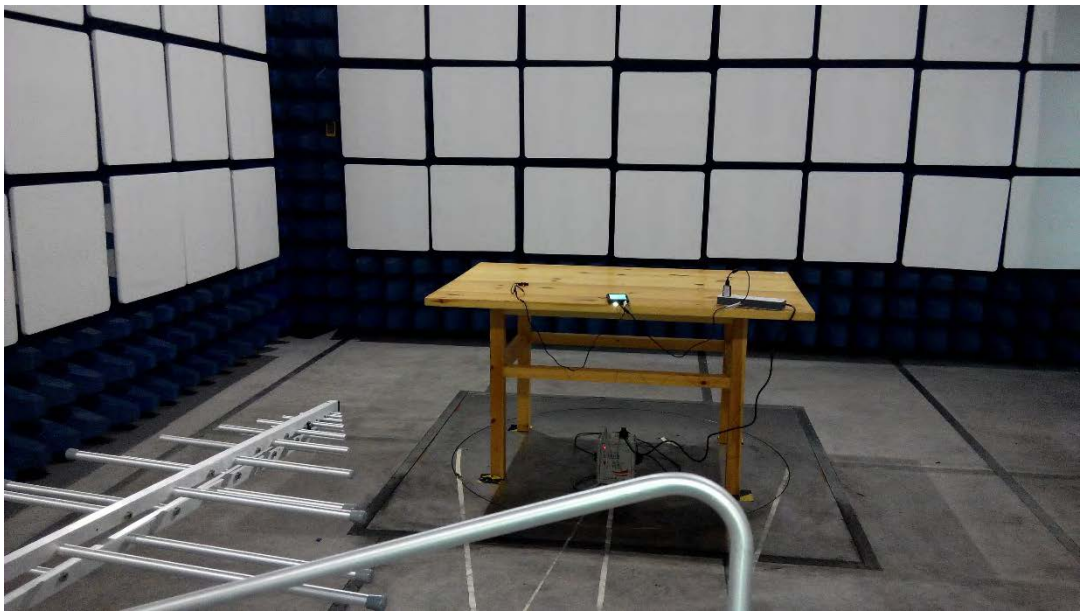
B.2 Conducted Emissions Test Photo



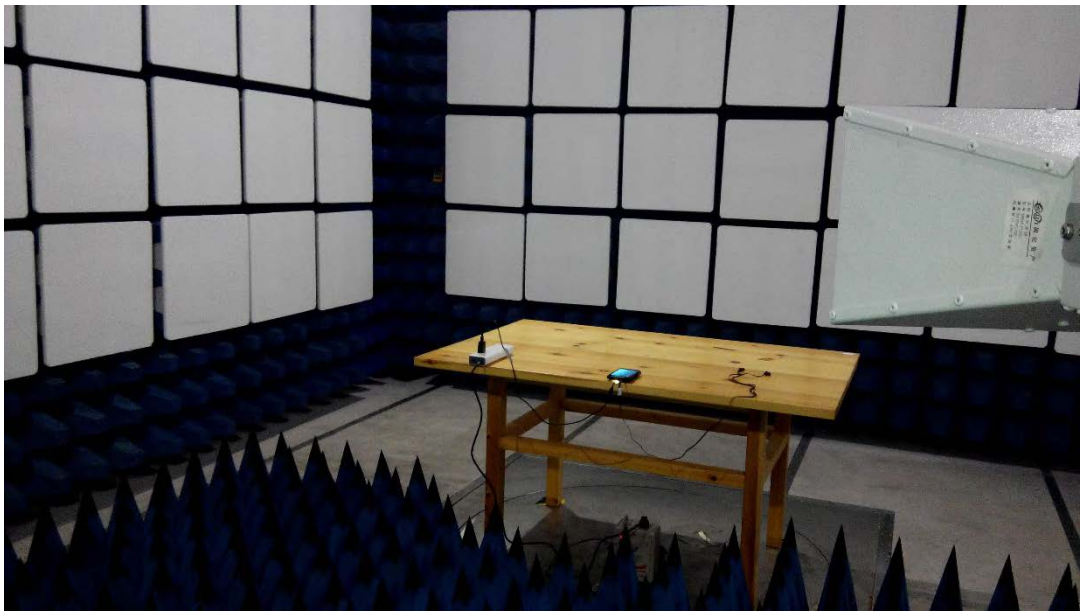
B.3 Radiated Test Photo



Below 30MHz



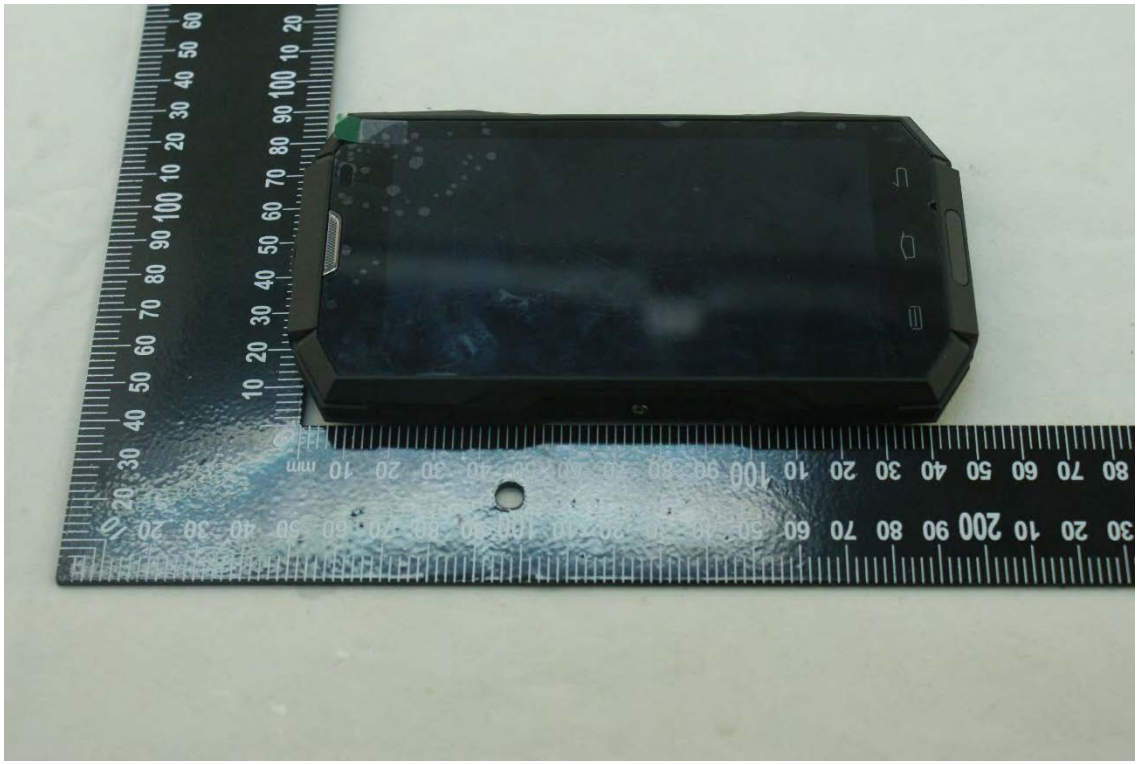
30MHz to 1GHz



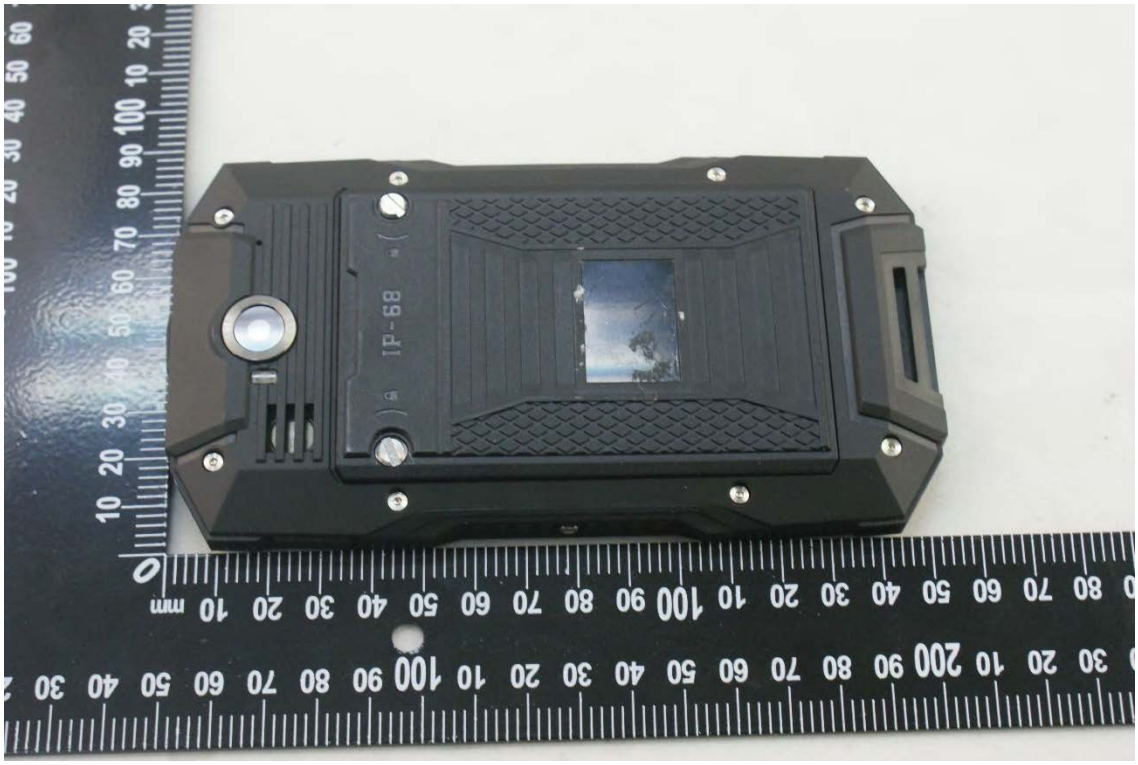
Above 1GHz

ANNEX C EUT PHOTOS

C.1 Appearance of the EUT

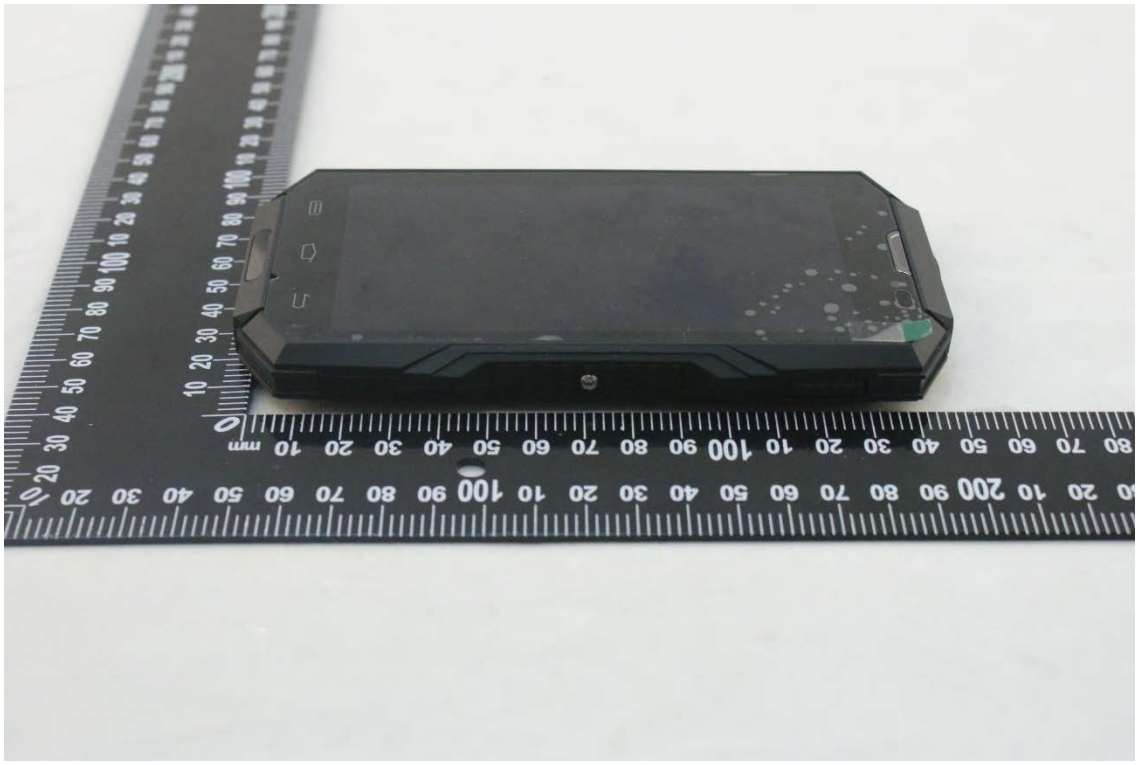


THE FRONT OF EUT



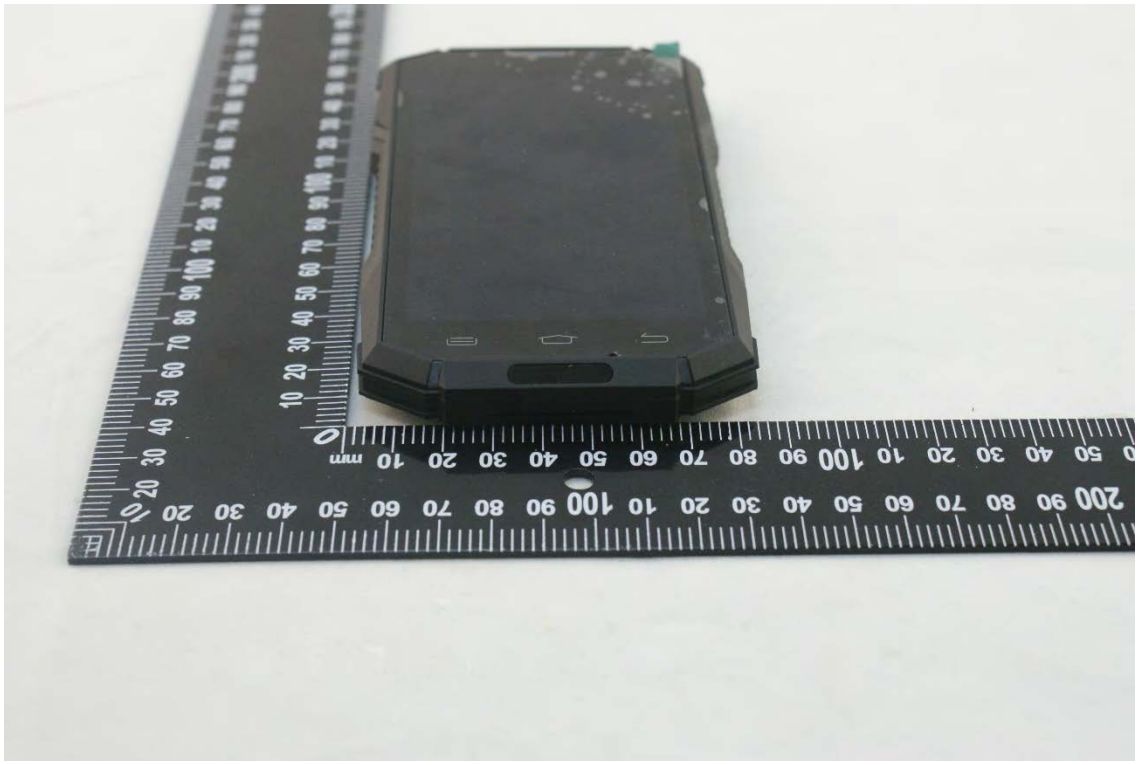
THE BACK OF EUT

THE LEFT OF EUT

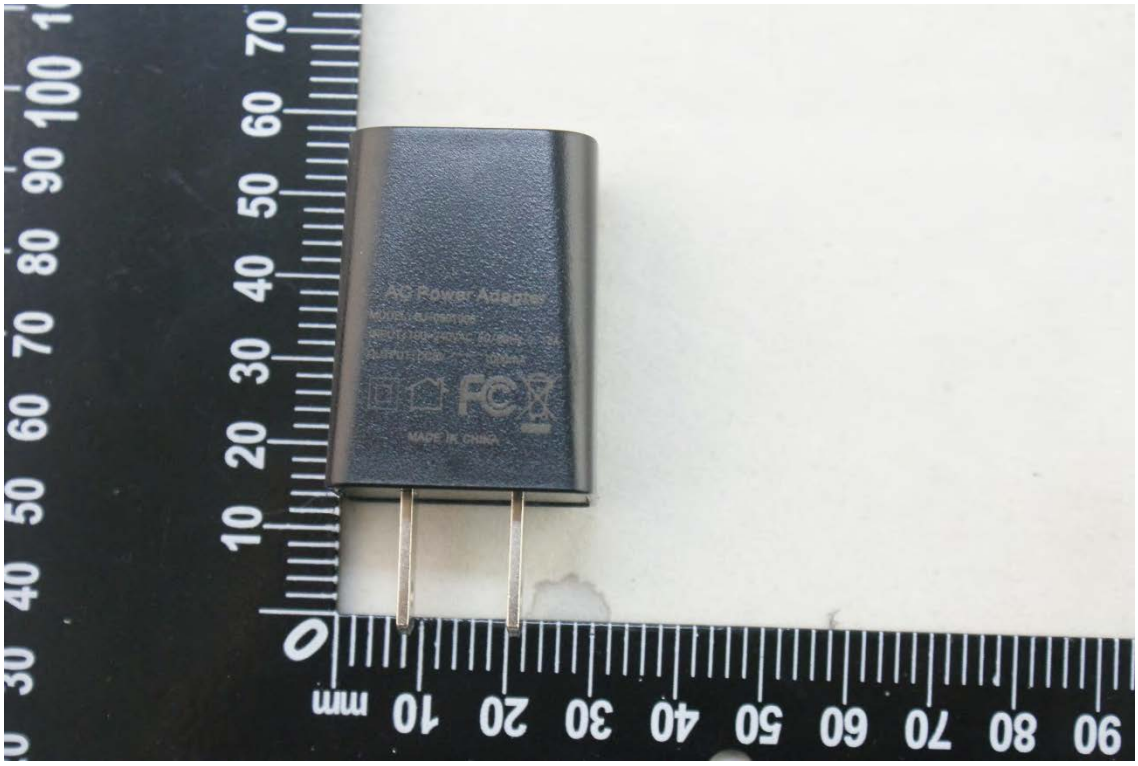


THE RIGHT OF EUT

THE UP OF EUT

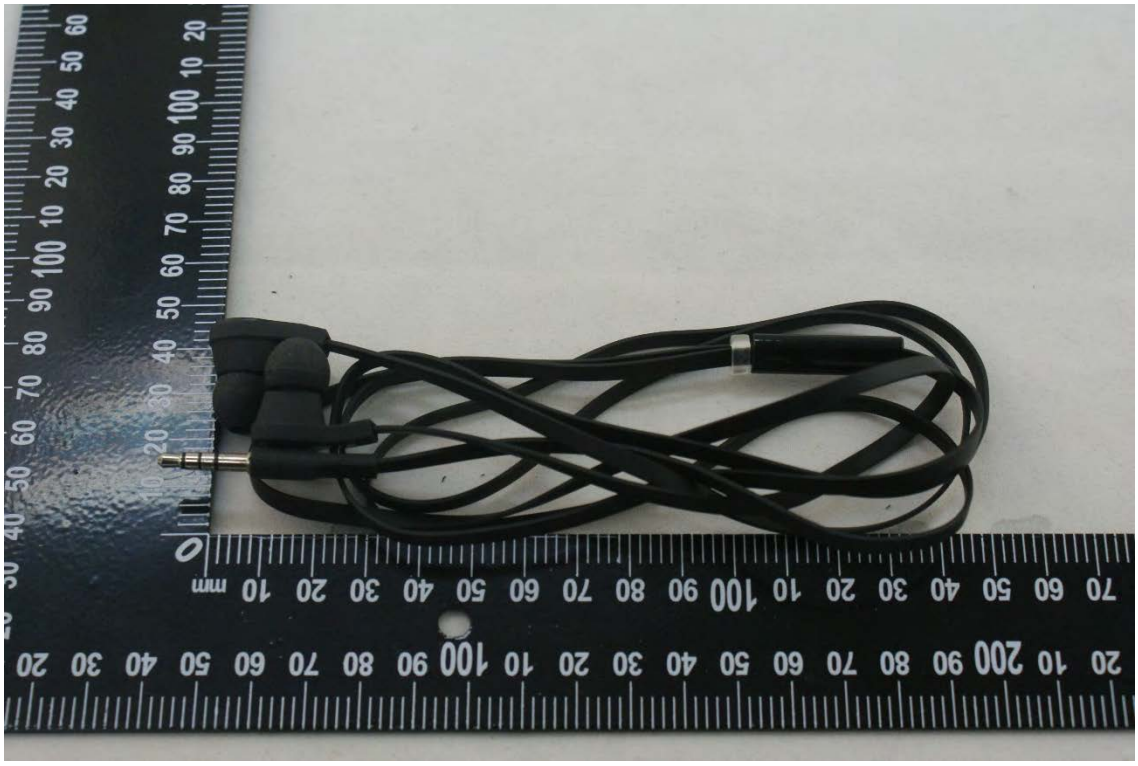


THE DOWN OF EUT



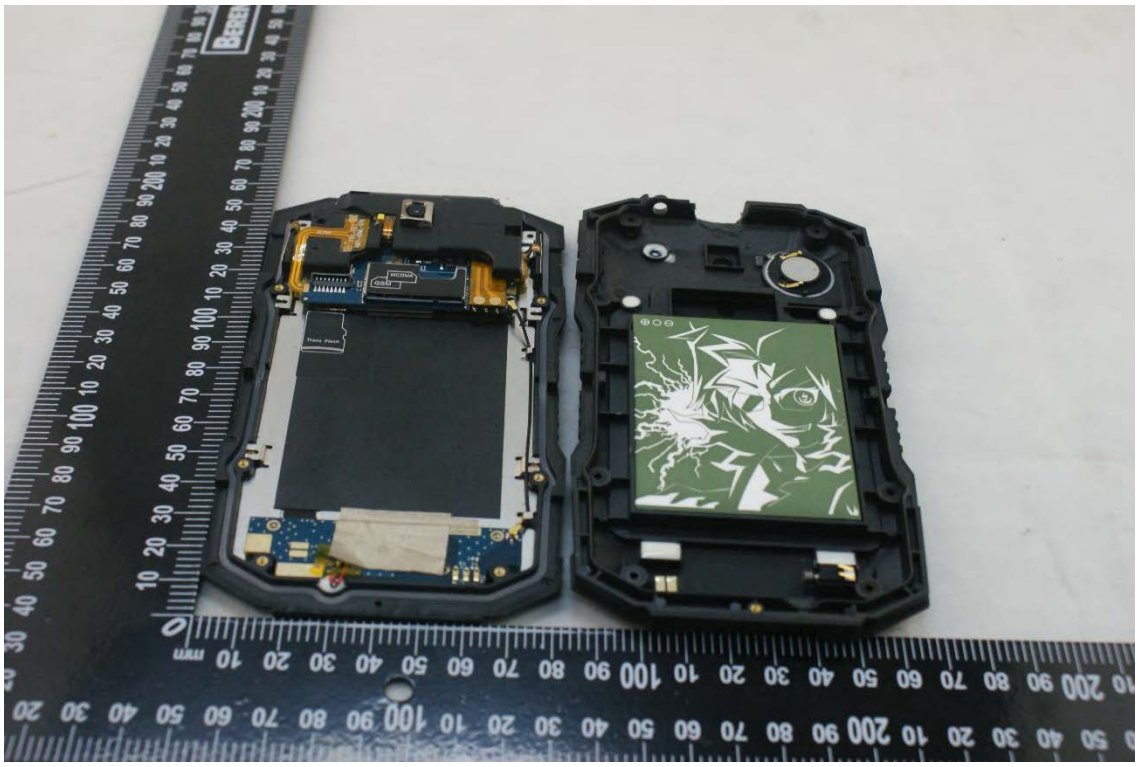
CHARGER

USB CABLE

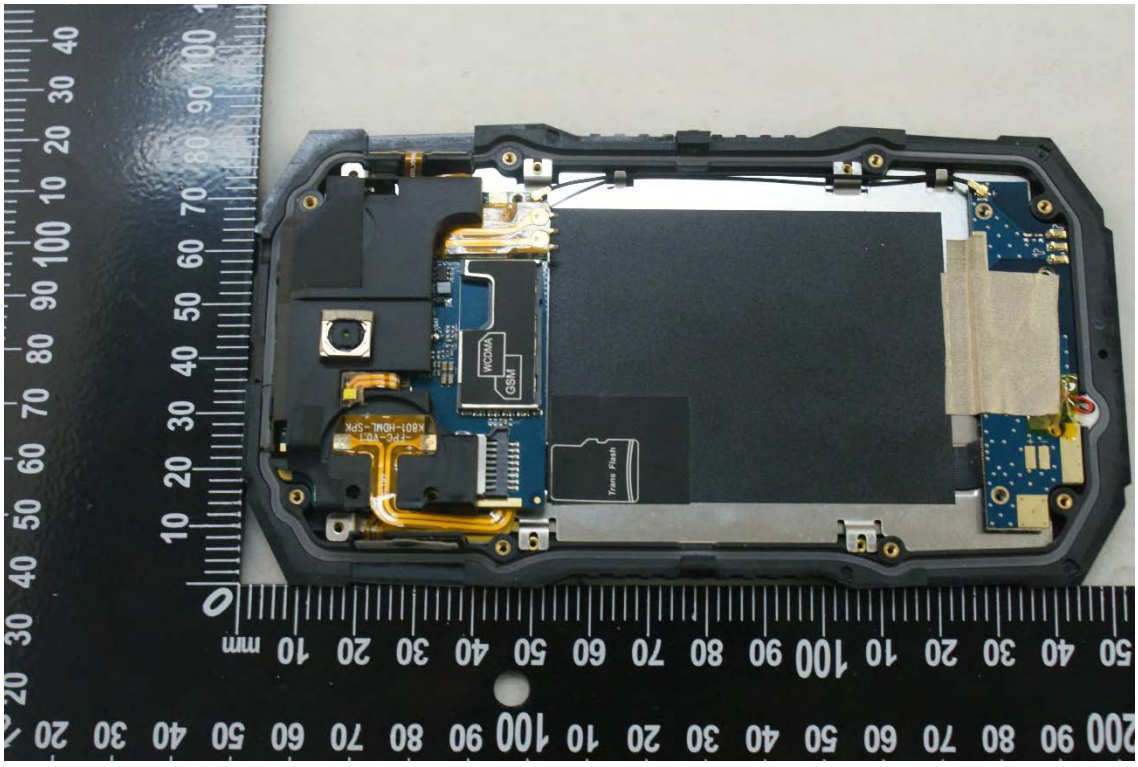


EARPHONE

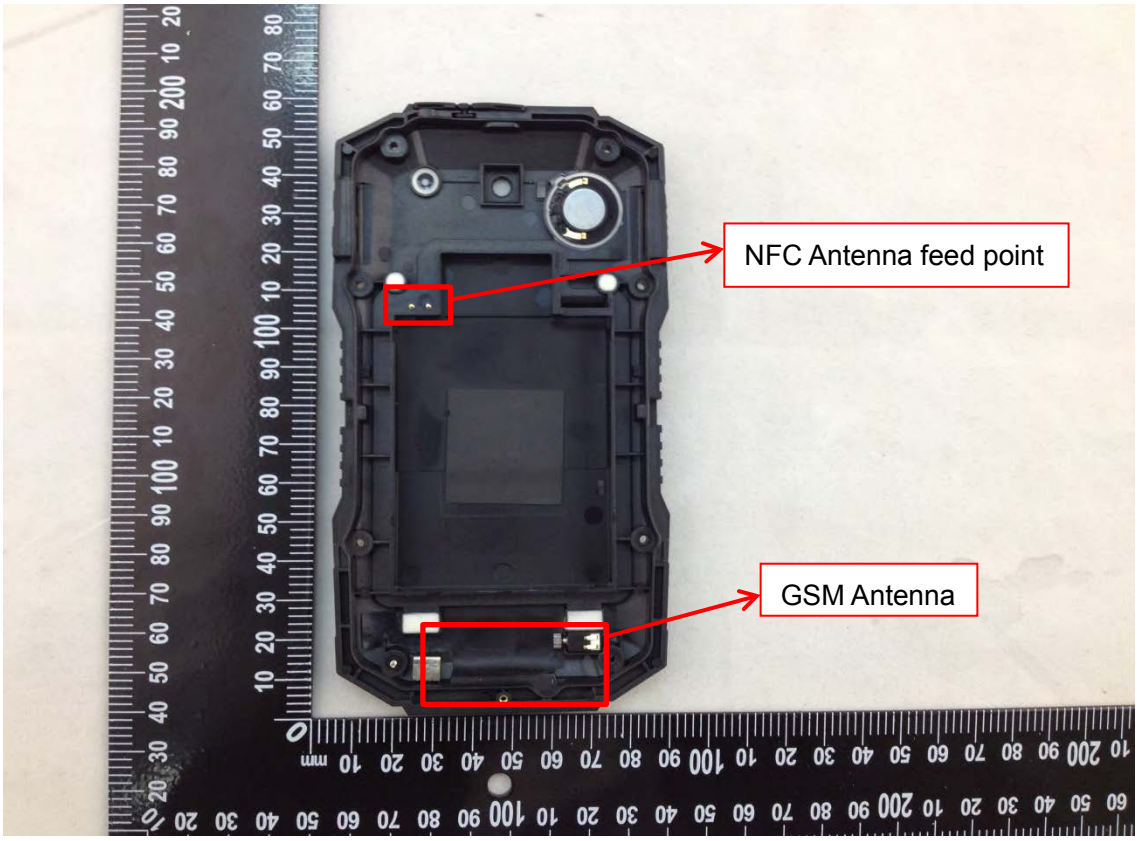
C.2 Inside of the EUT



EUT UNCOVER VIEW 1

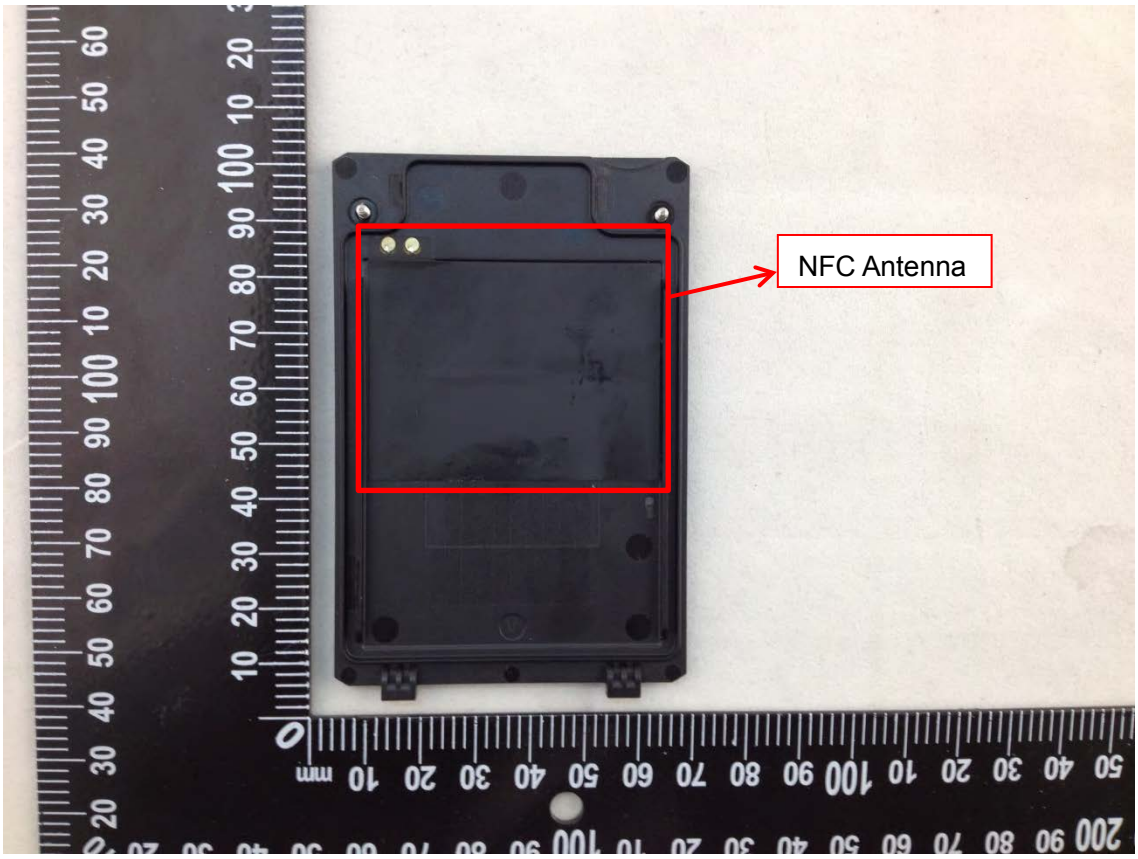


EUT UNCOVER VIEW 2

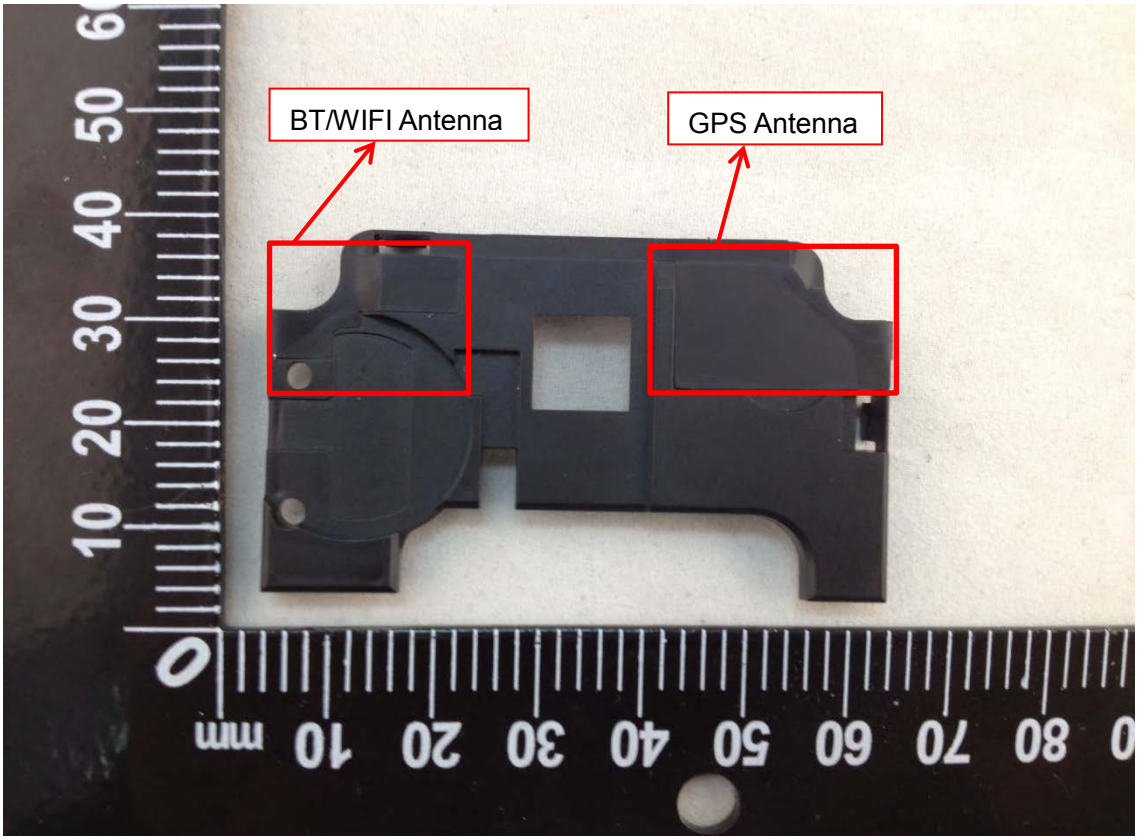


EUT UNCOVER VIEW 3

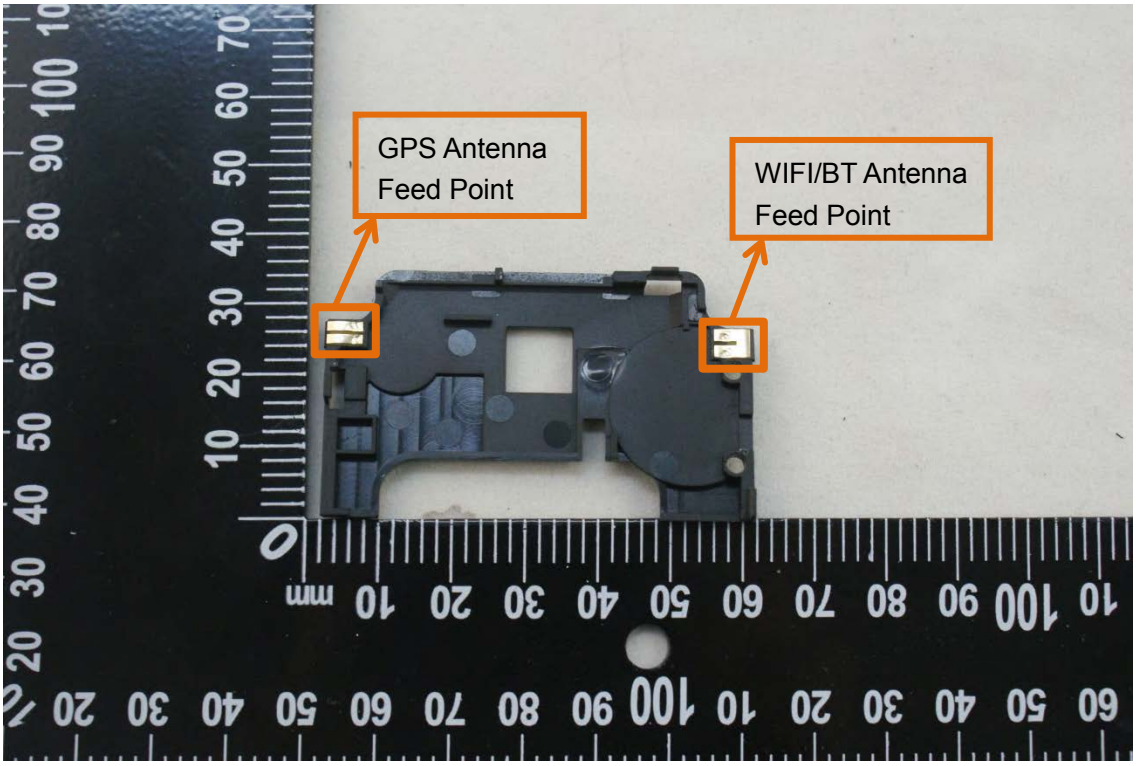
EUT UNCOVER VIEW 4



EUT UNCOVER VIEW 5

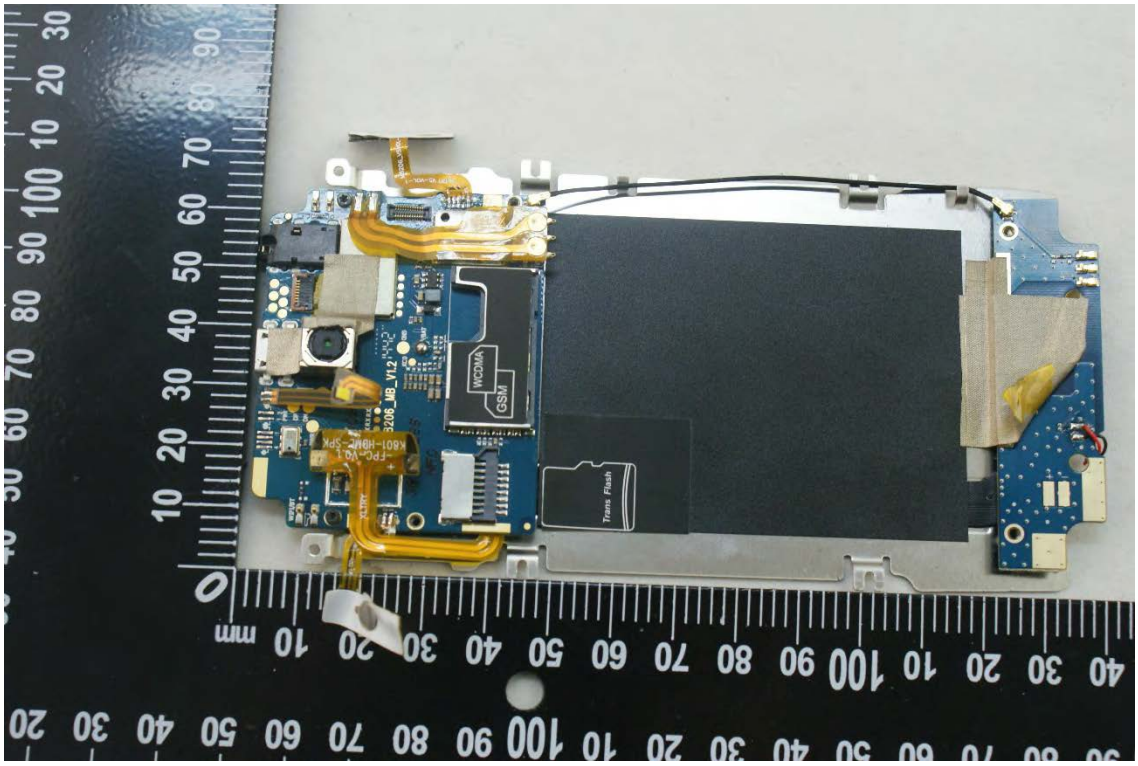


EUT UNCOVER VIEW 6

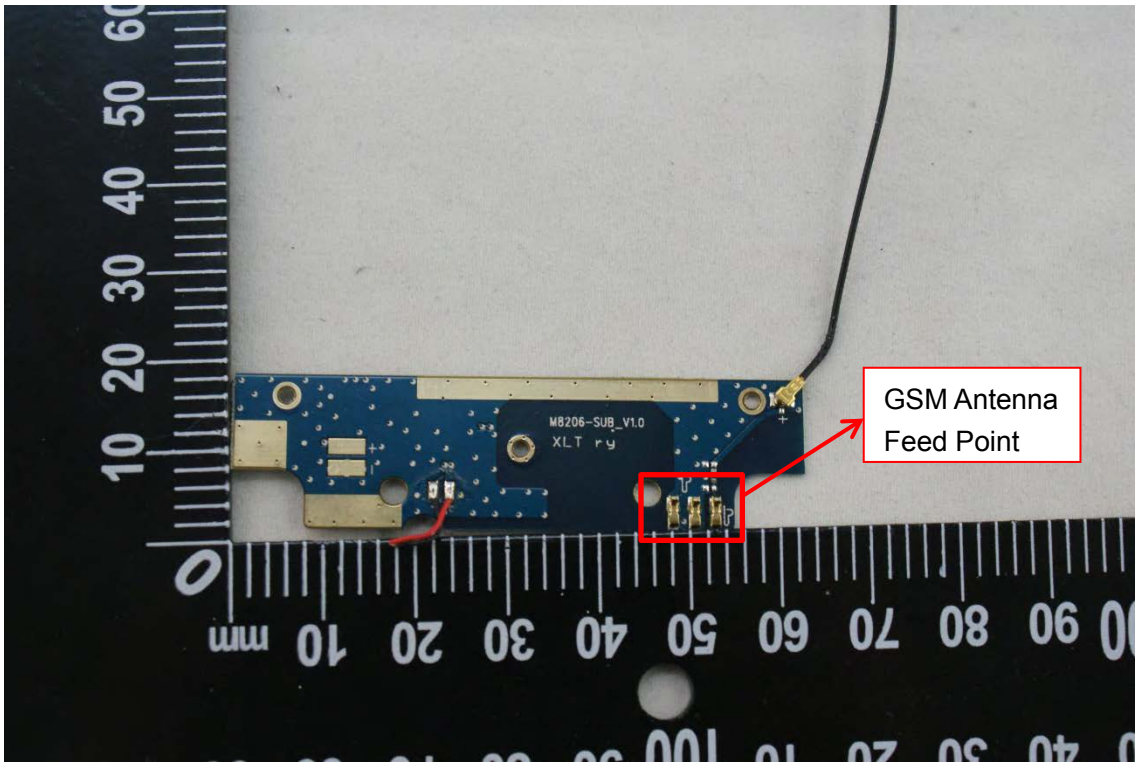


EUT UNCOVER VIEW 7

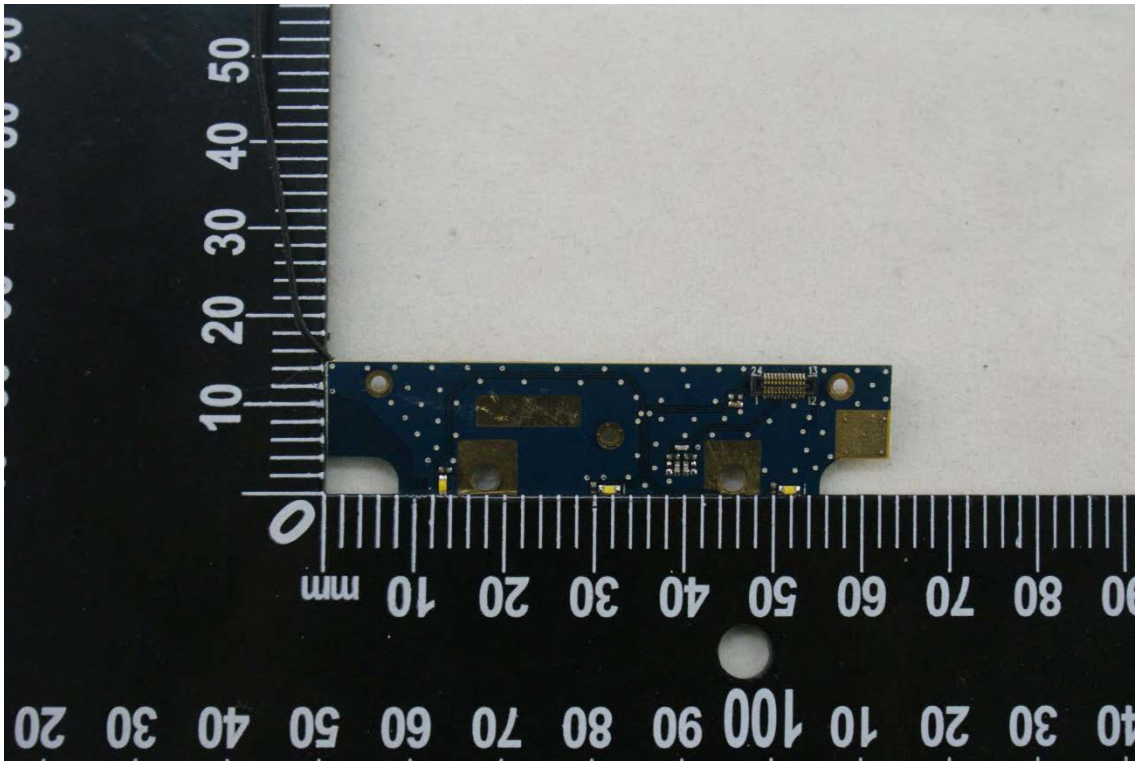
BATTERY



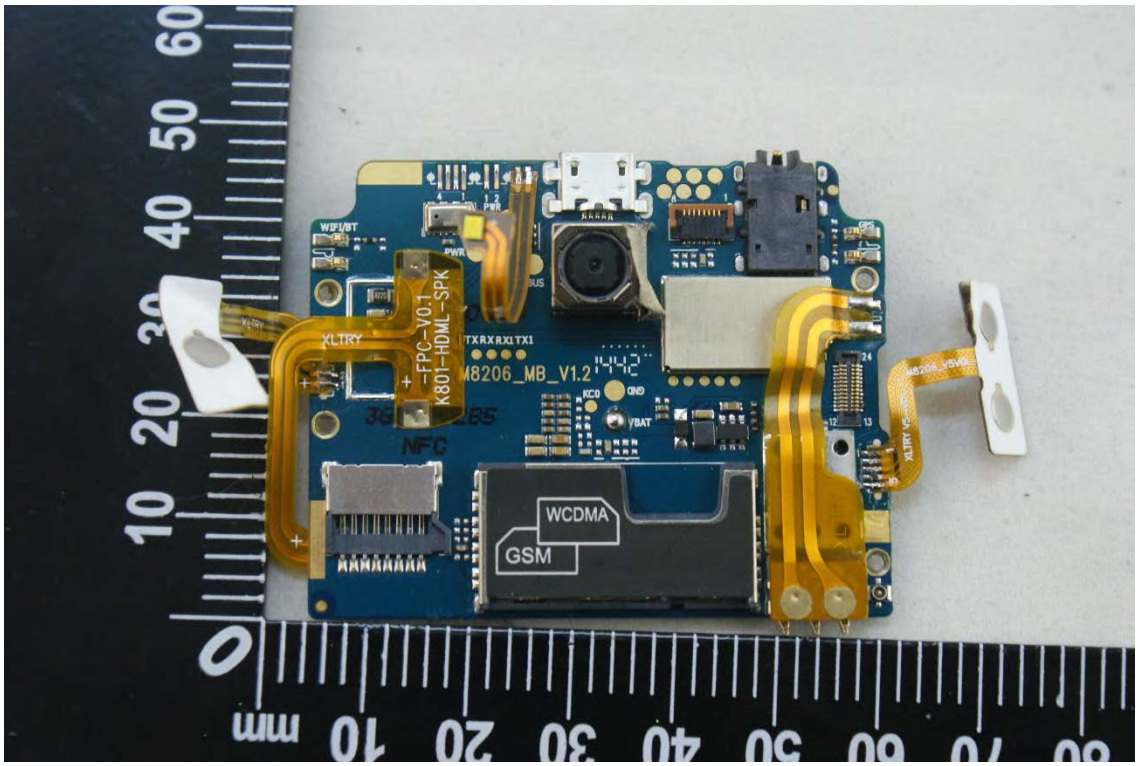
MAIN BOARD TOP VIEW 1



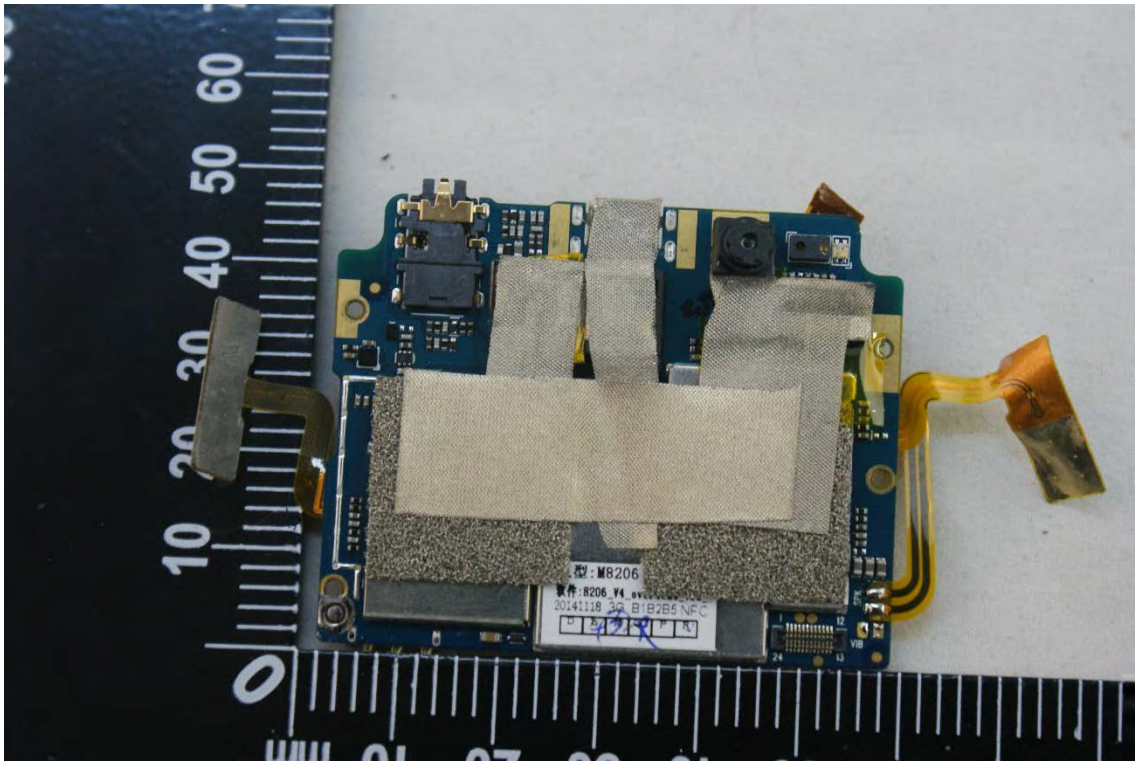
MAIN BOARD TOP VIEW 2



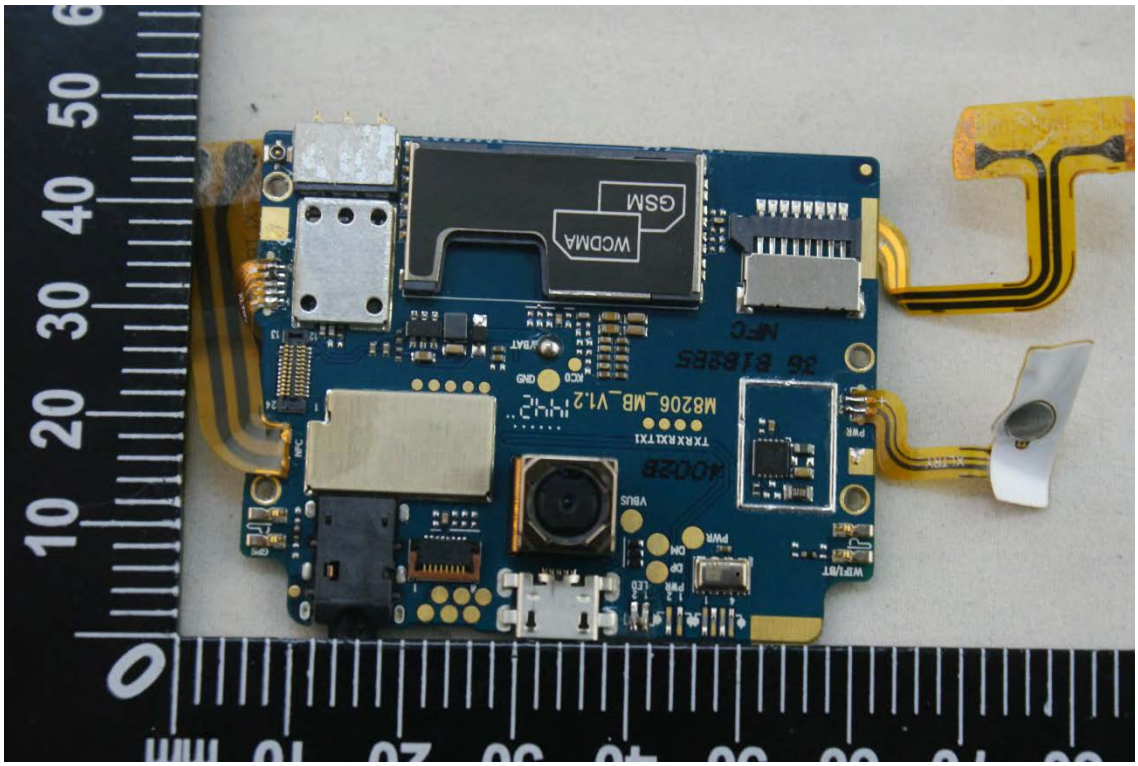
MAIN BOARD BACK VIEW 2



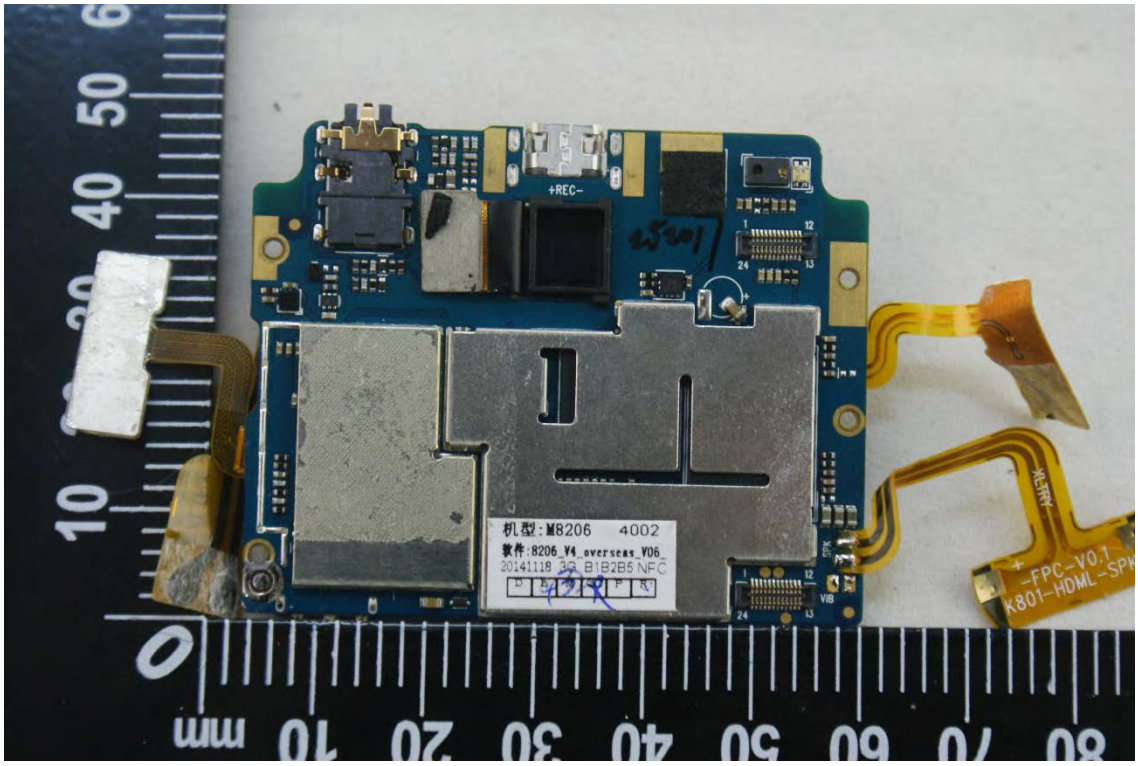
MAIN BOARD TOP VIEW 3



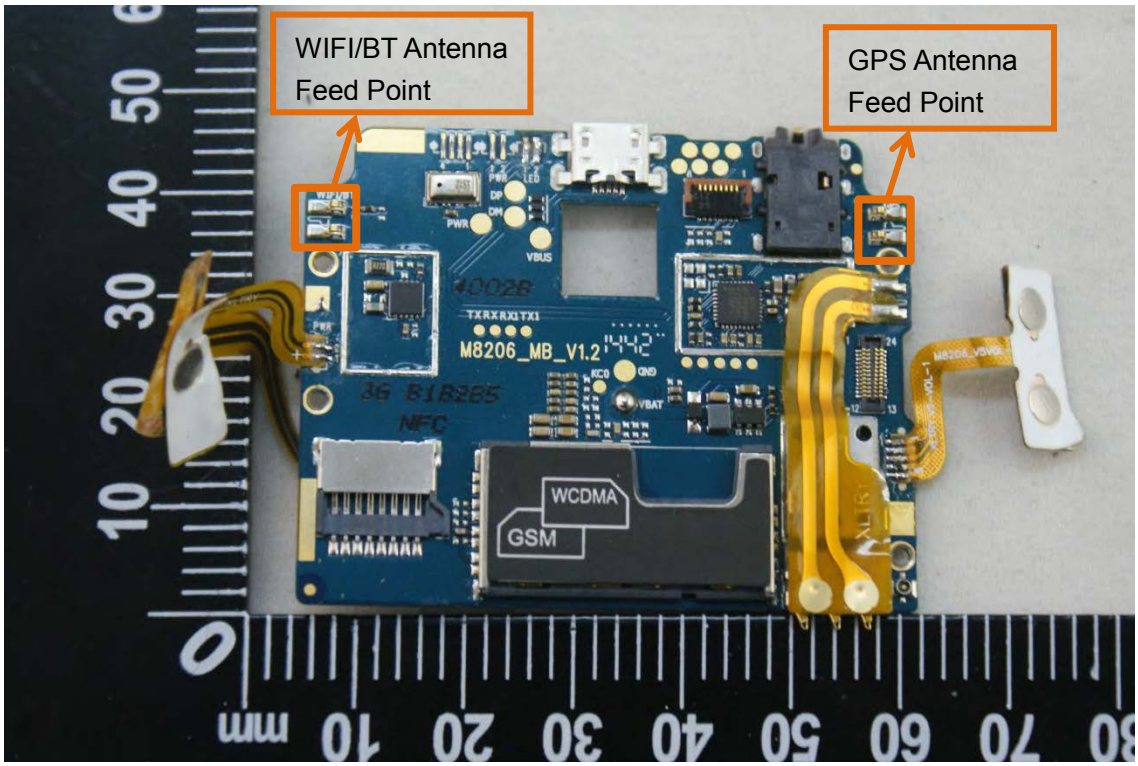
MAIN BOARD BACK VIEW 3



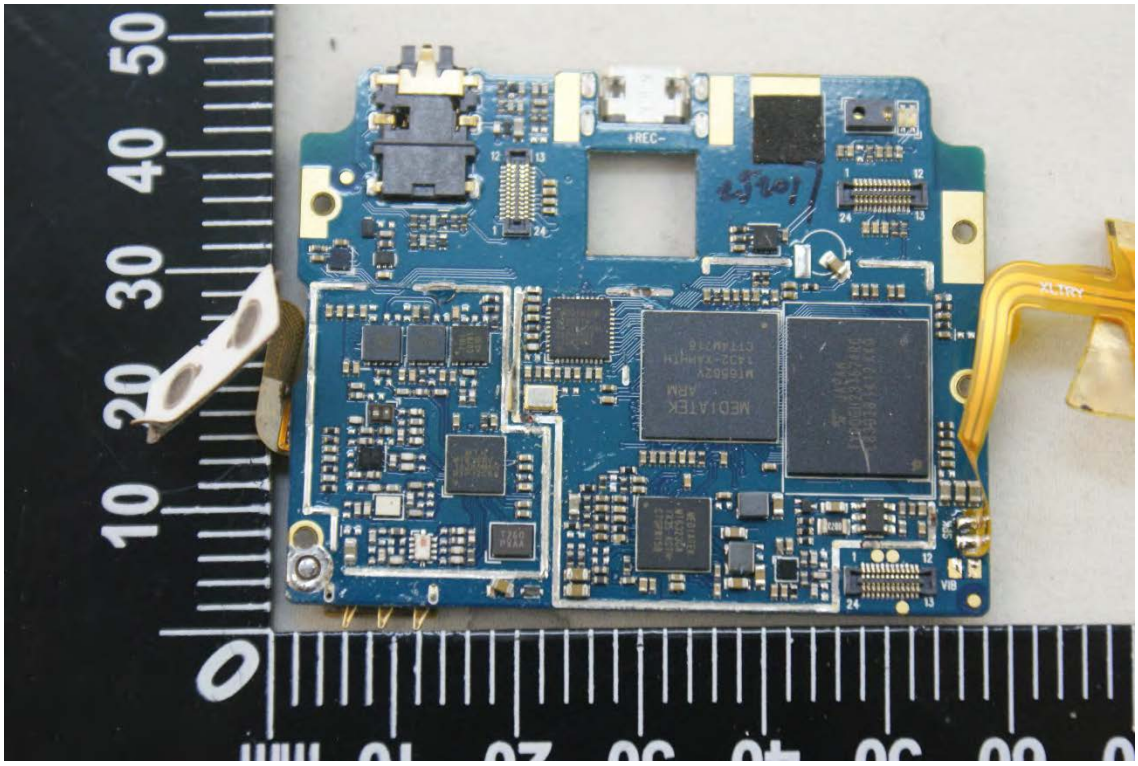
MAIN BOARD TOP VIEW 4



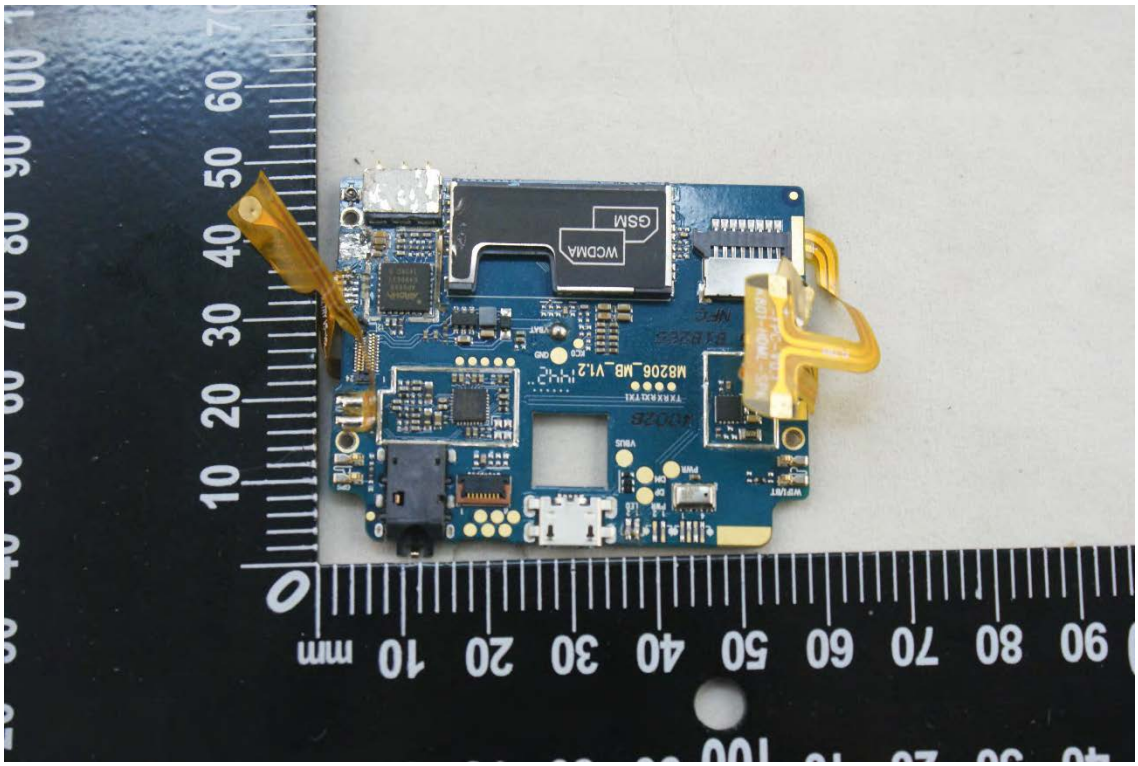
MAIN BOARD BACK VIEW 4



MAIN BOARD TOP VIEW 5



MAIN BOARD BACK VIEW 5



MAIN BOARD TOP VIEW 6

--END OF REPORT--