

FCC/ISED

RF

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
K2 Dual Core System

ISSUED TO
System Level Solutions Inc.

14100 Murphy Ave., San Martin, CA - 95046, United States.



Tested by:

Cao Shaocong
(Engineer)

Date Mar. 13, 2017

Approved by:

Wei Yanquan
(Chief Engineer)

Date Mar. 13, 2017

Report No.: BL-SZ1680264-601

EUT Type: K2 Dual Core System

Model Name: PI1WLDD000101

Brand Name: K2DC

Test Standard: 47 CFR Part 15 Subpart C
RSS-Gen (Issue 4, November 2014)
RSS-247 (Issue 1, May 2015)

FCC ID: 2AHK5-PI1WLD101

ISED Number: 21180-PI1WLD101

Test conclusion: Pass

Test Date: Aug. 20, 2016 ~ Aug. 26, 2016

Date of Issue: Mar. 13, 2017

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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Mar. 03, 2017	Initial Issue
Rev. 02	Mar. 13, 2017	Change the antenna connector photo.

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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	<p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625.</p> <p>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.</p>
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 v4.5.
- (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	System Level Solutions Inc.
Address	14100 Murphy Ave., San Martin, CA - 95046, United States.

2.2 Manufacturer Information

Manufacturer	System Level Solutions (India) Pvt. Ltd
Address	Plot#32, Zone-D/4, Phase-1, GIDC Estate, V.U. Nagar - 388 121, Gujarat, India.

2.3 Factory Information

Factory	Pronology Services (China) Inc.
Address	The Second Industrial Zone, Lou Village, Gongming Town, Guangming Dist., 518106, Shenzhen, Guangdong, China.

2.4 General Description for Equipment under Test (EUT)

EUT Type	K2 Dual Core System
Model Name Under Test	PI1WLDD000101
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	1B-01
Software Version	2.3.0
Dimensions (Approx.)	144mm x 55mm x 23 mm
Weight (Approx.)	0.098Kg
Network and Wireless connectivity	Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE), WIFI 802.11b, 802.11g and 802.11n (HT20)

2.5 Ancillary Equipment

Ancillary Equipment 1	HDMI Cable	
	Length (Approx.)	30 cm
Ancillary Equipment 2	USB Cable	
	Length (Approx.)	103 cm
Ancillary Equipment 3	Ycable	
	Length (Approx.)	104 cm

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
Transfer Rate	1 Mbps, 2 Mbps, 3 Mbps
Frequency Range	The frequency range used is 2402 MHz – 2480 MHz; The frequency block 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	Dipole Antenna
Antenna Gain	3 dBi (All involve the antenna gain test item, has been included in the final results)
About the Product	The equipment is K2 Dual Core System, it contains Bluetooth 3.0 and Bluetooth 4.0 Low Energy (BLE) operating at 2.4 GHz ISM band. Only the Bluetooth 3.0 was tested in this report.

2.7 Additional Instructions

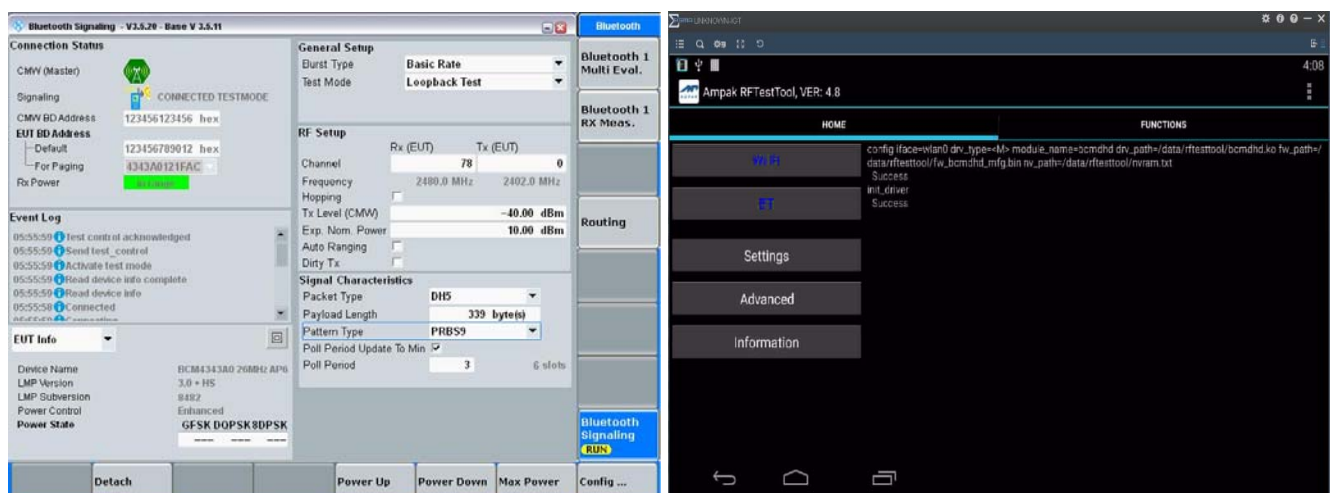
EUT Software Settings:

Mode	<input checked="" type="checkbox"/> Bluetooth test mode loop back enabled. EUT is controlled over CBT / CMU.
------	---

Power level setup in software		
Test Software Version	Ampak RFTestTool	
Mode	Channel	Soft Set
DH5	ALL	TX LEVEL is built-in set parameters and cannot be changed and selected.
2DH5	ALL	
3DH5	ALL	

Run Software:

DH5



3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-15 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	RSS-Gen (Issue 4, Nov. 2014)	General Requirements for Compliance of Radio Apparatus
4	RSS-247 (Issue 1, May 2015)	Digital Transmission Systems (DTSS), Frequency Hopping Systems(FHSS) and Licence-Exemp Local Area Network (LE-LAN) Devices
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	ISED Part No.	Channel	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	Note 2
3	Peak Output Power and E.I.R.P	15.247(b)	RSS-247, 5.4 (2)	Low/Middle/High	ANNEX A.2	Pass	
4	Occupied Bandwidth	15.247(a)	RSS-247, 5.1 (1)	Low/Middle/High	ANNEX A.3	Pass	Note 2
5	Carrier Frequency Separation	15.247(a)	RSS-247, 5.1 (2)	Hopping Mode	ANNEX A.4	Pass	Note 2
6	Time of Occupancy (Dwell time)	15.247(a)	RSS-247, 5.1 (4)	Hopping Mode	ANNEX A.5	Pass	Note 2
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	RSS-247, 5.5	Low/Middle/High	ANNEX A.6	Pass	Note 2
8	Conducted Emission	15.207	RSS-GEN, 8.8	Low/Middle/High	ANNEX A.7	Pass	Note 2
9	Radiated Spurious Emission	15.209 15.247(d)	RSS-247, 5.5	Hopping Mode, Low/Middle/High	ANNEX A.8	Pass	Note 2
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	RSS-247, 5.5	Hopping Mode, Low/Middle/High	ANNEX A.9	Pass	Note 2
11	Receiver Spurious Emissions	--	RSS-Gen, 7.1.2	--	--	N/A	Note 3

Note 1: Please refer to section 5.1

Note 2: Because of the modulation of $\pi/4$ -DQPSK same as 8-DPSK, and the test results are basically the same with them, so we chose 8-DPSK as a typical representative to appear on the report. Another we will show all the modes on the RF output power test item

Note 3: Only radio communication receivers operating in stand-alone mode within the band 30-960 MHz, as well as scanner receivers, are subject to Industry Canada requirements, so this test is not applicable.

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)	5 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2016.07.13	2017.07.12
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2016.07.13	2017.07.12
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2016.07.13	2017.07.12
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2016.07.13	2017.07.12
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2015.10.15	2016.10.14
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2016.07.05	2017.07.04
LISN	SCHWARZBECK	NSLK 8127	8127-687	2016.07.05	2017.07.04
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2016.07.13	2017.07.12
Power Splitter	KMW	DCPD-LDC	1305003215	2016.07.13	2017.07.12
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2016.07.13	2017.07.12
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2016.07.13	2017.07.12
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	2017.02.27
Shielded Enclosure	ChangNing	CN-130701	130703	--	--
Power Amplifier	OPHIR RF	5225F	1037	2017.02.17	2018.02.16
Power Amplifier	OPHIR RF	5273F	1016	2017.02.17	2018.02.16

4.3 MEASUREMENT UNCERTAINTY

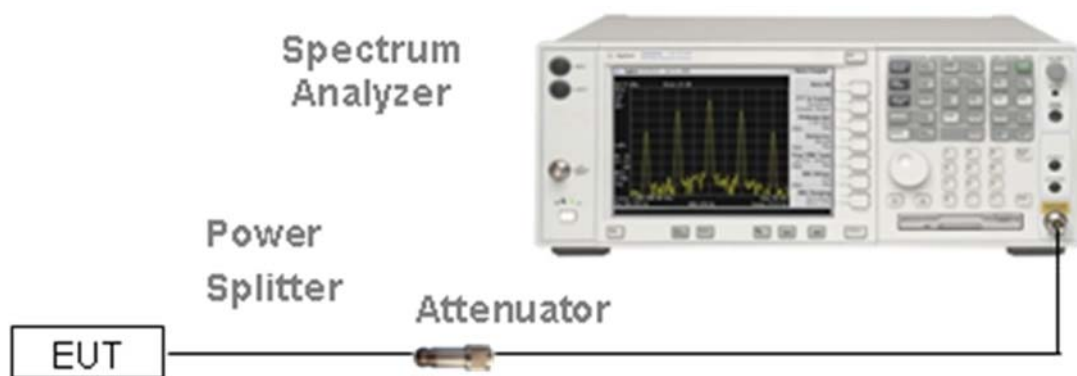
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
Occupied Channel Bandwidth	$\pm 4\%$
RF output power, conducted	± 1.4 dB
Power Spectral Density, conducted	± 2.5 dB
Unwanted Emissions, conducted	± 2.8 dB
All emissions, radiated	± 5.4 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 4\%$

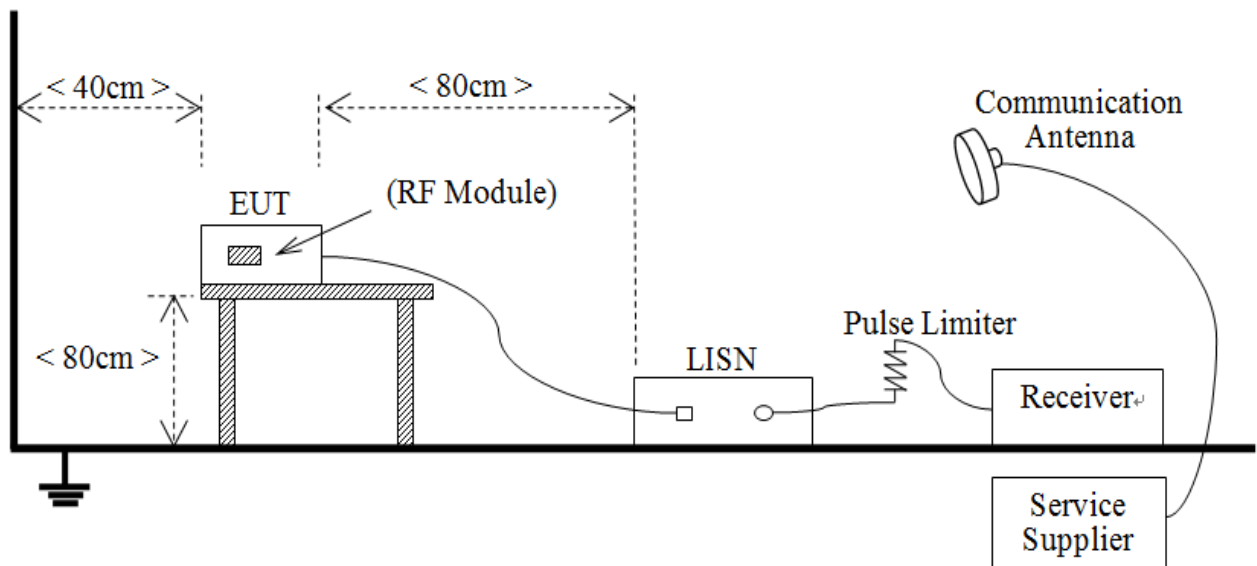
4.4 Description of Test Setup

4.4.1 For Antenna Port Test



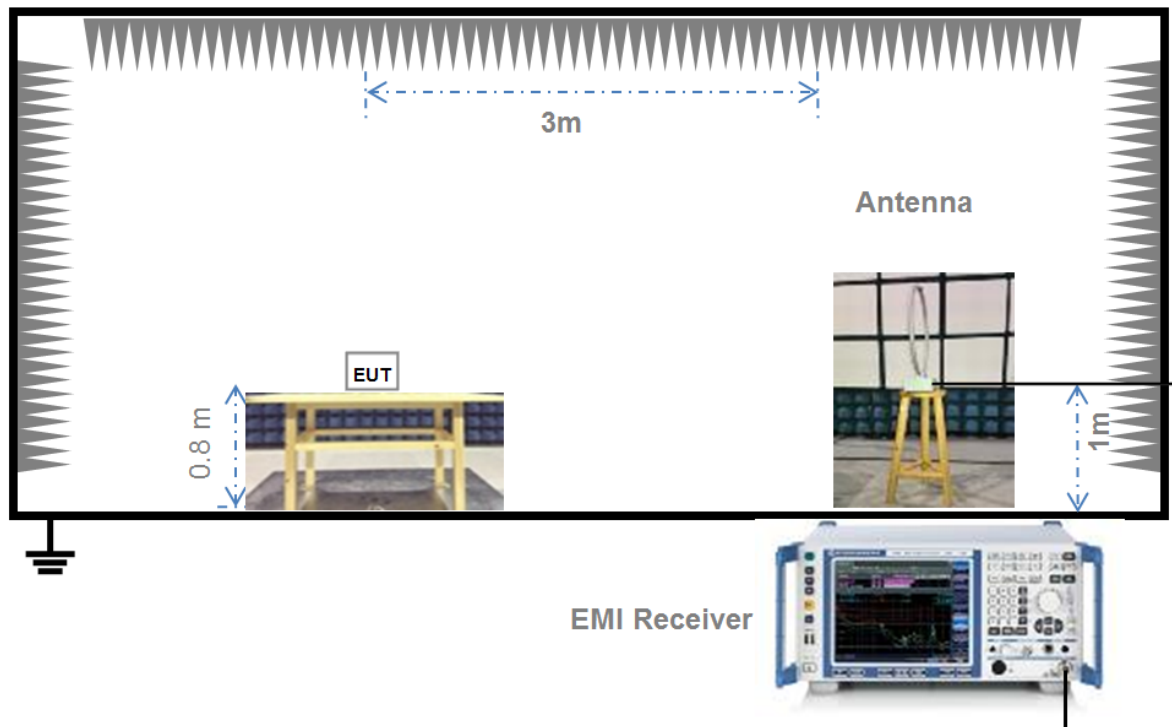
(Diagram 1)

4.4.2 For AC Power Supply Port Test



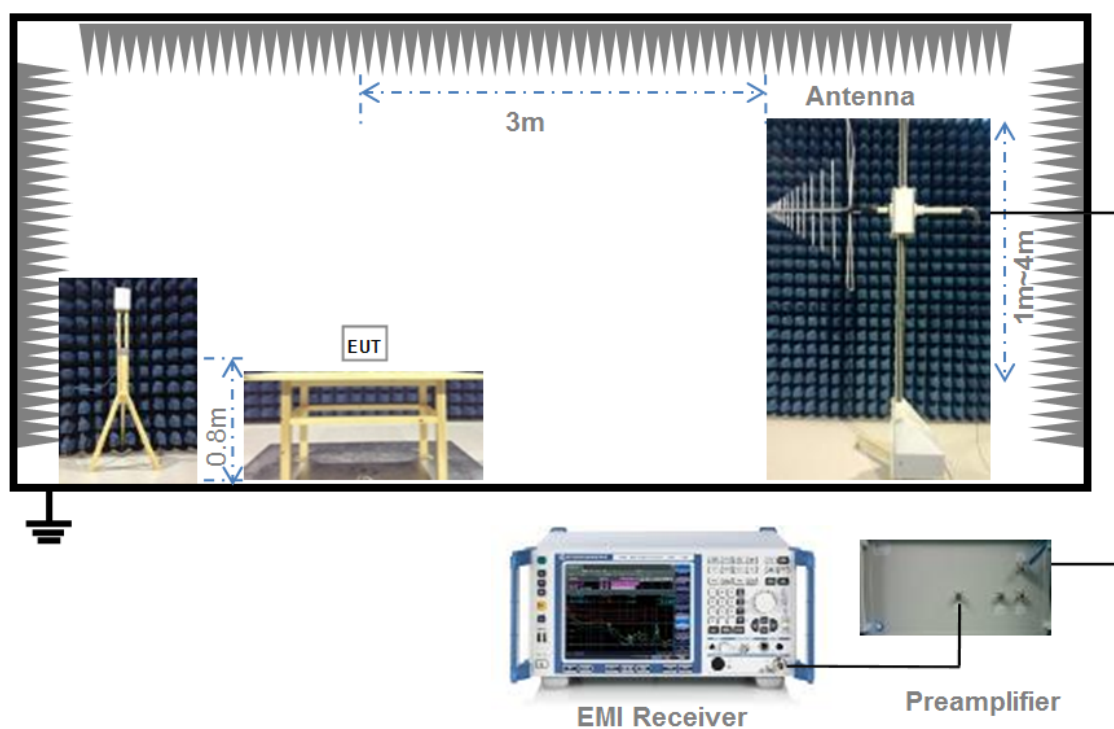
(Diagram 2)

4.4.3 For Radiated Test (Below 30 MHz)



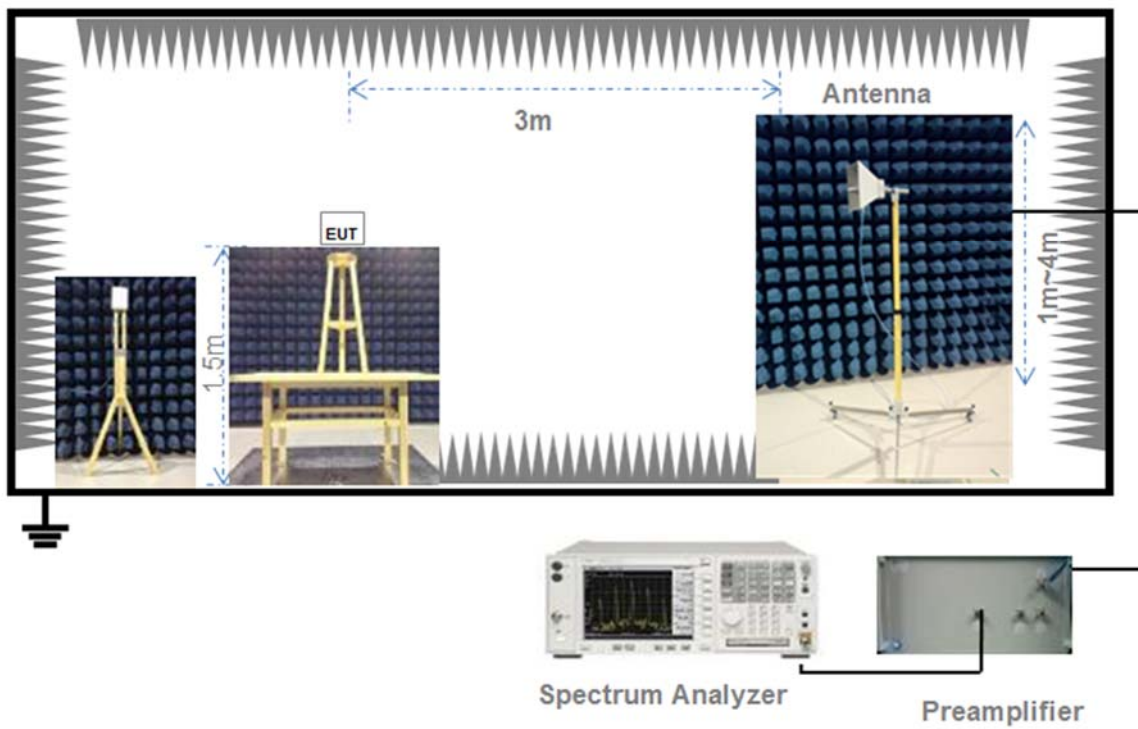
(Diagram 3)

4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.5 Measurement Results Explanation Example

4.5.1 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.

4.5.2 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)

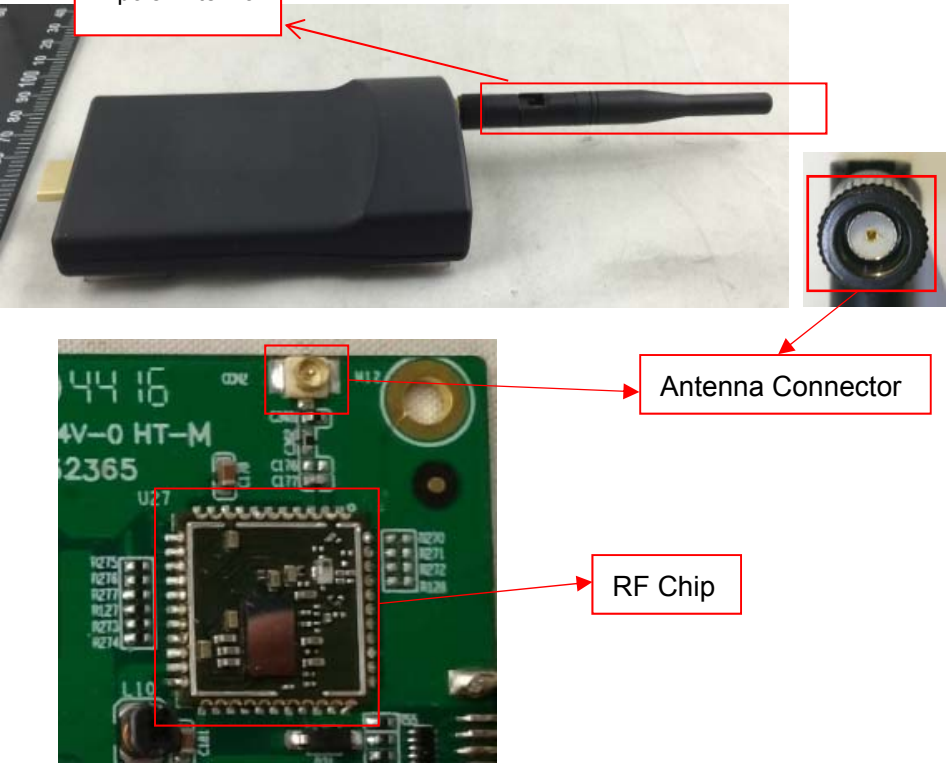
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply 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
Compliance with 15.203, use of a standard antenna jack or electrical connector is prohibited.	The antenna is the unique connector with a dipole antenna.

Reference Documents	Item
Photo	 <p>Dipole Antenna</p> <p>Antenna Connector</p> <p>RF Chip</p>

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); 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 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 \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)

Measurement of the 20dB bandwidth of the modulated signal.

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 the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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, provided the systems operate with an output power no greater than 125 mW.

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 & Authorized-band band-edge

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.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

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 $f \geq 1 \text{ GHz}$, 100 kHz for $f < 1 \text{ GHz}$

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 Band Edge (Restricted-band band-edge)

5.10.1 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).

5.10.2 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.

5.10.3 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.

5.10.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

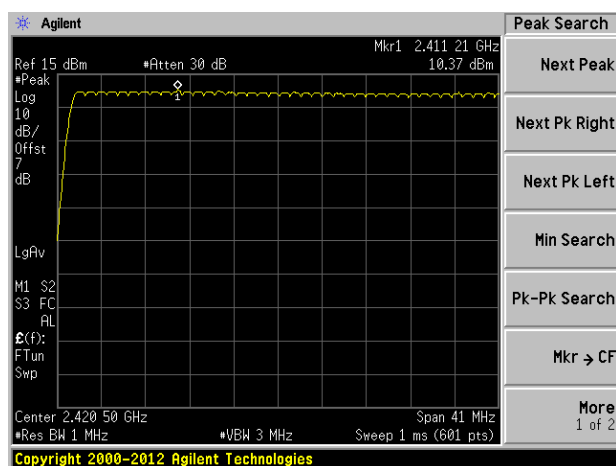
A.1 Number of Hopping Frequency

Test Data

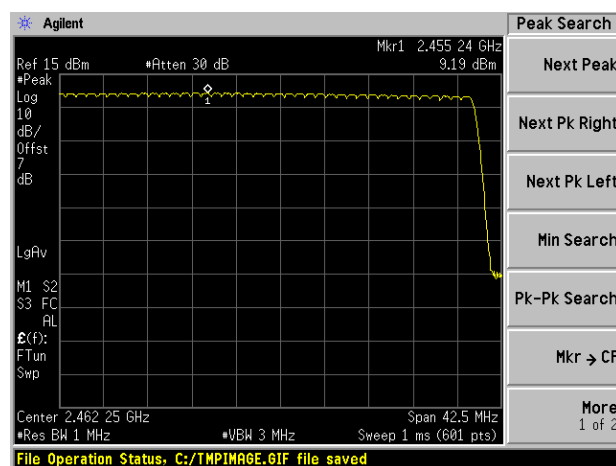
Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	Pass
8-DPSK	2400 - 2483.5	79	15	Pass

Test plots

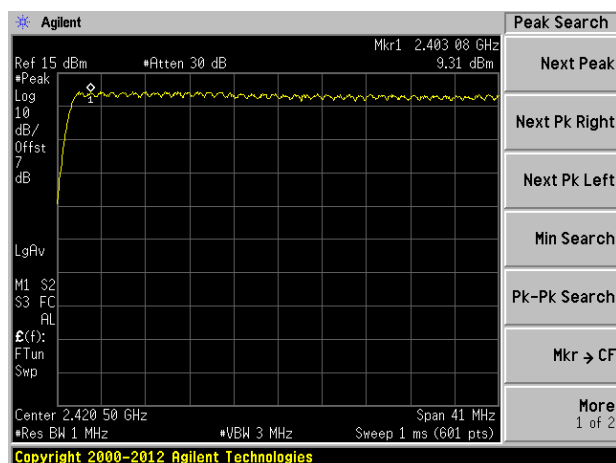
GFSK 2.4 GHz ~ 2.4415 GHz



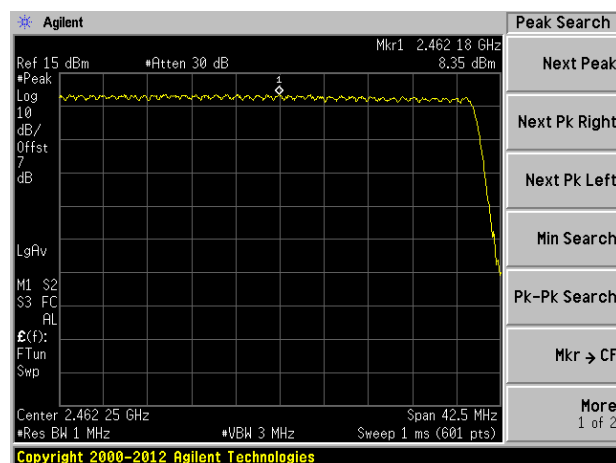
GFSK 2.4415 GHz ~ 2.4835 GHz



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

Test Data

Channel	Measured Output Peak Power		Limit		Verdict
	GFSK		dBm	mW	
	dBm	mW			
Low	10.32	10.76	30	1000	Pass
Middle	9.83	9.62			Pass
High	9.13	8.18			Pass

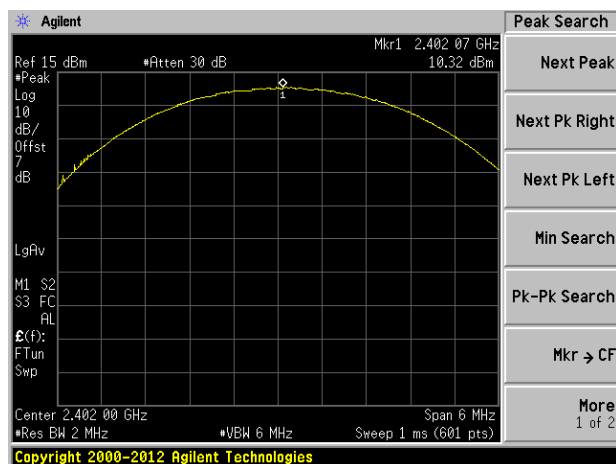
Channel	Measured Output Peak Power				Limit		Verdict
	π/4-DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW			
Low	9.25	8.41	9.61	9.14	21	125	Pass
Middle	8.45	7.00	8.73	7.46			Pass
High	7.52	5.65	7.78	6.00			Pass

E.I.R.P Test Data

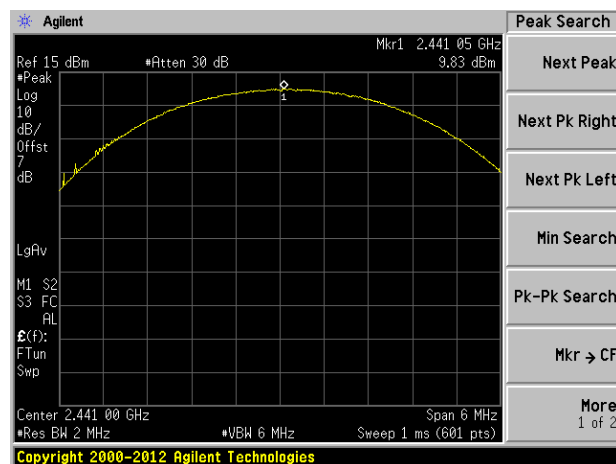
Channel	E.I.R.P						Limit		Verdict
	GFSK		π/4-DQPSK		8-DPSK		dBm	mW	
	dBm	mW	dBm	mW	dBm	mW			
Low	13.32	13.76	12.25	11.41	12.62	12.14	36	4000	Pass
Middle	12.83	12.62	11.45	10.00	11.73	10.46			Pass
High	12.13	11.18	10.52	8.65	10.78	9.00			Pass

Test plots

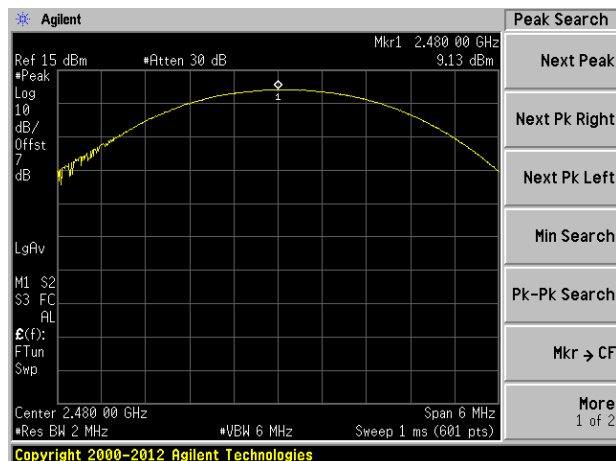
GFSK LOW CHANNEL



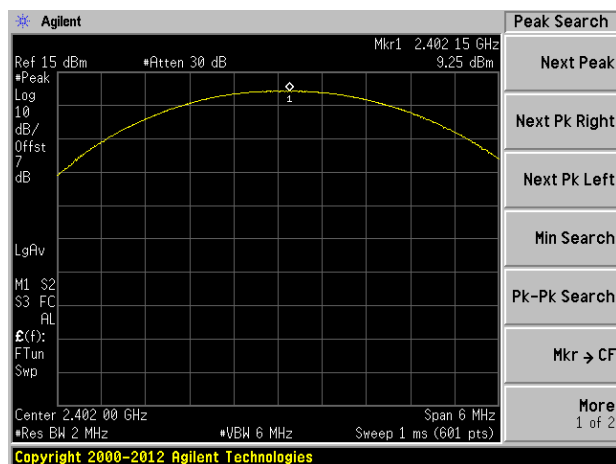
GFSK MIDDLE CHANNEL



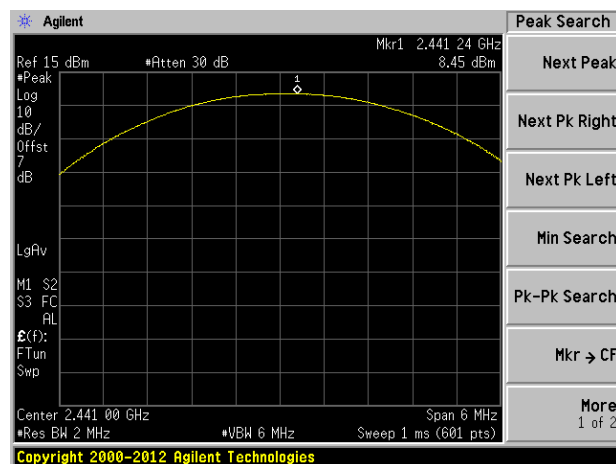
GFSK HIGH CHANNEL



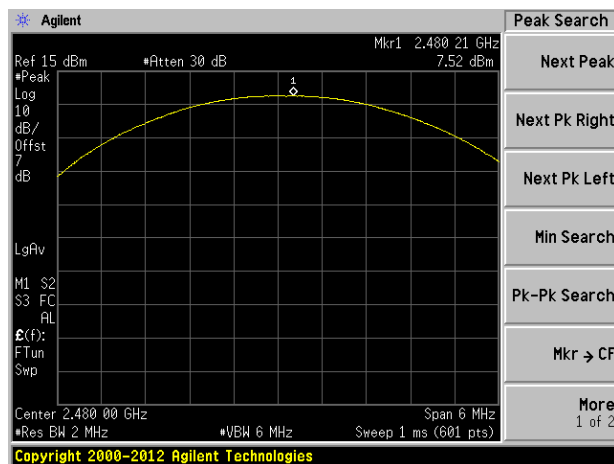
II/4-DQPSK LOW CHANNEL



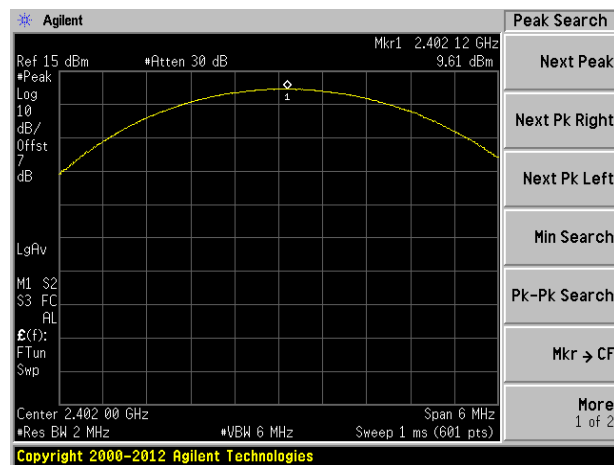
II/4-DQPSK MIDDLE CHANNEL



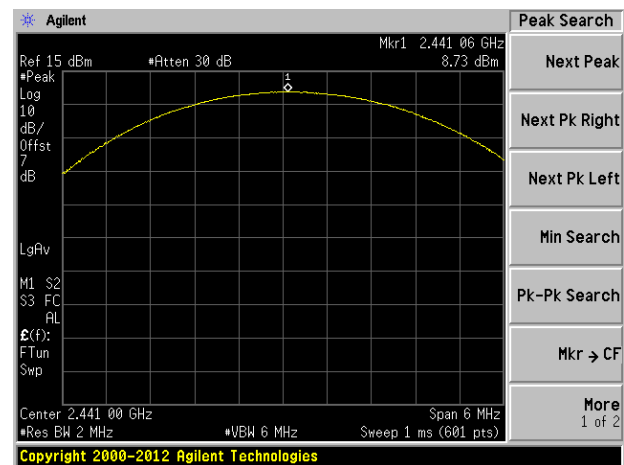
II/4-DQPSK HIGH CHANNEL



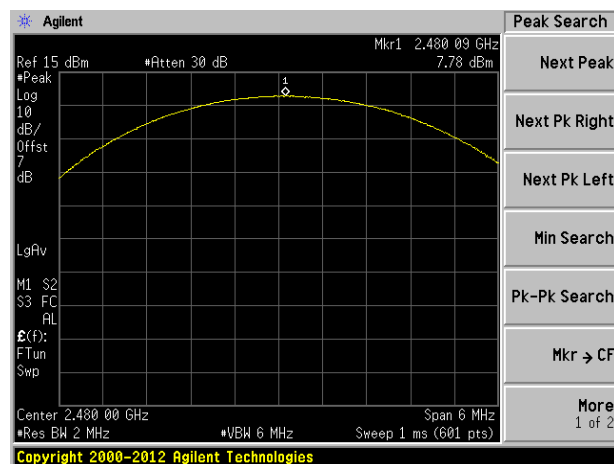
8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



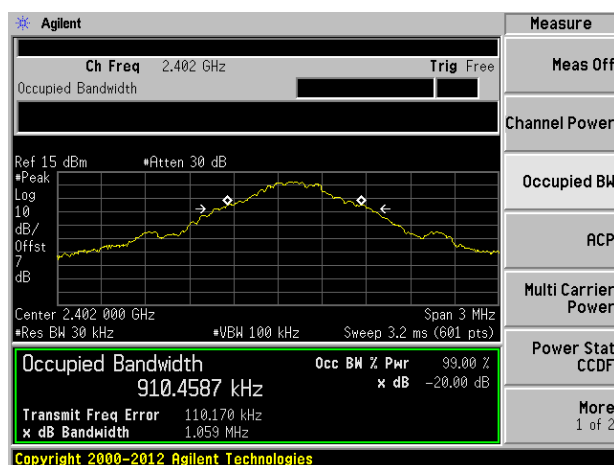
A.3 20 dB and 99% bandwidth

Test Data

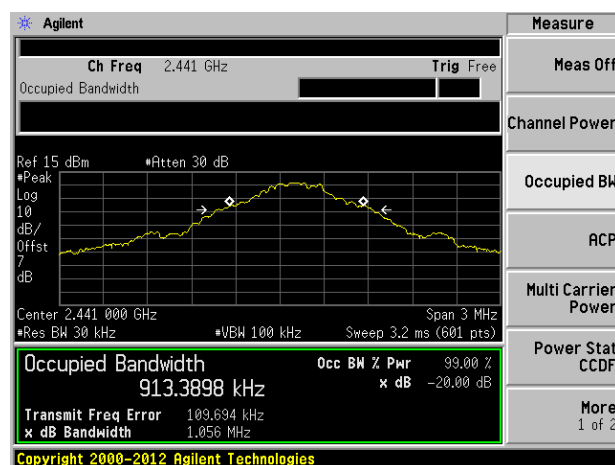
GFSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.059	0.910
Middle	1.056	0.913
High	1.055	0.913
8-DPSK		
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	1.343	1.222
Middle	1.356	1.235
High	1.340	1.236

Test plots

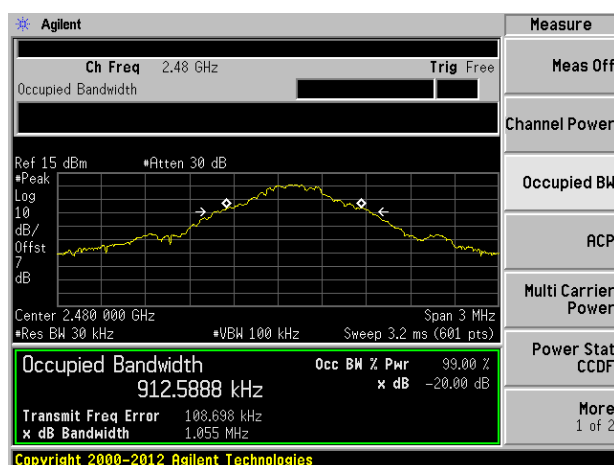
GFSK LOW CHANNEL



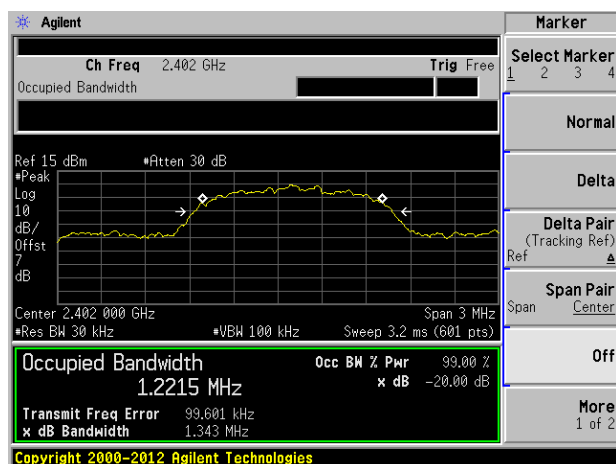
GFSK MIDDLE CHANNEL



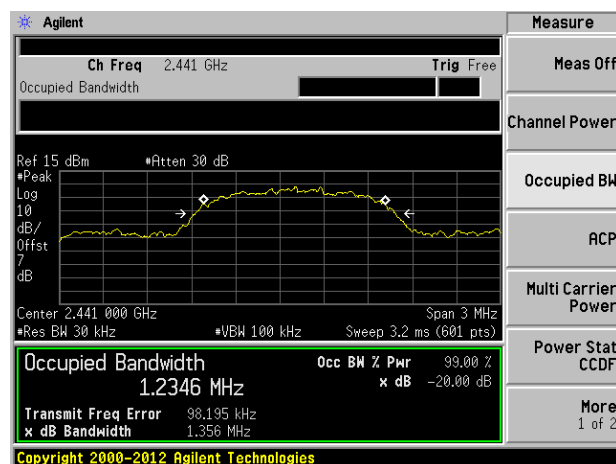
GFSK HIGH CHANNEL



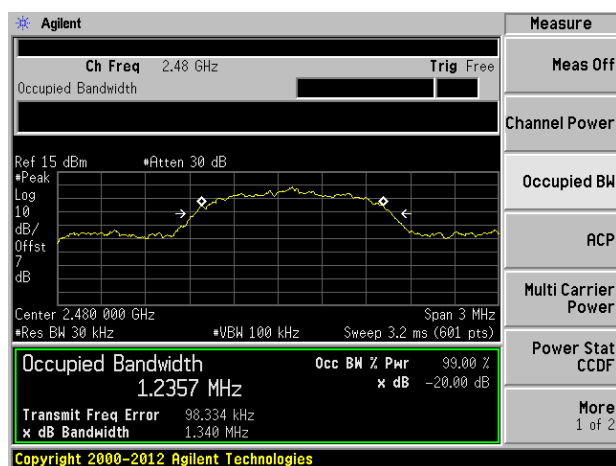
8-DPSK LOW CHANNEL



8-DPSK MIDDLE CHANNEL



8-DPSK HIGH CHANNEL



A.4 Hopping Frequency Separation

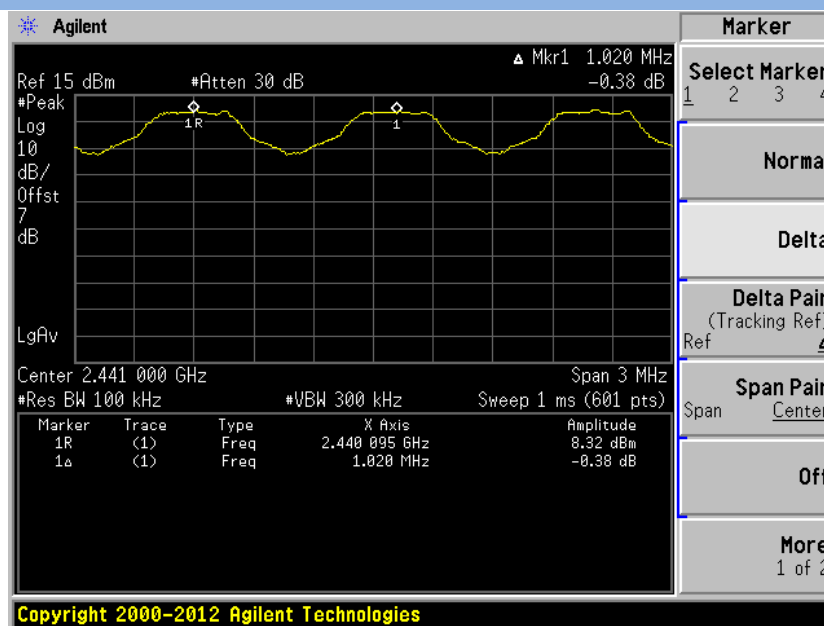
Test Data

Note: The systems operate with an output power no greater than 125 mw, The data provided in the section A.2.

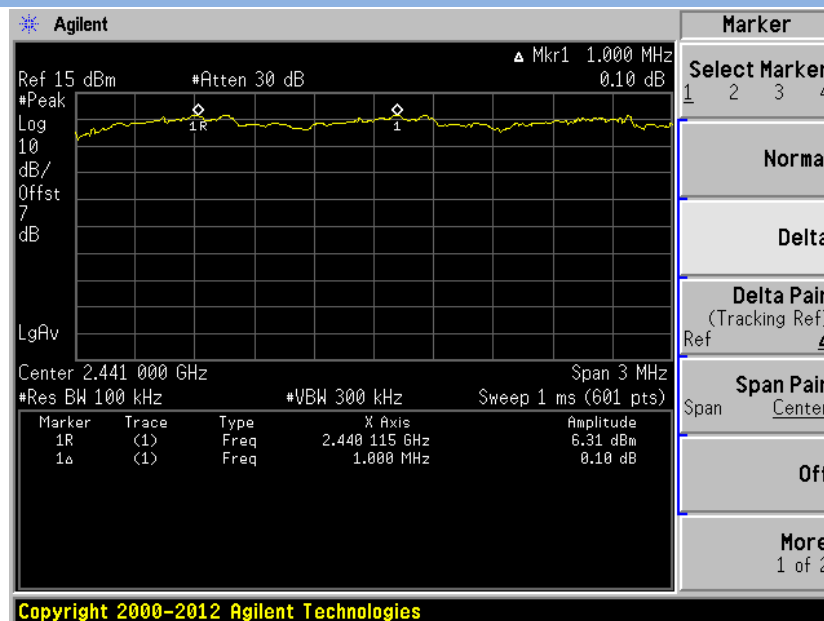
Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Verdict
GFSK	1.020	1.059	0.706	Pass
8-DPSK	1.000	1.356	0.904	Pass

Test Plots

GFSK



8-DPSK



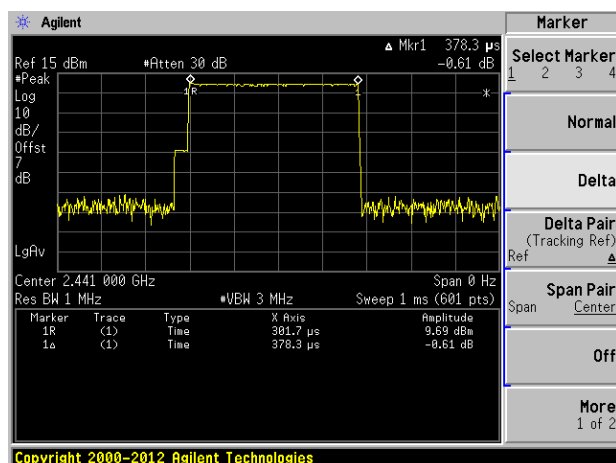
A.5 Average Time of Occupancy

Test Data

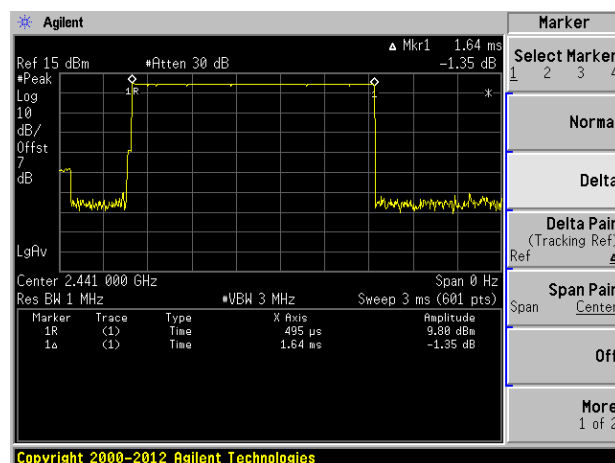
GFSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.378	121.060	0.4	Pass
DH 3	1.640	262.408	0.4	Pass
DH 5	2.887	307.956	0.4	Pass
8-DPSK				
DH Packet	Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
DH 1	0.388	124.260	0.4	Pass
DH 3	1.635	261.608	0.4	Pass
DH 5	2.887	307.956	0.4	Pass

Test Plots

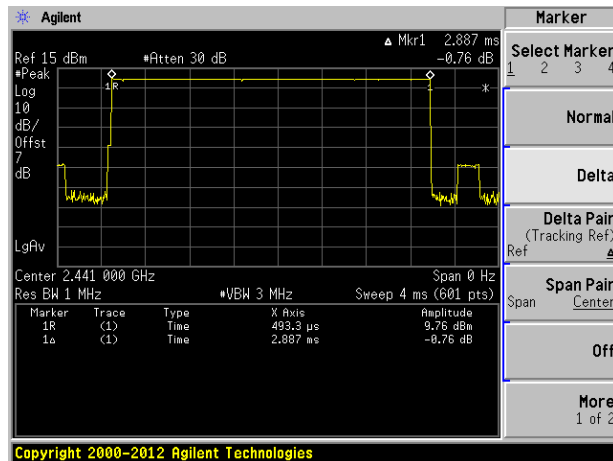
GFSK DH1



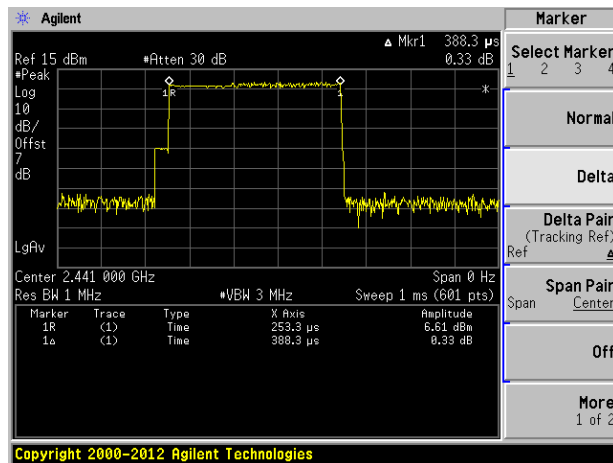
GFSK DH3



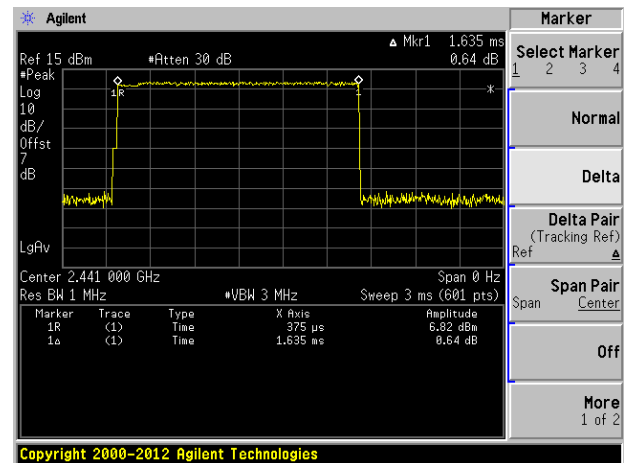
GFSK DH5



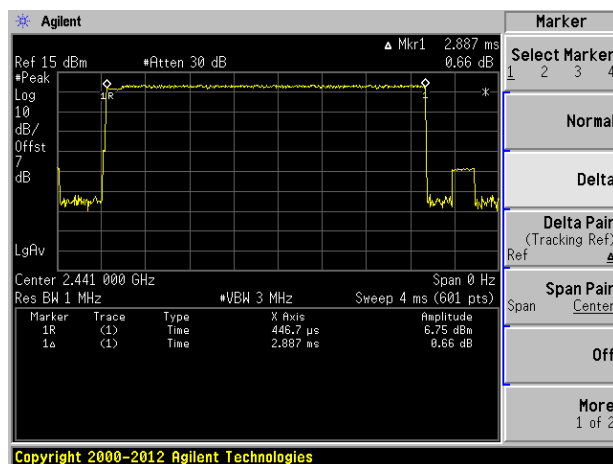
8-DPSK DH1



8-DPSK DH3



8-DPSK DH5



A.6 Conducted Spurious Emissions & Authorized-band band-edge

Test Data

GFSK Mode:

Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-47.91	9.78	-10.22	Pass
Middle	-46.35	9.25	-10.75	Pass
High	-47.99	8.48	-11.52	Pass

8-DPSK Mode:

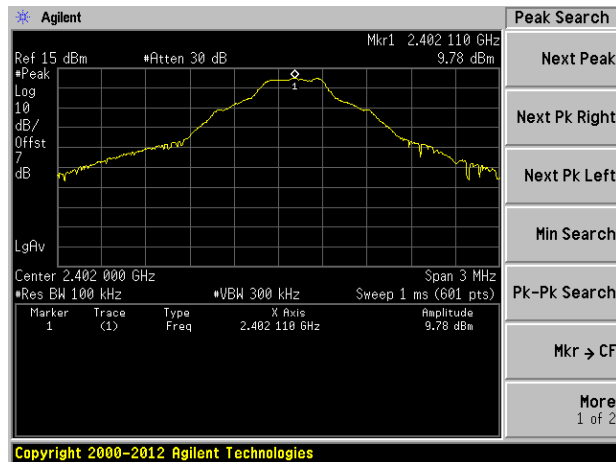
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-47.9	6.85	-13.15	Pass
Middle	-47.52	6.32	-13.68	Pass
High	-48.49	5.71	-14.29	Pass

Hopping Mode:

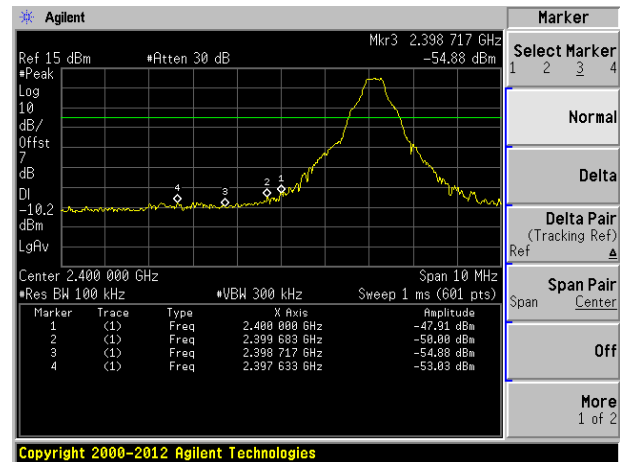
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
GFSK	-46.91	9.54	-10.46	Pass
8-DPSK	-46.70	6.99	-13.01	Pass

Test Plots

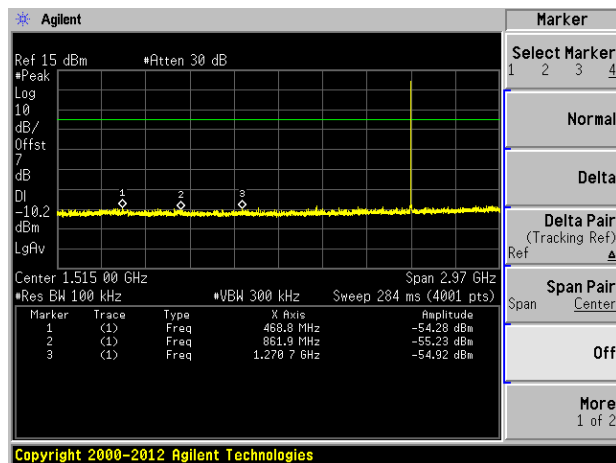
GFSK LOW CHANNEL, CARRIER LEVEL



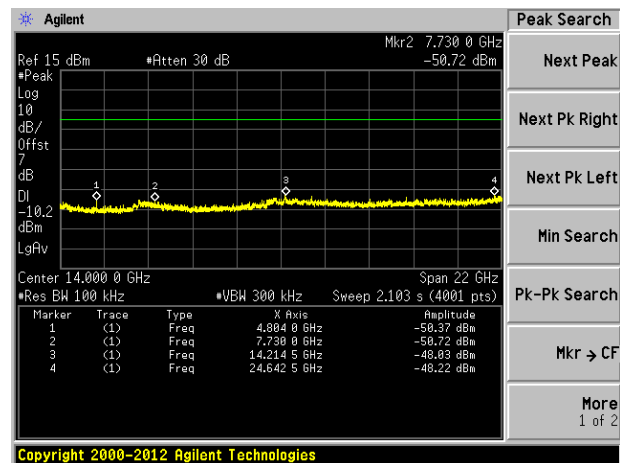
GFSK LOW CHANNEL, BAND EDGE



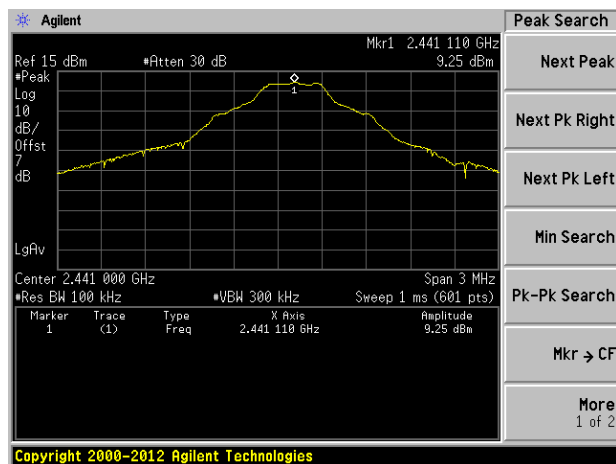
GFSK LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



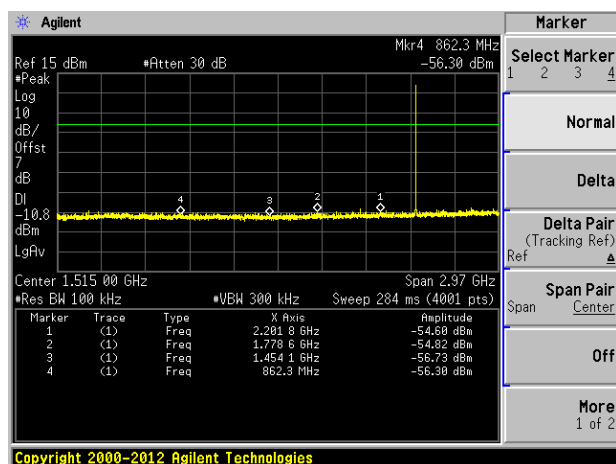
GFSK LOW CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



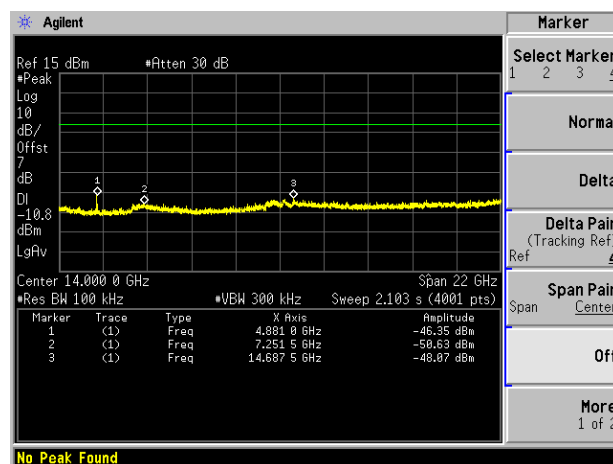
GFSK MIDDLE CHANNEL, CARRIER LEVEL



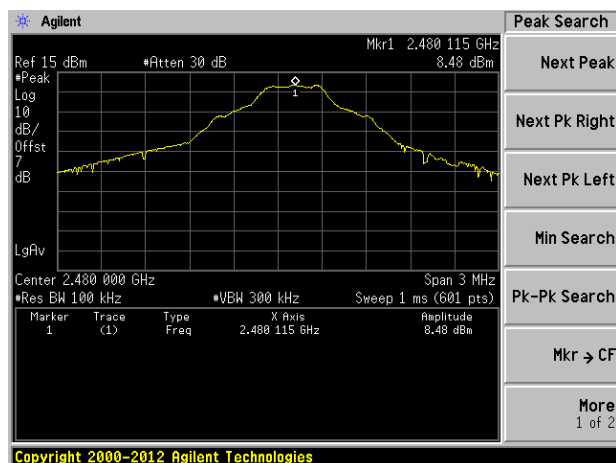
GFSK MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



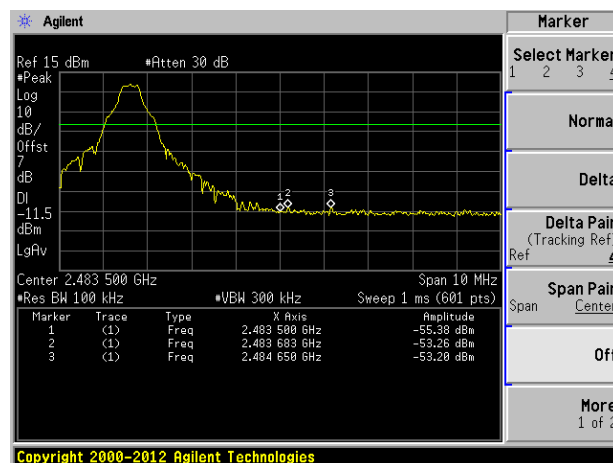
GFSK MIDDLE CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



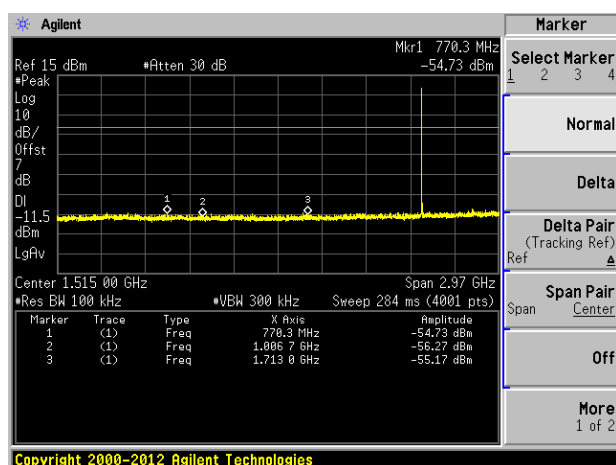
GFSK High CHANNEL , CARRIER LEVEL



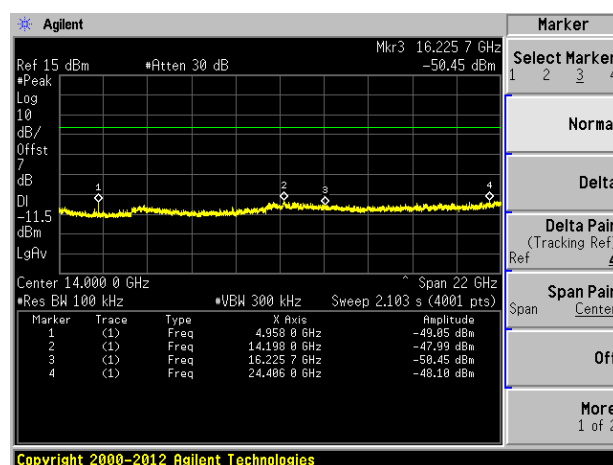
GFSK High CHANNEL , BAND EDGE



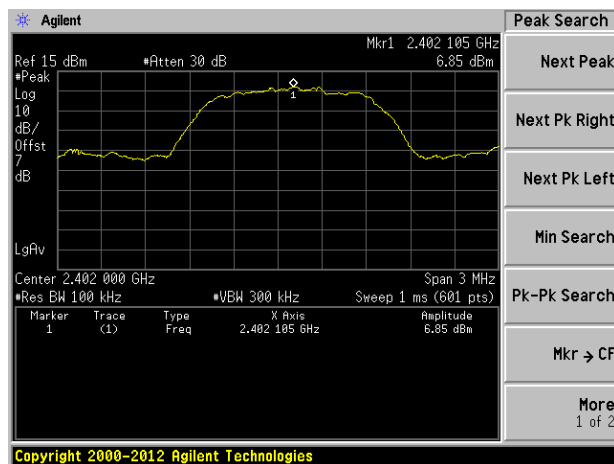
GFSK High CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



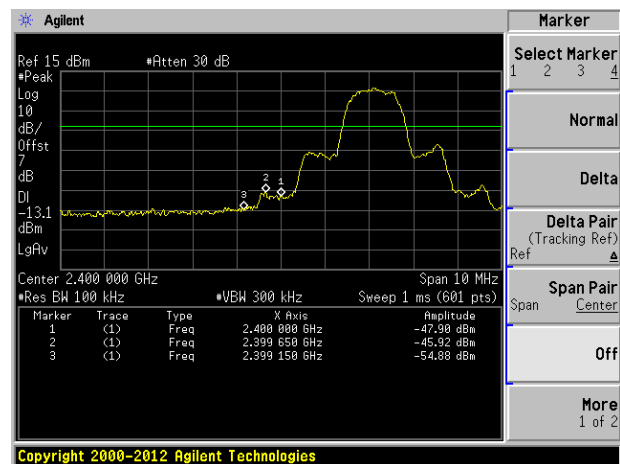
GFSK High CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



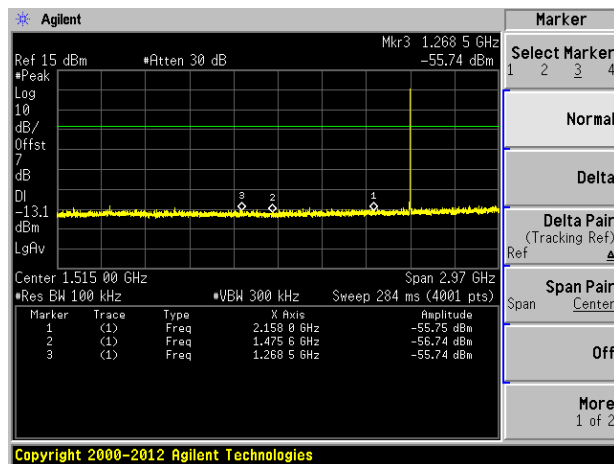
8-DPSK LOW CHANNEL , CARRIER LEVEL



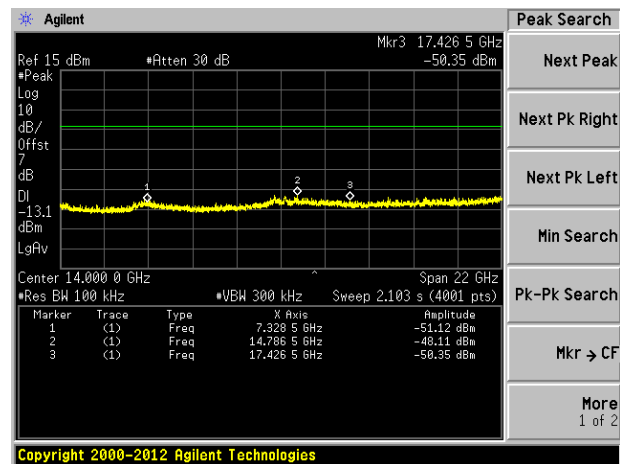
8-DPSK LOW CHANNEL , BAND EDGE



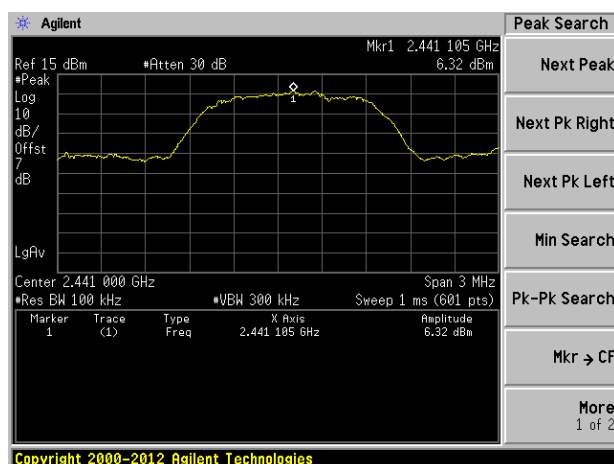
8-DPSK LOW CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



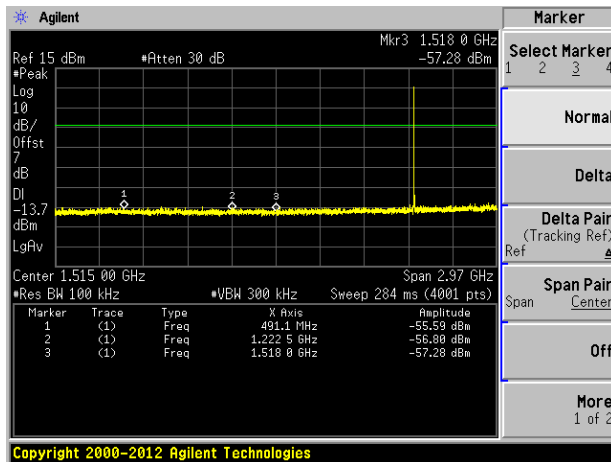
8-DPSK LOW CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



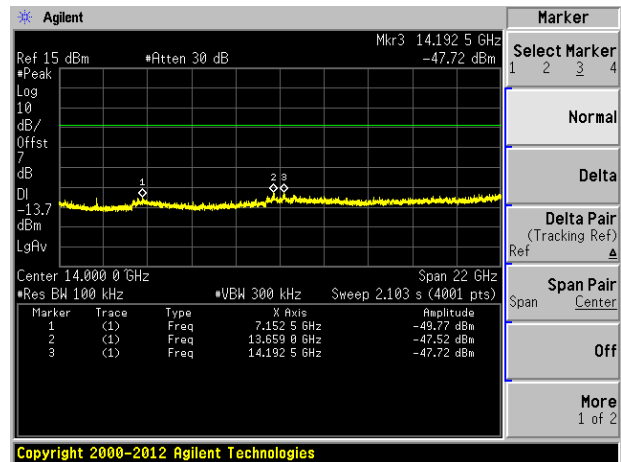
8-DPSK MIDDLE CHANNEL, CARRIER LEVEL



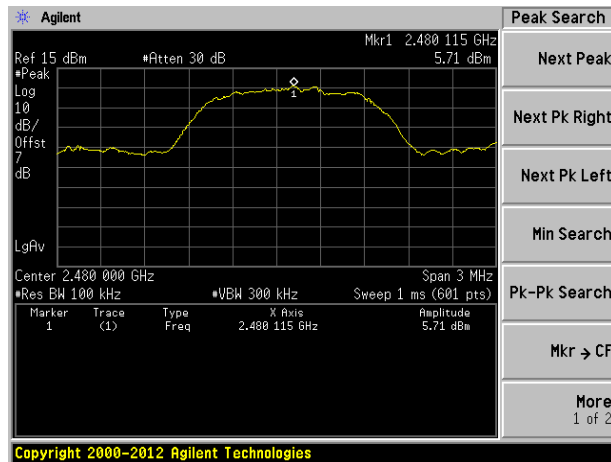
8-DPSK MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



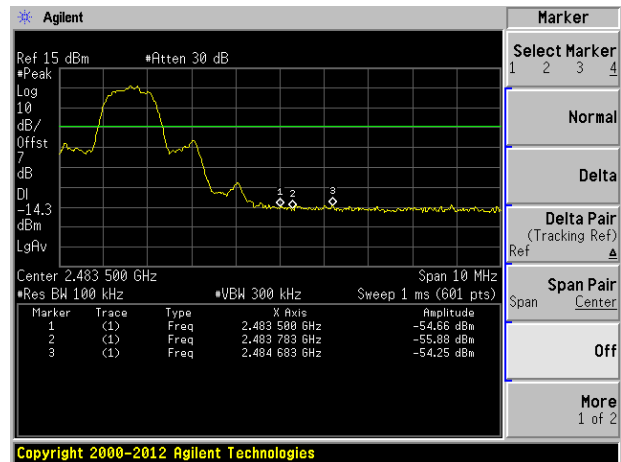
8-DPSK MIDDLE CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



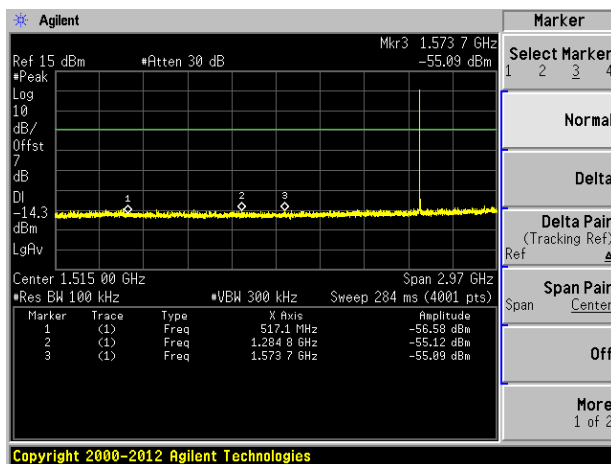
8-DPSK High CHANNEL , CARRIER LEVEL



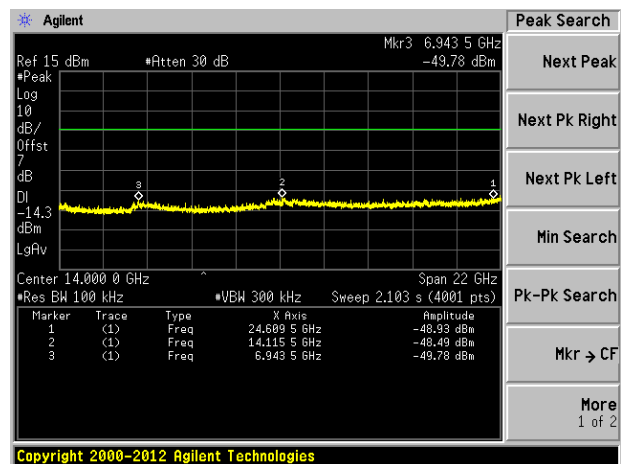
8-DPSK High CHANNEL , BAND EDGE



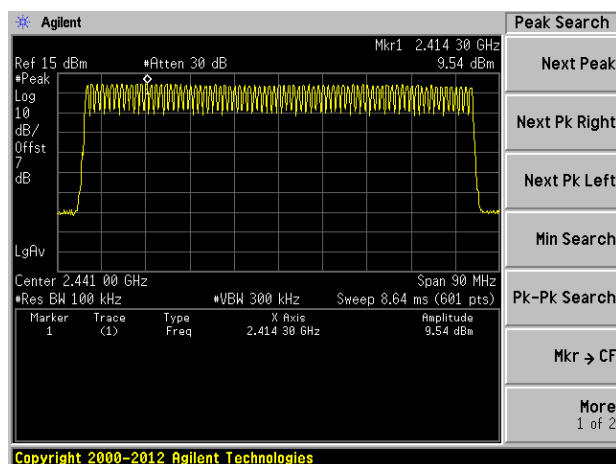
8-DPSK High CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



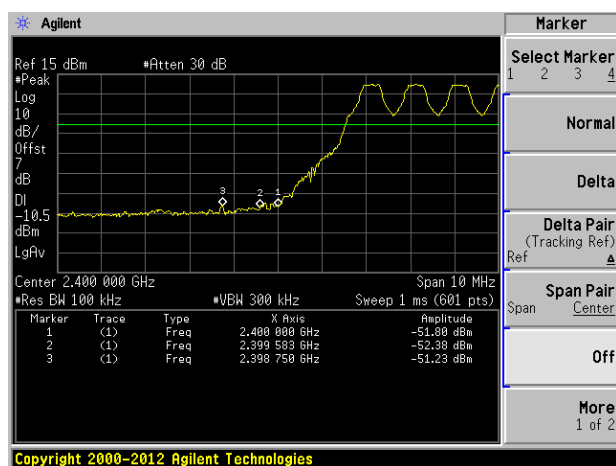
8-DPSK High CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



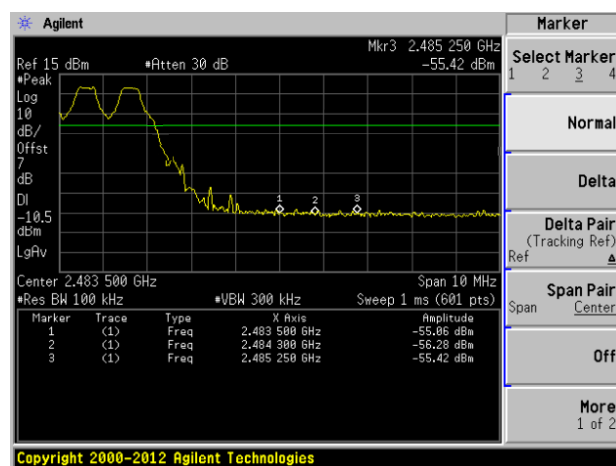
GFSK HOPPING, CARRIER LEVEL



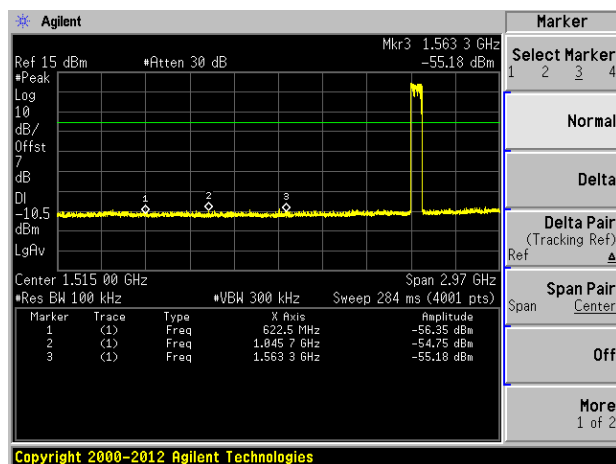
GFSK Hopping BAND EDGE (LOW)



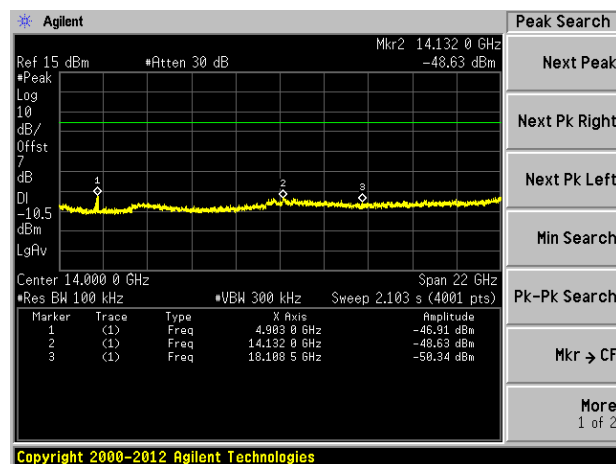
GFSK Hopping BAND EDGE (HIGH)



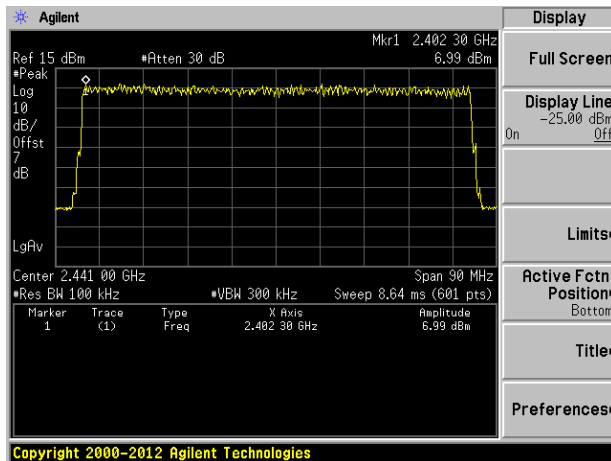
GFSK Hopping Mode, SPURIOUS 30 MHz ~ 3 GHz



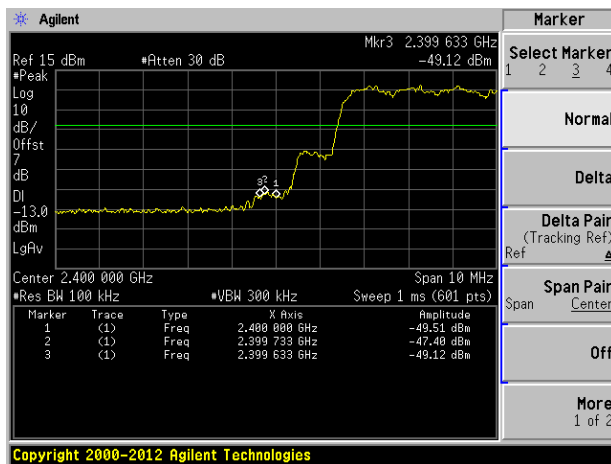
GFSK Hopping Mode, SPURIOUS 30 3GHz ~ 25 GHz



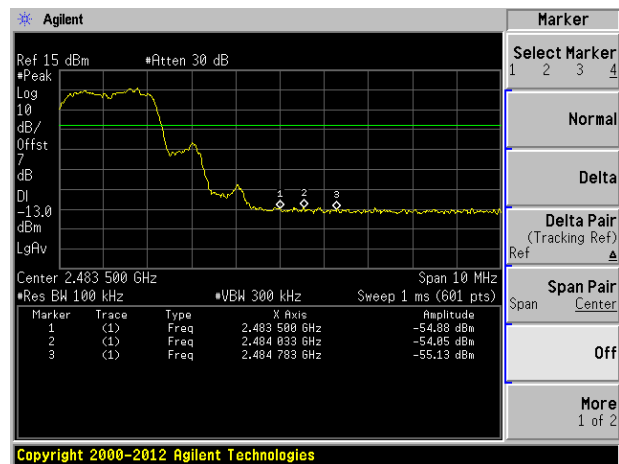
8-DPSK HOPPING, CARRIER LEVEL



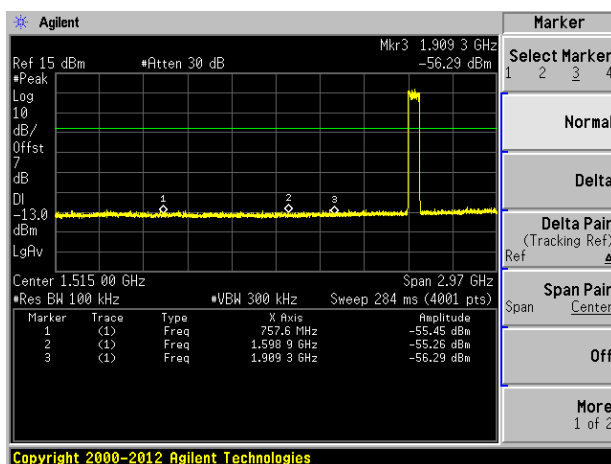
8-DPSK Hopping BAND EDGE (LOW)



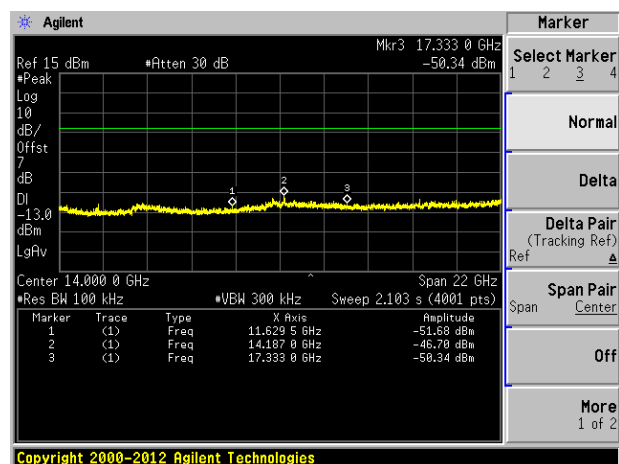
8-DPSK Hopping BAND EDGE (HIGH)



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



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

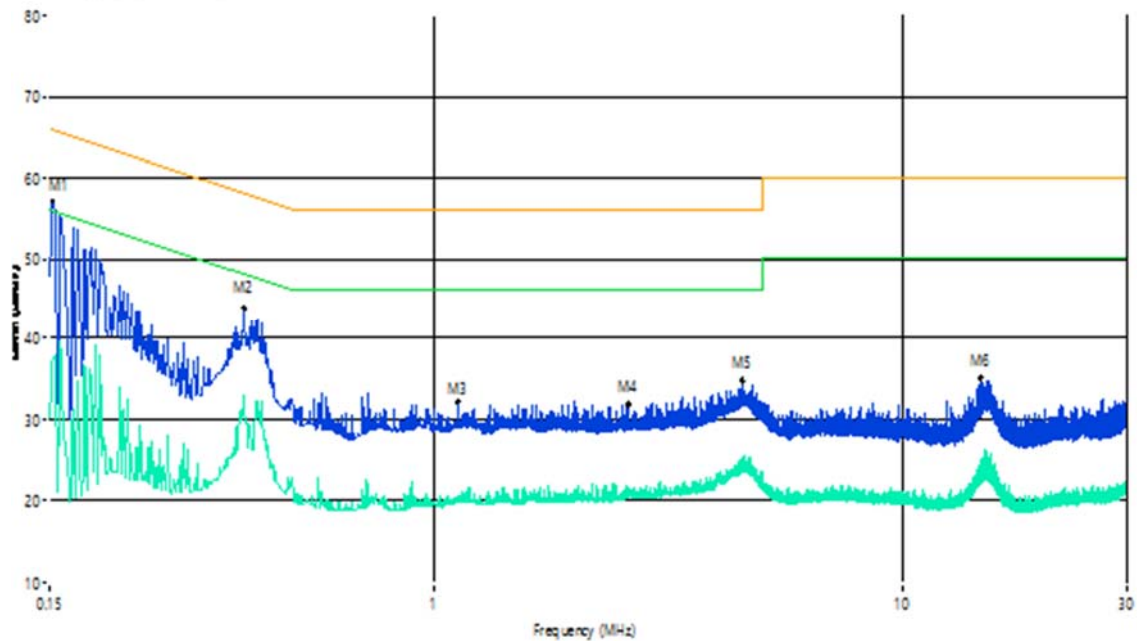


A.7 Conducted Emissions

Note 1: The EUT is working in the Normal link mode.

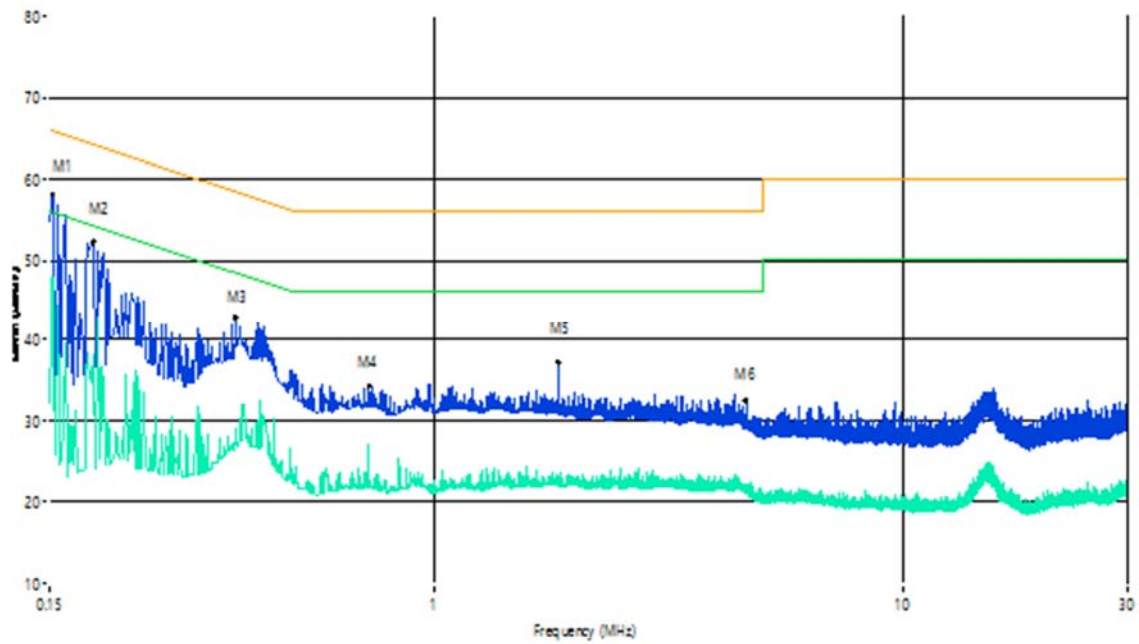
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.15	57.2	11.00	65.9	8.70	Peak	L Line	Pass
1**	0.15	37.4	11.00	55.9	18.50	AV	L Line	Pass
2	0.39	43.8	11.00	59.1	15.30	Peak	L Line	Pass
2**	0.39	33.1	11.00	49.1	16.00	AV	L Line	Pass
3	1.12	32.2	11.00	56.0	23.80	Peak	L Line	Pass
3**	1.12	20.6	11.00	46.0	25.40	AV	L Line	Pass
4	2.59	31.9	11.00	56.0	24.10	Peak	L Line	Pass
4**	2.59	20.6	11.00	46.0	25.40	AV	L Line	Pass
5	4.53	34.8	11.00	56.0	21.20	Peak	L Line	Pass
5**	4.53	24.1	11.00	46.0	21.90	AV	L Line	Pass
6	14.65	35.2	11.00	60.0	24.80	Peak	L Line	Pass
6**	14.65	23.5	11.00	50.0	26.50	AV	L Line	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.15	58.2	11.00	65.9	7.70	Peak	N Line	Pass
1**	0.15	48.1	11.00	55.9	7.80	AV	N Line	Pass
2	0.19	52.3	11.00	65.0	12.70	Peak	N Line	Pass
2**	0.19	38.3	11.00	55.0	16.70	AV	N Line	Pass
3	0.37	42.8	11.00	59.6	16.80	Peak	N Line	Pass
3**	0.37	29.0	11.00	49.6	20.60	AV	N Line	Pass
4	0.72	34.4	11.00	56.0	21.60	Peak	N Line	Pass
4**	0.72	27.1	11.00	46.0	18.90	AV	N Line	Pass
5	1.83	37.3	11.00	56.0	18.70	Peak	N Line	Pass
5**	1.83	23.1	11.00	46.0	22.90	AV	N Line	Pass
6	4.61	32.5	11.00	56.0	23.50	Peak	N Line	Pass
6**	4.61	22.2	11.00	46.0	23.80	AV	N Line	Pass

A.8 Radiated Emission

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

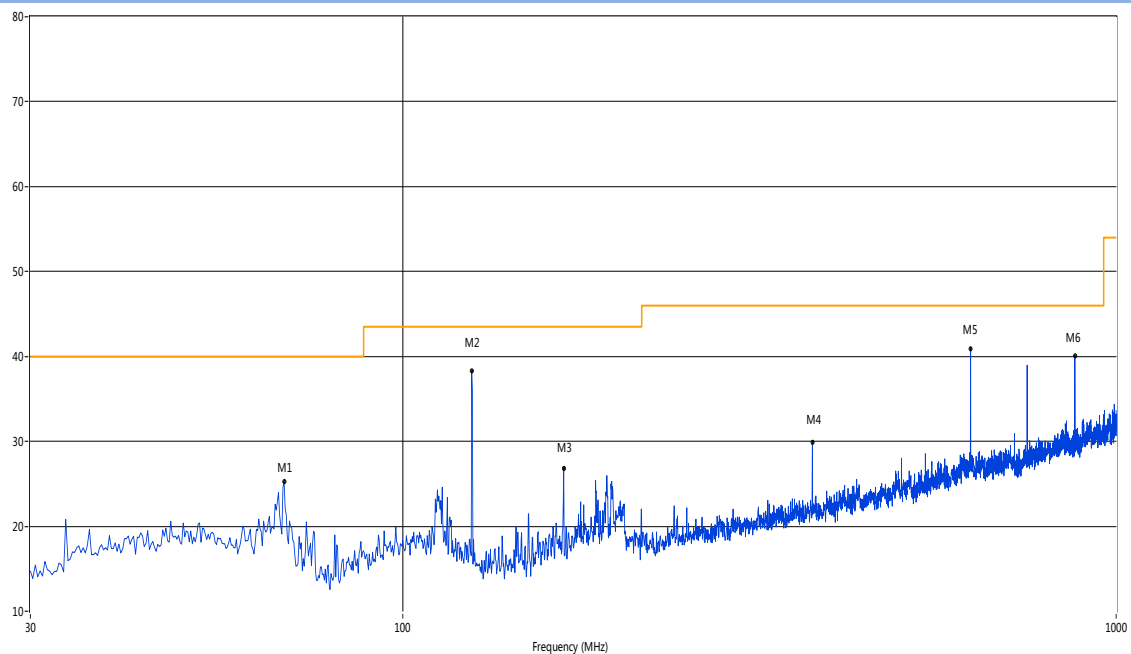
Note 2: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: The EUT is working in the Normal link mode below 1 GHz.

Test Data and Plots

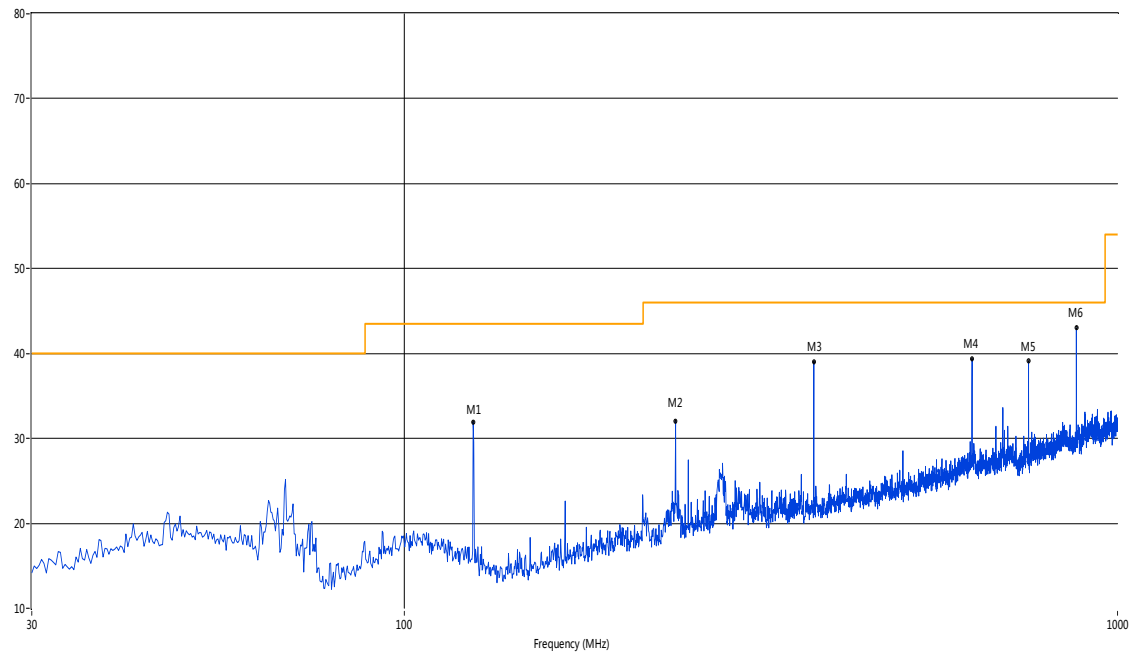
The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

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	68.06	25.28	-21.84	40.0	14.72	Peak	58.40	100	Vertical	Pass
2	124.79	38.26	-22.47	43.5	5.24	Peak	145.60	100	Vertical	Pass
3	167.95	26.83	-22.82	43.5	16.67	Peak	279.60	100	Vertical	Pass
4	374.99	29.85	-15.79	46.0	16.15	Peak	292.20	100	Vertical	Pass
5	624.95	40.97	-10.27	46.0	5.03	Peak	262.60	100	Vertical	Pass
6	874.90	40.05	-6.24	46.0	5.95	Peak	66.80	100	Vertical	Pass

30 MHz to 1 GHz, ANT H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	124.79	31.95	-22.47	43.5	11.55	Peak	53.80	100	Horizontal	Pass
2	239.95	32.07	-19.10	46.0	13.93	Peak	28.80	100	Horizontal	Pass
3	374.75	39.06	-15.82	46.0	6.94	Peak	182.50	100	Horizontal	Pass
4	624.95	39.39	-10.27	46.0	6.61	Peak	241.40	100	Horizontal	Pass
5	749.80	39.11	-8.59	46.0	6.89	Peak	201.30	100	Horizontal	Pass
6	874.90	42.85	-6.24	46.0	3.15	Peak	53.80	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

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1947.07	50.04	-2.41	74	23.96	Peak	290.8	150	Vertical	Pass
2	2402.25	105.18	-0.23	74	-31.18	Peak	213.8	150	Vertical	N/A
3	5949.30	51.88	15.91	74	22.12	Peak	105.9	150	Vertical	Pass
4	7920.55	45.39	14.31	74	28.62	Peak	35.5	150	Vertical	Pass
5	13467.55	47.26	19.71	74	26.74	Peak	198	150	Vertical	Pass
6	23971.71	43.39	11.04	74	30.61	Peak	214.1	150	Vertical	Pass

GFSK LOW 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	2292.14	48.82	-0.36	74	25.18	Peak	287.4	150	Horizontal	Pass
2	2402.20	101.32	-0.34	74	-27.32	Peak	292.1	150	Horizontal	N/A
3	4847.80	51.58	13.58	74	22.42	Peak	99.7	150	Horizontal	Pass
4	6617.72	49.16	17.10	74	24.84	Peak	77	150	Horizontal	Pass
5	15578.62	45.96	9.59	74	28.04	Peak	30	150	Horizontal	Pass
6	23881.86	45.16	12.78	74	28.85	Peak	222.5	150	Horizontal	Pass

GFSK MIDDLE 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	1946.45	49.32	-2.41	74	24.68	Peak	346.1	150	Vertical	Pass
2	2440.06	104.04	-0.23	74	-30.04	Peak	12.7	150	Vertical	N/A
3	5948.68	51.95	15.90	74	22.05	Peak	117	150	Vertical	Pass
4	11503.33	42.97	20.21	74	31.03	Peak	81.8	150	Vertical	Pass
5	17096.92	46.66	9.47	74	27.34	Peak	20.4	150	Vertical	Pass
6	19069.88	45.13	12.89	74	28.87	Peak	191	150	Vertical	Pass

GFSK MIDDLE 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	2291.28	49.48	-0.45	74	24.52	Peak	51.8	150	Horizontal	Pass
2	2440.49	101.04	-0.21	74	-27.04	Peak	160	150	Horizontal	N/A
3	4850.76	51.36	13.60	74	22.64	Peak	253	150	Horizontal	Pass
4	6292.01	42.83	20.22	74	31.17	Peak	252.2	150	Horizontal	Pass
5	14361.90	42.73	9.18	74	31.27	Peak	318.5	150	Horizontal	Pass
6	22653.91	43.78	12.49	74	30.22	Peak	333.7	150	Horizontal	Pass

GFSK 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	1946.38	50.34	-2.42	74	23.66	Peak	162.1	150	Vertical	Pass
2	2480.24	105.70	-0.23	74	-31.70	Peak	307.4	150	Vertical	N/A
3	5950.68	51.21	15.91	74	22.79	Peak	49	150	Vertical	Pass
4	6112.31	47.56	16.68	74	26.44	Peak	63.8	150	Vertical	Pass
5	12064.89	44.78	9.64	74	29.22	Peak	108.9	150	Vertical	Pass
6	19698.84	43.95	12.78	74	30.05	Peak	294.8	150	Vertical	Pass

GFSK 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	2292.44	49.76	-0.42	74	24.24	Peak	208.1	150	Horizontal	Pass
2	2480.55	100.68	-0.26	74	-26.68	Peak	218.6	150	Horizontal	N/A
3	4853.14	52.29	13.61	74	21.71	Peak	316.4	150	Horizontal	Pass
4	6482.95	45.40	20.20	74	28.60	Peak	336.2	150	Horizontal	Pass
5	14039.52	44.68	9.69	74	29.32	Peak	222.5	150	Horizontal	Pass
6	18043.26	46.71	11.74	74	27.29	Peak	326.1	150	Horizontal	Pass

8-DPSK LOW 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	1948.93	49.84	-2.44	74	24.16	Peak	23.8	150	Vertical	Pass
2	2402.24	105.75	-0.21	74	-31.75	Peak	183.8	150	Vertical	N/A
3	5946.51	52.33	15.91	74	21.67	Peak	337.5	150	Vertical	Pass
4	11031.61	43.53	20.01	74	30.47	Peak	248.6	150	Vertical	Pass
5	14996.26	44.24	9.32	74	29.76	Peak	26.6	150	Vertical	Pass
6	23782.03	42.73	11.50	74	31.27	Peak	5	150	Vertical	Pass

8-DPSK LOW 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	2292.77	50.01	-0.34	74	23.99	Peak	93.6	150	Horizontal	Pass
2	2402.24	100.71	-0.30	74	-26.71	Peak	354.1	150	Horizontal	N/A
3	4853.75	53.16	13.60	74	20.84	Peak	87.4	150	Horizontal	Pass
4	11031.61	43.98	17.62	74	30.02	Peak	191	150	Horizontal	Pass
5	12843.59	45.05	11.01	74	28.95	Peak	155.3	150	Horizontal	Pass
6	24540.77	46.50	9.34	74	27.50	Peak	303	150	Horizontal	Pass

8-DPSK MIDDLE 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	1948.62	49.81	-2.39	74	24.19	Peak	103.8	150	Vertical	Pass
2	2440.75	105.58	-0.23	74	-31.58	Peak	313.1	150	Vertical	N/A
3	5947.19	51.39	15.91	74	22.61	Peak	109.6	150	Vertical	Pass
4	7347.75	47.73	14.24	74	26.27	Peak	136.7	150	Vertical	Pass
5	16493.76	46.14	19.61	74	27.86	Peak	108.1	150	Vertical	Pass
6	22474.21	43.46	9.50	74	30.54	Peak	215.8	150	Vertical	Pass

8-DPSK MIDDLE 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	2289.48	49.11	-0.40	74	24.89	Peak	260.4	150	Horizontal	Pass
2	2440.58	101.33	-0.26	74	-27.33	Peak	67.2	150	Horizontal	N/A
3	4851.91	53.02	13.61	74	20.98	Peak	270.5	150	Horizontal	Pass
4	8583.20	48.35	18.95	74	25.65	Peak	318.8	150	Horizontal	Pass
5	15381.03	48.69	20.77	74	25.31	Peak	223.6	150	Horizontal	Pass
6	24940.10	46.51	11.24	74	27.49	Peak	75	150	Horizontal	Pass

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	1947.62	50.13	-2.39	74	23.87	Peak	86	150	Vertical	Pass
2	2480.22	104.79	-0.27	74	-30.79	Peak	240.4	150	Vertical	N/A
3	5951.71	51.92	15.92	74	22.08	Peak	352.1	150	Vertical	Pass
4	9380.62	46.66	19.67	74	27.34	Peak	276.9	150	Vertical	Pass
5	16587.35	42.64	11.76	74	31.37	Peak	100.7	150	Vertical	Pass
6	24750.42	47.73	8.77	74	26.27	Peak	21.1	150	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	2291.37	48.74	-0.38	74	25.26	Peak	67.9	150	Horizontal	Pass
2	2480.12	100.80	-0.26	74	-26.80	Peak	129.9	150	Horizontal	N/A
3	4850.35	51.95	13.60	74	22.05	Peak	27.1	150	Horizontal	Pass
4	6067.39	42.28	16.96	74	31.72	Peak	248.5	150	Horizontal	Pass
5	17731.28	46.80	9.14	74	27.20	Peak	232.8	150	Horizontal	Pass
6	20168.05	47.07	11.98	74	26.93	Peak	192.1	150	Horizontal	Pass

Hopping Mode:

GFSK MODE 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	1947.72	48.92	-2.39	74	25.08	Peak	62.7	150	Vertical	Pass
2	2402.24	104.15	-0.27	74	-30.15	Peak	43.7	150	Vertical	N/A
3	5948.58	51.85	15.90	74	22.15	Peak	235.5	150	Vertical	Pass
4	8605.66	49.21	14.17	74	24.79	Peak	88.2	150	Vertical	Pass
5	14975.46	43.71	8.73	74	30.29	Peak	271	150	Vertical	Pass
6	22813.64	46.42	9.42	74	27.58	Peak	339.9	150	Vertical	Pass

GFSK MODE 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	2290.55	49.50	-0.38	74	24.50	Peak	4.9	150	Horizontal	Pass
2	2402.21	99.90	-0.27	74	-25.90	Peak	335.8	150	Horizontal	N/A
3	4853.74	51.90	13.61	74	22.10	Peak	18.9	150	Horizontal	Pass
4	7156.82	46.41	14.87	74	27.59	Peak	126.3	150	Horizontal	Pass
5	13540.35	44.99	9.49	74	29.01	Peak	217.5	150	Horizontal	Pass
6	23103.16	48.06	11.09	74	25.94	Peak	188.1	150	Horizontal	Pass

8-DPSK MODE 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	1947.02	48.97	-2.39	74	25.03	Peak	33	150	Vertical	Pass
2	2402.15	105.34	-0.27	74	-31.34	Peak	147.9	150	Vertical	N/A
3	5946.31	51.75	15.91	74	22.25	Peak	200.1	150	Vertical	Pass
4	9167.22	47.70	17.05	74	26.30	Peak	237.8	150	Vertical	Pass
5	17502.50	45.70	11.44	74	28.30	Peak	128.8	150	Vertical	Pass
6	20427.62	46.46	10.08	74	27.54	Peak	114.4	150	Vertical	Pass

8-DPSK MODE 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	2293.43	48.73	-0.36	74	25.27	Peak	16.2	150	Horizontal	Pass
2	2402.18	100.75	-0.23	74	-26.75	Peak	357.8	150	Horizontal	N/A
3	4852.23	53.22	13.61	74	20.78	Peak	311.6	150	Horizontal	Pass
4	9088.60	43.42	14.35	74	30.58	Peak	315.5	150	Horizontal	Pass
5	15360.23	48.05	8.92	74	25.95	Peak	339.2	150	Horizontal	Pass
6	21236.27	45.07	13.57	74	28.93	Peak	128.3	150	Horizontal	Pass

A.9 Band Edge (Restricted-band 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.

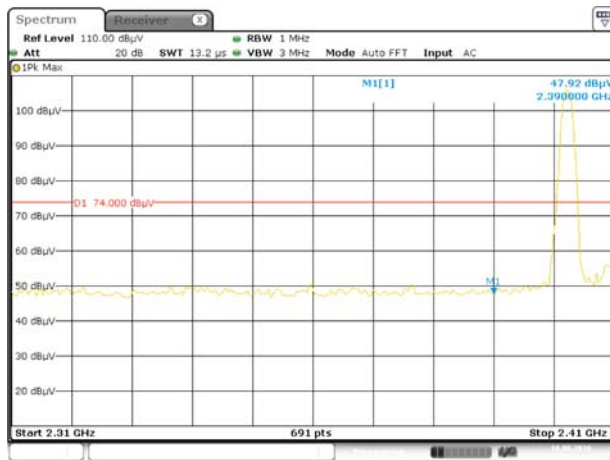
Note 2: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.

Note 3: According the ANSI C63.10-2013, 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.

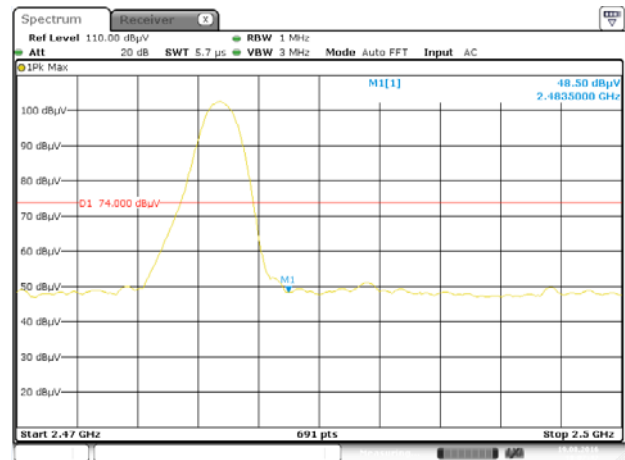
Test Mode	Test Channel	Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Remark	Verdict
GFSK	Low	2390.00	47.92	74	26.08	PEAK	Pass
		2390.00	--	54	--	AVERAGE	Pass
GFSK	HIGH	2483.50	48.50	74	25.50	PEAK	Pass
		2483.50	--	54	--	AVERAGE	Pass
8-DPSK	Low	2390.00	48.69	74	25.31	PEAK	Pass
		2390.00	--	54	--	AVERAGE	Pass
8-DPSK	HIGH	2483.50	58.28	74	15.72	PEAK	Pass
		2483.50	39.45	54	14.55	AVERAGE	Pass
GFSK(Hopping)	Low	2390.00	48.08	74	25.92	PEAK	Pass
		2390.00	--	54	--	AVERAGE	Pass
GFSK(Hopping)	HIGH	2483.50	47.95	74	26.05	PEAK	Pass
		2483.50	--	54	--	AVERAGE	Pass
8-DPSK (Hopping)	Low	2390.00	48.37	74	25.63	PEAK	Pass
		2390.00	--	54	--	AVERAGE	Pass
8-DPSK (Hopping)	HIGH	2483.50	53.82	74	20.18	PEAK	Pass
		2483.50	--	54	--	AVERAGE	Pass

Test Plots

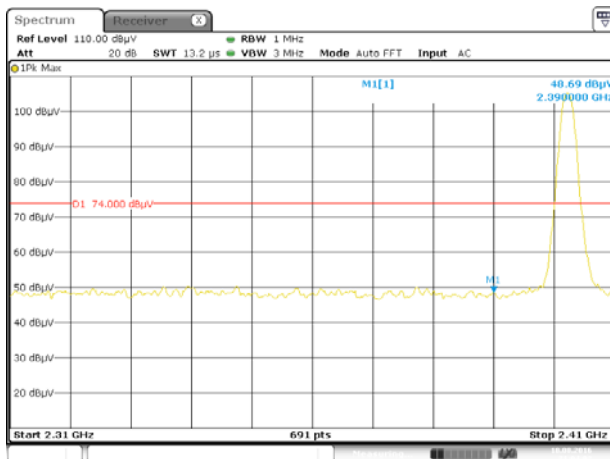
GFSK LOW CHANNEL , PEAK



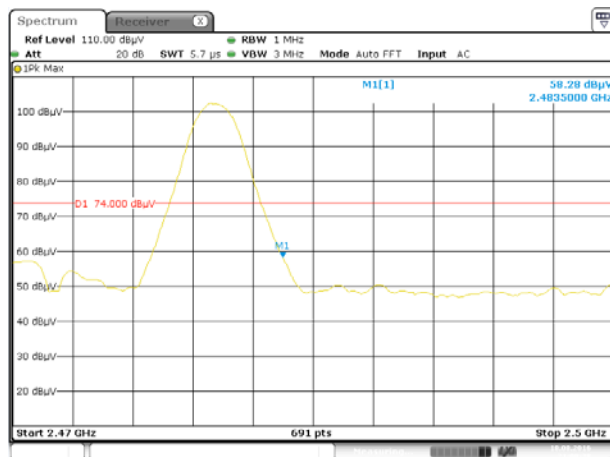
GFSK HIGH CHANNEL , PEAK



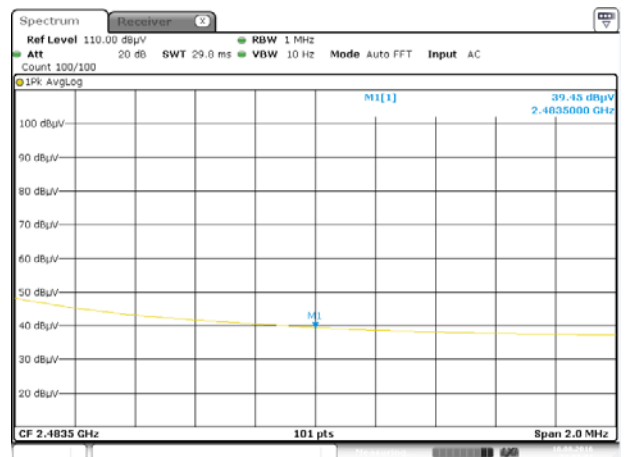
8-DPSK LOW CHANNEL , PEAK



8-DPSK HIGH CHANNEL , PEAK

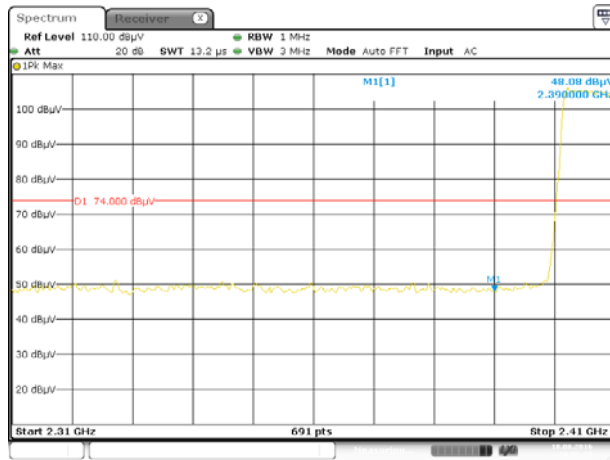


8-DPSK HIGH CHANNEL , AV

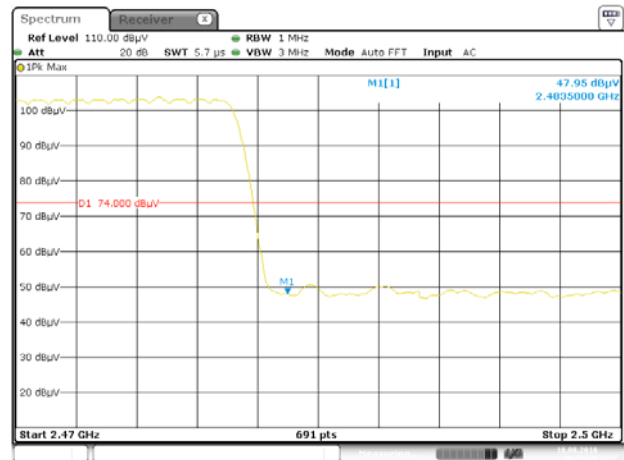


Hopping Mode:

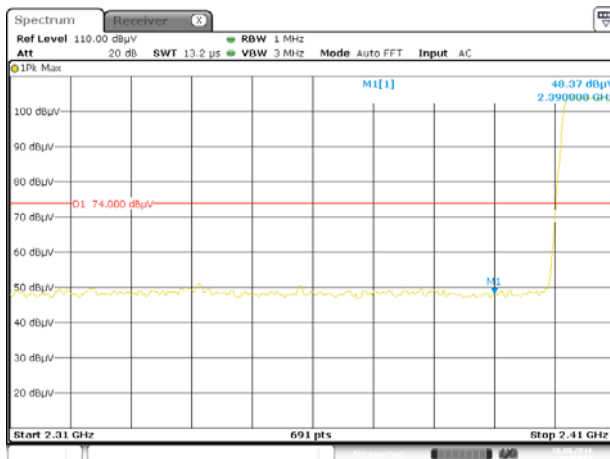
GFSK LOW FREQUENCY BAND, PEAK



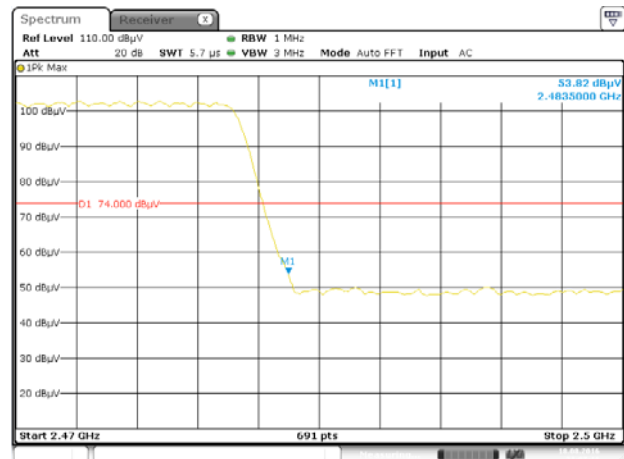
GFSK HIGH FREQUENCY BAND, PEAK



8-DPSK LOW FREQUENCY BAND, PEAK



8-DPSK HIGH FREQUENCY BAND, PEAK



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1680264-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ1680264-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ1680264-AI.PDF”.

--END OF REPORT--