

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART CTEST REPORT**FCC PART 15.247****Report Reference No.....: GTS20210408012-1-1****FCC ID.: 2AML6BB106B**Compiled by
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Date of issue.....: Apr. 08, 2021

Representative Laboratory Name.: Shenzhen Global Test Service Co.,Ltd.

Address: No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

Applicant's name.....: KINGRAY ELECTRONICS Co., LTD

Address: 3F, Building 13th, Xingwei the third Industrial Park, Fenghuang Village, Fuyong town, Baoan District, Shenzhen, Guangdong, China

Test specificationStandard: **FCC Part 15.247**

TRF Originator.....: Shenzhen Global Test Service Co.,Ltd.

Master TRF.....: Dated 2014-12

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Test item description Wireless Bluetooth Headphones

Trade Mark: N/A

Manufacturer: KINGRAY ELECTRONICS Co., LTD

Model/Type reference.....: BB427

Listed Models: BB106B, KRBT-861, KRBT-830, BIG-9934, EV7730, EV7731, EV7732

Modulation Type: GFSK,II/4DQPSK

Operation Frequency.....: From 2402MHz to 2480MHz

Rating: DC3.7V from battery

Result: **PASS***Jimmy Wang*

TEST REPORT

Test Report No. : GTS20210408012-1-1	Apr. 08, 2021 Date of issue
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Equipment under Test : Wireless Bluetooth Headphones

Model /Type : BB427

Listed Models : BB106B, KRBT-861, KRBT-830, BIG-9934, EV7730, EV7731, EV7732

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Manufacturer : **KINGRAY ELECTRONICS Co., LTD**

Address : 3F, Building 13th, Xingwei the third Industrial Park, Fenghuang Village, Fuyong town, Baoan District, Shenzhen, Guangdong, China

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Mar. 25, 2021
Testing commenced on	:	Mar. 26, 2021
Testing concluded on	:	Apr. 06, 2021

2.2 Product Description

Product Name:	Wireless Bluetooth Headphones
Model/Type reference:	BB427
Power supply:	DC 3.7V from battery
Hardware version:	AC6959A-730-M-V1.0
Software version:	V1.0
Sample ID:	GTS20210408012-1-1#/ GTS20210408012-1-2#
Adapter(Auxiliary test Provided by the laborator)	Mode:EP-TA20CBC Input:AC100-240V-50/60Hz, 0.5A Output:DC 5V,2A
Bluetooth :	
Supported Type:	Bluetooth BR/EDR
Modulation:	GFSK, $\pi/4$ DQPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PCB antenna
Antenna gain:	0 dBi

2.3 Test Sample

The application provides 2 samples to meet requirement.

Sample Number	Description
GTS20210408012-1-1#	Engineer sample – continuous transmit
GTS20210408012-1-2#	Normal sample – Intermittent transmit

2.4 Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 230V/ 50 Hz	<input type="radio"/> 120V/60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.7V from battery

2.5 Short description of the Equipment under Test (EUT)

This is a Wireless Bluetooth Headphones

For more details, refer to the user's manual of the EUT.

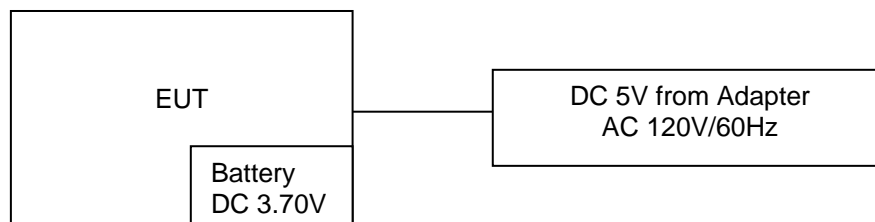
2.6 EUT operation mode

The Applicant provides communication tools software(FCC Assist) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 79 channels provided to the EUT and Channel 00/39/78 were selected to test.

Operation Frequency:

Channel	Frequency (MHz)
00	2402
01	2403
⋮	⋮
38	2440
39	2441
40	2442
⋮	⋮
77	2479
78	2480

2.7 Block Diagram of Test Setup



2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.9 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.:165725

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

A2LA-Lab Cert. No.: 4758.01

Shenzhen Global Test Service Co.,Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2024.

3.3 Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4 Summary of measurement results

Test Specification clause	Test case	Test Sample	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(a)(1)	Carrier Frequency separation	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Middle	Compliant
§15.247(a)(1)	Number of Hopping channels	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Full	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Full	Compliant
§15.247(a)(1)	Time of Occupancy (dwell time)	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Middle	Compliant
§15.247(a)(1)	Spectrum bandwidth of aFHSS system 20dB bandwidth	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Compliant
§15.247(b)(1)	Maximum output power	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Compliant
§15.247(d)	Band edge compliance conducted	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	Compliant
§15.205	Band edge compliance radiated	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	Compliant
§15.247(d)	TX spurious emissions conducted	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Compliant
§15.247(d)	TX spurious emissions radiated	GTS20210408 012-1-1#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Compliant
§15.209(a)	TX spurious Emissions radiated Below 1GHz	GTS20210408 012-1-2#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Π/4DQPSK	<input checked="" type="checkbox"/> Middle	Compliant
§15.107(a) §15.207	Conducted Emissions 9KHz-30 MHz	GTS20210408 012-1-2#	GFSK Π/4DQPSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	Π/4DQPSK	<input checked="" type="checkbox"/> Middle	Compliant

Remark:

1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18~40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

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

3.6 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2020/09/19	2021/09/18
LISN	R&S	ESH2-Z5	893606/008	2020/09/19	2021/09/18
EMI Test Receiver	R&S	ESPI3	101841-cd	2020/09/19	2021/09/18
EMI Test Receiver	R&S	ESCI7	101102	2020/09/19	2021/09/18
Spectrum Analyzer	Agilent	N9020A	MY48010425	2020/09/19	2021/09/18
Spectrum Analyzer	Agilent	E4407B	MY45132751	2020/09/19	2021/09/18
Spectrum Analyzer	R&S	FSV40	100019	2020/09/19	2021/09/18
Vector Signal generator	Agilent	N5181A	MY49060502	2020/09/19	2021/09/18
Signal generator	Agilent	E4421B	3610AO1069	2020/09/19	2021/09/18
Climate Chamber	ESPEC	EL-10KA	A20120523	2020/09/19	2021/09/18
Controller	EM Electronics	Controller EM 1000	N/A	N/A	N/A
Horn Antenna	Schwarzbeck	BBHA 9120D	01622	2020/09/19	2021/09/18
Active Loop Antenna	Beijing Da Ze Technology Co.,Ltd.	ZN30900C	15006	2020/10/11	2021/10/10
Bilog Antenna	Schwarzbeck	VULB9163	000976	2020/05/26	2021/05/25
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2020/09/19	2021/09/18
Amplifier	Schwarzbeck	BBV 9743	#202	2020/09/19	2021/09/18
Amplifier	Schwarzbeck	BBV9179	9719-025	2020/09/19	2021/09/18
Amplifier	EMCI	EMC051845B	980355	2020/09/19	2021/09/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2020/09/19	2021/09/18
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	KL142031	2020/09/19	2021/09/18
High-Pass Filter	K&L	41H10-1375/U12750-O/O	KL142032	2020/09/19	2021/09/18
RF Cable(below 1GHz)	HUBER+SUHNER	RG214	RE01	2020/09/19	2021/09/18
RF Cable(above 1GHz)	HUBER+SUHNER	RG214	RE02	2020/09/19	2021/09/18
Data acquisition card	Agilent	U2531A	TW53323507	2020/09/19	2021/09/18
Power Sensor	Agilent	U2021XA	MY5365004	2020/09/19	2021/09/18
Test Control Unit	Tonscend	JS0806-1	178060067	2020/06/19	2021/06/18
Automated filter bank	Tonscend	JS0806-F	19F8060177	2020/06/19	2021/06/18
EMI Test Software	Tonscend	JS1120-1	Ver 2.6.8.0518	/	/
EMI Test Software	Tonscend	JS1120-3	Ver 2.5.77.0418	/	/
EMI Test Software	Tonscend	JS32-CE	Ver 2.5	/	/
EMI Test Software	Tonscend	JS32-RE	Ver 2.5.1.8	/	/

Note: The Cal.Interval was one year.

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION

TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.

2 Support equipment, if needed, was placed as per ANSI C63.10-2013

3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013

4 The EUT received DC12V power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

5 All support equipments received AC power from a second LISN, if any.

6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.

7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

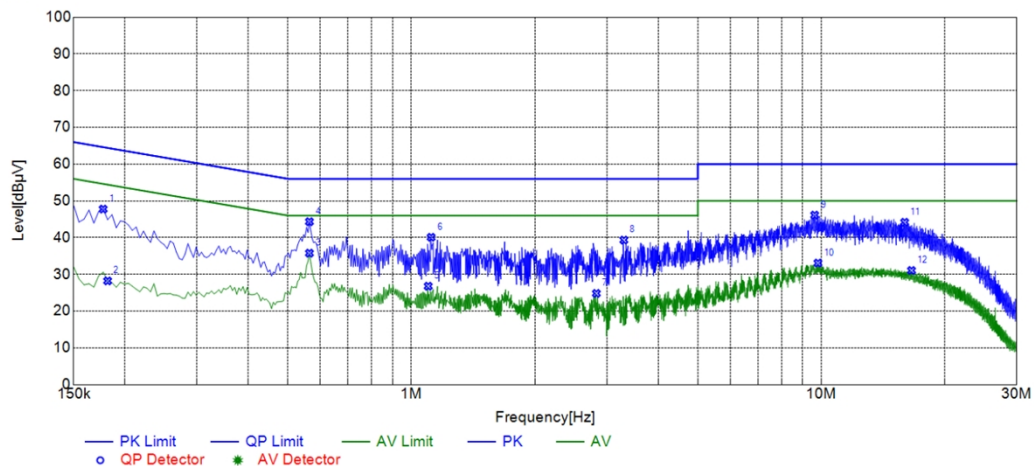
TEST RESULTS

Temperature	22.8°C	Humidity	56%
Test Engineer	Moon Tan	Configurations	BT

Remark:

- Both GFSK, Pi/4 DQPSK were test at Low, Middle, and Highchannel; only the worst result of *Pi/4 DQPSK* Middle Channel was reported as below:
- Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested,only the worst result of 120 VAC, 60 Hz was reported as below:

Power supply:	AC 120V/60Hz	Polarization	L
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Test Graph**Suspected List**

NO.	Frequency [MHz]	Reading [dBμV]	Factor [dB]	Result [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Line	Remark
1	0.1770	37.70	10.05	47.75	64.63	16.88	PK	L1	PASS
2	0.1815	18.16	10.06	28.22	54.42	26.20	AV	L1	PASS
3	0.5640	25.71	10.06	35.77	46.00	10.23	AV	L1	PASS
4	0.5640	34.28	10.06	44.34	56.00	11.66	PK	L1	PASS
5	1.0995	16.69	10.08	26.77	46.00	19.23	AV	L1	PASS
6	1.1175	30.01	10.08	40.09	56.00	15.91	PK	L1	PASS
7	2.8275	14.55	10.26	24.81	46.00	21.19	AV	L1	PASS
8	3.3000	29.00	10.33	39.33	56.00	16.67	PK	L1	PASS
9	9.6405	35.45	10.68	46.13	60.00	13.87	PK	L1	PASS
10	9.8205	22.40	10.68	33.08	50.00	16.92	AV	L1	PASS
11	15.9810	33.03	11.14	44.17	60.00	15.83	PK	L1	PASS
12	16.6065	19.86	11.20	31.06	50.00	18.94	AV	L1	PASS

Note:1. Result (dBμV) = Reading (dBμV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

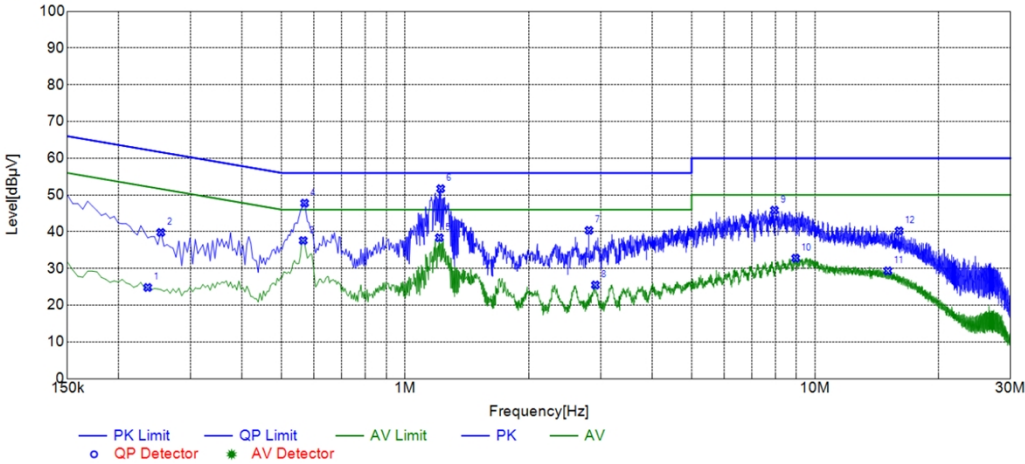
Power supply:

AC 120V/60Hz

Polarization

N

Test Graph



Suspected List

NO.	Frequency [MHz]	Reading [dBµV]	Factor [dB]	Result [dBµV]	Limit [dBµV]	Margin [dB]	Detector	Line	Remark
1	0.2355	14.79	10.03	24.82	52.25	27.43	AV	N	PASS
2	0.2535	29.80	10.01	39.81	61.64	21.83	PK	N	PASS
3	0.5640	27.52	10.06	37.58	46.00	8.42	AV	N	PASS
4	0.5685	37.71	10.06	47.77	56.00	8.23	PK	N	PASS
5	1.2120	28.28	10.09	38.37	46.00	7.63	AV	N	PASS
6	1.2210	41.62	10.09	51.71	56.00	4.29	PK	N	PASS
7	2.8095	30.12	10.26	40.38	56.00	15.62	PK	N	PASS
8	2.9130	15.21	10.28	25.49	46.00	20.51	AV	N	PASS
9	7.9620	35.23	10.63	45.86	60.00	14.14	PK	N	PASS
10	8.9700	22.13	10.67	32.80	50.00	17.20	AV	N	PASS
11	15.0630	18.27	11.06	29.33	50.00	20.67	AV	N	PASS
12	16.0440	29.09	11.13	40.22	60.00	19.78	PK	N	PASS

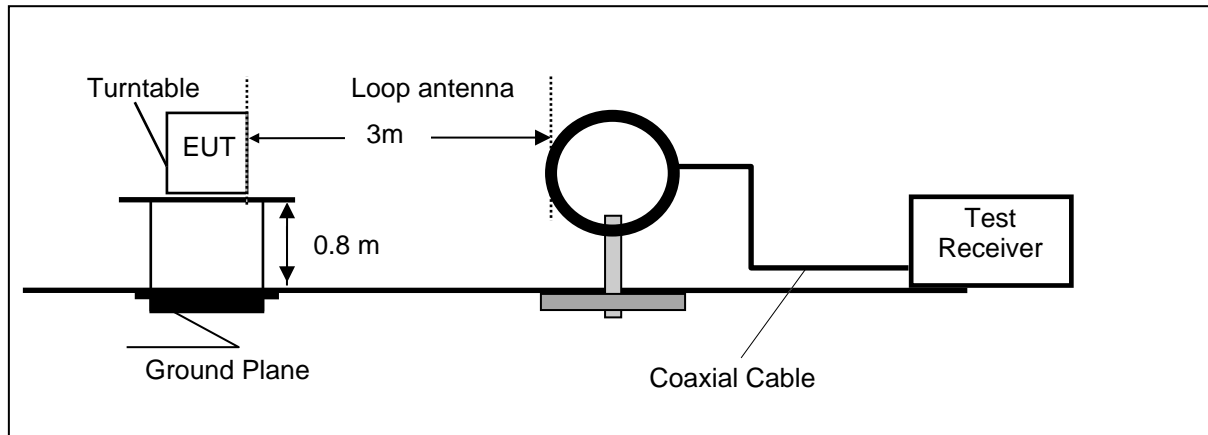
Note:1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

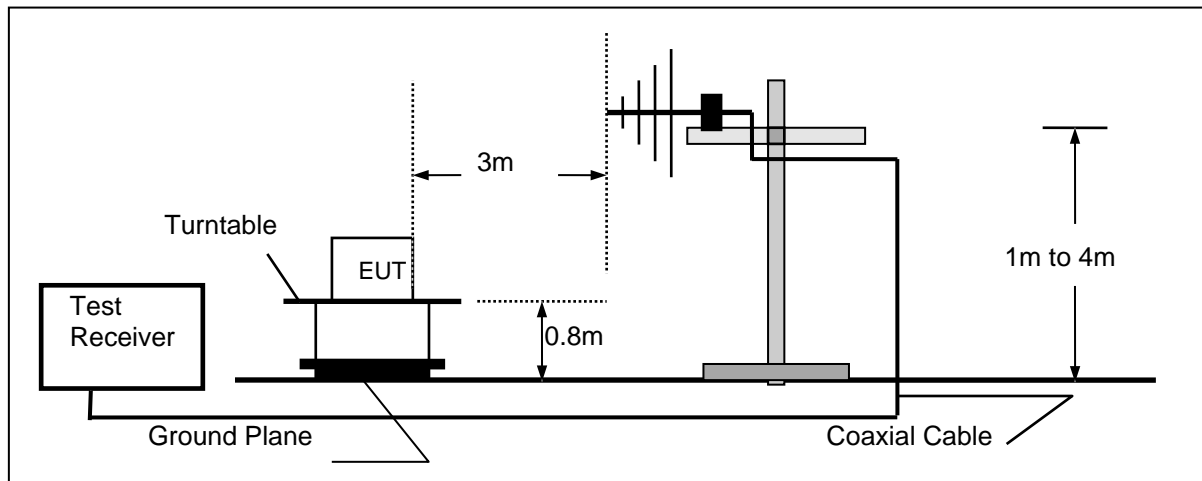
4.2 Radiated Emission

TEST CONFIGURATION

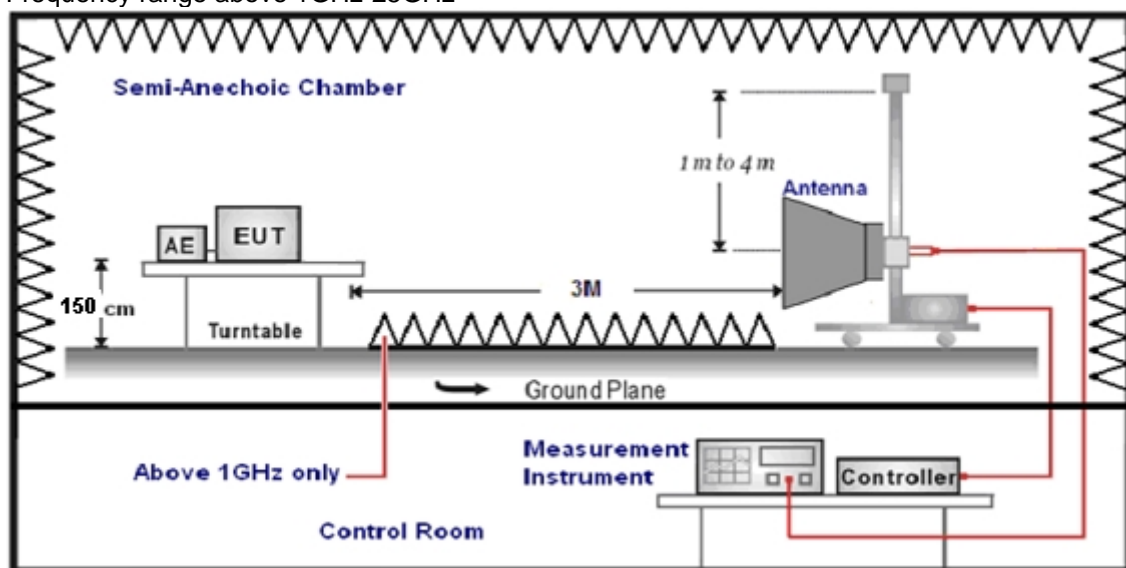
Frequency range 9 KHz–30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz–1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz–25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

$$\text{Transd} = AF + CL - AG$$

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT 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 desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

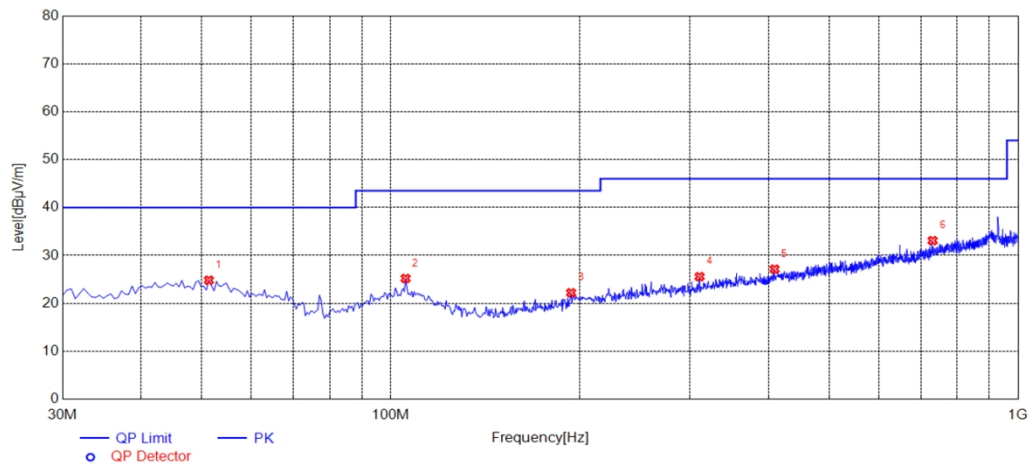
Frequency(MHz)	Distance(Meters)	Radiated(dBµV/m)	Radiated(µV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Temperature	22.8°C	Humidity	56%
Test Engineer	Moon Tan	Configurations	BT

Remark:

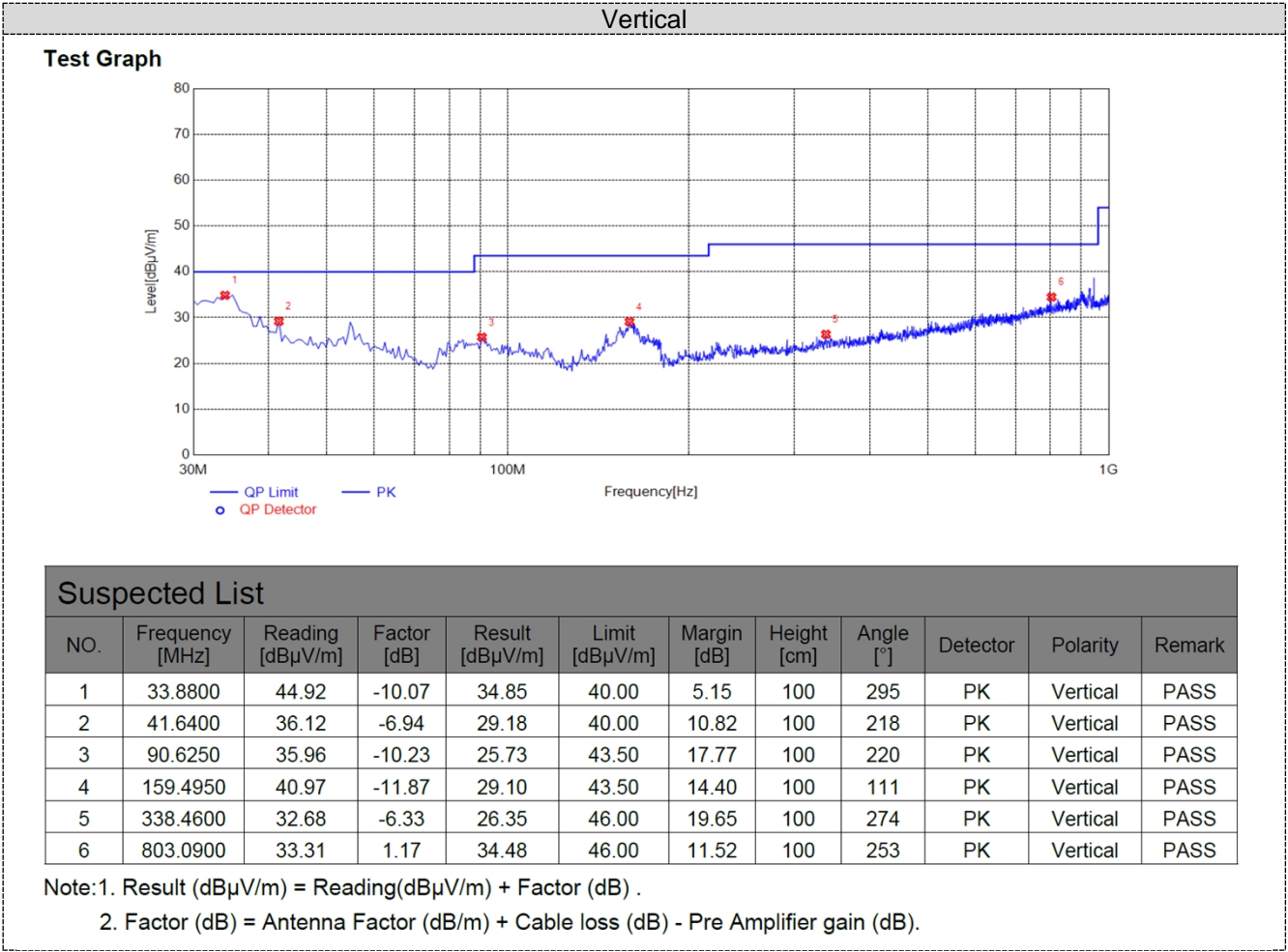
1. We measured Radiated Emission at GFSK, $\pi/4$ DQPSK mode from 9 KHz to 25GHz and recorded worst case at $\pi/4$ DQPSK DH5 mode.
2. For below 1GHz testing recorded worst at $\pi/4$ DQPSK DH5 middle channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz**Horizontal****Test Graph****Suspected List**

NO.	Frequency [MHz]	Reading [dBμV/m]	Factor [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	51.3400	31.50	-6.66	24.84	40.00	15.16	100	191	PK	Horizontal	PASS
2	105.6600	33.23	-8.03	25.20	43.50	18.30	100	5	PK	Horizontal	PASS
3	193.9300	31.89	-9.69	22.20	43.50	21.30	100	346	PK	Horizontal	PASS
4	310.8150	32.88	-7.31	25.57	46.00	20.43	100	162	PK	Horizontal	PASS
5	409.2700	32.23	-5.09	27.14	46.00	18.86	100	57	PK	Horizontal	PASS
6	730.8250	33.26	-0.17	33.09	46.00	12.91	100	262	PK	Horizontal	PASS

Note: 1. Result (dBμV/m) = Reading (dBμV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).



For 1GHz to 25GHz

Note: Both GFSK, Pi/4 DQPSK have been tested, only worse case Pi/4 DQPSK is reported.

GFSK (above 1GHz)

Frequency(MHz):			2402		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	56.98	PK	74	17.02	55.08	31.42	6.98	36.50	1.90
4804.00	47.22	AV	54	6.78	45.32	31.42	6.98	36.50	1.90
7206.00	49.15	PK	74	24.85	38.55	37.03	8.87	35.30	10.60
7206.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2402		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	58.08	PK	74	15.92	56.18	31.42	6.98	36.50	1.90
4804.00	48.72	AV	54	5.28	46.82	31.42	6.98	36.50	1.90
7206.00	49.95	PK	74	24.05	39.35	37.03	8.87	35.30	10.60
7206.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2441		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4882.00	57.01	PK	74	16.99	54.95	30.98	7.58	36.50	2.06
4882.00	46.85	AV	54	7.15	44.79	30.98	7.58	36.50	2.06
7323.00	49.28	PK	74	24.72	38.36	37.66	8.56	35.30	10.92
7323.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2441		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4882.00	58.11	PK	74	15.89	56.05	30.98	7.58	36.50	2.06
4882.00	48.05	AV	54	5.95	45.99	30.98	7.58	36.50	2.06
7323.00	50.08	PK	74	23.92	39.16	37.66	8.56	35.30	10.92
7323.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	58.59	PK	74	15.41	55.52	31.47	7.80	36.20	3.07
4960.00	48.06	AV	54	5.94	44.99	31.47	7.80	36.20	3.07
7440.00	50.62	PK	74	23.38	38.88	38.32	8.72	35.30	11.74
7440.00	--	AV	54	--	--	--	--	--	--

Frequency(MHz):			2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	59.69	PK	74	14.31	56.62	31.47	7.80	36.20	3.07
4960.00	48.86	AV	54	5.14	45.79	31.47	7.80	36.20	3.07
7440.00	51.72	PK	74	22.28	39.98	38.32	8.72	35.30	11.74
7440.00	--	AV	54	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier

3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

Results of Band Edges Test (Radiated)

Note: Both GFSK and Pi/4 DQPSK have been tested, only worse case GFSK is reported.

GFSK

Frequency(MHz):			2402		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	46.87	PK	74.00	27.13	52.28	27.49	3.32	36.22	-5.41
2390.00	--	AV	54.00	--	--	--	--	--	--
Frequency(MHz):			2402		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	49.27	PK	74.00	24.73	54.68	27.49	3.32	36.22	-5.41
2390.00	--	AV	54.00	--	--	--	--	--	--
Frequency(MHz):			2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	45.69	PK	74.00	28.31	51.20	27.45	3.38	36.34	-5.51
2483.50	--	AV	54.00	--	--	--	--	--	--
Frequency(MHz):			2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	47.09	PK	74.00	26.91	52.60	27.45	3.38	36.34	-5.51
2483.50	--	AV	54.00	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier
3. Margin value = Limit value - Emission level.
4. -- Mean the PK detector measured value is below average limit.

4.3 MaximumPeak Output Power

Limit

The Maximum Peak Output Power Measurement is 125mW (20.97).

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the powersensor.

Test Configuration



Test Results

Temperature	22.8°C	Humidity	56%
Test Engineer	Moon Tan	Configurations	BT

Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	00	-2.189	20.97	Pass
	39	-1.082		
	78	0.098		
$\pi/4$ DQPSK	00	-1.226	20.97	Pass
	39	-0.101		
	78	1.045		

Note: 1.The test results including the cable lose.

4.4 20dB Bandwidth

Limit

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

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

Test Configuration



Test Results

Temperature	22.8°C	Humidity	56%
Test Engineer	Moon Tan	Configurations	BT

Modulation	Channel	20dB bandwidth (MHz)	99% OBW (MHz)	Result
GFSK	CH00	0.962	0.8569	Pass
	CH39	0.953	0.8660	
	CH78	0.949	0.8578	
$\pi/4$ DQPSK	CH00	1.339	1.1916	
	CH39	1.327	1.1948	
	CH78	1.284	1.1978	

Test plot as follows:

GFSK Modulation	
<div><div><div><div>Agilent</div><div>L</div></div><div><div>Ch Freq</div><div>2.402 GHz</div><div>Trig Free</div></div><div>Occupied Bandwidth</div><div>Center 2.402000000 GHz</div><div><div>Ref 17 dBm</div><div>#Atten 25 dB</div></div><div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>2</div><div>dB</div></div><div><div>Center 2.402 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 4 ms (401 pts)</div></div><div><div>Occupied Bandwidth</div><div>856.8836 kHz</div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div><div>Transmit Freq Error</div><div>64.987 kHz</div><div>x dB Bandwidth</div><div>961.750 kHz</div></div></div></div>	<div><div>Freq/Channel</div><div>Center Freq</div><div>2.40200000 GHz</div><div>Start Freq</div><div>2.40050000 GHz</div><div>Stop Freq</div><div>2.40350000 GHz</div><div>CF Step</div><div>300.000000 kHz</div><div>Auto</div><div>Man</div><div>Freq Offset</div><div>0.00000000 Hz</div><div>Signal Track</div><div>On</div><div>Off</div><div>Scale Type</div><div>Log</div><div>Lin</div></div>
CH00	
<div><div><div><div>Agilent</div><div>L</div></div><div><div>Ch Freq</div><div>2.441 GHz</div><div>Trig Free</div></div><div>Occupied Bandwidth</div><div>Center 2.441000000 GHz</div><div><div>Ref 17 dBm</div><div>#Atten 25 dB</div></div><div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>2</div><div>dB</div></div><div><div>Center 2.441 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 4 ms (401 pts)</div></div><div><div>Occupied Bandwidth</div><div>866.0104 kHz</div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div><div>Transmit Freq Error</div><div>64.897 kHz</div><div>x dB Bandwidth</div><div>953.279 kHz</div></div></div></div>	<div><div>Freq/Channel</div><div>Center Freq</div><div>2.44100000 GHz</div><div>Start Freq</div><div>2.43950000 GHz</div><div>Stop Freq</div><div>2.44250000 GHz</div><div>CF Step</div><div>300.000000 kHz</div><div>Auto</div><div>Man</div><div>Freq Offset</div><div>0.00000000 Hz</div><div>Signal Track</div><div>On</div><div>Off</div><div>Scale Type</div><div>Log</div><div>Lin</div></div>
CH39	
<div><div><div><div>Agilent</div><div>L</div></div><div><div>Ch Freq</div><div>2.48 GHz</div><div>Trig Free</div></div><div>Occupied Bandwidth</div><div>Center 2.480000000 GHz</div><div><div>Ref 17 dBm</div><div>#Atten 25 dB</div></div><div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>2</div><div>dB</div></div><div><div>Center 2.48 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 4 ms (401 pts)</div></div><div><div>Occupied Bandwidth</div><div>857.7916 kHz</div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div><div>Transmit Freq Error</div><div>72.013 kHz</div><div>x dB Bandwidth</div><div>949.168 kHz</div></div></div></div>	<div><div>Freq/Channel</div><div>Center Freq</div><div>2.48000000 GHz</div><div>Start Freq</div><div>2.47850000 GHz</div><div>Stop Freq</div><div>2.48150000 GHz</div><div>CF Step</div><div>300.000000 kHz</div><div>Auto</div><div>Man</div><div>Freq Offset</div><div>0.00000000 Hz</div><div>Signal Track</div><div>On</div><div>Off</div><div>Scale Type</div><div>Log</div><div>Lin</div></div>
CH78	

$\pi/4$ DQPSK Modulation	
<div><div><div><div>Agilent</div><div>L</div></div><div><div>Ch Freq</div><div>2.402 GHz</div><div>Trig Free</div></div><div>Occupied Bandwidth</div><div>Center 2.40200000 GHz</div><div><div>Ref 17 dBm</div><div>#Atten 25 dB</div></div><div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>2</div><div>dB</div></div><div><div>Center 2.402 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 4 ms (401 pts)</div></div><div><div>Occupied Bandwidth</div><div>1.1916 MHz</div><div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div></div><div><div>Transmit Freq Error</div><div>65.837 kHz</div><div>x dB Bandwidth</div><div>1.339 MHz</div></div></div></div><div><div>Freq/Channel</div><div>Center Freq</div><div>2.40200000 GHz</div><div>Start Freq</div><div>2.40050000 GHz</div><div>Stop Freq</div><div>2.40350000 GHz</div><div>CF Step</div><div>300.000000 kHz</div><div>Auto</div><div>Man</div><div>Freq Offset</div><div>0.00000000 Hz</div><div>Signal Track</div><div>On</div><div>Off</div><div>Scale Type</div><div>Log</div><div>Lin</div></div></div>	
CH00	
<div><div><div><div>Agilent</div><div>L</div></div><div><div>Ch Freq</div><div>2.441 GHz</div><div>Trig Free</div></div><div>Occupied Bandwidth</div><div>Center 2.441000000 GHz</div><div><div>Ref 17 dBm</div><div>#Atten 25 dB</div></div><div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>2</div><div>dB</div></div><div><div>Center 2.441 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 4 ms (401 pts)</div></div><div><div>Occupied Bandwidth</div><div>1.1948 MHz</div><div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div></div><div><div>Transmit Freq Error</div><div>62.521 kHz</div><div>x dB Bandwidth</div><div>1.327 MHz</div></div></div></div><div><div>Freq/Channel</div><div>Center Freq</div><div>2.44100000 GHz</div><div>Start Freq</div><div>2.43950000 GHz</div><div>Stop Freq</div><div>2.44250000 GHz</div><div>CF Step</div><div>300.000000 kHz</div><div>Auto</div><div>Man</div><div>Freq Offset</div><div>0.00000000 Hz</div><div>Signal Track</div><div>On</div><div>Off</div><div>Scale Type</div><div>Log</div><div>Lin</div></div></div>	
CH39	
<div><div><div><div>Agilent</div><div>L</div></div><div><div>Ch Freq</div><div>2.48 GHz</div><div>Trig Free</div></div><div>Occupied Bandwidth</div><div>Center 2.480000000 GHz</div><div><div>Ref 17 dBm</div><div>#Atten 25 dB</div></div><div><div>#Peak</div><div>Log</div><div>10</div><div>dB/</div><div>Offst</div><div>2</div><div>dB</div></div><div><div>Center 2.48 GHz</div><div>#Res BW 30 kHz</div><div>#VBW 100 kHz</div><div>Span 3 MHz</div><div>Sweep 4 ms (401 pts)</div></div><div><div>Occupied Bandwidth</div><div>1.1978 MHz</div><div><div>Occ BW % Pwr</div><div>99.00 %</div><div>x dB</div><div>-20.00 dB</div></div><div><div>Transmit Freq Error</div><div>69.182 kHz</div><div>x dB Bandwidth</div><div>1.284 MHz</div></div></div></div><div><div>Freq/Channel</div><div>Center Freq</div><div>2.48000000 GHz</div><div>Start Freq</div><div>2.47850000 GHz</div><div>Stop Freq</div><div>2.48150000 GHz</div><div>CF Step</div><div>300.000000 kHz</div><div>Auto</div><div>Man</div><div>Freq Offset</div><div>0.00000000 Hz</div><div>Signal Track</div><div>On</div><div>Off</div><div>Scale Type</div><div>Log</div><div>Lin</div></div></div>	
CH78	