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TEST REPORT

FCC PART 15.247

Report Reference No.: CTL1702156501-WF08

Compiled by: Allen Wang
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Allen Wang

Tested by: Nice Nong
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Nice Nong

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(position+printed name+signature) (Manager)

Ivan Xie

Product Name : 8 inch 4G Tablet

Model/Type reference : TT800Q

List Model(s)..... : N/A

Trade Mark..... : N/A

FCC ID..... : 2AGCDJACS800Q

Applicant's name : JACS SOLUTIONS LLC

Address of applicant..... : 8808 Centre Park Drive Suite 305 Columbia, MD 21045, USA

Test Firm..... : Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm : Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road,
Nanshan District, Shenzhen, China 518055

Test specification..... :

Standard : FCC Part 15.247: Operation within the bands 902-928 MHz,
2400-2483.5 MHz and 5725-5850 MHz.

TRF Originator : Shenzhen CTL Testing Technology Co., Ltd.

Master TRF..... : Dated 2011-01

Date of Receipt..... : Jun. 15, 2017

Date of Test Date..... : Jun. 16, 2017–Jul. 11, 2017

Data of Issue..... : Jul. 12, 2017

Result..... : Pass

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TEST REPORT

Test Report No. :	CTL1702156501-WF08	Jul. 12, 2017
		Date of issue

Equipment under Test : 8 inch 4G Tablet

Model /Type : TT800Q

Listed Models : N/A

Applicant : **JACS SOLUTIONS LLC**

Address : 8808 Centre Park Drive Suite 305 Columbia, MD
21045, USA

Manufacturer : **SHENZHEN JIZHAO INFORMATION
TECHNOLOGY CO., LTD.**

Address : BUILDING NO.1 ZHONGKENUO INDUSTRIAL
PARK HEZHOU ROAD XIXIANG STREET BAOAN
DISTRICT SHENZHEN ,CHINA

Test result	Pass *
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*In the configuration tested, the EUT complied with the standards specified page 5.

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.

**** Modified History ****

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2017-07-12	CTL1702156501-WF08	Tracy Qi



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1. SUMMARY

1.1. 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

[ANSI C63.4: 2014](#): –American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz
Range of 9 kHz to 40GHz

[KDB558074 D01 V03r03](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(1)(i)	20dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247(b)	Pseudorandom Frequency Hopping Sequence	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency& Time of Occupancy	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.205/15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology 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. Registration 970318, December 19, 2013.

1.4. 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 CTL Testing Technology 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 CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

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

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	8 inch 4G Tablet
Model/Type reference:	TT800Q
Power supply:	DC 3.7V from battery
Bluetooth :	
Version:	Supported BT3.0
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PIFA antenna
Antenna gain:	1.0dBi

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

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software 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

Preliminary tests were performed in each mode and packet length of BT, and found worst case as below, finally test were conducted at those mode and recorded in this report.

Test Items	Worst case
Conducted Emissions	DH5 Middle channel
Radiated Emissions and Band Edge	DH5
Maximum Conducted Output Power	DH5/2DH5/3DH5
20dB Bandwidth	DH5/2DH5/3DH5
Frequency Separation	DH5/2DH5/3DH5 Middle channel
Number of hopping frequency	DH5/2DH5/3DH5
Time of Occupancy (Dwell Time)	DH1/DH3/DH5 Middle channel 2DH1/2DH3/2DH5 Middle channel 3DH1/3DH3/3DH5 Middle channel
Out-of-band Emissions	DH5/2DH5/3DH5

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.1 2	2017/06/02	2018/06/01
LISN	R&S	ESH2-Z5	860014/010	2017/06/02	2018/06/01
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2017/06/02	2018/06/01
EMI Test Receiver	R&S	ESCI	103710	2017/06/02	2018/06/01
Spectrum Analyzer	Agilent	E4407B	MY41440676	2017/05/21	2018/05/20
Spectrum Analyzer	Agilent	N9020	US46220290	2017/01/16	2018/01/17
Controller	EM Electronics	Controller EM 1000	N/A	2017/05/21	2018/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2017/05/19	2018/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2017/05/19	2018/05/18
Amplifier	Agilent	8349B	3008A02306	2017/05/19	2018/05/18
Amplifier	Agilent	8447D	2944A10176	2017/05/19	2018/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2017/05/20	2018/05/19
High-Pass Filter	K&L	9SH10-2700/X1 2750-O/O	N/A	2017/05/20	2018/05/19
High-Pass Filter	K&L	41H10-1375/U1 2750-O/O	N/A	2017/05/20	2018/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2017/06/02	2018/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2017/06/02	2018/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2017/06/02	2018/06/01

RF Cable	Megalon	RF-A303	N/A	2017/06/02	2018/06/01
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The calibration interval was one year

2.5. Related Submittal(s) / Grant (s)

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

2.6. Modifications

No modifications were implemented to meet testing criteria.



3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

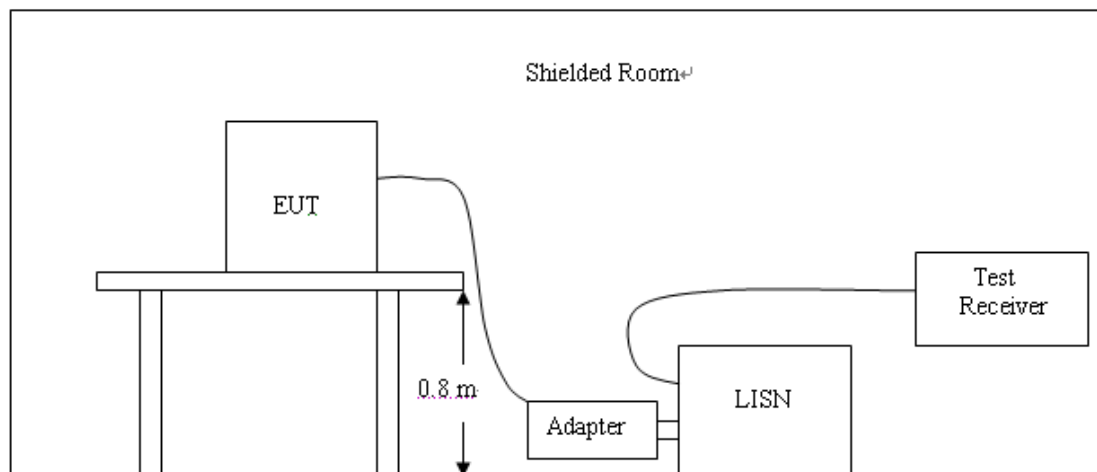
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

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 CONFIGURATION



TEST PROCEDURE

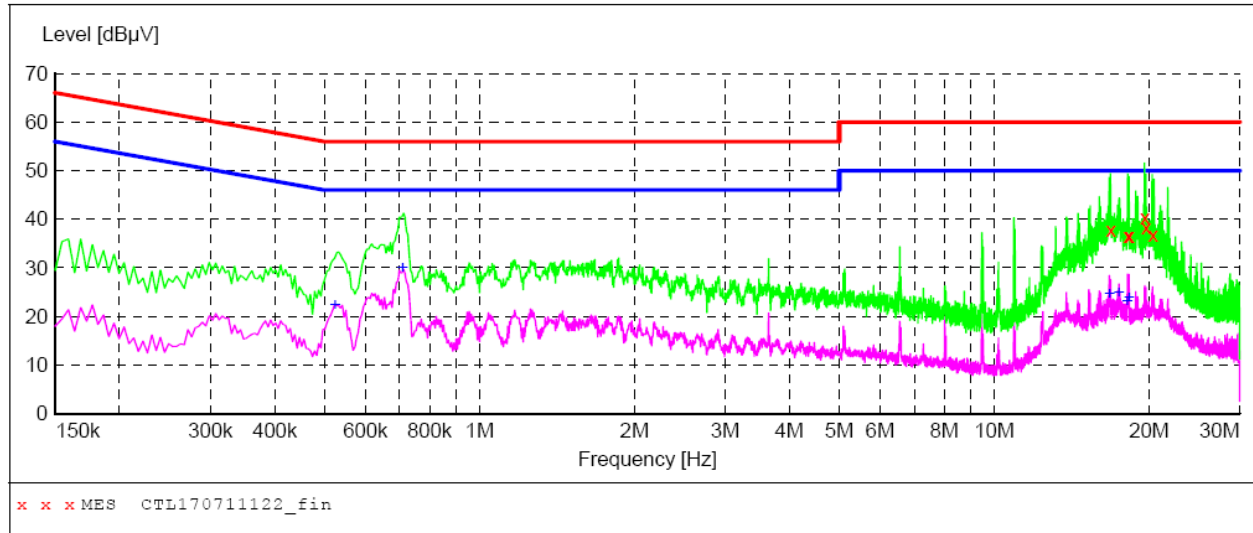
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as 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 adapter received AC120V/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.

TEST RESULTS

Remark: All modes of GFSK, Pi/4 DQPSK, and 8DPSK were test at Low, Middle, and High channel; only the worst result of GFSK Middle Channel was reported as below:

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL170711122_fin"**

7/11/2017 2:27PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
16.856000	37.90	10.8	60	22.1	QP	L1	GND
18.224000	36.50	10.9	60	23.5	QP	L1	GND
18.308000	36.60	10.9	60	23.4	QP	L1	GND
19.628000	40.40	10.9	60	19.6	QP	L1	GND
19.736000	38.30	10.9	60	21.7	QP	L1	GND
20.330000	36.80	11.0	60	23.2	QP	L1	GND

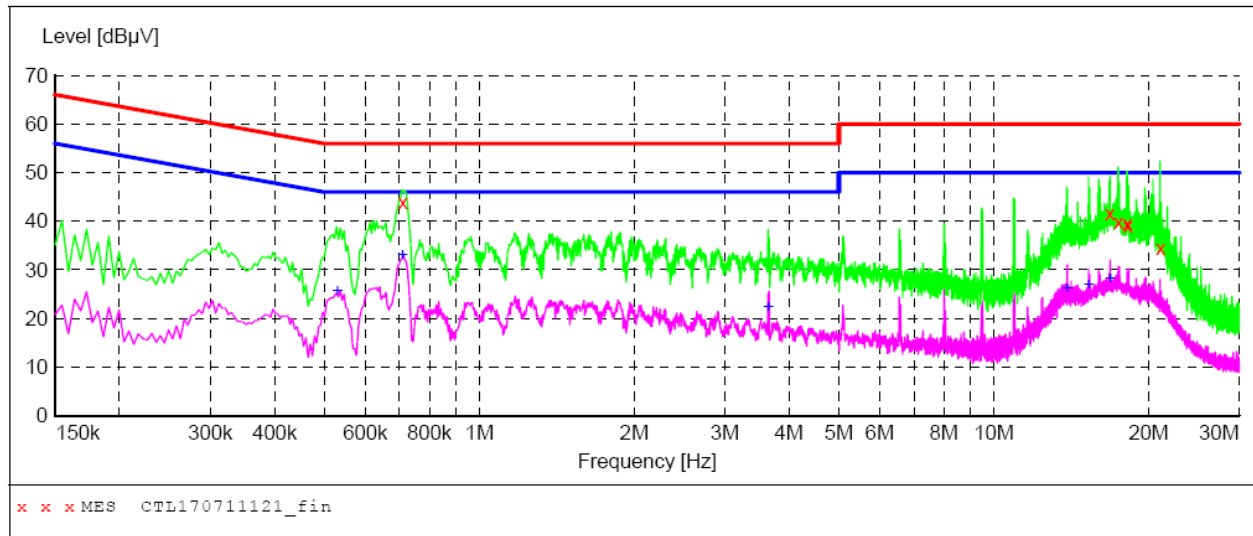
MEASUREMENT RESULT: "CTL170711122_fin2"

7/11/2017 2:27PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.524000	22.20	10.2	46	23.8	AV	L1	GND
0.710000	29.90	10.2	46	16.1	AV	L1	GND
16.766000	24.60	10.8	50	25.4	AV	L1	GND
17.486000	24.90	10.8	50	25.1	AV	L1	GND
18.146000	22.90	10.9	50	27.1	AV	L1	GND
18.308000	23.70	10.9	50	26.3	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL170711121_fin"**

7/11/2017 2:23PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.710000	43.90	10.2	56	12.1	QP	N	GND
16.802000	41.70	10.8	60	18.3	QP	N	GND
17.462000	39.80	10.8	60	20.2	QP	N	GND
18.170000	39.60	10.9	60	20.4	QP	N	GND
18.206000	39.10	10.9	60	20.9	QP	N	GND
21.086000	34.60	11.0	60	25.4	QP	N	GND

MEASUREMENT RESULT: "CTL170711121_fin2"

7/11/2017 2:23PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.530000	25.50	10.2	46	20.5	AV	N	GND
0.710000	32.90	10.2	46	13.1	AV	N	GND
3.650000	22.20	10.4	46	23.8	AV	N	GND
13.898000	26.00	10.6	50	24.0	AV	N	GND
15.314000	26.80	10.7	50	23.2	AV	N	GND
16.862000	28.20	10.8	50	21.8	AV	N	GND

3.2. Radiated Emissions and Band Edge

Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

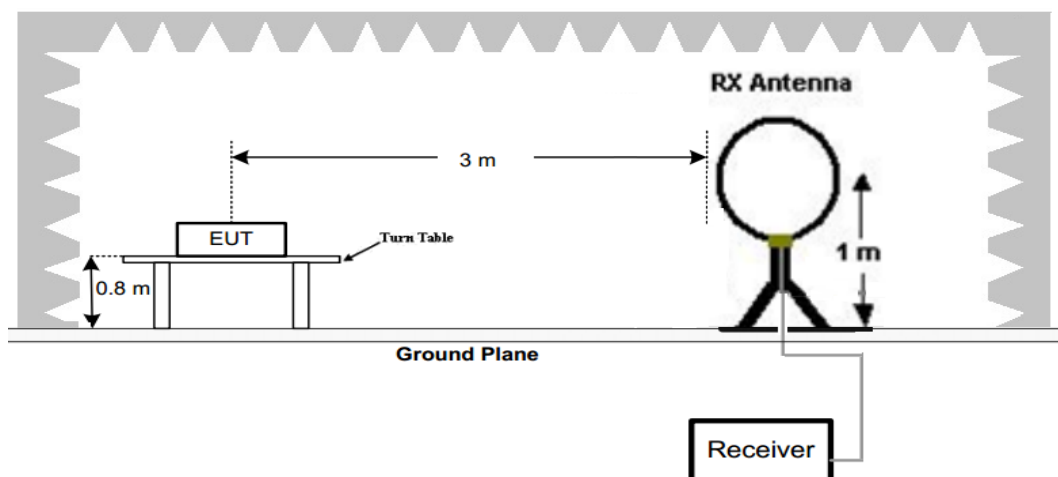
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

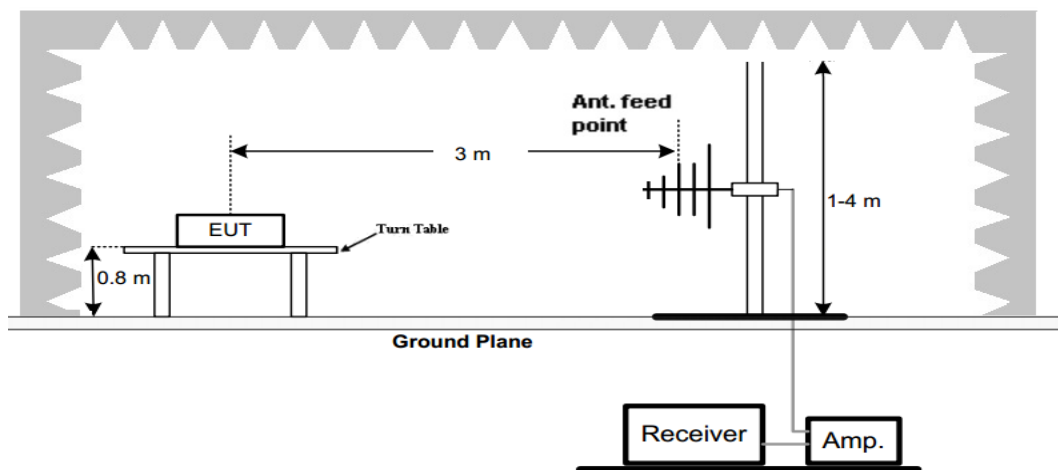
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz})) + 40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz})) + 40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30) + 40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150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

TEST CONFIGURATION

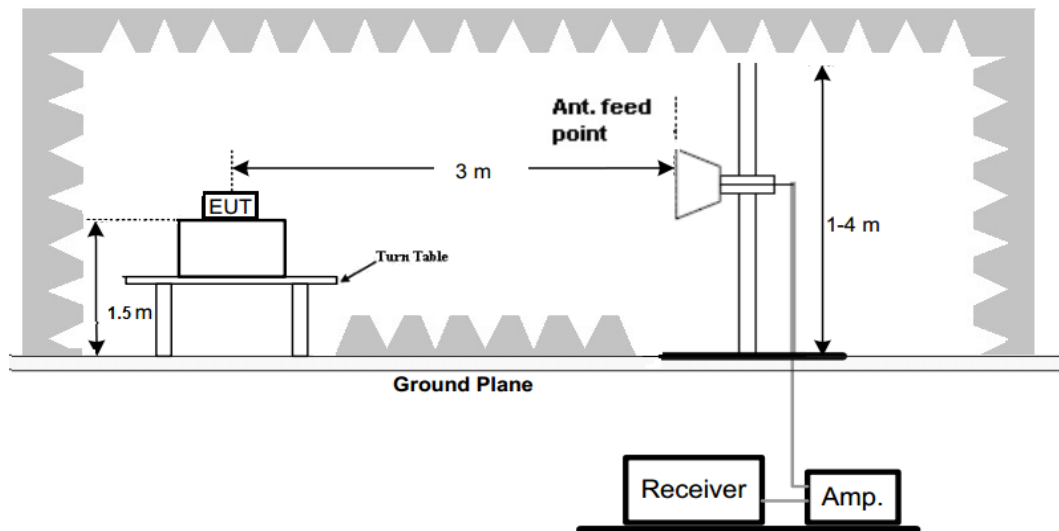
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
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.

TEST RESULTS

Remark:

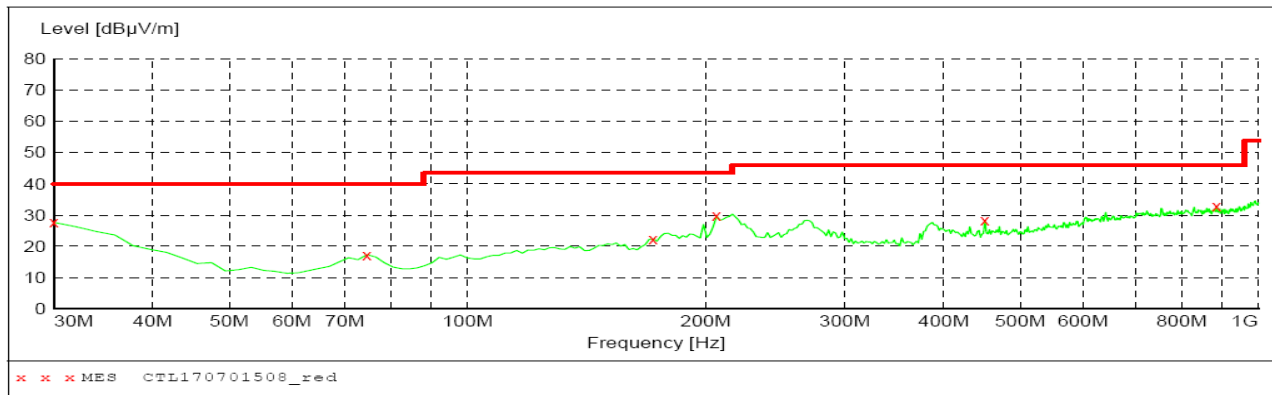
1. We measured Radiated Emission at GFSK, $\pi/4$ DQPSK and 8DPSK mode from 9 KHz to 25GHz and recorded worst case at GFSK DH5 mode.
2. For below 1GHz testing recorded worst at GFSK DH5 low channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

Horizontal

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

**MEASUREMENT RESULT: "CTL170701508_red"**

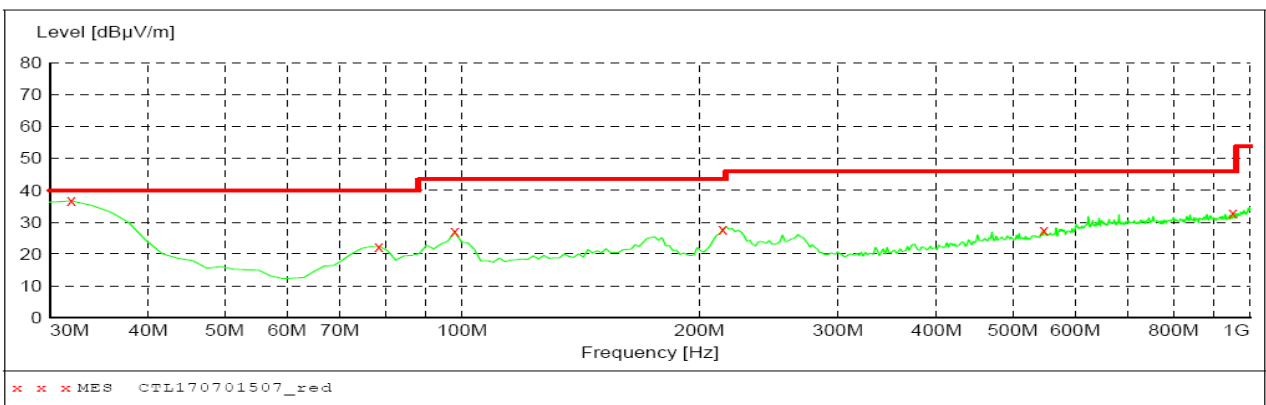
7/1/2017 2:27PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	27.60	22.1	40.0	12.4	---	0.0	0.00	HORIZONTAL
74.620000	17.30	9.0	40.0	22.7	---	0.0	0.00	HORIZONTAL
171.620000	22.40	14.5	43.5	21.1	---	0.0	0.00	HORIZONTAL
206.540000	29.70	14.6	43.5	13.8	---	0.0	0.00	HORIZONTAL
450.980000	28.30	19.5	46.0	17.7	---	0.0	0.00	HORIZONTAL
885.540000	32.90	26.2	46.0	13.1	---	0.0	0.00	HORIZONTAL

Vertical

SWEEP TABLE: "test (30M-1G)"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1

**MEASUREMENT RESULT: "CTL170701507_red"**

7/1/2017 2:24PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.940000	36.70	20.9	40.0	3.3	---	0.0	0.00	VERTICAL
78.500000	22.40	9.0	40.0	17.6	---	0.0	0.00	VERTICAL
97.900000	27.00	10.8	43.5	16.5	---	0.0	0.00	VERTICAL
214.300000	27.80	14.4	43.5	15.7	---	0.0	0.00	VERTICAL
547.980000	27.30	21.8	46.0	18.7	---	0.0	0.00	VERTICAL
951.500000	32.90	27.3	46.0	13.1	---	0.0	0.00	VERTICAL

For 1GHz to 25GHz

Note: GFSK, Pi/4 DQPSK and 8DPSK all have been tested, only worse case GFSK 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	47.55	PK	74	26.45	43.04	33.49	6.91	35.89	4.51
4804.00	--	AV	54	--	--	--	--	--	--
5013.50	43.25	PK	74	30.75	36.42	34.03	7.04	34.23	6.83
5013.50	--	AV	54	--	--	--	--	--	--
7206.00	44.50	PK	74	29.50	33.39	36.95	9.18	35.03	11.11
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	47.89	PK	74	26.11	43.38	33.49	6.91	35.89	4.51
4804.00	--	AV	54	--	--	--	--	--	--
5013.50	43.65	PK	74	30.35	36.82	34.03	7.04	34.23	6.83
5013.50	--	AV	54	--	--	--	--	--	--
7206.00	44.81	PK	74	29.19	33.70	36.95	9.18	35.03	11.11
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	47.93	PK	74	26.07	43.28	33.60	6.95	35.90	4.65
4882.00	--	AV	54	--	--	--	--	--	--
5110.25	44.12	PK	74	29.88	36.94	34.35	7.10	34.27	7.18
5110.25	--	AV	54	--	--	--	--	--	--
7323.00	45.66	PK	74	28.34	33.96	37.46	9.23	35.00	11.70
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	47.94	PK	74	26.06	43.29	33.60	6.95	35.90	4.65
4882.00	--	AV	54	--	--	--	--	--	--
5110.25	44.22	PK	74	29.78	37.04	34.35	7.10	34.27	7.18
5110.25	--	AV	54	--	--	--	--	--	--
7323.00	45.41	PK	74	28.59	33.71	37.46	9.23	35.00	11.70
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	47.89	PK	74	26.11	42.97	33.84	7.00	35.92	4.92
4960.00	--	AV	54	--	--	--	--	--	--
5175.25	44.78	PK	74	29.22	37.46	34.49	7.13	34.29	7.32
5175.25	--	AV	54	--	--	--	--	--	--
7440.00	44.25	PK	74	29.75	32.30	37.64	9.28	34.97	11.95
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	48.05	PK	74	25.95	43.13	33.84	7.00	35.92	4.92
4960.00	--	AV	54	--	--	--	--	--	--
5175.25	44.84	PK	74	29.16	37.52	34.49	7.13	34.29	7.32
5175.25	--	AV	54	--	--	--	--	--	--
7440.00	44.65	PK	74	29.35	32.70	37.64	9.28	34.97	11.95
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 Factor
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.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

Results of Band Edges Test (Radiated)

Note: GFSK, Pi/4 DQPSK and 8DPSK all have been tested, only worse case GFSK is reported.

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)
2402.00	96.52	PK	--	--	63.12	28.78	4.61	0.00	33.40
2402.00	88.12	AV	--	--	54.72	28.78	4.61	0.00	33.40
2365.50	45.23	PK	74	28.77	12.09	28.57	4.57	0.00	33.14
2365.50	--	AV	54	--	--	--	--	--	--
2390.00	50.24	PK	74	23.76	16.92	28.72	4.60	0.00	33.32
2390.00	--	AV	54	--	--	--	--	--	--
2400.00	52.53	PK	74	21.47	19.14	28.78	4.61	0.00	33.39
2400.00	--	AV	54	--	--	--	--	--	--

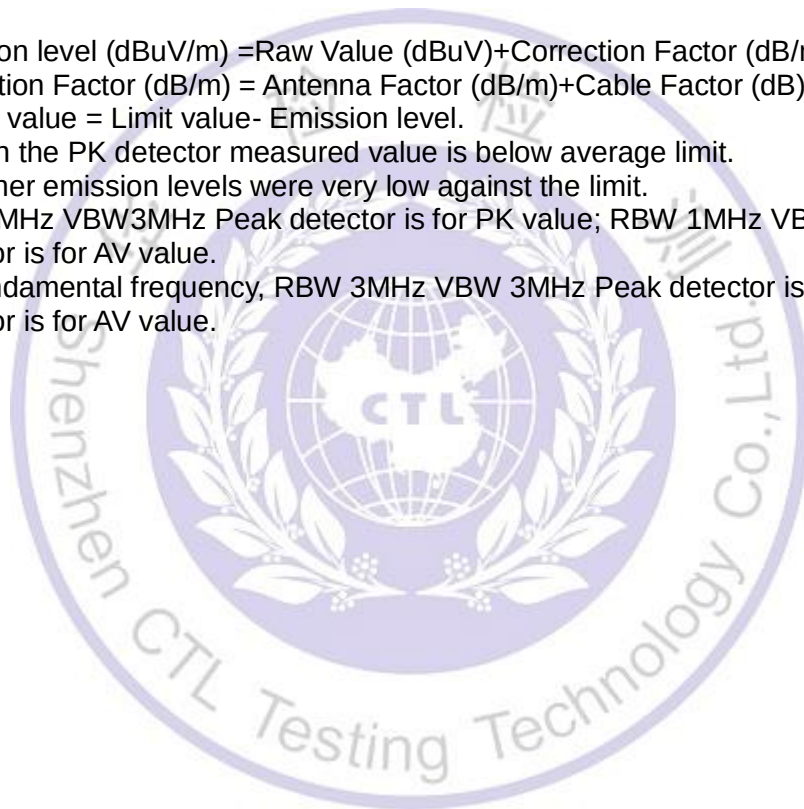
Frequency(MHz):			2402		Polarity:			VERTICAL	
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2402.00	96.69	PK	--	--	63.29	28.78	4.61	0.00	33.40
2402.00	88.35	AV	--	--	54.95	28.78	4.61	0.00	33.40
2365.50	45.41	PK	74	28.59	12.27	28.57	4.57	0.00	33.14
2365.50	--	AV	54	--	--	--	--	--	--
2390.00	50.69	PK	74	23.31	17.37	28.72	4.60	0.00	33.32
2390.00	--	AV	54	--	--	--	--	--	--
2400.00	52.41	PK	74	21.59	19.02	28.78	4.61	0.00	33.39
2400.00	--	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)
2480.00	96.41	PK	--	--	62.79	28.92	4.70	0.00	33.62
2480.00	87.85	AV	--	--	54.23	28.92	4.70	0.00	33.62
2483.50	51.23	PK	74	22.77	17.60	28.93	4.70	0.00	33.63
2483.50	--	AV	54	--	--	--	--	--	--
2484.75	49.56	PK	74	24.44	15.92	28.93	4.70	0.00	33.64
2484.75	--	AV	54	--	--	--	--	--	--
2500.00	40.83	PK	74	33.17	7.15	28.96	4.72	0.00	33.68
2500.00	--	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)
2480.00	96.56	PK	--	--	62.94	28.92	4.70	0.00	33.62
2480.00	87.74	AV	--	--	54.12	28.92	4.70	0.00	33.62
2483.50	51.59	PK	74	22.41	17.96	28.93	4.70	0.00	33.63
2483.50	--	AV	54	--	--	--	--	--	--
2484.75	49.62	PK	74	24.38	15.98	28.93	4.70	0.00	33.64
2484.75	--	AV	54	--	--	--	--	--	--
2500.00	40.89	PK	74	33.11	7.21	28.96	4.72	0.00	33.68
2500.00	--	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 Factor
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.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.



3.3. Maximum Peak Output Power

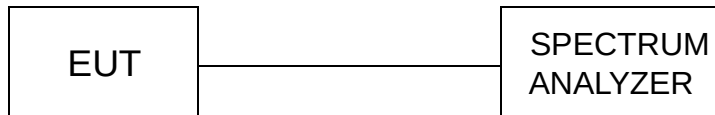
Limit

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 spectrum.

Test Configuration

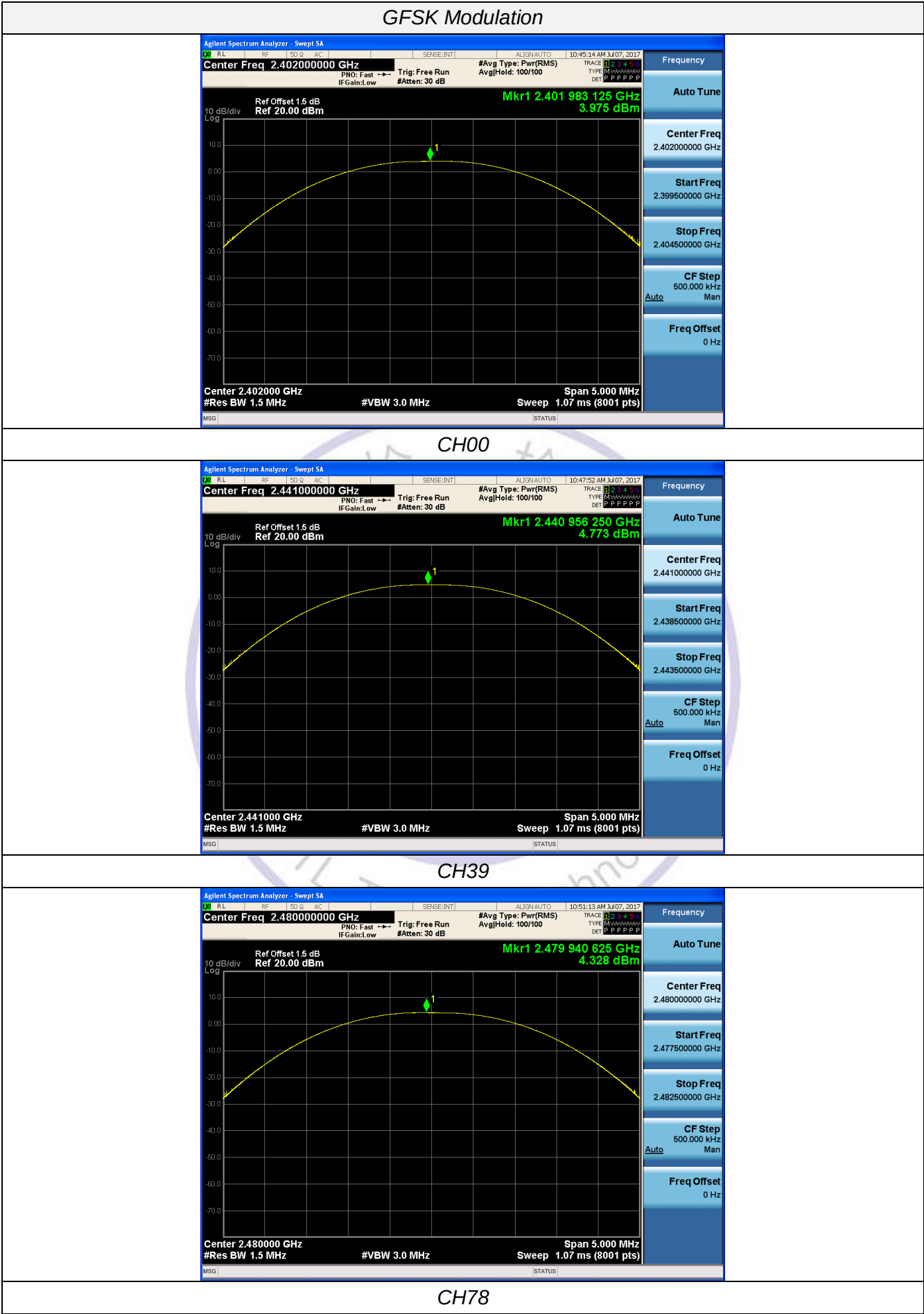


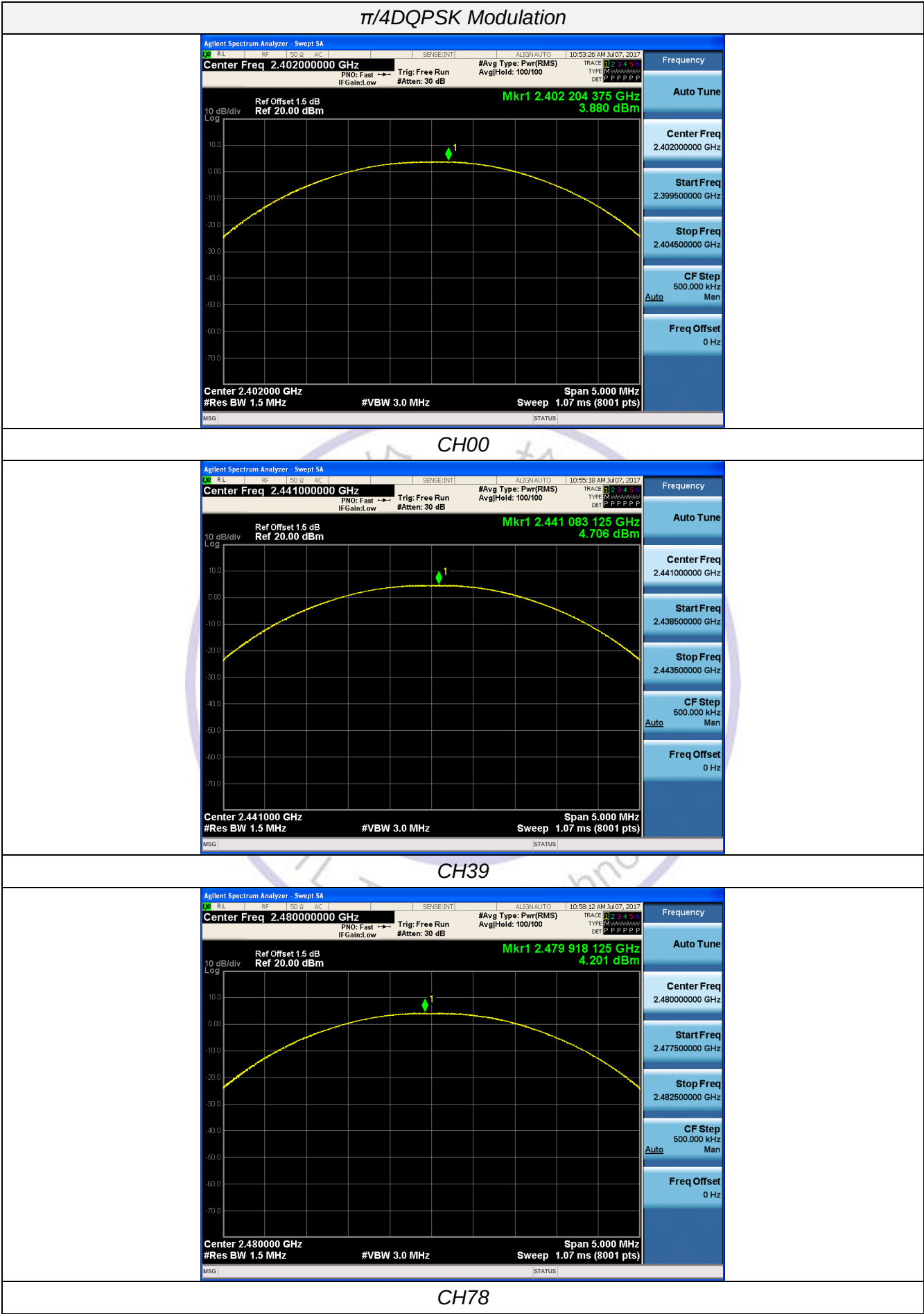
Test Results

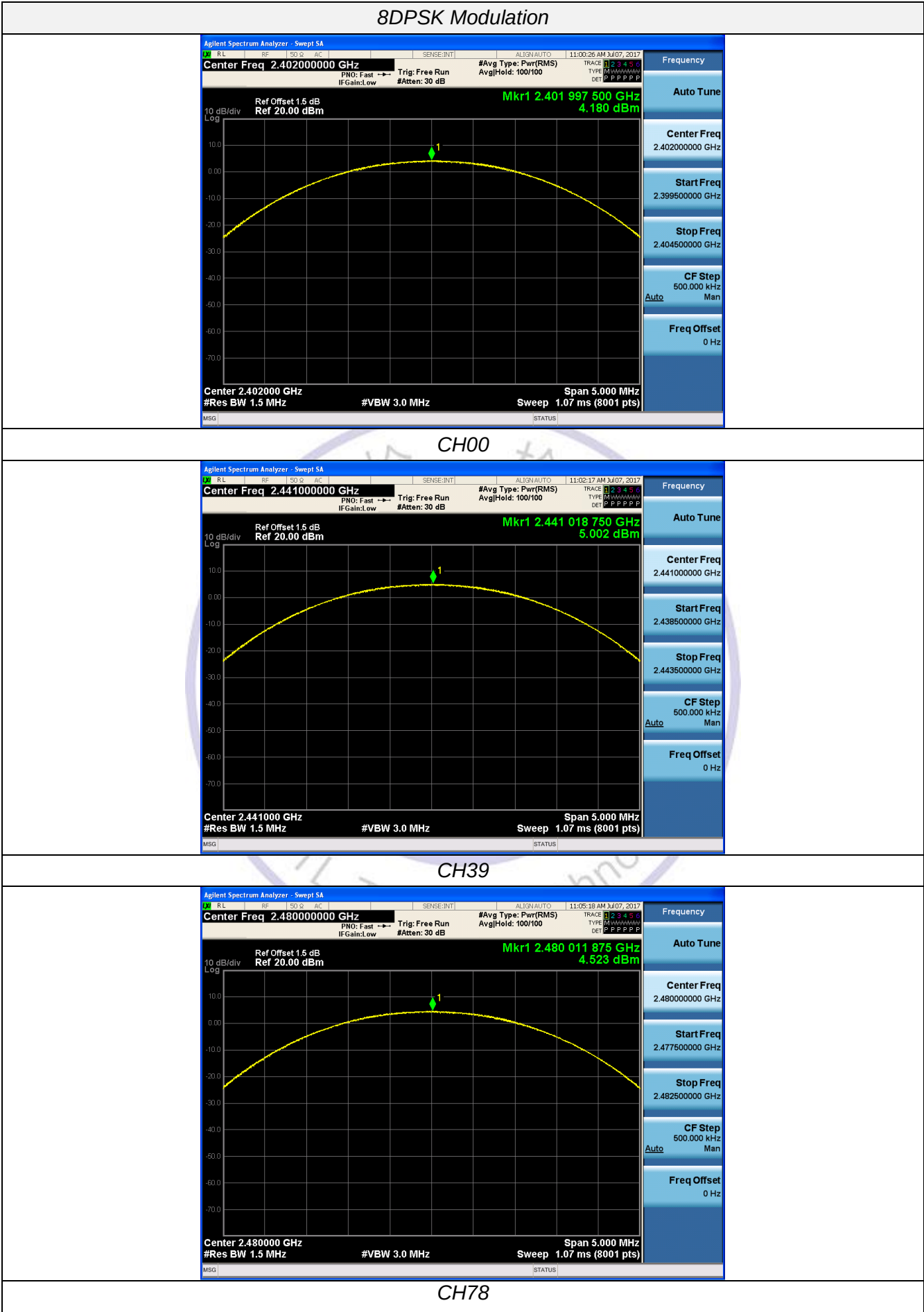
Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	00	3.975	20.97	Pass
	39	4.773		
	78	4.328		
π/4DQPSK	00	3.880	20.97	Pass
	39	4.706		
	78	4.201		
8DPSK	00	4.180	20.97	Pass
	39	5.002		
	78	4.523		

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

Test plot as follows:







3.4. 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

Modulation	Channel	20dB bandwidth (MHz)	99% OBW (MHz)	Result
GFSK	CH00	0.9505	0.90019	Pass
	CH39	0.9525	0.89577	
	CH78	0.9618	0.89782	
$\pi/4$ DQPSK	CH00	1.278	1.1702	
	CH39	1.281	1.1719	
	CH78	1.275	1.1681	
8DPSK	CH00	1.288	1.1728	
	CH39	1.299	1.1764	
	CH78	1.289	1.1753	

Test plot as follows:

Agilent Spectrum Analyzer - Occupied BW

RL RF 50 Ohms SENSE INT ALIGN/AUTO 10:45:33 AM 3/07, 2017

Center Freq 2.402000000 GHz Trg: Free Run Avg/Hold: 10/10 Radio Std: None

#IFGain: Low #Atten: 30 dB Radio Device: BST

Ref Offset 1.5 dB
Ref 20.00 dBm

Center 2.402 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms

Occupied Bandwidth	Total Power
900.19 kHz	10.9 dBm

Transmit Freq Error	OBW Power
14.882 kHz	99.00 %

x dB Bandwidth	x dB
950.5 kHz	-20.00 dB

MSG STATUS

Agilent Spectrum Analyzer - Occupied BW

RL F2 F3 F4 Occupied BW SEIZE INT] ALIGN/AUTO 10:48:11 AM 3/07, 2017

Center Freq 2.441000000 GHz Trig: Free Run Avg/Hold: 10/10 Radio Std: None

#IFGain: Low #Atten: 30 dB Radio Device: BSTS

Ref Offset 1.5 dB
Ref 20.00 dBm

10 dB/Div
Log

Center 2.441 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms

Occupied Bandwidth	Total Power
895.77 kHz	11.8 dBm

Transmit Freq Error	OBW Power
11.878 kHz	99.00 %

x dB Bandwidth	x dB
952.5 kHz	-20.00 dB

Agilent Spectrum Analyzer - Occupied BW

RL RF EDC FREQ SENSE INT ALIGN MAG 10:51:32 AM Jul07, 2017

Center Freq 2.480000000 GHz Center Freq: 2.480000000 GHz Radio Std: None

#IF Gain: Low → Trig: Free Run Avg/Hold: 10/10

Radio Device: BTS

#Att: 30 dB

Ref Offset 1.5 dB
Ref 20.00 dBm

10 dB/div
Log

Center 2.48 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms

Auto

Occupied Bandwidth		Total Power	
897.82 kHz		11.3 dBm	

Transmit Freq Error		OBW Power	
10.348 kHz		99.00 %	

x dB Bandwidth		x dB	
961.8 kHz		-20.00 dB	

MSG STATUS

Frequency

Center Freq
2.480000000 GHz

CF Step
300.000 kHz
Main

Freq Offset
0 Hz

CH78

Agilent Spectrum Analyzer - Occupied BW

RL RF SEIZE INT ALIGN/AUTO 10:53:45 AM 3/07, 2017

Center Freq 2.402000000 GHz

Trig: Free Run Avg/Hold: 10/10

Radio Std: None

#IFGain: Low #Atten: 30 dB Radio Device: BTS

Ref Offset 1.5 dB
Ref 20.00 dBm

Center 2.402 GHz
#Res BW 30 kHz

#VBW 100 kHz

Span 3 MHz
Sweep 3.2 ms

Occupied Bandwidth	Total Power
1.1702 MHz	9.20 dBm

Transmit Freq Error	OBW Power
8.585 kHz	99.00 %

x dB Bandwidth	x dB
1.278 MHz	-20.00 dB

Agilent Spectrum Analyzer - Occupied BW

RL F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20 F21 F22 F23 F24 F25 F26 F27 F28 F29 F30 F31 F32 F33 F34 F35 F36 F37 F38 F39 F40 F41 F42 F43 F44 F45 F46 F47 F48 F49 F50 F51 F52 F53 F54 F55 F56 F57 F58 F59 F60 F61 F62 F63 F64 F65 F66 F67 F68 F69 F70 F71 F72 F73 F74 F75 F76 F77 F78 F79 F80 F81 F82 F83 F84 F85 F86 F87 F88 F89 F90 F91 F92 F93 F94 F95 F96 F97 F98 F99 F100

Center Freq 2.441000000 GHz

Ref Offset 1.5 dB
Ref 20.00 dBm

Log

10 dB/div

0.00

-10.00

-20.00

-30.00

-40.00

-50.00

-60.00

-70.00

Center 2.441 GHz
#Res BW 30 kHz

#VBW 100 kHz

Span 3 MHz
Sweep 3.2 ms

Occupied Bandwidth

1.1719 MHz

Total Power

9.96 dBm

Transmit Freq Error

6.697 kHz

OBW Power

99.00 %

x dB Bandwidth

1.281 MHz

x dB

-20.00 dB

Frequency

Center Freq

2.441000000 GHz

CF Step

300.000 kHz

Auto

Freq Offset

0 Hz

MSG

STATUS

Agilent Spectrum Analyzer - Occupied BW

RL RF ISO A FREQ SENSE INT ALIGN AUTO 10:59:31 AM Jul 07, 2017

Center Freq 2.480000000 GHz Center Freq: 2.480000000 GHz Radio Std: None

Trig: Free Run Avg/Hold: 10/10

#IF Gain: Low #Atten: 30 dB Radio Device: BTS

Ref Offset 1.6 dB
Ref 20.00 dBm

Center 2.48 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 3.2 ms

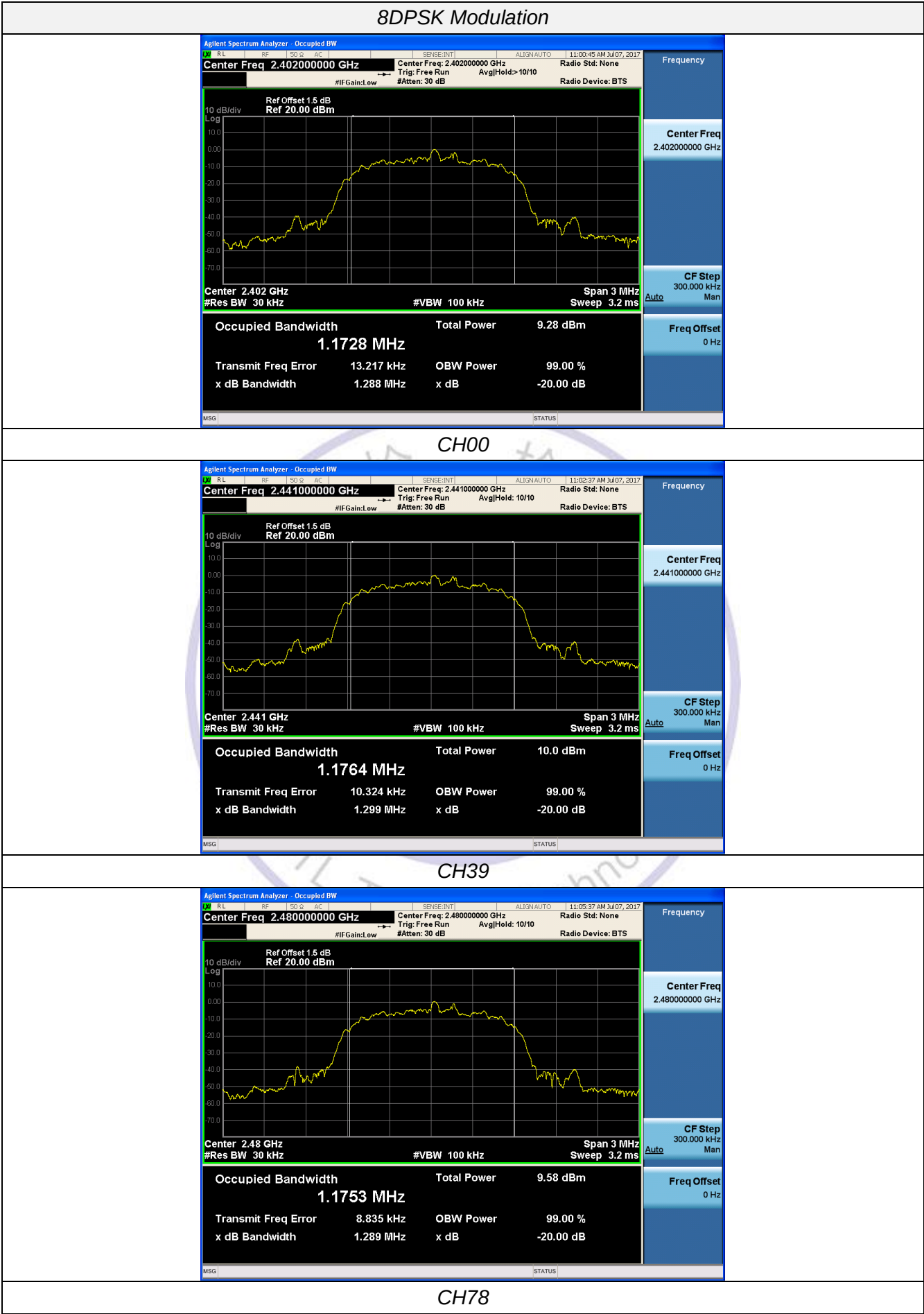
Occupied Bandwidth	Total Power
1.1681 MHz	9.46 dBm

Transmit Freq Error	OBW Power
4.470 kHz	99.00 %

x dB Bandwidth	x dB
1.275 MHz	-20.00 dB

MSG STATUS

CH78



3.5. Frequency Separation

LIMIT

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

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 100 KHz RBW and 300 KHz VBW.

TEST CONFIGURATION



TEST RESULTS

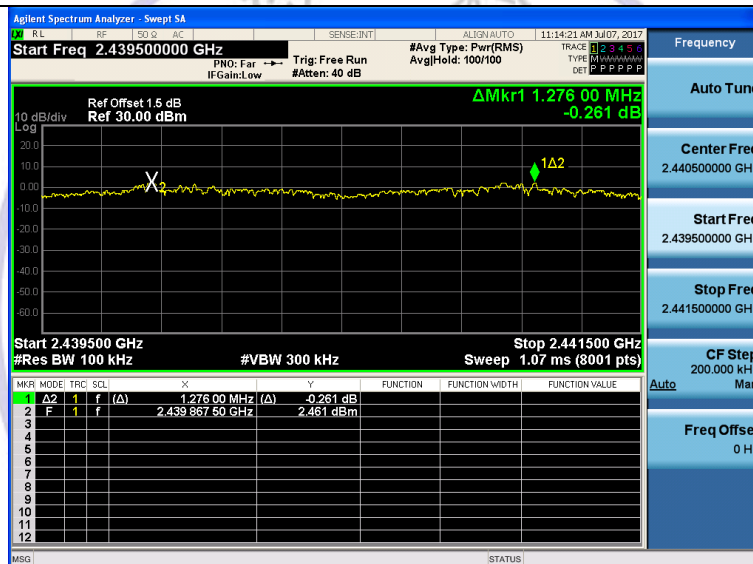
Modulation	Channel	Channel Separation (MHz)	Limit(MHz)	Result
GFSK	CH39	1.025	25KHz or $2/3 \times 20\text{dB}$ bandwidth	Pass
	CH40			
$\pi/4$ DQPSK	CH39	1.276	25KHz or $2/3 \times 20\text{dB}$ bandwidth	Pass
	CH40			
8DPSK	CH39	1.107	25KHz or $2/3 \times 20\text{dB}$ bandwidth	Pass
	CH40			

Note:

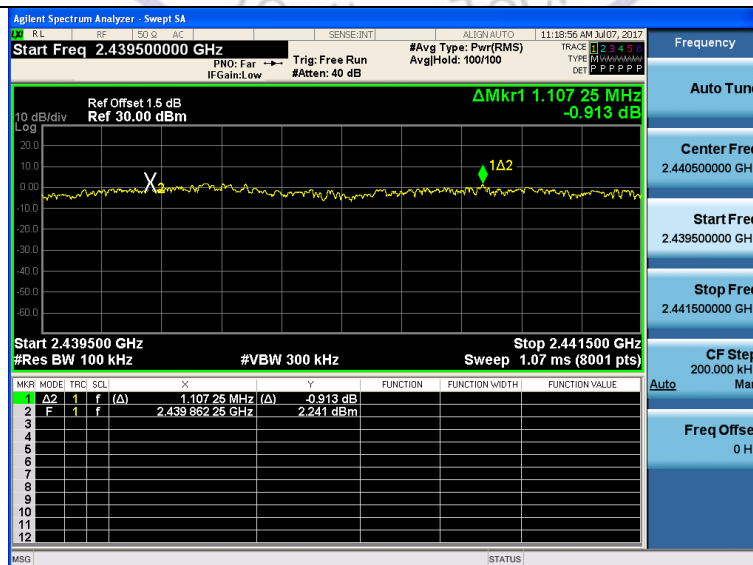
We have tested all mode at high, middle and low channel, and recorded worst case at middle

Test plot as follows:

16QAM Modulation



ΔMk



3.6. Number of hopping frequency

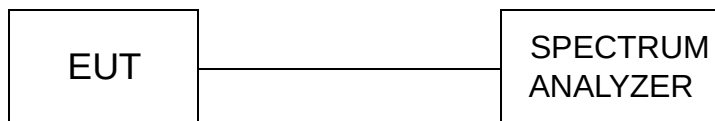
Limit

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

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with 100 KHz RBW and 300 KHz VBW.

Test Configuration



Test Results

Modulation	Number of Hopping Channel	Limit	Result
GFSK	79	≥15	Pass
π/4DQPSK	79		
8DPSK	79		

Test plot as follows: