

FCC 47 CFR PART 15 SUBPART C 15.247 TEST REPORT FOR

HIHI-40KH-TAB

Model: 40KH,QN_103

Issued to HiHi Ltd Loewy House, 11 Enterprise Way, Aviation Park West, Christchurch, Dorset, BH23 6EW, UK

Issued by

WH Technology Corp.



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APPENDIX 1 PHOTOS OF TEST CONFIGURATION PHOTOS OF EUT



General Information 1.

Applicant	:	HiHi Ltd		
Address	:	Loewy House, 11 Enterprise Way, Aviation Park West, Christchurch, Dorset, BH23 6EW, UK		
Manufacturer	:	Shenzhen Emdoor Digital Technology Co.,Ltd		
Address	:	H.Q.:6/F JinFuLai Building,49-1 Dabao Road, Bao An District, Shenzhen		
EUT	:	HIHI-40KH-TAB		
Model Name	:	40KH,QN_103		
Model Differences	:	Only model name different, others are all the same.		

Is here with confirmed to comply with the requirements set out in the FCC Rules and Regulations Part 15 Subpart C and the measurement procedures were according to ANSI C63.10-2013. The said equipment in the configuration described in this report shows the maximum emission levels emanating

FCC part 15 subpart C

Receipt Date : 08/23/2018

Tested By:

Sep.05, 2018

Sep.05, 2018

Date

Bell Wei / Manager Designation Number: TW2954

Final Test Date : 09/04

Tested B

Date

Bing Chang/ Engineer



2. Report of Measurements and Examinations

2.1 List of Measurements and Examinations

FCC Rule	Description of Test	Result
	FCC Part 15: 15.247(b)(1)	
Maximum Peak Output	ANSI C63.4 :2014&RSS-247 5.4(2) &	Pass
Power	ANSI C63.10 :2013	
Bandwidth	FCC Part 15: 15.215 ANSI C63.4 :2014&RSS-247 5.1(2) & ANSI C63.10 :2013	Pass
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.4 :2014& RSS-247 5.1(2) & ANSI C63.10 :2013	Pass
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.4 :2014&RSS-247 5.1(4) & ANSI C63.10 :2013	Pass
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.4 :2014&RSS-247 5.1(4) & ANSI C63.10 :2013	Pass
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.4 :2014&RSS-247 Section 5.5& ANSI C63.10 :2013	Pass
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.4 :2014&RSS-247 Section 5.5& ANSI C63.10 :2013	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.4 :2014&IC RSS Gen, Section 7.2.4& ANSI C63.10 :2013	Pass
Antenna requirement	15: 15.203 &IC RSS Gen, Section 7.1.4	Pass



3. Test Configuration of Equipment under Test

3.1 Description of the tested samples

EUT Name	: HIHI-40KH-TAB		
Model Number	: 40KH,QN_103		
FCCID	: 2AQZC-40KH		
Receipt Date	: 08/23/2018		
Power From	☑Inside ☑Outside ☑Adaptor ☑Battery □AC Power Source □DC Power Source □Support Unit PC or NB		
USB port	: DC5V1.8A		
Battery	: 3.8V 4000mAh		
Operate Frequency	: Refer to the channel list as described below (2.402 ~2.480 GHz)		
Modulation Technique	: GFSK, π/4-DQPSK, 8DPSK(1/2/3Mbps)		
Number of Channels	: 79		
Channel spacing	: □N/A ⊠ <u> 1 M</u> Hz		
Operating Mode	: □Simplex ☑ Half Duplex		
Antenna Type	: FPCB Antenna		
Antenna gain	1.0 dBi		



3.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		



3.3 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- b. The complete test system included Notebook and EUT for RF test.
- c. Test Software: Radio Test.exe
- d. New Battery was used for all testing and the worst radiated emission case from X,Y and Z axis evaluation was selected for testing.
- e. The following test modes were performed for test:
 - BT: CH00: 2402MHz, CH40: 2441MHz, CH78: 2480MHz



3.4 TEST Methodology & General Test Procedures

All testing as described bellowed were performed in accordance with ANSI C63.4:2014 and ANSI C63.10:2013.

Conducted Emissions

The EUT is placed on a wood table, which is at 0.8 m above ground plane acceding to clause 15.207 and requirements of ANSI C63.4:2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz are using CISPR Quasi-Peak / Average detectors.

Radiated Emissions

The EUT is a placed on a turn table, which is 0.8 m above ground plane. The turntable was rotated through 360 degrees to determine the position of maximum emission level. The EUT is placed at 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

- 1) Putting the EUT on the platform and turning on the EUT (on/off button on the bottom of the EUT).
- 2) Setting test channel described as "Channel setting and operating condition", and testing channel by channel.
- For the maximum output power measurement, we followed the method of measurement KDB558074 D01.
- 4) For the spurious emission test based on ANSI(2014), at the frequency where below 1GHz used quasi-peak detector mode; where above 1GHz used the peak and average detector mode. IF the peak value may be under average limit, the average mode will not be performed.



3.5 Measurement Uncertainty

Measurement Item	Uncertainty
Peak Output Power(conducted)	±1.345dB
Power Spectral Density	±1.347dB
Radiated emission(1G-25GHz)	±5.00dB
Radiated emission(30M-1GHz)	±3.89dB
Conducted emission	±1.81dB

3.6 Description of the Support Equipments

Setup Diagram

See test photographs attached in appendix 1 for the actual connections between EUT and support equipment.

Support Equipment

Peripherals Devices:

	OUTSIDE SUPPORT EQUIPMENT						
No.	Equipment	Model	Serial No.	FCC ID/	Trade	Data Cable	Power Cord
INU.	Equipment	Woder	Senai no.	BSMI ID	name	Data Cable	Power Cord
1.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			INSIDE SUP	PORT EQUIPM	MENT		
No.	Equipment	Model	Serial No.	FCC ID/	Trade	Data Cable	Power Cord
INU.	Equipment	Woder	Senai no.	BSMI ID	name		Fower Cold
1.	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: All the above equipment /cable were placed in worse case position to maximize emission signals during emission test

Grounding: Grounding was in accordance with the manufacturer's requirement and conditions for the intended use.



4. Test and measurement equipment

4.1 calibration

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2 equipment

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards. Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.



Test Site	Instrument	Manufacturer	Model No.	S/N	Next Cal. Date
	Spectrum (9K3GHz)	R&S	FSP3	833387/010	2018/09/20
	EMI Receiver	R&S	ESHS10	830223/008	2019/05/22
Conduction	LISN	Rolf Heine Hochfrequenztechni k	NNB-2/16z	98062	2019/05/25
	ISN	Schwarzbeck	8-Wire ISN CAT5	CAT5-8158-0094	2018/09/21
	RF Cable	N/A	N/A	EMI-3	2018/10/19
Radiation	Bilog antenna(30M -1G)	ETC	MCTD2786B	BLB16M04004/J B-5-004	2019/05/03
	Double Ridged Guide Horn antenna(1G- 18G)	ETC	MCTD 1209	DRH15N0 2009	2018/11/23
	Horn antenna (18G-26G)	com-power	AH-826	81000	2019/08/15
	LOOP Antenna (Below 30M)	com-power	AL-130	17117	2018/10/04
	Pre amplifier (30M-1G)	EMC INSTRUMENT	EMC9135	980334	2019/05/04
	Microwave Preamplifier (1G-18G)	EMC INSTRUMENT	EMC051845	980108&AT -18001	2018/10/23
	Pre amplifier (18G~26G)	MITEQ	JS4-18002600-3 0-5A	808329	2019/08/10
	EMI Test	R&S	ESVS30	826006/002	2018/11/28

TABLELIST OF TEST AND MEASUREMENT EQUIPMENT



Receiver		(20M-1000MHz)		
		N male on end		2018/10/19
RF Cable	EMCI	of	30m	
(open site)	EWCI	both sides	5011	2010/10/19
		(EMI4)		
RF CABLE	HARBOUT	LL142MI(4M+4M)	NA	2019/03/08
(1~26.5G)	INDUSTRIES		ΝA	2013/03/00
RF CABLE	HARBOUR	LL142MI(7M)	NA	2019/08/11
(1~26.5G)	INDUSTRIES			2010/00/11
Spectrum	R&S	FSP7	830180/006	2019/03/25
(9K7GHz)			000100/000	2010/00/20
Spectrum	AGILENT	8564EC	4046A0032	2019/03/01
(9K40GHz)	AGIELIA	000+20	4040/0002	2010/00/01
 Power Meter	R&S	NRVS	100696	2019/08/10
Power	R&S	URV5-Z4	0395.1619.05	2019/08/10
 Sensor	1.45			2019/06/10

*CALIBRATION INTERVAL OF INSTRUMENTS LISTED ABOVE IS ONE YEAR



5. Antenna Requirements

5.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.2 Antenna Construction and Directional Gain

Antenna Type: FPCB Antenna Antenna Gain: 1.0 dBi



6. Test of Conducted Emission

6.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 110 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2014 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB µ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

*Decreases with the logarithm of the frequency.

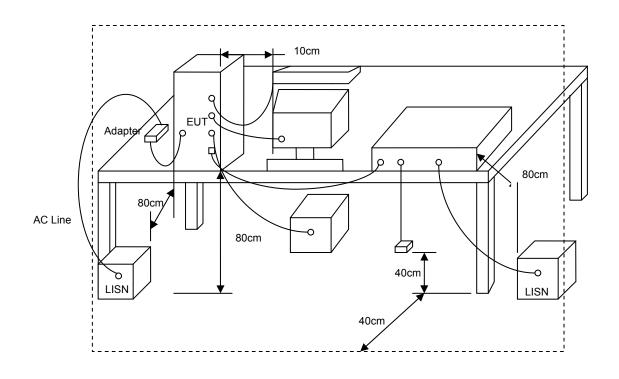
6.2 Test Procedures

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connecting to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



Date of Issue: Sep.05, 2018 Report No.: WH-FCC-R18091010-1

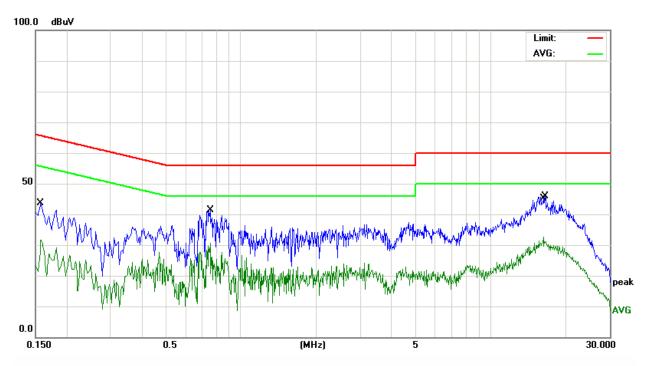
6.3 Typical Test Setup





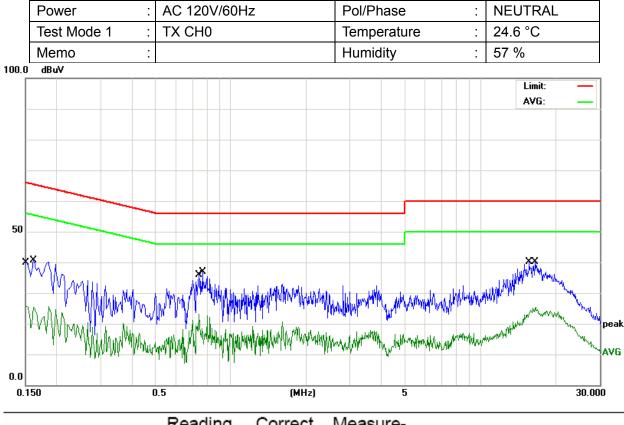
6.4 Test Result and Data

Power	AC 120V/60Hz	Pol/Phase :	LINE
Test Mode 1	TX CH0	Temperature :	24.6 °C
Memo		Humidity :	57 %



No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	0.1580	31.80	11.75	43.55	65.56	-22.01	QP
2	0.1580	19.97	11.75	31.72	55.56	-23.84	AVG
3	0.7539	31.41	9.97	41.38	56.00	-14.62	QP
4	0.7539	20.68	9.97	30.65	46.00	-15.35	AVG
5	16.2300	31.08	1.56	32.64	50.00	-17.36	AVG
6 *	16.5540	44.18	1.60	45.78	60.00	-14.22	QP





No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB	dBuV	dBu∨	dB	Detector
1		0.1500	13.98	11.94	25.92	55.99	-30.07	AVG
2		0.1620	29.06	11.68	40.74	65.36	-24.62	QP
3		0.7460	13.04	9.97	23.01	46.00	-22.99	AVG
4	*	0.7700	27.02	9.97	36.99	56.00	-19.01	QP
5		15.6460	38.61	1.48	40.09	60.00	-19.91	QP
6		16.5900	23.84	1.60	25.44	50.00	-24.56	AVG

Note:

All the modulation modes were tested, the data of the worst mode are recorded in the above pages and the others modulation methods do not exceed the limits.



7. Test of Radiated Emission

7.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in

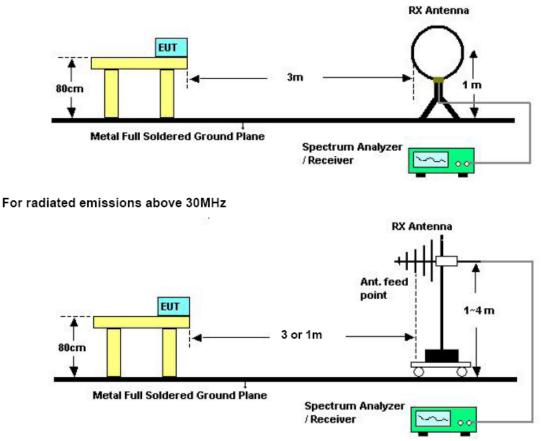


average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

i. "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

7.3 Typical Test Setup

For radiated emissions below 30MHz

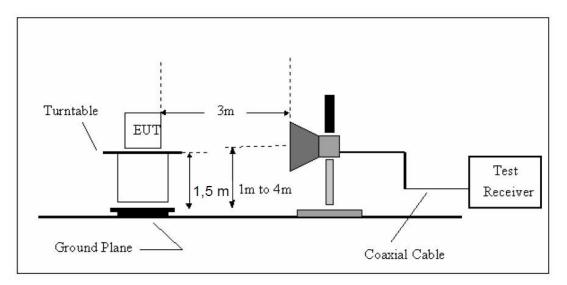


Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB); Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].



For radiated emissions frequency above 1GHz



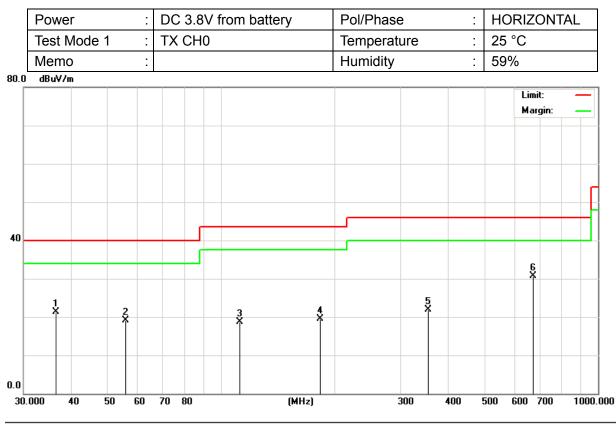
Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.



7.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

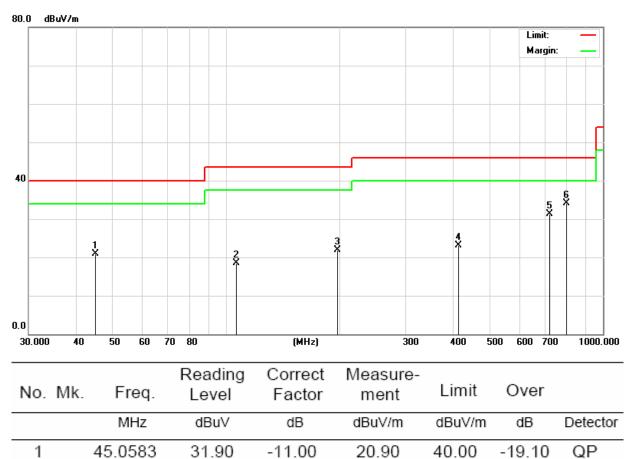
7.5 Test Result and Data (30MHz ~ 1GHz, worst emissions found)



No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		36.3814	33.62	-12.29	21.33	40.00	-18.67	QP
2		56.0007	30.92	-11.84	19.08	40.00	-20.92	QP
3		112.1305	30.41	-11.72	18.69	43.50	-24.81	QP
4		183.2005	30.75	-11.34	19.41	43.50	-24.09	QP
5		354.1831	29.75	-7.83	21.92	46.00	-24.08	QP
6	*	670.4893	31.49	-0.88	30.61	46.00	-15.39	QP



Power	:	DC 3.8V from battery	Pol/Phase	:	VERTICAL
Test Mode 1	:	TX CH0	Temperature	:	25 °C
Memo	:		Humidity	:	59%



Note:

2

3

4

5

6

×

106.7587

197.2000

414.7223

721.7259

798.9796

31.81

36.28

29.65

31.70

30.61

All the modulation modes were tested, the data of the worst mode are recorded in the above pages and the others modulation methods do not exceed the limits.

-13.23

-14.37

-6.63

-0.41

3.44

18.58

21.91

23.02

31.29

34.05

43.50

43.50

46.00

46.00

46.00

-24.92

-21.59

-22.98

-14.71

-11.95

QP

QP

QP

QP

QP



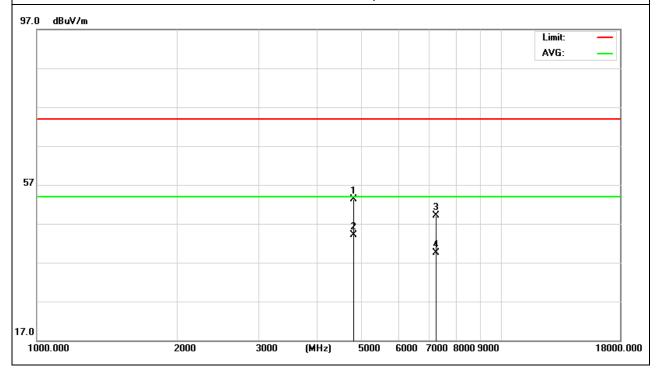
7.6 Test Result and Data (Between 1~25 GHz)

Power :	DC 3.8V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX 1Mbps CH0	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type	
4804.000	48.33	5.06	53.39	74.00	-20.61	peak	
4804.000	39.03	5.06	44.09	54.00	-9.91	AVG	
7206.000	42.15	7.03	49.18	74.00	-24.82	peak	
7206.000	32.48	7.03	39.51	54.00	-14.49	AVG	

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

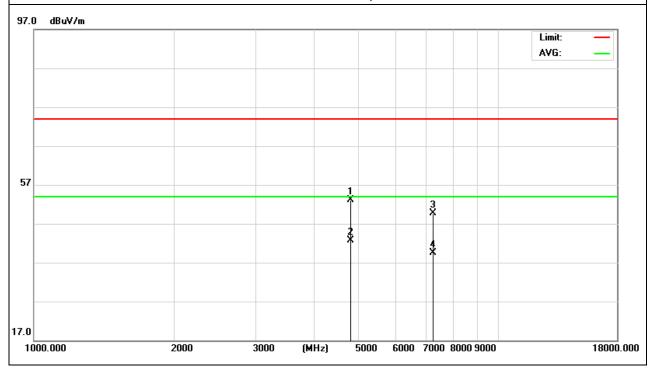




Power :	DC 3.8V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX 1Mbps CH0	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type	
4804.000	47.95	5.06	53.01	74.00	-20.99	peak	
4804.000	37.69	5.06	42.75	54.00	-11.25	AVG	
7206.000	42.74	7.03	49.77	74.00	-24.23	peak	
7206.000	32.45	7.03	39.48	54.00	-14.52	AVG	

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

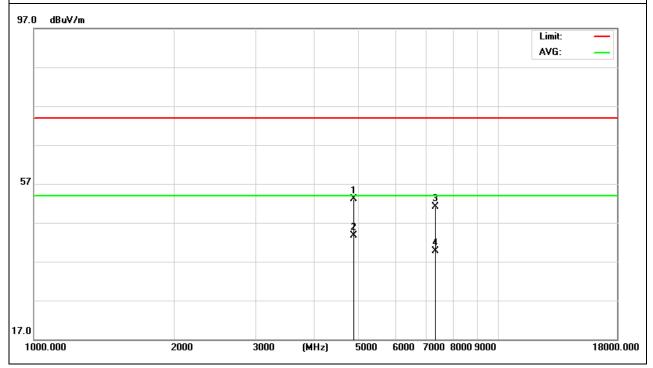
The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



Power :	DC 3.8V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX 1Mbps CH39	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin		
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type	
4882.000	48.03	5.14	53.17	74.00	-20.83	peak	
4882.000	38.47	5.14	43.61	54.00	-10.39	AVG	
7323.000	43.51	7.54	51.05	74.00	-22.95	peak	
7323.000	32.11	7.54	39.65	54.00	-14.35	AVG	

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

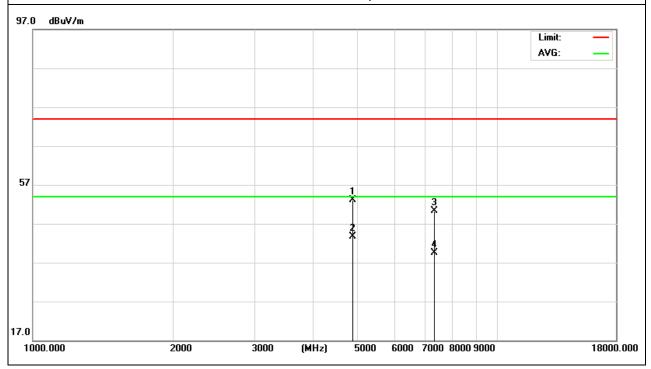




Power :	DC 3.8V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX 1Mbps CH39	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Dotoctor Typo
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4882.000	47.99	5.14	53.13	74.00	-20.87	peak
4882.000	38.63	5.14	43.77	54.00	-10.23	AVG
7323.000	42.71	7.54	50.25	74.00	-23.75	peak
7323.000	32.00	7.54	39.54	54.00	-14.46	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

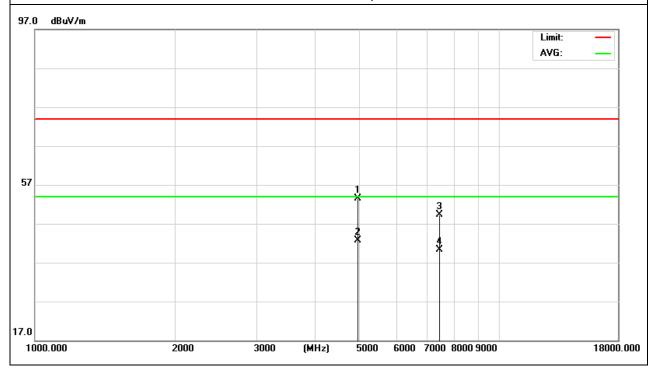
The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



Power :	DC 3.8V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX 1Mbps CH78	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4960.000	48.30	5.22	53.52	74.00	-20.48	peak
4960.000	37.49	5.22	42.71	54.00	-11.29	AVG
7440.000	41.33	8.06	49.39	74.00	-24.61	peak
7440.000	32.14	8.06	40.20	54.00	-13.80	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

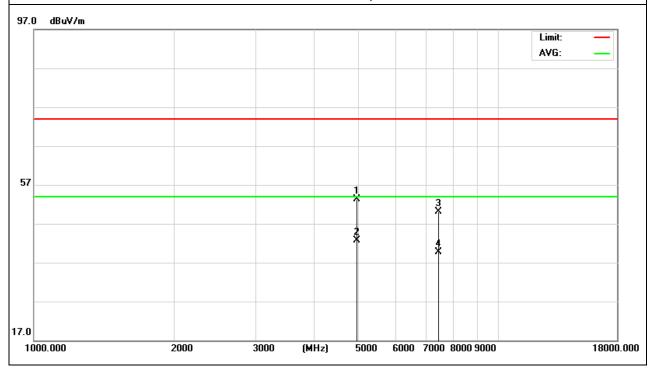




Power :	DC 3.8V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX 1Mbps CH78	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4960.000	48.00	5.22	53.22	74.00	-20.78	peak
4960.000	37.41	5.22	42.63	54.00	-11.37	AVG
7440.000	42.13	8.06	50.19	74.00	-23.81	peak
7440.000	31.63	8.06	39.69	54.00	-14.31	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

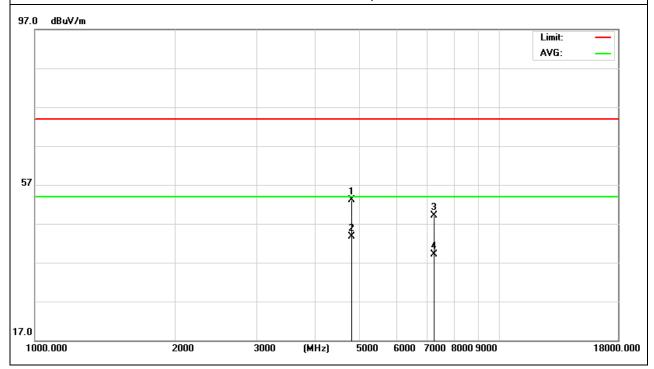
The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



Power :	DC 3.8V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX 3Mbps CH0	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
4804.000	48.01	5.06	53.07	74.00	-20.93	peak
4804.000	38.59	5.06	43.65	54.00	-10.35	AVG
7206.000	42.16	7.03	49.19	74.00	-24.81	peak
7206.000	32.01	7.03	39.04	54.00	-14.96	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

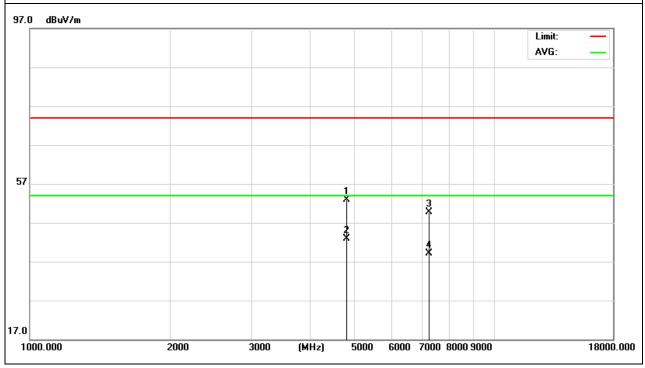




Power :	DC 3.8V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX 3Mbps CH0	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type
4804.000	47.89	5.06	52.95	74.00	-21.05	peak
4804.000	37.86	5.06	42.92	54.00	-11.08	AVG
7206.000	42.63	7.03	49.66	74.00	-24.34	peak
7206.000	32.06	7.03	39.09	54.00	-14.91	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

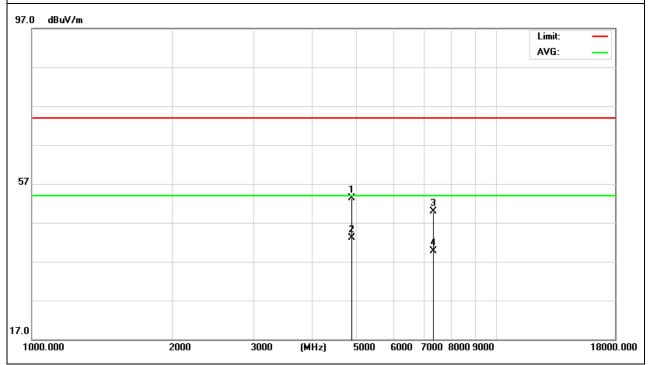
The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



Power :	DC 3.8V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX 3Mbps CH39	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Delector Type
4882.000	48.13	5.14	53.27	74.00	-20.73	peak
4882.000	37.96	5.14	43.10	54.00	-10.90	AVG
7323.000	42.33	7.54	49.87	74.00	-24.13	peak
7323.000	32.14	7.54	39.68	54.00	-14.32	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

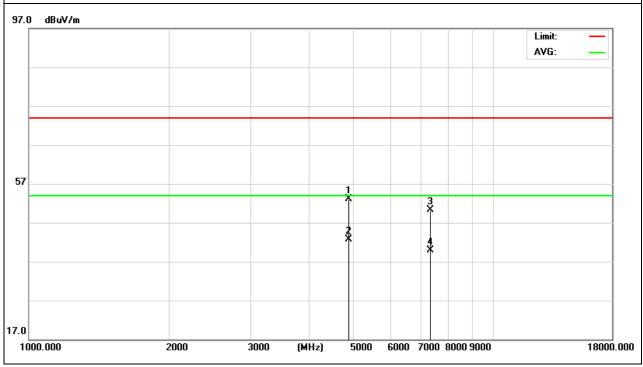




Power :	DC 3.8V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX 3Mbps CH39	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBµV)	(dB)	(dBµV/m) (dBµV/m) (dB)		Delector Type	
4882.000	47.93	5.14	53.07	74.00	-20.93	peak
4882.000	37.62	5.14	42.76	54.00	-11.24	AVG
7323.000	42.67	7.54	50.21	74.00	-23.79	peak
7323.000	32.41	7.54	39.95	54.00	-14.05	AVG

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

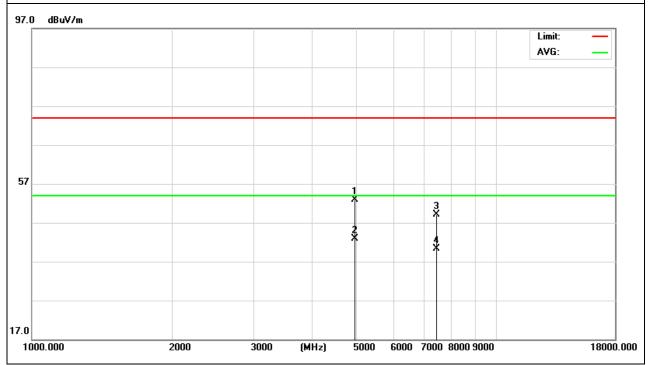
The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



Power :	DC 3.8V from battery	Pol/Phase :	HORIZONTAL
Test Mode 1 :	TX 3Mbps CH78	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	/m) (dBμV/m) (dB)		Delector Type	
4960.000	47.75	5.22	52.97	74.00	-21.03	peak	
4960.000	37.69	5.22	42.91	54.00	-11.09	AVG	
7440.000	41.02	8.06	49.08	74.00	-24.92	peak	
7440.000	32.33	8.06	40.39	54.00	-13.61	AVG	

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

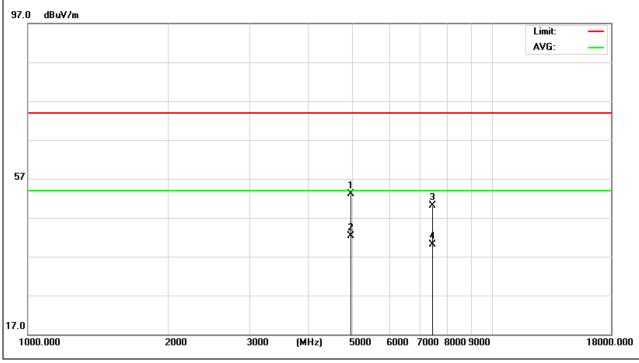




Power :	DC 3.8V from battery	Pol/Phase :	VERTICAL
Test Mode 1 :	TX 3Mbps CH78	Temperature :	25 °C
Memo :		Humidity :	59 %

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Detector Type	
4960.000	47.82	5.22	53.04	74.00	-20.96	peak	
4960.000	37.16	5.22	42.38	54.00	-11.62	AVG	
7440.000	42.03	8.06	50.09	74.00	-23.91	peak	
7440.000	32.11	8.06	40.17	54.00	-13.83	AVG	

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

- 1. The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.
- 2. GFSK, Pi/4 DQPSK,8DPSK all have been tested, only report worse case GFSK, 8DPSK is reported.



7.7 Restrict Band Emission Measurement Data

Radiated Method

Power :	DC 3.8V from battery	Pol/Phase :	H/V
Test Mode 1 :	GFSK / π/4 DQPSK / 8- DPSK	Temperature :	25 °C
Test Date :	Aug. 26, 2018	Humidity :	59 %

GFSK

Channel 0						Fu	ndamei	ntal Frequ	ency: 24	402 MHz
Frequency	Ant-Pol	Reading	Corrected Factor	Result	Remark	Lin (dBu [\]		Margin	Table	Ant High
(MHz)	H/V	(dBuV)	(dB)	(dBuV/m)		iV/m)	Peak	Ave	(dB)	IB) Ded.
2390	Н	42.37	-5.79	36.58	Peak	74	54	-37.42	245	1.5
	Н				Ave	74	54			
2390	V	43.63	-5.79	37.84	Peak	74	54	-36.16	162	1.5
	V				Ave	74	54			
2400	Н	45.19	-5.7	39.49	Peak	74	54	-34.51	216	1.5
	Н				Ave	74	54			
2400	V	44.51	-5.7	38.81	Peak	74	54	-35.19	158	1.5
	V				Ave	74	54			
Channel78						Fu	ndamer	ntal Frequ	ency: 24	80 MHz
		Meter	Corrected			Lin	nit			Ant
Frequency	Ant-Pol	Reading	Factor	Result	Remark	(dBuV/m)		Margin	Table	High
(MHz)	H/V	(dBuV)	(dB)	(dBuV/m)	Roman	Peak	Ave	(dB)	Deg.	(m)
2483.5	Н	42.20	-4.98	37.22	Peak	74	54	-36.78	354	1.5
	Н				Ave	74	54			
2483.5	V	43.53	-4.98	38.55	Peak	74	54	-35.45	168	1.5
	V				Ave	74	54			
2500	Н	41.11	-4.83	36.28	Peak	74	54	-37.72	358	1.5
	Н				Ave	74	54			
2500	V	41.61	-4.83	36.78	Peak	74	54	-37.22	157	1.5
	V				Ave	74	54			



π/4 DQPSK

Channel 0						Fu	ndamer	ntal Frequ	ency: 24	402 MHz
Frequency	Ant-Pol	Meter Reading	Corrected Factor	Result	Remark	Lin (dBu\		Margin	Table	Ant High
(MHz)	H/V	(dBuV)	(dB)	(dBuV/m)		Peak	Ave	(dB)	Deg.	(m)
2390	Н	44.14	-5.79	38.35	Peak	74	54	-35.65	356	1.5
	Н				Ave	74	54			
2390	V	44.22	-5.79	38.43	Peak	74	54	-35.57	175	1.5
	V				Ave	74	54			
2400	Н	43.91	-5.7	38.21	Peak	74	54	-35.79	347	1.5
	Н				Ave	74	54			
2400	V	44.02	-5.7	38.32	Peak	74	54	-35.68	161	1.5
	V				Ave	74	54			
Channel78						Fur	ndamer	ntal Frequ	ency: 24	80 MHz
Frequency	Ant-Pol	Meter Reading	Corrected Factor	Result	Remark	Limit (dBuV/m) Margin		Table	Ant High	
(MHz)	H/V	(dBuV)	(dB)	(dBuV/m)	Remark	Peak	Ave	(dB)	Deg.	(m)
2483.5	Н	42.25	-4.98	37.27	Peak	74	54	-36.73	349	1.5
	Н				Ave	74	54			
2483.5	V	42.26	-4.98	37.28	Peak	74	54	-36.72	167	1.5
	V				Ave	74	54			
2500	Н	40.62	-4.83	35.79	Peak	74	54	-38.21	355	1.5
	Н				Ave	74	54			
2500	V	40.33	-4.83	35.50	Peak	74	54	-38.50	174	1.5
	V				Ave	74	54			

8- DPSK

Channel 0						Fu	ndamer	ntal Frequ	ency: 24	402 MHz
Frequency	Ant-Pol Reading		Corrected Factor	Result	Remark	Lin (dBu\		Margin	Table	Ant High
(MHz)	H/V	(dBuV) (dB) (dBuV/r	(dBuV/m)	dBuV/m)	Peak	Ave	(dB)	Deg.	(m)	
2390	Н	42.44	-5.79	36.65	Peak	74	54	-37.35	343	1.5
	Н				Ave	74	54			
2390	V	42.41	-5.79	36.62	Peak	74	54	-37.38	148	1.5
	V				Ave	74	54			
2400	Н	45.44	-5.7	39.74	Peak	74	54	-34.26	349	1.5
	Н				Ave	74	54			
2400	V	43.08	-5.7	37.38	Peak	74	54	-36.62	166	1.5
	V				Ave	74	54			



Channel78						Fur	ndamer	ntal Frequ	ency: 24	180 MHz
Frequency	Ant-Pol	Meter Reading	Corrected Factor	Result	Remark		nit //m)	Margin	Table	Ant High
(MHz)	H/V	(dBuV)	(dB)	(dBuV/m)	Peak	Ave	(dB)	Deg.	(m)	
2483.5	Н	42.26	-4.98	37.28	Peak	74	54	-36.72	339	1.5
	Н				Ave	74	54			
2483.5	V	42.34	-4.98	37.36	Peak	74	54	-36.64	157	1.5
	V				Ave	74	54			
2500	Н	39.68	-4.83	34.85	Peak	74	54	-39.15	352	1.5
	Н				Ave	74	54			
2500	V	41.86	-4.83	37.03	Peak	74	54	-36.97	157	1.5
	V				Ave	74	54			



Note:

- 1. Emission level = Reading level + Correction factor
- 2. Correction factor : Antenna factor, Cable loss, Pre-Amp, etc.
- All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
- 4. Measurements above 1000 MHz, Peak detector setting:1 MHz RBW with 1 MHz VBW (Peak Detector).
- Measurements above 1000 MHz, Average detector setting: 1 MHz RBW with 10Hz VBW (AV Detector).
- 6. Peak detector measurement data will represent the worst case results.

Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.



8. Bandwidth Measurement Data

8.1 Test Limit

Please refer RSS-247 & section15.247.

8.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 100 KHz and VBW \ge 3x RBW.
- c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.
- d. The 20dB Bandwidth was measured and recorded.

8.3 Test Setup Layout





Date of Issue: Sep.05, 2018 Report No.: WH-FCC-R18091010-1

8.4 Test Result and Data

Test Date: Aug. 26, 2018 Atmospheric pressure: 1000 hPa

Temperature: 26℃ Humidity: 55%

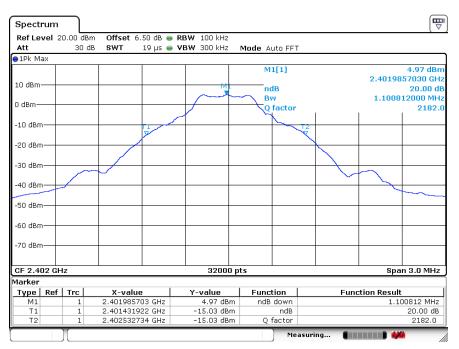
Modulation Standard	Channel	Frequency (MHz)	20dB Bandwidth (MHz)
	0	2402	1.101
GFSK	39	2441	1.104
	79	2480	1.104
	0	2402	1.351
π/4-DQPSK	39	2441	1.350
	79	2480	1.349
	0	2402	1.347
8- DPSK	39	2441	1.346
	78	2480	1.342



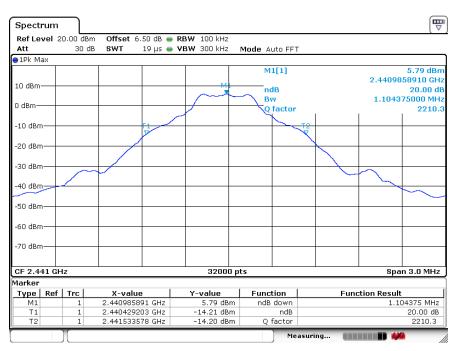
Date of Issue: Sep.05, 2018 Report No.: WH-FCC-R18091010-1

Result plot as follows:

Modulation Standard: GFSK Channel: 0



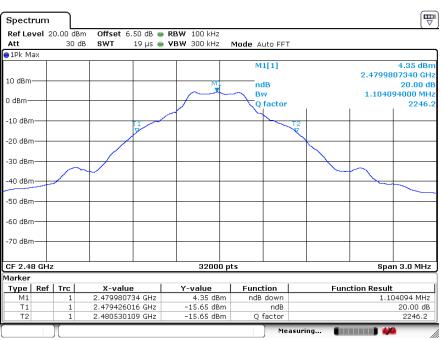
Modulation Standard: GFSK Channel: 39



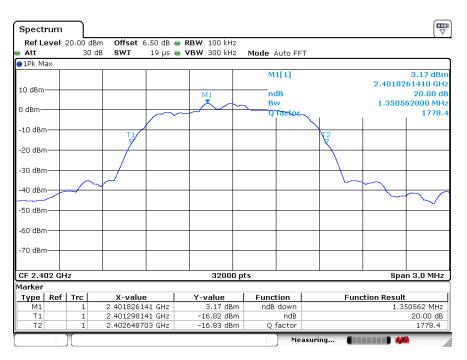


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Modulation Standard: GFSK Channel: 78



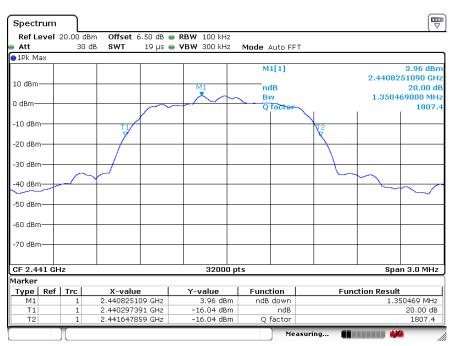
Modulation Standard: π/4-DQPSK Channel: 0





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Modulation Standard: π/4-DQPSK Channel: 39



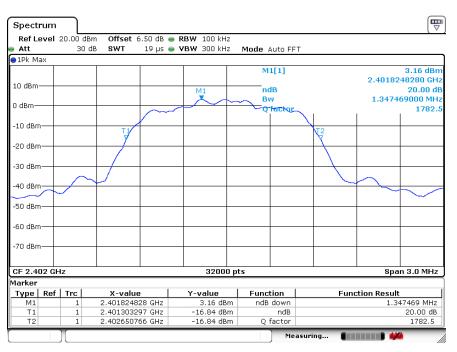
Modulation Standard: π/4-DQPSK Channel: 78

Ref Lev	el 20.00 d	Bm Offset 6.50 dB	RBW 100 kHz			Ę
Att			VBW 300 kHz	Mode Auto FF	т	
1Pk Max						
				M1[1]		2.54 dB
						2.4798257660 GF
LO dBm—			M1	ndB		20.00 c
) dBm				Bw		1.349250000 MF
ливні—				Q factor	N 1	1837
10 dBm—						
to abili		T1			<u>1</u> 2	
20 dBm—		7			<u> </u>	
20 0011						
30 dBm—						
00 00						
40 dBm—	+	\sim				\sim
50 dBm—						
60 dBm—						
70 dBm—						
CF 2.48 C	Hz		32000 p	ts		Span 3.0 MH:
larker			•			•
Type R	ef Trc	X-value	Y-value	Function	Fund	ction Result
M1	1	2.479825766 GHz	2.54 dBm	ndB down		1.34925 MHz
Τ1	1	2.479294672 GHz	-17.46 dBm	ndB		20.00 dE
T2	1	2.480643922 GHz	-17.46 dBm	Q factor		1837.9

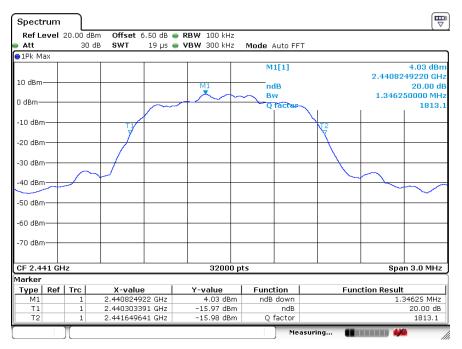


Date of Issue: Sep.05, 2018 Report No.: WH-FCC-R18091010-1

Modulation Standard: 8DPSK Channel: 0



Modulation Standard: 8DPSK Channel: 39

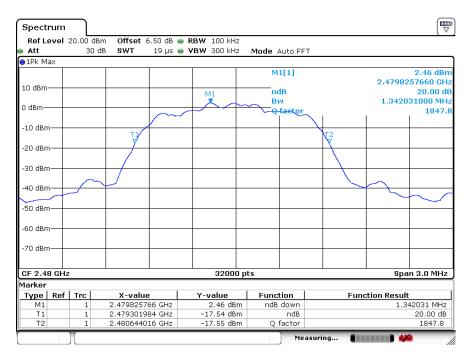


Modulation Standard: 8DPSK



Date of Issue: Sep.05, 2018 Report No.: WH-FCC-R18091010-1

Channel: 78





9. Maximum Peak Output Power

9.1 Test Limit

The Maximum Peak Output Power Measurement is 30dBm.

9.2 Test Procedures

- a. Peak power is measured using the wideband power meter.
- b. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.
- c. The Peak Output Power was measured and recorded.

9.3 Test Setup Layout





Date of Issue: Sep.05, 2018 Report No.: WH-FCC-R18091010-1

9.4 Test Result and Data

Test Date: Aug. 26, 2018 Atmospheric pressure: 1000hPa Temperature: 26°C Humidity: 55%

Modulation Standard	Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
	0	2402	5.13	3.26
GFSK	39	2441	6.01	3.99
	78	2480	4.43	2.77
	0	2402	4.81	3.03
π/4-DQPSK	39	2441	5.77	3.78
	78	2480	4.21	2.64
	0	2402	5.19	3.30
8- DPSK	39	2441	6.25	4.22
	78	2480	4.70	2.95



10. Carrier Frequency Separation

10.1 Test Limit

a. 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 operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 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.

10.2 Test Procedures

- b. The transmitter output was connected to spectrum analyzer.
- c. The spectrum analyzer's resolution bandwidth were set at 100KHz RBW and 300KHz VBW as that of the fundamental frequency. Set the sweep time=auto couple.
- d. The Carrier Frequency Separation was measured and recorded.

10.3 Test Setup Layout



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

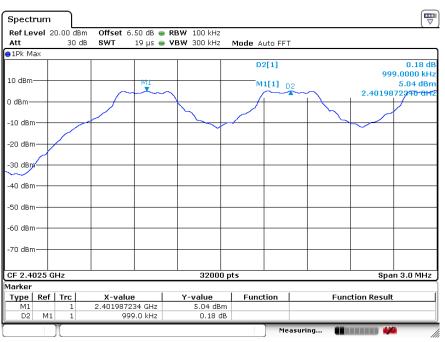


10.4 Test Result and Data

Test Date: Aug. 26, 2018 Atmospheric pressure: 1000 hPa Temperature: 26℃ Humidity: 55%

Mode/Channel	Channel separation (KHz)	20dB Bandwidth (KHz)	Limit (KHz) 2/3 20dB bandwidth	Conclusion
GFSK CH0	999.9	1101	734	PASS
GFSK CH39	999.9	1104	736	PASS
GFSK CH78	999.9	1104	736	PASS

Modulation Standard: GFSK Channel: 0





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Spectrum Ref Level 20.00 dBm Offset 6.50 dB 👄 RBW 100 kHz 19 µs 👄 **VBW** 300 kHz Att 30 dB SWT Mode Auto FFT ●1Pk Max D2[1] -0.02 dE 999.0000 kHz 5.81 dBm 2.4409850780 GHZ 10 dBm· M1[1] D2 X 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm--60 dBm -70 dBm-Span 3.0 MHz CF 2.4415 GHz 32000 pts Marker Type Ref Trc M1 1 D2 M1 1 Y-value Function 5.81 dBm -0.02 dB X-value 2.440985078 GHz 999.0 kHz Function Result Measuring...

Modulation Standard: GFSK Channel: 39

Modulation Standard: GFSK Channel: 78

Spectrum									
Ref Level	20.00 dBn	n Offset	6.50 dB 👄	RBW 100 kHz					
Att	30 dB	SWT	19 µs 👄	VBW 300 kHz	Mode Au	uto FFT			
1Pk Max									
					M1	1[1]			4.49 dBm
10 dBm								2.47898	15160 GHz
			M1		D2	2[1] D2			-0.16 dE
								99	9.0000 kHz
o abiii				N					
-10 dBm	<u> </u>								
	\sim								
-20 dBm									
-30 dBm				_					<u> </u>
									<u> </u>
-40 dBm									
-50 dBm									
-60 dBm									
-70 dBm									
CF 2.4795	GHz			32000 p	ts			Spa	n 3.0 MHz
1arker									
Type Ref	Trc	X-valı		Y-value	Funct	ion	Func	tion Result:	
M1	1	2.478981		4.49 dBm					
D2 M:	1 1	9	99.0 kHz	-0.16 dB					
						Measu	ıring 🔳		



Mode/Channel	Channel separation (KHz)	20dB Bandwidth (KHz)	Limit (KHz) 2/3 20dB bandwidth	Conclusion
8- DPSK CH0	999.9	1347	898	PASS
8- DPSK CH39	999.9	1346	897	PASS
8- DPSK CH78	999.9	1342	895	PASS

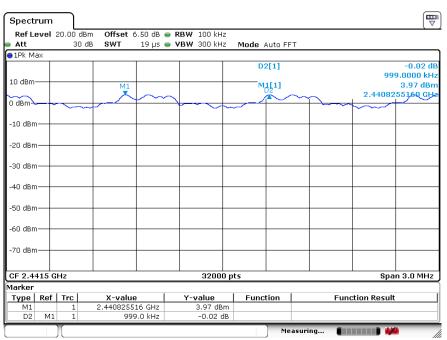
Modulation Standard: 8- DPSK Channel: 0

Ref Level Att	20.00 ae 30 i			RBW 100 kHz VBW 300 kHz	Mode Auto FFT			
1Pk Max			19 μ9 🕘	1011 000 1112	Mode Auto III			
_					D2[1]		999	0.17 di .0000 kH
10 dBm		M1			M1[1]			3.11 dBn 517,20 GH
0 dBm	\sim		~~~	\longrightarrow				\sim
-10 dBm								
-20 dBm								
-30 dBm								
-40 d8m								
-50 dBm								
-60 dBm								
-70 dBm								
, o dbiii								
CF 2.4025 G 1arker	Hz			32000 p	ts		Spar	n 3.0 MHz
Type Ref	Trc	X-value	<u> </u>	Y-value	Function	Eur	nction Result	
M1 D2 M1	1	2.4018261		3.11 dBm 0.17 dB	, unction	- Tu	iocion Result	



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Modulation Standard: 8- DPSK Channel: 39



Modulation Standard: 8- DPSK Channel: 78

Spectr	um										
Ref Le	vel :	20.00 d	Bm Offset	6.50 dB (RBW 100 kH	z					
Att		30	dB SWT	19 µs (VBW 300 kH	z Mode	Auto FF	т			
⊖1Pk Ma	х										
10 dBm-			Mi				M1[1]				2.61 dBm 55160 GHz -0.16 dB
0 dBm		_			<u></u>			$\sim \gamma$		99	9.0000 kHz
-10 dBm		\sim	~							\sum	
-20 dBm				_						$ \rightarrow $	
-30 dBm										`	
-40 dBm											
-50 dBm											
-60 dBm											
-70 dBm											
CF 2.47	'95 G	Hz			3200	0 pts				 Spa	n 3.0 MHz
Marker											
Туре	Ref	Trc	X-val		Y-value	Fun	ction		Func	tion Result	
M1 D2	M1	1	2.478825	516 GHz 99.0 kHz	2.61 dł -0.16						
							Me	asuring			•



11. Number Of Hopping Channel

11.1 Test Limit

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

11.2 Test Procedure

- a. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- The transmitter output was coupled to a spectrum analyzer via a antenna. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.
- c. The number of hopping channel was measured and recorded.

11.3 Test Setup Layout



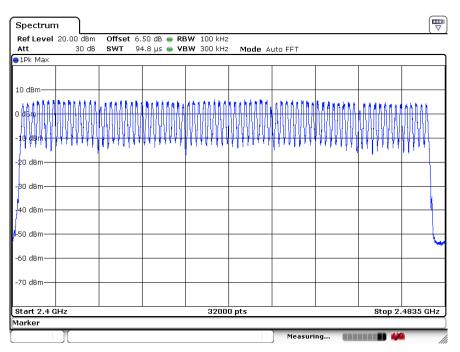


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11.4 Test Result and Data

Original test data for hopping channel number

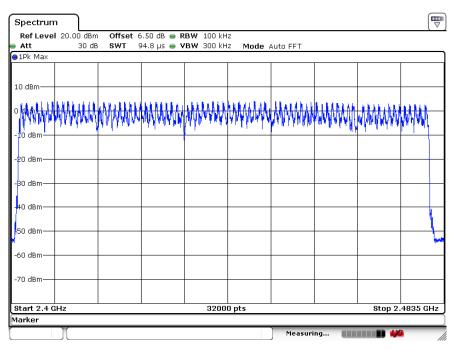
GFSK





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8- DPSK





12. Dwell Time

12.1 Test Limit

Please refer RSS-247 & section15.247

12.2 Test Procedure

- d. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- e. The transmitter output was coupled to a spectrum analyzer via a antenna. Set center frequency of spectrum analyzer = operating frequency
- f. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
- g. Repeat above procedures until all frequency measured were complete

12.3 Test Setup Layout



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



12.4 Test Result and Data

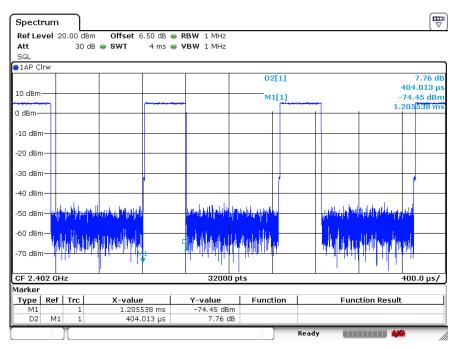
Original test data see the following page.

Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Conclusion					
	DH1	2402	0.404	129.280	<0.4	PASS					
GFSK	DH3	2402	1.663	266.080	<0.4	PASS					
	DH5	2402	2.907	310.080	<0.4	PASS					
	DH1	2402	0.413	132.160	<0.4	PASS					
8- DPSK	DH3	2402	2402 1.677 268.320 <		<0.4	PASS					
	DH5	2402	2.923	311.787	<0.4	PASS					
Note: 1 A pe	riod time = 0).4 (s) * 79 = 3	31.6(s)								
2 DH1	time slot = P	ulse Duration	* (1600/(1*7	79)) * A perio	d						
time I	time DH3 time slot = Pulse Duration * (1600/(3*79)) * A										
perio	period time DH5 time slot = Pulse Duration * (1600/(5*79))										
* A pe	* A period time										



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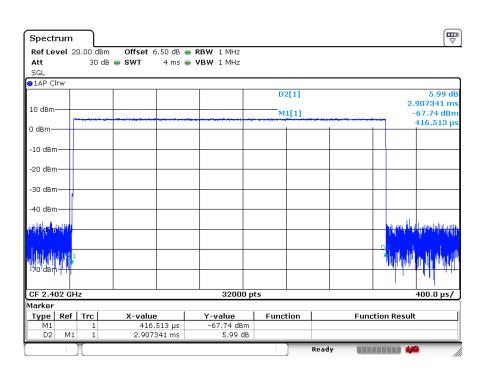
GFSK DH1/DH3/DH5



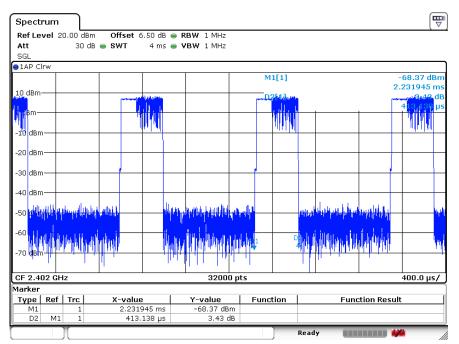
Spectrum	ר					
Ref Level 20.0	00 dBm	Offset 6.50 dB (BRBW 1 MHz			
Att	30 dB	SWT 4 ms (🛢 VBW 1 MHz			
SGL						
●1AP Clrw						
				M1[1]		-66.71 dBm
10 dBm						1.616551 ms
10 00111				D2[1]		0.41 dB 1.662552 ms
0 dBm				1	1	1.662332 ms
-10 dBm						
-20 dBm						
-30 dBm						
-40 dBm						
		e, J. K. H. K in configure disease of station	مالد			hittin an abaration and
-50 dBm						when a substitute of the difference
-60 dBm		n . 1. 1.				
-00 ubiii		hathtellall des lite a states.	. I. M ¹			ole ditta and the lattice of the design of the second second second second second second second second second s
-70 dBm			11 T			400.010.010.000
-/0 ubm		l lla a servera l	P			The second second second
						1
CF 2.402 GHz			32000 p	ts		400.0 µs/
Marker		,				
	rc	X-value	Y-value	Function	FI FI	unction Result
M1	1	1.616551 ms	-66.71 dBm			
D2 M1	1	1.662552 ms	0.41 dB			
					Ready	•••••••••••••••••••••••••••••••••••••••



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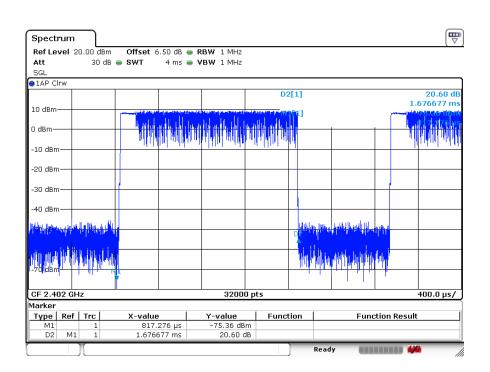


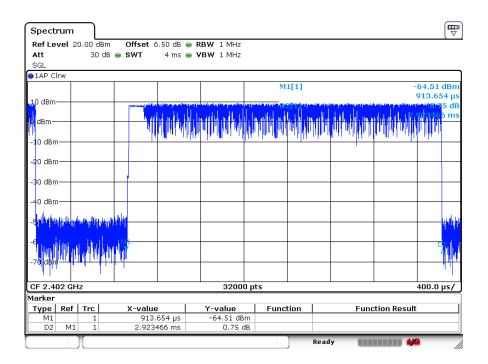
8- DPSK DH1/DH3/DH5





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13. Band Edges Measurement

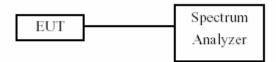
13.1 Test Limit

Below –20dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

13.2 Test Procedure

- h. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- i. Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- j. Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20dB relative to the maximum measured in-band peak PSD level.
- k. The band edges was measured and recorded.

13.3 Test Setup Layout



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



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13.4 Test Result and Data

Test Date:Aug. 26, 2018 Atmospheric pressure: 1000hPa Temperature: 26°C Humidity: 55%

Modulation Standard: GFSK

Spect	rum											
Ref Le Att	vel 2	20.00 dBr 30 dI			RBW 100 VBW 300		Mode /	\uto FFT				
😑 1Pk M	ax											
10 dBm								1[1] 2[1]			-	4.96 dBm 98590 GHz 5191 dBm 00000 GHz
0 dBm-									-		2.400	
-10 dBn		01 -15.04	0 dBm									
-20 dBn		/1 -13.04										
-30 dBn	n											
-40 dBn	n											
-50 dBn	n Antore	a and a state of the	n an	Alter Anter and	Mitting and in the second	All And	ulan, logia	a feature failing	وي المالية الم		And the feature of the	P Vietorius
-60 dBn	n —					-					,	
-70 dBn	n											
Start 2	2.31 0	Hz	1	1	32	000 pt	ts				Stop	2.41 GHz
Marker												
Туре	Ref	Trc	X-value		Y-value		Funct	tion		Func	tion Result	
M1 M2		1	2.40198	.4 GHz	4.96 -51.91							
		1						Mea	suring			• //

Spectrum											
Ref Level 2 Att	0.00 dBm 30 dB			■ RBW : ■ VBW :		Mode /	\uto FF	т			
⊖1Pk Max		1 1									
						м	1[1]			2.479	4.34 dBm 82340 GHz
10 dBm1						M	2[1]				54.09 dBm
0 dBm										2.483	50000 GHz
-10 dBm	1 -15.660	1 dBm									
-20 dBm	1 -15.000			_							
-30 dBm											
-30 dBm											
-40 dBm											
-50 dBm	MO										
the state of the	Killing Hay	habbartow straight	ist when	ويعدد استعنيه ال	milina	when when a	urtaforkalt (VIIII	-	and summer the	denter antique the second second
-60 dBm				-							
-70 dBm											
Start 2.47 G	Hz				32000 p	ots				Stop	2.57 GHz
Marker											
Type Ref		X-value		Y-V		Func	tion		Fun	ction Result	
M1 M2	1	2.479823	I4 GHz I5 GHz		.34 dBm .09 dBm						
)[Me	asurir	ng		1



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Modulation Standard: 8- DPSK

Spectrur	m										
Ref Leve Att	el 20.00 dBn 30 dB		_	RBW 100 kH VBW 300 kH		Auto FF	т				
∋1Pk Max											
					M	1[1]					09 dBm
10 dBm											60 GHz
20 00.00					M	2[1]			2 400	M1	22 dBm 00 GHz
0 dBm									2.400		00 0112
										11	
-10 dBm—										++	
	D1 -16.910	dBm								4	
-20 dBm—											
-30 dBm—											
-40 dBm—										1	
-40 0011										$\sum_{i=1}^{n}$	(
-50 dBm									M	ř_	<u> </u>
Militan Asfron	معلني سادرا الجبر جنيتك	and the second	in the second	When the With Sector Wighter 1	البديدية بالمحامة	and the second second	والم المعال	notan du viçan	the second second	ſ	Attended and
-60 dBm—	,						-		-		
-70 dBm—											
Start 2.31	L GHz			32000	pts		I		Stop	2.4	1 GHz
/larker											
	ef Trc	X-value		Y-value	Func	tion		Fund	tion Result		
M1	1	2.401826		3.09 dBn -51.22 dBn							
M2	1	2.	4 GHz	-51.22 dBn	n	<u> </u>		_			
						Mea	suring				/

Spectrum										
Ref Level :	20.00 dB	m Offset	6.50 dB	🖷 RBW 100 k	Hz					
🛛 Att	30 c	iB SWT 1	.13.7 µs	👄 VBW 300 k	Hz Mode	Auto F	FT			
⊖1Pk Max										
10 dBm						1[1] 2[1]			-	2.46 dBm 82660 GHz 54.94 dBm
0 dBm						-			2.483	50000 GHz
-10 dBm										
-20 dBm	1 -17.54	0 dBm				-				
-30 dBm										
-40 dBm										
-50 dBm	WIN MAN	-	Mahilughilmen	en lindersternet	-	Initerration	m		يصدونها ومغربها لعبر	where we are the second
-60 dBm										
-70 dBm										
Start 2.47 G	Hz	1	1	3200	0 pts	1			Stop	2.57 GHz
Marker										
Type Ref	Trc	X-value	.	Y-value	Func	tion		Func	tion Result	
M1 M2	1	2.47982	56 GHz 35 GHz	2.46 dl -54.94 dl						
)[Me	asuring.			



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Hopping

Modulation Standard: GFSK

Spectrum									
Ref Level 2	20.00 dBm	Offset 6.50	dB 😑 RI	BW 100 kHz					
Att	30 dB	SWT 113.7	µs 👄 VI	BW 300 kHz	Mode /	\uto FFT			
∋1Pk Max									
					M	1[1]			5.63 dBm
10 dBm									82660 GHz
					IVI:	2[1]		2.400	54.41 🔥 m
0 dBm								2.400	
									- AMAMANDA
-10 dBm									
	01 -14.37) dBm							
-20 dBm									
-30 dBm									
									1
-40 dBm									
									1
-50 dBm	الف حمديات		mumal	بالدعائد متداخلا	يبرر والمرم فكمريه	ير بينيار بريد	a hourse distant	اري) لا بر الفريون الاير _ المال ال	F
-60 dBm	ALC: NOT			Y	Interidicate alterna	and the second second	al a straight the sheet of a sec	A Supervision in the second	
-ou ubili									
-70 dBm									
-70 ubiii									
Start 2.31 0	Hz			32000	pts			Stop	2.41 GHz
larker									
	Trc	X-value		Y-value	Funct	tion	Func	tion Result	
M1 M2	1	2.4068266 GI 2.4 GI		5.63 dBn -54.41 dBn					
	1 1	2.4 0		5 HI GDI	·)	6		
						Measu	uring 🔳	••••	

Ref Level Att	20.00 dB 30 c		_	RBW 100 kHz VBW 300 kHz	Mode A	uto FFT			
1Pk Max									
					M1	L[1]		0.470	4.66 dBn 82660 GH
10 dBm-					MS	2[1]			-53.19 dBr
CARALLANA.									50000 GH
þiðshiðiði									
- PPOLISH V									
-19Yd8mi -1-1									
-20 dBm	D1 -15.3	40 dBm							
-20 asm									
-30 dBm									
00 00.00									
-40 dBm	L	_							
-50 dBm	M2	and an installed	Riebe an other	manual antimated of	and the second	يعبة المتعاد أبيتم	a salas a	مرمليها ال	الالتعام معافرا للمتعا الجا
	www.	and the second se	And	and the second		and the second second	A CONTRACTOR OF A CONTRACT	- AND	The Property of the last
-60 dBm									
-70 dBm									
-70 abm									
Start 2.47	GHz			32000	pts			Stop	2.57 GHz
1arker Type Rei	Trc	X-value		Y-value	Funct	ion I	E.m.	tion Result	
Type Ret M1	1	2.470826		4.66 dBm		1011	Funi	AIOH KESUI	L
M2	1		35 GHz	-53.19 dBm					



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Modulation Standard: 8- DPSK

Spectru	ım								
	vel 20.00			RBW 100 kH:					
Att 1Pk Max) dB SWT	113.7 µs 🧉	VBW 300 kH:	z Mode	Auto FFT	-		
Этык мах	< 		1			1[1]			3.88 dBm
					191	1[1]		2 407	3.88 uBm 98590 GHz
10 dBm—					M	2[1]			53.79 dem
									00000 G R z
0 dBm—									ALCOMAL)
									145.VPP31
-10 dBm-									 1 ` `
	D1 -16.	120 dBm							-
-20 dBm-									
00 Jp									
-30 dBm-									
-40 dBm-									
-to ubili									1
-50 dBm-								м	
Mad in provide	and films hairs	والمحلود المعرفة بالمحار ومعالم	Harrison and a second	الالالم المراجع المراجع المحالي المحالي المحالية ا	Nine Martin Andre	ANA MANY MANY	and the state of the	Mary Annabal	
-60 dBm-			•			· · · · · •			
-70 dBm-									
Start 2.3	1 011-			32000				Ot au	2.41 GHz
arker				32000	pts			stup	2.41 GHZ
	Ref Trc	X-valu	- 1	Y-value	Func	uan I	E	ction Result	
Type I M1	Ref Irc	2.40798		3.88 dBm		uon	Fun	LUUTI KESÜlt	
M2	1		2.4 GHz	-53.79 dBm					
							uning 🗖 🗖		
						Meas	uring 🔳		

Spectrum										
Ref Level				RBW 100 ki						(-
Att 🛛	30 di	3 SWT 1	.13.7 µs 🧉	• VBW 300 ki	Hz Mode	Auto FF	T			
∋1Pk Max										
10 dBm						1[1] 2[1]				2.81 dBn 82660 GH: 54.43 dBn
M1						2[1]				50000 GH:
									2.100	
	01 -17.190	dBm								
-30 dBm										
-40 dBm										
-50 dBm	M2		And a marking	#lansalined		mann	madantan	n an	www.	and the state of the second state of the secon
-60 dBm										
-70 dBm										
Start 2.47 G	Hz	1		3200) pts				Stop	2.57 GHz
Aarker										
Type Ref	Trc	X-value		Y-value	Func	tion		Func	tion Result	:
M1 M2	1	2.474826	56 GHz 35 GHz	2.81 dB -54.43 dB	m					
						Mea	suring			4)



14. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 - 410.0	4.500 – 5.150
0.49500 - 0.505**	16.69475 – 16.69525	608.0 - 614.0	5.350 - 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 - 1240.0	7.250 – 7.750
4.12500 - 4.12800	25.50000 - 25.67000	1300.0 – 1427.0	8.025 - 8.500
4.17725 – 4.17775	37.50000 - 38.25000	1435.0 – 1626.5	9.000 - 9.200
4.20725 – 4.20775	73.00000 - 74.60000	1645.5 – 1646.5	9.300 - 9.500
6.21500 - 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 - 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 - 138.00000	2200.0 - 2300.0	14.470 – 14.500
8.29100 - 8.29400	149.90000 - 150.05000	2310.0 - 2390.0	15.350 – 16.200
8.36200 - 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 - 8.38675	156.70000 - 156.90000	2655.0 - 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 - 167.17000	3260.0 - 3267.0	23.600 - 24.000
12.29000 - 12.29300	167.72000 - 173.20000	3332.0 - 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 - 285.00000	3345.8 – 3358.0	36.430 - 36.500
12.57675 – 12.57725	322.00000 - 335.40000	3600.0 - 4400.0	Above 38.6
13.36000 – 13.41000			

**: Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

14.1 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.