

TEST REPORT

For

Applicant : ACOUSTMAX INTERNATIONAL CO., LTD

- Address : Unit D16/F Cheuk Nang Plaza 250 Hennessy Road WanchaiHongKong
- **Product Name : Monster Solara**
 - Model Name : MNSOL-BLK
 - Remark : N/A
 - Brand Name : Monster
 - FCC Number : FCC ID: 2AAIN-MNSOLBLK
 - Report No. : MTE/CEC/B17040674
 - Date of Issue : Apr.25,2017
 - Issued by : Most Technology Service Co., Ltd.
 - No.5, 2nd Langshan Road, North District, Hi-tech Industrial
 - Park, Nanshan, Shenzhen, Guangdong, China
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1. PRODUCT INFORMATION

Equipment Under Test:	Monster Solara
Brand Name:	Monster
Model Number:	MNSOL-BLK
FCC Number:	FCC ID: 2AAIN-MNSOLBLK
Applicant:	ACOUSTMAX INTERNATIONAL CO., LTD
	Unit D16/F Cheuk Nang Plaza 250 Hennessy Road WanchaiHongKong
Manufacturer:	Shenzhen AngSi Technology Co., LTD
	902B,LingYun Buiding,Honglang North NO 2.Road ,Baoan District, Shenzhen
Technical Standards:	47 CFR Part 15 Subpart C (Part 15.247 of the FCC Rules)
File Number:	MTE/CEC/B17040674
Date of test:	Apr.11-24,2017
Deviation:	None
Condition of Test Sample:	Normal
Test Result:	PASS

The above equipment was tested by Most Technology Service Co., Ltd. for compliance with the requirements set forth in FCC rules and the Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment and the level of the immunity endurance of the equipment are within the compliance requirements.

The test results of this report relate only to the tested sample identified in this report.

Tested by (+ signature): Chloe

rested by (+ signature):	Childe	
	Chloe Cai (Engineer)	Apr.11-24,2017
Review by (+ signature):).hr	PROVED
	John Lin (Engineer)	Apr.25,2017
Approved by (+ signature):	Spor The	
	Yvette Zhou (Manager)	Apr.25,2017

2. GENERAL INFORMATION

2.1 Product Information

Product	Monster Solara
Brand Name	Monster
Model Number	MNSOL-BLK
Series Model Name:	N/A
Series Model Difference description:	N/A
Power Supply	 DC 5V by Adapter DC3.7VbyBattery
Frequency Range	2402MHz -2480MHz
Modulation Type:	GFSK,π/4-DQPSK, 8DPSK
Modulation Technique	FHSS
Channel Number	79
Antenna Type	PCB Antenna, Antenna Gain :4.0dBi
Temperature Range	-10°C ~ +40°C

NOTE:

1. For a more detailed features description about the EUT, please refer to User's Manual.

2.2 Objective

The objective of the report is to perform tests according to FCC Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices
2	DA00-705	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

No.	Section	Test Items	Result	Date of Test		
1	FCC 15.203	Antenna Requirement	PASS	2017-04-18		
2	FCC15.207 (a)	AC Power Line Conducted Emission	PASS	2017-04-18		
3	FCC15.209, 15.247(d)	Radiated Emission	PASS	2017-04-19		
4	FCC 15.247 (b)(1)	Conducted Peak Output Power	PASS	2017-04-18		
5	FCC 15.247 (a)(1)	20dB Emission Bandwidth	PASS	2017-04-18		
6	FCC 15.247 (a)(1)	Carrier Frequency Separation	PASS	2017-04-18		
7	FCC 15.247 (a)(1)(iii)	Number of Hopping Channel	PASS	2017-04-18		
8	FCC 15.247 (a)(1) (iii)	Dwell Time	PASS	2017-04-18		
9	FCC15.247(d)	Band Edge and Conducted Spurious Emissions	PASS	2017-04-18		
10	FCC15.247(d)	Restricted Frequency Bands	PASS	2017-04-19		
Remark: N/A means not applicable						

2.3 Test Standards and Results

Note: 1. The test result judgment is decided by the limit of measurement standard 2. The information of measurement uncertainty is available upon the customer's request.

2.4 Environmental Conditions

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

- Temperature: 15-35°C Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

3. TEST METHODOLOGY

3. 1TEST FACILITY

•••••••	
Test Site:	Most Technology Service Co., Limited
Location:	No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China
Description:	There is one 3m semi-anechoic an area test sites and two line conducted labs for final
	test. The Open Area Test Sites and the Line Conducted labs are constructed and
	calibrated to meet the FCC requirements in documents ANSI C63.10:2013 and CISPR 16
	requirements.
	The FCC Registration Number is 490827. The IC Registration Number is 7103A-1.
Site Filing:	The site description is on file with the Federal Communications
	Commission, 7435 Oakland Mills Road, Columbia, MD 21046.
Instrument	All measuring equipment is in accord with ANSI C63.10:2013 and CISPR 16
Tolerance:	requirements that meet industry regulatory agency and accreditation agency requirement.
Ground Plane:	Two conductive reference ground planes were used during the Line Conducted Emission,
	one in vertical and the other in horizontal. The dimensions of these ground planes are as
	below. The vertical ground plane was placed distancing 40 cm to the rear of the wooden
	test table on where the EUT and the support equipment were placed during test. The
	horizontal ground plane projected 50 cm beyond the footprint of the EUT system and
	distanced 80 cm to the wooden test table. For Radiated Emission Test, one horizontal
	conductive ground plane extended at least 1m beyond the periphery of the EUT and the
	largest measuring antenna, and covered the entire area between the EUT and the
	antenna.

3.2 GENERAL TEST PROCEDURES

Radiated Emissions

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.5 of ANSI C63.10:2013.

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10:2013, Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

4. SETUP OF EQUIPMENT UNDER TEST

4.1 SETUP CONFIGURATION OF EUT

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

4.2 TEST EQUIPMENT LIST

Instrumentation: The following list contains equipment used at Most for testing. The equipment conforms to the CISPR 16-1 / ANSI C63.2 Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10 kHz to 1.0 GHz or above.

No.	Equipment	Manufacturer	Model No.	S/N	Calibration date	Calibration Interval
1	Test Receiver	Rohde & Schwarz	ESCI	100492	2017/03/10	1 Year
2	Spectrum Analyzer	Agilent	E7405A	US44210471	2017/03/14	1 Year
3	L.I.S.N.	Rohde & Schwarz	ENV216	100093	2017/03/10	1 Year
4	Coaxial Switch	Anritsu Corp	MP59B	6200283933	2017/03/07	1 Year
5	Terminator	Hubersuhner	50Ω	No.1	2017/03/07	1 Year
6	RF Cable	SchwarzBeck	N/A	No.1	2017/03/07	1 Year
7	Test Receiver	Rohde & Schwarz	ESPI	101202	2017/03/10	1 Year
8	Bilog Antenna	Sunol	JB3	A121206	2017/03/14	1 Year
9	Horn Antenna	SCHWARZBECK	BBHA9120D	756	2017/03/14	1 Year
10	Horn Antenna	Penn Engineering	9034	8376	2017/03/14	1 Year
11	Cable	Resenberger	N/A	NO.1	2017/03/07	1 Year
12	Cable	SchwarzBeck	N/A	NO.2	2017/03/07	1 Year
13	Cable	SchwarzBeck	N/A	NO.3	2017/03/07	1 Year
14	Single Phase Power Line Filter	DuoJi	FNF 202B30	N/A	2017/03/07	1 Year
15	Test Receiver	Rohde & Schwarz	ESCI	100492	2017/03/10	1 Year
16	Loop antenna	ARA	PLA-1030/B	1039	2017/03/14	1 Year

NOTE: Equipments listed above have been calibrated and are in the period of validation.

5. 47 CFR Part 15 C Requirements

5.1 ANTENNA REQUIREMENT

5.1.1 Applicable Standard

According to FCC § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

5.1.2 Evaluation Criteria

(a) Antenna must be permanently attached to the unit.

(b) Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, Installer shall be responsible for verifying that the correct antenna is employed with the unit.

5.1.3 Result: Compliance.

The EUT has one integral antenna arrangement, which was permanently attached and the antenna gain is 4.0 dBi, fulfill the requirement of this section.

5.2 AC Power Line Conducted Emission 5.2.1Requirement

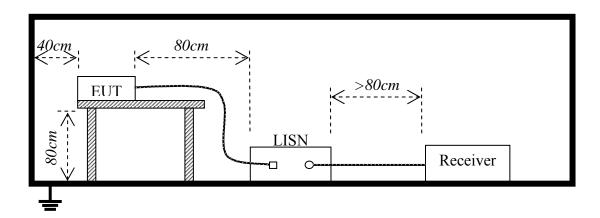
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the and 150 kHz-30 MHz, shall not exceed the limits in the following table:

Frequency	Maximum RF	Line Voltage
Frequency	Q.P.(dBuV)	Average(dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

**Note: 1. the lower limit shall apply at the band edges.

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

5.2.2 Block Diagram of Test Setup



5.2.3 Test procedure

- 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
- 2. Exploratory measurements were made to identify the frequency of the emission that has the highest amplitude relative to the limit;
- 3. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
- 4. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.
- 5. The bandwidth of test receiver (ESCI) set at 9 KHz.
- 6. All data was recorded in the Quasi-peak and average detection mode.

5.2.4 Test Result

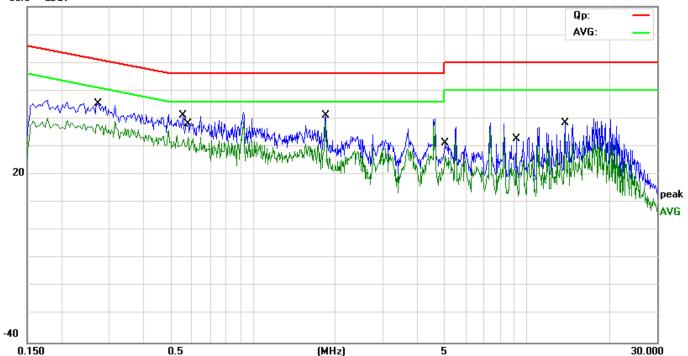
Pass

Note: All test modes are performed, only the worst case is recorded in this report.

Please refer the following pages.

EUT:	Monster Solara	M/N:	MNSOL-BLK
Mode:	Charging	Phase:	L1
Tested by:	SKY(Engineer)	Power:	DC 5V by Adapter
Temperature: / Humidity	23.4°C/ 52.7%	Test date:	2017-04-18



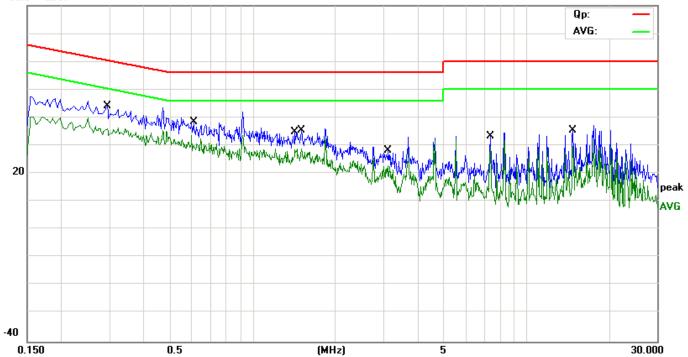


0.130		0.5			נשווצו		3		50.000
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	0.2700	28.23	9.60	37.83	51.12	-13.29	AVG		
2	0.2740	35.64	9.60	45.24	61.00	-15.76	QP		
3	0.5580	31.47	9.59	41.06	56.00	-14.94	QP		
4	0.5820	23.61	9.59	33.20	46.00	-12.80	AVG		
5	1.8500	31.65	9.60	41.25	56.00	-14.75	QP		
6 *	1.8500	29.46	9.60	39.06	46.00	-6.94	AVG		
7	5.0460	21.62	9.63	31.25	60.00	-28.75	QP		
8	5.0460	17.03	9.63	26.66	50.00	-23.34	AVG		
9	9.1820	22.97	9.68	32.65	60.00	-27.35	QP		
10	9.1820	17.35	9.68	27.03	50.00	-22.97	AVG		
11	13.8860	28.74	9.70	38.44	60.00	-21.56	QP		
12	13.8860	23.91	9.70	33.61	50.00	-16.39	AVG		

*:Maximum data x:Over limit !:over margin

EUT:	Monster Solara	M/N:	MNSOL-BLK
Mode:	Charging	Phase:	Ν
Tested by:	SKY(Engineer)	Power:	DC 5V by Adapter
Temperature: / Humidity	23.4°C/ 52.7%	Test date:	2017-04-18





No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1		0.2940	34.55	9.59	44.14	60.41	-16.27	QP		
2		0.2940	26.39	9.59	35.98	50.41	-14.43	AVG		
3	*	0.5980	24.19	9.59	33.78	46.00	-12.22	AVG		
4		0.6100	28.97	9.59	38.56	56.00	-17.44	QP		
5		1.4300	25.22	9.60	34.82	56.00	-21.18	QP		
6		1.5100	19.29	9.60	28.89	46.00	-17.11	AVG		
7		3.1260	18.70	9.61	28.31	56.00	-27.69	QP		
8		3.1260	13.32	9.61	22.93	46.00	-23.07	AVG		
9		7.4060	23.55	9.66	33.21	60.00	-26.79	QP		
10		7.4060	19.79	9.66	29.45	50.00	-20.55	AVG		
11		14.8100	25.63	9.70	35.33	60.00	-24.67	QP		
12		14.8100	19.94	9.70	29.64	50.00	-20.36	AVG		

*:Maximum data x:Over limit !:over margin

5.3 Radiated Emission 5.3.1Requirement

According to FCC section 15.247(d), 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) (see §15.205(c)).

According to FCC section 15.209(a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m at 3-meter)	Test Distance (m)	Field Strength (dBµV/m at 3-meter)
0.009 - 0.490	2400/F(kHz)	300	
0.490 - 1.705	24000/F(kHz)	30	
1.705-30	30	30	
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Note:

1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

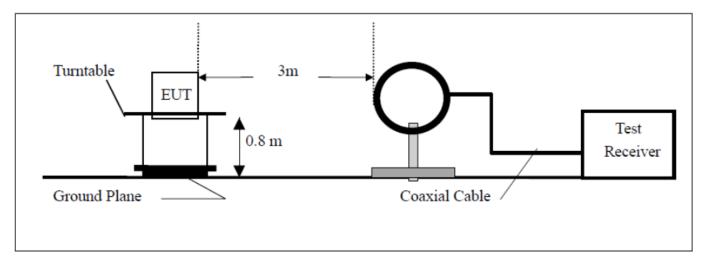
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

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) (see §15.205(c)).

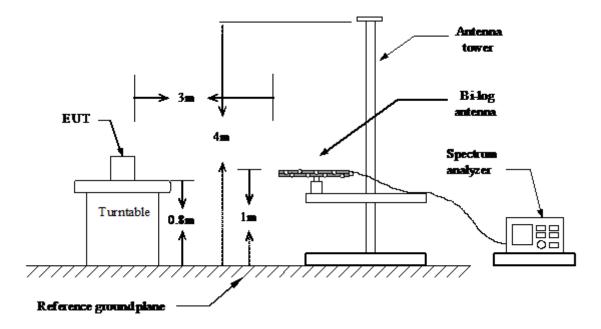
5.3.2 Test Configuration

Test Setup:

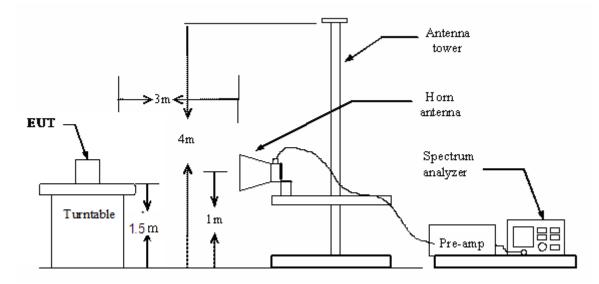
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



5.3.3 Test Procedure:

1. The EUT was placed on the top of a wooden table 0.8 meters (for measurement at frequency below 1GHz) and a wooden table 1.5 meters (for measurement at frequency above 1GHz) above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

- 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter, for the test frequency of above 1GHz, horn antenna opening in the test would have been facing the EUT when rise or fall) and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

6. Set the spectrum analyzer in the following setting as:

Below 1GHz: PEAK: RBW=100 kHz / VBW=300 kHz / Sweep=AUTO QP: RBW=120 kHz / Sweep=AUTO Above 1GHz: (a)PEAK: RBW=VBW=1MHz / Sweep=AUTO (b)AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

7. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

5.3.4 Test Result

Pass

Remark:

1. During the test, pre-scan the GFSK, π /4-QPSK, 8DPSK modulation, and found the GFSK modulation Low channel is worse case in above 1GHz and below 1GHz.

2. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

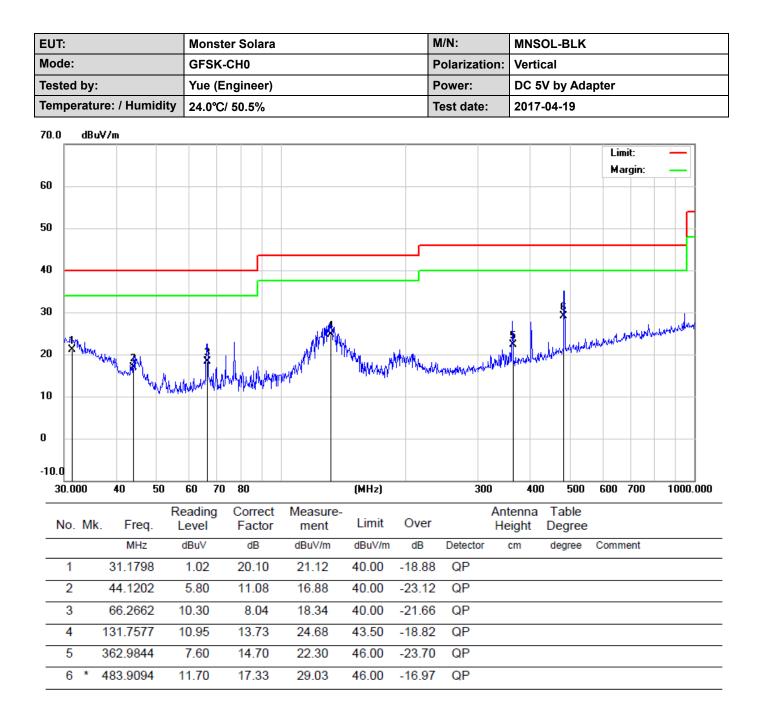
3. For radiated emissions from 9kHz to 30MHz, Test results show that the margin of over -20db.

Note: All test modes are performed, only the worst case is recorded in this report.

Please refer the following pages

Below 1GHz:

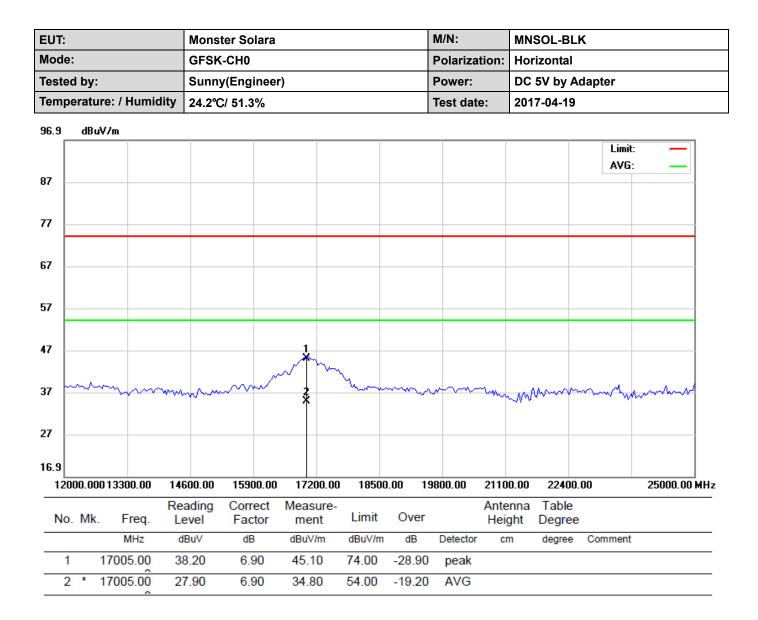
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0 10.0 30.0 No.	000 . Mk	40 Freq. MHz 33.3279 66.2662	50 60 Read Lev dBu 1.2 5.8 6.4	20 80 40	0 80 Corre Fact dB 18.6 8.0	ect Measur tor ment dBuV/m 64 19.84 14 13.84 03 20.33	re- Limit dBuV/m 40.00 40.00	Over dB -20.16 -26.16	300 Detector QP QP	Anten Heigł	na) 5 Table Degree	00 e ee	600	700		
0 10.0 30.0 1 2 3	000 . Mk	40 Freq. MHz 33.3279 66.2662 126.7723	50 60 Read Lev dBu 1.3 5.8 6.4 7.4	0 7 ding el 20 80 40 46	0 80 Corre Fact 18.6 8.0 13.9	ect Measur ment dBuV/m 64 19.84 14 13.84 13 20.33 12 21.38	Ee- Limit dBuV/m 40.00 40.00 43.50	Over dB -20.16 -26.16 -23.17	300 Detector QP QP QP	Anten Heigł	na) 5 Table Degree	00 e ee	600	700		

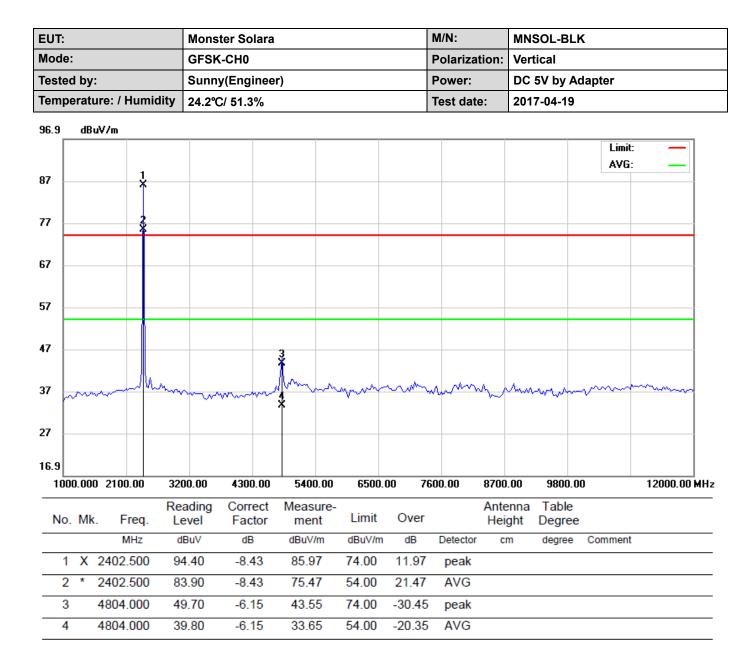


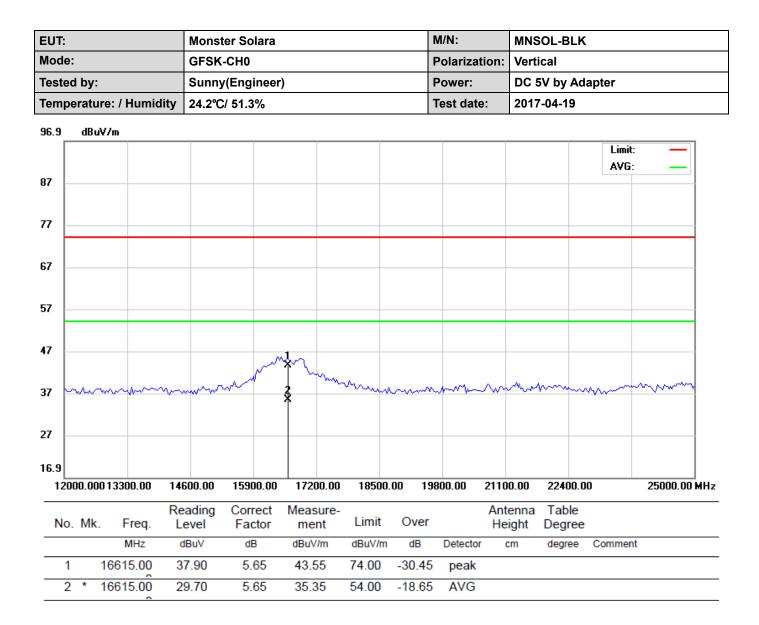
Above 1GHz:

EUT:			Monst	ter Solara			I	M/N:	MNS	SOL-BLK			
Mode	e:		GFSK	-CH0			I	Polarization	: Hori	Horizontal			
Teste	ed by:		Sunny	/(Engineer)		1	Power:	DC	DC 5V by Adapter 2017-04-19			
Temp	peratu	ire: / Humid	ity 24.2°C	/ 51.3%				Test date:	2017				
96.9	dBu	ıV/m											
[Limi		
87		1									AVG	i:	
"		Ť											
77		2											
67													
57													
ŀ													
47													
					3								
37	hn	m	when	mm	Manna	man	man	man	m	m	mm	man	
					4								
27					*								
16.9													
L	00.000	2100.00	3200.00	4300.00	5400.00	6500.0	0 76	00.00 870	0.00	9800.00		12000.00 N	Hz
			Reading	Correct	Measure-			Ar	tenna	Table			
N	o. M		Level	Factor	ment	Limit	Over		eight	Degree			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comme	nt	
		2402.000	94.70	-8.43	86.27	74.00	12.27	peak					
	2 *	2402.000	84.20	-8.43	75.77	54.00	21.77	AVG					
	3	4804.000	46.50	-6.15	40.35	74.00	-33.65						
	4	4804.000	34.30	-6.15	28.15	54.00	-25.85	AVG					

*:Maximum data x:Over limit !:over margin



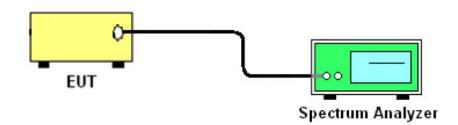




5.4 Conducted Peak Output Power 5.4.1 Requirement

According to FCC Section 15.247(b)(1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725- 5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts

5.4.2 Block Diagram of Test Setup



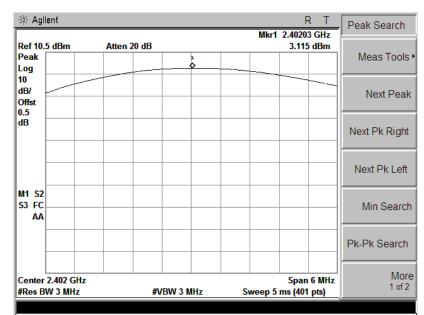
5.4.3 Test Procedure

- 1. Place the EUT on a bench and set in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI test receiver.
- 3. Add a correction factor to the display.

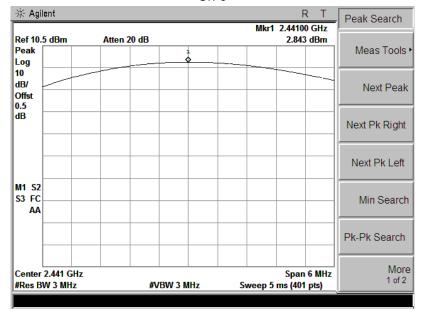
5.4.4 Test Result

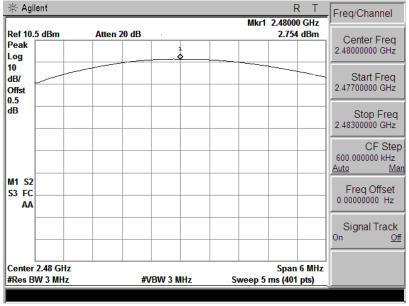
Test Item:	Peak Output Power	Temperature :	21°C
Tested by:	Kang (Engineer)	Relative Humidity :	59%

Mode	Channel	Frequency	Peak Output	Lir	nit	Pass/Fail	
Mode	Channol	(MHz)	Power(dBm)	(mW)	(dBm)		
	Low	2402	3.115	1000	30	Pass	
BDR (GFSK)	Middle	2441	2.843	1000	30	Pass	
	High	2480	2.754	1000	30	Pass	
	Low	2402	3.299	125	20.97	Pass	
EDR (π/4-DQPSK)	Middle	2441	2.734	125	20.97	Pass	
	High	2480	2.085	125	20.97	Pass	
	Low	2402	3.507	125	20.97	Pass	
EDR (8DPSK)	Middle	2441	2.900	125	20.97	Pass	
	High	2480	2.006	125	20.97	Pass	



Ch 0





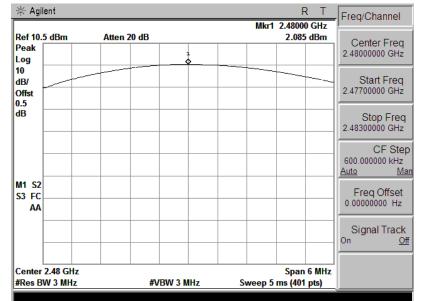
Ch 78

🔆 Agilent	i						F		Peak Search
D-640 E J	D	Aug 20	ID.		I	Mkr1	2.4020		
Ref 10.5 d Peak Log	Bm	Atten 20 d		÷			3.299	dBm	Meas Tools
10 dB/ Offst									Next Peak
0.5 dB									Next Pk Right
-									Next Pk Left
M1 S2 S3 FC AA									Min Search
									Pk-Pk Search
Center 2.4 #Res BW 3			#VBW 3	MHz	Swe	ep 5 i	Span ms (401	6 MHz pts)	More 1 of 2

π/4-DQPSK Mode

Ch 0

🔆 Agilent			R T	Freq/Channel
Ref 10.5 dBm	Atten 20 dB		Mkr1 2.44100 GHz 2.734 dBm	, ·
Peak Log				Center Freq 2.44100000 GHz
10 dB/ Offst 0.5				Start Freq 2.43800000 GHz
dB				Stop Freq 2.44400000 GHz
				CF Ste 600.000000 kHz <u>Auto M</u>
M1 S2 S3 FC AA				Freq Offset 0.00000000 Hz
				Signal Track ^{On <u>O</u>}
Center 2.441 GHz #Res BW 3 MHz		/BW 3 MHz	Span 6 MHz Sweep 5 ms (401 pts)	

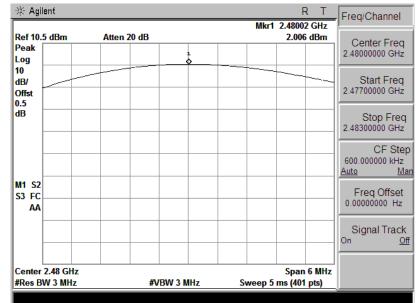


🔆 Agi	ent					F	х т	Peak Search
Ref 10.	5 dBm	Atten 20 dB			Mkr1	2.4020	2 GHz 7 dBm	
Peak Log			¹					Meas Tools
10 dB/ Offst 0.5								Next Peak
dB								Next Pk Right
								Next Pk Left
M1 S2 S3 FC AA								Min Search
								Pk-Pk Search
	2.402 GHz W 3 MHz	i	#VBW 3 MH	z S	weep 5		6 MHz pts)	More 1 of 2

8DPSK Mode

Ch 0

🔆 Agilent			R	T Freq/Channel
Ref 10.5 dBm	Atten 20 dB		Mkr1 2.44102 (2.9 d	GHz Bm
Peak Log				Center Freq 2.44100000 GHz
10 dB/ Offst 0.5				Start Freq 2.43800000 GHz
dB				Stop Freq 2.44400000 GHz
				CF Ste 600.000000 kHz <u>Auto M</u> i
M1 S2 S3 FC AA				Freq Offset 0.00000000 Hz
				Signal Track
Center 2.441 GHz #Res BW 3 MHz		/BW 3 MHz	Span 6 Sweep 5 ms (401 p	



5.5 20dB Emission Bandwidth

5.5.1 Test Requirement

The bandwidth of a frequency hopping channel is the -20 dB emission bandwidth, measured with the hopping stopped.

5.5.2 Test Procedure

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

5.5.3 Test Result

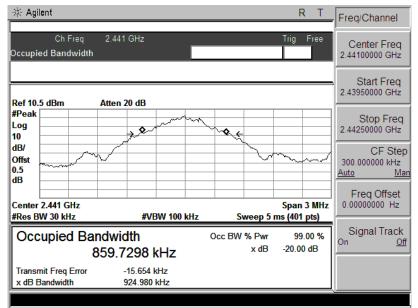
Test Item:	20dB Emission Bandwidth	Temperature :	23°C
Tested by:	Kang (Engineer)	Relative Humidity :	65%

Mode	Channel	Frequency (MHz)	20dB Bandwidth(MHz)
חחח	Low	2402	0.930
BDR (GFSK)	Middle	2441	0.925
	High	2480	0.922
	Low	2402	1.267
EDR (π/4-DQPSK)	Middle	2441	1.262
(174-DQI SI()	High	2480	1.263
	Low	2402	1.305
EDR (8DPSK)	Middle	2441	1.274
	High	2480	1.264

GFSK	Mode
------	------

🔆 Agilent			RT	Span
Occupied Bandwidth	2.402 GHz		Trig Free	Span 3.00000000 MHz
Span 3.000000	000 MHz			Span Zoom
#Peak	A contraction of the second se			Full Span
dB/ Offst 0.5 dB			h	Zero Span
Center 2.402 GHz #Res BW 30 kHz	#VBW 100 kHz	Sweep 5 m	Span 3 MHz 1s (401 pts)	Last Span
Occupied Band	dwidth 3.4338 kHz	Occ BW % Pwr x dB	99.00 % -20.00 dB	Zone
Transmit Freq Error x dB Bandwidth	-12.552 kHz 929.960 kHz			

Ch 0



☆ Agilent			RT	Freq/Channel
Ch Freq Dccupied Bandwidth	2.48 GHz		Trig Free	Center Freq 2.48000000 GHz
Ref 10.5 dBm	Atten 20 dB			Start Freq 2.47850000 GHz
#Peak Log 10	*****	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Stop Freq 2.48150000 GHz
dB/ Offst 0.5 dB			mann/	CF Step 300.000000 kHz <u>Auto Ma</u>
Center 2.48 GHz #Res BW 30 kHz	#VBW 100 kHz	Sweep 5 r	Span 3 MHz ns (401 pts)	Freq Offset 0.00000000 Hz
Occupied Ban 8	idwidth 60.5287 kHz	Occ BW <mark>% Pwr</mark> x dB	99.00 % -20.00 dB	Signal Track ^{On <u>Of</u>}
Transmit Freq Error x dB Bandwidth	-15.360 kHz 921.800 kHz			

			Q. 0		
🔆 Ag	ilent			RT	Freq/Channel
Occupi	Ch Freq ied Bandwidth	2.402 GHz		Trig Free	Center Freq 2.40200000 GHz
Ref 10	.5 dBm	Atten 20 dB			Start Freq 2.40050000 GHz
#Peak Log 10		* growt	Marina Rife		Stop Freq 2.40350000 GHz
dB/ Offst 0.5 dB				~~~~~	CF Step 300.000000 kHz <u>Auto Mar</u>
Center	r 2.402 GHz 3W 30 kHz	#VBW 100 k	Hz Sween 5	Span 3 MHz ms (401 pts)	Freq Offset 0.00000000 Hz
	cupied Ba		Occ BW % Pwr x dB	99.00 % -20.00 dB	Signal Track ^{On <u>Off</u>}
	mit Freq Error Bandwidth	-6.637 kHz 1.267 MHz			

π/4-DQPSK Mode

Ch 0

────────────────────────────────────			RT	Freq/Channel
Occupied Bandwidth	.441 GHz	Tri 	g Free	Center Freq 2.44100000 GHz
Center 2.441000	2000 GHz			Start Freq 2.43950000 GHz
#Peak	**************************************	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Stop Freq 2.44250000 GHz
dB/ Offst 0.5 dB			********	CF Step 300.000000 kHz <u>Auto Man</u>
Center 2.441 GHz #Res BW 30 kHz	#VBW 100 kHz	Sp Sweep 5 ms (4	an 3 MHz 401 pts)	Freq Offset 0.00000000 Hz
Occupied Band 1.1	width 845 MHz	Occ BW % Pwr x dB -20	99.00 % 0.00 dB	Signal Track ^{On <u>Off</u>}
Transmit Freq Error x dB Bandwidth	-17.788 kHz 1.262 MHz			

🔆 Agilent	i			RT	Freq/Channel
Occupied I	Ch Freq Bandwidth	2.48 GHz		Trig Free	Center Freq 2.48000000 GHz
Ref 10.5 d	Bm	Atten 20 dB			Start Freq 2.47850000 GHz
#Peak Log 10		*******	when when the second se		Stop Freq 2.48150000 GHz
dB/ Offst 0.5 dB	~~~~			Martin and a second	CF Step 300.000000 kHz <u>Auto Mar</u>
Center 2.4 #Res BW 3		#VBW 100	kHz Swee	Span 3 MHz p 5 ms (401 pts)	Freq Offset 0.00000000 Hz
Occup	bied Bar 1	ndwidth .1873 MHz	Occ BW % F	/wr 99.00 % dB -20.00 dB	Signal Track ^{On <u>Off</u>}
Transmit I x dB Ban	Freq Error dwidth	-17.869 kHz 1.263 MHz			

		RT	Freq/Channel
2.402 GHz		Trig Free	Center Freq 2.40200000 GHz
Atten 20 dB			Start Freq 2.40050000 GHz
→ A man and mark	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Stop Freq 2.40350000 GHz
		Ammana	CF Step 300.000000 kHz <u>Auto Mar</u>
#VBW 100 kHz	Swoon 5 r	Span 3 MHz	Freq Offset 0.00000000 Hz
dwidth 2059 MHz	Occ BW % Pwr x dB	99.00 % -20.00 dB	Signal Track ^{On <u>Off</u>}
-10.608 kHz 1.305 MHz			
	Atten 20 dB	Atten 20 dB Atten 20 dB #VBW 100 kHz Sweep 5 r dwidth Occ BW % Pwr 2059 MHz x dB -10.608 kHz	2.402 GHz Trig Free Atten 20 dB Atten 20 dB

8DPSK Mode

Ch 0

- ∰ Agilent		R	T Freq/Channel
Occupied Bandwidth	.441 GHz	Trig F	Center Freq 2.44100000 GHz
Center 2.441000	0000 GHZ		Start Freq 2.43950000 GHz
#Peak Log 10	» *		Stop Freq 2.44250000 GHz
dB/ Offst 0.5 dB			CF Step 300.000000 kHz <u>Auto Mar</u>
Center 2.441 GHz #Res BW 30 kHz	#VBW 100 kHz	Span 3 Sweep 5 ms (401 p	
Occupied Band 1.1	width 996 MHz	Occ BW % Pwr 99.00 x dB -20.00 d	I On Off
Transmit Freq Error x dB Bandwidth	-19.376 kHz 1.274 MHz		

🔆 Agilent			RT	Freq/Channel
Ch Free Occupied Bandwi	dth		Trig Free	Center Freq 2.48000000 GHz
Center 2.48 Ref 10.5 dBm	Atten 20 dB			Start Freq 2.47850000 GHz
#Peak Log 10	→ A ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m. a.e		Stop Freq 2.48150000 GHz
dB/ Offst 0.5 dB			*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	CF Step 300.000000 kHz <u>Auto Mar</u>
Center 2.48 GHz #Res BW 30 kHz	#VBW 100	kHz Sweep 5	Span 3 MHz ms (401 pts)	Freq Offset 0.00000000 Hz
Occupied I	Bandwidth 1.1975 MHz	Occ BW % Pwr x dB	99.00 % -20.00 dB	Signal Track ^{On <u>Off</u>}
Transmit Freq Erro x dB Bandwidth	or -20.355 kHz 1.264 MHz			

5.6 Carrier Frequency Separation 5.6.1 Test Requirement

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

5.6.2 Test Procedure

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

Span=wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) ≤RBW

Sweep=auto

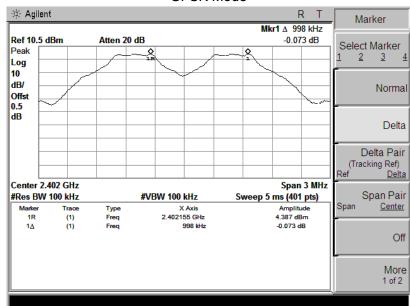
Detector function=peak

Trace=max hold

5.6.3 Test Result

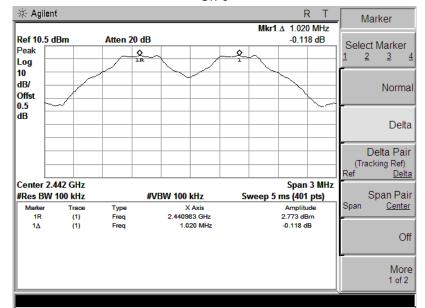
Test Item:	Carrier Frequency Separation	Temperature :	23°C
Tested by:	Kang (Engineer)	Relative Humidity :	65%

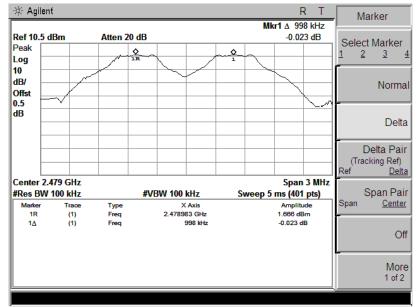
Mode	Channel	Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
חחח	Low	2402	0.998	0.930	Pass
BDR (GFSK)	Middle	2441	1.020	0.925	Pass
	High	2480	0.998	0.922	Pass
	Low	2402	1.005	0.845	Pass
EDR (π/4-DQPSK)	Middle	2441	1.013	0.841	Pass
$(\Pi/4-DQFSR)$	High	2480	0.998	0.842	Pass
	Low	2402	1.005	0.870	Pass
EDR (8DPSK)	Middle	2441	1.005	0.849	Pass
	High	2480	0.983	0.843	Pass

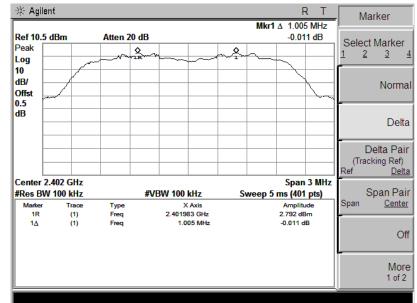


GFSK Mode

Ch 0

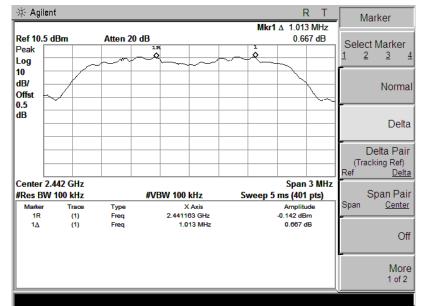


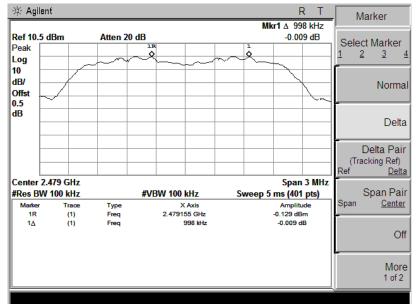


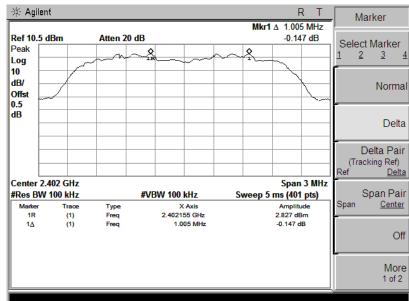


π/4-DQPSK Mode

Ch 0

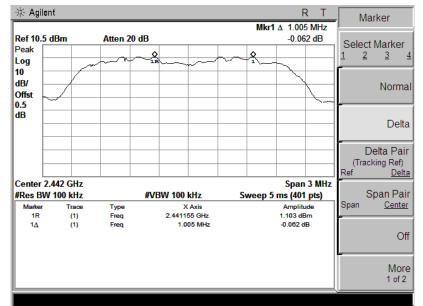


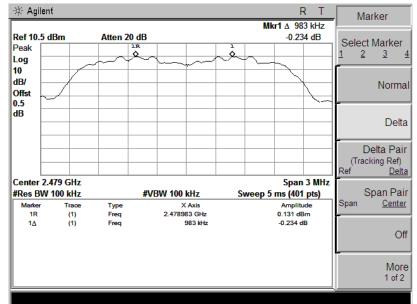




8DPSK Mode

Ch 0





5.7 Number of Hopping Channel 5.7.1 Test Requirement

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.7.2 Test Procedure

- 1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 2. Set the EUT in hopping mode from first channel to last.
- 3. By using the Max-Hold function record the Quantity of the channel.

5.7.3 Test Result

Test Item:	Number of Hopping Channel	Temperature :	23°C
Tested by:	Kang (Engineer)	Relative Humidity :	65%

Mode	Frequency Range (MHz)	Number of Hopping Channel	Limit
GFSK	2400-2483.5	79	≥15
π /4-DQPSK	2400-2483.5	79	≥15
8DPSK	2400-2483.5	79	≥15

*	Agil	ent								F	к т		Marker	
Ref Pea Log	ık [5 dBm		Atten 2	0 dB								ect Marl <u>2 3</u>	ker 4
10 dB/ Offs 0.5				MMM	THAT	NY NY						[No	rma
dB													D	elta
												(Tr Ref	Delta I acking F	
M1 S3												Span	Span <u>C</u> e	Pair enter
														Off
		4 GHz N 100 I	kHz		#VE	3W 300	kHz	Sweep	St p 8.599 i	top 2.48 ms (401				Nore of 2

GFSK Mode

🔆 Agil	ent								F	₹ T	Trac	e/View
Ref 10. Peak Log			Atten 2								1	Trace
10 dB/ Offst 0.5		hundhar	un Mund	whith	hwhwV	rtwh/h	Myr-Whr	vww	MMMM	www.		Clear Write
dB												Max Hold
												Min Hold
M1 S2 S3 FC AA												View
												Blank
Start 2. #Res B		kHz		#VE	3W 300	kHz	Sweep	St 5 8.599 i	op 2.483 ns (401			More 1 of 2

π/4-DQPSK

🔆 Agi	lent								R	Т	- Tr	ace/View
Ref 10. Peak	5 dBm		Atten 2	0 dB							1	Trace
Log 10 dB/ Offst 0.5	MMW	MrwWIIM	nhwrtift	nyt Made	White	white	n-wAWA	www.w	hwinaMha	~M/1		Clear Write
dB	ļ											Max Hold
										-		Min Hold
M1 S2 S3 FC AA												View
												Blank
Start 2. #Res B	.4 GHz W 100 I	kHz.		#VE	3W 300	kHz	Sweep		op 2.483 ms (401			More 1 of 2

8DPSK Mode

5.8 Dwell Time 5.8.1 Test Requirement

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.8.2 Test Procedure

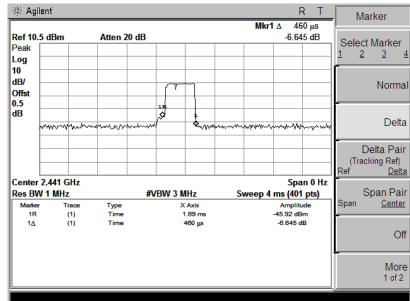
The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s Hop rate=1600/s

5.8.3 Test Result

Test Item:	Dwell Time	Temperature :	25°C
Tested by:	Kang (Engineer)	Relative Humidity :	65%

Mode	Packet	Pulse Time (ms)	Dwell Time(ms)	Limit(ms)	Result				
	DH1	0.460	147.20	400	Pass				
GFSK	DH3	1.750	280.00	400	Pass				
	DH5	2.990	318.94	400	Pass				
	2DH1	0.490	156.80	400	Pass				
π /4DQPSK	2DH3	1.740	278.40	400	Pass				
	2DH5	2.960	315.74	400	Pass				
	3DH1	0.490	156.80	400	Pass				
8DPSK	3DH3	1.710	273.60	400	Pass				
	3DH5	2.970	316.81	400	Pass				
Note: DH1/2DH1/3DH1: Dwell Time=Pulse Time(ms)X[(1600/2/79)X31.6]									
DH3/2D	DH3/2DH3/3DH3: Dwell Time= Pulse Time(ms)X[(1600/4/79)X31.6]								
DH5/2D	H5/3DH5: Dwell Time	e= Pulse Time(ms)>	<[(1600/6/79)X31	.6]					

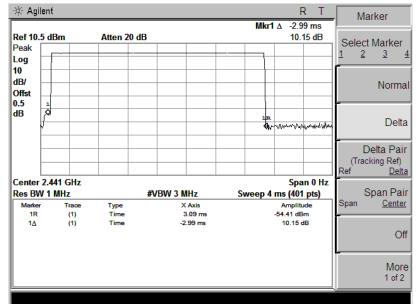


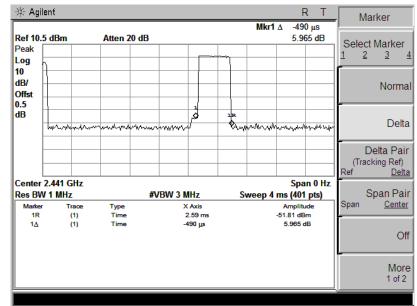
GFSK Mode

DH1

🔆 Agiler	nt			R T	Marker
				Mkr1 ∆ -1.75 ms	
Ref 10.5 Peak	dBm	Atten 20 dB		9.247 dB	Select Marker
Log					1 2 3
10					Norma
0.5 dB	1 0 		R R	way was a part of the second second second	Delta
_					Delta Pair (Tracking Ref) Ref Delta
Center 2.				Span 0 Hz	
Res BW 1			BW 3 MHz	Sweep 4 ms (401 pts)	Span Pai
Marker 1R	Trace (1)	Type Time	X Axis 2.23 ms	Amplitude -53.61 dBm	Span <u>Center</u>
1Δ	(1)	Time	-1.75 ms	9.247 dB	Of
					More
					1 of 2

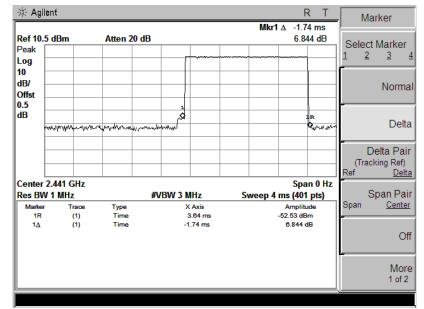
DH3



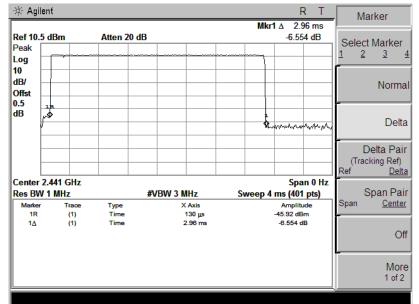


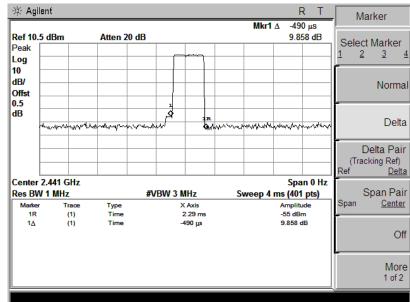
π/4-DQPSK Mode

DH1



DH3



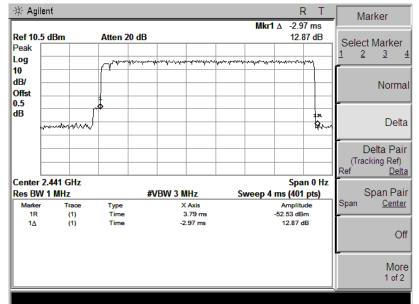


8DPSK Mode

DH1

🔆 Ag	ilent			R	T Marker
Ref 10	.5 dBm	Atten 20 dE	}	Mkr1 ∆ 1.71 -9.045	
Peak Log					<u>1 2 3 4</u>
10 dB/ Offst 0.5					Norma
dB	yname	ALE AN MANANA		• • • • • • • • • • • • • • • • • • •	ww.∿∽ Delta
					Delta Pair (Tracking Ref) Ref <u>Delta</u>
	r 2.441 GHz W 1 MHz		#VBW 3 MHz	Span Sweep 4 ms (401 p	ts) Span Pair
Marke 1R 1∆	(1)	Type Time Time	X Axis 1.13 ms 1.71 ms	Amplitude -45.56 dBm -9.045 dB	Span <u>Center</u>
14	(1)	Time	1.71 ms	-9.049 dB	Off
					More 1 of 2

DH3



5.9 Band Edge and Conducted Spurious Emissions 5.9.1 Test Requirement

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

5.9.2 Test Procedure

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
- 3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.

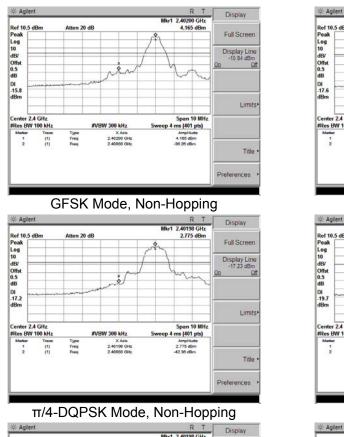
5.9.3 Test Result

Pass

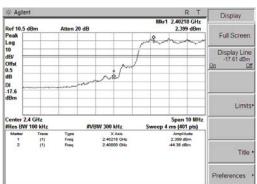
Remark:

During the Conducted Spurious Emissions test, pre-scan the GFSK, $\pi/4$ -QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.

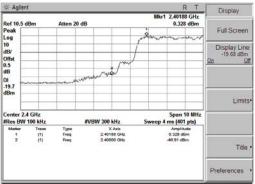
Test Item:	Band Edge	Temperature :	23°C
Tested by:	Kang (Engineer)	Relative Humidity :	65%



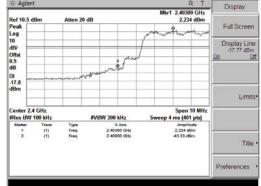
Band Edge, Left Side



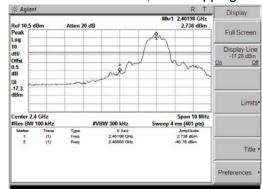
GFSK Mode, Hopping



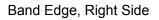
 π /4-DQPSK Mode, Hopping

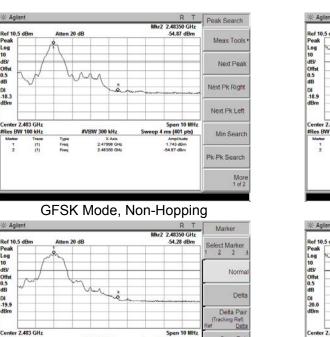


8DPSK Mode, Hopping



8DPSK Mode, Non-Hopping





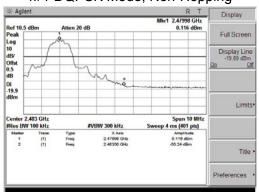
Ref 10.5 dB Peak Log 10 dB/ Offst 0.5 J DI -19.9 dBm Span 10 MH 4 ms (401 pts) Amplitude 0.12 dBm -54.28 dBm 2.483 GH Center 2,483 GHz #Res BW 100 kHz Mater Trace 1 (1) 2 (1) 7 300 kHz X Axis 2.48000 GHz 2.48350 GHz Span Pair Type Freq Freq Off More 1 of 2

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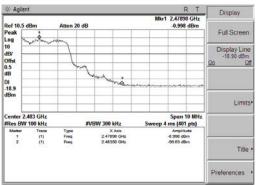
Ref 10.5 Peak Log 10 dB/ Offst 0.5 dB Di -18.3 dBm

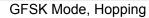
讲 Agilen

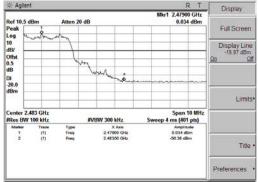
π/4-DQPSK Mode, Non-Hopping



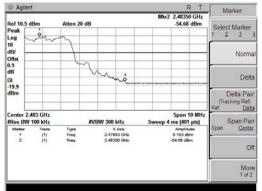
8DPSK Mode, Non-Hopping



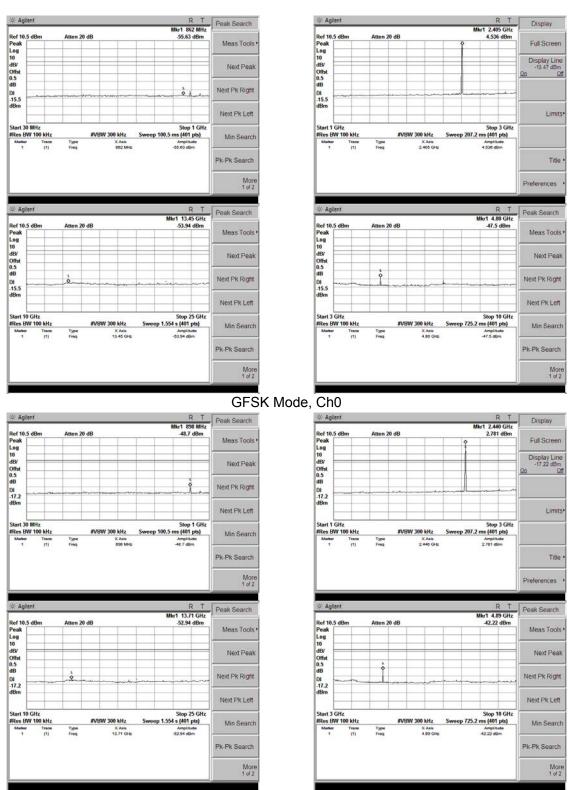




π/4-DQPSK Mode, Hopping



8DPSK Mode, Hopping



Conducted Spurious Emissions





Conducted Spurious Emissions

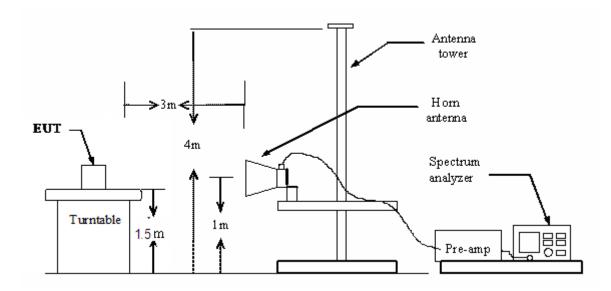
GFSK Mode, Ch78 π /4-DQPSK Mode, Hopping

5.10 Restricted Frequency Bands 5.10.1 Test Requirement

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. 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) (see §15.205(c)).

5.10.2 Test Configuration

Test Setup:



5.10.3 Test Procedure:

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

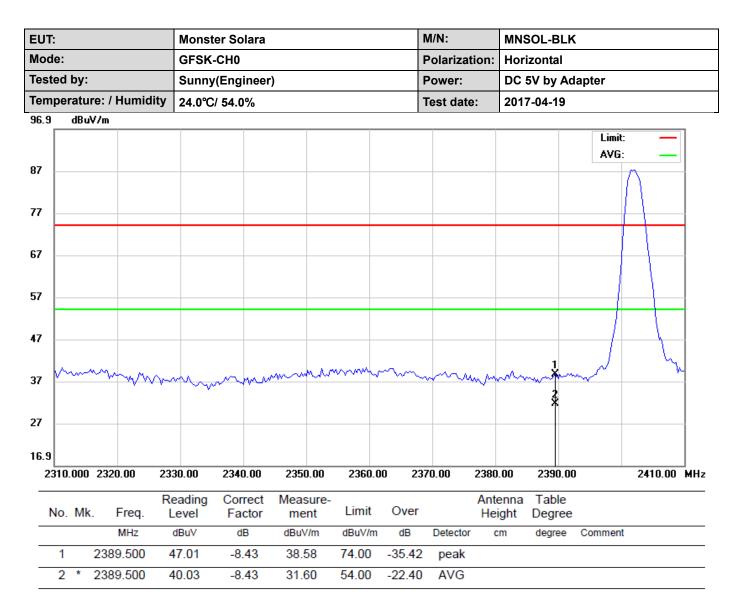
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

5.10.4 Test Result

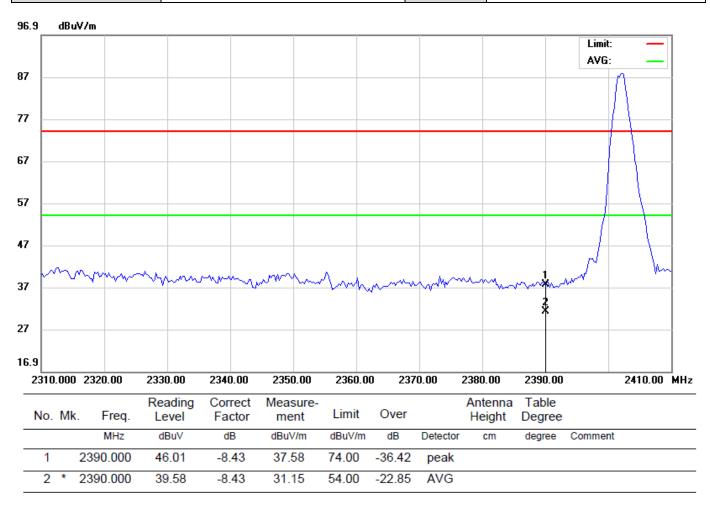
Pass

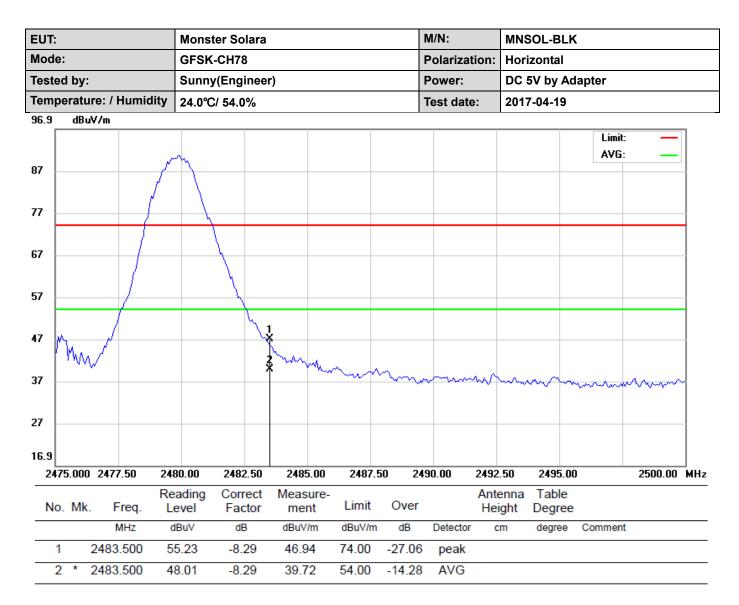
Note: All test modes are performed, only the worst case is recorded in this report.

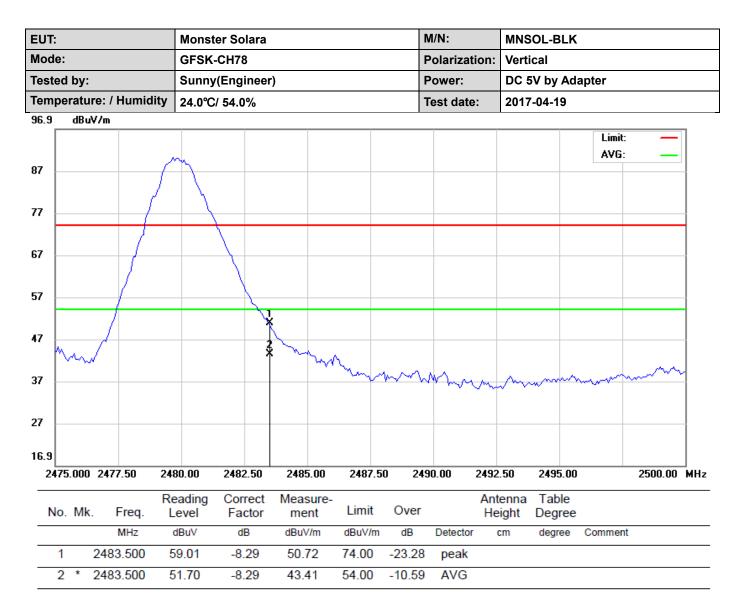
Please refer the following plots.

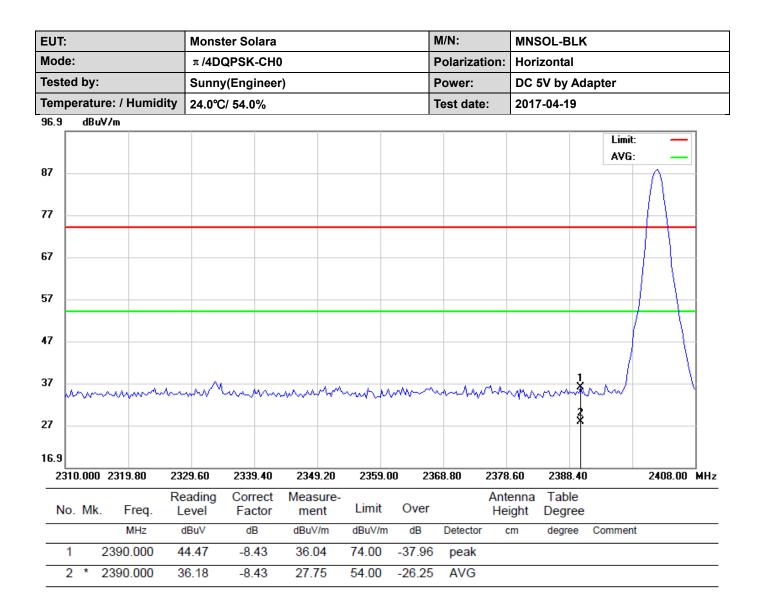


EUT:	Monster Solara	M/N:	MNSOL-BLK
Mode:	GFSK-CH0	Polarization:	Vertical
Tested by:	Sunny(Engineer)	Power:	DC 5V by Adapter
Temperature: / Humidity	24.0°C/ 54.0%	Test date:	2017-04-19

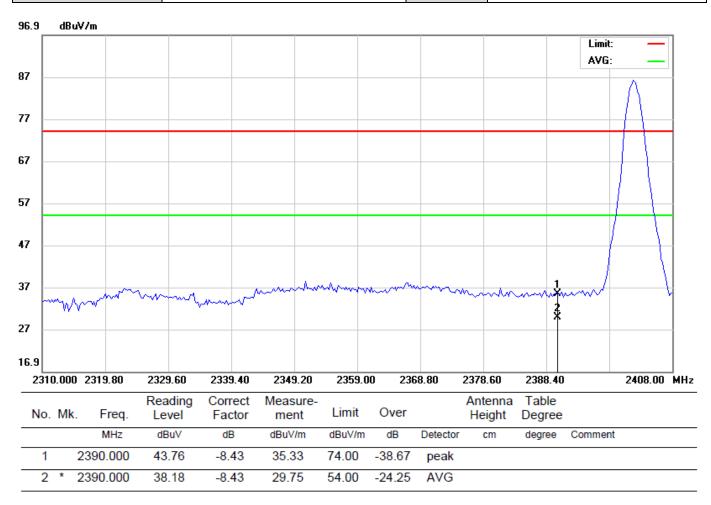




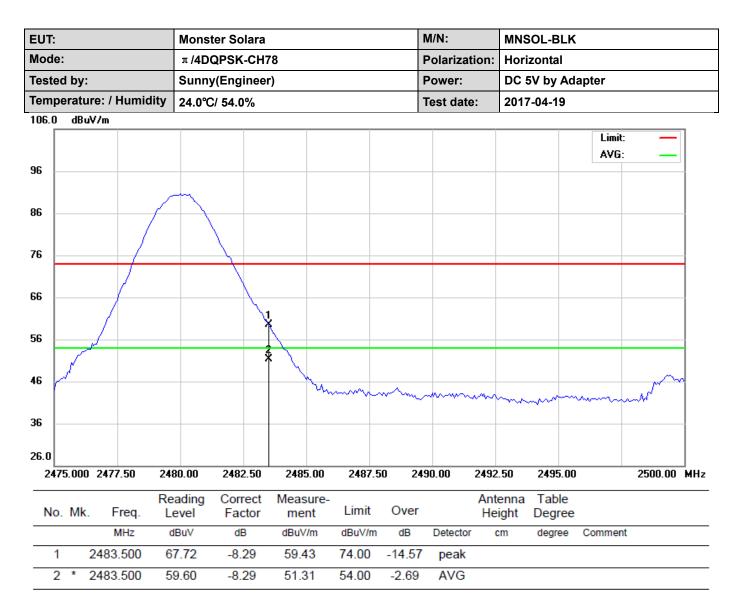


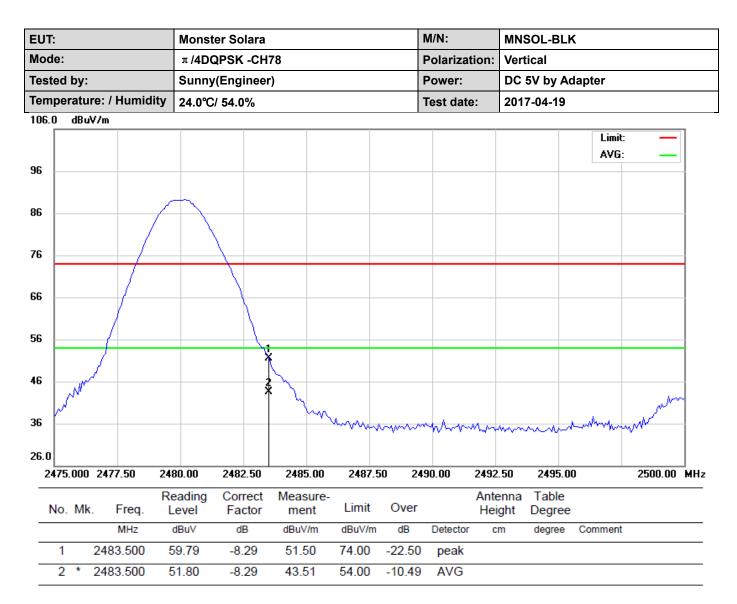


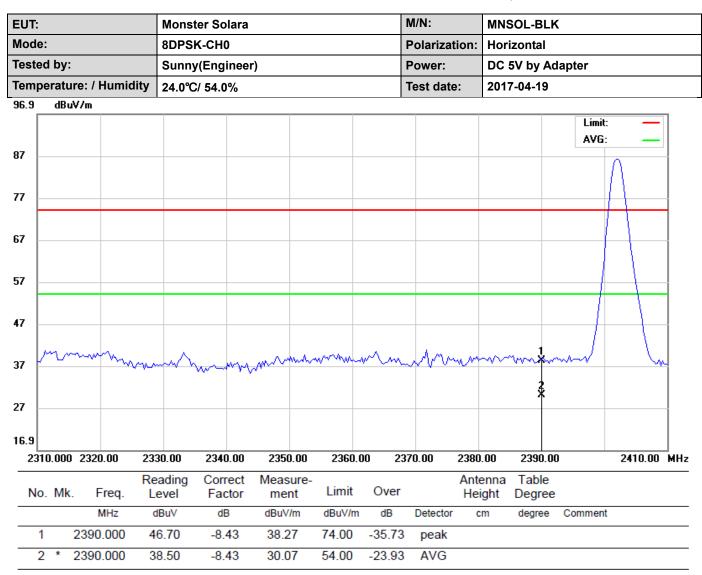
EUT:	Monster Solara	M/N:	MNSOL-BLK
Mode:	π /4DQPSK-CH0	Polarization:	Vertical
Tested by:	Sunny(Engineer)	Power:	DC 5V by Adapter
Temperature: / Humidity	24.0°C/ 54.0%	Test date:	2017-04-19



*:Maximum data x:Over limit !:over margin

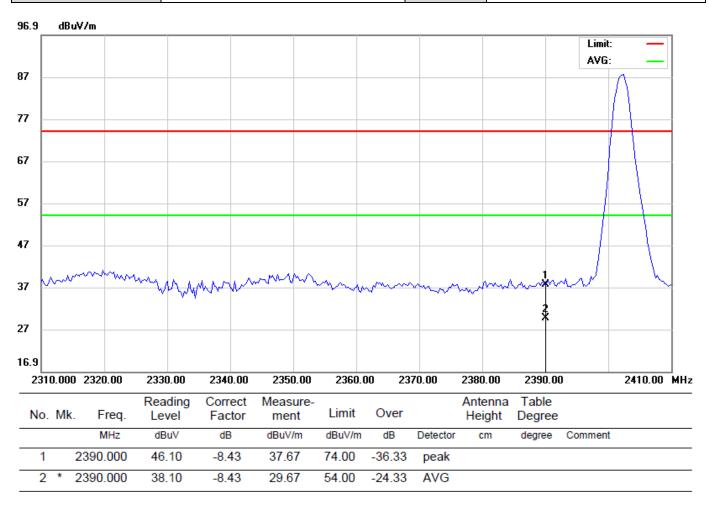


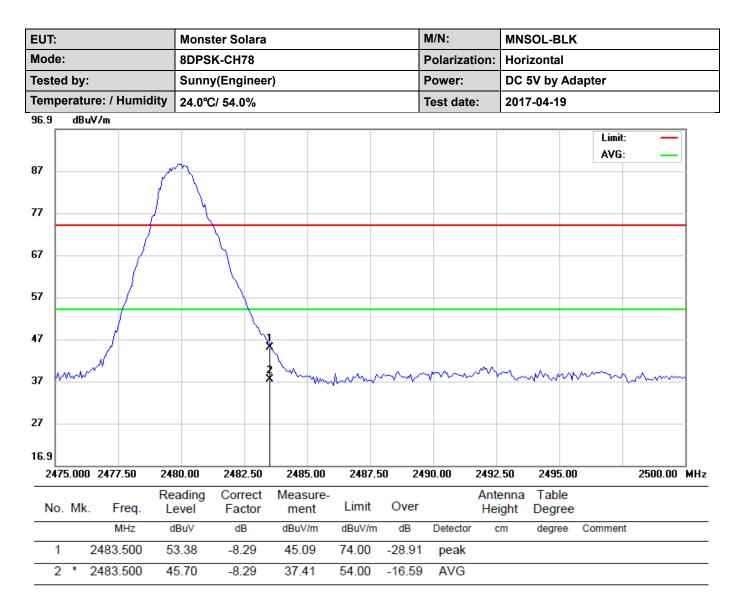


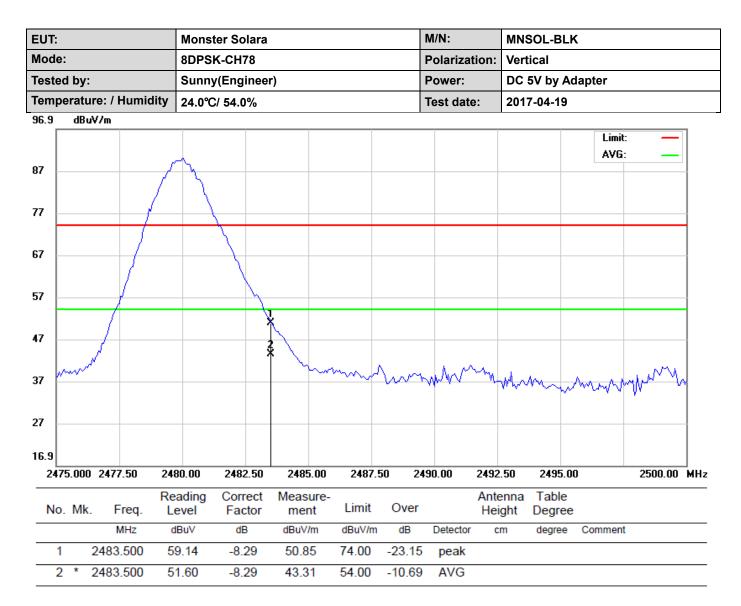


*:Maximum data x:Over limit !:over margin

EUT:	Monster Solara	M/N:	MNSOL-BLK
Mode:	8DPSK-CH0	Polarization:	Vertical
Tested by:	Sunny(Engineer)	Power:	DC 5V by Adapter
Temperature: / Humidity	24.0°C/ 54.0%	Test date:	2017-04-19







*:Maximum data x:Over limit !:over margin

End of the Report