

FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

Soundmax Electronics Limited

Car radio

Model Number: MGR450B

Additional Number: PGR45B

FCC ID: 2AB7S-MGR

Prepared By : Soundmax Electronics Limited
17/F EU YANG SANG TOWER, 11-15 CHATHAM ROAD,T.S.T,
KOWLOON Hong Kong China

Prepared By : EST Technology Co., Ltd.
Santun(guantai Road), Houjie Town, DongGuan City, GuangDong,
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Report Number : ESTE-R1703064
Date of Test : March 08,2017~ March 31,2017
Date of Report : April 05,2017

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Test Report Verification

Applicant:	Soundmax Electronics Limited		
Address:	117/F EU YANG SANG TOWER, 11-15 CHATHAM ROAD,T.S.T, KOWLOON Hong Kong China		
Manufacturer	Soundmax Electronics Limited		
Address:	117/F EU YANG SANG TOWER, 11-15 CHATHAM ROAD,T.S.T, KOWLOON Hong Kong China		
Factory	Team Force ELECTRONICS CO.,LTD		
Address:	FULONG INDUSTRIAL ZONE,FULONG VILLAGE,SHIPAI TOWN,DONGGUAN,GUANGDONG PROVINCE,P.R.CHINA		
E.U.T:	Car radio		
Model Number:	MGR450B		
Additional Number	PGR45B(model is different,the other is the same)		
Power Supply:	DC 12V		
Test Voltage:	DC 12V		
Trade Name:	SOUNDMAX	Serial No.:	-----
Date of Receipt:	March 08,2017	Date of Test:	March 08,2017~ March 31,2017
Test Specification:	FCC Rules and Regulations Part 15 Subpart C:2016 ANSI C63.10:2013		
Test Result:	The device described above is tested by EST Technology Co., Ltd.. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd. Date: Date of Report : April 05,2017		
Prepared by:	Tested by:	Approved by:	
			
Ada / Assistant	Tony.Tang/ Engineer	IcemanHu / Manager	
Other Aspects:	None.		
Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested			
This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.			

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	: Car radio
Model Number	: MGR450B
FCC ID	: 2AB7S-MGR
Operation frequency	: 2402MHz~2480MHz
Number of channel	: 79
Antenna	: Internal antenna, 0dBi gain
Modulation	: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK)
Sample Type	: Prototype production

2. SUMMARY OF TEST

2.1. Summary of test result

Description of Test Item	Standard	Results
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) DA 00-705	PASS
20dB Bandwidth	FCC Part 15: 15.215 DA 00-705	PASS
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) DA 00-705	PASS
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) DA 00-705	PASS
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) DA 00-705	PASS
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10: 2013 DA 00-705	PASS
Band Edge Compliance	FCC Part 15: 15.247(d) DA 00-705	PASS
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10: 2013 DA 00-705	N/A
Antenna requirement	FCC Part 15: 15.203	PASS
Note: 15.207 only signals conducted onto the AC power lines are required to be measured. The equipment is only DC power supply, so "Power Line Conducted Emissions" is not required.		

2.2. Test Facilities

EMC Lab : Certificated by CNAL, CHINA
Registration No.: L5288
Date of registration: December 07, 2015

Certificated by FCC, USA
Registration No.: 989591
Date of registration: November 15, 2016

Certificated by Industry Canada
Registration No.: 9405A-1
Date of registration: December 30, 2015

Certificated by VCCI, Japan
Registration No.: R-3663 & C-4103
Date of registration: July 25, 2011

Certificated by TUV Rheinland, Germany
Registration No.: UA 50195514 0001
Date of registration: January 07, 2011

Certificated by TUV/PS, Shenzhen
Registration No.: SCN1017
Date of registration: January 27, 2011

Certificated by Intertek ETL SEMKO
Registration No.: 2011-RTL-L1-18
Date of registration: April 28, 2011

Certificated by Siemic, Inc.
Registration No.: SLCN021
Date of registration: November 8, 2011

Certificated by Nemko, Hong Kong
Registration No.: 175193
Date of registration: May 4, 2011

Name of Firm : EST Technology Co., Ltd.

Site Location : San Tun Management Zone, Houjie Town, Dongguan,
Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.54dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.62dB
Uncertainty for Radiation Emission test (1GHz to 18GHz)	4.86dB
Uncertainty for radio frequency	7×10^{-8}
Uncertainty for conducted RF Power	0.20dB
Uncertainty for Power density test	0.26dB

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

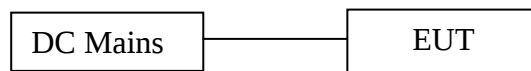
2.4. Assistant equipment used for test

2.4.1.

Trade Name	Model Number	Power Supply
YUASA	NPW45-12FR	DC12/45W

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 or 1.5 meter high above ground. EUT was be set into BT test mode by software before test.



(EUT: Car radio)

2.6. Test mode

The test software was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

Mode	Channel	Frequency
GFSK	Low	2402MHz
	Middle	2441MHz
	High	2480MHz
8-DPSK	Low	2402MHz
	Middle	2441MHz
	High	2480MHz
Note: "GFSK" and "8-DPSK" is the worst mode		

2.7. Channel List for Bluetooth

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2403	3	2404	4	2405
5	2406	6	2407	7	2408	8	2409
9	2410	10	2411	11	2412	12	2413
13	2414	14	2415	15	2416	16	2417
17	2418	18	2419	19	2420	20	2421
21	2422	22	2423	23	2424	24	2425
25	2426	26	2427	27	2428	28	2429
29	2430	30	2431	31	2432	32	2433
33	2434	34	2435	35	2436	36	2437
37	2438	38	2439	39	2440	40	2441
41	2442	42	2443	43	2444	44	2445
45	2446	46	2447	47	2448	48	2449
49	2450	50	2451	51	2452	52	2453
53	2454	54	2455	55	2456	56	2457
57	2458	58	2459	59	2460	60	2461
61	2462	62	2463	63	2464	64	2465
65	2466	66	2467	67	2468	68	2469
69	2470	70	2471	71	2472	72	2473
73	2474	74	2475	75	2476	76	2477
77	2478	78	2479	79	2480	-	-

2.8. Test Equipment

2.8.1. For conducted emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	832354	June,28,16	1 Year
Artificial Mains Networ	Rohde & Schwarz	ENV216	101260	June,28,16	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	101100	June,28,16	1 Year
Battery	YUASA	NPW45-12FR	12032239	N/A	N/A

2.8.2. For radiated emission test(30-1000MHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESVS10	100004	June,28,16	1 Year
Spectrum Analyzer	Agilent	E4411B	MY50140697	June,28,16	1 Year
Bilog Antenna	Teseq	CBL 6111D	27090	June,28,16	1 Year
Signal Amplifier	Agilent	310N	187037	June,28,16	1 Year
Battery	YUASA	NPW45-12FR	12032239	N/A	N/A

2.8.3. For radiated emission test(above 1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA9120D1002	June,28,16	1 Year
Signal Amplifier	SCHWARZBECK	BBV9718	9718-212	June,28,16	1 Year
Spectrum Analyzer	Agilent	E4408B	MY44211139	June,28,16	1 Year
Battery	YUASA	NPW45-12FR	12032239	N/A	N/A

3. MAXIMUM PEAK OUTPUT POWER

3.1. Limit

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, the e.i.r.p shall not exceed 4W

3.2. Test Procedure

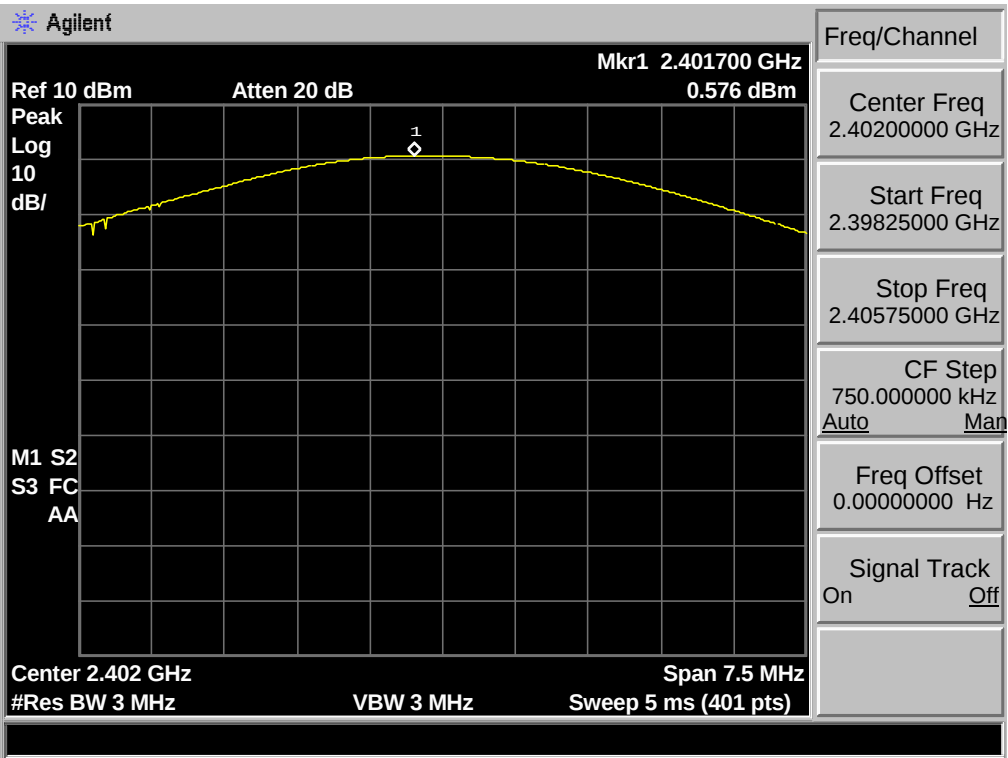
The transmitter output (antenna port) was connected to the spectrum analyzer

3.3. Test Result

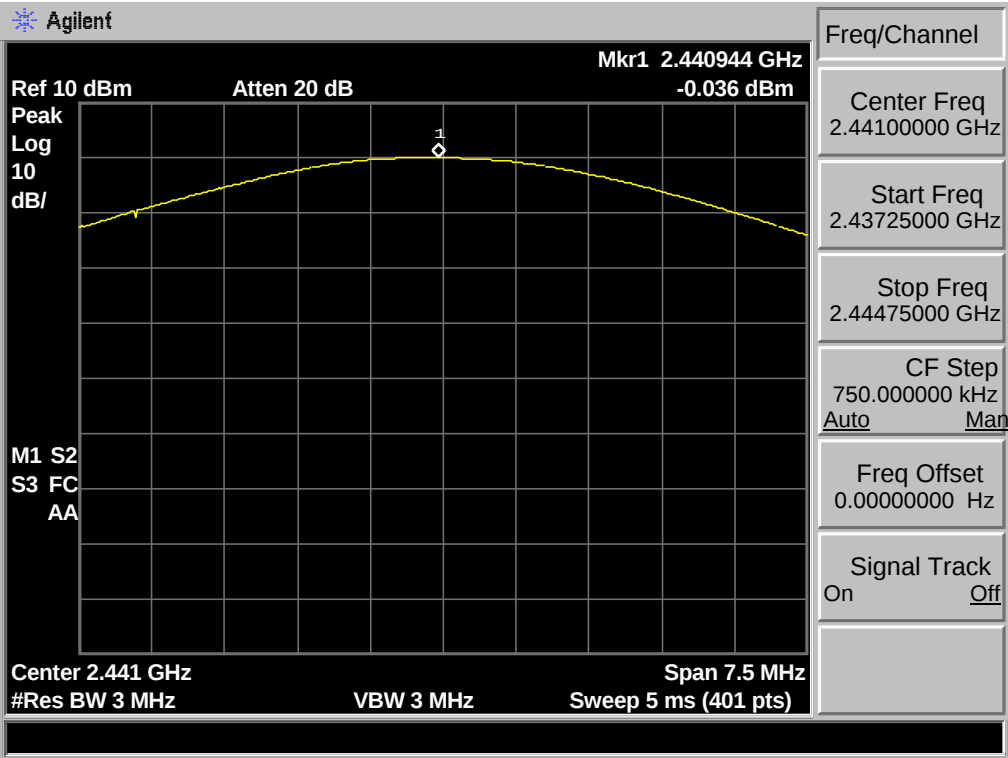
EUT: Car radio					
M/N: MGR450B					
Test date: 2017-03-24		Test site: RF site		Tested by: Tony Tang	
Mode	Freq (MHz)	Result (dBm)	Limit		Margin (dB)
			dBm	W	
GFSK	2402	0.576	30.00	1	29.424
	2441	-0.036	30.00	1	30.036
	2480	-1.040	30.00	1	31.040
8-DPSK	2402	0.003	21.00	0.125	20.997
	2441	-0.775	21.00	0.125	21.775
	2480	-1.836	21.00	0.125	22.836
Conclusion: PASS					

3.4. Test Data

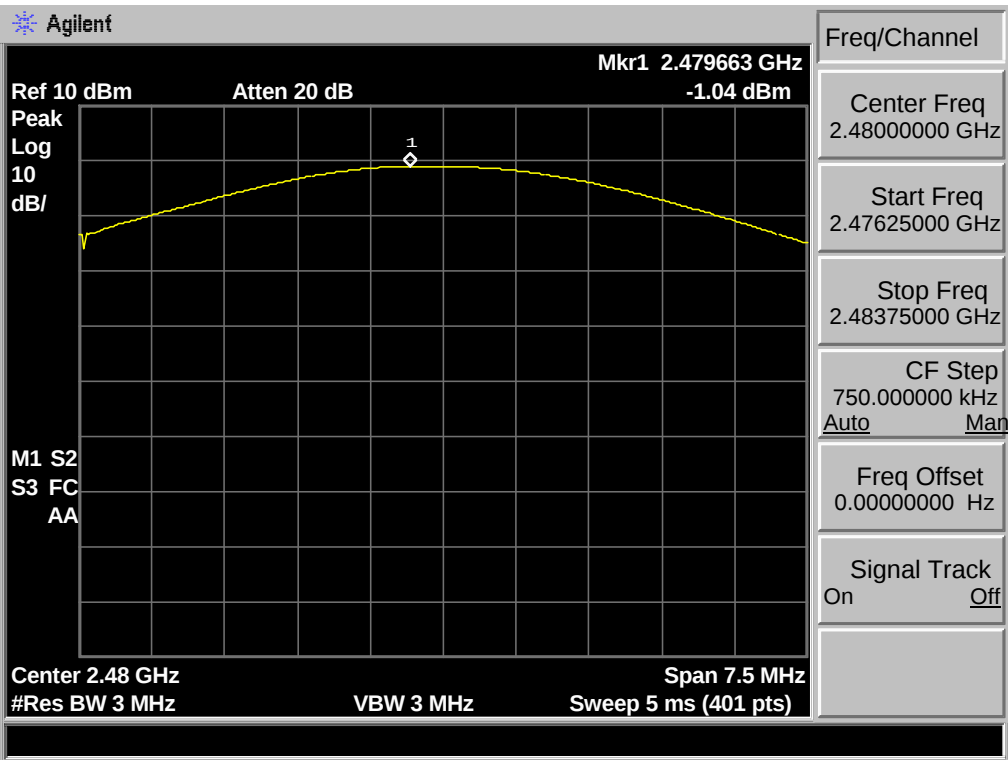
GFSK 2402 MHz



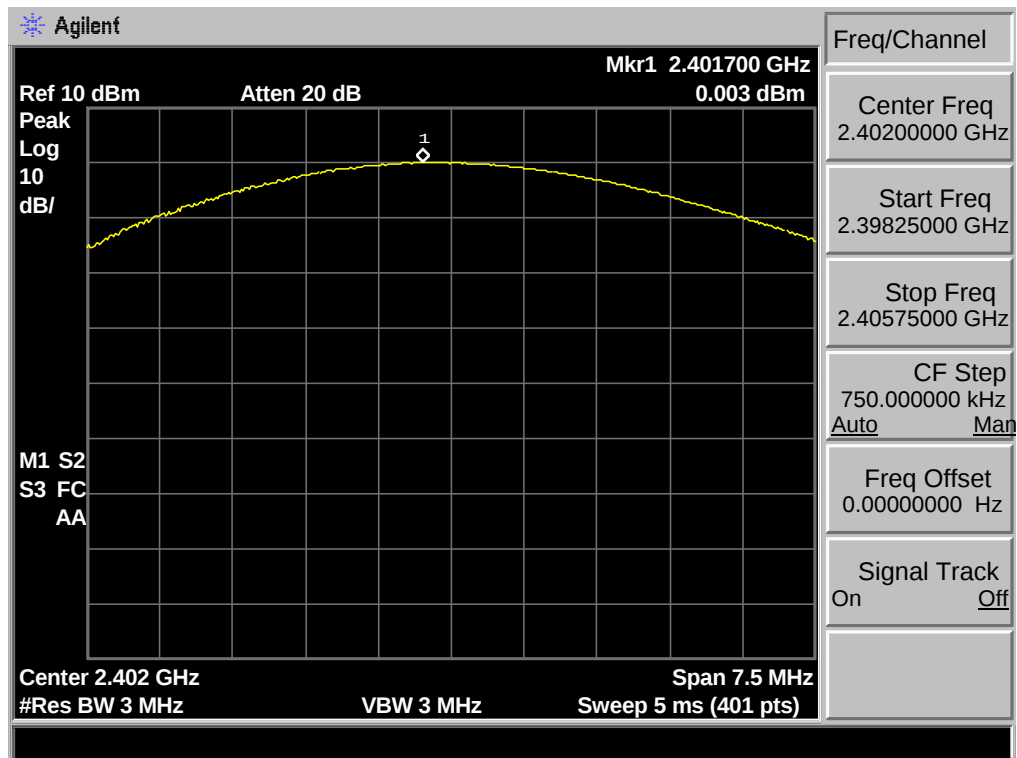
GFSK 2441 MHz



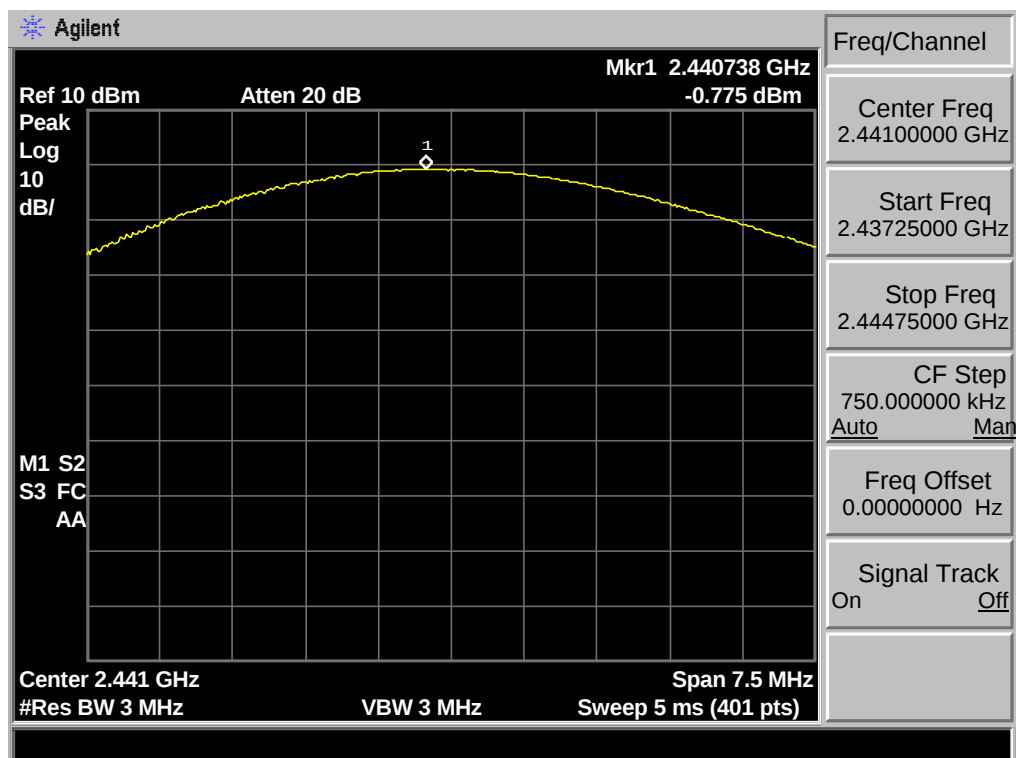
GFSK 2480 MHz



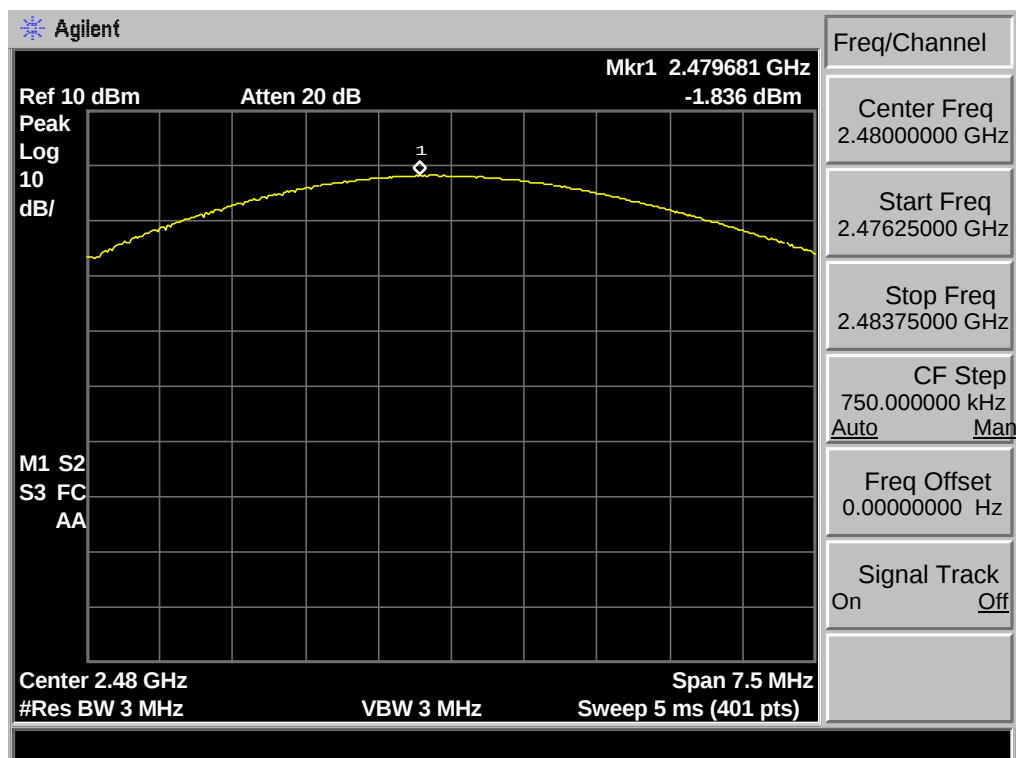
8-DPSK 2402 MHz



8-DPSK 2441 MHz



8-DPSK 2480 MHz



4. 20 DB BANDWIDTH

4.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.2. Test Procedure

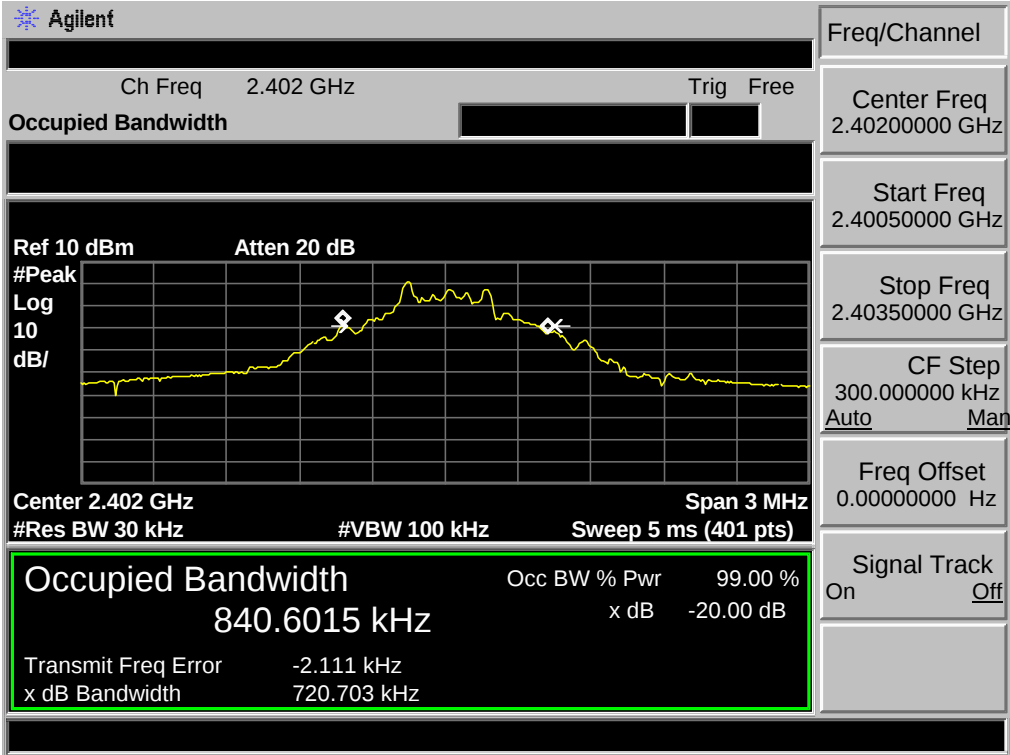
The transmitter output was coupled to a spectrum analyzer via a antenna. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.3. Test Result

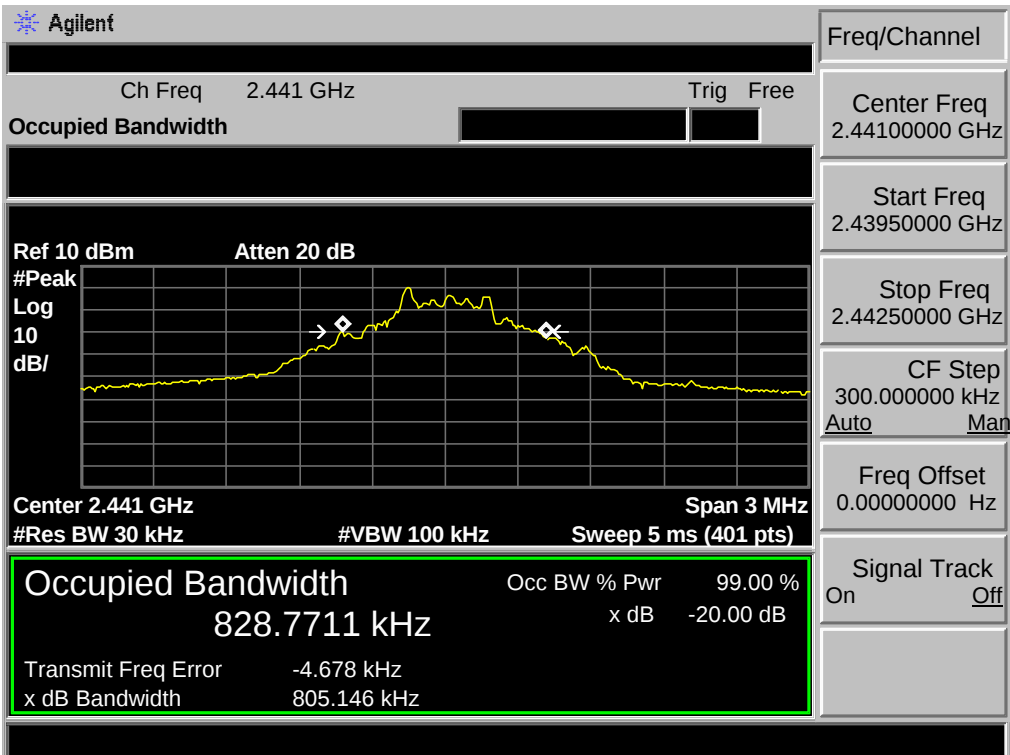
EUT: Car radio				
M/N: MGR450B				
Test date: 2017-03-24		Test site: RF site		Tested by: Tony Tang
Mode	Freq (MHz)	20dB Bandwidth (MHz)	Limit (kHz)	Conclusion
GFSK	2402	0.721	/	PASS
	2441	0.805	/	PASS
	2480	0.811	/	PASS
8-DPSK	2402	1.154	/	PASS
	2441	1.156	/	PASS
	2480	1.160	/	PASS

4.4. Test Data

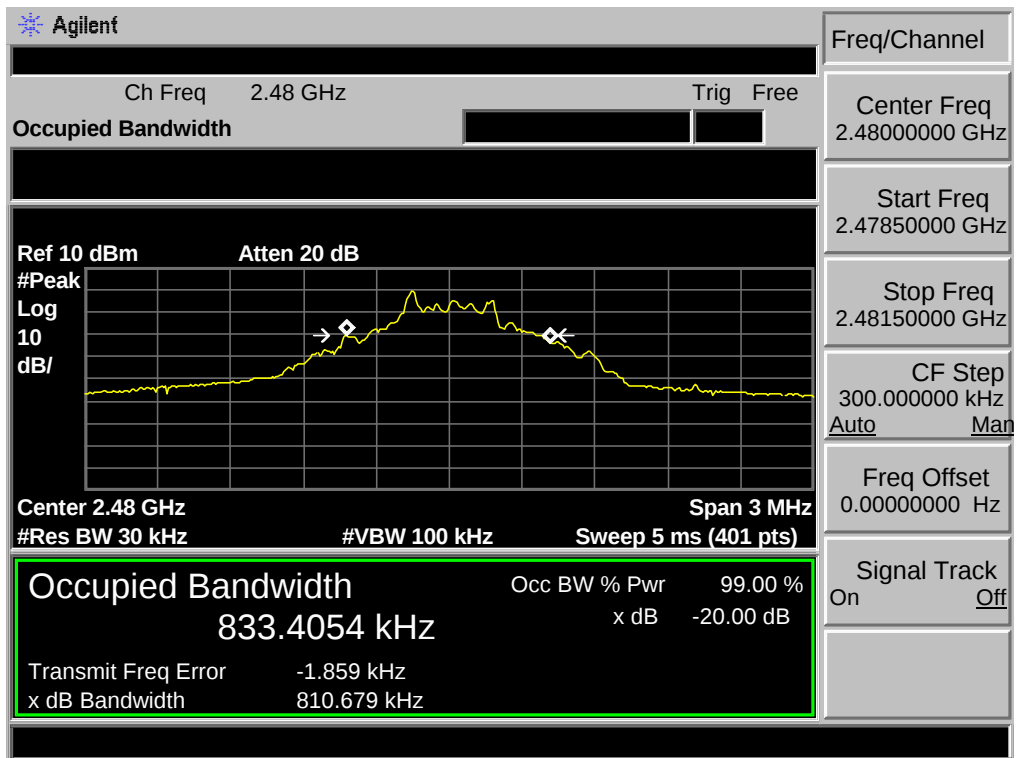
GFSK 2402MHz



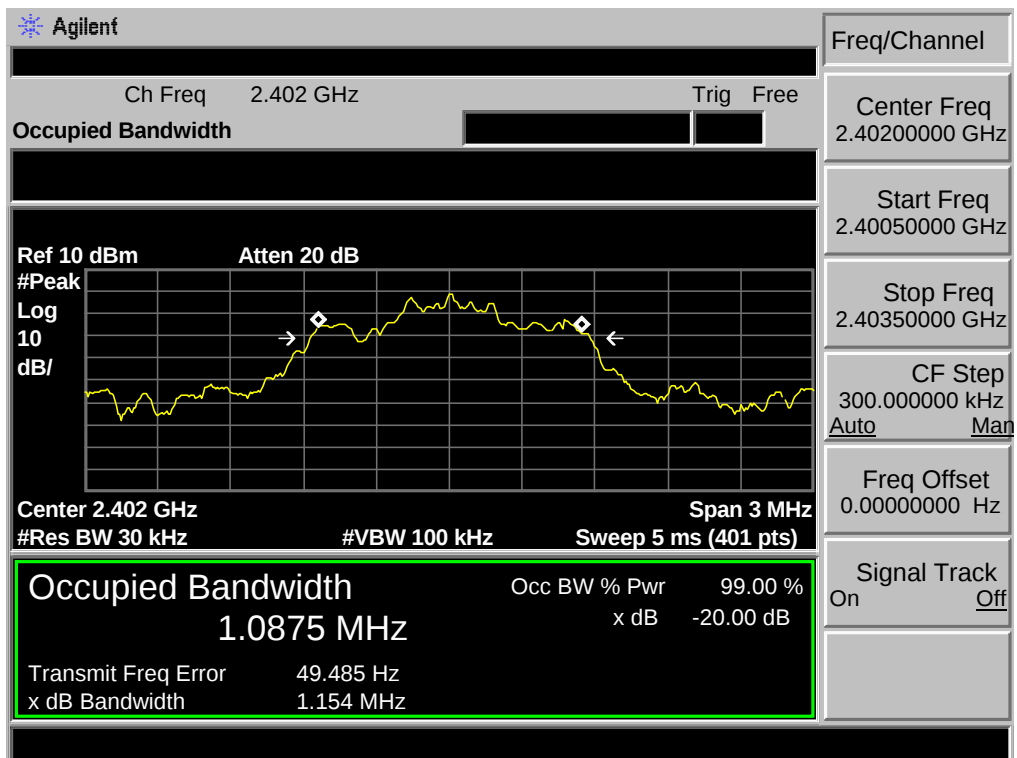
GFSK 2441MHz



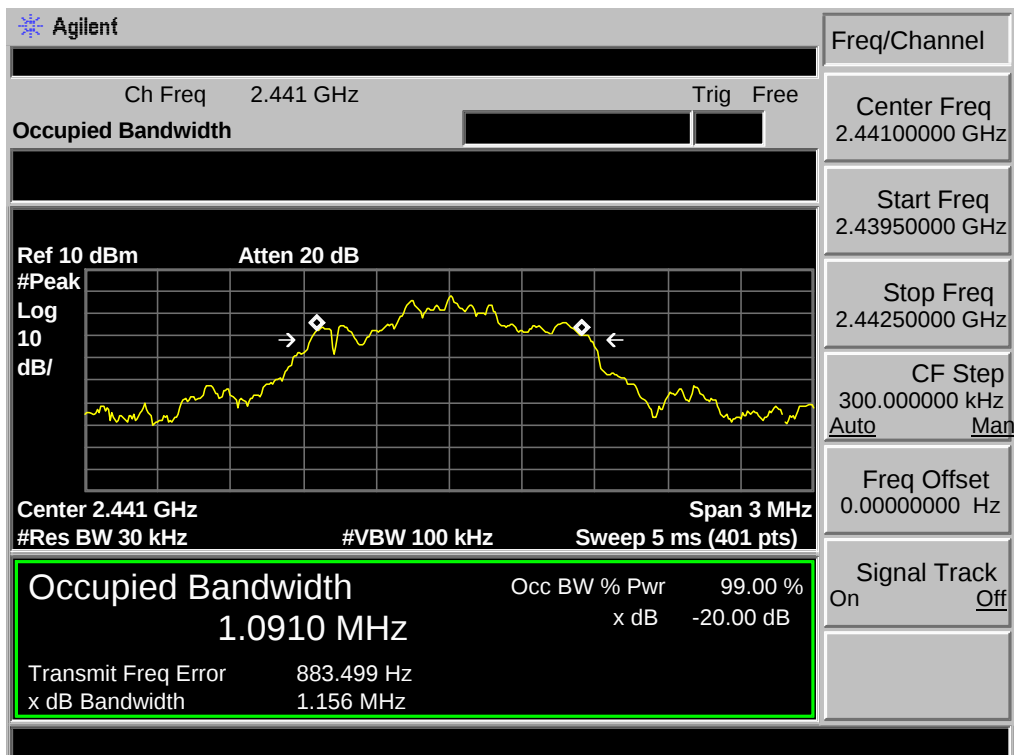
GFSK 2480MHz

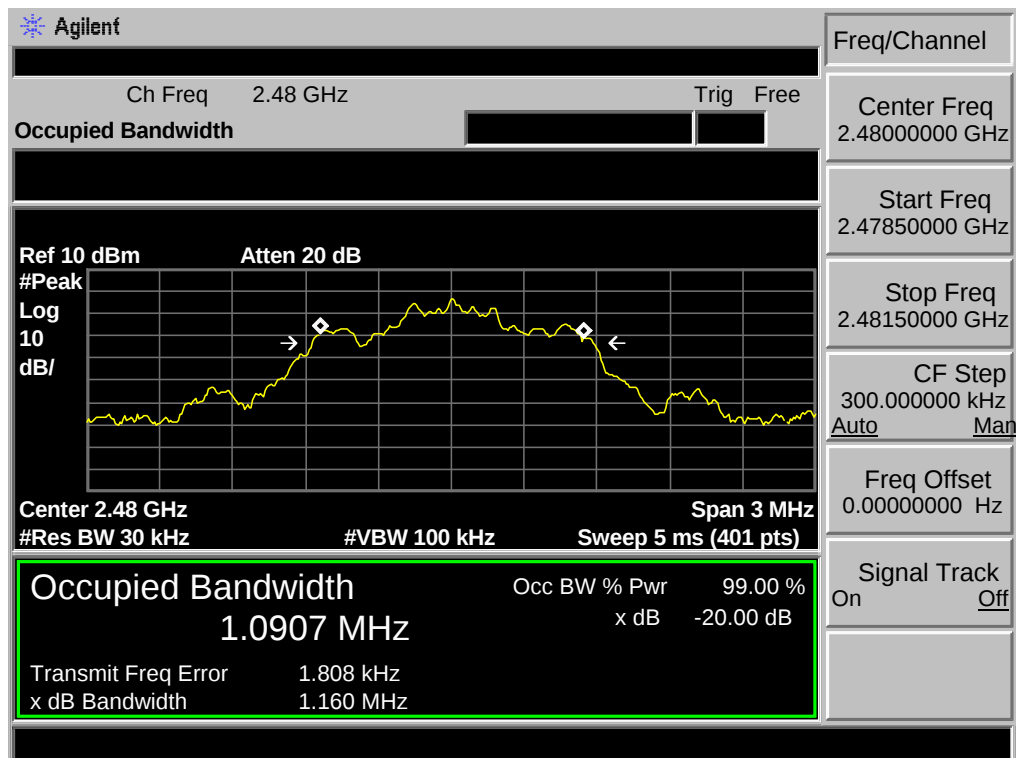


8-DPSK 2402MHz



8-DPSK 2441MHz



8-DPSK 2480MHz

5. CARRIER FREQUENCY SEPARATION

5.1. Limit

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

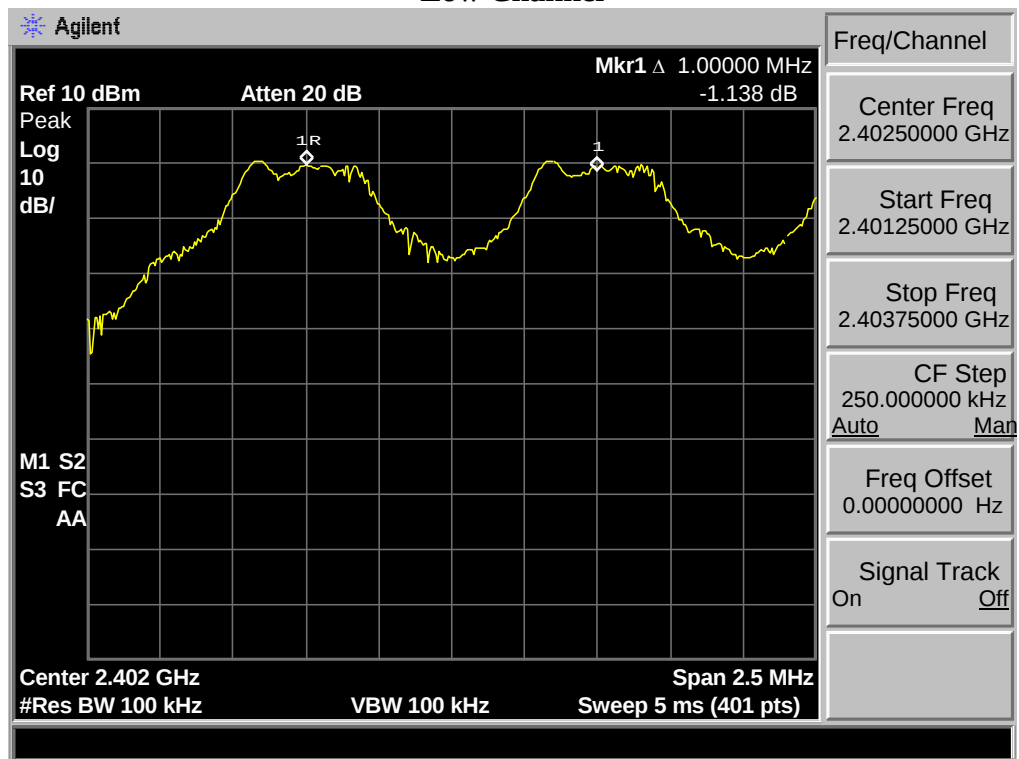
5.2. Test Procedure

The transmitter output was coupled to a spectrum analyzer via a antenna. The carrier frequency was measured by spectrum analyzer with 100kHz RBW and 100kHz VBW.

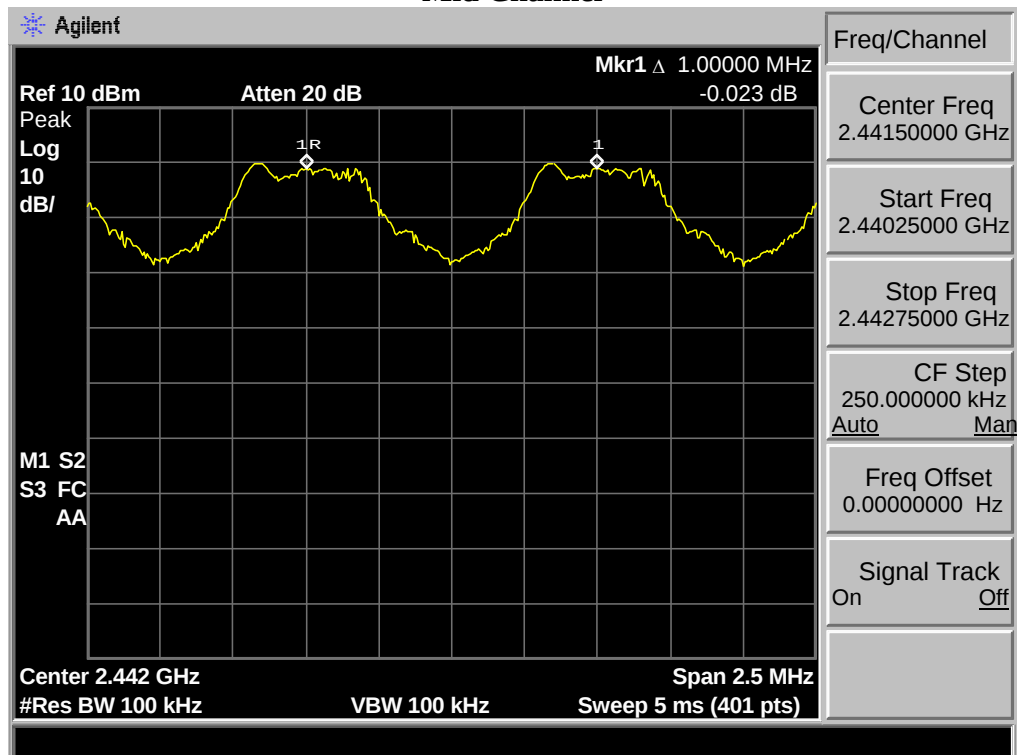
5.3. Test Result

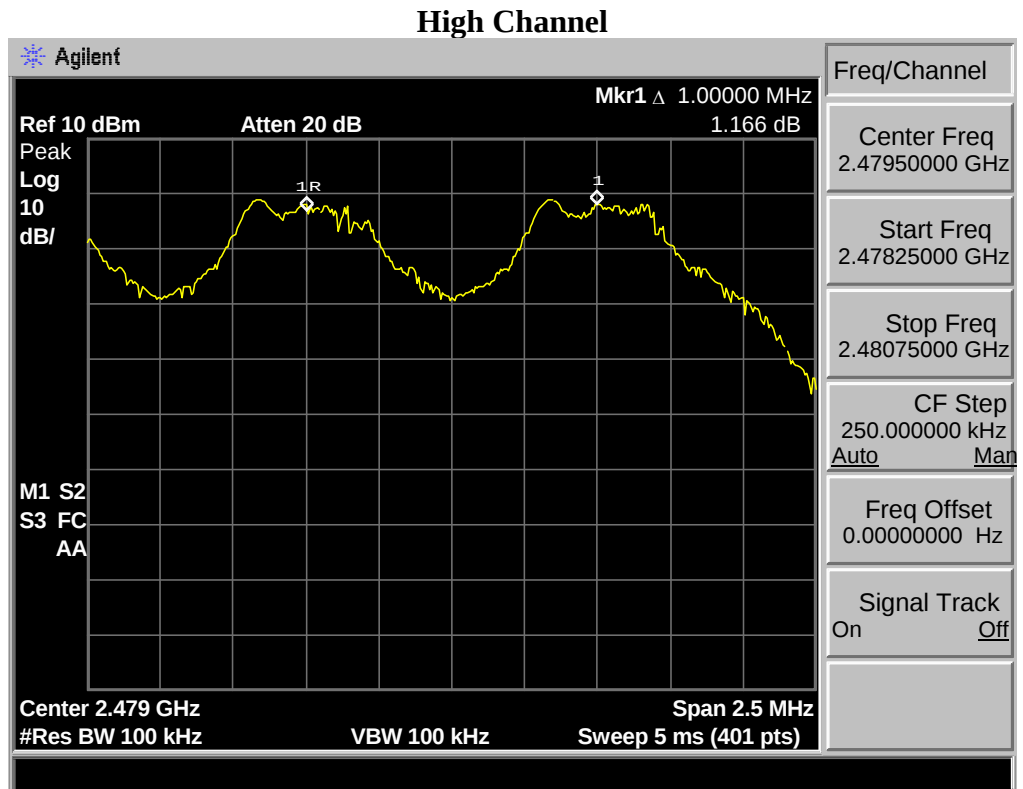
EUT: Car radio M/N: MGR450B				
Test date: 2017-03-24			Test site: RF site	Tested by: Tony Tang
Mode	Channel	Channel separation (MHz)	Limit	Conclusion
GFSK	Low CH	1.000	0.721 MHz	PASS
	Mid CH	1.000	0.805 MHz	PASS
	High CH	1.000	0.811 MHz	PASS
8-DPSK	Low CH	1.000	> 2/3 of the 20dB Bandwidth or 25[kHz](whichever is greater)	PASS
	Mid CH	1.000		PASS
	High CH	1.000		PASS

5.4. Test Data

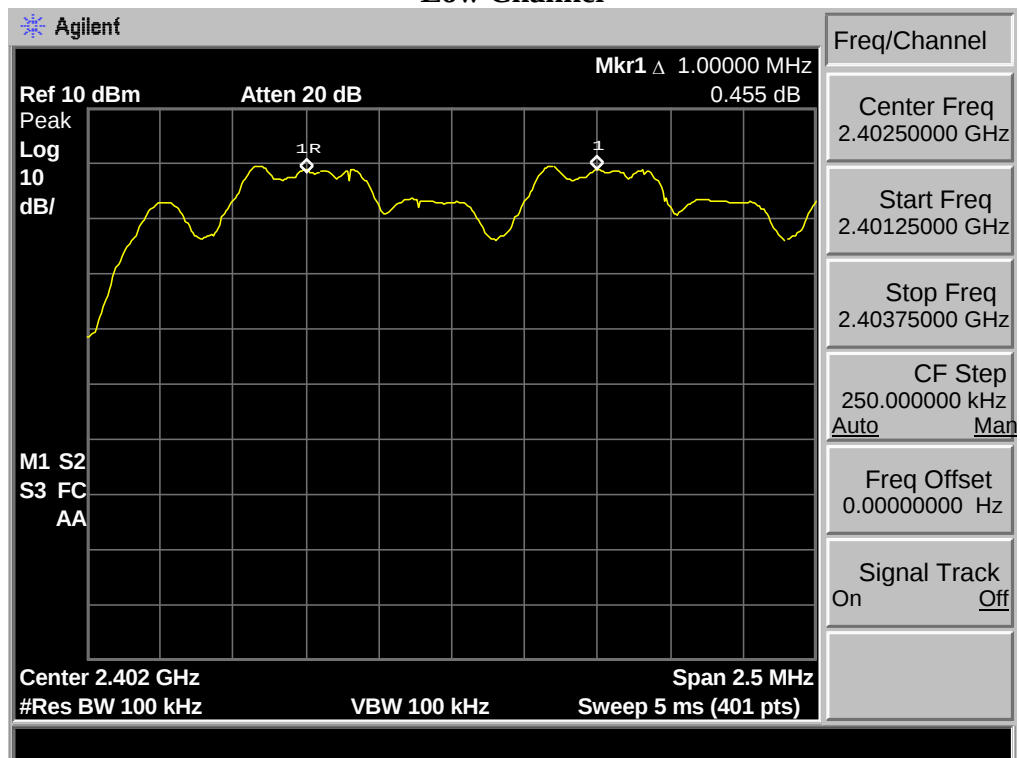
GFSK
Low Channel

Mid Channel

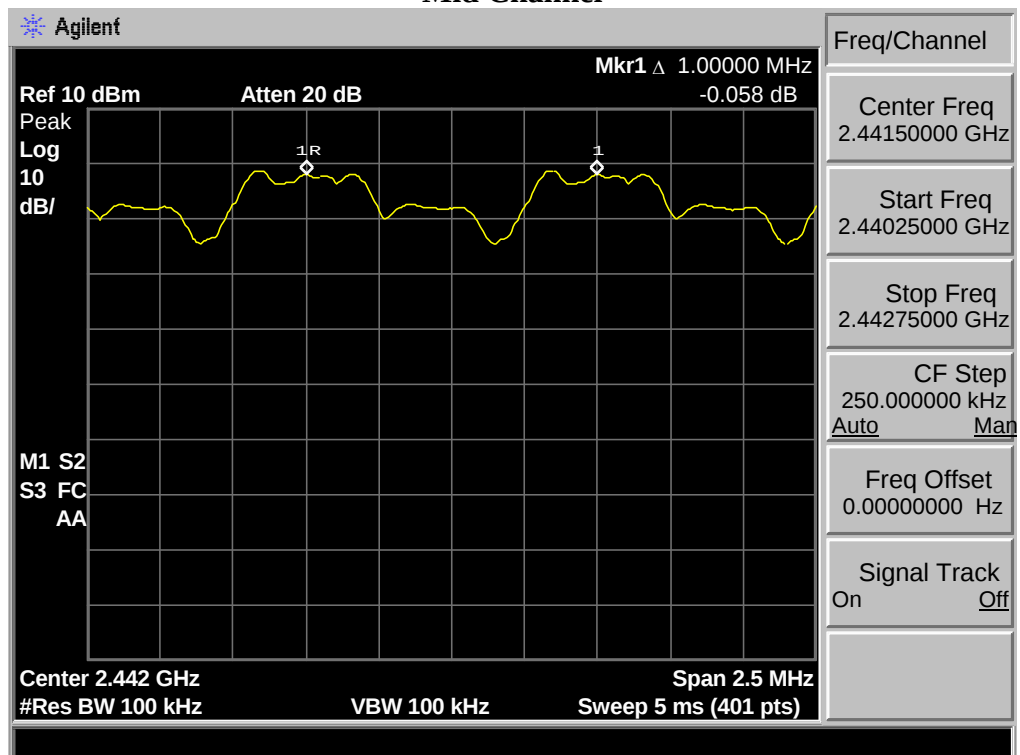


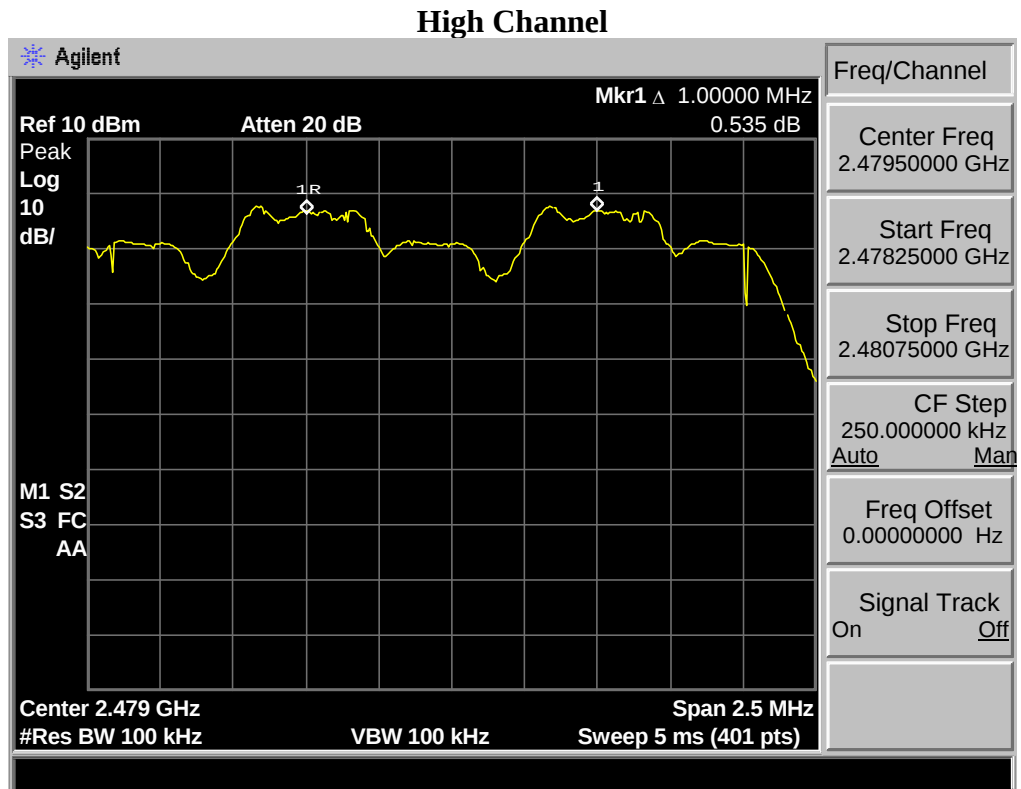


8-DPSK Low Channel



Mid Channel





6. NUMBER OF HOPPING CHANNEL

6.1. Limit

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

6.2. Test Procedure

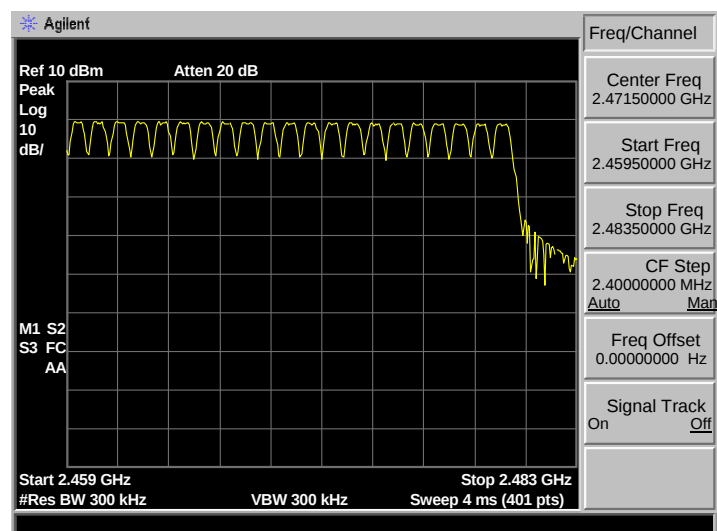
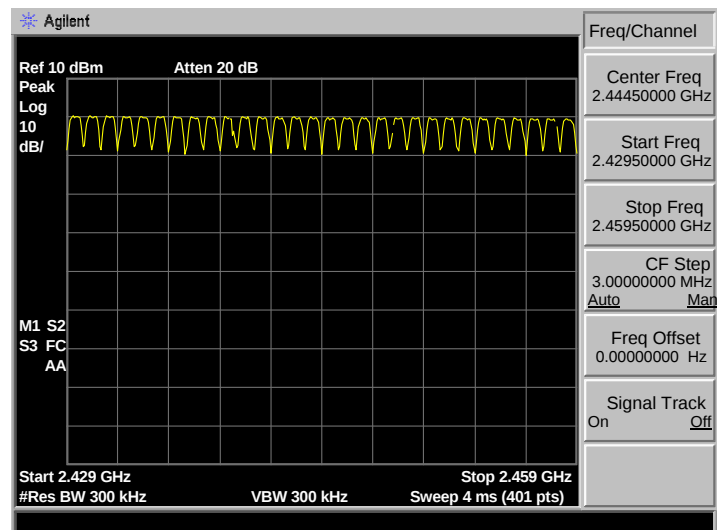
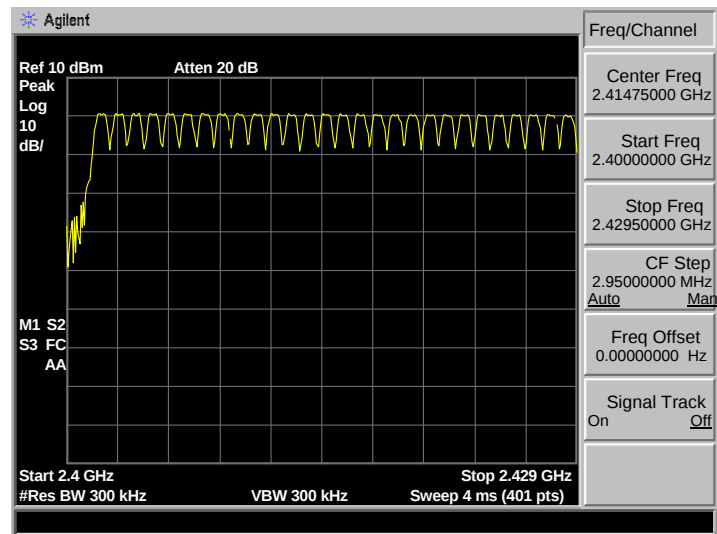
The transmitter output was coupled to a spectrum analyzer via a antenna. The number of hopping channel was measured by spectrum analyzer with 300kHz RBW and 300kHz VBW.

6.3. Test Result

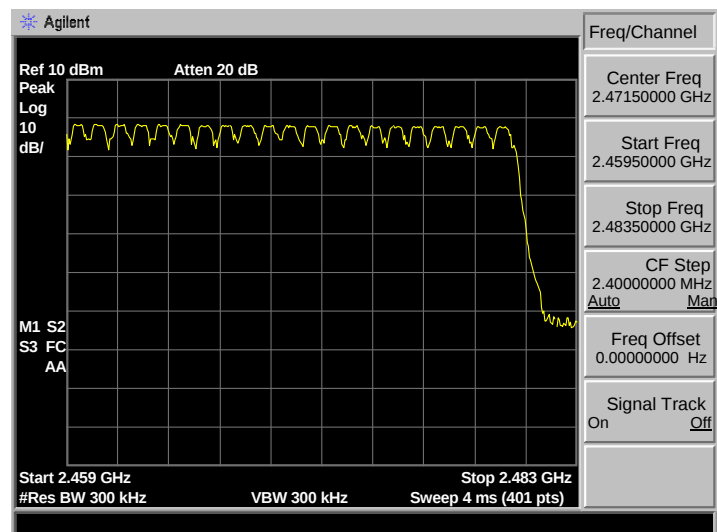
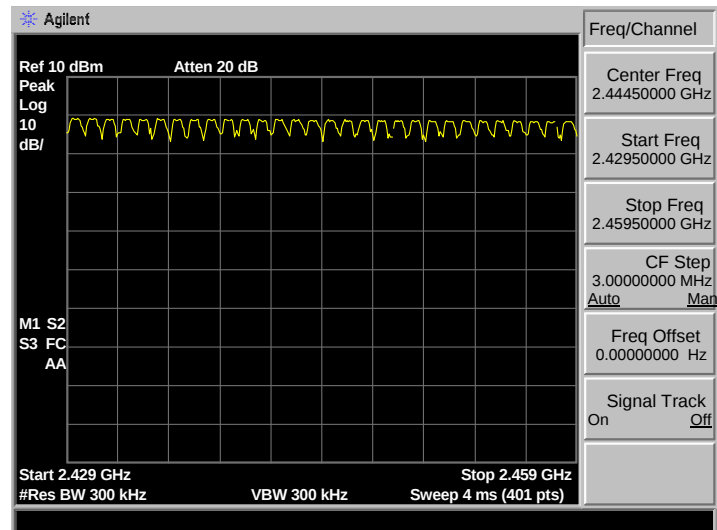
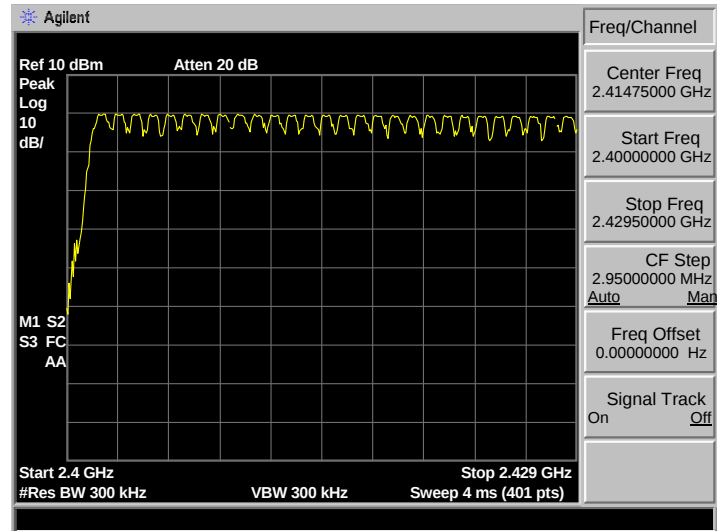
EUT: Car radio			
M/N: MGR450B			
Test date: 2017-03-24		Test site: RF site	Tested by: Tony.Tang
Mode	Number of hopping channel	Limit	Conclusion
GFSK	79	>15	PASS
8-DPSK	79	>15	PASS

6.4. Test Data

GFSK



8-DPSK



7. DWELL TIME

7.1. Limit

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.

7.2. Test Procedure

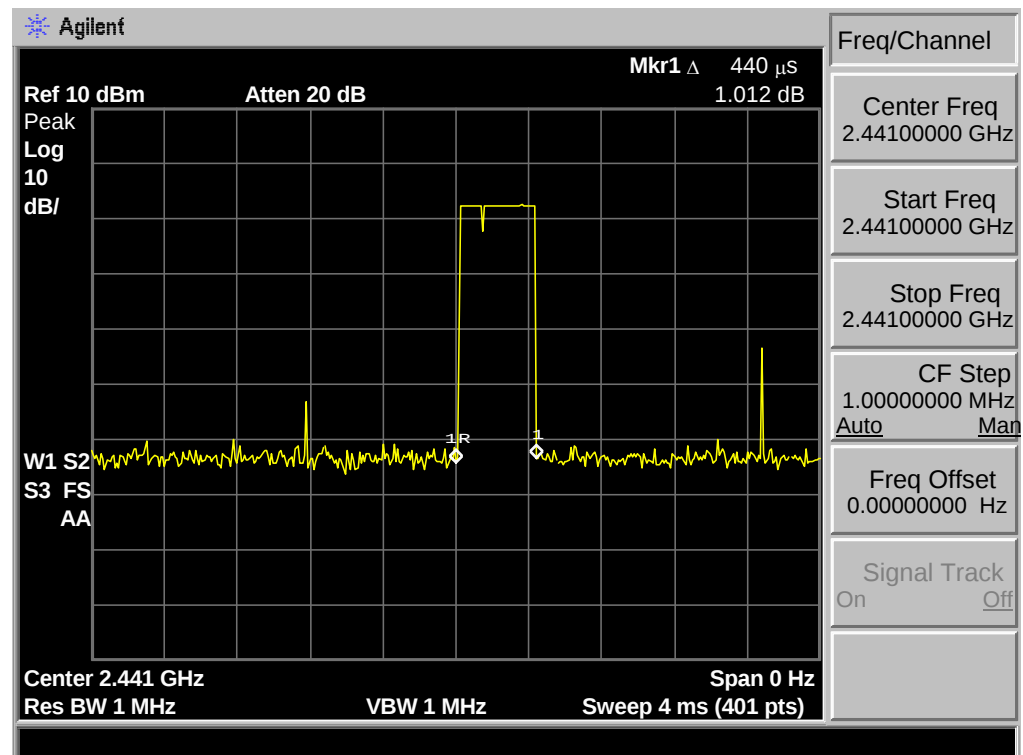
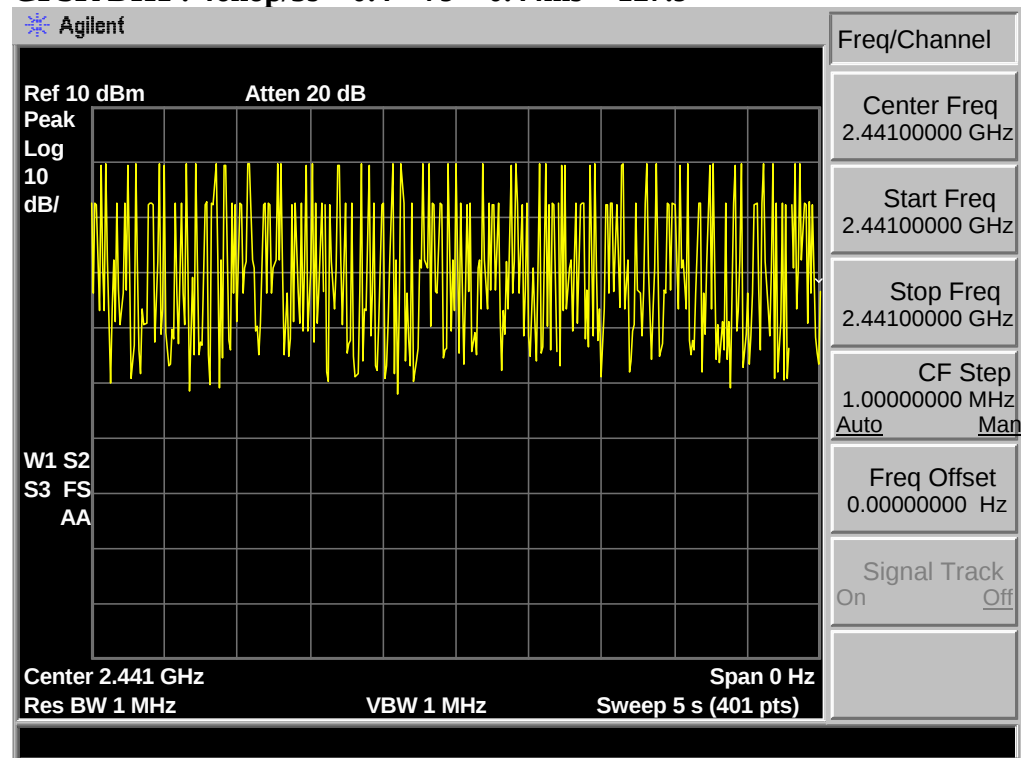
1. Connect the antenna port of the EUT to the spectrum analyzer by a low lost cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 1MHz, VBW= 1MHz, Frequency Span = 0 Hz.
4. Set sweep time properly to capture the entire dwell time per hopping channel.
5. Set detector type to Peak and trace mode to Max Hold and make the measurement.
6. Repeat step 3-5 until all channels measured were complete.

7.3. Test Result

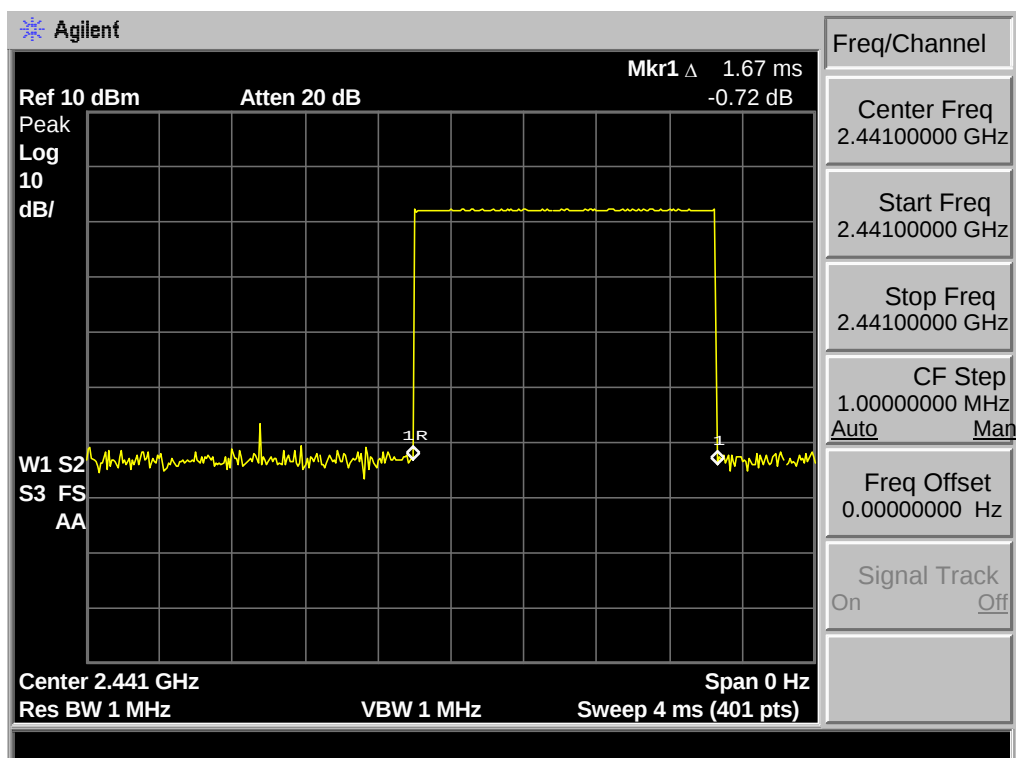
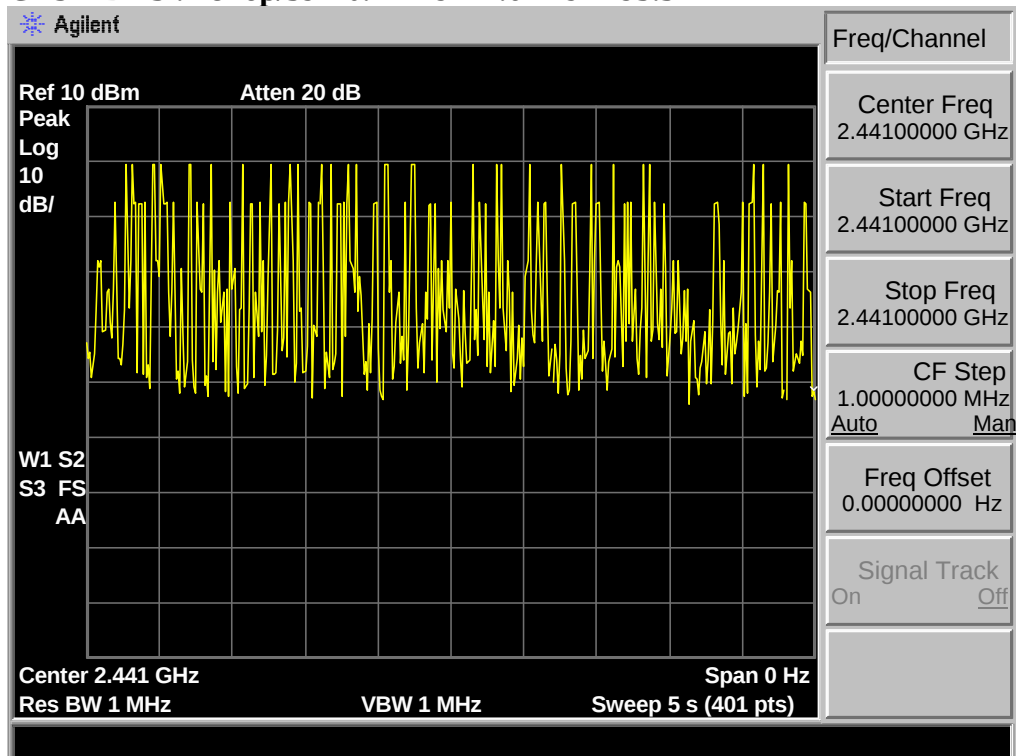
EUT: Car radio			
M/N: MGR450B			
Test date: 2017-03-24		Test site: RF site	Tested by: Tony Tang
Mode	Dwell time (ms)	Limit	Conclusion
GFSK DH1	127.9	<400ms	PASS
GFSK DH3	295.5	<400ms	PASS
GFSK DH5	278.7	<400ms	PASS
8-DPSK 3DH1	130.7	<400ms	PASS
8-DPSK 3DH3	290.1	<400ms	PASS
8-DPSK 3DH5	371.6	<400ms	PASS

7.4. Test Data

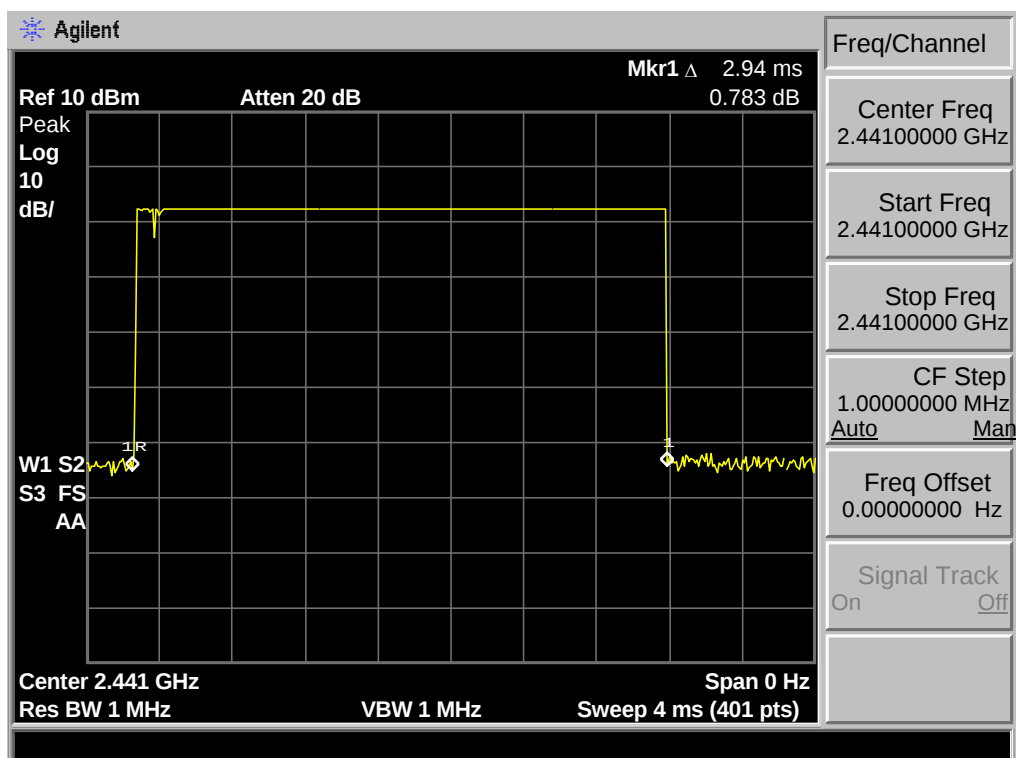
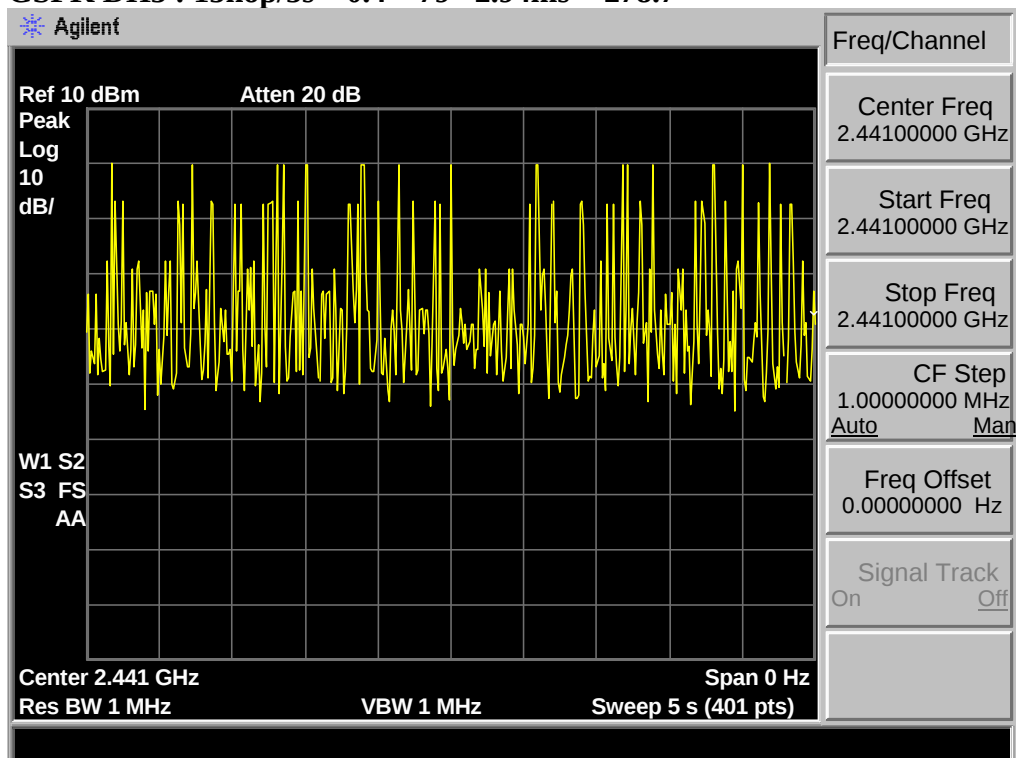
GFSK DH1 : $46\text{hop}/5\text{s} * 0.4 * 79 * 0.44\text{ms} = 127.9$



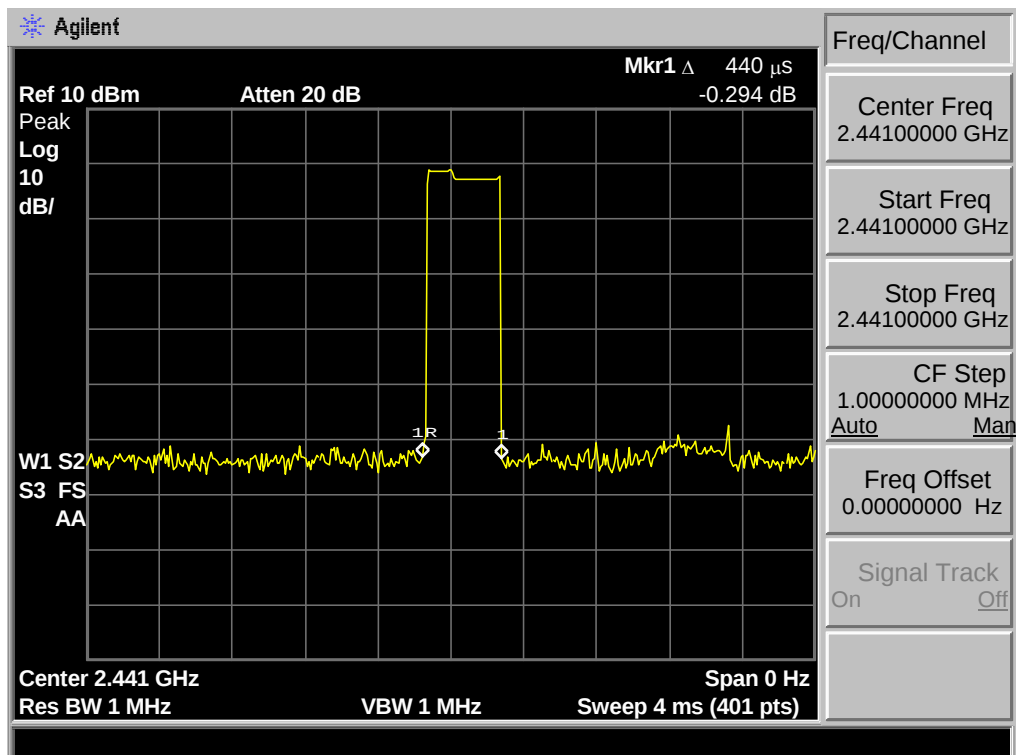
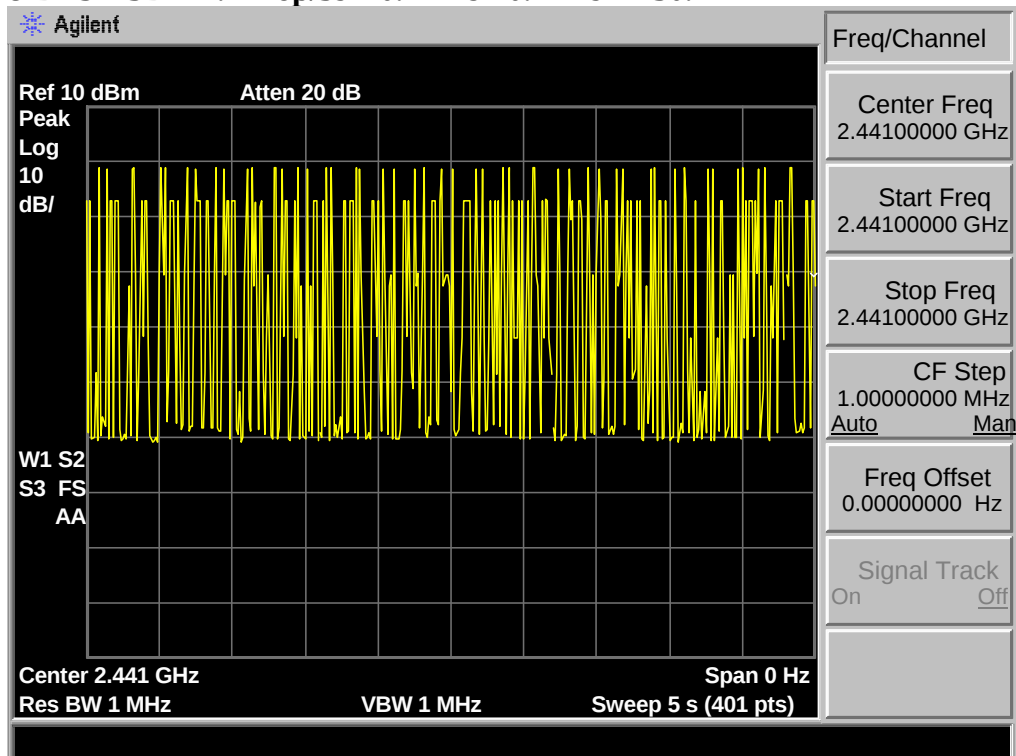
GFSK DH3 : $28\text{hop}/5\text{s} * 0.4 * 79 * 1.67\text{ms} = 295.5$



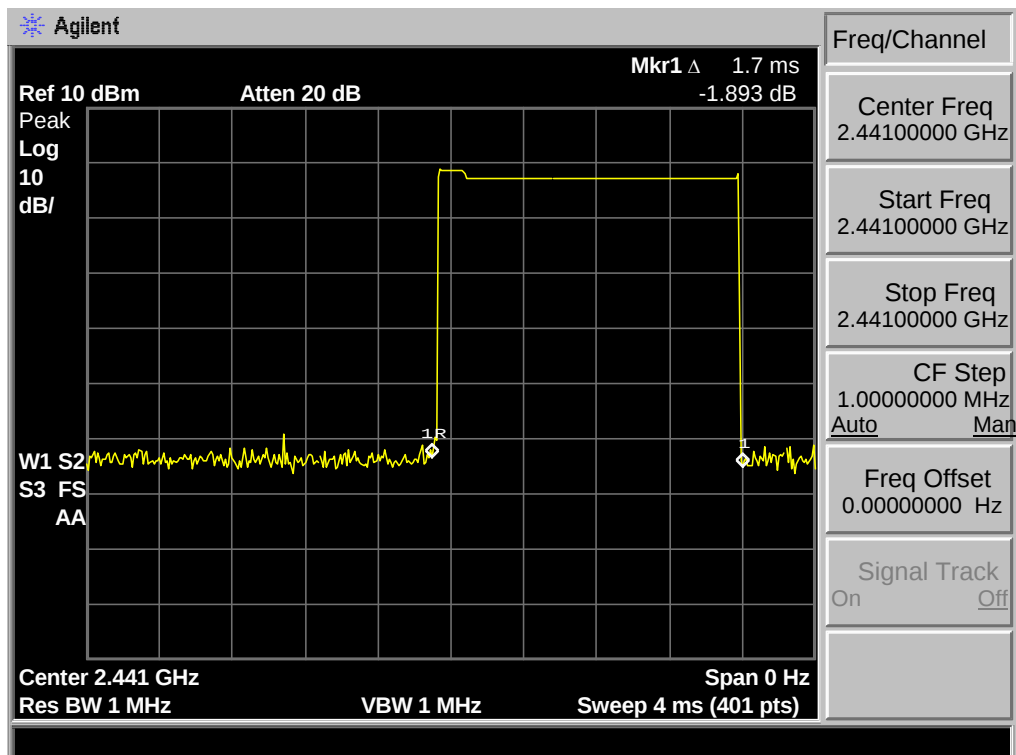
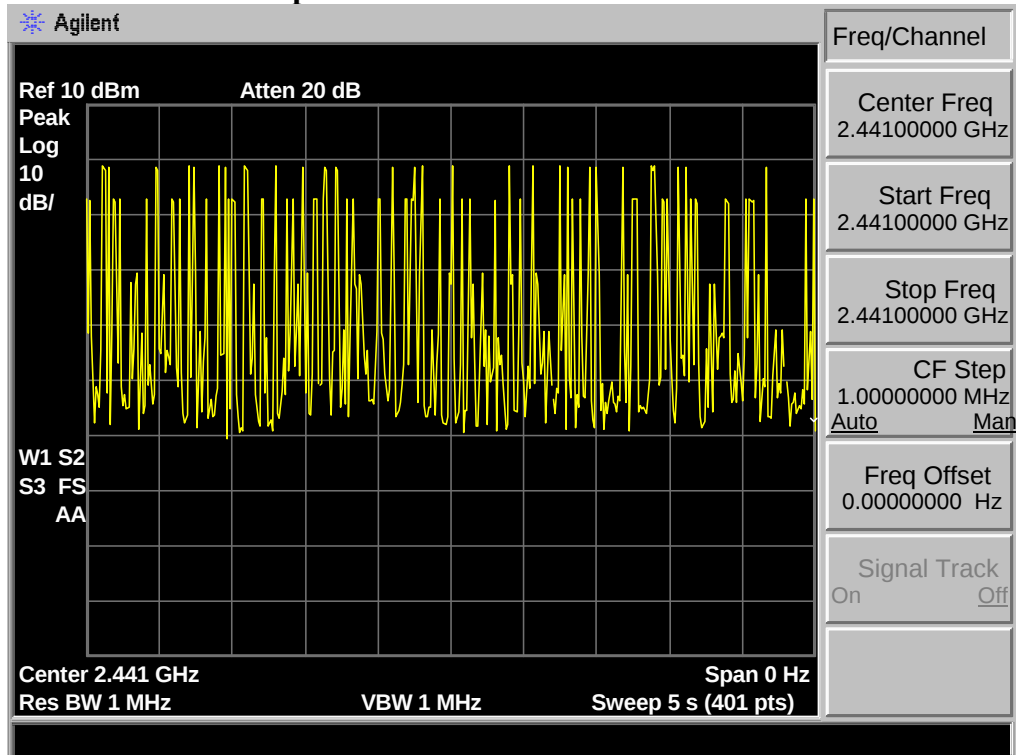
GSEK DH5 : 15hop/5s * 0.4 * 79 * 2.94ms = 278.7



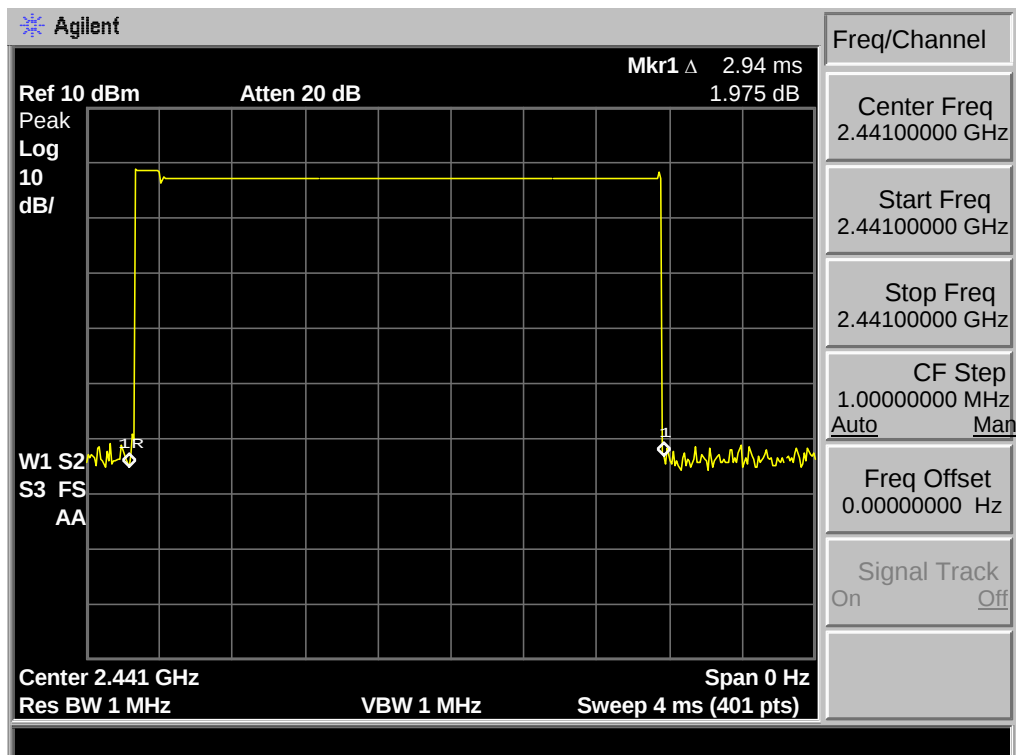
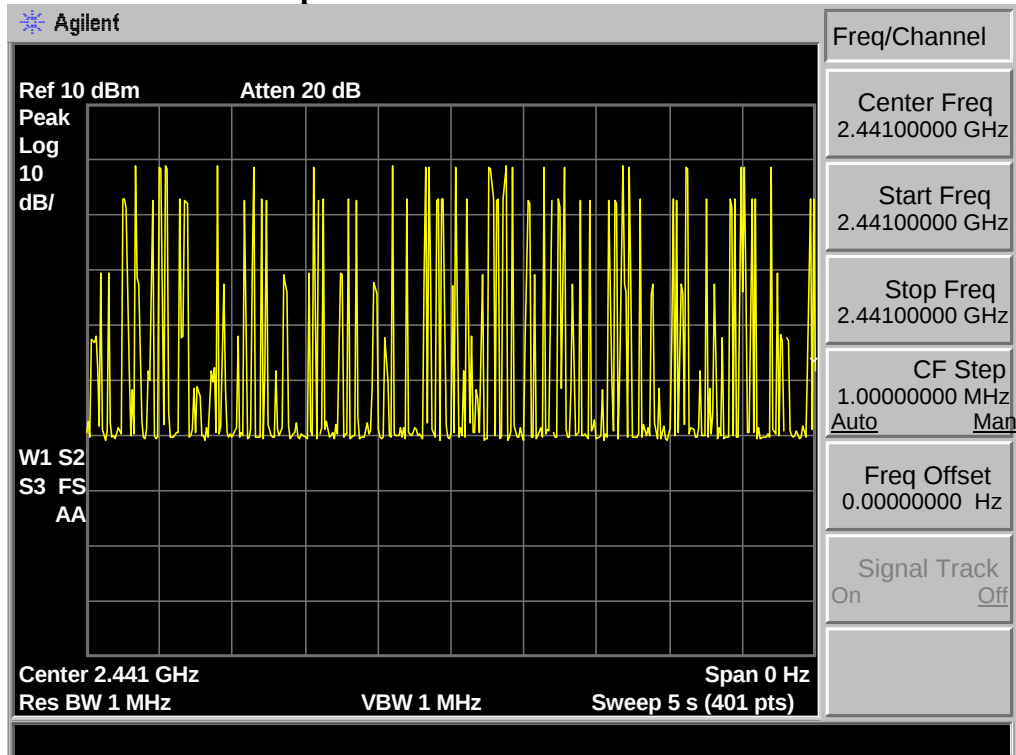
8-DPSK 3DH1 :47hop/5s * 0.4 * 79 *0.44ms = 130.7



8-DPSK 3DH3: $27\text{hop}/5\text{s} * 0.4 * 79 * 1.70\text{ms} = 290.1$



8-DPSK 3DH5 : $20\text{hop}/5\text{s} * 0.4 * 79 * 2.94\text{ms} = 371.6$



8. RADIATED EMISSIONS

8.1. Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

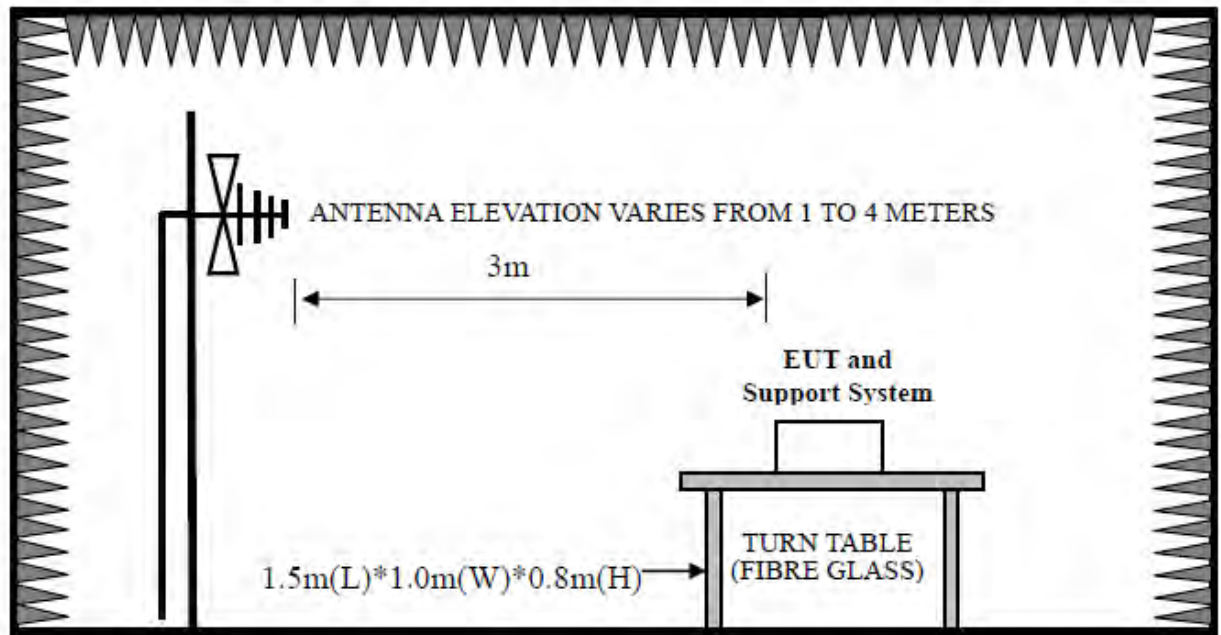
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

15.209 Limit

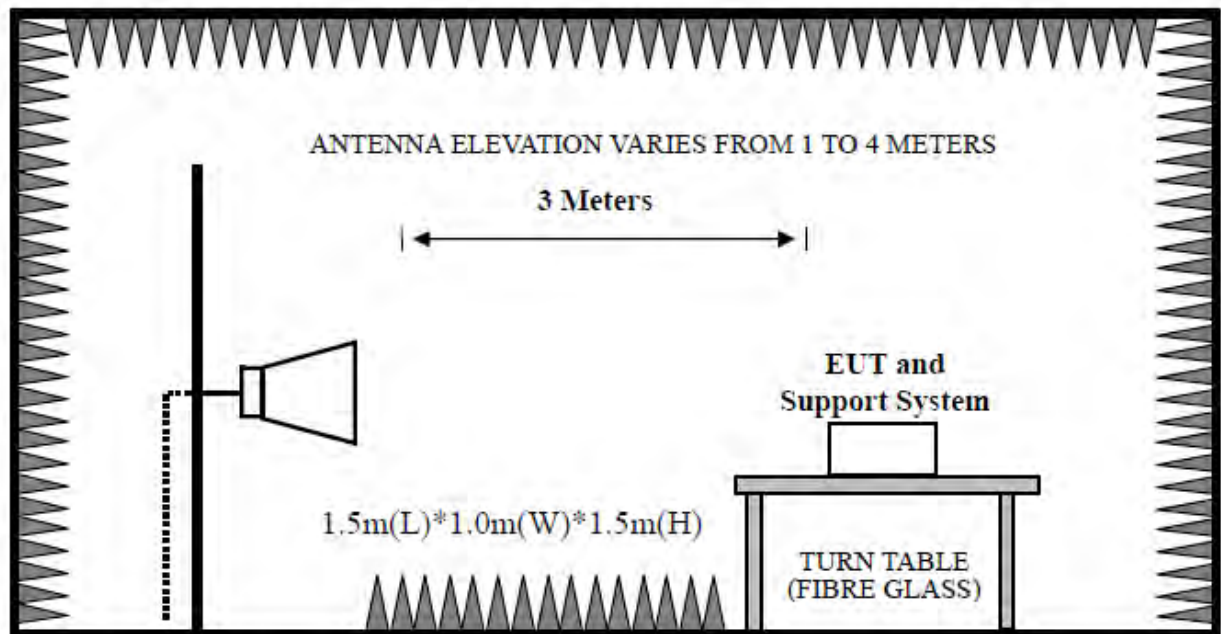
FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

8.2. Block Diagram of Test setup

30~1000MHz



Above 1GHz



8.3. Test Procedure

EUT was placed on a turn table, which is 0.8 meter high above ground for 30~1000MHz test, and which is 1.5 meter high above ground for above 1GHz test. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the EMI test receiver (R&S ESVS10) is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 1MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz

PEAK detector, 1MHz/1MHz for PAEK measurement,

PEAK detector, 1MHz/10Hz for Average measurement

The frequency range from 30MHz to 10th harmonic (25GHz) are checked.

8.4. Test Result

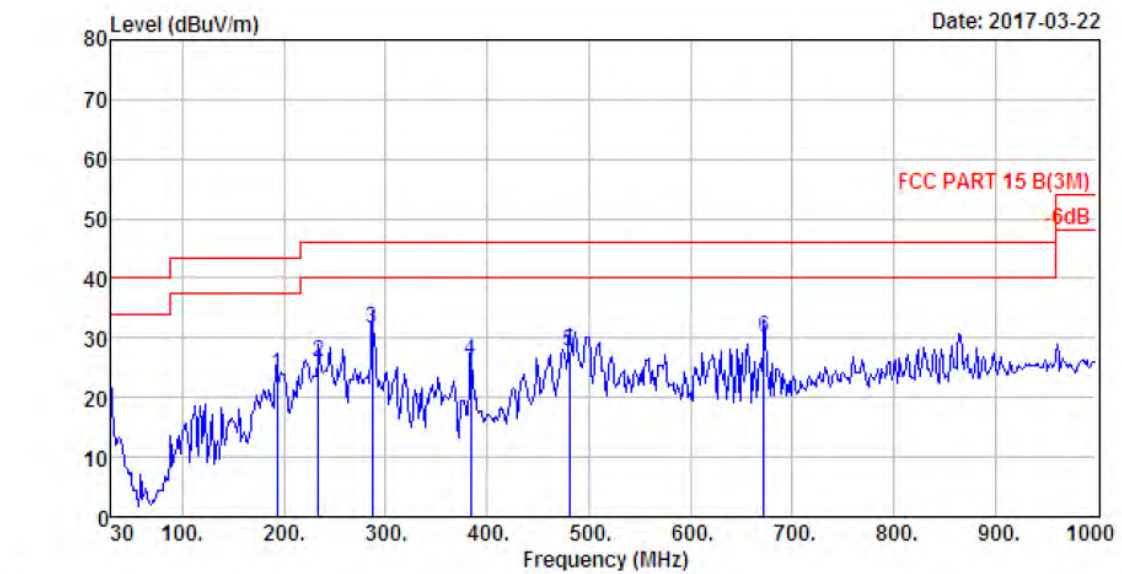
30MHz—25GHz Radiated emission Test result		
EUT: Car radio		
M/N: MGR450B		
Power: DC 12V		
Test date: 2017-03-22~03-24 Test site: 3m Chamber Tested by: Tony Tang		
Test mode: Tx Mode		
Pass		

Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

2、 The frequency 2402MHz 、2441MHz and 2480MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

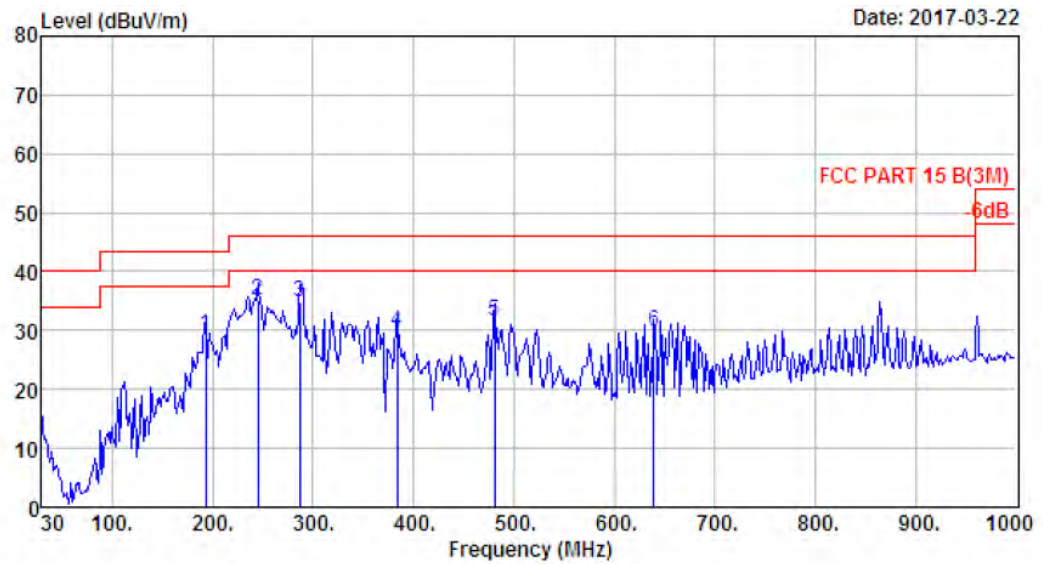
8.5. Test Data

30 MHz – 1000 MHz



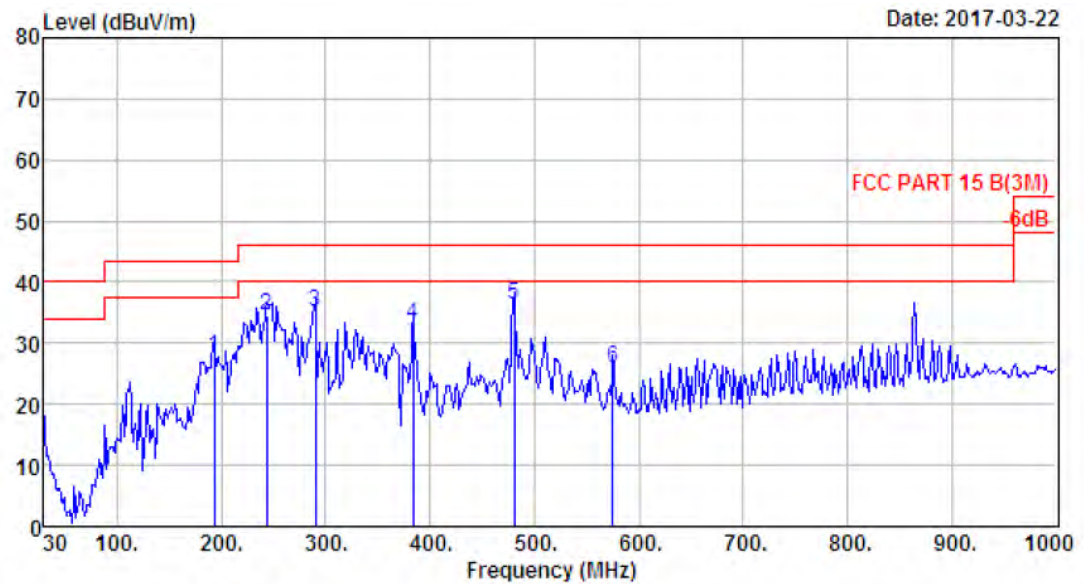
Site no. : site Data no. : 199
 Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	192.96	7.85	1.77	14.21	23.83	43.50	19.67	QP
2	233.70	9.64	2.09	14.14	25.87	46.00	20.13	QP
3	287.05	12.59	2.32	16.76	31.67	46.00	14.33	QP
4	384.05	15.24	2.64	8.54	26.42	46.00	19.58	QP
5	481.05	17.49	3.09	7.04	27.62	46.00	18.38	QP
6	672.14	20.23	3.62	6.35	30.20	46.00	15.80	QP



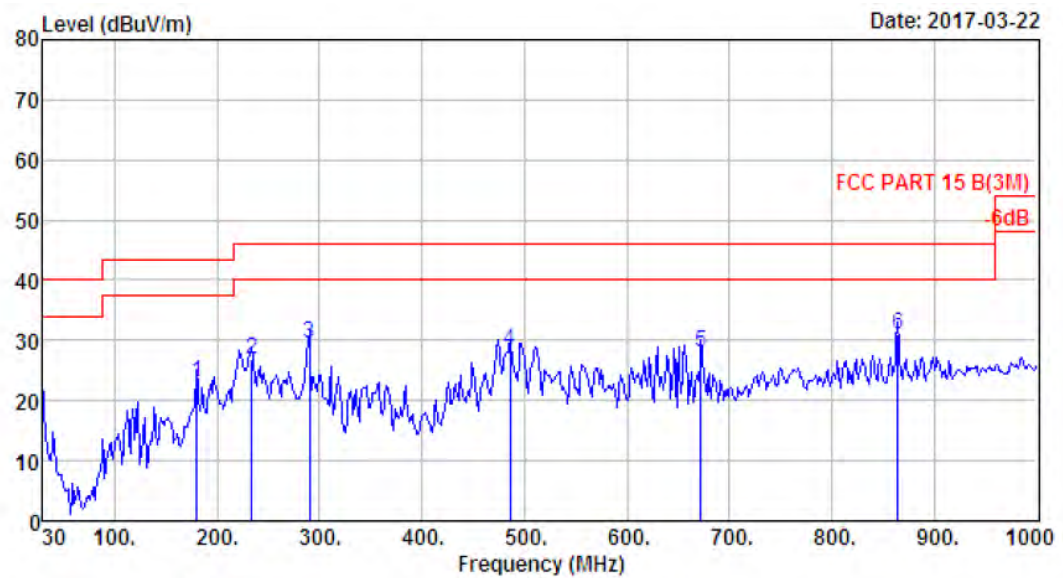
Site no. : 1# 966 Chamber Data no. : 200
 Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	192.96	7.85	1.77	19.71	29.33	43.50	14.17	QP
2	245.34	11.06	2.10	21.87	35.03	46.00	10.97	QP
3	287.05	12.59	2.32	19.78	34.69	46.00	11.31	QP
4	384.05	15.24	2.64	11.93	29.81	46.00	16.19	QP
5	481.05	17.49	3.09	10.86	31.44	46.00	14.56	QP
6	639.16	20.03	3.56	6.20	29.79	46.00	16.21	QP



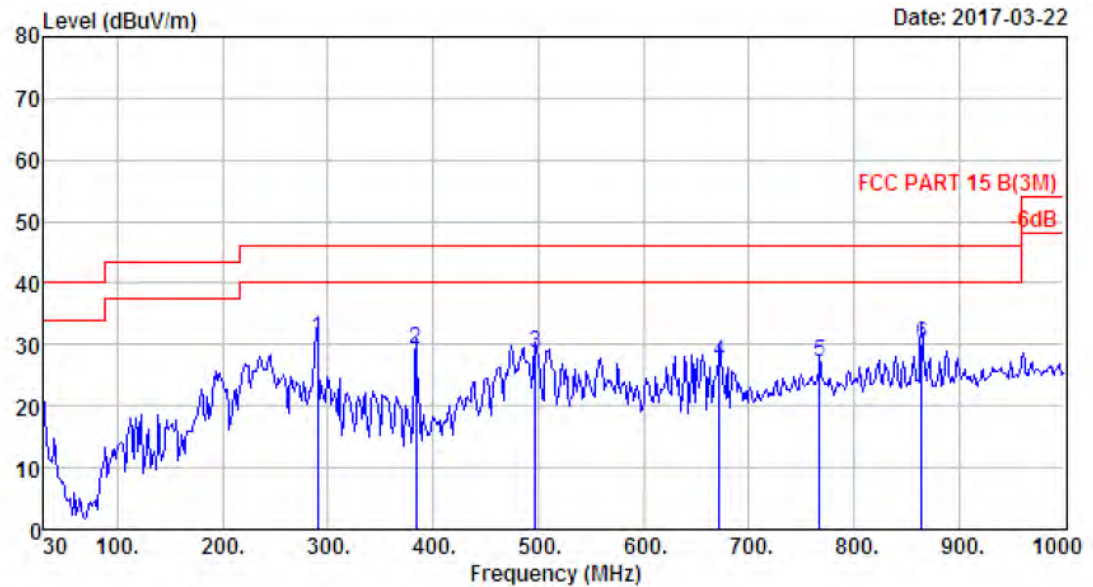
Site no. : 1# 966 Chamber Data no. : 201
 Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2441MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	192.96	7.85	1.77	18.25	27.87	43.50	15.63	QP
2	243.40	10.78	2.14	21.74	34.66	46.00	11.34	QP
3	289.96	12.73	2.32	20.18	35.23	46.00	10.77	QP
4	384.05	15.24	2.64	15.33	33.21	46.00	12.79	QP
5	481.05	17.49	3.09	15.88	36.46	46.00	9.54	QP
6	575.14	19.55	3.40	3.07	26.02	46.00	19.98	QP



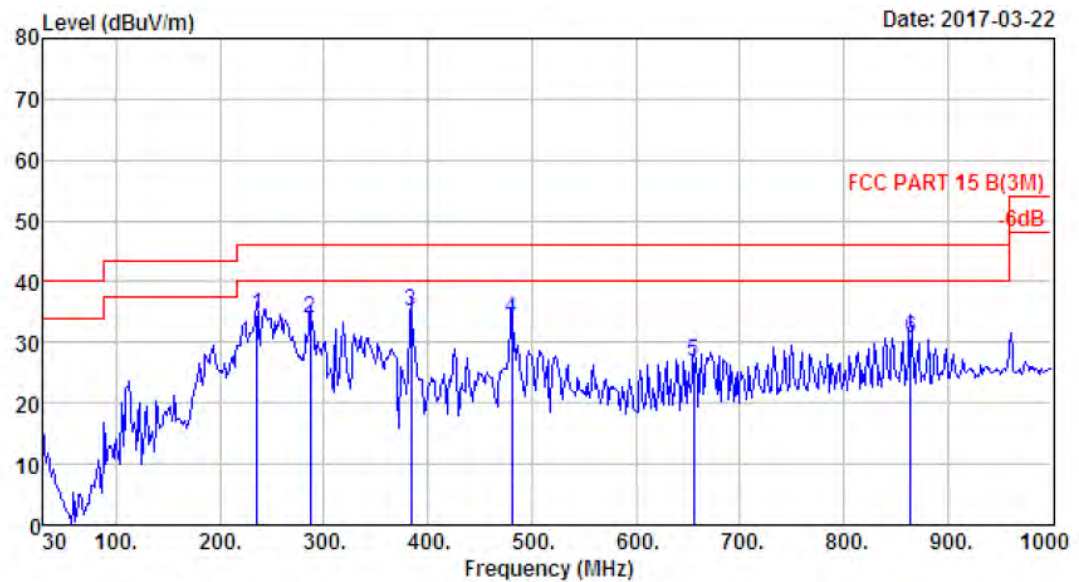
Site no. : 1# 966 Chamber Data no. : 202
 Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2441MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	180.35	8.95	1.70	12.47	23.12	43.50	20.38	QP
2	233.70	9.64	2.09	15.07	26.80	46.00	19.20	QP
3	289.96	12.73	2.32	14.49	29.54	46.00	16.46	QP
4	485.90	17.67	3.10	7.46	28.23	46.00	17.77	QP
5	672.14	20.23	3.62	4.12	27.97	46.00	18.03	QP
6	864.20	22.90	3.78	4.35	31.03	46.00	14.97	QP



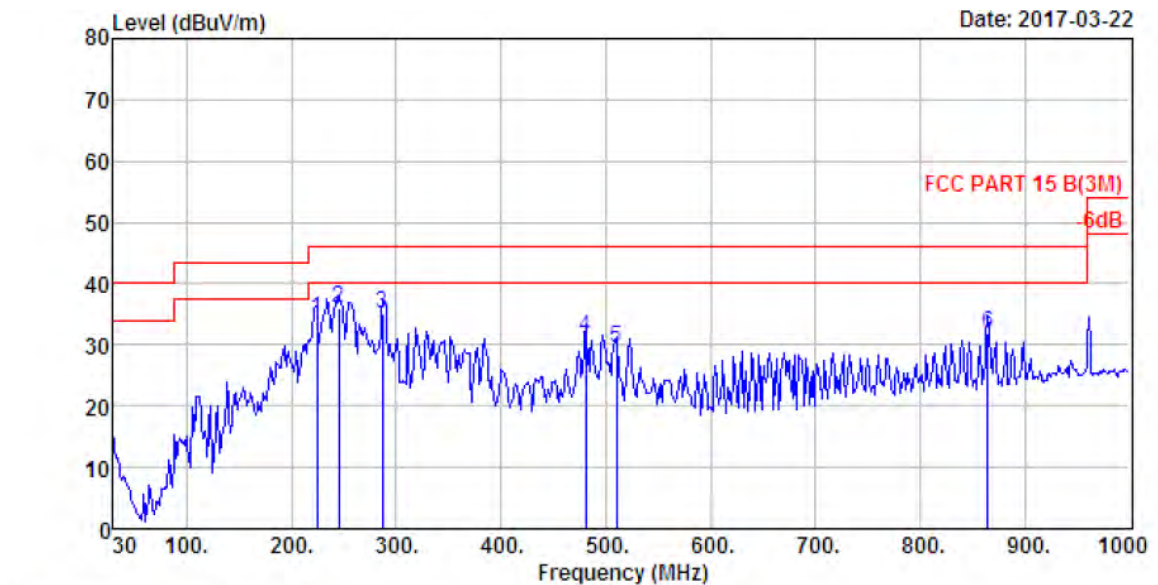
Site no. : 1# 966 Chamber Data no. : 203
 Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	289.96	12.73	2.32	15.87	30.92	46.00	15.08	QP
2	384.05	15.24	2.64	11.21	29.09	46.00	16.91	QP
3	497.54	17.86	3.10	7.58	28.54	46.00	17.46	QP
4	672.14	20.23	3.62	3.36	27.21	46.00	18.79	QP
5	767.20	22.04	3.87	1.26	27.17	46.00	18.83	QP
6	864.20	22.90	3.78	3.57	30.25	46.00	15.75	QP



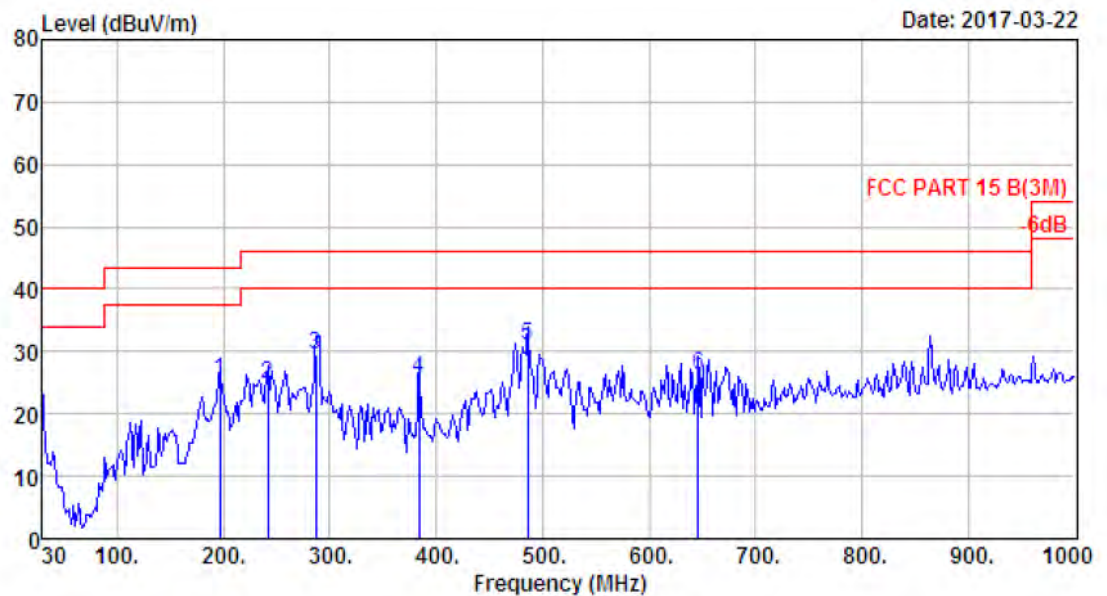
Site no. : 1# 966 Chamber Data no. : 204
 Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6°;Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	235.64	9.80	2.09	22.65	34.54	46.00	11.46	QP
2	287.05	12.59	2.32	19.02	33.93	46.00	12.07	QP
3	384.05	15.24	2.64	17.25	35.13	46.00	10.87	QP
4	481.05	17.49	3.09	13.22	33.80	46.00	12.20	QP
5	655.65	20.08	3.61	3.18	26.87	46.00	19.13	QP
6	864.20	22.90	3.78	3.91	30.59	46.00	15.41	QP



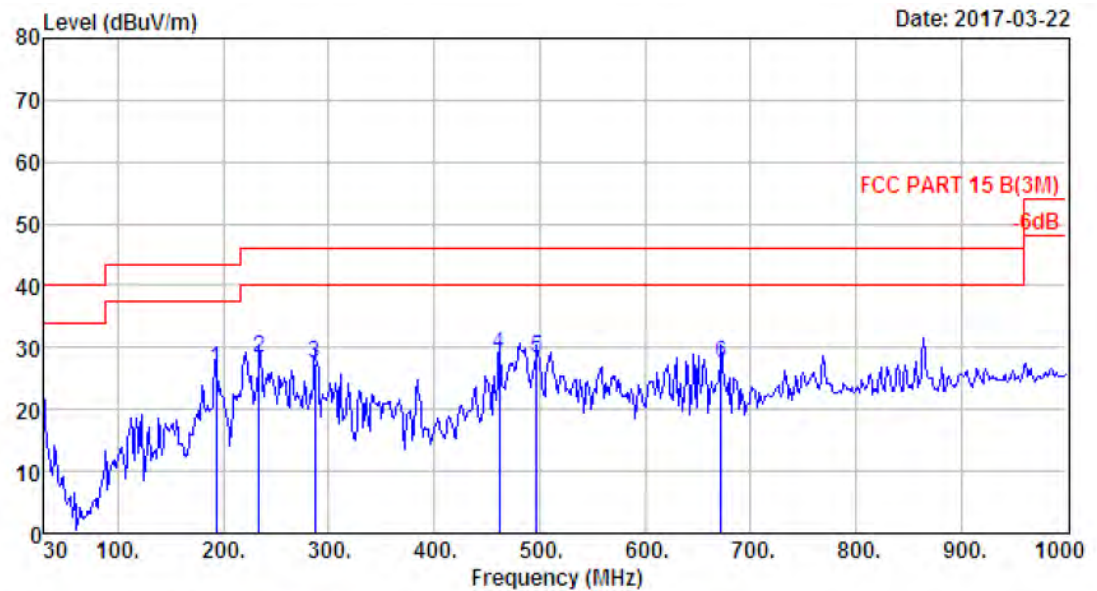
Site no. : 1# 966 Chamber Data no. : 205
 Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	224.00	9.42	2.01	22.88	34.31	46.00	11.69	QP
2	245.34	11.06	2.10	22.89	36.05	46.00	9.95	QP
3	287.05	12.59	2.32	20.29	35.20	46.00	10.80	QP
4	481.05	17.49	3.09	10.68	31.26	46.00	14.74	QP
5	510.15	17.94	3.16	8.33	29.43	46.00	16.57	QP
6	864.20	22.90	3.78	5.29	31.97	46.00	14.03	QP



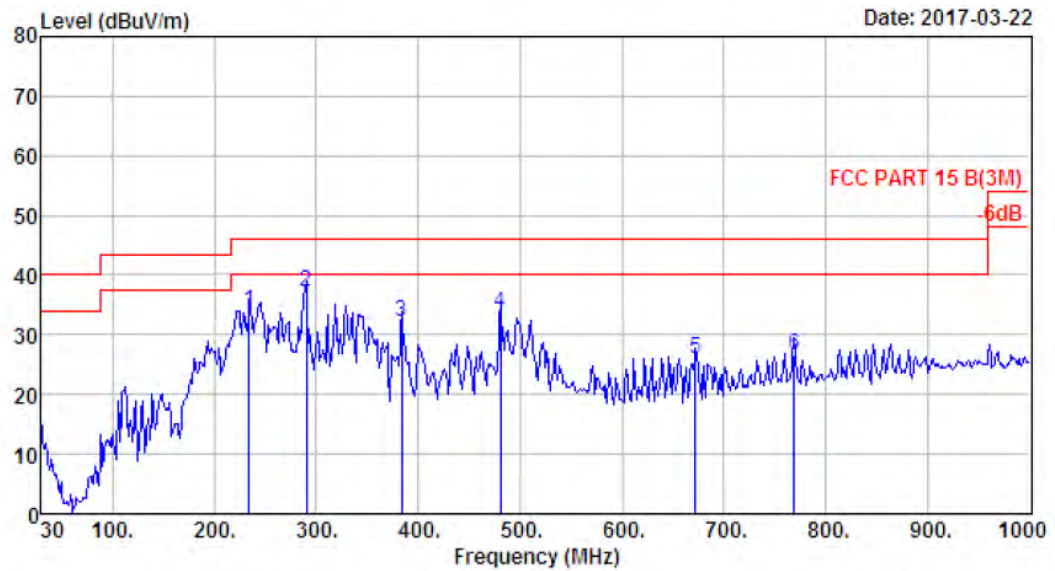
Site no. : 1# 966 Chamber Data no. : 206
 Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	196.84	7.72	1.81	15.95	25.48	43.50	18.02	QP
2	241.46	10.50	2.14	12.05	24.69	46.00	21.31	QP
3	287.05	12.59	2.32	14.60	29.51	46.00	16.49	QP
4	384.05	15.24	2.64	7.67	25.55	46.00	20.45	QP
5	485.90	17.67	3.10	10.24	31.01	46.00	14.99	QP
6	645.95	20.06	3.56	2.53	26.15	46.00	19.85	QP



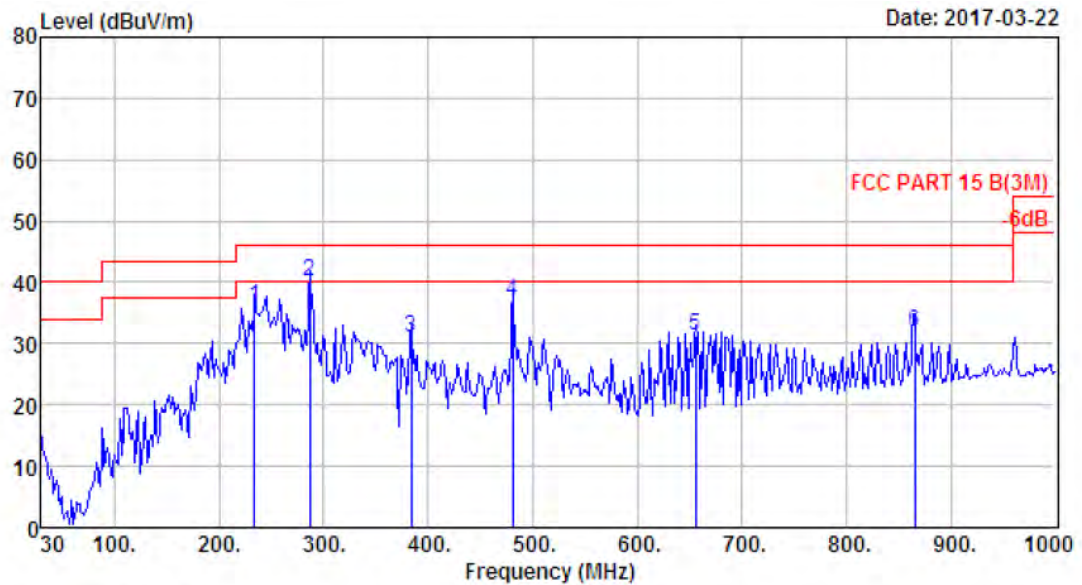
Site no. : 1# 966 Chamber Data no. : 207
 Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2441MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	192.96	7.85	1.77	16.91	26.53	43.50	16.97	QP
2	233.70	9.64	2.09	16.63	28.36	46.00	17.64	QP
3	287.05	12.59	2.32	12.61	27.52	46.00	18.48	QP
4	461.65	16.91	3.01	9.10	29.02	46.00	16.98	QP
5	497.54	17.86	3.10	7.32	28.28	46.00	17.72	QP
6	672.14	20.23	3.62	3.53	27.38	46.00	18.62	QP



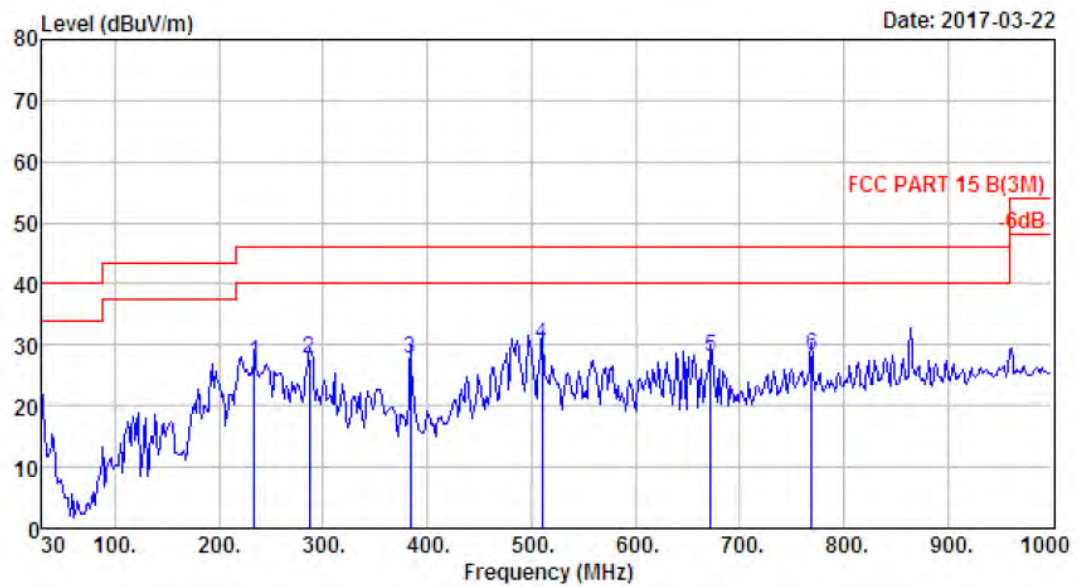
Site no. : 1# 966 Chamber Data no. : 208
 Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK IX 2441MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	233.70	9.64	2.09	22.24	33.97	46.00	12.03	QP
2	289.96	12.73	2.32	22.02	37.07	46.00	8.93	QP
3	384.05	15.24	2.64	14.19	32.07	46.00	13.93	QP
4	481.05	17.49	3.09	13.03	33.61	46.00	12.39	QP
5	672.14	20.23	3.62	2.01	25.86	46.00	20.14	QP
6	769.14	22.05	3.94	0.54	26.53	46.00	19.47	QP



Site no. : 1# 966 Chamber Data no. : 209
 Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	233.70	9.64	2.09	24.27	36.00	46.00	10.00	QP
2	287.05	12.59	2.32	25.11	40.02	46.00	5.98	QP
3	384.05	15.24	2.64	13.18	31.06	46.00	14.94	QP
4	481.05	17.49	3.09	16.38	36.96	46.00	9.04	QP
5	655.65	20.08	3.61	7.49	31.18	46.00	14.82	QP
6	865.17	22.89	3.78	5.30	31.97	46.00	14.03	QP



Site no. : 1# 966 Chamber Data no. : 210
 Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
 Limit : FCC PART 15 B(3M)
 Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	233.70	9.64	2.09	15.46	27.19	46.00	18.81	QP
2	287.05	12.59	2.32	12.72	27.63	46.00	18.37	QP
3	384.05	15.24	2.64	9.96	27.84	46.00	18.16	QP
4	510.15	17.94	3.16	8.95	30.05	46.00	15.95	QP
5	672.14	20.23	3.62	4.25	28.10	46.00	17.90	QP
6	769.14	22.05	3.94	2.46	28.45	46.00	17.55	QP

1000 MHz – 18000MHz

Site no. : 1# 966 Chamber Data no. : 211
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.64	92.43	92.02	74.00	-18.02	Peak
2	4804.00	31.25	11.77	35.64	35.77	43.15	74.00	30.85	Peak
3	7206.00	36.52	11.54	33.95	32.46	46.57	74.00	27.43	Peak
4	8684.00	37.32	11.45	33.66	32.36	47.47	74.00	26.53	Peak
5	11404.00	39.25	10.99	33.57	29.74	46.41	74.00	27.59	Peak
6	13954.00	41.35	10.96	32.99	29.78	49.10	74.00	24.90	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 212
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.64	86.50	86.09	74.00	-12.09	Peak
2	4804.00	31.25	11.77	35.64	33.17	40.55	74.00	33.45	Peak
3	7206.00	36.52	11.54	33.95	32.36	46.47	74.00	27.53	Peak
4	10180.00	38.42	11.49	34.53	31.54	46.92	74.00	27.08	Peak
5	11166.00	39.41	11.17	33.31	29.92	47.19	74.00	26.81	Peak
6	13886.00	41.16	11.04	33.03	29.52	48.69	74.00	25.31	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 213
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2441MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.00	27.60	6.67	34.85	91.04	90.46	74.00	-16.46	Peak
2	4882.00	31.37	12.07	35.76	35.33	43.01	74.00	30.99	Peak
3	7323.00	36.55	11.57	34.14	32.09	46.07	74.00	27.93	Peak
4	9075.00	37.53	11.49	34.20	31.65	46.47	74.00	27.53	Peak
5	11455.00	39.23	10.96	33.53	30.11	46.77	74.00	27.23	Peak
6	15280.00	38.90	10.99	33.54	32.63	48.98	74.00	25.02	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 214
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2441MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.00	27.60	6.67	34.85	86.81	86.23	74.00	-12.23	Peak
2	4882.00	31.37	12.07	35.76	32.81	40.49	74.00	33.51	Peak
3	7323.00	36.55	11.57	34.14	30.87	44.85	74.00	29.15	Peak
4	8650.00	37.27	11.45	33.68	30.74	45.78	74.00	28.22	Peak
5	11200.00	39.39	11.14	33.24	28.80	46.09	74.00	27.91	Peak
6	14005.00	41.46	10.90	33.01	27.68	47.03	74.00	26.97	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 215
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	35.11	87.32	86.50	74.00	-12.50	Peak
2	4960.00	31.49	12.44	36.01	33.06	40.98	74.00	33.02	Peak
3	7440.00	36.54	11.61	34.22	28.98	42.91	74.00	31.09	Peak
4	8735.00	37.40	11.45	33.76	29.71	44.80	74.00	29.20	Peak
5	11336.00	39.30	11.04	33.44	27.11	44.01	74.00	29.99	Peak
6	13784.00	40.88	11.16	33.05	26.78	45.77	74.00	28.23	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 216
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	35.11	88.92	88.10	74.00	-14.10	Peak
2	4960.00	31.49	12.44	36.01	35.17	43.09	74.00	30.91	Peak
3	7440.00	36.54	11.61	34.22	30.84	44.77	74.00	29.23	Peak
4	8735.00	37.40	11.45	33.76	30.51	45.60	74.00	28.40	Peak
5	11115.00	39.44	11.20	33.55	27.92	45.01	74.00	28.99	Peak
6	13920.00	41.26	11.00	33.00	29.57	48.83	74.00	25.17	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 217
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.64	85.18	84.77	74.00	-10.77	Peak
2	4804.00	31.25	11.77	35.64	33.36	40.74	74.00	33.26	Peak
3	7206.00	36.52	11.54	33.95	29.50	43.61	74.00	30.39	Peak
4	8684.00	37.32	11.45	33.66	29.70	44.81	74.00	29.19	Peak
5	11200.00	39.39	11.14	33.24	27.22	44.51	74.00	29.49	Peak
6	14090.00	41.54	10.91	33.13	28.36	47.68	74.00	26.32	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 218
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.00	27.61	6.62	34.64	90.43	90.02	74.00	-16.02	Peak
2	4804.00	31.25	11.77	35.64	31.93	39.31	74.00	34.69	Peak
3	7206.00	36.52	11.54	33.95	27.95	42.06	74.00	31.94	Peak
4	8514.00	36.96	11.45	34.07	29.20	43.54	74.00	30.46	Peak
5	11506.00	39.20	10.92	33.46	27.09	43.75	74.00	30.25	Peak
6	14005.00	41.46	10.90	33.01	27.91	47.26	74.00	26.74	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 219
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2441MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.00	27.60	6.67	34.85	85.10	84.52	74.00	-10.52	Peak
2	4882.00	31.37	12.07	35.76	33.21	40.89	74.00	33.11	Peak
3	7323.00	36.55	11.57	34.14	31.21	45.19	74.00	28.81	Peak
4	8684.00	37.32	11.45	33.66	29.13	44.24	74.00	29.76	Peak
5	11336.00	39.30	11.04	33.44	28.96	45.86	74.00	28.14	Peak
6	14583.00	41.65	10.92	33.73	29.70	48.54	74.00	25.46	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 220
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2441MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.00	27.60	6.67	34.85	89.28	88.70	74.00	-14.70	Peak
2	4882.00	31.37	12.07	35.76	32.01	39.69	74.00	34.31	Peak
3	7323.00	36.55	11.57	34.14	29.26	43.24	74.00	30.76	Peak
4	8514.00	36.96	11.45	34.07	31.41	45.75	74.00	28.25	Peak
5	11183.00	39.40	11.15	33.24	27.53	44.84	74.00	29.16	Peak
6	13206.00	39.38	11.46	32.79	26.88	44.93	74.00	29.07	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 221
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	35.11	87.18	86.36	74.00	-12.36	Peak
2	4960.00	31.49	12.44	36.01	32.55	40.47	74.00	33.53	Peak
3	7440.00	36.54	11.61	34.22	30.26	44.19	74.00	29.81	Peak
4	8735.00	37.40	11.45	33.76	31.58	46.67	74.00	27.33	Peak
5	11030.00	39.50	11.27	33.98	29.87	46.66	74.00	27.34	Peak
6	13954.00	41.35	10.96	32.99	30.12	49.44	74.00	24.56	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : 1# 966 Chamber Data no. : 222
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.58	6.71	35.11	87.42	86.60	74.00	-12.60	Peak
2	4960.00	31.49	12.44	36.01	34.22	42.14	74.00	31.86	Peak
3	7440.00	36.54	11.61	34.22	29.69	43.62	74.00	30.38	Peak
4	8786.00	37.48	11.46	33.90	30.41	45.45	74.00	28.55	Peak
5	11234.00	39.37	11.12	33.25	28.79	46.03	74.00	27.97	Peak
6	14345.00	41.76	10.92	33.39	28.99	48.28	74.00	25.72	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

18000MHz – 25000MHz

Pass

Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

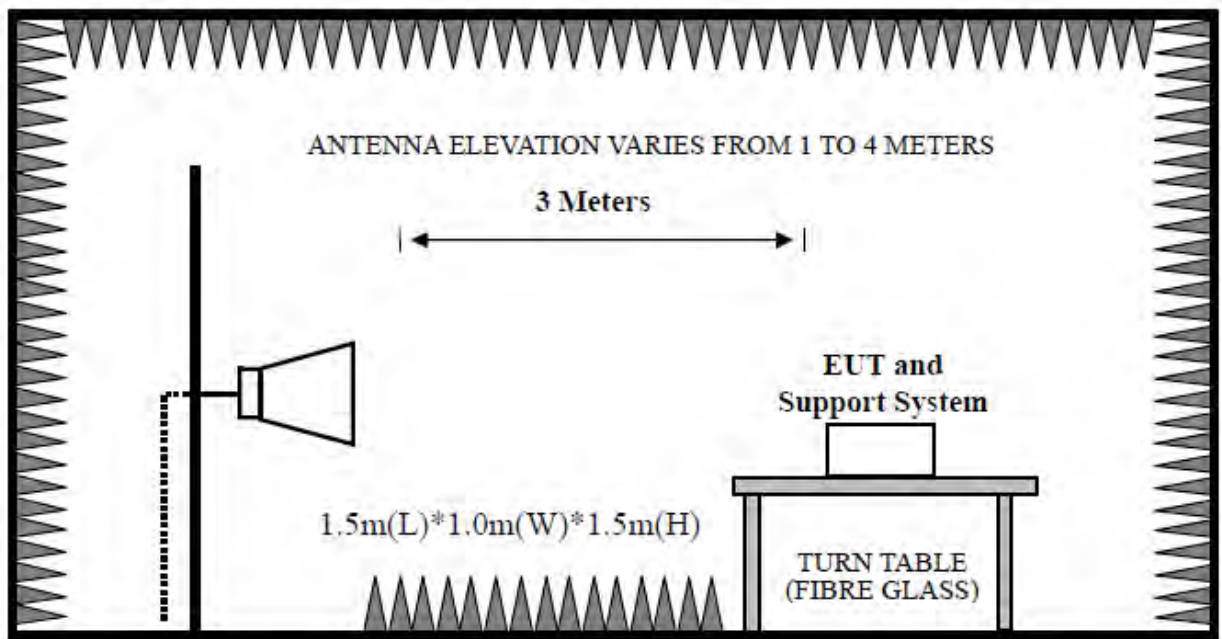
9. BAND EDGE COMPLIANCE

9.1. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

9.2. Block Diagram of Test setup

Above 1GHz



9.3. Test Procedure

EUT was placed on a turn table, which is 1.5 meter high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of emissions

- (a) Peak : RBW = 1MHz, VBW = 1MHz, Detector=PEAK detector, Sweep time = auto
- (b) AV : RBW = 1MHz, VBW = 10Hz, Detector=PEAK detector, Sweep time = auto .

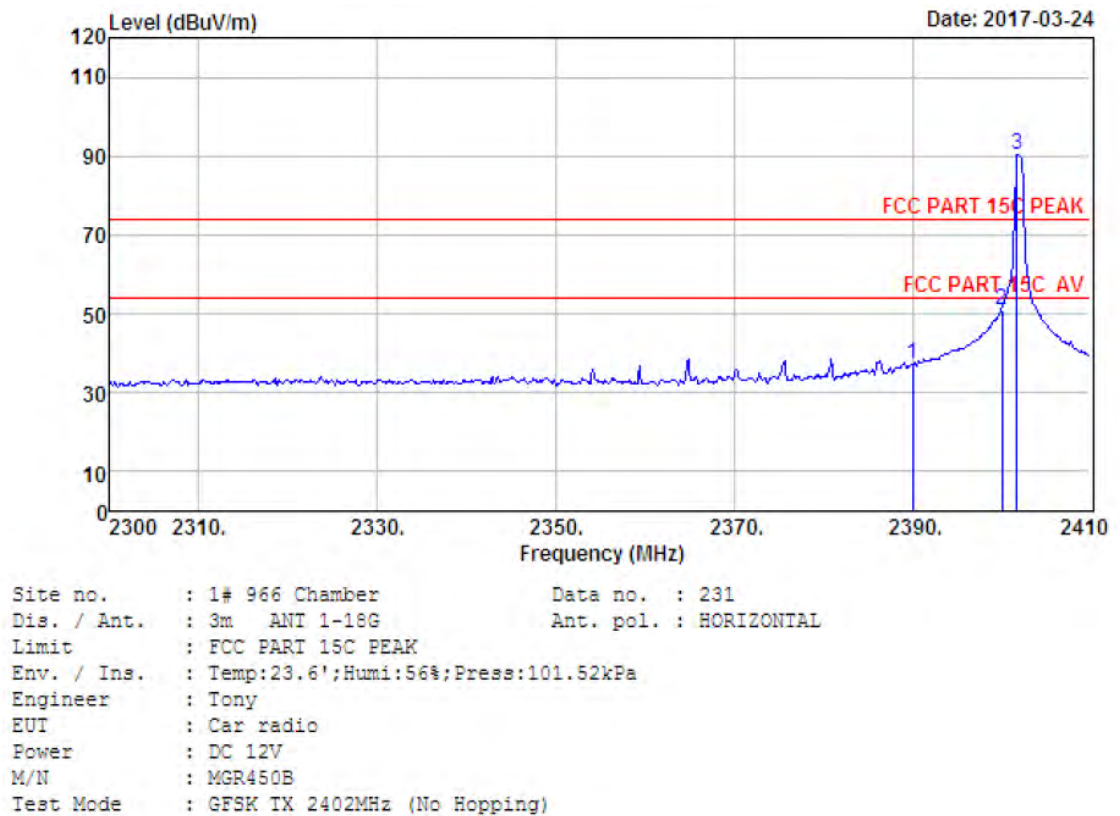
9.4. Test Result

EUT: Car radio
M/N: MGR450B
Power: DC 12V
Test date: 2017-03-24 Test site: 3m Chamber Tested by: Tony Tang
Test mode: Tx Mode (Hopping On & No Hopping)
Pass

Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

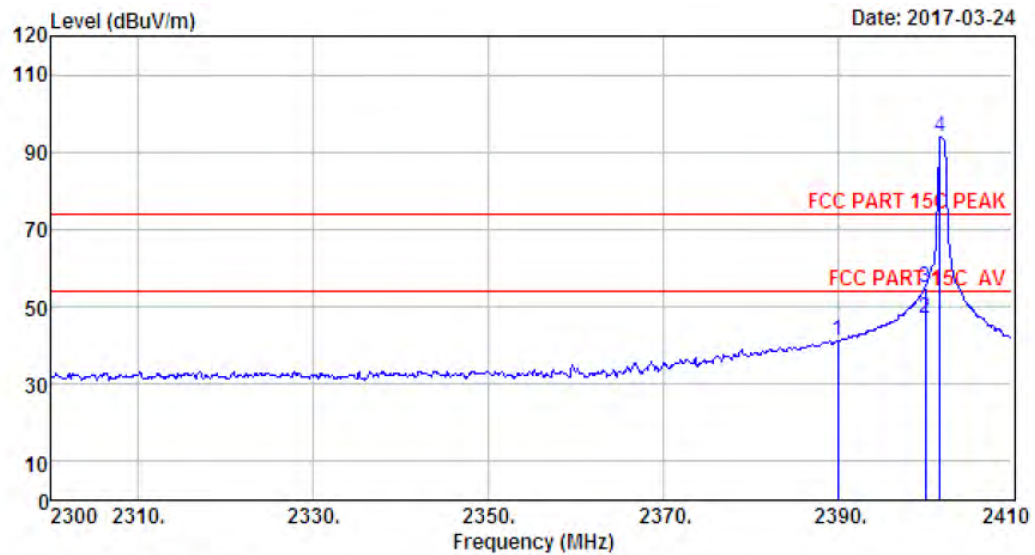
- 2、 The frequency 2402MHz 、 2441MHz and 2480MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

9.5. Test Data



	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBUV)	Emission Level (dBUV/m)	Limite (dBUV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	37.67	37.31	74.00	36.69	Peak
2	2400.00	27.61	6.62	34.64	51.54	51.13	74.00	22.87	Peak
3	2401.75	27.61	6.62	34.64	90.87	90.46	74.00	-16.46	Peak

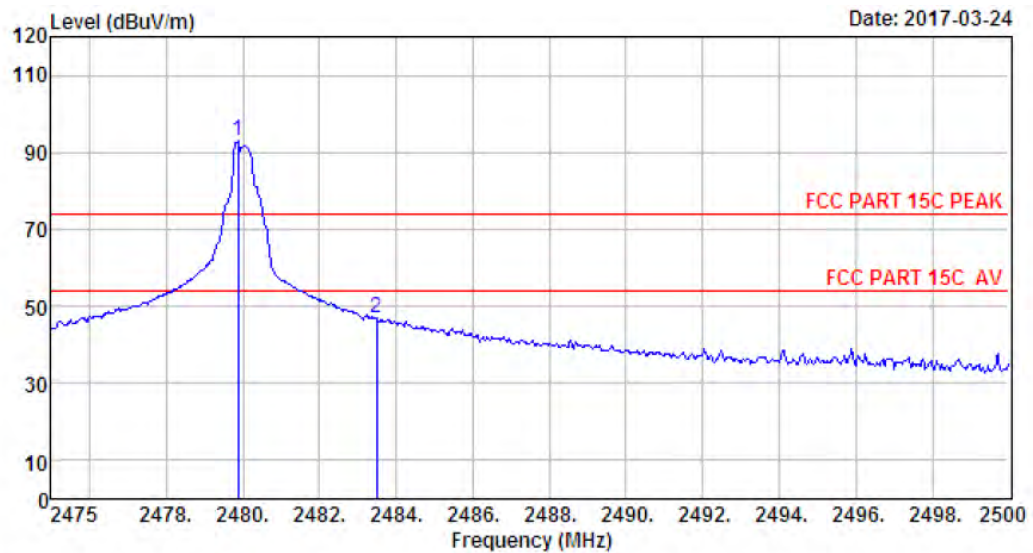
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 232
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	41.54	41.18	74.00	32.82	Peak
2	2400.00	27.61	6.62	34.64	47.41	47.00	54.00	7.00	Average
3	2400.00	27.61	6.62	34.64	55.41	55.00	74.00	19.00	Peak
4	2401.75	27.61	6.62	34.64	94.45	94.04	74.00	-20.04	Peak

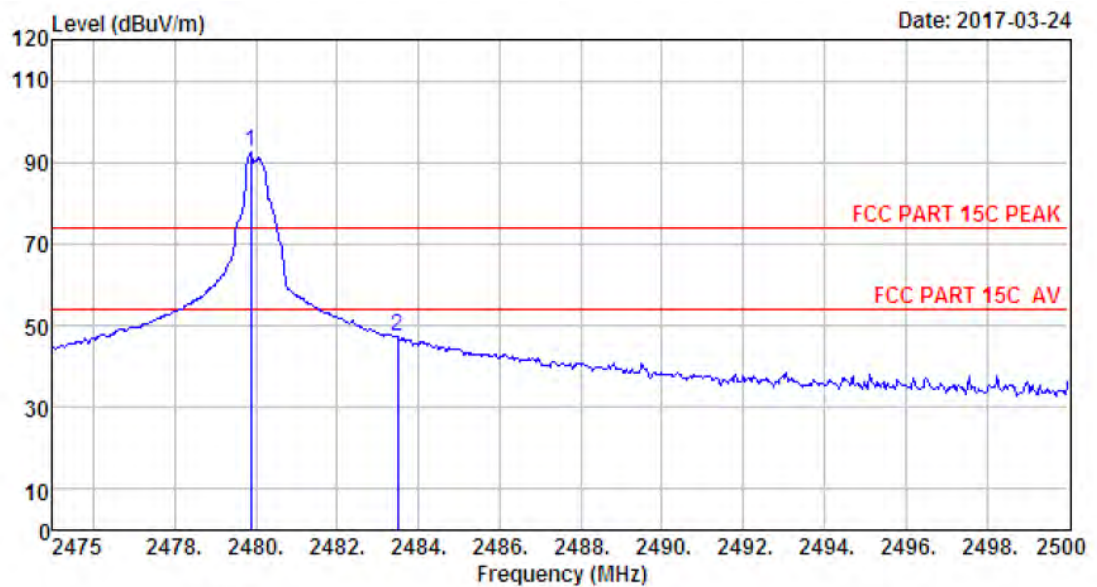
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 233
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUI : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.88	27.58	6.71	35.11	93.68	92.86	74.00	-18.86	Peak
2	2483.50	27.58	6.71	35.11	47.69	46.87	74.00	27.13	Peak

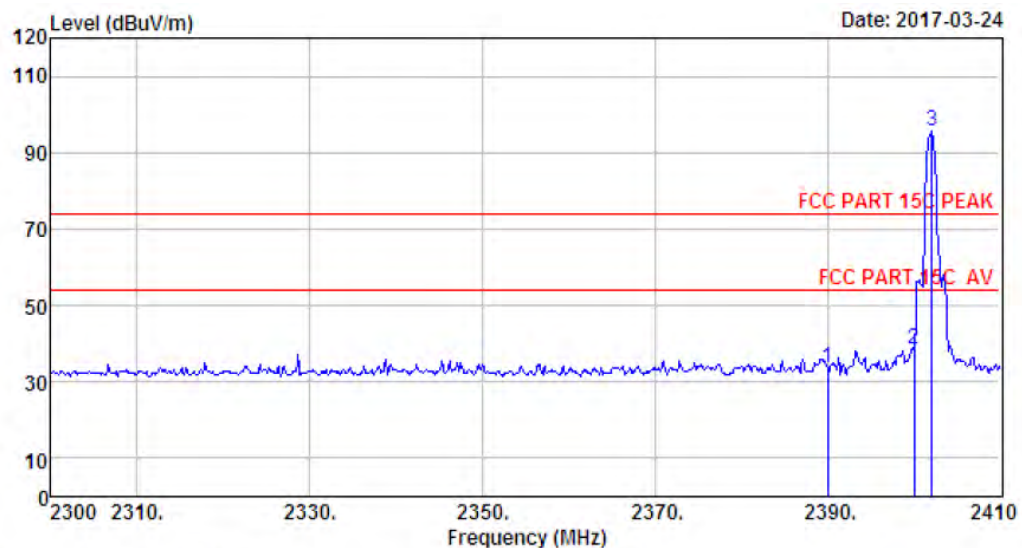
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 234
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.88	27.58	6.71	35.11	93.25	92.43	74.00	-18.43	Peak
2	2483.50	27.58	6.71	35.11	48.04	47.22	74.00	26.78	Peak

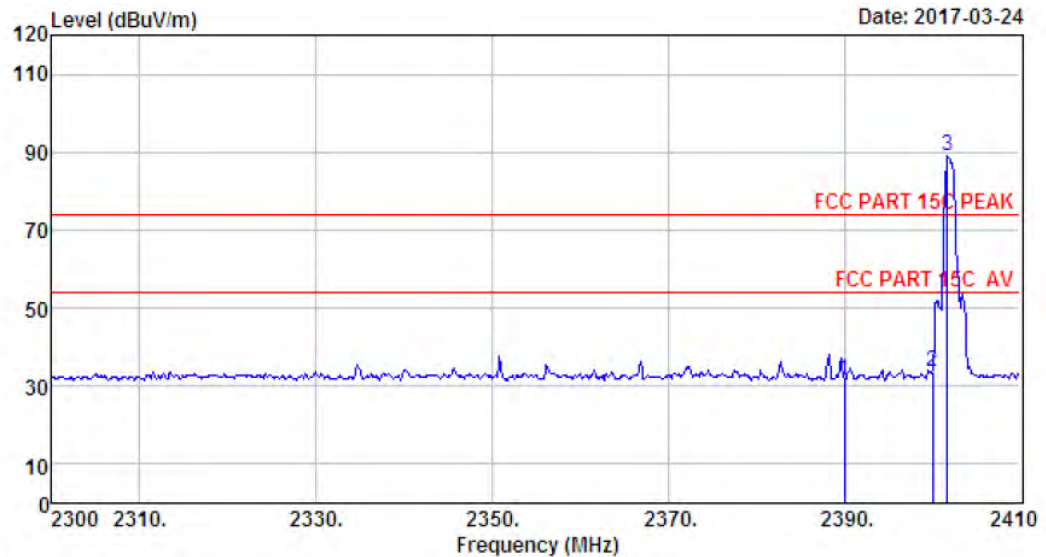
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 235
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6'; Humi:56%; Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	34.06	33.70	74.00	40.30	Peak
2	2400.00	27.61	6.62	34.64	38.99	38.58	74.00	35.42	Peak
3	2402.08	27.61	6.62	34.64	95.93	95.52	74.00	-21.52	Peak

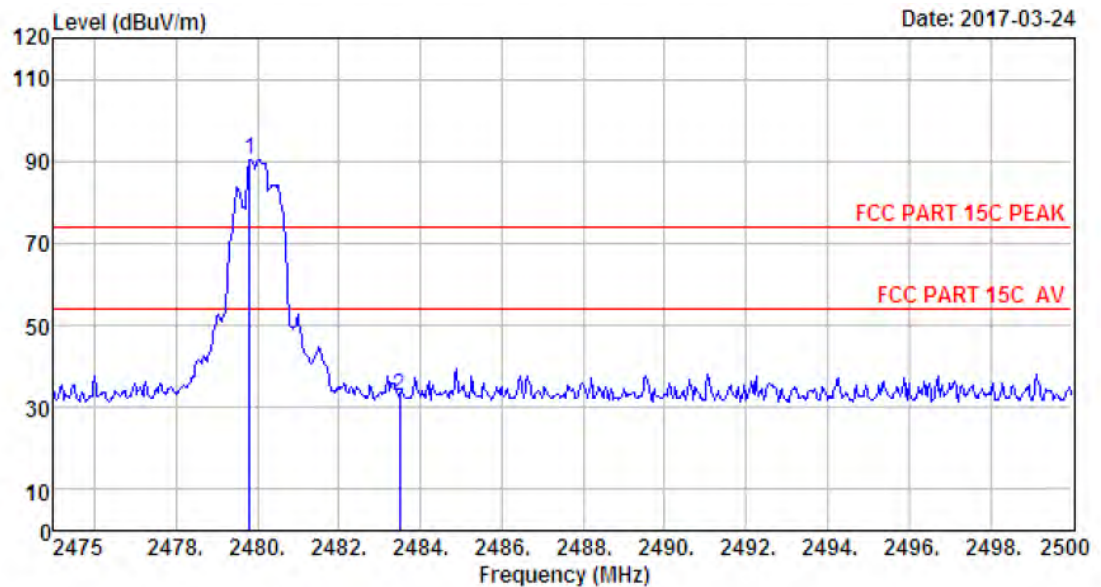
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 236
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	31.58	31.22	74.00	42.78	Peak
2	2400.00	27.61	6.62	34.64	34.14	33.73	74.00	40.27	Peak
3	2401.75	27.61	6.62	34.64	89.45	89.04	74.00	-15.04	Peak

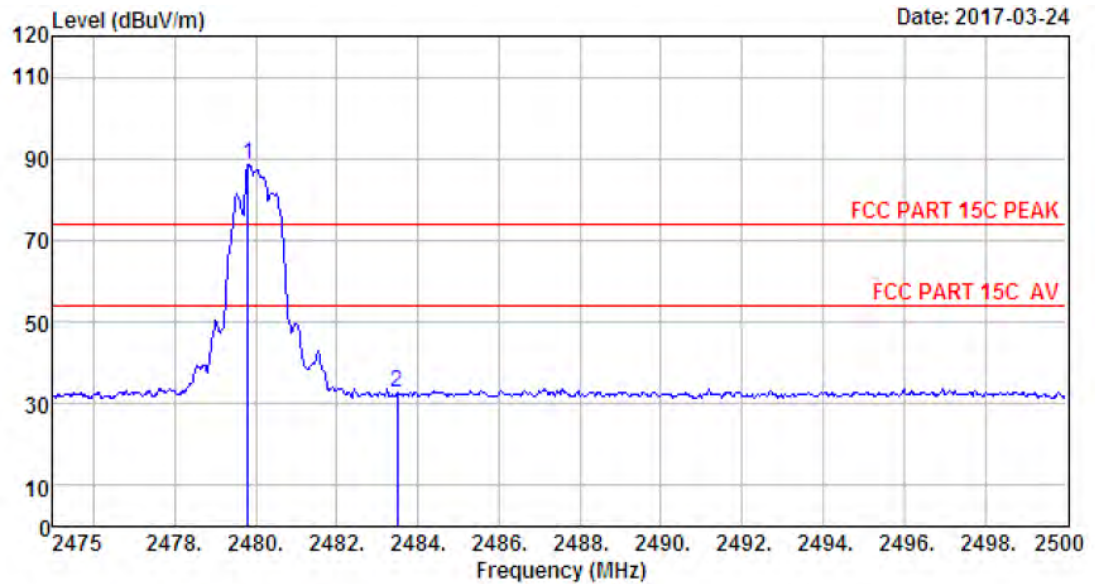
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 237
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.80	27.58	6.71	35.11	91.20	90.38	74.00	-16.38	Peak
2	2483.50	27.58	6.71	35.11	33.79	32.97	74.00	41.03	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

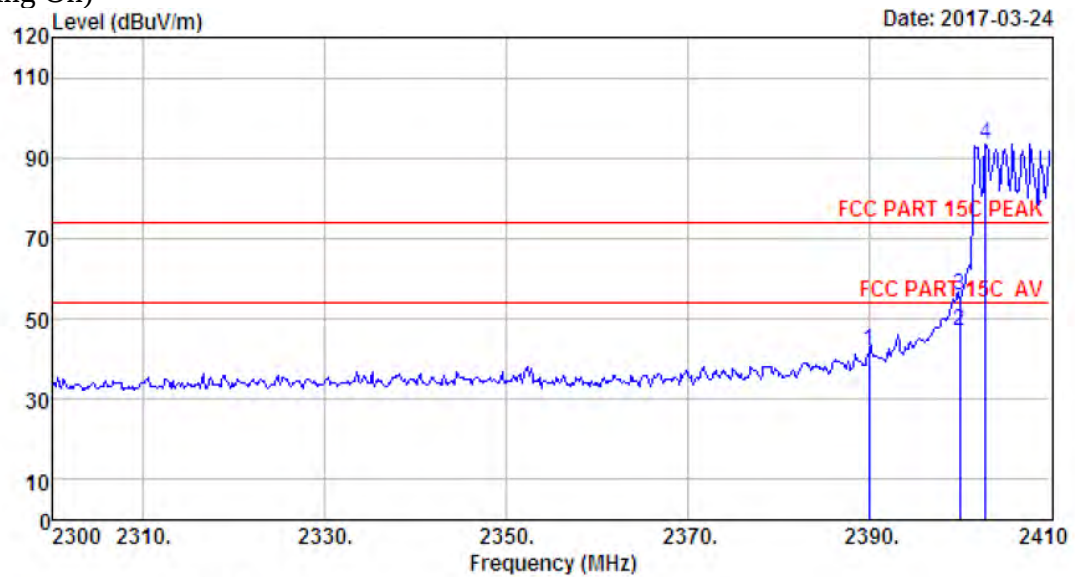


Site no. : 1# 966 Chamber Data no. : 238
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz (No Hopping)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.80	27.58	6.71	35.11	89.47	88.65	74.00	-14.65	Peak
2	2483.50	27.58	6.71	35.11	33.45	32.63	74.00	41.37	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

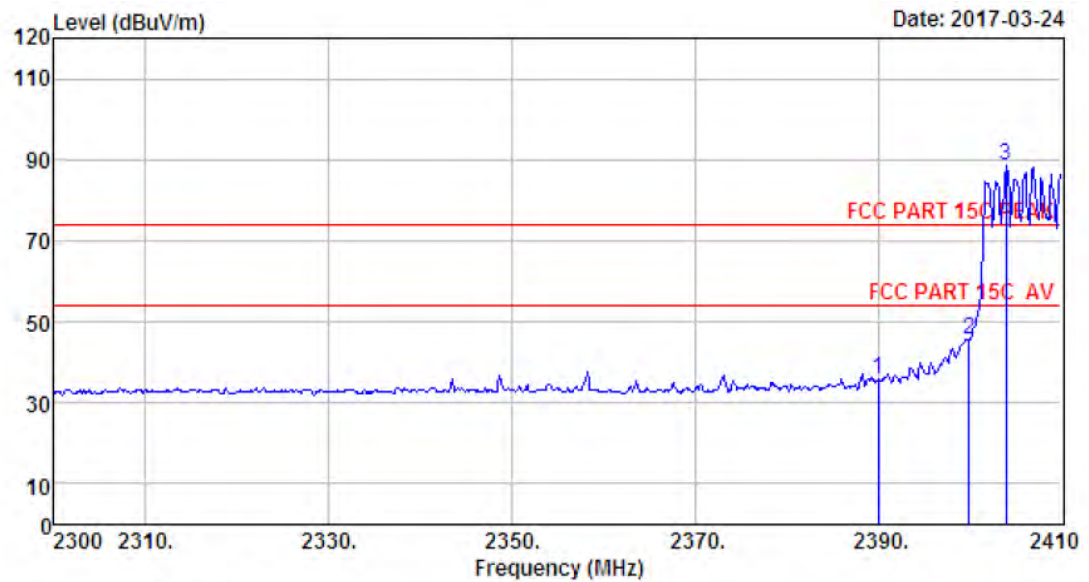
(\Hopping On)



Site no. : 1# 966 Chamber Data no. : 223
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	42.22	41.86	74.00	32.14	Peak
2	2400.00	27.61	6.62	34.64	47.18	46.77	54.00	7.23	Average
3	2400.00	27.61	6.62	34.64	56.18	55.77	74.00	18.23	Peak
4	2402.85	27.61	6.64	34.64	93.99	93.60	74.00	-19.60	Peak

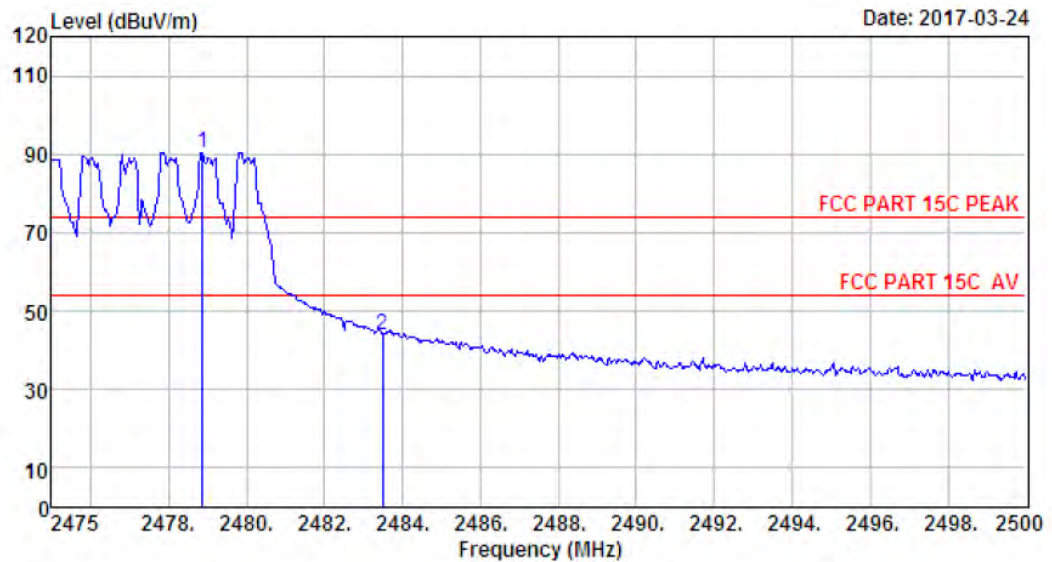
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 224
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2402MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2389.98	27.64	6.62	34.62	36.05	35.69	74.00	38.31	Peak
2	2399.99	27.61	6.62	34.64	45.98	45.57	74.00	28.43	Peak
3	2403.95	27.61	6.64	34.64	88.76	88.37	74.00	-14.37	Peak

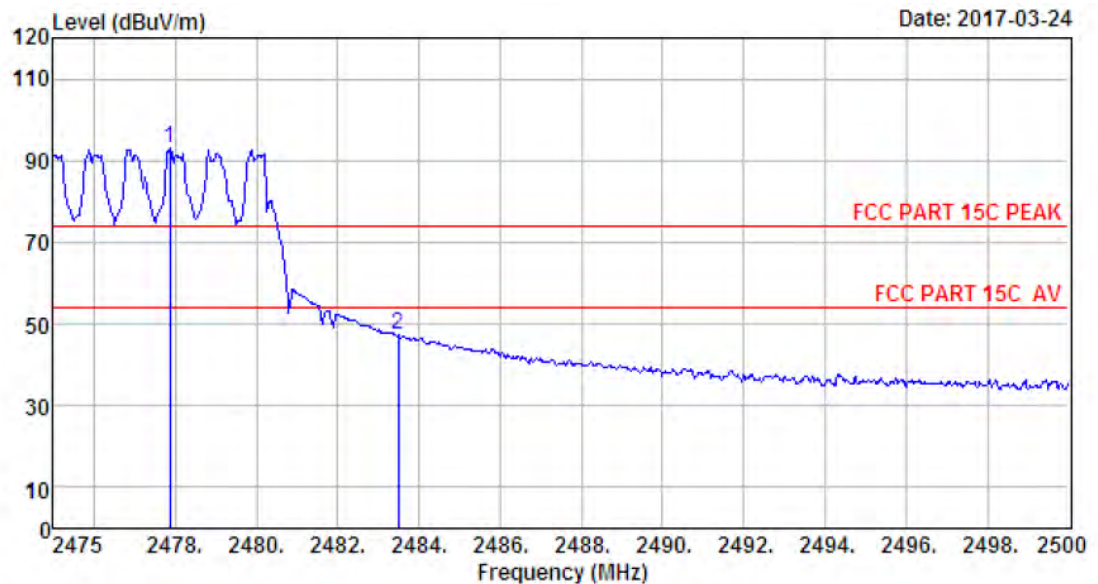
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 225
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2478.88	27.58	6.71	35.11	91.10	90.28	74.00	-16.28	Peak
2	2483.50	27.58	6.71	35.11	44.78	43.96	74.00	30.04	Peak

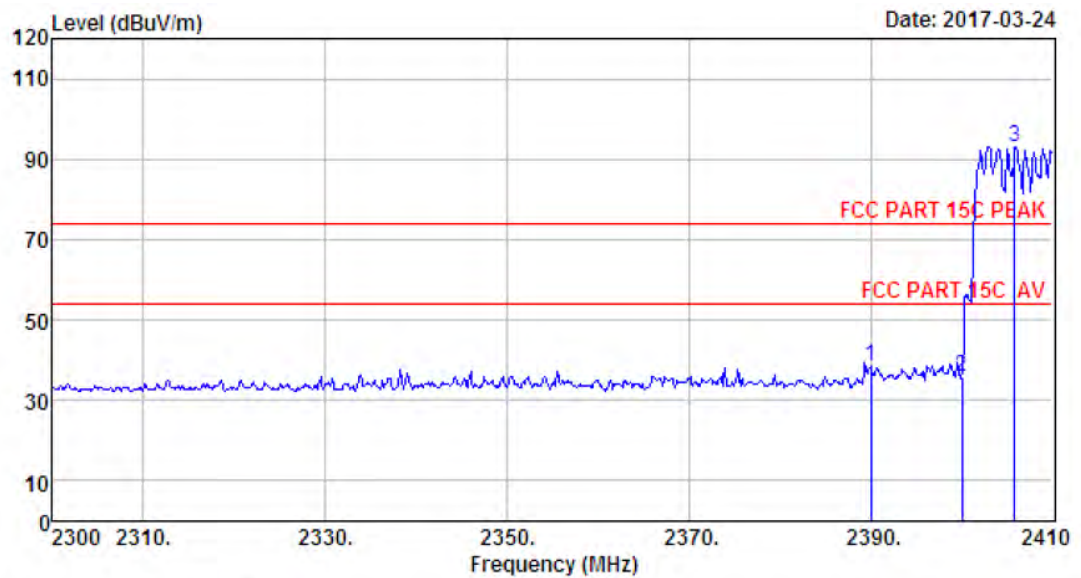
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 226
 Dis. / Ant. : 3m ANI 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : GFSK TX 2480MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2477.88	27.58	6.71	35.11	93.60	92.78	74.00	-18.78	Peak
2	2483.50	27.98	6.71	35.11	48.18	47.36	74.00	26.64	Peak

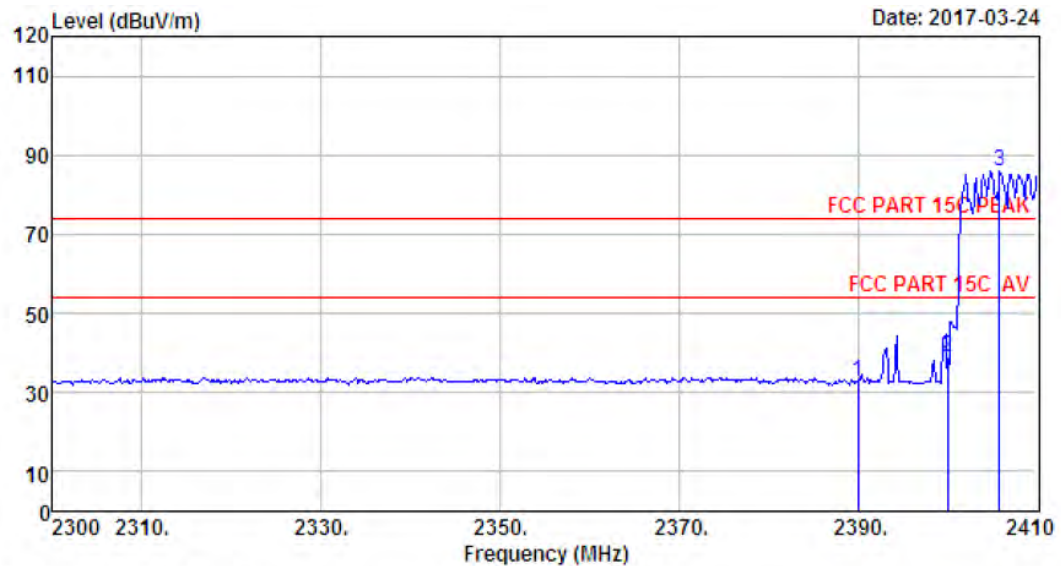
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 227
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6'; Humi:56%; Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	38.88	38.52	74.00	35.48	Peak
2	2400.00	27.61	6.62	34.64	36.39	35.98	74.00	38.02	Peak
3	2405.82	27.61	6.64	34.64	93.57	93.18	74.00	-19.18	Peak

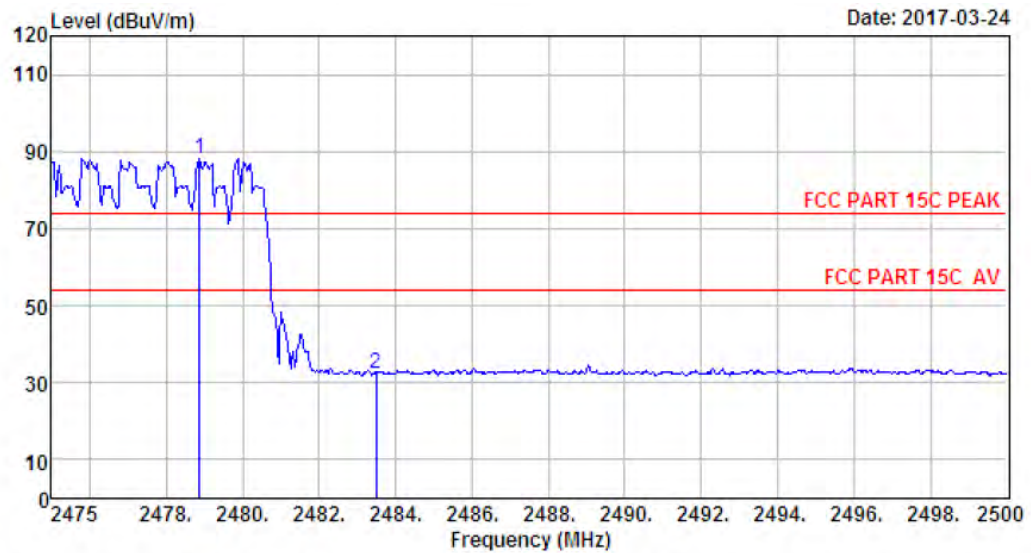
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 228
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2402MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.64	6.62	34.62	33.30	32.94	74.00	41.06	Peak
2	2400.00	27.61	6.62	34.64	39.31	38.90	74.00	35.10	Peak
3	2405.82	27.61	6.64	34.64	86.51	86.12	74.00	-12.12	Peak

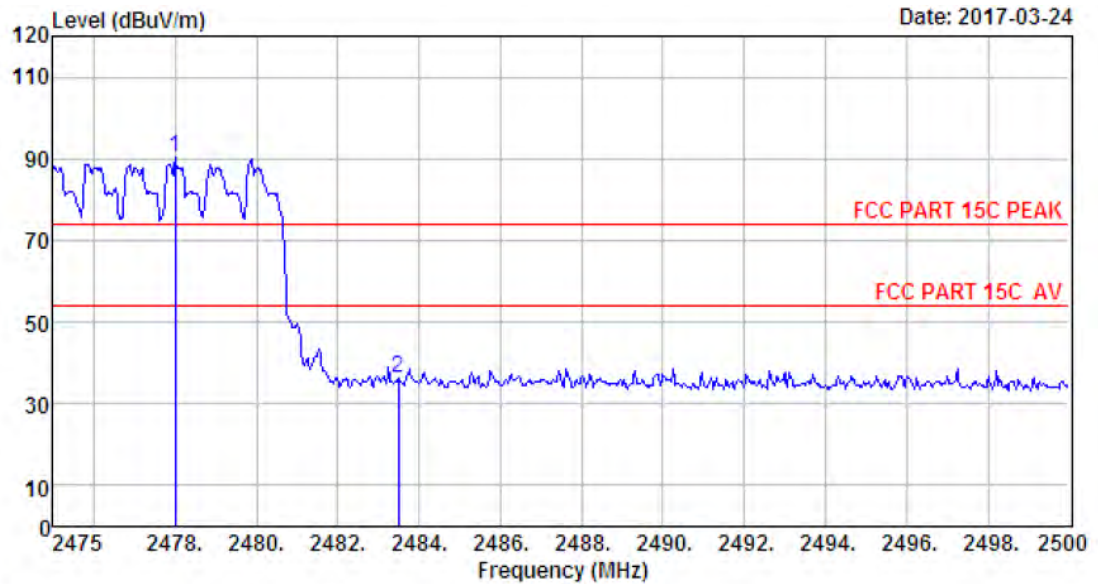
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 229
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2478.88	27.58	6.71	35.11	88.89	88.07	74.00	-14.07	Peak
2	2483.50	27.58	6.71	35.11	33.31	32.49	74.00	41.51	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 1# 966 Chamber Data no. : 230
 Dis. / Ant. : 3m ANT 1-18G Ant. pol. : VERTICAL
 Limit : FCC PART 15C PEAK
 Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
 Engineer : Tony
 EUT : Car radio
 Power : DC 12V
 M/N : MGR450B
 Test Mode : 8-DPSK TX 2480MHz (Hopping On)

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBUV)	Emission Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Remark
1	2478.00	27.58	6.71	35.11	91.32	90.50	74.00	-16.50	Peak
2	2483.50	27.58	6.71	35.11	37.05	36.23	74.00	37.77	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

10. ANTENNA REQUIREMENTS

10.1. Limit

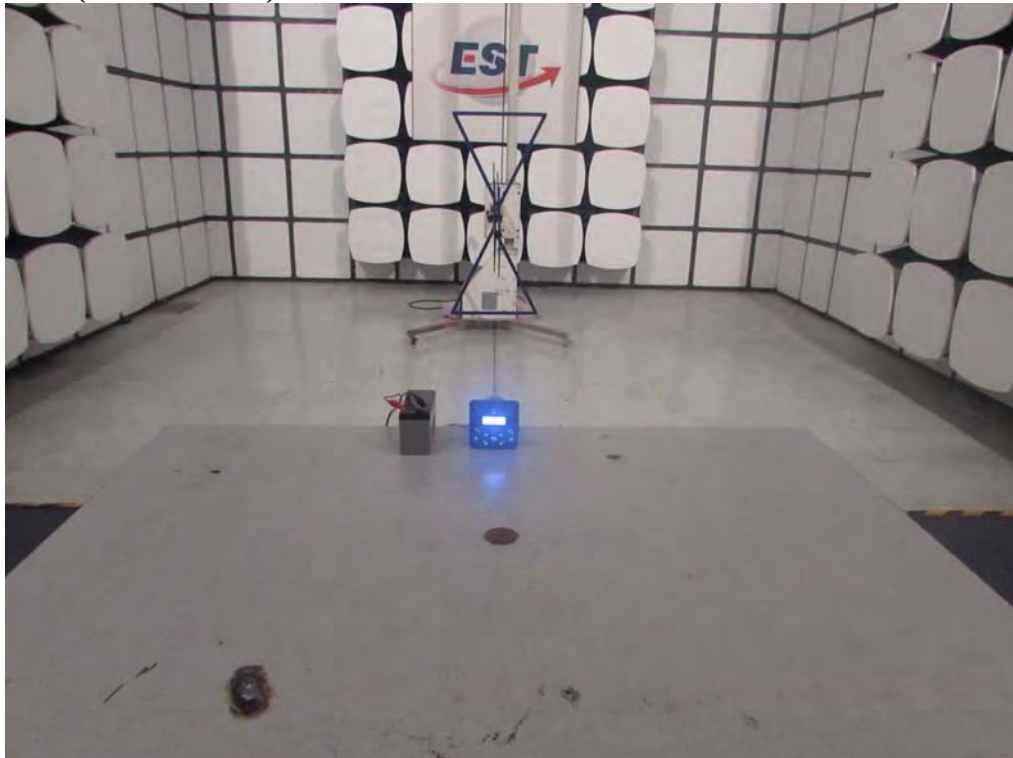
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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.

10.2. Result

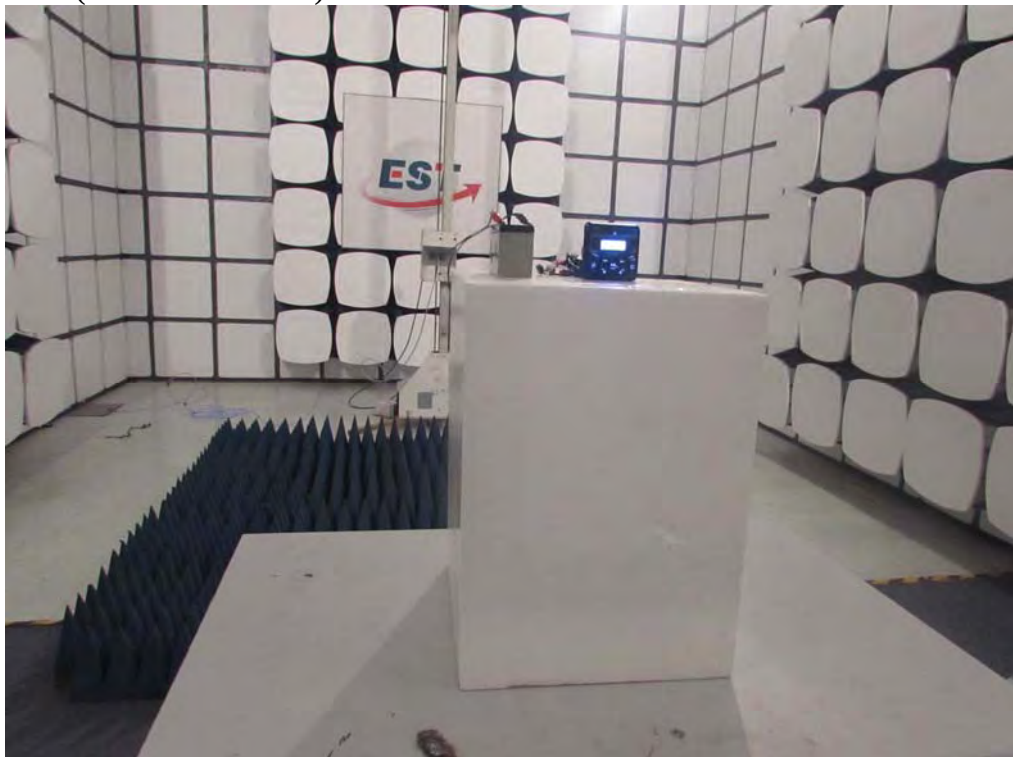
The antennas used for this product are Integrated PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

11. TEST SETUP PHOTO

Radiated Test (30-1000 MHz)



Radiated Test (1000-25000 MHz)



12. PHOTOS OF EUT

External Photos

M/N: MGR450B



External Photos

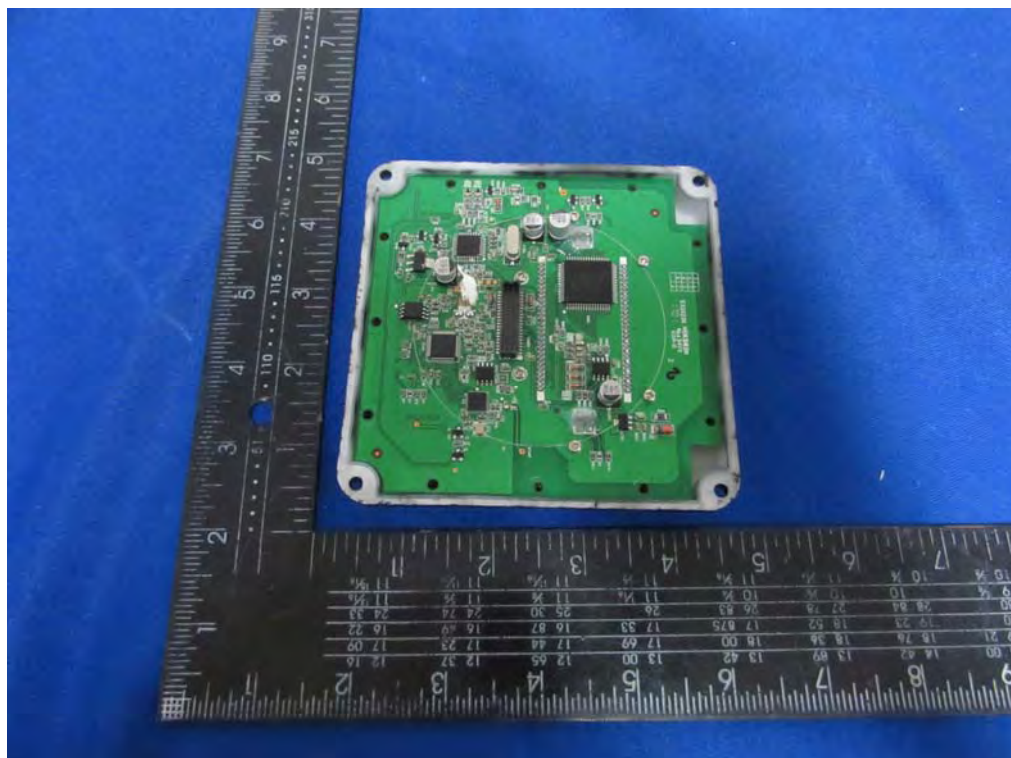
M/N: MGR450B



External Photos
M/N: MGR450B

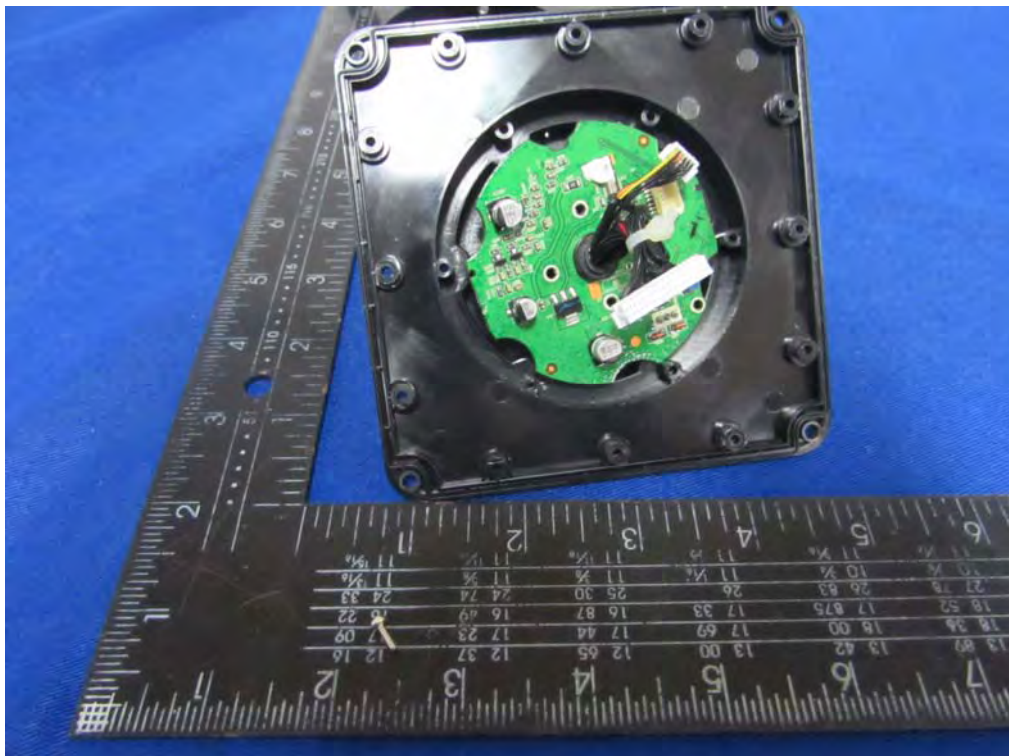
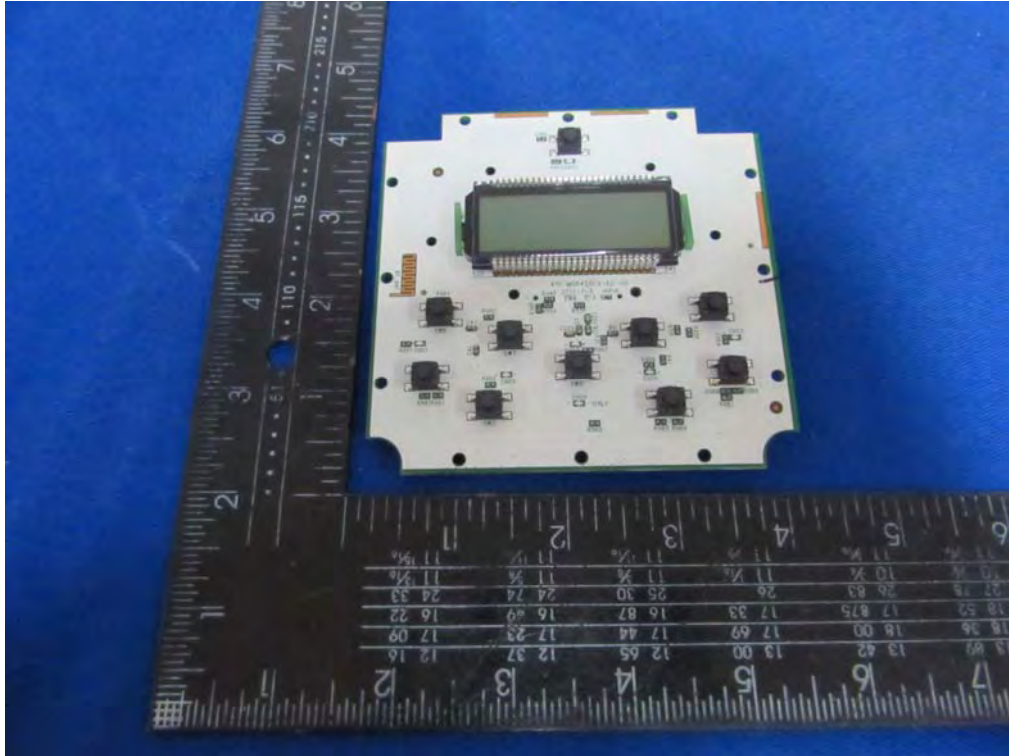


Internal Photos
M/N: MGR450B



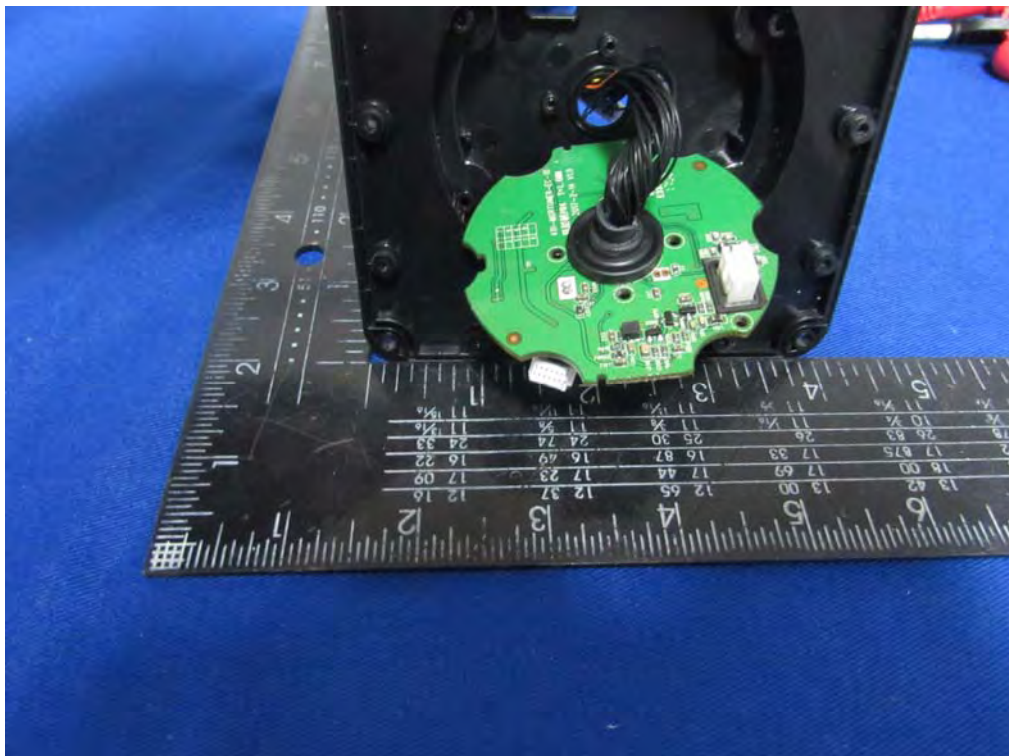
Internal Photos

M/N: MGR450B



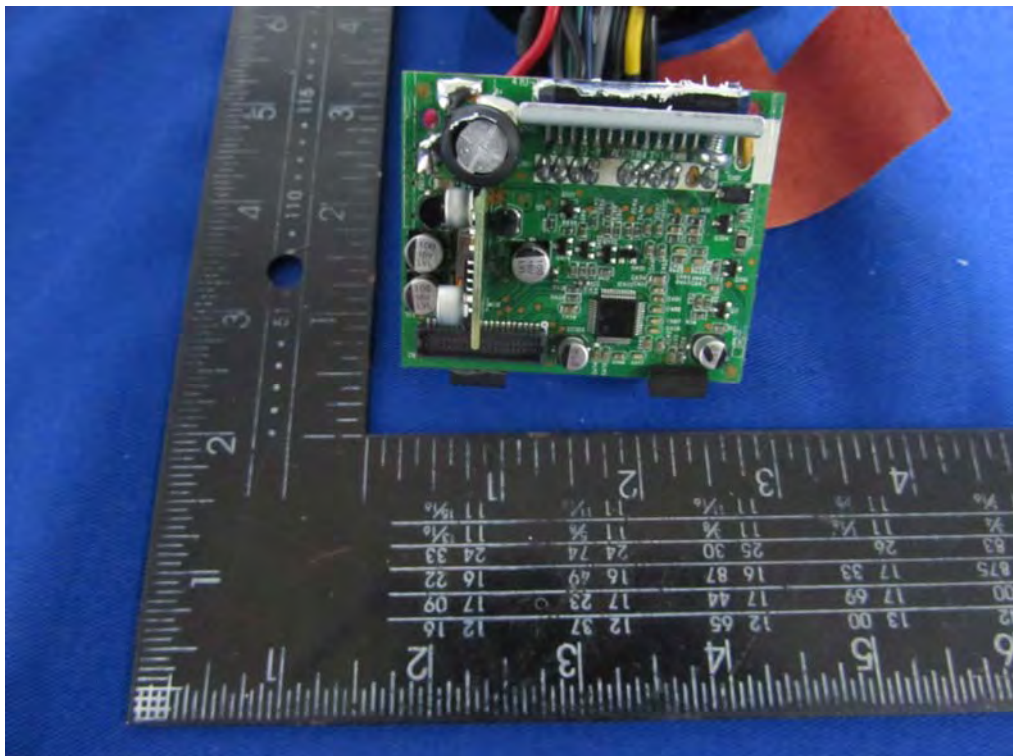
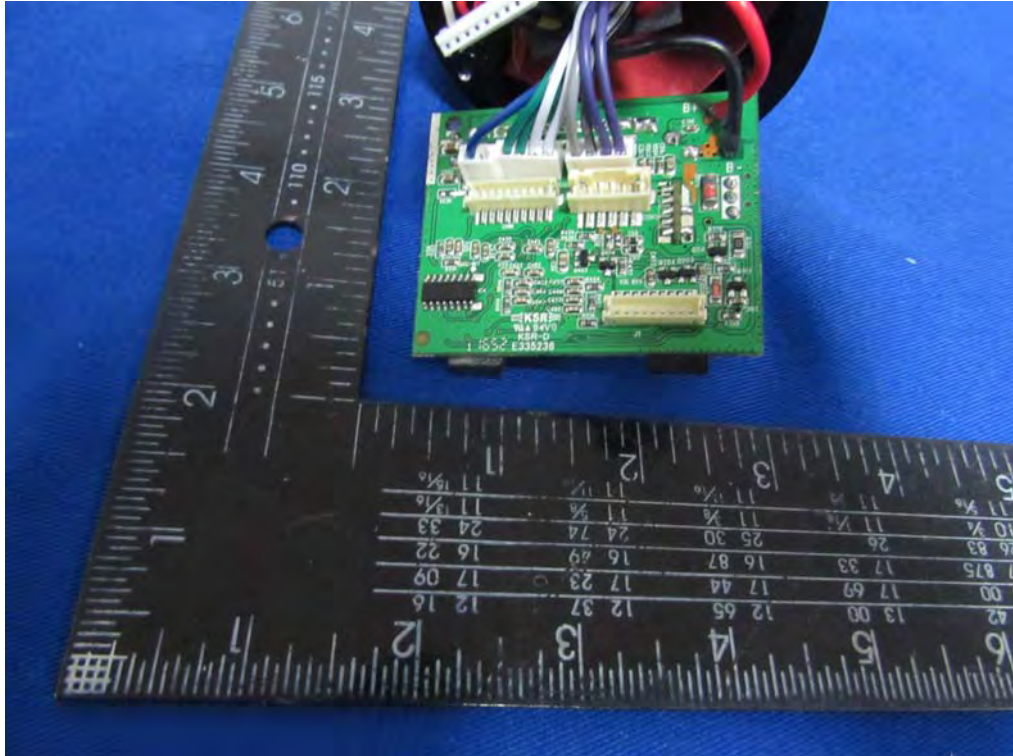
Internal Photos

M/N: MGR450B



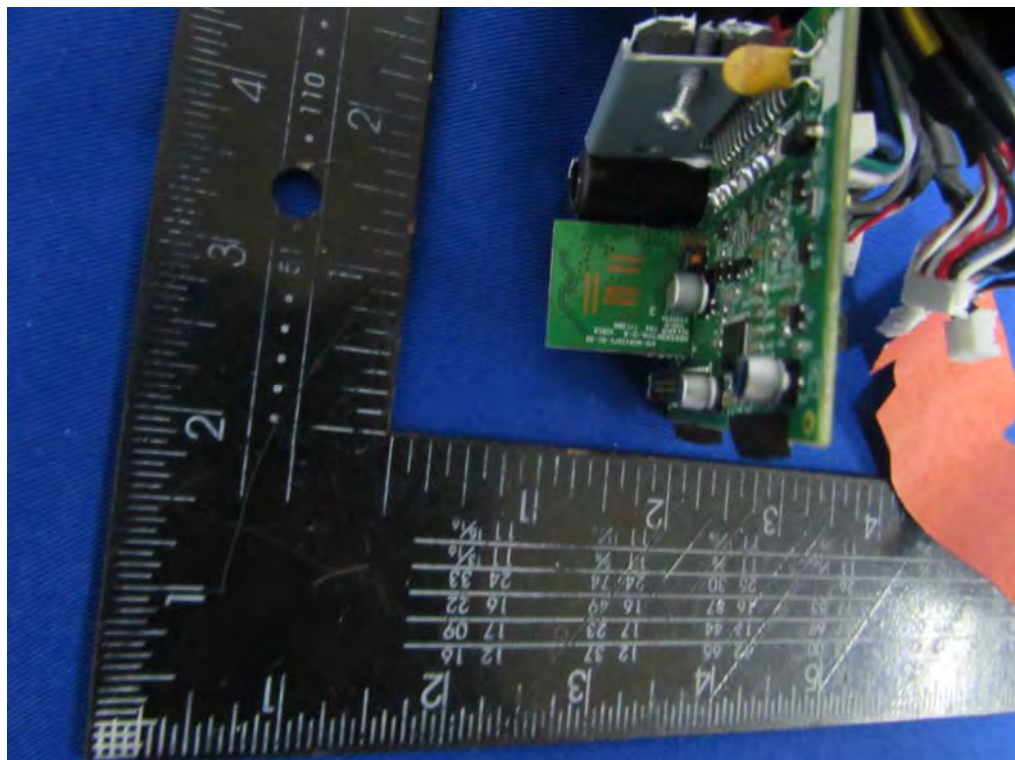
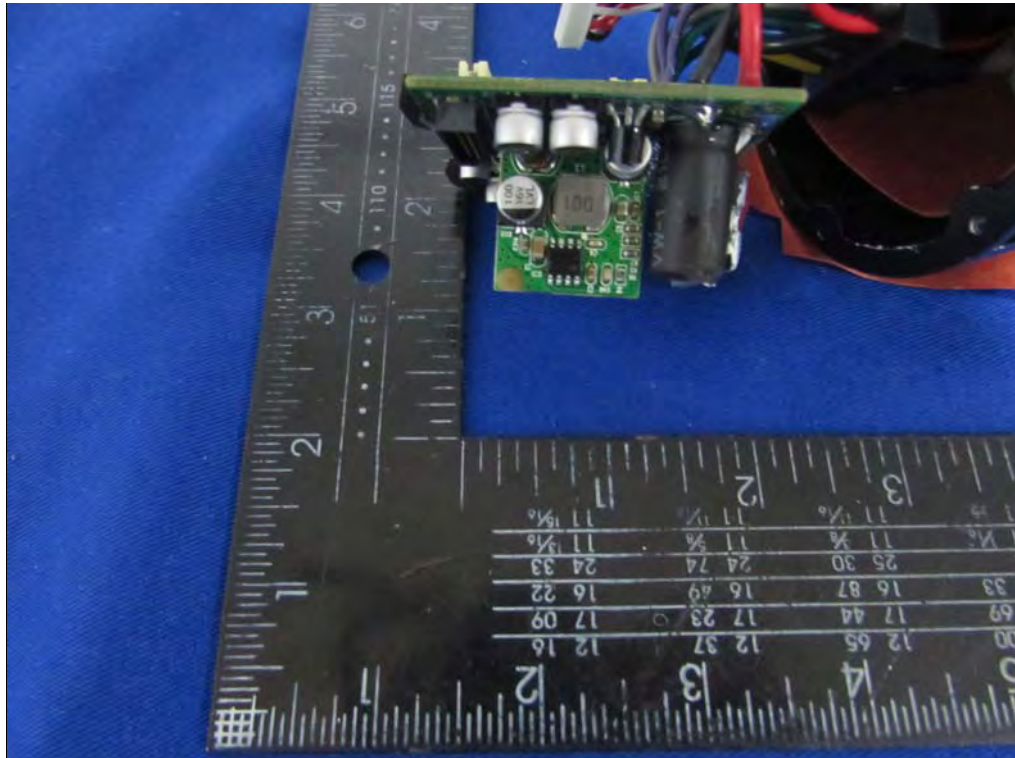
Internal Photos

M/N: MGR450B



Internal Photos

M/N: MGR450B



Internal Photos
M/N: MGR450B

BT
Antenna

