# 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,
China.

Tel: 86-769-83081888-808

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:**<br>**Address:** | Soundmax Electronics Limited<br>117/F EU YANG SANG TOWER, 11-15 CHATHAM ROAD,T.S.T, KOWLOON Hong Kong China | | |
| **Manufacturer**<br>**Address:** | Soundmax Electronics Limited<br>117/F EU YANG SANG TOWER, 11-15 CHATHAM ROAD,T.S.T, KOWLOON Hong Kong China | | |
| **Factory**<br>**Address:** | Team Force ELECTRONICS CO.,LTD<br>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<br>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.<br>This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd.<br>**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, π/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)<br>DA 00-705 | PASS |
| 20dB Bandwidth | FCC Part 15: 15.215<br>DA 00-705 | PASS |
| Carrier Frequency Separation | FCC Part 15: 15.247(a)(1)<br>DA 00-705 | PASS |
| Number Of Hopping Channel | FCC Part 15: 15.247(a)(1)(iii)<br>DA 00-705 | PASS |
| Dwell Time | FCC Part 15: 15.247(a)(1)(iii)<br>DA 00-705 | PASS |
| Radiated Emission | FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>ANSI C63.10: 2013<br>DA 00-705 | PASS |
| Band Edge Compliance | FCC Part 15: 15.247(d)<br>DA 00-705 | PASS |
| Power Line Conducted Emissions | FCC Part 15: 15.207<br>ANSI C63.10: 2013<br>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.

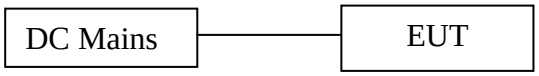
## 2.4. Assistant equipment used for test

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

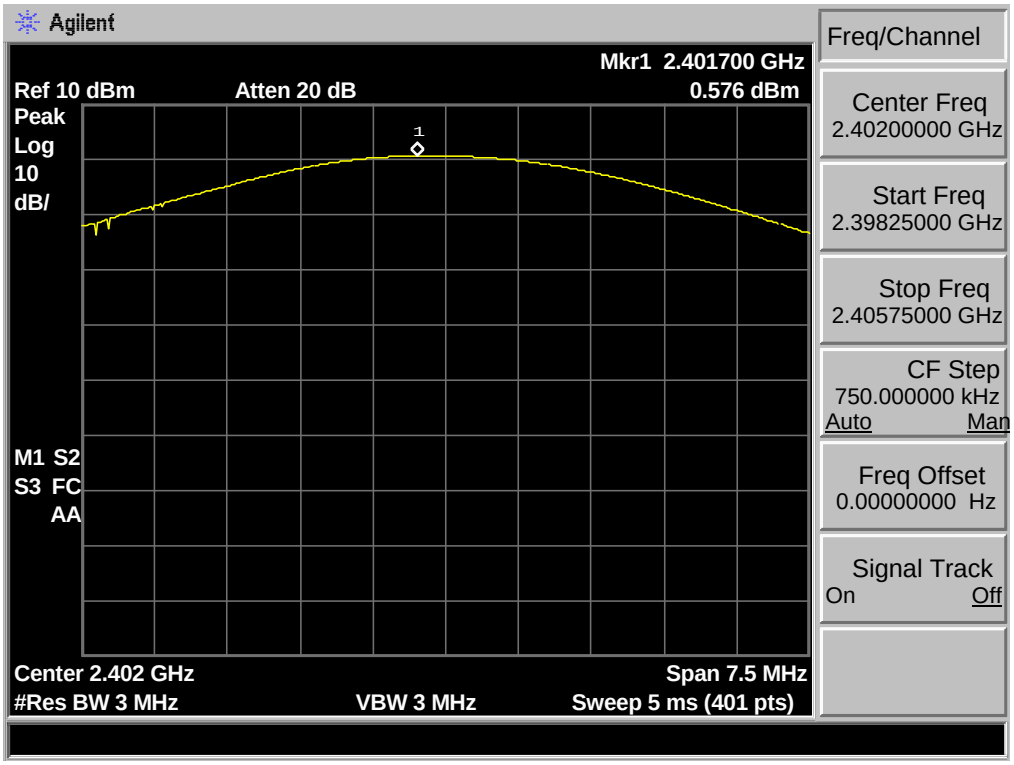
The transmitter output (antenna port) was connected to the spectrum analyzer

## 3.3. Test Result

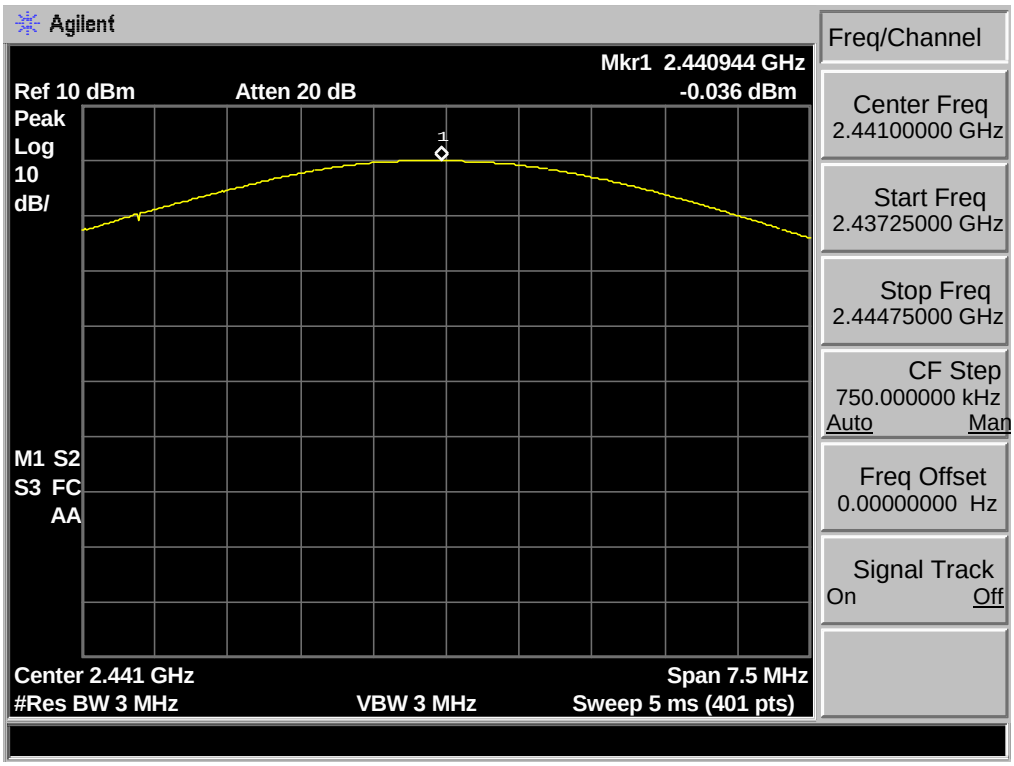
| EUT: Car radio<br>M/N: MGR450B | | | | | |
|---|---|---|---|---|---|
| Test date: 2017-03-24 | | Test site: RF site | Tested by: Tony Tang | | |
| Mode | Freq (MHz) | Result (dBm) | Limit | | Margin (dB) |
| | | | dBm | W | |
| GFSK | 2402 | 0.576 | 30.00 | 1 | 29.424 |
| | 2441 | -0.036 | 30.00 | 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

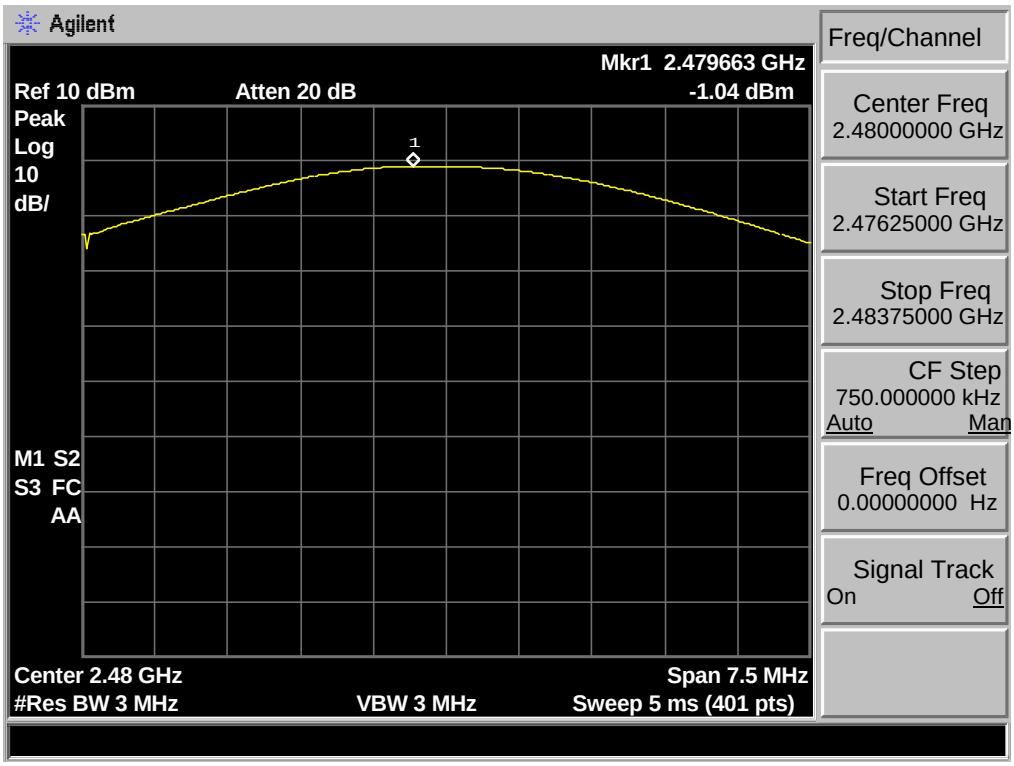
### GFSK 2402 MHz



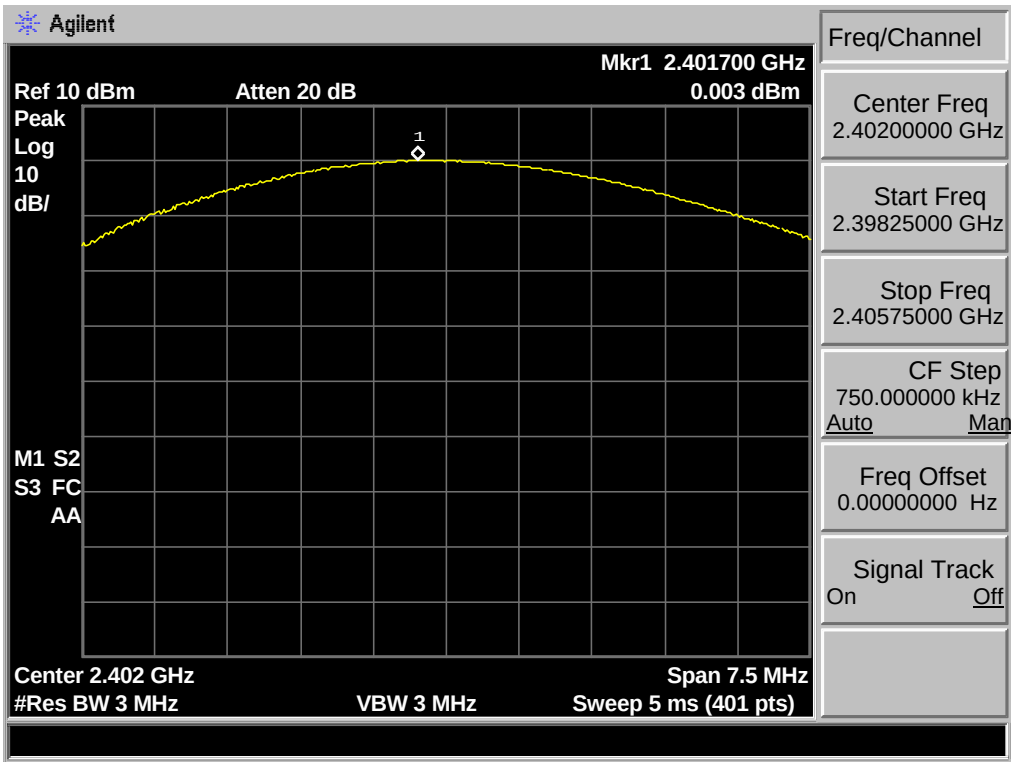

### GFSK 2441 MHz



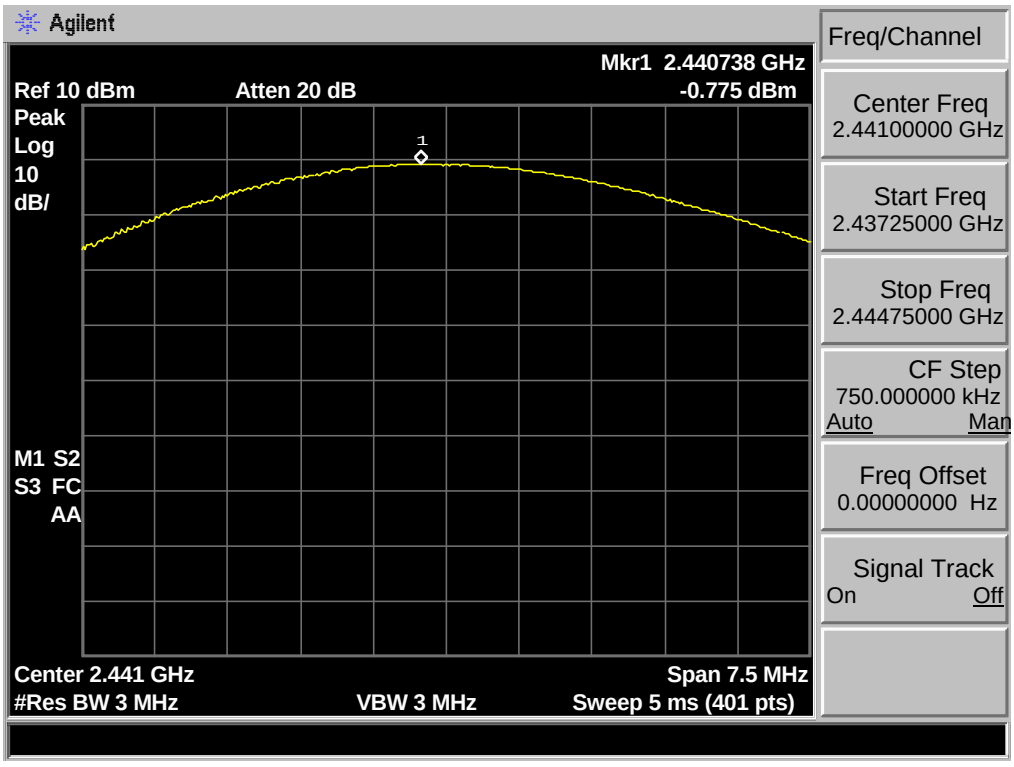
## GFSK 2480 MHz



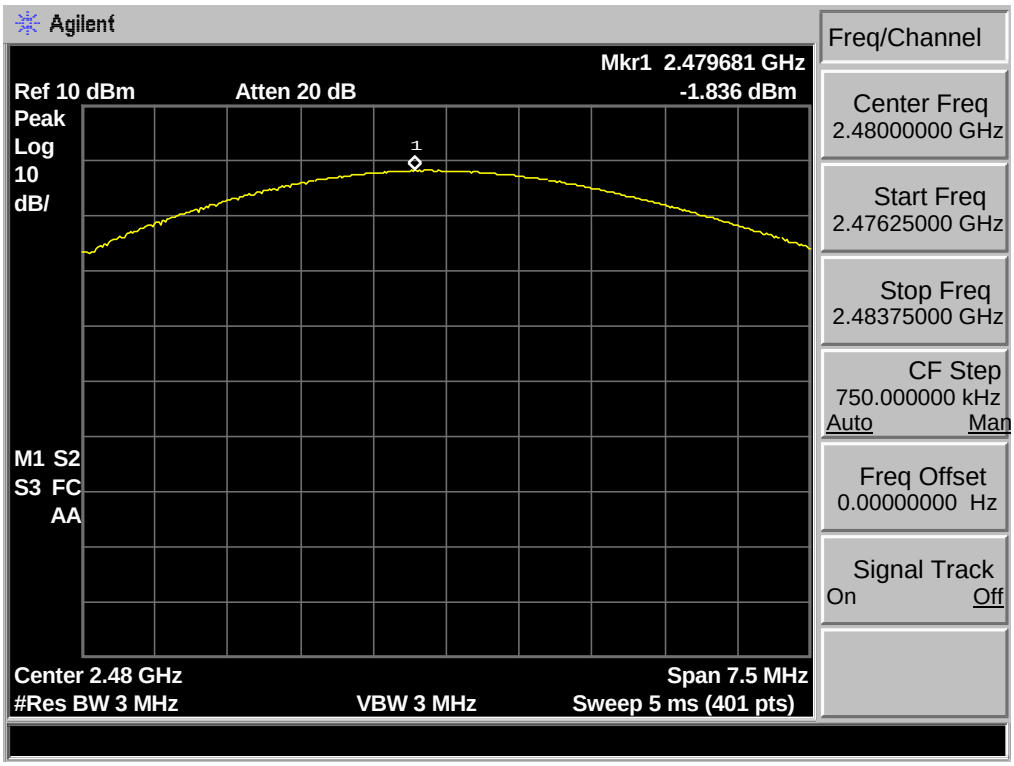
## 8-DPSK 2402 MHz




## 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

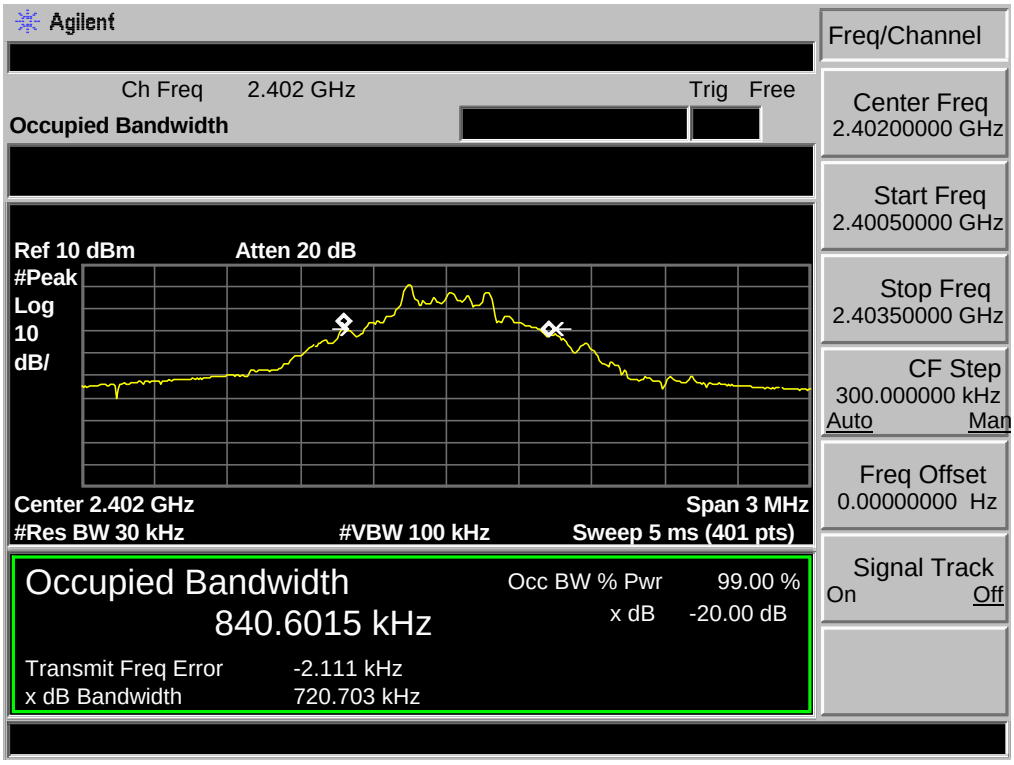
The transmitter output was coupled to a spectrum analyzer via a antenna. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

## 4.3. Test Result

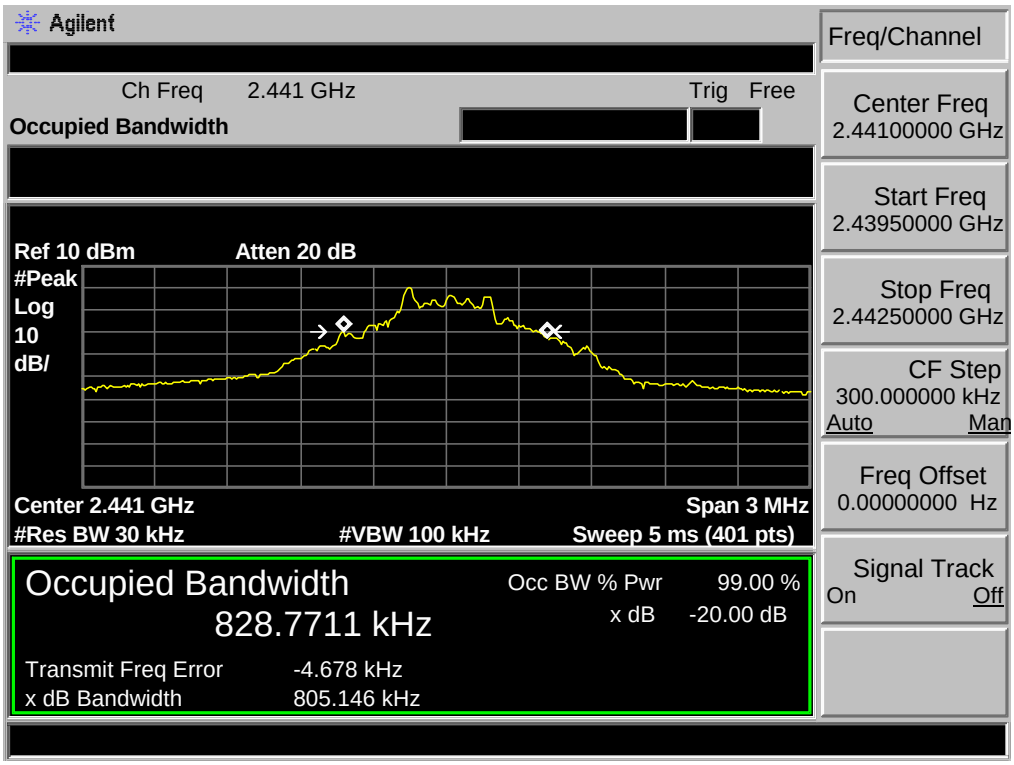
| EUT: Car radio<br>M/N: MGR450B | | | | |
|---|---|---|---|---|
| Test date: 2017-03-24 | | Test site: RF site | | Tested by: Tony Tang |
| Mode | Freq (MHz) | 20dB Bandwidth (MHz) | Limit (kHz) | Conclusion |
| GFSK | 2402 | 0.721 | / | PASS |
| | 2441 | 0.805 | / | PASS |
| | 2480 | 0.811 | / | PASS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

## 4.4. Test Data

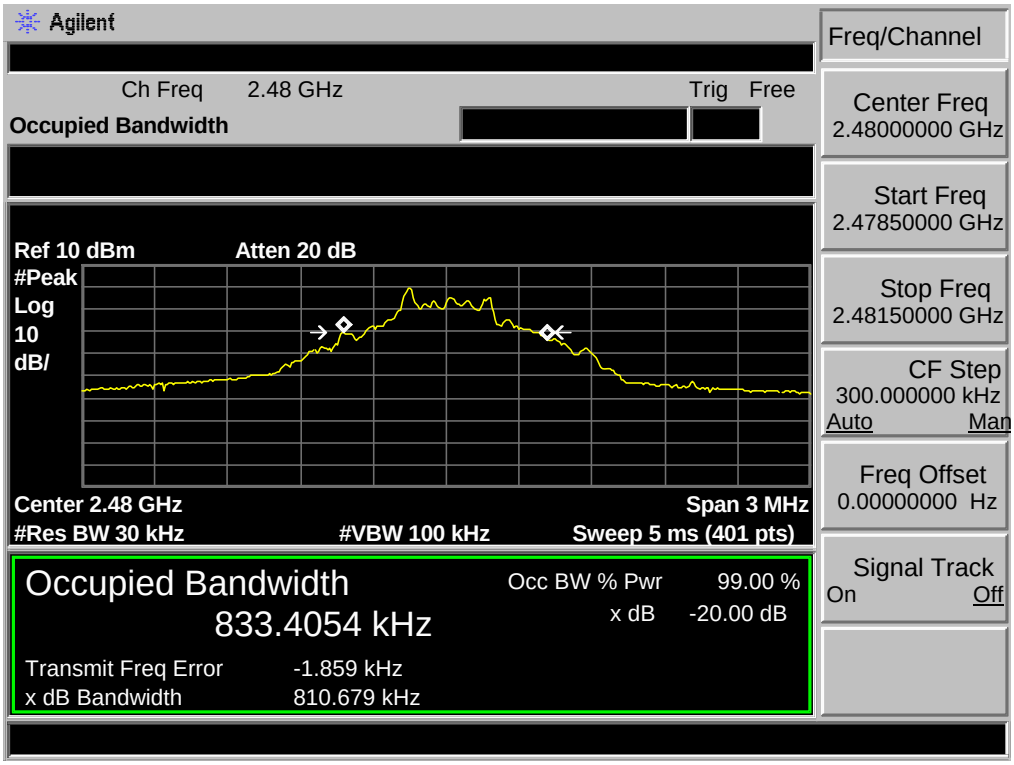
### GFSK 2402MHz



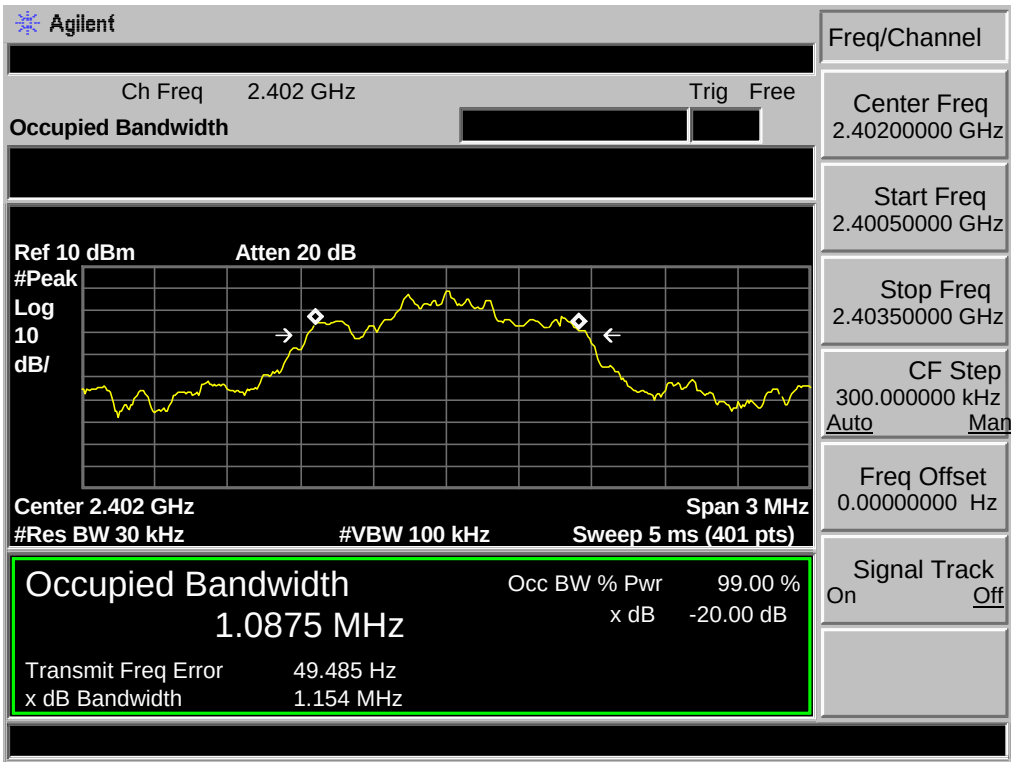

### GFSK 2441MHz



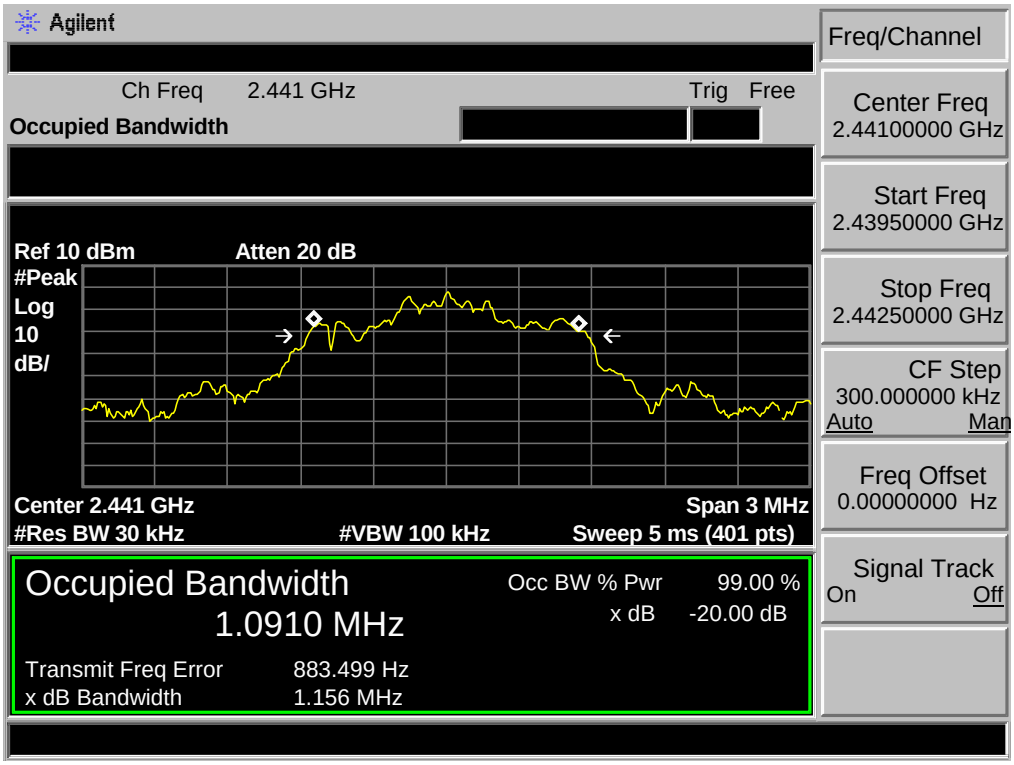
**GFSK 2480MHz**



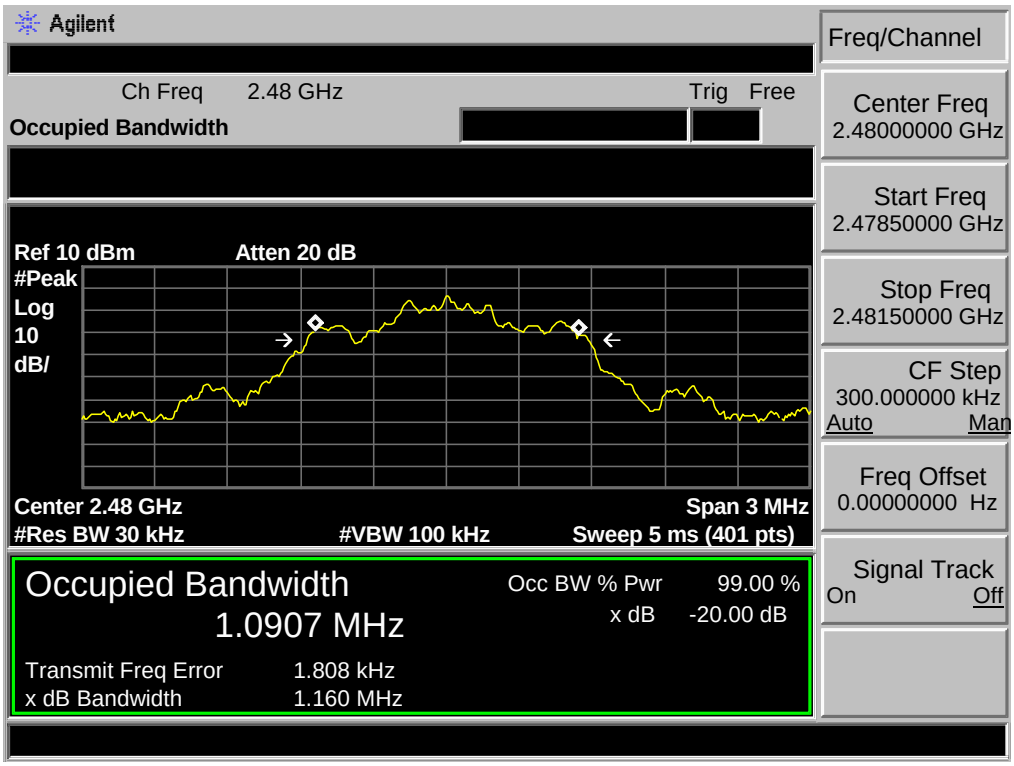
**8-DPSK 2402MHz**




**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

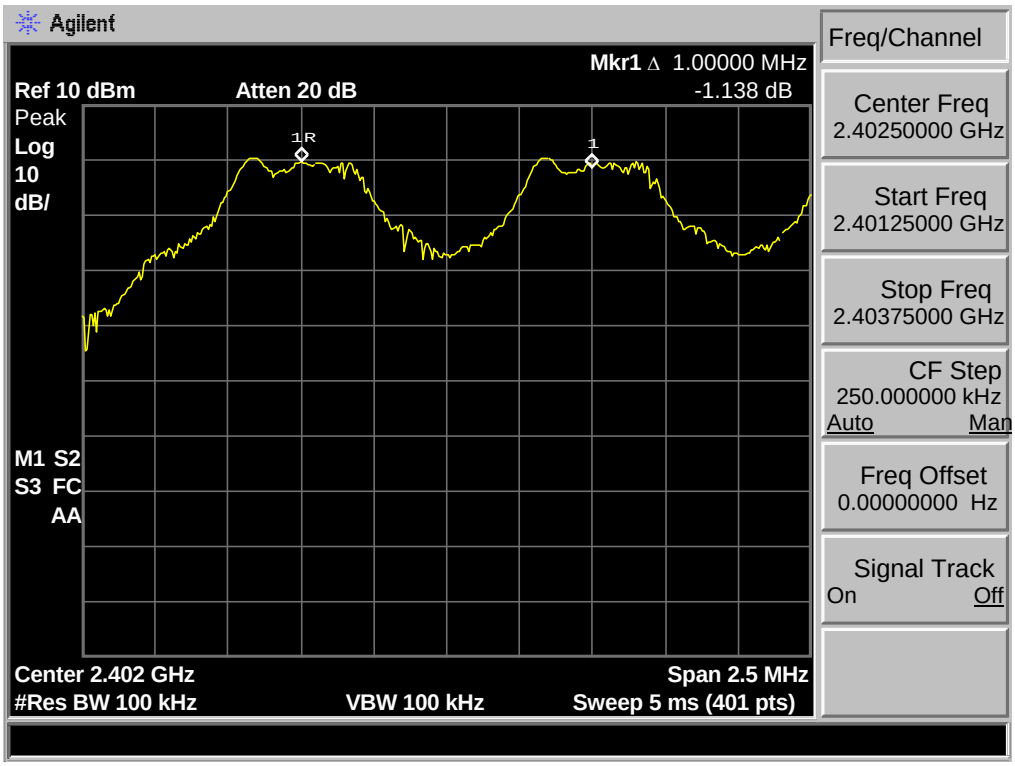
The transmitter output was coupled to a spectrum analyzer via a antenna. The carrier frequency was measured by spectrum analyzer with 100kHz RBW and 100kHz VBW.

## 5.3. Test Result

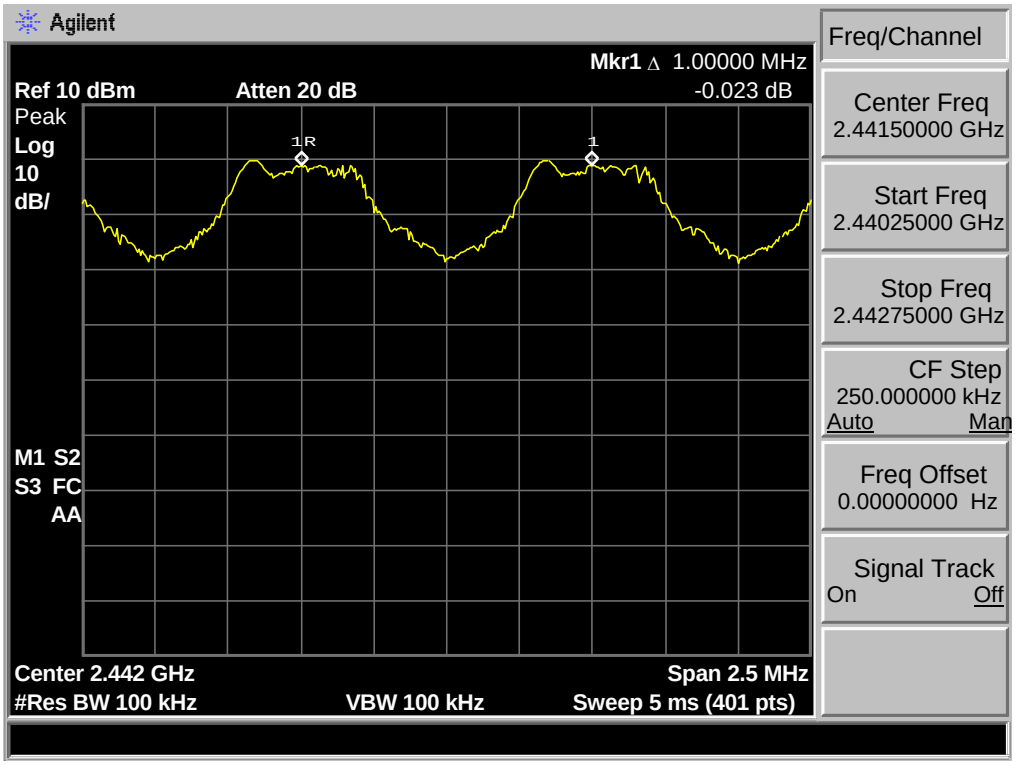
| EUT: Car radio<br>M/N: MGR450B | | | | |
|---|---|---|---|---|
| Test date: 2017-03-24 | | | Test site: RF site Tested by: Tony Tang | |
| Mode | Channel | Channel separation (MHz) | Limit | Conclusion |
| GFSK | Low CH | 1.000 | 0.721 MHz | PASS |
| | Mid CH | 1.000 | 0.805 MHz | PASS |
| | High CH | 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

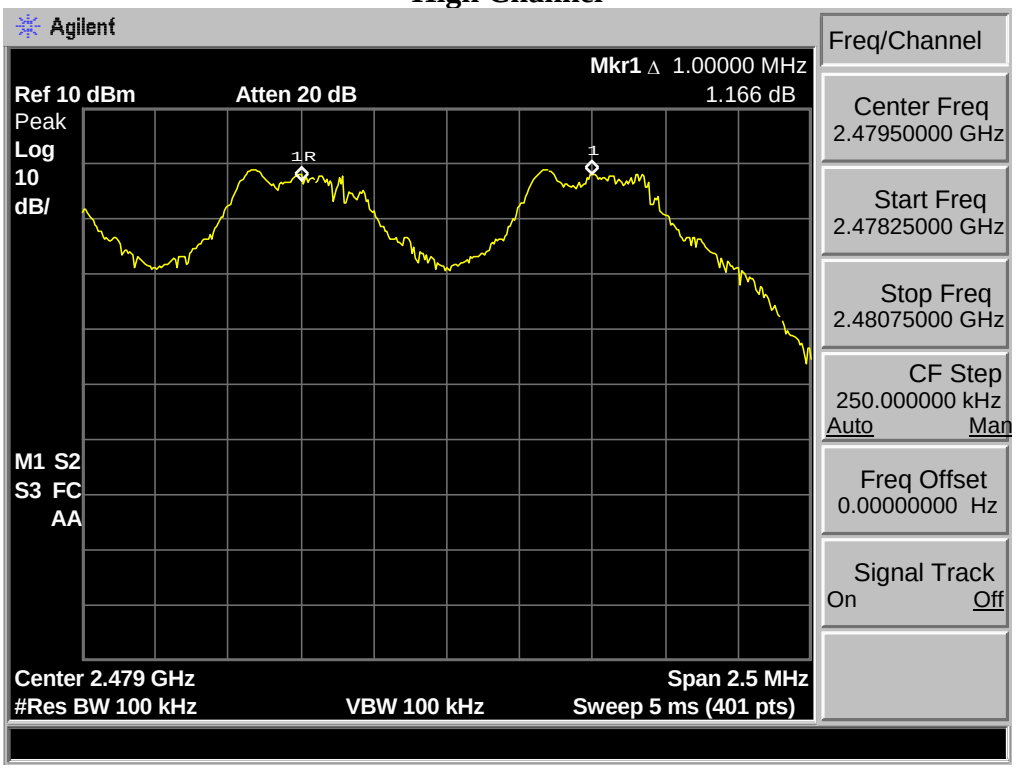
**GFSK**
**Low Channel**



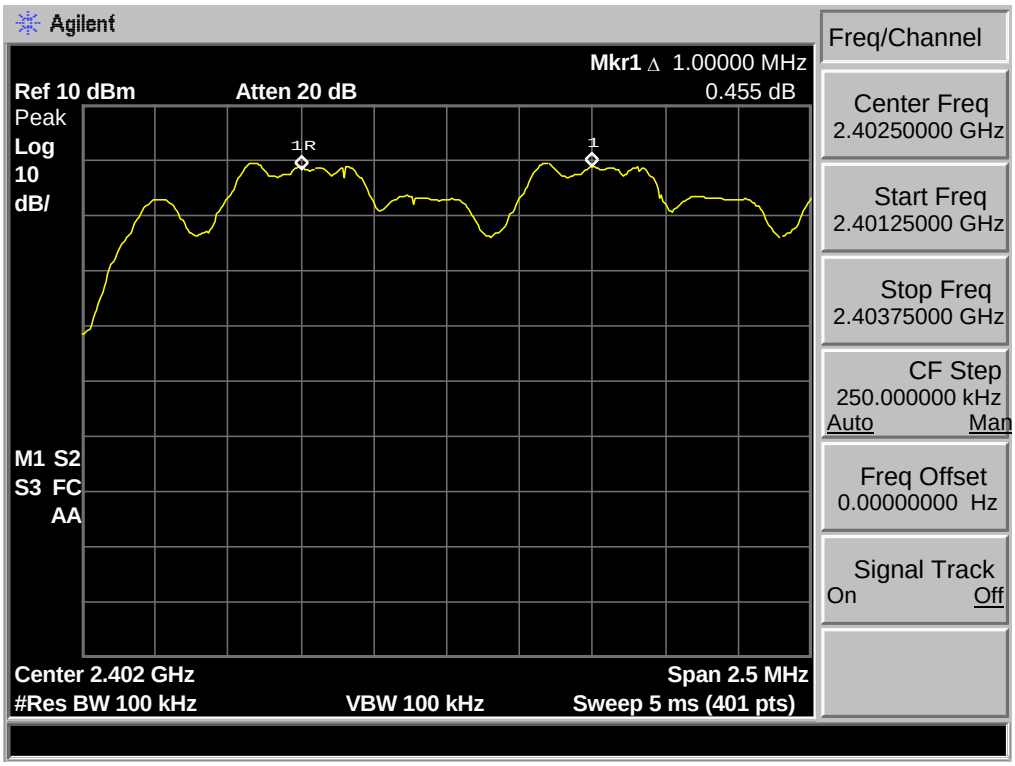

**Mid Channel**



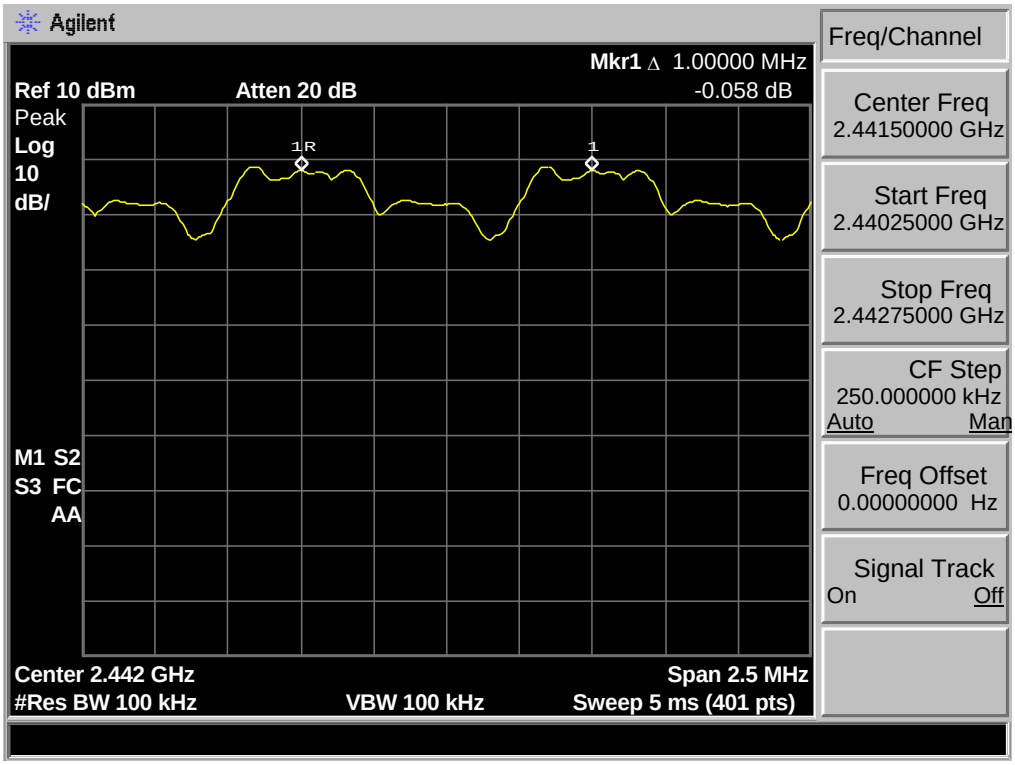
**High Channel**



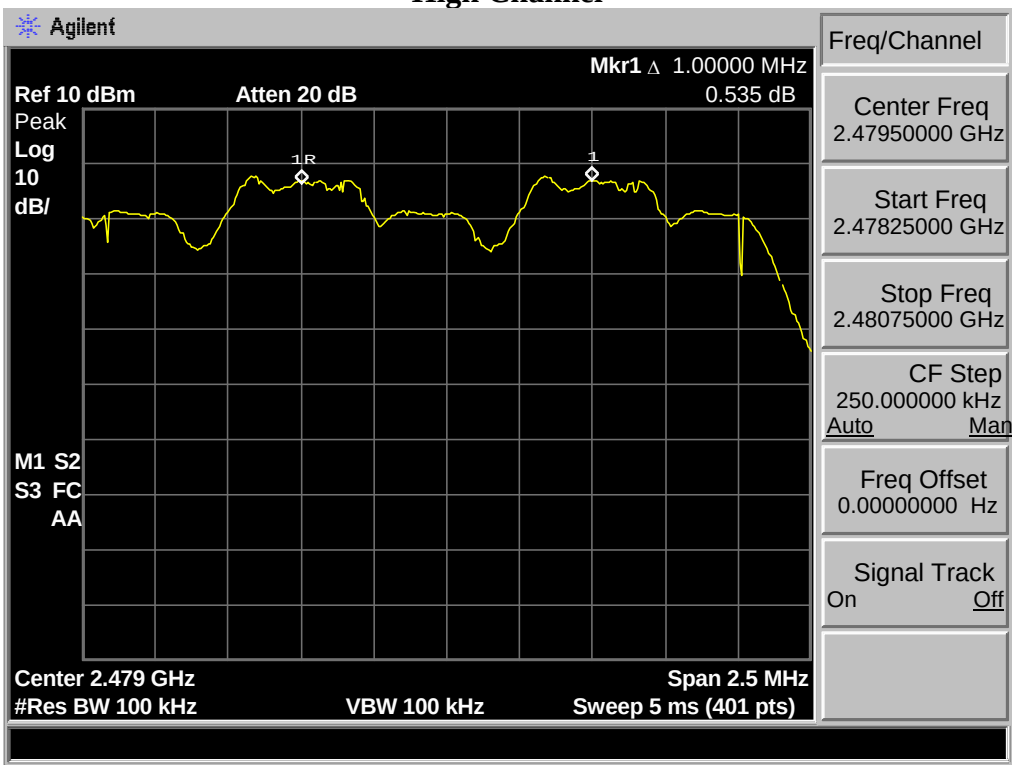
**8-DPSK**
**Low Channel**




**Mid Channel**



**High 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

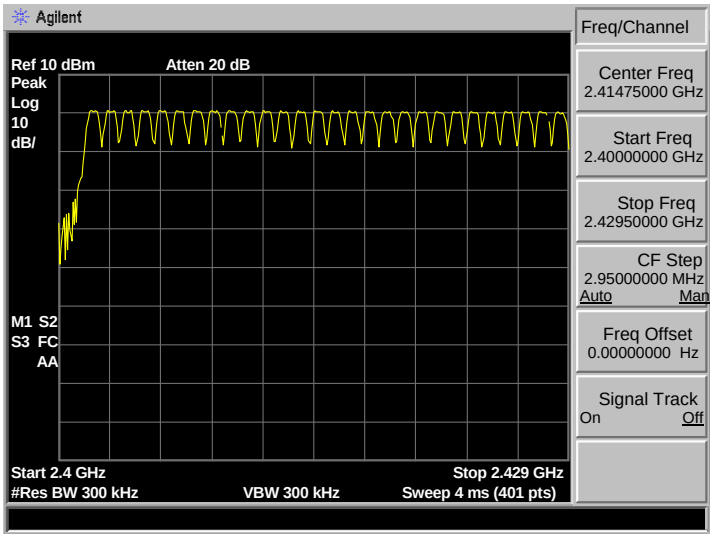
The transmitter output was coupled to a spectrum analyzer via a antenna. The number of hopping channel was measured by spectrum analyzer with 300kHz RBW and 300kHz VBW.

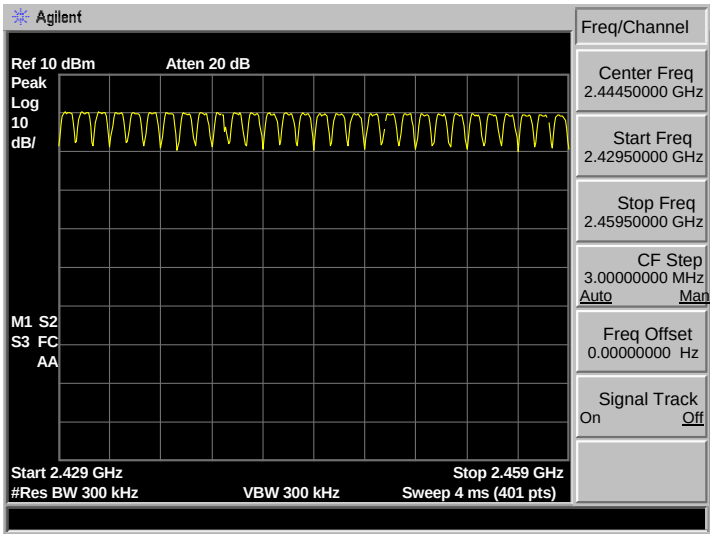
## 6.3. Test Result

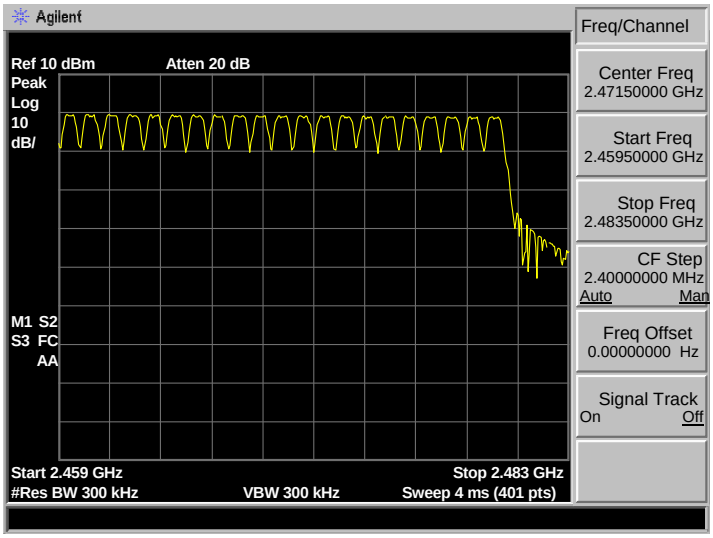
| EUT: Car radio<br>M/N: MGR450B | | | |
|---|---|---|---|
| Test date: 2017-03-24 | Test site: RF site | Tested by: Tony.Tang | |
| Mode | Number of hopping channel | Limit | Conclusion |
| GFSK | 79 | >15 | PASS |
| 8-DPSK | 79 | >15 | PASS |

## 6.4. Test Data

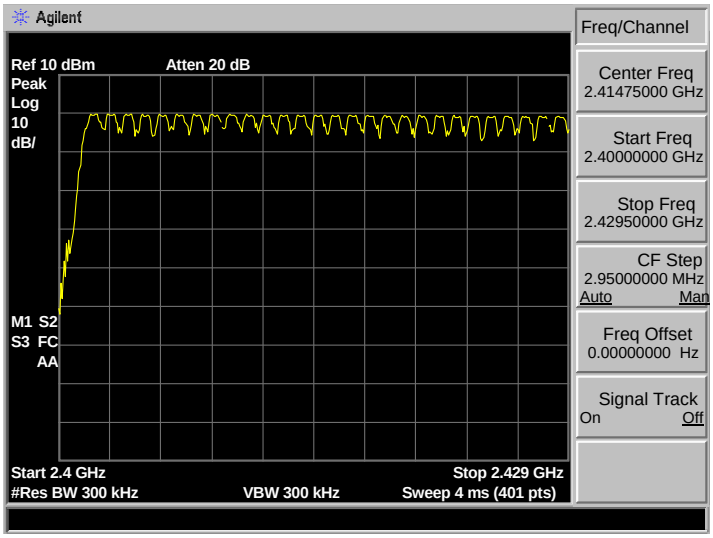
**GFSK**

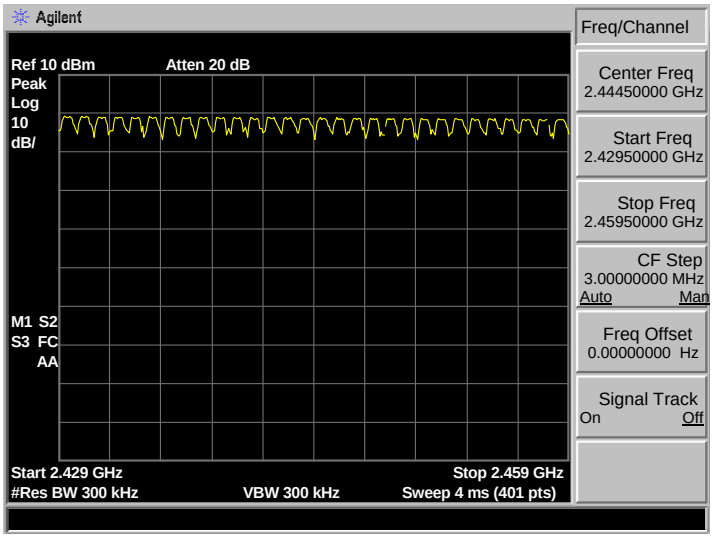


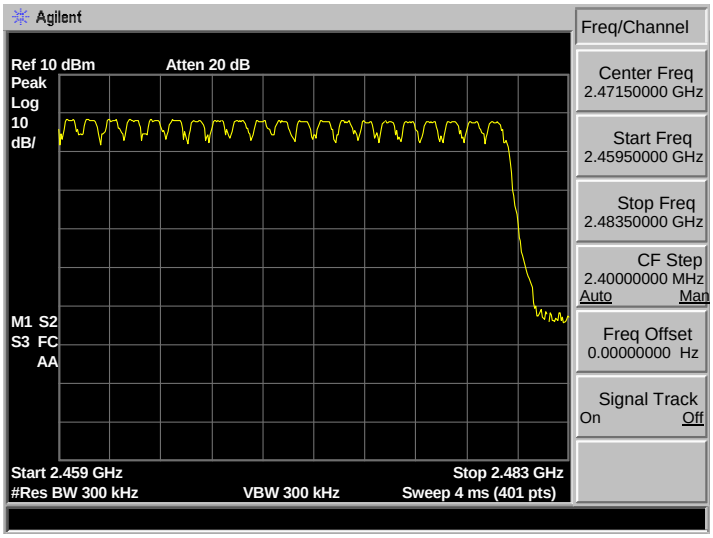



## 8-DPSK


Agilent
Freq/Channel
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center Freq
2.41475000 GHz
Start Freq
2.40000000 GHz
Stop Freq
2.42950000 GHz
CF Step
2.95000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Start 2.4 GHz
#Res BW 300 kHz
VBW 300 kHz
Stop 2.429 GHz
Sweep 4 ms (401 pts)


Agilent
Freq/Channel
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center Freq
2.44450000 GHz
Start Freq
2.42950000 GHz
Stop Freq
2.45950000 GHz
CF Step
3.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Start 2.429 GHz
#Res BW 300 kHz
VBW 300 kHz
Stop 2.459 GHz
Sweep 4 ms (401 pts)


Agilent
Freq/Channel
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center Freq
2.47150000 GHz
Start Freq
2.45950000 GHz
Stop Freq
2.48350000 GHz
CF Step
2.40000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Start 2.459 GHz
#Res BW 300 kHz
VBW 300 kHz
Stop 2.483 GHz
Sweep 4 ms (401 pts)

# 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

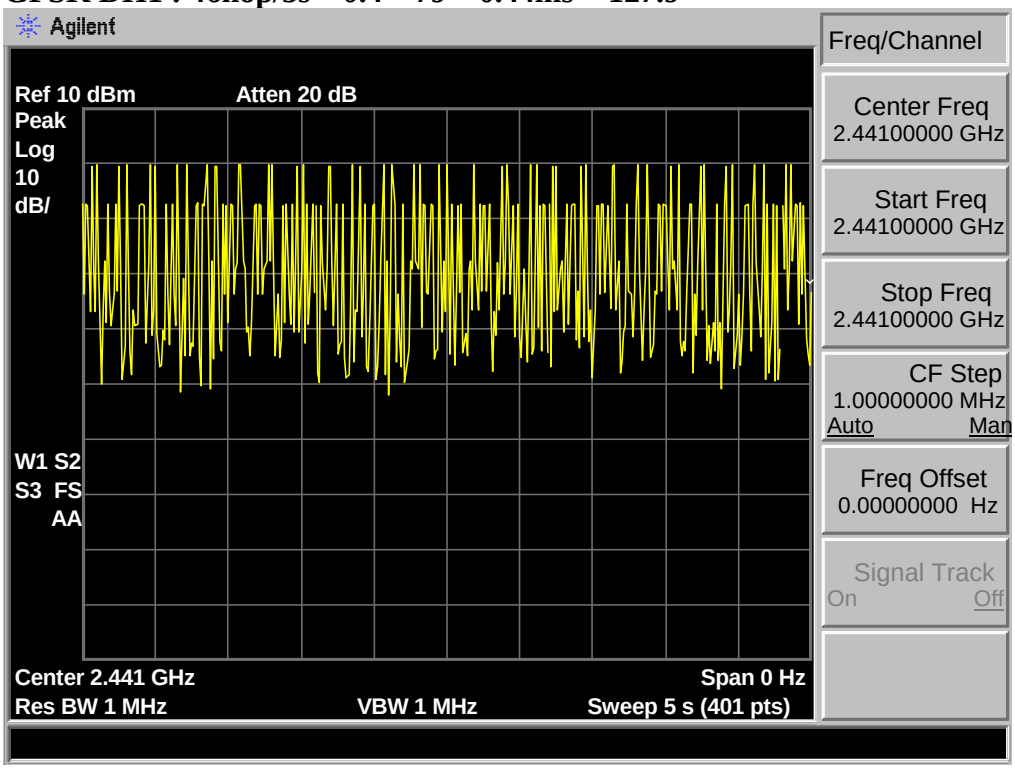
1. Connect the antenna port of the EUT to the spectrum analyzer by a low lost cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 1MHz, VBW= 1MHz, Frequency Span = 0 Hz.
4. Set sweep time properly 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.

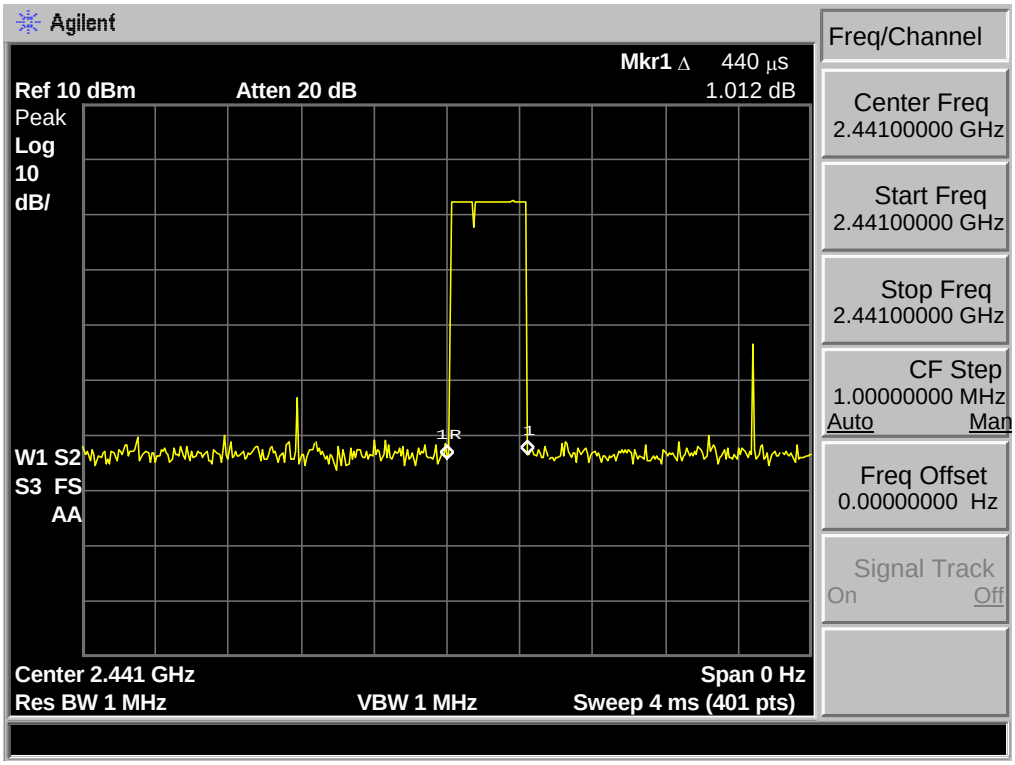
## 7.3. Test Result

| EUT: Car radio<br>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 |

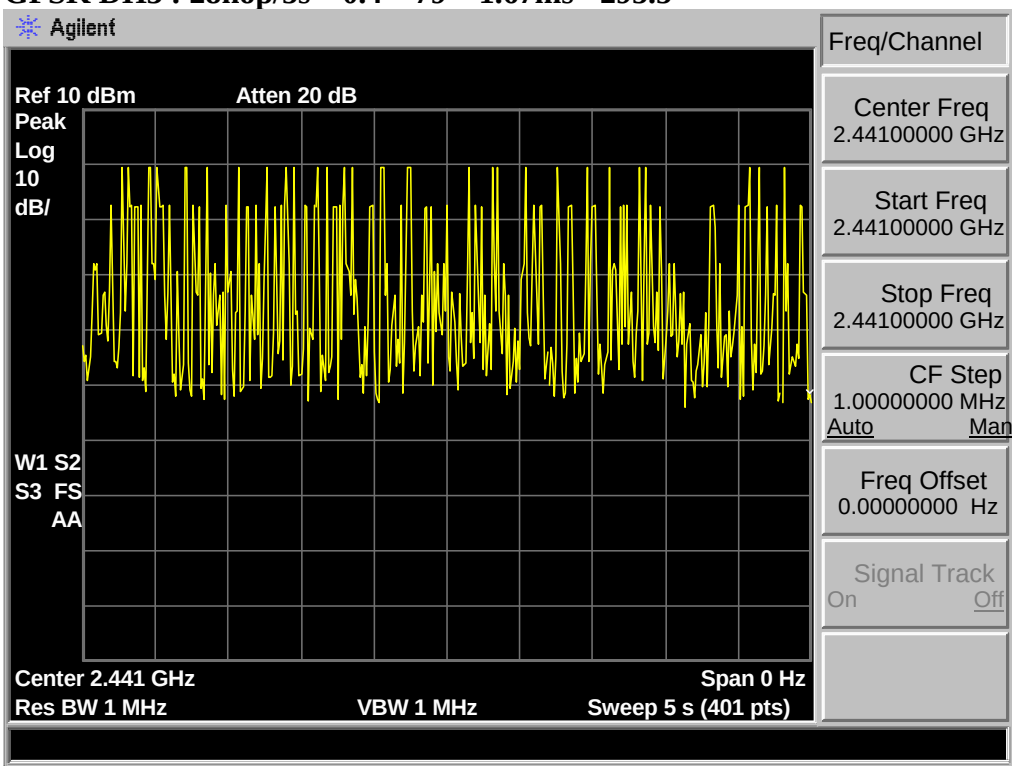
## 7.4. Test Data

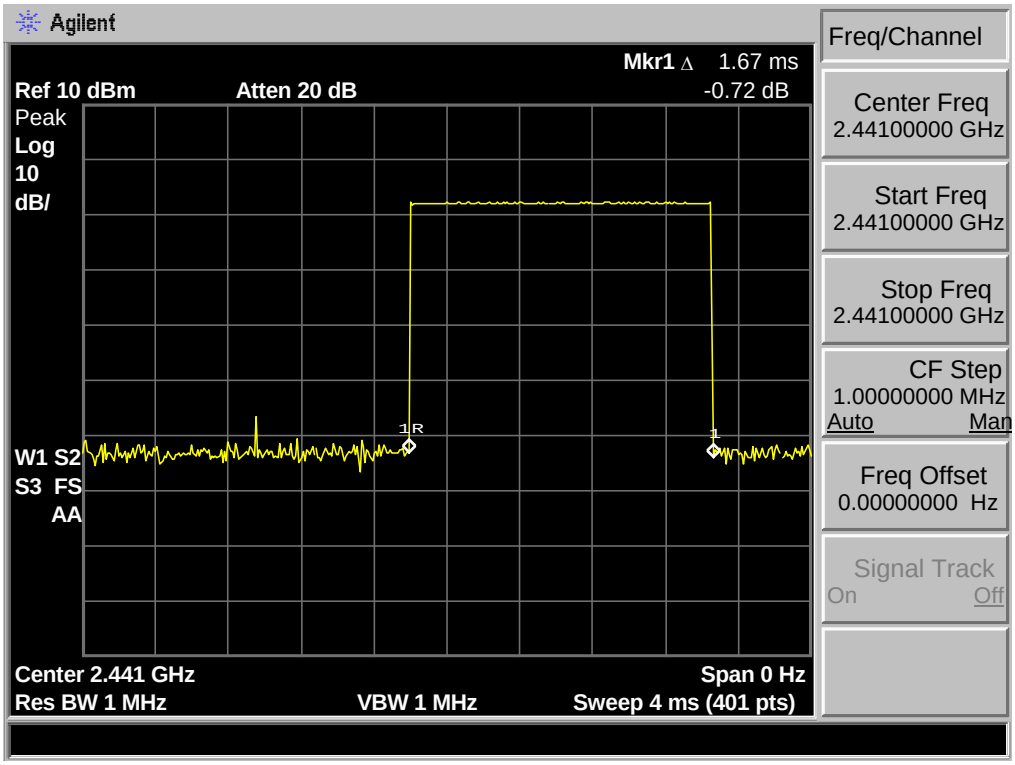
**GFSK DH1 : 46hop/5s * 0.4 * 79 * 0.44ms = 127.9**



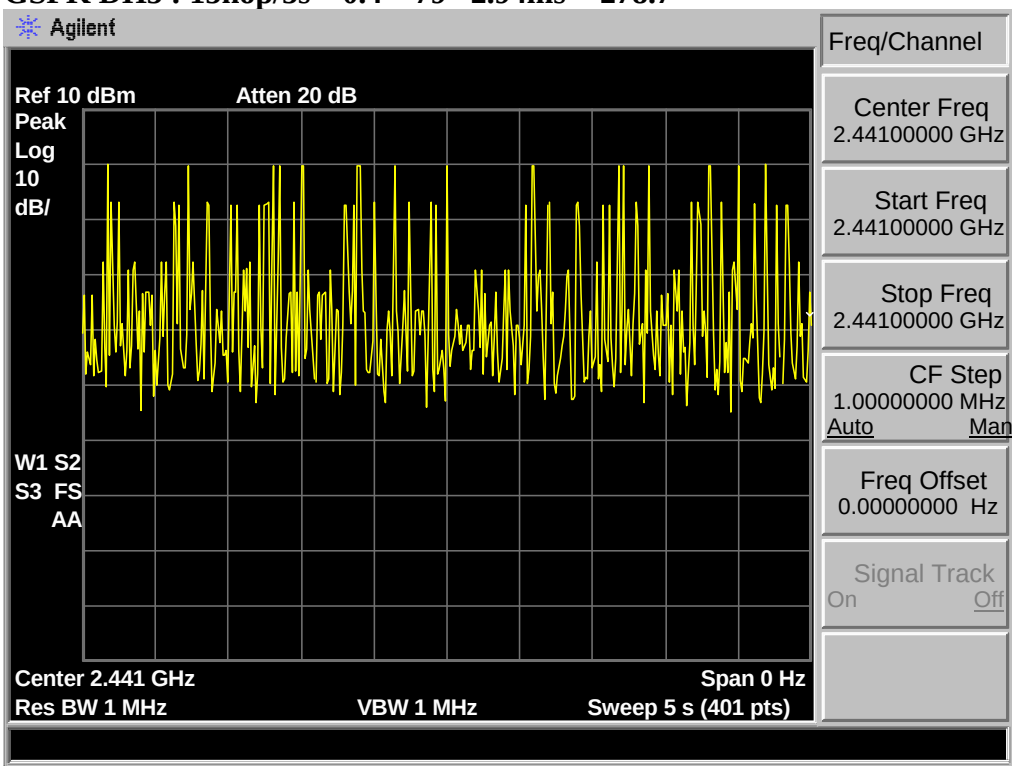



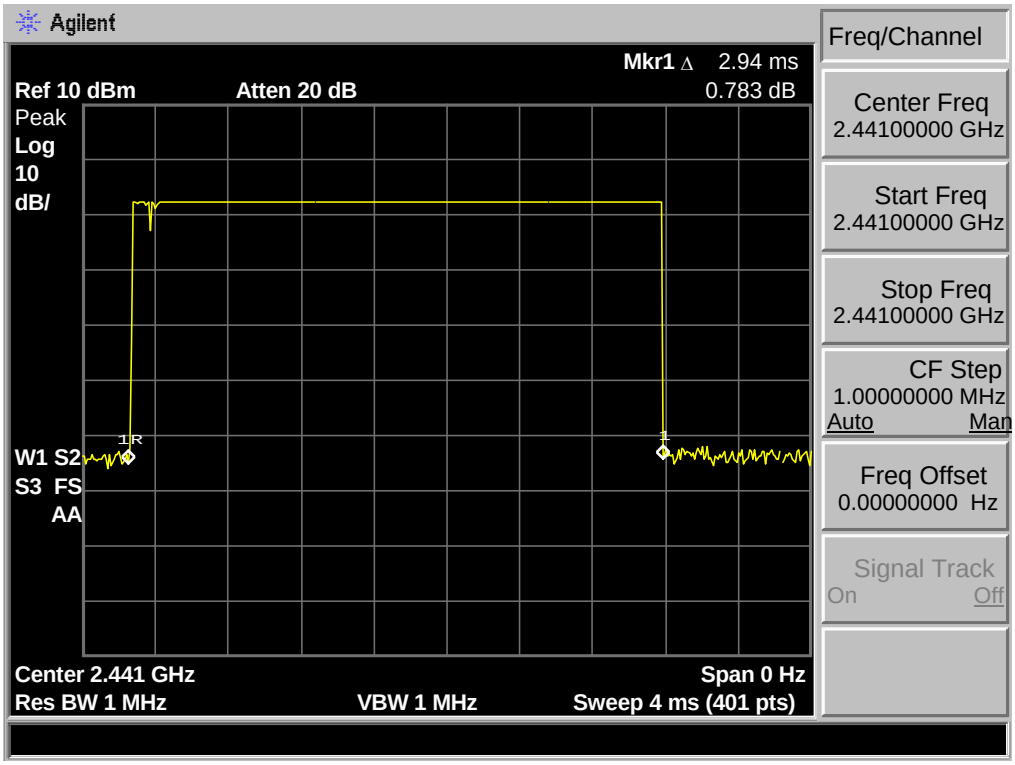
**GFSK DH3 : 28hop/5s * 0.4 * 79 * 1.67ms= 295.5**



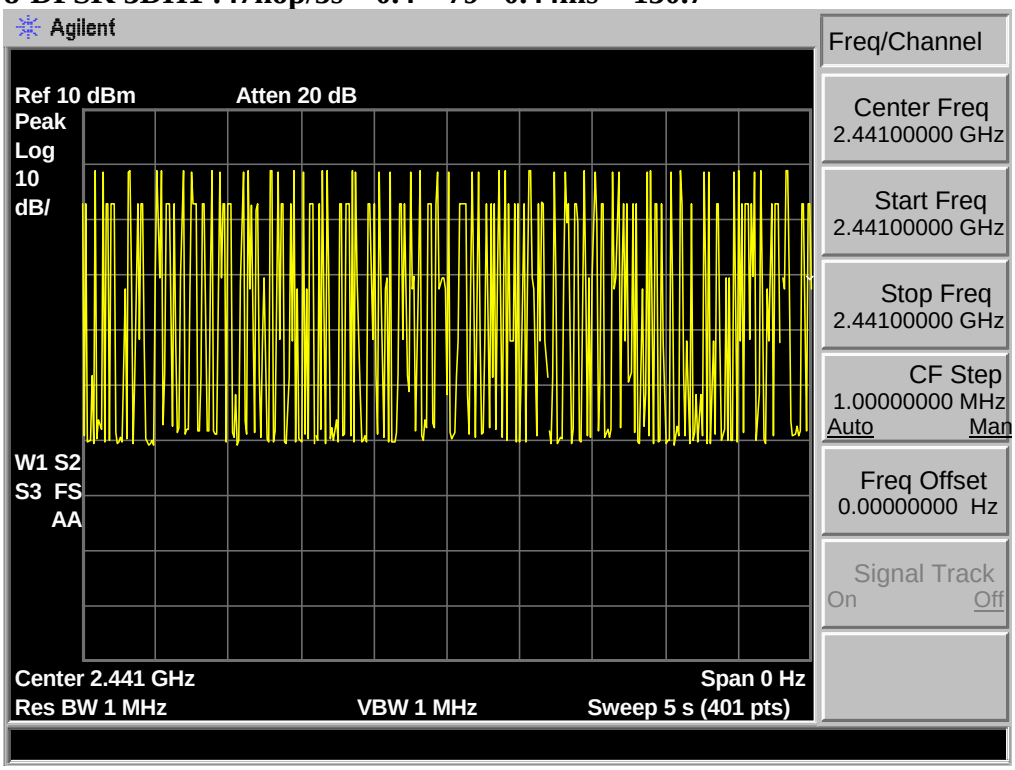



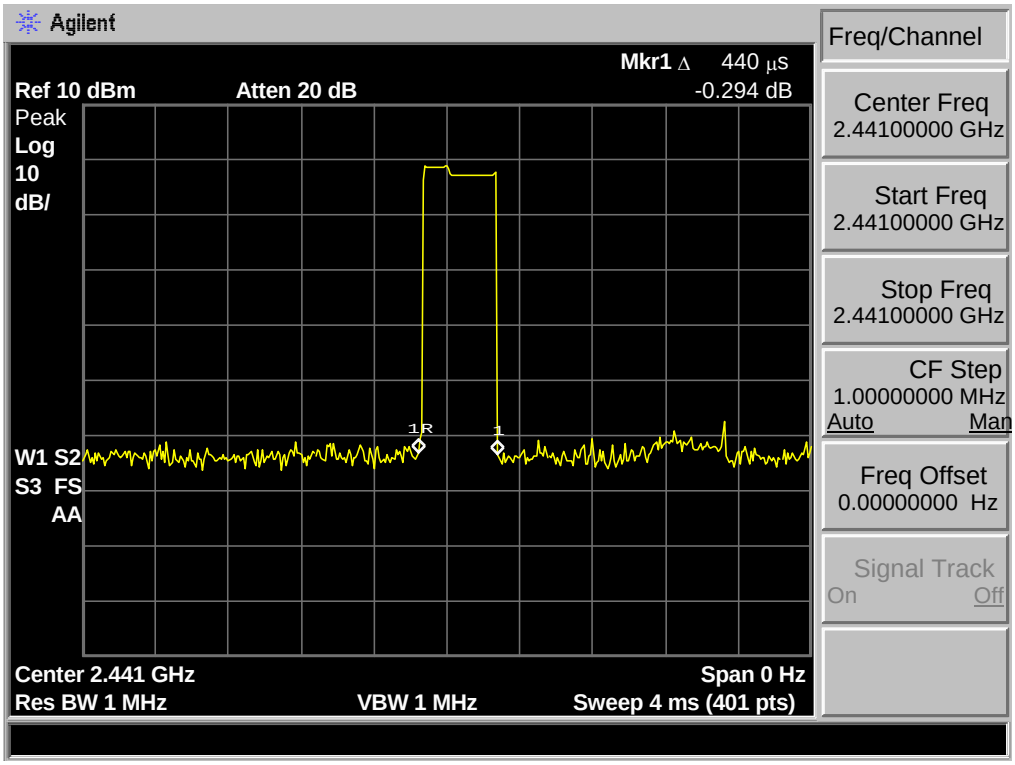
**GSFK DH5 : 15hop/5s * 0.4 * 79 *2.94ms = 278.7**



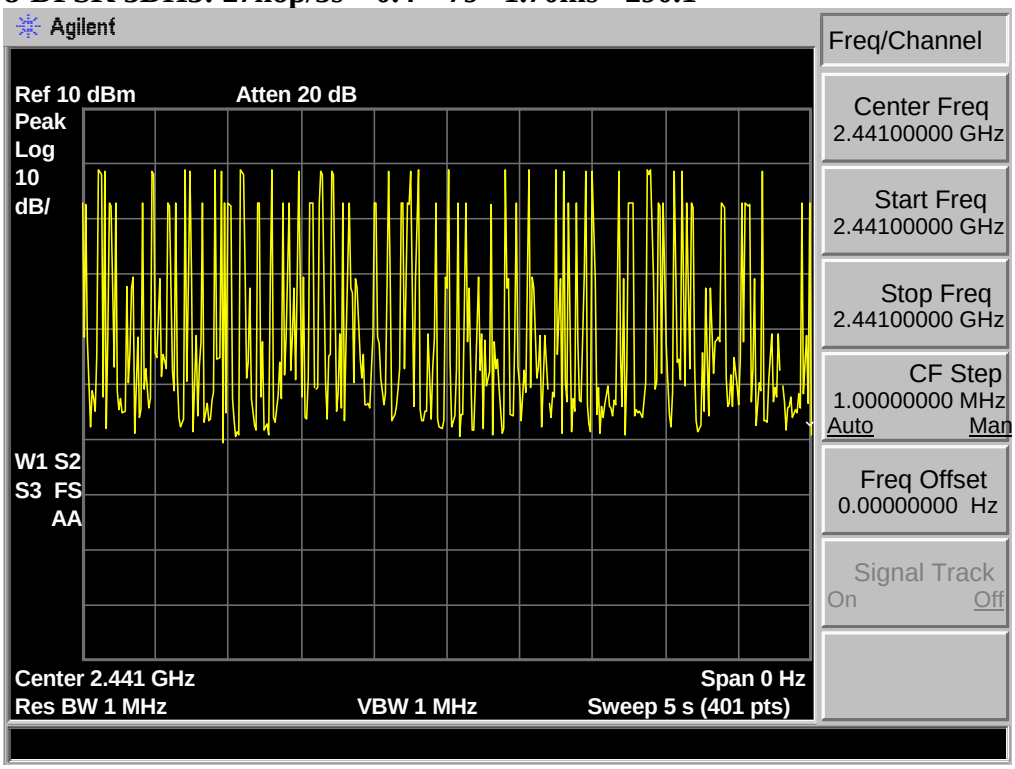



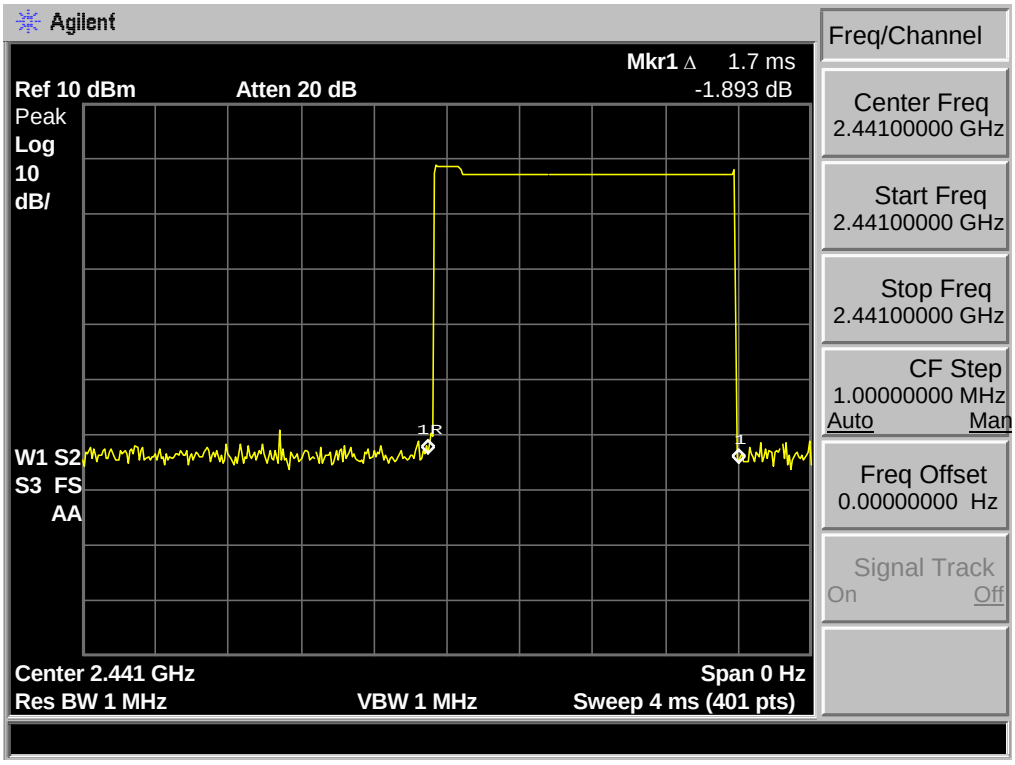
**8-DPSK 3DH1 :47hop/5s * 0.4 * 79 *0.44ms = 130.7**



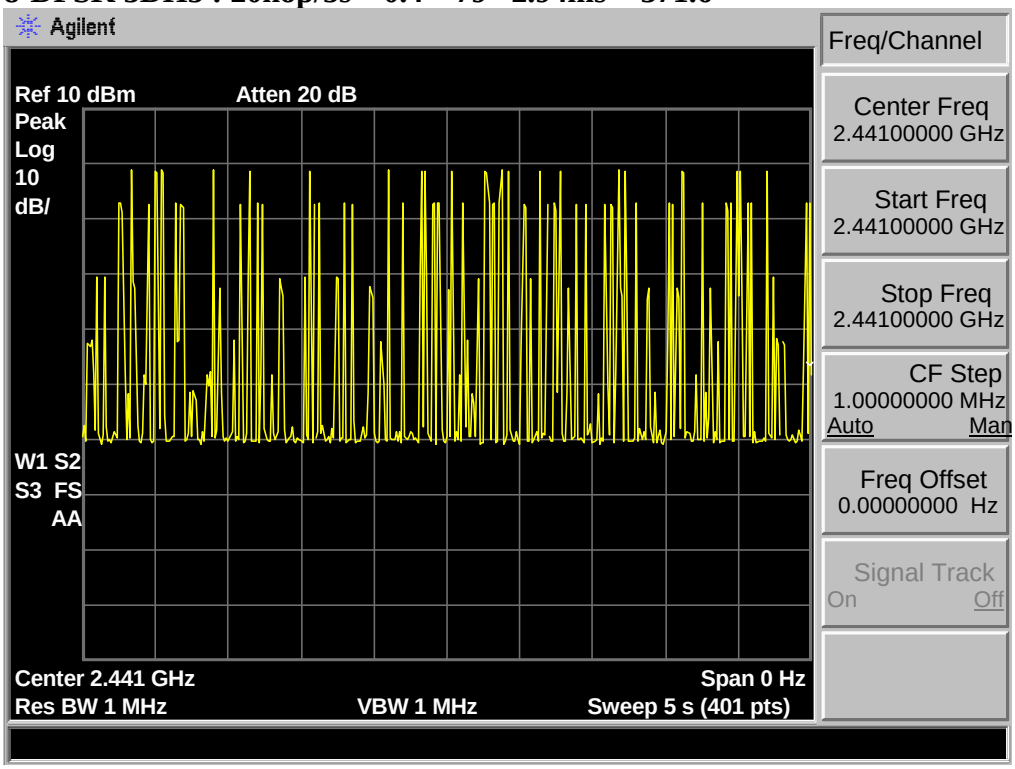



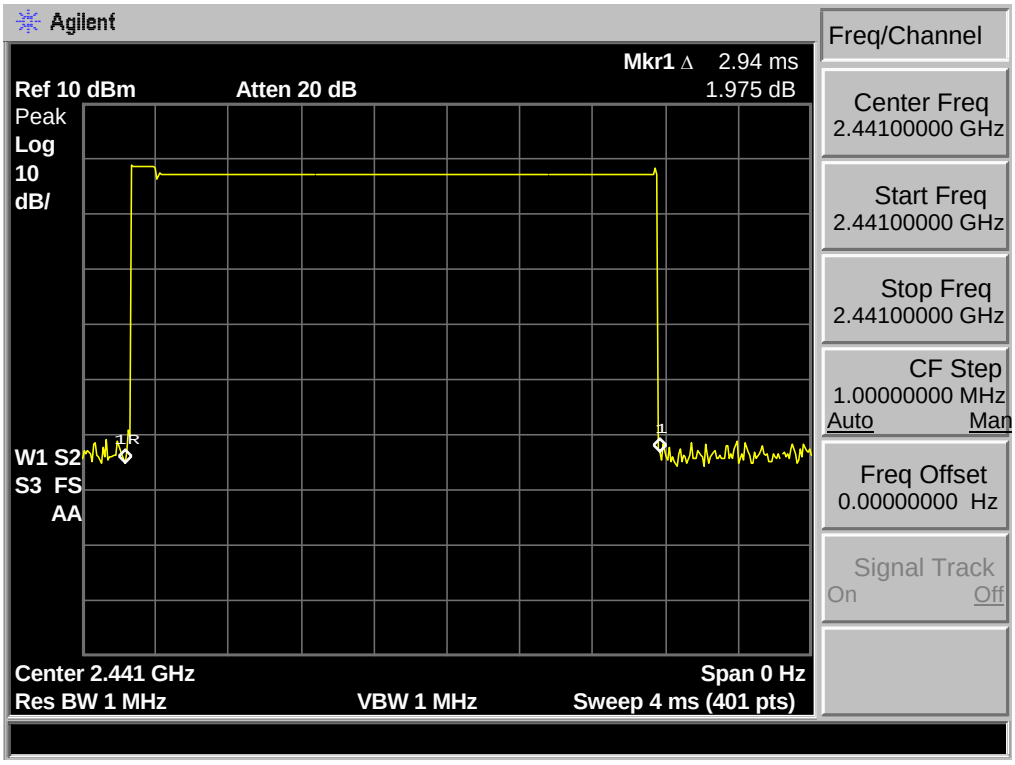
**8-DPSK 3DH3: 27hop/5s * 0.4 * 79 *1.70ms =290.1**



**8-DPSK 3DH5 : 20hop/5s * 0.4 * 79 *2.94ms = 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

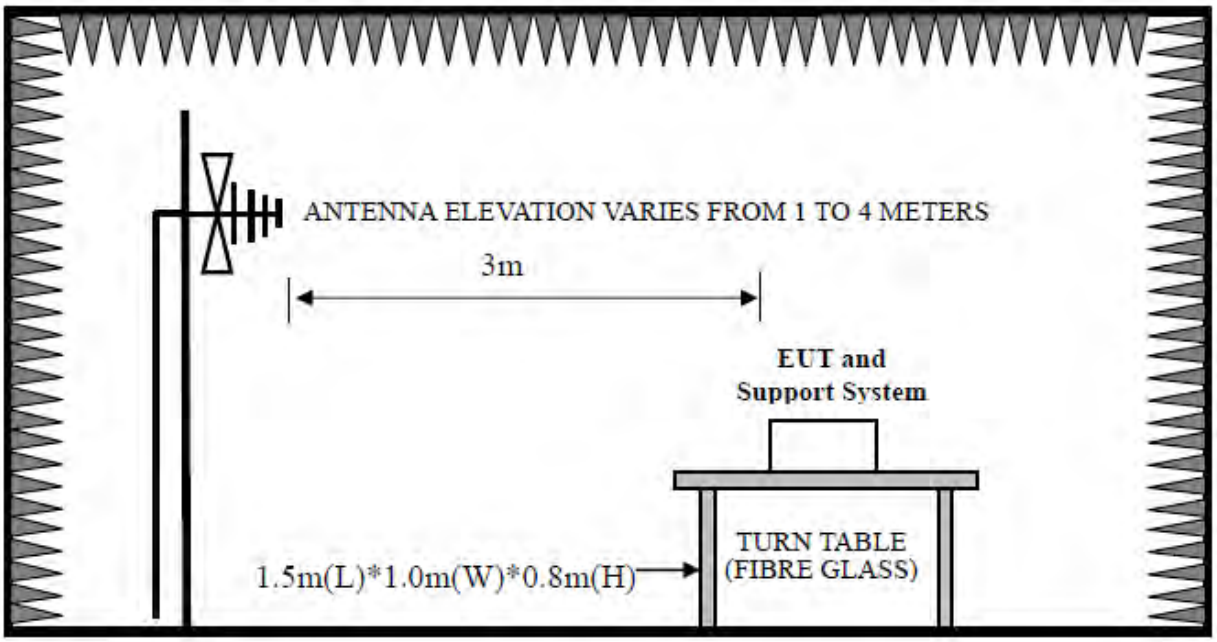
| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 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

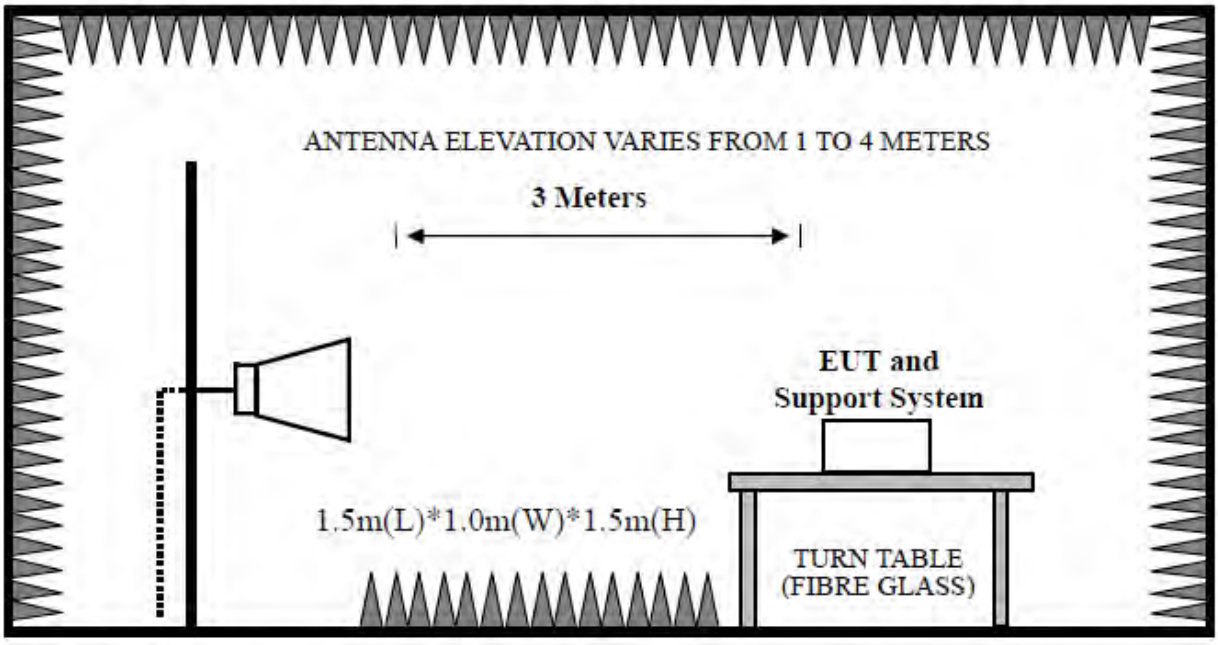
| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|---|---|---|---|
| | | μV/m | dB(μV)/m |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) | |

## 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 wiich 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

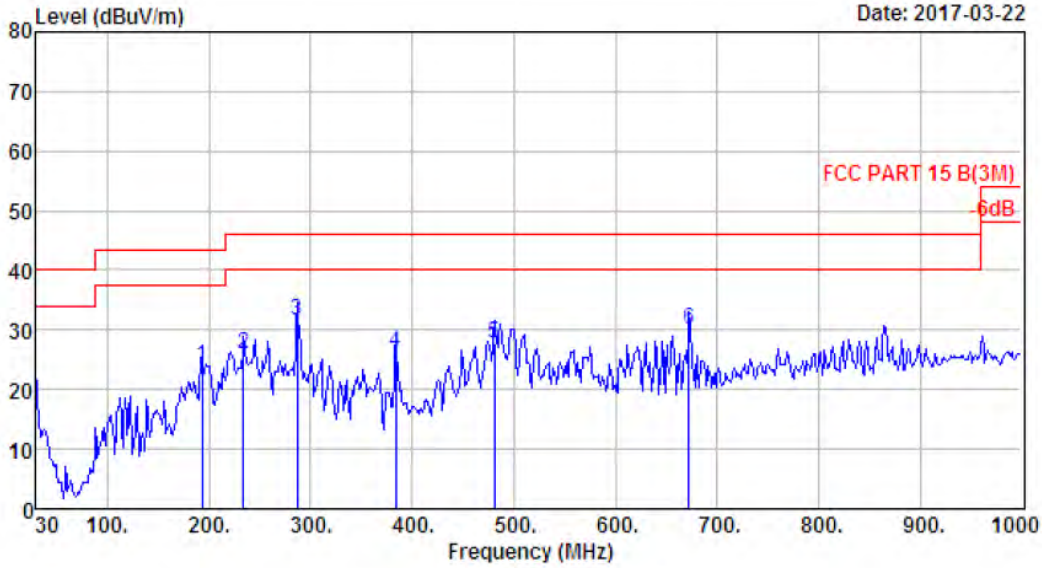
| 30MHz—25GHz Radiated emissison Test result |
|---|
| EUT: Car radio<br>M/N: MGR450B |
| Power: DC 12V |
| Test date: 2017-03-22~03-24 Test site: 3m Chamber Tested by: Tony Tang |
| Test mode: Tx Mode |
| Pass |

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.

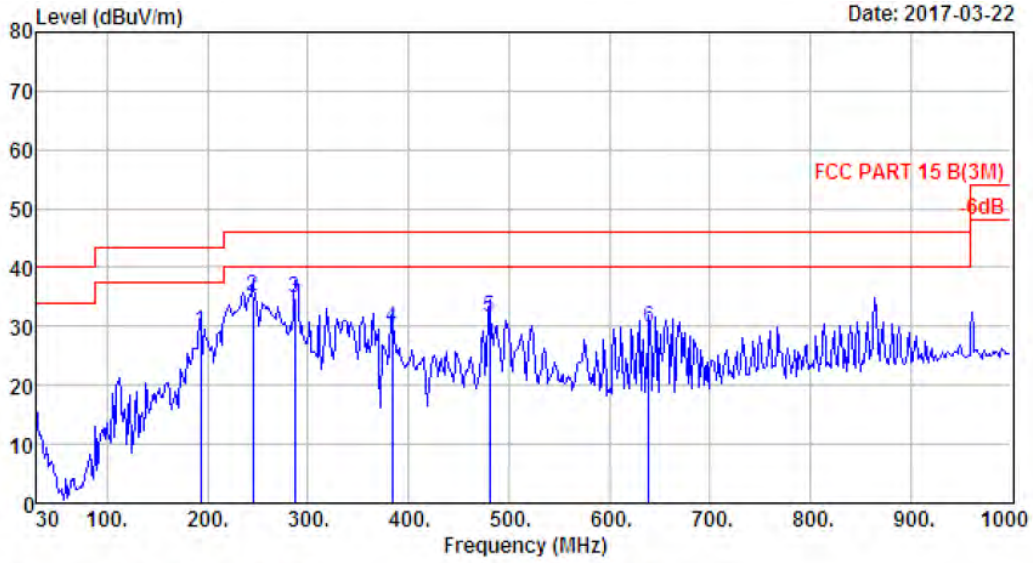
## 8.5. Test Data

30 MHz – 1000 MHz



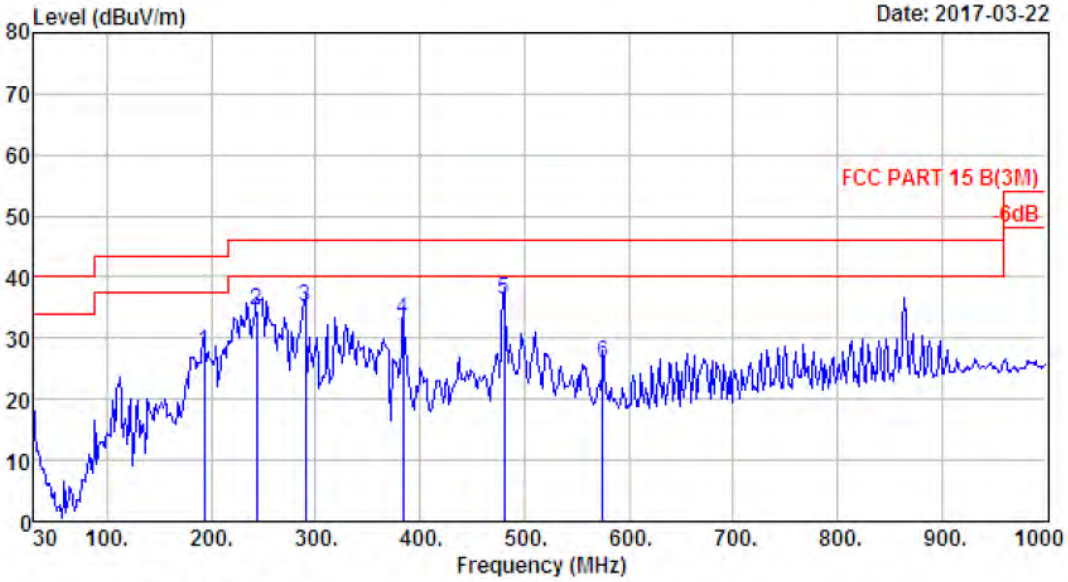

Site no. : site Data no. : 199
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : GFSK TX 2402MHz

| | 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 |



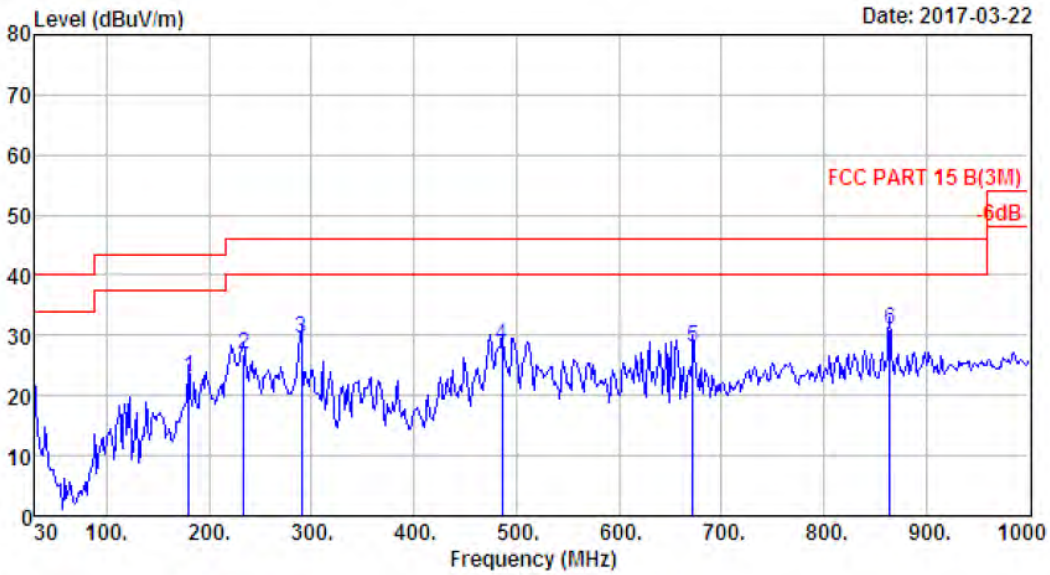

Site no. : 1# 966 Chamber Data no. : 200
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : GFSK TX 2402MHz

| | 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 |



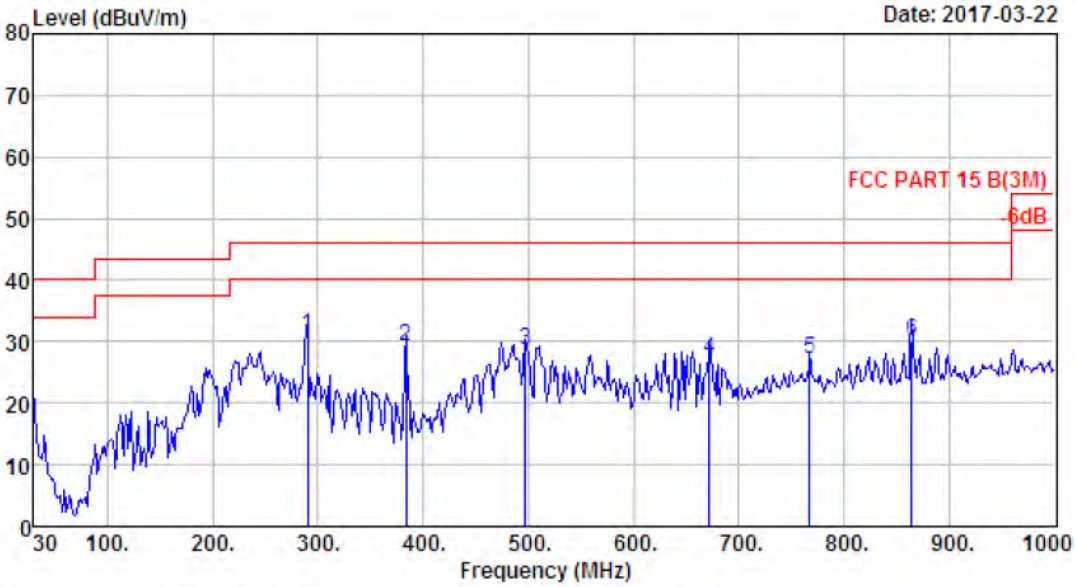

Site no. : 1# 966 Chamber Data no. : 201
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : GFSK TX 2441MHz

| | 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 |



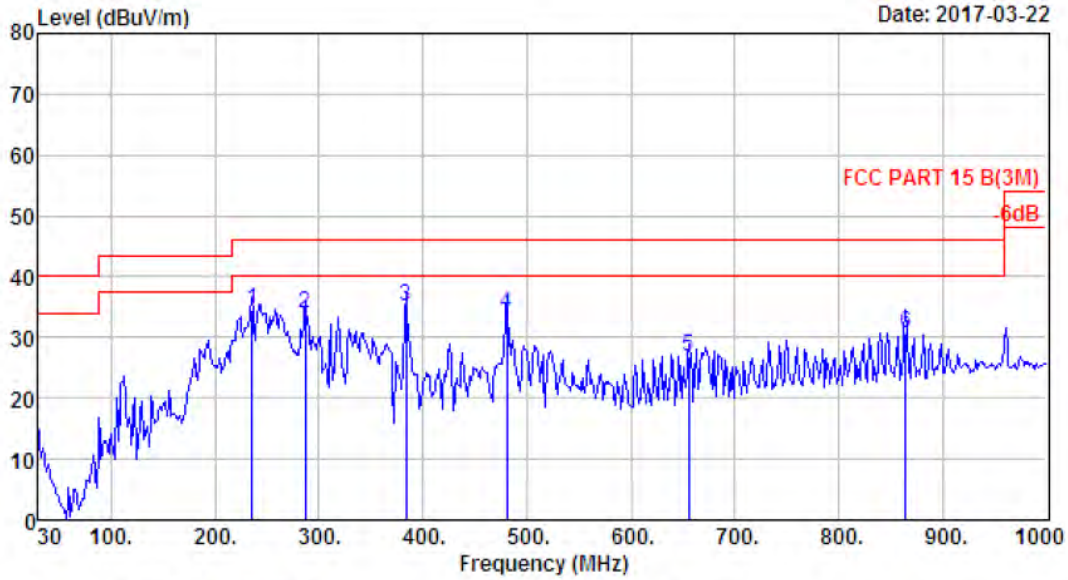

Site no. : 1# 966 Chamber Data no. : 202
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : GFSK TX 2441MHz

| | 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 |



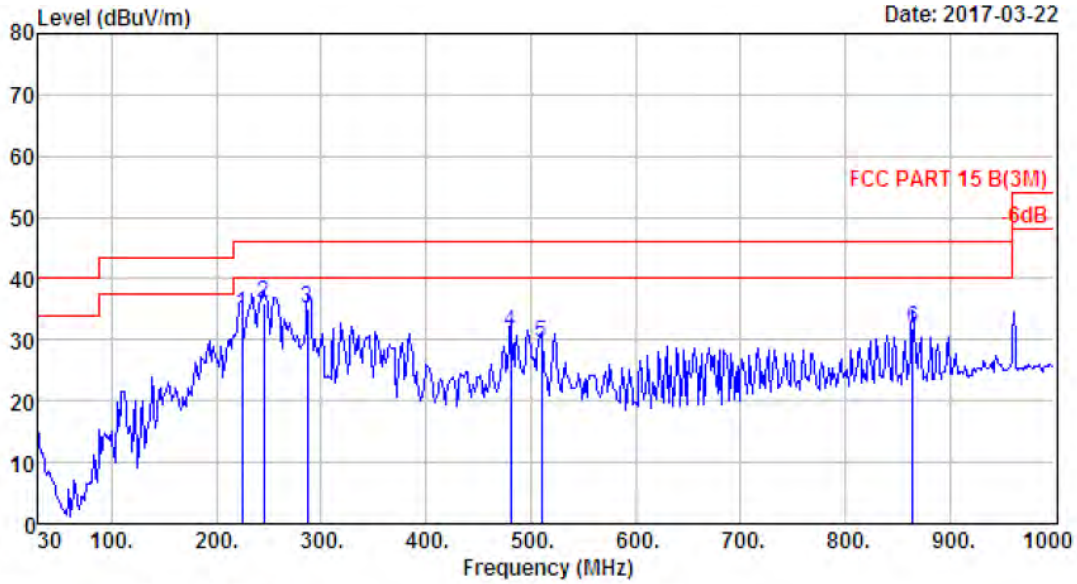

Site no. : 1# 966 Chamber Data no. : 203
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : GFSK TX 2480MHz

| | 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 |



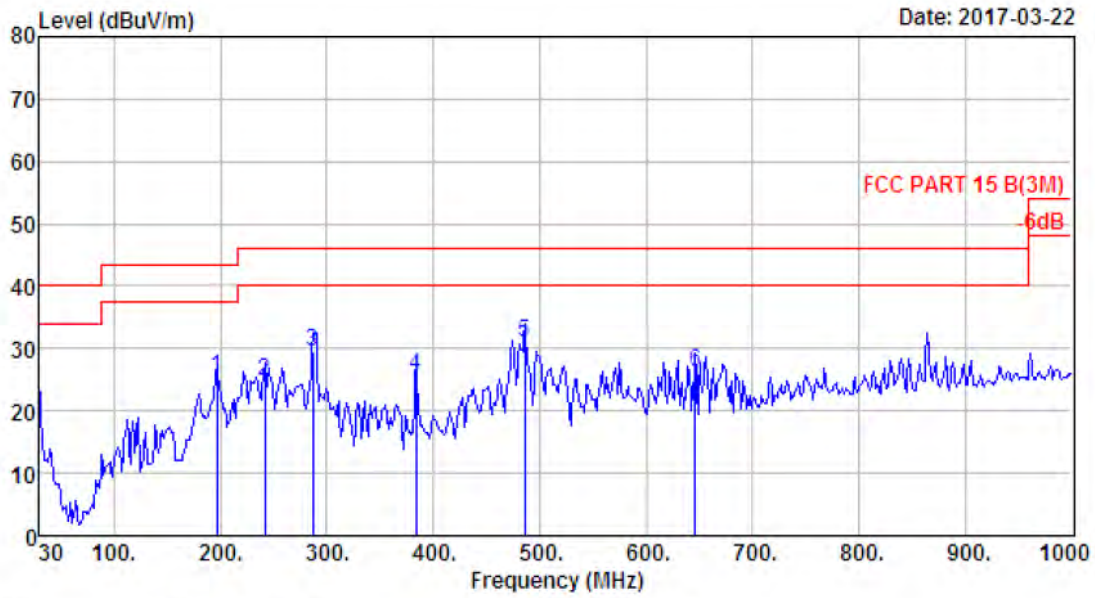

Site no. : 1# 966 Chamber Data no. : 204
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : GFSK TX 2480MHz

| | 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 |



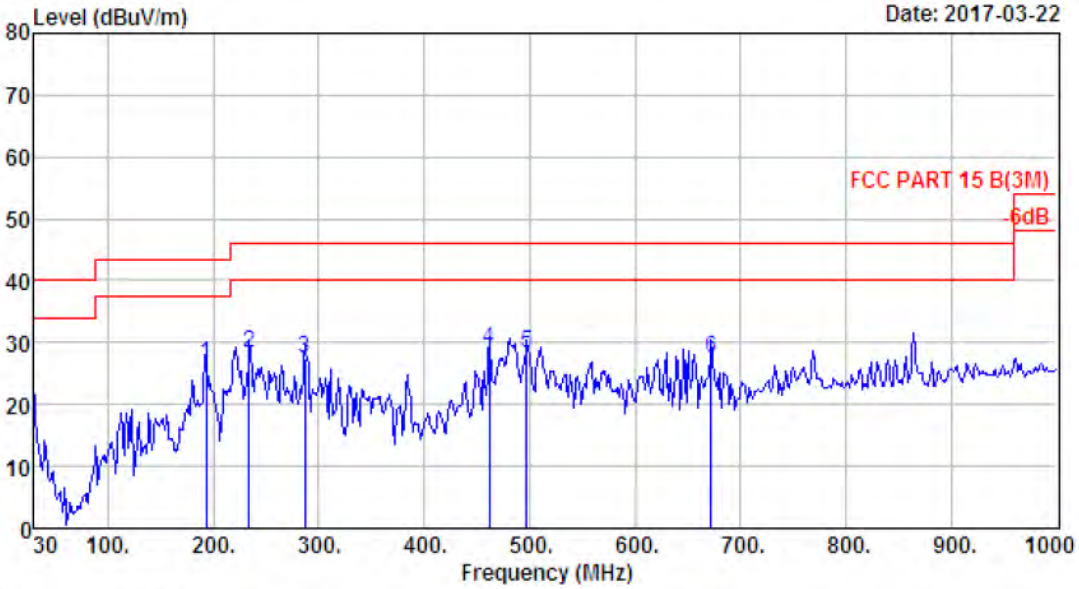

Site no. : 1# 966 Chamber Data no. : 205
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : 8-DPSK TX 2402MHz

| | 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 |



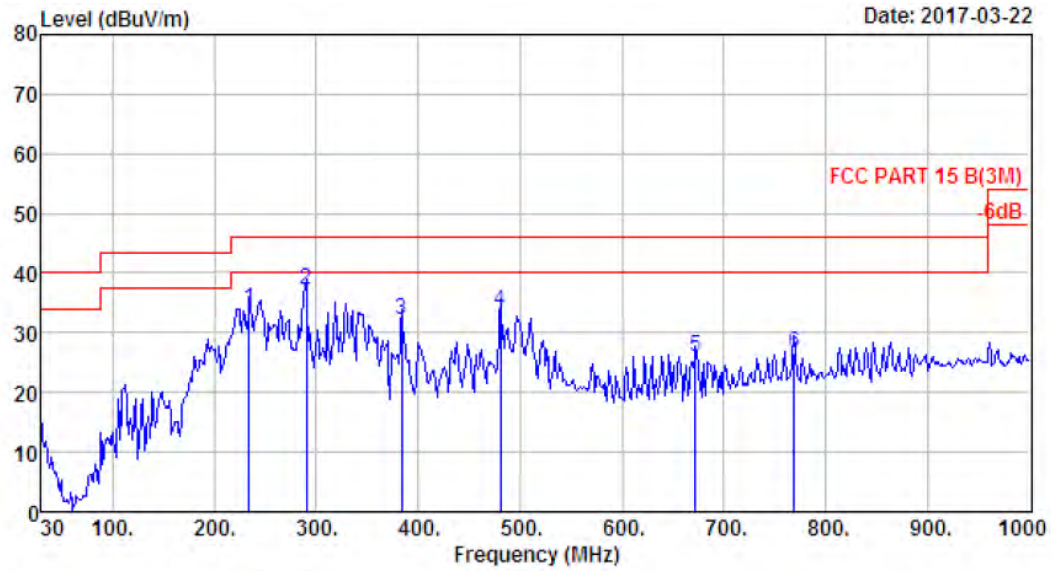

Site no. : 1# 966 Chamber Data no. : 206
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : 8-DPSK TX 2402MHz

| | 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 |



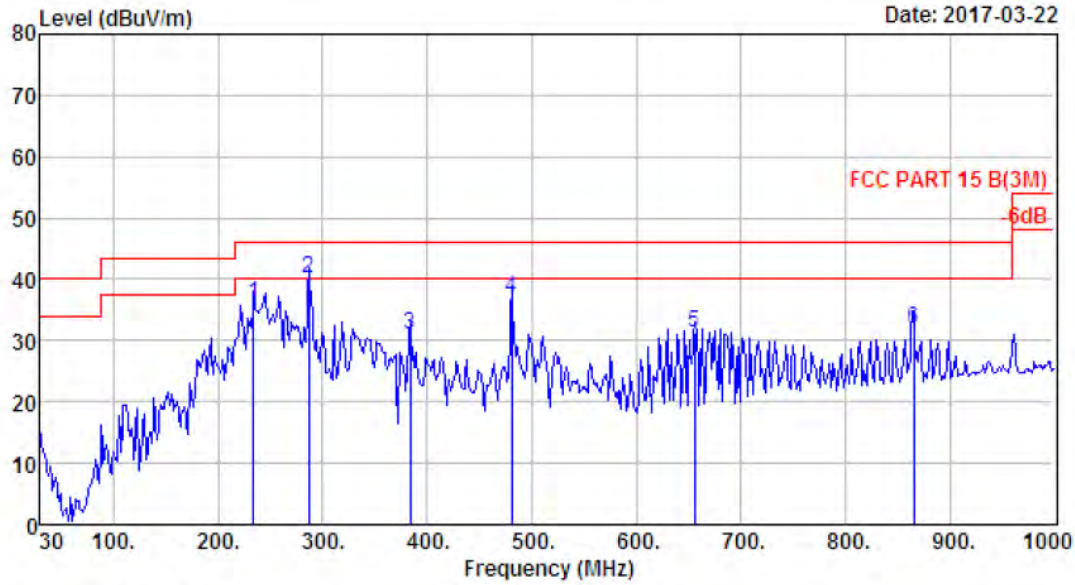

Site no. : 1# 966 Chamber Data no. : 207
Dis. / Ant. : 3m 27137 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : 8-DPSK TX 2441MHz

| | 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 |



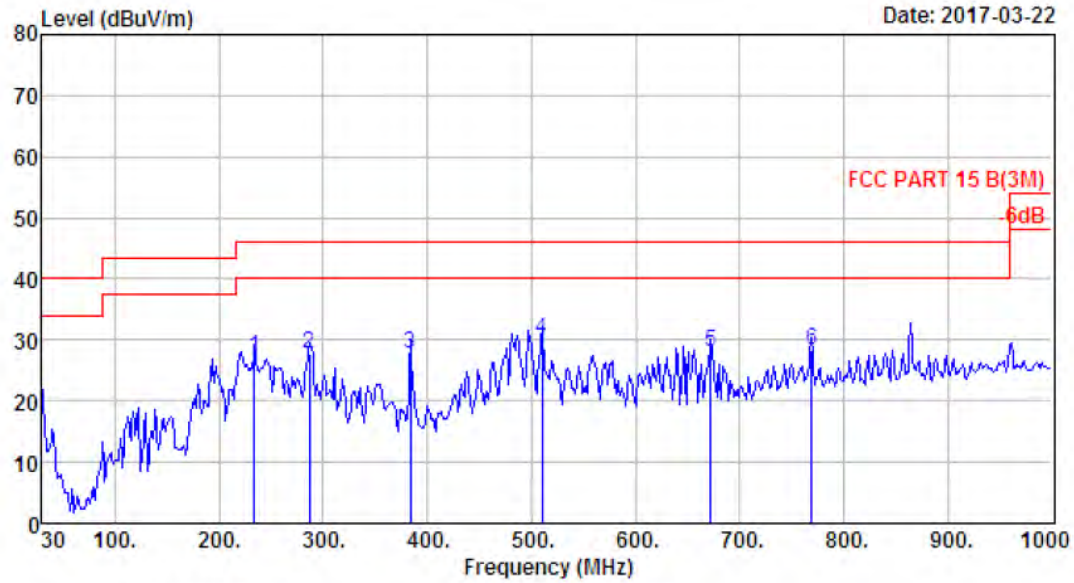

Site no. : 1# 966 Chamber Data no. : 208
Dis. / Ant. : 3m 27137 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:21.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : 8-DPSK TX 2441MHz

| | 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.

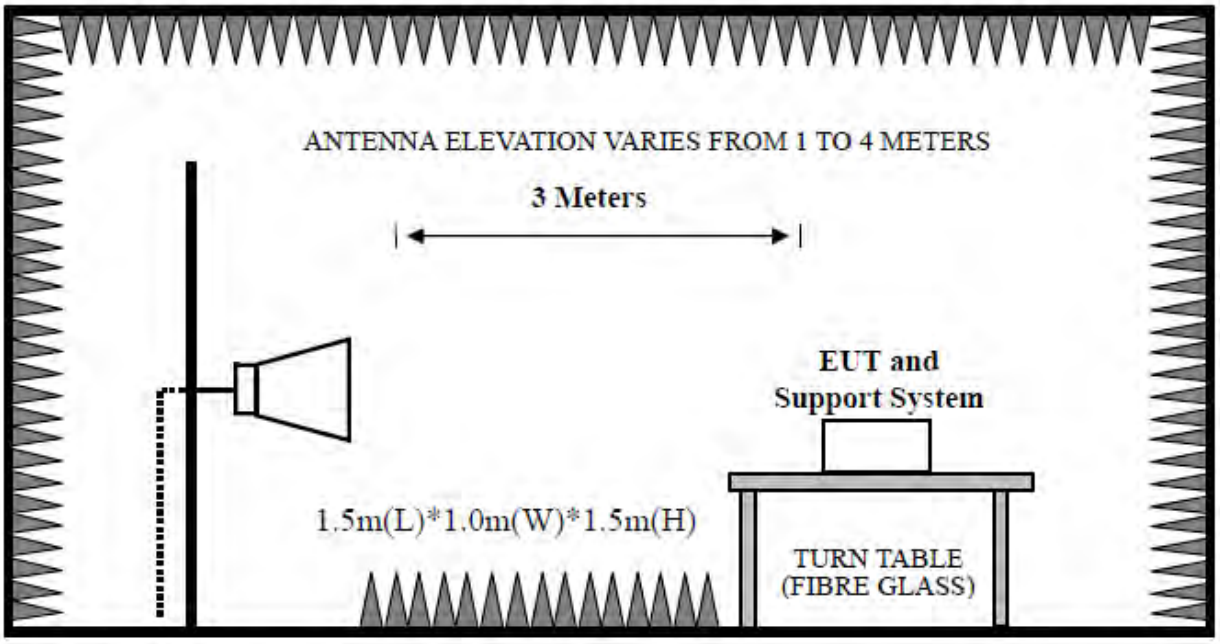
# 9. BAND EDGE COMPLIANCE

## 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 .

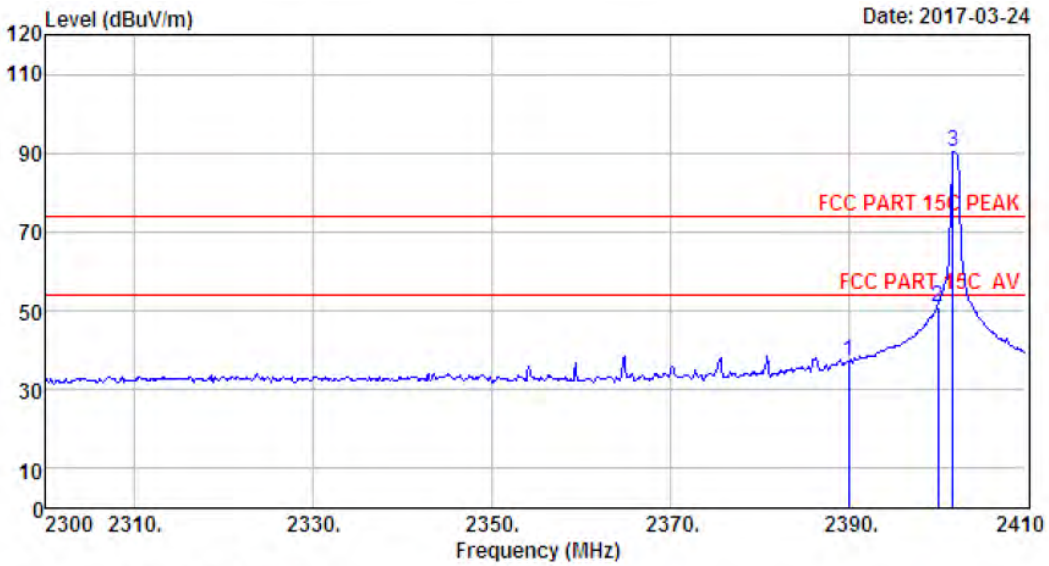
## 9.4. Test Result

| |
|---|
| EUT: Car radio<br>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.

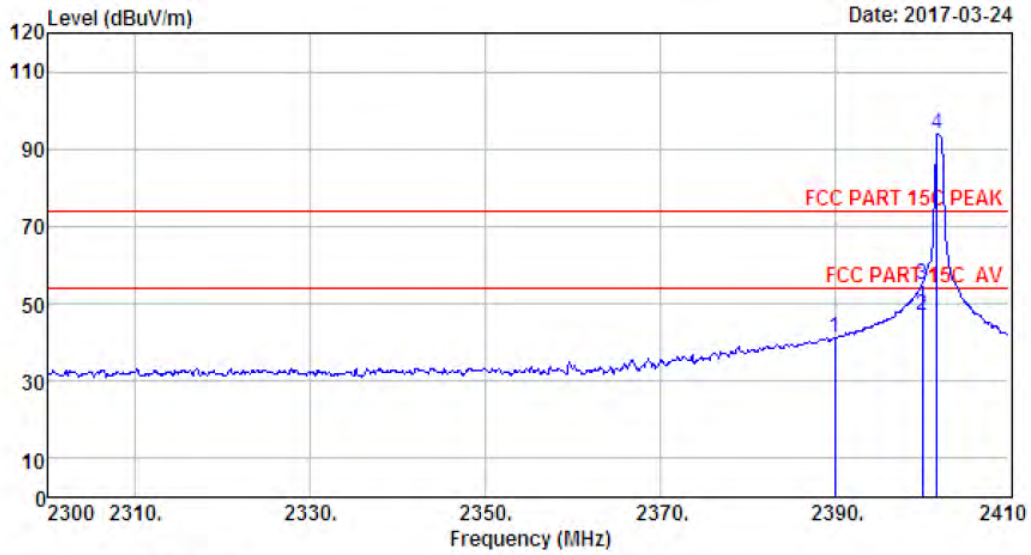
## 9.5. Test Data




Site no. : 1# 966 Chamber Data no. : 231
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 (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 | 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 |

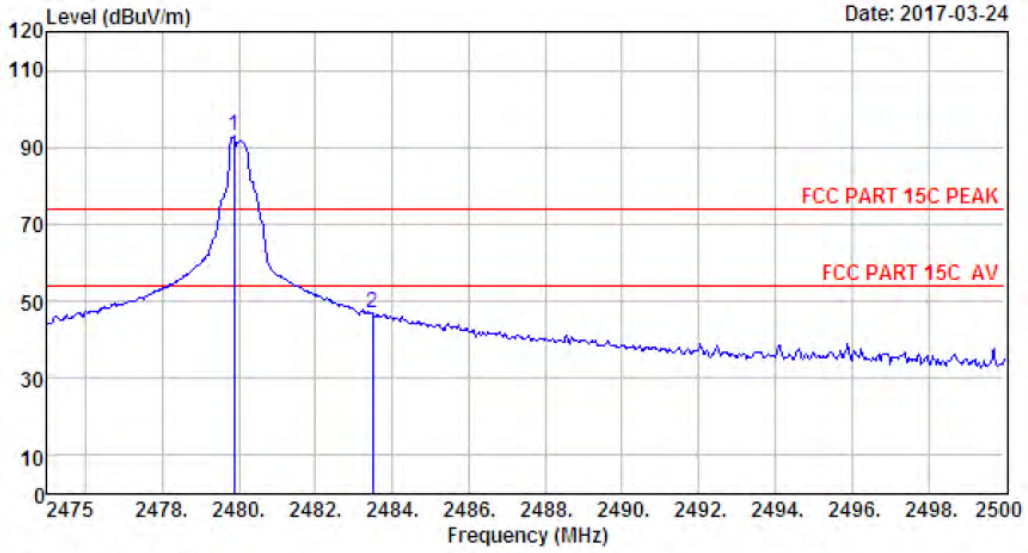
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

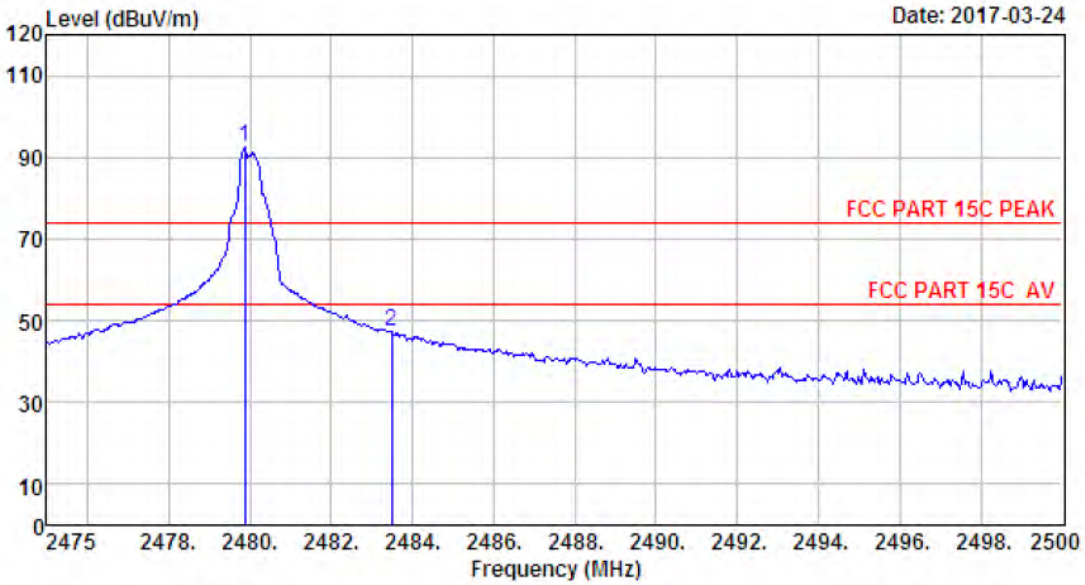
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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
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 | 93.68 | 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 |

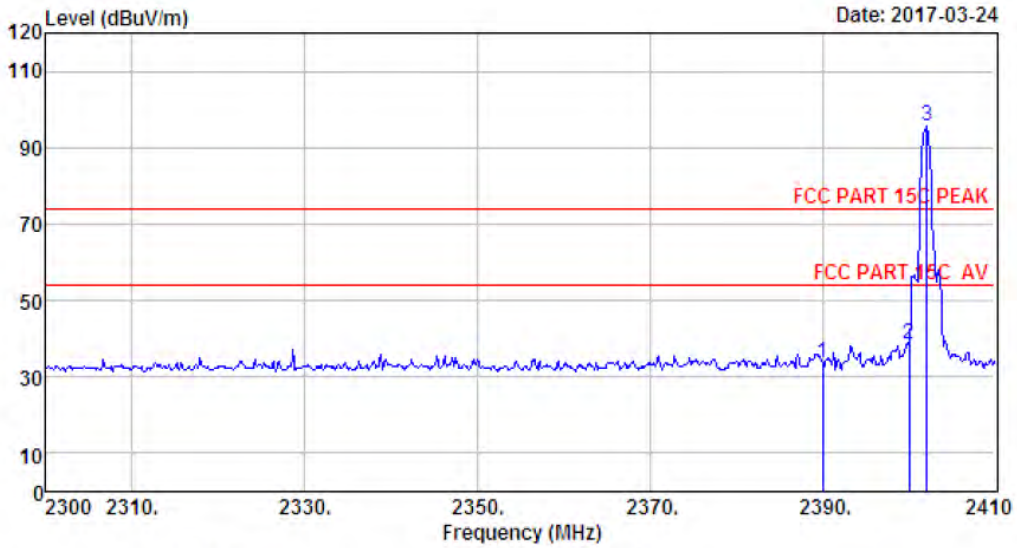
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

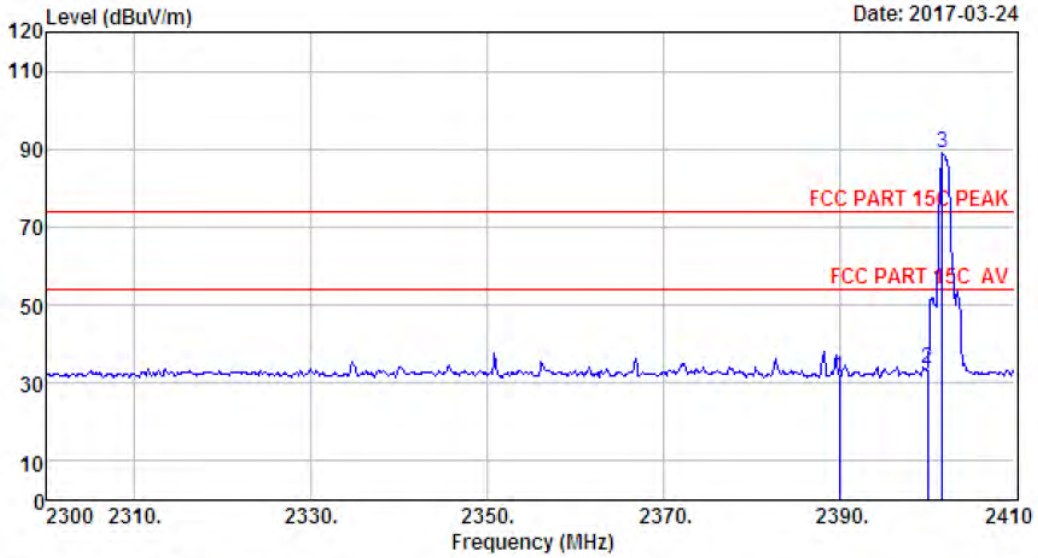
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

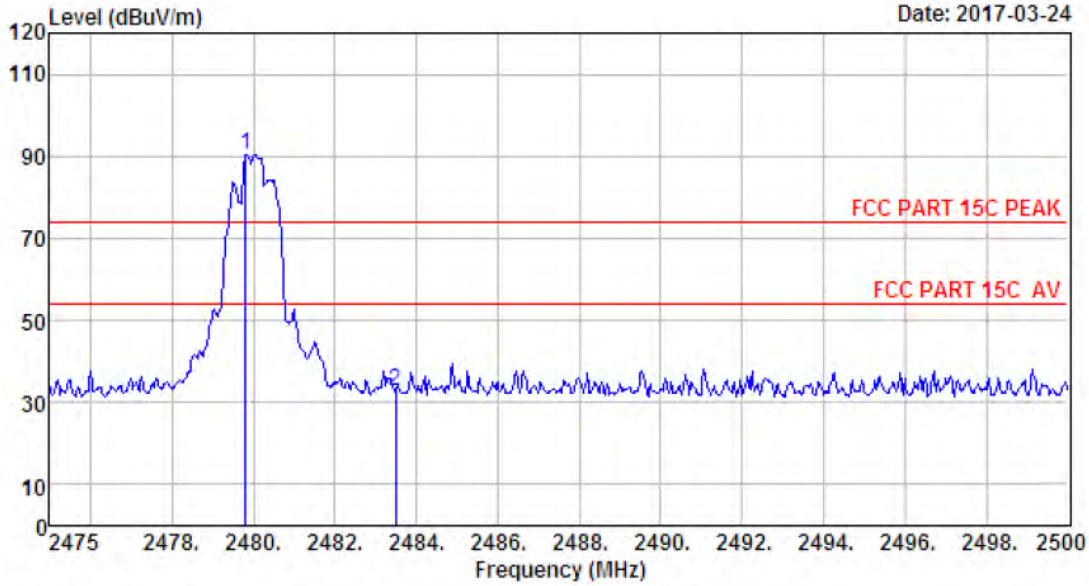
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

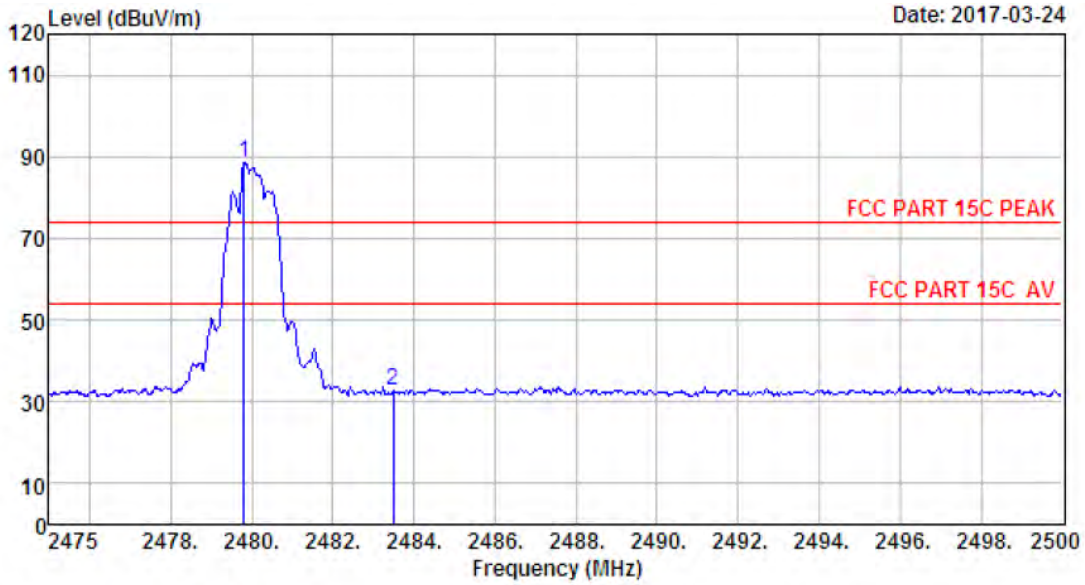
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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.

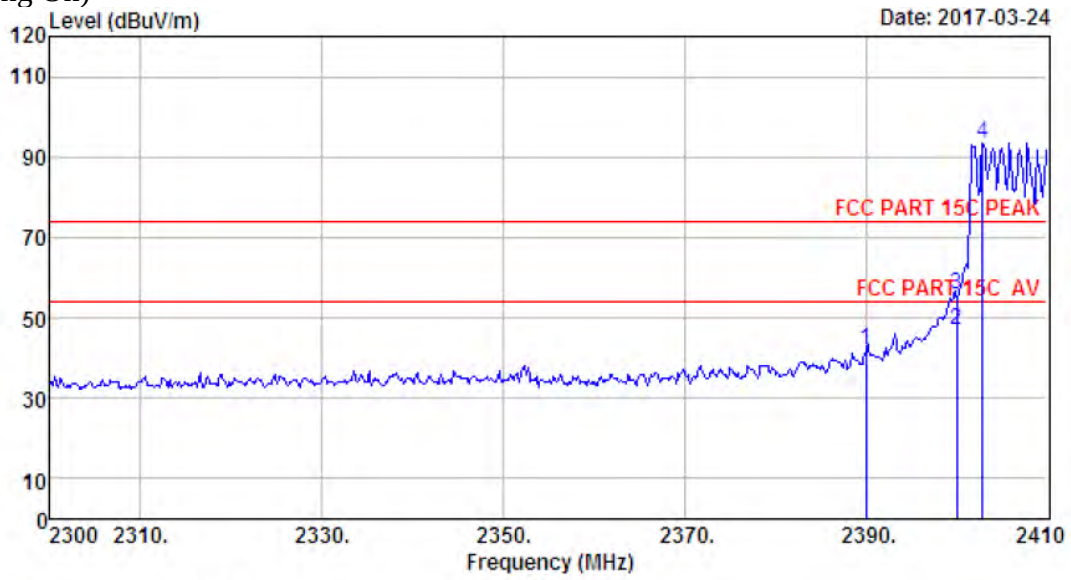



Site no. : 1# 966 Chamber Data no. : 238
Dis. / Ant. : 3m ANT 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.6';Humi:56%;Press:101.52kPa
Engineer : Tony
EUT : Car radio
Power : DC 12V
M/N : MGR450B
Test Mode : 8-DPSK TX 2480MHz (No Hopping)

| | 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.

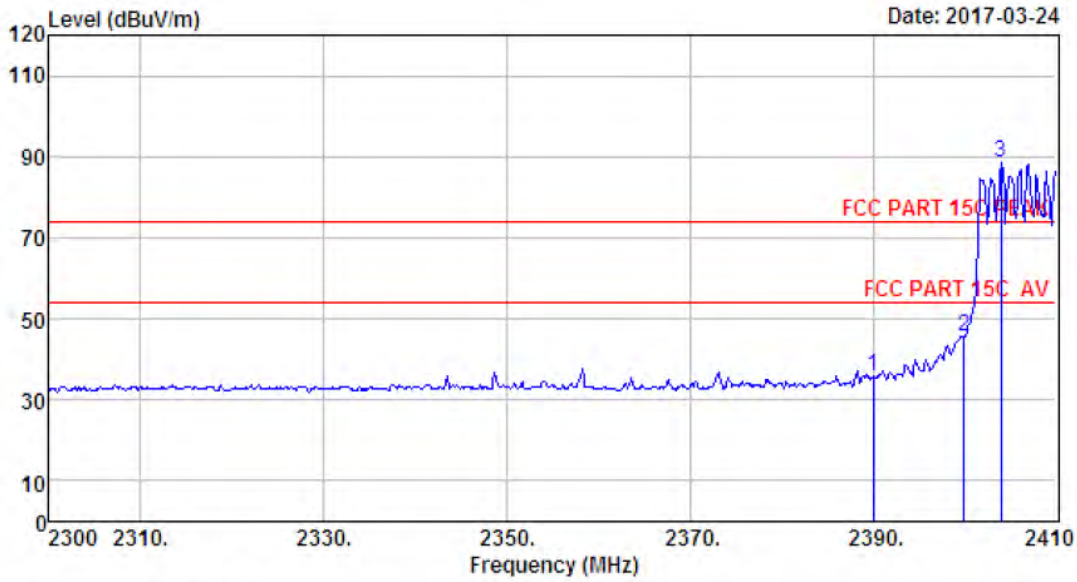
(\Hopping On)




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 |

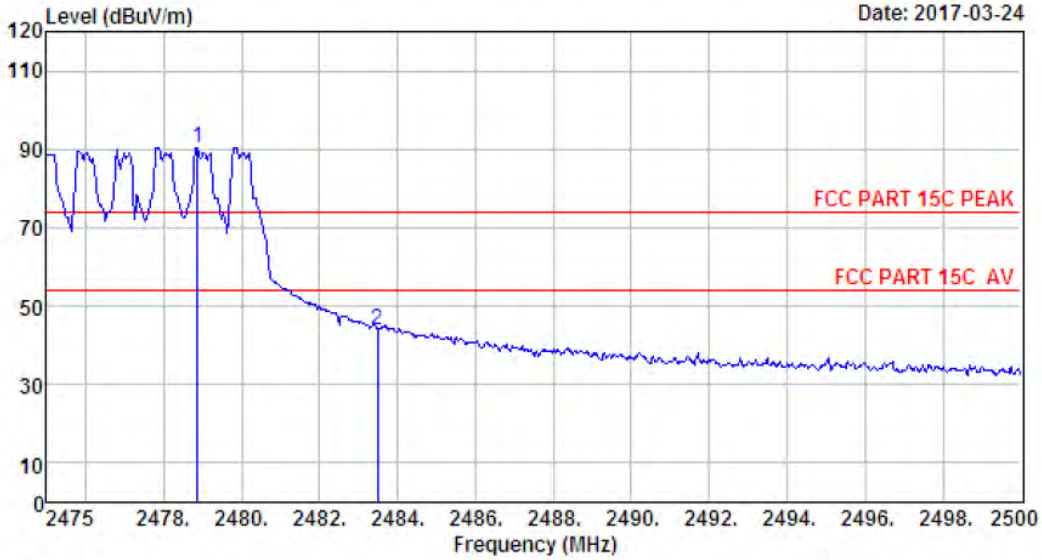
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

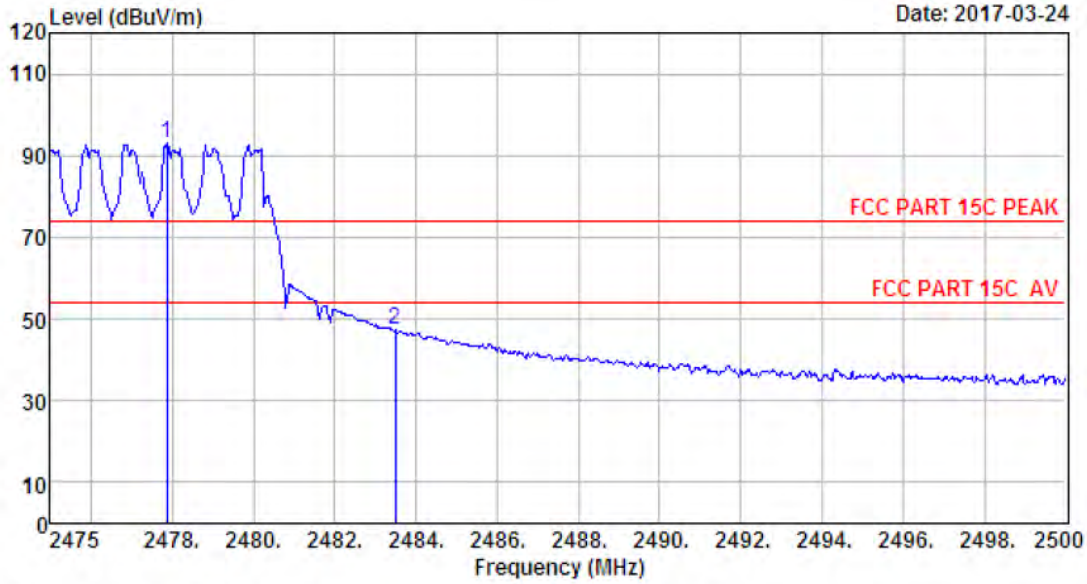
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

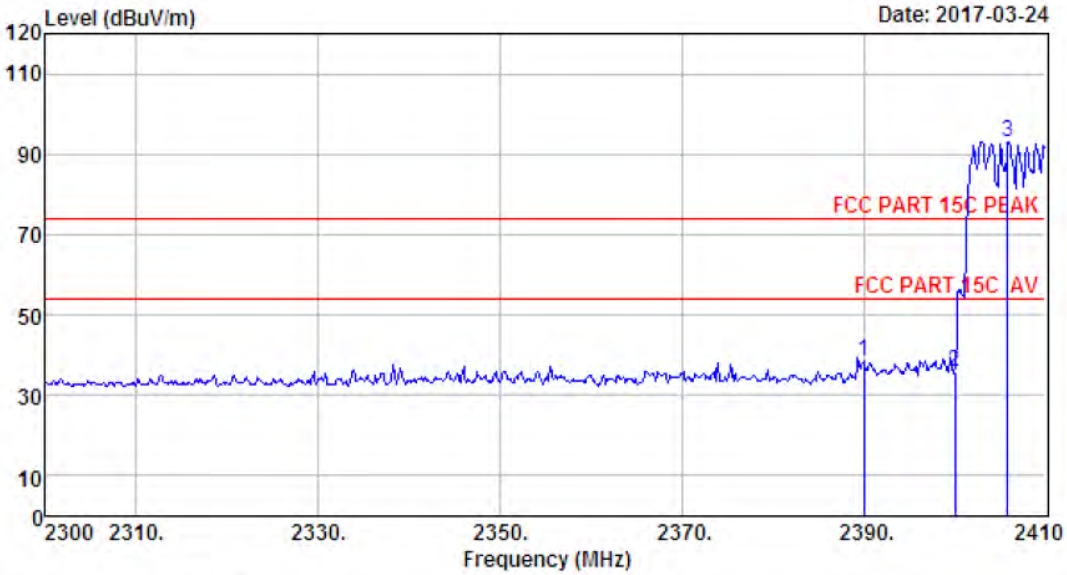
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 1# 966 Chamber Data no. : 226
Dis. / Ant. : 3m 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 (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 | 27.58 | 6.71 | 35.11 | 48.18 | 47.36 | 74.00 | 26.64 | Peak |

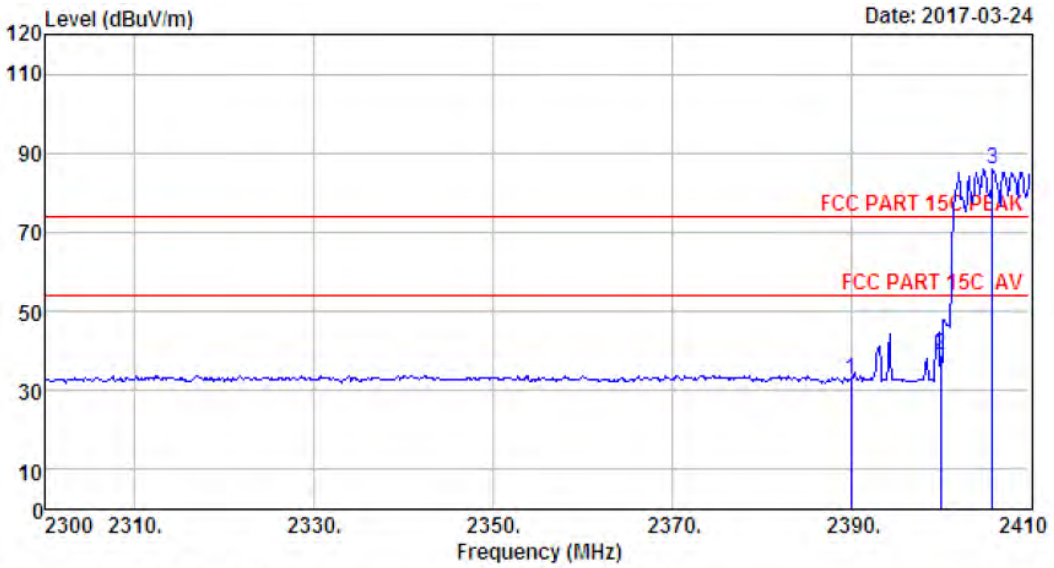
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

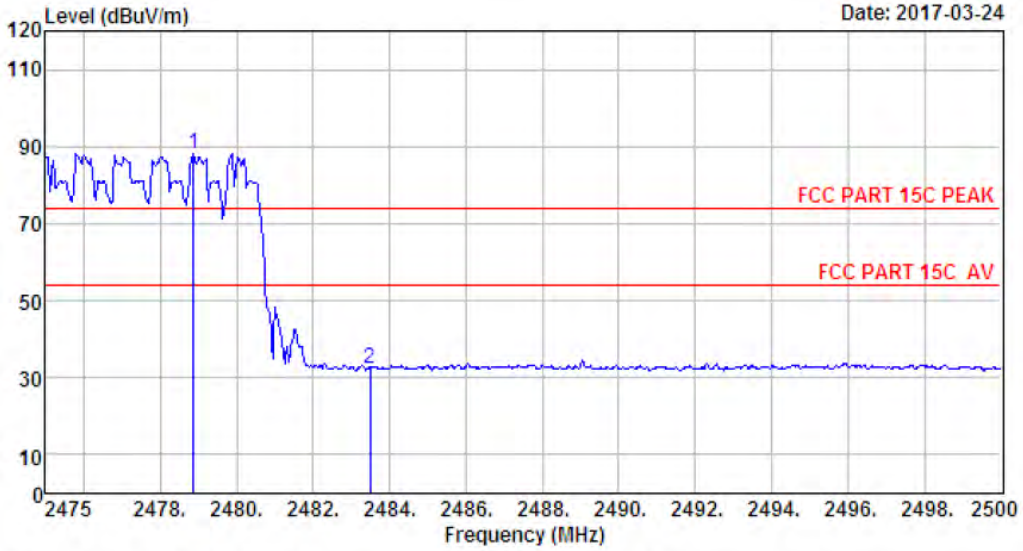
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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 |

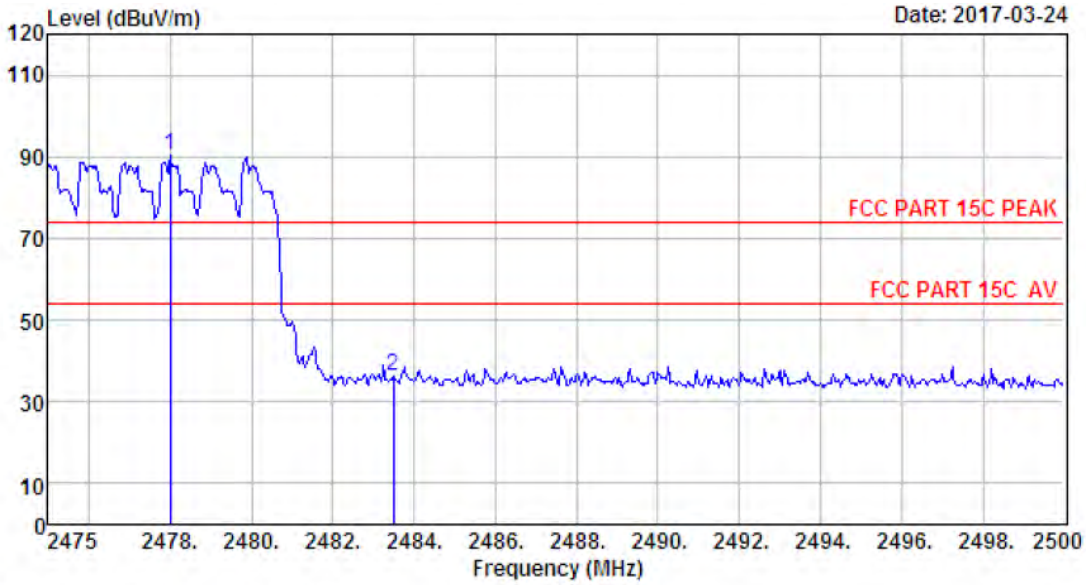
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.




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) | Limits (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

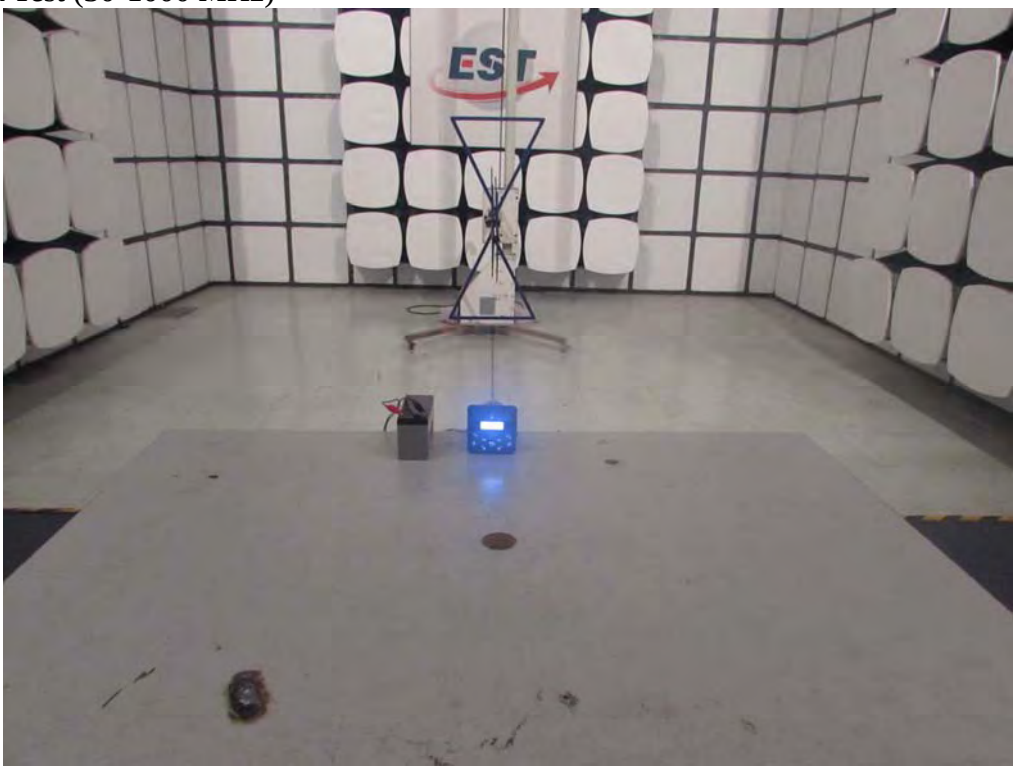
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional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

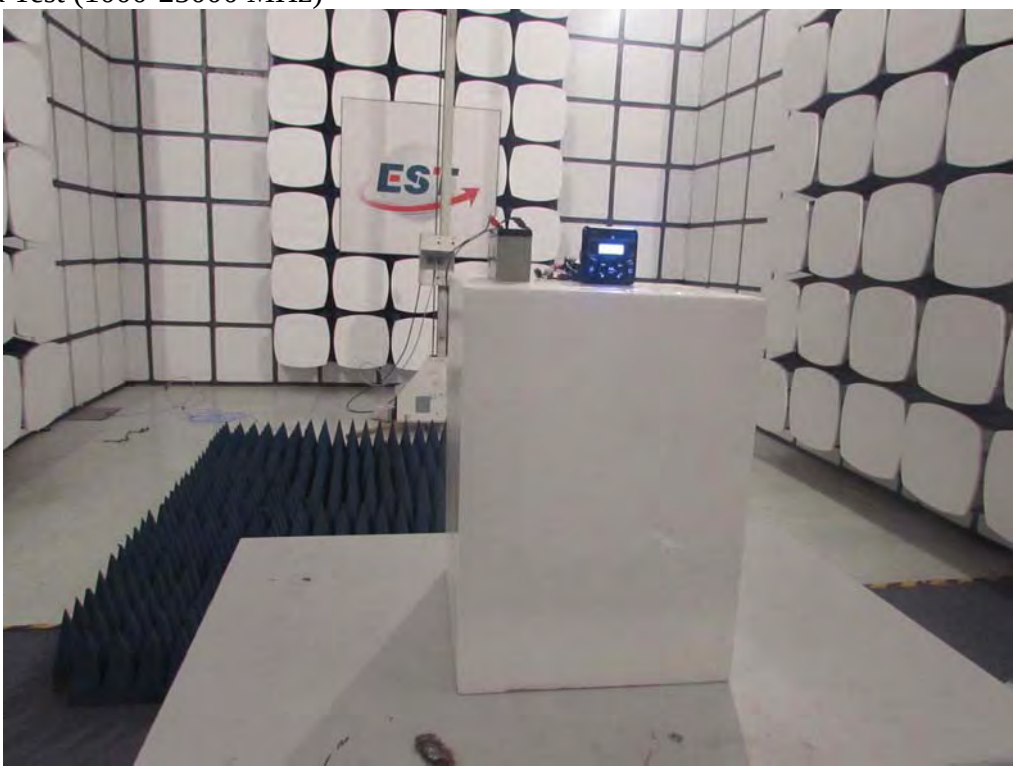
The antennas used for this product are Integrated PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

# 11. TEST SETUP PHOTO

Radiated Test (30-1000 MHz)



Radiated Test (1000-25000 MHz)



# 12. PHOTOS OF EUT

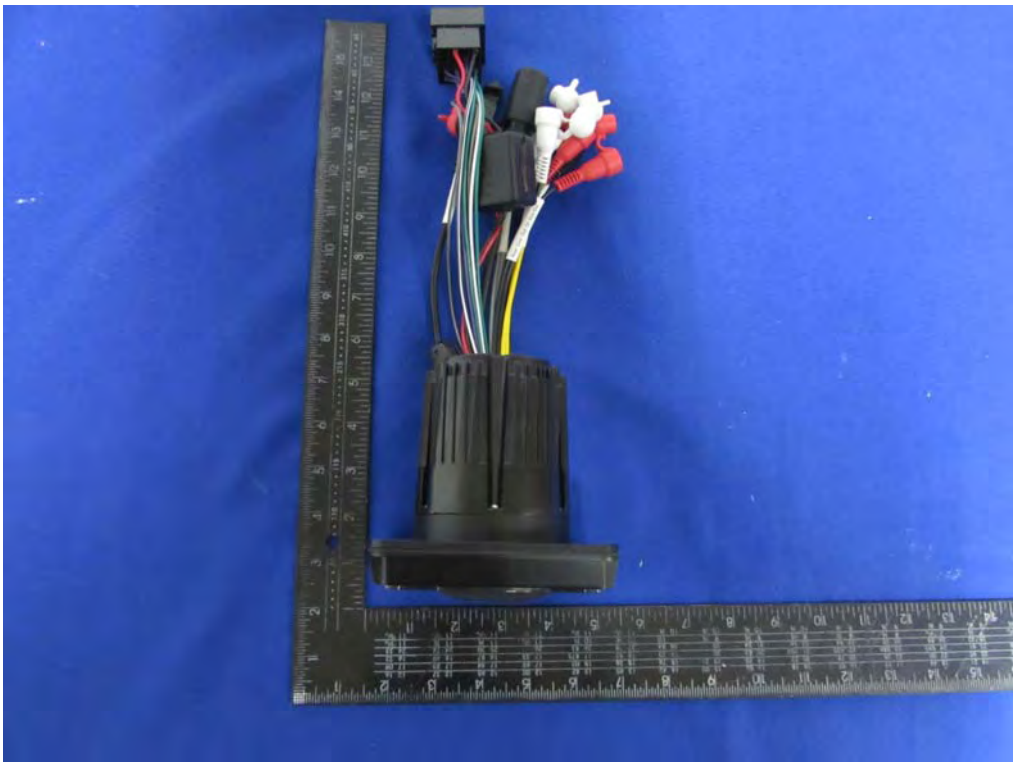
**External Photos**
M/N: MGR450B


**External Photos**

M/N: MGR450B

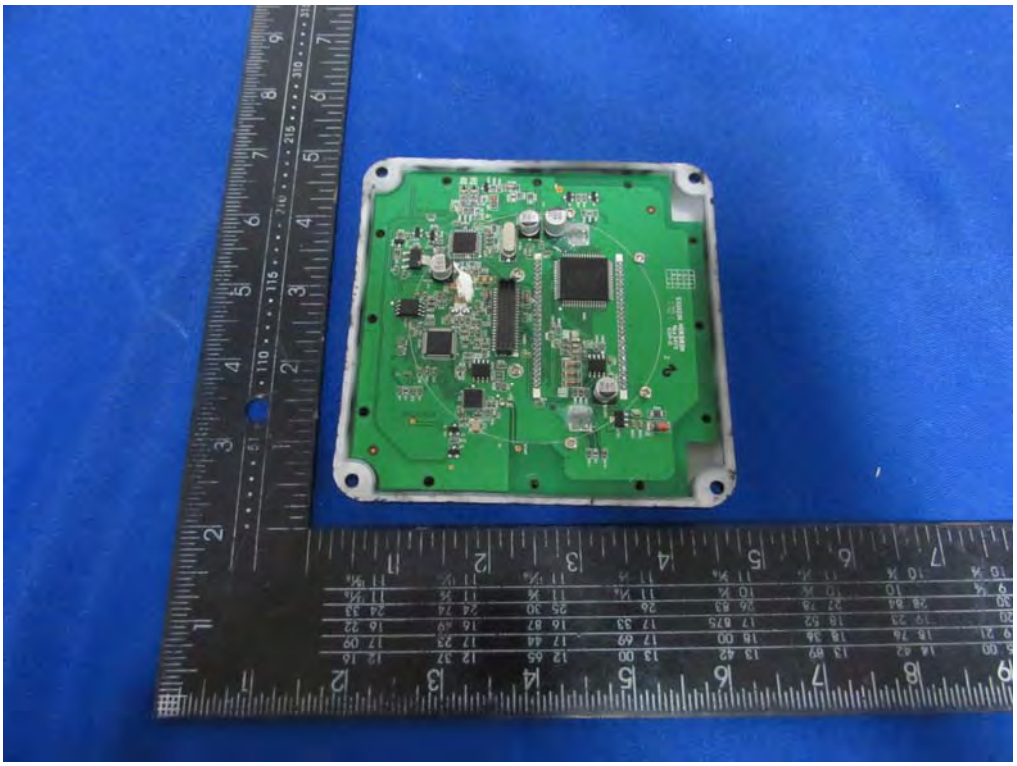
**External Photos**

M/N: MGR450B



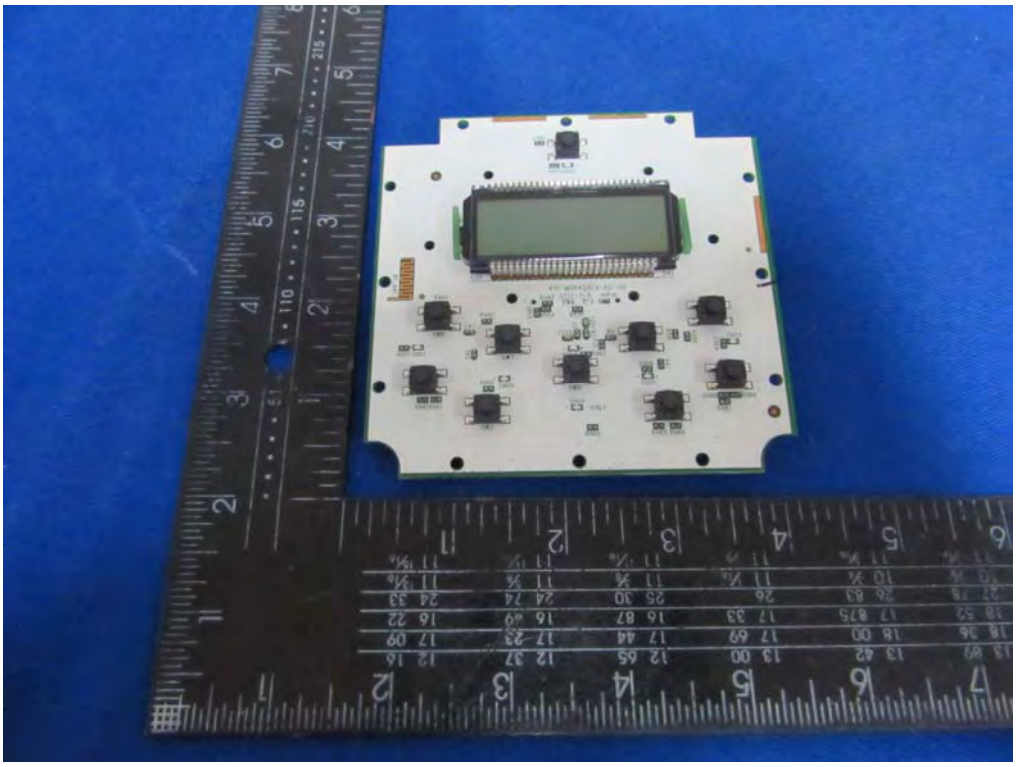
**Internal Photos**

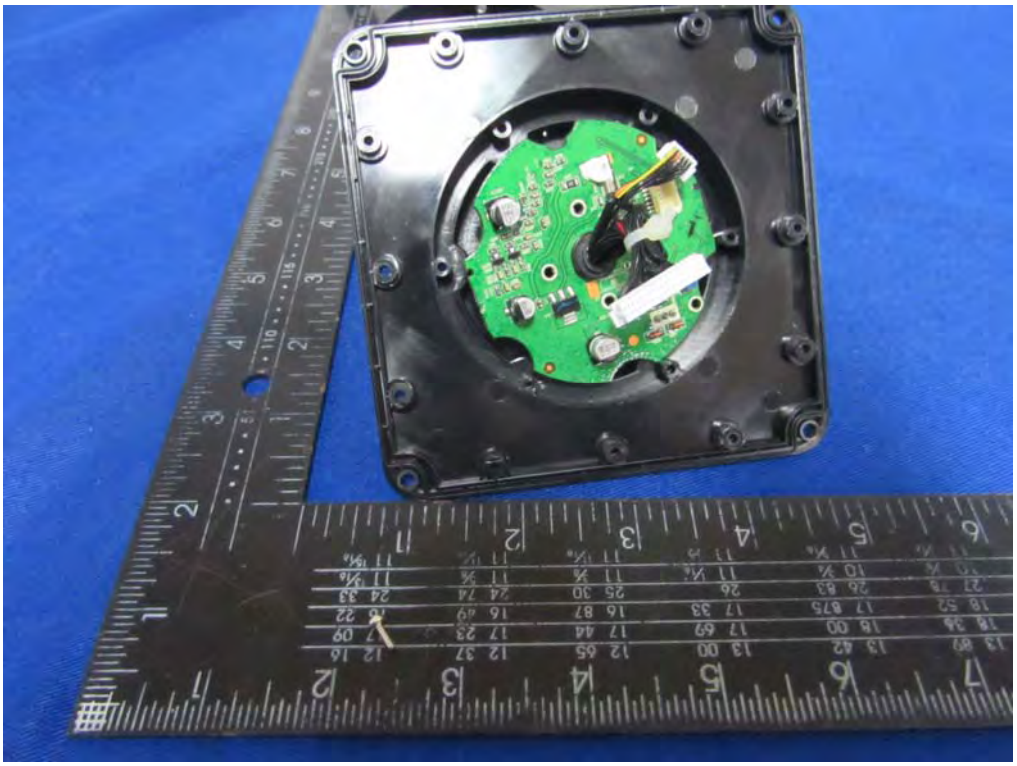
M/N: MGR450B



**Internal Photos**

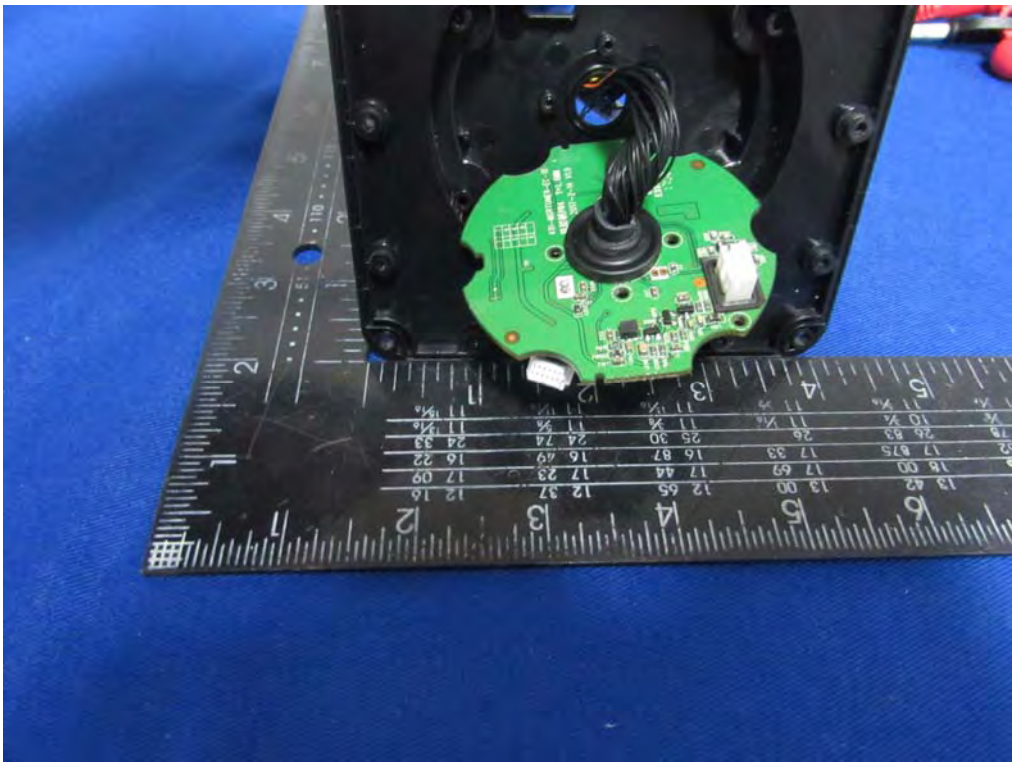
M/N: MGR450B





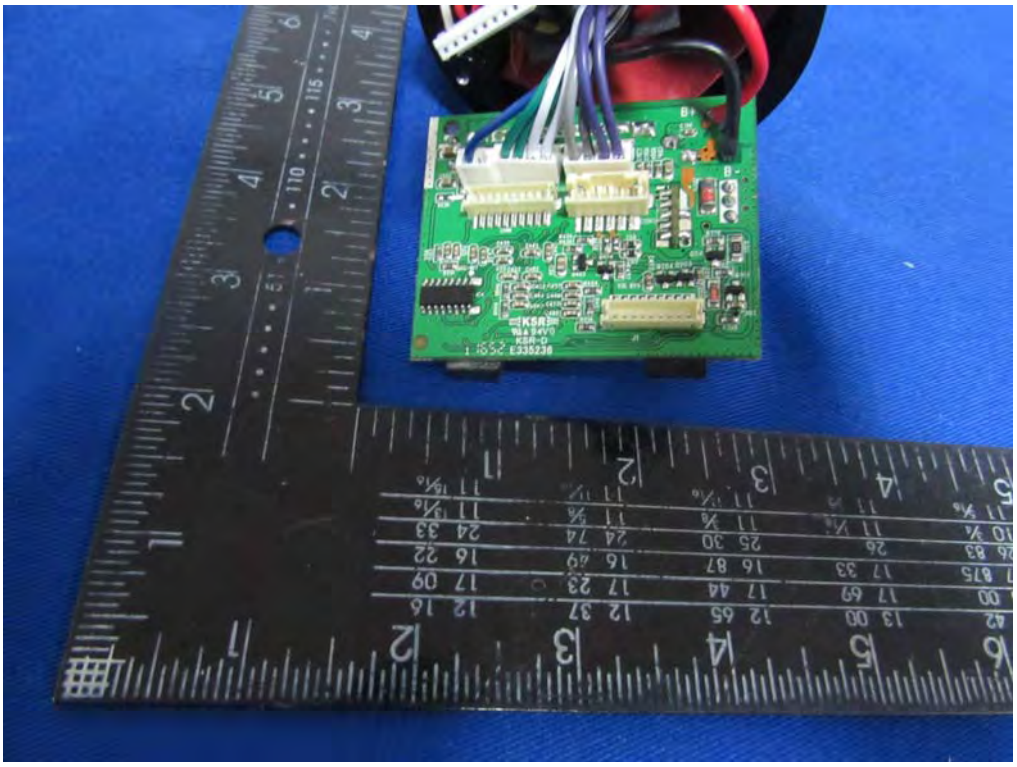
**Internal Photos**

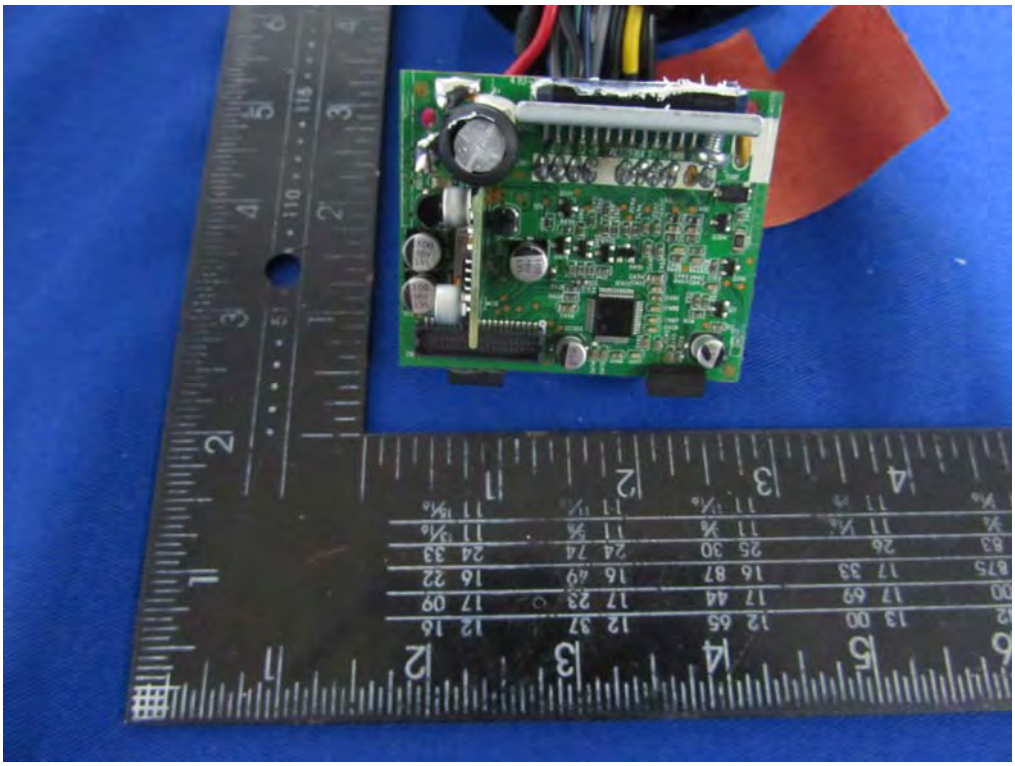
M/N: MGR450B



**Internal Photos**

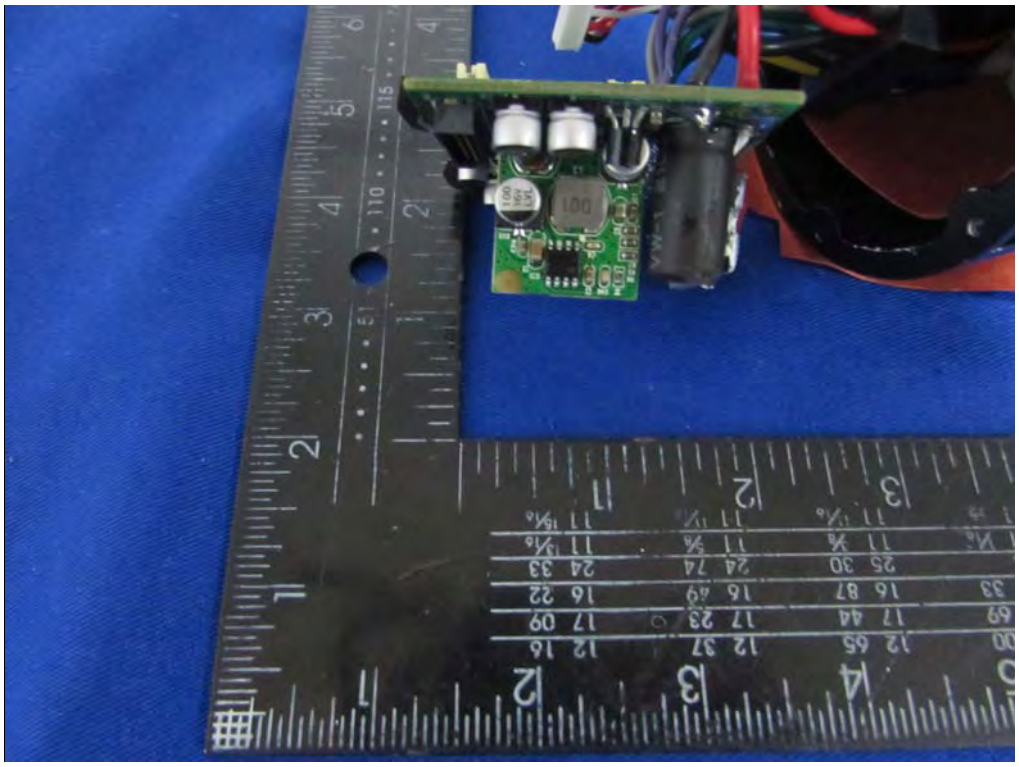
M/N: MGR450B

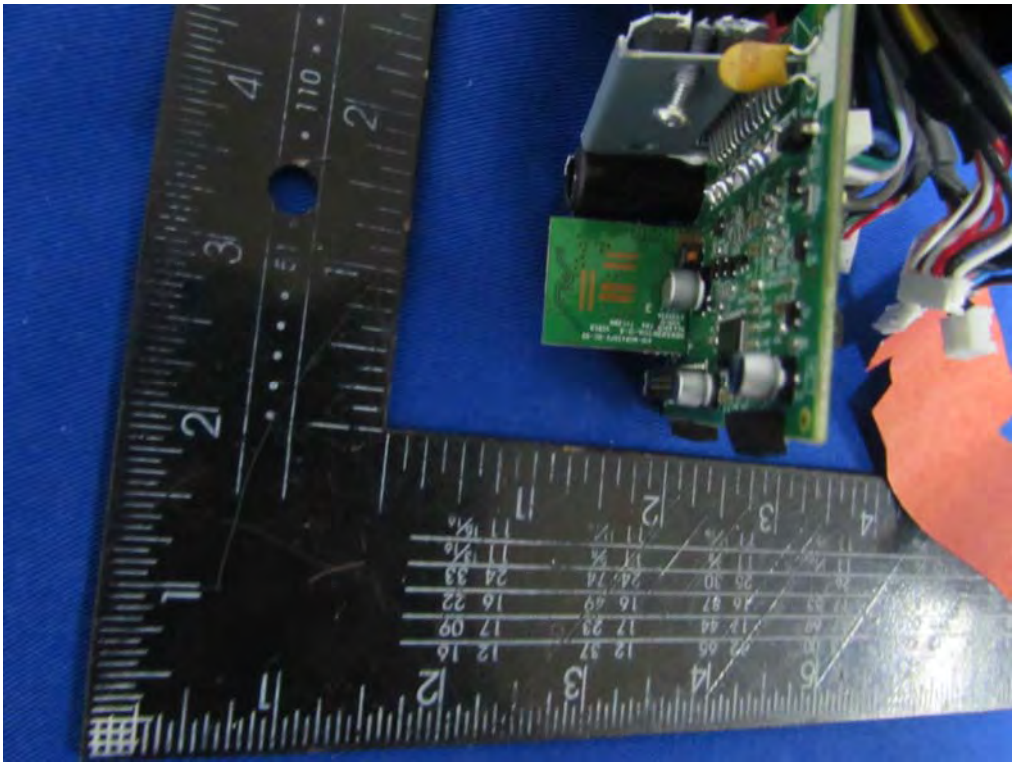




**Internal Photos**

M/N: MGR450B





**Internal Photos**

M/N: MGR450B