TECHNICAL REPORT

| | |
|---|---|
| Report No.: | FCC 1912104-01 |
| File Reference No.: | 2020-01-03 |
| Applicant: | SHENZHEN HANSONG ELECTRONICS CO.,LTD |
| Product: | CAR AUDIO VIDEO SYSTEM |
| Model No.: | XVM1000Ui, CMM10, CMM710, JVM100UiS, AVM1000UiN, AVM1000Ui |
| Trademark: | N/A |
| Test Standards: | FCC Part 15.247 |
| Test Result: | It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility |

Approved By

Jack Chung

Jack Chung

Manager

Dated: January 03, 2020

**Results appearing herein relate only to the sample tested**
**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**


## SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com

## Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

**CNAS-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of testing Laboratories.

**FCC-Registration No.: 744189**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

**Industry Canada (IC) —Registration No.:5205A**

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

**A2LA (Certification Number:5013.01)**

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

Test Report Conclusion

Content

1.0 **General Details**

1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TESTING LABORATORIES.

Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Telephone: (755) 83448688

Fax: (755) 83442996

Site Listed with Federal Communications commission (FCC)

Registration Number:744189

For 3m Anechoic Chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A

For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: SHENZHEN HANSONG ELECTRONICS CO.,LTD

Address: 2F,4th Industrial park, Heshuikou,Gongming,ShenZhen,GuangDong Province,China

Telephone: --

Fax: --

1.3 Description of EUT

| | |
|---|---|
| Product: | CAR AUDIO VIDEO SYSTEM |
| Manufacturer: | SHENZHEN HANSONG ELECTRONICS CO.,LTD |
| Address: | 2F,4th Industrial park, Heshuikou,Gongming,ShenZhen,GuangDong Province,China |
| Brand Name: | N/A |
| Model Number: | XVM1000Ui |
| Additional Model Number: | CMM10,CMM710,JVM100UiS,AVM1000UiN,AVM1000Ui |
| Type of Modulation | GFSK, Π/4D-QPSK, 8DPSK for Bluetooth |
| Frequency range | 2402-2480MHz for Bluetooth |
| Channel Spacing | 1MHz for Bluetooth |
| Frequency Selection | By software |
| Channel Number | 79 channel for Bluetooth |
| Antenna: | Ant 1: PCB antenna. The gain of the antennas is 0.58dBi<br>Ant 2: Integral antenna, The gain of the antennas is 2.0dBi<br>Note: there is only one transmission chain. And the two antennas can transmit at the same time. |
| Rating: | Input : DC12V |

1.4 Submitted Sample: 1 Samples

1.5 Test Duration

2019-12-10 to 2020-01-03

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Occupied Channel Bandwidth Uncertainty =5%

1.7 Test Engineer

The sample tested by Terry Tang

Print Name: Terry Tang

| **2.0 Test Equipment** | | | | | |
|---|---|---|---|---|---|
| Instrument Type | Manufacturer | Model | Serial No. | Date of Cal. | Due Date |
| ESPI Test Receiver | R&S | ESPI 3 | 100379 | 2019-06-21 | 2020-06-20 |
| TWO Line-V-NETW | R&S | EZH3-Z5 | 100294 | 2019-06-21 | 2020-06-20 |
| TWO Line-V-NETW | R&S | EZH3-Z5 | 100253 | 2019-06-21 | 2020-06-20 |
| Impuls-Begrenzer | R&S | ESH3-Z2 | 100281 | 2019-06-21 | 2020-06-20 |
| Loop Antenna | EMCO | 6507 | 00078608 | 2020-06-20 | 2020-06-20 |
| Spectrum | R&S | FSIQ26 | 100292 | 2019-06-21 | 2020-06-20 |
| Horn Antenna | A-INFO | LB-180400-KF | J211060660 | 2019-06-21 | 2020-06-20 |
| Horn Antenna | R&S | BBHA 9120D | 9120D-631 | 2018-07-09 | 2021-07-08 |
| Power meter | Anritsu | ML2487A | 6K00003613 | 2019-08-22 | 2020-08-21 |
| Power sensor | Anritsu | MA2491A | 32263 | 2019-08-22 | 2020-08-21 |
| Bilog Antenna | Schwarebeck | VULB9163 | 9163/340 | 2018-07-04 | 2021-07-03 |
| 9*6*6 Anechoic | -- | -- | N/A | 2018-02-07 | 2021-02-06 |
| EMI Test Receiver | RS | ESVB | 826156/011 | 2019-06-21 | 2020-06-20 |
| EMI Test Receiver | RS | ESH3 | 860904/006 | 2019-06-21 | 2020-06-20 |
| Spectrum | HP/Agilent | ESA-L1500A | US37451154 | 2019-06-21 | 2020-06-20 |
| Spectrum | HP/Agilent | E4407B | MY50441392 | 2019-06-21 | 2020-06-20 |
| Spectrum | RS | FSP | 1164.4391.38 | 2019-01-20 | 2020-01-19 |
| RF Cable | Zhengdi | ZT26-NJ-NJ-8 M/FA | -- | 2019-06-21 | 2020-06-20 |
| RF Cable | Zhengdi | 7m | -- | 2019-06-21 | 2020-06-20 |
| RF Switch | EM | EMSW18 | 060391 | 2019-06-21 | 2020-06-20 |
| Pre-Amplifier | Schwarebeck | BBV9743 | #218 | 2019-06-21 | 2020-06-20 |
| Pre-Amplifier | HP/Agilent | 8449B | 3008A00160 | 2019-06-21 | 2020-06-20 |
| LISN | SCHAFFNER | NNB42 | 00012 | 2019-01-08 | 2020-01-07 |

## 3.0 Technical Details

### 3.1 Summary of test results

**The EUT has been tested according to the following specifications:**

| Requirement | CFR 47 Section | Result | Notes |
|---|---|---|---|
| Antenna Requirement | 15.203, 15.247(b)(4) | N/A | Complies |
| Maximum Peak Out Power | 15.247 (b)(1), (4) | PASS | Complies |
| Carrier Frequency Separation | 15.247(a)(1) | PASS | Complies |
| 20dB Channel Bandwidth | 15.247 (a)(1) | PASS | Complies |
| Number of Hopping Channels | 15.247(a)(iii), 15.247(b)(1) | PASS | Complies |
| Time of Occupancy (Dwell Time) | 15.247(a)(iii) | PASS | Complies |
| Spurious Emission, Band Edge, and Restricted bands | 15.247(d),15.205(a), 15.209 (a),15.109 | PASS | Complies |
| Conducted Emissions | 15.207(a)，15.107 | PASS | Complies |
| RF Exposure | 15.247(i), 1.1307(b)(1) | PASS | Complies |

### 3.2 Test Standards

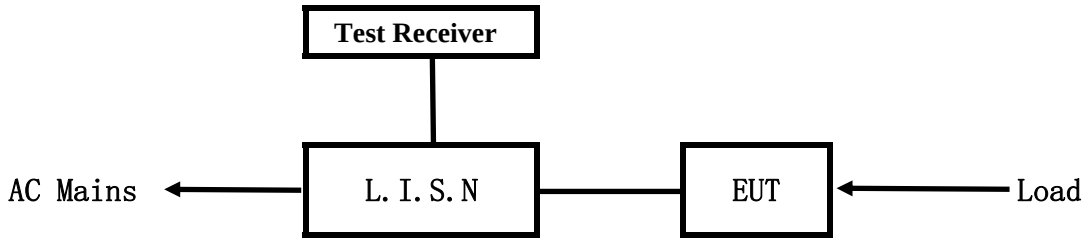
**FCC Part 15 Subpart & Subpart C, Paragraph 15.247**

## 4.0 EUT Modification

**No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.**

## 5. Power Line Conducted Emission Test

5.1 Schematics of the test



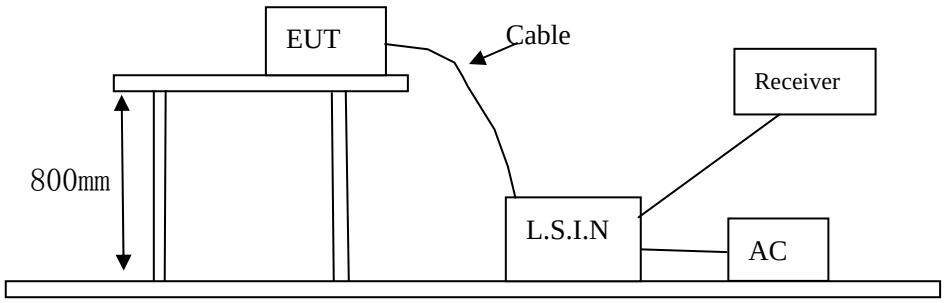

EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013.The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10–2013.

Test Voltage: 120V~60Hz

Block diagram of Test setup




5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

| Device | Manufacturer | Model | FCC ID |
|---|---|---|---|
| CAR AUDIO VIDEO SYSTEM | SHENZHEN HANSONG ELECTRONICS CO.,LTD | XVM1000Ui | 2AVAXHSNS20190001 |

B. Internal Device

| Device | Manufacturer | Model | Rating |
|---|---|---|---|
| | | | |

C. Peripherals

| Device | Manufacturer | Model | Rating |
|---|---|---|---|
| -- | | | |

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.107 ,15.207

| Frequency (MHz) | Class A Limits (dB μ V) | | Class B Limits (dB μ V) | |
|---|---|---|---|---|
| | Quasi-peak Level | Average Level | Quasi-peak Level | Average Level |
| 0.15 ～ 0.50 | 79.0 | 66.0 | 66.0～56.0* | 56.0～46.0* |
| 0.50 ～ 5.00 | 73.0 | 60.0 | 56.0 | 46.0 |
| 5.00 ～ 30.00 | 73.0 | 60.0 | 60.0 | 50.0 |

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The tighter limit shall apply at the transition frequencies

5.6 Test Results: N/A

**Note: EUT used in a vehicle, this test item not applicable.**

## 6 Radiated Emission Test

6.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189

(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.

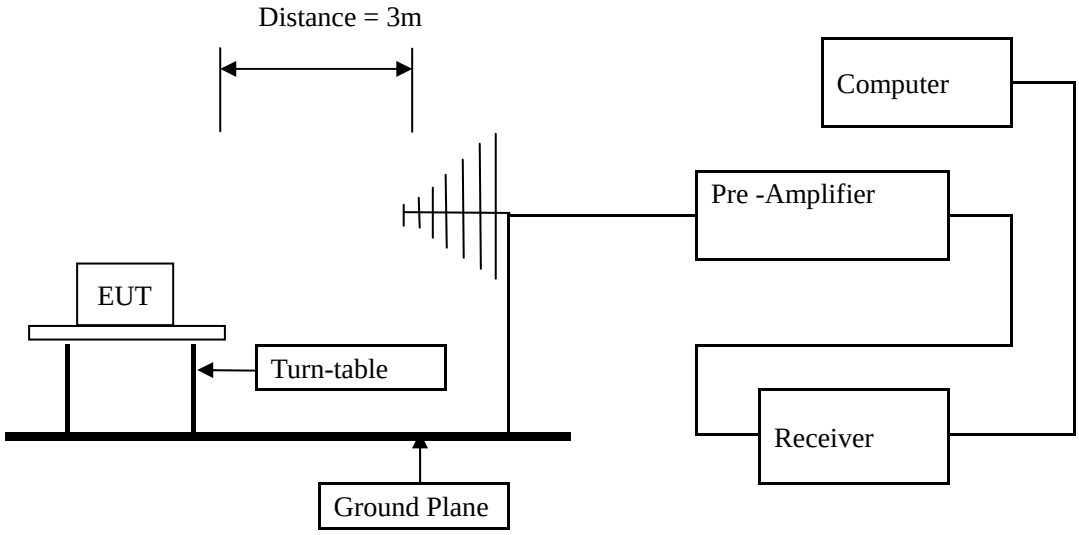
(3) The frequency spectrum from 30 MHz to 25GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector. Measurements were made at 3 meters.

(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "**QP**" in the data table.

(6) The antenna polarization : Vertical polarization and Horizontal polarization.

**Block diagram of Test setup**




6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

**Frequencies in restricted band are complied to limit on Paragraph 15.209 and 15.109 and RSS-210**

| Frequency Range (MHz) | Distance (m) | Field strength (dB μ V/m) |
|---|---|---|
| 30-88 | 3 | 40.0 |
| 88-216 | 3 | 43.5 |
| 216-960 | 3 | 46.0 |
| Above 960 | 3 | 54.0 |

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the higher limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

4. Л/4DQPSK was the worse case because it has highest output power

**Test result**

## General Radiated Emission Data and Harmonics Radiated Emission Data

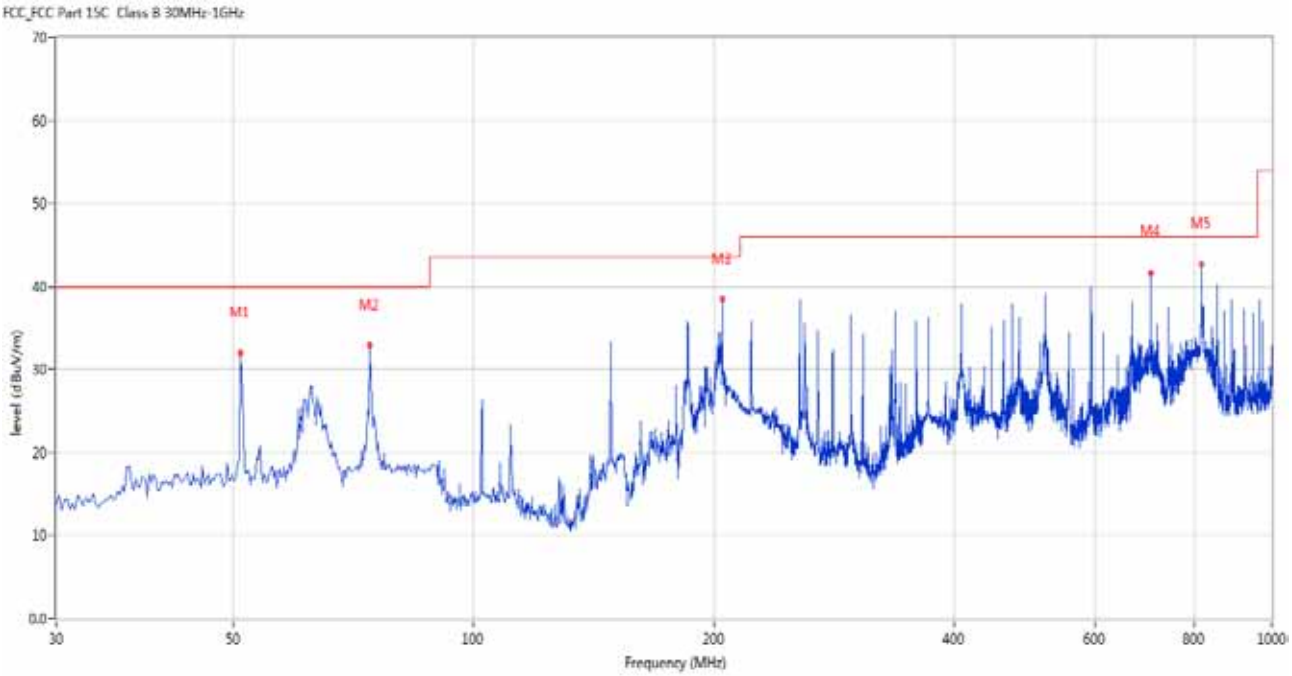
**Radiated Emission In Horizontal/Vertical (30MHz----1000MHz)**

EUT set Condition: Keep Bluetooth Transmitting

**Results:** **Pass**

Test Figure:

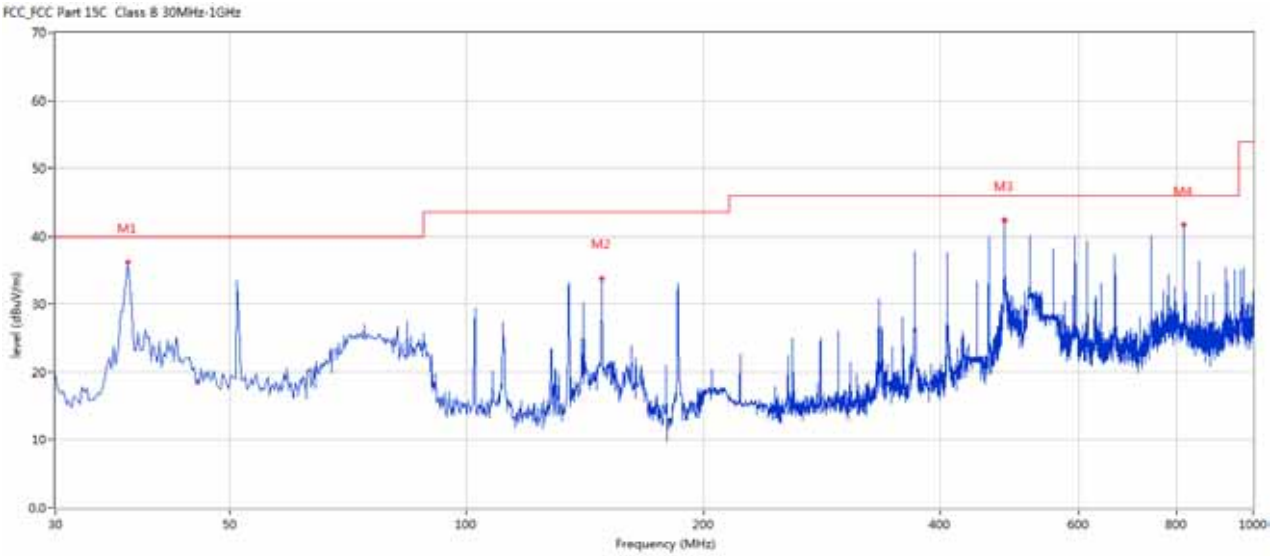
**H**




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 51.092 | 31.98 | -11.41 | 40.0 | -8.02 | Peak | 0.00 | 100 | H | Pass |
| 2 | 75.094 | 32.14 | -17.33 | 40.0 | -7.86 | Peak | 0.00 | 100 | H | Pass |
| 3 | 205.041 | 39.47 | -13.59 | 43.5 | -4.03 | Peak | 32.00 | 100 | H | Pass |
| 4 | 705.194 | 41.66 | -4.15 | 46.0 | -4.34 | Peak | 14.00 | 100 | H | Pass |
| 5 | 816.716 | 42.69 | -2.92 | 46.0 | -3.31 | Peak | 20.00 | 100 | H | Pass |

Test Figure:

**V**

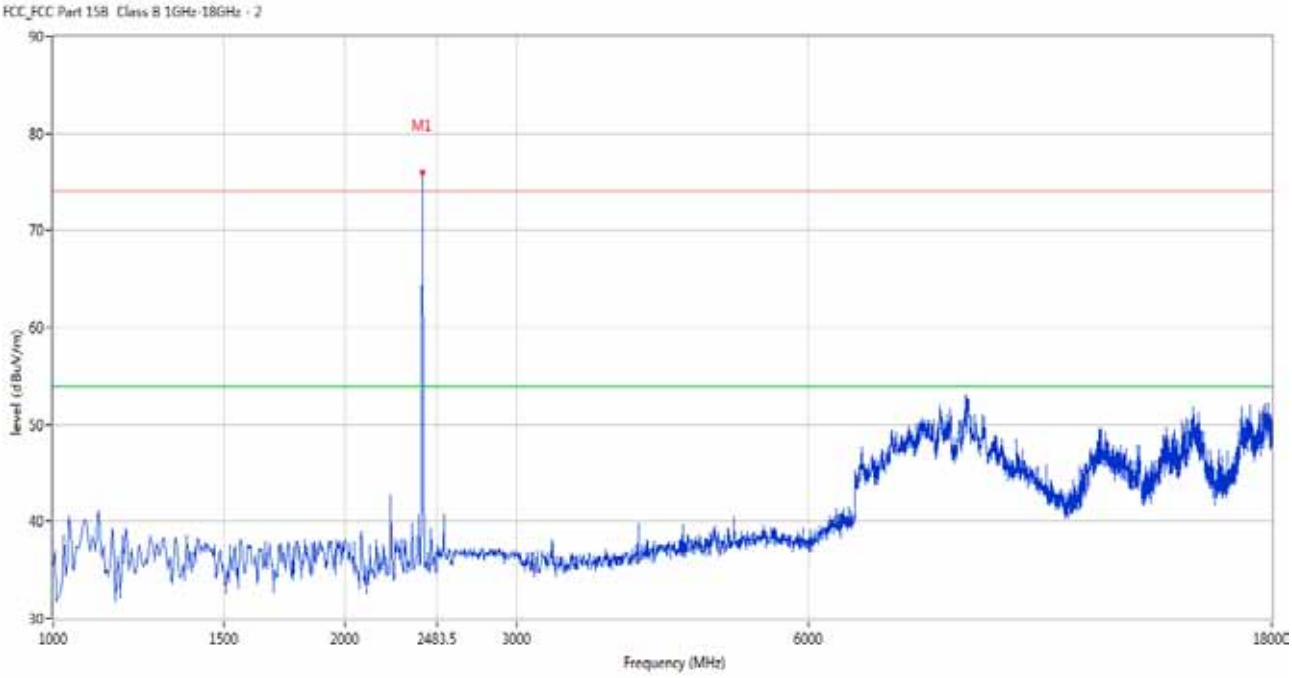



| No. | Frequenc y (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 37.031 | 36.17 | -13.17 | 40.0 | -3.83 | Peak | 354.00 | 100 | V | Pass |
| 2 | 148.310 | 34.83 | -17.16 | 43.5 | -8.67 | Peak | 354.00 | 100 | V | Pass |
| 3 | 482.634 | 42.42 | -7.37 | 46.0 | -3.58 | Peak | 359.00 | 100 | V | Pass |
| 4 | 816.716 | 41.82 | -2.92 | 46.0 | -4.18 | Peak | 354.00 | 100 | V | Pass |

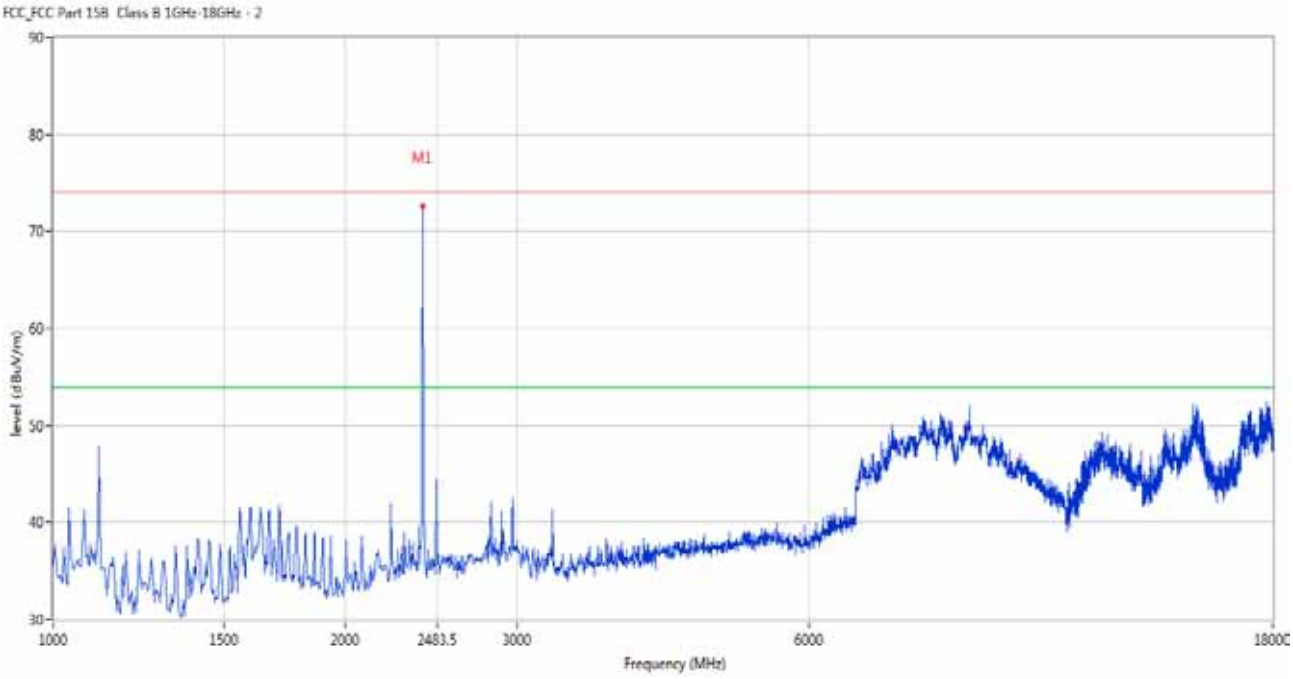
**Test Figures above 1GHz:**

Please refer to the following test plots for details:

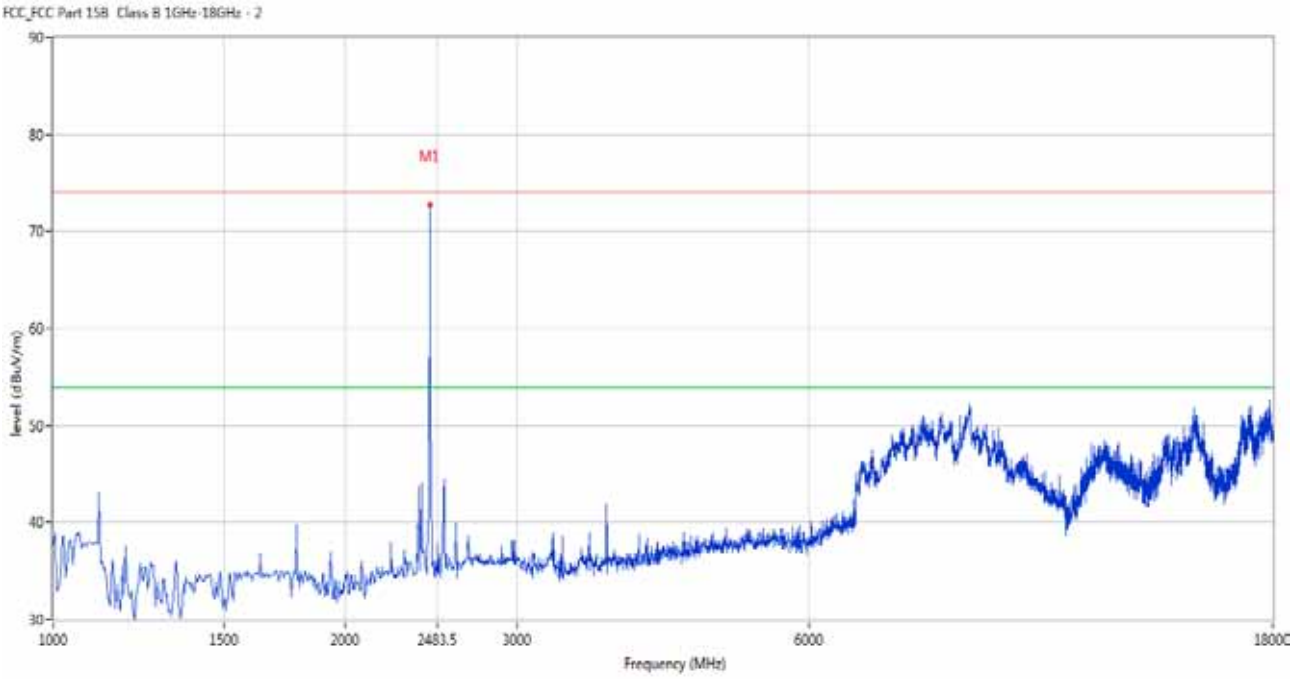
**Low Channel: Vertical**



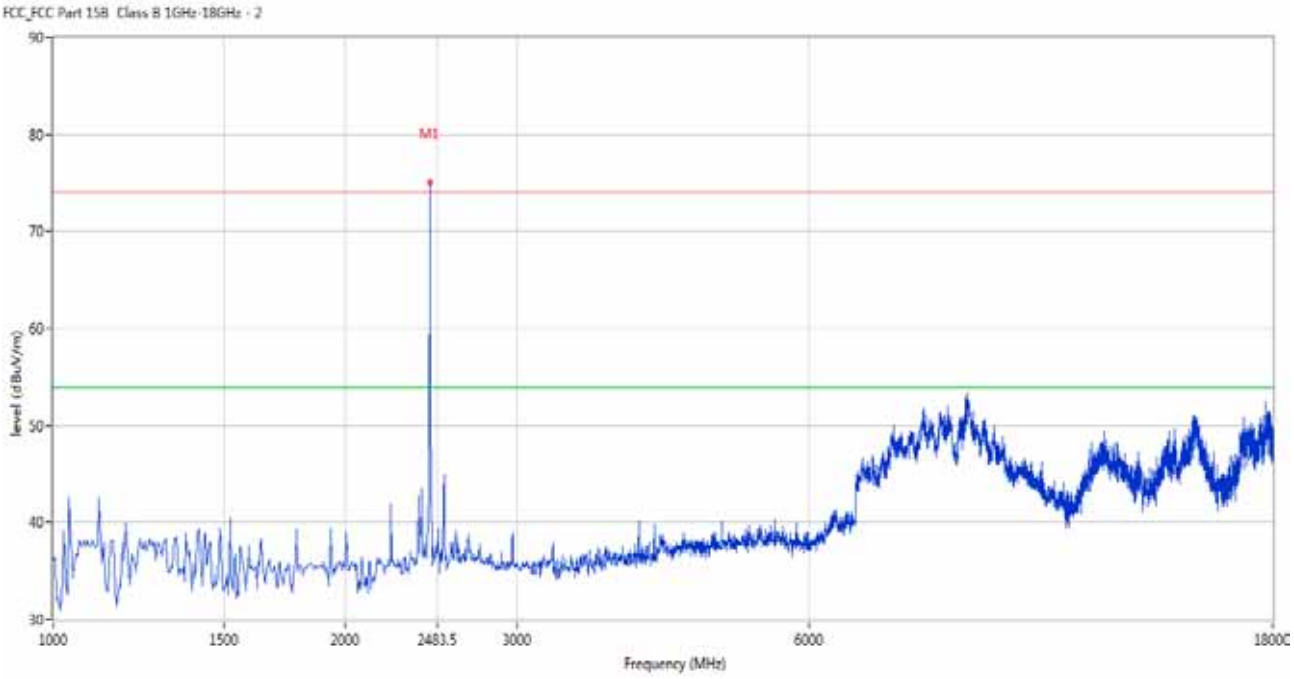
**Low Channel : Horizontal**



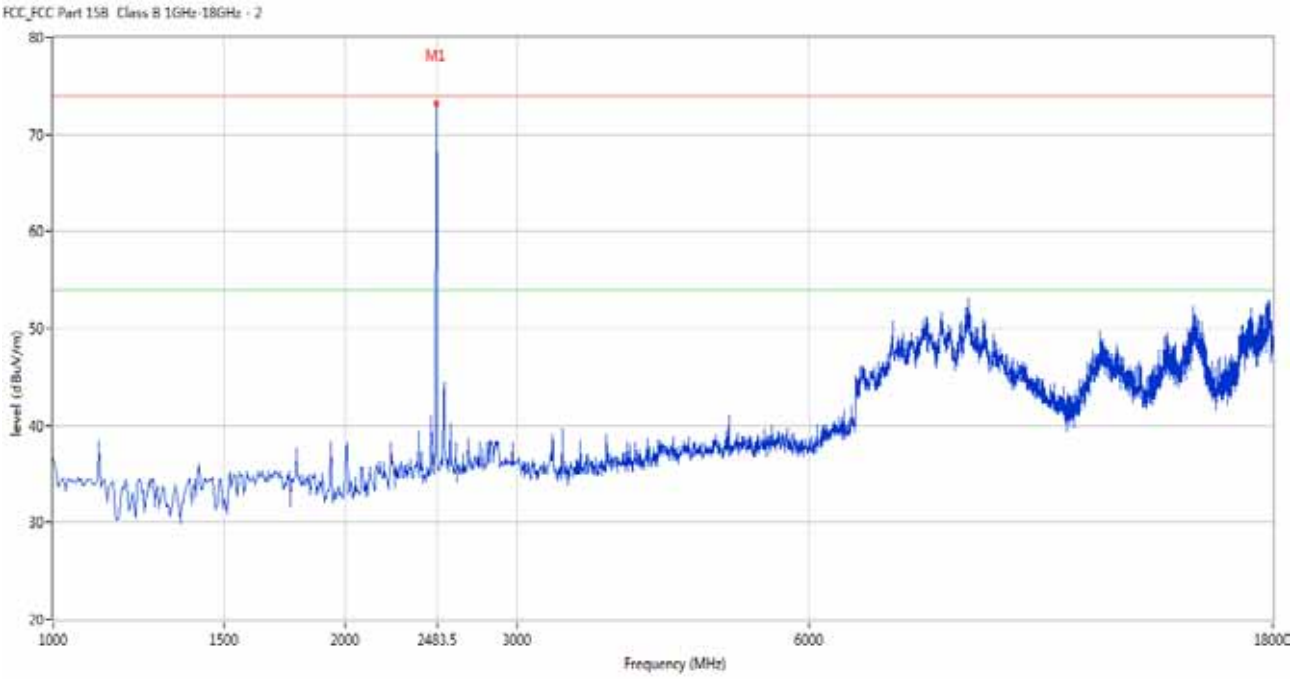
**Middle Channel : Horizontal**



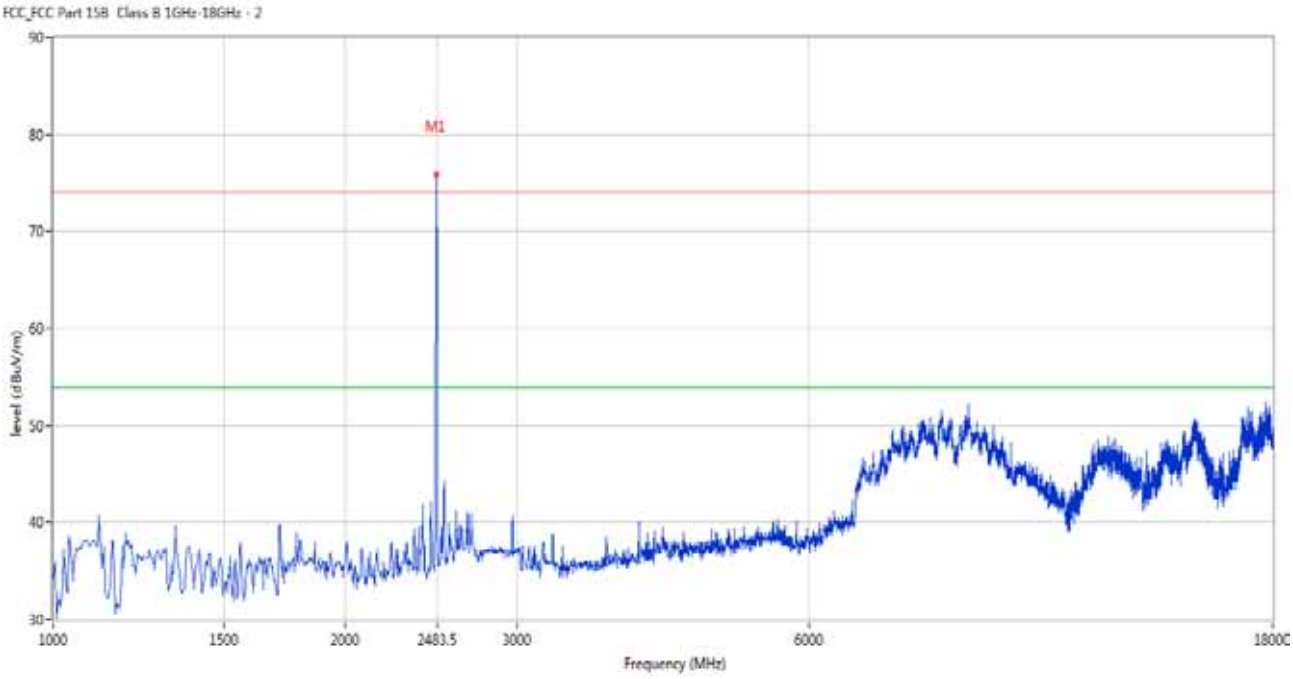
**Middle Channel : Vertical**



**High Channel : Horizontal**



**High Channel : Vertical**




**Note: 1. Level = Reading + AF + Cable - Preamp**
**2. For the radiated emissions above 18G and below 30MHz, it is the floor noise.**

## 7.0 20dB Bandwidth Measurement

### 7.1 Regulation

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.

### 7.2 Limits of 20dB Bandwidth Measurement

N/A

### 7.3 Test Procedure.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: Span =3MHz, RBW =30 kHz, VBW=100 kHz, Sweep = auto Detector function = peak, Trace = max hold

3. Measure the highest amplitude appearing on spectral display and record the level to calculate results. 6. Repeat above procedures until all frequencies measured were complete.

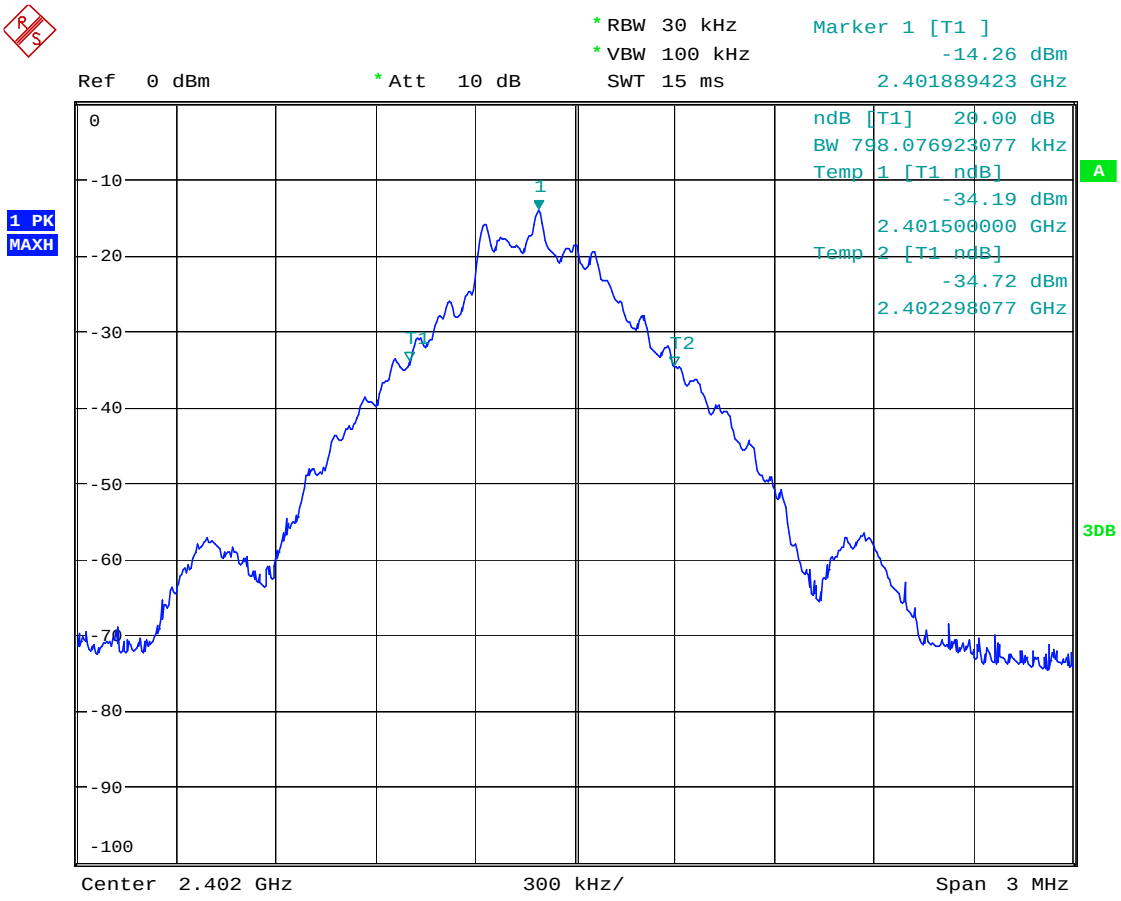
### 7.4 Test Result

**Type of Modulation: GFSK**

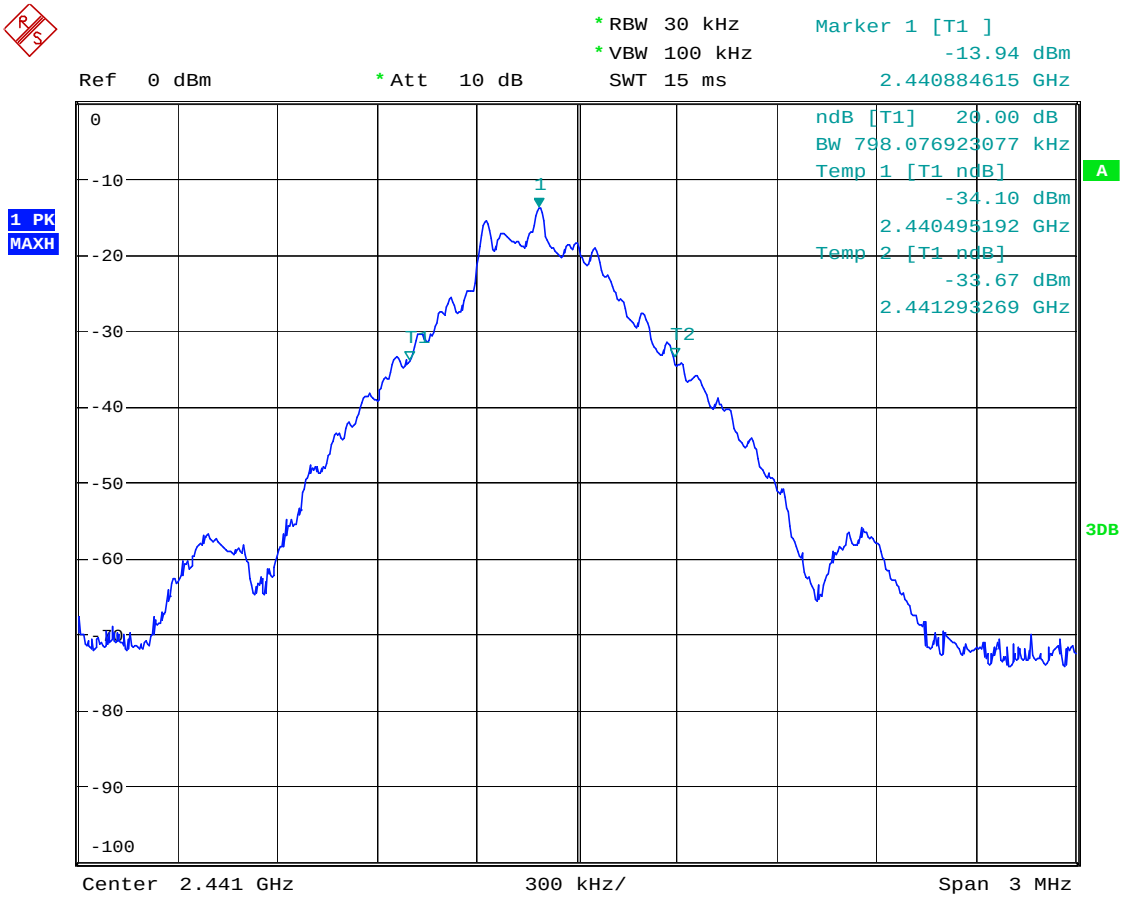
| EUT | CAR AUDIO VIDEO SYSTEM | | Model | XVM1000Ui |
|---|---|---|---|---|
| Mode | Keep Transmitting | | Input Voltage | DC12V |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Channel | Channel Frequency (MHz) | 20 dB Bandwidth (kHz) | Minimum Limit (kHz) | Pass/ Fail |
| Low | 2402 | 798 | -- | Pass |
| Middle | 2441 | 798 | -- | Pass |
| High | 2480 | 798 | -- | Pass |

Test Figure:

**1. Condition: Low Channel**

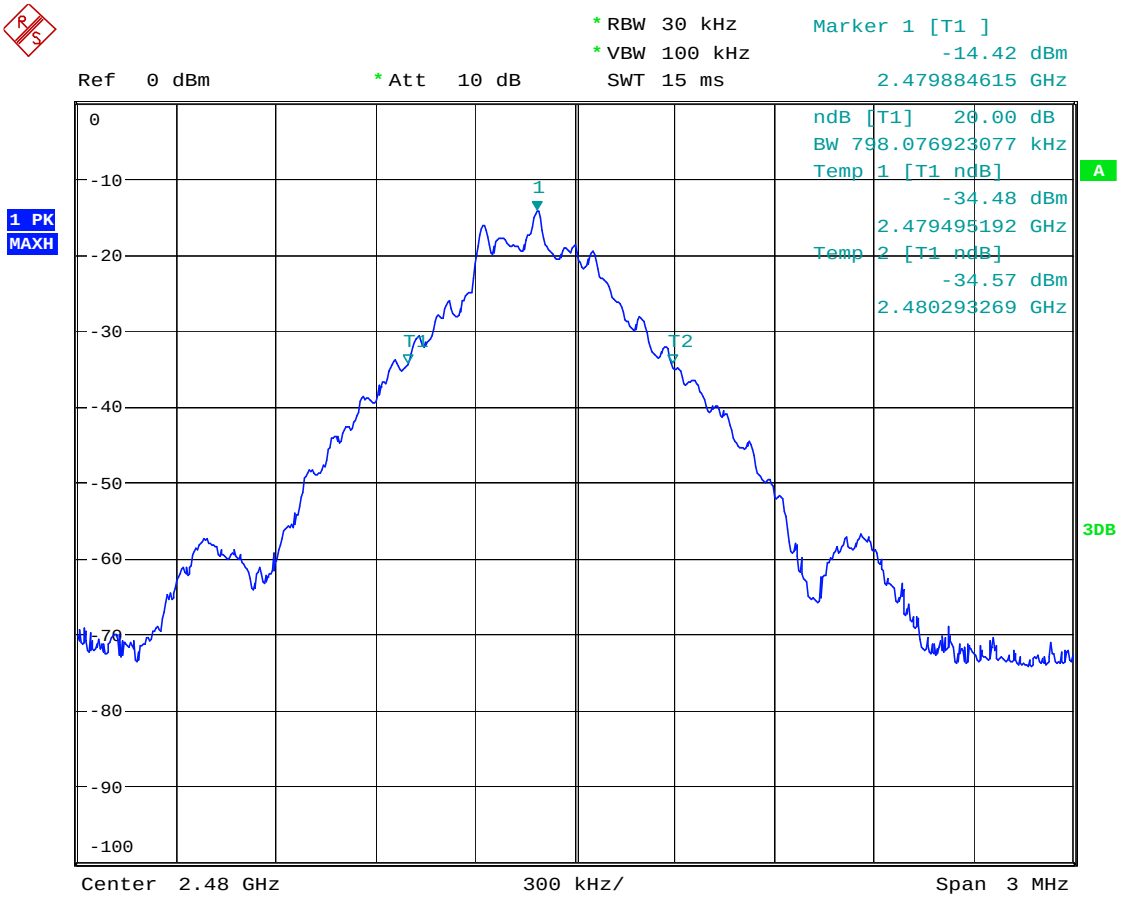


## 2. Condition: Middle Channel




Date: 2.JAN.2020 15:43:44

### 3. High Channel




Date: 2.JAN.2020 15:42:49

## Test Result

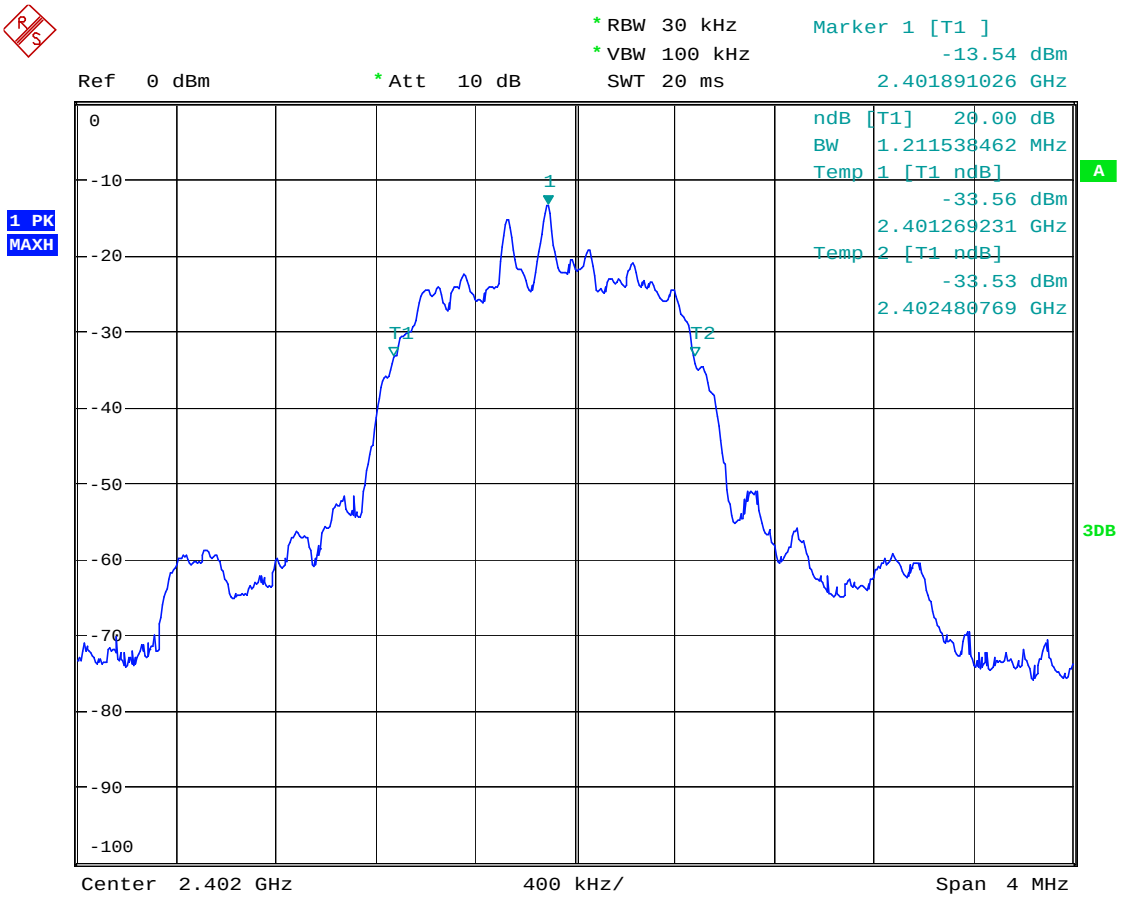
**Type of Modulation: Л/4D-QPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

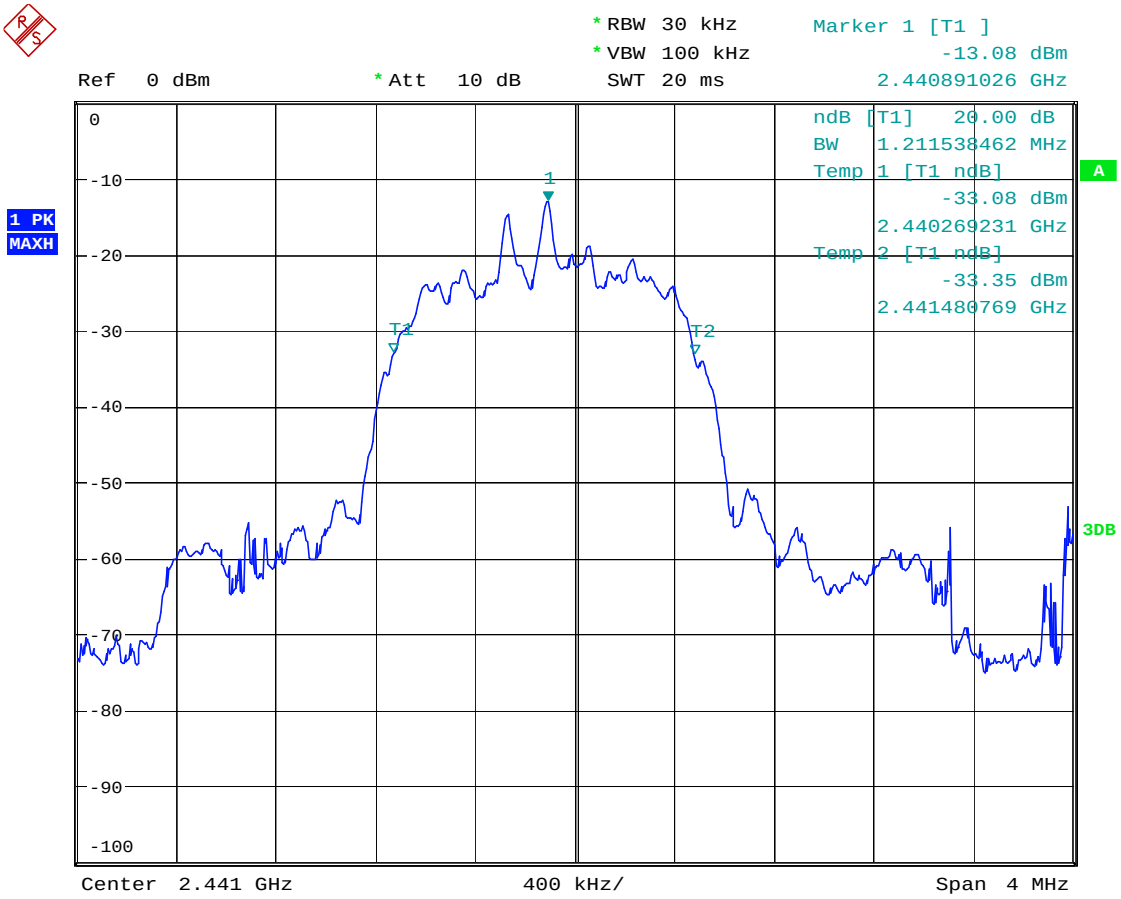
| Channel | Channel Frequency (MHz) | 20 dB Bandwidth (kHz) | Maximum Limit (kHz) | Pass/ Fail |
|---|---|---|---|---|
| Low | 2402 | 1212 | -- | Pass |
| Middle | 2441 | 1212 | -- | Pass |
| High | 2480 | 1212 | -- | Pass |

Test Figure:

**1. Condition: Low Channel**

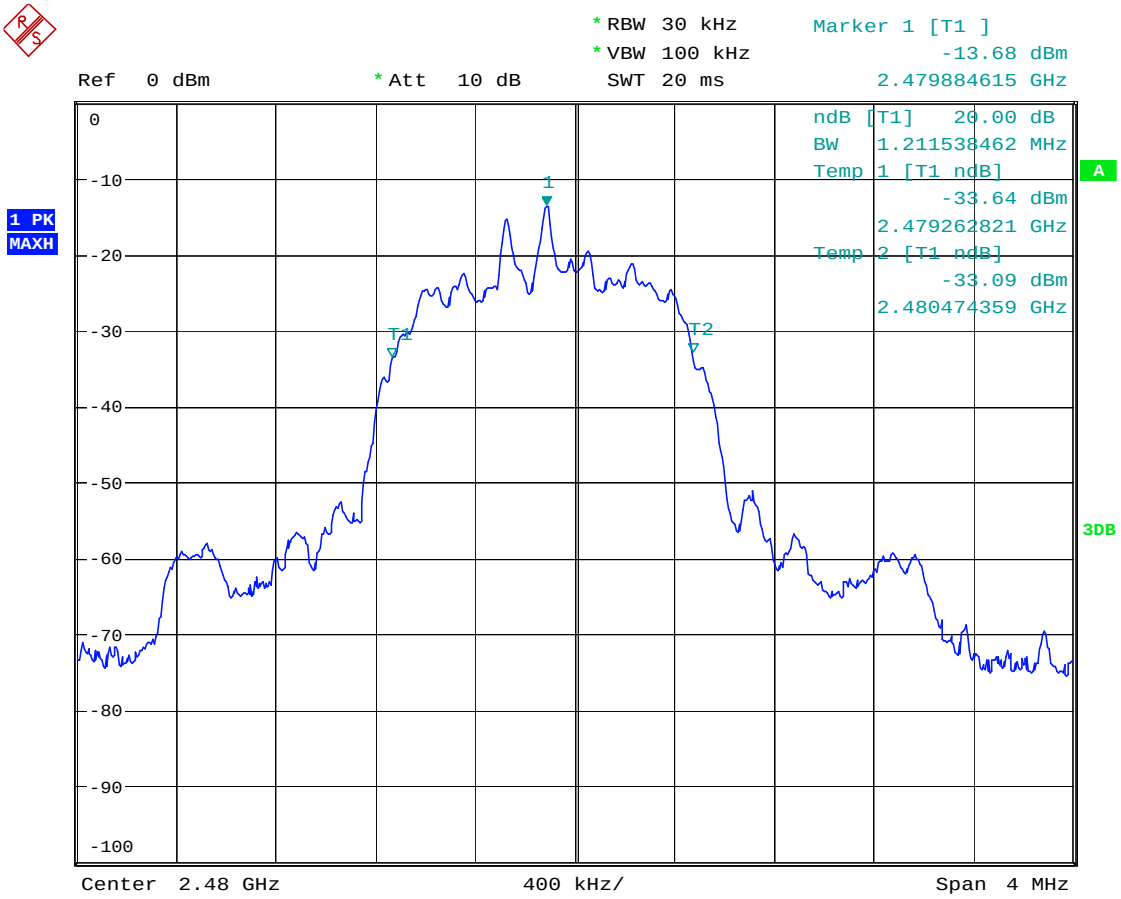


## 2. Condition: Middle Channel




Date: 3.JAN.2020 10:08:41

### 3. High Channel




Date: 3.JAN.2020 10:09:32

## Test Result

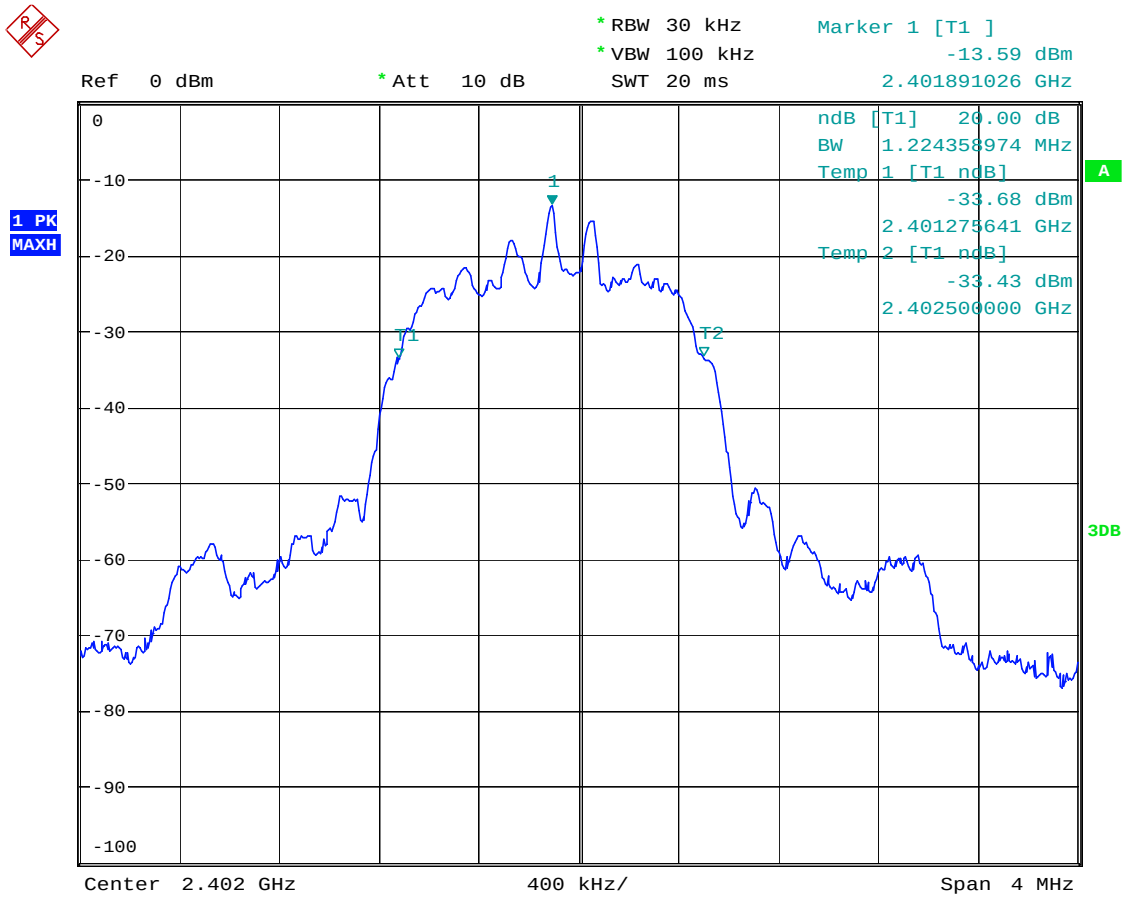
**Type of Modulation: 8DPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

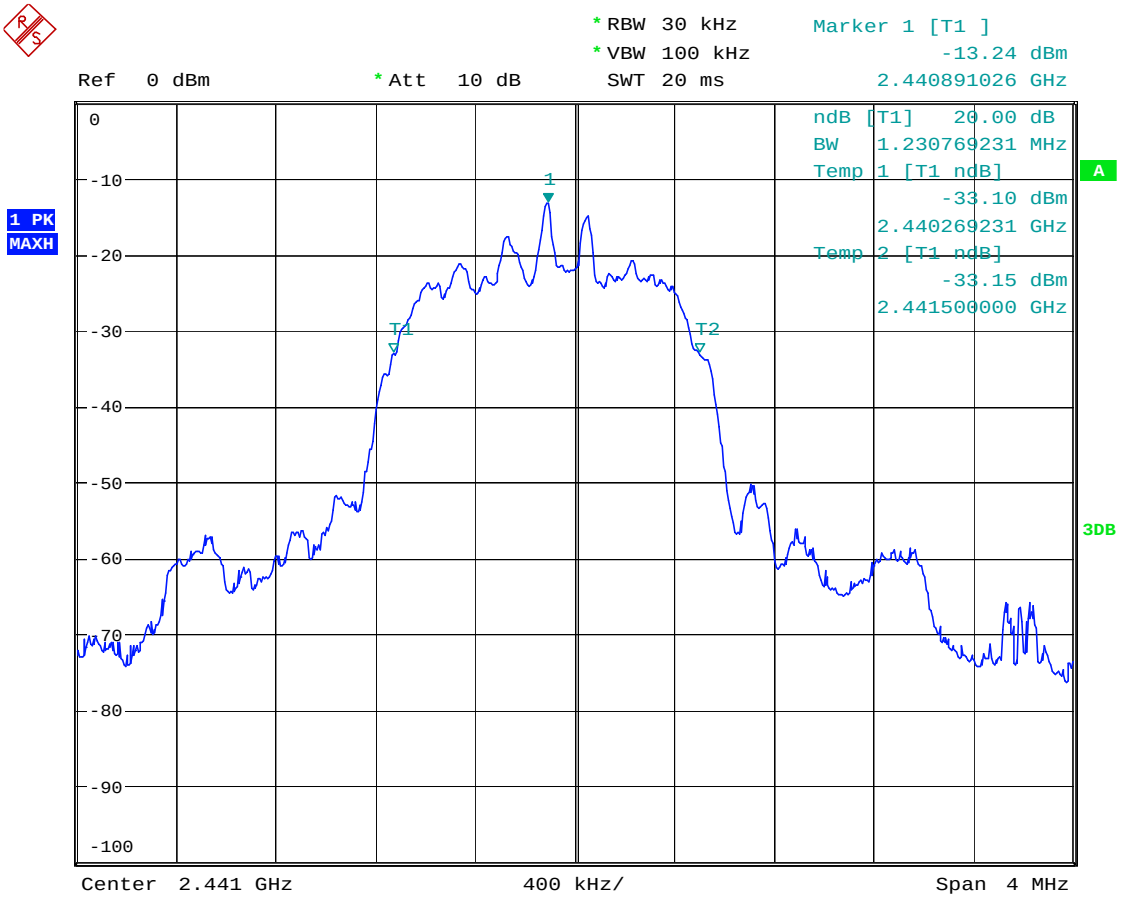
| Channel | Channel Frequency (MHz) | 20 dB Bandwidth (kHz) | Maximum Limit (kHz) | Pass/ Fail |
|---|---|---|---|---|
| Low | 2402 | 1224 | -- | Pass |
| Middle | 2441 | 1231 | -- | Pass |
| High | 2480 | 1224 | -- | Pass |

Test Figure:

**1. Condition: Low Channel**

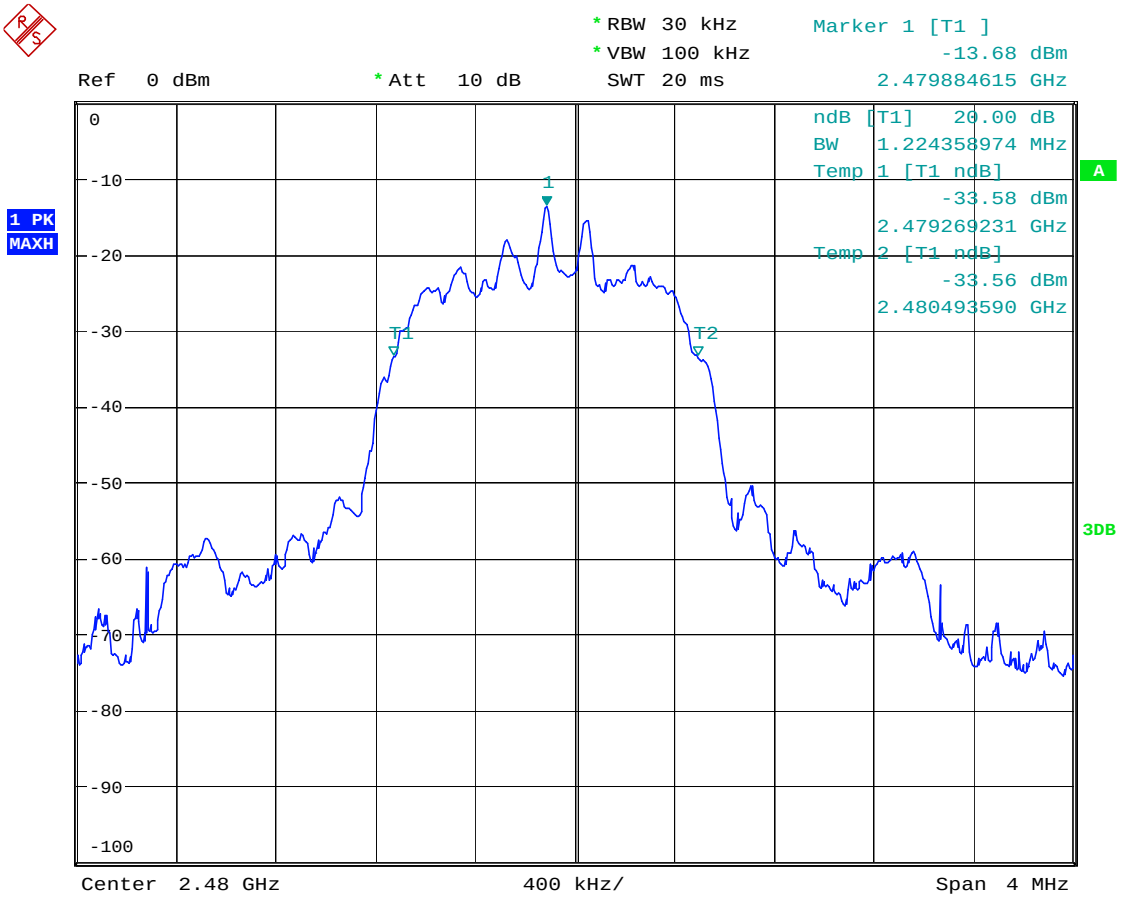


## 2. Condition: Middle Channel




Date: 3.JAN.2020 10:17:00

### 3. High Channel



# 8. Maximum Output Power

## 8.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band:0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

## 8.3 Test Procedure

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel; RBW > the 20 dB bandwidth of the emission being measured; VBW = RBW=3MHz;
Sweep = 60s; Detector function = RMS; Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
4. Repeat above procedures until all frequencies measured were complete.

**8.4Test Results**

**Type of Modulation: GFSK**

| EUT | CAR AUDIO VIDEO SYSTEM | | Model | XVM1000Ui |
|---|---|---|---|---|
| Mode | Keep Transmitting | | Input Voltage | DC12V |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Channel | Channel Frequency (MHz) | Max. Power Output (dBm) | Peak Power Limit (dBm) | Pass/ Fail |
| | | **Peak** | | |
| Low | 2402 | -13.22 | 30 | Pass |
| Middle | 2441 | -12.66 | 30 | Pass |
| High | 2480 | -13.39 | 30 | Pass |

Note: 1. the result basic equation calculation as follow:

Max. Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

3. The Peak power was measured

**Type of Modulation: Л/4D-QPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | | Model | XVM1000Ui |
|---|---|---|---|---|
| Mode | Keep Transmitting | | Input Voltage | DC12V |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Channel | Channel Frequency (MHz) | Max. Power Output (dBm) | Peak Power Limit (dBm) | Pass/ Fail |
| | | **Peak** | | |
| Low | 2402 | -11.43 | 21 | Pass |
| Middle | 2441 | -11.01 | 21 | Pass |
| High | 2480 | -11.50 | 21 | Pass |

Note: 1. the result basic equation calculation as follow:

Max. Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

3. The Peak power was measured

**Type of Modulation: 8DPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Channel Frequency (MHz) | Max. Power Output (dBm) | Peak Power Limit (dBm) | Pass/ Fail |
|---|---|---|---|---|
| | | **Peak** | | |
| Low | 2402 | -11.52 | 21 | Pass |
| Middle | 2441 | -11.52 | 21 | Pass |
| High | 2480 | -11.67 | 21 | Pass |

Note: 1. the result basic equation calculation as follow:

Max. Power Output = Power Reading + Cable loss + Attenuator

2. The worse case was recorded

3. The Peak power was measured

## 9. Carrier Frequency Separation

### 9.1 Regulation

According to §15.247(a)(1), 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.

### 9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

### 9.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span; Video (or Average) Bandwidth (VBW) ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.

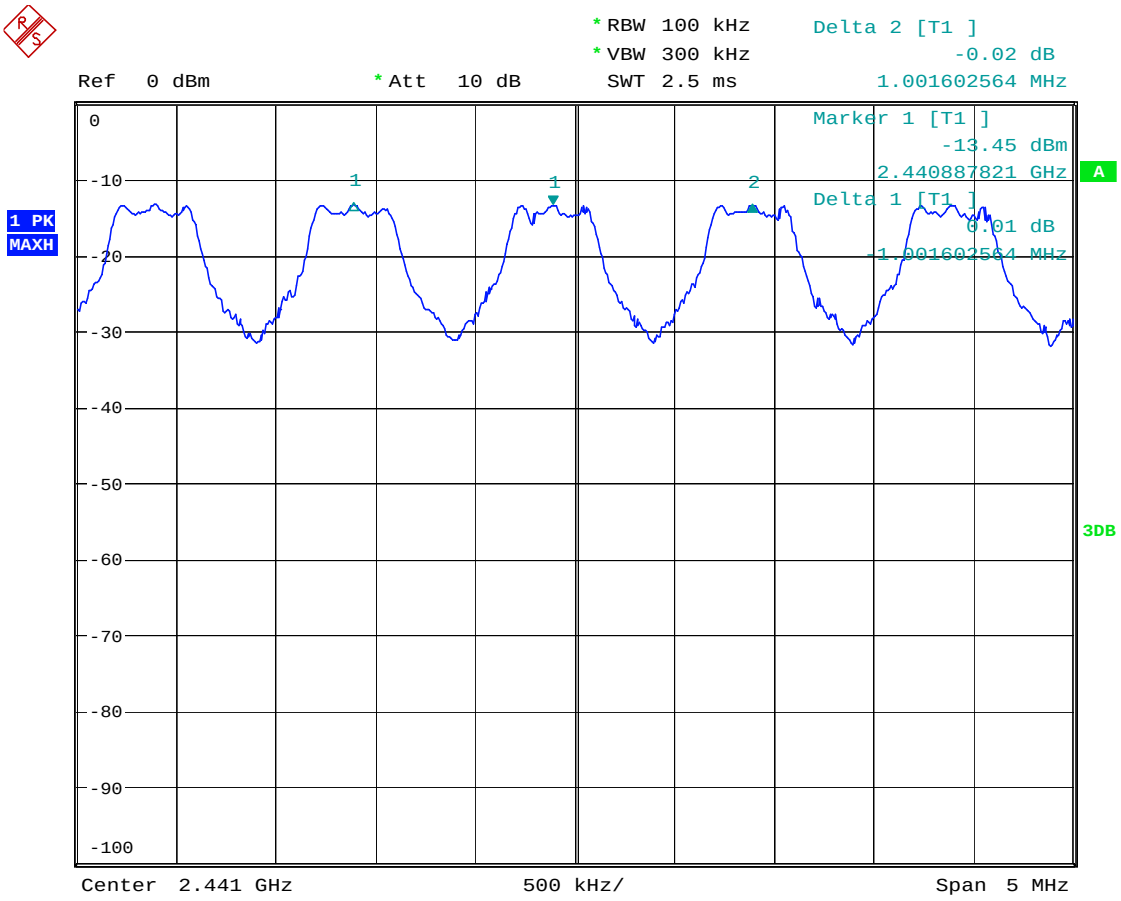
### 9.4Test Result

**Type of Modulation: GFSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Carrier Frequency Separation | Limit | Pass/ Fail |
|---|---|---|
| 1.002MHz | ⩾ 25 kHz or 2/3 of the 20 dB bandwidth | Pass |

## Test Plots



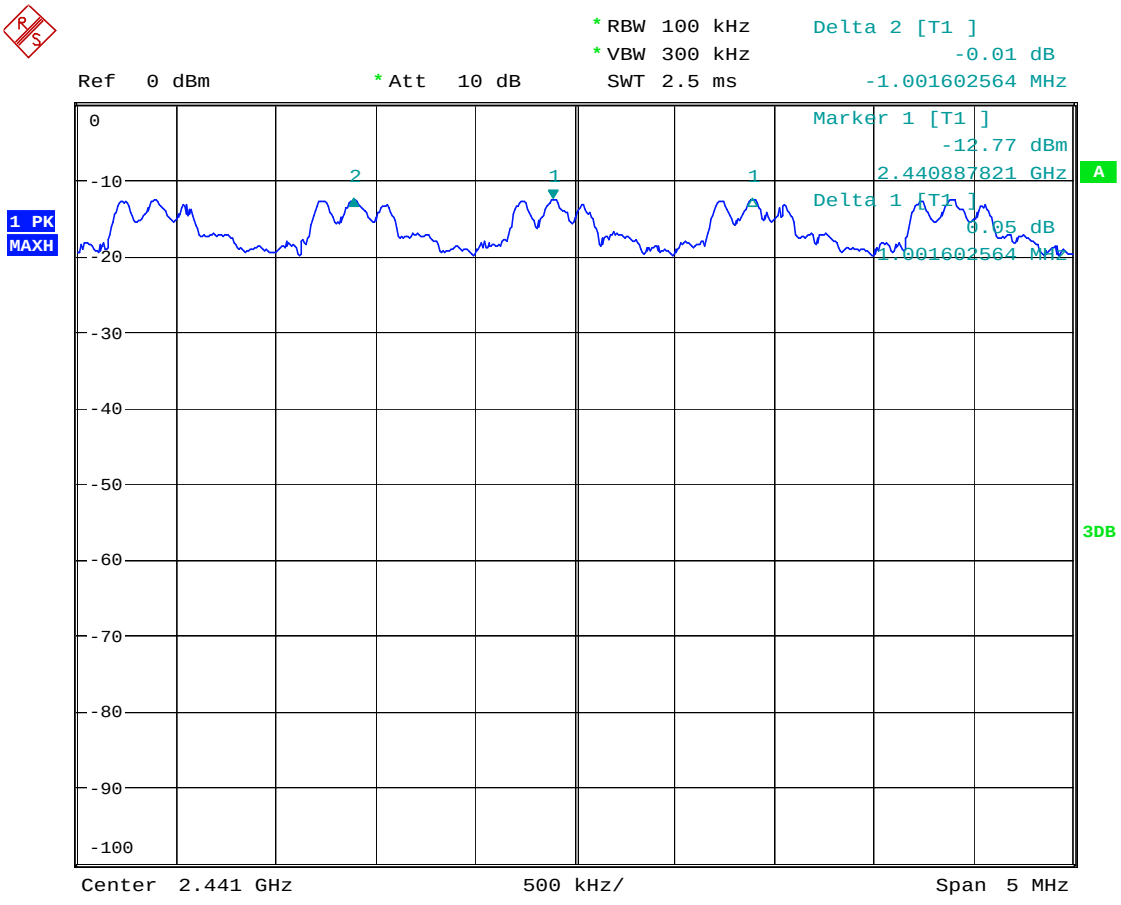

Date: 2.JAN.2020 17:16:28

**Type of Modulation: Л/4D-QPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Carrier Frequency Separation | Limit | Pass/ Fail |
|---|---|---|
| 1.002MHz | ⩾ 25 kHz or 2/3 of 20 dB bandwidth | Pass |

## Test Plots



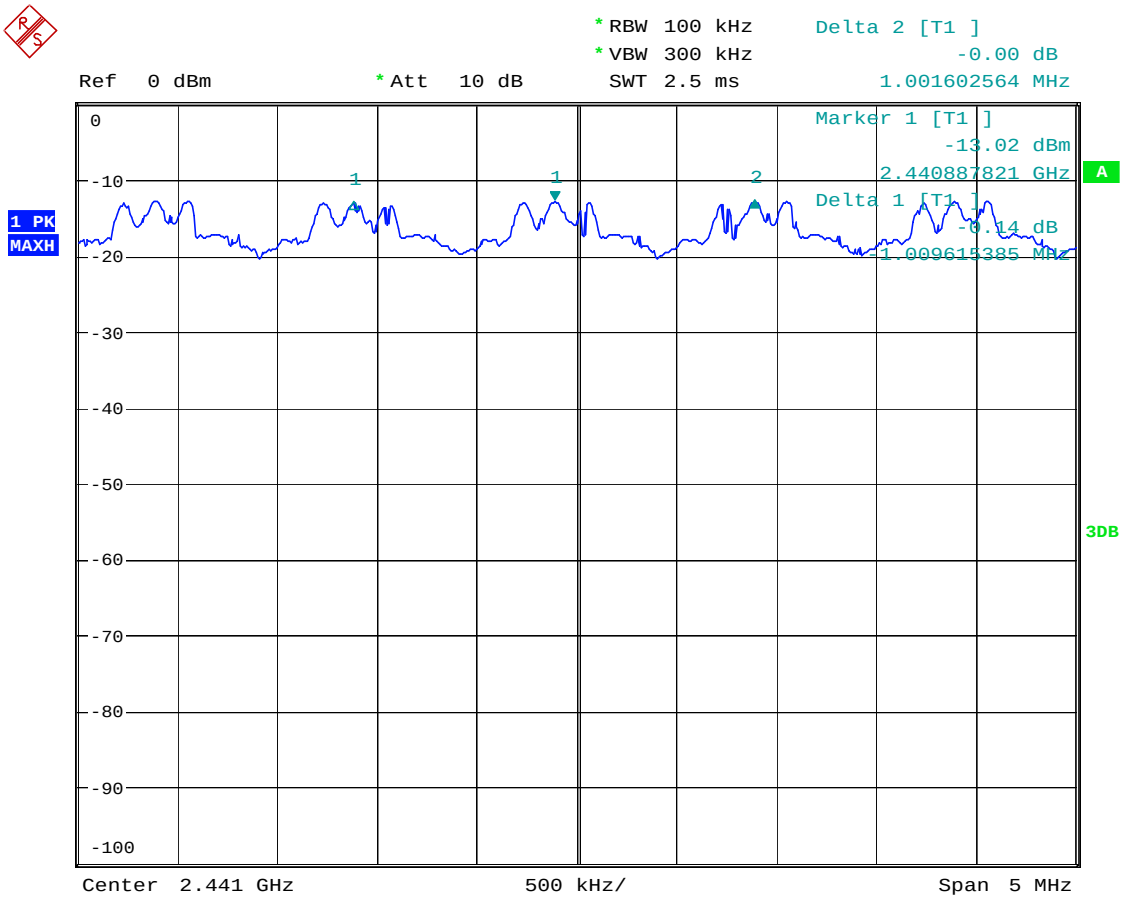

Date: 3.JAN.2020 09:27:12

**Type of Modulation: 8DPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Carrier Frequency Separation | Limit | Pass/ Fail |
|---|---|---|
| 1.002MHz | ⩾ 25 kHz or 2/3 of 20 dB bandwidth | Pass |

## Test Plots




Date: 3.JAN.2020 10:26:04

## 10. Number of Hopping Channels

### 10.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 10.2 Limits of Number of Hopping Channels

The frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

### 10.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW=100 kHz, VBW=300 kHz; Sweep = auto; Detector function = peak; Trace = max hold
3. Record the number of hopping channels.

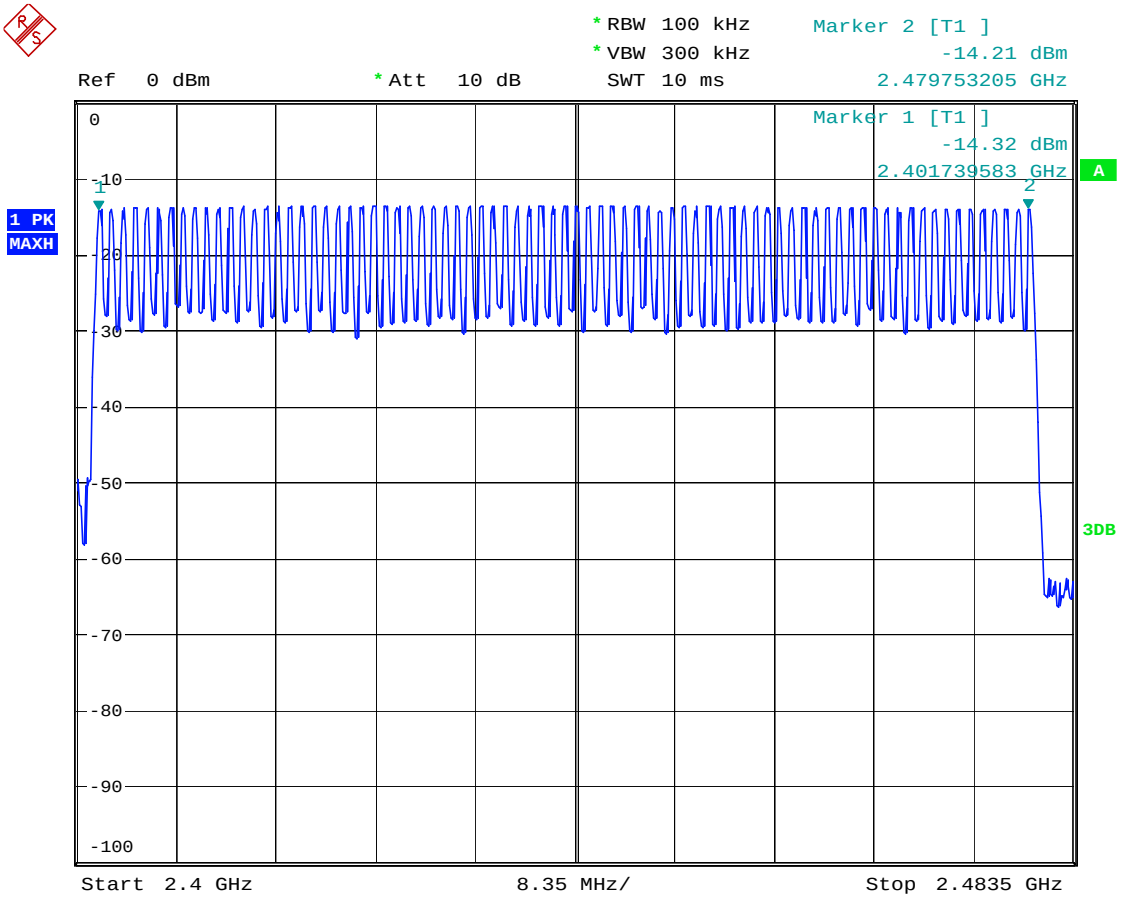
**10.4Test Result**

**Type of Modulation: GFSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Operating Frequency | Number of hopping channels | Limit | Pass/ Fail |
|---|---|---|---|
| 2402-2480MHz | 79 | ≥ 15 | Pass |

## Test Plot



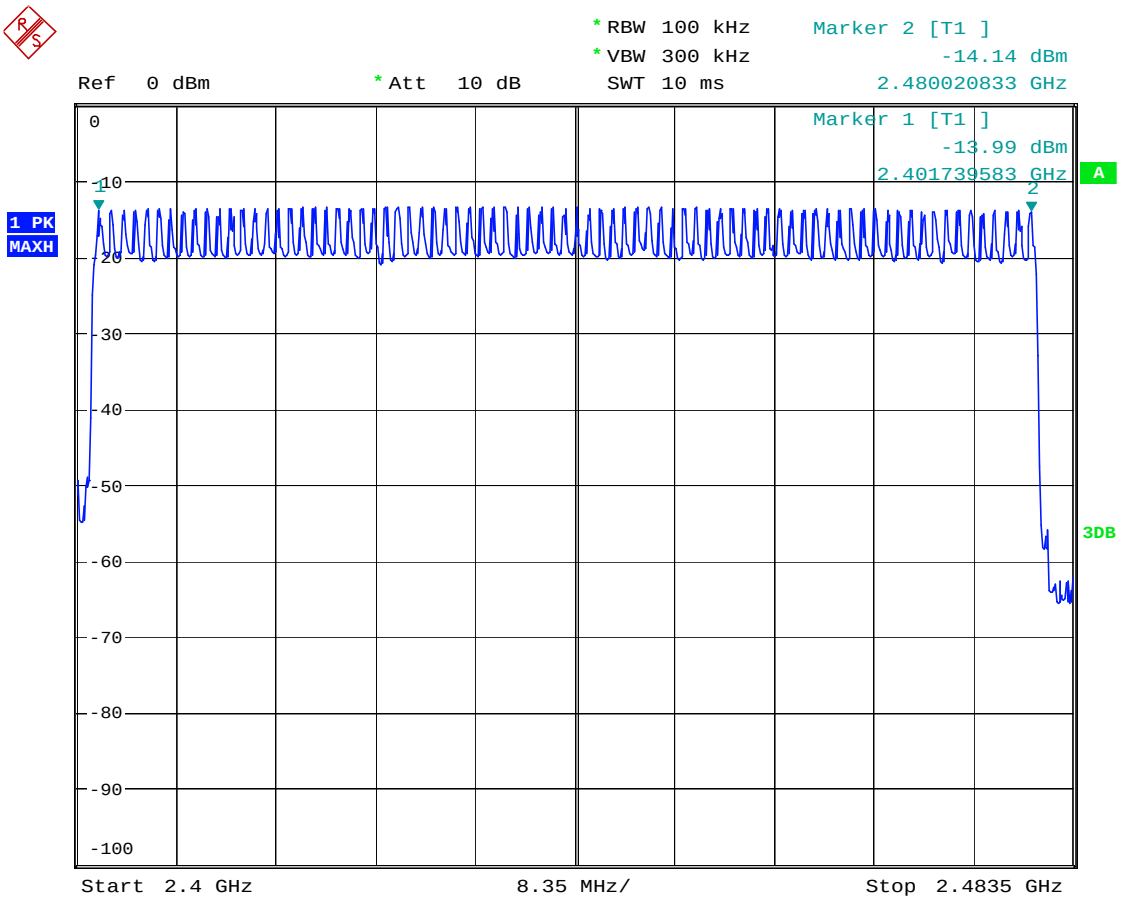

Date: 2.JAN.2020 15:39:01

**Type of Modulation: Л/4D-QPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Operating Frequency | Number of hopping channels | Limit | Pass/ Fail |
|---|---|---|---|
| 2402-2480MHz | 79 | ≥ 15 | Pass |

## Test Plot

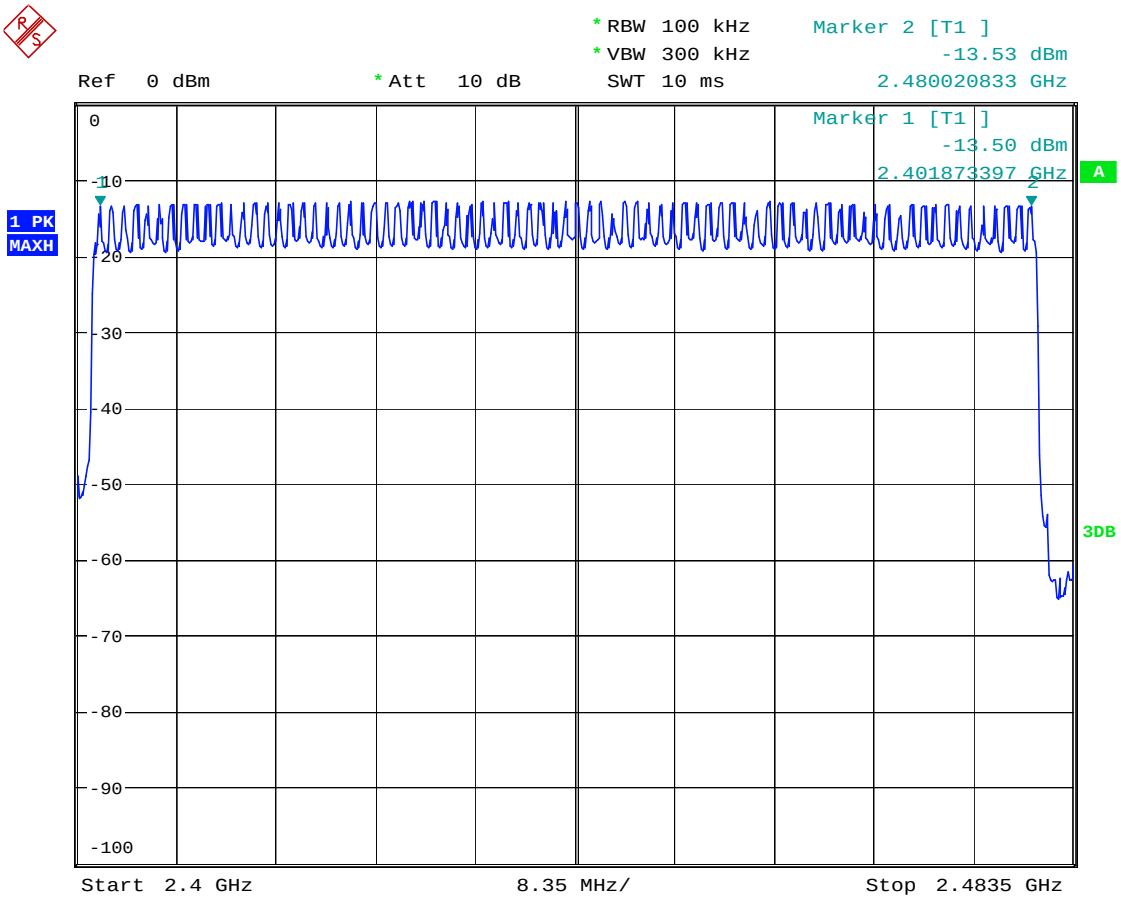


**Type of Modulation: 8DPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Operating Frequency | Number of hopping channels | Limit | Pass/ Fail |
|---|---|---|---|
| 2402-2480MHz | 79 | ≥ 15 | Pass |

## Test Plot




Date: 3.JAN.2020 10:48:15

## 11. Time of Occupancy (Dwell Time)

### 11.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 11.2 Limits of Carrier Frequency Separation

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

### 11.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold
3. Measure the dwell time using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.
5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

**11.4 Test Result**

**Type of Modulation: GFSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Reading | Hoping Rate | Actual | Limit |
|---|---|---|---|---|
| DH5 | | | | |
| Middle | 2.997ms | 266.667 hop/s | 0.320s | 0.4s |

Actual = Reading × (Hopping rate / Number of channels) × Test period, Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels.

A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

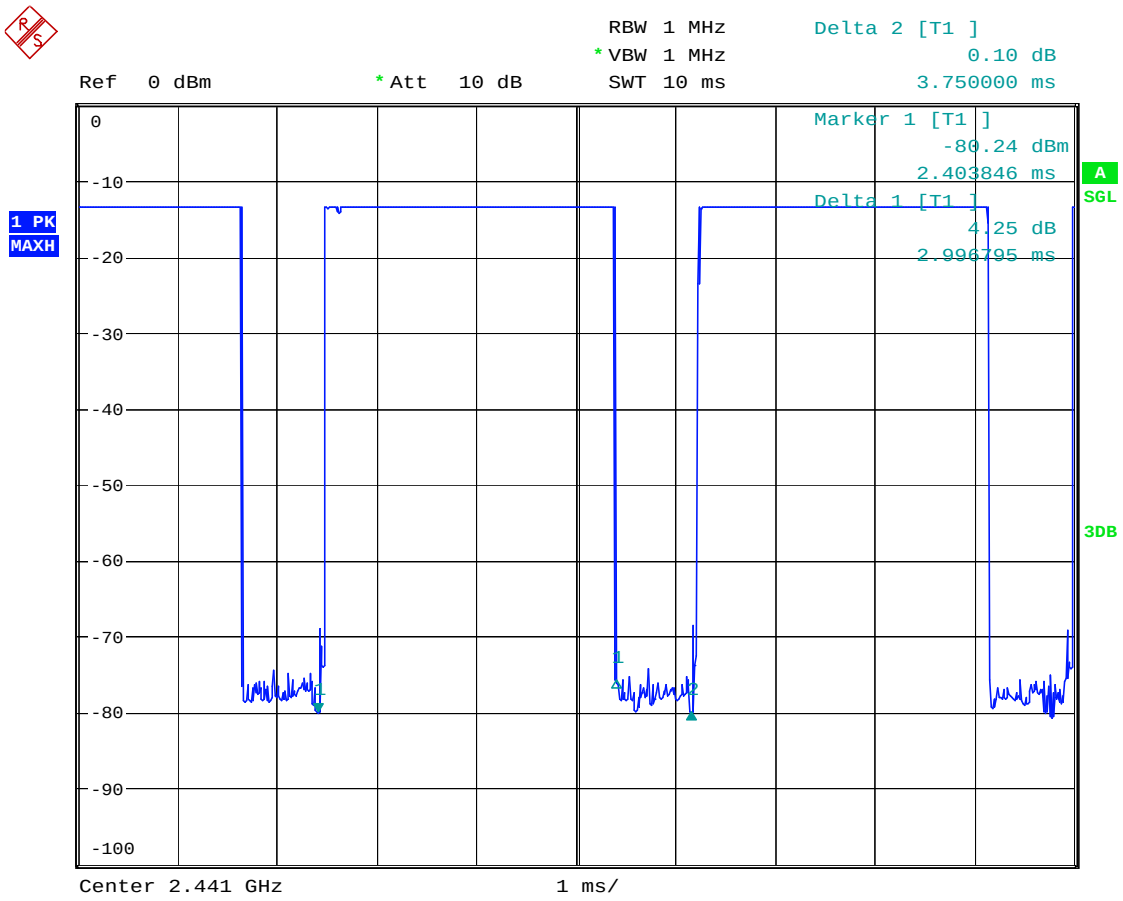
A DH3 Packet needs 3 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 400 hops per second with 79 channels.

A DH1 Packet needs 1 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 800 hops per second with 79 channels.

**Note: DH5 was the worst case.**

Test Plots:

**DH5**




Date: 2.JAN.2020 17:29:52

**Test Result**

**Type of Modulation: Л/4D-QPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Reading | Hoping Rate | Actual | Limit |
|---|---|---|---|---|
| DH5 | | | | |
| Middle | 3.013ms | 266.667 hop/s | 0.321s | 0.4s |

Actual = Reading × (Hopping rate / Number of channels) × Test period, Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels.

A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

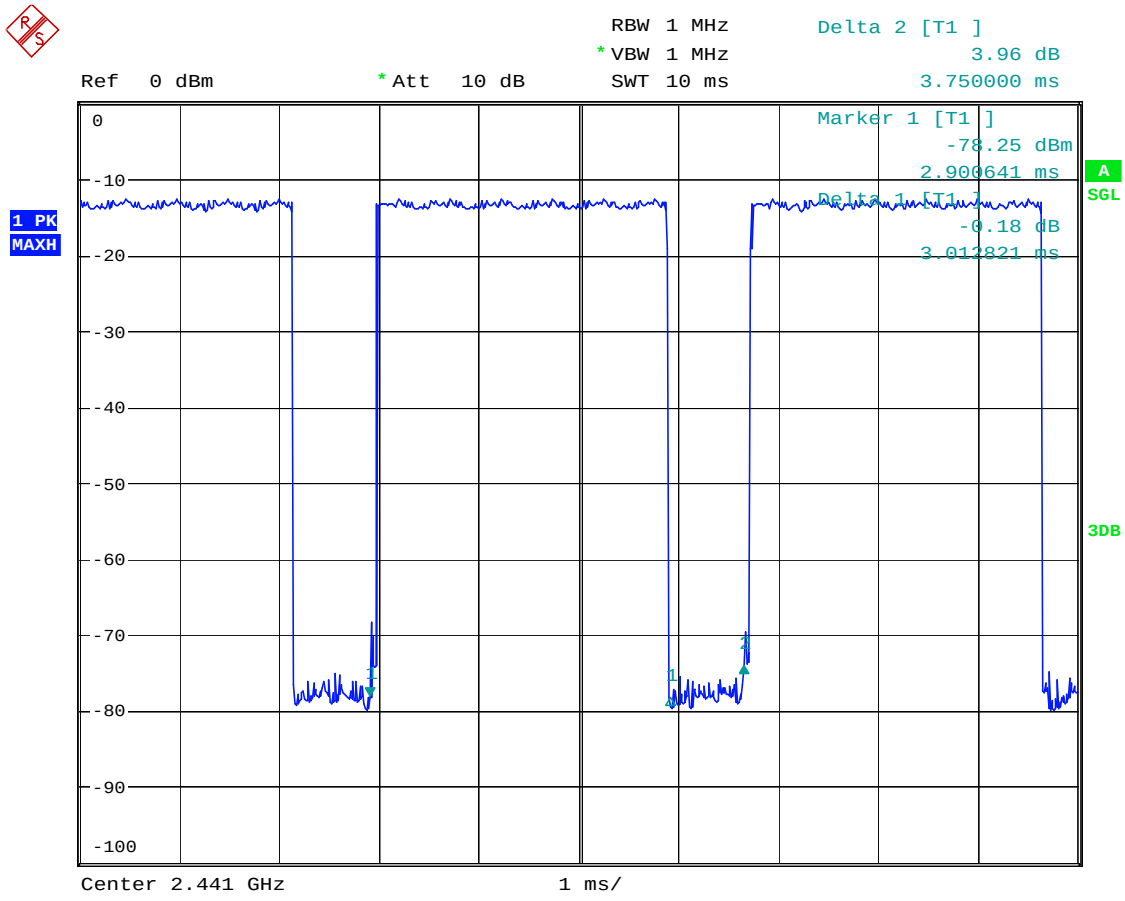
A DH3 Packet needs 3 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 400 hops per second with 79 channels.

A DH1 Packet needs 1 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 800 hops per second with 79 channels.

**Note: 2DH5 was the worst case.**

Test Plots:

**2DH5**




Date: 2.JAN.2020 17:30:57

**Type of Modulation: 8DPSK**

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Reading | Hoping Rate | Actual | Limit |
|---|---|---|---|---|
| DH5 | | | | |
| Middle | 3.013ms | 266.667 hop/s | 0.321s | 0.4s |

Actual = Reading × (Hopping rate / Number of channels) × Test period, Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds] NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels.

A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

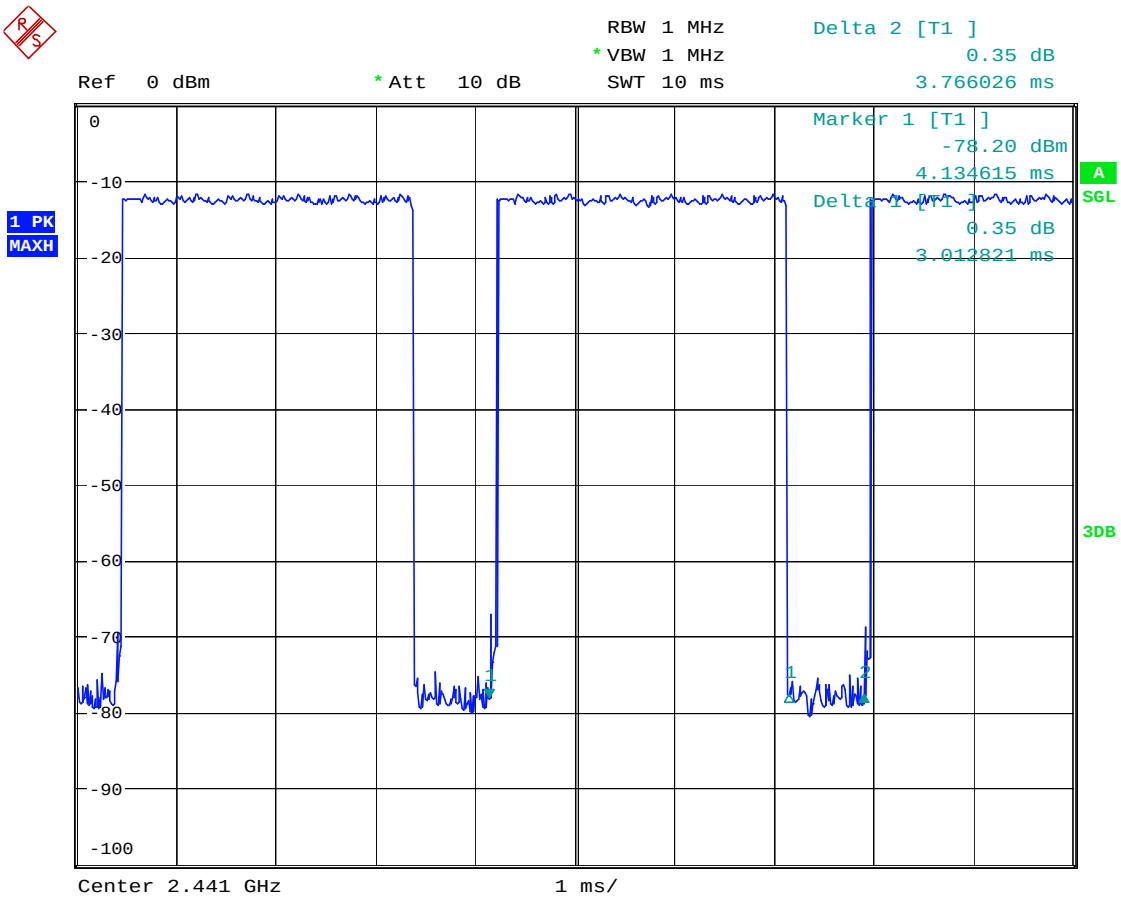
A DH3 Packet needs 3 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 400 hops per second with 79 channels.

A DH1 Packet needs 1 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 800 hops per second with 79 channels.

**Note: 3DH5 was the worst case.**

Test Plots:

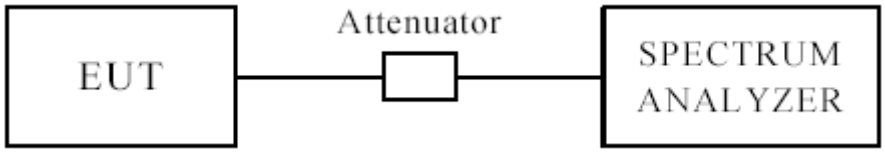
**3DH5**




Date: 3.JAN.2020 11:18:33

# 12 Out of Band Measurement

## 12.1 Test Setup




**The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup**

## 12.2 Limits of Out of Band Emissions Measurement

1. Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

## 12.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. Peak values with RBW=VBW=1MHz and PK detector.

For bandage test, the spectrum set as follows: RBW=100 kHz, VBW=300 kHz. A conducted measurement used

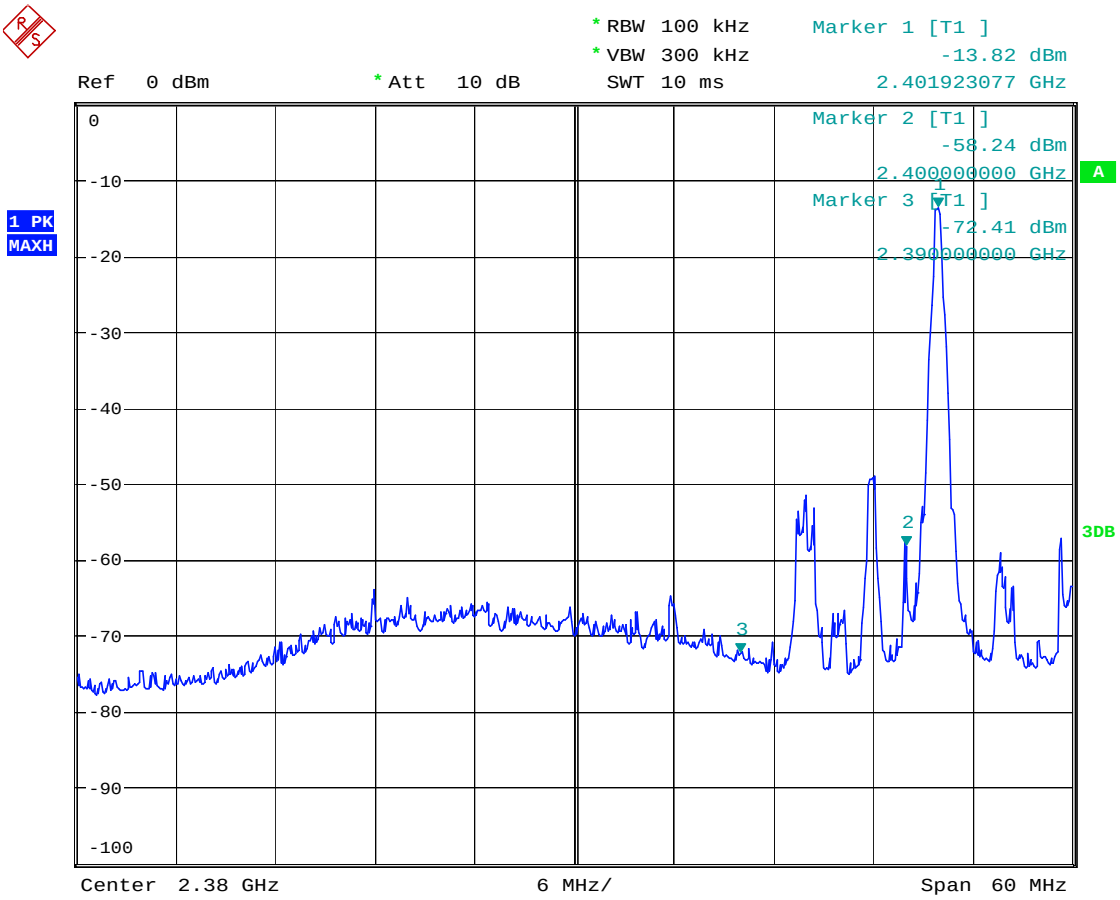
Note: 1. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.

**Type of Modulation: GFSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Low Channel |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



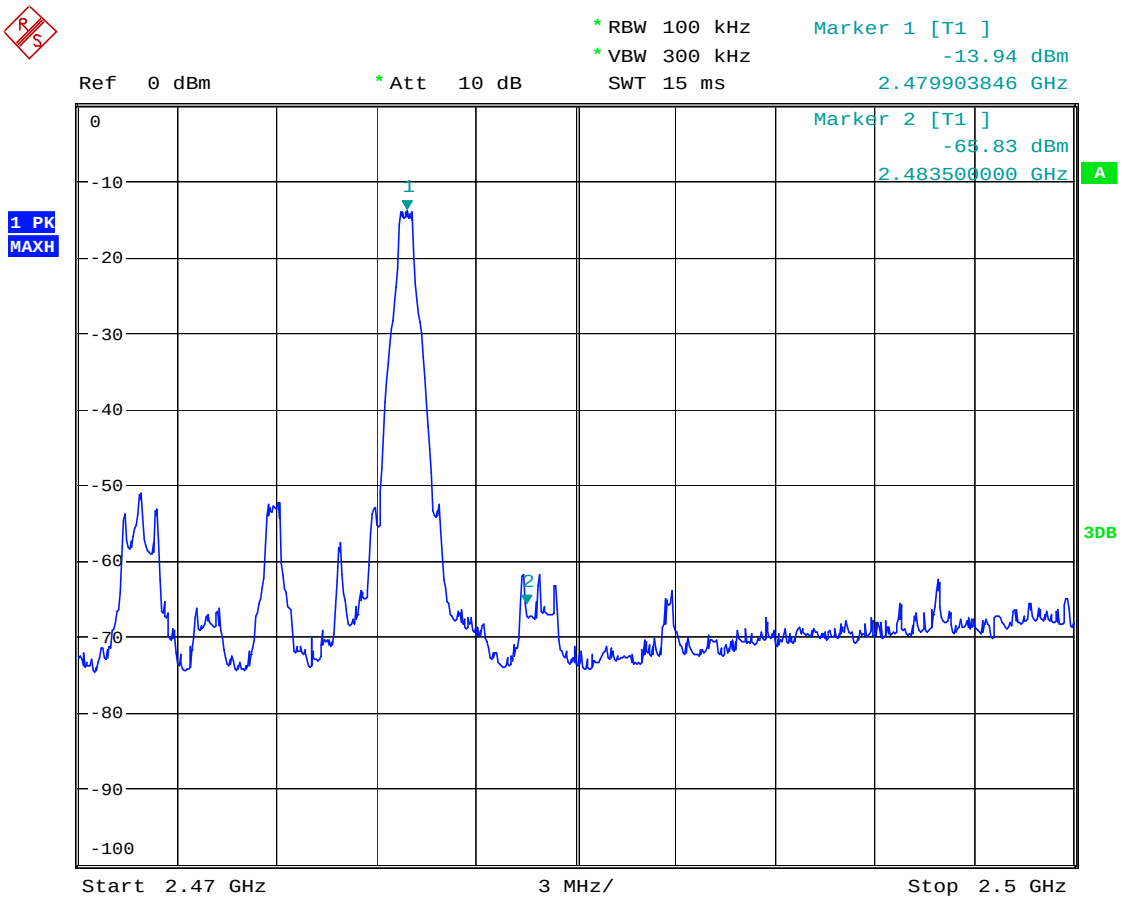

Date: 2.JAN.2020 17:22:41

**Type of Modulation: GFSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | High Channel |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



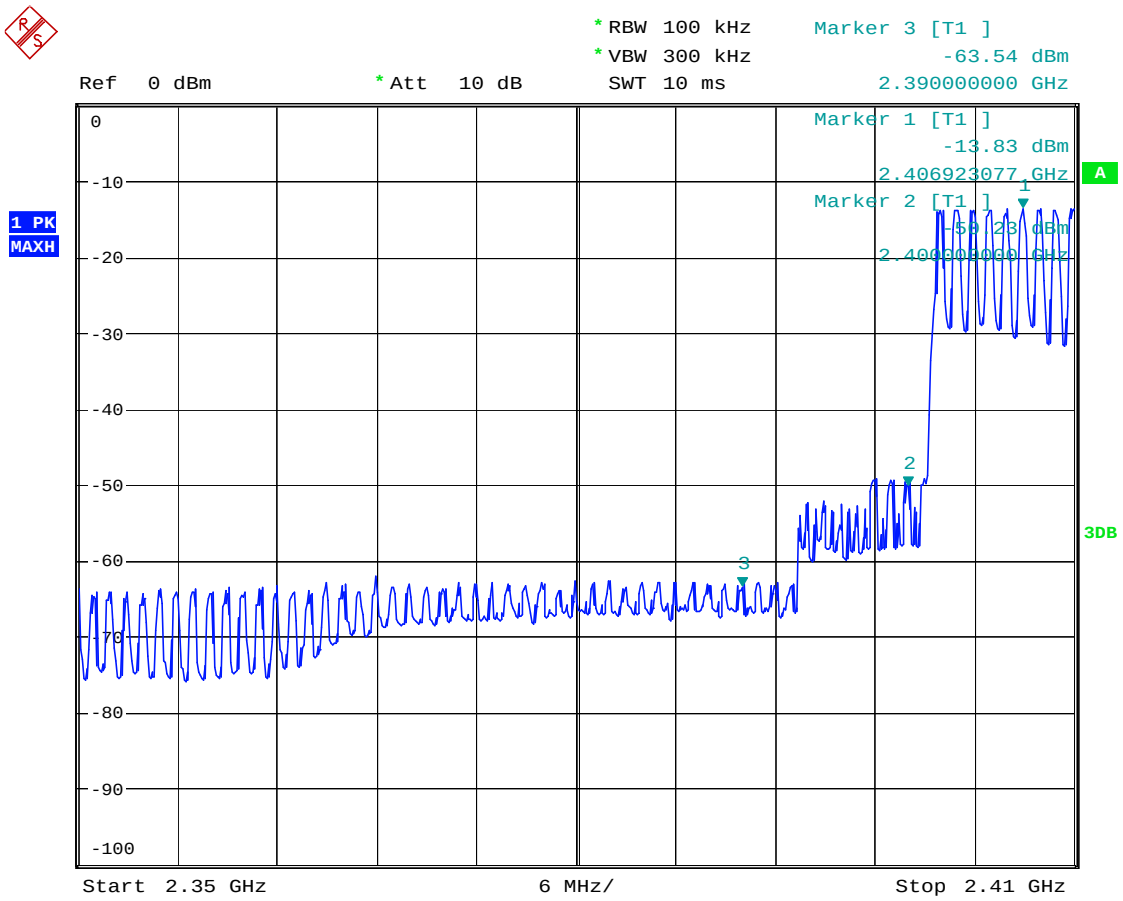

Date: 2.JAN.2020 17:23:40

**Type of Modulation: GFSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Hopping mode |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**

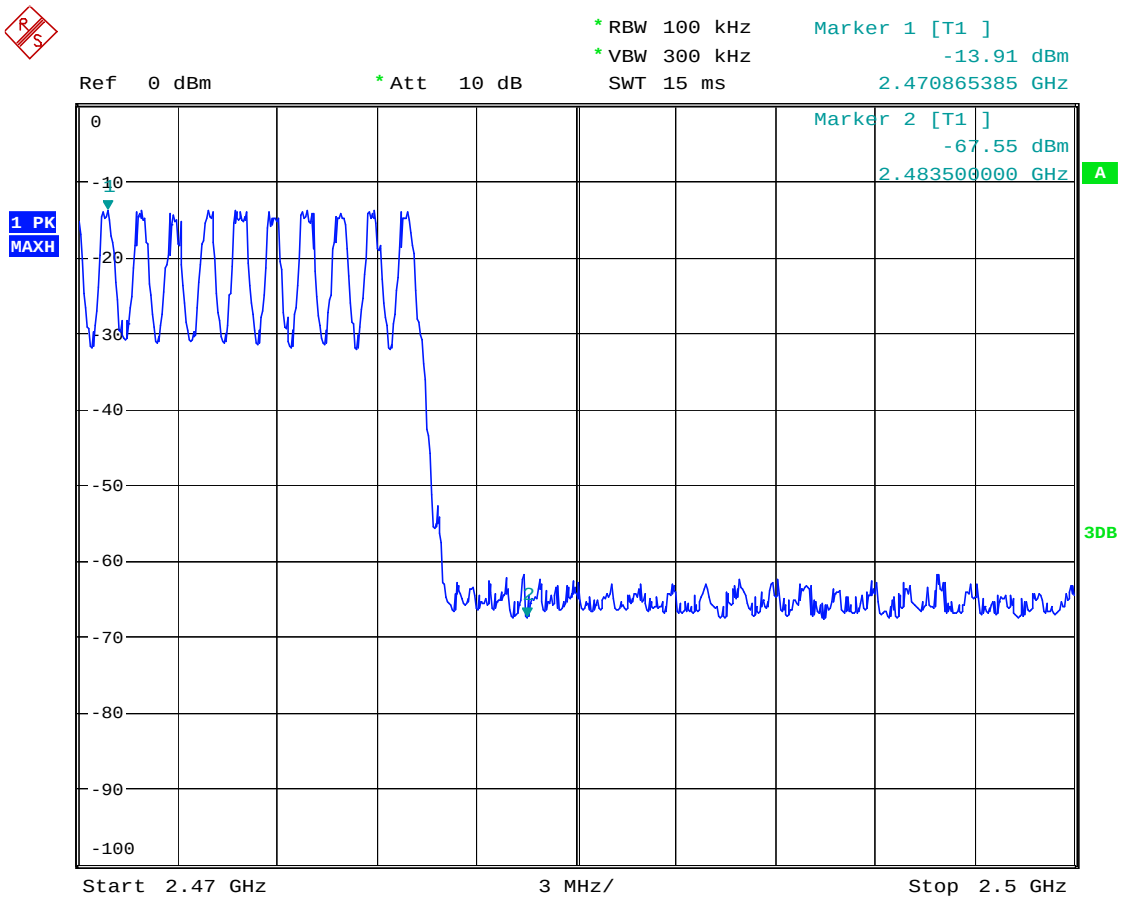


**Type of Modulation: GFSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Hopping mode |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



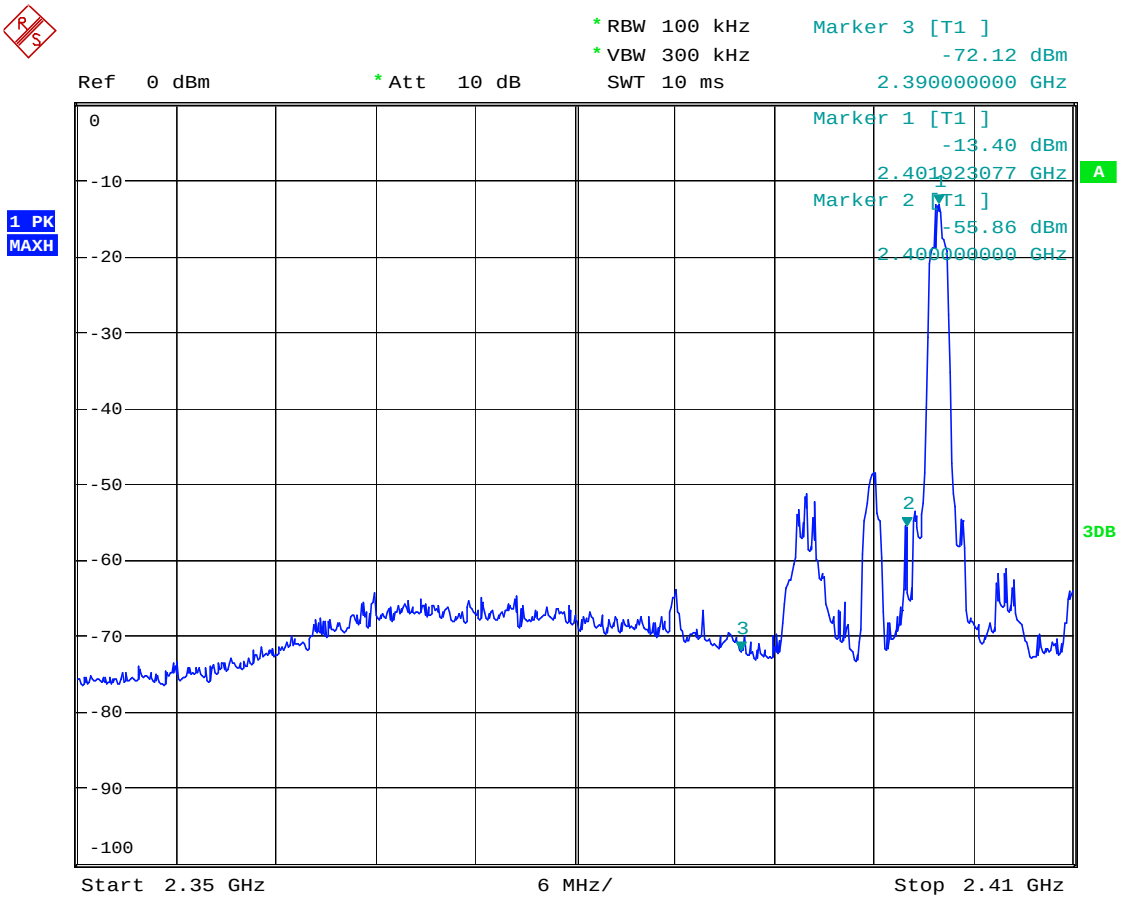

Date: 2.JAN.2020 17:26:05

**Type of Modulation: Л/4D-QPSK**

**12.4** Out of Band Test Result

| | | | |
|---|---|---|---|
| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Low Channel |
| Mode | Keeping Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



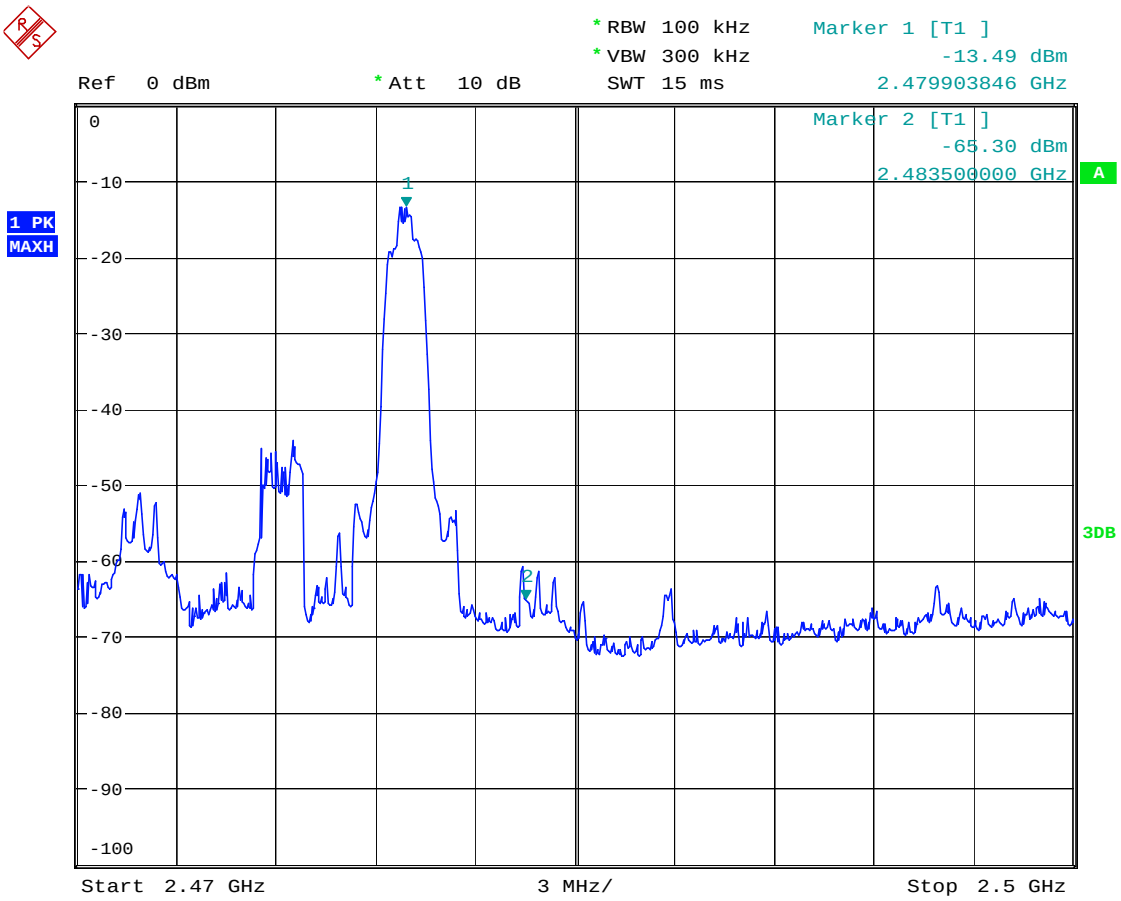

Date: 3.JAN.2020 10:01:33

**Type of Modulation: Л/4D-QPSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | High Channel |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



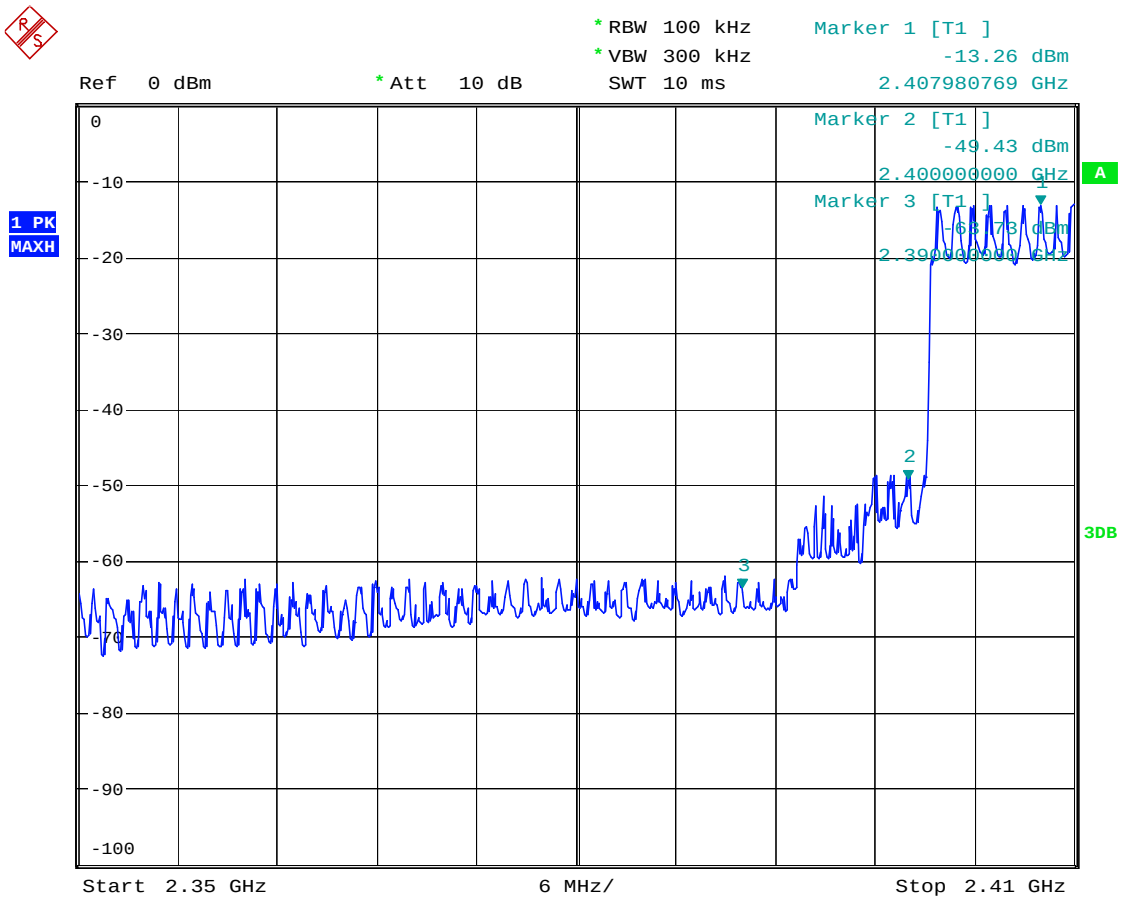

Date: 3.JAN.2020 09:59:55

**Type of Modulation: Л/4D-QPSK**

**12.4** Out of Band Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Hopping mode |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



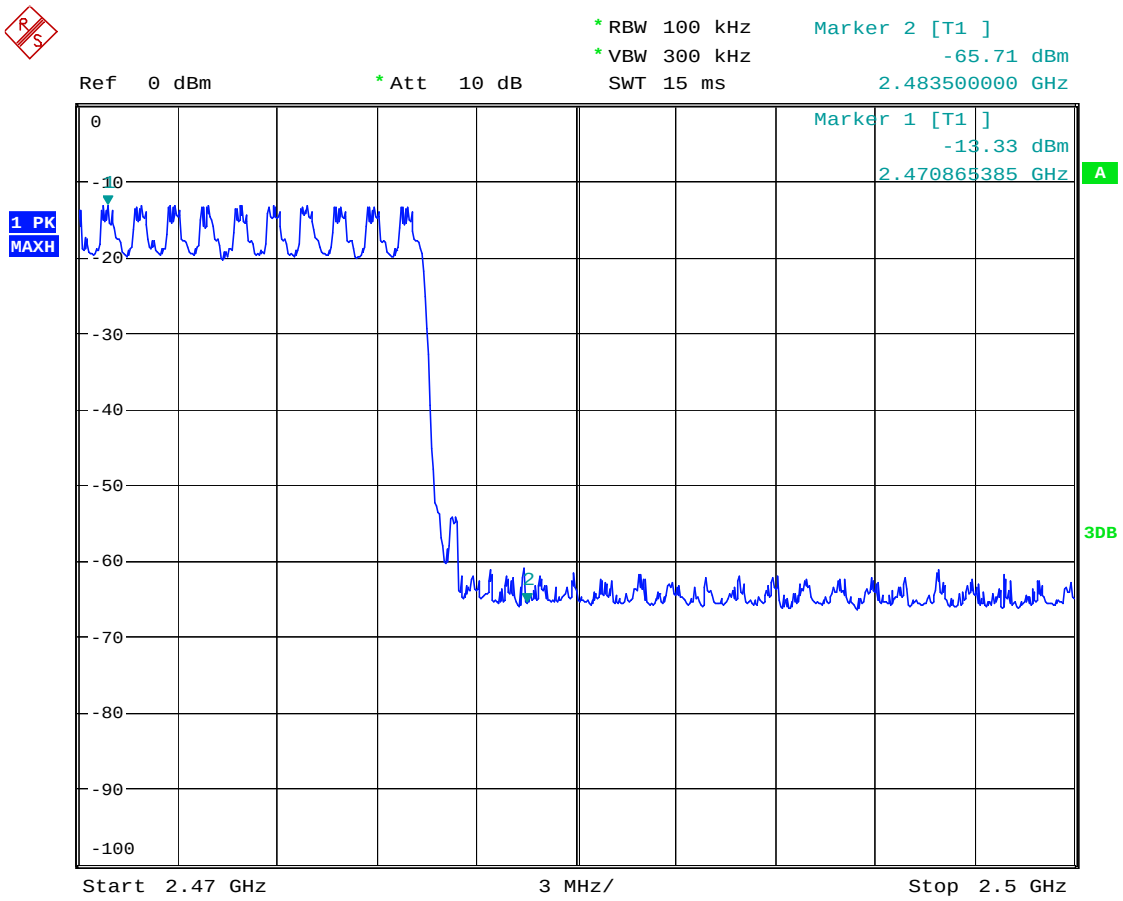

Date: 3.JAN.2020 10:04:31

**Type of Modulation: Л/4D-QPSK**

**12.4** Out of Band Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Hopping mode |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



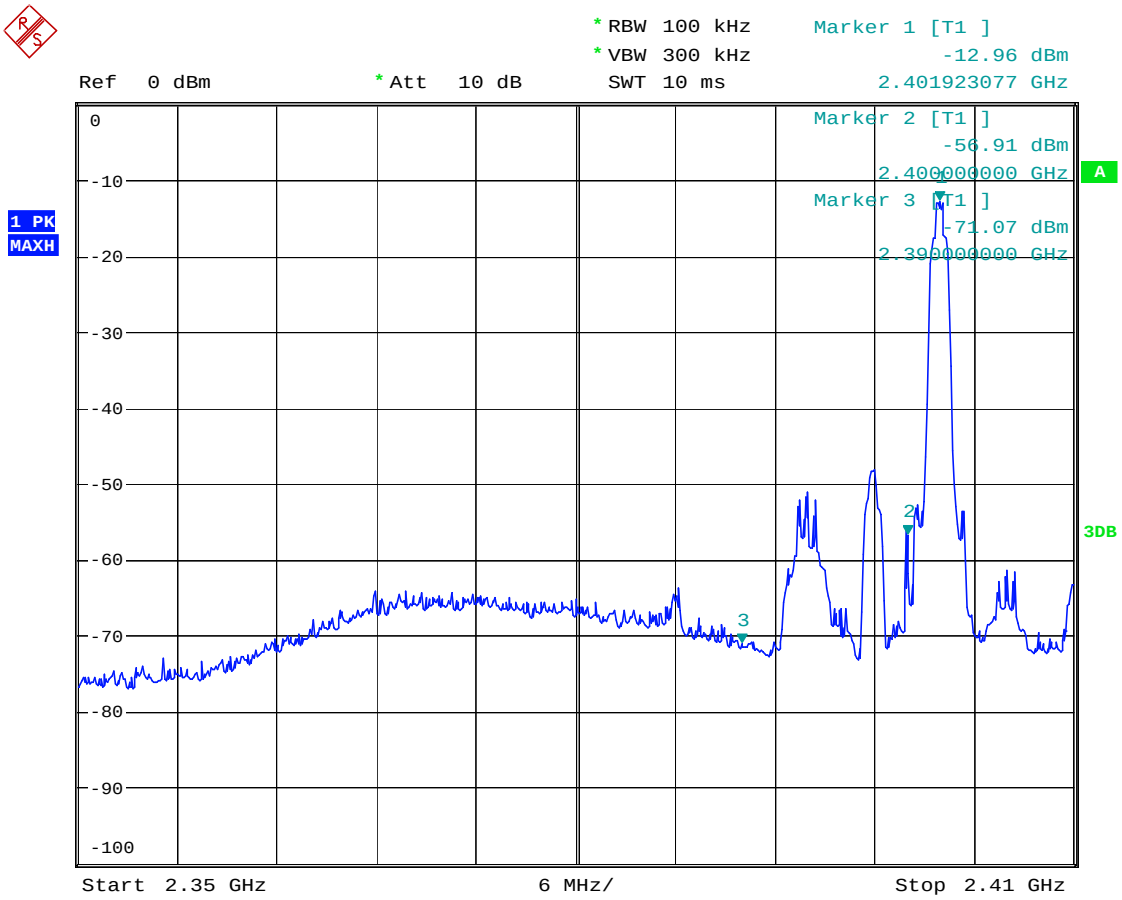

Date: 3.JAN.2020 09:57:44

**Type of Modulation: 8DPSK**

**12.4** Band Edge Test Result

| | | | |
|---|---|---|---|
| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Low Channel |
| Mode | Keeping Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



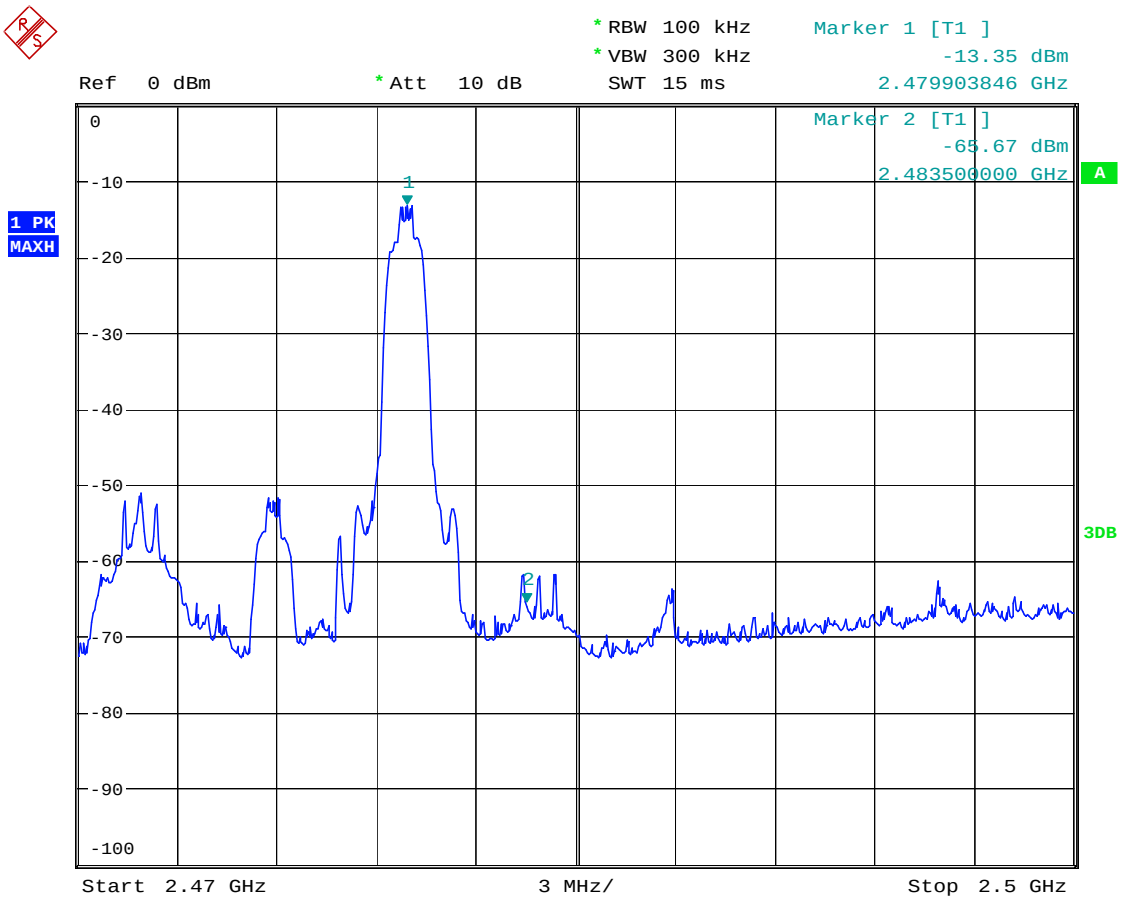

Date: 3.JAN.2020 11:07:44

**Type of Modulation: 8DPSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | High Channel |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**

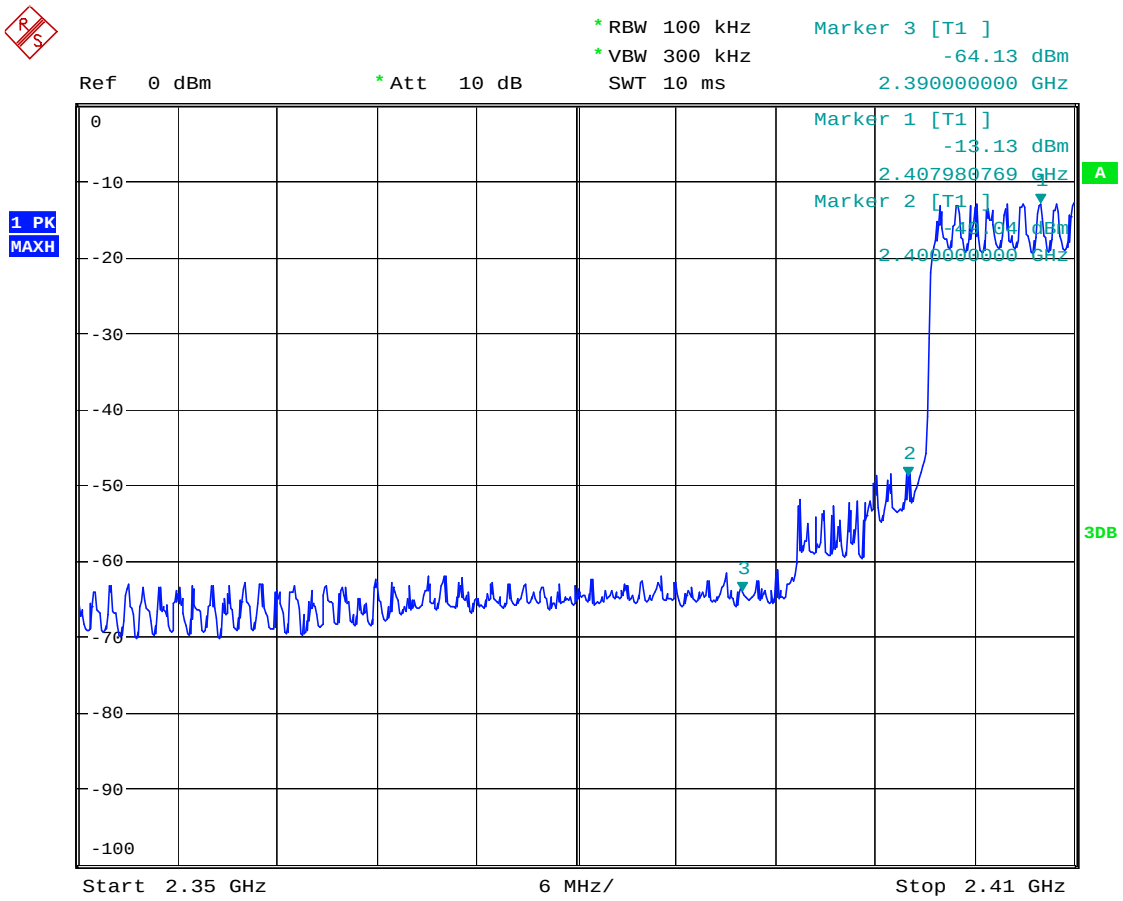


**Type of Modulation: 8DPSK**

**12.4** Band Edge Test Result

| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Hopping mode |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



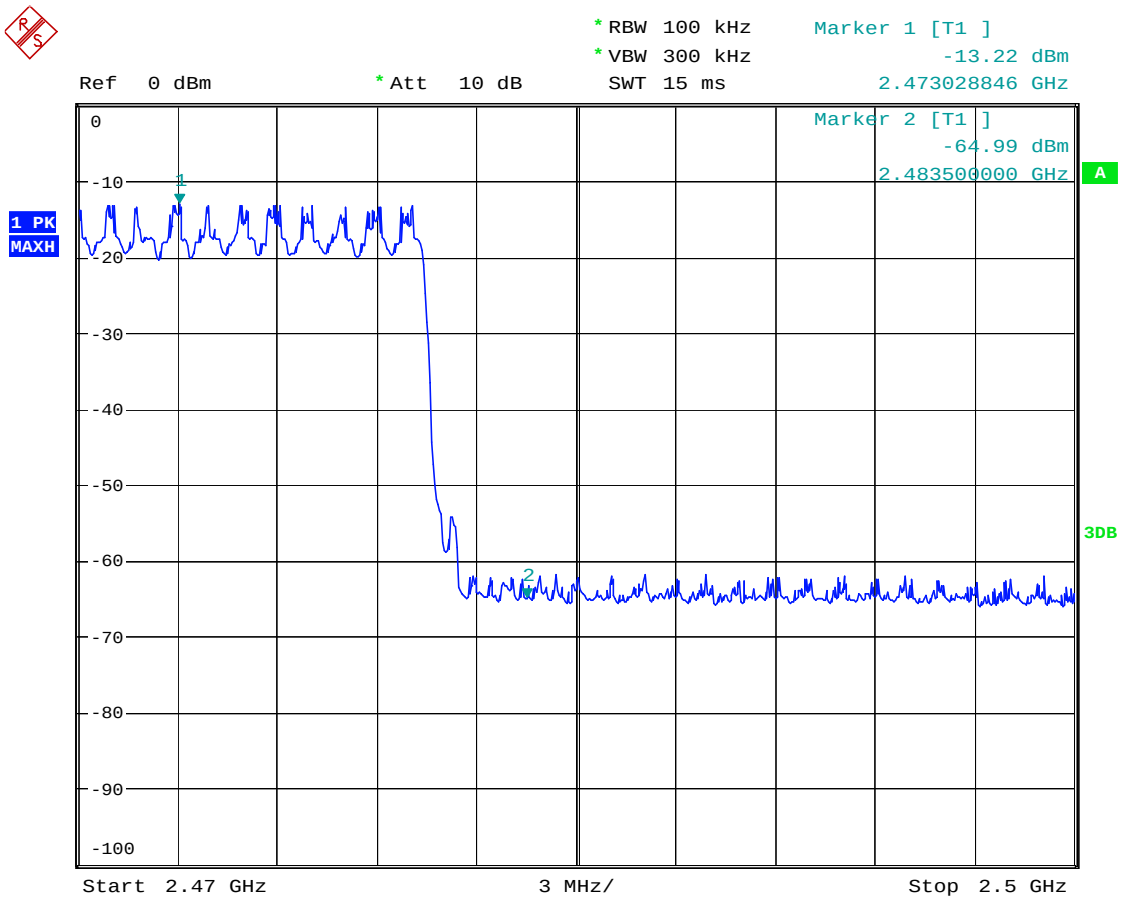

Date: 3.JAN.2020 11:06:14

**Type of Modulation: 8DPSK**

**12.4** Band Edge Test Result

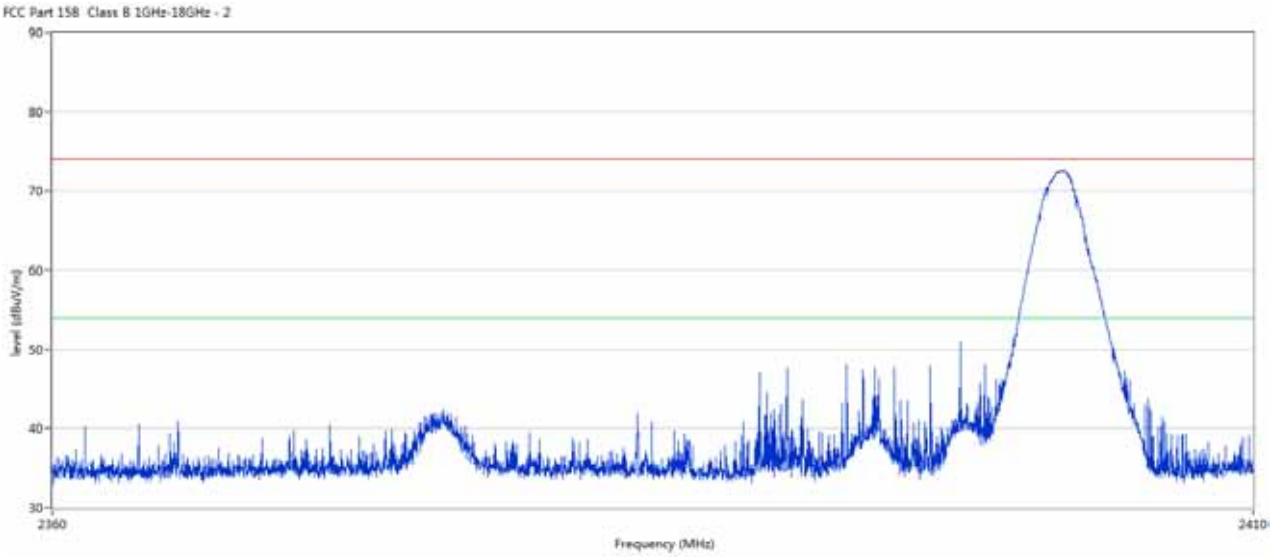
| Product: | CAR AUDIO VIDEO SYSTEM | Test Mode: | Hopping mode |
|---|---|---|---|
| Mode | Hopping On | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



**12.4** Restrict Band Measurement

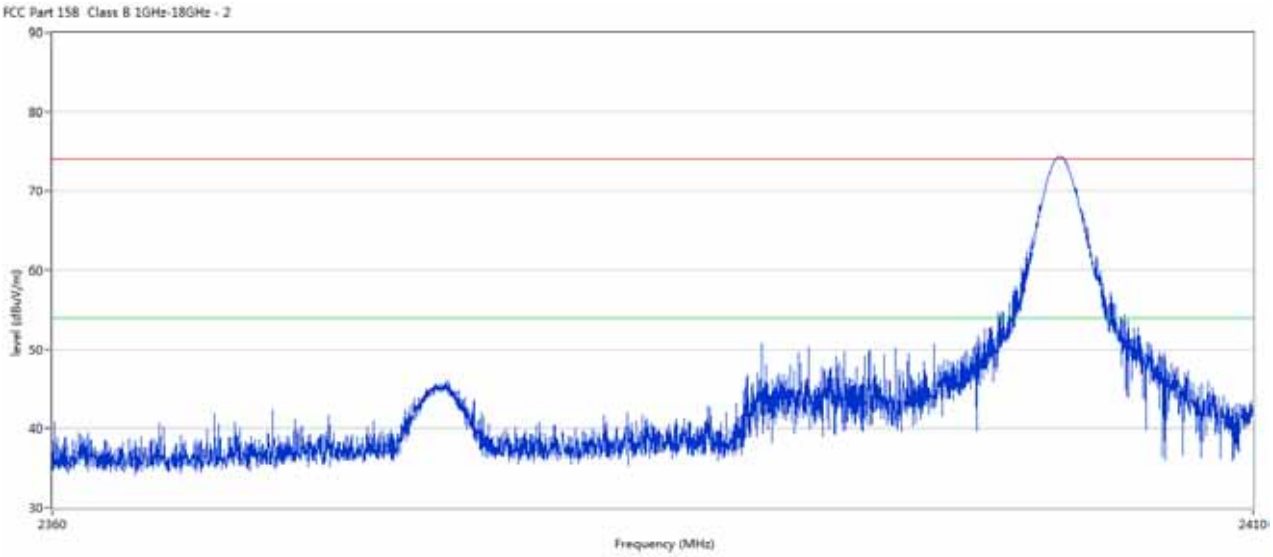
| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Modulation Type | 8DPSK |




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2390 | 47.69 | -3.53 | 54.0 | -6.31 | Peak | 171.00 | 100 | H | Pass |

**12.4** Restrict Band Measurement

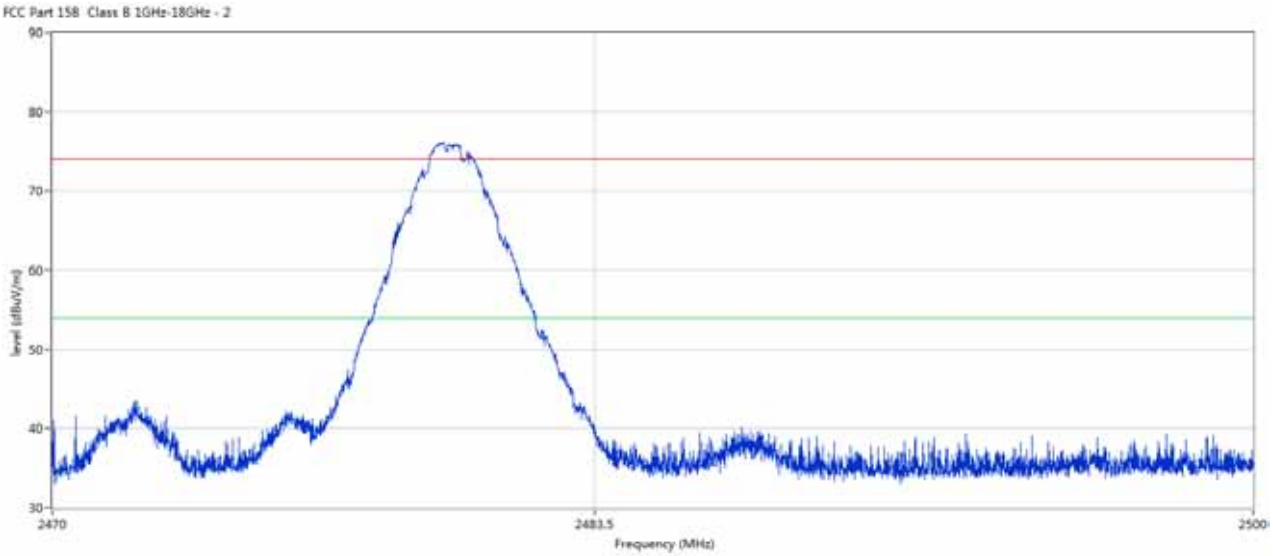
| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Modulation Type | 8DPSK |




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2390 | 50.81 | -3.53 | 54.0 | -3.19 | Peak | 130.00 | 100 | V | Pass |

**12.4** Restrict Band Measurement

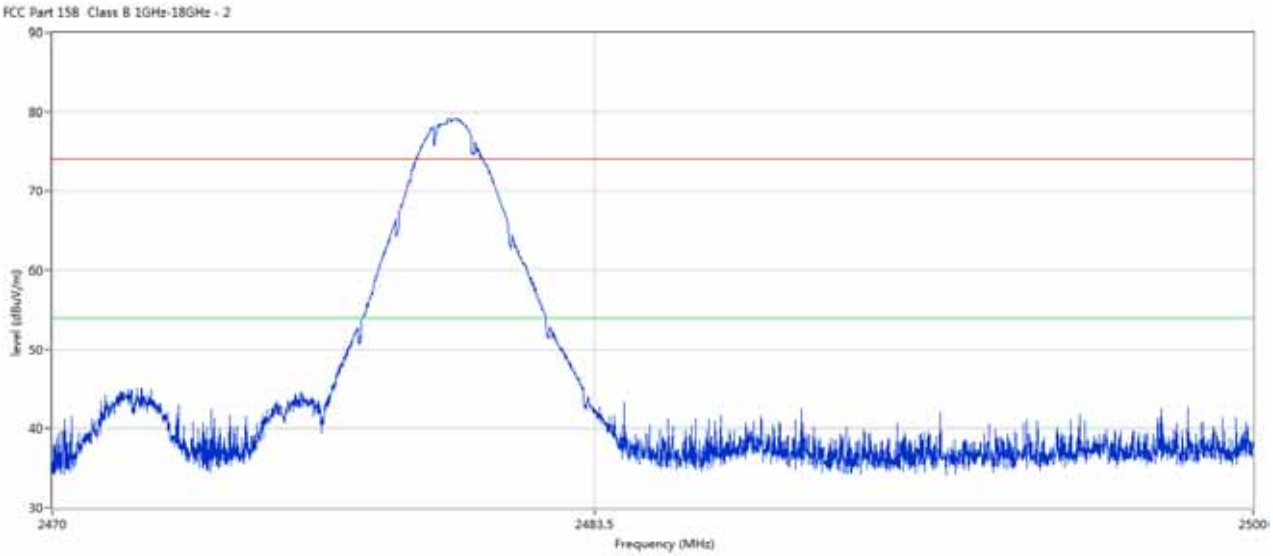
| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Modulation Type | 8DPSK |




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.5 | 41.72 | -3.57 | 54.0 | -12.28 | Peak | 108.00 | 100 | H | Pass |

**12.4** Restrict Band Measurement

| EUT | CAR AUDIO VIDEO SYSTEM | Model | XVM1000Ui |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC12V |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Modulation Type | 8DPSK |




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.5 | 44.13 | -3.57 | 54.0 | -9.87 | Peak | 173.00 | 100 | V | Pass |

**Note: 1. For Restricted band test, only the worst case was reported.**

**2. The measured PK value less than the AV limit, no necessary to take down the AV measurement result.**

## 13.0 Antenna Requirement

13.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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

13.2 Antenna Connected constructions

Ant 1: PCB antenna. The gain of the antennas is 0.58dBi

Ant 2: Integral antenna, The gain of the antennas is 2.0dBi

Note: there is only one transmission chain. And the two antennas can transmit at the same time.

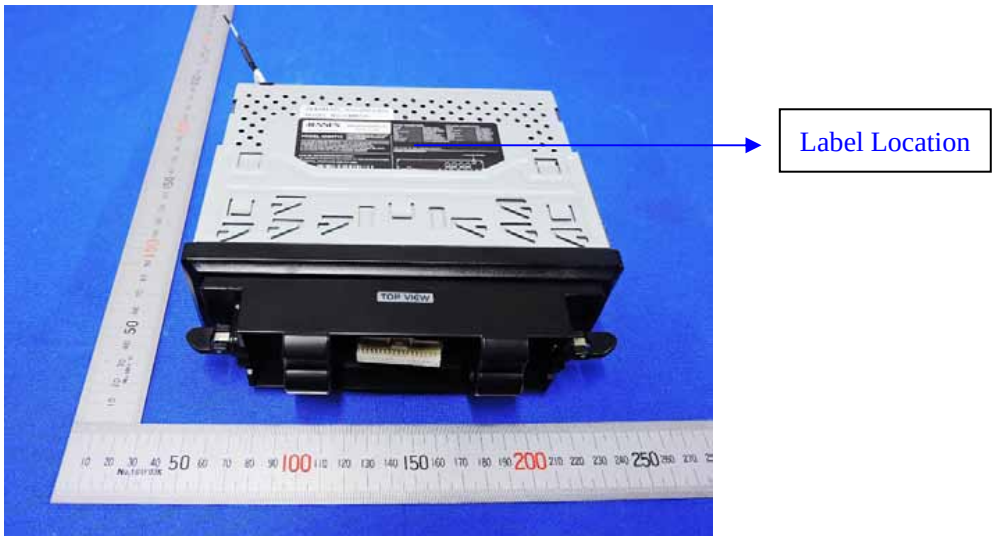
## 14.0 FCC ID Label

**FCC ID: 2AVAXHSNS20190001**

**This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

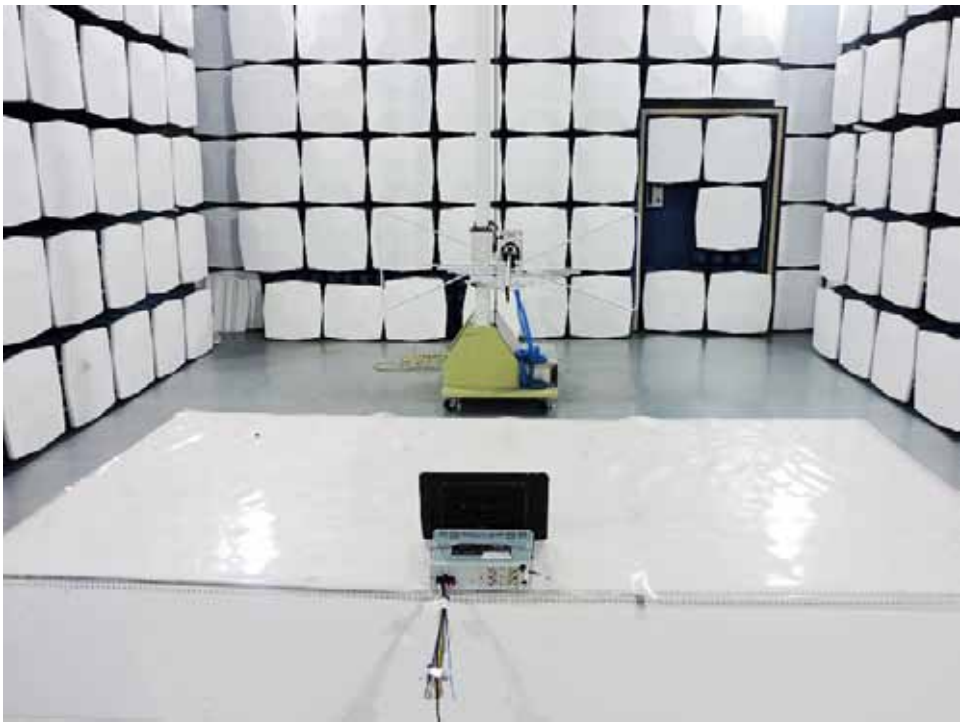
The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

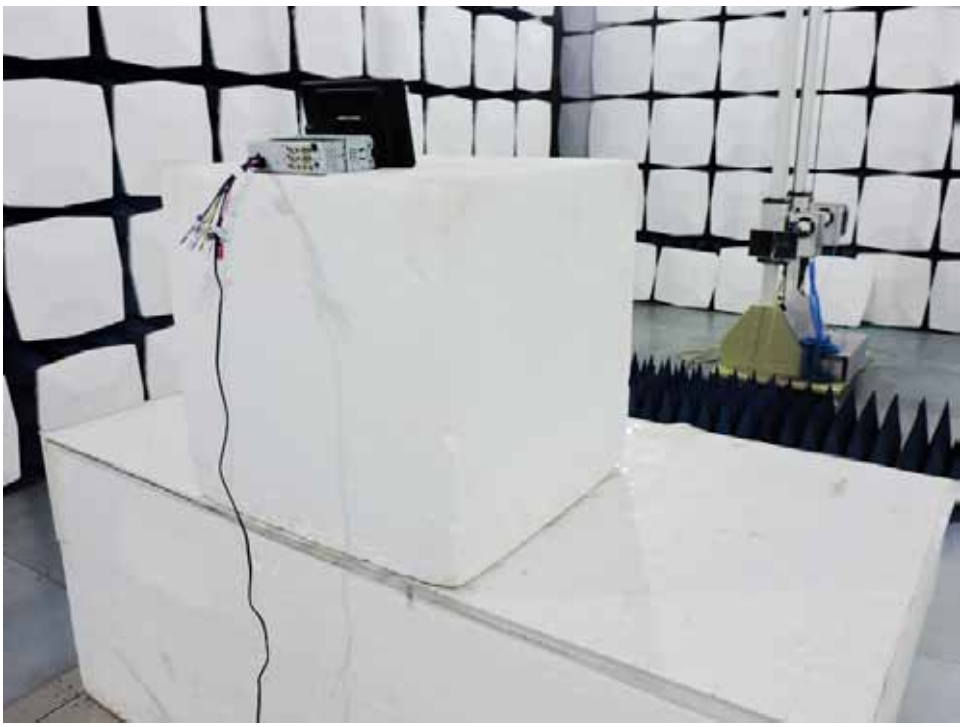
**Mark Location:**



## 15.0 Photo of testing

Radiated Emission Test Setup:

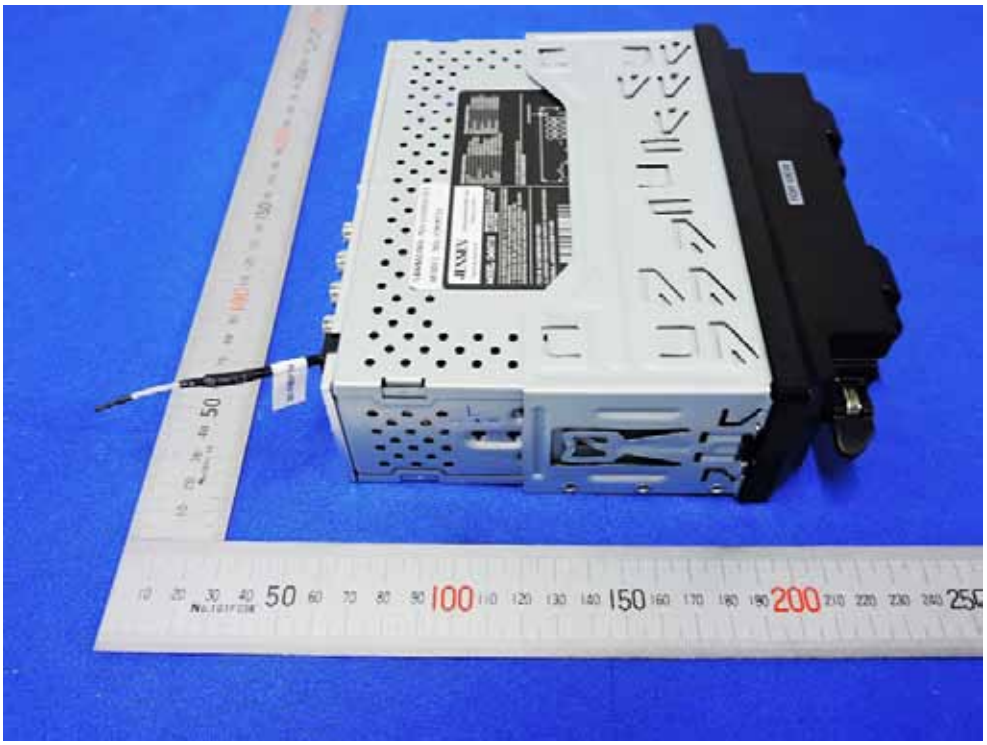


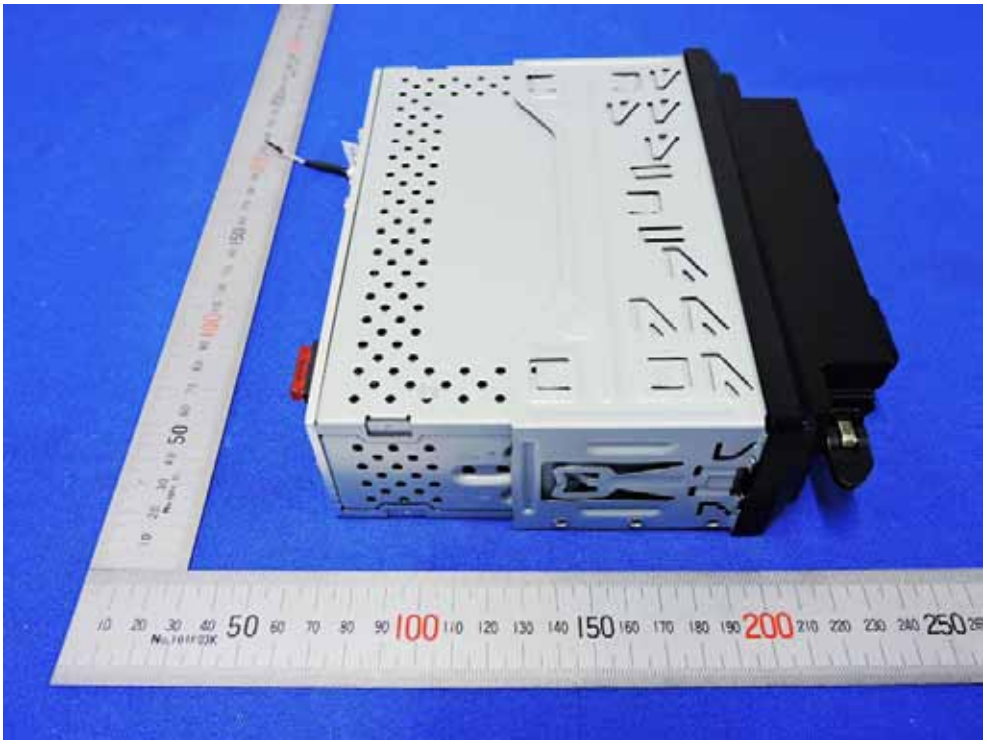


## Photographs – EUT

Outside view

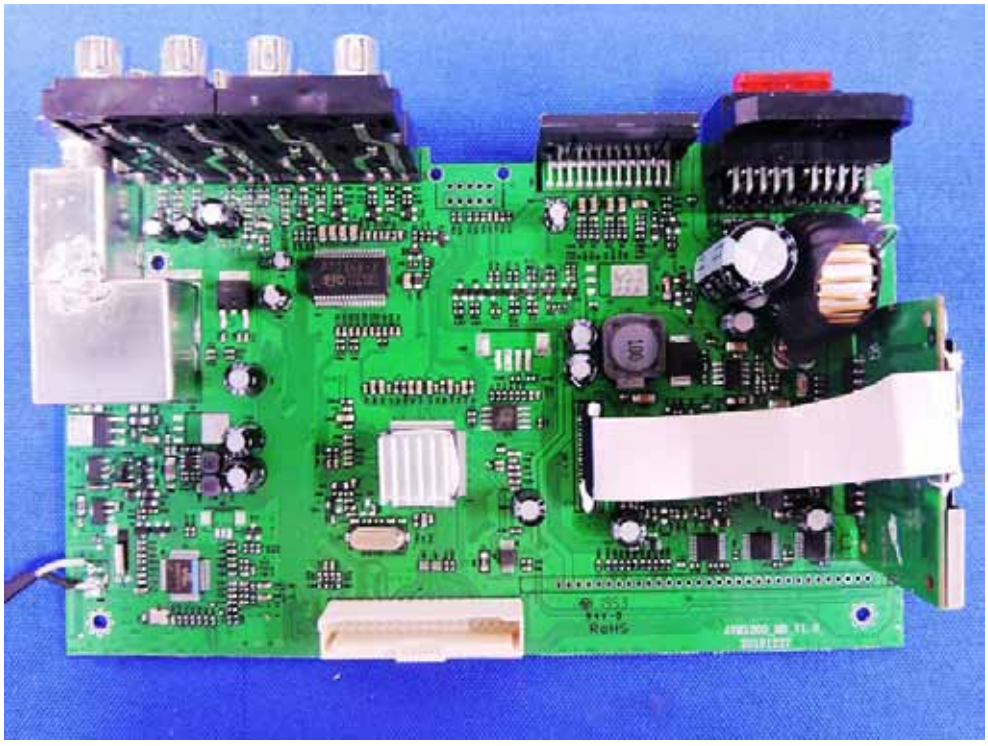
Outside view



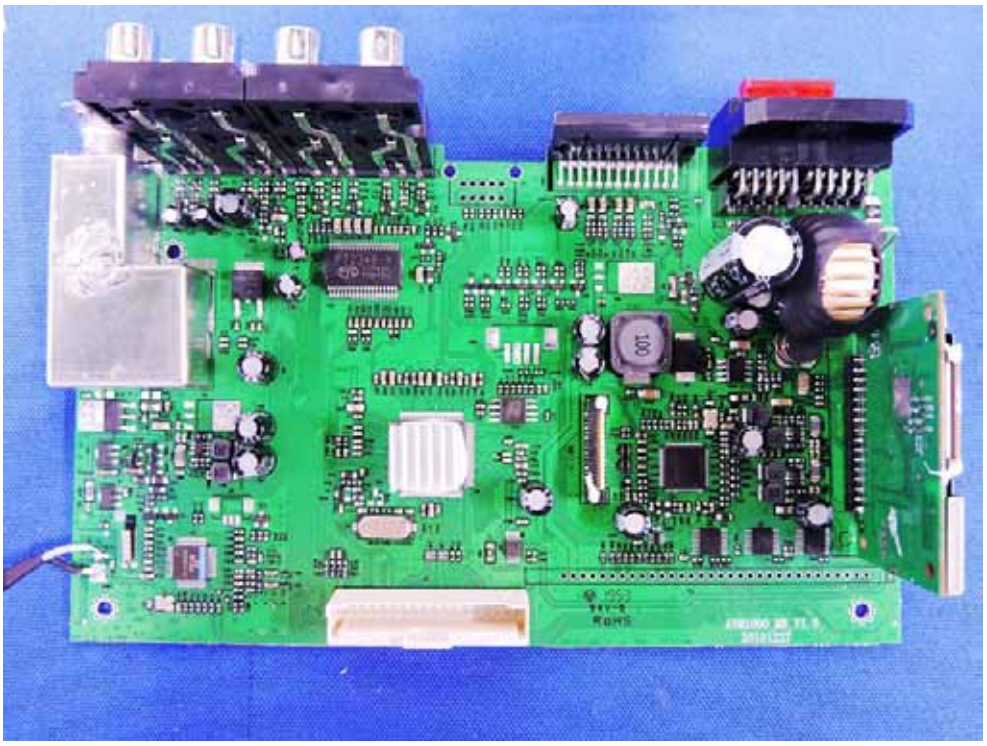


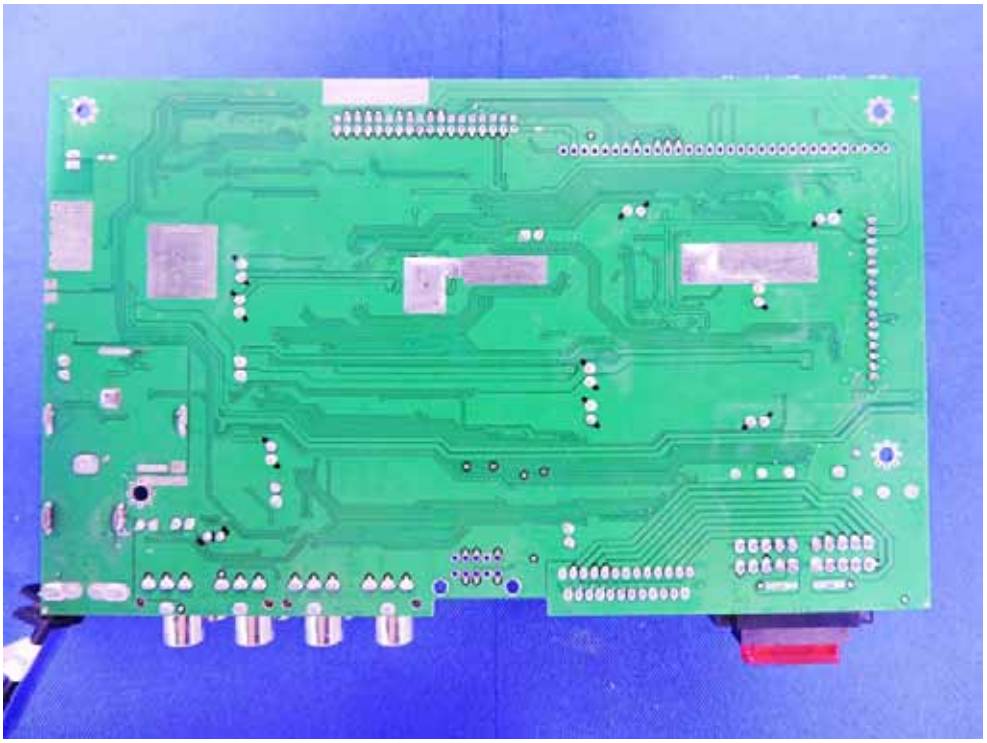
Outside view

Inside view

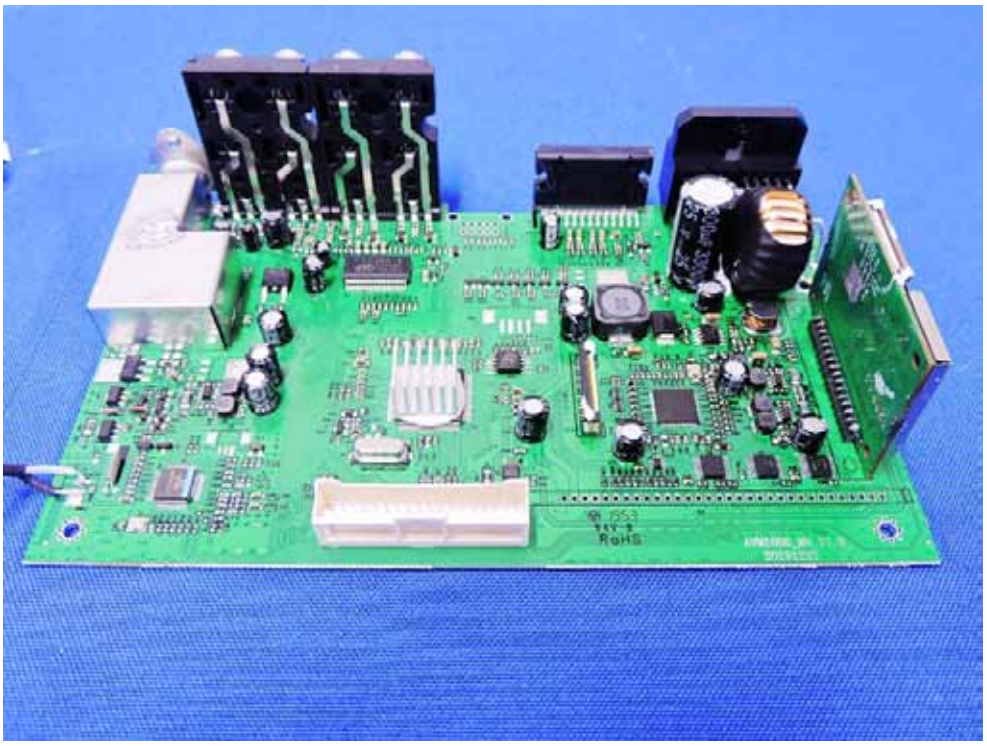


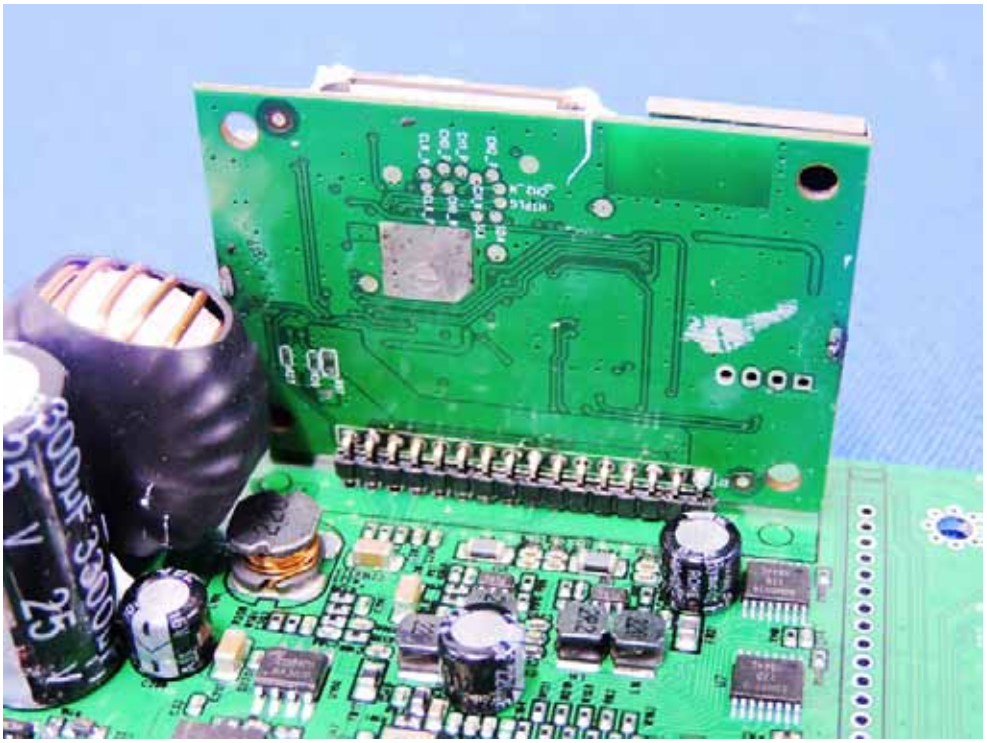
Inside view



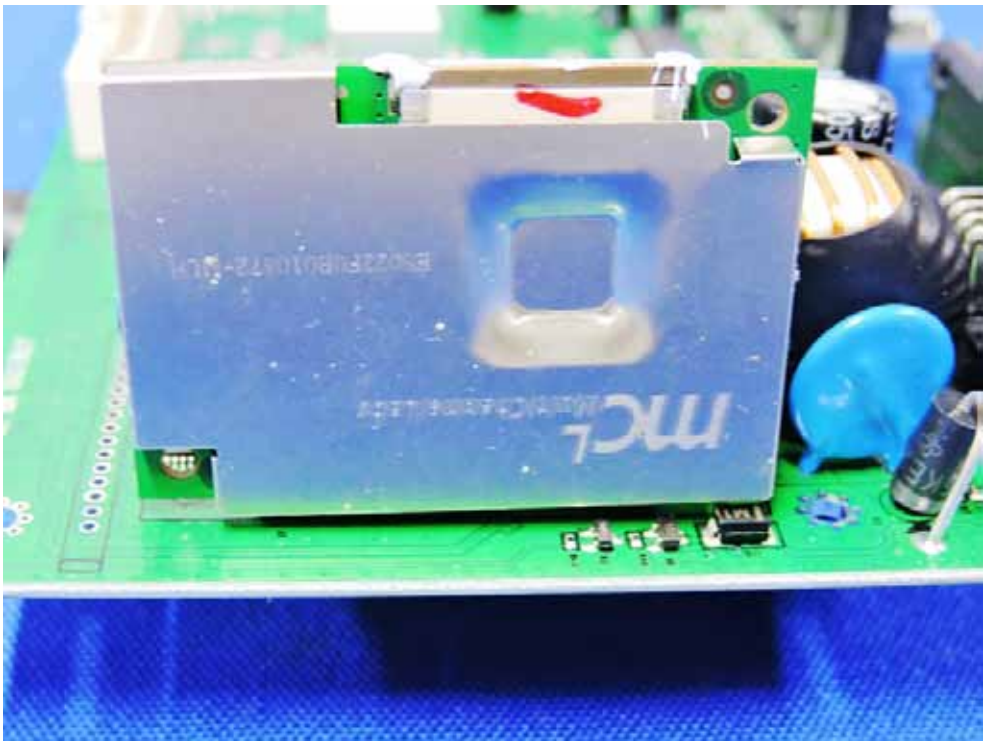


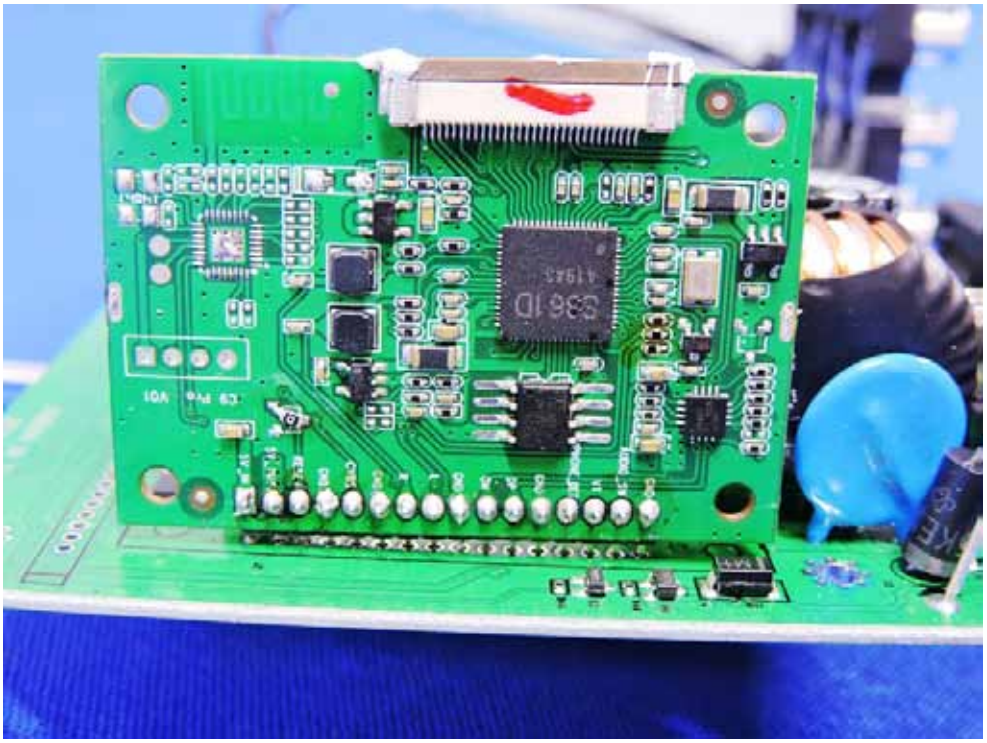
Inside view



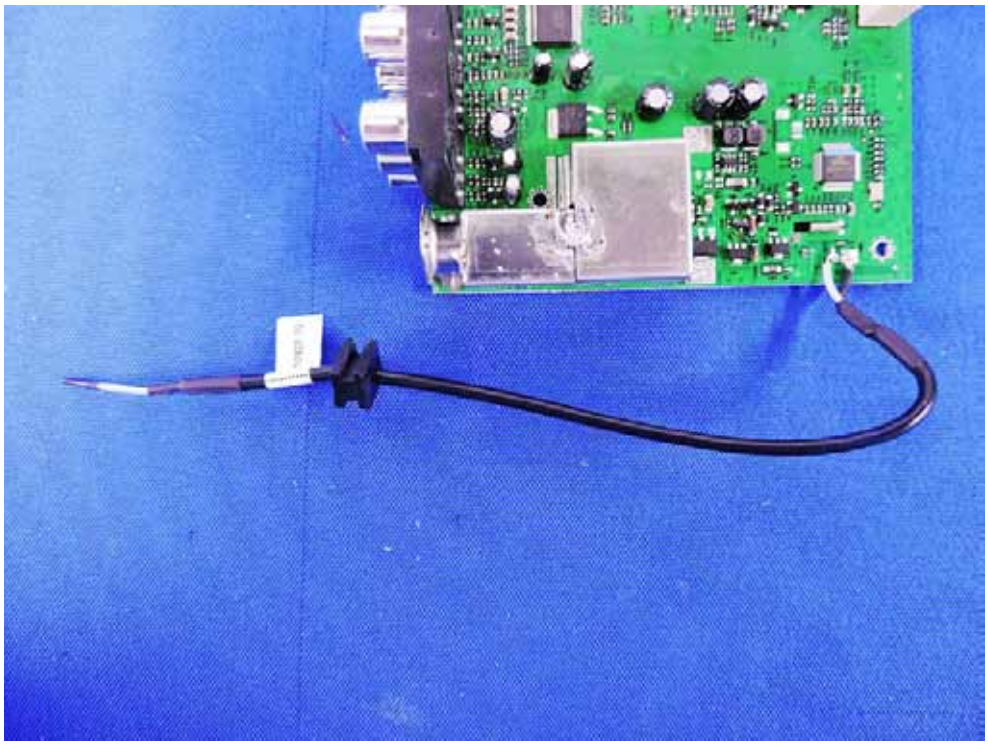


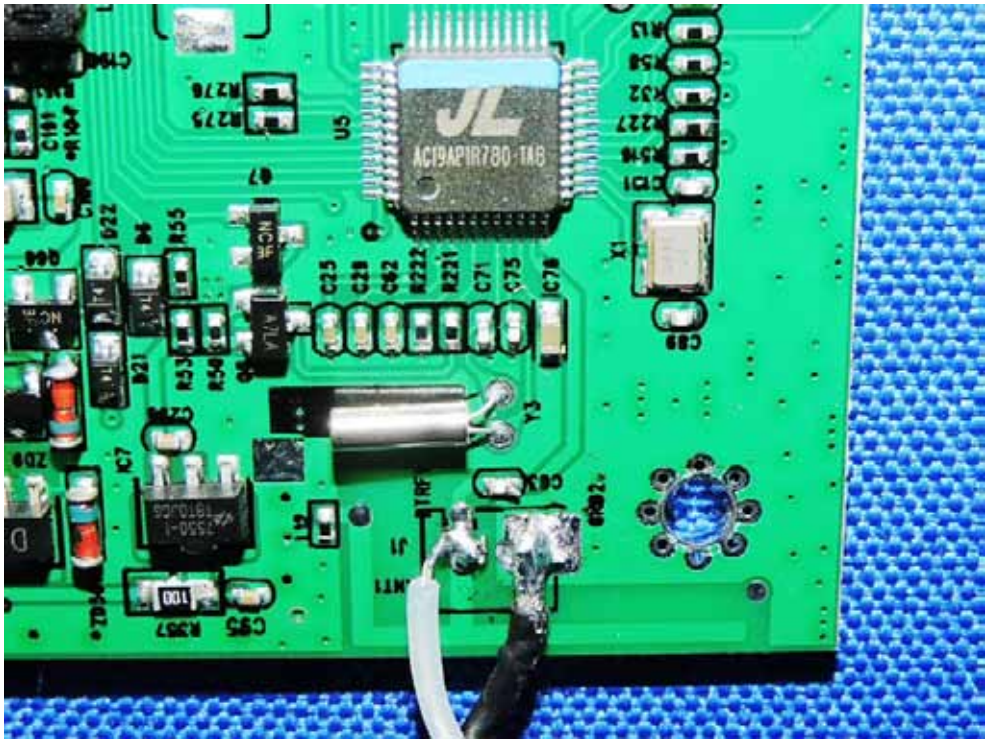
Inside view



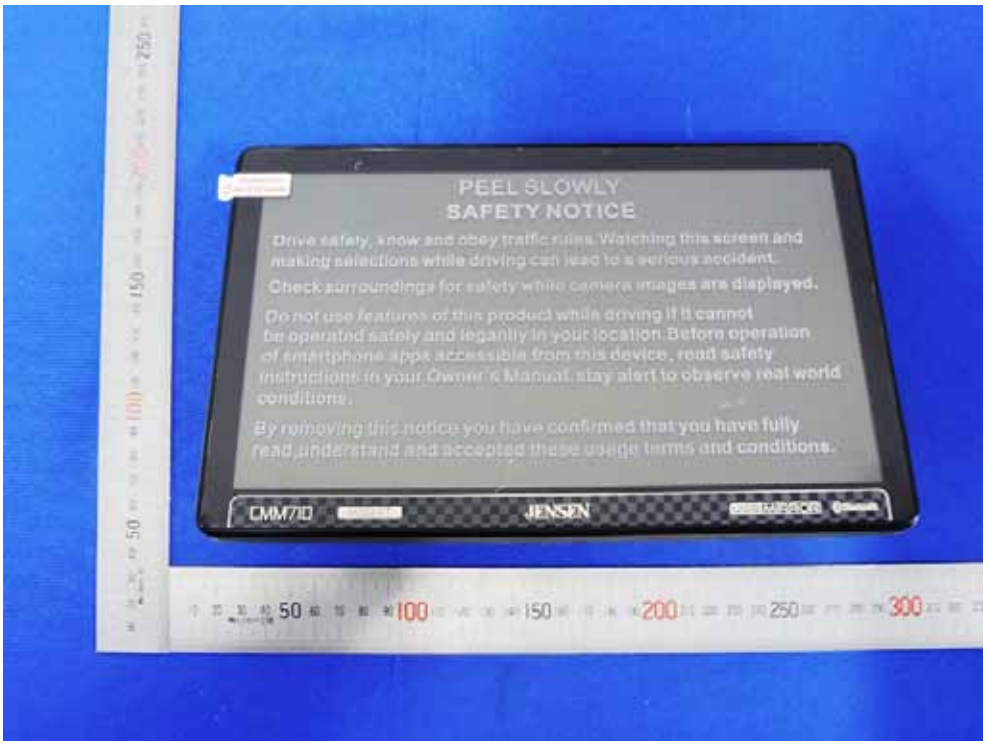


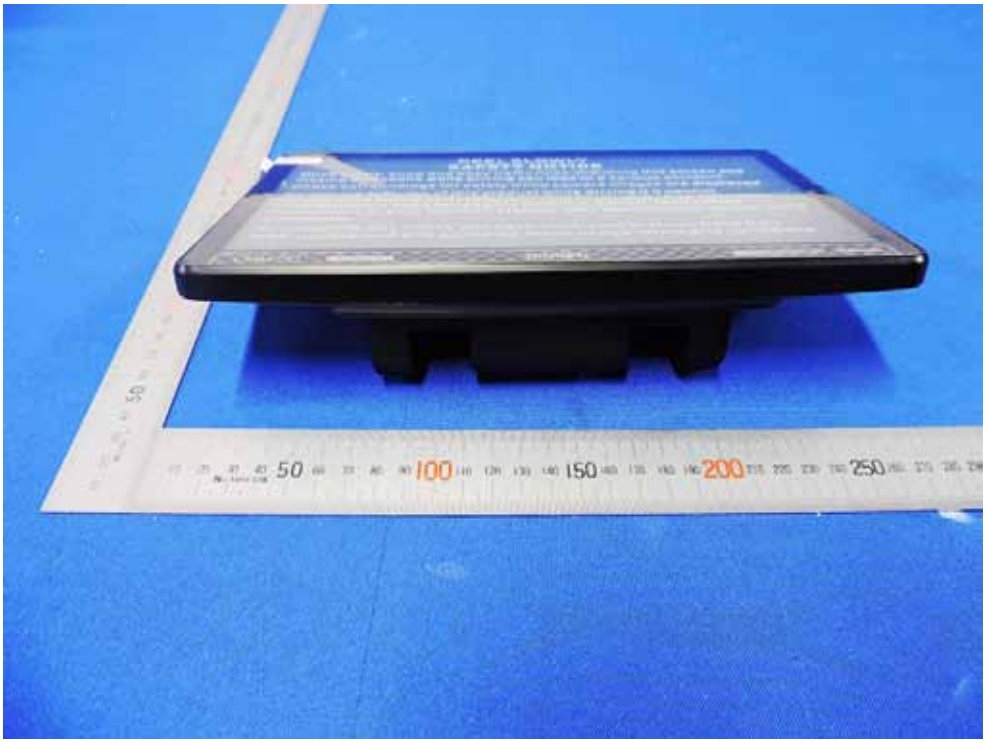
Inside view





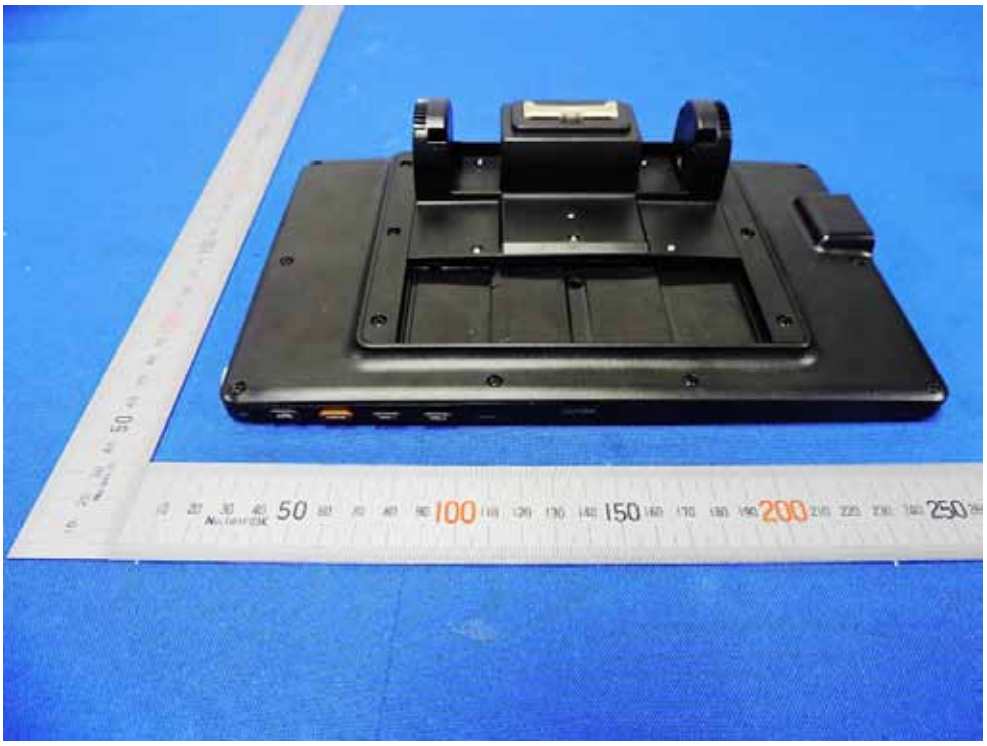
Outside view



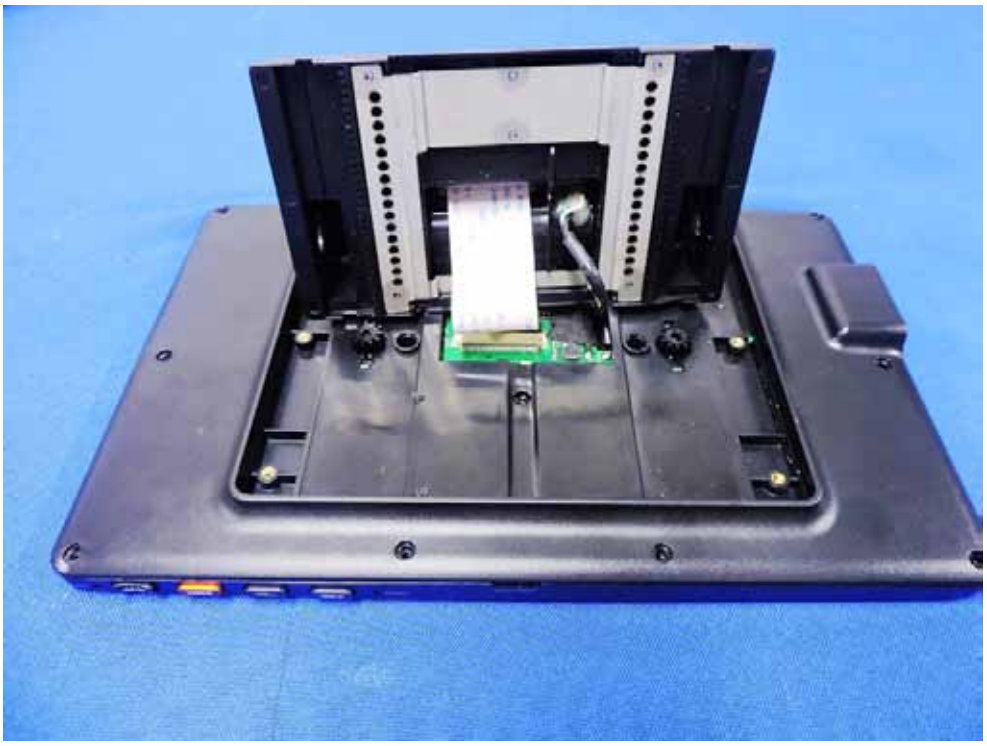



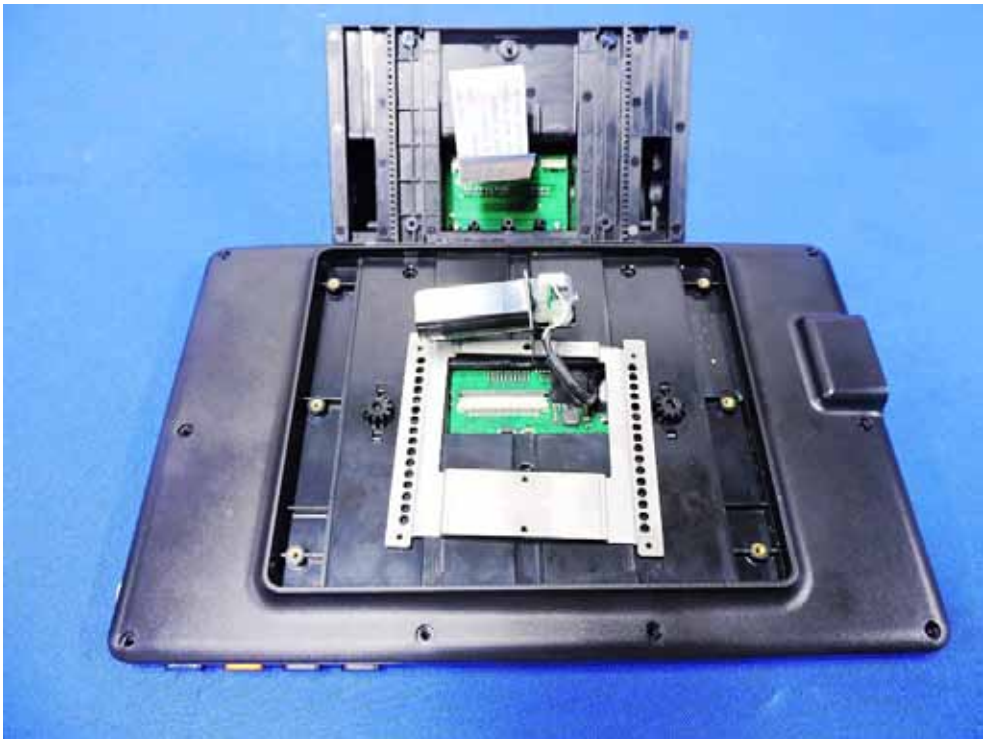
Outside view

Outside view

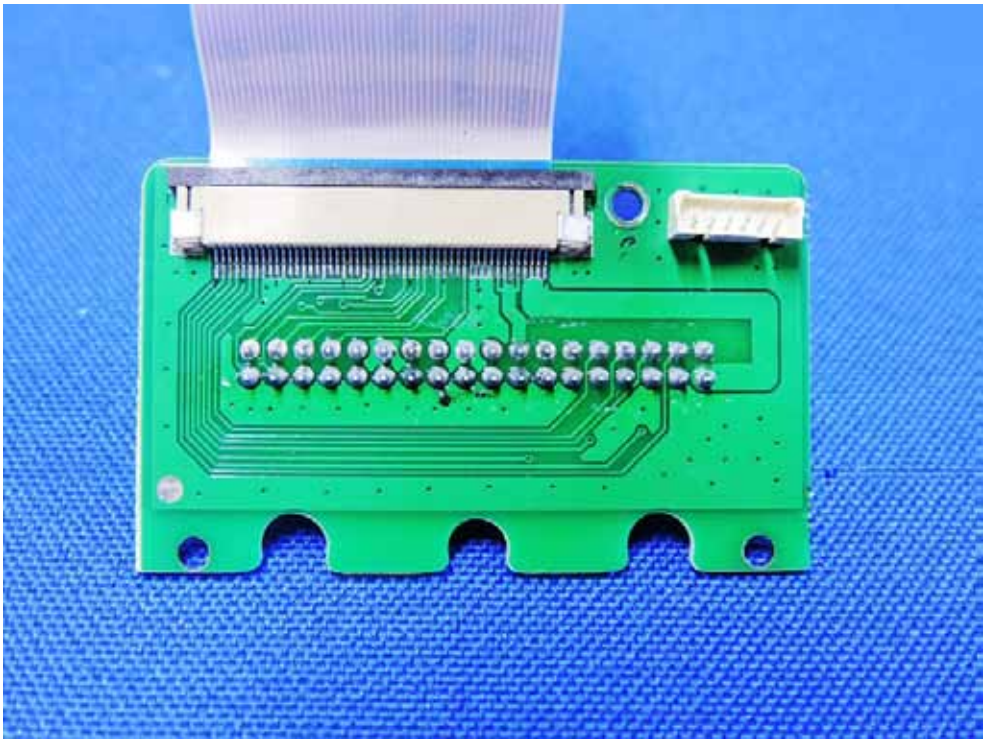


Inside view

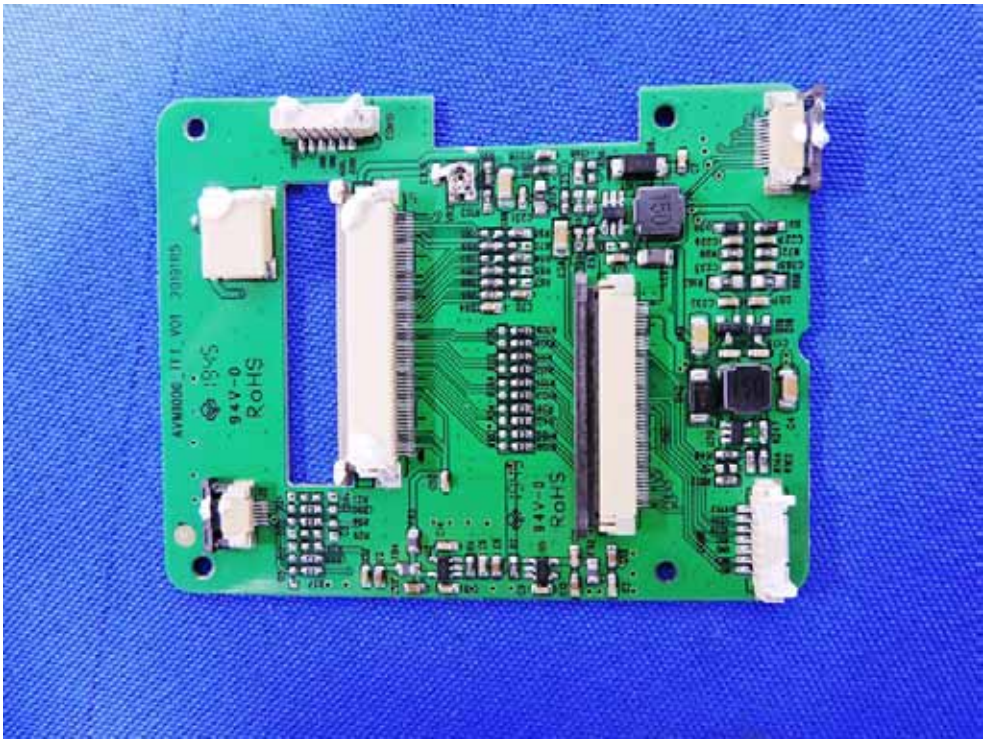




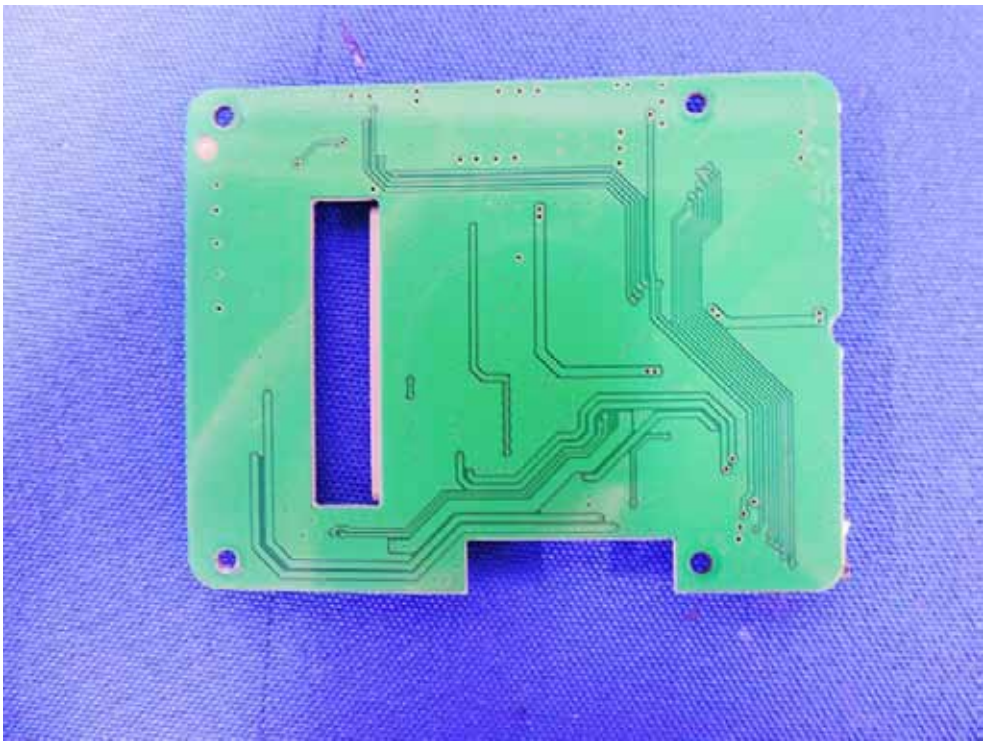
Inside view

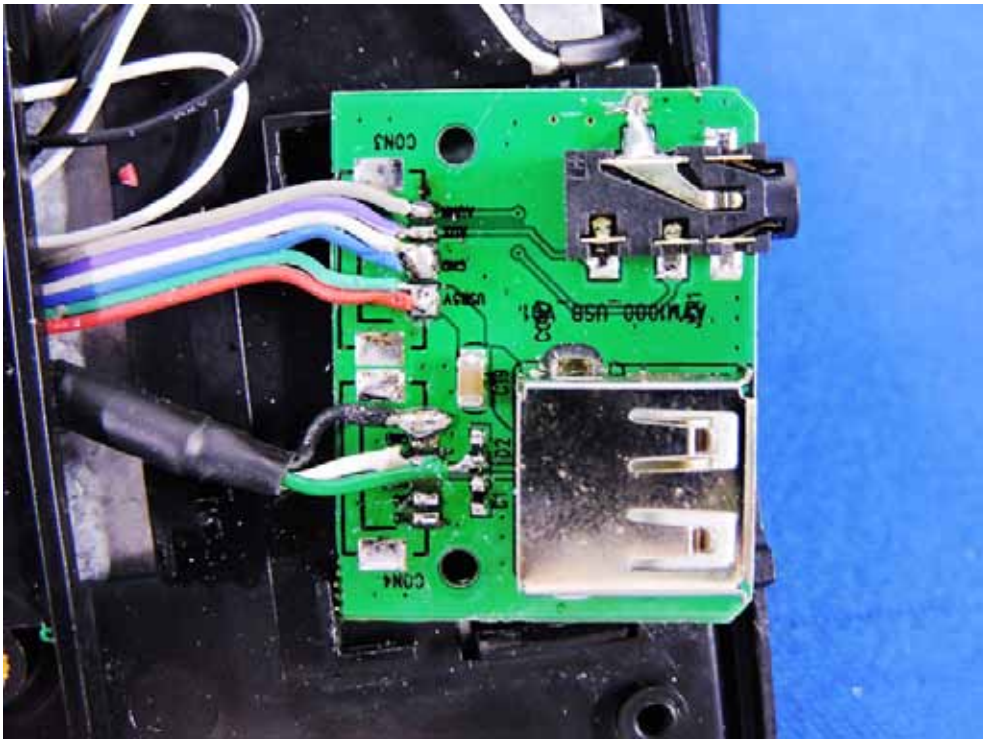



Inside view

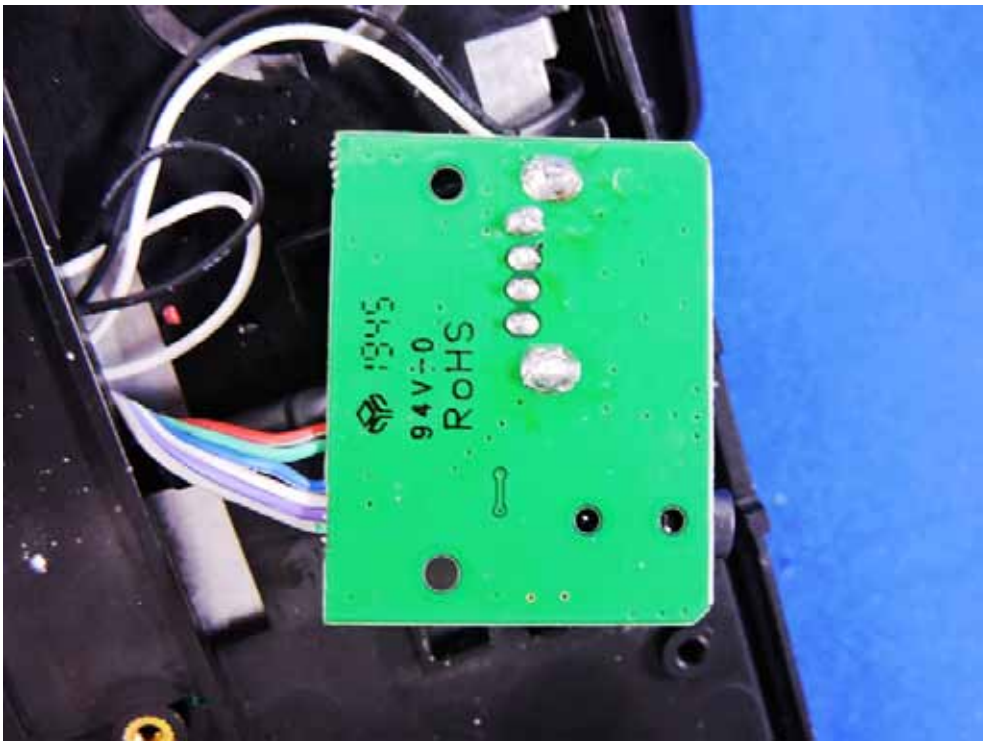


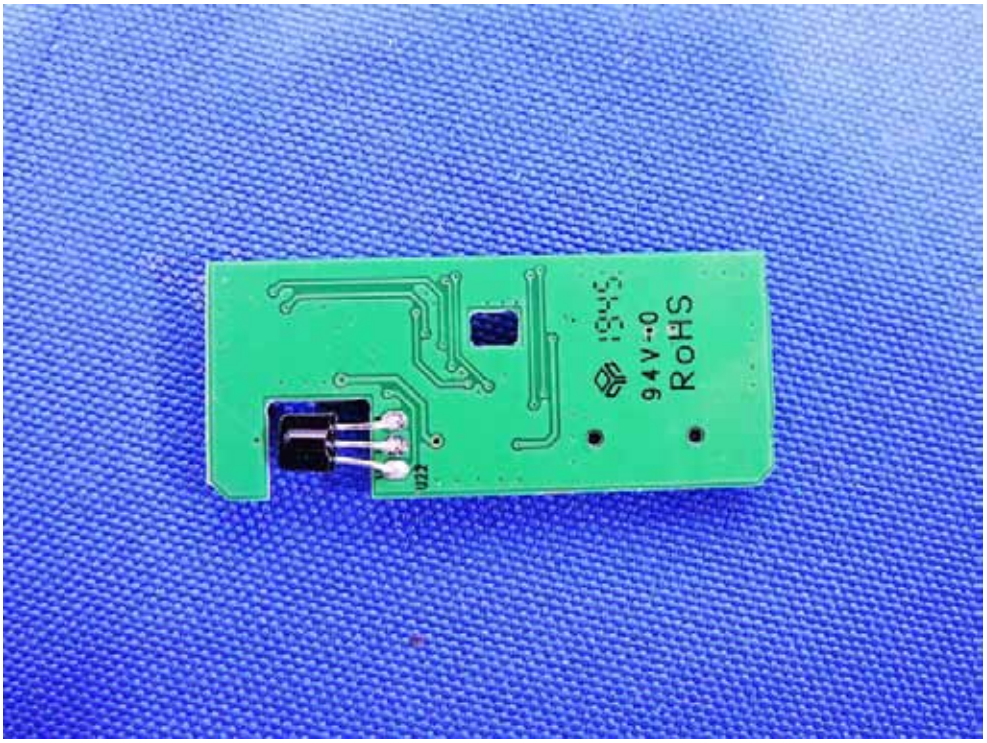
Inside view



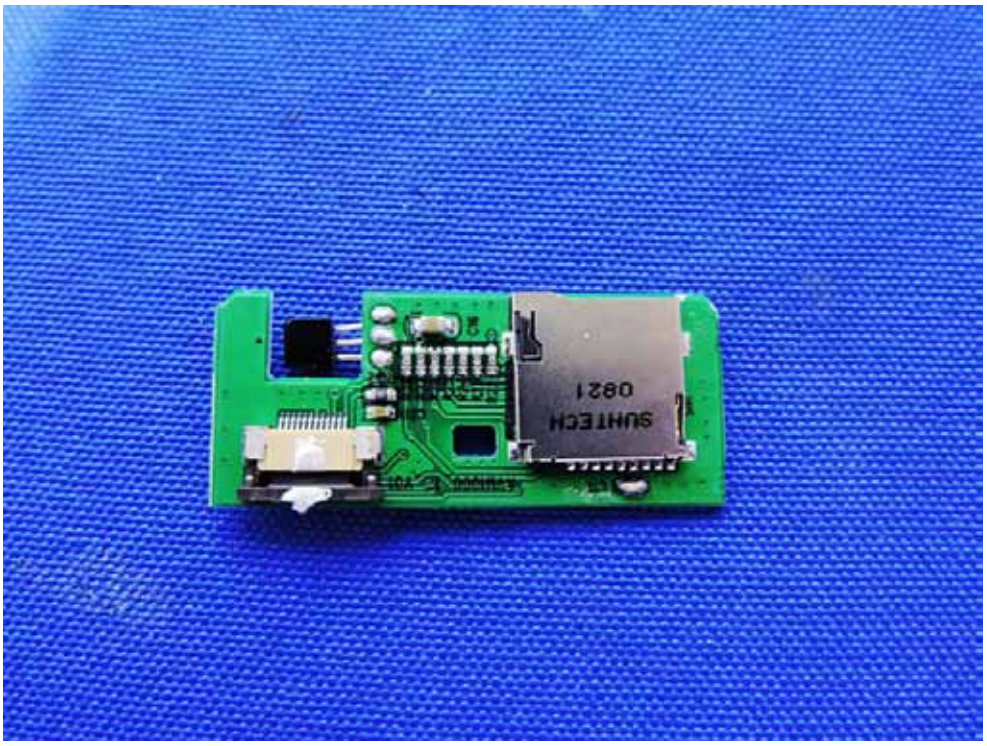


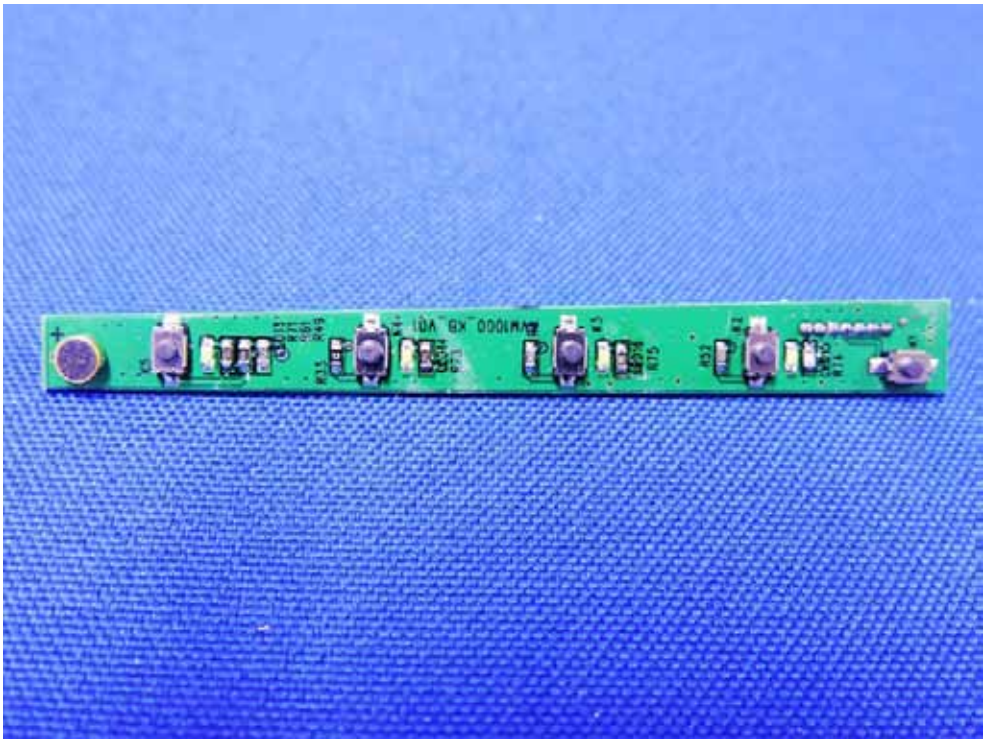
Inside view



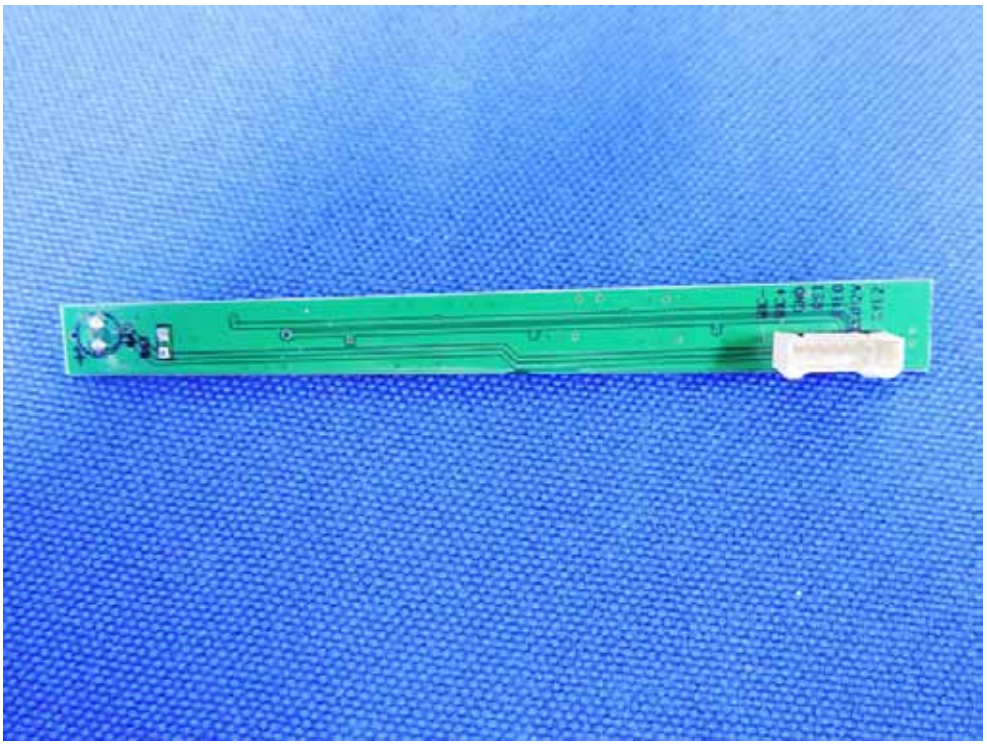



Inside view

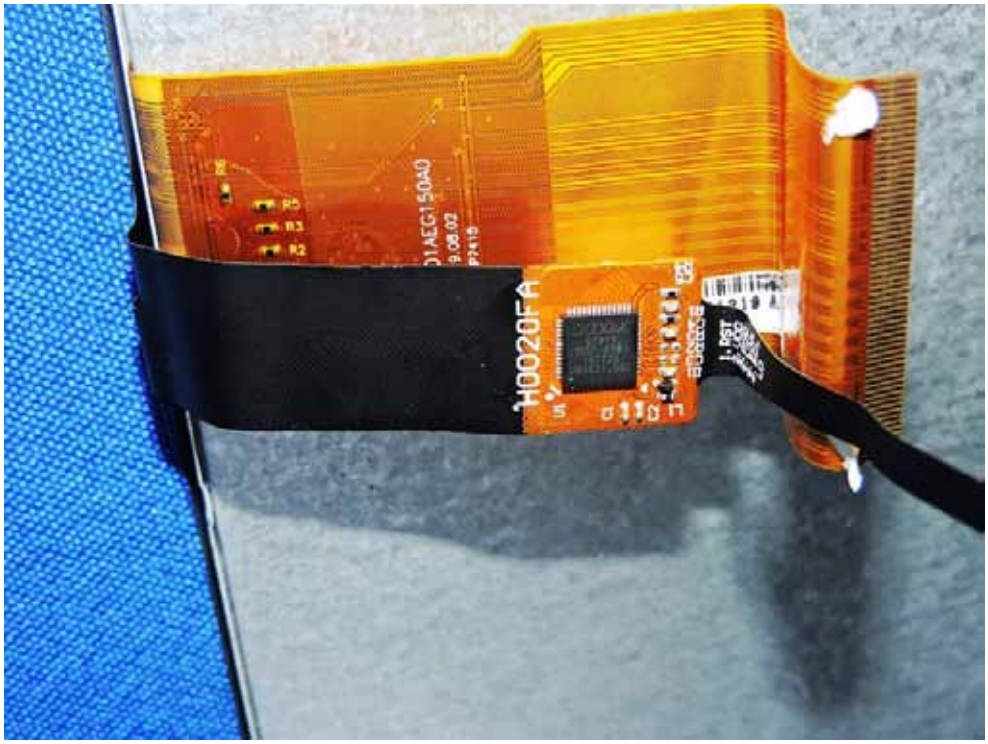


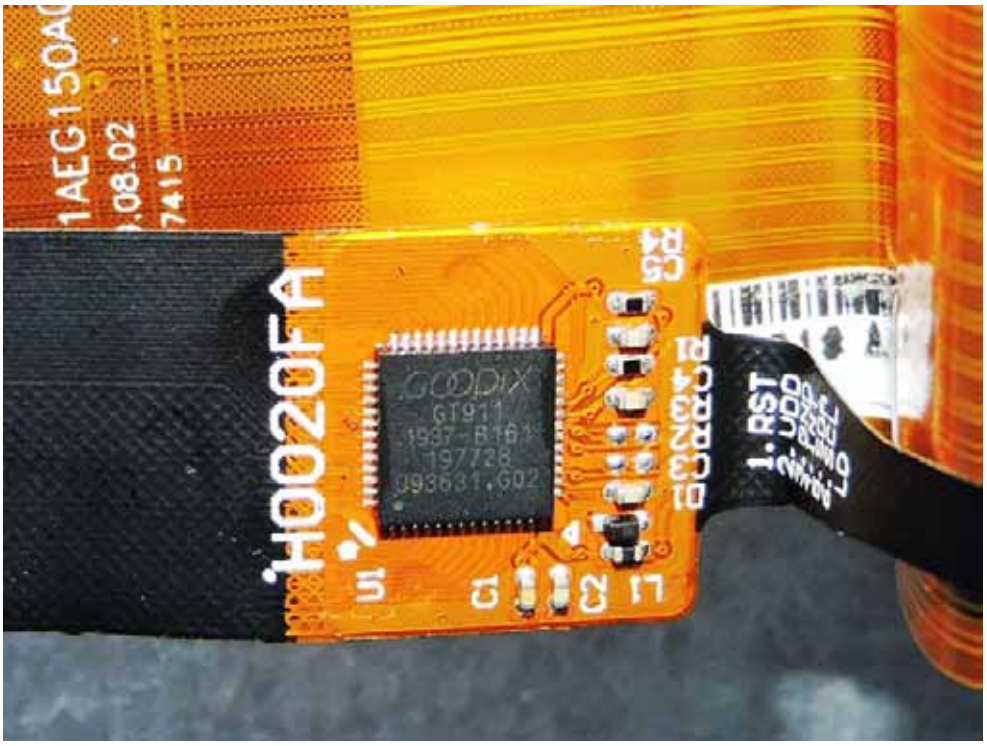
Inside view

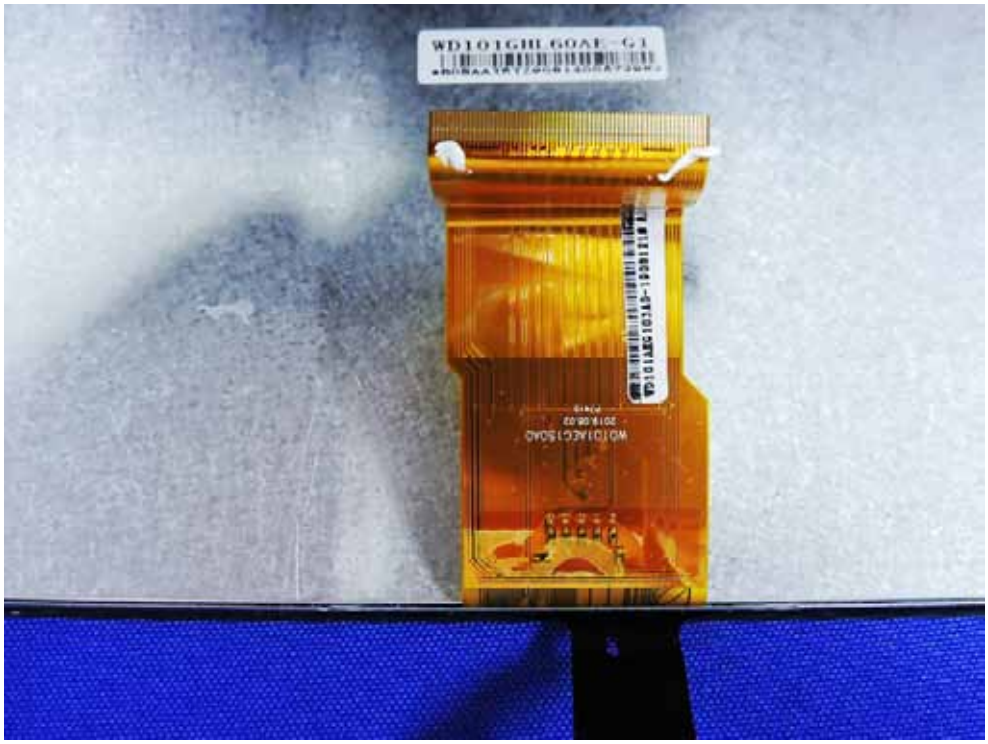


Inside view

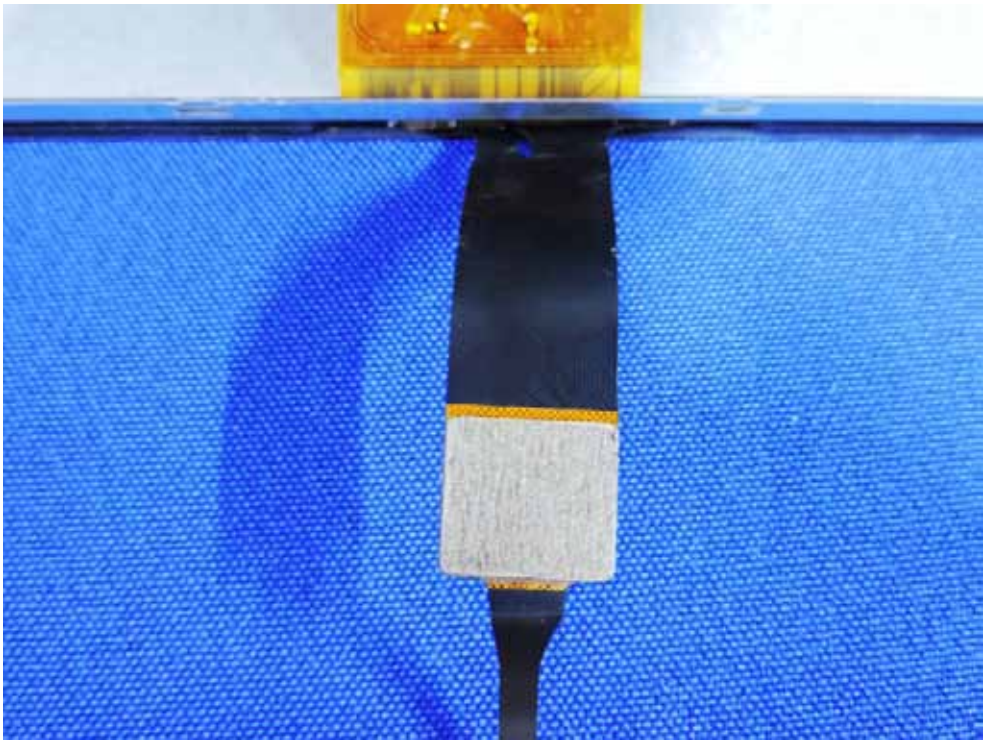



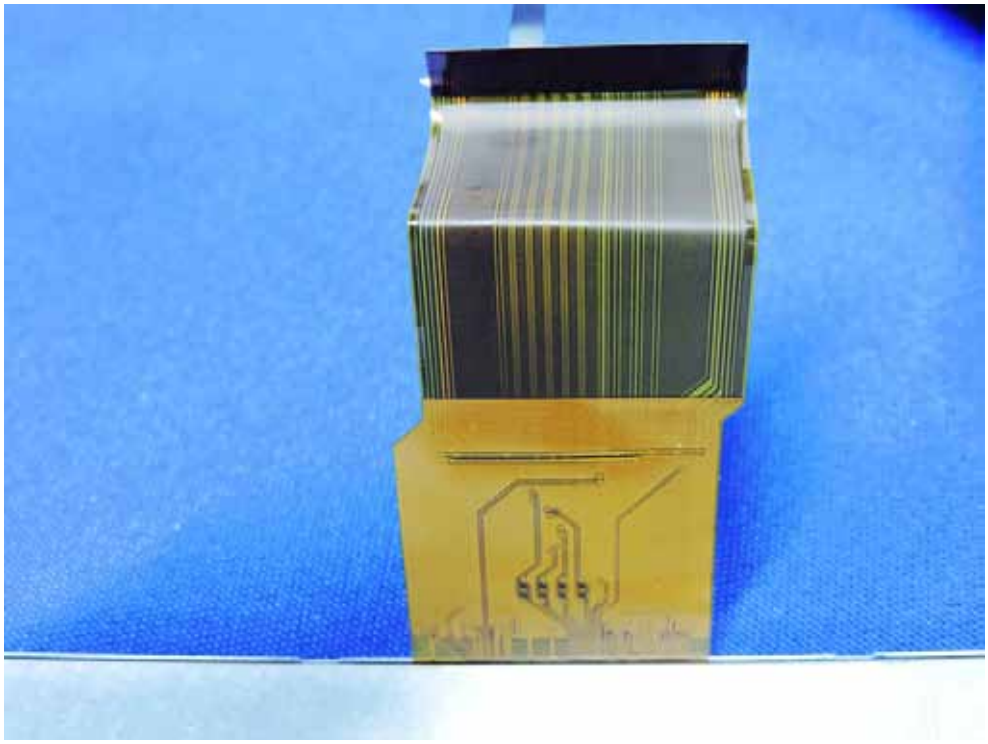
Inside view



Inside view





**--End of Report--**