# FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

Sony Corporation

Home Audio System

Model No.: MHC-V11

FCC ID: AK8MHCV11

Prepared for : Sony Corporation
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Date of Report : Nov.17, 2015

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# TEST REPORT CERTIFICATION

| | | |
|---|---|---|
| Applicant | : | Sony Corporation |
| Manufacturer | : | Sony Corporation |
| EUT Description | : | Home Audio System |
| FCC ID | : | AK8MHCV11 |
| | | (A) Model NO. : MHC-V11 |
| | | (B) Serial NO. : N/A |
| | | (C) Test Voltage : AC 120V/60Hz |

Tested for comply with:
FCC CRF 47 Part 15 Subpart C: 2014

Test procedure used:
ANSI C63.10: 2013

The device described above is tested by AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. to confirm comply with all the FCC Part 15 Subpart C requirements. The test results are contained in this test report and AUDIX TECHNOLOGY (SHENZHEN) CO., LTD. is assumed full responsibility for the accuracy and completeness of these tests. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC and IC requirements. This report contains data that are not covered by the NVLAP accreditation.

This Report is made under FCC Part 2.1075. No modifications were required during testing to bring this product into compliance.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX TECHNOLOGY (SHENZHEN) CO., LTD.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Date of Test : Oct.10~Nov.07, 2015 Report of date: Nov.17, 2015

Prepared by : Monica Liu
Monica Liu / Assistant

Reviewed by :
Sunny Lu/ Assistant Manager

AUDIX® 信華科技（深圳）有限公司
Audix Technology (Shenzhen) Co., Ltd.
EMC 部門報告專用章
Stamp only for EMC Dept. Report
Signature: David Jin

Approved & Authorized Signer :
David Jin / Manager

# 1. SUMMARY OF STANDARDS AND RESULTS

## 1.1.Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

| EMISSION | | |
|---|---|---|
| **Description of Test Item** | **Standard** | **Results** |
| Power Line Conducted Emission Test | FCC Part 15: 15.207<br>ANSI C63.10 2013 | PASS |
| Radiated Emission Test | FCC Part 15 15.209<br>FCC Part 15 15.247(d)<br>ANSI C63.10 2013 | PASS |
| Conducted Spurious Emissions | FCC Part 15: 15.247(a)(1)<br>ANSI C63.10 2013 | PASS |
| Carrier Frequency Separation Test | FCC Part 15: 15.247(a)(1)<br>ANSI C63.10 2013 | PASS |
| 20dB Bandwidth Test | FCC Part 15: 15.215<br>ANSI C63.10 2013 | PASS |
| Number Of Hopping Frequency Test | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10 2013 | PASS |
| Dwell Time Test | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10 2013 | PASS |
| Maximum Peak Output Power Test | FCC Part 15 15.247(b)(1)\<br>ANSI C63.10 2013 | PASS |
| Band Edge Compliance Test | FCC Part 15 15.247(d)<br>ANSI C63.10 2013 | PASS |

# 2. GENERAL INFORMATION

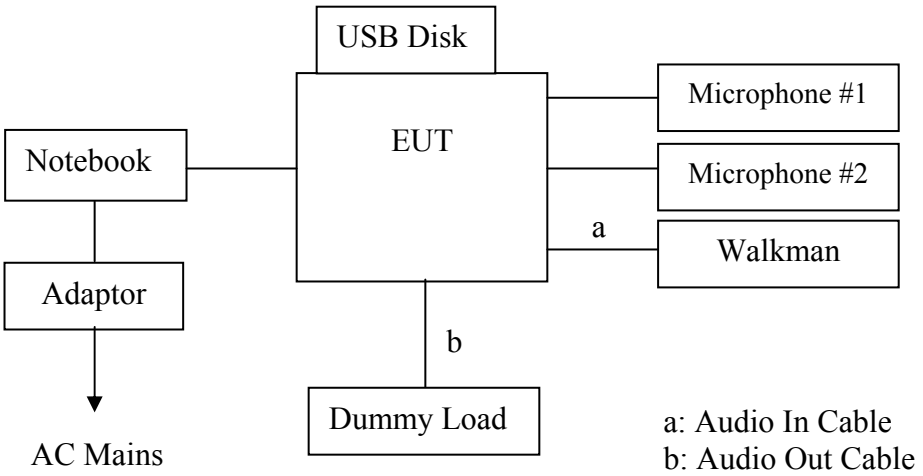
## 2.1. Description of Device (EUT)

| | |
|---|---|
| Product Name | : Home Audio System |
| Model Number | : MHC-V11 |
| FCC ID | : AK8MHCV11 |
| Radio | : Bluetooth V3.0+EDR<br>NFC Rx |
| Operation Frequency | : 2402-2480MHz for Bluetooth<br>13.56MHz for NFC |
| Channel Number | : Bluetooth V3.0+EDR: 79 channels |
| Modulation Technology | : Bluetooth V3.0+EDR:GFSK, π/4DQPSK,8-DPSK<br>NFC: ASK |
| Antenna Assembly Gain | : Integrated PCB Antenna, 2.4dBi PK gain |
| Applicant | : Sony Corporation<br>1-7-1 Konan, Minato-ku, Tokyo 108-0075 Japan |
| Manufacturer | : Sony Corporation<br>1-7-1 Konan, Minato-ku, Tokyo 108-0075 Japan |
| Remote Controller | : Manufacture: Sony, M/N: RMT-AM220U |
| Power Cable | : Unshielded, Detachable, 1.5m |
| FM Antenna Cable | : Unshielded, Detachable, 1.2m |
| Date of Test | : Oct.10~Nov.07, 2015 |
| Date of Receipt | : Oct.08, 2015 |

## 2.2. Tested Supporting System Details

| No. | Description | ACS No. | Manufacturer | Model | Serial Number |
|---|---|---|---|---|---|
| 1. | Notebook | --- | DELL | PP09S | --- |
| | | Power Cable: Unshielded, Detectable, 1.8m<br>Power Adaptor:Manufactuer:DELL;Model:LA65NS1-00; | | | |
| 2. | Walkman | --- | SONY | BNP-1 | --- |
| 3. | Microphone #1 | ACS-EMC-MIC01 | SONCN | SM-300 | --- |
| | | Data Cable: Shielded, Undetachable, 1.7m | | | |
| 3. | Microphone #2 | ACS-EMC-MIC02 | SONCN | SM-300 | --- |
| | | Data Cable: Shielded, Undetachable, 1.7m | | | |

## 2.3. Block Diagram of connection between EUT and simulators




**(EUT: Home Audio System)**

## 2.4. Test information

A special software was used to control EUT work in Continuous TX mode(GFSK, π/4DQPSK,8-DPSK Modulation), and select test channel.

| Tested mode, channel, and data rate information | | | |
|---|---|---|---|
| Mode | data rate (Mbps) | Channel | Frequency (MHz) |
| Tx Mode GFSK modulation | 1 | Low :CH 0 | 2402 |
| | 1 | Middle: CH39 | 2441 |
| | 1 | High: CH78 | 2480 |
| Tx Mode 8-DPSK modulation | 3 | Low :CH 0 | 2402 |
| | 3 | Middle: CH39 | 2441 |
| | 3 | High: CH78 | 2480 |
| Note: π/4DQPSK modulation is same type modulation with 8-DPSK, and according exploratory test, 8-DPSK will have worse emissions, so the final test were only performed with GFSK and 8-DPSK modulation. | | | |

## 2.5. Test Facility

Site Description

| | | |
|---|---|---|
| Name of Firm | : | Audix Technology (Shenzhen) Co., Ltd.<br>No. 6, Ke Feng Rd., 52 Block, Shenzhen Science & Industrial Park,Nantou, Shenzhen, Guangdong, China |
| 3m Anechoic Chamber | : | Certificated by FCC, USA<br>Registration Number: 90454<br>Valid Date: Dec.30, 2017 |
| 3m & 10m Anechoic Chamber | : | Certificated by FCC, USA<br>Registration Number: 794232<br>Valid Date: Jul.12, 2016 |
| EMC Lab. | : | Certificated by Industry Canada<br>Registration Number: IC 5183A-1<br>Valid Date: May.14, 2017 |
| | : | Certificated by DAkkS, Germany<br>Registration No: D-PL-12151-01-00<br>Valid Date: Dec.15, 2016 |
| | : | Accredited by NVLAP, USA<br>NVLAP Code: 200372-0<br>Valid Date: Mar.31, 2016 |

## 2.6. Measurement Uncertainty (95% confidence levels, k=2)

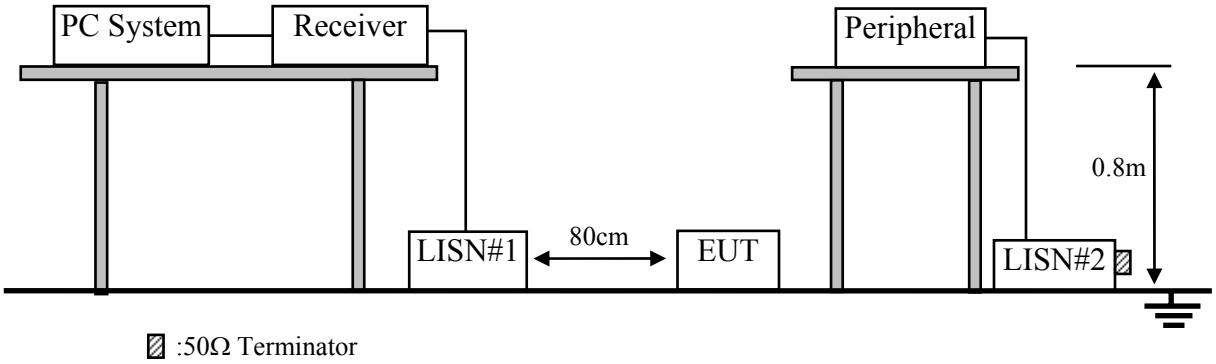
| Test Item | Uncertainty |
|---|---|
| Uncertainty for Conduction emission test in No. 1 Conduction | 3.4dB (150KHz to 30MHz) |
| Uncertainty for Radiation Emission test in 3m chamber | 2.6 dB(30~200MHz, Polarization: H) |
| | 2.6 dB(30~200MHz, Polarization: V) |
| | 3.0 dB(200M~1GHz, Polarization: H) |
| | 2.8 dB(200M~1GHz, Polarization: V) |
| Uncertainty for Radiation Emission test in 3m chamber (1GHz-18GHz) | 6.3 dB (1~6GHz, Distance: 3m) |
| | 5.7 dB (6~18GHz, Distance: 3m) |
| Uncertainty for Radiated Spurious Emission test in RF chamber | 3.6 dB |
| Uncertainty for Conduction Spurious emission test | 2.0 dB |
| Uncertainty for Output power test | 0.8 dB |
| Uncertainty for Bandwidth test | 83 kHz |
| Uncertainty for DC power test | 0.1 % |
| Uncertainty for test site temperature and humidity | 0.6℃ |
| | 3% |

# 3. POWER LINE CONDUCTED EMISSION TEST

## 3.1.Test Equipments

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | 1# Shielding Room | AUDIX | N/A | N/A | Apr.17,15 | 1 Year |
| 2. | Test Receiver | Rohde & Schwarz | ESCI | 100842 | Apr.28,15 | 1 Year |
| 3. | L.I.S.N.#1 | Rohde & Schwarz | ESH2-Z5 | 100429 | Oct.18,15 | 1 Year |
| 4. | L.I.S.N#2 | Kyoritsu | K NW-403D | 8-1750-2 | Apr.28,15 | 1 Year |
| 5. | Terminator | Hubersuhner | 50Ω | No.1 | Apr.28,15 | 1 Year |
| 6. | Terminator | Hubersuhner | 50Ω | No.2 | Apr.28,15 | 1 Year |
| 7. | RF Cable | MIYAZAKI | 3D-2W | No.1 | Apr.28,15 | 1Year |
| 8. | Coaxial Switch | Anritsu | MP59B | 6200766906 | Apr.28,15 | 1 Year |
| 9. | Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 101838 | Oct.17,15 | 1 Year |
| 10. | Test Software | AUDIX | E3 | 6.100913a | N/A | N/A |

## 3.2.Block Diagram of Test Setup




## 3.3.Power Line Conducted Emission Test Limits

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Quasi-Peak Level dB(μV) | Average Level dB(μV) |
| 150kHz ~ 500kHz | 66 ~ 56* | 56 ~ 46* |
| 500kHz ~ 5MHz | 56 | 46 |
| 5MHz ~ 30MHz | 60 | 50 |

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

## 3.4. Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4.1. Home Audio System (EUT)

Model Number : MHC-V11
Serial Number : N/A

3.4.2. Support Equipment: As Tested Supporting System Details, in Section 2.2.

## 3.5. Operating Condition of EUT

3.5.1. Setup the EUT and simulator as shown as Section 3.2.

3.5.2. Turn on the power of all equipments.

3.5.3. PC run test software to control EUT work in BT 3.0 Tx mode.

## 3.6. Test Procedure

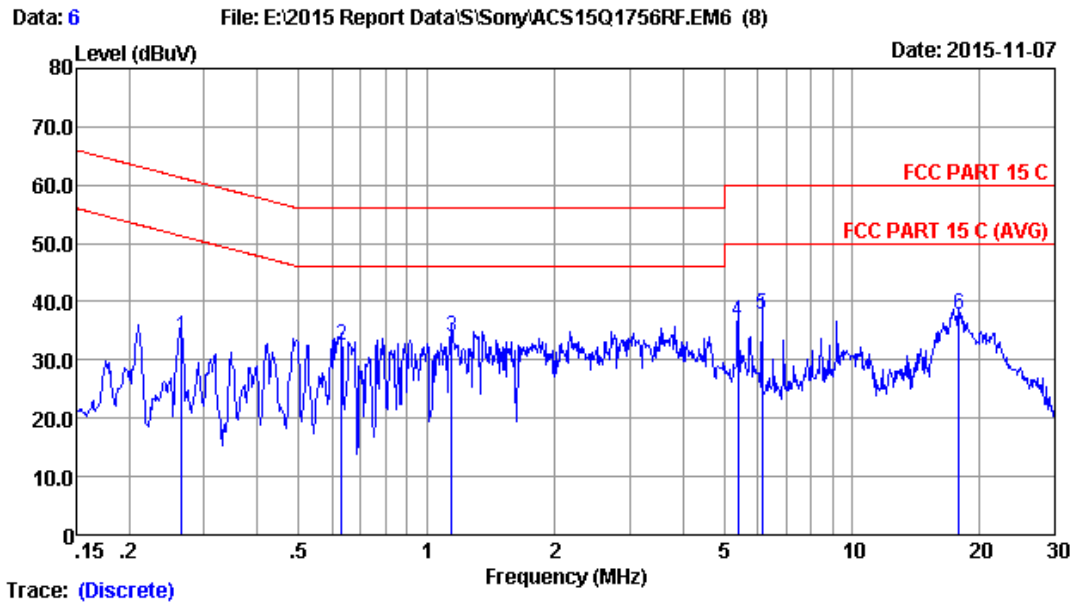
The EUT was placed on ground plane that it was floor-standing equipment. The EUT Power Via PC connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Test.

The bandwidth of test receiver (R & S ESCI ) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

## 3.7. Power Line Conducted Emission Test Results

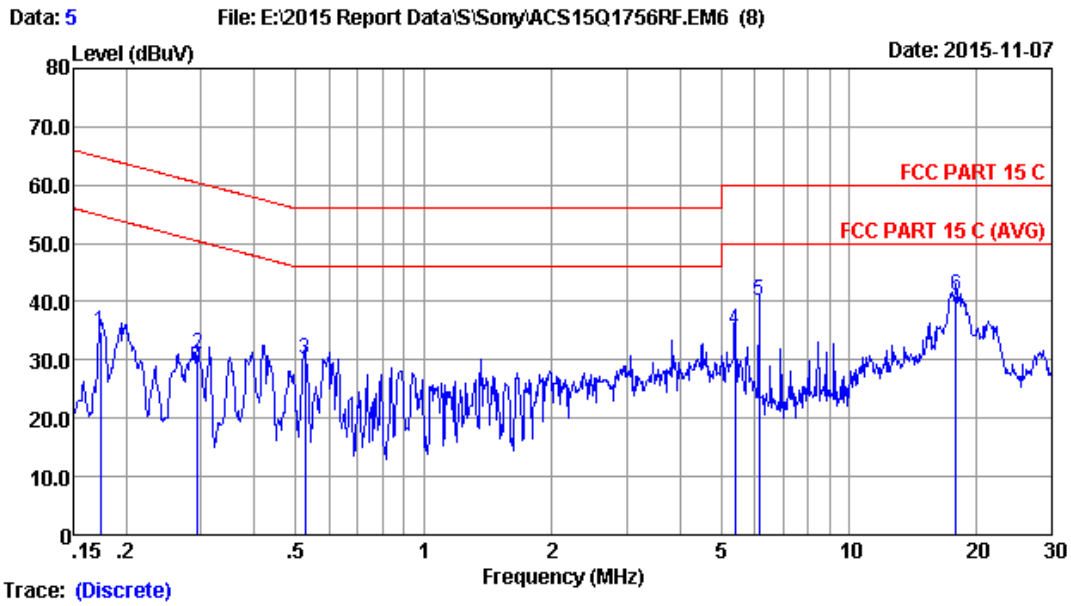
**PASS.** **(**All emissions not reported below are too low against the prescribed limits.)




Site no :1# Conduction Data No :6
Dis./Lisn :2015 KNW-242C VA
Limit :FCC PART 15 C
Env./Ins. :23.1*C/50% Engineer :Alvis-Wu
EUT :Home Audio System M/N:MHC-V11
Power Rating :AC 120V/60Hz
Test Mode :TX Mode

| No | Freq (MHz) | LISN Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV) | Limits (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.266 | 0.48 | 9.94 | 23.62 | 34.04 | 61.25 | 27.21 | QP |
| 2 | 0.630 | 0.46 | 9.95 | 22.12 | 32.53 | 56.00 | 23.47 | QP |
| 3 | 1.147 | 0.52 | 9.95 | 23.46 | 33.93 | 56.00 | 22.07 | QP |
| 4 | 5.390 | 0.61 | 10.00 | 25.86 | 36.47 | 60.00 | 23.53 | QP |
| 5 | 6.153 | 0.64 | 10.01 | 27.19 | 37.84 | 60.00 | 22.16 | QP |
| 6 | 17.849 | 0.89 | 10.12 | 26.90 | 37.91 | 60.00 | 22.09 | QP |

Remarks: 1.Emission Level=LISN Factor+Cable Loss(Include 10dB pulse limit)+Reading.
2.If the average limit is met when using a quasi-peak detector.
the EUT shall be deemed to meet both limits and measurement
with average detector is unnecessary.




Site no :1# Conduction Data No :5
Dis./Lisn :2015 KNW-242C VB
Limit :FCC PART 15 C
Env./Ins. :23.1*C/50% Engineer :Alvis-Wu
EUT :Home Audio System M/N:MHC-V11
Power Rating :AC 120V/60Hz
Test Mode :TX Mode

| No | Freq (MHz) | LISN Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV) | Limits (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.174 | 0.41 | 9.95 | 24.49 | 34.85 | 64.77 | 29.92 | QP |
| 2 | 0.294 | 0.40 | 9.94 | 20.52 | 30.86 | 60.41 | 29.55 | QP |
| 3 | 0.527 | 0.38 | 9.94 | 19.77 | 30.09 | 56.00 | 25.91 | QP |
| 4 | 5.390 | 0.31 | 10.00 | 24.73 | 35.04 | 60.00 | 24.96 | QP |
| 5 | 6.153 | 0.33 | 10.01 | 29.86 | 40.20 | 60.00 | 19.80 | QP |
| 6 | 17.849 | 0.64 | 10.12 | 30.29 | 41.05 | 60.00 | 18.95 | QP |

Remarks: 1.Emission Level=LISN Factor+Cable Loss(Include 10dB pulse limit)+Reading.
2.If the average limit is met when using a quasi-peak detector.
the EUT shall be deemed to meet both limits and measurement
with average detector is unnecessary.

# 4. RADIATED EMISSION MEASUREMENT

## 4.1.Test Equipment

Frequency range: 30~1000MHz

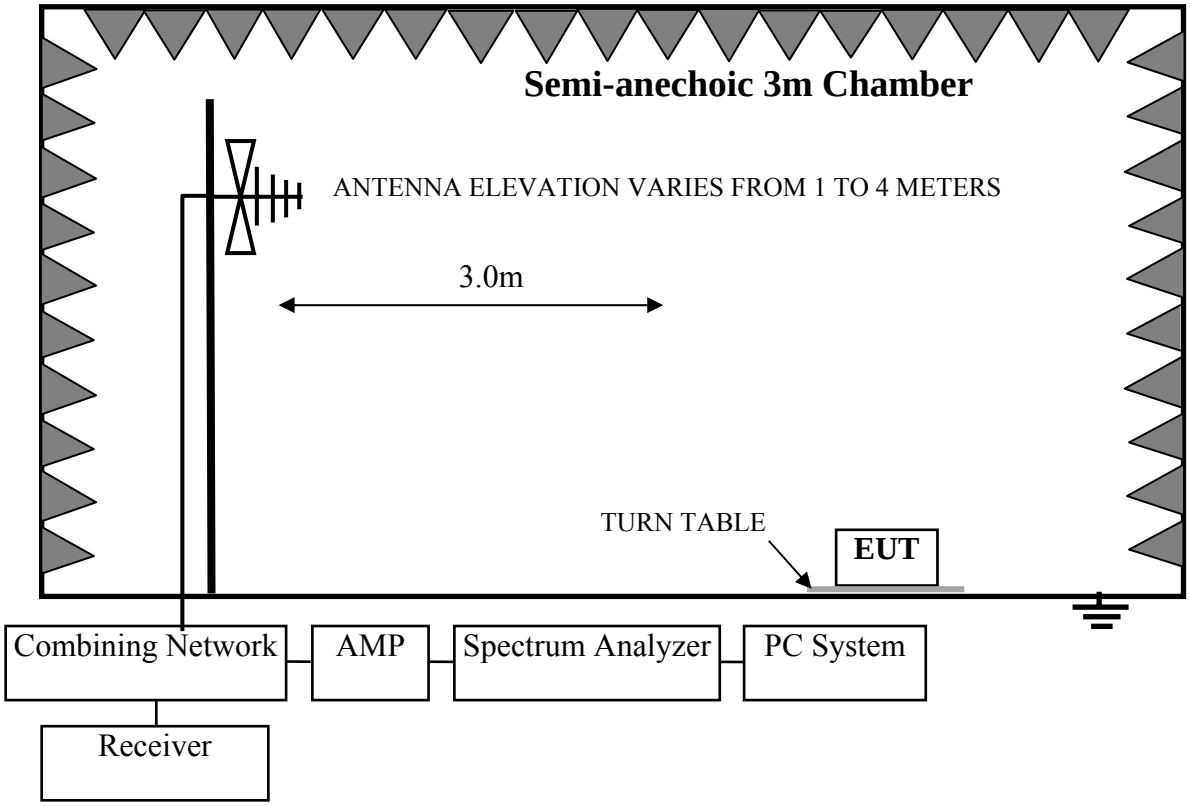
| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | 3#Chamber | AUDIX | N/A | N/A | Nov.23,14 | 1 Year |
| 2. | EMI Spectrum | Agilent | E4407B | MY41440292 | Apr.28,15 | 1 Year |
| 3. | Test Receiver | Rohde & Schwarz | ESVS10 | 834468/011 | Apr.28,15 | 1 Year |
| 4. | Amplifier | HP | 8447D | 2648A04738 | Apr.28,15 | 1 Year |
| 5. | Trilog-Broadband Antenna | SCHWARZBECK | VULB 9168 | 9168-493 | May.06,15 | 1 Year |
| 6. | RF Cable | MIYAZAKI | CFD400-N W(3.5M) | No.3 | Apr.28,15 | 1 Year |
| 7. | RF Cable | MIYAZAKI | CFD400-L W(22M) | No.7 | Apr.28,15 | 1 Year |
| 8. | Coaxial Switch | Anritsu | MP59B | 6201397222 | Apr.28,15 | 1 Year |
| 9. | Test Software | AUDIX | E3 | 6.2009-5-21a(n) | N/A | N/A |

Frequency range: above 1000MHz

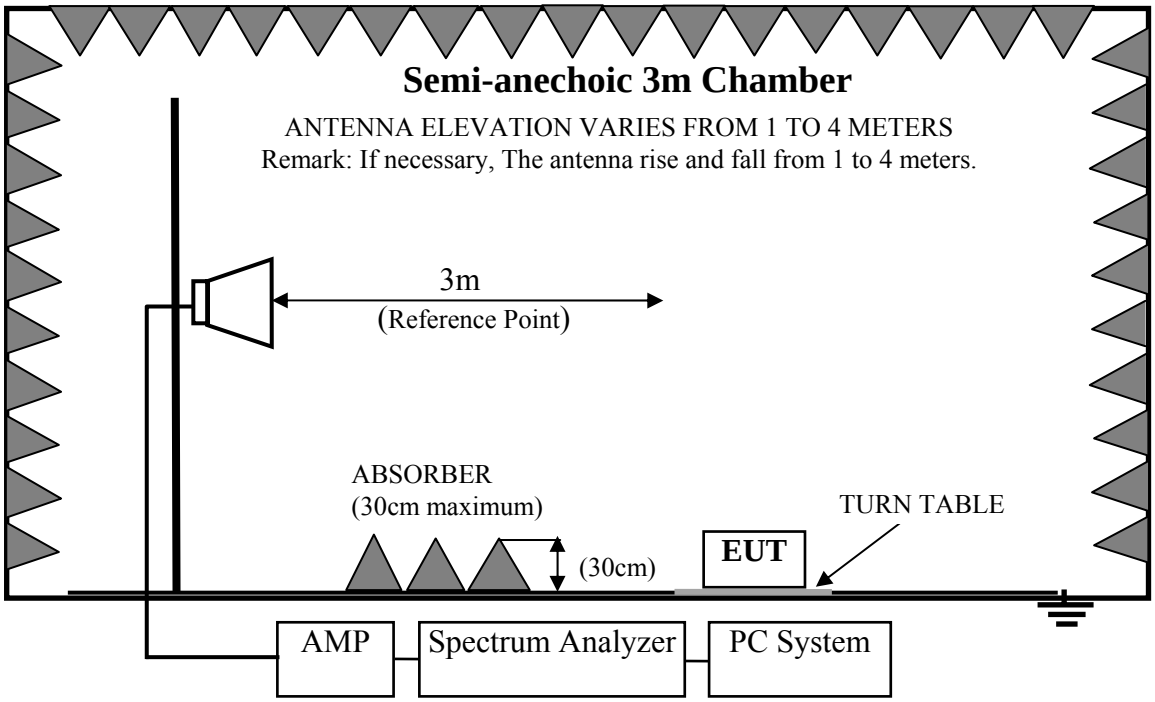
| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | 3#Chamber | AUDIX | N/A | N/A | Nov.02, 14 | 1 Year |
| 2. | Spectrum Analyzer | Agilent | E4407B | MY41440292 | Apr. 28,15 | 1 Year |
| 3. | Horn Antenna | ETC | MCTD 1209 | DRH15F03007 | Feb.03,15 | 1 Year |
| 4. | Amplifier | Agilent | 8449B | 3008A00863 | Apr. 28,15 | 1 Year |
| 5. | RF Cable | Hubersuhner | SUCOFLEX106 | 77977/6 | Apr. 28,15 | 1 Year |
| 6. | RF Cable | Hubersuhner | SUCOFLEX106 | 28616/2 | Apr. 28,15 | 1 Year |
| 7. | Horn Antenna | ETS | 3116 | 00060088 | Nov.08.14 | 1 Year |

## 4.2.Block Diagram of Test Setup

For frequency range 30MHz-1000MHz




For frequency range 1GHz-25GHz



## 4.3.Radiated Emission Limit Standard:

| 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 1000MHz | 3 | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) | |

Remark： (1) Emission level dBμV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

(4) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

## 4.4.EUT Configuration on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4.1. Home Audio System (EUT)

Model Number : MHC-V11
Serial Number : N/A

## 4.5.Operating Condition of EUT

4.5.1. Setup the EUT and simulator as shown as Section 4.2.

4.5.2. Turn on the power of all equipments.

4.5.3. Let EUT work in BT 3.0 Tx mode.

## 4.6.Test Procedure

EUT and its simulators are placed on a turn table. 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. Broadband antenna (calibrated bilog antenna) is used as receiving antenna for frequency 30MHz~1000MHz, and the Horm antenna is used as receiving antenna for frequency above 1GHz. Both horizontal and vertical polarization of the antenna is set on Test. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.10-2013 on radiated emission Test.

This test was performed with EUT in X, Y, Z position, and the worse case was found when EUT in X position as the test photo indicated.

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 RBW is set at 1MHz and VBW is set at 3MHz for peak emissions measurement above 1GHz

This device is pulse Modulated, a duty cycle factor was used to calculated average level based measured peak level.

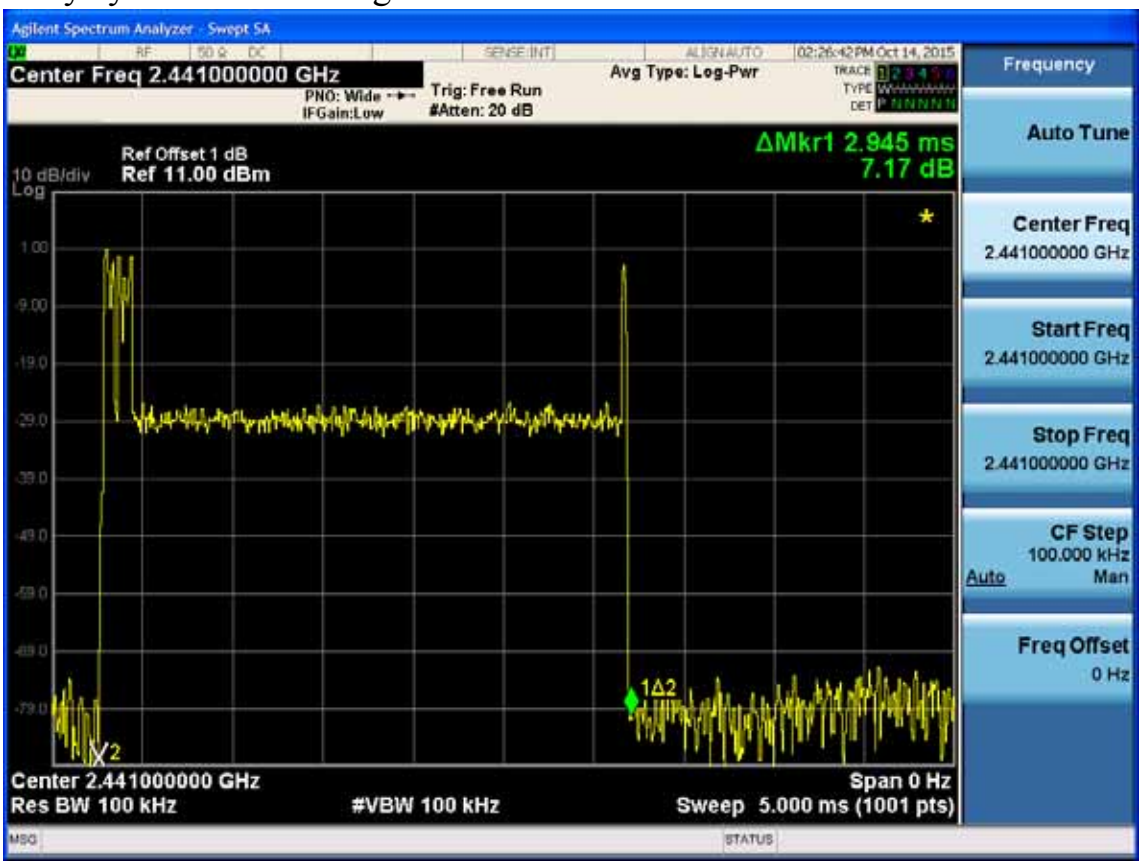
The frequency range from 30MHz to 10th harmonic (25GHz) are checked. and no any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

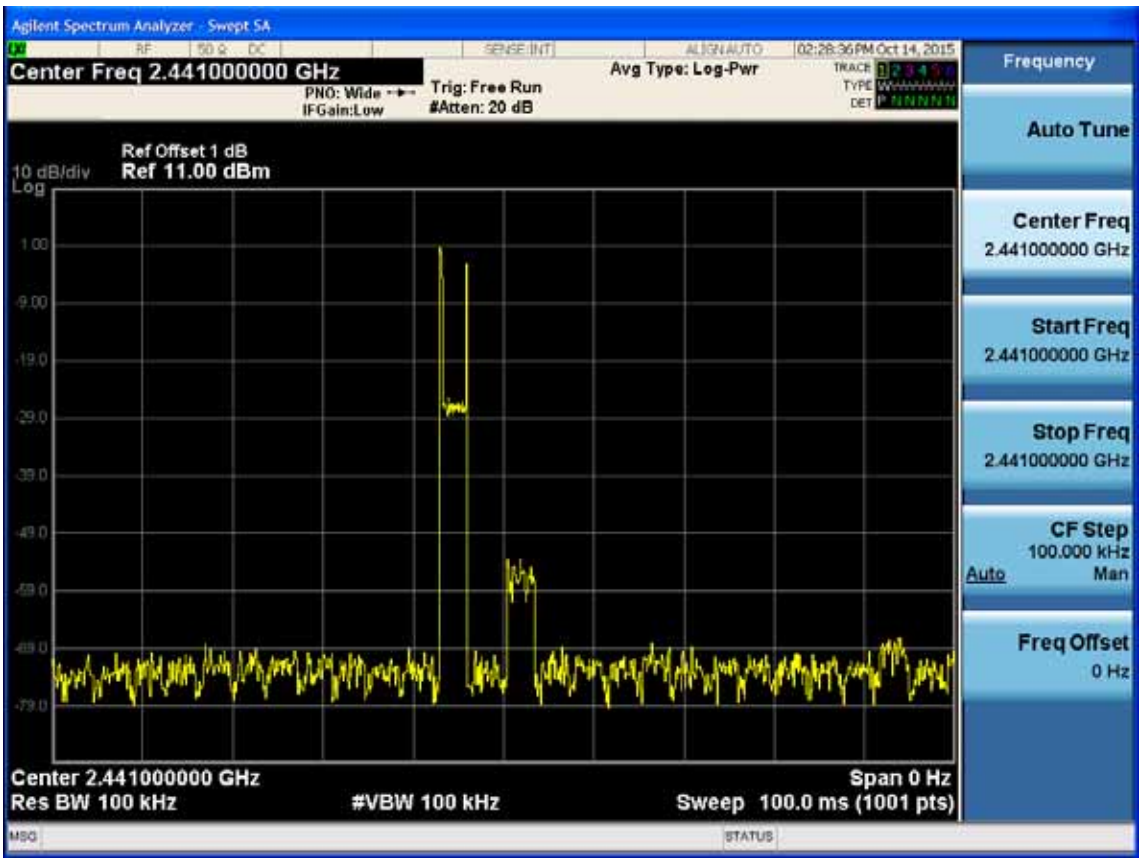
## 4.7.Radiated Emission Test Results

**PASS.**

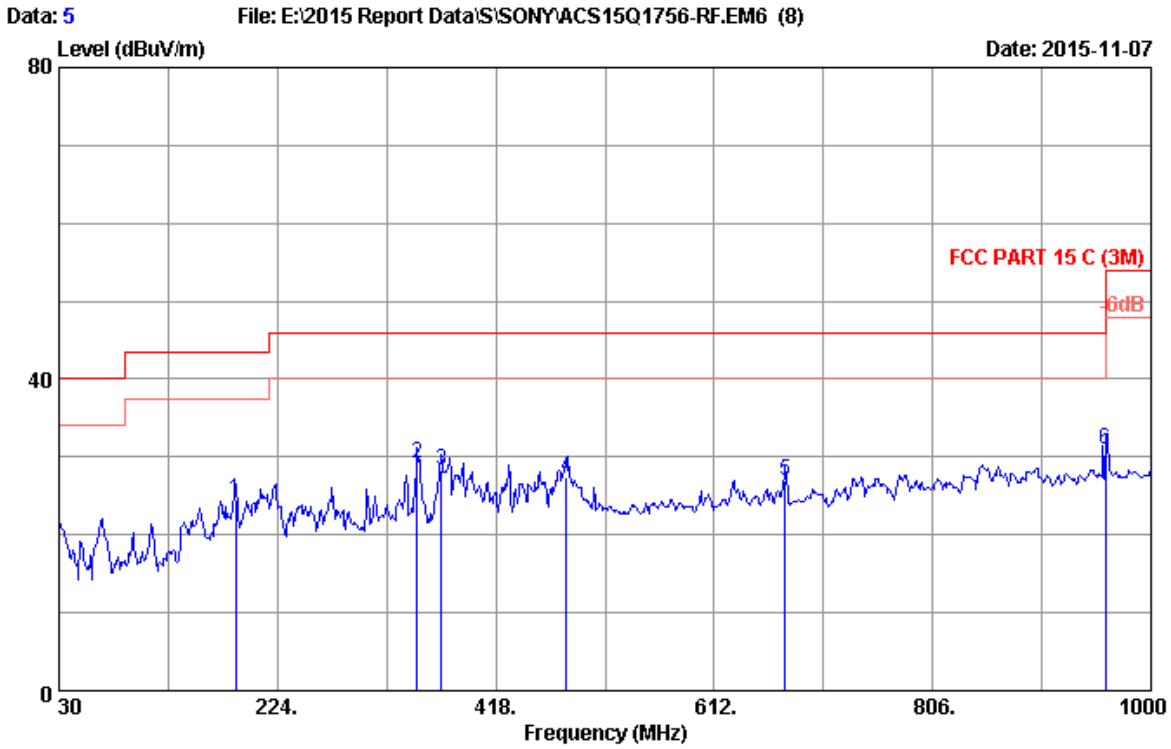
All the emissions from 30MHz to 25GHz were comply with the 15.209 Limit.
Note: The duty cycle factor for calculate average level is -30.618 dB, and average limit is 20dB below peak limit, so if peak measured level comply with average limit, the average level was deemed to comply with average limit.

Duty cycle factor = 20log（Dwell time/100ms）= -30.618



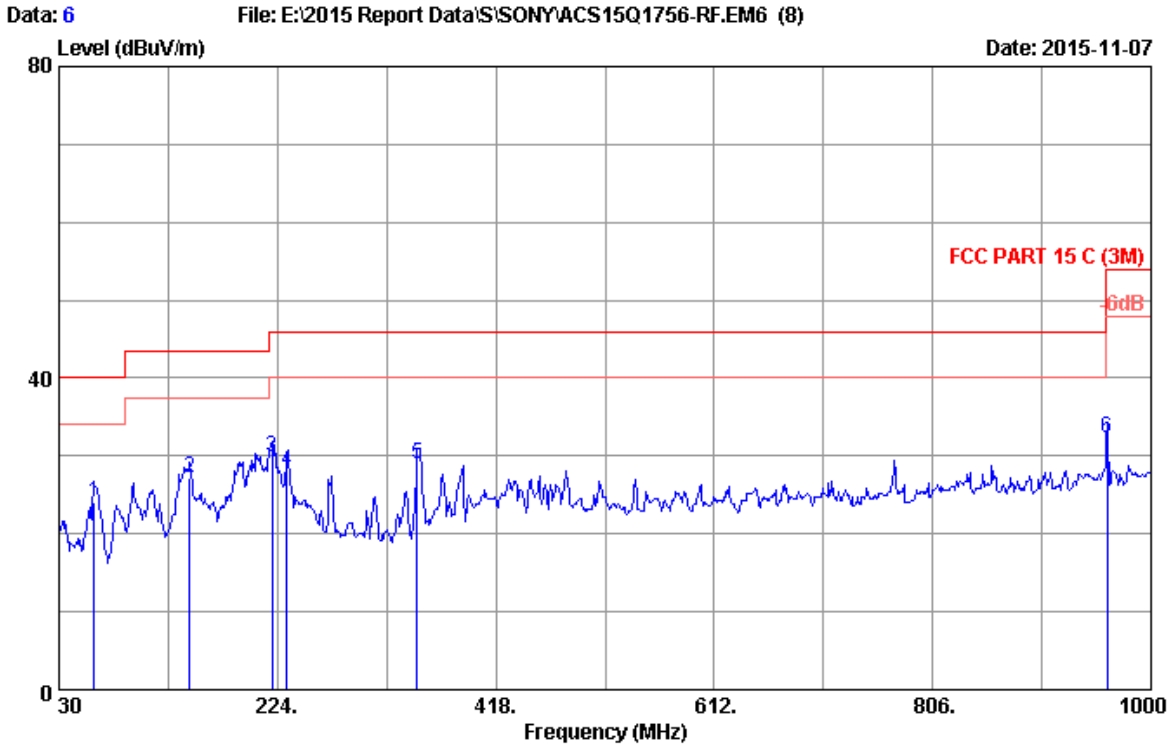
## Frequency: 30MHz~1GHz




Site no. : 3m Chamber Data no. : 5
Dis. / Ant. : 3m 2015 CBL6112D 35375 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 C (3M)
Env. / Ins. : 24*C/56% Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : TX Mode

| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 187.140 | 10.10 | 1.46 | 12.93 | 24.49 | 43.50 | 19.01 | QP |
| 2 | 348.160 | 15.51 | 2.05 | 11.58 | 29.14 | 46.00 | 16.86 | QP |
| 3 | 369.500 | 15.81 | 2.12 | 10.35 | 28.28 | 46.00 | 17.72 | QP |
| 4 | 481.050 | 17.83 | 2.47 | 7.19 | 27.49 | 46.00 | 18.51 | QP |
| 5 | 675.050 | 20.05 | 2.95 | 3.96 | 26.96 | 46.00 | 19.04 | QP |
| 6 | 959.260 | 22.58 | 3.62 | 4.80 | 31.00 | 46.00 | 15.00 | QP |

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

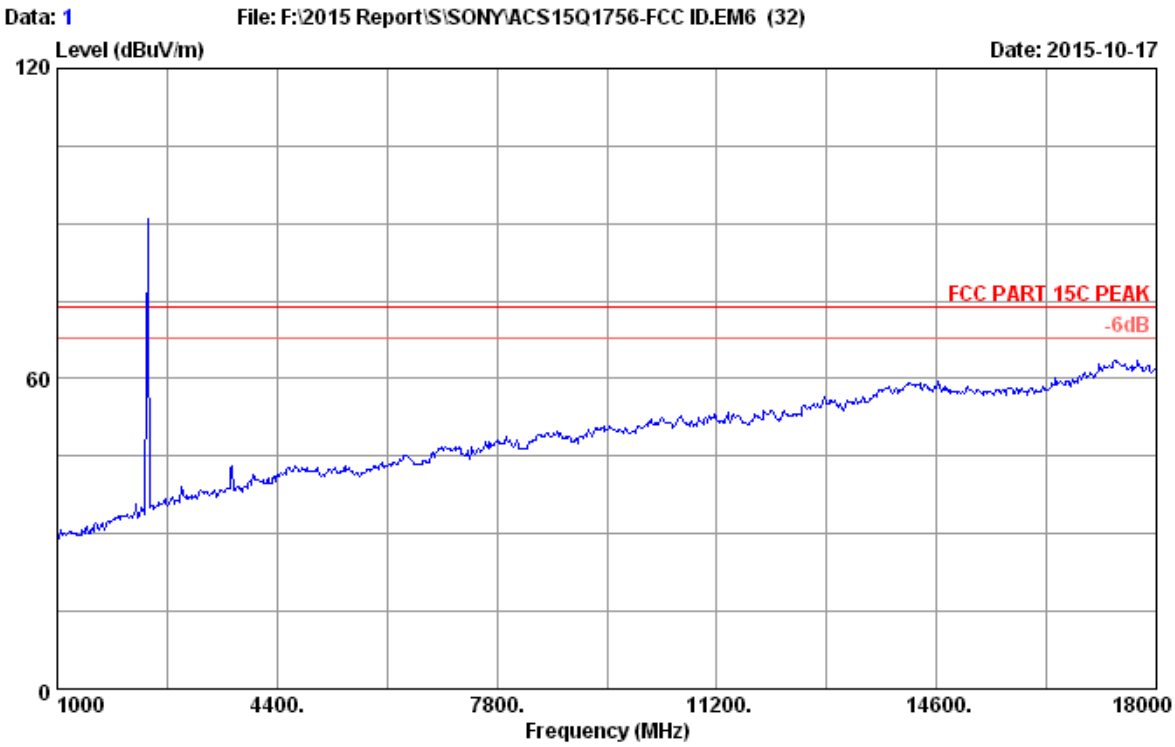



Site no. : 3m Chamber Data no. : 6
Dis. / Ant. : 3m 2015 CBL6112D 35375 Ant. pol. : VERTICAL
Limit : FCC PART 15 C (3M)
Env. / Ins. : 24*C/56% Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : TX Mode

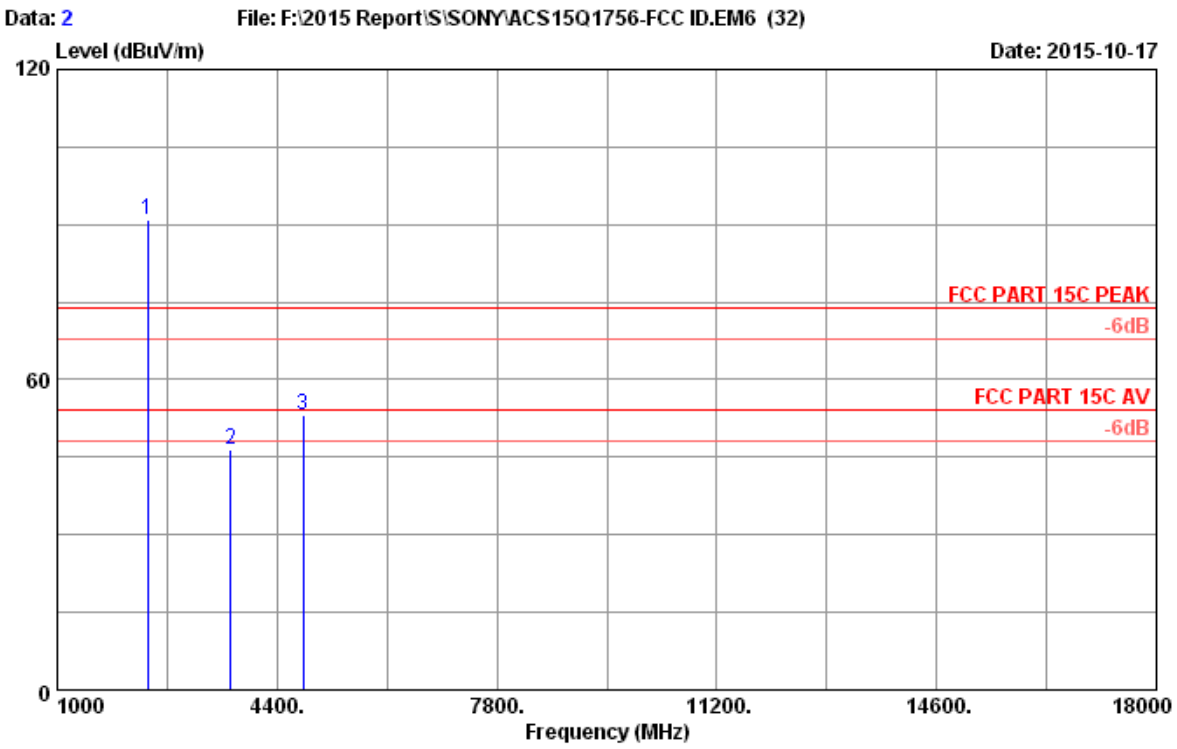
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 61.040 | 6.80 | 0.89 | 16.34 | 24.03 | 40.00 | 15.97 | QP |
| 2 | 146.400 | 11.70 | 1.29 | 14.16 | 27.15 | 43.50 | 16.35 | QP |
| 3 | 219.150 | 10.96 | 1.57 | 17.23 | 29.76 | 46.00 | 16.24 | QP |
| 4 | 232.730 | 11.81 | 1.62 | 14.58 | 28.01 | 46.00 | 17.99 | QP |
| 5 | 348.160 | 15.51 | 2.05 | 11.48 | 29.04 | 46.00 | 16.96 | QP |
| 6 | 961.200 | 22.60 | 3.62 | 6.11 | 32.33 | 54.00 | 21.67 | QP |

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

**Frequency: 1GHz~18GHz**



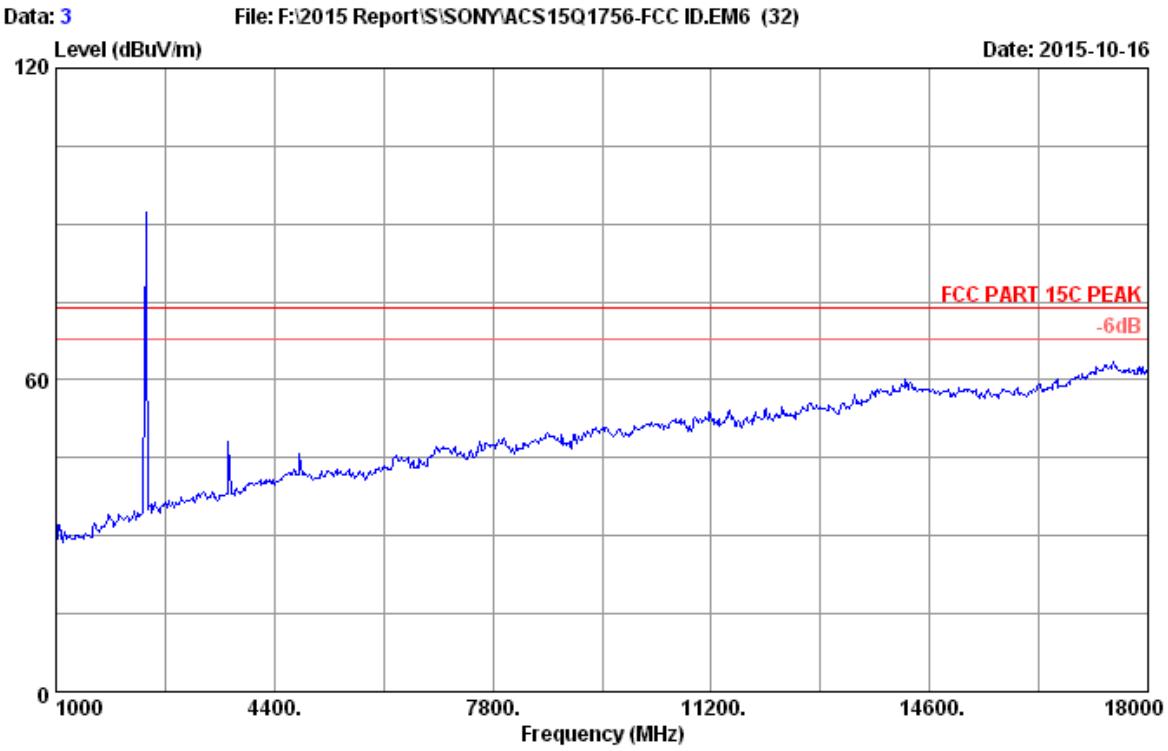

```
Site no.      : 3m Chamber                        Data no.  : 1
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2402MHz  Tx Mode
```



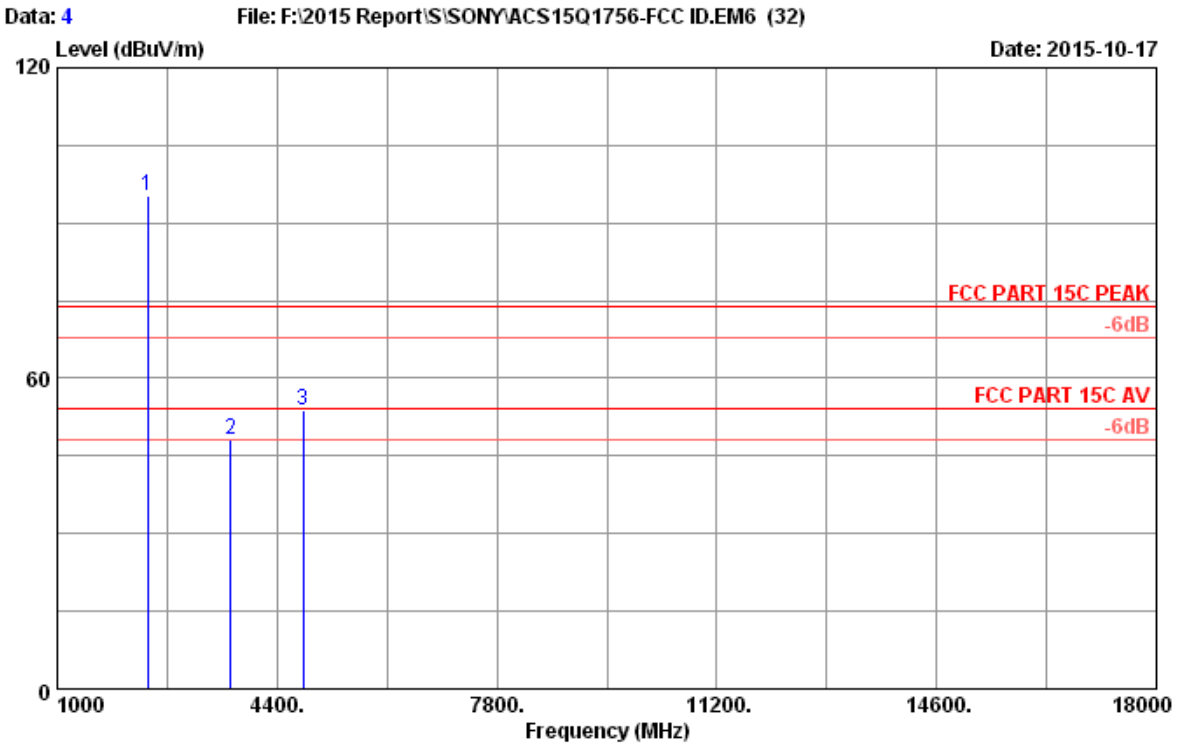

```
Site no.      : 3m Chamber                        Data no.  : 2
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2402MHz  Tx Mode
```

| No. | 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 | 2402.000 | 28.00 | 7.32 | 36.62 | 92.34 | 91.04 | 74.00 | -17.04 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 43.71 | 46.61 | 74.00 | 27.39 | Peak |
| 3 | 4804.000 | 33.69 | 9.46 | 35.54 | 45.70 | 53.31 | 74.00 | 20.69 | Peak |

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



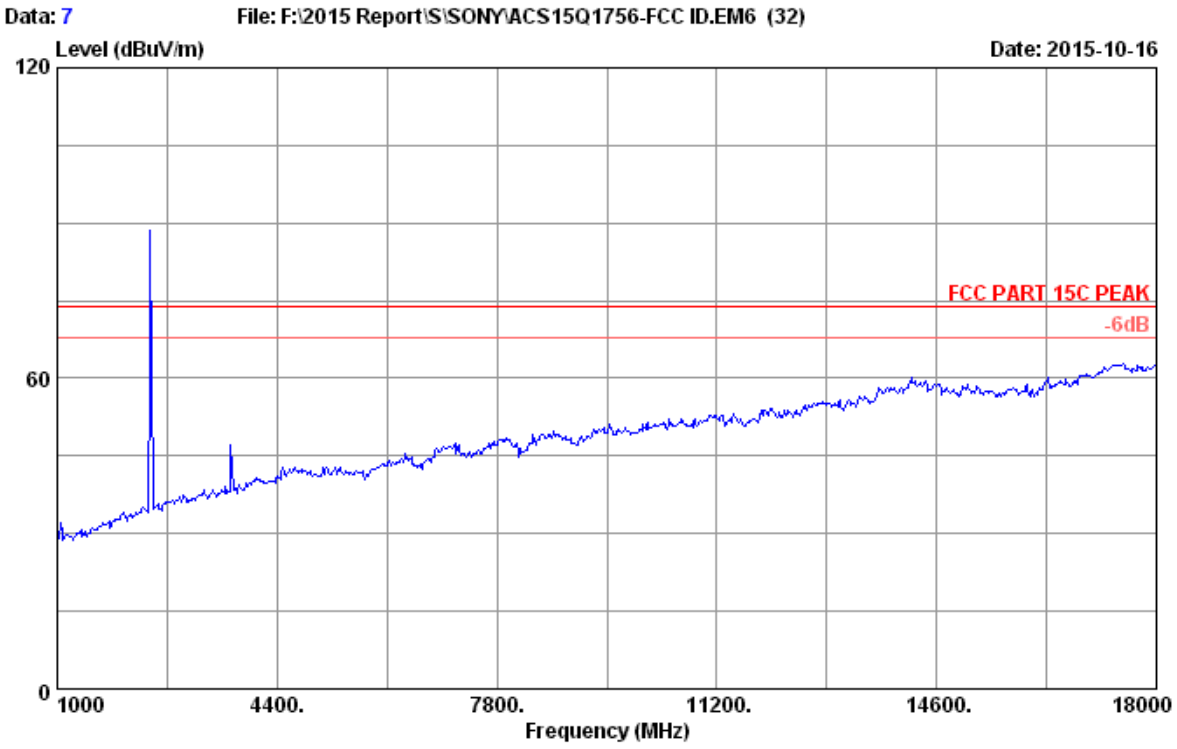

```
Site no.      : 3m Chamber                        Data no.  : 3
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2402MHz  Tx Mode
```



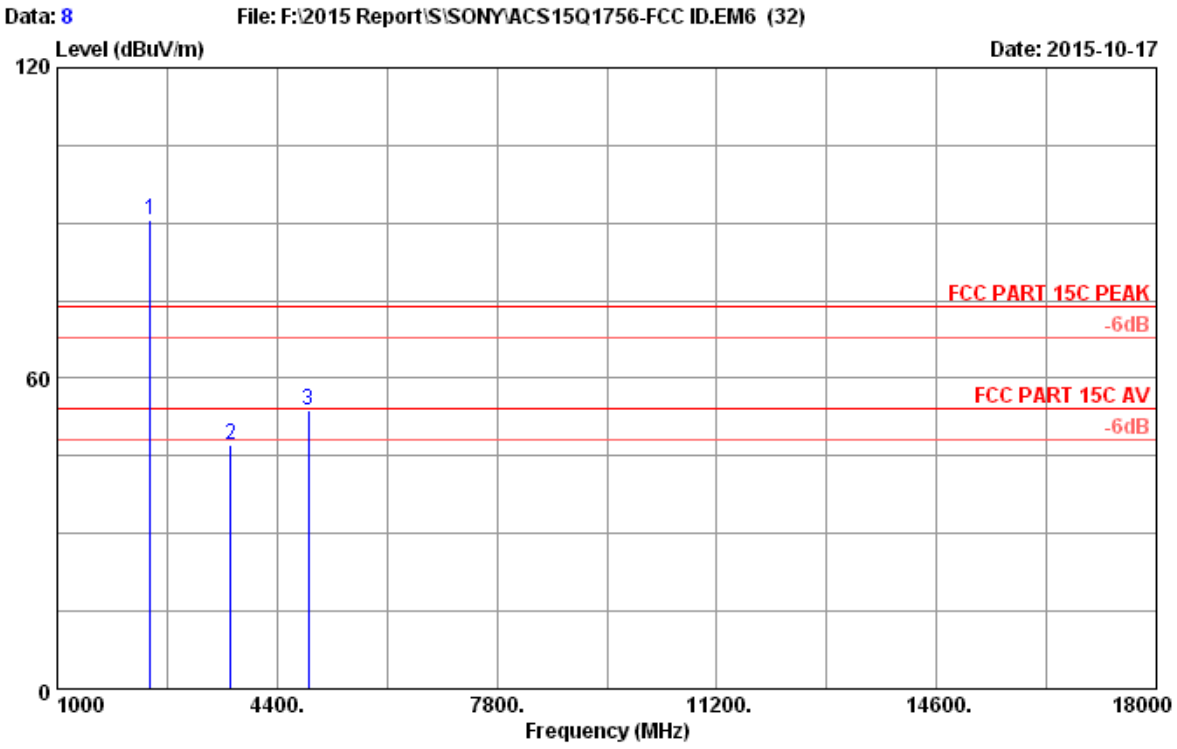

Site no. : 3m Chamber Data no. : 4
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2402MHz Tx Mode

| No. | 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 | 2402.000 | 28.00 | 7.32 | 36.62 | 96.45 | 95.15 | 74.00 | -21.15 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 45.10 | 48.00 | 74.00 | 26.00 | Peak |
| 3 | 4804.000 | 33.69 | 9.46 | 35.54 | 46.17 | 53.78 | 74.00 | 20.22 | Peak |

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



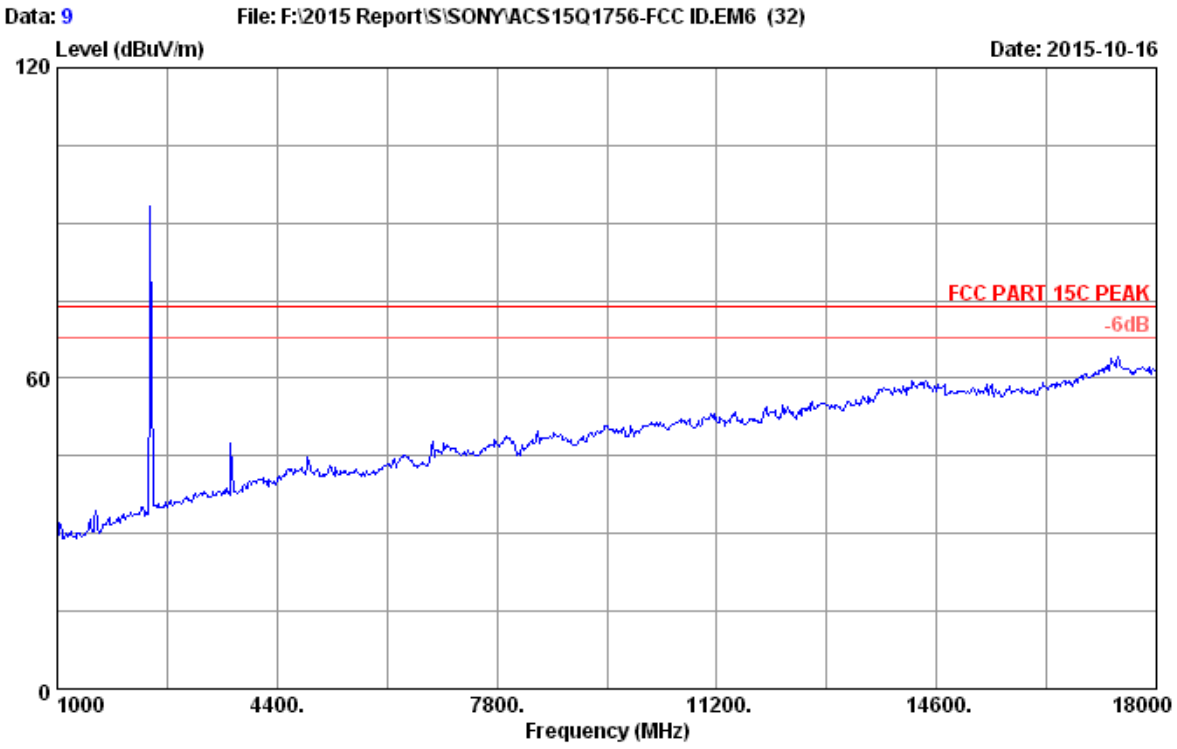

```
Site no.      : 3m Chamber                        Data no.  : 7
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2441MHz  Tx Mode
```



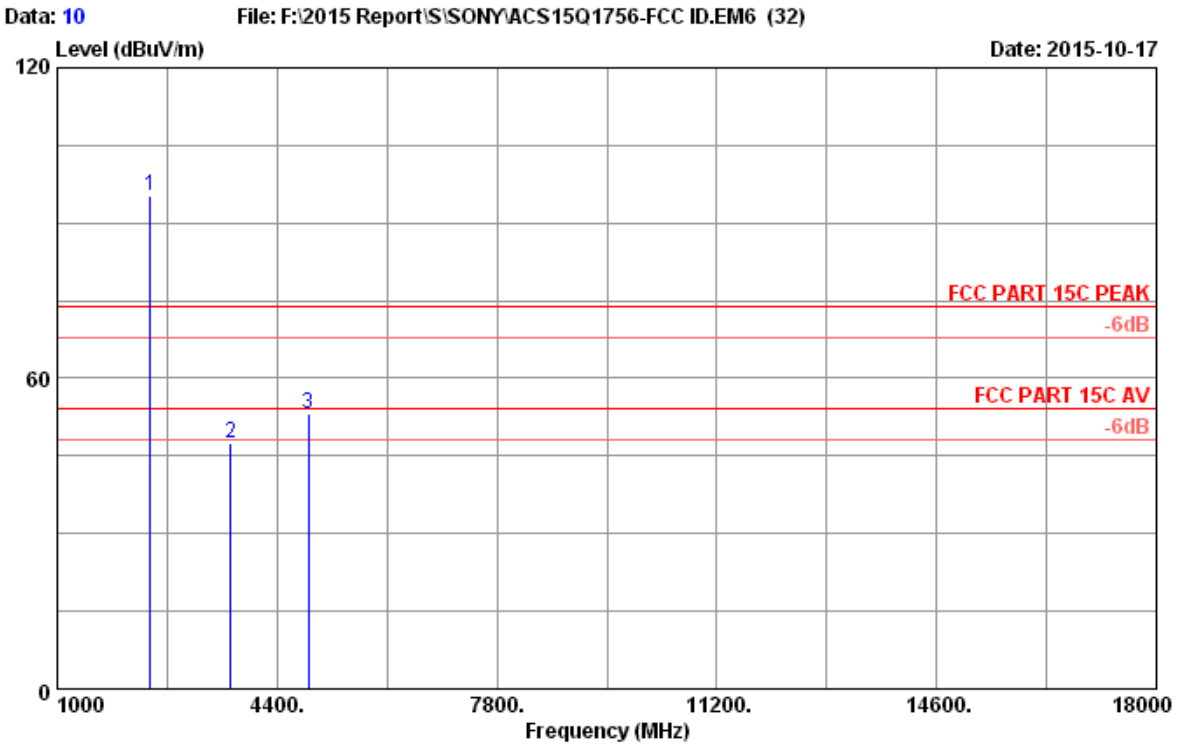

Site no. : 3m Chamber Data no. : 8
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2441MHz Tx Mode

| No. | 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 | 2441.000 | 28.08 | 7.39 | 36.60 | 91.73 | 90.60 | 74.00 | -16.60 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 44.39 | 47.29 | 74.00 | 26.71 | Peak |
| 3 | 4882.000 | 33.81 | 9.49 | 35.51 | 45.93 | 53.72 | 74.00 | 20.28 | Peak |

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



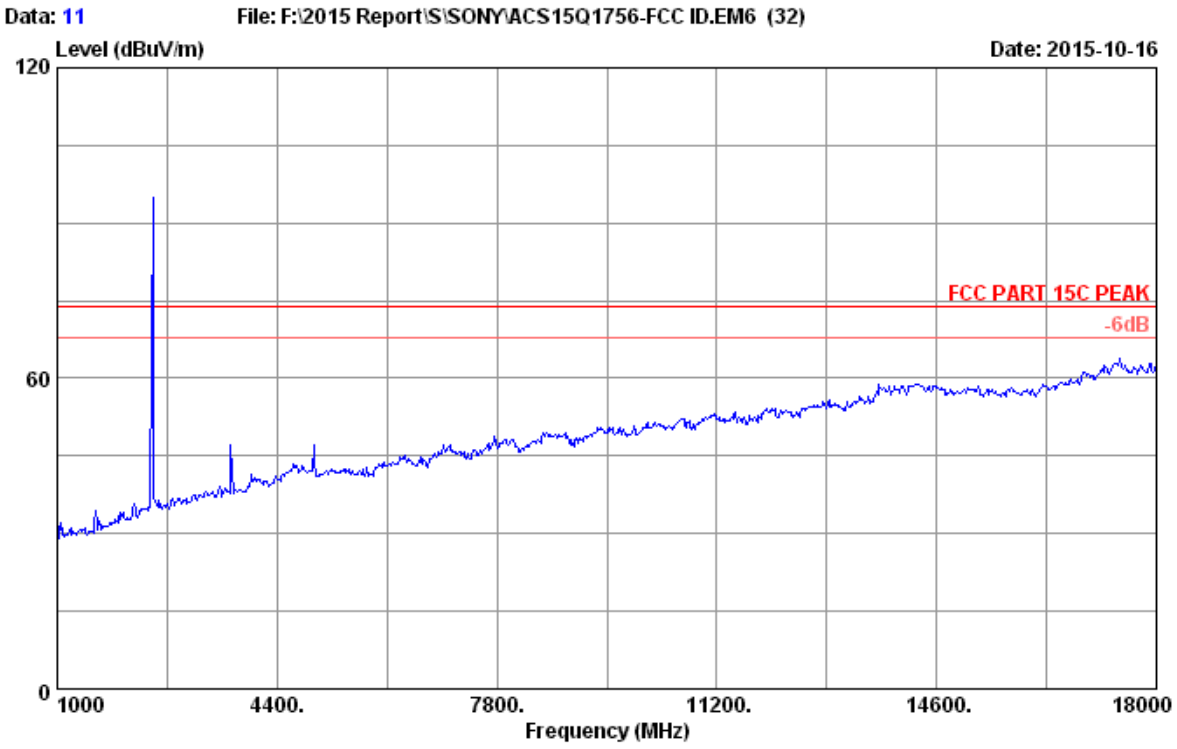

```
Site no.      : 3m Chamber                        Data no.  : 9
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2441MHz  Tx Mode
```



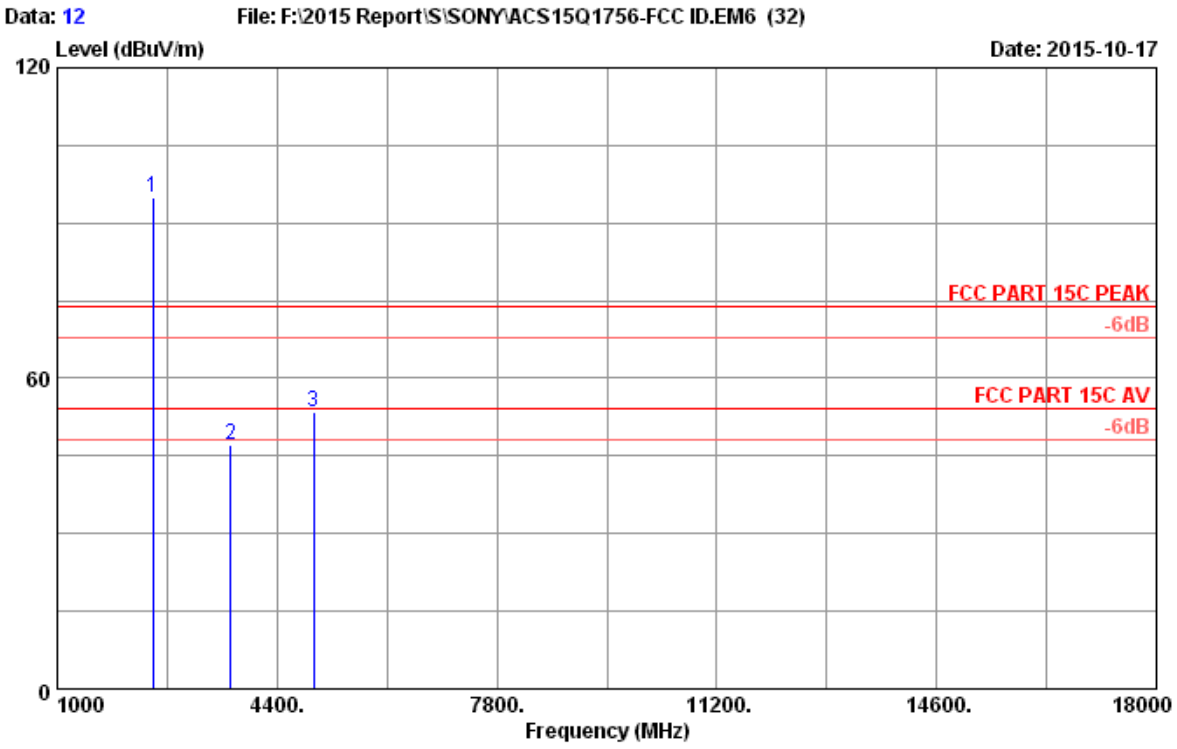

Site no. : 3m Chamber Data no. : 10
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2441MHz Tx Mode

| No. | 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 | 2441.000 | 28.08 | 7.39 | 36.60 | 96.27 | 95.14 | 74.00 | -21.14 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 44.51 | 47.41 | 74.00 | 26.59 | Peak |
| 3 | 4882.000 | 33.81 | 9.49 | 35.51 | 45.35 | 53.14 | 74.00 | 20.86 | Peak |

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



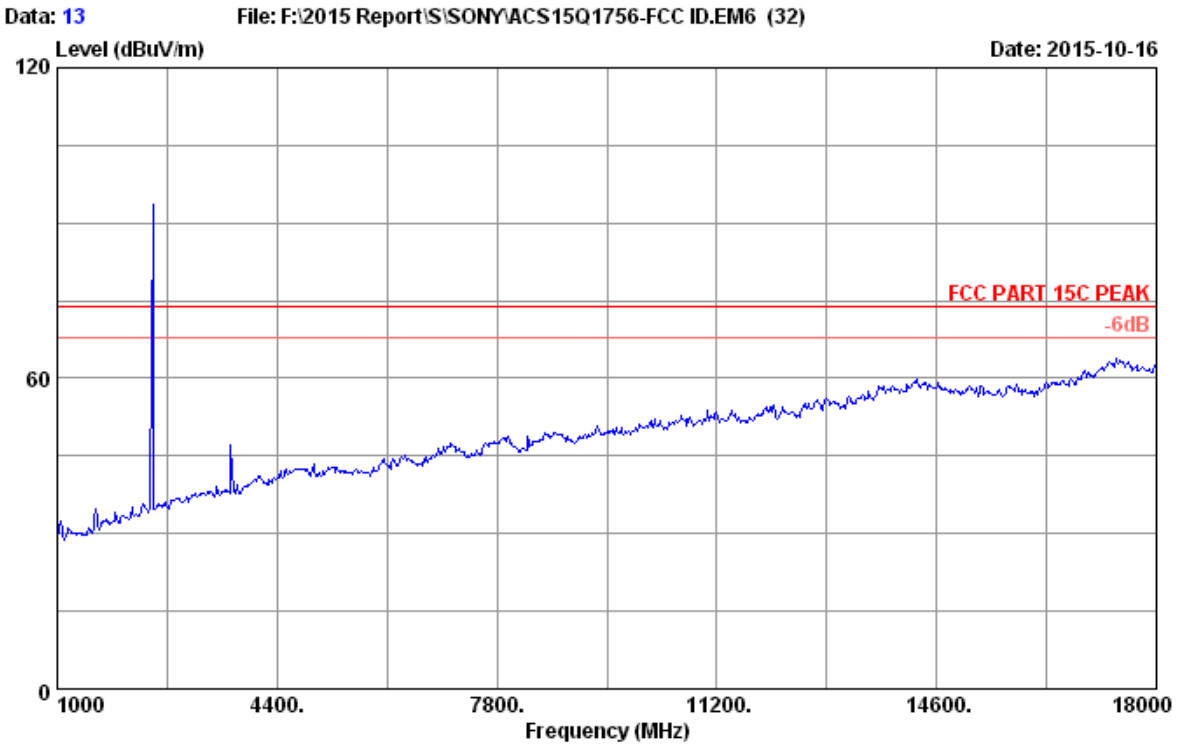

```
Site no.      : 3m Chamber                        Data no.  : 11
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2480MHz  Tx Mode
```



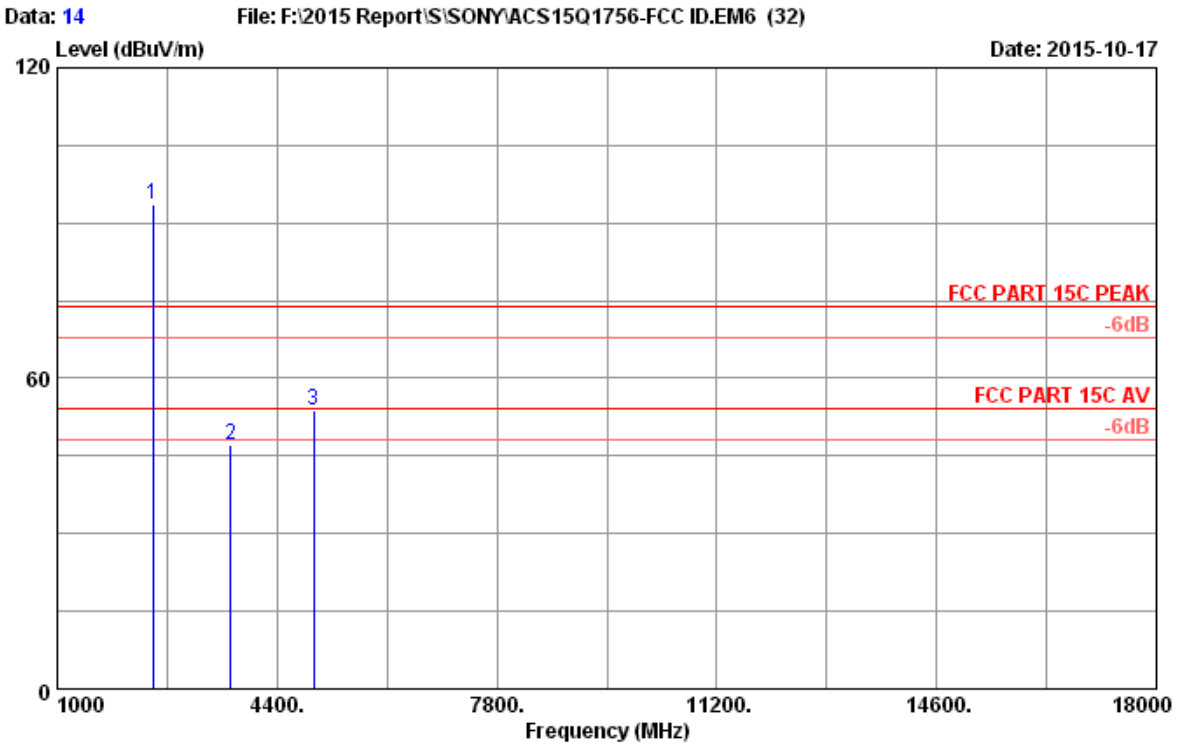

Site no. : 3m Chamber Data no. : 12
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2480MHz Tx Mode

| No. | 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 | 2480.000 | 28.16 | 7.47 | 36.59 | 96.01 | 95.05 | 74.00 | -21.05 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 44.32 | 47.22 | 74.00 | 26.78 | Peak |
| 3 | 4960.000 | 33.94 | 9.52 | 35.47 | 45.66 | 53.65 | 74.00 | 20.35 | Peak |

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



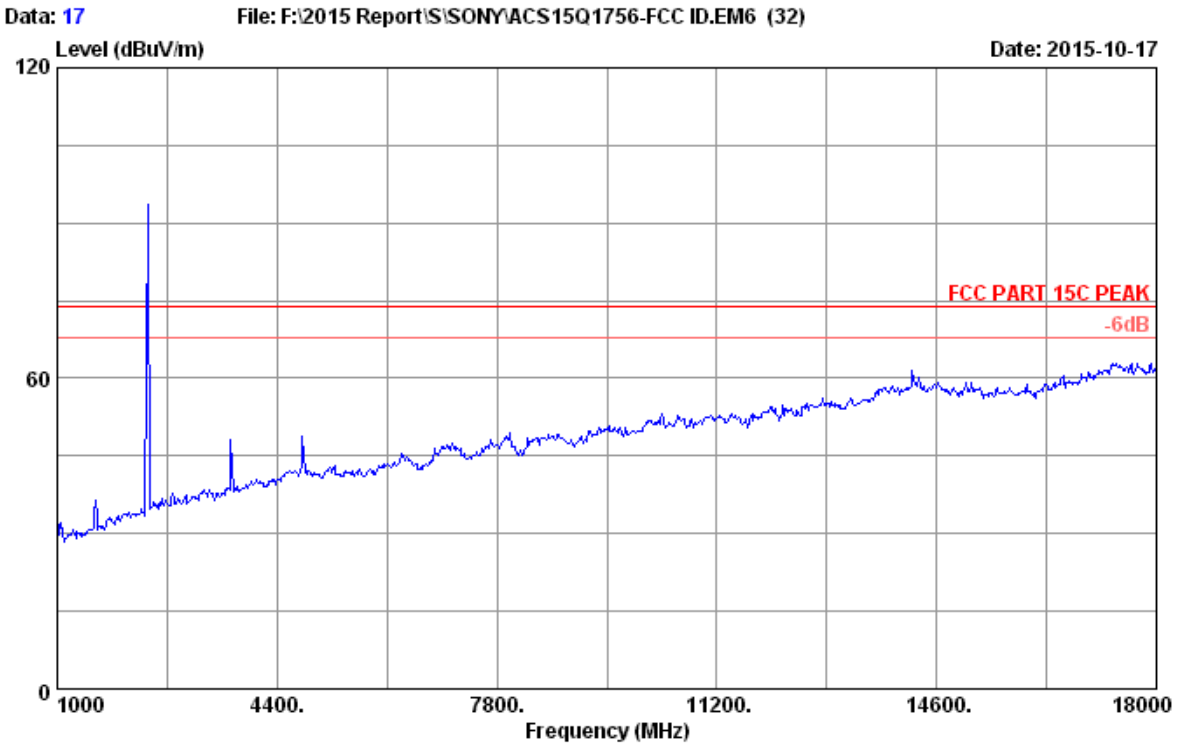

```
Site no.      : 3m Chamber                          Data no.  : 13
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2480MHz  Tx Mode
```



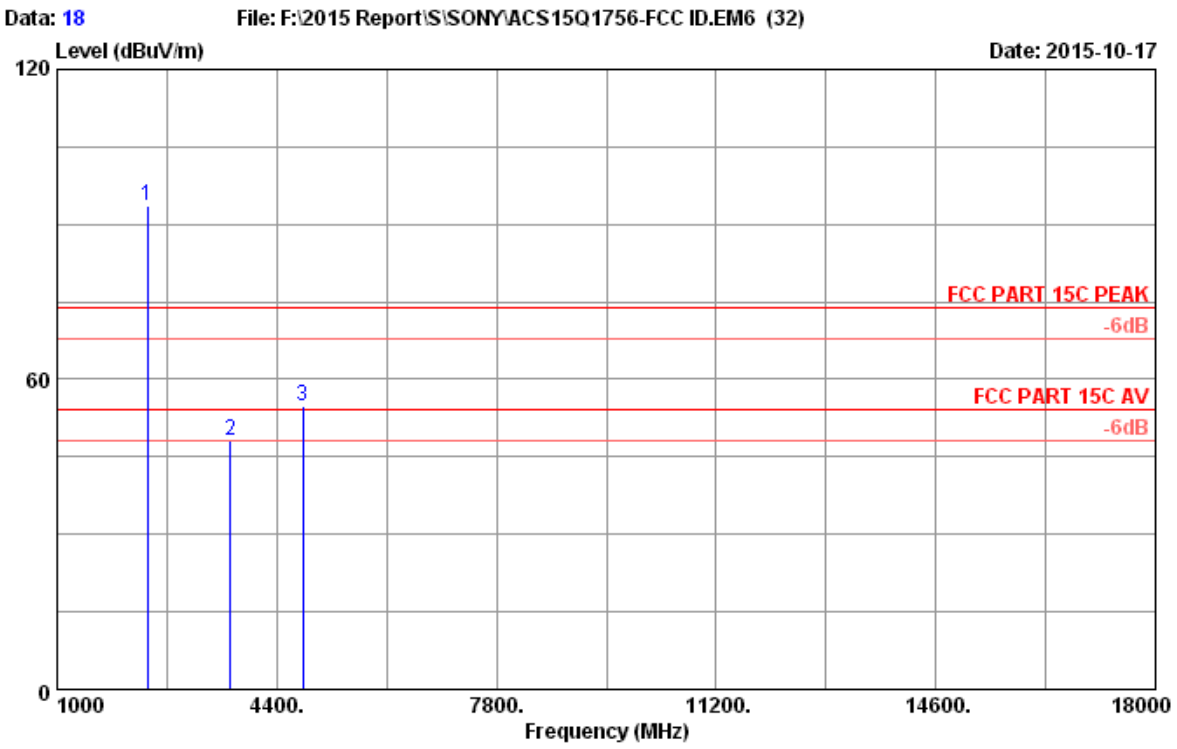

Site no. : 3m Chamber Data no. : 14
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2480MHz Tx Mode

| No. | 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 | 2480.000 | 28.16 | 7.47 | 36.59 | 94.54 | 93.58 | 74.00 | -19.58 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 44.12 | 47.02 | 74.00 | 26.98 | Peak |
| 3 | 4960.000 | 33.94 | 9.52 | 35.47 | 45.98 | 53.97 | 74.00 | 20.03 | Peak |

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




```
Site no.      : 3m Chamber                        Data no.  : 17
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2402MHz  Tx Mode
```

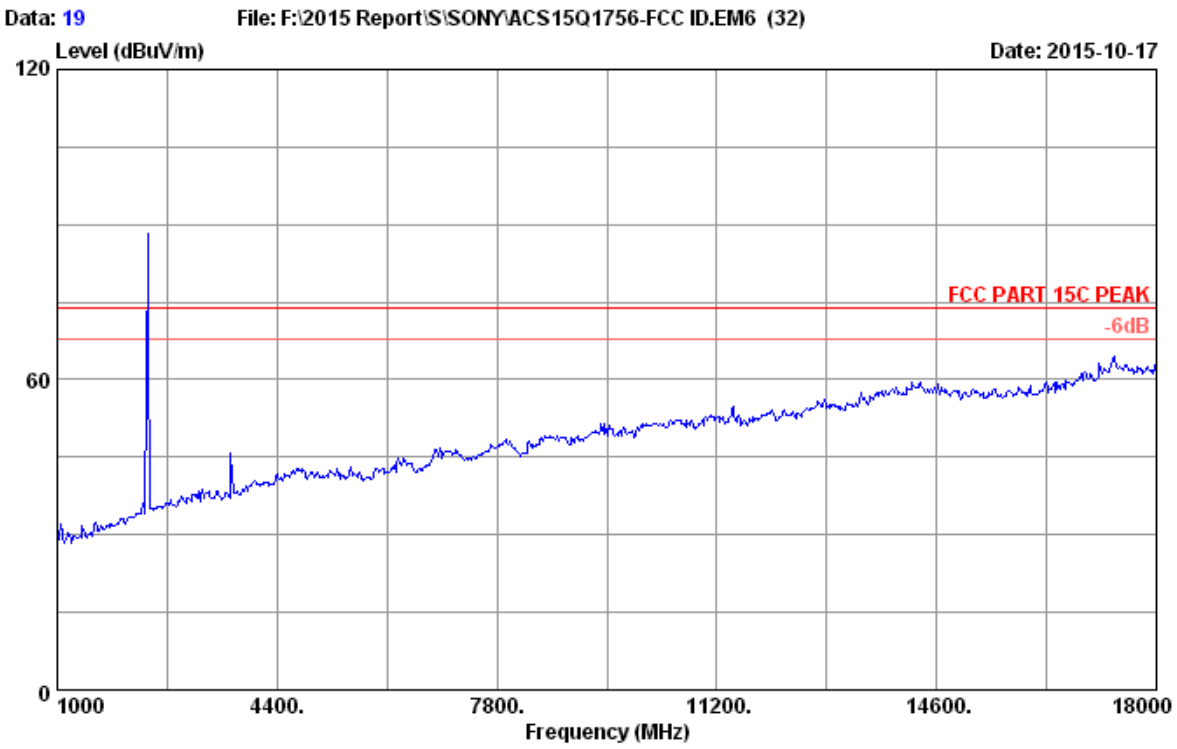



```
Site no.      : 3m Chamber                        Data no.  : 18
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2402MHz  Tx Mode
```

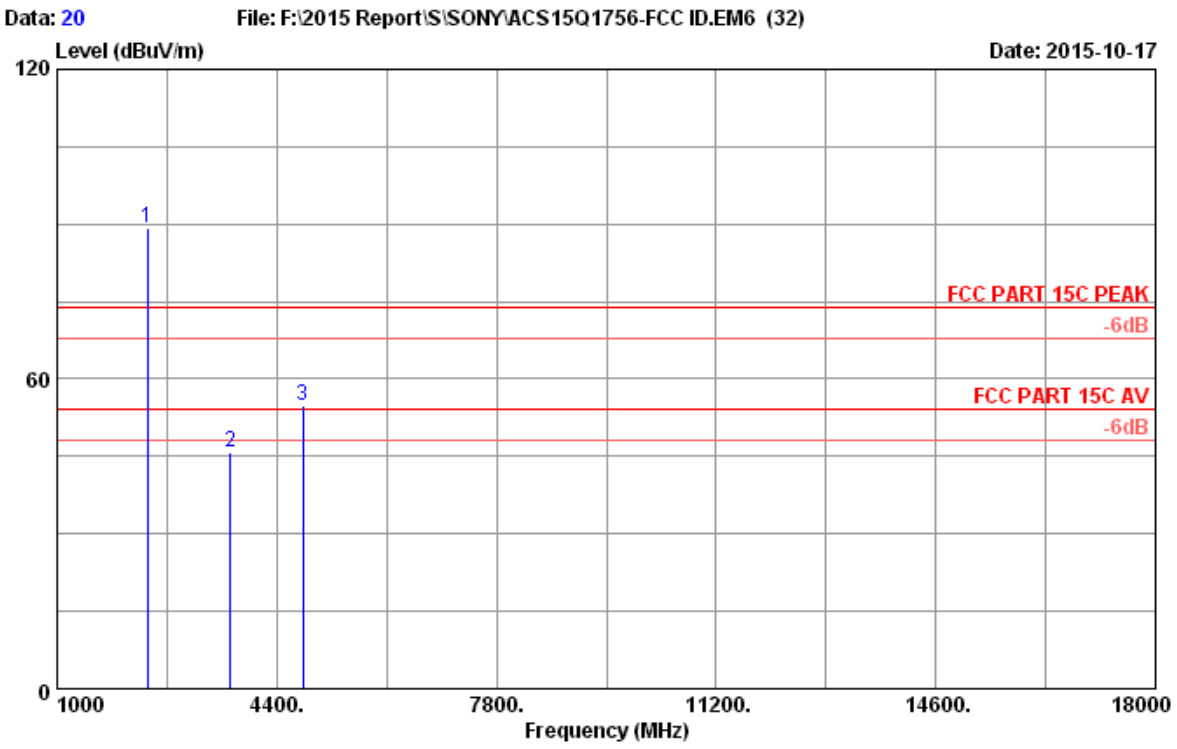
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.000 | 28.00 | 7.32 | 36.62 | 94.84 | 93.54 | 74.00 | -19.54 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 45.08 | 47.98 | 74.00 | 26.02 | Peak |
| 3 | 4804.000 | 33.69 | 9.46 | 35.54 | 47.12 | 54.73 | 74.00 | 19.27 | Peak |

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

| Frequency（MHz） | Peak level（dBuv/m） | Duty cycle factor (dB) | AV level (dBuv/m) | Limit(dBuv/m) | Conclusion |
|---|---|---|---|---|---|
| 4804.000 | 54.73 | -30.618 | 24.562 | 54 | Pass |




```
Site no.      : 3m Chamber                        Data no.  : 19
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2402MHz  Tx Mode
```

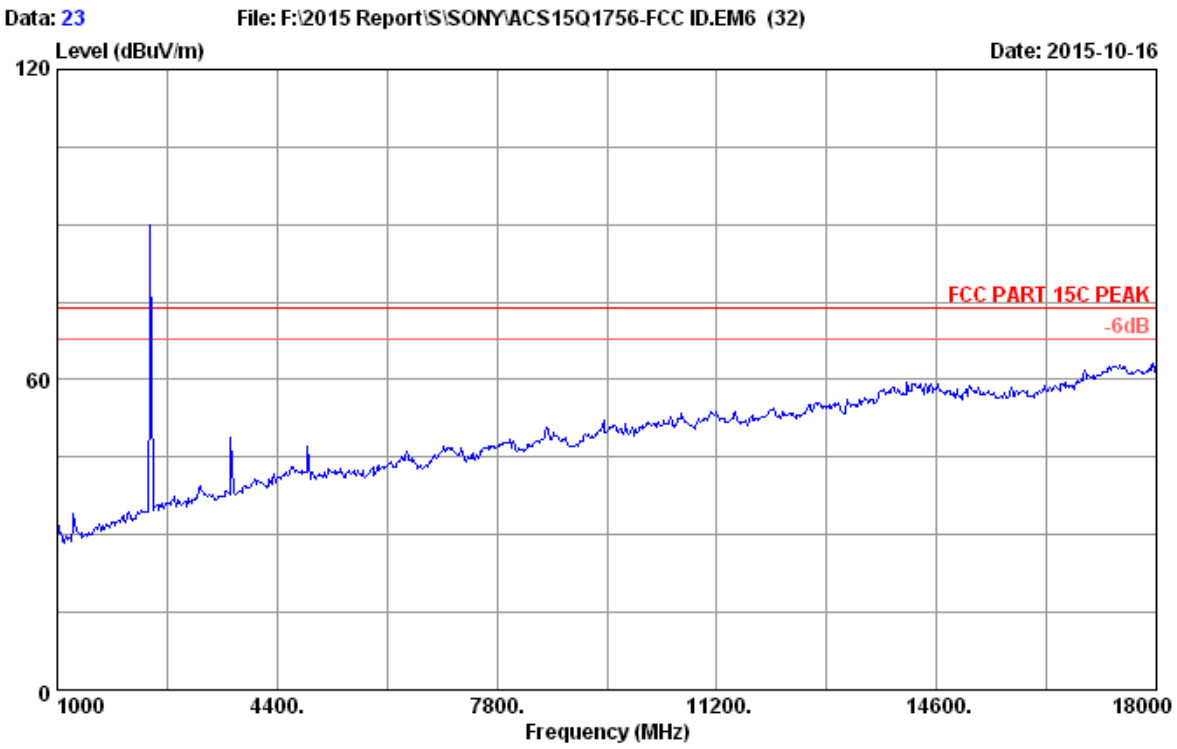



```
Site no.      : 3m Chamber                        Data no.  : 20
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2402MHz  Tx Mode
```

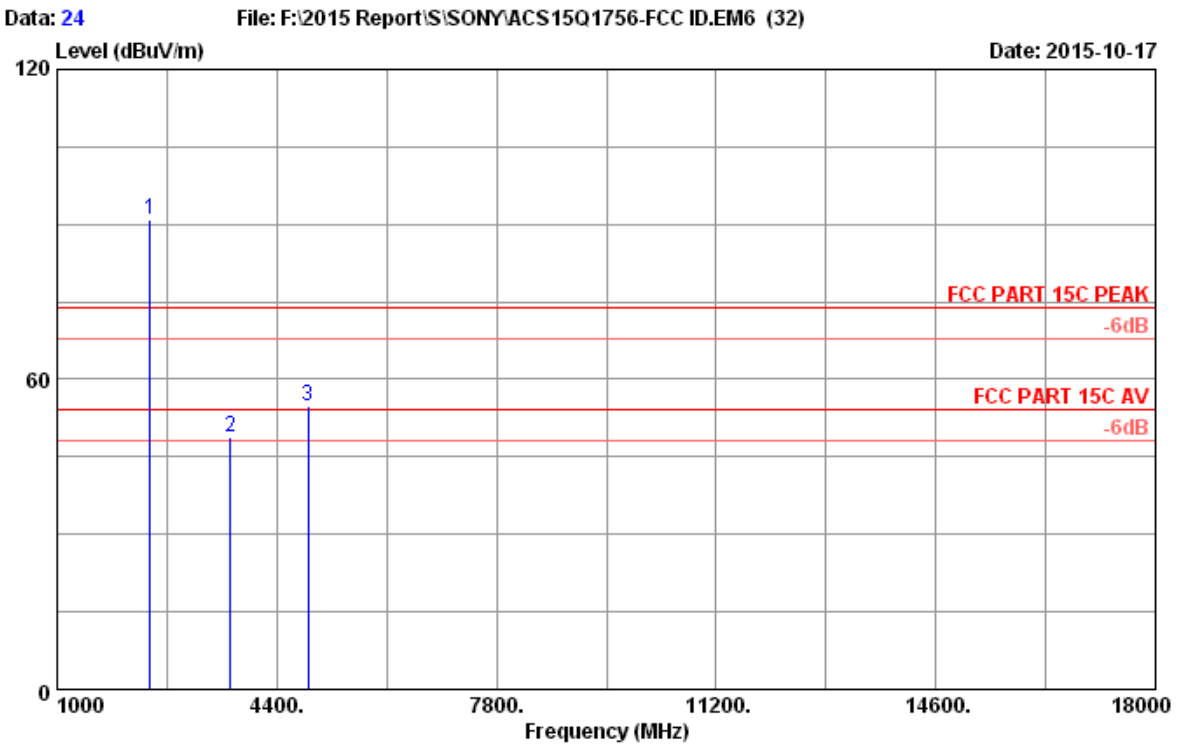
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.000 | 28.00 | 7.32 | 36.62 | 90.52 | 89.22 | 74.00 | -15.22 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 42.79 | 45.69 | 74.00 | 28.31 | Peak |
| 3 | 4804.000 | 33.69 | 9.46 | 35.54 | 47.27 | 54.88 | 74.00 | 19.12 | Peak |

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

| Frequency（MHz） | Peak level（dBuv/m） | Duty cycle factor (dB) | AV level (dBuv/m) | Limit(dBuv/m) | Conclusion |
|---|---|---|---|---|---|
| 4804.000 | 54.88 | -30.618 | 24.262 | 54 | Pass |




```
Site no.      : 3m Chamber                        Data no.  : 23
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2441MHz  Tx Mode
```

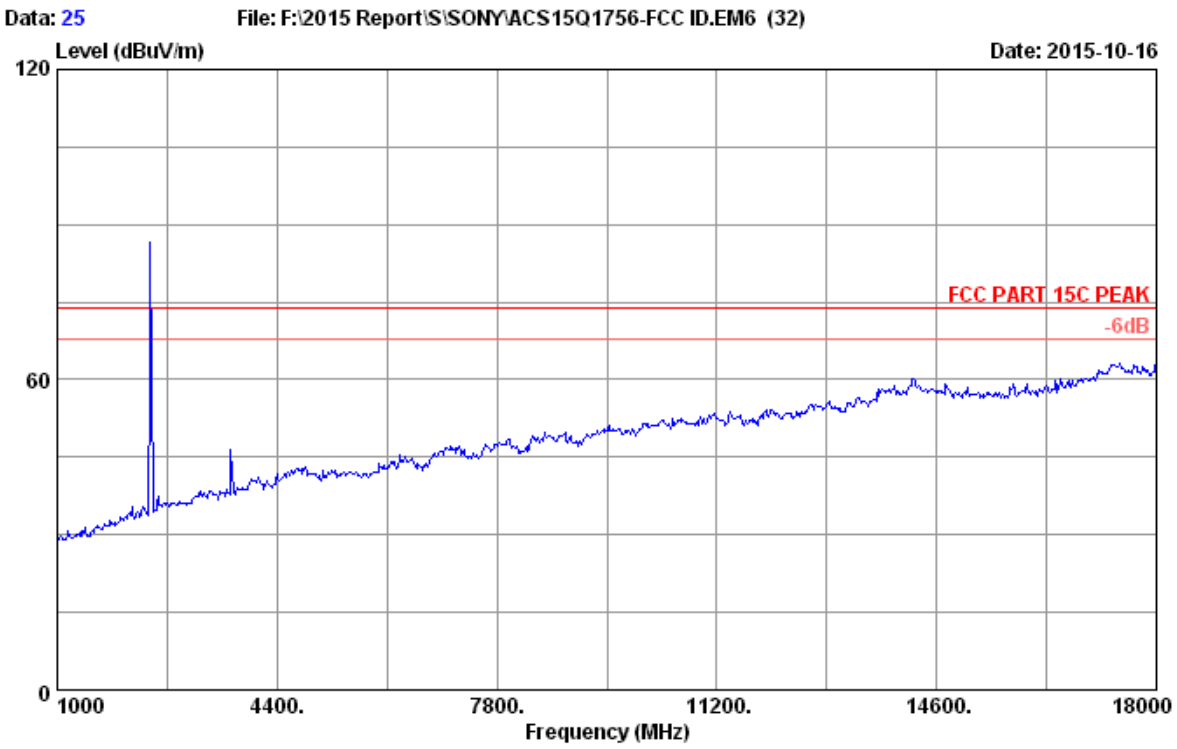



```
Site no.      : 3m Chamber                        Data no.  : 24
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2441MHz  Tx Mode
```

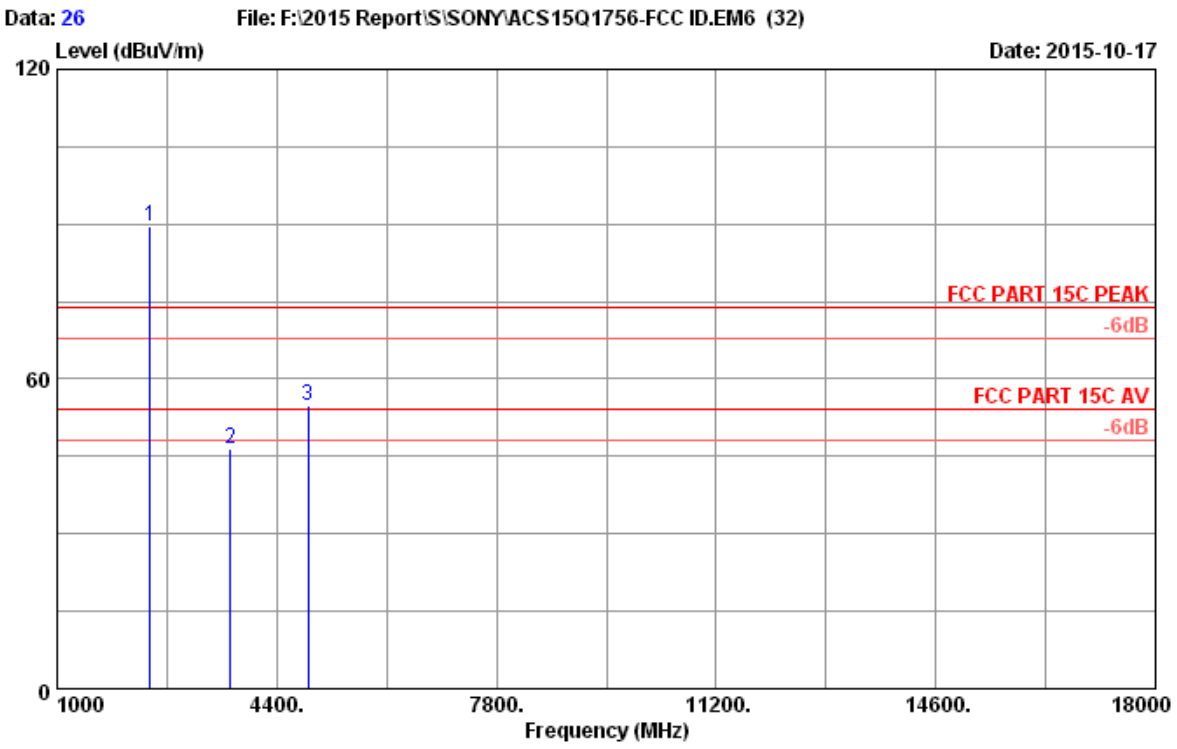
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2441.000 | 28.08 | 7.39 | 36.60 | 92.08 | 90.95 | 74.00 | -16.95 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 45.98 | 48.88 | 74.00 | 25.12 | Peak |
| 3 | 4882.000 | 33.81 | 9.49 | 35.51 | 46.98 | 54.77 | 74.00 | 19.23 | Peak |

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

| Frequency（MHz） | Peak level（dBuv/m） | Duty cycle factor (dB) | AV level (dBuv/m) | Limit(dBuv/m) | Conclusion |
|---|---|---|---|---|---|
| 4882.000 | 54.77 | -30.618 | 24.152 | 54 | Pass |




```
Site no.      : 3m Chamber                        Data no.  : 25
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2441MHz  Tx Mode
```

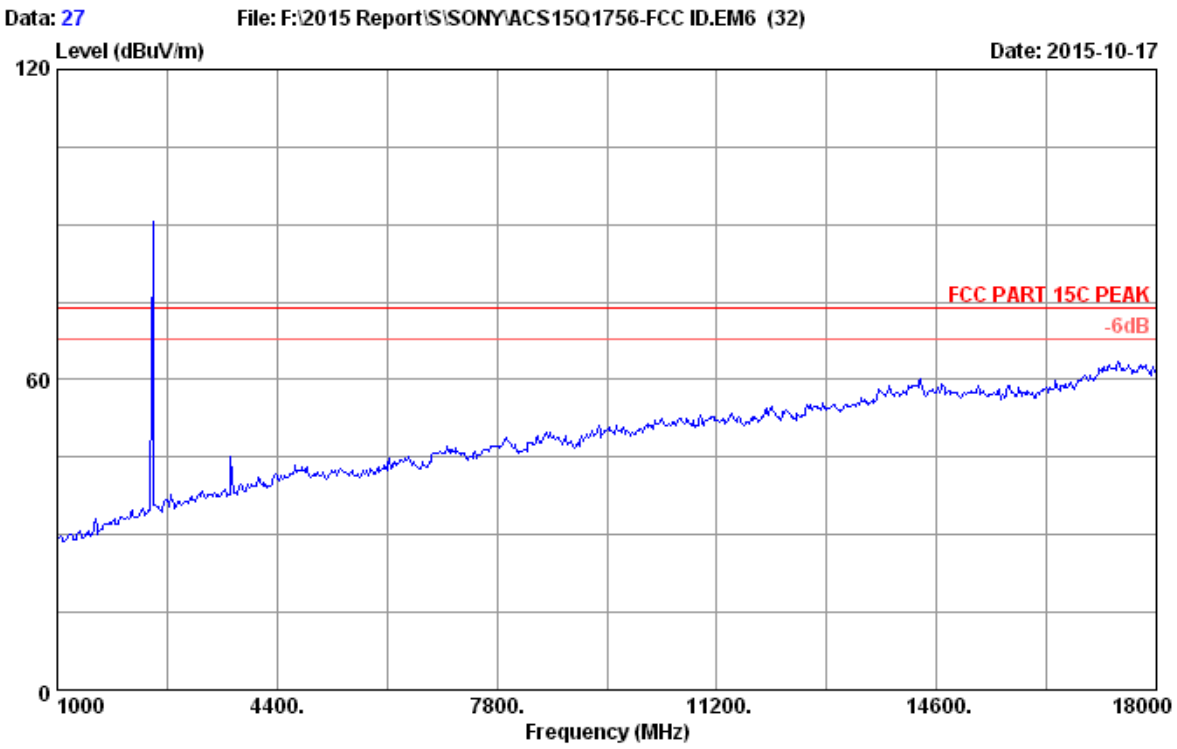



```
Site no.      : 3m Chamber                        Data no.  : 26
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2441MHz  Tx Mode
```

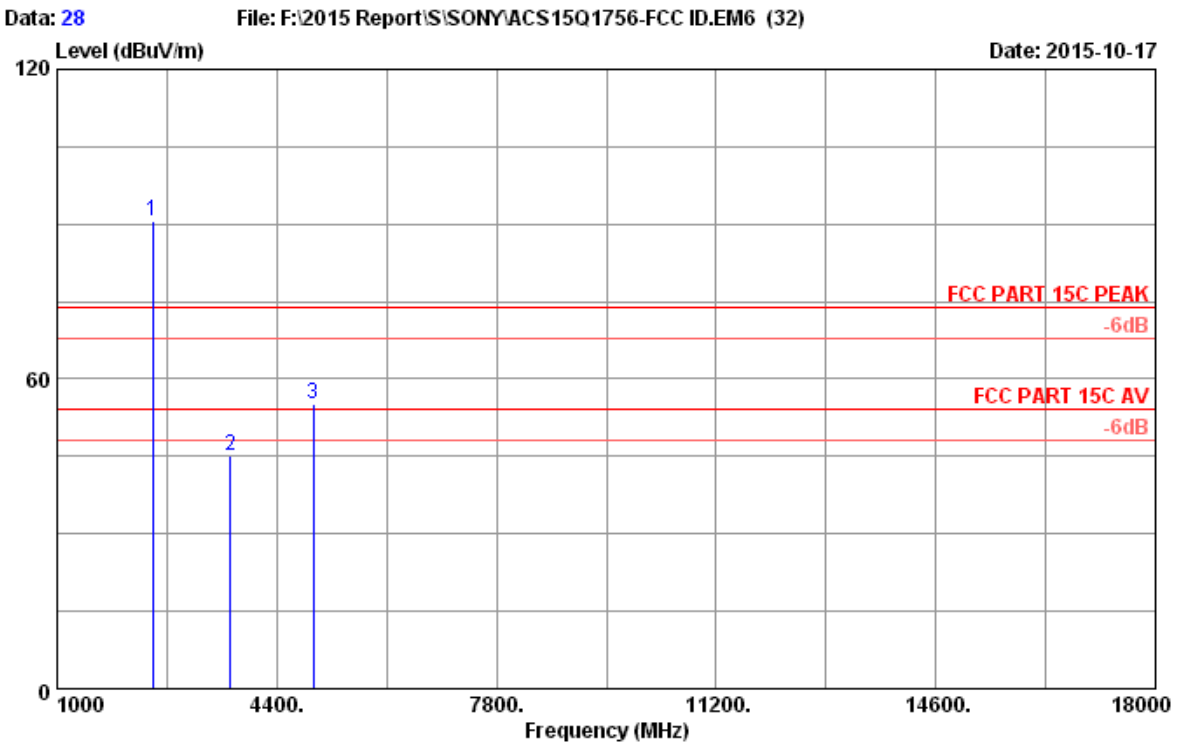
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2441.000 | 28.08 | 7.39 | 36.60 | 90.68 | 89.55 | 74.00 | -15.55 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 43.67 | 46.57 | 74.00 | 27.43 | Peak |
| 3 | 4882.000 | 33.81 | 9.49 | 35.51 | 47.10 | 54.89 | 74.00 | 19.11 | Peak |

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

| Frequency（MHz） | Peak level（dBuv/m） | Duty cycle factor (dB) | AV level (dBuv/m) | Limit(dBuv/m) | Conclusion |
|---|---|---|---|---|---|
| 4882.000 | 54.89 | -30.618 | 24.272 | 54 | Pass |




```
Site no.      : 3m Chamber                        Data no.  : 27
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2480MHz  Tx Mode
```

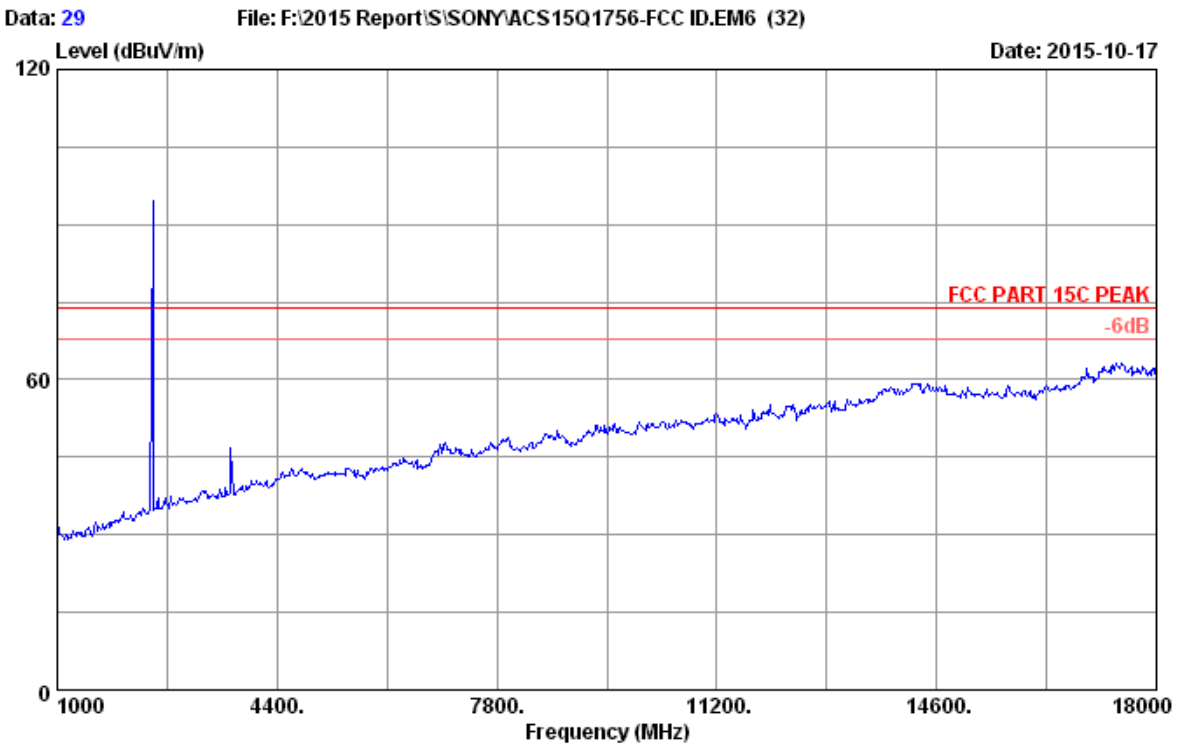



```
Site no.      : 3m Chamber                        Data no.  : 28
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2480MHz  Tx Mode
```

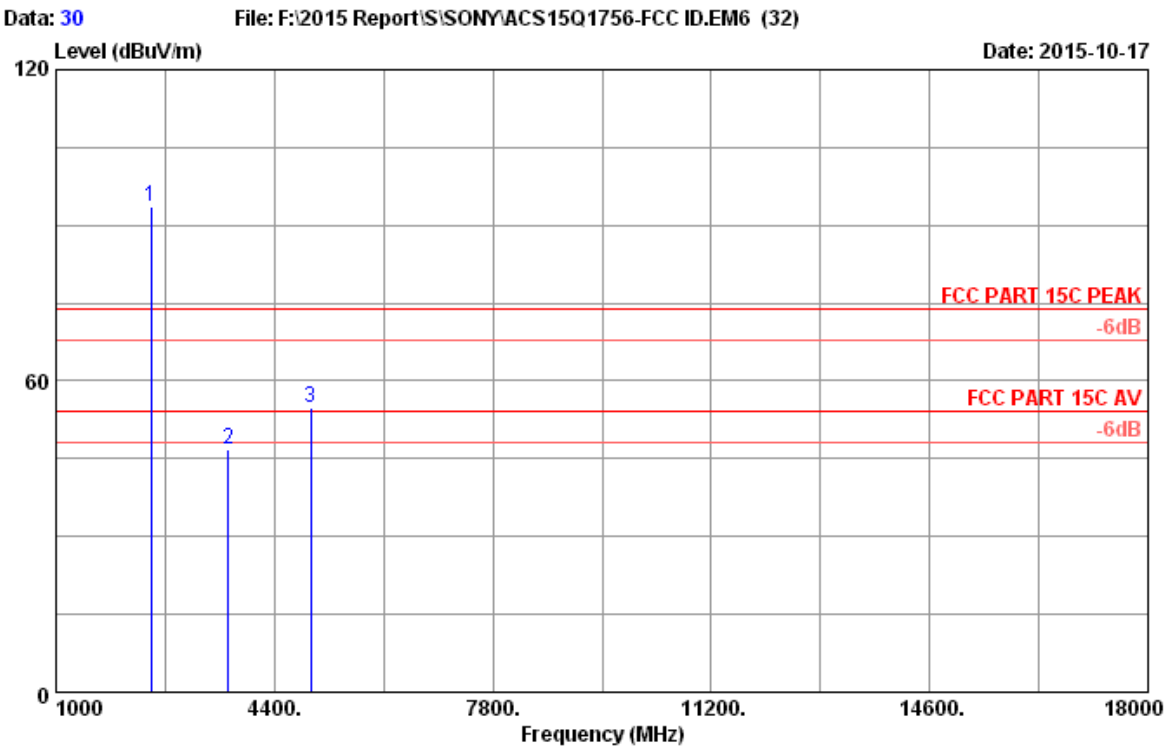
| No. | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | AMP factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.000 | 28.16 | 7.47 | 36.59 | 91.51 | 90.55 | 74.00 | -16.55 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 42.10 | 45.00 | 74.00 | 29.00 | Peak |
| 3 | 4960.000 | 33.94 | 9.52 | 35.47 | 47.05 | 55.04 | 74.00 | 18.96 | Peak |

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

| Frequency（MHz） | Peak level（dBuv/m） | Duty cycle factor (dB) | AV level (dBuv/m) | Limit(dBuv/m) | Conclusion |
|---|---|---|---|---|---|
| 4960.000 | 55.04 | -30.618 | 24.422 | 54 | Pass |




```
Site no.      : 3m Chamber                        Data no.  : 29
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2480MHz  Tx Mode
```




```
Site no.      : 3m Chamber                        Data no.  : 30
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : 8-DPSK 2480MHz  Tx Mode
```

| No. | 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 | 2480.000 | 28.16 | 7.47 | 36.59 | 94.59 | 93.63 | 74.00 | -19.63 | Peak |
| 2 | 3686.000 | 30.03 | 8.92 | 36.05 | 43.76 | 46.66 | 74.00 | 27.34 | Peak |
| 3 | 4960.000 | 33.94 | 9.52 | 35.47 | 46.83 | 54.82 | 74.00 | 19.18 | Peak |

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

| Frequency（MHz） | Peak level（dBuv/m） | Duty cycle factor (dB) | AV level (dBuv/m) | Limit(dBuv/m) | Conclusion |
|---|---|---|---|---|---|
| 4960.000 | 54.82 | -30.618 | 24.202 | 54 | Pass |

# 5. CONDUCTED SPURIOUS EMISSIONS

## 5.1.Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum | Agilent | N9030A | MY51380221 | Oct.29, 14 | 1Year |
| 2. | Attenuator (20dB) | Agilent | 8491B | MY39262165 | Apr. 28,15 | 1 Year |
| 3. | RF Cable | Hubersuhner | SUCOFLEX102 | 28620/2 | Apr. 28,15 | 1 Year |

## 5.2.Limit

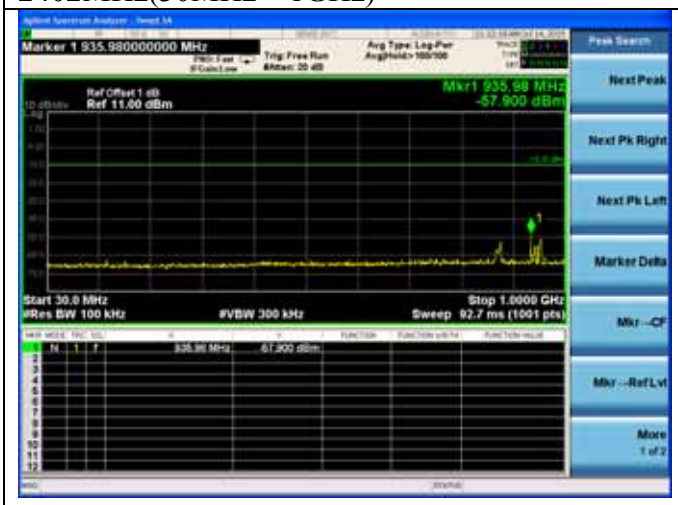
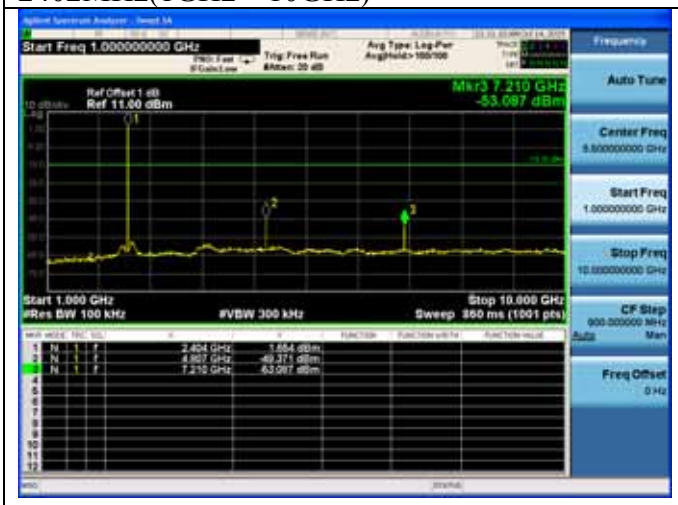
In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

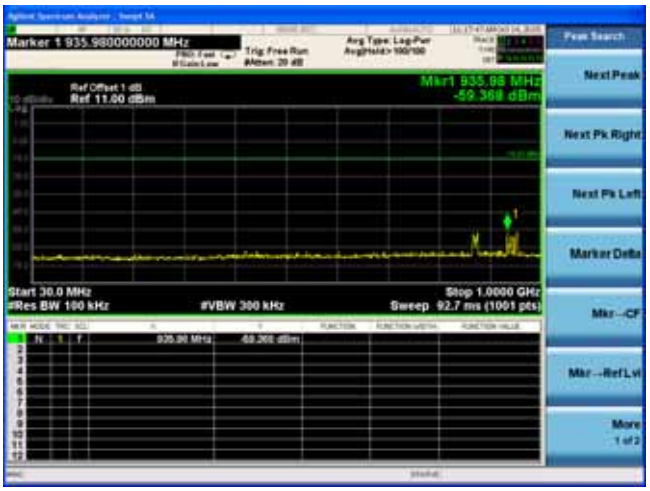
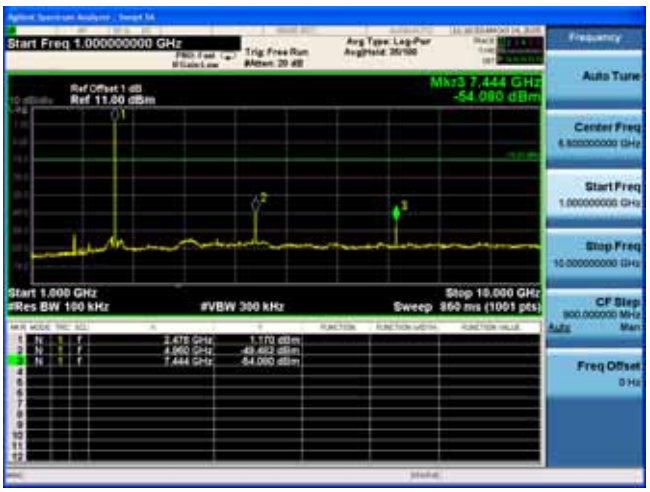
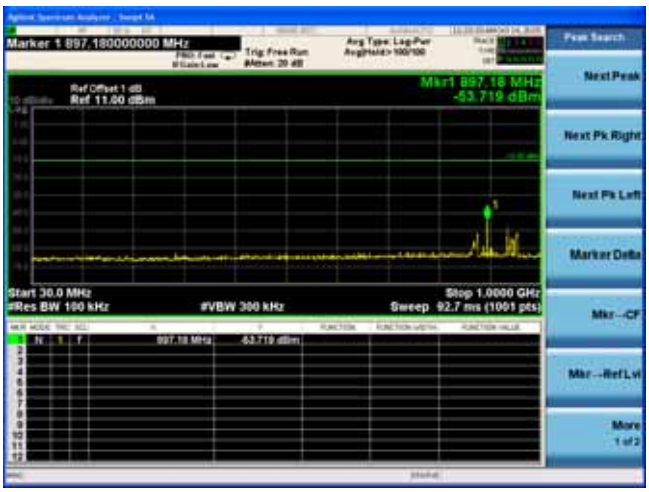
## 5.3.Test Procedure

The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions With peak detector.

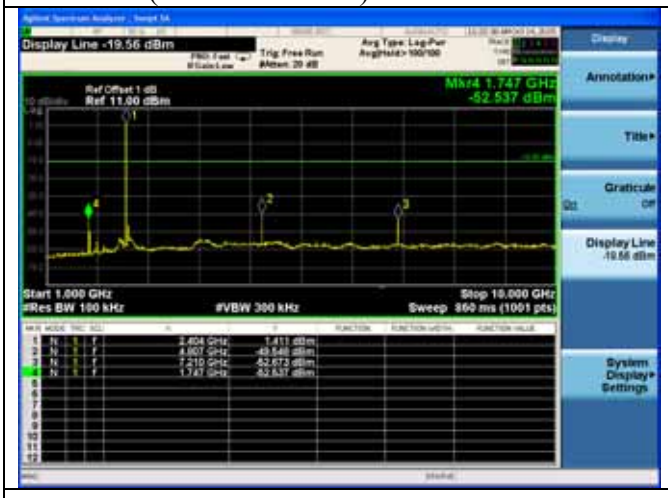
## 5.4.Test result

**PASS** (The testing data was attached in the next pages.)

| | |
|---|---|
| **Hopping off** | |
| **GFSK** | |
| 2402MHz(30MHz – 1GHz) | 2402MHz(10GHz – 25GHz) |
|  | |
| | |
| 2402MHz(1GHz – 10GHz) | 2441(30MHz – 1GHz) |
|  | |
| | |
| 2402MHz(2.3GHz – 2.4GHz) | 2441(1GHz – 10GHz) |
| | |

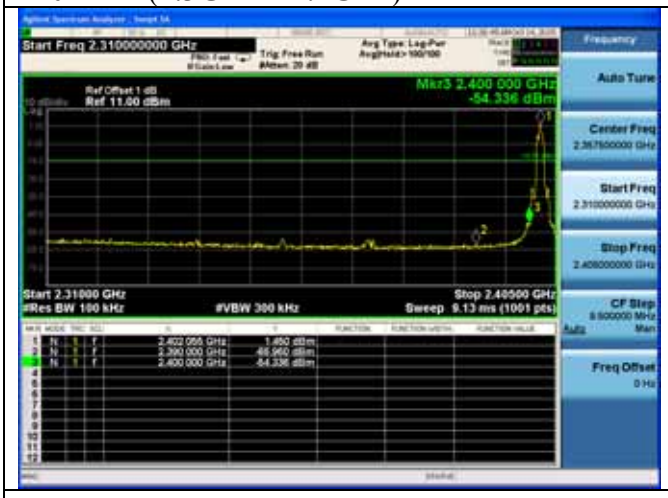
| 2441(10GHz – 25GHz) | 2480MHz(2.4GHz – 2.5GHz) |
|---|---|
| | |
| | |
| 2480MHz(30MHz – 1GHz) | 2480MHz(10GHz – 25GHz) |
|  | |
| | **8-DPSK** |
| 2480MHz(1GHz – 10GHz) | 2402MHz(30MHz – 1GHz) |
|  |  |

2402MHz(1GHz – 10GHz)

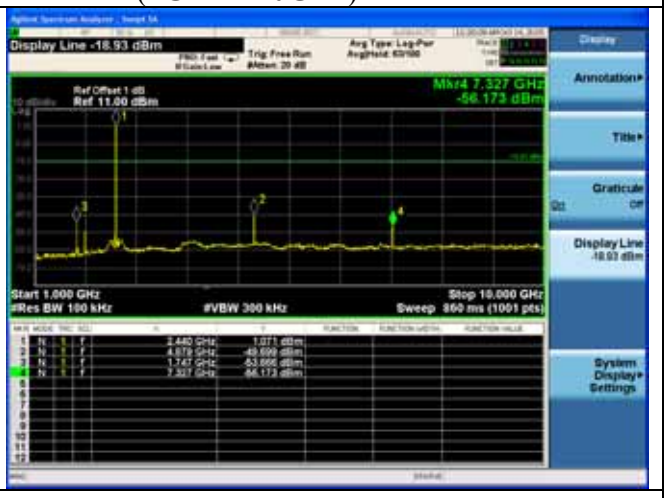



2441MHz (30MHz – 1GHz)

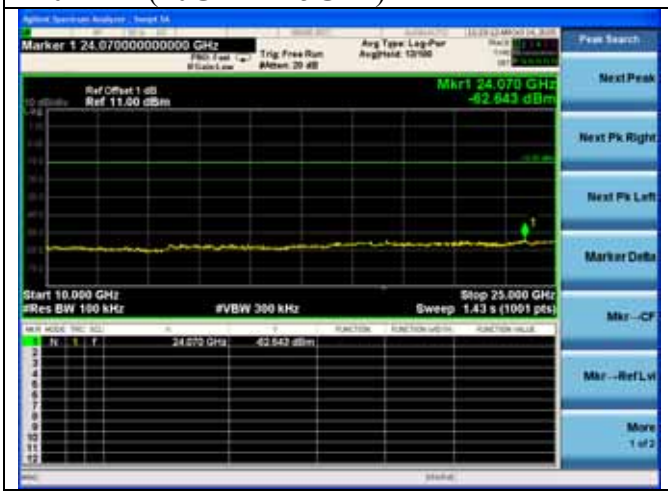
2402MHz(2.3GHz – 2.4GHz)



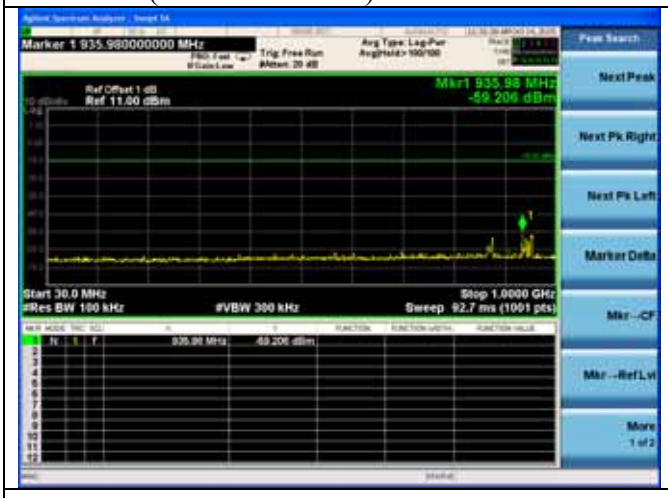
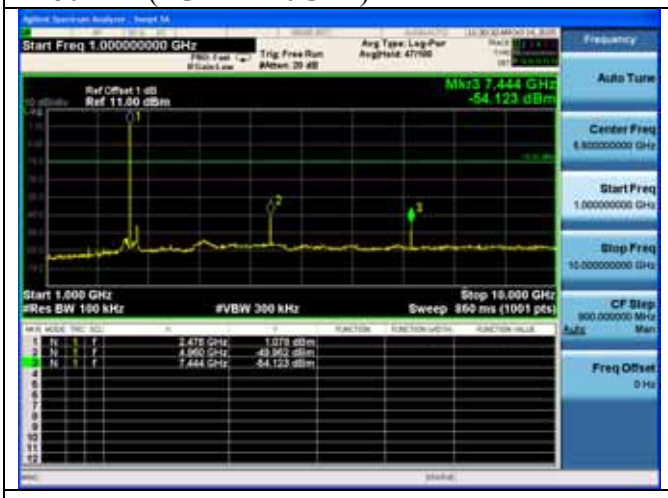
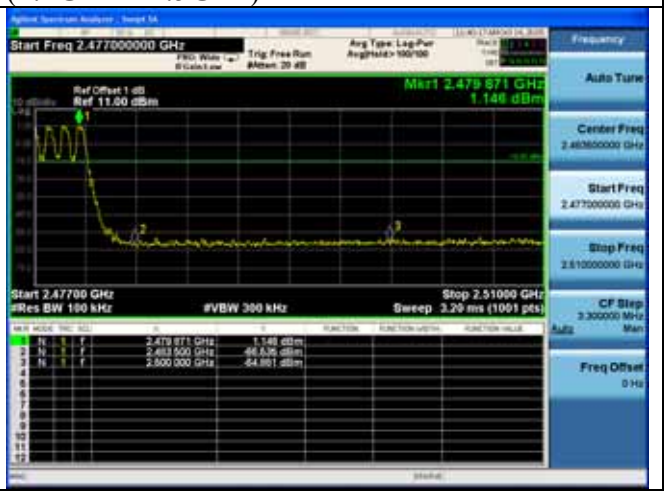

2441MHz(1GHz – 10GHz)

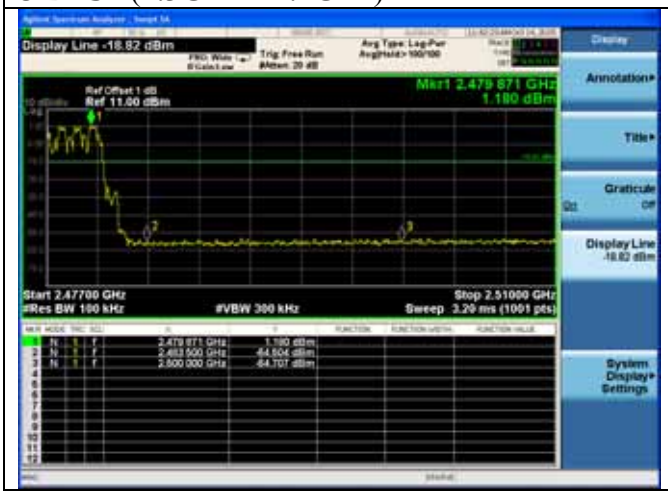



2402MHz(10GHz – 25GHz)




2441MHz(10GHz – 25GHz)

| 2480MHz(30MHz – 1GHz) | 2480MHz(10GHz – 25GHz) |
|---|---|
|  | |
| | **Hopping on** |
| 2480MHz(1GHz – 10GHz) | GFSK(2.3GHz – 2.4GHz) |
|  | |
| 2480MHz(2.4GHz – 2.5GHz) | (2.4GHz – 2.5GHz) |
| |  |

| **8-DPSK**(2.3GHz – 2.4GHz) | (2.4GHz – 2.5GHz) |
|---|---|
|  | |

# 6. 20 DB BANDWIDTH TEST

## 6.1.Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum | Agilent | N9030A | MY51380221 | Oct.29, 14 | 1Year |
| 2. | Attenuator (20dB) | Agilent | 8491B | MY39262165 | Apr. 28,15 | 1 Year |
| 3. | RF Cable | Hubersuhner | SUCOFLEX102 | 28620/2 | Apr. 28,15 | 1 Year |

## 6.2.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.

## 6.3.Test Results

| EUT: Home Audio System | | | |
|---|---|---|---|
| M/N: MHC-V11 | | | |
| Test Date: 2015-10-14 | | Test site: RF Chamber | Tested by: THOMAX |
| Temperature: 22.3±0.6℃ | | Humidity: 50.7±3.0% | Pressure: 101.6±1.0kpa |
| Test Mode | Frequency (MHz) | 20dB bandwidth (KHz) | Limit (KHz) |
| GFSK | 2402 | 681.7 | N/A |
| | 2441 | 676.3 | N/A |
| | 2480 | 679.4 | N/A |
| 8-DPSK | 2402 | 1163.0 | N/A |
| | 2441 | 1163.0 | N/A |
| | 2480 | 1164.0 | N/A |
| Conclusion：PASS | | | |

| **GFSK** | **8-DPSK** |
|---|---|
| 2402MHz | 2402MHz |
| | |
| | |
| 2441MHz | 2441MHz |
| | |
| | |
| 2480MHz | 2480MHz |
| | |

# 7. CARRIER FREQUENCY SEPARATION TEST

## 7.1.Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | N9030A | MY51380221 | Oct. 29, 14 | 1Year |
| 2. | RF Cable | Hubersuhner | SUCOFLEX102 | 28620/2 | Apr. 28,15 | 1 Year |

## 7.2.Limit

Frequency hopping systems shall have hopping channel carrier frequency separated by a minimum of 25kHz or the 20dB 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.

## 7.3.Test Results.

| | | |
|---|---|---|
| EUT: Home Audio System | | |
| M/N: MHC-V11 | | |
| Test date: 2015-10-14 | Pressure: 101.4±1.0kpa | Humidity: 51.4±3.0% |
| Tested by: THOMAX | Test site: RF Site | Temperature: 23.4±0.6℃ |

| Test Mode | Channel separation | Limit(KHz) | Conclusion |
|---|---|---|---|
| GFSK | 1.0MHz | 808.67 | PASS |
| 8-DPSK | 1.0MHz | 581.67 | PASS |

# 8. NUMBER OF HOPPING FREQUENCY TEST

## 8.1.Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | N9030A | MY51380221 | Oct.29, 14 | 1Year |
| 2. | RF Cable | Hubersuhner | SUCOFLEX102 | 28620/2 | Apr.28, 15 | 1 Year |

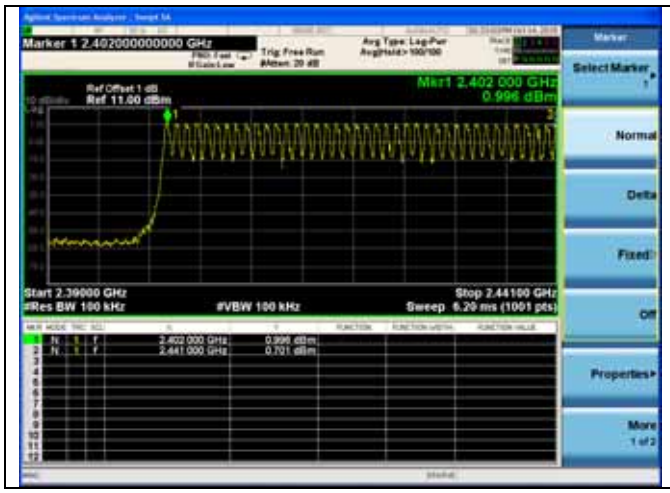
## 8.2.Limit

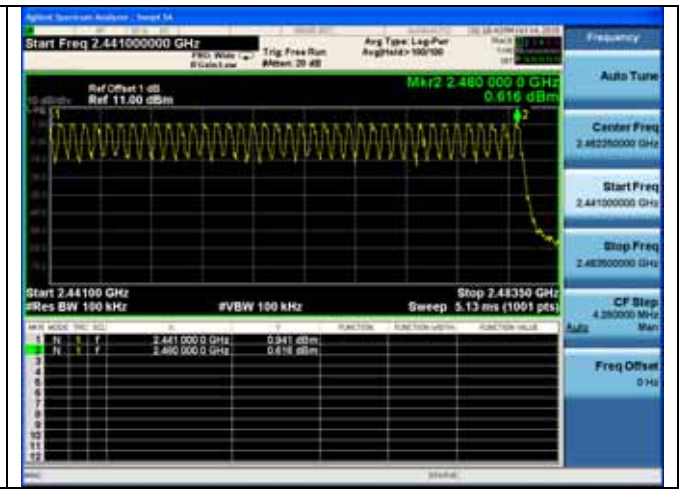
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

## 8.3.Test Results

| | | |
|---|---|---|
| EUT: Home Audio System | | |
| M/N: MHC-V11 | | |
| Test date: 2015-10-14 | Pressure: 101.4±1.0kpa | Humidity: 51.4±3.0% |
| Tested by: THOMAX | Test site: RF Site | Temperature: 23.4±0.6℃ |

| Test Mode | Number of channel | Limit | Conclusion |
|---|---|---|---|
| 8-DPSK | 79 | >=15 | PASS |
| GFSK | 79 | >=15 | PASS |



# 9. DWELL TIME

## 9.1.Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | Agilent | N9030A | MY51380221 | Oct.29, 14 | 1Year |
| 2. | RF Cable | Hubersuhner | SUCOFLEX102 | 28620/2 | Apr.28, 15 | 1 Year |

## 9.2.Limit

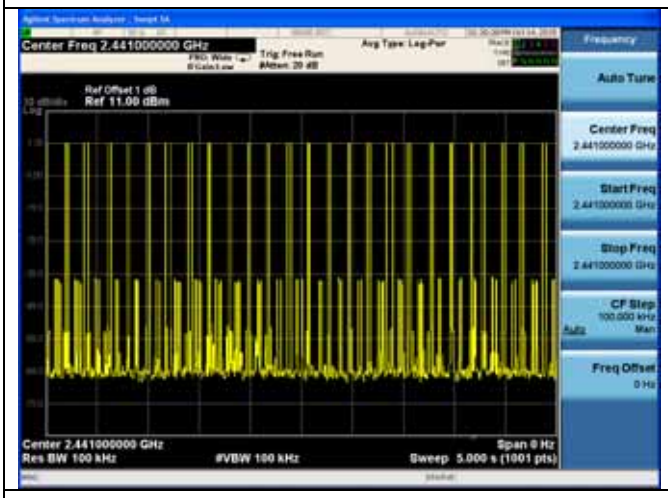
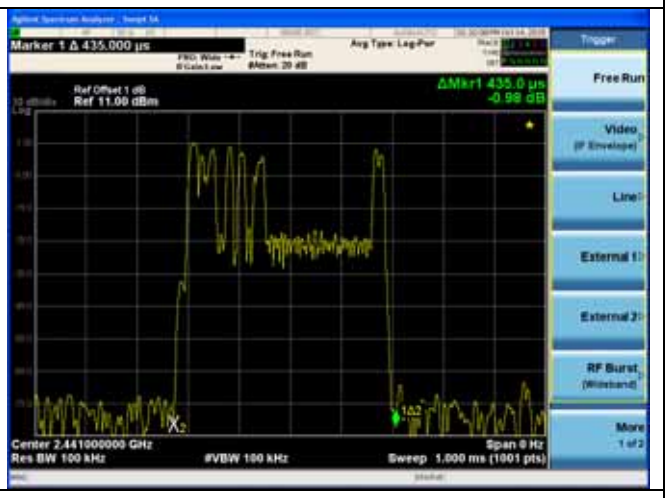
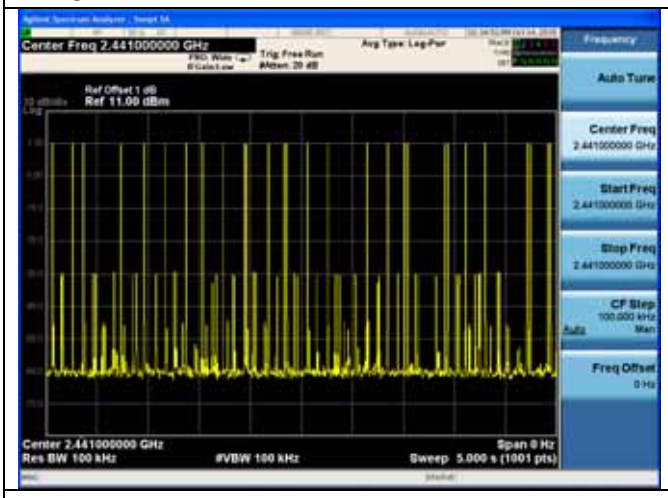
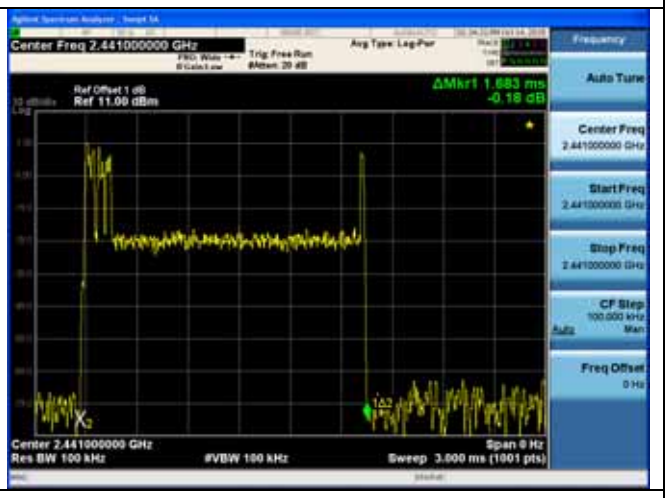
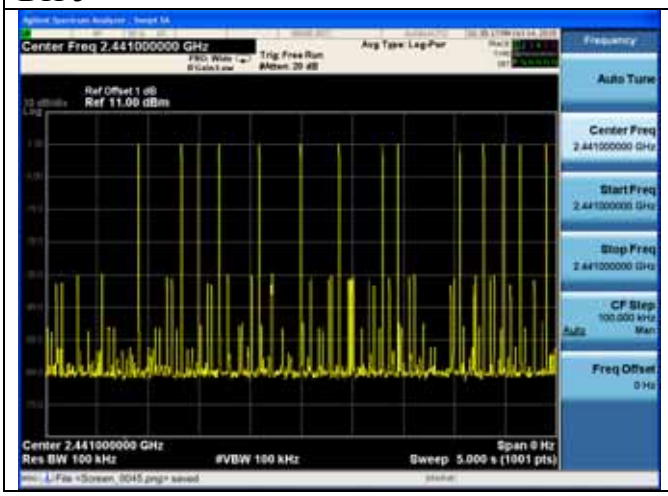
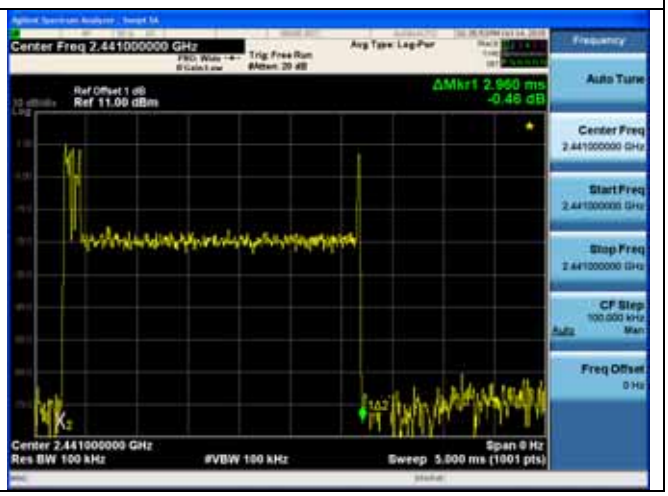
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

## 9.3.Test Results

| | | |
|---|---|---|
| EUT: Home Audio System | | |
| M/N: MHC-V11 | | |
| Test date: 2015-10-14 | Pressure: 101.4±1.0kpa | Humidity: 51.4±3.0% |
| Tested by: THOMAX | Test site: RF Site | Temperature: 23.4±0.6℃ |

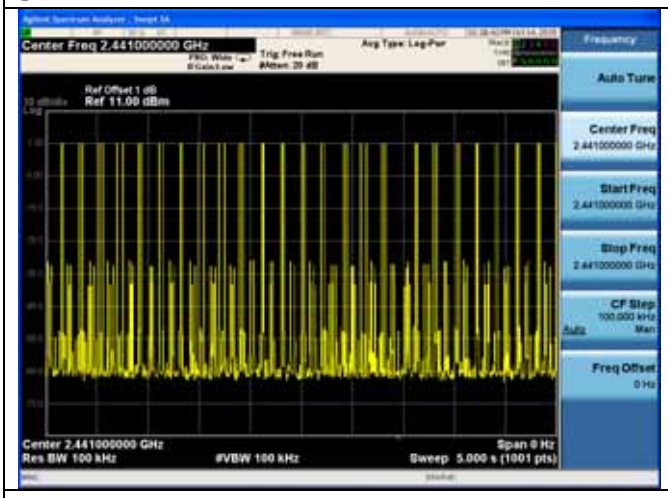
| Mode | | dwell time | Limit | Conclusion |
|---|---|---|---|---|
| GFSK | DH1 | 44hops/5s*0.4*79chanels*0.435ms =120.965ms | <400ms | PASS |
| | DH3 | 26hops/5s*0.4*79chanels*1.683ms =276.551ms | <400ms | PASS |
| | DH5 | 14hops/5s*0.4*79chanels*2.960ms =261.901ms | <400ms | PASS |
| 8-DPSK | DH1 | 43hops/5s*0.4*79chanels*0.432ms =117.400ms | <400ms | PASS |
| | DH3 | 26hops/5s*0.4*79chanels*1.689ms =277.536ms | <400ms | PASS |
| | DH5 | 15hops/5s*0.4*79chanels*2.950ms =279.660ms | <400ms | PASS |

Note: All the lower levels were signaled from receiver and should not be considered in here.

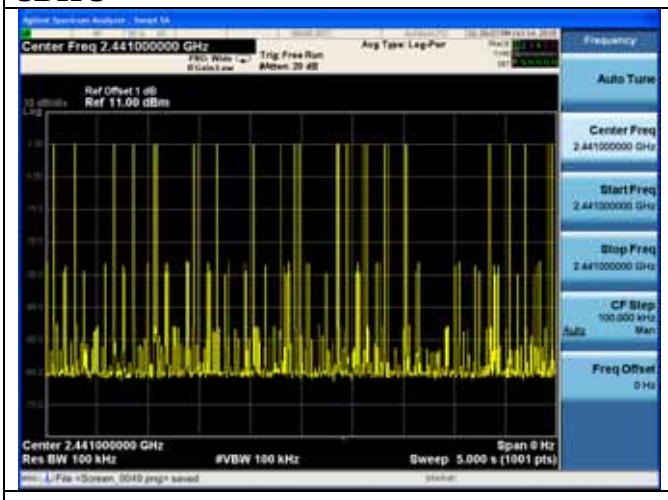
| **GFSK** | |
|---|---|
| DH 1 | |
|  |  |
| | |
| DH 3 | |
|  |  |
| | |
| DH 5 | |
|  |  |

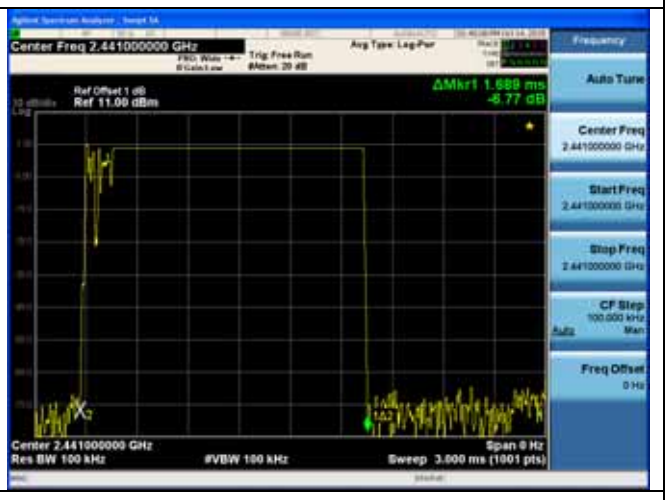
## 8-DPSK

### 3DH 1

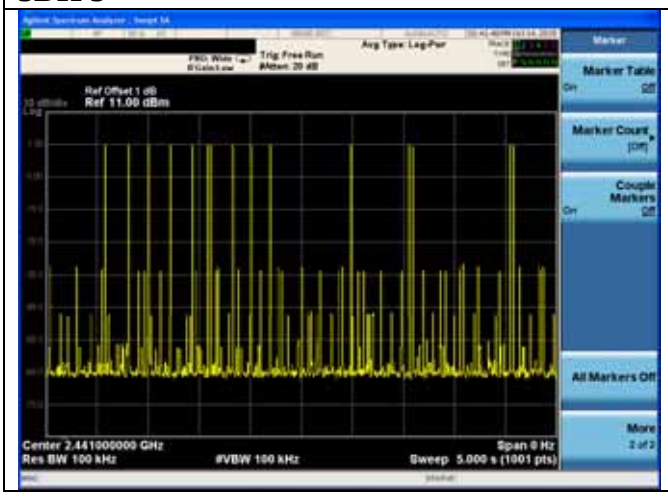


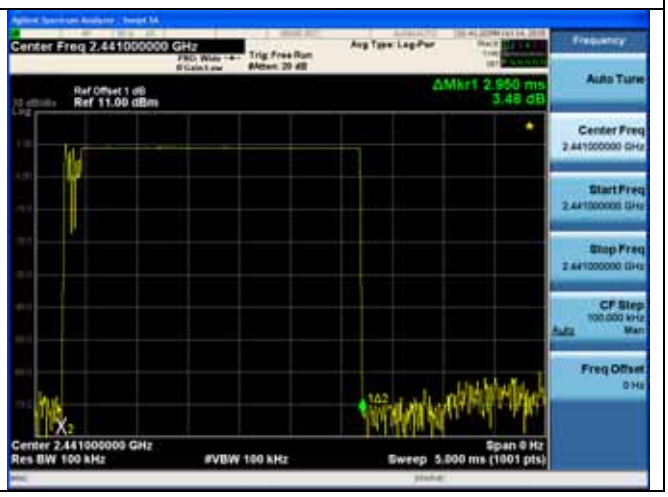
### 3DH 3




### 3DH 5



# 10. MAXIMUM PEAK OUTPUT POWER TEST

## 10.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum | Agilent | N9030A | MY51380221 | Oct.29, 14 | 1Year |
| 2. | Power meter | Anritsu | ML2487A | 6K00002472 | Apr. 28,15 | 1Year |
| 3. | Power sensor | Anritsu | MA2491A | 0033005 | Apr. 28,15 | 1Year |
| 4. | Attenuator (20dB) | Agilent | 8491B | MY39262165 | Apr. 28,15 | 1Year |
| 5. | RF Cable | Hubersuhner | SUCOFLEX102 | 28610/2 | Apr. 28,15 | 1Year |

## 10.2. 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.

## 10.3. Test Procedure

Connected the EUT's antenna port to Power Sensor, and use power meter to test peak output power directly.

## 10.4. Test Results

| EUT: Home Audio System | | | |
|---|---|---|---|
| M/N: MHC-V11 | | | |
| Test Date: 2015-10-14 | | Test site: RF Chamber | Tested by: THOMAX |
| Temperature: 22.3±0.6℃ | | Humidity: 50.7±3.0% | Pressure: 101.6±1.0kpa |
| Test Mode | Frequency (MHz) | Peak output Power （dBm） | Limit (dBm) |
| GFSK | 2402 | 1.702 | 30 |
| | 2441 | 1.543 | 30 |
| | 2480 | 1.494 | 30 |
| 8-DPSK | 2402 | 2.084 | 30 |
| | 2441 | 1.844 | 30 |
| | 2480 | 1.838 | 30 |
| Conclusion: PASS | | | |

# 11. BAND EDGE COMPLIANCE TEST

## 11.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Spectrum | Agilent | E4446A | US44300459 | Apr.28,15 | 1 Year |
| 2. | Amp | HP | 8449B | 3008A02495 | Apr.28,15 | 1 Year |
| 3. | Horn Antenna | ETC | MCTD 1209 | DRH15F03007 | Feb.03,15 | 1 Year |
| 4. | HF Cable | Hubersuhner | Sucoflex104 | 274094/4 | Apr.28,15 | 1 Year |

## 11.2. 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.

## 11.3. Test Produce

For upper band emissions that are up to two bandwidths(2MHz) away (2483.5MHz to 2485.5MHz） from the band-edge use below produce:

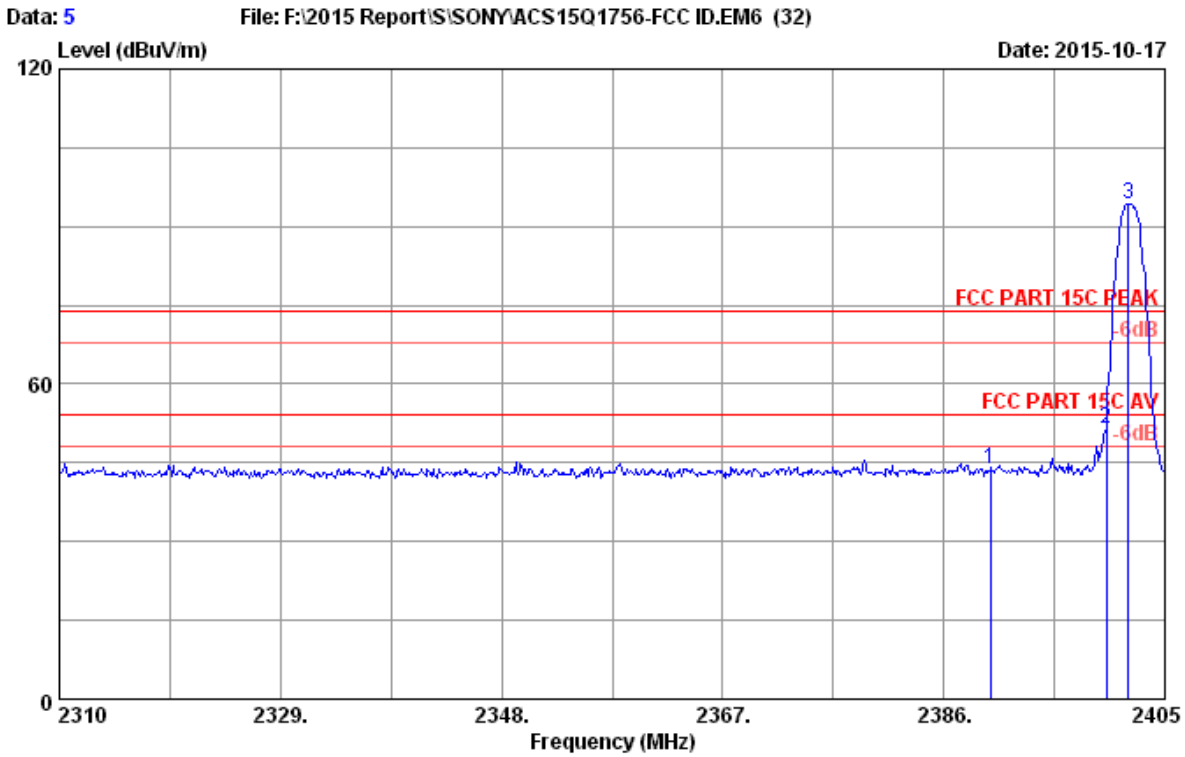
1. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 100KHz and with a video bandwidth 300KHz. Record the peak levels of the fundamental emission and the relevant band-edge emission, Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
2. Subtract the delta measured in step (1) from the maximum field strengths measured in clause 4 .The resultant field strengths are then used to determine band-edge compliance as required by Section 15.205

For emissions above two bandwidths away from the band-edge use below produce:

1. The EUT is placed on a insulating material (up to 12mm thick) worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upperband-edges of the emission:
   (a) PEAK: RBW=1MHz ;VBW=3MHz, PK detector, Sweep=AUTO
   (b) This is pulse Modulation device a duty cycle factor was used to calculate average level based measured peak level.

## 11.4. Test Results

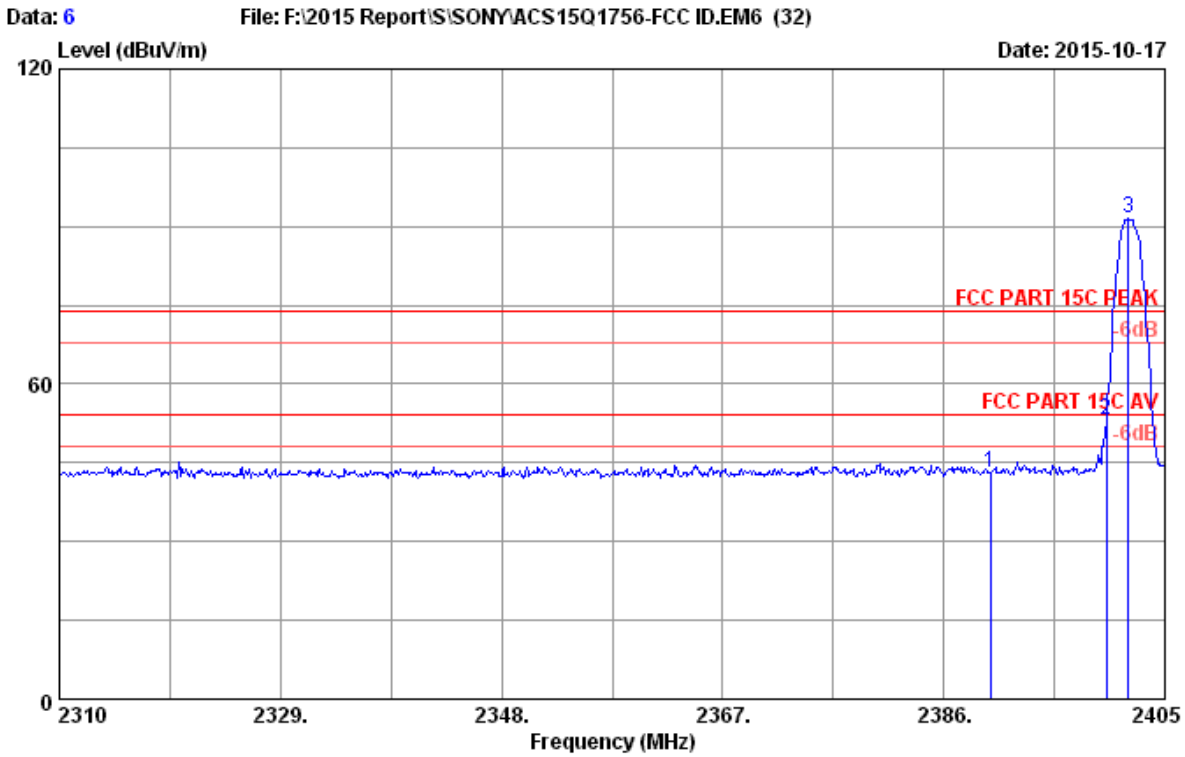
Pass (The testing data was attached in the next pages.)
Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.




Site no. : 3m Chamber Data no. : 5
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2402MHz Tx Mode

| No. | 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 | 2390.000 | 27.98 | 7.28 | 36.62 | 45.29 | 43.93 | 74.00 | 30.07 | Peak |
| 2 | 2400.000 | 28.00 | 7.32 | 36.62 | 52.84 | 51.54 | 74.00 | 22.46 | Peak |
| 3 | 2401.865 | 28.00 | 7.32 | 36.62 | 95.59 | 94.29 | 74.00 | -20.29 | Peak |

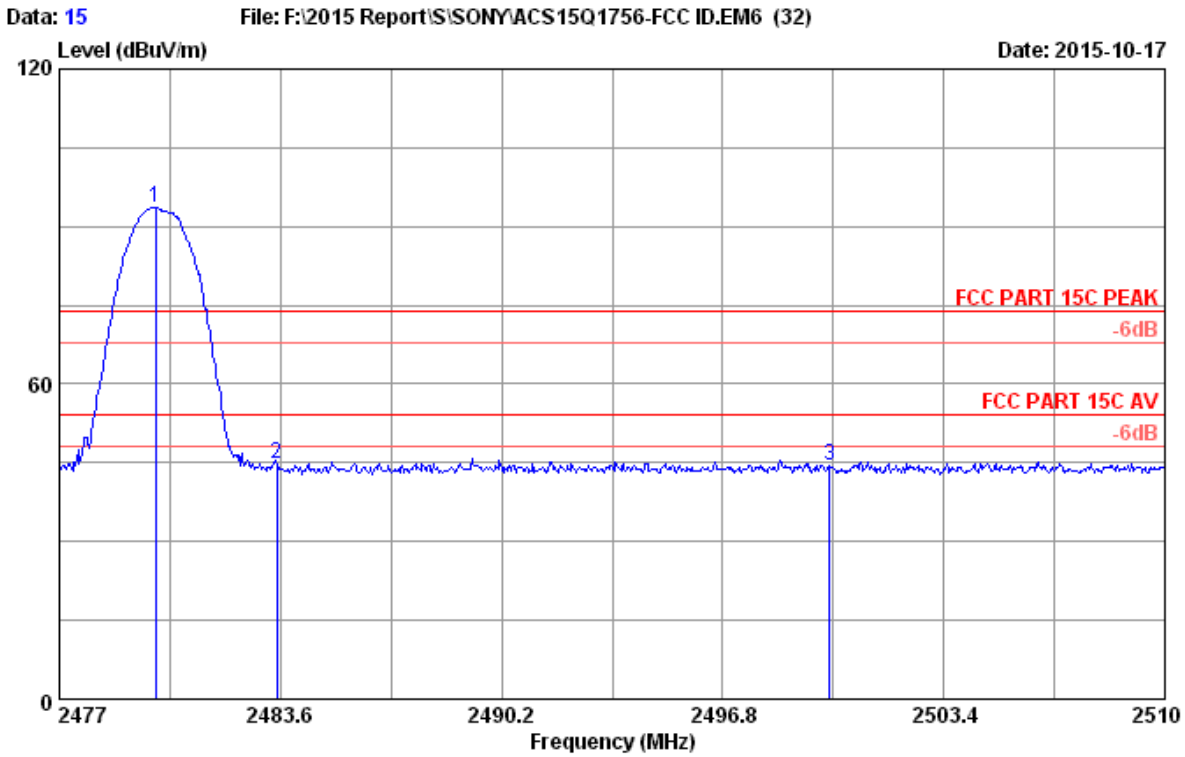
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 3m Chamber Data no. : 6
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2402MHz Tx Mode

| No. | 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 | 2390.000 | 27.98 | 7.28 | 36.62 | 44.53 | 43.17 | 74.00 | 30.83 | Peak |
| 2 | 2400.000 | 28.00 | 7.32 | 36.62 | 54.57 | 53.27 | 74.00 | 20.73 | Peak |
| 3 | 2401.865 | 28.00 | 7.32 | 36.62 | 92.76 | 91.46 | 74.00 | -17.46 | Peak |

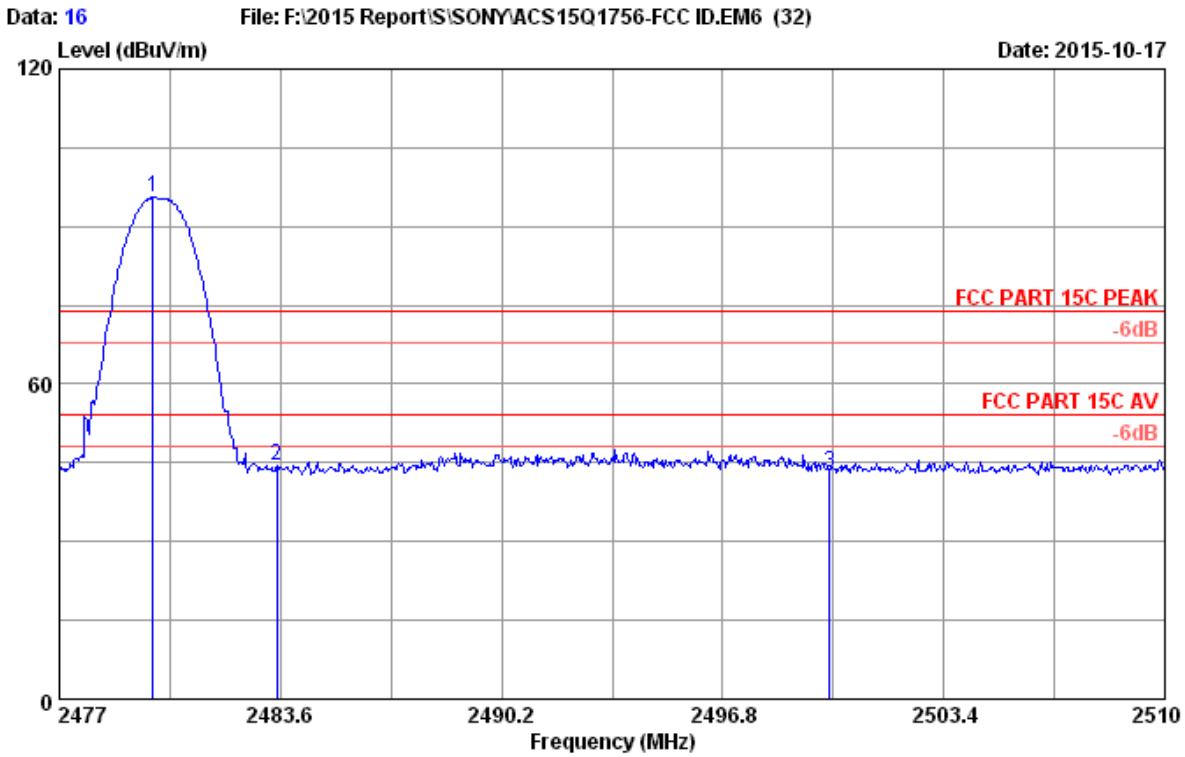
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




```
Site no.      : 3m Chamber                        Data no.  : 15
Dis. / Ant.   : 3m   2015 MCTD1209   3006   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : 23.8*C/48.4%
Engineer      : Thomax
EUT           : Home Audio System  M/N:MHC-V11
Power rating  : AC 120V/60Hz
Test Mode     : GFSK 2480MHz  Tx Mode
```

| No. | 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 | 2479.871 | 28.16 | 7.47 | 36.59 | 94.52 | 93.56 | 74.00 | -19.56 | Peak |
| 2 | 2483.500 | 28.17 | 7.51 | 36.59 | 45.61 | 44.70 | 74.00 | 29.30 | Peak |
| 3 | 2500.000 | 28.20 | 7.51 | 36.58 | 45.31 | 44.44 | 74.00 | 29.56 | Peak |

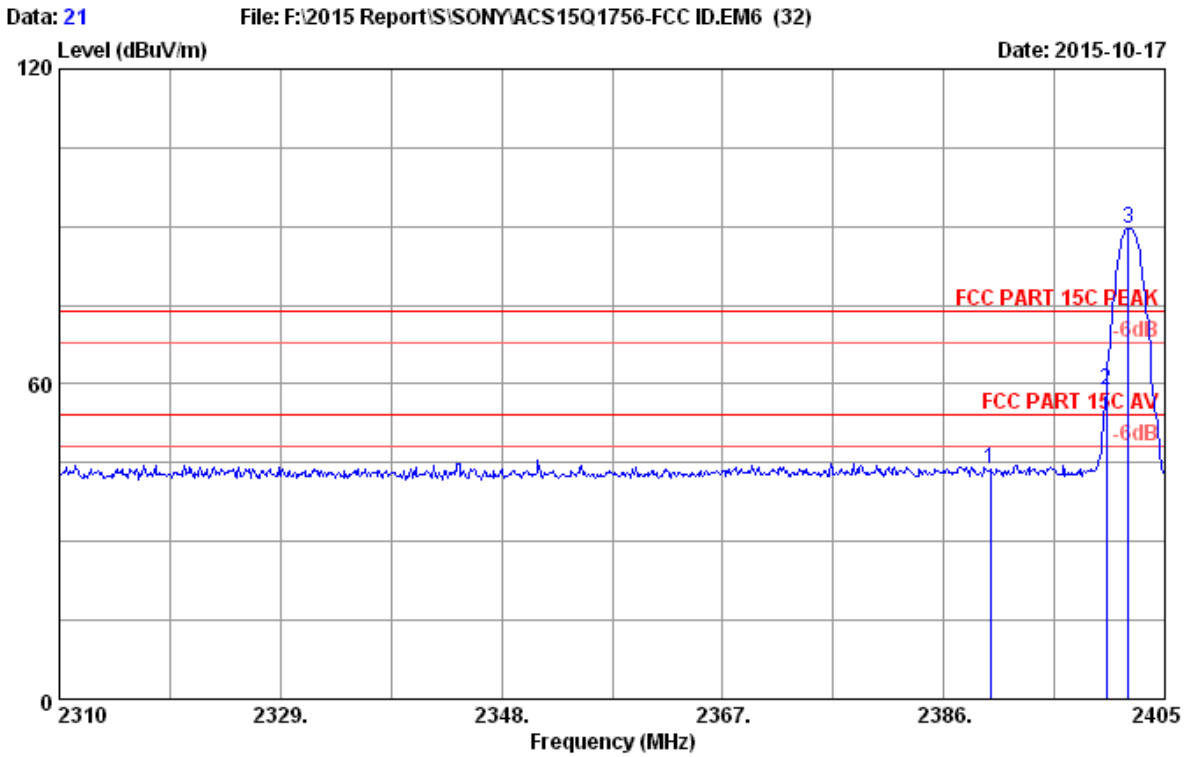
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 3m Chamber Data no. : 16
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : GFSK 2480MHz Tx Mode

| No. | 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 | 2479.805 | 28.16 | 7.47 | 36.59 | 96.47 | 95.51 | 74.00 | -21.51 | Peak |
| 2 | 2483.500 | 28.17 | 7.51 | 36.59 | 45.45 | 44.54 | 74.00 | 29.46 | Peak |
| 3 | 2500.000 | 28.20 | 7.51 | 36.58 | 44.06 | 43.19 | 74.00 | 30.81 | Peak |

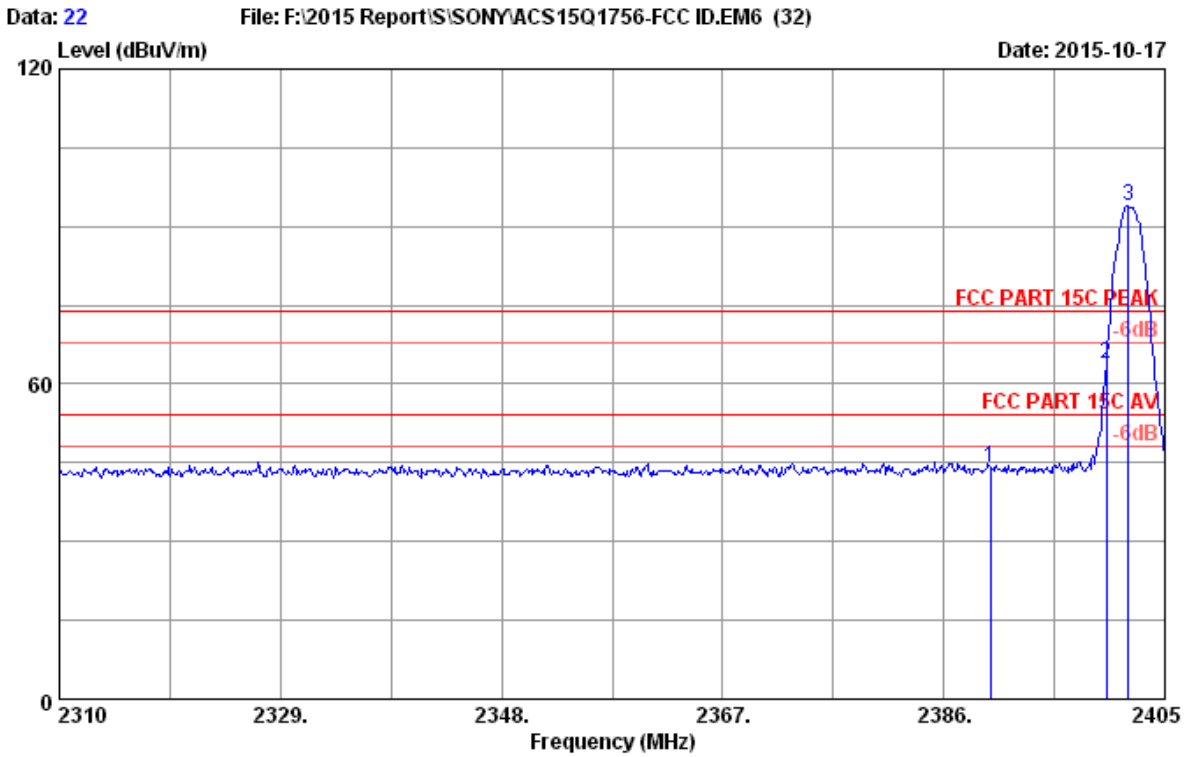
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 3m Chamber Data no. : 21
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : 8-DPSK 2402MHz Tx Mode

| No. | 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 | 2390.000 | 27.98 | 7.28 | 36.62 | 45.08 | 43.72 | 74.00 | 30.28 | Peak |
| 2 | 2400.000 | 28.00 | 7.32 | 36.62 | 60.05 | 58.75 | 74.00 | 15.25 | Peak |
| 3 | 2401.865 | 28.00 | 7.32 | 36.62 | 90.76 | 89.46 | 74.00 | -15.46 | Peak |

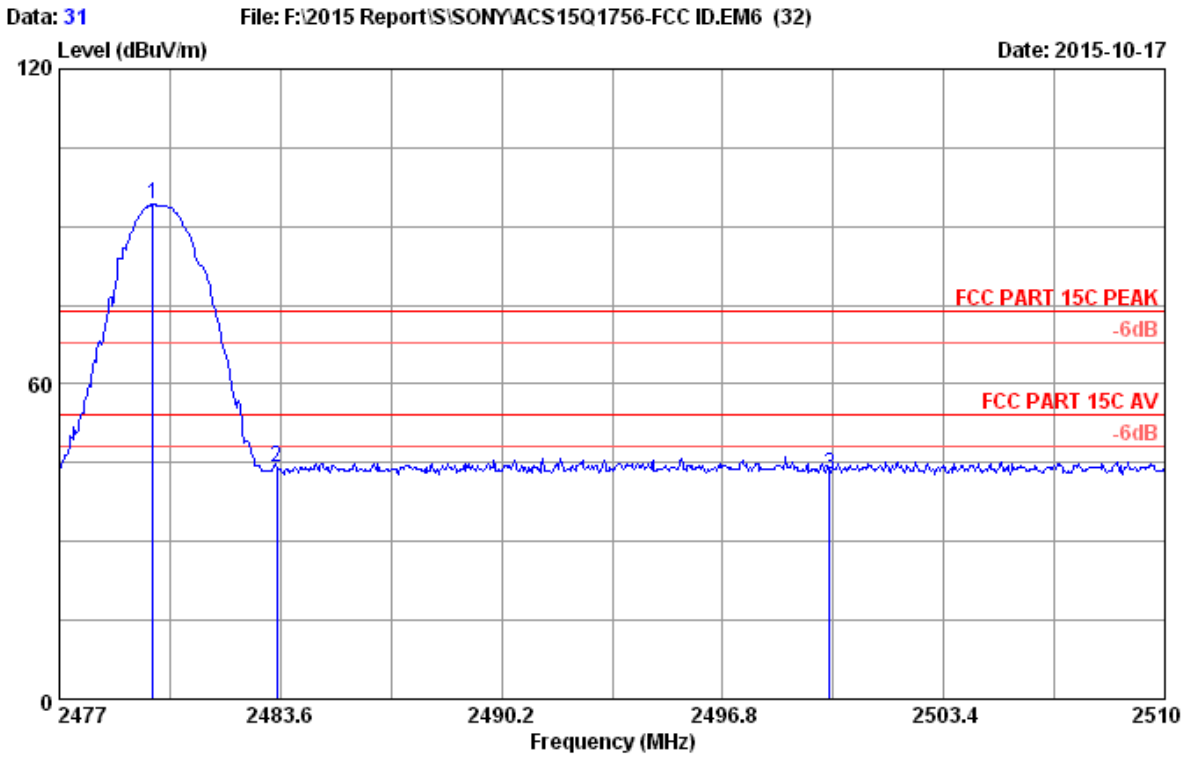
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 3m Chamber Data no. : 22
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : 8-DPSK 2402MHz Tx Mode

| No. | 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 | 2390.000 | 27.98 | 7.28 | 36.62 | 45.33 | 43.97 | 74.00 | 30.03 | Peak |
| 2 | 2400.000 | 28.00 | 7.32 | 36.62 | 65.31 | 64.01 | 74.00 | 9.99 | Peak |
| 3 | 2401.865 | 28.00 | 7.32 | 36.62 | 95.14 | 93.84 | 74.00 | -19.84 | Peak |

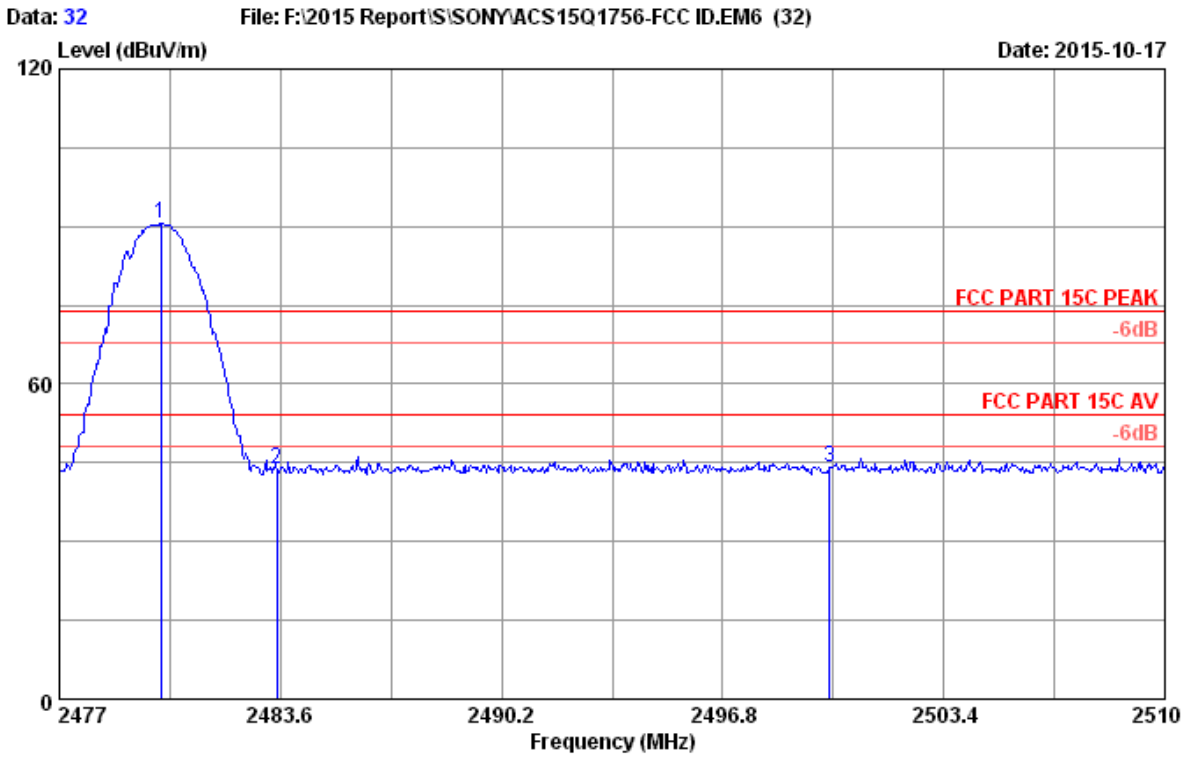
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp Factor
2. The emission levels that are 20dB below the official limit are not reported.




Site no. : 3m Chamber Data no. : 31
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : 8-DPSK 2480MHz Tx Mode

| No. | 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 | 2479.805 | 28.16 | 7.47 | 36.59 | 95.10 | 94.14 | 74.00 | -20.14 | Peak |
| 2 | 2483.500 | 28.17 | 7.51 | 36.59 | 44.99 | 44.08 | 74.00 | 29.92 | Peak |
| 3 | 2500.001 | 28.20 | 7.51 | 36.58 | 43.64 | 42.77 | 74.00 | 31.23 | Peak |

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




Site no. : 3m Chamber Data no. : 32
Dis. / Ant. : 3m 2015 MCTD1209 3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.8*C/48.4%
Engineer : Thomax
EUT : Home Audio System M/N:MHC-V11
Power rating : AC 120V/60Hz
Test Mode : 8-DPSK 2480MHz Tx Mode

| No. | 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 | 2480.036 | 28.16 | 7.47 | 36.59 | 91.45 | 90.49 | 74.00 | -16.49 | Peak |
| 2 | 2483.500 | 28.17 | 7.51 | 36.59 | 44.64 | 43.73 | 74.00 | 30.27 | Peak |
| 3 | 2500.000 | 28.20 | 7.51 | 36.58 | 45.14 | 44.27 | 74.00 | 29.73 | Peak |

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

# 12. ANTENNA REQUIREMENT

## 12.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 12.2. Antenna Connected Construction

The antennas used for this product are PCB antenna 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 2.4dBi

# 13. DEVIATION TO TEST SPECIFICATIONS

[NONE]