# FCC PART 15 SUBPART C MEASURMENT AND TEST REPORT

For

Guangzhou FiiO Electronics Technology Co., Ltd.

2/F, F Building, Hougang Industrial Zone, Shigang Huangshi West Road, Baiyun District, Guangzhou City, China

E.U.T.: Portable High Resolution Music Player

Model Name: FX7121

Brand Name: FiiO

FCC ID: R56-FX7121

Report Number: NTC1511042F-2

Test Date(s): November 04, 2015 to November 22, 2015

Report Date(s): November 24, 2015

Prepared by

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| Prepared By | Approved & Authorized Signer |
|---|---|
| Rose Hu / Engineer | Sunm Lv / Q.A. Director |

Note: This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Dongguan Nore Testing Center Co., Ltd. The test results referenced from this report are relevant only to the s ample tested.

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# 1. GENERAL INFORMATION

## 1.1 Product Description for Equipment under Test

This device is a Portable High Resolution Music Player with BT and Wi-Fi functions, it's powered by DC 5V come from USB port or DC 3.7V li-ion battery. For more details features, please refer to User's Manual.

| | | |
|---|---|---|
| Manufacturer/ Factory | : | Guangzhou FiiO Electronics Technology Co., Ltd. |
| Address | : | 2/F, F Building, Hougang Industrial Zone, Shigang Huangshi West Road, Baiyun District, Guangzhou City, China |
| Power Supply | : | DC 5V Come from USB Port<br>DC 3.7V li-ion battery |
| Test voltage | : | AC 120V 60Hz(Adapter input),<br>DC 3.7V Li-ion battery<br>(Only the worst case was recorded in the report.) |
| Model name | : | FX7121 |
| Model difference | : | None |
| Hardware version | : | X7 WIFI_BT V03 |
| Software version | : | 001 |
| Serial number | : | N/A |

**Technical parameters**
**For WIFI Function**

| | | |
|---|---|---|
| Frequency Range | : | 2412-2462MHz for 802.11b/g/n(HT20) |
| Modulation | : | CCK, DQPSK, DBPSK for 802.11b<br>OFDM for 802.11g/n |
| Number of Channel | : | 11 for 802.11b/g/n(HT20) |
| Channel space | : | 5MHz |
| Date Rate | : | 802.11b:1~11Mbps, 802.11g:6~54Mbps<br>802.11n: 6.5~72Mbps |
| Antenna Type | : | PCB antenna |
| Antenna Gain | : | 2 dBi |
| Note | : | This report only applies to modulation technology DTS(WIFI). |

**For BT function**
BT Version:
BLE(V4.0) and backward compatible, 2.1+EDR version.
We prepare version BLE(V4.0) and 2.1+EDR for RF test.

| Item | BT2.1+EDR | BLE(V4.0) |
|---|---|---|
| Frequency | 2402-2480MHz | 2402-2480MHz |
| Modulation | GFSK, π/4-DQPSK, 8DPSK | GFSK |
| Number of Channel | 79 | 40 |
| Channel space | 1MHz | 2MHz |
| Antenna Type | PCB antenna | PCB antenna |
| Antenna Gain | 2 dBi | 2 dBi |

## WIFI Channel List

| 802.11 b/g/n(HT20) | |
|---|---|
| **Channel** | **Frequency MHz** |
| 1 | 2412 |
| 2 | 2417 |
| 3 | 2422 |
| 4 | 2427 |
| 5 | 2432 |
| 6 | 2437 |
| 7 | 2442 |
| 8 | 2447 |
| 9 | 2452 |
| 10 | 2457 |
| 11 | 2462 |

**Note:** According to section 15.31(m), regards to the operating frequency range over 10MHz, the Lowest, middle, and the Highest frequency of channel were selected to perform the test. The selected frequency see below:

| 802.11b/g/n(HT20) | |
|---|---|
| **Channel** | **Frequency MHz** |
| 1 | 2412 |
| 6 | 2437 |
| 11 | 2462 |

## 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **R56-FX7121** filing to comply with Section 15.247 of the FCC Part 15(2014), Subpart C Rule.

## 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10-2013 and KDB558074 (v03r03). Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters. All other measurements were made in accordance with the procedures in 47 CFR part 2.

## 1.4 Equipment Modifications

Not available for this EUT intended for grant.

## 1.5 Support Device

| | | |
|---|---|---|
| Adapter | : | Manufacturer: iStore<br>iStore: APA722AUI-50<br>M/N: APA722<br>Input: AC100-240V 50/60Hz, 0.5A<br>Output: DC5.0V 2.1A |

## 1.6 Test Facility and Location

Listed by FCC, August 02, 2011
The Certificate Registration Number is 665078.
Listed by Industry Canada, July 01, 2011
The Certificate Registration Number is 46405-9743.

Dongguan NTC Co., Ltd.
(Full Name: Dongguan Nore Testing Center Co., Ltd.)

Building D, Gaosheng Science and Technology Park, Hongtu Road,
Nancheng District, Dongguan City, Guangdong, China
(Full Name: Building D, Gaosheng Science & Technology Park,
Zhouxi Longxi Road, Nancheng District, Dongguan, Guangdong, China.

## 1.7 Summary of Test Results

| FCC Rules | Description Of Test | Result |
|---|---|---|
| §15.207 (a) | AC Power Conducted Emission | Compliance |
| §15.247(b)(3) | Max. Conducted Output Power | Compliance |
| §15.247(a)(2) | 6dB Bandwidth | Compliance |
| §15.247(e) | Power Spectral Density | Compliance |
| §15.247(d) | Band Edge and Conducted Spurious Emissions | Compliance |
| §15.247(d),§15.209, §15.205 | Radiated Spurious Emissions and Restricted Bands | Compliance |
| §15.203 | Antenna Requirement | Compliance |

# 2. System Test Configuration

## 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

## 2.2 Special Accessories

Not available for this EUT intended for grant.

## 2.3 Description of test modes

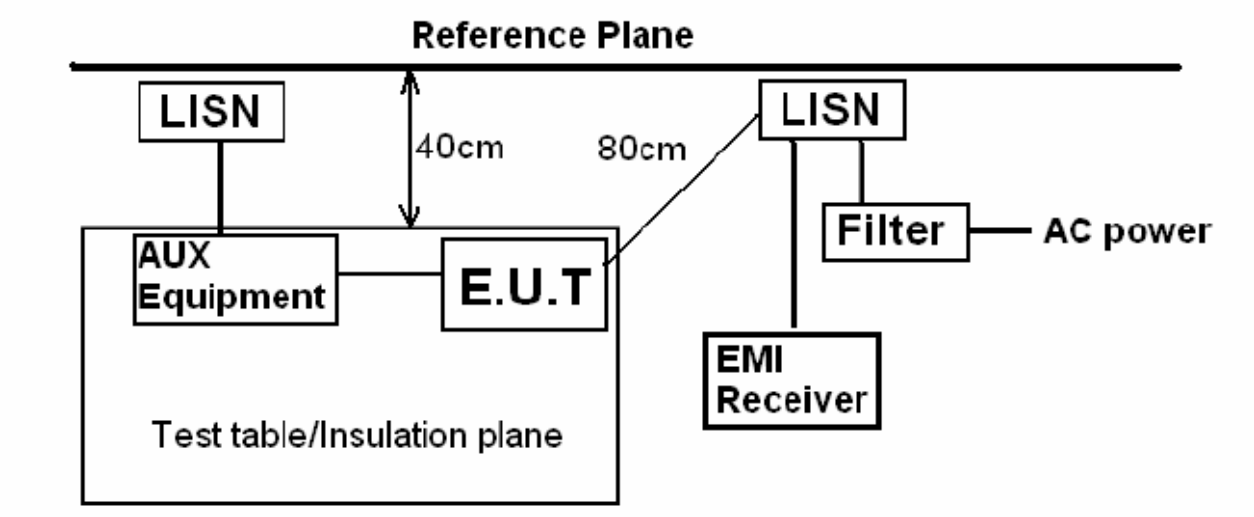
The EUT has been tested under continuous operating condition. Test program used to control the EUT staying in continuous transmitting mode. The Lowest, middle and highest channel were chosen for testing, and modulation type CCK, DQPSK, DBPSK, OFDM and all data rate were tested. But only the worst case data is shown in this report.

## 2.4 EUT Exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

# 3. Conducted Emissions Test

## 3.1 Test SET-UP (Block Diagram of Configuration)




## 3.2 Test Condition

**Test Requirement: FCC Part 15.207**

**Frequency Range: 150KHz ~ 30MHz**

**Detector: RBW 9KHz, VBW 30KHz**

**Operation Mode: Charging+WIFI Mode**

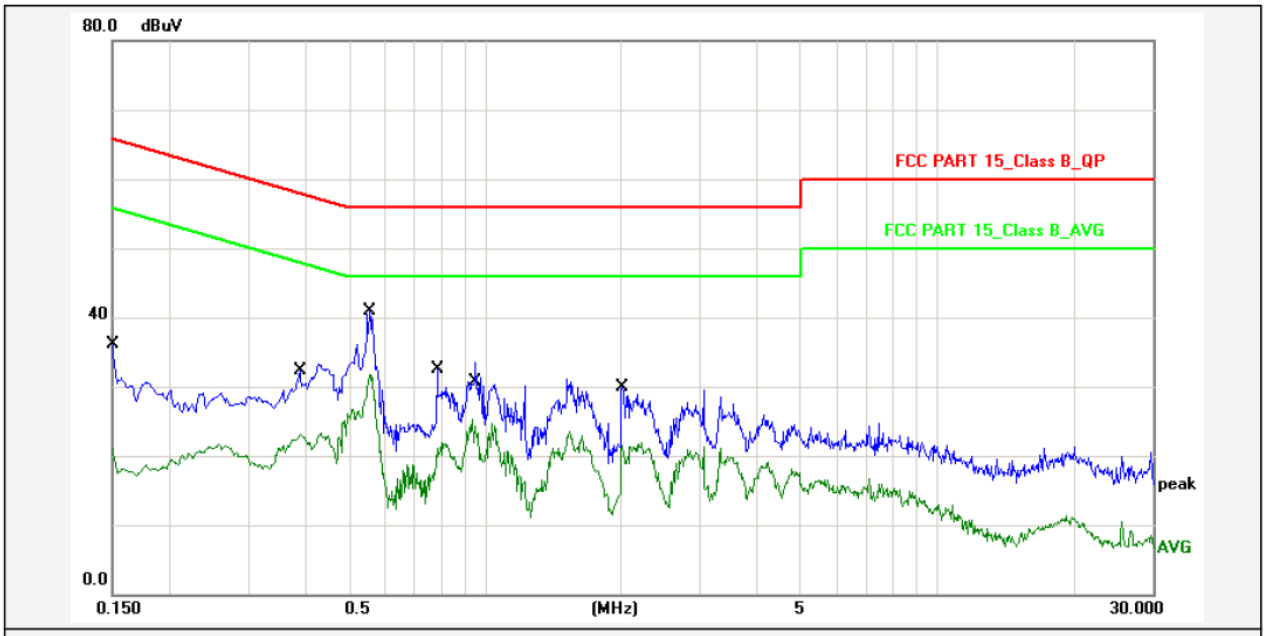
## 3.3 Measurement Results

**Please refer to following plots.**

**Dongguan NTC Co., Ltd.**
**Tel: +86-769-22022444 Fax: +86-769-22022799**
Web: Http://www.ntc-c.com

Site: Conduction

Test Time: 2015-11-6 14:24:13




| | | | |
|---|---|---|---|
| Report No.: | FX7121 | | |
| Test Standard: | FCC PART 15_Class B_QP | | |
| Test item: | Conducted Emission | Phase: | L1 |
| Applicant: | Fiio | Temp.( )/Hum.(%): | 26(C) / 42 % |
| Product: | Portable High Resolution Music Player | Power Rating: | AC 120V 60Hz Adapter input |
| Model No.: | FX7121 | Test Engineer: | Anson |

Test Mode: Charging+Wi-Fi Mode

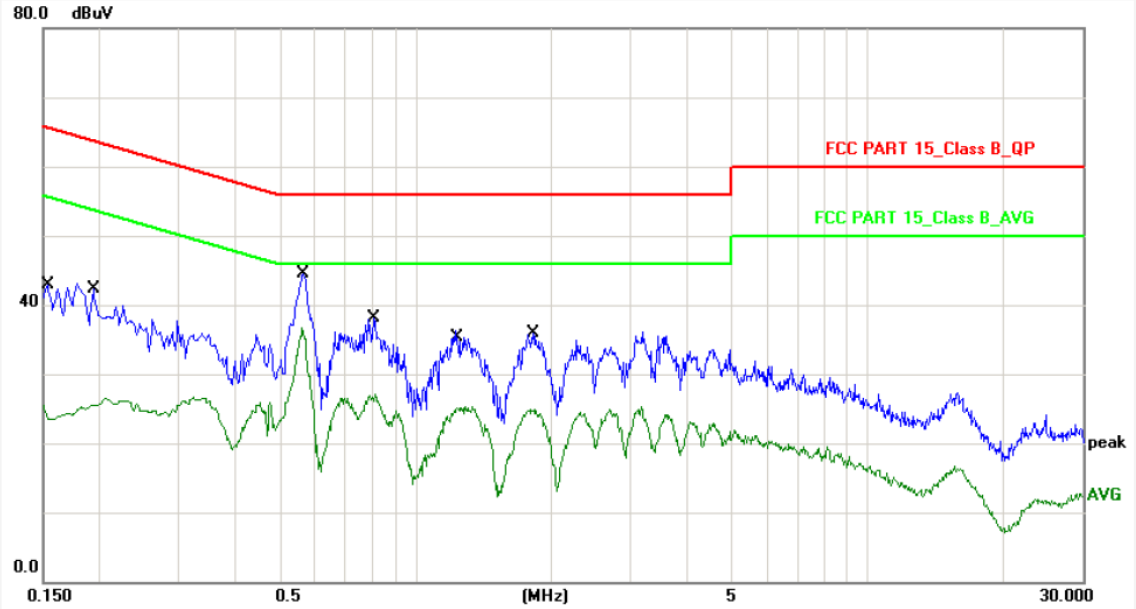
Remark:

| No. | Frequency (MHz) | Factor (dBuV) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 10.80 | 23.90 | 34.70 | 65.99 | -31.29 | QP | P | |
| 2 | 0.1500 | 10.80 | 10.60 | 21.40 | 55.99 | -34.59 | AVG | P | |
| 3 | 0.3899 | 10.80 | 18.20 | 29.00 | 58.06 | -29.06 | QP | P | |
| 4 | 0.3899 | 10.80 | 18.10 | 28.90 | 48.06 | -19.16 | AVG | P | |
| 5 | 0.5580 | 10.80 | 24.89 | 35.69 | 56.00 | -20.31 | QP | P | |
| 6 | 0.5580 | 10.80 | 20.91 | 31.71 | 46.00 | -14.29 | AVG | P | |
| 7 | 0.7860 | 10.80 | 13.80 | 24.60 | 56.00 | -31.40 | QP | P | |
| 8 | 0.7860 | 10.80 | 11.05 | 21.85 | 46.00 | -24.15 | AVG | P | |
| 9 | 0.9420 | 10.80 | 16.30 | 27.10 | 56.00 | -28.90 | QP | P | |
| 10 | 0.9420 | 10.80 | 13.00 | 23.80 | 46.00 | -22.20 | AVG | P | |
| 11 | 2.0180 | 10.80 | 11.90 | 22.70 | 56.00 | -33.30 | QP | P | |
| 12 | 2.0180 | 10.80 | 10.65 | 21.45 | 46.00 | -24.55 | AVG | P | |

**Dongguan NTC Co., Ltd.**
**Tel: +86-769-22022444 Fax: +86-769-22022799**
Web: Http://www.ntc-c.com

Site: Conduction

Test Time: 2015-11-6 19:01:25




**Report No.:** FX7121
**Test Standard:** FCC PART 15_Class B_QP
**Test item:** Conducted Emission
**Phase:** N
**Applicant:** Fiio
**Temp.( )/Hum.(%):** 26(C) / 40 %
**Product:** Portable High Resolution Music Player
**Power Rating:** AC 120V 60Hz Adapter input
**Model No.:** FX7121
**Test Engineer:** Anson

**Test Mode:** Charging+Wi-Fi Mode
**Remark:**

| No. | Frequency (MHz) | Factor (dBuV) | Reading (dBuV) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1539 | 10.80 | 41.70 | 52.50 | 65.78 | -13.28 | QP | P | |
| 2 | 0.1539 | 10.80 | 12.30 | 23.10 | 55.78 | -32.68 | AVG | P | |
| 3 | 0.1940 | 10.80 | 34.90 | 45.70 | 63.86 | -18.16 | QP | P | |
| 4 | 0.1940 | 10.80 | 8.20 | 19.00 | 53.86 | -34.86 | AVG | P | |
| 5 | 0.5620 | 10.80 | 24.90 | 35.70 | 56.00 | -20.30 | QP | P | |
| 6 | 0.5620 | 10.80 | 15.80 | 26.60 | 46.00 | -19.40 | AVG | P | |
| 7 | 0.8100 | 10.80 | 17.30 | 28.10 | 56.00 | -27.90 | QP | P | |
| 8 | 0.8100 | 10.80 | 10.00 | 20.80 | 46.00 | -25.20 | AVG | P | |
| 9 | 1.2420 | 10.80 | 18.30 | 29.10 | 56.00 | -26.90 | QP | P | |
| 10 | 1.2420 | 10.80 | 8.60 | 19.40 | 46.00 | -26.60 | AVG | P | |
| 11 | 1.8260 | 10.80 | 15.40 | 26.20 | 56.00 | -29.80 | QP | P | |
| 12 | 1.8260 | 10.80 | 5.90 | 16.70 | 46.00 | -29.30 | AVG | P | |

# 4. Max. Conducted Output Power

## 4.1 Measurement Procedure

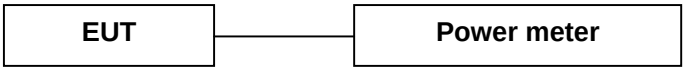
Maximum Conducted Output power at Antenna Terminals, FCC Rules 15.247(b)(3):

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW⩾DTS bandwidth
This procedure shall be used when the measurement instrument has available a resolution bandwidth than is greater than the DTS bandwidth.

1. Set the RBW⩾DTS bandwidth;
2. Set VBW⩾3*RBW;
3. Set span⩾3*RBW;
4. Sweep time = auto couple
5. Detector = peak
6. Trace mode = max hold;
7. Allow trace to fully stabilize;
8. Use peak marker function to determine the peak amplitude level.

## 4.2 Test SET-UP (Block Diagram of Configuration)




## 4.3 Measurement Results

**Pass**

Please refer to following table and plots.

| | | | |
|---|---|---|---|
| Temperature : | 24 ℃ | Humidity : | 50% |
| Test By: | Sance | Test Date : | November 18, 2015 |
| Test Result: | PASS | | |
| Frequency MHz | Data Rate Mbps | Peak Output Power dBm | Limit dBm |
| IEEE 802.11b Mode (CCK, Antenna Gain=2dBi) | | | |
| Low Channel: 2412 | 1 | 7.22 | 30 |
| Middle Channel: 2437 | 1 | 7.14 | 30 |
| High Channel: 2462 | 1 | 5.54 | 30 |
| IEEE 802.11g Mode (OFDM, Antenna Gain=2dBi) | | | |
| Low Channel: 2412 | 6 | 7.89 | 30 |
| Middle Channel: 2437 | 6 | 6.61 | 30 |
| High Channel: 2462 | 6 | 6.36 | 30 |
| IEEE 802.11n(HT20) Mode (OFDM, Antenna Gain=2dBi) | | | |
| Low Channel: 2412 | 6.5 | 7.28 | 30 |
| Middle Channel: 2437 | 6.5 | 6.82 | 30 |
| High Channel: 2462 | 6.5 | 5.22 | 30 |

# 5. 6dB&20dB Bandwidth

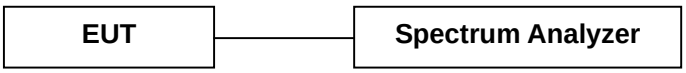
## 5.1 Measurement Procedure

DTS 6dB Channel Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074(v03r03):

1. For 6dB bandwidth, Set the RBW = 100KHz.
   For 20dB bandwidth, Set the RBW=1-5% of the OBW, not to exceed 1MHz.
2. Set the VBW ⩾ 3 x RBW
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

## 5.2 Test SET-UP (Block Diagram of Configuration)



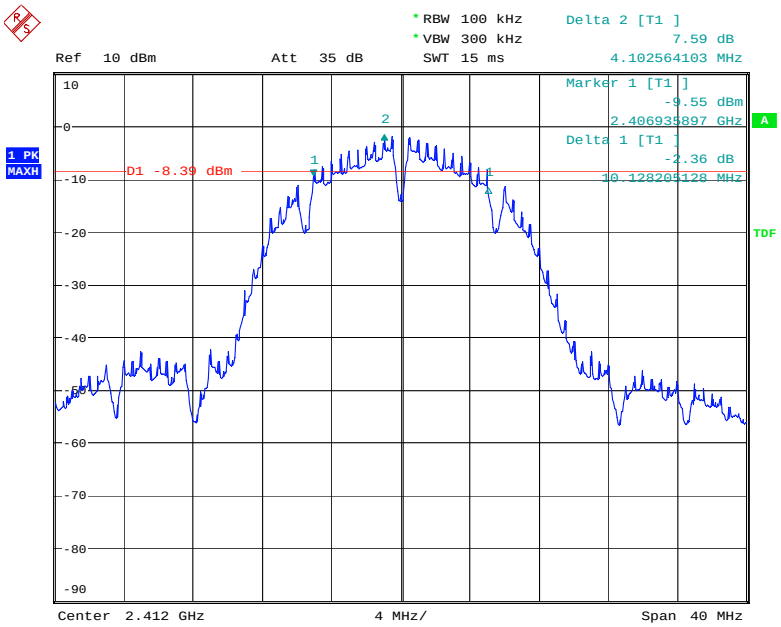

## 5.3 Measurement Results

**Pass**

Please refer to following table and plots.

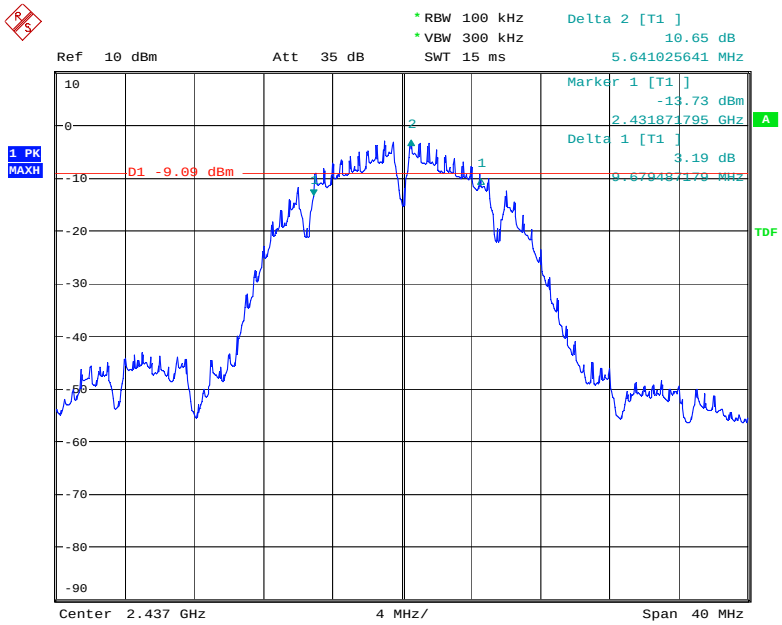
| | | | | |
|---|---|---|---|---|
| Temperature : | 24 ℃ | Humidity : 50 % | | |
| Test By: | Sance | Test Date : November 18, 2015 | | |
| Test Result: | PASS | | | |
| Frequency MHz | Data Rate Mbps | 6dB Bandwidth MHz | 20dB Bandwidth MHz | Limit |
| IEEE 802.11b Mode (CCK) | | | | |
| Low Channel: 2412 | 1 | 10.13 | 15.58 | >500KHz |
| Middle Channel: 2437 | 1 | 9.68 | 15.51 | >500KHz |
| High Channel: 2462 | 1 | 9.68 | 15.51 | >500KHz |
| IEEE 802.11g Mode (OFDM) | | | | |
| Low Channel: 2412 | 6 | 16.15 | 19.42 | >500KHz |
| Middle Channel: 2437 | 6 | 16.22 | 19.36 | >500KHz |
| High Channel: 2462 | 6 | 16.28 | 19.42 | >500KHz |
| IEEE 802.11n(HT20) Mode (OFDM) | | | | |
| Low Channel: 2412 | 6.5 | 17.76 | 19.68 | >500KHz |
| Middle Channel: 2437 | 6.5 | 16.47 | 19.74 | >500KHz |
| High Channel: 2462 | 6.5 | 17.76 | 19.68 | >500KHz |

## 6dB Bandwidth
## 802.11b Low Channel



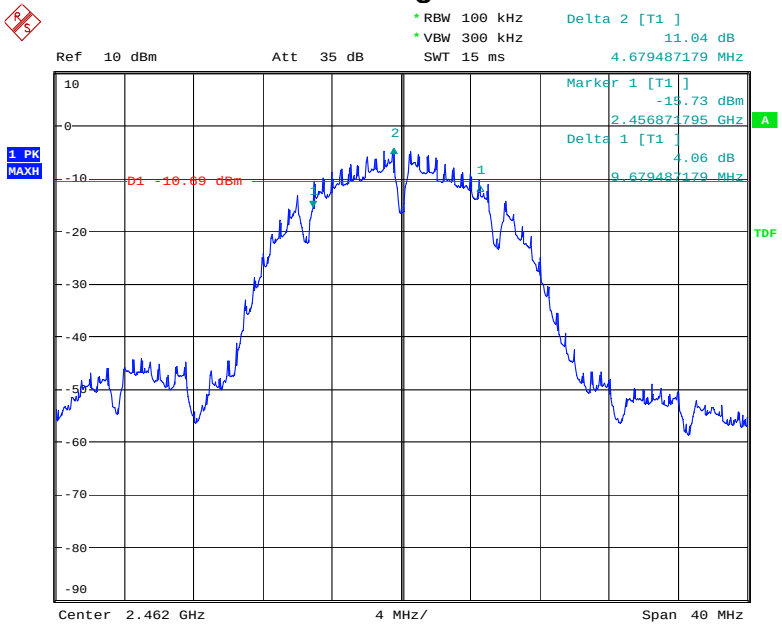

Date: 18.NOV.2015 14:18:48

## 802.11b Middle Channel



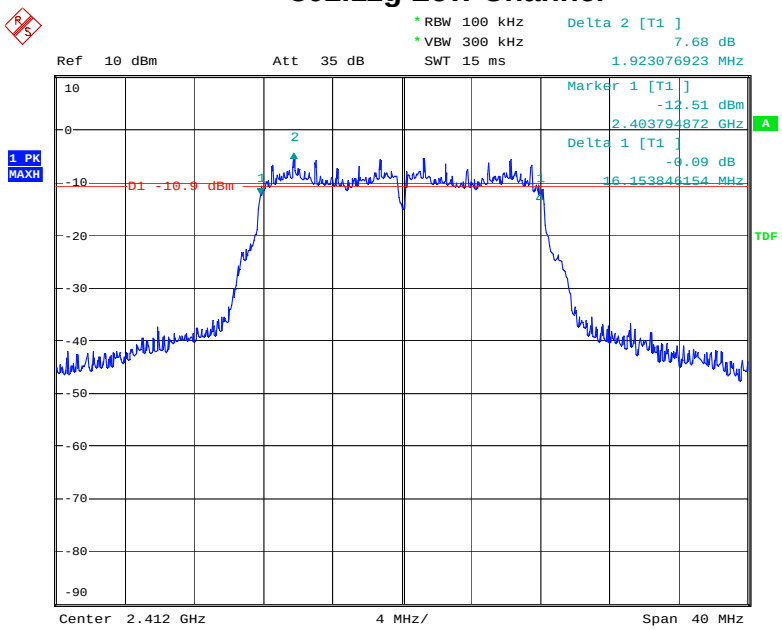

Date: 18.NOV.2015 14:20:07

## 802.11b High Channel



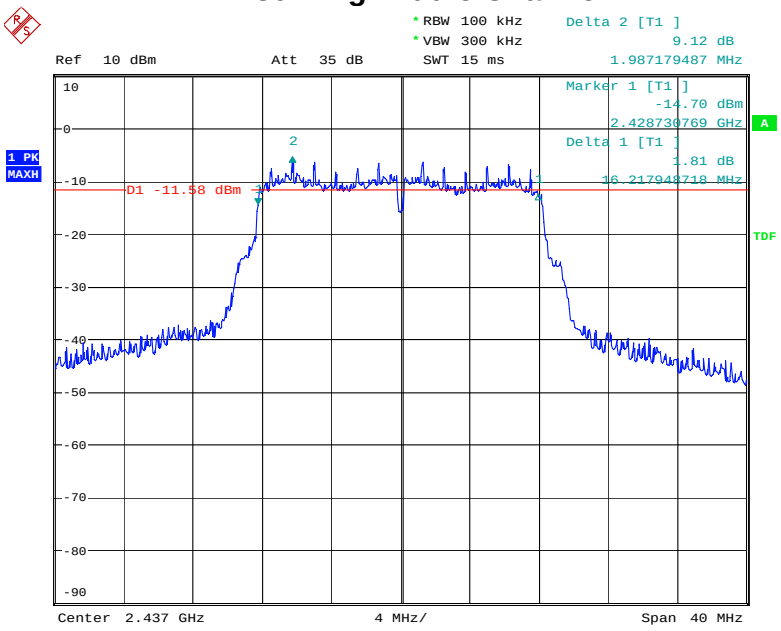

Date: 18.NOV.2015 14:27:24

## 802.11g Low Channel



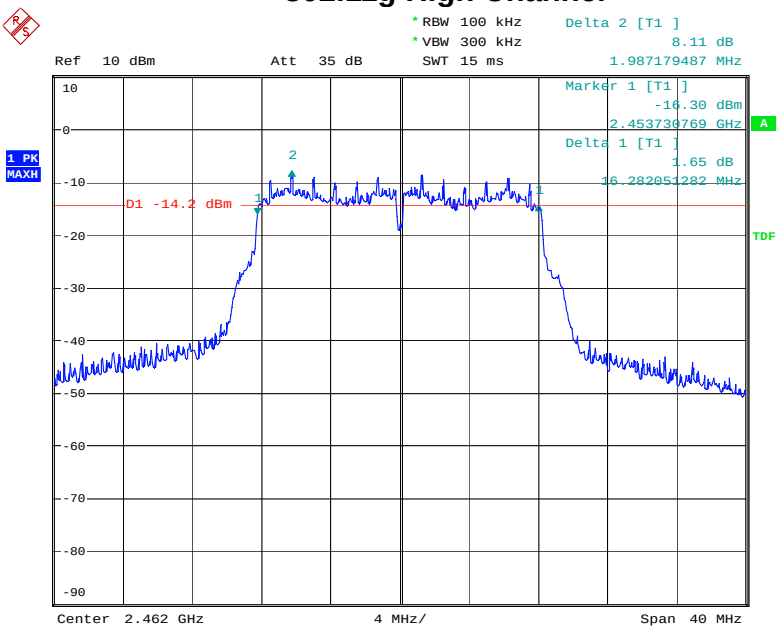

Date: 18.NOV.2015 14:17:36

## 802.11g Middle Channel



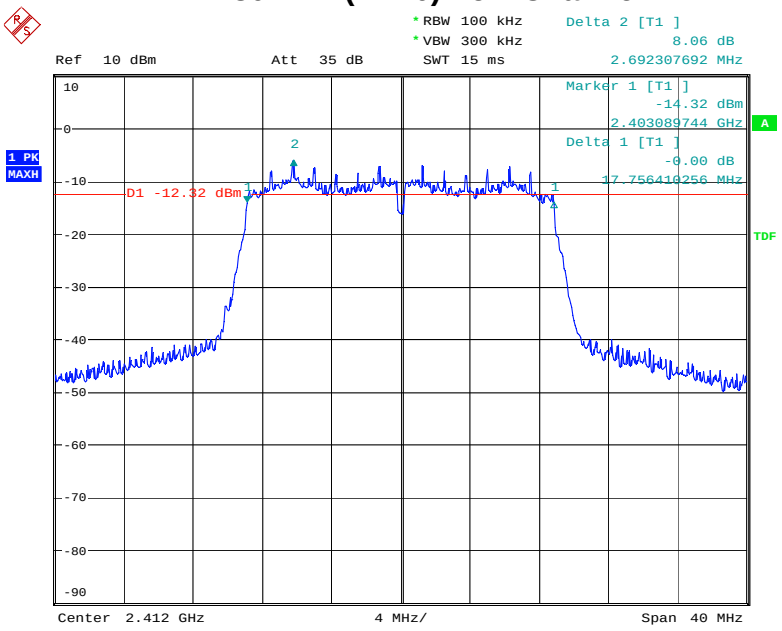

Date: 18.NOV.2015 14:15:29

## 802.11g High Channel



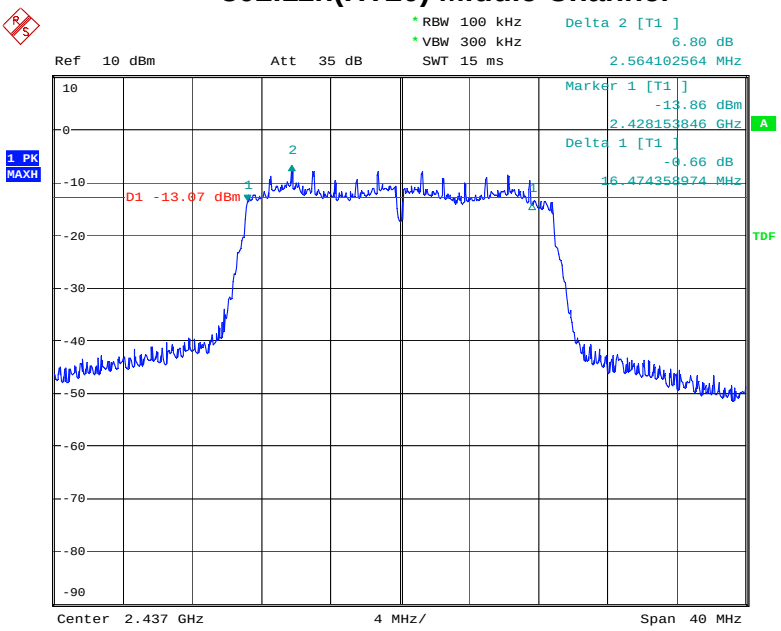

Date: 18.NOV.2015 14:13:39

## 802.11n(HT20) Low Channel



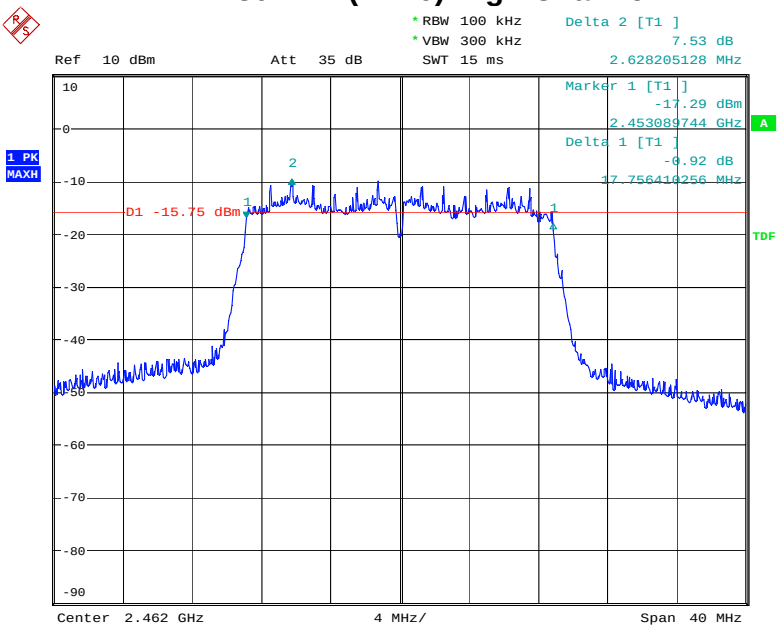

Date: 18.NOV.2015 14:05:05

## 802.11n(HT20) Middle Channel



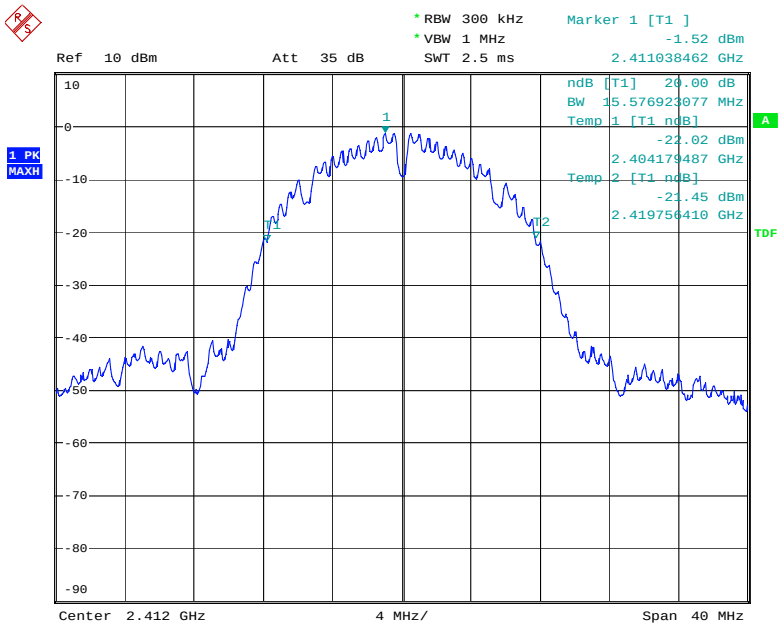

Date: 18.NOV.2015 14:07:41

## 802.11n(HT20) High Channel



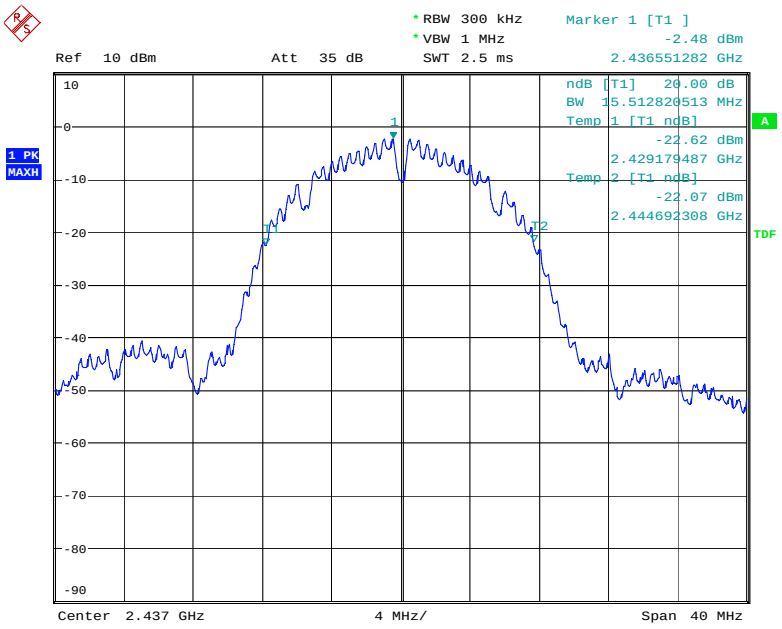

Date: 18.NOV.2015 14:09:28

## 20dB Bandwidth
## 802.11b Low Channel



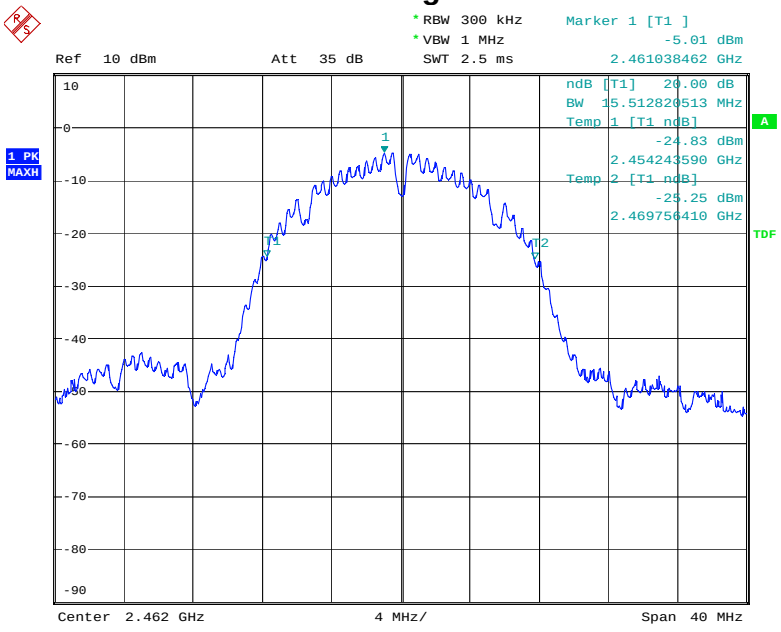

Date: 18.NOV.2015 14:42:53

## 802.11b Middle Channel



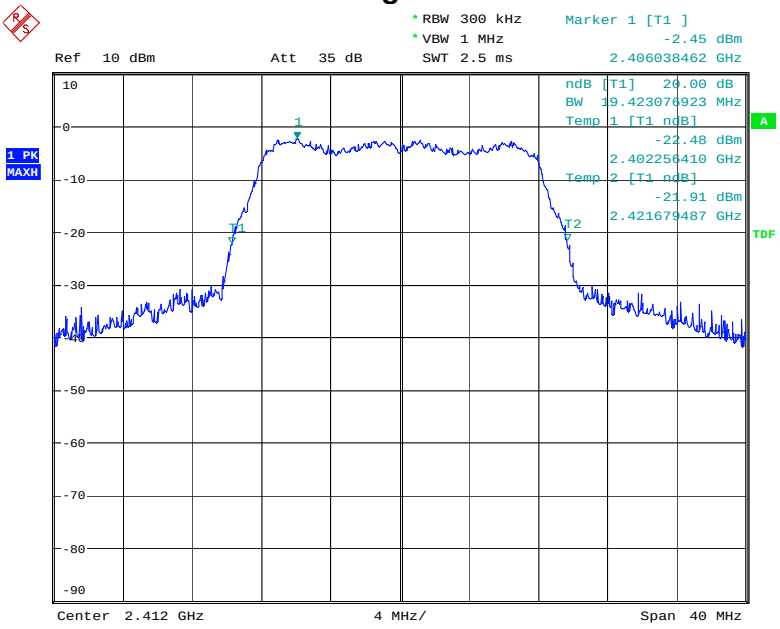

Date: 18.NOV.2015 14:43:28

## 802.11b High Channel



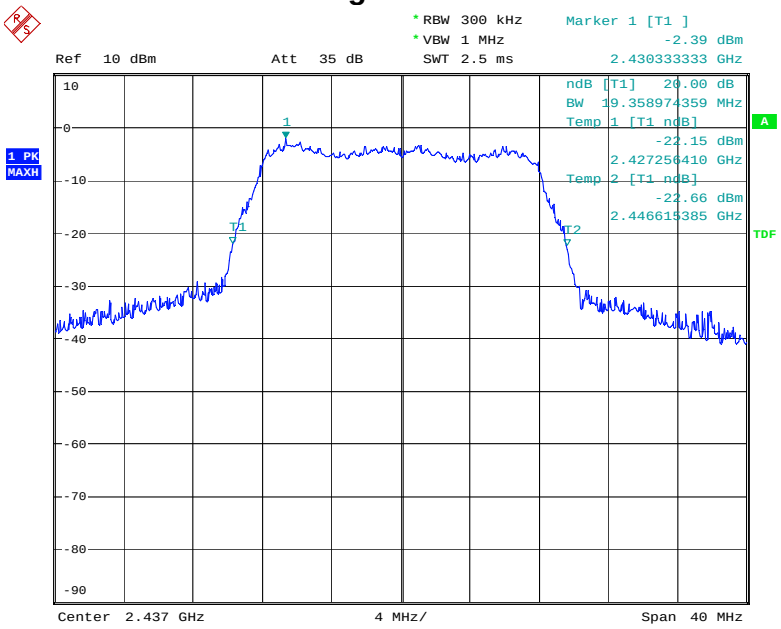

Date: 18.NOV.2015 14:43:50

## 802.11g Low Channel



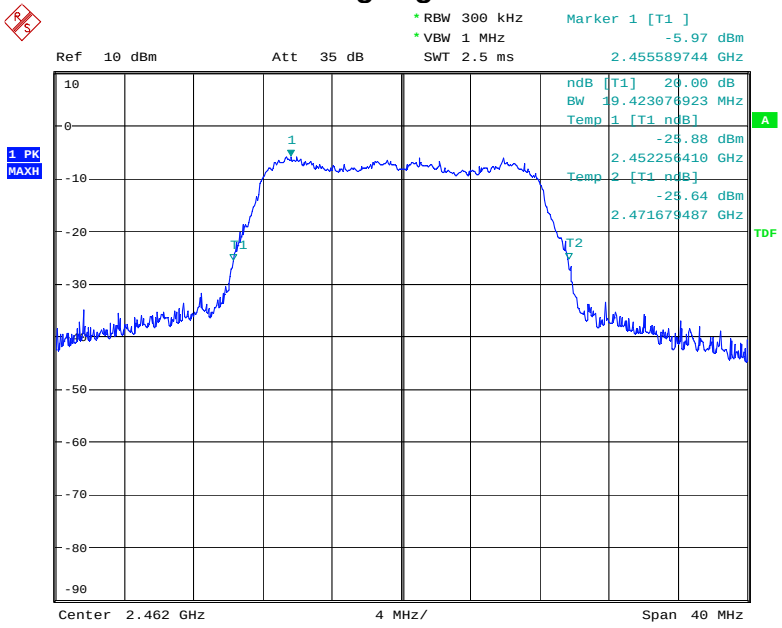

Date: 18.NOV.2015 14:44:42

## 802.11g Middle Channel



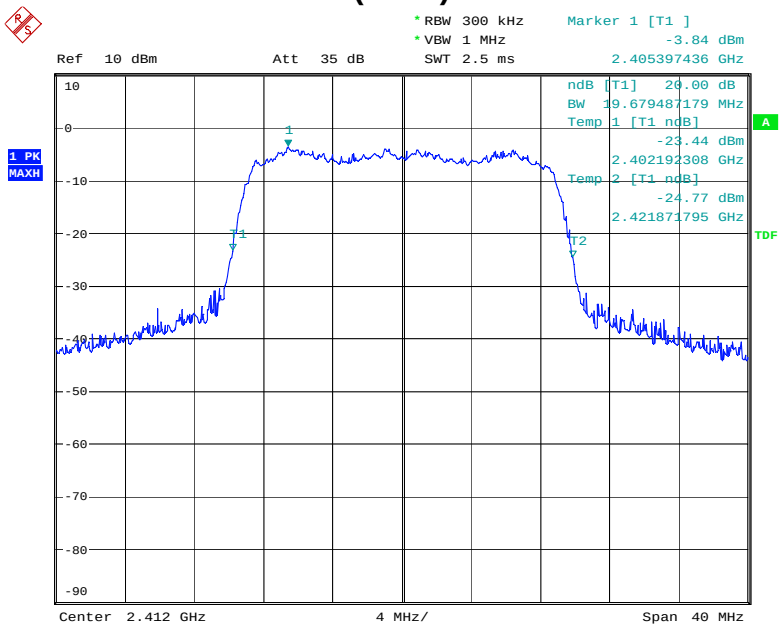

Date: 18.NOV.2015 14:46:09

## 802.11g High Channel



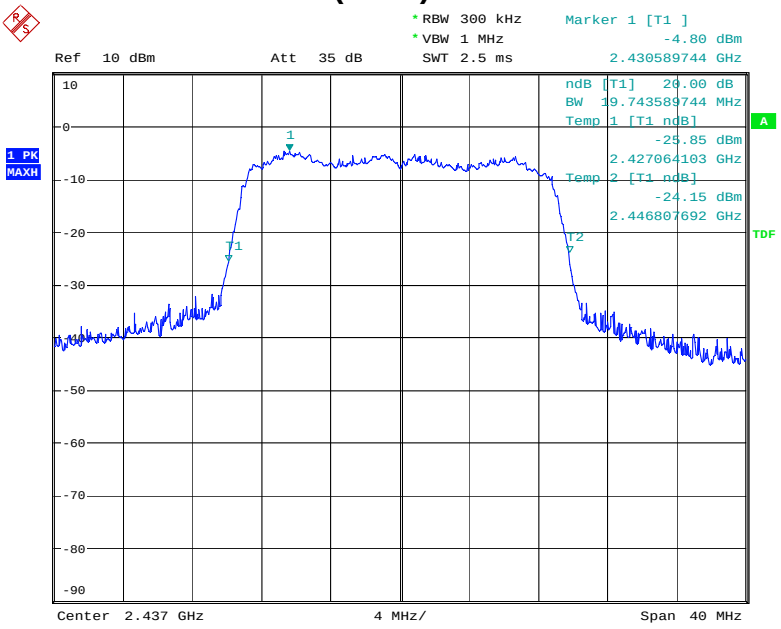

Date: 18.NOV.2015 14:46:53

## 802.11n(HT20) Low Channel



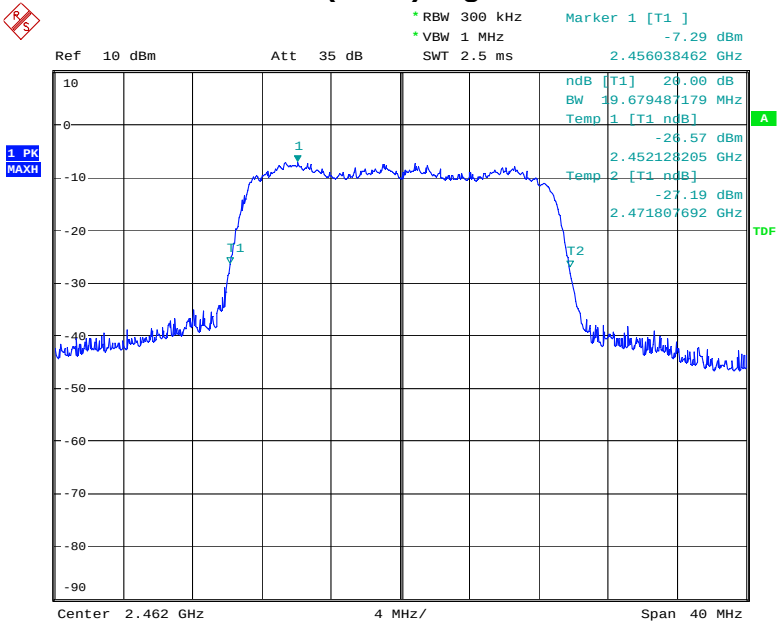

Date: 18.NOV.2015 14:48:22

## 802.11n(HT20) Middle Channel




Date: 18.NOV.2015 14:49:15

## 802.11n(HT20) High Channel




Date: 18.NOV.2015 14:50:10

# 6. Power Spectral Density

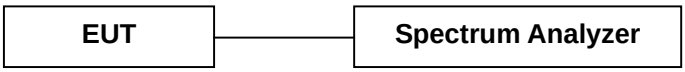
## 6.1 Measurement Procedure

DTS 6dB Channel Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer was set as below according to FCC KDB558074 (v03r03):

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz⩽RBW⩽100KHz
4. Set the VBW ⩾ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

## 6.2 Test SET-UP (Block Diagram of Configuration)



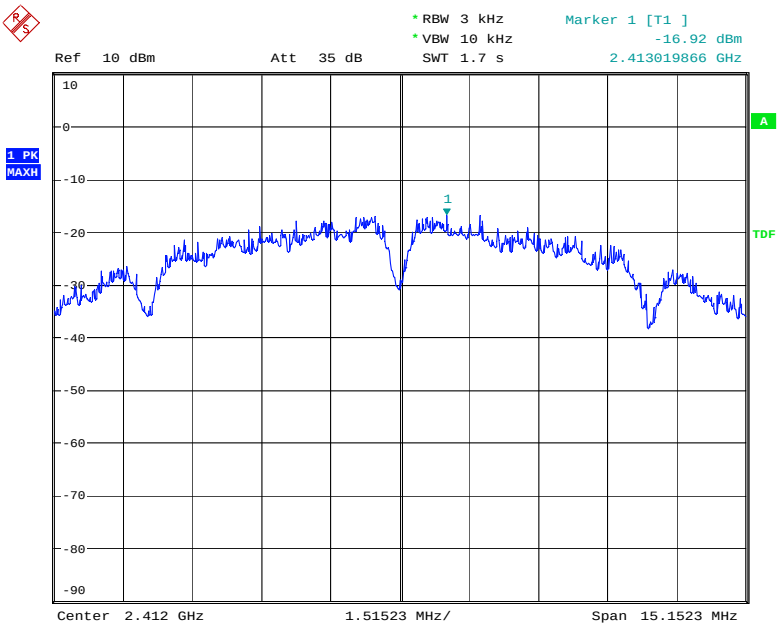

## 6.3 Measurement Results

**Pass**

Please refer to following table and plots.

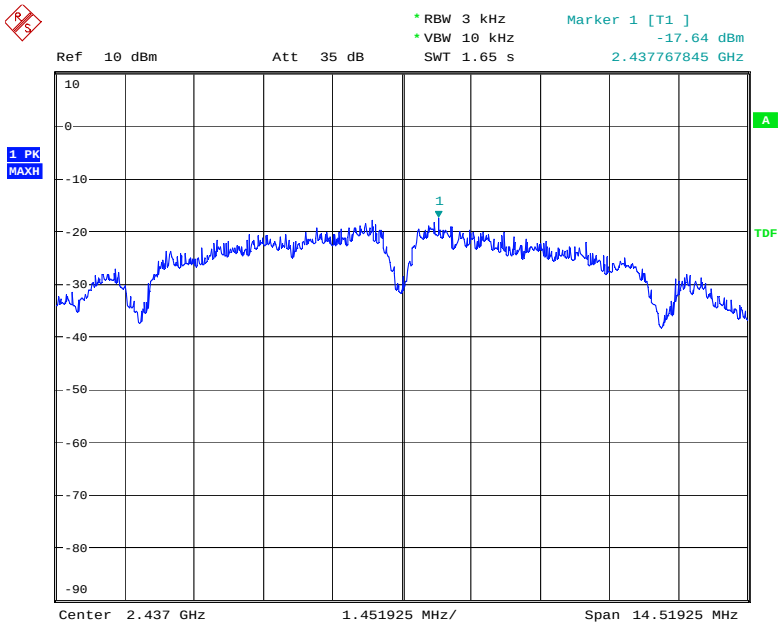
| | | | |
|---|---|---|---|
| Temperature : | 24 ℃ | Humidity : | 50 % |
| Test By: | Sance | Test Date : | November 18, 2015 |
| Test Result: | PASS | | |
| Frequency MHz | Data Rate Mbps | PSD dBm/3kHz | Limit dBm/3kHz |
| IEEE 802.11b Mode (CCK) | | | |
| Low Channel: 2412 | 1 | -16.92 | 8 |
| Middle Channel: 2437 | 1 | -17.64 | 8 |
| High Channel: 2462 | 1 | -19.02 | 8 |
| IEEE 802.11g Mode (OFDM) | | | |
| Low Channel: 2412 | 6 | -19.59 | 8 |
| Middle Channel: 2437 | 6 | -20.82 | 8 |
| High Channel: 2462 | 6 | -23.21 | 8 |
| IEEE 802.11n(HT20) Mode (OFDM) | | | |
| Low Channel: 2412 | 6.5 | -21.35 | 8 |
| Middle Channel: 2437 | 6.5 | -22.80 | 8 |
| High Channel: 2462 | 6.5 | -24.34 | 8 |

## 802.11b Low Channel



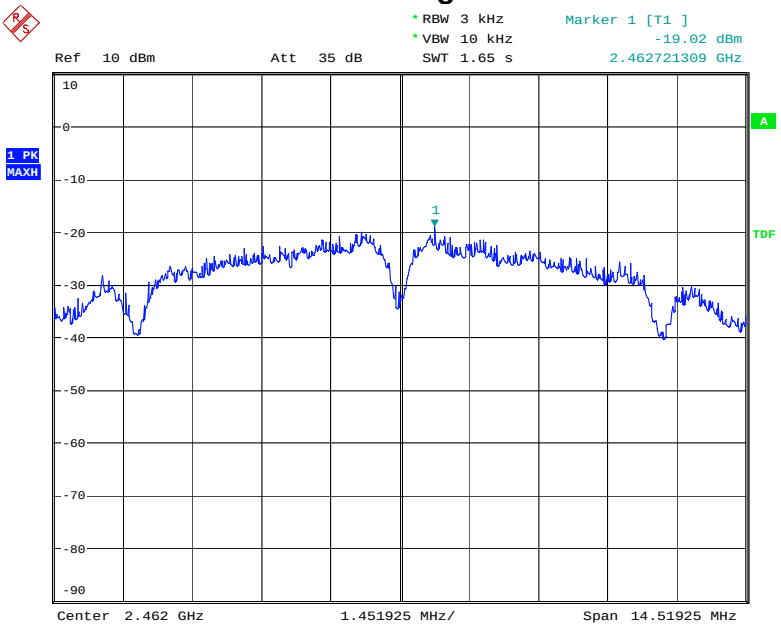

Date: 18.NOV.2015 14:24:11

## 802.11b Middle Channel



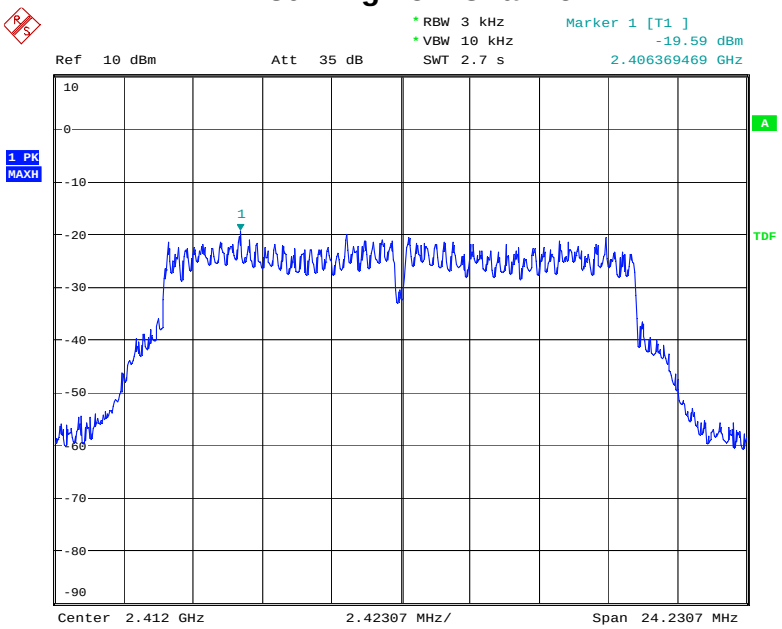

Date: 18.NOV.2015 14:24:56

## 802.11b High Channel



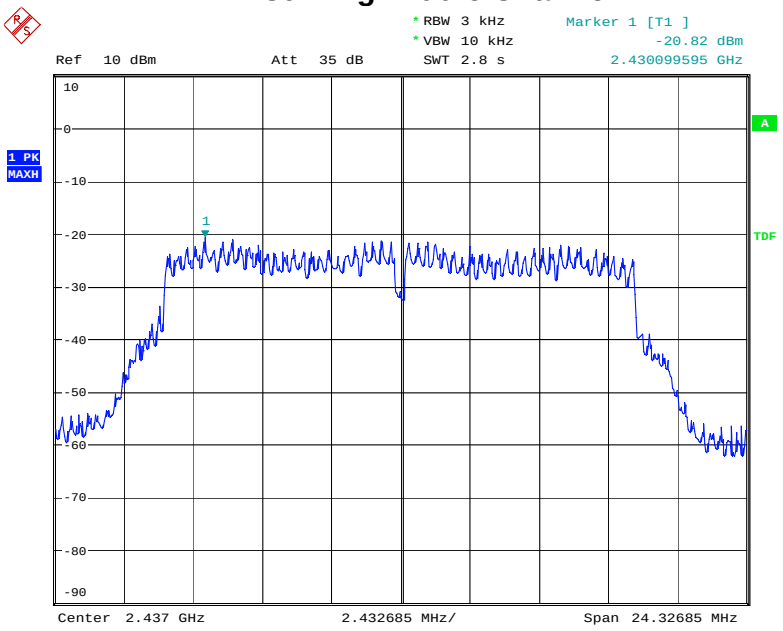

Date: 18.NOV.2015 14:27:59

## 802.11g Low Channel



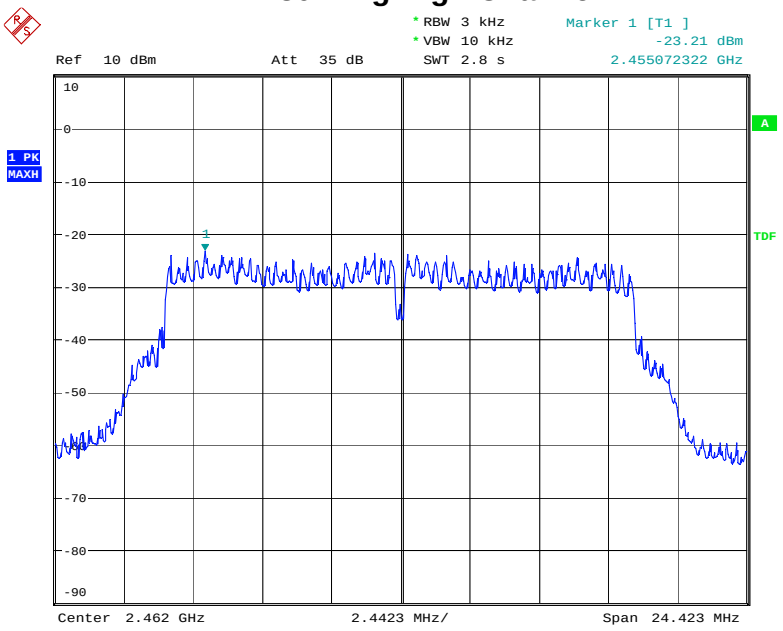

Date: 18.NOV.2015 14:29:47

## 802.11g Middle Channel



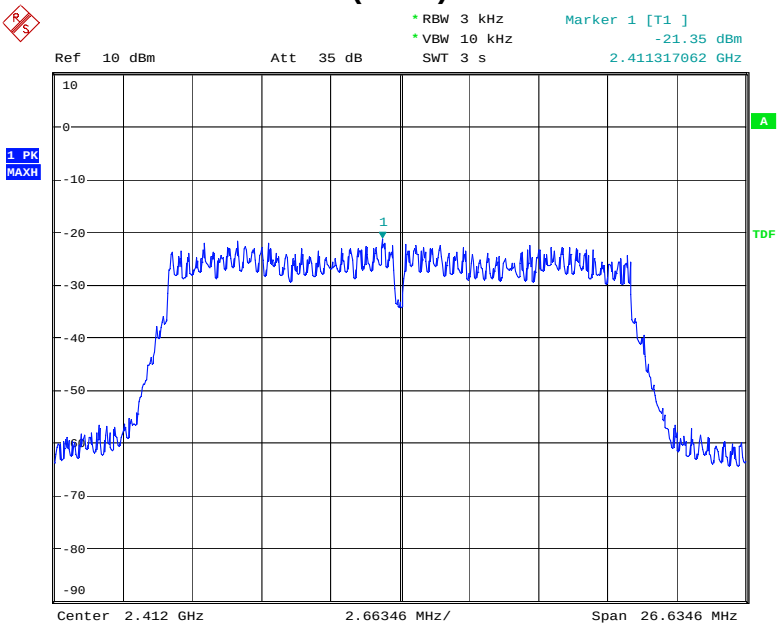

Date: 18.NOV.2015 14:30:34

## 802.11g High Channel



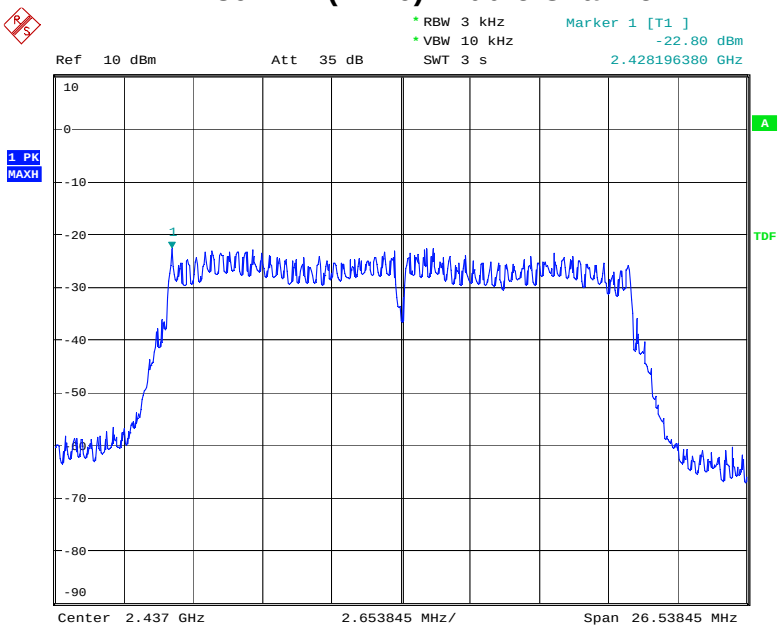

Date: 18.NOV.2015 14:31:18

## 802.11n(HT20) Low Channel



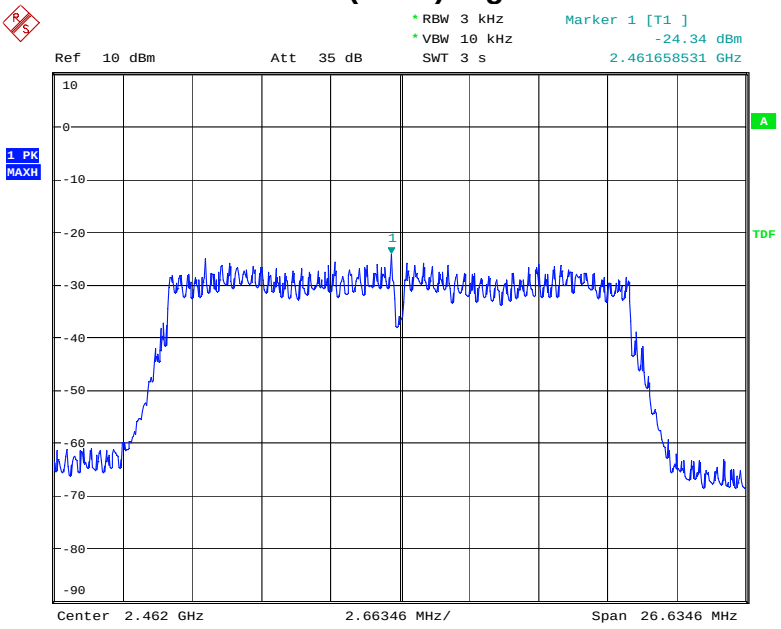

Date: 18.NOV.2015 14:31:56

## 802.11n(HT20) Middle Channel




Date: 18.NOV.2015 14:32:38

## 802.11n(HT20) High Channel




Date: 18.NOV.2015 14:33:09

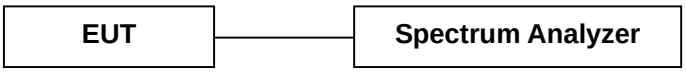
# 7. Band Edge and Conducted Spurious Emissions

## 7.1 Requirement and Measurement Procedure

Out of Band Conducted Emissions, FCC Rule 15.247(d):

The transmitter output is connected to spectrum analyzer. The resolution bandwidth is set to100KHz, and the video bandwidth set to 300KHz.

## 7.2 Test SET-UP (Block Diagram of Configuration)




## 7.3 Measurement Results

The test plots showed that all spurious emission and up to the tenth harmonic was measured and they were found to be at least 20dB below the highest level of the desired power in the passband. Please refer to below tables and plots.

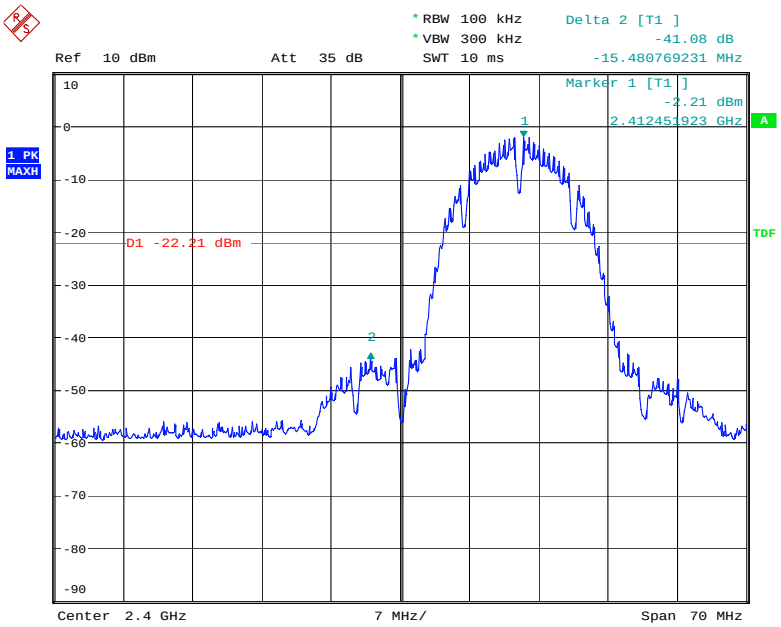
Spurious Emission in restricted band:

| | | | |
|---|---|---|---|
| Operation Mode: | TX | Test Date : | November 19, 2015 |
| Frequency Range: | Above 1GHz | Temperature : | 24 ℃ |
| Test Result: | PASS | Humidity : | 50 % |
| Measured Distance: | 3m | Test By: | Sance |

| Freq. (MHz) | Ant.Pol. (H/V) | Reading Level(dBuV) | | Factor (dB/m) | Emission Level (dBuV) | | Limit 3m (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PK | AV | | PK | AV | PK | AV | PK | AV |
| **Test Mode: 802.11b** | | | | | | | | | | |
| 2390.000 | H | 43.45 | 32.49 | 8.06 | 51.51 | 40.55 | 74.00 | 54.00 | -22.49 | -13.45 |
| 2390.000 | V | 40.24 | 28.09 | 8.06 | 48.30 | 36.15 | 74.00 | 54.00 | -25.70 | -17.85 |
| 2483.500 | H | 42.68 | 31.59 | 8.36 | 51.04 | 39.95 | 74.00 | 54.00 | -22.96 | -14.05 |
| 2483.500 | V | 41.83 | 30.90 | 8.36 | 50.19 | 39.26 | 74.00 | 54.00 | -23.81 | -14.74 |
| **Test Mode: 802.11g** | | | | | | | | | | |
| 2390.000 | H | 53.92 | 36.63 | 8.06 | 61.98 | 44.69 | 74.00 | 54.00 | -12.02 | -9.31 |
| 2390.000 | V | 60.68 | 40.80 | 8.06 | 68.74 | 48.86 | 74.00 | 54.00 | -5.26 | -5.14 |
| 2483.500 | H | 60.84 | 40.97 | 8.36 | 69.20 | 49.33 | 74.00 | 54.00 | -4.80 | -4.67 |
| 2483.500 | V | 60.45 | 40.15 | 8.36 | 68.81 | 48.51 | 74.00 | 54.00 | -5.19 | -5.49 |
| **Test Mode: 802.11n(HT20)** | | | | | | | | | | |
| 2390.000 | H | 58.43 | 40.19 | 8.06 | 66.49 | 48.25 | 74.00 | 54.00 | -7.51 | -5.75 |
| 2390.000 | V | 52.71 | 31.77 | 8.06 | 60.77 | 39.83 | 74.00 | 54.00 | -13.23 | -14.17 |
| 2483.500 | H | 58.78 | 38.93 | 8.36 | 67.14 | 47.29 | 74.00 | 54.00 | -6.86 | -6.71 |
| 2483.500 | V | 60.58 | 35.23 | 8.36 | 68.94 | 43.59 | 74.00 | 54.00 | -5.06 | -10.41 |

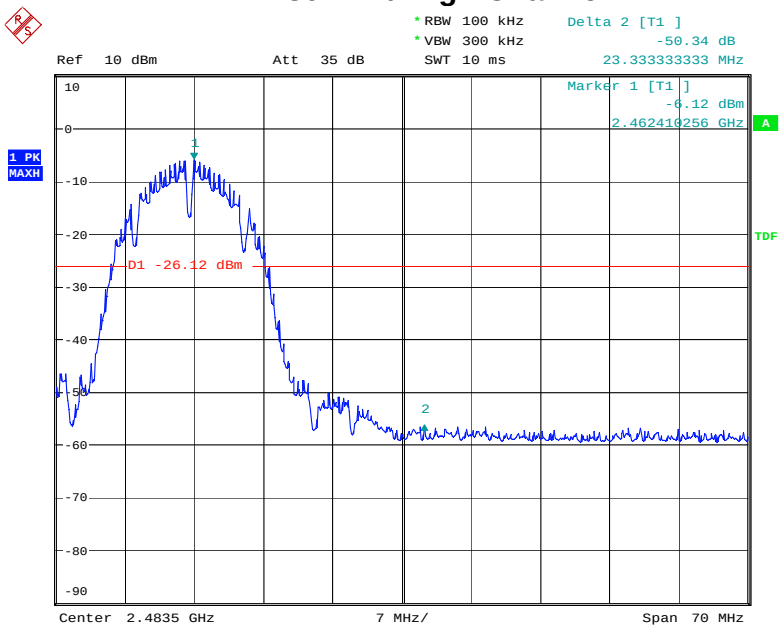
**Note:** (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : ±3.7dB

## Band Edge
## 802.11b Low Channel



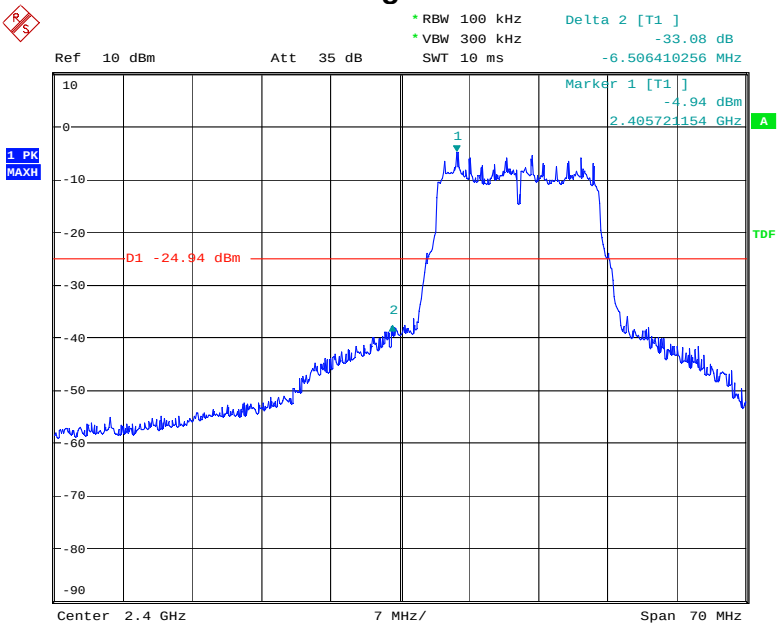

Date: 18.NOV.2015 14:34:37

## 802.11b High Channel



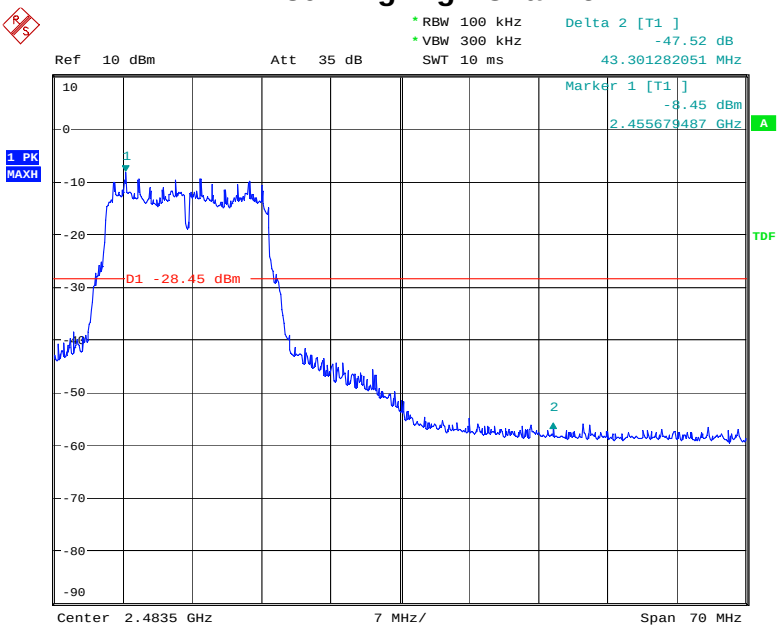

Date: 18.NOV.2015 14:35:39

## 802.11g Low Channel



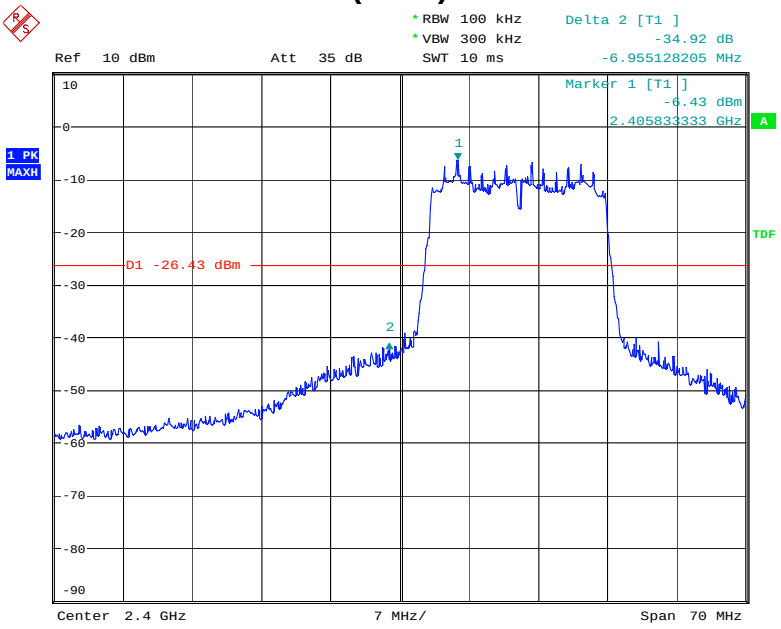

Date: 18.NOV.2015 14:36:43

## 802.11g High Channel



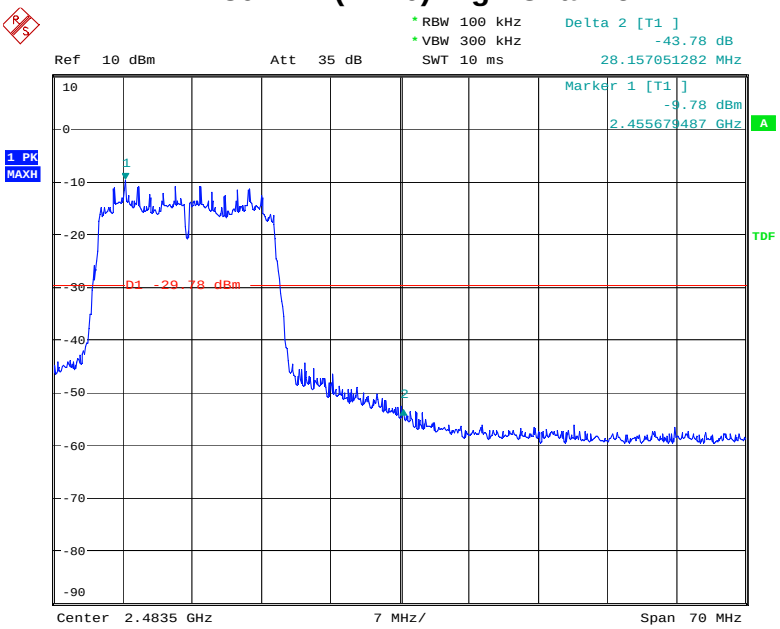

Date: 18.NOV.2015 14:37:42

## 802.11n(HT20) Low Channel




Date: 18.NOV.2015 14:38:41

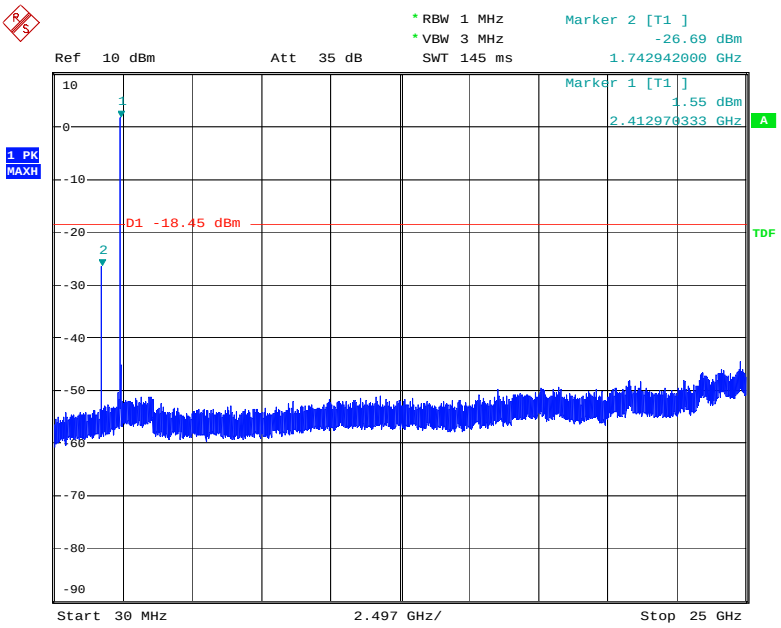
## 802.11n(HT20) High Channel




Date: 18.NOV.2015 14:39:24

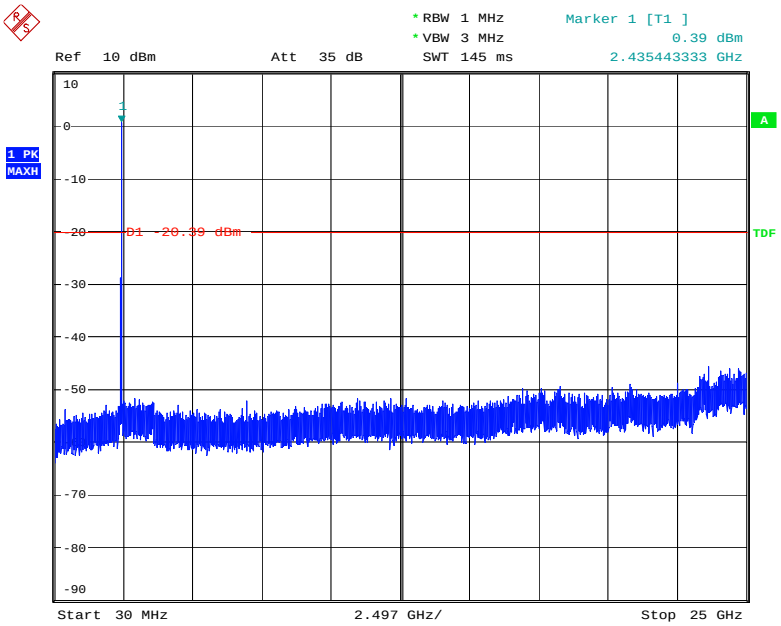
# Conducted Spurious Emissions

## The worst case: 802.11g
## Low Channel



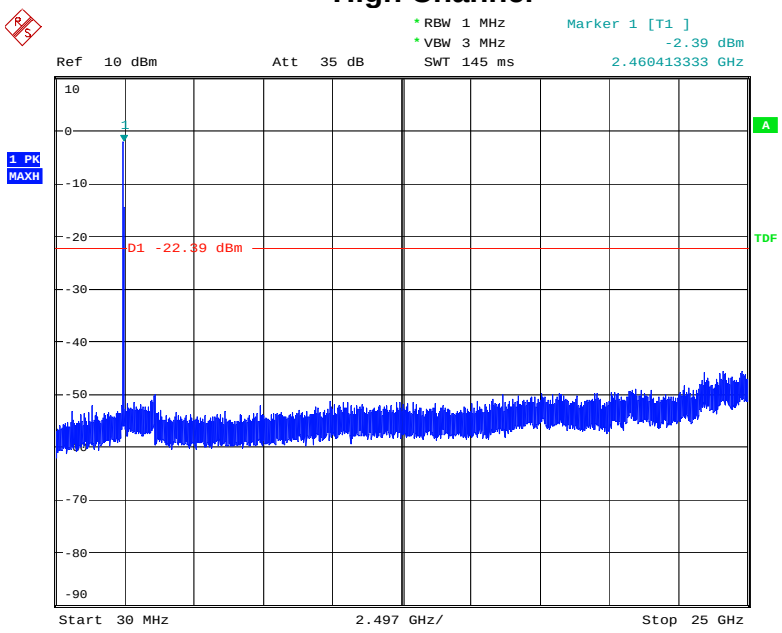

Date: 18.NOV.2015 15:20:25

## Middle Channel




Date: 18.NOV.2015 15:21:07

## High Channel



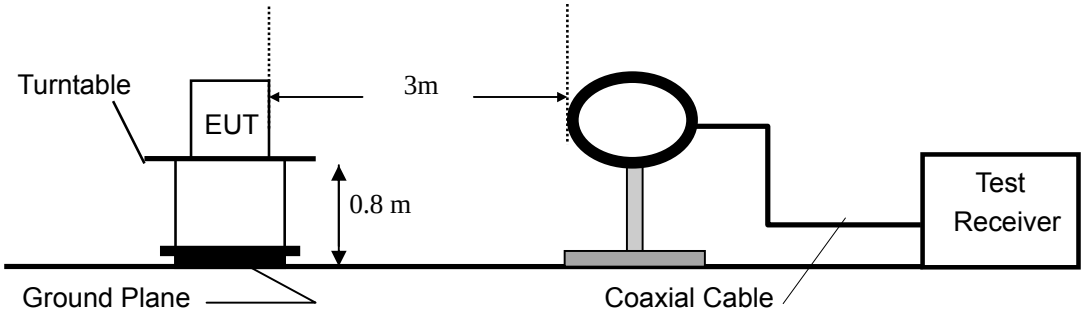

Date: 18.NOV.2015 15:22:02

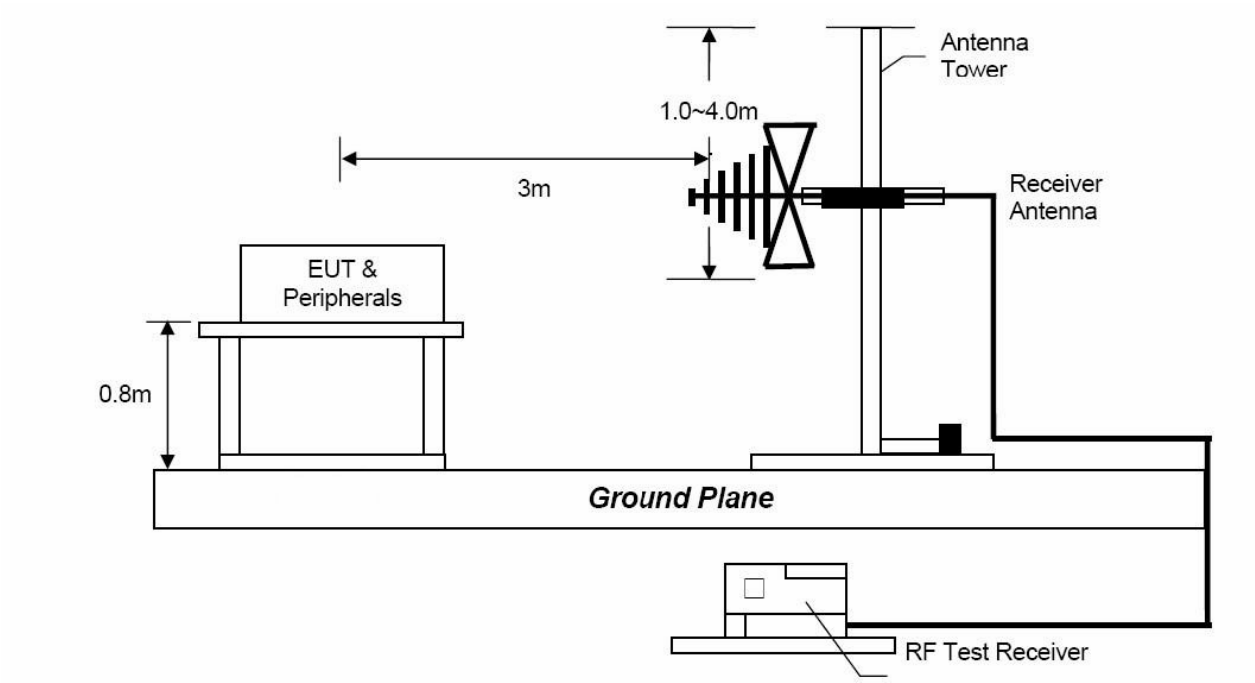
**Note: Sweep points=30001pts**

# 8. Radiated Spurious Emissions and Restricted Bands

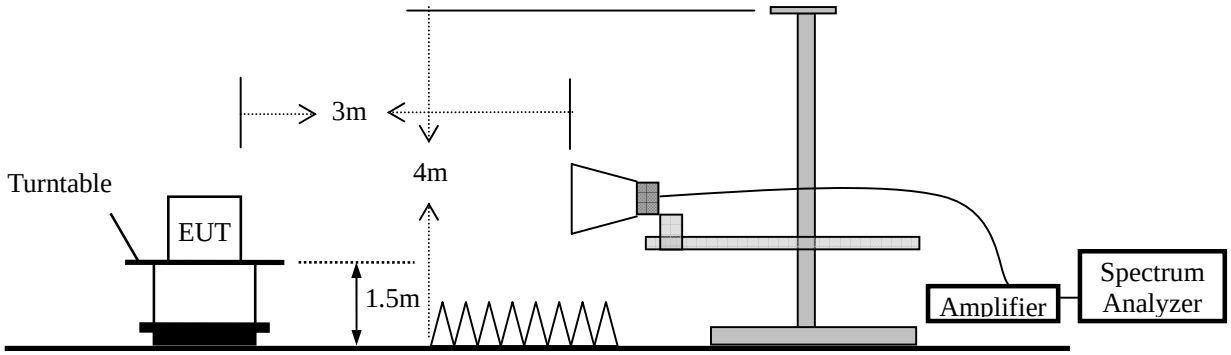
## 8.1 Test SET-UP (Block Diagram of Configuration)

### 8.1.1 Radiated Emission Test Set-Up, Frequency Below 30MHz



8.1.2 Radiated Emission Test Set-Up, Frequency above 1GHz




## 8.2 Measurement Procedure

a. Blow 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi- anechoic chamber room. Above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

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

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

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.

e. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

For 30MHz to 1GHz:
Sept the spectrum analyzer as: RBW=120kHz, VBW=300kHz, Detector=Quasi-Peak

For Above 1GHz:
Set the spectrum analyzer as: RBW=1MHz, VBW=3MHz, Detector=Peak.
Set the spectrum analyzer as: RBW=1MHz, VBW=10Hz, Detector=Peak.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

| Frequency Band (MHz) | Level | Resolution Bandwidth | Video Bandwidth |
|---|---|---|---|
| 30 to 1000 | QP | 120 kHz | 300 kHz |
| Above 1000 | Peak | 1 MHz | 3 MHz |
| | Average | 1 MHz | 10 Hz |

## 8.3 Limit

| Frequency range MHz | Distance Meters | Field Strengths Limit (15.209) μV/m |
|---|---|---|
| 0.009 ~ 0.490 | 300 | 2400/F(kHz) |
| 0.490 ~ 1.705 | 30 | 24000/F(kHz) |
| 1.705 ~ 30 | 30 | 30 |
| 30 ~ 88 | 3 | 100 |
| 88 ~ 216 | 3 | 150 |
| 216 ~ 960 | 3 | 200 |
| Above 960 | 3 | 500 |

Remark：(1) Emission level (dB)μV = 20 log Emission level μV/m
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.
(5) §15.247(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

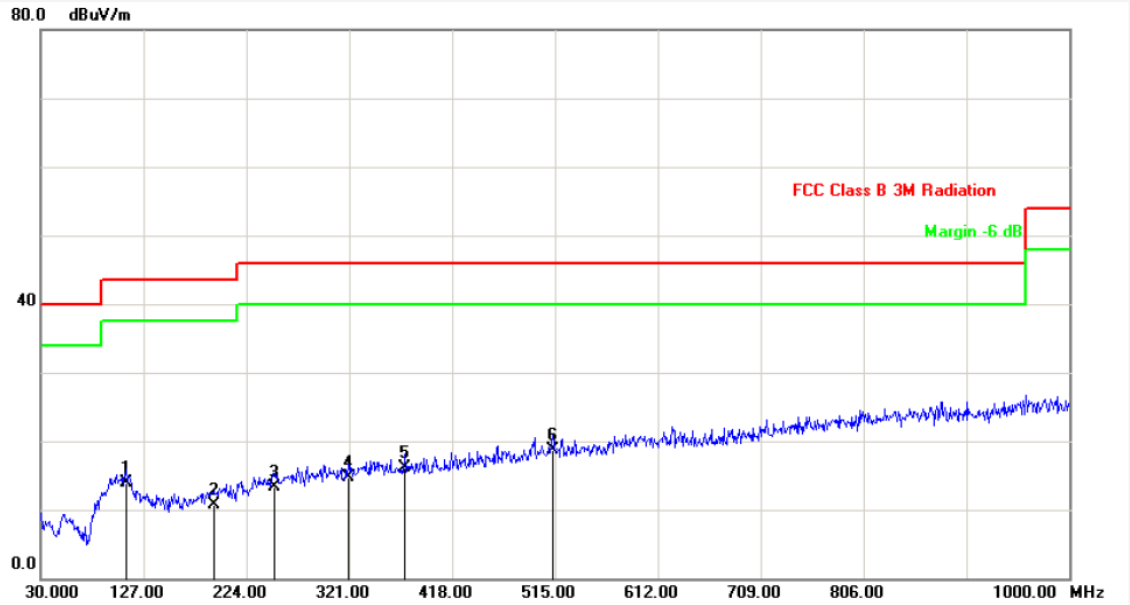
## 8.4 Measurement Results

**Please refer to following plots.**

**Dongguan NTC Co., Ltd.**
Tel:+86-769-22022444 Fax:+86-769-22022799
Web: Http://www.ntc-c.com

Site: Radiation

Test Time: 2015-11-14 9:17:05




| | | | |
|---|---|---|---|
| Report No.: | FX7121 | | |
| Test Standard: | FCC Class B 3M Radiation | Test Distance: | |
| Test item: | Radiation Emission | Ant. Polarization: | Horizontal |
| Applicant: | FiiO | Temp.(C)/Hum.(%): | 21(C) / 55 % |
| Product: | Portable High Resolution Music Player | Power Rating: | DC 3.7V |
| Model No.: | FX7121 | Test Engineer: | Jerry |

Test Mode: Wi-Fi Mode

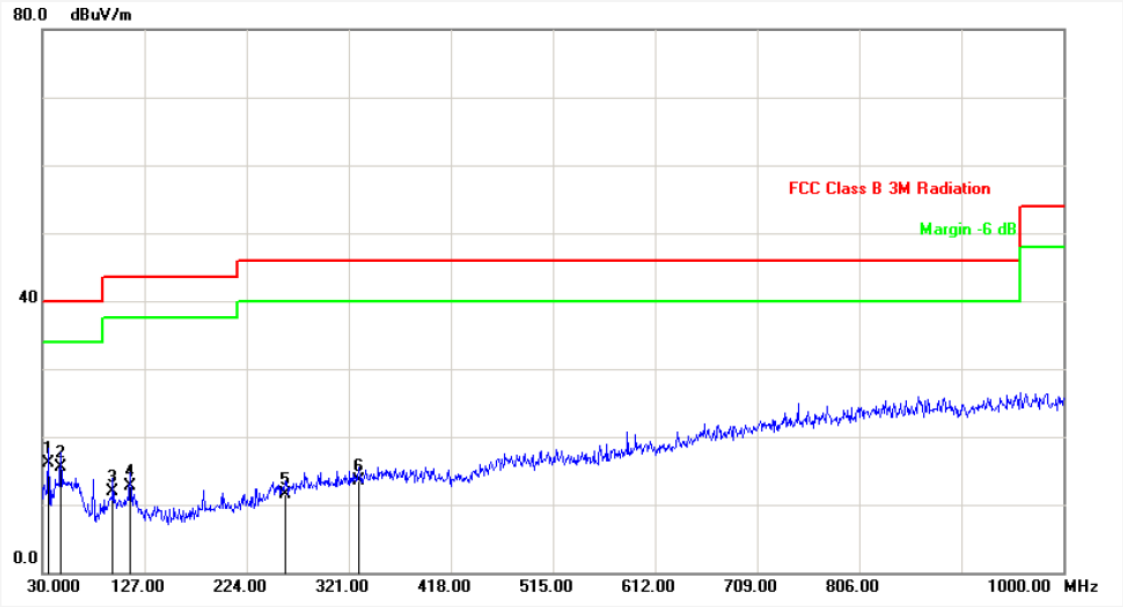
Remark: 802.11g Lowest channel

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 110.5100 | -12.26 | 26.16 | 13.90 | 43.50 | -29.60 | QP | | | P | |
| 2 | 192.9600 | -13.48 | 24.18 | 10.70 | 43.50 | -32.80 | QP | | | P | |
| 3 | 250.1900 | -11.69 | 24.99 | 13.30 | 46.00 | -32.70 | QP | | | P | |
| 4 | 320.0299 | -9.93 | 24.63 | 14.70 | 46.00 | -31.30 | QP | | | P | |
| 5 | 373.3800 | -9.18 | 25.38 | 16.20 | 46.00 | -29.80 | QP | | | P | |
| 6 | 513.0600 | -6.74 | 25.54 | 18.80 | 46.00 | -27.20 | QP | | | P | |

**Dongguan NTC Co., Ltd.**
**Tel:+86-769-22022444 Fax:+86-769-22022799**
Web: Http://www.ntc-c.com

Site: Radiation

Test Time: 2015-11-14 9:11:51




| | | | |
|---|---|---|---|
| **Report No.:** | **FX7121** | | |
| **Test Standard:** | **FCC Class B 3M Radiation** | **Test Distance:** | |
| **Test item:** | **Radiation Emission** | **Ant. Polarization:** | **Vertical** |
| **Applicant:** | **FiiO** | **Temp.(C)/Hum.(%):** | **21(C) / 55 %** |
| **Product:** | **Portable High Resolution Music Player** | **Power Rating:** | **DC 3.7V** |
| **Model No.:** | **FX7121** | **Test Engineer:** | **Jerry** |

**Test Mode:** **Wi-Fi Mode**

**Remark:** **802.11g Lowest channel**

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 35.8200 | -16.88 | 33.08 | 16.20 | 40.00 | -23.80 | QP | | | P | |
| 2 | 47.4600 | -13.50 | 29.10 | 15.60 | 40.00 | -24.40 | QP | | | P | |
| 3 | 96.9300 | -15.91 | 27.81 | 11.90 | 43.50 | -31.60 | QP | | | P | |
| 4 | 113.4200 | -16.03 | 28.73 | 12.70 | 43.50 | -30.80 | QP | | | P | |
| 5 | 260.8600 | -13.41 | 24.91 | 11.50 | 46.00 | -34.50 | QP | | | P | |
| 6 | 330.7000 | -11.60 | 25.20 | 13.60 | 46.00 | -32.40 | QP | | | P | |

| | | | |
|---|---|---|---|
| Test Mode: | 802.11b | Test Date : | November 19, 2015 |
| Frequency Range: | Above 1GHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 50 % |
| Measured Distance: | 3m | Test By: | Sance |

| Freq. (MHz) | Ant.Pol. (H/V) | Reading Level(dBuV) | | Factor (dB/m) | Emission Level (dBuV) | | Limit 3m (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PK | AV | | PK | AV | PK | AV | PK | AV |
| **Operation Mode: TX Mode (Low)** | | | | | | | | | | |
| 4824 | V | 45.11 | 34.61 | 14.72 | 59.83 | 49.33 | 74.00 | 54.00 | -14.17 | -4.67 |
| 7236 | V | 39.92 | 25.15 | 20.74 | 60.66 | 45.89 | 74.00 | 54.00 | -13.34 | -8.11 |
| --- | | | | | | | | | | |
| 4824 | H | 38.32 | 27.85 | 14.72 | 53.04 | 42.57 | 74.00 | 54.00 | -20.96 | -11.43 |
| 7236 | H | 37.67 | 22.81 | 20.74 | 58.41 | 43.55 | 74.00 | 54.00 | -15.59 | -10.45 |
| --- | | | | | | | | | | |
| **Operation Mode: TX Mode (Mid)** | | | | | | | | | | |
| 4874 | V | 41.14 | 33.45 | 14.93 | 56.07 | 48.38 | 74.00 | 54.00 | -17.93 | -5.62 |
| 7311 | V | 36.71 | 22.90 | 20.88 | 57.59 | 43.78 | 74.00 | 54.00 | -16.41 | -10.22 |
| --- | | | | | | | | | | |
| 4874 | H | 46.06 | 33.94 | 14.93 | 60.99 | 48.87 | 74.00 | 54.00 | -13.01 | -5.13 |
| 7311 | H | 37.23 | 23.43 | 20.88 | 58.11 | 44.31 | 74.00 | 54.00 | -15.89 | -9.69 |
| --- | | | | | | | | | | |
| **Operation Mode: TX Mode (High)** | | | | | | | | | | |
| 4924 | V | 47.11 | 34.18 | 15.15 | 62.26 | 49.33 | 74.00 | 54.00 | -11.74 | -4.67 |
| 7386 | V | 37.28 | 25.18 | 21.04 | 58.32 | 46.22 | 74.00 | 54.00 | -15.68 | -7.78 |
| --- | | | | | | | | | | |
| 4924 | H | 42.85 | 34.16 | 15.15 | 58.00 | 49.31 | 74.00 | 54.00 | -16.00 | -4.69 |
| 7386 | H | 36.28 | 23.22 | 21.04 | 57.32 | 44.26 | 74.00 | 54.00 | -16.68 | -9.74 |
| --- | | | | | | | | | | |

**Note:**
(1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level + Factor
(3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(4) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
(5) Measurement uncertainty : ±3.7dB.
(6) Horn antenna used for the emission over 1000MHz.

| | | | |
|---|---|---|---|
| Test Mode: | 802.11g | Test Date : | November 19, 2015 |
| Frequency Range: | Above 1GHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 50 % |
| Measured Distance: | 3m | Test By: | Sance |

| Freq. (MHz) | Ant.Pol. (H/V) | Reading Level(dBuV) | | Factor (dB/m) | Emission Level (dBuV) | | Limit 3m (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PK | AV | | PK | AV | PK | AV | PK | AV |
| **Operation Mode: TX Mode (Low)** | | | | | | | | | | |
| 4824 | V | 38.91 | 25.05 | 14.72 | 53.63 | 39.77 | 74.00 | 54.00 | -20.37 | -14.23 |
| 7236 | V | 31.62 | 16.49 | 20.74 | 52.36 | 37.23 | 74.00 | 54.00 | -21.64 | -16.77 |
| --- | | | | | | | | | | |
| 4824 | H | 45.57 | 29.62 | 14.72 | 60.29 | 44.34 | 74.00 | 54.00 | -13.71 | -9.66 |
| 7236 | H | 38.75 | 23.86 | 20.74 | 59.49 | 44.60 | 74.00 | 54.00 | -14.51 | -9.40 |
| --- | | | | | | | | | | |
| **Operation Mode: TX Mode (Mid)** | | | | | | | | | | |
| 4874 | V | 39.59 | 27.74 | 14.93 | 54.52 | 42.67 | 74.00 | 54.00 | -19.48 | -11.33 |
| 7311 | V | 37.44 | 23.83 | 20.88 | 58.32 | 44.71 | 74.00 | 54.00 | -15.68 | -9.29 |
| --- | | | | | | | | | | |
| 4874 | H | 41.40 | 25.84 | 14.93 | 56.33 | 40.77 | 74.00 | 54.00 | -17.67 | -13.23 |
| 7311 | H | 37.23 | 22.99 | 20.88 | 58.11 | 43.87 | 74.00 | 54.00 | -15.89 | -10.13 |
| --- | | | | | | | | | | |
| **Operation Mode: TX Mode (High)** | | | | | | | | | | |
| 4924 | V | 42.56 | 28.17 | 15.15 | 57.71 | 43.32 | 74.00 | 54.00 | -16.29 | -10.68 |
| 7386 | V | 37.47 | 23.14 | 21.04 | 58.51 | 44.18 | 74.00 | 54.00 | -15.49 | -9.82 |
| --- | | | | | | | | | | |
| 4924 | H | 41.49 | 26.10 | 15.15 | 56.64 | 41.25 | 74.00 | 54.00 | -17.36 | -12.75 |
| 7386 | H | 37.58 | 23.14 | 21.04 | 58.62 | 44.18 | 74.00 | 54.00 | -15.38 | -9.82 |
| --- | | | | | | | | | | |

**Note:** (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level + Factor
(3) Factor= Antenna Gain + Cable Loss – Amtplifier Gain
(4) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
(5) Measurement uncertainty : ±3.7dB.
(6) Horn antenna used for the emission over 1000MHz.

| | | | |
|---|---|---|---|
| Test Mode: | 802.11n(HT20) | Test Date : | November 19, 2015 |
| Frequency Range: | Above 1GHz | Temperature : | 24℃ |
| Test Result: | PASS | Humidity : | 50 % |
| Measured Distance: | 3m | Test By: | Sance |

| Freq. (MHz) | Ant.Pol. (H/V) | Reading Level(dBuV) | | Factor (dB/m) | Emission Level (dBuV) | | Limit 3m (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PK | AV | | PK | AV | PK | AV | PK | AV |
| **Operation Mode: TX Mode (Low)** | | | | | | | | | | |
| 4824 | V | 43.18 | 27.85 | 14.72 | 57.90 | 42.57 | 74.00 | 54.00 | -16.10 | -11.43 |
| 7236 | V | 37.39 | 23.14 | 20.74 | 58.13 | 43.88 | 74.00 | 54.00 | -15.87 | -10.12 |
| --- | | | | | | | | | | |
| 4824 | H | 39.30 | 25.74 | 14.72 | 54.02 | 40.46 | 74.00 | 54.00 | -19.98 | -13.54 |
| 7236 | H | 36.99 | 22.80 | 20.74 | 57.73 | 43.54 | 74.00 | 54.00 | -16.27 | -10.46 |
| --- | | | | | | | | | | |
| **Operation Mode: TX Mode (Mid)** | | | | | | | | | | |
| 4874 | V | 45.50 | 26.02 | 14.93 | 60.43 | 40.95 | 74.00 | 54.00 | -13.57 | -13.05 |
| 7311 | V | 39.58 | 25.10 | 20.88 | 60.46 | 45.98 | 74.00 | 54.00 | -13.54 | -8.02 |
| --- | | | | | | | | | | |
| 4874 | H | 39.05 | 24.53 | 14.93 | 53.98 | 39.46 | 74.00 | 54.00 | -20.02 | -14.54 |
| 7311 | H | 39.33 | 24.97 | 20.88 | 60.21 | 45.85 | 74.00 | 54.00 | -13.79 | -8.15 |
| --- | | | | | | | | | | |
| **Operation Mode: TX Mode (High)** | | | | | | | | | | |
| 4924 | V | 40.87 | 24.27 | 15.15 | 56.02 | 39.42 | 74.00 | 54.00 | -17.98 | -14.58 |
| 7386 | V | 39.14 | 25.06 | 21.04 | 60.18 | 46.10 | 74.00 | 54.00 | -13.82 | -7.90 |
| --- | | | | | | | | | | |
| 4924 | H | 39.44 | 25.38 | 15.15 | 54.59 | 40.53 | 74.00 | 54.00 | -19.41 | -13.47 |
| 7386 | H | 39.78 | 25.28 | 21.04 | 60.82 | 46.32 | 74.00 | 54.00 | -13.18 | -7.68 |
| --- | | | | | | | | | | |

**Note:** (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level + Factor
(3) Factor= Antenna Gain + Cable Loss – Amplifier Gain
(4) Data of measurement within this frequency range shown " ---" in the table above means the reading of emissions are attenuated more than 10dB below the permissible limits.
(5) Measurement uncertainty : ±3.7dB.
(6) Horn antenna used for the emission over 1000MHz.

# 9. Antenna Application

## 9.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
Systems operating in the 2400-2483.5MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

## 9.2 Measurement Results

The antenna is PCB antenna and no consideration of replacement, and the best case gain of the antenna is 2dBi. So, the antenna is consider meet the requirement.

## 10. Test Equipment List

| Description | Manufacturer | Model Number | Serial Number | Characteristics | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| Test Receiver | Rohde & Schwarz | ESCI7 | 100837 | 9KHz~7GHz | Nov. 24, 2014 | Nov. 23, 2015 |
| Antenna | Schwarzbeck | VULB9162 | 9162-010 | 30MHz~7GHz | Nov. 27, 2014 | Nov. 26, 2015 |
| Positioning Controller | UC | UC 3000 | N/A | 0~360°, 1-4m | N/A | N/A |
| Color Monitor | SUNSPO | SP-140A | N/A | N/A | N/A | N/A |
| Single Phase Power Line Filter | SAEMC | PF201A-32 | 110210 | 32A | N/A | N/A |
| 3 Phase Power Line Filter | SAEMC | PF401A-200 | 110318 | 200A | N/A | N/A |
| DC Power Filter | SAEMC | PF301A-200 | 110245 | 200A | N/A | N/A |
| Cable | Huber+Suhner | CBL2-NN-1M | 22390001 | 9KHz~7GHz | Nov. 07, 2015 | Nov. 06, 2016 |
| Cable | Huber+Suhner | CIL02 | N/A | 9KHz~7GHz | Nov. 07, 2015 | Nov. 06, 2016 |
| RF Cable | Huber+Suhner | SF-104 | MY16559/4 | 9KHz~25GHz | Mar. 07, 2015 | Mar. 06, 2016 |
| Power Amplifier | HP | HP 8447D | 1145A00203 | 100KHz~1.3GHz | Nov. 07, 2015 | Nov. 06, 2016 |
| Horn Antenna | Schwarzbeck | BBHA9170 | 9170-372 | 15GHz~26.5GHz | Oct.23, 2015 | Oct.22, 2016 |
| Horn Antenna | Com-Power | AH-118 | 071078 | 1GHz~18GHz | Nov. 05, 2015 | Nov. 04, 2016 |
| Loop antenna | Daze | ZA30900A | 0708 | 9KHz~30MHz | Oct.10, 2015 | Oct.09, 2016 |
| Spectrum Analyzer | Rohde & Schwarz | FSU26 | 200409/026 | 20Hz~26.5GHz | Sep. 01, 2015 | Aug. 31, 2016 |
| Pre-Amplifier | Agilent | 8449B | 3008A02964 | 1GHz~26.5GHz | Nov. 03, 2015 | Nov. 02, 2016 |
| L.I.S.N. | Rohde & Schwarz | ENV 216 | 101317 | 9KHz~30MHz | Nov. 07, 2015 | Nov. 06, 2016 |
| Temporary antenna connector | TESCOM | SS402 | N/A | 1G-18GHz | N/A | N/A |
| Power Meter | Anritsu | ML2495A | 1139001 | 100k-65GHz | Nov. 05, 2015 | Nov. 04, 2016 |
| Power Sensor | Anritsu | MA2411B | 100345 | 300M-40GHz | Nov. 05, 2015 | Nov. 04, 2016 |

---End---