**Shenzhen Asia Test Technology Co., Ltd.**

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# FCC RADIO TEST REPORT
# FCC ID: 2AKLL-INVENTOR2

**Product：** Inventor Ⅱ (3D printer)

**Trade Name：** FLASHFORGE 3D PRINTER

**Model Name：** INVENTOR Ⅱ

**Serial Model：** N/A

## Prepared for

Zhejiang Flashforge 3D Technology CO., Ltd.

No.518, Xianyuan Road, Jinhua, Zhejiang, China

## Prepared by

Shenzhen Asia Test Technology Co.,Ltd.

7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District, Shenzhen, China

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# TEST RESULT CERTIFICATION

**Manufacture's Name**... Zhejiang Flashforge 3D Technology CO., Ltd.

Address ..... No.518, Xianyuan Road, Jinhua，Zhejiang, China

**Product description**

Product name ..... Inventor Ⅱ (3D printer)

Model and/or type reference ..... INVENTOR Ⅱ

Additional Model ..... N/A

**Standards** ..... FCC Part15.247

Test procedure ..... ANSI C63.10-2013

This device described above has been tested by ATT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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**Date of Test** .....

Date (s) of performance of tests ..... Dec. 23 2016 ~Jan. 23 2017

Date of Issue..... Jan. 23 2017

Test Result..... **Pass**

Testing Engineer : Jack Yu

(Jack Yu)

Technical Manager : Jerry You

(Jerry You)

Authorized Signatory : Can Liu

(Can Liu)

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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| Test Item | FCC Part No. | Requirements | Verdict |
|---|---|---|---|
| DTS (6 dB) Bandwidth | 15.247(a)(2) | ≥ 500 kHz. | PASS |
| Maximum Peak Conducted Output Power | 15.247(b)(3) | For directional gain:< 30dBm – (G[dBi] –6 [dB]),peak; Otherwise :< 30dBm, peak. | PASS |
| Maximum Power Spectral Density Level | 15.247(e) | For directional gain :< 8dBm/3 kHz – (G[dBi] –6[dB]), peak. Otherwise :< 8dBm/3 kHz, peak. | PASS |
| Band Edges Compliance | 15.247(d) | < -20dBr/100 kHz if total peak power ≤power limit. | PASS |
| Unwanted Emissions into Non-Restricted Frequency Bands | 15.247(d) | < -20dBr/100 kHz if total peak power ≤power limit. | PASS |
| Unwanted Emissions into Restricted Frequency Bands (Conducted) | 15.247(d) 15.209 | < -20dBr/100 kHz if total peak power ≤power limit. | PASS |
| Unwanted Emissions into Restricted Frequency Bands (Radiated) | 15.247(d) 15.209 | FCC Part 15.209 field strength limit; | PASS |
| AC Power Line Conducted Emissions | 15.207 | FCC Part 15.207 conducted limit; | PASS |

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

Summary of measurement results

| Test Specification clause | Test case | Test Mode | Test Channel | Recorded In Report | | Pass | Fail | NA | NP | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| §15.247(b)(4) | Antenna gain | 802.11b | ☒ Lowest ☒ Middle ☒ Highest | 802.11b | ☒ Lowest ☒ Middle ☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.247(e) | Power spectral density | 802.11b 802.11g 802.11n HT20 | ☒ Lowest ☒ Middle ☒ Highest | 802.11b 802.11g 802.11n HT20 | ☒ Lowest ☒ Middle ☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.247(a)(1) | Spectrum bandwidth – 6 dB bandwidth | 802.11b 802.11g 802.11n HT20 | ☒ Lowest ☒ Middle ☒ Highest | 802.11b 802.11g 802.11n HT20 | ☒ Lowest ☒ Middle ☒ Highest | ☒ ☒ | ☐ | ☐ | ☐ | complies |
| §15.247( | Maximum output | 802.11b 802.11g | ☒ Lowest ☒ Middle | 802.11b 802.11g | ☒ Lowest ☒ Middle | ☒ ☒ | ☐ | ☐ | ☐ | complies |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| b)(1) | power | 802.11n HT20 | ☒ Highest | 802.11n HT20 | ☒ Highest | ☒ | | | | |
| §15.247(d) | Band edge compliance conducted | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Highest | ☒<br>☒ | ☐ | ☐ | ☐ | complies |
| §15.205 | Band edge compliance radiated | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.247(d) | TX spurious emissions conducted | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒<br>☒ | ☐ | ☐ | ☐ | complies |
| §15.247(d) | TX spurious emissions radiated | 802.11b<br>802.11g<br>802.11n HT20 | ☒ Lowest<br>☒ Middle<br>☒ Highest | 802.11b | ☒ Lowest<br>☒ Middle<br>☒ Highest | ☒ | ☐ | ☐ | ☐ | complies |
| §15.109 | RX spurious emissions radiated | -/- | -/- | -/- | -/- | ☒ | ☐ | ☐ | ☐ | complies |
| §15.209(a) | TX spurious Emissions radiated < 30 MHz | 802.11b | -/- | 802.11b | -/- | ☒ | ☐ | ☐ | ☐ | complies |
| §15.107(a)<br>§15.207 | Conducted Emissions < 30 MHz | 802.11b | -/- | 802.11b | -/- | ☒ | ☐ | ☐ | ☐ | complies |

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## 1.1 TEST FACILITY

Shenzhen Asia Test Technology Co.,Ltd.
7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District, Shenzhen, China
FCC Registration No.: 348715

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

| No. | Item | Uncertainty |
|---|---|---|
| 1 | Conducted Emission Test | ±1.38dB |
| 2 | RF power,conducted | ±0.16dB |
| 3 | Spurious emissions,conducted | ±0.21dB |
| 4 | All emissions,radiated(<1G) | ±4.68dB |
| 5 | All emissions,radiated(>1G) | ±4.89dB |
| 6 | Temperature | ±0.5°C |
| 7 | Humidity | ±2% |

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# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| Equipment | Inventor Ⅱ (3D printer) |
| Model Name | INVENTOR Ⅱ |
| Serial number | S10001 |
| Serial Model | N/A |
| Model Difference | N/A |
| WLAN FCC Operation frequency | IEEE 802.11b:2412-2462MHz<br>IEEE 802.11g:2412-2462MHz<br>IEEE 802.11n HT20:2412-2462MHz |
| WLAN FCC Modulation Type | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) |
| Antenna | 0dbi, PCB antenna |
| Ratings | DC 24V, 2.71A |
| Adapter | M/N:KPL-060M-VI<br>Input:100-240V~, 50/60Hz, 1.7A<br>Output:24Vdc, 2.71A, 65W |
| Battery | N/A |
| HW: | MM_201604 |
| SW: | V1.1 |

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## 2.2 DESCRIPTION OF TEST MODES

IEEE 802.11b/g/n: The product support thirteen channels but only use Eleventh channels in USA.

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

2.2.1 TEST MODES

| Test Case | Test Conditions | |
|---|---|---|
| | Configuration | Description |
| DTS (6 dB) Bandwidth | Measurement Method | FCC KDB 558074 §8.2 Option 2 |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H |
| Maximum Peak Conducted Output Power | Measurement Method | FCC KDB 558074§9.1.2 |
| | Test Environment | NTNV |
| | Test Setup | Test Setup 1 |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H |
| Maximum Power Spectral Density Level | Measurement Method | FCC KDB 558074 §10.2 (peak PSD). |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H |
| Unwanted Emissions into Non-Restricted Frequency Bands | Measurement Method | FCC KDB 558074§11.0. |
| | Test Environment | NTNV |
| | Test Setup | Test Setup 1 |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H |
| Unwanted Emissions into Restricted Frequency Bands (Conducted) | Measurement Method | FCC KDB 558074§12.2, Conducted (antenna-port). |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H |

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| | | |
|---|---|---|
| | | 11n HT20_L, 11n HT20_M, 11n HT20_H |
| Unwanted Emissions into Restricted | Measurement Method | FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port). |
| | Test Environment | NTNV |
| | EUT Configuration | 11b_L,11b_M,11b_H<br>11g_L,11g_M,11g_H<br>11n HT20_L, 11n HT20_M, 11n HT20_H |

| Test Case | Test Conditions | |
|---|---|---|
| | Configuration | Description |
| AC Power Line Conducted Emissions | Measurement Method | AC mains conducted. |
| | Test Environment | NTNV |
| | EUT Configuration | 11g_M (Worst Conf.). |

Remark:
1. For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.
2. Typical working modes for each IEEE 802.11mode are selected to perform tests. The manufacturer provide special test software(WLAN facility) to control TX duty cycle >98% for TX test. Set the output power to max(PK) as Prescribed by the manufacturer.

| Test Mode | Test Modes Description |
|---|---|
| IEEE 802.11b | IEEE 802.11b with data rate of 1 Mbps using SISO mode. |
| IEEE 802.11g | IEEE 802.11g with data rate of 6 Mbps using SISO mode. |
| IEEE 802.11n HT20 | IEEE 802.11n with data date of MCS0 and bandwidth of 20MHz using SISO mode. |

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2.2.2 EUT operation mode

| Test Mode | RF Ch. | TX Freq. [MHz] | RX Freq. [MHz] | Ch. BW [MHz] |
|---|---|---|---|---|
| IEEE 802.11b | L | Ch No. 1 / 2412MHz | --- | 20 |
| | M | Ch No. 6 / 2437 MHz | --- | 20 |
| | H | Ch No. 11/ 2462MHz | --- | 20 |
| IEEE 802.11g | L | Ch No. 1 / 2412MHz | --- | 20 |
| | M | Ch No. 6 / 2437 MHz | --- | 20 |
| | H | Ch No. 11/ 2462MHz | --- | 20 |
| IEEE 802.11n HT20 | L | Ch No. 1 / 2412MHz | --- | 20 |
| | M | Ch No. 6 / 2437 MHz | --- | 20 |
| | H | Ch No. 11/ 2462MHz | --- | 20 |

2.2.3 EUT configuratio

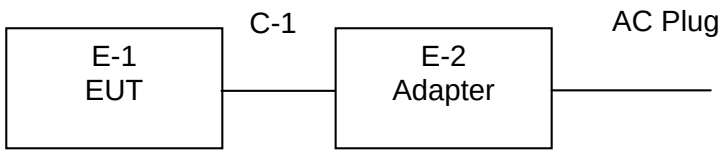
**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - supplied by the lab

| | | | |
|---|---|---|---|
| ○ | Power Cable | Length (m) : | / |
| | | Shield : | / |
| | | Detachable : | / |
| ○ | Multimeter | Manufacturer : | / |
| | | Model No. : | / |

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED




## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment | Brand | Model/Type No. | Series No. | Note |
|---|---|---|---|---|---|
| E-1 | Inventor Ⅱ (3D printer) | FLASHFORGE 3D PRINTER | INVENTOR Ⅱ | N/A | EUT |
| E-2 | Adapter | N/A | KPL-060M-VI | N/A | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

| Item | Shielded Type | Ferrite Core | Length | Note |
|---|---|---|---|---|
| C-1 | NO | NO | 0.8m | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

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## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

| Equipment No. | Instrument | Manufacturer | Model Name | Serial Number | Specification | Cal. Data | due date |
|---|---|---|---|---|---|---|---|
| 1 | Semi-anechoic chamber | Changzhou Chengyu | EC3088 | N/A | 9*6*6m | 10/25/2016 | 10/24/2017 |
| 2 | Broadband antenna | R&S | VULB 9160 | VULB91 60-516 | 30MHz-1500 MHz | 10/25/2016 | 10/24/2017 |
| 3 | Horn antenna | R&S | BBHA 9120D | 10087 | 1GHz-18GH z | 06/05/2016 | 10/24/2017 |
| 4 | Test receiver | R&S | ESCI | 101686 | 9KHz-3GHz | 10/25/2016 | 10/24/2017 |
| 5 | EMI Measuring Receiver | R&S | ESR | 101660 | 9KHz-40GHz | 10/25/2016 | 10/24/2017 |
| 6 | Multi-device controller | MF | MF-7868 | MF78680 8762 | N/A | 10/25/2016 | 10/24/2017 |
| 7 | Amplifier | EM | EM-30180 | 060538 | 1GHz-18GH z | 10/25/2016 | 10/24/2017 |
| 8 | Amplifier | Schwarzbeck | BBV 9475 | BBV 9475-663 | 1GHz-18GH z | 06/05/2016 | 06/04/2017 |
| 9 | Spectrum Analyzer | agilent | E4440B | US44300368 | 1GHz-26.5GH z | 06/05/2016 | 06/04/2017 |
| 10 | Test receiver | R&S | ESCI | 101689 | 9KHz-3GHz | 10/25/2016 | 10/24/2017 |
| 11 | LISN | R&S | NSLK81 26 | 8126466 | 9k-30MHz | 10/25/2016 | 10/24/2017 |
| 12 | LISN | Narda | L2-16B | 5589756 | 9k-30MHz | 10/25/2016 | 10/24/2017 |
| 13 | Power Meter | Anritsu | ML2495A | N/A | 40MHz | 10/25/2016 | 10/24/2017 |
| 14 | Power sensor | Anritsu | MA2411B | N/A | 40MHz | 10/25/2016 | 10/24/2017 |
| 15 | Radiated Cable 1# | FUJIKURA | 5D-2W | 01 | 30MHz-1GHz | 10/25/2016 | 10/24/2017 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 16 | Radiated Cable 2# | FUJIKURA | 10D2W | 02 | 1GHz -25GHz | 10/25/2016 | 10/24/2017 |
| 17 | Conducted Cable 1# | FUJIKURA | 1D-2W | 01 | 9KHz-30MHz | 10/25/2016 | 10/24/2017 |
| 18 | SMA Antenna connector | Dosin | Dosin-SMA | N/A | N/A | 10/25/2016 | 10/24/2017 |
| Note: The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.<br>The Cal.Interval was one year | | | | | | | |

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# 3. EMC EMISSION TEST

## 3.1 CONDUCTED EMISSION MEASUREMENT

### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

| FREQUENCY (MHz) | | | Standard |
|---|---|---|---|
| | Quasi-peak | Average | |
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * | CISPR |
| 0.50 -5.0 | 56.00 | 46.00 | CISPR |
| 5.0 -30.0 | 60.00 | 50.00 | CISPR |

| | | | |
|---|---|---|---|
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * | FCC |
| 0.50 -5.0 | 56.00 | 46.00 | FCC |
| 5.0 -30.0 | 60.00 | 50.00 | FCC |

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---|---|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

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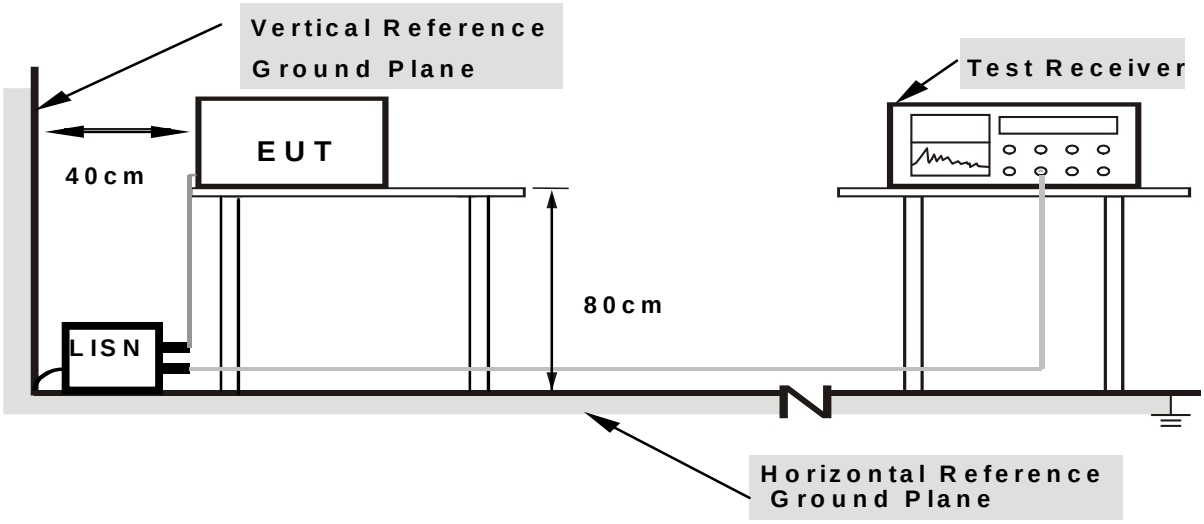
### 3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP




Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

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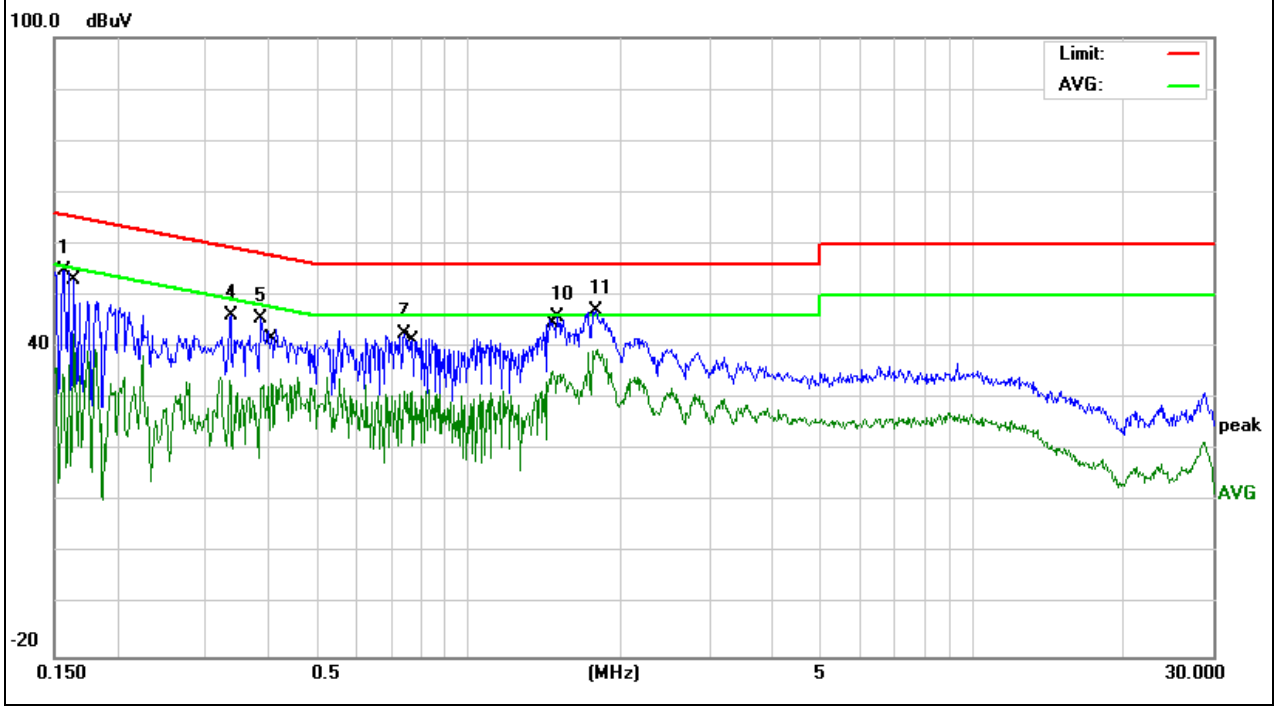
### 3.1.6 TEST RESULTS

| Phase : | L | Test Voltage : | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1555 | 43.96 | 10.84 | 54.80 | 65.70 | -10.90 | peak | |
| 2 | | 0.1632 | 32.14 | 10.33 | 42.47 | 55.29 | -12.82 | AVG | |
| 3 | | 0.3339 | 23.16 | 10.42 | 33.58 | 49.35 | -15.77 | AVG | |
| 4 | | 0.3356 | 35.75 | 10.42 | 46.17 | 59.31 | -13.14 | peak | |
| 5 | | 0.3860 | 35.10 | 10.42 | 45.52 | 58.15 | -12.63 | peak | |
| 6 | | 0.4060 | 22.53 | 10.42 | 32.95 | 47.73 | -14.78 | AVG | |
| 7 | | 0.7459 | 32.02 | 10.41 | 42.43 | 56.00 | -13.57 | peak | |
| 8 | | 0.7740 | 21.07 | 10.41 | 31.48 | 46.00 | -14.52 | AVG | |
| 9 | | 1.4699 | 24.84 | 10.45 | 35.29 | 46.00 | -10.71 | AVG | |
| 10 | | 1.4979 | 35.36 | 10.45 | 45.81 | 56.00 | -10.19 | peak | |
| 11 | | 1.7900 | 36.58 | 10.44 | 47.02 | 56.00 | -8.98 | peak | |
| 12 | * | 1.7980 | 28.97 | 10.44 | 39.41 | 46.00 | -6.59 | AVG | |

Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit

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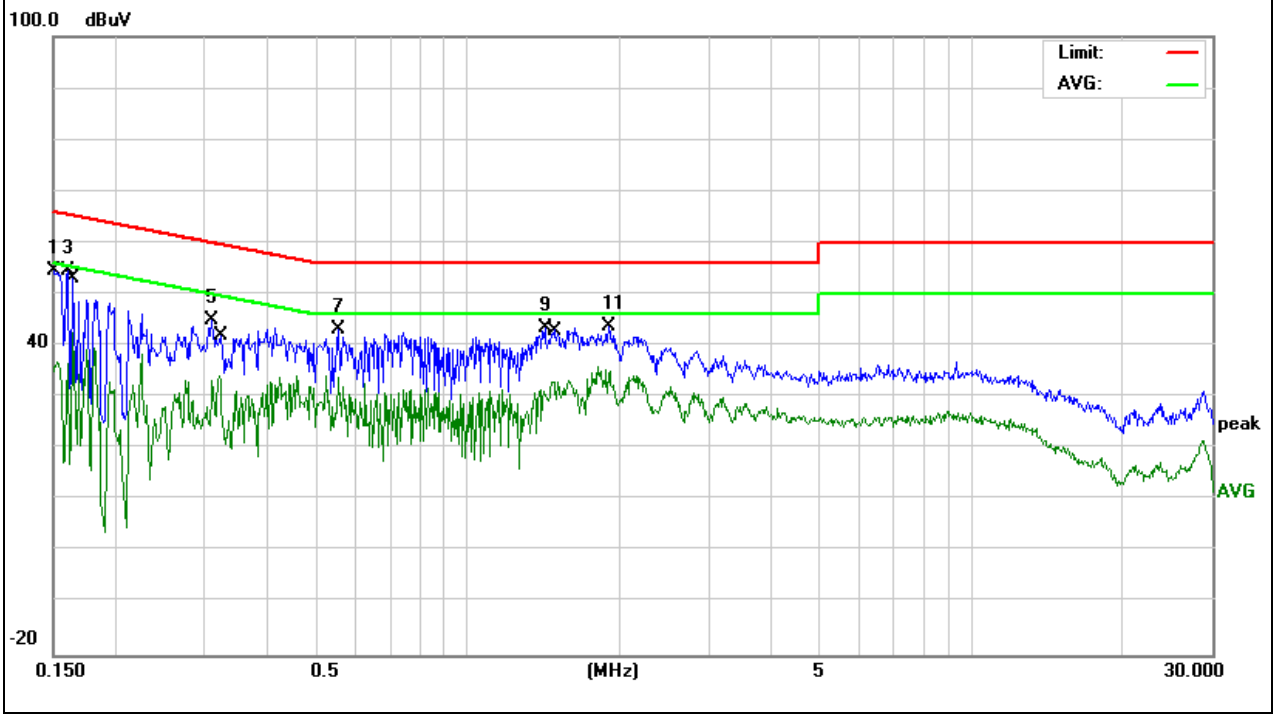
| Phase : | N | Test Voltage : | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1507 | 43.10 | 11.40 | 54.50 | 65.96 | -11.46 | peak | |
| 2 | | 0.1524 | 25.52 | 11.21 | 36.73 | 55.86 | -19.13 | AVG | |
| 3 | | 0.1598 | 44.15 | 10.35 | 54.50 | 65.47 | -10.97 | peak | |
| 4 | | 0.1632 | 32.14 | 10.33 | 42.47 | 55.29 | -12.82 | AVG | |
| 5 | | 0.3082 | 34.58 | 10.42 | 45.00 | 60.02 | -15.02 | peak | |
| 6 | | 0.3199 | 23.62 | 10.42 | 34.04 | 49.71 | -15.67 | AVG | |
| 7 | | 0.5540 | 32.68 | 10.41 | 43.09 | 56.00 | -12.91 | peak | |
| 8 | | 0.5540 | 23.49 | 10.41 | 33.90 | 46.00 | -12.10 | AVG | |
| 9 | | 1.4220 | 32.95 | 10.45 | 43.40 | 56.00 | -12.60 | peak | |
| 10 | | 1.4700 | 22.57 | 10.45 | 33.02 | 46.00 | -12.98 | AVG | |
| 11 | | 1.9060 | 33.24 | 10.44 | 43.68 | 56.00 | -12.32 | peak | |
| 12 | * | 1.9140 | 24.61 | 10.44 | 35.05 | 46.00 | -10.95 | AVG | |

Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit

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## 3.2 RADIATED EMISSION MEASUREMENT

### 3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

| **Spectrum Parameter** | **Setting** |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / *10Hz* for Average |
| **Receiver Parameter** | **Setting** |
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

### 3.2.2 TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.

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2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 24MHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Bilog Antenna | 3 |
| 1GHz-18GHz | Horn Antenna | 3 |
| 18GHz-25GHz | Horn Anternna | 3 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto | Peak |
| | Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

More procudre as follows;

**1) Sequence of testing 9 kHz to 30 MHz**

**Setup:**
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

**Premeasurement:**
--- The turntable rotates from 0° to 315° using 45° steps.

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--- The antenna height is 1.0 meter.
--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

**Final measurement:**
--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

**2) Sequence of testing 30 MHz to 1 GHz**

**Setup:**
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

**Premeasurement:**
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height changes from 1 to 4 meter.
--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

**Final measurement:**
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
--- The final measurement will be done with QP detector with an EMI receiver.
--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

**3) Sequence of testing 1 GHz to 18 GHz**

**Setup:**
--- The equipment was set up to simulate a typical usage like described in the user manual or

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described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 3 meter.
--- The EUT was set into operation.

**Premeasurement:**
--- The turntable rotates from 0° to 315° using 45° steps.
--- The antenna is polarized vertical and horizontal.
--- The antenna height scan range is 1 meter to 2.5 meter.
--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

**Final measurement:**
--- The final measurement will be performed with minimum the six highest peaks.
--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

**4) Sequence of testing above 18 GHz**

**Setup:**
--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
--- Auxiliary equipment and cables were positioned to simulate normal operation conditions
--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
--- The measurement distance is 1 meter.
--- The EUT was set into operation.

**Premeasurement:**
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.
Final measurement:
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

**Field Strength Calculation**

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The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

For example

| Frequency (MHz) | FS (dBμV/m) | RA (dBμV/m) | AF (dB) | CL (dB) | AG (dB) | Transd (dB) |
|---|---|---|---|---|---|---|
| 300.00 | 40 | 58.1 | 12.2 | 1.6 | 31.90 | -18.1 |

Transd=AF +CL-AG

### 3.2.3 DEVIATION FROM TEST STANDARD

No deviation

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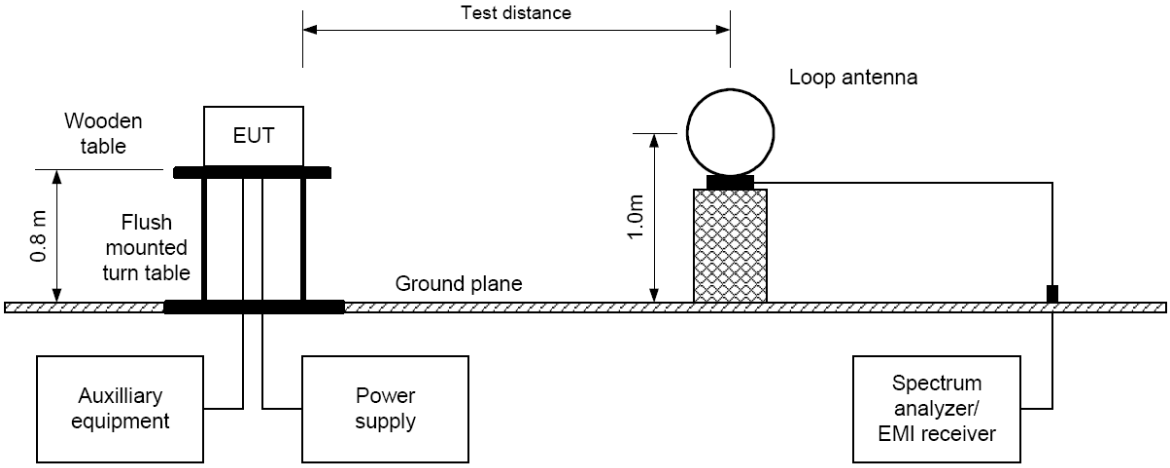
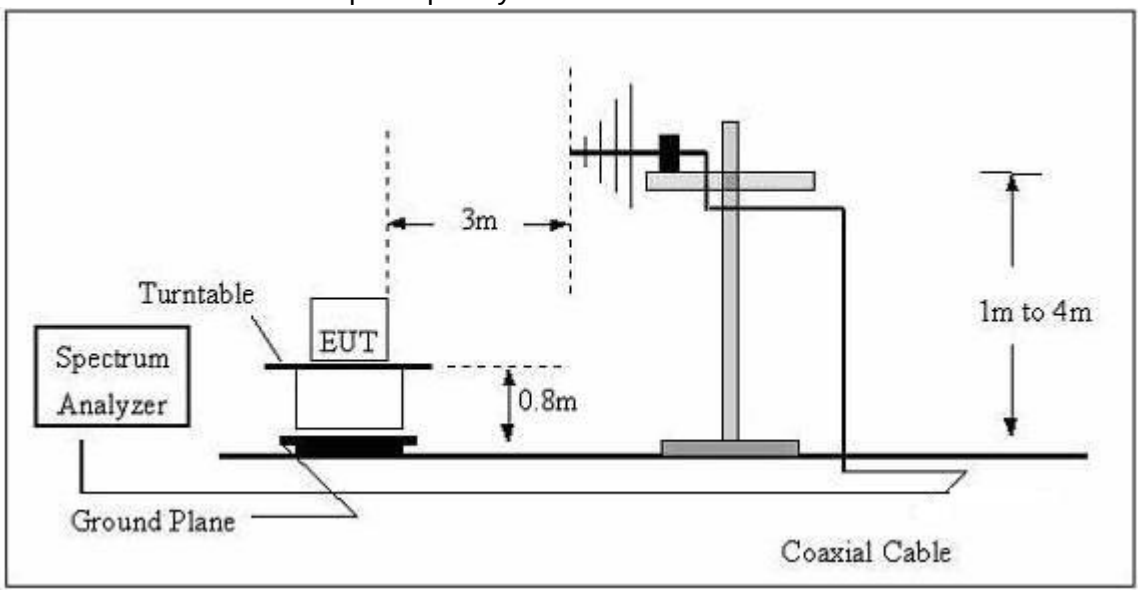
### 3.2.4 TEST SETUP

（A）Radiated Emission Test-Up Frequency Below 30MHz




（B）Radiated Emission Test-Up Frequency 30MHz~1GHz

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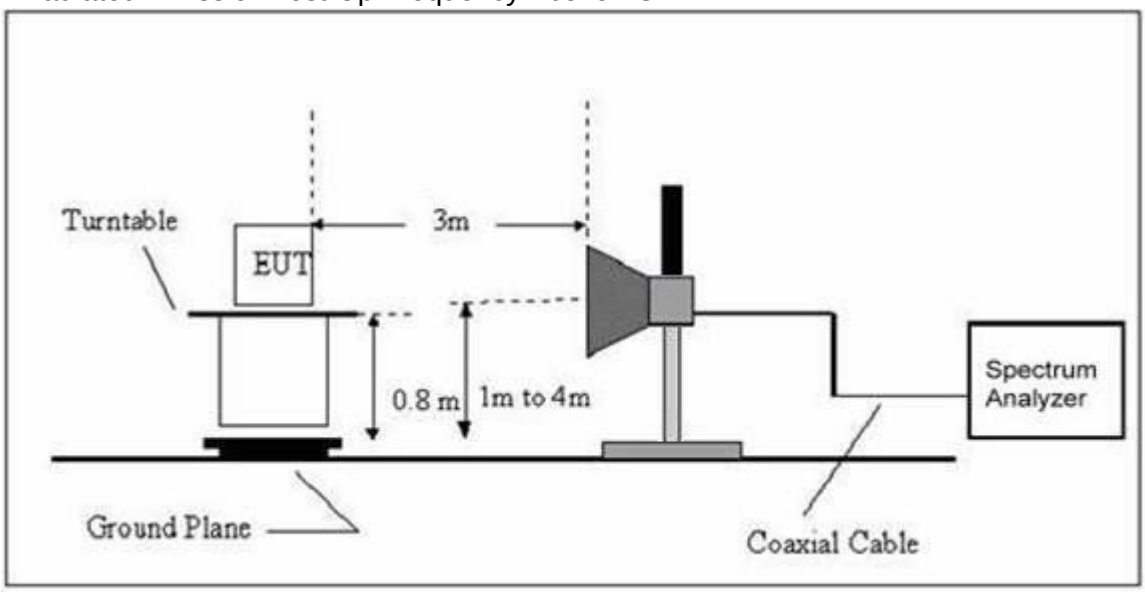
（C）Radiated Emission Test-Up Frequency Above 1GHz




### 3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

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### 3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

| | | | |
|---|---|---|---|
| EUT： | Inventor Ⅱ (3D printer) | Model Name. ： | INVENTOR Ⅱ |
| Temperature： | 20 ℃ | Relative Humidtity： | 48% |
| Pressure： | 1010 hPa | Test Voltage ： | DC 24V from adapter AC 120V/60Hz |
| Test Mode ： | TX | Polarization : | -- |

| Freq. | Reading | Limit | Margin | State |
|---|---|---|---|---|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | P |
| -- | -- | -- | -- | P |

**NOTE:**

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

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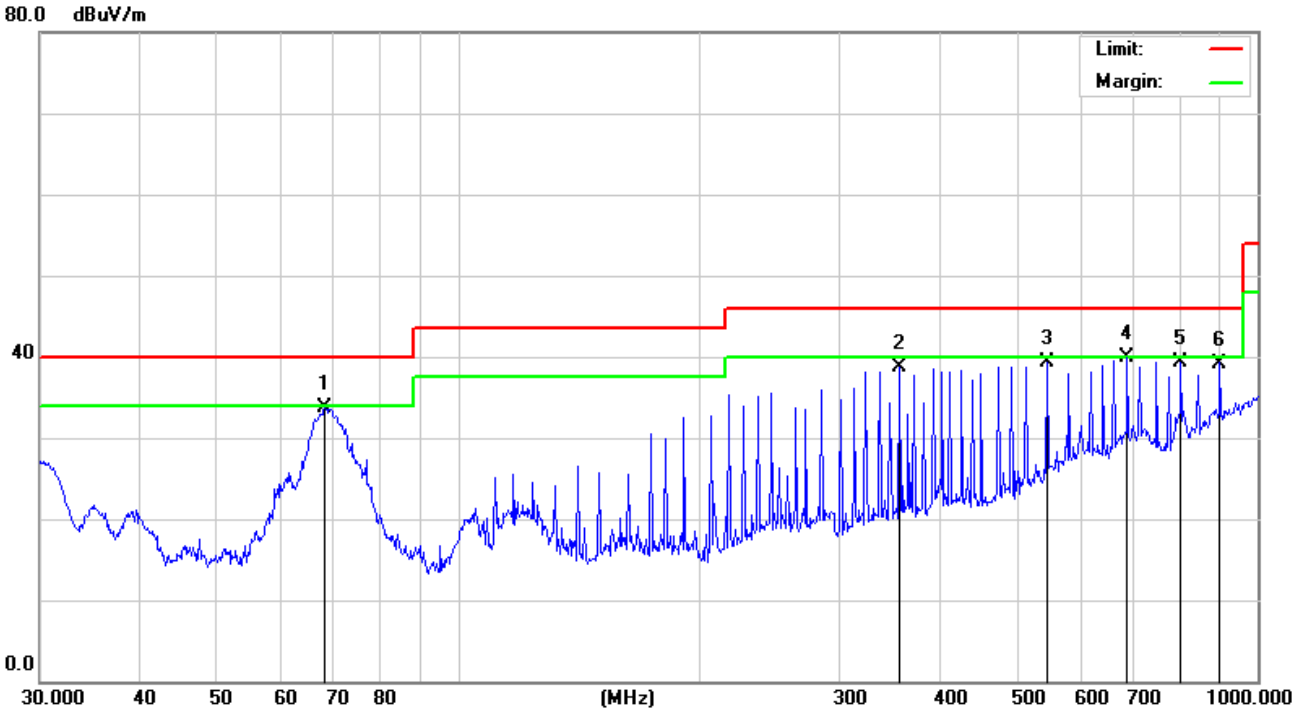
### 3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

| | | | |
|---|---|---|---|
| Polarization: | Horizontal | Test Voltage : | DC 24V from adapter AC 120V/60Hz |
| Test Mode : | 802.11B TX 2412 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 68.1512 | 52.87 | -19.08 | 33.79 | 40.00 | -6.21 | QP |
| 2 | | 356.6757 | 46.43 | -7.73 | 38.70 | 46.00 | -7.30 | QP |
| 3 | | 545.1825 | 43.16 | -3.86 | 39.30 | 46.00 | -6.70 | QP |
| 4 | * | 687.1507 | 40.46 | -0.56 | 39.90 | 46.00 | -6.10 | QP |
| 5 | | 801.7862 | 36.00 | 3.30 | 39.30 | 46.00 | -6.70 | QP |
| 6 | | 896.9963 | 36.42 | 2.78 | 39.20 | 46.00 | -6.80 | QP |

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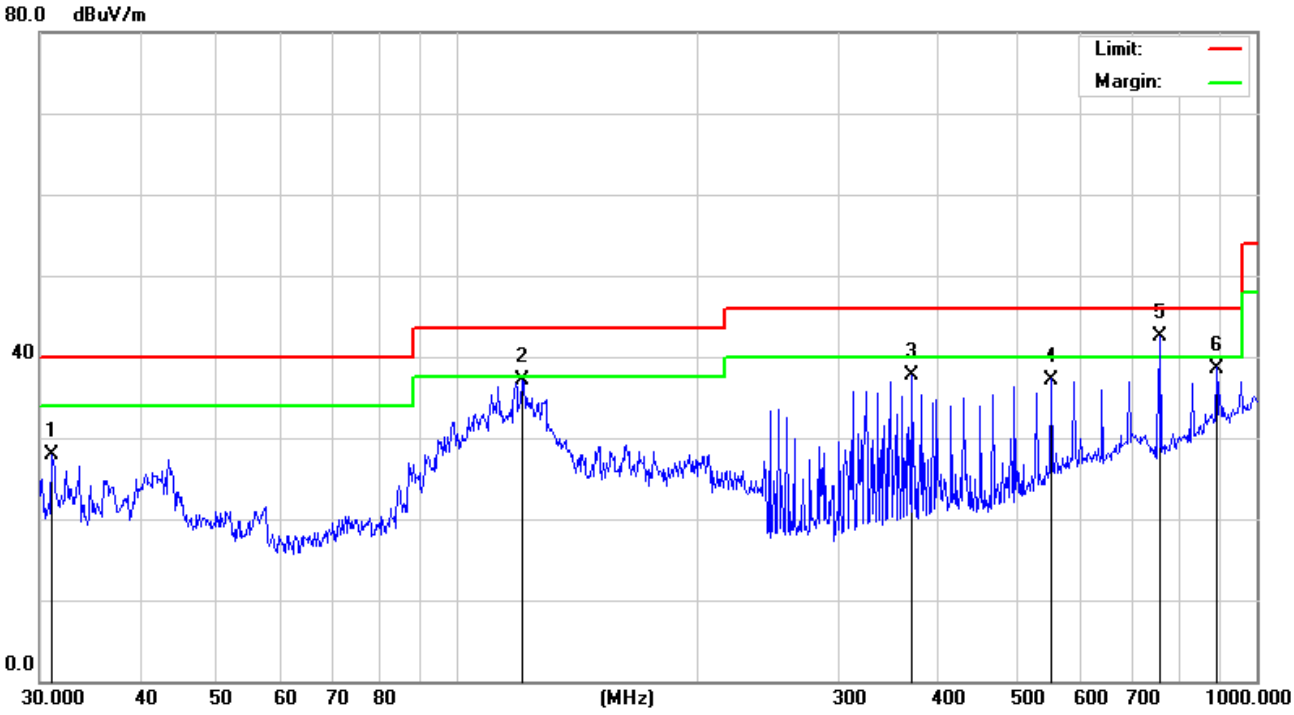
| Polarization: | Vertical | Test Voltage : | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode : | 802.11B TX 2412 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 31.0703 | 43.28 | -15.38 | 27.90 | 40.00 | -12.10 | QP |
| 2 | | 120.2766 | 52.01 | -14.91 | 37.10 | 43.50 | -6.40 | QP |
| 3 | | 369.4045 | 45.24 | -7.56 | 37.68 | 46.00 | -8.32 | QP |
| 4 | | 552.8831 | 40.69 | -3.49 | 37.20 | 46.00 | -8.80 | QP |
| 5 | * | 758.0407 | 43.43 | -0.93 | 42.50 | 46.00 | -3.50 | QP |
| 6 | | 890.7278 | 35.87 | 2.73 | 38.60 | 46.00 | -7.40 | QP |

Note:test perform on 802.11b/g/n mode,"802.11b TX2412" mode is the worst mode and has been reported.

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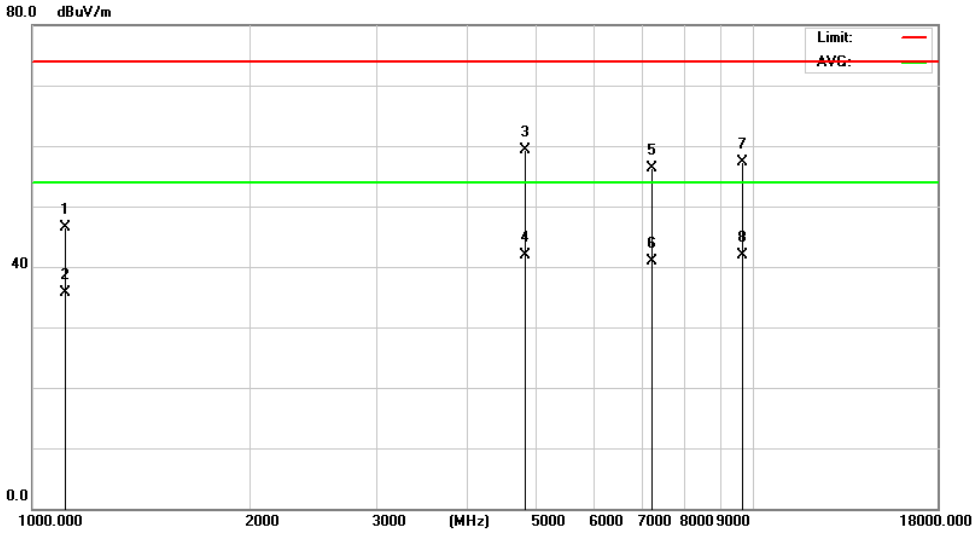
### 3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

| Polarization: | Horizontal | Test Voltage : | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode : | 802.11B TX 2412 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 1112.170 | 55.42 | -8.90 | 46.52 | 74.00 | -27.48 | peak |
| 2 | | 1112.170 | 44.52 | -8.90 | 35.62 | 54.00 | -18.38 | AVG |
| 3 | | 4824.120 | 51.26 | 8.14 | 59.40 | 74.00 | -14.60 | peak |
| 4 | | 4824.120 | 33.68 | 8.14 | 41.82 | 54.00 | -12.18 | AVG |
| 5 | | 7236.110 | 44.67 | 11.73 | 56.40 | 74.00 | -17.60 | peak |
| 6 | | 7236.110 | 29.22 | 11.73 | 40.95 | 54.00 | -13.05 | AVG |
| 7 | | 9648.000 | 39.72 | 17.68 | 57.40 | 74.00 | -16.60 | peak |
| 8 | * | 9648.000 | 24.15 | 17.68 | 41.83 | 54.00 | -12.17 | AVG |

Note:test perform on 802.11b/g/n mode,"802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 10G.

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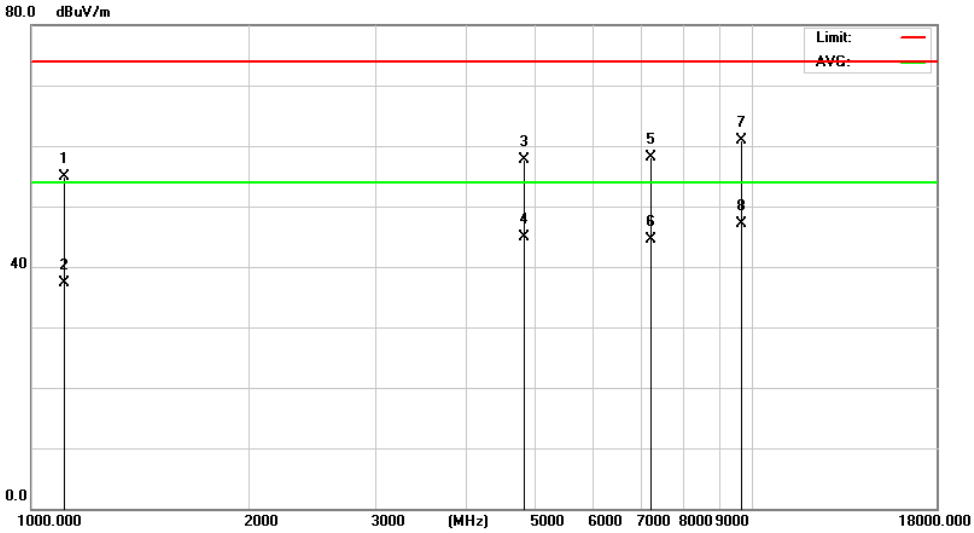
| Polarization： | Vertical | Test Voltage ： | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode ： | 802.11B TX 2412 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 1112.170 | 63.77 | -8.90 | 54.87 | 74.00 | -19.13 | peak |
| 2 | | 1112.170 | 46.25 | -8.90 | 37.35 | 54.00 | -16.65 | AVG |
| 3 | | 4824.120 | 49.47 | 8.14 | 57.61 | 74.00 | -16.39 | peak |
| 4 | | 4824.120 | 36.77 | 8.14 | 44.91 | 54.00 | -9.09 | AVG |
| 5 | | 7236.110 | 46.35 | 11.73 | 58.08 | 74.00 | -15.92 | peak |
| 6 | | 7236.110 | 32.81 | 11.73 | 44.54 | 54.00 | -9.46 | AVG |
| 7 | | 9648.000 | 43.22 | 17.68 | 60.90 | 74.00 | -13.10 | peak |
| 8 | * | 9648.000 | 29.37 | 17.68 | 47.05 | 54.00 | -6.95 | AVG |

Note:test perform on 802.11b/g/n mode,"802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 10G.

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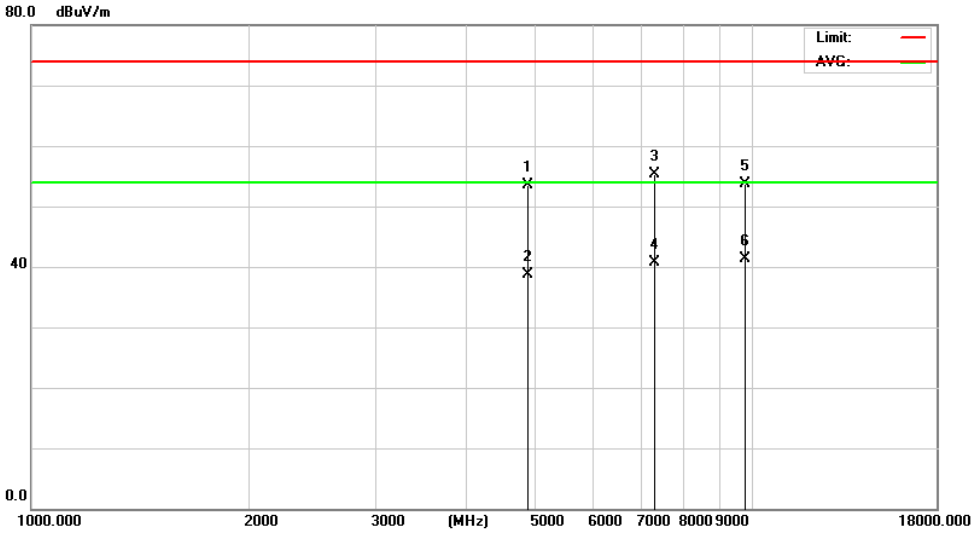
| Polarization： | Horizontal | Test Voltage ： | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode ： | 802.11B TX 2437 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4874.000 | 45.27 | 8.17 | 53.44 | 74.00 | -20.56 | peak |
| 2 | | 4874.000 | 30.56 | 8.17 | 38.73 | 54.00 | -15.27 | AVG |
| 3 | | 7311.000 | 43.33 | 12.07 | 55.40 | 74.00 | -18.60 | peak |
| 4 | | 7311.110 | 28.64 | 12.07 | 40.71 | 54.00 | -13.29 | AVG |
| 5 | | 9748.000 | 35.45 | 18.20 | 53.65 | 74.00 | -20.35 | peak |
| 6 | * | 9748.000 | 23.18 | 18.20 | 41.38 | 54.00 | -12.62 | AVG |

Note:test perform on 802.11b/g/n mode,"802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 10G.

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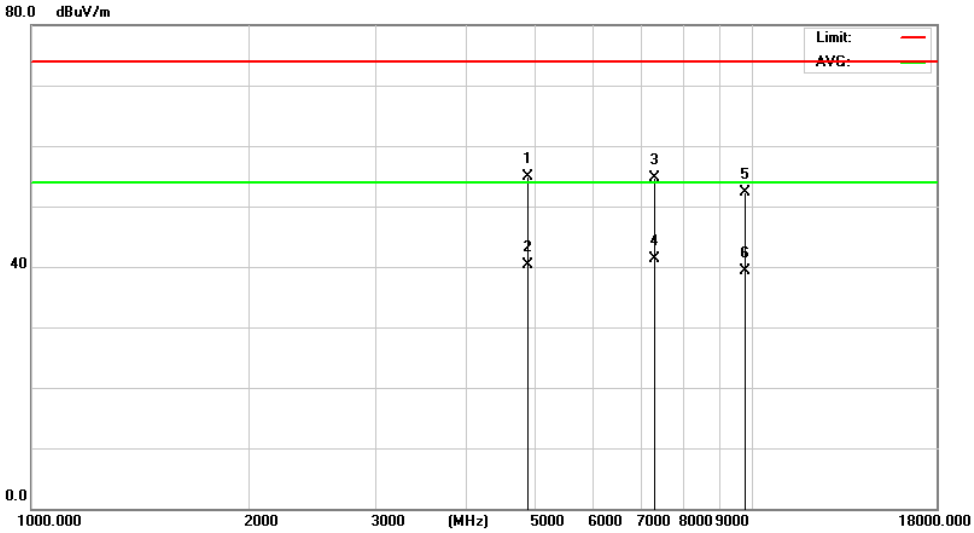
| Polarization： | Vertical | Test Voltage ： | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode ： | 802.11B TX 2437 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4874.000 | 46.71 | 8.17 | 54.88 | 74.00 | -19.12 | peak |
| 2 | | 4874.000 | 32.11 | 8.17 | 40.28 | 54.00 | -13.72 | AVG |
| 3 | | 7311.000 | 42.69 | 12.07 | 54.76 | 74.00 | -19.24 | peak |
| 4 | * | 7311.110 | 29.24 | 12.07 | 41.31 | 54.00 | -12.69 | AVG |
| 5 | | 9748.000 | 34.02 | 18.20 | 52.22 | 74.00 | -21.78 | peak |
| 6 | | 9748.000 | 21.19 | 18.20 | 39.39 | 54.00 | -14.61 | AVG |

Note:test perform on 802.11b/g/n mode,"802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 10G.

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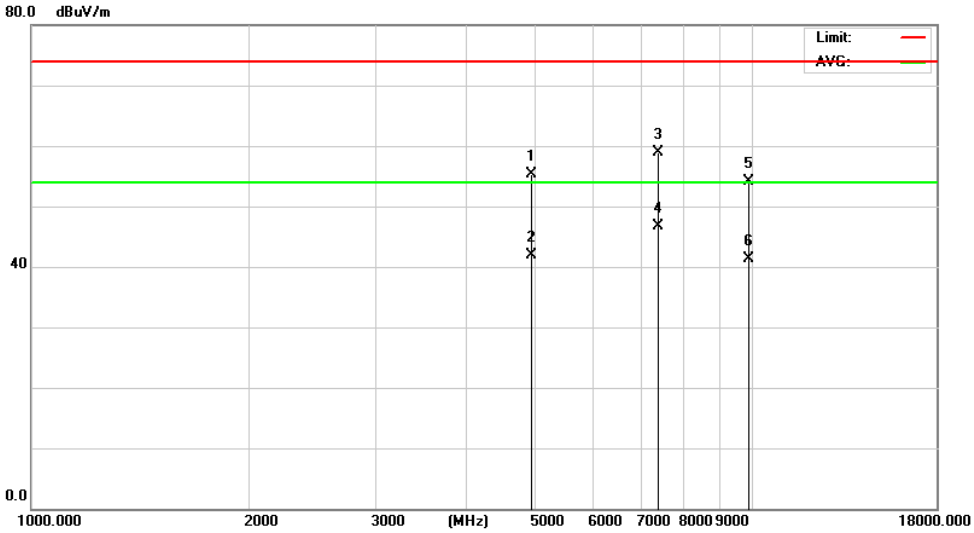
| Polarization： | Horizontal | Test Voltage ： | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode ： | 802.11B TX 2462 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4924.000 | 47.18 | 8.20 | 55.38 | 74.00 | -18.62 | peak |
| 2 | | 4924.000 | 33.69 | 8.20 | 41.89 | 54.00 | -12.11 | AVG |
| 3 | | 7386.000 | 46.55 | 12.41 | 58.96 | 74.00 | -15.04 | peak |
| 4 | * | 7386.000 | 34.28 | 12.41 | 46.69 | 54.00 | -7.31 | AVG |
| 5 | | 9848.000 | 35.36 | 18.71 | 54.07 | 74.00 | -19.93 | peak |
| 6 | | 9848.000 | 22.61 | 18.71 | 41.32 | 54.00 | -12.68 | AVG |

Note:test perform on 802.11b/g/n mode,"802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 10G.

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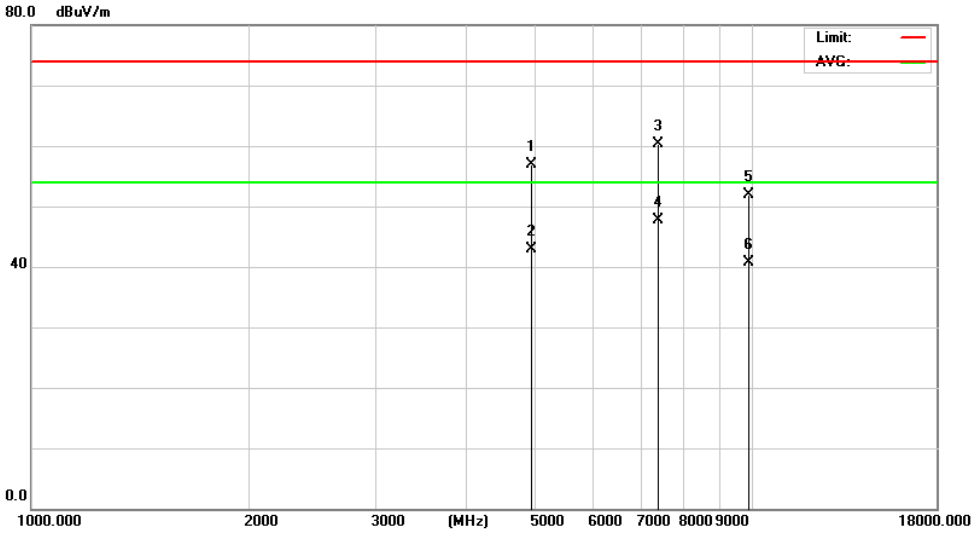
| Polarization： | Vertical | Test Voltage ： | DC 24V from adapter AC 120V/60Hz |
|---|---|---|---|
| Test Mode ： | 802.11B TX 2462 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4924.000 | 48.65 | 8.20 | 56.85 | 74.00 | -17.15 | peak |
| 2 | | 4924.000 | 34.66 | 8.20 | 42.86 | 54.00 | -11.14 | AVG |
| 3 | | 7386.000 | 47.95 | 12.41 | 60.36 | 74.00 | -13.64 | peak |
| 4 | * | 7386.000 | 35.36 | 12.41 | 47.77 | 54.00 | -6.23 | AVG |
| 5 | | 9848.000 | 33.11 | 18.71 | 51.82 | 74.00 | -22.18 | peak |
| 6 | | 9848.000 | 21.96 | 18.71 | 40.67 | 54.00 | -13.33 | AVG |

Note:test perform on 802.11b/g/n mode,"802.11b" mode is the worst mode and has been reported. spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported above 10G.

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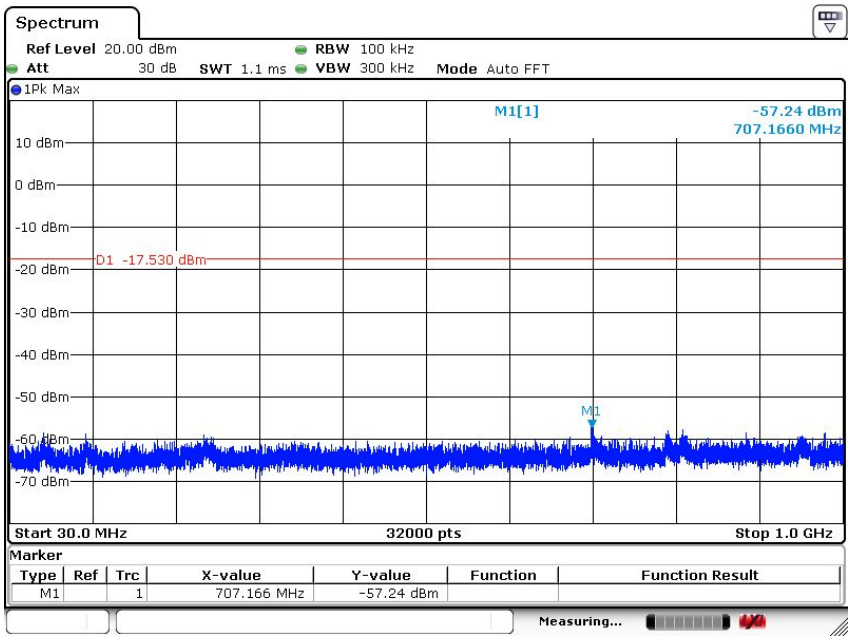
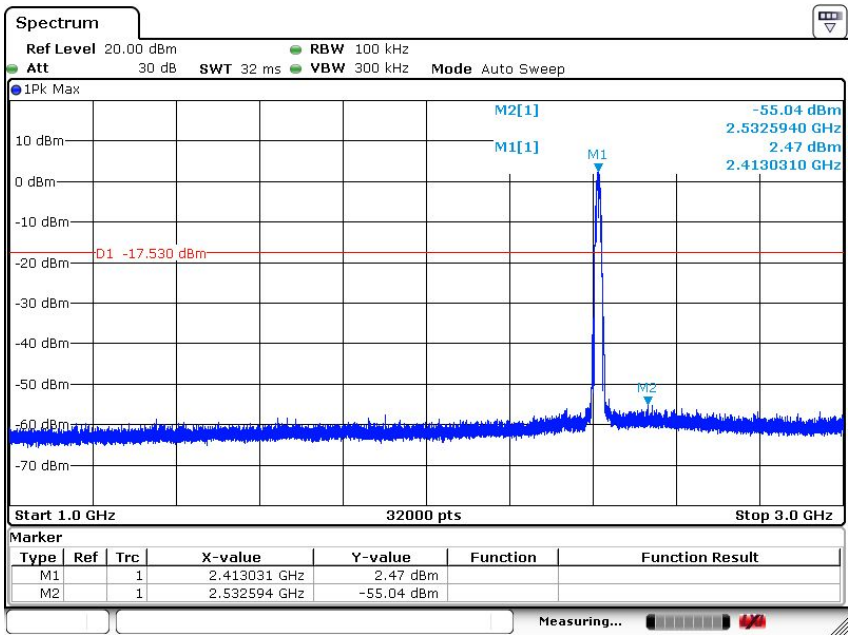
Conducted Spurious Emissions at Antenna Port:

802.11b Low Channel

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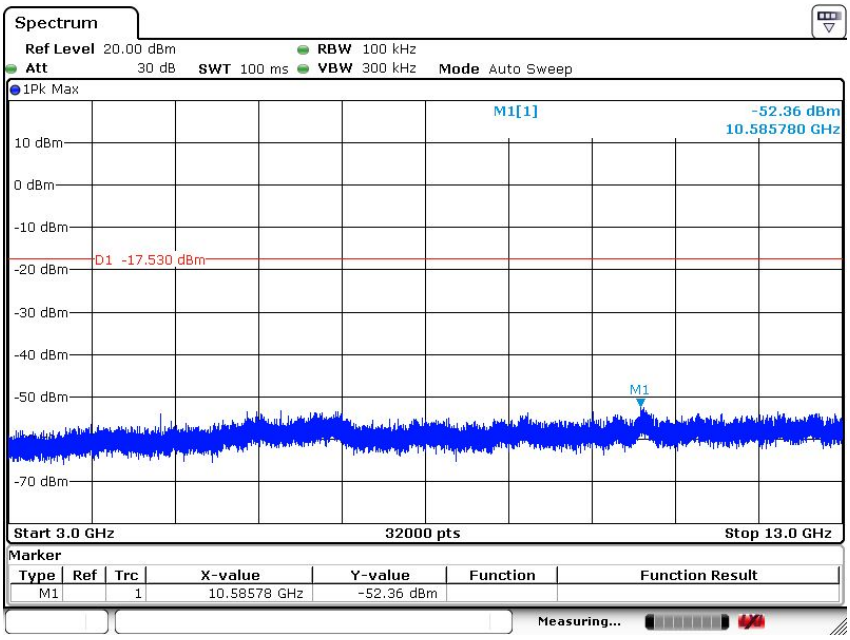


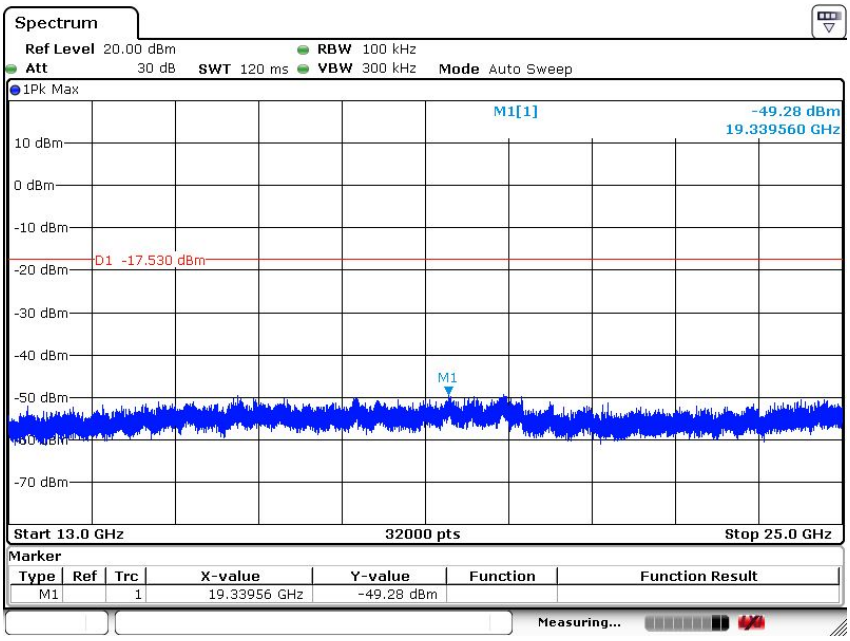


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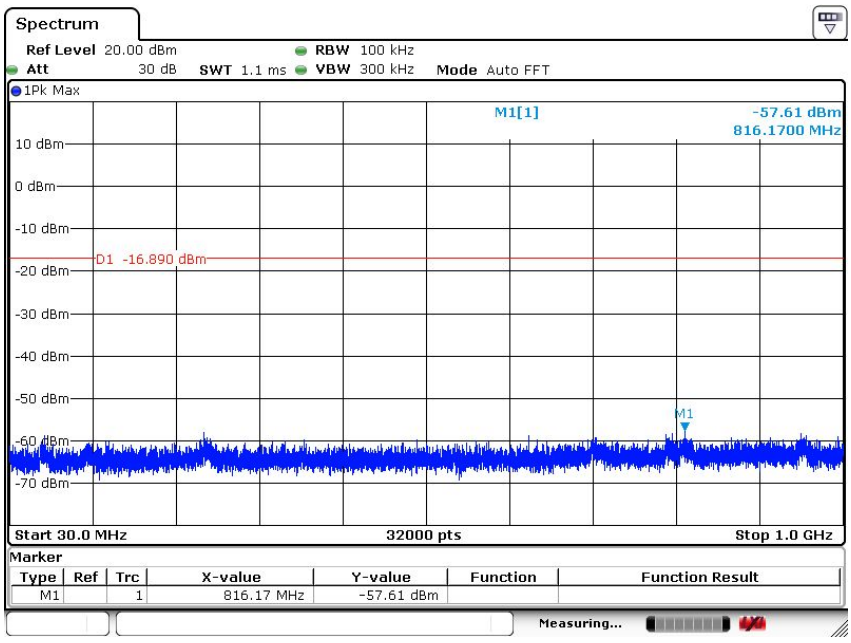
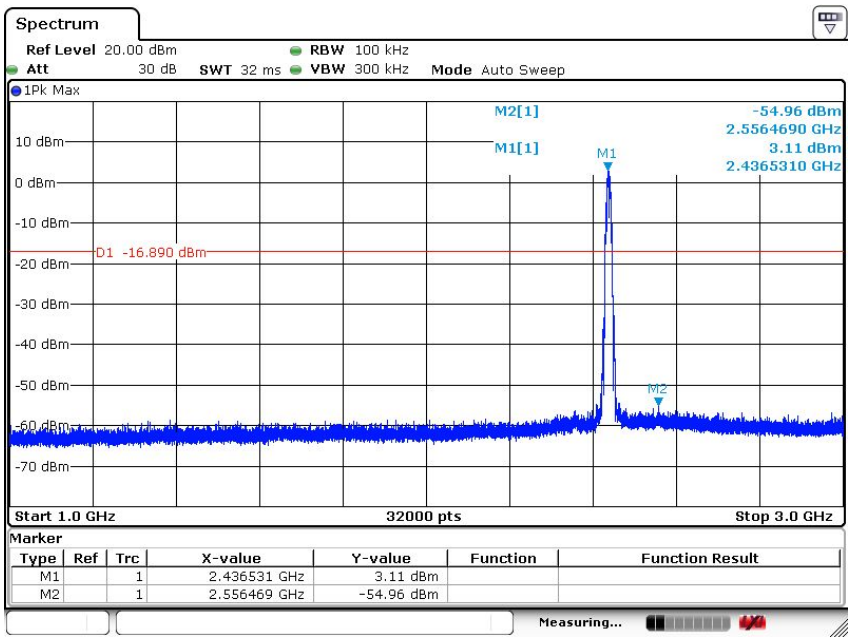
802.11b Middle Channel




Date: 8.JAN.2017 16:19:00




Date: 8.JAN.2017 16:18:47

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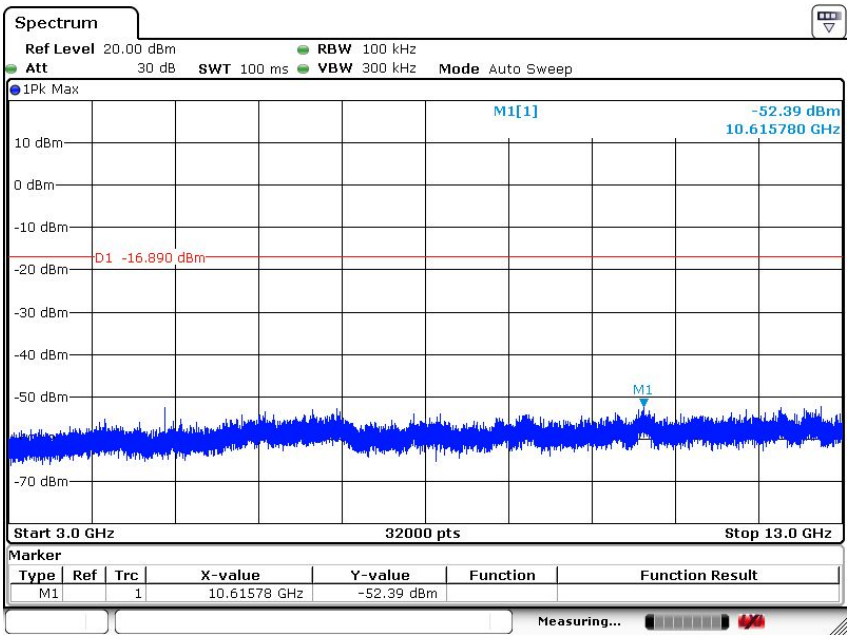
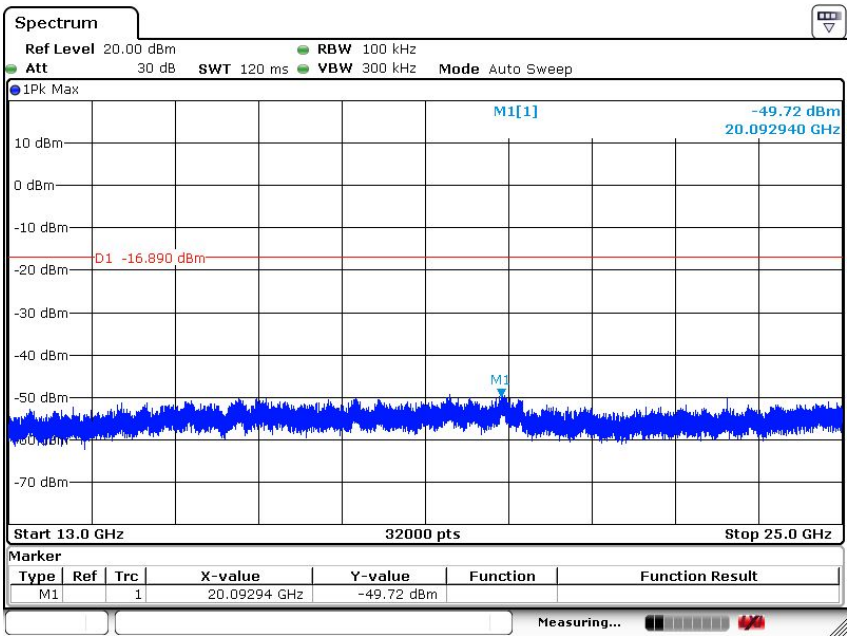



Date: 8.JAN.2017 16:19:11




Date: 8.JAN.2017 16:19:22

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