TECHNICAL REPORT

| | |
|---|---|
| Report No.: | TW2103062-01E |
| File Reference No.: | 2021-05-25 |
| Applicant: | SHENZHEN JINGWEIXIAN TECHNOLOGY CO.,LTD |
| Product: | Cutting Plotter |
| Model No.: | CH16, CH24, C16, C24, CA16, CA24, CX16, CX24, CH10, C10, CX10, CA10 |
| Trademark: | SKYCUT |
| Test Standards: | FCC Part 15.247 |
| Test Result: | It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility |

Approved By:

Terry Tang

Manager

Dated: May 25, 2021

**Results appearing herein relate only to the sample tested**

**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**


**SHENZHEN TIMEWAY TESTING LABORATORIES**

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

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

## Special Statement:

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

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

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

**CNAS-LAB Code: L2292**

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

**FCC-Registration No.: 744189**

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

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

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

**A2LA (Certification Number:5013.01)**

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

Test Report Conclusion

Content

1.0 **General Details**

1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TESTING LABORATORIES.

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

Telephone: (755) 83448688

Fax: (755) 83442996

Site Listed with Federal Communications commission (FCC)

Registration Number:744189

For 3m Anechoic Chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A

For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: SHENZHEN JINGWEIXIAN TECHNOLOGY CO.,LTD

Address: 2-4 Floor, Building C, XinHang Technology Park, No. 229, Qingshui Road, Wulian Community, Longgang Street, Longgang District, Shenzhen

Telephone: --

Fax: --

1.3 Description of EUT

Product: Cutting Plotter

Manufacturer: SHENZHEN JINGWEIXIAN TECHNOLOGY CO., LTD

Address: 2-4 Floor, Building C, XinHang Technology Park, No. 229, Qingshui Road, Wulian Community, Longgang Street, Longgang District, Shenzhen

Brand Name: SKYCUT

Model Number: CH16

Additional Model Number: CH24, C16, C24, CA16, CA24, CX16, CX24, CH10, C10, CX10, CA10

| | |
|---|---|
| Type of Modulation | IEEE 802.11b: DSSS (CCK, QPSK, DBPSK) |
| | IEEE 802.11g/n (HT20, HT40): OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Frequency range | IEEE 802.11b/g/n (HT20): 2412-2462MHz; 802.11n HT40: 2422-2452MHz |
| Channel Spacing | 5MHz for IEEE 802.11b/g/n HT20, HT40 |
| Air Data Rate | IEEE 802.11b: 11, 5.5, 2, 1 Mbps |
| | IEEE 802.11g: 54, 48,36, 24, 18, 12, 9, 6 Mbps |
| | IEEE 802.11n HT20/HT40: mcs0-mcs9 |
| Frequency Selection | By software |
| Channel Number | IEEE 802.11b/g/n (HT20): 11 Channels; EEE 802.11n (HT40): 7 Channels; |

| | |
|---|---|
| Antenna: | PCB antenna used. The gain of the antennas is 2.0dBi |
| Input Voltage: | DC24V, 2.75A from power supply |
| Power Supply: | Model: GM60-240275-F; Input: 100-240V~, 50/60Hz, 2.0A, Output: DC24V, 2.75A, 66W |

1.4 Submitted Sample: 1 Samples

1.5 Test Duration
2021-03-05 to 2021-05-24

1.6 Test Uncertainty
Conducted Emissions Uncertainty =3.6dB
Radiated Emissions below 1GHz Uncertainty =4.7dB
Radiated Emissions above 1GHz Uncertainty =6.0dB
Conducted Power Uncertainty =6.0dB
Occupied Channel Bandwidth Uncertainty =5%

1.7 Test Engineer

The sample tested by _____

Print Name: Andy Xing

| **2.0 Test Equipment** | | | | | |
|---|---|---|---|---|---|
| Instrument Type | Manufacturer | Model | Serial No. | Date of Cal. | Due Date |
| ESPI Test Receiver | R&S | ESPI 3 | 100379 | 2020-06-23 | 2021-06-22 |
| LISN | R&S | EZH3-Z5 | 100294 | 2020-06-23 | 2021-06-22 |
| LISN | R&S | EZH3-Z5 | 100253 | 2020-06-23 | 2021-06-22 |
| Impuls-Begrenzer | R&S | ESH3-Z2 | 100281 | 2020-06-23 | 2021-06-22 |
| Loop Antenna | EMCO | 6507 | 00078608 | 2018-06-25 | 2021-06-24 |
| Spectrum | R&S | FSIQ26 | 100292 | 2020-06-23 | 2021-06-22 |
| Horn Antenna | A-INFO | LB-180400-KF | J211060660 | 2020-06-23 | 2021-06-22 |
| Horn Antenna | R&S | BBHA 9120D | 9120D-631 | 2018-07-09 | 2021-07-08 |
| Power meter | Anritsu | ML2487A | 6K00003613 | 2020-06-23 | 2021-06-22 |
| Power sensor | Anritsu | MA2491A | 32263 | 2020-06-23 | 2021-06-22 |
| Bilog Antenna | Schwarebeck | VULB9163 | 9163/340 | 2018-07-04 | 2021-07-03 |
| 9*6*6 Anechoic | -- | -- | N/A | 2020-07-06 | 2021-07-05 |
| EMI Test Receiver | RS | ESVB | 826156/011 | 2020-06-23 | 2021-06-22 |
| EMI Test Receiver | RS | ESH3 | 860904/006 | 2020-06-23 | 2021-06-22 |
| Spectrum | HP/Agilent | ESA-L1500A | US37451154 | 2020-06-23 | 2021-06-22 |
| Spectrum | HP/Agilent | E4407B | MY50441392 | 2020-06-23 | 2021-06-22 |
| Spectrum | RS | FSP | 1164.4391.38 | 2021-01-15 | 2021-01-14 |
| RF Cable | Zhengdi | ZT26-NJ-NJ-8 M/FA | -- | 2020-06-23 | 2021-06-22 |
| RF Cable | Zhengdi | 7m | -- | 2020-06-23 | 2021-06-22 |
| RF Switch | EM | EMSW18 | 060391 | 2020-06-23 | 2021-06-22 |
| Pre-Amplifier | Schwarebeck | BBV9743 | #218 | 2020-06-23 | 2021-06-22 |
| Pre-Amplifier | HP/Agilent | 8449B | 3008A00160 | 2020-06-23 | 2021-06-22 |
| LISN | SCHAFFNER | NNB42 | 00012 | 2021-01-06 | 2022-01-05 |

## 3. DESCRIPTION OF TEST MODES

**IEEE 802.11b, 802.11g, 802.11n (HT20) mode**

The EUT had been tested under operating condition. There are three channels have been tested as following:

| Channel | Frequency (MHz) |
|---|---|
| Low | 2412 |
| Middle | 2437 |
| High | 2462 |

IEEE 802.11b mode: 11Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n (HT20) mode: mcs0 (worst case) were chosen for full testing

**IEEE 802.11n (HT40) mode**

The EUT had been tested under operating condition. There are three channels have been tested as following:

| Channel | Frequency (MHz) |
|---|---|
| Low | 2422 |
| Middle | 2437 |
| High | 2452 |

IEEE 802.11n (HT40) mode: msc0 data rate (worst case) were chosen for full testing

Note: during the test, the duty cycle is set up to 100%

## 3.0 Technical Details

### 3.1 Summary of test results

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

| Standard | Test Type | Result | Notes |
|---|---|---|---|
| FCC Part 15, Paragraph 15.203 | Antenna Requirement | PASS | Complies |
| FCC Part 15, Paragraph 15.207 | Conducted Emission Test | PASS | Complies |
| FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit | Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth>500kHz | PASS | Complies |
| FCC Part 15, Paragraph 15.247(b) | Maximum peak output power Limit: max. 30dBm | PASS | Complies |
| FCC Part 15, Paragraph 15.205 & 15.209 | Transmitter Radiated Emission Limit: Table 15.209 | PASS | Complies |
| FCC Part 15, Paragraph 15.247(e) | Power Spectral Density Limit: max. 8dBm/3kHz | PASS | Complies |
| FCC Part 15, Paragraph 15.247(d) | Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209 | PASS | Complies |

### 3.2 Test Standards

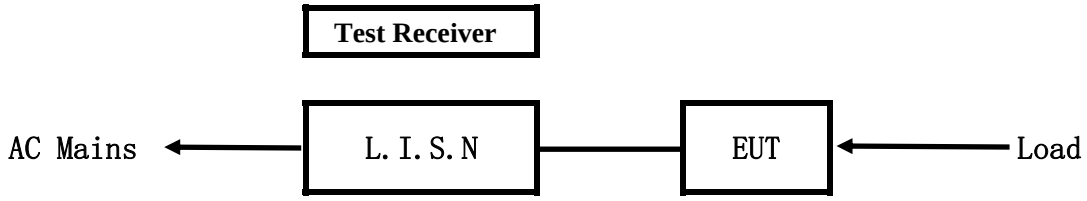
**FCC Part 15 Subpart & Subpart C, Paragraph 15.247**

## 4.0 EUT Modification

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

## 5.0 Power Line Conducted Emission Test

5.1 Schematics of the test



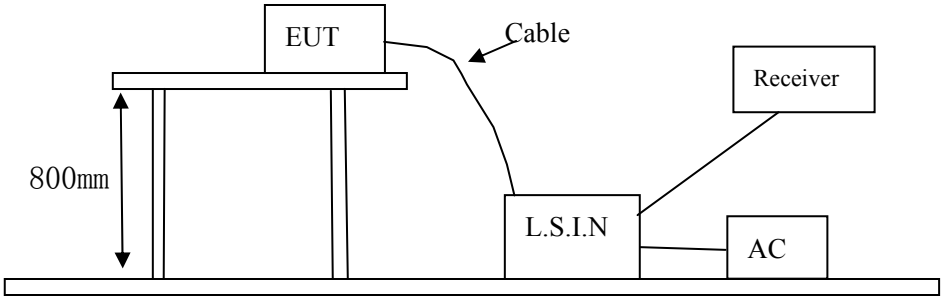

EUT: Equipment Under Test

5.2 Test Method and test Procedure

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

Test Voltage: 120V~, 60Hz

Block diagram of Test setup




5.3 Configuration of The EUT

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

A. EUT

| Device | Manufacturer | Model | FCC ID |
|---|---|---|---|
| Cutting Plotter | SHENZHEN JINGWEIXIAN TECHNOLOGY CO., LTD | CH16, CH24, C16, C24, CA16, CA24, CX16, CX24, CH10, C10, CX10, CA10 | 2AVGR-CH16 |

B. Internal Device

| Device | Manufacturer | Model | FCC ID/DOC |
|---|---|---|---|
| N/A | | | |

C. Peripherals

| Device | Manufacturer | Model | Rating |
|---|---|---|---|
| N/A | | | |

5.4 EUT Operating Condition

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

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

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

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

2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

**A: Conducted Emission on Live Terminal (150kHz to 30MHz)**

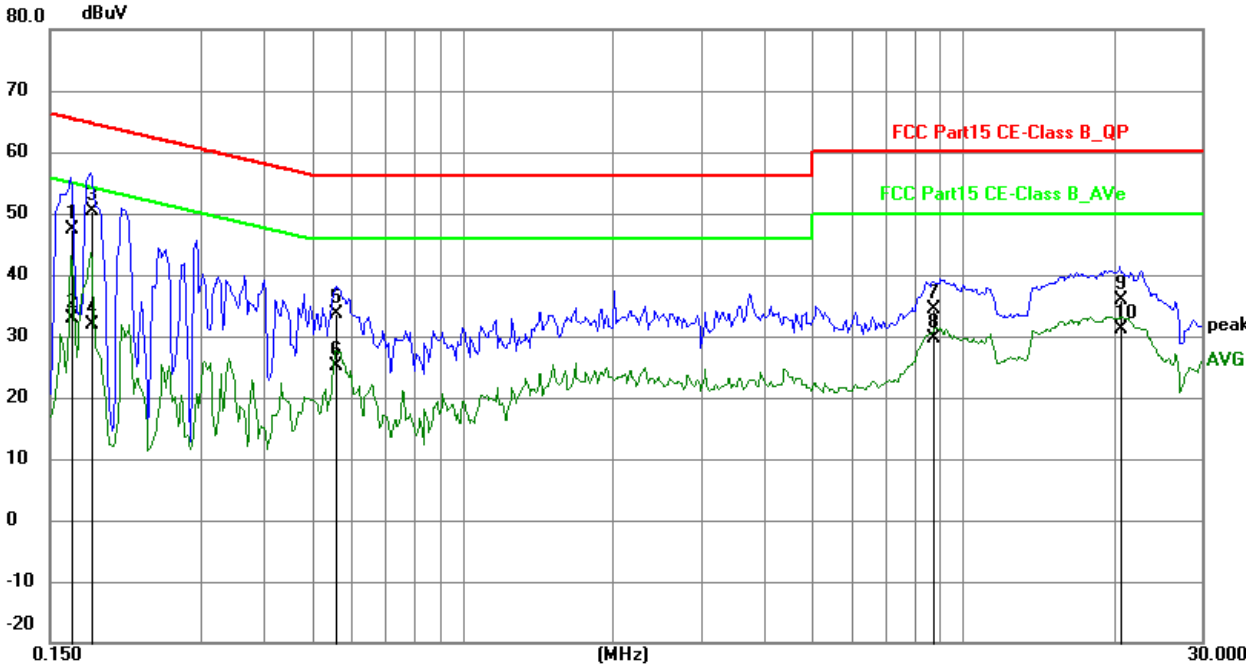
**EUT Operating Environment**

Temperature: 26℃ Humidity: 65%RH Atmospheric Pressure: 101 KPa

**EUT set Condition: Keep WIFI Transmitting**

**Results: PASS**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1655 | 37.71 | 9.77 | 47.48 | 65.18 | -17.70 | QP | P |
| 2 | 0.1655 | 23.21 | 9.77 | 32.98 | 55.18 | -22.20 | AVG | P |
| 3 | 0.1812 | 40.58 | 9.76 | 50.34 | 64.43 | -14.09 | QP | P |
| 4 | 0.1812 | 22.11 | 9.76 | 31.87 | 54.43 | -22.56 | AVG | P |
| 5 | 0.5595 | 23.91 | 9.77 | 33.68 | 56.00 | -22.32 | QP | P |
| 6 | 0.5595 | 15.35 | 9.77 | 25.12 | 46.00 | -20.88 | AVG | P |
| 7 | 8.6862 | 24.40 | 10.09 | 34.49 | 60.00 | -25.51 | QP | P |
| 8 | 8.6862 | 19.43 | 10.09 | 29.52 | 50.00 | -20.48 | AVG | P |
| 9 | 20.6826 | 25.23 | 10.72 | 35.95 | 60.00 | -24.05 | QP | P |
| 10 | 20.6826 | 20.39 | 10.72 | 31.11 | 50.00 | -18.89 | AVG | P |

**B: Conducted Emission on Neutral Terminal (150kHz to 30MHz)**

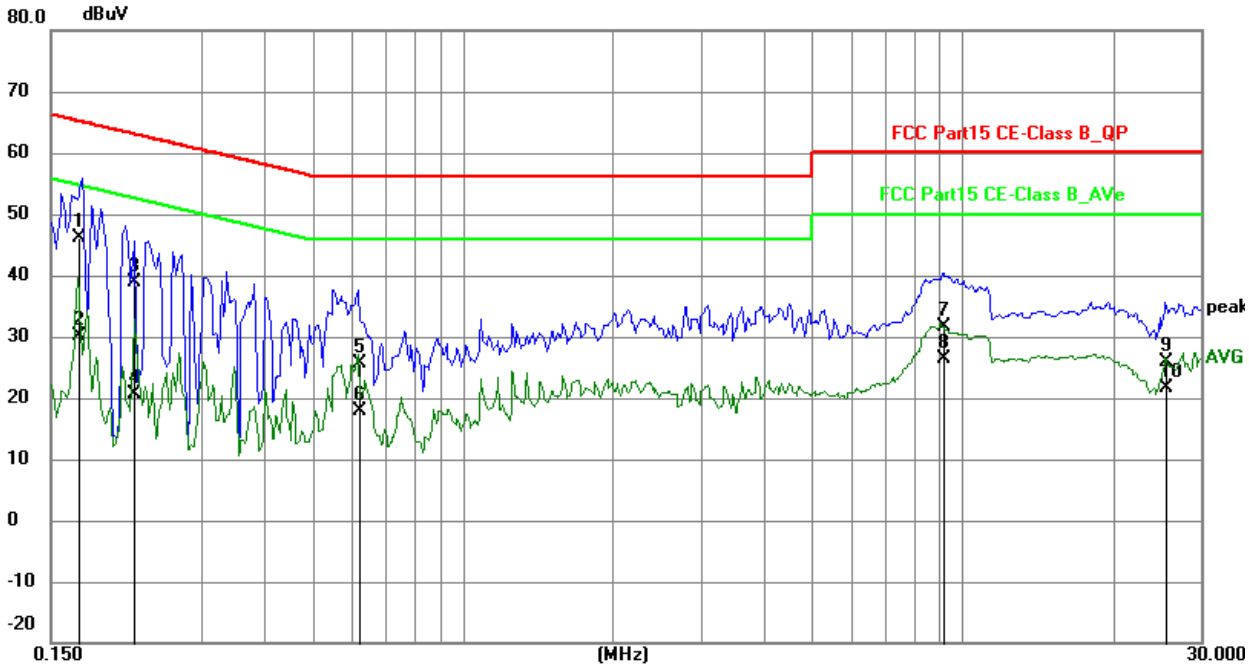
**EUT Operating Environment**

Temperature: 26℃ Humidity: 65%RH Atmospheric Pressure: 101 KPa

**EUT set Condition: Keep WIFI Transmitting**

**Results: Pass**

Please refer to following diagram for individual




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1695 | 36.46 | 9.77 | 46.23 | 64.98 | -18.75 | QP | P |
| 2 | 0.1695 | 20.32 | 9.77 | 30.09 | 54.98 | -24.89 | AVG | P |
| 3 | 0.2202 | 29.17 | 9.75 | 38.92 | 62.81 | -23.89 | QP | P |
| 4 | 0.2202 | 10.76 | 9.75 | 20.51 | 52.81 | -32.30 | AVG | P |
| 5 | 0.6180 | 15.89 | 9.78 | 25.67 | 56.00 | -30.33 | QP | P |
| 6 | 0.6180 | 8.15 | 9.78 | 17.93 | 46.00 | -28.07 | AVG | P |
| 7 | 9.1386 | 21.54 | 10.12 | 31.66 | 60.00 | -28.34 | QP | P |
| 8 | 9.1386 | 16.29 | 10.12 | 26.41 | 50.00 | -23.59 | AVG | P |
| 9 | 25.5303 | 14.96 | 11.02 | 25.98 | 60.00 | -34.02 | QP | P |
| 10 | 25.5303 | 10.61 | 11.02 | 21.63 | 50.00 | -28.37 | AVG | P |

## 6 Radiated Emission Test

6.1 Test Method and test Procedure:

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

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

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

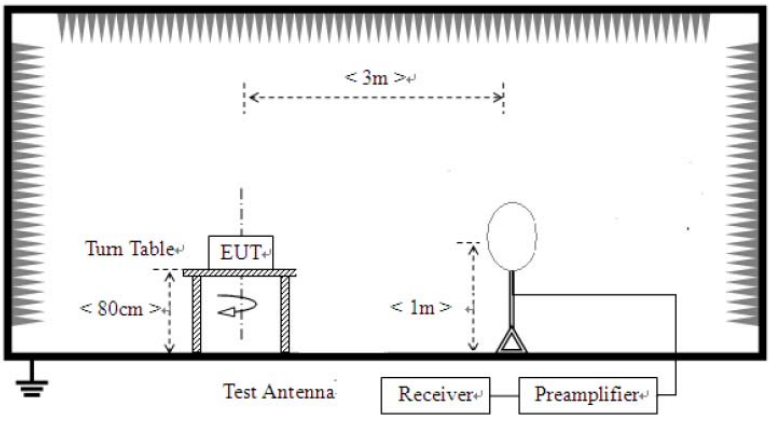
(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

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

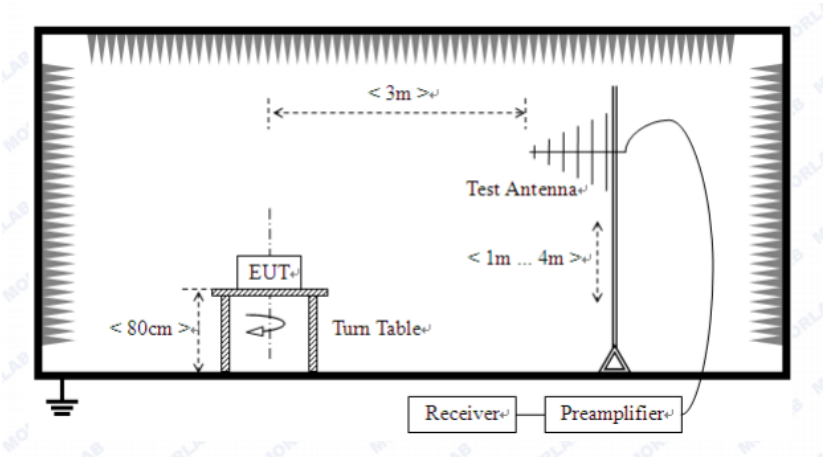
(6) The antenna polarization : Vertical polarization and Horizontal polarization.

**Block diagram of Test setup**

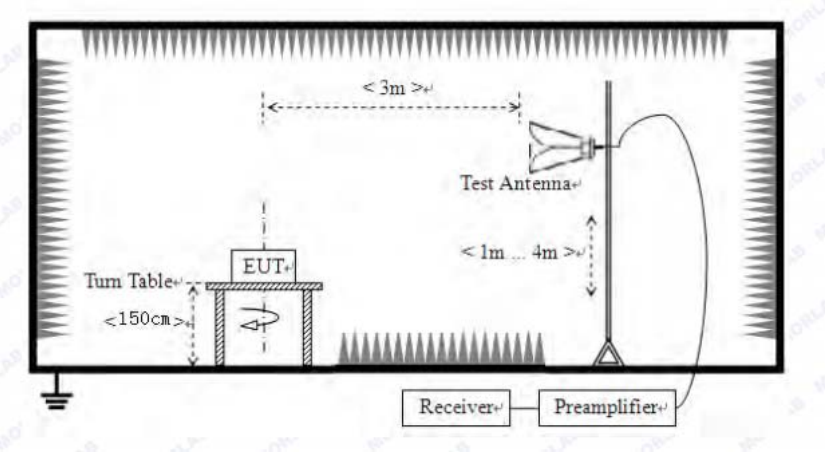
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz




For radiated emissions above 1GHz




6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

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

**Frequencies in restricted band are complied to limit on Paragraph 15.209**

**Limits for frequency below 30MHz**

| Frequency Range (MHz) | Distance (m) | Field strength (V/m) |
|---|---|---|
| 0.009-0.490 | 300 | 2400/F(kHz) |
| 0.490-1.705 | 30 | 24000/F(kHz) |
| 1.705-30 | 30 | 30 |

**Limits for frequency Above 30MHz**

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

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

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

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

**4. Worse case were recorded in the test report. 802.11b was the worst case.**

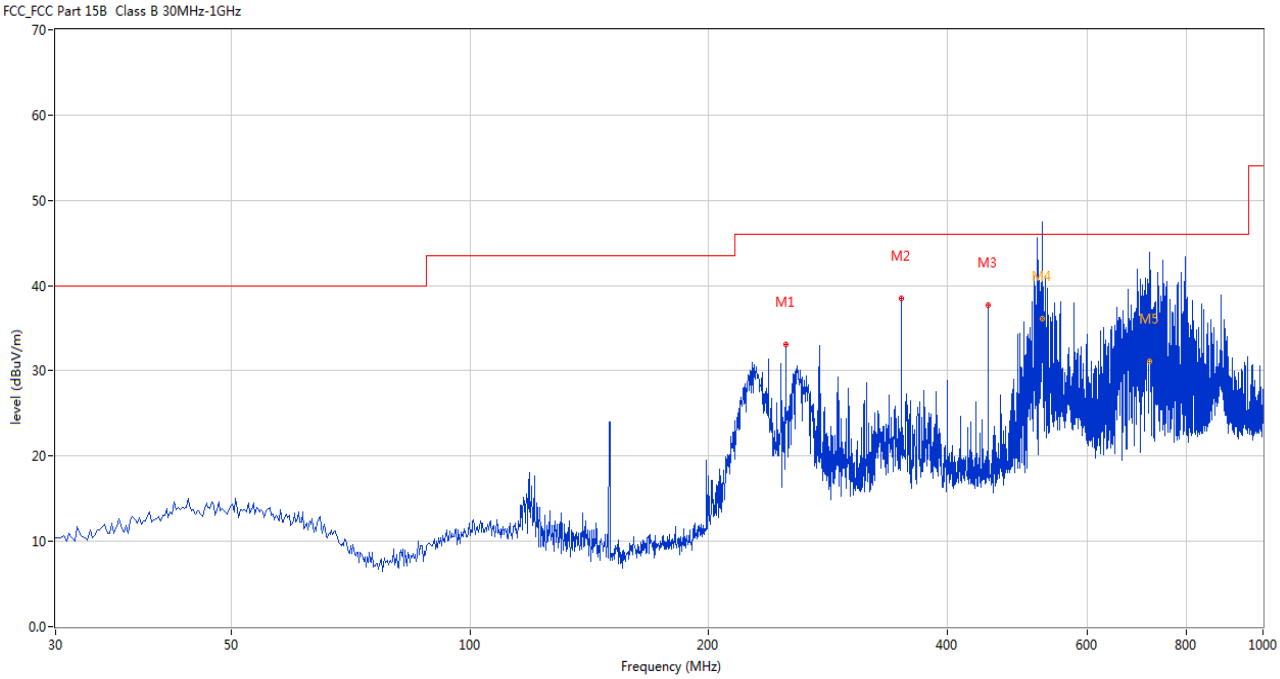
**Test result**

**General Radiated Emission Data and Harmonics Radiated Emission Data**

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

EUT set Condition: **Keep Transmitting**

**Results:** **Pass**




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 249.893 | 33.06 | -12.08 | 46.0 | -12.94 | Peak | 33.00 | 100 | Horizontal | Pass |
| 2 | 350.020 | 38.48 | -9.32 | 46.0 | -7.52 | Peak | 18.00 | 100 | Horizontal | Pass |
| 3 | 449.905 | 37.70 | -8.01 | 46.0 | -8.30 | Peak | 189.00 | 100 | Horizontal | Pass |
| 4 | 526.700 | 53.41 | -6.55 | 46.0 | 7.41 | Peak | 174.00 | 199 | Horizontal | N/A |
| 4* | 526.700 | 36.18 | -6.55 | 46.0 | -9.82 | QP | 174.00 | 199 | Horizontal | Pass |
| 5 | 719.876 | 46.45 | -4.06 | 46.0 | 0.45 | Peak | 129.00 | 164 | Horizontal | N/A |
| 5* | 719.876 | 31.14 | -4.06 | 46.0 | -14.86 | QP | 129.00 | 164 | Horizontal | Pass |

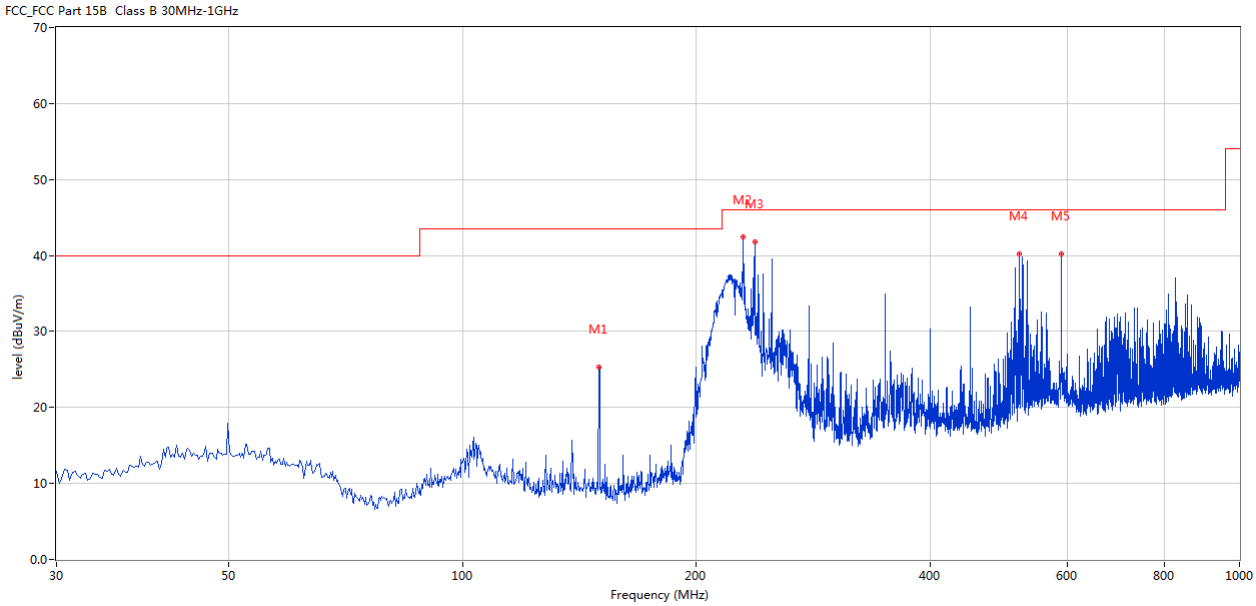
**Test result**

## General Radiated Emission Data and Harmonics Radiated Emission Data

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

EUT set Condition: **Keep Transmitting**

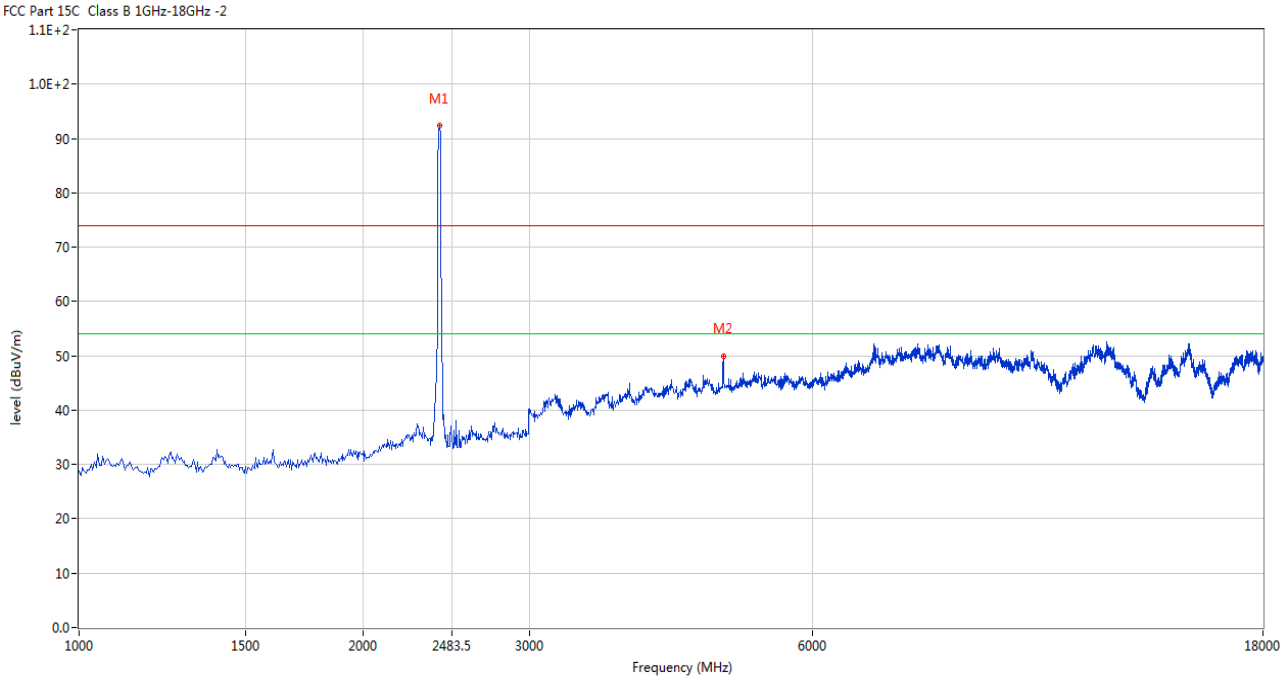
**Results:** **Pass**




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 149.765 | 25.28 | -17.05 | 43.5 | -18.22 | Peak | 234.00 | 100 | Vertical | Pass |
| 2 | 229.528 | 42.39 | -12.68 | 46.0 | -3.61 | Peak | 174.00 | 100 | Vertical | Pass |
| 3 | 237.771 | 41.85 | -12.44 | 46.0 | -4.15 | Peak | 219.00 | 100 | Vertical | Pass |
| 4 | 520.212 | 40.20 | -6.76 | 46.0 | -5.80 | Peak | 55.00 | 100 | Vertical | Pass |
| 5 | 589.793 | 40.22 | -5.08 | 46.0 | -5.78 | Peak | 301.00 | 100 | Vertical | Pass |

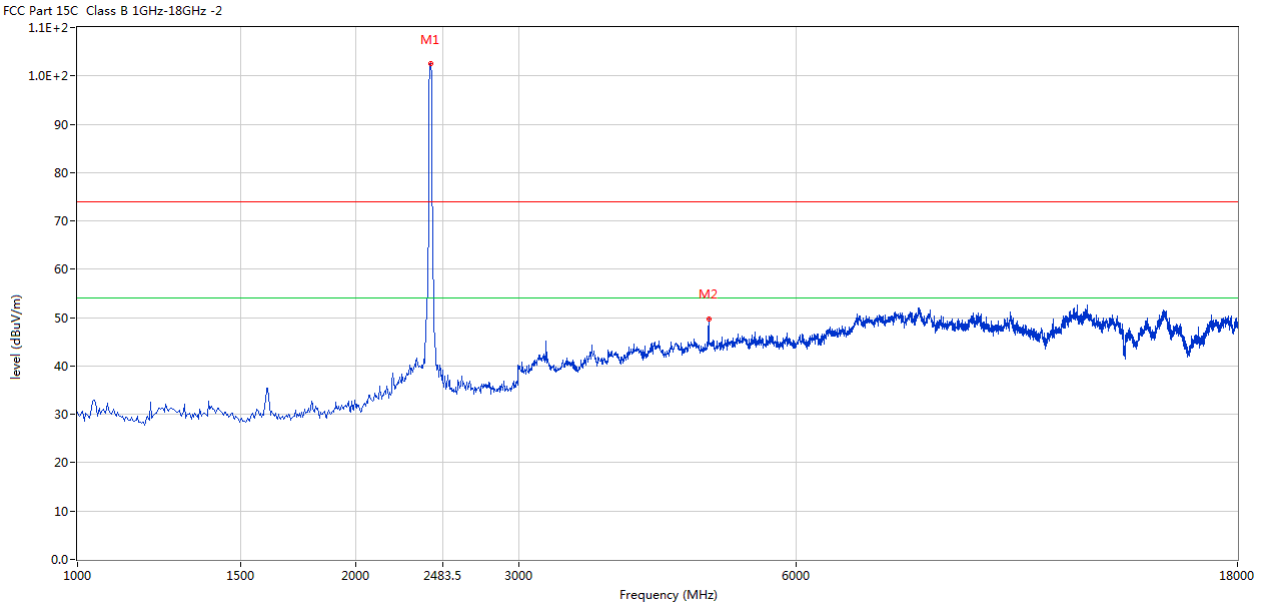
Please refer to the following test plots for details:

**CH01 for 11b: Horizontal**



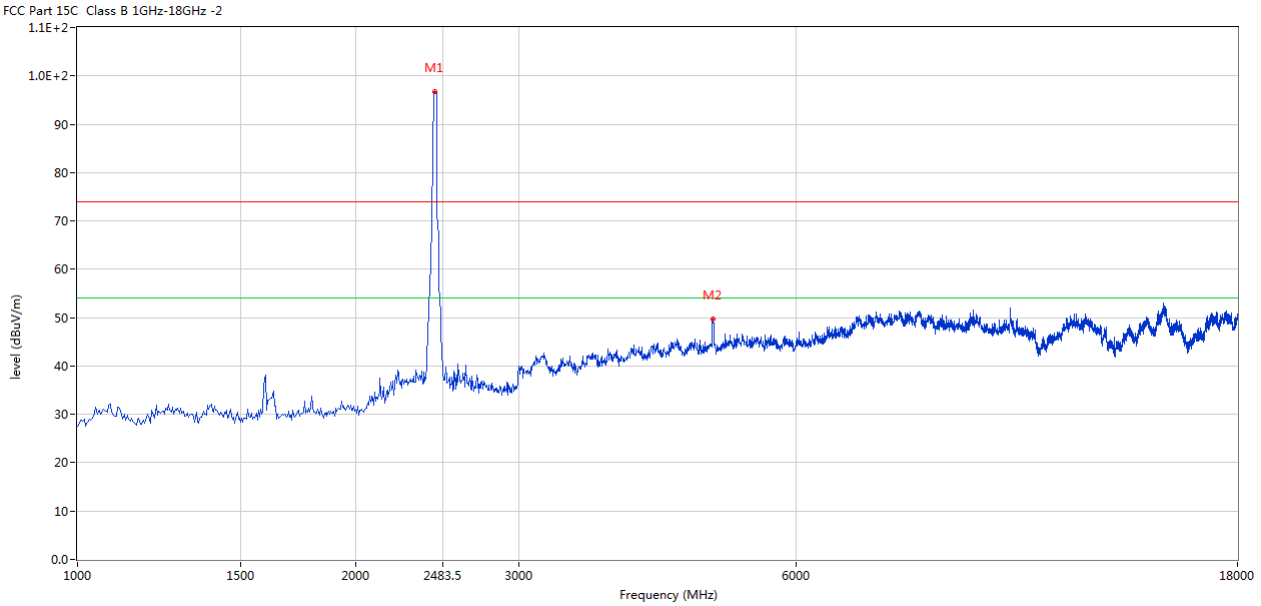

| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4820.750 | 50.00 | 3.14 | 74.0 | -24.00 | Peak | 71.00 | 150 | Horizontal | Pass |

**CH01 for 11b: Vertical**



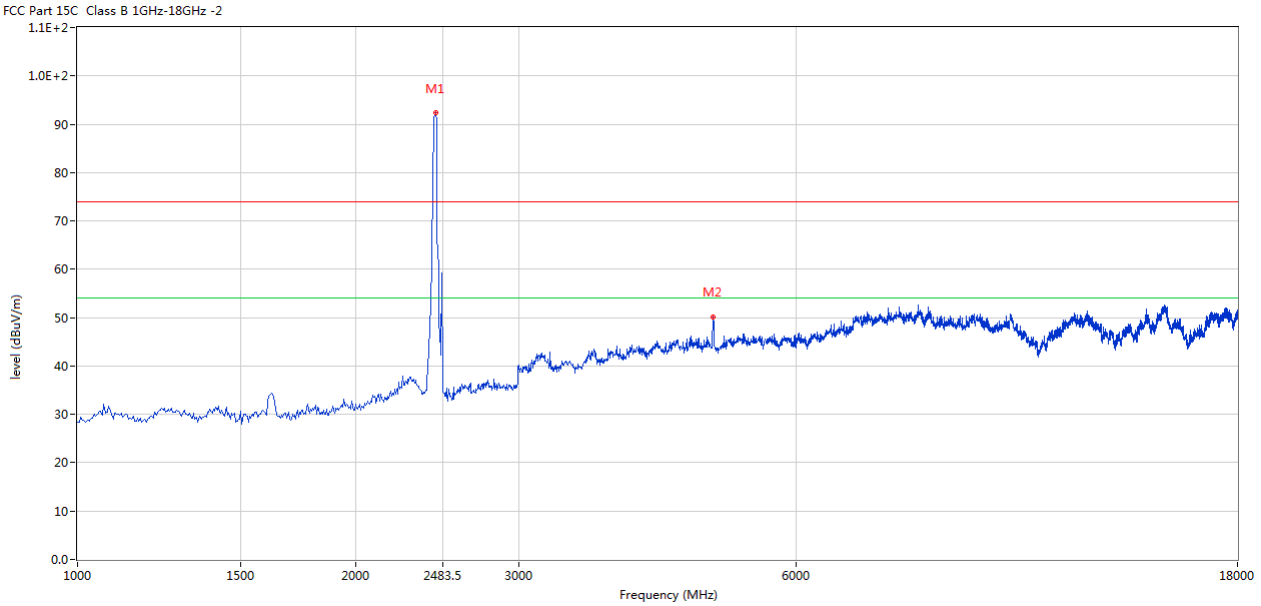

| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4820.750 | 50.70 | 3.14 | 74.0 | 23.30 | Peak | 353.00 | 150 | Vertical | Pass |

## CH06 for 11b: Vertical



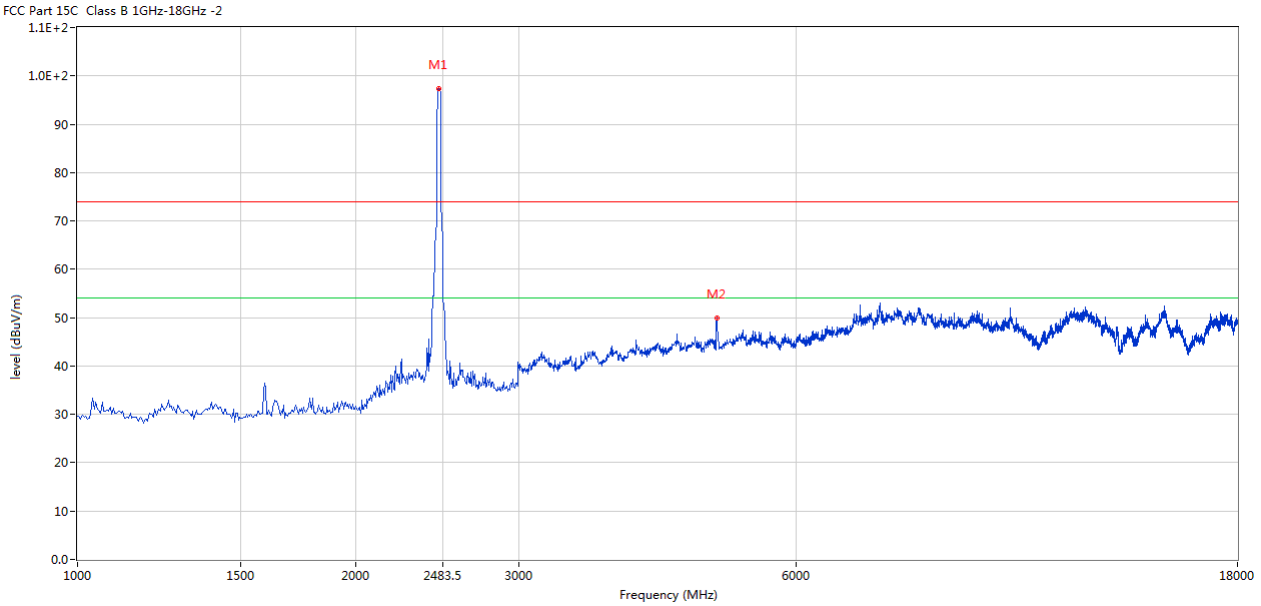

| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4876.000 | 50.74 | 3.19 | 74.0 | -23.26 | Peak | 295.00 | 150 | Vertical | Pass |

## CH06 for 11b: Horizontal



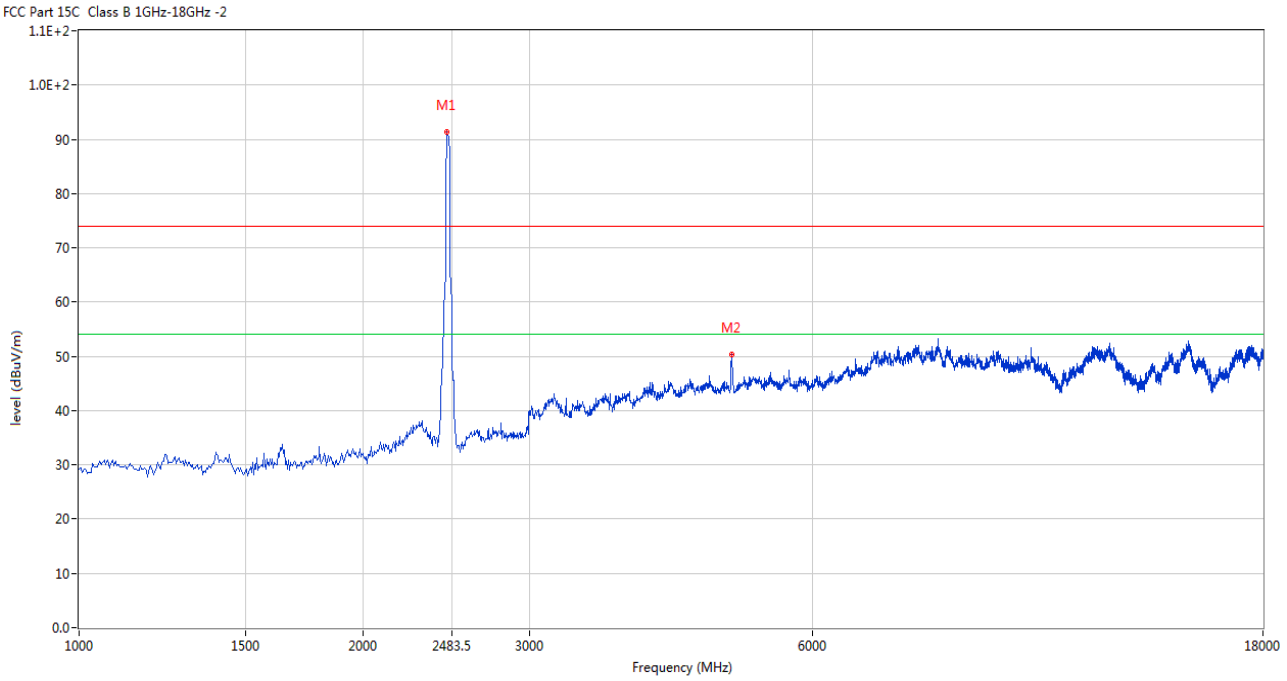

| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4871.750 | 50.12 | 3.19 | 74.0 | -23.88 | Peak | 113.00 | 150 | Horizontal | Pass |

## CH11 for 11b: Vertical




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4918.500 | 50.98 | 3.26 | 74.0 | -23.02 | Peak | 259.00 | 150 | Vertical | Pass |

**CH11 for 11b: Horizontal**




| No. | Frequency (MHz) | Results (dBuV/m) | Factor (dB) | Limit (dBuV/m) | Over Limit (dB) | Detector | Table (o) | Height (cm) | ANT | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 4918.500 | 50.37 | 3.26 | 74.0 | -23.63 | Peak | 27.00 | 150 | Horizontal | Pass |

Note: 1. Result Level = Reading + Factor

2. Factor= AF + Cable Loss- Preamp

3. Margin = Result– Limit

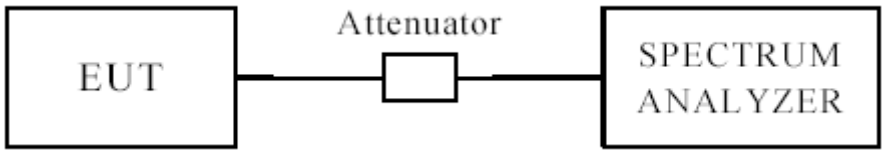
4. The measured PK value less than the AV limit, no necessary to take down the AV measurement result.

5. For radiated Emissions from 18G~25GHz, the emission level are attenuated 20dB below the limit. So it does not recorded in report.

6. For radiated emissions below 30MHz, it is the floor noise and the field strength is much less than the limit for 20dB.

## 7.0 6dB Bandwidth Measurement

### 7.1 Test Setup




### 7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

### 7.3 Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to 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) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

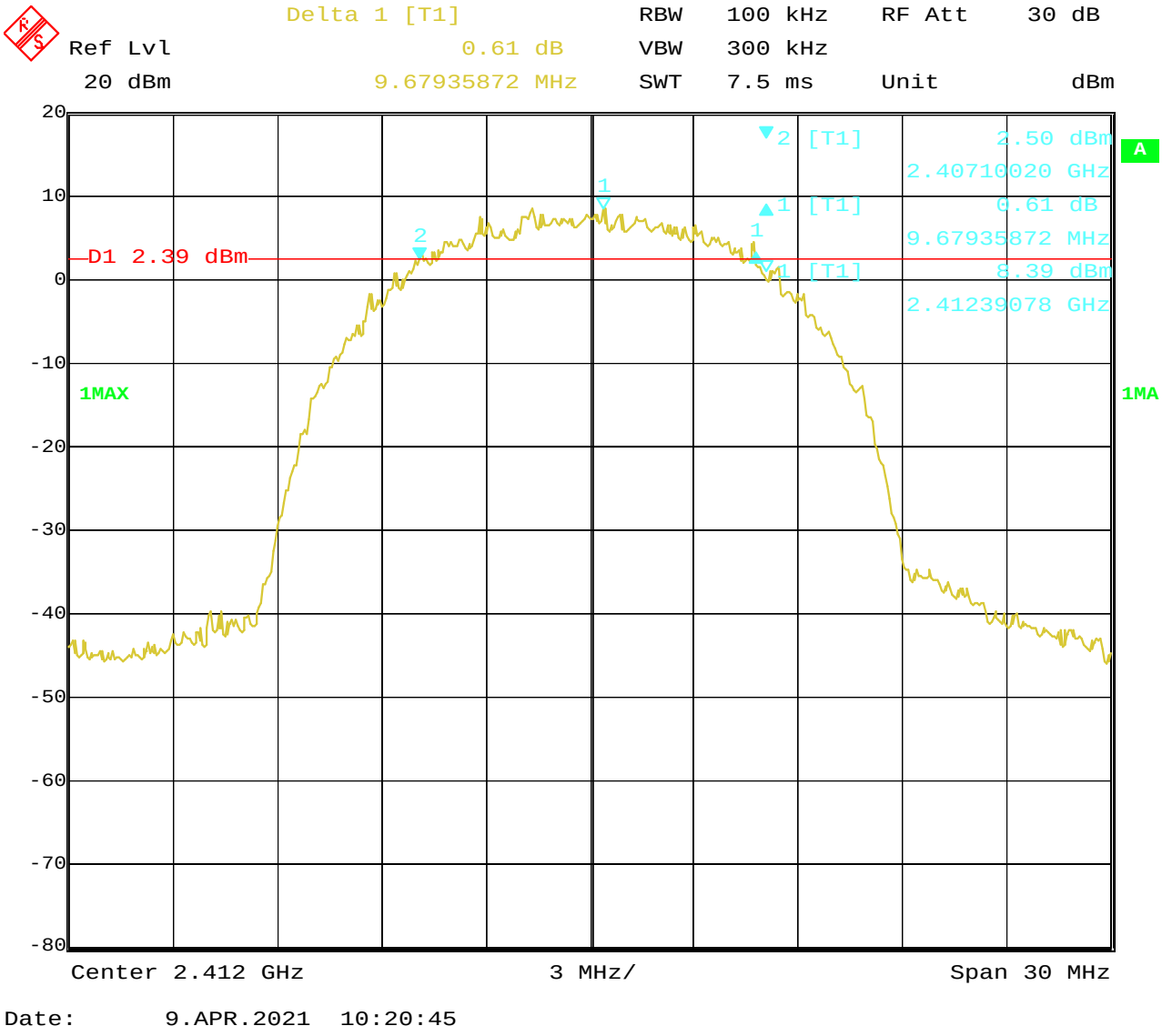
### 7.4 Test Result

**6dB Occupied Bandwidth**

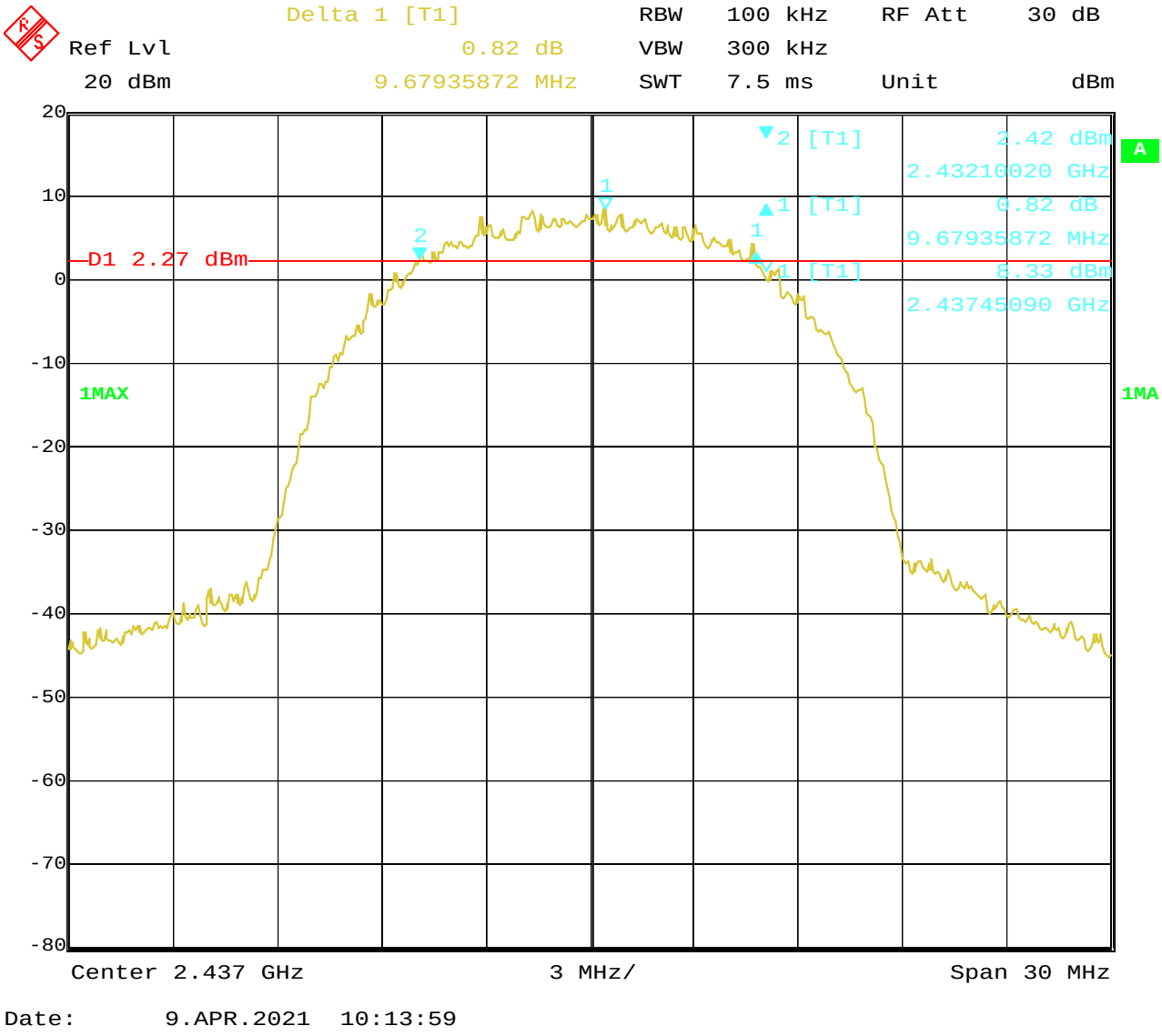
| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11b | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Channel Frequency (MHz) | Data Transfer Rate (Mbps) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/ Fail |
|---|---|---|---|---|---|
| 1 | 2412 | 11 | 9.68 | 0.5 | Pass |
| 6 | 2437 | 11 | 9.68 | 0.5 | Pass |
| 11 | 2462 | 11 | 9.68 | 0.5 | Pass |

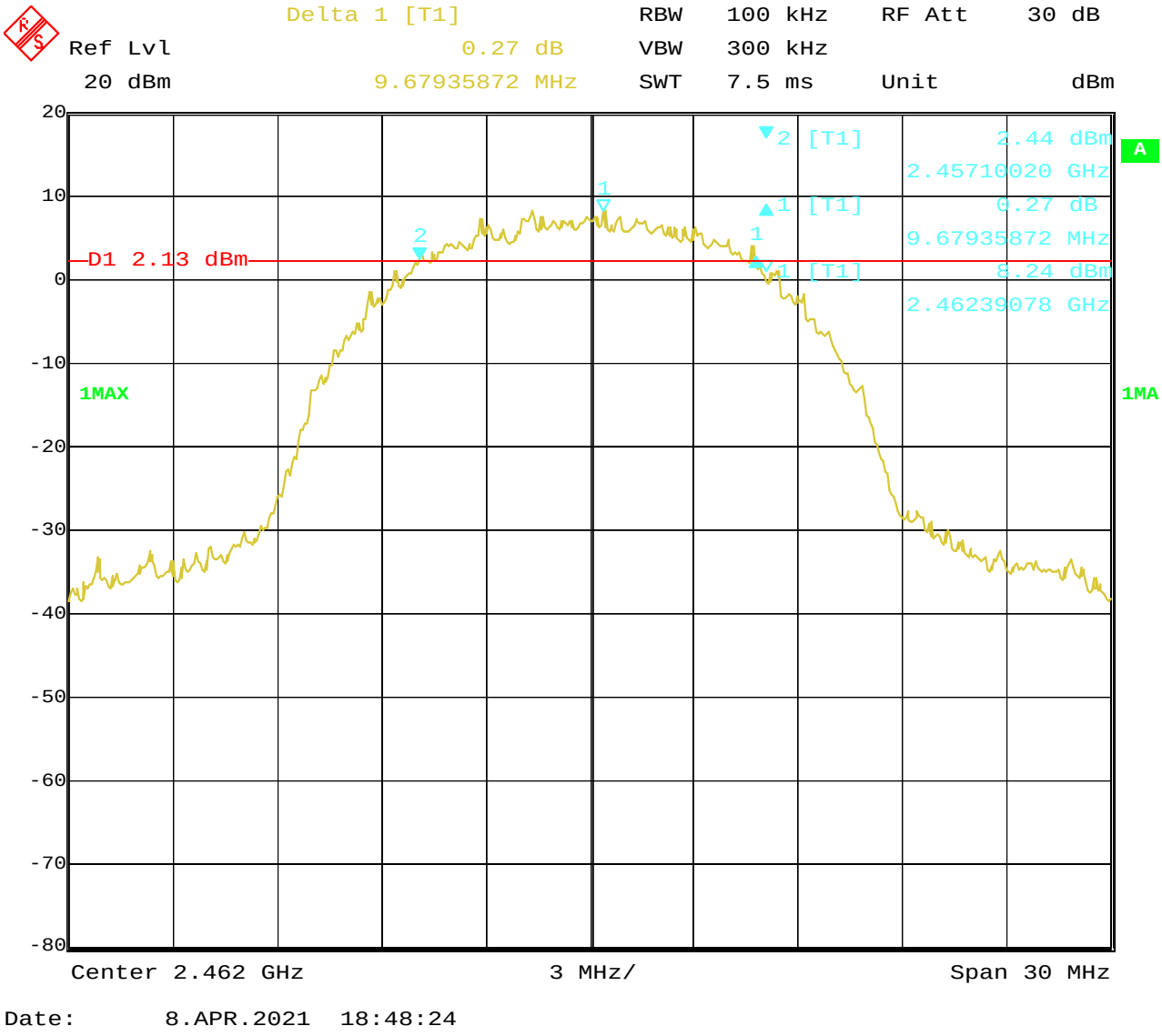
**1. 802.11b at 11Mbps of CH01**



**2. 802.11b at 11Mbps of CH06**



### 3. 802.11b at 11Mbps of CH11



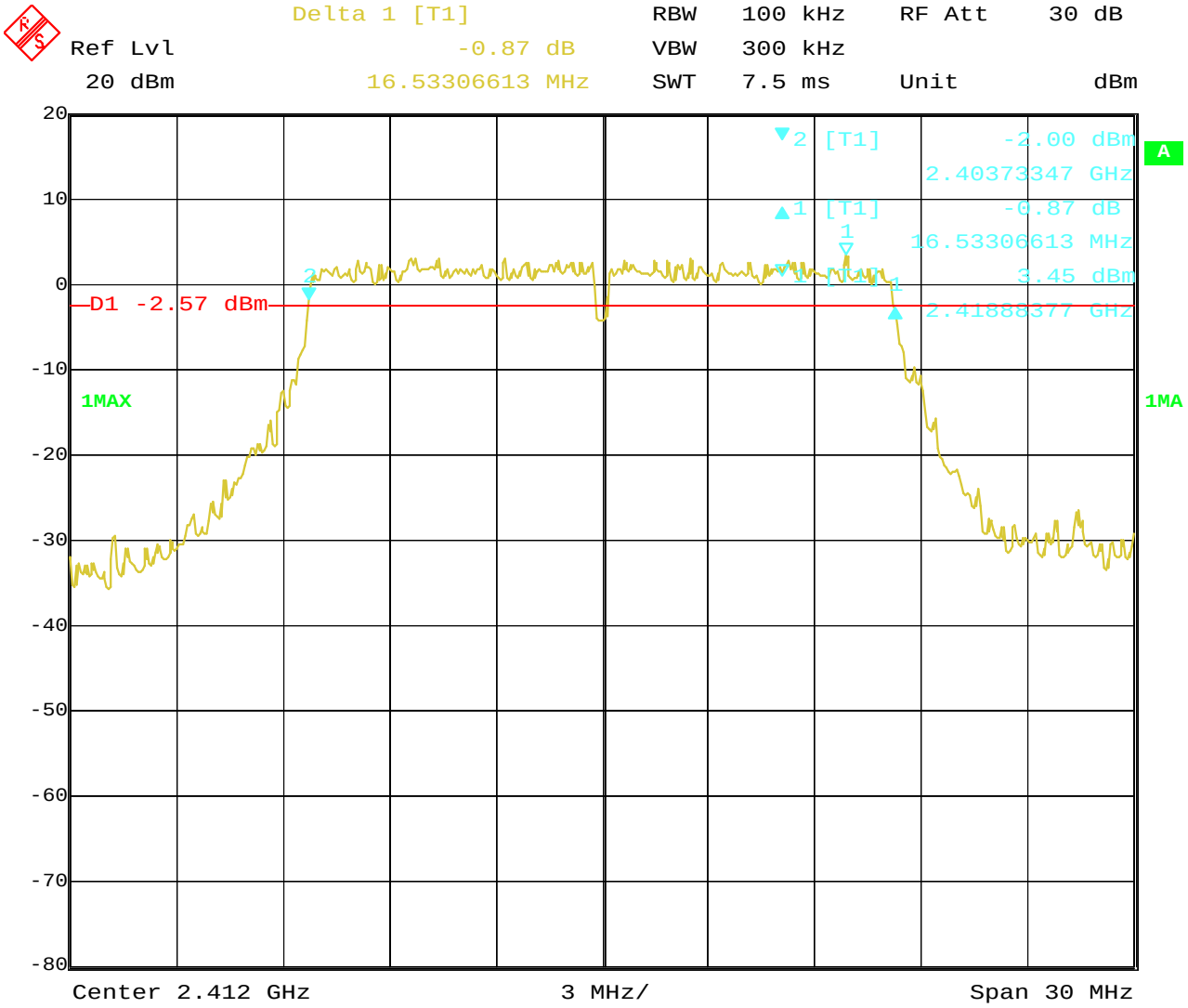
**6dB Occupied Bandwidth**

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11g | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

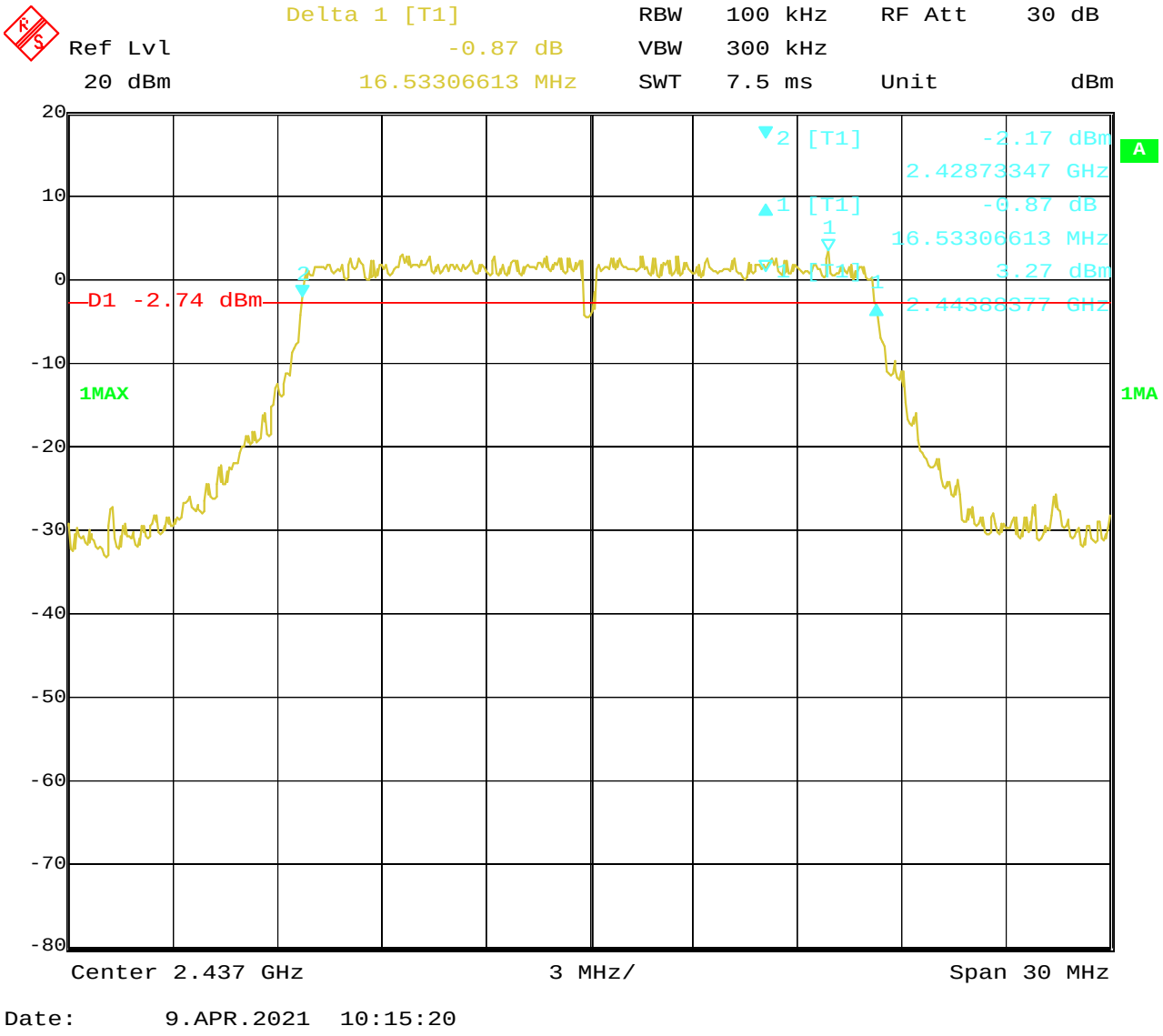
| Channel | Channel Frequency (MHz) | Data Transfer Rate (Mbps) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/ Fail |
|---|---|---|---|---|---|
| 1 | 2412 | 6 | 16.53 | 0.5 | Pass |
| 6 | 2437 | 6 | 16.53 | 0.5 | Pass |
| 11 | 2462 | 6 | 16.53 | 0.5 | Pass |

**Test Plots:**

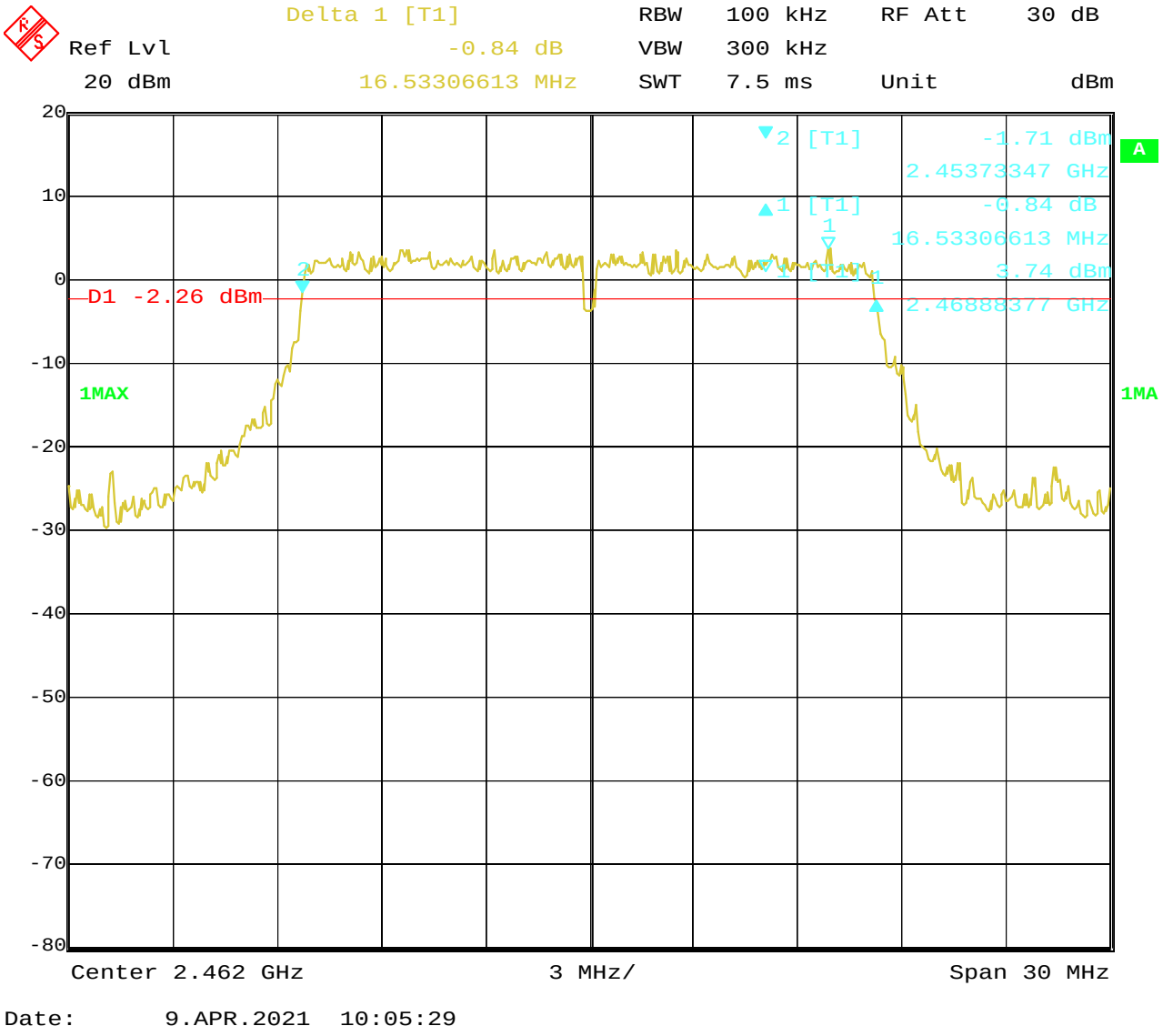
**1. 802.11g at 6Mbps of CH01**



**2. 802.11g at 6Mbps of CH06**



**3. 802.11g at 6Mbps of CH11**



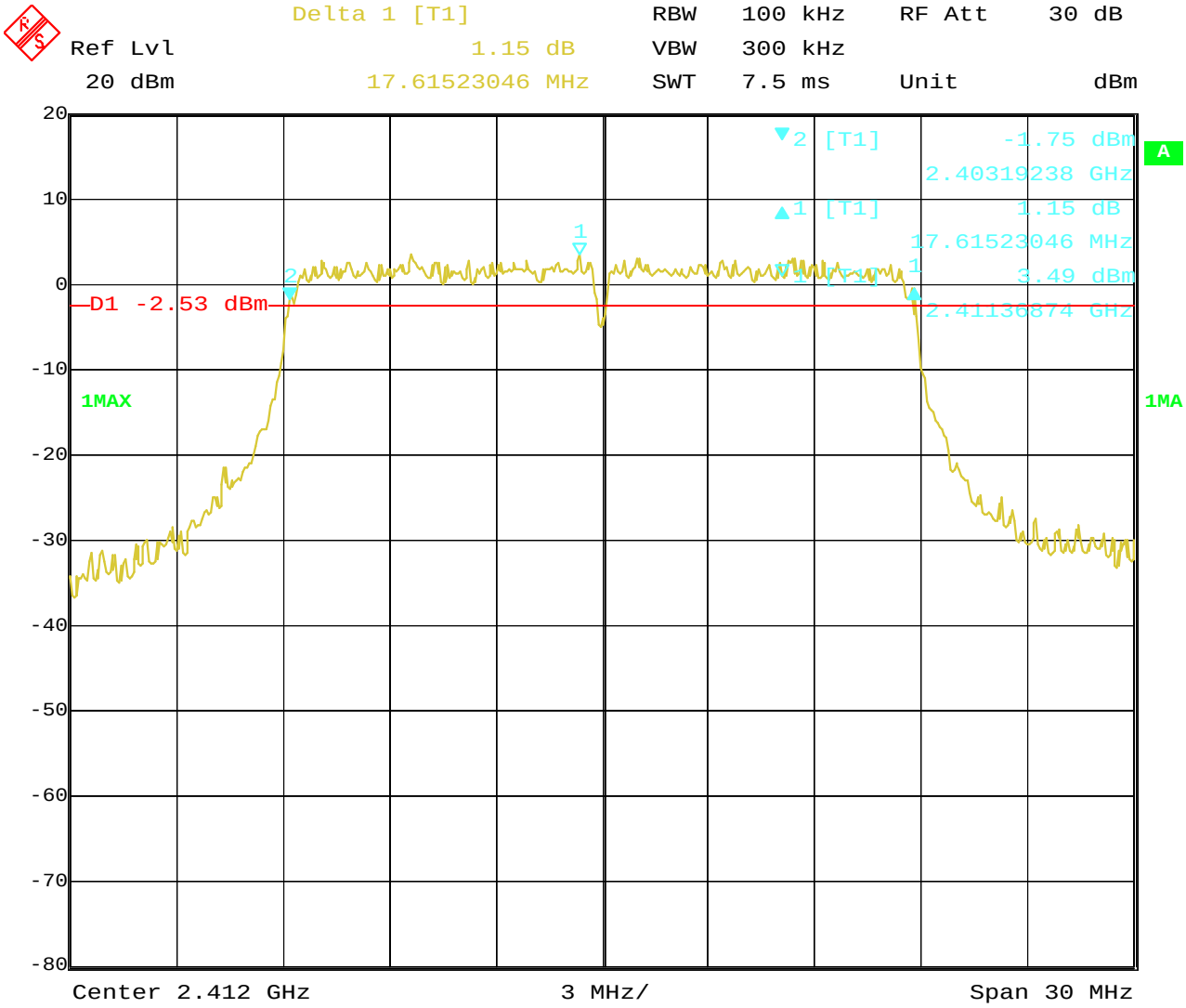
**6dB Occupied Bandwidth**

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11n HT20 | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

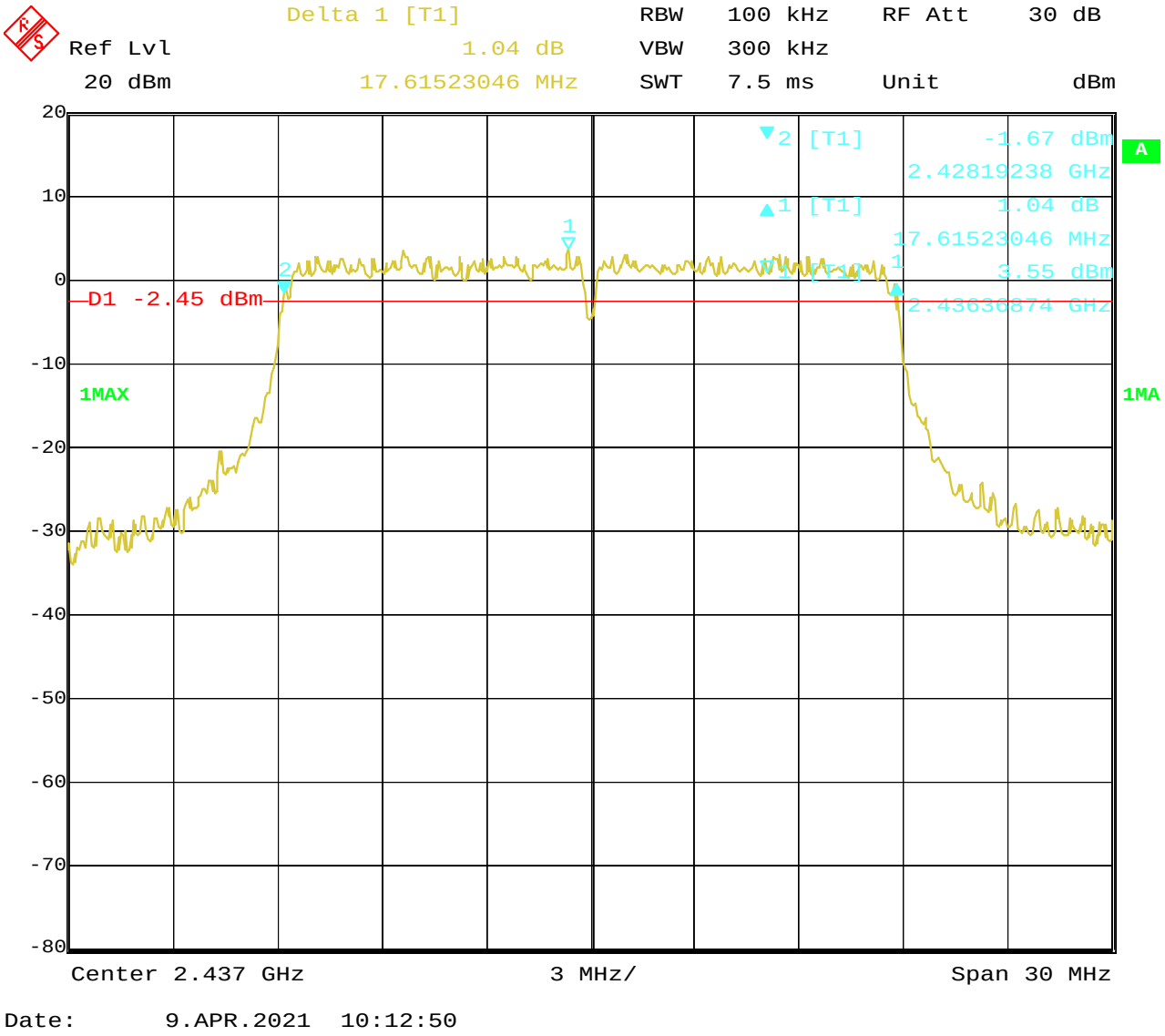
| Channel | Channel Frequency (MHz) | Data Transfer Rate (Mbps) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/ Fail |
|---|---|---|---|---|---|
| 1 | 2412 | mcs0 | 17.62 | 0.5 | Pass |
| 6 | 2437 | mcs0 | 17.62 | 0.5 | Pass |
| 11 | 2462 | mcs0 | 17.62 | 0.5 | Pass |

**Test Plots:**

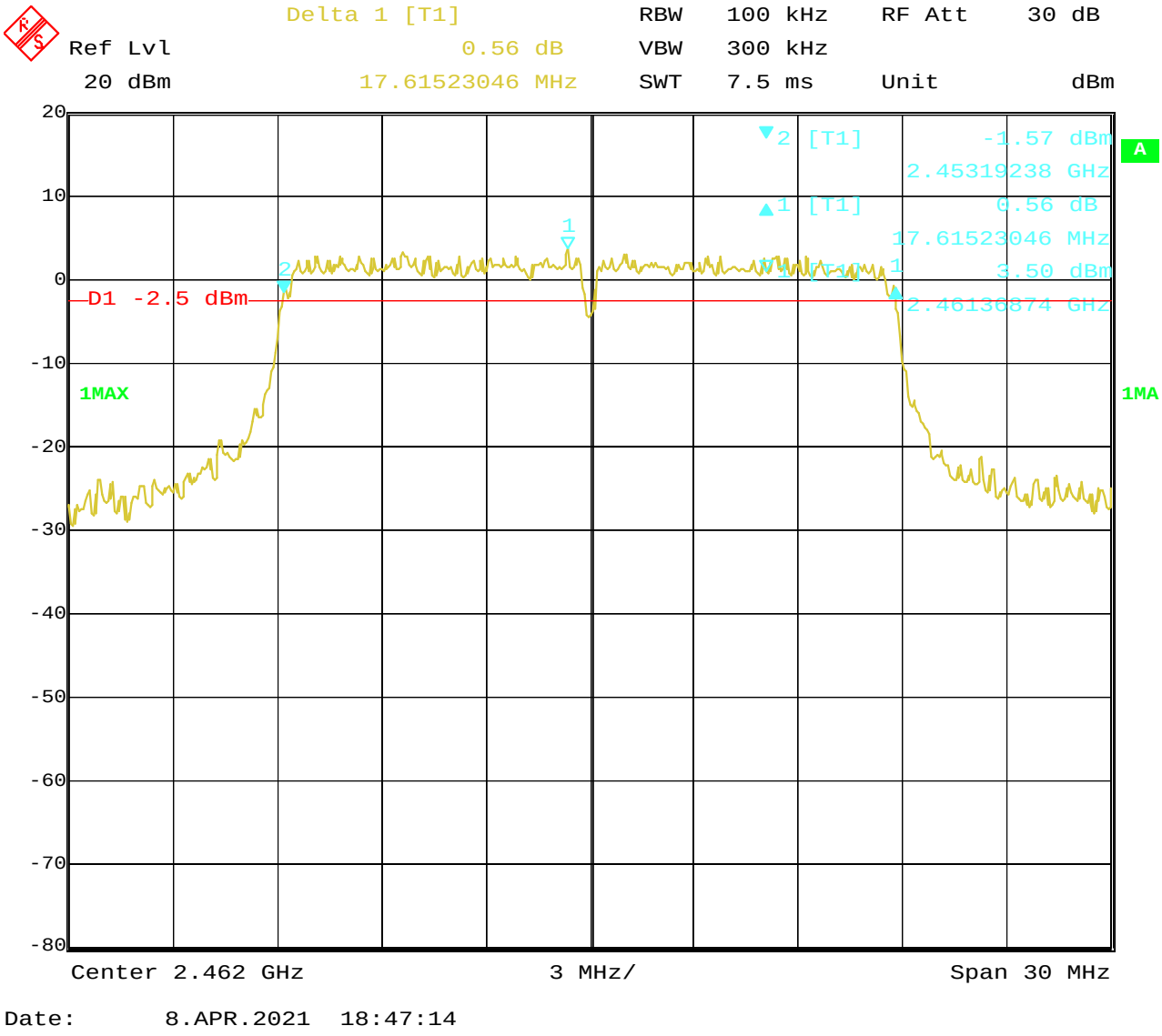
**1. 802.11n at HT20 of CH01**



**2. 802.11n at HT20 of CH06**



**3. 802.11n at HT20 of CH11**



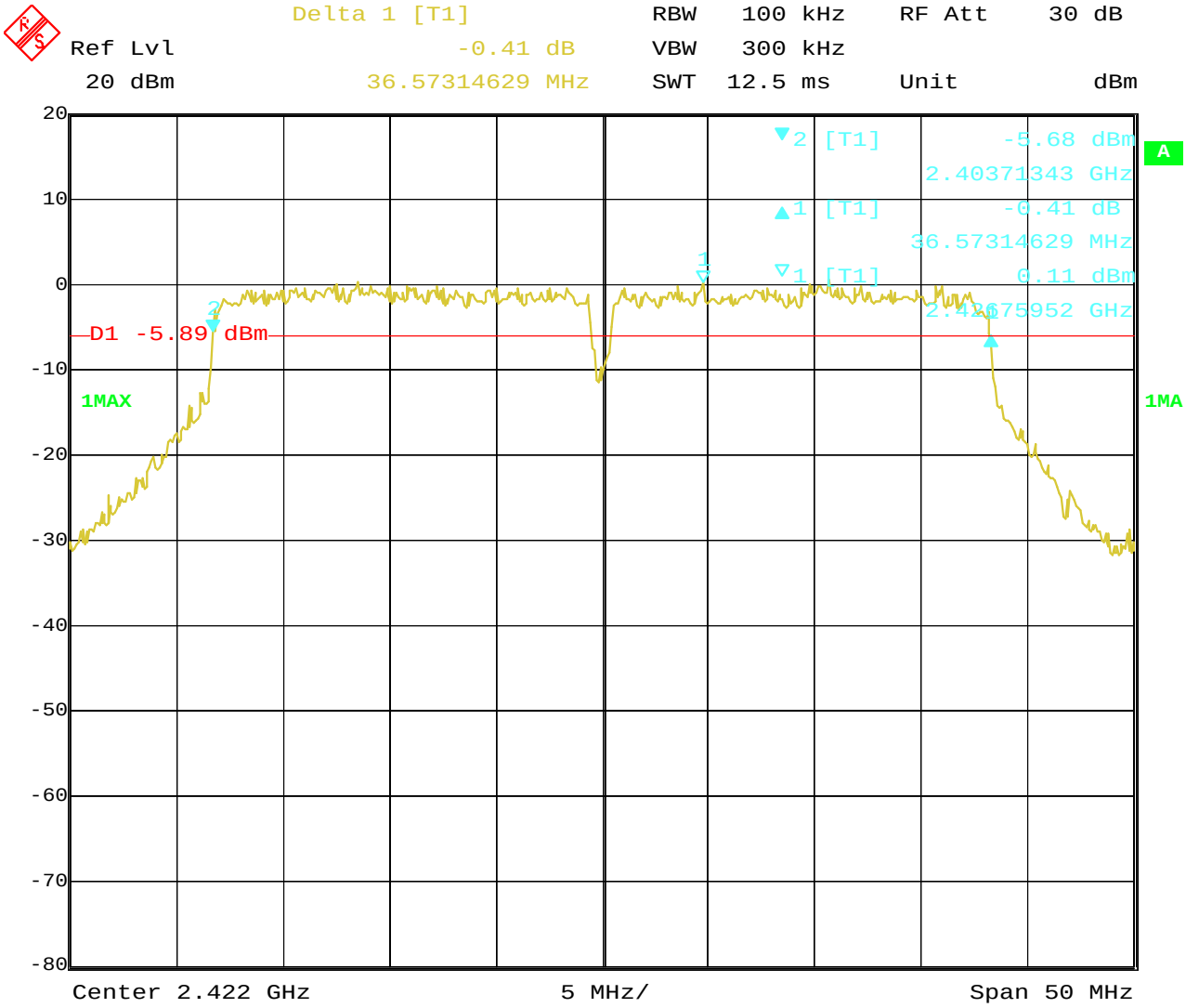
**6dB Occupied Bandwidth**

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11n HT40 | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

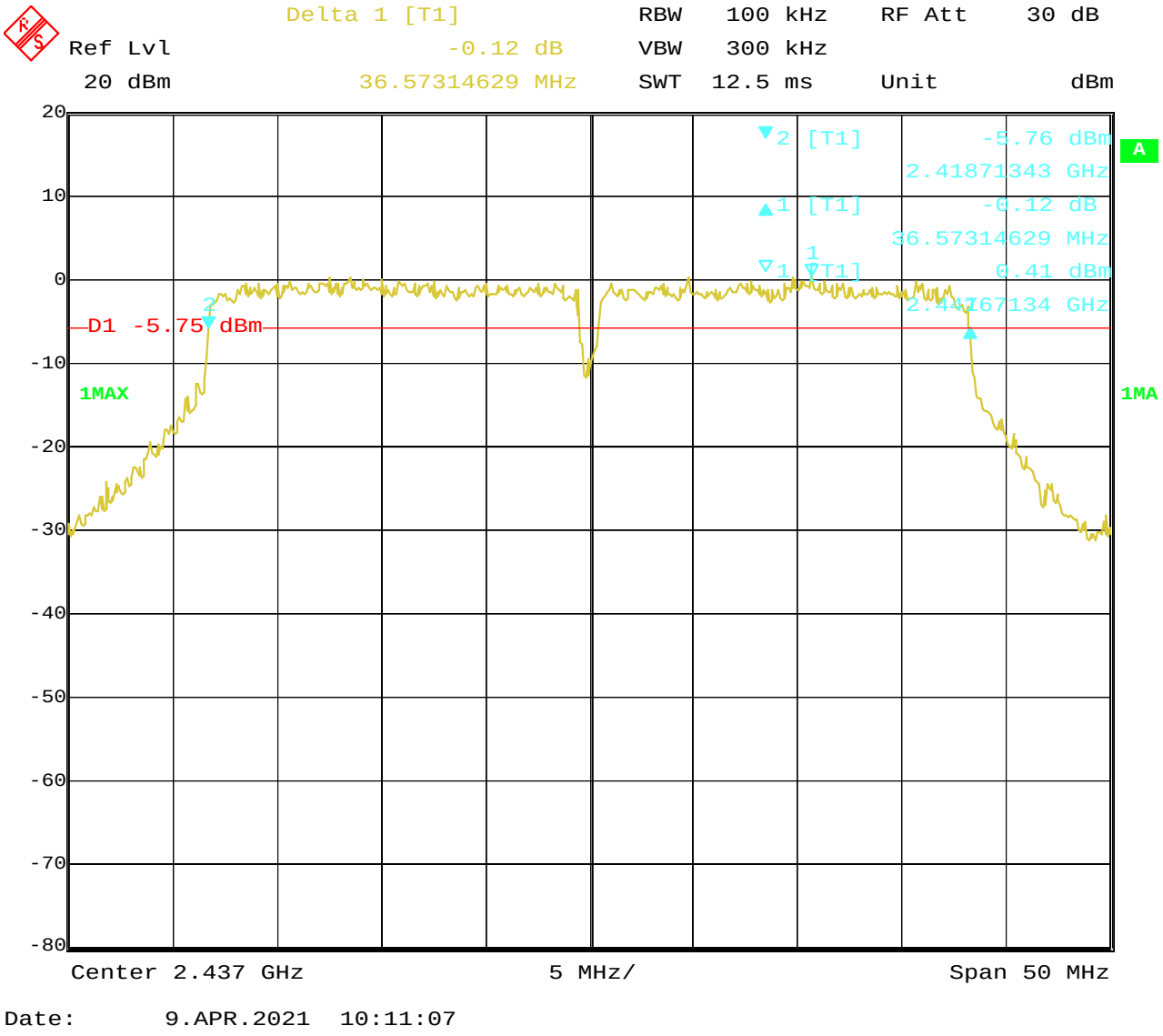
| Channel | Channel Frequency (MHz) | Data Transfer Rate (Mbps) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/ Fail |
|---|---|---|---|---|---|
| 3 | 2422 | mcs0 | 36.57 | 0.5 | Pass |
| 6 | 2437 | mcs0 | 36.57 | 0.5 | Pass |
| 9 | 2452 | mcs0 | 36.57 | 0.5 | Pass |

**Test Plots:**

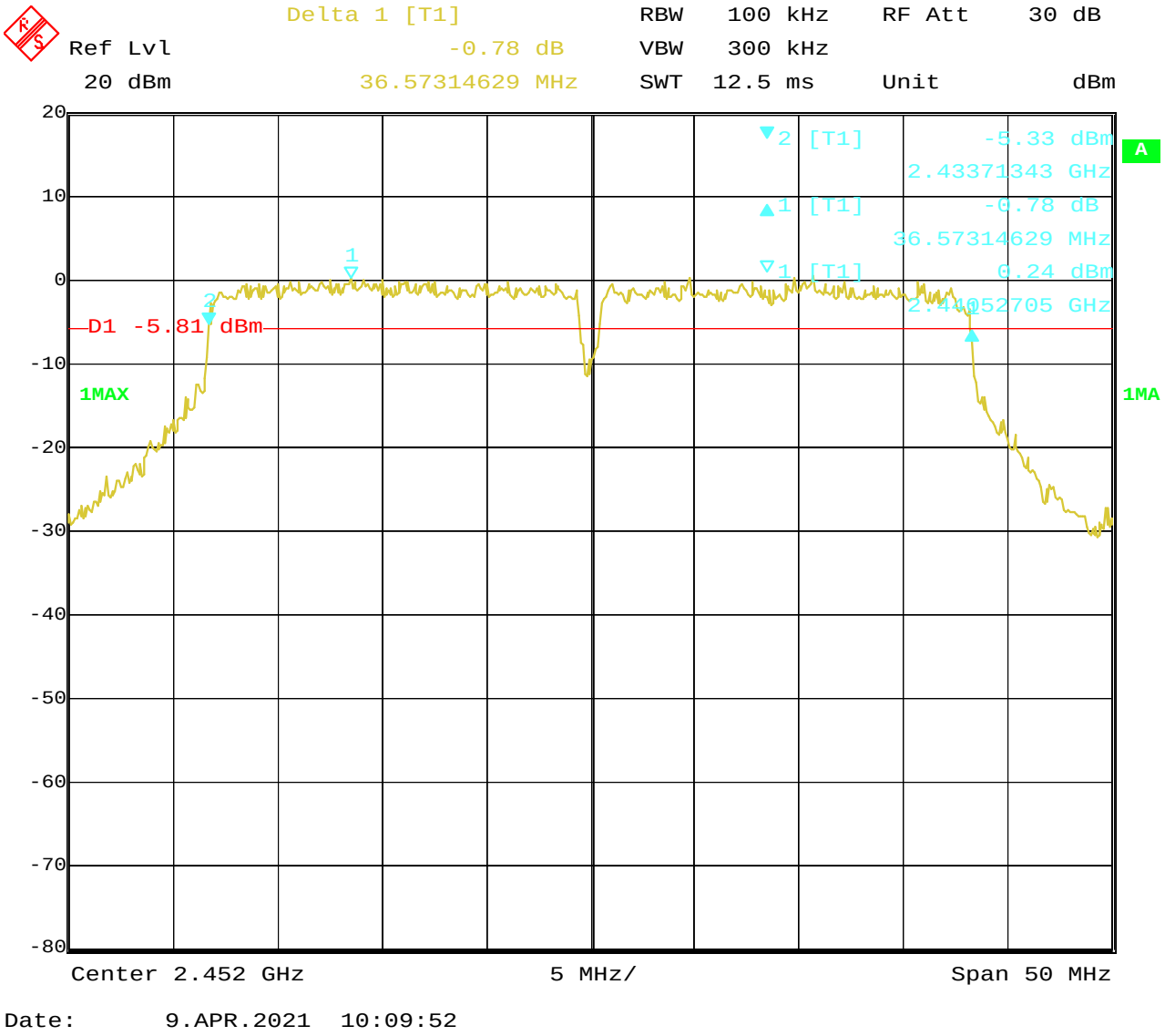
**1. 802.11n at HT40 of CH03**



**2. 802.11n at HT40 of CH06**

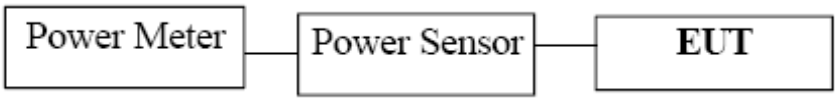


**3. 802.11n at HT40 of CH09**



# 8. Maximum Output Power

## 8.1 Test Setup




## 8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

## 8.3 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector ( conducted measurement ) while EUT was operating in transmit mode at the appropriate centre frequency.

**Note: the Peak power was measured**

**8.4Test Results**

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11b | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Frequency (MHz) | Max. Power Output (dBm) | Power Limit (dBm) | Pass/ Fail |
|---|---|---|---|---|
| 1 | 2412 | 25.32 | 30 | Pass |
| 6 | 2437 | 25.21 | 30 | Pass |
| 11 | 2462 | 24.55 | 30 | Pass |

Note: 1. At finial test to get the worst-case emission at 1Mbps for CH01, CH06 and CH11
2. The result basic equation calculation as follow:
Power Output = Power Reading + Cable loss + Attenuator
3. The worse case was recorded

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11g | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Frequency (MHz) | Max. Power Output (dBm) | Power Limit (dBm) | Pass/ Fail |
|---|---|---|---|---|
| 1 | 2412 | 25.45 | 30 | Pass |
| 6 | 2437 | 25.16 | 30 | Pass |
| 11 | 2462 | 24.69 | 30 | Pass |

Note: 1. At finial test to get the worst-case emission at 6Mbps for CH01, CH06 and CH11
2. The result basic equation calculation as follow:
Power Output = Power Reading + Cable loss + Attenuator
3. The worse case was recorded

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11n (HT20) | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Frequency (MHz) | Max. Power Output (dBm) | Power Limit (dBm) | Pass/ Fail |
|---|---|---|---|---|
| 1 | 2412 | 25.59 | 30 | Pass |
| 6 | 2437 | 25.34 | 30 | Pass |
| 11 | 2462 | 24.83 | 30 | Pass |

Note: 1. At finial test to get the worst-case emission at mcs0 of 11n HT20 for CH01, CH06 and CH11
2. The result basic equation calculation as follow:
Power Output = Power Reading + Cable loss + Attenuator
3. The worse case was recorded

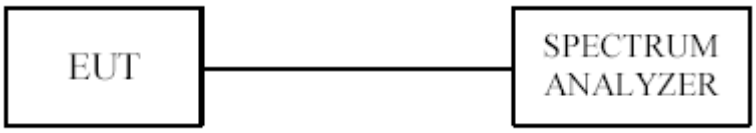
| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11n (HT40) | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Frequency (MHz) | Max. Power Output (dBm) | Power Limit (dBm) | Pass/ Fail |
|---|---|---|---|---|
| 3 | 2412 | 23.16 | 30 | Pass |
| 6 | 2437 | 23.93 | 30 | Pass |
| 9 | 2462 | 23.49 | 30 | Pass |

Note: 1. At finial test to get the worst-case emission at msc0 of 11n HT40 for CH03, CH06 and CH09
2. The result basic equation calculation as follow:
Power Output = Power Reading + Cable loss + Attenuator
3. The worse case was recorded

# 9. Power Spectral Density Measurement

## 9.1 Test Setup




## 9.2 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density Measurement is 8dBm/3kHz.

## 9.3 Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 10 kHz.
3. Set the VBW ≥ 30 kHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
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.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be ≤ 8 dBm/3kHz.

**9.4Test Result**

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11b 11Mbps | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Frequency (MHz) | Power Spectral Density (dBm/10kHz) | Limit (dBm/3kHz) | Pass/ Fail |
|---|---|---|---|---|
| 1 | 2412 | -1.21 | 8 | Pass |
| 6 | 2437 | -1.54 | 8 | Pass |
| 11 | 2462 | -1.66 | 8 | Pass |

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11g 6Mbps | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Frequency (MHz) | Power Spectral Density (dBm/10kHz) | Limit (dBm/3kHz) | Pass/ Fail |
|---|---|---|---|---|
| 1 | 2412 | -5.48 | 8 | Pass |
| 6 | 2437 | -5.62 | 8 | Pass |
| 11 | 2462 | -5.75 | 8 | Pass |

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11n HT20 mcs0 | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

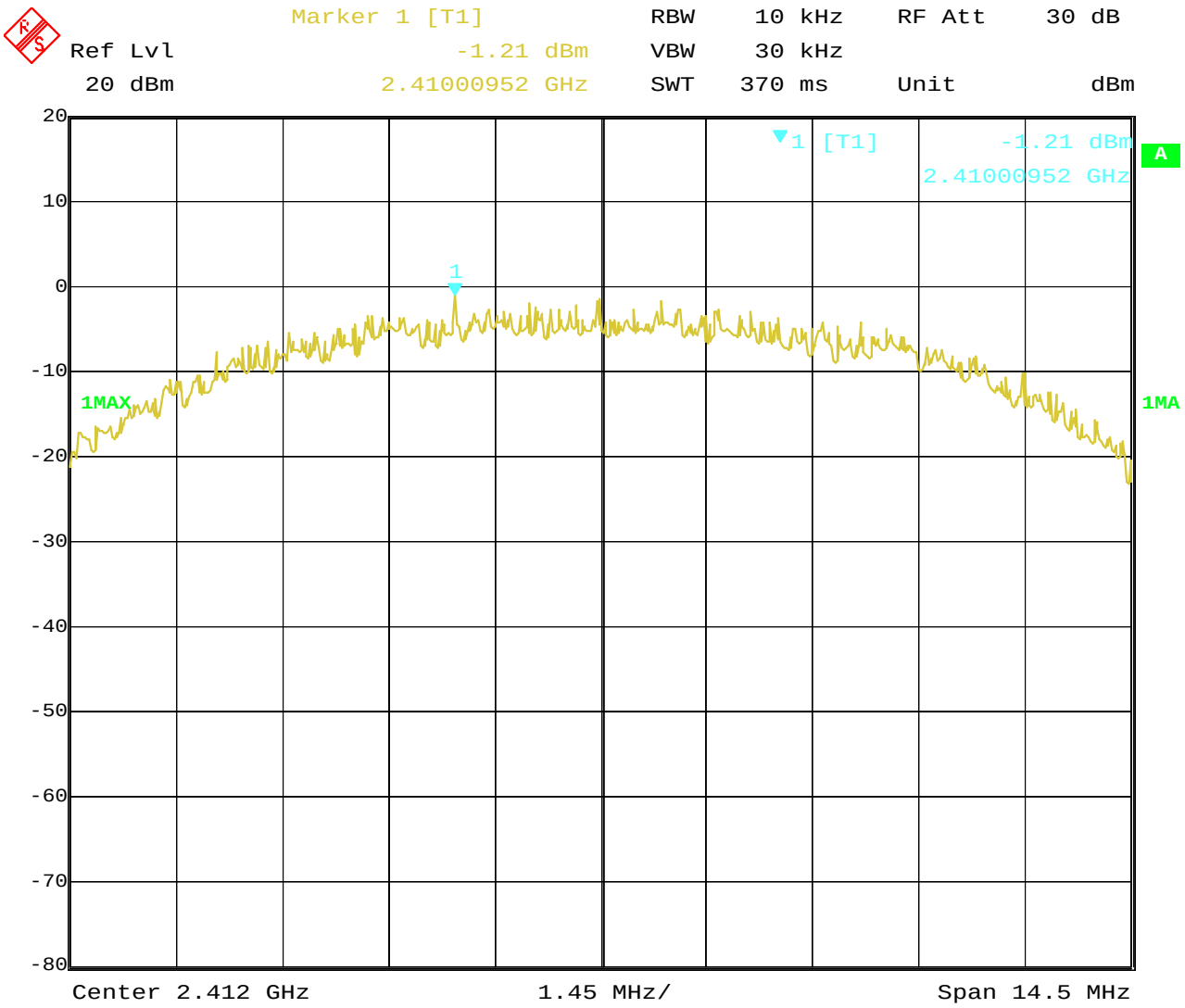
| Channel | Frequency (MHz) | Power Spectral Density (dBm/10kHz) | Limit (dBm/3kHz) | Pass/ Fail |
|---|---|---|---|---|
| 1 | 2412 | -4.97 | 8 | Pass |
| 6 | 2437 | -6.00 | 8 | Pass |
| 11 | 2462 | -5.22 | 8 | Pass |

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | 802.11n HT40 mcs0 | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |

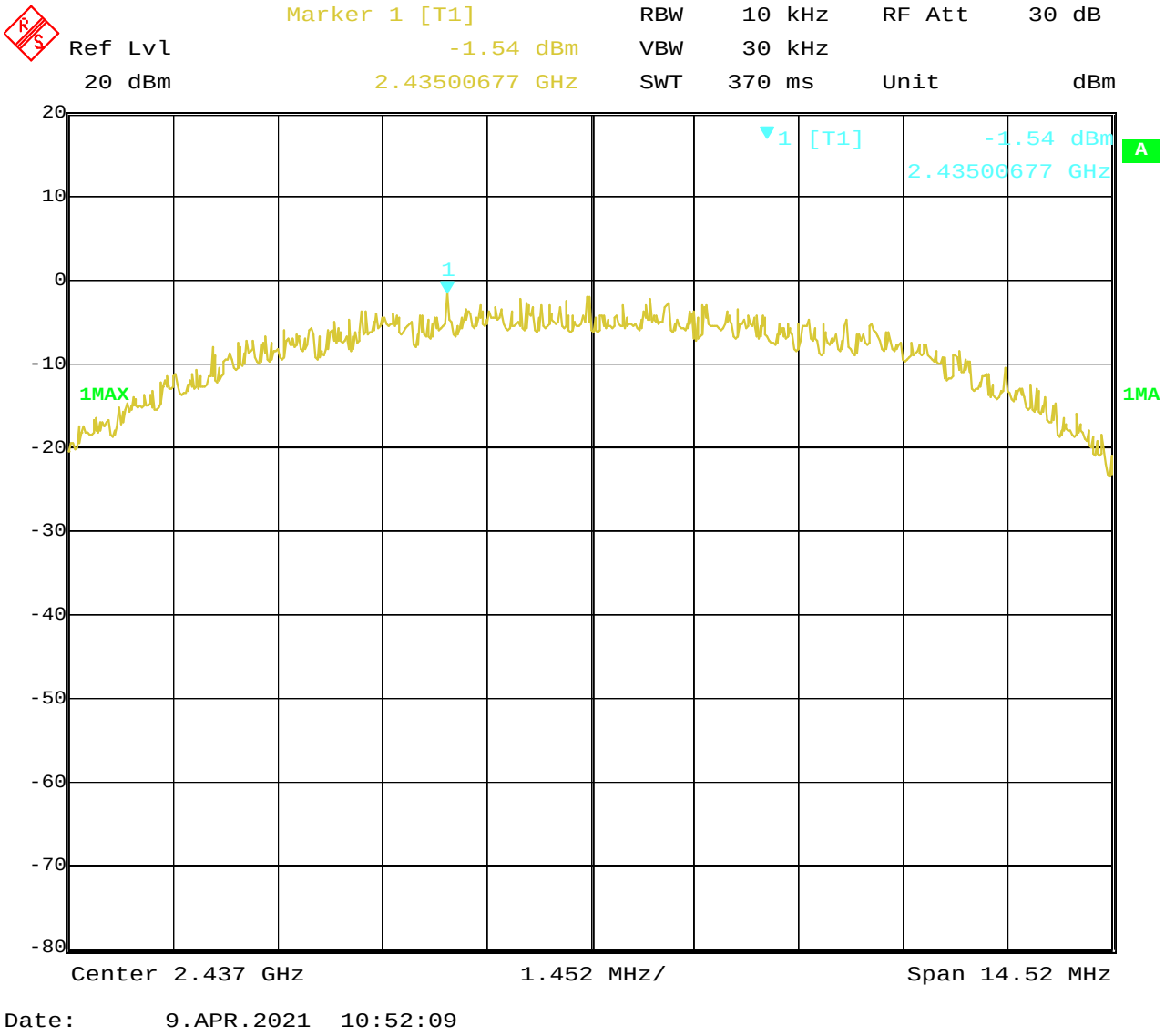
| Channel | Frequency (MHz) | Power Spectral Density (dBm/10kHz) | Limit (dBm/3kHz) | Pass/ Fail |
|---|---|---|---|---|
| 3 | 2422 | -8.89 | 8 | Pass |
| 6 | 2437 | -7.46 | 8 | Pass |
| 9 | 2452 | -8.68 | 8 | Pass |

### 9.5 Photo of Power Spectral Density Measurement

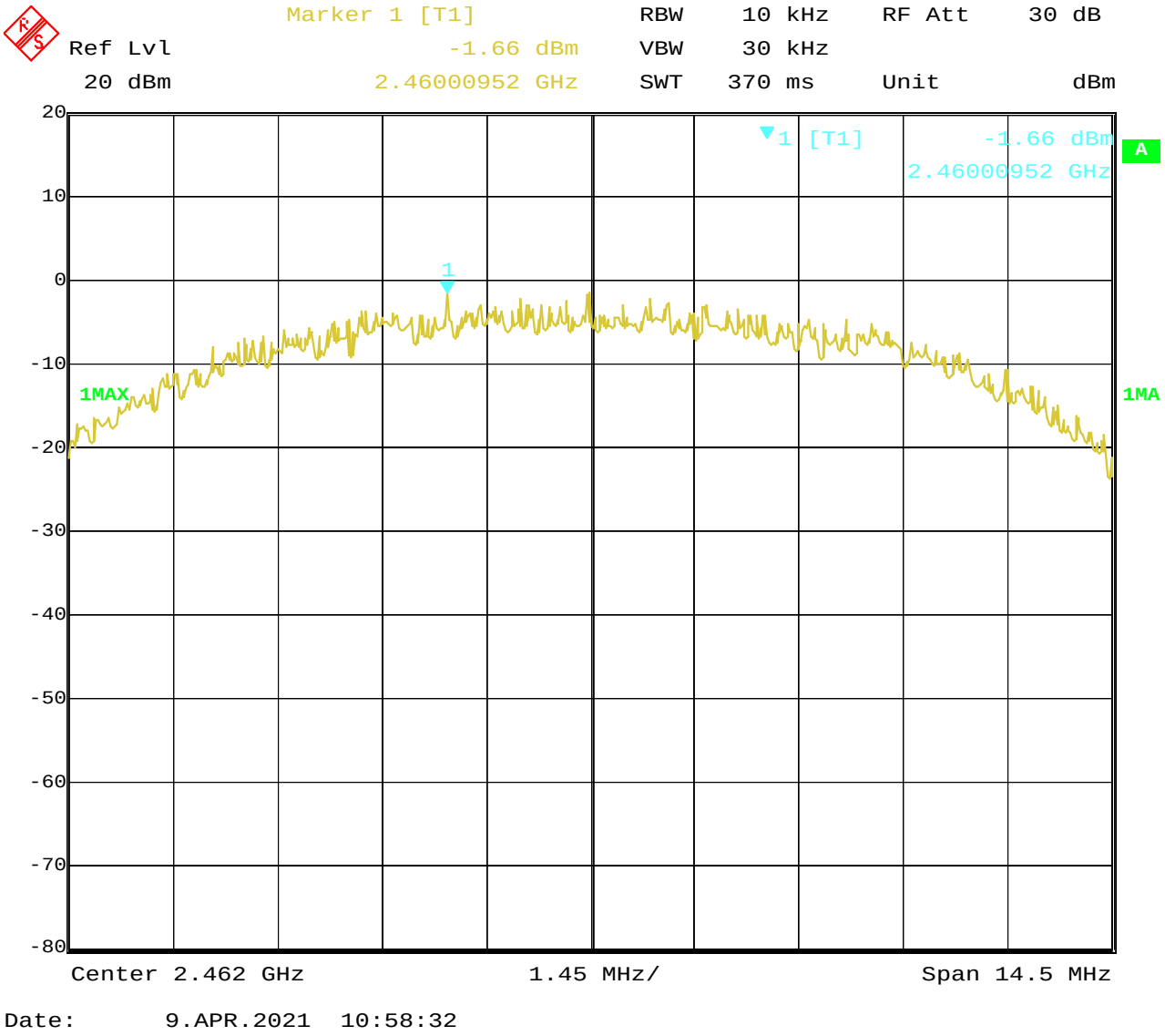
1.802.11b at 11Mbps of CH01



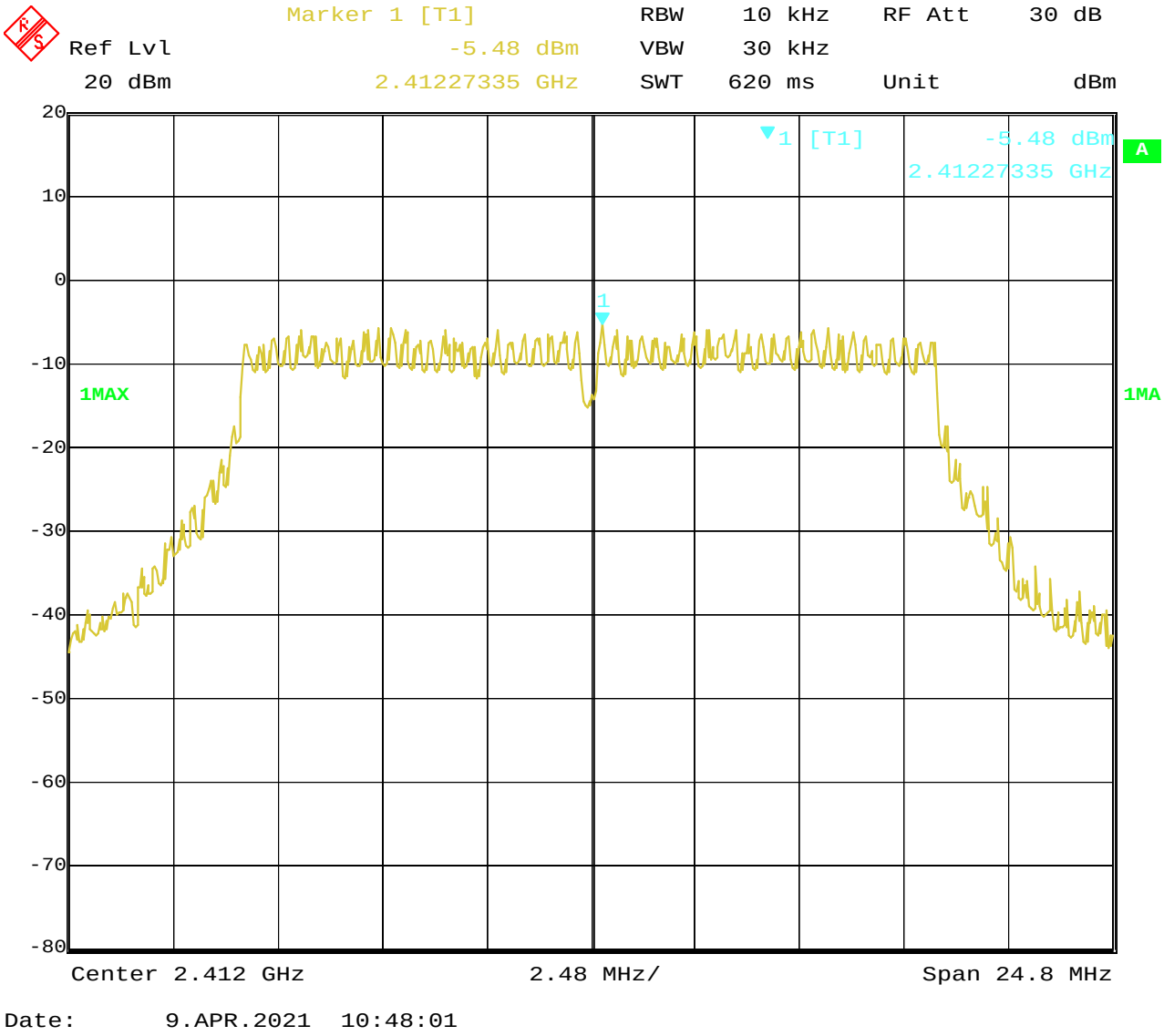
2. 802.11b at 11Mbps at CH06



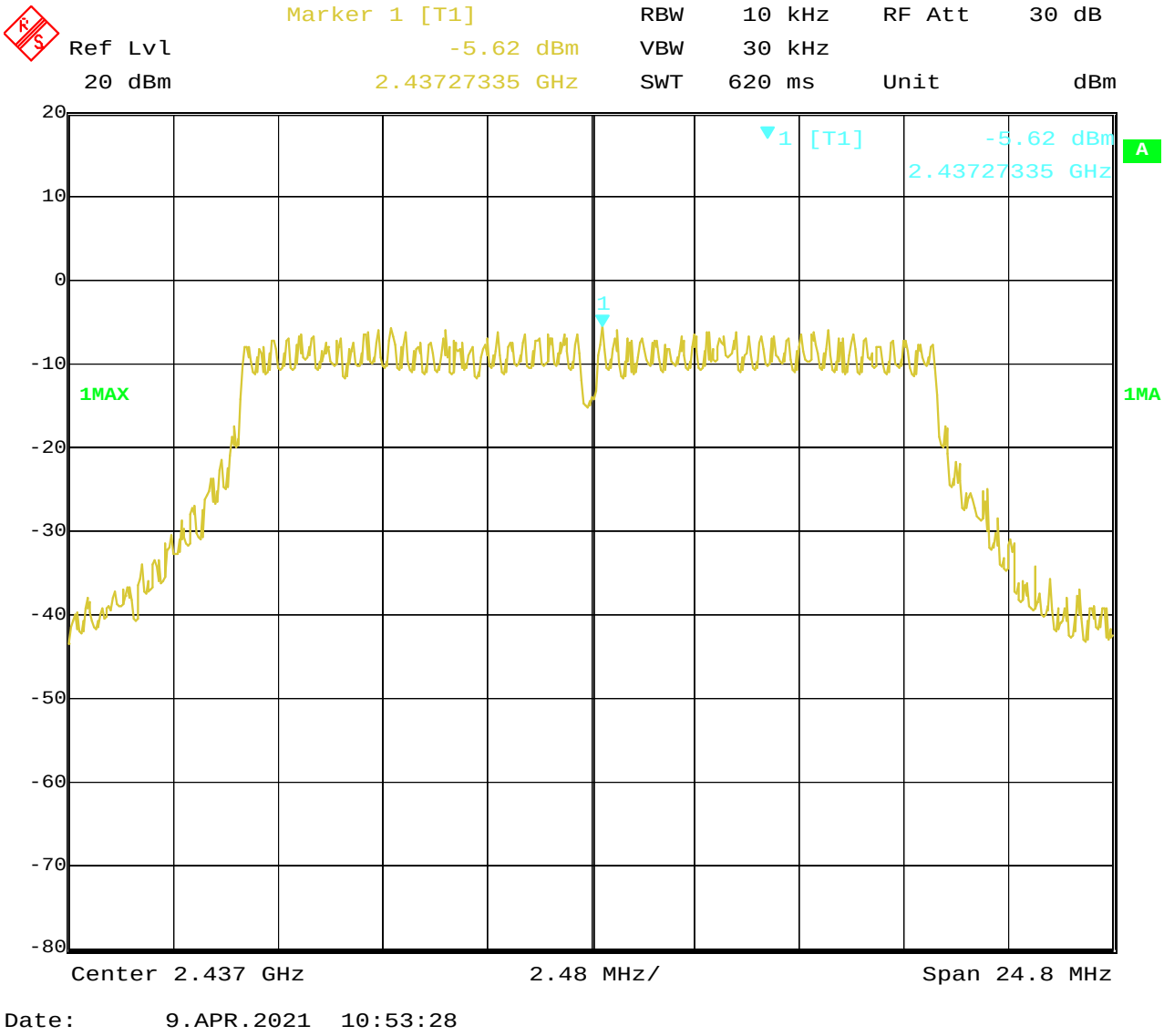
3. 802.11b at 11Mbps of CH11



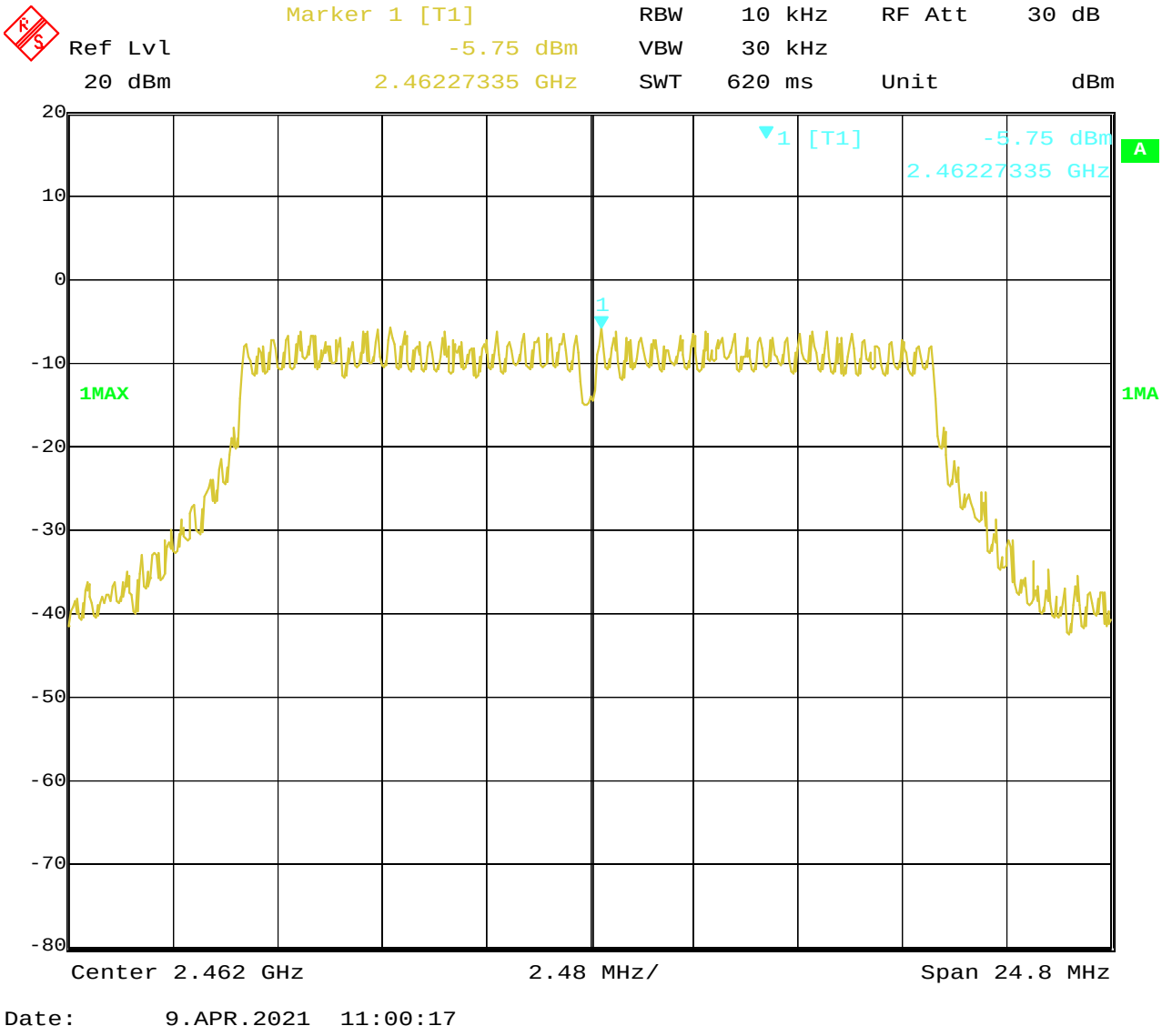
4. 802.11g at 6Mbps of CH1



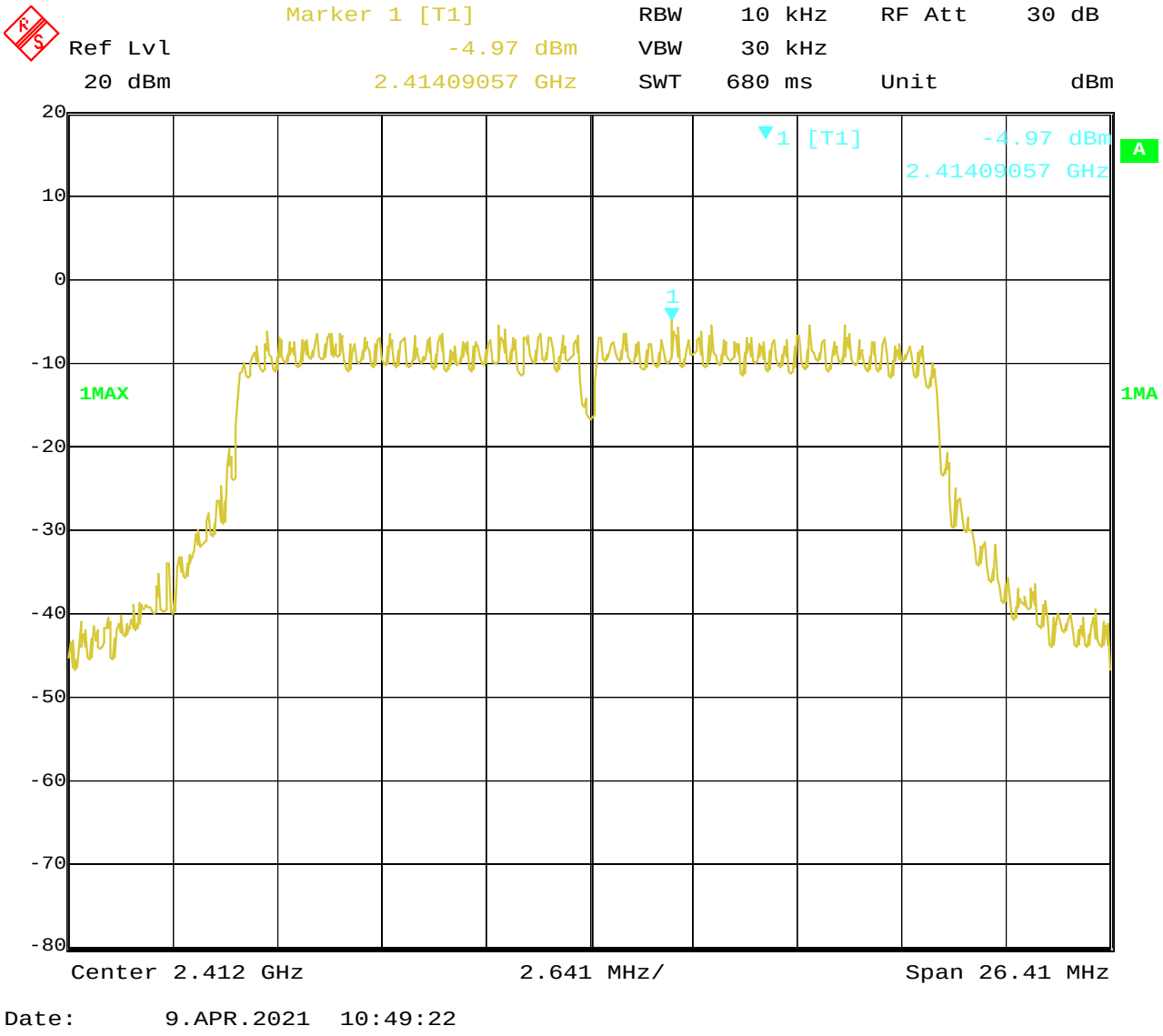
5. 802.11g at 6Mbps of CH6



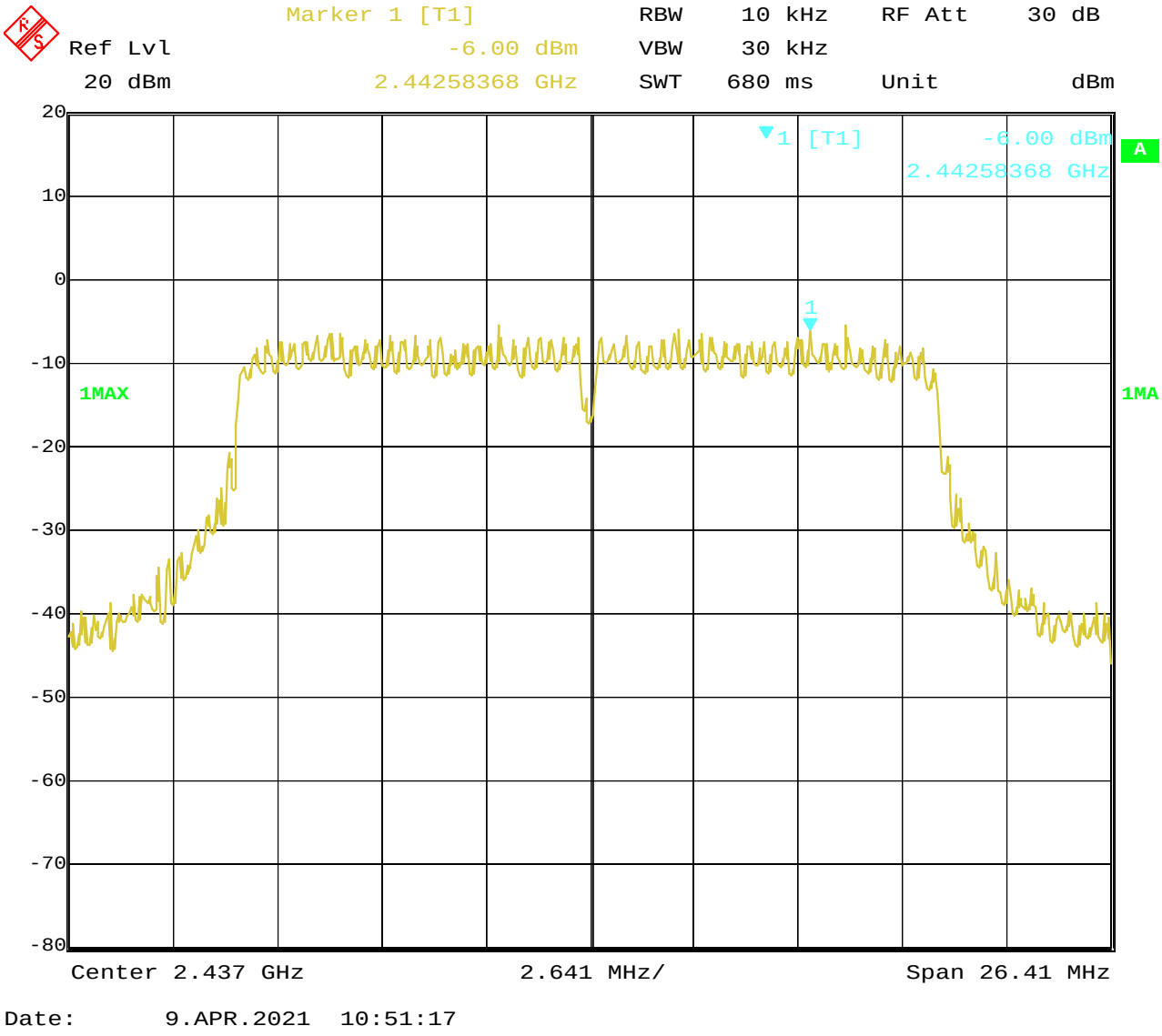
6. 802.11g at 6Mbps of CH11



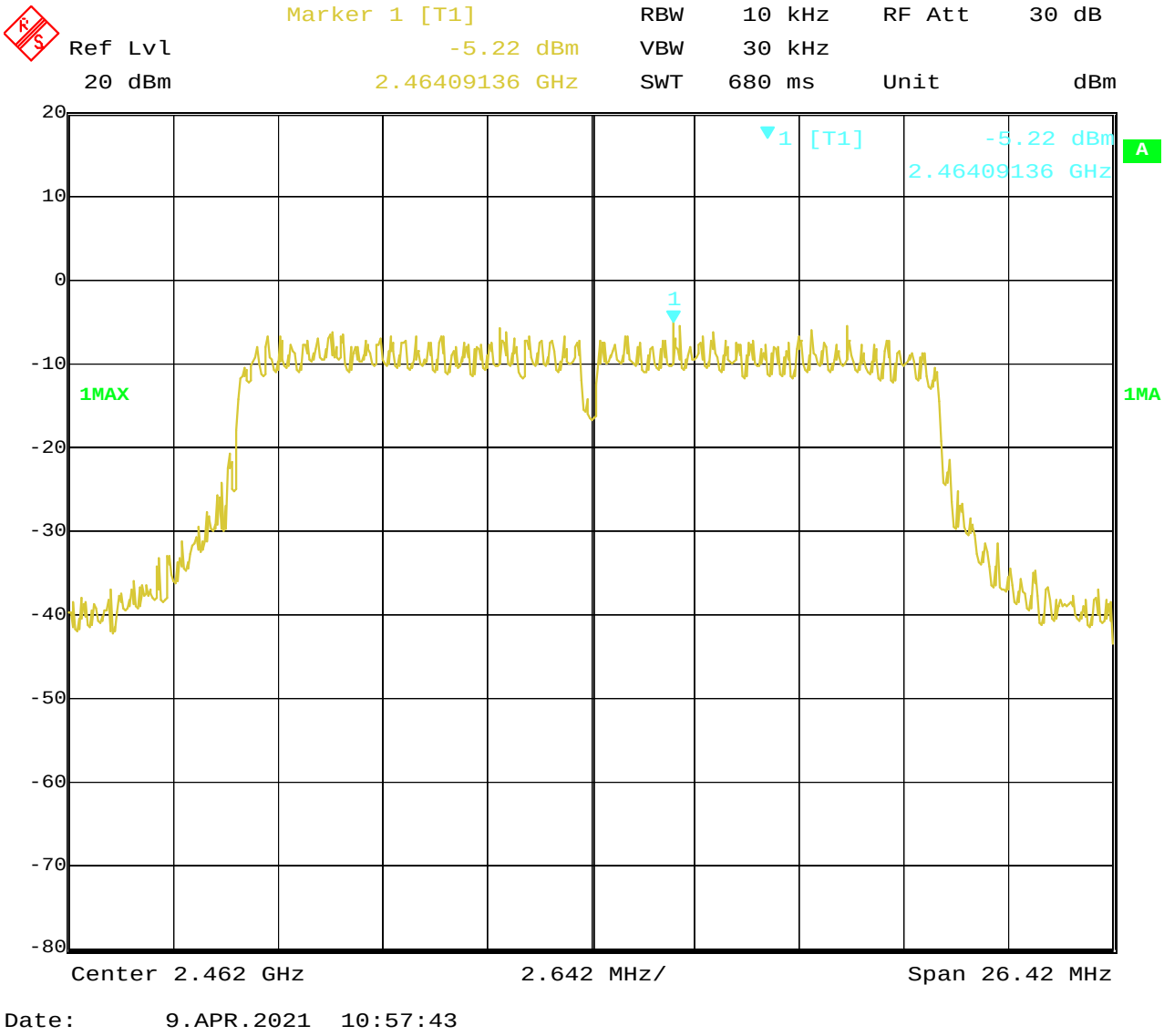
7. 802.11n at HT20 of CH01



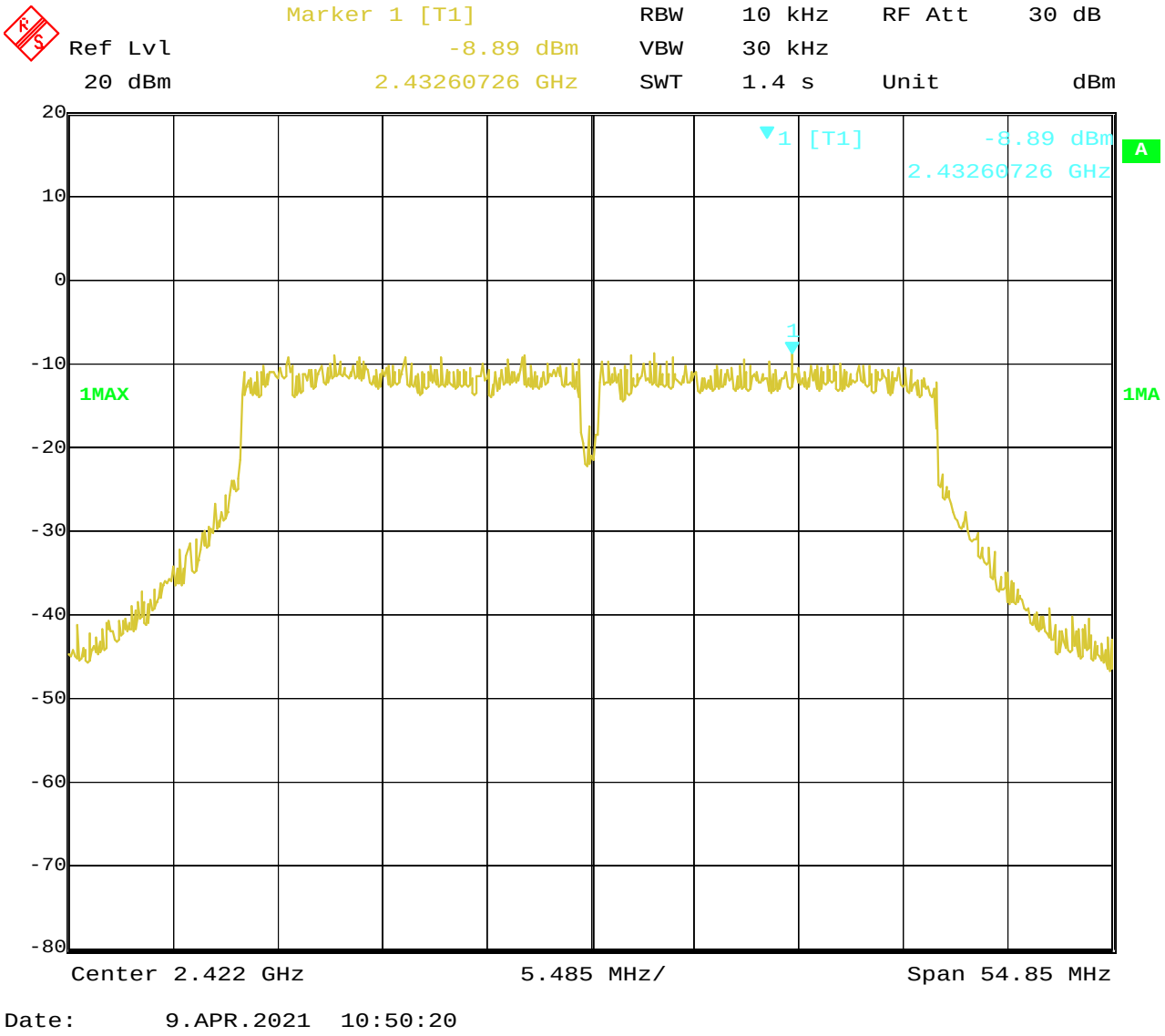
8. 802.11n at HT20 of CH06



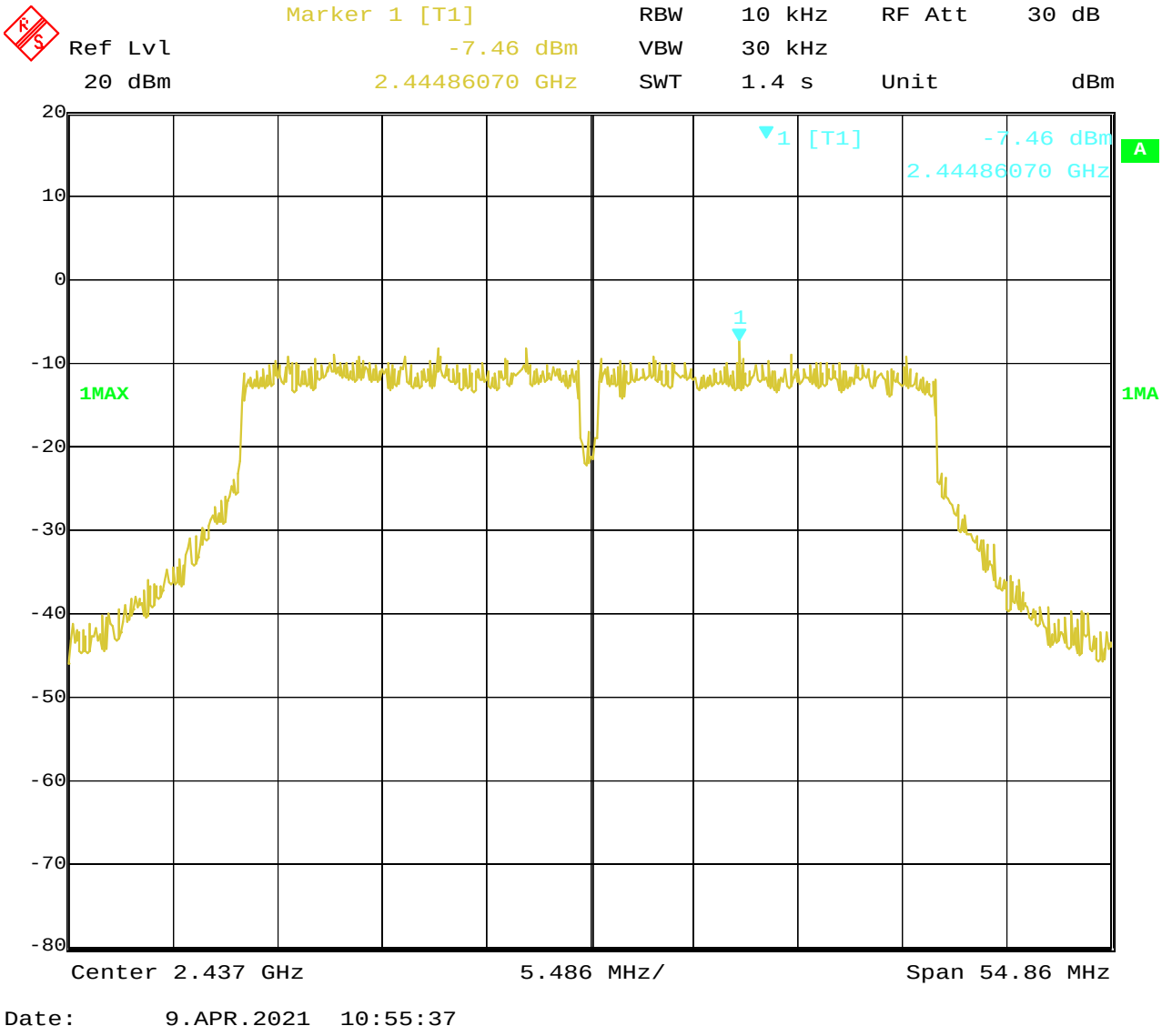
9. 802.11n at HT20 of CH11



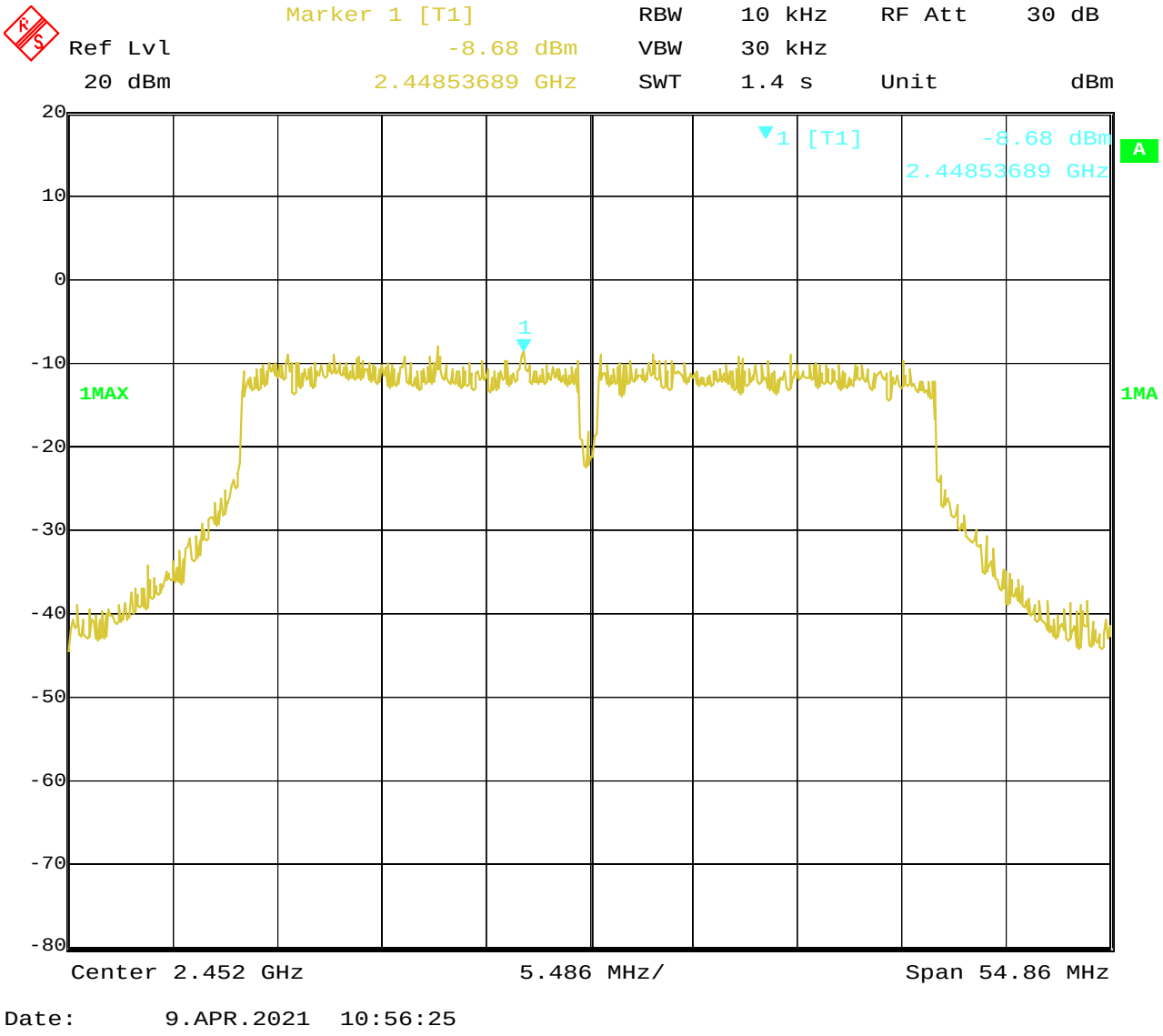
10. 802.11n at HT40 of CH03



11. 802.11n at HT40 of CH06

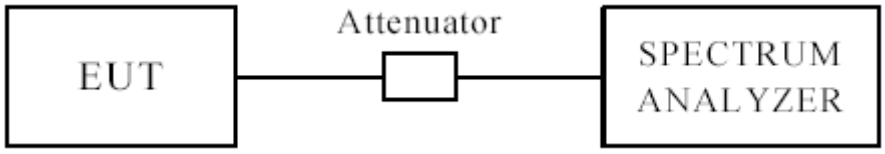


12. 802.11n at HT40 of CH09



# 10 Out of Band Measurement

## 10.1 Test Setup for band edge




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

## 10.2 Limits of Out of Band Emissions Measurement

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

## 10.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. (Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector)

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

## 10.4 Test Result

Please see next pages

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

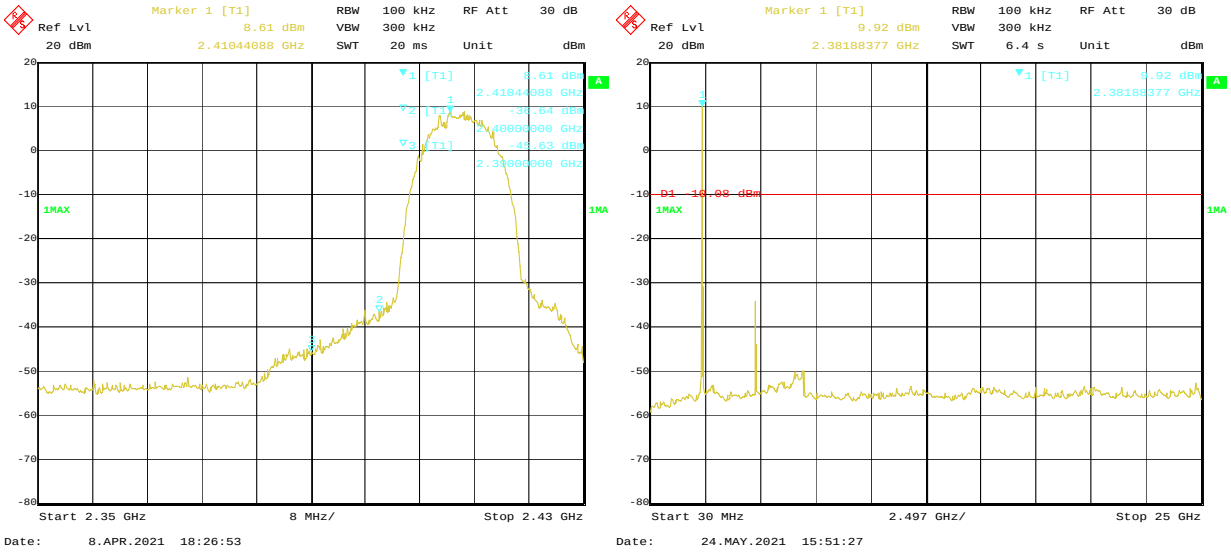
For 802.11b mode

CH01 at 11Mbps

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**

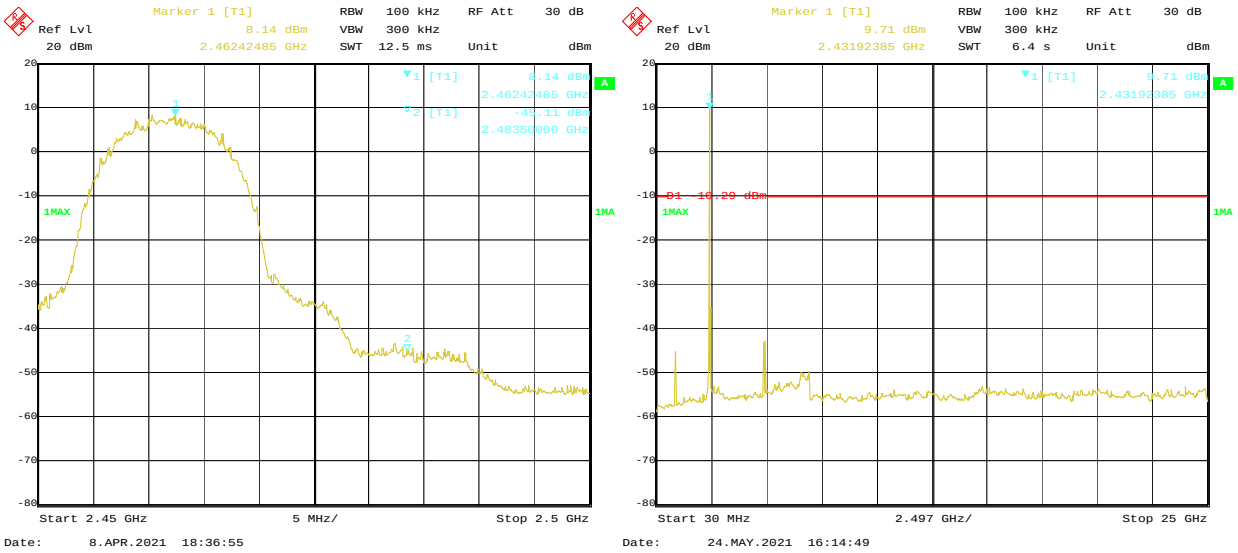


CH11 at 11Mbps

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



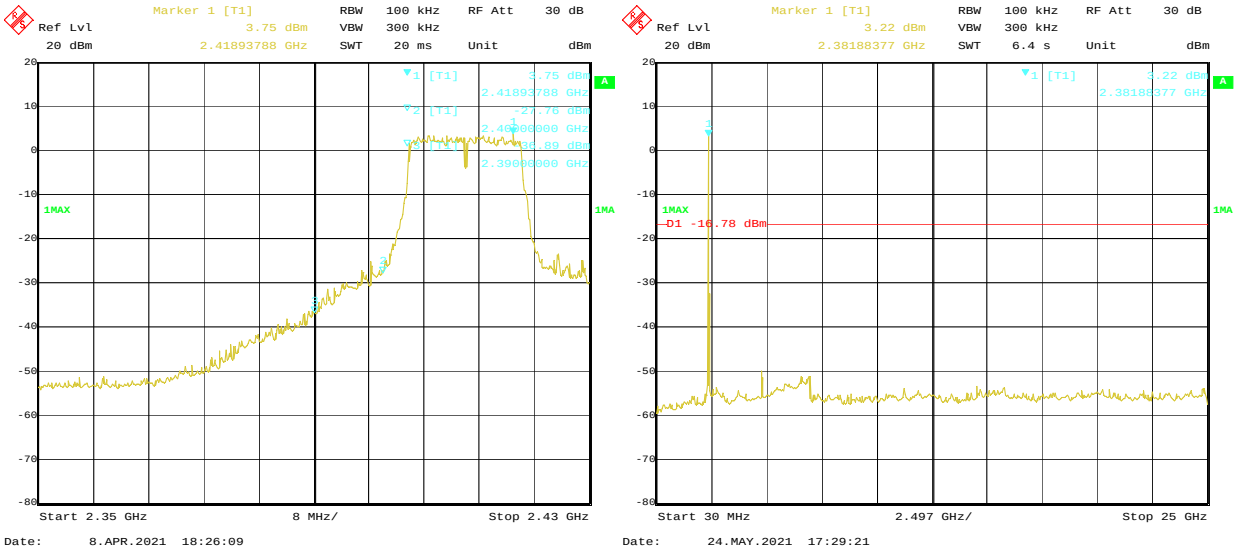
For 802.11g mode

CH01 at 6Mbps

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**

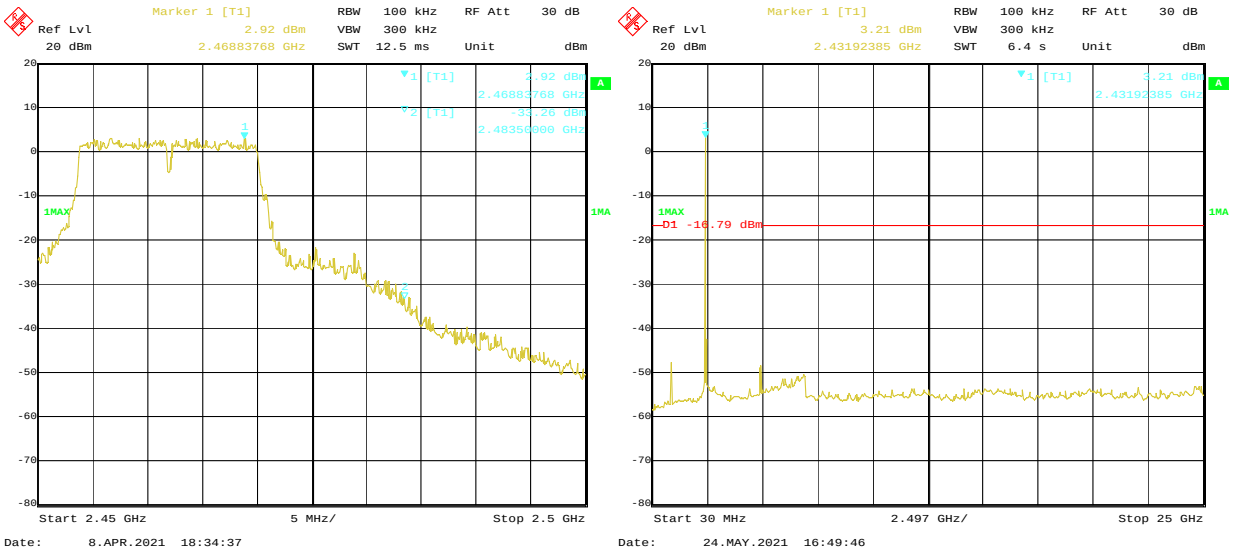


CH11 at 6Mbps

## 10.4 Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



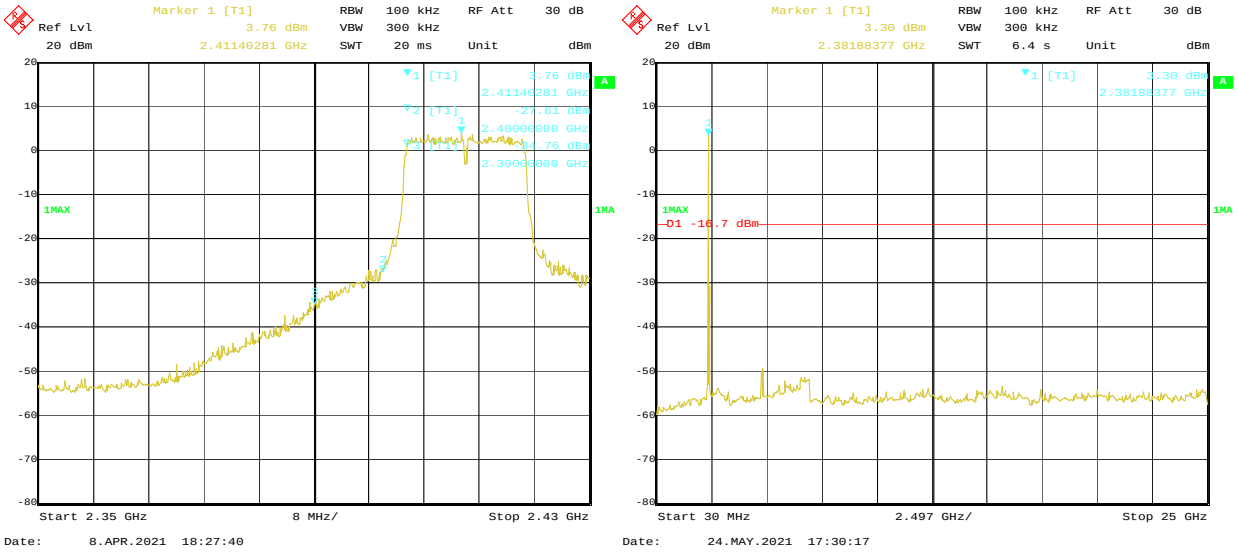
For 802.11n (HT20) mode

CH01 at mcs0

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**

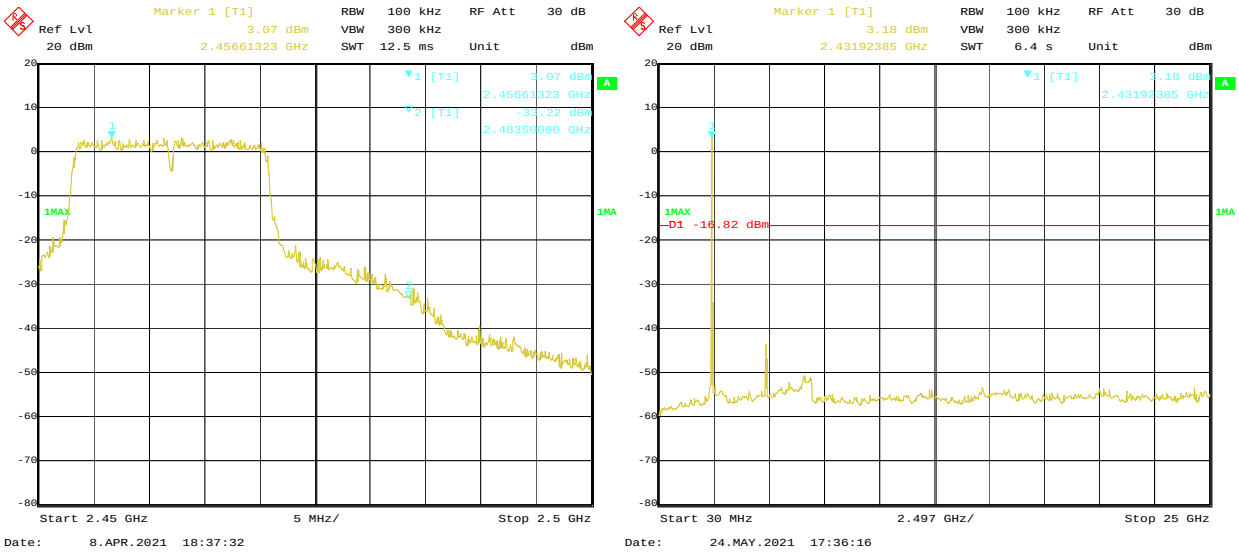


CH11 at mcs0

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



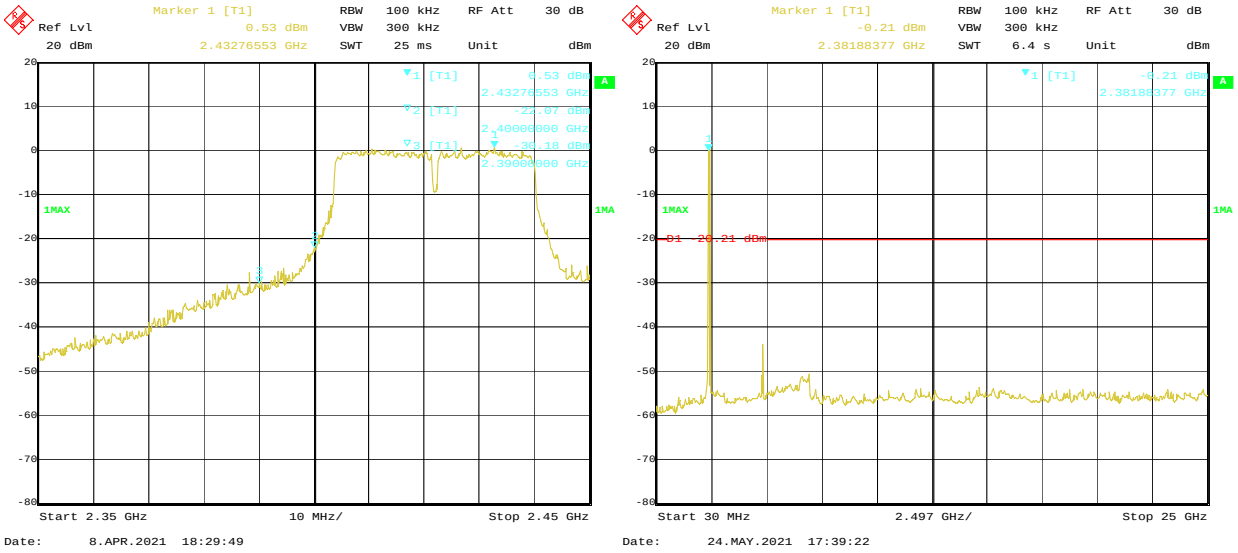
For 802.11n (HT40) mode

CH03 at msc0

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**

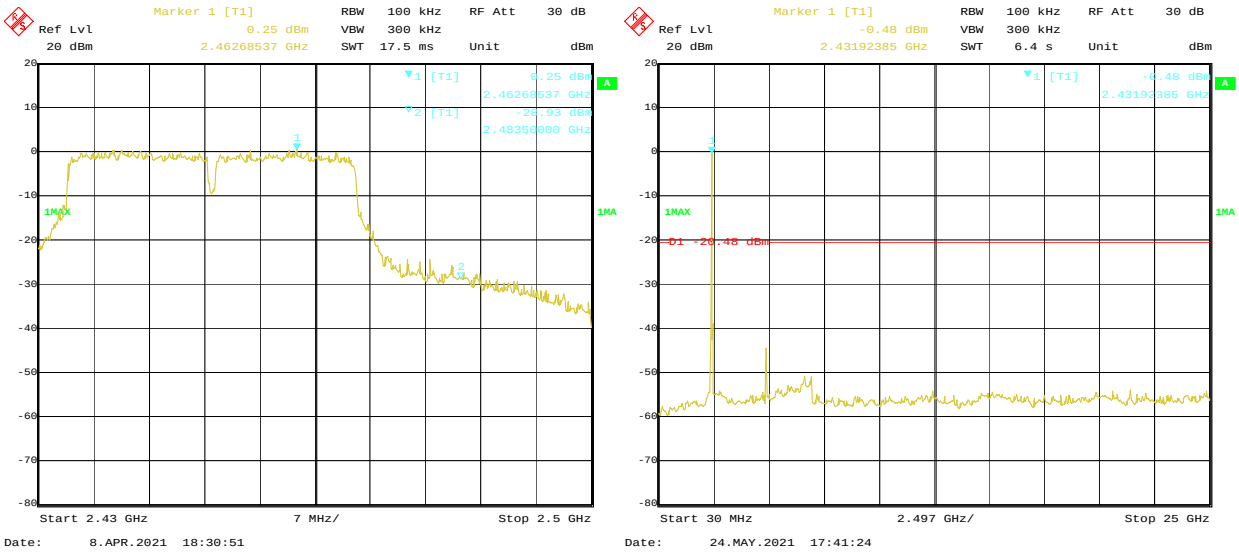


CH09 at msc0

**10.4** Band-edge Measurement

| EUT | Cutting Plotter | Model | CH16 |
|---|---|---|---|
| Mode | Keeping Transmitting | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | Humidity | 56% RH |
| Test Result: | Pass | Detector | PK |

**Test Figure:**



**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11b mode, Low Channel, Horizontal | | | | |
| 2390 | PK (dBμV/m) | 52.13 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 44.68 | | 54(dBμV/m) |
| 802.11b mode, Vertical | | | | |
| 2390 | PK (dBμV/m) | 57.90 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 41.53 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11b mode, High Channel, Horizontal | | | | |
| 2483.5 | PK (dBμV/m) | 53.39 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 36.75 | | 54(dBμV/m) |
| 802.11b mode, High Channel, Vertical | | | | |
| 2483.5 | PK (dBμV/m) | 60.16 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 44.27 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11g mode, Low Channel, Horizontal | | | | |
| 2390 | PK (dBμV/m) | 55.80 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 39.08 | | 54(dBμV/m) |
| 802.11g mode, Vertical | | | | |
| 2390 | PK (dBμV/m) | 61.19 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 44.36 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11g mode, High Channel, Horizontal | | | | |
| 2483.5 | PK (dBμV/m) | 57.71 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 41.06 | | 54(dBμV/m) |
| 802.11g mode, High Channel, Vertical | | | | |
| 2483.5 | PK (dBμV/m) | 64.35 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 47.13 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11n HT20 mode, Low Channel, Horizontal | | | | |
| 2390 | PK (dBμV/m) | 56.76 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 39.93 | | 54(dBμV/m) |
| 802.11n HT20 mode, Low Channel, Vertical | | | | |
| 2390 | PK (dBμV/m) | 62.41 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 46.05 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11n HT20 mode, High Channel, Horizontal | | | | |
| 2483.5 | PK (dBμV/m) | 58.77 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 42.32 | | 54(dBμV/m) |
| 802.11n HT20 mode, High Channel, Vertical | | | | |
| 2483.5 | PK (dBμV/m) | 65.29 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 48.18 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11n HT40 mode, Low Channel, Horizontal | | | | |
| 2390 | PK (dBμV/m) | 59.92 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 43.57 | | 54(dBμV/m) |
| 802.11n HT20 mode, Low Channel, Vertical | | | | |
| 2390 | PK (dBμV/m) | 66.48 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 50.67 | | 54(dBμV/m) |

**10.5** Restricted band Measurement

| EUT | Cutting Plotter | | Model | CH16 |
|---|---|---|---|---|
| Mode | Keeping Transmitting | | Input Voltage | 120V~ |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| 802.11n HT40 mode, High Channel, Horizontal | | | | |
| 2483.5 | PK (dBμV/m) | 61.04 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 44.60 | | 54(dBμV/m) |
| 802.11n HT20 mode, High Channel, Vertical | | | | |
| 2483.5 | PK (dBμV/m) | 68.25 | Limit | 74(dBμV/m) |
| | AV (dBμV/m) | 51.66 | | 54(dBμV/m) |

# 11.0 Antenna Requirement

## 11.1 Standard Applicable

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

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

## 11.2 Antenna Connected construction

PCB antenna used. The gain of each antenna is 2.0dBi.

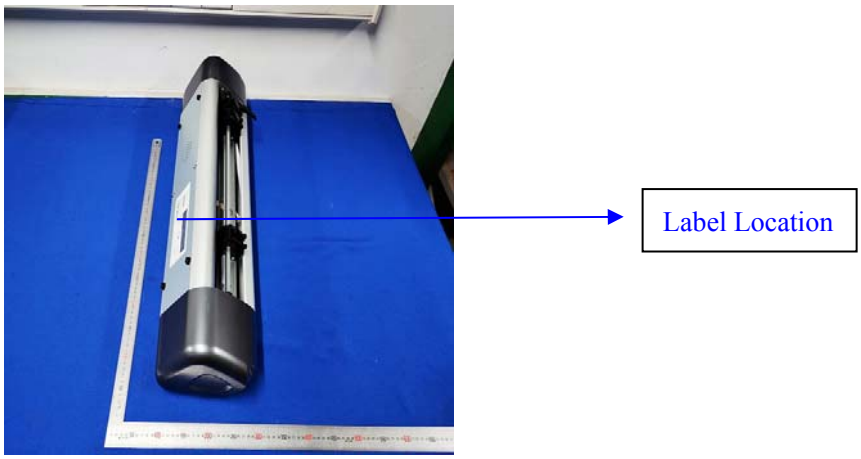
## 12.0 FCC ID Label

**FCC ID: 2AVGR-CH10**

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

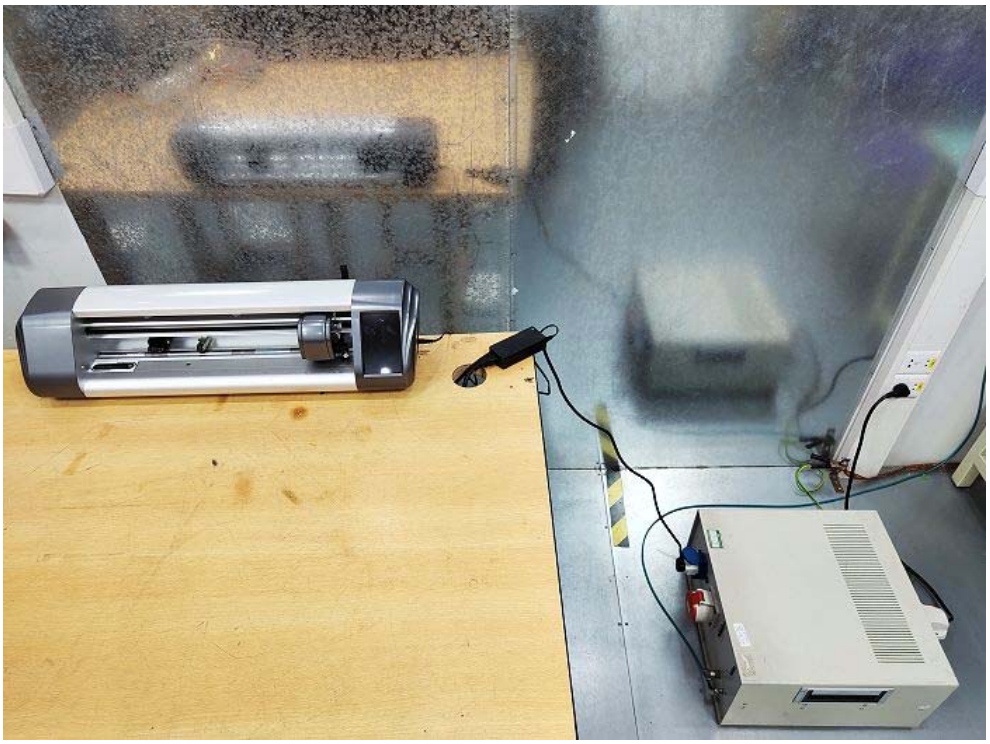
The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

**Mark Location:**

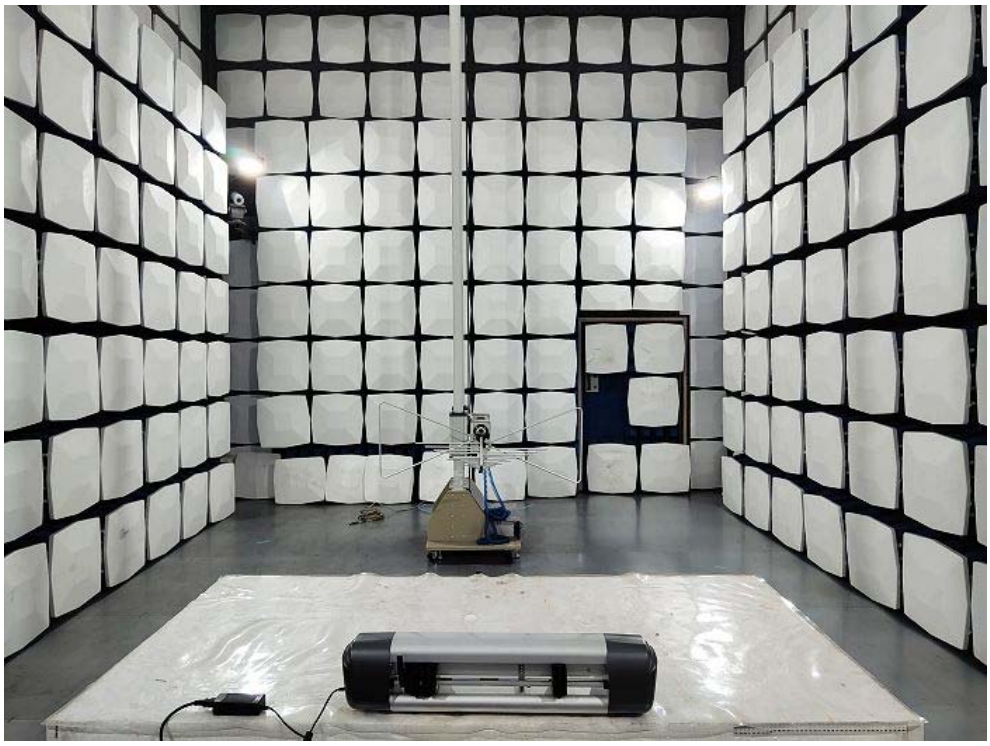


## 13.0 Photo of testing

Conducted Emission Test Setup:



Radiated Emission Test Setup:



## Photographs – EUT

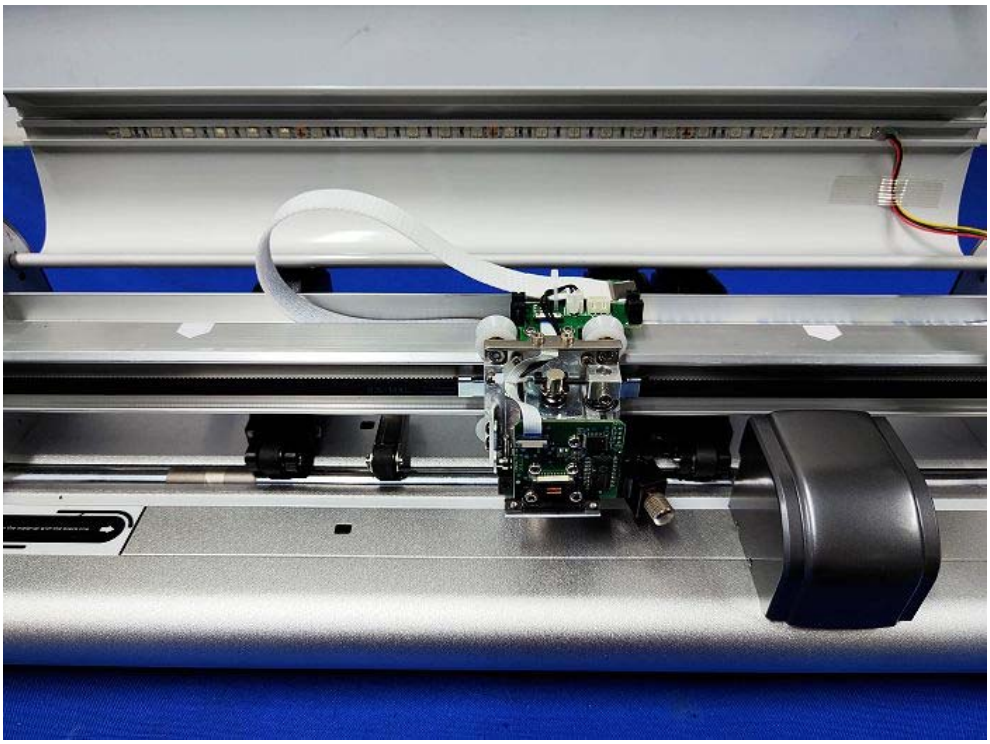
Outside View

Outside View

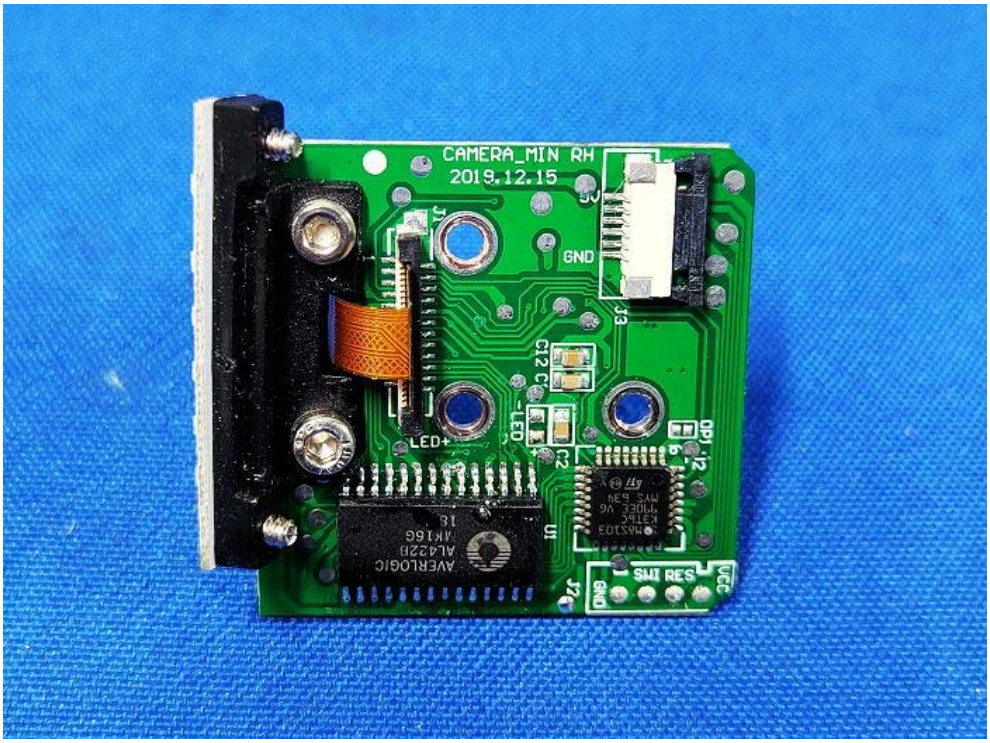
Outside View

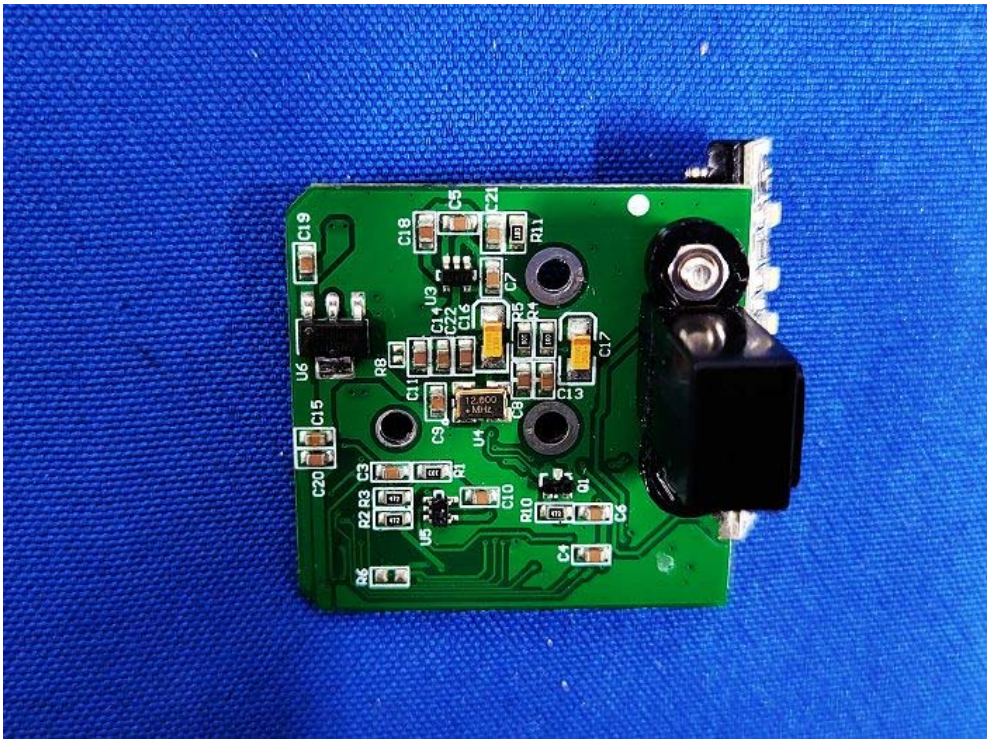
Outside View


Inside view

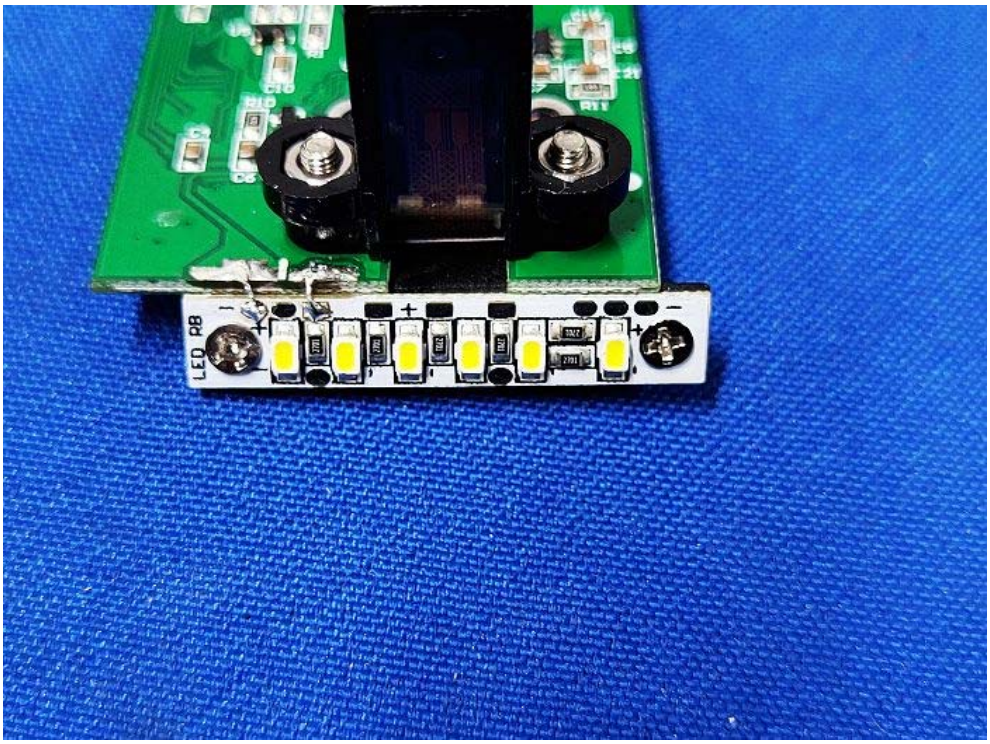


Inside view

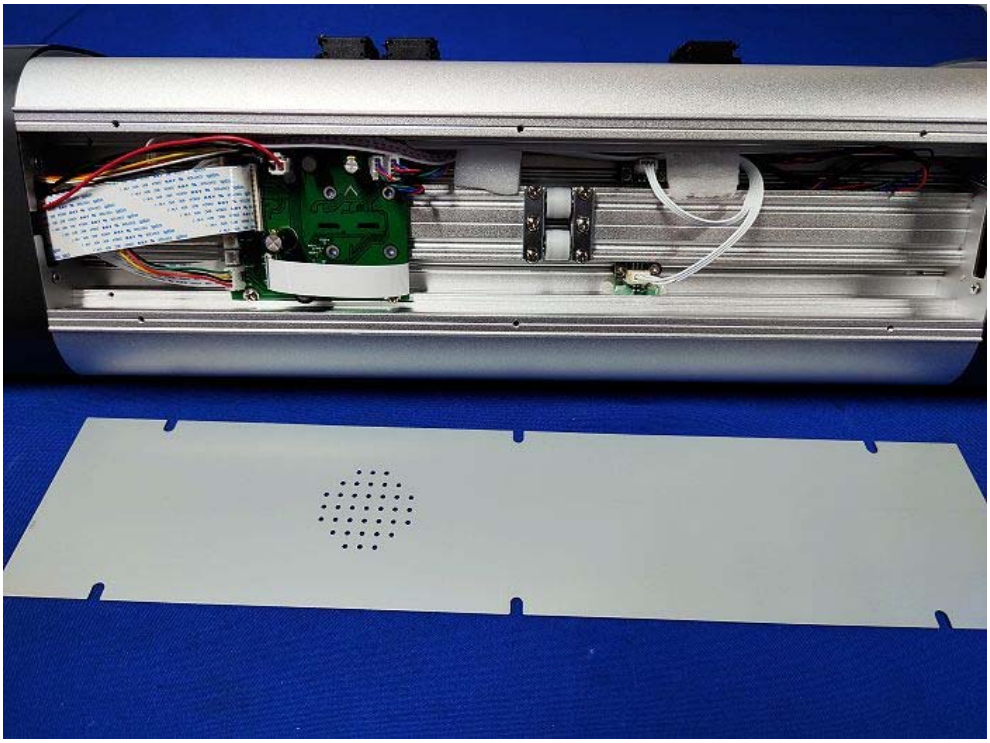


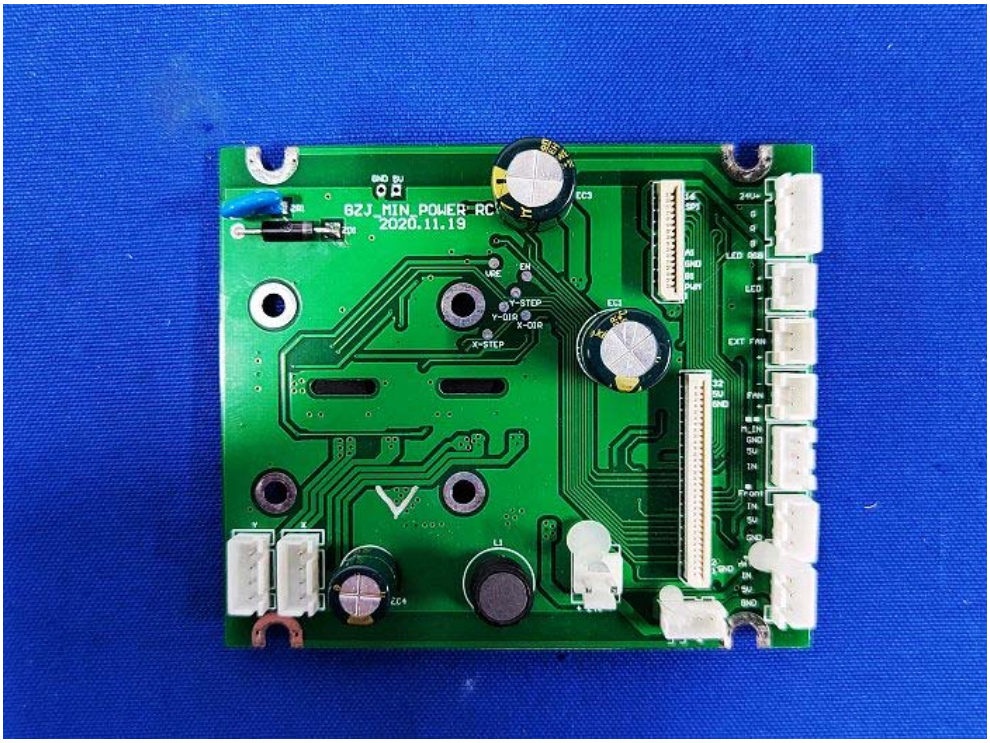



Inside view

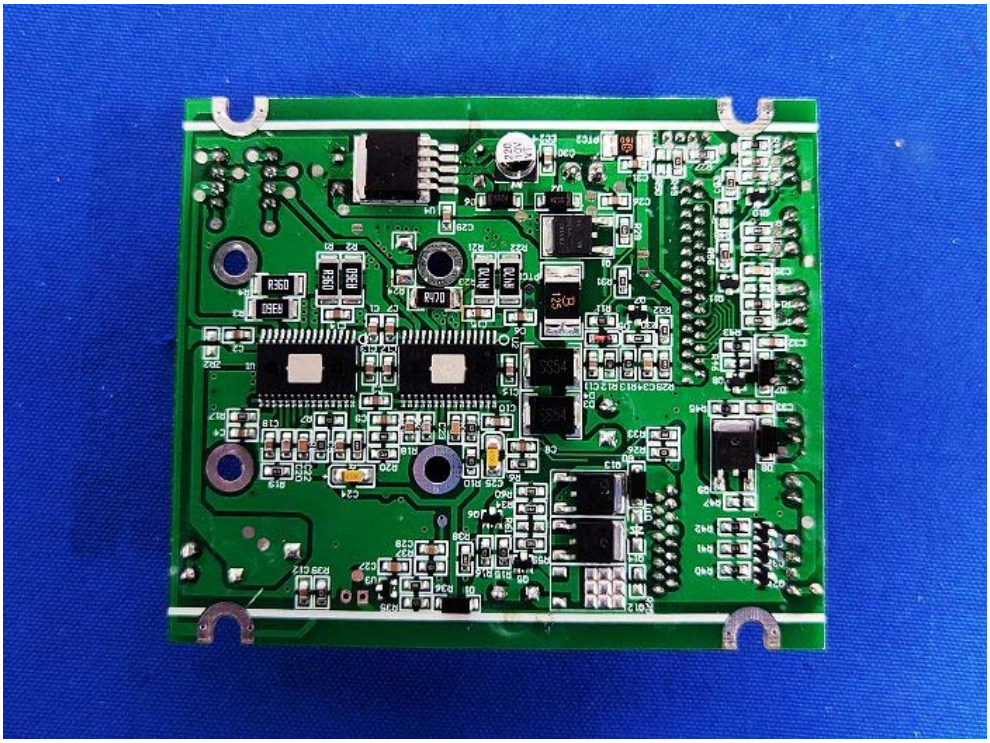


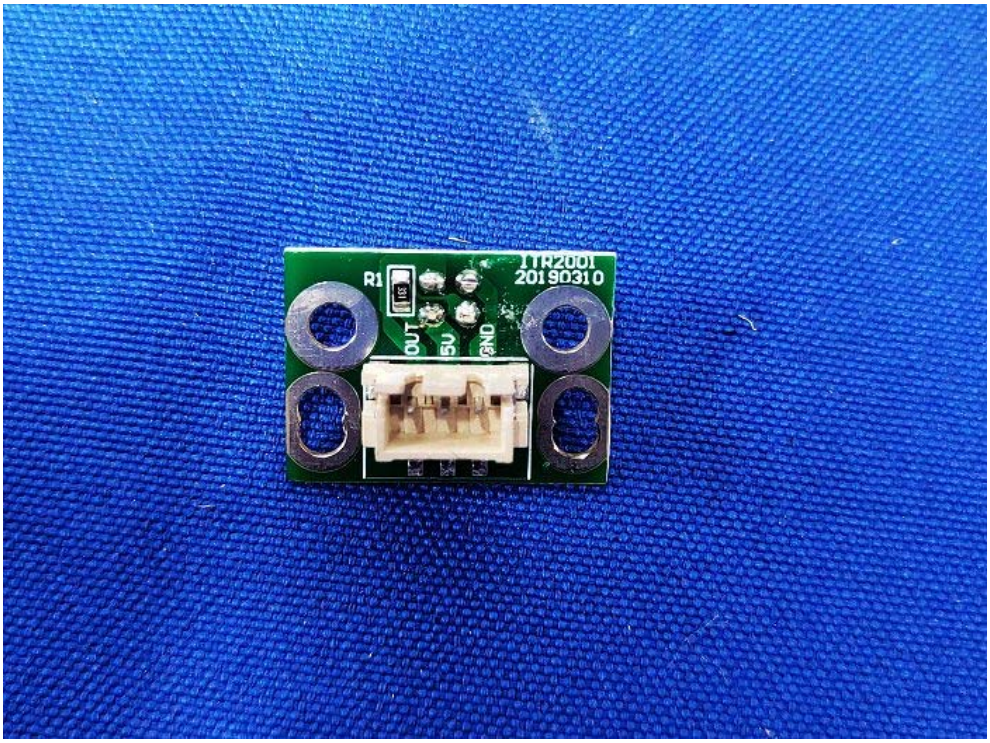

Inside view



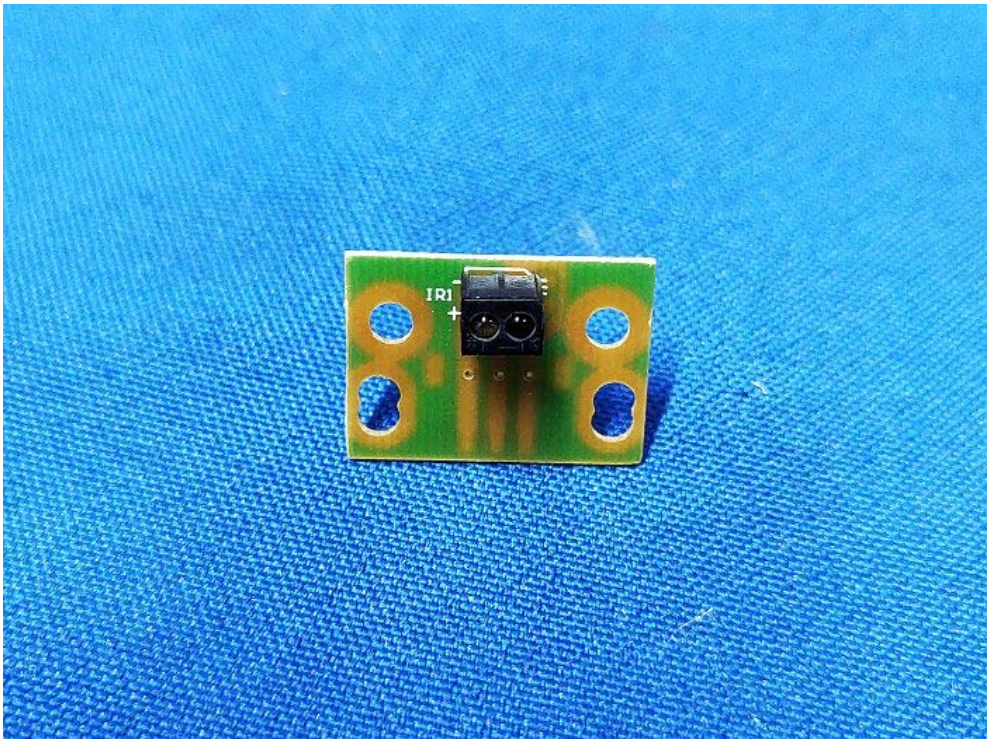


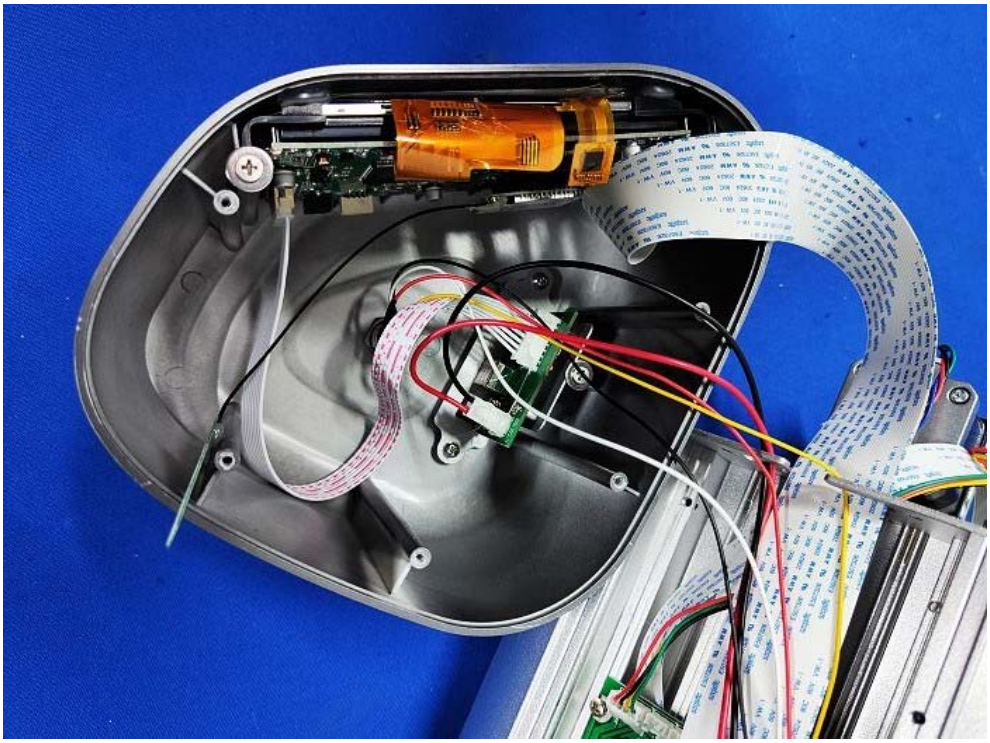
Inside view



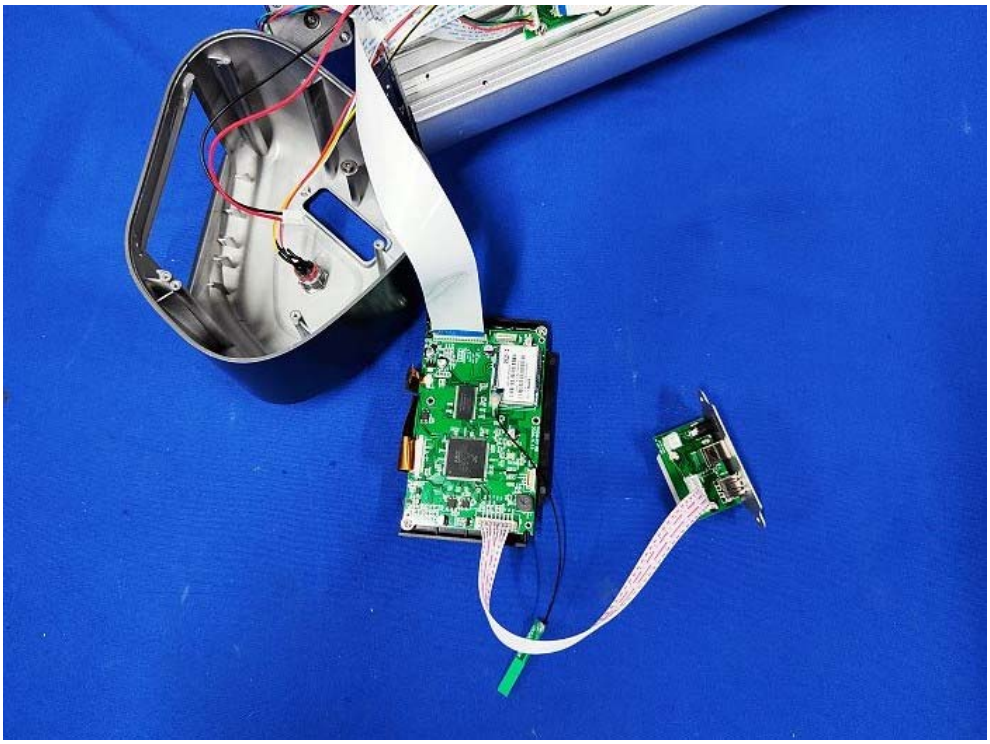


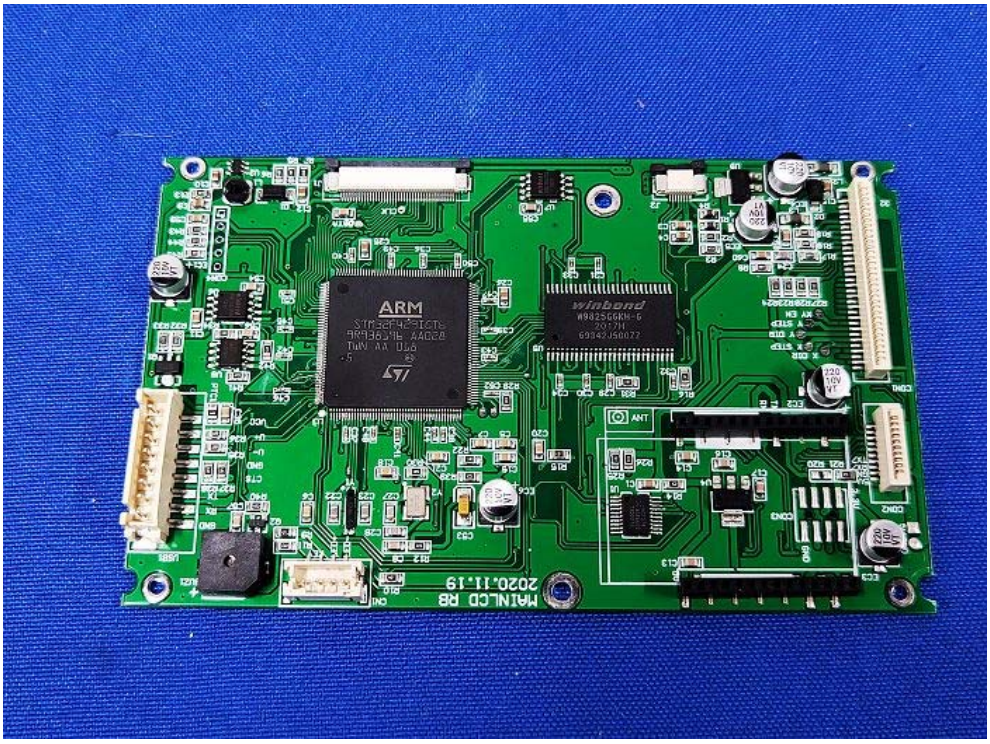
Inside view



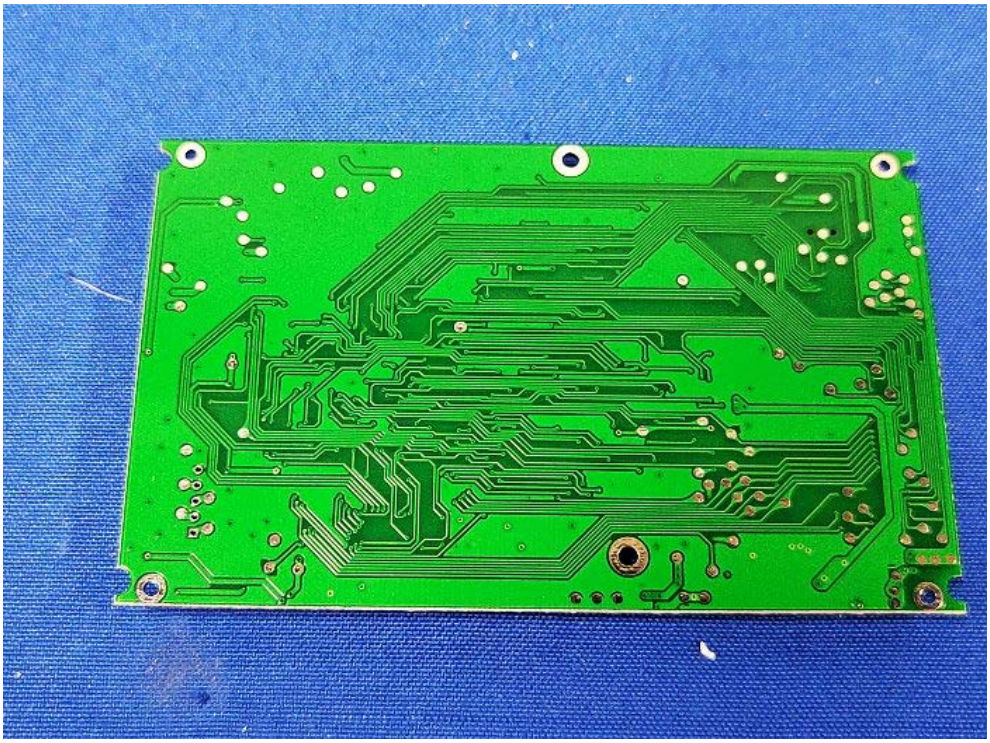



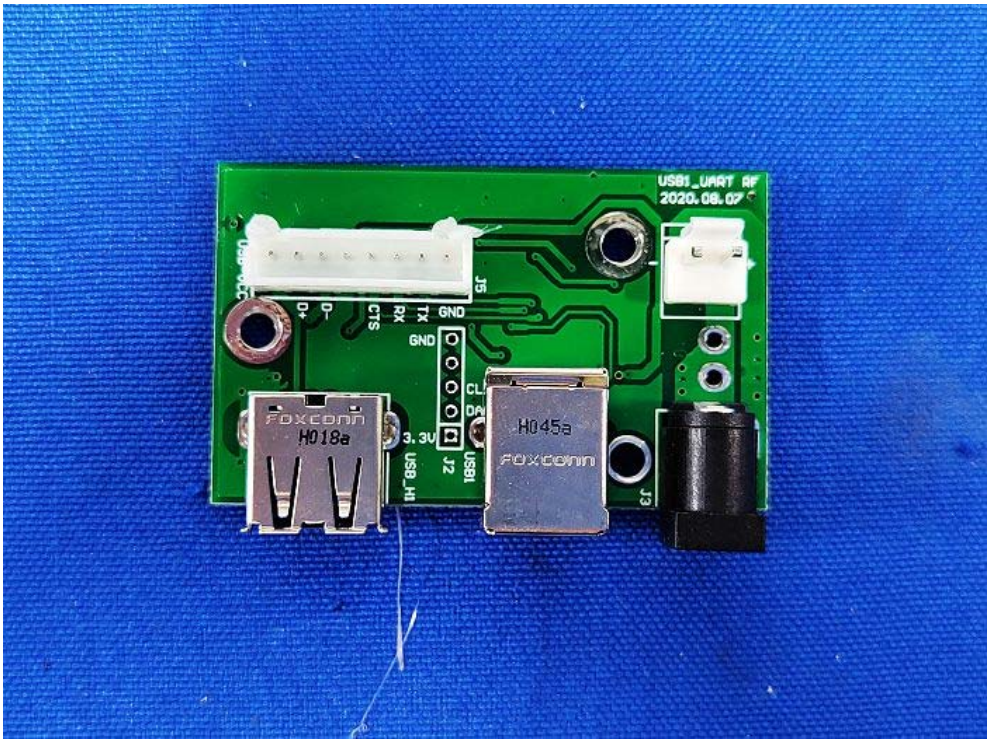
Inside view



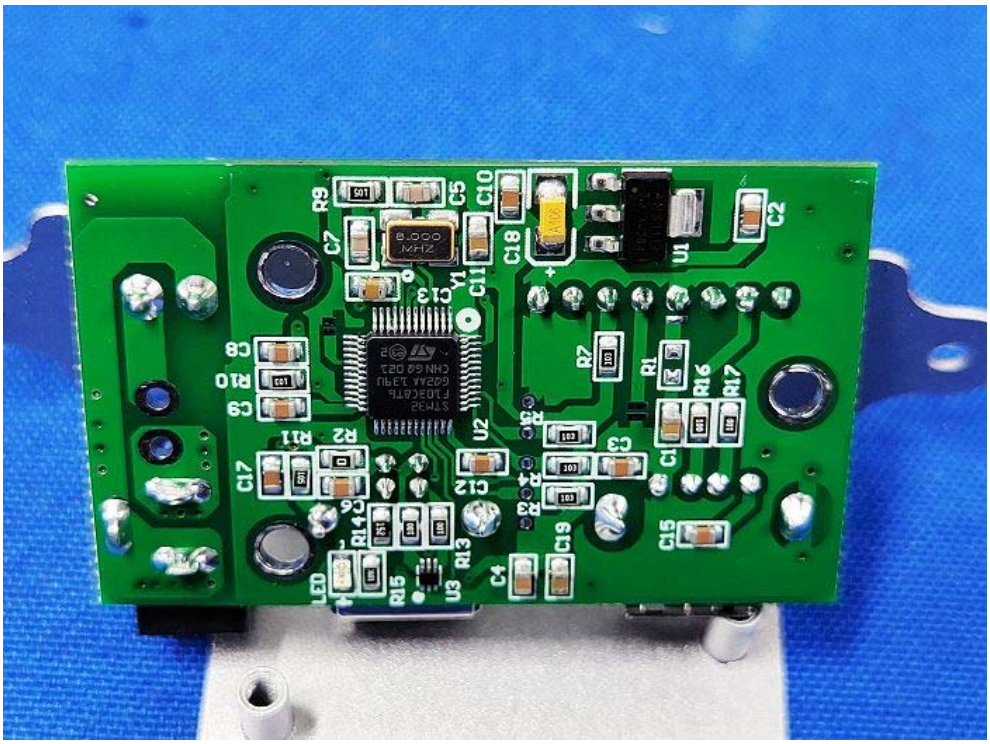


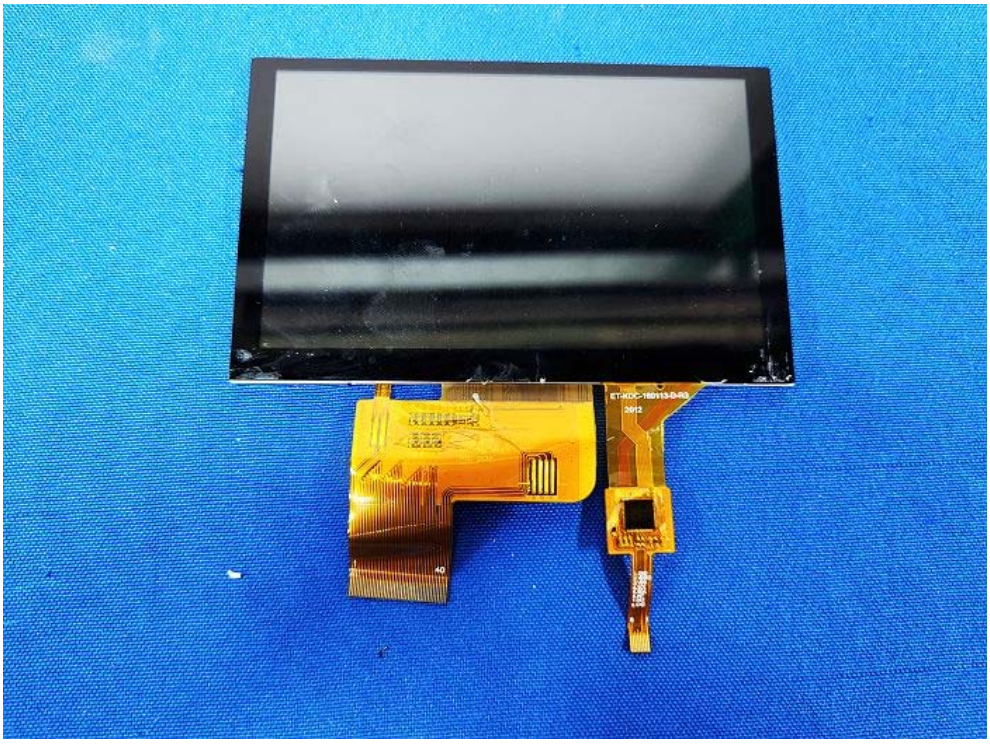
Inside view



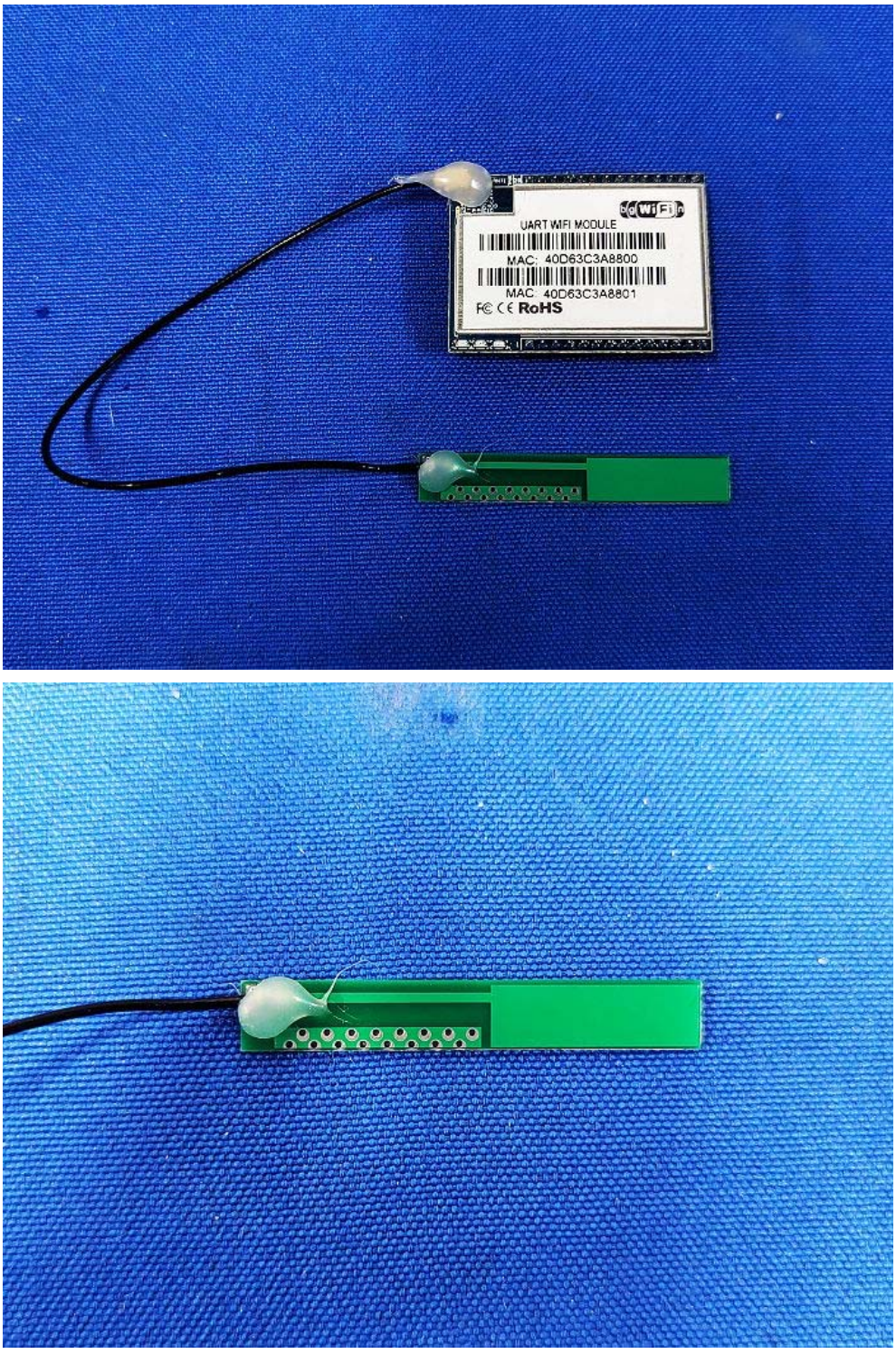


Inside view

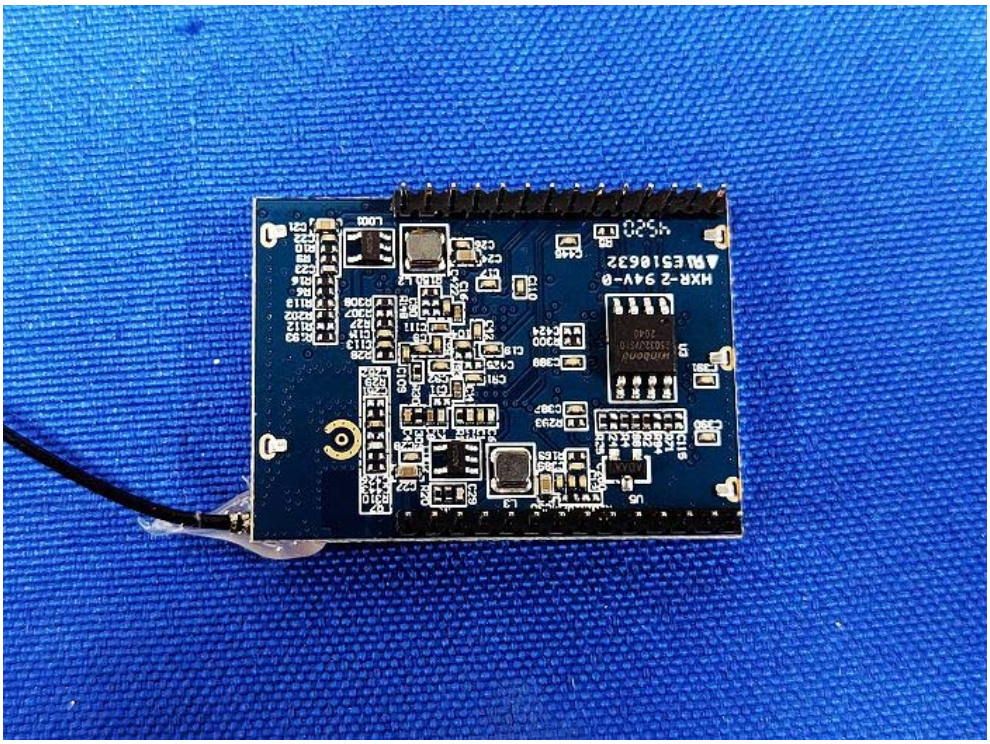


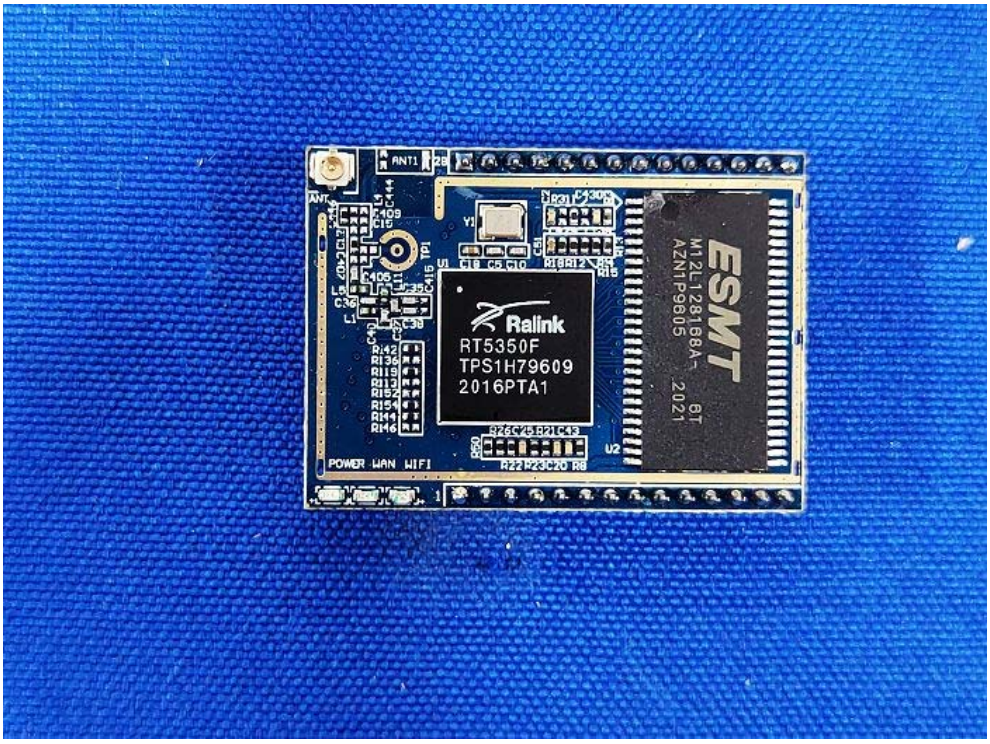



Inside view

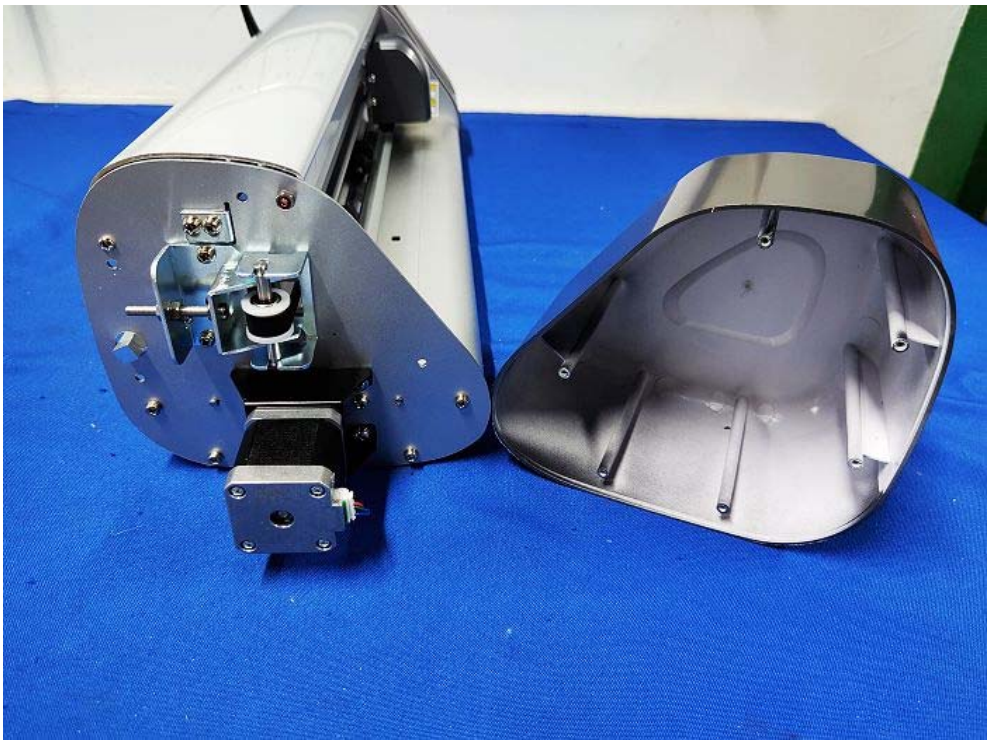


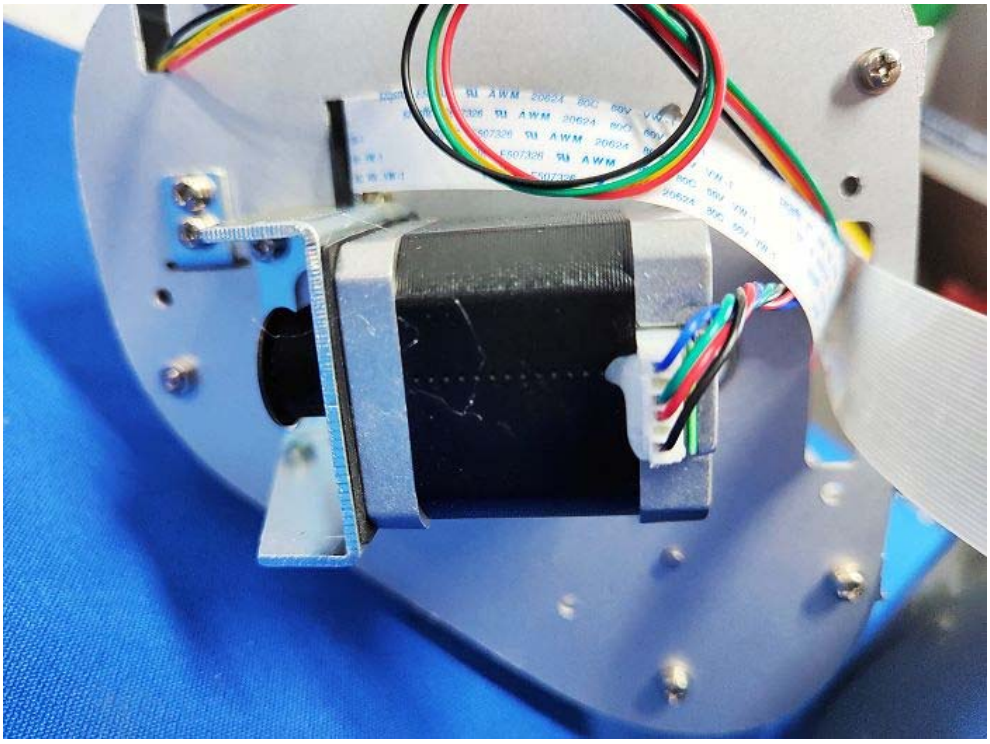
Inside view





Inside view





**End of the report**