



■Report No.: DDT-R21091301-1E03

■Issued Date: Oct. 20, 2021

# FCC AND ISED CERTIFICATION TEST REPORT

FOR

|                      |   |                                                                                        |
|----------------------|---|----------------------------------------------------------------------------------------|
| Applicant            | : | Beijing Orion Star Technology Co., Ltd.                                                |
| Address              | : | Room A-2570, 2nd Floor, No. 30, Shixing Street,<br>Shijingshan District, Beijing China |
| Equipment under Test | : | AI Delivery Robot                                                                      |
| Model No.            | : | OS-R-DR01                                                                              |
| Trade Mark           | : | ORIONSTAR                                                                              |
| FCC ID               | : | 2A3BD-OSRDR01                                                                          |
| IC                   | : | 27780-OSRDR01                                                                          |
| Manufacturer         | : | Beijing Orion Star Technology Co., Ltd.                                                |
| Address              | : | Room A-2570, 2nd Floor, No. 30, Shixing Street,<br>Shijingshan District, Beijing China |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

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# REPORT

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## Test Report Declare

|                             |   |                                                                                     |
|-----------------------------|---|-------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Beijing Orion Star Technology Co., Ltd.                                             |
| <b>Address</b>              | : | Room A-2570, 2nd Floor, No. 30, Shixing Street, Shijingshan District, Beijing China |
| <b>Equipment under Test</b> | : | AI Delivery Robot                                                                   |
| <b>Model No.</b>            | : | OS-R-DR01                                                                           |
| <b>Trade Mark</b>           | : | ORIONSTAR                                                                           |
| <b>Manufacturer</b>         | : | Beijing Orion Star Technology Co., Ltd.                                             |
| <b>Address</b>              | : | Room A-2570, 2nd Floor, No. 30, Shixing Street, Shijingshan District, Beijing China |

**Test Standard Used:** FCC Rules and Regulations Part 15 Subpart C, RSS-247 Issue 2 February 2017.

**Test procedure used:** ANSI C63.10:2013, RSS-Gen Issue 5, Apr. 2018, 558074 D01 15.247 Meas Guidance v05r02.

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC&ISED standards.**

|                         |                    |                      |                               |
|-------------------------|--------------------|----------------------|-------------------------------|
| <b>Report No:</b>       | DDT-R21091301-1E03 |                      |                               |
| <b>Date of Receipt:</b> | Sep. 13, 2021      | <b>Date of Test:</b> | Sep. 13, 2021 ~ Oct. 19, 2021 |

**Prepared By:**

Ben Jin

**Ben Jin/Engineer**

**Approved By:**



**Damon Hu/EMC Manager**

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

### Revision History

| Rev. | Revisions     | Issue Date    | Revised By |
|------|---------------|---------------|------------|
| ---  | Initial issue | Oct. 20, 2021 |            |
|      |               |               |            |

## 1. Summary of Test Results

| The EUT have been tested according to the applicable standards as referenced below. |                                                                                        |         |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------|
| Description of Test Item                                                            | Standard                                                                               | Results |
| 6Db Bandwidth and 99% Bandwidth                                                     | FCC 15.247 (a) (2)<br>RSS-247 Clause 5.2 (a)                                           | PASS    |
| Conducted Output Power                                                              | FCC 15.247 (b) (3)<br>RSS-247 Clause 5.4 €                                             | PASS    |
| Power Spectral Density                                                              | FCC 15.247 €<br>RSS-247 Clause 5.2 (b)                                                 | PASS    |
| Band-edge and Spurious Emissions<br>(Conducted)                                     | FCC 15.247 (d)<br>RSS-247 Clause 5.5                                                   | PASS    |
| Radiated Spurious Emissions                                                         | FCC 15.247 (d)<br>FCC 15.209<br>FCC 15.205<br>RSS-247 Clause 5.5<br>RSS-GEN Clause 8.9 | PASS    |
| Radiated Band Edge Compliance                                                       | FCC 15.247 (d)<br>FCC 15.209<br>FCC 15.205<br>RSS-247 Clause 5.5<br>RSS-GEN Clause 8.9 | PASS    |
| Power Line Conducted Emission                                                       | FCC 15.207<br>RSS-GEN Clause 8.8                                                       | PASS    |
| Antenna requirement                                                                 | FCC 15.203<br>RSS-GEN Clause 8.3                                                       | PASS    |

## 2. General test information

### 2.1. Description of EUT

|                          |                                                                                                                                                                                                                               |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT* Name                | : AI Delivery Robot                                                                                                                                                                                                           |
| Model Number             | : OS-R-DR01                                                                                                                                                                                                                   |
| EUT function description | : Please reference user manual of this device                                                                                                                                                                                 |
| Power supply             | : DC 32V 3.93A from external AC/DC Adapter<br>: DC 29.4V from Li-ion battery                                                                                                                                                  |
| Radio Technology         | : IEEE 802.11b/g/n                                                                                                                                                                                                            |
| FCC Operation frequency  | : IEEE 802.11b: 2412MHz-2462MHz<br>: IEEE 802.11g: 2412MHz-2462MHz<br>: IEEE 802.11n HT20: 2412MHz-2462MHz<br>: IEEE 802.11n HT40: 2422MHz-2452MHz                                                                            |
| Modulation               | : IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>: IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>: IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK)                                                                     |
| Transmitter rate         | : IEEE 802.11b: 1, 2, 5.5, 11 Mbps<br>: IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>: IEEE 802.11n HT20: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65 Mbps<br>: IEEE 802.11n HT40: 13.5, 27, 40.5, 54, 81, 108, 121.5, 135 Mbps |
| Antenna Gain             | : Maximum PK gain: 2 dBi                                                                                                                                                                                                      |
| Sample Type              | : Series production                                                                                                                                                                                                           |
| Serial number            | : N/A                                                                                                                                                                                                                         |

Note: EUT is the ab. of equipment under test.

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

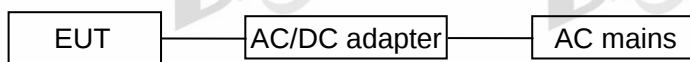
### 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model number         | Serial No. | Other                                                   |
|----------------------------|--------------|----------------------|------------|---------------------------------------------------------|
| AC/DC Adapter              | GUAN YU DA   | GM130-3200<br>393-1F | N/A        | Input: AC 100-240V, 50/60Hz, 2.5A; Output: DC 32V 3.93A |

### 2.3. Assistant equipment used for test

| Assistant equipment | Manufacturer | Model number | EMC Compliance | SN  |
|---------------------|--------------|--------------|----------------|-----|
| N/A                 | N/A          | N/A          | N/A            | N/A |

## 2.4. Block diagram of EUT configuration for test



Test software: ESP.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

| Tested mode, channel, and data rate information |                  |                                |           |                    |
|-------------------------------------------------|------------------|--------------------------------|-----------|--------------------|
| Mode                                            | Setting Tx Power | data rate (Mbps)<br>(see Note) | Channel   | Frequency<br>(MHz) |
| IEEE 802.11b                                    | /                | 11                             | LCH: CH1  | 2412               |
|                                                 | /                | 11                             | MCH: CH6  | 2437               |
|                                                 | /                | 11                             | HCH: CH11 | 2462               |
| IEEE 802.11g                                    | /                | 6                              | LCH: CH1  | 2412               |
|                                                 | /                | 6                              | MCH: CH6  | 2437               |
|                                                 | /                | 6                              | HCH: CH11 | 2462               |
| IEEE 802.11n HT20                               | /                | MCS 0                          | LCH: CH1  | 2412               |
|                                                 | /                | MCS 0                          | MCH: CH6  | 2437               |
|                                                 | /                | MCS 0                          | HCH: CH11 | 2462               |
| IEEE 802.11n HT40                               | /                | MCS 0                          | LCH: CH3  | 2422               |
|                                                 | /                | MCS 0                          | MCH: CH6  | 2437               |
|                                                 | /                | MCS 0                          | HCH: CH9  | 2452               |

Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.

## 2.5. Deviations of test standard

No Deviation

## 2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

|                    |           |
|--------------------|-----------|
| Temperature range: | 21-25°C   |
| Humidity range:    | 40-75%    |
| Pressure range:    | 86-106kPa |

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, G-20118

## 2.8. Measurement uncertainty

| Test Item                                              | Uncertainty                                                                                                                                                           |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bandwidth                                              | 1.1%                                                                                                                                                                  |
| Peak Output Power (Conducted) (Spectrum analyzer)      | 0.86 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ );<br>1.38 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )                                                        |
| Peak Output Power (Conducted) (Power Sensor)           | 0.74 dB                                                                                                                                                               |
| Power Spectral Density                                 | 0.74 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ );<br>1.38 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )                                                        |
| Frequencies Stability                                  | $6.7 \times 10^{-8}$ (Antenna couple method)<br>$5.5 \times 10^{-8}$ (Conducted method)                                                                               |
| Conducted spurious emissions                           | 0.86 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ );<br>1.40 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )<br>1.66 dB ( $8 \text{ GHz} \leq f < 22 \text{ GHz}$ ) |
| Uncertainty for radio frequency (RBW<20 kHz)           | $3 \times 10^{-8}$                                                                                                                                                    |
| Temperature                                            | 0.4°C                                                                                                                                                                 |
| Humidity                                               | 2%                                                                                                                                                                    |
| Uncertainty for Radiation Emission test (30 MHz-1 GHz) | 4.70 dB (Antenna Polarize: V)<br>4.84 dB (Antenna Polarize: H)                                                                                                        |
| Uncertainty for Radiation Emission test (1 GHz-40 GHz) | 4.10 dB (1-6 GHz)<br>4.40 dB (6 GHz-18 GHz)<br>3.54 dB (18 GHz-26 GHz)<br>4.30 dB (26 GHz-40 GHz)                                                                     |
| Uncertainty for Power line conduction emission test    | 3.32 dB (150 kHz-30 MHz)                                                                                                                                              |

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

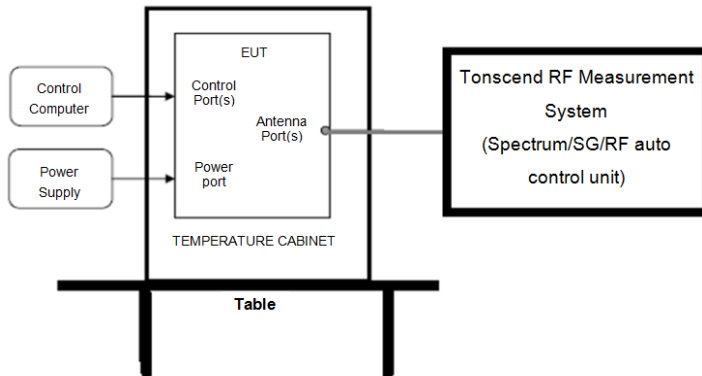
### 3. Equipment used during test

| Equipment                                                                                 | Manufacturer | Model No.   | Serial No.      | Last Cal.     | Cal. Interval |
|-------------------------------------------------------------------------------------------|--------------|-------------|-----------------|---------------|---------------|
| <input type="checkbox"/> RF Connected Test (Tonscend RF Measurement System 1#)            |              |             |                 |               |               |
| Spectrum analyzer                                                                         | R&S          | FSU26       | 200071          | Sep. 02, 2021 | 1 Year        |
| Wideband Radio Communication tester                                                       | R&S          | CMW500      | 120259          | Sep. 02, 2021 | 1 Year        |
| Vector Signal Generator                                                                   | Agilent      | E8267D      | US49060192      | Sep. 18, 2021 | 1 Year        |
| Vector Signal Generator                                                                   | Agilent      | N5182A      | MY48180737      | Jun. 01, 2021 | 1 Year        |
| RF Control Unit                                                                           | Tonsend      | JS0806-2    | 158060010       | Jun. 01, 2021 | 1 Year        |
| Temp&Humi Programmable                                                                    | ZHIXIANG     | ZXGDJS-150L | ZX170110-A      | Jun. 01, 2021 | 1 Year        |
| Test Software                                                                             | JS Tonscend  | JS1120-3    | Ver.2.6.77.0518 | N/A           | N/A           |
| <input checked="" type="checkbox"/> RF Connected Test (Tonscend RF Measurement System 2#) |              |             |                 |               |               |
| Signal analyzer                                                                           | R&S          | FSQ26       | 101272          | Jun. 01, 2021 | 1 Year        |
| Wideband Radio Communication tester                                                       | R&S          | CMW500      | 117491          | Jun. 01, 2021 | 1 Year        |
| Vector Signal Generator                                                                   | Agilent      | N5182A      | MY19060405      | Jun. 01, 2021 | 1 Year        |
| Vector Signal Generator                                                                   | Agilent      | N5182A      | MY48180912      | Jun. 01, 2021 | 1 Year        |
| RF Control Unit                                                                           | Tonsend      | JS0806-2    | DDT-ZC01449     | Jun. 01, 2021 | 1 Year        |
| Temp&Humi Programmable                                                                    | ZHIXIANG     | ZXGDJS-150L | ZX170110-A      | Jun. 01, 2021 | 1 Year        |
| Test Software                                                                             | JS Tonscend  | JS1120-3    | Ver.2.6.77.0518 | N/A           | N/A           |
| <input checked="" type="checkbox"/> Radiation 3#chamber                                   |              |             |                 |               |               |
| EMI Test Receiver                                                                         | R&S          | ESU         | 100472          | Jun. 01, 2021 | 1 Year        |
| Spectrum analyzer                                                                         | Agilent      | E4447A      | MY50180031      | Jun. 01, 2021 | 1 Year        |
| Active Loop antenna                                                                       | Schwarzbeck  | FMZB-1519   | 1519-038        | Nov. 18, 2020 | 1 Year        |
| Trilog Broadband Antenna                                                                  | Schwarzbeck  | VULB 9163   | 01429           | Aug. 07, 2021 | 1 Year        |
| Double Ridged Horn Antenna                                                                | Schwarzbeck  | BBHA9120    | 02108           | Jul. 17, 2021 | 1 Year        |
| Broad Band Horn Antenna                                                                   | Schwarzbeck  | BBHA 9170   | 790             | May 08, 2021  | 1 Year        |
| Pre-amplifier                                                                             | COM-POWER    | PAM-118A    | 18040084        | Sep. 02, 2021 | 1 Year        |
| Pre-amplifier                                                                             | COM-POWER    | PAM-840A    | 461369          | Mar. 15, 2021 | 1 Year        |
| Test software                                                                             | Audix        | E3          | V 6.1.1.1       | N/A           | N/A           |
| <input type="checkbox"/> Power Line Conducted Emissions Test 1#                           |              |             |                 |               |               |
| Test Receiver                                                                             | R&S          | ESCI        | 100551          | Sep. 02, 2021 | 1 Year        |
| LISN 1                                                                                    | R&S          | ENV216      | 101109          | Sep. 02, 2021 | 1 Year        |
| LISN 2                                                                                    | R&S          | ESH2-Z5     | 100309          | Sep. 02, 2021 | 1 Year        |
| Pulse Limiter                                                                             | R&S          | ESH3-Z2     | 101242          | Sep. 02, 2021 | 1 Year        |
| CE Cable 1                                                                                | HUBSER       | N/A         | W10.01          | Sep. 02, 2021 | 1 Year        |
| LISN 3                                                                                    | SCHWARZBECK  | NSLK 8163   | 00017           | Sep. 02, 2021 | 1 Year        |

|                                                |        |         |                      |               |        |
|------------------------------------------------|--------|---------|----------------------|---------------|--------|
| Test software                                  | Audix  | E3      | V 6.11111b           | N/A           | N/A    |
| <b>☑Power Line Conducted Emissions Test 2#</b> |        |         |                      |               |        |
| Test Receiver                                  | R&S    | ESCI    | 101028               | Sep. 02, 2021 | 1 Year |
| LISN 1                                         | R&S    | ENV216  | 101170               | Sep. 02, 2021 | 1 Year |
| Pulse Limiter                                  | R&S    | KH43101 | 431011801568-1<br>2# | Jun. 01, 2021 | 1 Year |
| CE Cable 2                                     | HUBSER | RG214-5 | N/A                  | Jun. 01, 2021 | 1 Year |
| Test software                                  | Audix  | E3      | V 6.11111b           | N/A           | N/A    |

## 4. 6dB Bandwidth and 99% Bandwidth

### 4.1. Block diagram of test setup



### 4.2. Limits

For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz

### 4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) 99% Bandwidth set the spectrum analyzer as follows:

|                |          |
|----------------|----------|
| RBW:           | 300 kHz  |
| VBW:           | 1 MHz    |
| Detector Mode: | Peak     |
| Sweep time:    | auto     |
| Trace mode     | Max hold |

(3) 6dB Bandwidth set the spectrum analyzer as follows:

|                |          |
|----------------|----------|
| RBW:           | 100 kHz  |
| VBW:           | 300 kHz  |
| Detector Mode: | Peak     |
| Sweep time:    | auto     |
| Trace mode     | Max hold |

(4) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**4.4. Test result****6dB Bandwidth**

| Test Mode | Channel | Ant  | 6dB Bandwidth (MHz) | Limit (MHz) | Verdict |
|-----------|---------|------|---------------------|-------------|---------|
| 11B       | 2412    | Ant1 | 9.320               | 0.5         | Pass    |
| 11B       | 2437    | Ant1 | 9.320               | 0.5         | Pass    |
| 11B       | 2462    | Ant1 | 10.160              | 0.5         | Pass    |
| 11G       | 2412    | Ant1 | 16.480              | 0.5         | Pass    |
| 11G       | 2437    | Ant1 | 16.480              | 0.5         | Pass    |
| 11G       | 2462    | Ant1 | 16.480              | 0.5         | Pass    |
| 11N20     | 2412    | Ant1 | 17.080              | 0.5         | Pass    |
| 11N20     | 2437    | Ant1 | 17.120              | 0.5         | Pass    |
| 11N20     | 2462    | Ant1 | 17.160              | 0.5         | Pass    |
| 11N40     | 2422    | Ant1 | 33.120              | 0.5         | Pass    |
| 11N40     | 2437    | Ant1 | 33.440              | 0.5         | Pass    |
| 11N40     | 2452    | Ant1 | 33.360              | 0.5         | Pass    |

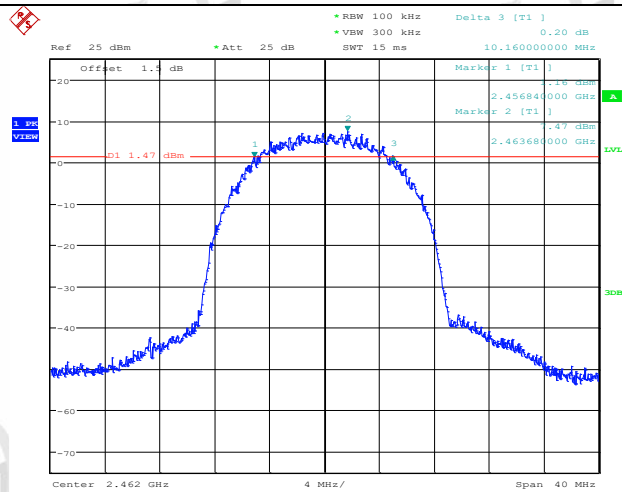
**99% Bandwidth**

| Test Mode | Channel | Ant  | 99% OBW (MHz) | Limit (MHz) | Verdict |
|-----------|---------|------|---------------|-------------|---------|
| 11B       | 2412    | Ant1 | 13.12         | ---         | Pass    |
| 11B       | 2437    | Ant1 | 13.12         | ---         | Pass    |
| 11B       | 2462    | Ant1 | 13.08         | ---         | Pass    |
| 11G       | 2412    | Ant1 | 16.56         | ---         | Pass    |
| 11G       | 2437    | Ant1 | 16.56         | ---         | Pass    |
| 11G       | 2462    | Ant1 | 16.56         | ---         | Pass    |
| 11N20     | 2412    | Ant1 | 17.36         | ---         | Pass    |
| 11N20     | 2437    | Ant1 | 17.36         | ---         | Pass    |
| 11N20     | 2462    | Ant1 | 17.32         | ---         | Pass    |
| 11N40     | 2422    | Ant1 | 34.48         | ---         | Pass    |
| 11N40     | 2437    | Ant1 | 34.40         | ---         | Pass    |
| 11N40     | 2452    | Ant1 | 34.48         | ---         | Pass    |

#### 4.5. Original test data

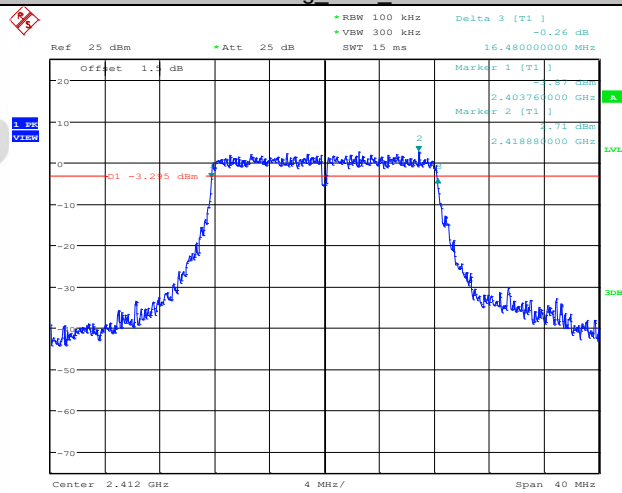
6dB Bandwidth





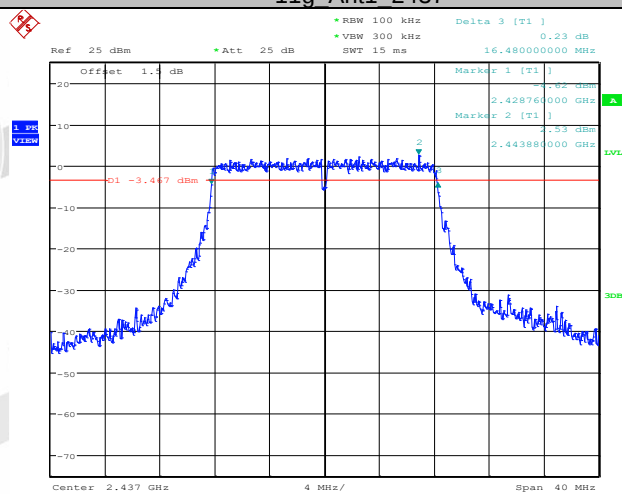
Date: 28.SEP.2021 09:31:17

## 11g Ant1 2412



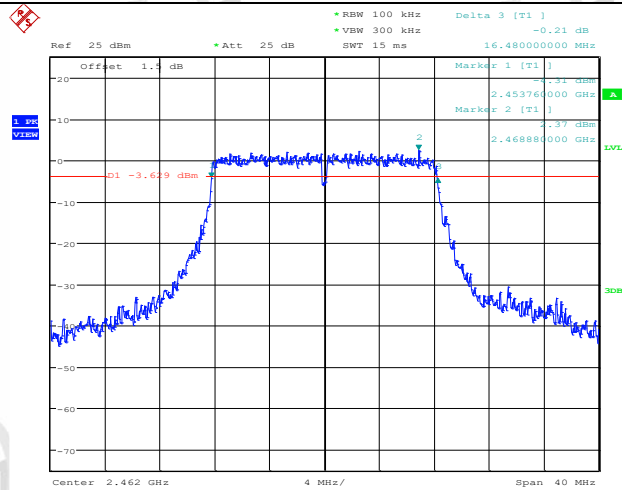
Date: 28.SEP.2021 09:33:05

## 11g Ant1 2437



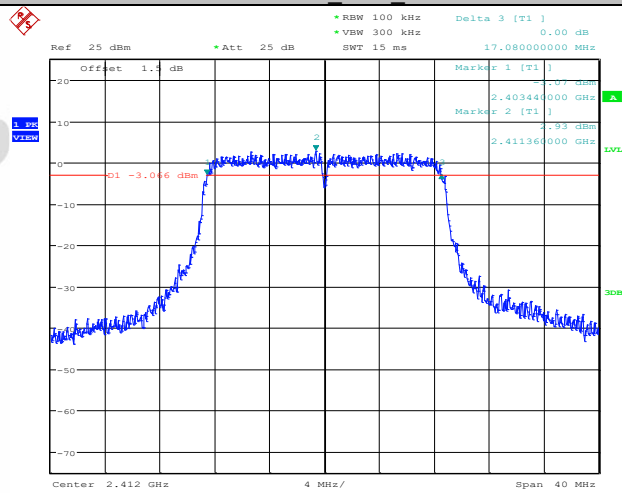
Date: 28.SEP.2021 09:34:50

## 11g Ant1 2462



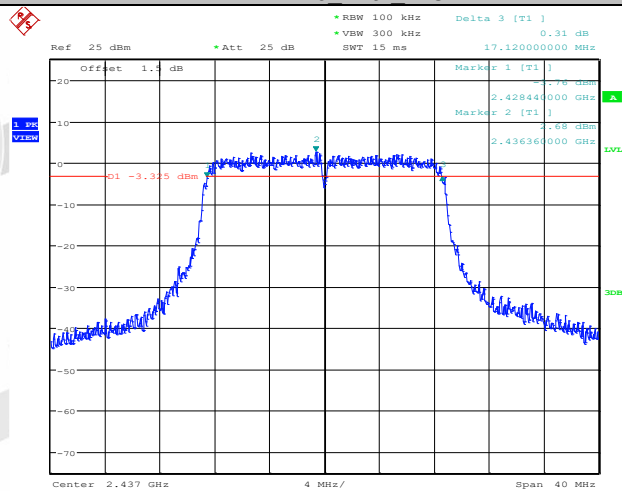
Date: 28.SEP.2021 09:37:33

## 11n20 Ant1 2412



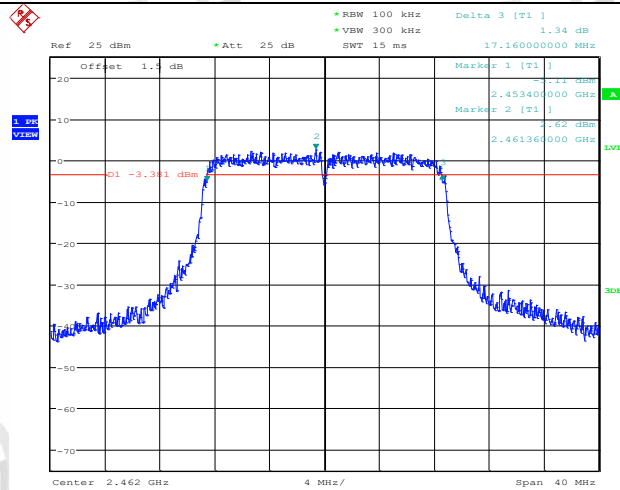
Date: 28.SEP.2021 09:40:23

## 11n20 Ant1 2437



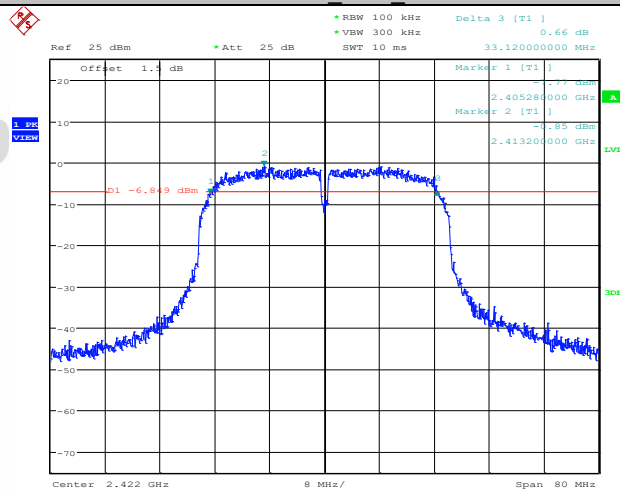
Date: 28.SEP.2021 09:42:29

## 11n20 Ant1 2462



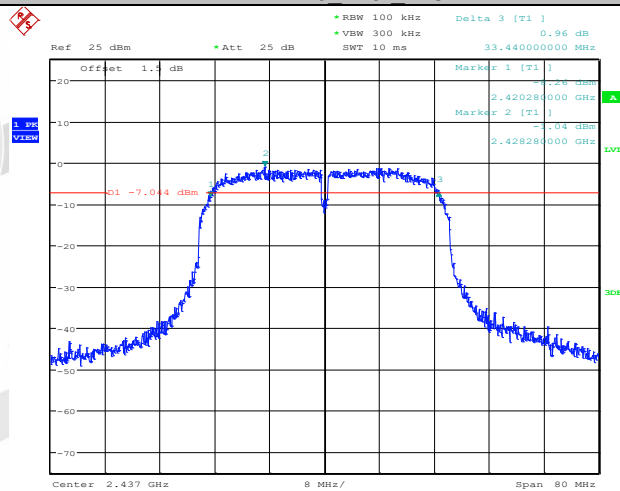
Date: 28.SEP.2021 09:44:33

## 11n40 Ant1 2422



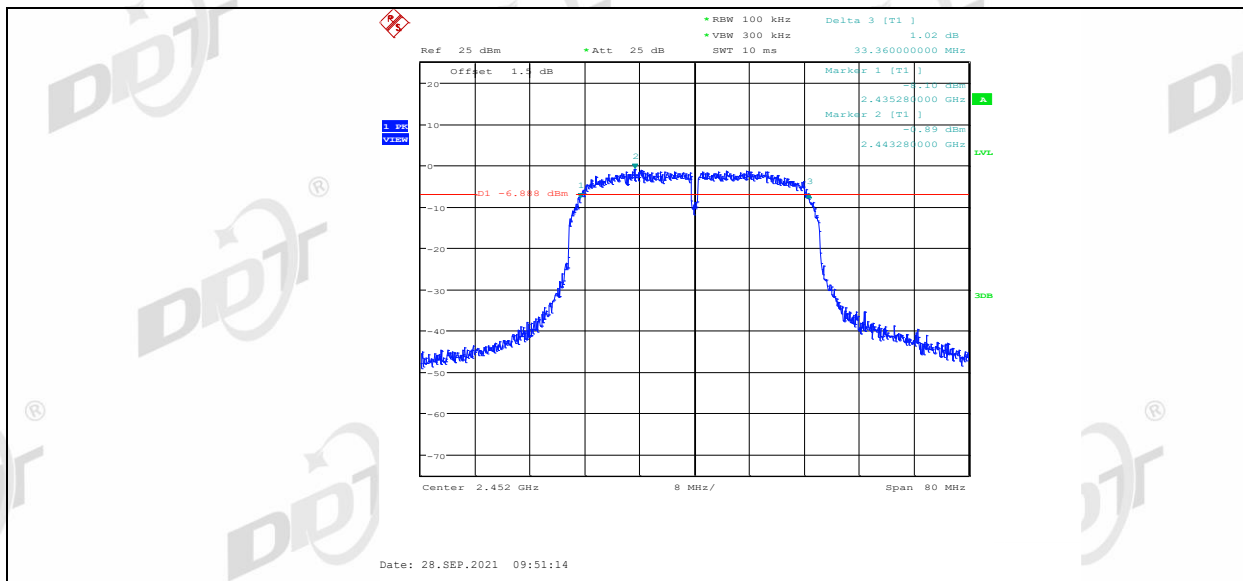
Date: 28.SEP.2021 09:46:36

## 11n40 Ant1 2437

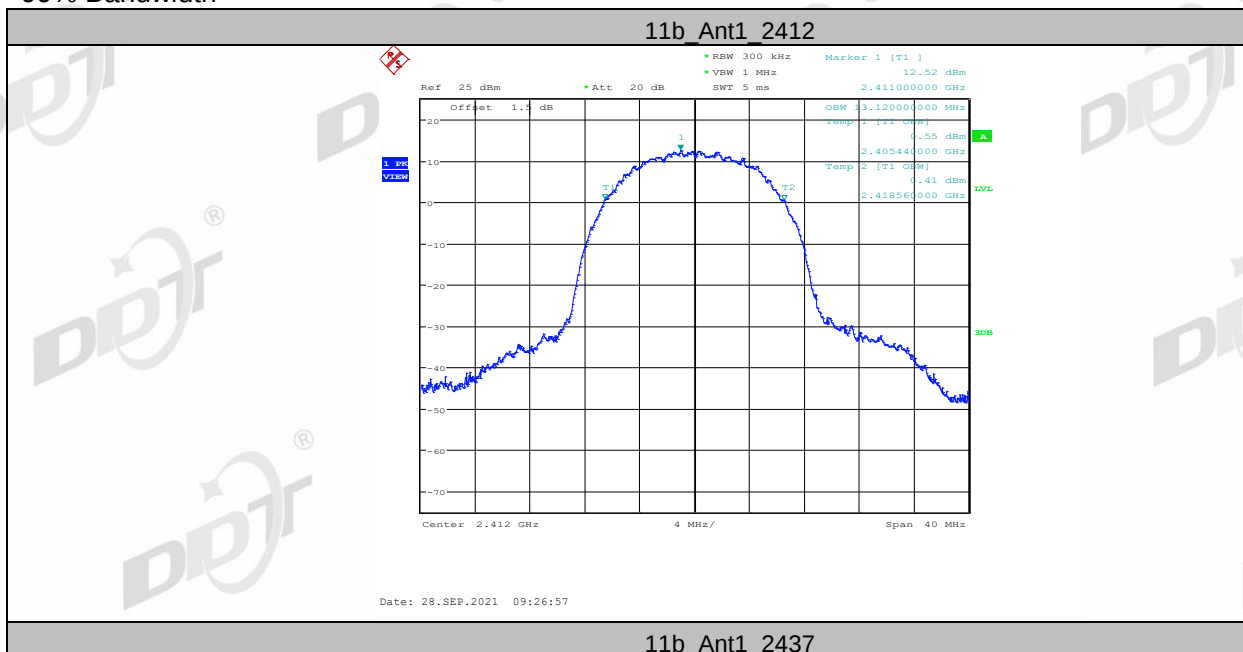


Date: 28.SEP.2021 09:49:05

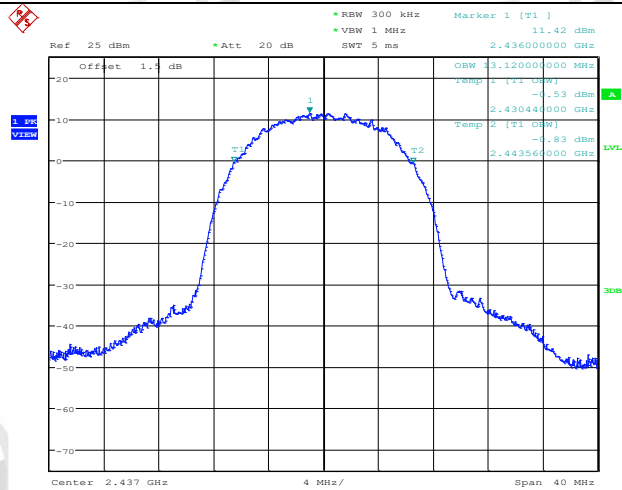
## 11n40 Ant1 2452



## 99% Bandwidth

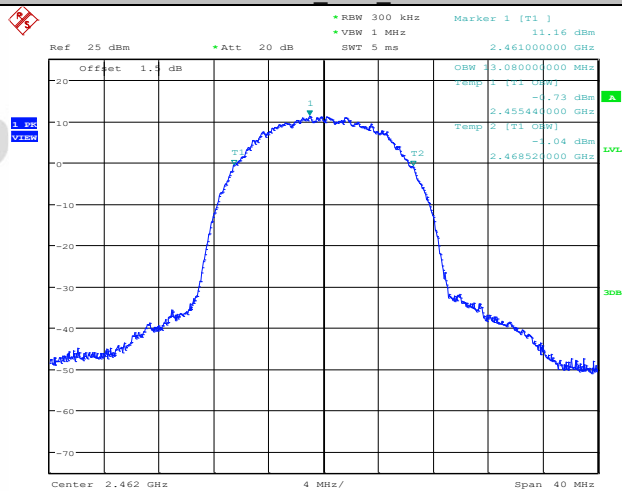


11b Ant1 2437



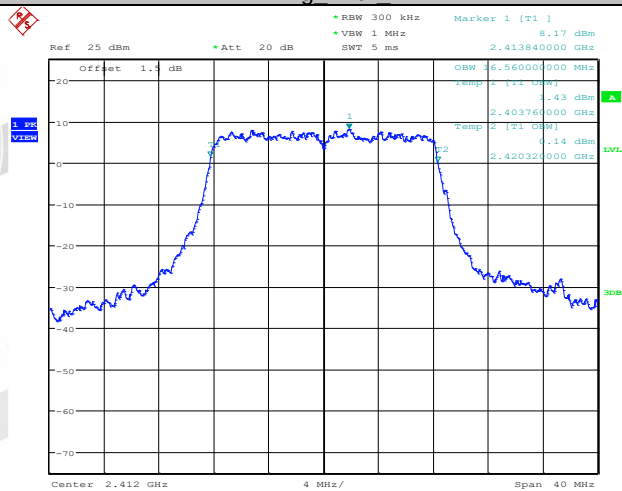
Date: 28.SEP.2021 09:29:10

## 11b Ant1 2462



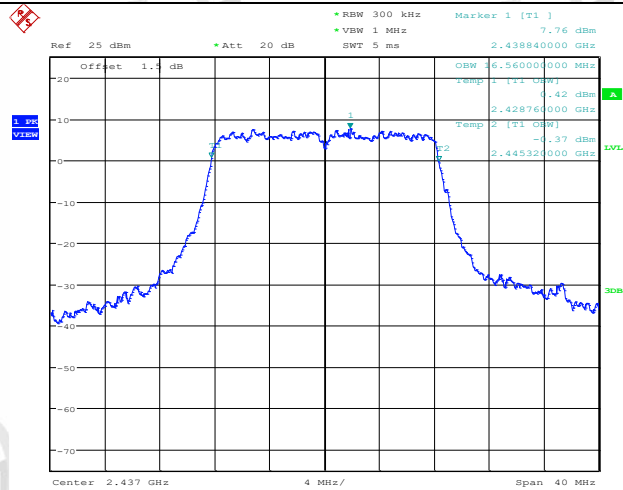
Date: 28.SEP.2021 09:31:28

## 11g Ant1 2412



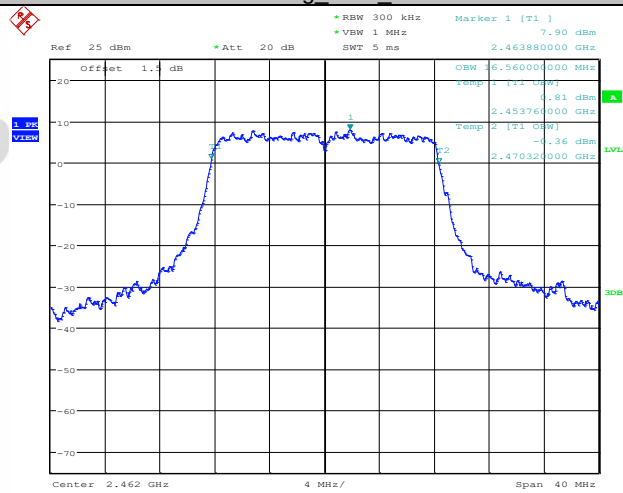
Date: 28.SEP.2021 09:33:17

## 11g Ant1 2437



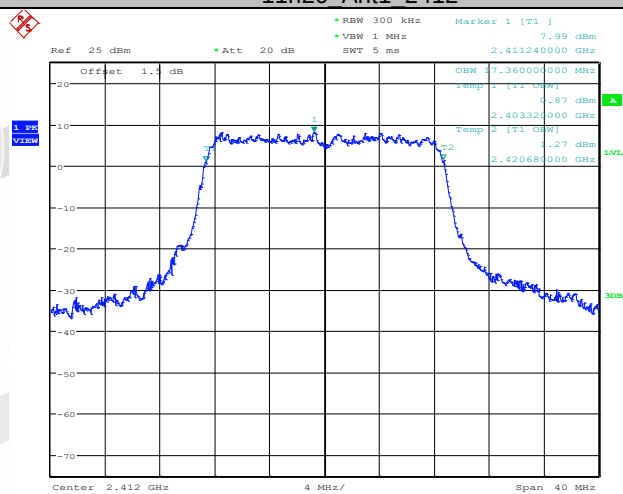
Date: 28.SEP.2021 09:35:01

## 11g Ant1 2462



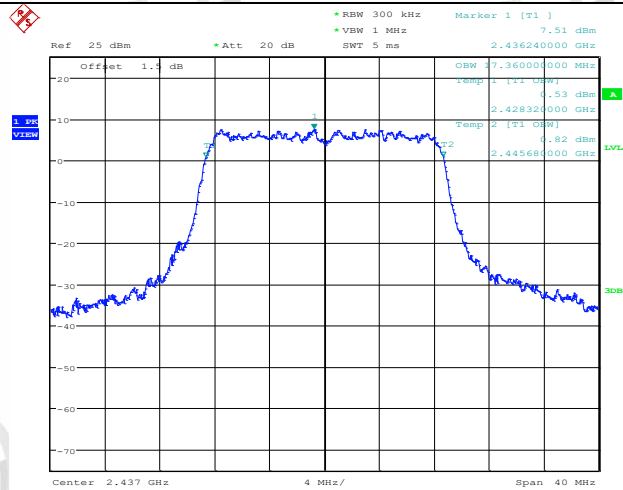
Date: 28.SEP.2021 09:37:45

## 11n20 Ant1 2412



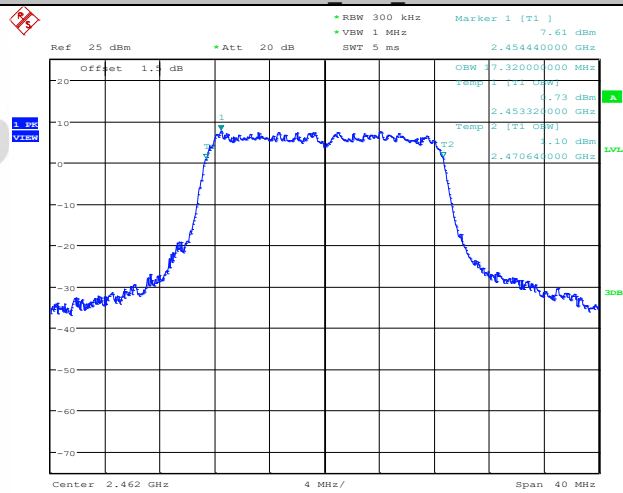
Date: 28.SEP.2021 09:40:35

## 11n20 Ant1 2437



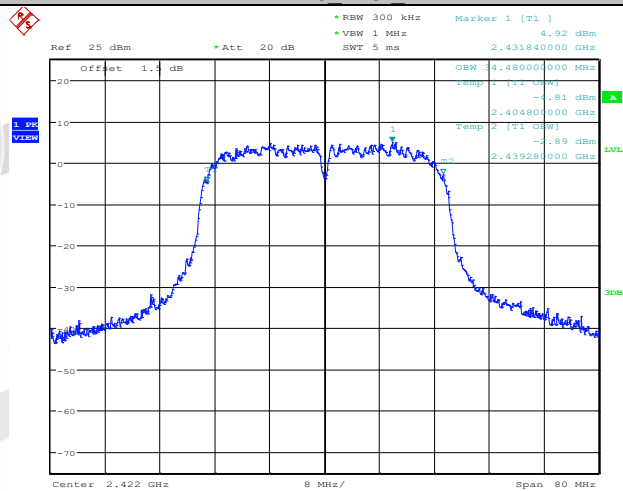
Date: 28.SEP.2021 09:42:41

## 11n20 Ant1 2462



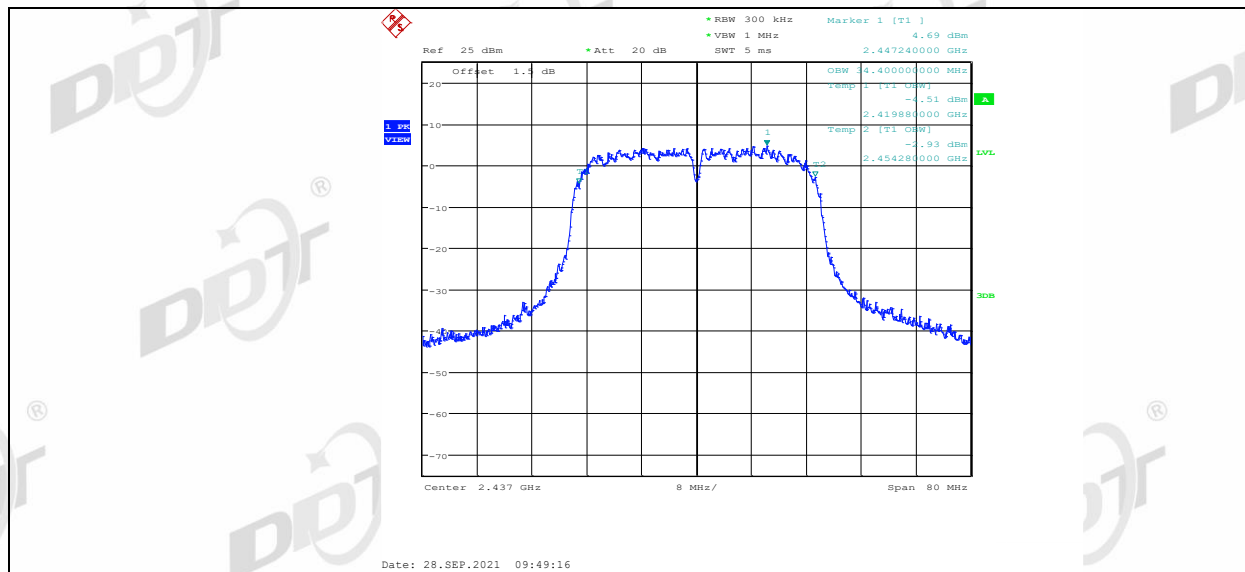
Date: 28.SEP.2021 09:44:44

## 11n40 Ant1 2422

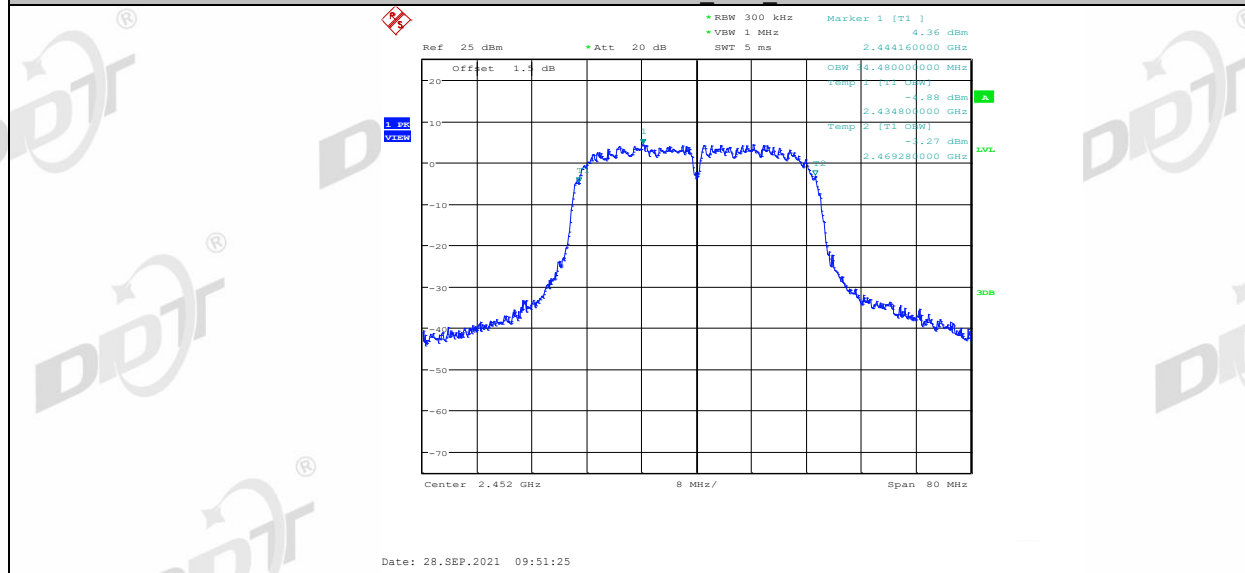


Date: 28.SEP.2021 09:46:47

## 11n40 Ant1 2437



## 11n40 Ant1 2452



## 5. Conducted peak Output Power

### 5.1. Block diagram of test setup

Same as section 4.1

### 5.2. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi, the e.i.r.p shall not exceed 4W.

### 5.3. Test Procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator

Measure the output power of each antenna port by power sensor.

## 5.4. Test Result

| Test Mode | Channel | Ant  | Conducted Output Power (dBm) | Limit[dBm] |
|-----------|---------|------|------------------------------|------------|
| 11B       | 2412    | ANT1 | 16.74                        | 30         |
| 11B       | 2437    | ANT1 | 17.08                        | 30         |
| 11B       | 2462    | ANT1 | 16.28                        | 30         |
| 11G       | 2412    | ANT1 | 15.47                        | 30         |
| 11G       | 2437    | ANT1 | 15.77                        | 30         |
| 11G       | 2462    | ANT1 | 14.92                        | 30         |
| 11N20     | 2412    | ANT1 | 15.39                        | 30         |
| 11N20     | 2437    | ANT1 | 15.64                        | 30         |
| 11N20     | 2462    | ANT1 | 14.78                        | 30         |
| 11N40     | 2422    | ANT1 | 14.97                        | 30         |
| 11N40     | 2437    | ANT1 | 15.16                        | 30         |
| 11N40     | 2452    | ANT1 | 14.74                        | 30         |

| Test Mode | Channel | Ant  | EIRP (dBm) | Limit[dBm] |
|-----------|---------|------|------------|------------|
| 11B       | 2412    | ANT1 | 18.74      | 36         |
| 11B       | 2437    | ANT1 | 19.08      | 36         |
| 11B       | 2462    | ANT1 | 18.28      | 36         |
| 11G       | 2412    | ANT1 | 17.47      | 36         |
| 11G       | 2437    | ANT1 | 17.77      | 36         |
| 11G       | 2462    | ANT1 | 16.92      | 36         |
| 11N20     | 2412    | ANT1 | 17.39      | 36         |
| 11N20     | 2437    | ANT1 | 17.64      | 36         |
| 11N20     | 2462    | ANT1 | 16.78      | 36         |
| 11N40     | 2422    | ANT1 | 16.97      | 36         |
| 11N40     | 2437    | ANT1 | 17.16      | 36         |
| 11N40     | 2452    | ANT1 | 16.74      | 36         |

Note: EIRP (dBm)=Conducted Output Power (dBm)+ Antenna Gain (dBi)

## 6. Power Spectral Density

### 6.1. Block diagram of test setup

Same as section 4.1

### 6.2. Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 6.3. Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

|                  |                                                      |
|------------------|------------------------------------------------------|
| Center frequency | DTS Channel center frequency                         |
| RBW:             | $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ |
| VBW:             | $\geq 3\text{RBW}$                                   |
| Span             | 1.5 times the DTS bandwidth                          |
| Detector Mode:   | RMS                                                  |
| Sweep time:      | auto                                                 |
| Trace mode       | Max hold                                             |

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

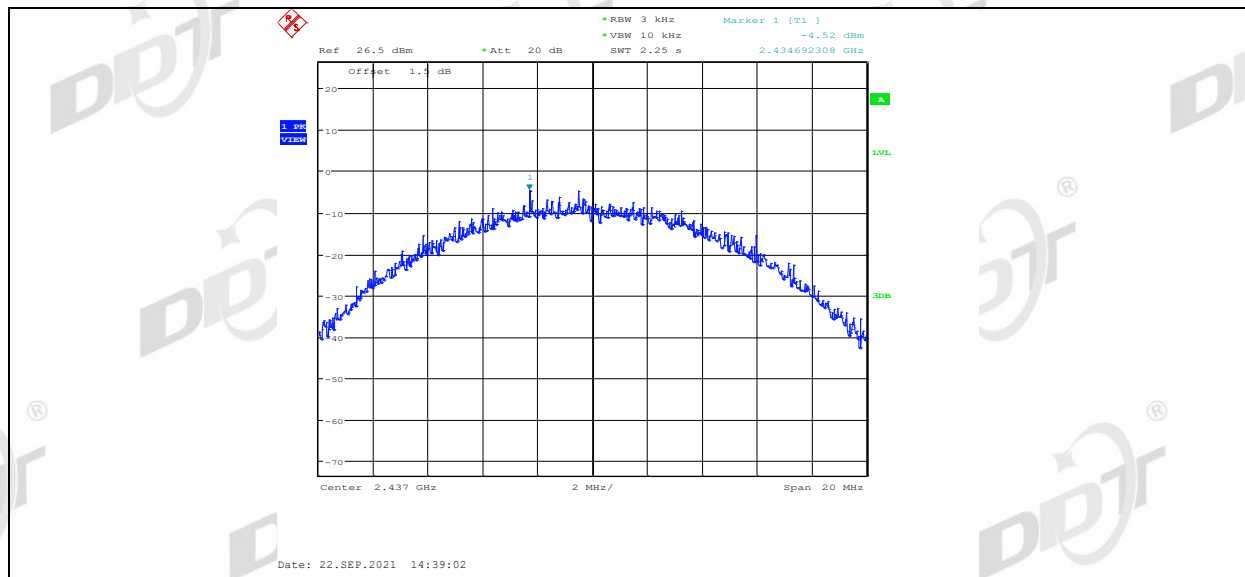
(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 6.4. Test Result

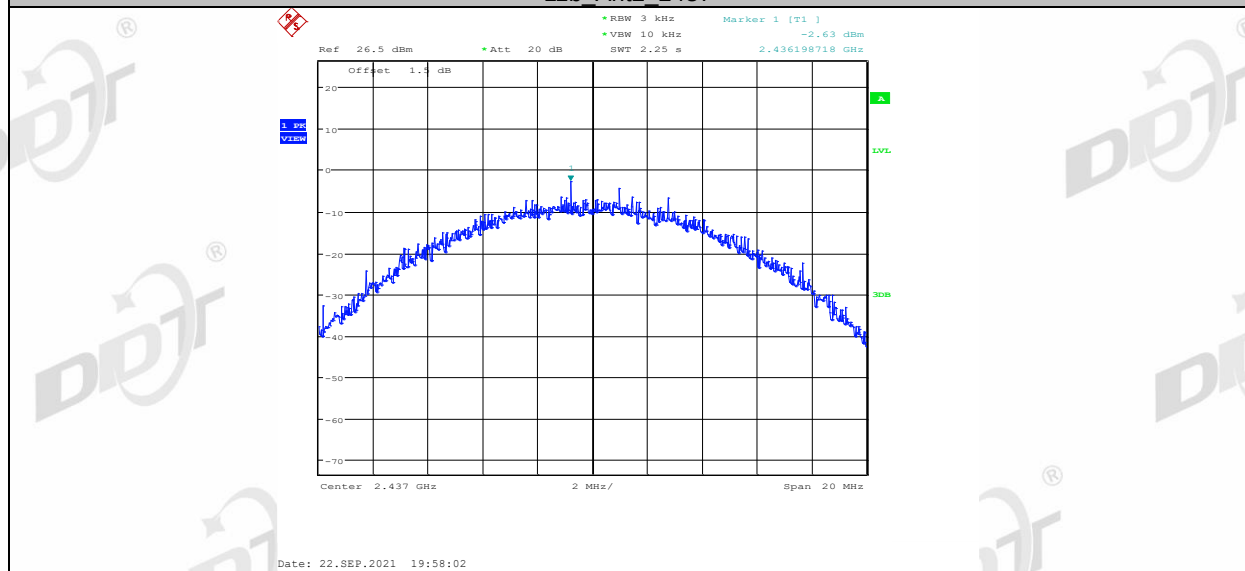
| Test Mode | Test Channel | Ant  | PSD [dBm] | Limit[dBm/3kHz] | Verdict |
|-----------|--------------|------|-----------|-----------------|---------|
| 11B       | 2412         | ANT1 | -5.75     | 8.00            | Pass    |
| 11B       | 2437         | ANT1 | -4.52     | 8.00            | Pass    |
| 11B       | 2462         | ANT1 | -4.32     | 8.00            | Pass    |
| 11G       | 2412         | ANT1 | -8.85     | 8.00            | Pass    |
| 11G       | 2437         | ANT1 | -10.41    | 8.00            | Pass    |
| 11G       | 2462         | ANT1 | -10.3     | 8.00            | Pass    |
| 11N20     | 2412         | ANT1 | -7.31     | 8.00            | Pass    |
| 11N20     | 2437         | ANT1 | -10.15    | 8.00            | Pass    |
| 11N20     | 2462         | ANT1 | -8.67     | 8.00            | Pass    |
| 11N40     | 2422         | ANT1 | -12.91    | 8.00            | Pass    |
| 11N40     | 2437         | ANT1 | -11.2     | 8.00            | Pass    |
| 11N40     | 2452         | ANT1 | -13.16    | 8.00            | Pass    |

## 6.5. Original Test Data

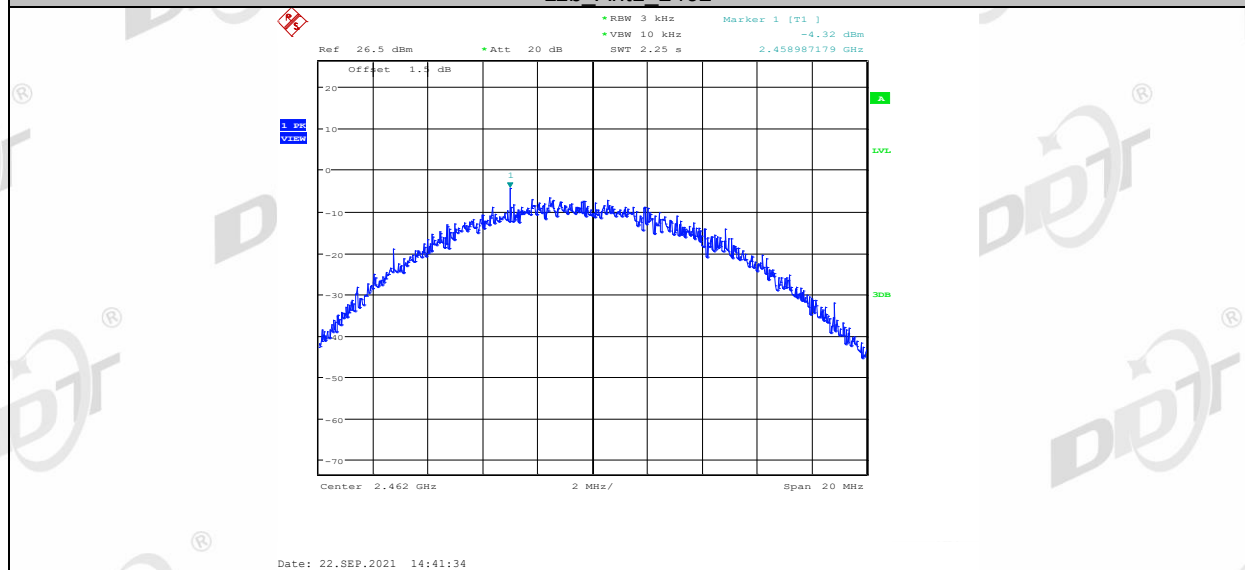




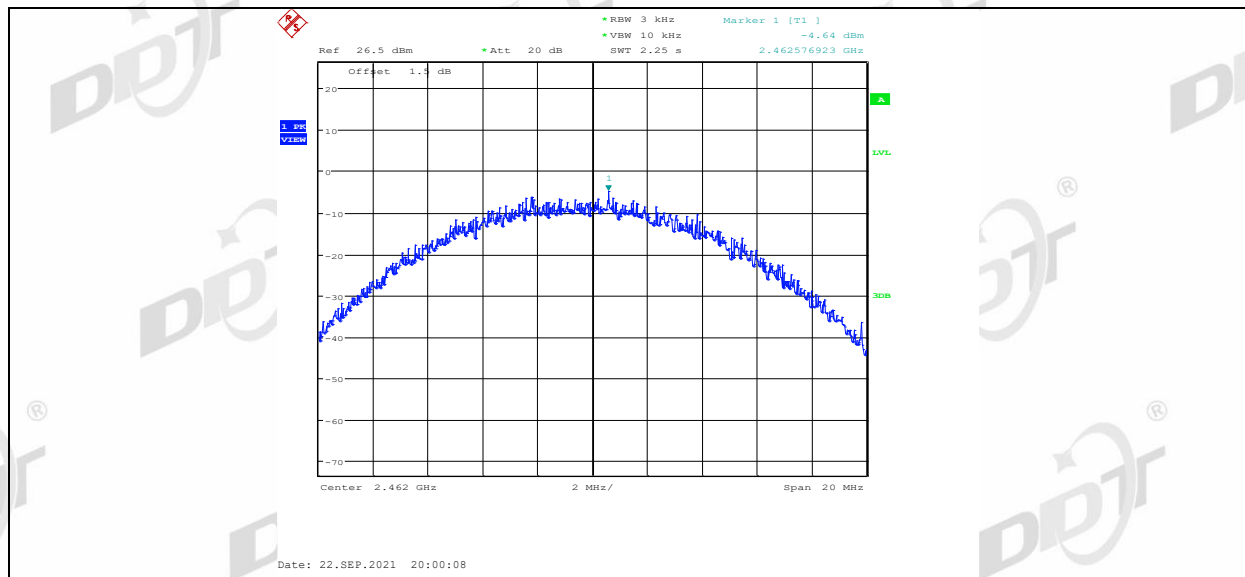
11b Ant2 2437



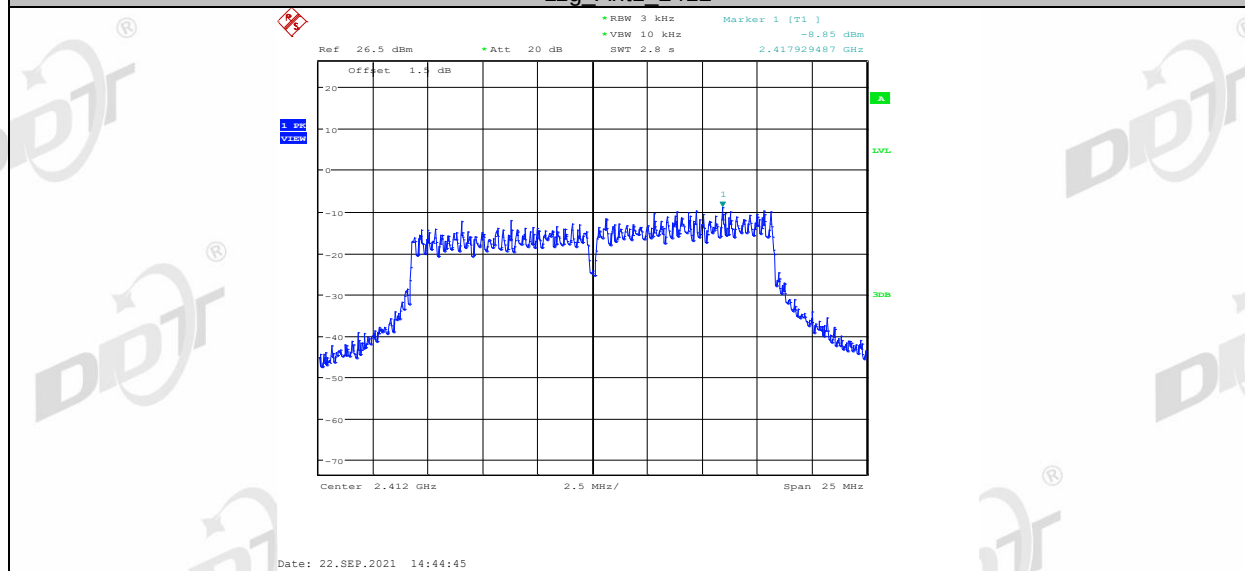
11b Ant1 2462



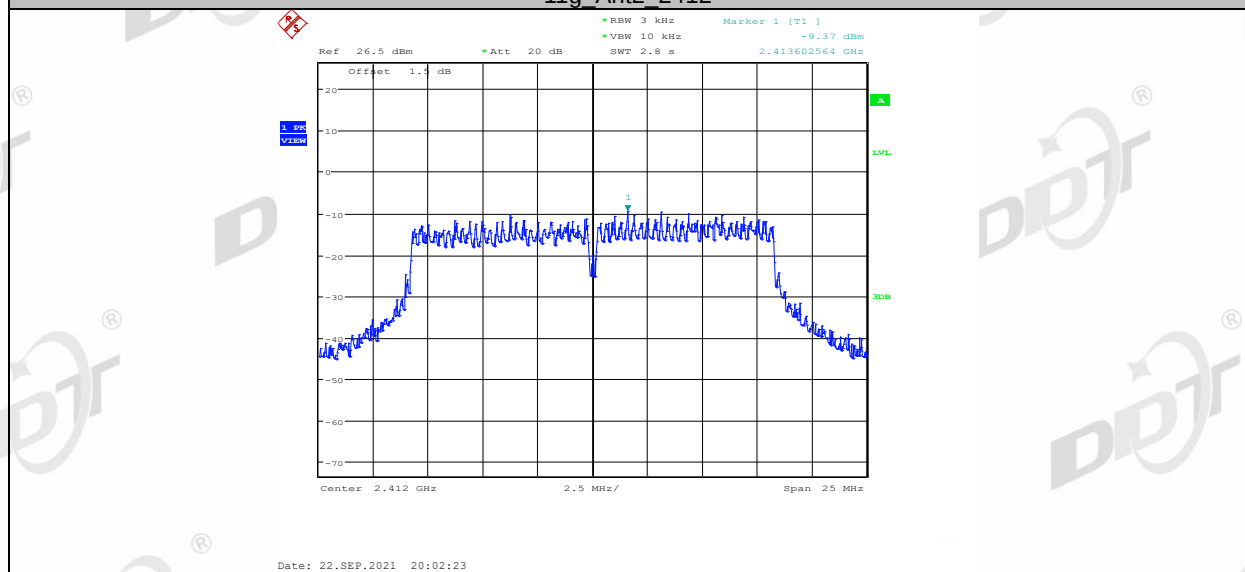
11b Ant2 2462



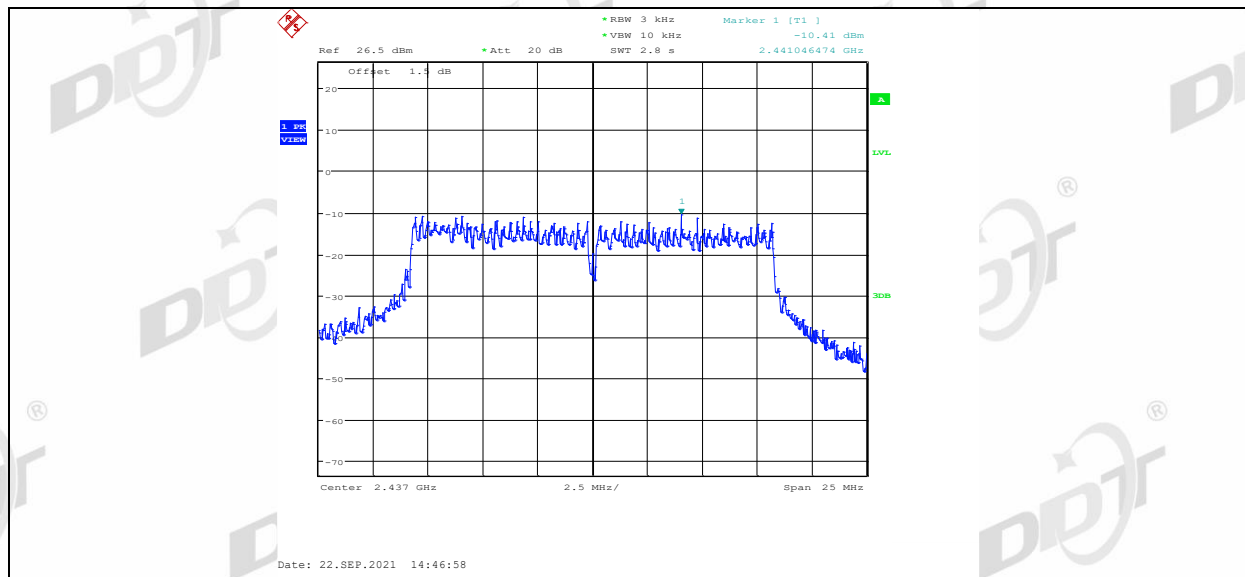
11g Ant1 2412



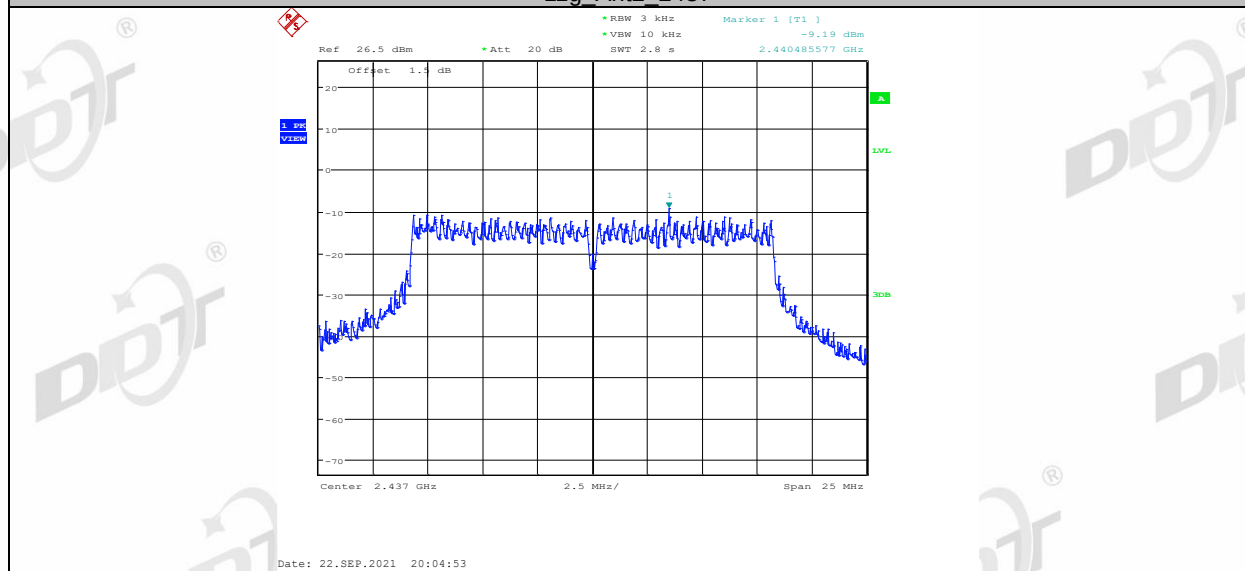
11g Ant2 2412



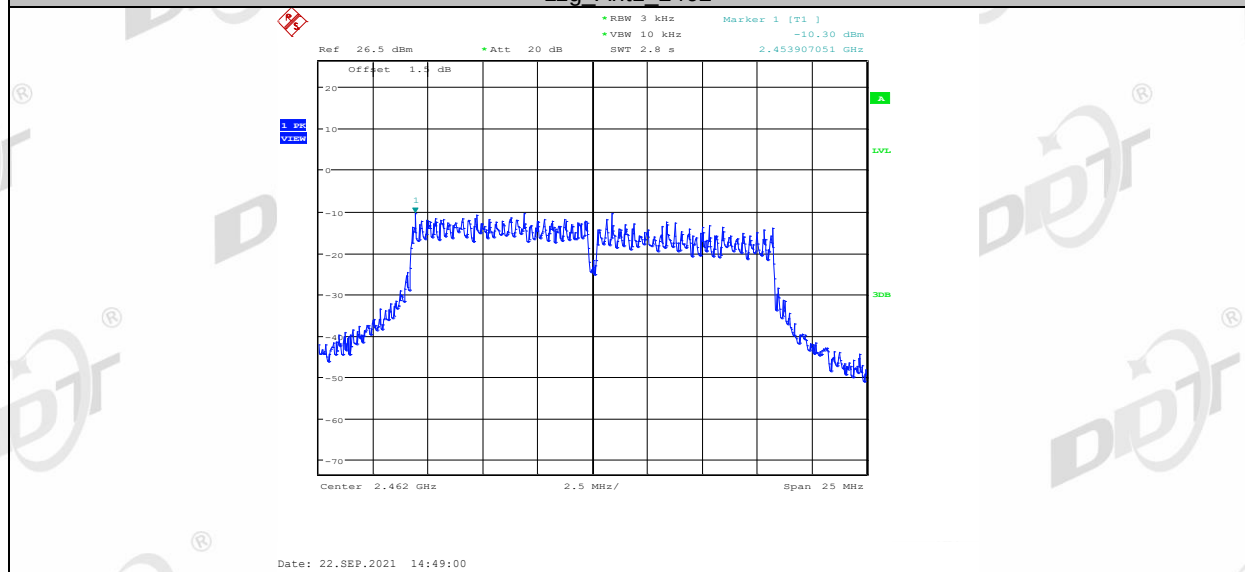
11g Ant1 2437



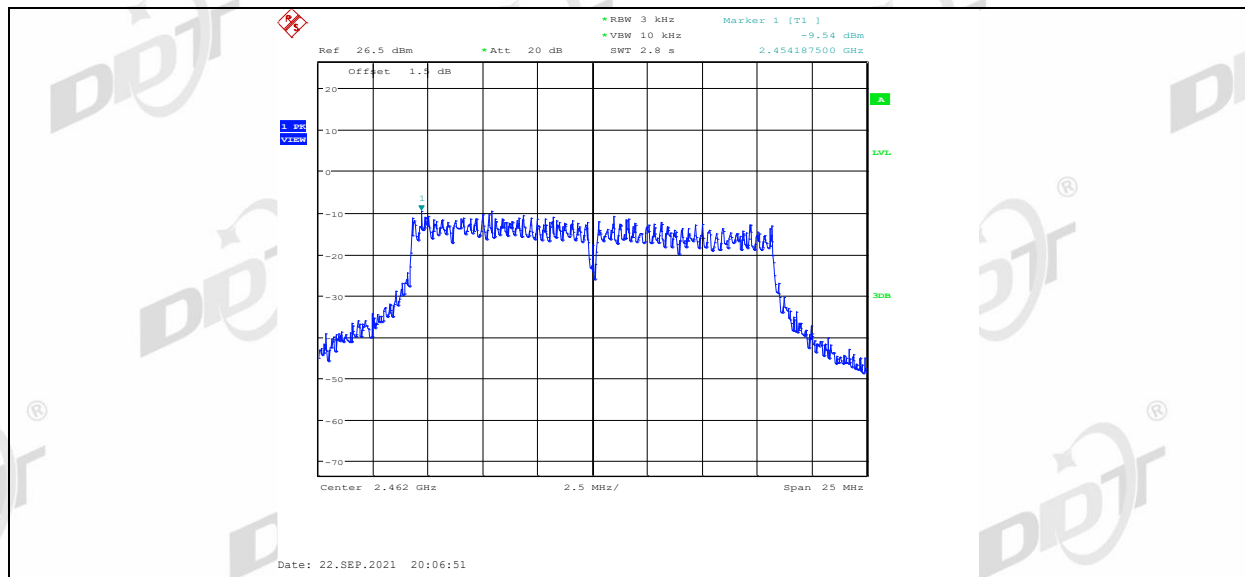
11g Ant2 2437



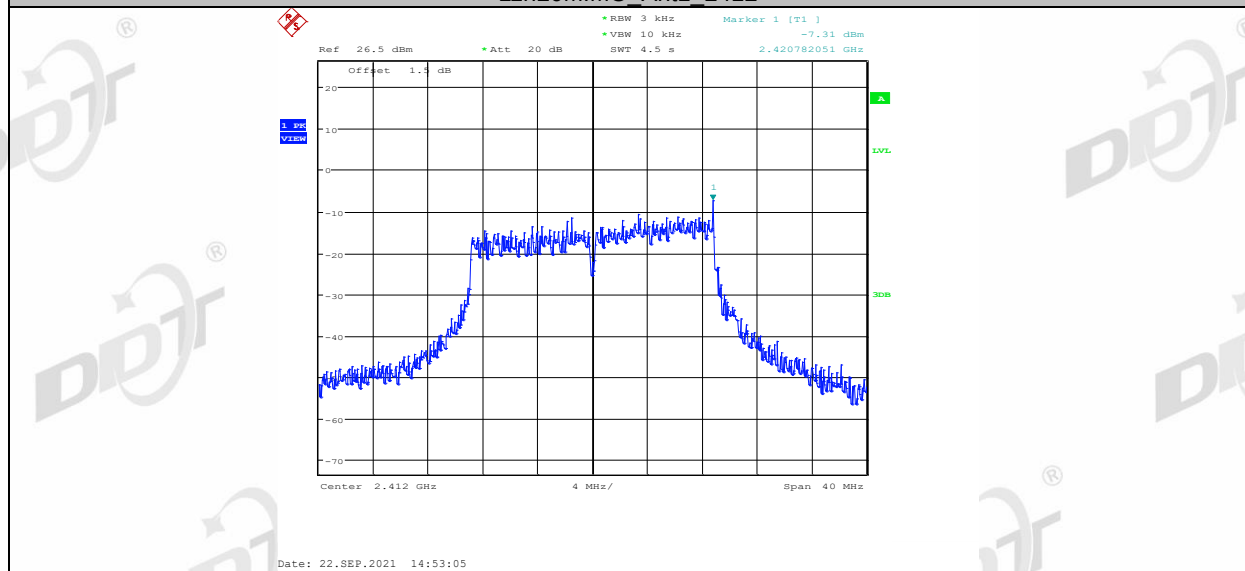
11g Ant1 2462



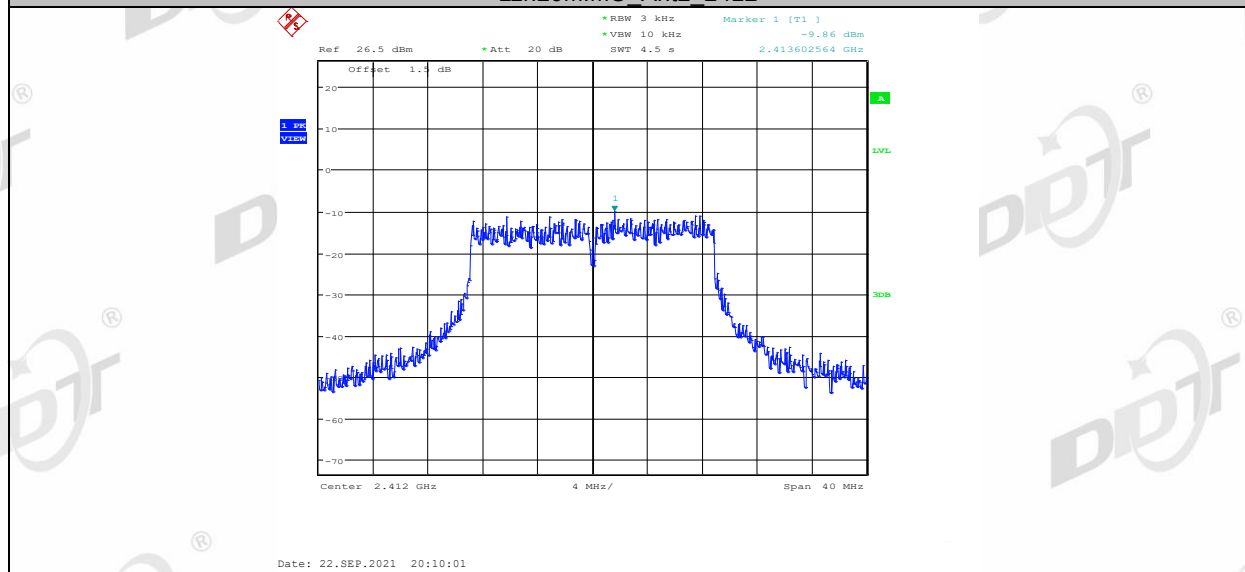
11g Ant2 2462



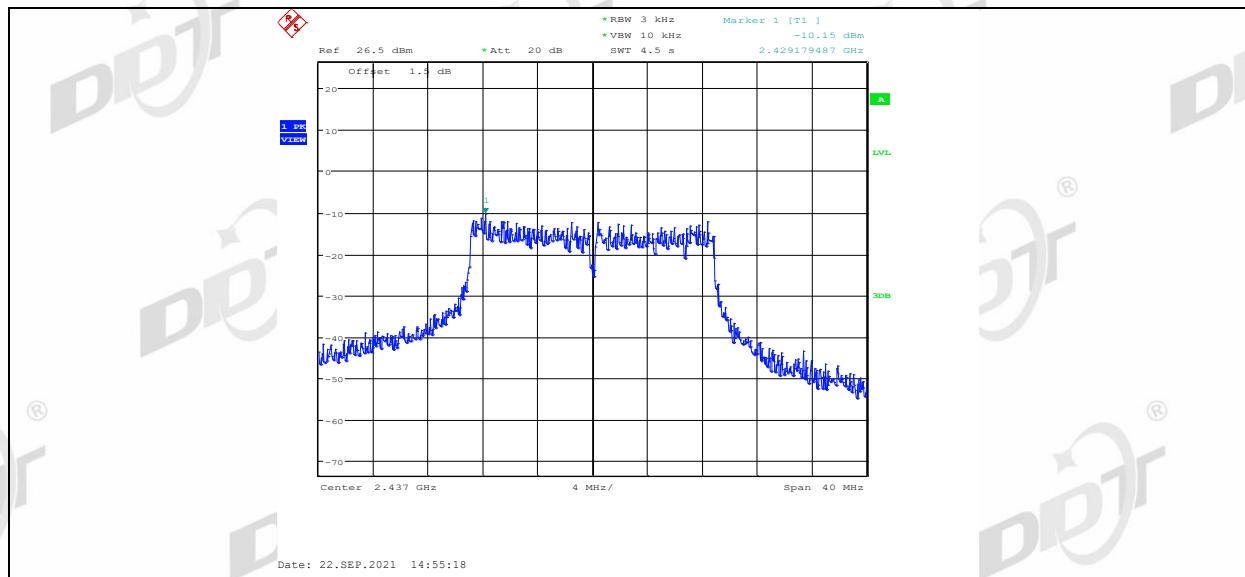
11n20MIMO\_Ant1\_2412



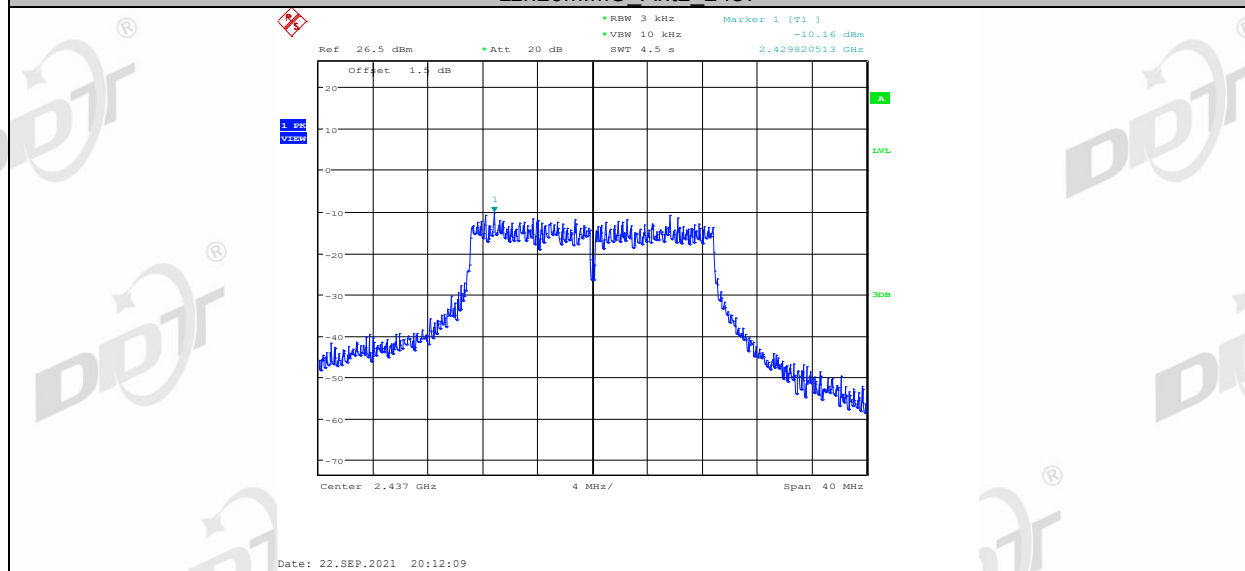
11n20MIMO\_Ant2\_2412



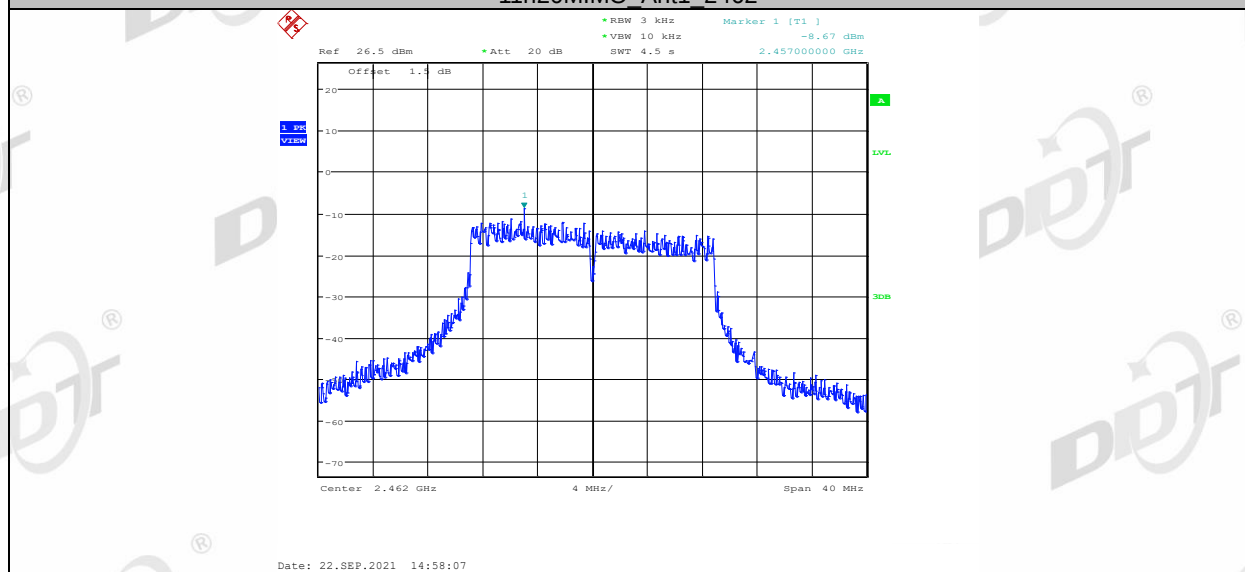
11n20MIMO\_Ant1\_2437



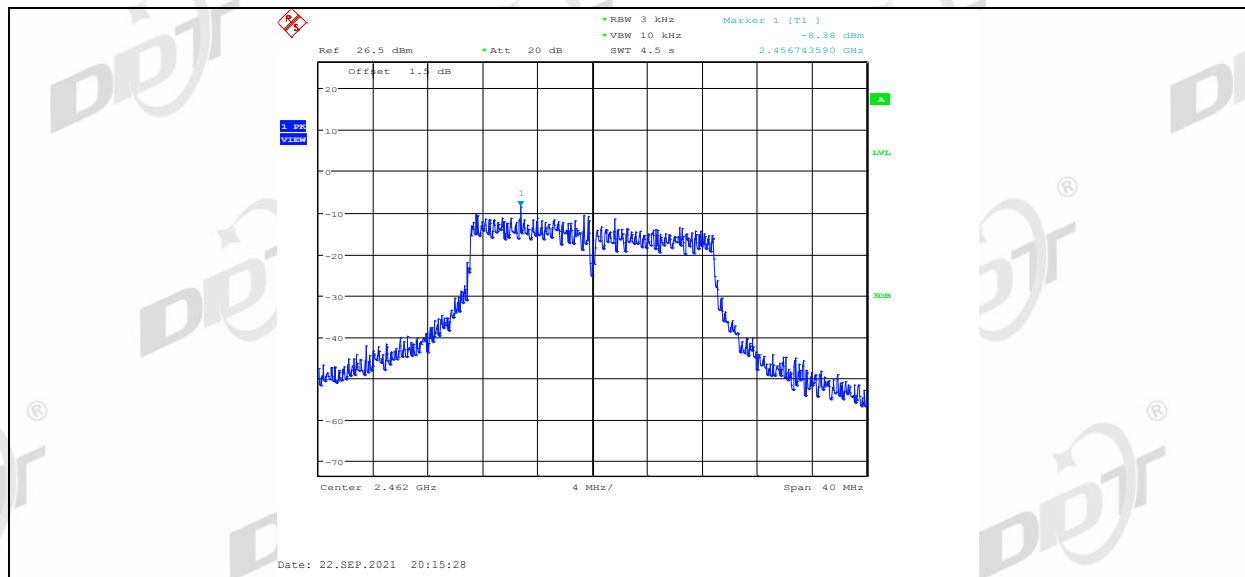
11n20MIMO\_Ant2\_2437



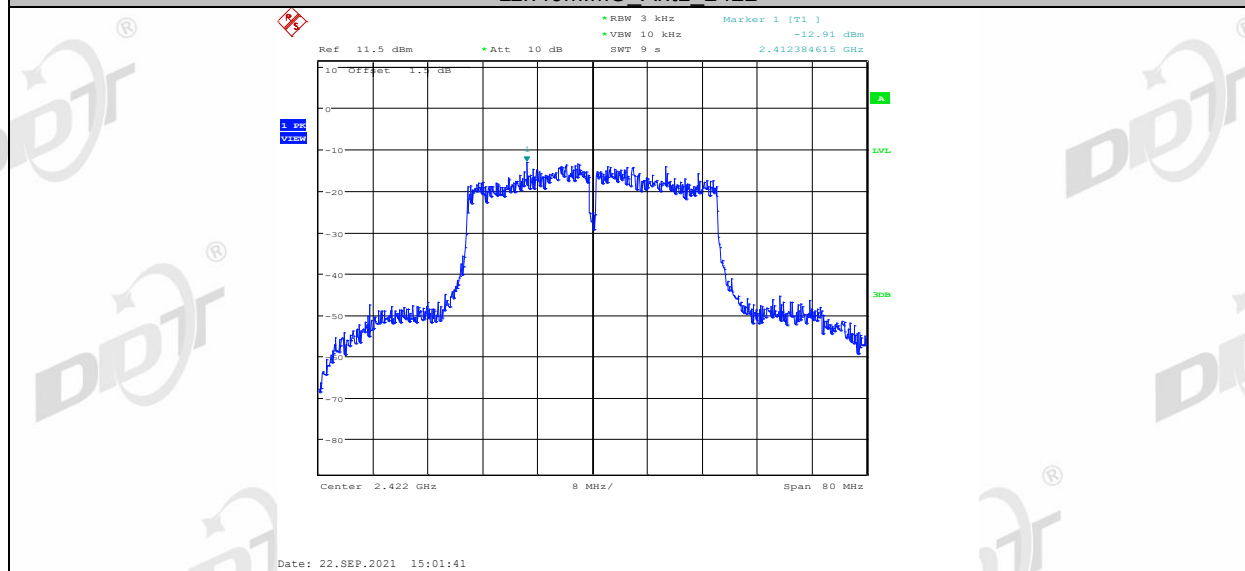
11n20MIMO\_Ant1\_2462



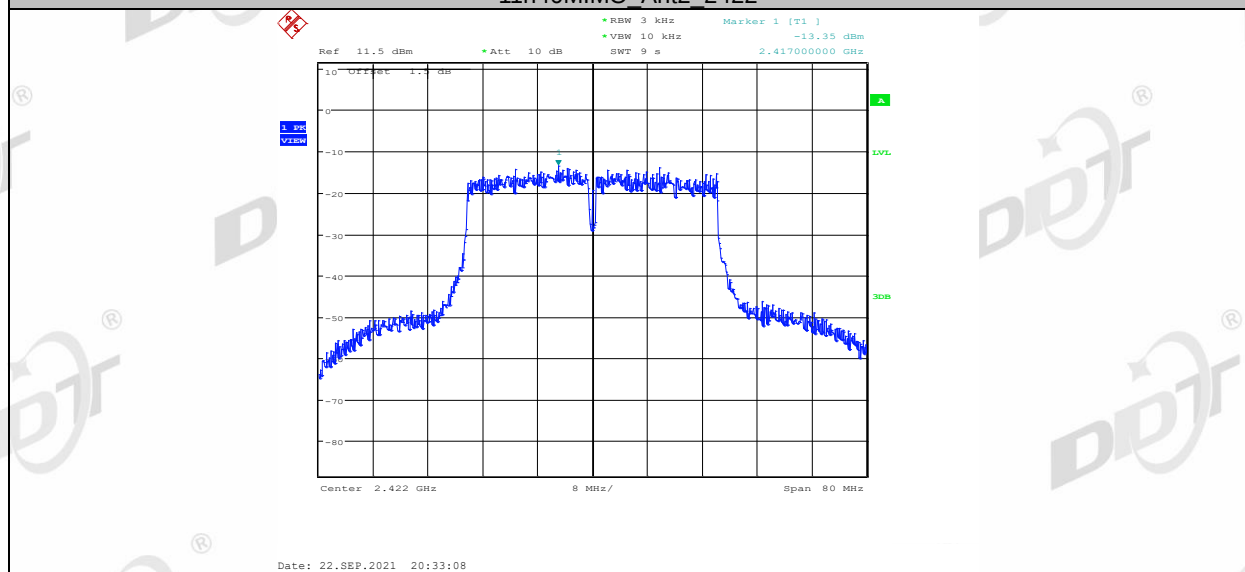
11n20MIMO\_Ant2\_2462



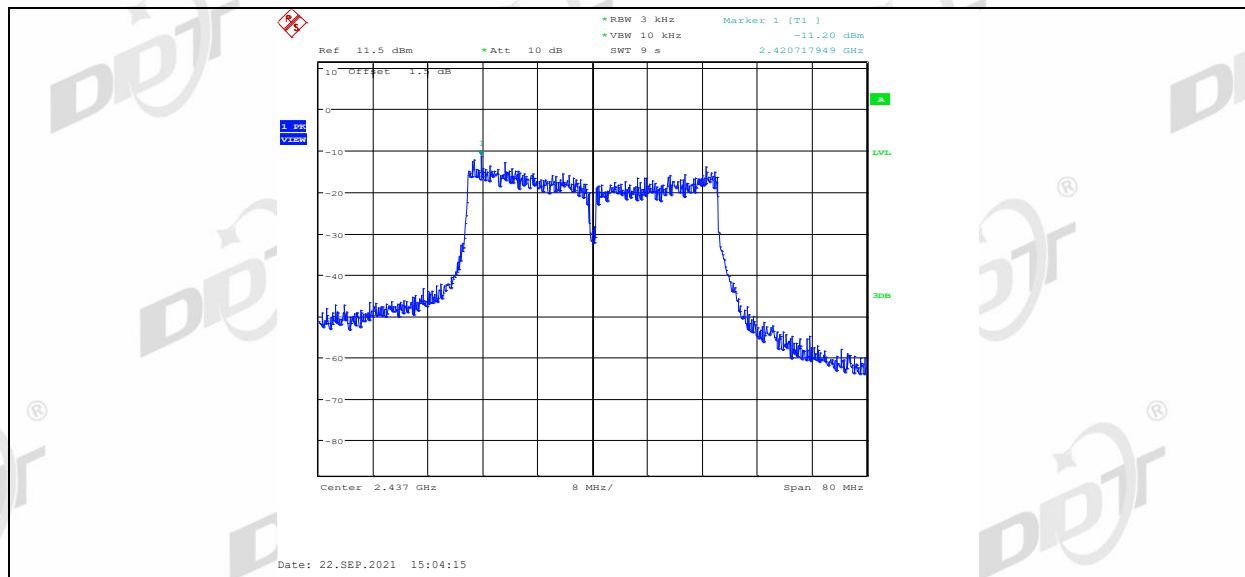
11n40MIMO\_Ant1\_2422



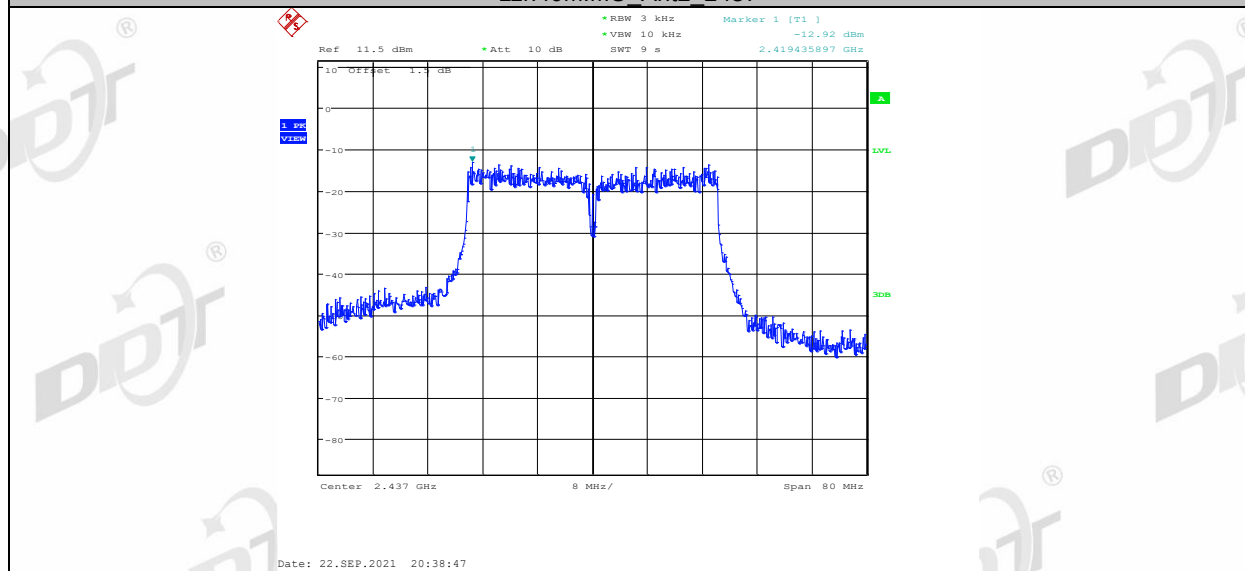
11n40MIMO\_Ant2\_2422



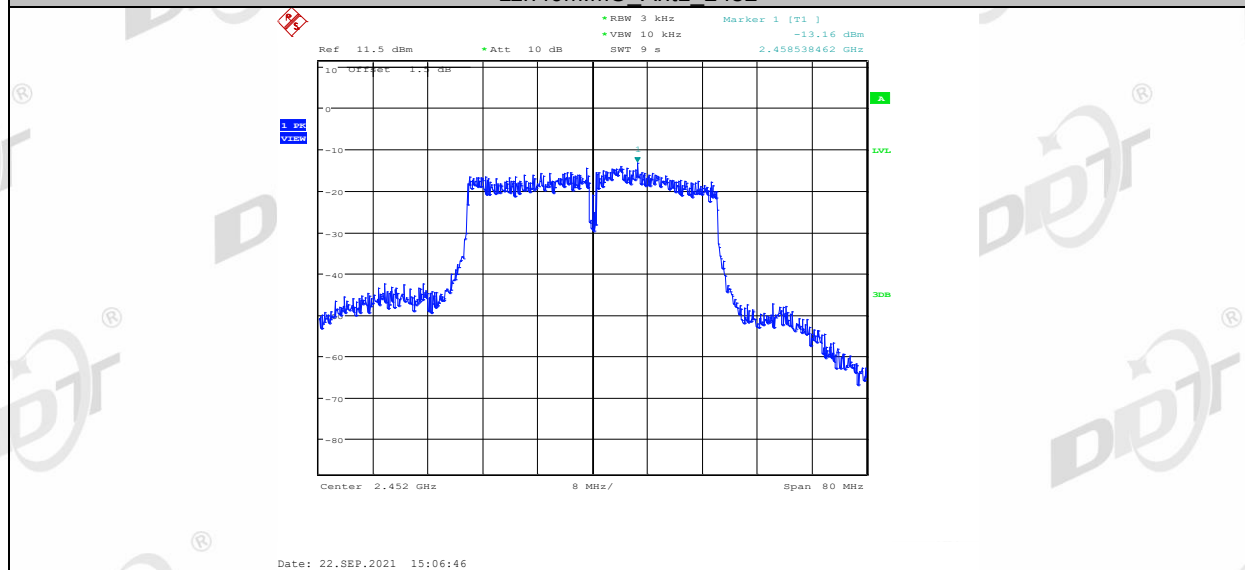
11n40MIMO\_Ant1\_2437



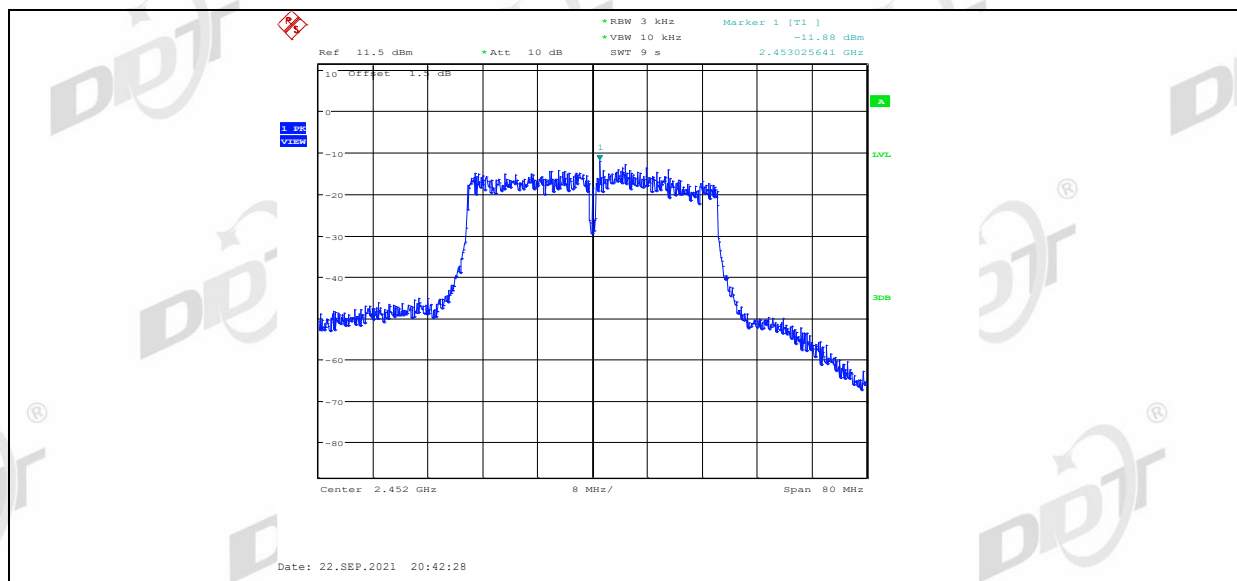
11n40MIMO\_Ant2\_2437



11n40MIMO\_Ant1\_2452



11n40MIMO\_Ant2\_2452



## 7. Band Edge and Spurious Emissions (Conducted)

### 7.1. Block diagram of test setup

Same as section 4.1

### 7.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

### 7.3. Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

|                  |                              |
|------------------|------------------------------|
| Center frequency | DTS Channel center frequency |
| RBW:             | 100 kHz                      |
| VBW:             | 300 kHz                      |
| Span             | 1.5 times the DTS bandwidth  |
| Detector Mode:   | Peak                         |
| Sweep time:      | auto                         |
| Trace mode       | Max hold                     |

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

|                              |                                          |
|------------------------------|------------------------------------------|
| RBW:                         | 100 kHz                                  |
| VBW:                         | 300 kHz                                  |
| Span                         | Encompass frequency range to be measured |
| Number of measurement points | $\geq \text{span}/\text{RBW}$            |
| Detector Mode:               | Peak                                     |
| Sweep time:                  | auto                                     |
| Trace mode                   | Max hold                                 |

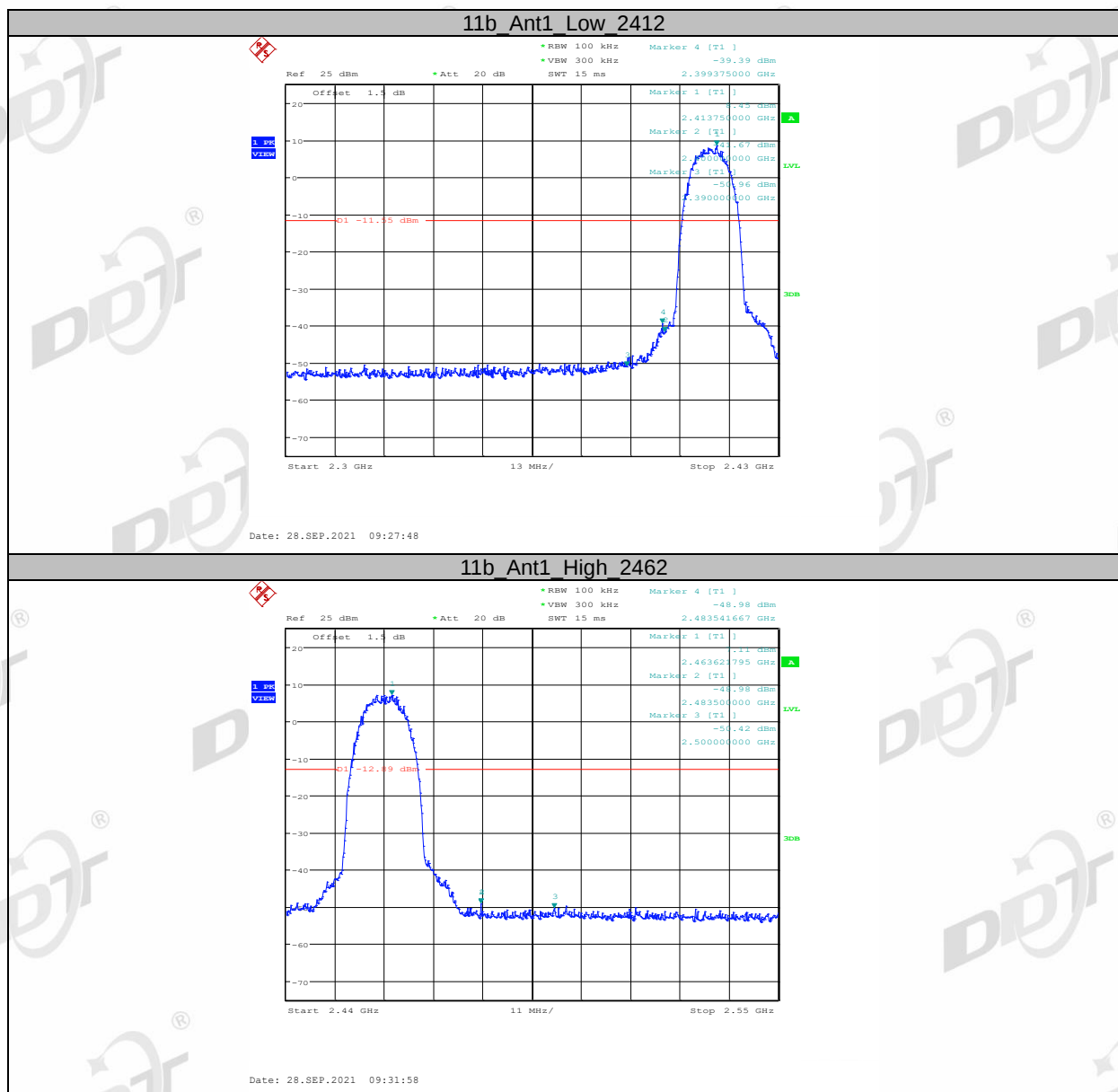
(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

## 7.4. Test Result

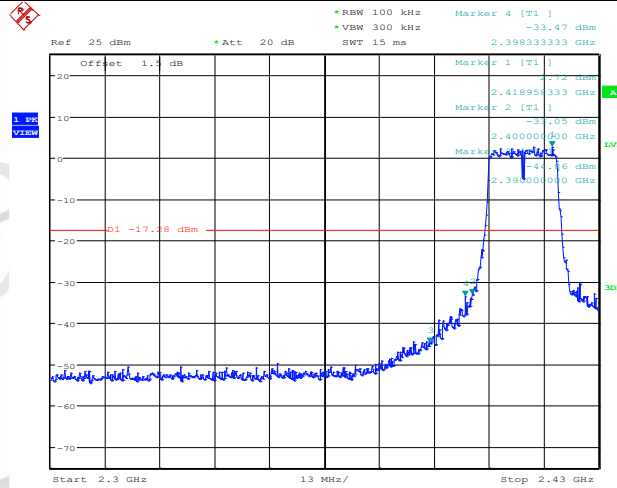
| EUT Set Mode | CH or Frequency | Ant1 Result (dBm) | EUT Set Mode | CH or Frequency | Ant1 Result (dBm) |
|--------------|-----------------|-------------------|--------------|-----------------|-------------------|
| 11b          | CH1             | Pass              | 11n HT 20    | CH1             | Pass              |
|              | CH6             | Pass              |              | CH6             | Pass              |
|              | CH11            | Pass              |              | CH11            | Pass              |
| 11g          | CH1             | Pass              | 11n HT 40    | CH3             | Pass              |
|              | CH6             | Pass              |              | CH6             | Pass              |
|              | CH11            | Pass              |              | CH9             | Pass              |

## 7.5. Original test data

### Band Edge

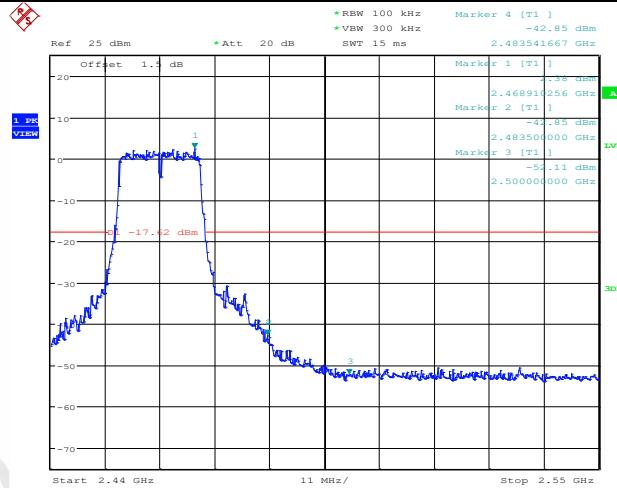


## 11g\_Ant1\_Low\_2412



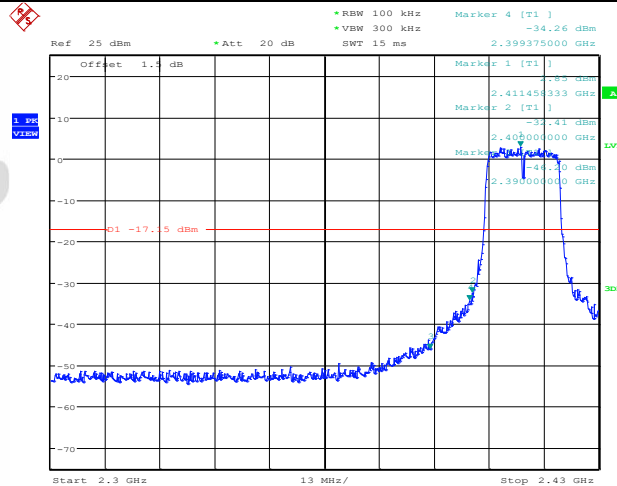
Date: 28.SEP.2021 09:33:45

## 11g\_Ant1\_High\_2462



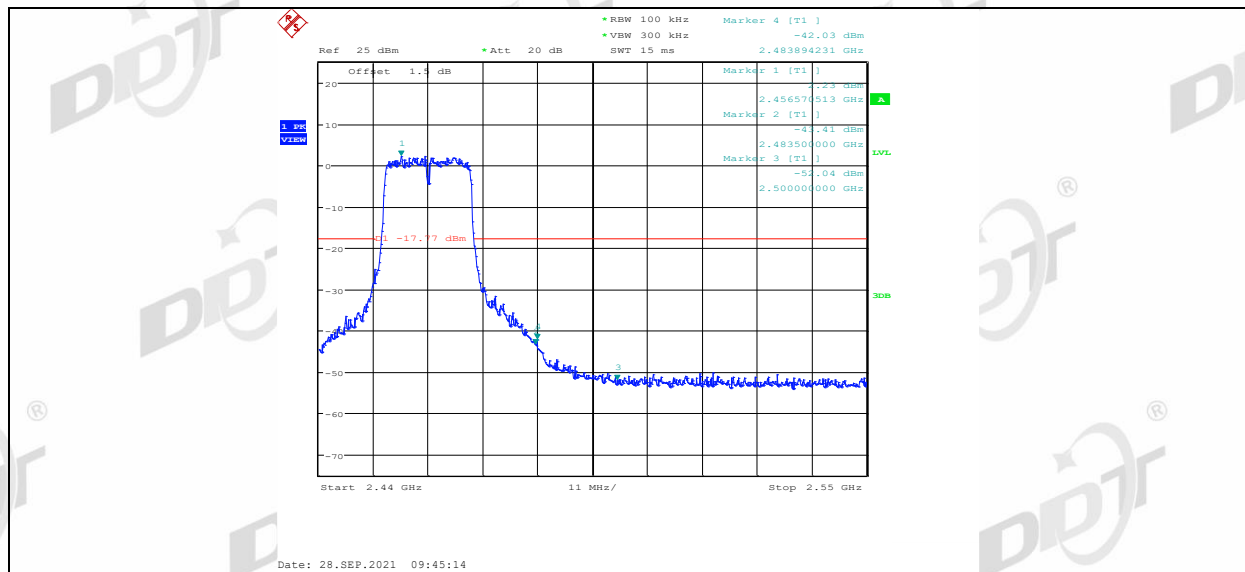
Date: 28.SEP.2021 09:38:34

## 11n20\_Ant1\_Low\_2412

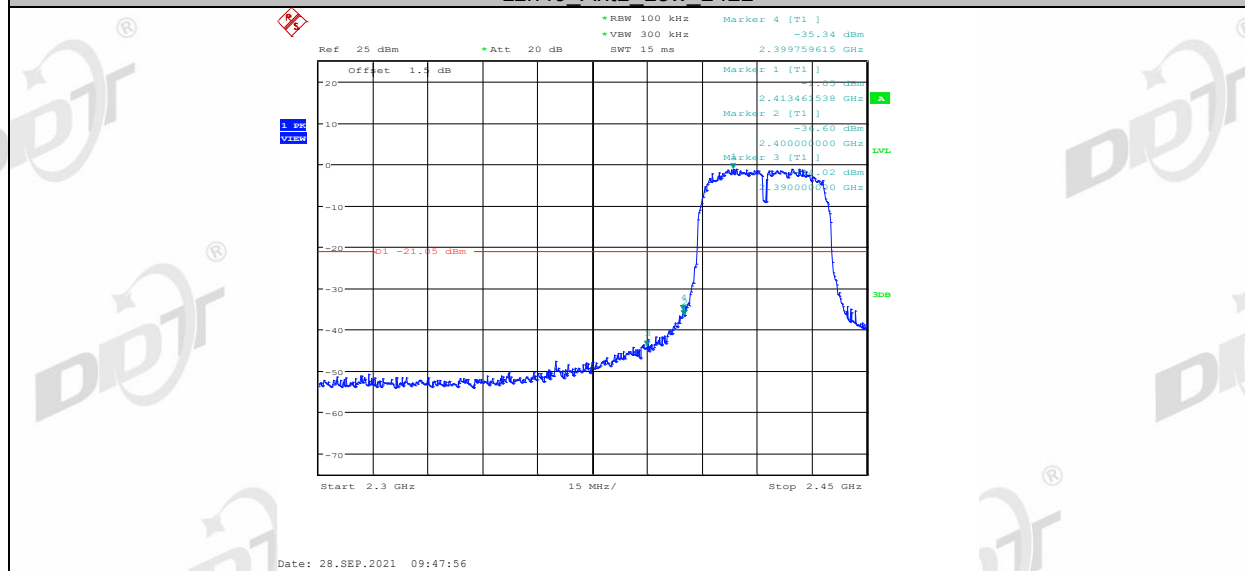


Date: 28.SEP.2021 09:41:16

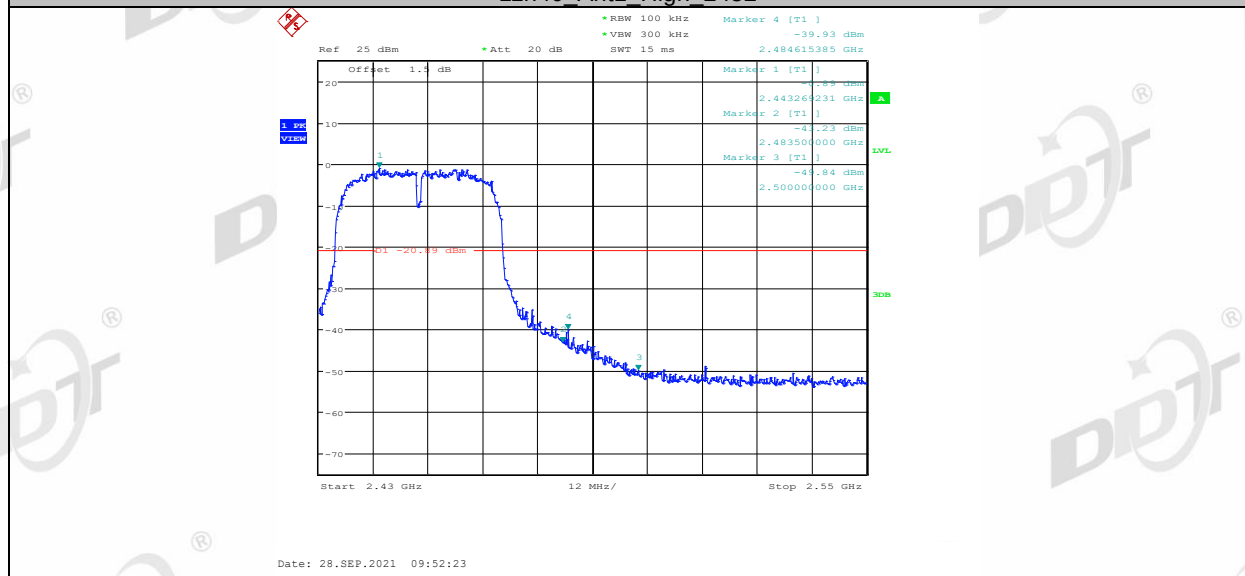
## 11n20\_Ant1\_High\_2462



11n40 Ant1 Low 2422

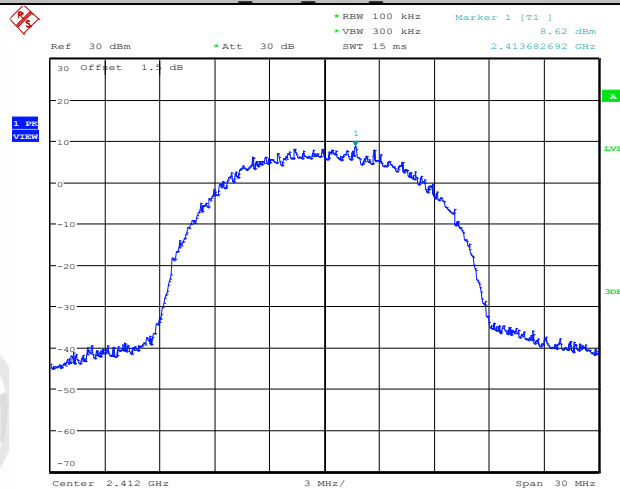


11n40 Ant1 High 2452



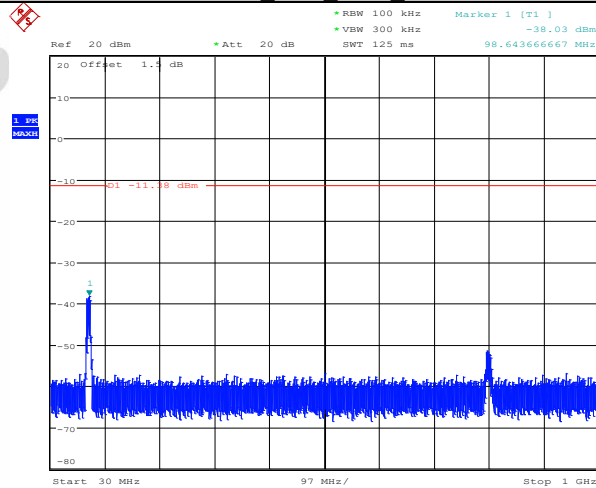
## Spurious Emissions

11b\_Ant1\_2412\_0~Reference



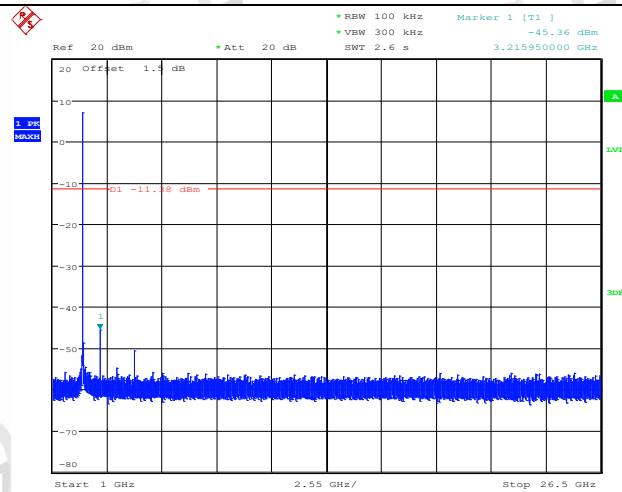
Date: 28.SEP.2021 09:27:56

11b\_Ant1\_2412\_30~1000



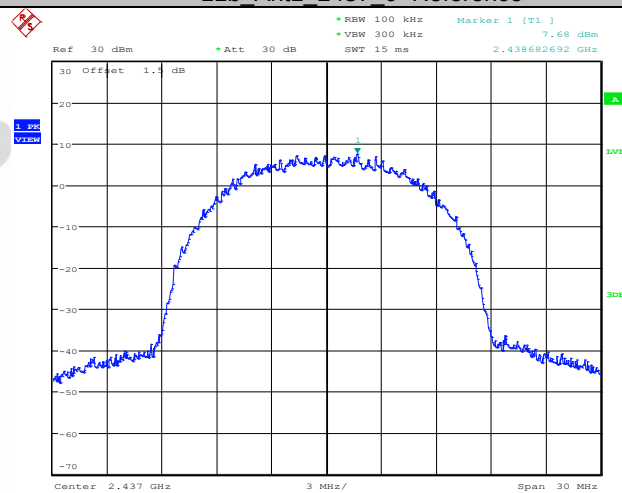
Date: 28.SEP.2021 09:28:01

11b\_Ant1\_2412\_1000~26500



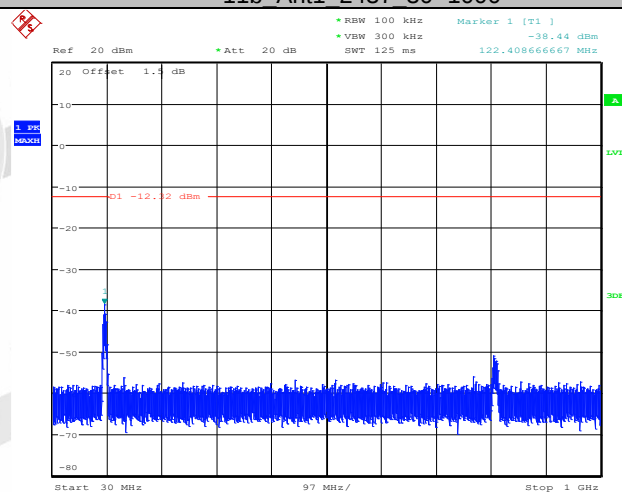
Date: 28.SEP.2021 09:28:24

## 11b Ant1 2437 0~Reference



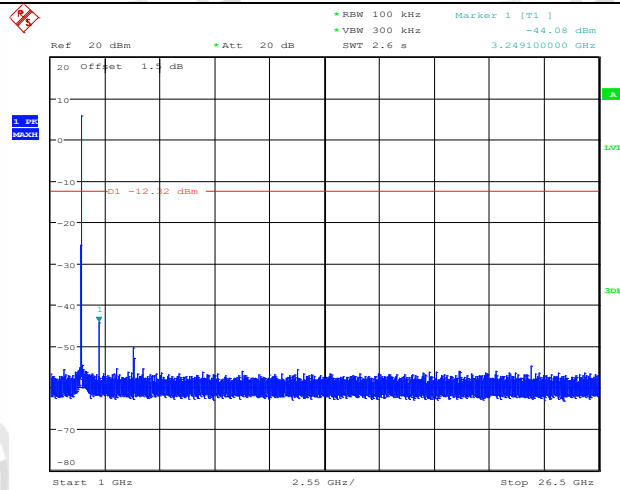
Date: 28.SEP.2021 09:30:19

## 11b Ant1 2437 30~1000



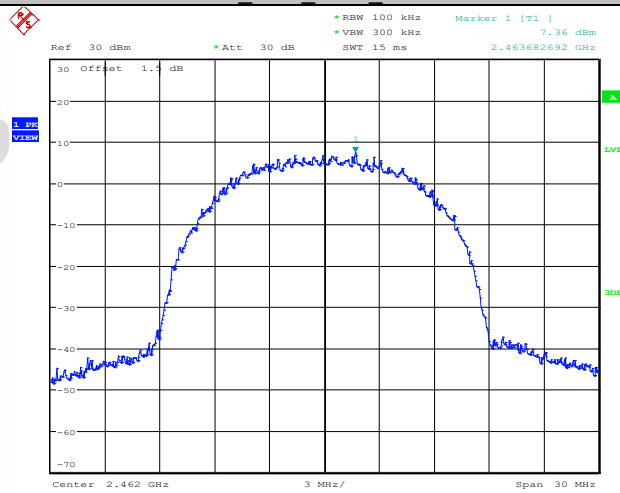
Date: 28.SEP.2021 09:30:25

## 11b Ant1 2437 1000~26500



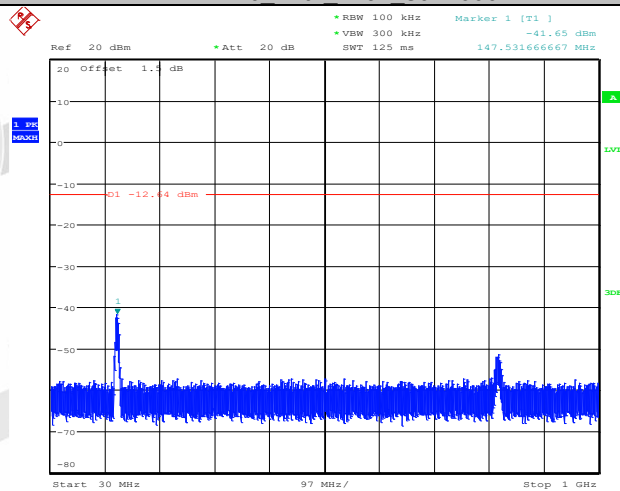
Date: 28.SEP.2021 09:30:47

## 11b\_Ant1\_2462\_0-Reference



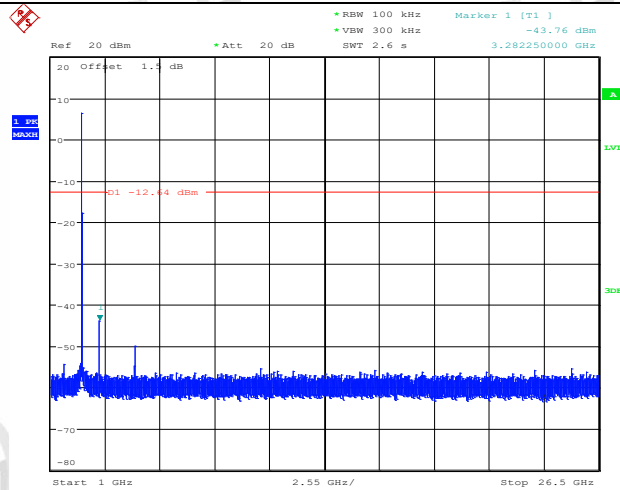
Date: 28.SEP.2021 09:32:06

## 11b\_Ant1\_2462\_30-1000



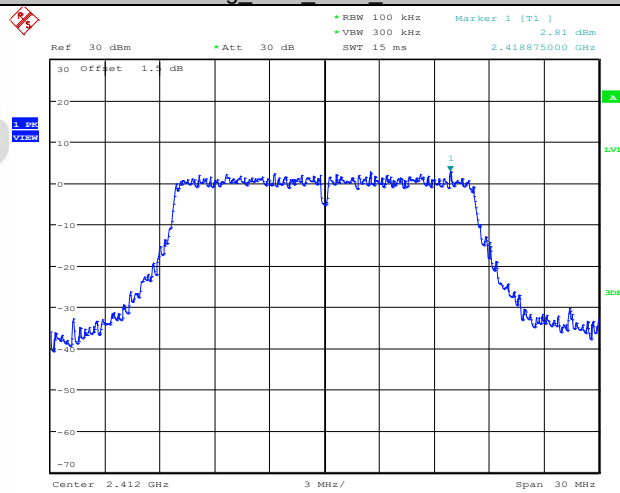
Date: 28.SEP.2021 09:32:11

## 11b\_Ant1\_2462\_1000-26500



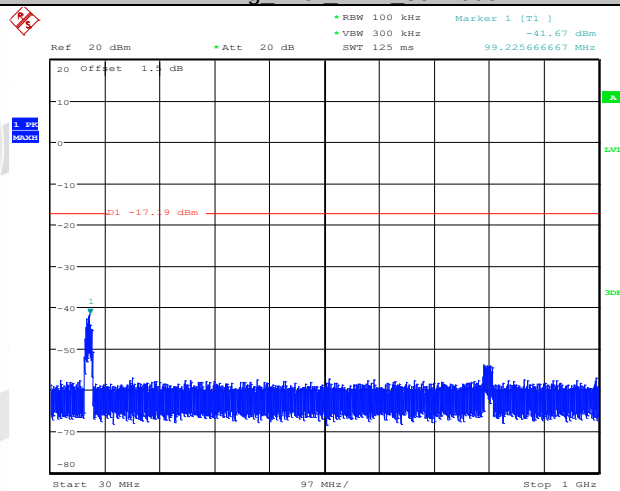
Date: 28.SEP.2021 09:32:34

## 11g\_Ant1\_2412\_0-Reference



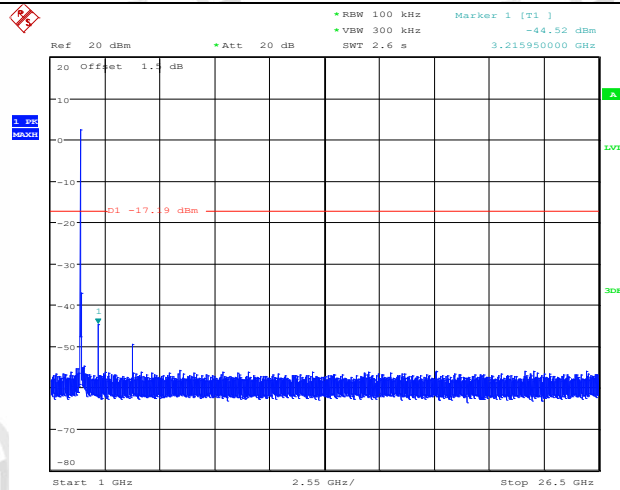
Date: 28.SEP.2021 09:33:53

## 11g\_Ant1\_2412\_30-1000



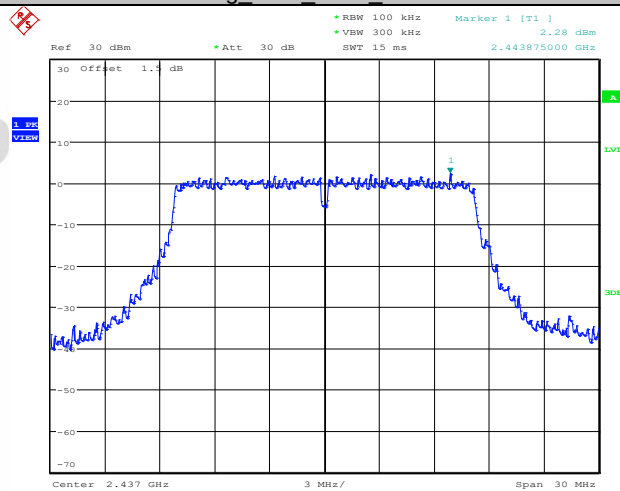
Date: 28.SEP.2021 09:33:59

## 11g\_Ant1\_2412\_1000-26500



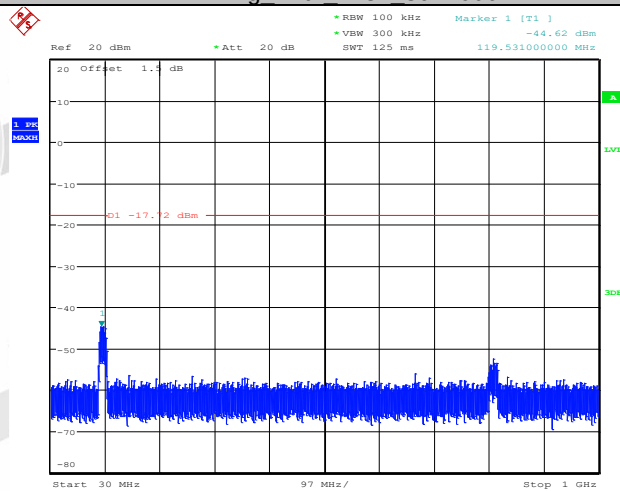
Date: 28.SEP.2021 09:34:21

## 11g\_Ant1\_2437\_0-Reference



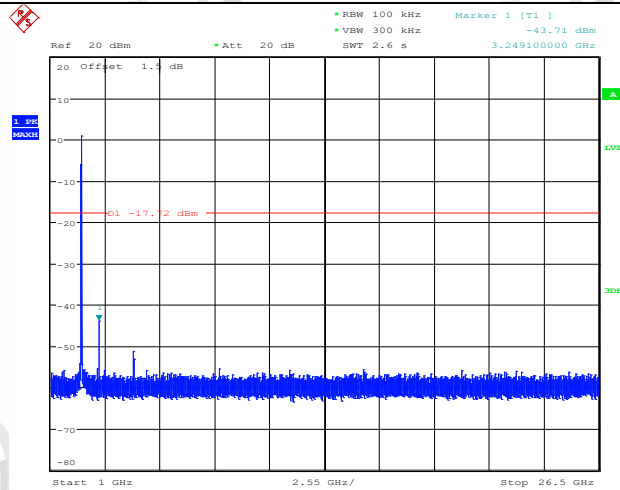
Date: 28.SEP.2021 09:36:28

## 11g\_Ant1\_2437\_30-1000



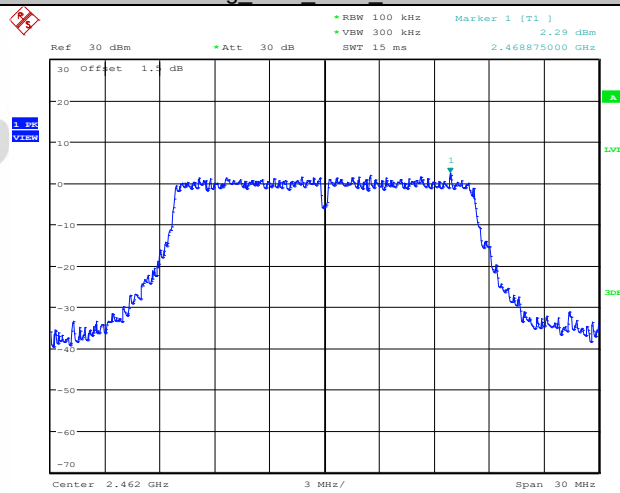
Date: 28.SEP.2021 09:36:34

## 11g\_Ant1\_2437\_1000-26500



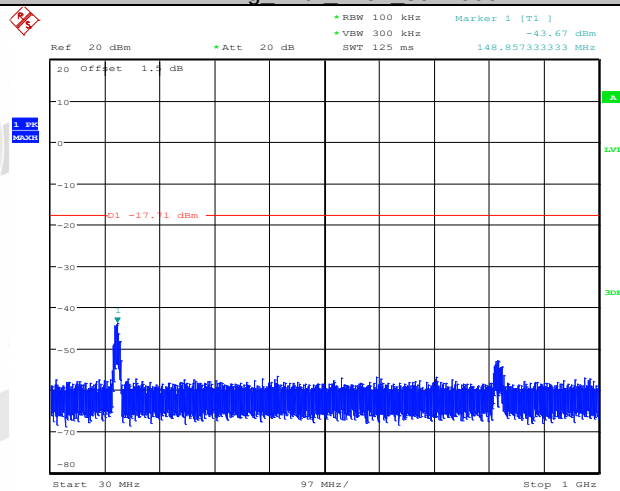
Date: 28.SEP.2021 09:36:56

## 11g\_Ant1\_2462\_0-Reference



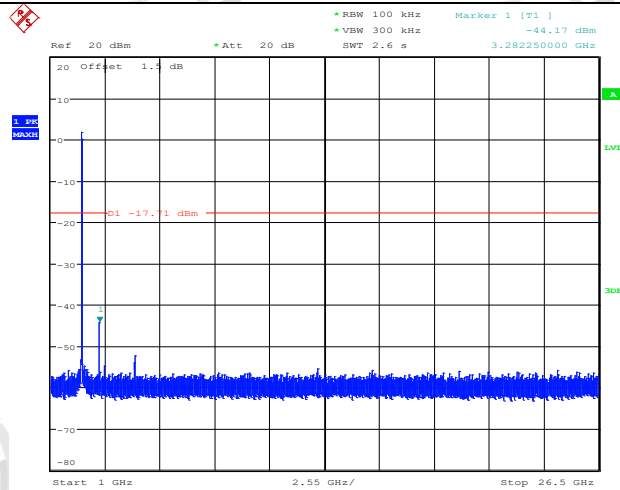
Date: 28.SEP.2021 09:38:42

## 11g\_Ant1\_2462\_30-1000



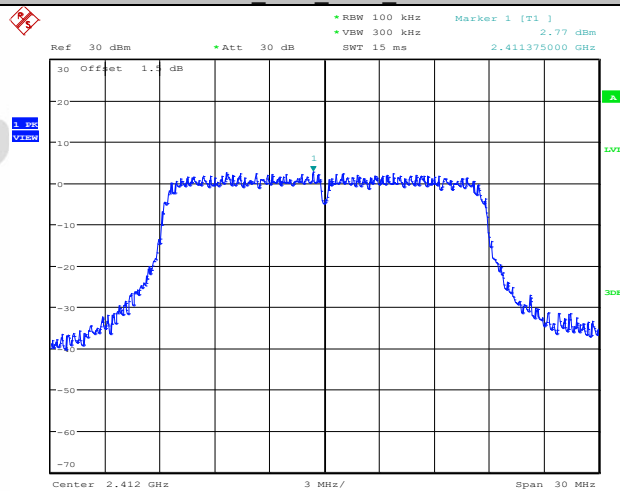
Date: 28.SEP.2021 09:38:48

## 11g\_Ant1\_2462\_1000-26500



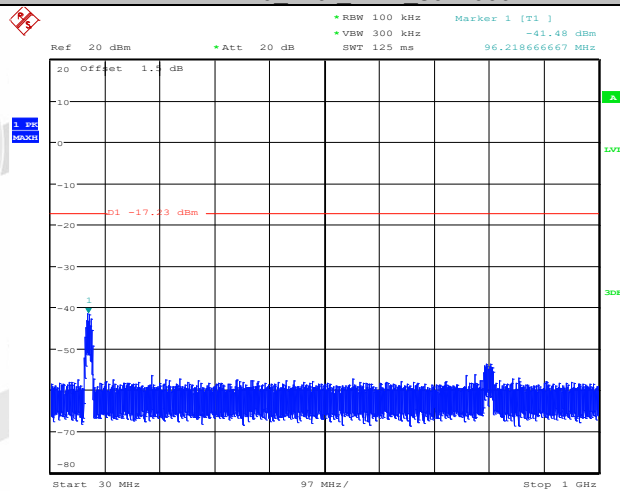
Date: 28.SEP.2021 09:39:10

## 11n20\_Ant1\_2412\_0-Reference



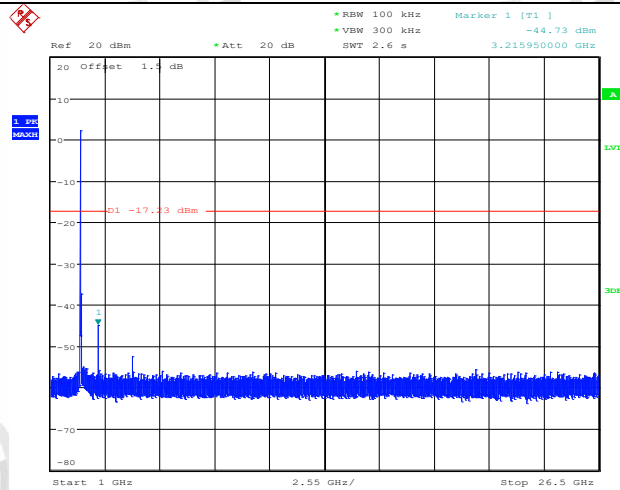
Date: 28.SEP.2021 09:41:24

## 11n20\_Ant1\_2412\_30~1000



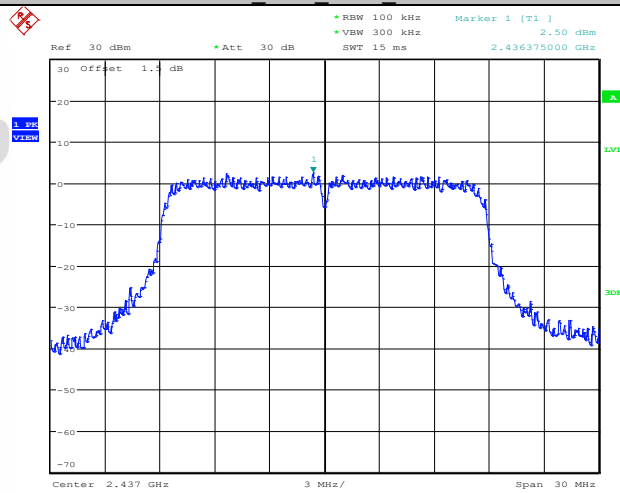
Date: 28.SEP.2021 09:41:29

## 11n20\_Ant1\_2412\_1000~26500



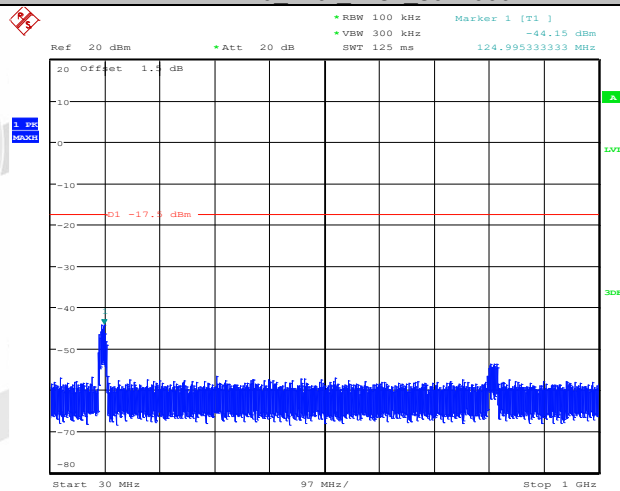
Date: 28.SEP.2021 09:41:52

## 11n20 Ant1 2437 0-Reference



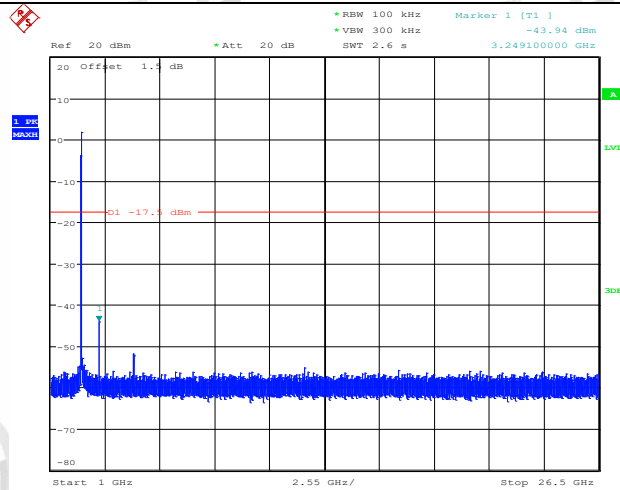
Date: 28.SEP.2021 09:43:33

## 11n20 Ant1 2437 30~1000



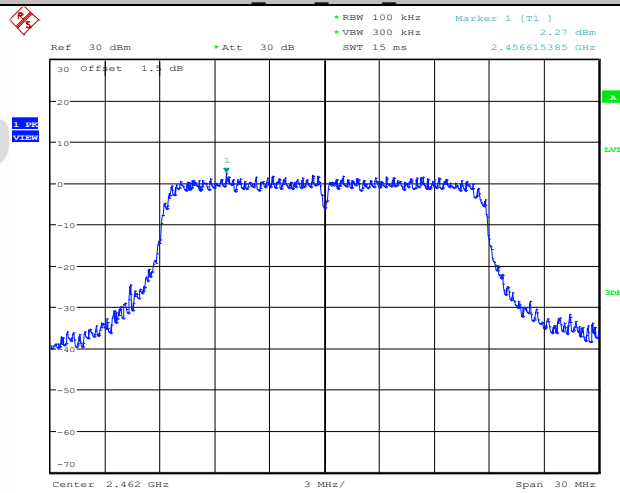
Date: 28.SEP.2021 09:43:39

## 11n20 Ant1 2437 1000~26500



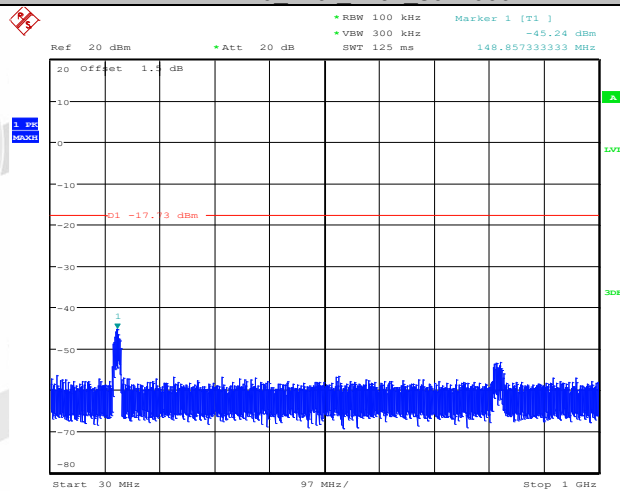
Date: 28.SEP.2021 09:44:01

## 11n20\_Ant1\_2462\_0-Reference



Date: 28.SEP.2021 09:45:22

## 11n20\_Ant1\_2462\_30~1000



Date: 28.SEP.2021 09:45:27

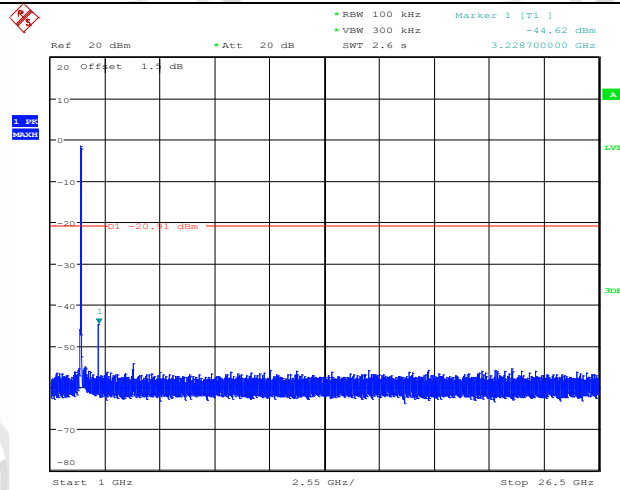
## 11n20\_Ant1\_2462\_1000~26500



Date: 28.SEP.2021 09:48:03

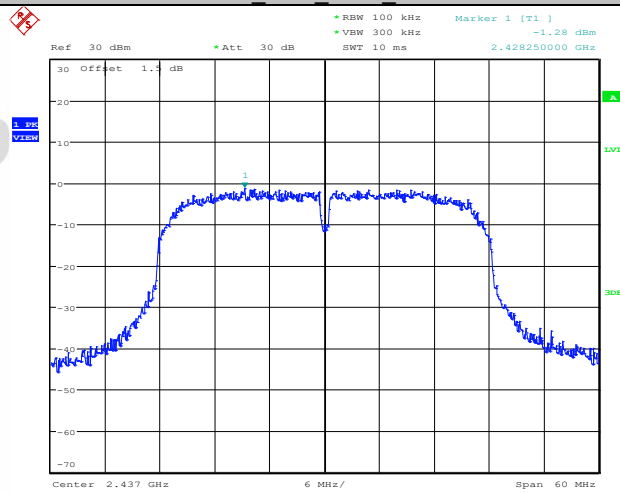
Date: 28.SEP.2021 09:48:09

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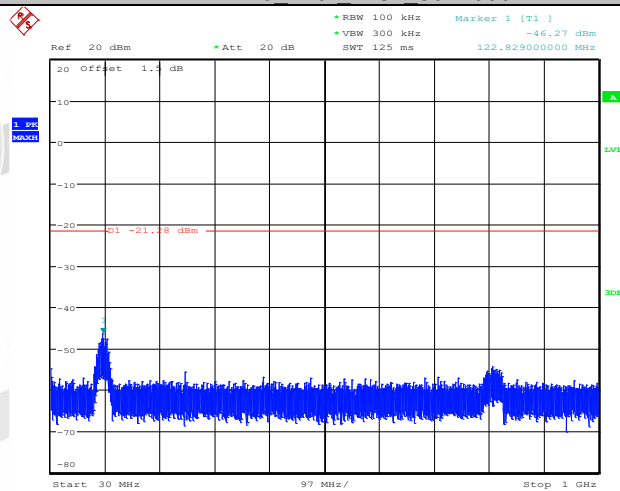
Date: 28.SEP.2021 09:48:31

## 11n40\_Ant1\_2437\_0-Reference



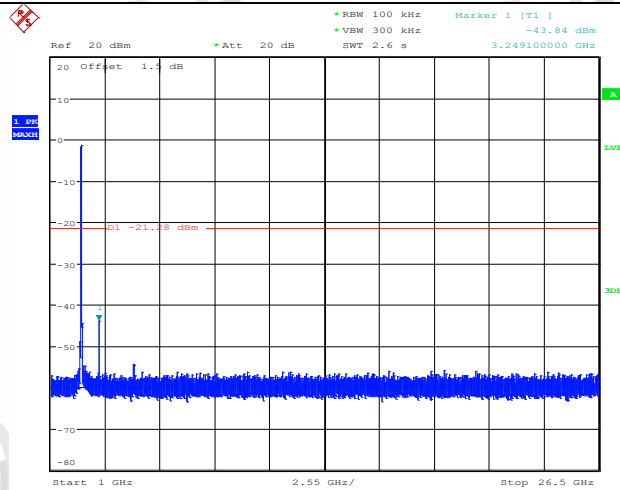
Date: 28.SEP.2021 09:50:19

## 11n40\_Ant1\_2437\_30~1000



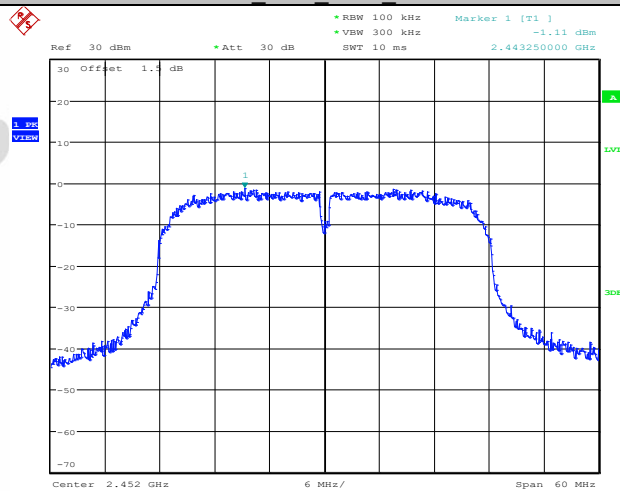
Date: 28.SEP.2021 09:50:24

## 11n40\_Ant1\_2437\_1000~26500



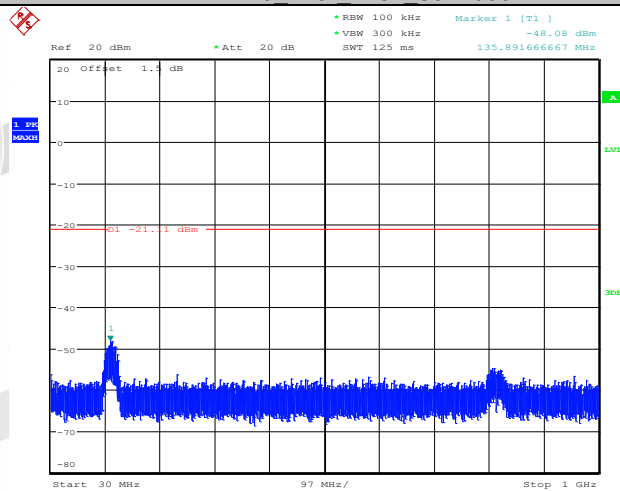
Date: 28.SEP.2021 09:50:47

## 11n40\_Ant1\_2452\_0-Reference



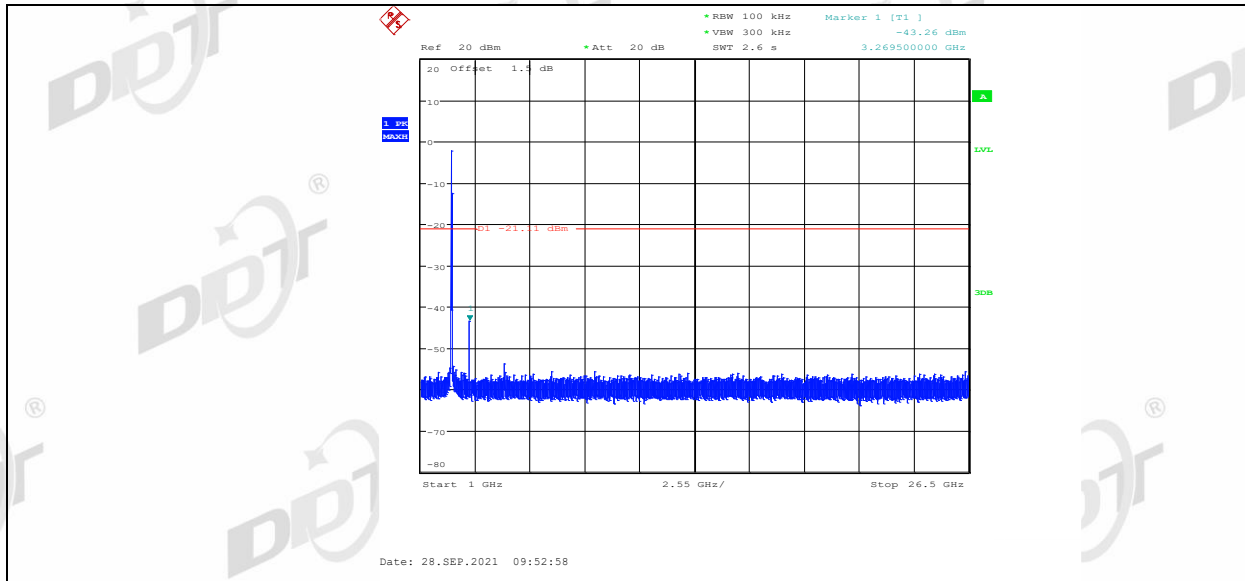
Date: 28.SEP.2021 09:52:30

## 11n40\_Ant1\_2452\_30~1000



Date: 28.SEP.2021 09:52:36

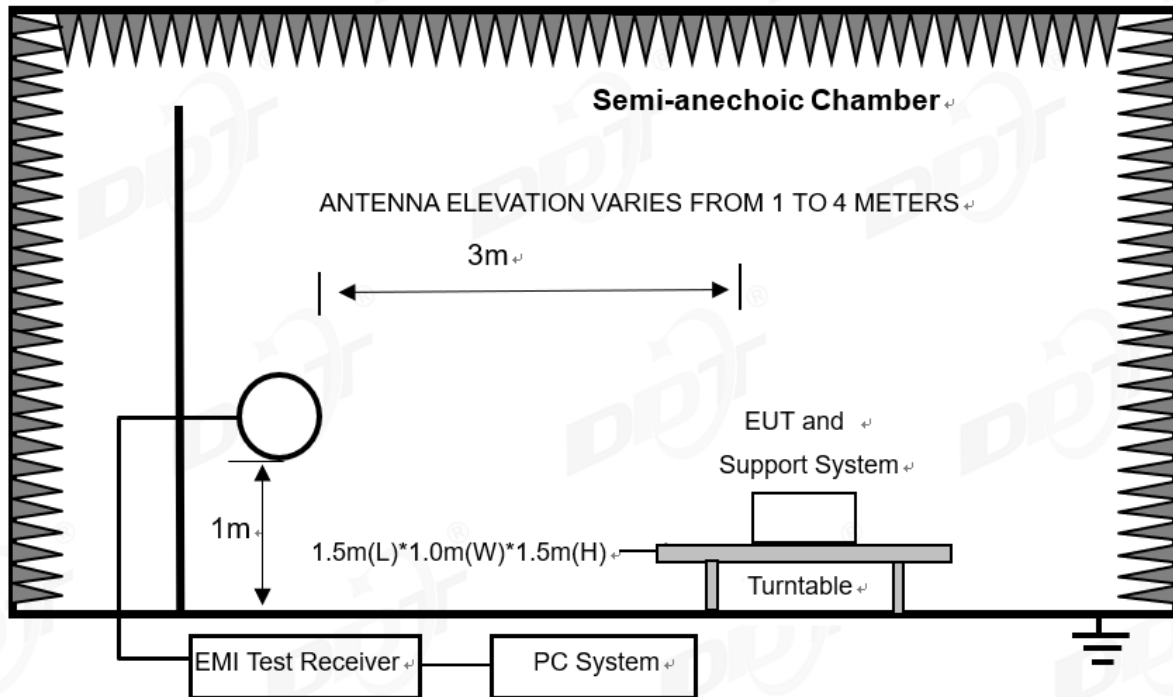
## 11n40\_Ant1\_2452\_1000~26500



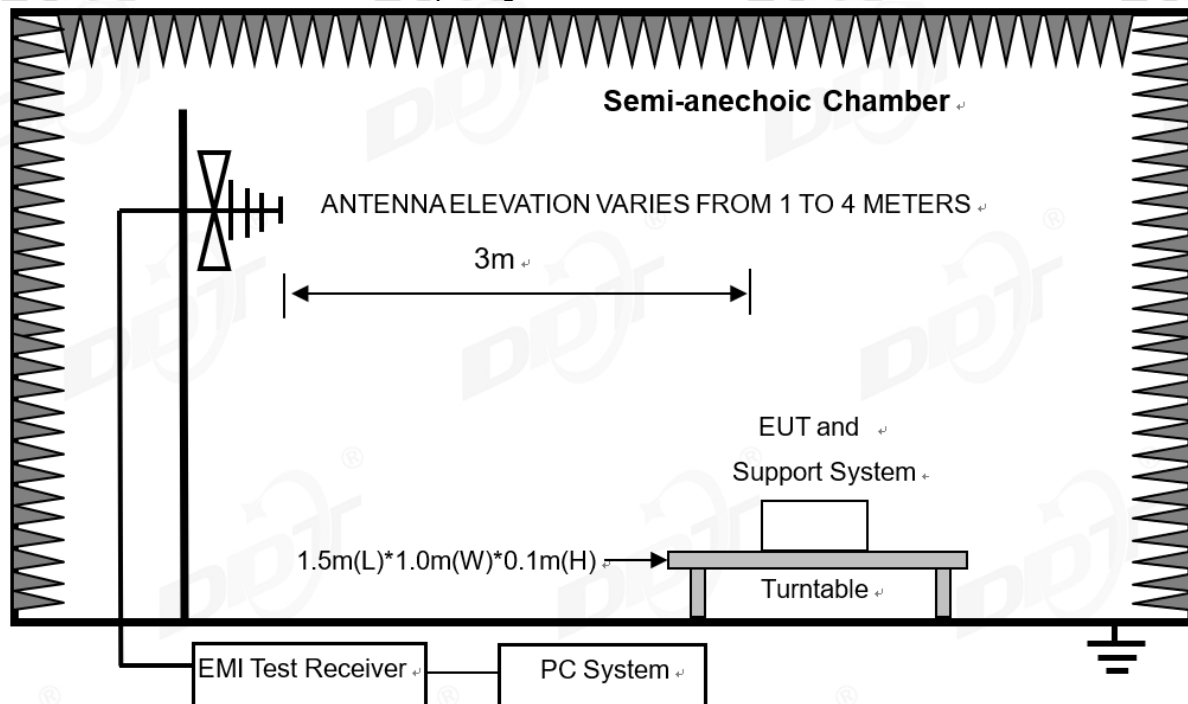
## 8. Radiated Spurious Emissions

### 8.1. Block diagram of test setup

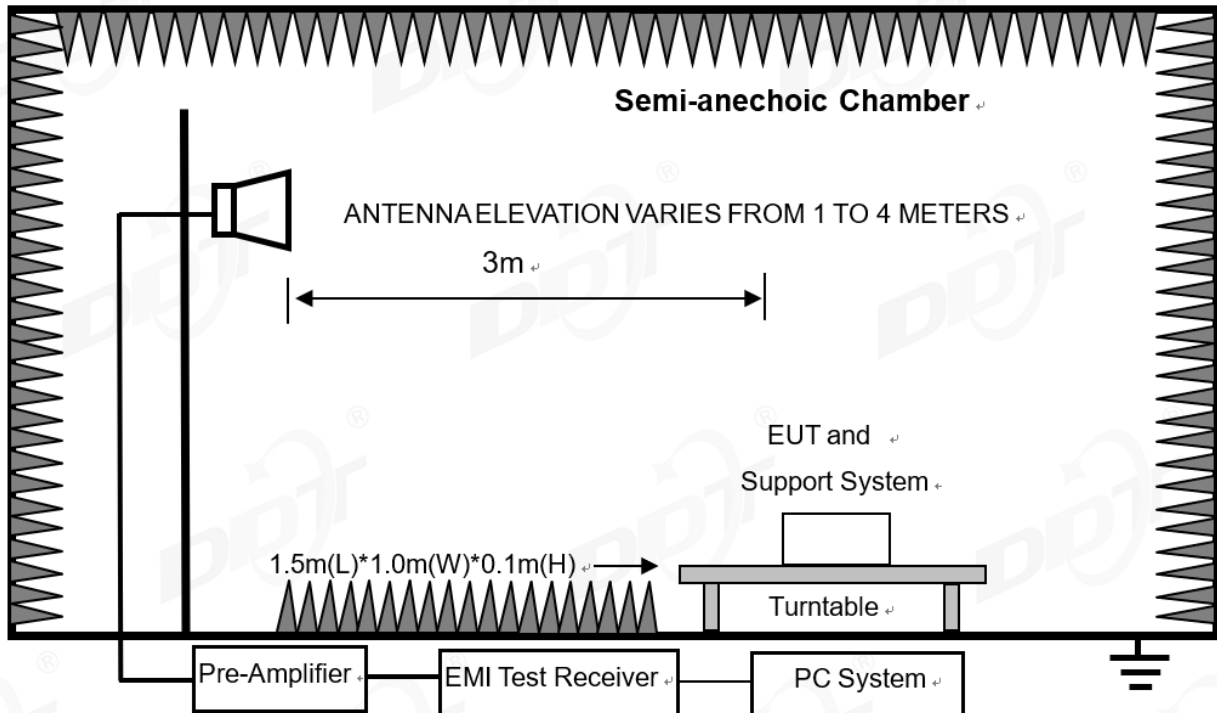
In 3m Anechoic Chamber Test Setup Diagram for 9 kHz-30 MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

## 8.2. Limit

- (1) FCC 15.205 Restricted frequency band
- (2)

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 10.495-0.505      | 16.69475-16.69525   | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.80425-16.80475   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.1772&4.17775    | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.2072&4.20775    | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | (2)         |
| 13.36-13.41       |                     |               |             |

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6

## RSS-Gen section 8.10 Restricted frequency bands\*

| MHz             | MHz                 | MHz           | GHz         |
|-----------------|---------------------|---------------|-------------|
| 0.090-0.110     | 12.51975-12.52025   | 240-285       | 3500-4400   |
| 0.495-0.505     | 12.57675-12.57725   | 322-335.4     | 4.5-5.15    |
| 2.1735-2.1905   | 13.36-13.41         | 399.9-410     | 5.35-5.46   |
| 3.020-3.026     | 16.42-16.423        | 608-614       | 7.25-7.75   |
| 4.125-4.128     | 16.69475-16.69525   | 960-1427      | 8.025-8.5   |
| 4.1772&4.17775  | 16.80425-16.80475   | 1435-1626.5   | 9.0-9.2     |
| 4.2072&4.20775  | 25.5-25.67          | 1645.5-1646.5 | 9.3-9.5     |
| 5.677-5.683     | 37.5-38.25          | 1660-1710     | 10.6-12.7   |
| 6.215-6.218     | 73-74.6             | 1718.8-1722.2 | 13.25-13.4  |
| 6.26775-6.26825 | 74.8-75.2           | 2200-2300     | 14.47-14.5  |
| 6.31175-6.31225 | 108-138             | 2310-2390     | 15.35-16.2  |
| 8.291-8.294     | 149.9-150.05        | 2483.5-2500   | 17.7-21.4   |
| 8.362-8.366     | 156.52475-156.52525 | 2655-2900     | 22.01-23.12 |
| 8.37625-8.38675 | 156.7-156.9         | 3260-3267     | 23.6-24.0   |
| 8.41425-8.41475 | 162.0125-167.17     | 3332-3339     | 31.2-31.8   |
| 12.29-12.293    | 167.72-173.2        | 3345.8-3358   | 36.43-36.5  |
|                 |                     |               | Above 38.6  |

\* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

## (2) FCC 15.209 Limit &amp; RSS-Gen section 8.9 Limit

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT                           |               |
|------------------|--------------------|-------------------------------------------------|---------------|
|                  |                    | μV/m                                            | dB(μV)/m      |
| 0.009 ~ 0.490    | 300                | 2400/F(kHz)                                     | 67.6-20log(F) |
| 0.490 ~ 1.705    | 30                 | 24000/F(kHz)                                    | 87.6-20log(F) |
| 1.705 ~ 30.0     | 30                 | 30                                              | 29.54         |
| 30 ~ 88          | 3                  | 100                                             | 40.0          |
| 88 ~ 216         | 3                  | 150                                             | 43.5          |
| 216 ~ 960        | 3                  | 200                                             | 46.0          |
| 960 ~ 1000       | 3                  | 500                                             | 54.0          |
| Above 1000       | 3                  | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) |               |

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3m}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30m}(\text{dB}\mu\text{V}/\text{m}) + 40\text{Log}(30m/3m)$$

## (3) Limit for this EUT

The emissions appearing within 15.205 restricted frequency bands shall not exceed the limits

shown in 15.209, and the emissions appearing within RSS-Gen section 8.10 Restricted frequency bands shall not exceed the limits shown in RSS-Gen section 8.9, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits and RSS-Gen section 8.9 limits.

### 8.3. Test Procedure

- (1) EUT height should be 0 m for below 1 GHz at a semi-anechoic chamber while EUT height should be 0 m for above 1 GHz at full chamber or semi-anechoic chamber ground with absorbers.
- (2) The antenna used as below table.

| Test frequency range | Test antenna used                      | Measuring distance |
|----------------------|----------------------------------------|--------------------|
| 9 kHz-30 MHz         | Active Loop antenna                    | 3 m                |
| 30 MHz-1 GHz         | Trilog Broadband Antenna               | 3 m                |
| 1 GHz-18 GHz         | Double Ridged Horn Antenna(1GHz-18GHz) | 3 m                |
| 18 GHz-40 GHz        | Horn Antenna(18GHz-40GHz)              | 1 m                |

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30 MHz, the Trilog Broadband Antenna or Horn Antenna was located 3 m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

- (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1m above ground.)

- (b) Change work frequency or channel of device if practicable.

- (c) Change modulation type of device if practicable.

- (d) Change power supply range from 85% to 115% of the rated supply voltage

- (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was

investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9kHz to 18GHz.

- (4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.
- (5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9-90 kHz, 110-490 kHz, for emissions from 9 kHz-90 kHz, 110 kHz-490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.
- (6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW

| Frequency band | RBW     |
|----------------|---------|
| 9 kHz-150 kHz  | 200 Hz  |
| 150 kHz-30 MHz | 9 kHz   |
| 30 MHz-1 GHz   | 120 kHz |

- (7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; RMS detector RBW 1 MHz VBW 10 Hz for Average measure (according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure).

#### 8.4. Test result

##### **PASS. (See below detailed test result)**

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits and RSS-Gen section 8.9 limits.

Note1: According exploratory test no any obvious emission was detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in 11B, Tx CH6 mode.

## Radiated Emission test (below 1GHz)

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\ZCB\FCC BELOW 1G\FCC BELOW 1G\_00003.EMI

Test Date : 2021-09-24

Tested By : Kennys

EUT : AI Delivery Robot

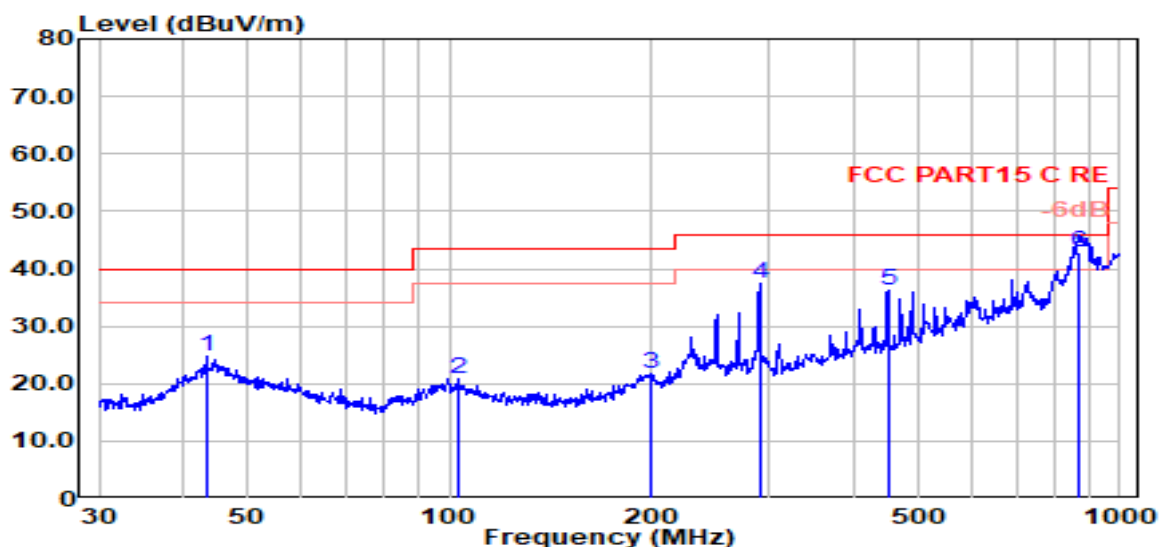
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : Tx mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa Antenna/Distance : VLUB 9163 3#/3m/HORIZONTAL

Memo : 2.4GWIFI



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 43.35          | 6.50                    | 14.61                       | 3.65                | 24.77                       | 40.00                     | -15.23                | QP       | HORIZONTAL   |
| 2              | 102.72         | 5.54                    | 11.53                       | 3.90                | 20.97                       | 43.50                     | -22.53                | QP       | HORIZONTAL   |
| 3              | 199.29         | 5.42                    | 11.97                       | 4.35                | 21.73                       | 43.50                     | -21.77                | QP       | HORIZONTAL   |
| 4              | 290.02         | 19.72                   | 13.00                       | 4.67                | 37.39                       | 46.00                     | -8.61                 | QP       | HORIZONTAL   |
| 5              | 451.14         | 15.13                   | 15.80                       | 5.21                | 36.14                       | 46.00                     | -9.86                 | QP       | HORIZONTAL   |
| 6              | 869.13         | 15.04                   | 21.48                       | 6.31                | 42.83                       | 46.00                     | -3.17                 | QP       | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\ZCB\FCC BELOW 1G\FCC BELOW 1G\_00004.EMI

Test Date : 2021-09-24

Tested By : Kennys

EUT : AI Delivery Robot

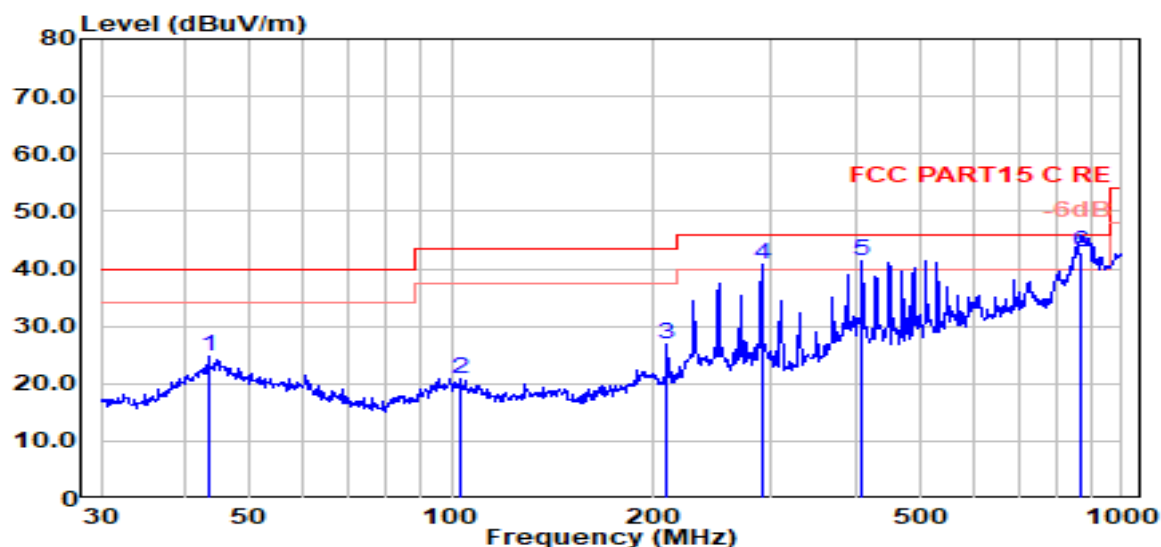
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : Tx mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa Antenna/Distance : VLUB 9163 3#/3m/VERTICAL

Memo : 2.4GWIFI



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 43.35          | 6.50                    | 14.61                       | 3.65                | 24.77                       | 40.00                     | -15.23                | QP       | VERTICAL     |
| 2              | 102.72         | 5.54                    | 11.53                       | 3.90                | 20.97                       | 43.50                     | -22.53                | QP       | VERTICAL     |
| 3              | 210.05         | 11.63                   | 10.90                       | 4.38                | 26.92                       | 43.50                     | -16.58                | QP       | VERTICAL     |
| 4              | 290.02         | 23.20                   | 13.00                       | 4.67                | 40.87                       | 46.00                     | -5.13                 | QP       | VERTICAL     |
| 5              | 410.38         | 20.45                   | 15.81                       | 5.08                | 41.34                       | 46.00                     | -4.66                 | QP       | VERTICAL     |
| 6              | 869.13         | 15.04                   | 21.48                       | 6.31                | 42.83                       | 46.00                     | -3.17                 | QP       | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

**Radiated Emission test (above 1GHz)**

| Freq (MHz)      | Read level (dBμV) | Antenna Factor (dB/m) | PRM Factor(dB) | Cable Loss (dB) | Result Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector type | Polarization |
|-----------------|-------------------|-----------------------|----------------|-----------------|-----------------------|----------------|-------------|---------------|--------------|
| <b>11b CH1</b>  |                   |                       |                |                 |                       |                |             |               |              |
| 4824.00         | 52.22             | 31.38                 | 2.77           | 40.36           | 46.00                 | 54.00          | -8.00       | Average       | HORIZONTAL   |
| 4824.00         | 60.30             | 31.38                 | 2.77           | 40.36           | 54.08                 | 74.00          | -19.92      | Peak          | HORIZONTAL   |
| 8106.00         | 47.67             | 37.14                 | 3.53           | 39.81           | 48.53                 | 74.00          | -25.47      | Peak          | HORIZONTAL   |
| 11591.00        | 46.33             | 39.79                 | 4.16           | 40.14           | 50.15                 | 74.00          | -23.85      | Peak          | HORIZONTAL   |
| 14498.00        | 45.08             | 41.80                 | 4.61           | 39.65           | 51.84                 | 74.00          | -22.16      | Peak          | HORIZONTAL   |
| 16402.00        | 46.00             | 38.66                 | 4.88           | 39.98           | 49.56                 | 74.00          | -24.44      | Peak          | HORIZONTAL   |
| 17983.00        | 34.85             | 48.97                 | 5.08           | 40.69           | 48.21                 | 54.00          | -5.79       | Average       | HORIZONTAL   |
| 17983.00        | 40.85             | 48.97                 | 5.08           | 40.69           | 54.21                 | 74.00          | -19.79      | Peak          | HORIZONTAL   |
| 4824.00         | 50.39             | 31.38                 | 2.77           | 40.36           | 44.17                 | 54.00          | -9.83       | Average       | VERTICAL     |
| 4824.00         | 59.32             | 31.38                 | 2.77           | 40.36           | 53.10                 | 74.00          | -20.90      | Peak          | VERTICAL     |
| 7273.00         | 48.17             | 36.26                 | 3.48           | 39.73           | 48.18                 | 74.00          | -25.82      | Peak          | VERTICAL     |
| 10622.00        | 46.50             | 39.92                 | 4.03           | 40.35           | 50.10                 | 74.00          | -23.90      | Peak          | VERTICAL     |
| 13478.00        | 46.96             | 39.95                 | 4.39           | 40.07           | 51.23                 | 74.00          | -22.77      | Peak          | VERTICAL     |
| 16742.00        | 44.16             | 39.67                 | 4.93           | 40.05           | 48.71                 | 74.00          | -25.29      | Peak          | VERTICAL     |
| 17983.00        | 35.51             | 48.97                 | 5.08           | 40.69           | 48.88                 | 54.00          | -5.12       | Average       | VERTICAL     |
| 17983.00        | 40.51             | 48.97                 | 5.08           | 40.69           | 53.88                 | 74.00          | -20.12      | Peak          | VERTICAL     |
| <b>11b CH6</b>  |                   |                       |                |                 |                       |                |             |               |              |
| 4876.00         | 51.84             | 31.50                 | 2.78           | 40.38           | 45.75                 | 54.00          | -8.25       | Average       | HORIZONTAL   |
| 4876.00         | 60.85             | 31.50                 | 2.78           | 40.38           | 54.76                 | 74.00          | -19.24      | Peak          | HORIZONTAL   |
| 7562.00         | 47.80             | 36.94                 | 3.48           | 39.76           | 48.46                 | 74.00          | -25.54      | Peak          | HORIZONTAL   |
| 10469.00        | 45.46             | 39.83                 | 4.02           | 40.41           | 48.90                 | 74.00          | -25.10      | Peak          | HORIZONTAL   |
| 13257.00        | 45.93             | 39.47                 | 4.40           | 40.22           | 49.58                 | 74.00          | -24.42      | Peak          | HORIZONTAL   |
| 16759.00        | 44.03             | 39.73                 | 4.93           | 40.05           | 48.64                 | 74.00          | -25.36      | Peak          | HORIZONTAL   |
| 17881.00        | 38.39             | 47.58                 | 5.05           | 40.63           | 50.39                 | 54.00          | -3.61       | Average       | HORIZONTAL   |
| 17881.00        | 41.57             | 47.58                 | 5.05           | 40.63           | 53.58                 | 74.00          | -20.42      | Peak          | HORIZONTAL   |
| 4876.00         | 56.49             | 31.50                 | 2.78           | 40.38           | 50.40                 | 54.00          | -3.60       | Average       | VERTICAL     |
| 4876.00         | 59.38             | 31.50                 | 2.78           | 40.38           | 53.28                 | 74.00          | -20.72      | Peak          | VERTICAL     |
| 7545.00         | 47.82             | 36.93                 | 3.48           | 39.75           | 48.47                 | 74.00          | -25.53      | Peak          | VERTICAL     |
| 9755.00         | 46.84             | 38.75                 | 3.75           | 40.43           | 48.91                 | 74.00          | -25.09      | Peak          | VERTICAL     |
| 11897.00        | 46.81             | 39.42                 | 4.27           | 40.11           | 50.40                 | 74.00          | -23.60      | Peak          | VERTICAL     |
| 14634.00        | 44.79             | 41.48                 | 4.64           | 39.64           | 51.27                 | 74.00          | -22.73      | Peak          | VERTICAL     |
| 17762.00        | 39.73             | 45.96                 | 5.01           | 40.56           | 50.15                 | 54.00          | -3.85       | Average       | VERTICAL     |
| 17762.00        | 42.40             | 45.96                 | 5.01           | 40.56           | 52.82                 | 74.00          | -21.18      | Peak          | VERTICAL     |
| <b>11b CH11</b> |                   |                       |                |                 |                       |                |             |               |              |
| 4924.00         | 53.81             | 31.62                 | 2.79           | 40.38           | 47.83                 | 54.00          | -6.17       | Average       | HORIZONTAL   |
| 4927.00         | 64.23             | 31.62                 | 2.79           | 40.39           | 58.26                 | 74.00          | -15.74      | Peak          | HORIZONTAL   |
| 7902.00         | 47.27             | 37.14                 | 3.51           | 39.79           | 48.13                 | 74.00          | -25.87      | Peak          | HORIZONTAL   |
| 10605.00        | 46.22             | 39.92                 | 4.03           | 40.36           | 49.82                 | 74.00          | -24.18      | Peak          | HORIZONTAL   |
| 13631.00        | 46.88             | 40.24                 | 4.43           | 39.96           | 51.59                 | 74.00          | -22.41      | Peak          | HORIZONTAL   |
| 17014.00        | 44.08             | 40.55                 | 4.96           | 40.11           | 49.48                 | 74.00          | -24.52      | Peak          | HORIZONTAL   |
| 17796.00        | 39.93             | 46.43                 | 5.02           | 40.58           | 50.80                 | 54.00          | -3.20       | Average       | HORIZONTAL   |
| 17796.00        | 42.47             | 46.43                 | 5.02           | 40.58           | 53.34                 | 74.00          | -20.66      | Peak          | HORIZONTAL   |
| 4924.00         | 53.81             | 31.62                 | 2.79           | 40.38           | 47.83                 | 54.00          | -6.17       | Average       | VERTICAL     |

|          |       |       |       |       |       |       |        |         |          |
|----------|-------|-------|-------|-------|-------|-------|--------|---------|----------|
| 7885.00  | 46.54 | 37.72 | 42.38 | 8.68  | 50.56 | 74.00 | -23.44 | Peak    | VERTICAL |
| 10469.00 | 45.84 | 39.55 | 42.54 | 10.36 | 53.21 | 74.00 | -20.79 | Peak    | VERTICAL |
| 14141.00 | 43.63 | 41.44 | 42.38 | 12.22 | 54.91 | 74.00 | -19.09 | Peak    | VERTICAL |
| 14141.00 | 35.17 | 41.44 | 42.38 | 12.22 | 46.45 | 54.00 | -7.55  | Average | VERTICAL |
| 16181.00 | 42.49 | 39.76 | 42.28 | 12.84 | 52.81 | 74.00 | -21.19 | Peak    | VERTICAL |
| 17881.00 | 41.89 | 47.50 | 42.47 | 14.35 | 61.27 | 74.00 | -12.73 | Peak    | VERTICAL |
| 17881.00 | 30.67 | 47.50 | 42.47 | 14.35 | 50.05 | 54.00 | -3.95  | Average | VERTICAL |

Note: 1.30MHz~25GHz: (For only the module 3, we scan with 11b mode, 11g mode, 11n HT20 mode and 11n HT40 mode, the worst case is 11b mode)

2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

| Freq (MHz)                             | Read level (dBμV) | Antenna Factor (dB/m) | PRM Factor(dB) | Cable Loss (dB) | Result Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector type | Polarization |
|----------------------------------------|-------------------|-----------------------|----------------|-----------------|-----------------------|----------------|-------------|---------------|--------------|
| <b>11b CH1 &amp; 11n HT20 MIMO CH1</b> |                   |                       |                |                 |                       |                |             |               |              |
| 4804.00                                | 53.16             | 31.33                 | 2.76           | 40.36           | 46.89                 | 54.00          | -7.11       | Average       | HORIZONTAL   |
| 4804.00                                | 60.18             | 31.33                 | 2.76           | 40.36           | 53.91                 | 74.00          | -20.09      | Peak          | HORIZONTAL   |
| 7443.00                                | 48.03             | 36.74                 | 3.48           | 39.74           | 48.51                 | 74.00          | -25.49      | Peak          | HORIZONTAL   |
| 9976.00                                | 47.63             | 38.80                 | 3.79           | 40.58           | 49.64                 | 74.00          | -24.36      | Peak          | HORIZONTAL   |
| 11812.00                               | 46.79             | 39.53                 | 4.24           | 40.12           | 50.44                 | 74.00          | -23.56      | Peak          | HORIZONTAL   |
| 14617.00                               | 46.21             | 41.52                 | 4.64           | 39.64           | 52.73                 | 74.00          | -21.27      | Peak          | HORIZONTAL   |
| 18000.00                               | 36.13             | 49.20                 | 5.09           | 40.70           | 49.72                 | 54.00          | -4.28       | Average       | HORIZONTAL   |
| 18000.00                               | 43.18             | 49.20                 | 5.09           | 40.70           | 56.77                 | 74.00          | -17.23      | Peak          | HORIZONTAL   |
| 4804.00                                | 52.15             | 31.33                 | 2.76           | 40.36           | 45.88                 | 54.00          | -8.12       | Average       | VERTICAL     |
| 4804.00                                | 60.43             | 31.33                 | 2.76           | 40.36           | 54.16                 | 74.00          | -19.84      | Peak          | VERTICAL     |
| 7273.00                                | 48.17             | 36.26                 | 3.48           | 39.73           | 48.18                 | 74.00          | -25.82      | Peak          | VERTICAL     |
| 9738.00                                | 47.20             | 38.75                 | 3.74           | 40.42           | 49.28                 | 74.00          | -24.72      | Peak          | VERTICAL     |
| 12016.00                               | 47.43             | 39.28                 | 4.31           | 40.10           | 50.92                 | 74.00          | -23.08      | Peak          | VERTICAL     |
| 14651.00                               | 46.03             | 41.44                 | 4.65           | 39.63           | 52.48                 | 74.00          | -21.52      | Peak          | VERTICAL     |
| 18000.00                               | 35.74             | 49.20                 | 5.09           | 40.70           | 49.33                 | 54.00          | -4.67       | Average       | VERTICAL     |

Note: 1.30MHz~25GHz: (For simultaneous transmission of multiple channels and mode in the 2.4G WIFI of module 3 and 2.4G WIFI of module 2, no noticeable emission. For module 3, we scan with 11b mode, 11g mode, 11n HT20 mode and 11n HT40 mode; for module 2, we scan with 11b mode ANT 1 and ANT 2, 11g mode ANT 1 and ANT 2, 11n HT20 mode ANT 1 and ANT 2, 11n HT40 mode ANT 1 and ANT 2; the the worst case is 11b mode of module 3 and 11 n HT20 MIMO of module 2)

2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

| Freq<br>(MHz)                              | Read<br>level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | PRM<br>Factor(dB) | Cable<br>Loss<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>(dBμV/m) | Margin<br>(dB) | Detector<br>type | Polarization |
|--------------------------------------------|-------------------------|-----------------------------|-------------------|-----------------------|-----------------------------|-------------------|----------------|------------------|--------------|
| <b>11b CH1&amp; 11n20 MIMO(WLAN) CH36</b>  |                         |                             |                   |                       |                             |                   |                |                  |              |
| 9211.00                                    | 46.94                   | 38.18                       | 3.67              | 40.05                 | 48.74                       | 74.00             | -25.26         | Peak             | HORIZONTAL   |
| 11370.00                                   | 46.17                   | 39.93                       | 4.10              | 40.16                 | 50.04                       | 74.00             | -23.96         | Peak             | HORIZONTAL   |
| 12747.00                                   | 46.39                   | 38.80                       | 4.34              | 40.32                 | 49.20                       | 74.00             | -24.80         | Peak             | HORIZONTAL   |
| 14464.00                                   | 45.75                   | 41.74                       | 4.61              | 39.65                 | 52.44                       | 74.00             | -21.56         | Peak             | HORIZONTAL   |
| 16181.00                                   | 45.60                   | 38.13                       | 4.82              | 39.94                 | 48.62                       | 74.00             | -25.38         | Peak             | HORIZONTAL   |
| 18000.00                                   | 36.06                   | 49.20                       | 5.09              | 40.70                 | 49.65                       | 54.00             | -4.35          | Average          | HORIZONTAL   |
| 18000.00                                   | 43.32                   | 49.20                       | 5.09              | 40.70                 | 56.91                       | 74.00             | -17.09         | Peak             | HORIZONTAL   |
| 4824.00                                    | 50.39                   | 31.38                       | 2.77              | 40.36                 | 44.17                       | 54.00             | -9.83          | Average          | VERTICAL     |
| 4824.00                                    | 59.32                   | 31.38                       | 2.77              | 40.36                 | 53.10                       | 74.00             | -20.90         | Peak             | VERTICAL     |
| 7273.00                                    | 48.17                   | 36.26                       | 3.48              | 39.73                 | 48.18                       | 74.00             | -25.82         | Peak             | VERTICAL     |
| 10622.00                                   | 46.50                   | 39.92                       | 4.03              | 40.35                 | 50.10                       | 74.00             | -23.90         | Peak             | VERTICAL     |
| 13478.00                                   | 46.96                   | 39.95                       | 4.39              | 40.07                 | 51.23                       | 74.00             | -22.77         | Peak             | VERTICAL     |
| 16742.00                                   | 44.16                   | 39.67                       | 4.93              | 40.05                 | 48.71                       | 74.00             | -25.29         | Peak             | VERTICAL     |
| 17983.00                                   | 35.51                   | 48.97                       | 5.08              | 40.69                 | 48.88                       | 54.00             | -5.12          | Average          | VERTICAL     |
| <b>11b CH1&amp; 11n20 MIMO(WLAN) CH52</b>  |                         |                             |                   |                       |                             |                   |                |                  |              |
| 9160.00                                    | 47.73                   | 38.09                       | 3.67              | 40.01                 | 49.47                       | 74.00             | -24.53         | Peak             | HORIZONTAL   |
| 10792.00                                   | 46.53                   | 39.96                       | 4.02              | 40.28                 | 50.23                       | 74.00             | -23.77         | Peak             | HORIZONTAL   |
| 12390.00                                   | 46.99                   | 38.83                       | 4.27              | 40.22                 | 49.88                       | 74.00             | -24.12         | Peak             | HORIZONTAL   |
| 14430.00                                   | 45.32                   | 41.67                       | 4.60              | 39.66                 | 51.94                       | 74.00             | -22.06         | Peak             | HORIZONTAL   |
| 16436.00                                   | 45.63                   | 38.75                       | 4.88              | 39.99                 | 49.28                       | 74.00             | -24.72         | Peak             | HORIZONTAL   |
| 18000.00                                   | 36.11                   | 49.20                       | 5.09              | 40.70                 | 49.70                       | 54.00             | -4.30          | Average          | HORIZONTAL   |
| 18000.00                                   | 44.04                   | 49.20                       | 5.09              | 40.70                 | 57.63                       | 74.00             | -16.37         | Peak             | HORIZONTAL   |
| 8735.00                                    | 45.80                   | 37.32                       | 3.62              | 39.87                 | 46.86                       | 74.00             | -27.14         | Peak             | VERTICAL     |
| 10588.00                                   | 47.63                   | 39.92                       | 4.03              | 40.36                 | 51.21                       | 74.00             | -22.79         | Peak             | VERTICAL     |
| 12016.00                                   | 46.70                   | 39.28                       | 4.31              | 40.10                 | 50.18                       | 74.00             | -23.82         | Peak             | VERTICAL     |
| 13801.00                                   | 46.36                   | 40.54                       | 4.49              | 39.84                 | 51.55                       | 74.00             | -22.45         | Peak             | VERTICAL     |
| 16164.00                                   | 44.64                   | 38.09                       | 4.82              | 39.93                 | 47.62                       | 74.00             | -26.38         | Peak             | VERTICAL     |
| 18000.00                                   | 36.03                   | 49.20                       | 5.09              | 40.70                 | 49.62                       | 54.00             | -4.38          | Average          | VERTICAL     |
| 18000.00                                   | 43.86                   | 49.20                       | 5.09              | 40.70                 | 57.45                       | 74.00             | -16.55         | Peak             | VERTICAL     |
| <b>11b CH1&amp; 11n20 MIMO(WLAN) CH100</b> |                         |                             |                   |                       |                             |                   |                |                  |              |
| 8973.00                                    | 46.19                   | 37.75                       | 3.66              | 39.90                 | 47.70                       | 74.00             | -26.30         | Peak             | HORIZONTAL   |
| 10639.00                                   | 46.95                   | 39.93                       | 4.03              | 40.34                 | 50.56                       | 74.00             | -23.44         | Peak             | HORIZONTAL   |
| 12475.00                                   | 47.01                   | 38.73                       | 4.26              | 40.24                 | 49.76                       | 74.00             | -24.24         | Peak             | HORIZONTAL   |
| 14277.00                                   | 45.39                   | 41.40                       | 4.58              | 39.67                 | 51.70                       | 74.00             | -22.30         | Peak             | HORIZONTAL   |
| 16181.00                                   | 45.53                   | 38.13                       | 4.82              | 39.94                 | 48.55                       | 74.00             | -25.45         | Peak             | HORIZONTAL   |
| 18000.00                                   | 36.32                   | 49.20                       | 5.09              | 40.70                 | 49.91                       | 54.00             | -4.09          | Average          | HORIZONTAL   |
| 18000.00                                   | 44.21                   | 49.20                       | 5.09              | 40.70                 | 57.80                       | 74.00             | -16.20         | Peak             | HORIZONTAL   |
| 9177.00                                    | 46.64                   | 38.12                       | 3.67              | 40.02                 | 48.40                       | 74.00             | -25.60         | Peak             | VERTICAL     |
| 10843.00                                   | 46.36                   | 39.97                       | 4.02              | 40.26                 | 50.09                       | 74.00             | -23.91         | Peak             | VERTICAL     |
| 12645.00                                   | 46.75                   | 38.76                       | 4.31              | 40.29                 | 49.52                       | 74.00             | -24.48         | Peak             | VERTICAL     |
| 14583.00                                   | 45.59                   | 41.60                       | 4.63              | 39.64                 | 52.17                       | 74.00             | -21.83         | Peak             | VERTICAL     |
| 16453.00                                   | 44.80                   | 38.79                       | 4.89              | 39.99                 | 48.49                       | 74.00             | -25.51         | Peak             | VERTICAL     |
| 18000.00                                   | 36.45                   | 49.20                       | 5.09              | 40.70                 | 50.04                       | 54.00             | -3.96          | Average          | VERTICAL     |

|                                            |       |       |      |       |       |       |        |         |            |
|--------------------------------------------|-------|-------|------|-------|-------|-------|--------|---------|------------|
| 18000.00                                   | 44.37 | 49.20 | 5.09 | 40.70 | 57.96 | 74.00 | -16.04 | Peak    | VERTICAL   |
| <b>11b CH1&amp; 11n20 MIMO(WLAN) CH149</b> |       |       |      |       |       |       |        |         |            |
| 9228.00                                    | 46.36 | 38.21 | 3.67 | 40.06 | 48.19 | 74.00 | -25.81 | Peak    | HORIZONTAL |
| 10724.00                                   | 46.50 | 39.94 | 4.03 | 40.31 | 50.16 | 74.00 | -23.84 | Peak    | HORIZONTAL |
| 12628.00                                   | 47.10 | 38.75 | 4.30 | 40.29 | 49.86 | 74.00 | -24.14 | Peak    | HORIZONTAL |
| 14481.00                                   | 44.44 | 41.77 | 4.61 | 39.65 | 51.16 | 74.00 | -22.84 | Peak    | HORIZONTAL |
| 16538.00                                   | 45.10 | 39.02 | 4.90 | 40.01 | 49.02 | 74.00 | -24.98 | Peak    | HORIZONTAL |
| 18000.00                                   | 36.16 | 49.20 | 5.09 | 40.70 | 49.75 | 54.00 | -4.25  | Average | HORIZONTAL |
| 18000.00                                   | 42.81 | 49.20 | 5.09 | 40.70 | 56.40 | 74.00 | -17.60 | Peak    | HORIZONTAL |
| 8769.00                                    | 46.93 | 37.38 | 3.62 | 39.88 | 48.06 | 74.00 | -25.94 | Peak    | VERTICAL   |
| 10316.00                                   | 47.40 | 39.50 | 3.95 | 40.47 | 50.36 | 74.00 | -23.64 | Peak    | VERTICAL   |
| 11710.00                                   | 46.89 | 39.65 | 4.21 | 40.13 | 50.61 | 74.00 | -23.39 | Peak    | VERTICAL   |
| 13818.00                                   | 45.49 | 40.57 | 4.49 | 39.83 | 50.72 | 74.00 | -23.28 | Peak    | VERTICAL   |
| 15467.00                                   | 45.03 | 38.64 | 4.47 | 39.74 | 48.40 | 74.00 | -25.60 | Peak    | VERTICAL   |
| 18000.00                                   | 35.52 | 49.20 | 5.09 | 40.70 | 49.11 | 54.00 | -4.89  | Average | VERTICAL   |
| 18000.00                                   | 43.04 | 49.20 | 5.09 | 40.70 | 56.63 | 74.00 | -17.37 | Peak    | VERTICAL   |

Note: 1.30MHz~25GHz: (For simultaneous transmission of multiple channels and mode in the 2.4G WIFI of module 3 and 5G WIFI of module 2, no noticeable emission. For module 3, we scan with 11b mode, 11g mode, 11n HT20 mode and 11n HT40 mode; for module 2, we scan with 11a mode ANT 1 and ANT 2, 11n20 MIMO mode ANT 1 and ANT 2, 11n40 MIMO mode ANT 1 and ANT 2, 11ac20 MIMO mode ANT 1 and ANT 2; 11ac40 MIMO mode ANT 1 and ANT 2. 11ac80 MIMO mode ANT 1 and ANT 2, the worst case is 11b mode of module 3 and 11n20 MIMO of module 2)

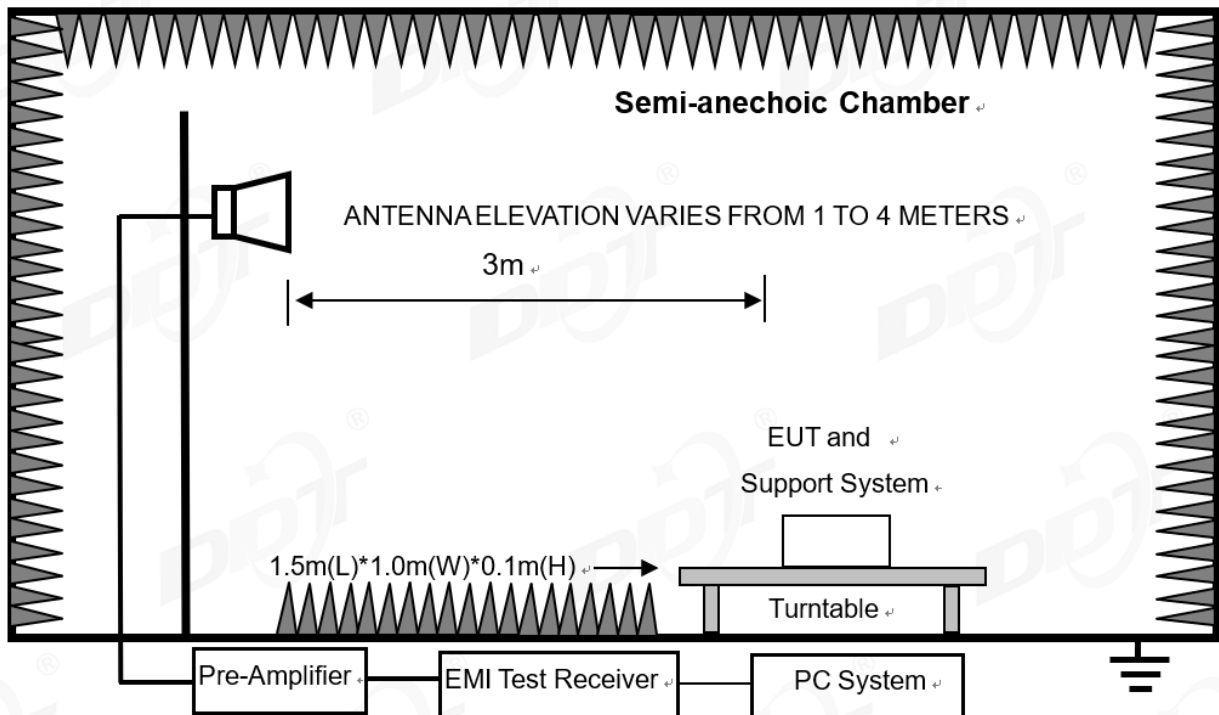
2. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

## 9. Radiated Band Edge Compliance

### 9.1. Block diagram of test setup



### 9.2. Limit

All restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400 MHz to 2483.5 MHz shall be at least 20dB below the fundamental emissions or comply with RSS-Gen Issue 3 clause 7.2.5 (Same as FCC 15.209) limits.

### 9.3. Test Procedure

Same with clause 8.3 except change investigated frequency range from 2310 MHz to 2430 MHz and 2440 MHz to 2500 MHz.

Remark: All restriction band have been tested, and only the worst case is shown in report.

Note:1. For simultaneous transmission of multiple channels and mode in the 2.4G WIFI of module 3, 5G WIFI of module 2, and 2.4G WIFI of module 2, no noticeable emission. So, we choose only the worst case in the report.

Note:2. For simultaneous transmission of multiple channels in the WLAN ,2.4G WIFI, WCDMA, and LTE, no noticeable emission was found.

### 9.4. Test result

**PASS.** (See below detailed test result)

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00003.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

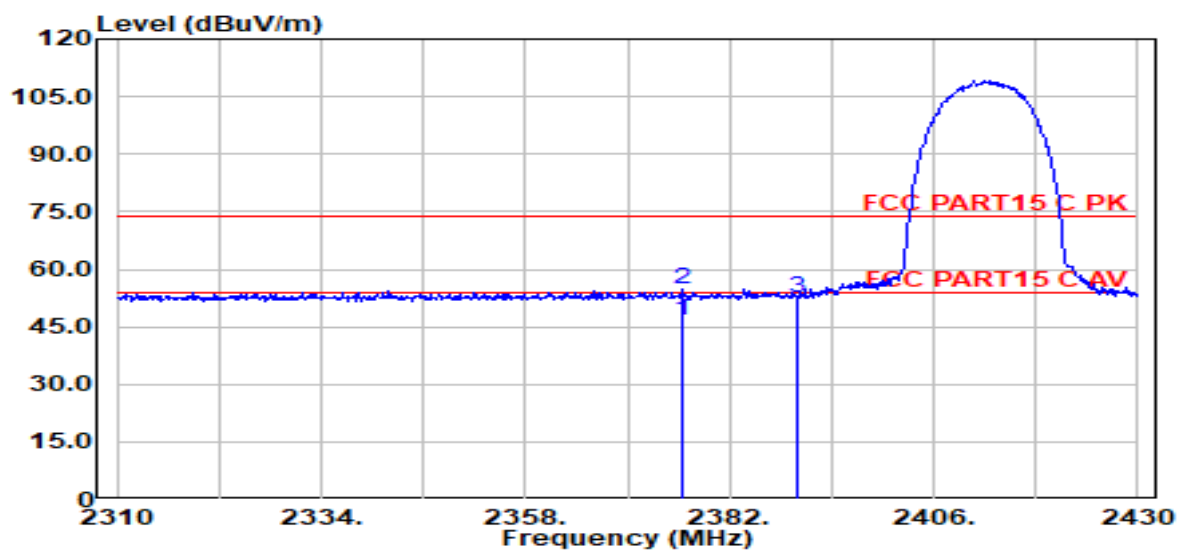
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/HORIZONTAL

Memo : 11B 2412



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2376.48        | 17.36                   | 27.53                       | 1.73                | 0.00                  | 46.62                       | 54.00                     | -7.38                 | Average  | HORIZONTAL   |
| 2              | 2376.48        | 25.69                   | 27.53                       | 1.73                | 0.00                  | 54.95                       | 74.00                     | -19.05                | Peak     | HORIZONTAL   |
| 3              | 2390.00        | 23.03                   | 27.57                       | 1.73                | 0.00                  | 52.33                       | 74.00                     | -21.67                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00004.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

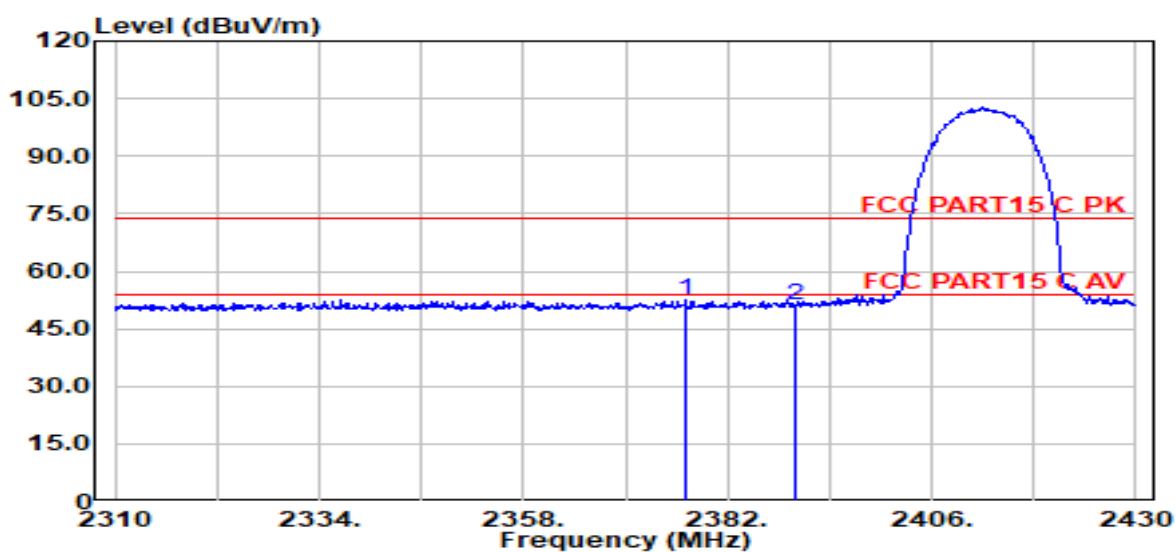
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11B 2412



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2377.08        | 23.24                   | 27.53                       | 1.73                | 0.00                  | 52.50                       | 74.00                     | -21.50                | Peak     | VERTICAL     |
| 2              | 2390.00        | 21.97                   | 27.57                       | 1.73                | 0.00                  | 51.27                       | 74.00                     | -22.73                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00006.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

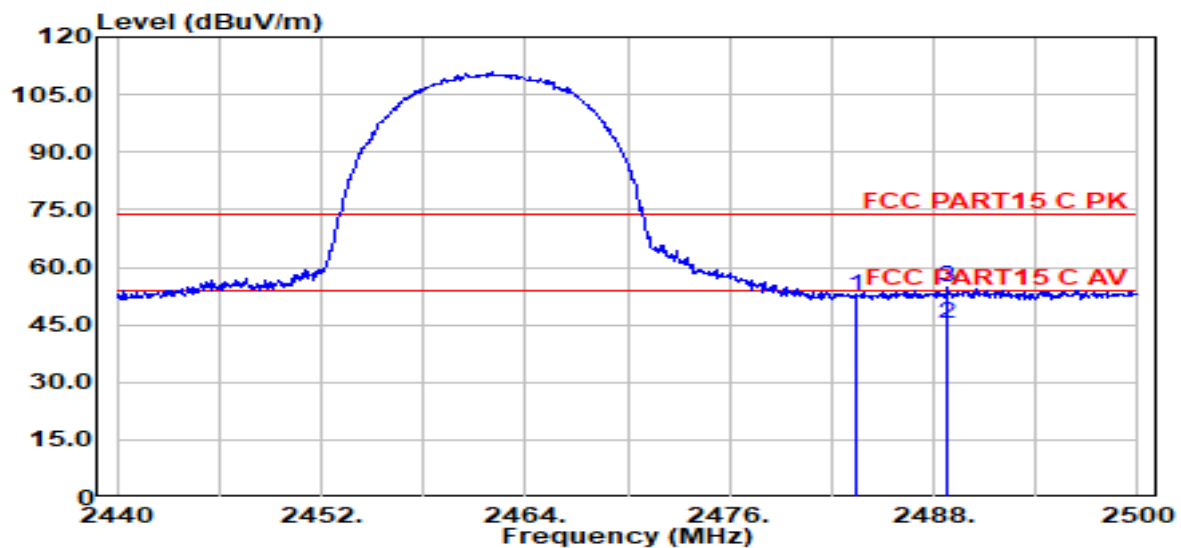
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11B 2462



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 22.72                   | 27.85                       | 1.74                | 0.00                  | 52.31                       | 74.00                     | -21.69                | Peak     | HORIZONTAL   |
| 2              | 2488.84        | 15.82                   | 27.87                       | 1.74                | 0.00                  | 45.43                       | 54.00                     | -8.57                 | Average  | HORIZONTAL   |
| 3              | 2488.84        | 25.05                   | 27.87                       | 1.74                | 0.00                  | 54.65                       | 74.00                     | -19.35                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00005.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

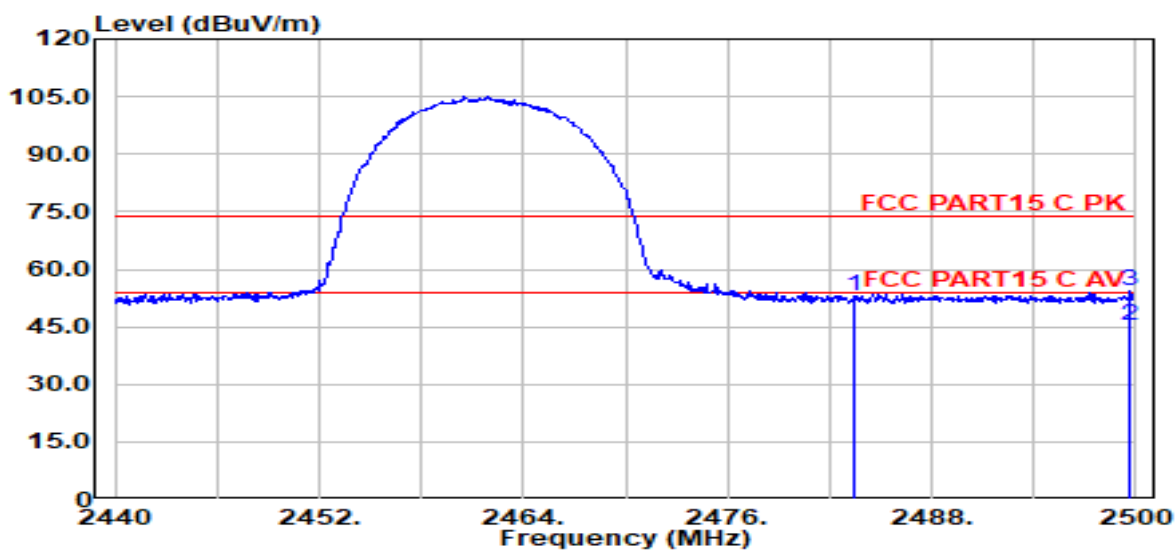
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11B 2462



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 23.29                   | 27.85                       | 1.74                | 0.00                  | 52.88                       | 74.00                     | -21.12                | Peak     | VERTICAL     |
| 2              | 2499.70        | 15.62                   | 27.90                       | 1.74                | 0.00                  | 45.26                       | 54.00                     | -8.74                 | Average  | VERTICAL     |
| 3              | 2499.70        | 24.56                   | 27.90                       | 1.74                | 0.00                  | 54.20                       | 74.00                     | -19.80                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00007.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

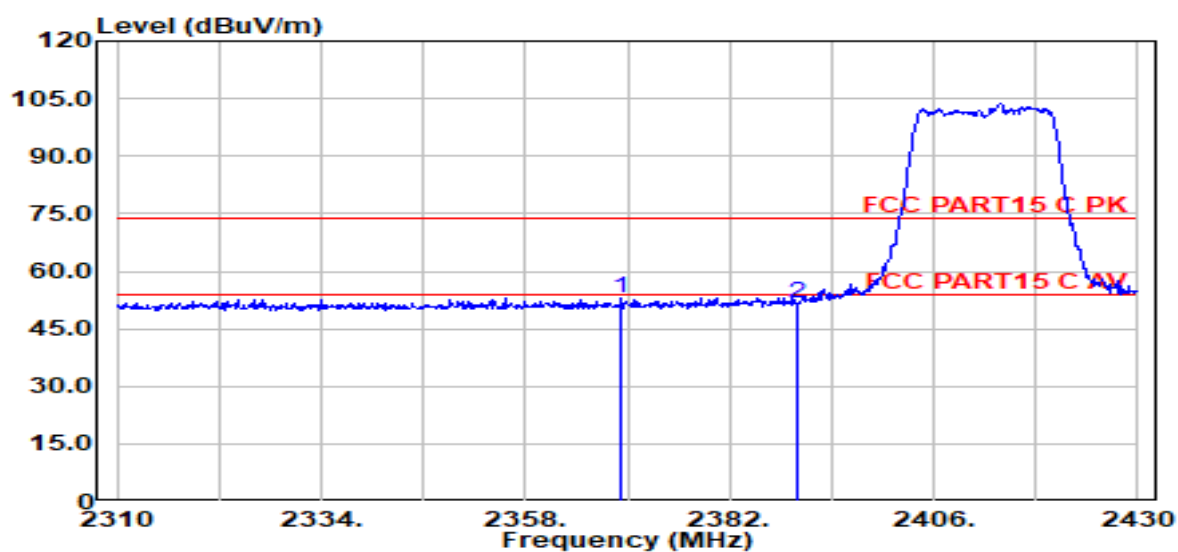
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11G 2412



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2369.28        | 23.88                   | 27.51                       | 1.73                | 0.00                  | 53.12                       | 74.00                     | -20.88                | Peak     | HORIZONTAL   |
| 2              | 2390.00        | 22.51                   | 27.57                       | 1.73                | 0.00                  | 51.81                       | 74.00                     | -22.19                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00008.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

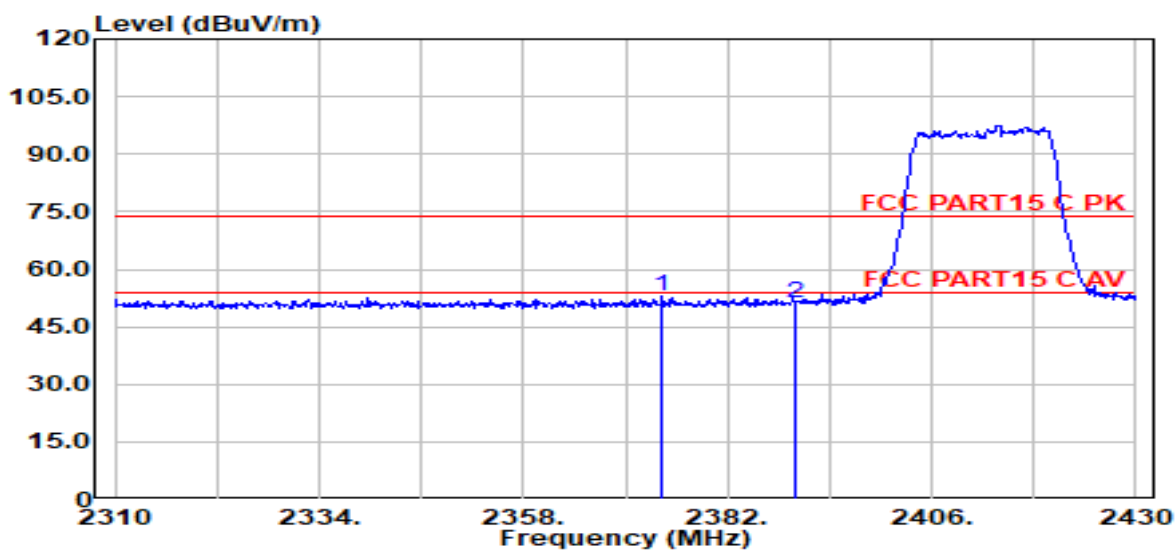
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11G 2412



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2374.32        | 23.63                   | 27.52                       | 1.73                | 0.00                  | 52.89                       | 74.00                     | -21.11                | Peak     | VERTICAL     |
| 2              | 2390.00        | 21.87                   | 27.57                       | 1.73                | 0.00                  | 51.17                       | 74.00                     | -22.83                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00010.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

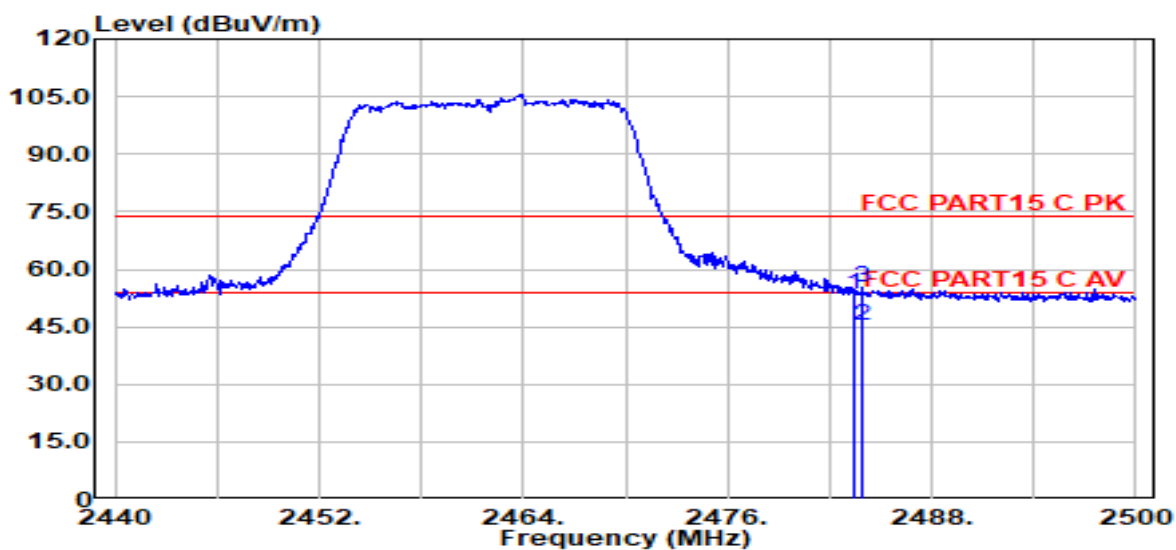
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11G 2462



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 23.76                   | 27.85                       | 1.74                | 0.00                  | 53.35                       | 74.00                     | -20.65                | Peak     | HORIZONTAL   |
| 2              | 2483.98        | 15.72                   | 27.85                       | 1.74                | 0.00                  | 45.31                       | 54.00                     | -8.69                 | Average  | HORIZONTAL   |
| 3              | 2483.98        | 25.78                   | 27.85                       | 1.74                | 0.00                  | 55.37                       | 74.00                     | -18.63                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00009.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

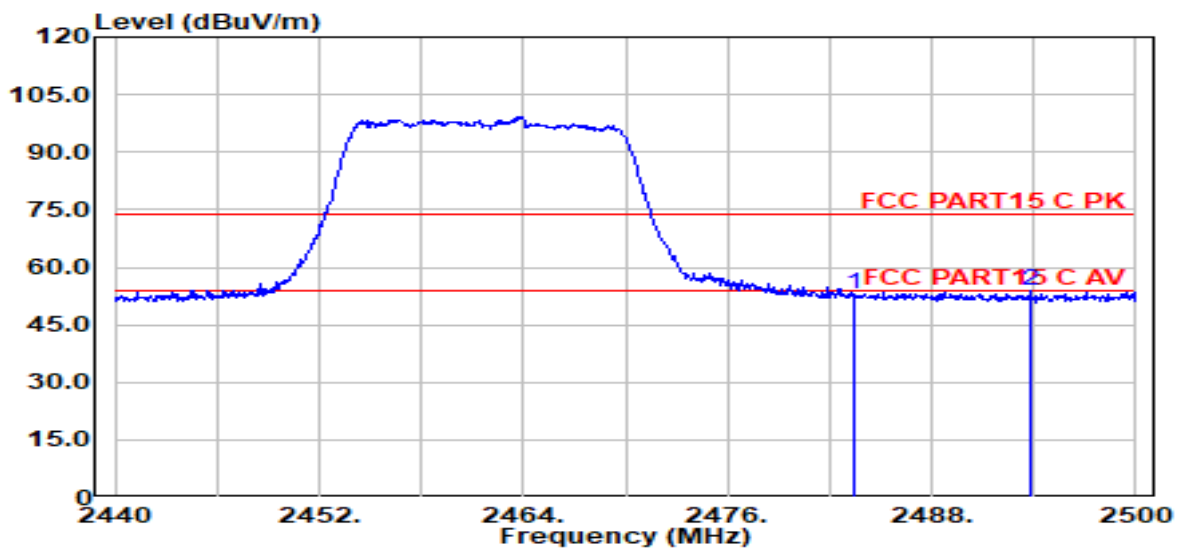
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11G 2462



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 23.40                   | 27.85                       | 1.74                | 0.00                  | 52.99                       | 74.00                     | -21.01                | Peak     | VERTICAL     |
| 2              | 2493.82        | 24.04                   | 27.88                       | 1.74                | 0.00                  | 53.66                       | 74.00                     | -20.34                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00011.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

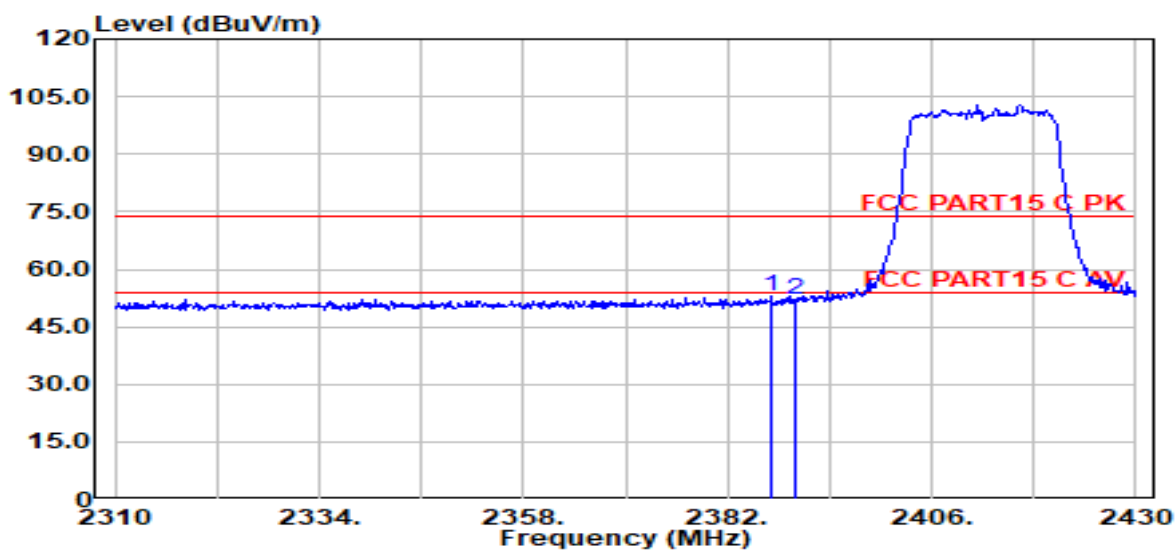
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11N20 2412



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2387.16        | 23.69                   | 27.56                       | 1.73                | 0.00                  | 52.98                       | 74.00                     | -21.02                | Peak     | HORIZONTAL   |
| 2              | 2390.00        | 22.98                   | 27.57                       | 1.73                | 0.00                  | 52.28                       | 74.00                     | -21.72                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00012.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

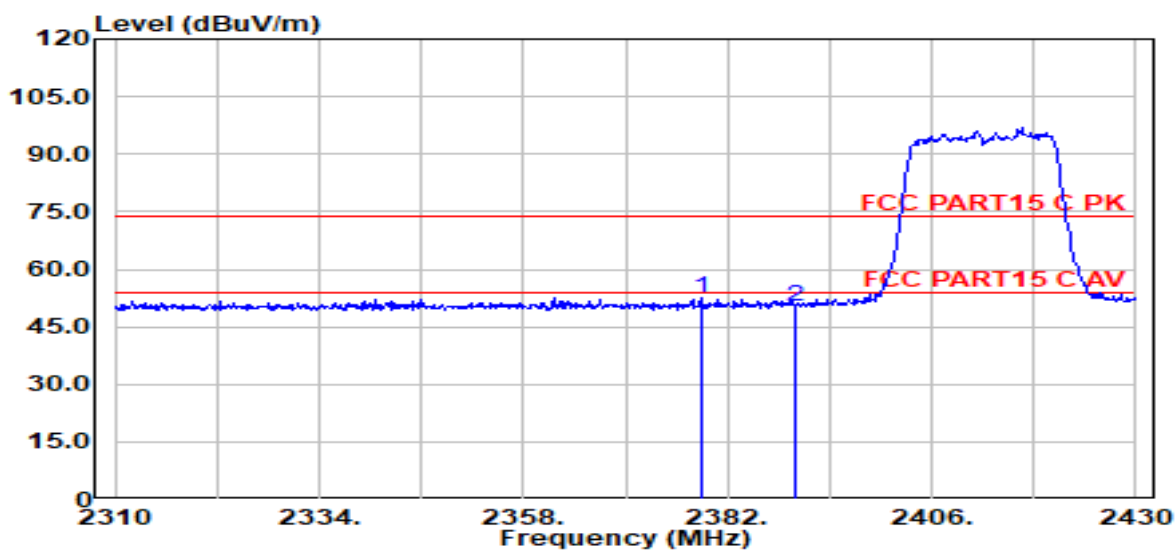
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11N20 2412



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2378.88        | 23.20                   | 27.54                       | 1.73                | 0.00                  | 52.47                       | 74.00                     | -21.53                | Peak     | VERTICAL     |
| 2              | 2390.00        | 20.93                   | 27.57                       | 1.73                | 0.00                  | 50.24                       | 74.00                     | -23.76                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00014.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

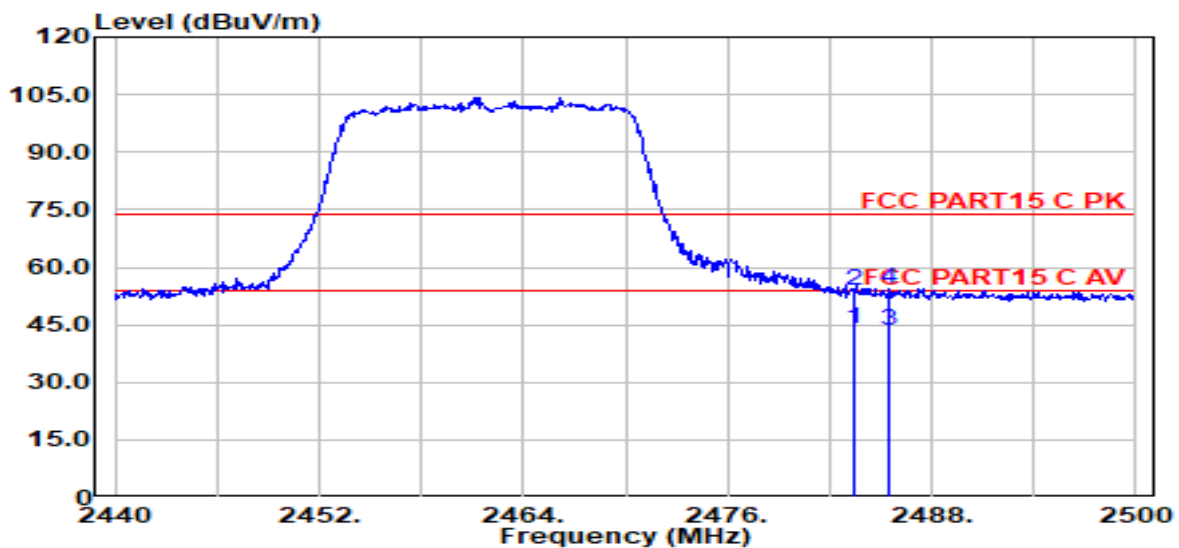
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11N20 2462



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 14.56                   | 27.85                       | 1.74                | 0.00                  | 44.15                       | 54.00                     | -9.85                 | Average  | HORIZONTAL   |
| 2              | 2483.50        | 24.32                   | 27.85                       | 1.74                | 0.00                  | 53.91                       | 74.00                     | -20.09                | Peak     | HORIZONTAL   |
| 3              | 2485.54        | 14.06                   | 27.86                       | 1.74                | 0.00                  | 43.66                       | 54.00                     | -10.34                | Average  | HORIZONTAL   |
| 4              | 2485.54        | 24.78                   | 27.86                       | 1.74                | 0.00                  | 54.38                       | 74.00                     | -19.62                | Peak     | HORIZONTAL   |

N Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00013.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

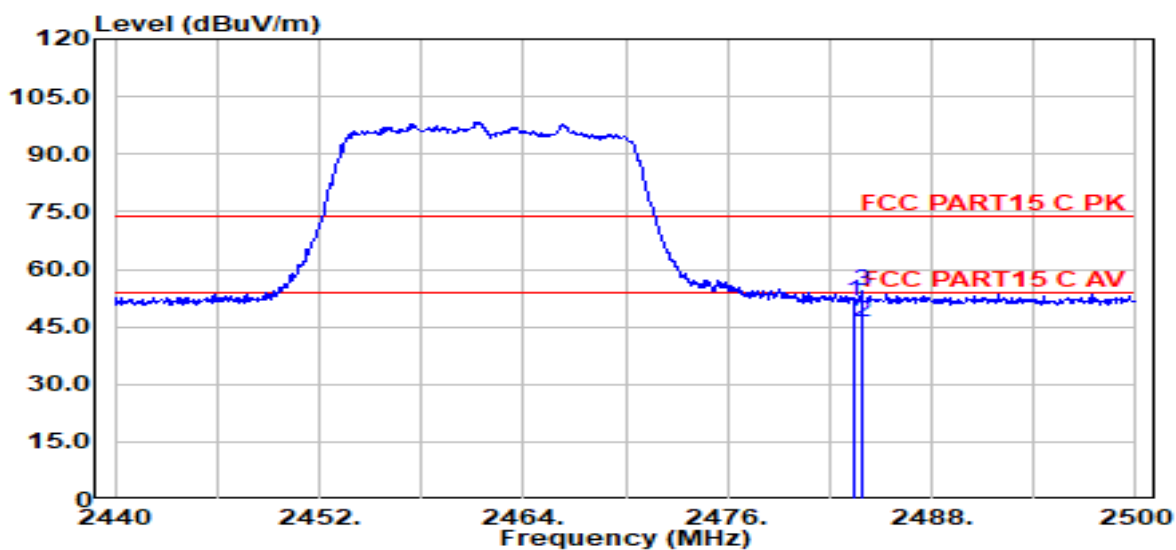
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11N20 2462



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 21.91                   | 27.85                       | 1.74                | 0.00                  | 51.50                       | 74.00                     | -22.50                | Peak     | VERTICAL     |
| 2              | 2483.92        | 16.82                   | 27.85                       | 1.74                | 0.00                  | 46.41                       | 54.00                     | -7.59                 | Average  | VERTICAL     |
| 3              | 2483.92        | 24.69                   | 27.85                       | 1.74                | 0.00                  | 54.28                       | 74.00                     | -19.72                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00015.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

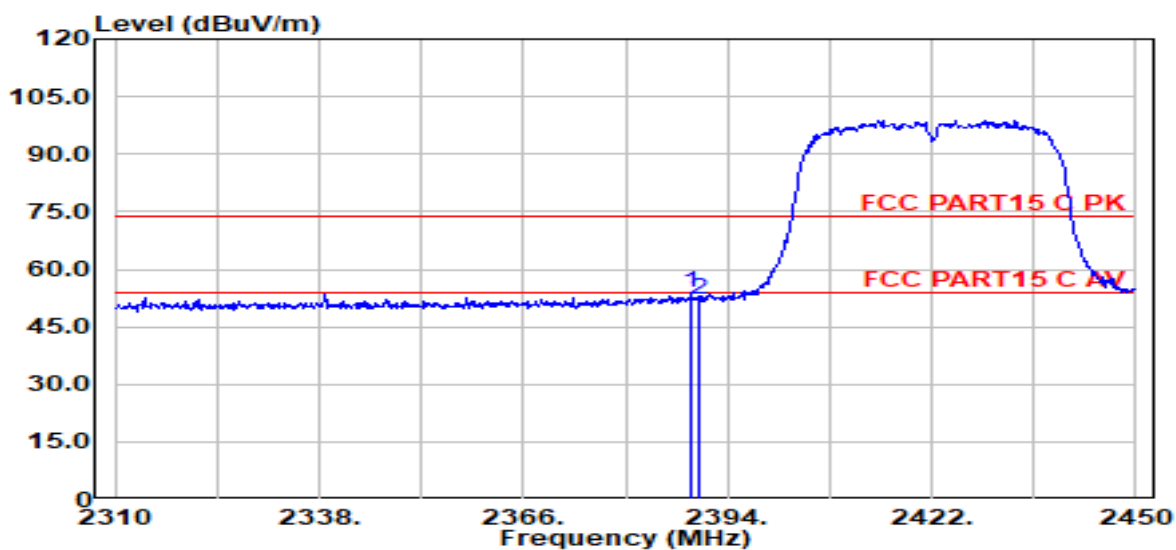
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11N40 2422



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2389.10        | 24.44                   | 27.57                       | 1.73                | 0.00                  | 53.74                       | 74.00                     | -20.26                | Peak     | HORIZONTAL   |
| 2              | 2389.94        | 22.92                   | 27.57                       | 1.73                | 0.00                  | 52.22                       | 74.00                     | -21.78                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00016.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

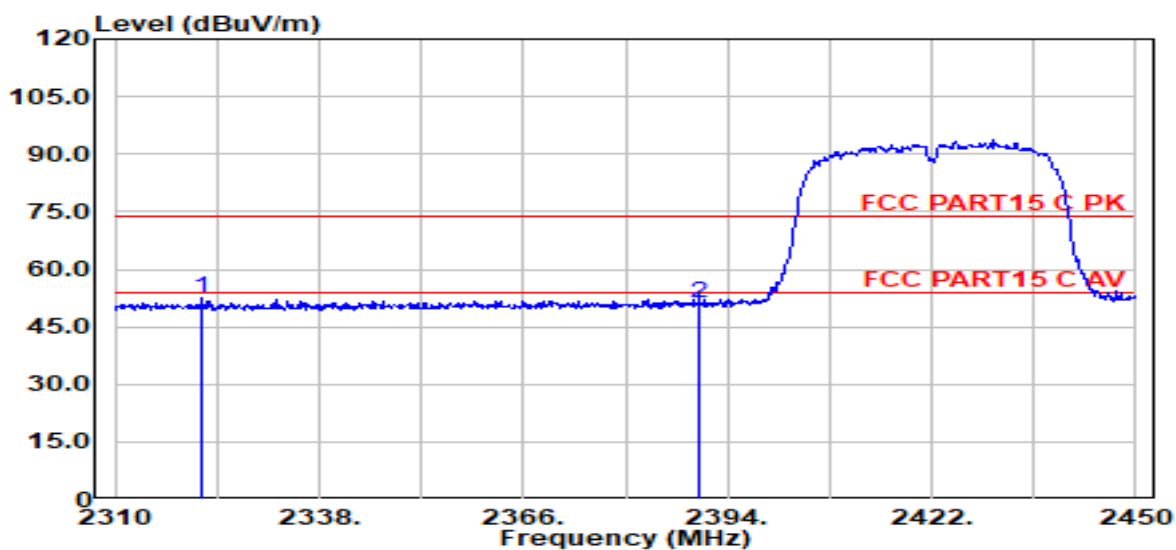
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11N40 2422



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2321.90        | 23.26                   | 27.37                       | 1.73                | 0.00                  | 52.36                       | 74.00                     | -21.64                | Peak     | VERTICAL     |
| 2              | 2390.00        | 21.95                   | 27.57                       | 1.73                | 0.00                  | 51.26                       | 74.00                     | -22.74                | Peak     | VERTICAL     |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00018.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

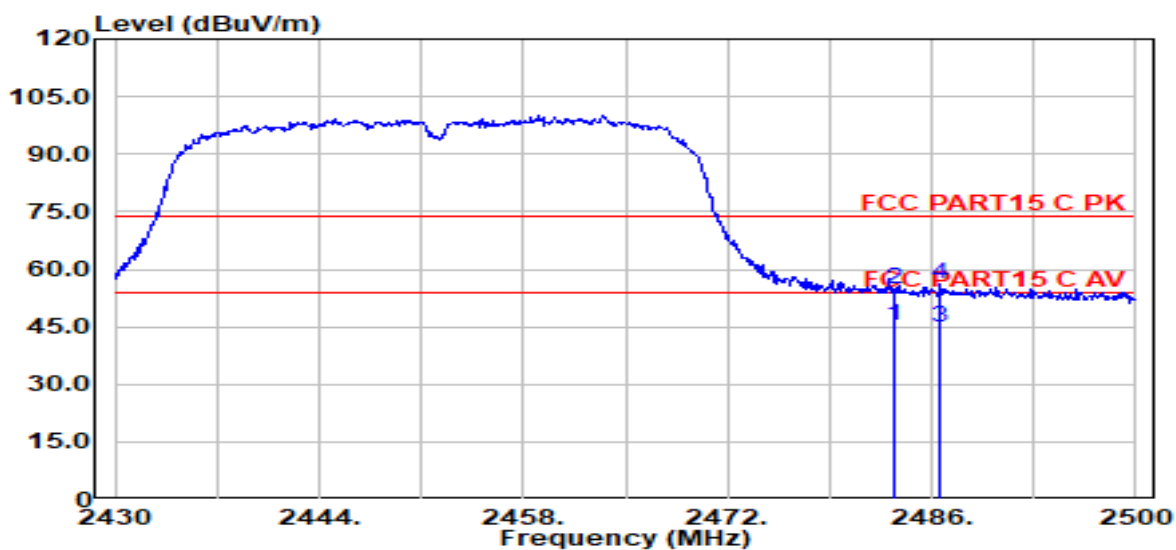
Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°, Humi:55%, Press:100.1kPa

Antenna/Distance : 2020 BBHA  
9120D/3m/HORIZONTAL

Memo : 11N40 2452



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 15.47                   | 27.85                       | 1.74                | 0.00                  | 45.06                       | 54.00                     | -8.94                 | Average  | HORIZONTAL   |
| 2              | 2483.50        | 25.21                   | 27.85                       | 1.74                | 0.00                  | 54.80                       | 74.00                     | -19.20                | Peak     | HORIZONTAL   |
| 3              | 2486.63        | 15.32                   | 27.86                       | 1.74                | 0.00                  | 44.92                       | 54.00                     | -9.08                 | Average  | HORIZONTAL   |
| 4              | 2486.63        | 26.43                   | 27.86                       | 1.74                | 0.00                  | 56.03                       | 74.00                     | -17.97                | Peak     | HORIZONTAL   |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Site : DDT 3m Chamber 3#

D:\2021 report data\Q21091301-1R OS-R-DR01\FCC ABOVE 1G 2.4G\FCC ABOVE 1G\_00017.EMI

Test Date : 2021-10-08

Tested By : Kennys

EUT : AI Delivery Robot

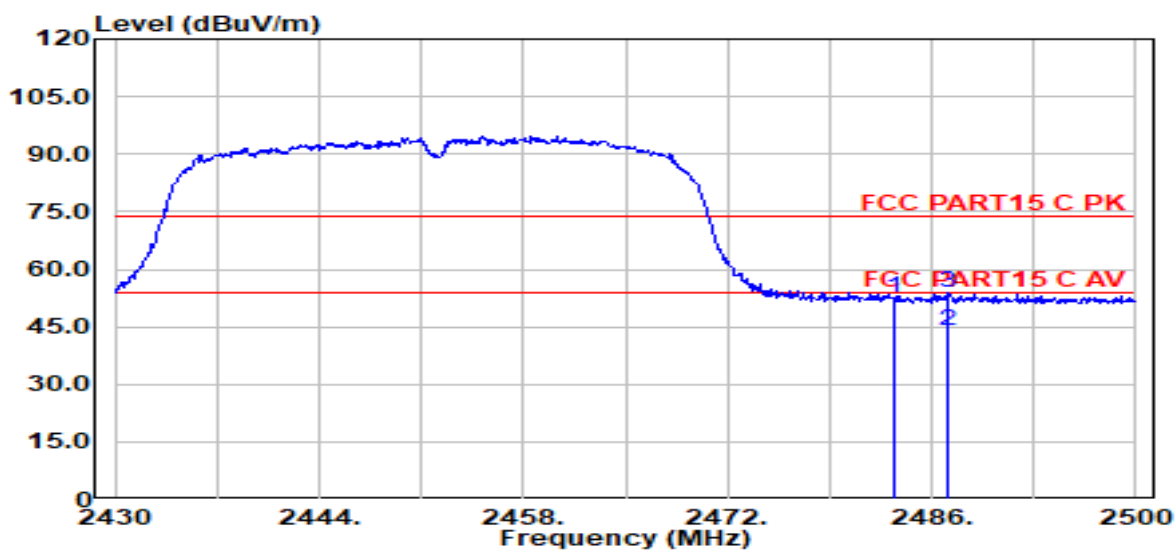
Model Number : OS-R-DR01

Power Supply : AC 120V/60Hz

Test Mode : TX mode

Condition : Temp:24.5°,Humi:55%,Press:100.1kPa Antenna/Distance : 2020 BBHA 9120D/3m/VERTICAL

Memo : 11N40 2452



| Item<br>(Mark) | Freq.<br>(MHz) | Read<br>Level<br>(dBμV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss<br>dB | PRM<br>Factor<br>(dB) | Result<br>Level<br>(dBμV/m) | Limit<br>Line<br>(dBμV/m) | Over<br>Limit<br>(dB) | Detector | Polarization |
|----------------|----------------|-------------------------|-----------------------------|---------------------|-----------------------|-----------------------------|---------------------------|-----------------------|----------|--------------|
| 1              | 2483.50        | 22.98                   | 27.85                       | 1.74                | 0.00                  | 52.57                       | 74.00                     | -21.43                | Peak     | VERTICAL     |
| 2              | 2487.05        | 14.45                   | 27.86                       | 1.74                | 0.00                  | 44.05                       | 54.00                     | -9.95                 | Average  | VERTICAL     |
| 3              | 2487.05        | 24.45                   | 27.86                       | 1.74                | 0.00                  | 54.05                       | 74.00                     | -19.95                | Peak     | VERTICAL     |

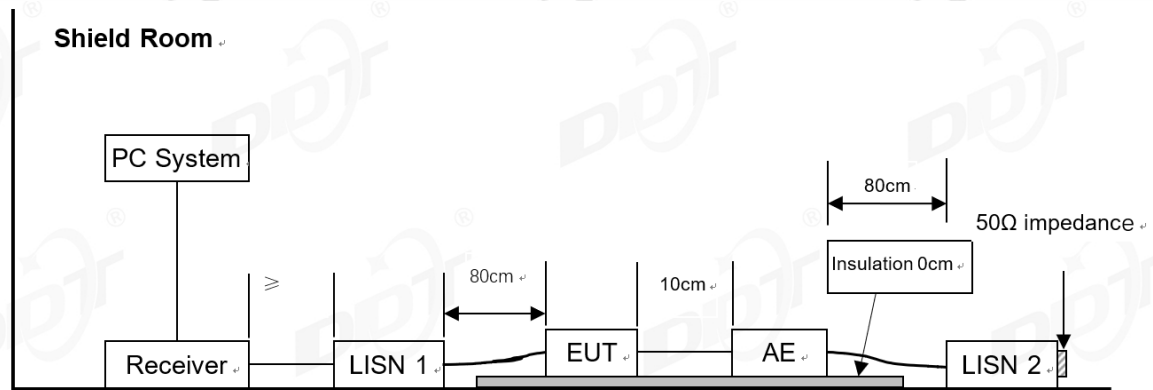
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## 10. Power Line Conducted Emission

### 10.1. Block diagram of test setup



### 10.2. Power Line Conducted Emission Limits (Class B)

| Frequency         | Quasi-Peak Level<br>dB(μV) | Average Level<br>dB(μV) |
|-------------------|----------------------------|-------------------------|
| 150 kHz ~ 500 kHz | 66 ~ 56*                   | 56 ~ 46*                |
| 500 kHz ~ 5 MHz   | 56                         | 46                      |
| 5 MHz ~ 30 MHz    | 60                         | 50                      |

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 10.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

#### 10.4. Test Result

**PASS. (See below detailed test result)**

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: "----" means peak detection; "----" means average detection

Note3: Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/60Hz, recorded worse case (AC 120V/60Hz).

# TR-4-E-010 Conducted Emission Test Result

**Test Site** : DDT 5# Shield Room

D:\2021 report data\Q21091301-1E\CE.EM6

**Test Date** : 2021-09-15

**Tested By** : Kennys

**EUT** : AI Delivery Robot

**Model Number** : OS-R-DR01

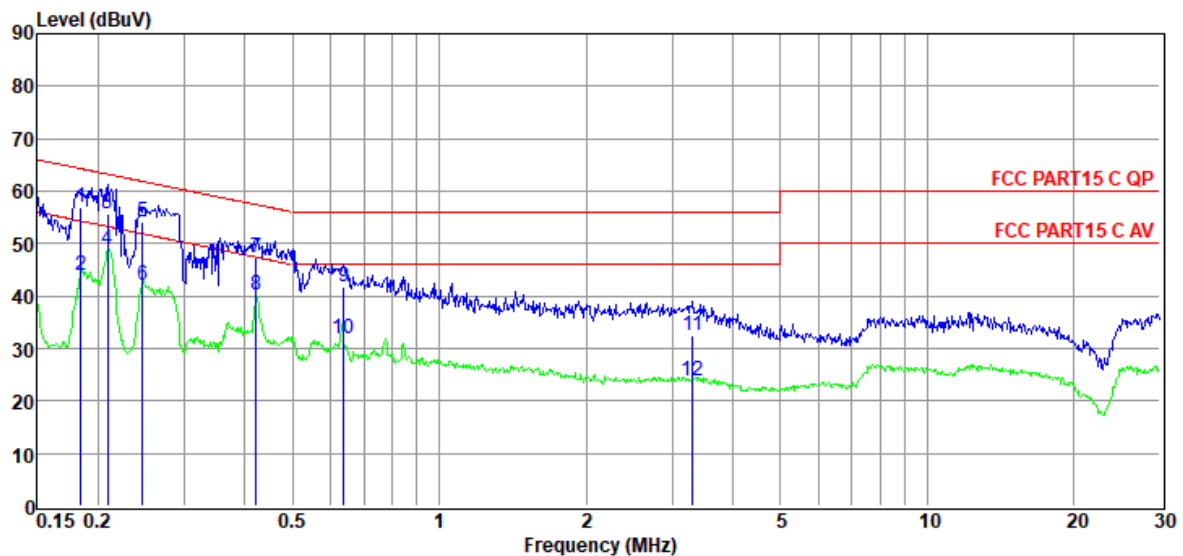
**Power Supply** : AC 120V/60Hz

**Test Mode** : Tx mode

**Condition** : Temp:24.5°C,Humi:55.5%,Press:101.4kPa

**LISN** : 2020 ENV 216 2#/LINE

**Memo** : 2.4GWIFI



| Item   | Freq. | Read Level | LISN Factor | Cable Loss | Pulse Limiter Factor | Result Level | Limit Line | Over Limit | Detector | Phase |
|--------|-------|------------|-------------|------------|----------------------|--------------|------------|------------|----------|-------|
| (Mark) | (MHz) | (dBμV)     | (dB)        | (dB)       | (dB)                 | (dBμV)       | (dBμV)     | (dB)       |          |       |
| 1      | 0.18  | 37.44      | 9.42        | 0.04       | 10.01                | 56.91        | 64.28      | -7.37      | QP       | LINE  |
| 2      | 0.18  | 24.36      | 9.42        | 0.04       | 10.01                | 43.83        | 54.28      | -10.45     | Average  | LINE  |
| 3      | 0.21  | 36.35      | 9.42        | 0.04       | 10.01                | 55.82        | 63.23      | -7.41      | QP       | LINE  |
| 4      | 0.21  | 29.39      | 9.42        | 0.04       | 10.01                | 48.86        | 53.23      | -4.37      | Average  | LINE  |
| 5      | 0.25  | 34.68      | 9.43        | 0.04       | 10.01                | 54.16        | 61.86      | -7.70      | QP       | LINE  |
| 6      | 0.25  | 22.48      | 9.43        | 0.04       | 10.01                | 41.96        | 51.86      | -9.90      | Average  | LINE  |
| 7      | 0.42  | 27.96      | 9.45        | 0.05       | 10.01                | 47.47        | 57.42      | -9.95      | QP       | LINE  |
| 8      | 0.42  | 20.85      | 9.45        | 0.05       | 10.01                | 40.36        | 47.42      | -7.06      | Average  | LINE  |
| 9      | 0.64  | 22.33      | 9.45        | 0.06       | 10.01                | 41.85        | 56.00      | -14.15     | QP       | LINE  |
| 10     | 0.64  | 12.48      | 9.45        | 0.06       | 10.01                | 32.00        | 46.00      | -14.00     | Average  | LINE  |
| 11     | 3.31  | 13.04      | 9.46        | 0.09       | 10.01                | 32.60        | 56.00      | -23.40     | QP       | LINE  |
| 12     | 3.31  | 4.40       | 9.46        | 0.09       | 10.01                | 23.96        | 46.00      | -22.04     | Average  | LINE  |

Note: 1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

# TR-4-E-010 Conducted Emission Test Result

Test Site : DDT 5# Shield Room

D:\2021 report data\Q21091301-1E\CE.EM6

Test Date : 2021-09-15

Tested By : Kennys

EUT : AI Delivery Robot

Model Number : OS-R-DR01

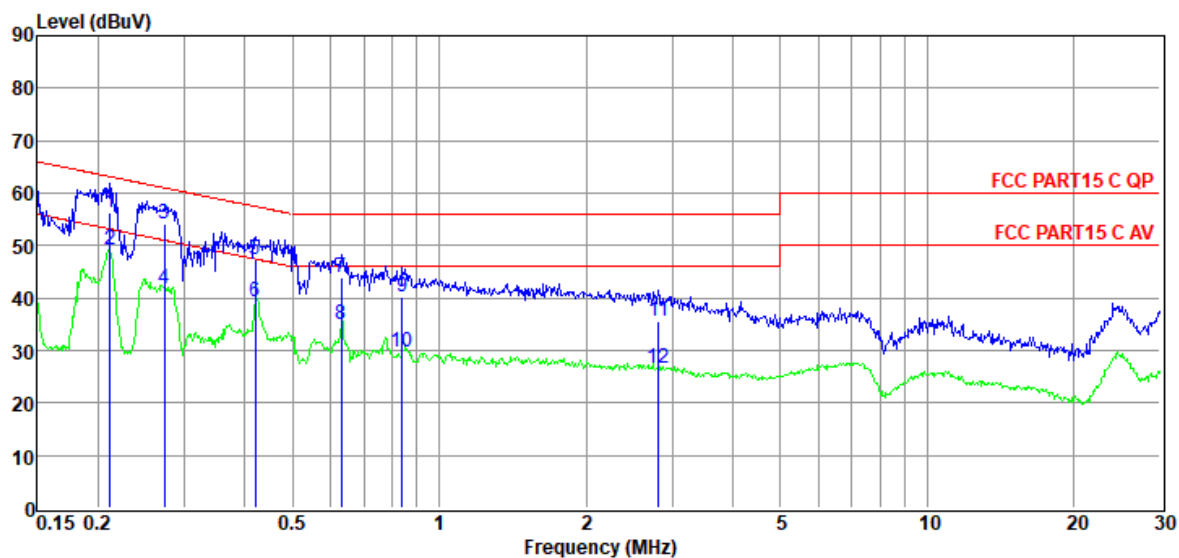
Power Supply : AC 120V/60Hz

Test Mode : Tx mode

Condition : Temp:24.5°C,Humi:55.5%,Press:101.4kPa

LISN : 2020 ENV 216 2#/NEUTRAL

Memo : 2.4GWIFI



| Item   | Freq. | Read Level | LISN Factor | Cable Loss | Pulse Limiter Factor | Result Level | Limit Line | Over Limit | Detector | Phase   |
|--------|-------|------------|-------------|------------|----------------------|--------------|------------|------------|----------|---------|
| (Mark) | (MHz) | (dBμV)     | (dB)        | (dB)       | (dB)                 | (dBμV)       | (dBμV)     | (dB)       |          |         |
| 1      | 0.21  | 36.94      | 9.39        | 0.04       | 10.01                | 56.38        | 63.14      | -6.76      | QP       | NEUTRAL |
| 2      | 0.21  | 29.78      | 9.39        | 0.04       | 10.01                | 49.22        | 53.14      | -3.92      | Average  | NEUTRAL |
| 3      | 0.27  | 34.78      | 9.39        | 0.04       | 10.01                | 54.22        | 61.03      | -6.81      | QP       | NEUTRAL |
| 4      | 0.27  | 22.22      | 9.39        | 0.04       | 10.01                | 41.66        | 51.03      | -9.37      | Average  | NEUTRAL |
| 5      | 0.42  | 27.99      | 9.40        | 0.05       | 10.01                | 47.45        | 57.46      | -10.01     | QP       | NEUTRAL |
| 6      | 0.42  | 19.76      | 9.40        | 0.05       | 10.01                | 39.22        | 47.46      | -8.24      | Average  | NEUTRAL |
| 7      | 0.63  | 24.34      | 9.40        | 0.06       | 10.01                | 43.81        | 56.00      | -12.19     | QP       | NEUTRAL |
| 8      | 0.63  | 15.41      | 9.40        | 0.06       | 10.01                | 34.88        | 46.00      | -11.12     | Average  | NEUTRAL |
| 9      | 0.84  | 20.79      | 9.41        | 0.07       | 10.01                | 40.28        | 56.00      | -15.72     | QP       | NEUTRAL |
| 10     | 0.84  | 10.26      | 9.41        | 0.07       | 10.01                | 29.75        | 46.00      | -16.25     | Average  | NEUTRAL |
| 11     | 2.81  | 16.17      | 9.43        | 0.09       | 10.01                | 35.70        | 56.00      | -20.30     | QP       | NEUTRAL |
| 12     | 2.81  | 7.18       | 9.43        | 0.09       | 10.01                | 26.71        | 46.00      | -19.29     | Average  | NEUTRAL |

Note: 1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).

4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

## 11. Antenna Requirements

### 11.1. Limit

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

For intentional device, according to RSS-Gen issue 5 section 6.8.

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

### 11.2. Result

The antennas used for this product are integrated antenna and other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2 dBi.