

**FCC/ IC - TEST REPORT**

Report Number : **68.912.20.0014.01** Date of Issue: August 7, 2020

Model : **WW1-W, WW1-W-CUST, WW3-W, WW3-W-CUST, WW3-RL-W, WW3-RL-W-CUST, WW5-RL-W, WW5-RL-W-CUST**

Product Type : WaveLinx Lite Wallstation

Applicant : Cooper Lighting LLC

Address : 1121 Hwy 74 s., Peachtree City, GA 30269, United States

Production Facility : LEEDARSON LIGHTING CO., LTD

Address : Xingda Road, Xingtai Industrial Zone, Changtai County,  
Zhangzhou, Fujian, China

Test Result : **n Positive      o Negative**

Total pages including Appendices : **38**

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## 2 Details about the Test Laboratory

### Details about the Test Laboratory

#### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch  
Building 12&13, Zhiheng Wisdomland Business Park,  
Nantou Checkpoint Road 2, Nanshan District,  
Shenzhen City, 518052,  
P. R. China

FCC Registration Number: 514049

FCC Designation Number: CA5009

ISED#: 10320A

Telephone: 86 755 8828 6998  
Fax: 86 755 8828 5299

### 3 Description of the Equipment under Test

|                               |                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------|
| Product/PMN:                  | WaveLinx Lite Wallstation                                                                      |
| Model no./HVIN:               | WW5-RL-W                                                                                       |
| FCC ID:                       | 2AKCY-WWZIG                                                                                    |
| IC:                           | 4706A-WWZIG                                                                                    |
| Ratings:                      | 120-270VAC, 50/60Hz, 5mA                                                                       |
| RF Transmission<br>Frequency: | 2405MHz-2480MHz                                                                                |
| No. of Operated Channel:      | 16                                                                                             |
| Modulation:                   | OQPSK                                                                                          |
| Antenna Type:                 | PIFA antenna                                                                                   |
| Antenna Gain:                 | 2.4dBi                                                                                         |
| Description of the EUT:       | The Equipment Under Test (EUT) is a WaveLinx Lite Wallstation supports 2.4GHz Zigbee function. |

## 4 Summary of Test Standards

| Test Standards                                 |                                                                                                                                 |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| FCC Part 15 Subpart C<br>10-1-2019 Edition     | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators                                                          |
| RSS-Gen<br>Issue 5, Amendment 1,<br>March 2019 | General Requirements and Information for the Certification of Radio<br>Apparatus                                                |
| RSS-247<br>Issue 2 February 2017               | Digital Transmission Systems (DTSS), Frequency Hopping Systems<br>(FHSS) and License-Exempt Local Area Network (LE-LAN) Devices |

All the test methods were according to KDB558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10 (2013).

## 5 Summary of Test Results

| Test Condition                                               |                                             | Test Site | Test Result                         |                          |                                     |
|--------------------------------------------------------------|---------------------------------------------|-----------|-------------------------------------|--------------------------|-------------------------------------|
|                                                              |                                             |           | Pass                                | Fail                     | N/A                                 |
| §15.207<br>RSS-GEN 8.8                                       | Conducted emission AC power port            | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247 (b) (3) & RSS-247 5.4(d)                             | Conducted peak output power                 | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(a)(1)<br>RSS-247 5.1(b)                              | 20dB bandwidth                              | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)<br>§RSS-247 5.1(b)                             | Carrier frequency separation                | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| RSS-247 5.4(d)                                               | Equivalent Isotropic Radiated Power         | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| RSS-GEN 6.7                                                  | 99% Occupied Bandwidth                      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(a)(1)(iii)<br>RSS-247 5.1(d)                         | Number of hopping frequencies               | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)<br>RSS-247 5.1(d)                         | Dwell Time                                  | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| RSS-247 5.2(a)                                               | 6dB bandwidth                               | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(e)<br>RSS-247 5.2(b)                                 | Power spectral density                      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d)<br>RSS-247 5.5                                    | Spurious RF conducted emissions             | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d)<br>RSS-247 5.5                                    | Band edge                                   | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d) & §15.209 & §15.205<br>RSS-247 5.5 & RSS-Gen 6.13 | Spurious radiated emissions for transmitter | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.203<br>RSS-Gen 6.8                                       | Antenna requirement                         | Note 2    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a PIFA antenna, which gain is 2.4dBi. In accordance to RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

## 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: 2AKCY-WWZIG and IC: 4706A-WWZIG complies with Section 15.207, 15.205, 15.209, 15.247 of the FCC Part 15, Subpart C Rules; RSS-Gen Issue 5 and RSS-247 issue 2.

All models are identical except their mechanical design is a little different. Such as the number of buttons or the icon of the buttons. So all the tests were applied on WW5-RL-W, other models are deemed to fulfill the requirement without testing.

### SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date: July 28, 2020

Testing Start Date: July 28, 2020

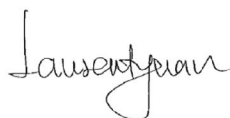
Testing End Date: August 3, 2020

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:



Laurent Yuan  
EMC Project Manager



Henry Chen  
EMC Project Engineer

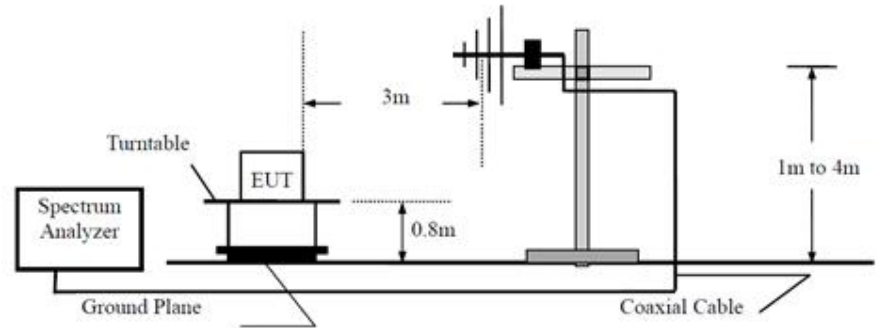


Louise Liu  
EMC Test Engineer

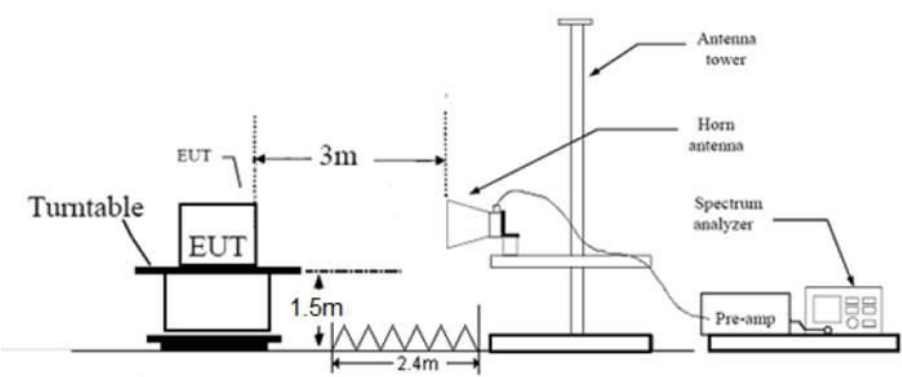
7 Test Setups

7.1 Radiated test setups

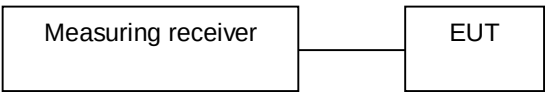
Below 1GHz



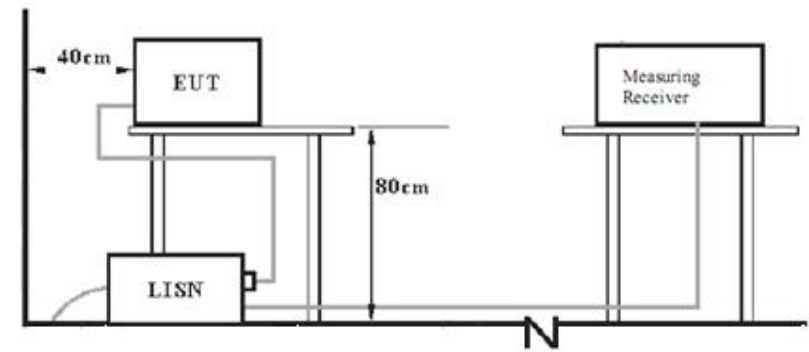
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



## 8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO. | S/N |
|-------------|--------------|-----------|-----|
| ---         | ---          | ---       | --- |

Test software information:

|                       |                  |             |
|-----------------------|------------------|-------------|
| Test Software Version | EMI_Test_Tool    |             |
| Modulation            | Setting TX Power | Packet Type |
| OQPSK                 | 8dBm             | /           |

The system was configured to channel 11, 19, and 26 for the test.

## 9 Technical Requirement

### 9.1 Conducted Emission

#### Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

#### Limit

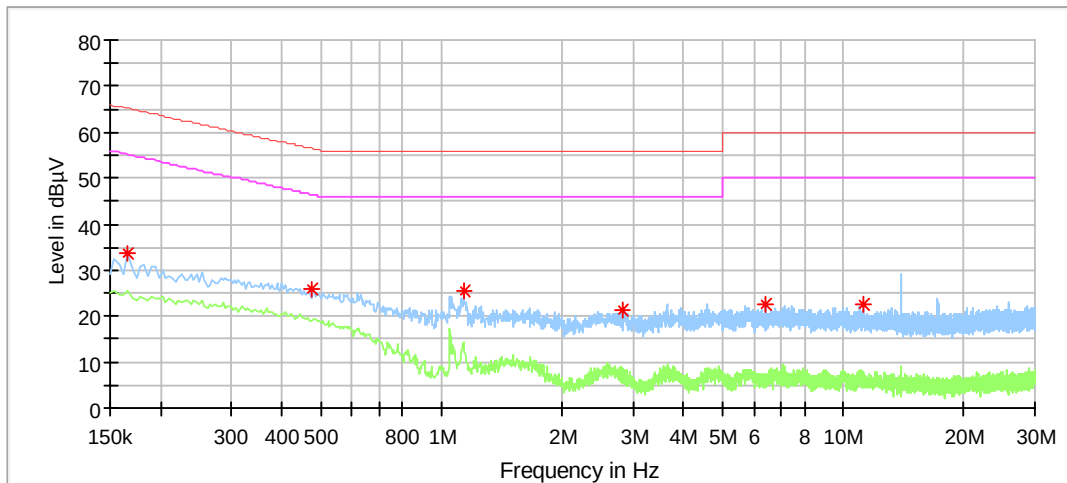
According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

| Frequency<br>MHz | QP Limit<br>dBμV | AV Limit<br>dBμV |
|------------------|------------------|------------------|
| 0.150-0.500      | 66-56*           | 56-46*           |
| 0.500-5          | 56               | 46               |
| 5-30             | 60               | 50               |

Remark: “\*” Decreasing linearly with logarithm of the frequency

## Conducted Emission

Product Type : WaveLinx Lite Wallstation  
 M/N : WW5-RL-W  
 Operating Condition : Normal working with transmitting  
 Test Specification : Power Line, Live  
 Comment : AC 120V/60Hz



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.166000        | 33.85          | ---            | 65.16        | 31.31       | L1   | 9.5        |
| 0.478000        | 25.73          | ---            | 56.37        | 30.64       | L1   | 9.5        |
| 1.138000        | 25.24          | ---            | 56.00        | 30.76       | L1   | 9.6        |
| 2.818000        | 21.41          | ---            | 56.00        | 34.59       | L1   | 9.6        |
| 6.390000        | 22.49          | ---            | 60.00        | 37.51       | L1   | 9.7        |
| 11.250000       | 22.40          | ---            | 60.00        | 37.60       | L1   | 9.7        |

Remark :

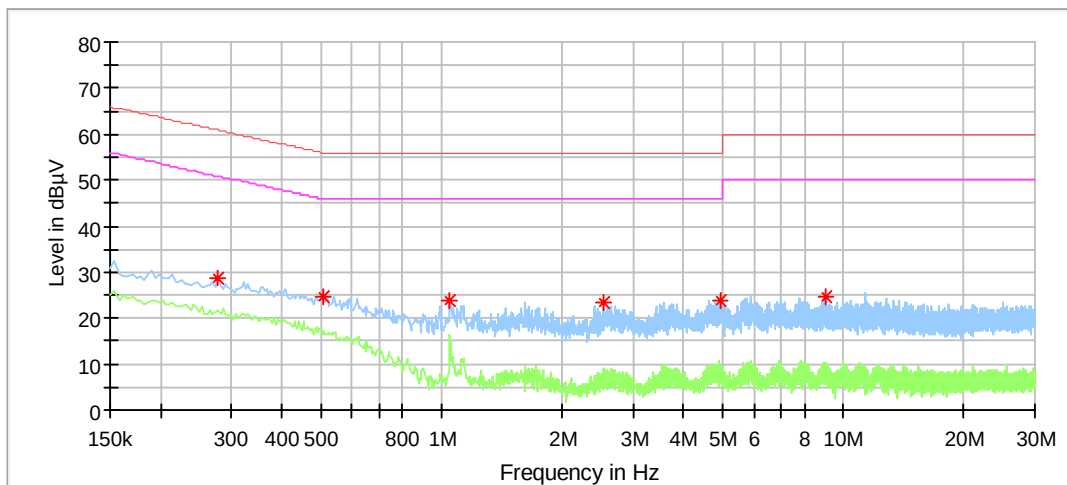
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

## Conducted Emission

Product Type : WaveLinx Lite Wallstation  
 M/N : WW5-RL-W  
 Operating Condition : Normal working with transmitting  
 Test Specification : Power Line, Neutral  
 Comment : AC 120V/60Hz



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.278000        | 28.58          | ---            | 60.88        | 32.30       | N    | 9.6        |
| 0.510000        | 24.72          | ---            | 56.00        | 31.28       | N    | 9.6        |
| 1.050000        | 23.83          | ---            | 56.00        | 32.17       | N    | 9.6        |
| 2.526000        | 23.41          | ---            | 56.00        | 32.59       | N    | 9.6        |
| 4.966000        | 23.95          | ---            | 56.00        | 32.05       | N    | 9.7        |
| 9.090000        | 24.77          | ---            | 60.00        | 35.23       | N    | 9.7        |

Remark :

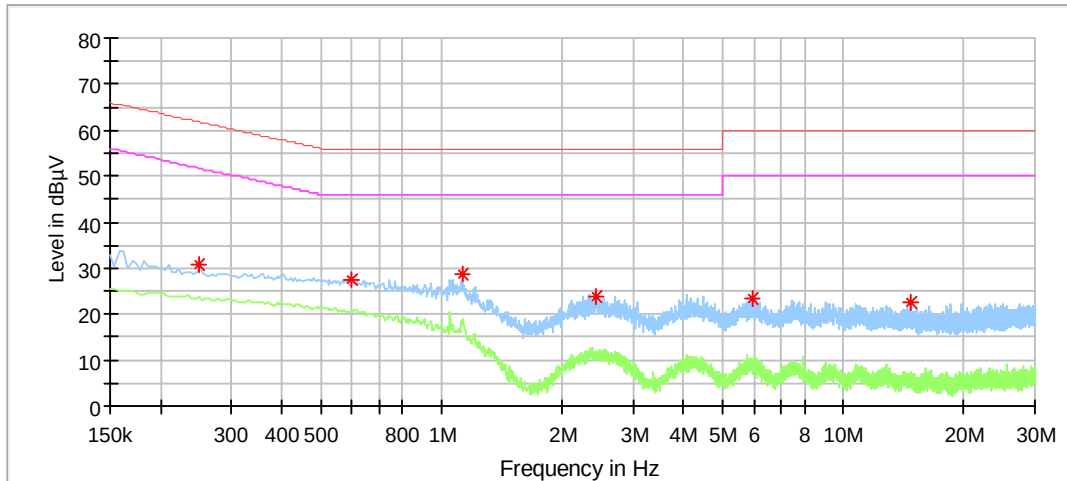
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

## Conducted Emission

Product Type : WaveLinx Lite Wallstation  
 M/N : WW5-RL-W  
 Operating Condition : Normal working with transmitting  
 Test Specification : Power Line, Live  
 Comment : AC 270V/60Hz



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.250000        | 30.79          | ---            | 61.76        | 30.97       | L1   | 9.5        |
| 0.598000        | 27.41          | ---            | 56.00        | 28.59       | L1   | 9.6        |
| 1.130000        | 28.70          | ---            | 56.00        | 27.30       | L1   | 9.6        |
| 2.422000        | 23.97          | ---            | 56.00        | 32.03       | L1   | 9.6        |
| 5.946000        | 23.35          | ---            | 60.00        | 36.65       | L1   | 9.7        |
| 14.746000       | 22.41          | ---            | 60.00        | 37.59       | L1   | 9.7        |

Remark :

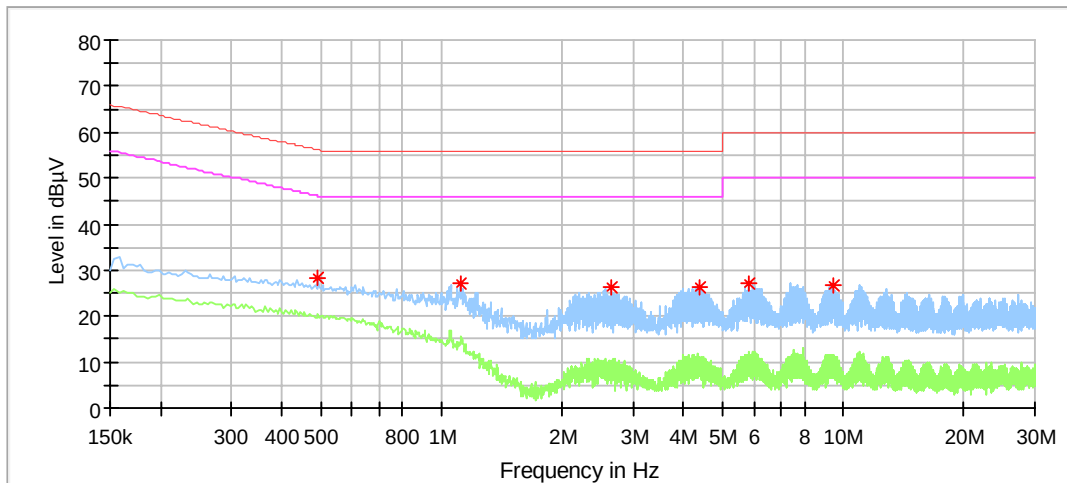
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

## Conducted Emission

Product Type : WaveLinx Lite Wallstation  
 M/N : WW5-RL-W  
 Operating Condition : Normal working with transmitting  
 Test Specification : Power Line, Neutral  
 Comment : AC 270V/60Hz



## Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.494000        | 28.13          | ---            | 56.10        | 27.97       | N    | 9.6        |
| 1.114000        | 27.12          | ---            | 56.00        | 28.88       | N    | 9.6        |
| 2.654000        | 26.25          | ---            | 56.00        | 29.75       | N    | 9.6        |
| 4.398000        | 26.09          | ---            | 56.00        | 29.91       | N    | 9.7        |
| 5.818000        | 27.27          | ---            | 60.00        | 32.73       | N    | 9.7        |
| 9.454000        | 26.59          | ---            | 60.00        | 33.41       | N    | 9.7        |

Remark :

Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

## 9.2 Conducted Peak output power

### Test Method

1. Connect the power meter to the EUT
  - a) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
  - b) At all times the EUT is transmitting at its maximum power control level.
  - c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Adjust the measurement in dBm by adding  $10\log(1/x)$ , where x is the duty cycle to the measurement result.

### Limits

Conducted peak output power limit as below:

| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|------------------------|------------|--------------|
| 2400-2483.5            | $\leq 1$   | $\leq 30$    |

For e.i.r.p limit as below:

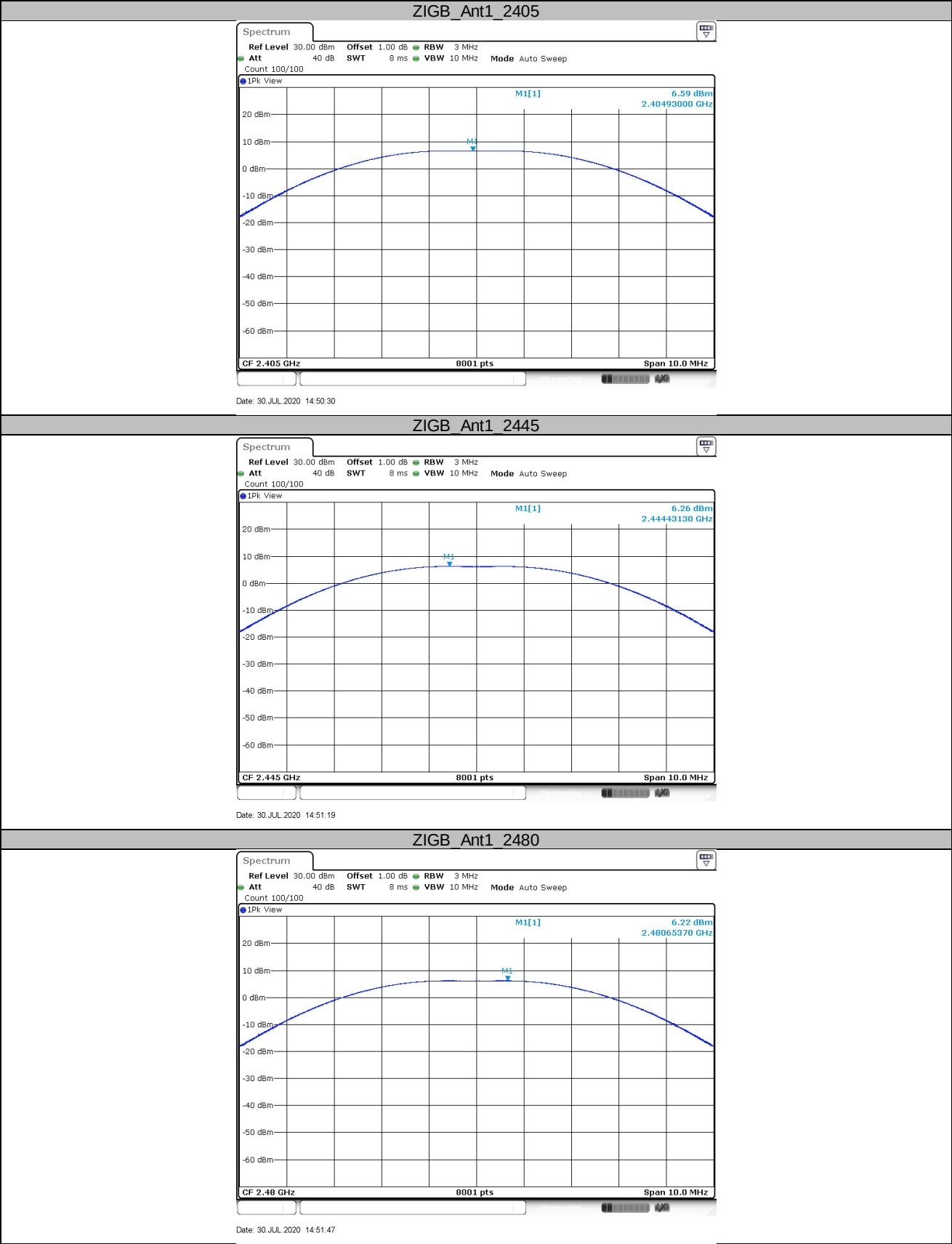
| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|------------------------|------------|--------------|
| 2400-2483.5            | $\leq 4$   | $\leq 30$    |

Test result as below table

| Frequency<br>MHz       | Conducted Peak<br>Output Power<br>dBm | Antenna<br>Gain(dBi) | EIRP(dBm) | Result |
|------------------------|---------------------------------------|----------------------|-----------|--------|
| Bottom channel 2405MHz | 6.59                                  | 2.4                  | 8.99      | Pass   |
| Middle channel 2445MHz | 6.26                                  | 2.4                  | 8.64      | Pass   |
| Top channel 2480MHz    | 6.22                                  | 2.4                  | 8.62      | Pass   |



Test Graphs



### 9.3 6 dB Bandwidth and 99% Occupied Bandwidth

#### Test Method

1. Use the following spectrum analyzer settings:  
RBW=100K, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq$  6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

#### Limit

Limit [kHz]

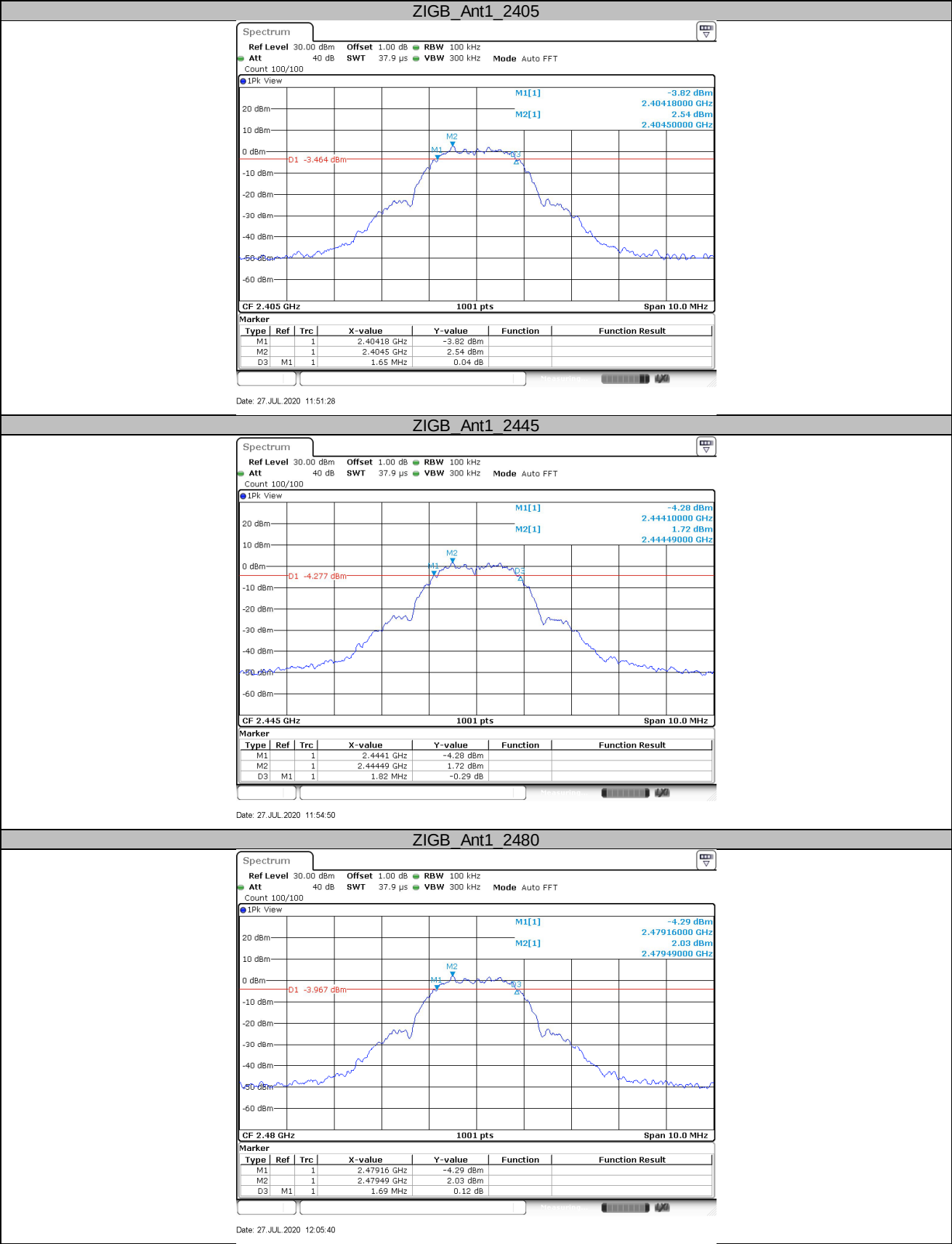
$\geq 500$

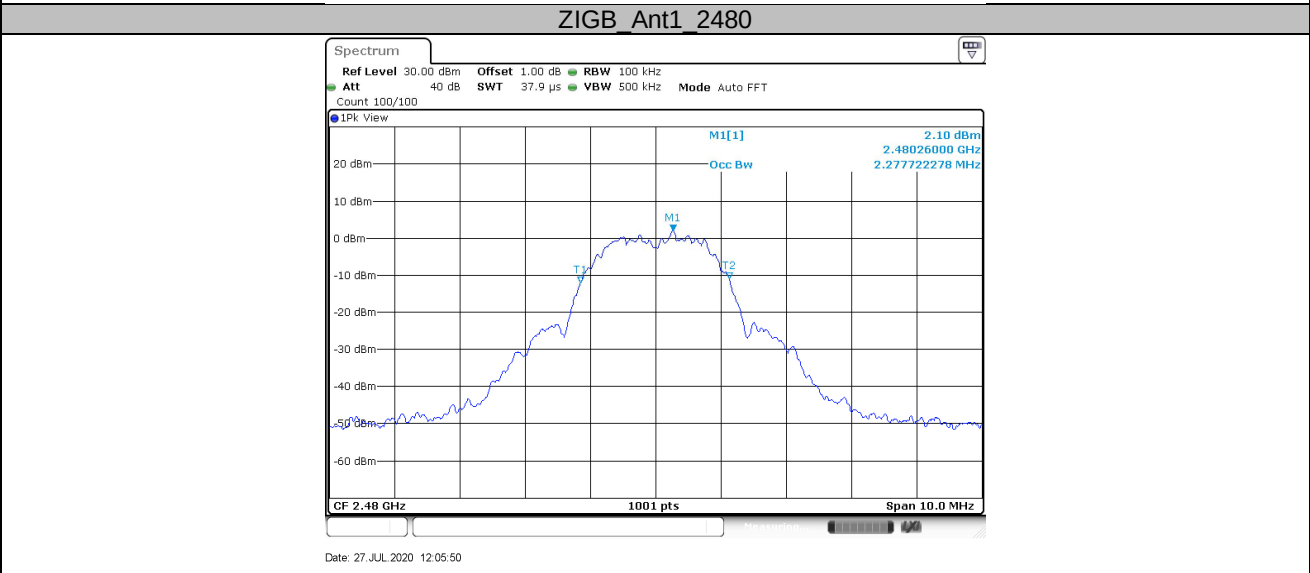
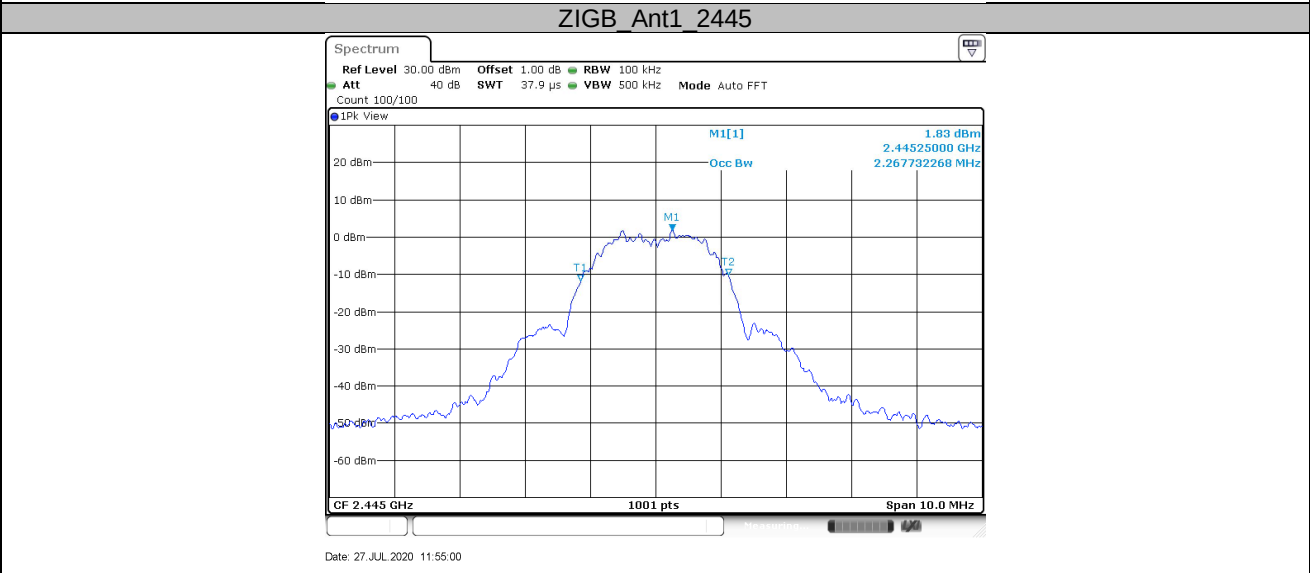
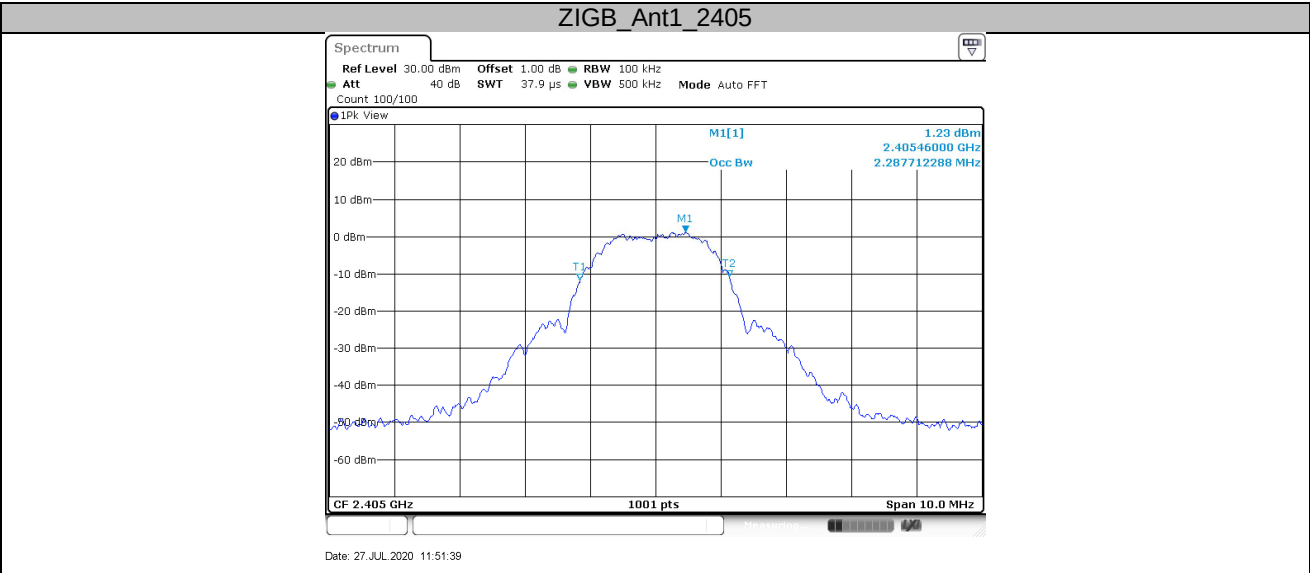
#### Test result

| Frequency<br>MHz       | 6dB bandwidth<br>MHz | 99% bandwidth<br>MHz | Result |
|------------------------|----------------------|----------------------|--------|
| Bottom channel 2405MHz | 1.650                | 2.288                | Pass   |
| Middle channel 2445MHz | 1.820                | 2.268                | Pass   |
| Top channel 2480MHz    | 1.690                | 2.278                | Pass   |



Test Graphs





## 9.4 Power spectral density

### Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW $\geq$ 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

### Limit

Limit [dBm/3KHz]

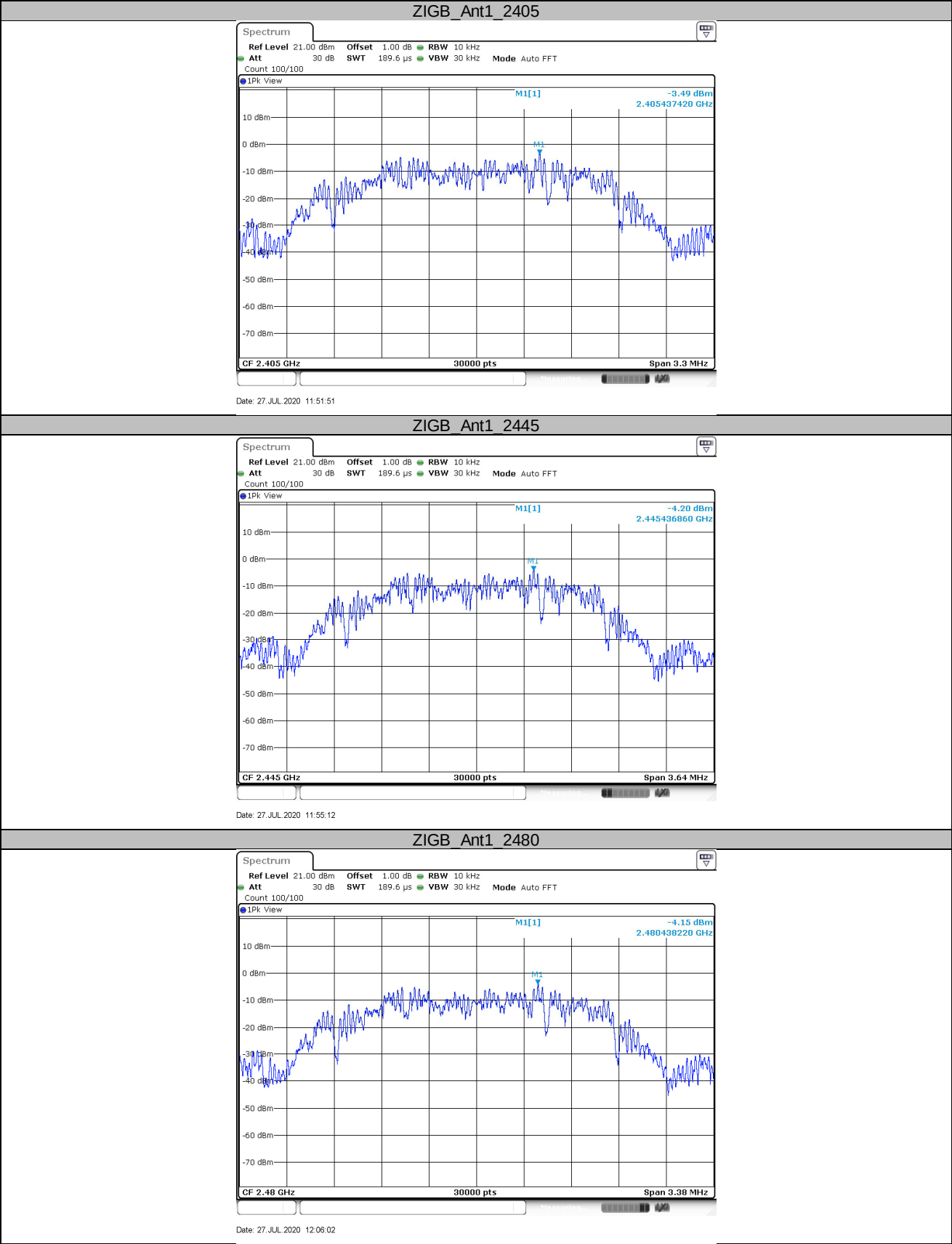
$\leq 8$

### Test result

| Frequency<br>MHz       | Power spectral<br>density<br>dBm/10KHz | Result |
|------------------------|----------------------------------------|--------|
| Top channel 2405MHz    | -3.49                                  | Pass   |
| Middle channel 2445MHz | -4.2                                   | Pass   |
| Bottom channel 2480MHz | -4.15                                  | Pass   |



Test Graphs



## 9.5 Spurious RF conducted emissions

### Test Method

1. Establish a reference level by using the following procedure:
  - a. Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
  - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
  - a. Set the center frequency and span to encompass frequency range to be measured.
  - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

### Limit

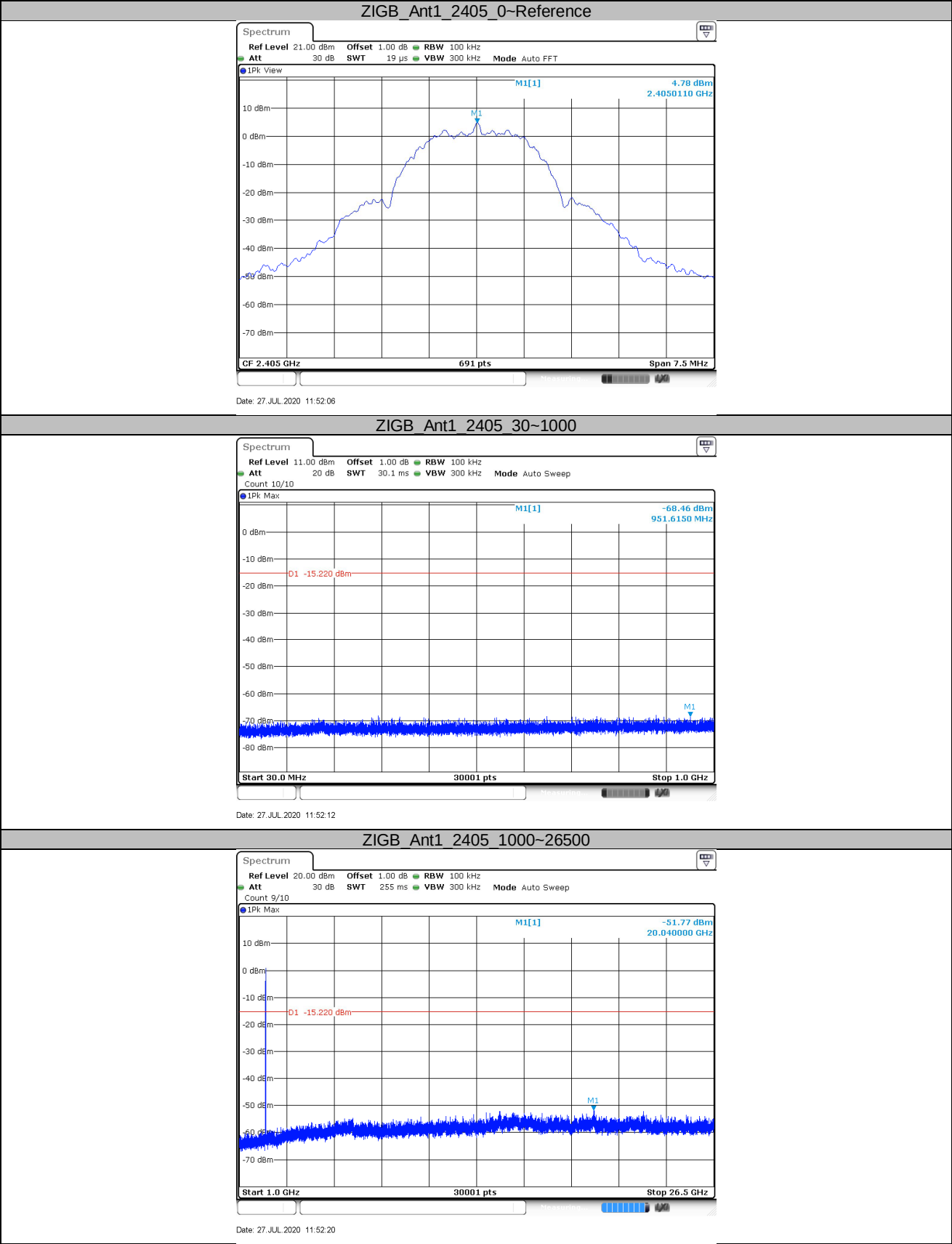
| Frequency Range<br>MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000               | -20         |

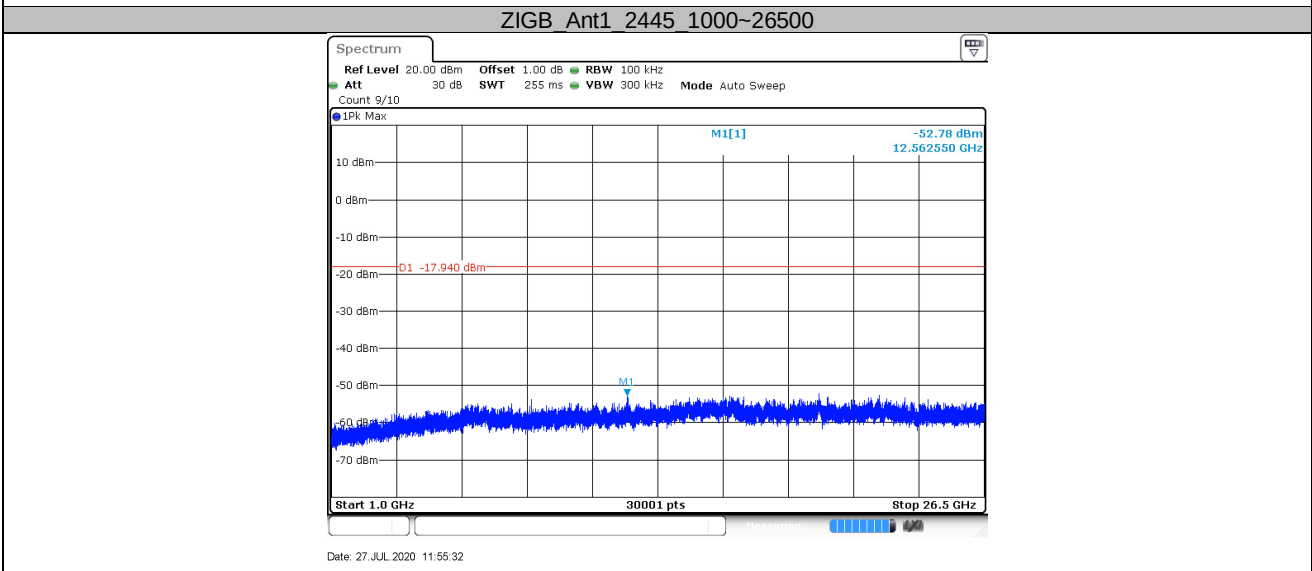
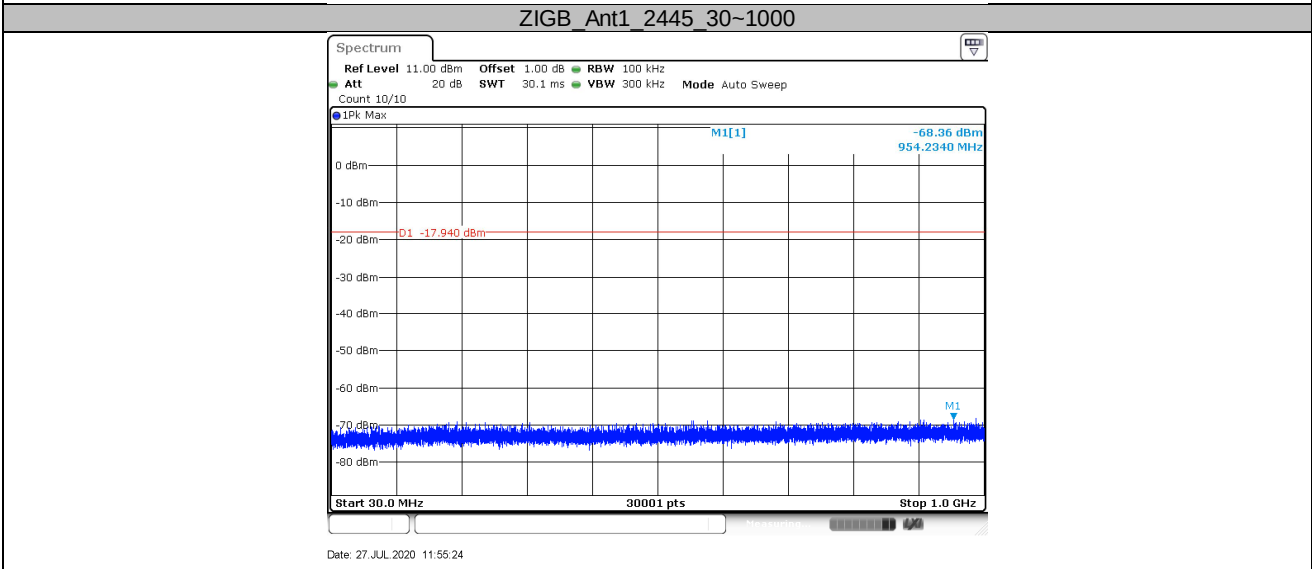
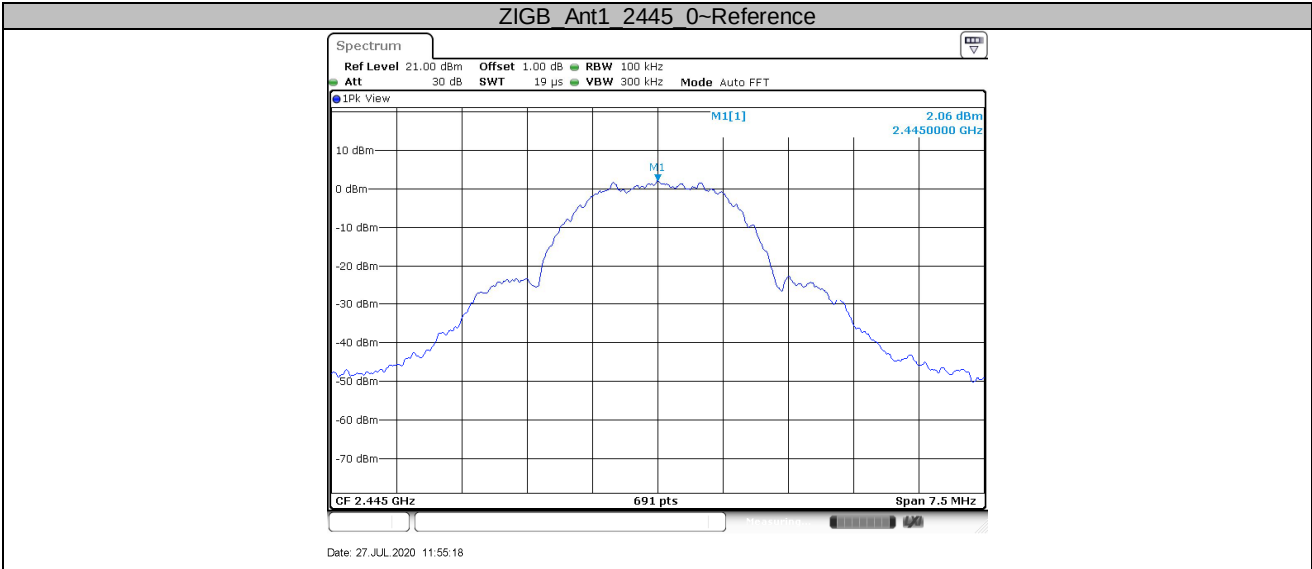
### Test Result:

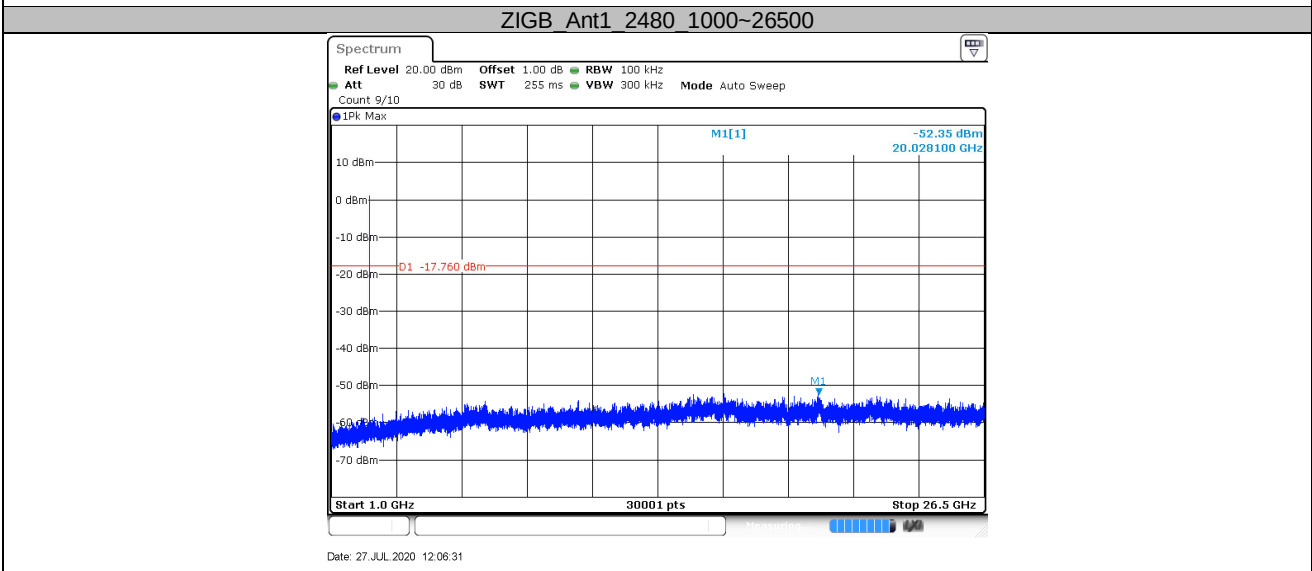
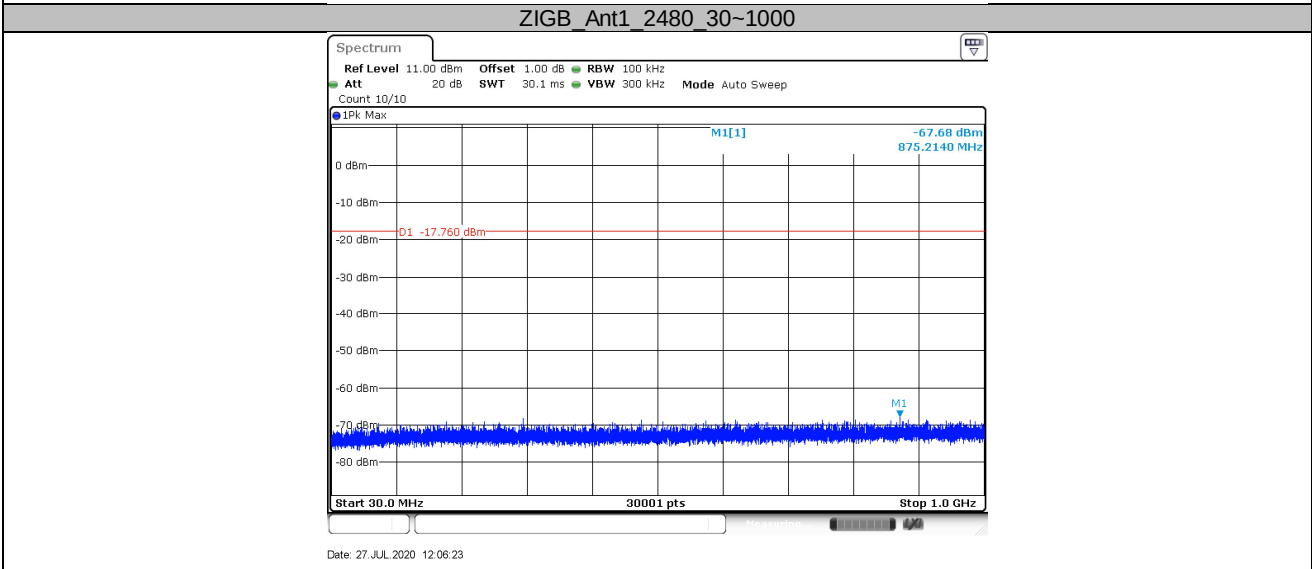
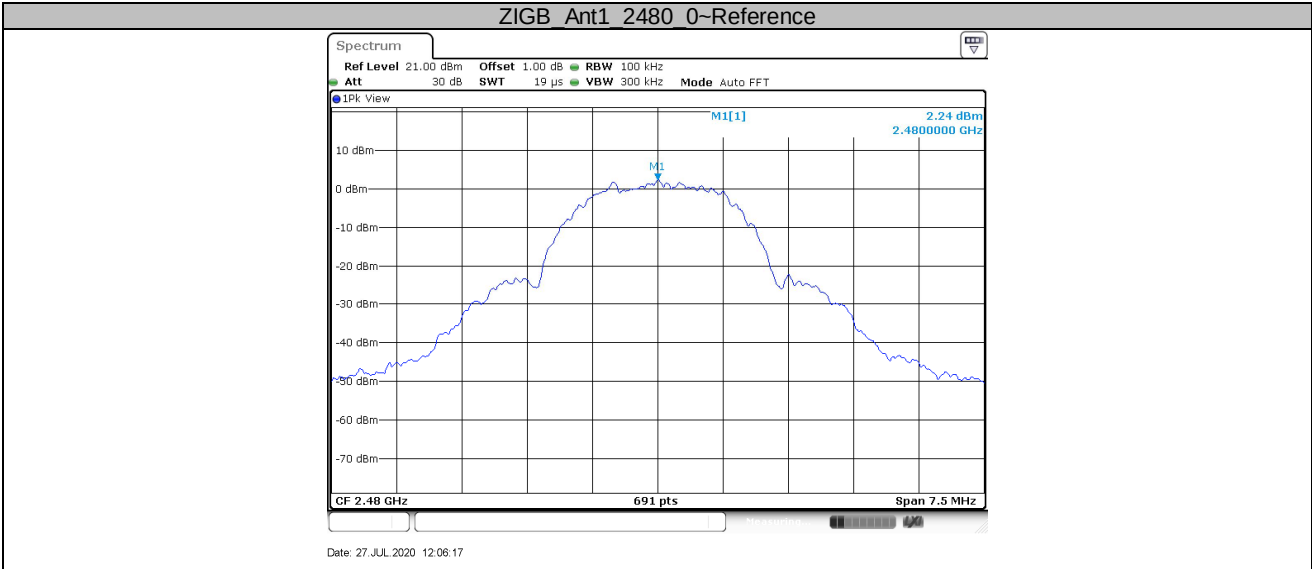
| Test Mode | Antenna | Channel (MHz) | Freq Range (MHz) | Ref Level (dBm) | Result (dBm) | Limit (dBm) | Verdict |
|-----------|---------|---------------|------------------|-----------------|--------------|-------------|---------|
| Zigbee    | ANT1    | 2405          | 30~1000          | 4.78            | -68.46       | -15.22      | PASS    |
| Zigbee    | ANT1    | 2405          | 1000~26500       | 4.78            | -51.77       | -15.22      | PASS    |
| Zigbee    | ANT1    | 2445          | 30~1000          | 2.06            | -68.36       | -17.94      | PASS    |
| Zigbee    | ANT1    | 2445          | 1000~26500       | 2.06            | -52.78       | -17.94      | PASS    |
| Zigbee    | ANT1    | 2480          | 30~1000          | 2.24            | -67.68       | -17.76      | PASS    |
| Zigbee    | ANT1    | 2480          | 1000~26500       | 2.24            | -52.35       | -17.76      | PASS    |



Test Graphs







## 9.6 Band edge

### Test Method

- 1 Use the following spectrum analyzer settings:  
Span = wide enough to capture the peak level of the in-band emission and all spurious  
RBW = 100 kHz, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

### Limit

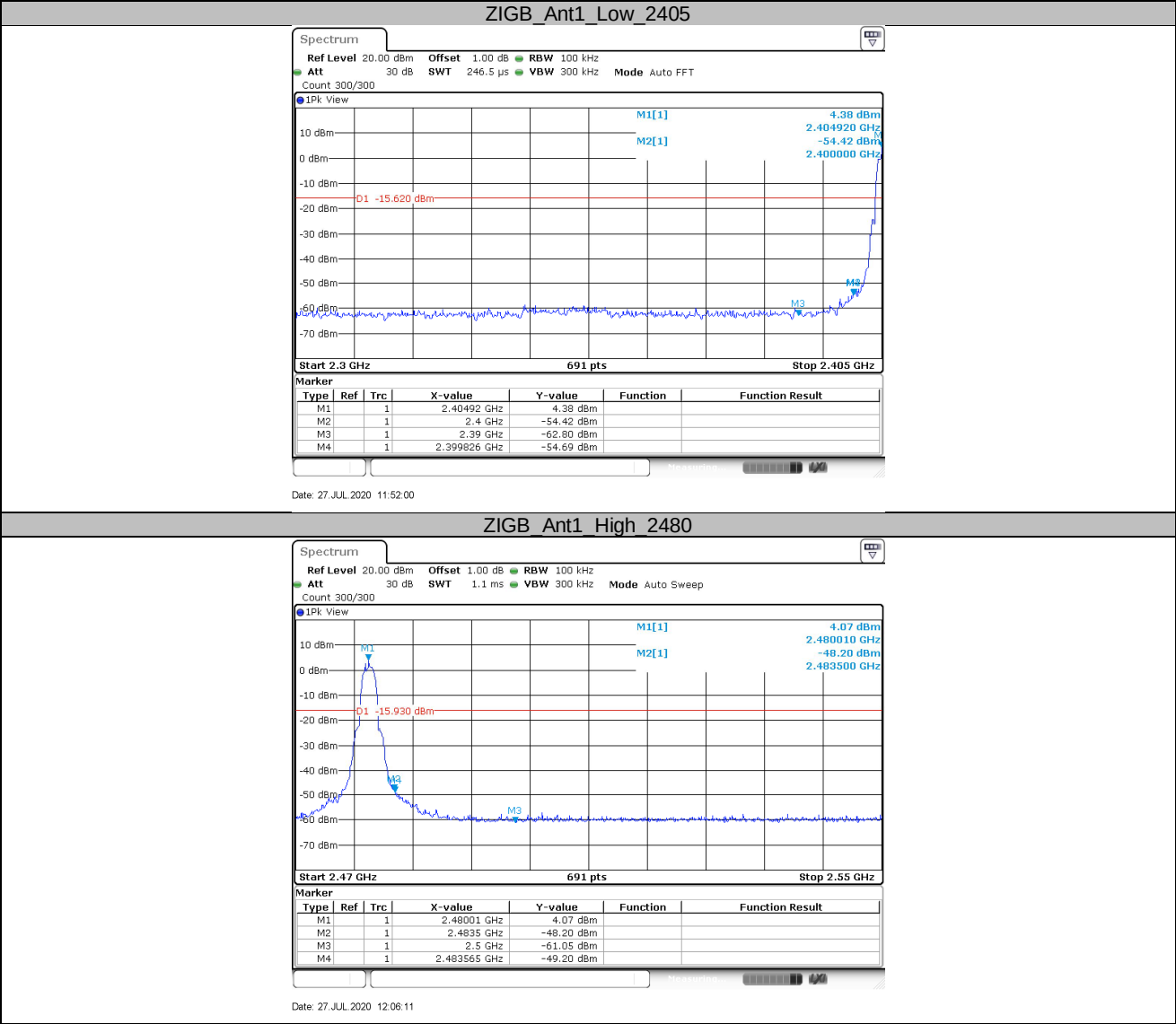
| Frequency Range<br>MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000               | -20         |

### Test result

| Test Mode | Channel (MHz) | Reference Level(dBm) | Result (dBm) | Limit (dBm) | Verdict |
|-----------|---------------|----------------------|--------------|-------------|---------|
| Zigbee    | 2405          | 4.38                 | -54.69       | -15.62      | PASS    |
| Zigbee    | 2480          | 4.07                 | -49.2        | -15.93      | PASS    |



Test Graphs



## 9.7 Spurious radiated emissions for transmitter

### Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:  
For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious  
 RBW = 100 KHz to 120KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious  
 RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1MHz.

b) VBW =  $[3 \times \text{RBW}]$ .

c) Detector = RMS (power averaging), if  $[\text{span} / (\# \text{ of points in sweep})] \leq \text{RBW} / 2$ .

Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.

d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)

e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of  $1 / D$ , where  $D$  is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is  $[10 \log (1 / D)]$ , where  $D$  is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

- 2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is  $[20 \log (1 / D)]$ , where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
- 3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

## Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209.

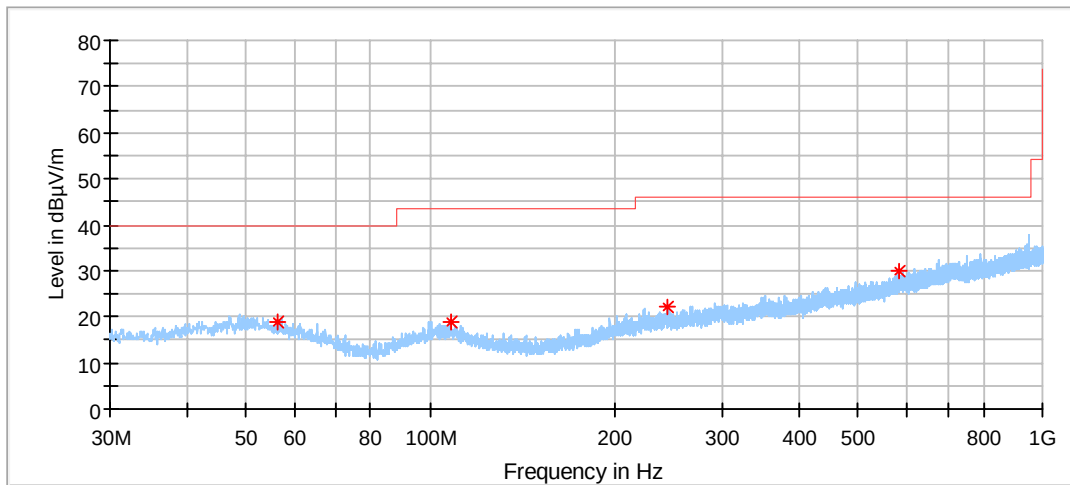
| Frequency<br>MHz | Field Strength<br>uV/m | Field Strength<br>dBμV/m | Detector |
|------------------|------------------------|--------------------------|----------|
| 30-88            | 100                    | 40                       | QP       |
| 88-216           | 150                    | 43.5                     | QP       |
| 216-960          | 200                    | 46                       | QP       |
| 960-1000         | 500                    | 54                       | QP       |
| Above 1000       | 500                    | 54                       | AV       |
| Above 1000       | 5000                   | 74                       | PK       |

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

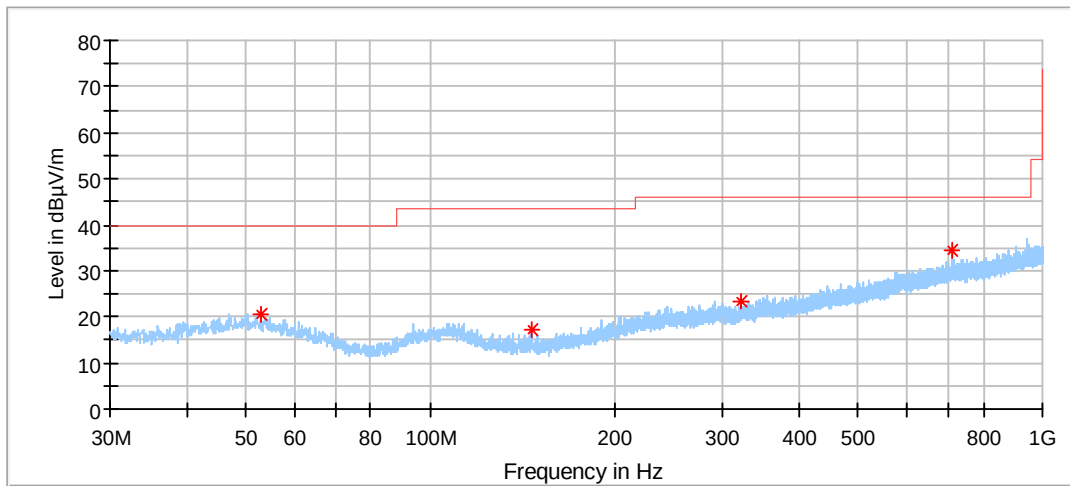
## Spurious radiated emissions for transmitter

### Transmitting spurious emission test result as below:

Below 1G:

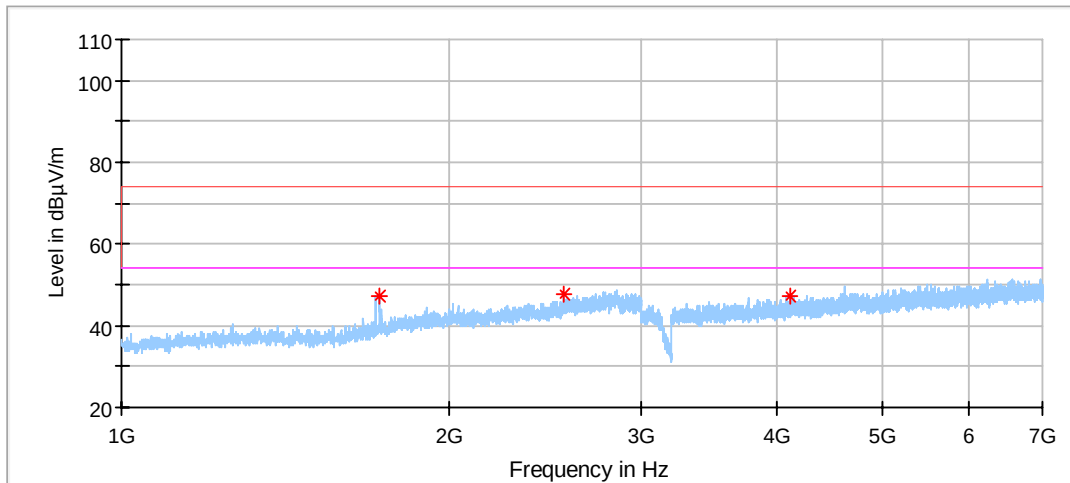


| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 56.190000       | 19.07            | 40.00          | 20.93       | 100.0       | H   | 211.0         | 13.8         |
| 108.138889      | 18.94            | 43.50          | 24.56       | 100.0       | H   | 211.0         | 12.4         |
| 243.938889      | 22.11            | 46.00          | 23.89       | 100.0       | H   | 11.0          | 14.0         |
| 582.953889      | 29.82            | 46.00          | 16.18       | 100.0       | H   | 156.0         | 20.9         |

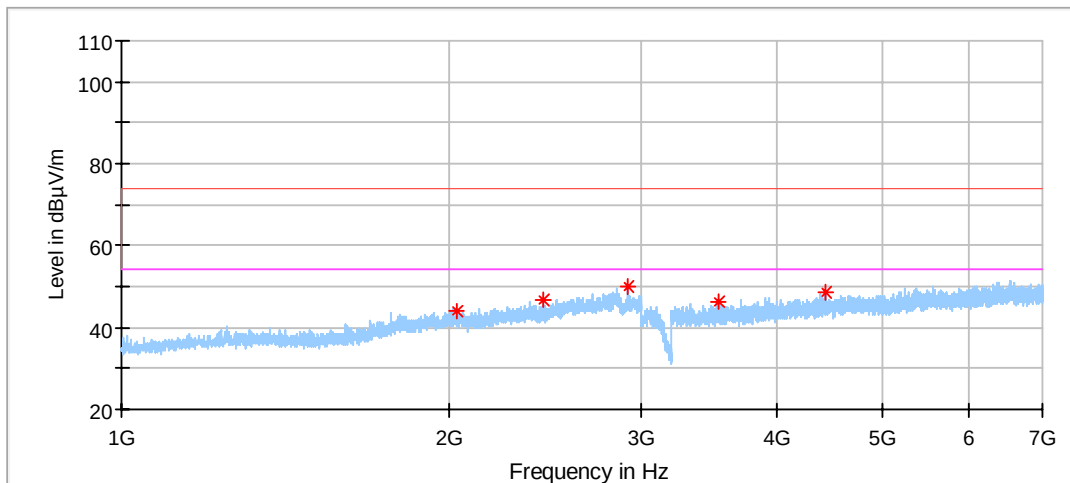


| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 52.741111       | 20.49            | 40.00          | 19.51       | 100.0       | V   | 89.0          | 14.4         |
| 146.723333      | 17.29            | 43.50          | 26.21       | 100.0       | V   | 2.0           | 8.7          |
| 321.431111      | 23.53            | 46.00          | 22.47       | 100.0       | V   | 27.0          | 15.5         |
| 713.688333      | 34.29            | 46.00          | 11.71       | 100.0       | V   | 143.0         | 23.2         |

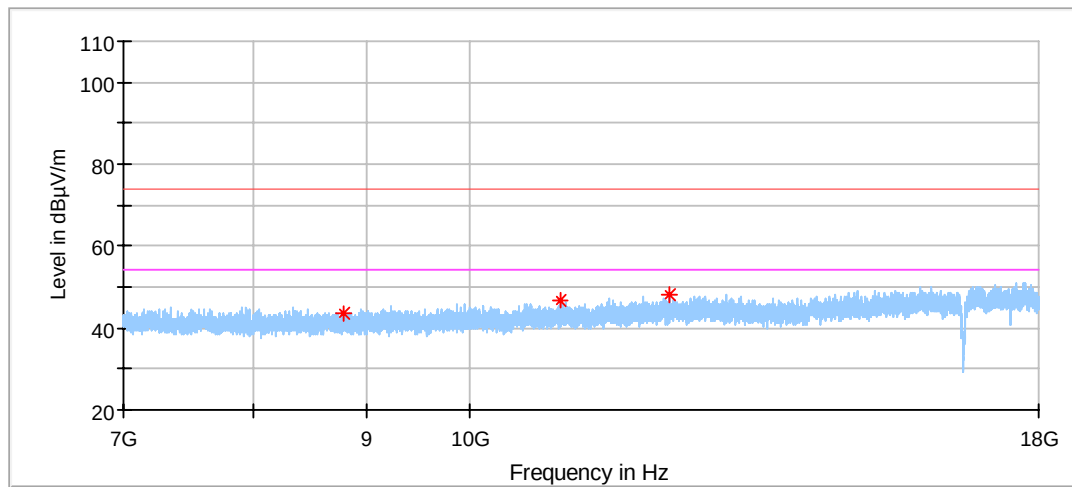
## Low channel 2405MHz Test Result



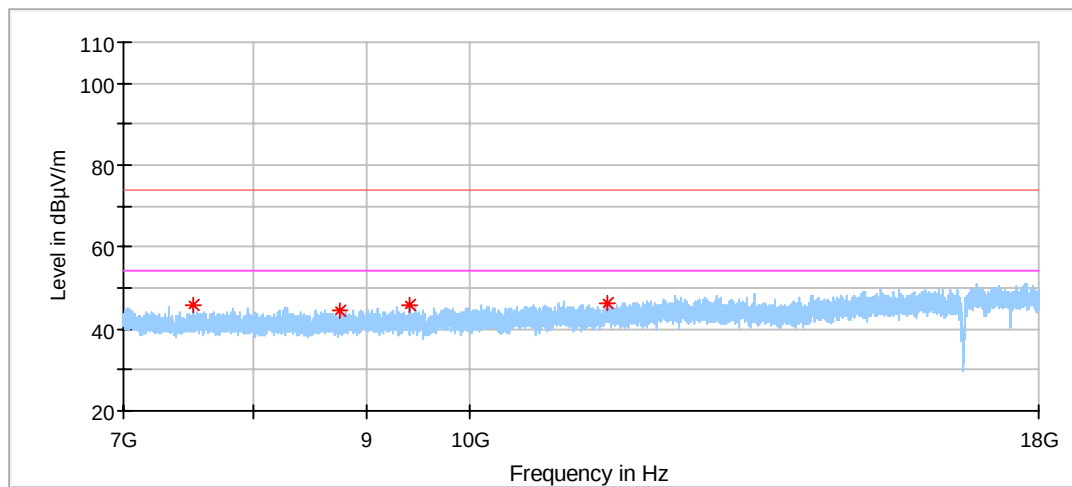
| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 1727.500000     | 47.06            | 74.00          | 26.94       | 150.0       | H   | 159.0         | -6.5         |
| 2549.500000     | 47.49            | 74.00          | 26.51       | 150.0       | H   | 314.0         | -2.0         |
| 4103.000000     | 47.42            | 74.00          | 26.58       | 150.0       | H   | 222.0         | 1.5          |



| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 2032.000000     | 44.00            | 74.00          | 30.00       | 150.0       | V   | 289.0         | -4.5         |
| 2436.000000     | 46.63            | 74.00          | 27.37       | 150.0       | V   | 87.0          | -2.7         |
| 2911.500000     | 49.79            | 74.00          | 24.21       | 150.0       | V   | 309.0         | -0.7         |
| 3535.000000     | 46.52            | 74.00          | 27.48       | 150.0       | V   | 241.0         | -0.8         |
| 4425.500000     | 48.49            | 74.00          | 25.51       | 150.0       | V   | 132.0         | 2.9          |

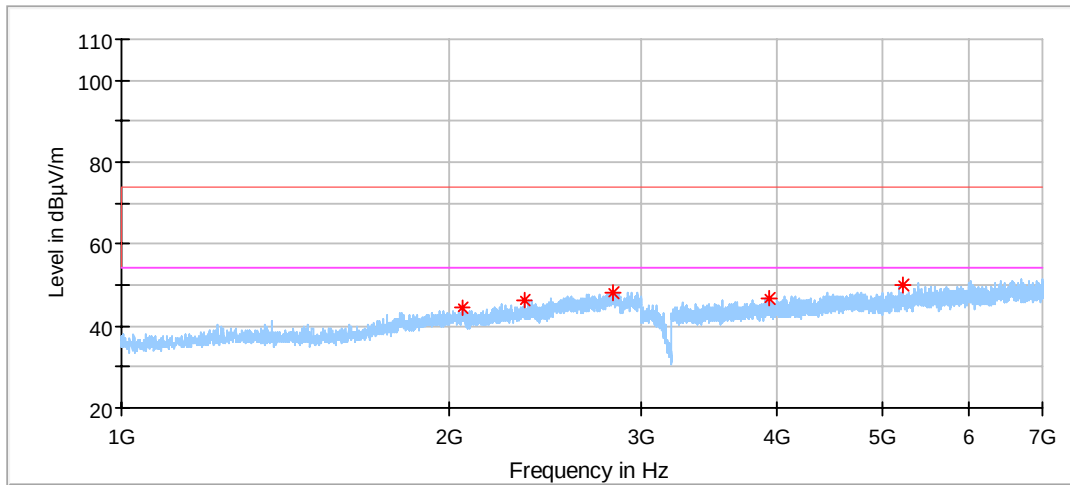


| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 8783.000000     | 43.72            | 74.00          | 30.28       | 150.0       | H   | 218.0         | 6.8          |
| 10978.500000    | 46.83            | 74.00          | 27.17       | 150.0       | H   | 126.0         | 8.2          |
| 12301.000000    | 48.04            | 74.00          | 25.96       | 150.0       | H   | 0.0           | 9.9          |

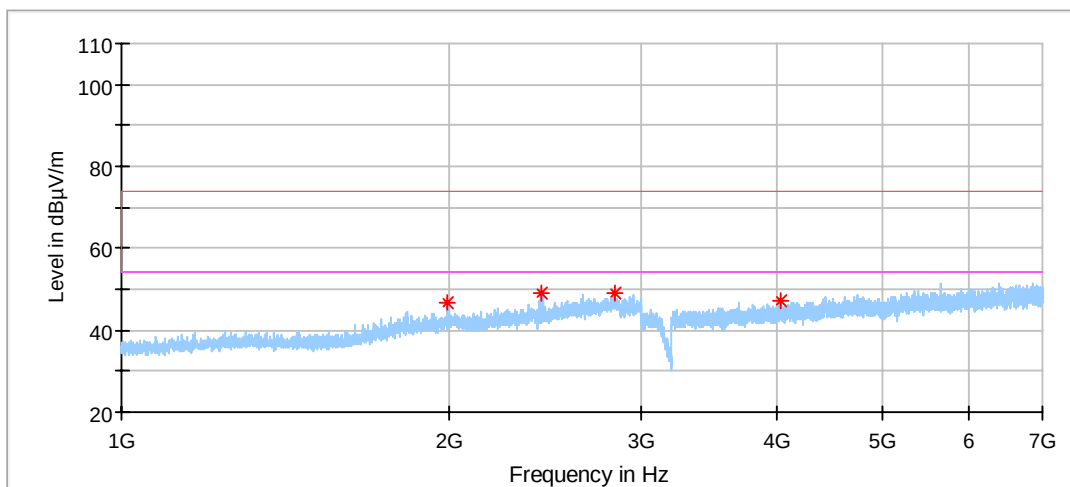


| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 7525.500000     | 45.71            | 74.00          | 28.29       | 150.0       | V   | 4.0           | 6.7          |
| 8747.500000     | 44.51            | 74.00          | 29.49       | 150.0       | V   | 0.0           | 6.7          |
| 9402.000000     | 45.79            | 74.00          | 28.21       | 150.0       | V   | 47.0          | 7.2          |
| 11545.000000    | 46.18            | 74.00          | 27.82       | 150.0       | V   | 303.0         | 8.8          |

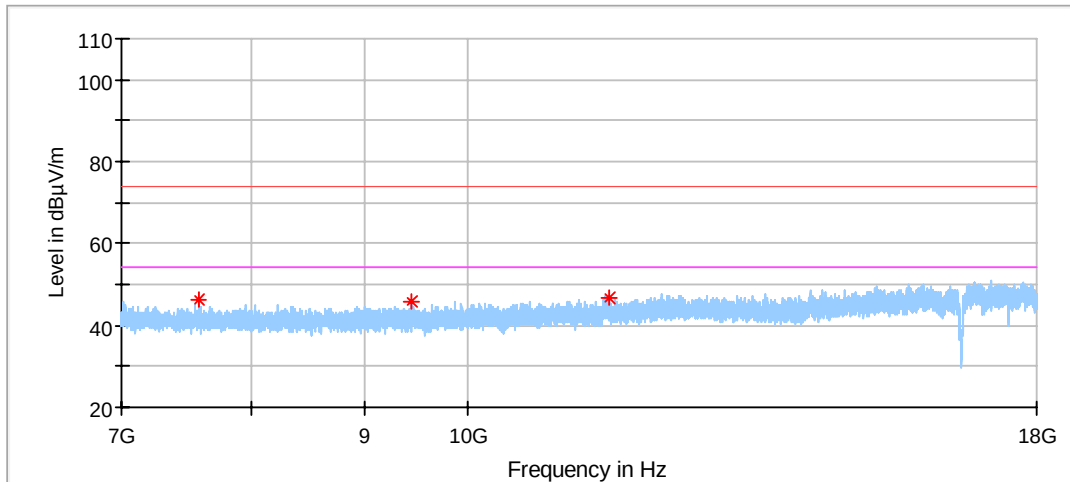
## Middle channel 2445MHz Test Result



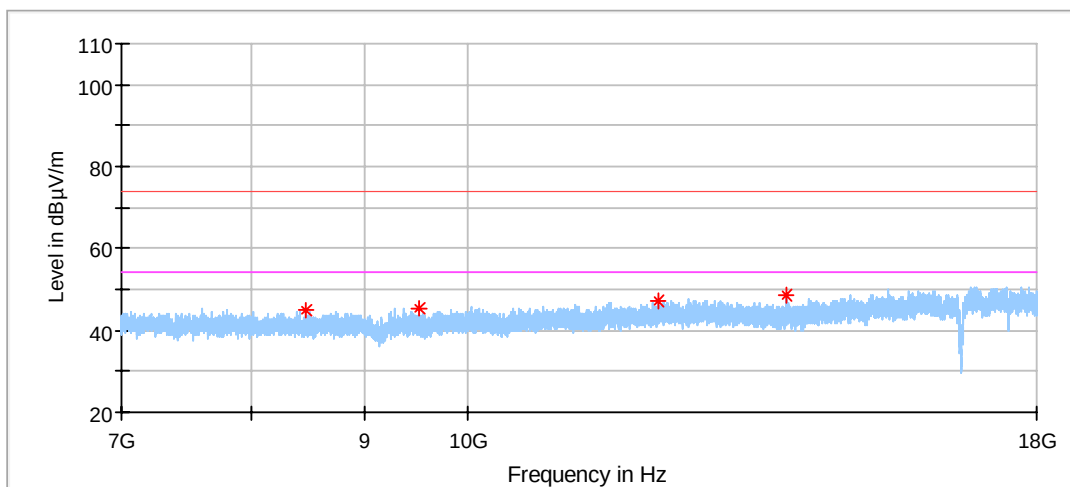
| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 2053.500000     | 44.43            | 74.00          | 29.57       | 150.0       | H   | 192.0         | -4.4         |
| 2347.000000     | 46.48            | 74.00          | 27.52       | 150.0       | H   | 152.0         | -3.3         |
| 2822.000000     | 48.09            | 74.00          | 25.91       | 150.0       | H   | 90.0          | -0.8         |
| 3925.500000     | 46.87            | 74.00          | 27.13       | 150.0       | H   | 154.0         | 1.3          |
| 5214.500000     | 49.87            | 74.00          | 24.13       | 150.0       | H   | 42.0          | 3.0          |



| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 1992.000000     | 46.82            | 74.00          | 27.18       | 150.0       | V   | 146.0         | -4.3         |
| 2428.500000     | 48.90            | 74.00          | 25.10       | 150.0       | V   | 284.0         | -2.9         |
| 2837.000000     | 49.16            | 74.00          | 24.84       | 150.0       | V   | 103.0         | -0.7         |
| 4034.000000     | 47.21            | 74.00          | 26.79       | 150.0       | V   | 206.0         | 1.2          |

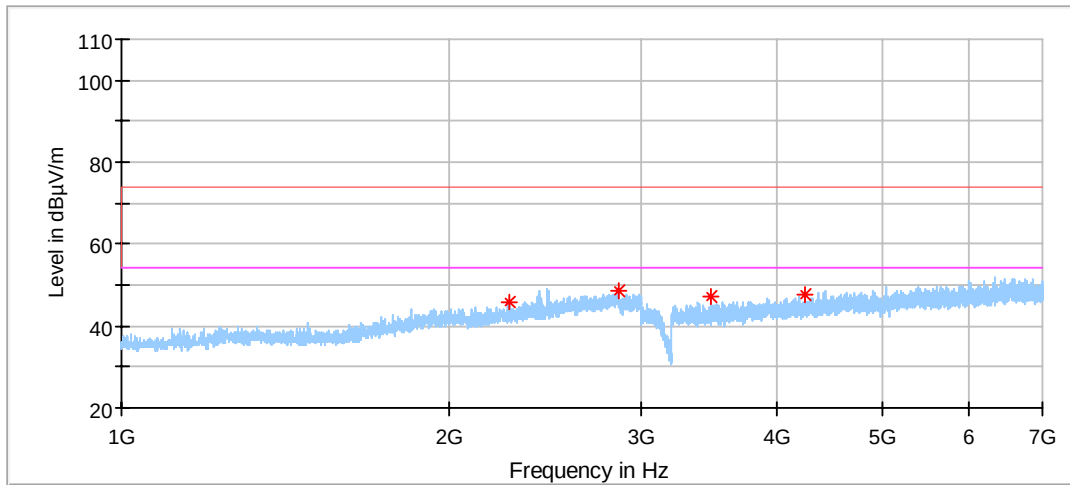


| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 7584.500000     | 46.38            | 74.00          | 27.62       | 150.0       | H   | 81.0          | 6.6          |
| 9433.500000     | 45.74            | 74.00          | 28.26       | 150.0       | H   | 172.0         | 7.2          |
| 11573.000000    | 46.82            | 74.00          | 27.18       | 150.0       | H   | 195.0         | 8.8          |

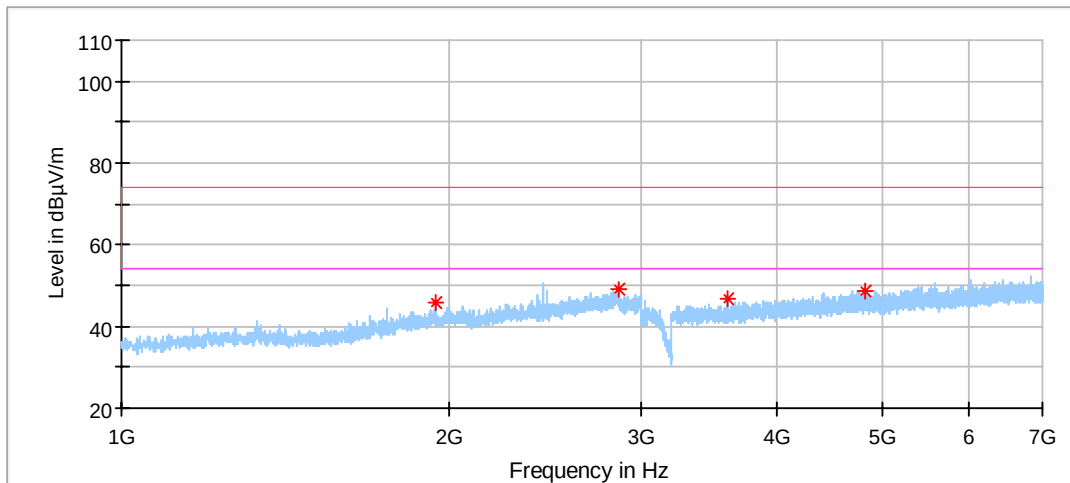


| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 8472.500000     | 44.90            | 74.00          | 29.10       | 150.0       | V   | 359.0         | 6.6          |
| 9510.000000     | 45.19            | 74.00          | 28.81       | 150.0       | V   | 47.0          | 7.3          |
| 12168.000000    | 47.11            | 74.00          | 26.89       | 150.0       | V   | 47.0          | 9.6          |
| 13890.500000    | 48.70            | 74.00          | 25.30       | 150.0       | V   | 0.0           | 10.0         |

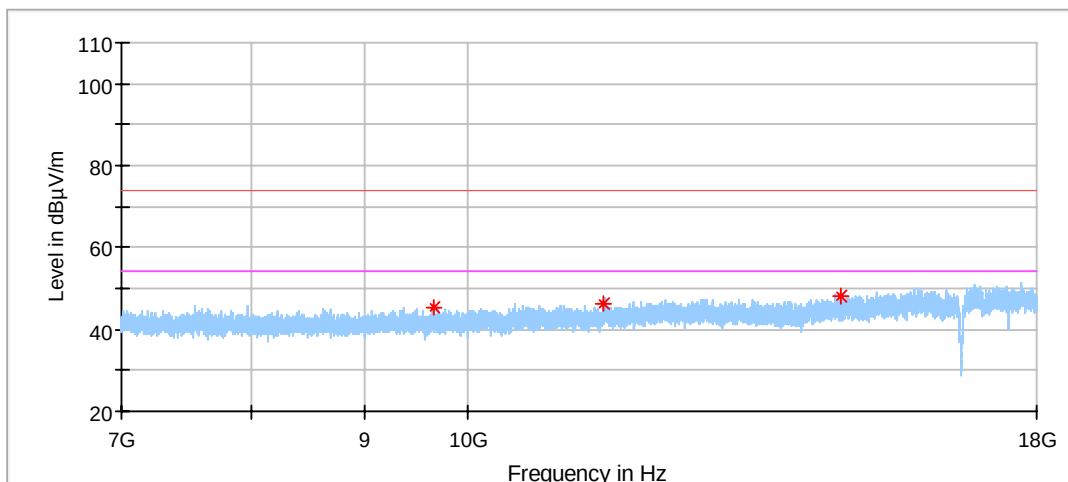
## High channel 2480MHz Test Result



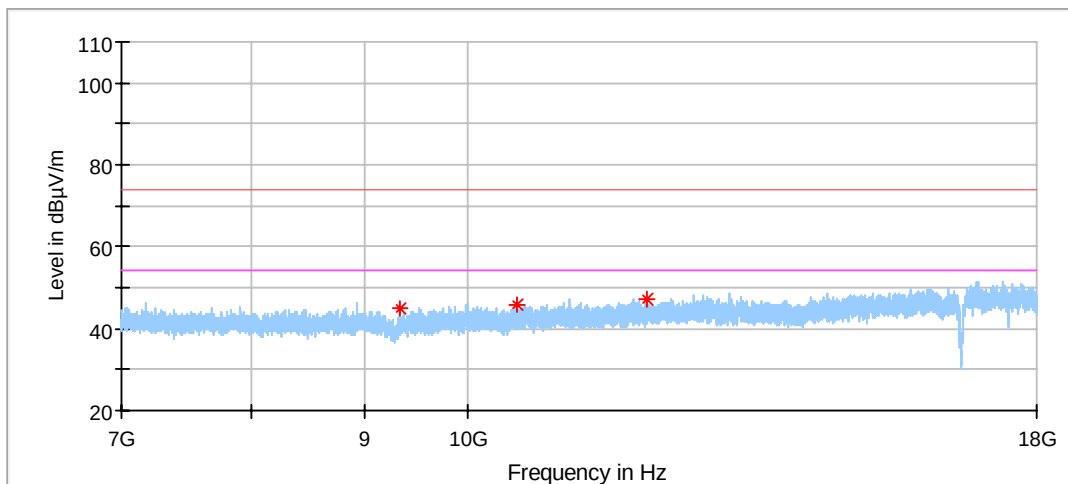
| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 2273.000000     | 45.80            | 74.00          | 28.20       | 150.0       | H   | 291.0         | -3.7         |
| 2858.000000     | 48.60            | 74.00          | 25.40       | 150.0       | H   | 69.0          | -1.0         |
| 3470.500000     | 47.01            | 74.00          | 26.99       | 150.0       | H   | 16.0          | -1.0         |
| 4244.000000     | 47.90            | 74.00          | 26.10       | 150.0       | H   | 215.0         | 2.0          |



| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 1944.500000     | 45.90            | 74.00          | 28.10       | 150.0       | V   | 128.0         | -4.9         |
| 2854.000000     | 48.92            | 74.00          | 25.08       | 150.0       | V   | 198.0         | -0.8         |
| 3602.500000     | 46.59            | 74.00          | 27.41       | 150.0       | V   | 235.0         | -0.6         |
| 4816.000000     | 48.66            | 74.00          | 25.34       | 150.0       | V   | 100.0         | 3.1          |



| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 9664.000000     | 45.41            | 74.00          | 28.59       | 150.0       | H   | 336.0         | 7.7          |
| 11516.500000    | 46.40            | 74.00          | 27.60       | 150.0       | H   | 80.0          | 8.8          |
| 14692.000000    | 48.08            | 74.00          | 25.92       | 150.0       | H   | 175.0         | 11.5         |



| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 9327.500000     | 44.80            | 74.00          | 29.20       | 150.0       | V   | 4.0           | 7.3          |
| 10530.000000    | 45.84            | 74.00          | 28.16       | 150.0       | V   | 254.0         | 8.0          |
| 12046.000000    | 47.39            | 74.00          | 26.61       | 150.0       | V   | 24.0          | 9.9          |

## Remark:

- (1) Data of measurement within frequency range 18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report;
- (2) Level=Reading Level + Correction Factor  
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain  
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss  
 (The Reading Level is recorded by software which is not shown in the sheet)

## 10 Test Equipment List

### Radiated Emission Test

| DESCRIPTION                         | MANUFACTURER    | MODEL NO. | EQUIPMENT ID       | SERIAL NO.      | CAL INTERVAL (YEAR) | CAL. DUE DATE |
|-------------------------------------|-----------------|-----------|--------------------|-----------------|---------------------|---------------|
| EMI Test Receiver                   | Rohde & Schwarz | ESR 7     | 68-4-74-19-001     | 102176          | 1                   | 2021-6-29     |
| Trilog Super Broadband Test Antenna | Schwarzbeck     | VULB 9163 | 68-4-80-14-002     | 707             | 1                   | 2021-8-4      |
| Horn Antenna                        | Rohde & Schwarz | HF907     | 68-4-80-14-005     | 102294          | 1                   | 2021-7-14     |
| Loop Antenna                        | Rohde & Schwarz | HFH2-Z2   | 68-4-80-14-006     | 100398          | 1                   | 2021-7-6      |
| Pre-amplifier                       | Rohde & Schwarz | SCU 18    | 68-4-29-14-001     | 102230          | 1                   | 2021-6-21     |
| Attenuator                          | Agilent         | 8491A     | 68-4-81-16-001     | MY39264334      | 1                   | 2021-6-21     |
| 3m Semi-anechoic chamber            | TDK             | 9X6X6     | 68-4-90-14-001     | ----            | 3                   | 2022-10-28    |
| Test software                       | Rohde & Schwarz | EMC32     | 68-4-90-14-001-A10 | Version10.35.02 | N/A                 | N/A           |

### TS8997 Test System

| DESCRIPTION                               | MANUFACTURER    | MODEL NO.          | EQUIPMENT ID       | SERIAL NO.          | CAL INTERVAL (YEAR) | CAL. DUE DATE |
|-------------------------------------------|-----------------|--------------------|--------------------|---------------------|---------------------|---------------|
| Signal Generator                          | Rohde & Schwarz | SMB100A            | 68-4-48-14-001     | 108272              | 1                   | 2021-6-21     |
| Vector Signal Generator                   | Rohde & Schwarz | SMBV100A           | 68-4-48-18-001     | 262825              | 1                   | 2021-6-21     |
| Communication Synthetical Test Instrument | Rohde & Schwarz | CMW 270            | 68-4-48-18-003     | 101251              | 1                   | 2021-6-21     |
| Signal Analyzer                           | Rohde & Schwarz | FSV40              | 68-4-74-14-004     | 101030              | 1                   | 2021-6-21     |
| Vector Signal Generator                   | Rohde & Schwarz | SMU 200A           | 68-4-48-14-003     | 105324              | 1                   | 2021-6-22     |
| RF Switch Module                          | Rohde & Schwarz | OSP120/OSP-B157    | 68-4-93-14-003     | 101226/100851       | 1                   | 2021-6-21     |
| Power Splitter                            | Weinschel       | 1580               | 68-4-85-14-001     | SC319               | 1                   | 2021-7-16     |
| 10dB Attenuator                           | Weinschel       | 4M-10              | 68-4-81-14-003     | 43152               | 1                   | 2021-6-21     |
| 10dB Attenuator                           | R&S             | DNF                | 68-4-81-14-004     | DNF-001             | 1                   | 2021-6-21     |
| 10dB Attenuator                           | R&S             | DNF                | 68-4-81-14-005     | DNF-002             | 1                   | 2021-6-21     |
| 10dB Attenuator                           | R&S             | DNF                | 68-4-81-14-006     | DNF-003             | 1                   | 2021-6-21     |
| 10dB Attenuator                           | R&S             | DNF                | 68-4-81-14-007     | DNF-004             | 1                   | 2021-6-21     |
| Test software                             | Rohde & Schwarz | EMC32              | 68-4-48-14-003-A10 | Version 10.60.10    | N/A                 | N/A           |
| Test software                             | Tonscend        | System for BT/WIFI | 68-4-74-14-006-A13 | Version 2.6.77.0518 | N/A                 | N/A           |
| Shielding Room                            | TDK             | TS8997             | 68-4-90-19-003     | ----                | 1                   | 2020-11-07    |

## 11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| System Measurement Uncertainty                                          |                                                                                      |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Test Items                                                              | Extended Uncertainty                                                                 |
| Uncertainty for Radiated Spurious Emission 25MHz-3000MHz                | Horizontal: 4.81dB;<br>Vertical: 4.89dB;                                             |
| Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz             | Horizontal: 4.69dB;<br>Vertical: 4.68dB;                                             |
| Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz            | Horizontal: 4.89dB;<br>Vertical: 4.87dB;                                             |
| Uncertainty for Conducted RF test with TS 8997                          | RF Power Conducted: 1.16dB<br>Frequency test involved:<br>0.6×10 <sup>-7</sup> or 1% |
| Uncertainty Evaluation for Power Spectral Density Conducted measurement | 1.17dB                                                                               |
| Uncertainty Evaluation for Spurious emissions Conducted measurement     | 1.43dB                                                                               |
| Uncertainty Evaluation for Humidity                                     | 0.936%                                                                               |
| Uncertainty Evaluation for Temperature                                  | 0.195 °C                                                                             |