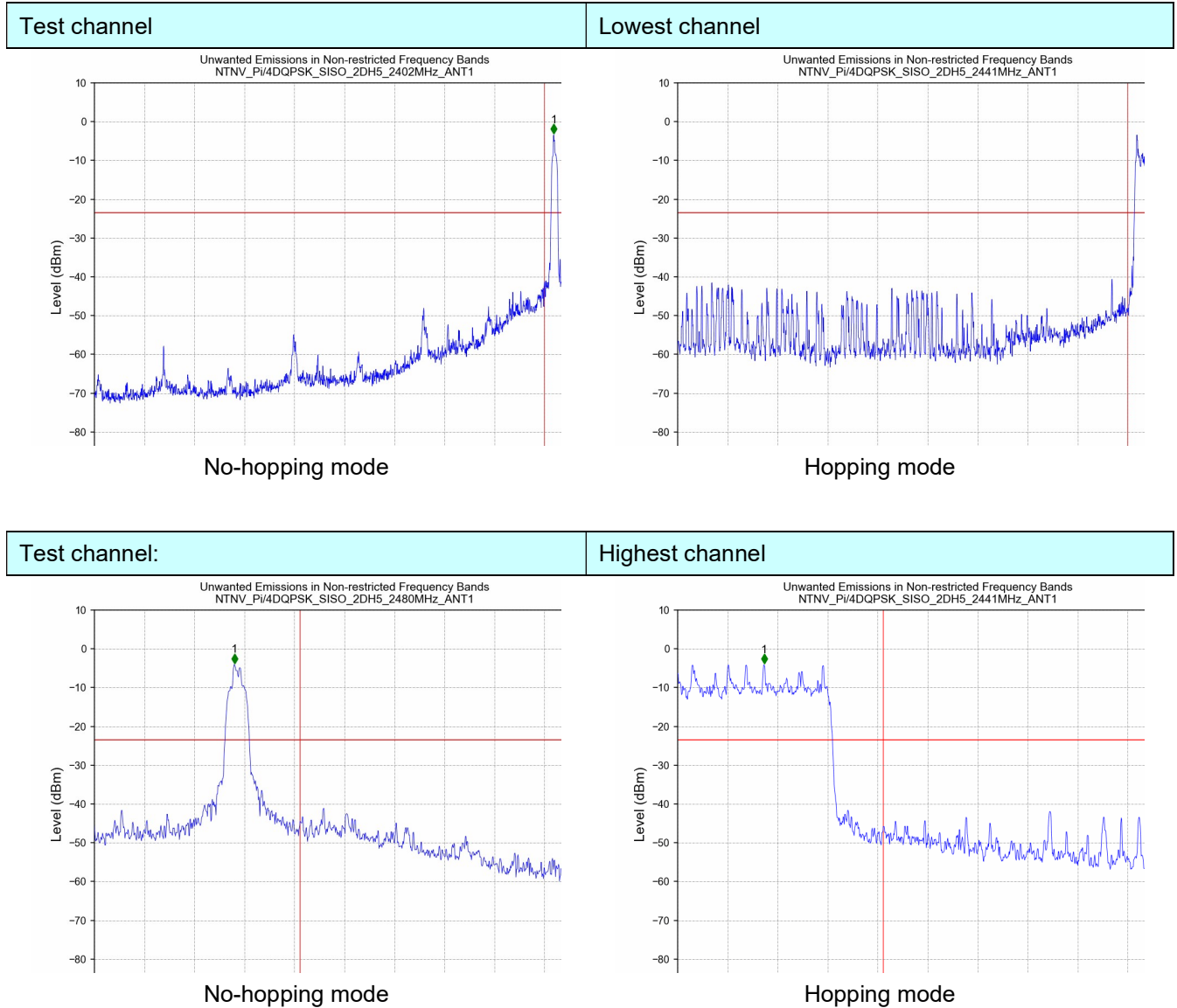
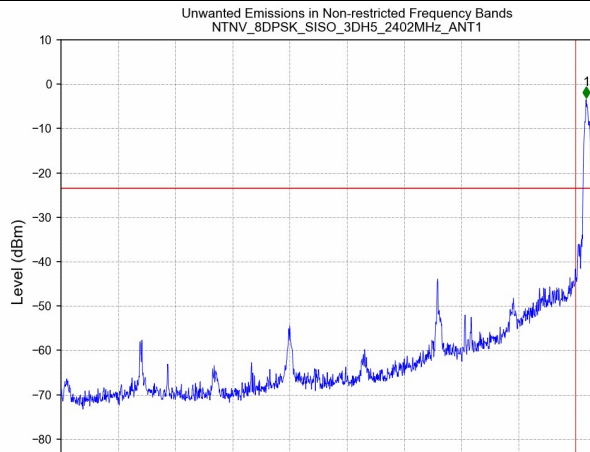


### $\pi/4$ -DQPSK Mode:

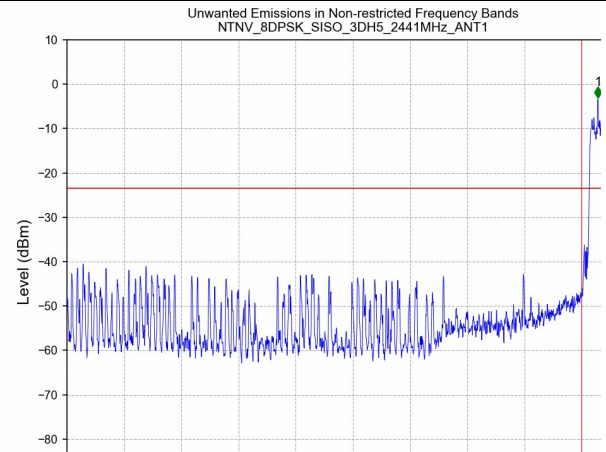


### 8-DPSK Mode:

| Test channel: | Lowest channel |
|---------------|----------------|
|---------------|----------------|

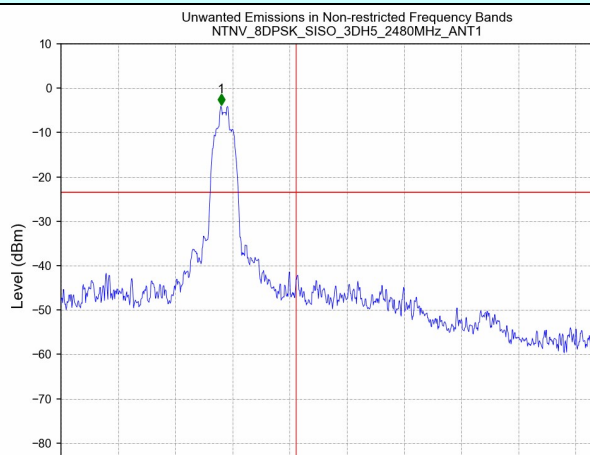


No-hopping mode

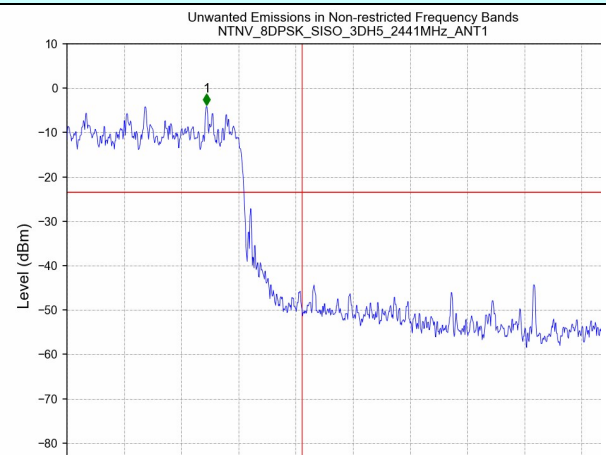


Hopping mode

| Test channel: | Highest channel |
|---------------|-----------------|
|---------------|-----------------|

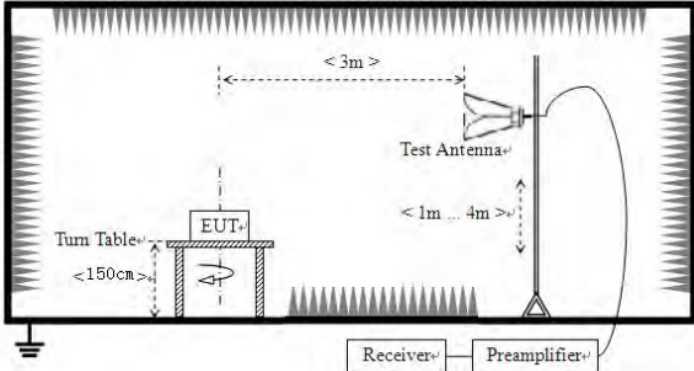


No-hopping mode



Hopping mode

### 6.7.2. Radiated Emission Method

|                       |  |          |         |                    |         |               |  |
|-----------------------|--|----------|---------|--------------------|---------|---------------|--|
| Test Requirement:     | FCC Part15 C Section 15.209 and 15.205   |          |         |                    |         |               |  |
| Test Method:          | ANSI C63.10:2013   |          |         |                    |         |               |  |
| Test Frequency Range: | All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.   |          |         |                    |         |               |  |
| Test site:            | Measurement Distance: 3m   |          |         |                    |         |               |  |
| Receiver setup:       | Frequency  | Detector |         | RBW                | VBW     | Remark        |  |
|                       | Above 1GHz   | Peak     |         | 1MHz               | 3MHz    | Peak Value    |  |
|                       |  | Peak     |         | 1MHz               | 10Hz    | Average Value |  |
| Limit:                | Frequency  |          |         | Limit (dBuV/m @3m) |         | Remark        |  |
|                       | Above 1GHz   |          |         | 54.00              |         | Average Value |  |
|                       |  |          |         | 74.00              |         | Peak Value    |  |
| Test setup:           |   |          |         |                    |         |               |  |
| Test Procedure:       | <div>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>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.</div> <div>3. The antenna height 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.</div> <div>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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</div> |          |         |                    |         |               |  |
| Test Instruments:     | Refer to section 6.0 for details   |          |         |                    |         |               |  |
| Test mode:            | Refer to section 5.2 for details   |          |         |                    |         |               |  |
| Test results:         | Pass   |          |         |                    |         |               |  |
| Test environment:     | Temp.:   | 25 °C    | Humid.: | 52%                | Press.: | 1012mbar      |  |

**Measurement Data**

Remark: GFSK, Pi/4 DQPSK,8-DPSK all have been tested, only worse case GFSK is reported.

Operation Mode: GFSK TX Low channel(2402MHz)

**Horizontal (Worst case)**

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2390      | 59.30         | 26.20          | 5.72       | 33.30         | 57.92          | 74.00    | -16.08 | peak          |
| 2390      | 43.22         | 26.20          | 5.72       | 33.30         | 41.84          | 54.00    | -12.16 | AVG           |

**Vertical:**

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2390      | 57.45         | 26.20          | 5.72       | 33.30         | 56.07          | 74.00    | -17.93 | peak          |
| 2390      | 46.21         | 26.20          | 5.72       | 33.30         | 44.83          | 54.00    | -9.17  | AVG           |

Operation Mode: GFSK TX High channel (2480MHz)

**Horizontal (Worst case)**

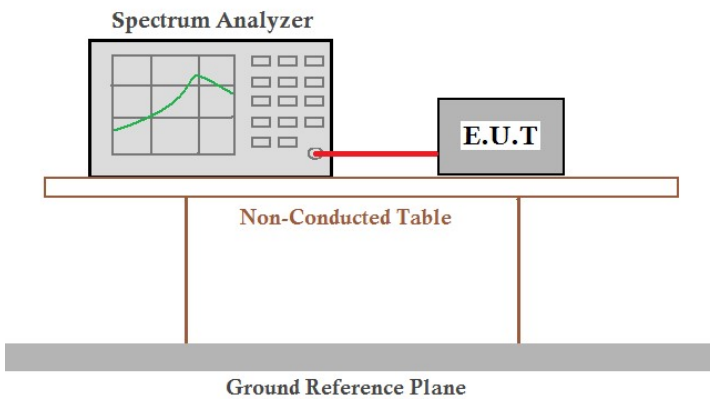
| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2483.5    | 55.26         | 28.60          | 6.97       | 32.70         | 58.13          | 74.00    | -15.87 | peak          |
| 2483.5    | 42.16         | 28.60          | 6.97       | 32.70         | 45.03          | 54.00    | -8.97  | AVG           |

**Vertical:**

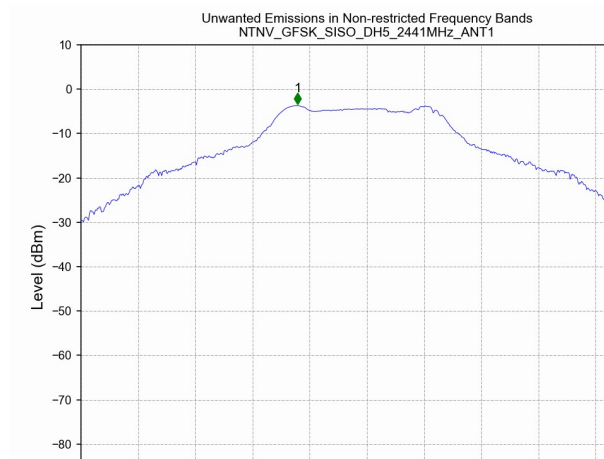
| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2483.5    | 54.93         | 28.60          | 6.97       | 32.70         | 57.80          | 74.00    | -16.20 | peak          |
| 2483.5    | 41.33         | 28.60          | 6.97       | 32.70         | 44.20          | 54.00    | -9.80  | AVG           |

## 6.8. Spurious Emission

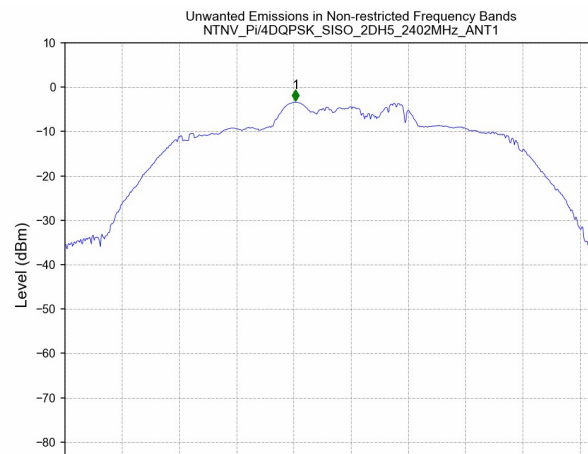
### 6.8.1. Conducted Emission Method

|                   |   |       |         |     |         |          |
|-------------------|---|-------|---------|-----|---------|----------|
| Test Requirement: | FCC Part15 C Section 15.247 (d)   |       |         |     |         |          |
| Test Method:      | ANSI C63.10:2013  |       |         |     |         |          |
| Limit:            | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement. |       |         |     |         |          |
| Test setup:       |  <p>The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>                                   |       |         |     |         |          |
| Test Instruments: | Refer to section 6.0 for details  |       |         |     |         |          |
| Test mode:        | Refer to section 5.2 for details  |       |         |     |         |          |
| Test results:     | Pass  |       |         |     |         |          |
| Test environment: | Temp.:  | 25 °C | Humid.: | 52% | Press.: | 1012mbar |

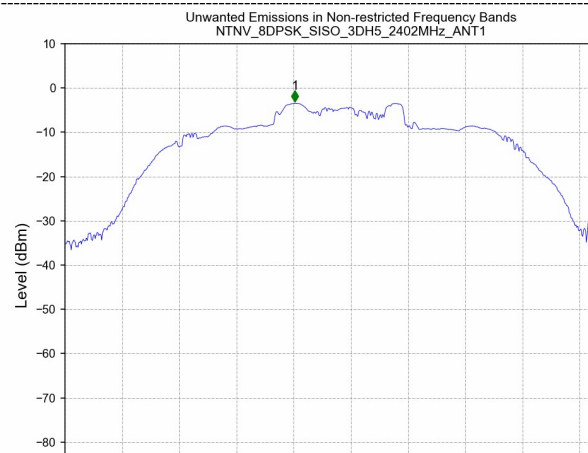
## Reference



## GFSK

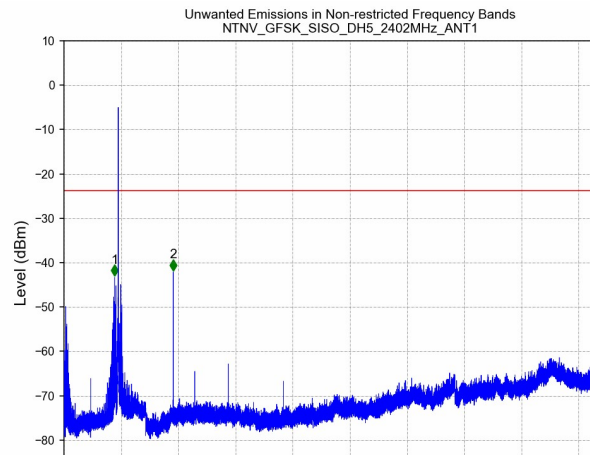


## $\pi/4$ QPSK

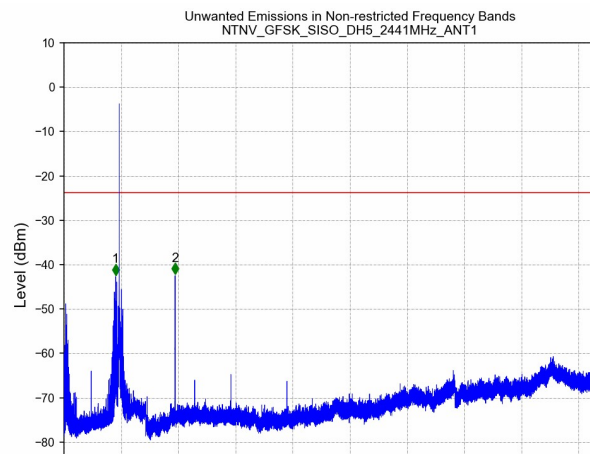


## 8-DPSK

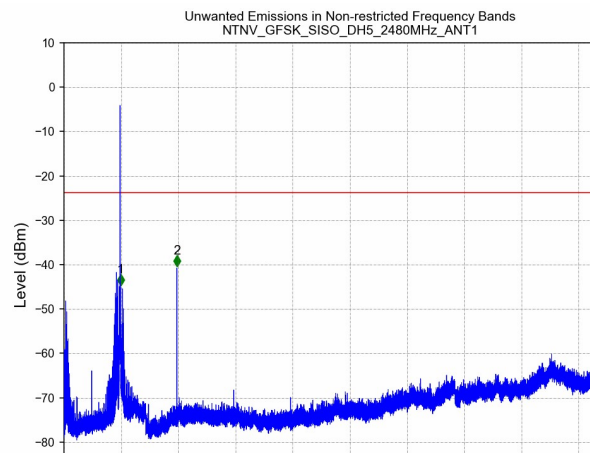
### GFSK



### CH00

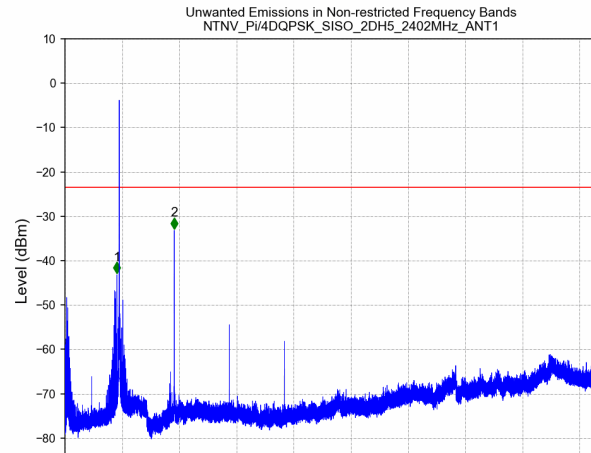


### CH39

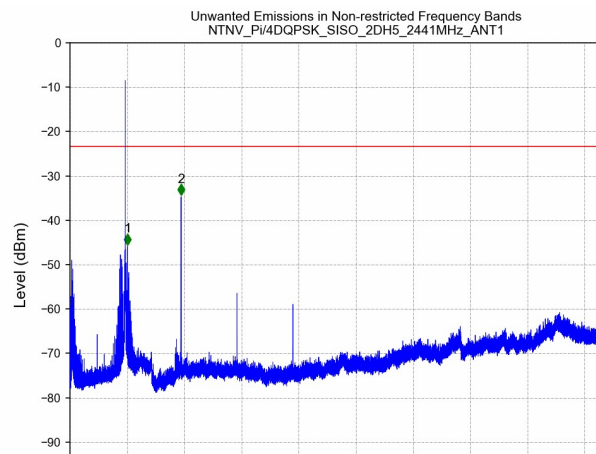


### CH78

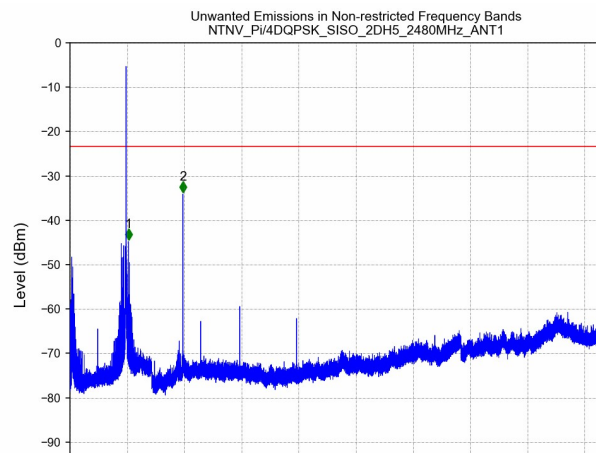
### $\pi/4$ DQPSK



### CH00



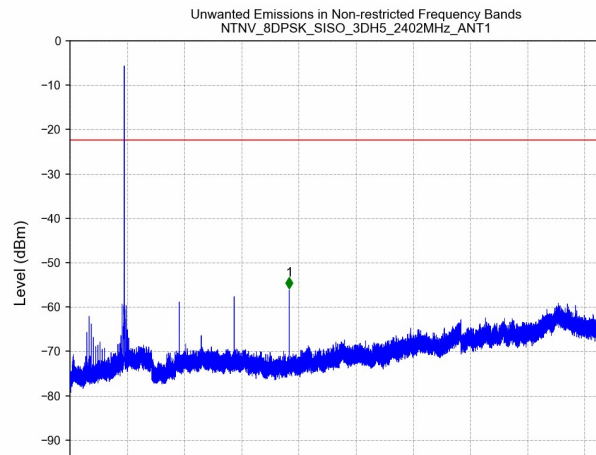
### CH39



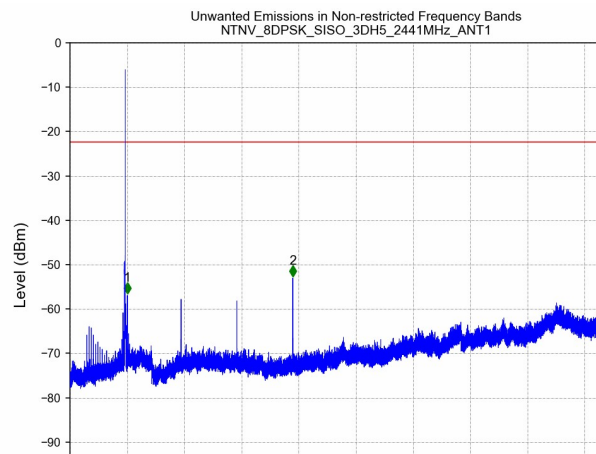
### CH78



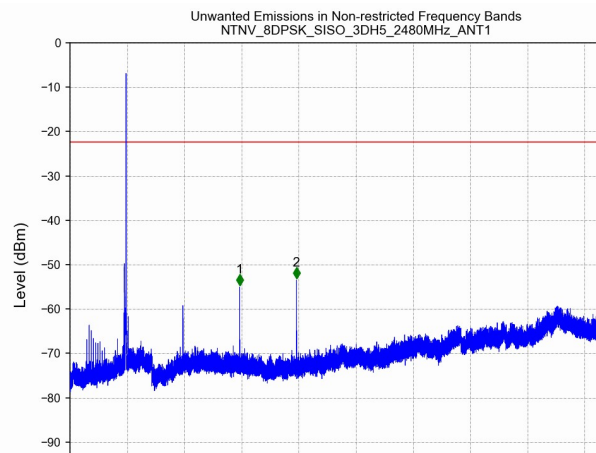
### 8-DPSK



### CH00

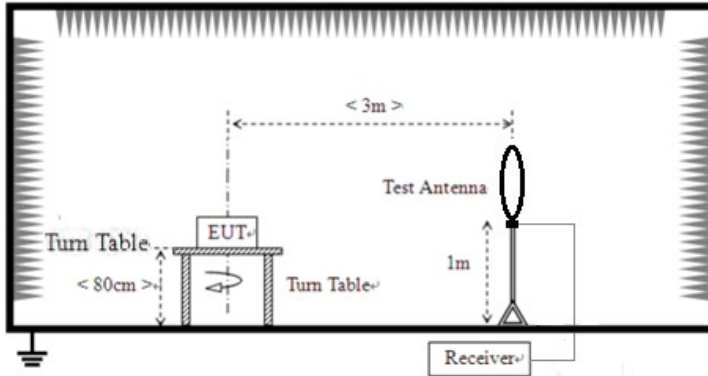


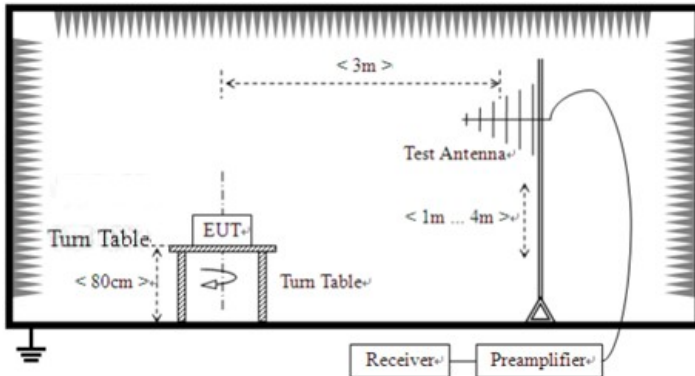
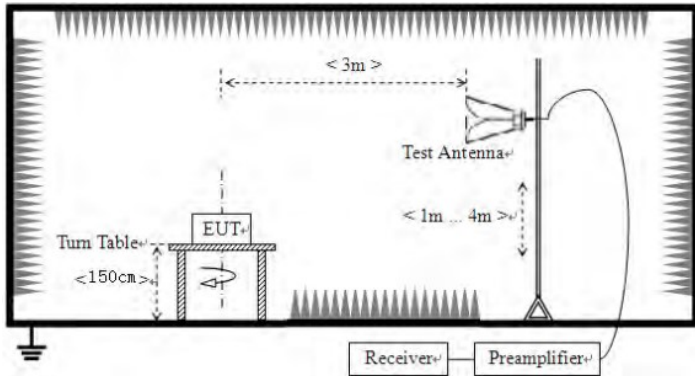
### CH39



### CH78

### 6.8.2. Radiated Emission Method

|                       |  |              |         |                      |            |
|-----------------------|--|--------------|---------|----------------------|------------|
| Test Requirement:     | FCC Part15 C Section 15.209  |              |         |                      |            |
| Test Method:          | ANSI C63.10:2013   |              |         |                      |            |
| Test Frequency Range: | 9kHz to 25GHz  |              |         |                      |            |
| Test site:            | Measurement Distance: 3m   |              |         |                      |            |
| Receiver setup:       | Frequency  | Detector     | RBW     | VBW                  | Value      |
|                       | 9KHz-150KHz  | Quasi-peak   | 200Hz   | 600Hz                | Quasi-peak |
|                       | 150KHz-30MHz   | Quasi-peak   | 9KHz    | 30KHz                | Quasi-peak |
|                       | 30MHz-1GHz   | Quasi-peak   | 120KHz  | 300KHz               | Quasi-peak |
|                       | Above 1GHz   | Peak         | 1MHz    | 3MHz                 | Peak       |
|                       |  | Peak         | 1MHz    | 10Hz                 | Average    |
| Limit:                | Frequency  | Limit (uV/m) | Value   | Measurement Distance |            |
|                       | 0.009MHz-0.490MHz  | 2400/F(KHz)  | QP      | 300m                 |            |
|                       | 0.490MHz-1.705MHz  | 24000/F(KHz) | QP      | 30m                  |            |
|                       | 1.705MHz-30MHz   | 30           | QP      | 30m                  |            |
|                       | 30MHz-88MHz  | 100          | QP      | 3m                   |            |
|                       | 88MHz-216MHz   | 150          | QP      |                      |            |
|                       | 216MHz-960MHz  | 200          | QP      |                      |            |
|                       | 960MHz-1GHz  | 500          | QP      |                      |            |
|                       | Above 1GHz   | 500          | Average |                      |            |
|                       |  | 5000         | Peak    |                      |            |
| Test setup:           | For radiated emissions from 9kHz to 30MHz  |              |         |                      |            |
|                       |  |              |         |                      |            |

|                   |   |
|-------------------|---|
|                   | <p>For radiated emissions from 30MHz to1GHz</p>  <p>For radiated emissions above 1GHz</p>    |
| Test Procedure:   | <ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>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.</li><li>3. The antenna height 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.</li><li>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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li></ol> |
| Test Instruments: | Refer to section 6.0 for details  |
| Test mode:        | Refer to section 5.2 for details  |
| Test environment: | Temp.: 25 °C    Humid.: 52%    Press.: 1012mbar   |



Report No.: HTT202202144F01

|               |               |
|---------------|---------------|
| Test voltage: | AC 120V, 60Hz |
| Test results: | Pass          |

**Measurement data:**

*Remarks:*

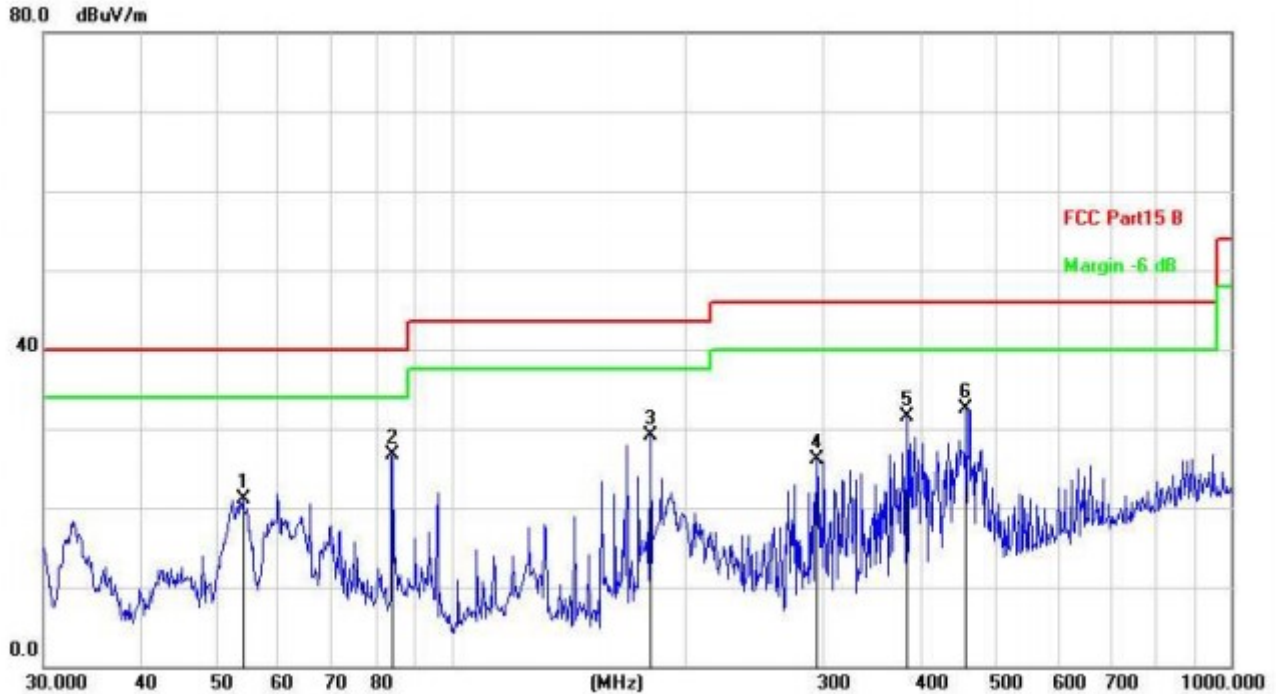
1. *During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

■ **9kHz~30MHz**

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

## For 30MHz-1GHz

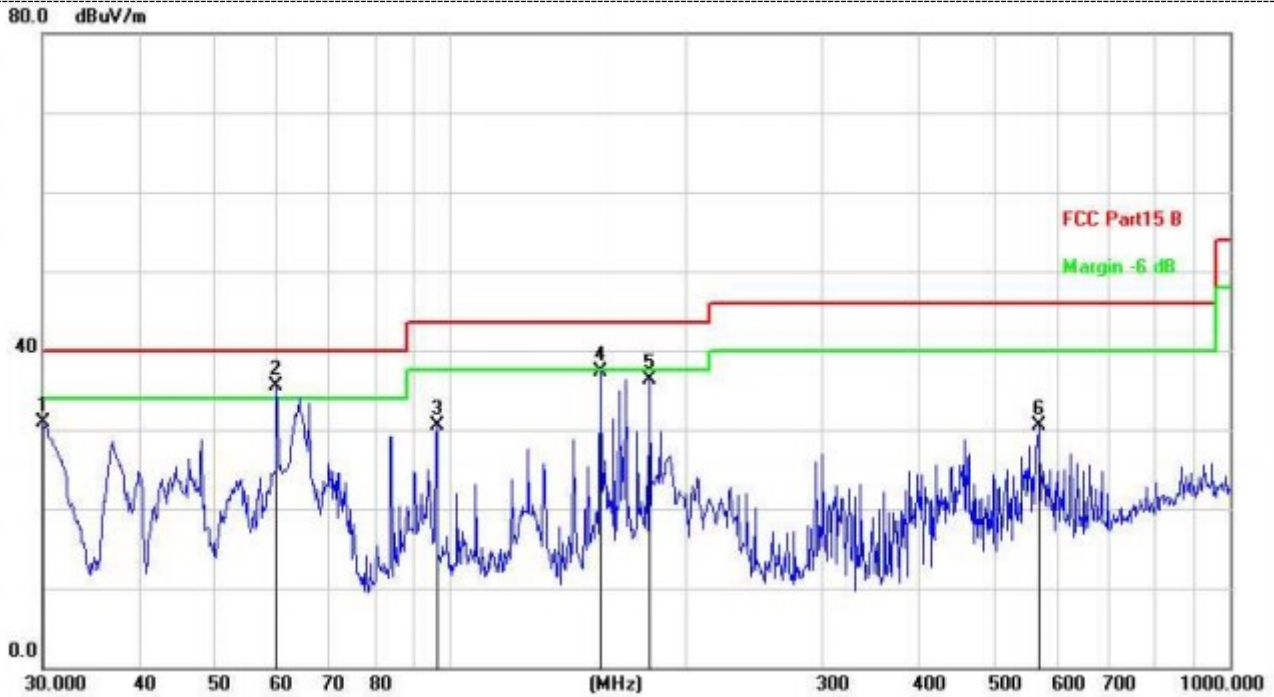
### Horizontal



| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit | Over   |          |
|-----|-----|----------|---------|---------|----------|-------|--------|----------|
|     |     | MHz      | Level   | Factor  | ment     |       |        | Detector |
|     |     |          | dBuV    | dB      | dBuV/m   | dB/m  | dB     |          |
| 1   |     | 54.0711  | 38.76   | -17.57  | 21.19    | 40.00 | -18.81 | QP       |
| 2   | *   | 84.1100  | 48.67   | -21.97  | 26.70    | 40.00 | -13.30 | QP       |
| 3   |     | 180.0165 | 48.61   | -19.43  | 29.18    | 43.50 | -14.32 | QP       |
| 4   |     | 294.1136 | 43.45   | -17.35  | 26.10    | 46.00 | -19.90 | QP       |
| 5   |     | 383.9318 | 48.19   | -16.75  | 31.44    | 46.00 | -14.56 | QP       |
| 6   |     | 457.5073 | 46.50   | -14.05  | 32.45    | 46.00 | -13.55 | QP       |

Final Level =Receiver Read level + Correct Factor

### Vertical



| No. | Mk. | Freq.    | Reading | Correct | Measure- | Limit | Over   |          |
|-----|-----|----------|---------|---------|----------|-------|--------|----------|
|     |     | MHz      | Level   | Factor  | ment     |       |        | Detector |
|     |     |          | dBuV    | dB      | dBuV/m   | dB/m  | dB     |          |
| 1   |     | 30.0000  | 49.58   | -18.59  | 30.99    | 40.00 | -9.01  | QP       |
| 2   | *   | 59.8588  | 53.61   | -18.12  | 35.49    | 40.00 | -4.51  | QP       |
| 3   |     | 96.0986  | 51.76   | -21.30  | 30.46    | 43.50 | -13.04 | QP       |
| 4   |     | 155.9101 | 55.14   | -17.77  | 37.37    | 43.50 | -6.13  | QP       |
| 5   |     | 180.0165 | 55.92   | -19.63  | 36.29    | 43.50 | -7.21  | QP       |
| 6   |     | 568.6127 | 40.64   | -10.22  | 30.42    | 46.00 | -15.58 | QP       |

Final Level =Receiver Read level + Correct Factor

**For 1GHz to 25GHz**

Remark: For test above 1GHz GFSK, Pi/4 DQPSK and 8-DPSK were test at Low, Middle, and High channel; only the worst result of GFSK was reported as below:

**CH Low (2402MHz)****Horizontal:**

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4804      | 51.26         | 31.40          | 8.18       | 31.50         | 59.34          | 74.00    | -14.66 | peak          |
| 4804      | 37.15         | 31.40          | 8.18       | 31.50         | 45.23          | 54.00    | -8.77  | AVG           |
| 7206      | 45.11         | 35.80          | 10.83      | 31.40         | 60.34          | 74.00    | -13.66 | peak          |
| 7206      | 30.51         | 35.80          | 10.83      | 31.40         | 45.74          | 54.00    | -8.26  | AVG           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

**Vertical:**

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4804      | 50.88         | 31.40          | 8.18       | 31.50         | 58.96          | 74.00    | -15.04 | peak          |
| 4804      | 35.15         | 31.40          | 8.18       | 31.50         | 43.23          | 54.00    | -10.77 | AVG           |
| 7206      | 42.16         | 35.80          | 10.83      | 31.40         | 57.39          | 74.00    | -16.61 | peak          |
| 7206      | 30.66         | 35.80          | 10.83      | 31.40         | 45.89          | 54.00    | -8.11  | AVG           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



## CH Middle (2441MHz)

## Horizontal:

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4880      | 51.26         | 31.40          | 9.17       | 32.10         | 59.73          | 74.00    | -14.27 | peak          |
| 4880      | 37.15         | 31.40          | 9.17       | 32.10         | 45.62          | 54.00    | -8.38  | AVG           |
| 7320      | 42.98         | 35.80          | 10.83      | 31.40         | 58.21          | 74.00    | -15.79 | peak          |
| 7320      | 28.45         | 35.80          | 10.83      | 31.40         | 43.68          | 54.00    | -10.32 | AVG           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4880      | 51.88         | 31.40          | 9.17       | 32.10         | 60.35          | 74.00    | -13.65 | peak          |
| 4880      | 34.15         | 31.40          | 9.17       | 32.10         | 42.62          | 54.00    | -11.38 | AVG           |
| 7320      | 42.66         | 35.80          | 10.83      | 31.40         | 57.89          | 74.00    | -16.11 | peak          |
| 7320      | 28.77         | 35.80          | 10.83      | 31.40         | 44.00          | 54.00    | -10.00 | AVG           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.





## CH High (2480MHz)

## Horizontal:

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4960      | 51.26         | 31.40          | 9.17       | 32.10         | 59.73          | 74.00    | -14.27 | peak          |
| 4960      | 35.12         | 31.40          | 9.17       | 32.10         | 43.59          | 54.00    | -10.41 | AVG           |
| 7440      | 44.67         | 35.80          | 10.83      | 31.40         | 59.90          | 74.00    | -14.10 | peak          |
| 7440      | 27.16         | 35.80          | 10.83      | 31.40         | 42.39          | 54.00    | -11.61 | AVG           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Vertical:

| Frequency | Meter Reading | Antenna Factor | Cable Loss | Preamp Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|----------------|------------|---------------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB/m)         | (dB)       | (dB)          | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4960      | 52.01         | 31.40          | 9.17       | 32.10         | 60.48          | 74.00    | -13.52 | peak          |
| 4960      | 37.55         | 31.40          | 9.17       | 32.10         | 46.02          | 54.00    | -7.98  | AVG           |
| 7440      | 43.51         | 35.80          | 10.83      | 31.40         | 58.74          | 74.00    | -15.26 | peak          |
| 7440      | 28.77         | 35.80          | 10.83      | 31.40         | 44.00          | 54.00    | -10.00 | AVG           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |
| ---       | ---           |                |            | ---           | ---            | ---      | ---    | ---           |

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

## Remark:

(1) Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(2) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed.



## 7. Test Setup Photo

Reference to the **appendix I** for details.

## 8. EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----