



| No. | Mk | . Freq.   | Level | Factor | ment   | Limit  | Over                 |          |         |
|-----|----|-----------|-------|--------|--------|--------|----------------------|----------|---------|
| -   |    | MHz       | dBuV  | dB/m   | dBuV/m | dBuV/m | dB                   | Detector | Comment |
| 1   |    | 4960.000  | 40.02 | 5.42   | 45.44  | 74.00  | -28.56               | peak     |         |
| 2   |    | 5817.500  | 42.58 | 6.78   | 49.36  | 74.00  | -24.64               | peak     |         |
| 3   |    | 7440.000  | 39.09 | 8.48   | 47.57  | 74.00  | -26.43               | peak     |         |
| 4   |    | 8543.500  | 40.09 | 9.14   | 49.23  | 74.00  | -24.77               | peak     |         |
| 5   |    | 9920.000  | 37.30 | 11.69  | 48.99  | 74.00  | -25.01               | peak     |         |
| 6   | *  | 11504.500 | 38.81 | 13.68  | 52.49  | 74.00  | - <mark>21.51</mark> | peak     |         |
|     |    |           |       |        |        |        |                      |          |         |

(Reference Only





| No. | Mk | . Freq.   | Level | Factor | ment   | Limit  | Over   |          |         |
|-----|----|-----------|-------|--------|--------|--------|--------|----------|---------|
|     |    | MHz       | dBuV  | dB/m   | dBuV/m | dBuV/m | dB     | Detector | Comment |
| 1   |    | 4960.000  | 40.10 | 5.42   | 45.52  | 74.00  | -28.48 | peak     |         |
| 2   |    | 5794.000  | 41.35 | 6.77   | 48.12  | 74.00  | -25.88 | peak     |         |
| 3   |    | 7440.000  | 39.31 | 8.48   | 47.79  | 74.00  | -26.21 | peak     |         |
| 4   |    | 8308.500  | 40.69 | 9.04   | 49.73  | 74.00  | -24.27 | peak     |         |
| 5   |    | 9920.000  | 36.41 | 11.69  | 48.10  | 74.00  | -25.90 | peak     |         |
| 6   | *  | 11011.000 | 38.73 | 13.45  | 52.18  | 74.00  | -21.82 | peak     |         |
|     |    |           |       |        |        |        |        |          |         |

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Remark:

- 1. Final Level =Receiver Read level + Correct factor
- 2. Correct factor = Antenna Factor + Cable Loss Preamplifier Factor
- 3. The emission levels of other frequencies are very lower than the limit and not show in test report.

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# 16 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS

| Test Standard          | 47 CFR Part 15, Subpart C 15.247  |
|------------------------|-----------------------------------|
| Test Method            | ANSI C63.10 (2013) Section 6.10.5 |
| Test Mode (Pre-Scan)   | ТХ                                |
| Test Mode (Final Test) | ТХ                                |
| Tester                 | Jozu                              |
| Temperature            | <b>25</b> ℃                       |
| Humidity               | 60%                               |

#### 16.1 LIMITS

| Frequency(MHz) | Field<br>strength(microvolts/meter) | Measurement<br>distance(meters) |
|----------------|-------------------------------------|---------------------------------|
| 0.009-0.490    | 2400/F(kHz)                         | 300                             |
| 0.490-1.705    | 24000/F(kHz)                        | 30                              |
| 1.705-30.0     | 30                                  | 30                              |
| 30-88          | 100                                 | 3                               |
| 88-216         | 150                                 | 3                               |
| 216-960        | 200                                 | 3                               |
| Above 960      | 500                                 | 3                               |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



#### 16.2 BLOCK DIAGRAM OF TEST SETUP



#### 16.3 PROCEDURE

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. 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.

e. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. 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.



h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



### 16.4 TEST DATA



# [TestMode: TX low channel]; [Polarity: Vertical]

| No. Mk | Freq.    | Reading<br>Level | Correct<br>Factor | Measure-<br>ment | Limit  | Over                 |          |         |
|--------|----------|------------------|-------------------|------------------|--------|----------------------|----------|---------|
|        | MHz      | dBuV             | dB/m              | dBuV/m           | dBuV/m | dB                   | Detector | Comment |
| 1      | 2310.000 | 44.77            | -2.43             | 42.34            | 74.00  | -31.66               | peak     |         |
| 2 *    | 2390.000 | 43.76            | -1.11             | 42.65            | 74.00  | - <mark>31.35</mark> | peak     |         |

\*:Maximum data x:Over limit !:over margin

(Reference Only





| No. Mk. | Freq.    | Level | Factor | ment   | Limit  | Over   |          |         |
|---------|----------|-------|--------|--------|--------|--------|----------|---------|
| 8       | MHz      | dBuV  | dB/m   | dBuV/m | dBuV/m | dB     | Detector | Comment |
| 1       | 2310.000 | 44.55 | -2.43  | 42.12  | 74.00  | -31.88 | peak     |         |
| 2 *     | 2390.000 | 44.43 | -1.11  | 43.32  | 74.00  | -30.68 | peak     |         |

(Reference Only





| No. Mk. | Freq.    | Level | Factor | ment   | Limit  | Over   |          |         |
|---------|----------|-------|--------|--------|--------|--------|----------|---------|
| 8       | MHz      | dBuV  | dB/m   | dBuV/m | dBuV/m | dB     | Detector | Comment |
| 1 *     | 2483.500 | 50.75 | -3.96  | 46.79  | 74.00  | -27.21 | peak     |         |
| 2       | 2500.000 | 43.73 | -4.00  | 39.73  | 74.00  | -34.27 | peak     |         |

(Reference Only





| No. | N | /k. | Freq.    | Level | Correct<br>Factor | Measure-<br>ment | Limit  | Over   |          |         |
|-----|---|-----|----------|-------|-------------------|------------------|--------|--------|----------|---------|
|     |   |     | MHz      | dBuV  | dB/m              | dBuV/m           | dBuV/m | dB     | Detector | Comment |
| 1   | * |     | 2483.500 | 48.17 | -3.96             | 44.21            | 74.00  | -29.79 | peak     |         |
| 2   |   |     | 2500.000 | 44.10 | -4.00             | 40.10            | 74.00  | -33.90 | peak     |         |

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Remark:

- 1. Final Level =Receiver Read level + Correct factor
- 2. Correct factor = Antenna Factor + Cable Loss Preamplifier Factor
- 3. The emission levels of other frequencies are very lower than the limit and not show in test report.

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| Test Standard          | 47 CFR Part 15, Subpart C 15.247                     |  |  |  |  |
|------------------------|--|--|--|--|--|
| Test Method            | ANSI C63.10 (2013) Section 7.8.8 & Section 11.13.3.2 |  |  |  |  |
| Test Mode (Pre-Scan)   | ТХ   |  |  |  |  |
| Test Mode (Final Test) | ТХ   |  |  |  |  |
| Tester                 | Jozu   |  |  |  |  |
| Temperature            | <b>25</b> ℃  |  |  |  |  |
| Humidity               | 60%  |  |  |  |  |

# 17 CONDUCTED BAND EDGES MEASUREMENT

#### 17.1 LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## 17.2 BLOCK DIAGRAM OF TEST SETUP





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### 17.3 TEST DATA



# 18 DWELL TIME

| Test Standard          | 47 CFR Part 15, Subpart C 15.247 |
|------------------------|----------------------------------|
| Test Method            | ANSI C63.10 (2013) Section 7.8.4 |
| Test Mode (Pre-Scan)   | ТХ                               |
| Test Mode (Final Test) | ТХ                               |
| Tester                 | Jozu                             |
| Temperature            | <b>25</b> ℃                      |
| Humidity               | 60%                              |

#### 18.1 LIMITS

| Frequency(MHz) | Limit  |
|----------------|--|
|                | 0.4S within a 20S period(20dB                  |
| 002.028        | bandwidth<250kHz)                              |
| 902-928        | 0.4S within a 10S period(20dB                  |
|                | bandwidth≥250kHz)                              |
|                | 0.4S within a period of 0.4S multiplied by the |
| 2400-2483.5    | number   |
|                | of hopping channels                            |
| 5725-5850      | 0.4S within a 30S period                       |

# 18.2 BLOCK DIAGRAM OF TEST SETUP





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### 18.3 TEST DATA



# **19 HOPPING CHANNEL NUMBER**

| Test Standard          | 47 CFR Part 15, Subpart C 15.247 |  |  |  |  |
|------------------------|----------------------------------|--|--|--|--|
| Test Method            | ANSI C63.10 (2013) Section 7.8.3 |  |  |  |  |
| Test Mode (Pre-Scan)   | ТХ                               |  |  |  |  |
| Test Mode (Final Test) | ТХ                               |  |  |  |  |
| Tester                 | Jozu                             |  |  |  |  |
| Temperature            | <b>25</b> ℃                      |  |  |  |  |
| Humidity               | 60%                              |  |  |  |  |

#### 19.1 LIMITS

| Frequency range(MHz) | Number of hopping channels (minimum) |  |  |
|----------------------|--------------------------------------|--|--|
| 000 000              | 50 for 20dB bandwidth <250kHz        |  |  |
| 902-928              | 25 for 20dB bandwidth ≥250kHz        |  |  |
| 2400-2483.5          | 15                                   |  |  |
| 5725-5850            | 75                                   |  |  |

### 19.2 BLOCK DIAGRAM OF TEST SETUP



19.3 TEST DATA



# 20 CARRIER FREQUENCIES SEPARATION

| Test Standard          | 47 CFR Part 15, Subpart C 15.247 |  |  |  |  |
|------------------------|----------------------------------|--|--|--|--|
| Test Method            | ANSI C63.10 (2013) Section 7.8.2 |  |  |  |  |
| Test Mode (Pre-Scan)   | ТХ                               |  |  |  |  |
| Test Mode (Final Test) | ТХ                               |  |  |  |  |
| Tester                 | Jozu                             |  |  |  |  |
| Temperature            | <b>25</b> ℃                      |  |  |  |  |
| Humidity               | 60%                              |  |  |  |  |

### 20.1 LIMITS

**Limit:** 2/3 of the 20dB bandwidth base on the transmission power is less than 0.125W

### 20.2 BLOCK DIAGRAM OF TEST SETUP



20.3 TEST DATA



# 21 APPENDIX

# Appendix1

#### **Maximum Conducted Output Power**

| Condition | Mode  | Frequency | Antenna Conducted Power |        | Limit | Verdict |
|-----------|-------|-----------|-------------------------|--------|-------|---------|
|           |       | (MHz)     |                         | (dBm)  | (dBm) |         |
| NVNT      | 1-DH1 | 2402      | Ant1                    | -0.359 | 21    | Pass    |
| NVNT      | 1-DH1 | 2441      | Ant1                    | 0.246  | 21    | Pass    |
| NVNT      | 1-DH1 | 2480      | Ant1                    | -0.58  | 21    | Pass    |
| NVNT      | 2-DH1 | 2402      | Ant1                    | 1.834  | 21    | Pass    |
| NVNT      | 2-DH1 | 2441      | Ant1                    | 2.62   | 21    | Pass    |
| NVNT      | 2-DH1 | 2480      | Ant1                    | 1.753  | 21    | Pass    |

### Power NVNT 1-DH1 2402MHz Ant1



Power NVNT 1-DH1 2441MHz Ant1





# Power NVNT 1-DH1 2480MHz Ant1



Power NVNT 2-DH1 2402MHz Ant1





# Power NVNT 2-DH1 2441MHz Ant1



Power NVNT 2-DH1 2480MHz Ant1







#### -20dB Bandwidth

| Condition | Mode  | Frequency | Antenna | -20 dB Bandwidth | Limit -20 dB    | Verdict |
|-----------|-------|-----------|---------|------------------|-----------------|---------|
|           |       | (MHz)     |         | (MHz)            | Bandwidth (MHz) |         |
| NVNT      | 1-DH1 | 2402      | Ant1    | 0.932            | 0               | Pass    |
| NVNT      | 1-DH1 | 2441      | Ant1    | 0.896            | 0               | Pass    |
| NVNT      | 1-DH1 | 2480      | Ant1    | 0.948            | 0               | Pass    |
| NVNT      | 2-DH1 | 2402      | Ant1    | 1.265            | 0               | Pass    |
| NVNT      | 2-DH1 | 2441      | Ant1    | 1.302            | 0               | Pass    |
| NVNT      | 2-DH1 | 2480      | Ant1    | 1.297            | 0               | Pass    |

### -20dB Bandwidth NVNT 1-DH1 2402MHz Ant1



-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1





### -20dB Bandwidth NVNT 1-DH1 2480MHz Ant1



### -20dB Bandwidth NVNT 2-DH1 2402MHz Ant1





### -20dB Bandwidth NVNT 2-DH1 2441MHz Ant1

![](_page_23_Figure_4.jpeg)

### -20dB Bandwidth NVNT 2-DH1 2480MHz Ant1

![](_page_24_Picture_0.jpeg)

| Agilent Spectrum Analyzer - Occupied B      | 3W  |  |  |   |
|---|---|--|--|---|
| R T RF 50 Ω AC<br>Senter Freq 2.480000000   | ) GHz<br>#IFGain:Low                        | SENSE:INT<br>Center Freq: 2.4800000<br>Trig: Free Run<br>#Atten: 30 dB | ALIGN AUTO<br>000 GHz<br>Avg Hold: 100/100 | 06:18:54 PMDec 15, 2022<br>Radio Std: None<br>Radio Device: BTS |
| Ref Offset 4.08 d<br>0 dB/div Ref 24.08 dBr | B<br>n                                      |  |  | Mkr3 2.480634 GHz<br>-24.506 dBm                                |
| .og   |   |  |  |   |
| 4.08  |   | <b>1</b>   |  |   |
| 5.92  |   | An man all   |  |   |
| 15.9  | and when when when when when when when when | A war warmen   | Mar man                                    | <u>₩</u> 3  |
| 25.9  | 8   | <u> </u>   |  | Many  |
| 35.9  |   |  | _  |   |
| 45.9 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~   | 0   |  |  | Marmon Var  |
| 55.9  |   |  |  |   |
| 65.9  | ~   |  |  |   |
| Center 2.48 GHz<br>#Res BW 30 kHz           |   | #VBW 100 k   | Hz   | Span 2 MHz<br>Sweep 2.667 ms                                    |
| Occupied Bandwidt                           | th  | Total Power  | 5.76 dBm                                   |   |
| 1.  | 1619 MHz                                    |  |  |   |
| Transmit Freq Error                         | -14.032 kHz                                 | <b>OBW Power</b>   | 99.00 %                                    |   |
| x dB Bandwidth                              | 1.297 MHz                                   | x dB   | -20.00 dB                                  |   |
|   |   |  | 071710                                     |   |

![](_page_25_Picture_0.jpeg)

#### **Occupied Channel Bandwidth**

| Condition | Mode  | Frequency (MHz) | Antenna | 99% OBW (MHz) |
|-----------|-------|-----------------|---------|---------------|
| NVNT      | 1-DH1 | 2402            | Ant1    | 0.81475       |
| NVNT      | 1-DH1 | 2441            | Ant1    | 0.81691       |
| NVNT      | 1-DH1 | 2480            | Antl    | 0.83632       |
| NVNT      | 2-DH1 | 2402            | Ant1    | 1.1592        |
| NVNT      | 2-DH1 | 2441            | Antl    | 1.1631        |
| NVNT      | 2-DH1 | 2480            | Antl    | 1.1631        |

## OBW NVNT 1-DH1 2402MHz Ant1

![](_page_25_Figure_5.jpeg)

### OBW NVNT 1-DH1 2441MHz Ant1

![](_page_26_Picture_0.jpeg)

![](_page_26_Figure_2.jpeg)

# OBW NVNT 1-DH1 2480MHz Ant1

![](_page_26_Figure_4.jpeg)

### OBW NVNT 2-DH1 2402MHz Ant1

![](_page_27_Picture_0.jpeg)

![](_page_27_Figure_2.jpeg)

# OBW NVNT 2-DH1 2441MHz Ant1

![](_page_27_Figure_4.jpeg)

OBW NVNT 2-DH1 2480MHz Ant1

![](_page_28_Picture_0.jpeg)

| Agilent Spectrum Analyzer - Occupied B   | W  |  |  |  |
|--|--|--|--|--|
| R T RF 50Ω AC<br>Center Freq 2.480000000 | GHz  | SENSE:INT<br>Center Freq: 2.480000<br>Trig: Free Run | ALIGNAUTO<br>000 GHz<br>Availhold: 100(100 | 04:21:02 PMDec 19, 2022<br>Radio Std: None |
|  | ↔<br>#IFGain:Low                               | #Atten: 30 dB  | nighten. teertee                           | Radio Device: BTS                          |
| Ref Offset 4.08 di                       | в  |  |  |  |
| 10 dB/div Ref 24.08 dBn                  | n <u>,                                    </u> |  |  |  |
| 14.1                                     |  |  |  |  |
| 4.08                                     |  |  |  |  |
| 5.92                                     | AN   | man  | man  |  |
| 15.9                                     | and the  |  | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~    |  |
| 25.9                                     |  |  | My .                                       |  |
| 35.9                                     |  |  | 1  |  |
| 459 MAMAMMM                              | mar .  |  | - W  | mon man man man                            |
| 55.9                                     |  |  |  |  |
| 65.9                                     |  |  |  |  |
| 03.0                                     |  |  |  |  |
| Center 2.48 GHz                          |  |  |  | Span 3 MHz                                 |
| Res BW 30 KHz                            |  | #VBW 100 K   | Hz   | Sweep 3.333 ms                             |
| Occupied Bandwidt                        | h  | Total Power  | 11.8 dBm                                   |  |
| 1.                                       | 1631 MHz                                       |  |  |  |
| Transmit Freq Error                      | -16.780 kHz                                    | <b>OBW Power</b>                                     | 99.00 %                                    |  |
| x dB Bandwidth                           | 1.301 MHz                                      | x dB   | -20.00 dB                                  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| 150                                      |  |  | STATUS                                     |  |

![](_page_29_Picture_0.jpeg)

#### **Band Edge**

| Condition | Mode  | Frequency | Antenna | Hopping    | Max Value | Limit | Verdict |
|-----------|-------|-----------|---------|------------|-----------|-------|---------|
|           |       | (MHz)     |         | Mode       | (dBc)     | (dBc) |         |
| NVNT      | 1-DH1 | 2402      | Ant1    | No-Hopping | -52.58    | -20   | Pass    |
| NVNT      | 1-DH1 | 2480      | Ant1    | No-Hopping | -52.8     | -20   | Pass    |
| NVNT      | 2-DH1 | 2402      | Ant1    | No-Hopping | -53.75    | -20   | Pass    |
| NVNT      | 2-DH1 | 2480      | Ant1    | No-Hopping | -52.11    | -20   | Pass    |

# Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Ref

![](_page_29_Figure_5.jpeg)

Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Emission