

# Delivery Specifications

## Supplier Specification Submission

### 納入仕様書

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                           |                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------|
| ■ Date of application                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 提出年月日                                                     | Ref. No. <u>NA</u>                                                                  |
| <u>2023/4/20</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                           | ● New application                                                                   |
| ■ Specification number                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 仕様書番号                                                     | <input type="checkbox"/> New Parts(s) is added to accepted specification            |
| <u>TBD</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                           | <input type="checkbox"/> Revision of accepted specification (Requested by Sony)     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                           | <input type="checkbox"/> Revision of accepted specification (Requested by Supplier) |
| ■ Part number                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 部品番号                                                      | ● One                                                                               |
| <u>TBD</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                           | <input type="checkbox"/> Two or more                                                |
| ■ Tentative Part number                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 試作番号                                                      |                                                                                     |
| <u>NA</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                           |                                                                                     |
| ■ Part name                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 部品名称                                                      |                                                                                     |
| <u>WLAN/BT MODULE (WiFi 6E)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                           |                                                                                     |
| ■ Supplier code & Supplier's name                                                                                                                                                                                                                                                                                                                                                                                                                                          | 納入者名 及び 取引先コード                                            |                                                                                     |
| <u>NA</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <u>Nanning Fulian FuGui Precision Industrial Co.,Ltd.</u> |                                                                                     |
| ■ Manufacturer's name                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 製造社名                                                      | Nanning Fulian FuGui Precision Industrial Co.,Ltd.                                  |
| ■ Person responsible                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 責任者名                                                      | Ruyan Li                                                                            |
| ■ Person in charge of engineering                                                                                                                                                                                                                                                                                                                                                                                                                                          | 技術担当者名                                                    | Robin Xu                                                                            |
| ■ Person in charge of sales                                                                                                                                                                                                                                                                                                                                                                                                                                                | 営業担当者名                                                    | Ted Wu                                                                              |
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| ■ Supplier's product name                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 納入者製品名                                                    | <u>WLAN/BT Module(WiFi 6E)</u>                                                      |
| ■ Supplier's product number                                                                                                                                                                                                                                                                                                                                                                                                                                                | 製品番号                                                      | <u>J20H105</u>                                                                      |
| ■ Drawing number                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 図面番号                                                      | <u>NA</u>                                                                           |
| <p>● The specification attached to this sheet does not deviate from Sony specification.</p> <p><input type="checkbox"/> Revision(s) within the limits of Sony specification is proposed. Revision proposal(s) is listed below.</p> <p><input type="checkbox"/> Revision(s) beyond the limits of Sony specification is proposed. Revision proposal(s) is listed below. However, all other items contained within the specification are identical to Sony specification.</p> |                                                           |                                                                                     |
| ■ Revision                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 仕様変更欄                                                     |                                                                                     |
| Sony specification<br>ソニー仕様                                                                                                                                                                                                                                                                                                                                                                                                                                                | Proposed revision<br>変更希望仕様                               | Reason for revision<br>変更理由                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                           |                                                                                     |

|                     |                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Description | WLAN/BT Module(WiFi 6E)                                                                                                                                                                              |
| SONY Part Number    | TBD                                                                                                                                                                                                  |
| FOXCONN Part Number | J20H105.00                                                                                                                                                                                           |
| FOXCONN Model Name  | J20H105.00                                                                                                                                                                                           |
| Issue Version:      | 00                                                                                                                                                                                                   |
| Manufacturer        | <b>Nanning Fulian FuGui Precision Industrial Co.,Ltd.</b><br>Address: NO.51, Tongle Road, Foxconn Industrial Park,<br>District Jiangnan, Nanning, Guangxi China.<br>Tel: +86-0771-5086999 Ext: 35400 |
| Production Factory  | <b>Nanning Fulian FuGui Precision Industrial Co.,Ltd.</b><br>Address: NO.51, Tongle Road, Foxconn Industrial Park,<br>District Jiangnan, Nanning, Guangxi China.<br>Tel: +86-0771-5086999 Ext: 35400 |
| Production Country  | People's Republic of China                                                                                                                                                                           |

Revision History

| Version | PCB version | Change Description    | Date      |
|---------|-------------|-----------------------|-----------|
| 00      | V015        | Initial release (ES2) | 2023/2/24 |
|         |             |                       |           |
|         |             |                       |           |
|         |             |                       |           |
|         |             |                       |           |
|         |             |                       |           |
|         |             |                       |           |

## Certification ID / Test Report No.

| Country | Certification | Certification No. | Remark |
|---------|---------------|-------------------|--------|
| USA     | FCC           | TBD               |        |
| Japan   | TELEC         | TBD               | *1     |
| Canada  | ISED          | TBD               | *2     |
|         |               |                   |        |
|         |               |                   |        |
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|         |               |                   |        |

**\*1 Remark for TELEC:**

5GHz帯 (W52, W53) 及び 6GHz帯 (LPI) : 屋内利用限定(5.2GHz帯高出力データ通信システムの基地局や中継局との通信を除く)

5GHz band (W52, W53) and 6GHz band (LPI): Indoor use only (except communicate to W52 high power radio)

**\*2 Remark for ISED:**

- a. Operation shall be limited to indoor use only; and
- b. Operation on oil platforms, cars, trains, boats and aircraft shall be prohibited except for on large aircraft flying above 10,000 ft.

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# 1 Product Introduction

J20H105.00 is an USB2.0 WLAN/Bluetooth combo module based on Mediatek MT7921AUN chipset. MT7921AUN is a highly integrated single chip which features a low power 2x2 11a/b/g/n/ac/ax dual band Wi-Fi subsystem and a Bluetooth v5.2 subsystem.

## Features

- IEEE 802.11 a/b/g/n/ac/ax compliant
- Support 20MHz, 40MHz, 80Mhz bandwidth in 2.4GHz, 5GHz, 6GHz band
- Dual-band 2T2R mode
- Bluetooth v5.2 with BLE (BT low energy)
- Supports BT/BLE dual mode
- Supports BT/Wi-Fi coexistence
- OTP memory in MT7921AUN chipset for RF calibration data storage
- Support wake on WLAN/BT
- Single-side SMT process
- Four layers HDI PCB, ENIG
- Module dimension: 20.00 mm x 18.00 mm x 2.55 mm (Typical)
- Weight :2g(Typical)

## Interfaces and Power supply

- 71 LGA pads
- Four RF pad (Two for WiFi, Two for BT)
- 3.3 V / 1A power supply required
- USB 2.0 interface
- WOWL (wake on WLAN)/WOBT(wake on BT), active low
- RST\_WL/RST\_BT, active low
- RST (reset), active low

## 5 Electrical Specification

### 5.1 Electrical Characteristics

#### 5.1.1 Absolute maximum rating

| Symbol    | Condition | Description           | Min  | Typ. | Max. | Unit |
|-----------|-----------|-----------------------|------|------|------|------|
| 3.3 V     | --        | 3.3V power supply     | -0.3 | 3.3  | 3.63 | V    |
| RST       | --        | Reset                 | -0.3 | 3.3  | 3.63 | V    |
| Operating | --        | Operating temperature | -10  | 25   | 60   | °C   |
| Tstorage  | --        | Storage temperature   | -40  | 25   | 85   | °C   |
| Hstorage  | --        | Storage humidity      | 10   | --   | 85   | %RH  |

#### 5.1.2 Recommended operating rating

| Symbol                  | Condition | Description                       | Min  | Typ. | Max. | Unit  |
|-------------------------|-----------|-----------------------------------|------|------|------|-------|
| VDD33                   | --        | 3.3V power supply required        | 2.97 | 3.3  | 3.63 | V     |
| VRipple                 | --        | 3.3V ripple voltage (pp) required | --   | --   | 160  | mV    |
| Tstorage                | --        | Storage temperature               | -40  | --   | 85   | °C    |
| Hstorage                | --        | Storage humidity                  | 10   | --   | 85   | %RH   |
| WOWL<br>WOBT            | VOH       | Wake on WLAN, high logic voltage  | 2.45 | --   | 3.6  | V     |
|                         | VOL       | Wake on WLAN, low logic voltage   | -0.3 | --   | 0.4  | V     |
|                         | RPU       | Input pull-up resistance          | 10   | 50   | 100  | K ohm |
|                         | RPD       | Input pull-down resistance        | 10   | 50   | 100  | K ohm |
| RST_WL<br>RST_BT<br>RST | VIH       | Reset, high logic voltage         | 2    | --   | 3.6  | V     |
|                         | VIL       | Reset, low logic voltage          | -0.3 | --   | 0.8  | V     |
|                         | RPU       | Input pull-up resistance          | 10   | 50   | 100  | K ohm |
|                         | RPD       | Input pull-down resistance        | 10   | 50   | 100  | K ohm |
| Tambient                | --        | Ambient temperature               | -10  | --   | 60   | °C    |
| Hambient                | --        | Ambient humidity                  | 10   | --   | 90   | %RH   |

#### 5.1.3 HBM ESD level

| Symbol                      | Level | Test standard     |
|-----------------------------|-------|-------------------|
| All pad except RF           | ± 2KV | JEITA ED-4701/304 |
| WiFi0, WiFi1,BT0,BT1 RF pad | ± 1KV |                   |

## 5.2 Power sequence

### Power on sequence

If DVDDIO voltage is 3.3V, these pins can be wired.

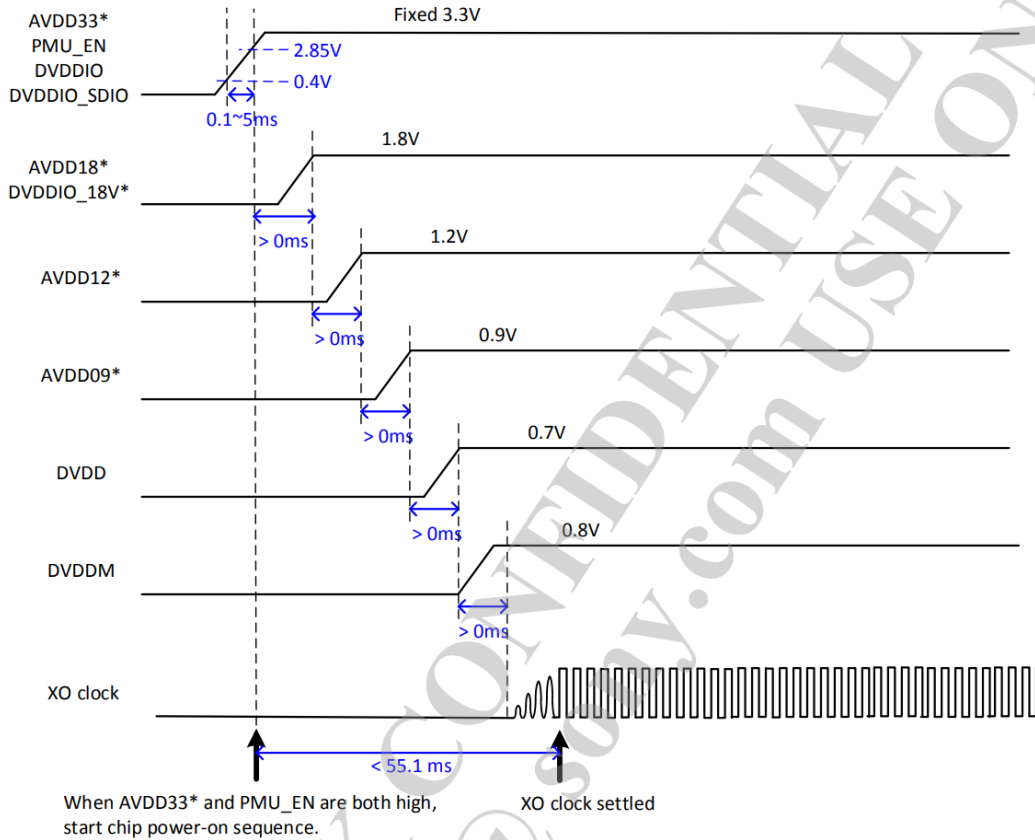
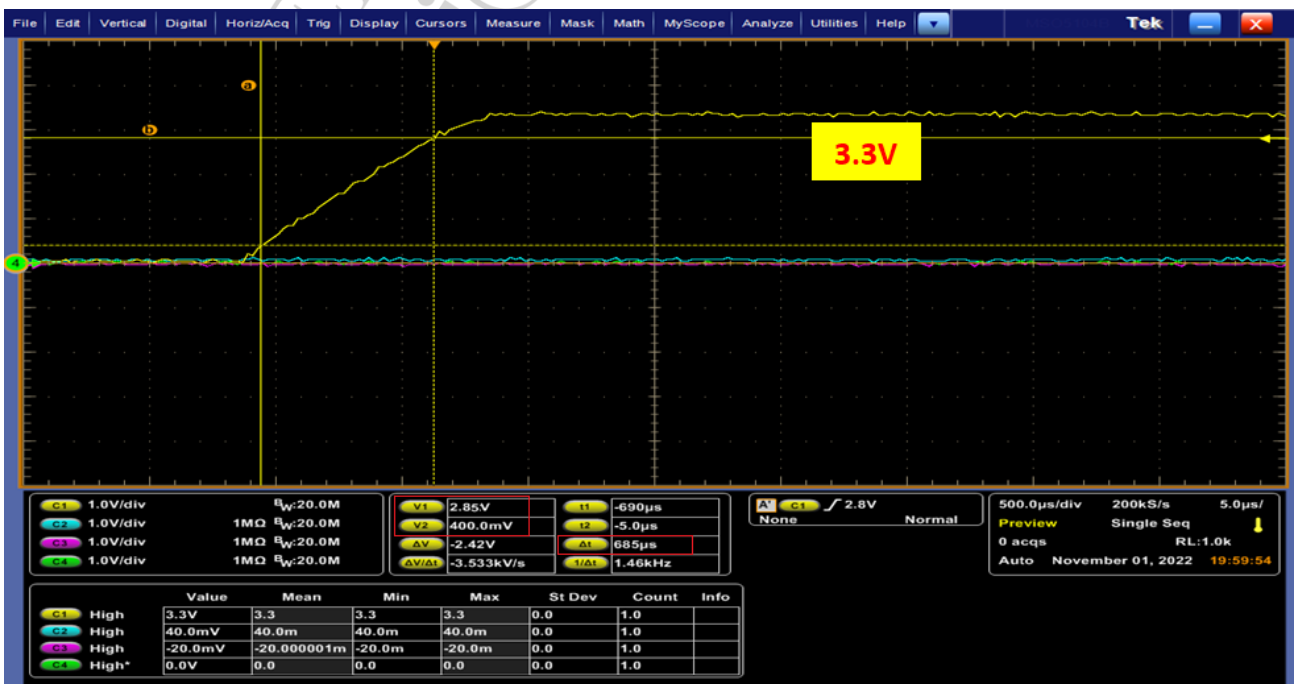
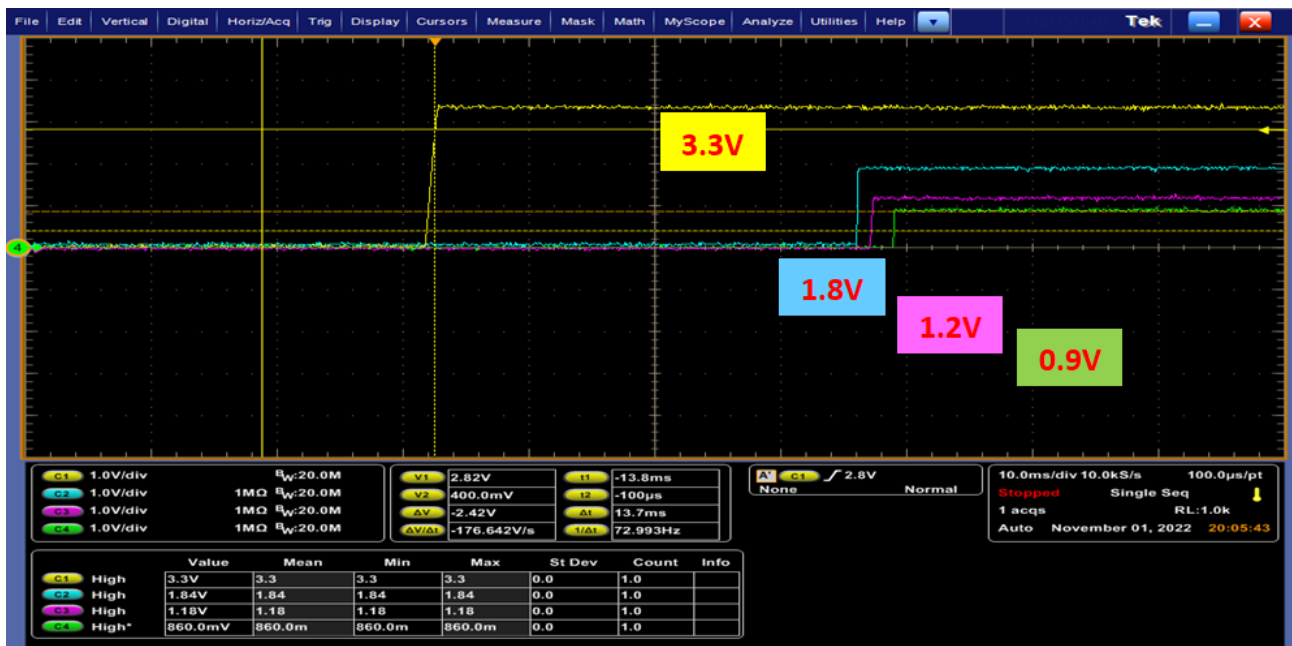


Figure 4 Chip power on sequence if DVDDIO is 3.3V



DVDDIO from 0.4V to 2.85V, the rising time is 0.68ms can meet datasheet requirement 0.1~5ms.



From DVDDIO 2.85V to AVDD18 1.8V on, the time is more than 0ms, can meet datasheet requirement >0ms.



From DVDDIO 2.85V to XO clock settled, the time is 46.9ms, can meet spec <55.1ms

The screenshot shows a Tektronix oscilloscope interface with four waveforms (C1, C2, C3, C4) displayed on a grid. The waveforms are labeled with their respective voltage levels: 3.3V (yellow), 1.8V (blue), 1.2V (pink), and 0.9V (green). The interface includes a menu bar at the top with options like File, Edit, Vertical, Digital, Horiz/Acq, Trig, Display, Cursors, Measure, Mask, Math, MyScope, Analyze, Utilities, and Help. The bottom of the screen features a data table with columns for Value, Mean, Min, Max, St Dev, Count, and Info. The table contains data for four channels (C1, C2, C3, C4) with their respective voltage levels and counts.

|    | Value | Mean    | Min    | Max    | St Dev | Count | Info |
|----|-------|---------|--------|--------|--------|-------|------|
| C1 | High  | 3.26V   | 3.26   | 3.26   | 0.0    | 1.0   |      |
| C2 | High  | 1.86V   | 1.86   | 1.86   | 0.0    | 1.0   |      |
| C3 | High  | 1.2V    | 1.2    | 1.2    | 0.0    | 1.0   |      |
| C4 | High* | 900.0mV | 900.0m | 900.0m | 0.0    | 1.0   |      |



### 5.3 Current consumption

WiFi/BT Tx current consumption@ Target Power at 25 °C

| Mode          |            | Target Power (dBm) | Max current (mA) | High Level (mA) | RMS (mA) |
|---------------|------------|--------------------|------------------|-----------------|----------|
| WiFi 2.4G +BT | CCK-1M     | 16                 | 500              | 476             | 454      |
|               | CCK-11M    | 16                 | 524              | 500             | 405      |
|               | OFDM-6M    | 15                 | 540              | 504             | 443      |
|               | OFDM-54M   | 14                 | 508              | 500             | 282      |
|               | HT20-MCS0  | 15                 | 532              | 508             | 434      |
|               | HT20-MCS7  | 14                 | 516              | 496             | 270      |
|               | HE20-MCS0  | 15                 | 540              | 516             | 358      |
|               | HE20-MCS11 | 13                 | 500              | 472             | 227      |
| WiFi 5G +BT   | OFDM-6M    | 13                 | 684              | 652             | 523      |
|               | OFDM-54M   | 12                 | 676              | 640             | 364      |
|               | HT20-MCS0  | 13                 | 700              | 660             | 578      |
|               | HT20-MCS7  | 12                 | 676              | 656             | 353      |
|               | HT40-MCS0  | 13                 | 716              | 668             | 514      |
|               | HT40-MCS7  | 12                 | 684              | 672             | 298      |
|               | VHT20-MCS0 | 13                 | 692              | 640             | 510      |
|               | VHT20-MCS8 | 11                 | 660              | 632             | 299      |
|               | VHT40-MCS0 | 13                 | 724              | 680             | 481      |
|               | VHT40-MCS9 | 11                 | 668              | 652             | 257      |
|               | VHT80-MCS0 | 13                 | 740              | 708             | 407      |
|               | VHT80-MCS9 | 11                 | 684              | 660             | 243      |
|               | HE20-MCS0  | 13                 | 692              | 660             | 468      |
|               | HE20-MCS11 | 11                 | 732              | 704             | 328      |
|               | HE40-MCS0  | 13                 | 724              | 684             | 459      |
|               | HE40-MCS11 | 11                 | 740              | 716             | 338      |
|               | HE80-MCS0  | 13                 | 732              | 708             | 407      |
|               | HE80-MCS11 | 11                 | 748              | 732             | 325      |
| WiFi 6G +BT   | HE20-MCS0  | 13                 | 808              | 716             | 565      |
|               | HE20-MCS11 | 11                 | 752              | 720             | 345      |
|               | HE40-MCS0  | 13                 | 792              | 748             | 529      |
|               | HE40-MCS11 | 11                 | 768              | 724             | 339      |
|               | HE80-MCS0  | 13                 | 800              | 752             | 438      |
|               | HE80-MCS11 | 11                 | 760              | 720             | 315      |

1. WiFi TX Target power ANT1&ANT2
2. BT TX Power(1dBm)
3. Measure the 3.3V power consumption
4. Packet TX
5. The chip variation is +/- 25%.

WiFi /BT Tx current consumption@ Max Power at 25 °C

| Mode          |            | MAX Power (dBm) | Max current (mA) | High Level (mA) | RMS (mA) |
|---------------|------------|-----------------|------------------|-----------------|----------|
| WiFi 2.4G +BT | CCK-1M     | 18              | 608              | 548             | 526      |
|               | CCK-11M    | 18              | 584              | 544             | 441      |
|               | OFDM-6M    | 17              | 592              | 548             | 477      |
|               | OFDM-54M   | 16              | 560              | 524             | 299      |
|               | HT20-MCS0  | 17              | 576              | 536             | 465      |
|               | HT20-MCS7  | 16              | 560              | 536             | 285      |
|               | HE20-MCS0  | 17              | 568              | 536             | 377      |
|               | HE20-MCS11 | 15              | 512              | 484             | 235      |
| WiFi 5G +BT   | OFDM-6M    | 15              | 752              | 676             | 594      |
|               | OFDM-54M   | 14              | 704              | 660             | 384      |
|               | HT20-MCS0  | 15              | 736              | 680             | 589      |
|               | HT20-MCS7  | 14              | 704              | 660             | 361      |
|               | HT40-MCS0  | 15              | 760              | 700             | 534      |
|               | HT40-MCS7  | 14              | 720              | 700             | 310      |
|               | VHT20-MCS0 | 15              | 736              | 680             | 538      |
|               | VHT20-MCS8 | 13              | 680              | 652             | 312      |
|               | VHT40-MCS0 | 15              | 752              | 704             | 493      |
|               | VHT40-MCS9 | 13              | 688              | 668             | 270      |
|               | VHT80-MCS0 | 15              | 768              | 728             | 431      |
|               | VHT80-MCS9 | 13              | 704              | 684             | 251      |
|               | HE20-MCS0  | 15              | 736              | 692             | 490      |
|               | HE20-MCS11 | 13              | 760              | 720             | 346      |
|               | HE40-MCS0  | 15              | 760              | 720             | 496      |
|               | HE40-MCS11 | 13              | 768              | 732             | 351      |
|               | HE80-MCS0  | 15              | 760              | 716             | 417      |
|               | HE80-MCS11 | 13              | 720              | 696             | 289      |
| WiFi 6G +BT   | HE20-MCS0  | 15              | 840              | 768             | 592      |
|               | HE20-MCS11 | 13              | 784              | 744             | 353      |
|               | HE40-MCS0  | 15              | 840              | 788             | 484      |
|               | HE40-MCS11 | 13              | 768              | 760             | 338      |
|               | HE80-MCS0  | 15              | 832              | 788             | 465      |
|               | HE80-MCS11 | 13              | 784              | 748             | 324      |

1. WiFi TX Max power ANT1&ANT2(Target Power+2dBm)
2. BT TX Power(3dBm)
3. Measure the 3.3V power consumption
4. Packet TX
5. The chip variation is +/- 25%.

Power consumption test base on below test tool:

1. MFG Driver: package\_MT7921\_20210617\_Ulv2.39\_DLLv6.42\_AP\_2020.11.06.1329
2. WCN Combo Tool(W2036)

## 5.4 WLAN/Bluetooth RF Characteristics

| ITEM                           | Specification                                          |  |                  |                  |                |                                         |       |
|--------------------------------|--------------------------------------------------------|--|------------------|------------------|----------------|-----------------------------------------|-------|
| Chipset Solution               | Mediatek MT7921AUN                                     |  |                  |                  |                |                                         |       |
| TX/RX                          | WLAN 2 Tx/Rx + Bluetooth 2 Tx/Rx                       |  |                  |                  |                |                                         |       |
| Frequency Range                | 2400 ~ 2483.5 MHz<br>5150 ~ 5850 MHz<br>5925 ~ 7125MHZ |  |                  |                  |                |                                         |       |
| Modulation & Maximum data rate | <b>802.11b</b>                                         |  |                  |                  |                |                                         |       |
|                                | Modulation                                             |  | Data rate (Mbps) |                  |                |                                         |       |
|                                | DBPSK                                                  |  | 1 Mbps           |                  |                |                                         |       |
|                                | DQPSK                                                  |  | 2 Mbps           |                  |                |                                         |       |
|                                | CCK                                                    |  | 5.5 Mbps         |                  |                |                                         |       |
|                                | CCK                                                    |  | 11 Mbps          |                  |                |                                         |       |
|                                | <b>802.11a/g</b>                                       |  |                  |                  |                |                                         |       |
|                                | Modulation                                             |  | FEC rate         | Data rate (Mbps) |                |                                         |       |
|                                | BPSK                                                   |  | 1/2              | 6                |                |                                         |       |
|                                | BPSK                                                   |  | 3/4              | 9                |                |                                         |       |
|                                | QPSK                                                   |  | 1/2              | 12               |                |                                         |       |
|                                | QPSK                                                   |  | 3/4              | 18               |                |                                         |       |
|                                | 16QAM                                                  |  | 1/2              | 24               |                |                                         |       |
|                                | 16QAM                                                  |  | 3/4              | 36               |                |                                         |       |
|                                | 64QAM                                                  |  | 2/3              | 48               |                |                                         |       |
|                                | 64QAM                                                  |  | 3/4              | 54               |                |                                         |       |
|                                | <b>802.11n (20MHz)</b>                                 |  |                  |                  |                |                                         |       |
|                                | Modulation                                             |  | MCS index        | FEC rate         | Spatial Stream | Data rate (Mbps)<br>800ns GI / 400ns GI |       |
|                                | BPSK                                                   |  | 0                | 1/2              | 1              | 6.5                                     | 7.2   |
|                                | QPSK                                                   |  | 1                | 1/2              | 1              | 13                                      | 14.4  |
|                                | QPSK                                                   |  | 2                | 3/4              | 1              | 19.5                                    | 21.7  |
|                                | 16-QAM                                                 |  | 3                | 1/2              | 1              | 26                                      | 28.9  |
|                                | 16-QAM                                                 |  | 4                | 3/4              | 1              | 39                                      | 43.3  |
|                                | 64-QAM                                                 |  | 5                | 2/3              | 1              | 52                                      | 57.8  |
|                                | 64-QAM                                                 |  | 6                | 3/4              | 1              | 58.5                                    | 65    |
|                                | 64-QAM                                                 |  | 7                | 5/6              | 1              | 65                                      | 72.2  |
|                                | BPSK                                                   |  | 8                | 1/2              | 2              | 13                                      | 14.4  |
|                                | QPSK                                                   |  | 9                | 1/2              | 2              | 26                                      | 28.9  |
|                                | QPSK                                                   |  | 10               | 3/4              | 2              | 39                                      | 43.3  |
|                                | 16-QAM                                                 |  | 11               | 1/2              | 2              | 52                                      | 57.8  |
|                                | 16-QAM                                                 |  | 12               | 3/4              | 2              | 78                                      | 86.7  |
|                                | 64-QAM                                                 |  | 13               | 2/3              | 2              | 104                                     | 115.6 |
|                                | 64-QAM                                                 |  | 14               | 3/4              | 2              | 117                                     | 130   |
|                                | 64-QAM                                                 |  | 15               | 5/6              | 2              | 130                                     | 144.4 |

**802.11n (40MHz)**

| Modulation | MCS index | FEC rate | Spatial Stream | Data rate (Mbps)<br>800ns GI / 400ns GI |     |
|------------|-----------|----------|----------------|-----------------------------------------|-----|
| BPSK       | 0         | 1/2      | 1              | 13.5                                    | 15  |
| QPSK       | 1         | 1/2      | 1              | 27                                      | 30  |
| QPSK       | 2         | 3/4      | 1              | 40.5                                    | 45  |
| 16-QAM     | 3         | 1/2      | 1              | 54                                      | 60  |
| 16-QAM     | 4         | 3/4      | 1              | 81                                      | 90  |
| 64-QAM     | 5         | 2/3      | 1              | 108                                     | 120 |
| 64-QAM     | 6         | 3/4      | 1              | 121.5                                   | 135 |
| 64-QAM     | 7         | 5/6      | 1              | 135                                     | 150 |
| BPSK       | 8         | 1/2      | 2              | 27                                      | 30  |
| QPSK       | 9         | 1/2      | 2              | 54                                      | 60  |
| QPSK       | 10        | 3/4      | 2              | 81                                      | 90  |
| 16-QAM     | 11        | 1/2      | 2              | 108                                     | 120 |
| 16-QAM     | 12        | 3/4      | 2              | 162                                     | 180 |
| 64-QAM     | 13        | 2/3      | 2              | 216                                     | 210 |
| 64-QAM     | 14        | 3/4      | 2              | 243                                     | 270 |
| 64-QAM     | 15        | 5/6      | 2              | 270                                     | 300 |

**802.11ac (20MHz)**

| Modulation | MCS index | FEC rate | Spatial Stream | Data rate (Mbps)<br>800ns GI / 400ns GI |       |
|------------|-----------|----------|----------------|-----------------------------------------|-------|
| BPSK       | 0         | 3/4      | 1              | 6.5                                     | 7.2   |
| QPSK       | 1         | 1/2      | 1              | 13                                      | 14.4  |
| QPSK       | 2         | 3/4      | 1              | 19.5                                    | 21.7  |
| 16-QAM     | 3         | 1/2      | 1              | 26                                      | 28.9  |
| 16-QAM     | 4         | 3/4      | 1              | 39                                      | 43.3  |
| 64-QAM     | 5         | 2/3      | 1              | 52                                      | 57.8  |
| 64-QAM     | 6         | 3/4      | 1              | 58.5                                    | 65    |
| 64-QAM     | 7         | 5/6      | 1              | 65                                      | 72.2  |
| 256-QAM    | 8         | 3/4      | 1              | 78                                      | 86.7  |
| 256-QAM    | 9         | 5/6      | 1              | N/A                                     | N/A   |
| BPSK       | 0         | 3/4      | 2              | 13                                      | 14.4  |
| QPSK       | 1         | 1/2      | 2              | 26                                      | 28.9  |
| QPSK       | 2         | 3/4      | 2              | 39                                      | 43.3  |
| 16-QAM     | 3         | 1/2      | 2              | 52                                      | 57.8  |
| 16-QAM     | 4         | 3/4      | 2              | 78                                      | 86.7  |
| 64-QAM     | 5         | 2/3      | 2              | 104                                     | 115.6 |
| 64-QAM     | 6         | 3/4      | 2              | 117                                     | 130   |
| 64-QAM     | 7         | 5/6      | 2              | 130                                     | 144.4 |
| 256-QAM    | 8         | 3/4      | 2              | 156                                     | 173.3 |
| 256-QAM    | 9         | 5/6      | 2              | N/A                                     | N/A   |

**802.11ac (40MHz)**

| Modulation | MCS index | FEC rate | Spatial Stream | Data rate (Mbps)<br>800ns GI / 400ns GI |     |
|------------|-----------|----------|----------------|-----------------------------------------|-----|
| BPSK       | 0         | 3/4      | 1              | 13.5                                    | 15  |
| QPSK       | 1         | 1/2      | 1              | 27                                      | 30  |
| QPSK       | 2         | 3/4      | 1              | 40.5                                    | 45  |
| 16-QAM     | 3         | 1/2      | 1              | 54                                      | 60  |
| 16-QAM     | 4         | 3/4      | 1              | 81                                      | 90  |
| 64-QAM     | 5         | 2/3      | 1              | 108                                     | 120 |
| 64-QAM     | 6         | 3/4      | 1              | 121.5                                   | 135 |
| 64-QAM     | 7         | 5/6      | 1              | 135                                     | 150 |
| 256-QAM    | 8         | 3/4      | 1              | 162                                     | 180 |
| 256-QAM    | 9         | 5/6      | 1              | 180                                     | 200 |
| BPSK       | 0         | 3/4      | 2              | 27                                      | 30  |
| QPSK       | 1         | 1/2      | 2              | 54                                      | 60  |
| QPSK       | 2         | 3/4      | 2              | 81                                      | 90  |
| 16-QAM     | 3         | 1/2      | 2              | 108                                     | 120 |
| 16-QAM     | 4         | 3/4      | 2              | 162                                     | 180 |
| 64-QAM     | 5         | 2/3      | 2              | 216                                     | 210 |
| 64-QAM     | 6         | 3/4      | 2              | 243                                     | 270 |
| 64-QAM     | 7         | 5/6      | 2              | 270                                     | 300 |
| 256-QAM    | 8         | 3/4      | 1              | 324                                     | 360 |
| 256-QAM    | 9         | 5/6      | 1              | 360                                     | 400 |

**802.11ac (80MHz)**

| Modulation | MCS index | FEC rate | Spatial Stream | Data rate (Mbps)<br>800ns GI / 400ns GI |       |
|------------|-----------|----------|----------------|-----------------------------------------|-------|
| BPSK       | 0         | 3/4      | 1              | 29.3                                    | 32.5  |
| QPSK       | 1         | 1/2      | 1              | 58.5                                    | 65    |
| QPSK       | 2         | 3/4      | 1              | 87.8                                    | 97.5  |
| 16-QAM     | 3         | 1/2      | 1              | 117                                     | 130   |
| 16-QAM     | 4         | 3/4      | 1              | 175.5                                   | 195   |
| 64-QAM     | 5         | 2/3      | 1              | 234                                     | 260   |
| 64-QAM     | 6         | 3/4      | 1              | 263.3                                   | 292.5 |
| 64-QAM     | 7         | 5/6      | 1              | 292.5                                   | 325   |
| 256-QAM    | 8         | 3/4      | 1              | 351                                     | 390   |
| 256-QAM    | 9         | 5/6      | 1              | 390                                     | 433.3 |
| BPSK       | 0         | 3/4      | 2              | 58.5                                    | 65    |
| QPSK       | 1         | 1/2      | 2              | 117                                     | 130   |
| QPSK       | 2         | 3/4      | 2              | 175.5                                   | 195   |
| 16-QAM     | 3         | 1/2      | 2              | 234                                     | 260   |
| 16-QAM     | 4         | 3/4      | 2              | 351                                     | 390   |
| 64-QAM     | 5         | 2/3      | 2              | 468                                     | 520   |
| 64-QAM     | 6         | 3/4      | 2              | 526.5                                   | 585   |
| 64-QAM     | 7         | 5/6      | 2              | 585                                     | 650   |
| 256-QAM    | 8         | 3/4      | 1              | 702                                     | 780   |
| 256-QAM    | 9         | 5/6      | 1              | 780                                     | 866.7 |

**802.11ax (20MHz)**

| <b>HE-MCSs for 242-tone RU and non-OFDMA 20MHZ</b> |     |            |     |                |                |                |                |                |                |
|----------------------------------------------------|-----|------------|-----|----------------|----------------|----------------|----------------|----------------|----------------|
| HE-MCS Index                                       | DCM | Modulation | R   | Nss=1          |                |                | Nss=2          |                |                |
|                                                    |     |            |     | 0.8 $\mu$ s GI | 1.6 $\mu$ s GI | 3.2 $\mu$ s GI | 0.8 $\mu$ s GI | 1.6 $\mu$ s GI | 3.2 $\mu$ s GI |
| 0                                                  | 1   | BPSK       | 1/2 | 4.3            | 4.0            | 3.6            | 8.6            | 8.1            | 7.3            |
|                                                    | 0   |            | 1/2 | 8.6            | 8.1            | 7.3            | 17.2           | 16.3           | 14.6           |
| 1                                                  | 1   | QPSK       | 1/2 | 8.6            | 8.1            | 7.3            | 17.2           | 16.3           | 14.6           |
|                                                    | 0   |            | 1/2 | 17.2           | 16.3           | 14.6           | 34.4           | 32.5           | 29.3           |
| 2                                                  | NA  | QPSK       | 3/4 | 25.8           | 24.4           | 21.9           | 51.6           | 48.8           | 43.9           |
| 3                                                  | 1   | 16-QAM     | 1/2 | 17.2           | 16.3           | 14.6           | 34.4           | 32.5           | 29.3           |
|                                                    | 0   |            | 1/2 | 34.4           | 32.5           | 29.3           | 68.8           | 65             | 58.5           |
| 4                                                  | 1   |            | 3/4 | 25.8           | 24.4           | 21.9           | 51.6           | 48.8           | 43.9           |
|                                                    | 0   |            | 3/4 | 51.6           | 48.8           | 43.9           | 103.2          | 97.5           | 87.8           |
| 5                                                  | NA  | 64-QAM     | 2/3 | 68.8           | 65.0           | 58.5           | 137.6          | 130            | 117            |
| 6                                                  |     | 64-QAM     | 3/4 | 77.4           | 73.1           | 65.8           | 154.9          | 146.3          | 131.6          |
| 7                                                  |     | 64-QAM     | 5/6 | 86.0           | 81.3           | 73.1           | 172.1          | 162.5          | 146.3          |
| 8                                                  |     | 256-QAM    | 3/4 | 103.2          | 97.5           | 87.8           | 206.5          | 195            | 175.5          |
| 9                                                  |     | 256-QAM    | 5/6 | 114.7          | 108.3          | 97.5           | 229.4          | 216.7          | 195            |
| 10                                                 |     | 1024-QAM   | 3/4 | 129.0          | 121.9          | 109.7          | 258.1          | 243.8          | 219.4          |
| 11                                                 |     | 1024-QAM   | 5/6 | 143.4          | 135.4          | 121.9          | 286.8          | 270.8          | 243.8          |

**802.11ax (40MHz)**

| <b>HE-MCSs for 484-tone RU and non-OFDMA 40MHZ</b> |     |            |     |                |                |                |                |                |                |
|----------------------------------------------------|-----|------------|-----|----------------|----------------|----------------|----------------|----------------|----------------|
| HE-MCS Index                                       | DCM | Modulation | R   | Nss=1          |                |                | Nss=2          |                |                |
|                                                    |     |            |     | 0.8 $\mu$ s GI | 1.6 $\mu$ s GI | 3.2 $\mu$ s GI | 0.8 $\mu$ s GI | 1.6 $\mu$ s GI | 3.2 $\mu$ s GI |
| 0                                                  | 1   | BPSK       | 1/2 | 8.6            | 8.1            | 7.3            | 17.2           | 16.3           | 14.6           |
|                                                    | 0   |            | 1/2 | 17.2           | 16.3           | 14.6           | 34.4           | 32.5           | 29.3           |
| 1                                                  | 1   | QPSK       | 1/2 | 17.2           | 16.3           | 14.6           | 34.4           | 32.5           | 29.3           |
|                                                    | 0   |            | 1/2 | 34.4           | 32.5           | 29.3           | 68.8           | 65             | 58.5           |
| 2                                                  | NA  | QPSK       | 3/4 | 51.6           | 48.8           | 43.9           | 103.2          | 97.5           | 87.8           |
| 3                                                  | 1   | 16-QAM     | 1/2 | 34.4           | 32.5           | 29.3           | 68.8           | 65             | 58.5           |
|                                                    | 0   |            | 1/2 | 68.8           | 65             | 58.5           | 137.6          | 130            | 117            |
| 4                                                  | 1   |            | 3/4 | 51.6           | 48.8           | 43.9           | 103.2          | 97.5           | 87.8           |
|                                                    | 0   |            | 3/4 | 103.2          | 97.5           | 87.8           | 206.5          | 195            | 175.5          |
| 5                                                  | NA  | 64-QAM     | 2/3 | 137.6          | 130            | 117            | 275.3          | 260            | 234            |
| 6                                                  |     | 64-QAM     | 3/4 | 154.9          | 146.3          | 131.6          | 309.7          | 292.5          | 263.3          |
| 7                                                  |     | 64-QAM     | 5/6 | 172.1          | 162.5          | 146.3          | 344.1          | 325            | 292.5          |
| 8                                                  |     | 256-QAM    | 3/4 | 206.5          | 195            | 175.5          | 412.9          | 390            | 351            |
| 9                                                  |     | 256-QAM    | 5/6 | 229.4          | 216.7          | 195            | 458.8          | 433.3          | 390            |
| 10                                                 |     | 1024-QAM   | 3/4 | 258.1          | 243.8          | 219.4          | 516.2          | 487.5          | 438.8          |
| 11                                                 |     | 1024-QAM   | 5/6 | 286.8          | 270.8          | 243.8          | 573.5          | 541.7          | 487.5          |

**802.11ax (80MHz)****HE-MCSs for 996-tone RU and non-OFDMA 80MHZ**

| HE-MCS Index | DCM | Modulation | R   | Nss=1    |          |          | Nss=2    |          |          |
|--------------|-----|------------|-----|----------|----------|----------|----------|----------|----------|
|              |     |            |     | 0.8μs GI | 1.6μs GI | 3.2μs GI | 0.8μs GI | 1.6μs GI | 3.2μs GI |
| 0            | 1   | BPSK       | 1/2 | 18.0     | 17.0     | 15.3     | 36.0     | 34.0     | 30.6     |
|              | 0   |            | 1/2 | 36.0     | 34.0     | 30.6     | 72.1     | 68.1     | 61.3     |
| 1            | 1   | QPSK       | 1/2 | 36.0     | 34.0     | 30.6     | 72.1     | 68.1     | 61.3     |
|              | 0   |            | 1/2 | 72.1     | 68.1     | 61.3     | 144      | 136      | 123      |
| 2            | NA  | QPSK       | 3/4 | 108.1    | 102.1    | 91.9     | 216      | 204      | 184      |
| 3            | 1   | 16-QAM     | 1/2 | 72.1     | 68.1     | 61.3     | 144      | 136      | 123      |
|              | 0   |            | 1/2 | 144.1    | 136.1    | 122.5    | 288      | 272      | 245      |
| 4            | 1   |            | 3/4 | 108.1    | 102.1    | 91.9     | 216      | 204      | 184      |
|              | 0   |            | 3/4 | 216.2    | 204.2    | 183.8    | 432      | 408      | 368      |
| 5            | NA  | 64-QAM     | 2/3 | 288.2    | 272.2    | 245.0    | 577      | 544      | 490      |
| 6            |     | 64-QAM     | 3/4 | 324.3    | 306.3    | 275.6    | 649      | 613      | 551      |
| 7            |     | 64-QAM     | 5/6 | 360.3    | 340.3    | 306.3    | 721      | 681      | 613      |
| 8            |     | 256-QAM    | 3/4 | 432.4    | 408.3    | 367.5    | 865      | 817      | 735      |
| 9            |     | 256-QAM    | 5/6 | 480.4    | 453.7    | 408.3    | 961      | 907      | 817      |
| 10           |     | 1024-QAM   | 3/4 | 540.4    | 510.4    | 459.4    | 1081     | 1021     | 919      |
| 11           |     | 1024-QAM   | 5/6 | 600.4    | 567.1    | 510.4    | 1201     | 1134     | 1021     |

Don't support 40MHz bandwidth at 2.4 GHz frequency band.

## **Federal Communication Commission Interference Statement**

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC regulations restrict the operation of this device to indoor use only.

The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

### **Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

**This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:**

## **2.2 List of applicable FCC rules**

This module has been tested for compliance with FCC Part 15.247 & 15.407.

## **2.3 Summarize the specific operational use conditions**

The module is tested for standalone mobile RF exposure use conditions. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

This module is authorized for Indoor Client Device applications under the control of a low-power indoor access point or subordinate. The final host product:

Must be limited to indoor locations only; Cannot have a direct connection to the internet; and Is prohibited from the control of or communications with unmanned aircraft systems

## **2.4 Limited module procedures**

Not applicable.

## **2.5 Trace antenna designs**

Any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

## **2.6 RF exposure considerations**

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

## **2.7 Antennas**

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

| Antenna NO. | Brand | Model | Antenna gain(dBi) | Frequency range | Antenna Type |
|-------------|-------|-------|-------------------|-----------------|--------------|
| WiFi 0      | N/A   | N/A   | 0.19              | 2.4~2.4835GHz   | Monopole     |
|             |       |       | 1.74              | 5.15~5.25GHz    |              |
|             |       |       | 1.41              | 5.25~5.35GHz    |              |
|             |       |       | 2.97              | 5.47~5.725GHz   |              |
|             |       |       | 2.2               | 5.725~5.85GHz   |              |
|             |       |       | 2.5               | 5.925~6.425GHz  |              |
|             |       |       | 2.76              | 6.425~6.525GHz  |              |
|             |       |       | 2.9               | 6.525~6.875GHz  |              |
|             |       |       | 2.74              | 6.875~7.125GHz  |              |

|        |     |     |      |                |          |
|--------|-----|-----|------|----------------|----------|
| WiFi 1 | N/A | N/A | 3.5  | 2.4~2.4835GHz  | Monopole |
|        |     |     | 1.84 | 5.15~5.25GHz   |          |
|        |     |     | 1.9  | 5.25~5.35GHz   |          |
|        |     |     | 2.3  | 5.47~5.725GHz  |          |
|        |     |     | 2.1  | 5.725~5.85GHz  |          |
|        |     |     | 2.3  | 5.925~6.425GHz |          |
|        |     |     | 1.11 | 6.425~6.525GHz |          |
|        |     |     | 1.83 | 6.525~6.875GHz |          |
|        |     |     | 3.66 | 6.875~7.125GHz |          |
| BT 0   | N/A | N/A | 1.5  | 2.4~2.4835GHz  | PIFA     |
| BT 1   | N/A | N/A | 0.2  | 2.4~2.4835GHz  | PIFA     |

## **2.8 Label and compliance information**

The final end product must be labeled in a visible area with the following: “Contains FCC ID: **AK8J20H105**”.

The grantee's FCC ID can be used only when all FCC compliance requirements are met.

## **2.9 Information on test modes and additional testing requirements**

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

## **2.10 Additional testing, Part 15 Subpart B disclaimer**

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance with this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter tests will not be required. However, the OEM integrator is still responsible for testing their end product for any additional compliance requirements required with this module installed.

**e.g. Note: Host Guidance is provided in KDB 996369 D04 Module Integration Guide.**

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

## **Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or

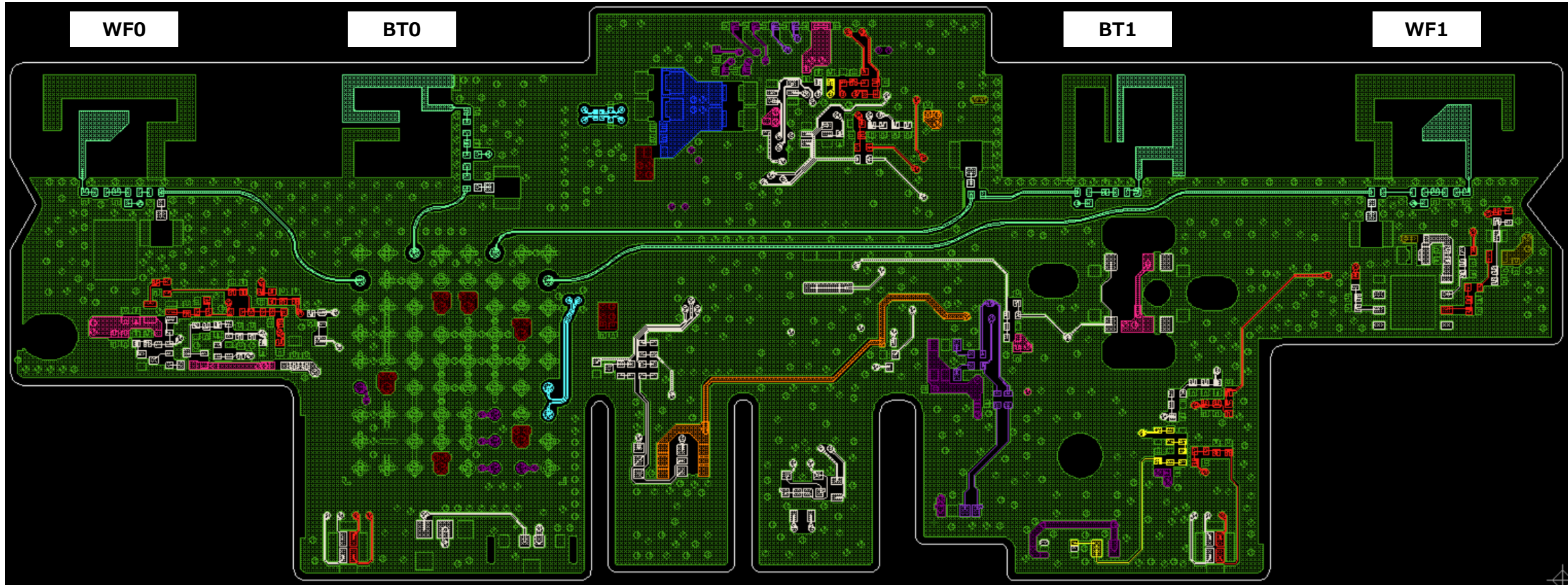
remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warnings as shown in this manual.

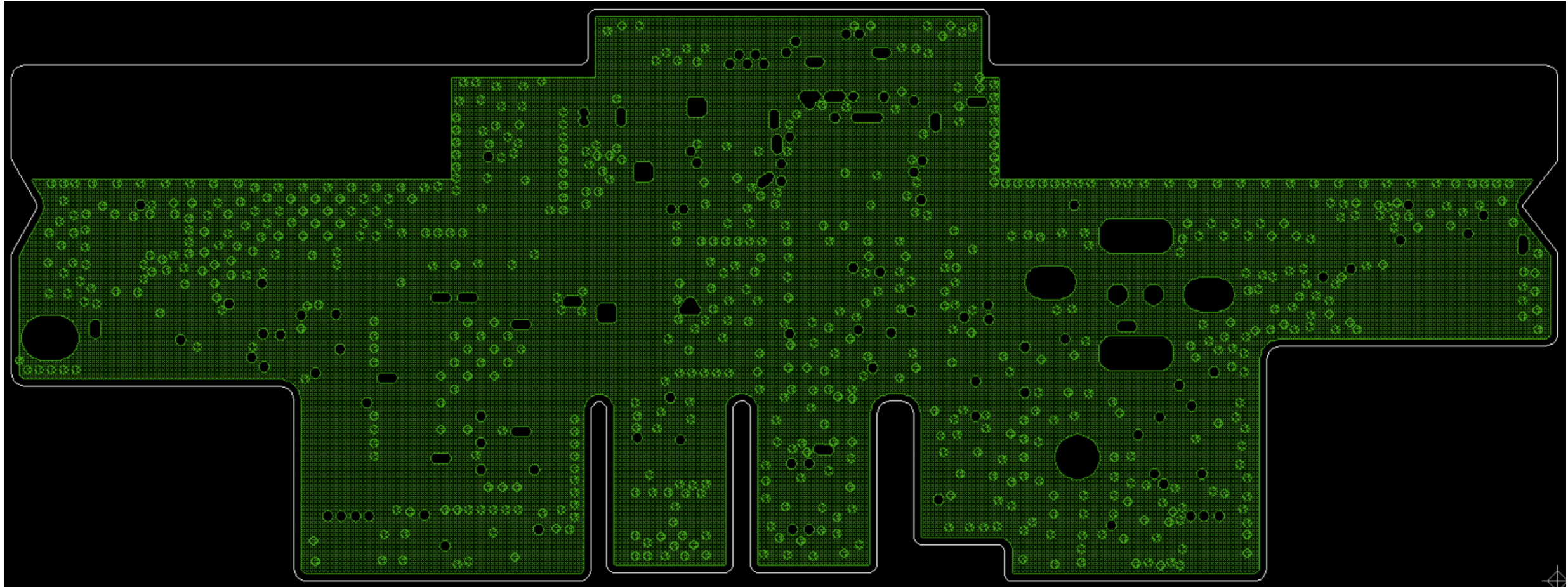
**OEM/Host manufacturer responsibilities**

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment

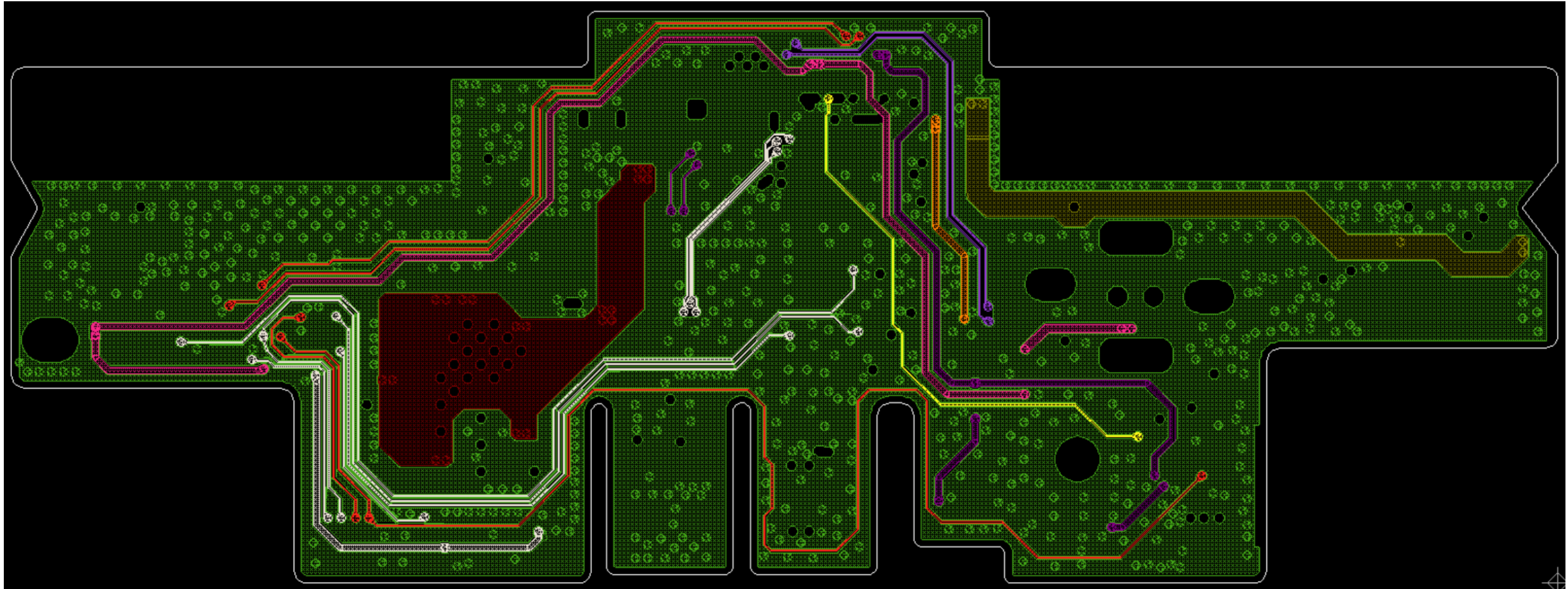
# Main board Layout – layer 4(Bottom)



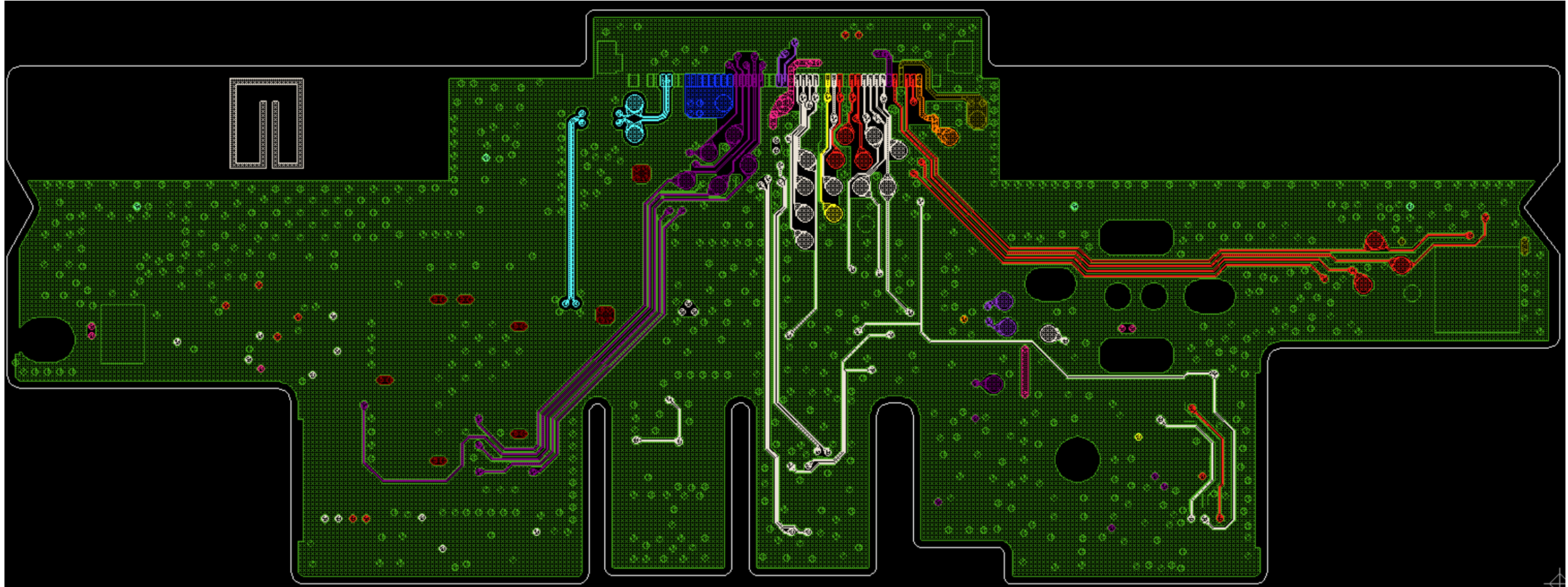
# Main board Layout – layer 3



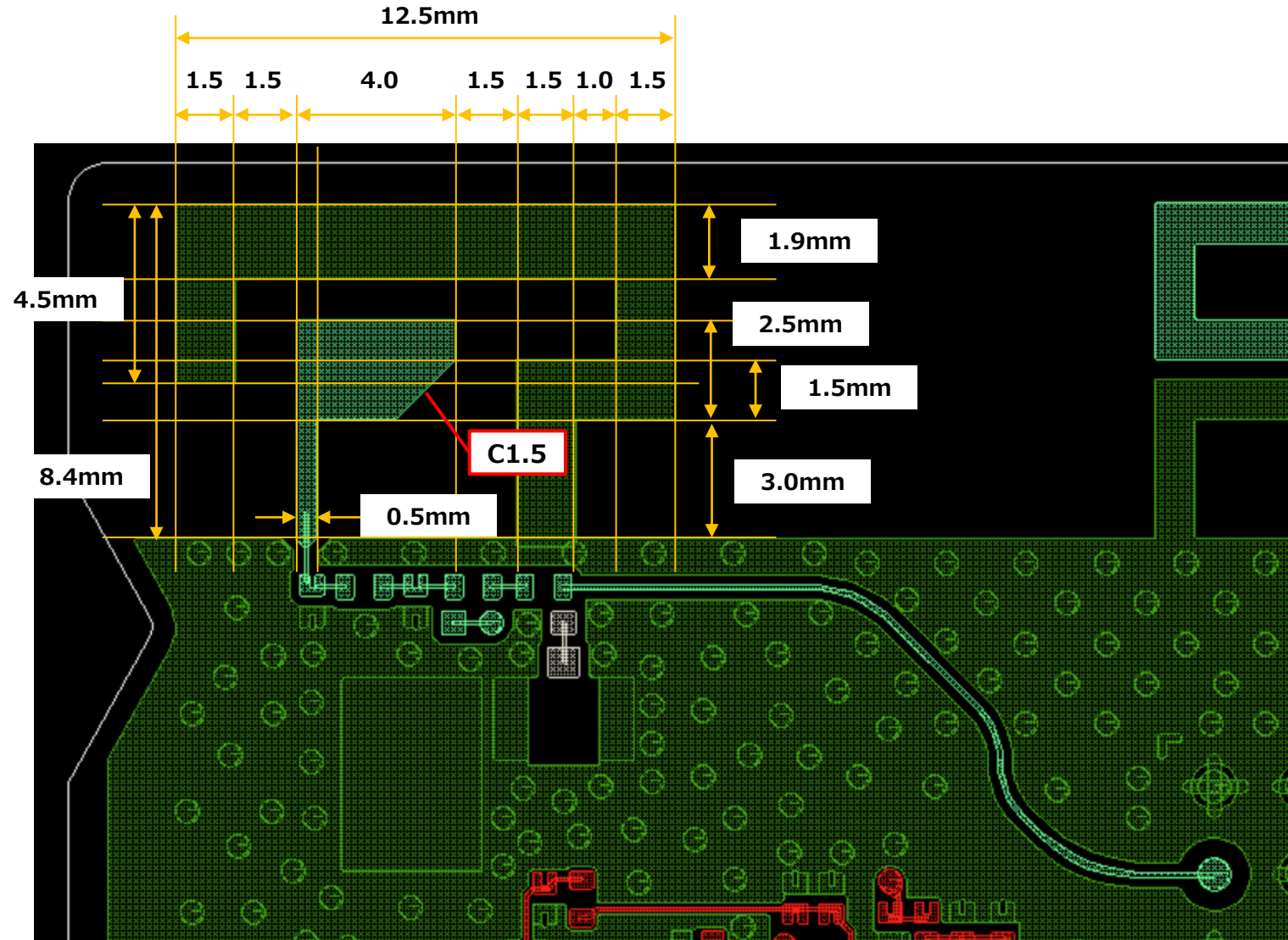
# Main board Layout – layer 2



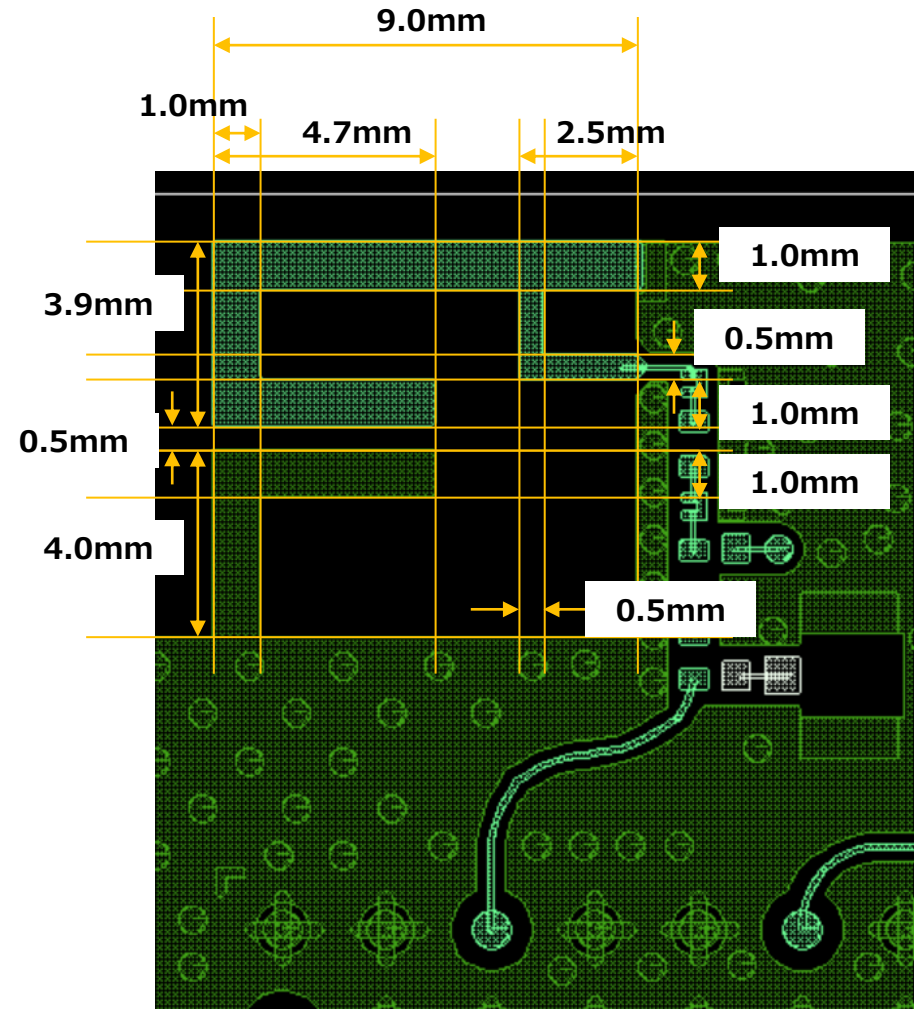
# Main board Layout – layer 1(Top)



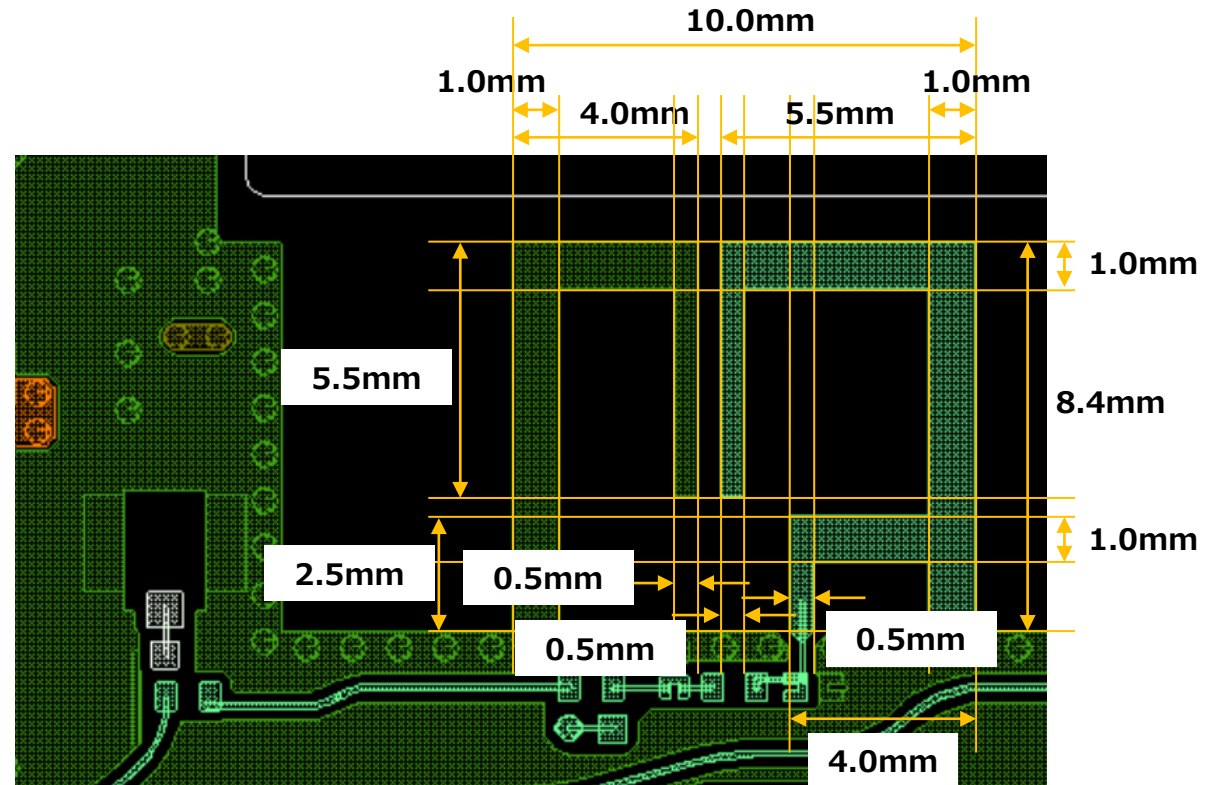
# Main board Antenna dimension – WF0



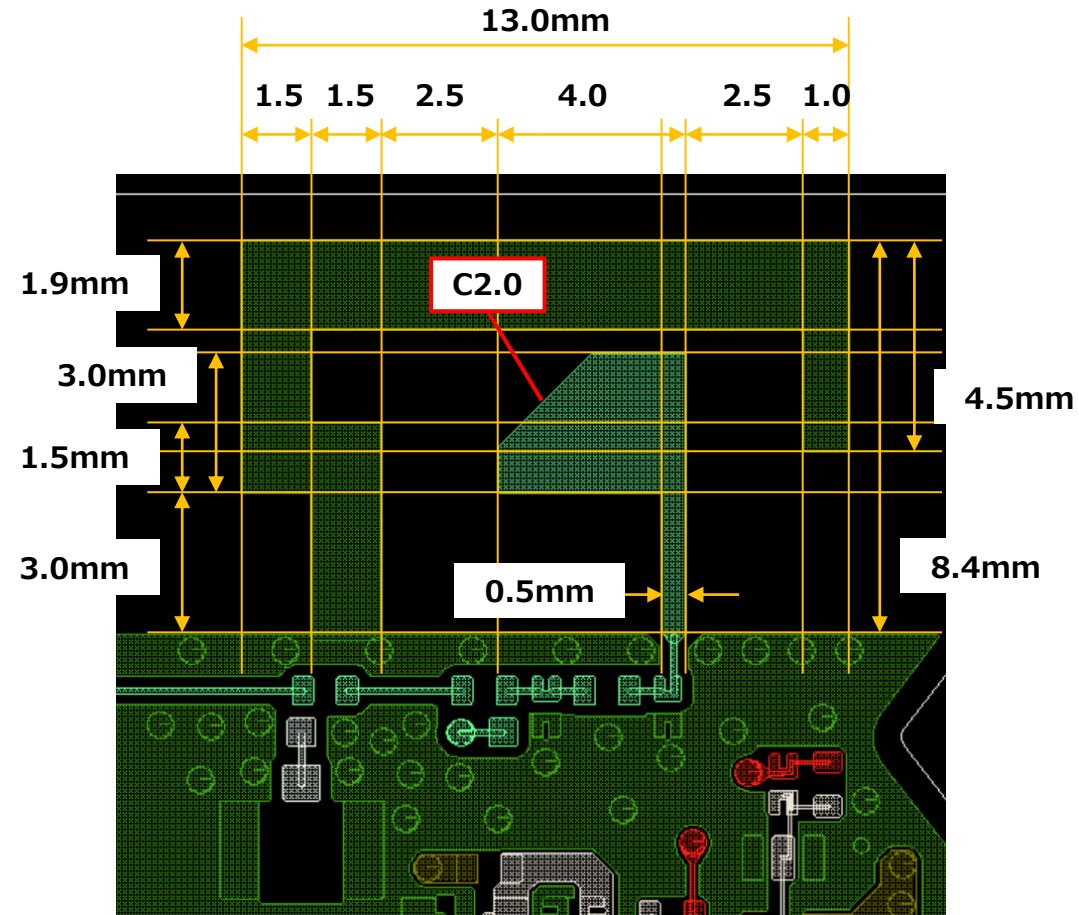
# Main board Antenna dimension – BT0



# Main board Antenna dimension – BT1



# Main board Antenna dimension – WF1



# RF trace length

Length Single 50ohm MSL, Length unit is [mm]

