

# FCC RF EXPOSURE EVALUATION REPORT

Product Name: GPON ONT  
Trade Mark: HALNy  
Model No.: HL-4GQV  
Report Number: 200704006RFC-4  
Test Standards: FCC 47 CFR Part 1 Subpart I  
FCC ID: 2AWIZHL4GQV  
Test Result: PASS  
Date of Issue: October 15, 2020

Prepared for:

**FIBRAIN sp.zo.o.**  
**Poland, Zaczernie 190F, 36-062**

Prepared by:

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October 15, 2020

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## Version

| Version No. | Date             | Description |
|-------------|------------------|-------------|
| V1.0        | October 15, 2020 | Original    |



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## 1. GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

|                                 |                                |
|---------------------------------|--------------------------------|
| <b>Applicant:</b>               | FIBRAIN sp.zo.o.               |
| <b>Address of Applicant:</b>    | Poland, Zaczernie 190F, 36-062 |
| <b>Manufacturer:</b>            | FIBRAIN sp.zo.o.               |
| <b>Address of Manufacturer:</b> | Poland, Zaczernie 190F, 36-062 |

### 1.2 EUT INFORMATION

|                               |                                 |                        |                   |
|-------------------------------|---------------------------------|------------------------|-------------------|
| <b>Product Name:</b>          | GPON ONT                        |                        |                   |
| <b>Model No.:</b>             | HL-4GQV                         |                        |                   |
| <b>Trade Mark:</b>            | HALNy                           |                        |                   |
| <b>DUT Stage:</b>             | Identical Prototype             |                        |                   |
| <b>EUT Supports Function:</b> | 2.4 GHz ISM Band:               | IEEE 802.11b/g/n       |                   |
|                               | 5 GHz U-NII Bands:              | 5 150 MHz to 5 250 MHz | IEEE 802.11a/n/ac |
|                               |                                 | 5 250 MHz to 5 350 MHz | IEEE 802.11a/n/ac |
|                               |                                 | 5 470 MHz to 5 725 MHz | IEEE 802.11a/n/ac |
|                               |                                 | 5 725 MHz to 5 850 MHz | IEEE 802.11a/n/ac |
| <b>Sample Received Date:</b>  | July 4, 2020                    |                        |                   |
| <b>Sample Tested Date:</b>    | July 4, 2020 to August 19, 2020 |                        |                   |

### 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

| For 2.4 GHz ISM Band of Wi-Fi |                                                                                                                                                                                                       |                  |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Frequency Band:               | 2400 MHz to 2483.5 MHz                                                                                                                                                                                |                  |
| Frequency Range:              | 2412 MHz to 2462 MHz                                                                                                                                                                                  |                  |
| Support Standards:            | IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40                                                                                                                                      |                  |
| Type of Modulation:           | IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK)<br>IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK)<br>IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK)<br>IEEE 802.11n-HT40: OFDM(64-QAM, 16-QAM, QPSK, BPSK) |                  |
| Data Rate:                    | IEEE 802.11b: Up to 11 Mbps<br>IEEE 802.11g: Up to 54 Mbps<br>IEEE 802.11n-HT20: Up to MCS15<br>IEEE 802.11n-HT40: Up to MCS15                                                                        |                  |
| Number of Channels:           | IEEE 802.11b: 11<br>IEEE 802.11g: 11<br>IEEE 802.11n-HT20: 11<br>IEEE 802.11n-HT40: 7                                                                                                                 |                  |
| Channel Separation:           | 5 MHz                                                                                                                                                                                                 |                  |
| Antenna Type:                 | Chain 0                                                                                                                                                                                               | External Antenna |
|                               | Chain 1                                                                                                                                                                                               | External Antenna |
| Antenna Gain:                 | Chain 0                                                                                                                                                                                               | 5 dBi            |
|                               | Chain 1                                                                                                                                                                                               | 5 dBi            |
| Directional gain:             | 8.01 dBi                                                                                                                                                                                              |                  |
| Maximum Peak Power:           | IEEE 802.11b: 24.26 dBm<br>IEEE 802.11g: 24.76 dBm<br>IEEE 802.11n-HT20: 26.54dBm<br>IEEE 802.11n-HT40: 26.15 dBm                                                                                     |                  |

| For 5 GHz U-NII Bands of Wi-Fi |                                                       |  |
|--------------------------------|-------------------------------------------------------|--|
| Frequency Bands:               | 5150 MHz to 5250 MHz (U-NII-1)                        |  |
|                                | 5250 MHz to 5350 MHz (U-NII-2A)                       |  |
|                                | 5470 MHz to 5725 MHz (U-NII-2C)                       |  |
|                                | 5 725 MHz to 5 850 MHz (U-NII-3)                      |  |
| Frequency Ranges:              | 5180 MHz to 5240 MHz                                  |  |
|                                | 5260 MHz to 5320 MHz                                  |  |
|                                | 5500 MHz to 5700 MHz                                  |  |
|                                | 5 745 MHz to 5 825 MHz                                |  |
| Support Standards:             | IEEE 802.11a/n/ac                                     |  |
| TPC Function:                  | Not Support                                           |  |
| DFS Operational mode:          | Master                                                |  |
| Type of Modulation:            | IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)          |  |
|                                | IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)          |  |
|                                | IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK) |  |
| Channel Spacing:               | IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz                  |  |
|                                | IEEE 802.11n-HT40/ac-VHT40: 40 MHz                    |  |
|                                | IEEE 802.11ac-VHT80: 80 MHz                           |  |
| Data Rate:                     | IEEE 802.11a: Up to 54 Mbps                           |  |
|                                | IEEE 802.11n-HT20: Up to MCS31                        |  |
|                                | IEEE 802.11n-HT40: Up to MCS31                        |  |
|                                | IEEE 802.11ac-VHT20: Up to MCS8                       |  |

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|                                       |                                                                                                                               |                             |         |          |          |         |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------|----------|----------|---------|
|                                       | IEEE 802.11ac-VHT40: Up to MCS9                                                                                               |                             |         |          |          |         |
|                                       | IEEE 802.11ac-VHT80: Up to MCS9                                                                                               |                             |         |          |          |         |
| Number of Channels:                   | 5150 MHz to 5250 MHz:<br>4 for IEEE 802.11a/n-HT20/ac-VHT20<br>2 for IEEE 802.11n-HT40)/ac-VHT40<br>1 for IEEE 802.11acVHT80  |                             |         |          |          |         |
|                                       | 5250 MHz to 5350 MHz:<br>4 for IEEE 802.11a/n-HT20/ac-VHT20<br>2 for IEEE 802.11n-HT40)/ac-VHT40<br>1 for IEEE 802.11acVHT80  |                             |         |          |          |         |
|                                       | 5470 MHz to 5725 MHz:<br>11 for IEEE 802.11a/n-HT20/ac-VHT20<br>5 for IEEE 802.11n-HT40/ac-VHT40<br>2 for IEEE 802.11ac-VHT80 |                             |         |          |          |         |
|                                       | 5725 MHz to 5850 MHz:<br>5 for IEEE 802.11a/n-HT20/ac-VHT20<br>2 for IEEE 802.11n-HT40/ac-VHT40<br>1 for IEEE 802.11ac-VHT80  |                             |         |          |          |         |
| Antenna Type:                         | Chain 0                                                                                                                       | External Antenna            |         |          |          |         |
|                                       | Chain 1                                                                                                                       | External Antenna            |         |          |          |         |
|                                       | Chain 2                                                                                                                       | External Antenna            |         |          |          |         |
|                                       | Chain 3                                                                                                                       | External Antenna            |         |          |          |         |
| Antenna Gain:                         | Chain 0                                                                                                                       | 5150 MHz to 5250 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5250 MHz to 5350 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5470 MHz to 5725 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5725 MHz to 5850 MHz: 5 dBi |         |          |          |         |
|                                       | Chain 1                                                                                                                       | 5150 MHz to 5250 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5250 MHz to 5350 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5470 MHz to 5725 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5725 MHz to 5850 MHz: 5 dBi |         |          |          |         |
|                                       | Chain 2                                                                                                                       | 5150 MHz to 5250 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5250 MHz to 5350 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5470 MHz to 5725 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5725 MHz to 5850 MHz: 5 dBi |         |          |          |         |
|                                       | Chain 3                                                                                                                       | 5150 MHz to 5250 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5250 MHz to 5350 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5470 MHz to 5725 MHz: 5 dBi |         |          |          |         |
|                                       |                                                                                                                               | 5725 MHz to 5850 MHz: 5 dBi |         |          |          |         |
| Maximum conducted output power (dBm): | SISO_Chain 0                                                                                                                  |                             | U-NII-1 | U-NII-2A | U-NII-2C | U-NII-3 |
|                                       | IEEE 802.11a:                                                                                                                 |                             | 11.86   | 11.52    | 9.82     | 13.52   |
|                                       | SISO_Chain 1                                                                                                                  |                             | U-NII-1 | U-NII-2A | U-NII-2C | U-NII-3 |
|                                       | IEEE 802.11a:                                                                                                                 |                             | 11.39   | 11.99    | 10.00    | 13.65   |
|                                       | SISO_Chain 2                                                                                                                  |                             | U-NII-1 | U-NII-2A | U-NII-2C | U-NII-3 |
|                                       | IEEE 802.11a:                                                                                                                 |                             | 6.22    | 7.49     | 6.82     | 7.12    |
|                                       | SISO_Chain 3                                                                                                                  |                             | U-NII-1 | U-NII-2A | U-NII-2C | U-NII-3 |
|                                       | IEEE 802.11a:                                                                                                                 |                             | 11.18   | 11.78    | 10.63    | 12.80   |
|                                       | MIMO_Chain 0+1+2+3                                                                                                            |                             | U-NII-1 | U-NII-2A | U-NII-2C | U-NII-3 |

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|  |                      |       |       |       |       |
|--|----------------------|-------|-------|-------|-------|
|  | IEEE 802.11n-HT20:   | 14.85 | 15.33 | 13.74 | 18.45 |
|  | IEEE 802.11n-HT40:   | 12.60 | 12.96 | 12.25 | 18.04 |
|  | IEEE 802.11ac-VHT20: | 14.73 | 15.16 | 13.61 | 18.45 |
|  | IEEE 802.11ac-VHT40: | 12.59 | 12.96 | 12.22 | 17.88 |
|  | IEEE 802.11ac-VHT80: | 12.46 | 11.72 | 10.34 | 15.65 |

## 1.4 OTHER INFORMATION

| Test channels for 2.4 GHz ISM Band of Wi-Fi |                      |                       |           |            |
|---------------------------------------------|----------------------|-----------------------|-----------|------------|
| Mode                                        | Tx/Rx Frequency      | Test RF Channel Lists |           |            |
|                                             |                      | Lowest(L)             | Middle(M) | Highest(H) |
| IEEE 802.11b                                | 2412 MHz to 2462 MHz | Channel 1             | Channel 6 | Channel 11 |
|                                             |                      | 2412 MHz              | 2437 MHz  | 2462 MHz   |
| IEEE 802.11g                                | 2412 MHz to 2462 MHz | Channel 1             | Channel 6 | Channel 11 |
|                                             |                      | 2412 MHz              | 2437 MHz  | 2462 MHz   |
| IEEE 802.11n-HT20                           | 2412 MHz to 2462 MHz | Channel 1             | Channel 6 | Channel 11 |
|                                             |                      | 2412 MHz              | 2437 MHz  | 2462 MHz   |
| IEEE 802.11n-HT40                           | 2422 MHz to 2452 MHz | Channel 3             | Channel 6 | Channel 9  |
|                                             |                      | 2422 MHz              | 2437 MHz  | 2452 MHz   |

| Test channels for 5 GHz U-NII Bands of Wi-Fi             |                      |                       |             |             |
|----------------------------------------------------------|----------------------|-----------------------|-------------|-------------|
| Mode                                                     | Tx/Rx Frequency      | Test RF Channel Lists |             |             |
|                                                          |                      | Lowest(L)             | Middle(M)   | Highest(H)  |
| IEEE 802.11a<br>IEEE 802.11n-HT20<br>IEEE 802.11ac-VHT20 | 5150 MHz to 5250 MHz | Channel 36            | Channel 44  | Channel 48  |
|                                                          |                      | 5180 MHz              | 5220 MHz    | 5240 MHz    |
|                                                          | 5250 MHz to 5350 MHz | Channel 52            | Channel 60  | Channel 64  |
|                                                          |                      | 5260 MHz              | 5300 MHz    | 5320 MHz    |
|                                                          | 5470 MHz to 5725 MHz | Channel 100           | Channel 116 | Channel 140 |
|                                                          |                      | 5500 MHz              | 5580 MHz    | 5700 MHz    |
| IEEE 802.11n-HT40<br>IEEE 802.11ac-VHT40                 | 5150 MHz to 5250 MHz | Channel 149           | Channel 157 | Channel 161 |
|                                                          |                      | 5745 MHz              | 5785 MHz    | 5805 MHz    |
|                                                          | 5250 MHz to 5350 MHz | Channel 38            | --          | Channel 46  |
|                                                          |                      | 5190 MHz              | --          | 5230 MHz    |
|                                                          | 5470 MHz to 5725 MHz | Channel 54            | --          | Channel 62  |
|                                                          |                      | 5270 MHz              | --          | 5310 MHz    |
|                                                          | 5725 MHz to 5850 MHz | Channel 102           | Channel 110 | Channel 134 |
|                                                          |                      | 5510 MHz              | 5550 MHz    | 5670 MHz    |
|                                                          | 5725 MHz to 5850 MHz | Channel 151           | --          | Channel 159 |
|                                                          |                      | 5755 MHz              | --          | 5795 MHz    |
| IEEE 802.11ac-HT80                                       | 5150 MHz to 5250 MHz | --                    | Channel 42  | --          |
|                                                          |                      | --                    | 5210 MHz    | --          |
|                                                          | 5250 MHz to 5350 MHz | --                    | Channel 58  | --          |
|                                                          |                      | --                    | 5290 MHz    | --          |

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|  |                      |             |             |             |
|--|----------------------|-------------|-------------|-------------|
|  | 5470 MHz to 5725 MHz | Channel 106 | --          | Channel 122 |
|  |                      | 5530 MHz    | --          | 5610 MHz    |
|  | 5725 MHz to 5850 MHz | --          | Channel 155 | --          |
|  |                      | --          | 5775 MHz    | --          |

## 1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

### FCC 47 CFR Part 1 Subpart I

All test items have been performed and recorded as per the above standards

## 1.6 TEST LOCATION

All tests were performed at:

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## 1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

### CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

### A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

### ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

### FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

## 1.8 DEVIATION FROM STANDARDS

None.

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**1.9 ABNORMALITIES FROM STANDARD CONDITIONS**

None.

**1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER**

None.

**2. EQUIPMENT LIST**

Please refer to the RF test report.



### 3. MPE EVALUATION

#### 3.1 REFERENCE DOCUMENTS FOR EVALUATION

| No. | Identity                                        | Document Title                                                                              |
|-----|-------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1   | FCC 47 CFR Part 1 Subpart I                     | PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969                       |
| 2   | KDB 447498 D01 General RF Exposure Guidance v06 | RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES |

#### 3.2 MPE COMPLIANCE REQUIREMENT

##### 3.2.1 Limits

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

##### Limits for Occupational / Controlled Exposure

| Frequency range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                  | 6                                                                      |
| 3.0-30                | 1842/f                            | 4.89/f                            | (900/f)*                                | 6                                                                      |
| 30-300                | 61.4                              | 0.163                             | 1.0                                     | 6                                                                      |
| 300-1500              | /                                 | /                                 | F/300                                   | 6                                                                      |
| 1500-100000           | /                                 | /                                 | 5                                       | 6                                                                      |

##### Limits for General Population / Uncontrolled Exposure

| Frequency range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|------------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                  | 30                                                                     |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                | 30                                                                     |
| 30-300                | 27.5                              | 0.073                             | 0.2                                     | 30                                                                     |
| 300-1500              | /                                 | /                                 | F/1500                                  | 30                                                                     |
| 1500-100000           | /                                 | /                                 | 1                                       | 30                                                                     |

**Note:** f = frequency in MHz: \* = Plane-wave equivalents power density.

##### 3.2.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

#### 3.3 MPE CALCULATION METHOD

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

S = power density (in appropriate units, e.g., mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

#### 3.4 MPE CALCULATION RESULTS

**Note:** For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test

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report.

### 3.4.1 For WLAN

For Wi-Fi function, operating at 2412MHz to 2462 MHz for IEEE802.11b/g/n and operating at 5150 MHz to 5250 MHz for IEEE802.11a/n/ac and operating at 5250 MHz to 5350 MHz for IEEE802.11a/n/ac and operating at 5470 MHz to 5725 MHz for IEEE802.11a/n/ac and operating at 5725 MHz to 5850 MHz for IEEE802.11a/n/ac.

#### 3.4.1.1 Antenna Type:

Chain 0: External Antenna

Chain 1: External Antenna

Chain 2: External Antenna

Chain 3: External Antenna

#### 3.4.1.2 Antenna Gain:

Chain 0: 2412MHz to 2462 MHz: 5 dBi  
5150 MHz to 5250 MHz: 5 dBi  
5250 MHz to 5350 MHz: 5 dBi  
5470 MHz to 5725 MHz: 5 dBi  
5725 MHz to 5850 MHz: 5 dBi

Chain 1: Same as chain 0

Chain 2: Same as chain 0

Chain 3: Same as chain 0

For MIMO mode (4Tx/4Rx), there are four transmission antennas. Chain 0 ,Chain 1,Chain 2and Chain 3 used at the same time and antenna ports have uniform output powers. The Chain 0 ,Chain 1,Chain 2and Chain 3 antenna ports can be used alone. The transmit signals are correlated with each other.

$$\text{The directional gain} = G_{\text{ANT}} + 10 \log(N_{\text{ANT}}) \text{ dBi}$$

#### 3.4.1.3 Results for WLAN

##### For SISO (1TX/1RX) Mode

| Operating Mode |              | Freq. | Declared maximum conducted average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | MPE Limit | MPE Value |
|----------------|--------------|-------|-------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|-----------|-----------|
|                |              | (MHz) | (dBm)                                           |                                                | (dBi)        | (dBm)                   | (mW)                  | (mw/cm²)  |           |
| SISO           | IEEE 802.11b | 2412  | 23                                              | 1.5                                            | 5            | 29.5                    | 891.2509              | 1         | 0.1773    |
|                |              | 2437  | 23                                              | 1.5                                            | 5            | 29.5                    | 891.2509              | 1         | 0.1773    |
|                |              | 2462  | 23                                              | 1.5                                            | 5            | 29.5                    | 891.2509              | 1         | 0.1773    |
|                | IEEE 802.11g | 2412  | 24                                              | 1                                              | 5            | 30.0                    | 1000.0000             | 1         | 0.1989    |
|                |              | 2437  | 24                                              | 1                                              | 5            | 30.0                    | 1000.0000             | 1         | 0.1989    |
|                |              | 2462  | 24                                              | 1                                              | 5            | 30.0                    | 1000.0000             | 1         | 0.1989    |
|                | IEEE 802.11a | 5180  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |
|                |              | 5220  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |
|                |              | 5240  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |
|                |              | 5260  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |
|                |              | 5300  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |
|                |              | 5320  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |
|                |              | 5500  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1         | 0.0100    |

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| Operating Mode | Freq. | Declared maximum conducted average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | MPE Limit             | MPE Value |
|----------------|-------|-------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|-----------------------|-----------|
|                | (MHz) | (dBm)                                           |                                                | (dBi)        | (dBm)                   | (mW)                  | (mw/cm <sup>2</sup> ) |           |
|                | 5580  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1                     | 0.0100    |
|                | 5700  | 8                                               | 4                                              | 5            | 17                      | 50.1187               | 1                     | 0.0100    |
|                | 5745  | 10                                              | 4                                              | 5            | 19                      | 79.4328               | 1                     | 0.0158    |
|                | 5785  | 10                                              | 4                                              | 5            | 19                      | 79.4328               | 1                     | 0.0158    |
|                | 5825  | 10                                              | 4                                              | 5            | 19                      | 79.4328               | 1                     | 0.0158    |

#### For MIMO (4TX/4RX) Mode

| Operating Mode |                                          | Freq. | Declared maximum conducte<br>d average output power | Max. positive tolerance according manufacturer | Antenna Gain | Calculated maximum EIRP | Declared maximum EIRP | MPE Limit             | MPE Value |
|----------------|------------------------------------------|-------|-----------------------------------------------------|------------------------------------------------|--------------|-------------------------|-----------------------|-----------------------|-----------|
|                |                                          | (MHz) | (dBm)                                               |                                                | (dBi)        | (dBm)                   | (mW)                  | (mw/cm <sup>2</sup> ) |           |
| MIMO           | IEEE 802.11n-HT20                        | 2412  | 26                                                  | 1                                              | 5            | 32                      | 1584.8932             | 1                     | 0.3153    |
|                |                                          | 2437  | 26                                                  | 1                                              | 5            | 32                      | 1584.8932             | 1                     | 0.3153    |
|                |                                          | 2462  | 26                                                  | 1                                              | 5            | 32                      | 1584.8932             | 1                     | 0.3153    |
|                | IEEE 802.11n-HT40                        | 2422  | 26                                                  | 1                                              | 5            | 32                      | 1584.8932             | 1                     | 0.3153    |
|                |                                          | 2437  | 26                                                  | 1                                              | 5            | 32                      | 1584.8932             | 1                     | 0.3153    |
|                |                                          | 2452  | 26                                                  | 1                                              | 5            | 32                      | 1584.8932             | 1                     | 0.3153    |
|                | IEEE 802.11n-HT20<br>IEEE 802.11ac-VHT20 | 5180  | 14                                                  | 1                                              | 5            | 20                      | 100.0000              | 1                     | 0.0199    |
|                |                                          | 5220  | 14                                                  | 1                                              | 5            | 20                      | 100.0000              | 1                     | 0.0199    |
|                |                                          | 5240  | 14                                                  | 1                                              | 5            | 20                      | 100.0000              | 1                     | 0.0199    |
|                |                                          | 5260  | 15                                                  | 1                                              | 5            | 21                      | 125.8925              | 1                     | 0.0250    |
|                |                                          | 5300  | 15                                                  | 1                                              | 5            | 21                      | 125.8925              | 1                     | 0.0250    |
|                |                                          | 5320  | 15                                                  | 1                                              | 5            | 21                      | 125.8925              | 1                     | 0.0250    |
|                |                                          | 5500  | 13                                                  | 1                                              | 5            | 19                      | 79.4328               | 1                     | 0.0158    |
|                |                                          | 5580  | 13                                                  | 1                                              | 5            | 19                      | 79.4328               | 1                     | 0.0158    |
|                |                                          | 5700  | 13                                                  | 1                                              | 5            | 19                      | 79.4328               | 1                     | 0.0158    |
|                |                                          | 5745  | 18                                                  | 1                                              | 5            | 24                      | 251.1886              | 1                     | 0.0500    |
|                |                                          | 5785  | 18                                                  | 1                                              | 5            | 24                      | 251.1886              | 1                     | 0.0500    |
|                |                                          | 5825  | 18                                                  | 1                                              | 5            | 24                      | 251.1886              | 1                     | 0.0500    |
|                | IEEE 802.11n-HT40<br>IEEE 802.11ac-VHT40 | 5190  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5230  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5270  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5310  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5510  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5550  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5670  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5755  | 18                                                  | 1                                              | 5            | 24                      | 251.1886              | 1                     | 0.0500    |
|                |                                          | 5795  | 18                                                  | 1                                              | 5            | 24                      | 251.1886              | 1                     | 0.0500    |
|                | IEEE 802.11ac-VHT80                      | 5230  | 12                                                  | 1                                              | 5            | 18                      | 63.0957               | 1                     | 0.0126    |
|                |                                          | 5290  | 11                                                  | 1                                              | 5            | 17                      | 50.1187               | 1                     | 0.0100    |
|                |                                          | 5530  | 10                                                  | 1                                              | 5            | 16                      | 39.8107               | 1                     | 0.0079    |
|                |                                          | 5610  | 10                                                  | 1                                              | 5            | 16                      | 39.8107               | 1                     | 0.0079    |
|                |                                          | 5775  | 15                                                  | 1                                              | 5            | 21                      | 125.8925              | 1                     | 0.0250    |

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### 3.4.2 Simultaneous Multi-band Transmission MPE Analysis

#### 3.4.2.1 List of Mode for Simultaneous Multi-band Transmission

| No. | Configurations       | Support/Not Support |
|-----|----------------------|---------------------|
| 1   | 2.4G _WLAN +5G _WLAN | Support             |

#### 3.4.2.2 Results for transmit simultaneously

| No. | Configurations        | Maximum MPE Value<br>(mw/cm <sup>2</sup> ) |         |                            | Limits<br>(mw/cm <sup>2</sup> ) |
|-----|-----------------------|--------------------------------------------|---------|----------------------------|---------------------------------|
|     |                       | 2.4G WLAN                                  | 5G WLAN | Transmit<br>simultaneously |                                 |
| 1   | 2.4G _WLAN + 5G _WLAN | 0.3153                                     | 0.0500  | 0.3653                     | 1                               |

**Note 1:** According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:

*Transmit simultaneously MPE =  $\Sigma$  of MPE ratios*

*MPE ratios = Field strengths or power density / MPE limit at the test frequency*

## APPENDIX 1 PHOTOS OF TEST SETUP

N/A

## APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

\*\*\* End of Report \*\*\*

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