

# FCC RF Exposure Evaluation

Report Number:

**F231636**

Equipment under Test (EUT):

**Dual band Wi-Fi 6 / Bluetooth 5.3 low energy module**

**IRIS-W1**

Applicant:

**u-blox AG**



Deutsche  
Akkreditierungsstelle  
D-PL-17186-01-00

## References

- [1] **CFR 47 Rule part 1** Practice and Procedure
- [2] **CFR 47 Rule part 2** Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
- [3] **KDB 447498 D04 Interim General RF Exposure Guidance v01**

Assessed and  
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# 1 Identification

## 1.1 Applicant

|                            |                                 |
|----------------------------|---------------------------------|
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| Country:                   | Switzerland                     |
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## 1.2 Manufacturer

|                            |                                 |
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| Address:                   | Zürcherstrasse 68, 8800 Thalwil |
| Country:                   | Switzerland                     |
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| eMail address:             | filip.kruzela@u-blox.com        |

## 1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**  
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Accredited by *Deutsche Akkreditierungsstelle GmbH* in compliance with  
DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-06.

## 1.4 EUT (Equipment under Test)

| EUT                        |                                                     |
|----------------------------|-----------------------------------------------------|
| Test object: *             | Dual band Wi-Fi 6 / Bluetooth 5.3 low energy module |
| Model name: *              | IRIS-W1                                             |
| Model number: *            | IRIS-W101-00B<br>IRIS-W106-00B                      |
| Order number: *            | IRIS-W101-00B<br>IRIS-W106-00B                      |
| FCC ID: *                  | XPYIRISW1                                           |
| IC certification number: * | 8595A-IRISW1                                        |
| PMN: *                     | IRIS-W101-00B<br>IRIS-W106-00B                      |
| HVIN: *                    | IRIS-W101-00B<br>IRIS-W106-00B                      |
| FVIN: *                    | 922600.0200.000<br>922700.0200.000                  |
| HMN: *                     | not applicable                                      |

\* Declared by the applicant

## 1.5 Technical Data of Equipment

| General EUT data                                    |                                |                                 |                                 |
|-----------------------------------------------------|--------------------------------|---------------------------------|---------------------------------|
| Power supply EUT / evaluation board: *              | DC                             |                                 |                                 |
| Supply voltage EUT: *                               | $U_{Nom} = 3.3 \text{ V}_{DC}$ | $U_{Min} = 3.15 \text{ V}_{DC}$ | $U_{Max} = 3.45 \text{ V}_{DC}$ |
| Supply voltage Evaluation board: *                  | $U_{Nom} = 4.0 \text{ V}_{DC}$ | $U_{Min} = 5.0 \text{ V}_{DC}$  | $U_{Max} = 6.0 \text{ V}_{DC}$  |
| Temperature range: *                                | -40°C to +85°C                 |                                 |                                 |
| Lowest internal clock / radio radio frequency:<br>* | 40 MHz                         |                                 |                                 |
| Highest internal clock / radio radio frequency:     | 5825 MHz                       |                                 |                                 |

| IEEE 802.11 frequencies (2.4 GHz) |          |
|-----------------------------------|----------|
| 20 MHz                            |          |
| Channel 1                         | 2412 MHz |
| Channel 2                         | 2417 MHz |
| Channel 3                         | 2422 MHz |
| Channel 4                         | 2427 MHz |
| Channel 5                         | 2432 MHz |
| Channel 6                         | 2437 MHz |
| Channel 7                         | 2442 MHz |
| Channel 8                         | 2447 MHz |
| Channel 9                         | 2452 MHz |
| Channel 10                        | 2457 MHz |
| Channel 11                        | 2462 MHz |

| Bluetooth® low energy frequencies |          |            |          |
|-----------------------------------|----------|------------|----------|
| Channel 00                        | 2402 MHz | Channel 01 | 2404 MHz |
| Channel 02                        | 2406 MHz | Channel 03 | 2408 MHz |
| ...                               | ...      | ...        | ...      |
| Channel 18                        | 2438 MHz | Channel 19 | 2440 MHz |
| ...                               | ...      | ...        | ...      |
| Channel 36                        | 2474 MHz | Channel 37 | 2476 MHz |
| Channel 38                        | 2478 MHz | Channel 39 | 2480 MHz |

| 802.15.4 frequencies |          |            |          |
|----------------------|----------|------------|----------|
| Channel 11           | 2405 MHz | Channel 12 | 2410 MHz |
| ...                  | ...      | ...        | ...      |
| Channel 18           | 2440 MHz | Channel 19 | 2445 MHz |
|                      |          |            |          |
| Channel 25           | 2475 MHz | Channel 26 | 2480 MHz |

| IEEE 802.11 frequencies (5 GHz) |          |
|---------------------------------|----------|
| 20 MHz                          |          |
| Channel 36                      | 5180 MHz |
| Channel 40                      | 5200 MHz |
| Channel 44                      | 5220 MHz |
| Channel 48                      | 5240 MHz |
| Channel 52                      | 5260 MHz |
| Channel 48                      | 5280 MHz |
| Channel 60                      | 5300 MHz |
| Channel 64                      | 5320 MHz |
| Channel 100                     | 5500 MHz |
| Channel 104                     | 5520 MHz |
| Channel 108                     | 5540 MHz |
| Channel 112                     | 5560 MHz |
| Channel 116                     | 5580 MHz |
| Channel 120*                    | 5600 MHz |
| Channel 124*                    | 5620 MHz |
| Channel 128*                    | 5640 MHz |
| Channel 132                     | 5660 MHz |
| Channel 136                     | 5680 MHz |
| Channel 140                     | 5700 MHz |
| Channel 149                     | 5745 MHz |
| Channel 153                     | 5765 MHz |
| Channel 157                     | 5785 MHz |
| Channel 161                     | 5805 MHz |
| Channel 165                     | 5825 MHz |

| IEEE 802.11 radio mode (2.4 + 5 GHz) |                                                                                                                                   |                                                                                                                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Fulfills radio specification: *      | IEEE 802.11 b<br>IEEE 802.11 g<br>IEEE 802.11 a<br>IEEE 802.11 n (20 MHz)<br>IEEE 802.11 ac (20 MHz)<br>IEEE 802.11 ax20 (20 MHz) |                                                                                                                                 |
| Radio IC: *                          | NXP RW612ET / RW610 ET                                                                                                            |                                                                                                                                 |
| Type of modulation: *                | IEEE 802.11 a                                                                                                                     | BPSK, QPSK, 16-QAM, 64-QAM<br>(6/9/12/18/24/36/48/54 Mbit/s)                                                                    |
|                                      | IEEE 802.11 n20                                                                                                                   | BPSK, QPSK, 16-QAM, 64-QAM<br>(up to 72.2 Mbit/s 1 spatial stream)<br>(up to 144.4 Mbit/s 2 spatial stream)                     |
|                                      | IEEE 802.11 ac20                                                                                                                  | BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM<br>(up to 86.65 Mbit/s 1 spatial stream)<br>(up to 173.3 Mbit/s 2 spatial stream)           |
|                                      | IEEE 802.11 ax20                                                                                                                  | BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM<br>(up to 143.4 Mbit/s 1 spatial stream)<br>(up to 286.8 Mbit/s 2 spatial stream) |
| Operating frequency range: *         | IEEE 802.11b                                                                                                                      | 2412 – 2462 MHz                                                                                                                 |
|                                      | IEEE 802.11g                                                                                                                      | 2412 – 2462 MHz                                                                                                                 |
|                                      | IEEE 802.11a                                                                                                                      | 5180 – 5240 MHz, 5260 – 5320 MHz<br>5500 – 5720 MHz, 5745 – 5825 MHz,                                                           |
|                                      | IEEE 802.11n 20 MHz                                                                                                               | 2412 – 2462 MHz<br>5180 – 5240 MHz, 5260 – 5320 MHz<br>5500 – 5720 MHz, 5745 – 5825 MHz,                                        |
|                                      | IEEE 802.11ac 20 MHz                                                                                                              | 2412 – 2462 MHz<br>5180 – 5240 MHz, 5260 – 5320 MHz<br>5500 – 5720 MHz, 5745 – 5825 MHz,                                        |
|                                      | IEEE 802.11ax 20 MHz                                                                                                              | 2412 – 2462 MHz<br>5180 – 5240 MHz, 5260 – 5320 MHz<br>5500 – 5720 MHz, 5745 – 5825 MHz,                                        |

\* Declared by the applicant

| Bluetooth® low energy radio mode |                                 |                            |
|----------------------------------|---------------------------------|----------------------------|
| Fulfil radio specification: *    | Bluetooth® Low Energy (BLE) 5.3 |                            |
| Radio IC: *                      | NXP RW612ET / RW610 ET          |                            |
| Type of modulation: *            | BLE (1 Mbps PHY)                | GFSK                       |
|                                  | BLE (2 Mbps PHY)                | GFSK                       |
|                                  | BLE (0.5 Mbps PHY)              | GFSK                       |
|                                  | BLE (0.125 Mbps PHY)            | GFSK                       |
| Operating frequency range: *     | BLE (1 Mbps PHY)                | 2402 – 2480 MHz            |
|                                  | BLE (2 Mbps PHY)                | 2402 – 2480 MHz            |
|                                  | BLE (0.5 Mbps PHY)              | 2402 – 2480 MHz            |
|                                  | BLE (0.125 Mbps PHY)            | 2402 – 2480 MHz            |
| Number of channels: *            | BLE (1 Mbps PHY)                | 40 (2 MHz channel spacing) |
|                                  | BLE (2 Mbps PHY)                | 40 (2 MHz channel spacing) |
|                                  | BLE (0.5 Mbps PHY)              | 40 (2 MHz channel spacing) |
|                                  | BLE (0.125 Mbps PHY)            | 40 (2 MHz channel spacing) |

| IEEE 802.15.4 radio mode      |                        |          |
|-------------------------------|------------------------|----------|
| Fulfil radio specification: * | IEEE 802.15.4          |          |
| Radio IC: *                   | NXP RW612ET / RW610 ET |          |
| Type of modulation: *         | O-QPSK                 | 250 kbps |
| Operating frequency range: *  | 2405 – 2480 MHz        |          |

\* Declared by the applicant

## 1.6 Additional Information

None

## 2 Evaluation Methods

### 2.1 RF exposure test exemptions for single sources

#### 2.1.1 General Exemption 1.1307(b)(3)(i)(A)

The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in [paragraph \(b\)\(3\)\(ii\)\(A\)](#) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

#### 2.1.2 SAR Based Exemption 1.1307(b)(3)(i)(B)

Determination of exemption

The available maximum time-averaged power of effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz inclusive.

For the following separation distances [d] and frequency ranges  $P_{th}$  is given by the following formulas

|                             | 0.5 cm $\leq d \leq 20$ cm                                                                                                                       | 20 cm $< d \leq 40$ cm                              |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 0.2 GHz $\leq f < 1.5$ GHz  | $P_{th}(mW) = ERP_{20cm} \left( \frac{d}{20} \right)^x$ $ERP_{20cm} (mW) = 2040f$ $x = -\log_{10} \left( \frac{60}{ERP_{20cm} \sqrt{f}} \right)$ | $P_{th}(mW) = ERP_{20cm}$ $ERP_{20cm} (mW) = 2040f$ |
| 1.5 GHz $\leq f \leq 6$ GHz | $P_{th}(mW) = ERP_{20cm} \left( \frac{d}{20} \right)^x$ $ERP_{20cm} (mW) = 3060$ $x = -\log_{10} \left( \frac{60}{ERP_{20cm} \sqrt{f}} \right)$  | $P_{th}(mW) = ERP_{20cm}$ $ERP_{20cm} (mW) = 3060$  |

#### 2.1.3 MPE Based Exemption 1.1307(b)(3)(i)(C)

By using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

| RF Source frequency [MHz] | Threshold ERP [W] |
|---------------------------|-------------------|
| 0.3 -1.34                 | $1920 R^2$        |
| 1.34 – 30                 | $3450 R^2/f^2$    |
| 30 – 300                  | $3.83 R^2$        |
| 300 – 1500                | $0.0128 R^2/f$    |
| 1500 - 100000             | $19.2 R^2$        |

#### 2.1.4 Stand alone MPE evaluation limits

The human exposure to RF emissions from such devices could be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and / or power density. The limits for General Population / Uncontrolled Exposure are given in the following table from §1.1310(e)1:

| Frequency Range [MHz] | Electric Field Strength (E) [V/m] | Magnetic Field Strength (H) [A/m] | Power Density (S) [mW/cm <sup>2</sup> ] | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S [min] |
|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------------|--------------------------------------------------------------|
| 0.3 – 1.34            | 614                               | 1.63                              | *(100)                                  | < 30                                                         |
| 1.34 – 30             | 824/f                             | 2.19/f                            | *(180/f <sup>2</sup> )                  | < 30                                                         |
| 30 – 300              | 27.5                              | 0.073                             | 0.2                                     | < 30                                                         |
| 300 – 1500            |                                   |                                   | f/1500                                  | < 30                                                         |
| 1500 – 100,000        |                                   |                                   | 1.0                                     | < 30                                                         |

Limits for General Population / Uncontrolled Exposure.

Note: f = frequency in MHz; \* Plane – wave equivalent power density

d: minimum separation distance from antenna to the user

The power density is calculated as follows:

$$S = \frac{P \cdot G \cdot D}{4 \cdot \pi \cdot d^2}$$

Where:

P: conducted power

G: Antenna gain (linear)

D: Duty Cycle

## 2.2 RF exposure test exemptions for simultaneous transmission sources

### 2.2.1 1 mW Test Exemption for simultaneous transmission sources

As discussed in §1.1307(b)(3)(ii)(A) [1] the 1 mW exemption intended for single transmitters may be also applied to simultaneous transmission conditions, within the same host device, according one of the following criteria:

- a. When the maximum available power each individual transmitting antenna with the same time averaging period is  $\leq 1$  mW, and the nearest parts of the antenna structures of the simultaneously operating transmitters are separated by at least 2 cm
- b. When the aggregate maximum available power of all transmitting antennas is  $\leq 1$  mW in the same time-averaging period

This exemption may not be combined with any other exemption.

### 2.2.2 Simultaneous transmission SAR based and MPE based test exemptions

Although this is not a module integration in the sense of product approval, the procedure for simultaneous transmission specified in KDB 447498 D04 Interim General RF Exposure Guidance v01 in chapter 2.2 was taken into account:

According to the RF exposure KDB 447498 D04 General RF Exposure Guidance v01 in chapter 2.2.2:

This case is described in detail in § 1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of the following formular is satisfied.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

For these test exemptions to apply, the maximum output power, duty factor, and other applicable parameters used in the standalone ERP determination tests, must be the same, or corresponding to a more conservative choice, than those required for simultaneous transmission.

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is  $\leq 1.0$ , according to calculated/estimated, numerically modelled, or measured field strengths or power density. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to the MPE limit at the test frequency.

### 2.2.3 Test exemption based on the SAR to Peak Location Separation Ratio

When the ERP-based condition in the previous section does not apply, a test exemption may be still applicable based on the SAR to peak location separation ratio (SPLSR) procedure.

In this case, the simultaneously transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SPLSR that qualifies for the additional test exemption.

This ratio is defined as:

$$SPLSR = (SAR_1 + SAR_2)^{\frac{1.5}{R_i}}$$

Where:  $SAR_1$  and  $SAR_2$  = highest reported SAR or estimated SAR values for the two sources in the pair  $i$ , and  $R_i$  is their distance in mm.

When  $SPLSR \leq 0.0.4$  (rounded to two decimal digits), for all antenna pairs in the configuration, then the device qualifies for 1 g SAR test exemption.

When 10 g SAR applies (e.g. for extremities) the corresponding test exemption condition is  $SPLSR \leq 0.10$ .

If any antenna pair does not qualify for simultaneous transmission SAR test exemption, then the device must be tested for SAR compliance, according to the enlarged zoom scan and volume scan post-processing procedures in KDB Pub. 865664 D01.

### 3 Results of evaluation

#### 3.1 Used evaluation methods

| RF Exposure test exemptions for single sources |                                        |                |         |
|------------------------------------------------|----------------------------------------|----------------|---------|
| Used                                           | Method                                 | See sub-clause | Comment |
| <input type="checkbox"/>                       | General Exemption 1.1307(b)(3)(i)(A)   | 2.1.1          | -       |
| <input checked="" type="checkbox"/>            | SAR Based Exemption 1.1307(b)(3)(i)(B) | 2.1.2          | -       |
| <input type="checkbox"/>                       | MPE Based Exemption 1.1307(b)(3)(i)(C) | 2.1.3          | -       |
| <input type="checkbox"/>                       | MPE Calculation                        | 2.1.4          | -       |

| RF Exposure test exemptions for simultaneous transmission sources |                                                      |                |         |
|-------------------------------------------------------------------|------------------------------------------------------|----------------|---------|
| Used                                                              | Method                                               | See sub-clause | Comment |
| <input checked="" type="checkbox"/>                               | Not applicable*                                      | -              | -       |
| <input type="checkbox"/>                                          | 1 mW test Exemption acc. 2.2.1 [3]                   | 2.2.1          |         |
| <input type="checkbox"/>                                          | SAR and MPE Based Exemption acc. 2.2.2 [3]           | 2.2.2          |         |
| <input type="checkbox"/>                                          | SAR to Peak location separation ratio acc. 2.2.3 [3] | -              |         |

\*As declared no simultaneous transmission is possible

#### 3.2 Evaluation Distance

According to the CFR47 §2.1091 the device as declared by the applicant is a mobile device which is used at least with the following separation distances between the device and the users.

| Antenna   | Min separation distance as declared by the applicant |
|-----------|------------------------------------------------------|
| Antenna 1 | 4                                                    |

### 3.3 WLAN 2.4 GHz Emissions

The following information are based on [1] Test-Report F231636E1 from Phoenix Testlab GmbH

#### Antenna 1 SAR Based Exemption 1.1307(b)(3)(i)(B)

| P <sub>con</sub><br>[dBm]<br>incl. Tuneup      | P <sub>con</sub><br>[mW ]<br>incl. Tuneup | Ant. Gain<br>[dBi]  | Cable<br>Antenuation<br>[dB] | P <sub>e.i.r.p</sub><br>[dBm] | P <sub>e.i.r.p</sub><br>[mW] | P <sub>e.r.p</sub><br>[dBm] | P <sub>e.r.p</sub><br>[mW] |
|------------------------------------------------|-------------------------------------------|---------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|
| 19                                             | 79.43                                     | 2.37                | 0                            | 21.37                         | 137.09                       | 19.22                       | 83.59                      |
|                                                |                                           |                     |                              |                               |                              |                             |                            |
| Frequency<br>[GHz]                             | d<br>[cm]                                 | ERP <sub>20cm</sub> | x                            | P <sub>th</sub><br>[mW]       | P <sub>e.r.p.</sub><br>[mW]  | Result                      |                            |
| 2.437                                          | 3.1                                       | 3060                | 1.901                        | 88.42                         | 83.59                        | exempted                    |                            |
| for 0.5 cm ≤ D ≤ 20 cm and 1.5 GHz ≤ f ≤ 6 GHz |                                           |                     |                              |                               |                              |                             |                            |

Due to the fact that for separation distances larger than D the value for P<sub>e.r.p</sub> is lower than P<sub>th</sub> this emission is exempted from SAR Evaluation

### 3.4 Bluetooth LE - 2.4 GHz Emissions

The following information are based on [1] Test-Report F231636E1 from Phoenix Testlab GmbH

#### Antenna 1 SAR Based Exemption 1.1307(b)(3)(i)(B)

| P <sub>con</sub><br>[dBm]<br>incl. Tuneup      | P <sub>con</sub><br>[mW ]<br>incl. Tuneup | Ant. Gain<br>[dBi]  | Cable<br>Antenuation<br>[dB] | P <sub>e.i.r.p</sub><br>[dBm] | P <sub>e.i.r.p</sub><br>[mW] | P <sub>e.r.p</sub><br>[dBm] | P <sub>e.r.p</sub><br>[mW] |
|------------------------------------------------|-------------------------------------------|---------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|
| 17.3                                           | 53.70                                     | 2.37                | 0                            | 19.67                         | 92.68                        | 17.52                       | 56.51                      |
|                                                |                                           |                     |                              |                               |                              |                             |                            |
| Frequency<br>[GHz]                             | d<br>[cm]                                 | ERP <sub>20cm</sub> | x                            | P <sub>th</sub><br>[mW]       | P <sub>e.r.p.</sub><br>[mW]  | Result                      |                            |
| 2.44                                           | 2.5                                       | 3060                | 1.901                        | 58.71                         | 56.51                        | exempted                    |                            |
| for 0.5 cm ≤ D ≤ 20 cm and 1.5 GHz ≤ f ≤ 6 GHz |                                           |                     |                              |                               |                              |                             |                            |

Due to the fact that for separation distances larger than D the value for P<sub>e.r.p</sub> is lower than P<sub>th</sub> this emission is exempted from SAR Evaluation

### 3.5 802.15.4 - 2.4 GHz Emissions

The following information are based on [1] Test-Report F231636E1 from Phoenix Testlab GmbH

#### Antenna 1 SAR Based Exemption 1.1307(b)(3)(i)(B)

| P <sub>con</sub><br>[dBm]<br>incl. Tuneup      | P <sub>con</sub><br>[mW ]<br>incl. Tuneup | Ant. Gain<br>[dBi]  | Cable<br>Antenuation<br>[dB] | P <sub>e.i.r.p</sub><br>[dBm] | P <sub>e.i.r.p</sub><br>[mW] | P <sub>e.r.p</sub><br>[dBm] | P <sub>e.r.p</sub><br>[mW] |
|------------------------------------------------|-------------------------------------------|---------------------|------------------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|
| 13                                             | 19.95                                     | 2.37                | 0                            | 15.37                         | 34.43                        | 13.22                       | 21.00                      |
|                                                |                                           |                     |                              |                               |                              |                             |                            |
| Frequency<br>[GHz]                             | d<br>[cm]                                 | ERP <sub>20cm</sub> | x                            | P <sub>th</sub><br>[mW]       | P <sub>e.r.p.</sub><br>[mW]  | Result                      |                            |
| 2.44                                           | 1.5                                       | 3060                | 1.901                        | 22.23                         | 21.00                        | exempted                    |                            |
| for 0.5 cm ≤ D ≤ 20 cm and 1.5 GHz ≤ f ≤ 6 GHz |                                           |                     |                              |                               |                              |                             |                            |

Due to the fact that for separation distances larger than D the value for P<sub>e.r.p</sub> is lower than P<sub>th</sub> this emission is exempted from SAR Evaluation

### 3.6 WLAN 5 GHz Emissions

The following information are based on [1] Test-Report F231636E2 from Phoenix Testlab GmbH

#### Antenna 1 SAR Based Exemption 1.1307(b)(3)(i)(B)

| P <sub>con</sub><br>[dBm]<br>incl. Tuneup                                                      | P <sub>con</sub><br>[mW]<br>incl. Tuneup | Ant. Gain<br>[dBi]  | P <sub>e.i.r.p</sub><br>[dBm] | P <sub>e.i.r.p</sub><br>[mW] | P <sub>e.r.p</sub><br>[dBm] | P <sub>e.r.p</sub><br>[mW] |
|------------------------------------------------------------------------------------------------|------------------------------------------|---------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|
| 18.6                                                                                           | 72.44                                    | 3.4                 | 22                            | 158.49                       | 19.85                       | 96.64                      |
|                                                                                                |                                          |                     |                               |                              |                             |                            |
| Frequency<br>[GHz]                                                                             | d<br>[cm]                                | ERP <sub>20cm</sub> | x                             | P <sub>th</sub><br>[mW]      | P <sub>e.r.p</sub><br>[mW]  | Result                     |
| 5.6                                                                                            | 4                                        | 3060                | 2.082                         | 107.32                       | 96.64                       | exempted                   |
| for $0.5 \text{ cm} \leq D \leq 20 \text{ cm}$ and $1.5 \text{ GHz} \leq f \leq 6 \text{ GHz}$ |                                          |                     |                               |                              |                             |                            |

Due to the fact that for separation distances larger than d the value for P<sub>e.r.p</sub> is lower than P<sub>th</sub> this emission is exempted from SAR Evaluation

## 4 Conclusion

The IRIS-W1 complies in all operational modes to the limits given in CFR 47 §1.1310(e)1 in a separation distance of 3.1 cm for antenna 1 for all technologies.

| Technology       | Min separation distance [cm] |
|------------------|------------------------------|
| WLAN 2.4 GHz     | 3.1                          |
| WLAN 5 GHz       | 4.0                          |
| Bluetooth LE     | 2.5                          |
| 802.15.4         | 1.5                          |
| All technologies | 4.0                          |

## 5 Report History

| Report Number | Date       | Comment             |
|---------------|------------|---------------------|
| F231636       | 10.07.2024 | Initial Test Report |
| -             | -          | -                   |
| -             | -          | -                   |