

Test report No:  
 NIE: 66479RAN.002

## Assessment report RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091

|   |   |
|---|---|
| (*) Identification of item under evaluation | Radio mesh device   |
| (*) Trademark                               | KONE  |
| (*) Model and /or type reference            | Pulse (KM51671506G01)<br>Pulse (KM51671506G02)<br>Pulse (KM51671506G03)   |
| (*) Other identification of the product     | Kone Reference Number: 51786350D12<br>FCC ID: 2ALQBPULSE<br>IC ID: 4228A-PULSE<br>HW version: Rev.C<br>SW version: 5.0.0.46 |
| (*) Features                                | Wirepas radio, USB and RS485 serial connections   |
| (*) Manufacturer                            | KONE CORPORATION<br>Keilasatama 3 02150 ESPOO, Finland  |
| Test method requested, standard             | FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.  |
| Summary                                     | IN COMPLIANCE   |
| Approved by (name / position & signature)   | Miguel Lacave<br>Antennas Lab Manager   |
| Date of issue                               | 2021-07-02  |
| Report template No                          | FAN36_02<br>(*) "Data provided by the client"   |

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## Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item under evaluation", "Trademark", "Model and/or type reference", "General description of the device" and "Other identification of the product").
2. Maximum antenna gain and use distance information.
3. The sample consists of a Radio mesh device.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

## Identification of the client

Bittium Oy

Ritaharjuntie 1; 90590 Oulu; Finland

## Document history

| Report number | Date       | Description   |
|---------------|------------|---------------|
| 66479RAN.002  | 2021-07-02 | First release |

## Appendix A: FCC RF Exposure assessment result

## General description of the device under evaluation

The device under evaluation consists of a Radio mesh device.

According to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 20cm.

The equipment specifications for each supported technology are shown in Table 1. Values corresponding to antenna gain have been declared by the manufacturer. Values corresponding to Bluetooth Low Energy (Wirepas) have been measured and stated into DEKRA Testing and Certification, S.A.U. test report num. 66479RRF.002.

| Technology / Mode | Band    | Frequency (MHz) | Maximum Conducted Output Power (dBm) | Antenna peak gain (dBi) | Maximum E.I.R.P. (dBm) | Maximum E.I.R.P. (mW) |
|-------------------|---------|-----------------|--------------------------------------|-------------------------|------------------------|-----------------------|
| BTLE (Wirepas)    | 2.4 GHz | 2400 - 2483.5   | 4.29                                 | 3.00                    | 7.29                   | 5.36                  |

**Table 1:** Equipment specifications

## RF Exposure Assessment result and verdict

Limits for Maximum Permissible Exposure (MPE) to comply with FCC 47 CFR § 2.1091 are defined in “§1.1310 Radiation Exposure limits, paragraph (e)”:

| Technology / Mode | Band    | Frequency (MHz) | Distance (cm) | Power density (mW/cm <sup>2</sup> ) | FCC General Population Limit (mW/cm <sup>2</sup> ) | Verdict     |
|-------------------|---------|-----------------|---------------|-------------------------------------|--|-------------|
| BTLE (Wirepas)    | 2.4 GHz | 2400 - 2483.5   | 20.00         | 0.00                                | 1.00   | <b>Pass</b> |

**Table 2:** Assessment result and verdict

## Appendix B: FCC RF Exposure information

## RF Exposure evaluation

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance  $\geq 20$  cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz)  | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|--|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b>         |                               |                               |                                     |                          |
| 0.3–3.0 .....  | 614                           | 1.63                          | *100                                | 6                        |
| 3.0–30 .....   | 1842/f                        | 4.89/f                        | *900/f <sup>2</sup>                 | 6                        |
| 30–300 .....   | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300–1,500 .....  | .....                         | .....                         | f/300                               | 6                        |
| 1,500–100,000 .....  | .....                         | .....                         | 5                                   | 6                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 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                       |
| 300–1,500 .....  | .....                         | .....                         | f/1500                              | 30                       |
| 1,500–100,000 .....  | .....                         | .....                         | 1.0                                 | 30                       |

f = frequency in MHz \* = Plane-wave equivalent power density

## MPE Evaluation

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Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

$$\text{Power density: } S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\pi R[cm]^2}$$

Where:

$S$  = power density

$P_{E.I.R.P.}$  = Equivalent isotropically radiated power

$R$  = distance to the center of radiation of the antenna (evaluation distance)

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

$P_T$  = transmitter output power (including tune-up tolerance)

$G_T$  = gain of the transmitting antenna

$L_C$  = signal attenuation in the connecting cable between the transmitter and the antenna if applicable