

## 4 FCC §2.1091 & ISED RSS-102 - RF Exposure

### 4.1 Applicable Standards

According to FCC §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz)                                      | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|-------------------------|
| <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                      |
| 300-1500                                                   | /                             | /                             | f/1500                              | 30                      |
| 1500-100,000                                               | /                             | /                             | 1.0                                 | 30                      |

Note: f = frequency in MHz

\* = Plane-wave equivalent power density

According to ISED RSS-102 Issue 5:

#### 2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz<sup>6</sup> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

## 4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

The MPE calculation was based on the power of cellular networks since the cellular networks has higher power.

## 4.3 Test Results for FCC

Model: OKO 5MS5 with Module FCC ID: RI7ME910G1WW

| Frequency Band | Max Conducted Power (dBm) | Tune-up Power (dBm) | Evaluated Distance (cm) | Antenna Gain (dBi) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|----------------|---------------------------|---------------------|-------------------------|--------------------|-------------------------------------|-----------------------------|--------|
| NB-IoT         |                           |                     |                         |                    |                                     |                             |        |
| 2              | 23.86                     | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 4              | 23.62                     | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 5              | 23.24                     | 25                  | 20                      | 0                  | 0.063                               | 0.549                       | Pass   |
| 12             | 23.56                     | 25                  | 20                      | 0                  | 0.063                               | 0.466                       | Pass   |
| 13             | 23.68                     | 25                  | 20                      | 0                  | 0.063                               | 0.518                       | Pass   |
| 25             | 23.7                      | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 26             | 23.86                     | 25                  | 20                      | 0                  | 0.063                               | 0.543                       | Pass   |
| 66             | 23.81                     | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 71             | 21.89                     | 22                  | 20                      | 0                  | 0.032                               | 0.442                       | Pass   |
| 85             | 23.63                     | 25                  | 20                      | 0                  | 0.063                               | 0.465                       | Pass   |

| Frequency Band | Max Conducted Power (dBm) | Tune-up Power (dBm) | Evaluated Distance (cm) | Antenna Gain (dBi) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|----------------|---------------------------|---------------------|-------------------------|--------------------|-------------------------------------|-----------------------------|--------|
| eMTC           |                           |                     |                         |                    |                                     |                             |        |
| 2              | 23.86                     | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 4              | 23.62                     | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 5              | 23.24                     | 25                  | 20                      | 0                  | 0.063                               | 0.549                       | Pass   |
| 12             | 23.56                     | 25                  | 20                      | 0                  | 0.063                               | 0.466                       | Pass   |
| 13             | 23.68                     | 25                  | 20                      | 0                  | 0.063                               | 0.518                       | Pass   |
| 25             | 23.7                      | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 26             | 23.86                     | 25                  | 20                      | 0                  | 0.063                               | 0.543                       | Pass   |
| 66             | 23.81                     | 25                  | 20                      | 0                  | 0.063                               | 1.0                         | Pass   |
| 85             | 23.63                     | 25                  | 20                      | 0                  | 0.063                               | 0.465                       | Pass   |

| Frequency Band | Max Conducted Power (dBm) | Tune-up Power (dBm) | Division Factors (dB) | Antenna Gain (dBi) | Max E.R.P./E. I.R.P (dBm) | Evaluated Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|----------------|---------------------------|---------------------|-----------------------|--------------------|---------------------------|-------------------------|-------------------------------------|-----------------------------|--------|
| GPRS           |                           |                     |                       |                    |                           |                         |                                     |                             |        |
| 850(1slot)     | 33.23                     | 33.5                | -9.03                 | 0                  | 24.47                     | 20                      | 0.056                               | 0.549                       | Pass   |
| 850(2slots)    | 31.87                     | 33.5                | -6.02                 | 0                  | 27.48                     | 20                      | 0.111                               | 0.549                       | Pass   |
| 850(3slots)    | 29.91                     | 30                  | -4.26                 | 0                  | 25.74                     | 20                      | 0.075                               | 0.549                       | Pass   |
| 850(4slots)    | 27.67                     | 28                  | -3.01                 | 0                  | 24.99                     | 20                      | 0.063                               | 0.549                       | Pass   |
| 1900(1slot)    | 30.26                     | 30.5                | -9.03                 | 0                  | 21.47                     | 20                      | 0.028                               | 1.0                         | Pass   |
| 1900(2slots)   | 30.41                     | 30.5                | -6.02                 | 0                  | 24.48                     | 20                      | 0.056                               | 1.0                         | Pass   |
| 1900(3slots)   | 29.56                     | 30                  | -4.26                 | 0                  | 25.74                     | 20                      | 0.075                               | 1.0                         | Pass   |
| 1900(4slots)   | 28.98                     | 29                  | -3.01                 | 0                  | 25.99                     | 20                      | 0.079                               | 1.0                         | Pass   |
| EDGE           |                           |                     |                       |                    |                           |                         |                                     |                             |        |
| 850(1slot)     | 27.31                     | 28                  | -9.03                 | 0                  | 18.97                     | 20                      | 0.016                               | 0.549                       | Pass   |
| 850(2slots)    | 27.52                     | 28                  | -6.02                 | 0                  | 21.98                     | 20                      | 0.031                               | 0.549                       | Pass   |
| 850(3slots)    | 27.84                     | 28                  | -4.26                 | 0                  | 23.74                     | 20                      | 0.047                               | 0.549                       | Pass   |
| 850(4slots)    | 26.84                     | 27                  | -3.01                 | 0                  | 23.99                     | 20                      | 0.050                               | 0.549                       | Pass   |
| 1900(1slot)    | 26.72                     | 27                  | -9.03                 | 0                  | 17.97                     | 20                      | 0.012                               | 1.0                         | Pass   |
| 1900(2slots)   | 26.53                     | 27                  | -6.02                 | 0                  | 20.98                     | 20                      | 0.025                               | 1.0                         | Pass   |
| 1900(3slots)   | 26.44                     | 27                  | -4.26                 | 0                  | 22.74                     | 20                      | 0.037                               | 1.0                         | Pass   |
| 1900(4slots)   | 26.30                     | 27                  | -3.01                 | 0                  | 23.99                     | 20                      | 0.050                               | 1.0                         | Pass   |

Model: OKO 58S5 with Module FCC ID: RI7LE910NAV2

| Frequency Band | Reference Frequency (MHz) | Tune-up Power (dBm) | Evaluated Distance (cm) | Antenna Gain (dBi) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Result |
|----------------|---------------------------|---------------------|-------------------------|--------------------|-------------------------------------|-----------------------------|--------|
| LTE FDD        |                           |                     |                         |                    |                                     |                             |        |
| FDD 12         | 699.0                     | 24.00               | 20                      | 0                  | 0.050                               | 0.466                       | Pass   |
| FDD 17         | 704.0                     | 24.00               | 20                      | 0                  | 0.050                               | 0.469                       | Pass   |
| FDD 13         | 777.0                     | 24.00               | 20                      | 0                  | 0.050                               | 0.518                       | Pass   |
| FDD 5          | 824.7                     | 24.00               | 20                      | 0                  | 0.050                               | 0.55                        | Pass   |
| FDD 4          | 1710.7                    | 24.00               | 20                      | 0                  | 0.050                               | 1.000                       | Pass   |
| FDD 2          | 1850.7                    | 24.00               | 20                      | 0                  | 0.050                               | 1.000                       | Pass   |
| WCDMA/HSPA     |                           |                     |                         |                    |                                     |                             |        |
| FDD V          | 826.4                     | 24.50               | 20                      | 0                  | 0.056                               | 0.551                       | Pass   |
| FDD II         | 1852.4                    | 24.50               | 20                      | 0                  | 0.056                               | 1.000                       | Pass   |

#### 4.4 RF Exposure Exemption Evaluation for ISED

Model: OKO 5MS5 with Module IC: 5131A-ME910G1WW

| Frequency Band | Max Conducted Power (dBm) | Tune-up Power (dBm) | Antenna Gain (dBi) | Tune-up EIRP (W) | Limit (W) | Result |
|----------------|---------------------------|---------------------|--------------------|------------------|-----------|--------|
| NB-IoT         |                           |                     |                    |                  |           |        |
| 2              | 23.86                     | 25                  | 0                  | 0.316            | 2.239     | Exempt |
| 4              | 23.62                     | 25                  | 0                  | 0.316            | 2.122     | Exempt |
| 5              | 23.24                     | 25                  | 0                  | 0.316            | 1.288     | Exempt |
| 12             | 23.56                     | 25                  | 0                  | 0.316            | 1.151     | Exempt |
| 13             | 23.68                     | 25                  | 0                  | 0.316            | 1.238     | Exempt |
| 25             | 23.7                      | 25                  | 0                  | 0.316            | 2.239     | Exempt |
| 26             | 23.86                     | 25                  | 0                  | 0.316            | 1.278     | Exempt |
| 66             | 23.81                     | 25                  | 0                  | 0.316            | 2.122     | Exempt |
| 71             | 21.89                     | 22                  | 0                  | 0.158            | 1.110     | Exempt |
| 85             | 23.63                     | 25                  | 0                  | 0.316            | 1.150     | Exempt |

| Frequency Band | Max Conducted Power (dBm) | Tune-up Power (dBm) | Antenna Gain (dBi) | Tune-up EIRP (W) | Limit (W) | Result |
|----------------|---------------------------|---------------------|--------------------|------------------|-----------|--------|
| eMTC           |                           |                     |                    |                  |           |        |
| 2              | 23.86                     | 25                  | 0                  | 0.316            | 2.239     | Exempt |
| 4              | 23.62                     | 25                  | 0                  | 0.316            | 2.122     | Exempt |
| 5              | 23.24                     | 25                  | 0                  | 0.316            | 1.288     | Exempt |
| 12             | 23.56                     | 25                  | 0                  | 0.316            | 1.151     | Exempt |
| 13             | 23.68                     | 25                  | 0                  | 0.316            | 1.238     | Exempt |
| 25             | 23.7                      | 25                  | 0                  | 0.316            | 2.239     | Exempt |
| 26             | 23.86                     | 25                  | 0                  | 0.316            | 1.278     | Exempt |
| 66             | 23.81                     | 25                  | 0                  | 0.316            | 2.122     | Exempt |
| 85             | 23.63                     | 25                  | 0                  | 0.316            | 1.150     | Exempt |

| Frequency Band | Max Conducted Power (dBm) | Tune-up Power (dBm) | Division Factors (dB) | Antenna Gain (dBi) | Max E.R.P/E.I.R.P (dBm) | Max E.R.P/E.I.R.P (W) | Limit (W) | Result |
|----------------|---------------------------|---------------------|-----------------------|--------------------|-------------------------|-----------------------|-----------|--------|
| GPRS           |                           |                     |                       |                    |                         |                       |           |        |
| 850(1slot)     | 33.23                     | 33.5                | -9.03                 | 0                  | 24.47                   | 0.280                 | 1.288     | Exempt |
| 850(2slots)    | 31.87                     | 33.5                | -6.02                 | 0                  | 27.48                   | 0.560                 | 1.288     | Exempt |
| 850(3slots)    | 29.91                     | 30                  | -4.26                 | 0                  | 25.74                   | 0.375                 | 1.288     | Exempt |
| 850(4slots)    | 27.67                     | 28                  | -3.01                 | 0                  | 24.99                   | 0.316                 | 1.288     | Exempt |
| 1900(1slot)    | 30.26                     | 30.5                | -9.03                 | 0                  | 21.47                   | 0.140                 | 2.239     | Exempt |
| 1900(2slots)   | 30.41                     | 30.5                | -6.02                 | 0                  | 24.48                   | 0.281                 | 2.239     | Exempt |
| 1900(3slots)   | 29.56                     | 30                  | -4.26                 | 0                  | 25.74                   | 0.375                 | 2.239     | Exempt |
| 1900(4slots)   | 28.98                     | 29                  | -3.01                 | 0                  | 25.99                   | 0.397                 | 2.239     | Exempt |
| EDGE           |                           |                     |                       |                    |                         |                       |           |        |
| 850(1slot)     | 27.31                     | 28                  | -9.03                 | 0                  | 18.97                   | 0.079                 | 1.288     | Exempt |
| 850(2slots)    | 27.52                     | 28                  | -6.02                 | 0                  | 21.98                   | 0.158                 | 1.288     | Exempt |
| 850(3slots)    | 27.84                     | 28                  | -4.26                 | 0                  | 23.74                   | 0.237                 | 1.288     | Exempt |
| 850(4slots)    | 26.84                     | 27                  | -3.01                 | 0                  | 23.99                   | 0.251                 | 1.288     | Exempt |
| 1900(1slot)    | 26.72                     | 27                  | -9.03                 | 0                  | 17.97                   | 0.063                 | 2.239     | Exempt |
| 1900(2slots)   | 26.53                     | 27                  | -6.02                 | 0                  | 20.98                   | 0.125                 | 2.239     | Exempt |
| 1900(3slots)   | 26.44                     | 27                  | -4.26                 | 0                  | 22.74                   | 0.188                 | 2.239     | Exempt |
| 1900(4slots)   | 26.30                     | 27                  | -3.01                 | 0                  | 23.99                   | 0.251                 | 2.239     | Exempt |

Model: OKO 58S5 with Module IC: 5131A-LE910NAV2

| Frequency Band | Reference Frequency (MHz) | Tune-up Power (dBm) | Antenna Gain (dBi) | Tune-up EIRP (W) | Limit (W) | Result |
|----------------|---------------------------|---------------------|--------------------|------------------|-----------|--------|
| LTE FDD        |                           |                     |                    |                  |           |        |
| FDD 12         | 699.0                     | 24.00               | 0                  | 0.251            | 1.151     | Pass   |
| FDD 17         | 704.0                     | 24.00               | 0                  | 0.251            | 1.157     | Pass   |
| FDD 13         | 777.0                     | 24.00               | 0                  | 0.251            | 1.238     | Pass   |
| FDD 5          | 824.7                     | 24.00               | 0                  | 0.251            | 1.289     | Pass   |
| FDD 4          | 1710.7                    | 24.00               | 0                  | 0.251            | 2.122     | Pass   |
| FDD 2          | 1850.7                    | 24.00               | 0                  | 0.251            | 2.240     | Pass   |
| WCDMA/HSPA     |                           |                     |                    |                  |           |        |
| FDD V          | 826.4                     | 24.50               | 0                  | 0.282            | 1.291     | Pass   |
| FDD II         | 1852.4                    | 24.50               | 0                  | 0.282            | 2.241     | Pass   |