For Maximum Permissible Exposure (MPE) evaluation of the base unit, the maximum power density at 20 cm from this mobile transmitter shall be less than the General Population / Uncontrolled MPE limit in OET Bulletin 65 and meet the requirement listed in KDB447498.

For the 2.4GHz WiFi KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +14.5 dBm (Minimum) and +26.1 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 1) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at B/G/NHT20/NHT40 mode with SISO function:

The Conducted Power = 26.1 dBm
= 407.4 mW

The Conducted Power source-based time-averaging output power
= (407.4 * 1.000) mW
= 407.4 mW

The power density at 20cm = 407.4 *1.58/ $4\pi R^2$
= 0.128 mW cm^{-2}

For the 2.4GHz WiFi KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +14.7 dBm (Minimum) and 26.2 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 2) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at B/G/NHT20/NHT40 mode with SISO function:

The Conducted Power = 26.2dBm
= 416.9 mW

The Conducted Power source-based time-averaging output power
= (416.9* 1.000) mW
= 416.9 mW

The power density at 20cm = 416.9 *1.58/ $4\pi R^2$
= 0.131 mW cm^{-2}

For the 2.4GHz BLE KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +6.8 dBm (Minimum) and +12.8 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 1) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at BLE mode with SISO function:

The Conducted Power = 12.8 dBm
= 19.1 mW

The Conducted Power source-based time-averaging output power
= (19.1 * 1.000) mW
= 19.1 mW

The power density at 20cm = $19.1 * 1.58 / 4\pi R^2$
= 0.006 mW cm^{-2}

For the 2.4GHz BLE KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +6.7 dBm (Minimum) and 12.7 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 2) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at BLE mode with SISO function:

The Conducted Power = 12.7 dBm
= 18.6 mW

The Conducted Power source-based time-averaging output power
= (18.6 * 1.000) mW
= 18.6 mW

The power density at 20cm = $18.6 * 1.58 / 4\pi R^2$
= 0.006 mW cm^{-2}

For the 2.4GHz BDR/EDR KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +5.0 dBm (Minimum) and +11.0 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 1) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at BDR/EDR mode with SISO function:

The Conducted Power = 26.1 dBm
= 12.6 mW

The Conducted Power source-based time-averaging output power
= (12.6 * 1.000) mW
= 12.6 mW

The power density at 20cm = 12.6 *1.58/ $4\pi R^2$
= 0.004 mW cm^{-2}

For the 2.4GHz BDR/EDR KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +5.2 dBm (Minimum) and 11.2 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 2) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at BDR/EDR mode with SISO function:

The Conducted Power = 11.2 dBm
= 13.2 mW

The Conducted Power source-based time-averaging output power
= (13.2 * 1.000) mW
= 13.2 mW

The power density at 20cm = 13.2 *1.58/ $4\pi R^2$
= 0.004 mW cm^{-2}

For the 5.0GHz KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +6.9 dBm (Minimum) and +17.7 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 1) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at A/NHT20/NHT40/ACHT20/ACHT40/ACHT80 with SISO function:

The Conducted Power = 17.7 dBm
= 58.9mW

The Conducted Power source-based time-averaging output power
= (58.9* 1.000) mW
= 58.9 mW

The power density at 20cm = 58.9 *1.58/ $4\pi R^2$
= 0.0185 mW cm^{-2}

For the 5.0GHz KUBEv1-001 of tested model: KUBEv1-001, the measured powers among all the measured channels were within its production tolerance: +6.9dBm (Minimum) and +17.9 dBm (Maximum). The antenna gain of KUBEv1-001 (Antenna 2) is 2.0 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100.0% (1 x100%). From these data and its operating configuration – Mobile device, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

Activated at A/NHT20/NHT40/ACHT20/ACHT40/ACHT80 with SISO function:

The Conducted Power = 17.9 dBm
= 61.7mW

The Conducted Power source-based time-averaging output power
= (61.7* 1.000) mW
= 61.7 mW

The power density at 20cm = 61.7 *1.58/ $4\pi R^2$
= 0.0194 mW cm^{-2}

Per KDB 447498 D01 v06, simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0.

The MPE ratio for KUBEv1-001 can be calculated as follow:

For 2.4GHz part:

SISO for B/G/NHT20/NHT40 mode through ANT1:
= The power density at 20cm / MPE limit
= 0.128 mW cm^{-2} / 1.0 mW cm^{-2}
= 0.128

SISO for B/G/NHT20/NHT40 mode through ANT2:
= The power density at 20cm / MPE limit
= 0.128 mW cm^{-2} / 1.0 mW cm^{-2}
= 0.131

SISO for BDR/ERD mode through ANT1/2:
= The power density at 20cm / MPE limit
= 0.004 mW cm^{-2} / 1.0 mW cm^{-2}
= 0.004

SISO for BLE mode through ANT1/2:
= The power density at 20cm / MPE limit
= 0.006 mW cm^{-2} / 1.0 mW cm^{-2}
= 0.006

For 5.0GHz part:
SISO for A/NHT20/NHT40/ACHT20/ACHT40/ACHT80 mode through ANT1:
= The power density at 20cm / MPE limit
= 0.0185 mW cm^{-2} / 1.0 mW cm^{-2}
= 0.0185

SISO for A/NHT20/NHT40/ACHT20/ACHT40/ACHT80 mode through ANT2:
= The power density at 20cm / MPE limit
= 0.0194 mW cm^{-2} / 1.0 mW cm^{-2}
= 0.0194

The sum of the MPE ratios for all simultaneous transmitting antennas:

2.4GHz WiFi SISO with ANT1 and 2.4GHz BDR/EDR SISO with ANT1/2
= 0.128 + 0.004
= 0.132

2.4GHz WiFi SISO with ANT2 and 2.4GHz BDR/EDR SISO with ANT1/2
= 0.131 + 0.004
= 0.135

2.4GHz WiFi SISO with ANT1 and 2.4GHz BLE SISO with ANT1/2
= 0.128 + 0.006
= 0.134

2.4GHz WiFi SISO with ANT2 and 2.4GHz BLE SISO with ANT1/2
= 0.131 + 0.006
= 0.137

5.0GHz WiFi SISO with ANT1 and 2.4GHz BDR/EDR SISO with ANT1/2
= 0.0185 + 0.004
= 0.0225

5.0GHz WiFi SISO with ANT2 and 2.4GHz BDR/EDR SISO with ANT1/2
= 0.0194 + 0.004
= 0.0234

2.4GHz WiFi SISO with ANT1 and 2.4GHz BLE SISO with ANT1/2
= 0.0185 + 0.006
= 0.0245

2.4GHz WiFi SISO with ANT2 and 2.4GHz BLE SISO with ANT1/2
= 0.0194 + 0.006
= 0.0254

As the sum of MPE ratios for all simultaneous transmitting antennas is ≤ 1.0, simultaneous transmission MPE test exclusion will be applied.

Conclusion

In frequency range of 1,500 - 100,000MHz, the MPE limit is 1.0 $mWcm^{-2}$ for general population and uncontrolled exposure. As simultaneous transmission MPE test exclusion is applied and the measured power density at 20cm from all the standalone transmissions is lower than the MPE limit, the compliance to the MPE limit can be ensured by indicating the minimum 20cm separation between the transmitter's radiating structures and body of the user or nearby persons.

The following RF exposure statement is proposed to be included in the user manual:

“ FCC RF Radiation Exposure Statement
Caution: To maintain compliance with the FCC’s RF exposure guidelines, place the base unit at least 20cm from nearby persons.”