




# Human Exposure to Radiofrequency Electromagnetic Fields - Safe Distance Calculations as defined by OET65

## Metnet 60G Mesh Node v2

## 1. Revision History

Date	Doc Issue	Author	Comment
13/05/2021	1.0	Andy Crisp	First Issue

### 1.1 Authorisation

Date	Name	Title	Signature
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## 2. Overview

Metnet 60G Mesh Node v2 is predominantly used for mmWave Fixed Wireless Access (FWA) and produces microwave radio frequency signals in the 60 GHz frequency band for communicating data across distances of typically up to 500 metres.

The Metnet 60G Mesh Node v2 will be used in commercial and industrial applications and will be installed and mounted at a height of greater than 5 meters on either a pole, lamppost or residential or commercial property out of the reach and at a safe distance from the General Public.

The Metnet 60G Mesh Node v2 will be installed and maintained by professional operatives who are aware of the risks of Electromagnetic Fields and an installation manual is supplied with instructions and safety notices.

The assessment takes into consideration all intended and foreseen operating conditions that were reasonably foreseen at the time of the assessment.

This document shows the calculation of the compliance boundary for the Metnet 60G Mesh Node v2 product to meet the basic restrictions as defined in OET65 Edition 97-01.

### 2.1 Metnet 60G Mesh Node v2 device characteristics

Each Metnet 60G Mesh Node v2 unit:

- Have 4 integrated radios each operating in the 60GHz band covering 57GHz – 71GHz (802.11ad channels 1 to 6) with a maximum 2.16GHz channel bandwidth.
- Each radio has 16 (4 patches per channel) Receive and 16 (4 patches per channel) Transmit Beamforming channels
- Individual radios have 13 levels of adaptive encoding (Modulation Coding Scheme (MCS) 0 – 12) per radio
- Have multi sector horizontal coverage of 310°, 6° beamwidth and 18° vertical fixed coverage with a range capability of up to 500 meters

### 2.2 Maximum Transmitted Power

Each of the 4 radios have individual electronic steerable beamforming phase array antennas (16x16) with 22dBi of gain resulting in a maximum transmitter power of +40dBm EIRP.

The Transmitted Power has been tested and verified to CFR47 Part 15(c) §15.255 (Operation within the band 57-71 GHz) and the Maximum Transmitted Power reported has been shown it does not exceed +40dBm EIRP as detailed in the CFR47 Part 15(c) §15.255 radio test reports.

### 3. General Public Exposure to Electromagnetic Fields

The far field (spherical) calculation method defined in equation 3 of OET65 has been used to define the compliance boundary, using the maximum EIRP noted above.

As referenced in Section 2 of the OET 65, the calculation gives a conservative result for the near field (it overestimates the field strength) thus the exposure at the distance calculated below will be well within safe limits.

#### 3.1 Calculation of the compliance boundary for General Public Exposure

##### 3.1.1 Limits

The limit for general population exposure according to OET65 is 1mW/cm<sup>2</sup> (10W/m<sup>2</sup>).

##### 3.1.2 Safe Distance Calculation

The maximum RF power output from a single node radio is 40 dBm (10W) EIRP (with QPSK modulation).

The Metnet Mesh v2 60G node transmits continuously with the 4 radio transmitters operating simultaneously:

$$(R^{N1} + R^{N2} = R^{N3} + R^{N4}) = 40 \text{ dBm (10W)} + 40 \text{ dBm (10W)} + 40 \text{ dBm (10W)} + 40 \text{ dBm (10W)}$$

S = Power Density – basic restriction is 1mW/cm<sup>2</sup> (10W/m<sup>2</sup>)

P = Output Power

G = Gain (relative to isotropic)

r = compliance boundary radius

$$S = (PG) / (4\pi r^2)$$

$$PG = 10W + 10W + 10W + 10W = 40 \text{ Watts}$$

Therefore:

$$r^2 = (PG) / (S4\pi)$$

$$r^2 = 40 / (10 \times 4\pi)$$

##### 3.1.3 General Public Compliance Boundary distance required

Product	General Public Boundary Distance Required (r)	OET65 Power Density Limit
Metnet 60G Mesh Node v2	56.43cm	1mW/cm <sup>2</sup> (10W/m <sup>2</sup> )

## 4. Workers Exposure to Electromagnetic Fields

Metnet 60G Mesh Node v2 will only be installed and maintained by professional operatives.

In the user installation manual, it is detailed that the Metnet 60G Mesh Node v2 should not be powered whilst the unit is being installed. This ensures that workers are safe from any harmful radiation whilst handling the Metnet 60G Mesh Node v2 during installation.

Despite this the boundary distance is detailed to make the installers aware of the risk that they should take into consideration particularly after the Metnet 60G Mesh Node v2 has been applied.

### 4.1 Calculation of compliance boundary for Workers Exposure

#### 4.1.1 Limits

The limit for occupational exposure according to OET65 is  $5\text{mW}/\text{cm}^2$  ( $50\text{W}/\text{m}^2$ ).

#### 4.1.2 Safe Distance Calculation

The maximum RF power output from a single node radio is 40 dBm (10W) EIRP (with QPSK modulation).

The Metnet Mesh v2 60G node transmits continuously with the 4 radio transmitters operating simultaneously:

$$(R^{N^1} + R^{N^2} = R^{N^3} + R^{N^4}) = 40 \text{ dBm (10W)} + 40 \text{ dBm (10W)} + 40 \text{ dBm (10W)} + 40 \text{ dBm (10W)}$$

S = Power Density – basic restriction is  $5\text{mW}/\text{cm}^2$  ( $50\text{W}/\text{m}^2$ )

P = Output Power

G = Gain (relative to isotropic)

r = compliance boundary radius

$$S = (PG) / (4\pi r^2)$$

$$PG = 10\text{W} + 10\text{W} + 10\text{W} + 10\text{W} = 40 \text{ Watts}$$

Therefore:

$$r^2 = (PG) / (S4\pi)$$

$$r^2 = 40 / (50 \times 4\pi)$$

#### 4.1.3 Workers Compliance Boundary distance required

Product	Workers Boundary Distance Required (r)	OET65 Power Density Limit
Metnet 60G Mesh Node v2	25.23cm	$5\text{mW}/\text{cm}^2$ ( $50\text{W}/\text{m}^2$ )