

MPE Analysis Report

The Equipment-Under-Test (EUT) VAULT 2 is a Streaming Music Player, Vault and CD-Ripper. The EUT contains a Bluetooth module which has Bluetooth 4.0 BLE and Bluetooth 3.0 features. The EUT can accept analog audio signal, digital audio signal, music content from CD, harddisk and wireless audio signal via Bluetooth devices. The EUT is powered by 100-240VAC.

Antenna Type: Internal, Integral
Antenna Gain: 2dBi

Operating mode	Nominal Conducted Power	Production Tolerance	Modulation Type
Bluetooth 4.0 BLE	7.02 dBm	+/- 3dB	GFSK

Operating mode	Nominal Radiated Field Strength	Production Tolerance	Modulation Type
Bluetooth 3.0	102.8 dB μ V/m at 3m	+/- 3dB	GFSK

For Maximum Permissible Exposure (MPE) evaluation of the VAULT 2, 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.

1) For the Bluetooth 4.0 BLE, maximum conducted power measured within its production tolerance was 10.02dBm (maximum). The antenna gain is 2 dBi = 1.58 (num gain) and the maximum source-based time-averaging duty factor is 100%. From these data, 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:

The conducted power = 10.02dBm (10.05mW)

The radiated (EIRP) source-based time-averaging output power
= (10.05 * 1.58) mW
= 15.9 mW

The power density at 20 cm from the antenna
= EIRP / 4 π R²
= 0.0032 mW cm⁻²

2) For the Bluetooth 3.0, maximum field strength measured within its production tolerance (FS) was 105.8 dB μ V/m (maximum). The distance (D) between the antenna and the equipment under test (EUT) was 3 meters. And the maximum source-based time-averaging duty factor is 100%. From these data, 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:

$$\text{The radiated power} = (FS \cdot D)^2 / 30 = 11.4 \text{ mW}$$

$$\begin{aligned} \text{The radiated (EIRP) source-based time-averaging output power} \\ &= (11.4 \cdot 1) \text{ mW} \\ &= 11.4 \text{ mW} \end{aligned}$$

$$\begin{aligned} \text{The power density at 20 cm from the antenna} \\ &= \text{EIRP} / 4\pi R^2 \\ &= 0.0023 \text{ mW cm}^{-2} \end{aligned}$$

In the frequency range of 1,500 - 100,000MHz, the MPE limit is 1.0 mWcm⁻² for general population and uncontrolled exposure. As the measured power density at 20cm from the transmitter 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 product at least 20cm from nearby persons.”