

MPE Analysis Report

The Equipment-Under-Test (EUT) PULSE 2i is a Premium Wireless Steaming Speaker. The EUT contains both WLAN (WiFi) and Bluetooth modules. The Bluetooth module has Bluetooth 4.0 BLE and Bluetooth 3.0 features. The EUT can accept analog audio signal, digital audio signal and wireless audio signal via Bluetooth devices. An iOS/Android apps Bluesound installed in Smartphone can act as the remote control of the EUT. The EUT has internal power amplifiers and loudspeaker. It is powered by 100-240VAC. The EUT is powered by 100-240VAC.

WiFi Module

Antenna Type: Internal, Integral
Antenna Gain: 2dBi

B mode: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Output in dBm
Low		17.11
Channel:	2412	
Middle		17.20
Channel:	2437	
High		17.21
Channel:	2462	

G mode: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Output in dBm
Low		19.34
Channel:	2412	
Middle		19.89
Channel:	2437	
High		19.91
Channel:	2462	

NHT20: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Output in dBm
Low		18.11
Channel:	2412	
Middle		18.76
Channel:	2437	
High		18.91
Channel:	2462	

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NHT40: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Output in dBm
Low Channel:	2422	18.69
Middle Channel:	2437	19.01
High Channel:	2452	19.11

AC20: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Conducted output power in dBm
5180		4.6
5200		4.3
5240		4.2
5745		4.8
5785		2.8
5825		1.6

AC40: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Conducted output power in dBm
5190		4.1
5230		4.2
5755		4.3
5795		2.5

AC80 product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Conducted output power in dBm
5210		5.3
5775		4.3

A mode: product tolerance +/-3dB
Nominal conducted power

Frequency (MHz)		Conducted output power in dBm
5180		7.6
5200		6.5
5240		6.0
5745		7.1
5785		4.4
5825		3.8

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NHT20: product tolerance +/-3dB

Nominal conducted power

Frequency (MHz)	Conducted output power in dBm
5180	4.5
5200	3.9
5240	4.1
5745	4.7
5785	3.5
5825	2.2

NHT40: product tolerance +/-3dB

Nominal conducted power

Frequency (MHz)	Conducted output power in dBm
5190	4.0
5230	4.1
5755	4.6
5795	3.5

Bluetooth Module

Antenna Type: Internal, Integral

Antenna Gain: 2dBi

Bluetooth 3.0 and Bluetooth 4.0 BLE

EIRP range is 0dBm to 8dBm

Modulation type: GFSK

FCC ID: Q2O-PULSE2I

IC: 152B-PULSE2I

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

1) For the Bluetooth portion of the unit, the measured powers among all the measured channels were within its production tolerance. The antenna gain is 2 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100%. From these data and its operating configuration, the exposed power density at a distance (R) of **Error! Reference source not found.**cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

$$\begin{aligned} &\text{The EIRP radiated power} \\ &= 8 \text{ dBm} \\ &= 6.31 \text{ mW} \end{aligned}$$

$$\begin{aligned} &\text{The radiated (EIRP) source-based time-averaging output power} \\ &= (6.31 * 1) \text{ mW} \\ &= 6.31 \text{ mW} \end{aligned}$$

$$\begin{aligned} &\text{The power density at } \mathbf{Error! Reference source not found.cm} \\ &= 6.31 / 4\pi R^2 \\ &= 0.00126 \text{ mW cm}^{-2} \end{aligned}$$

2) For the WiFi portion of the unit, the measured powers among all the measured channels were within its production tolerance. The antenna gain is 2 dBi = 1.58 (num gain) and its maximum source-based time-averaging duty factor is 100%. From these data and its operating configuration, the exposed power density at a distance (R) of **Error! Reference source not found.**cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

$$\begin{aligned} &\text{The EIRP radiated power} \\ &= \text{conducted power (with maximum tolerance) + antenna gain} \\ &= (19.91 + 3) + 2 \text{ dBm} \\ &= 24.91 \text{ dBm (309.74 mW)} \end{aligned}$$

$$\begin{aligned} &\text{The radiated (EIRP) source-based time-averaging output power} \\ &= (309.74 * 1) \text{ mW} \\ &= 309.74 \text{ mW} \end{aligned}$$

$$\begin{aligned} &\text{The power density at 20 cm from the antenna} \\ &= \text{EIRP} / 4\pi R^2 \\ &= 0.06165 \text{ mW cm}^{-2} \end{aligned}$$

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:

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“ FCC RF Radiation Exposure Statement

Caution: To maintain compliance with the FCC’s RF exposure guidelines, place the Internet Music System at least 20cm from nearby persons.”

In addition, for this product with multiple transmitter and antenna (Bluetooth and WiFi), the requirement of Simultaneous Transmission evaluation has also been considered and has complied with the following conditions of the worse case;

$$\text{MPE1/Limit1} + \text{MPE2/Limit2} \leq 1$$

Thus,

$$\begin{array}{lcl} 0.00126/1 & + & 0.06165/1 = 0.06291 \\ \text{Bluetooth} & & \text{WiFi} \end{array}$$

It is concluded that no Simultaneous Transmission evaluation is required.