RF Exposure Report

The equipment under test (EUT) is an Echelon Reflect with BT4.1 (dual-mode) operating in 2402-2480MHz and 2.4G WIFI function operating in 2412-2462MHz, The EUT is powered by AC 120V/60Hz. Bluetooth and WIFI transmitters are share one antenna but cannot transmit simultaneously. User cannot access USB/LAN/SD card ports in normal use. For more detail information pls. refer to the user manual.

Bluetooth Function:

Bluetooth Version: 4.1 EDR
Antenna Type: Internal antenna
Antenna Gain: 3dBi.
The normal radiated output power (e.i.r.p) is: -9 dBm (tolerance: +/- 3dB).
The normal conducted output power is: -12 dBm (tolerance: +/- 3dB).
Modulation Type: GFSK, π/4-DQPSK and 8-DPSK

According to the KDB 447498:
The Maximum peak radiated emission for the EUT is 89.1dBμV/m at 3m in the frequency 2402MHz
The EIRP = [(FS*D) ^2 / 30] mW = -6.13 dBm
which is within the production variation.

The Minimum peak radiated emission for the EUT is 84.1 dBμV/m at 3m in the frequency 2480MHz
The EIRP = [(FS*D) ^2 / 30] mW = -11.13dBm
which is within the production variation.

The maximum conducted output power specified is -9 dBm =0.126mW
The source- based time-averaging conducted output power
= 0.126 * Duty factor mW (where Duty Factor≤1)
= 0.126 mW

The SAR Exclusion Threshold Level:
= 3.0 * (min. test separation distance, mm) / sqrt (freq. in GHz)
= 3.0 * 5 / sqrt (2.480) mW
= 9.53 mW

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

Bluetooth Version: 4.1 BLE
Antenna Type: Internal antenna
Antenna Gain: 3dBi.
The normal radiated output power (e.i.r.p) is: 3 dBm (tolerance: +/- 1dB).
The normal conducted output power is: 0 dBm (tolerance: +/- 1dB).
Modulation Type: GFSK

According to the KDB 447498:
The Maximum peak radiated emission for the EUT is 99.1dBμV/m at 3m in the frequency 2402MHz
The EIRP = [(FS*D) ^2 / 30] mW = 3.87 dBm
which is within the production variation.

The Minimum peak radiated emission for the EUT is 98.1 dBμV/m at 3m in the frequency 2440MHz
The EIRP = [(FS*D) ^2 / 30] mW = 2.87 dBm
which is within the production variation.

The maximum conducted output power specified is 1 dBm =1.26 mW
The source- based time-averaging conducted output power
= 1.26 * Duty factor mW (where Duty Factor≤1)
= 1.26 mW

The SAR Exclusion Threshold Level:
= 3.0 * (min. test separation distance, mm) / sqrt (freq. in GHz)
= 3.0 * 5 / sqrt (2.480) mW
= 9.53 mW

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

WIFI Function:

Modulation Type: CCK, BPSK, QPSK, 16QAM, 64QAM, DQPSK, DBPSK
Antenna Type: Internal antenna
Antenna Gain: 3 dBi
The nominal conducted output power specified: 20dBm (Tolerance: +/- 4dB)
The nominal radiation output power specified: 23dBm (Tolerance: +/- 4dB)

The maximum conducted output power for the EUT is 23.45 dBm in the frequency 2.437GHz 802.11g mode which is within the production variation.

The minimum conducted output power for the EUT is 17.26 dBm in the frequency 2.462GHz 802.11b mode which is within the production variation.

According to FCC Part 2.1091, this unlicensed transmitting devices is categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use,
According to the KDB 447498 and OET 65, the simple calculation as below:

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

The maximum E.I.R.P = 20dBm+4dB+3dBi=27dBm=501.19mW
The source-based time averaged maximum radiated power = 501.19 x Duty Cycle = 501.19mW

From above 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:
= 501.19mW / 4πR^2
= 0.1 mW/cm^2

The MPE limit is 1.0 mW/cm^2 for general population and uncontrolled exposure in the Wi-Fi frequency range according to FCC Part 1.1310. 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 structure and body of the user or nearby persons.

Transmitter Duty Cycle Calculation
The EUT transmit continuously during the test, the duty cycle is 1.

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

"FCC RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons."