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WLL Report #14832-02 Rev 0

Zenner USA
15280 Addison Rd, Suite 340
Addison, TX 75001

Model: Zenner USA Bluetooth Installation Radio (Model 100-0023-001)

FCC ID: 2ACOABTIR

Washington Laboratories, Ltd. performed a SAR Evaluation on the Zenner USA Bluetooth Installation Radio (Model 100-0023-001). This product is a portable transmitter, operating between 902.5MHz and 927MHz. It is designed to be body worn (Belt Worn) by the user with a separation distance ≤ 5mm and therefore SAR must be considered.

This device also includes a certified Bluetooth module, FCC ID: SQGBT900 that has been previously approved as a portable device for distances <5mm from the user. As the configuration of the Bluetooth Installation Radio does not allow the Bluetooth module and the 900MHz band radio to trasmit simultaneously only the 900MHz band radio will be evaluated in these results.

FCC Exclusion Results:

The EUT was tested under FCC Part 15.247 as an FHSS device (WLL Test Report 14832-01) and the maximum measured power was determined as 13.8mW (11.4dBm) conducted at the antenna port, The Production tolerance is +10dBm with +/-2dBm ,a maximum value of 15.85mW This will be rounded to 16mW per FCC Guidance.

The EUT is limited to a maximum duty cycle of 39% (this is explained at the end of this report. A 39% duty cylcle give a power reduction of 10Log(0.39) or -4dB. The 12dBm power will be reduced to 8dBm (6mW)for this evaluation.

Refering to the FCC Documument, 447498 D01 General RF Exposure Guidance v05r02, Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies, section 4.1 allows for the exclusion of SAR Testing if the device meets the following requirements:

$$[(\textit{max. power of channel, including tune-up tolerance, mW})/(\textit{min. test separation distance, mm})] \cdot [\sqrt{f_{(GHz)}}] \leq 3.0 \text{ for 1-g SAR and} \leq 7.5 \text{ for 10-g extremity SAR}$$

Where,

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is used.

Using the above formula and test data for the highest power channel:

$$(6 \div 5) \text{ X } \sqrt{0.9025} = 1.1 \leq 3.0 \text{ Low Channel}$$

$$(6 \div 5) \text{ X } \sqrt{0.915} = 1.2 \leq 3.0 \text{ Center Channel}$$

$$(6 \div 5) \text{ X } \sqrt{0.927} = 1.2 \leq 3.0 \text{ High Channel}$$

This EUT qualifies for FCC SAR exclusion.

Radio Transmission Times

There are three types of operations that involve wireless transmission: install, read, and firmware update.

1) The install operation consists of:
    a. Transmits a 740 ms synchronization and authorization message
    b. With transmitter off and receiver on, waits 250 ms for a response from the remote device or a 1000ms timeout.
    c. Transmits a 300 ms installation transmission
    d. With transmitter off and receiver on waits 1350ms for the remote device to complete the installation process and send a response or a 2000ms timeout.
    (740+300) / (740+250+300+1350) = 39% maximum duty cycle.
2) The read operation consists of:
    a. Transmits a 740 ms synchronization and authorization message
    b. With transmitter off and receiver on, waits 250ms for a response from the remote device or a 1000ms timeout
    c. Transmits a 75 ms read request message
    d. With transmitter off and receiver on, waits 1000ms for the remote device to respond with the current reading data or a 1000ms timeout.
    (740+75) / (740+250+75+1000) = 39% maximum duty cycle.
3) During a firmware update,:
    a. Transmits a firmware data packet for a time period of 90 ms
    b. With transmitter off and receiver on, waits for an ack/nak response from the remote device which will arrive in 40ms or timeout in 1000ms
    c. If the response times-out after 1000ms, re-transmits the data packet (step 3a); otherwise, if an ack/nak is received, delays 100ms with transmitter off to enforce a maximum transmit duty cycle.
    90 / (90+40+100) = 39% maximum duty cycle
    d. Repeats steps 3a..3c until the firmware has been transferred

Zenner has additionally incorporated fail-safe software that enforces a maximum 39% transmit duty cycle over any 30 minute window, automatically disabling the transmitter if that duty cycle is reached.

Sincerely,

James Ritter
Compliance Engineer

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President