

American Telecommunications Certification Body Inc.

6731 Whittier Ave, McLean, VA 22101

November 24, 2004

RE: Zebra Technologies

FCC ID: I28MD-BTC2TY2

I have a few comments on the above referenced Application.

General Issues:

1) In the antenna gain information file, the extra attenuation shown in the calculations does not appear to match the table for both the QL family antennas. Please correct as appropriate.

Response: Please see the revised antenna specification document uploaded with this response. Zebra corrected the second QL antenna calculation, but believes the first one is correct. The table at the end only relates to the test antennas that Zebra provided to Rhein Tech. Cable lengths used at Zebra for antenna patterns and gain were not necessarily the same as what is in the table, so the correction factors can be different. In many cases, the lengths were the same. The correction factors that Zebra used in the document correspond to the Zebra cable lengths used for the antenna gain testing.

2) This application appears to cover 9 configurations. However only 2 labels appear to be provided. Both sample labels appear to be for the external portion of the final devices and not the module itself. However one label uses the word "contains" while the other does not. Please explain/justify this. Additionally, the first label does not include information regarding the FCC 2 part statement or DoC information. Please explain/correct as necessary.

Response: Please review the label samples again, as both samples do include the word "contains", as do the labels for the other printers in which the EUT would be placed. Samples of the labels for the other printers can be provided if necessary. The EUT itself is only .5 x .5 inches, far too small to hold the FCC ID label. The FCC 2 part statement actually appears on a label on the outside of the device, as can be seen in the External Photo exhibits.

3) It appears that an excessive length of cable was used between the module and antenna compared to the length that will normally be installed. The FCC desires the shortest cable expected to be used. Will all devices utilize this length cable. If not, how was the effect of the excess cable factored into the testing/results.

Response: Testing was performed with longer cables in order to test the antenna as they will be installed in the final host products. This cable length was necessary for testing purposes. Additionally, this length eliminated any influence of the antenna and housing to the module under test. Based on the low emissions data and the low loss of the cable (see antenna specification document) we feel that this test configuration was an appropriate compromise between cable length and the physical constraints of the test environment.

4) Page 6 of the test report appears to suggest testing was only done up to the 2nd LO harmonic. Please explain as the FCC expects testing performed to 10 x the highest frequency generated or used.

Response: Emissions were investigated up to 24 GHz. The 2nd LO" language in the test report was not applicable to this device and has been removed.

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5) Page 49 shows average measurements above 1 GHz. However, compliance must also be shown to the peak limits above 1 GHz. Please either provide peak measurements or an explanation of the peak to average ratio.

Response: Peak measurements are now included with average for compliance. Please see the revised test report uploaded with this response.

6) 5 out of 6 pages of the schematics do not show values/emissions designators. Please correct.

Response: As agreed upon in an email on November 29, the schematic file uploaded on November 29 addresses this issue.

7) Spurious emissions must be tested for a low, mid, and high channel. Only middle channel results were provided. Please provide additional data.

Response: Low and high channels are now included. Please see the revised test report.

8) Were spurious emission measured for both H and V polarities in order to obtain worse case results for each antenna?

Response: Yes, spurious emissions were measured for both horizontal and vertical polarities. Worst case data is presented in the test report.

9) The maximum dwell time measured was 8 ms in a 31.6 second period. Something does not appear correct regarding how the TX was behaving. Most Bluetooth tests show results just under the 400 msec requirement. Assuming a TX time of 419 us, this would mean the device would return to the same channel approximately every 66 msec assuming a full duplex TX. In a 31.6 sec period of time the same channel would be visited 477 times. Additionally, if the device was properly hopping through the hop table, the spacing between all TX cycles would be the same. This is not shown in plot 11-3 and therefore each channel does not appear to be used equally on the average as required by the rules. Lastly, the theory of operation mentions beacon intervals lasting 100 ms, which implies dwell times of 200 msec or longer. Note that the minimum hop cycle listed in the theory of operation is 2.5 hops per second or 400 msec dwell time maximum. Please provide more theory of dwell time information or data as necessary regarding this issue. Note that additionally, for systems with 20 dB bandwidth < 1 MHz, a 30 second measurement period is specified.

Response: The longest pulse noted in normal operation of this device while in active communication with an off-the-shelf device was 262 us, which is now included in the report. In normal communication mode, it is difficult to show the spacing due to the cross communication timing with the alternate device. If it could be shown, equal pulses of 262 us could be equivalent to 300 pulses in a 30 second period or a 78.6 ms average occupancy rate. It has been shown in the now included plots that 215 pulses for a 56.3 ms occupancy rate, both of which are well below the 400 ms limit.

10) The 6 dB bandwidth is not applicable to this device and therefore this data should be removed from the report.

Response: Noted – thank you. This data has been removed from the revised report uploaded with this application.

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11) Something appears odd about the 20 dB bandwidth. I have never seen a Bluetooth with this narrow of a bandwidth. Most appear to have about an 800-900 kHz 20 dB bandwidth using a 10 or 30 kHz RBW. Is it possible the test software is not behaving properly? How does this affect other tests? Please review and verify as necessary.

Response: The wrong mode was used for these bandwidth plots, the plots have been retaken using the correct mode.

12) The users manual should include prohibition against co-location such as: "The antenna(s) used for this transmitter must not be co-located or must not operate in conjunction with any other antenna."

Response: Please refer to the revised manual uploaded with this response.

13) It is suggested to provide an RF exposure exhibit similar to the example attached as appropriate for this device.

Response: Please see the revised RF exposure exhibit uploaded with this application. Thank you for the example.

14) FYI.....Proposed Grant Notes:

Limited Modular Approval (LMA). Approval is limited to installation only within Zebra Technologies Corporation devices using antennas specified in this filing. Power output listed is conducted. The WLAN device and antenna must be installed and properly labeled by the OEM. The antenna(s) used for this transmitter must not be co-located or must not operate in conjunction with any other antenna. End-users must be provided with specific operating instructions for satisfying RF exposure compliance. End users must not be provided with information on how to remove or install the device.

Response: Noted – thank you.

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The items indicated above must be submitted before processing can continue on the above referenced application. Failure to provide the requested information may result in application termination. Correspondence should be considered part of the permanent submission and may be viewed from the Internet after a Grant of Equipment Authorization is issued. Please do not respond to this correspondence using the email reply button. In order for your response to be processed expeditiously, you must submit your documents through the AmericanTCB.com website. Also, please note that partial responses increase processing time and should not be submitted. Any questions about the content of this correspondence should be directed to the sender.