Elliott

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Timothy Johnson
American TCB

May 21, 2003

RE: Alien Technology, FCC ID: P65B2450R01-A

Dear Mr. Johnson

Our responses to your questions are inserted beneath each of the issues you raised:

1) Please provide a clearer or higher resolution photographs of the RF boards.

> These have been taken. The improved quality pictures have been uploaded to the ATCB website as *Internal Photographs (Revised).pdf*

2) A sample list of hopping frequencies was provided. Please explain if this is the only hopping list used or if the device may use one of several different sequences. If multiple sequences may be used, please provide information regarding how the tables are generated.

> This is the only hopping list used.

3) Please provide information regarding compliance with 15.247(g) & (h).

> It should be noted that, under normal operating conditions, the device is intended to be used on a continuous mode to monitor for tags passing within the vicinity of the reader. This ensures that all hopping channels are used equally.

> The system does not incorporate any intelligence to recognize other users within the spectrum band. It does not employ any means of coordinating frequency hopping to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

4) Please provide a justification for Class A environment.

> The system is intended for use in commercial and industrial locations, primarily in warehouses, for tracking high quantities of goods in and out of storage. It may also be installed in the receiving area of larger retail outlets.

> The system is not intended to be used in residential environments.

5) Although conducted measurements were provided, it is recommended that the conducted emissions meet the future limits (CISPR) that will be required in the next few years.

> The conducted emissions test has been repeated against the new limits of Part 15.207. The data has been uploaded to the ATCB website as *R50982(revised).pdf.* .

6) The users manual is missing the following information "This device must not be co-located or operating in conjunction with any other antenna or transmitter." Please provide an updated users manual.

> The statement has been inserted into the manual (refer to page 22 of the pdf document). The user's manual has been uploaded as *User's Manual (revised).pdf.*

7) One of the plots for the middle channel antenna conducted results appears to be missing. Please provide

> The plot has been inserted. The data has been uploaded to the ATCB website as *R50982(revised).pdf.*

8) There appears to be an error in note 2 on page 21 & 25 of 25 regarding the dBc levels. Please correct.

> The data has been corrected. The data has been uploaded to the ATCB website as *R50982(revised).pdf.*

9) The operational description discusses passive and semi-passive tags. It is mentioned that the semi-passive tags have longer distances. Generally passive tags do not require certification due to the fact that they are passive in nature and just considered part of the transmit path. However it seems like the semi-passive tags require their own certification. However it does not appear that any tags have been certified uner Alien Technology. Please explain.

> To clarify the terminology of "semi-passive tag": The only active (powered) aspect of this type of the tag, is that the tag's state machine, is powered by a 3.3volt external battery. The backscatter properties, of the tag, are identical to those of a "passive" tag. The only difference between this type of tag and a passive tag is that the "semi passive" tags digital circuitry is powered by an external battery and the passive tags are powered by the rectified RF energy from the receiver.

The tags state machine is used to decode incoming data to identify whether it is of the correct type. If the incoming data is correctly identified the state machine enables the backscatter of a coded response the reader will recognize.

There are no independent LO's or other radiating sources on the tag that would qualify this device to be an intentional radiator. No gain is applied to the incident signal, the returned signal is purely a passive backscatter of the incident energy.

10) The operational description mentions that backscattered information appears in the form of AM modulated sidebands centered at a 2 MHz offset. Please explain compliance of the receiver bandwidth matching the transmitter bandwidth as specified in 15.247(a)(1) given the 2 MHz offset.

Following the mixer IF output is a band pass filter, centered at 2 MHz with a 20 dB bandwidth that matches that of the transmitter's nominal 20 dB bandwidth of 470kHz. The channel spacing is 833kHz.

11) Please explain what is meant by the receiver being 2 channels as given in the users manual.

The two channels are parallel channels used to create spatial diversity for the received signal as detailed below.

Alien Technology uses two mixers, in the down conversion, of back scattered RF to base band. The RF input for both mixers originates at the same location in the system, which in this case is the RF output of an amplifier which is driven by the receive antenna. The LO inputs for each mixer originate from the same frequency hopping LO except that one LO signal path is physically phase shifted by 90 degrees.

The base band output of the mixers form two IF chains with one being phase shifted by 90 degrees relative to the other. This allows for a backscattered signal, which could in a null on one channel due to phase cancellation (because of the distance between the reader and tag being conducive for this effect), to have a signal at a relative maximum on the other channel. This I/Q relationship compensates for backscatter phase cancellations due to the physical location of the tag to the reader i.e., when one channel is in a spatial null, the other channel is in a spatial maximum. The DSP circuitry selects the most robust signal to perform further signal processing on.

12) FYI, Passive tags generally do not require their own certification, due to the fact that they are passive in nature. However, the semi-passive tags may or may not require their certification depending on their design.

      Based on the above description of the semi-passive tags' design Alien consider that they will not require certification.

To support our responses as detailed above the following files have been uploaded to the ATCB website:

Internal Photographs:	*Internal Photographs (Revised).pdf*
Revised test data:	*R50982(revised).pdf*
User's Manual:	*User Manual (revised).pdf*

If you have further questions or need clarification on any of the above, please contact me via doc@elliottlabs.com.

Regards,

Mark Briggs
Director of Engineering