November 28, 2001

RE: Reply to correspondence reference number 21356
731 Confirmation Number: EA102697
FCC ID: HSW-2411M
Applicant: Cirronet
Agent: ACS Inc.

Mr. Dayhoff:

We provide the following reply to your inquiry:

Item #1 - Please show the calculated MPE safe distance for each antenna provided with the system, in order to prove compliance with RF Exposure requirements. This information must be provided in the User Manual as well to give warning of RF Exposure levels near the antenna. Please provide the text of your proposed manual warning.

A draft user's manual was submitted with the filing on 10/25/01. On page 3 of the manual, instructions to the user are given for each antenna. The instructions indicate the antennas are to be professionally installed only, and in such a way that nearby persons do not come within 2 meters of the fixed mounted antenna, and 20cm from the mobile antennas. The calculated safe distance of the highest gain mobile antenna is 5.63cm, therefore the specified distance of at least 20cm, will more than ensure compliance with RF exposure requirements. I have included the text below:

Notice to WIT2411 users/installers using the following fixed antenna:

Mobile Mark 9dBi Corner Reflector

The field strength radiated by this antenna, when connected to a transmitting WIT2411 module, may exceed FCC mandated RF exposure limits. FCC rules require professional installation of this antenna in such a way that the general public will not be closer than 2 m from the radiating aperture this antenna. End users of these systems must also be informed that RF exposure limits may be exceeded if personnel come closer than 2 m to the aperture of this antenna.

Notice to WIT2411 users/installers using the following mobile antennas:

Mobile Mark 9dBi omnidirectional,
Cirronet 6dBi patch,
Ace 2dBi dipole,

The field strength radiated by any one of these antennas, when connected to a transmitting WIT2411 module, may exceed FCC mandated RF exposure limits. FCC rules require professional installation of these antennas in such a way that the general public will not be closer than 20 cm from the radiating aperture of any of these antennas. End users of these systems must also be informed that RF exposure limits may be exceeded if personnel come closer than 20 cm to the apertures of any of these antennas.

Item #2 - Please explain how the module meets the eight requirements of FCC Public Notice DA 00-1407.

1. The device has it's own RF shielding and does not rely on host devices to comply with part 15 limits. The device complies with the limits in a standalone configuration as represented in the test report. External photos, with and without the RF Shielding were submitted on 10/9/01.
2. All modulation is internal to the device, so there is no method to achieve excessive data rates or over-modulation.
3. Digital and RF power is taken from the AC/DC converter(9V), and regulated to 3.3V through a linear regulator (Micrel 5209). The Loop components are subregulated from this 3.3 by a Toshiba TK11233.
4. Section 7.1 of the test report submitted to the commission on 10/9/01 states how compliance with 15.203 is ensured. I have included the text of that section below as well:

> ***"7.1 Antenna Requirement - FCC Section 15.203***
> *To ensure compliance with 15.203, we propose attaching a reverse-sex SMA connector to the 2dBi Stub, and a reverse N to the 9dBi omni and the 9dBi corner reflector. The 6dBi patch employs the specialty MMCX connector and so is exempt.*
>
> *We have arranged for the manufacturer of the stub antenna to provide reverse-sex SMA connector for this antenna. OEM customers wanting to use this antenna in their product will first need to obtain a special part number from Cirronet to give to the antenna manufacturer. The manufacturer, upon receipt of this number, will know to attach the reverse-sex SMA connector to the end of the antenna before shipping.*
>
> *The customer then purchases an adapter cable from Cirronet that will connect the*
> *MMCX port on our module to the reverse-sex connector on the antenna. No other type of commercially available antenna will attach to this reverse-sex SMA.*
>
> *This same process will also be used with the 9dBi omni antenna and the corner reflector but using reverse N connectors rather than reverse SMA. Given the nonstandard nature of the interconnect between module and antenna and the difficulty involved in circumventing that connection, we believe that this procedure meets the requirements called out in 15.203.*
>
> *The special Cirronet part numbers for the three antennas equipped with reverse sex connectors are listed below.*
>
> | | |
> |---|---|
> | *Mobile Mark 9dBi Corner Reflector* | *SCR9-2400-RN* |
> | *ACE 2dBi Stubby* | *ACE-2400NF* |
> | *Mobile Mark 9dBi Omni* | *OD9-2400-RN"* |

5. The device was tested in a standalone configuration and complies with the part 15 emission limits regardless of the device into which it is eventually installed. The

device is typically powered by the host device therefore conducted emissions do not apply. All data cables to the device during testing were at least 10cm to prevent coupling from the case of the module to supporting equipment. All accessories and supporting equipment were unmodified or commercially available. Set up photograph during the test is given below:

6. A sample label was submitted on 10/17/01 and a clarification sent on 10/25/01. In addition, the users manual submitted on 10/25/01 contains information to the installer about the labeling requirements. That text contained in the manual is shown below for reference:

   "If the WIT2411 is installed within another device the outside of the device into which the WIT2411 is installed must also display a label referring to the enclosed module. The label required for the WIT2411 module is as follows: ***Contains Transmitter Module FCCID: HSW-2411M."***

7. The WIT2411M complies with all rules that apply to it as shown in the assured in the test report.

8. As explained in the reply to item #1 above, the WIT2411M complies with all applicable RF exposure requirements.

Item # 3 - Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, in order to show the device meets the definition of a FHSS TX, found in Section 2.1 of FCC Rules.

The theory of operation submitted with the filing contains the hopping sequence channels for TX and RX of the device.

Hopping sequences are calculated by the following algorithm.

Channel[n] = (2*N + H[n]) mod 43 (decimal)

Where:

n = 0..43 (decimal)

N = network identifier (selected by end user)

H = ROM lookup table:

0, 22, 9, 35, 16, 38, 3, 27, 11, 34, 6, 25

14, 39, 1, 26, 12, 33, 18, 42, 13, 32, 2, 36

20, 40, 10, 28, 5, 24, 37, 19, 31, 4, 17, 41

23, 7, 29, 15, 30, 8, 21

This selection algorithm provides a family of hopping patterns that are rotational shifts of one another dependent on a "network identifier" parameter N, which can be selected by the user. The lookup table was chosen by a computer search of randomly generated candidates to meet criteria of:

1) maximizing short-term frequency diversity to avoid fading and interference

2) minimizing cross-interference between unsynchronized colocated systems

3) high orthogonality between generated hop patterns

It is also very simple to calculate within an 8-bit microprocessor.

Item #4: Describe how the associated receiver complies with the requirement that its input bandwidth matches the transmitted signal bandwidth.

I hope this answers your questions however, should you need additional information oe clarification of this information please contact me directly.

With Kind Regards,

Sam Wismer
Engineering Manager
ACS, Inc.