



To: Mr. Tim Johnson, American TCB
From: David Waitt, Airespace
Subject: Inquiries regarding Certification application for FCC ID QTZVAP1200
Date: 23 Feb 2003

Tim,
Below are the replies to your inquiries regarding this application. The answers are numbered corresponding to your inquiries in your letter dated 10 Feb 2003. If something is unclear, or if you have additional concerns, please contact me.

Best Regards,

A handwritten signature in black ink, appearing to read "David Waitt".

David Waitt
Consultant representing Airespace

ATCB #1:

The external photos appear to show 2 RF connectors (possibly TNC). However these connectors do not appear to be shown in the internal photographs or test photos (these appear to contain 2 different RF connectors-possibly SMA). None of these ports appear to have been used. Are these photographs of the same device. Please explain.

Airespace:

There are two reverse TNC connectors on the production versions Airespace VAP1200 radio. The housing of the unit that was tested for FCC compliance was a prototype unit. The design of the housing was not complete at the time of compliance testing, nor was connector selection complete. The prototype housing incorporated SMA connectors, while the production version will incorporate R-TNC connectors. This is the reason for the photos of two different units. The prototype housing was tested while the production version was photographed.

However, the external connectors will not be used in this particular radio at this time. The firmware within the radio will prevent the selection of an external antenna.

It is anticipated in the future that use of external antennas will be authorized with a permissive change to this grant. External antennas were not tested for this application because external antenna selection has not been finalized. To reduce the cost of modifying the tooling of the product once the external antenna selection is finalized, and the permissive change granted, the external connectors were incorporated into the unit early in the product development cycle.

ATCB #2:

Please provide photographs and descriptions of each antenna used in/within the device.

Airespace:

Detailed pictures of the 2.4 and 5 GHz antennas are included in the document VAP1200_int_photos.pdf that has been uploaded.

ATCB #3:

The internal photographs must show the top and bottom of each board. However the internal photographs only appear to show the top of one main board. Additionally, close up photographs of the RF TX boards should be provided (including the top and bottom and also with the subshields installed and removed). Please provide additional photos as necessary.

Airespace:

Additional detailed photos of the main PCB in the radio as well as the RF module are included in the document VAP1200_int_photos.pdf that has been uploaded.

ATCB #4:

Please label one of the photographs to show which antennas are for use with what part of the TX (i.e. 15.247 vs. UNII).

Airespace:

Additional detailed photos of the antennas within the radio are included in the document VAP1200_int_photos.pdf that has been uploaded. The 2.4 GHz and the 5GHz antennas have been identified in the photos

ATCB #5:

Please provide a exhibit for the operational description of the device.

Airespace:

A brief operational description of the device is contained on page 4 of the test report

ATCB #6:

The schematics/block diagram shows a variety of internal/external antenna possibilities. Please provide a list of the specific antenna configurations tested and included for compliance of this device. From the test photographs, it appears only the internal antennas were tested.

Airespace:

Antennas that will be used with this product are the internal antennas that were tested for compliance. Use of external antennas currently will be disabled. External antennas may be authorized in the future with a permissive change.

ATCB #7:

The FCC statements in the users manual state the device is a class A device. Please provide a justification for Class A environment.

Airespace:

The Airespace VAP1200 (and its associated Ethernet switch) is intended only for industrial / corporate environments. Marketing of the products will not be targeted at individuals for residential use. The VAP1200 will not be available for purchase at consumer oriented retail outlets.

15.247 Specific Information

ATCB #8:

The users manual mentions various models of the EUT with different combinations of A/B cards. Please call to discuss. Note: The part list explains that the device has an RF card access panel.

Airespace:

This product (FCC ID QTZVAP1200) is an 802.11-A/B radio. The same housing and PCB will be used in future Airespace products that will be certified as either an 802.11-A OR an 802.11-B radio (not a combo radio). Thus, a future single band radio will still have two RF module slots, only one of which will be used. The reason for this is to allow the use of one housing and one PCB to be factory configured for three different products (802.11 A/B, 802.11 A, 802.11 B)

Additionally:

- The 802.11 A/B VAP radio uses the same 802.11 A/B RF module in each of the two module slots. The transmit band is selected automatically (A or B) depending on what slot the module is inserted into.
- Once the dual band card is inserted into a slot, it functions essentially as a single band module. Additionally, only the specific module tested for this application will function in the VAP1200. If a different model of RF module is inserted into the VAP1200, the firmware within the VAP1200 will not recognize the RF module, therefore it will not function.

There are 2.4 GHz and 5 GHz antennas on each side of the main board within the VAP1200. As outlined in the report, the power from the 5 GHz module is divided and connected to the 5 GHz antenna on each side of the main board. This is to obtain a somewhat omni-directional pattern at 5GHz. There is also a 2.4 GHz antenna on each side of the main board. An RF switch continuously switches between each of the two antennas. When a signal is received, and transmitted, the antenna that provides the best "connection" is the antenna that is used for that connection. Therefore, even though there are two 2.4 GHz antennas within the VAP1200, only one is used at a time

15.247 Specific Inquiries

ATCB #9:

The RF exposure mentions +17 dBm setting, however the maximum power listed is 15.29. Was the device not functioning correctly or was there additional loss measured through a switch? Please explain. Note that the device is expected to be tested under the highest TX power and match the manufactures expected power.

Airespace: As shown in the 15.247 report, the transmit power was measured at the output of the switch. This was done in order to measure the power that is present at the input of the antenna. Taking into account the losses of the switch and other small losses in the system yields a power reading that is somewhat below the actual power setting.

ATCB #10:

Page 4 of the test report states the antennas are "integral" to the 802.11 A/B boards. Is this correct or are they integral to the host device?

Airespace:

In this case, on page four, the references the fact that the VAP has integral antennas for each band. The antennas are integral to the VAP. The antennas are NOT part of the RF modules contained in the VAP.

ATCB #11:

Please explain precautions that are in place so that the end user is not capable of setting the low or high channels to +17 dBm. For instance the drivers should not allow the +17 dBm setting on these channels.

Airespace:

The firmware within the VAP will ONLY allow FCC compliant configurations. The firmware will prevent the output power from being set to an inappropriate level on a specific channel. See additional attestation.

ATCB #12:

The test data from Elliott labs seems to show data entitled (Atheros Reference Card) that are higher than the final measurements shown. Please explain.

Airespace:

The reference to the "Atheros Reference Card" in the data within the appendix is troubleshooting data. During the compliance testing, for comparison purposes, a "Reference card" was borrowed from Atheros Corp to compare the test results of that reference card to the test results of the production module that was being tested in the Airespace VAP radio.

ATCB #13:

Note: For antenna conducted spurious measurements, the FCC specifies 100 kHz. Please use this setting for future submittals.

Airespace:

Whoops! Noted.

UNII Specific Inquiries

General Information

ATCB #1:

It does not appear that AC power line conducted emissions were supplied to show compliance with 15.207. Please provide this information. Please note that while the final device may be subjected to 15A Verification requirements, the limits of 15.207 for the TX portion of the device are equivalent to Class B. Any emissions that exceed the limits of 15.207, but meet 15.107 class A limits must be shown to not originate from the TX portion of the device.

Airespace:

The unit did meet the AC Line conducted emission requirements of Part 15.207. The results have been appended to the UNIII report accompanying this application.

ATCB #2:

Please verify that the device has been properly tested to for Part 15, Class A limits as previously mentioned.

Airespace:

The device has been tested and is in compliance with the Class A limits of Part 15. The product was tested at EMC Compliance Management, 670 national Ave, Mt. View California. A technical file containing the test results, test report, photos and technical drawings is on file at Airespace.

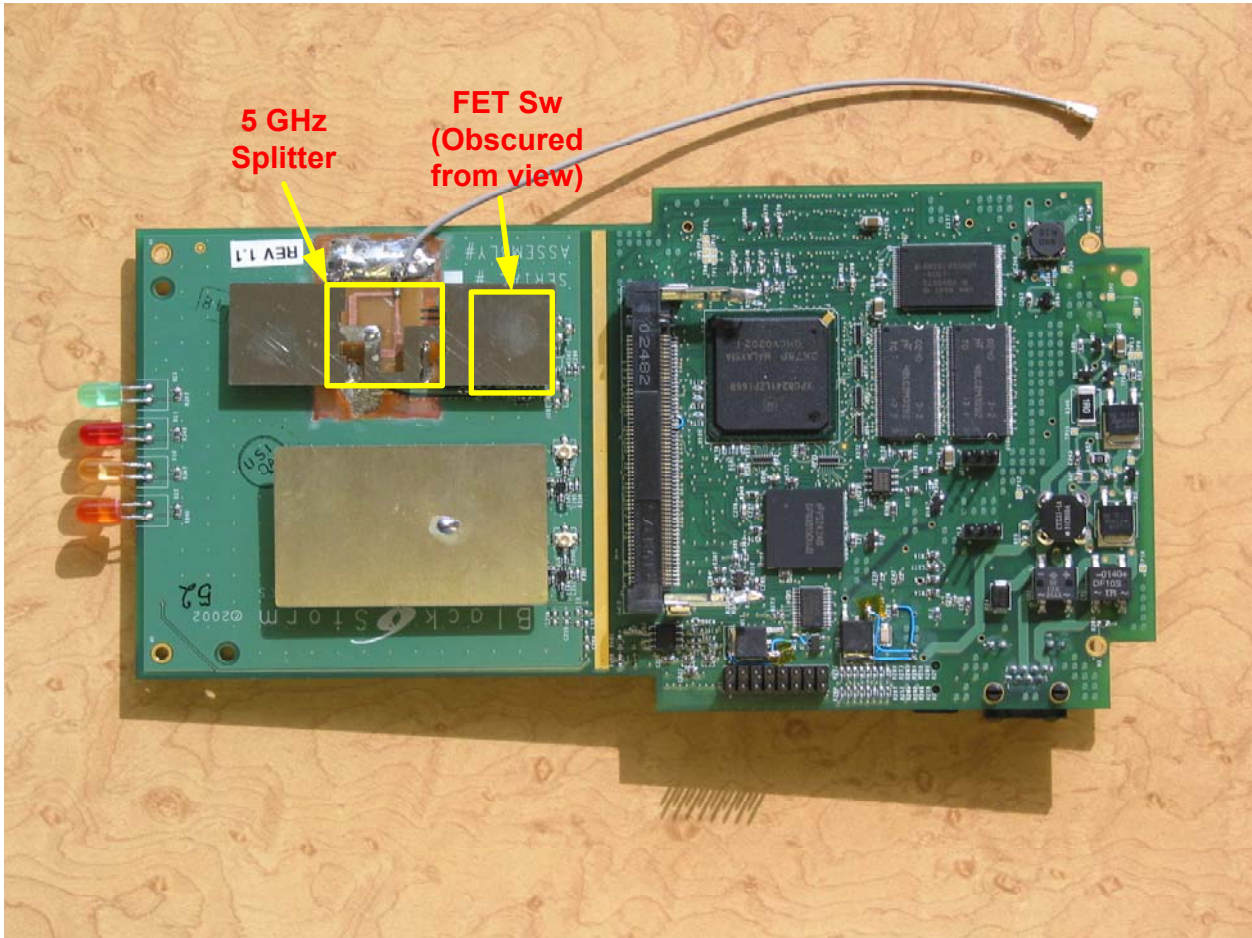
UNII Specific Information

ATCB #3:

The UNII Block Diagram in the UNII test report shows a splitter that goes to 2 different internal antennas as well as FET switch. The photographs do not appear to show a splitter or switch. Are these in the device. Please explain or provide labeled photographs to show these components.

Airespace:

The photo below shows the 802.11 A side of the product. The splitter is partially obscured the 5GHz antennas, but is highlighted. The FET switch is a small surface mount semiconductor that is completely is beneath the 5GHz antenna and is obscured from view.



ATCB #4:

The "Report Organization and Results Summary" paragraph incorrectly references 15.247.

Airespace:

The report has been corrected and the reference to 15.247 has been removed.

ATCB #5:

The list of measurement antennas given in the equipment list appears incomplete. Please review.

Airespace:

The equipment list has been updated to include the missing measurement system, the HP 8564E Spectrum analyzer and its associated antennas.

ATCB #6:

Please provide an attestation from the manufacturer regarding the reduction of power (both 802.11 A/B) being programmed and set in the final product such that the end user can not adjust the power above the set points determined.

Airespace:

The firmware within the VAP1200 is being developed by Airespace. It is this firmware that configures and controls the 802.11 card (which is a purchased component). Since Airespace is developing the firmware that will allow the user to configure the VAP1200 for operation, the company has the ability to limit the maximum power for each of the 802.11 channels. The power levels measured during the compliance testing will be the maximum allowed power levels in the user configuration. A letter attesting to this has been uploaded with this reply.

ATCB #7:

Please explain if this device contains a "Turbo" mode of operation. If so, was this feature tested?

Airespace:

The device does not have a "Turbo mode".

ATCB #8:

The power measurements were made using a power meter. The FCC has published acceptable procedures using a spectrum analyzer, but do not mention using a power meter. I believe that there has been some concern regarding the accuracy of power meters for measurement of wideband signal that are greater than 10 MHz. I have provided a copy of the FCC recently published notice for your review.

Airespace:

It was my understanding that the procedures outlined in the public notice were recommended procedures, not mandatory. The power was measured with the power meter because the wider bandwidth of the power head would give a more accurate measurement than the narrower bandwidth (3 or 5 MHz MAX RBW) of the spectrum analyzer.

ATCB #9:

The setpoints appear to agree with the measured power when lowered to 10 dBm, but have a variation of 3 dB on the higher set points. Please explain.

Airespace:

Several additional 802.11 cards have been measured and have shown to be consistent with the card used during the compliance testing. It appears that the "power level" in the test software application used to control the module for the testing is adjusted for AVG power as we are seeing the AVG Pout correlate very well to the software setting, while the PEAK power is reading approx several dB higher.

ATCB #10:

In the 5.15-5.25 GHz band, the channel 36 power was measured at 16.9 dBm with a setpoint of +13 dBm and a limit of +17 dBm. However channel 48 has a setpoint of +14 dBm with a limit of +17 dBm, but appears not to be measured. Please provide power measurements for this channel (reference 15.407(b)(7)).

Airespace:

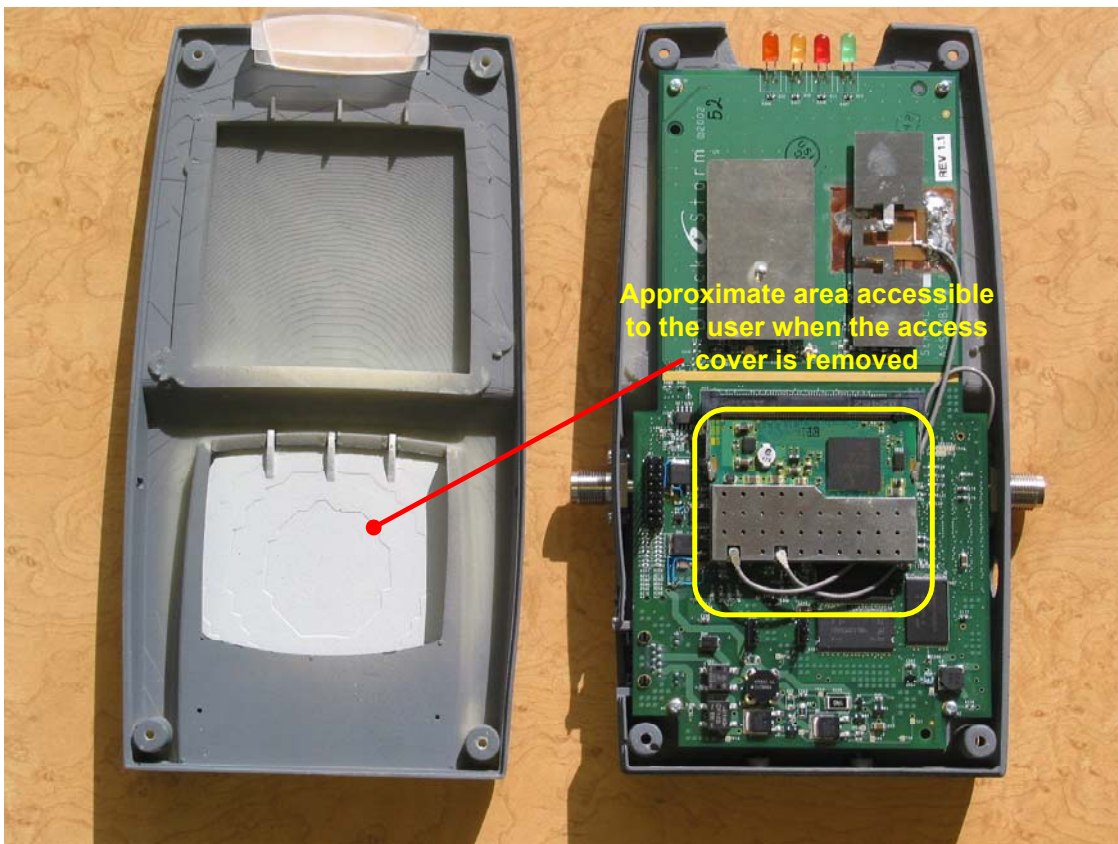
The power measurement for the channel that was omitted has been put into the report. The maximum transmit power for channel 48 (5240MHz) was 15.3dBm. Additionally the power has been re-measured on channel 36 and found to be 15.4 dBm. This is also reflected in the revised report.

ATCB #11:

Please provide information regarding 15.407(c), (d), (e), & (g). Note that the "access door" and any information to the user on how to install the unit will be a concern for operation in the 5.15-5.25 due to the integral antenna requirement. Note that an antenna that attaches with a connector inside of the case is acceptable, provided that there is no need for the user to ever open the case.

Airespace:

The photo below illustrates the area that would be accessible to the user of the access panel were removed. The user could install the card and connect the coaxial cables to the module. There is no need for the user to open the housing of the VAP1200 in order to perform an upgrade to the product. Note that at this time, an upgrade to the product is not possible. The current VAP1200 includes both 802.11 A & B cards, thus there is no upgrade path possible. Upgrades will only be possible when single band units are made available. These single band VAP radios will be certified separately and the compliance mechanisms for allowing an upgrade will be addressed at that time. (See attestation letter and additional letter addressing 15.407 (c) (d) (e) (g))



ATCB #12:

Is the second paragraph in the procedure regarding the 5 GHz Out of Band Spurious Emissions correct. This appears to be referencing the 15.247 conducted test using a 100 kHz RBW. The plots for this test do show the expected 1 MHz RBW setting. Additionally, please add the limits to the tabular results.

Airespace:

The reference to the 15.247 limits has been removed. In addition the limits have been added to the tables in the report

ATCB #13:

The peak excursion procedure shows "?" for some of the VBW settings and also appears to be provided 2 different times (Trace 1/2, Trace A/B). Additionally the information regarding the integration is only necessary for the power measurement and therefore does not apply to this procedure. Please correct.

Airespace:

The report has been corrected to reflect a VBW setting of 3MHz for trace 1 and a VBW of 300kHz for trace 2.

ATCB #14:

The Note under the table of the 5 GHz Radiated Emissions in Restricted Bands states 15.205 and 15.209 limitations. Please note that the 15.205 references the limits of 15.209. However, this section does not appear to mention 15.407(b) (1-3). Additionally, please explain how the limit of 15.407 are taken into account in the data tables of this section. Note that the RBW appears to be met for the 5.15 and 5.35 bandedges, but it is not certain how the -17/-27 dBm/MHz requirements are shown.

Airespace:

The limits were mistakenly omitted from the tabular data. The tables have been corrected and now contain the limits. Additionally, the data for the -17dBm bandedge requirement for the upper UNII band (5725-5825) was mistakenly omitted. The bandedge data has been incorporated into the revised report.

ATCB #15:

The notes on table for Run 1b state power levels different than appear in the power level setting table earlier in the report. Please explain or correct.

Airespace:

This is an error. This tabular data was "copied and pasted" in from the original lab data. Initially, emissions in the "outlying" restricted bands were tested and were found to be in compliance. Following this test, the "bandedge" restricted bands were tested and it was necessary to lower the transmit power to 13dBm in order to comply with the bandedge requirements.

Once it was determined that the power had to be reduced to meet the band edge requirement, the "outlying" restricted band measurements were repeated. Apparently the transmit power at the top of the table was not modified to reflect this lower power setting.

ATCB #16:

FYI. Please note that for the Spectral Density Tests, the VBW is specified as $> \text{RBW}$, not $\geq \text{RBW}$.

Airespace:

Whoops (Again) Thank you.