Chris Harvey

From: vicky.liu [vicky.liu@tw.ccsemc.com]

Sent: Monday, June 25, 2007 5:04 AM

To: charvey-tcb@ccsemc.com; charveyemc@verizon.net

Cc: application@tw.ccsemc.com

Subject: RE: RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Dear Chirs,

Thank for your reply and my answer is as belowing.

Q: Does this device use Spatial Multiplexing MIMO.

Ans: Yes

Q: and does it drive each antenna incoherently?

Ans: Yes

Vicky Liu 劉淑芳

Certification Dept.

Compliance Certification Services Inc.
Rm.258, Bldg.17, No.195, Sec.4, Chung
Hsing Rd.,Chutung,Hsinchu,Taiwan,R.O.C.
Tel: 886-3-5910068   EXT: 504
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----- 轉呈者 vicky.liu/ccsemc 於 2007/06/25 04:53 PM -----

"Chris Harvey"
<charveyemc@verizon.net>

2007/06/23 11:24 AM

收件人：   "'vicky.liu'" <vicky.liu@tw.ccsemc.com>, <charvey-tcb@ccsemc.com>

副本抄送：   <application@tw.ccsemc.com>

主旨：   RE: RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Vicky, I am trying to find additional resources to give you additional guidance:

I hope the article at this web address can help give some of the theory behind coherent and non-coherent RF channels:

7/10/2007

Traditionally, multiple antennas (at one side of the wireless link) have been used to perform interference cancellation and to realize diversity and array gain through coherent combining.

Noncoherent MIMO-OFDM Systems — With perfect CSI (Channel State Information) at the receiver and no CSI at the transmitter, and fixed transmit power, capacity increases with bandwidth until it saturates and is given by the receive SNR. In the noncoherent case, where neither the transmitter nor the receiver have CSI, the capacity behavior as a function of bandwidth is markedly different: for full-band OFDM systems (i.e., the transmit signal occupies all time-frequency slots), beyond a certain critical bandwidth, "overspreading" occurs, and the capacity goes to zero. The "overspreading" phenomenon was first described in [10] in the context of SISO systems and can be explained as follows. Increasing the bandwidth results in a proportional increase in the number of independent frequency-diversity branches (provided the channel satisfies the uncorrelated scattering assumption). Since the receiver is not assumed to have CSI, these diversity branches contribute to "channel uncertainty" which leads to a capacity penalty. For large bandwidths (and hence small SNR per degree of freedom) this penalty eventually drives the capacity to zero. In the MIMO case, increasing the number of transmit and receive antennas, on the one hand, increases the total number of degrees of freedom for communication and, on the other hand, results in an increase in channel uncertainty. Since the total available transmit power is split uniformly across transmit antennas, increasing the number of transmit antennas results in a smaller SNR per degree of freedom which leads to the existence of a finite optimum (in the sense of capacity maximizing) number of transmit antennas. Increasing the number of receive antennas, on the other hand, yields an increase in the receive SNR and is hence always beneficial. In summary, for MIMO-OFDM systems operating at bandwidths of several GHz, such as MIMO-based ultra-wideband systems, it is generally not advisable to use a large number of transmit antennas. Figure 2 provides a numerical result illustrating this phenomenon.

7/10/2007

http://www.nari.ee.ethz.ch/commth/pubs/files/jsac04.pdf

QUESTION: We are in the process developing the following systems: Phase array system, Sectorized antenna system, and Spatial Multiplexing Multiple-In Multiple-Out (MIMO) antenna system. From the FCC's perspective, what are the calculations for the antenna gain of each system?

ANSWER: Basic MIMO types of devices can be simply calculated using the sum of all powers into a single antenna element. This is somewhat of an overestimation in the calculation, but usually should meet mobile applications easily. For portable applications, the antennas are generally much closer together and therefore the overestimation is even smaller. However, the FCC, in its TCB training of May 2005, will accept the following calculations for the aforementioned systems:

• **Spatial Multiplexing Multiple-In Multiple-Out (MIMO) antenna system:** spatial MIMO mode antenna systems in which the power is driven incoherently at each frequency, the directional gain equals the gain of each element. All other modes that drive multiple antennas including legacy modes for communicating with no MIMO devices, the directional gain equals the gain of antenna element plus 10 log the number of antenna elements.

From: vicky.liu [mailto:vicky.liu@tw.ccsemc.com]
Sent: Friday, June 22, 2007 10:07 PM
To: charvey-tcb@ccsemc.com; charveyemc@verizon.net
Cc: application@tw.ccsemc.com
Subject: RE: RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Dear Chirs,

We need your help, because our client wants to get FCC certification as soon as possible. Our client can not understand the question what do you mean, so they can not reply for you. Our client tries to guess what you want to ask and the answer is belowing.

Q: Does this device use Spatial Multiplexing
Ans: Yes, it supports 2 spatial streams .

Q: and does it drive each antenna incoherently?

Ans: 1. Does TCB want to know whether there is a phase difference between every antenna ?
     The phase difference on pcb between every antenna is not a critial parameter in 11n product .
      I can't find any similar description in 11n standard . If TCB really wants to know it ,
     please explain why he needs this .

   2. Does TCB want to know whether the antennas transmit signal at the same time ?

     Cyclic shift is disable in 11b/g , only Tx 0 is used in 11b/g .
     Cyclic shift is enable in 11n .

7/10/2007

Vicky Liu 劉淑芳

Certification Dept. 🧡 💚

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----- 轉呈者 vicky.liu/ccsemc 於 2007/06/23 09:51 AM -----

vicky.liu
劉淑芳

收件人：	charvey-tcb@ccsemc.com
副本抄送：	
主旨：	RE: RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

2007/06/23 09:29 AM

Dear Chris,

Thank you for your reply. But our client does not understand what do you mean that "Does this device use Spatial Multiplexing

and does it drive each antenna incoherently?" Could you explain for this sentence and what do you mean about antenna incoherently??

7/10/2007

Vicky Liu 劉淑芳

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----- 轉呈者 vicky.liu/ccsemc 於 2007/06/22 04:20 PM -----

vicky.liu
劉淑芳

收件人： ting.lin/ccsemc@ccsemc, shirley.chen/ccsemc@ccsemc
副本抄送： chingf.wu/ccsemc@ccsemc
主旨： RE: RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

2007/06/22 08:56 AM

Dear Ting,

請幫我回答紅字的部分:

Vicky, thank you for your response. While you continue to provide information, you still have not answered the specific question I have asked.

Please completely answer the question with a 'yes' or a 'no'. Does this device use Spatial Multiplexing and does it drive each antenna incoherently?

If you are unsure, please ask the applicant for the answer.

7/10/2007

Vicky Liu 劉淑芳

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E-mail: vicky.liu@tw.ccsemc.com
URL: http://www.ccsemc.com.tw

----- 轉呈者 vicky.liu/ccsemc 於 2007/06/22 08:50 AM -----

"Chris Harvey"
<charveyemc@verizon.net>

2007/06/21 09:12 PM

收件人： "'vicky.liu'" <vicky.liu@tw.ccsemc.com>

副本抄送： <application@tw.ccsemc.com>

主旨： RE: RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Vicky, thank you for your response. While you continue to provide information, you still have not answered the specific question I have asked.

Please completely answer the question with a 'yes' or a 'no'. Does this device use Spatial Multiplexing and does it drive each antenna incoherently?

If you are unsure, please ask the applicant for the answer.

Best regards,

Chris Harvey

From: vicky.liu [mailto:vicky.liu@tw.ccsemc.com]
Sent: Thursday, June 21, 2007 3:32 AM
To: Chris Harvey
Cc: application@tw.ccsemc.com
Subject: Re:RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

7/10/2007

Dear Chris,

Thank you for your reply and my answer is as belowing.

Q: Please include confirmation that this device operates only as a:
(1)2x3 (Answered)

(2)Spatial Multiplexed MIMO
 ans:Ralink chipset support 2 spatial streams

(3)that drives each antenna incoherently (Not Answered)
 and whether the unit uses Cyclic Diversity. (Answered)
 ans: Please find the attachment which is the description of Operation.

Please completely answer the question. Does this device use Spatial Multiplexing and does it drive each antenna incoherently?

Vicky Liu   劉淑芳

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URL: http://www.ccsemc.com.tw

"Chris Harvey" <charveyemc@verizon.net>		
	收件人：	"'vicky.liu'" <vicky.liu@tw.ccsemc.com>
	副本抄送：	<application@tw.ccsemc.com>
2007/06/20 09:02 PM	主旨：	RE: RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Vicky, you still have not answered each part of the question that was asked.

7/10/2007

Q: Please include confirmation that this device operates only as a:
2x3 (Answered)
Spatial Multiplexed MIMO (Not Answered)
that drives each antenna incoherently (Not Answered)
and whether the unit uses Cyclic Diversity. (Answered)

Please completely answer the question. Does this device use Spatial Multiplexing and does it drive each antenna incoherently?

Best regards,

Chris Harvey

From: vicky.liu [mailto:vicky.liu@tw.ccsemc.com]
Sent: Wednesday, June 20, 2007 5:51 AM
To: Chris Harvey
Cc: application@tw.ccsemc.com
Subject: Re:RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Dear Chris,

Thank you for your reply. And I have revised the product name and test date of the test report. Please find the attachment which is the FCC & IC test report.

Q:Please include confirmation that this device operates only as a 2x3 Spatial Multiplexed MIMO that derives each antenna incoherently and whether the unit uses Cyclic Diversity.

Ans: 1. You can find that the Ralink is a 2T3R device in page 1 of 2860 datasheet .

   2. Ralink chipset doesn't support Cyclic Diversity in 11b&g .

Vicky Liu　劉淑芳

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"Chris Harvey" <charveyemc@verizon.net>

2007/06/15 08:42 PM

收件人：　　"'vicky.liu'" <vicky.liu@tw.ccsemc.com>, <charvey-tcb@ccsemc.com>

副本抄送：　　<application@tw.ccsemc.com>

主旨：　　RE: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Vicky, thank you for the replacement Operational exhibit in English. This new exhibit still does not address the need for the following information:

```
Please include confirmation that this device operates only as a 2x3 Spatial
Multiplexed MIMO that derives each antenna incoherently and whether the unit uses
Cyclic Diversity.
```

Please provide this additional information in order to complete this review.

Best regards,

Chris Harvey

From: vicky.liu [mailto:vicky.liu@tw.ccsemc.com]
Sent: Thursday, June 14, 2007 11:14 PM
To: charvey-tcb@ccsemc.com

Cc: application@tw.ccsemc.com
Subject: Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Dear Charvey,

Thank you for your reply. Please find the attachment which is the Description of Operation.

Vicky Liu   劉淑芳

Certification Dept.

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----- 轉呈者 vicky.liu/ccsemc 於 2007/06/14 09:35 AM -----

<charvey-tcb@ccsemc.com>

2007/06/09 02:08 AM

收件人：   <application@tw.ccsemc.com>
副本抄送：   <charvey-tcb@ccsemc.com>
主旨：   Alpha Networks Inc., FCC ID: RRK-AR680W, Assessment NO.: AN07T6875, Notice#1

Dear Vicky Liu,

You are listed as the Technical Contact for the above referenced TCB application. THe following item needs to be addressed before teh review can be continued:

The Operational Description exhibit submitted with this application is written in Chinese. Please provide an operational Description exhibit in English that addresses the MIMO capabilities of this device. Please include confirmation that this device operates only as a 2x3 Spatial Multiplexed MIMO that derives each antenna incoherently and whether the unit uses Cyclic Diversity.

The items indicated above must be submitted before processing can continue on the above referenced application. Failure to provide the requested information within 30 days of the original e-mail date may result in application dismissal and forfeiture of the filing fee. Also, please note that partial responses increase

7/10/2007

processing time and should not be submitted. Any questions about the content of
this correspondence should be directed to the e-mail address listed below the name
of the sender.

Best regards,

Chris Harvey
charvey-tcb@ccsemc.com

_____

7/10/2007