

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	STC and SISO power levels	
Date Submitted	<b>2006-09-21</b>	
Source(s)	Erik Lindskog, Beceem Communications Djordje Tujkovic, Beceem Communications Ran Yaniv, Alvarion Amir Francos, Alvarion Yaron Alpert, Alverion Dave Pechner, ArrayComm Wonil Roh, Samsung	Voice: +1-408-757-1140 <a href="mailto:elindskog@beceem.com">elindskog@beceem.com</a> <a href="mailto:dtujkovic@beceem.com">dtujkovic@beceem.com</a> <a href="mailto:ran.yaniv@alvarion.com">ran.yaniv@alvarion.com</a> <a href="mailto:amir.francos@alvarion.com">amir.francos@alvarion.com</a> <a href="mailto:yaron.alpert@alvarion.com">yaron.alpert@alvarion.com</a> <a href="mailto:dpechner@arraycomm.com">dpechner@arraycomm.com</a> <a href="mailto:wonil.roh@samsung.com">wonil.roh@samsung.com</a>
Re:		
Abstract	Clarification to transmit power level in different zones	
Purpose	Clarifies the transmit power level for data and pilot sub-carriers in different zones	
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures < <a href="http://ieee802.org/16/ipr/patents/policy.html">http://ieee802.org/16/ipr/patents/policy.html</a> >, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair < <a href="mailto:chair@wirelessman.org">mailto:chair@wirelessman.org</a> > as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site < <a href="http://ieee802.org/16/ipr/patents/notices">http://ieee802.org/16/ipr/patents/notices</a> >.	

## STC and SISO power levels

**Erik Lindskog<sup>1</sup>, Djordje Tujkovic<sup>1</sup>, Ran Yaniv<sup>2</sup>, Amir Francos<sup>2</sup>, Yaron Alpert<sup>2</sup>,  
Dave Pechner<sup>3</sup>, Wonil Roh<sup>4</sup>**

<sup>1</sup>Beceem Communications, <sup>2</sup>Alvarion, <sup>3</sup>ArrayComm, <sup>4</sup>SAMSUNG Electronic

### 1. Problem Statement and suggested remedy

In IEEE Std 802.16e-2005 the nominal total transmitted power per symbol in a DL STC zone is required to be Num\_STC\_Antennas more than the nominal total transmitted power per symbol in a SISO zone. This is an unreasonable narrow constraint. We here propose to only limit the max total transmitted power in a DL STC or SISO zone for the case that dedicated pilots are not used. In addition we clarify that the pilots in a DL STC zone is boosted by 3 dB more than in a SISO zone to compensate for the reduced pilot density. Likewise we clarify the pilots in an UL STC zone is boosted by 3 dB compared to the data subcarriers also to compensate for the reduced pilot density in STC mode as compared to SISO mode.

### 2. Proposed Text Changes

[In Section '8.4.9.4.3 Pilot modulation']:

Modify the second paragraph according to:

~~In the downlink and for the optional uplink tile structure all permutations except uplink PUSC and, downlink TUSC1 and the DL and UL STC permutations/modes,~~ each pilot shall be transmitted with a boosting of 2.5 dB over the average non-boosted power of each data tone. These pilot subcarriers shall be modulated according to Equation (135).

Replace the paragraph on page 633 "In STC mode with DL PUSC ... , ignoring data boosting" with the following paragraphs:

In a DL STC zone the per pilot tone power is 5.5 dB above the per data tone power for each transmit antenna.

In a UL STC zone the per pilot tone power is 3 dB above the per data tone power for each transmit antenna.

[In Section '8.4.9.6 Zone boosting']:

Add the following paragraphs at the end of the Section 8.4.9.6 Zone boosting:

The total transmit power for any symbol in a given STC zone without dedicated pilots shall not be more than:

$[P_{tx\_Preamble} - 4.2 + 10 \cdot \log_{10}(\text{Num\_STC\_Antennas})]$  dBm,

where Num\_STC\_Antennas is the number of STC antennas defined in the STC\_DL\_IE() and Ptx\_Preamble is the total power transmitted in the preamble symbol, in dBm. Other than this requirement, the power level in the STC zones without dedicated pilots in a frame are unrelated to the power level in the non-STC zones in a frame.