

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
	<b>Proposed harmonized text for DL MIMO SDD text: Vendor-specific precoding in MU-MIMO</b>	
Date Submitted	<b>07/12/2008</b>	
Source(s)	Yang Tang, Young Hoon Kwon, Zhigang Rong, Jianmin Lu Huawei	E-mail: <a href="mailto:ytang@huawei.com">ytang@huawei.com</a>
	Ron Porat Nextwave	E-mail : <a href="mailto:RPorat@nextwave.com">RPorat@nextwave.com</a>
	Fred Vook, Fan Wang, Bishwarup Mondal, Mark Cudak Motorola	E-mail : <a href="mailto:Fred.Vook@motorola.com">Fred.Vook@motorola.com</a>
Re:	Call for comments on DL MIMO SDD text (IEEE C80216m-08_657r2)	
Abstract	Proposed harmonized text for vendor-specific precoding matrix in DL MU-MIMO	
Purpose	Discuss and adopt in DL MIMO RG	
Notice	<i>This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.</i>	
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	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: < <a href="http://standards.ieee.org/guides/bylaws/sect6-7.html#6">http://standards.ieee.org/guides/bylaws/sect6-7.html#6</a> > and < <a href="http://standards.ieee.org/guides/opman/sect6.html#6.3">http://standards.ieee.org/guides/opman/sect6.html#6.3</a> >. Further information is located at < <a href="http://standards.ieee.org/board/pat/pat-material.html">http://standards.ieee.org/board/pat/pat-material.html</a> > and < <a href="http://standards.ieee.org/board/pat">http://standards.ieee.org/board/pat</a> >.	

# Proposed harmonized text for DL MIMO SDD text: Vendor-specific precoding matrix for MU-MIMO

*Yang Tang, Young Hoon Kwon, Zhigang Rong, Jianmin Lu  
Huawei*

*Ron Porat  
Nextwave*

*Fred Vook, Fan Wang, Bishwarup Mondal, Mark Cudak  
Motorola*

## Proposed Text

### 11.x.1.1.1. Precoding technique

The basic precoding techniques for MU-MIMO are ~~codebook based precoding and~~ can be either standardized or vendor-specific ~~adaptive precoding / beamforming~~. Up to four MSs can be assigned to each resource allocation.

In MU-MIMO systems, the received signal of the  $f$ -th subcarrier in the  $i$ -th MS can be described as:

$$\mathbf{y}_{i,f} = \mathbf{H}_{i,f} \sum_{j=1}^K \mathbf{V}_{j,f} \mathbf{x}_{j,f} + \mathbf{n}_{i,f}$$

where  $K$  is the number of the allocated users,  $\mathbf{V}_{j,f}$  is the precoding matrix of the  $f$ -th subcarrier for the transmit signal to the  $j$ -th MS,  $\mathbf{x}_{j,f}$  is the transmit signal of the  $f$ -th subcarrier to the  $j$ -th MS and  $\mathbf{n}_{i,f}$  is the noise of the  $f$ -th subcarrier in the  $i$ -th MS.

The form and derivation of the assembled precoding matrix,  $\mathbf{V}_f = [\mathbf{v}_{1,f} \dots \mathbf{v}_{K,f}]$ , ~~can also be~~ is vendor-specific. If the assembled precoding matrix is unitary, it is defined as unitary MU-MIMO. ~~, where the precoding vectors are orthogonal to each other to further simplify the processing.~~ If the precoding matrix is non-unitary, it performs non-unitary MU-MIMO. ~~With uplink sounding, the transmitter precoding is vendor specific (either unitary or non-unitary).~~ Note that beamforming is enabled with this precoding mechanism. Non-linear precoding is FFS.