IEEE P802.22 Wireless RANs

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| MIMO Text: Maximum Ratio Combining for the Std.802.22b Standard |
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| Author(s): |
| Name | Company | Address | Phone | email |
| Gabriel Porto Vilardi | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | gpvillardi@nict.go.jp |
| Pin-Hsun Lin | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | pslin@nict.go.jp |
| Zhang Xin | NICT | 20 Science Park Road, #01-09A/10 TeleTech Park, Singapore |  | amy.xinzhang@ieee.org |
| Chang-Woo Pyo | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | cwpyo@nict.go.jp |
| Chunyi Song | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | songe@ieee.org |
| Masayuki Oodo | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | moodo@nict.go.jp |
| Keiichi Mizutani  | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | songe@ieee.org |
| Hiroshi Harada | NICT | 3-4, Hikarino-oka, Yokosuka, 239-0847, Japan |  | harada@ieee.org |

Abstract

This document is complementary to the DCN IEEE 802.22-13/0131r0. It provides text referent to transmit diversity and receive diversity in MIMO systems, considered in 802.22b standard.

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The invention provided in the document IEEE 802.22-13/0131r0 consisted of a system with multiple antennas at the transmitter, however, with single antenna at the receiver.

The current document provides text describing how to extend the aforementioned contribution to exploit diversity inherent to multiple receiving antennas.

If more than one antenna is available in the receiver terminal, maximum ratio combining (MRC) can be utilized to significantly enhance link reliability. For simplicity, in the following example consider that the number of antennas available at the receiver is 2. The present invention, however, can be utilized for any number of receive antennas.

In order to use MRC, little modification is necessary to what has been presented in DCN IEEE 802.22-13/0131r0. The ‘Array Gain Maximization’ block, now, performs



for 2 TX antennas, and



for 4 TX antennas. Here, IAm is the array interference in the first RX antenna, given in the previous sections and I’Am represents the array interferences in the second RX antenna. Since the channel to the second RX antenna is given by **H** = [h3 h4], for two TX antennas, and **H** = [h5 h6 h7 h8], for 4 TX antennas, I’Am becomes





or















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The ‘array gain maximization’ block at the transmitter sends *m* to the collocated ‘transmit vector selector’ block while the ‘array gain maximization’ block at the receiver sends *m* to the collocated ‘combiner block’. The ‘combiner block’ will combine the received signal, just as described in the previous sections of DCN IEEE 802.22-13/0131r0, in order to deliver  to the ML detector. Note that  is given in the previous sections and is given by



with y’ being the signal received by the second RX antenna and **H** = [h3 h4], for 2TX, or **H** = [h5 h6 h7 h8], for 4 TX.

The technique contained in DCN IEEE 802.22-13/0131r0 together with its extension, provided in the current document, is full rate and full diversity added to array gain.

**References:**

[1] G.P. Villardi *et al.*, ”MIMO Text for the Std. 802.22b Standard”, doc.: IEEE 802.22-13/0131-r0, August 2013.