IEEE P802.11  
Wireless LANs

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| Clarifications to Box 2 MIMO simulation calibrations | | | | |
| Date: 2015-05-10 | | | | |
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Abstract

The methodology document is missing text regarding how MIMO calibration is being performed for box 2. We propose clarification text for the methodology document.

The current methodology document has missing text regarding how the MIMO SINR values are collected for calibration purposes in box 2, even though several IEEE members have already have submitted calibration MIMO results for box 2.

The suggested clarification is described below.

It should be noted that even with the suggested text below, the methodoly document is still missing information about the precoding matrix and receiver assumptions for calibrations. Given that the number of antennas or simulation setup is not described in the methodology document, it may not be appropraite to capture those assumptions in the methodology document but in some other document such as TGax scenario document or the Box 2 simulation calibration document.

---- Start of Text Changes to the TGax Simulation Methodology document ---

## Box 2

The multipath SINR is defined as the instantaneous frequency-domain equalizer output SINR with the fading channels from both the desire transmitter and interfering transmitters.

For example, if a STA is the transmitter, the intended receiver is the associated AP; if an AP is the transmitter, the intended receiver is one of the STAs associated with it. The interfering transmitters are defined in each test.

The multipath SINR of the receiver node-RX with the desired transmitter node-TX at the m-th tone assumes the received signal as



The SINR depends on the receiver type (such as MRC/MMSE). The number of interfering transmitter in the BSS that the receiver belongs to is always 0.

For example, for SISO case (1x1, no precoding), the SINR is defined as



The long-term received power at a receiver node-RX from a (desired or interfering) transmitter node-TX is defined as in box1.

For MIMO, the SINRs of each spatial stream is collected for plotting results.

For example, for MIMO case with linear receiver, the SINR for j-th spatial stream is defined as

,

Where is the linear receive filter used at the receiver, represents the j-th column vector of the matrix, and  is the L-2 norm of a vector.

Note: For Box 2, there is no notion of an “un-associated user”, i.e., no check is performed to ensure that a STA can maintain MCS0.

### Test 1 (interference free)

For this test, only DL multipath SINR is required. No interfering transmitter is defined for each BSS. Therefore, for the n-th BSS, *Ω(k)={}* and *N(k)=0*, for *k=1…NBSS*.

### Test 2 (DL only)

For a receiver (STA) in the n-th BSS, the interfering transmitters are defined to be all non-associated APs. Therefore, *Ω(k)={AP-k}, N(k)=1* for *k=1…NBSS­, k≠n*.

### Test 3 (all nodes per channel access rule)

A channel access rule is used to select 0 or 1 transmitters per BSS. For the corresponding receiver in the n-th BSS, the interfering transmitters are defined to be the nodes that obtain channel access by the rule. Therefore, *Ω(k)={none, or AP-k, or STA-i, for some iϵФ(k)}*, *N(k) = 0 or 1*, for *k=1…NBSS­*.

Channel access rules use CCA are defined as:

1. Order all nodes (STAs and APs) and put them in a list in a random order, initialize a set of transmitter *T*={}, and *Ω(k)={}*, for *k=1…NBSS­*
2. While the list is not empty:
   1. Select the first node and remove it from the list.
   2. Calculate the interference based on the current *Ω(k),* for *k=1…NBSS­.*That is,



The interference power is measured across the entire simulation bandwidth.

* 1. Compare the interference with a CCA threshold of -70dBm. If the interference is smaller than the threshold,
     1. Add this node to *T*, and set *Ω(n)={this node},*if this node belongs to BSS-n.
     2. If this node is an AP, randomly selects an associated STA as receiver; if this node is a STA, the receiver is the associated AP.
     3. Remove all existing nodes in the same BSS from the list.

1. Output the set of transmitter *T*.

A flow chart of such a CCA-based channel access rule:



Figure 4: CCA-based channel access rule flow chart

A separate CDF will be generated for DL and UL SINR.

### Procedure of test

* For each test on a selected calibration scenario, at least [x] drops of STA/AP and [x] TX events per drop are required for convergence.
* In each drop,
  + Drop STAs/APs, and associate each STA with an AP according to the scenario.
  + In each TX event, select the transmitter and receiver nodes, and collect the multipath SINR per tone for the pairs of transmitter/receiver.
  + The fading channel evolves over the TX events (detailed to be added).
* Generate the distribution (CDF) of multipath SINR collected over the simulation time from multiple drops.
  + The CDF of SINR per tone.
  + The CDF of effective SINR per reception based on capacity mapping, i.e.,



where *Ntones* is the number of tone and NSTS is the number of spatial streams.

* + The data format of SINR CDF is the SINR value for each percentile.
* Calibration goal:
  + The difference between distributions from multiple companies should be within [x]%.

---- End of Text Change ----