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The ideal MCS is chosen using the RBIR abstraction technique (the mode that maximizes throughput for PER<10%).

AP orientation fixed; Client rotated in azimuth in steps of 10°.

Channel bonded 40MHz transmission using 128 subcarriers (5GHz carrier).

Table 2: 3x3 MIMO channel power profiles:

<table>
<thead>
<tr>
<th>Location</th>
<th>SNR (dB)</th>
<th>Best Throughput (Mbps)</th>
<th>Eigenvalues of 2x2</th>
<th>Eigenvalues of 3x3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional</td>
<td>24.0</td>
<td>12.3, 12.3</td>
<td>2.35, 1.60</td>
<td>36.0</td>
</tr>
<tr>
<td>Omni</td>
<td>23.1</td>
<td>13.2, 1.06</td>
<td>2.35, 1.60</td>
<td>36.0</td>
</tr>
</tbody>
</table>

Discussion of Results:

- In more distant rooms (e.g. location 5), dynamic 2x2 EBF using directional antennas provides 70-99% (depending on client orientation) of the throughput achieved by the more expensive 3x3 system. For omni antennas the relative throughput dropped to 45-62%.
- Results vary significantly according to the chosen antenna pair when directional antennas are applied. With omni antennas performance was largely independent of antenna choice.
- For directional antennas, dynamic antenna selection ensures good Eigen-structure in the 2x2 channel matrix for most client orientations, reducing the sensitivity to orientation observed with a fixed 2x2 directional system.
- Overall, the performance of optimum 2x2 EBF is particularly strong at low SNR values for directional antennas.

Conclusions:

- The performance of 2x2 EBF with optimum antenna selection is competitive to 3x3 EBF, especially when directional antennas are used at low SNR values. For distant rooms, 3x3 EBF is only 15% better (in terms of throughput) than 2x2 EBF when directional antennas and dynamic antenna selection are applied. 2x2 EBF with semi-directional antennas results in a 45% reduction in throughput (compared to 3x3 EBF). Multiple directional antennas can enhance 802.11n performance in a home environment. The combined effect of the antennas should retard the impact of client orientation.
- We conclude that EBF with ideal 2x2 antenna selection (taken from a larger set of 3x3 directional antennas) is attractive and cost-effective solution for wireless applications in the home.
- Future work will incorporate real antenna pattern data into the model.

References: