Improvement of MIMO Channel Capacity Using Block-wise Controlled Transmit-Array Antenna

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Introduction

- **Environment with limited paths**
  - Keyhole effect increases spatial correlation
  - High propagation loss degrades SNR
  
- **Our previous work**
  - Keyhole effect increases spatial correlation
  
- **Proposed Mechanism and Configuration of Transmit-array**
  - By controlling load impedance,
    - SNR can be improved by controlling path directions
    - Spatial correlation can be decreased by path dispersion
  
- **Numerical Result**
  - Enhanced channel capacity
  - Large number of antennas realize high channel capacity

**Analysis condition**

<table>
<thead>
<tr>
<th>Simulation method</th>
<th>Raytracing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>2.4 GHz</td>
</tr>
<tr>
<td>Antenna element (Tx / Rx)</td>
<td>Dipole antenna</td>
</tr>
<tr>
<td>Number of antenna (Tx x Rx)</td>
<td>2x2 (MIMO)</td>
</tr>
<tr>
<td>Reactance value</td>
<td>-100 ≤ X ≤ 10</td>
</tr>
<tr>
<td>Optimum method</td>
<td>Steepest gradient method</td>
</tr>
</tbody>
</table>

**Conclusion**

- **Transmit-array with square division type (n=4):**
  - 1% value of channel capacity can be improved by 7.2 bits/s/Hz

- **Simplified control system is needed:**
  - Control system becomes simpler than that with fully controlled structure