Throughput Measurement of 2-by-2 LCX-MIMO System in Real Indoor Linear-cell Environment

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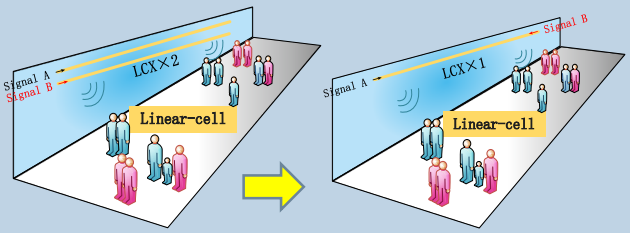
LCX-MIMO system in Linear-cell

Leaky coaxial(LCX) cable is widely utilized in long and narrow environment, called linear-cell, as an antenna. To employ a 2-by-2 MIMO(Multiple-Input Multiple-Output) system, two LCX cables are necessary in conventional way.

By transmitting the signal to both ends of LCX cable, one LCX cable can be used as two antennas and reduce the half requirement of antennas while deploying MIMO system. It can save cost and be easy for installing.



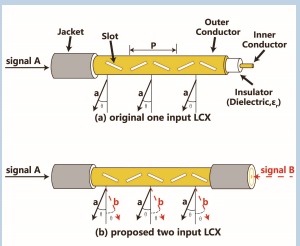
Conventional LCX-MIMO　　Proposed LCX-MIMO

Maximum Radiation Angle

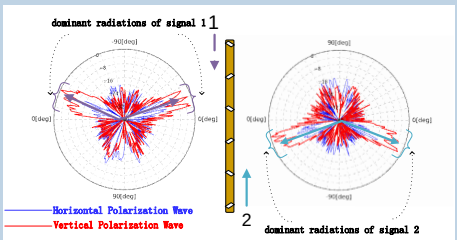
The direction θ of dominant radio changes with adjusting the period between slots.

$$\theta = \sin^{-1}\left(\sqrt{\epsilon_r} + \frac{m\lambda}{P}\right), (m=-1,-2,\ldots)$$

θ : relative permittivity
λ : wavelength in cable
P : period of slots



The property of radio propagation, measured in anechoic chamber, also proves the dominant signal spreads to the air with special direction from different ends of cable.



In this way, the receiver can distinguish the signal from different ends of cable as two antennas.

Conclusion

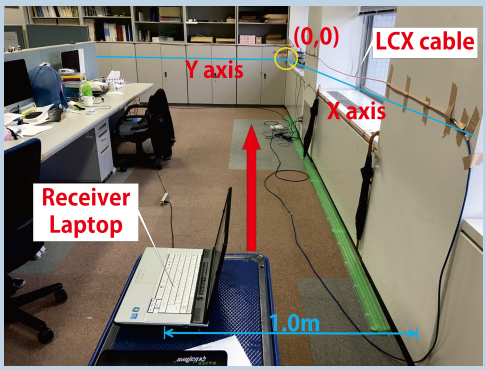
- Proposed LCX-MIMO system can be implemented over real indoor linear-cell environment and largely increase the system throughput
- Compared with MIMO system of onmi-directional antennas, proposal presents better and steadier performance in some area.

Indoor Environment

The feasibility of proposed method has already been proved in anechoic chamber where the reflection didn't exist. Moreover we design an experiment in real linear-cell environment to verify if the proposal is able to build a MIMO system.

A wireless AP and a laptop are used as transmitter and receiver. Both ends of a LCX cable connects to the ports of AP for building a 2-by-2 MIMO system. As a reference, two omni-directional antennas are fixed in origin point.

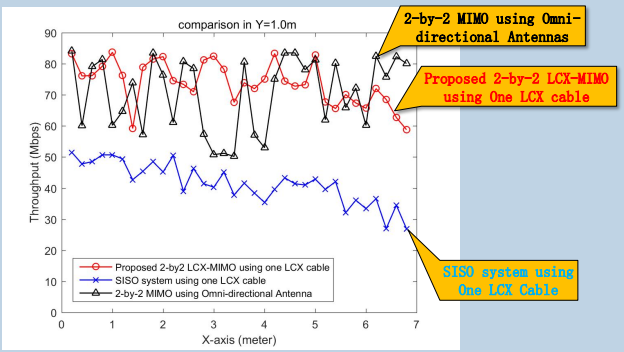
- Experimental Environment



- Experimental Parameters

Experiment Configuration	
Standard	IEEE 802.11n
Channel	36
Bandwidth	20MHz
Guard Interval	Short(1/16)
Fragmentation Threshold	2346Bytes
Transmit Power	15dBm for 1 antenna 10dBm for 2 antennas
Modulation Coding Scheme (Rate)	Automatic (54Mbps/antenna)

Experimental Results



Compared with SISO(single-input single-output) system using one LCX cable, proposed method increases two time throughput over almost all positions.

Moreover, the proposed LCX-MIMO system can reach better and steadier performance of system throughput than MIMO system constructed by conventional omni-directional antennas in the area where is near to the origin point.

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