Experimental Evaluation of Matching Method Based on Image Impedances for Near Field MIMO

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*1MN : Matching Network
*2SNR : Signal Noise to Ratio

Introduction

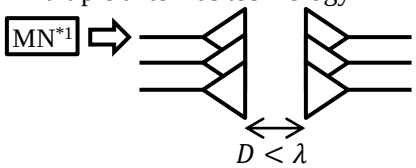
■ Short range communication

Data transmission

Need to high data-rate in short range communication for HD video transmission etc.

■ Near Field MIMO(Multiple-Input Multiple-Output)

Multiple antennas technology × Near field electromagnetic coupling



☹ Facing antennas in near field significantly affect antenna characteristics each other[2]

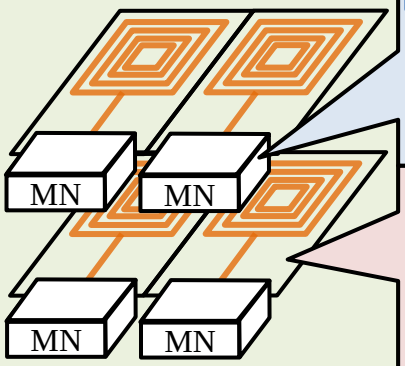
☺ High channel capacity in short range due to high SNR*2 and low spatial correlation[1]

Matching is difficult in near field communication

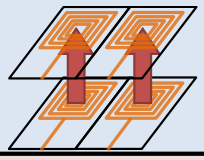
Matching method for near field MIMO is needed

Proposed Method

Proposed matching model



Problem
Facing antennas affect matching characteristics each other



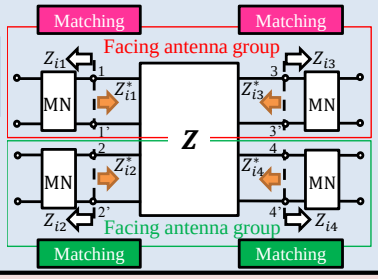
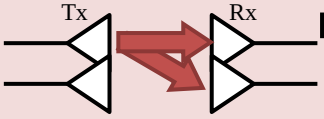
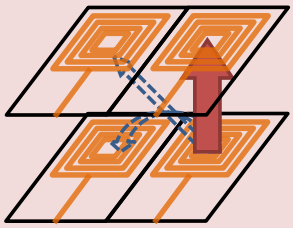


Image impedances
Matching for facing antennas at the same time considering near field

Problem
Diagonal mutual coupling affects the condition of image impedances

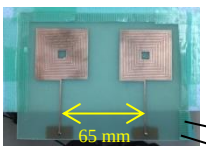




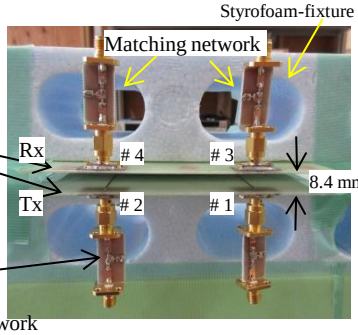
Spiral antenna
☺ Inductive strong coupling between facing antennas
=> Other antenna's coupling is negligible

Realization of matching for near field MIMO

Experimental Result



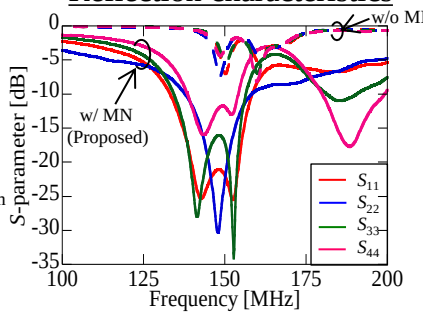
Fabricated antennas



Fabricated matching network

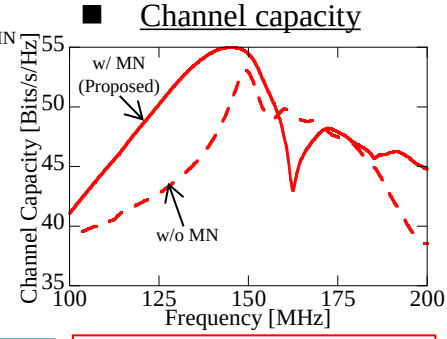
Frequency	150 MHz
Antenna & MN substrate	FR-4
Antenna distance	8.4 mm
Element spacing	65 mm
Transmitting power	0 dBm
Noise power	− 90 dBm

■ Reflection characteristics



Reflection characteristics < −10 dB

■ Channel capacity



Channel capacity is improved at the center frequency

Conclusion

Proposed matching method is effective in enhancing channel capacity of near field MIMO