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Modeling and Optimizing Reconfigurable Intelligent Surfaces in Wireless Environments

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In [1], the authors have recently introduced a circuits-based approach for modeling the mutual coupling of reconfigurable surfaces, which comprise sub-wavelength spaced passive scattering elements coupled with electronic circuits for enabling the reconfiguration of the surface. The approach is based on a finite-length discrete dipole representation of a reconfigurable surface, and on the assumption that the current distribution on each thin wire dipole is a sinusoidal function. Under these assumptions, the voltages at the ports of a multi-antenna receiver can be formulated in terms of the voltage generators at a multi-antenna transmitter through a transfer function matrix that explicitly depends on the mutual coupling and the tuning circuits through the mutual impedances between every pair of thin wire dipoles. In [2] and [3], the authors have proposed optimization methods for application of the model in wireless networks. Finally, in [4], the authors have formulated the mutual impedances in an integral form.

In this talk, we report the latest research work on modeling reconfigurable intelligent surfaces as a collection of mutually coupled dipoles driven by tunable impedances, as well as recent advances on optimizing the tunable impedances for application to multiple-antenna wireless systems.

Further information about part of the technical content of this presentation can be found in [1]-[4].

REFERENCES

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