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ASIC² PROJECT:
MEMRISTOR-BASED PHASE SHIFTERS

The growing demand to connect up the world is pushing wireless systems to be smaller than ever. This is part of the increasing move to a data driven world with billions of connected devices in the era of the Internet of Things (IoT) and space and energy are critical design criteria. Traditionally, miniaturization was possible owing to a focus in a single frequency and a single communication protocol. However, the real challenge is scaling multi-frequency/multi-protocol RF systems and memristors can help us achieve that!

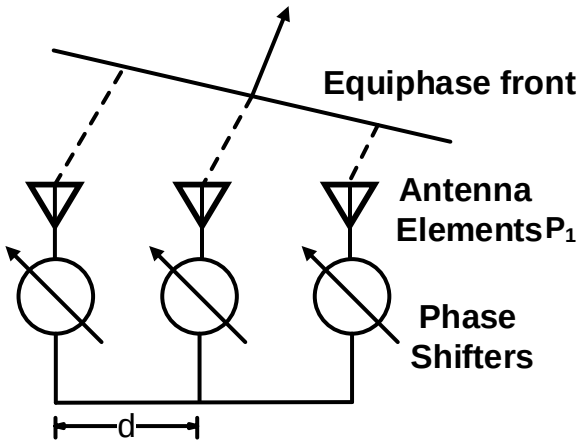

Figure 1 - Phased antenna array

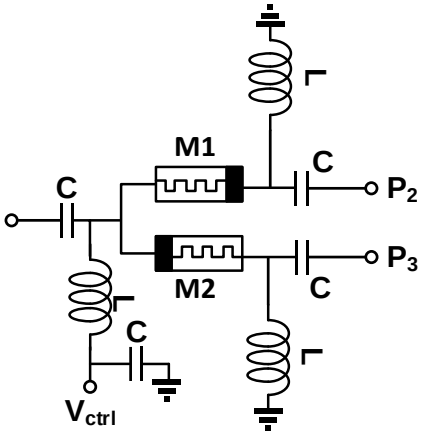

Figure 2 - Series memristive SPDT

Project Description:

Novel memristors have shown high performance at high-frequency. We proposed two topologies of single-bias memristive Single-Pole Double-Throw (SPDT) switches. These topologies exhibit low insertion loss and high isolation, while adding non-volatility to RF switches that result in reduction of energy consumption, which makes them excellent candidates for energy-constrained wireless systems. This project intends to use RF memristors and these SPDT topologies to build RF phase shifters. By integrating programmable RF output phase features, multiple devices can be easily synchronized to build scalable MIMO and beam-forming radio architectures.

Schedule:

- Study the working principles of memristor and memristive SPDT.
- Design of different topologies of phase shifters.
- Simulations in Cadence Virtuoso or ADS and performance evaluation.
- Control system.

Course Requirements:

Waves & Distributed systems, Circuit Theory, RFIC course (recommended)

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