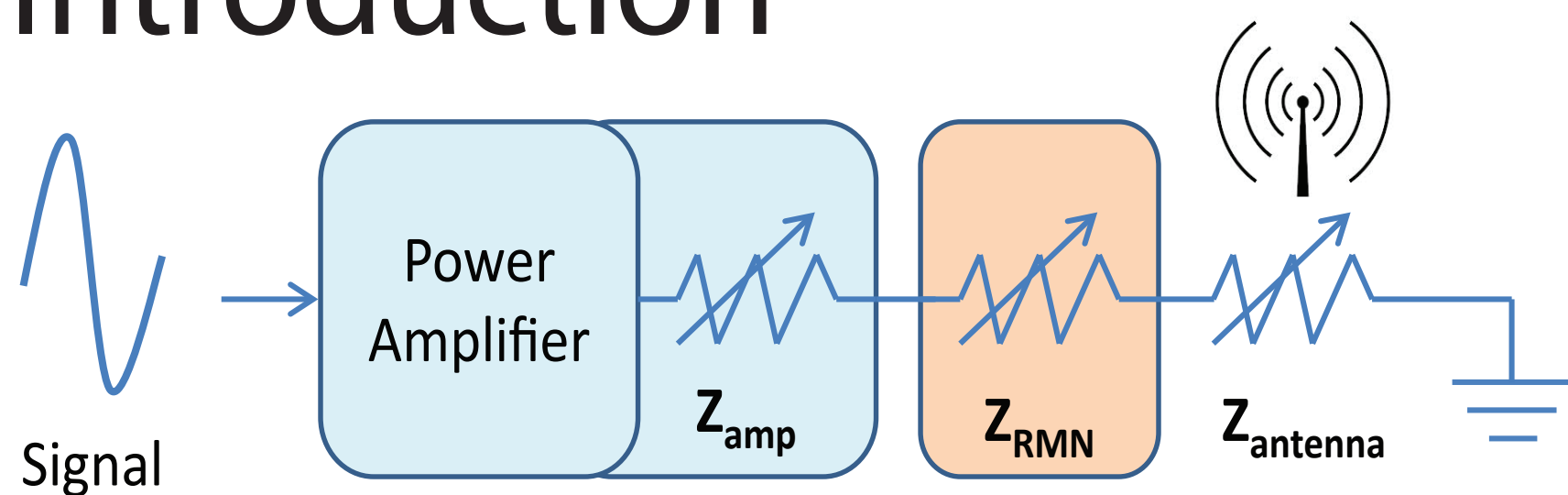# Reconfigurable Matching Networks for Antenna Impedance Mismatch Mitigation

Raytheon

Introduction

In RF transmission systems, an **impedance mismatch** results in inefficient power transfer from the amplifier to the antenna. A **reconfigurable matching network (RMN)** may be used to correct for a variety of mismatches and improve power efficiency.

The goals of this project were to:

- **Find and evaluate** products that may be used as viable components in an RMN
- **Create a topology** for an RMN that may be utilized with these components
- **Simulate and evaluate** the effectiveness of this RMN

Reconfigurable Matching Network

The team chose to use a **loaded line** technique for the RMN. These consist of tunable capacitors with specific lengths of transmission line between them. The loaded line can be configured to correct for a variety of mismatches over a wide frequency band.


Components

Insertion loss of series WS1050


Insertion loss of shunt PE64102
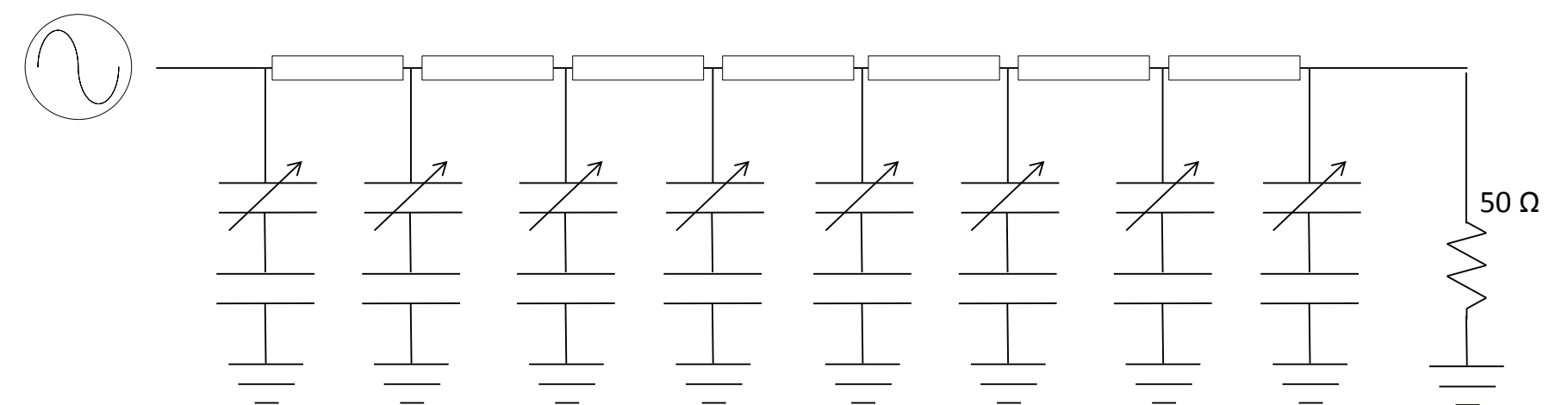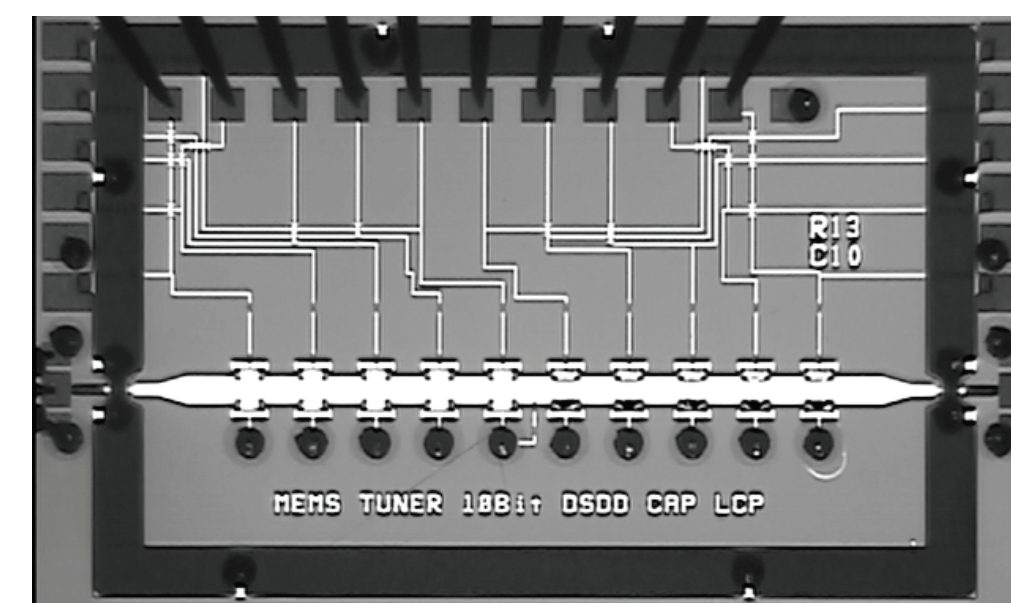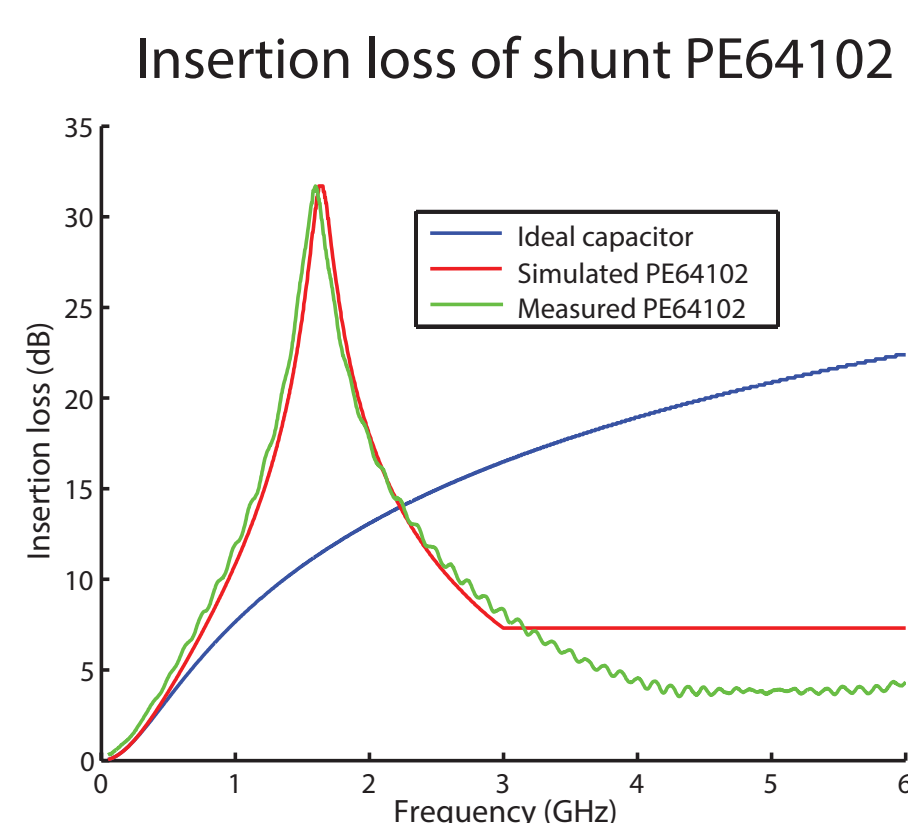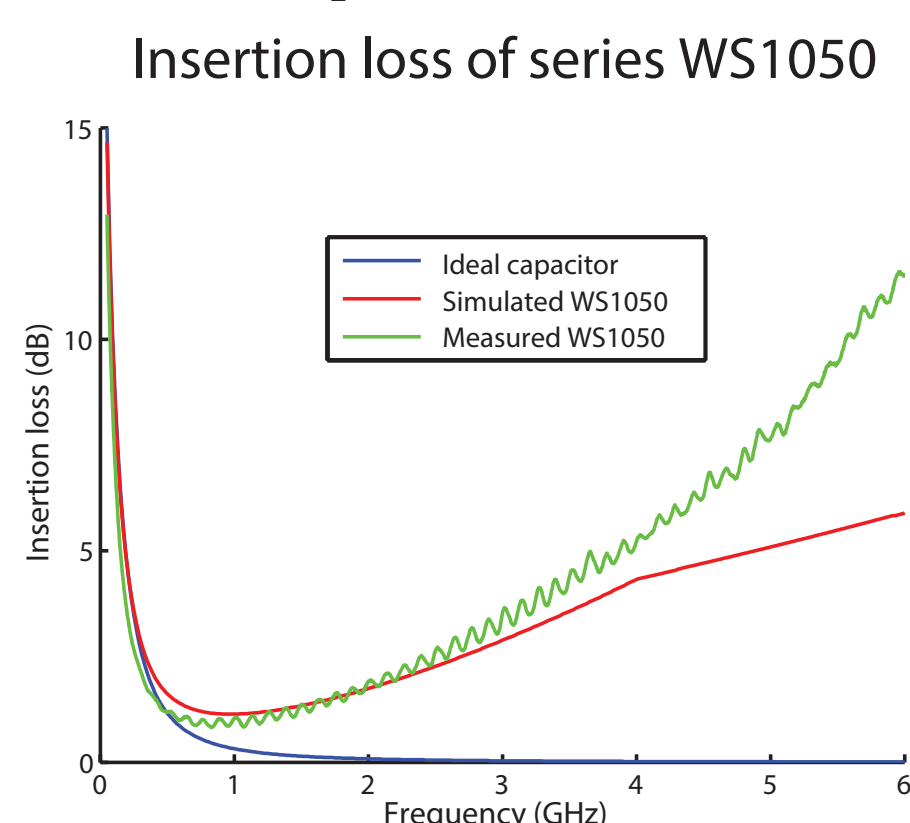
Digitally tunable capacitors (DTCs) were selected as the fundamental components of the RMN. The team selected two products designed for wireless communication applications, the WiSpry WS1050 and Peregrine PE64102 and characterized them to validate their behavior.

Results

The team simulated the RMN to see how it would correct for a variety of mismatches across a wide range of frequencies. The simulation chooses the optimal state of the RMN for each mismatch.

These results indicate that the Wispry 1050 DTC may be used in a loaded line topology to effectively improve the performance of an RF system with an impedance mismatch.

Effect of RMN on Mismatch
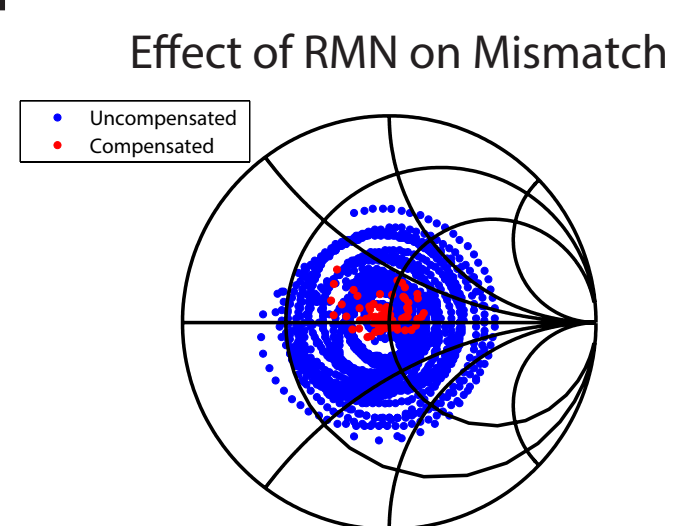
The RMN can correct for various mismatches. Values closer to center are better matched

Effect of RMN on Insertion Loss
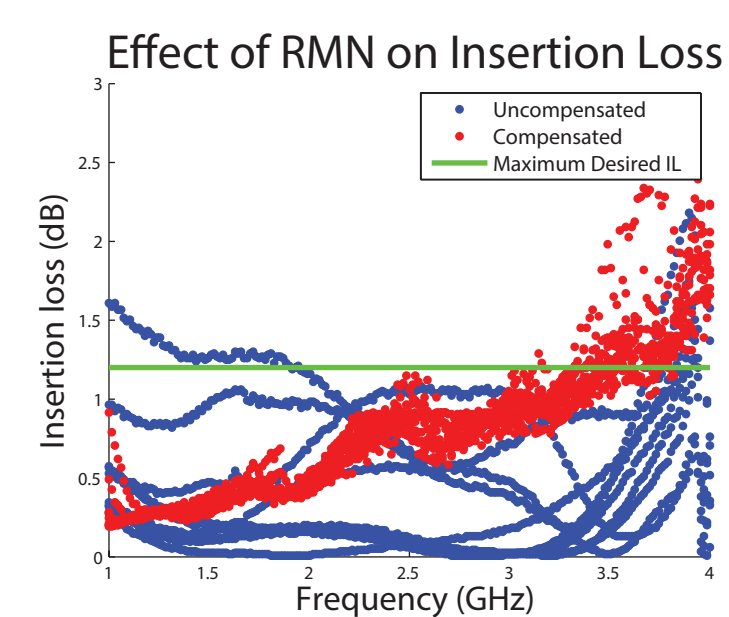
The RMN improves insertion loss at lower frequencies, but worsens it at higher frequencies

Effect of RMN on Return Loss
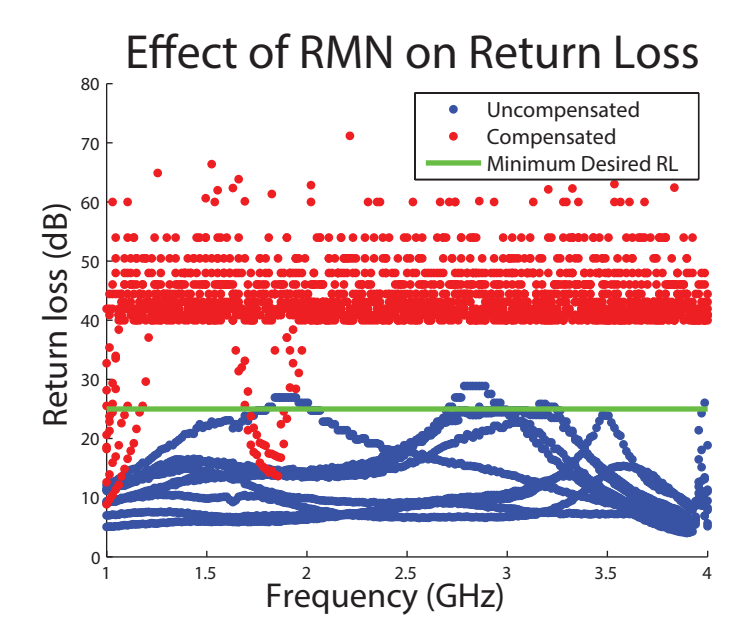
The RMN drastically improves return loss across all frequencies, higher values are more desirable

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