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RF uWave Lab

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Post-Lab Report #3

**Summary:** The purpose of this lab was to familiarize students with the ADS software and its capabilities. The was done by having student simulate realistic capacitive and inductive circuit elements, including the parasitic factors associated with real world components. Once simulation circuits were completed, an optimization function was executed to tailor the simulated component’s response to input frequency bands to more closely match the behavior of a real component obtained via measurement instrumentation.

**Discussion:** Compared to ideal capacitors and inductors, the measured (and therefore the simulated) cap and inductor behaviors showed signs of capacitive, inductive and resistive elements, regardless of which component was being measured. These parasitic behaviors result from the physical structure of the components. These imperfections are unavoidable in practical component manufacturing but are not present in theoretical ideals.

A component capacitor is constructed by surrounding two parallel planes in some casing with a dielectric between the planes. Ideally, charge will not flow through the dielectric or the casing, but in a practical component, small amounts of charge are allowed to pass through, giving the cap its resistive element. As charge flows through any length of conductor, a magnetic field is generated around said conductor giving it a small inductive property. The leads coming off a practical capacitor add their inductive behavior to the overall system, and thus, give practical caps a small inductive element.

A component inductor is constructed by surrounding a small coil of conductor in some casing with leads extending out of said casing. Because all conductors have some natural resistance to charge flow, the inductor behaves slightly resistive. Inductors get their capacitive element from parallel turns of the internal wires generating an electric field due to the slight voltage difference along their length. The casing material can act as a dielectric and thus, a separation of charges occurs.



