Modeling Wireless Power Transfer of Two Planar Coils in Resonance

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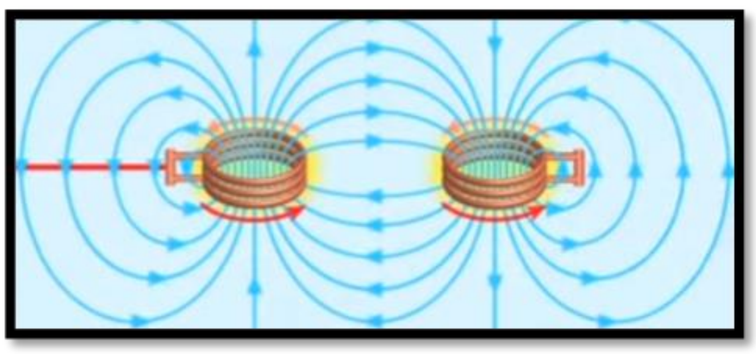
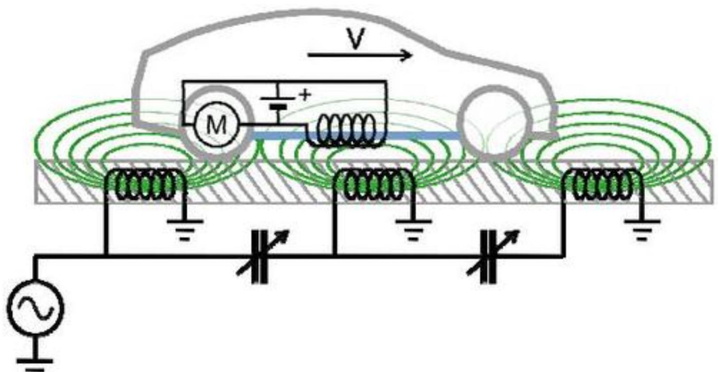


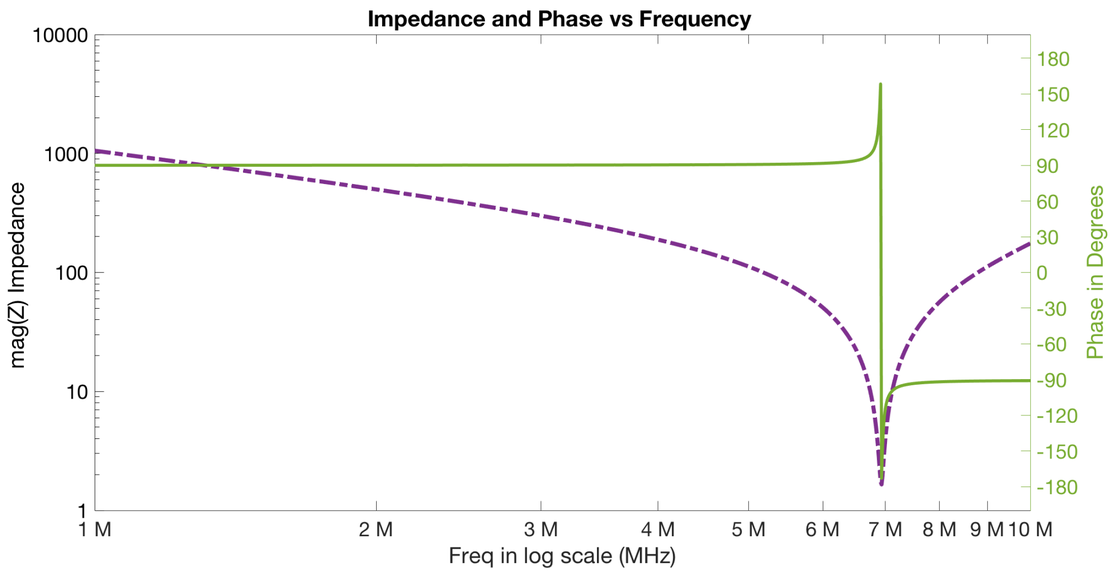
Wireless Power Transfer

Applications for wireless power transfer:

- Device charging
- Ventricular assist devices, pacemaker

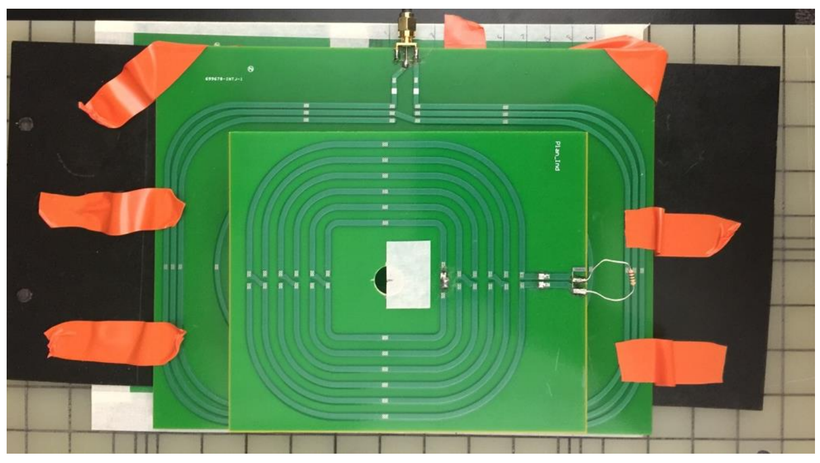


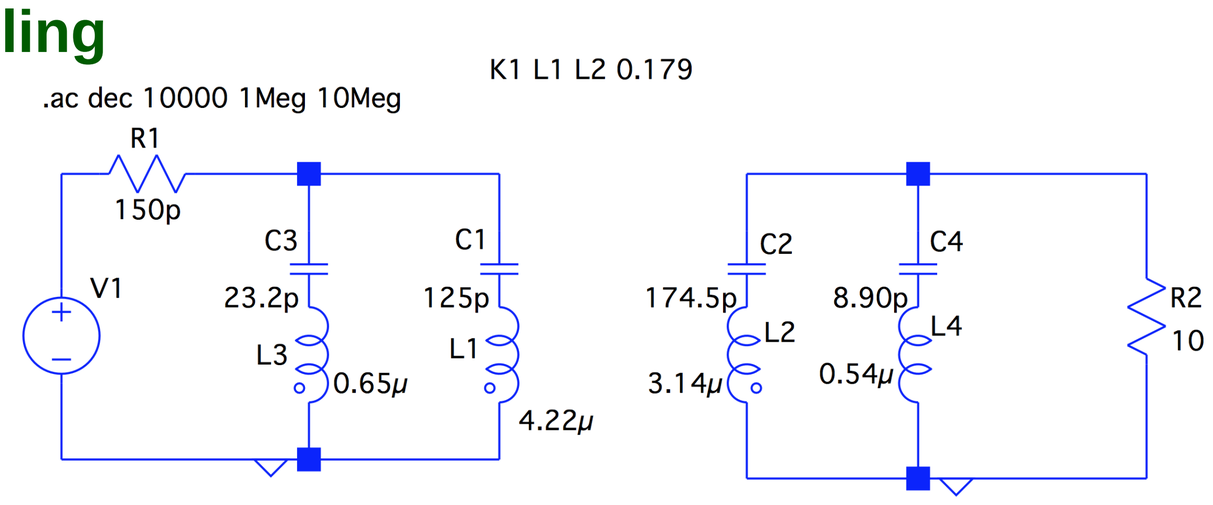
How resonance plays a part?



- Current passing through a wire will generate a magnetic field.
- Magnetic field will induce a voltage in coil of wire.
- Using resonance, a lower impedance allows for more power transfer.
- Coupling varies with orientation. Modeling helps to design a more efficient power converter.

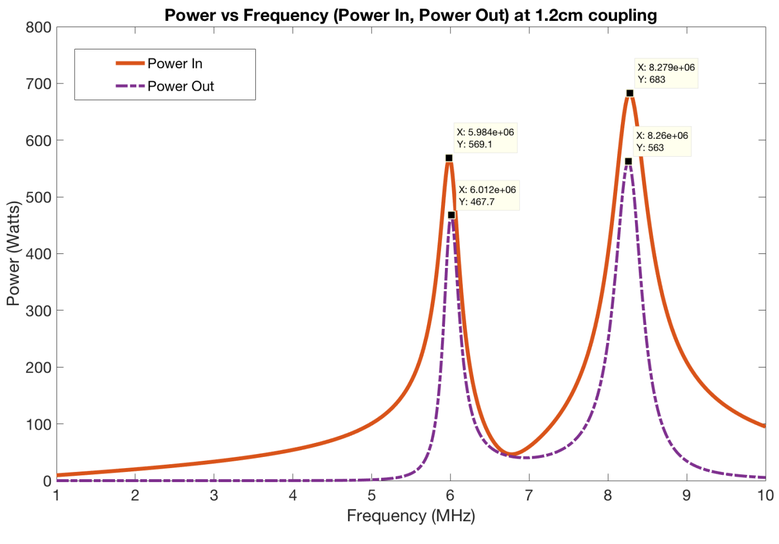
Modeling

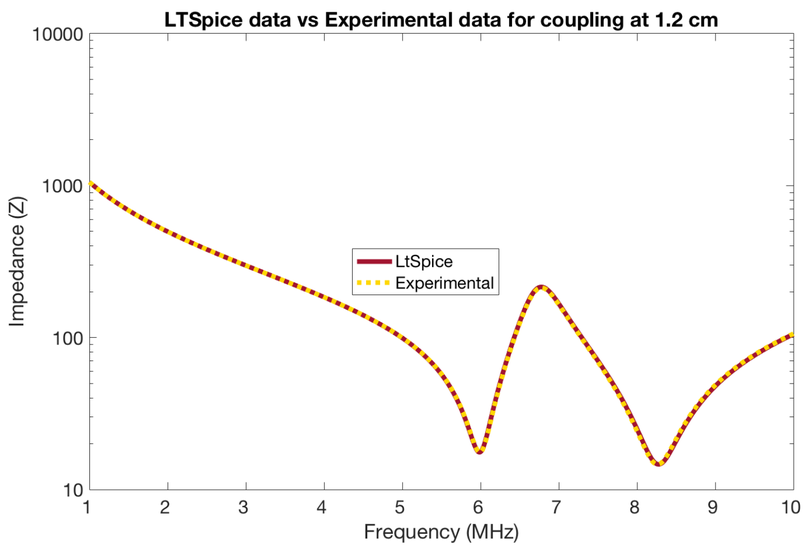




LTSpice model for two coils. L3 and L4 and C3 and C4 are used to model second harmonic behaviors.

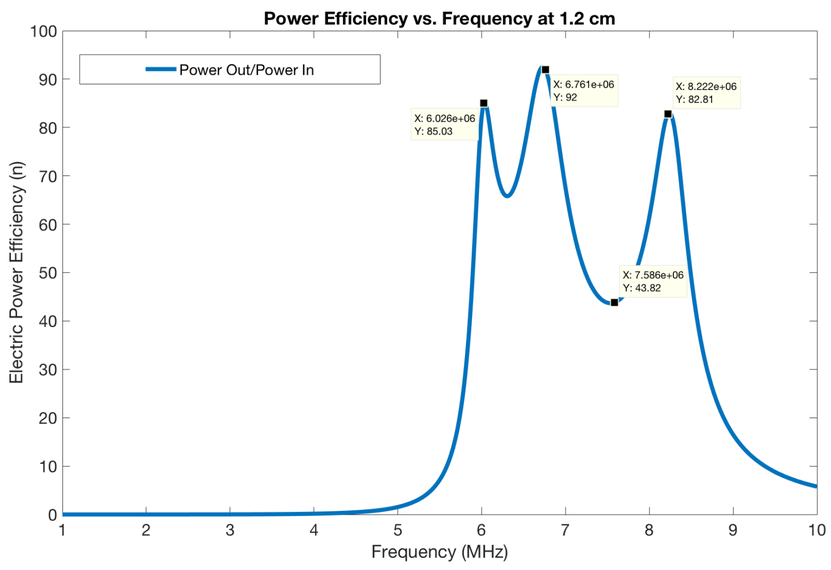
Validity of the system can be determined by comparing the experimental and simulated data





Things to take into account when modeling:

- Parasitic capacitances of the traces. Impedance of the traces.
- Obstructions for achieving resonance i.e. Impedance, Shielding, Magnetics
- Direct interaction with traces change Impedance.
- Changes in the magnetic field affect Resonance and Impedance.



Future work:
Determine an accurate simulation system for multiple receiver coils.

Using multidimensional interpolation to obtain an analytical
model for the coupling of multiple coils.