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Designing an Electric Vehicle Wireless Charging System

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Designing an Electric Vehicle Wireless Charging System

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ASPIRE
NSF Engineering Research Center

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Purpose

To design a wireless charging system for an electric toy car.

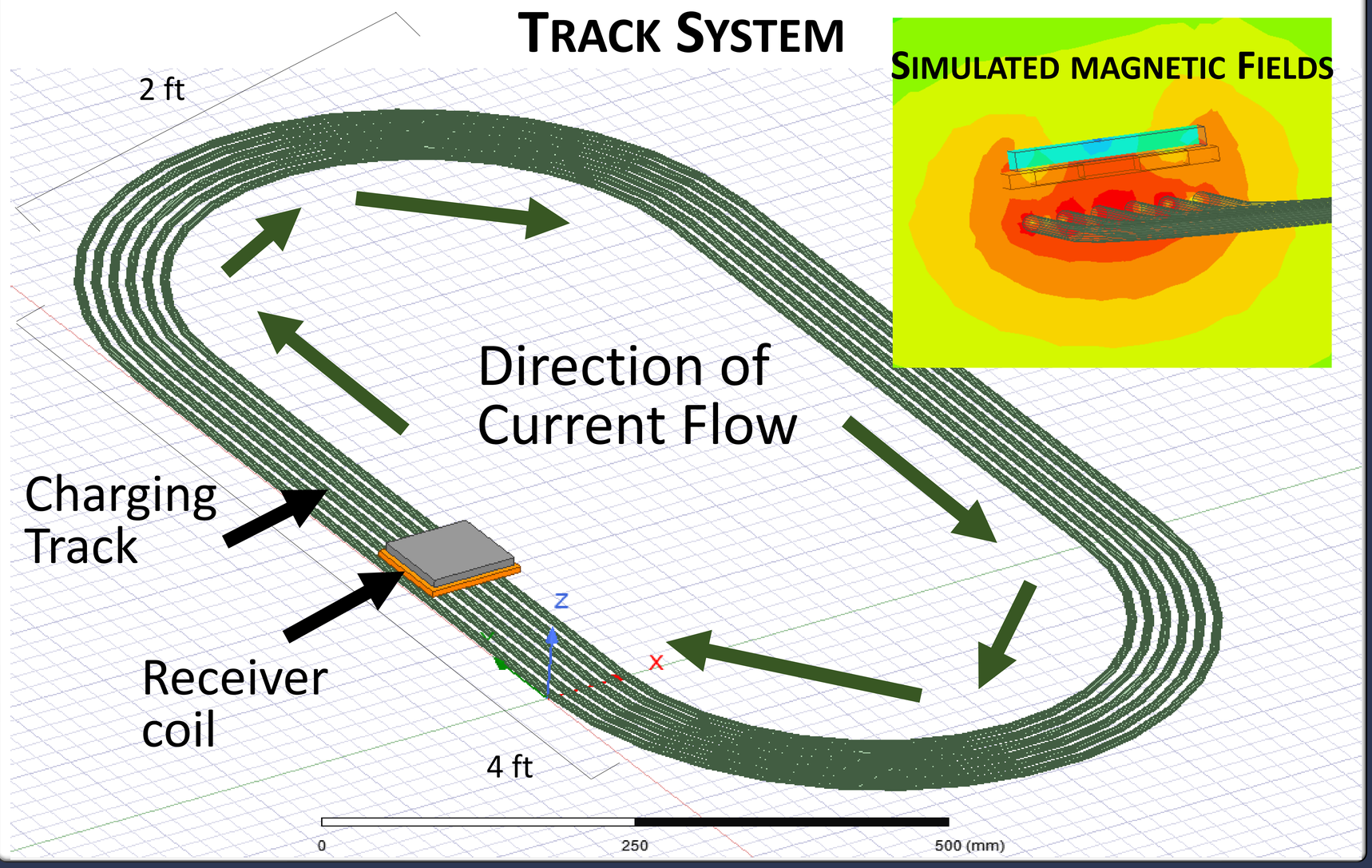
Track will be used for teaching junior high and high schoolers about the engineering design process.

Challenge

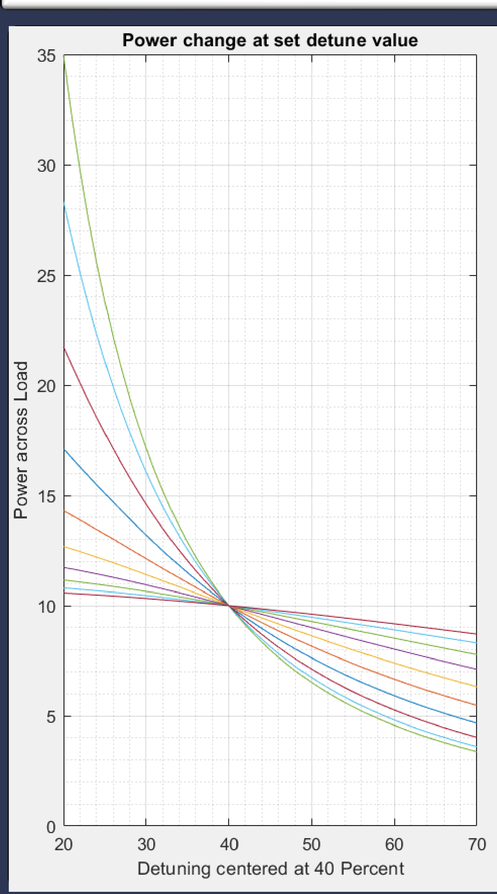
Design a system that will be:

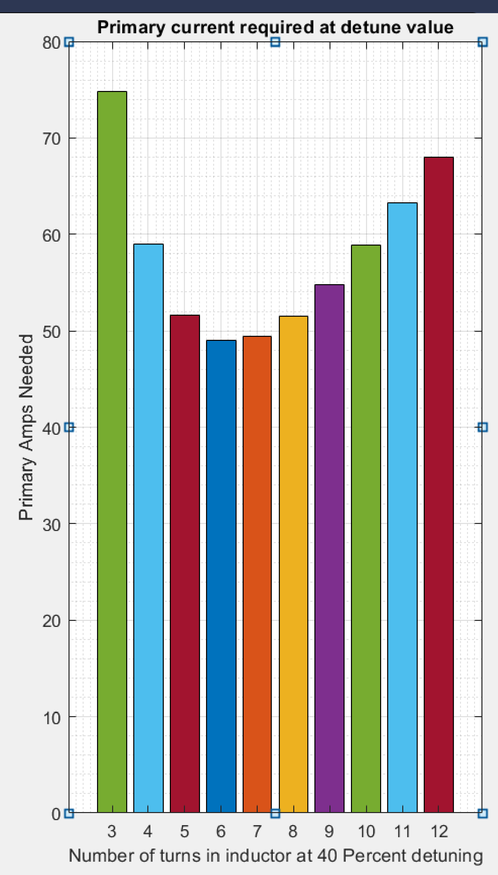
- Cost effective
- Safe for students
- Provide consistent power to car motor

Track System



Simulated Magnetic Fields





Design Process

1. Design the geometry of track and car dimensions
2. Determine circuit that will provide 10 W of power to car motor safely and consistently
3. Verify designs using mathematics and computer simulation software

Repeat steps 1-3 to optimize solution

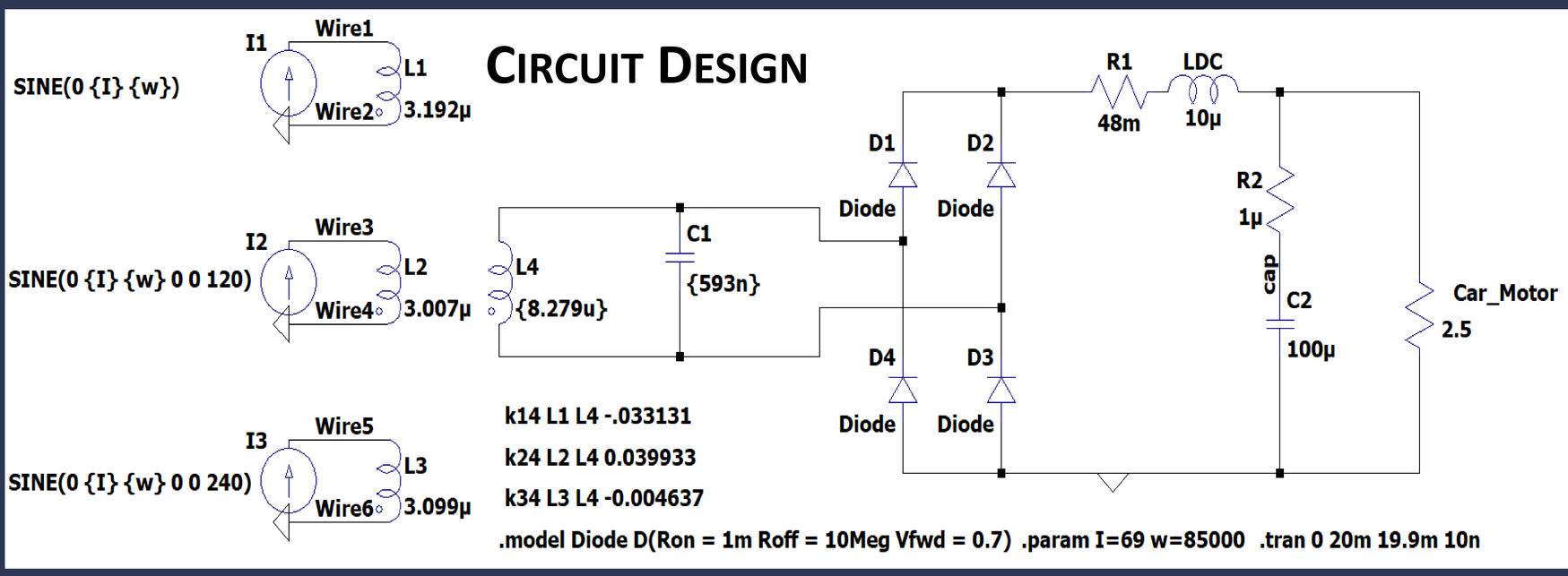
Constraints

- 10 W of power to car motor
- Low power change with +- 10% capacitance tolerance
- Low secondary voltage

Variables

- Resonant capacitance and inductance
- Primary coil currents
- Coil size and air gap

Circuit Design



Chosen Design

The following variables were found to be the cheapest, safest, and most consistent solution:

12 Turns in car inductor coil

40% detuned resonant circuit for voltage safety

68.01 Amps current in track