Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

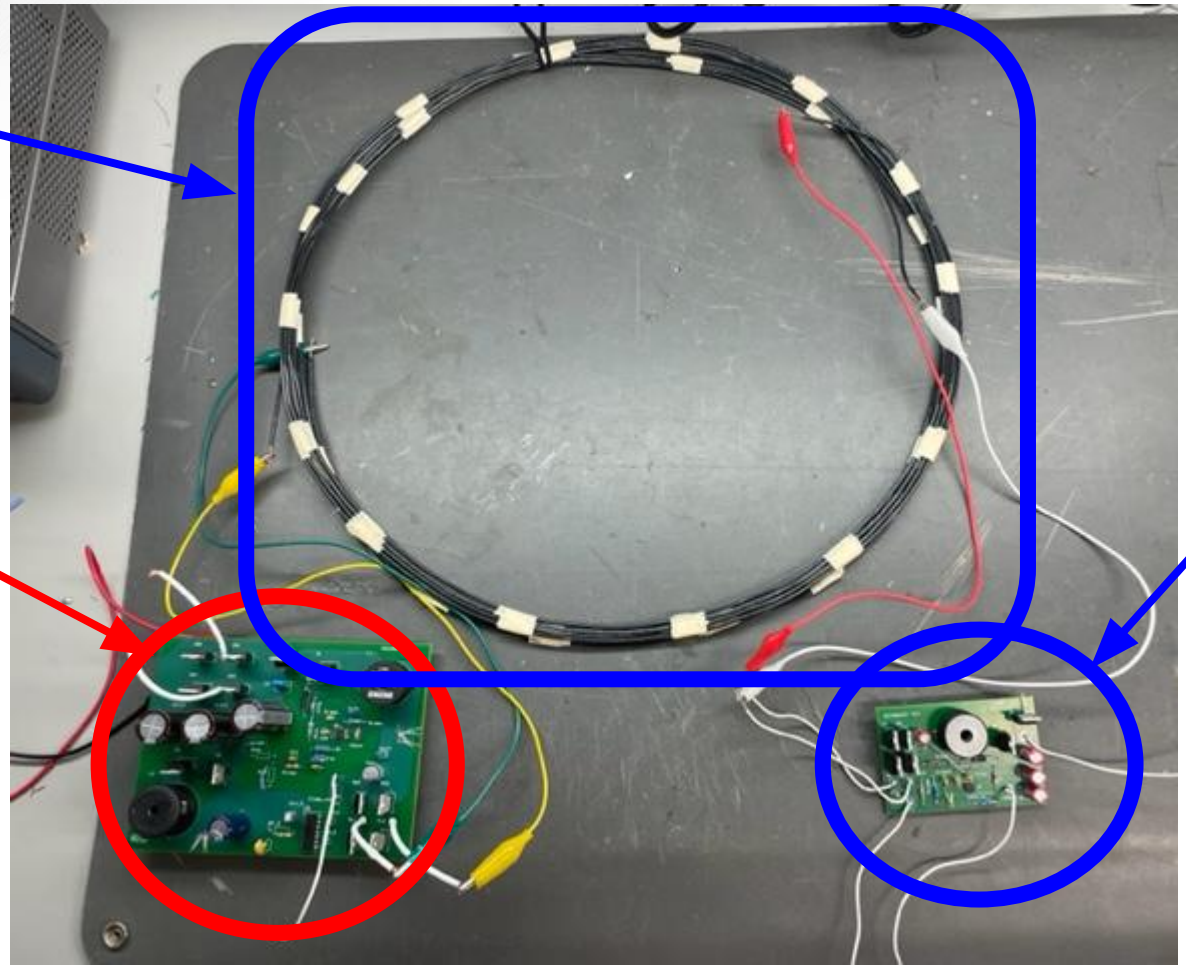
ECEN 404 Final Presentation
Team 55 EV Wireless Charger

Alyssa Brown and Teddy Lehman
TA: Max Lesser
Sponsor: Dr. Oscar Moreira

Problem Overview

- Provide a convenient alternative to wired chargers for electric vehicles
- Charge a 36V battery through inductive wireless power transfer

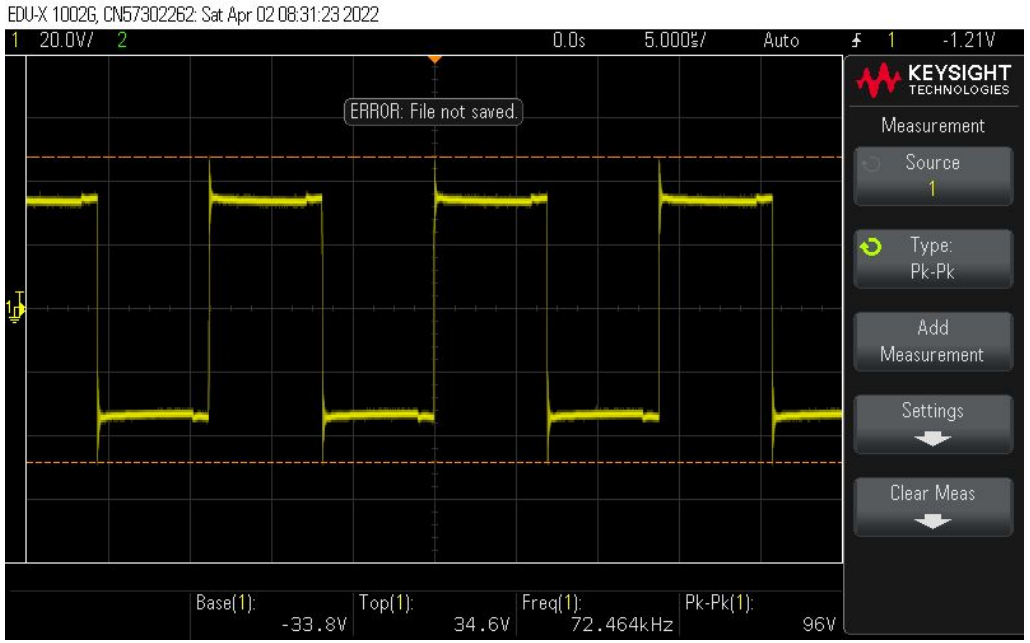
Integrated System Diagram



Primary Design Accomplishments

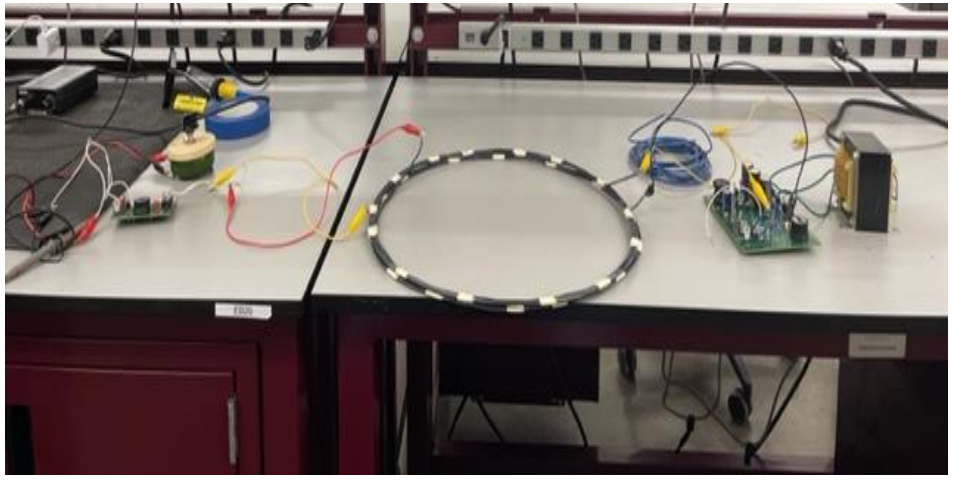
- Designed two buck converters to operate an inverter driving the inductive coils
- Configured inverter to optimize power delivery

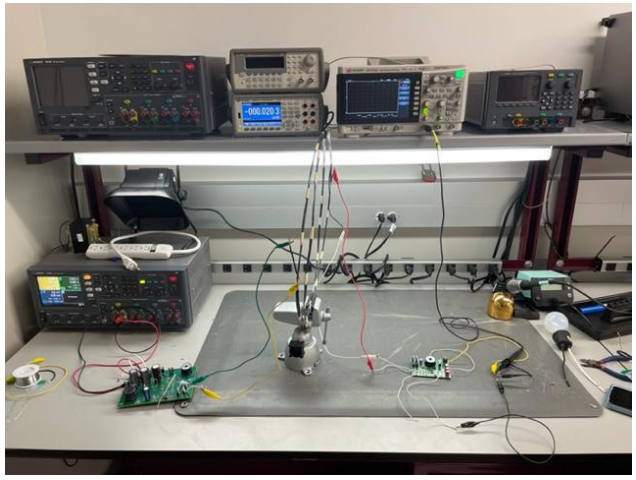
Item	Met
Inverter Voltage Supplied	Yes
Inverter Controller Supplied	Yes
Inverter Driving Load	Yes



Primary Design Accomplishments

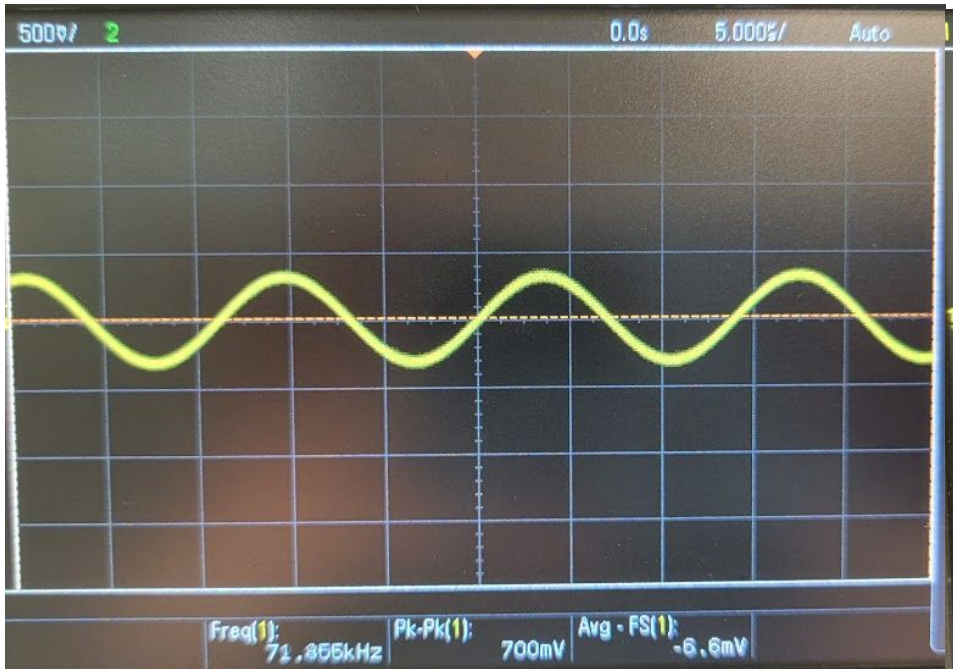
- Dual input power supplies
  - AC Input through a transformer
  - DC Input from a solar panel
    - Tested using DC lab supply

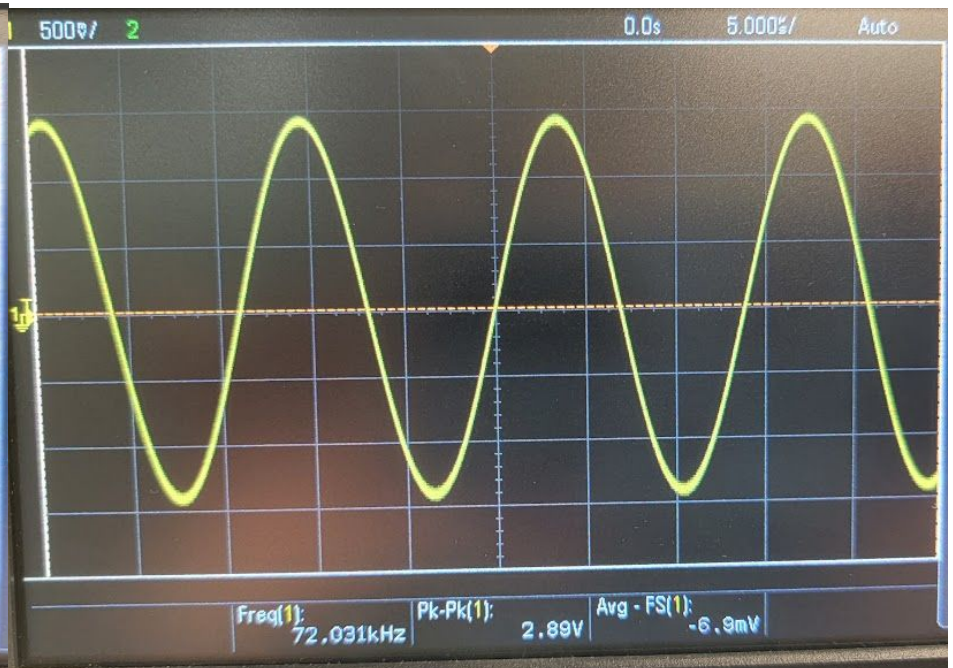




WPT Design Accomplishments

- Designed multiple coils for best design
- Compensated Original Coils for Resonance Operation



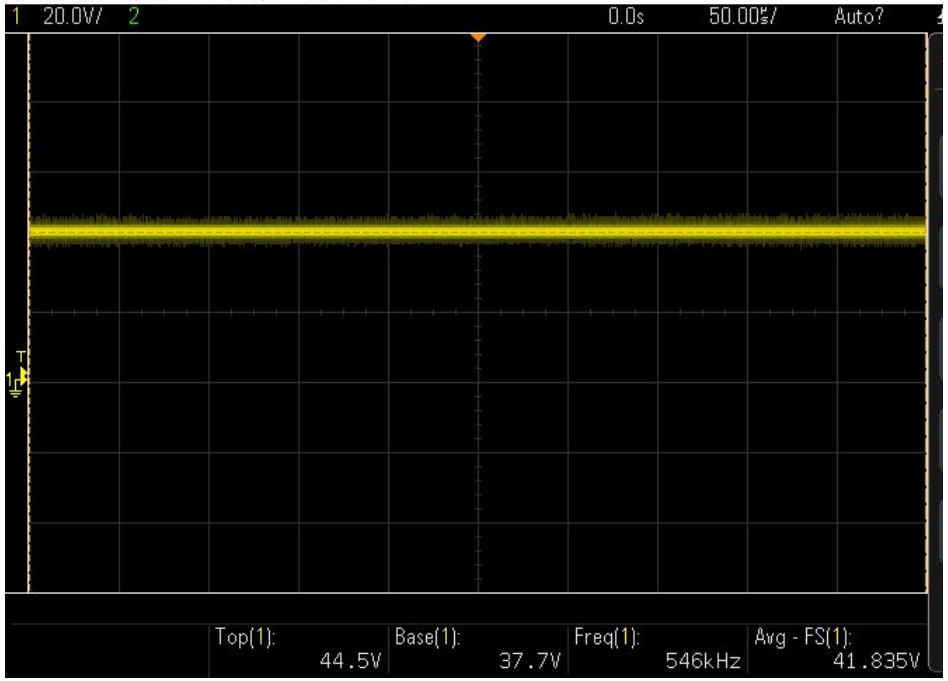


Secondary Design Accomplishments

- Rectifier provides DC output
- Boost converter provides extra push when needed
  - In case of misalignment

Secondary Design Accomplishments

Item	Met
Output Voltage at 40V	Yes
Output Current at 0.5A	Yes



Problems

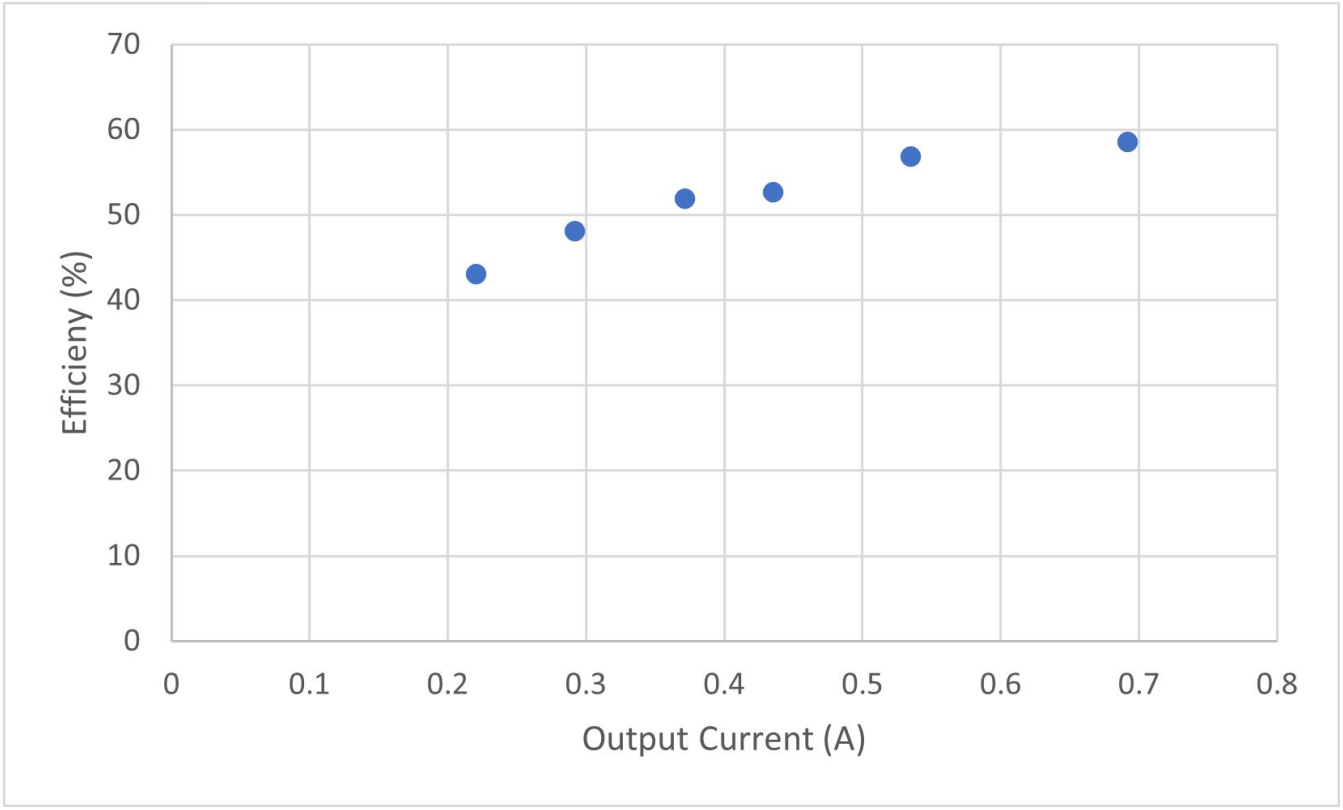
- Overheating of MOSFET
- Boost Converter Current Limit at high load

Solutions

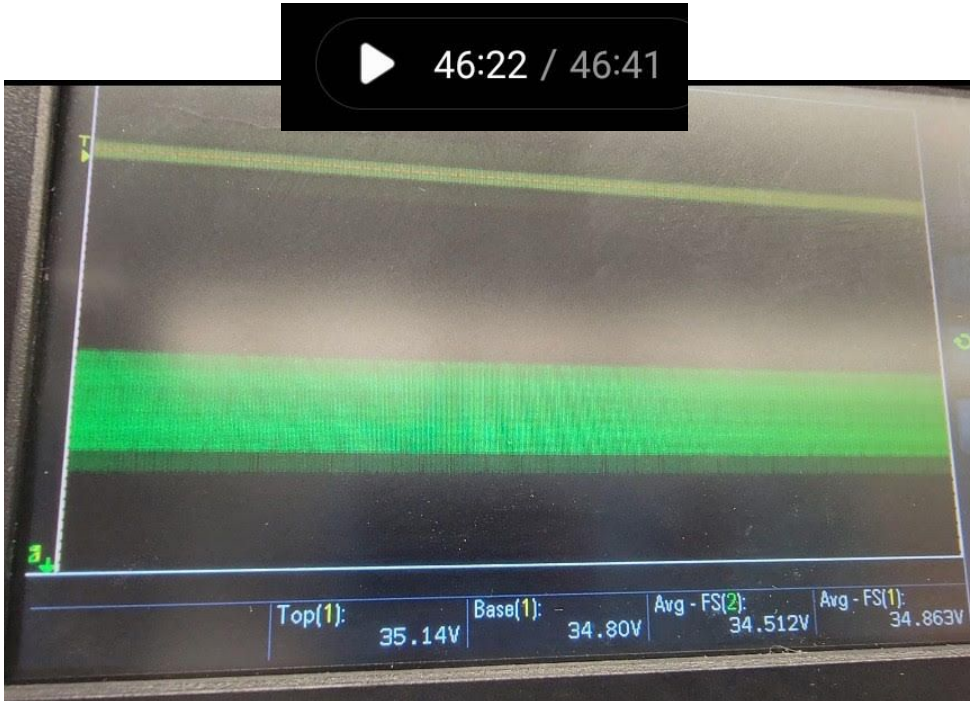
- Addition of a fan on secondary side
- Drive at higher voltage, possible change in capacitor configuration

Integrated System Results

- Resistive Load Transient Results



Battery Charging Results



https://youtu.be/croI2SQUdw8

Misalignment Test

	Measurement
Maximum Coil Separation Distance	2.54cm
Maximum Misalignment	5cm

https://youtu.be/uJhsu8lEdOo

Integrated System Results

Resistive Load Operation

Name	Value
DC Input Voltage	40V
DC Input Current	1.3A
Max Input Power	52W
Operating Frequency	72kHz
DC Output Voltage	40V
Max Output Current	690mA
Max Output Power	30.4W
Max Power Efficiency	58%

Battery Load Operation

Name	Value
DC Input Voltage	40.5V
DC Input Current	2.0A
Max Input Power	81W
Operating Frequency	72kHz
DC Output Voltage	36V
Max Output Current	1.9A
Max Output Power	68.4W
Max Power Efficiency	84%

Conclusions

- System is fully integrated
- Battery seems to have helped performance
- Further testing with battery charging is underway
- Sponsor approved modified validation requirements were met

Validation Plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Responsible Engineer
3.2.3.3	AC Input Operation	Charger functions with AC Input (120V) from wall outlet through step down transformer (40V)	Measure output with Oscilloscope	PASSED	Teddy
3.2.3.3	DC Input Operation	Charger functions with DC power supply input of 40V	Measured with Oscilloscope	PASSED	Teddy
3.2.3.5.1	Output 40V	Charger produces at least a 40V signal at output connection	Measured with Oscilloscope	PASSED	Alyssa
3.2.3.5.1	Output Current at **0.5A**	Output current of **0.5A** with load	Measured with multimeter over resistive load	PASSED	Alyssa
3.2.1.1	Efficiency	Charger has an overall power efficiency of **50%**	Measurement from scope used in calculation	PASSED	Both