

INTO THE WIND

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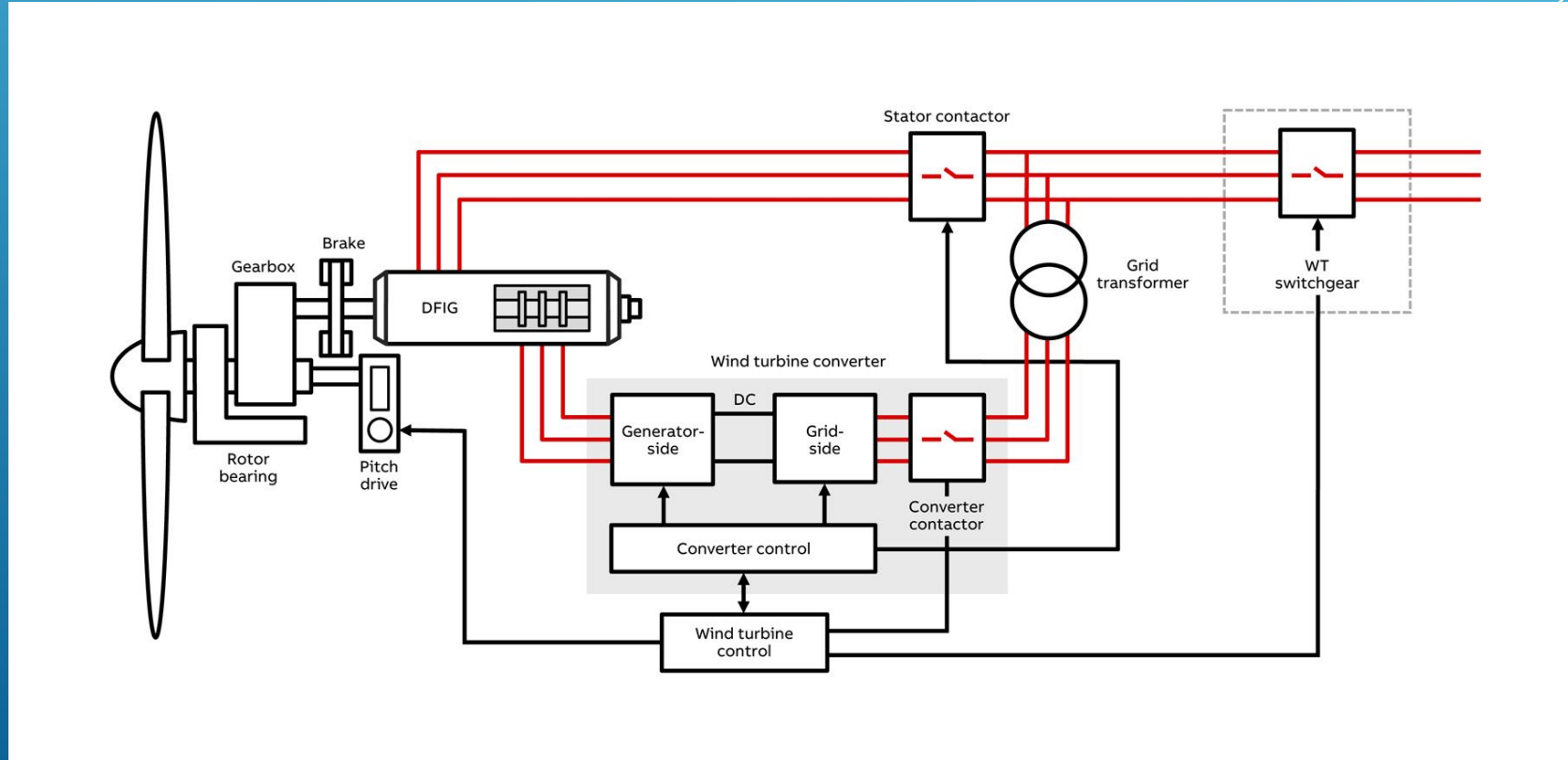
HERB HESS

Design Review 2

- OVERVIEW
- HARDWARE SELECTION
- SIMULATIONS
- COMPONENT TESTING
- SOFTWARE DEVELOPMENT
- BUDGET
- ENACTED PLANS
- PLANS FOR THE FUTURE

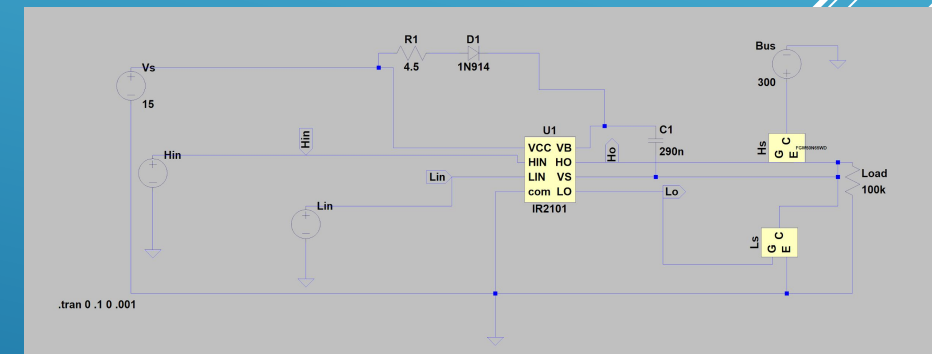
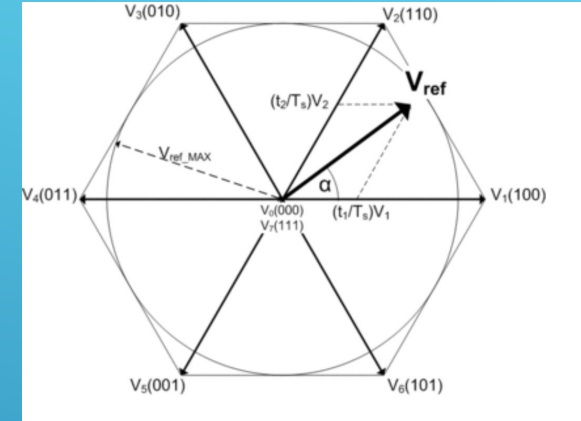
OVERVIEW

Goal: To build a machine that enables research on topics like subsynchronous resonance on a doubly fed induction generator (DFIG)



PREVIOUS TOPICS


- ▶ IGBT
- ▶ Gate Drive
- ▶ Single Leg Simulation
- ▶ uC Spec (STM32G474)
- ▶ Software Process
- ▶ Field Oriented Control/Space Vector



GANTT CHART

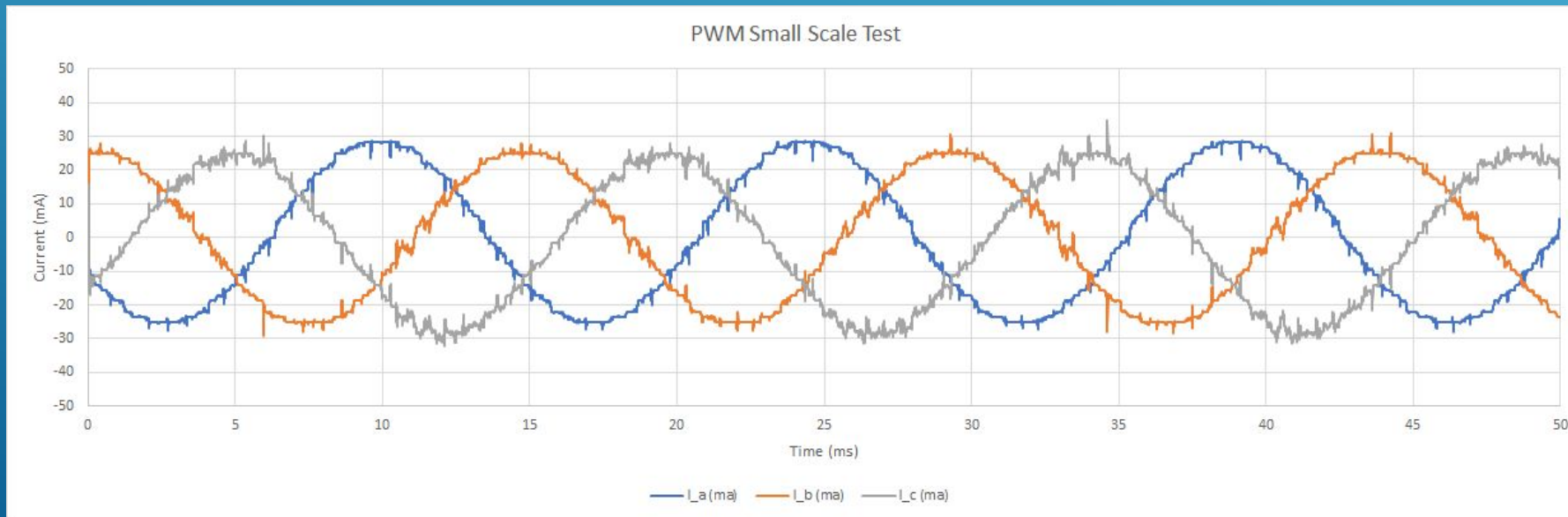
- ▶ Blue (BDR)
- ▶ Pink (ADR)
- ▶ <https://docs.google.com/spreadsheets/d/1iOVhLNAXKZ89FYX0XDfDzDFJ6ekhOAHjskBlyJlmeIc/edit?ts=5e3c9875#gid=0>

DQ SPACE VECTOR SIMULATION

- ▶ Commands in D-Q space
 - ▶ Determines switch state & times
 - ▶ Minimizes switching events
 - ▶ Simulates switching by controlling phase voltages (ideal switch)
 - ▶ Current in an R-L load
 - ▶ Active PI controller (current based)
- 
- A decorative graphic consisting of several parallel white lines of varying lengths, slanted upwards from left to right, located in the bottom right corner of the slide.

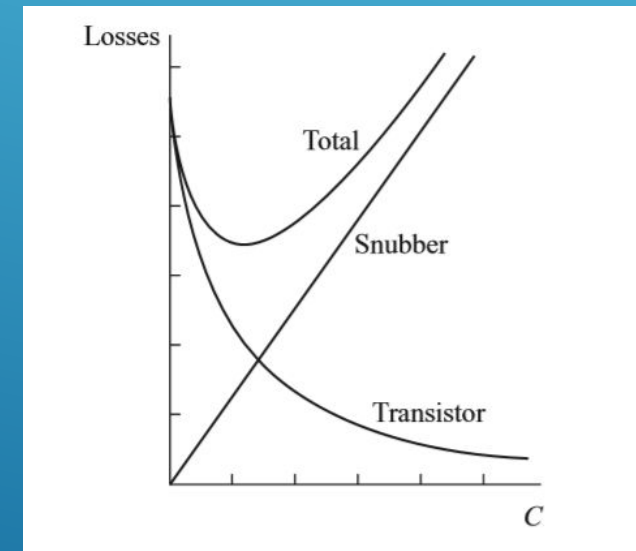
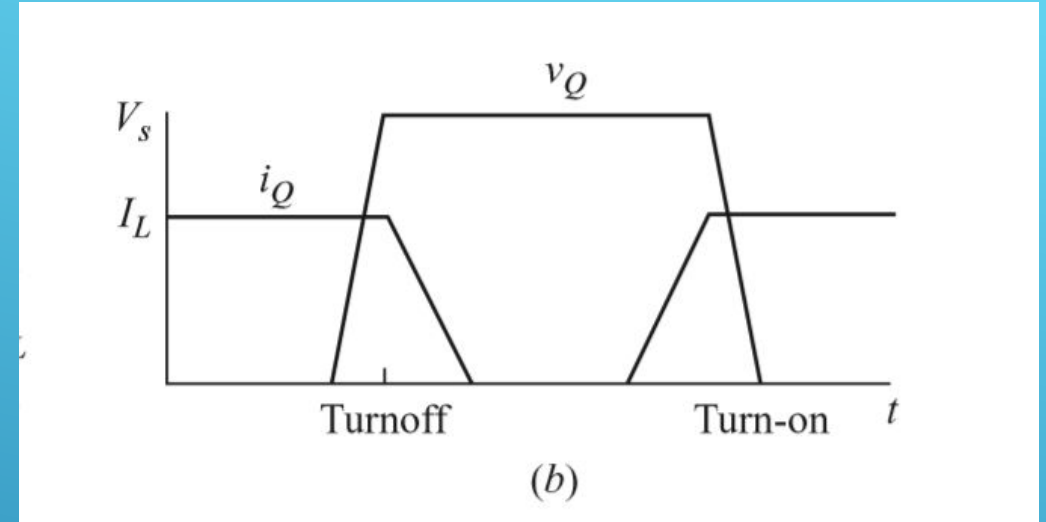
PWM SMALL SCALE TESTS

- ▶ Receives commands in DQ space
- ▶ Determines switch states and applies via center aligned PWM
- ▶ Utilizes Gate Drivers, Power MOSFETs, and a 3-phase Y circuit with R-L load on each phase



SNUBBERS

- ▶ Calculations
- ▶ Simulations
- ▶ Adjustments
- ▶ Finalized Choice



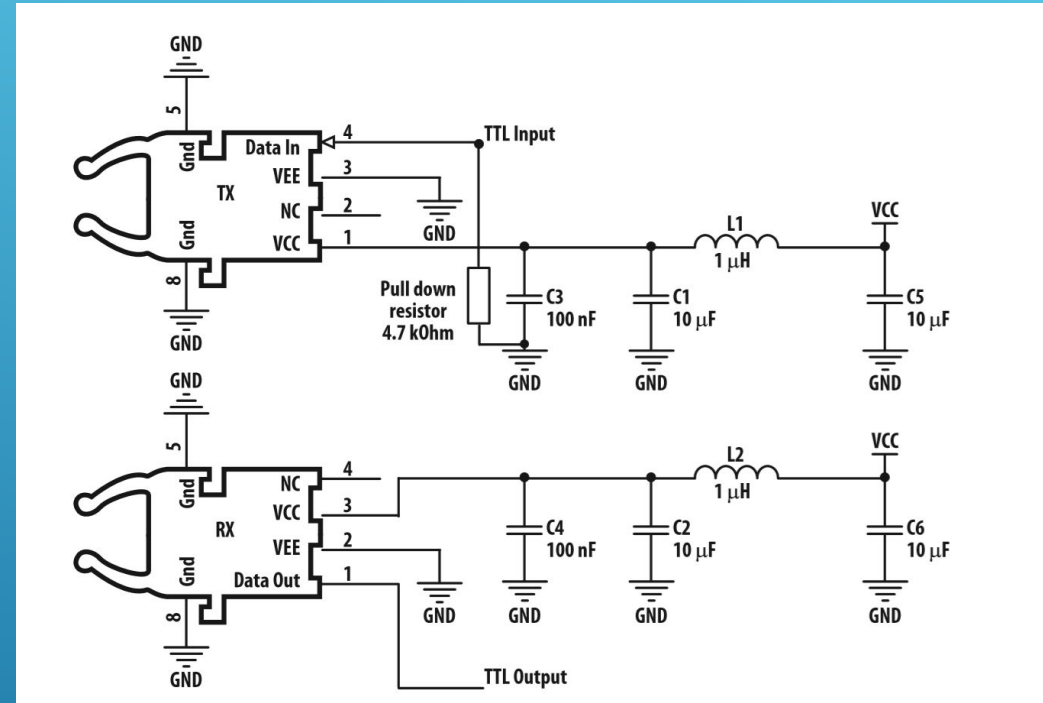
OPTICS

- ▶ Component Selection

 - ▶ 50 MBd

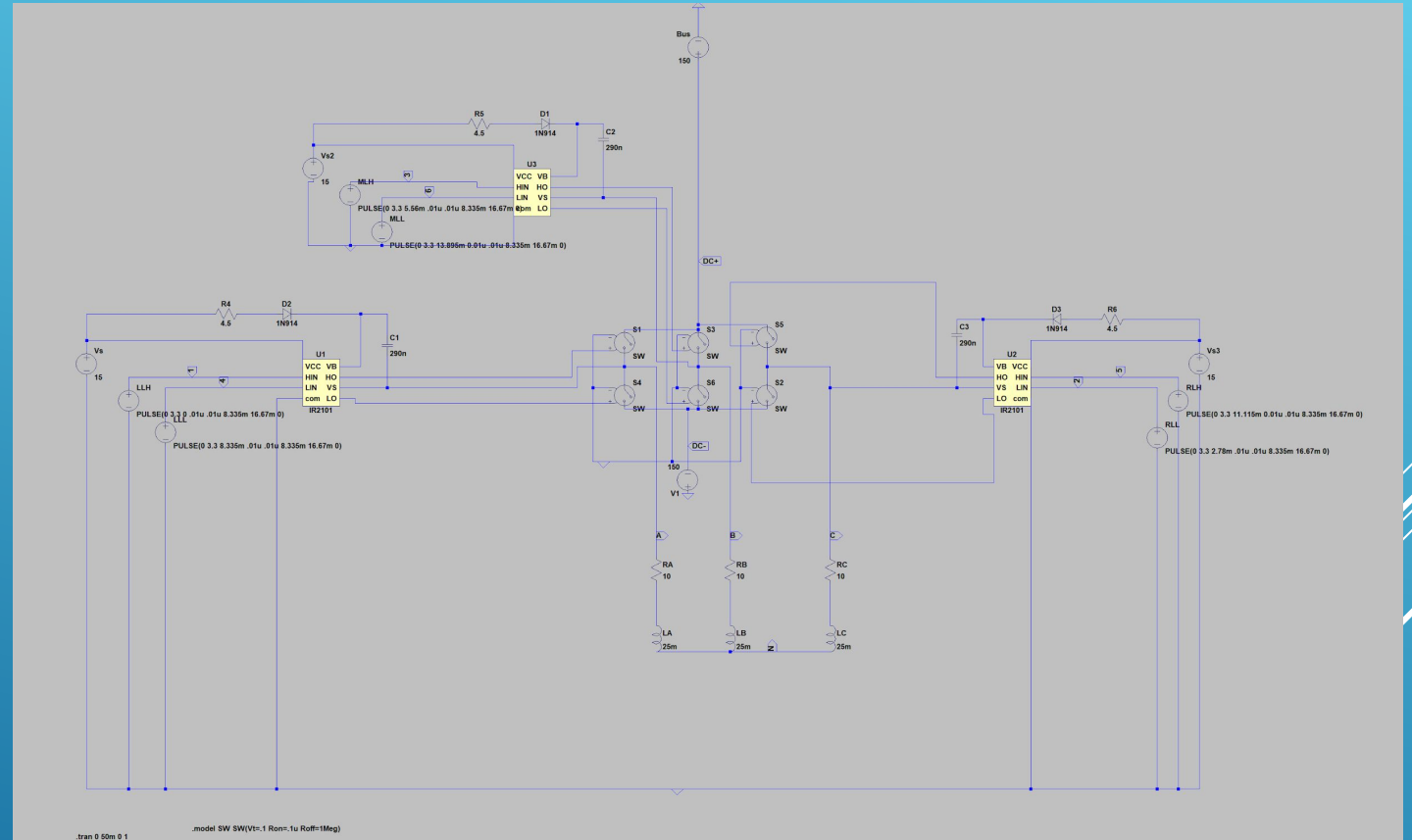
 - ▶ Cheap

- ▶ Noise



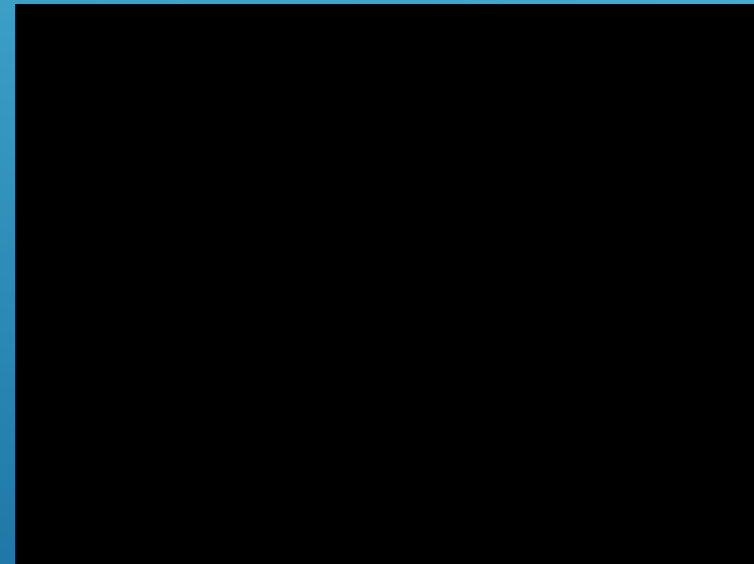
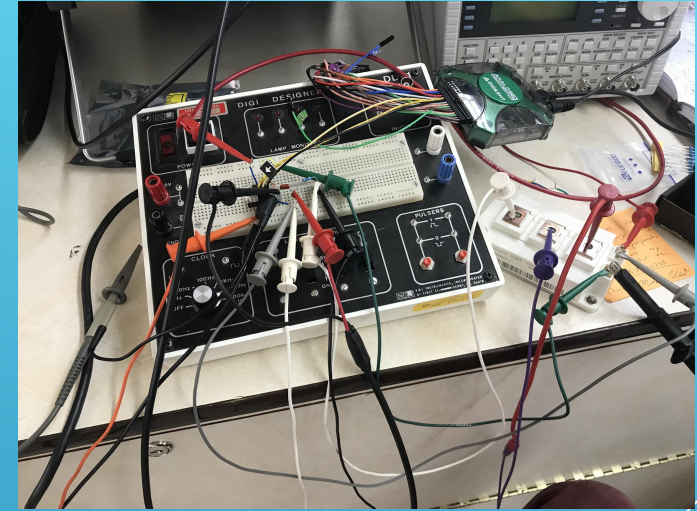
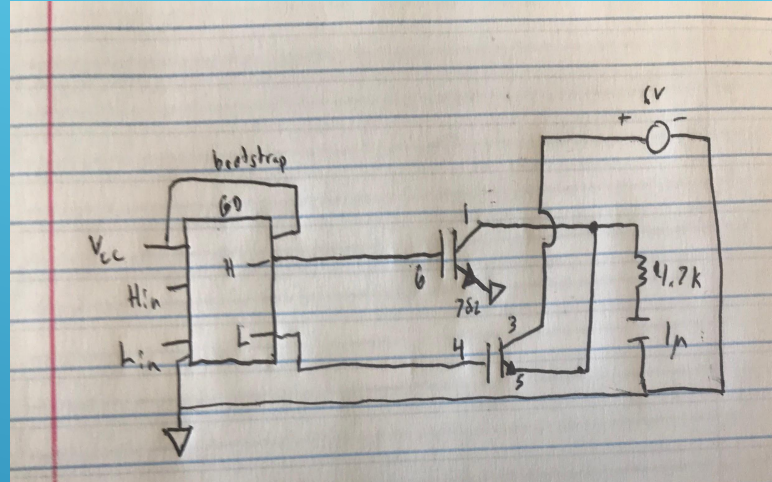
IDEAL 6 STEP

- ▶ Configuration
- ▶ Simulation




HARDWARE TESTS

- ▶ Gate Drive
- ▶ IGBT
- ▶ Optics
- ▶ Inductors

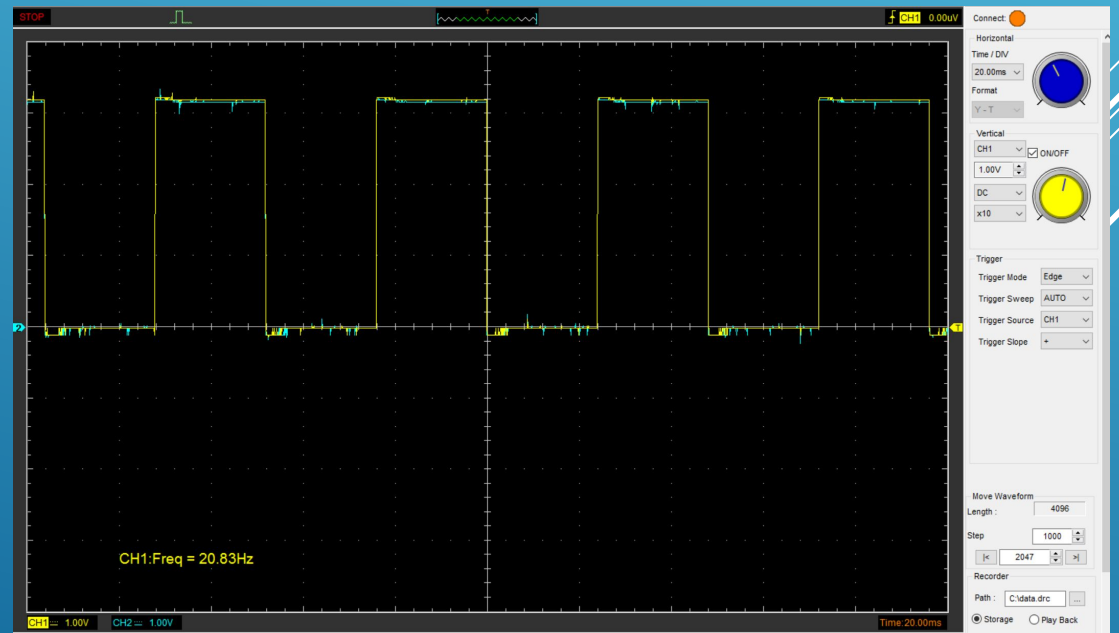
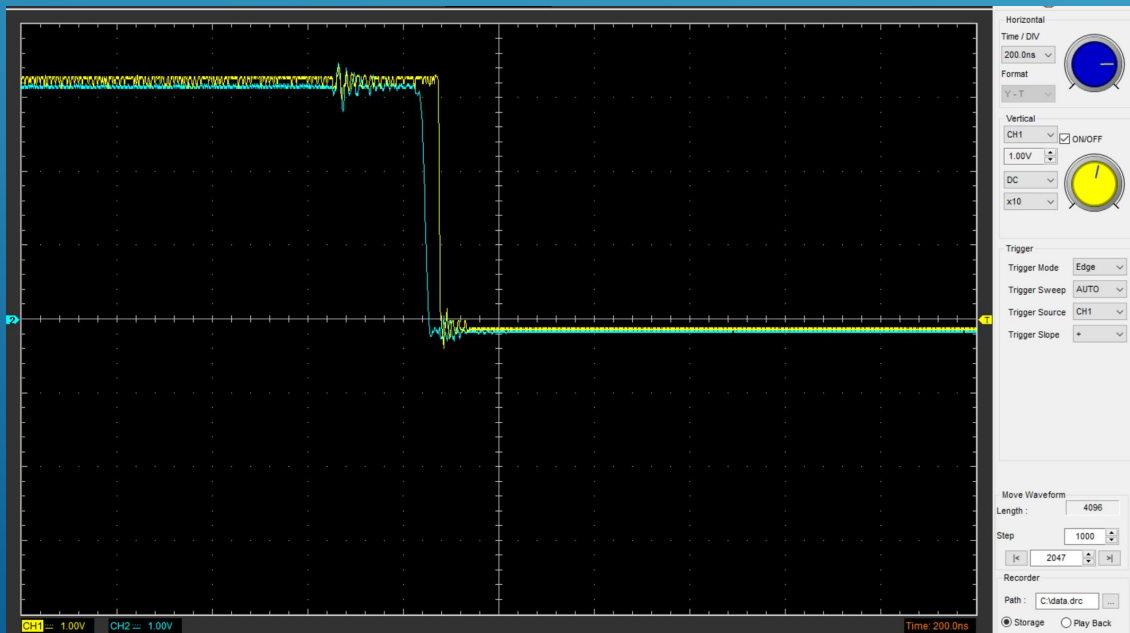
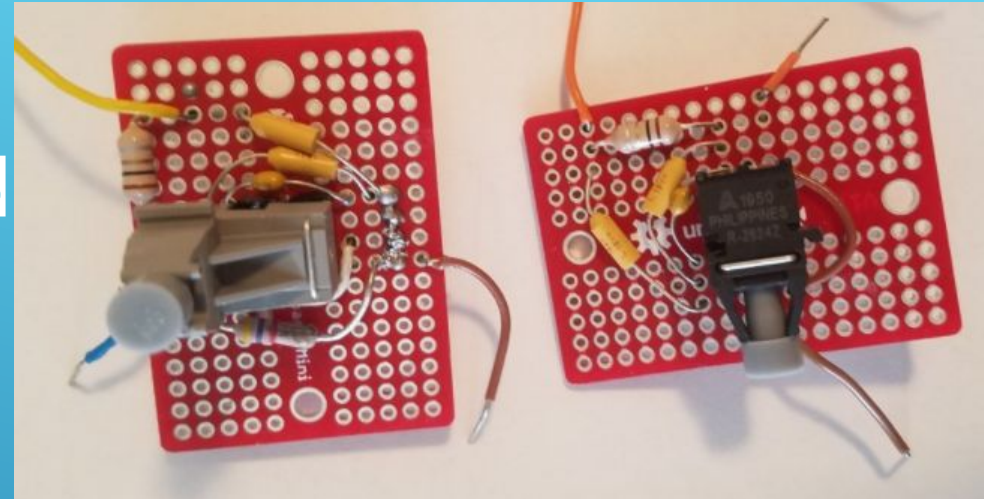


DESIGN DRAFT

- ▶ Snubber Connections
 - ▶ Power Supply
 - ▶ Spice
 - ▶ Further Additions
 - ▶ GD Fault Control
- 
- A decorative graphic consisting of several parallel white lines of varying lengths, slanted diagonally from the bottom right towards the top right, set against a blue gradient background.

PERF BOARDS & PCB'S

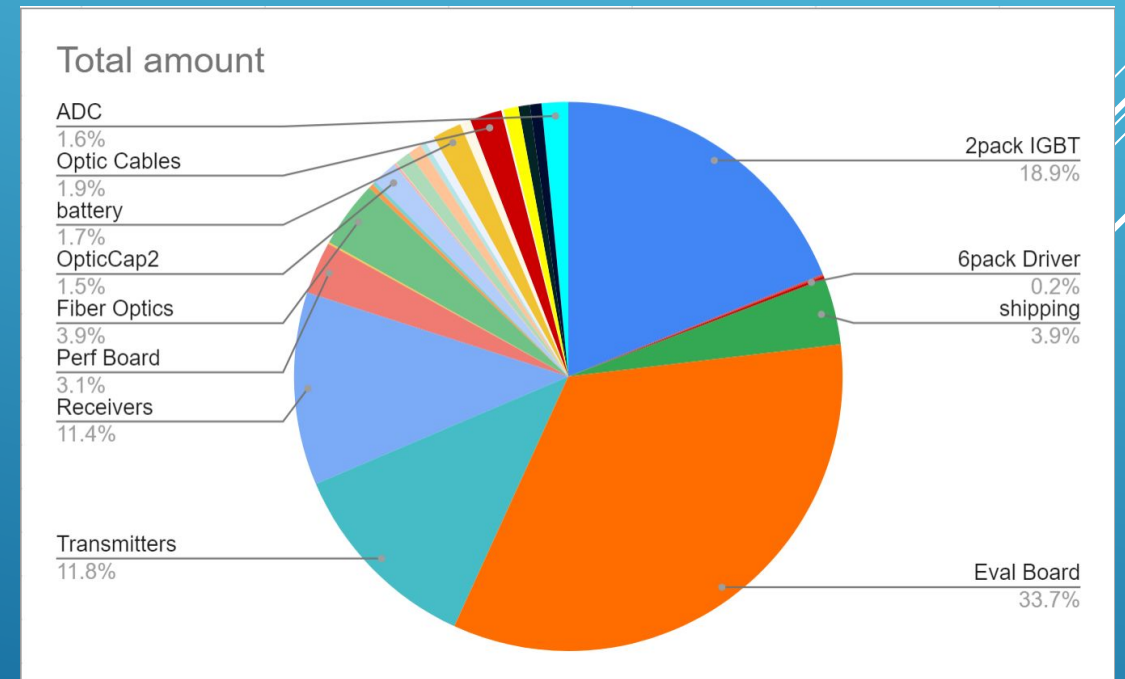
- ▶ 10 Optic Boards Built and Tested
 - ▶ 40 ns delay
- ▶ Eagle



BUDGET

- ▶ <https://docs.google.com/spreadsheets/d/1m d3HiLUdFwgxnfEHKfPMXHBftiNSOF3GV T5-ZfIH1 Q/edit#gid=0>

- ▶ Gate Drive/Protection PCB



FUTURE TASKS

- ▶ Gantt Chart (Red)
- ▶ <https://docs.google.com/spreadsheets/d/1iOVhLNAXKZ89FYX0XDfDzDFJ6ekhOAHjskBlyJlmeIc/edit#gid=0>

THANKS FOR LISTENING

