

EE/CprE/SE 492 WEEKLY REPORT 2

February 27th – March 10th

Group number: 29

Project title: Building Blocks and Sub-Circuits with Magnetic Field Generators

Client &/Advisor: Robert Bouda, Wei Shen Theh, Mani Mina

Team Members/Role:

Andrew Murphy - Circuit Design, Simulation and Testing

Steven Huynh - Circuit Design, Simulation and Testing

William Nichols - CST Waveguide and Coupler Models Designer

Michael Lopez - Matlab/Simulink Mach-Zehnder Model Designer

Umair Sarwar - Inductor coil in Comsol Designer

- **Weekly Summary** For this bi-weekly report, the team members continued to work on a variety of different goals. This week, we were informed by the ETG that our parts had arrived, which allowed us to conduct physical testings. To conduct physical testings, two members of the team incorporated all of our preferred components we've ordered onto the breadboard. From there, two physical models were developed for the circuit testings, one that was based on the Magnetic Field Generator circuit, and the other on the Zero Voltage Switching circuit. We continued our experimentation of CST as well as COMSOL. For CST, the focus was to develop a simulation for our waveguide. For COMSOL, we calculated the magnetic flux density of a spiral coil. We also continued to integrate a prototype of the Mach-Zehnder simulation in Matlab, we use a python code that our client provided for us and converted it in to matlab code. From there, we used the converted matlab code in simulink.

- **Past week accomplishments**
 - Andrew and Steven: Conducted physical testings after parts were delivered to the ETG. For the MFG circuit, a waveform was produced that generated a current of 12.6 Amps with a rise time of 40 nanoseconds(ns). For the ZVS circuit, measurements were conducted using two different MOSFETs to see the different resulted the measurements would produce. Using the CSD18504KCS MOSFET, a waveform was produced with a rise time of 56 ns and a current of 41 Amps, when the voltage from drain to source is at 3.5 volts. The ZVS circuit that contained the PSMN8R0-40PS MOSFET, the waveform produced a rise time of 40 ns, with a current of 41 Amps when the voltage from drain to source is at 1.25 volts.
 - Michael Lopez: finished creating general models for the Mach-zehnder with the

Magneto-Optic Faraday Rotator and without the Magneto-Optic Faraday Rotator within Simulink. Research into multiple methods on configuring the effects of the Faraday Rotator in Simulink to get the desired outcome.

- William Nichols: Studied methods of configuring waveguides into CST so it can be modified to various purposes for an actual waveguide.

- Umair Sarwar: Studied in computing ways for the magnetic density of a spiral for future integrations into coil design.

○ **Pending issues** *(If applicable: Were there any unexpected complications? Please elaborate.)*

- William: Unable to solve some problems in CST. Unable to get both the upper and lower frequency bounds in the waveguide to be the same. Both bounds seem to change without any input, and are unsure about how to change it.

- Michael Lopez: The output waves from the simulation do not match what is currently being expected within both models of the Mach Zehnder. Goes against research and computations made for the Mach Zehnder.

○ **Individual contributions**

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Andrew Murphy	Create KiCad footprint, Update KiCad PCB designs.	18	86
William Nichols	Studied Waveguide design and started working on creating a Mach-Zehnder loop in CST.	9	70
Michael Lopez	Creating a Mach-Zehnder Optical Simulation within MATLAB/Simulink	14	114
Steven Huynh	Assisting in KiCad PCB design, Researching Compatible parts for physical testings	17	53
Umair Sarwar	Created Spiral Coil within COMSOL using 2D Model and attempting to verify magnetic flux density by hand.	8	58

- **Plans for the upcoming week** *(Please describe duties for the upcoming week for each member. What is(are) the task(s)? Who will contribute to it? Be as concise as possible.)*
 - Andrew and Steven: Develop PCB design to submit to ETG for ordering
 - William Nichols: Worked on a Waveguide and Mach-Zehnder loop in CST.