

EE 491 Weekly Report DEC15-17 Week 20 (10/06/15-10/12/15)

Advisors: Dr. Ravi Hadimani and Neelam Prahbu **Client: Iowa State University**
Members (roles): Marion Okoth (Team Leader), Elizabeth Clarkin (Website) and Matthew Mulloy (Weekly Reports)
Project Title: Magnetic Sensor Design.

Weekly Summary

The main goals this week were to evaluate current progress for Marian and Elizabeth and begin preparations for instructor meeting.

Meeting notes:

10/12 [Group Meeting with Advisors](#)

Duration: 60 min **Members Present:** All

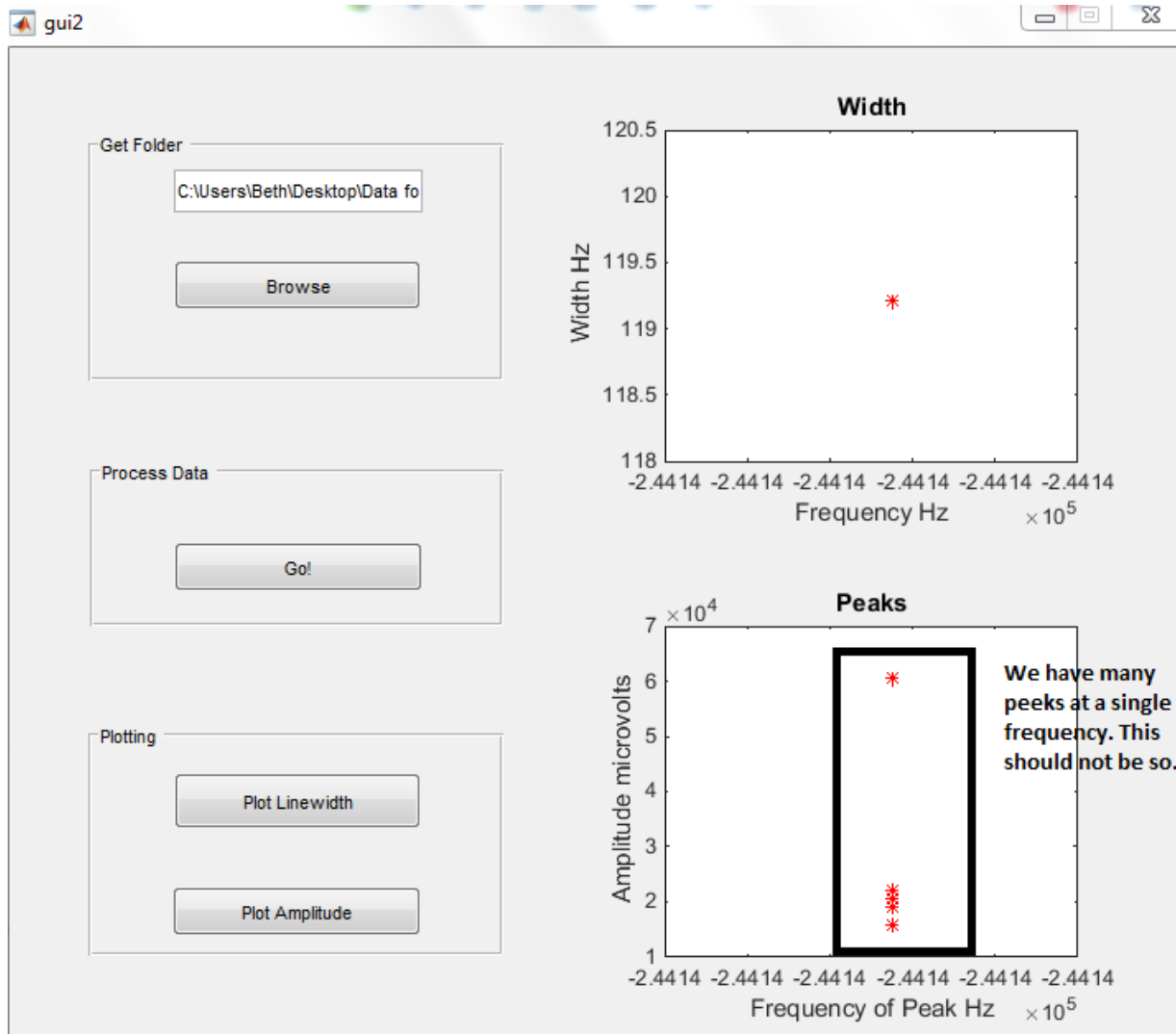
Purpose and Goals:

This week's goal was to evaluate current progress and discuss future work.

- Matthew
 - Polymer creation
 - Non-magnetic
 - 3-D printing
 - Shielding requirements
 - Material cost
 - Material relative permeability
 - Material flexibility
- Marion
 - PI 55, SA 70, ISU ferrite measurements results
 - Shielding increased # of resonances
 - Resonances are weak and may be an amplification of noise
 - Shielding box removes noise, allowing hidden peaks
 - Possible causes of resonances
 - Material imperfections
 - Reflection due to load mismatch
 - Line not matched to source
- Elizabeth
 - Chebyshev bandpass filter, 5th order
 - Circuit matches load at 50 Ohms
 - Attenuation in frequency vs dB
 - Limit of attenuation reduction

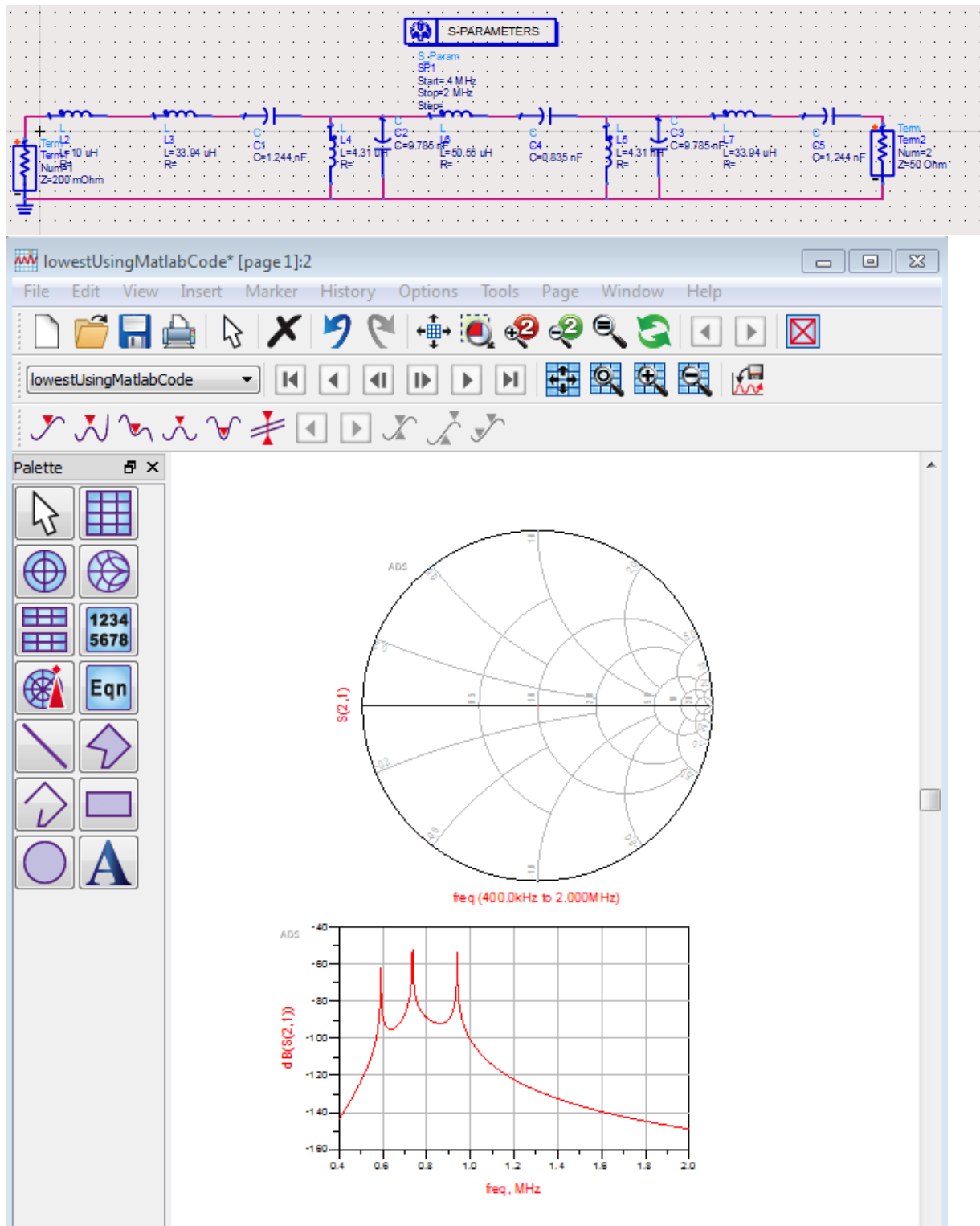
- Circuit creation
- Software
 - Can read multiple files
 - Frequency incorrect
- Frequency width dependent on materials

Elizabeth's Current Progress



The software currently handles multiple files and the the problem of detecting the wrong peek has been fixed. Currently there is an error that returns the same peek frequency for a given material regardless of the input frequency. I am searching for the source of this error. An image of this error is attached to this email. Because we are still getting multiple peaks I do not believe the error is in the way multiple files are handled. Moving forward I am looking at the Fourier transform to determine if it is being executed in correctly. This is being done by running the code on files of data with known transforms and seeing if the results comeback correctly. When they don't, I try running them with just the fft function. In this way I can work back adding layers of complexity until I find the error.

Impedance Matching Progress



This is the current version of the impedance matching circuit as well as the simulation results. This is for 0.6 to 1 MHz. As you can see from the Smith chart the impedance is mostly normalized. We are worried about the ripple that comes with the Chebyshev filter if these will give us some false resonances but we believe they are small enough to be ignored.

Pending issues

1. Semester documents
2. Semester goals

Individual Contributions (this week)

Matthew Mulloy: Attended the meeting, COMSOL simulation, weekly report (5 hrs.)

Elizabeth Clarkin: Attended the meeting, ADS, Chebyshev Filter (8 hrs.)

Marion Okoth: Attended meeting, wide pulse measurements on PI55, found 33 resonances, ADS broadband impedance measurements, Chebyshev Filter (11 hrs.)

Total contributions this semester

Matthew Mulloy (28.5 hrs.)

Elizabeth Clarkin (26 hrs.)

Marion Okoth (30 hrs.)

Total contributions for the project

Matthew Mulloy (135 hrs.)

Elizabeth Clarkin (159 hrs.)

Marion Okoth (120.5 hrs.)