15 Feb. 2012

Chapt. 2 ELEC 340 TA Lab Log Progress Report

TA: Philip B. Alipour

General Log and Notes:

1. What happened in the lab?

i. Session Started at 1:30PM. The formal duration is 1:30 to 4:20PM.
ii. Total of 16 students were present, 3 students were absent and shall not be attending the forthcoming sessions
iii. Marking results handouts and comments were given in form of slips on the students for their lab report's electronic submissions
iv. Unfortunately, I had to dismiss the students 40 minutes early on the day, since they all had exams exactly at the time where the lab finishes. So they weren't focused and all were under stress.
v. However, I helped them out and checked whether they would be able to run sine plane simulations, and asked them questions on how they would be able to conduct proper analysis, discretize, explain different field types, parameters, vectors and relevant data extraction. So, for the first part (inclusive of the theory behind the planewave), I made sure they understood how to build a cavity field and analyze the field effects (also showed them how to use the tutorial and other examples/features of the program).
vi. Although this was the case with most students, due to Point 1.iv they couldn't finish up the magnetic plates for their resonator construction with field fully. So, they were asking for permission to gain access to the lab so they could finish up their report before deadline.
vii. **Prof. Poman So** (the main course instructor) was informed about this via email dated: Sat, 16 Feb 2013 09:15:33 0800. His solution was to distribute the **MEFiSTo** software via email to students so they could work at home and submit reports on time.
viii. All relevant electronic versions with results from the lab are to be submitted before Sat, 12.00 AM March 2nd 2013.
ix. Further, outside of the scope of the lab manual, where students needed hints for solving a problem had constructive feedbacks and interactive discussions to clarify a concept upon design and analysis.
Note: It was emphasized that students should finish their work in groups of two, and of course, possibly giving hints to each other for better usability of tools and not the solution per se, unless asked from the TA in person. However, the outcome was satisfactory and the overall marking was based on the efforts and progress of the students made on this lab session.
x. Based on the required students' progress throughout the major sessions specified at http://www.cerl.ece.uvic.ca/poman/Courses/ELEC340/ELEC340.htm, it is mandatory to attend all labs punctually and no later. It is deemed that all pairs have an equal share of participation. No attendance is deemed as 0% even when a group report is submitted on behalf of the individual.

Notes for the Attending Students on the forthcoming lab sessions:

1.1. Additional info on theoretical analysis

Lab manual on the theoretical discussions, and running planewave Gaussian simulation between pp. 18-22 of the lab manual, have been further elaborated in Sect. 2.2 below.

1.2. Details on parts that the students found challenging
Discretization, Planewave simulation analysis and resonator design integrating the planewave simulation into its cavity. See section 2.2 below.

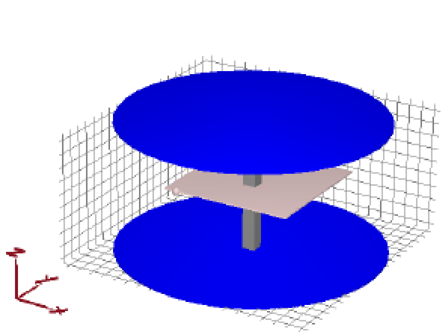
2. The lab report
Must abide by the content structure required in your lab manual. In addition, answering to the four questions for this session. Bonus marks for an extra 5% of the 100% lab mark is considered for those who include planewave simulation and explanation for a normalized plane.

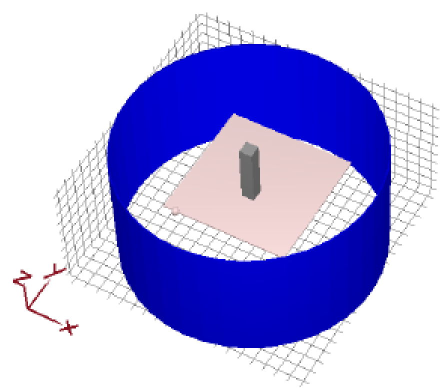
2.1. Deadline for submission: for this session is Saturday Feb. 2, midnight 00:00 hours before Sunday.

- **Late submission policy:** 25% reduction of the lab mark per day
- **marking scheme(?):** x out of 100% which will be converted to 5% of the total course mark.
- **Format of front page:** as given in your lab log, including student names and ID for each 08-group.

2.2. Additional hints for what should be in the report

Basically, the current problem is to create a resonator useful for RLC circuits which in principle includes both, **capacitance** and **inductance** (a capacitor and inductor). This validates Faraday's law of induction as well as capacitance. So you could answer the lab questions 1 through 4 by this, once you have successfully completed this task in designing it and exporting + extracting the relevant data for your analysis.

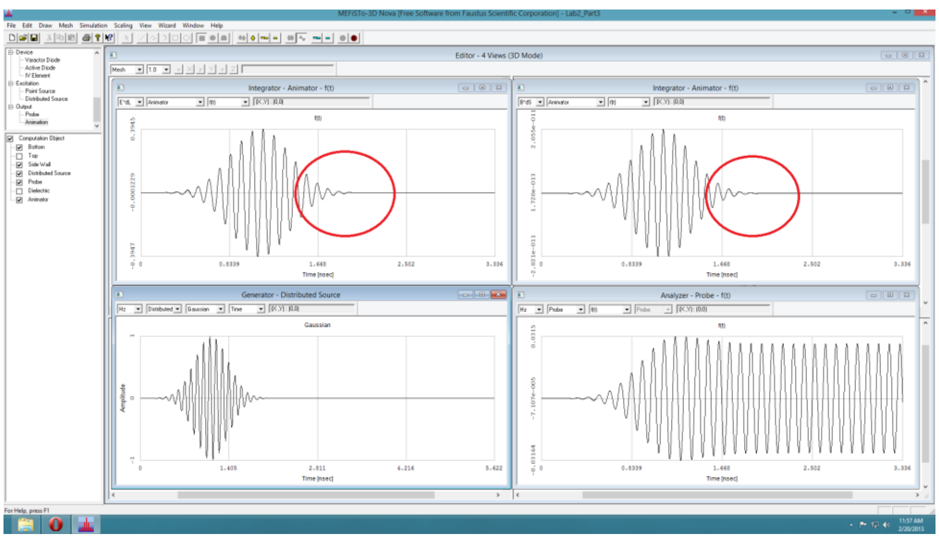




The following is a problem encountered by one of the groups (for confidential reasons on the internet, I had to name them as X and Y, unless otherwise permitted)

> Date: Wed, 20 Feb 2013 12:03:41 -0800
> Subject: ELEC 340 Lab 2

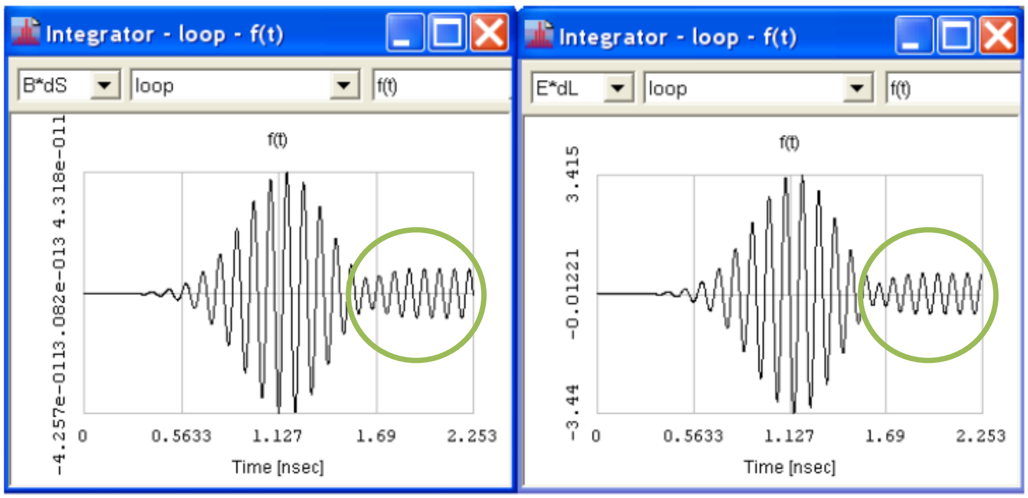
> From: xxxx@xxx
> To: phibal12@uvic.ca
>
> Hi Philip,
>
> Y and I have been addressing some questions that arose during Lab 2.
> Now that we have the software, I have been redoing parts 3-5. Our problem
> is that we can't seem to obtain the tail section of the integration
> waveforms that are shown in the lab manual. For example, in Part 3 we're
> asked to verify Faraday's Law. I believe that we have our parameters set
> as described in the manual. I have attached a screen shot of our output.
> Our f(t) waveform shows the energy resonating after the excitation has
> died away. However, as I have highlighted in the screen shot, we are
> missing information in the integral waveforms as shown in lab manual
> figure 2-8 on page 25. Any insight you could provide would be much
> appreciated.
>
> Cheers,
> X



From: phibal12@uvic.ca
To: xxxx@xxx

1- The design consists of both components. Have you checked whether the wall is included in your design (Fig. 2.7 b)? Furthermore, have you *discretized* under mesh and simulation tools (remember this is the student version, so no worries if the E or H-planar support is disabled)? You need to discretize your way of data being displayed and thus recorded.
Note: The term "discretize" stands for making the data pattern discrete and concentrated on a very specific frame of your interest (not a great range from e.g. -1 to 1 of real numbers, just say between close to -0 and +0 dependably. This makes all producing/expected values in-bound of your specified range of data).

2- You have to make sure all your frequencies are confined in the circuit so to preserve voltage oscillations between magnets (the cavity/hollow part of your design) and their loop. Otherwise, any energy type dies out and you won't see any tuned flux after excitation (from source) supported as a waveguide. Think of it as a microwave Cavity where standing waves circulate repeatedly in it (your **f(t)** or frequency in Hertz). Meaning that, if this is not assured in your design, you have lost the capacitance bit as well as inductance (generating voltages), proportionally. As shown below, this is expected according to the log, hereby circled **to maintain a continuous frequency**.



Therefore, the design is incomplete or contains leaks. So check for these two. I'll raise this in the lab-log as well.

3- Remember, what we are exciting is the atoms in the plates (resonators), to produce charges, one + other -, thus, the flow from one pole to another, minus to positive.[1] So you are in this case generating voltage. You must maintain this, i.e. conserve it as an E-field between the magnetic plates (cavity/hollow).

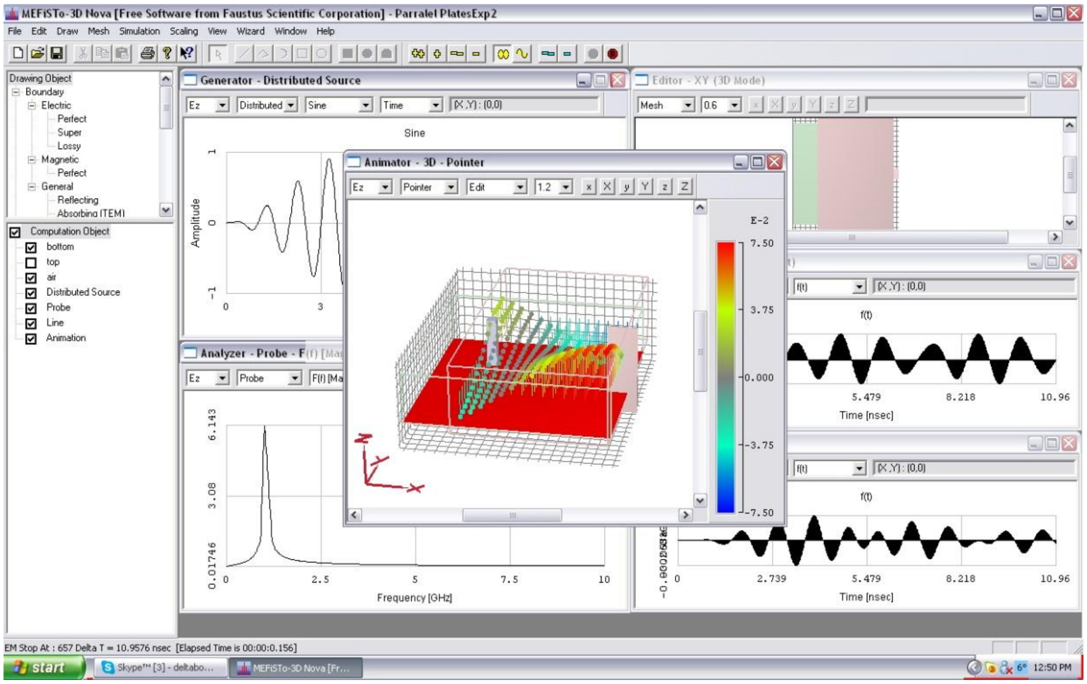
4- To guarantee this process, you must have the wall and specify its bounds relative to plate radius as explained in your manual. Remember, in your installed files you also have the tutorial. Find discretization. There are also tutorial examples in its relevant folder.

5- To make sure everything is OK, run Gaussian analysis just like the Cavity to see where the excitation occurs and the harmonics of the charge flows in your cavity. For a tuned representation of the field, which is perfectly shown on page 22 by mapping its principle to your design, you may see whether you have capacitance.

6- About inductance, it is pretty clear. The resonator must have an S shape plane or (Co-)Sinewave between the magnetic plates (denoting the magnetic field H) maintaining an amplitude frequency between -1 and 1, as well as an E-field between 0 and 1 with shape of a hilltop just like the one produced on page 22 (See the frequency diagram next to the

[1] From the standpoint of Physics, it's negative to positive. The particle responsible for electricity, the electron, has a negative charge. In, for example, a battery, the negative terminal has an excess of electrons and the positive terminal has a deficit. When the two terminals are connected, the electrons begin flowing from the negative to the positive (then back to the negative, internally in the battery).

Examples at http://en.wikipedia.org/wiki/Resonator). I presume one group produced this during the lab.



Once you're done with in-bound checks and S-plane simulations in your simulator, then any data produced in your analyzer and generators would validate Faraday's law, since the ***continuation of the waveguide is now preserved within your cavity***. You may include these results in your report in a collective manner (one to three multi-view screenshots, on the simulated planes, and results in a tiled up fashion).

7- About error estimations and reductions, the hint is in your control data attributes for say a generator, the margin of error is generated and by reducing the steps, reduced by the program (see pp. 22 and 77 of your Tutorial). But you may conduct your own deviation or uncertainty calculations once you have made sure these components are included in your design prior to data analysis.

8- For Plane wave simulations, the screenshot I have attached next to the problem raised by X, suggests the *pointer* view analysis in the animator rather than areal/integral type for accurate measurements during data export.

2.3. Questions for bonus marks

i. Just answer the lab manual questions (the four questions), and in general include the planewave parts on or between the magnetic plates (within your resonator) and if possible the normalized form.

ii. Normalized plane(wave) means that no charge or particle is jumping outside of the cavity bounds or leaks happening. A normalized space is a space where the probability of almost all particles = 0.99 (below 0.9 or < 0.8 is not good and there is some significant leak happening, hypothetically speaking) remain within the bounds of the space. In this case, your "cavity" once you have properly discretize the shell and your plates inclusively. If your plane is pretty normalized during simulation steps you should not experience erratic spikes. Each erratic spike (a great jump) means there is either a leakage or a sudden flow (surge) which is not good and abnormal. A tuned state is when all charges are bouncing up and down between the +/- poles of the parallel plates in your resonator within the given bounds.

iii. If you include this, it means you have applied the cavity model from page 22, and its wave simulation properly to your resonator. Explain in the pointed flow just as I have explained/illustrated before in a screenshot (on p. 4 of this log), what is actually going on in terms of charges between the plates, the point of excitation, etc.
<u>This will indeed gain you the total bonus marks.</u>

iv. You may include this analysis to get extra marks. But remember to answer the questions in the lab manual since this is part of your report.

3. Next lab

3.1. Date: 8^{th} March 2013

3.2. Swapping: Must email both your TA and the main course instructor, Prof. Poman So, say in case of being absent, or need to take a session with another TA on a later date, or similar issues.

3.3. Objective of the lab

See Experiment 2, Sections II and IV of the manual.

3.4. Prelab/ other requirements

See Experiment 2, Sections II and IV of the manual.

Have a productive week,

With best regards,

Philip B. Alipour,
Ph.D. Fellow Researcher in Electrical Engineering,
Dept. of Electrical and Computer Engineering, University of Victoria, V8W 3P6, Canada,
Office: ELW Room # A358,
Homepage: http://web.uvic.ca/~phibal12/