ECE 403 **Final Report Guidelines** **Spring 2017**

Univ. of Illinois **Version 1.05 April 23, 2017** **Prof. Allen**

1 Overview

Each student should submit (1) a copy of the report of their group, and (2) a short personal report.

1. **Group Report (DUE Friday 5/5)**: Your group report should be in the form of a scientific report, and cover all the required material, as described in the rest of this document. In previous semesters, the reports have been 10-20 pages in length. Depending on your font size, number of figures, etc., your report length may vary - it is most important that you are thorough and meet the requirements stated below. We strongly recommend that you use LaTeX to write your report. You can also use LaTeX online using such sites as https://www.overleaf.com/ and https://www.sharelatex.com/.

2. **Personal Report (DUE TBA, probably after presentations)**: A few pages should be sufficient. In your personal report you can make comments about how things went for you in the class, and in your group. If you felt one of the group members did not do his share of work, this would be a good time to mention that (kindly).

Group presentations will be held on **Monday 5/8** (more information to follow). You will present your report as a group. Each person should speak (e.g. each person should present a few slides). How you divide the presentation is up to you.

2 Report Content

The core of your report should cover Labs 3-6, analyzing the loudspeaker. For instance, we estimated the Hunt parameters using multiple methods - explain these methods and compare the results. You can also use your Hunt parameters to predict your pressure measurements, then compare predicted and actual results. In the theory and methods sections of your lab report, you should demonstrate understanding of two-port network and Hunt parameter methods.

Your report should include, at minimum, the following topics covered by these labs:

1. Loudspeaker electrical impedance measurements:
   - Loudspeaker electrical impedance cone unloaded
   - Loudspeaker electrical impedance with speaker cone blocked (which Hunt parameter does this measure?)
   - Loudspeaker electrical impedance with different masses placed on the speaker cone (Lab 3 mass calibration to estimate the Hunt parameters, Z_e, Z_m, $T = B_0 l$)
   - Loudspeaker electrical impedance with speakers face to face (Lab 4 reciprocity calibration to calculate the Hunt Parameters)

2. Pressure measurements using the ER-7C microphone:
   - Electrical-to-pressure transfer function (Lab 4 & 5)
   - Two-cavity Thévenin calibration (Lab 5). In HWe we predicted the Thévenin parameters from the Hunt parameters - try this with your data

- Radiation impedance (Lab 6), calculated using a pressure measurement along with your Thévenin calibration

You may also wish to include measurements of the low-pass and Twin-T networks (Lab 2) or other measurements (Lab 7) in your report.

3 General Guidelines

Document structure

A standard scientific report includes **Introduction, Methods, Results, Discussion, and Conclusions** sections. The goal of your lab work in this course is to analyze a loudspeaker. You may perform several experiments to do this - therefore, you can write up each experiment separately, or break your sections (e.g. Methods, Results) into subsections detailing each experiment. ***It is very important to include the theory behind your measurements in the Introduction and Methods sections! You can get a good grade even if your measurements are not great, by showing that you understand the theory and experiments.***

You really should use LaTeXto make your report look nice. We will place a template on the website for you to see how this is done. Once you have the LaTeXfile, the commands to generate the pdf are **latex file.tex; dvipdf file.dvi**. This will result in a final output file called **file.pdf**.

Figures & Equations

All figures should be clearly labeled, with text that is **large enough** to read easily. Units should always been included, where applicable. There is a nice command that you can put at the top of your Matlab script which will increase the font size everywhere: **set(0,'defaulttextfontsize',24);**. You can cite references such as Kim and Allen [2013] in text or in parenthesis [Kim and Allen, 2013]. Note that the template file 'mybib.bib' may already have some references you can use.

Use labels that make sense such as **xlabel('Frequency [kHz]')**. Use loglog scales. You can refer to your figures (e.g. Fig. 1) using LaTeX's '
label' and '
ref' system. You can also make equations (that look nice!) quite easily, after you learn the syntax. You can have Equations with numbers, without numbers, multi-line equations, and so on.

$$X_{dogs} = \lfloor \sqrt{N} \rfloor \tag{1}$$

where N is calculated as[1]

$$\begin{aligned} N &= 1 + \frac{Y_{people}}{Z_{gramophones}} - X_{cats} \\ &= \frac{Y_{people} + (1 - X_{cats}) Z_{gramophones}}{Z_{gramophones}}. \end{aligned} \tag{2}$$

References

N. Kim and J. B. Allen. Two-port network analysis and modeling of a balanced armature receiver. *Hearing Research*, 301:156–167, 2013.

[1] if N is negative, you may have a cat problem

Figure 1: Here is an example caption, about Nipper, the famous gramophone dog.