

USU SPS Tesla Coil Speaker Interim Report
Submitted by Ethan Lindstrom, USU SPS President, June 15, 2008

We initially met as a presidency with Ryan Hoffman, the graduate student advisor for the project, and developed a plan achieving the project goals. We decided to hold a first meeting with the whole group (of 20-25 students) to go over the plans and schedule for the project, as well as to have a small presentation on building circuits for those who had not done so before (a large fraction of the group). At that meeting we formed three teams to build the subsystems for the tesla coil speaker. A project leader was chosen (Ethan Lindstrom), and a leader was chosen for each team as well (Audio Subsystem: Mark Glade, Flame Control: Jennifer Albretsen and Jodie Tvedtnes, High Voltage: Brett Bostrom). Each leader had a lab notebook to record the group progress, and any difficulties encountered on the way.

The greatest challenge for the groups was to familiarize themselves with the electronic components and schematics. As the teams built the subsystems, most of the problems came from incorrect identification and placement of parts. We burned up quite a few components during the preliminary testing and integration of the subsystems. The biggest problem with the High Voltage subsystem turned out to be an incorrectly identified part—it looked like the right part but wasn't and so we spent several hours troubleshooting everything else only to pull that out and find that it was an op-amp, not a gate driver. But as team members grew more familiar with their subsystems and schematics (after two or three meetings), the work proceeded quickly and we were slightly ahead of the schedule we had proposed. As each subsystem was finished and tested we integrated them together.

It was pretty amazing to see the flame the first time the High Voltage subsystem worked. It wasn't very big, but there was a purple flame, and we had built the electronic system that was creating it. I think seeing the flame helped people get excited about the project and push to finish their subsystems. And that enthusiasm was much needed to overcome some of the difficulties of integration. When we put all the systems together it just didn't work. We traced the problem to the toroidal transformer. That part has been the biggest headache we've had so far. The primary coil has 120 turns and the secondary has 60, and we are now on our third toroid. We've taken turns winding them as each one has failed.

Once we had a working toroid we were able to troubleshoot the rest of the problems and produced sound from the tesla coil. At first the sound was barely audible. After some more troubleshooting the sound output level was good, not quite at the level of a normal speaker, but it could easily be heard from several feet away. Once it was working well (the troubleshooting took most of April and part of May) we put it into a box to make it a little safer, and it promptly dropped to the barely audible level again.

We are currently split into two teams, one is troubleshooting the tesla coil, while the other team is setting up the experiment and getting everything ready to record data. Thus far, it has been a very positive experience and many group members have commented that they are having a lot of fun and learning a lot as we go along.