

Senior Design Team – 31

ECE Senior Design Project 2005-06
Progress Report

Reconfigurable Analog Emulation of Transformer Tap Changer for Load Flow Analysis

Submitted to Dr. Chika O. Nwankpa and the Senior Design Project Committee
Of the
Electrical and Computer Engineering Department
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Team Number – **ECE – 31**

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Executive Summary

Today, real power systems are complicated structures that involve numerous buses, loads, and generators. It is highly desirable to reproduce the behavior of power system functionality. Reproduction of power system functionality is called emulation. Once a power system is emulated, its every function is under control of a user of the emulator. Emulation of the power system is important because with emulation we can completely analyze power flows within the network and predict what will happen at any point of that network at any time. Even though real power systems are complicated, emulation must be fast and reconfigurable, that is, it should be possible to make emulation of power systems faster during emulation in order to analyze power flow network completely.

The deliverables of our project are:

- Stage 1: Analog Behavioral Model (ABM) version of an On Load Tap Changing (OLTC) emulator
- Stage 2: PSpice circuit version based on Operational Transconductance Amplifier(OTA) of OLTC emulator
- Stage 3: Prototype of OLTC emulator on a Printed Circuit Board

With respect to our deliverables we have accomplished:

- Stage 1:
 - A circuit of a transformer emulated in 4DC networks with variable resistances to emulate tap changing(resistances are functions of tap position)
 - An ABM controller for the OLTC (input: voltage magnitude, output: transformer tap setting t)
- Stage 2:
 - PSpice analog circuit OLTC emulation via OTA based variable resistance circuits.
- Stage 3:
 - A LabVIEW controller to interface with analog OLTC emulator.
 - Design of Printed Circuit Board (PCB) layout