



Wolfspeed University Capstone Project Proposals

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Project #1

Development of Open Source, Linearized Power Amplifier (PA) Demonstration Platform

Project Category

Capstone Project

May be run as combined EE and CS project

Anticipated number of students needed:

4-10 bachelors level students, depending on scope

Background and Description (A short description of the problem we are looking to solve):

Digital pre-distortion (DPD) is the de facto linearization standard for wireless cellular infrastructure. The goal of this project is to create a complete, open source, linearized power amplifier platform. The scope of the platform development includes RF power amplifier, digital hardware, computer control, GUI and DPD algorithm development.

The platform is intended to provide a learning vehicle for the following cases: -

- Teach students RF Power Amplifier design using industry tools and models.
- Teach students digital communication concepts by implementation of open source communication standards.
- To enable the RF power amplifier designer to evaluate the linearizability of the design, and quantify the impact of hardware changes to the amplifier.
- To enable the digital engineer to evaluate the linearized PA performance achieved with DPD algorithms being developed.

Preliminary List or Statement of Design Requirements:

The platform should be fully self-contained, and comprise of the following hardware components.

RF Power Amplifier + Pre-Driver– Cree CG2H40010



RF power amplifier will be designed around the Cree CG2H40010. The design and fabrication may be undertaken by students with an interest in RF power amplifier design, or a Cree reference circuit board may be obtained for inclusion in the platform. A pre-amplifier will be required to drive the Device Under Test. This can either be designed using a Cree device, or investigated and selected from commercially available options.

Digital Hardware Platform



Group will investigate and select the digital hardware and transceiver for to implement the digital pre-distortion system. An example of open source support hardware is the LimeSDR mini platform.

PC Interface and Control System – Raspberry Pi 4



The hardware control and user interface will be based around the Raspberry Pi 4 platform.

Additional Information

All hardware and software used in the platform should be open source.

Hardware recommendations for the platform may be changed as improved hardware becomes available. However, hardware replacements must adhere to Open Source ethos of the platform.

The cost of one set of hardware will be covered by Wolfspeed.

Useful Links

<https://www.gnuradio.org/>

https://wiki.gnuradio.org/index.php/Main_Page

<https://wiki.myriadrf.org/LimeADPD>

<https://limemicro.com/technology/limeadpd/>

SDR Platform Examples

<https://deepwavedigital.com/>

<https://www.nuand.com/product/bladerf-xa9/>