

Flash-IOT

Weekly Team Meeting 01/23

23 Jan 2020 / 2:30 PM / VLSI LAB

ATTENDEES

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AGENDA

- Introduction to our improved circuits.
- Showing our customized lenses
- Submitting our pre-registration form

NOTES

- Introduction to our improved circuits
 - During the winter break, we purchased modules for Photodiode circuits. This includes: a TIA module, a cascaded sallen-key filter with negative voltage generator and new Photodiodes
 - TIA module
 - The TIA module
 - The TIA modules consists of three stages: pre-amp, Transimpedance amp and a subtractor to adjust DC level. The opamps require dual supplies
 - In the experiment, we can optimize the signal ranging from -2.1V to 200mV($V_{pp} = 2.3V$) under plus and minus 5V power supply.
 - The output of the signal is 180 degrees phase shift.
 - However, we are not able to adjust DC level by the potentiometer on the board which means we need an extra adding circuits to shift the DC level to 0 - 2.3V.

- We also used function generator and LED lights to evaluate the bandwidth of the module, when the frequency above **10Khz**, the distortion is obvious and it becomes unstable.
- The Sallen-key Filter
 - The Sallen-key filter is customized to have 16dB gain and 200kHz cutoff frequency low pass properties.
 - The Sallen-key filter has not been tested with the TIA modules because of the mismatch in power supplies.
 - The negative 5V generator can output -4.9V and 100mA.
- New Photodiodes:
 - We purchased two new Photodiodes: one is 3.9mm*3.9mm UV enhanced PIN photodiode. The performance is similar to BPX 61 under short distance low frequency testing. The other one has a die size of 5.9mm*5.9mm which has a larger area to perceive the light. It can be helpful to increase our communication distance.
- Customized lenses:
 - All the lens we purchased are convex lens. We designed to place the lens in front of the photodiode so that the focal point is located at the photodiode.
 - We have three different sizes of lens, D stands for diameter and F stands for focus:
 - D = 10mm, F = 10mm
 - D = 20mm, F = 25mm
 - D = 20mm, F = 50mm
 - We also purchased a 450nm bandpass filter lens. In our experiment, it can effectively filter out the **fluorescent light signals** flicker at 120Hz. However, it cannot filter out the ambient room light that consists of LED lights.
- Submitting our pre-registration form
 - Pre-registration form has been approved by Dr. Li and Dr. Ay. It is ready to be submitted.

ACTION ITEMS

- We will build a DC adder to shift the signals below 0V. The goal of the output is 0 to 5 volts. Hence, the Sallen key filter will be tested and implemented in this design.
- We will improve our LED switches to drive 1W LED lights. Paralleling inverters can increase the output current of the LED. Currently we are facing sparking issues.
- We will build the lens holders and the entire structure of this product by 3D printer. Therefore, next week we need to study how to draw the 3D structure in the software.