Developing a Robust Testing System for Evaluating Texas Instrument's Phase Light Modulator Devices

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Background

Texas Instruments is developing a phase light modulator (PLM) device. Testing the performance of PLM devices requires a controlled and repeatable testing system. The team researched and evaluated a variety of LEDs, temperature and light sensors, as well as the electrical and optical components that are needed to operate and control the light sources and sensors. The selected light sources, sensors and the mechanical system are constructed in a compact system.

Objective

Develop a robust PLM testing system that can be used to characterize PLM response to a variety of illumination conditions. The test system should be able to test 20 PLM devices:

- Under different wavelengths and intensities of light
- At different incident angles
- With temperature and light intensity monitoring
- With automated data logging capabilities

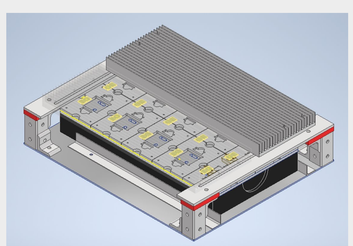
Mechanical System

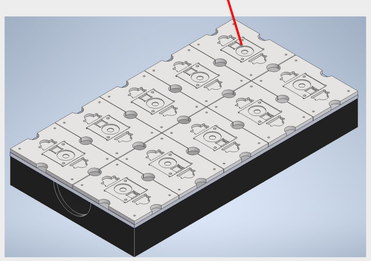
The design needed to incorporate all components of the system, but also provide physical structure to hold the system together. Two different subassemblies were created:

- Slide on box structure with:
  - PLM tray
  - Sensors Box
  - Electrical components

- Frame with alignment system for:
  - Heatsinks
  - LED light sources
  - Collecting and Collimating Lenses

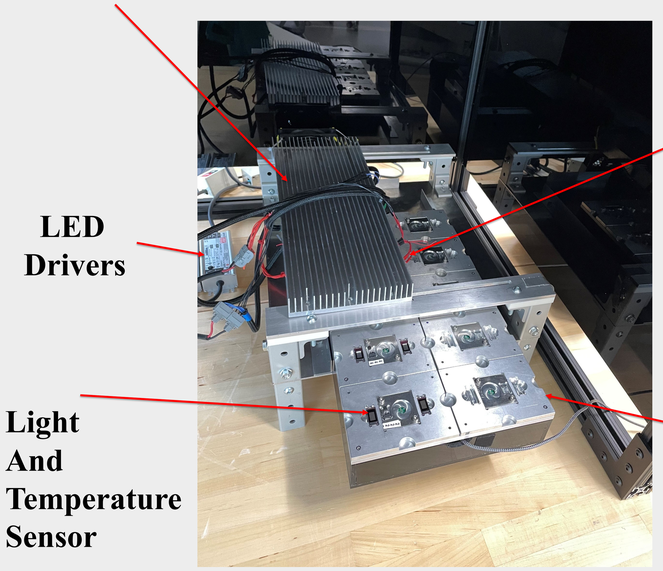
Indicate what are the components ??





Testing System

The testing system include a variety of sensors, LED, lens and Mechanical components.

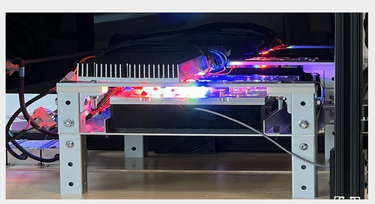


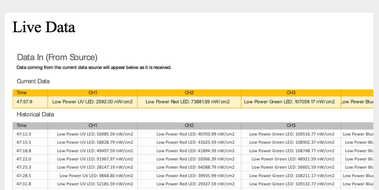
Testing and Data Acquisition

- Start with a zeroth order test as a reference
- Perform a burn-in test for different durations
- Conduct a zeroth order test immediately
- Compare the results and evaluate any performance changes that may have occurred

Burn-In Test Parameters

- Light intensity: 3.14 w/cm^2
- Time: 24, 48, 72, 96 hours
- Wavelength: 405nm – 905 nm

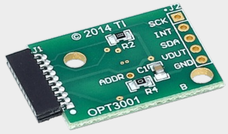




Sensor Integration

Light Intensity Sensor

- Optical Spectrum: 300 nm to 1000 nm
- Measurement Levels: 1.2 nW/cm^2 to 10 mW/cm^2
- Operating Temperature: -40° C to 85° C



TI OPT3002-EVM

Temperature Sensor

- ±0.5° C Accuracy
- Operating Temperature: -55° C to +125° C
- Single GPIO configuration
- Minimal size and wiring
- Reading by Address

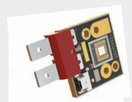
Dallas DS18B20 Temp. Sensor

Light Integration

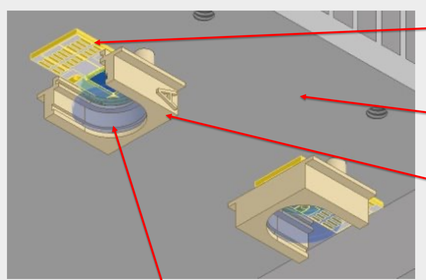
LEDs of different wavelengths are driven by varying currents to meet two different power density requirements.

RGB LEDs

Blue LED



Green LED



Acknowledgements

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