Optical Design Process

TECHNOLOGY FORUM

Optical Design Process Example

Product Design Example

- Design of Dental Light
  - Requirements: Illuminate the area equal to a dollar bill (6" x 3"). Minimize light outside this area. Use of the shelf components.

  - Outcome: Started with TIR optic, ended up with planar Fresnel optic at completion of project.

Target Optical Specifications:
Measured spot size: **6" x 3"**
Measured splash size: **None specified**
Lux on axis: **25,000 Lux @ 700mm**
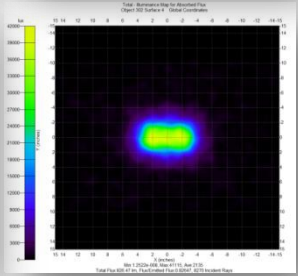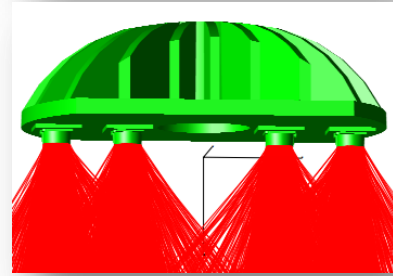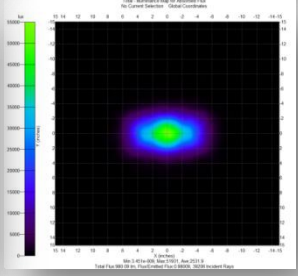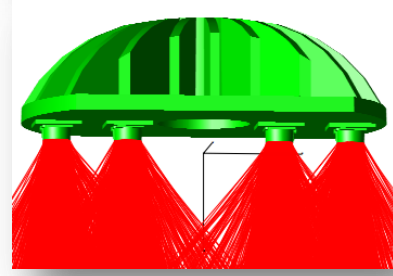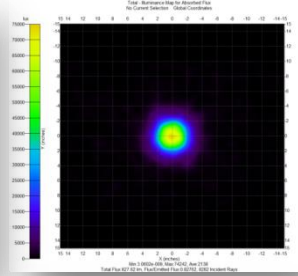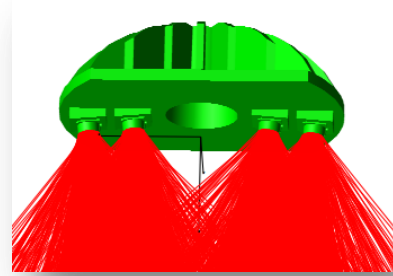Lux @ 2.5"$_x$: **18750 Lux (75% of maximum) @ 700mm**
Lux @ 1"$_y$: **18,750 Lux (75% of maximum) @ 700mm**
Lux @ 2.5"$_y$ (63.5mm): **Less than 1300 Lux @ 700mm**
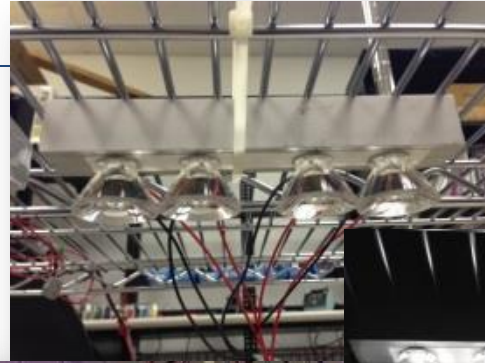Lumen Output: **1,100 Lumens minimum**

NORLUX

Discovery Phase

- Crude CAD models

- Simulate early and often

- Analyze feasibility and develop design direction

Alpha Prototype Phase

- Develop crude prototype(s)
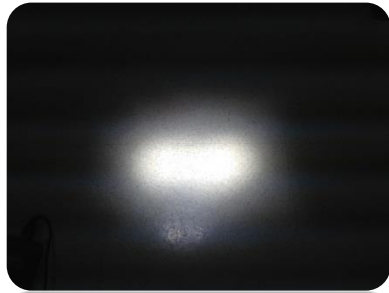- Test initial analysis and compare to simulation results

Alpha Prototype Phase

- Test alpha prototype(s) and collect data
- Re-analyze feasibility and design direction

**CREE XP-G w/ LEDiL
10 DEGREE**

**CREE XP-E w/ LEDiL
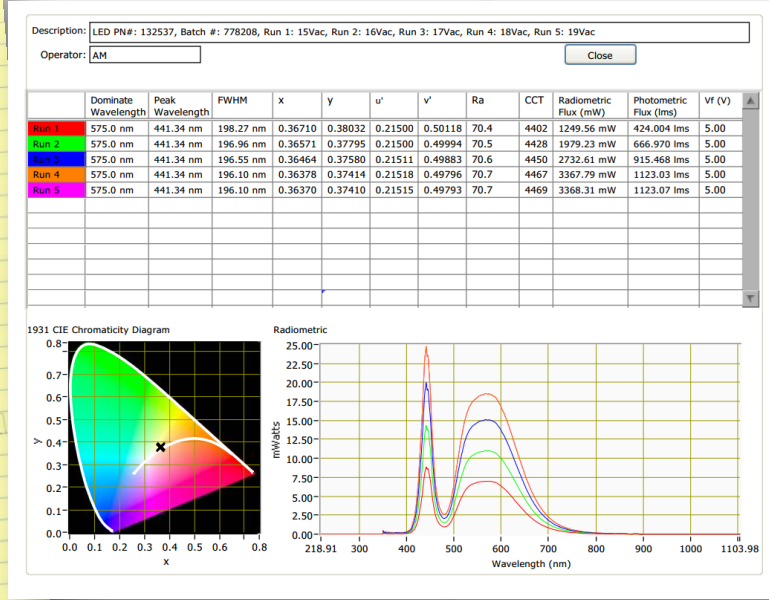8 DEGREE**

**CREE XP-G w/ KHATOD
5.5 DEGREE**

HALOGEN FIXTURE
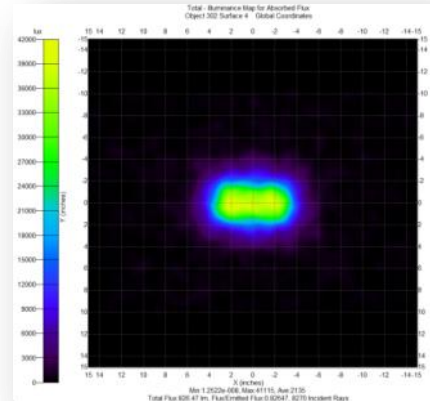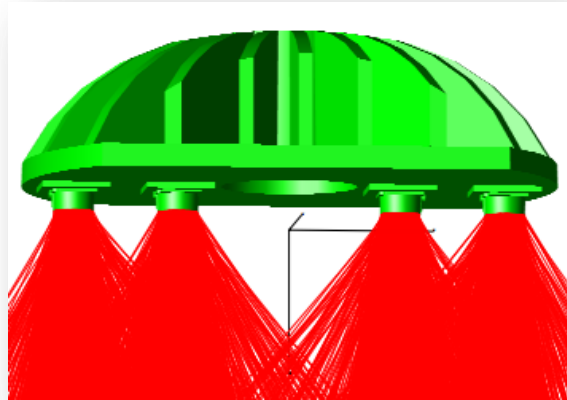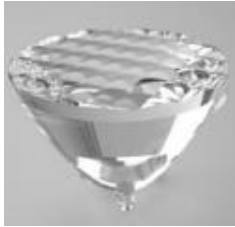
Data Collection
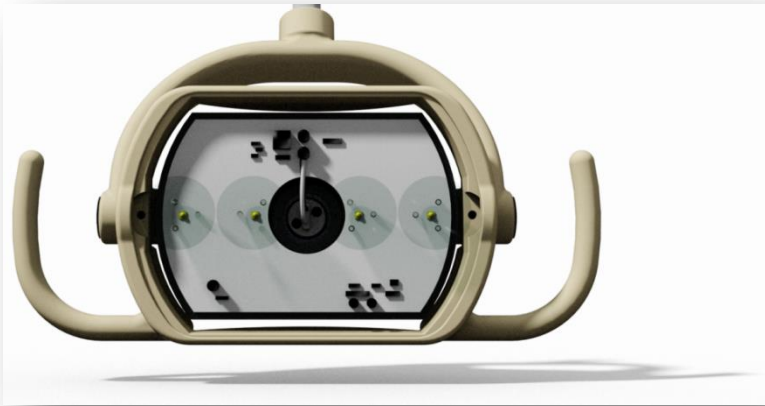
- Collect data from alpha prototype(s)

Decision – Phase gate

- Analyze data

- Develop path to move optical design forward

- Move to detail design phase

Detail Design Phase

- Further develop CAD models

- Electrical design and PCB layout

- Additional simulations

Beta Prototype Phase

- Beta prototype testing
  - Looks like – functions like prototype

Decision - Phase Gate

- Analyze data

- Phase gate/milestone decision

  - Pivot if necessary

  - Know when to consult with subject matter expert

  - Repeat process if necessary