Evaluating The Circadian Experience of Supportive Living Residents

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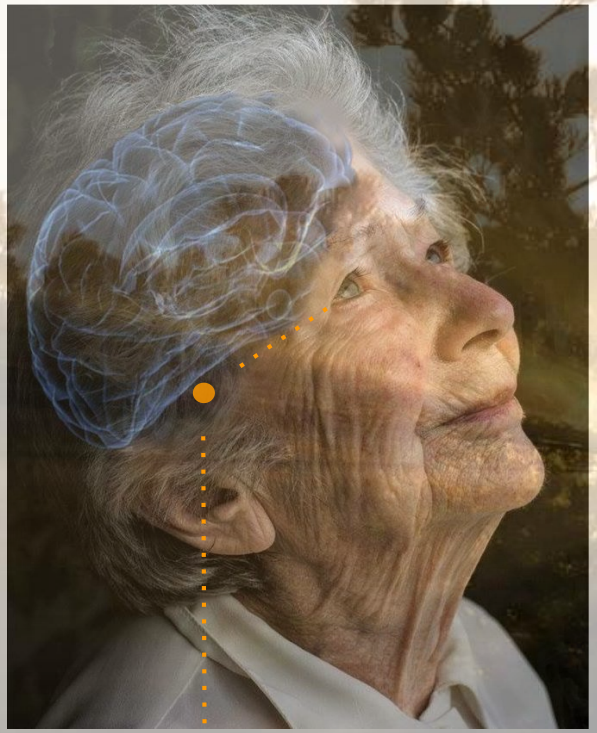


Suprachiasmatic Nucleus (SCN)

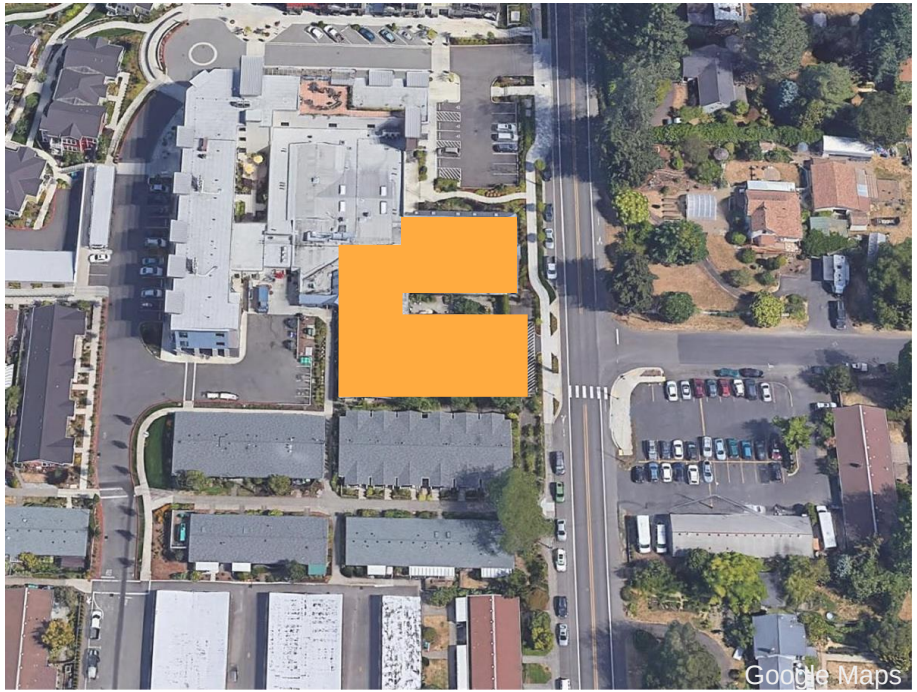
Context

A 23 bed Supportive Living Facility in Portland, Oregon provides skilled nursing and memory care

Constructed in 1960

Primarily shared residential rooms

Dining Room / Activity Room



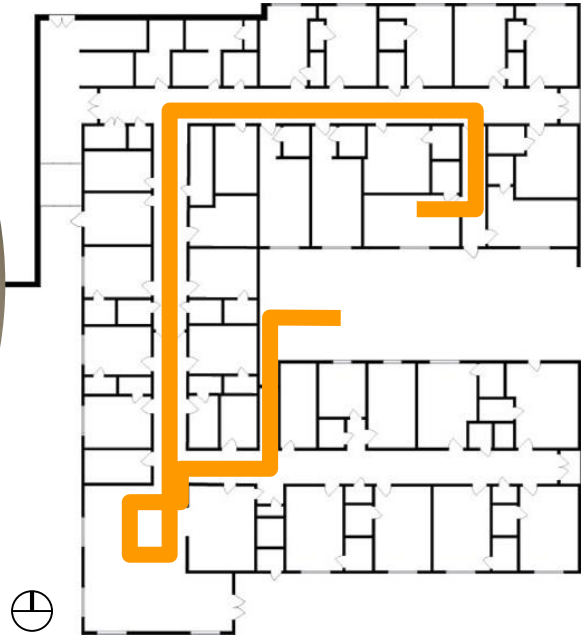
Phase 1
Day-In-The-Life Simulation

Methodology

Phase 1

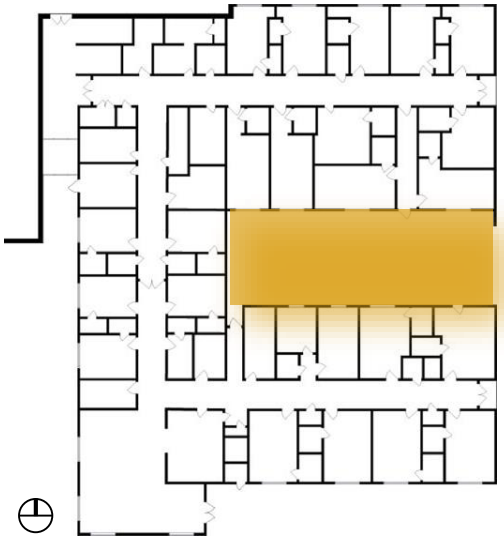
“Day-in-the-Life” Simulation

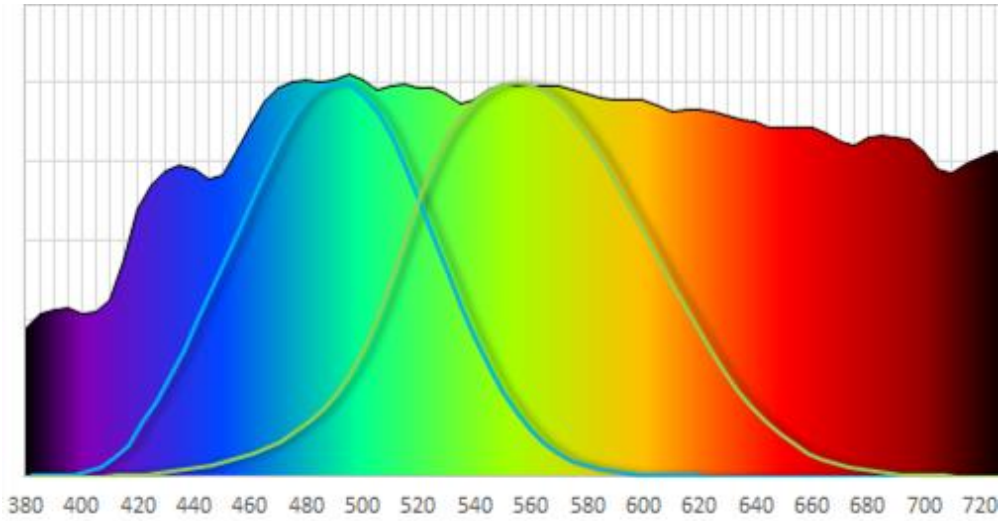
A spectrophotometer fastened to a chair was pushed throughout the facility according to a prototypical resident schedule to capture spectral lighting conditions over the course of a day



Spectral Lighting Conditions **Courtyard**

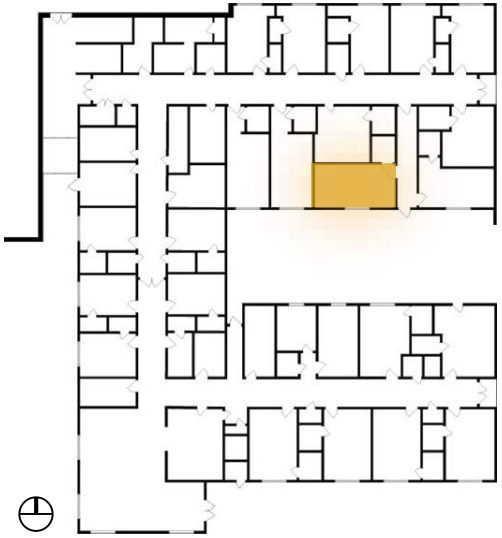
May 11, 2019
2:15 pm PDT
Clear Sky





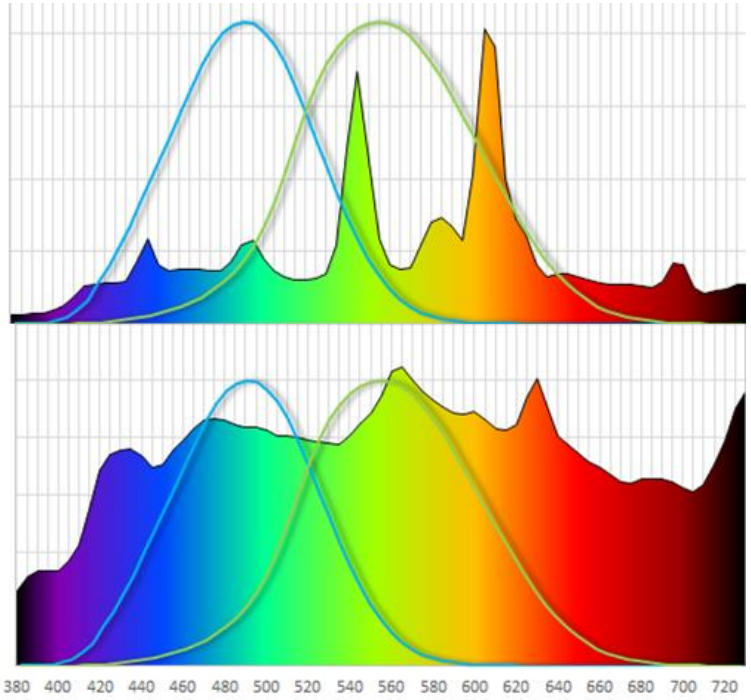
Circadian Visual Lamp Data

Spectral Lighting Conditions **Resident Room**



11:00 am PDT

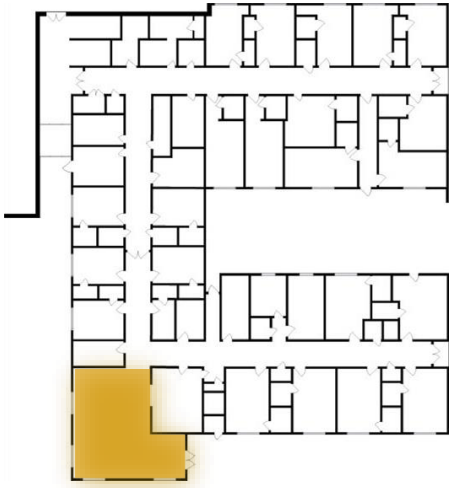
3:15 pm PDT



Spectral Lighting Conditions

Dining Room

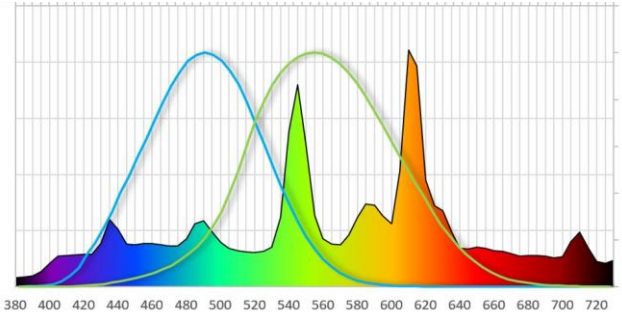
Main activity space for residents



Breakfast

10:05 AM

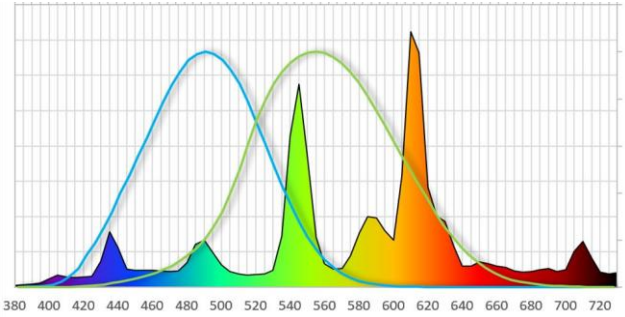
May 11, 2019: clear sky



Lunch

1:05PM

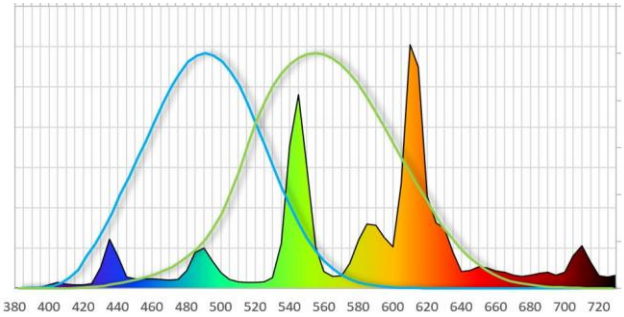
May 11, 2019: clear sky



Dinner

5:05PM

May 11, 2019: clear sky



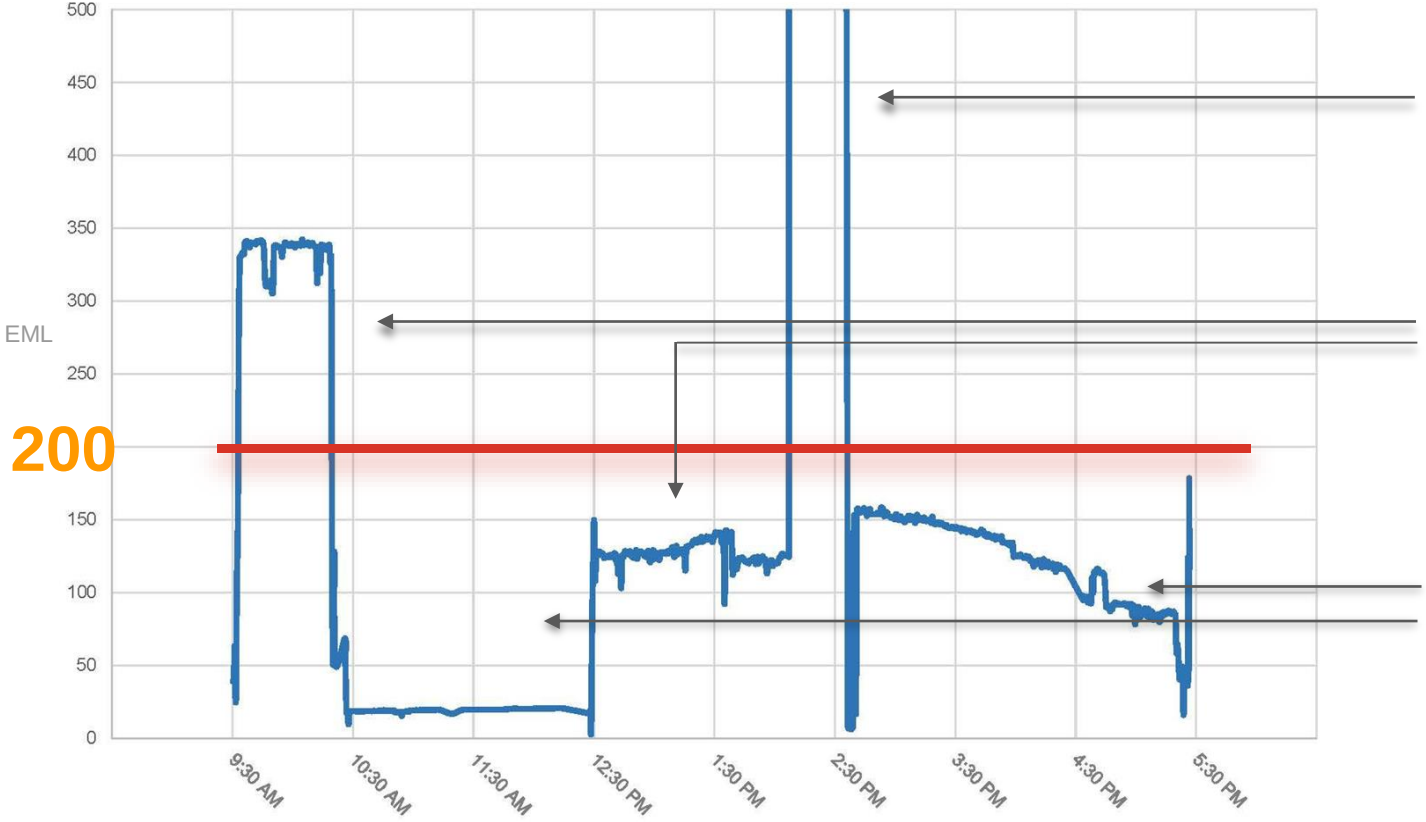
Calculating EML

Lux X **M/P** = **EML**

(**Light Intensity from a Design or Measured Value** X **Derived from the Spectral Power Distribution of the source.** = **Equivalent Melanopic Lux**)

Lucas et al. 2014

“Day in the Life” Simulation: EML May 11, Clear Sky

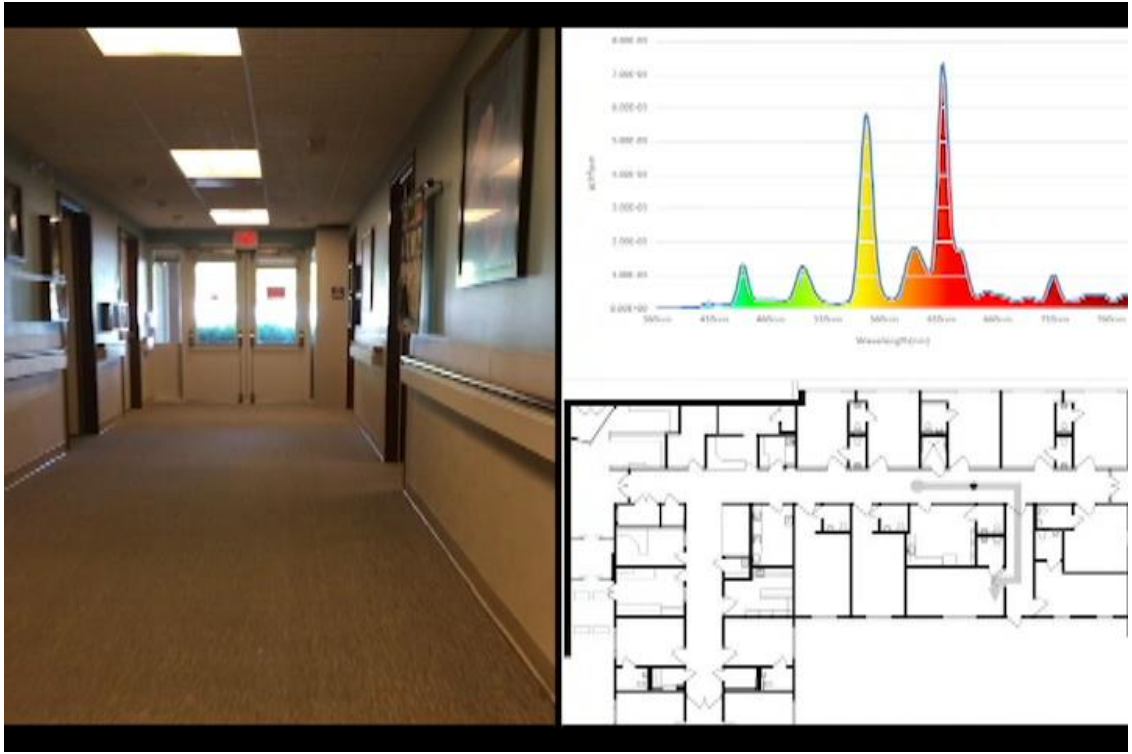


Outside

Dining Room

Bedroom

“Day in the Life” Simulation: **Video**



Phase 2
Light Intensity Data Collection

Methodology

Phase 2

Light Intensity Data:

Four research subjects wore Hobo data loggers while participating in their normal routines for 72 hours. Two were defined as active, getting out and about regularly, while the other two preferred to spend most of their time in their own rooms.

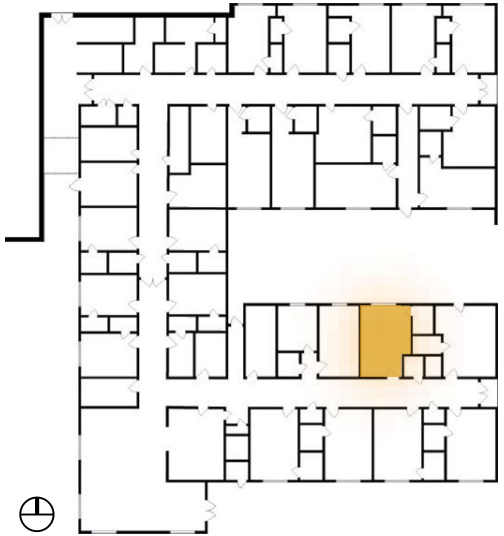
Typical Resident Room

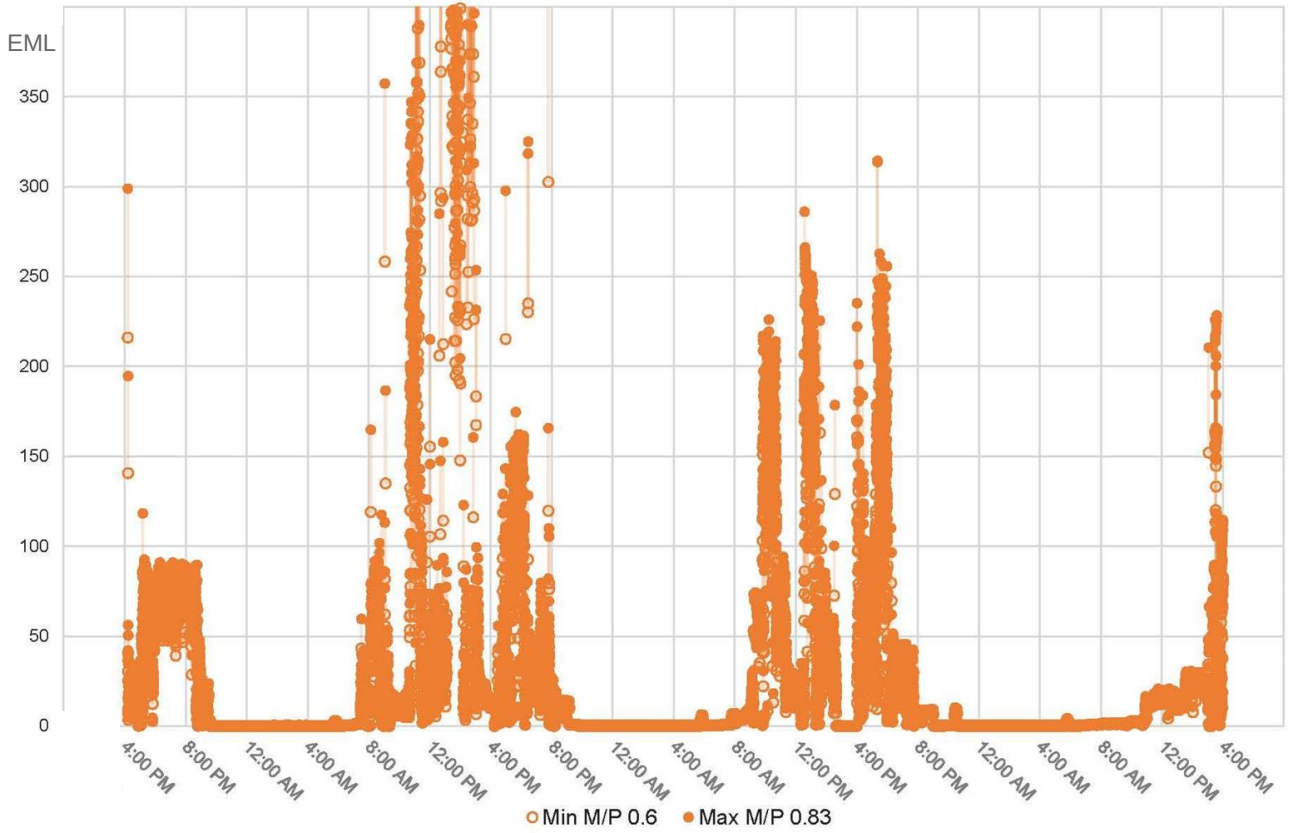
Corridor

Dining/Activity Room

EML Range Est. Resident A

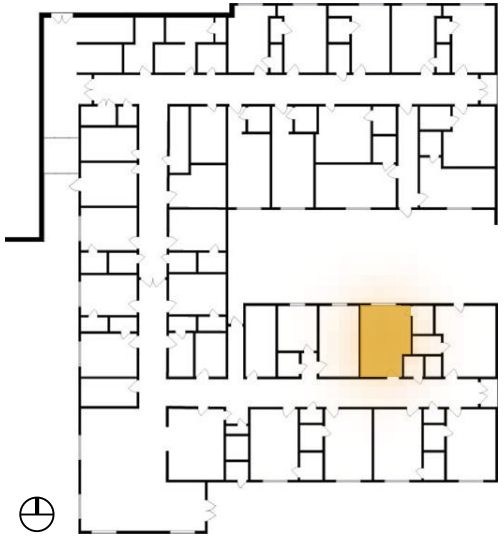
May 18, Clear Sky

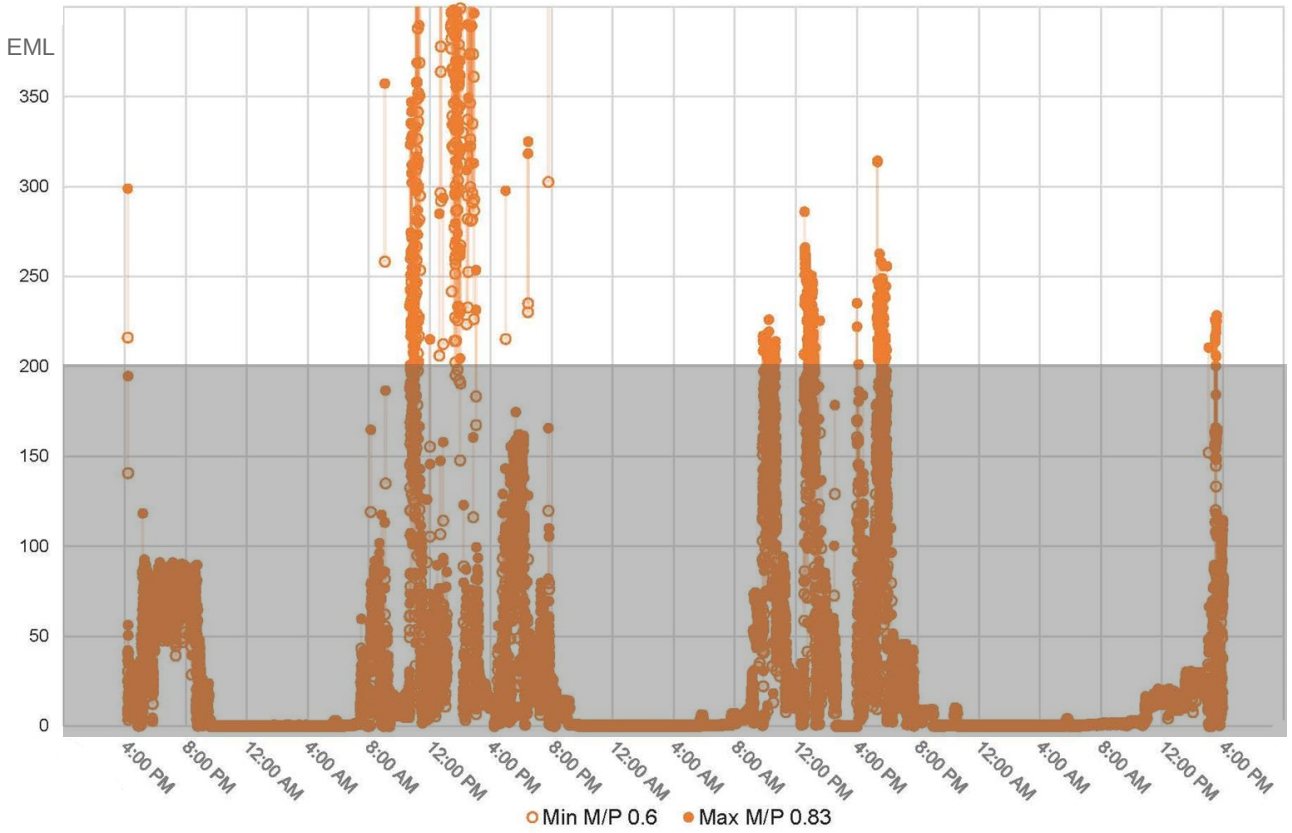




EML Range Est. Resident A

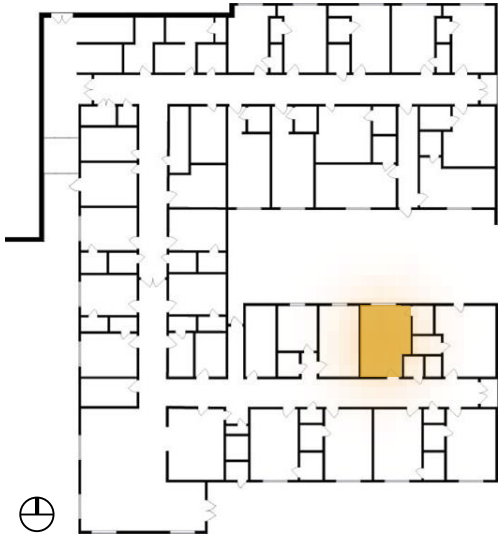
May 18, Clear Sky

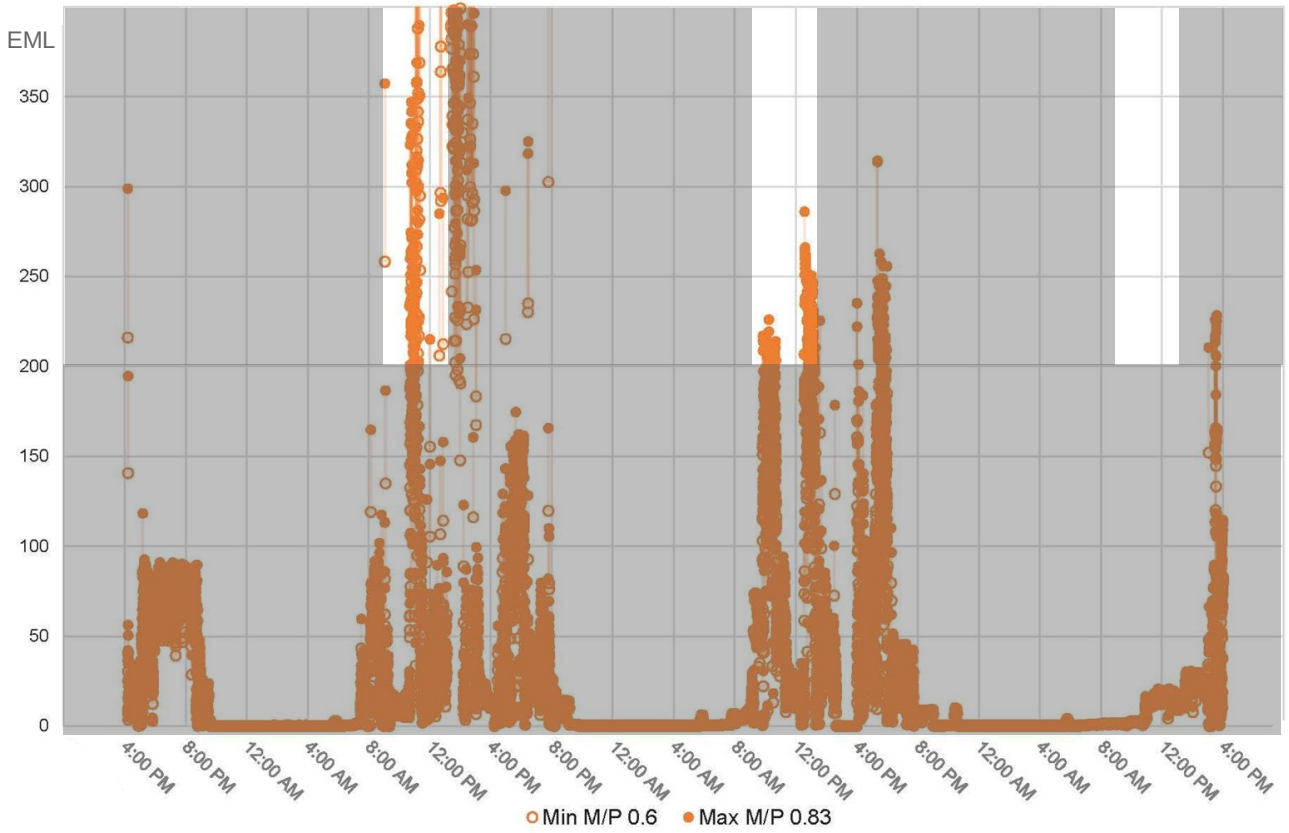




EML Range Est. Resident A

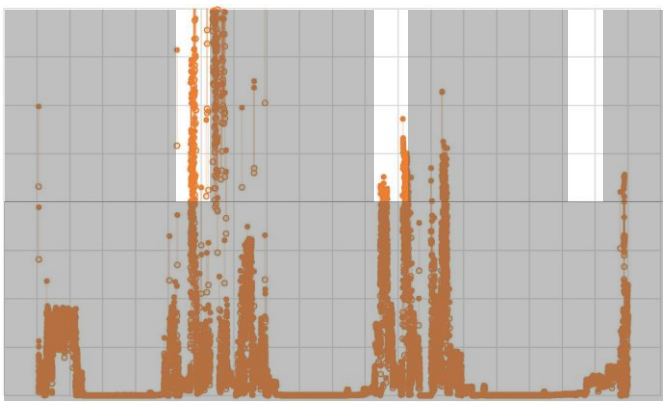
May 18, Clear Sky

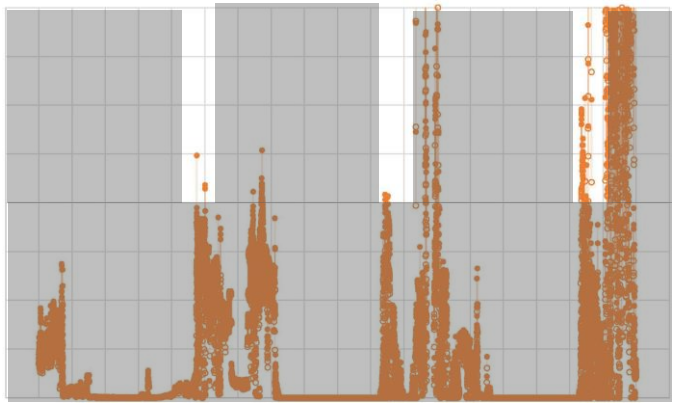




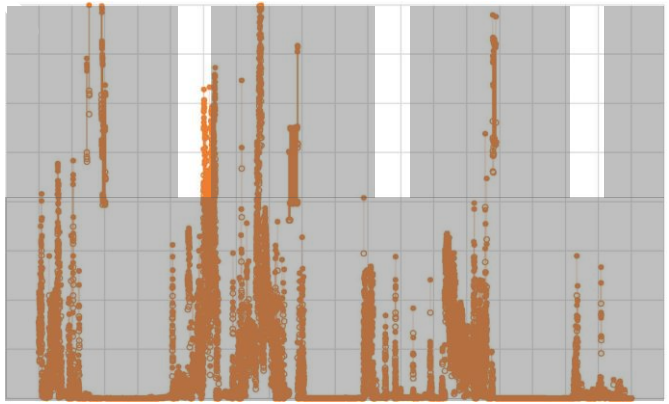
Comparison

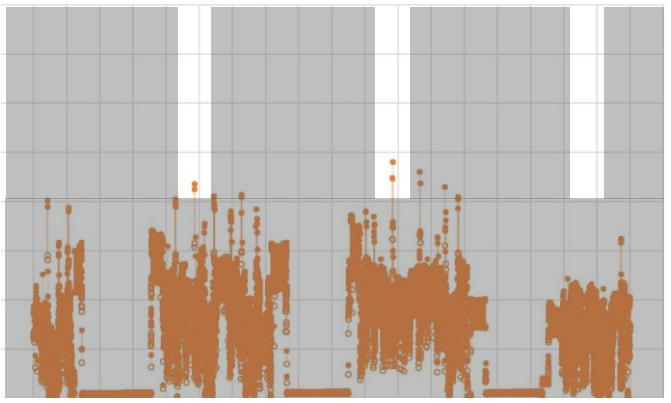
Actively come and go





Stay within the facility most days





Phase 3
Lab Data Collection

Methodology

Phase 3

Lab Data Collection:

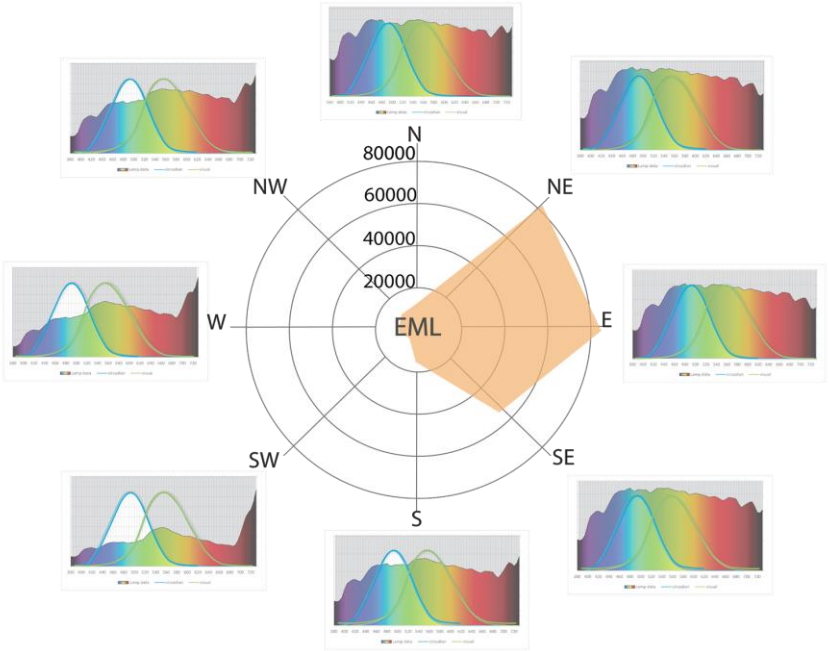
A series of spectral observations were made to determine the influence of architectural factors on EML, in Eugene, Oregon during late spring of 2019. Various sky conditions, orientations, lighting type(s), and observer heights were tested.

Sunny vs Overcast

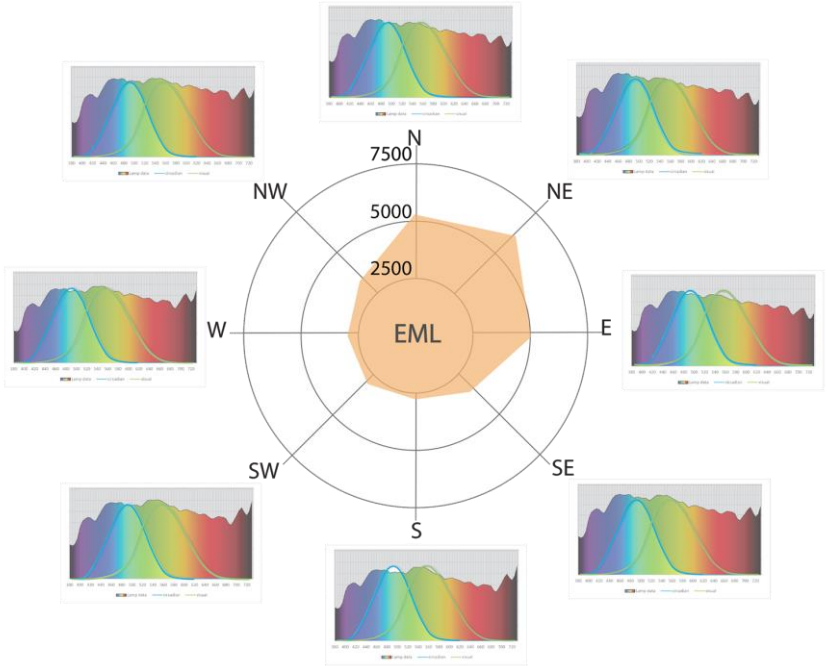
Courtyard - Sunny

Courtyard - Overcast

Sunny vs Overcast



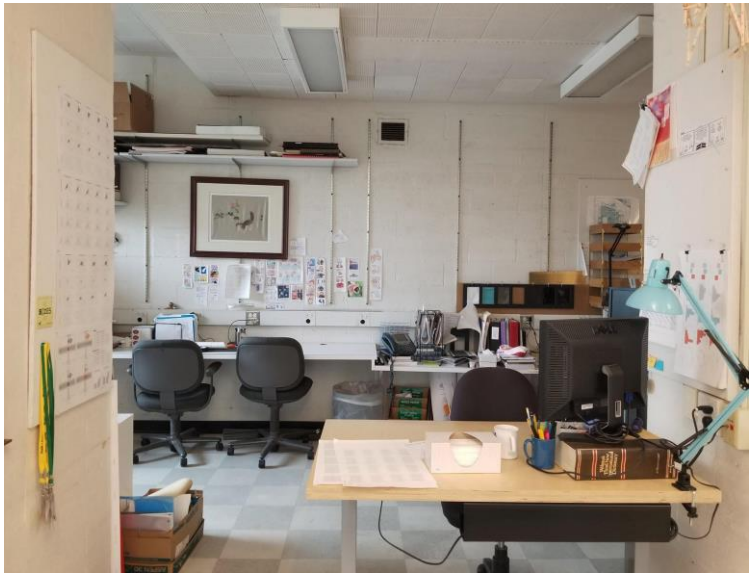
Courtyard - Sunny



Courtyard - Overcast

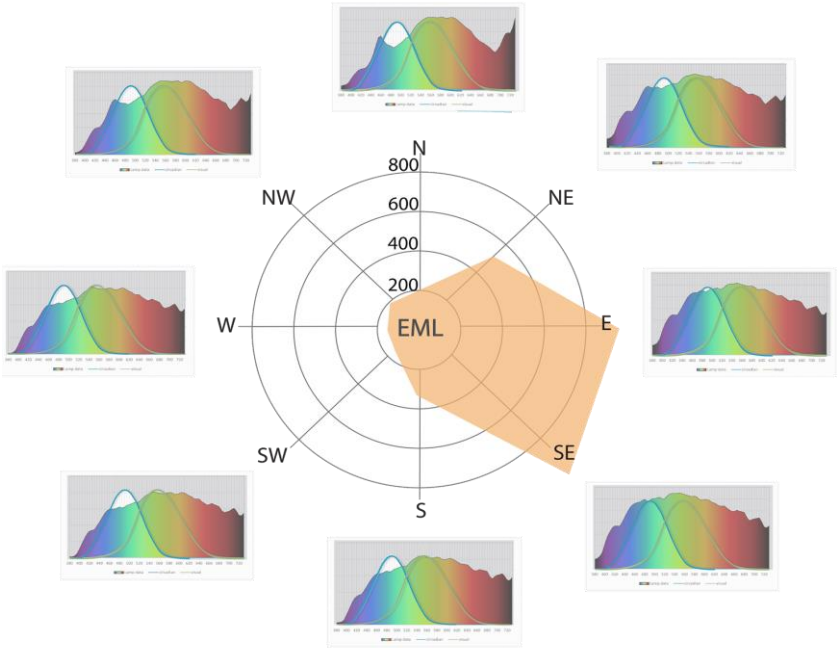
Sunny vs Overcast

Open Office- Sunny

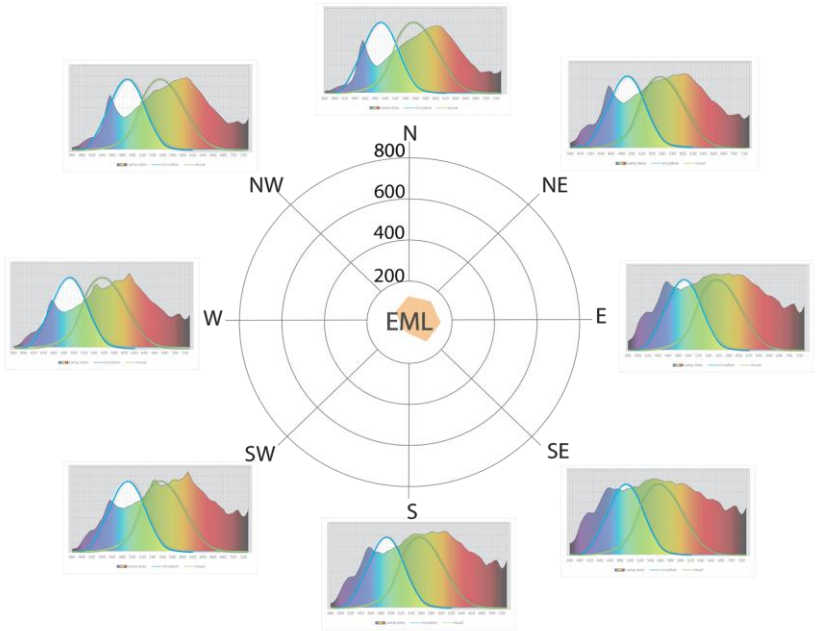


Open Office - Overcast

Sunny vs Overcast

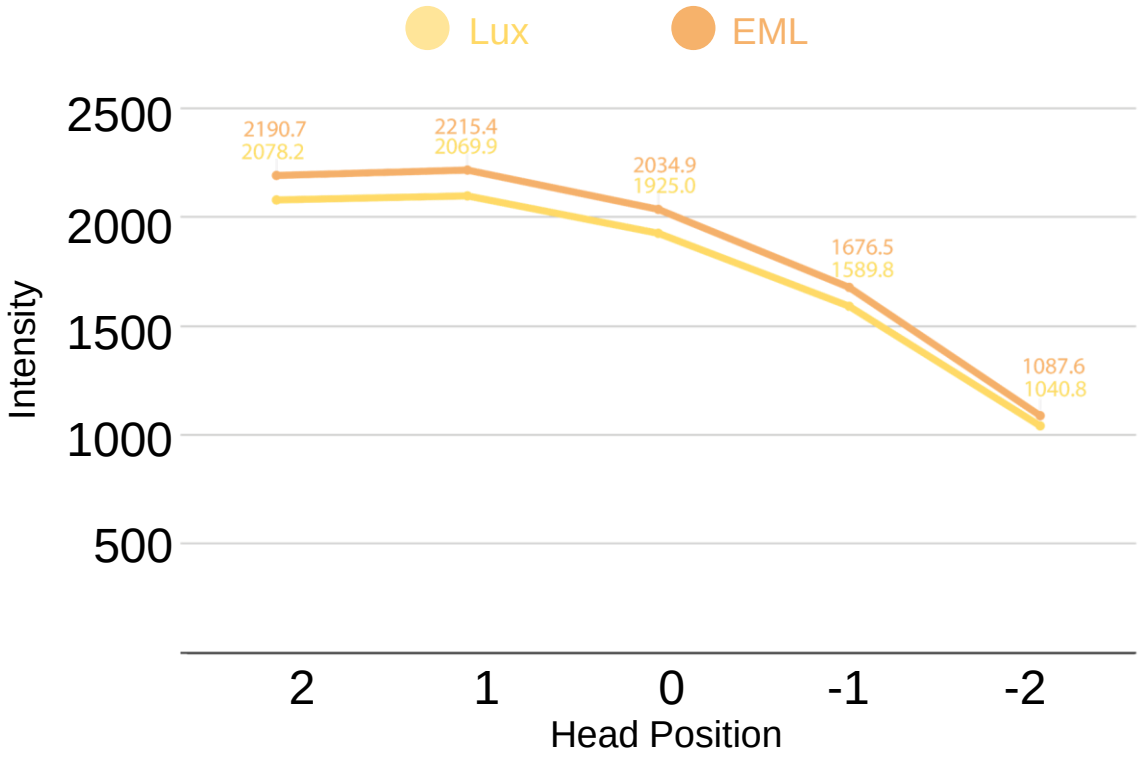


Open Office - Sunny



Open Office - Overcast

Gaze Direction



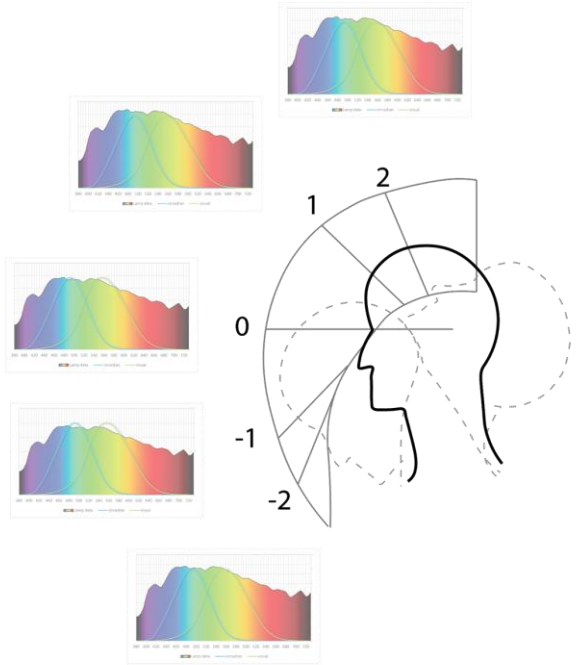
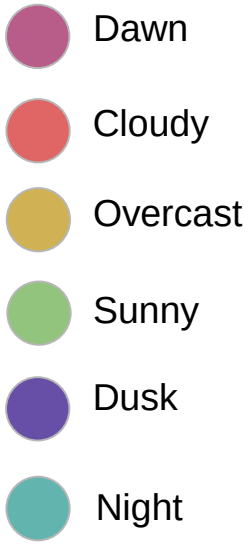
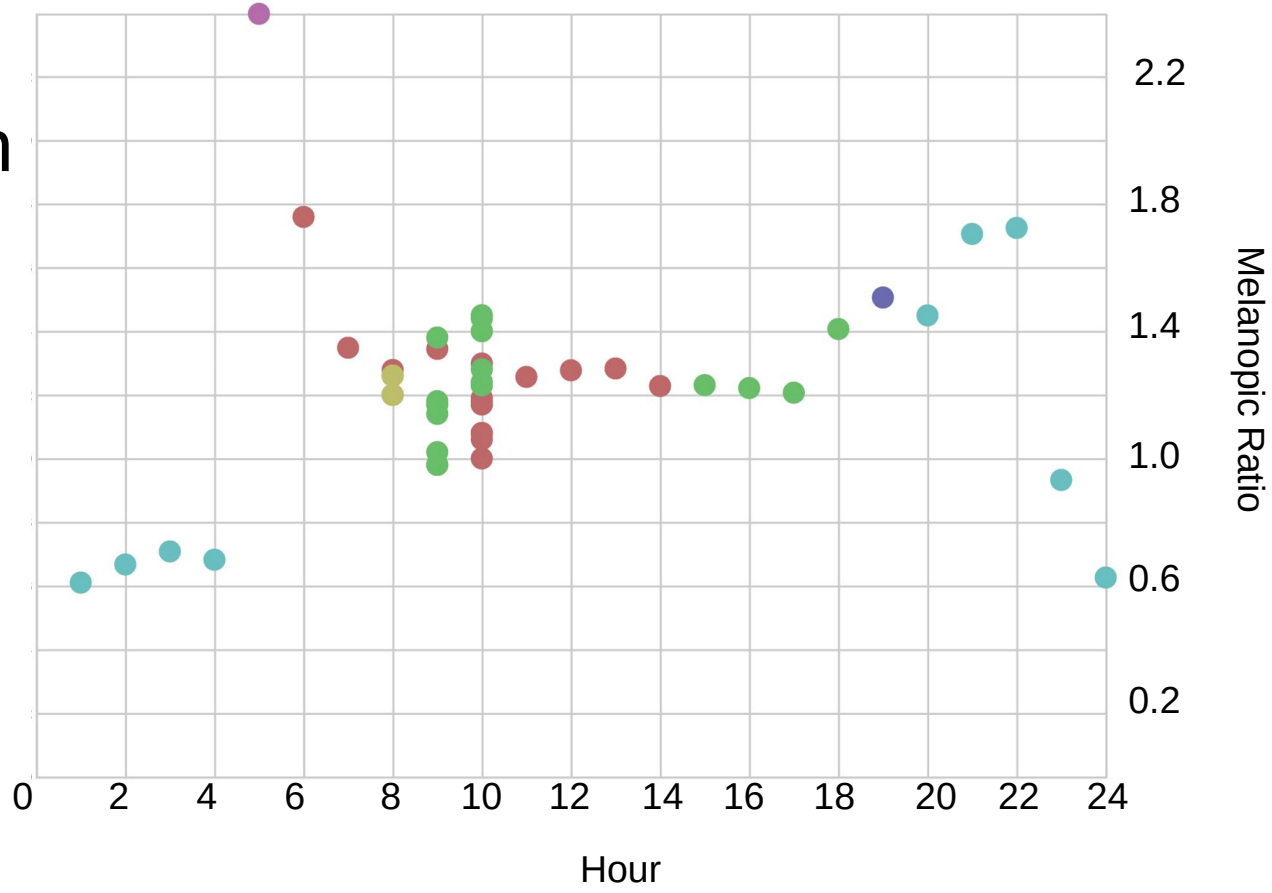


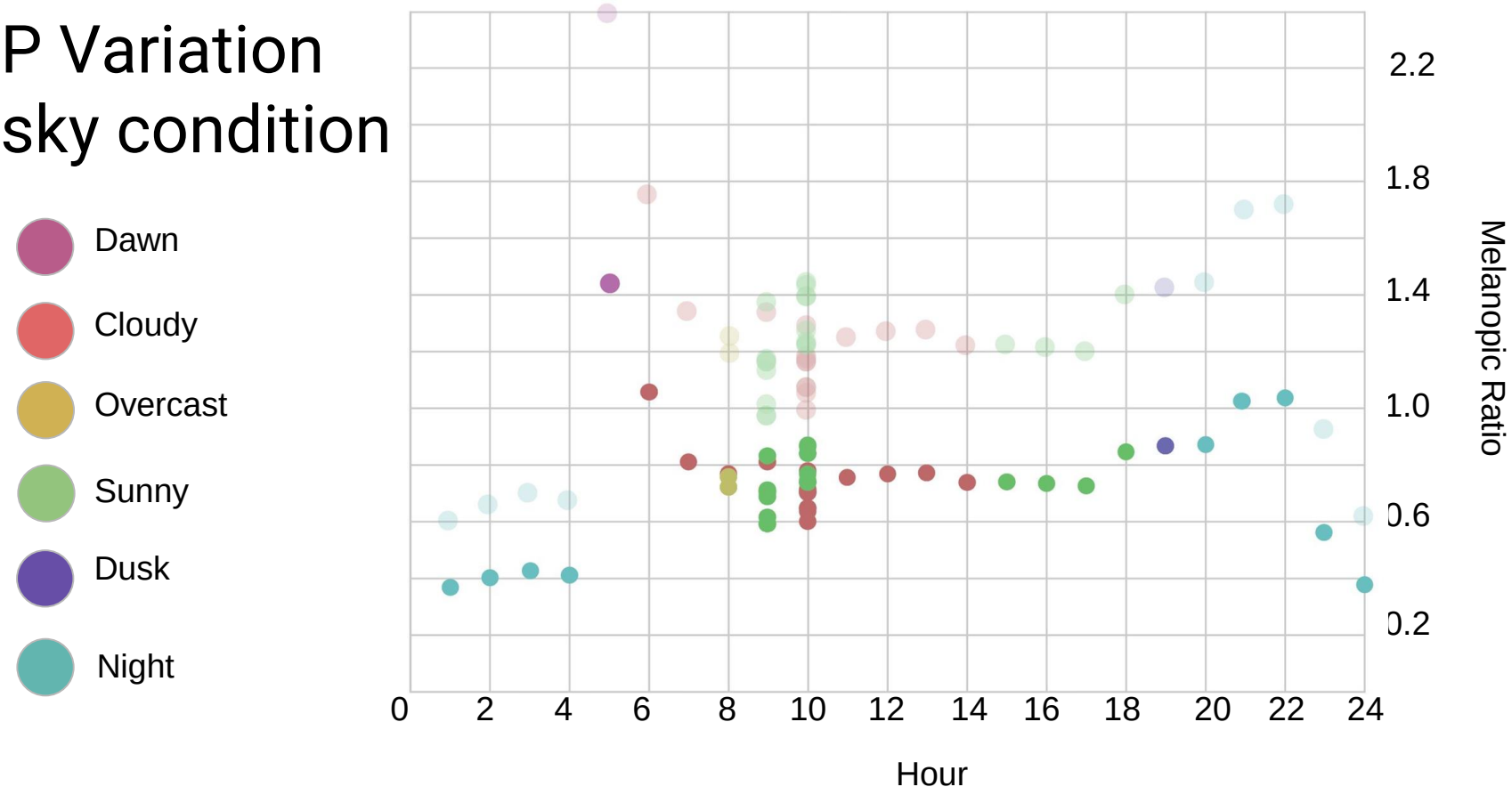
Diagram adopted from Human Dimension in Interior Space

M/P Variation by sky condition

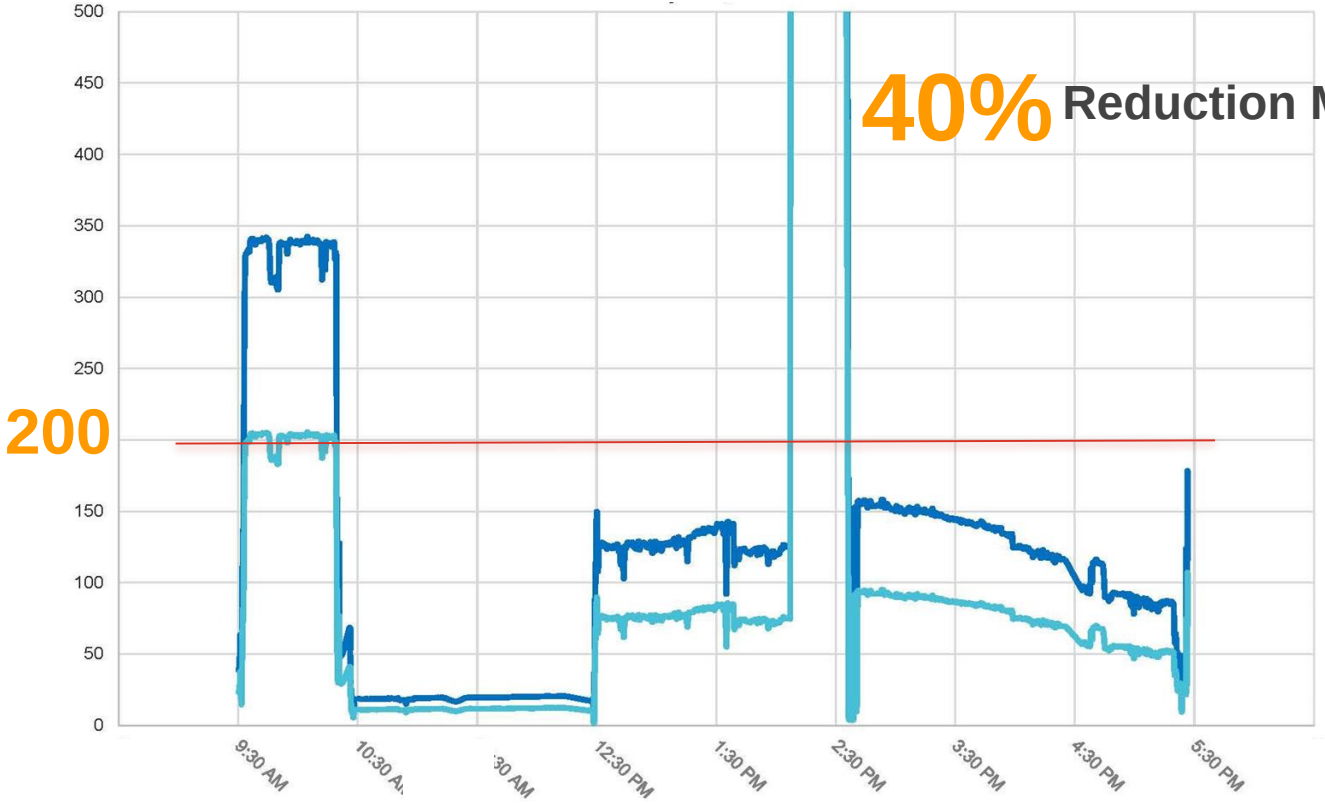




M/P Variation by sky condition



“Day in the Life” Simulation: EML Age Comparison



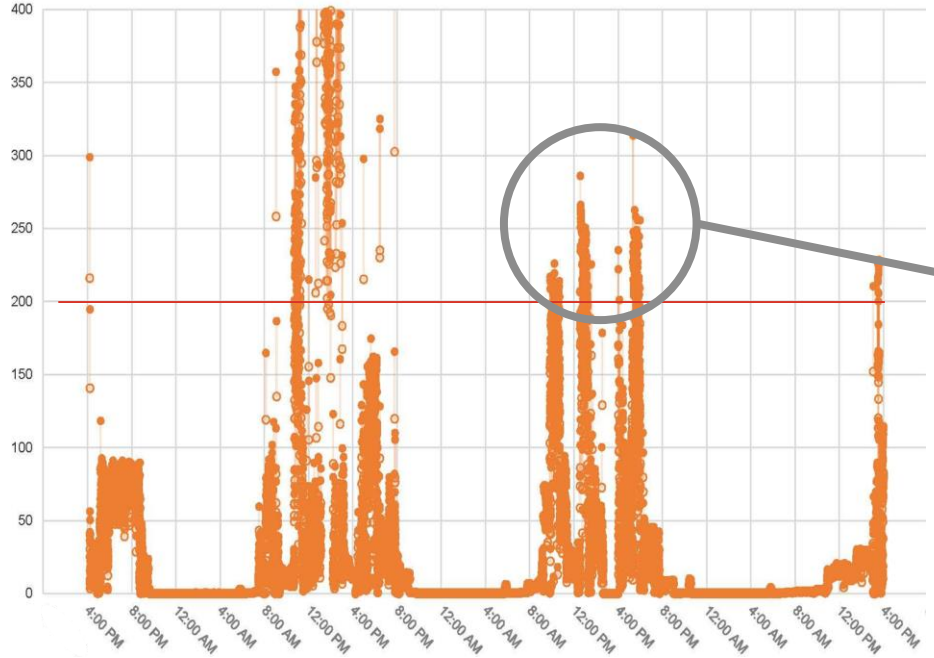
40% **Reduction Melanopic Receptivity**

EML Age 32

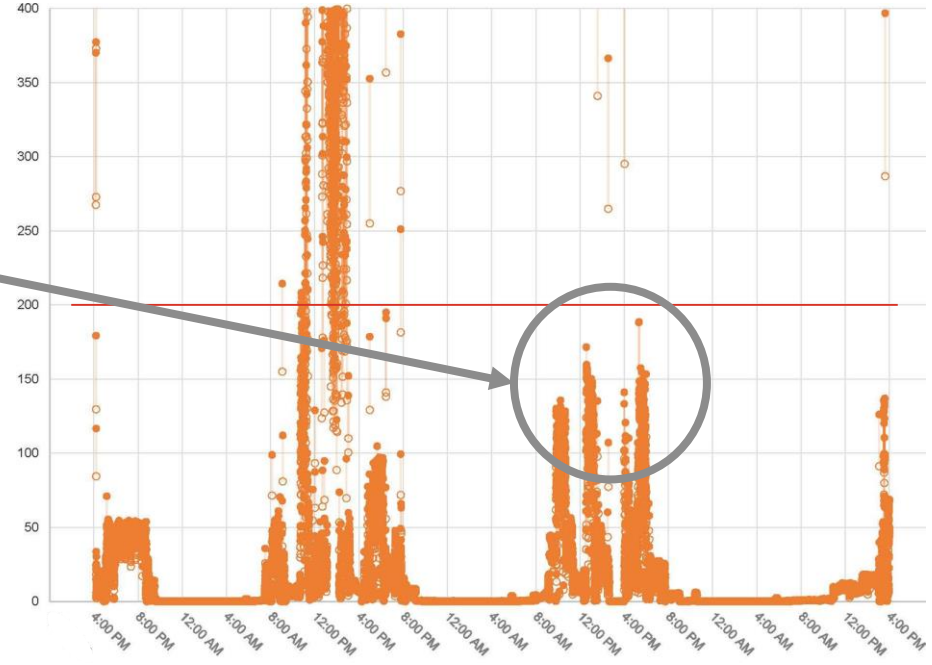
EML Age 70

40% EML Reduction Comparison Resident A

Estimated EML As Measured



40 % Reduction Applied



Summary

- **EML exposure is influenced by environmental, architectural, behavioral and biological factors.**

- **Out of the four residents that participated in the study, none received adequate EML exposure during the three days of testing.**

- **Architects can support circadian light accessibility by:**
  - **Designing phase advancing and delaying spaces**
  - **Providing choices for occupants**
  - **Careful design of windows, skylights, and shading elements**
  - **Organizing functions within spaces to maximize light exposure (furniture, etc)**

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