



Sleep Cabin Prototype

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Project Background

The Milwaukee Bucks are a championship NBA team looking to maximize athletes' performance by enhancing quality of sleep. Our team designed a sleep cabin prototype that the Bucks could build that will promote sleep and recovery by controlling environmental variables.

Final Design Concept



STC Rated Door
Rating = 64

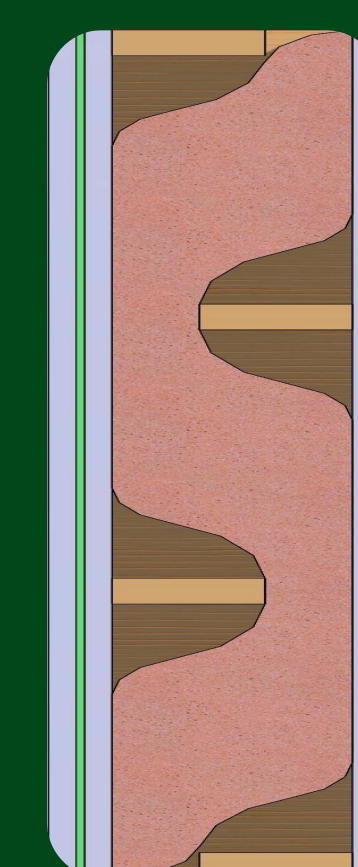
Exterior
9.5 W x 10.8 L x 9.5 H [ft]

Aesthetic
The Bucks players voted on this design

Bed
Our final design will include a ZeroBody Pro XL, a dry float bed, for promoting recovery

Final & Prototype Features

Sound Attenuation
Identical building techniques of walls, floor, and ceiling to achieve STC rating of 60



The walls feature double layered drywall with green glue sandwiched in between and insulation weaved between staggered studs

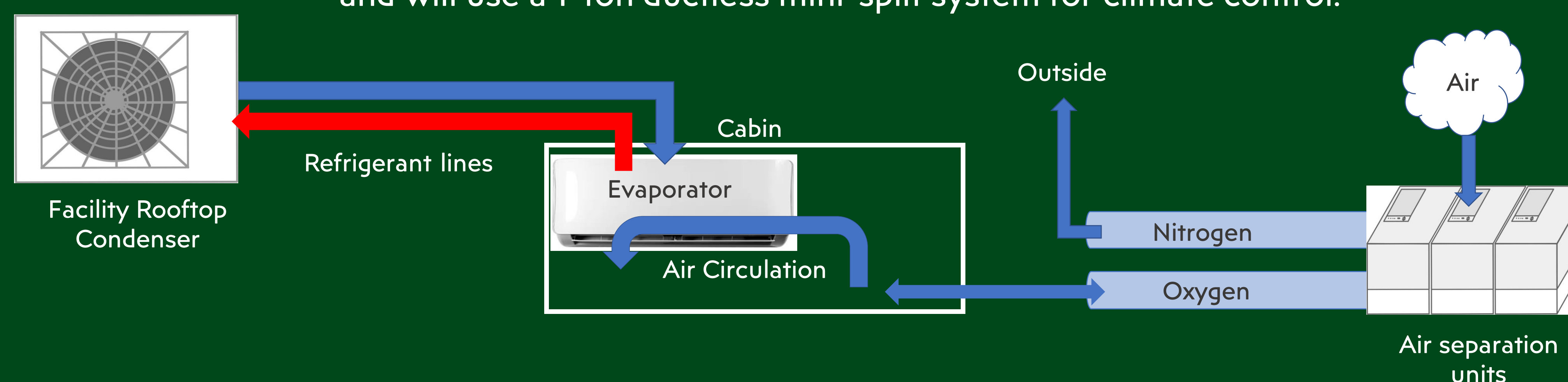
Lighting
Adjustable Phillips Hue Light Strips controlled from a phone or Google Nest Hub

Accessories
Google Nest Hub, Google Mini, Levoit Air Purifier, and Acoustical Panels

Sensor System
Identical sensor packages to measure light, sound, air quality, and temperature

HVAC & Altitude

Our final design will simulate higher altitude by creating a hypoxic environment and will use a 1-ton ductless mini-split system for climate control.



Functional Prototype



Exterior
5.25 W x 9 L x 8.45 H [ft]

Non-STC Rated Door
Rating = 35

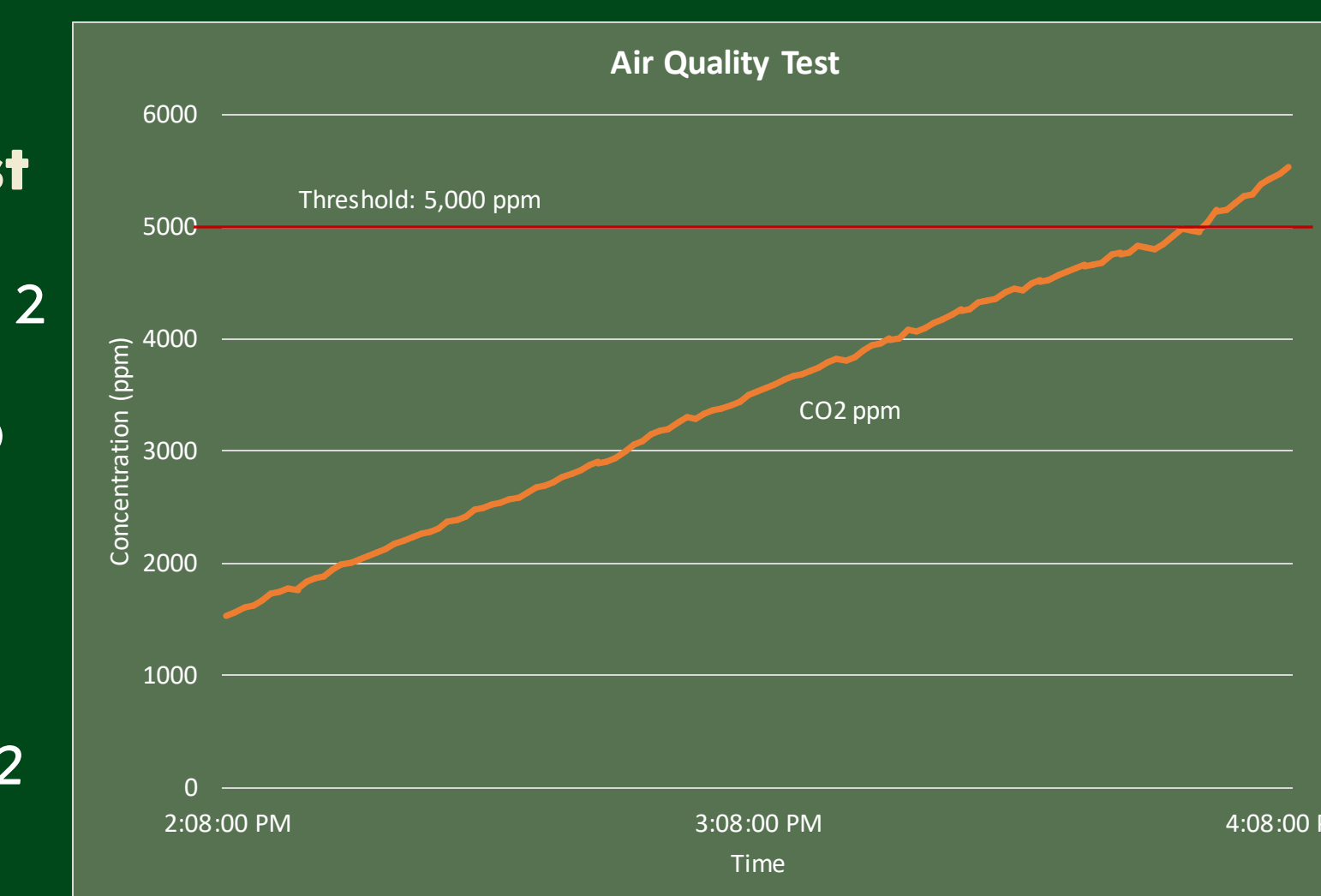


Testing & Data

Air Quality Test

Collected data for 2 hours using Air Pod from HAQ Lab

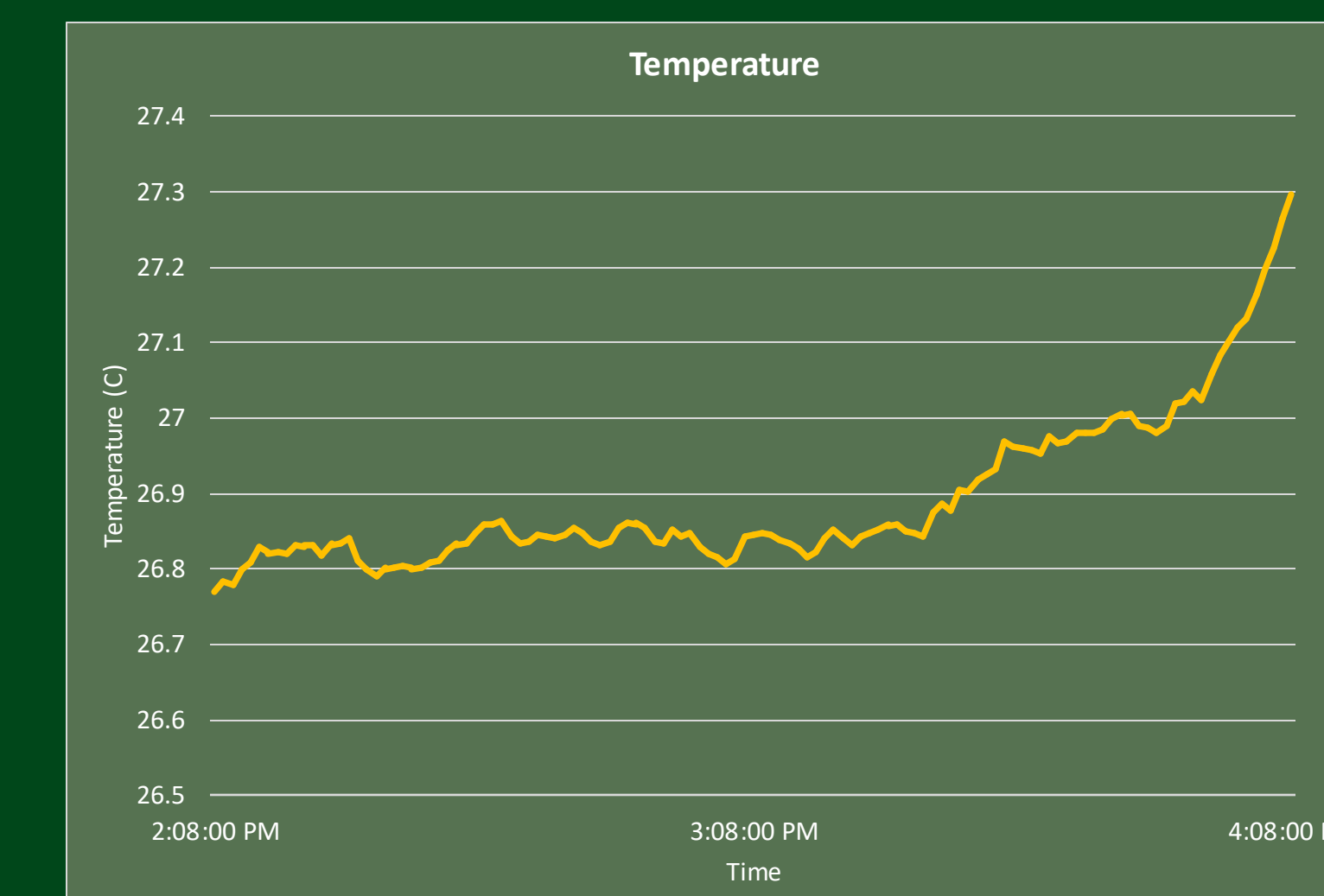
Max CO2 concentration reached was 5,532 ppm



Temperature Test

Collected data for 2 hours using Air Pod from HAQ Lab

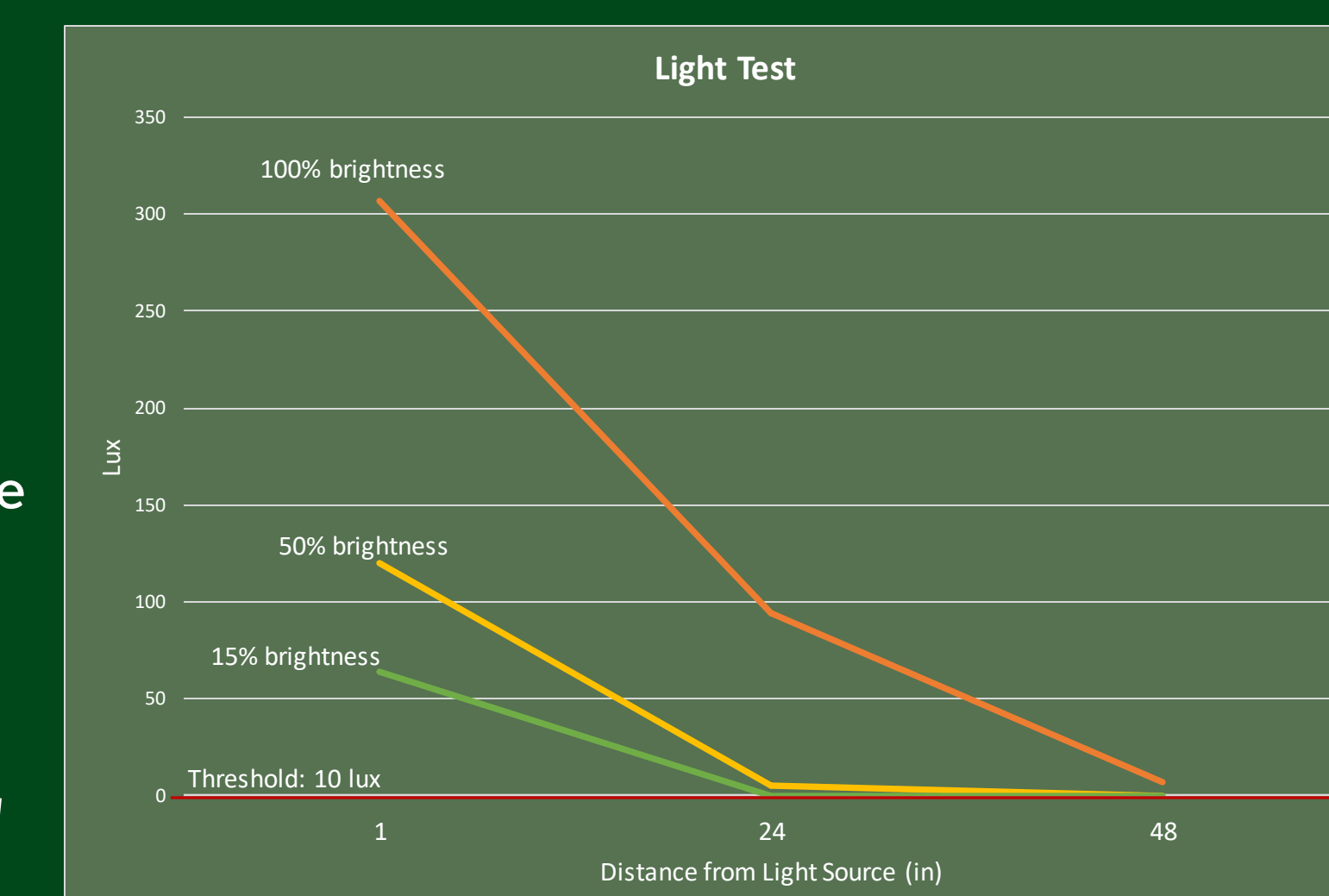
Min temp = 80°F
Max temp = 81°F
Avg temp = 80.2°F



Light Test

Measured lux values at 3 distances from light source at 3 brightness levels

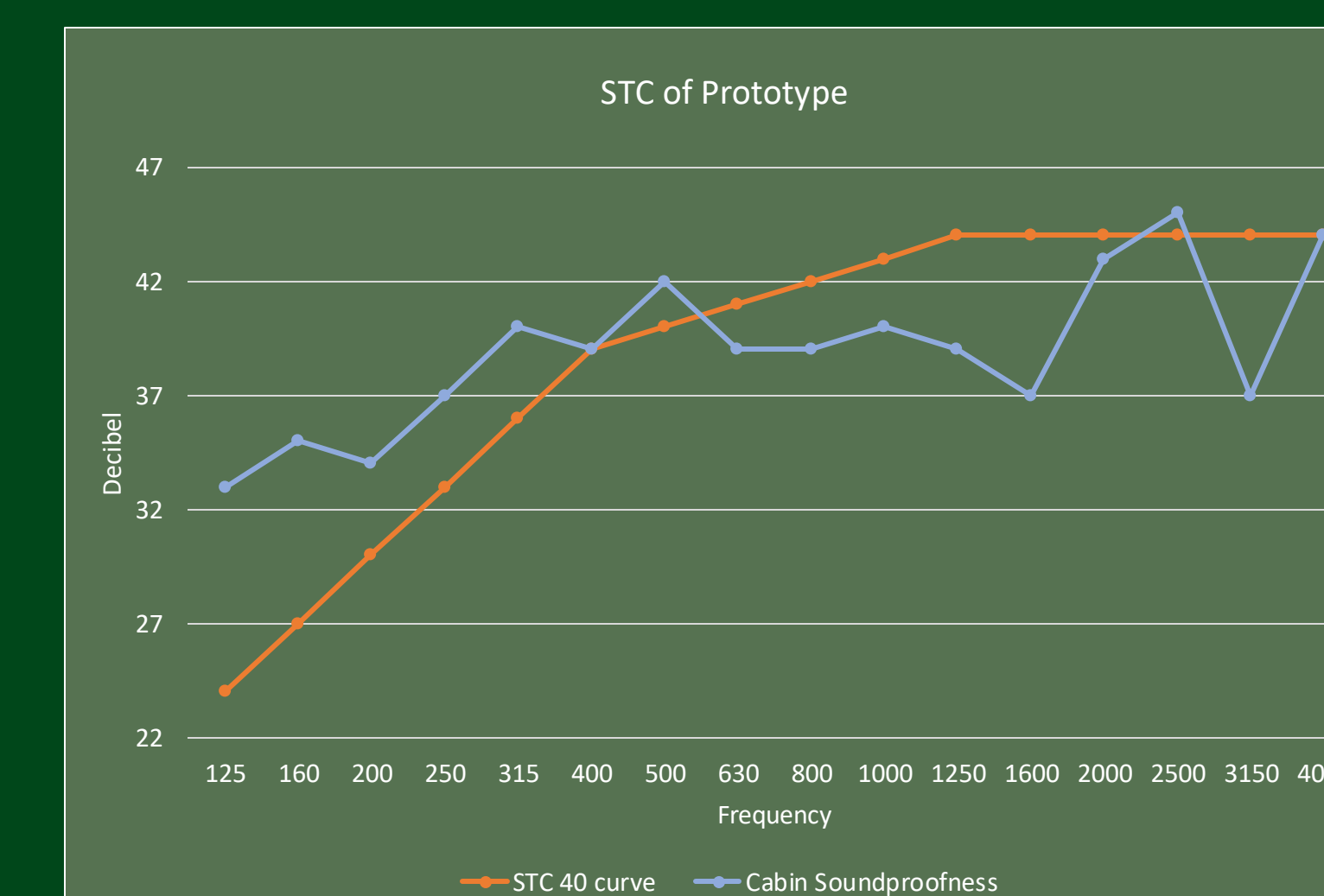
In all cases, <10 lux at head level



Sound Proofing Test

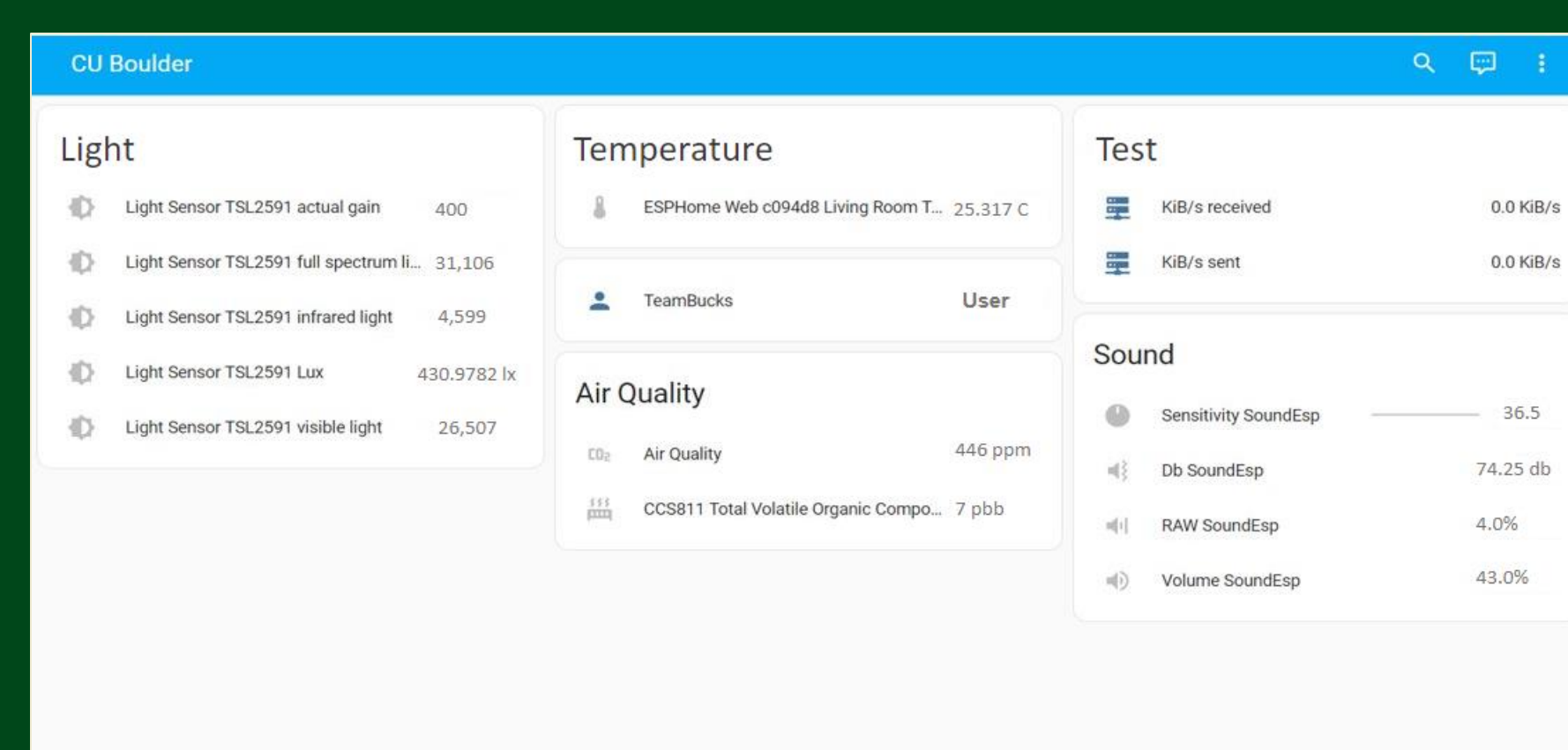
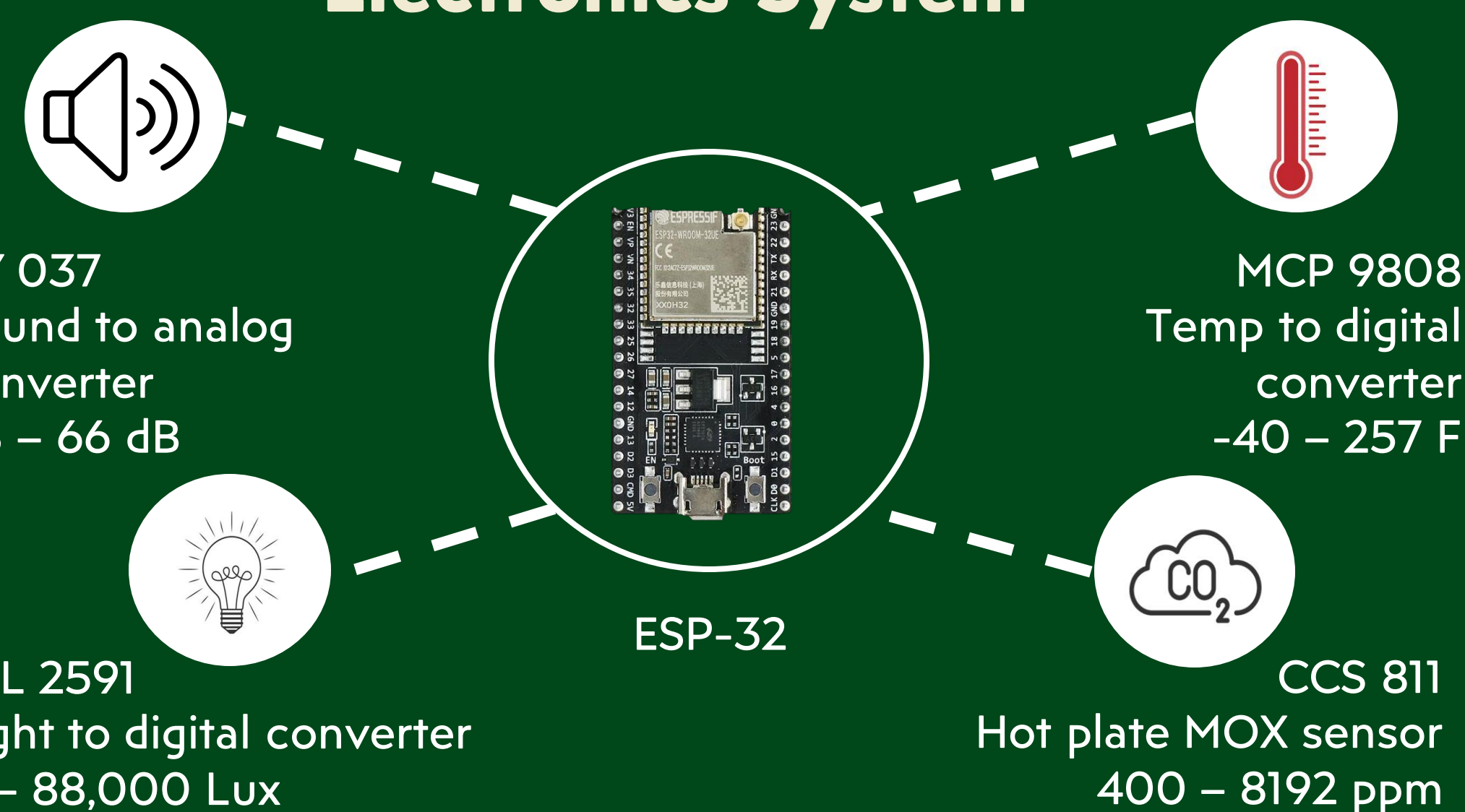
Measured decibel values inside prototype with and without door closed and fit data to STC curve to determine STC rating

STC rating = 40



| Category | Requirement |
|---------------|--|
| Sound | The STC rating of the cabin shall not be less than 60 |
| Light | Light shall not exceed 10 lux while used for sleeping, amber light with wavelengths 500-595nm will be emitted |
| Temperature | Temperature can be adjusted between 65 - 80 degrees F |
| Air Quality | The carbon concentration inside the cabin shall not exceed 5000 ppm after 2 hours of occupancy. The system shall be able to simulate altitude of no more than 8,500 ft |
| Comfort | The bed shall be at least 7 ft 2 in long |
| Sleep Sensing | Athletes shall be monitored while using the cabin for environmental and physiological changes |

Electronics System



Outcome & Future Work

Our team is providing our client a proposal pitch package which will include a presentation slide deck, floor plans for the final build, and a rough cost estimate (assisted by Weitz Construction, Altitude Control Technologies, & MTECH).

Our client will present the proposal pitch package to his upper management in hopes to get the final design permanently installed in the Milwaukee Bucks training facility.