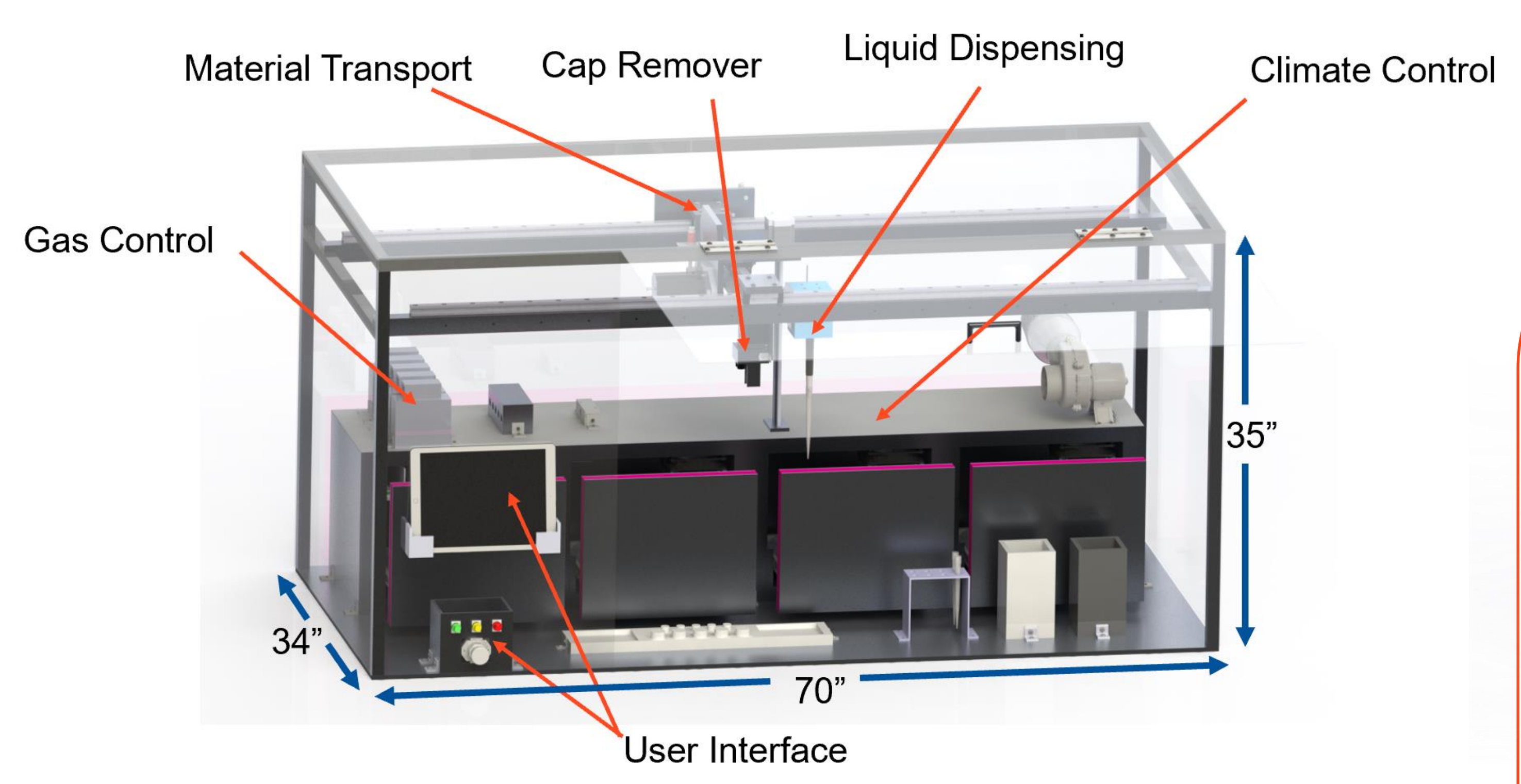


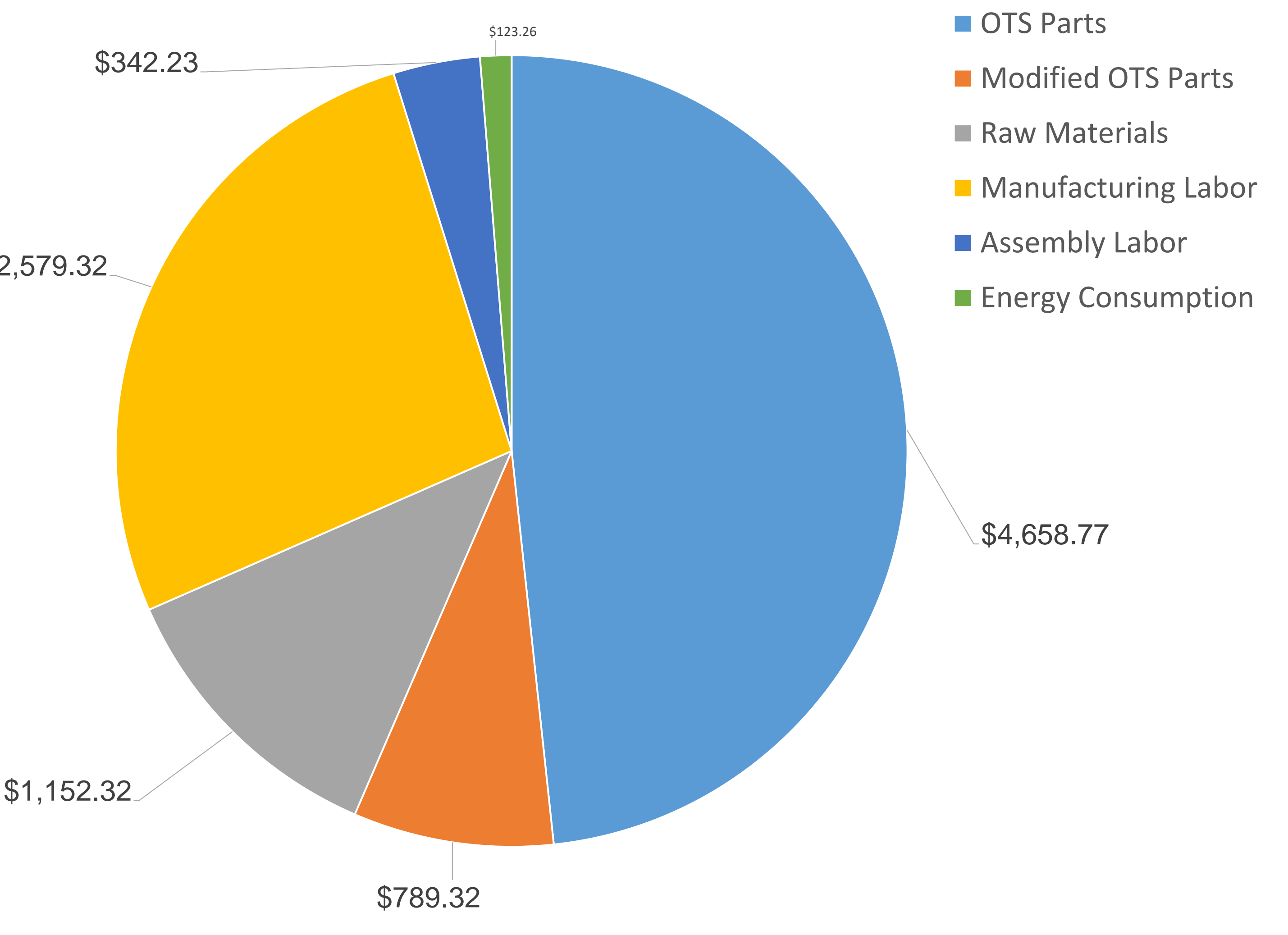
Abstract

The MECCR excels in both adding nutrients and removing waste. This was to achieve the hedgehog concept to minimize the length of time cells are not in the controlled environment. This means the cells are culturing in a fully automated gas and temperature-controlled environment for procedures such as shaking of well plates or tubes, and measurements needed to track the growth of the cells. The plate movement device must be cheap, because it is placed in four different controlled environments. The plate movement subsystem also must be compact, to keep the overall size of the reactor to the size of a benchtop. Four different measurement devices were designed to fit in each climate-controlled container, the most complicated being the non-384 well plate measurement system, this component can collimate the light for 5 well plate sizes to get very accurate measurements. Similar designs are integrated into the other 3 containers for the 384 wells plate and different sized tubes. The design meets all the needs set forth by the UF Biofoundry.

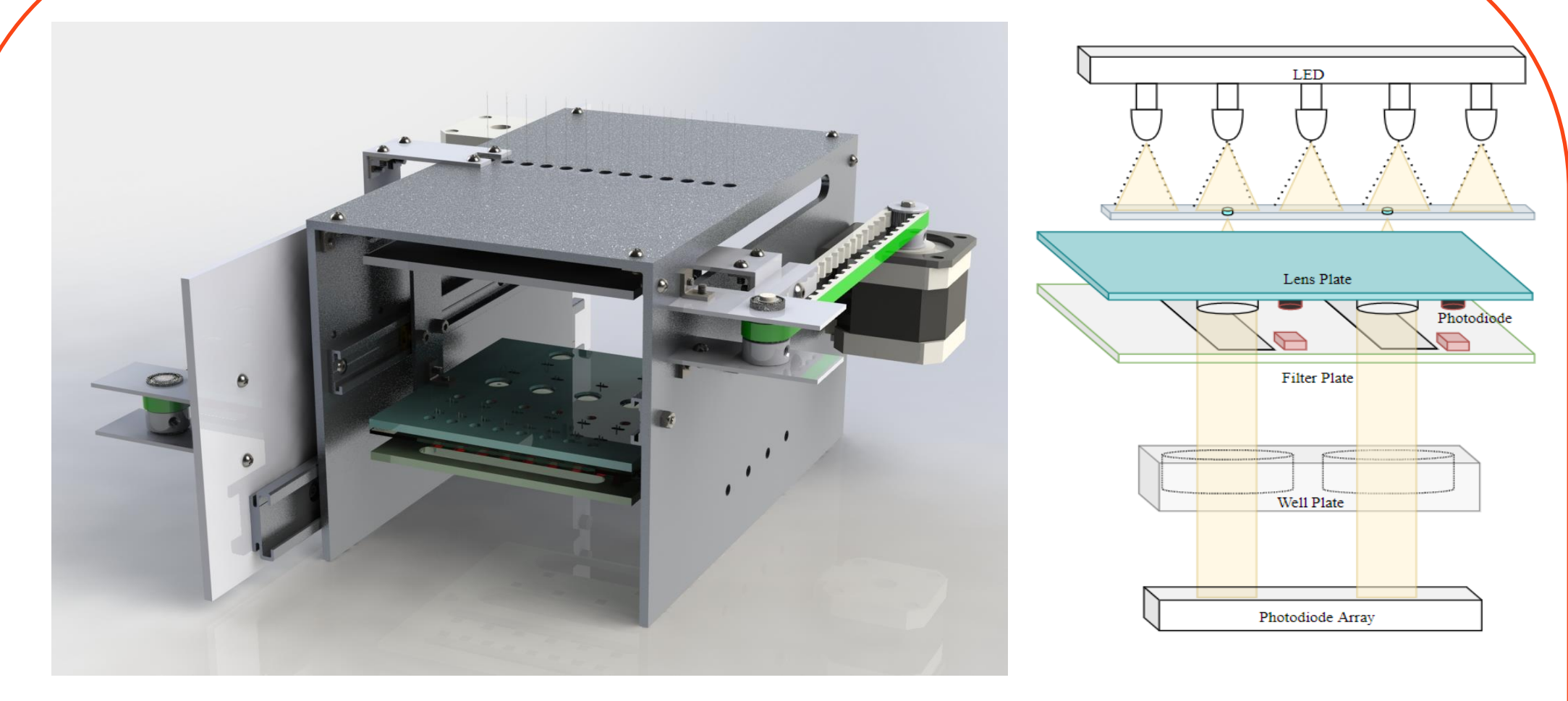
Full System



Cost Estimation

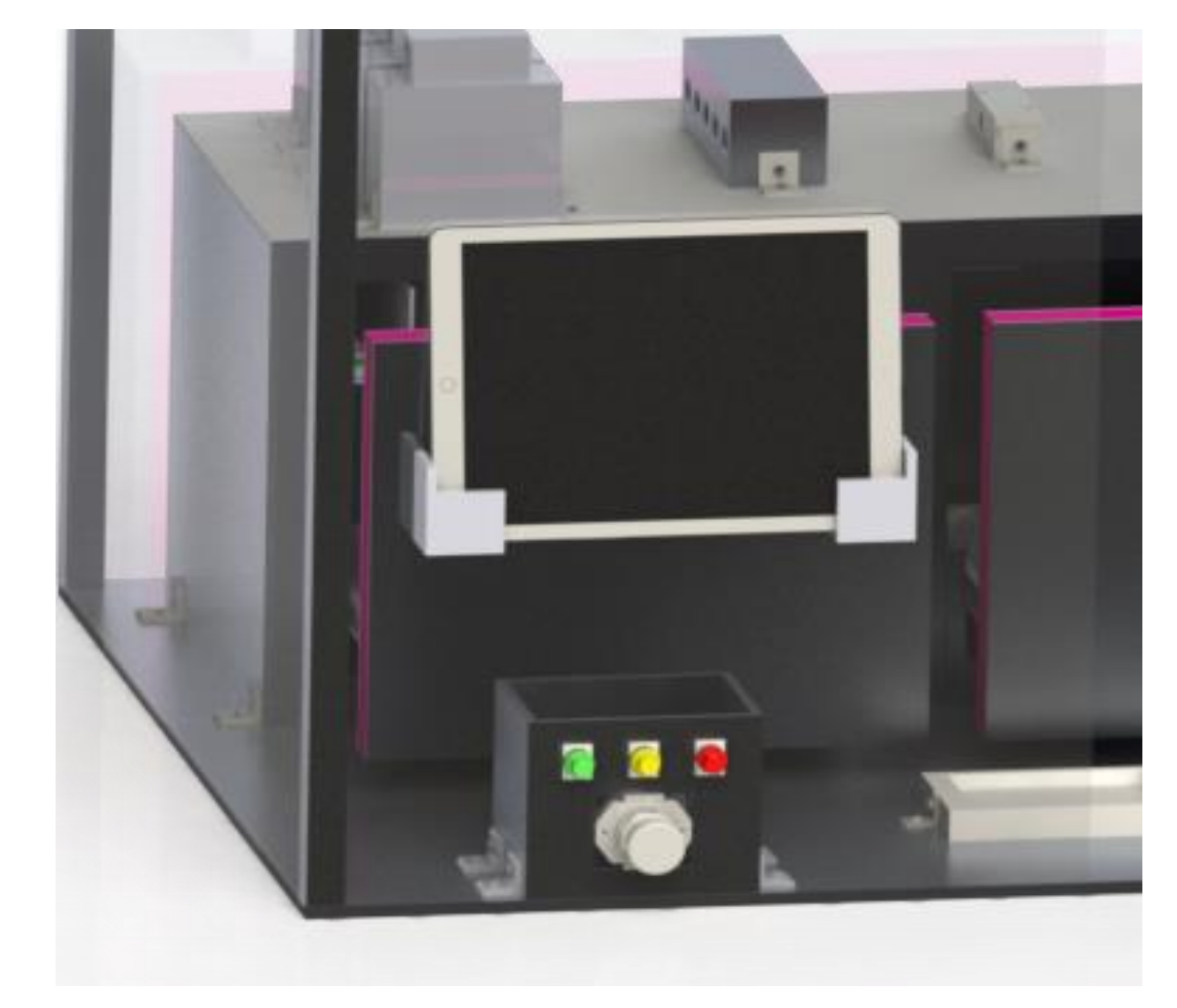


Subsystems:



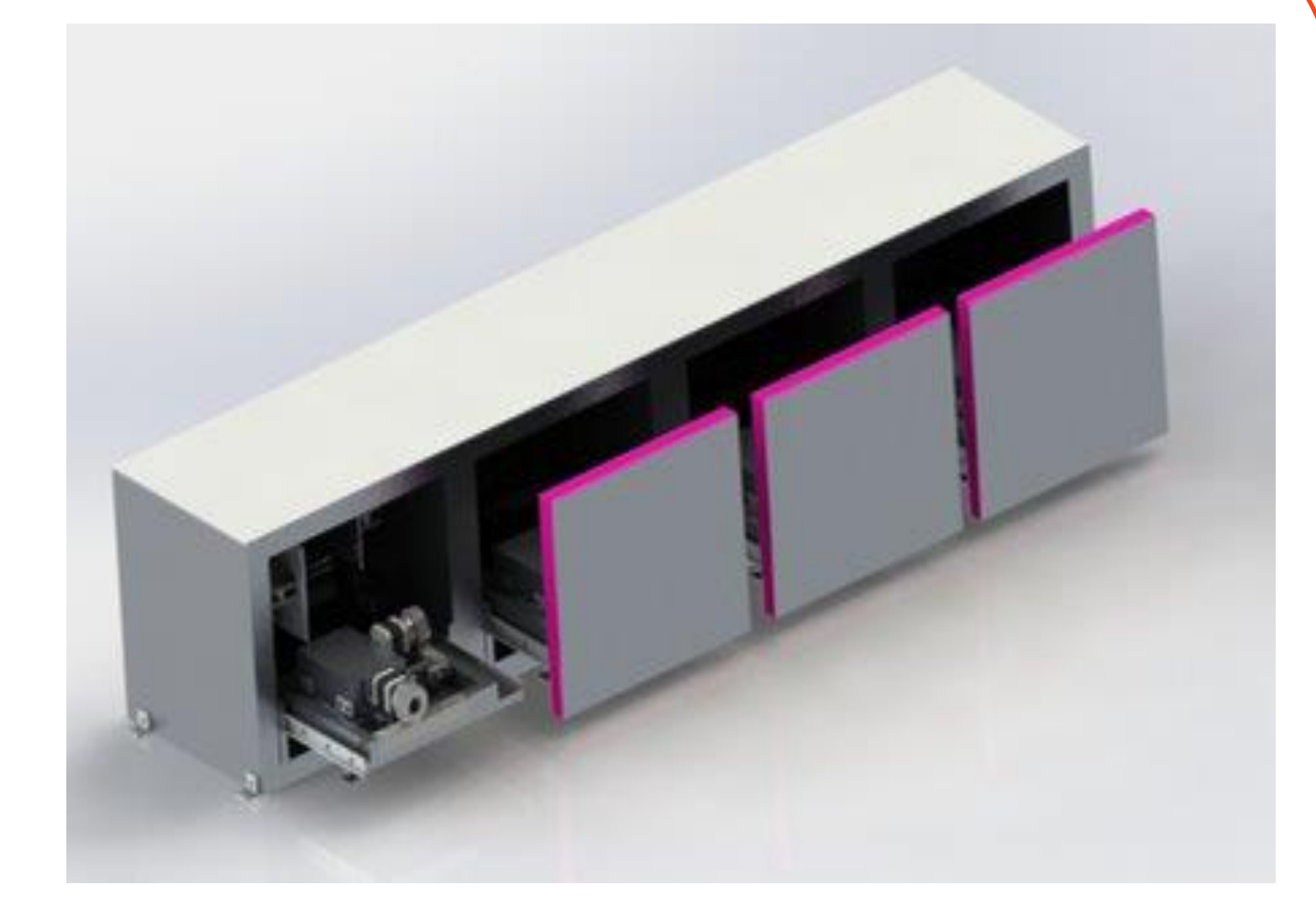
Measurement

- Measures all wells/tubes in a column
 - Uses 600 nm LEDs
- Measurement 384**
- Takes measurements of an entire 384-well plate in less than a second
- Measurement NON-384**
- Takes measurements for 6, 24, 48, 96, and 96-deep well plates



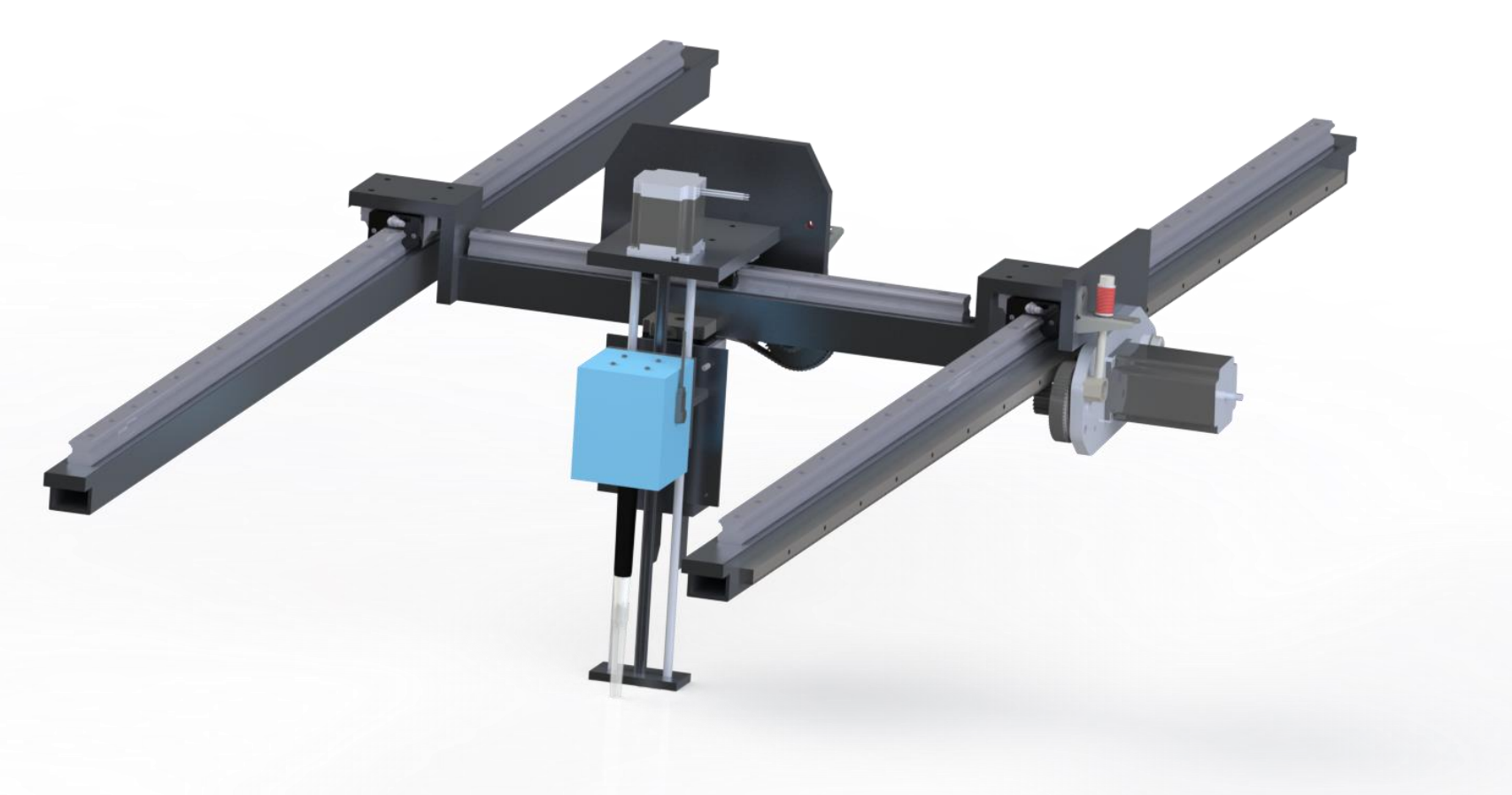
User Interface

- Emergency stop button with switching current of 6 A @ 120 VAC
- 3 LEDs and Audio/Visual output
- Latest iPad generation
- Raspberry Pi with smoothie board to control all desired operations
- DAQ is used with LabView for sensors and data storage



Climate Control

- DHT22 Temperature Sensor
- TEC1-12710 device
- Blows both hot and cold air
- Copper heat pipes
- Aluminum Heat Sink
- Air Flow: 53.9 CFM
- 5 Nema 4 Brass Body Valves
- Pore Diffuser
- Gas Manifold



Material Transport

- Moves liquid dispensing and cap/lid remover systems.
- Rack and pinion system used to move in x and y axis.
- Stepper motor system used to move in z axis.
- Proximity sensor used to avoid collisions.

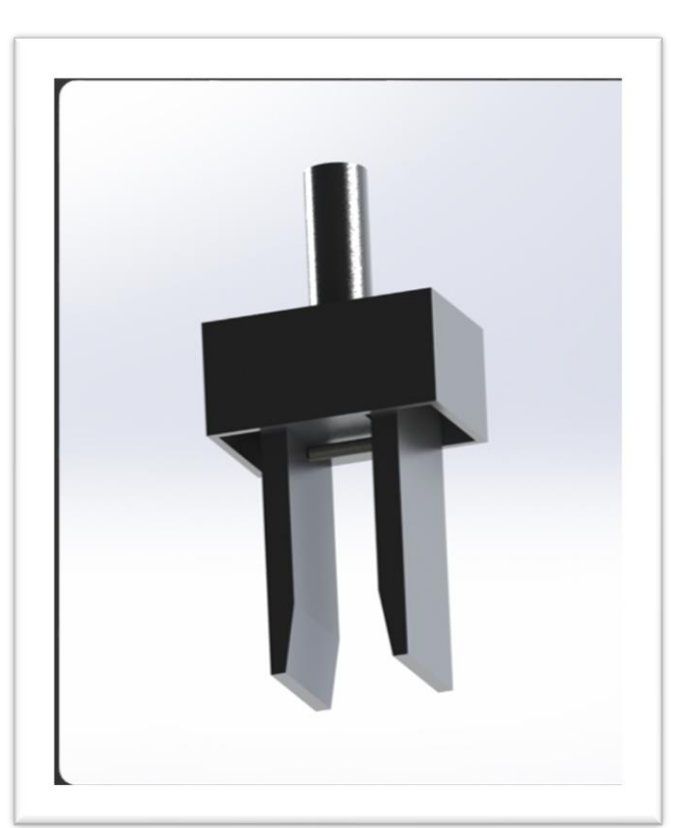


Liquid Dispensing

- NEMA 17 Stepper Motor
- Lead screw attached to plunger
- Positive air displacement
- Storage unit for fluid handling and waste management
- Disposable pipette tips
- Tip ejector mechanism

Plate Movement

- NEMA-17 Motor with lead screw drives lateral (linear) movement of shaker and rails are utilized to allow for movement
- Another NEMA-17 motor attached to ball bearings and creates orbital and double orbital motion
- Ball bearings allow for double orbital motion



Cap and Lid Removal

- A spring-controlled grip rotated using a stepper motor
- Conical tube cap added to center of well plate

Structure/Enclosure

- Aluminum frame
- Acrylic glass case
- BS-2 biosafety cabinet

