

Yuejia's Portfolio

Yuejia Yin 31/01/2022

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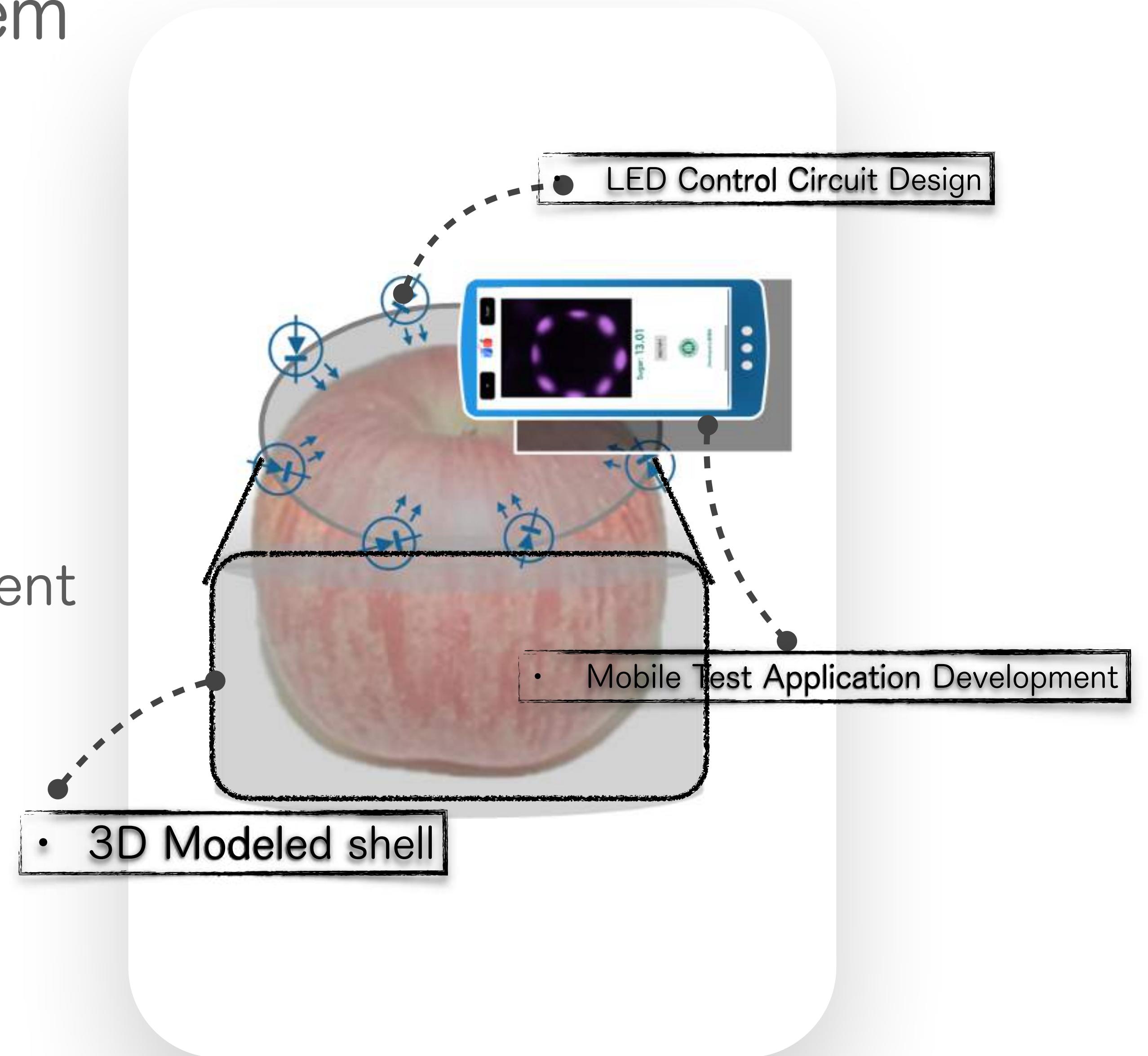
Part I. Apple Brix Test System(at school)

Part 2. Night Vision Enhancement on AR Glasses(at school)

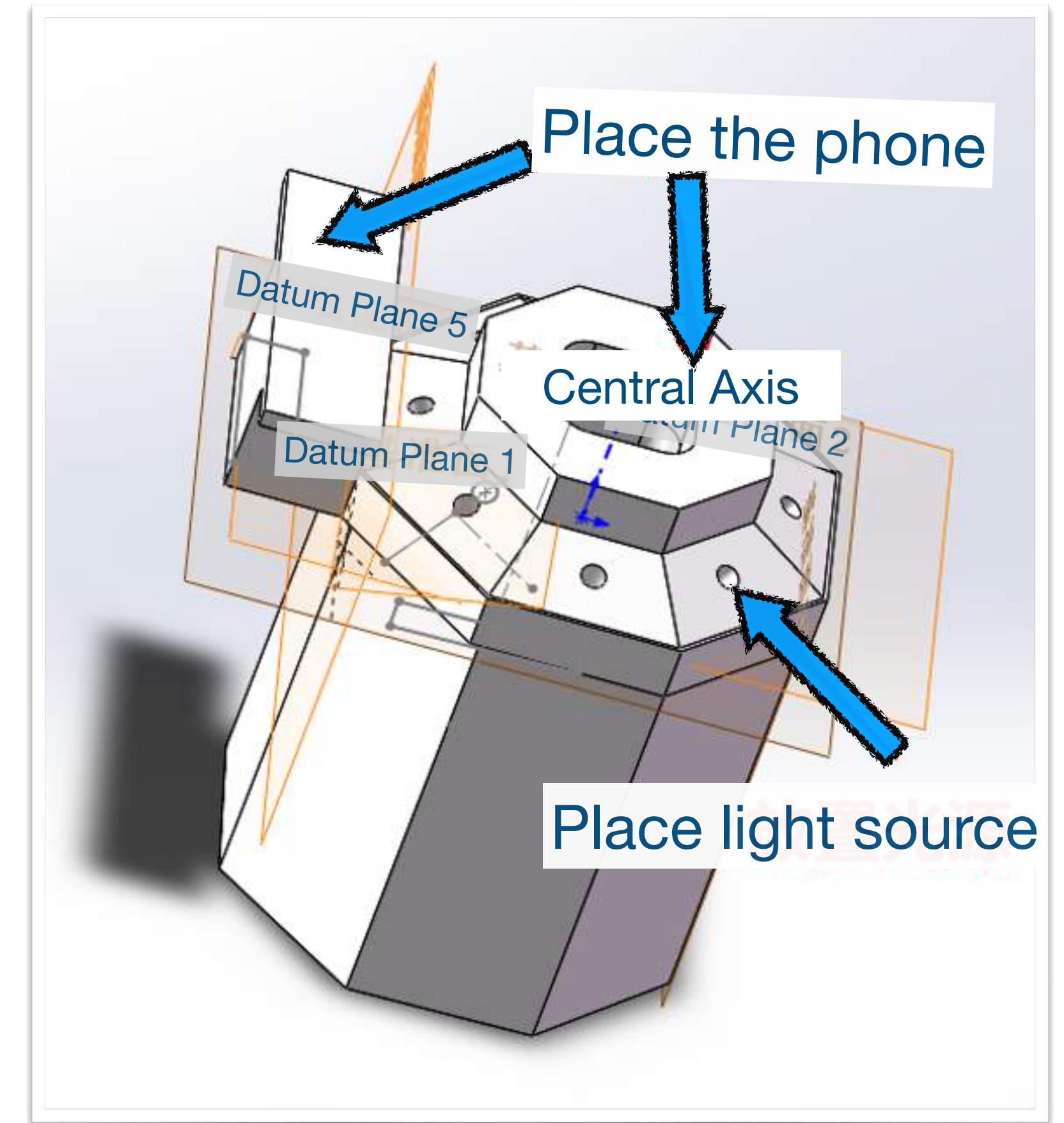
Part 3. Graffiti, Travels...

Part I. Apple Brix Test System

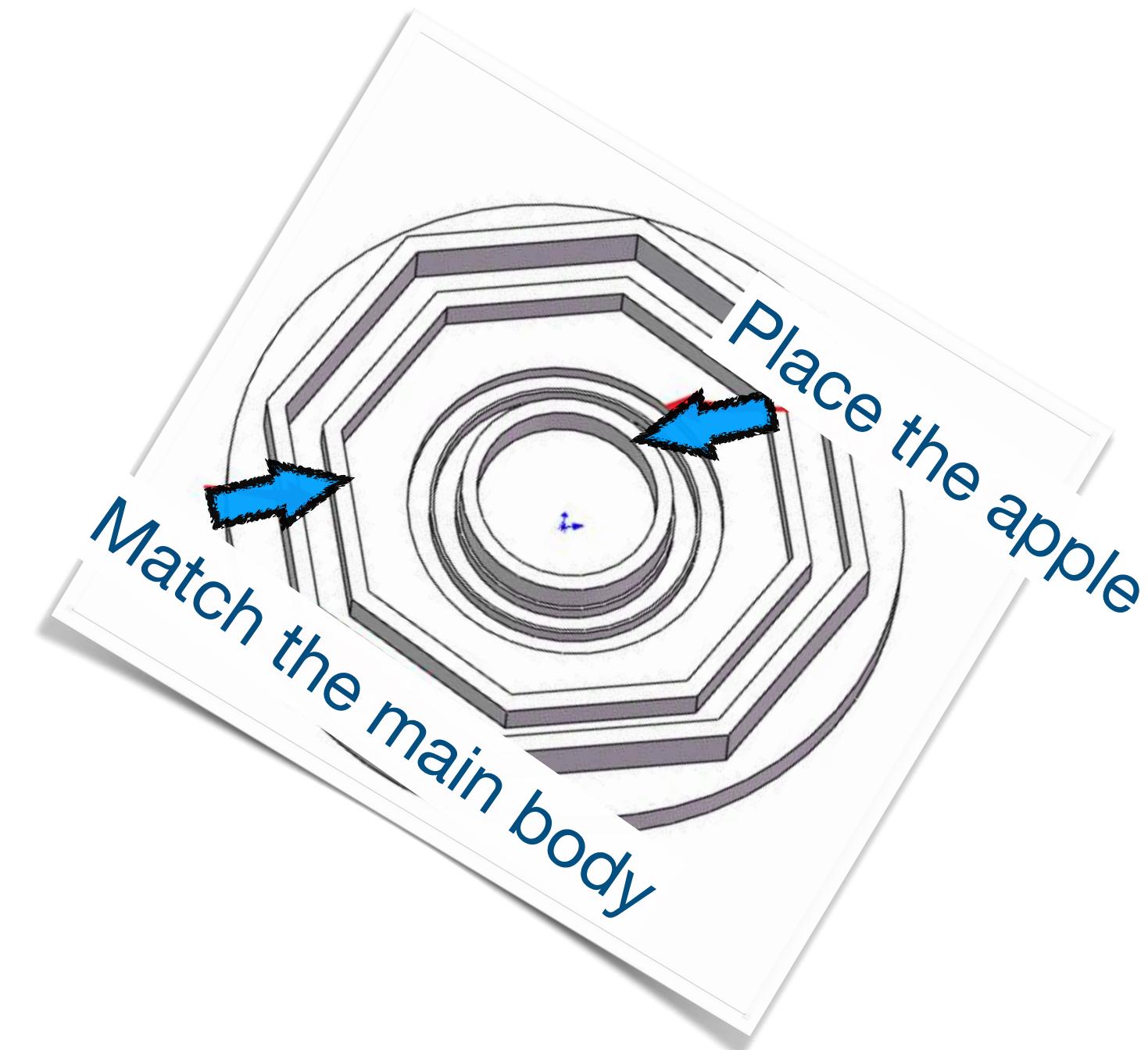
- 3D Modeled Shell
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3D Modeled Shell

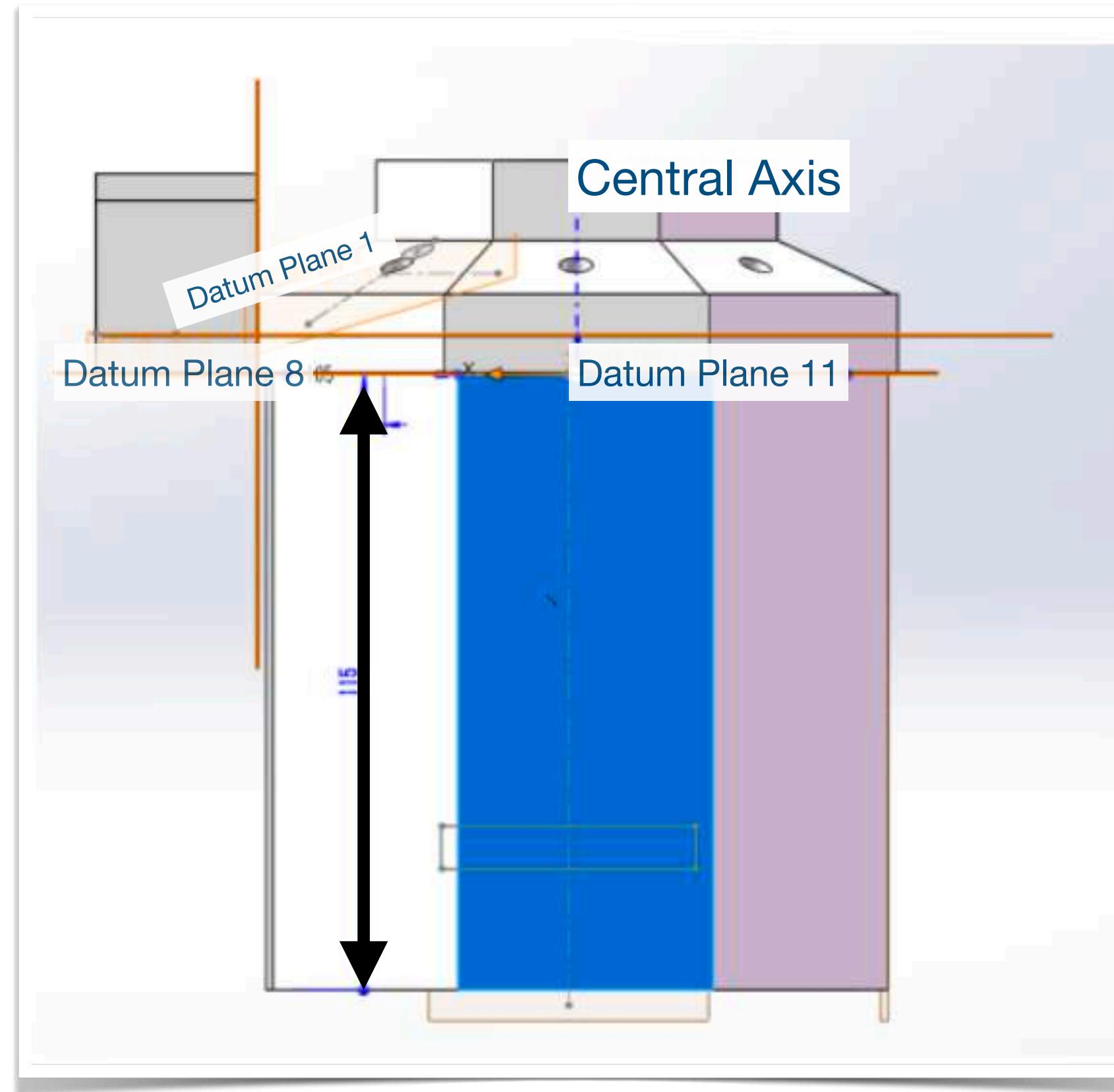


Main Body

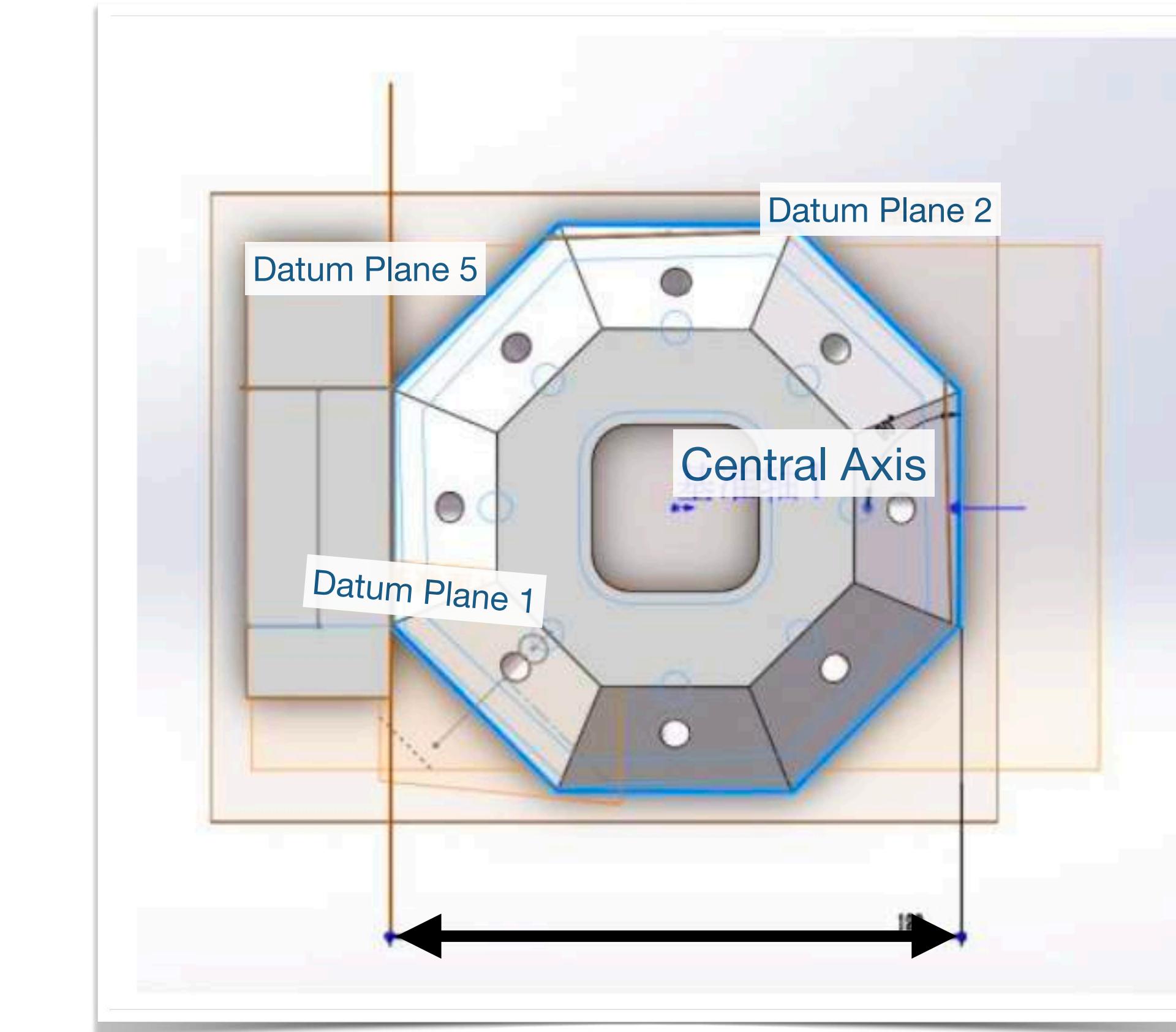


Pedestal

Main Body



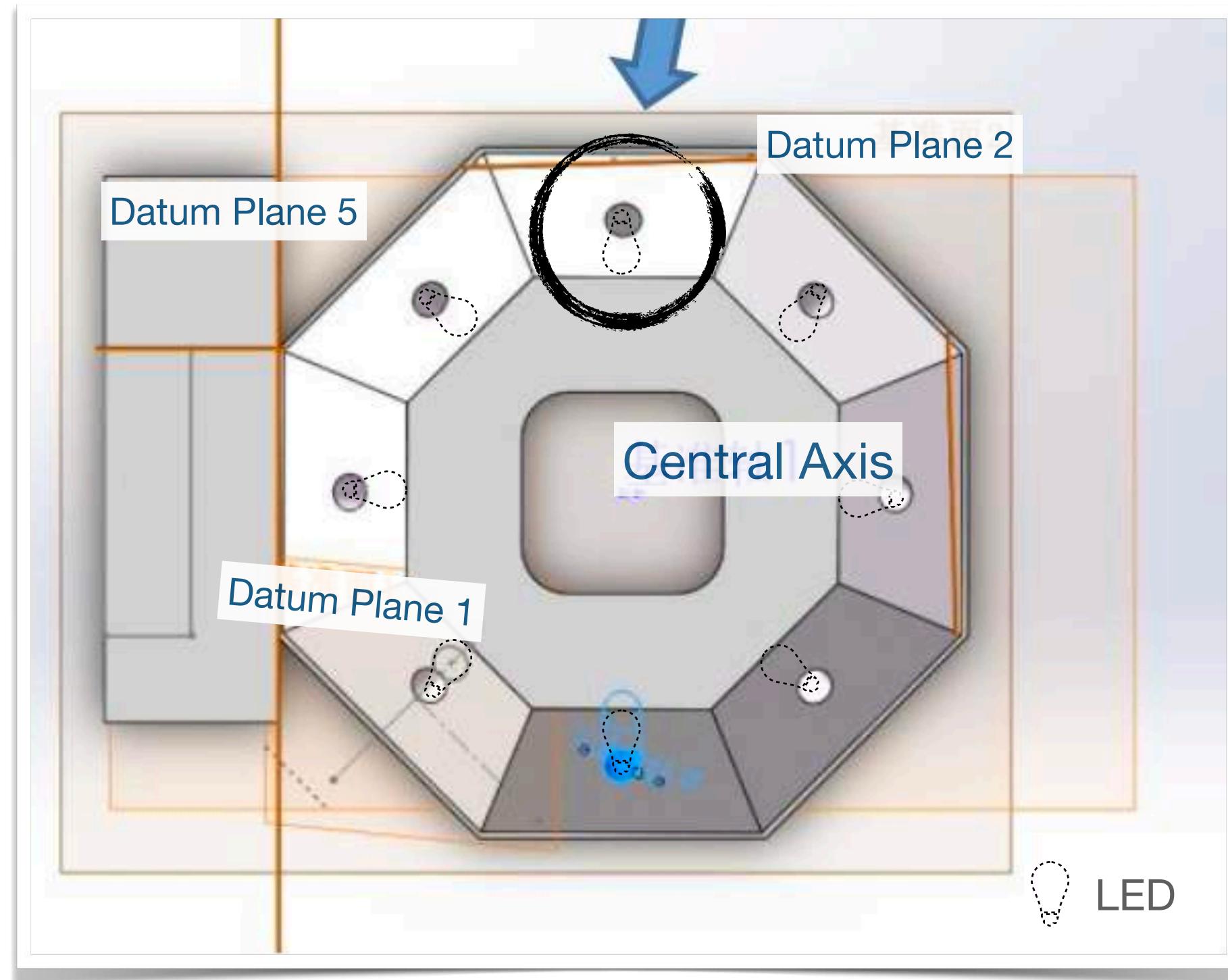
Side wall length is 115mm.



The distance between two parallel sides of a regular octagon is 120mm.

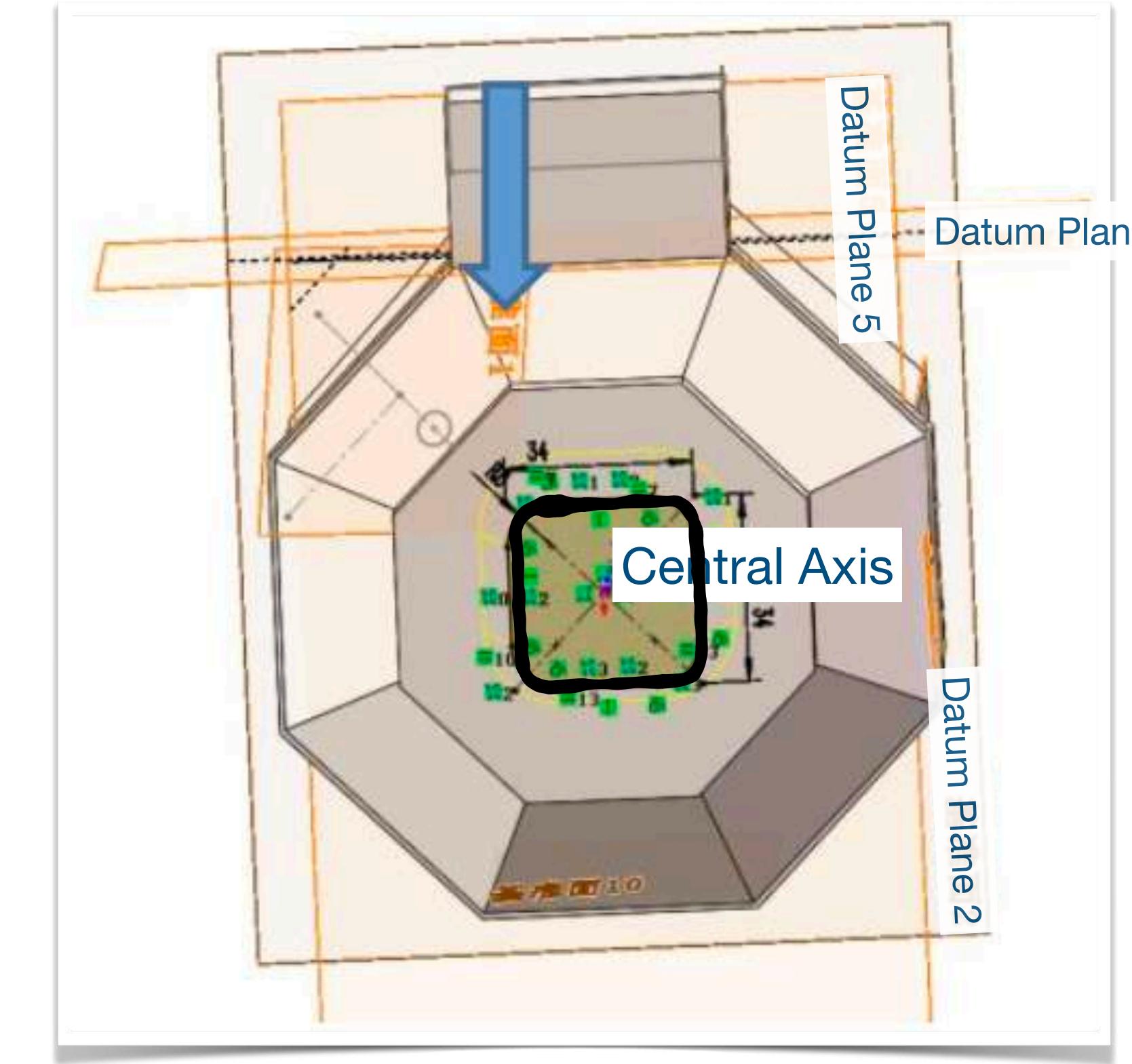
This size is designed to make the area illuminated by the light source meet the 6cm*6cm size specified by the competition after placing the apple in the base while leaving a small gap of appropriate size between the apple and the sidewall.

Main Body



Pore diameter is 6.3mm.

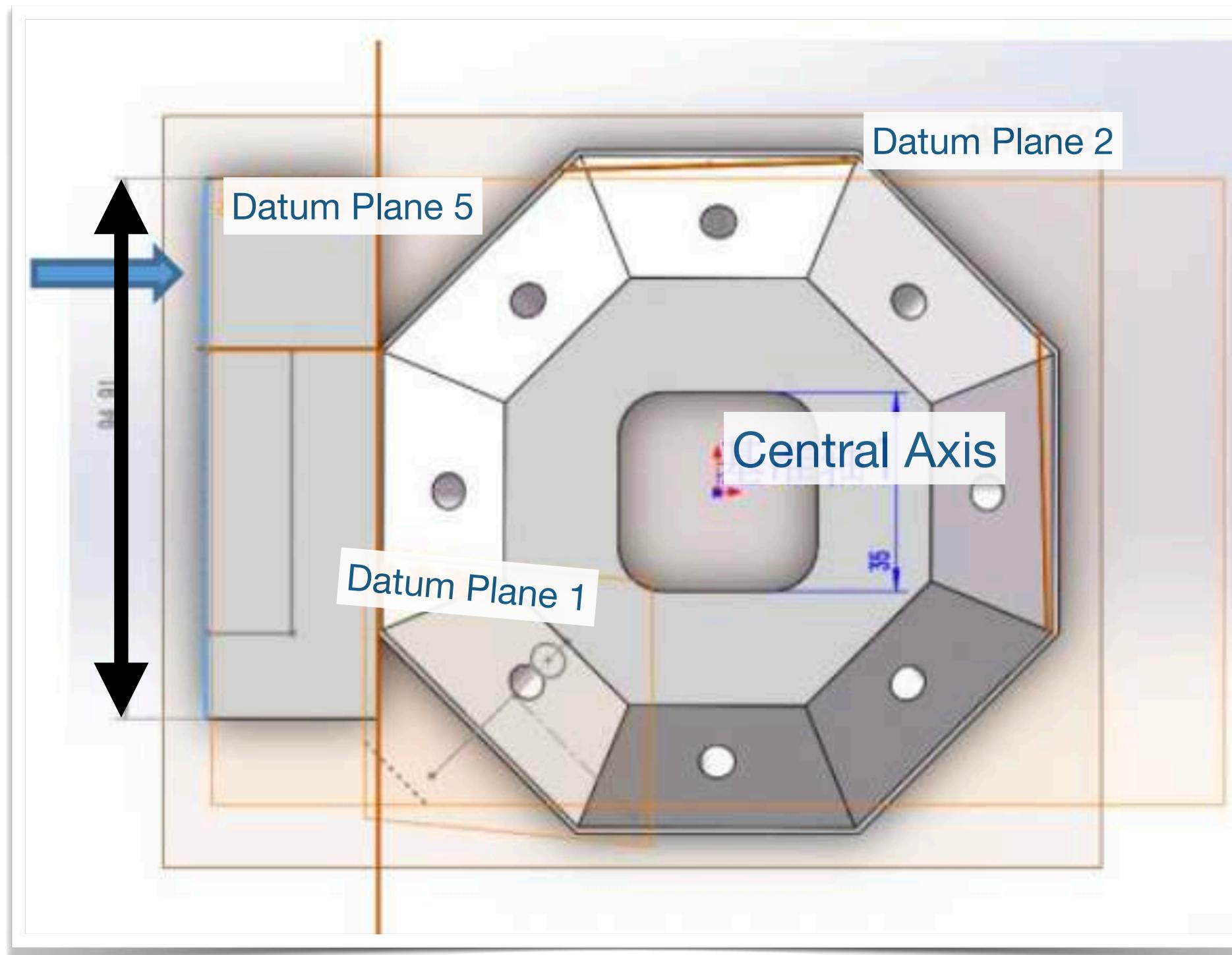
Aim to match the LED size.



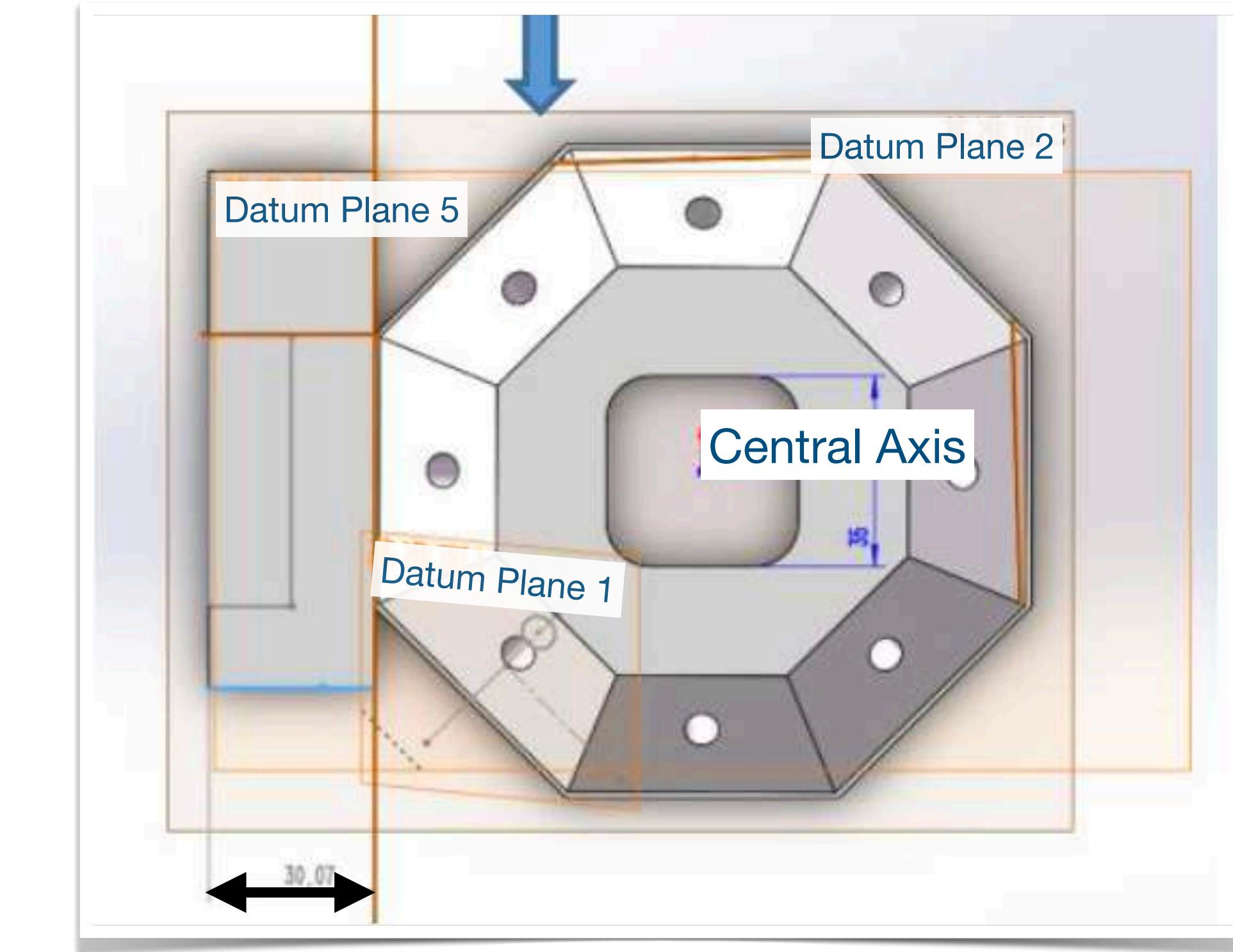
The rounded rectangle length is 34mm.

Aim to match the phone's camera size.

Main Body



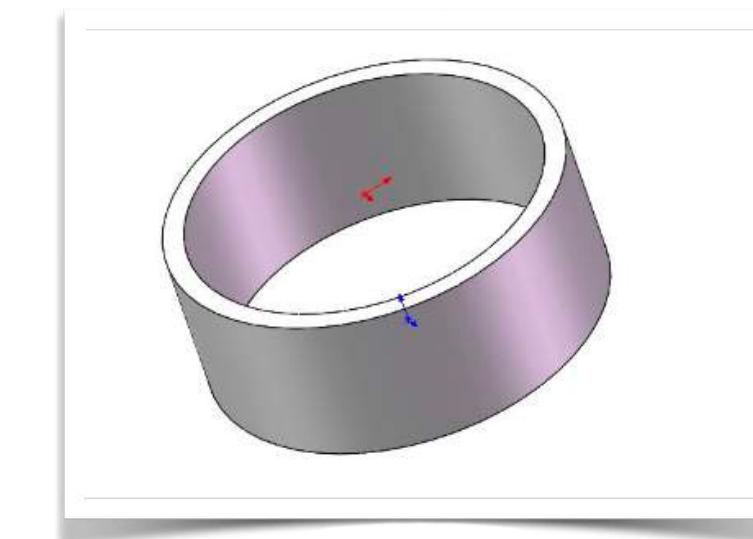
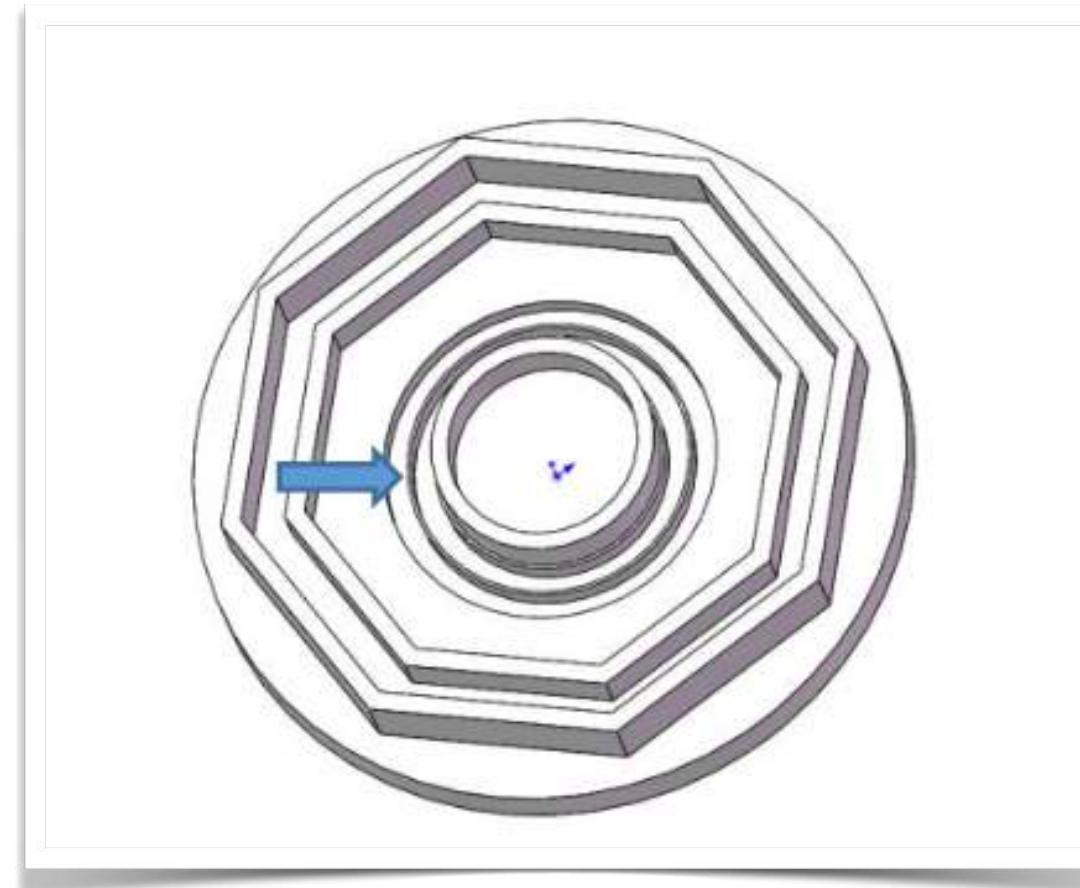
Phone tray length: 94.91mm



Phone tray width: 94.91mm

This size could best hold the phone.

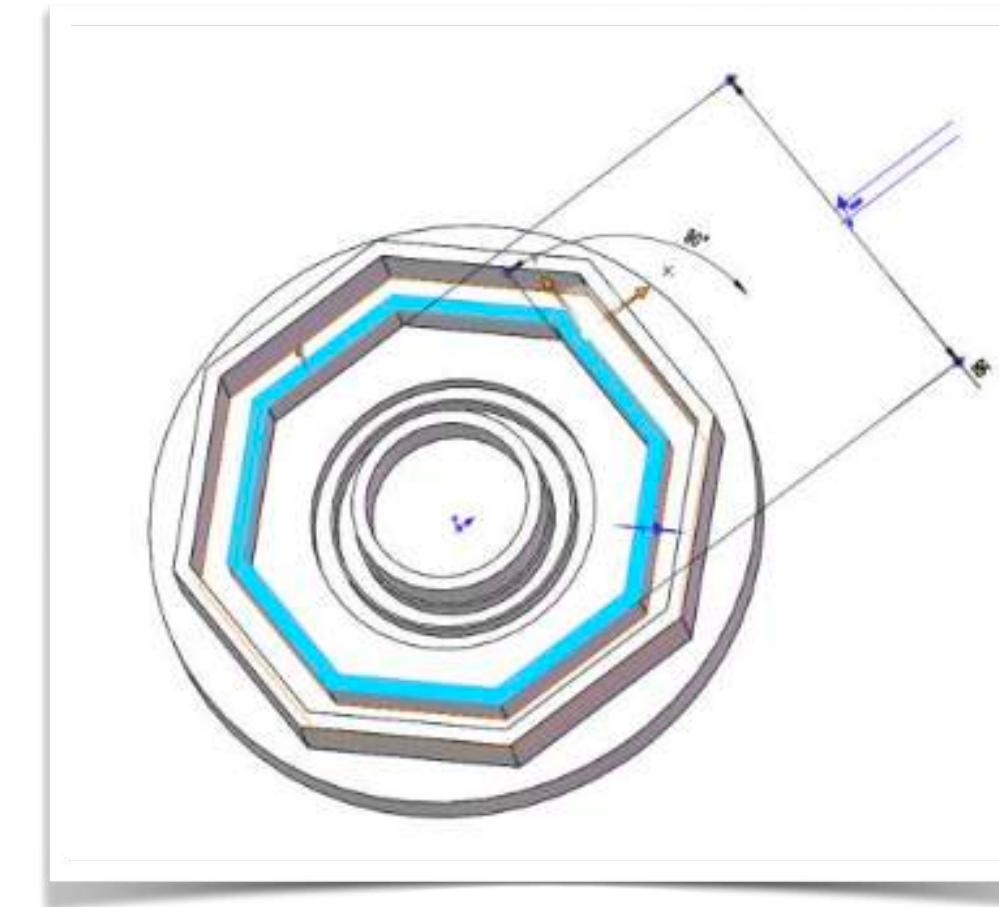
Pedestal



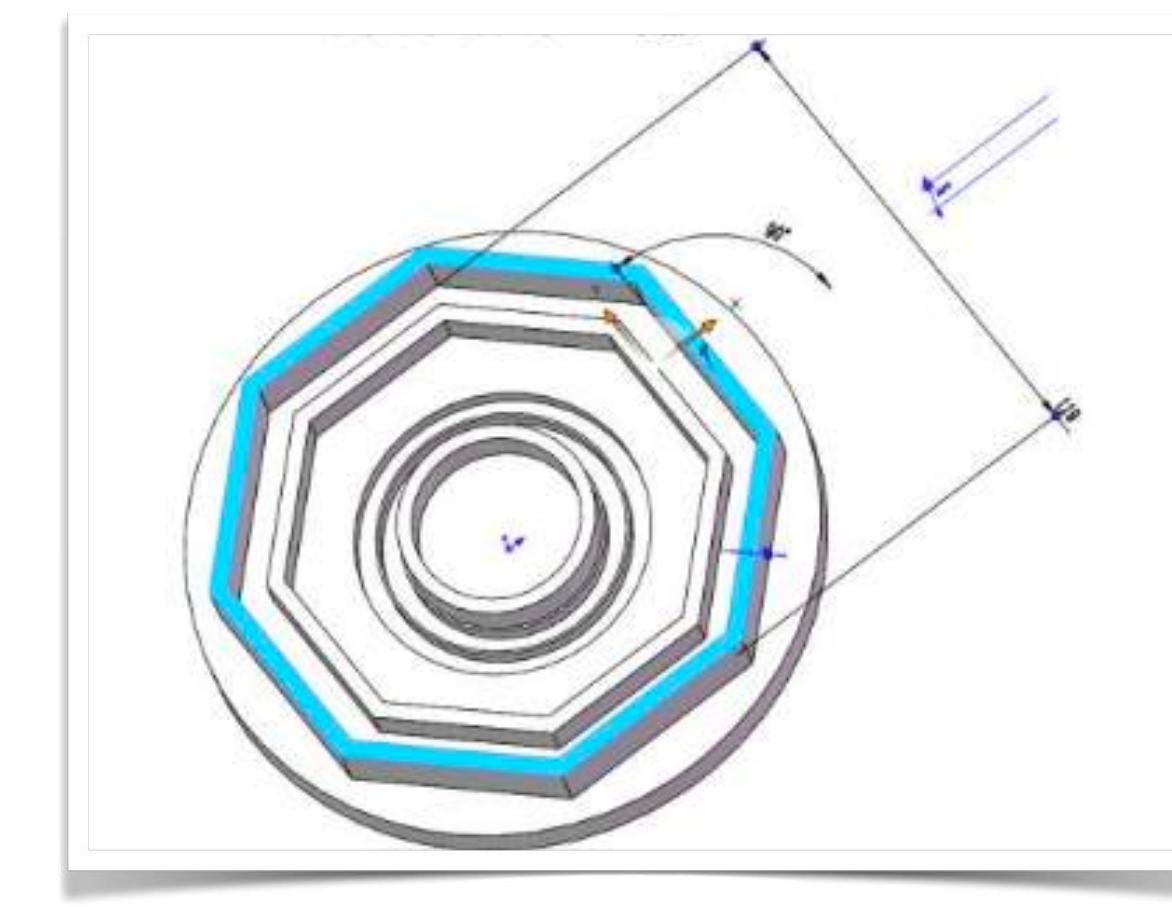
A small ring column combines with a slightly larger inner ring pit to support irregularly shaped apples to allow the phone to take photos and minimize errors.

The inner ring of the cylinder that holds the apple is 30mm in diameter and 15mm in height.

Pedestal



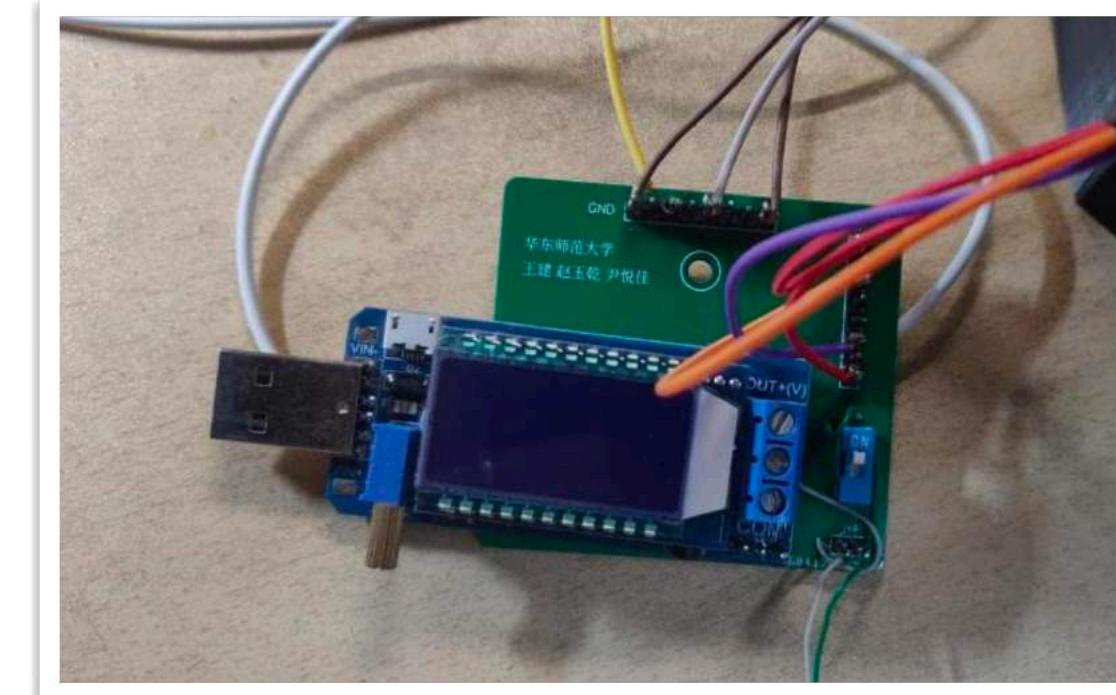
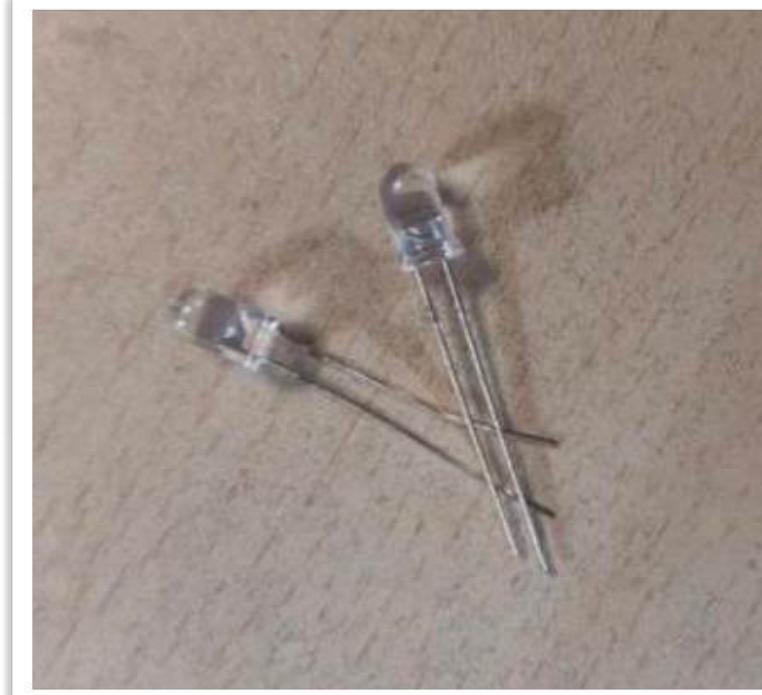
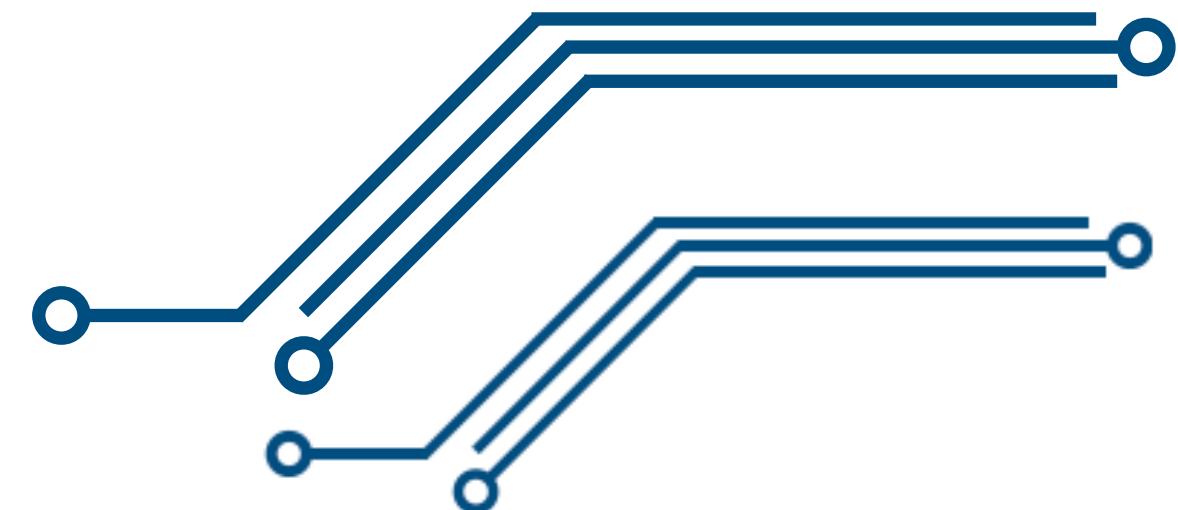
Inner diameter length of the inner wall: 95mm.



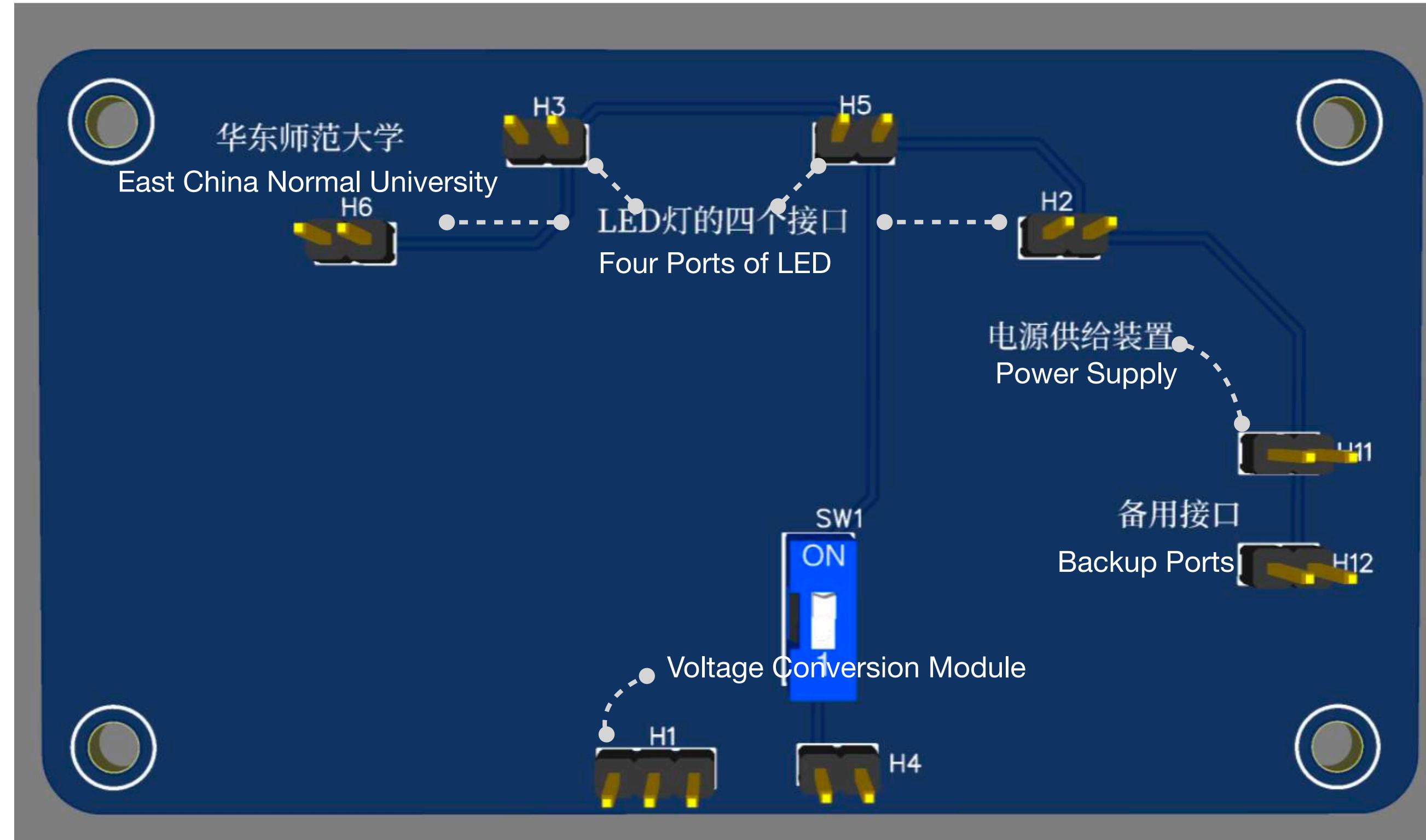
Outer diameter length of the inner wall: 115mm.

This size can be better suited to the main body of the measurement hardware, respectively.

LED Control Circuit Design

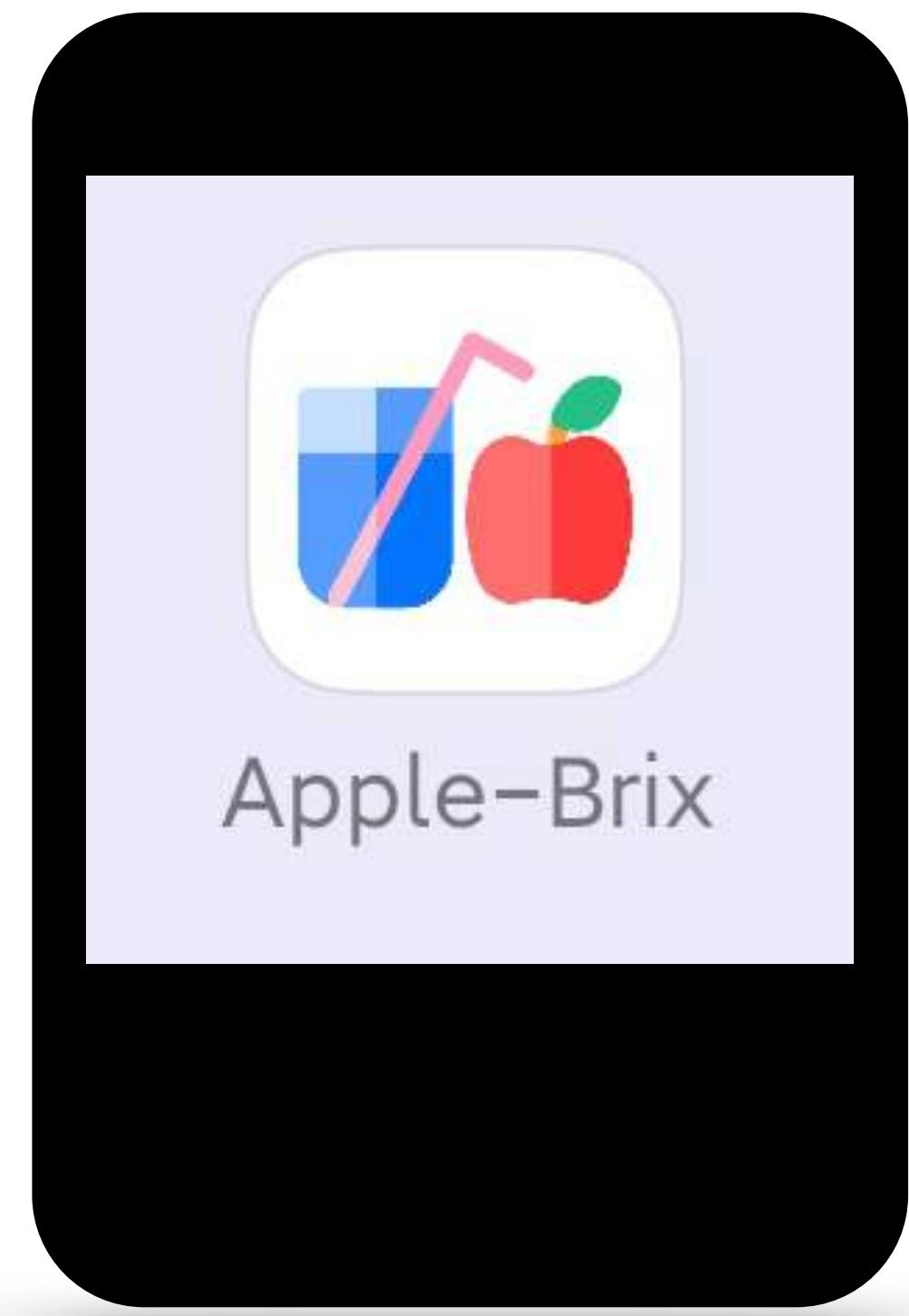


Schematic Diagram

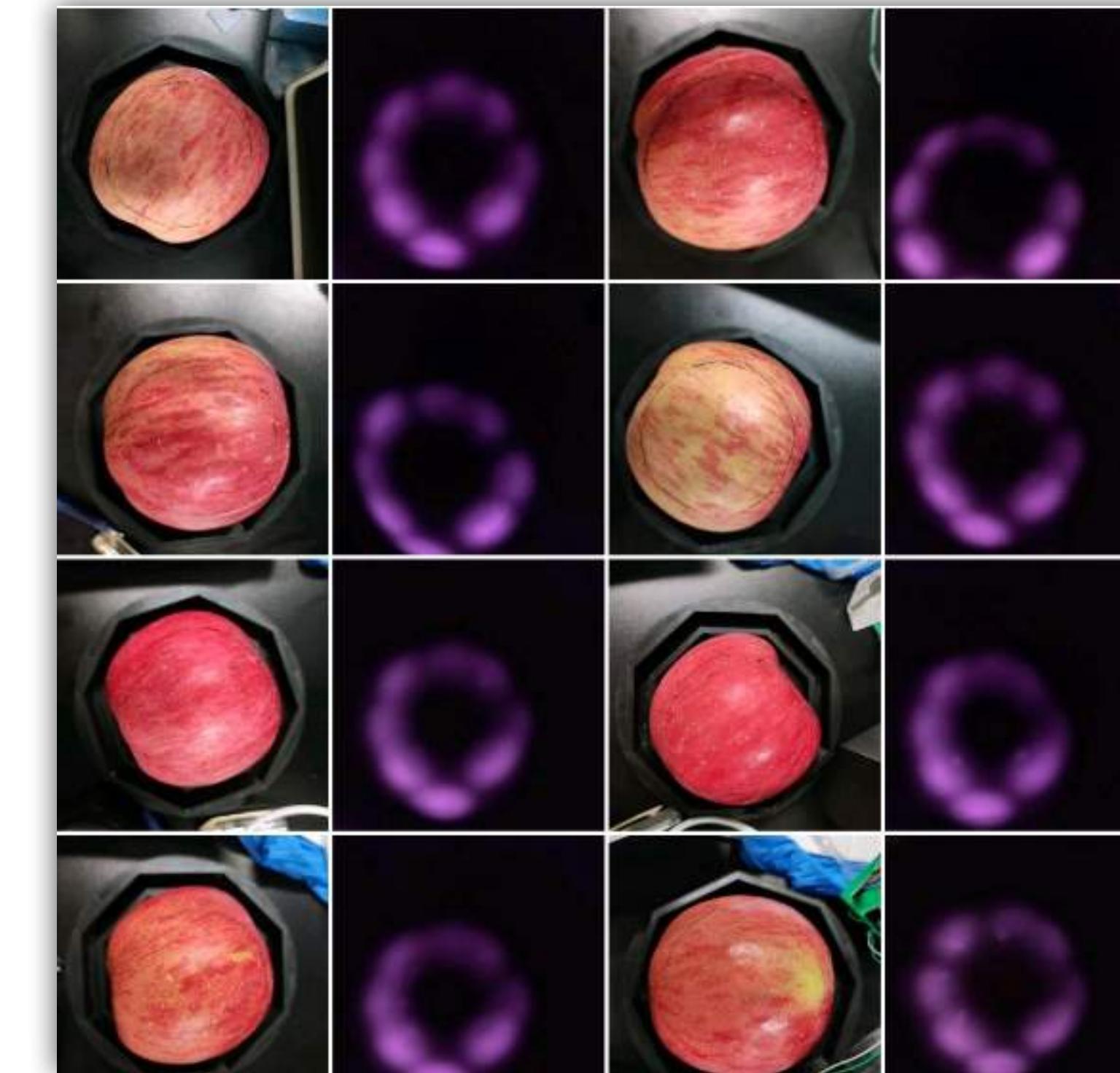
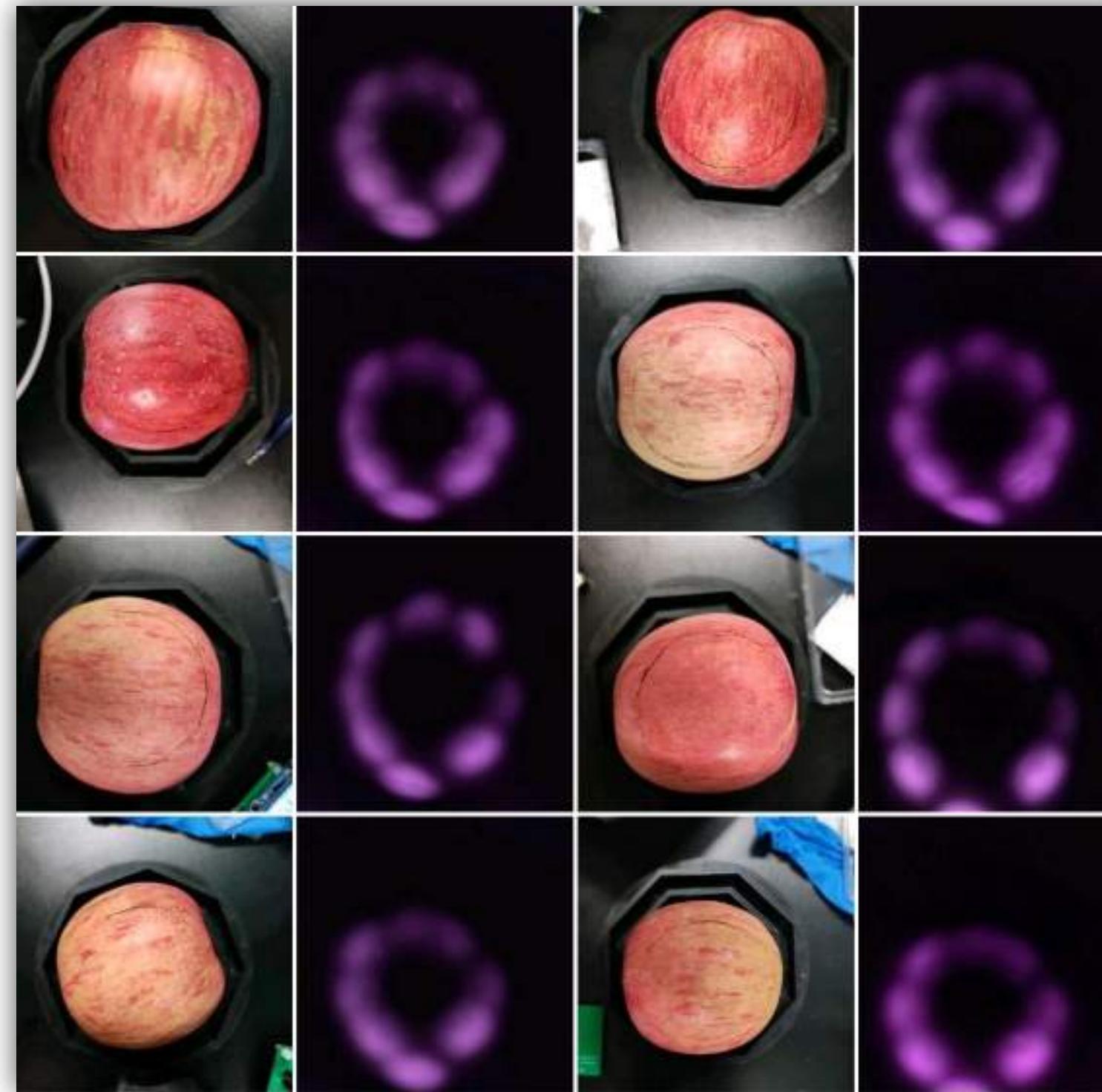


The voltage conversion module is added to the lower-left part of the PCB board, and it is soldered to the pin header H1.

Mobile Test Application Development



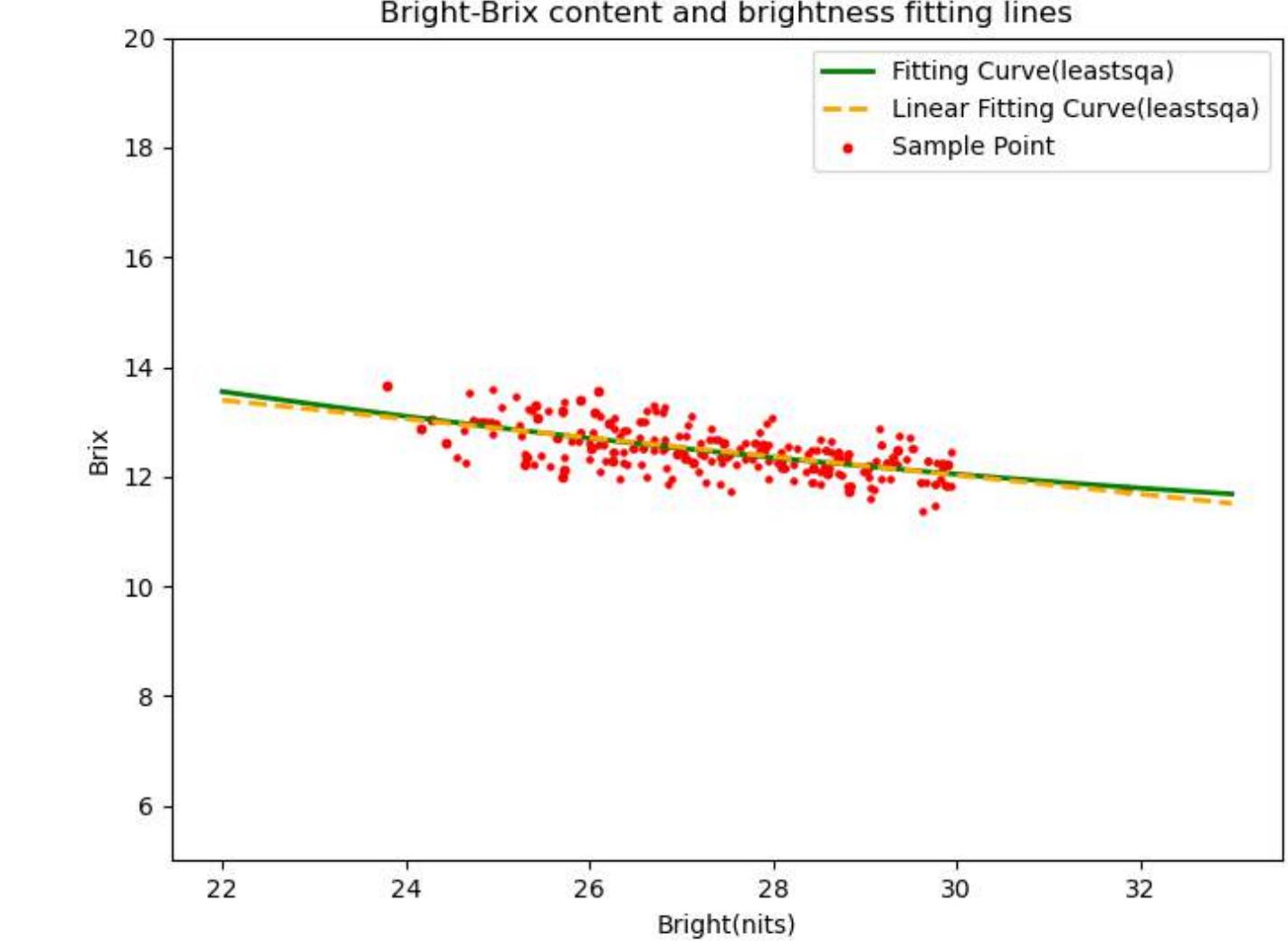
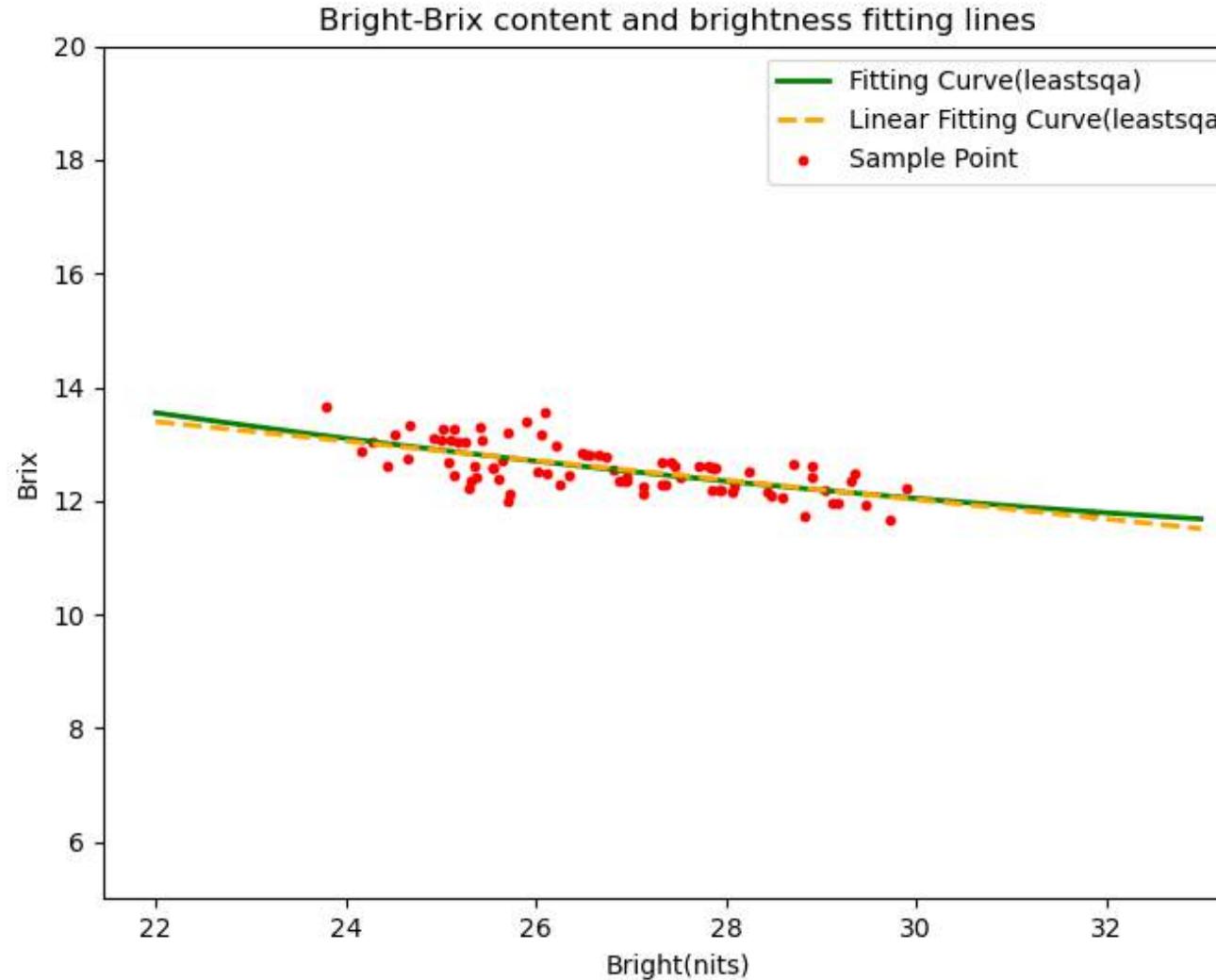
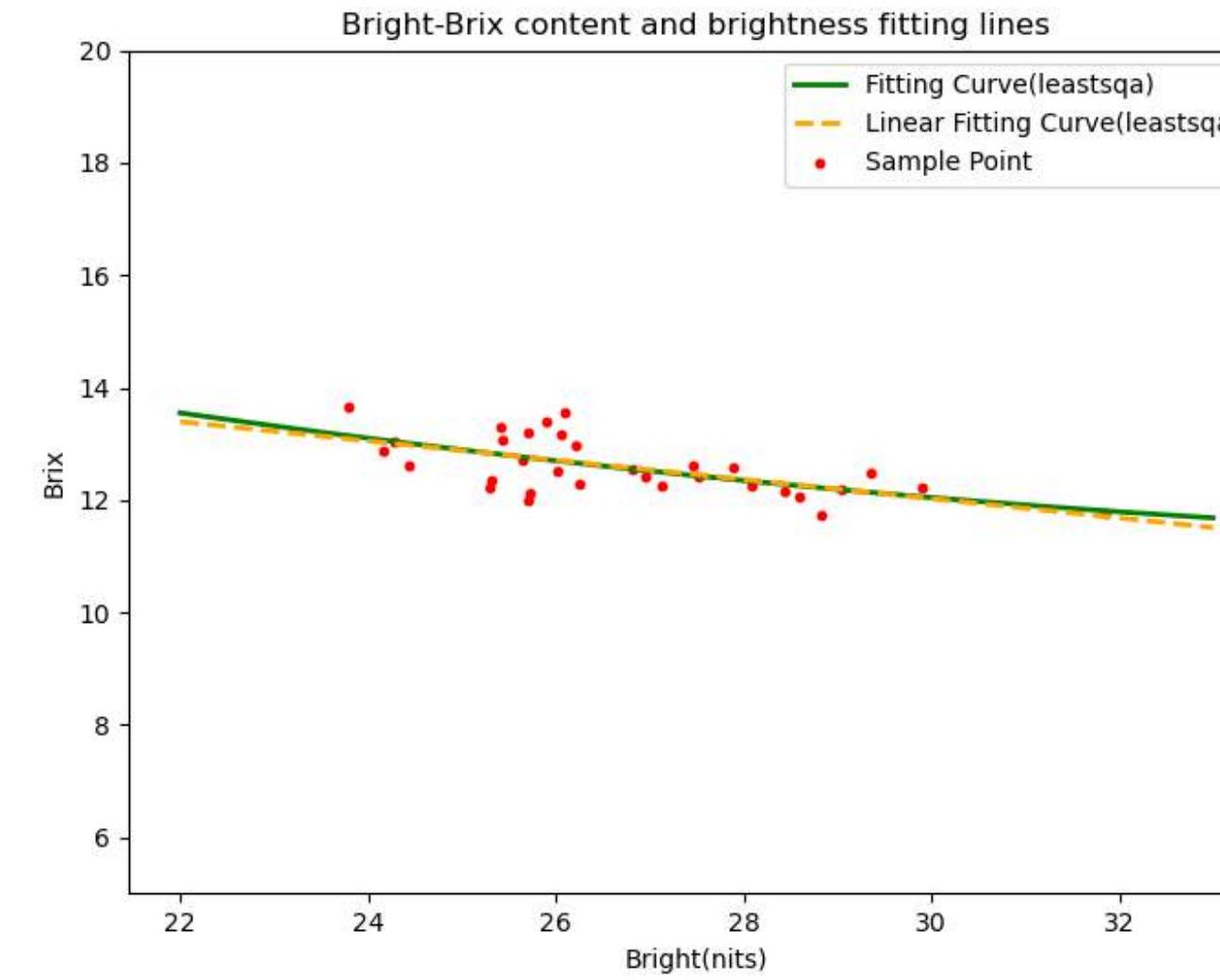
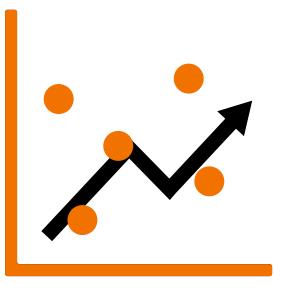
Dataset Collecting



Brightness	17.33	18.03	17.96	17.80	18.54	19.26	20.26	18.30	21.91	16.57	23.81	21.41	23.13	22.42	20.78	19.68
Brix	13.0	12.2	12.6	12.5	12.7	12.3	12.4	12.1	12.3	12.2	12.6	12.5	11.78	11.4	12.0	12.2

It is a demo. Actually, we have collected hundreds of samples like this.

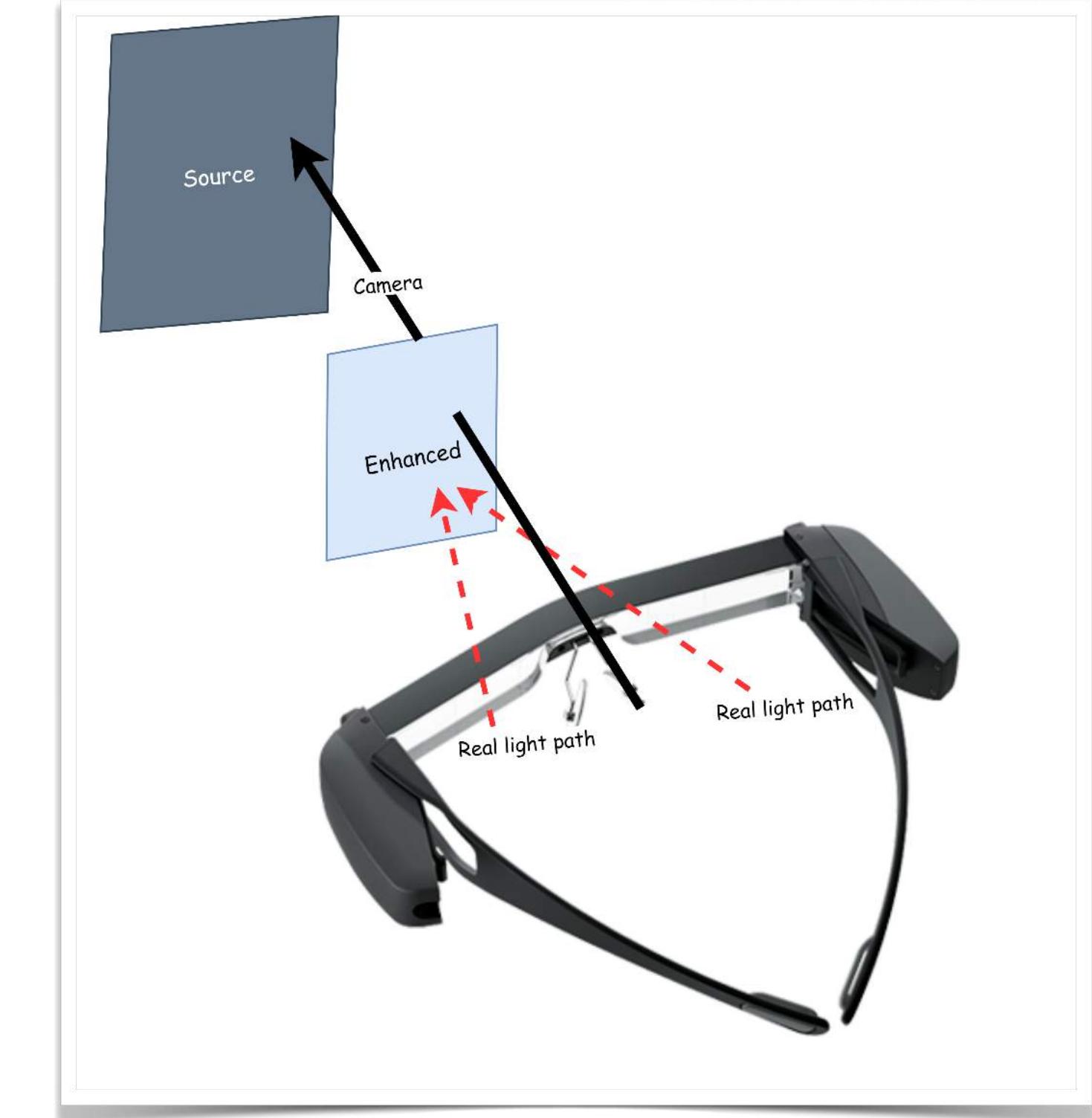
Machine Learning



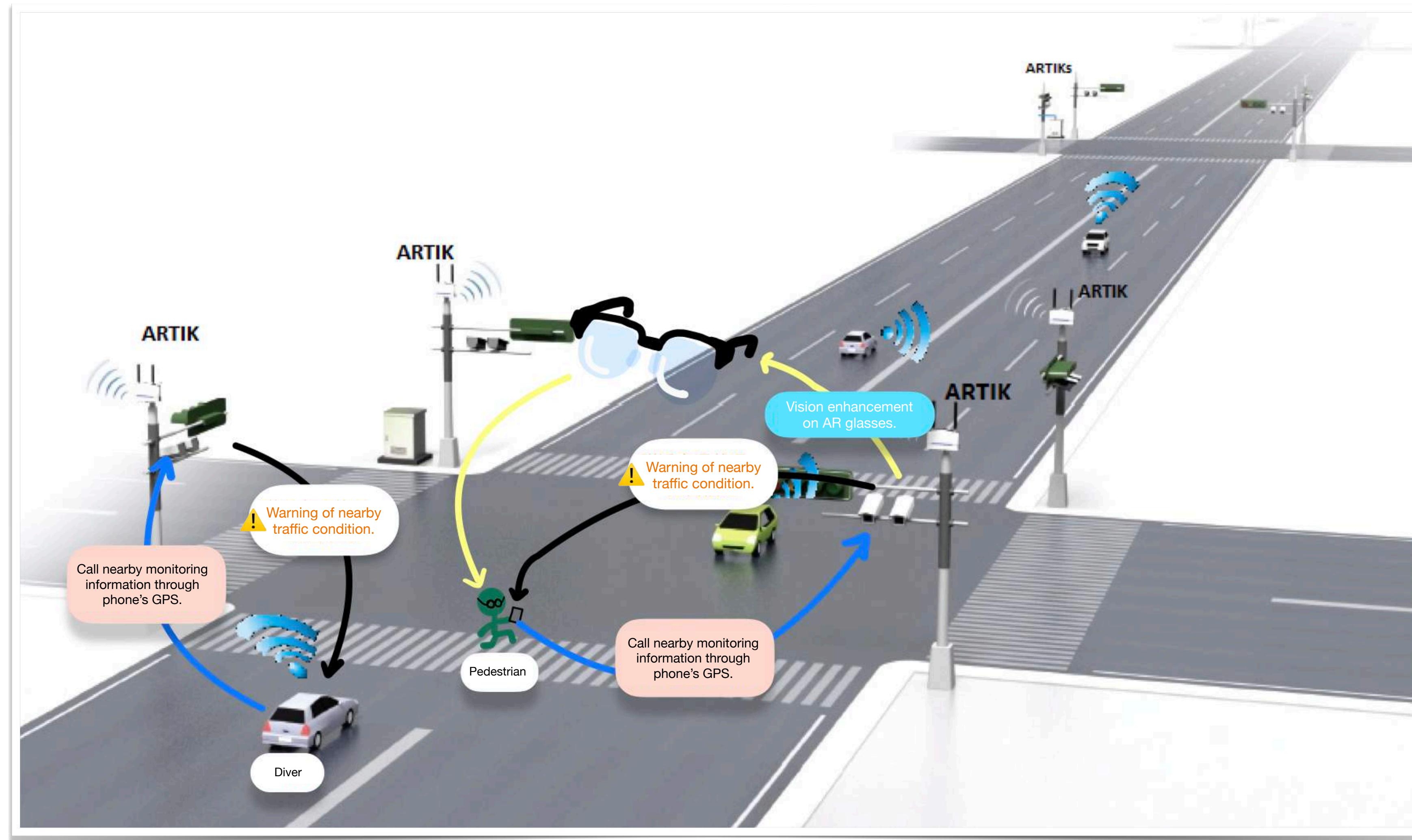
We use *Linear Regression* to map apples' brightness to apples' brix.

Part 2. Night Vision Enhancement on AR Glasses

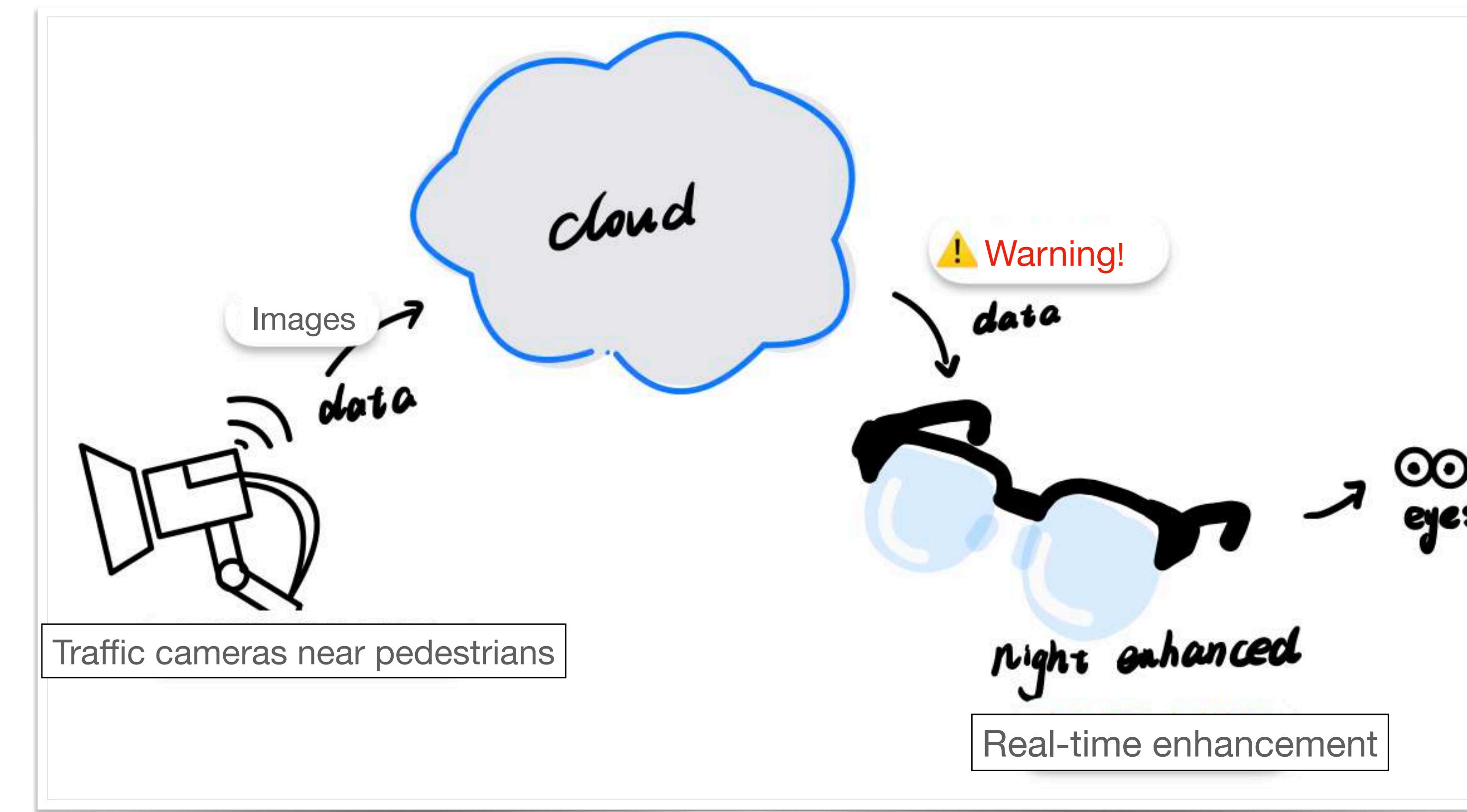
- Overall Design
- Internal Data Transfer
- Core Techniques
- Innovation
- Results and Demo



Overall Design



Internal Data Transfer

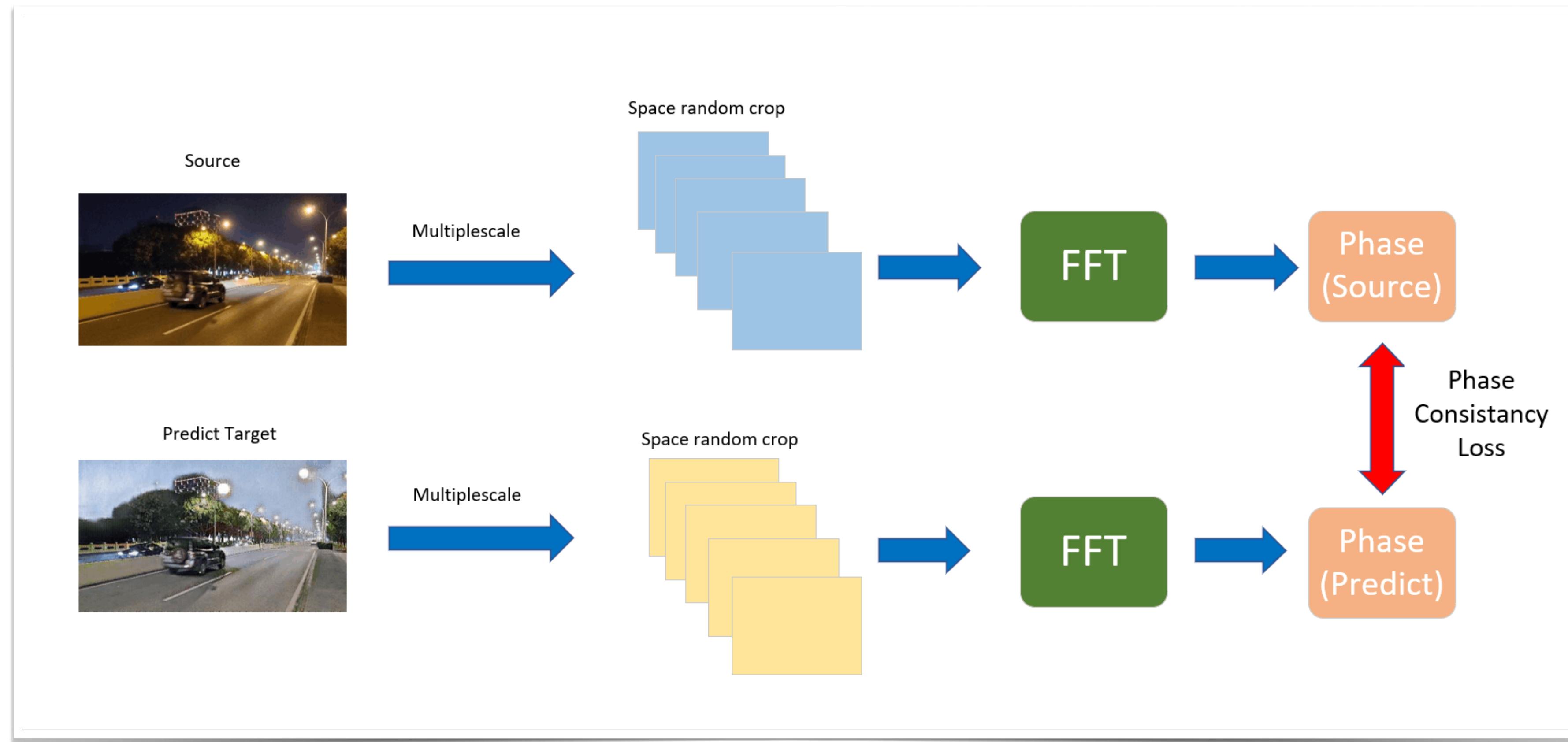


Core Techniques

Core Techniques	Advantages
CycleGAN+featureGAN	After enhancement, the original image features can still be retained.
Multi- scale FFT semantic extractor (novel)	Introduce loss function in the image frequency domain to improve semantic consistency.
Compress the model via once-for-all algorithm.	Cut unnecessary connections in the model, greatly reduce the computing resources occupied by the model, and can run on platforms such as mobile phones and AR glasses.
Complete mobile platform tensor and image conversion API (novel)	Real-time transform the tensors output by the model into images on the mobile side and enhance the images.
Danger warning	Frame nearby dangerous vehicles in red via object recognition model and depth estimation algorithm.

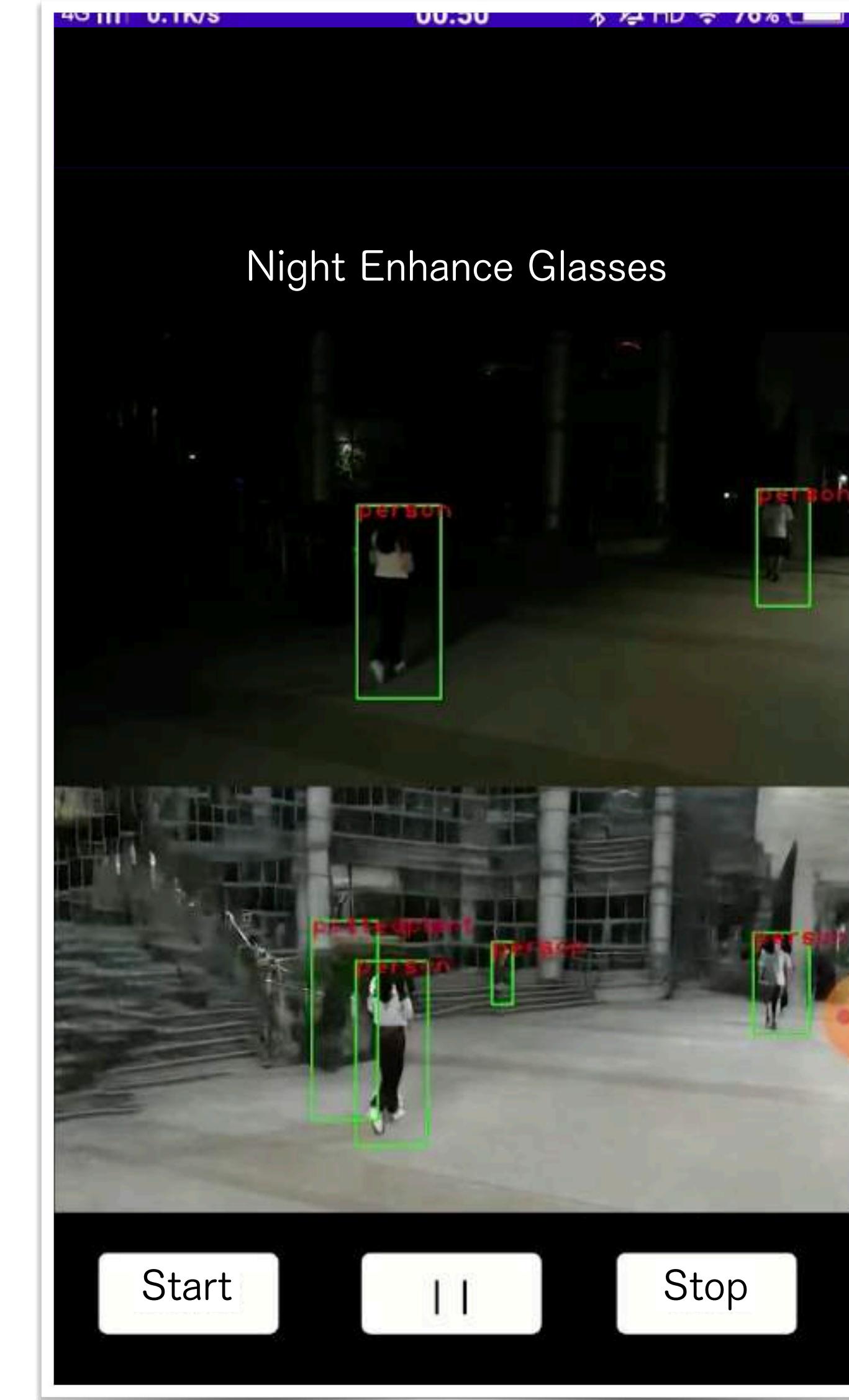
Innovation

Multi-Scale FFT Semantic Extractor

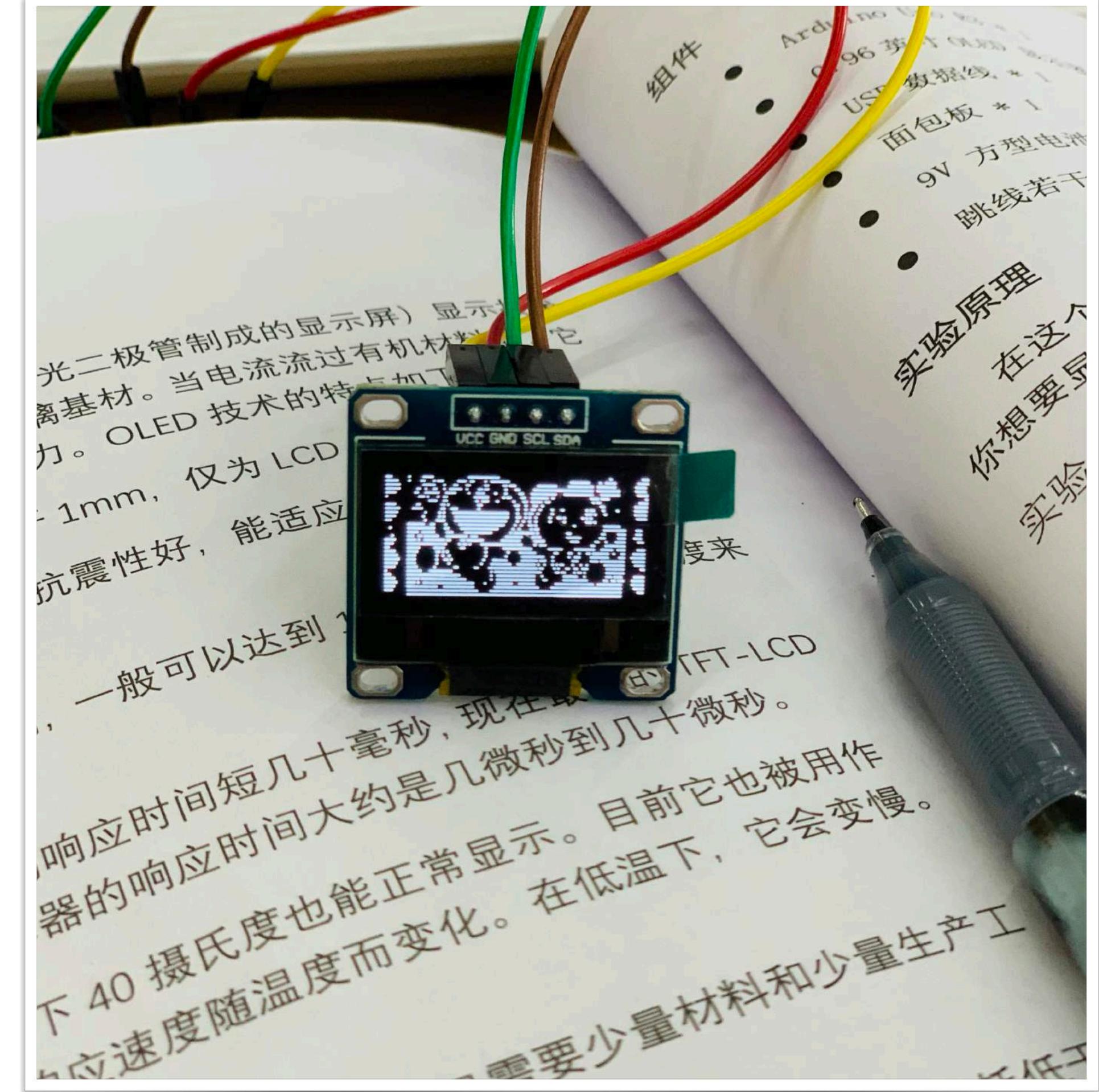


Results and Demo

	Original	Enhanced Uncompressed	Enhanced compressed	ground-truth
ssim	0.1924	0.7820	0.8426	1
psnr	7.77	23.10	22.4593	100
niqe	4.3375	0.7375	/	0.8946



Part 3. Graffiti, Travels…

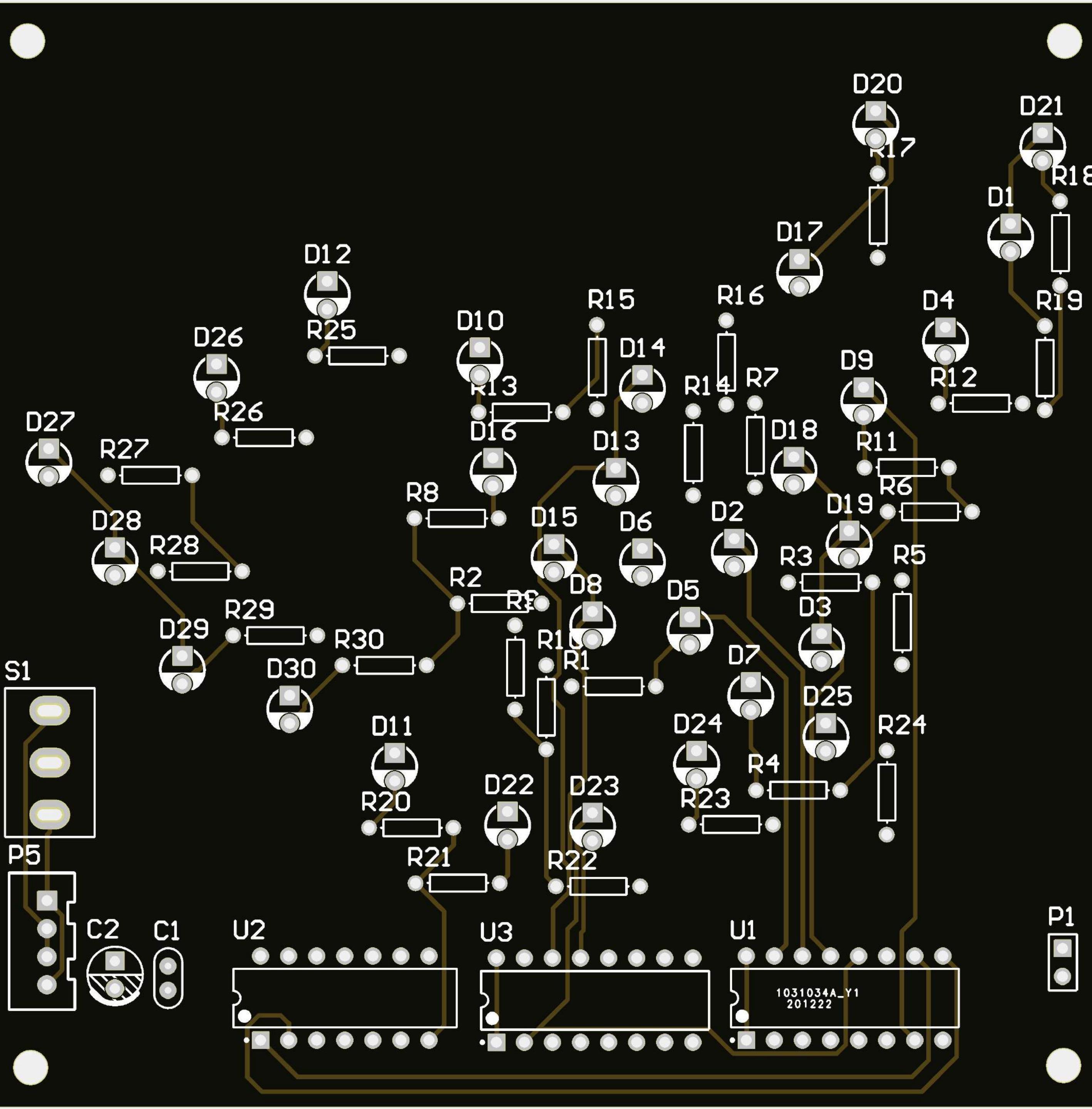




homeland



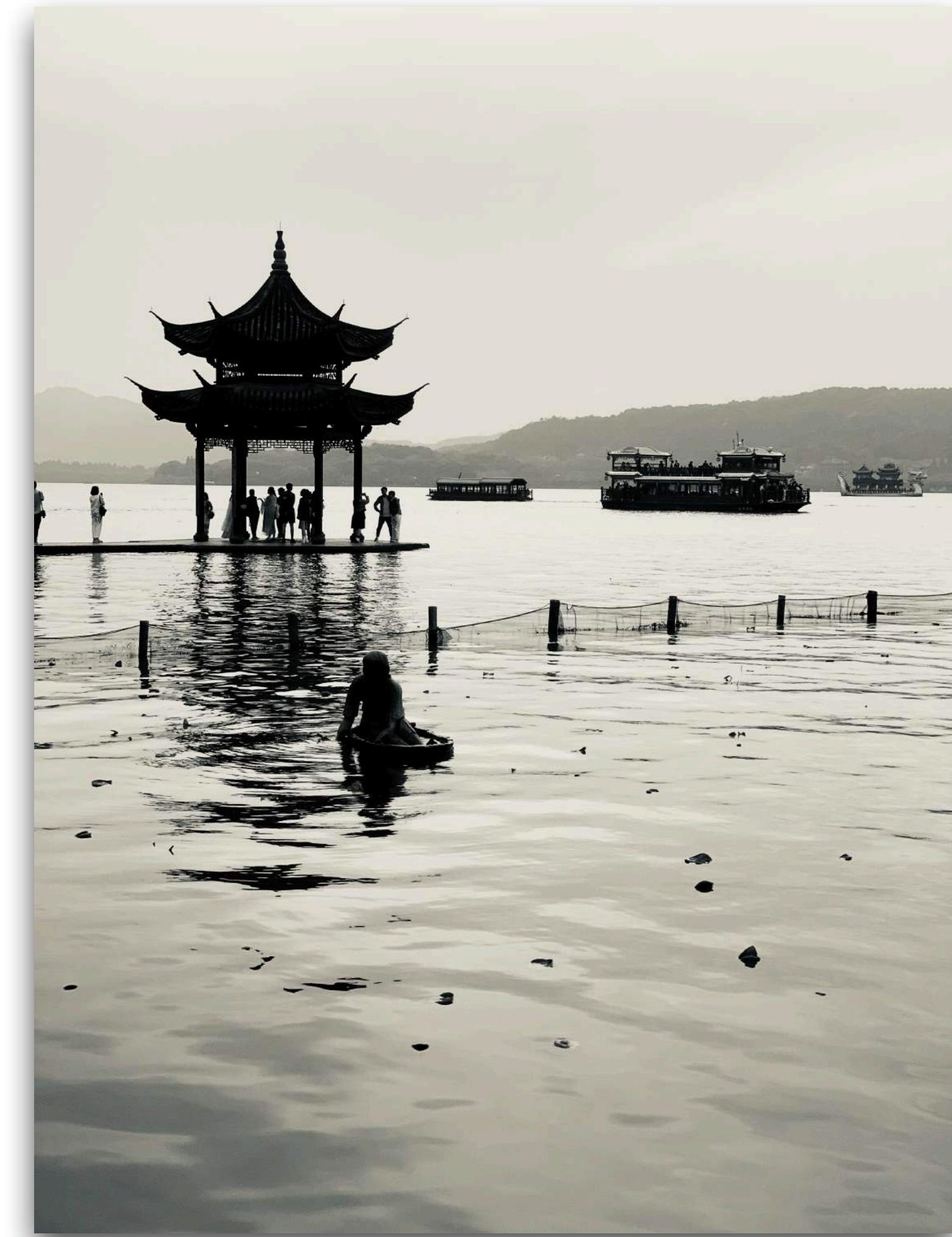
Digital Circuit Design



Travels



Suzhou Park



West Lake

Travels



Tibet

Chinese Characters Exhibition



Thanks for Watching

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