FINAL PRESENTATION

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SCIENTIFIC MOTIVATION

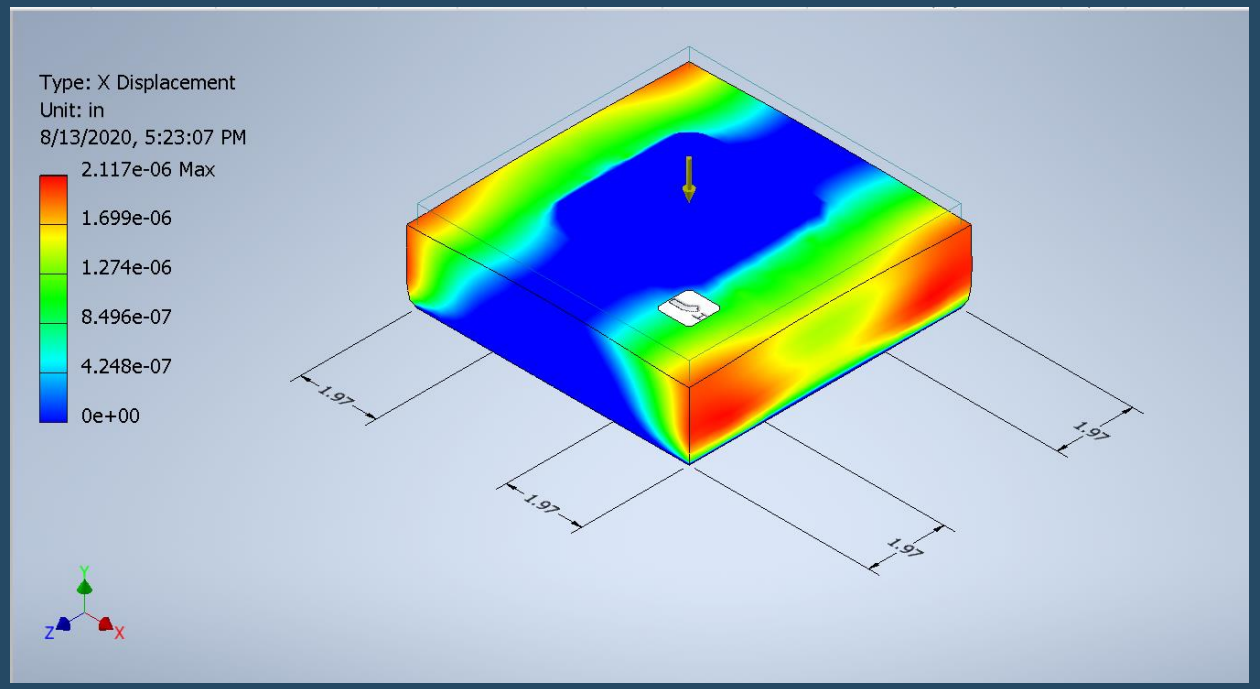
- Test the performance of new aerogel material for the Cherenkov Detector.
- Allows for the detection of kaons to gather data for the calculation of the kaon form factor.
- Lead to a better understanding of the strong force
- One of the fundamental forces that holds particles together.

GOAL

Find the ideal position and dimension of the fiberglass within the aerogel.

METHOD- INVENTOR

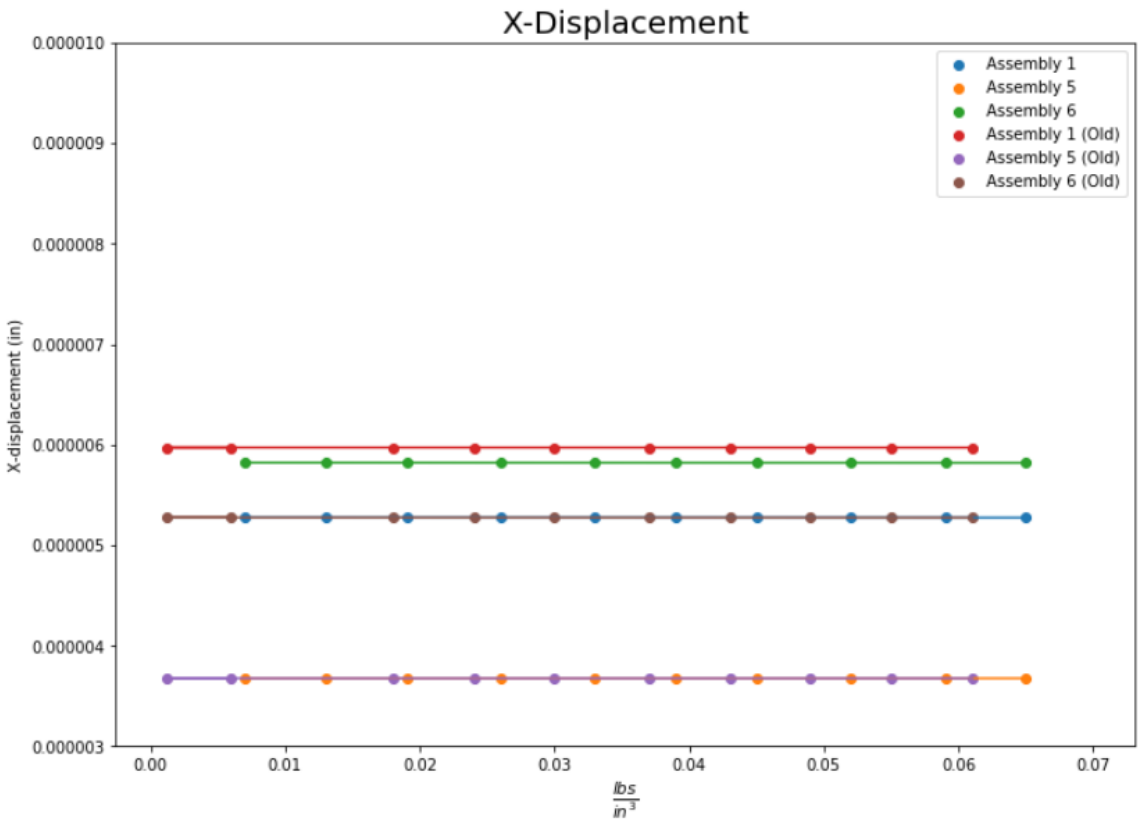
- Create the aerogel and fiberglass parts.
- Assemble the two parts appropriately.
- Compile the data of the max displacement



METHOD- PYTHON

- Take the max values of displacement.
- Run the code to graph.

```
import numpy as np
import matplotlib.pyplot as plt

pts = np.array([(2,4,6,8,10), (0.00000134,0.000002569,0.000003798,0.000005028,0.000006257),
                (0.000001402,0.000002697,0.000003992,0.000005287,0.000006582),
                (0.000001437,0.00000278,0.000004122,0.000005465,0.000006808),
                (0.000001485,0.0000029,0.000004309,0.000005722,0.000007139)])

f = plt.figure(figsize=(11.69,8.27))

x_1 = pts[0,:]
y_1 = pts[1,:]
y_2 = pts[2,:]
y_3 = pts[3,:]
y_4 = pts[4,:]

plt.scatter(x_1,y_1, label = 'Assembly 19')
plt.scatter(x_1,y_2, label = 'Assembly 23')
plt.scatter(x_1,y_3, label = 'Assembly 24')
plt.scatter(x_1,y_4, label = 'Assembly 25')

m, b = np.polyfit(x_1, y_1, 1)
plt.plot(x_1, m*x_1 + b)
m, b = np.polyfit(x_1, y_2, 1)
plt.plot(x_1, m*x_1 + b)
m, b = np.polyfit(x_1, y_3, 1)
plt.plot(x_1, m*x_1 + b)
m, b = np.polyfit(x_1, y_4, 1)
plt.plot(x_1, m*x_1 + b)


plt.ylim(0.000001, 0.0000075)
plt.legend()
plt.title('X-Displacement', fontsize = 20)
plt.xlabel('Force (N)')
plt.ylabel('X-displacement (in)')
plt.show()
```

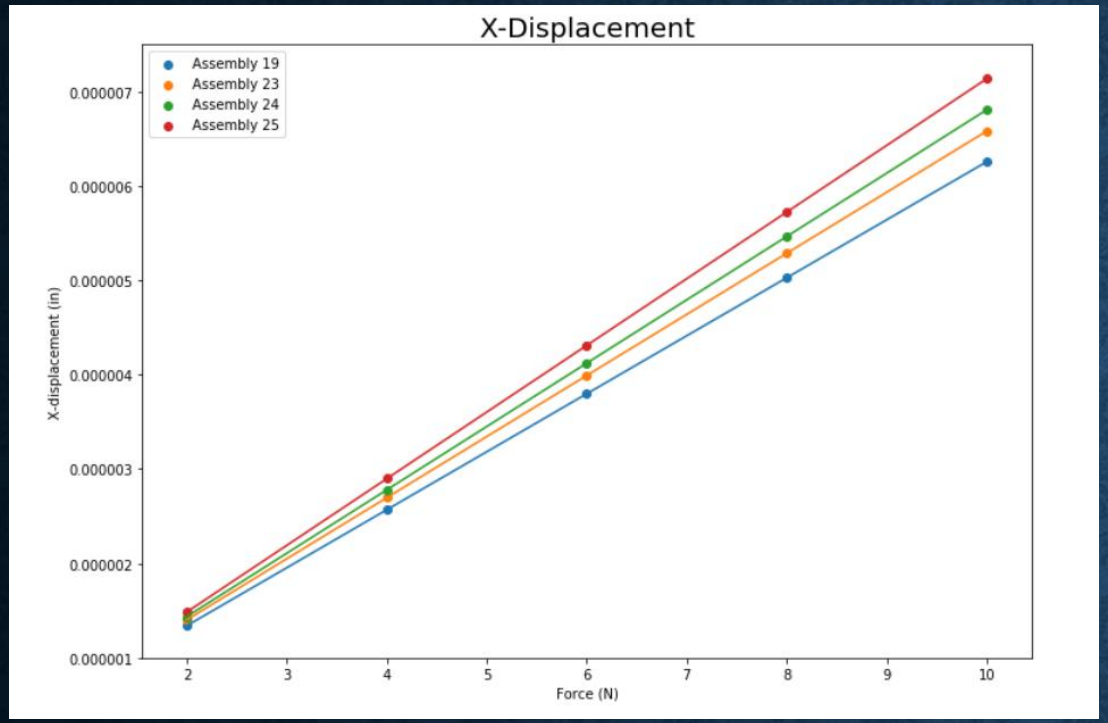


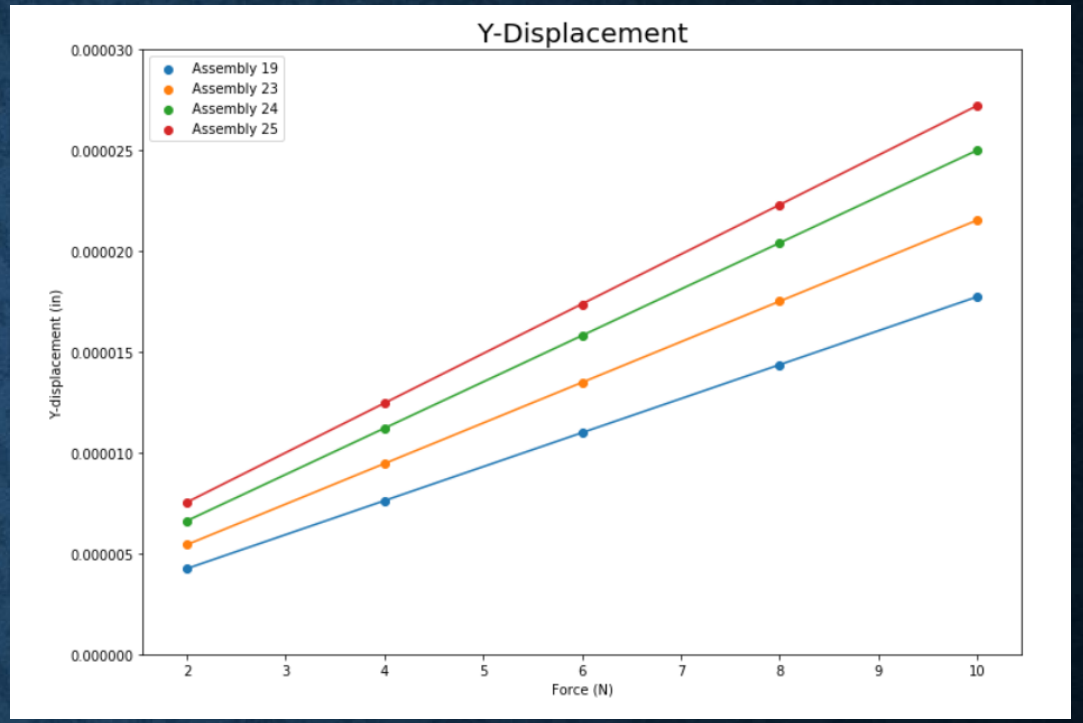
RESULTS: FIBERGLASS DENSITY

- Density does not affect the displacement.
- Assembly 5 still has the smallest displacement of the assemblies.

NEW ASSEMBLIES

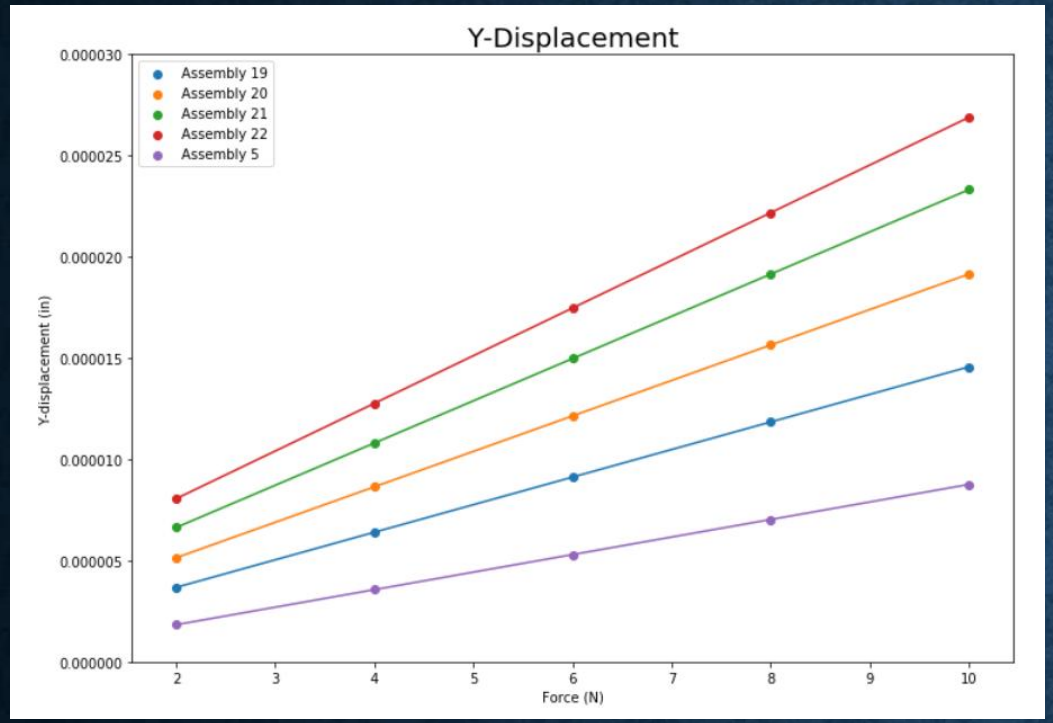
- Assembly 19, 23, 24, 25: 12 cm length w/ 3 cm, 4 cm, 5 cm, 6cm width.
- Assembly 20, 26, 27, 28: 14 cm length w/ 3, 4, 5, 6 cm width.
- Assembly 21, 29, 30, 31: 16 cm length w/ 3, 4, 5, 6 cm width.
- Assembly 22, 32, 33, 34: 18 cm length w/ 3, 4, 5, 6 cm width.
- Assembly 15, 16, 17, 18: 20 cm length w/ 3, 4, 5, 6 cm width.

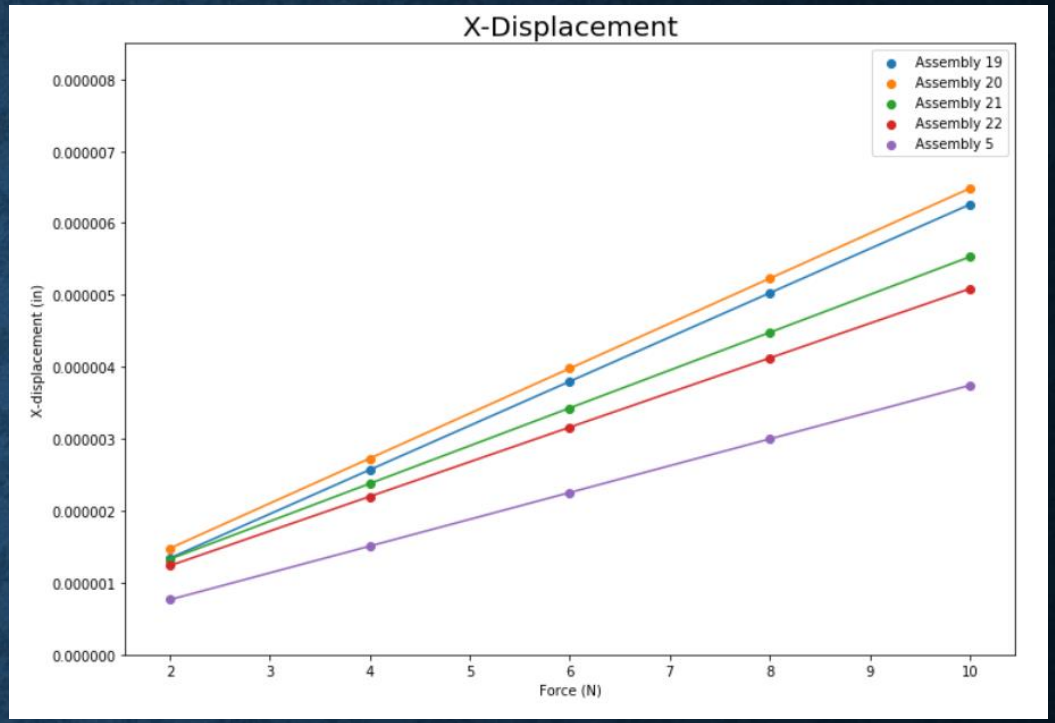




RESULTS:

- In all dimensions of the aerogel, the one with the smallest width (3cm) had the smallest displacement.





RESULTS: 3CM WIDTH

- Ideal positioning when compared to the other aerogel configurations with 3cm width:
  - Assembly 5: 10x10x1 cm w/ 8 cm fiberglass.

SUMMARY

- 10 cm length was not tested.
  - Trend shows that shorter length and width would result in smaller increase in displacement.

- Ideal configuration: 10 cm x 10 cm x 10cm w/ 8 cm fiberglass on the bottom (below surface).

OUTLOOK

- Test more configurations; smaller dimensions.
- Construct the Cherenkov Detector with the modified aerogel.
- Conduct physical experiments to test the performance of the modified aerogel.

- Improvements:
  - Running the simulations was time consuming.
    - Find another program or add-on that can test a range of values without manually changing those values.

THANK YOU