

Try with PTFE 0.002" sheet: [Attach:Photo\\_PTFE\\_trial.png](#)

Can adhere with acrylic film very well without any glue.

The stretch of acrylic film can be maintained by covering both side with this sheet, doesn't need glue and also easy to peel off.

Can be a good way for stretched acrylic film manipulation.

Multi-layer fabrication investigation

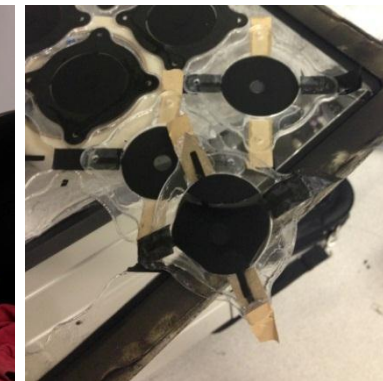
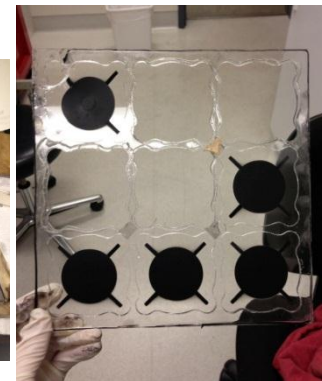
Result: made a 5-layer EAP ([Attach:Photo\\_5layer\\_EAP.png](#))

by trying two different ways of fabrication in batch ([Attach:Photo\\_fabrication\\_in\\_batch.png](#)) and deal with the connection problem.



Comment:

That's a good thing to reduce failure rate of fabrication



First method: using transferring frame to separate the acrylic film into independent areas for ceasing the tearing propagation ([Attach:Photo\\_transferring\\_frame.png](#)).

Glue the base on one cell, cut it off, glue on another one, so as to increase the layers on the base.

The base is made from one eighth acrylic plate, difficult to have all continuous edges glued on the film. Glue problem also occurred between two acrylic layers ([Attach:Photo\\_layers\\_adhereing\\_failure.png](#)).

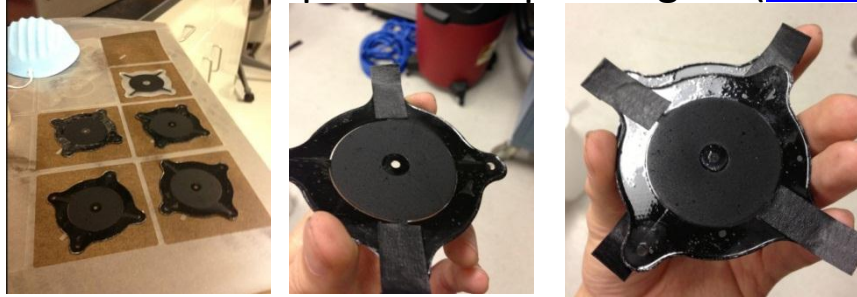
I will show you the procedures when you visit here. It is easier to understand.

Comment:

I can't understand what Happened to this process Could you tell me a little Bit more with simple figure

## Multi-layer fabrication investigation

Second method: glue thin supporting frames to each layer just on one side, cut them off as units and pile them up with glue ([Attach:Photo\\_piling\\_units.png](#)).



A supporting frame with flexibility (0.01" fiberglass currently, could be even thinner) can be much better and more easily glue on the acrylic film than rigid acrylic plate. After cutting the cells out, the acrylic film edges warp and curl little bit ([Attach:Photo\\_cell\\_edge\\_curl.png](#))

, which will increase the overall thickness when these cells are piled up. Need to find ways to prevent it.

Electrical connection: ([Attach:Photo\\_electrical\\_connection.png](#))

Conductive tape should be thin and flexible, not easy to wrinkle.

The thickness of tape is bad for evenly touching and gluing between two layers, better to extend the electrode line and put the conductive tape outside the frame.

**Suggestion: How about using Electrolytic copper foil( 0.009mm thickness )**

**As adhesive tape,**

**I found a product ( [copper adhesive tape example](#) ). Please check it.**

Thanks for the suggestion. It is good it thickness is so small. But it also says the overall thickness is 0.03mm, but actually still good enough.

## Experiment

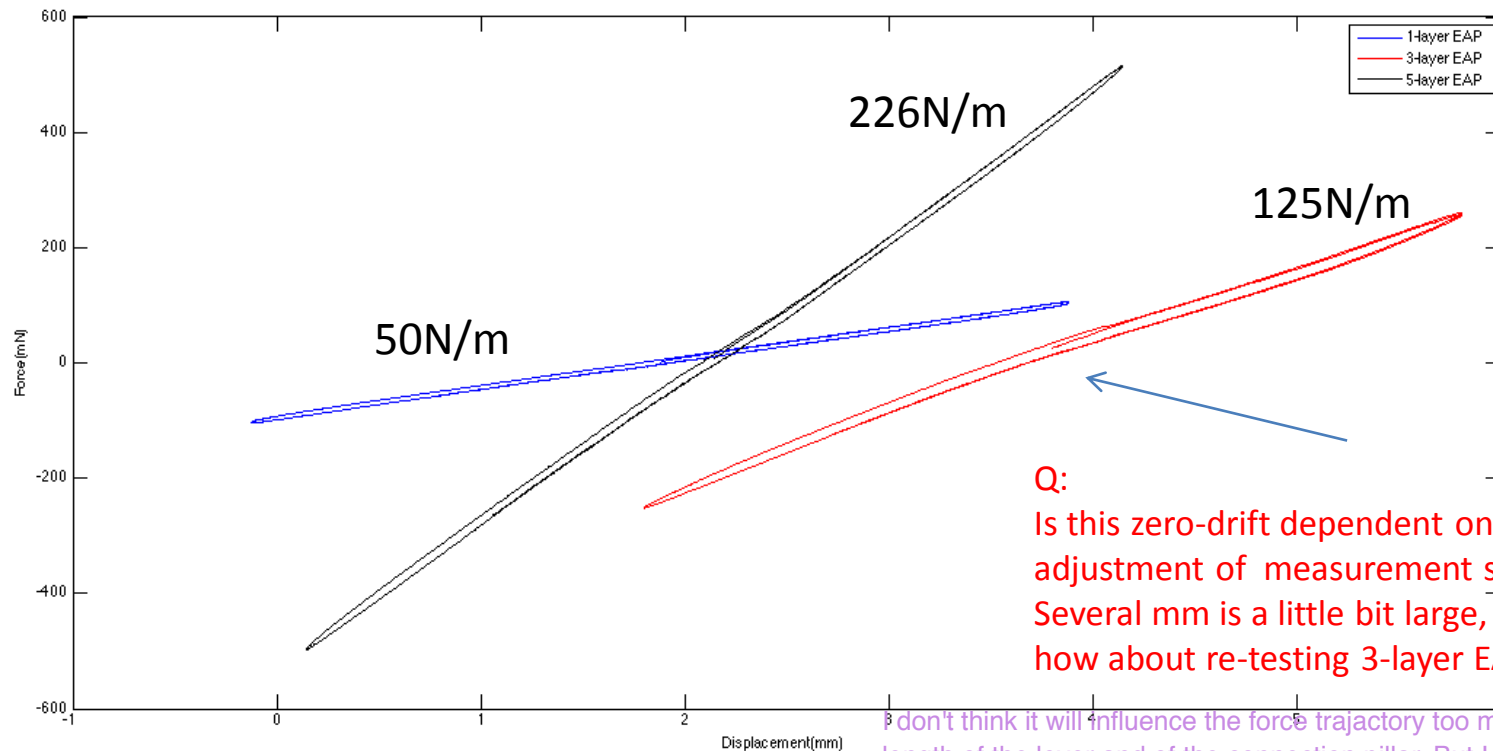
### Hysteresis and stiffness of 1, 3, 5-layer EAP

(supporting frame of 3-layer one has been strengthen)

: [Attach:Plot hysteresis and stiffness 0.4Hz 2Amp.png](#)

The hysteresis doesn't actually scale up with the increase of layer number.

Need to mention, each layer in **3-layer EAP has only one side electrode** while 1 and 5-layer have two-sided electrode.



don't think it will influence the force trajectory too much based on the length of the lever and of the connection pillar. But I can retest it.

Feb27 – Mar6

## Experiment

Hysteresis of 5-layer EAP under different frequencies:

[Attach:Plot\\_hysteresis\\_different\\_frequencies.png](#)

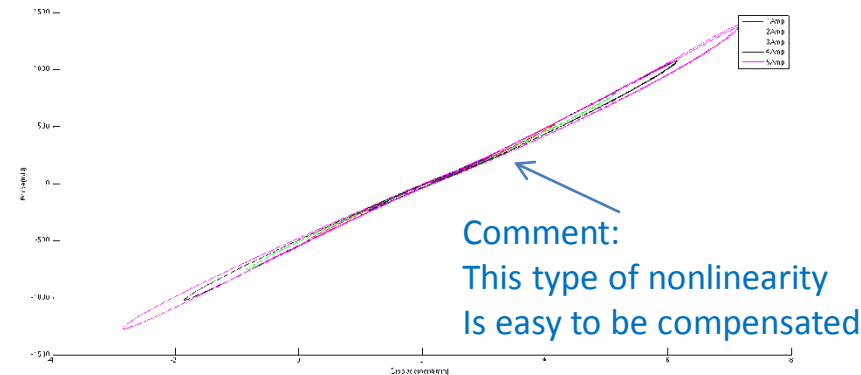
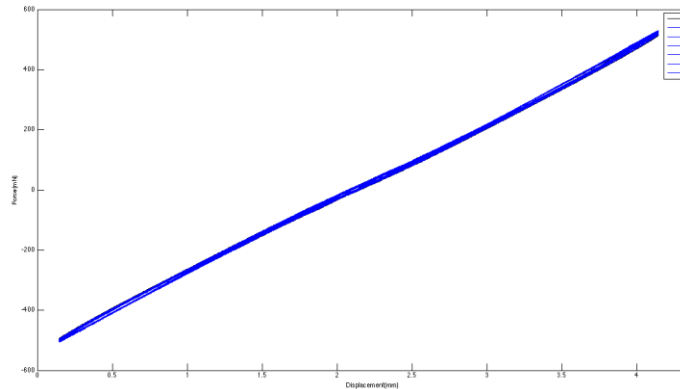
Hysteresis of 5-layer EAP under different amplitudes:

[Attach:Plot\\_hysteresis\\_different\\_amplitudes.png](#)

Q:

How large the range of frequency  
In this experiment?

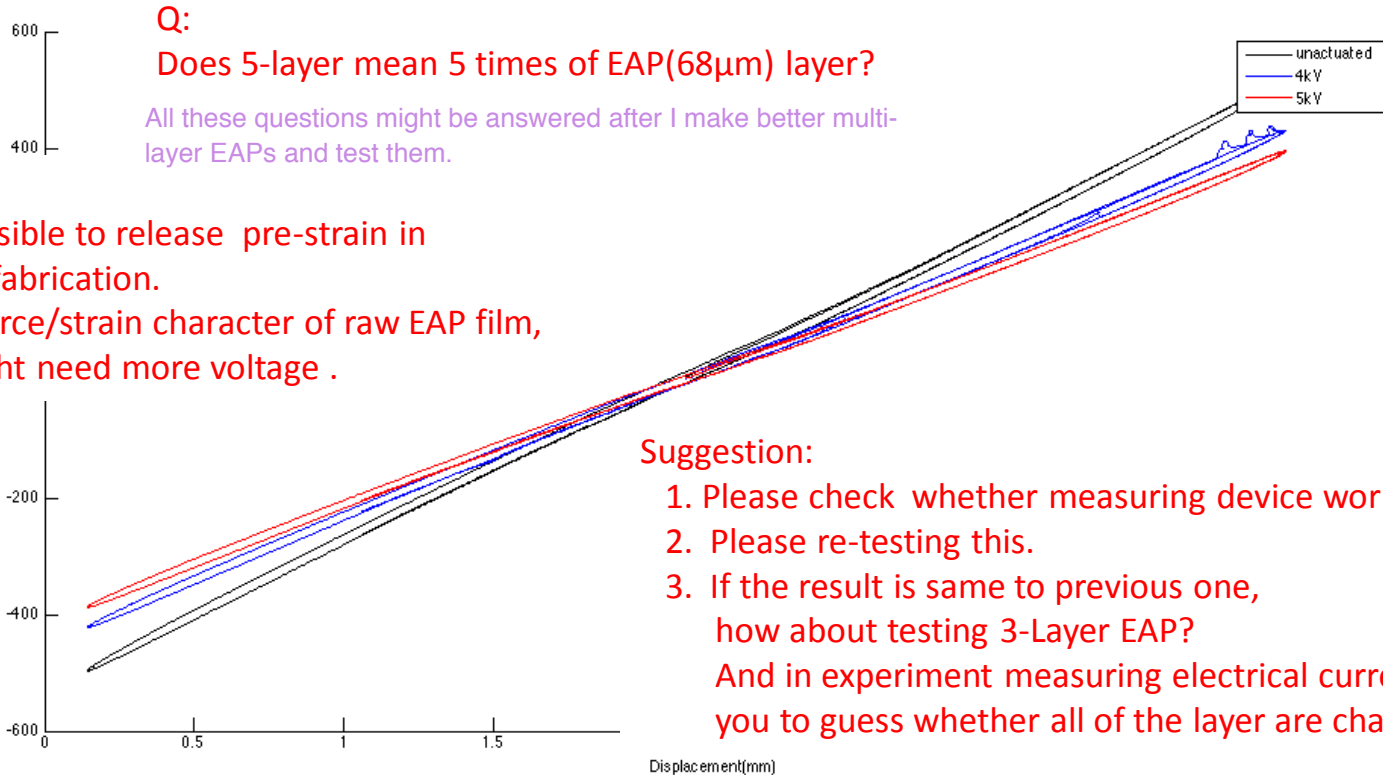
It is from 0.4 to 2 Hz. I will test with higher  
frequencies in this week.



Feb27 – Mar6

## Experiment

Actuated 5-layer EAP: [Attach:Plot\\_actuated\\_tests\\_Mar5.png](#)



The stiffness range is small, which is because of:

- 1) one of the layer doesn't work because of lack of conductive tape.
- 2) no electrical connection strengthen between two adjacent layers.
- 3) short occurred because of acrylic sheet contamination during fabrication and cannot actually generate the input voltage (the plot legend is for input voltage, not actual value)