

# 3Dプリンタを用いて木材の異方性を模擬した材料の試作

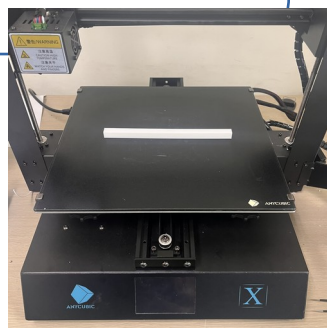
7019555 柴田桜花

異方性



方向によって特性が異なる

3Dプリンタで再現

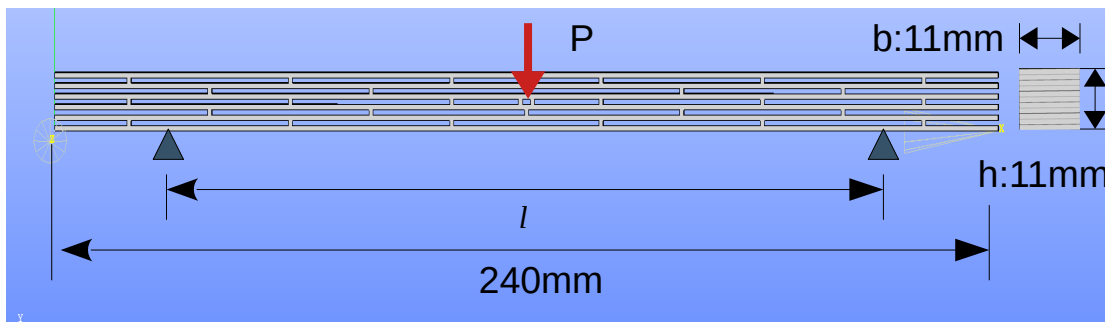


曲げ試験

単純支持3点曲げ



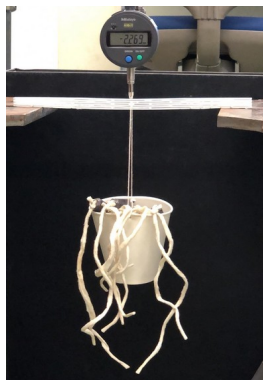
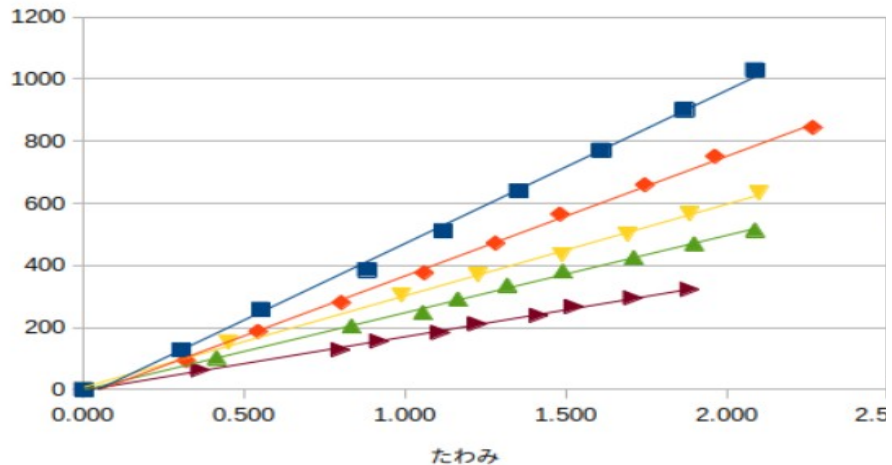
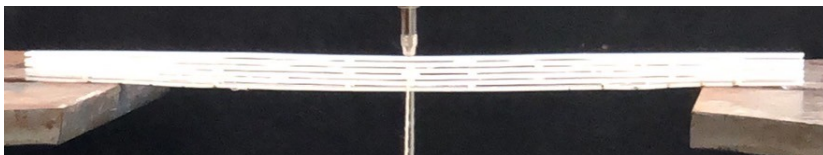
ヤング率の導出



たわみの公式

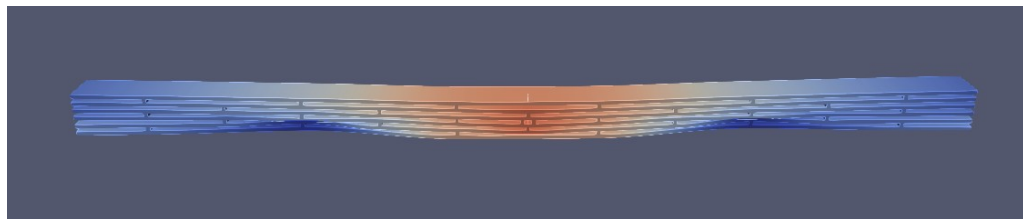
$$\delta = \frac{Pl^3}{48EI} \quad \Rightarrow \quad \frac{Pl^3}{48I} = E\delta$$

# 実験①



スパン $l$ [mm]	曲げヤング率 $E$ [GPa]
200	0.492
180	0.385
160	0.295
140	0.249
120	0.173

# Salome 解析①

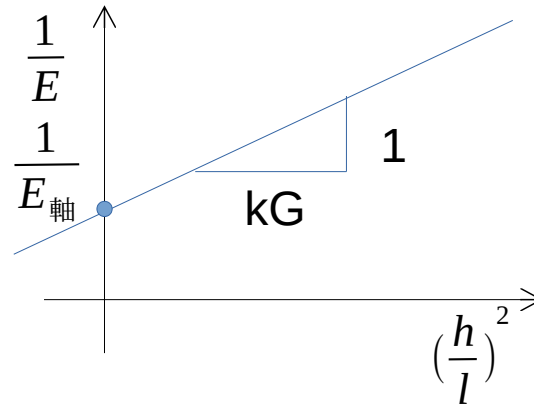


$$E = \frac{Pl^3}{48I\delta}$$

スパン $l$ [mm]	曲げヤング率 $E$ [GPa]
200	0.483
180	0.382
160	0.332
140	0.320
120	0.231

# 軸ヤング率とせん断弾性係数の導出

$$\frac{1}{E} = \frac{1}{kG} \left(\frac{h}{l}\right)^2 + \frac{1}{E_{\text{軸}}}$$

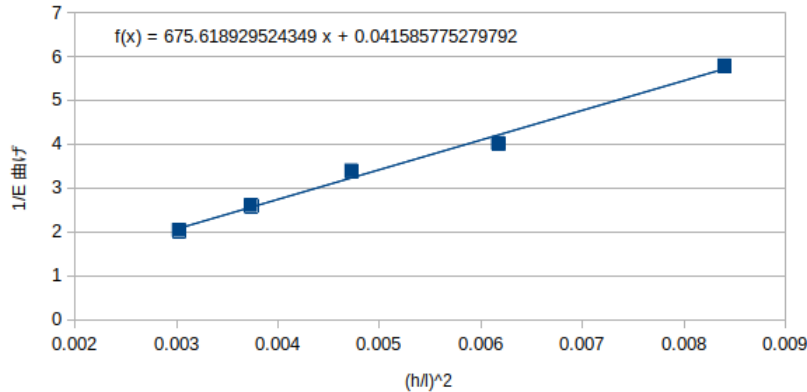


切片：軸ヤング率E  
傾き：せん断弾性係数G

## 実験①

E 軸 [GPa]	24.047
G[GPa]	0.00178

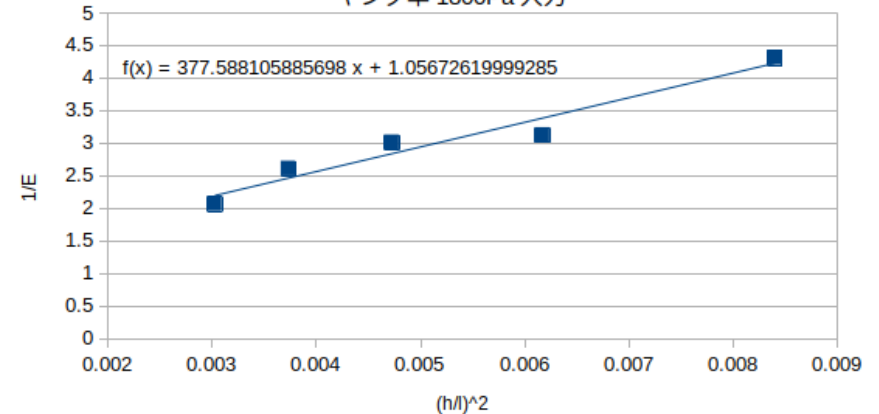
せん断弾性係数プロット



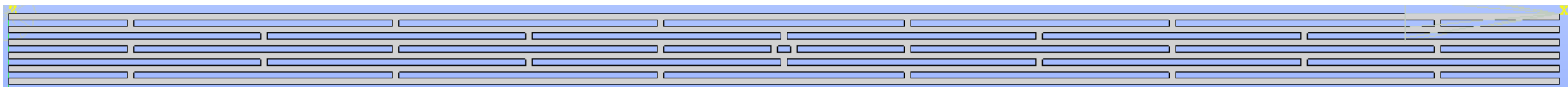
## Salome 解析①

E 軸 [GPa]	0.943
G[GPa]	0.00318

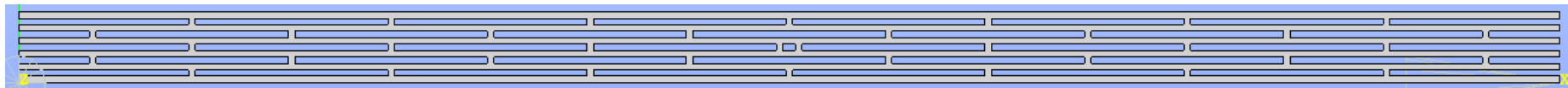
せん断弾性係数プロット  
ヤング率 1800Pa 入力



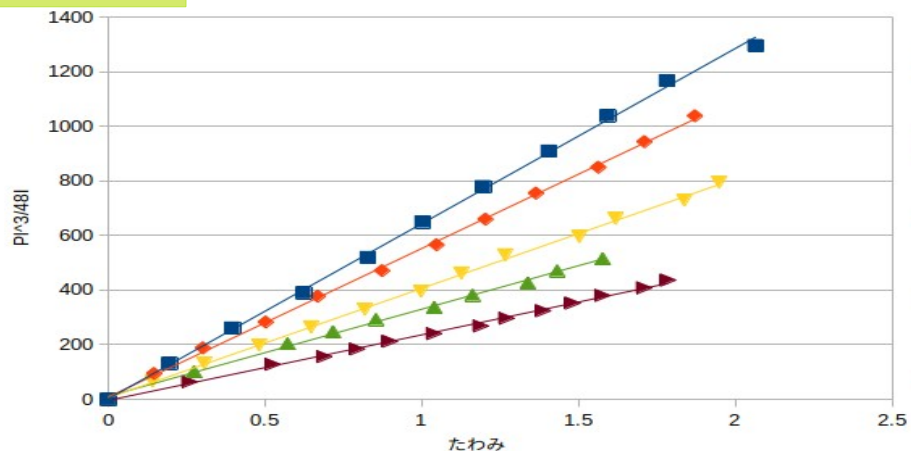
前回



今回

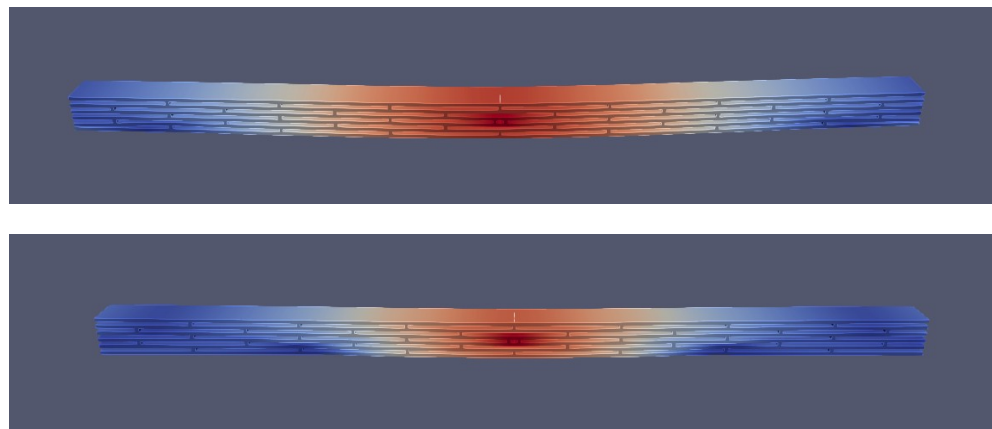


## 実験②



スパン $l$ [mm]	曲げヤング率 $E$ [GPa]
200	0.641
180	0.544
160	0.401
140	0.318
120	0.240

## Salome 解析②

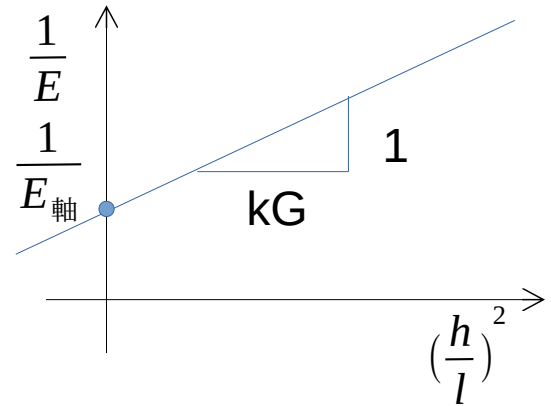


$$E = \frac{Pl^3}{48I\delta}$$

スパン $l$ [mm]	曲げヤング率 $E$ [GPa]
200	0.664
180	0.548
160	0.451
140	0.412
120	0.312

# 軸ヤング率とせん断弾性係数の導出

$$\frac{1}{E} = \frac{1}{kG} \left(\frac{h}{l}\right)^2 + \frac{1}{E_{\text{軸}}}$$



切片：軸ヤング率E  
傾き：せん断弾性係数G

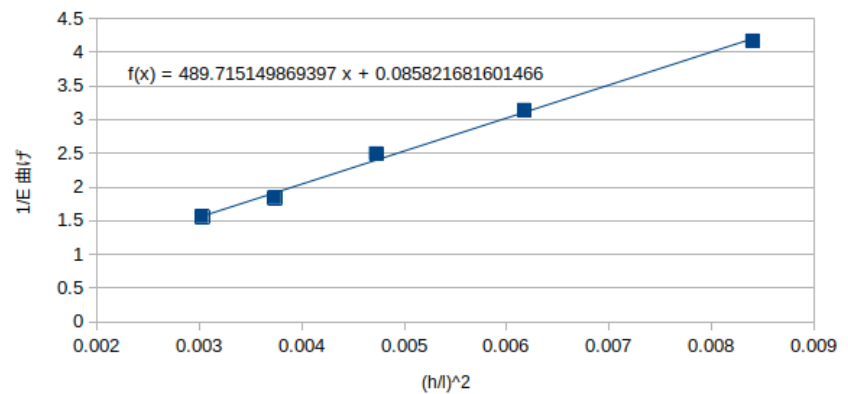
## 実験②

E 軸 [GPa]	11.652
G[GPa]	0.00245

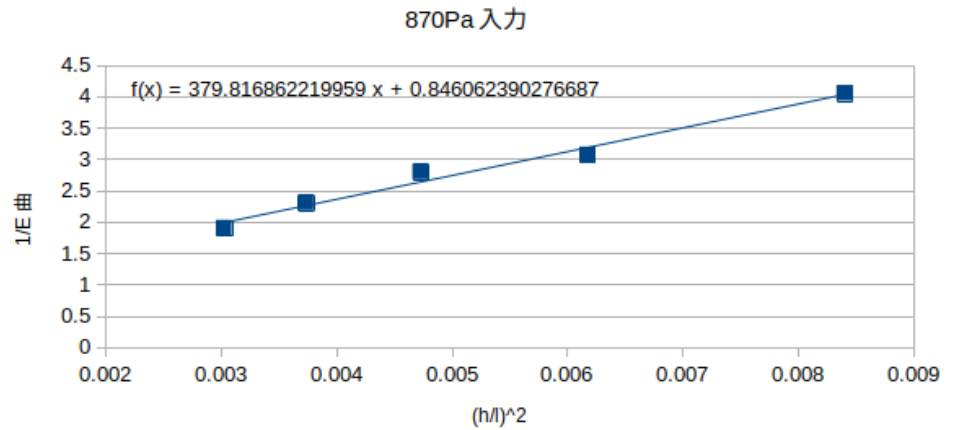
## Salome 解析②

E 軸 [GPa]	1.494
G[GPa]	0.00399

せん断弾性係数算定プロット



salome せん断弾性係数算定プロット



# まとめ

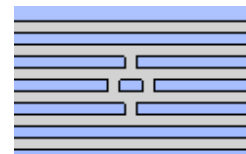
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E 軸 [GPa]	24.047
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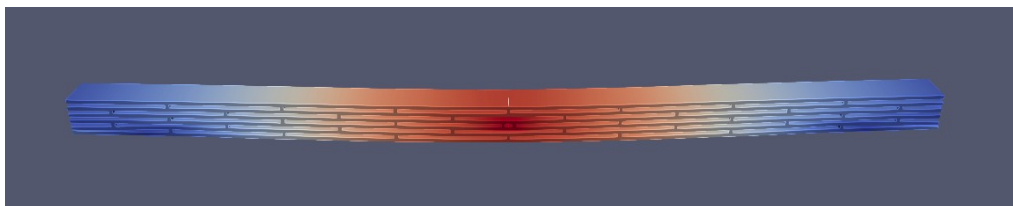
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E 軸 [GPa]	0.943
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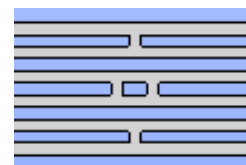
## 実験②

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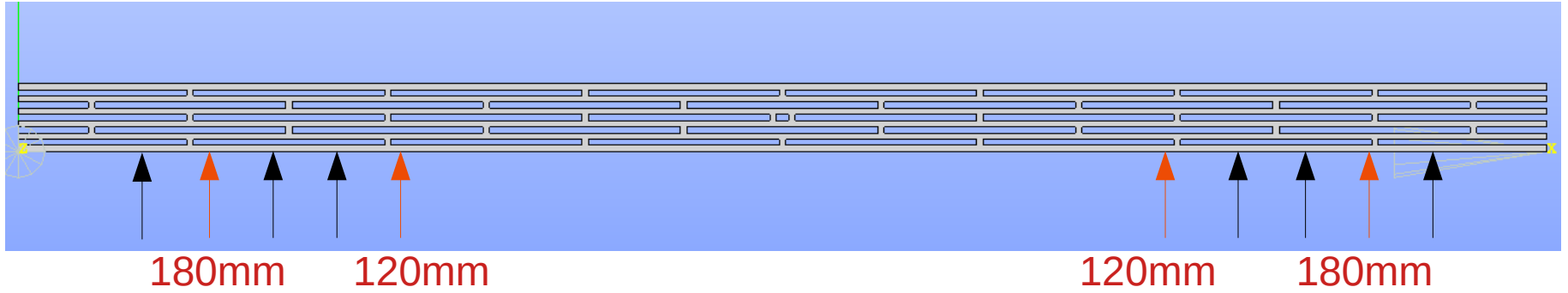


## Salome 解析②

E 軸 [GPa]	1.494
G[GPa]	0.00399



# スリット位置と支点



せん断弾性係数算定プロット

