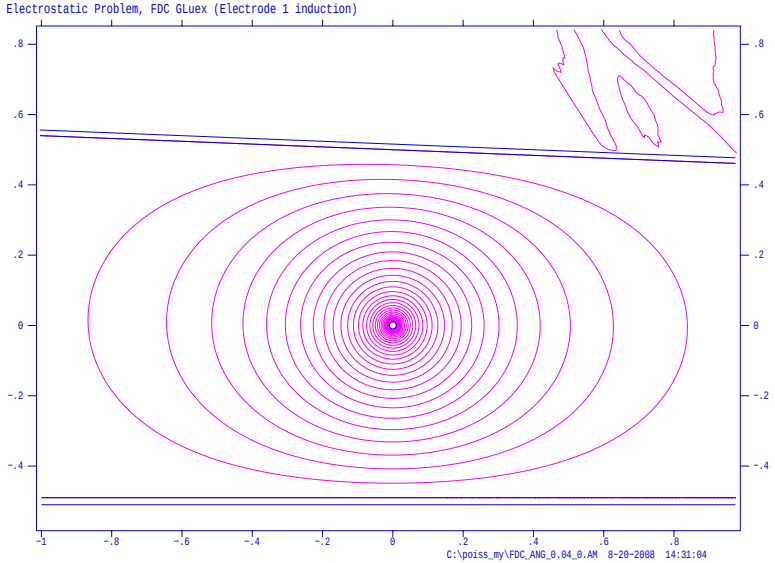
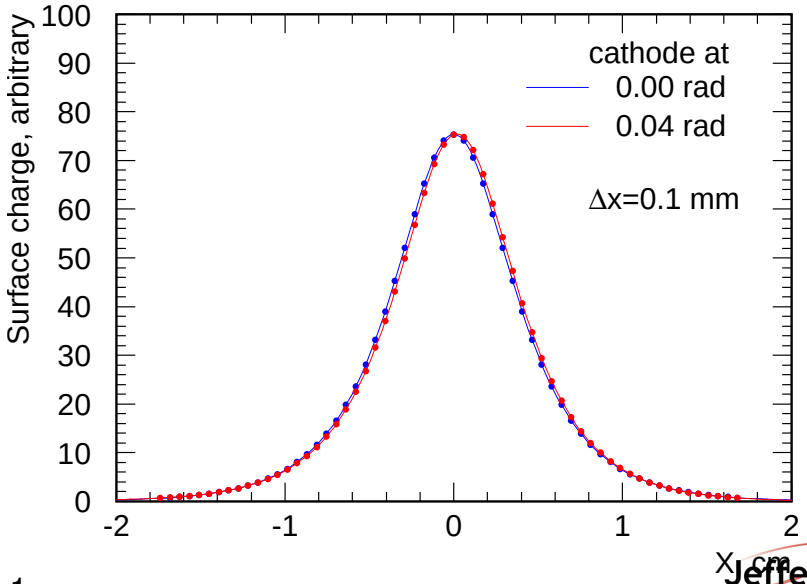
Cathode Flatness Impact on the Resolution

Cathode: $X = \sum_{strips} x_i \cdot S_i$
Gap gradient $\Rightarrow$ shift in X

Result:
$\Delta X \approx 50\mu$m for $\alpha = 0.02$
Prototype:
$\alpha_{max} \sim$ 0.2mm/30mm=0.0067

Gain:
$\frac{\Delta A}{A} \sim -\log(A)\frac{\Delta L}{L}$
$A(L = 4mm) \sim 2 \cdot A(L = 5mm)$





Cathode Tension Measurement

Weight

A ring/disk places on the foil center (ΔZ - sagging, T - tension, W - weight, R - foil OD)

$\Delta Z = W/(2\pi T) \cdot \log \frac{R}{r}$

$\Delta Z = 1\text{mm}$, $T = 660\text{N/m}$, $R = 500\text{mm}$, $r = 150\text{mm} \Rightarrow$

$W = 3.4\text{N}$, $m = 350\text{g}$

Overpressure

Overpresssure P under the membrane:

$\Delta Z = P/(4T) \cdot (R^2 - r^2)$

$\Delta Z = 1\text{mm}$, $T = 660\text{N/m}$, $r = 0\text{mm} \Rightarrow \; P = 10^{-4}\text{bar}$

Vibration

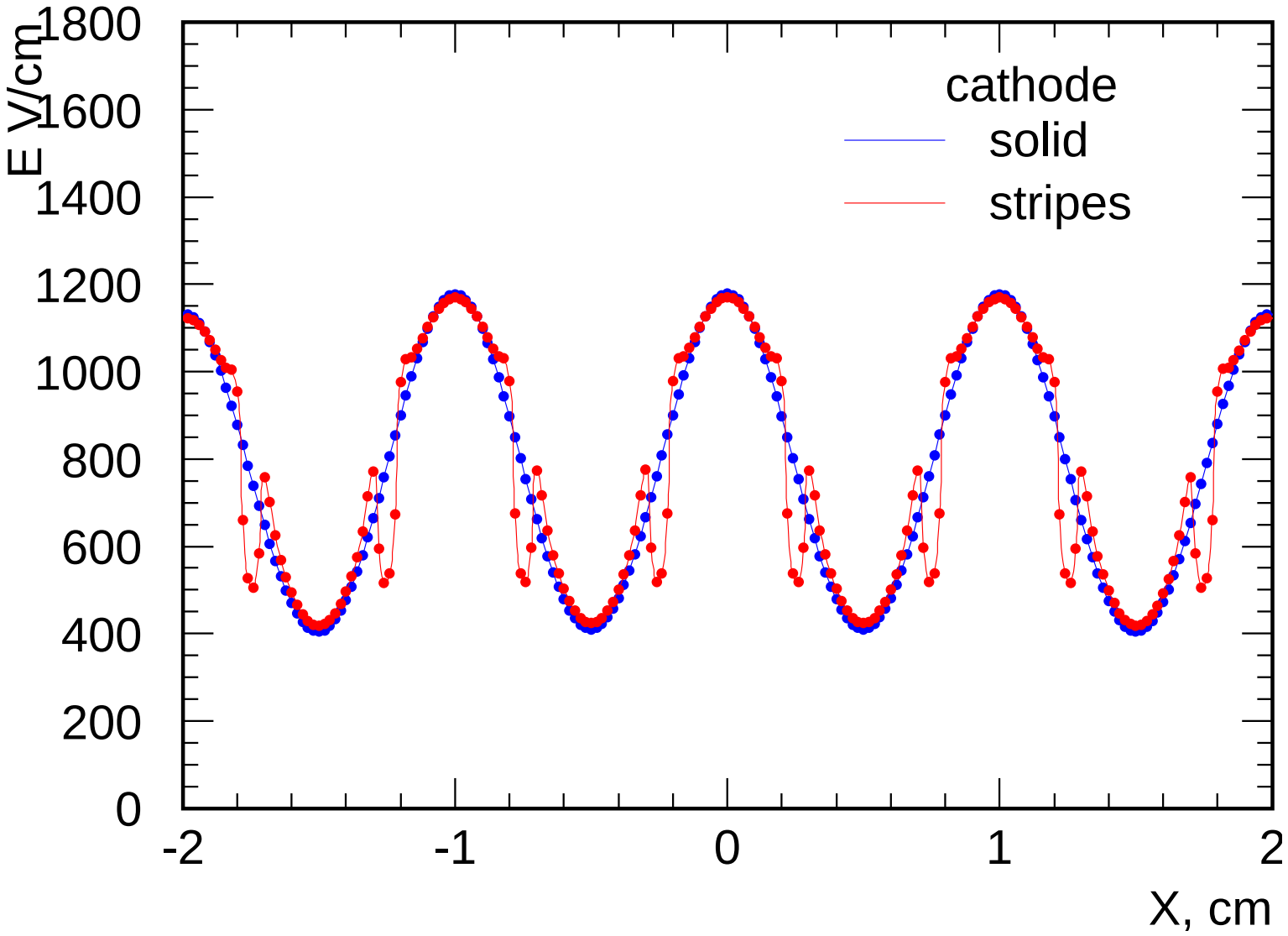
Frequencies of radialy-symmetric modes (σ - surface density):

$f_k = \frac{B_{\circ k}}{2\pi R}\sqrt{\frac{T}{\sigma}}$, $\qquad B_{\circ k} = 2.40, 5.52, \ldots$ - Bessel zeros

$T = 660\text{N/m}$, $5\mu\text{m}$ copper $\Rightarrow$ f=75 Hz

$T = 660\text{N/m}$, $2\mu\text{m}$ copper $\Rightarrow$ f=91 Hz

Electric Field



Jefferson Lab