

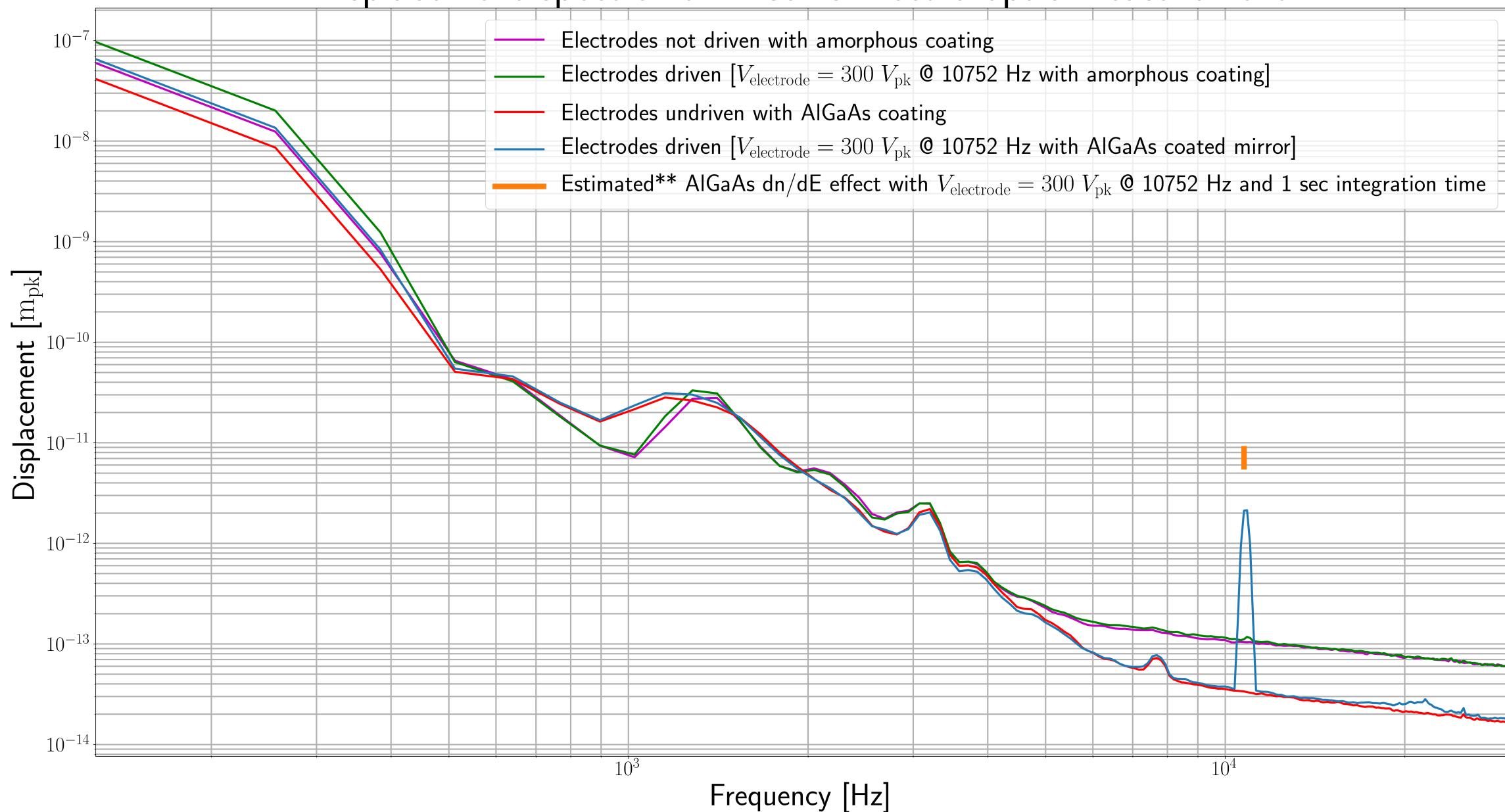


# Measuring AlGaAs Electro-optic / Piezoelectric effect (initial results)

Danny Vander-Hyde , Stefan Ballmer, and  
Steve Penn

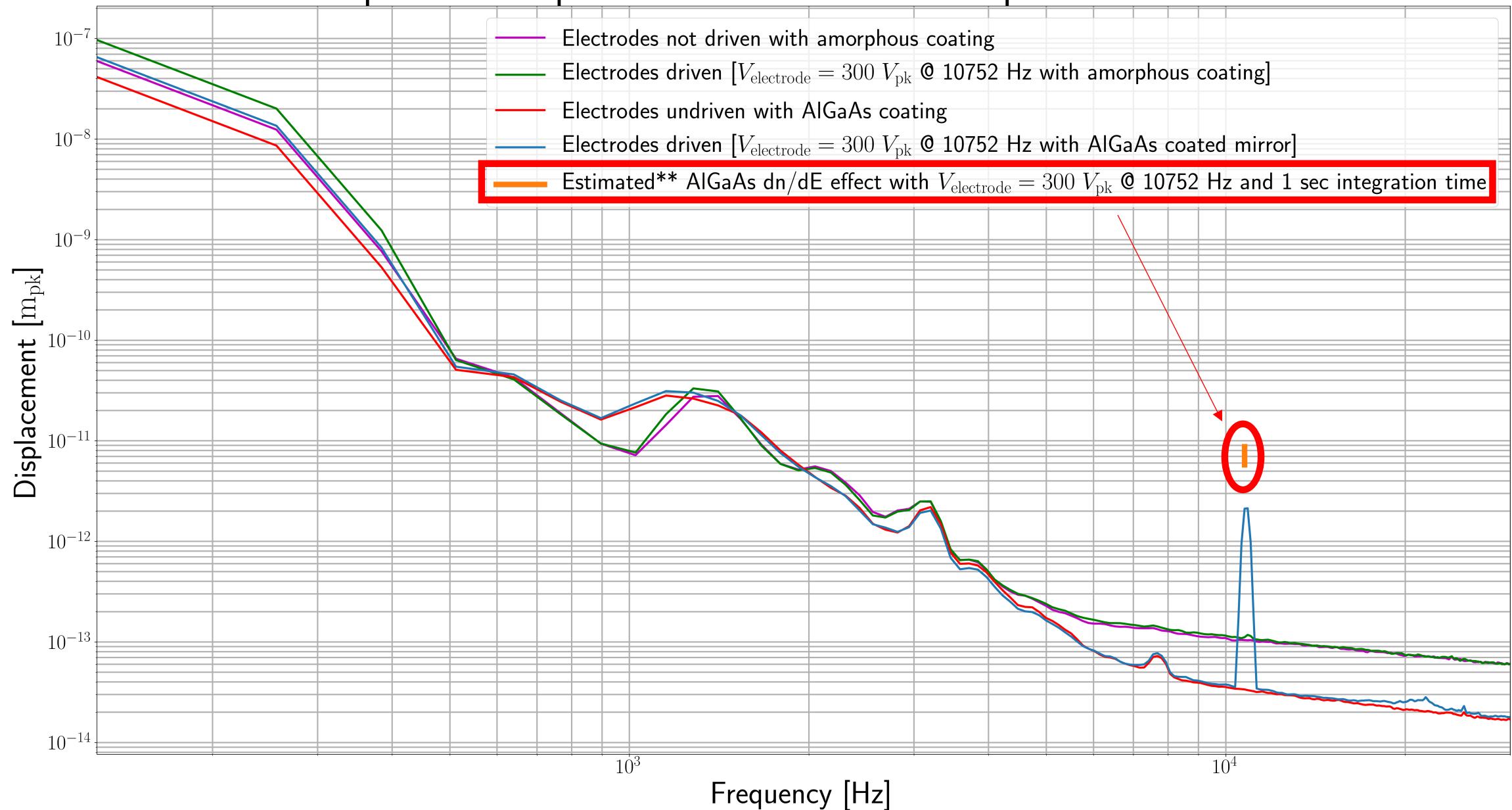
# Initial results (04-26-2020)

## Displacement spectra for AlGaAs Electro-optic measurement



# The Model

## Displacement spectra for AlGaAs Electro-optic measurement



# Where does this estimate come from?

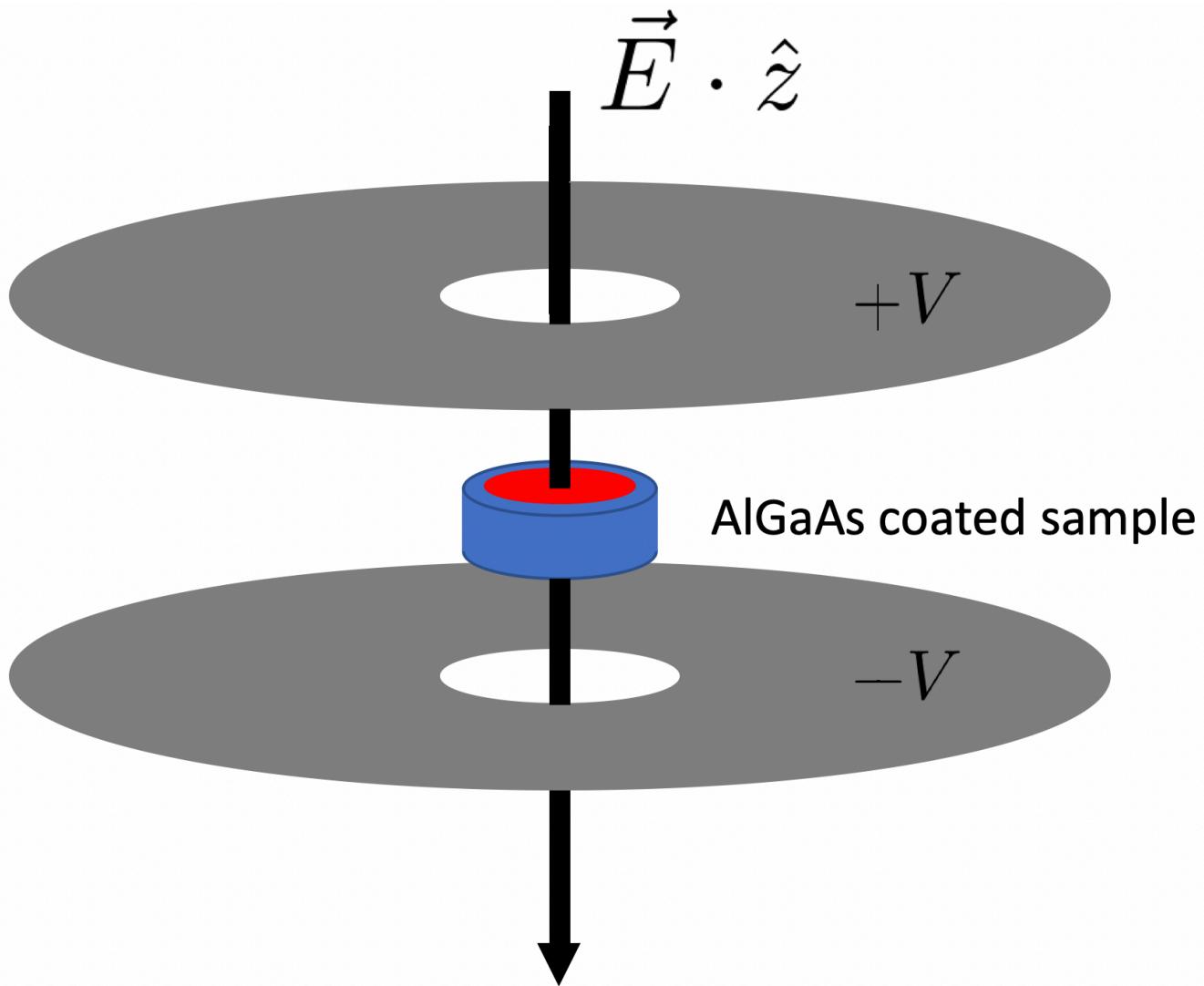
- Two parts:
  - $dn/dE$  based on Marty's calculation for stratified media
  - Numerical Poisson computation used to estimate field strength normal to surface of optic ( $E_z$ )

# $\text{dn}/\text{dE}$ estimate for HR AlGaAs coating

$$\frac{\partial \phi}{\partial E} = 4.5 * 10^{-10} \text{ 1/V/m}$$

$$\frac{\partial x}{\partial E} = \frac{1064 * 10^{-9}}{4\pi} \frac{\partial \phi}{\partial E} = 3.8 * 10^{-17} \text{ [m/V/m]}$$

# Numerical Poisson calculator (basic construction)

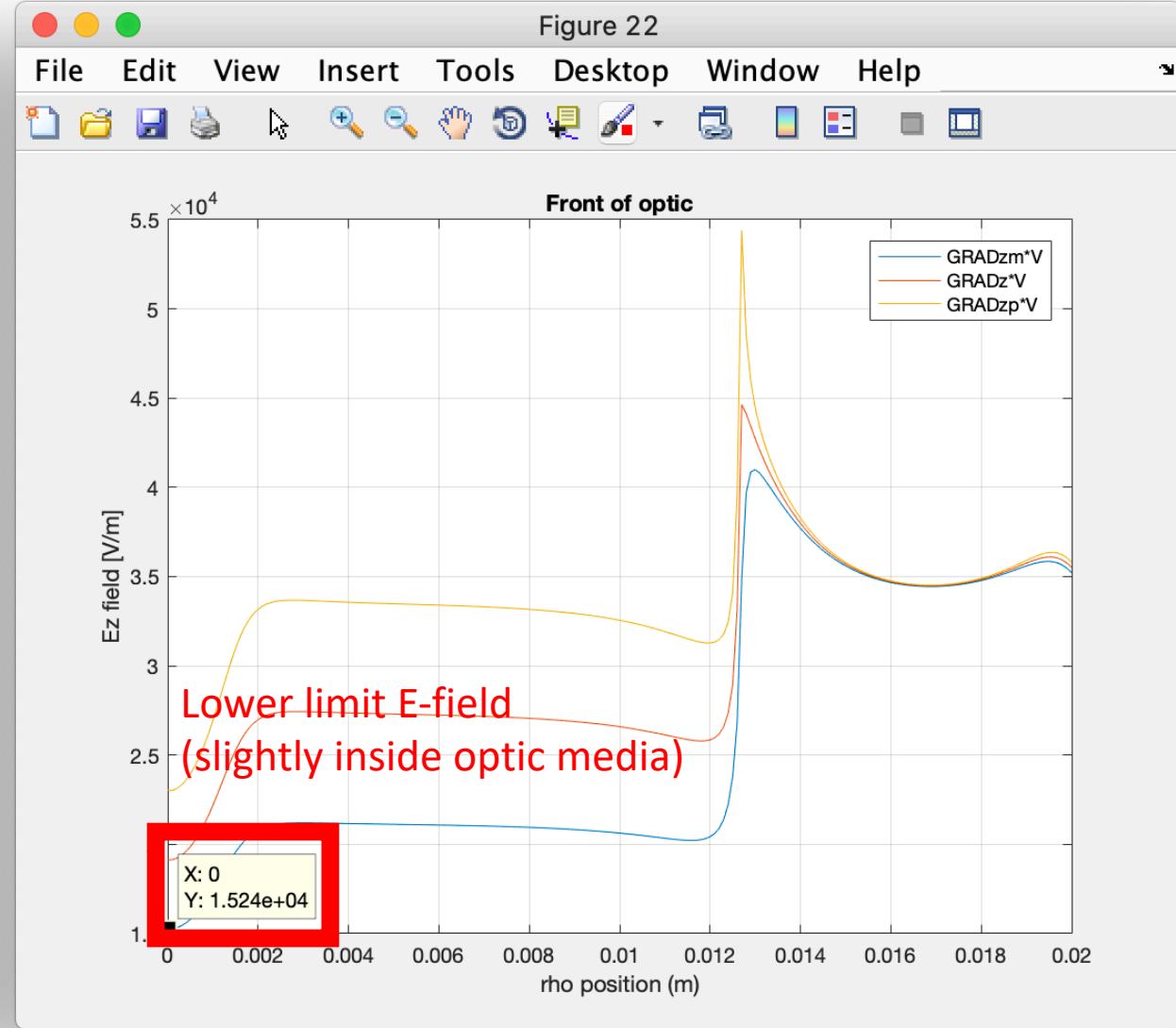
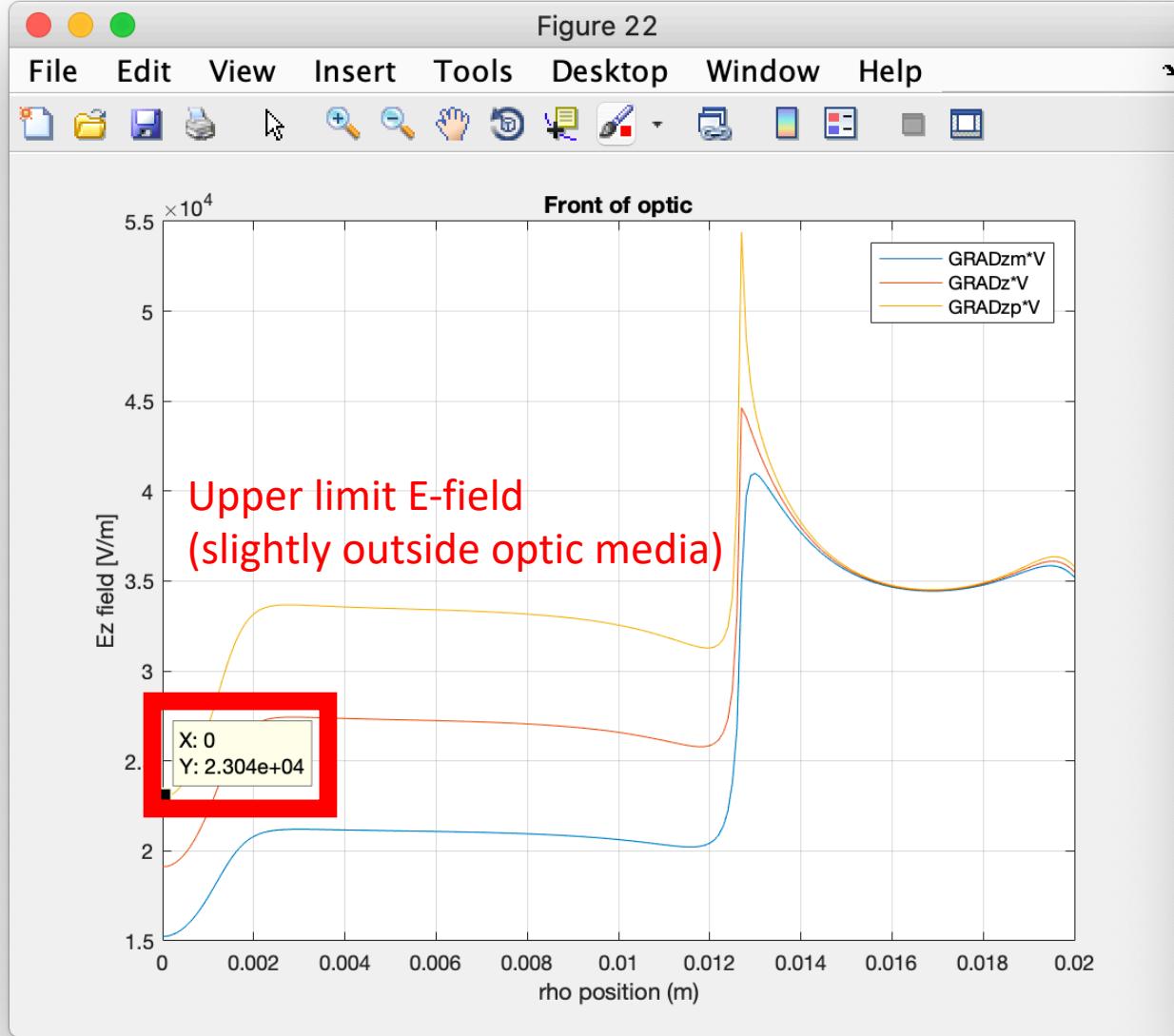


*Figure elements are  
not to scale*

# Numerical Poisson calculator (inputs)

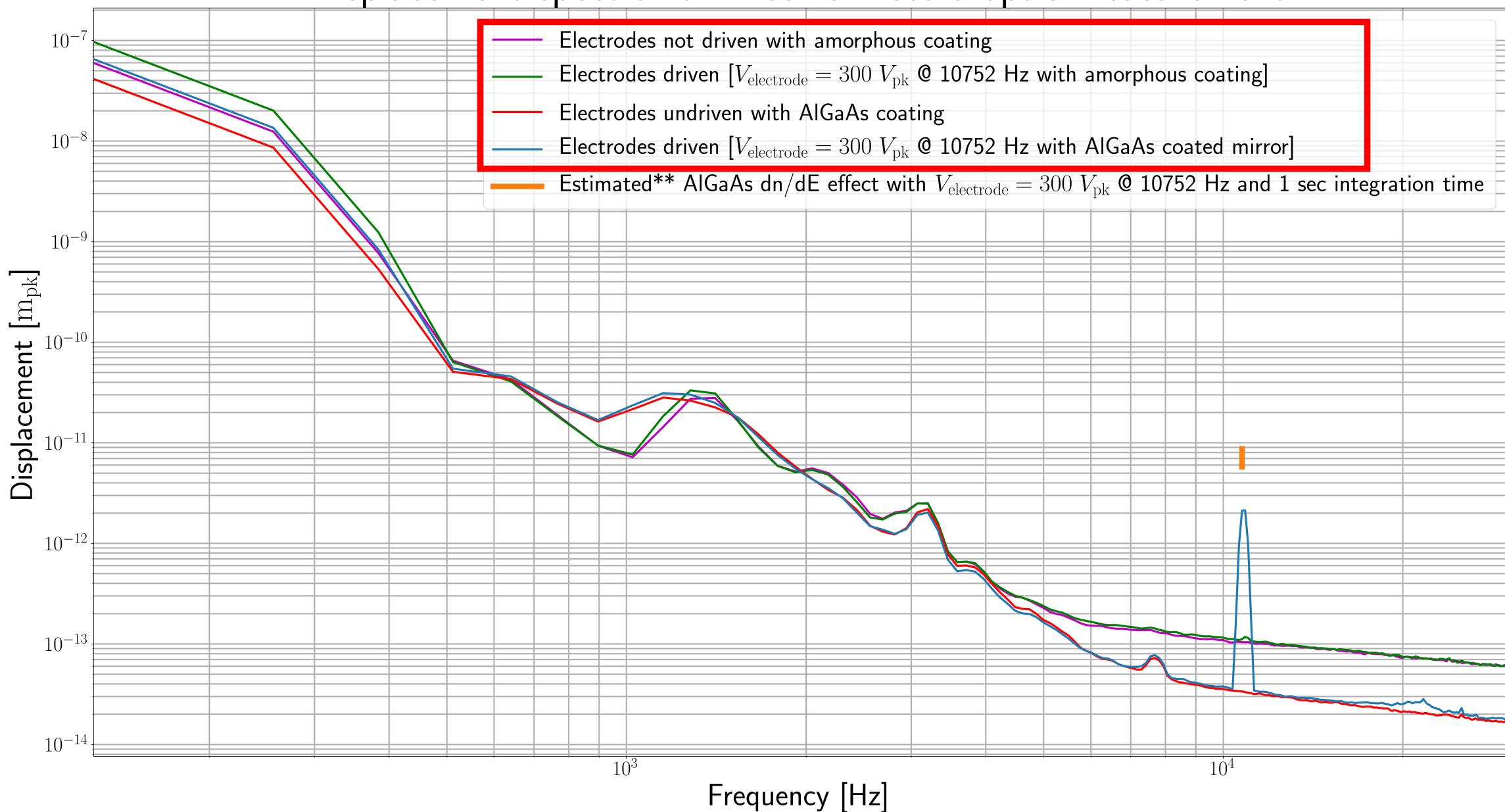
- Electrode plate settings:
  - Plates diameter : 76.2 mm
  - Central holes diameter : 3 mm
  - Plate separation : 9 mm
  - Voltage across electrodes : 300 V
- Optic settings:
  - Optic diameter : 25.4 mm
  - Optic thickness : 7 mm
  - Material : Fused silica

# Numerical Poisson calculator (results)

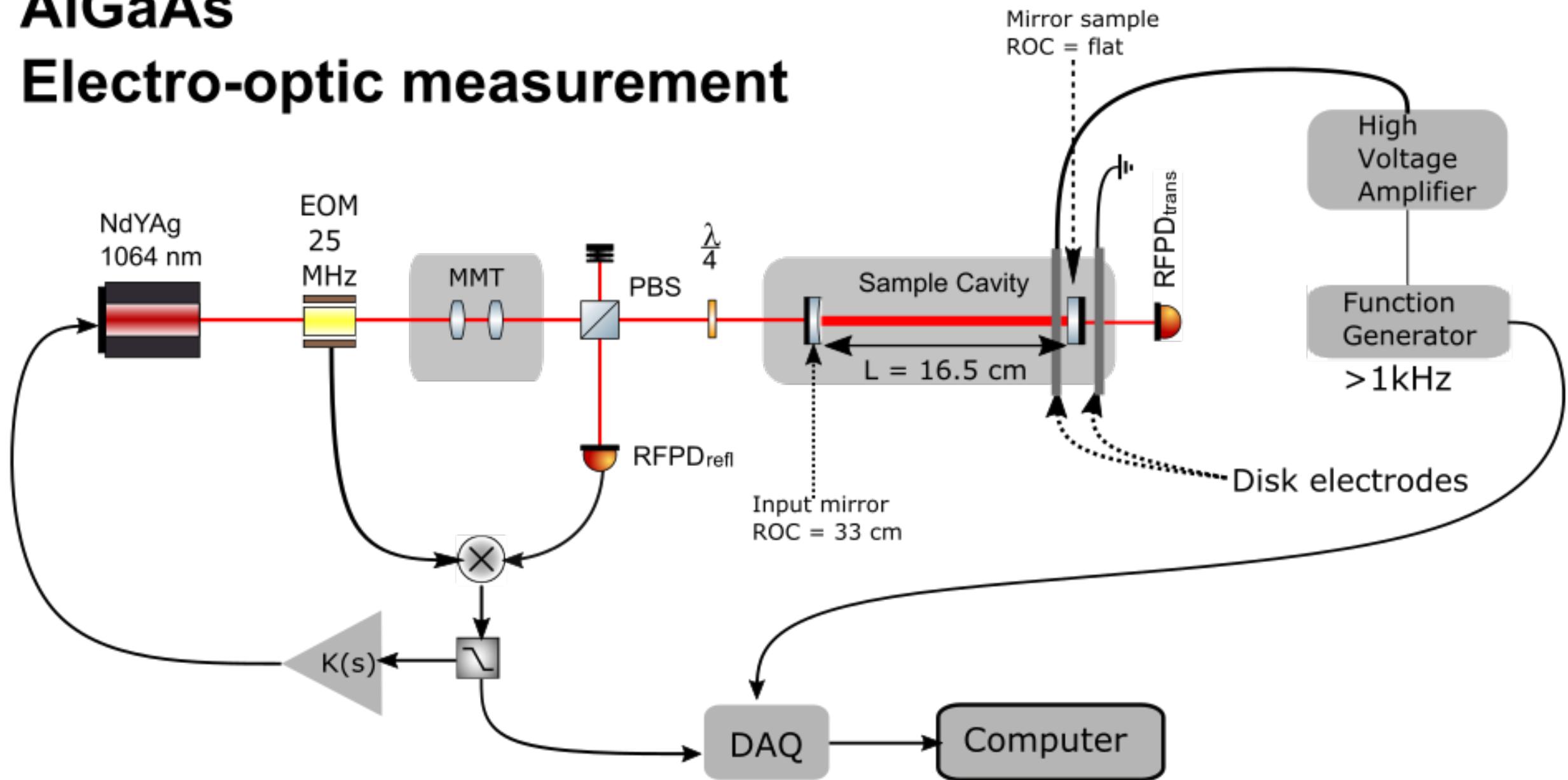


# The Measurement

## Displacement spectra for AlGaAs Electro-optic measurement

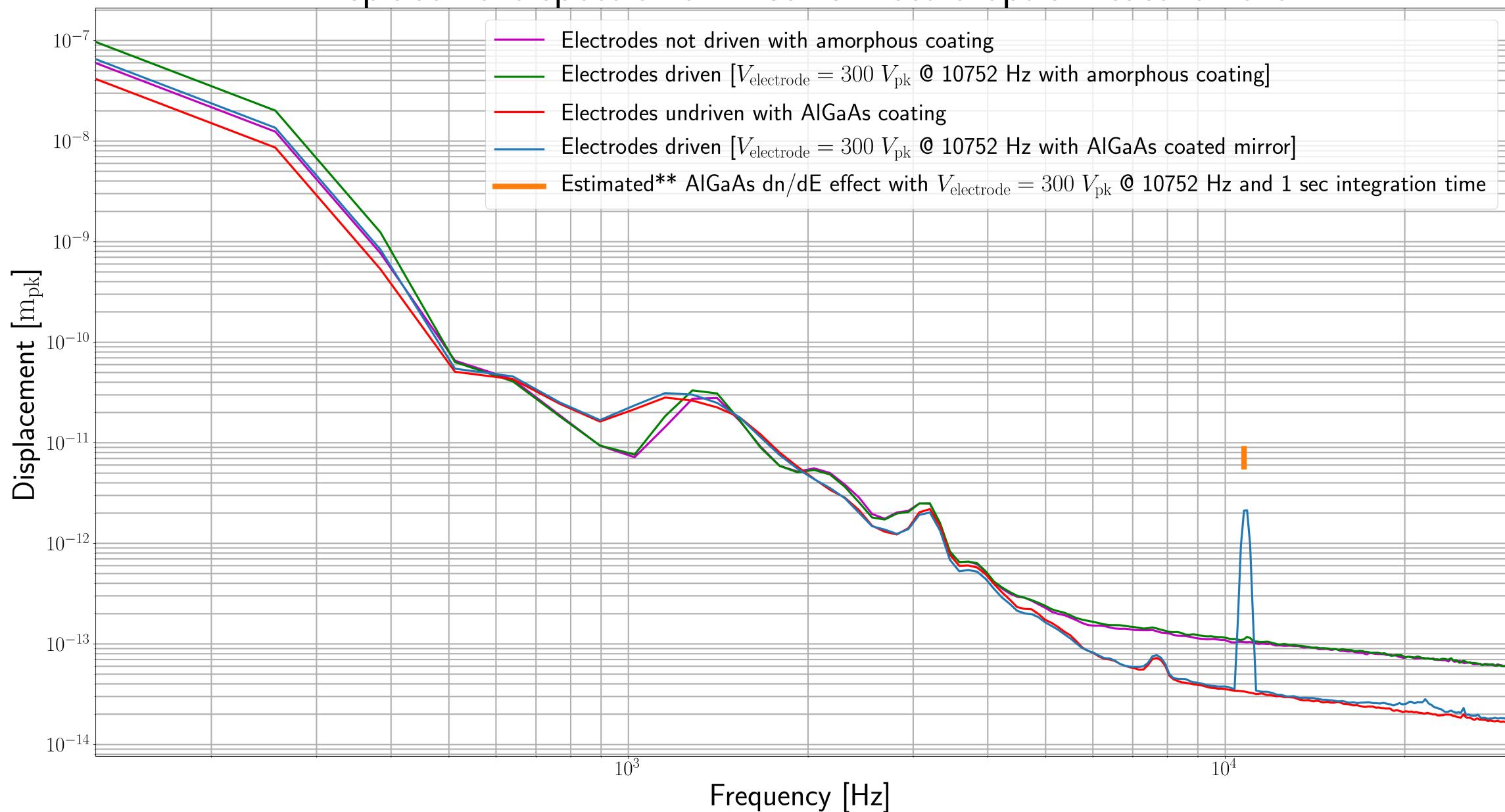


# AlGaAs Electro-optic measurement



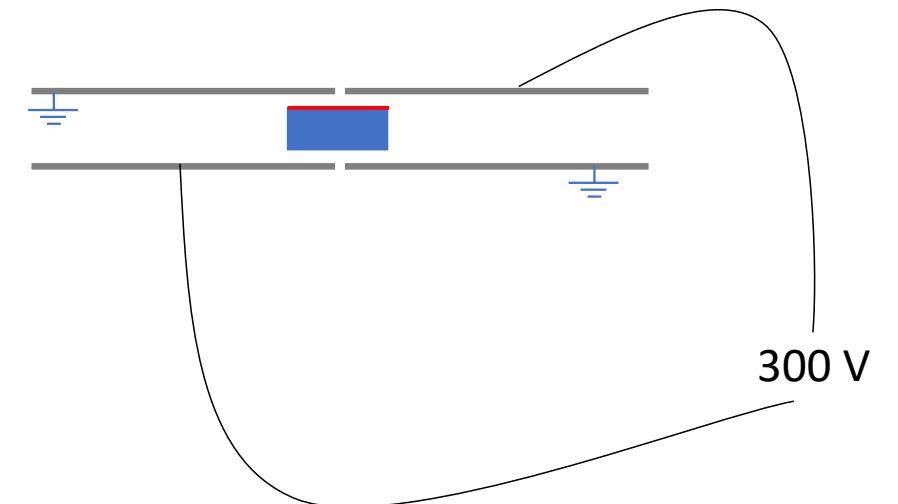
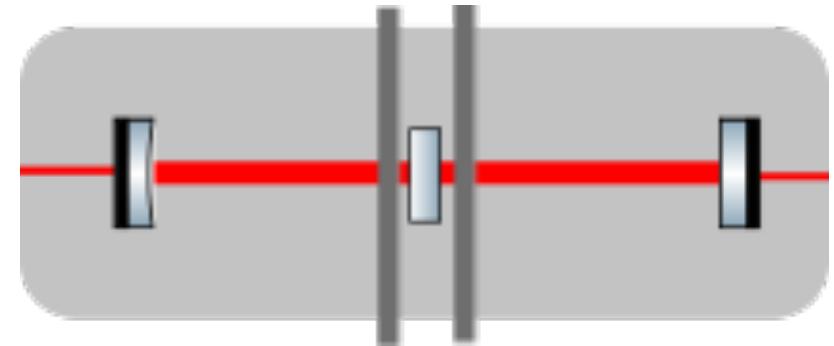
# Initial results (04-26-2020)

## Displacement spectra for AlGaAs Electro-optic measurement



# Next measurements

- *Acquiring a higher frequency resolution using DTT*
- Calibration measurement using GaAs wafer
  - Slight adjustment to current experiment (electrode + sample placed intracavity)
- Measure  $dn/dE + dn/dL$  effects for controlled non-normal fields
  - Alternative split electrode design
  - Additional features to current experiment to decouple contributions



Questions?