# SNL Experiments

SAND2016-6686PE

- Nd:YAG 1064 nm laser with pulse width of 8.5 nanoseconds
- Aluminum target, alloy 6061
- 38 mJ per pulse
- 250 μm spot size
- 2.3 GW/cm^2 Peak Irradiance
- 1:1.8 Imaging
- 50 μm image plane resolution
- Spatial averaging over entire height of the detector

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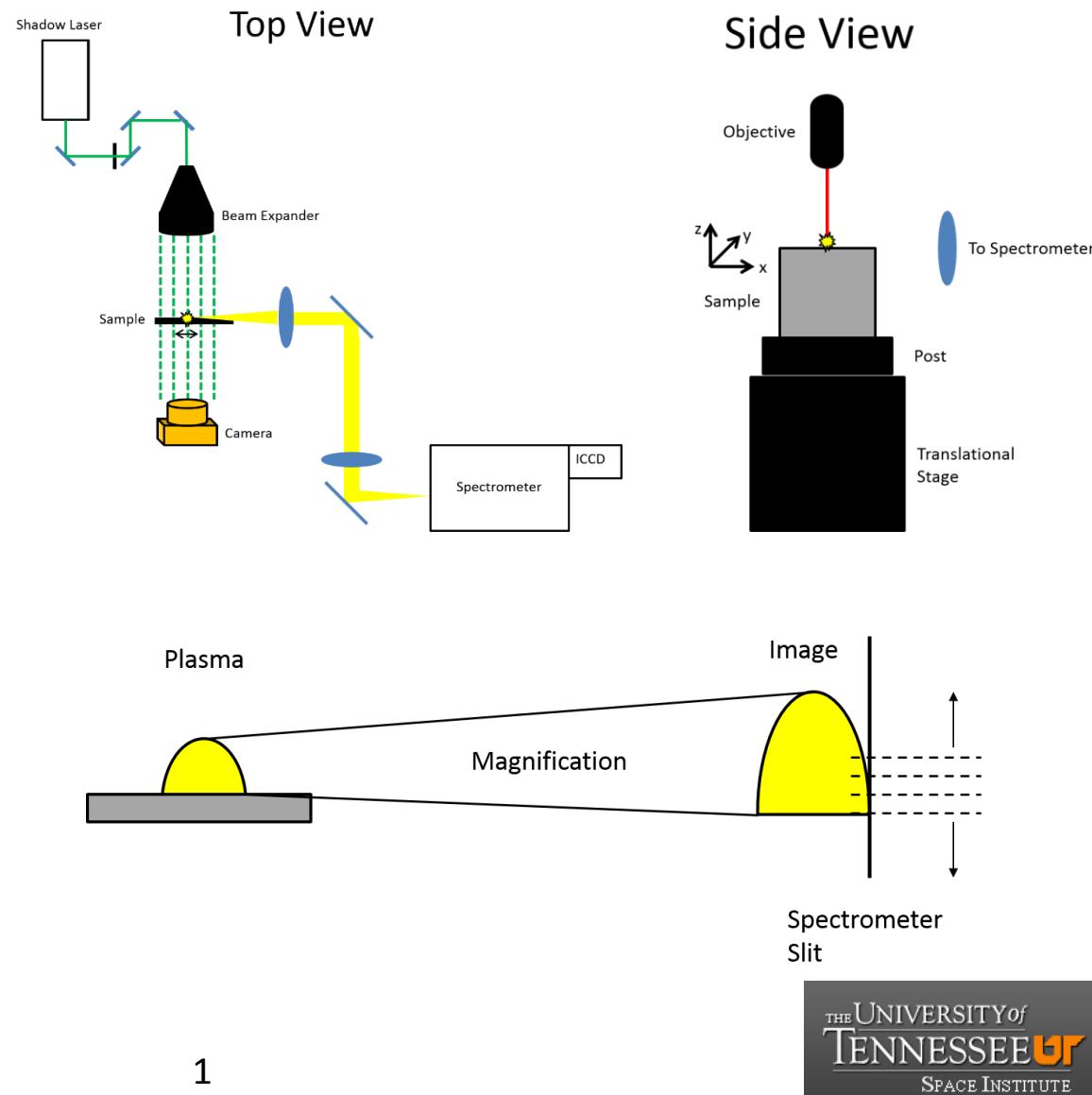
Plasma Shockwave

Determine geometry of the plasma shockwave expansion according to modified Taylor-Sedov point blast model

$$R(t) = \xi \left(\frac{E}{\rho}\right)^{1/(n+2)} t^{2/(n+2)}$$

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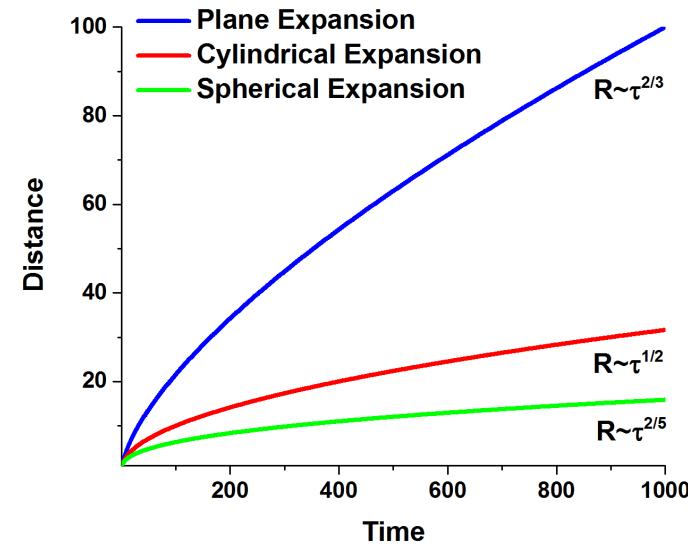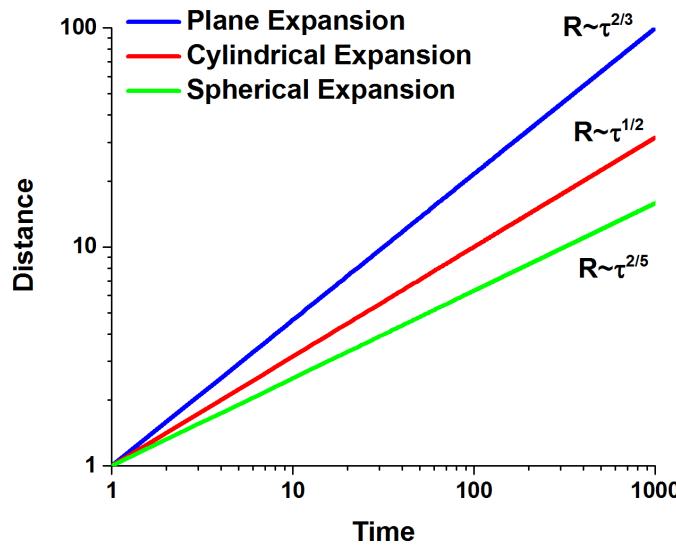
Shadowgraphs
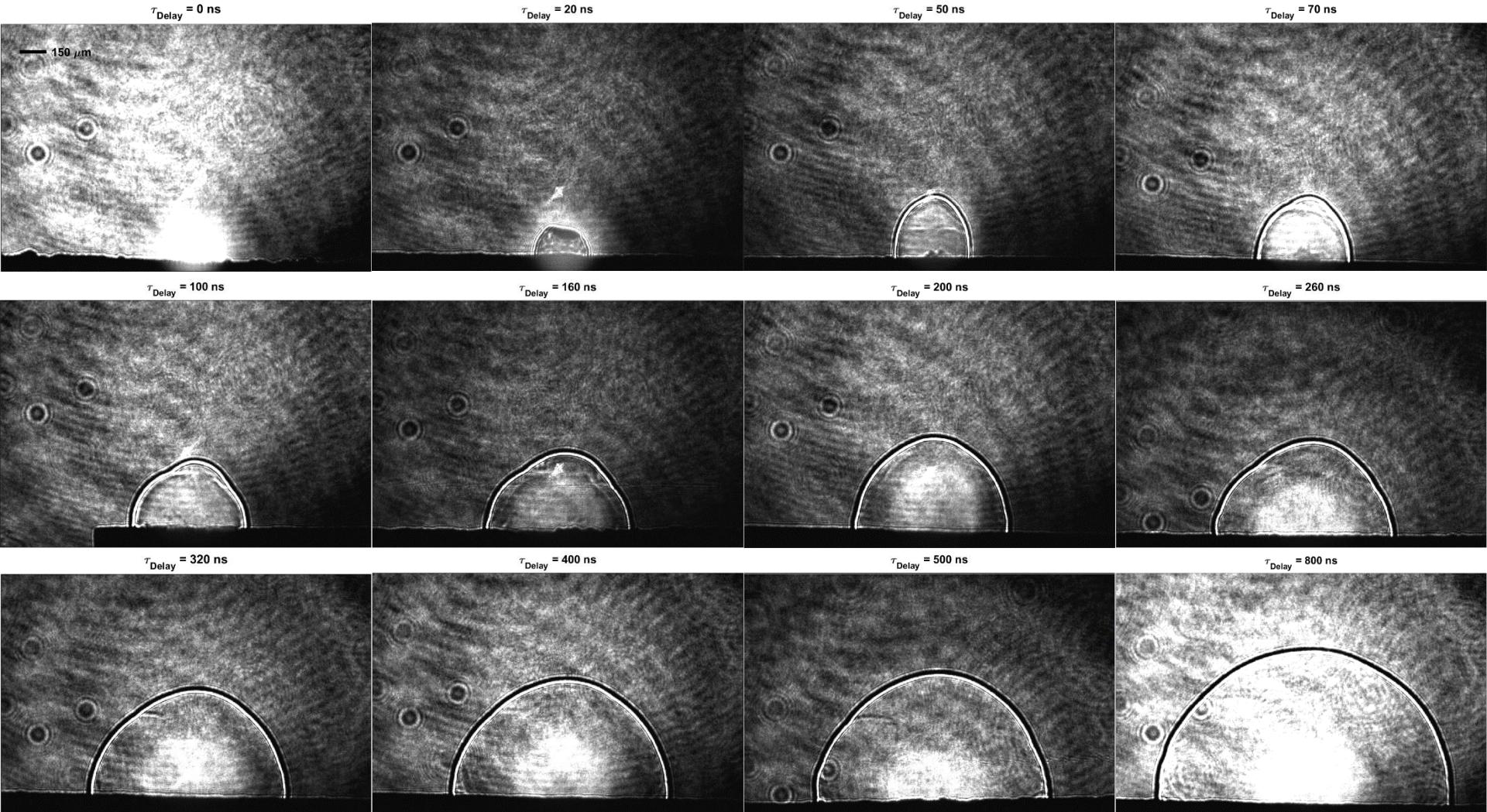
Image Analysis

Apply Canny edge detection method to find the shockwave and surface edges

Process:
1) Create background image/subtract background
2) Apply edge detection to find surface
3) Apply edge detection to find shock front position
4) Find area between surface and shock front
5) Infer shockwave height and width

Original Image

τ_{Delay} = 100 ns

150 μm

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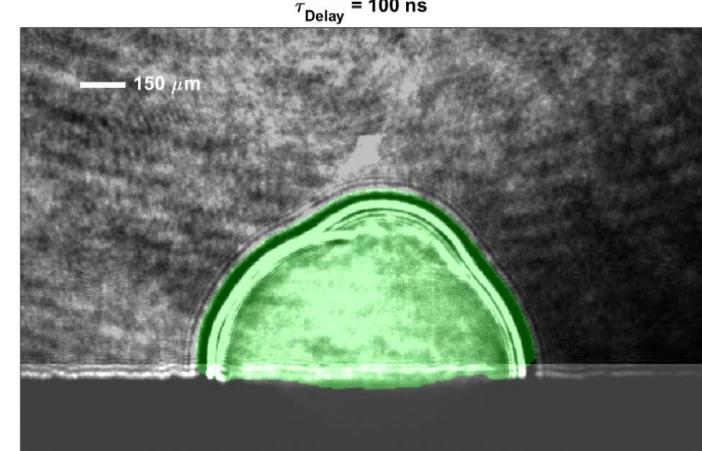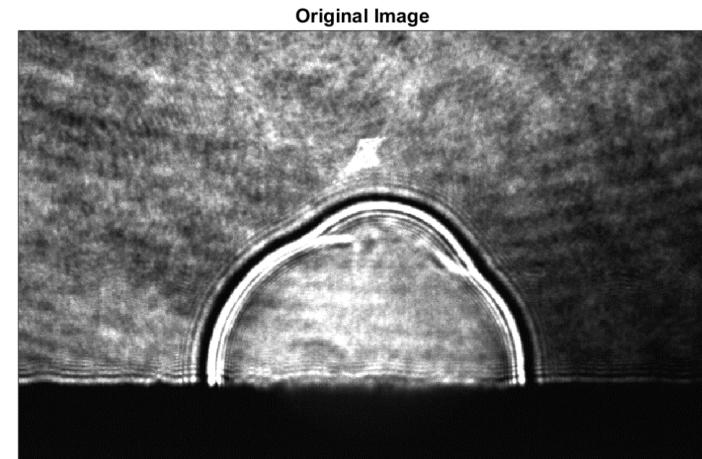
Shockwave Expansion

**Visualize Results**
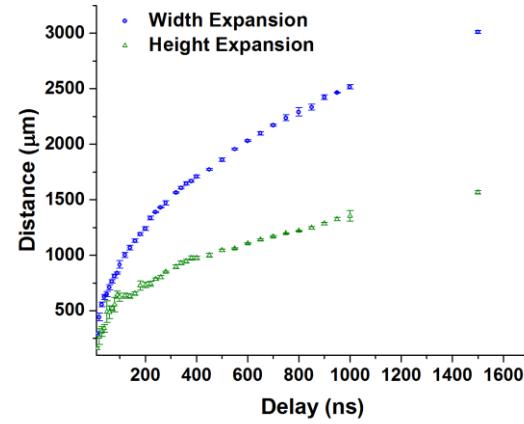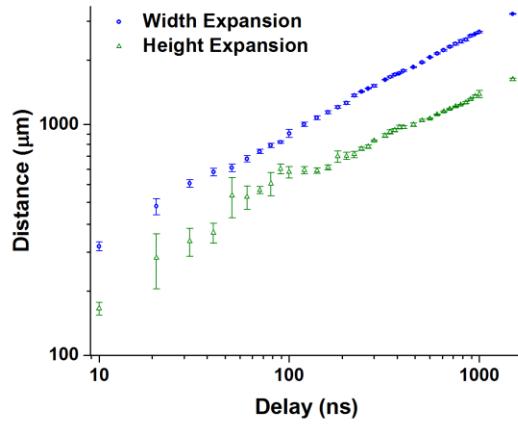
Fit to Infer Expansion Coefficients

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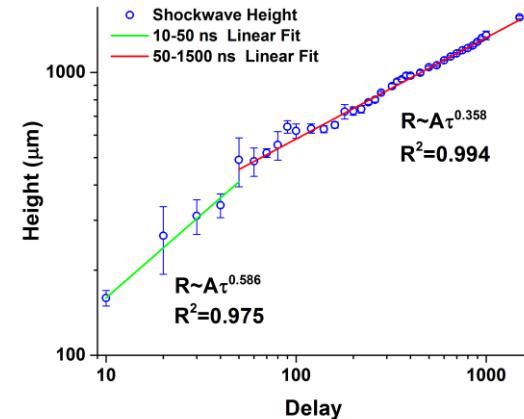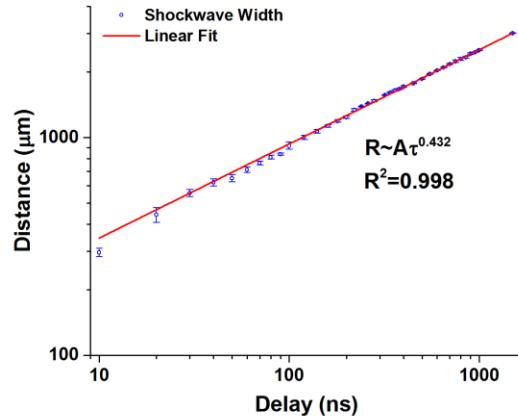
SNL Spectra 200-400 nm

SNL Spectra 400-800 nm

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N$^+$ N$_e$ Results

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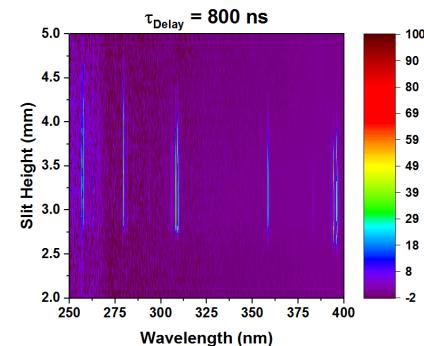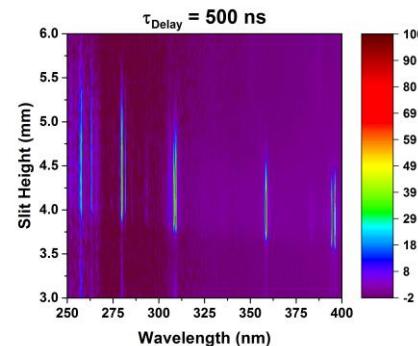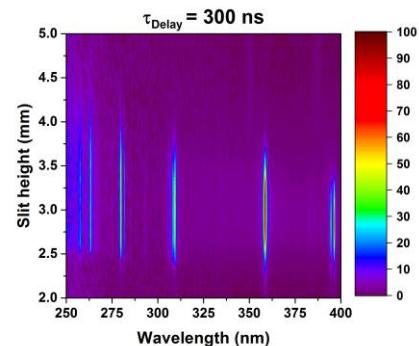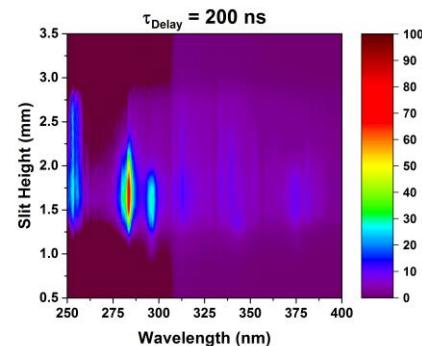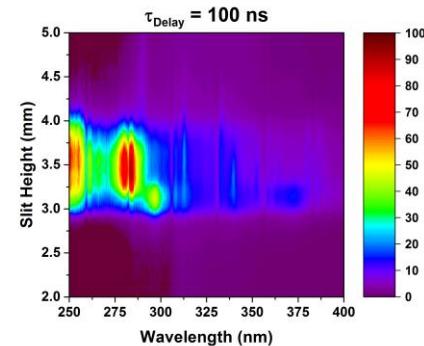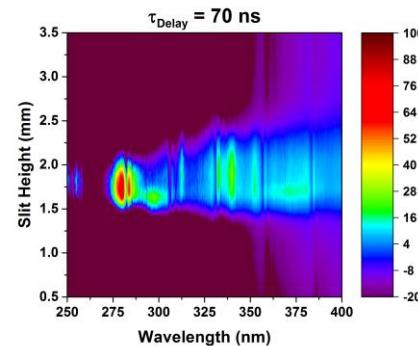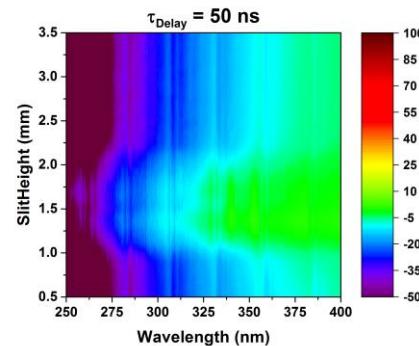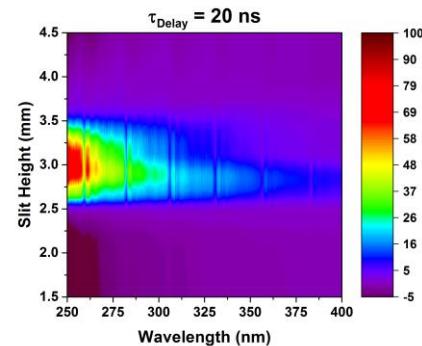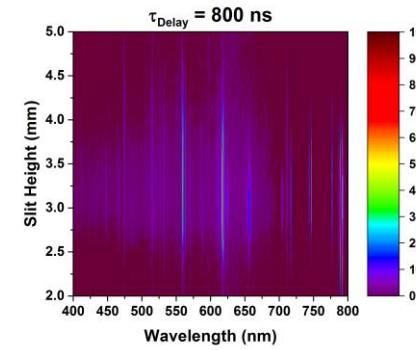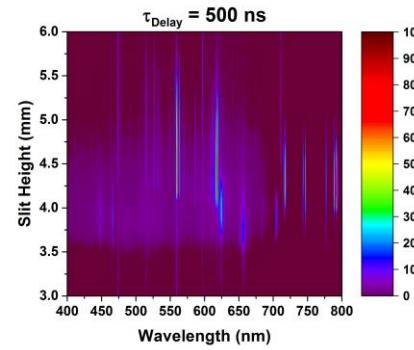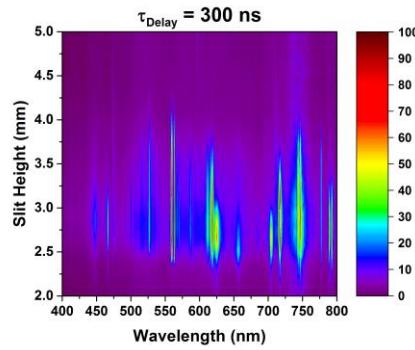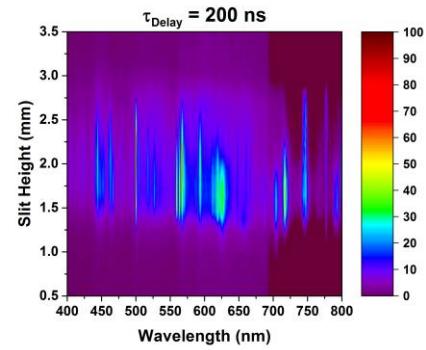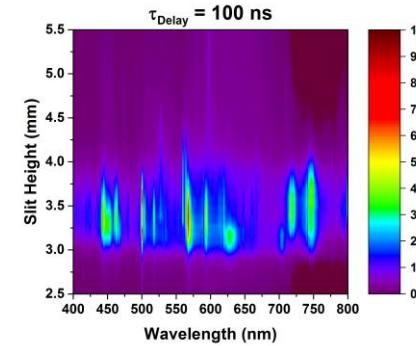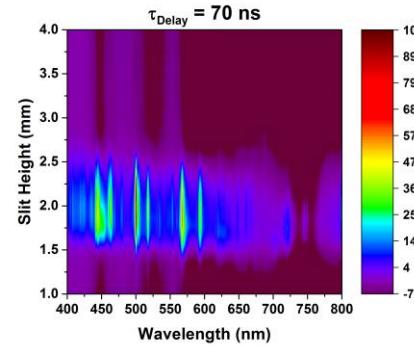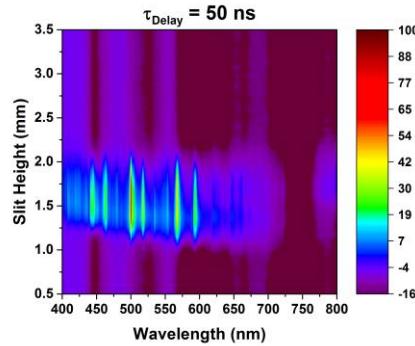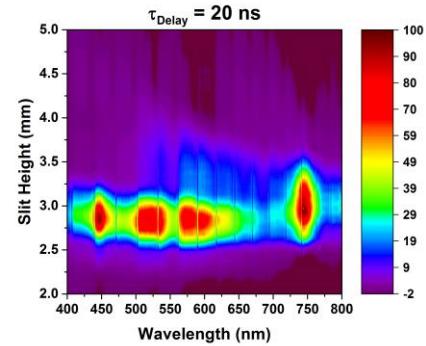
Al$^+$ N$_e$ Results
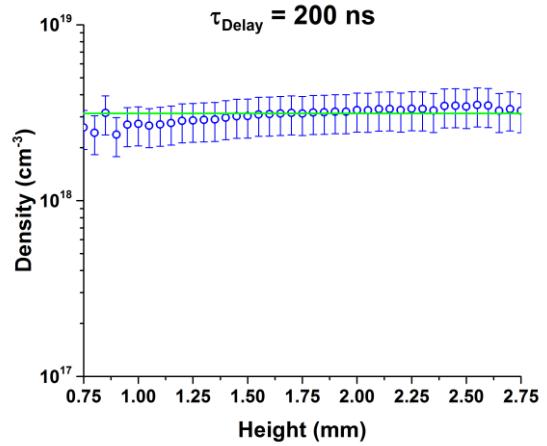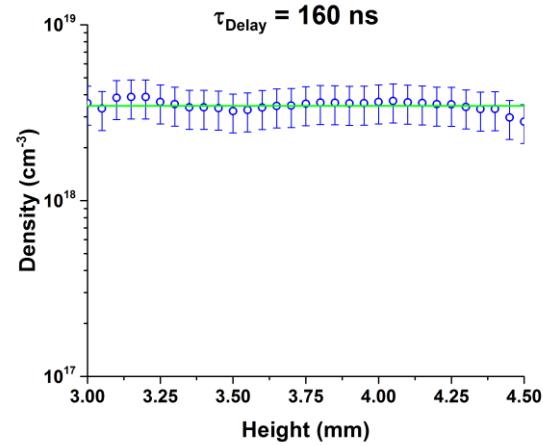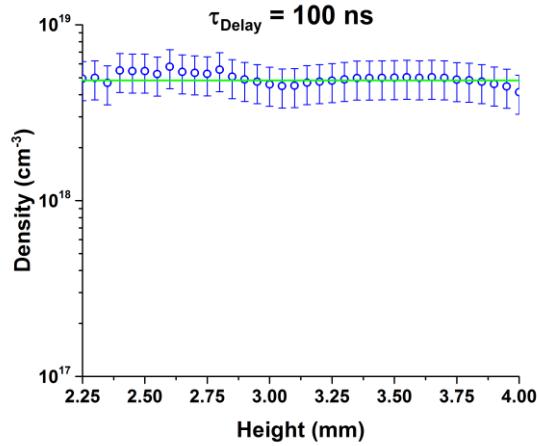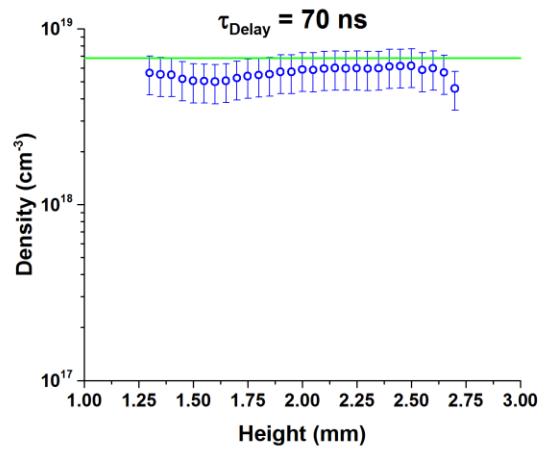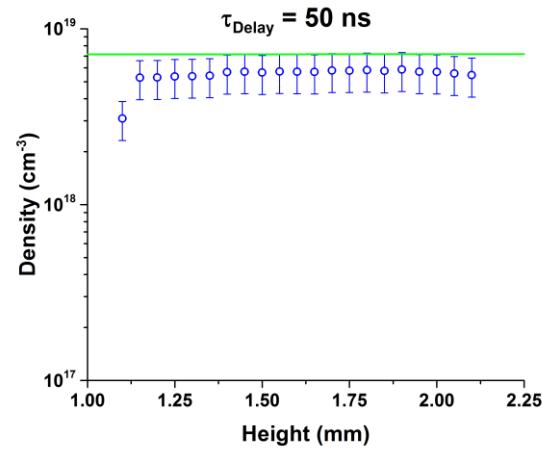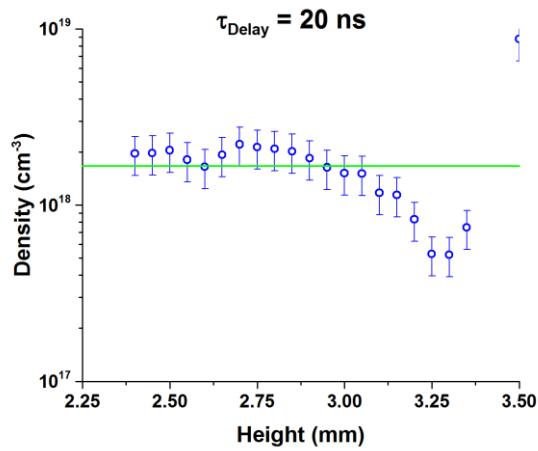
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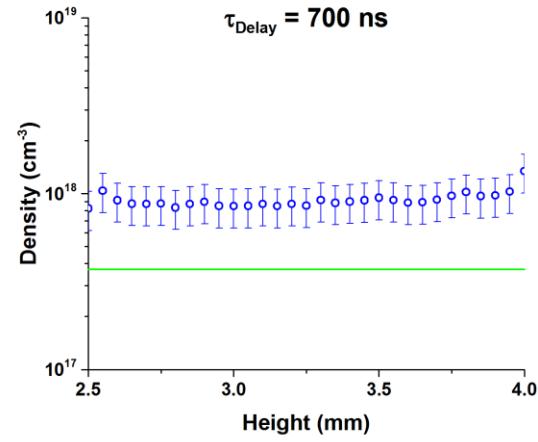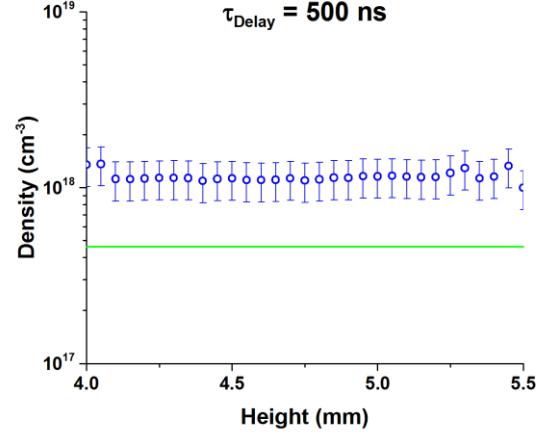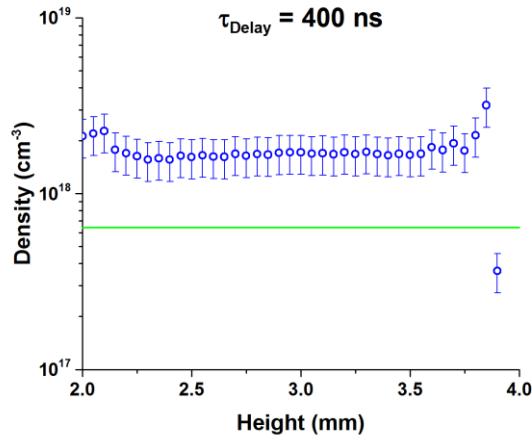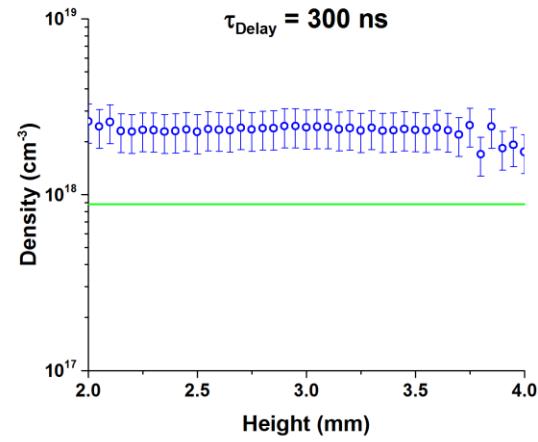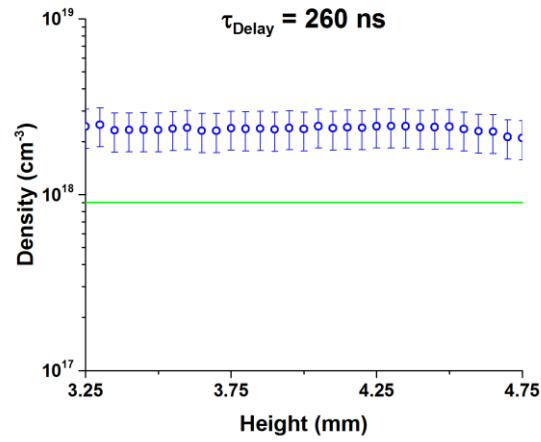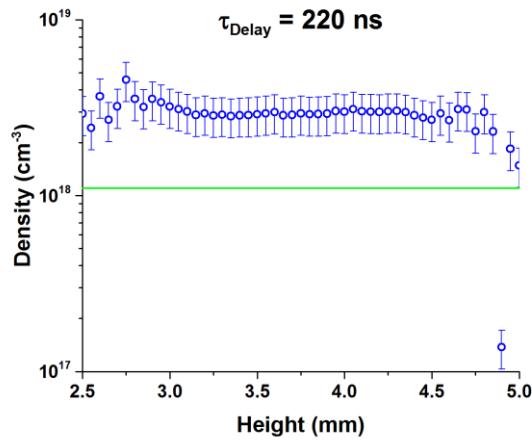
Spatially Averaged N$_e$ Results

Calculate spatially averaged N$_e$ by summing over entire sets of vertically resolved spectra and then fitting summation