TitanLabs tm

Partial Test Report
For
I675-TL-S20 SN: 1001

By

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Outline

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  - Data and Analysis
- Temporal Resolution
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  - Data Analysis
- Spatial Resolution and Spatial Field of View
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- Sweep Speeds and Linearity
- Distortions
  - 3ns Scan Speed Distortions
- Setup Images
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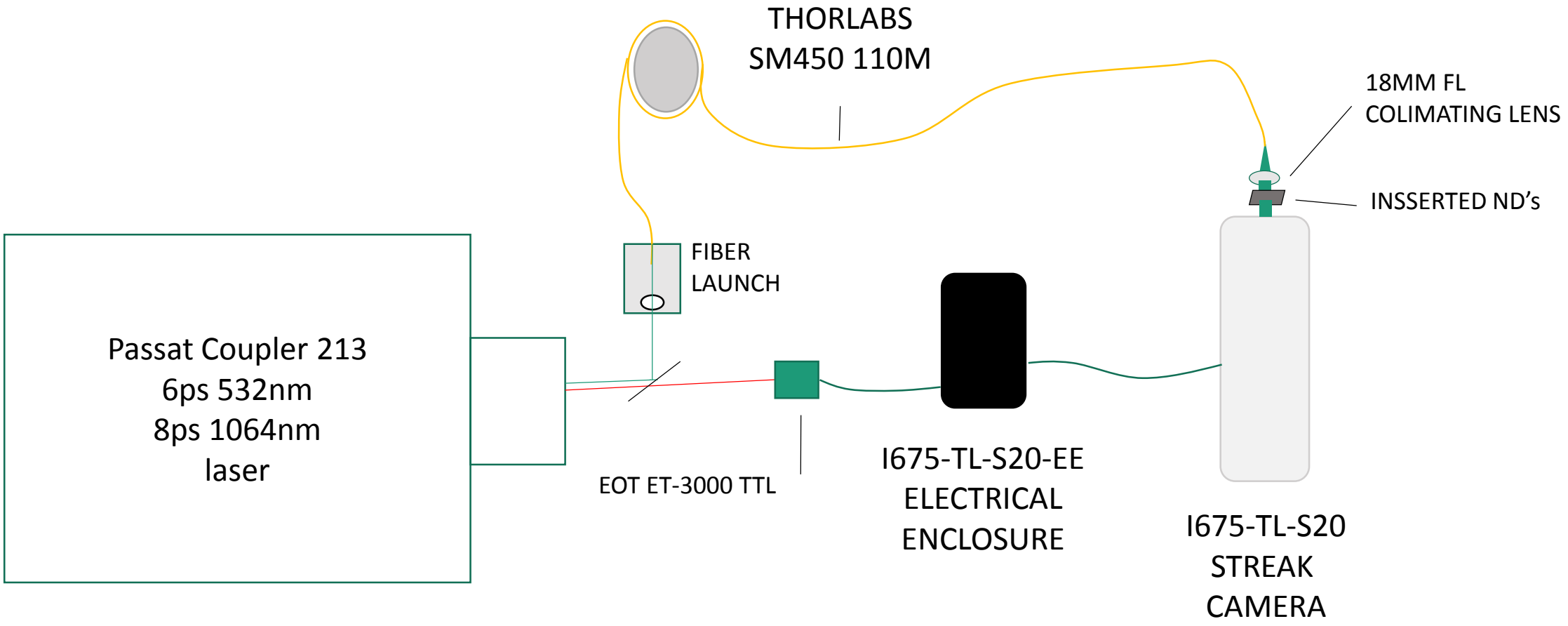
Dynamic Range Experimental Setup



Dynamic Range Procedure

- Launch 532nm light into SM450 fiber as seen in experimental setup.
- To optimize launch direct output into Hamamatsu vacuum photodiode and monitor intensity to optimize launch while monitoring duration to insure you are not getting intensity induced temp broadening.
- Move fiber to collimator and check collimation and alignment as shown in Experimental Setup
- Set camera to fastest scan speed 0.03ns/mm or 3ns
- Acquire data and adjust ND levels until ~ 20% temporal broadening is observed representing 10% Child Langmuir Space-Charge-Limit.
- Adjust MCP gain to keep signal intensity at a reasonable level
- Add ND in 0.5 OD steps until signal is no longer detectible when MCP is at 100% gain.

Note: 6ps Laser Pulse is expanded while traveling through 110 Meters of fibe

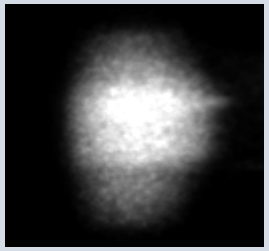
Dynamic Range Data

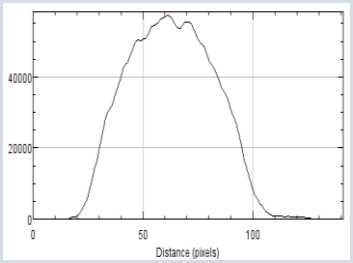
Settings:

- 100ц Slit Width
- Slit to PC Lens 58mm FL @ F 1.4
- MCP to CCD Lens 58mm FL @ F 1.4
- CCD Hama..Orca HR 4 X 4 Binning
  1000pixles x 656 supper-pixels

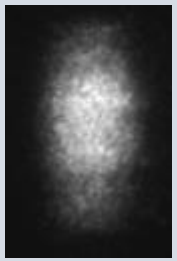
Line outs from Selected Data Points:

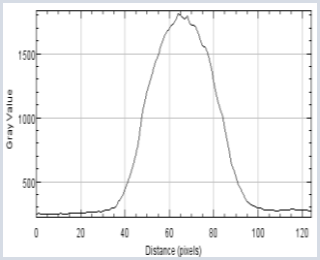
OD=1.0
55pixles FWHM



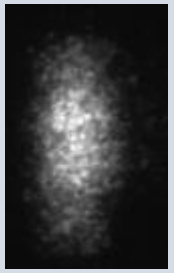


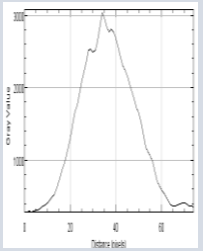
OD=1.5,
36pixles FWHM



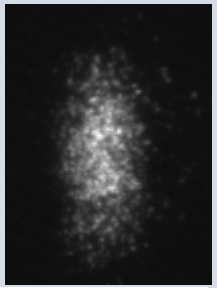


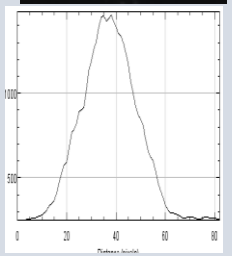
OD=2.0,
30pixles FWHM



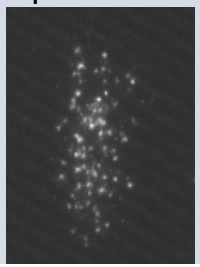


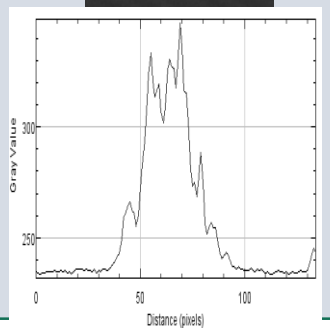
OD=2.5,
29pixles FWHM



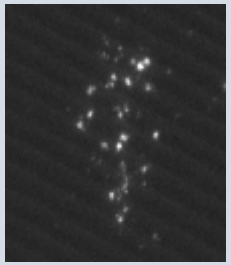


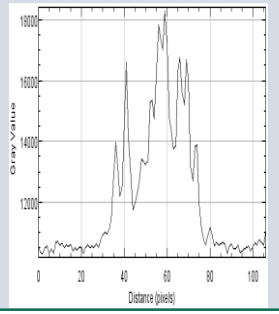
OD=3.5
22 pixles FWHM



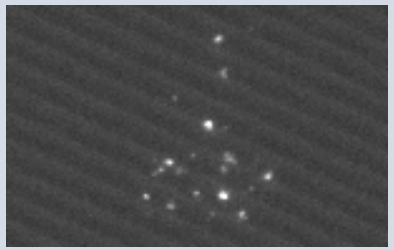


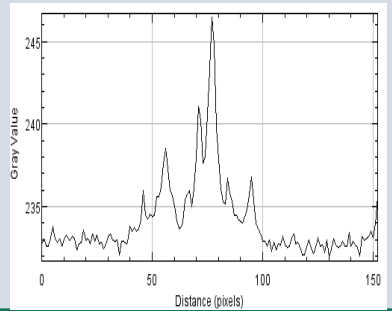
OD=4.0
30 pixels FWHM



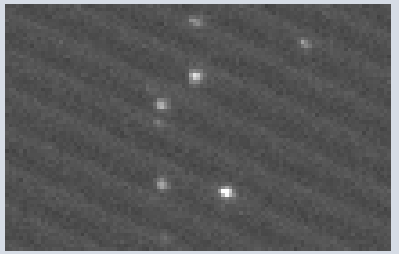


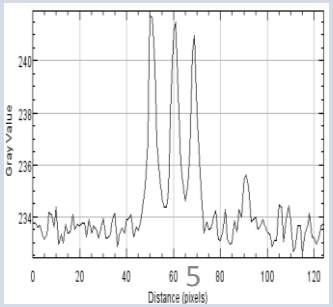
OD=4.5
20 pixels FWHM



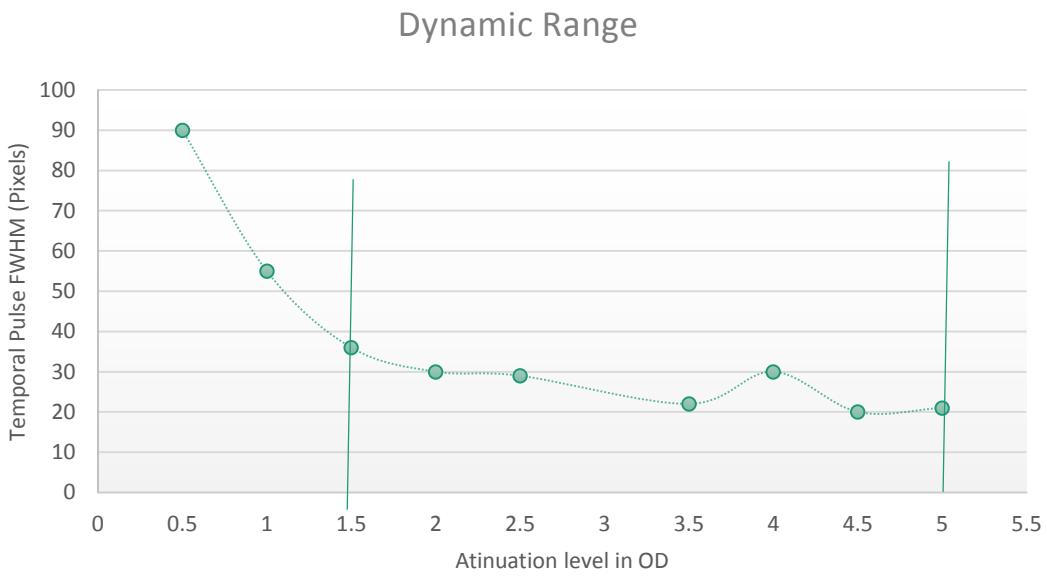


OD=5.0
21 pixels FWHM





Dynamic Range Analysis



Dynamic Range > 1000/1

Less then 20% broadened Dynamic Range=

OD5-OD1.5 = OD3.5 ~ 3000/1

Temporal Resolution Procedure

- Determine speed (ps/Pixel) for Regions of sweep with 3 GHz Comb.
- Determine minimum pulse duration by putting short pulse laser into slow scan speed (Pulse duration shorter than can be resolved by the sow scan speed) and measure temporal full width at ½ max.
- Multiply minimum pulse width times speed ps/pixel to determine temporal resolution

Note 6ps Laser Pulse is expanded while traveling through 110 Meters of fiber

Temporal Resolution

0.03ns/mm or 3ns scan speed 3GHz Comb

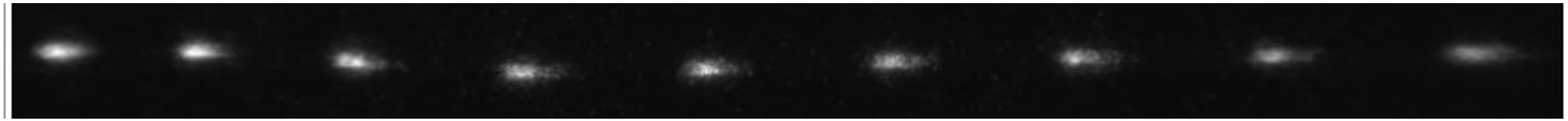
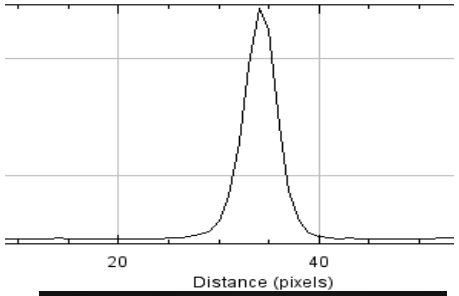
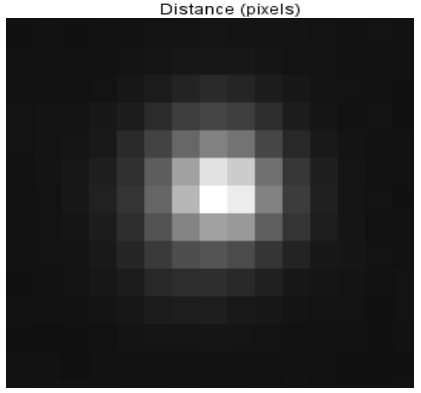


IMAGE #1										
		3ns Scan Speed								
Pulse		1	2	3	4	5	6	7	8	9
Pulse location		27	114	217	327	447	566	690	810	940
Pixels between pulses			87	103	110	120	119	124	120	130
ps/pixel			3.827586207	3.233009709	3.027272727	2.775	2.798319328	2.685483871	2.775	2.561538





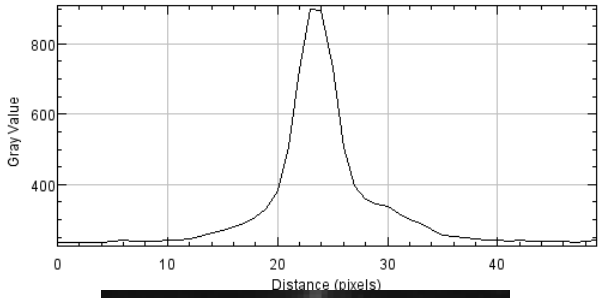
6ps laser in 6um SM Fiber
5.9ns/mm slow scan speed
Temporal Pixel Position 507

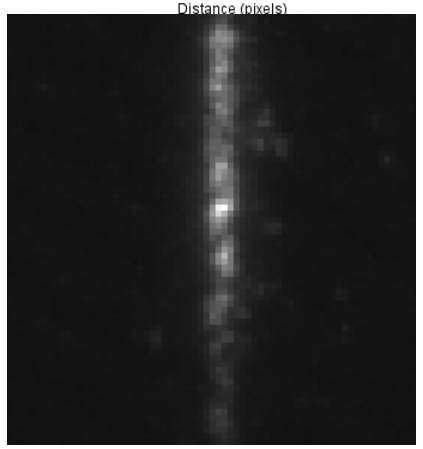
Ps/Pixel =2.8

Full Width half max = 4 pixels

4 pixels X 2.8ps/pixel=11.2ps

Temporal resolution = 11.2ps





6ps laser in 100u Slit
5.9ns/mm slow scan speed
Temporal Pixel Position 554

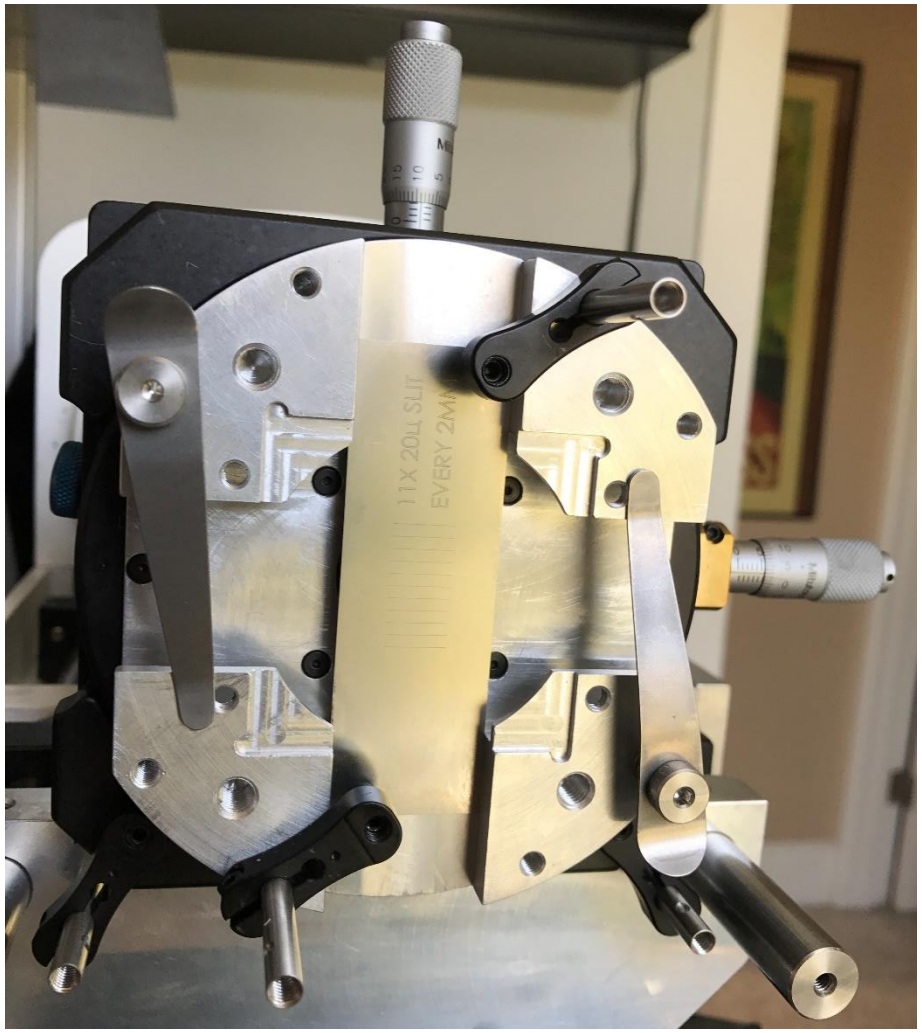
Ps/Pixel =2.8

Full Width half max = 4 pixels

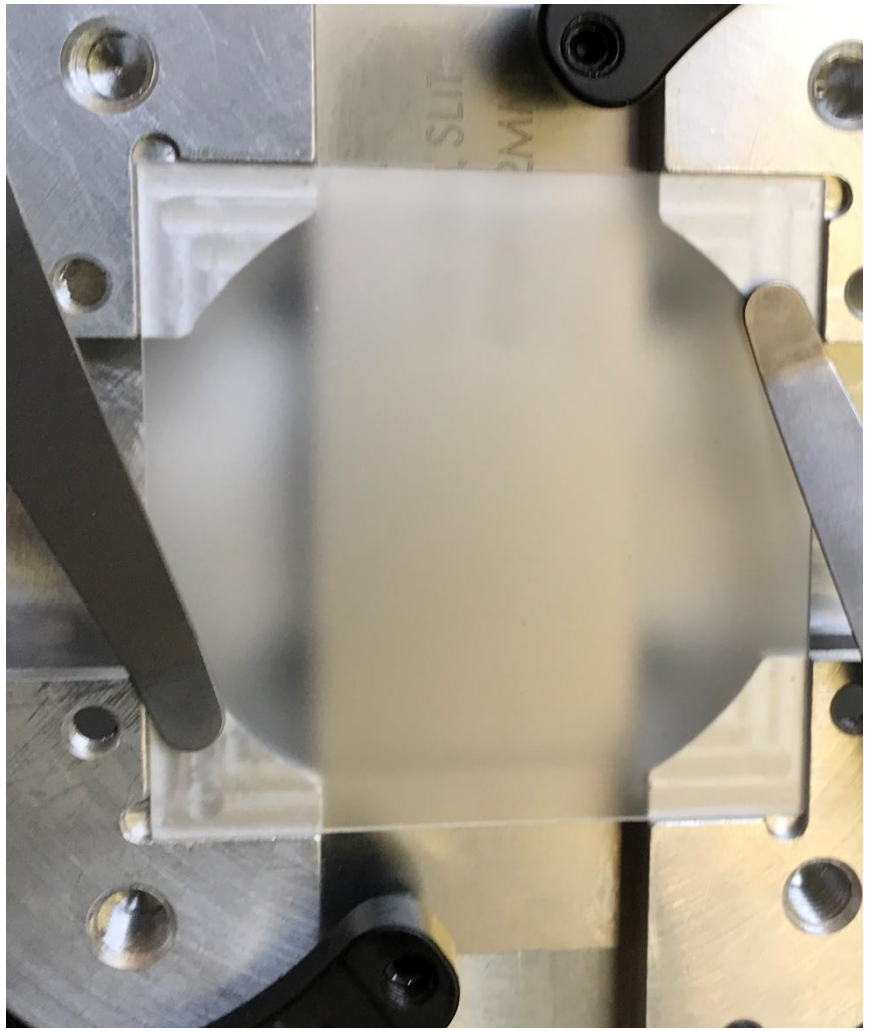
4 pixels X 2.8ps/pixel=11.2ps

Temporal resolution = 11.2ps

Setting Front End Magnification/ Field of View

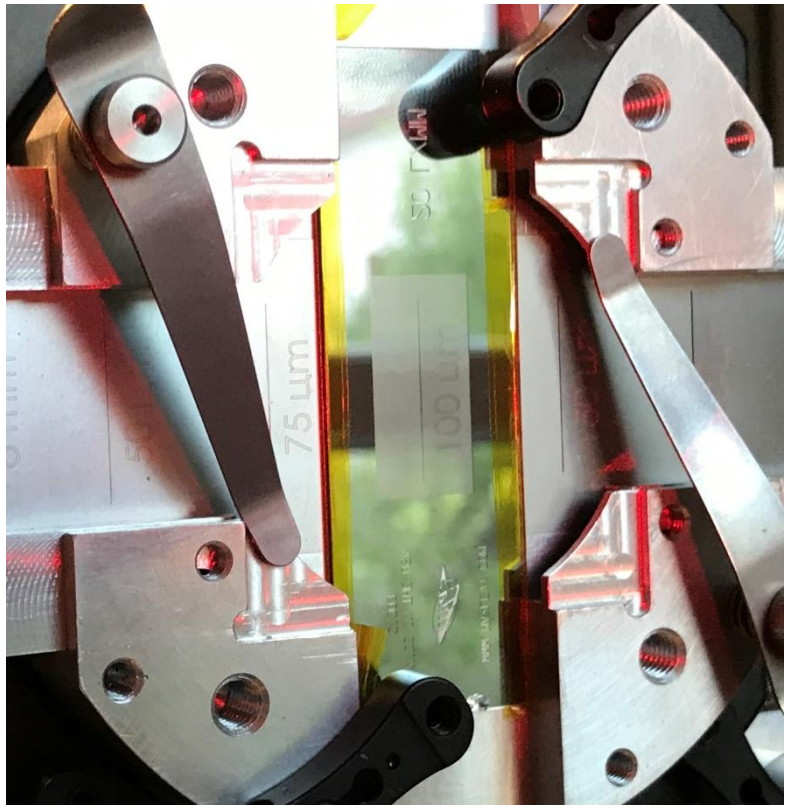


20um Slit Every 2mm Mask (No slit plate)



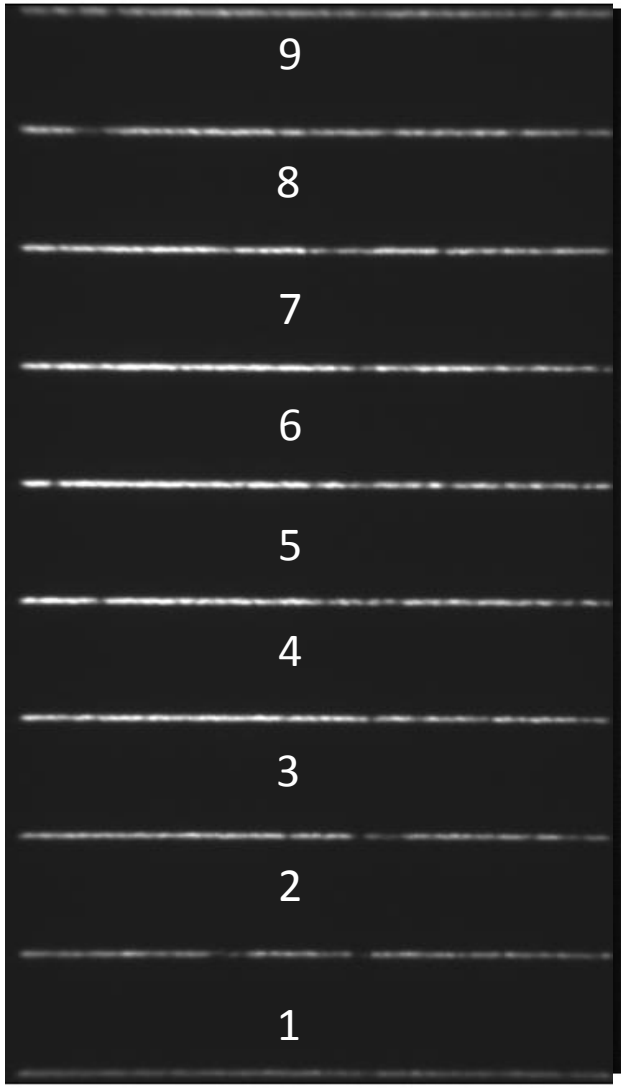
20um Slit Every 2mm Mask + Diffuser

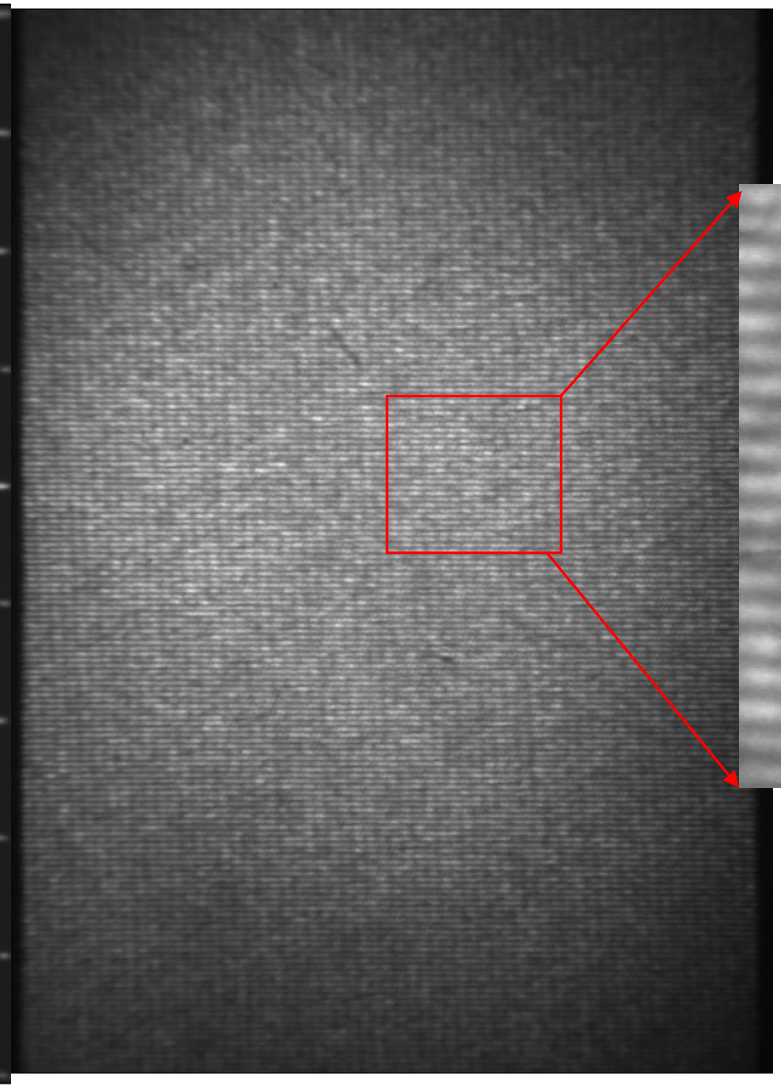
Spatial Resolution Experimental Setup
10 LP/mm RR Mask Installed



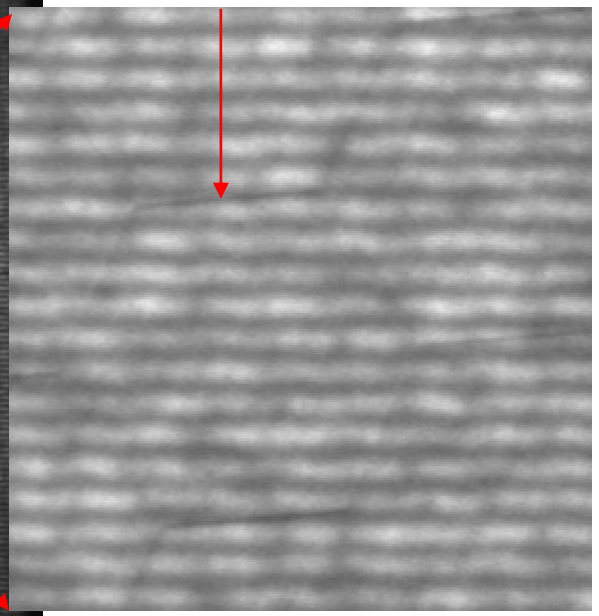
Note: For data set the slit plate was removed.

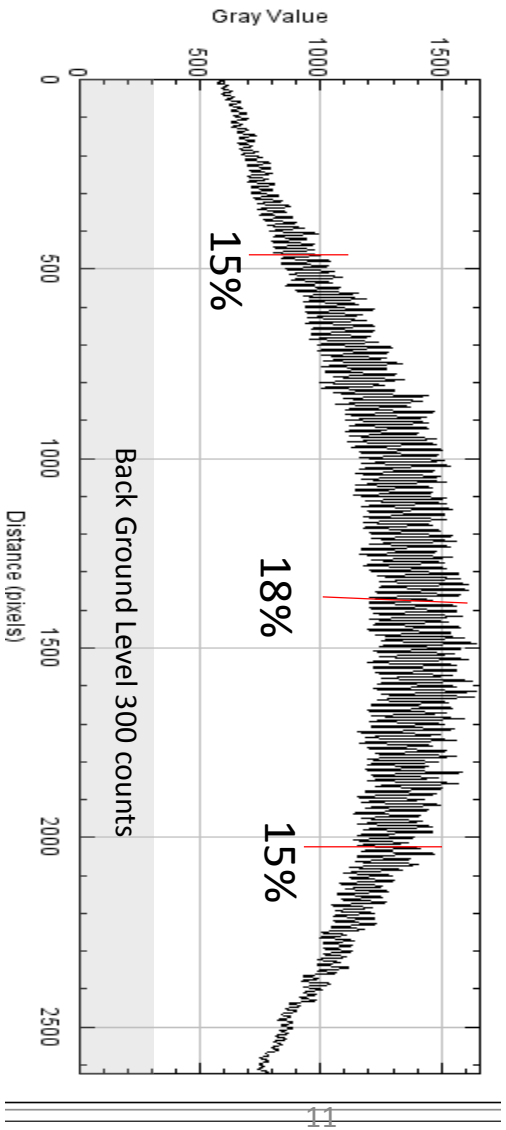
Field of view and Spatial resolution with MCP
Front and Back End Lens 58mm F4 - 10lp/mm RR





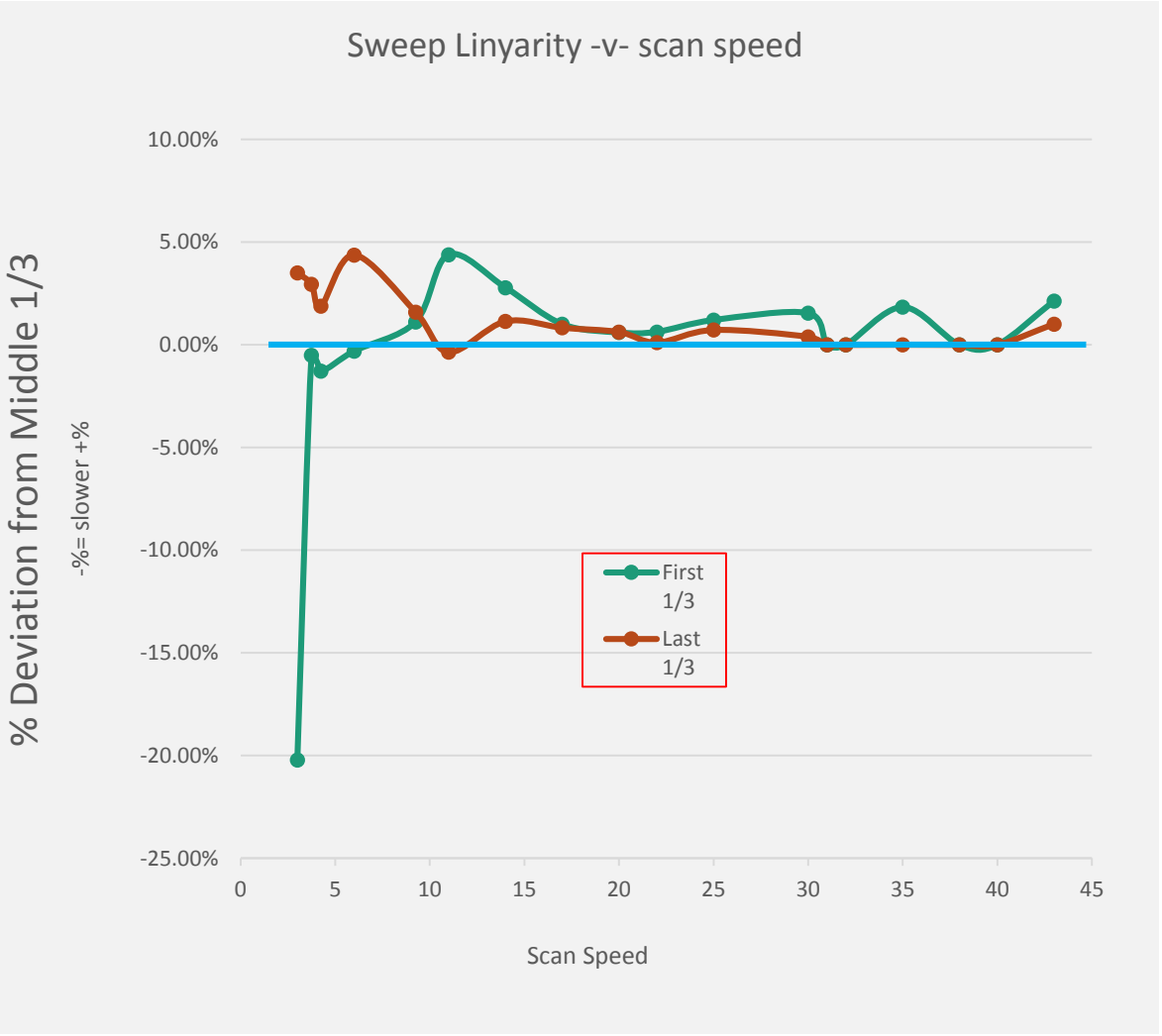
MCP
Hexagonal
Cells





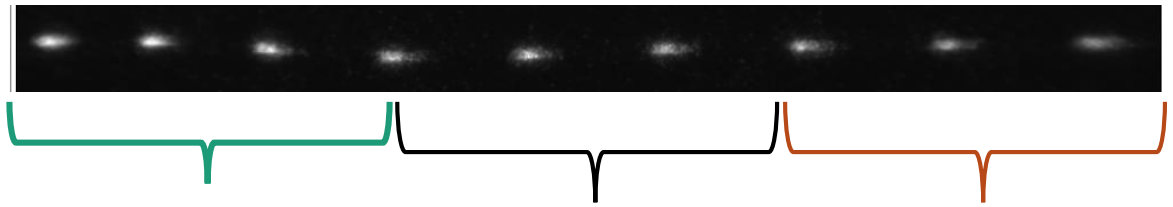
9.1 X 2mm=18.2mm FOV

Scan Speeds and Sweep Linearity



3GHz Comb bin 4x4 1000 x 564

3ns (0.03ns/mm)

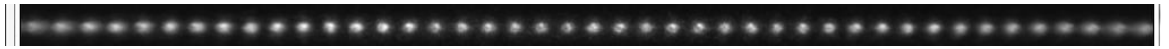


ps/Pixel	3.318	2.76	2.663

3.75ns (0.06ns/mm)

ps/Pixel	3.923	3.903	3.788

14ns (0.5ns/mm)



ps/Pixel	14.239	14.05	14.453

30ns (1.03ns/mm)

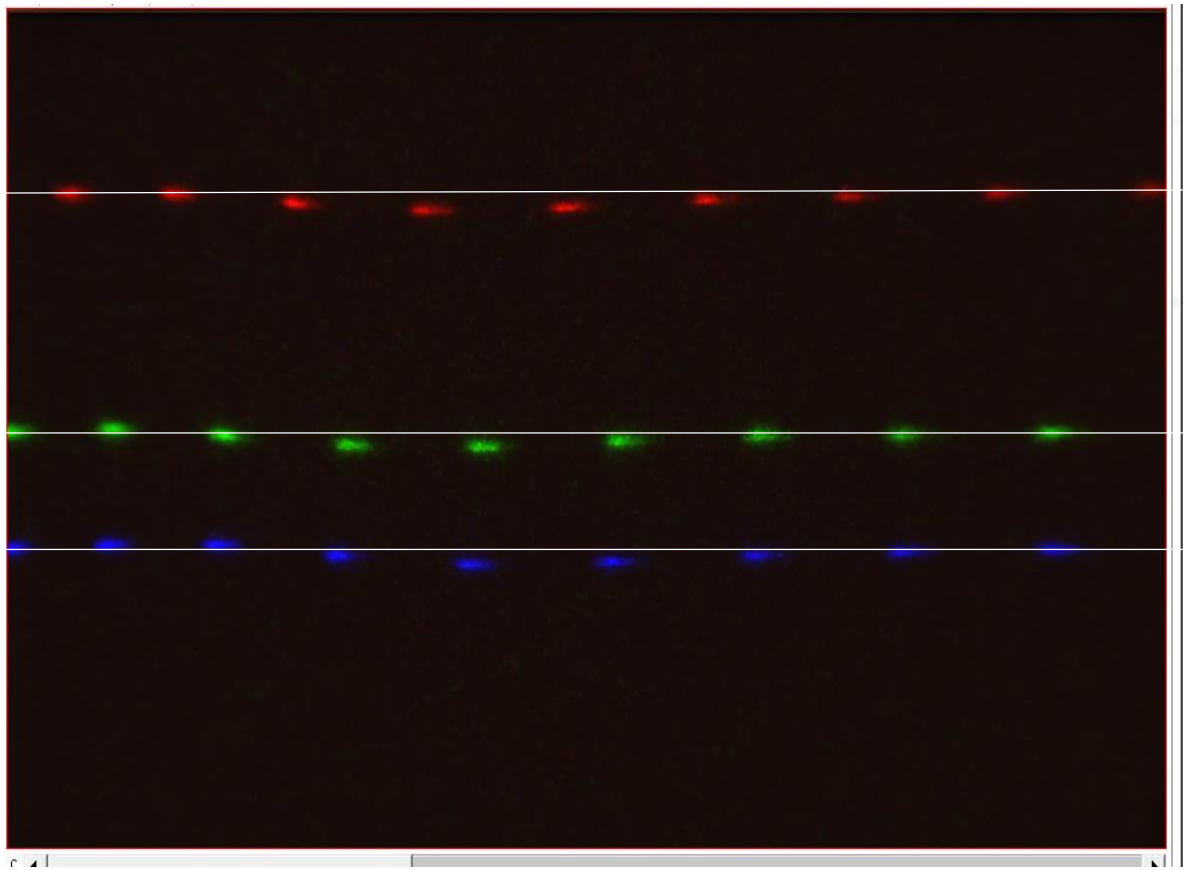
ps/Pixel	29.246	29.704	29.587

35ns (1.2ns/mm)

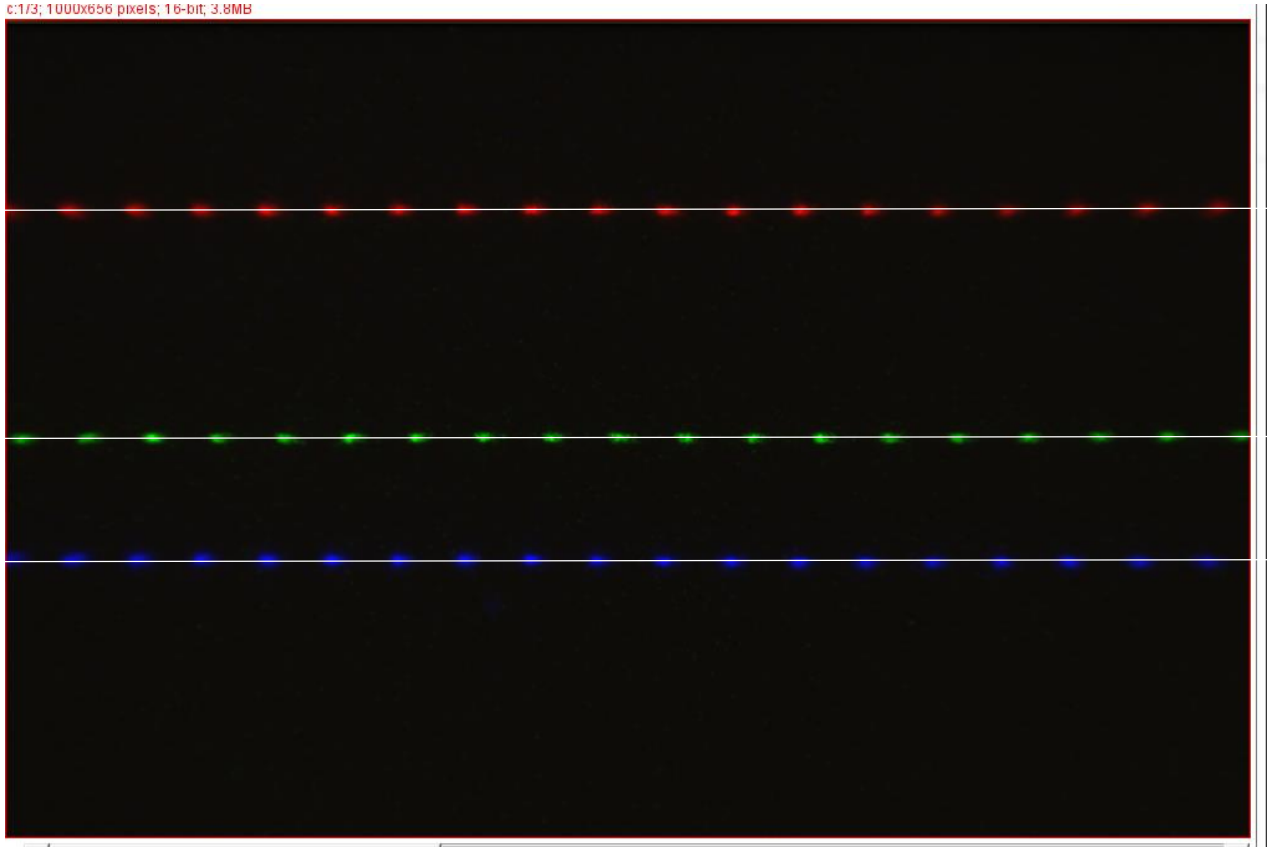
ps/Pixel	33.78	34.412	34.41

Streak Tube Distortions

3ns (0.03ns/mm) Scan Speed

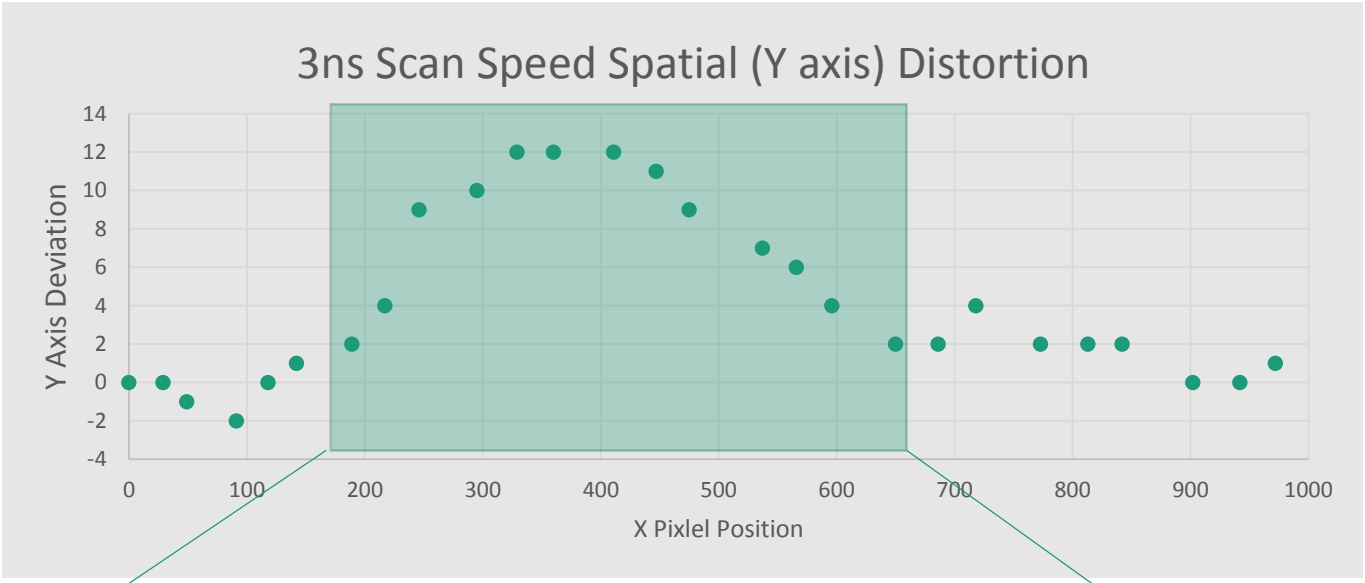


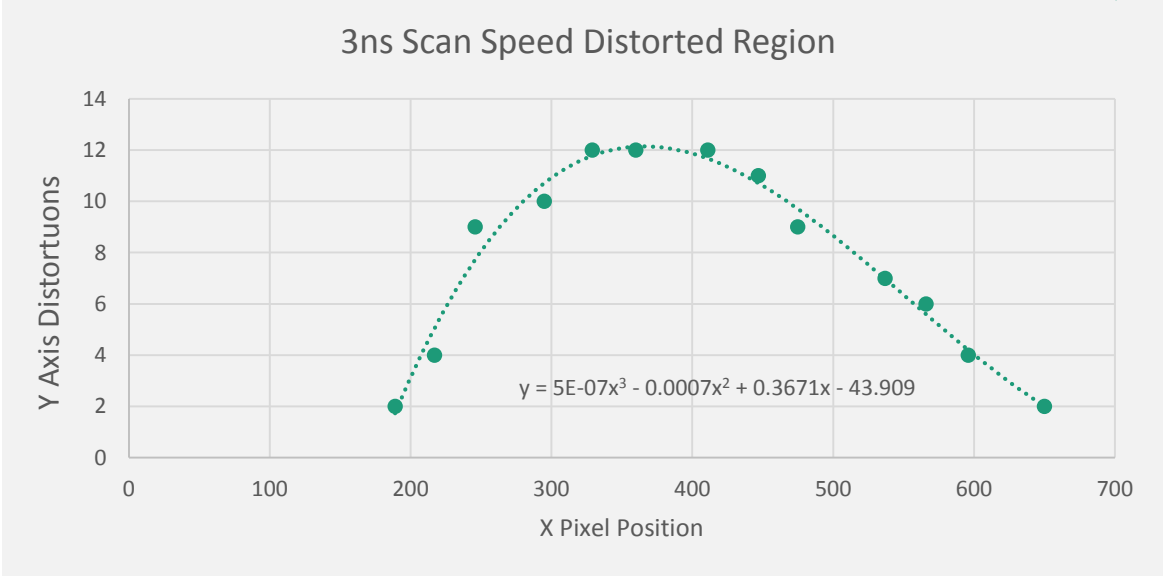
6ns (0.2ns/mm) Scan Speed



3ns is the only sweep speed in which significant streak tube distortion was observed

3ns Scan Speed Distortion Characterized





Mathematical Representation

Y_o=Initial Y axis value

Y_1=Corrected Y axis value

$Y_1 = Y_o + C$

X=(Temporal) X axis Pixel position

$C(X)=0$ if $X<190$ or $X>650$

$C(X)= .0000005x^3 - 0.0007x^2 + 0.3671x - 43.909$ if $190 \geq X \leq 650$

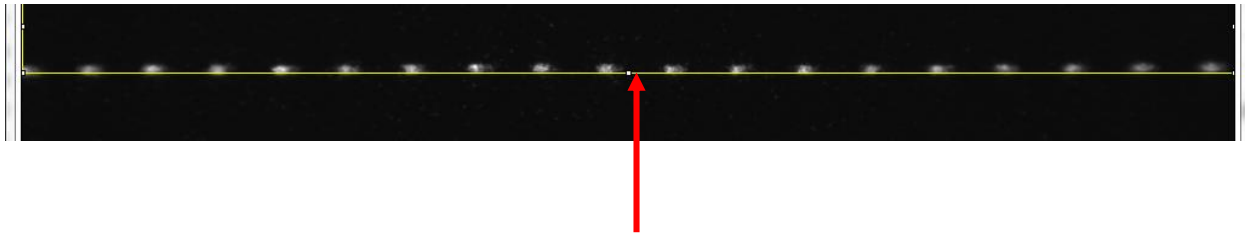
Camera Setup

Slit Rotation
Focus Mode

Slit Rotation
Vertical Reference

CCD Rotation Swept 3GHz comb

0.2ns/mm 6.0ns Scan Speed



CCD Rotation
Horizontal Reference