Fast Camera Stuff

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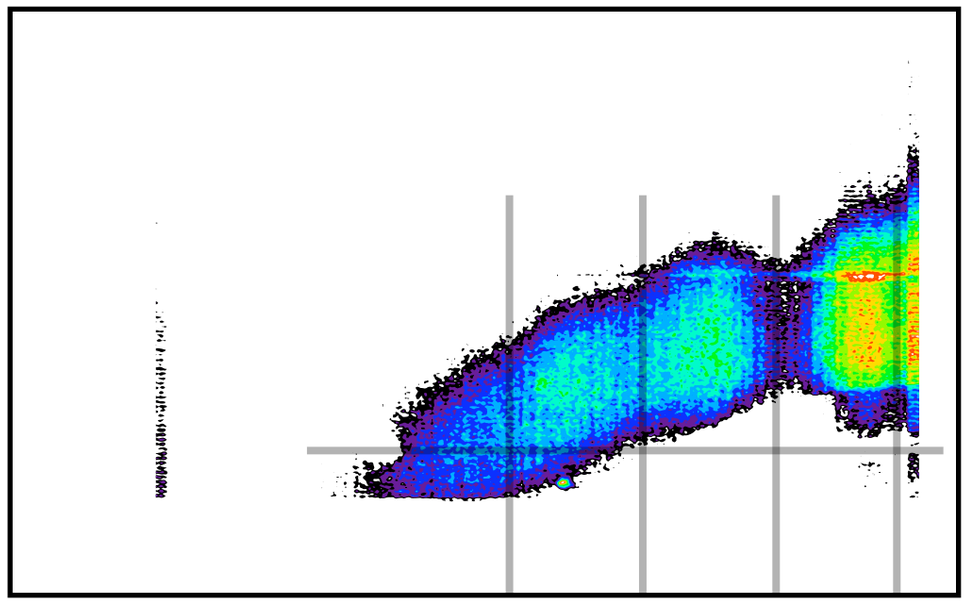
As The Frame Rate Increases, the Amount of Collected Light Decreases Dramatically

- The raw images for the camera data exist on the range [0,255].
- For 8,000 fps, it appears that there is enough light to saturate the camera CCD. In a sequence of images, the maximum pixel value will approach or hit 255.
- For 10,000 fps, it's more like 80/255 ~30% for the raw images.
- We need an image intensifier if we're going faster than 10,000 fps. We REALLY need an image intensifier if we're even thinking about 20,000+ fps otherwise we won't collect any light at all.

We Would Like To Get The Camera Far From The Light Source.

- When the camera is mounted on the chamber, the "line-of-sight" radiation corrupts the images.
- In attempt to reduce the effect of noise by, we further decrease the amount of light by obscuring the view with a copper mesh.
- The mesh might cause more problems than it solves?
- NSTX views a 30x30 cm area via a 400x400 pixel coherent fiber optic bundle.

Long-time Average Image



Copper mesh obscuring view (grey grid)

What is a coherent fiber optic bundle?

- What is the difference between coherent and incoherent fibers?
  In a bundle of fibers, if the relative position of each individual fiber at one end of the bundle is exactly the same as those at the other end, then the fibers are said to be coherent. Coherent fiber bundles are used to relay an image from one end of the fiber to the other, whereas incoherent fibers cannot. Incoherent fibers are primarily used to transmit light or signals rather than images.

- http://www.ceramoptec.com/bundles1.htm specifically says "Nuclear plasma diagnostics" for their coherent fiber optic bundles.

- We need to investigate this option and price.

We Can Still Get Some Good Information From The Camera

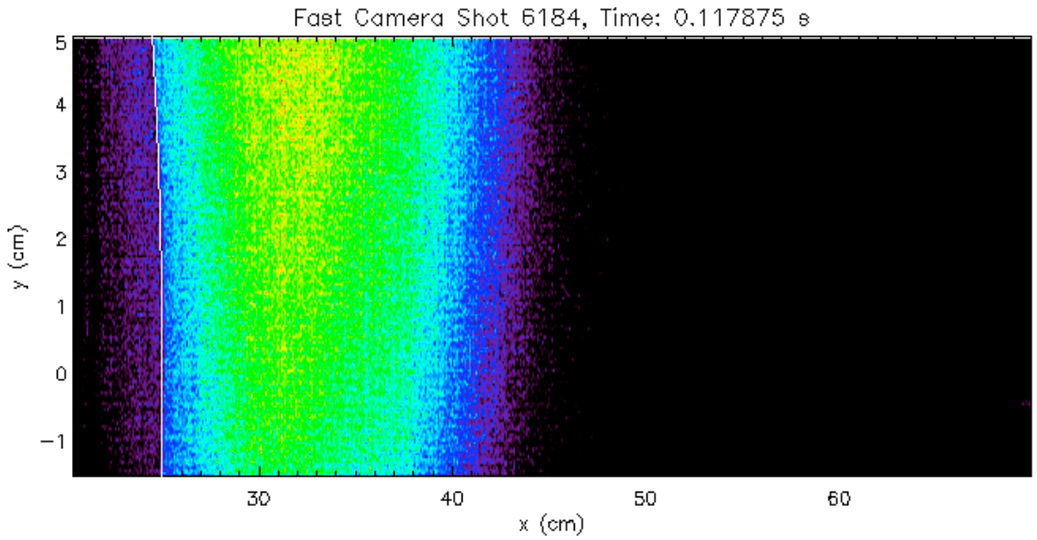
- Total light intensity in time is correlated with density diagnostics in the same vicinity.
- Images of light are correlated with images from the polar imager.
- Radial light intensity profiles match with expectations (next slide).

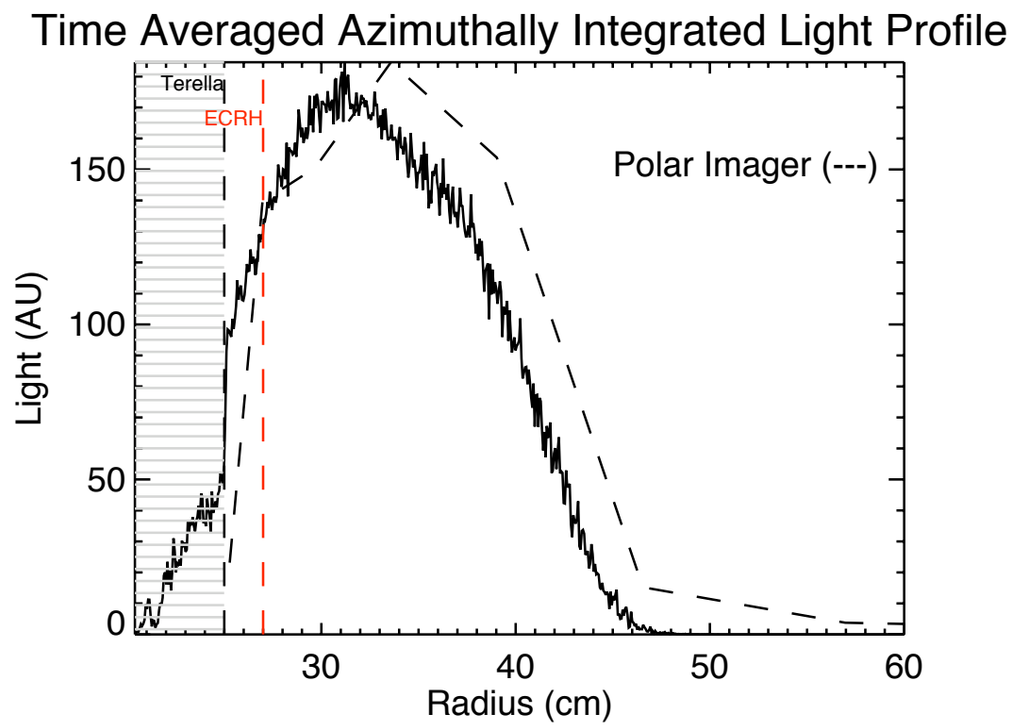
Light Profile And Polar Imager (density) Profiles Agree

- The fast camera looks at a region of the plasma that spans a small angle, but shows the entire radius.

- The radial light profile agrees with polar imager, and actually shows a ‘knee’ where the concavity of the profile changes.

- There is some uncertainty with the actual coordinates,



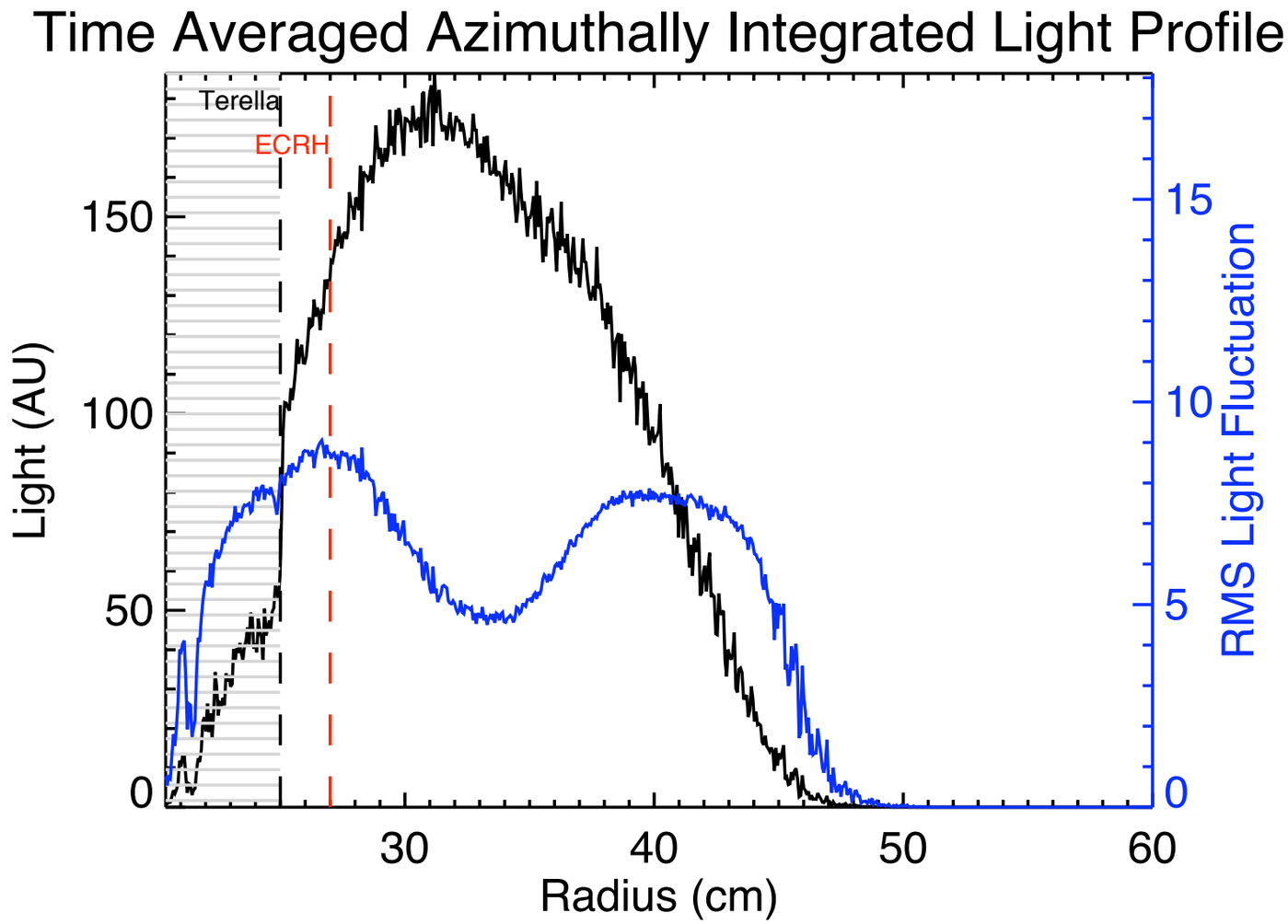


The Fluctuations Peak Where the Gradients are the Steepest

- There is a steep **outboard** gradient where fluctuations are high. Probably where the drive for the underlying linear instability is the highest.

- There is a steep **inboard** gradient where fluctuations are high. This is also where the ECRH is localized.

- ñ/<n> ~ 10%



Radial Fluctuations are in the Low Wavenumbers

- The radial light fluctuation wavenumber spectrum shows that the radial fluctuations are of the largest scale (~20 cm).

- The azimuthal fluctuations show a similar phenomena (not shown).