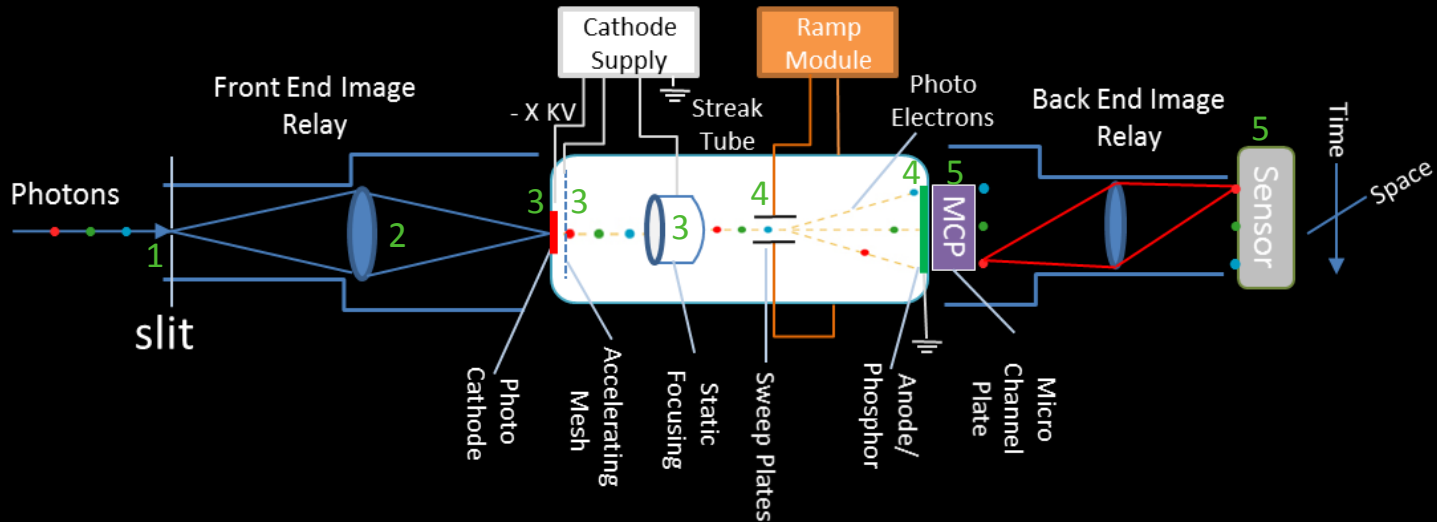


What is a streak camera?



- ❖ A streak camera creates a detailed record of an optical phenomena as it changes in time. It accomplishes this by converting light into photoelectrons and then sweeps them across a phosphor screen.
- ❖ Streak cameras can be found at the National Ignition Facility (NIF) in Livermore CA; the Caltech Optical Imaging Laboratory, and various other facilities and laboratories.
- ❖ They're used by physicists, scientist, engineers and others interested in high speed imaging, internal confinement fusion, molecular motion and interactions (photosynthesis, red blood cells absorbing oxygen), light emitting semiconductor martial (LED's), and much more.

How does a streak camera work?

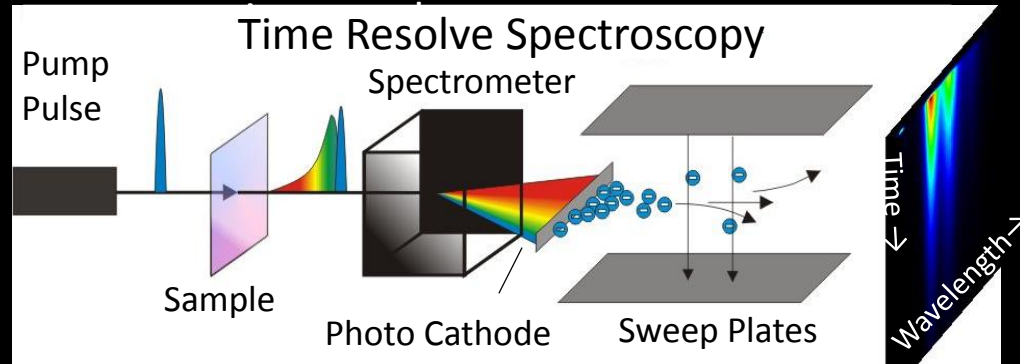


Let's follow the path of a photon / photo electron as it travels through an optical streak camera:

1. Light enters the streak camera through the slit. The narrow dimension of the slit will later represent time and the long dimension space (the effective length and resolution of the long axis determines the camera's bandwidth).
2. The image of the slit is transported to the photo cathode by a lens or mirror based on the front-end image relay system.
3. The photo cathode responds to the photons by releasing photoelectrons which are given forward momentum by the accelerating mesh and focused by the static-focusing elements.
4. Next, the photo electrons interact with the sweep plates. When the system is waiting for a sweep trigger, one plate has a negative charge and the other plate has a positive charge. Since the electron is negatively charged it will be attracted to the positive plate and repelled by the negative plate, effectively bending the electron stream to one side of the streak tube. When the ramp module is triggered, the negative plate becomes positive and other, negative. During that small moment in time when the polarity change happens, the stream of photo electrons sweeps across the phosphor which transforms the photoelectrons back into photons of light (this is the data).
5. The image on the phosphor is then amplified by the Micro Channel Plate (MCP) then relayed to the sensor which captures it.

How are Streak Cameras is Used?

Streak Cameras are an enabling technology, they make diagnostics possible that could not exist without them: One common application is time resolved spectroscopy shown below. Measuring wavelength or cooler changing in time.



The Power Of High Speed

Streak cameras are all about speed and resolution; enough to capture whatever fast changing optical event or distortion we want to observe. Sports photography has much the same goal. In the three frames below, the resolution and high frame rate of the camera enable us to see Michael Phelps (left) reaching the wall moments before his competition to win his 7th gold medal in the 2000 Olympics.

