Project Description

AXIS-PX: Subpicosecond X-Ray Streak Camera

AXIS-PX is the **only commercial x-ray streak camera** that can streak **450 spatial resolution points** (18 mm slit) with a time resolution of **700 fs** (measured at FWHM).

Stand-alone system with:

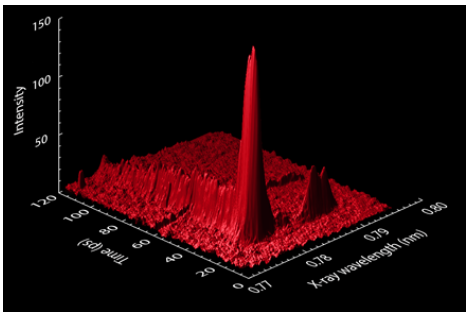
- High-end PHOTONIS bilamellar streak tube
- Interchangeable photocathodes

Applications:

- Laser-generated plasma sources
- Z-pinch Plasmas
- Synchrotron Science
- High Energy Physics

Project Details

Categories:
Ultrafast Streak Cameras



- -35°C cooled 16-bit CCD coupled by fiber optics
- EMI-rugged electronics
- Internal computer with remote control
- Full calibration on a fs laser

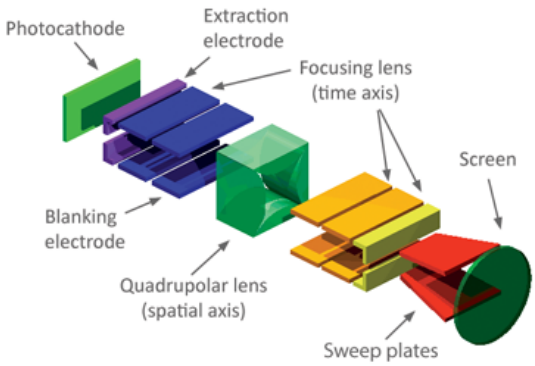
- X-ray Lasers
- X-ray Free Electron Lasers (XFEL)

AXIS-PX SPECIFICATIONS

STREAK TUBE

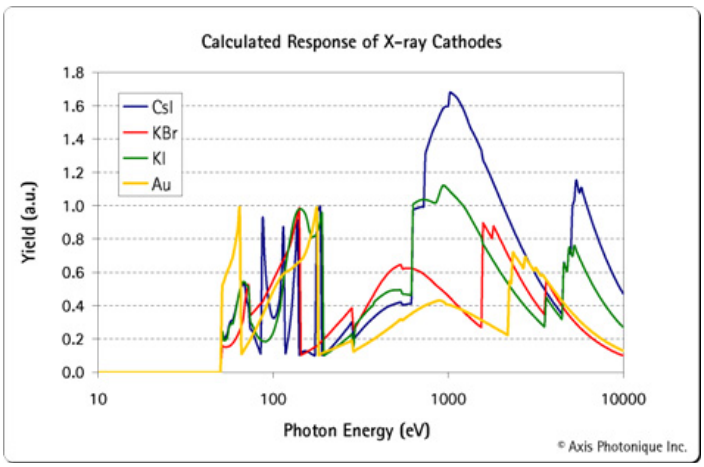
PHOTONIS bilamellar family: These open tubes use bilamellar optics to provide a subpicosecond temporal resolution whilst maintaining excellent spatial resolution.

PHOTONIS Bilamellar Streak Tube



SPECTRAL RESPONSE

Photocathode is interchangeable. The user chooses the cathode material to match his experiment.



SPATIAL RESOLUTION

Photocathode length (X): 18 mm

Spatial Resolution (dx): 40µm with 50% contrast

Number of spatial resolution units in screen (X/dx): 450 points

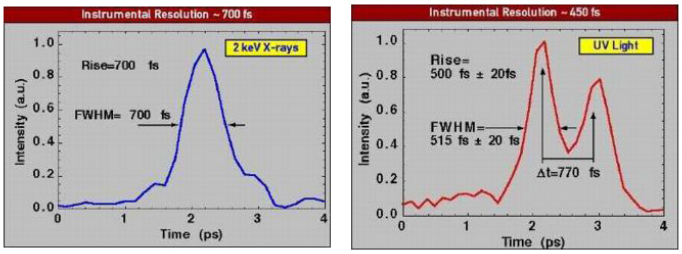
TIME RESOLUTION

Available Ranges (T): 200 ps to 1 ms

Number of time-resolution units in screen (Nt): 675

Single-shot Time Resolution:

- For ranges > 700 ps: range/675
- For ranges < 700 ps: 700 fs



TRIGGER

	Standard Single-Shot Sweep Units	Optional Laser-Triggered S Unit
Trigger pulse Requirements	Electrical 5-10 V in 50Ω, 50-200 ns duration	Femtosecond laser 100 µJ @ 800 nm
Maximum repetition rate	100 Hz	5 kHz
Jitter	< 15 ps RMS	~ 1/2 ps (depending on the properties of the laser)

READOUT

Readout type: -30 °C Thermo-Electrically-Cooled Digital camera

CCD chip size: 2048 x 2048 pixels; 27 mm x 27 mm

Digitizer: 16 bits

Coupling to streak tube: 1:1 Fiber optic taper

Cooling: 15-20 °C cooling water is required for the CCD camera

OPERATION MODES

Normal sweep

The sweep crosses the whole screen and ends outside.

Timing mode

The sweep always remains in the screen. It is used to synchronize the streak camera to the experiment.

Focus mode

The slit image is positioned at the center of the screen. The sweep trigger is disabled. This mode is used to align the experimental setup and to adjust the incident light level.

VACUUM

Operation Pressure: < 1×10-5 torr at the cathode

Vacuum flange:

- ISO-200 for re-entrant camera,
- ISO-160 for High-End camera
- or custom flanges

Storage chamber: Each x-ray streak camera comes with a small vacuum chamber equipped with a UV window for calibration or storage.

INTERNAL COMPUTER and SOFTWARE

AXIS-PX is an autonomous system that is operated locally by connecting a monitor, a keyboard and a mouse.

It comes with an internal computer that controls the streak tube supplies, the sweep circuits, monitors voltage stability, performs different self tests and safety checks. It can also control other optional peripherals via the USB port.

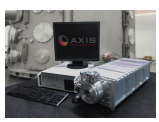
All required software comes pre-installed on the system. It is used to:

- Control whole system and acquire images
- Control the laser system (optional)
- Plot lineouts along time axis or space axis
- save image in different formats

Remote control over Gigabit Ethernet :

- “Windows Remote Desktop”
- Web base GUI
- High level device servers (TANGO, OPC, etc…) are available.

AVAILABLE CONFIGURATIC



Open-Front end with custom flange

Airbox for use with the Ten Inch Manipulator (TIM) diagnostic insertion

AXIS-PXE in airbox in use at ELI-Beamlines (CZ).

GENERAL

Electrical input: Universal AC, 110-240V, 50-60 Hz

Certification: CE

Tests and Calibration: Before shipping, each system is tested on a femtosecond laser at the Advanced Laser Light Source.

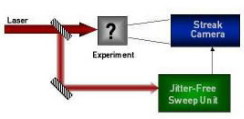
Installation and Training: A qualified engineer is sent to your laboratory to install the system and train users.

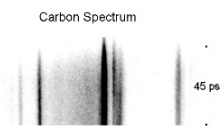
OPTIONS

Blanking circuits
With the blanking option, streak tube is blocked during the time the signals sweeps back to its start position. This feature is required when the optical signal lasts longer than the sweep range.

Remote control over Optical Ethernet
to operate system via optical Ethernet 1 Gbs (1000 Base SX).

Laser-triggered sweep unit for CPA lasers
Because of its 500 fs RMS jitter, this unit allows the analysis of ultrafast events at repetition rates up to 5 kHz while conserving the excellent spatial and temporal resolution of the AXIS streak camera. This is the ideal tools ultrafast spectroscopy with large dynamic range and high signal-to-noise ratio **It requires about 100 µJ per laser pulse.**





Only a fraction of the laser energy is taken to trigger photoconductive switches. This allows signal averaging over a large number of laser shots.

XUV spectrum of Carbon averaged over 600 shots at 10 Hz with a temporal resolution of 4 ps.
M. Nantel, et al, Phys. Rev. Let. 80, 4442 (1998)

Timing fiducial input fiber
This assembly allows sending a timing UV pulse on the photocathode. This pulses is sent through a UV optical fiber. This is to record an absolute time reference on each shot.

Slow scan mode
Operation mode in which the sweep crosses the whole screen in 0.5 to 15 second. It is used to characterize spatial non-uniformity in the instrumental response by illuminating it with a constant brightness light source.

24V supply
To power the whole system with a DC voltage between 23V and 28V.

X-ray Spectrometer
X-ray spectrometer that fits special needs.

Related Projects