SYDOR

TECHNOLOGIES

ROSS 1000 STREAK CAMERA SYSTEM

COMPLEX MEASUREMENTS—CRITICAL RESULTS

A streak camera is a powerful scientific instrument used to study ultra-fast phenomena, ideal for high-bandwidth recording of optical events. It efficiently converts fast optical signals to a spatial signal that can be read out with a conventional camera, resulting in a record of the light intensity versus time. They are used to study optical events in the visible spectrum spanning from a single nanosecond to multiple milliseconds.

Streak cameras play a critical role in physics, life sciences, fusion research, and advanced technology industries. The components and systems are delicate and extremely complex to manufacture. Because of the complexities, Sydor is one of the very few worldwide manufacturers of streak cameras, and the leading supplier to critical US and European laboratories.

APPLICATIONS

- Time Resolved Spectroscopy: allows users to measure changes of wavelength over time - useful for detectiing transmission absorbotion changes
- Time-Resolved Imaging: useful for those involved in plasma physics - studying plasma discharges or shockwave propagation
- Pulse Characterization: used to collect a temporal profile of ultra-fast laser pulses

BENEFITS

- Gated image intensifier provides signal gain and prevents stray electrons from contaminating the swept image
- Single-shot or Accumulation Modes for use with various intensities
- All-reflective Offner input optics that eliminates chromatic aberrations
- Includes RossAPP software that automates trigger synchronization, displays real-time profile and statistical data, applies corrections, provides corrected lineouts and more
- Future-proofed design allows users to purchase additional ramp modules to accommodate changing sweep speeds as timing requirements evolve

ABOUT THE ROSS 1000 STREAK CAMERA

The ROSS 1000 Streak Camera System is engineered to meet the needs of facilities performing diverse experiments within a range of temporal requirements. The unit is compact, portable, and provides users with maximum flexibility, with each timing module providing up to 16 sweep windows. If needed, timing modules can be swapped to accommodate user's application changes– providing flexibility for evolving experimental changes. Through Sydor's powerful ROSSApp software, the system's internal triggers can be synchronized automatically with a single experiment master trigger, ensuring intuitive and user-friendly synchronization.

COMPLEX MEASUREMENTS—CRITICAL RESULTS

CUSTOM RAMP MODULES

The ramp modules of every ROSS 1000 system are customized in collaboration with the customer, with sweep speeds being tailored to the intended use-case. By hand-selecting each sweep speed on a case-by-case basis, users are provided with a balance between the best temporal resolution and spatial resolution possible. The ROSS 1000 can have up to two boards in a single ramp module. The fast board can do four speeds from 1 ns to 30 ns, while the slow boards can accommodate two ranges with eight sweep speeds each. Experienced users can select their desired sweep speeds at initial inquiry or application calls can be scheduled to determine the best speeds given the experiments being performed.

ROSS 1000 SWEEP MODULES

The ROSS 1000 can have up to two boards in a single module. The fast board can do 4 speeds from 1ns to 30ns. The slow boards can do up to two ranges with 8 speeds each																								
	ns									µs									ms					
Speeds	1	3	5	10	20	50	100	200	500	1	2	5	10	20	50	100	200	500	1	2	5	10	20	50
Options	Fast Board					Slow Board Range																		
Res	3.33	6.67	16.67	33.33	66.67	166.67	333.33	666.67	1.67	3.33	6.67	16.67	33.33	66.67	166.67	333.33	666.67	1.67	3.33	6.67	16.67	33.33	66.67	166.67
Res Units	ps								ns									µs						
Rep Rate	10 kHz	10 kHz	10 kHz	10 kHz	10 kHz	20 kHz	20 kHz	20 kHz	20 kHz	20 kHz	20 kHz	10 kHz	7 kHz	3 kHz	1 kHz	1 kHz	500Hz	100Hz	100Hz	100Hz	20Hz	5Hz	1Hz	1Hz

EXPERMIMENTAL FLEXIBILITY

The ROSS 1000 system can be used as a single-shot device or in accumulation mode for low-light signals. In accumulation mode, the signal is swept multiple times during a single CCD exposure. This is valuable for experiments being performed with low light signals. The swept signal can be driven at rates of up to 20 kHz depending on sweep speeds that are selected.

SUPERIOR PERFORMANCE

Traditional imaging optics are lossy and introduce undesirable aberrations. As an alternative, for base-only systems, units are built with all-reflective Offner input optics which eliminates chromatic aberrations and provides superior performance compared to traditional inputs.

SPECTROSCOPY-SPECIFIC CONFIGURATIONS

For spectroscopy applications, Sydor can supply a spectrometer for use with the streak camera. This can either be directly coupled or mated using the Sydor-exclusive Spectrometer Interface Module. This light-tight module allows for fine positioning control and securely couples the two instruments in a manner that protects the photocathode, while maintaining the fidelity and alignment of the input signal.

POWERFUL SOFTWARE

Each ROSS System is supplied with the highly interactive ROSSApp software, which runs the streak camera and, when used, the spectrometer as well. This powerful tool collects data, performs image analysis, and is capable of scripting for easy automation of repetitive tasks, such as calibration or exporting of image data. RossApp is designed to be highly interactive. It can display intensity profiles along multiple regions and perform curve fits to the profiles within the application. The application can provide image statistics, histogram displays, and has an adjustable color Look Up Table for seeing details in the image data. To ease data analysis, the software comes preprogrammed with background subtraction, flatfield, geometric distortion correction, and time correction to enable immediate analysis.

CALIBRATION & ACCESSORIES

All ROSS Streak Cameras built by Sydor Technologies are rigorously tested and shipped with a factory-standard calibration. The calibration performed on each ROSS Streak Camera includes a Geometric Correction, a Temporal Calibration for each unique sweep speed, a Flatfield Correction and calibration for best focus voltage. To preserve the fidelity of the user's streak camera's calibration, an external calibration package is available that allows users to calibrate in-situ on the ROSS 5800.

COMPONENTS FOR OPTICAL CALIBRATION

- Optical Comb Generator: The Sydor Optical Comb Generator can be used as both a timing reference and a temporal calibration source. The comb generator features two calibrated pre-set frequencies that are set at the factory. The Comb Generator can be imaged through the input slit or routed through the external periscope.
- Reticle Nest and Reticles: The Sydor Reticle nest is designed to mate directly to the front of the Offner Input Optics slit assembly. It provides the user a highly repeatable and convenient method for imaging reticle patterns onto the photocathode of the streak tube by mounting the reticle pattern at the focal plane of the input slit. By mapping the distortions of streak tube, users will easily be able to correct for these distortions in ROSSApp. It is recommended that the user backlight the reticle patterns with a Flatfield Illuminator.
- Flatfield Illuminator: The Sydor Flatfield Illuminator features <1% peak to valley illumination uniformity and three internal illumination LEDs: Red (630 nm), Green (517 nm), Blue (472 nm). The Flatfield Illuminator provides even illumination of the photocathode and allows the user to correct for illumination response at the edges of the field of view.
- Fiberized Laser Pulser (FLP): The Sydor FLP is a compact VCSEL connected to a fiber output and is designed to be driven with an external pulse generator at frequencies from DC to 10MHz. The FLP is ideal for determining the delay-to-center time for each sweep speed and can be used to simulate a timing set-up prior to experiment. Use of the FLP requires a digital delay/pulse generator such as the Stanford Research Systems DG 645 which Sydor can provide.
- Fiberized Laser Pulse Generator (FLPG): The Sydor FLPG is a compact, VCSEL-based, optical pulse generator that delivers a triggered laser pulse capable of repetition rates ranging from single shot to 300 kHz for the most demanding applications. It is ideal for accurate, time base calibration and may be used as a single pulse fiducial. The standard FLPG emits a 650 nm pulse with a pulse width of 40 ps.

TIMING

- Temporal Resolution: Down to ~3.33 ps for our fastest sweeps
- Unit Repetition Rate: Up to 20 kHz – see sweep module capabilities image
- Sweep Window Customization: Every Sweep window duration is custom, for the best temporal resolution and total data acquisition duration optimized to a customer's experimental timing needs. See separate sweep window configuration diagram for options and total data acquisition duration optimized to a customer's experimental timing needs. See separate sweep window configuration diagram for options.
- Trigger Jitter: 10 ps
- Image Intensifier Gating: Extinction Ratio >10^6, 3 ns FWHM @ 200 kHz max
- Trigger Signals: 5 V TTL (50 Ohm)
- Master Trigger Options: The user may supply a single trigger, which is then used to trigger all the other components of the system, such as sweeps, gating, shutter, and CCD, with the appropriate timing.

STREAK TUBE

- Photocathode Materials: S20B, Low Noise S20, S20 (others possible dependent on spectral response requirements)
- Input Windows: Fused Silica
- Accelerating Electrode Configuration: Mesh
- Tube Magnification: 2:1 typical
- Image Intensifier: Single stage image intensifier with adjustable gain
- Shielding: Mu metal shielding to prevent EMC interference
- Static Spatial Resolution: >10 LP/mm with contrast exceeding 40%

INPUT OPTIONS & OPTICS

- Offner Input Optics: Included as standard - works for all wavelengths from UV to Near IR and removes any chromatic aberrations
- Spectrometer Options: Coupling to most spectrometers possible with various options for focal lengths and multiple grating turrets with flip in mirrors. Commonly provided with Teledyne Princeton Instruments SpectraPro HRS300 or HRS500.
- Calibration Inputs: Bench top calibration equipment such as fiberised laser pulsers, comb generators, and resolution reticles available on request
- Slit Adjustment: Micrometer for adjustment of slit opening between 50 µm and 1 mm

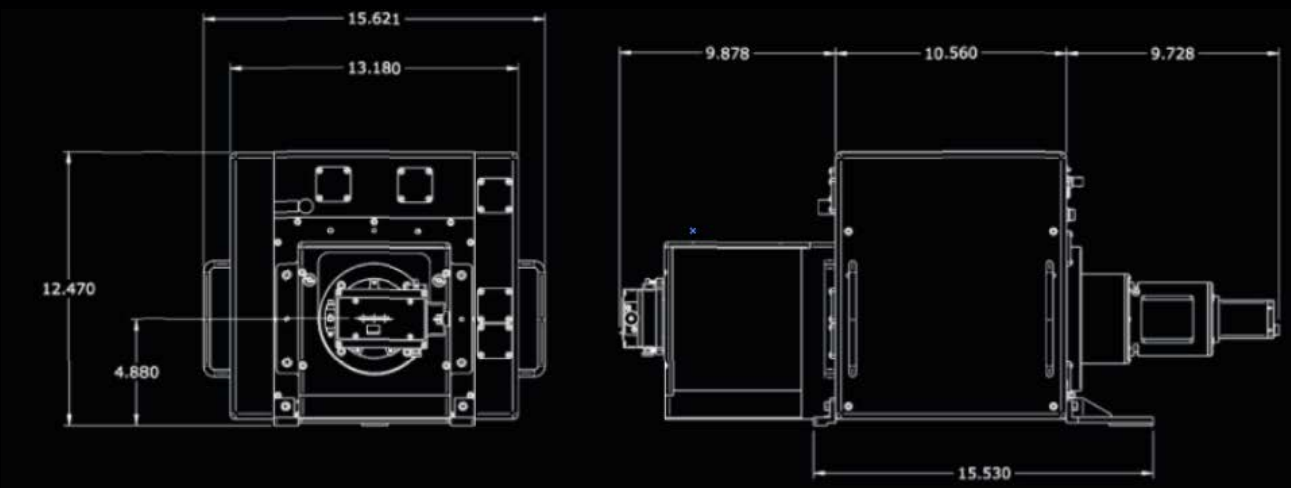
READOUT CAMERAS

- Camera Resolution: 2452x2056
- Temporal Dark Noise: 2 e-
- Max resolution rep rate: 23 fps @ full resolution (faster rates available when binning)
- Pixel Size: 3.45 µm x 3.45 µm

PC & SOFTWARE

- Software: ROSSApp software lifetime license included with system. Controls complete camera system either locally or remotely for acquisition and image processing
- Calibration Features: Calibration routines for spatial AND temporal non-linearity corrections. Factory generated calibration files included at shipment, plus re-calibration options accessible in software
- Interface: Ethernet
- Power: Standatd mains supply (120/240V)
- Operating System: Windows

PRODUCT DIMENSIONS (INCHES)



BENEFITS OF WORKING WITH SYDOR TECHNOLOGIES

- Trusted and proven supplier to major US and worldwide labs running critical experiments
- Offer inclusive support from our PhD support staff via telephone and email for the life of the system
- Factory calibration and QA of all systems for ultimate confidence in performance.
- Recommended operating parameters provided with every system
- Annual on-site, hybrid, or remote maintenance plans
- Accessory packages for table-top calibration
- Turnkey VISAR optical systems
- Complete design & integration services

COMPLEX MEASUREMENTS—CRITICAL RESULTS