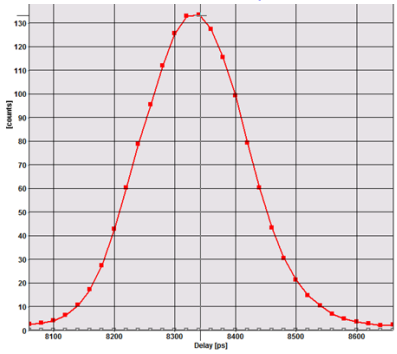
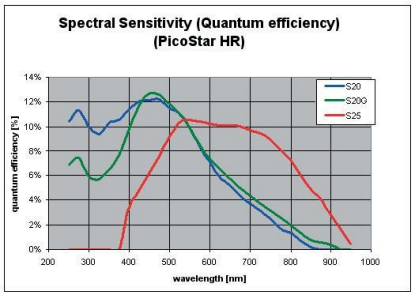
picosecond time-resolved imaging

PicoStar HR

State-of-the-art
Ultra-High Rep. Rate Picosecond
Time-gated Intensified CMOS Camera
Minimum gate width <300ps
Trigger Rate <110MHz

Gate Width Profile: <300ps @ 80MHz





The PicoStar HR ICCD camera is based on a state-of-the-art picosecond time-gated, ultra-high trigger rate image intensifier (based on proprietary technology) coupled to the CCD/CMOS camera via high optical efficiency relay optics. The camera offers an ultra-high, trigger rate time-gated mode with minimum width <300ps @ trigger rate <110MHz and an ultra-high-frequency intensifier gain modulation mode up to 1GHz. It is intended for picosecond time-resolved optical imaging and spectroscopy in conjunction with mode-locked femto/picosecond pulsed or high frequency intensity modulated lasers for applications such as fluorescence lifetime imaging, Plasma Kinetics, Imaging through scattering media, picosecond time-gated (fluorescence suppression) Raman spectroscopy, LIDAR etc. The image intensifier control unit is self-contained and includes trigger input conditioning circuitry, intensifier high voltage supplies and protection, gain control, bias circuitry and remote computer control. The internal micro-controller may be either controlled manually via front panel keypad or remotely via USB interface. The intensifier head and the control unit are linked together via a 2m long umbilical, highly shielded cable. The PicoStar HR may be coupled to the experimental setup (microscope, sample, spectrograph etc.) via F or C-mount or customized adaptors.

General System Specifications:

Gate width	<300ps (200ps best effort) @ trigger rate <110MHz
Sensitivity	>100 counts/photoelectron @ max. gain
System Dynamic	~2000:1
Spatial Resolution	>20 lp/mm
Pixel Size	12µm x 12µm
Image Intensifier	
Design	GEN II proximity focused, single stage MCP
Size	18mm diameter
Photocathode	S20 (200-750nm) or S25 (350-750nm)
Phosphor	P43; other phosphors on request
Optical Output	Fiber optic face plate
Jitter	<20ps RMS
Intrinsic delay	<30ns

Operating Modes: **Trigger Rate <110MHz**

- Logic(LDC) — Intensifier gate slaved to a logic input (TTL or ECL)
  Gate width: 2ns -1ms; max. duty cycle: 5%
- Logic(HDC) — Intensifier gate slaved to a logic input (TTL or ECL)
  Gate width: 2ns - 1ms; max. duty cycle: 50%
- Comb — Gate width: <300ps – 1ns; Trigger rate: < 110MHz
  Trigger input: sinusoid, TTL or ECL; max duty cycle: 50%
- RF — Gain Modulation: Frequency range 1MHz-1GHz
  Trigger Input: sinusoid, TTL or ECL; 2V p-p, AC-coupled
- DC — Active while the DC button is pressed

Camera Housing

Optical Input: F or C mount or customized adaptor
Image Intensifier
Relay Optics (2:1.17; η >12%)
Optical Output: C-mount (male) for coupling to the CCD/CMOS camera

Image Intensifier Control Unit

All image intensifier operating parameters (operating mode, gate width, gain, trigger settings etc.) may be controlled manually via the front panel keypad or remotely via ASCII commands using the serial RS232/USB interface.

Options and Accessories

Higher Spatial Resolution

High Axial Magnetic Field unit for higher image intensifier spatial resolution via magnetic field enhanced photoelectron focusing

TauTec LLC
8860 Columbia 100 Parkway, Suite 104 • Columbia, MD 21045
eMail: info@tautec.com, www.tautec.com

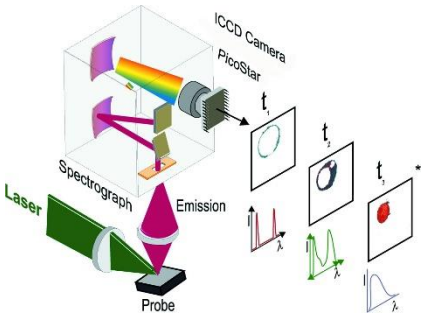
picosecond time-resolved imaging

Imager CMOS Camera
Area Scan Global Shutter
1920 x1280 array, 5.86µm pixel, 12bit, 100 frames/s, 5e$^-$ read noise, USB 3 readout

Delay Generators
For synchronization with pulsed lasers, precise timing and scan of the intensifier gate with respect to the trigger pulse, the following Delay units are available:
HDG Delay Generator: Delay Range 50ns; Trigger Rate: 20 -110 MHz; Jitter <10ps
PSD Pulse & Delay Generator: Delay Range 50ns; Trigger Rate: <200 MHz; Jitter <5ps
P500 Desktop 4-Channel Digital Pulse & Delay Generator
Delay Range: <1000s; Trigger Rate <14MHz; Jitter <25ps

HDG Delay Generator	PSD Pulse & Delay Generator	P500 Pulse & Delay Generator
		

Experimental Setup: Picosecond Time-Gated Optical Imaging/Spectroscopy



APPLICATIONS

- **Picosecond Time-resolved Optical Imaging and Spectroscopy**
- Fluorescence Lifetime Imaging Microscopy (FLIM/FRET)
- 3D-FLIM in conjunction with multifocal multiphoton microscopy
- Imaging through scattering media
- Diffuse optical tomography, optical breast imaging, photon migration
- Time-gated total internal reflection fluorescence microscopy
- Single molecule, Quantum Dot imaging and spectroscopy
- Dynamics of photophysical and photochemical processes
- Time-gated Raman spectroscopy & imaging: suppression of fluorescence
- Fluorescence quenching near silver/gold nanoparticles
- Pump-Probe imaging & spectroscopy
- Plasma kinetics/dynamics imaging and spectroscopy
- OLED characterization: electroluminescence kinetics and heterogeneity
- Dynamics of exciton, polariton and charge transport processes in semiconductors
- Ultrafast magnetic domain switching using time-resolved Kerr microscopy
- Gating and Ranging; LIDAR
- Underwater imaging through turbid media

TauTec LLC
8860 Columbia 100 Parkway, Suite 104 • Columbia, MD 21045
eMail: info@tautec.com, www.tautec.com