



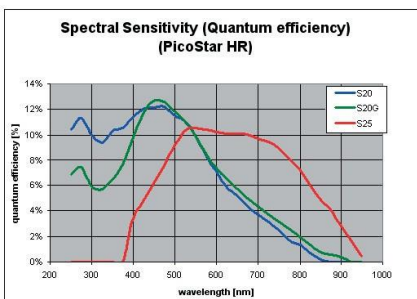
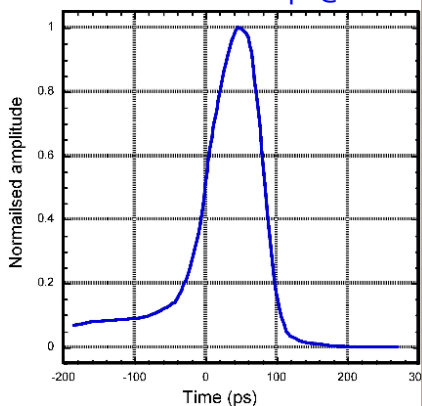
picosecond time-resolved imaging

PicoStar

state-of-the-art
Picosecond time-gated
Intensified CMOS Camera
min. Gate Width: <100ps
Trigger Rate: <10kHz



Gate Width Profile: 80ps @ 10kHz



The PicoStar is an ICCD camera consisting of a state-of-the-art. picosecond time-gated image intensifier (based on proprietary technology) coupled to the CCD/CMOS camera via a high optical efficiency relay optics. **In the fast time-gated mode, the image intensifier has a minimum gate width <100ps @ trigger rate <10kHz** It is intended for applications such as picosecond time-resolved optical imaging and spectroscopy in conjunction with picosecond pulsed lasers, 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 either controlled directly 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 camera can be coupled to the optical setup (microscope, sample, spectrograph etc.) via F or C mount or customized adaptors.

General System Specifications:

Min. Gate width	<100ps (FWHM) @ trigger rate <10kHz
Sensitivity	>100 counts/photoelectron @ max. gain
Dynamic range	~2000:1
Spatial Resolution	>25lp/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)
Min. Gate Width	<100ps (FWHM); 80ps on best effort basis
Phosphor	P43 standard, other phosphors (P20 or P46) types on request
Optical Output	Fiber optic face plate
Jitter	<10ps RMS
Intrinsic delay	~50ns

Operating Modes: Trigger rate: <10kHz

- ▶ Fast Mode Gate width (FWHM): <100ps – 5ns; Trigger rate: <10kHz
- ▶ Slow Mode Intensifier gate slaved to a logic input (TTL or ECL)
Gate width: 10ns -1ms; max. duty cycle: 5%
- ▶ DC active while the DC button is pressed

Housing:

Optical Input	F or C mount or customized adaptor
Image Intensifier	
Relay lens	(2:1.17; $\eta > 12\%$), Vignetting < 3%
Optical Output	C-mount (male) for coupling to the CCD/CMOS camera

Control Unit

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

Options and Accessories:

Higher Spatial Resolution

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

Delay Generator

For precise timing and scan of the intensifier gate with respect to the trigger pulse

4-Channel Digital Pulse & Delay Generator

Delay Range: <1000s; Trigger Rate < 14MHz, Jitter < 25ps

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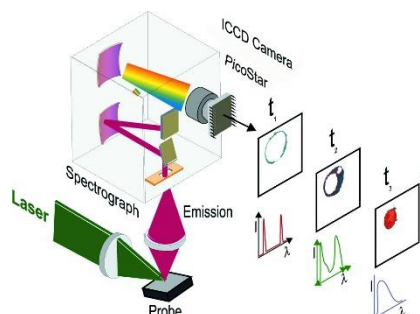
Imager CMOS Camera

Sensor	Sony IMX174; Global Shutter
Array	1920(H) x 1200(V)
Pixel Size	5.86 μ m x 5.86 μ m
Exposure time	34 μ s - 10s
Full well capacity	32,000e ⁻
Read Noise	6e ⁻ RMS
Dark Noise	6-7e ⁻ /pixel/s
Digital output	12bit
Frame Rate	>100 frames/s @ 12bit
Interface	USB 3
Synchronization	via Hardware or Software trigger or free run
Lens mount	C-mount

Software

The Software suite offers stable, reliable and flexible data exchange between the camera and PCs, for Windows and Linux on x86 and ARM based systems – at a very low CPU load. An easy-to-use set of tools lets you configure the camera's interface. Use the graphical interface to set camera parameters, to capture and display images. The camera software suite also contains a powerful SDK allowing integration in third party software e.g. LabView, Matlab and Micromanager.

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



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