



HRPCS *High Resolution Photon Counting System*

The HRPCS5, now in its 5th generation, is a true single photon counting camera providing the ability to capture and integrate ultra-low-light images in real time. The HRPCS5 is a parallel readout device capable of detecting multiple photons at the exactly the same time. Its readout rate of 50 frames per second at full resolution, low dark count rate 1.3 Mpix sensor provides high sensitivity over a wide dynamic range. Bespoke versions of the HRPCS5 can be delivered with any of the wide range of Photek's image intensifiers. Full systems can be provided with sensor cooling for ultra low noise, computer controlled sample stage, sample temperature control and light-tight enclosures. Operation has never been easier thanks to the plug-n-play USB 3.0 interface and intuitive Image32 software that includes functions specifically designed for photon counting applications.



KEY ATTRIBUTES

- ◆ 50 full frames per second
- ◆ 1.3 megapixel readout
- ◆ Variety of high QE, low noise photo-cathodes covering the full UV-VIS band
- ◆ Bright field mode for focusing
- ◆ Integrated optical gating
- ◆ Fiber optic input for proximity focus
- ◆ USB3 interface
- ◆ Easy to use software with functions specifically designed for photon counting
- ◆ Custom options available

APPLICATIONS

- ◆ Bioluminescence Imaging of Luciferase and Aequorin
- ◆ Chemiluminescence Imaging
- ◆ ATP-Bioluminescence Studies
- ◆ Simultaneous fluorescence and luminescence imaging
- ◆ Analysis of microtiter plates
- ◆ Autoradiography
- ◆ X-ray and particle photon counting
- ◆ Low light fluorescence

SPECIFICATIONS

CAMERA	Standard	High Speed Option
Sensor	e2v EV76C560ABT	Sony IMX174
Image Format	1280 x 1024 pixels	1936 x 1216
Pixel Size	5.3 microns	5.86 microns
Frame Rate (full frame)	60 fps	166 fps
ADC	10 bits	12 bits
Interface	USB 3.0	USB 3.0

GATING	Standard	High Speed Option
Min Gate Width	50 ns	3 ns
Max Repetition Rate	10 kHz	300 kHz

GATING CONTROL	Standard	High Speed Option
Gate Controller	HRPCS	GIC3
Delay/Width Increment	5 ns steps	1 ns steps
Internal Time Base in Asynchronous Mode	Up to 10 KHz	Up to 300 KHz
Trigger Mode	External / Camera / Time base	
Camera Trigger	Synchronous (1 gate trigger per camera frame) Asynchronous (multiple gate triggers per camera frame)	

INTENSIFIER	Standard	High Speed Option
Intensifier	MCP218 or MCP225	
Input Window Material	Fibre Optic or Fused Silica	
Photocathode	SB, Bialkali, S20, S25	
Resolution	25 lp/mm	
Gain	Fully adjustable	
Uniformity	10% SD/mean	
Phosphor (Decay time)	P43 (1 ms to 10%) or P46 (300 ns to 10%)	
Coupling method	Fibre Optic Taper	Relay Lens
Effective Pixel Size (18mm)	8.7 microns	9.3 microns
Effective Pixel Size (25mm)	12 microns	13 microns

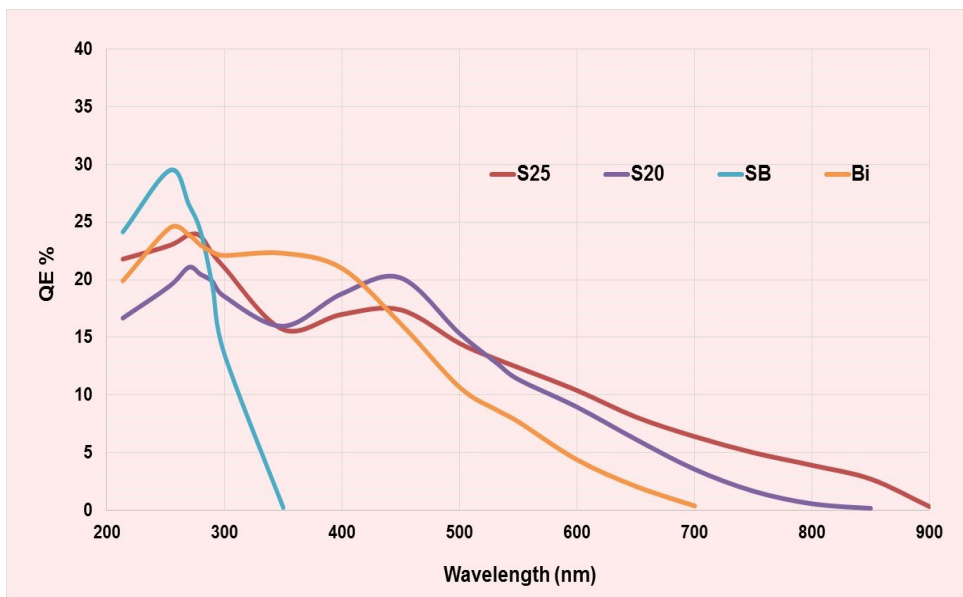
FEATURES

- Single photon counting
- Photon location determined by integral center-of-gravity calculation
- Optical gating to < 3 ns
- Fibre optic coupling
- Bright field mode
- USB interface
- Image 32 Software
- Fully integrated gating control and power supply
- High QE image intensifiers
- Highly customizable

BENEFITS

- Noiseless readout enhances sensitivity at very low light levels and enables long integration times
- Ensures high spatial resolution in photon counting mode
- Accurately capture fast transient events while reducing unwanted background
- Optimum coupling of the image intensifier to the sensor, boosting gain and reducing vignetting
- Simplifies camera focus
- Plug-n-play operation
- Easy to use software specifically designed for photon counting, intensified cameras
- No troublesome high voltage cabling
- Best-in-class QE throughout the UV ensuring best overall signal-to-noise
- Options include alternative sensors, 25/40 mm image intensifiers, customized software and a wide range of accessories

QUANTUM EFFICIENCY CURVES



DARK COUNT RATE

	At 20°C
SB	<5
Bi	<50
S20	<2000
S25	<20,000

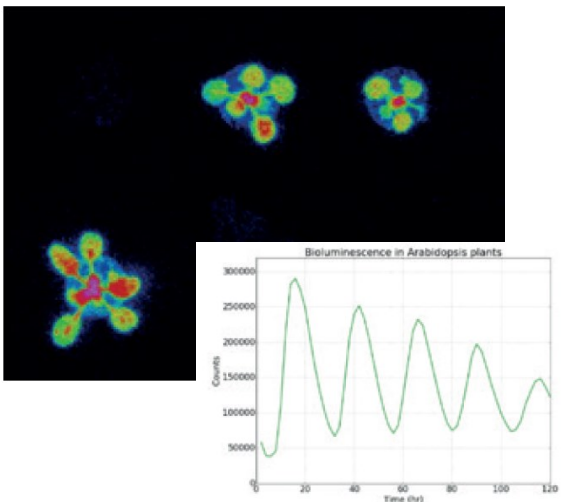
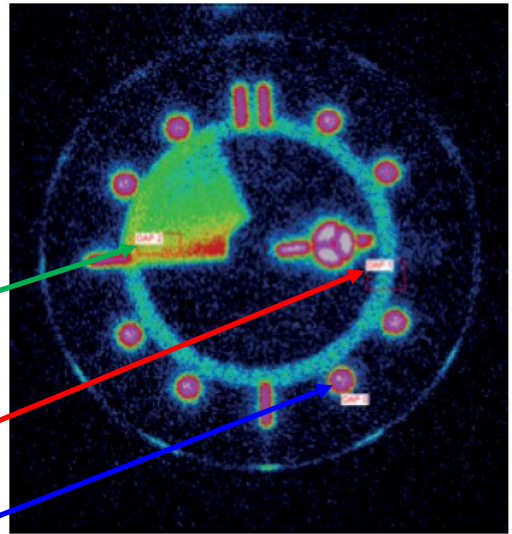
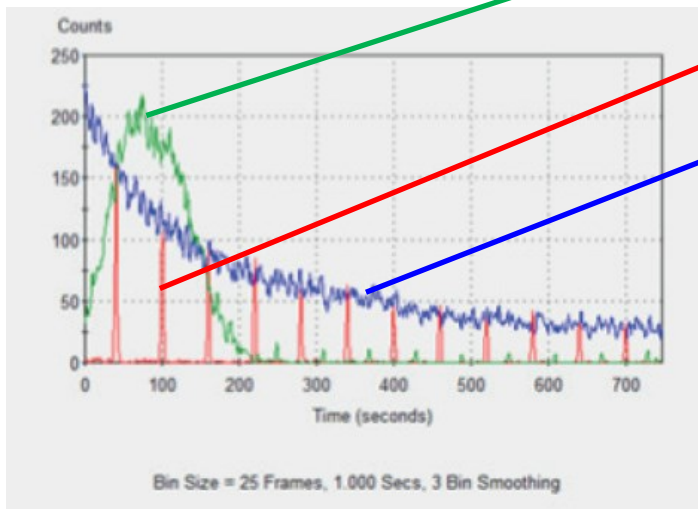
Note: The spectral graphs shown above are for indication only. Detectors with Fibre Optic input windows will have lower sensitivity and no response below 300nm. If high UV response and fast gating is required, a mesh substrate is recommended. The high speed option will have lower sensitivity. Please contact the Sales office to discuss your exact requirements.

Luminescence dial of a watch after integrating for 700 seconds with three regions of interest highlighted.

Green curve—region of interest over the minute hand for the first several hundred seconds

Red Curve—region of interest under luminous portion of the second hand, showing signal every 60 seconds

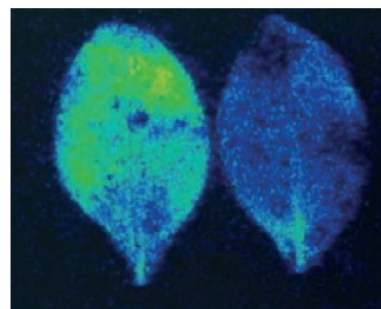
Blue Curve—Five o'clock luminous dot showing overall intensity decrease with time after initial excitation.



TOC1:Luciferase bioluminescence from 12 day old Arabidopsis seedlings.

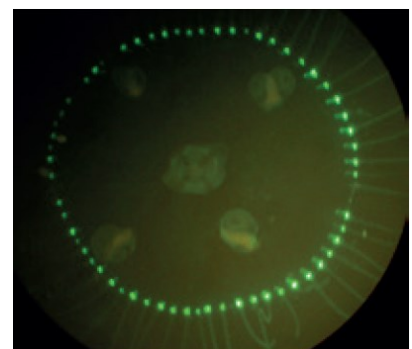
Images courtesy of Antony Dodd — University of Bristol

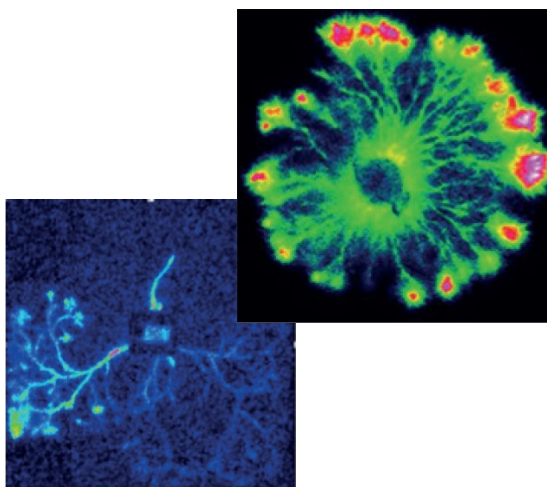
Images courtesy of A K Campbell - University of Wales, College of Medicine and School of Pharmacy



The effect of cooling roots on the leaf's free Ca^{2+}

GFP fluorescence in a jelly fish, excited by blue light

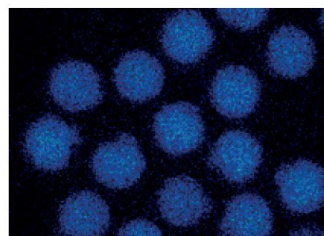




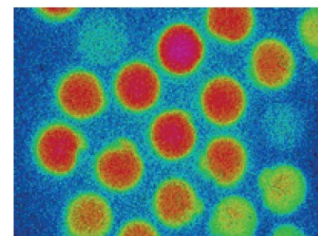
Photon counting scintillation imaging obtained as part of research into fungal networks

Images courtesy of Mark Fricker — Oxford University

Chemiluminescence of luciferase



Fluorescence of Ca²⁺ dye



Accumulated photons emitted from mouse eggs for a 10 minute window during an experiment that lasted several hours. The chemiluminescent light is from a luciferase fusion protein (PLCz-luciferase) that is expressed in the eggs and shown in the left image. The right image is the fluorescent light emitted during epifluorescent illumination at 490 nm of a Ca²⁺ sensitive fluorescent dye loaded into the same eggs.

Images courtesy of K Swann — Cardiff University

ACCESSORIES

Photek has a full range of accessories, enabling our customers to design a complete experimental set-up with confidence that it will work as a system straight out of the box. Contact our experts to help you design the perfect solution for your application.

COMPONENT	FUNCTION
Dark Box	Light tight box with 500mm x 500mm working area, focus adjustment and reagent capillary tubes
Sample Stage	Image samples on a temperature controlled stage
Temperature Controller	Control cooled detector heads and sample stages
LED Light Box	Selectable LEDs to provide uniform sample illumination



SOFTWARE

To harness the power of the HRPCS, Photek provides its unique and easy to use imaging software. The Image32 image processing software provides a wide range of tools for manipulating images and analyzing data.

A simple to use dialog box for controlling the camera is provided for camera setup including: region of interest, sub sampling, exposure time, gain and recording options. Event list data including x, y photon location and time can be saved to a file for later analysis.

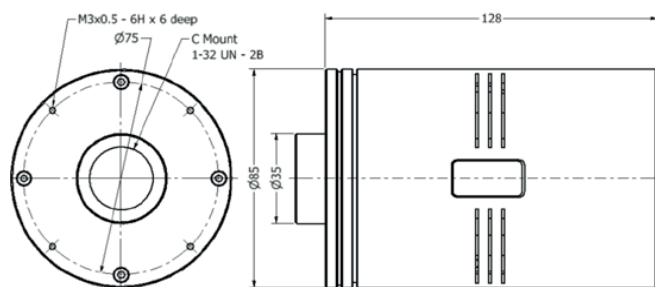


Included with the HRPCS: AC Power Brick and mains cable USB 3.0 Camera Cable, USB 2.0 Control Cable, CD with Image32 Software, User Manual

Computer Requirements	Operating Conditions
Processor: i5 CPU, 2GHz minimum	Operating Temperature: 10°C - 40°C
RAM: 4GB minimum	Relative Humidity: <70% (non-condensing)
Operating System: Windows 7,8,10	Storage Temperature: 0°C - 55°C
USB 3.0 port available	Power Requirements
Minimum Monitor Resolution: 1024 x 768	12V Power brick supplied, 100-240 VAC, 50-60 Hz

MECHANICAL

Standard option



High speed option

