

# HiCAM Fluor

Cooled High-Speed Fluorescence Camera



The HiCAM Fluor is a versatile streaming camera system designed for fluorescence microscopy. It features a 3 megapixel image sensor that captures detailed images at high frame rates of up to 1000 fps at 1200 x 1200 pixels. Thanks to the integrated fiber-coupled image intensifier, it operates under low-light conditions, making it the ideal camera for high-speed fluorescence microscopy. Cooling of the intensifier significantly reduces the amount of noise.

With its gated image intensifier, the camera's effective exposure time can be reduced. The minimum gate width of 3 ns (FWHM) increases the range of light levels at which the camera can be used. It also eliminates motion blur and enables time-resolved filtering.

The fanless design of the camera minimizes vibrations to ensure sharp images. Very low noise levels are achieved by Peltier cooling the image intensifier. Noise levels are reduced by a factor of up to 100 times as compared to uncooled intensified cameras.

Images are streamed to a computer using a CoaXPress interface. This high-speed interface enables recording times limited only by hard disk space. Linking the camera to a framegrabber with on-board FPGA enables realtime analysis of the streamed data.



HiCAM Fluor 15001A02 16/03/2015

## KEY FEATURES

### Easy coupling

Flexible and efficient lens coupling to all major-brand microscopes with C-mount or F-mount camera ports.

### High resolution image intensifiers

Gen III image intensifiers offer the world's highest resolution and sensitivity in the UV, visible or near infrared.

### Short gate pulse widths

Down to 40 ns (FWHM) with minimal jitter.

### High gate repetition rates

Up to 100 kHz

### Compact design

For an easy fit to your imaging or microscopy setup.

## APPLICATIONS

High-speed Fluorescence Imaging

Bio- and Chemiluminescence Imaging

Microfluidics

Particle Image Velocimetry (PIV)

Single photon imaging

Time-resolved imaging and spectroscopy

Laser Induced Fluorescence (LIF)

Combustion

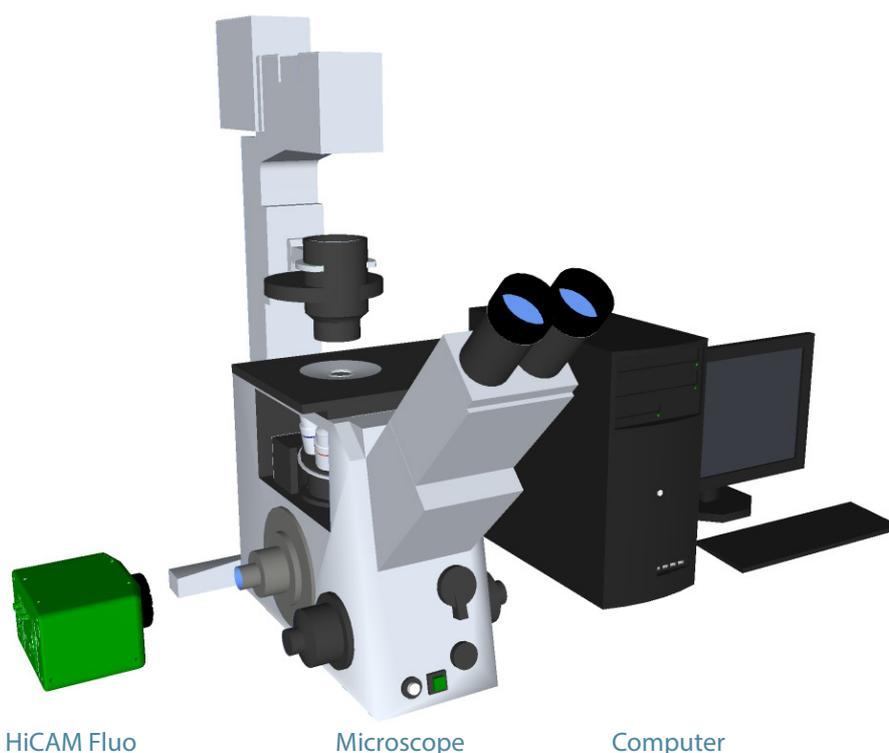
Plasma physics

Astronomy

# CAMERA SPECIFICATION

|                             |               |             |           |
|-----------------------------|---------------|-------------|-----------|
| Maximum resolution (pixels) | 1710 x 1696   |             |           |
| Resolution (pixels)         | 1710 x 1696   | 1200 x 1200 | 480 x 480 |
| Frame rate (fps)            | 540           | 1000        | 5000      |
| Minimum exposure time       | 2 $\mu$ s     |             |           |
| Pixel size                  | 8 x 8 $\mu$ m |             |           |
| Computer interface          | CoaXPress     |             |           |
| SDK and LabView driver      | Optional      |             |           |

## Setup



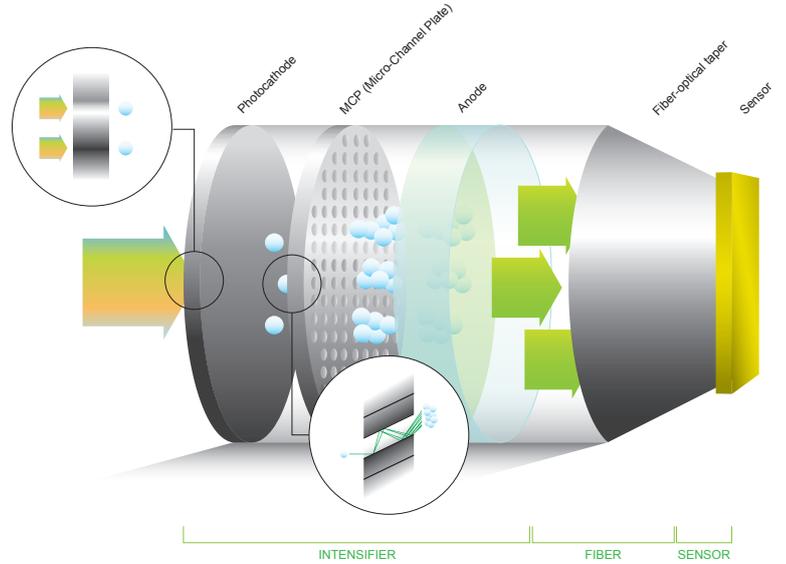
# GATING PROPERTIES

|                              |                      |                             |
|------------------------------|----------------------|-----------------------------|
| Gain Control                 | ✓                    |                             |
| Gate control                 | ✓                    |                             |
| Anode current limiter        | ✓                    |                             |
| Internal trigger generator   | ✓                    |                             |
| Shutter control              | ✓                    | Optional                    |
| Gating pulse width range     | 40 ns – 10 s         | < 3 ns – 10 s               |
| Minimal pulse width (jitter) | 40 ns (< 250 ps RMS) | < 3 ns (< 80 ps RMS)        |
| Pulse width increments       | 10 ns                | 10 ps                       |
| Pulse repetition rate        | 100 kHz              | 300 kHz, 2.5 MHz burst mode |

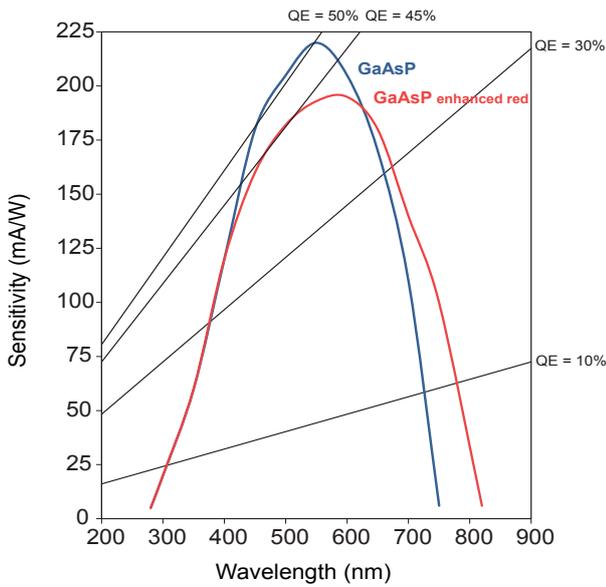
## Image intensifier

Photons are converted into electrons at the photocathode. These are accelerated towards the micro-channel plate by an electric field and hit the channel walls. Depending on the voltage across the channel, multiple electrons are generated by secondary emission.

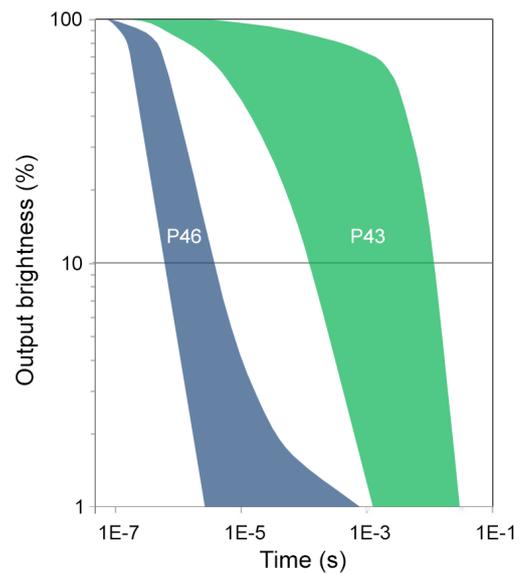
This cloud of electrons is accelerated towards the anode screen, where the electrons are converted back into photons by the phosphor layer. These photons are transferred to the camera by a fiberoptical taper.



## Intensifier sensitivity



## Phosphor response time



# IMAGE INTENSIFIER PROPERTIES

Image intensifier Proximity-focused Gen III GaAsP (filmless)

Photon gain (max) 36000 lm/m<sup>2</sup>/lux

Spatial resolution bare intensifier Up to 62.5 lp/mm

Phosphor P46 (P20, P43 on request)

Input window Borosilicate glass

### 18 mm Gen III intensifier

Effective area on input 12.78 x 12.68 mm

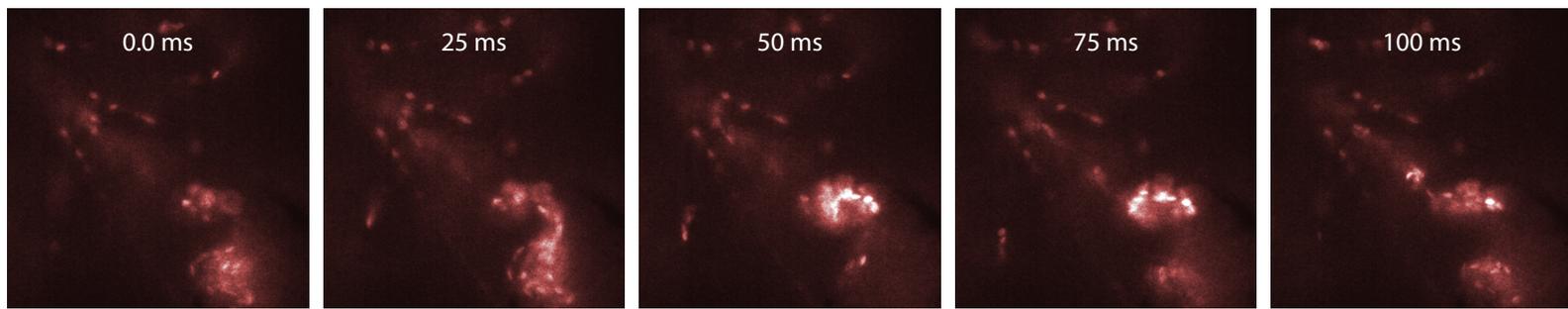
Input window thickness 5.5 mm

### 25 mm Gen III intensifier

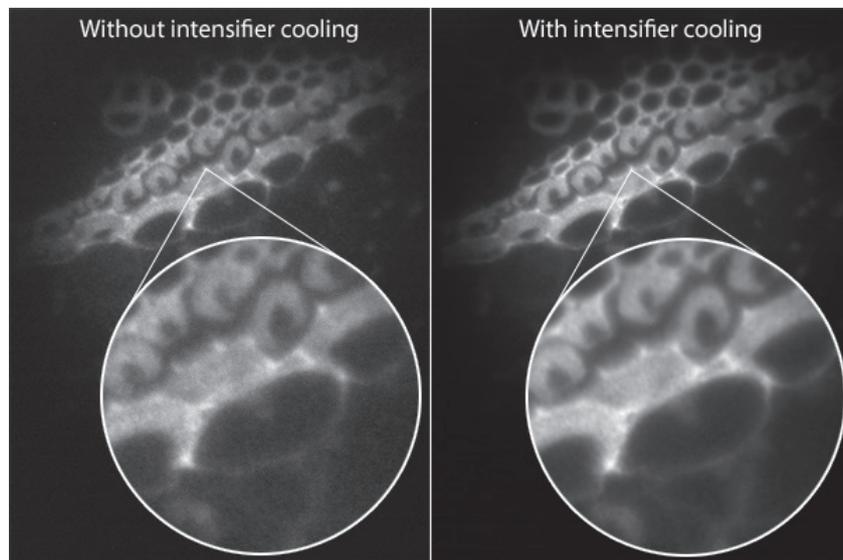
17.75 x 17.61 mm

6.0 mm

## Applications



Frames from a 2000 fps recording of the heart of a zebrafish. On average, the heart of a zebrafish beats 2 to 3 times a second. By labelling the blood cells with a DS\_red fluorescent dye, detailed images of the various stages of one heartbeat can be recorded.



Images of a lily of the valley sample without (left) and with (right) image intensifier cooling.