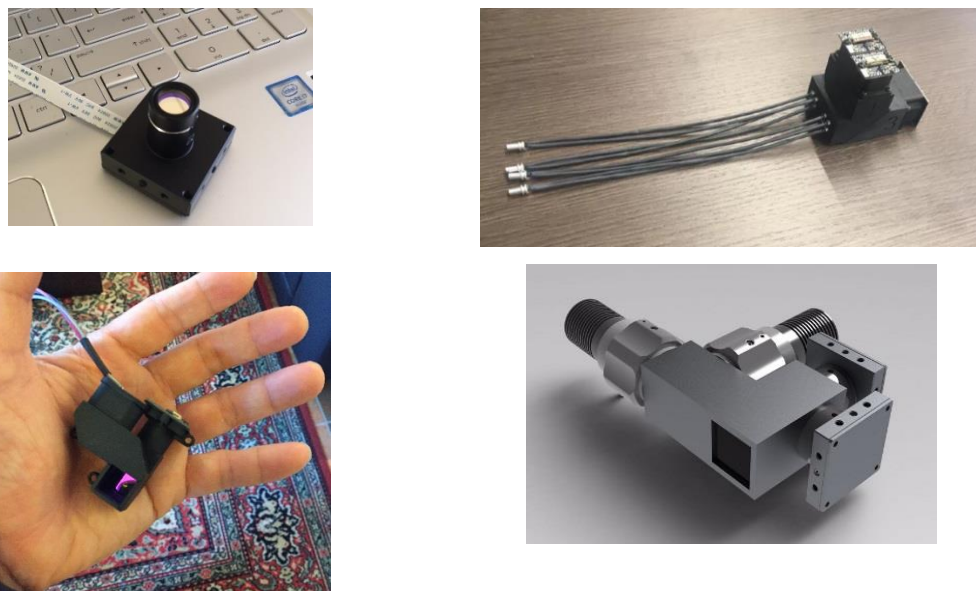


## CMOS Compact Fluorescence Imager

### Product overview

The Anitoa CFI x24 ( $x = 1, 2, 3, 4$ ) is a family of compact multi-spectral fluorescence imagers for molecular sensing and imaging. CFIx24 is enabled by Anitoa's ultra-low-light CMOS image sensors to achieve high sensitivity, wide dynamic range and low background noise. Its low cost, small form factor, ruggedness make it optimally suited for use in a portable device in medical, life science and industrial applications. An example of such application is a field portable nucleic-acid-test (NAT) system for molecular diagnostics, food or environment safety assurance.



*Figure 1. Compact multi-wavelengths fluorescence imager. **Left top**: 1-channel system with filter installed; **left bottom**: a micro 2-channel system with confocal LED optimized for microfluidics applications; **Right top**: a fiber coupled 4 channel system; **Right bottom**: Con-focal 2 channel imager with integrated 2 channel UV excitation LED for tissue imaging.*

The CFI x24 compact multi-spectral fluorescence imager is offered in 1, 2, 3, or 4 channel configurations, with optional integrated LED-based excitation light source. CFI x24 has a USB interface (USB HID or USB 2.0). A Windows-based image capture software, ULVision from Anitoa, is provided to acquire and analyze fluorescence images. A software development kit (SDK) is also

available (with optional Python language interface) for users who wish to develop custom image acquisition and analysis software.

## Features of CFI x24

- High sensitivity, wide dynamic range and low background noise.
- Equipped with ultra-low-light sensitive CMOS image sensor.
- Compact and rugged. No internal moving parts.
- Multi-wavelength channels sensing capability.
- USB 2.0 or HID interface. No driver needed (USB HID option).
- Low power. USB provided 5V power. <100mW active power (3 channel system w/o LED).
- Wide operating temperature range -25 °C – 55 °C.
- Imaging software and SDK provided.
- Video mode support (up to 38 FPS)
- Optional integrated LED with collimation lenses and excitation filters in a con-focal configuration.

## Sample configuration of CFI x24 (x = 2, microfluidic camera)

Imager resolution	24x24 pixels
Object dimension	10mm x 10mm
Focal distance	5mm
Integration time	1 ms - 65 seconds, software controlled
ADC resolution	12-bit
Signal Interface	USB HID (plug and play) or USB 2.0 (Video mode support)
Video Mode	Up to 38 fps in 12X12 mode; up to 12 fps in 24X24 mode
Detection threshold	~3.0 x 10 <sup>-6</sup> lux at the surface of the image sensor
Dynamic range	>85dB (dual gain mode)
SnR	Minimum 13dB at detection threshold
Supply	5.0V (through USB 2.0 interface)
Power consumption	< 100mW (LED off)
Operating temperature	-25 – 65 °C
Temperature sensor spec	±0.1 °C accuracy
Wave length channel 1*	@525nm, 50nm bandwidth. (Fluorophors supported: FAM, Alexa Fluor 488, SYBR Green 1, etc.)
Wave length channel 2**	@630nm, 20nm bandwidth. (Fluorophors: ROX, Texas Red, CY 3.4, etc.)

- \*: Wavelength characteristics can be modified by changing filters.
- \*\* : We support 1 – 4 channels in different configurations.

### ULVision Software

CFIx24 is offered with integrated ULVision software for multi-spectral fluorescence image capture and analysis. ULVision communicate with the CFI x24 in a complete plug and play fashion. ULVision allows the user to apply fine control of image capture in different operating modes, adjust resolution, sensitivity, exposure time, performing temperature compensated dark subtraction as a means of eliminating background noise.

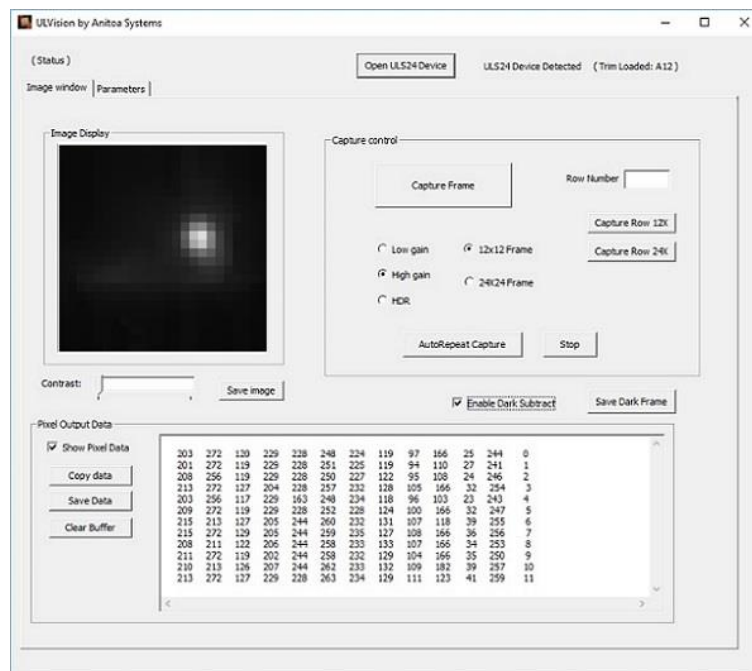


Figure 2 The Anitoa ULVision software

ULVision SDK is available for developers to integrate camera control and data sense in their own software infrastructure. An optional Python language interface further allow integration of CFI x24 in the Python environment (supports Numpy) for data acquisition and analysis.

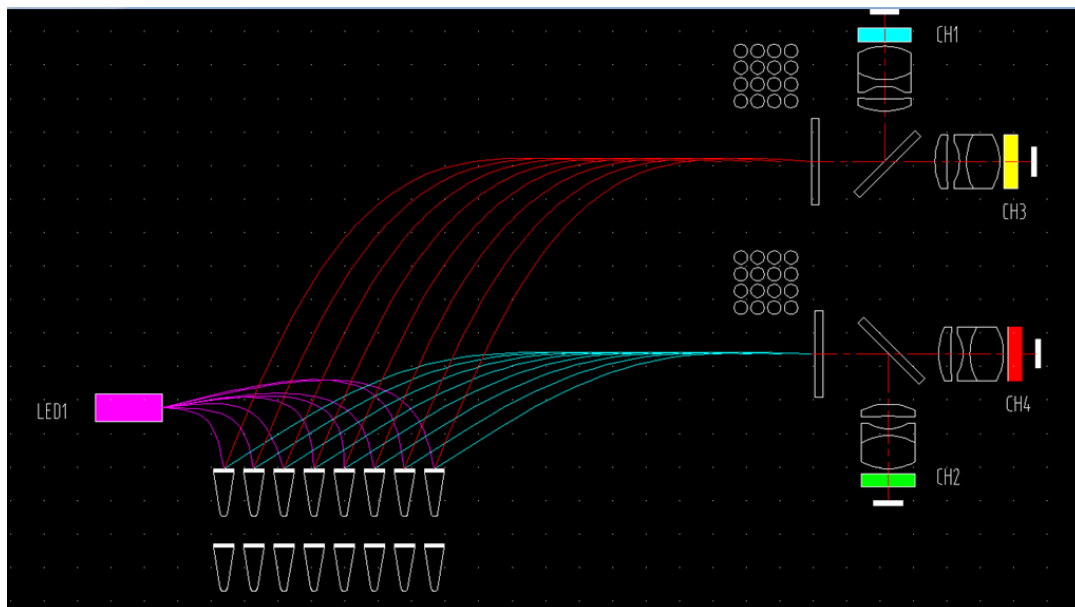
### LED-based light source option

Matching excitation LED-based light sources and filters are also available from Anitoa. The LED light sources are provided with collimating lenses and excitation filters. LED light sources can be provided separately, or integrated with the imaging module in a con-focal configuration. LED light source power and timing control is supported seamlessly by the ULVision software.

With integrated con-focal LED light source, CFI x24 provides the most convenient and consistent lighting performance in an integrated package. CFI x24 LED option generates highly stable, properly synchronized, collimated and filtered excitation light for fluorescence imaging. This configuration ensures high quality image and excellent sample to sample repeatability.

### Fiber coupled compact fluorescence camera (CFI x24f)

CFI x24f is a family of fluorescence camera systems that uses fiber optics bundle to collect light from the samples. Multiple fiber bundles enter into the camera to form a grid of light sensing spots. The fibers are multi-mode so they can cover a wide range of wavelengths. Below is an diagram illustrating a 4-channel fiber coupled system.



## Applications

### Biomedical and life science

Molecular sensing/imaging based fluorescence signaling principles.

- DNA quantification (e.g. in DNA/RNA sequencing sample preparation).
- DNA microarray read out.
- qPCR system, microfluidic qPCR and Digital PCR
- Microfluidic or Lateral flow immunoassay (ELISA).
- Capillary electrophoresis
- Circulating Tumor Cell imaging.
- Tissue auto-fluorescence imaging for metabolic monitoring
- Fluorescence In-situ Hybridization (FISH)
- Read out of quantum-dot-tagged molecules or cells.

For more information about applications, please see application notes from AnitOA web site (<http://www.anitOA.com/technology.html>)

Application data showcase

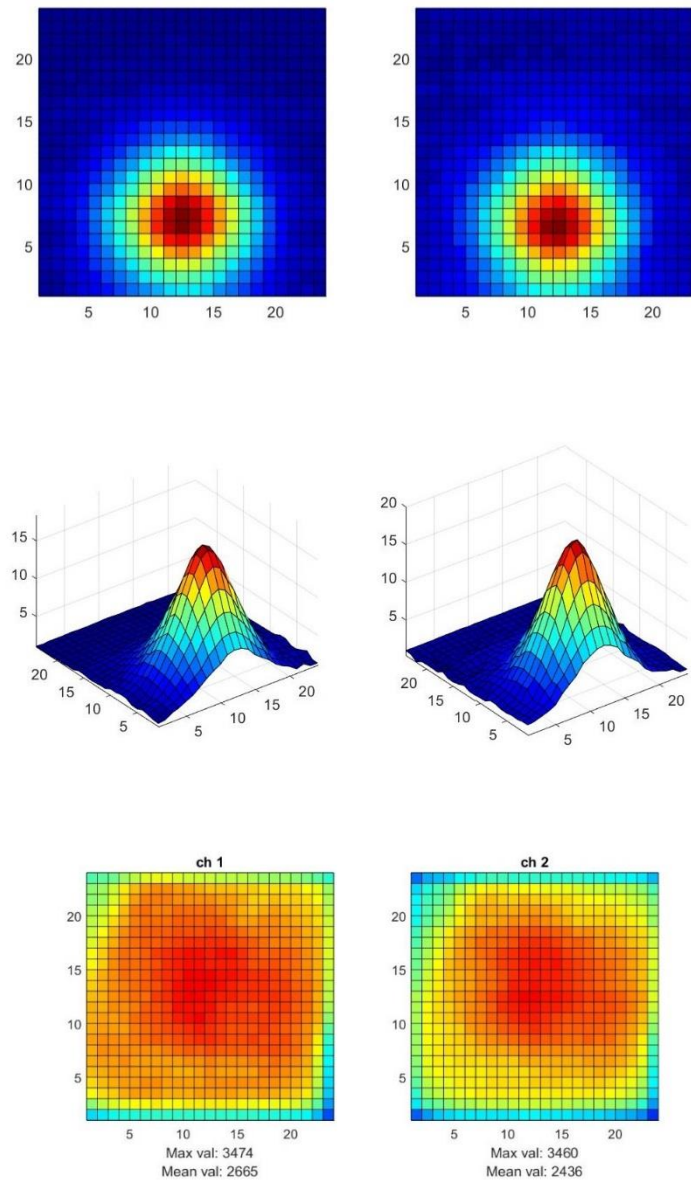


Figure 3. Auto-fluorescence emission from tissue sample. Top and middle: 2D and 3D histograms of collimated UV LED output measurement. Bottom, auto-fluorescence emission from tissue sample as indicator of metabolism level in organs transplantation (credit: Swedish ICT/ACREO).



## CFI x24 Preliminary Product Spec

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### Inquiry contact

CFI x24 is offered in a semicustom fashion. For quote and delivery time estimate, please contact us at address below. Anitoa will supply a questionnaire to gather customer requirement information before providing a quote and lead time estimate.

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