

## CMOS Compact Chemiluminescence Imager

### Product overview

The Anitoa CCI x24 ( $x = 1, 2$ ) is a family of compact multi-spectral chemiluminescence imagers for molecular sensing. CCI x24 is enabled by Anitoa's ultra-low-light CMOS image sensors and a specially designed large aperture, short focal distance optics to achieve exceptional low-light sensitivity, wide dynamic range and low noise. Due to its low-cost, low-power, small form factor and ruggedness, CCI x24 is optimally suited for use in a portable device in medical, life science and industrial applications. An example of such application is a field portable chemiluminescence immunoassay reader system for molecular diagnostics, food or environment safety assurance.



*Figure 1. Compact multi-wavelengths chemiluminescence imager. **Top left:** 2-channel system with straight image port; **Right:** 1-channel system with straight image port. **Bottom left:** A hand-held, battery-powered, Bluetooth enabled chemiluminescence immunoassay reader instrument enabled by CCI 224.*

The CCI x24 compact multi-spectral chemiluminescence imager is offered in 1 or 2 channel configurations, with optional 45 degree mirror to achieve right angle imaging port orientation. CCI x24 has an USB interface (USB HID or USB 2.0). A Windows-based image capture software, ULVision, is provided to acquire and analyze chemiluminescence 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.

The 2-channel imager configuration is useful for measuring chemiluminescence emission in two wavelength spectrum. This is useful for achieving better signal to noise ratio (SnR) and CV value by using differential signal analysis.

### Features of CCI x24

- High sensitivity, wide dynamic range and low background noise.
- Equipped with ultra-low-light sensitive CMOS image sensor.
- Compact and rugged.
- Multi-wavelength channels sensing capability. The second channel can be used for dual color chemistry, or as a reference channel for improved data consistency and SnR.
- USB 2.0 or HID interface. No driver needed (USB HID option).
- Low power. USB provided 5V power. <75mW active power.
- Wide operating temperature range -15 °C – 55 °C.
- Imaging software and SDK provided.
- Video mode support (up to 38 FPS)

## Sample configuration of CCI x24 (x = 2)

Imager resolution	24x24 pixels
Object dimension	5mm x 5mm, extensible to 8mmX8mm with focal length adjust
Focal distance	8mm – 10mm
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	$\sim 3.0 \times 10^{-6}$ 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
Operating temperature	-15 – 55 °C
Temperature sensor spec	$\pm 0.3$ °C accuracy
Wave length channel 1**	@400nm - 565nm (Blue green band)
Wave length channel 2***	@585nm - 900nm (Orange, red, NIR)

\*: On-chip temperature sensor is used for temperature compensated dark current noise removal.

\*\* : Wavelength characteristics can be modified by changing filters.

\*\*\*: We support 1 – 2 channels in different configurations.

## ULVision Software

CCI x24 is offered with integrated ULVision software for multi-spectral fluorescence or chemiluminescence image capture and analysis. ULVision communicate with the CCI 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.

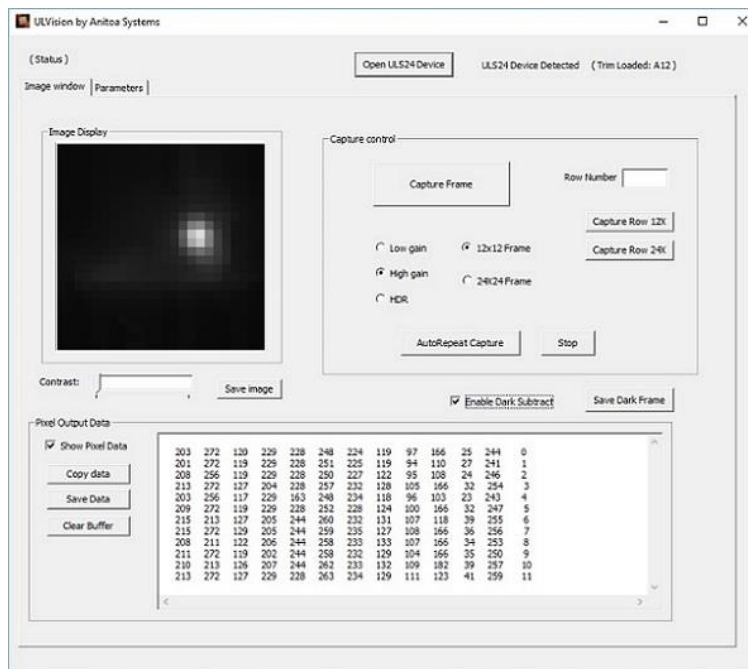


Figure 2 The Anitoa ULVision software

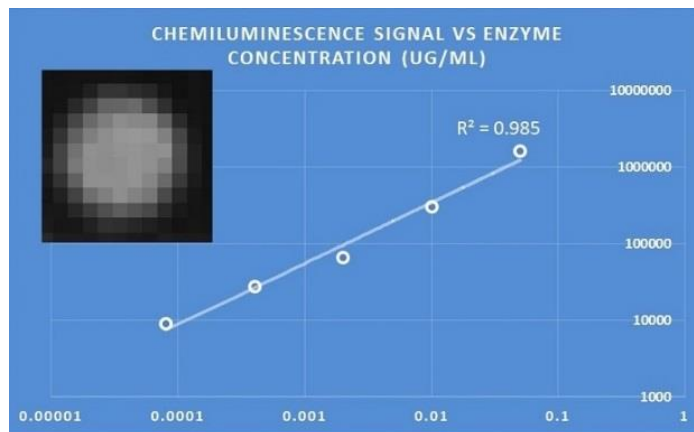
ULVision SDK is available for developers to integrate camera control and data sense in their own software infrastructure. An optional Python language interface further allow integration of CCI x24 in the Python environment (supports Numpy) for data acquisition and analysis.

## Applications

### Biomedical and life science

Molecular sensing/imaging based chemiluminescence signaling principles.

- Microfluidic or Lateral flow chemiluminescence immunoassay (CLIA, ELISA).
- DNA sequencing (Pyro-sequencing).
- Bateria detection sensor based ATP catalization-induced chemiluminescence.
- DNA quantification (e.g. in DNA/RNA sequencing sample preparation).



*Figure 3. Chemiluminescence immnoassay (CLIA) application enabled by CCI 224. CLIA Performance data showing concentration vs light read out.*

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

## Package content

1. CCI x24 chemiluminescence camera module with ULS24, and lens system pre-installed.
2. An ARM-32 Cortex M3 based main electronics interface board.
3. USB dongle containing all software and documentation.
4. 16 pin 0.5mm pitch FFC cables to connect camera with main board.
5. USB type A to type B cable
6. Lens cleaning cloth



## CCI x24 Preliminary Product Spec

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### Inquiry contact

CCI 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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