

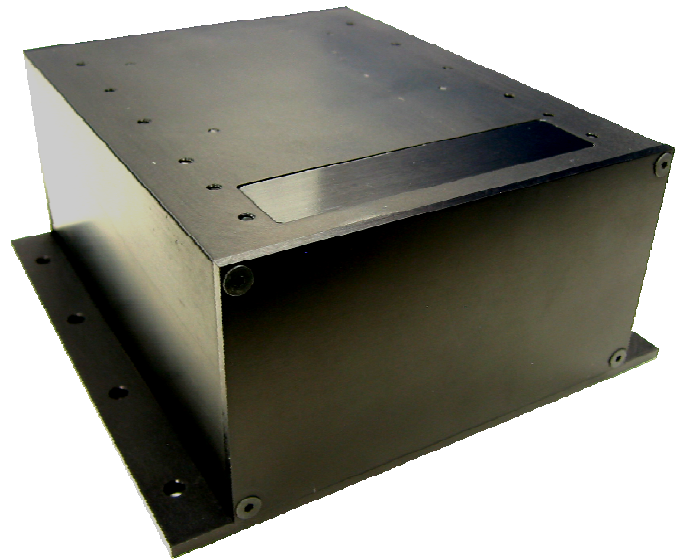
X-ray Time Delay Integration (TDI) camera

XTI12848 TDI Series

Time Delay Integration (TDI) is a special image acquisition method that is used for in-line inspection application that requires high-speed, high sensitivity and high resolution. XTI12848 TDI camera, when equipped with appropriate shielding, is specifically designed to be used in high-energy x-ray, gamma-ray, and betatron imaging applications. An off-axis, FOP (Fiber Optic Plate) design protects the CCD sensor from direct harmful radiation. Users can select the scintillator for specific applications. Pixels are $48\ \mu\text{m} \times 48\ \mu\text{m}$. Binning modes 2x2, 4x4, 8x8, etc. allow for imaging at lower resolutions.

Key Features

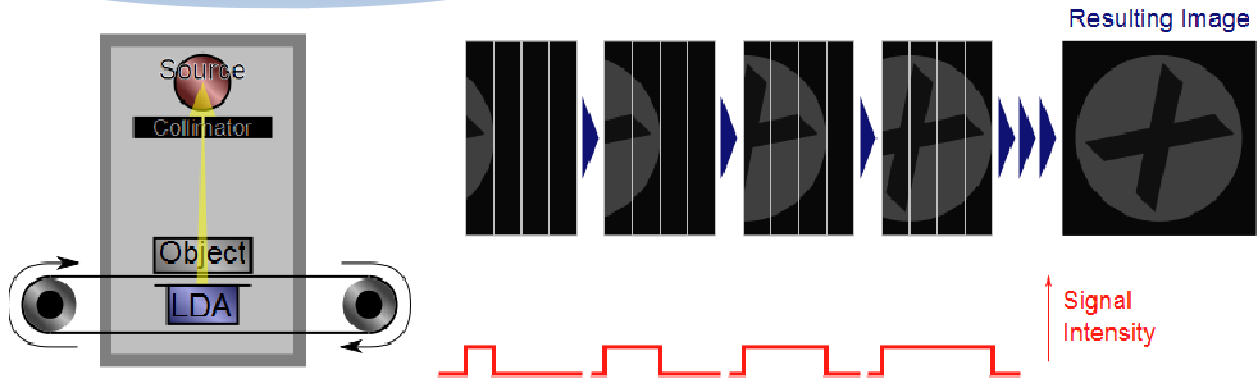
- High speed, resolution & sensitivity
- Imaging with off-axis, fiber-optic design
- User-select X-ray scintillating material GOS, CsI(Tl), CdWO₄, etc.
- A selection of lengths:
 - 4 inches (2048 pixels)
 - 6 inches (3072 pixels)
 - 9 inches (4608 pixels)
 - 12 inches (6144 pixels)
- Highly extended lifetimes
- Camera Link (Base configuration) and GigE Vision interfaces
- 16-bit digitization and data output
- 100-240-V, 50-60-Hz power
- Software development kit (SDK) with application programming interface (API)



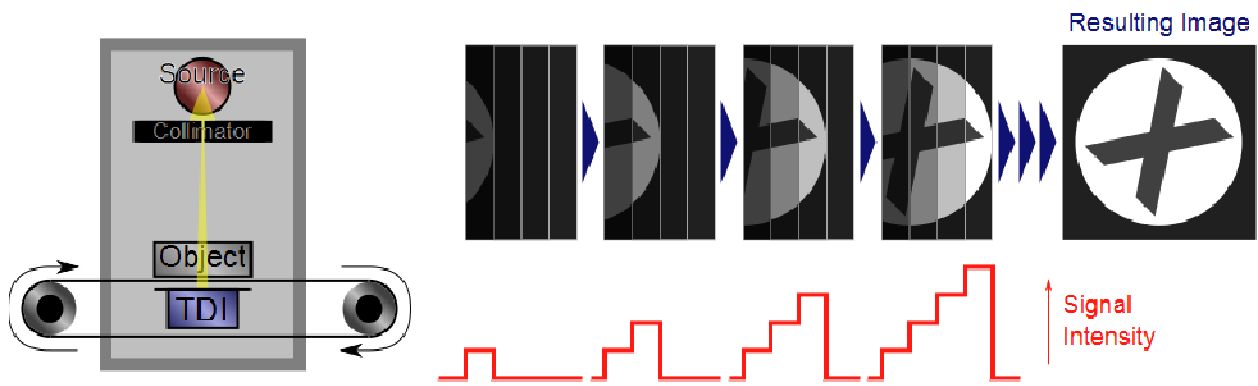
Applications

- In-line Non-Destructive Testing (NDT)
- High-energy x-ray, gamma-ray, betatron and neutron imaging

Principal of Operation



Traditional LDA Application

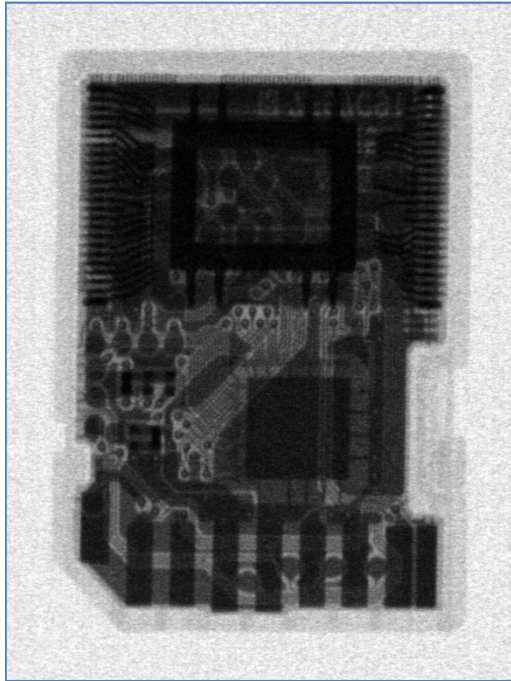


TDI Application

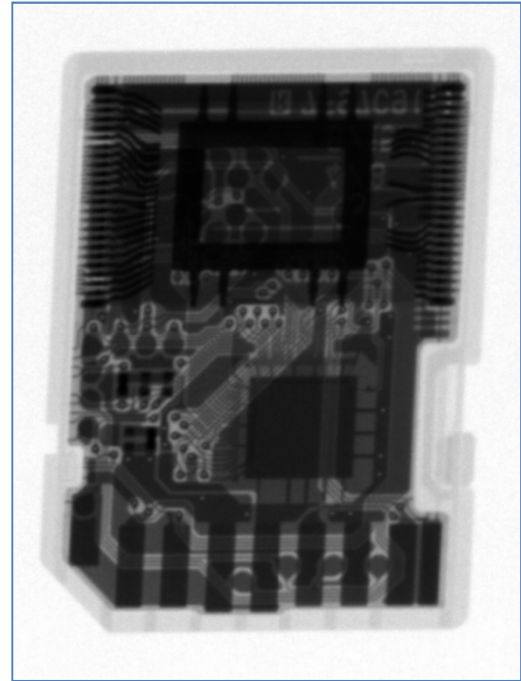
In the operation of both traditional Linear Diode Array (LDA) and TDI detectors, objects must be moving relative to the detectors. In an LDA, a single line of diodes collect signal. Once the object has past the diode line, no more signal is collected. A TDI device has multiple diode lines and the signal for each line can be passed to the next line. As the object passes over each line, each line collects signal and then passes the signal to the following line. After the object passes the final line, the full integrated signal is read out. When the TDI device is synchronized to the moving object, an image with higher resolution at lower light level is achieved. As a result signal-to-noise ratio in TDI camera is much higher than that in a line-scan camera.

Comparison Images

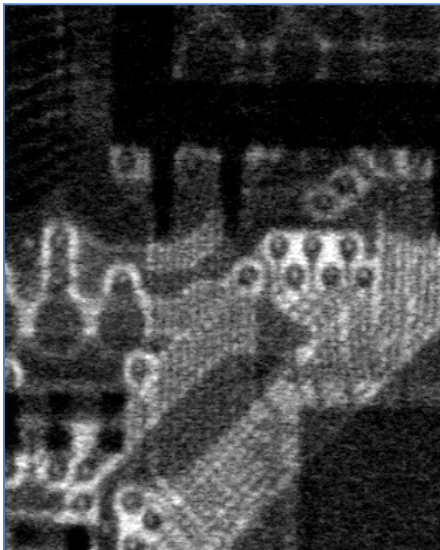
Radiographs of SD card using traditional LDA and XTI12848 TDI



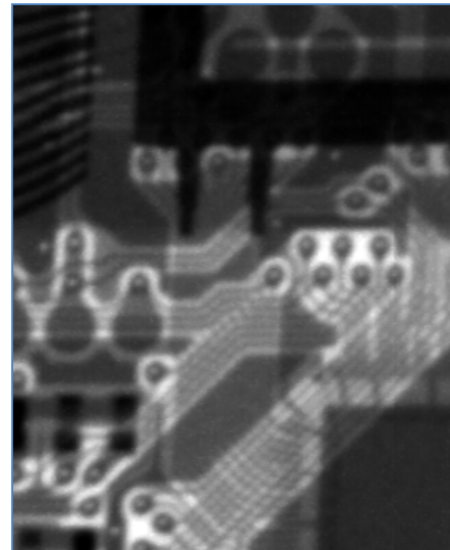
Traditional LDA (50um)



TDI (48 um)

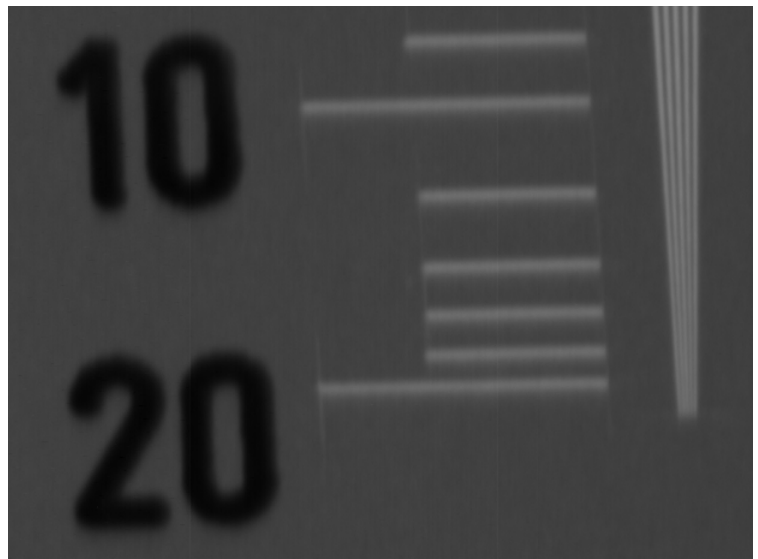
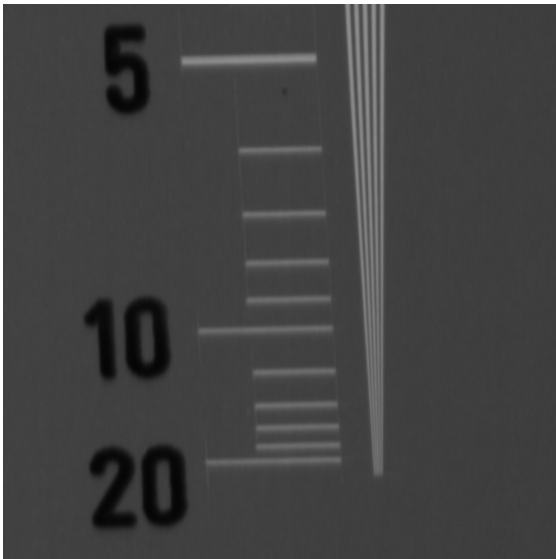


Traditional LDA zoomed-in view

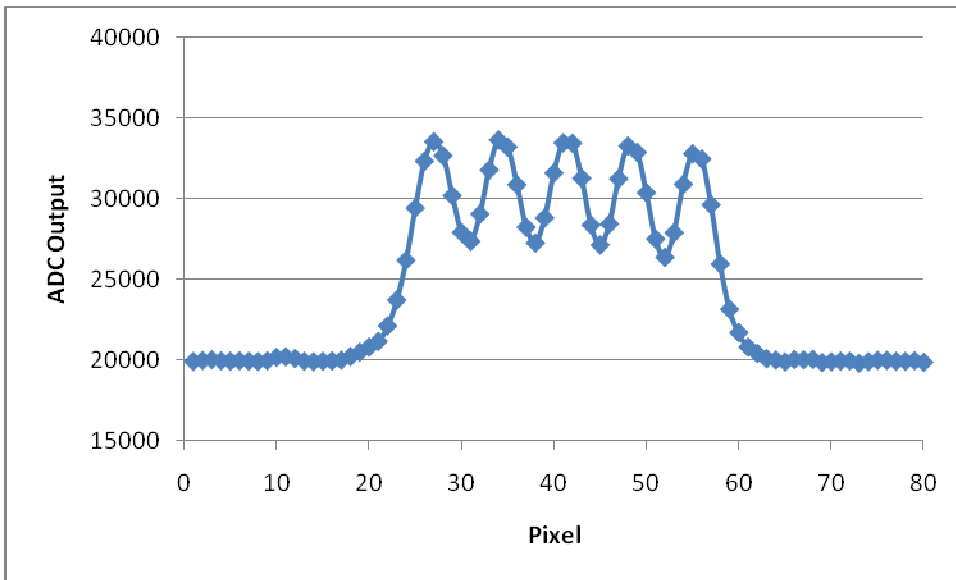


TDI zoomed-in view (S/N improved 9X)

Resolution



TDI camera spatial resolution with 3.4× geometric magnification



TDI camera MTF at 10 lp/mm (with 3.4× geometric magnification)

Specification

Model	XTI12848-004	XTI12848-006	XTI12848-009	XTI12848-012
TDI stages and number of pixels	2048 × 128	3072 × 128	4608 × 128	6144 × 128
Pixel size	48 μm × 48 μm			
X-ray sensitive area	98 × 6.1 mm ²	147 × 6.1 mm ²	221 × 6.1 mm ²	295 × 6.1 mm ²
Maximum X-ray energy	15 MeV ⁱ			
CCD pixel clock	3 MHz			
TDI line rate	Up to 10 KHz ⁱⁱ			
A/D converter	16 bit			
Camera Link data rate	48 to 84 MHz ⁱⁱⁱ			
Power requirement	100–240 V, 50–60 Hz			
Power consumption	25 W	38 W	63 W	75 W
Readout direction	Bidirectional			
Selectable number of stages	32, 64, 96, 128			

ⁱ Models available in 250 KV, 320 KV, 450 KV, 600 KV, 6 MeV, 9 MeV, 15 MeV versions.

ⁱⁱ Line rate may be limited by scintillator choice or by bandwidth considerations of interface. 10 KHz provided with CsI and Camera Link interface.

ⁱⁱⁱ Camera Link data rate depends on exact camera configuration.

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