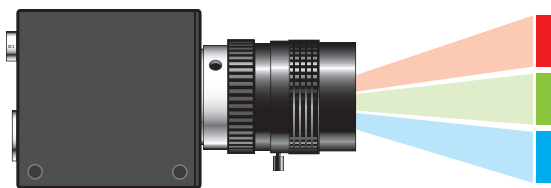


Tri-linear Colour Line Scan Technology

Colour imaging is beginning to play a more important role in machine vision. In many cases, colour is the only way to identify objects that are otherwise too similar in greyscale in monochrome imaging. Colour line scan cameras have been widely used in applications such as banknote and cheque scanning, 100% print inspection, electronics and PCB manufacturing, food inspection, tile, wood, textile, and web inspections, et cetera.

How Tri-linear Colour Line Scan works

There are several technologies used in colour imaging including 3 CCD and tri-linear. Tri-linear technology uses three linear arrays fabricated on one die—one each for red, green, and blue. In operation, each of the arrays captures a primary color image (R, G, or B) simultaneously but at slightly different points on the moving object. To combine the color channels into a properly registered full-color image, the camera or the imaging system's framegrabber must compensate for this spatial separation, usually by buffering the first and second lines to match with the third.

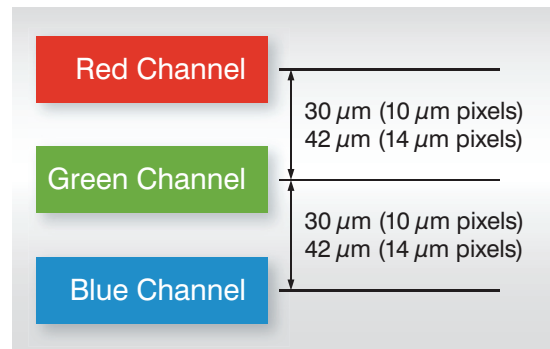


Schematic of a tri-linear colour camera

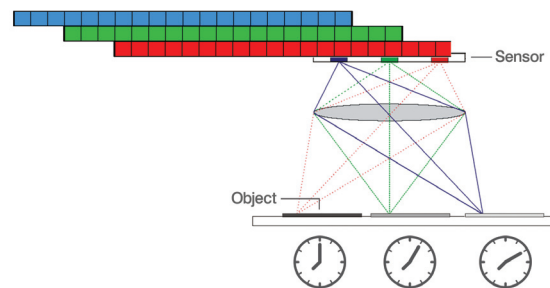
Advanced Features

Minimal line-spacing between colour channels

DALSA's unique tri-linear technology minimizes line-spacing between colour channels, accomplishing three-pixel center-to-center line spacing compared with 8–9 pixel line spacing in most competing designs. This minimal line-spacing not only significantly improves colour fidelity and reduces image artefacts due to synchronization, it also makes it easier to align the sensor to the inspection web, enabling certain applications that were otherwise infeasible using larger line-spacing.



Line spacing between RGB channels is only 3 lines apart centre-to-centre in DALSA's tri-linear sensors



Spatial correction in tri-linear camera

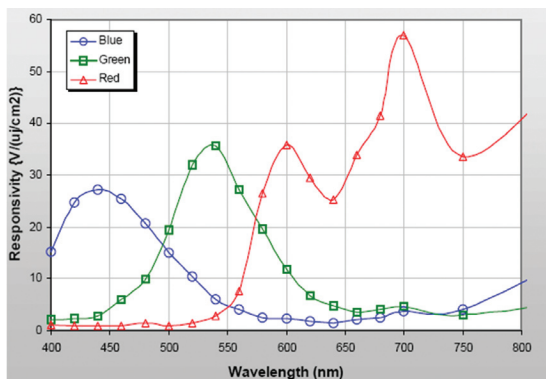


Highest line rate

Line rate is an important factor when considering a inspection system components. A camera that provides higher line rates allows decreased inspection time and higher system throughput, thereby increasing efficiency. DALSA's tri-linear cameras deliver the highest line rate in the colour market, to a maximum of 33 kHz (2k model) and 18 kHz (4k model) for a total maximum throughput of 240 Mpixels/s.

Improved blue/UV responsivity

Responsivity in the blue/UV region is particularly important for certain applications such as wafer, food and cotton/textile inspections, where shorter wavelengths are used to identify smaller features. DALSA's tri-linear cameras offer improved responsivity and imaging performance in the short wavelength spectrum.



Spectral responsivity of DALSA's tri-linear sensor

High reliability colour filters

DALSA uses special pigment absorption filters with Gaussian line shape in the transmission spectra and the highest light fastness for its tri-linear colour filters. Light fastness is a measure of colour fading against exposure to light, and is measured on a scale of 1–8, (1 is poor while 8 is excellent). Common organic dyes measured between 4–5, but DALSA's colour filter is measured to have a light fastness of 7–8. This is particularly important for line scan applications, as they often require high-intensity light sources which can fade lesser filters over time.

Benefits and Tradeoffs

Tri-linear technology provides a significant advantage in speed and cost-savings when considered against more expensive prism-based 3 CCD color cameras and the specially designed lenses required for optimal performance. Tri-linear colour cameras are best for objects with flat surfaces as in web inspections. To ensure best image quality and fewest artefacts, tri-linear cameras need to be mounted and aligned properly, e.g. perpendicular to the web surface and movement direction, and DALSA's reduced line spacing makes this alignment easier.

Tri-linear in Action

Built with our tri-linear technology, DALSA's Piranha Color cameras deliver the highest line rates and resolutions in the industry, with sophisticated features including anti-blooming, exposure control for each colour, white balancing, flat field correction, luminance output, and user friendly GUI interface. Contact your local DALSA representative to find out how you can put this power to work for you.