



OptoMetrix, Inc.

Technology Newsletter Q1, 2002

President's Message

The purpose of this newsletter is to keep you up-to-date on the latest technical developments at OptoMetrix. I hope that you find it of value and perhaps you will pass it on to a colleague with similar interests. Feedback, both positive and negative, is always appreciated. I can be reached at rafalk@optomet.com.

R. Aaron Falk

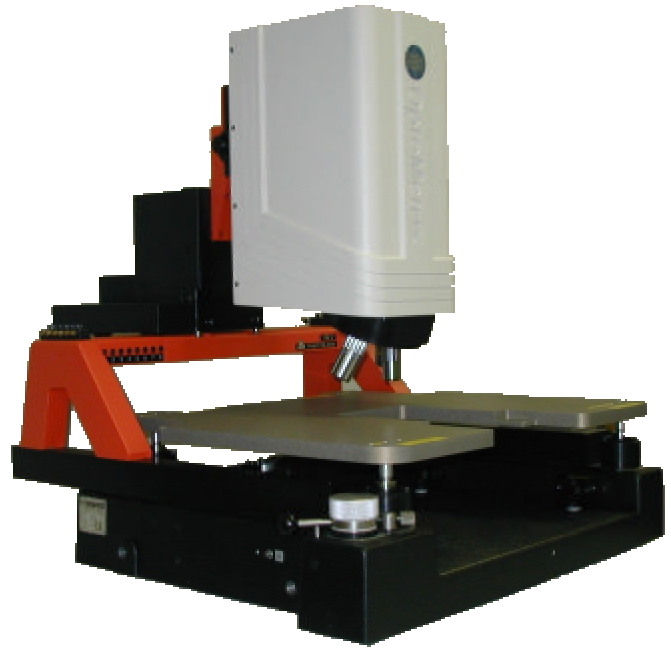
LSM Usability

"A tool that is hard to use, does not get used¹."

The focus of this quarter's newsletter is laser scanning microscope (LSM) features that enhance usability. These features add value, not through their ability to detect a specific failure, but in reducing the process time and simplifying the overall process.

User friendly software with layered complexity, as found in our OptoVision application, is a key ingredient to tool efficiency. Layered complexity is the design process of placing the basic, most used controls, at the front of the application for the beginning or occasional user. Layered below are detailed controls, user preferences, popup menus, macro-languages, etc. for the dedicated operator.

Our LSM also offers some unique hardware features designed to promote ease of use. These include a focus aid, variable image resolution, region of interest selection, X/Y scan exchange, and 12 bit imaging.



Real-Time Focus Aid

LSMs are a difficult to focus, especially at high magnification. Out of focus LSM images are black, yielding no indication of focus. In addition, the image display update rate is rather slow in an LSM compared to a CCD camera. Many minutes can be consumed trying to obtain an initial rough focus in a typical LSM².

OptoMetrix utilizes parfocal objectives to minimize focus time. In addition, we have developed a real-time focus aid³ for our LSM. The focus aid operates during the image acquisition cycle to produce a visible feedback to the user of the LSM focus. Initial focus of the LSM can be accomplished in a few seconds without even looking at the image display.

¹ Heard from every FA manager I have ever met.

² Reports from LSM users indicate times as long as 30 minutes to obtain a focus at 100X!

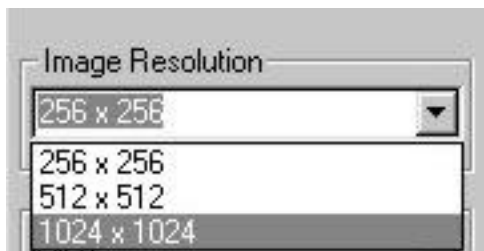
³ Patent pending



Photo of focus aid display

The photo above shows the dual display of the focus aid. The left display indicates the average reflected light level sensed by the LSM and the right display indicates the level of the AC components of the reflected light level. The left display level increases as focus is approached, and the right display increases as sharp focus is achieved. Both displays are active during the entire image scan, yielding real-time feedback on image focus.

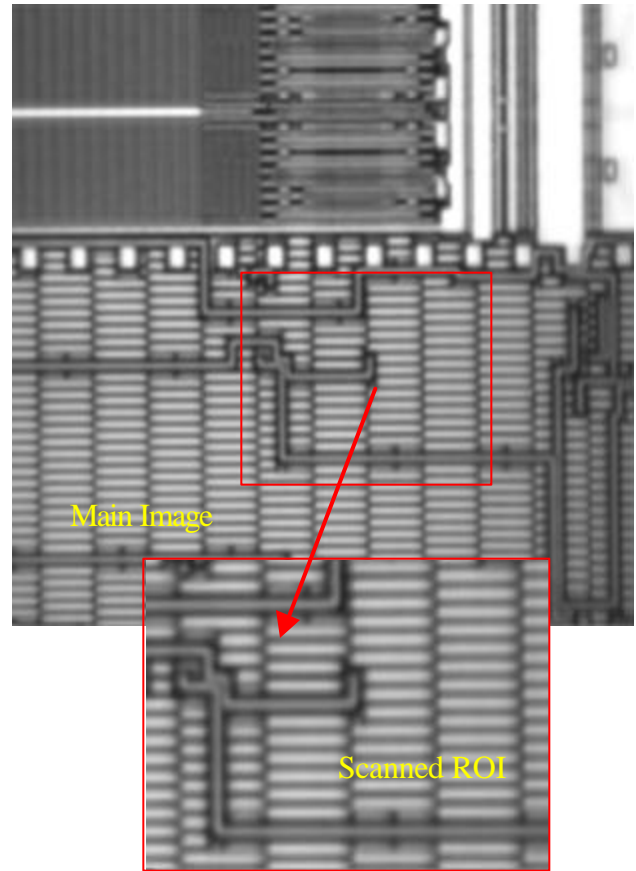
Variable Image Resolution and Region of Interest Selection



Software control for setting image resolution

Scanning microscopes can produce large format images, e.g. 1024x1024 pixels with very high resolution (number of pixels per diffraction

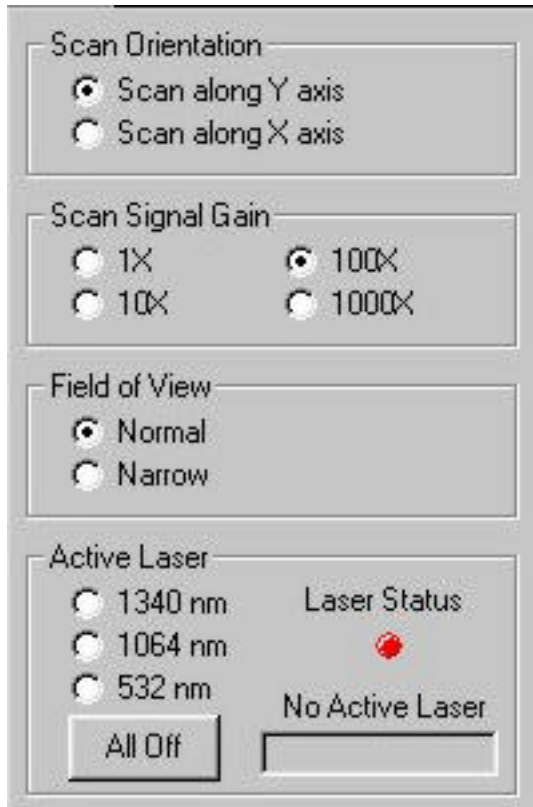
spot). Such large format images can require lengthy acquisition times, scaling roughly as the product of the X and Y pixel counts. High resolution is generally unnecessary for basic navigation around the chip and initial failure localization. The OptoMetrix LSM offers users a selection of resolutions, 256x256, 512x512, and 1024x1024 pixels while maintaining constant field-of-view. 256x256 pixel resolution allows rapid initial setup and examination of the test device. A click of a button can then increase the resolution for more detailed work.



Example of selection and imaging of ROI

Region-of-interest (ROI) selection is an additional time saving feature. Click and drag on an image to produce a rectangular ROI. This limited field of view can then be scanned independently, a real time saver for long averages at high resolution.

X/Y Scan Interchange



Software control for setting scan direction

The FA signatures obtained by an LSM have both space and time components. Signatures with long relaxation times (e.g. latch-up) can mask structures, which lie further down the scan direction. Initially users of these techniques had to rotate the test device to change the scan direction, typically by 90 degrees. This rotation can be rather difficult in many instances, for example a chip in a test board. The OptoMetrix LSM exchanges the X and Y scan directions with a simple mouse click. The resultant images are registered to a few pixels, allowing easy comparison.

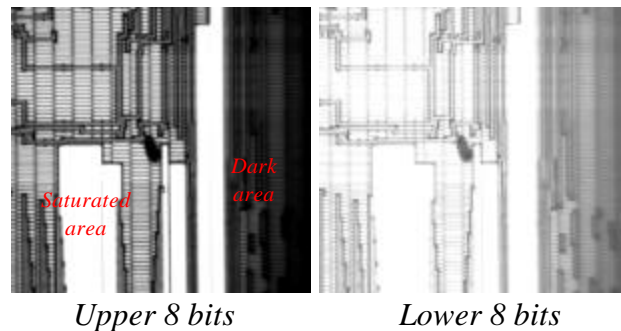
12 Bit Imaging

The range of reflectance from an IC is huge with highly reflective metal adjacent to highly absorptive p-wells or n-wells. 8 bit gray scale images only supply a dynamic range of 256, which is not

enough. FA signals also encompass a large dynamic range in a single image. 12 bit gray scale images, as supplied by the OptoMetrix LSM, yield a dynamic range of 4096.

A significant problem with these images is that computer screens only show 8 bit gray scale⁴. Our software utilizes contrast and brightness controls to allow mapping of any portion of the 12 bit image into the 8 bit display. In the example below, the dark area shows little detail even though the intensity from the metal areas is fully saturating the detector. Shifting the display to show the lower 8 bits of the 12 bit image shows the presence of significant detail in the dark area of the image.

An additional issue is that many image viewers do not handle gray scales other than 8 bit in a graceful fashion. Our software allows export of images into standard formats (TIFF, BMP, JPEG) of the 8 bits displayed image. A viewer-only form of OptoVision is also supplied to customers for use on additional computers.



12 bit image with different bit slices displayed

For more information on OptoMetrix products, contact us at sales@optomet.com or 425-251-6363 x18.

⁴ The eye can only distinguish 7-8 bits in a single image, so why build a display with higher resolution.