BWA-CAM
Application Note

5/14/2012

Background Noise from Gas Discharge or Flash Lamp Pumped Lasers

The BWA-CAM is included in Haas Laser Technologies **Laser Beam Analyzer System.** This application note covers beam profiling and M squared measurement as it relates to background noise.

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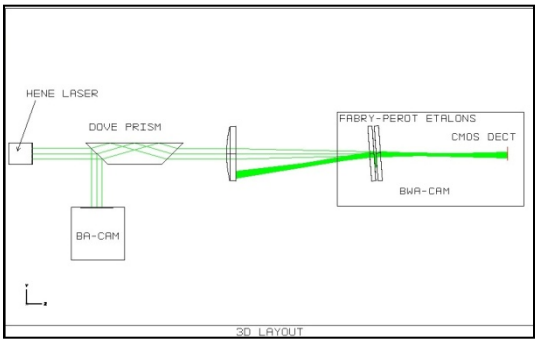
BACKGROUND NOISE FROM GAS DISCHARGE OR FLASH LAMP PUMPED LASERS

The key to meaningful and accurate beam profile and M-squared measurement is identifying and subtracting background noise. In particular gas discharge lasers and flash lamp pumped lasers bring an interesting challenge that may not be obvious to the user.

Figure 1 shows how even the minimal discharge glow of a low power HeNe laser can influence the background of an M-squared measurement with the BWA-CAM. The spot to the far right, region of interest (ROI) 12 is the first time slice of the beam waist well before focus.

Centered about this spot and identified by the red circle, is a broad patch of light that is the light from the laser's discharge glow.

In spite of the fact that the background subtraction is set, this light is still quite pronounced and influences the measurement of the diameters of ROIs 8, 9, 10, 11 and 12. The ROIs to the left of the minimal beam waist spot, ROI 7, have a lower background noise then the ROIs 8 through 12. This of course affects the size of beam diameters of these spots and how they will be calculated.

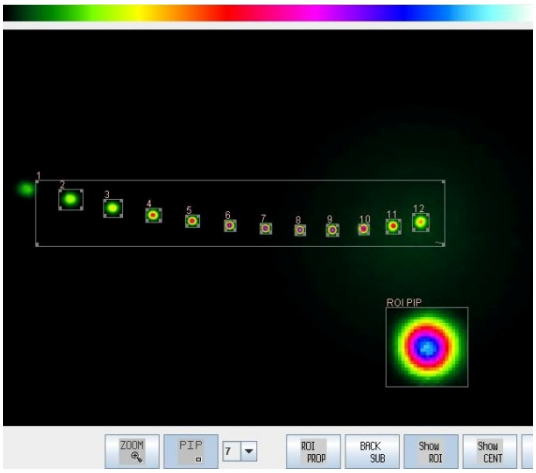


The image above shows the basic setup where the HeNe laser is very close to the measurement system. Having the laser in close proximity permits enough light to pass through to the detector and manifest as unwanted background noise.

How does one remove the influence of this background noise? Well, there are a couple of approaches one can take. First, one can insert an aperture after the laser to minimize the level of light reaching the detector.

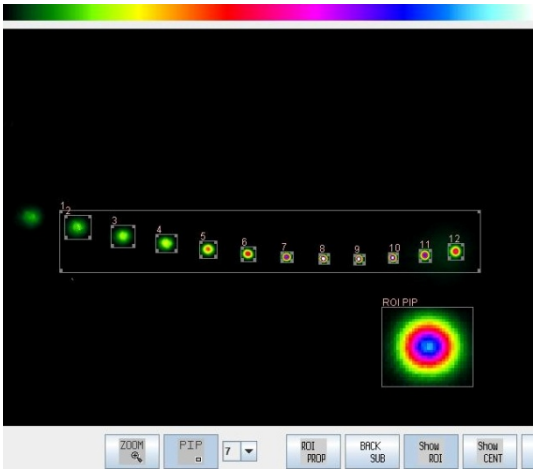
The following image shows the level of background

when an iris is placed between the laser and the dove prism:



Clearly the background has been significantly reduced but not completely eliminated. One could improve this by moving the iris after the focusing lens. Another option would be to move the laser farther away from the optical setup provided the space is available.

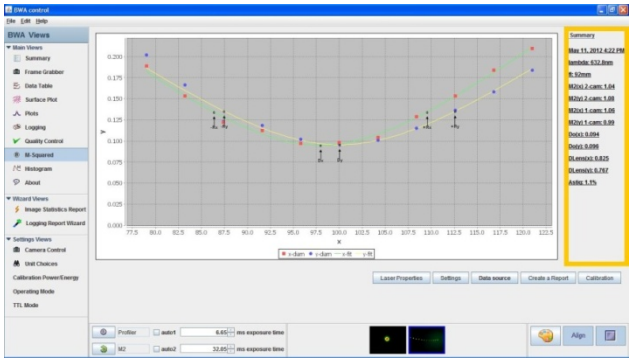
We moved the laser back about 350mm away and kept the iris in place and the following is the result after this change:



Clearly the level of background is dramatically reduced but not completely eliminated. We could move the laser further back or move the iris further forward. Another option is to insert into the BWA-CAM filter cartridge an interference filter which will pass the laser's wavelength but block all other wavelengths visible to the camera. This technique is required on all fiber laser systems as the pump wavelength passes through the BWA-CAM's Fabry-Perot etalon system as the pump diode wavelength is typically in the 970nm to 980nm range and shows up as an intense, large, first spot.

The main region of interest could as well be adjusted to remove the first spot from the analysis and this is an acceptable option as well that remove that data point from the measurement analysis. The next image shows the result after a filter is placed into the beam path. In this image there is no evidence of biased background noise.

Paying attention to laser distance, placement of an iris or the use of an optical filter will help provide a more accurate and meaningful beam profile measurement of the laser's beam waist and resulting M-squared value.



For additional information, contact a Haas Laser Technology sales representative **(973) 598-1150** or visit our website www.haaslti.com

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Specifications subject to change without notice. Consult a Haas Laser Tech engineer for the latest specification changes or any additional assistance.