Re: laser optics design

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- *From*: Jamie <jacarter3@xxxxxxxxxxxxx>

- *Date*: Wed, 25 Jul 2007 07:54:09 −0700

I am posting this again as it didn't appear to appear in the news group...

The impact of the laser (coherent beam with a Gaussian amplitude distribution possibly with higher order Hermite or Laguerre modes) effects depends greatly upon the type of optics and the application. General practice is to design the optical system using standard optical design methods using a Gaussian pupil apodization that represents the anticipated laser size. Generally I use a set of wavelengths that include the laser wavelength but add two lines close to and on either side of the laser wavelength to minimize dispersion unless I know that the laser will give an exact the wavelength (or wavelengths for multiple line lasers like Argon of Krypton plasma lasers) due to a known energy band gap. Semiconductor lasers (laser diodes) can give a range a wavelengths depending on doping variances (in the fabrication process, wafer to wafer) and due to temperature variation.

The optical system should perform as "diffraction limited" for all configurations of the optical design especially for "pre lens" scanner systems. Post lens scanners where the scanner (galvanometer of polygon, etc.) probably have only one configuration unless a variable beam expander of focus shifting configuration set are employed. After ensuring that the optical system is diffraction limited for both design residuals and optical fabrication and alignment tolerance residuals, the system should be assessed for its Gaussian beam behavior.

Most modern optical design programs have a Gaussian beam analysis feature nowadays. This feature will create a paraxial expansion about the chief ray and perform an ABCD matrix type of calculation that gives the spot size, beam curvature, waist size and waist location in both axes and for every surface in the prescription. These results should agree with your design intent if the system is designed properly. Often some iteration may be needed between the geometrical design and Gaussian analysis.

Two thing t note about laser system design and Gaussian beam characteristics:

1] There are just to types optical systems, focal and not focal (afocal). Afocal systems that are diffraction limited have Gaussian beam characteristics that are identical to the geometrical characteristics. The magnification and imaging of waist through the afocal black box is identical to the geometrical magnification and pupil imaging. For focusing systems, the focused laser waist will deviate from the geometric focus and that gives he need for the Gaussian analysis.

2] If the system is NOT diffraction limited, the Gaussian analysis is meaningless. This is the single most frequent problem that beginners have with designing laser systems.

I have more tips and tricks, but these must wait until I have more time to give to writing them down.

Hope this helps.

James Carter
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On Jul 25, 12:02 am, kan <kanikpalo...@xxxxxxxxx> wrote:

> hello
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> I am a new fellow in this field.
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> Please help me out suggesting which software to use for designing laser systems, or gaussian optics systems.
>
> is there any good books which deal with the problems of gaussian optics design?
>
> Thanks
>
> Kanik

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