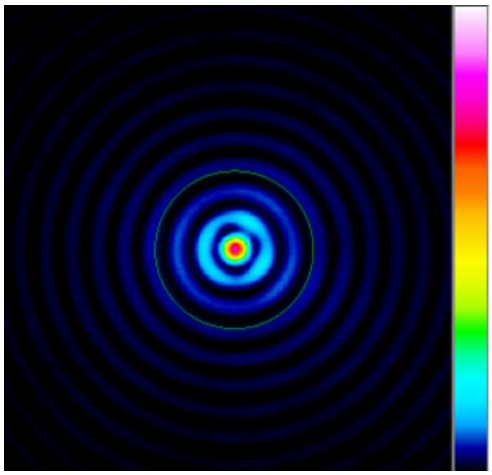
Beam Profiling At A Glance

Many industries rely on lasers to provide high-quality, repeatable results at scale. From designing a new process, to validating designs and troubleshooting existing optical trains, beam profilers help you understand more about your lasers and develop more effective processes with less downtime.



What does a beam profiler do?

Laser beam profilers quantify the spatial relative intensity of a beam at a given plane - **think of it as an intensity map of your beam.** Beam profiles are also often represented as 1D plots along a single direction.

What is a beam profiler used for?

Detailed information about your laser can be extracted from beam profiles. Diameters, beam shape, beam propagation behavior, quality/M^2, and much more. A beam profiler is the Swiss army knife of your laser characterization setup.

What can a beam profiler measure?

Some parameters include:

Diameter – Clip level ($1/e^2$, FWHM, or custom), enclosed power, and ISO11146 diameters

Centroid locations – Relative or absolute centroid measurement with four flexible centroid definitions

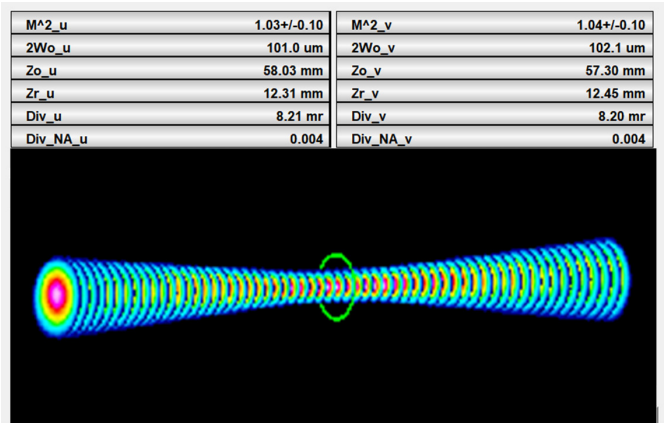
Focal Plane Location – Easily quantify focal plane location and drift with automated DataRay M2DU stages.

Divergence – Either with a single profile or multiple profiles at different Z planes

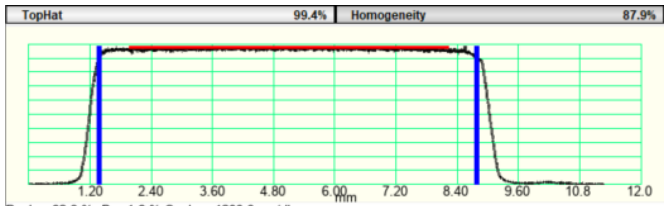
M^2/Quality – Quantify M^2 quickly with automated M^2 measurement systems

Beam Shape – Gaussian and top-hat fits, homogeneity, edge steepness, identify hot or cold spots

Track Parameters – Strip charts and data logging – track important parameters over time



Multi-plane measurement for M^2, pointing, divergence and focal plane location.

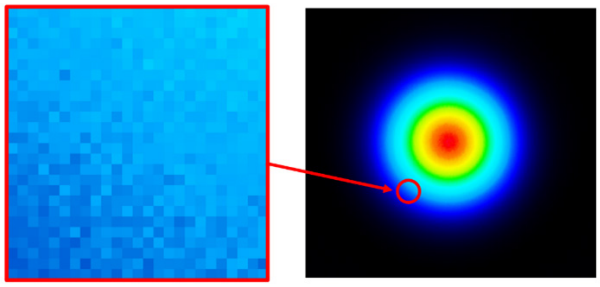


Top-hat fit and homogeneity

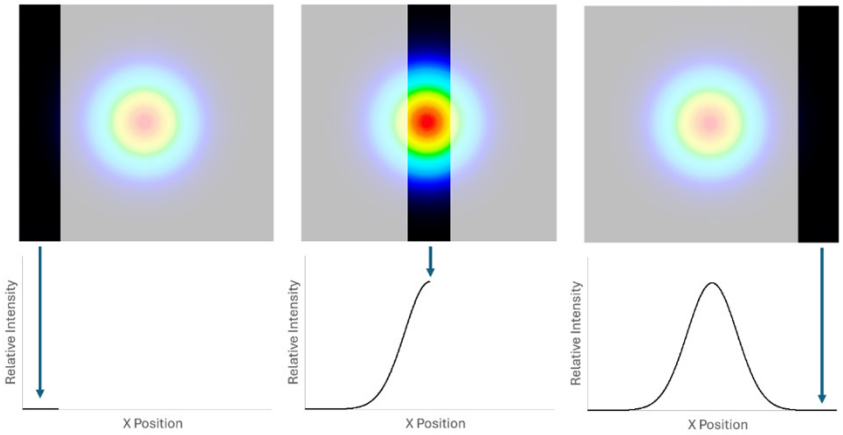
How do beam profilers work?

There are two fundamentally different types of beam profilers: scanning slit devices and camera-based profilers.

Camera profilers utilize an array of pixels, each of which provides a discrete measurement of relative intensity. The image formed by this camera image is a true 2D beam profile. Anywhere along this image, the data from a line of pixels provides a true 1D profile.



Cameras provide pixel-by-pixel true 2D beam profiles



Scanning slit profiles provide integrated 1D profiles

Scanning slit profilers use two slit-shaped apertures that are mechanically moved across the beam in X and Y. The light passing through the slit is collected by a single-element photodetector. All the light passing through the slit at a given slit position provides a single relative intensity point, so these are integrated/ summed profiles.

How do I choose a profiler that is right for my application?

When choosing a beam profiler, several application details will narrow down options quickly.

Wavelength – Do I need a broad wavelength range system or a limited spectrum?
Beam diameter – Is my beam small (a few microns) or is it larger, in the mm range and above?
CW or pulsed – Do I have a CW (continuous) or a pulsed beam?
Power/energy – If CW, what is the average power? If pulsed, what is the repetition rate, pulse energy, and pulse width?
Required measurements – What are you trying to achieve with a profiling system?

DataRay has specialized in laser beam profiling systems since 1988. Our team of profiling experts with decades of experience is happy to discuss your application and recommend the best solution for your beam profiling needs. Reach out to us today at sales@dataray.com or +1-831-215-2200.