

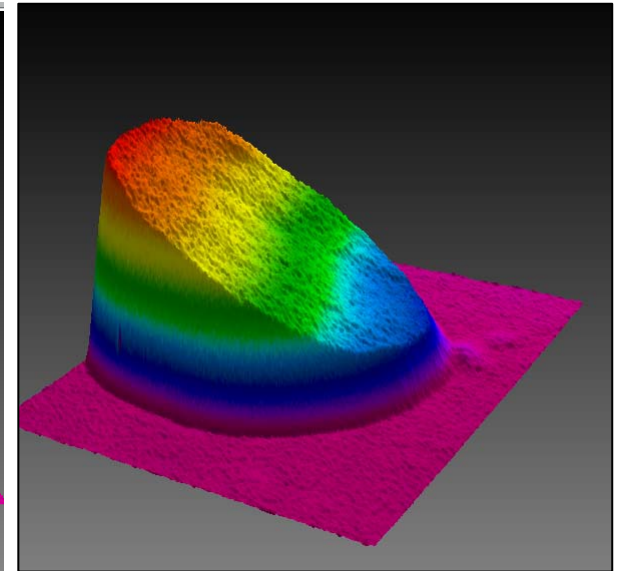
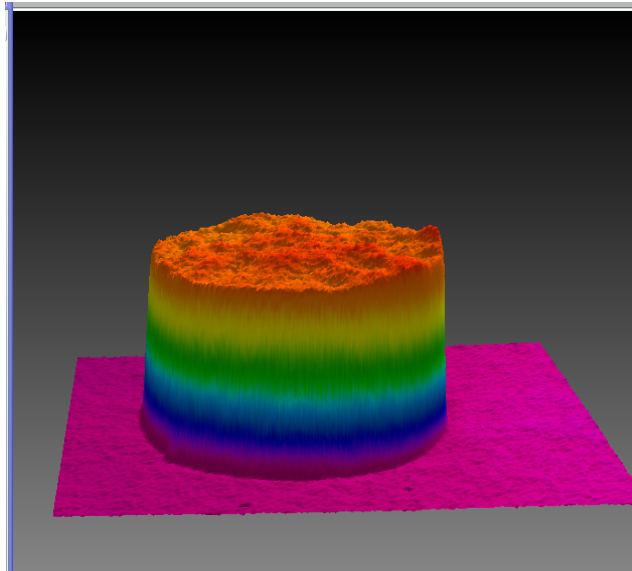
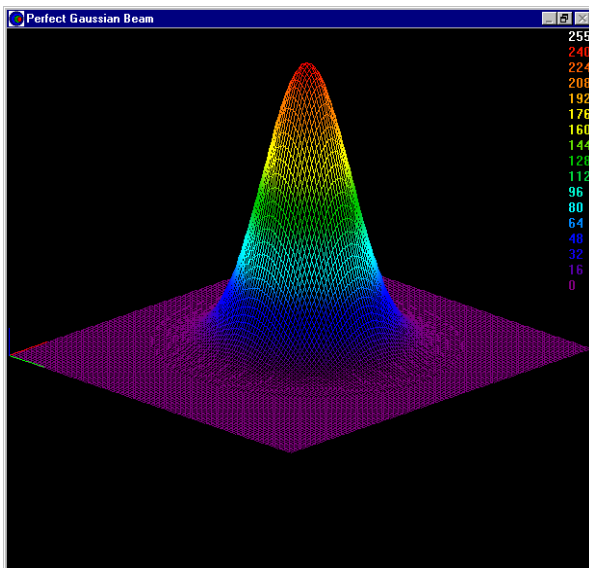
Death Of The Mode Burn

A NEW METHOD
to Assure the Performance of
High Power CO₂ Lasers



PROBLEM:

- Quality Cutting, Marking, Drilling & Ablating Require More Than Consistent Laser Power
 - Example: Gaussian for cutting, Flat-top for welding
 - They can easily have the same average power but different spatial distribution



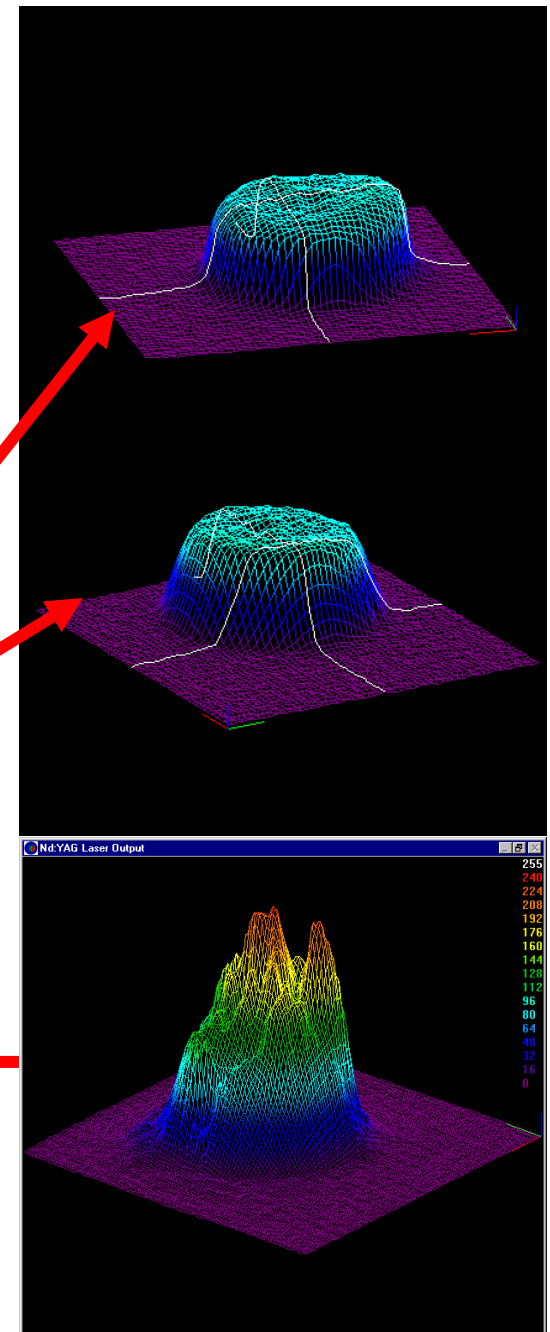
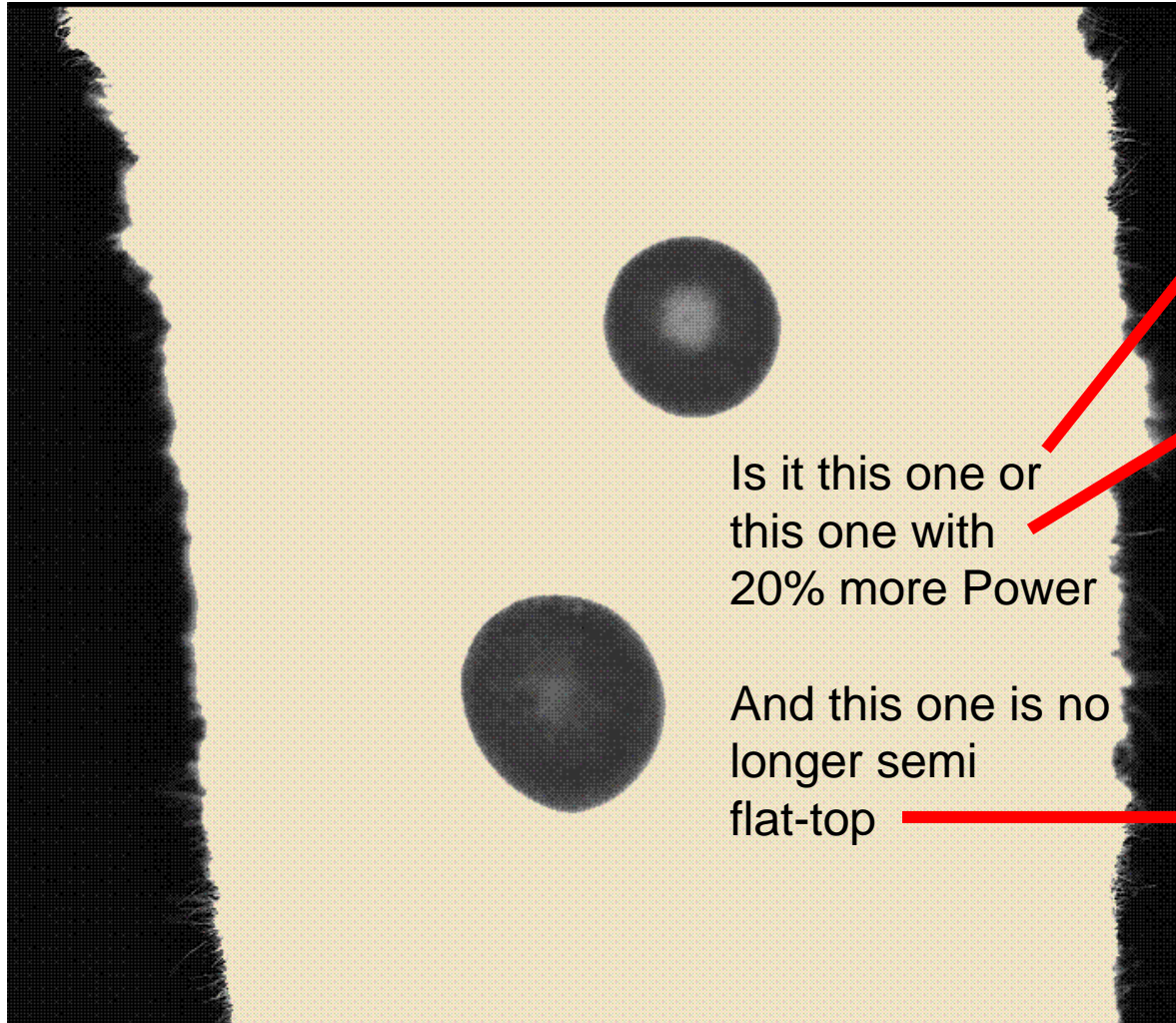
Industrial, High Power CO2 Lasers Need to be Profiled

- There are Two Distinct Ways to Measure Spatial Distribution
 - Non-Electronic
 - Electronic

Non-Electronic

- Burn paper
 - + Gives the rough order of magnitude of the beam size
 - + Can show some structure
 - Only capture short burst
 - Dynamic range of 3; unburned, burned, ash
 - Not sufficient for any quantitative numbers
 - Can not show significant hot spots or holes in the beam from misalignment of the laser cavity

Why Burn Paper Tells You Very Little



Non-Electronic

- Fluorescent Cards

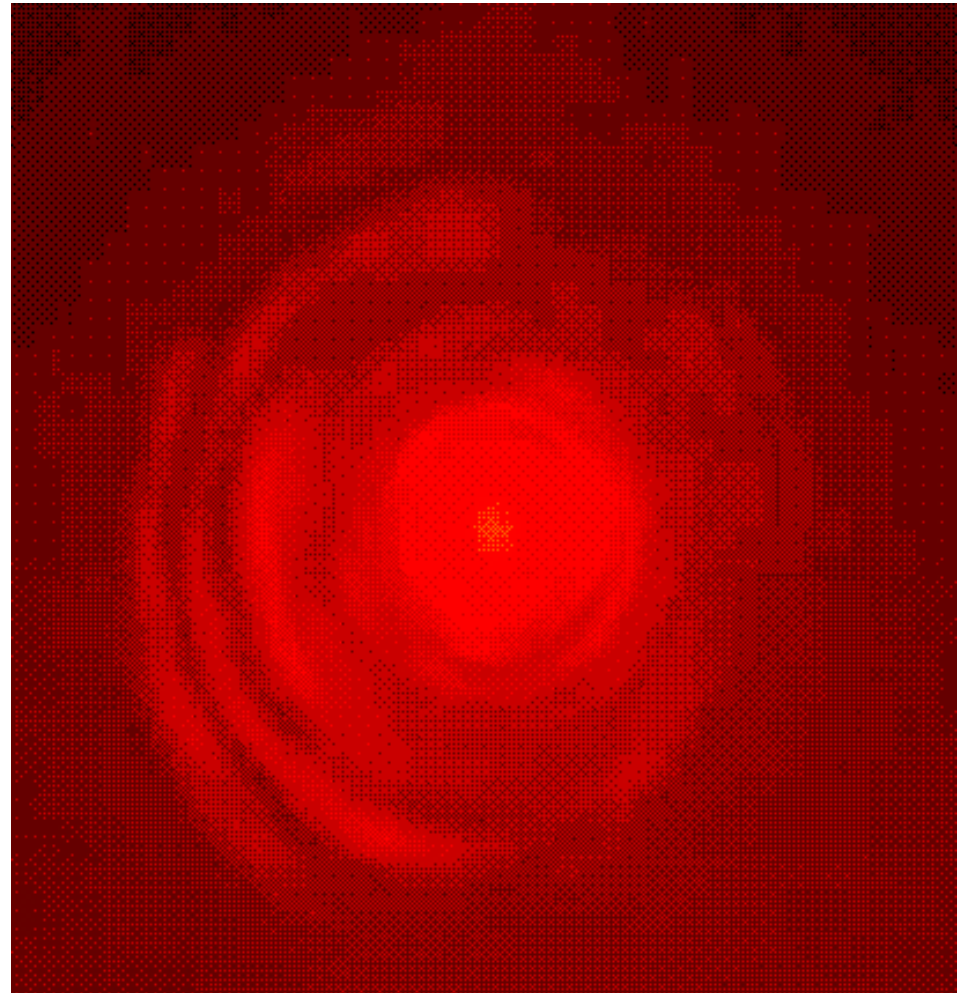
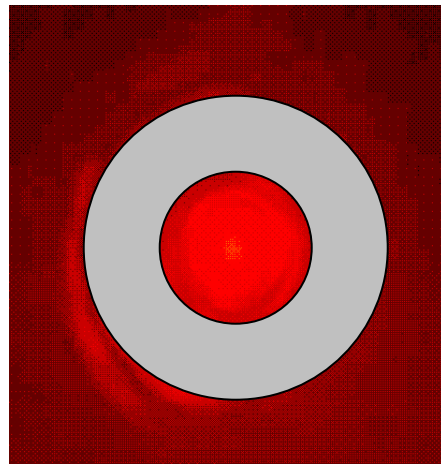
- + Only qualitative

- ✓ The eye is a logarithmic detector and can see many orders of magnitude in signal intensity
- ✓ Even when a good Gaussian beam is present, the eye will give the impression that the beam is much larger than the measured width, often by a factor of 3
- ✓ The eye cannot discern changes in beam intensity that are smaller than a factor of 2-10

Why Fluorescent Cards Tell You Very Little

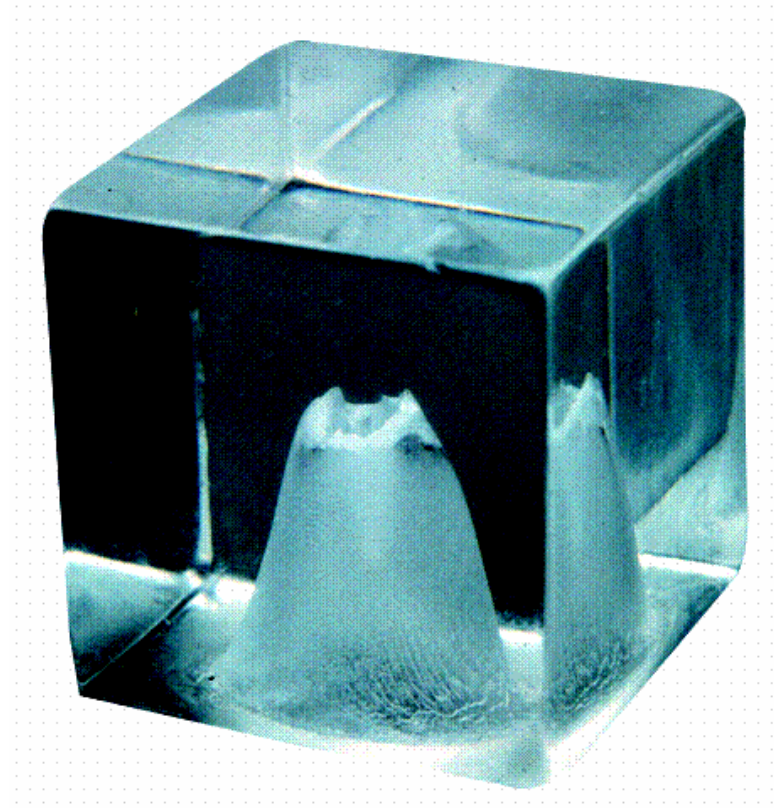
- Cannot be used in high power CO₂ applications due to safety issues

In this example all Power in the donut area is only 1% of the total power. It doesn't look like that to your eye



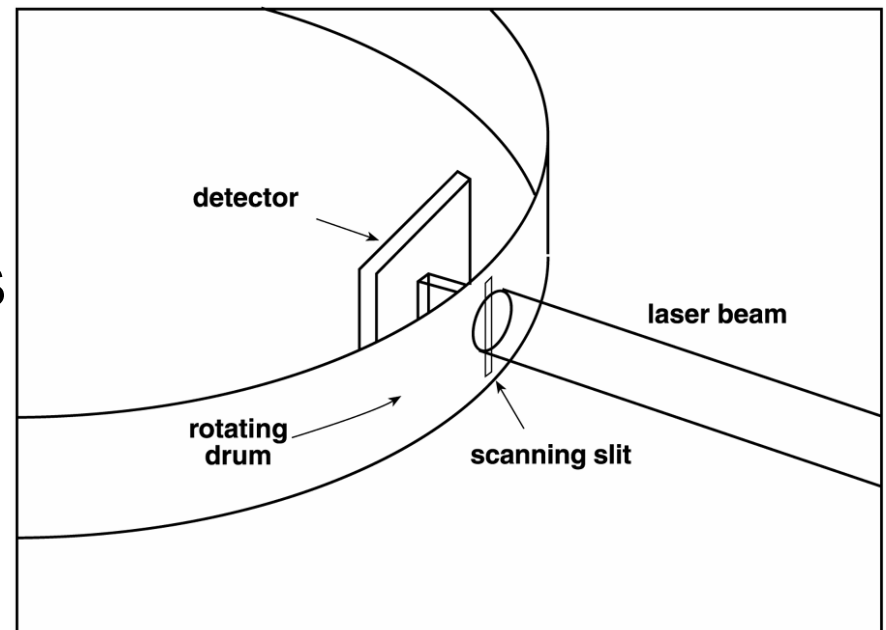
Non-Electronic

- Acrylic Mode Burns
 - + Works well for CO₂
 - + Qualitative
 - + Can show structure
 - Creates toxic fumes
 - Only shows average over time
 - Time consuming to make
 - Very rough quantitative measurements



Current Electronic Technology

- Scanning Slit & Pinhole Devices
 - + Quantitative
 - + One image every few seconds
 - 2D image built from 1D measurements
 - High power requires attenuation
 - Micron- sized pinholes not conducive to industrial use



Current Electronic Technology

- Spinning wire device

Similar to Pinhole but can withstand high powers without attenuation

± All the same +/-'s as scanning slit and pinhole devices

+ Can see focus spot

- Expensive

Current Electronic Technology

- Camera-Based Systems

 - Pyroelectric camera array

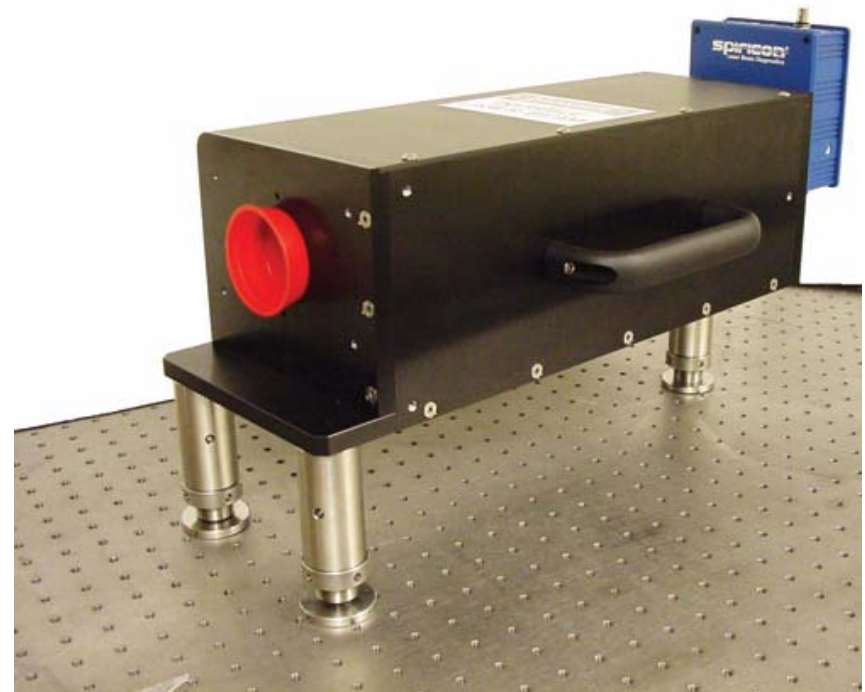
 - + Real-time image acquisition and display

 - + Quantitative

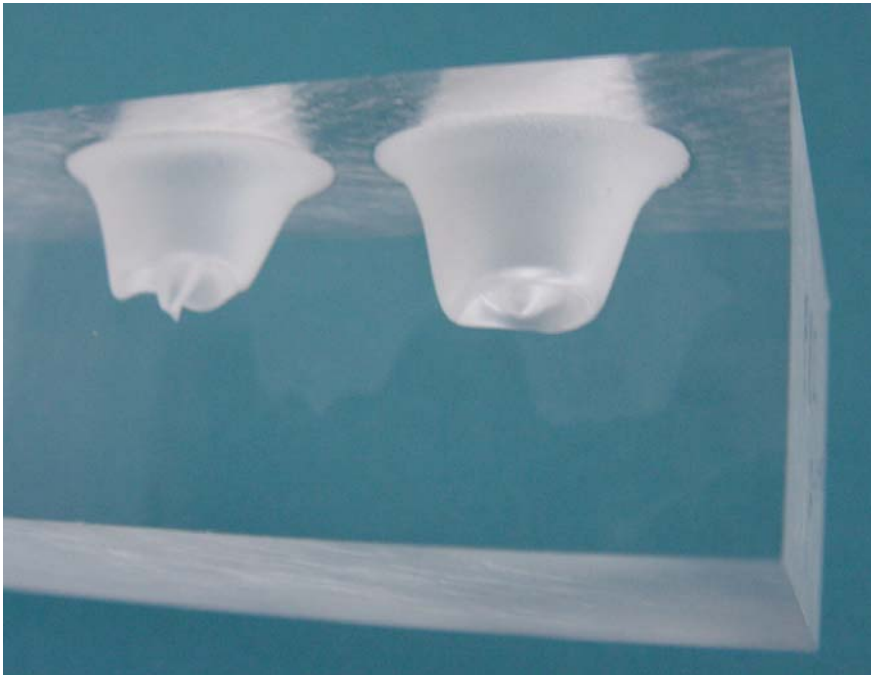
 - High power requires attenuation

 - Delicate equipment

 - Expensive



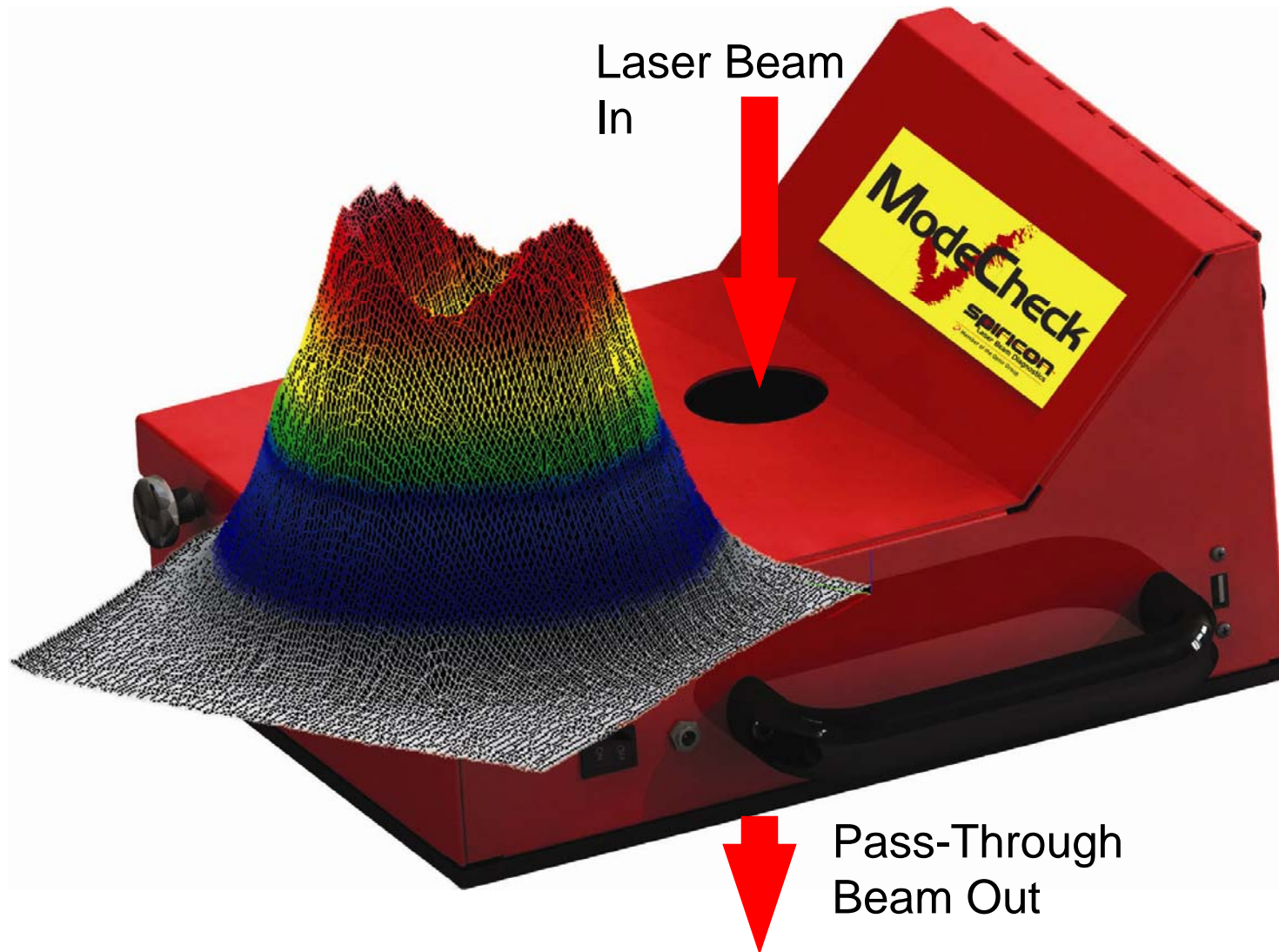
Today an Acrylic Mode Burn is the Most Widely Used Method for Checking the Spatial Distribution of a CO₂ Laser



Need a System That Can Replace Acrylic Mode Burns, that is

- Not Hazardous to the operator
 - Eliminate toxic fumes
- Low cost to purchase and maintain
 - Eliminate buying blocks of Acrylic
- Simple to operate yet industrially rugged
 - No vacuum or high pressure air hoses
 - Fully portable
- Electronic storage of the results
 - Eliminate storage and warehousing of mode blocks

ModeCheck™ Industrial Beam Profiler for CO₂



Set up in Laser WorkStation

- Remove Focusing optic
- Locate beam with pointing beam or similar device
- Place ModeCheck in place
- Turn on Laser
- Instantly see, measure and electronically store the beam characteristics

Able to measure Vertical and Horizontal Beams

- Design accommodates all beam orientations
- Power Meter interface supported by the software to give **SIMULTANEOUS Power and Profile** readings

New Software to Simplify Data Collection

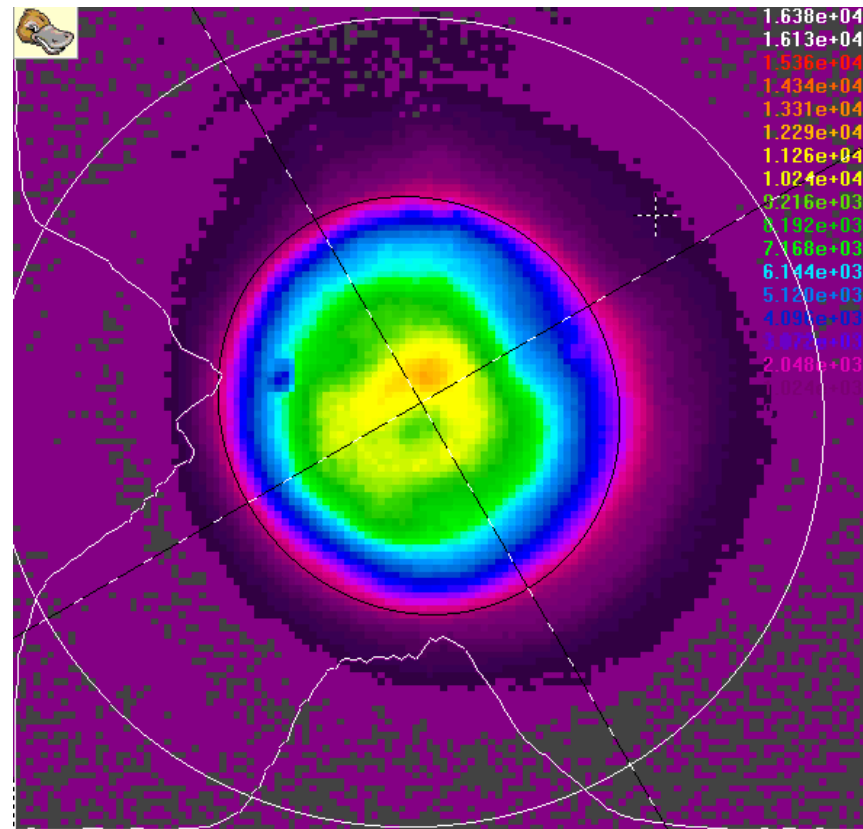
- Based on OSI BeamGage-Newest Beam Analysis Software in ten years
- Able to Simultaneously show 2D and 3D Images in Real-Time
- Basic beam width calculations eliminates using calipers on mode blocks
- Stores data for playback and review
- Designed for the industrial laser tech or plant technician

Measure your laser before processing!

- Watch as beam size dramatically shrinks during the welding process!

This shrinkage was the source of the slow welding speed

[Click to Play Video](#)

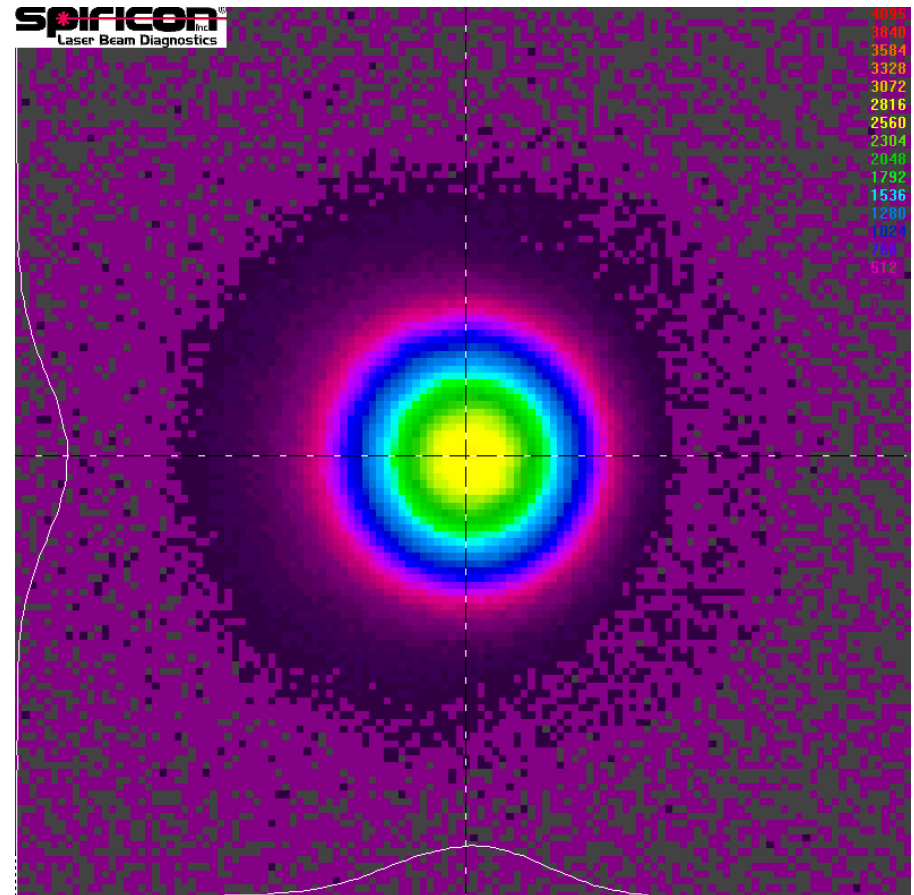


Measure your laser before processing!

- Marking date & lot codes on aluminum

Mode shifting during the process caused characters to smear

[Click to Play Video](#)

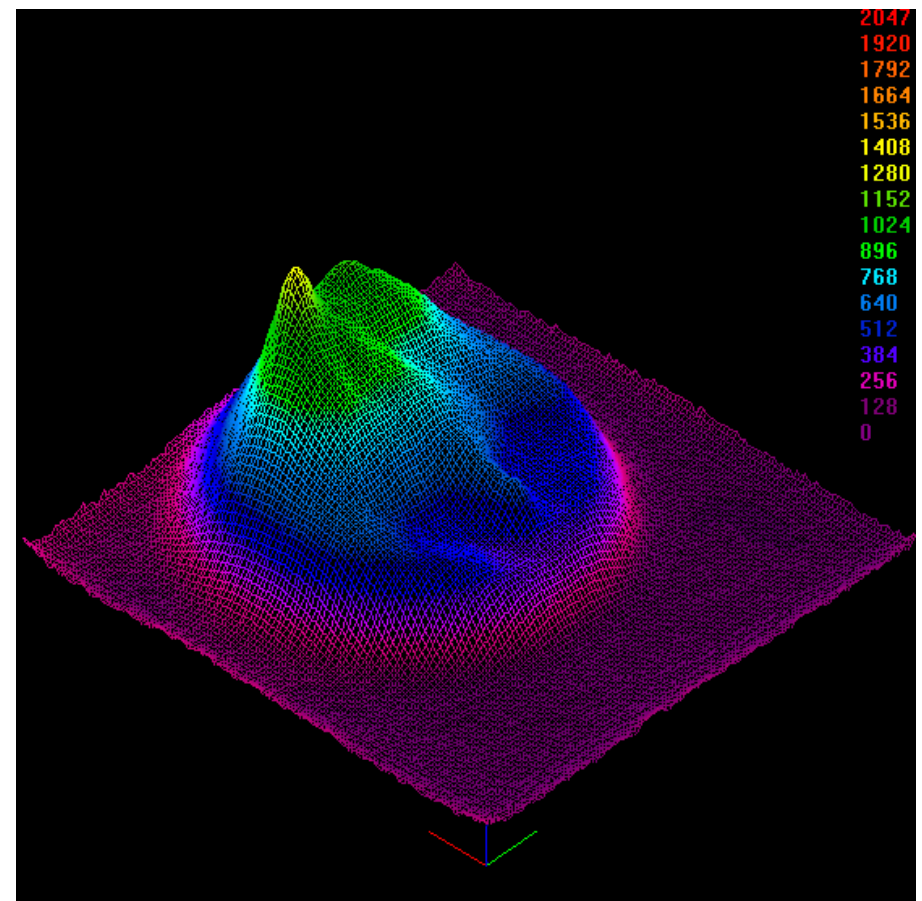


The Advantage of Real-Time Beam Profiling

- REAL-TIME information
- Able to tune in live mode
- Reduce down time
- Fast laser diagnosis

Watch as this operator tunes his laser!

[Click to Play Video](#)



SUMMARY - ModeCheck™

- A low-cost system every CO₂ laser Technician can use
- Real-time “mode burns” - eliminate hazardous vapors
- Instantaneously “see” and measure the beam - reduce set-up time between jobs
- Optimize laser efficiency - reduce cost per part
- Predict laser preventive maintenance - increase manufacturing efficiency
- Reduces scrap
- Up to 5KW CO₂

Thank You

- For more information, call:
435-753-3729
- Return to www.ophir-spiricon.com/lasercheck

