
PRIMES
COMPETENCE IN BEAM DIAGNOSTICS

FLEXIBLE FOCUS DIAGNOSTICS IN IR AND NIR WITH **FocusMonitor FM+**

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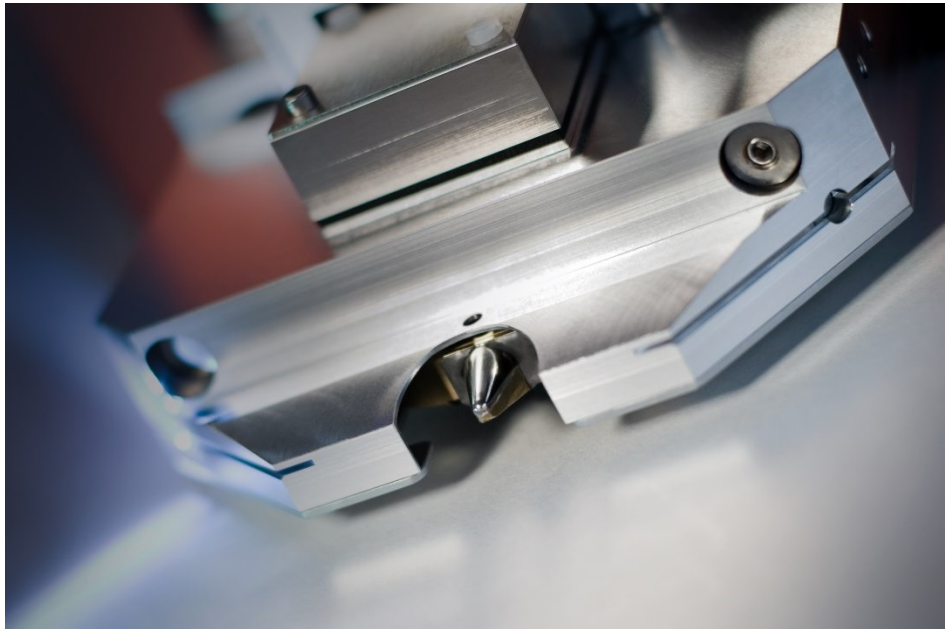
FLEXIBLE FOCUS DIAGNOSTICS WITH **FocusMonitor FM+**

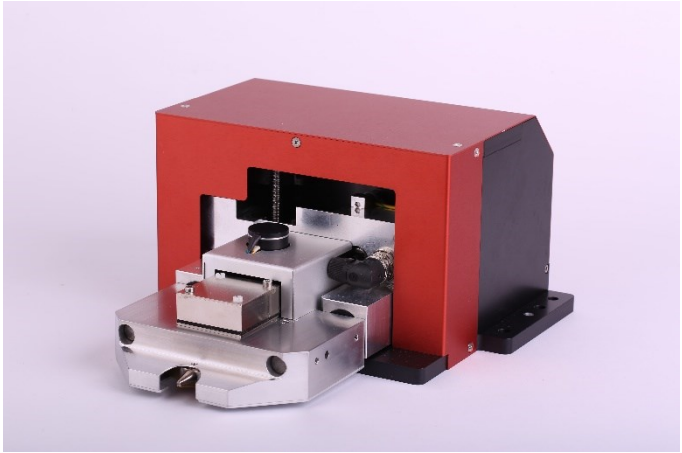
- Focus diagnosis and caustic measurement based on ISO 11146
- Opto-mechanically scanning method based on the FocusMonitor
- Improved design and new electronics in conjunction with new software



FLEXIBLE FOCUS DIAGNOSTICS WITH FM+

- New design
- New electronics
- New software
- Easier usage

Parameter	FM	FM+
Resolution	256 px	1024 px
Dynamic range	12 bit	16 bit
Interface	RS485	Ethernet 100 Mbit
Measuring window	fixed	selectable



FocusMonitor FM35

FLEXIBLE FOCUS DIAGNOSTICS WITH FM+

- New design
- New electronics
- New software
- Easier usage

Parameter	FM	FM+
Resolution	256 px	1024 px
Dynamic range	12 bit	16 bit
Interface	RS485	Ethernet 100 Mbit
Measuring window	fixed	selectable

FocusMonitor FM+

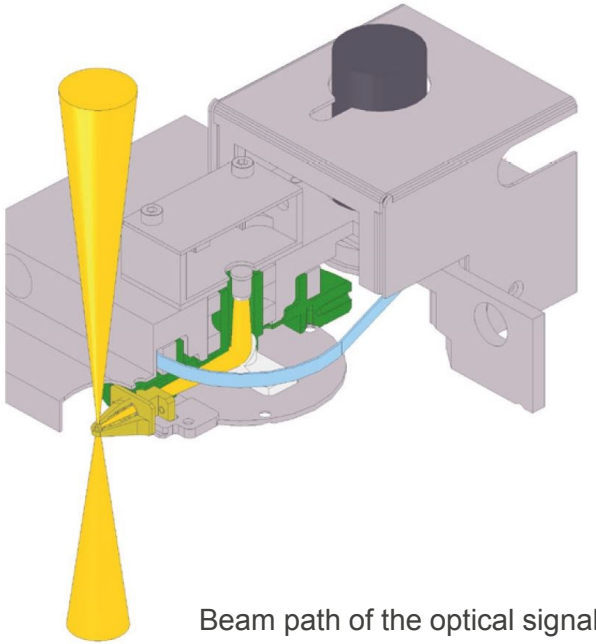
TECHNICAL DATA OF THE FM+

Measurement Parameters			
Power range		30 – 50 000 W	
Wavelength range		0,4 – 12 µm	
Detectors	DFY-PS+ (Silicium)	NIR / VIS	0,4 – 1,1 µm
	DFIG-PS+ (InAS, GaAs)	NIR	1 – 1,7 µm
	DFCM+ (pyroelektrisch)	CO_2	9 – 12 µm
Beam dimension		100 – 3000 µm	
Working range X / Y		8 x 8 mm	
Working range Z		120 mm	
Measurement time per plane		5 to 40 seconds	

FocusMonitor FM+

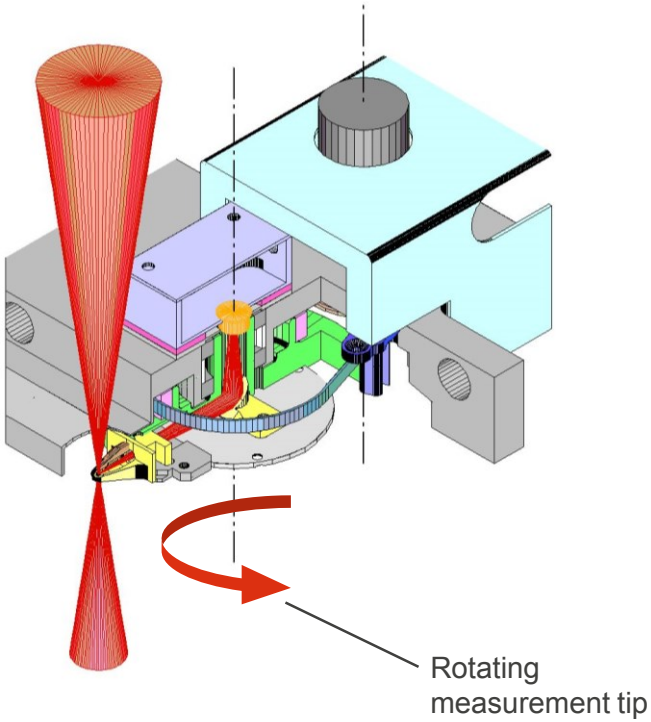
MEASUREMENT PRINCIPAL OF THE FM+

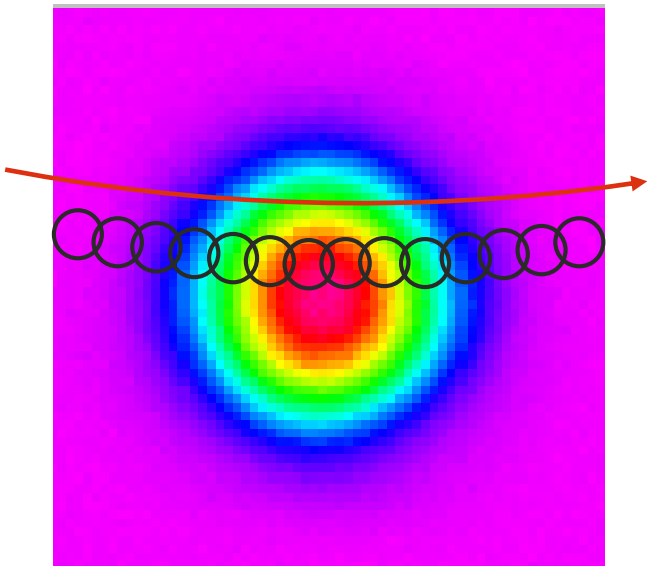
- Opto-mechanically scanning system
  - Mobile horizontal slide
  - Rotating measuring tip
  - Detection by pinhole in the µm range
- Information
  - Beam propagation
  - Divergence, beam quality (BPP, M^2)
  - Focus position in X / Y / Z



Beam path of the optical signal within the FM+

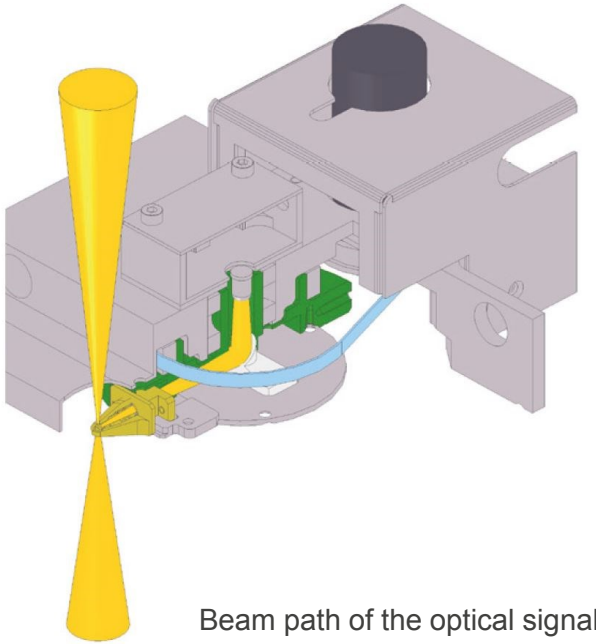
MEASUREMENT PRINCIPAL OF THE FM+





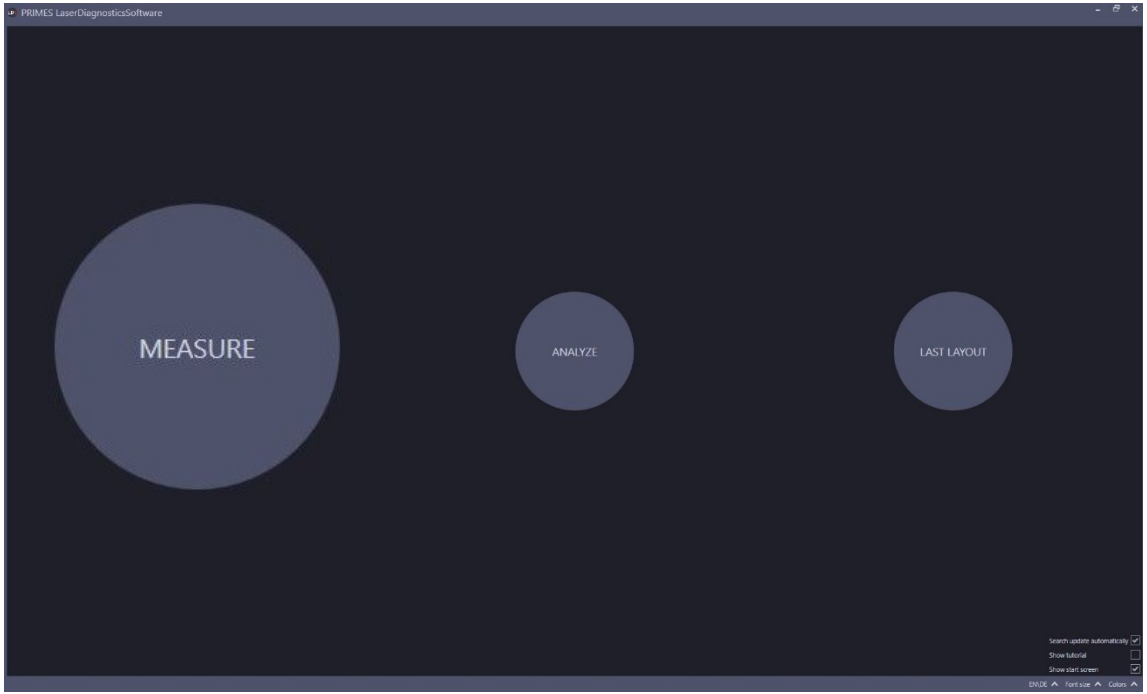
MEASUREMENT PRINCIPAL OF THE FM+

- Beam parameters
  - Focus position z_0
  - Focus diameter d_F
  - Divergence angle θ
  - Beam quality M^2
  - …
- Aberrations
  - Astigmatism
  - Contaminated optics
  - Clipping
  - …



Beam path of the optical signal within the FM+

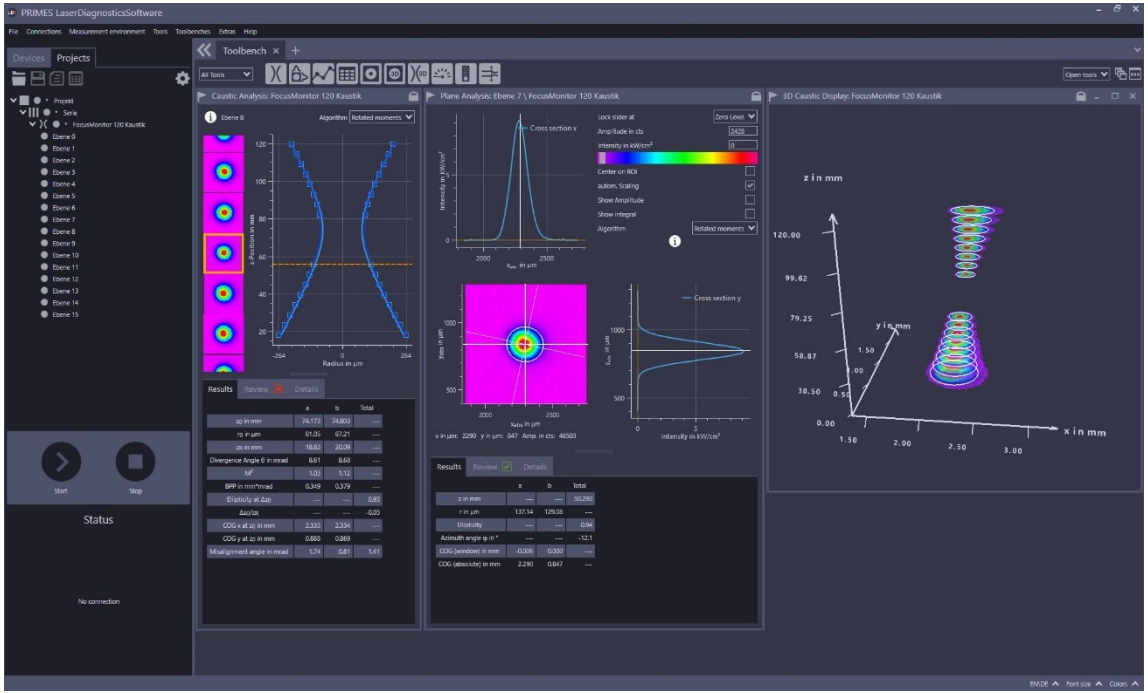
THE NEW LaserDiagnosticsSoftware - LDS



MEASURING WITH THE NEW LDS

- Automatic caustic measurement
  - Connection
  - Adjustment
  - Measurement

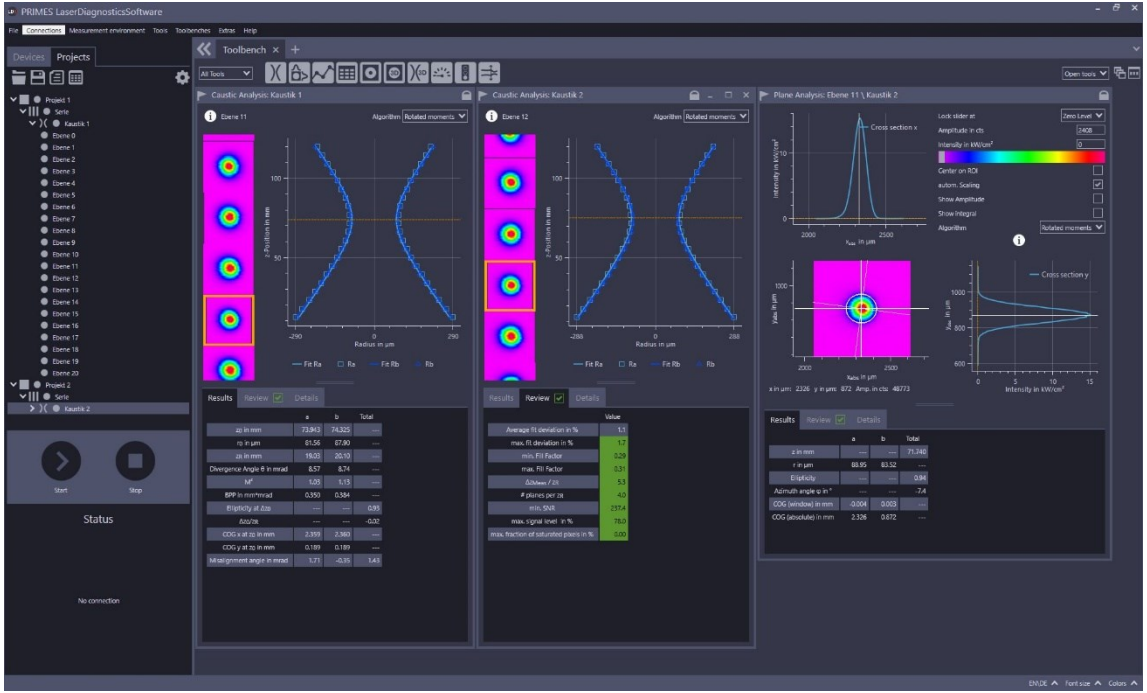
MEASURING WITH THE NEW LDS



- Manual caustic measurement
  - Comparable with former LDS
  - straightforward project management

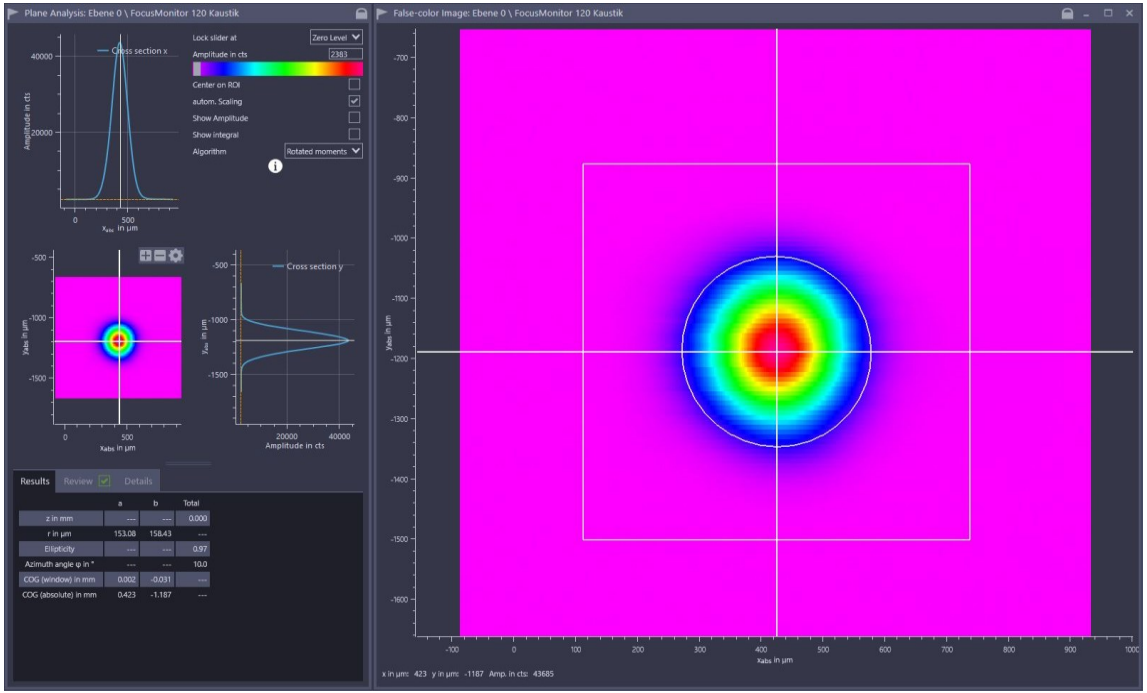
ANALYZE WITH THE NEW LDS

ANALYZE WITH THE NEW LDS



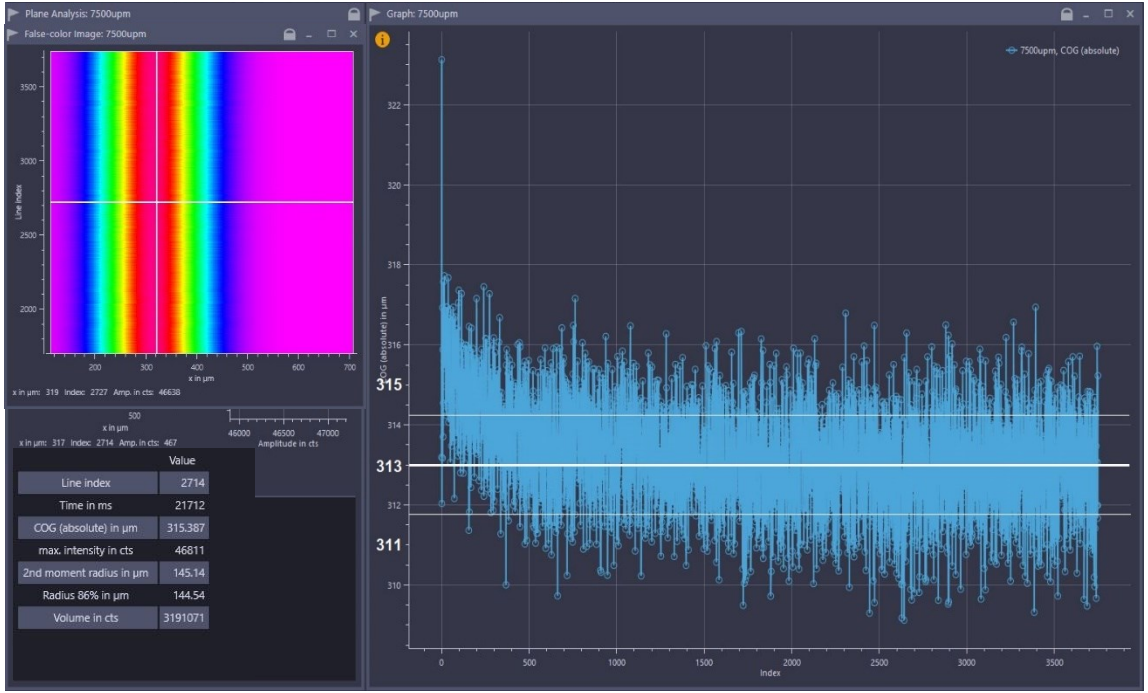
- Caustic analysis
  - Intelligent analysis
  - Handling of multiple data sets

ANALYZE WITH THE NEW LDS



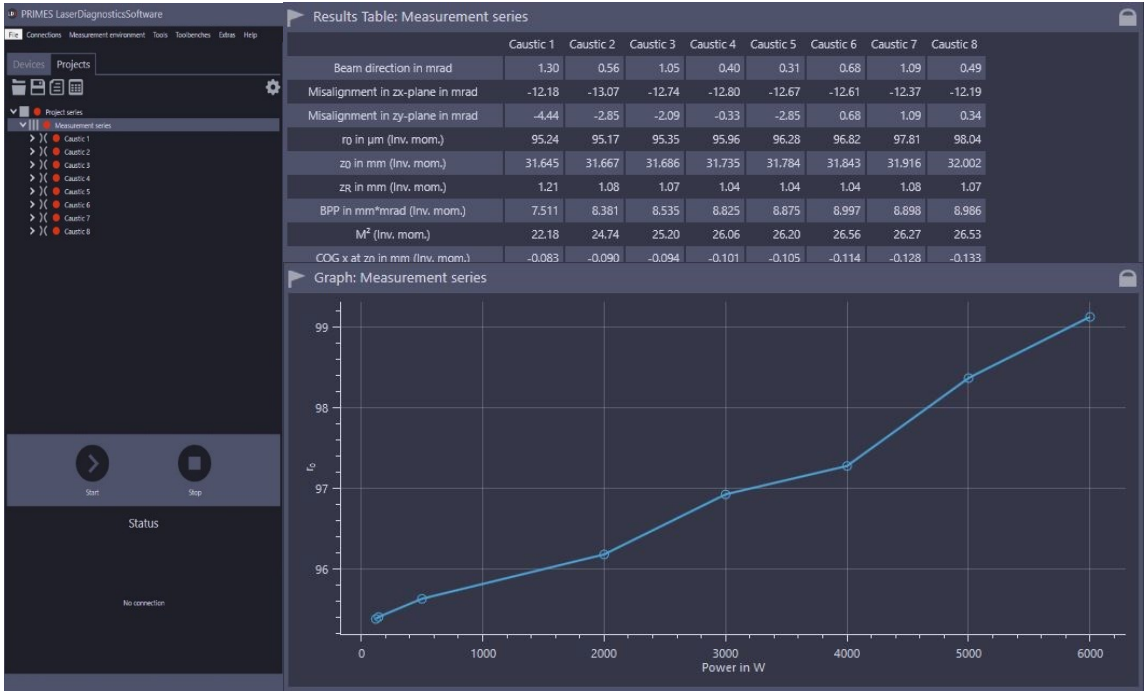
- Evaluation based on constant ROI
  - Operator independent measurement
  - Easy in use

ANALYZE WITH THE NEW LDS



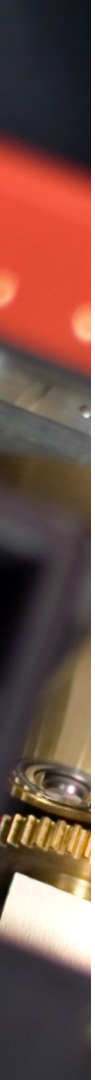
- Minimized trace offset
  - Optimized visualisation of small spots
  - High resolution

ANALYZE WITH THE NEW LDS



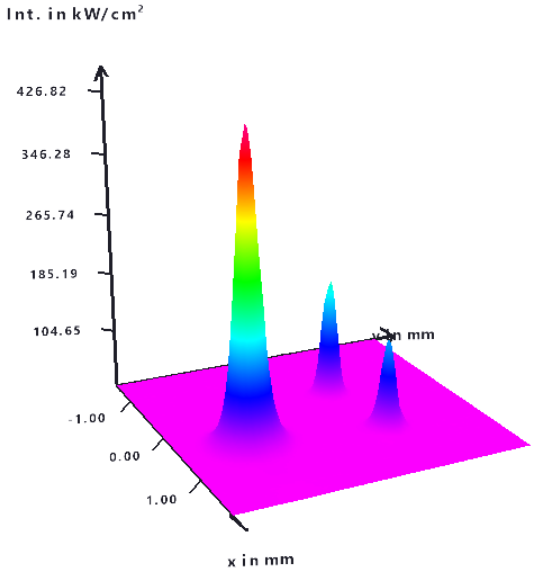
	Caustic 1	Caustic 2	Caustic 3	Caustic 4	Caustic 5	Caustic 6	Caustic 7	Caustic 8
Beam direction in mrad	1.30	0.56	1.05	0.40	0.31	0.68	1.09	0.49
Misalignment in zx-plane in mrad	-12.18	-13.07	-12.74	-12.80	-12.67	-12.61	-12.37	-12.19
Misalignment in zy-plane in mrad	-4.44	-2.85	-2.09	-0.33	-2.85	0.68	1.09	0.34
r_0 in µm (Inv. mom.)	95.24	95.17	95.35	95.96	96.28	96.82	97.81	98.04
z_0 in mm (Inv. mom.)	31.645	31.667	31.686	31.735	31.784	31.843	31.916	32.002
z_R in mm (Inv. mom.)	1.21	1.08	1.07	1.04	1.04	1.04	1.08	1.07
BPP in mm*mrad (Inv. mom.)	7.511	8.381	8.535	8.825	8.875	8.997	8.898	8.986
M^2 (Inv. mom.)	22.18	24.74	25.20	26.06	26.20	26.56	26.27	26.53
COG x at z_0 in mm (Inv. mom.)	-0.083	-0.090	-0.094	-0.101	-0.105	-0.114	-0.128	-0.133

- Comparison of measurement
  - Customizable evaluation
  - Mapping of time series



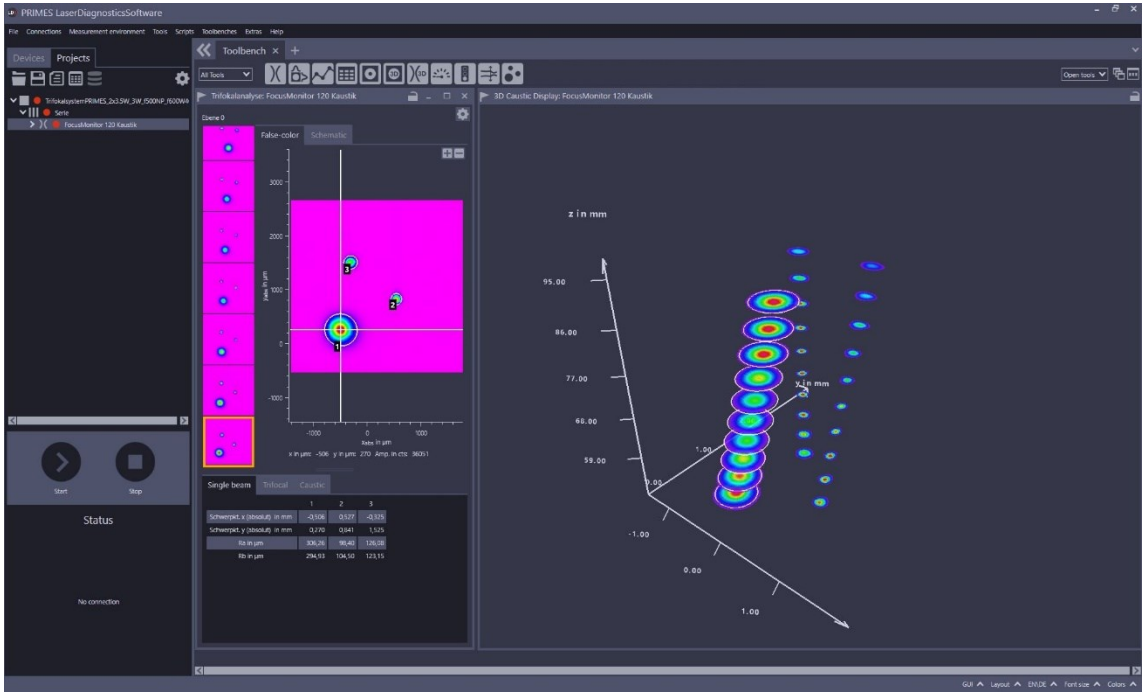
PLUGINS
FOR THE NEW LDS

PLUGIN – TRIFOCAL ANALYSIS



- Analysis for a special measurement task
  - Customized and flexible
  - Individual adaptation of the new LDS
- Practical example
  - Focus of the individual beams
  - Radii of the single rays
  - Distances between the focal points
  - Ideal feed direction

PLUGIN – TRIFOCAL ANALYSIS



- Customized LDS
  - Measurement-specific
  - Arbitrarily expandable

FLEXIBLE FOCUS DIAGNOSTICS WITH **FocusMonitor FM+**

- Higher measuring quality
  - Higher resolution up to 1024 px
  - Extended dynamic range with improved signal to noise ratio
  - Large measurement range with one configuration
  - Improved track synchronization
  - Evaluation based on constant ROI
- Higher operating comfort with new LDS
  - Automatic caustic measurement
  - Easy handling of multiple data sets
  - Ethernet - faster data transfer
  - Simultaneous operation of other devices
  - Easy alignment into the beam path

Focus Monitor FM+

THANK YOU FOR YOUR ATTENTION!
QUESTIONS?

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