LEPAS

LEPAS Light Emittance Pattern Analysis System

1. Introduction
2. What is LEPAS?
3. Market for LEPAS
4. Our products and important features
5. Future

Presented by Bertram Lohmüller

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LEPAS

High-speed 2-dimensional optical beam analysis for industrial demands

fast - real time data collection and processing

repeatable - less moving parts, software macros

reliable - ruggedized design

precise - high resolution sensors and optics for operating wavelengths

cost effective

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Market for LEPAS

Fibre optics; manufacturing, R&D

Cables

Lasers, LEDs; manufacturing, R&D

Telecommunication, Automotive,
Optical Sensors, Consumer Electronics

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Photon is our business

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Products

Optics

Cameras

Frame Grabber and Software

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Optics

Far Field Optic,
A3267

What is Far Field?

Angular intensity distribution of a light source observed at an infinit position

Optics

Far Field Optic

f-θ optic, converts divergence angle distribution to position distribution

Very high repeatability because no moving parts

Very fast because of 2-d realtime image processing

Optics

Far Field Optic

System

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Optics

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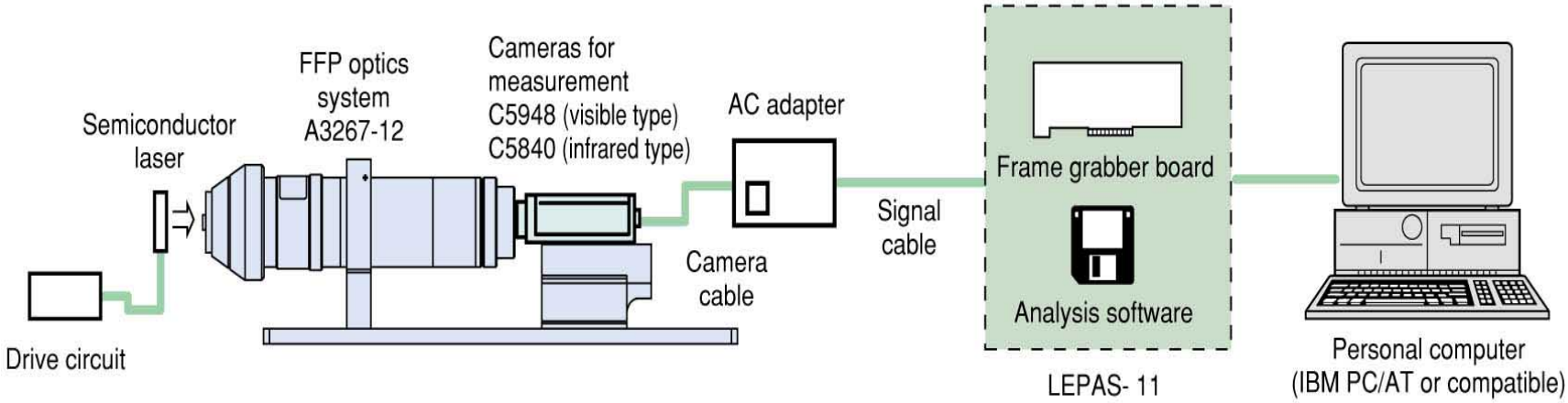
Far Field Optic

Set up



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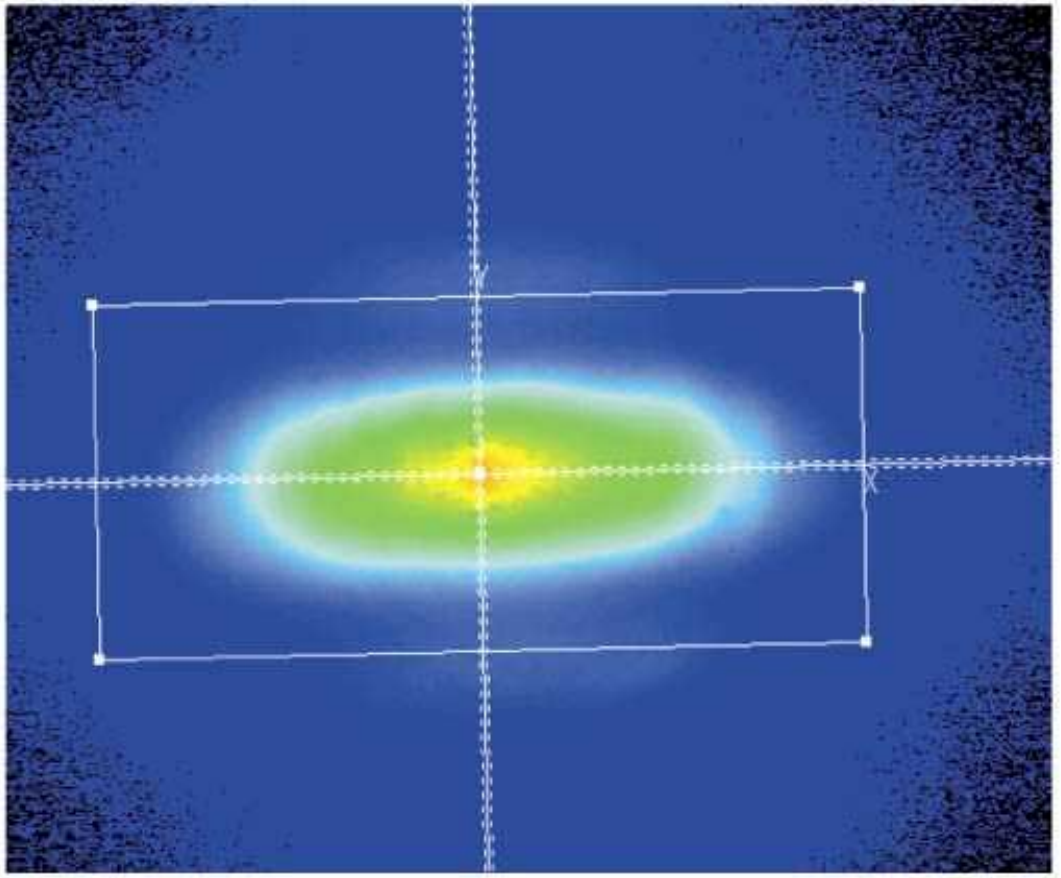
Optics

Far Field Optic

Video image



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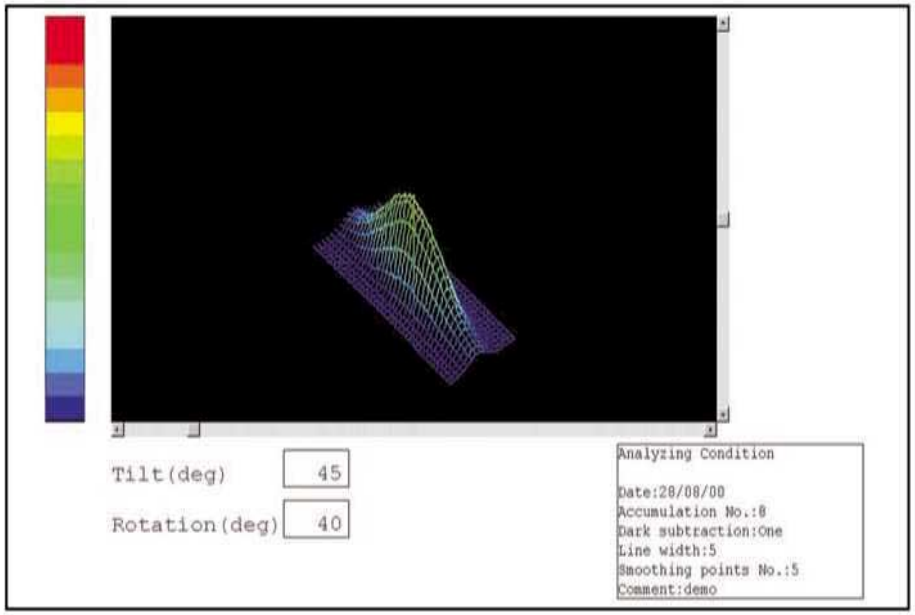
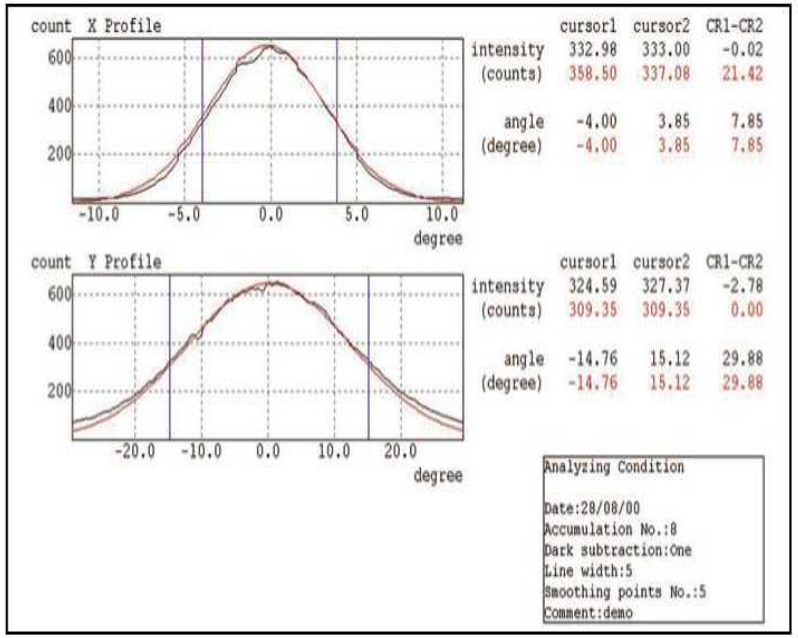
Optics

Far Field Optic

Results



	FWHM	1/e	1/e2
Peak intensity(counts)		788	
Peak position(deg)		0.20, 0.20	
Total beam energy(counts)		4874732	
Gravity position(deg)	0.36,0.36	0.36,0.36	0.36,0.36
Beam width(deg)	7.85,29.10	9.32,35.55	12.61,54.27
Beam Gauss width(deg)	8.04,29.10	10.06,34.74	13.67,48.87
Beam area(pixel2)	3712.00	6062.00	13772.00
Beam energy(counts)	1897106	2695299	4091656
Average energy(counts)	511.07	444.62	297.10
Dispersion(%)	14.75	23.39	51.49
Tilt(deg)	86.60	86.57	86.46
Elliptisity(%)	386.71	389.55	418.28



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Optics

Near Field Optics,
A4859

What is Near Field?

2-dimensional intensity distribution at the surface of a fibre end or a light source

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Optics

Near Field Optic

Objective lens,
beam splitter, magnification correction lens,
expansion relay lens

High magnification up to 2000x

Easy positioning by magnification correction lens

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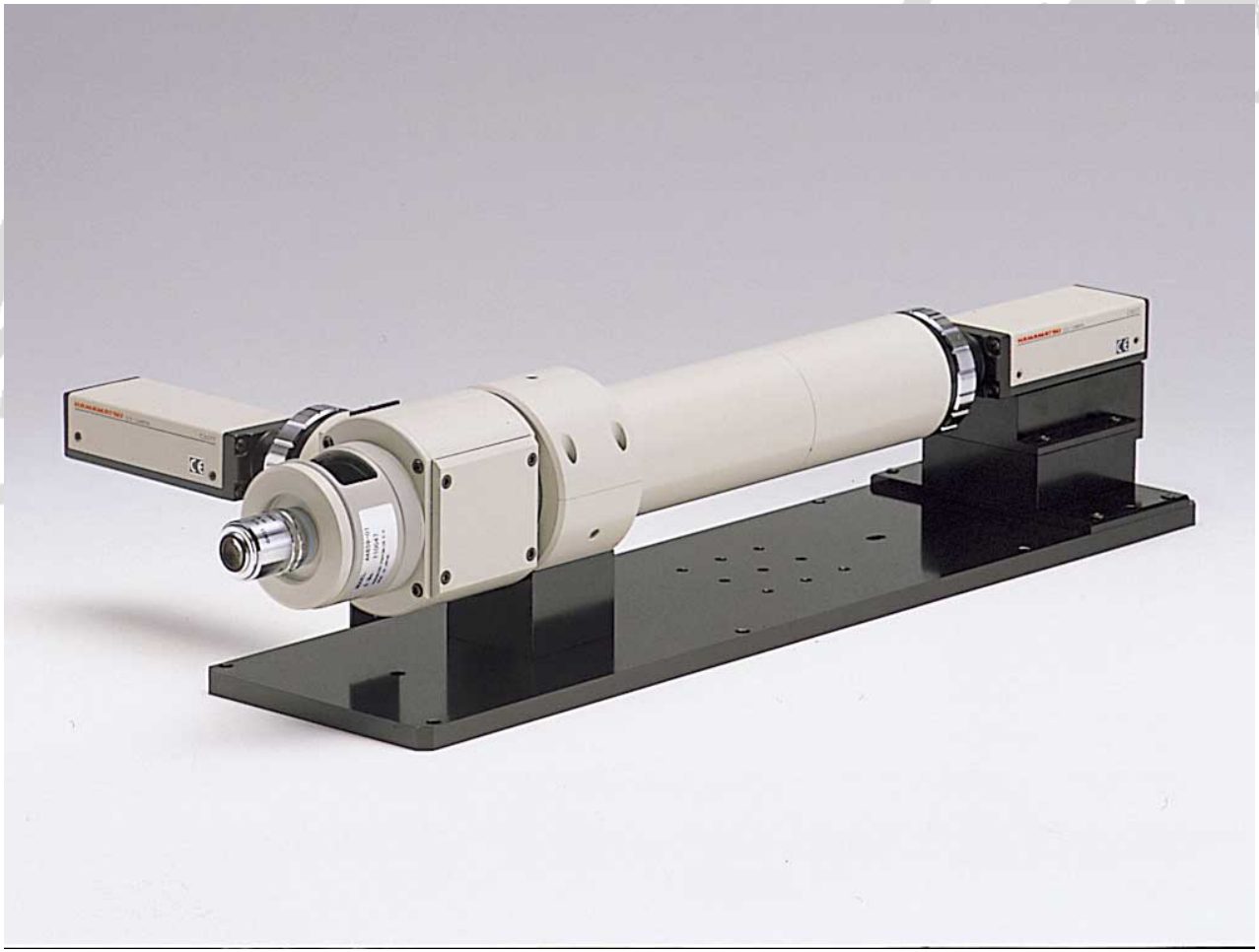
Optics

Near Field Optic



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Optics

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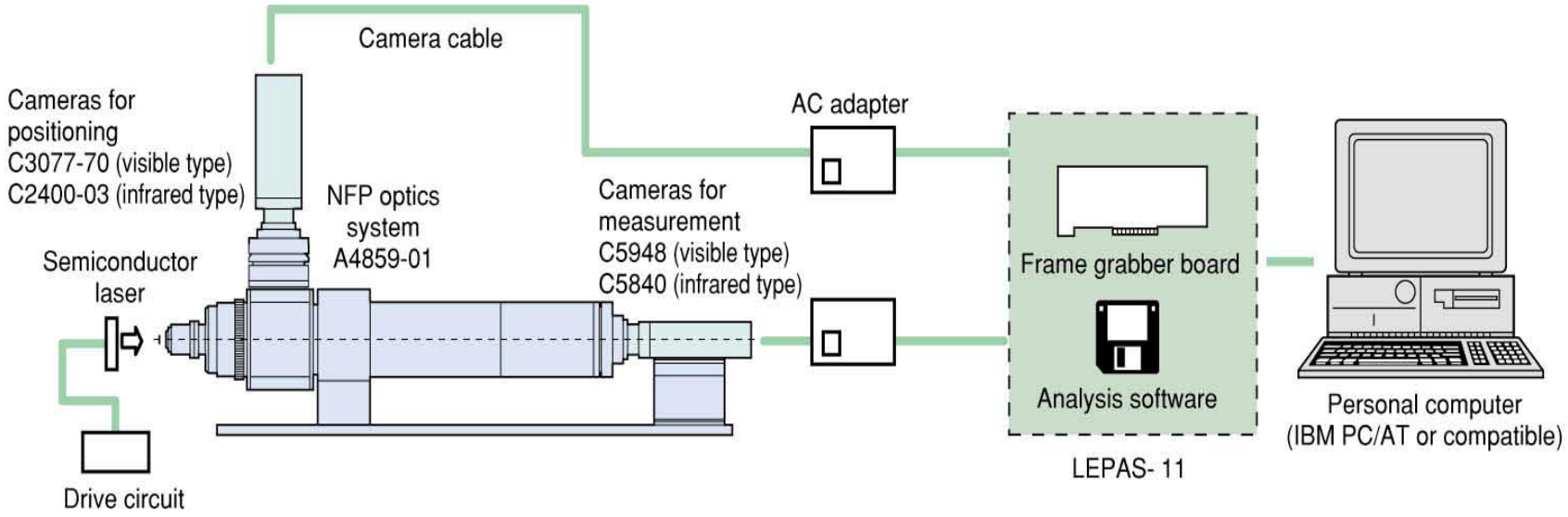
Near Field Optic

Set up



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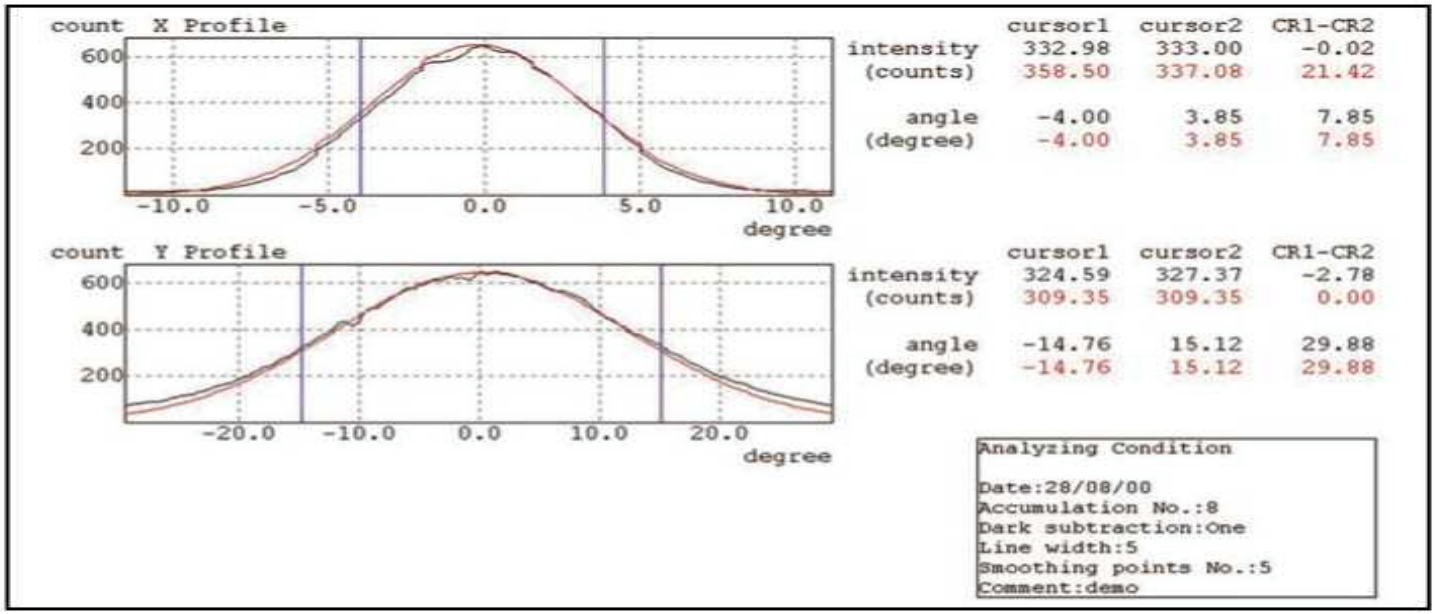
Optics

Near Field Optic

Results

	FWHM	1/e	1/e2
Peak intensity(counts)		854	
Peak position(um)		-0.61, -0.28	
Total beam energy(counts)		15871654	
Gravity position(um)	-0.53,-0.25	-0.55,-0.26	-0.55,-0.26
Beam width(um)	2.89,0.99	3.36,1.18	4.58,1.76
Beam Gauss width(um)	2.53,1.09	3.02,1.33	4.27,1.87
Beam area(um2)	2.21	3.20	6.35
Beam energy(counts)	7677368	9830534	13493308
Average energy(counts)	589.34	521.24	360.29
Dispersion(%)	18.29	26.24	53.60
Tilt(deg)	0.18	0.31	0.31
Elliptisity(%)	308.22	294.32	275.00



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Optics

M^2 Optic,
A7681

What is M^2?

Describing the propagation factor of laser beams (ISO 11146)

Calculated by $M^2=\pi D_0 \Theta / 4\lambda$

D_0 = beam waist diametre
Θ = beam divergence angle
λ = wavelength

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Optics

M^2 optic

Dual paths optic; near field optic for waist Ø,
far field optic for beam divergence

Additional positioning optic

Advantages compare to „knife edge method“:

very fast, real time processing
high repeatability, no moving parts

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Optics

M^2 optic

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Optics

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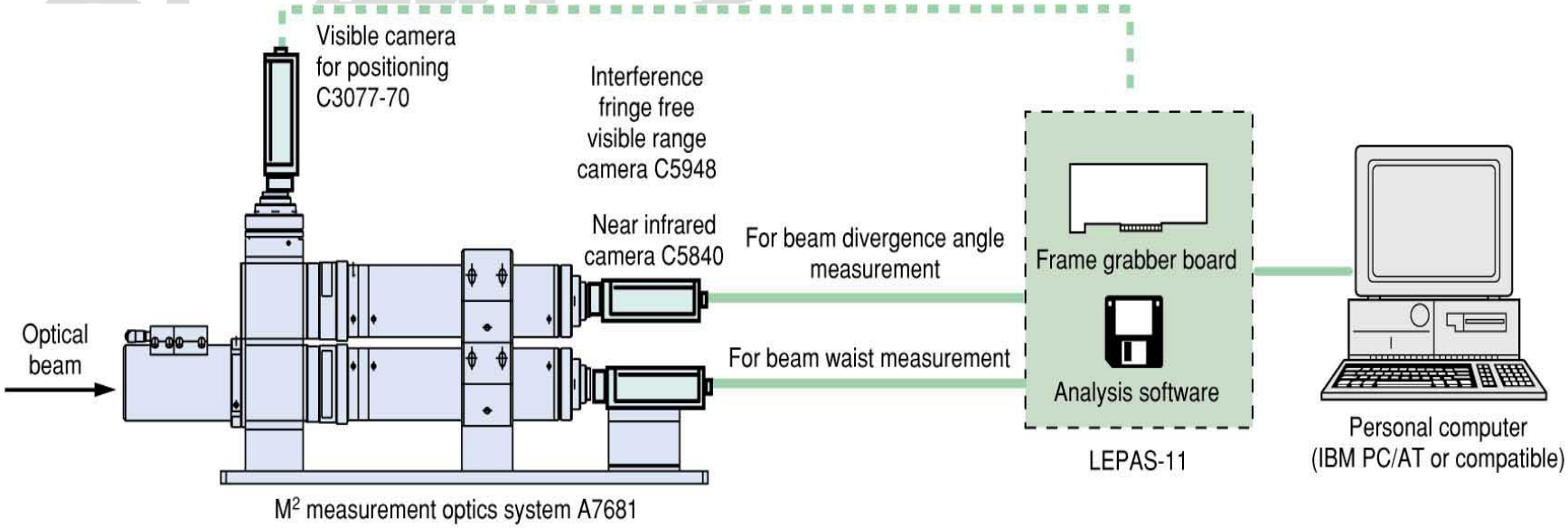
M^2-optic

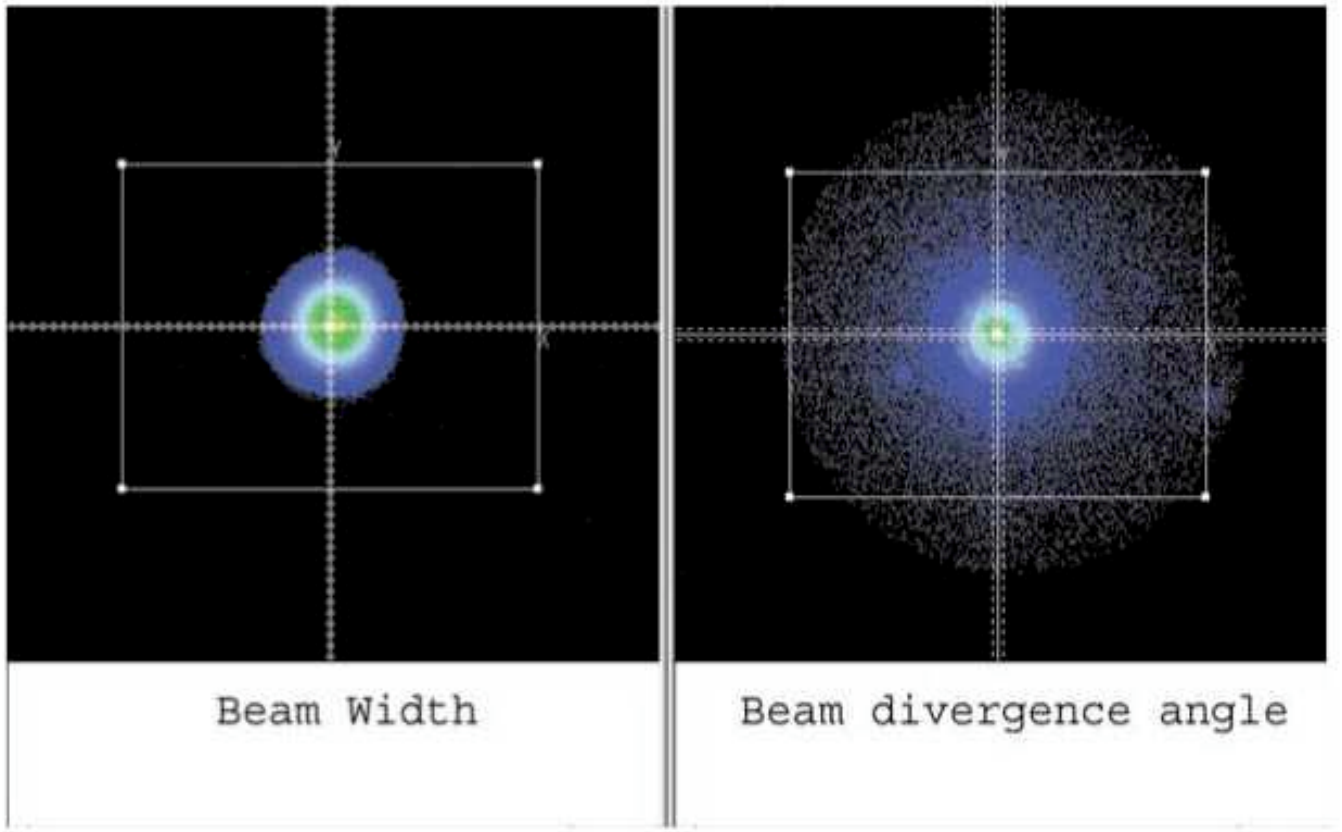
Set up



Optics

M^2-Optic

Video Image



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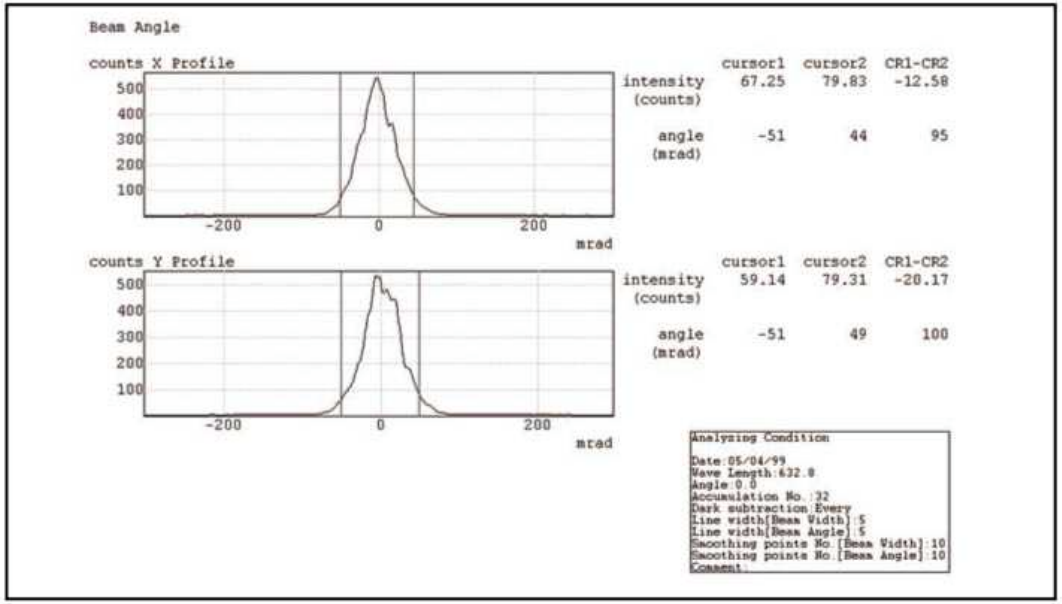
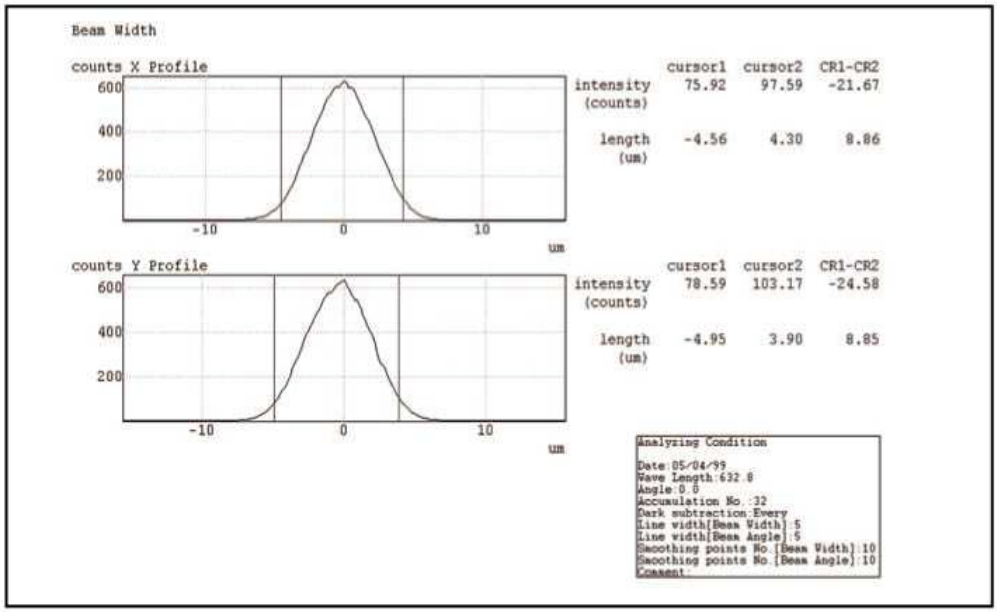
Optics

M^2-Optic

Results





	X	Y
Beam width(um)	8.85	8.85
Beam angle(mrad)	95	100
M2()	1.04	1.10

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Optics

Expanding optic **A6501** for near field measurements of

LEDs
Multimode fibres

Magnification: x50

Optics

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Lateral magnification optic **A6216** for identifying the position of:

LDs
LEDs
fibres
wave guides

Magnification: x1

Optics

FOP screen optic **A6502** for direct beam projection

Measuring area:	65mm Ø
zoom:	1/5-1/1
wavelength range:	400nm-2000nm
screen uniformity error:	<5%
spatial resolution:	100µm

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Optics

UV-VIS converting optic **A5997**
for excimer- or N^2-laser

Using phosphor screen to convert UV-light into visible light

Measuring area:	65mmØ
zoom:	1/5 - 1/1
wavelength range:	190nm-380nm
spatial resolution:	100µm
damage threshold:	10W/cm²
γ (linearity):	1

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0ptics

High Power YAG Laser optic **A6503**

With beam splitter and 3 attenuator-wheels

Aperture size:	17mmØ
Wavelenght range:	800nm-1100nm
Spatial resolution:	12µm
Damage threshold:	50J/cm^2
Attenuation values:	0,1%-100%

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Optics

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Automatic Positioning Optic **A6746** for measuring beam position and beam angles

Consisting of NFP-, FFP- and positioning-optics

Wavelength range:	630nm-1100nm
Resolution:	0,1µm
Measuring area:	120µmx160µm
Angle area:	+/- 33°

Cameras

Near Infrared CCD-Image converter Camera **C5840**

Image converter for IR-to-VIS,
attached CCD sensor for video output

Linear - quantitative intensity measurements possible

No lag - fast

Robust - reliable

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Cameras

Infrared Vidicon Camera **C2400-03**

Infrared tube camera, video output

High sensitivity

Large wavelength range, 400nm-2µm

Cost effective

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Cameras

Interference free CCD camera **C5948**

FOP (fibre optic plate) mounted directly onto the CCD chip instead of protetection sheath and filter

FOP of several hundreds of fibres gives different propagation modes on the output. The coherence is lost.

No interference pattern of coherent light between protection sheath and filter allows precise beam analysis

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Cameras

Visible CCD camera **C3077**

General purpose CCD video camera

- Compact size
- large wavelength range; 400nm-1100nm
- cost effective

Cameras

Ultraviolet CCD camera **C8000-20**

Detection of ultraviolet light

Large wavelength range; 120nm-1200nm

video output

Frame Grabber and Software

LEPAS-11 frame grabber **C7197**

High speed image transmission of up to 30 frames/s

multiple camera input of up to 3 video cameras

image accumulation function for image improvement

background subtraction

external trigger for synchronization

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Frame grabber and Software

Standard operating software for windows- 95/98, -NT

Real time monitor for online observation and alignment

Recording function for sequence storing

external trigger mode for TTL trigger

calibration mode for length, angle, gamma correction

print mode

data transfer to MS Excel

data storage of beam parameter and image

display function for B&W-, pseudo color, Gaussian fit

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Conclusion

2-dimensional intensity data collection, monitoring and analysis for fibres, lasers, LEDs

Fast due to realtime video processing

Reliable due to robust design, less moving parts

Cost effective

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Thank you very much for your attention

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