PIAS™-II

Personal Image Analysis System

Print Quality Measurements
anytime, anywhere

⇨ objective, reliable, easy ⇦

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PIAS™-II

Personal Image Analysis System

PIAS™-II – *another innovation from QEA. Our latest-model Personal Image Analysis System mobile unit performs objective image analysis better than ever, when you need it, where you need it*.

A Digital Loupe

Now your analyses can be free of the subjectivity and ambiguity of the traditional loupe. The PIAS™-II is built on international print quality standards and calibrated measurements. It is a high-performance digital microscope that changes the way we communicate about image quality. A high-speed USB interface enables real-time sharing of images, opinions and ideas. Time and distance are no longer barriers to free-flowing communication.

An advanced analytical tool for all

The PIAS™-II opens up access to the most advanced technology. Objective image quality analysis and decision-making are not just for the laboratory and a handful of specialists anymore. Product design, R&D, quality control, field service, customer support, sales and marketing – every level of the enterprise has a critical competitive interest in tools that make the difference, and with the PIAS™-II objective print quality analysis has never been easier or more affordable. Now you can observe quality, analyze quality and make important decisions anytime, anywhere.

Features Highlights

- Quantitative print quality analysis based on ISO-13660 international standard
- Spatial and density calibrated measurements
- Comprehensive library of print quality analysis tools from QEA's IAS*Lab*™ software
- Three levels of software to suit your needs: basic viewer, standard, or advanced analysis toolbox
- Customizable software with plug-in SDK option
- High-performance digital camera
- High-speed USB interface to PC or UMPC (Ultra-Mobile PC)
- Two interchangeable optics options
- Low resolution, large field of view module
- High resolution, high precision module
- Flexible design for future HW and SW upgrades
- Affordable price
- Portable, ergonomic design
- No battery or external power required

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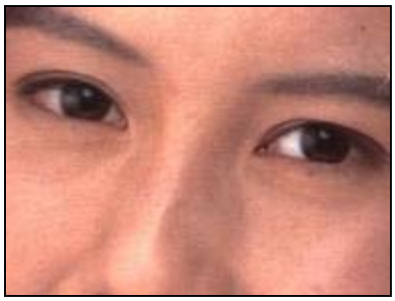
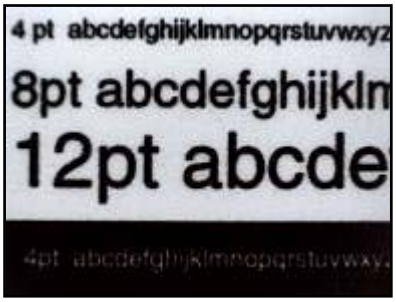
PIAS™-II – A Digital Loupe

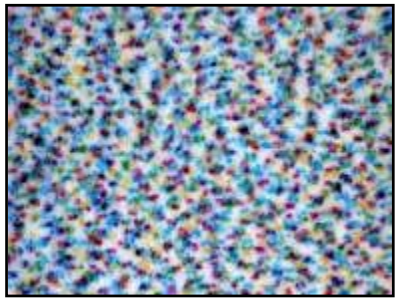
Application Examples




Technology Benchmarking

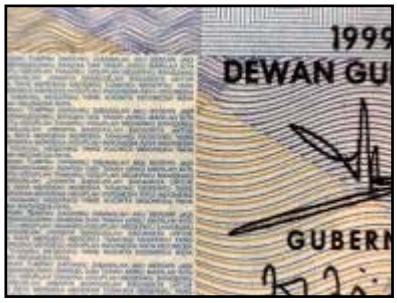
Printing System Design



Ink-Media R&D and QC

Problem Solving for Forensic Analysis



- The PIAS™-II as a digital loupe is revolutionizing image quality communication. The ability to display high-resolution images in real time enables instantaneous sharing of perception and opinion. The old fashioned loupe is a thing of the past.

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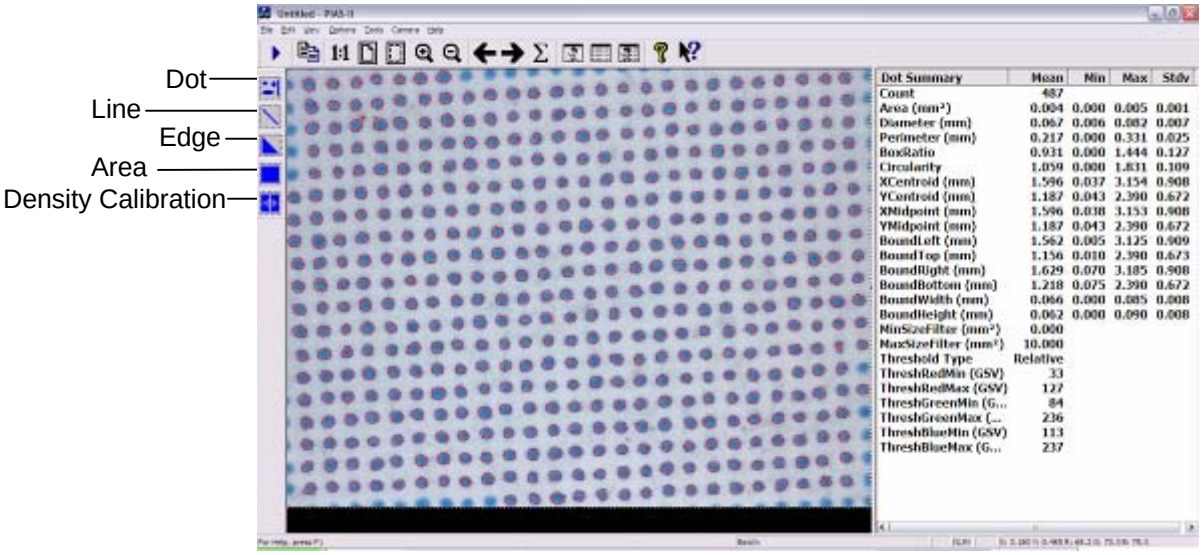
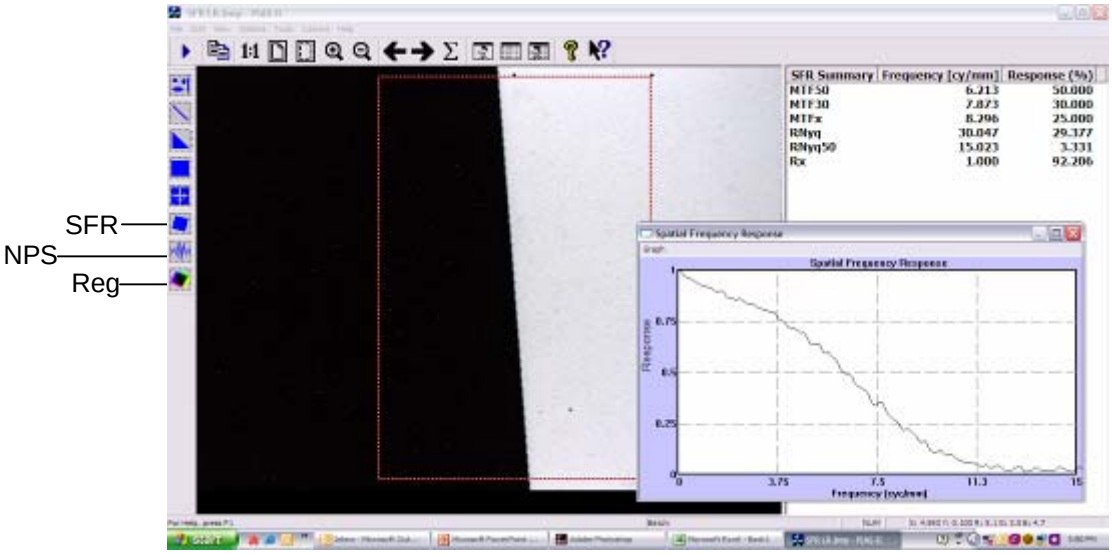
PIAS™-II – An Advanced Analytical Tool

Standard Toolbox: Dot, Line, Edge, Area Properties and Density Calibration



Advanced Toolbox: All the standard tools plus SFR (spatial frequency response), NPS (noise power spectrum) and Reg (color registration using SFR method)



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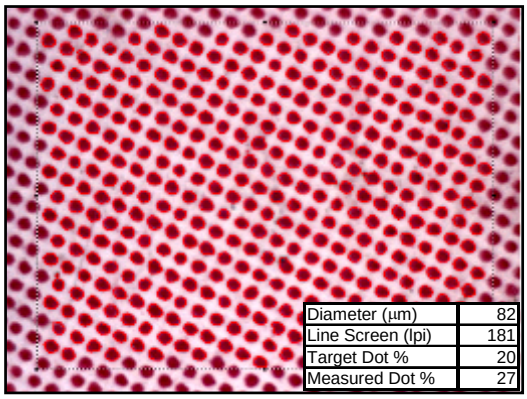
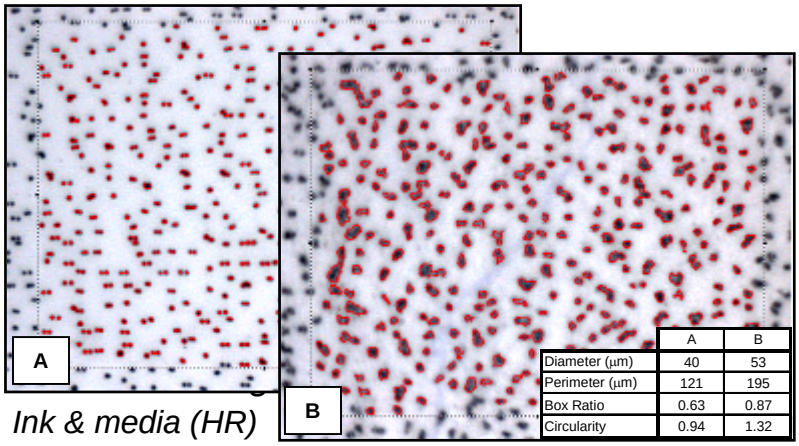
Measuring Dot Properties:

Application Examples (LR=Low Resolution Optics; HR=High Resolution Optics)



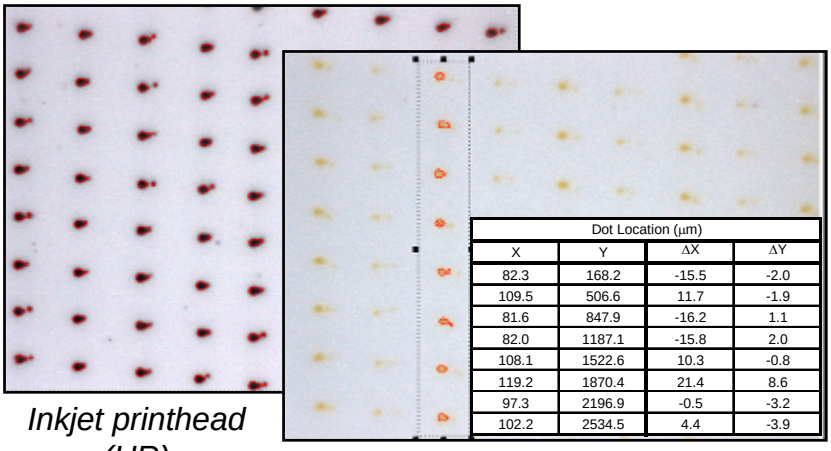
Diameter (µm)	82
Line Screen (lpi)	181
Target Dot %	20
Measured Dot %	27

Halftone & dot gain (HR)



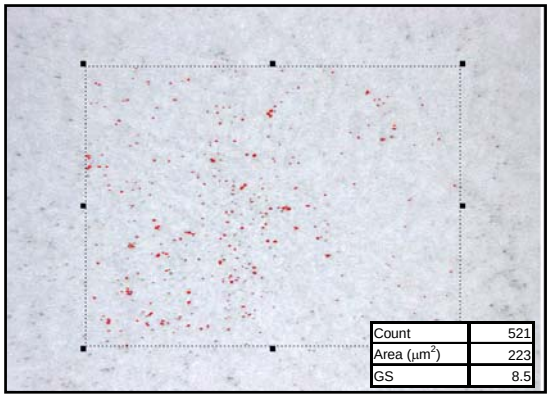
	A	B
Diameter (µm)	40	53
Perimeter (µm)	121	195
Box Ratio	0.63	0.87
Circularity	0.94	1.32

Ink & media (HR)



Dot Location (µm)			
X	Y	ΔX	ΔY
82.3	168.2	-15.5	-2.0
109.5	506.6	11.7	-1.9
81.6	847.9	-16.2	1.1
82.0	1187.1	-15.8	2.0
108.1	1522.6	10.3	-0.8
119.2	1870.4	21.4	8.6
97.3	2196.9	-0.5	-3.2
102.2	2534.5	4.4	-3.9

Inkjet printhead (HR)

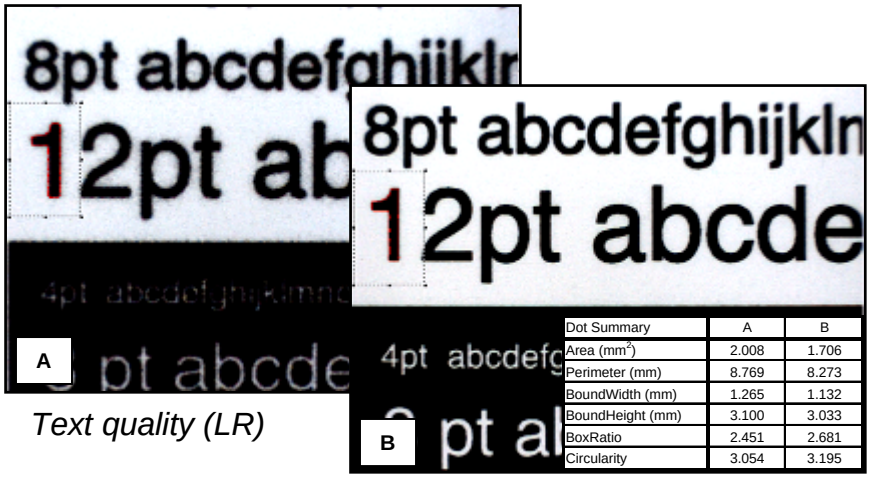


Count	521
Area (µm²)	223
GS	8.5

Background & satellites (HR)

Dot Summary	Mean
Area (mm²)	54.723
Perimeter (mm)	69.461
BoundWidth (mm)	10.717
BoundHeight (mm)	10.133
BoxRatio	0.946
Circularity	7.027

Feature identification & analysis (LR)



Dot Summary	A	B
Area (mm²)	2.008	1.706
Perimeter (mm)	8.769	8.273
BoundWidth (mm)	1.265	1.132
BoundHeight (mm)	3.100	3.033
BoxRatio	2.451	2.681
Circularity	3.054	3.195

Text quality (LR)

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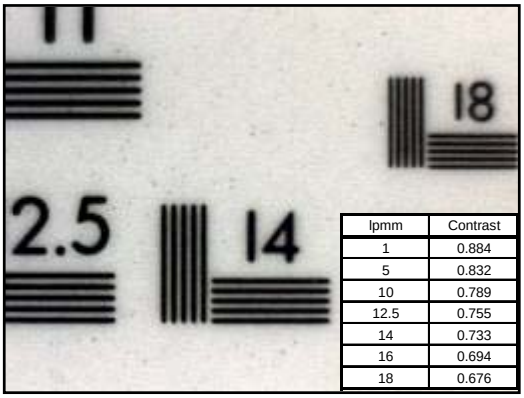
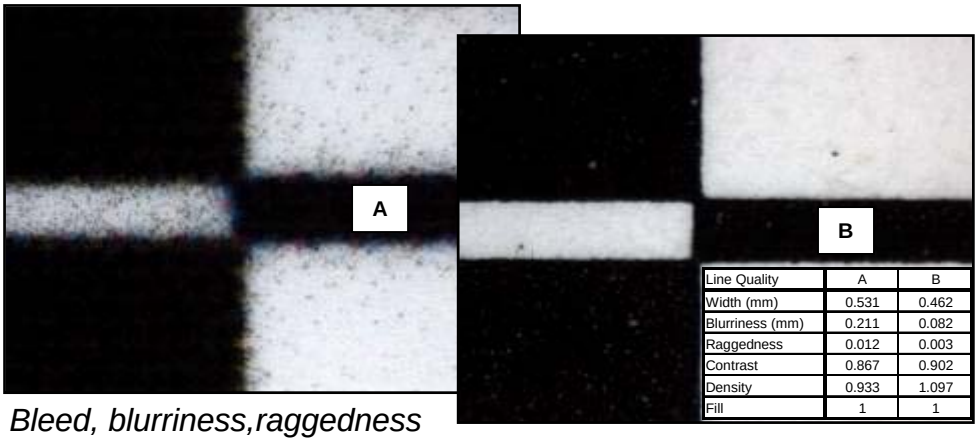
Measuring Line Properties:

Application Examples (LR=Low Resolution Optics; HR=High Resolution Optics)



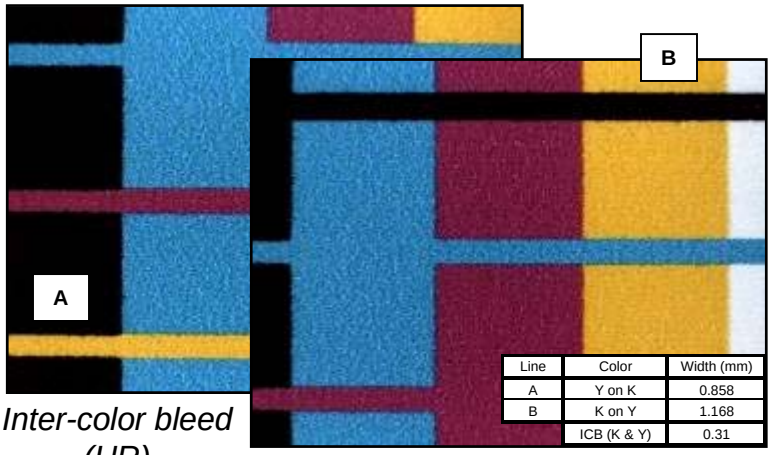
lpmm	Contrast
1	0.884
5	0.832
10	0.789
12.5	0.755
14	0.733
16	0.694
18	0.676

Contrast and resolution (HR)



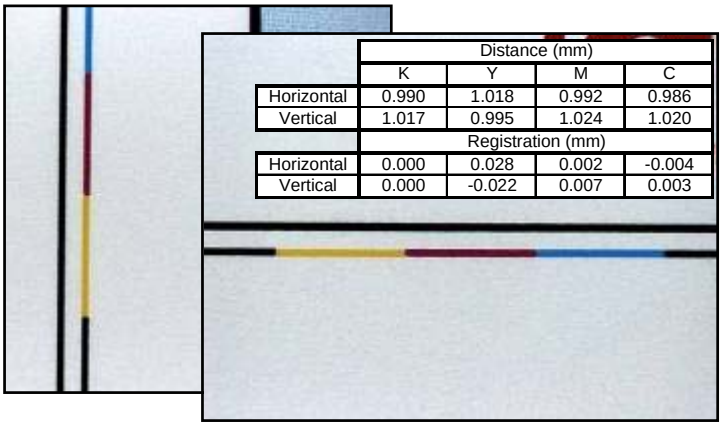
Line Quality	A	B
Width (mm)	0.531	0.462
Blurriness (mm)	0.211	0.082
Raggedness	0.012	0.003
Contrast	0.867	0.902
Density	0.933	1.097
Fill	1	1

Bleed, blurriness,raggedness & darkness (HR)



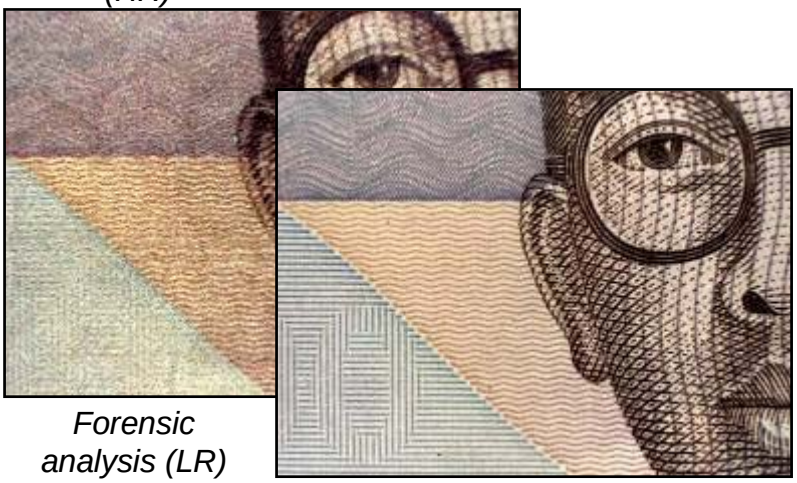
Line	Color	Width (mm)
A	Y on K	0.858
B	K on Y	1.168
	ICB (K & Y)	0.31

Inter-color bleed (HR)

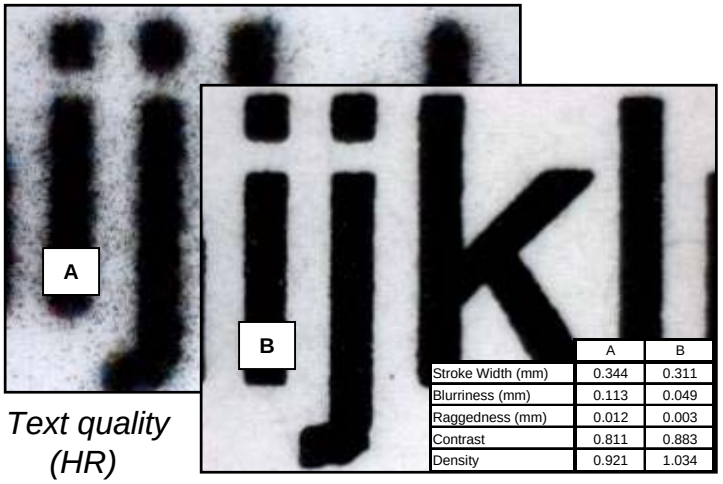


	Distance (mm)			
	K	Y	M	C
Horizontal	0.990	1.018	0.992	0.986
Vertical	1.017	0.995	1.024	1.020
	Registration (mm)			
Horizontal	0.000	0.028	0.002	-0.004
Vertical	0.000	-0.022	0.007	0.003

Color registration (HR)



Forensic analysis (LR)



	A	B
Stroke Width (mm)	0.344	0.311
Blurriness (mm)	0.113	0.049
Raggedness (mm)	0.012	0.003
Contrast	0.811	0.883
Density	0.921	1.034

Text quality (HR)

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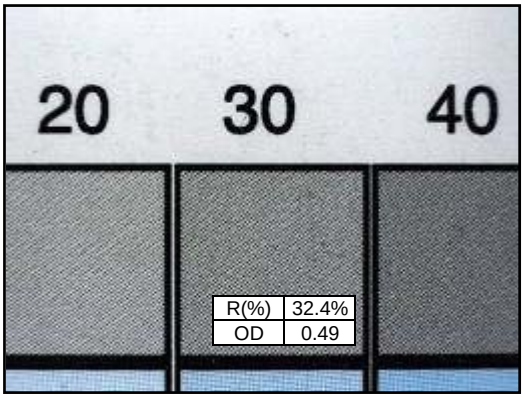
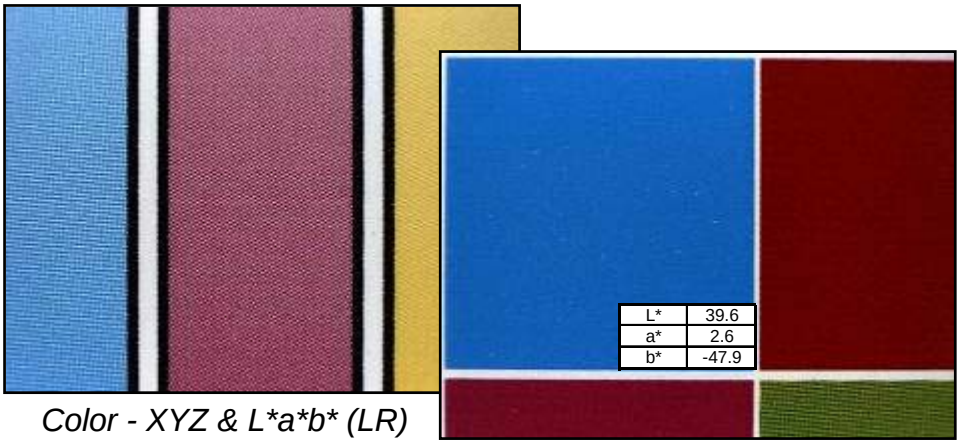
Measuring Area Properties:

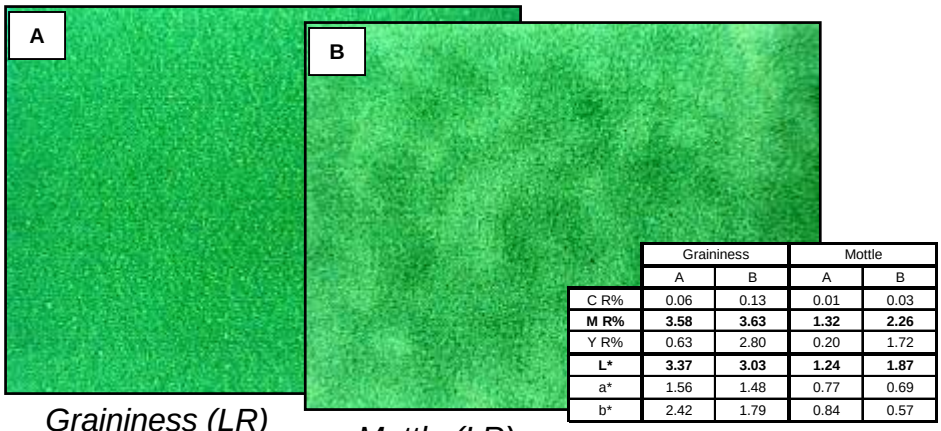
Application Examples (LR=Low Resolution Optics; HR=High Resolution Optics)



Reflectance, density & tone reproduction (LR)

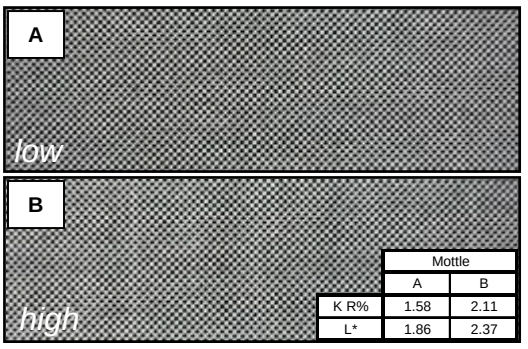


*Color - XYZ & L*a*b* (LR)*



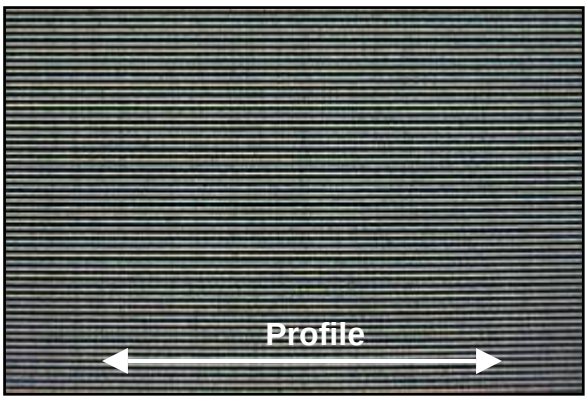
	Graininess		Mottle	
	A	B	A	B
C R%	0.06	0.13	0.01	0.03
M R%	**3.58**	**3.63**	**1.32**	**2.26**
Y R%	0.63	2.80	0.20	1.72
L*	**3.37**	**3.03**	**1.24**	**1.87**
a*	1.56	1.48	0.77	0.69
b*	2.42	1.79	0.84	0.57

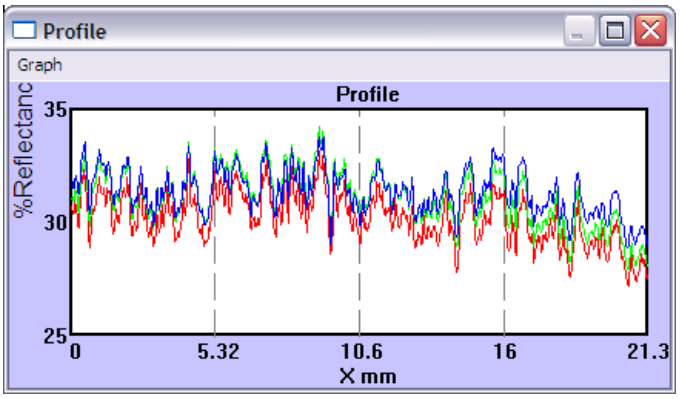
Graininess (LR) *Mottle (LR)*



	Mottle	
	A	B
K R%	1.58	2.11
L*	1.86	2.37

Mottle (LR)





Reflectance profile (LR)

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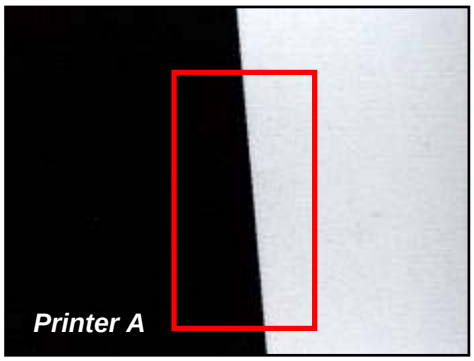
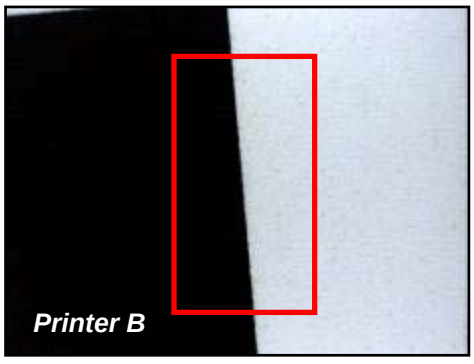
Advanced PQ Analysis Tools: SFR

SFR (Spatial Frequency Response) – ISO12233:2000

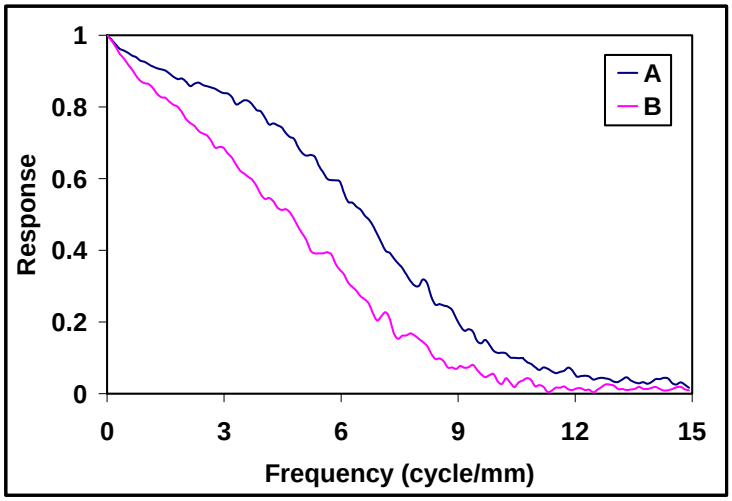
- Uses Fourier techniques to measure the spatial frequency response to a slanted edge.
- The slanted edge causes the edge gradient to be measured at many phases relative to the sensor, eliminating aliasing effects.
- Interpretation and analysis of SFR curve is the same as MTF (Modulation Transfer Function)

Example:





Spatial Frequency Response



In the figures on the left, the edge produced by Printer A appears sharper. The SFR curves suggest that Printer A has higher contrast than Printer B at all frequencies.

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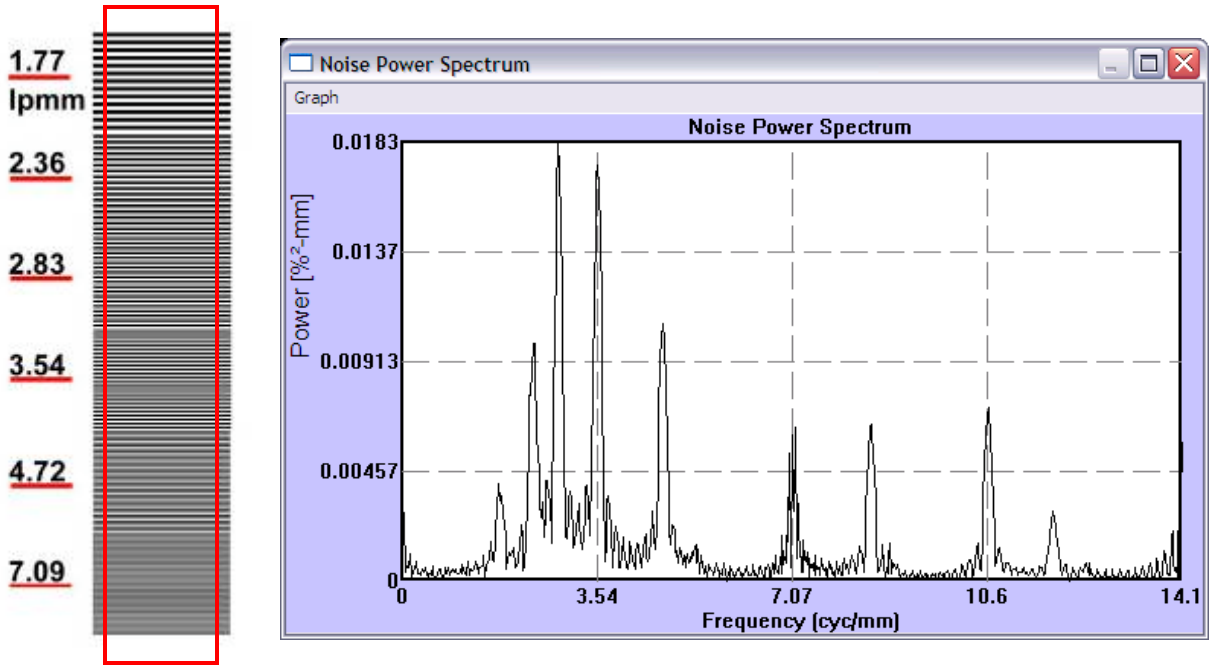
Advanced PQ Analysis Tools: NPS

NPS (Noise Power Spectrum)

- Performs Fourier transform of the auto-correlation function.
- When applied to a spatial image, this is often called the “Wiener Spectrum.” In practical terms, the Wiener Spectrum measures the noise variance at each spatial frequency.
- The area under the NPS curve equals the total variance of the image (s^2).

Example:



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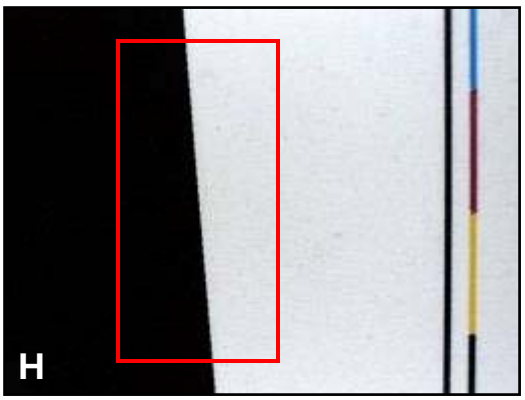
Advanced PQ Analysis Tools: Color Registration

REG (Color Registration)

- Target is a slant edge black/white transition.
- In an ideal system, the transition would occur at the same spatial coordinate in all color planes.
- In this analysis, the relative location of the transition in each of the color planes is reported.

Example:



Registration Error (mm)			
	H Direction		
	Red	Green	Blue
Red	0	0.002	-0.002
Green	-0.002	0	-0.004
Blue	0.002	0.004	0

	V Direction		
	Red	Green	Blue
Red	0	0.014	-0.014
Green	-0.014	0	-0.029
Blue	0.014	0.029	0

PIAS™-II

Personal Image Analysis System

Specifications*

System configuration	One camera module and one optics module including: Software options: a) viewer (bundled), b) standard analysis toolbox (option 1) or c) advanced analysis toolbox (option 2) CD with installation software and documentation; USB cable & carrying case
Camera Module	Color CCD (640x480).
Optics Module	Interchangeable modules (one optics module is bundled with a camera module in the standard system configuration, the other optics module is an option at an additional cost): High resolution module ~ 5μm/pixel Low resolution module ~ 33μm/pixel
Field of View (FOV)	High resolution module: ~ 3.2mm x 2.4mm Low resolution module: ~ 21.3mm x 16mm
Illumination	White LED in optic modules; reflective measurements
Interface	USB 2.0
PC Requirement	PC or UMPC (Ultra-mobile PC) with Windows XP OS
Power requirement	External by PC via USB; no additional power required
Calibration	Spatial and reflectance (density)
Basic Digital Loupe (Bundled)	Viewer (includes file save, open, and zoom functions). On-screen reticle. No analysis function.
Standard Image Analysis Toolbox (Software Option 1)	General purpose image analysis toolbox including **dot, line, area properties** and **density calibration** (Digital Loupe functions included)**.** ***Dot & halftone attributes***: count, area, diameter, perimeter, box ratio, circularity, dot%, line screen, screen angle, xy coordinates, bounding box, size and color filters, absolute or relative thresholds, dilation-erosion, processing, boundary dot exclusion, special background or satellite tool. ***Line and edge attributes (ISO-13660)****:* width, blurriness, raggedness, contrast, fill, darkness, line breaks, orientation, distance, xy coordinates, color plane, orientation & polarity; auto or user selection; threshold definition ***Area attributes (ISO-13660)***: RGB, reflectance, density, XYZ, L*a*b*, ΔE, graininess, mottle; density standards: status A, status T, DIN, DIN NB, visual; color illuminants & observers: A, B, C, D50, D55, D65, D75, E, 2° and 10° ***Others***: ROI definition; image and data copy, save and print; zoom; color channel selection; overlay; profile; histogram; image flip or rotate; result display selection; font size selection
Advanced Image Analysis Toolbox (Software Option 2)	**In addition to** all the functions in the **Standard Toolbox**: ***SFR*** (Spatial Frequency Response) ***NPS*** (Noise Power Spectrum) ***Reg*** (Color Registration using the slant edge method)

* Subject to change without notice.

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