ImageQuant™ LAS 4000

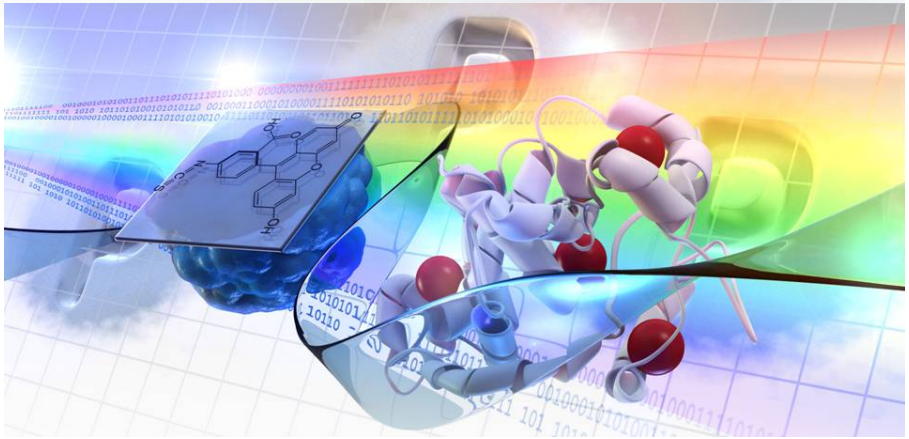
Biomolecular imagers

GE Healthcare Life-Sciences Ltd.,
Taiwan Branch
奇異亞洲醫療設備股份有限公司

Protein Separation Product Specialist
Neil Chang 張駿儒

TEL : (886 2)2516 5280 ext 72118
FAX : (886 2)2516 5260
E-mail : neil.chang@ge.com
www.gelifesciences.com

GE imagination at work

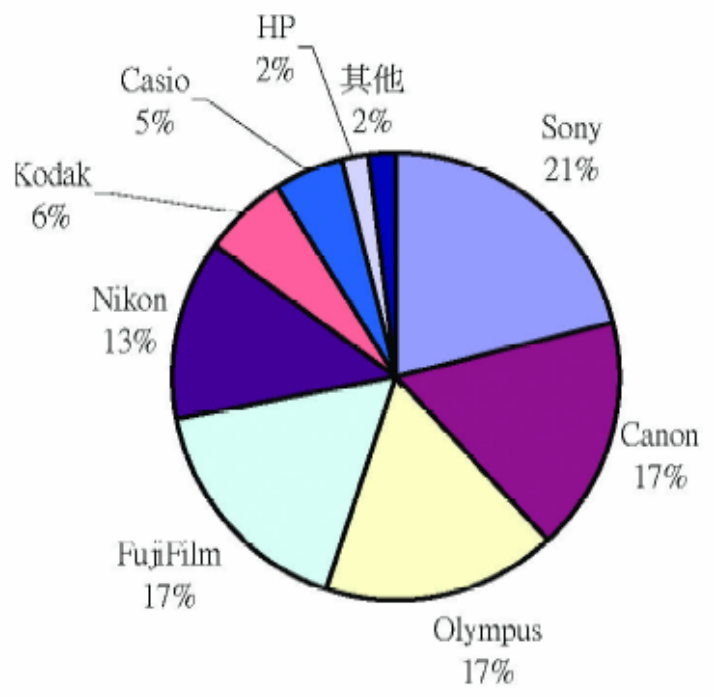


CONTENT

- GE Healthcare and FUJIFILM
- ImageQuant LAS-4000 features
  >versatility
  >sensitivity/resolution
  >speed
- Analysis software IQTL
- ImageQuant LAS-4000 application

imagination at work

Worldwide CCD camera brands




FUJIFILM
GE imagination at work

FUJIFILM lifescience product

FUJIFILM Global

Home | Products | Support | News | Sustainability | About Us

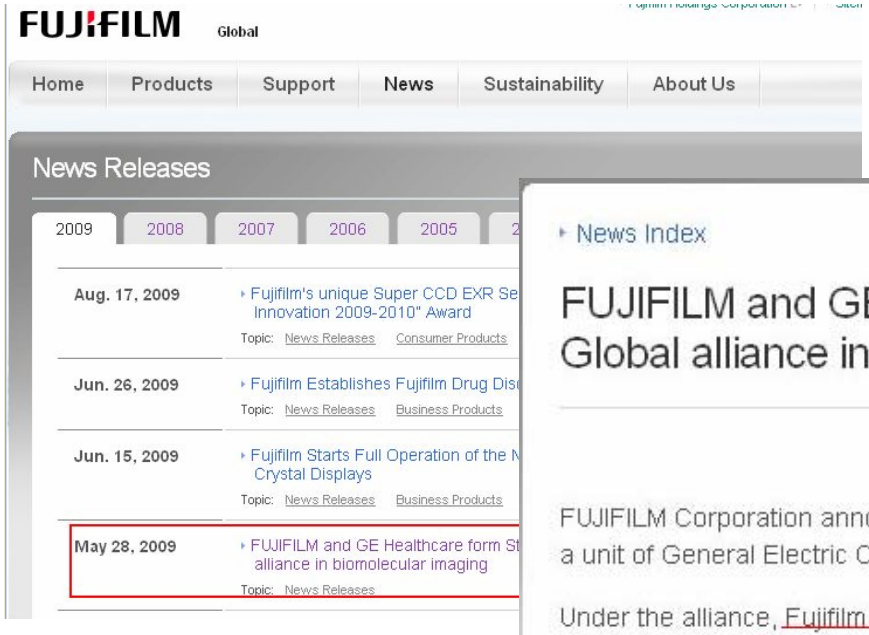
LAS-4000

This model succeeded LAS-3000 which was equipped with Fujifilm's proprietary high sensitive and high resolution CCD technology and further evolved to the system with various capable applications with wider line-ups of optional product. In addition to the existed epi-blue, green and red illuminators, epi-UV and epi-IR illuminators are lined up. Since near infrared rays from epi-IR illuminator well penetrate live tissue, in vivo imaging of small animal, such as mouse, with high sensitivity and high resolution is available.

Fujifilm has discontinued sales of this product. An equivalent product is available through GE Healthcare.

▸ Products Page of GE Healthcare Website

GE Healthcare and FUJIFILM



News Index

FUJIFILM and GE Healthcare form Strategic Alliance in Life Sciences Global alliance in biomolecular imaging

May 28, 2009

FUJIFILM Corporation announces that it has entered into a Strategic Alliance Agreement with GE Healthcare, a unit of General Electric Company (NYSE: GE).

Under the alliance, Fujifilm will develop, manufacture and supply advanced biomolecular imaging systems to GE Healthcare. The products will be sold worldwide under the GE brand in the life science research and drug discovery markets.

Life science research has advanced rapidly in recent years with the advent of tools for genomic and protein research such as biomolecular labeling, detection and analysis. These technologies have helped reveal the functions of proteins, thereby contributing to scientists' understanding of disease processes. The use of life science instrumentation and reagents in bioscience research is growing, and the demand for new and innovative enabling technologies is expanding.

Overview of the alliance:

1. Fujifilm will supply image analyzing systems for bioscience research to GE Healthcare, and GE Healthcare will market and sell them under the GE brand.
2. GE Healthcare will be responsible for marketing/sales of the systems worldwide, and will provide total solutions including instruments, ECL and DIGE labeling reagents, and applications support. Additionally, GE Healthcare will provide instrument services for the systems.
3. Fujifilm and GE Healthcare will collaborate to develop image analyzing systems that are optimized for customer applications.

Source: Fujifilm

GE imagination at work

GE Healthcare and FUJIFILM

strategic alliance

- Strategic alliance merging instruments and reagents
- Development of new products
- Reduce external imager suppliers to one
- Improve quality in the field

GE Healthcare has formed an alliance with Fujifilm to provide a new range of imagers for all your quantitative imaging needs.

NEW biomolecular imagers

ImageQuant™ LAS 4000

ImageQuant LAS 4000 mini

Typhoon™ FLA 9000

Typhoon FLA 7000

GE imagination at work

Biomolecular Imagers
ImageQuant™LAS 4000mini

ImageQuant LAS 4000 mini

The sensitive imager for chemiluminescence and gel documentation

- Quantitative Westerns
- Extreme sensitivity
- UV fluorescence
- Gel documentation

ImageQuant™ LAS 4000 mini

The sensitive imager for chemiluminescence and gel documentation

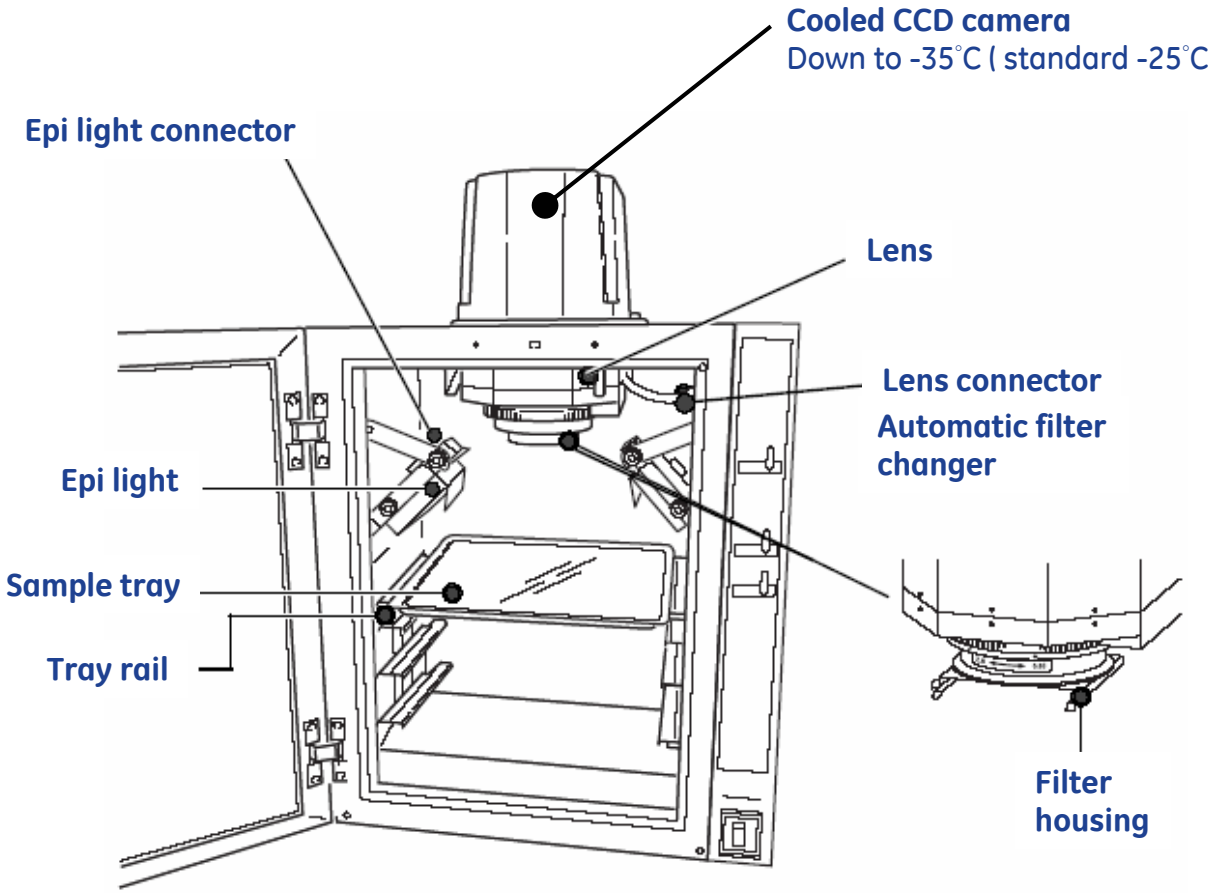
- Chemiluminescence
  - Amersham™ ECL™, ECL Plus, and ECL Advance™
- Epi-white light digitization
  - Coomassie™ blue and silver-stained gels
- UV and blue fluorescence upgrades
  - EtBr and SYBR™ Green stained gels
- Up to 12 x 18 cm gels

sensitivity, speed and versatility.

GE imagination at work

ImageQuant™ LAS 4000mini

components



LAS-4000mini inside view

Versatility

versatility

ImageQuant™ LAS 4000 mini

Imaging applications

Standard

Chemiluminescence/Bioluminescence

• ECL™	• ECL Plus™
• ECL Advance™	• Lumi-Light Plus
• SuperSignal®	• CDP-Star®
• CSPD®	• Renaissance™
• Bright-Star™	• Luciferase

Digitizing/White epi-illumination

• NBT/BCIP	• Silver Staining	• CBB

Upgrade

Fluorescence/Blue epi-illumination

• SYBR® Green I	• SYBR® Green II
• SYBR® Gold	• SYPRO® Ruby
• SYPRO® Orange	• SYPRO® Tangerine
• FITC	• FAM™
• AttoPhos™	

Fluorescence/trans-UV

• Ethidium Bromide

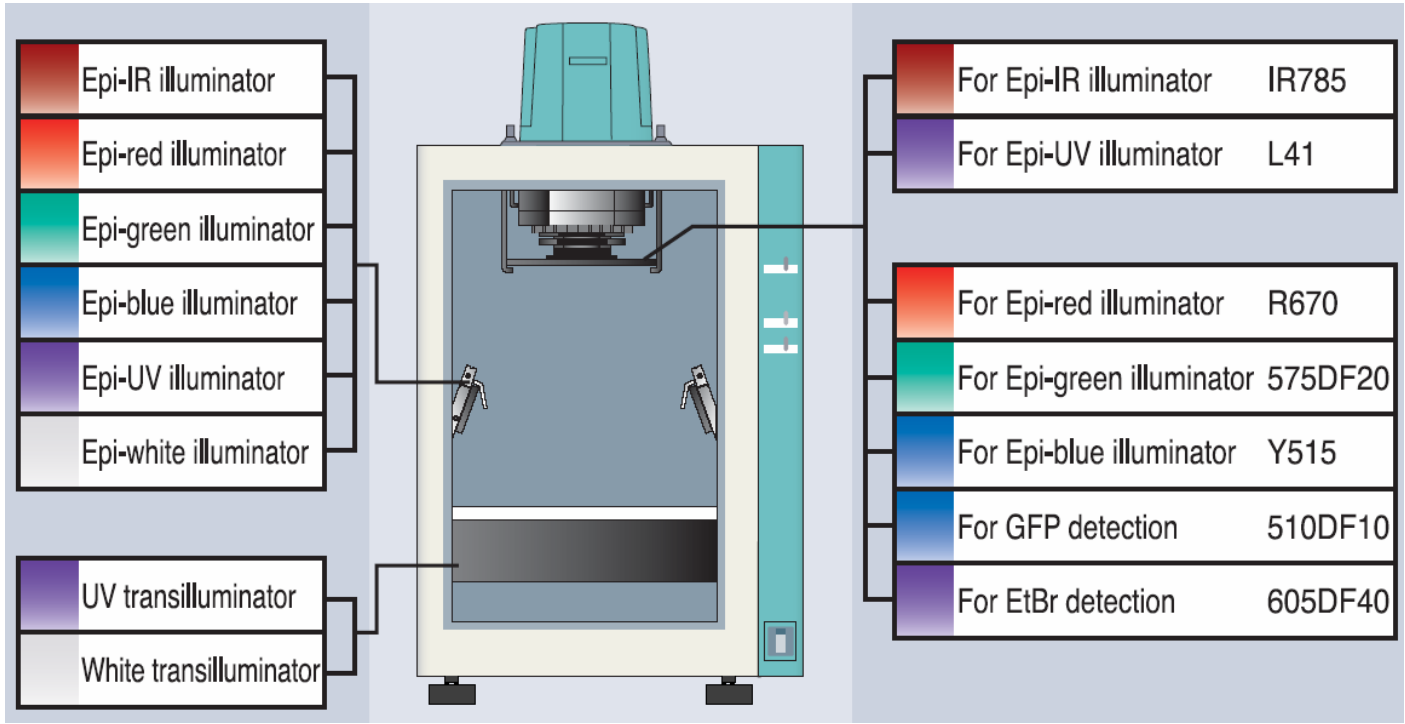
GE imagination at work

Source: Fujifilm

Light sources and filter options

Excitation light source units

Various filters



Detection Reagents

Corresponding Table

Classification	Reagent name	Setting of LAS-4000			
		Method	Light	Filter	Iris
Chemiluminescence	ECL	Chemiluminescence	none	Through	0.85
	ECL+	Chemiluminescence	none	Through	0.85
	Lumi-Light Plus	Chemiluminescence	none	Through	0.85
	Renaissance	Chemiluminescence	none	Through	0.85
	Super Signal	Chemiluminescence	none	Through	0.85
	Bright-Star	Chemiluminescence	none	Through	0.85
	CDP-Star	Chemiluminescence	none	Through	0.85
	CSPD	Chemiluminescence	none	Through	0.85

Classification	Reagent name	Setting of LAS-4000			
		Method	Light	Filter	Iris
Digitization	Silver stain	Digitization:DIA	White (DIA)	Through	2.8
	CBB stain	Digitization:DIA	White (DIA)	Through	2.8
	X-ray film	Digitization:DIA	White (DIA)	Through	2.8
	NBT/BCIP	Digitization:EPI	White (EPI)	Through	2.8
Fluorescence dye (Chemifluorescence)	Attophos[1]	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	ECL+	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85

Classification	Reagent name	Setting of LAS-4000			
		Method	Light	Filter	Iris
Fluorescence dye	SYBR Green I	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	SYBR Green II	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	EtBr	Fluorescence:EtBr	UV (312nm DIA)	605DF40	2.8
	SYBR Gold	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	SYPRO Ruby	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	SYPRO Orange	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	SYPRO tangerine	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	FITC	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	FAM	Fluorescence:SYBR Green	Blue (460nm EPI)	Y515-Di	0.85
	EGFP	Fluorescence:GFP	Blue (460nm EPI)	510DF10	0.85
	ECFP	Fluorescence:GFP	Blue (460nm EPI)	510DF10	0.85
	RITC	Fluorescence:Cy3	Green (520nm EPI)	575DF20	0.85
	Cy3	Fluorescence:Cy3	Green (520nm EPI)	575DF20	0.85
	Cy5	Fluorescence:Cy5	Red (630nm EPI)	R670	0.85
	Q-dot	Fluorescence:DAPI	UV (365nm EPI)	L41	2.8
	Dy781	Fluorescence:IR	Infrared (710nm EPI)	IR785	0.85

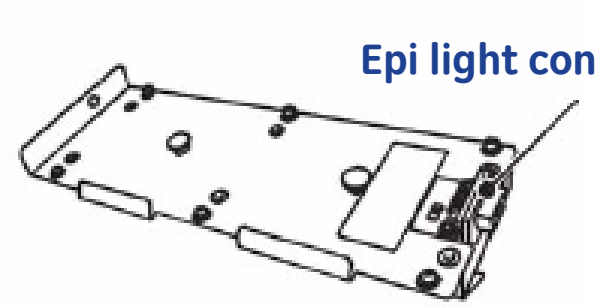
Sampling convenience

Sample setting

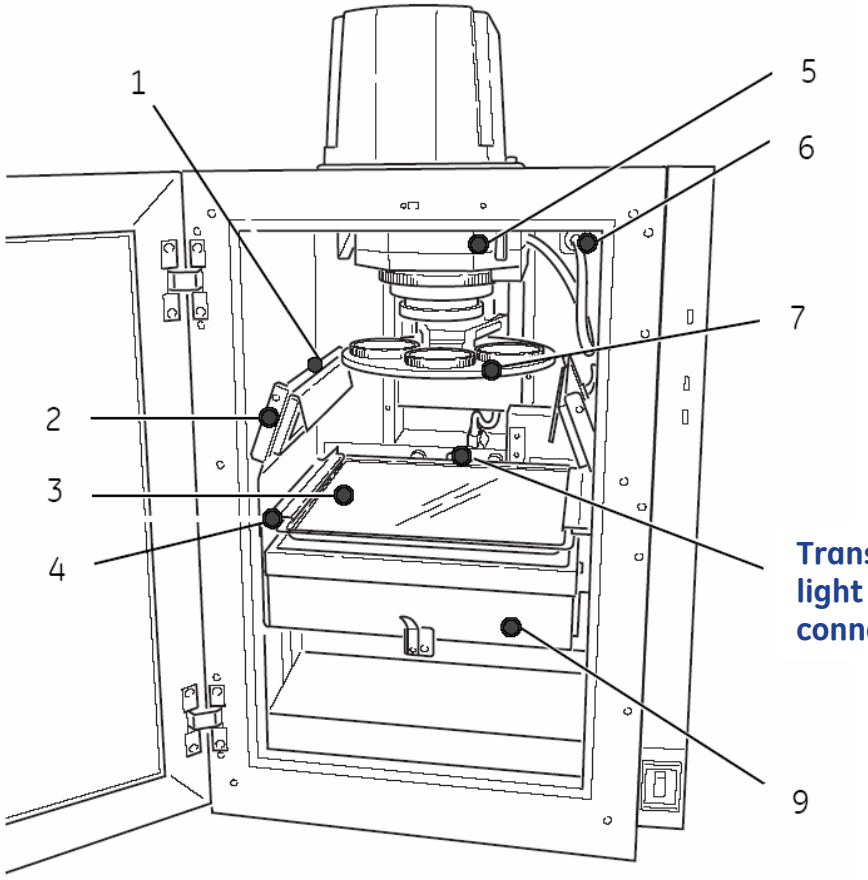
Detection	Samples	Trays
Chemiluminescence Bioluminescence	Membrane	Epi tray
	Titer plate	NP tray
Fluorescence	Gel (UV detection)	UV trans tray
	Gel (LED detection)	Epi tray
	Membrane	Epi tray
Digitization	Membrane	Epi tray
	Gel (CBB, silver stain)	White trans tray

Modular design

> All components design by FUJIFILM
> Fuji manufactures the whole unit (COMPATIBILITY)



Epi light connector



Transmitted light source connector

LED light source

ImageQuant LAS

General LED

Sensitivity/resolution

Large-aperture F0.85 lens

Bright FUJINON™ F0.85 43 mm lens

- Specifically designed for the proprietary Super CCD chip by Fujifilm™
  - > High sensitivity
  - > Designed for chemiluminescence

Optional lens :
Wide view lens (F1.8 24 mm (SIGMA)) 25 x 25 cm

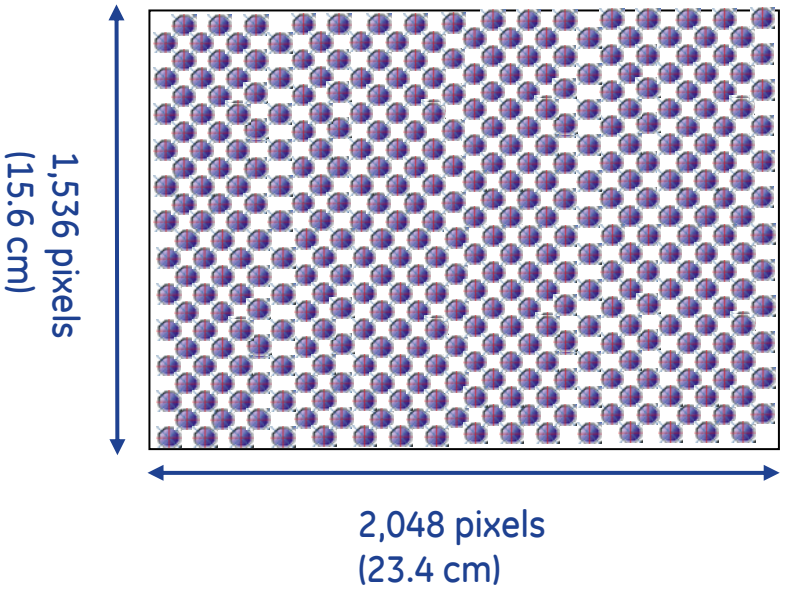
FUJINON VRF43LMD3 F0.85 LENS

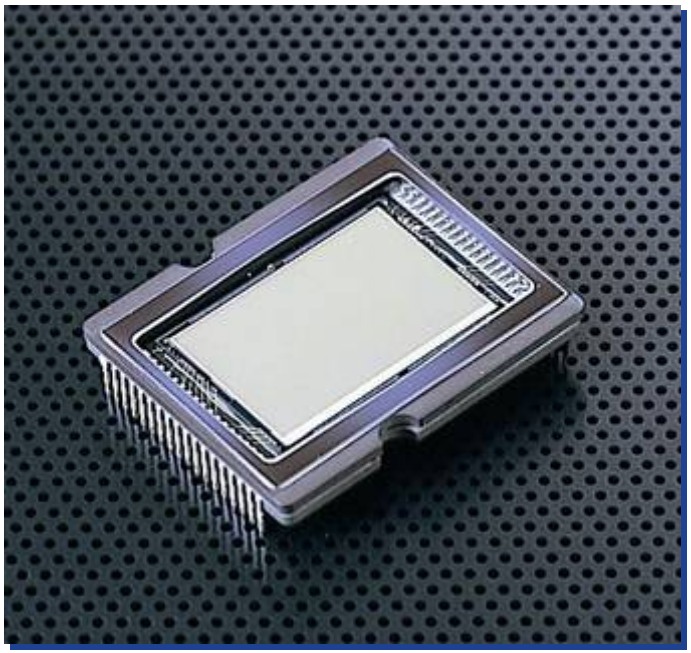
NEW Super CCD area type imaging chip

Unique pixel layout

> 3.2 megapixel Fujifilm™ Super CCD (2,048 x 1,536)

> 6.3 megapixel virtual image resolution can be acquired (3,072 x 2,048)





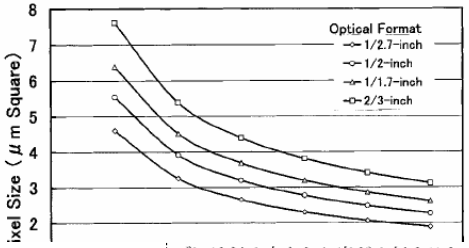
Super honeycomb CCD

Super CCD

A Progressive Scan CCD Image Sensor for DSC Applications

Tetsuo Yamada, *Member, IEEE*, Katsumi Ikeda, Yong-Gwan Kim, Hideki Wakoh, Tetsuo Toma, Tomohiro Sakamoto, Kazuaki Ogawa, Eiichi Okamoto, Kazuyuki Masukane, Kazuya Oda, and Masafumi Inuiya

***Abstract*—A progressive-scan CCD image sensor with a standard double-layer poly-silicon is designed on a new architecture of pixel interleaved array named PIACCD. The pixel layout is estimated to enlarge the saturation voltage by 1.3 times and heighten the sensitivity with the 1.4 times enlarged equilateral aperture opened above each photodiode. The three-dimensional simulation ensures that the unique electrode pattern layout has an advantage to accelerate the signal charge transfer. The pixel interleaved array heightens the resolution by $2^{1/2}$ times in comparison with that of the same pixel number ITCCD in horizontal and vertical directions. The resolution characteristics fit to the fine pattern sensitivity of the human eye and the power spectrum distributions**



向上させて
れる錯乱円
レンズで集
ig. 5 (a))。
イクロレン
ズには斜め方向から光が入射するため錯乱円が大きくなる(Fig. 5 (b))。この時，インターライン型CCDのような長方形のPD形状を持つ場合は，錯乱円が遮光壁によって遮られやすくなる。これによってCCD出力が低下する現象を「F値依存の感度低下」と呼ぶ。スーパーCCDハニカムの場合，PD形状は円に近い八角形であるため，このF値依存の感度低下が起こりにくい。したがって，F値を開放側にしたときの信号電荷量は，インターライン型CCDよりも有利になる。

以上のような信号電荷量の向上は，感度，S/N，ダイナミックレンジといった画質性能の向上に貢献する。

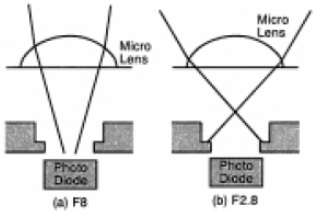


Fig. 5 Sensitivity decrease depending on F-number.

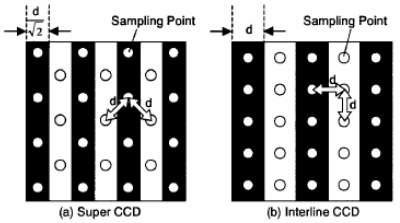


Fig. 6 Line pattern sampling.

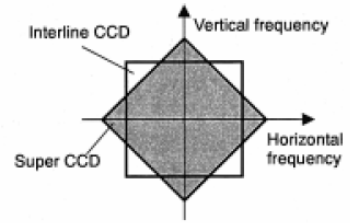


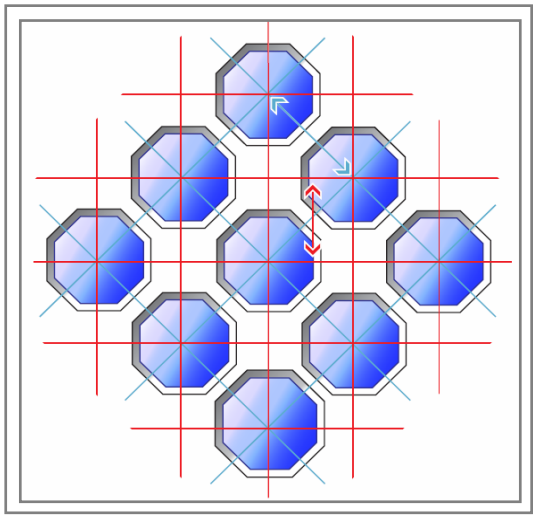
Fig. 7 Reproducible frequency band.

この特性の違いこそが，スーパーCCDハニカムが解像度的に有利な理由である。なぜなら，世の中の被写体

CCD provides up to 6.3 megapixels

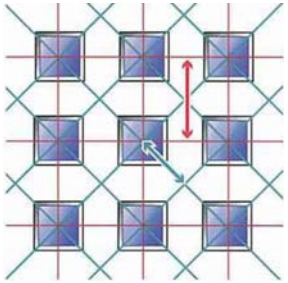
> High pixel density gives better resolution than square matrices

> Binning up to 8 x 8 for high sensitivity

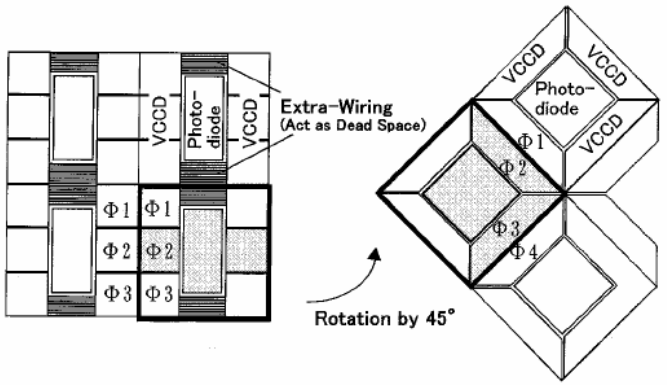


New pixel of PIACCD

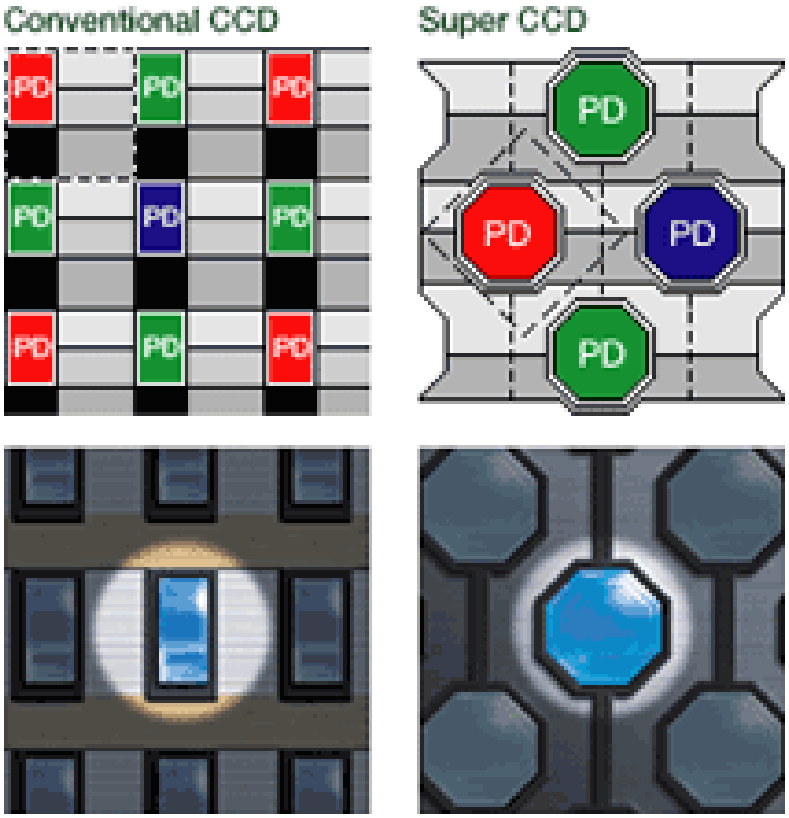
Pixel size
(center to center)
10.75 μ m



Conventional pixel of ITCCD



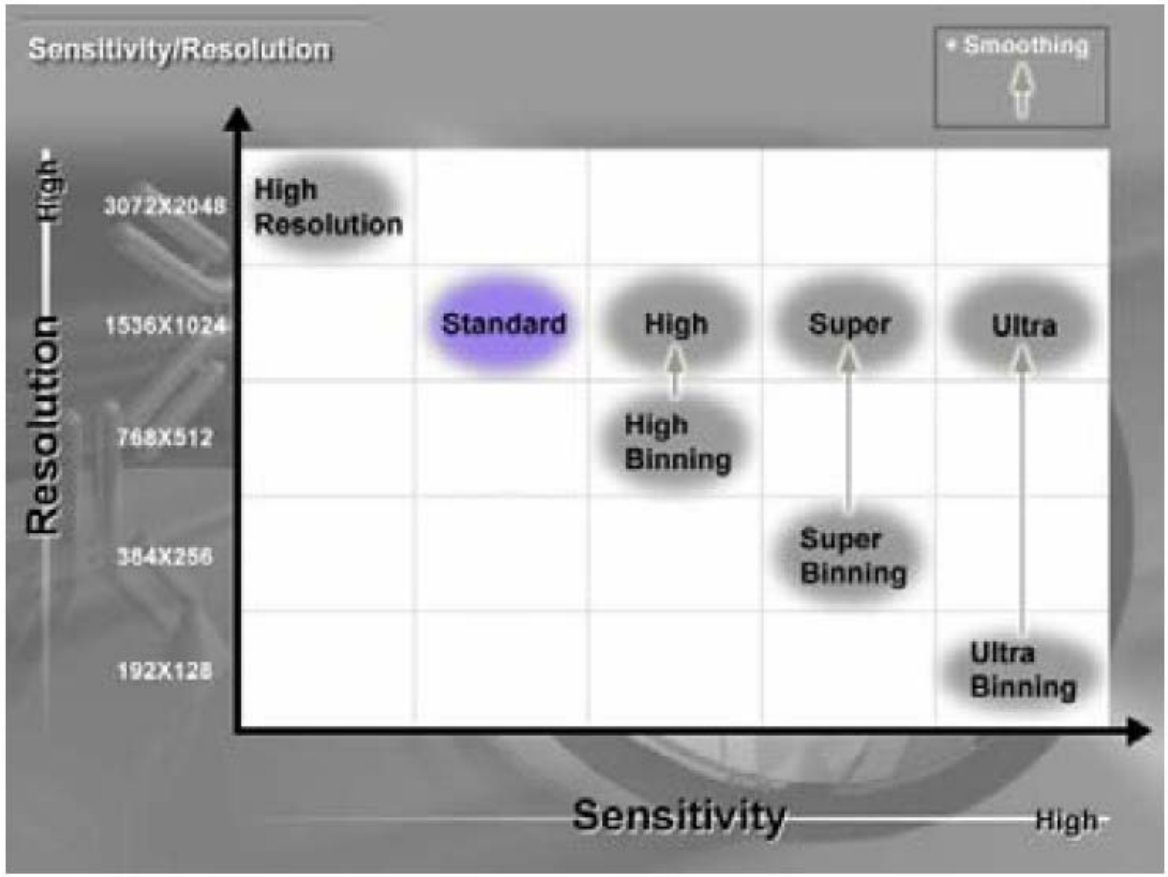
CCD affording up to 6.3 megapixels



Fujifilm took a different spin with the Bayer filter in its Super CCD sensor. Rather than a standard grid of RGB elements, *Fujifilm turned everything at a 45° angle.* This has two benefits: it makes the sensor elements larger (octagons rather than rectangles) and thus more sensitive, and the pixels are closer to each other than with a standard image sensor. *Because of this, Super CCD sensors with 3 MP can produce 6 MP images nearly as good as those from true 6 MP sensors.*

NEW Binning mode

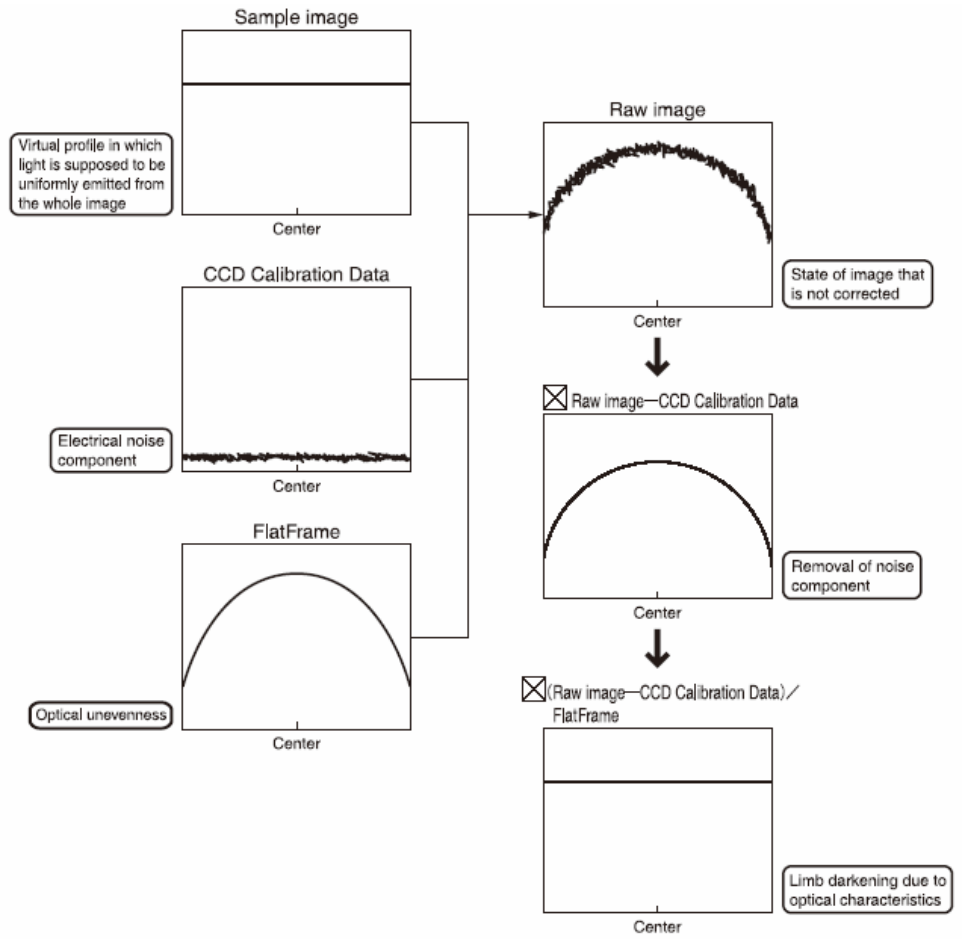
> **Binning** efficiently increase sensitivity, significantly enhances the S/N ratio
> Four binning mode : standard, high, super and ultra
> **Smoothing** compensate for loss of resolution



Sensitivity	Image file size
High Resolution	12.6 MB
Standard	3.15 MB
High	3.15 MB
Super	3.15 MB
Ultra	3.15 MB
High Binning	786 KB
Super Binning	197 KB
Ultra Binning	49.2 KB

Calibration and correction

> CCD calibration
> dark-frame correction
> flat-frame correction
> distortion correction

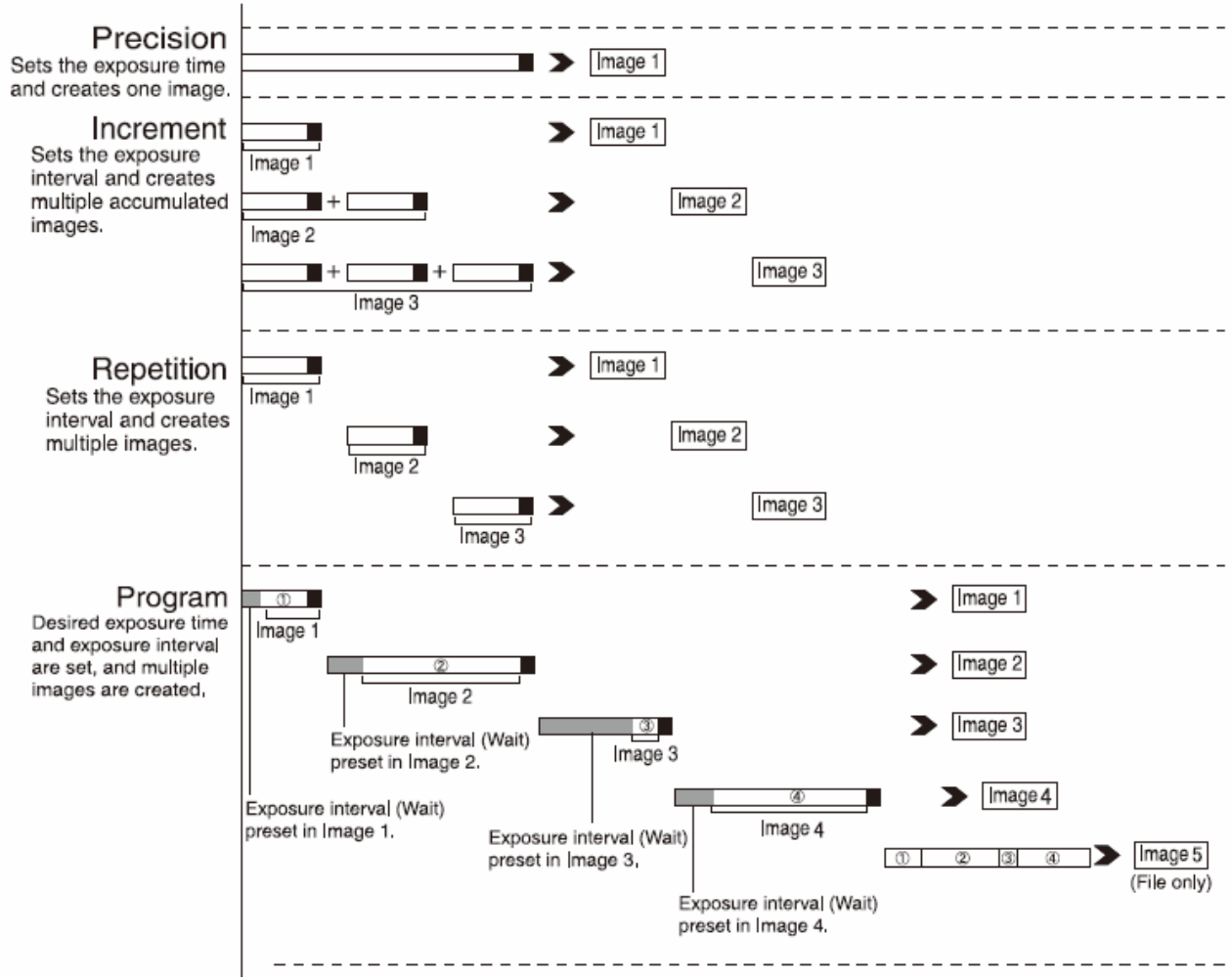


Exposure options

-exposure : 1/100 sec. to 30 hrs

Exposure type

> precision
> increment
> repetition
> program



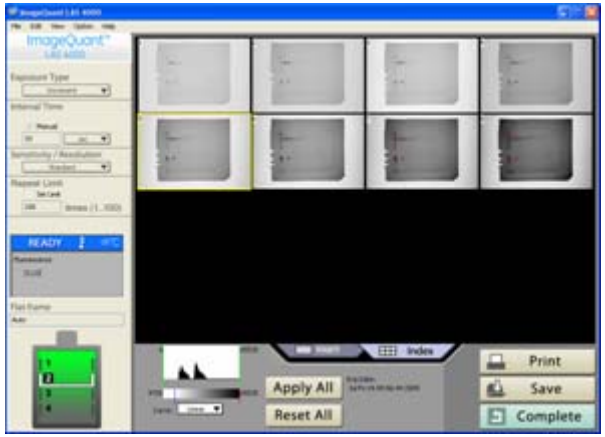
Speed
(easy to operate)

Easy, rapid, and sophisticated control

> Remote control from a computer
> Quicker response to reduce stress
> Easy filter exchange
> User-friendly capture software

ImageQuant

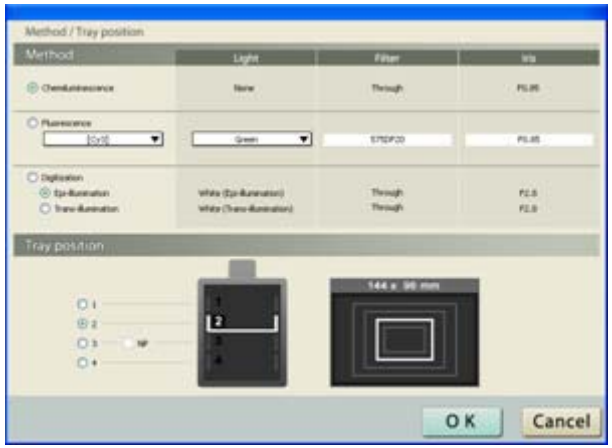
(Windows™ XP ™ Pro SP2 compatible, USB2.0)



Exposure increment

Intuitive software gives the results you need

- Specifies all imaging parameters including sensitivity, resolution, and methods
- Carries out all image correction functions
- Increment mode shows signal increase in real time
- Helps users create their own setting and methods
- Merges chemiluminescent signal with marker image

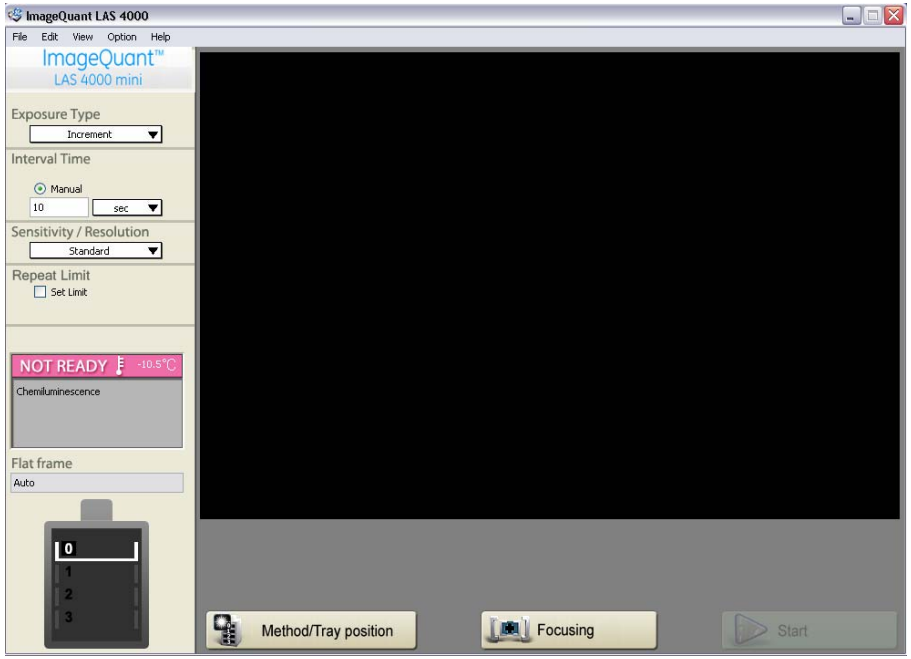


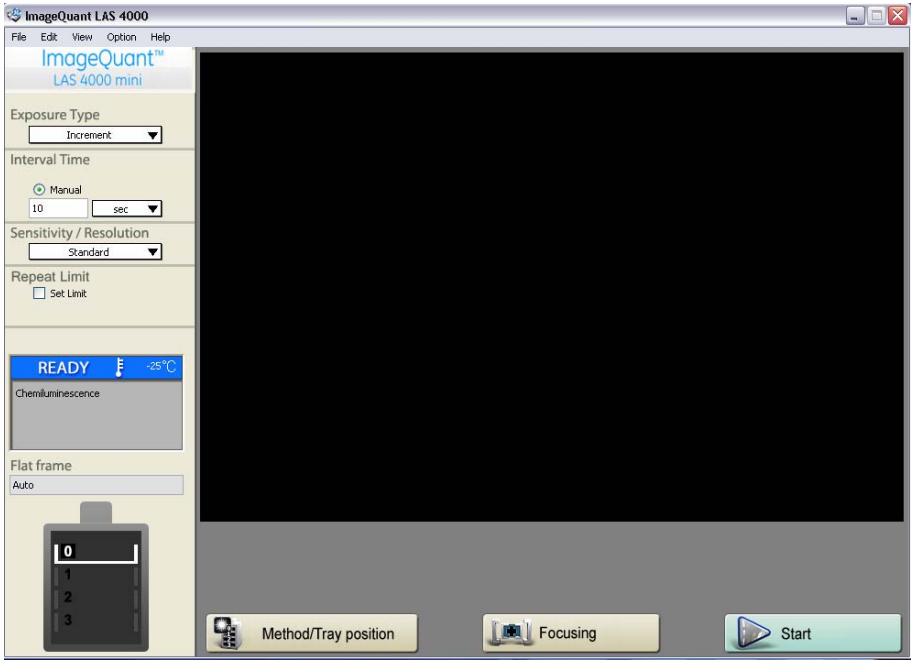
Method/tray position

Speed

CCD camera cooling speed

> Down to -25˚C about 3 ~4 mins
> Down to -35˚C (standard -25˚C)





GE imagination at work

Speed

ImageQuant™ control software

- Intuitive and easy to learn
- Interactive image capture
- Optimal image settings every time

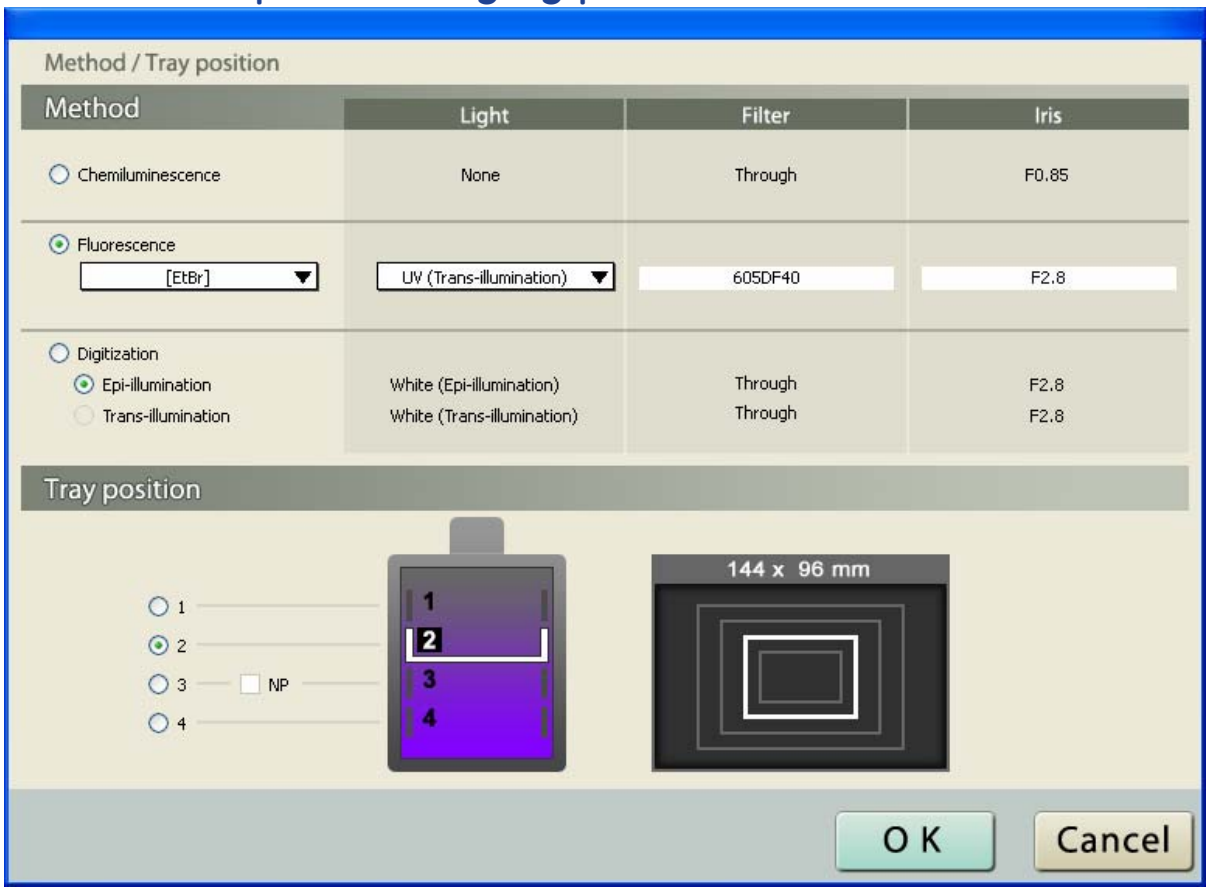
Speed

Easy, rapid, and sophisticated imaging

Method driven operation

Intuitive software gives the results you need

- All imaging parameters are computer-controlled
- Method-driven control for optimal imaging performance

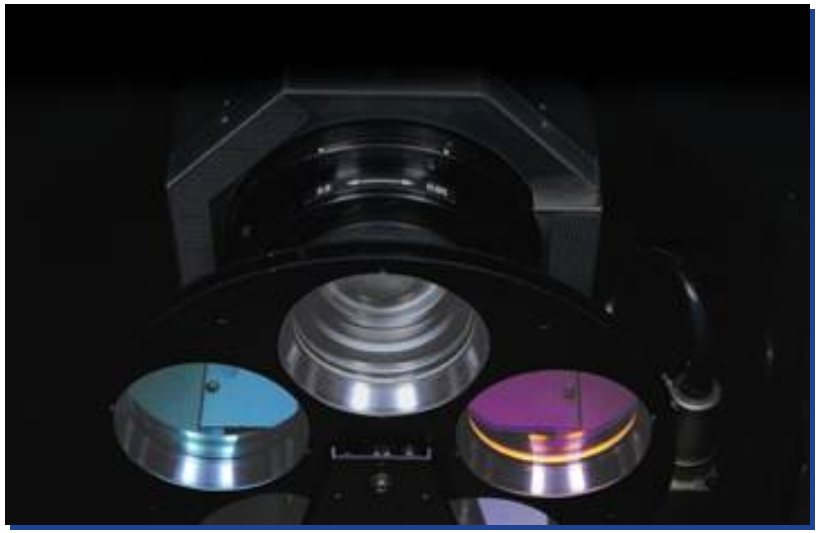


Speed

The right settings every time

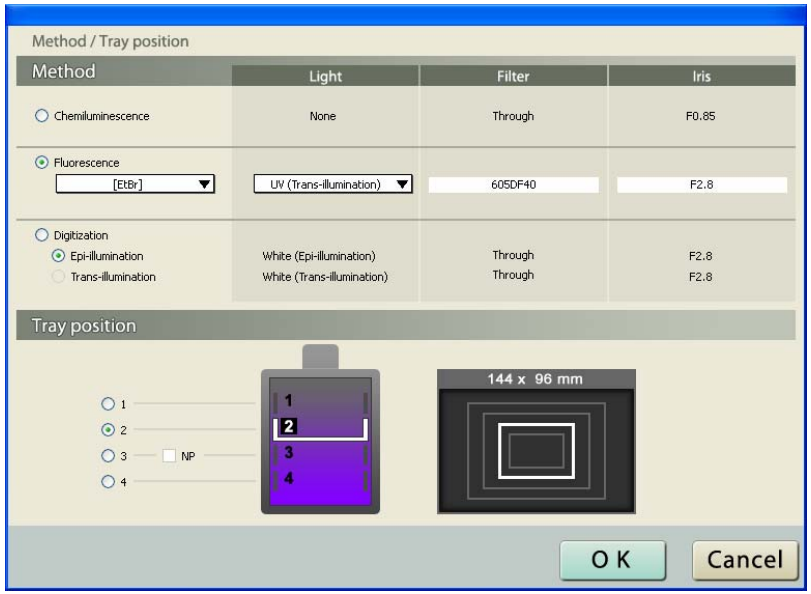
Automatic filters

Automated 4-position filter holder* mounted below the lens



4-position filter holder

Filter selection is computer-controlled according to the selected method

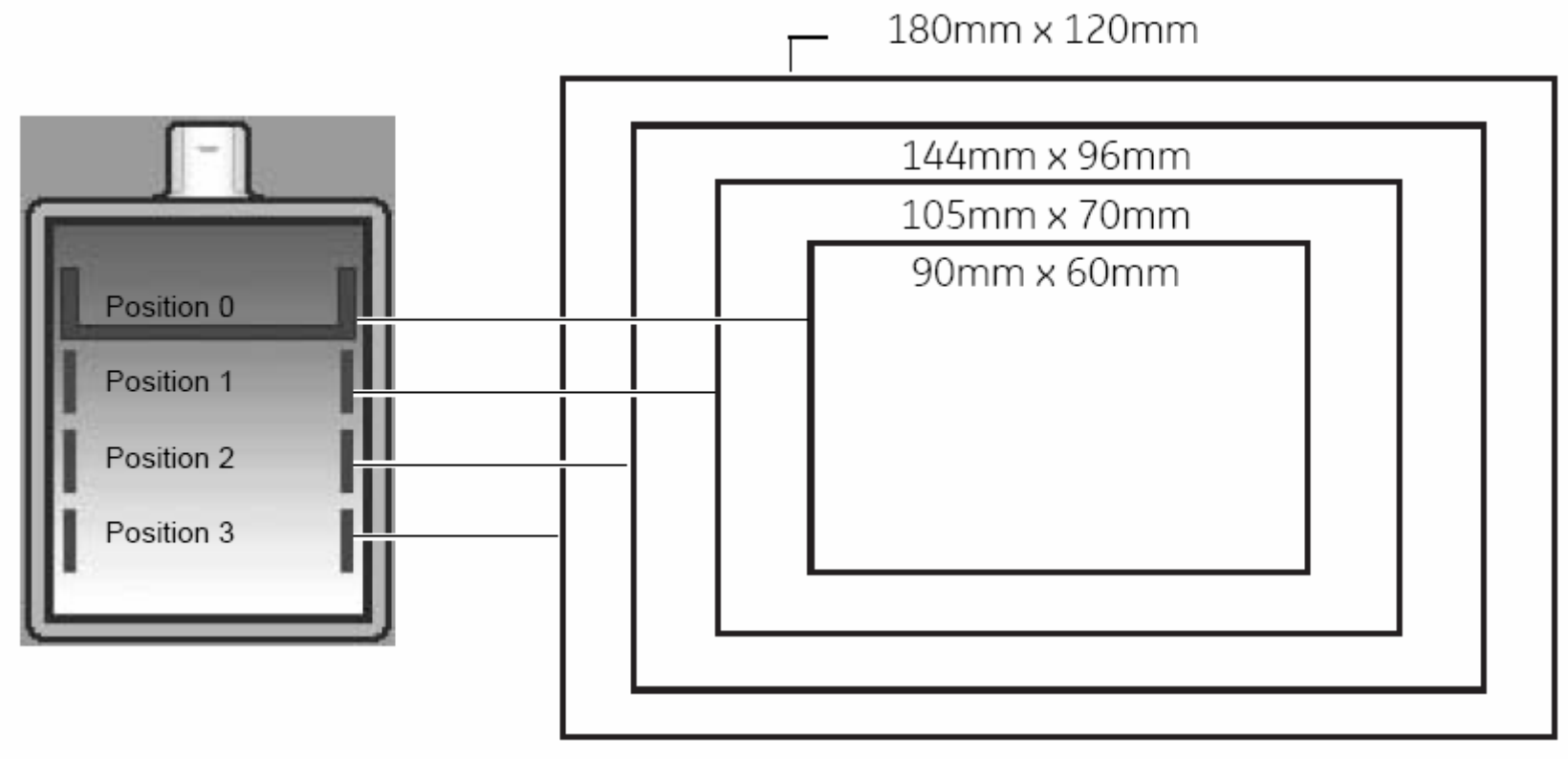


Automatic filter selection

** ImageQuant™ LAS 4000 and 4010 only*

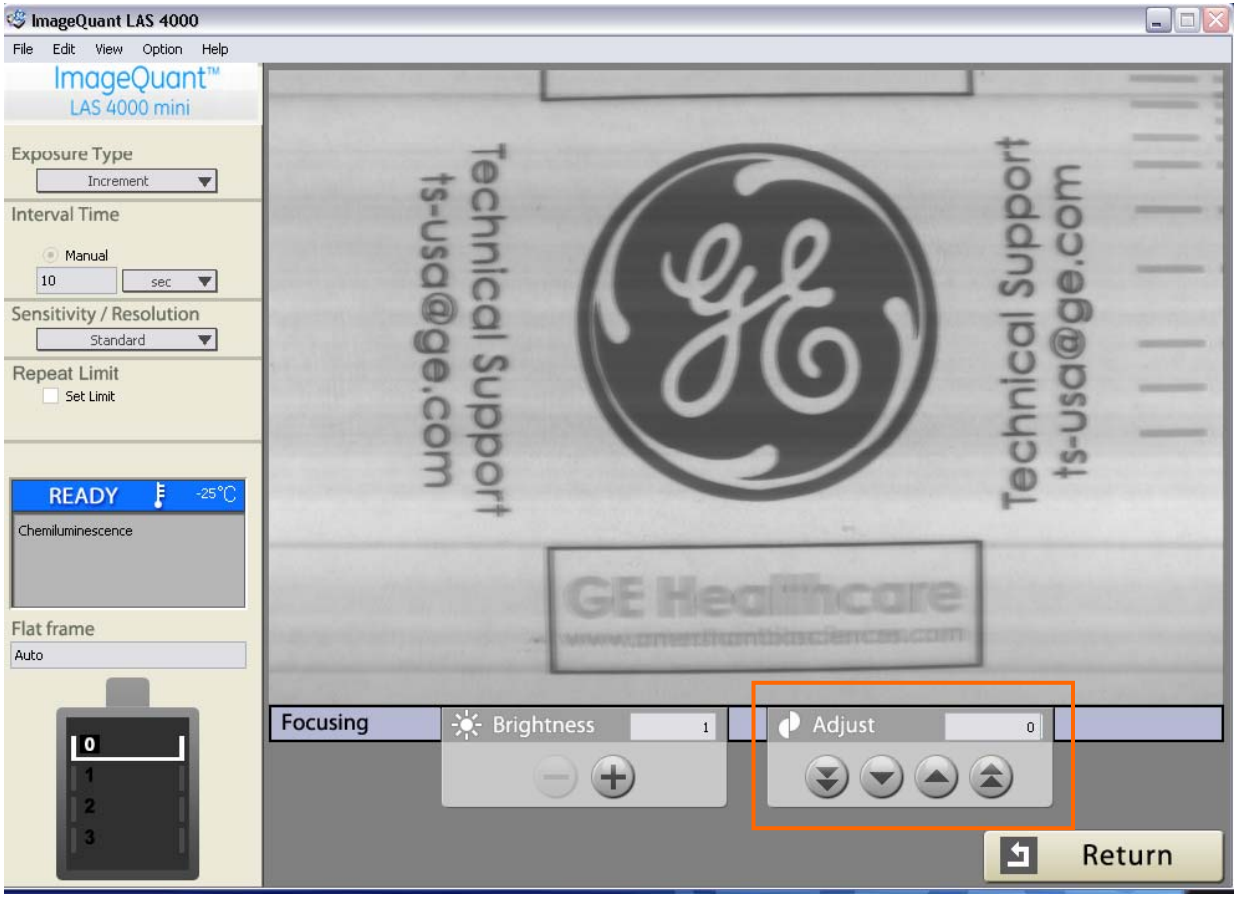
GE imagination at work

Tray position & size



Focusing

> Auto focusing
  -customized fine tuning
  -view brightness



Speed

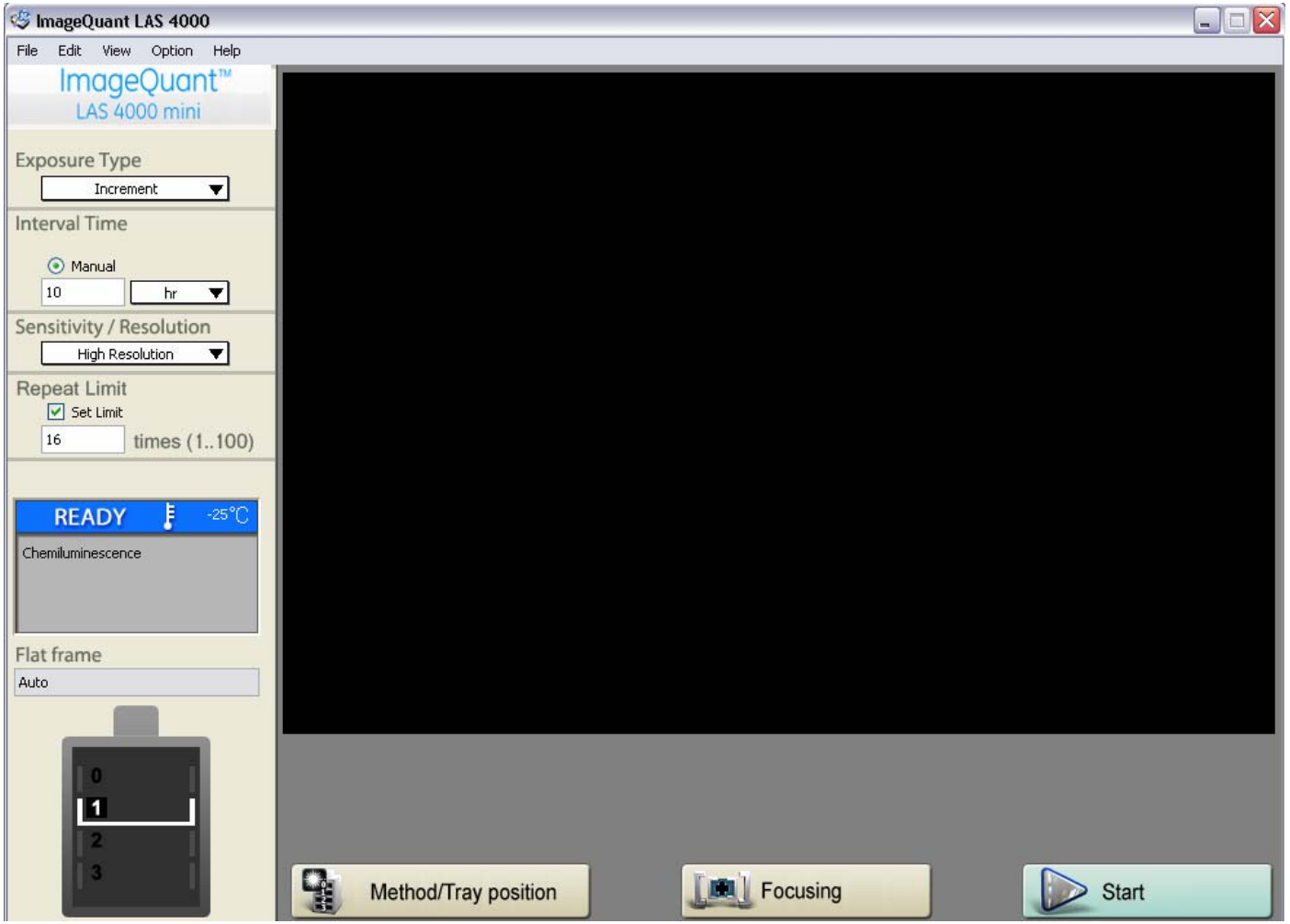
Parameters setting

Exposure type
> precision
> increment
> repetition
> program

Interval time
> Auto
> Manual
(1/100 sec. to 30 hrs)

Sensitivity/resolution
> high resolution
> standard
> high
> super
> ultra
> High binning
> Super binning
> Ultra binning

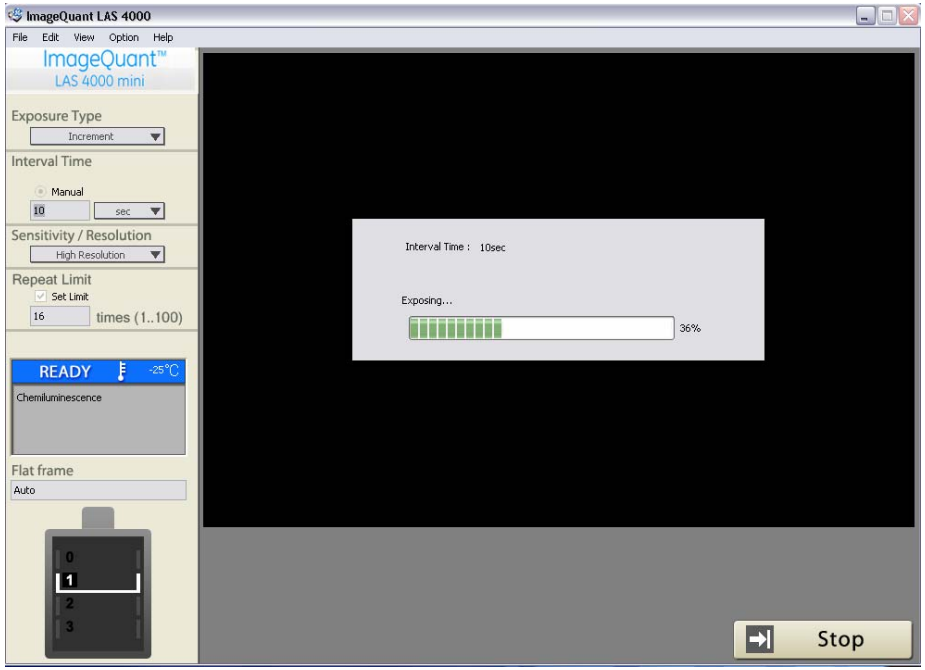
Repeat limit
> 1-100



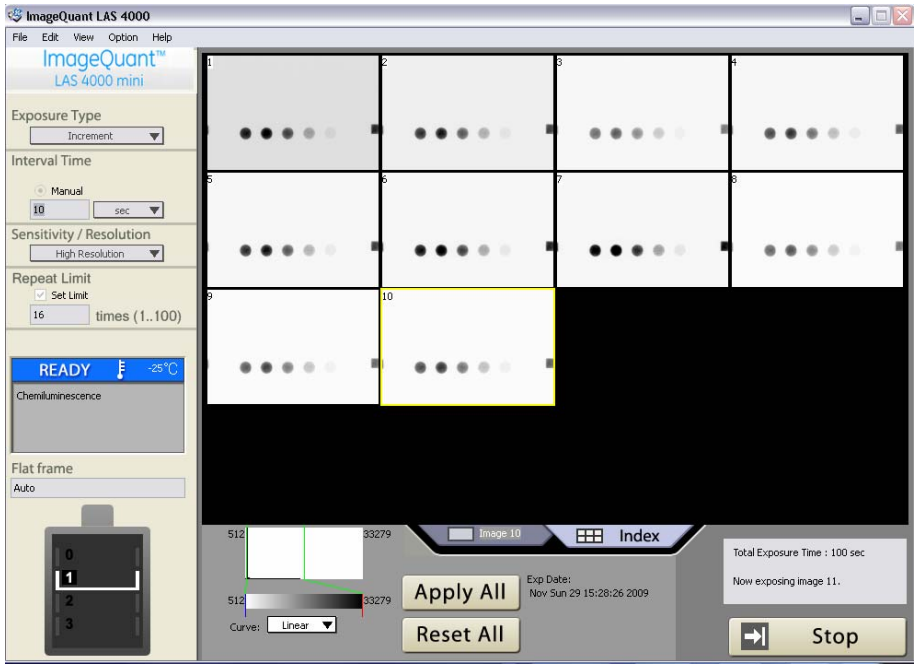
GE imagination at work

Start

During exposure

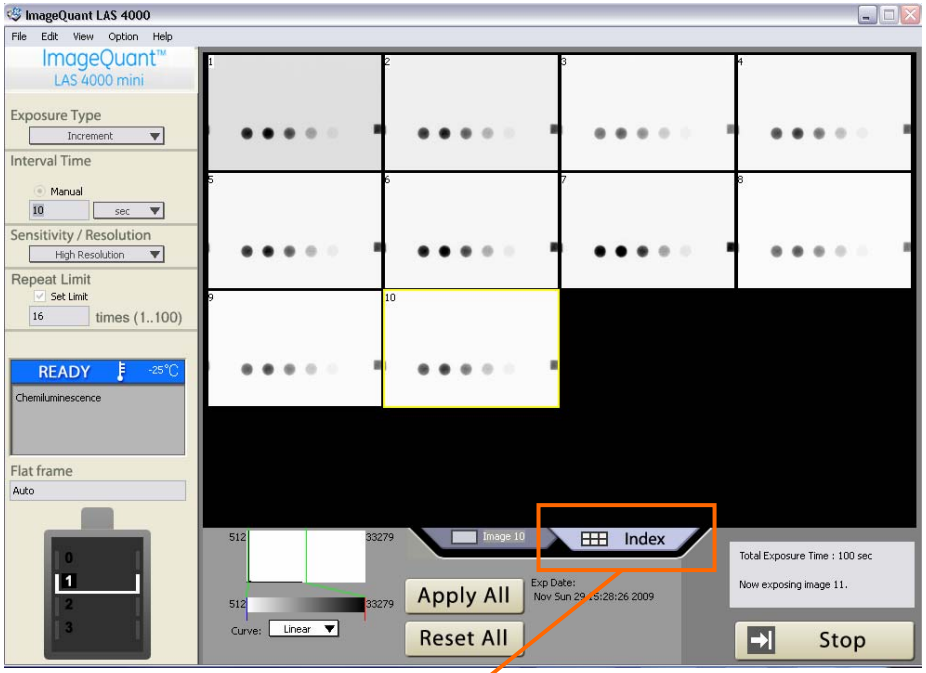


Precision type

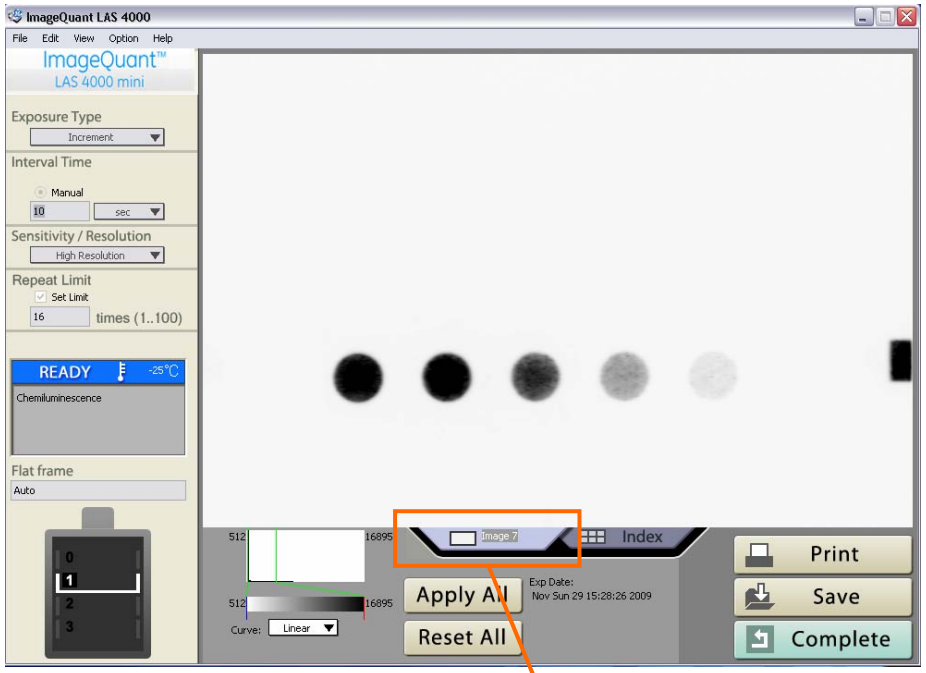


Increment type

Image window



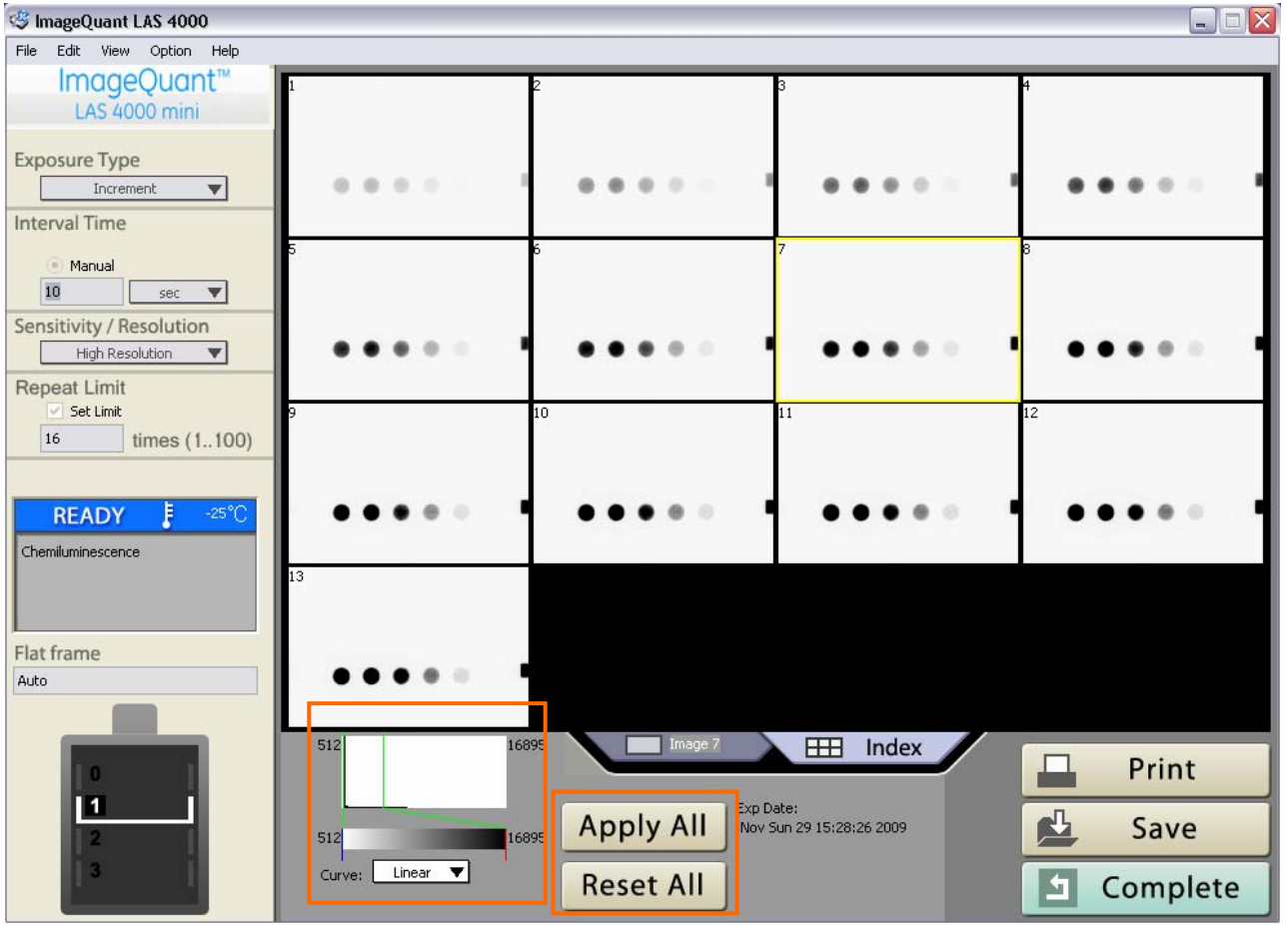
Index



Single image

Speed

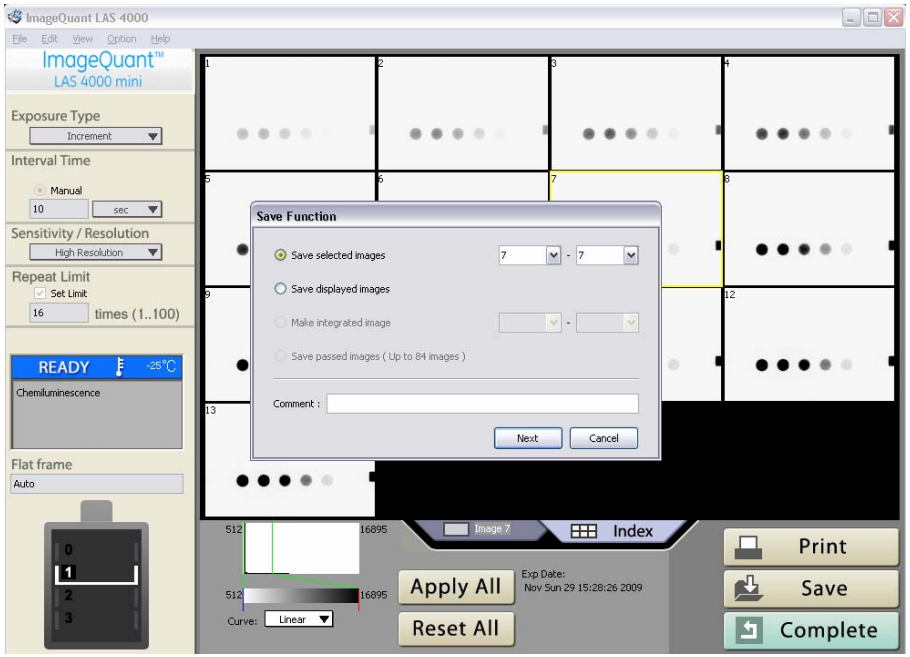
After exposure



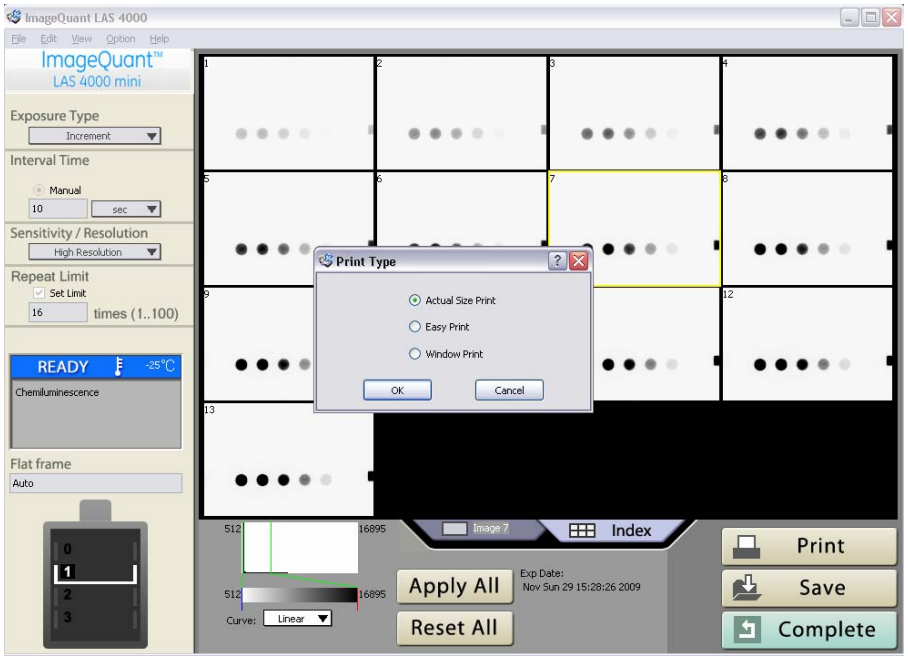
Speed

Image data

save



print



GE imagination at work

Application

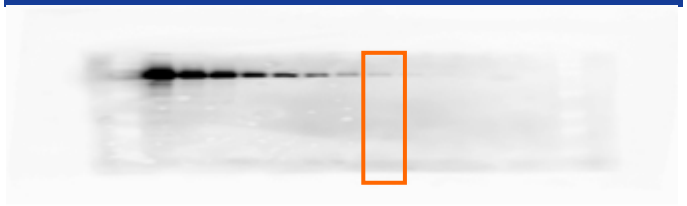
imagination at work

ImageQuant™ LAS 4010 linearity

ECL™ Plus for quantitative Westerns

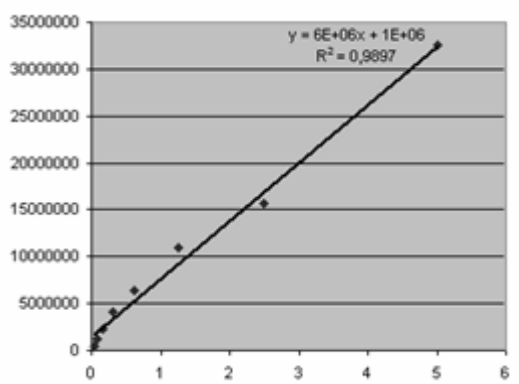
Sample: transferrin dilution series
Reagent: ECL Plus
Mode: chemiluminescence
Binning: 1 x 1

Chemiluminescence



LOD: 39 pg transferrin

$R^2 = 0.9897$

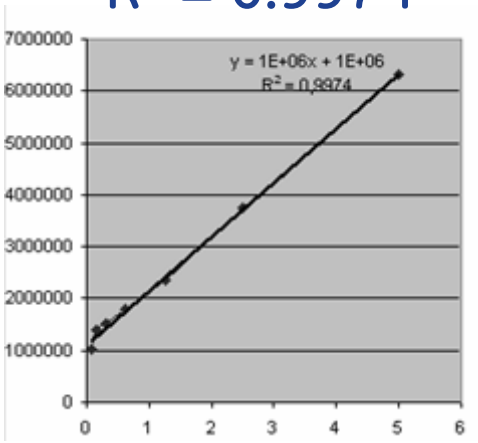


Sample: CHO cell lysate ERK
Reagent: ECL Plus
Mode: chemifluorescence
Binning: 1 x 1

Chemifluorescence

LOD: 78 pg lysate

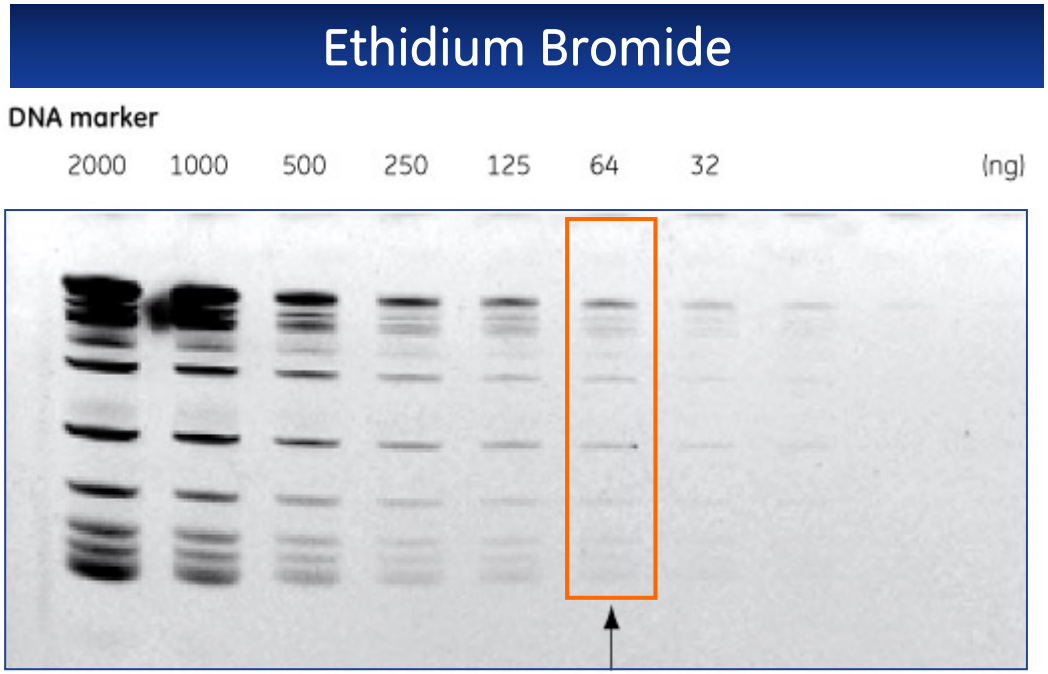
$R^2 = 0.9974$



GE imagination at work

ImageQuant™ LAS 4000

EtBr gel documentation

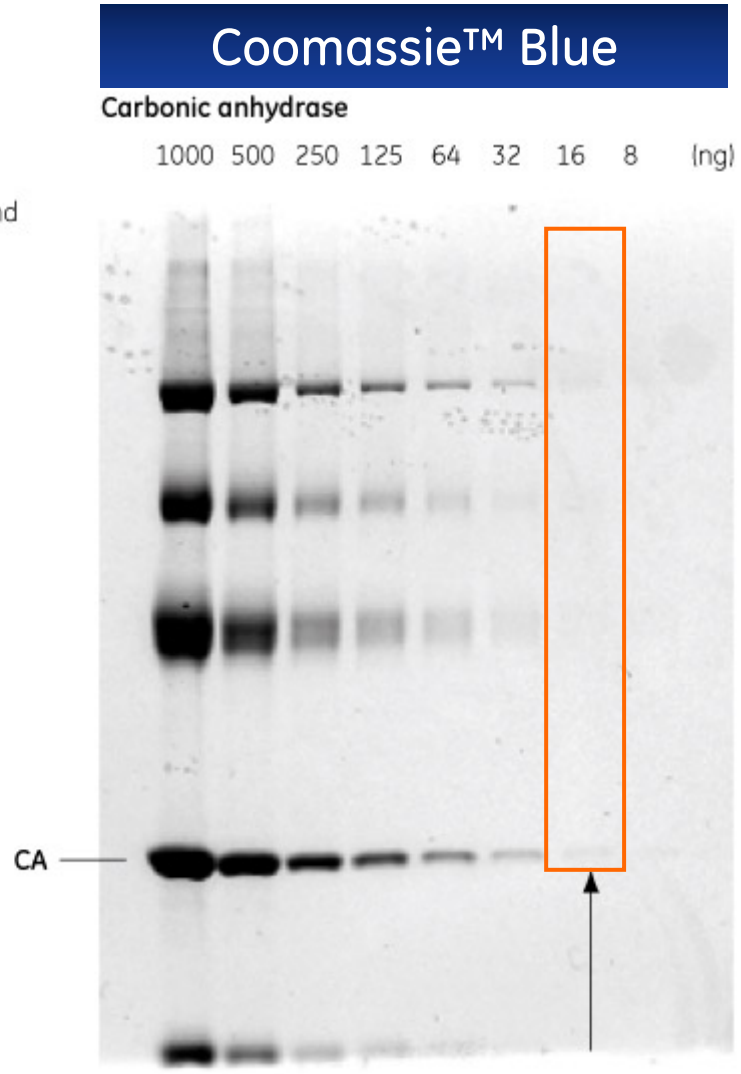


Sample: DNA marker
Stain: EtBr
Mode: UV epifluorescence
Binning: 1 × 1
LOD: 64 ng
L: $R^2 = 0.9968$

ImageQuant™ LAS 4000

CBB gel documentation

Sample: LMW marker and carbonic anhydrase dilution series
Stain: Coomassie Blue
Mode: Epi-white
Binning: 1 × 1
LOD: 16 ng
L: $R^2 = 0.9755$

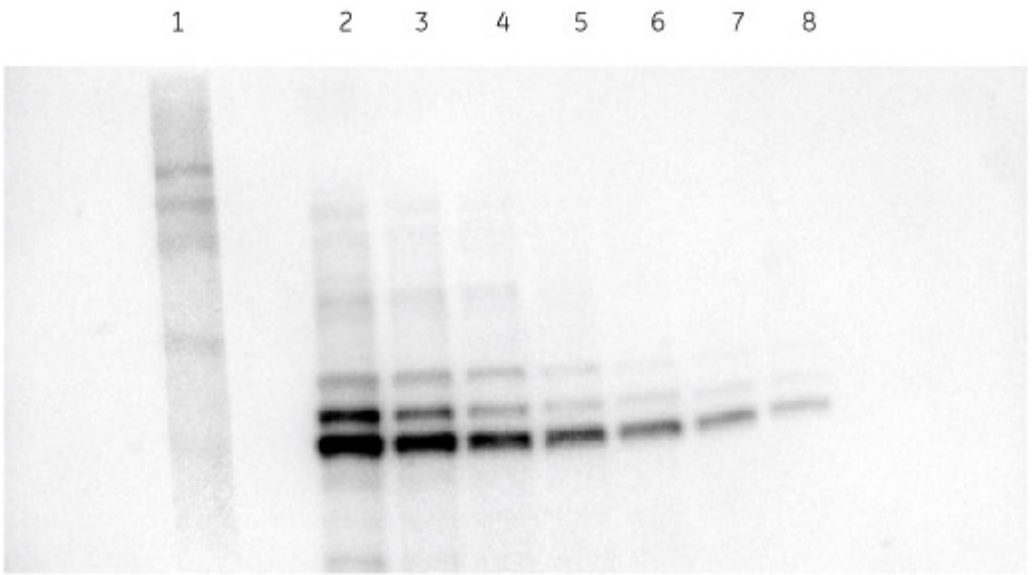


GE imagination at work

ImageQuant™ LAS 4000

Acquire and digitize

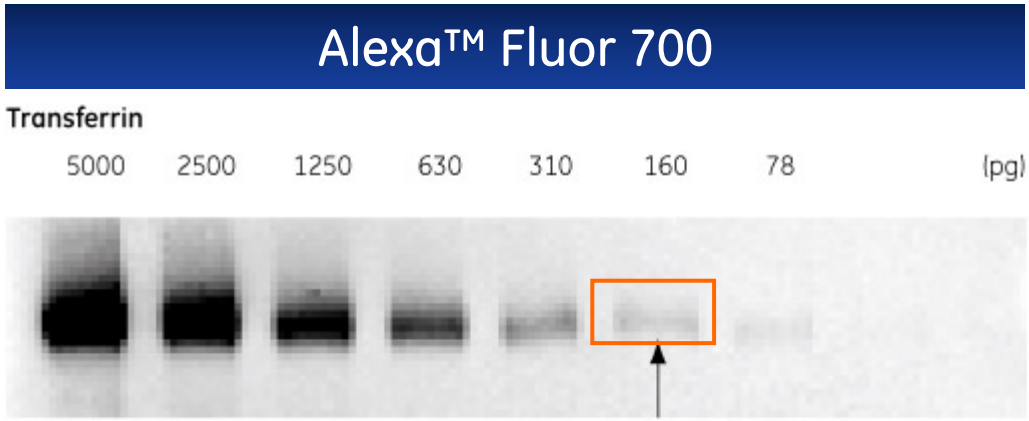
Marker + Chemiluminescence



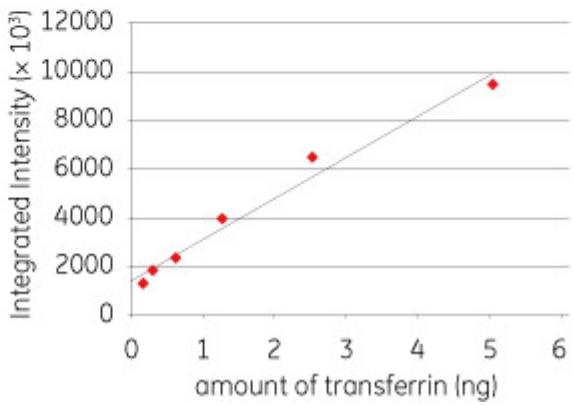
Simultaneously exposing image using chemiluminescenceand white incident light sources

ImageQuant™ LAS 4010

Infrared fluorescence



Sample: Transferrin
Membrane: Hybond LFP
Detection:
Primary antibody:
rabbit anti-human transferrin
Secondary antibody:
anti-rabbit Alexa 700
Mode: IR epifluorescence
Binning: 1 × 1
LOD: 160 pg transferrin

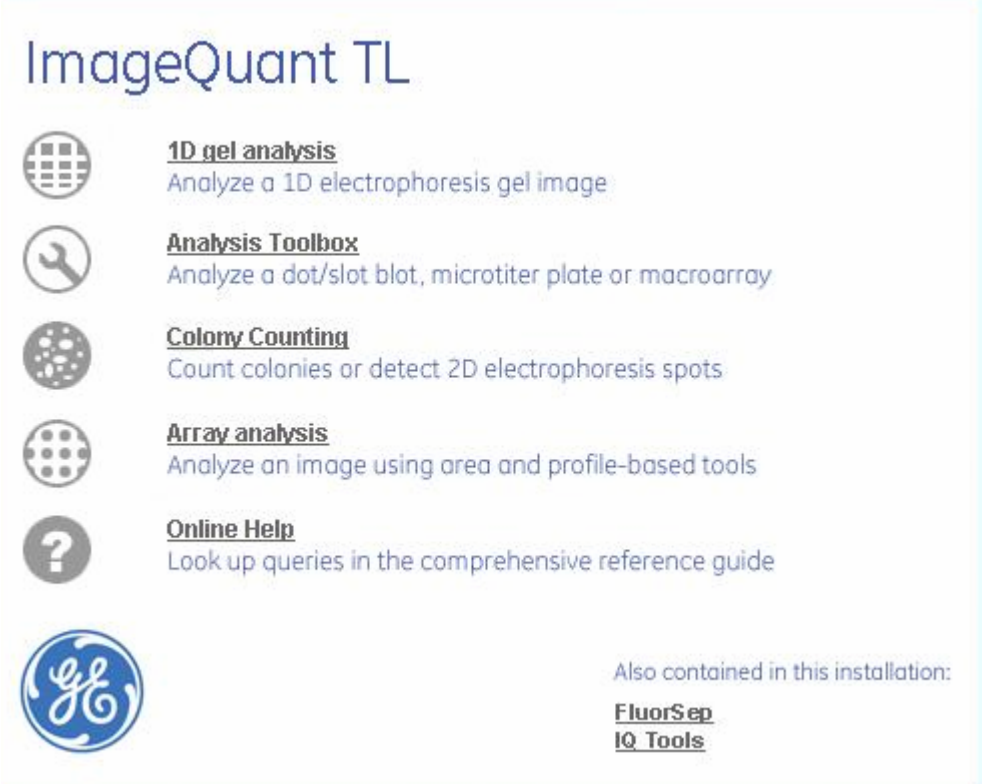


ImageQuant TL7.0 analysis software

imagination at work

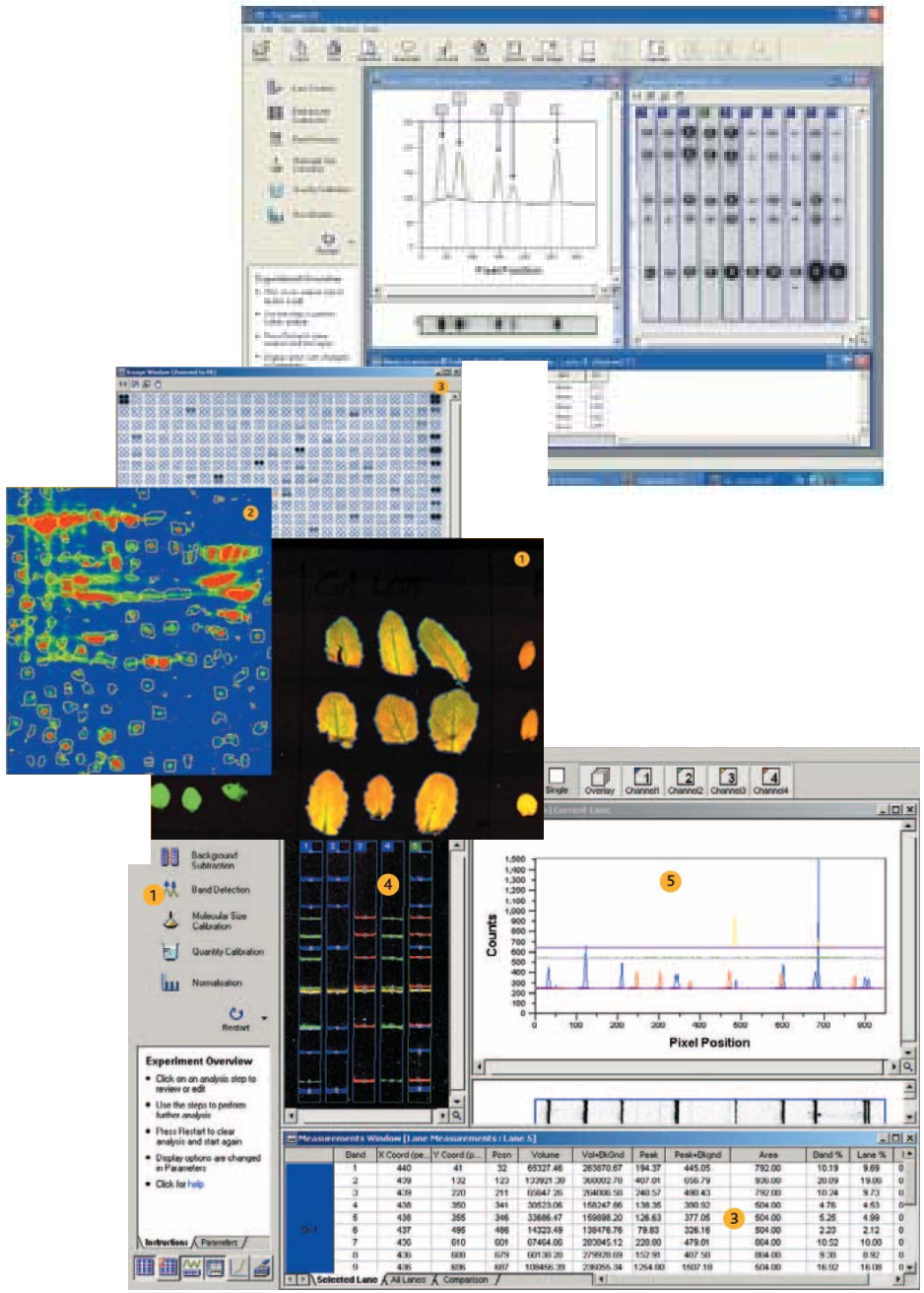
ImageQuant TL7.0 analysis software

- Friendly
- Easy to use
- Auto/Manual operation
- Multi-format, easy to export (ex. excel)



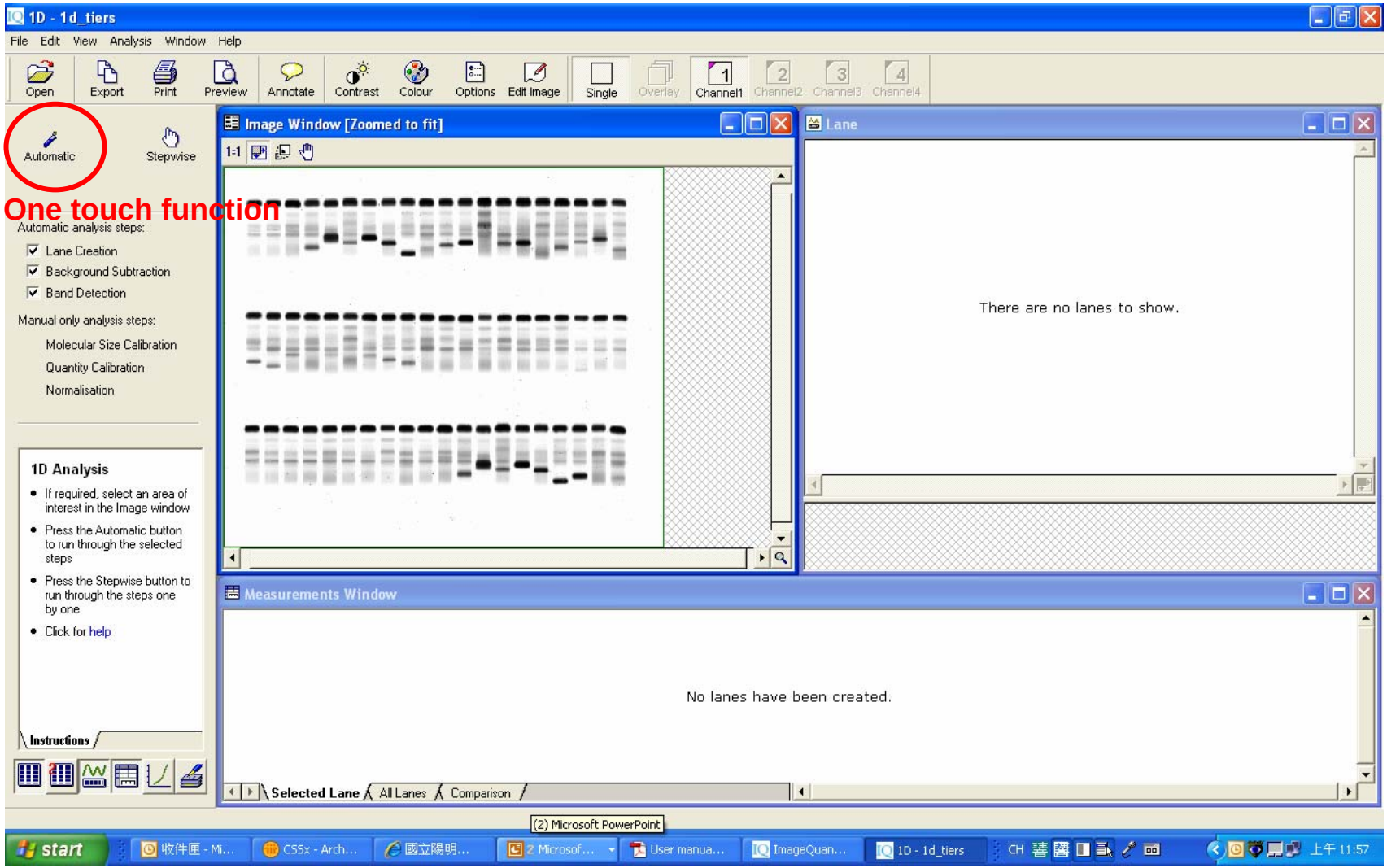
ImageQuant TL 7.0

- **1-D gel analysis module**
  Increased automation and ease of use
- **Array analysis module**
  From simple analyses to quantitative data
- **Colony counting module**
  Accurate colony counts and simple 2-D spot measurement within seconds
- **Analysis Toolbox**
  Range of generic tools allow a flexible approach to analysis

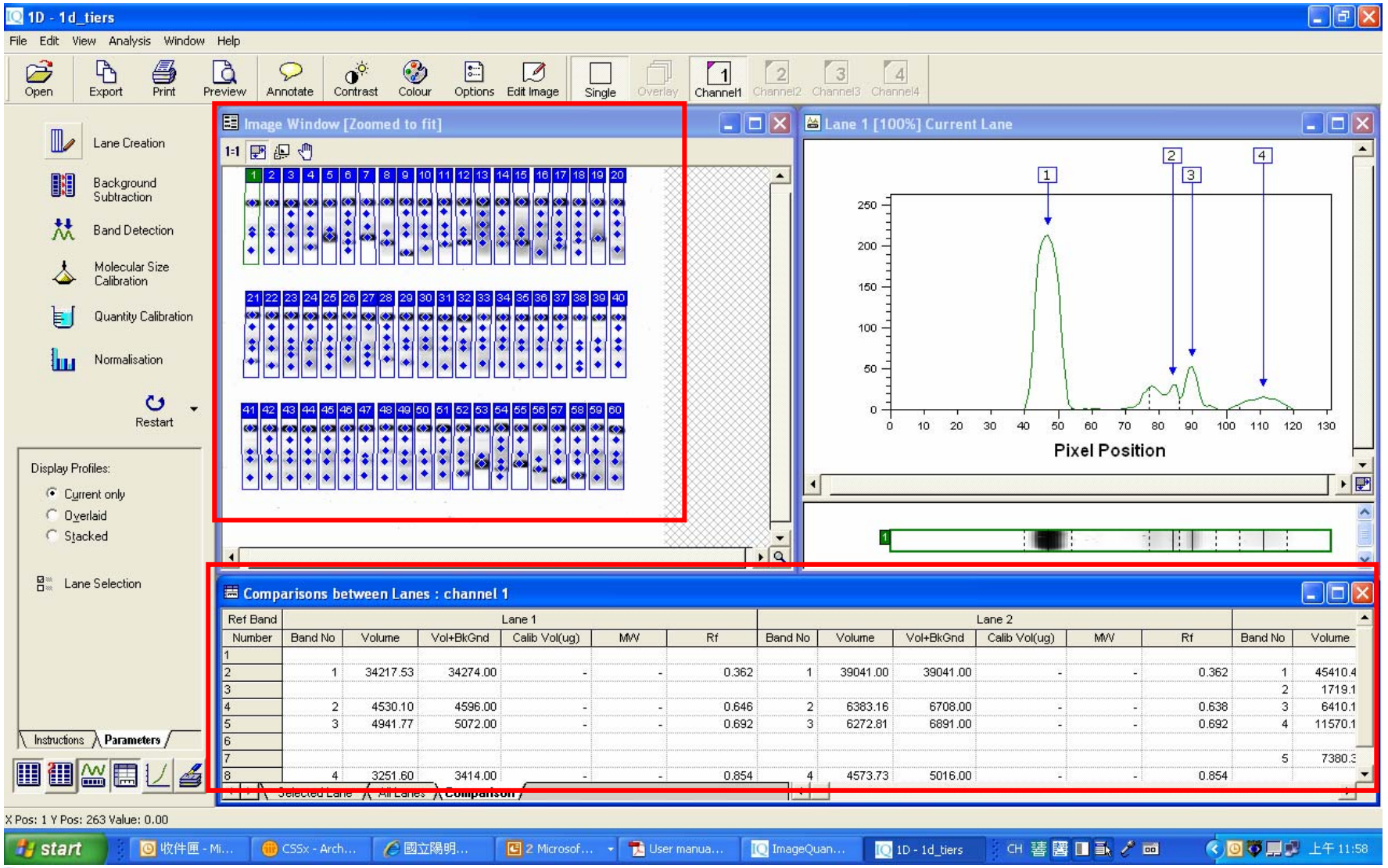


GE imagination at work

Stronge automatic analysis function



Data export


1D - 1d_tiers
File Edit View Analysis Window Help
Open Export Print Preview Annotate Contrast Colour Options Edit Image Single Overlay Channel1 Channel2 Channel3 Channel4
Lane Creation
Background Subtraction
Band Detection
Molecular Size Calibration
Quantity Calibration
Normalisation
Restart
Display Profiles:
Current only
Overlaid
Stacked
Lane Selection
Instructions Parameters
Image Window [Zoomed to fit]
Lane 1 [100%] Current Lane
Pixel Position
Comparisons between Lanes : channel 1
Ref Band Number
Lane 1
Lane 2
Band No Volume Vol+BkGnd Calib Vol(ug) MW Rf
1 34217.53 34274.00 - - 0.362
2 4530.10 4596.00 - - 0.646
3 4941.77 5072.00 - - 0.692
4 3251.60 3414.00 - - 0.854
2 39041.00 39041.00 - - 0.362
3 6383.16 6708.00 - - 0.638
4 6272.81 6891.00 - - 0.692
5 4573.73 5016.00 - - 0.854
45410.4
1719.1
6410.1
11570.1
7380.3
Selected Lane All Lanes Comparison
X Pos: 1 Y Pos: 263 Value: 0.00
start
CH
上午 11:58

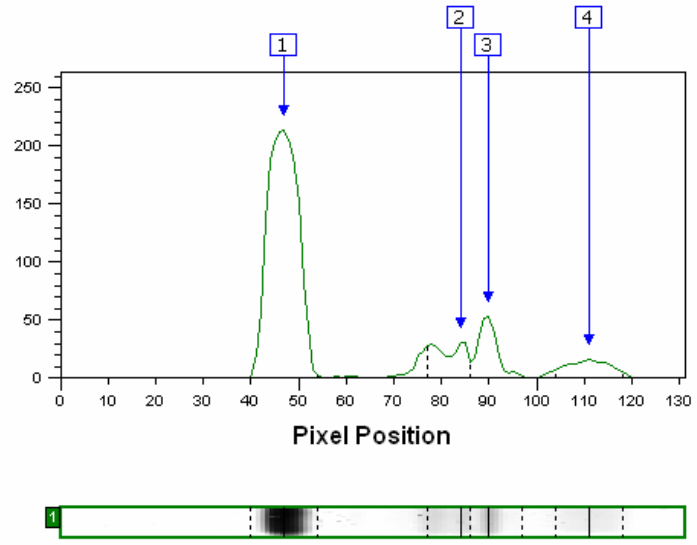
Excel format data

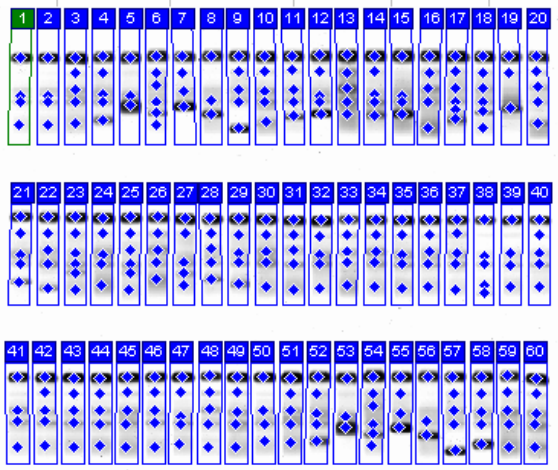
Microsoft Excel - Book2

File Edit View Insert Format Tools Data Window Help Adobe PDF

Q30

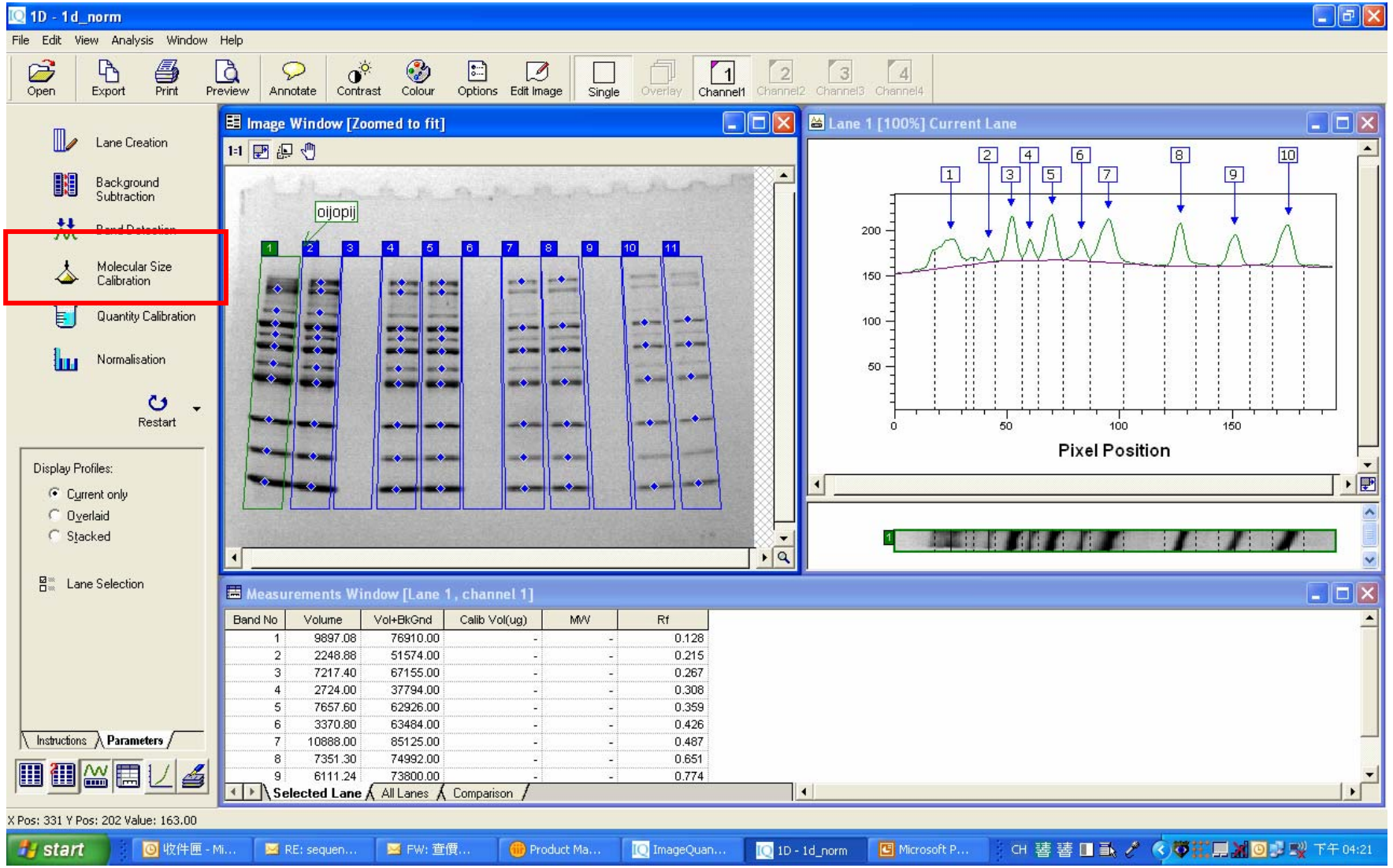
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Ref Band	Lane 1	Lane 1	Lane 1	Lane 1	Lane 1	Lane 1	Lane 2	Lane 2	Lane 2	Lane 2	Lane 2	Lane 2	Lane 3
2	Number	Band No	Volume	Vol+BkGnd	Calib Vol(ug)	MW	Rf	Band No	Volume	Vol+BkGnd	Calib Vol(ug)	MW	Rf	Band No
3	1													
4	2	1	34217.53	34274	-	-	0.362	1	39041	39041	-	-	0.362	1
5	3													2
6	4	2	4530.1	4596	-	-	0.646	2	6383.16	6708	-	-	0.638	3
7	5	3	4941.77	5072	-	-	0.692	3	6272.81	6891	-	-	0.692	4
8	6													
9	7													5
10	8	4	3251.6	3414	-	-	0.854	4	4573.73	5016	-	-	0.854	



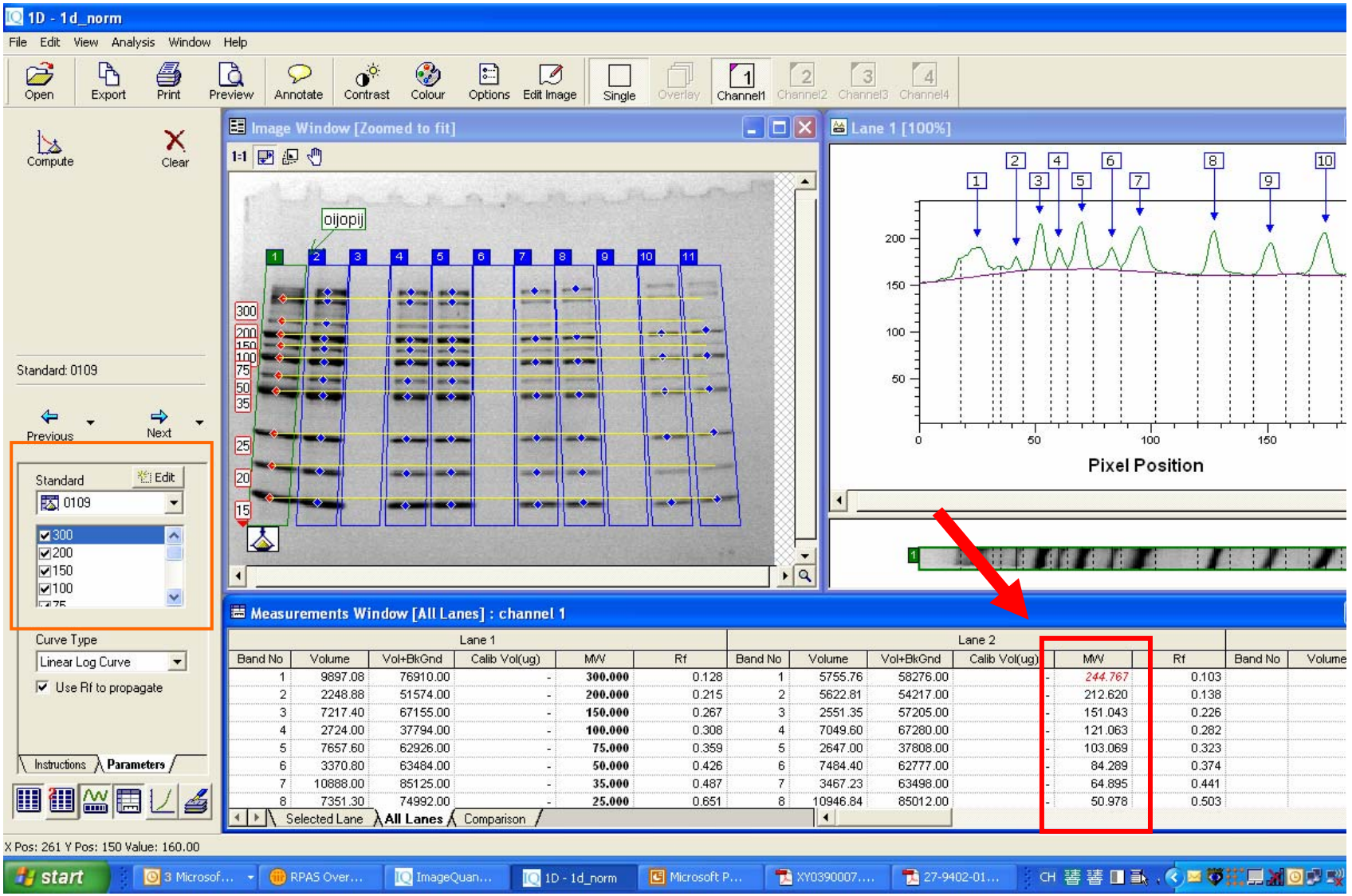


Sheet 1 / Sheet 2 /

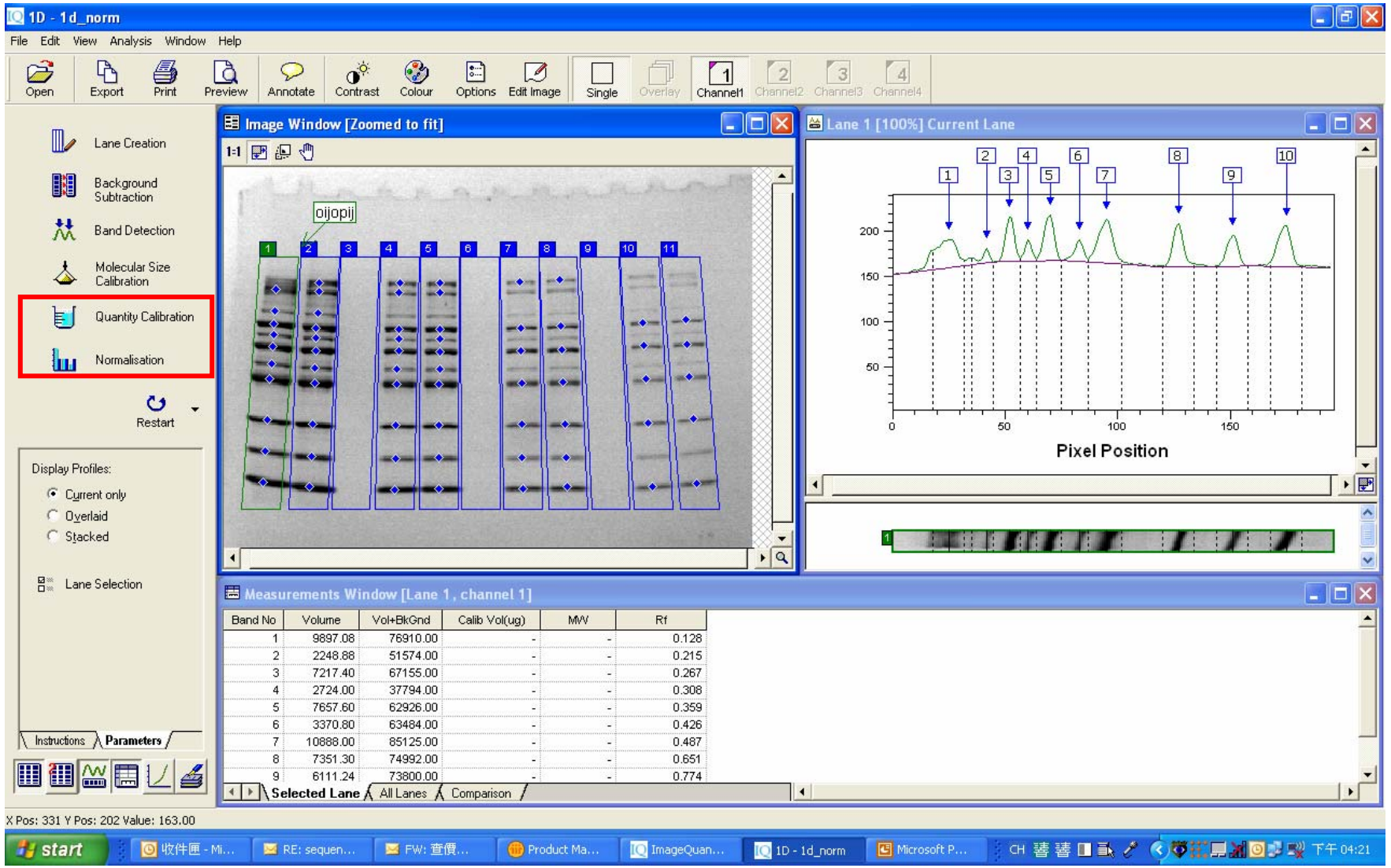
Molecular weight calibration



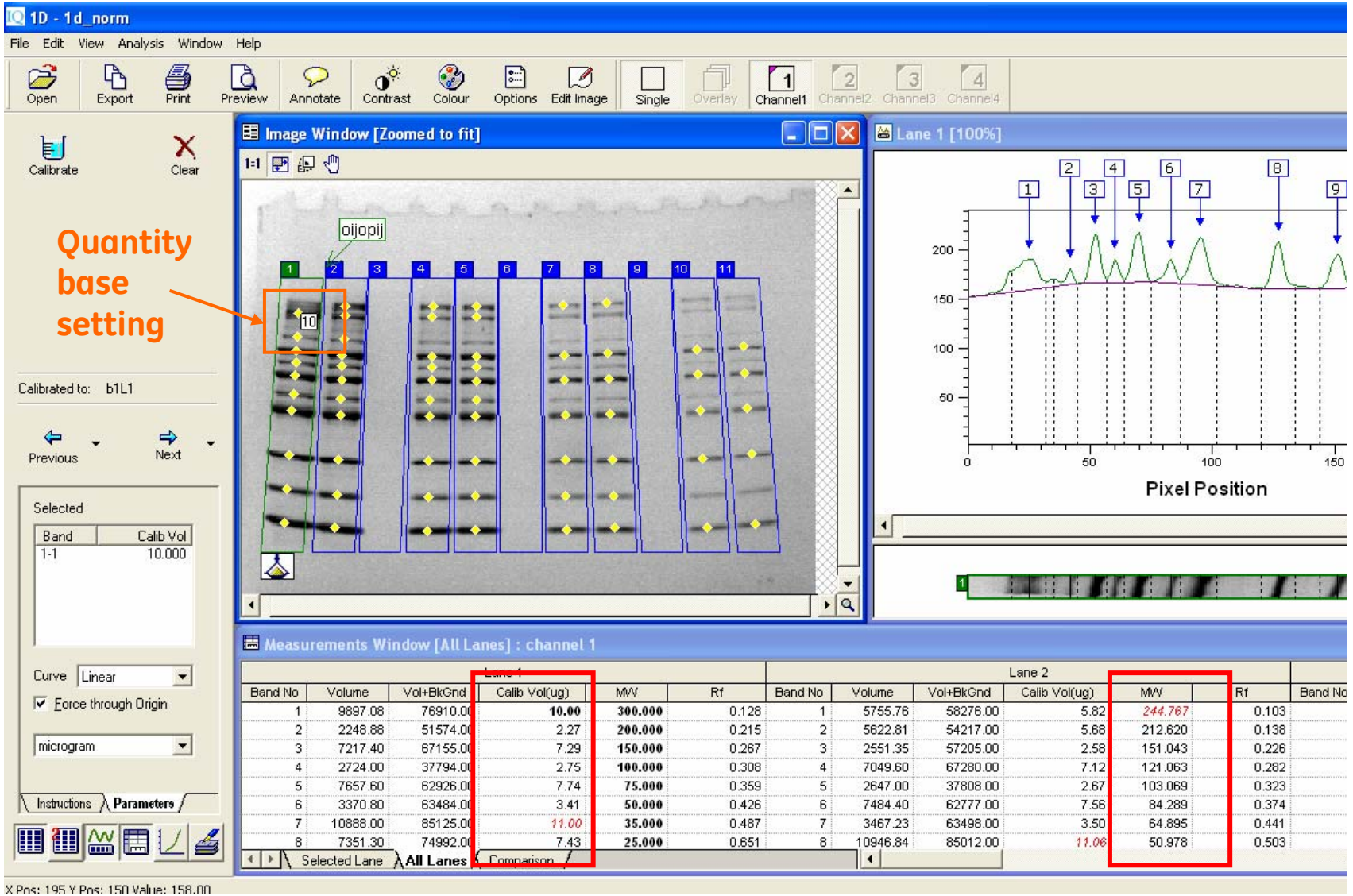
Molecular weight calibration



Quantity calibration/Normalisation



Quantity calibration/Normalisation



ImageQuant™ LAS 4000mini
Specifications

CCD Chip:	Fujifilm™ Super CCD 15.6 x 23.4 mm
Pixels:	3.2 million (6.3 megapixel image resolution)
Pixel size:	approx. 11 µm
Lens:	F0.85 43 mm
Cooling:	down to -35 °C (standard -25 C)
	Two-stage thermoelectric module with air circulation
Dynamic range:	4 orders of magnitude
Exposure modes:	automatic/manual
Exposure time:	automatic/manual (1/100 seconds to 30 hours)
Pixel correction:	Dark-frame correction, flat-frame correction, distortion correction
Image quality correction:	binning and smoothing
Image size:	up to 12 MB
Read pixel size :	down to 35 µm
Max sample size:	21 x 14 cm (25 x 25 cm with wide angle lens)

ImageQuant™ LAS 4000mini

Features & benefits

Open for future needs

- Fully upgradeable to multicolor fluorescence imaging

Highest resolution

- 16-bit 3.2 megapixel camera provides up to 6.3 megapixel virtual imaging

Fast & sensitive

- Bright F0.85 lens designed for chemiluminescence imaging

Versatile

- Multiple capture modes make use of four orders of dynamic range
- Trans-UV and epi-white light fluorescence applications

Easy-to-use

- Intuitive capture software
- Easy-to-install, single cable, no hassle

Robust

- Suitable for a multiuser environment

GE imagination at work

GE Healthcare

Thanks for your attention.