NH DyeAGNOSTICS

OCTOPLUS QPLEX

FLUORESCENCE IMAGER

for fast & powerful 2D gel image acquisition

DyeAGNOSTICS

Octoplus QPLEX
Fluorescence Imager

The new Octoplus QPLEX fluorescence imager sets a novel standard for fluorescence 2D gel imaging. It combines the sensitivity of laser-based systems with the rapid image acquisition of CCD cameras. The Octoplus QPLEX system introduces the latest improvements in fluorescence excitation and emission detection technologies and is developed for the specific 4-color multiplexing (quadruplexing) fluorescence imaging of Refraction-2D™ QPLEX dyes.

In addition, Octoplus QPLEX performs fluorescent and chemiluminescent Western blot analysis to the highest standards available. The robust setup of the device is designed for daily use and does not require any maintainance.

Made in Germany

"Refraction-2D™ multiplex fluorescence 2D gel analysis helps us to identify novel protein biomarkers for cancer diagnostics."

Prof. Dr. Dr. J. Habermann and Dr. Timo Gemoll. University of Lübeck

"We very much appreciate the rapid 2D gel image acquisition by a highly specific and sensitive CCD camera based system."

Prof. Dr. Barbara Sitek, Medical Proteom Center Bochum

▶ Quadroplex fluorescence

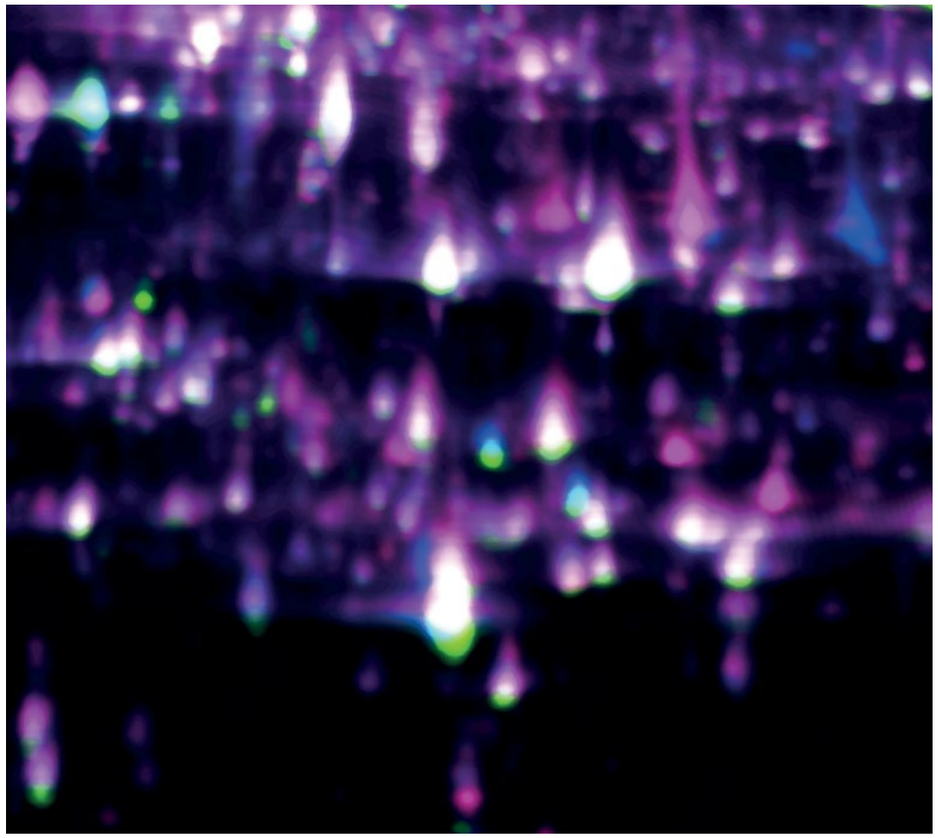
2D gel imaging

- ✓ Ultra-sensitive 4-color fluorescence detection
- ✓ High resolution 2D gel imaging
- ✓ Rapid image acquisition

Octoplus QPLEX Fluorescence Imager

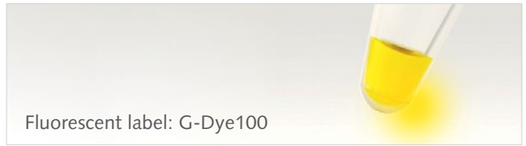
Quadruplex fluorescence 2D gel imaging

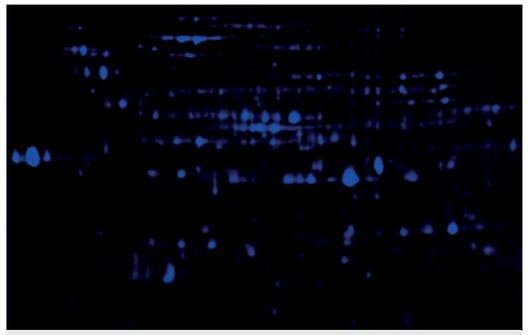
Octoplus QPLEX is especially designed for Refraction-2D™ and Saturn-2D™ multiplex fluorescence 2D gel analysis. The powerful combination of carefully developed system components for fluorescence light excitation and detection create a perfect system for sensitive image acquisition.
The image acquisition of a Refraction-2D™ QPLEX gel size 24 x 20 cm (images for G-Dye100, G-Dye200 G-Dye300 and G-Dye400) is performed within minutes. A complete series of gels (e.g. six Refraction-2D™ QPLEX gels) can be imaged in less than one hour.



Refraction-2D™ QPLEX analysis of three different *Arabidopsis thaliana* ecotypes.

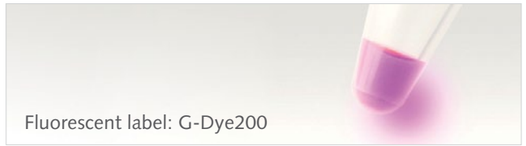
G-Dye100 + G-Dye200 + G-Dye300 + G-Dye400
= 5 min image acquisition

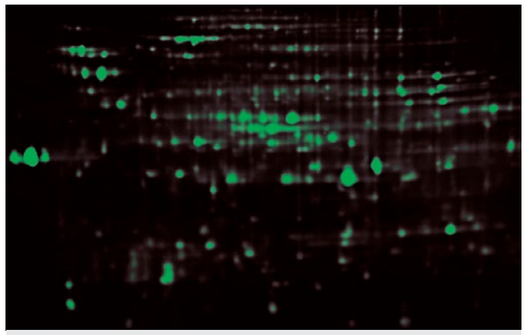




G-Dye100 image

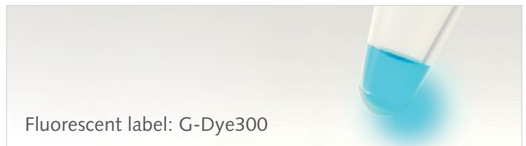
Octoplus QPLEX Blue HP LED, G100BP filter
Bit depth: 16 bit
Gel size: 24 x 20 cm, pH 3-10
Sample: 50 µg total protein from *E. coli*

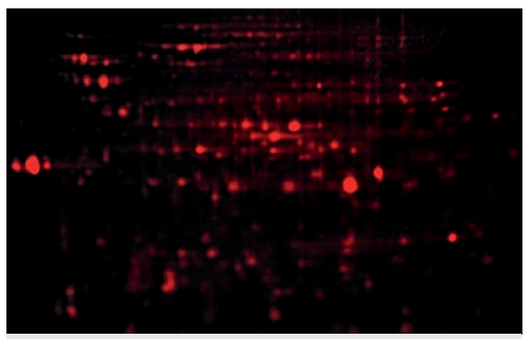




G-Dye200 image

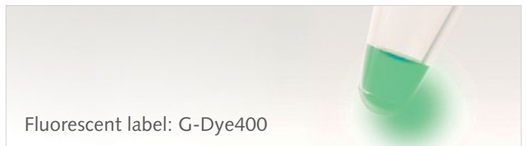
Octoplus QPLEX Green HP LED, G200BP filter
Bit depth: 16 bit
Gel size: 24 x 20 cm, pH 3-10
Sample: 50 µg total protein from *E. coli*

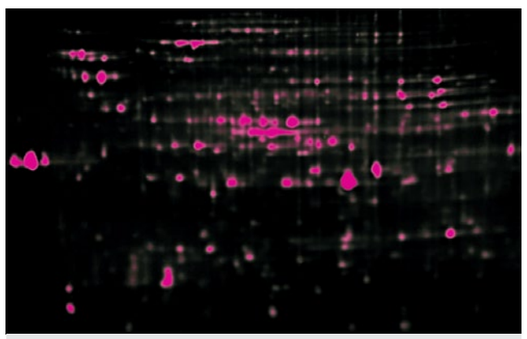




G-Dye300 image

Octoplus QPLEX Red LED, G300BP filter
Bit depth: 16 bit
Gel size: 24 x 20 cm, pH 3-10
Sample: 50 µg total protein from *E. coli*





G-Dye400 image

Octoplus QPLEX Infra Red LED, G400BP filter
Bit depth: 16 bit
Gel size: 24 x 20 cm, pH 3-10
Sample: 50 µg total protein from *E. coli*

Sensitivity of fluorescence 2D gel imaging

The latest developments in high power LED technology (light emitting diode) combined with a high quantum efficiency CCD sensor (charge coupled device) over a spectrum of 470 to 770 nm enables the Octoplus QPLEX system to compete with laser based fluorescence imaging devices (Fig. 1+2).

Octoplus QPLEX

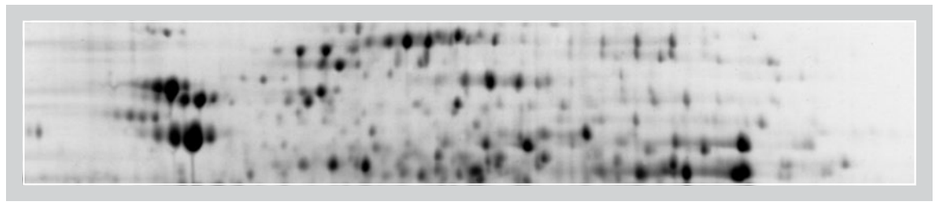
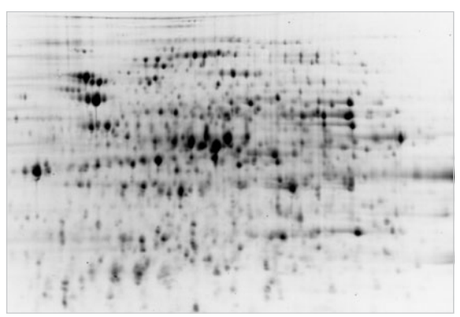


Fig 1. Green HP LED; G200BP filter; bit depth: 16 bit; gel size: 24 x 20 cm, pH 4-7;
Sample: 50 µg total protein from *E. coli* pre-labeled with G-Dye100 (minimal labeling);
Detailed view of the 2D gel shown below.

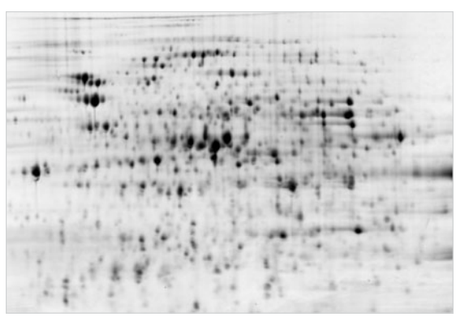
Typhoon FLA 9000

Fig 2. 532 nm green SHG laser; LPG (575LP) filter; bit depth: 16 bit; gel size: 24 x 20 cm, pH 4-7;
Sample: 50 µg total protein from *E. coli* pre-labeled with G-Dye100 (minimal labeling);
Detailed view of the 2D gel shown below.

Image acquired by Octoplus QPLEX



Scan acquired by Typhoon FLA 9000



Acknowlegement: The 2D gel was provided by courtesy of Prof. Dr. Dr. J. Habermann
and Dr. T. Gemoll, University of Lübeck, Germany

Specificity of detection of fluorescence light

Multiplex fluorescence imaging requires highly specific fluorescence light excitation and emission. Octoplus QPLEX is equipped with a fine tuned set of 4 highly specific excitation and emission band pass filters.

To test for detection specificity 4 x 5 µg of *E. coli* total protein was pre-labeled with G-Dye100, G-Dye200, G-Dye300 and G-Dye400 and separated by 1D SDS-PAGE (lanes 1-4, lane 5: QPLEX pre-labeled protein marker, Fig. 3). To analyze filter specificity (cross talk), the specific lane was detected by using the corresponding excitation (HP LED respectively laser) and emission filter set (Figures below).

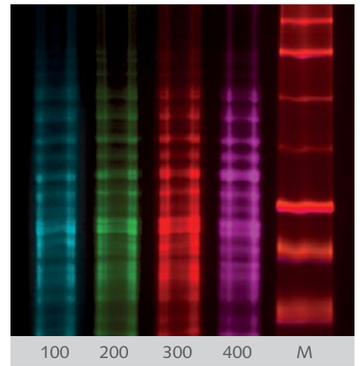


Fig. 3. G-Dye100 - 400 overlay
Image acquired by Octoplus QPLEX

Octoplus QPLEX

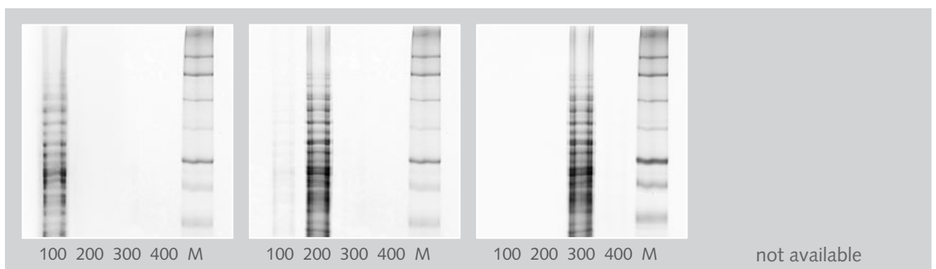
G-Dye100 image
Blue HP LED
G100BP filter

G-Dye200 image
Green HP LED
G200BP filter

G-Dye300 image
Red HP LED
G300BP filter

G-Dye400 image
IR HP LED
G400BP filter

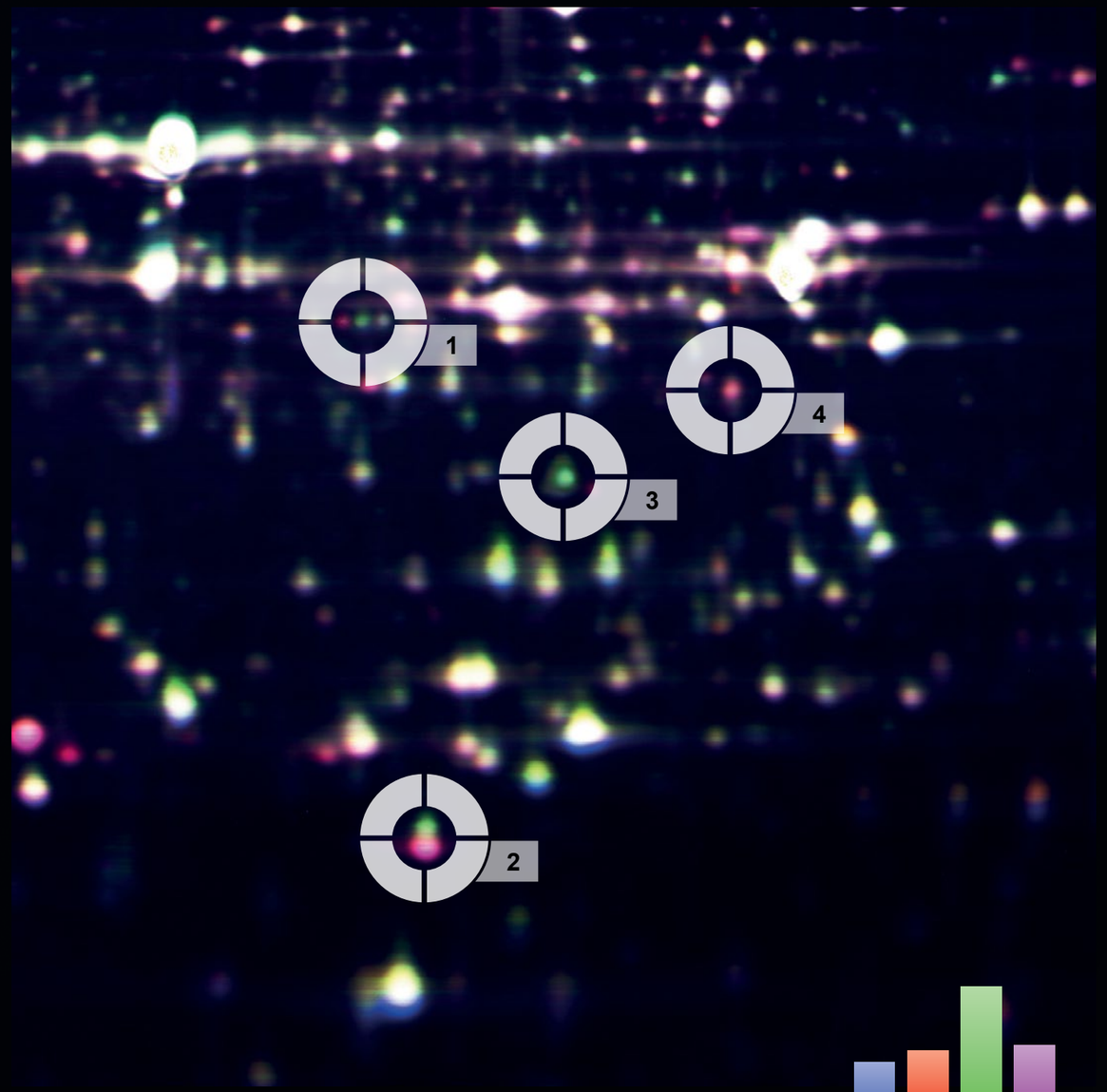
Typhoon FLA 9000



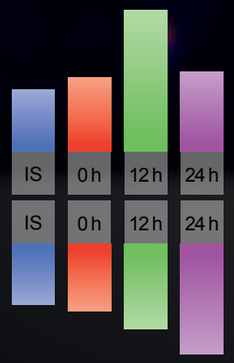
G-Dye100 scan
Blue LD laser
LPB (510LP) filter

G-Dye200 scan
Green SHG laser
LPG (575LP) filter

G-Dye300 scan
Red LD laser
LPR (665LP) filter



1	PTM (Phosphorylation)	3	12 h upregulation (2.3 fold)
2	PTM (Glycosylation)	4	24 h downregulation (1.8 fold)



Refraction-2D™ QPLEX 2D gel analysis of *Arabidopsis thaliana* (Col.) 0 h, 72 h and 144 h upon treatment with Bion® (salicylic acid analogon, stimulates pathogen defense). Imaging by Octoplus QPLEX.

World´s first
quadruplex 2D gel analysis

- **Refraction-2D™ QPLEX protein labeling**
- **Octoplus QPLEX fluorescence imaging**

Refraction-2D™ QPLEX

4-color 2D gel protein labeling

Comparing up to 4 different samples within the same analysis: Refraction-2D™ QPLEX introduces the world´s first 4-color coding for 2D gels. The G-Dyes (G-Dye100, G-Dye200, G-Dye300 and G-Dye400) combine the most powerful fluorescence properties with a superior photo stability and easy, accurate spot picking.

Kit content

- G-Dye100 – high performance fluorescence dye
- G-Dye200 – high performance fluorescence dye
- G-Dye300 – high performance fluorescence dye
- G-Dye400 – high performance fluorescence dye

- G-Dye labeling stop solution
- G-Dye solvent
- G-Dye low retention tips
- G-Dye low retention micro centrifuge tubes

- Extra G-Dye100 for easy spot picking (included in 12G kits)

- ▶ Fluorescence
- ▶ Chemiluminescence
- ▶ Colorimetric

1D gel imaging

- ✓ Simultaneous fluorescence imaging of 4 different dyes
- ✓ Sensitive & quantitative chemiluminescence
- ✓ Bright colorimetric imaging

1D Fluorescence Imaging

The Octoplus QPLEX HP LED module emittes light with 4 different wavelenghts to excite the diverse fluorophores. Highly specific excitation and emission filters avoid any crosstalk issues. Figure 4 shows 4 differently fluorescent labeled proteins separated by SDS-PAGE and imaged by Octoplus QPLEX. Complex samples of less than 1 µg of protein can be analyzed with high accuracy (Fig. 5).

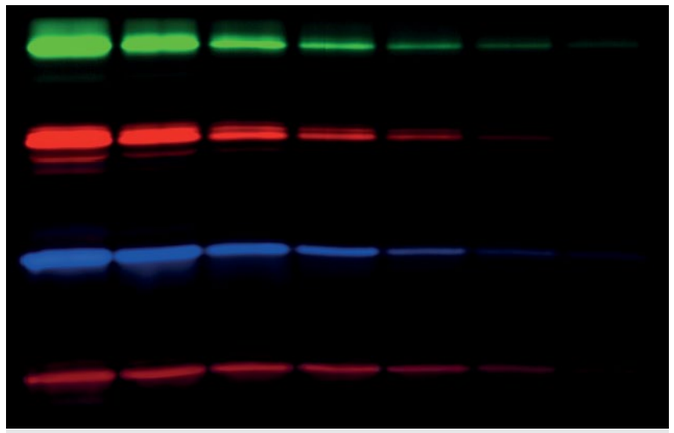


Fig. 4. Serial dilution of T-Dye labeled proteins: BSA + T-Green 210, Casein + T-Rex 330, Lactoglobulin + G-Dye100, RNase A + T-Red 410. Proteins were separated by SDS-PAGE and imaged by Octoplus QPLEX. Imaging times: T-Green 210: 35 sec, T-Rex 330: 5 sec, G-Dye100: 10 sec, T-Red 410: 30 sec.

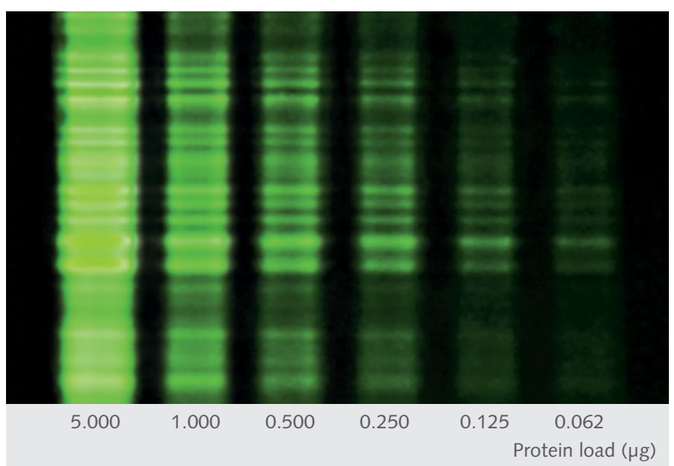


Fig. 5. *E. coli* total protein extract pre-labeled with T-Green 210. Separation by SDS-PAGE. Octoplus QPLEX imaging time: 20 sec. To ensure protein quantificaytion all signals are below saturation (max. grey value < 65,536 px).

Sample multiplexing

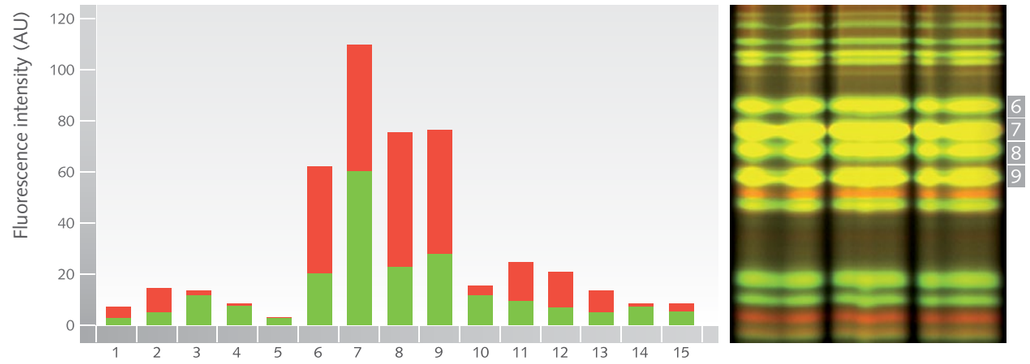


Fig. 6. Sample multiplexing of 2 µg T-Red 310 and T-Green 210 labeled protein derived from domestic pig (*Sus scrofa domesticus*) comparing two different extraction protocols. Evaluation by 1D software.

Multiplex fluorescence Western blot

Multiplex fluorescence Western blot analysis allows the specific detection of different proteins within one sample. The specific and rapid imaging (< 1 sec) is performed by Octoplus QPLEX.

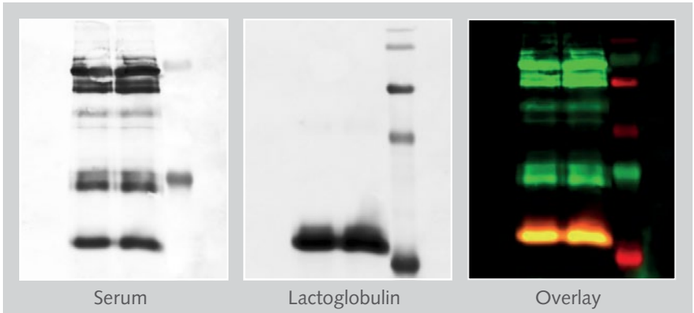


Fig. 7. Multiplex fluorescence Western blot. Protein derived from human serum was extracted and pre-labeled with T-Green 210. 2 x 10 µg of protein (lane 1 & 2) was separated by SDS-PAGE and then transfered onto a low fluorescent membrane. The blot was subjected to a lactoglobulin antibody and then to a T-Red 310 conjugated secondary antibody. The proteins were detected by Octoplus QPLEX imaging. Exposure time: 0.3 sec.

Signal sensitivity & linearity

The Octoplus QPLEX system detects fluorescent signals from minimally pre-labeled proteins (one fluorophore per protein) in the lower nanogram range. Even for this low amount of protein, the signal linearity remains at an ideal level (R^2= 0.996 [Fig. 8.]).

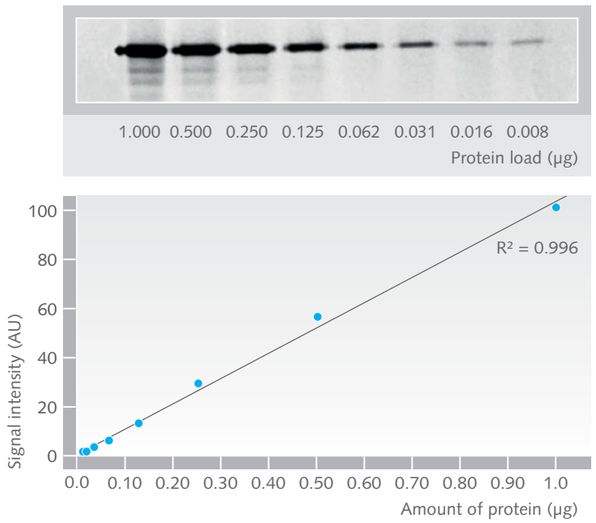


Fig. 8. Serial dilution of BSA minimally labeled with T-Rex 330. Proteins were separated by SDS-PAGE and then imaged using Octoplus QPLEX. Signal intensities were analyzed by LabImage 1D analysis software.

Dynamic range

The dot blot experiment (Fig. 9) shows a linear dynamic range of 4-5 decades.

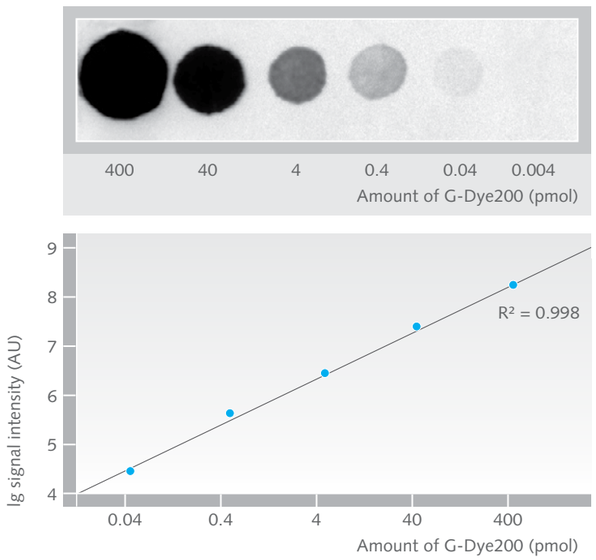


Fig. 9. Serial diluiton of G-Dye200 fluorescent label. The dye was directly spotted onto a low-fluorescent blotting paper and imaged by Octoplus QPLEX. Signal intensities were analyzed by LabImage 1D analysis software.

Chemiluminescence

With a superior CCD chip, a lab quality lens and a 4-5 orders of magnitude dynamic range Octoplus QPLEX captures chemiluminescence at the highest performance available on the market.

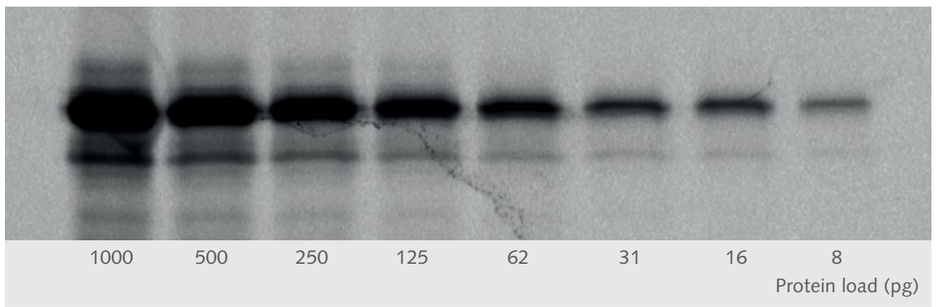


Fig. 10. Serial dilution of Casein. Proteins were separated by SDS-PAGE, then transfered by Western blotting onto a nitrocellulose membrane. The blot was subjected to a Casein antibody and then to a HRP-conjugated secondary antibody. The proteins were detected by ECL (Pierce) with an Octoplus QPLEX imaging time of 2.5 min.

Colorimetric applications (optional)

The optional white light transillumination module allows perfect imaging of silver or Coomassie® blue stained gels.

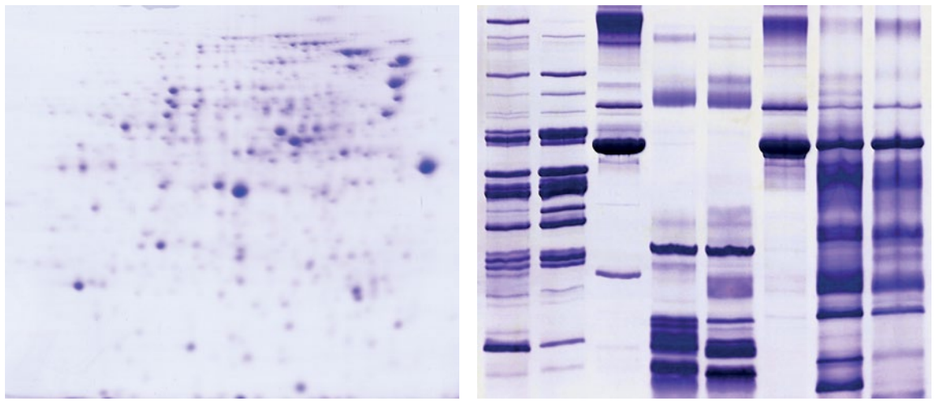


Fig.11a and 11b. Colorimetric analysis of Coomassie® blue stained 1D and 2D gels.

Octoplus QPLEX inside

High sensitivity 16-bit chip with dark pixel for low noise

Special optical lens for large imaging area and high image quality

Highly specific QPLEX filter set (blue, green, red, infra red)

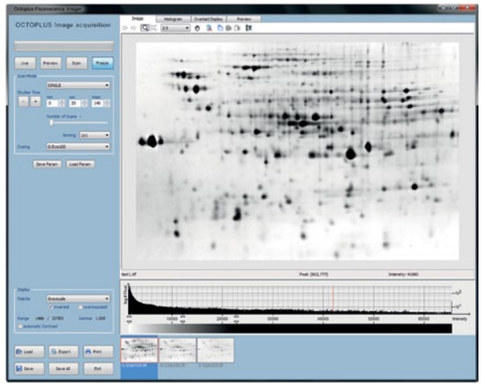
HP LED unit with specific filters and diffusor lenses for homogenous illumination

10 stage sample tray size 30 x 22 cm on dual-action dampers

Robust housing for daily routine

Image capture software

The easy to use image capture software performs different capture modes for optimal image acquisition. The raw image data are saved and a copy is taken for further analysis by 1D and 2D software. This data separation allows you to always revert back to your original images. 1D and 2D gel image analysis software is available separately.



Instrument specifications

CCD Camera	Kodak KAF-3200 CCD full frame chip with microlens technology 16-bit (65,536 grey values)
Cooling	4-stage Peltier cooling (ΔT -60 K)
Chip resolution	3.2 MP (2,184 w x 1,472 h pixel)
Pixel size	6.8 x 6.8 µm full well capacity 55,000 e^-
Quantum efficiency	475 nm ≈ 65% 525 nm ≈ 75% 575 nm ≈ 85% 665 nm ≈ 85% 760 nm ≈ 65%
Dynamic range	4-5 orders of magnitude
Lens	Schneider-Kreuznach (F 0.95 / 25 mm)
Focusing	Manual remote operation
Binning modes	1 x 1, 2 x 2, ... , 10 x 10

Fluorescence unit	RGB-IR fluorescence high performance (HP) LED unit including specific filter and diffusor lenses
Filter	G100BP (blue) G200BP (green) G300BP (red) G400BP (infra red) WL (white light) upgradable to 4 additional filters
Max. sample size	30 x 22 cm
Sample tray	10 stage sample tray mounted on dual-action dampers
Interface	USB 2.0 / Ethernet
Operating system	Windows 7
Operating temperature	Up to 30°C
Size (W x H x D)	41 cm x 90 cm x 40 cm
Weight	Approx. 45 kg

Ordering information

PR130 Octoplus QPLEX Fluorescence Imager
- Quadruplex HP LED module
  (specific blue, red, green & infra red fluorescence detection)
- Quadruplex emission filter set, additional WL filter
- Chemiluminescence
- Image capture software
- Control PC

PR132 White-light transmission module
PR137 Display 24“
PR136 1D analysis software LabImage
PR134 2D analysis software Delta2D (fix/ floating/ consumable)

Related products

PR03 Low fluorescent glass cassettes, size 8 x 10 cm
PR04 Low fluorescent glass cassettes, size 22 x 27.5 cm

Related consumables

Please refer to our protein labeling kit eBrochure
available on our website:
PDF NH DyeAGNOSTICS Protein Labeling Kits eBrochure 2012-2013 (engl.)

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