Amersham Typhoon Biomolecular Imager

IMAGING SYSTEMS, SOFTWARE, AND ACCESSORIES

Amersham™ Typhoon™ Biomolecular Imager (Fig 1) is a new generation of laser scanners that provide you with exceptional data quality through extremely sensitive detection, high image resolution, and a very broad linear dynamic range. These versatile imaging systems support multiple imaging modes, including phosphor imaging, red/green/blue (RGB) and long and short wavelengths of near infrared fluorescence (NIR), as well as optical densitometry (OD) of proteins in stained gels. The Amersham Typhoon 5 model offers a five-laser configuration option with advanced photomultiplier tubes to cover all of these imaging modes. Four other Amersham Typhoon models are available—one for RGB fluorescence/OD measurement/phosphor imaging, one for NIR short/NIR long/Green fluorescence, one for NIR short/NIR long fluorescence, and one for phosphor imaging—so you can choose the best option based on the needs of the system users. Moreover, upgrade paths among different models are available at any time after the installation.

Amersham Typhoon scanners deliver:

- **Versatility:** use one system to image multifluorescent-, radioisotope-labeled, and colorimetric samples on gels, membranes, multiwell plates, culture dishes, glass slides, and tissue sections. The IP model is for phosphor imaging only but can be upgraded
- **Accurate quantitation:** detect signals from as low as 3 pg of protein and differences across a dynamic range with greater than five orders of magnitude
- **High resolution:** resolve fine details in your sample with a pixel resolution of as low as 10 µm
- **High sample throughput:** large scanning area of 40 × 46 cm enables you to simultaneously image up to 20 gels or blots, measuring 10 × 8 cm in size. It is also possible to scan up to 9 multiwell plates in a single scan. This throughput facilitates comparisons among blots and plates, reduces workload, and decreases waiting time. The IP model has a scanning area of 35 x 43 cm, which fits Cytiva's largest imaging plate

Fig 1. Amersham Typhoon Biomolecular Imagers are versatile, high-performance laser scanners for sensitive and quantitative measurements in a multiuser environment. The image shows the main instrument (right), the Amersham Eraser (top left), on top of the accessory cabinet (bottom left).

- **Flexibility:** modular design allows you to customize the imager for your users' needs. Systems can be adapted with stages, detectors, filters, and lasers. Several upgrade kits are available
- **Ease of use:** Amersham Typhoon 5, RGB, NIR Plus, and NIR models have auto- and semi auto-scan functions, as well as automatic filter recognition

The Amersham Typhoon series of scanners provides you with versatile and flexible imaging to precisely quantitate proteins, nucleic acids, and other biomolecules. Amersham Typhoon 5, Amersham Typhoon RGB, Amersham Typhoon NIR Plus, and Amersham Typhoon NIR are variable-mode laser scanners that allow users to easily add or change filters to create new laser and filter combinations (Fig 2).

Fig 2. Users can easily exchange the filters in Amersham Typhoon 5, RGB, NIR Plus, and NIR models. If a new filter is inserted or a filter is changed, the instrument automatically recognizes the filter and updates the control software.

Table 1. Typhoon scanner series comprises five different configurations

	Phosphor imaging	Densitometry (OD)	RGB fluorescence	Near-infrared fluorescence
Amersham Typhoon IP	X	O	O	O
Amersham Typhoon NIR	O	O	O	X
Amersham Typhoon NIR Plus	O	X*	X**	X
Amersham Typhoon RGB	X	X	X	O
Amersham Typhoon 5	X	X	X	X

OD = optical density * Optical density accessory (OD plate) is needed ** Only Green fluorescence channel is included
X: supported O: not supported

All Amersham Typhoon models are versatile laser scanners for precise quantitation of biomolecules in gels, blots, and other sample types. Amersham Typhoon 5 model has the same capabilities as the Amersham Typhoon RGB model, with the addition of near-infrared (NIR) functionality. Amersham Typhoon NIR Plus model has the same NIR fluorescence functionality as the NIR model, with the addition of green fluorescence functionality (Table 1).

Amersham Typhoon models support the following imaging modes:

- Near-infrared fluorescence imaging for NIR fluorescent Western blotting and other applications (Amersham Typhoon 5, NIR Plus, and NIR only; all other models can be upgraded)
- Visible fluorescence imaging in red, green, blue (RGB) channels (Amersham Typhoon 5 and RGB; all other models can be upgraded) to support multiplex fluorescence imaging (e.g., 2D-DIGE)
- Imaging of multiplex RGB fluorescent Western blots, using ECL Plex™ and/or other fluorophore-labeled antibodies (Amersham 5 and RGB, NIR Plus includes green fluorescence, NIR short/long, IP model can be upgraded)
- Phosphor imaging, in which samples containing 3H, 14C, 32P, 33P, 35S (or other sources) are exposed to a storage phosphor screen (imaging plate) (Amersham Typhoon 5, RGB, and IP; all other models can be upgraded)
- Optical densitometry for quantitation of colorimetrically-stained samples (e.g., Coomassie™ blue, silver stain) (Amersham Typhoon 5, RGB, and NIR Plus*; all other models can be upgraded)
  *Optical density accessory (OD plate) required
- Chemiluminescence imaging that does not require maximum sensitivity (dark scan function) (Amersham Typhoon 5, RGB, and NIR Plus; all other models can be upgraded); for detection of low abundance proteins we recommend the ImageQuant™ LAS 500 or Amersham Imager 600

Broad linear dynamic range

Amersham Typhoon scanners provide a broad linear dynamic range in all detection modes, for example when using Cy™5 labeled proteins (Fig 3).

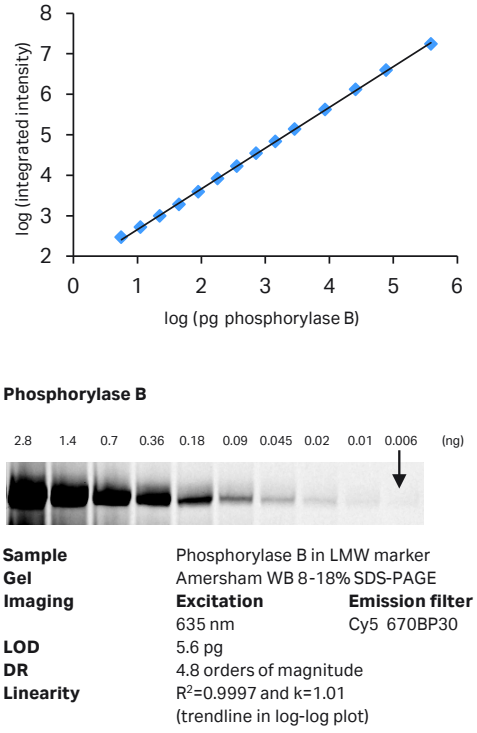


Fig 3. Phosphorylase B was labeled with CyDye™ DIGE fluor Cy5 minimal dye and separated using a precast gradient Amersham WB gel. The gel was imaged with Amersham Typhoon using normal scan speed. A selection of a dilution series is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 5.6 pg, and the linear dynamic range (DR) was 4.8 orders of magnitude.

Technical features

Optimal choice of filter, stage, laser and PMT

Amersham Typhoon scanners can house up to eight filters with automatic filter recognition. To attain optimal imaging conditions, you can easily access and exchange emission filters without tools. This feature makes the instrument highly suitable for use in a multiuser environment. In addition to default high performance band-pass filters, there are four open filter positions in which users can put IR-filters, long-pass filters, or custom filters. This next generation of Typhoon scanners feature easier handling of custom filters and a new custom filter box for ease of use.

Stages (Fig 4) give the correct positioning and stability for optimal imaging of a range of sample types. Samples that can be scanned include agarose and polyacrylamide gels, membranes, DIGE gels, microplates, culture dishes, glass slides, and tissue sections. Also, radioisotope-labeled samples can be scanned using a phosphor imaging plate. The system can simultaneously scan two DIGE gels, each measuring up to 21.5 × 27.5 cm, with the multi-stage. Large format sequencing gels (33 x 42 cm) can be scanned using the optional glass stage guide along with the multi-stage. The stages are easily removed from the system for cleaning.

For the detection of radioactivity and fluorescence, emitted light is collected and transformed to an electrical signal by a photomultiplier tube (PMT). The electrical signal is then converted into digital information by A/D conversion for image display and analysis. Amersham Typhoon comes equipped with new bi-alkali and multi-alkali PMTs. This combination provides excellent detection over a very broad spectrum. Each PMT is selected for optimal response to the detected emission wavelength. The bi-alkali PMT is used for phosphor imaging, whereas the multialkali PMT is used for all fluorescence and densitometry imaging modes.

Fig 4. (A) The IP stage, (B) fluor stage, and (C) multi-stage are designed to accommodate a variety of sample formats and imaging modes.

Imaging applications

Amersham Typhoon 5 and RGB enable users to image fluorescent, radiolabeled, and colorimetrically stained gels with a single system.

Fluorescence detection—visible and near-infrared

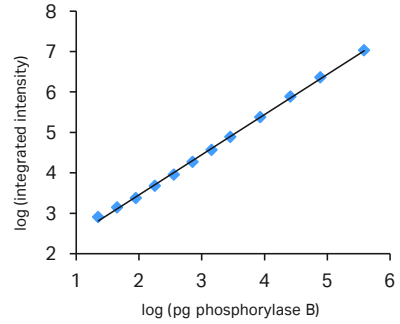
Upon excitation, light is emitted from a fluorescently labeled sample in proportion to the amount of labeled protein or DNA in the sample. The high sensitivity and broad dynamic range of Amersham Typhoon 5, RGB, NIR Plus, and NIR scanners (Figs 3, 5–9) makes it possible to measure low and high abundant proteins in a single scan.

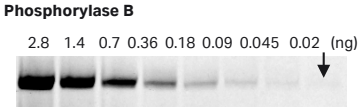
Multiple fluorescent wavelengths can be detected with minimal cross-talk for comparative expression experiments. See Table 2 for emission filters.

Table 2. Emission filters

Filter*	Wavelength range (nm)	Detection examples
IP	BP390	Phosphorimaging
Cy2 525BP20	515 to 535	Cy2, GFP
Cy3 570BP20	560 to 580	Cy3
Cy5 670BP30	655 to 685	Cy5 ECL Plex Cy5
IRshort 720BP20	710 to 730	Alexa Fluor™ 700, Cy5.5, IRDye™ 680
IRlong 825BP30	810 to 840	Alexa Fluor 790, IRDye 800

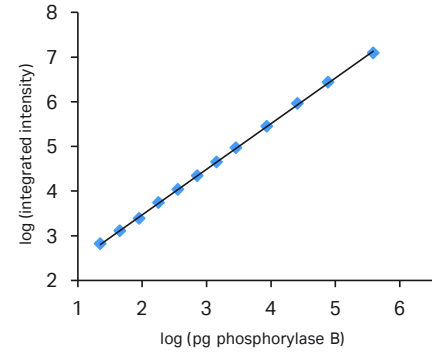
*Long pass filters LPB515, LPG550 and LPR660 are available as optional filters.

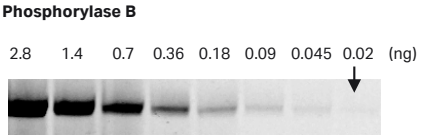




Sample	Phosphorylase B in LMW marker	
Gel	Amersham WB 8-18% SDS-PAGE	
Imaging	**Excitation**	**Emission filter**
	488 nm	Cy2 525BP20
LOD	22 pg	
DR	4.2 orders of magnitude	
Linearity	R^2=0.9989 and k=0.99 (trendline in log-log plot)	

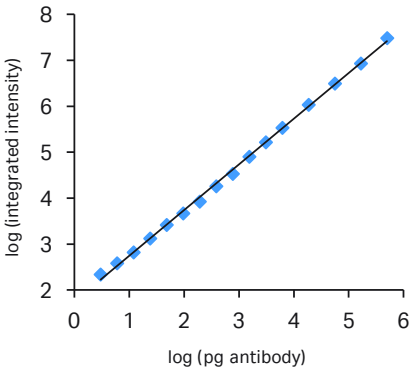
Fig 5. Phosphorylase B was labeled with CyDye DIGE fluor Cy2 minimal dye and separated using an Amersham WB electrophoresis gel. The gel was imaged with Amersham Typhoon using normal scan speed. A selection of a dilution series is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 22 pg, and the linear dynamic range (DR) was 4.2 orders of magnitude.

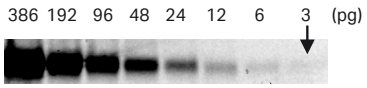




Sample	Phosphorylase B in LMW marker	
Gel	Amersham WB 8-18% SDS-PAGE	
Imaging	**Excitation**	**Emission filter**
	635 nm	Cy3 570BP20
LOD	22 pg	
DR	4.2 orders of magnitude	
Linearity	R^2=0.9998 and k=1.02 (trendline in log-log plot)	

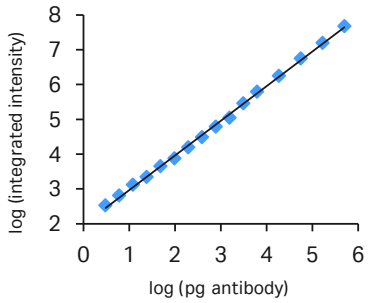
Fig 6. Phosphorylase B was labeled with CyDye DIGE fluor Cy3 minimal dye and separated using an Amersham WB electrophoresis gel. The gel was imaged with Amersham Typhoon using normal scan speed. A selection of a dilution series is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 22 pg, and the linear dynamic range (DR) was 4.2 orders of magnitude.

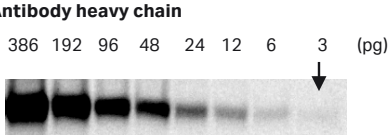




Sample	IRDye™ 680 goat anti-rabbit antibody	
Gel	Amersham WB 13.5% SDS-PAGE	
Imaging	**Excitation**	**Emission filter**
	685 nm	720BP20 (IRshort)
LOD	3 pg	
DR	5.2 orders of magnitude	
Linearity	R^2=0.9988 and k=1.00 (trendline in log-log plot)	

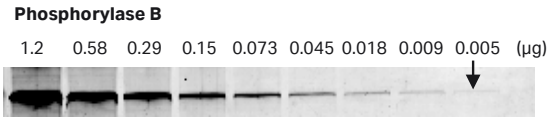
Fig 7. Antibody conjugated with IRDye 680 was separated using anAmersham WB electrophoresis gel. To reduce noise, the gel was imaged with Amersham Typhoon using slow scan speed. A selection of a dilution series is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 3 pg, and the linear dynamic range (DR) was 5.2 orders of magnitude.





Sample	IRDye 800 goat anti-rabbit antibody	
Gel	Amersham WB 13.5% SDS-PAGE	
Imaging	**Excitation**	**Emission filter**
	785 nm	825BP30 (IRlong)
LOD	3 pg	
DR	5.2 orders of magnitude	
Linearity	R^2=0.9988 and k=1.00 (trendline in log-log plot)	

Fig 8. Antibody conjugated with IRDye 800 was separated using an Amersham WB electrophoresis gel. To reduce noise, the gel was imaged with Amersham Typhoon using slow scan speed. A selection of a dilution series is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 3 pg, and the linear dynamic range (DR) was 5.2 orders of magnitude.

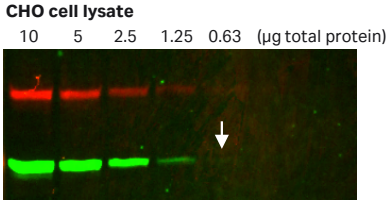


Sample	Phosphorylase B in LMW marker	
Gel	ExcelGel™ SDS Gradient 8-18 (GE)	
Imaging	**Excitation**	**Emission filter**
	488 nm	Cy3 LPG
LOD	5 ng	
DR	2.4 orders of magnitude	
Linearity	R^2=0.989	

Fig 9. A mixture of proteins (LMW Marker, Cytiva) was separated by SDS-PAGE followed by staining with SYPRO™ Ruby Protein Gel Stain. The gel was imaged with Amersham Typhoon using normal scan speed. A selection of a dilution series of Phosphorylase B is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 5 ng, and the linear dynamic range (DR) was 2.4 orders of magnitude.

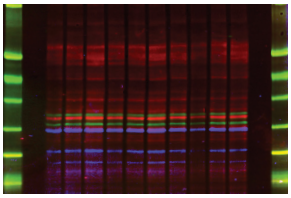
Sensitive multiplex detection of Western blots

The versatile Amersham Typhoon 5, RGB, NIR, and NIR Plus scanners are well suited for imaging of fluorescent Western blot membranes. This method is very sensitive, and the signal is proportional to protein quantity. Moreover, it is possible to detect more than one protein at the same time by means of secondary antibodies labeled with different fluorophores. Amersham Typhoon provides high sensitivity and a broad linear dynamic range, supporting its use for quantitative Western blotting (Fig 10–13).



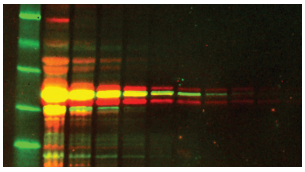
Sample	CHO cell lysate with transferrin	
Membrane	Amersham Hybond™ LFP 0.2 PVDF	
Target proteins	Transferrin and tubulin	
Detection	**Primary antibodies**	
	Rabbit anti-human transferrin, Mouse anti-Tubulin	
	Secondary antibodies	
	Amersham WB Cy5 GAR, IRDye 800 GAM	
Imaging	**Excitation**	**Emission filter**
	635 nm	Cy5 670BP30
	785 nm	825BP30 (IRlong)
LOD	0.63 µg	

Fig 10. Multiplex detection of proteins by Western blotting. Transferrin and endogenous tubulin were targeted in a dilution series of CHO cell lysate using Amersham anti-rabbit Cy5 (red) and anti-mouse IR Dye 800 (green) secondary antibodies. Imaging was performed with Amersham Typhoon scanner. The arrow indicates the limit of detection (LOD) for tubulin. The low background enables reliable quantitation of specific signals relative to a housekeeping protein.



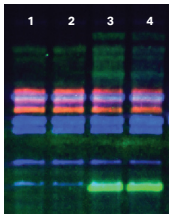
Sample	CHO cell lysate	
Gel	SDS-PAGE 8-18%	
Membrane	Amersham Hybond P 0.45 PVDF	
Detection	**Primary antibodies**	
	Rabbit anti-ERK	
	Mouse anti-GAPDH	
	Secondary antibodies	
	ECL Plex Cy3 GAR	
	Alexa Plus 800 GAM	
	Total protein stain	
	Amersham QuickStain™	
Imaging	**Excitation**	**Emission Filter**
	532 nm	Cy3 570BP20 (green)
	685 nm	IRshort 720BP20 (red)
	785 nm	IRlong 825BP30 (blue)

Fig 11. Triplex protein detection with total protein normalization. Different amounts of CHO cell lysate were loaded on an SDS-PAGE gel for Western blot detection. ERK and GAPDH were detected using the 532 nm and 785 nm lasers respectively. Amersham QuickStain labeled total protein for normalization was detected using the 685 nm laser.



Sample	CHO cell lysate, two-fold dilution starting at 40 µg	
Gel	SDS-PAGE 8-18%	
Membrane	Amersham Protran™ Premium 0.45 NC	
Detection	**Primary antibodies**	
	Rabbit anti-ERK	
	Mouse anti-actin	
	Secondary antibodies	
	Alexa Plus 680 GAM	
	Alexa Plus 800 GAR	
Imaging	**Excitation**	**Emission filter**
	685 nm	IRshort 720BP20 (green)
	785 nm	IRlong 825BP30 (red)

Fig 12. Western blot of a dilution series of CHO cell lysate. Two-plex detection of target protein ERK using Alexa Plus 800 Ab and house-keeping protein actin using Alexa Plus 680 Ab.

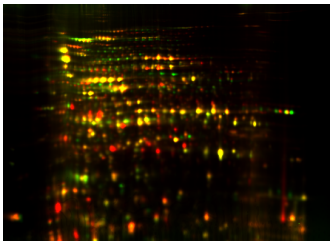


Sample	CHO cell lysate (lane 1 to 4) with recombinant GST (lane 3 and 4)	
Gel	SDS-PAGE 8-18%	
Membrane	Amersham Protran Premium 0.45 NC	
Detection	**Primary antibodies**	
	Rabbit anti-ERK	
	Mouse anti-GAPDH and mouse anti-actin	
	Goat anti CHO-HCP and goat anti-GST	
	Secondary antibodies	
	Donkey anti-goat DyLight™ 549	
	Goat anti-rabbit Alexa™ Plus 680	
	Goat anti-mouse Alexa Plus 800	
Imaging	**Excitation**	**Emission Filter**
	532 nm	Cy3 570BP20 (green)
	685 nm	IRshort 720BP20 (red)
	785 nm	IRlong 825BP30 (blue)

Fig 13. Detection of proteins using three different primary antibody species (rabbit, mouse, and goat) is possbile with the NIRplus scanner.

2D-DIGE

Amersham Typhoon scanners are designed for use with analysis software such as Melanie™ 9 (Figs 14–16). The strengths of these imaging systems—high sensitivity and broad dynamic range for measuring low and high abundant proteins in one scan—make them highly suited for 2D-DIGE applications, enabling you to detect and accurately quantitate subtle changes in protein expression. By generating overlaid, multichannel images for each gel with minimal cross-talk, Typhoon 5 and Typhoon RGB exploit the multiplexing potential of CyDye DIGE fluors to remove experimental variation between gels. When images are analyzed using high-quality software such as Melanie 9, you will be able to accurately and confidently measure very small differences in protein abundance.



Sample	1 - Cell lysate of *E-coli*	
	2 - Cell lysate of *E-coli* treated with benzoic acid	
IPG strips	3-10 NL, 24 cm	
Gel	Precast low-fluorescent DIGE gel	
Imaging	**Excitation**	**Emission filter**
	488 nm	Cy2 525BP20
	532 nm	Cy3 570BP20
	635 nm	Cy5 670BP30

Fig 14. Green/Red-overlay image of a two-dimensional difference gel electrophoresis (2D-DIGE) gel with control and treated samples, and internal standard. The control and treated samples were labeled with Cy3 and Cy5 DIGE Fluors minimal dye labeling protocol. The internal standard sample was labeled with Cy2 DIGE Fluor. The data sets were evaluated using the Melanie 2D analyis software, see Fig 15 and 16.

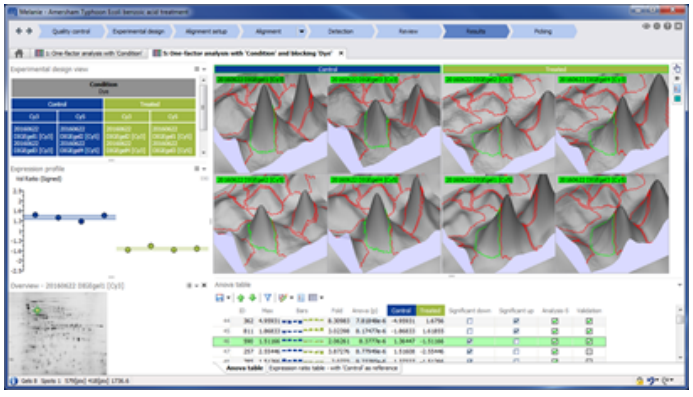


Fig 15. Example of a DIGE experiment analyzed with Melanie 8 (version 8.0.1) software. The effect of benzoic acid treatment on the Escherichia coli proteome was examined. Four replicates each were prepared for the control (blue) and benzoic acid-treated (green) samples, for a total of 8 different samples run on 4 gels. A pooled internal standard was included as a third sample on each gel. The experimental design view (top left) indicates that dye was used as a blocking factor in the statistical analysis. The dye-corrected estimates of the ANOVA p-values further improve the ability to detect subtle but true differences in protein expression, even for overlapping spots. This is shown by the 3-D views of the illustrated protein spot and the corresponding expression profile (middle left).

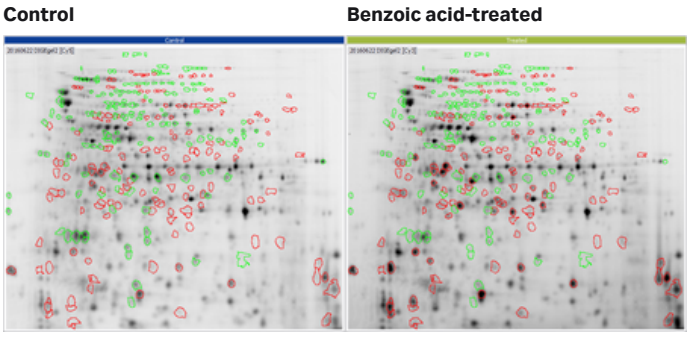
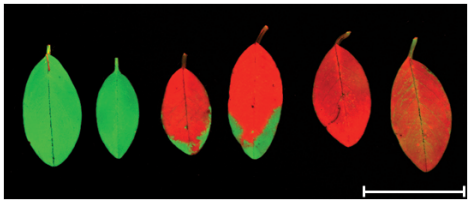


Fig 16. Representative control (blue) and treated (green) gel images of the experiment described in Fig 14 and Fig 15. Spots that are significantly upregulated (p values < 0.001) in the treated group are shown in red; downregulated spots are shown in green.

Fluorescence measurements of biological samples

The large working area of Amersham Typhoon makes it ideally suited for fluorescence investigations of distribution of fluorescent compounds in biological samples. There are numerous different applications, and sample types, which rely on fluorescence as the method of detection. As an example in Figure 17, the distribution of chlorophyll in leaves was measured for multiple samples using different laser and filter combinations and the fluor stage. Popular model organisms that are used to address questions in biology include Arabidopsis thaliana, Drosophila melanogaster, and C. elegans. With the Amersham Typhoon it is easy to measure the two-dimensional distribution of fluorophores in a biological sample, including natural fluorophores, fluorophore-tagged antibodies, and fluorescent proteins.

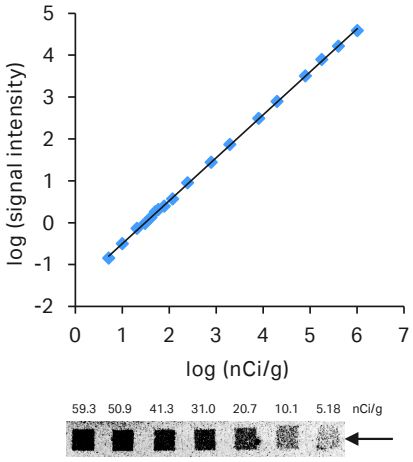


Sample	Green and yellow leaves from *Cotoneaster sp.*	
Imaging mode	Fluorescence	
Imaging	**Excitation**	**Emission filter**
	488 nm	515 nm long-pass (green)
	532 nm	570BP20 (red)

Fig 17. Fluorescence two-color overlay image of green and yellow leaves measured with the Amersham Typhoon scanner. The two leaves in the middle were partly green and partly yellow. Chlorophyll fluorescence can be measured with a long-pass filter and the 488 nm laser. The shift in fluorescence during leaf senescence as a result of chlorophyll loss can be measured with high resolution, in this case with 25 µm pixel size. The white scale bar is 20 mm. The large working area of the Amersham Typhoon scanner (40 x 46 cm) allows for easy imaging of multiple leaves.

Detection of radioactivity

To detect radioactive signals using phosphor imaging, samples containing radioactive probes are exposed to a storage phosphor screen (imaging plate). Light is emitted from the screen in proportion to the amount of radioactivity in the sample upon laser-induced stimulation (Figs 18-20). All storage phosphor screens from Cytiva are compatible with the Amersham Typhoon scanners.



Sample	^{14}C autoradiographic standard (CFQ12000)	
	3 hour exposure to BAS-SR Imaging Plate	
Imaging	**Excitation**	**Emission filter**
	635 nm	IP BP390
LOD	0.00518 µCi/g	
DR	5.3 orders of magnitude	
Linearity	R^2=0.9998 and k=1.03	
	(trendline in log-log plot)	

Fig 18. Scanned image of a 14C autoradiographic standard using Amersham Typhoon. A selection of the standard is shown in the image; the arrow indicates the limit of detection (LOD). The linear dynamic range (DR) was 5.3 orders of magnitude

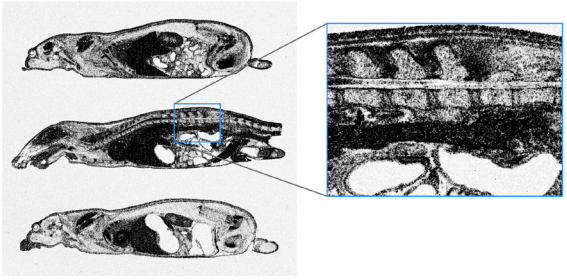
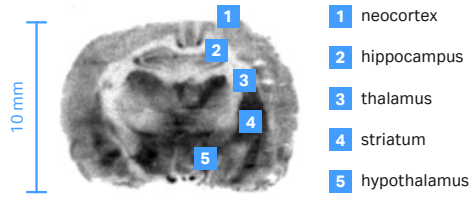


Fig 19. Autoradiography images of rat injected with 14C glucose. The magnified area shows part of the spine. Samples were prepared by Sekisui Medical Co., LTD.



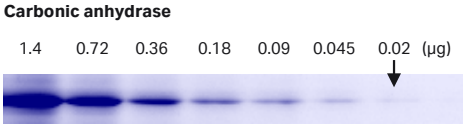
Sample	Section of rat brain	
Imaging	**Excitation**	**Emission filter**
	635 nm	IP BP390

Fig 20. Autoradiogram showing the binding of DaTscan™ (123I-ioflupane) to a coronal brain section of rat brain (linear contrast). DaTscan (Cytiva) is a SPECT radiopharmaceutical used for dopamine transporter imaging in the diagnosis of Parkinson disease. Sections were incubated with 1 nM DaTscan, in phosphate buffered saline, pH 7.4 (PBS), for 60 min. After incubation was completed, sections were rinsed extensively; 3 x 3 min in cold PBS and dried before being exposed to SR imaging plates (Cytiva) for 60 min. The sections were scanned with 25 µm pixel size using the Amersham Typhoon scanner. The scale bar is 10 mm.

Sample preparation by Sergio Estrada, Preclinical PET –MRI Platform, Dept. of Medicinal Chemistry, Uppsala University.

Densitometry

When using Amersham Typhoon 5 and RGB, excitation light passes through the sample and excites a fluorescent plate. The emitted light from the plate passes through the sample again and is collected and converted to an electrical signal. The method is suitable for documentation of colorimetrically stained gels (Fig 21). These Amersham Typhoon scanners also have optical density measurements for quantitation purposes.



Sample	Carbonic anhydrase in LMW marker	
Gel	Tris Glycine 8-16% SDS-PAGE (Novex)	
Imaging mode	Optical density	
Imaging	**Excitation**	**Emission filter**
	532 nm	Cy3 570BP20
LOD	23 ng	
DR	1.8 orders of magnitude	
Linearity	R^2=0.988	

Fig 21. A mixture of proteins (LMW Marker, Cytiva) was separated by SDS-PAGE followed by staining with Coomassie Brilliant Blue (G-350). The gel was imaged with Amersham Typhoon in optical density mode. A selection of a dilution series of carbonic anhydrase is shown in the image; the arrow indicates the limit of detection (LOD). The detection limit was 23 ng and the linear dynamic range (DR) was 1.8 orders of magnitude.

File formats

Data are stored either in linear 16-bit grayscale (.TIF file format), in square root encoded 16-bit (.GEL file format), or log encoded 16-bit (.IMG file format). The .GEL and .IMG formats provide the highest dynamic resolution for fluorescence and phosphor imaging. All file formats are TIF based images and compatible with common image analysis softwares, such as ImageJ (NIH, USA).

Image analysis

Designed for seamless data transfer and quantitative gel and blot analysis, Cytiva provides image analysis software for use with Amersham Typhoon (Table 3).

Table 3. Image analysis software

Software	Analysis
ImageQuant™ TL	1D gel electrophoresis, dot blots, arrays, colony counting, and user-defined gel analysis
Melanie 2D	2D gels, including single stain, 2D-DIGE, and 2D-DIBE for HCP Coverage assay

Validation support

A comprehensive suite of life cycle validation services is available for laboratory systems used in good practice environments, such as GLP, GMP, or GCP. The documentation is developed and approved by validation experts. Installation Qualification and Operation Qualification (IQ/OQ) are performed on-site by trained service engineers. Our engineers can also help with periodic re-qualification (RQ) and evaluate, verify, and document system changes and software upgrades with Change Control Protocols (CCP).

Product specifications

	Amersham Typhoon 5	Amersham Typhoon RGB	Amersham Typhoon NIR Plus	Amersham Typhoon NIR	Amersham Typhoon IP
Detection modes:	Fluorescence, phosphor imaging, densitometry, and chemiluminescence (Dark scan)	Fluorescence, phosphor imaging, densitometry, and chemiluminescence (Dark scan)	2xNIR and G fluorescence, densitometry*, and chemiluminescence (Dark scan)	2xNIR fluorescence	Phosphor imaging
Laser excitation wavelengths	LD488, SHG532, LD635, LD685, LD785	LD488, SHG532, LD635	SHG532, LD685, LD785	LD685, LD785	LD635
Optional excitation wavelengths:		LD685, LD785	LD 488, LD635	LD 488, SHG532, LD635	LD488, SHG532, LD685, LD785
Radioisotopes:	3H, 11C, 14C, 125I, 18F, 32P, 33P, 35S, 99mTc, and other sources of ionizing radiation	3H, 11C, 14C, 125I, 18F, 32P, 33P, 35S, 99mTc, and other sources of ionizing radiation	none	none	3H, 11C, 14C, 125I, 18F, 32P, 33P, 35S, 99mTc, and other sources of ionizing radiation
Measurable dynamic range:	> 5 orders of magnitude	> 5 orders of magnitude	> 5 orders of magnitude	> 5 orders of magnitude	> 5 orders of magnitude
Bit depth:	16-bit	16-bit	16-bit	16-bit	16-bit
Scanning area:	40 × 46 cm	40 × 46 cm	40 x 46 cm	40 x 46 cm	35 x 43 cm
Pixel sizes:	10, 25, 50, 100, 200 µm, and prescan 1000 µm	10, 25, 50, 100, 200 µm, and prescan 1000 µm	10, 25, 50, 100, 200 µm, and prescan 1000 µm	10, 25, 50, 100, 200 µm, and prescan 1000 µm	10, 25, 50, 100, and 200 µm
Standard filters:	IP 390BP, Cy2 525BP20, Cy3 570BP20, Cy5 670BP30, IRshort 720BP20, IRlong 825BP30	IP 390BP, Cy2 525BP20, Cy3 570BP20, Cy5 670BP30	Cy3 570BP20, IRshort 720BP20, IRlong 825BP30	IRshort 720BP20, IRlong 825BP30	IP 390BP
Optional filters:	Cy2 LPB515, Cy3 LPG550, Cy5 LPR660	Cy2 LPB515, Cy3 LPG550, Cy5 LPR660	Cy3 LPG550	None	None
Sample stages:	Fluor Stage, Multi-Stage, and IP Stage	Fluor Stage, Multi- Stage, and IP Stage	Fluor Stage	Fluor Stage	IP Stage
Dimensions (W × H × D):	900 × 400 × 800 mm	900 × 400 × 800 mm	900 × 400 × 800 mm	900 × 400 × 800 mm	900 × 400 × 800 mm
Weight:	94 kg	93 kg	93 kg	93 kg	92 kg
Line frequency:	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Temperature:	18°C to 28°C	18°C to 28°C	18°C to 28°C	18°C to 28°C	18°C to 28°C
Humidity:	20% to 70% (no condensation)	20% to 70% (no condensation)	20% to 70% (no condensation)	20% to 70% (no condensation)	20% to 70% (no condensation)
Supply voltage:	100 - 240 VAC ± 10%	100 - 240 VAC ± 10%	100 - 240 VAC ± 10%	100 - 240 VAC ± 10%	100 - 240 VAC ± 10%
Power consumption:	Approx. 0.3 kVA	Approx. 0.3 kVA	Approx. 0.3 kVA	Approx. 0.3 kVA	Approx. 0.3 kVA

*Optical density accessory (OD Plate) required.

Minimum computer requirement

OS	Windows® 7 Professional (64-bit) Windows 8.1 Pro (64-bit) Windows 10 Pro (64-bit)
Internal memory	8 GB
Processor	Intel® Core i5 processor
Hard disk	80 GB
USB ports	USB 2.0
Optical drive	DVD-ROM Drive

Please contact your local sales representative for the latest recommended computer configuration.

Ordering information

System	Quantity	Product code
Amersham Typhoon 5	1	29187191
Amersham Typhoon RGB	1	29187193
Amersham Typhoon NIR Plus	1	29264463
Amersham Typhoon NIR	1	29238583
Amersham Typhoon IP	1	29187194

One license of ImageQuant TL software is provided with each model of Amersham Typhoon scanners.

Upgrade kits	Quantity	Product code
AmTyphoon_IP_RGB_Upgrade IP to RGB model upgrade	1	29231384
AmTyphoon_NIR_B_Upgrade NIR to Blue Fluorescent function	1	29348804
AmTyphoon_IP_B_Upgrade IP to Blue Fluorescent function	1	29348736
AmTyphoon_RGB_2IR_Upgrade RGB to 5 model upgrade	1	29231387
AmTyphoon_IP_NIR_Upgrade Add NIR function to IP model upgrade	1	29264465
AmTyphoon_NIR_IP_Upgrade Add IP function to NIR model	1	29264464
AmTyphoon_NIR_GPlus_Upgrade NIR to NIR Plus model upgrade	1	29264467
AmTyphoon_NIR_RGBFluor_Upgrade Add RGB fluorescent function to NIR	1	29264468

Please contact Cytiva for additional upgrade combinations.

Optional accessories	Quantity	Product code
Amersham Eraser	1	29187190
Accessory Cabinet AmTyphoon	1	29191637
SlideGlass holder Amersham Typhoon	1	29191521
Cy2(LP) Fltr LPB515 AmTyphoon	1	29191632
Cy3(LP) Fltr LPG550 AmTyphoon	1	29191633
Cy5(LP) Fltr LPR660 AmTyphoon	1	29191634
33 × 42 glass plate guide Amersham Typhoon	1	29215514
Custom filter boxes Amersham Typhoon	1	29191540
Multi-stage AmTyphoon	1	29187198
OD Plate AmTyphoon	1	29191517
Titer plate holder AmTyphoon	1	29191520

Information on upgrade kits for additional lasers, filters, and other items can be obtained by contacting Customer Support.

Related products	Quantity	Product code
Amersham QuickStain	1	RPN4000
CyDye conjugated antibodies Amersham ECL Plex goat-α-mouse IgG-Cy3, 150 µg	150 µg	PA43009
Amersham ECL Plex goat-α-rabbit IgG-Cy3, 150 µg	150 µg	28901106
Protein markers Amersham ECL Plex Fluorescent Rainbow Markers	120 µl	RPN850E
Amersham ECL Plex Fluorescent Rainbow Markers	500 µl	RPN851E
Blotting paper 3MM Chr	100 sheets	3030-861
Blotting membranes Amersham Hybond P 0.45 PVDF 80 mm x 90 mm	25 sheets/PK	10600100
Amersham Hybond LFP 0.2 PVDF 80 mm × 90 mm	25 sheets/PK	10600102
Amersham Protran Premium 0.45 NC 80 mm × 90 mm	25 sheets/PK	10600096
Blocking agent Amersham ECL™ Prime Blocking Reagent	40 g	RPN418

Validation support	Quantity	Product code
IQOQ Amersham Typhoon IP	1	29245025
IQOQ Amersham Typhoon RGB	1	29245024
IQOQ Amersham Typhoon 5	1	29145023
IQOQ Amersham Typhoon NIR	1	29288012
IQOQ Amersham Typhoon NIR+	1	29288014

Analysis software	Quantity	Product code
ImageQuant TL, node locked	1	29291744
ImageQuant TL Security, node locked	1	29291745
Melanie 9 Classic Node-locked	1	29270534
Melanie 9 DIGE Node-locked	1	29270536
Melanie 9 Coverage Node-locked	1	29270543

Phosphor screen (Imaging plate)	Quantity	Product code
BAS-IP MS 2040 E *Phosphorimaging plate,* *20 × 40 cm, multipurpose*	1	28956474
BAS-IP MS 2025 E *Phosphorimaging plate,* *20 × 25 cm, multipurpose*	1	28956475
BAS-IP MS 3543 E *Phosphorimaging plate,* *35 × 43 cm, multipurpose*	1	28956476
BAS-IP SR 2040 E *Phosphorimaging plate,* *20 × 40 cm, high resolution*	1	28956477
BAS-IP SR 2025 E *Phosphorimaging plate,* *20 × 25 cm, high resolution*	1	28956478
BAS-IP TR 2040 E *Phosphorimaging plate,* *20 × 40 cm, for tritium detection*	1	28956481
BAS-IP TR 2025 E *Phosphorimaging plate,* *20 × 25 cm, for tritium detection*	1	28956482
BAS-IP ND 2040 E *Phosphorimaging plate,* *20 × 40 cm, for neutron detection*	1	29017133
BAS-IP ND 2025 E *Phosphorimaging plate,* *20 × 25 cm, for neutron detection*	1	29017139
Exposure Cassette, 20 × 25 cm	1	29175523
Exposure Cassette, 35 × 43 cm	1	29175524

The different screens are designed for general use (MS), high resolution suitable for morphological work such as autoradiography (SR), detection of the weak energy of the Tritium signal (TR), and detection of neutron (ND).

Discontinued mounted and unmounted GP phosphor screens are compatible with Amersham Typhoon. These products can be scanned with a Fluor stage (unmounted) and Multi stage (mounted). The Fluor stage and Multi stage are optional accessories for Amersham Typhoon IP.