



# FUSION

CHEMILUMINESCENCE & FLUORESCENCE IMAGING

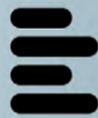


**VILBER LOURMAT**

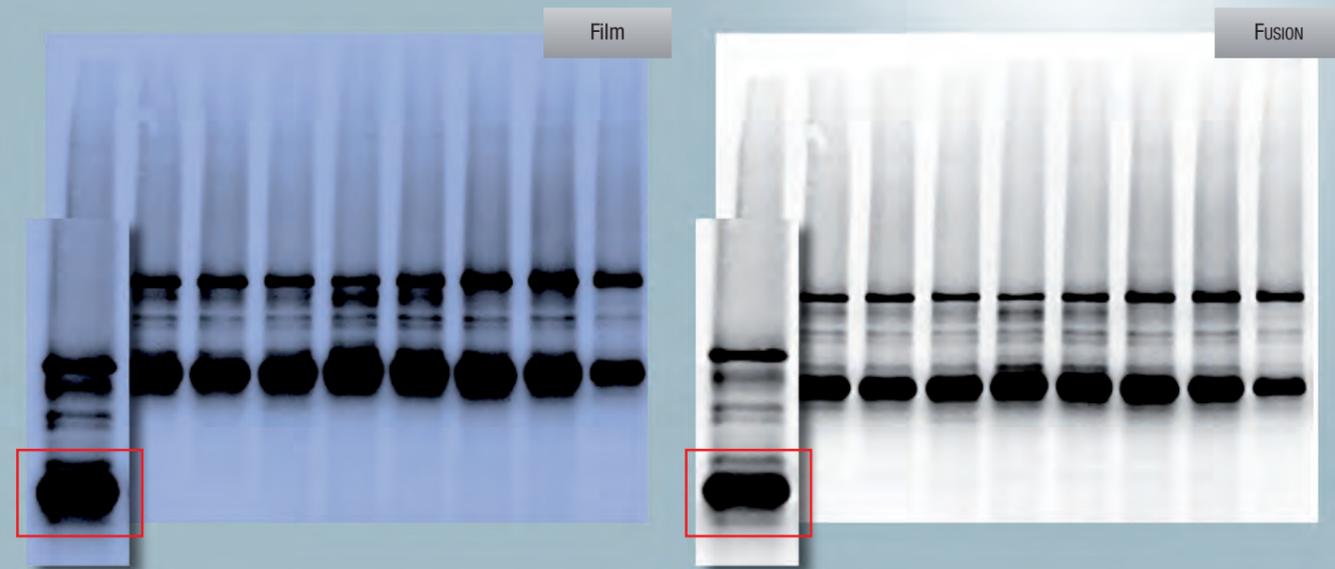


# FUSION

## Performance & innovations



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### Linearity

The signal response linearity describes the relationship between the detected signal and the sample quantity within the camera dynamic range. Linearity is critical for accurate quantification.

The greater the linearity, the more precisely proteins can be quantitated over that range. The Fusion linear range is enhanced by our unique High Sensitivity Reading (HSR) technology which minimizes the noise and increases the image dynamic. The Fusion is then extremely linear over its wide dynamic range and can easily detect large intensity difference between bright and faint bands before reaching saturation.

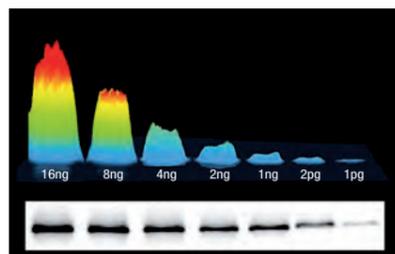


Fig.1: Protein quantity versus detected signal. Precise detection and quantitation of strong as well as weak signals using the Fusion High Sensitivity Reading (HSR) technology

### Ultra sensitive imaging

The Fusion is an extensive portfolio of ultra-sensitive imaging platform, widely considered to be 'best in class'. Using the most advanced large pixel CCD technology to collect more light, in combination with our unique state of the art V.084 motorized optical lens, the Fusion FX7 offers the best sensitivity and speed, and reaches the lowest limits of detection.

The Fusion's imaging performance is automatically optimized for a wide variety of application requirements:

- For chemiluminescence, the time to get the image is dramatically reduced and precious antibody can be saved.
- For fluorescence, ultra-sensitive detection capability facilitates the use of shorter excitation exposure, thereby reducing photobleaching and phototoxicity and lowering dye concentrations.

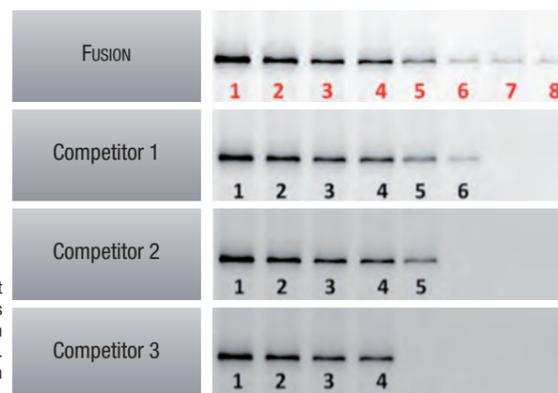


Fig.2: Comparative low light images taken with Fusion versus competitive systems with comparable imaging settings. The images are displayed with same relative intensity scaling.

### Band revelation with Clarity™

With the Fusion, dive into the layers of your samples to capture images from the deep inside of your blot or gel. Our unique Clarity™ technology combined with our razor sharp V.084 lens enhances the revelation of your bands, even under low light condition. The image is always at its best, clear and sharp. The bands appear clearly and are detached from their surroundings. The very faint bands are visible and distinguishable. The Fusion combines the best optical lens and imaging technology to reach unrivalled faint bands detection.

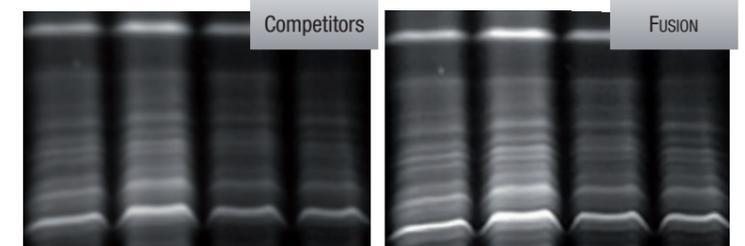


Fig.3: Without Clarity™ display

Fig.4: With Clarity™ display

### Signal to noise

The aim of the Fusion is to maximize the signal and to minimize the noise to achieve the best signal to noise ratio for the lowest limit of detection. Thanks to our High Sensitivity Reading (HSR) technology, the Fusion reduces the various sources of noise to the lowest floor level and the signal can stand out from the surrounding background. The figures 5 and 6 are a comparison of weak chemiluminescence signal images showing the sensitivity benefit of the Fusion HSR technology face to a competitive system. The HSR technology allows to reach the lowest limit of sensitivity.

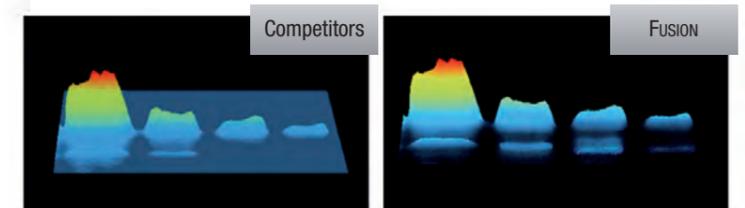
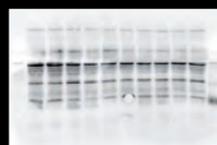
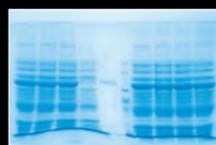


Fig.5: Competitive system. A two-fold dilution series of transferrin was transferred to a PVDF membrane. The faint signal cannot stand out from the surrounding noise level

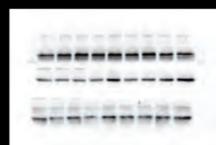
Fig.6: The Fusion combined with the High Sensitivity Reading (HSR) technology provide a better signal to noise and more bands are detected. Fusion FX7, cooling at -42°C.



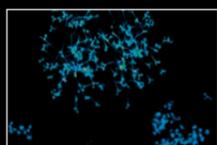
Chemiluminescence blot



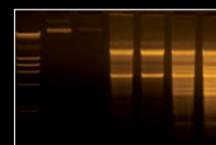
Protein gel



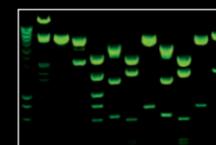
Western blot



Luciferase on Arabidopsis



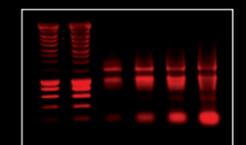
Ethidium bromide



GelGreen



SYBR Safe



GelRed



# FUSION

## Advanced technologies



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### The V.084 lens

The Fusion custom made V.084 lens combines sensitivity and optical performance for very faint light conditions. The optical system includes ultra-low dispersion components to enhance the sensitivity and aspheric elements to deliver consistently sharp images. The V.084 lens has a focusing distance of only 25cm to provide unrivalled sensitivity, clarity and image quality.

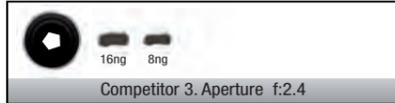
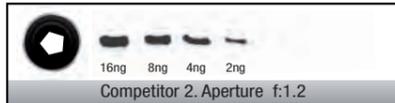
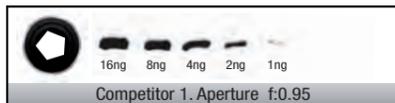
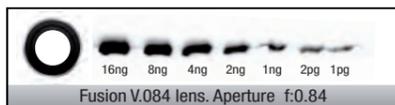


Fig.8: At same exposure time, the V.084 lens has unrivalled sensitivity

### Spectral Unmixing

Numerous fluorescent dyes are available for multicolor fluorescence imaging. However, interpreting multicolor images can be challenging as the spectral overlap of the excitation and emission characteristics often limits the possibilities to combine these fluorescent markers within one sample.

The Fusion Spectral Unmixing is a powerful algorithm designed to correct the spectral crosstalk between different color channels such as for instance, to separate the Cy2™ signal from the Cy3™ crosstalk. With this powerful technique it becomes possible to ascertain the contribution of different fluorochromes to the total signal and, by chromatic redistribution of the intensity, to restore a clear signal for each color channel undisturbed by emission from the other fluorochromes. Spectral Unmixing does not create artificially embellished images. The chromatic information inherent to the data is used to redistribute the fluorescence intensity pixel by pixel while the total pixel intensity is maintained. Thus, quantitative analysis is not only still possible but delivers more significant data.

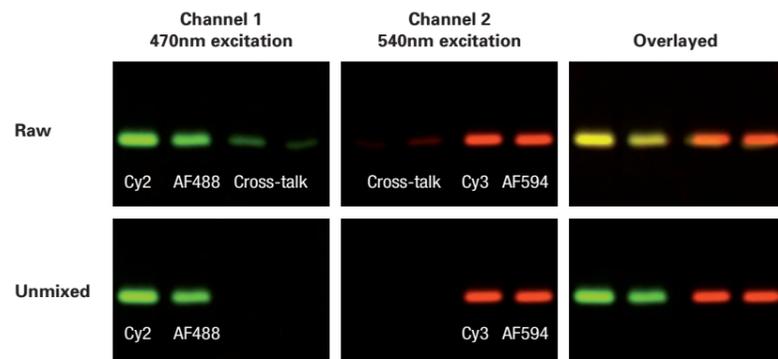


Fig.9: Fluorescent images were acquired using a Fusion Spectra system. The sample contains Cy2™, AlexaFluor 488, Cy3™ and AlexaFluor 594. The Spectral Unmixing removed the crosstalk.

### High Sensitivity Reading (HSR) technology

Fusion's High Sensitivity Reading (HSR) is a unique technology which delivers ultra-low noise and high sensitivity without altering the raw image data. Thanks to a camera modular design, a dual amplifier architecture and a complete control of the electronic components, the camera noise is reduced to a fraction.

The HSR technology is a camera "on-head" built-in technology. During the light exposure, the non-necessary camera components are shut down. Once the exposure time is over, the camera components are automatically turned back. The shut-down process during the image exposition reduced the camera noise, resulting in a better chip capacity to collect the signal.

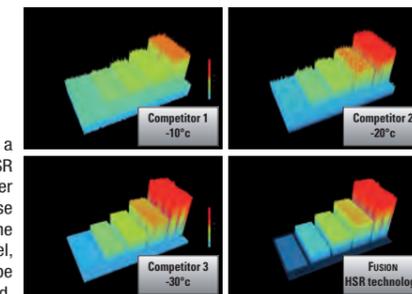


Fig.10: At same exposure time with a LED plate standard, the HSR technology provides a better sensitivity by reducing the noise ground level. By keeping the background to its lowest floor level, the very faint signal can easily be detected and quantified.

### The SuperResolution with no pixel size compromise

The Fusion FX7 SuperResolution technology provides unparalleled 10 megapixels resolution without compromising read noise, dynamic range, field of view and sensitivity. This means up to 5 times more accurate and more quantitative data compared to competitors.

Our Fusion scientific grade CCD camera has been specifically designed for scientific imaging and signal measurement. The Fusion cameras are based on large sensor format and unrivalled pixel size combined with micro lens technology. Given two sensors with equal numbers of pixels, the sensor with the larger pixel size collects more photons resulting in more sensitivity.

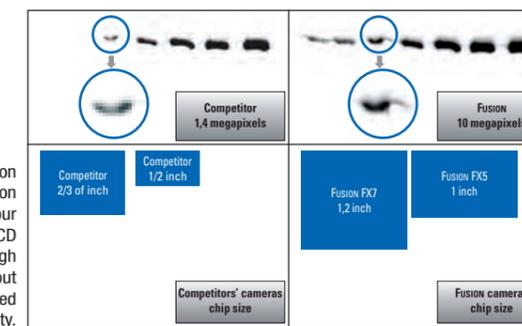
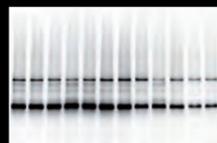


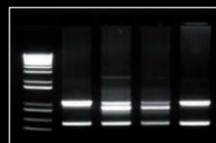
Fig.11: The Fusion SuperResolution combined with our scientific grade CCD cameras offers high resolution without pixelisation and unrivalled sensitivity.



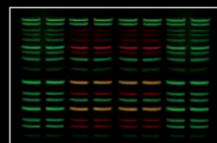
ECL



Super Signal



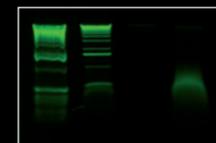
Ethidium bromide



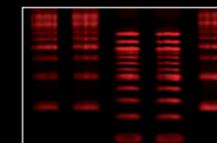
IR/NIR multiplexing



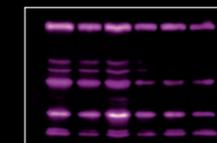
Texas Red



SybrGreen



SyproRed



SyproRuby



# FUSION Applications



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## Multimodal platform

The Fusion is the first multimodal imaging platform designed for molecular biology laboratories. It can cover chemiluminescence, bioluminescence, fluorescence, multiplexing fluorescence, multispectral imaging and chemifluorescence applications.

The Fusion can accommodate up to 7 excitations channels in the IR, NIR, visible and UV area and is ideal for a large array of applications such as Western blot chemiluminescence, Western blot fluorescence, 1D DNA gel, 1D protein colorimetric samples, stain free gel and blot.

The modularity design of the Fusion makes the system fully upgradable. You can simply start with a dedicated chemiluminescence system and upgrade your system as your number of applications grows.



## The Apps Studio

The Fusion Apps Studio is a revolutionary approach to imaging. The Studio is an innovative library of applications which contains more than 40 different protocols for your blot, gel and other bioluminescence samples. The protocols are easily accessible and gathered into four master protocols: DNA/RNA gels, Protein gels, Protein blots, Bioluminescence and others. The Studio contains the excitation and the emission spectra of the main fluorophores used in modern molecular biology laboratory. It also suggests the best possible system configuration in terms of excitation light source, emission filter and sensitivity level. The Apps Studio ensures reproducibility and one click image acquisition for the best ease of use.

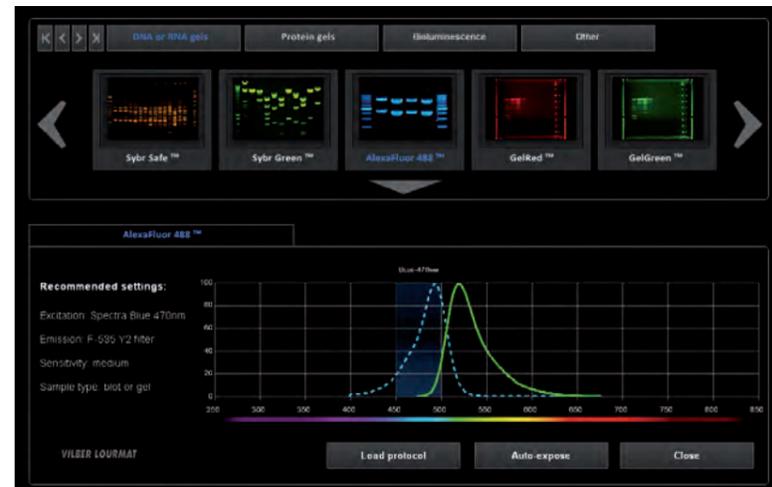


Fig.12: Apps Studio contains more than 40 different protocols for your blot, gel and other bioluminescence sample.

## Chemiluminescence and bioluminescence

Chemiluminescence is the main method used to detect proteins in Western blotting. The chemiluminescent reaction occurs when an enzyme such as horseradish peroxidase (HRP) or alkaline phosphatase reacts with a chemiluminescent substrate (such as luminol or diacetate) to produce a weak signal. The emitted light has a wavelength between 400 and 500 nm. The Fusion system is the chemiluminescence imaging master thanks to its unrivalled sensitivity and lowest noise. This makes the system ideal not only for Western blot, but also for luciferase on plants or small animals, and any other bioluminescence sample.

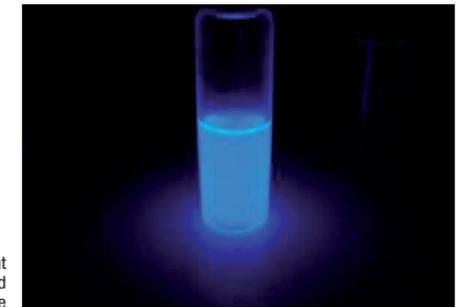


Fig.13: Luciferase light encapsulated in a PCR tube

## Fluorescence and multi-fluorescence

Fluorescence is the main method used for gene expression and protein detection. It results from a process that occurs in molecules known as fluorophores. The fluorophore absorbs the excitation light, reaching a higher energy state. By returning to its former state, it emits fluorescent light. The aim of the imaging system is to separate the emitted light from the excitation light in order to obtain an optimum sample image. The Fusion can accommodate up to 7 excitation and emission channels in the IR, NIR, visible and UV area and is ideal for a large array of applications such as Western blot fluorescence, 1D DNA gel, 1D protein colorimetric samples, multiplexing, stain free gel and blot.

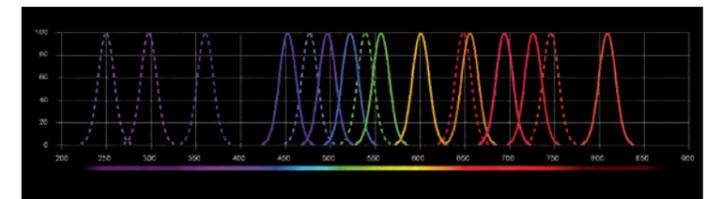


Fig.14: The Fusion can accommodate up to 7 excitation and emission channels in the IR, NIR, visible and UV area



Western blot



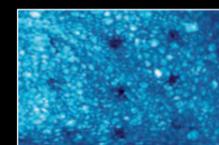
Western blot



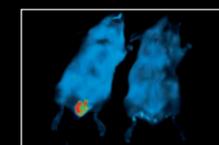
DNA/RNA gel



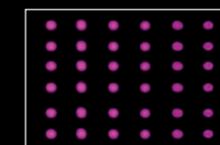
Microtitration plate



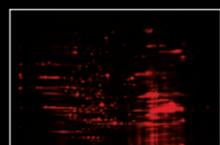
Bacteria imaging



Small animal imaging



Dot blot



2D gel



# FUSION Software



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## Precise and intuitive

Fusion has an outstanding ease of use. The system and software are ergonomically designed. The simple and self-understandable interface is very user friendly.

Combined with the Apps Studio, the protocol driven image acquisition is as quick as intuitive: adjust your exposure, save, print or quantify.

Thanks to the auto-exposure mode, the system will automatically capture the best image with just one click. There is no need for exposure time guessing and image stacking. The Fusion autoexposure mode automatically provides you the best possible image from your sample.



Fig.15: The Fusion interface is well organized and intuitive

## Fusion 3D Scan

A new dimension for imaging technology

The Fusion 3D scan is a revolutionary approach in the field of molecular imaging. The Fusion 3D Scan images your sample in real time and reconstructs the data to create live three dimensional model. The 3D reconstruction provides direct information regarding the image dynamic, background level and protein or DNA quantity. A little change of exposure time will refresh the 3D view automatically. The saturation effect can be controlled live before the image is freezed.

The Fusion 3D Scan opens a new frontier for protein or DNA imaging. 3D modeling will change the way you see your 1D blot or gel image into 3D results.

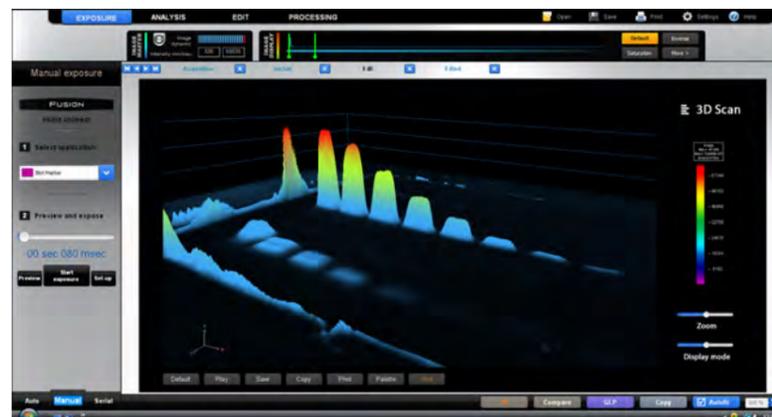


Fig.16: The 3D scan is performed while the image is acquired by the camera, opening new area for molecular biology

## Superior quantitative results

The Fusion system is directly integrated with the Bio-1D software for quantification and normalization. Bio-1D is a sophisticated and intuitive analysis software designed for virtually any fluorescence or chemiluminescence sample. The software combines the power of a comprehensive set of analytical tools and automatic functions in an incredible intuitive environment. It includes 8 different analysis modules from molecular weight calculation to volume quantification, through microtitration, colony counting, distance calculation and protein quantification.

The analysis can be saved as a template and re-used for further analysis to facilitate routine analysis.

All result tables and graphics can be printed or exported in a Windows® compatible format.



Fig.17: The Bio-1D Quantification software is smoothly integrated in the Fusion interface

## Image Master Assistant

Our exclusive Image Master helps you to obtain the optimum image at a glance. It automatically monitors the maximum and the minimum intensity obtained on the image, indicates it's dynamic, signal to noise ratio, and warns you about pixel saturation.

The Image Master informs you when the raw data are affected by a post-processing function such as background subtraction or image addition. The Image Master is simply perfect for quantification and publication as it helps you to keep the control on the image, making sure your image is always appropriate whatever its use.

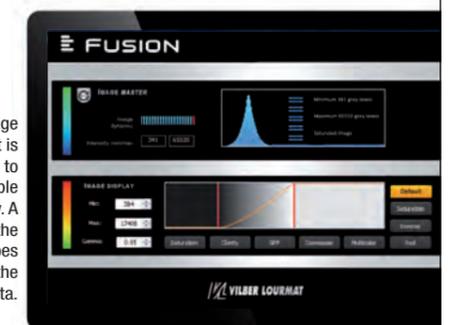
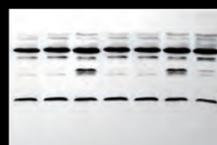
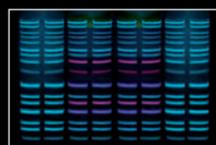


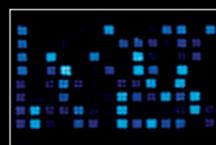
Fig.18: The Image Master Assistant is a powerful tool to control your sample image quality. A modification of the image display does not modify the Image Master data.



Western blot



DNA/RNA gel



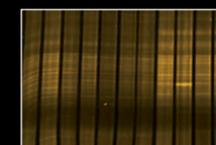
Macro array



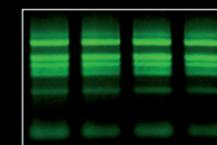
PCR control



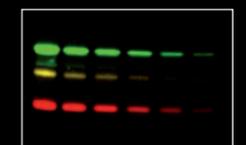
Protein gel



Protein gel



GFP



IR/NIR Western blot



# FUSION

## Spectra



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### Spectra inside

The Spectra LED light module is designed to add a wide range of applications to your system. With Fusion Spectra, you have 7 excitation wavelengths at your fingertips, ranging from UV to infrared. Up to 4 NET-LED modules can be installed simultaneously in the system in addition to several UV excitation sources.

The very tight LED spectrum is additionally constrained with a very narrow excitation filter.

This means less background in the images of your sample and a higher signal to noise ratio to detect the weakest signals.

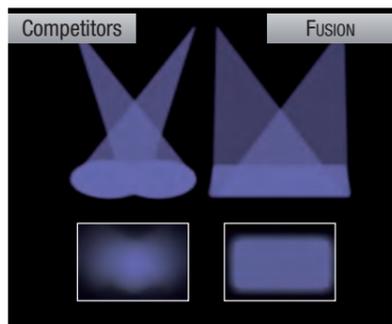


Fig.19: The large Spectra LED Array (right) provides a uniform illumination over a large surface compared to competitive spot of light solution (left)

## Multimodal imaging platform

The FUSION FX Spectra is the first multimodal imaging platform designed for molecular biology laboratories. It covers chemiluminescence, bioluminescence, fluorescence, multiplexing fluorescence and chemifluorescence applications. Thanks to the Spectra LED modules, the system can accommodate up to 7 excitation channels in the IR, NIR, visible RGB and UV area.

The FUSION FX Spectra is ideal for a large array of applications such as Western blot chemiluminescence, Western blot fluorescence, 1D DNA gel, 1D protein colorimetric samples, stain free gel and blot. You can for instance detect two proteins on the same blot using fluorescence labeling, protein expression can be quantitated relative to a housekeeping protein without the need for stripping and reprobing. Protein signals can be overlaid so that both signals can be visualized simultaneously. Triplexed detection can also be performed for instance for the detection of two proteins of interest, for example, a protein with and one without post translational modification (PTM), normalized to a housekeeping protein on the same blot.

Each individual light source delivers only a precisely defined range of the spectrum. As a result, you benefit from extremely high-contrast images – images that will enable you to achieve meaningful scientific results in tasks ranging from simple routine applications to complex multiplex applications. The spectral overlap is minimized with the 100nm separation gap of the excitation sources and narrow optical filtering of the emission source. The LED Spectra modules can be easily changed, meaning that Fusion can be adapted simply as the requirements of your applications evolve.

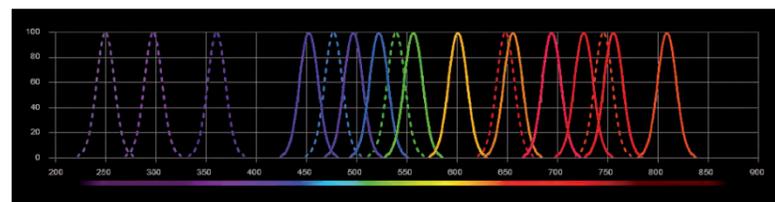


Fig.20: Fusion Spectra excitation and emission sources in the UV, Visible, NIR and IR ranges.

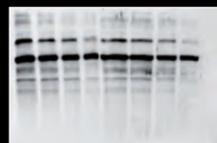
### Key features

- 7 excitations channels options in the IR, NIR, visible RGB and UV area
- 10 Spectra narrow band filters available from 440 to 850nm
- 40 fluorescence and chemiluminescence predefined imaging protocols at your fingertips
- Same or better sensitivity than a film
- Unique V.084 lens performance
- Super speed image acquisition
- 3D Dynamic Scan Technology
- NetLed Spectra technology for a large and optimum uniform illumination area
- Long life lasting LED for thousands of hours of use
- Intuitive Apps Studio interface
- Spectral Unmixing for signal cross talk separation
- Instant cooling for fast availability of the system
- High Sensitivity Reading™ Technology for a better signal to noise ratio
- CFR21 Part 11 ready
- Full GLP compliance
- Clarity™ technology for razor sharp band revelation

- SuperResolution™ technology for ultimate megapixel resolution
- Large sensor DARQ scientific CCD camera
- Large pixel size
- Pure image integrity and raw data protection
- ImageMaster™ technology to obtain the optimum image at a glance
- Free software for image acquisition and image analysis
- Fast and easy quantification using housekeeping protein
- EasyPlex™ technology for fast and easy image acquisition of several dyes on the same sample
- Stainless steel, aluminium and steel darkroom for the best robustness
- Reproducible and comparable quantification data
- Scientific TIFF file or proprietary file format
- UV, SuperBright or SkyLight transilluminator included
- Interchangeable transilluminator
- Choice of filtered EPI UV 254nm, 365nm and blue 470nm

### Configurations

- Spectra range**  
Choice between three different configurations:
- Spectra IR/NIR/G: three channels, green, N IR, IR
  - Spectra RGB: three channels, blue, green and red
  - Spectra One: one channel either blue, green, NIR or IR
- Spectra emission filters not included. Optional EPI blue Transilluminator and F590 included for standard gel applications
- FUSION FX Spectra series**  
Fully automatic. Motorized filter wheel. Motorized V.084 lens
- FUSION FX7 Spectra with the DARQ7 camera
  - FUSION FX5 Spectra with the DARQ5 camera
- Fusion SL Spectra series**  
Semi-automatic. Motorized filter wheel. Manual V.084 lens
- FUSION SL4 Spectra with the DARQ7 camera
  - FUSION SL2 Spectra with the DARQ5 camera
- Fusion-Capt Spectra software**  
Apps Studio - 3D Dynamic Scan - Spectral Unmixing - EasyPlex
- Options**  
Choice of 10 different Spectra emission filters  
SkyLight transilluminator or Super-Bright MX transilluminator  
White light or blue light conversion screen  
EPI UV 254nm, 365nm and blue 470nm



Western blot



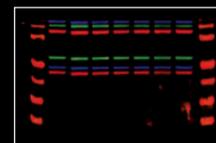
Luciferase assay



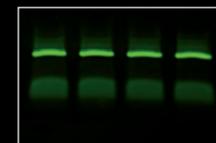
DNA/RNA gel



IR imaging



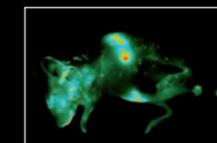
RGB multiplexing



NIR imaging



Protein gel & blot



In vivo imaging



# FUSION

## FX



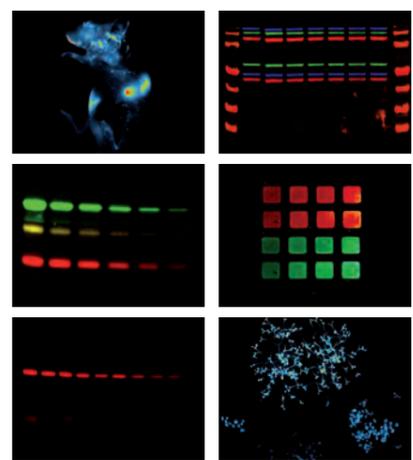
**VILBER LOURMAT**



### Spectra ready

The Fusion FX can image both chemiluminescence and fluorescence applications. For fluorescence, the Fusion FX system is easily upgradable with LED Spectra modules for blue, green, near infrared or infrared illumination.

The Spectra module is ideal for a large array of applications such as Western blot chemiluminescence, Western blot fluorescence, 1D DNA gel, 1D protein colorimetric samples, stain free gel and blot.

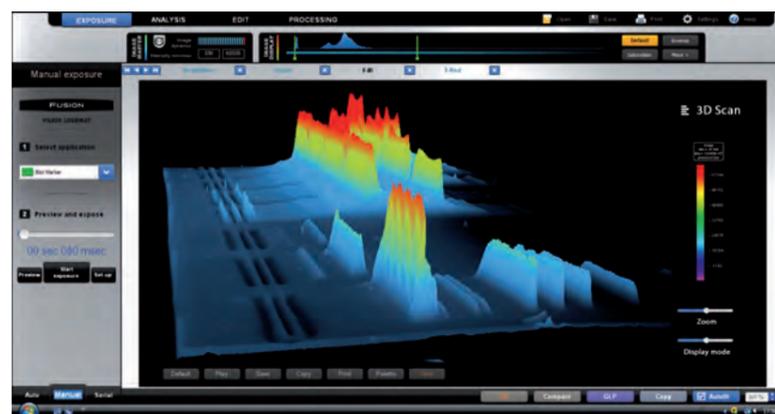


## A complete integrated system for Western blot and gel imaging

The unrivalled Fusion FX is ideal for chemiluminescence, bioluminescence and UV fluorescence applications. With the FX system, you can see your blot in the new light of ultrasensitive imaging at speeds never achieved before.

The FX is based on an advanced set of performance ideal to high fidelity and quantitative scientific measurement. The camera modular electronic design and the dual amplifier architecture deliver raw data with virtually no loss of information, no image distortion, no image processing, no pixelization, and with ultimate sensitivity and dynamic range.

The massive metal made Fusion FX darkroom has been designed for long durability and light tightness. With the aid of its integrated processor technology, the intelligent darkroom supervises monitors and controls all system functions. As an example, sensors identify the distance of the object, the intensity of the LED illumination is optimally chosen, and automatic focus can be used.



### Features & benefits

- Numerous fluorescence and chemiluminescence predefined imaging protocols at your fingertips
- Same or better sensitivity than a film
- Unique V.084 lens performance
- Super speed image acquisition
- 3D Dynamic Scan Technology
- Long life lasting white light LED for thousands of hours of use
- Intuitive Apps Studio interface
- Instant cooling for fast availability of the system
- High Sensitivity Reading™ Technology for a better signal to noise ratio
- CFR21 Part 11 ready
- Full GLP compliance
- Clarity™ technology for razor sharp band revelation
- SuperResolution™ technology for ultimate megapixel resolution
- Large sensor DARQ scientific CCD camera
- Large pixel size
- Pure image integrity and raw data protection
- ImageMaster™ technology to obtain the

- optimum image at a glance
- Free software for image acquisition and image analysis
- Fast and easy quantification using housekeeping protein
- Intensity of the white light LED illumination automatically adjusted
- Stainless steel, aluminium and steel darkroom for the best robustness
- Smart sensors to identify the distance of the object
- Reproducible and comparable quantification data
- Autofocus
- Autoexposure
- Motorized filter wheel
- Scientific TIFF file or proprietary file format
- UV, SuperBright or SkyLight transilluminator included
- Interchangeable transilluminator
- Choice of filtered EPI UV 254nm, 365nm and blue 470nm

### Configurations

**FUSION FX series**  
Fully automatic systems with a motorized filter wheel and a motorized V.084 lens

- FUSION FX7 Spectra with the DARQ7 camera
- FUSION FX5 Spectra with the DARQ5 camera

Transilluminator and F590 included for standard gel applications

**FUSION Capt FX software**

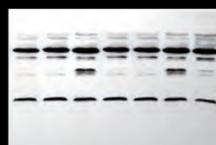
- Apps Studio
- 3D Dynamic Scan

**Options**

- SkyLight transilluminator
- Super-Bright MX transilluminator
- White light or blue light conversion screen
- EPI UV 254nm, 365nm and blue 470nm
- Spectra modules and Spectra emission filters



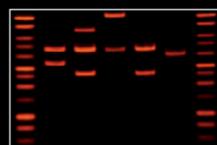
SuperSignal



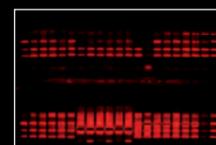
ECL



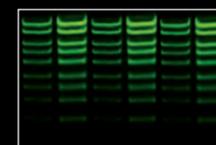
Ethidium bromide



SybrSafe



GelRed



SybrGreen



GFP



FITC



### **TURN YOUR SEARCH INTO ANSWERS**

VILBER is the leading European provider of molecular imaging systems, analysis software and UV fluorescence equipment.

Founded over 50 years ago to serve the research, VILBER has pioneered the post electrophoresis market and introduced breakthrough products such as stand alone gel-documentation, Bio-1D imaging software, Super-Bright UV technology, dedicated chemiluminescence imaging system and 3D approach to 1D gel analysis.

Through a network of owned subsidiary offices and local distributors located in over 60 countries around the world, VILBER offers a broad range of products.

For more information about VILBER, visit our website at [www.vilber.com](http://www.vilber.com)

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