The Red fluorescence Microscope

LEAM Solution

Elliot

LE.AM Solution, founded in 2017, built its expertise through **over 10 years** of advancing microscope-based optical instrumentation before developing fluorescence microscopy systems.

A Decade of Optical Innovation



Optical Design Expertise



Illumination system



Detection Technologies

10+

Years Experience

Optical instrumentation expertise

2017

Founded

LE.AM Solution established

LE.AM SOLUTION

Lens and Microptic

FLUORESCENCE MICROSCOPY

Fluorescence microscopy is a powerful tool used in biological research

Visualization

Specific molecules, cells, or subcellular structures with high sensitivity and specificity.

Application

From Study cellular processes and disease mechanisms to drug discovery and diagnostics



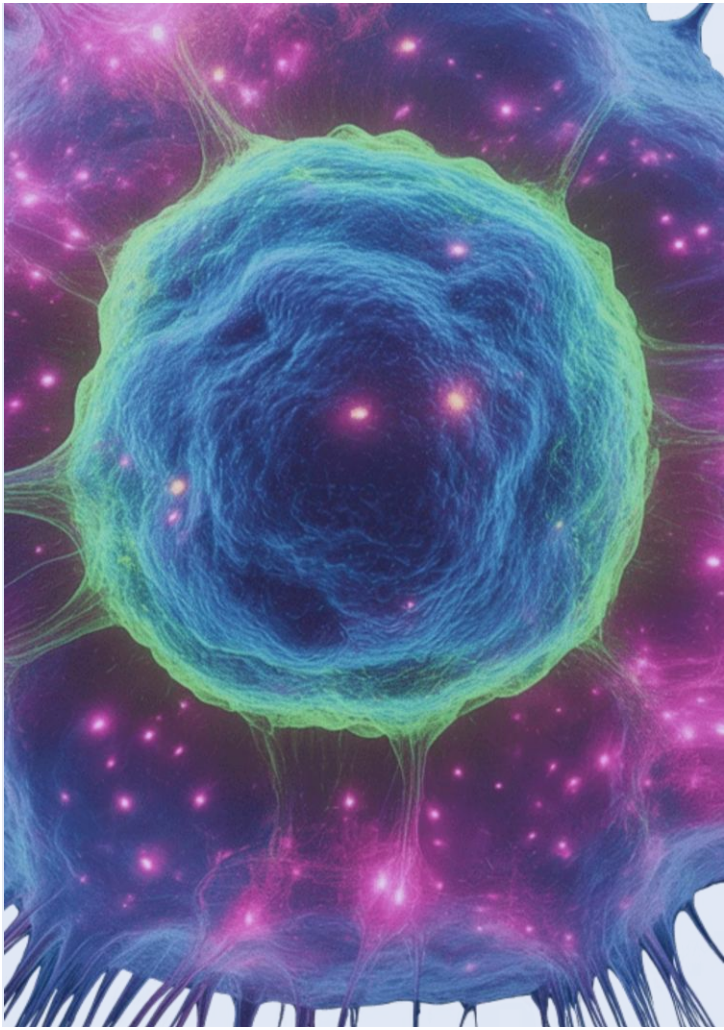
Fluorescence Imaging Methods

Fluorescence Microscopy

Traditional wide-field illumination technique using mercury or LED light sources to excite fluorescent samples across the entire field of view simultaneously.

Confocal Microscopy

Advanced laser-scanning method that uses focused laser beams and pinhole apertures to create high-resolution optical sections through thick specimens.



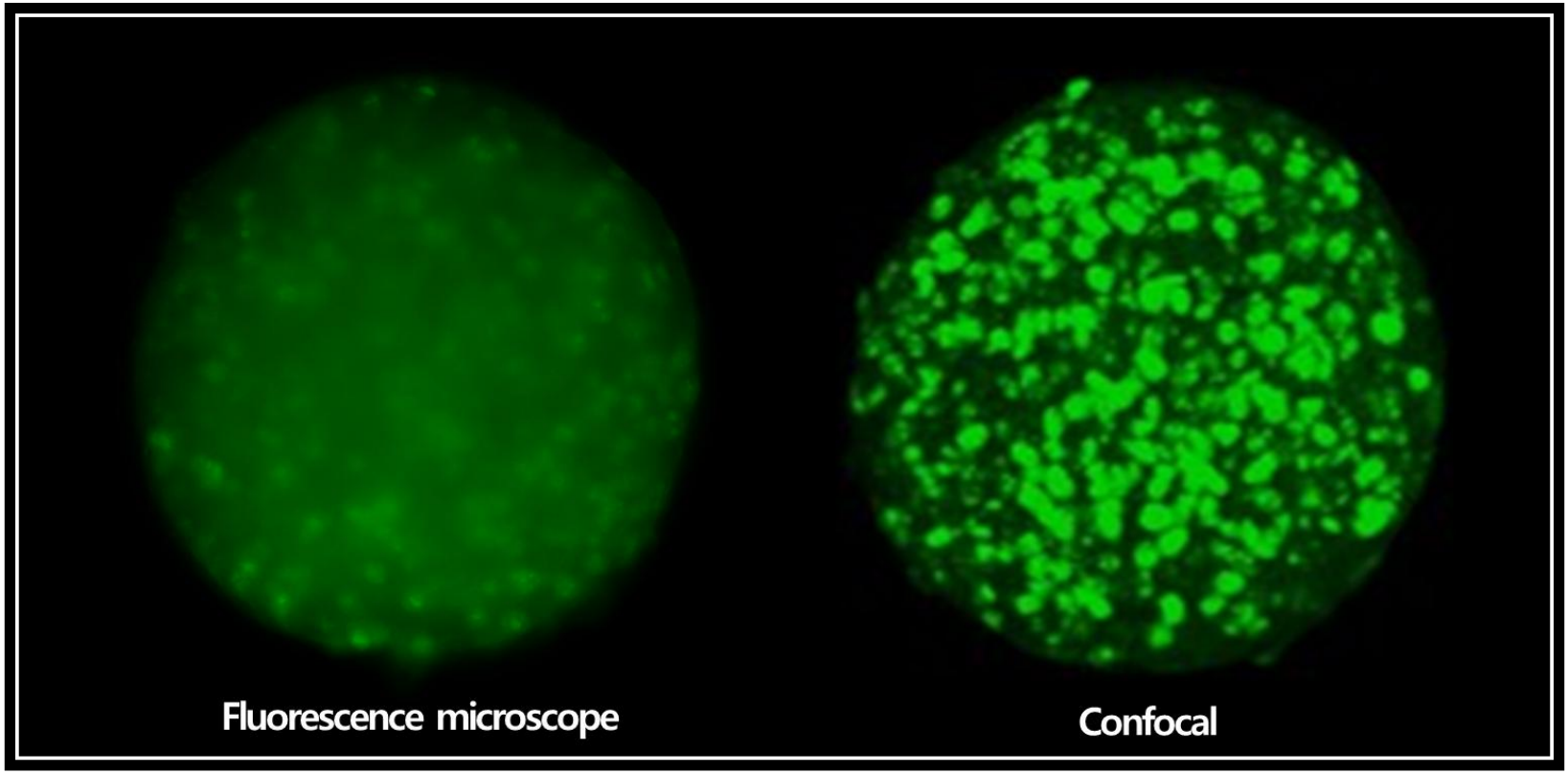
What is the difference?

Fluorescence Microscopy
Uses a wide cone of light. Illuminates the entire sample at once. Provides broad field imaging.

Confocal Microscopy
Setup Uses a focused laser beam. Scans the sample point-by-point. Provides sharper, clearer and brighter images.



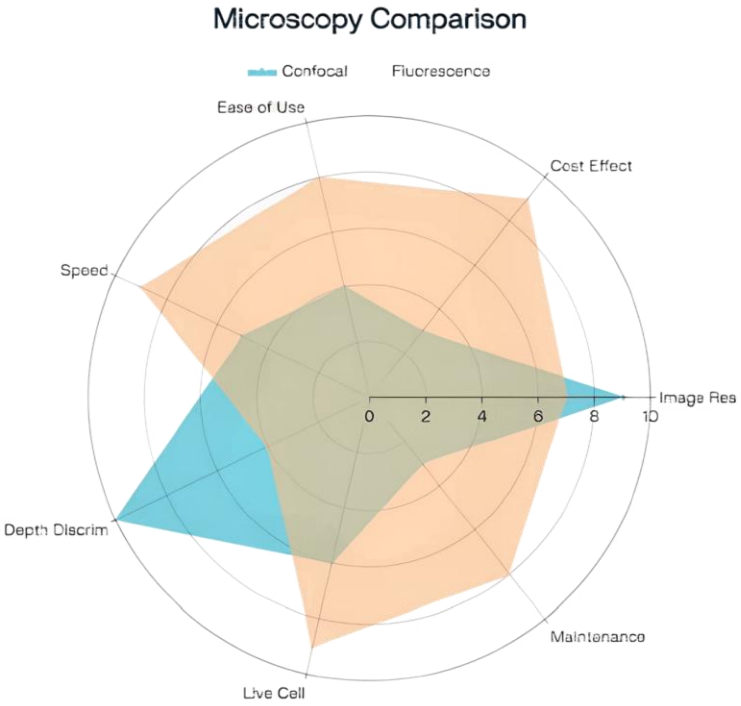
What is the difference?



The fluorescence microscopy approach captures all focal planes simultaneously, resulting in a softer, more diffuse appearance due to out-of-focus light. It shows a smooth, uniform fluorescent sphere with even illumination across the entire sample.

The confocal technique utilizes point-by-point laser scanning and a pinhole aperture to eliminate out-of-focus light, producing sharper optical sections with enhanced contrast and three-dimensional resolution. It reveals detailed, high-resolution fluorescent structures with clear definition of individual cellular components or organelles.

Confocal vs Fluorescence Microscopy: Performance Comparison



Confocal microscopy excels in depth discrimination and resolution but requires complex laser systems, expensive maintenance, and specialized training . In contrast, fluorescence microscopy systems like Red offer superior cost-effectiveness, ease of use, and faster imaging speeds, making them more accessible for routine research applications. The Red system particularly excels in live cell compatibility, where reduced phototoxicity and faster acquisition times are critical for maintaining cell viability during extended observations

Understanding the Thickness of Fluorescent Sample

Glass Slide

A standard 1.0mm thick glass slide is typically used.
The slide provides the basic structure to support the sample.

Fluorescent Sample

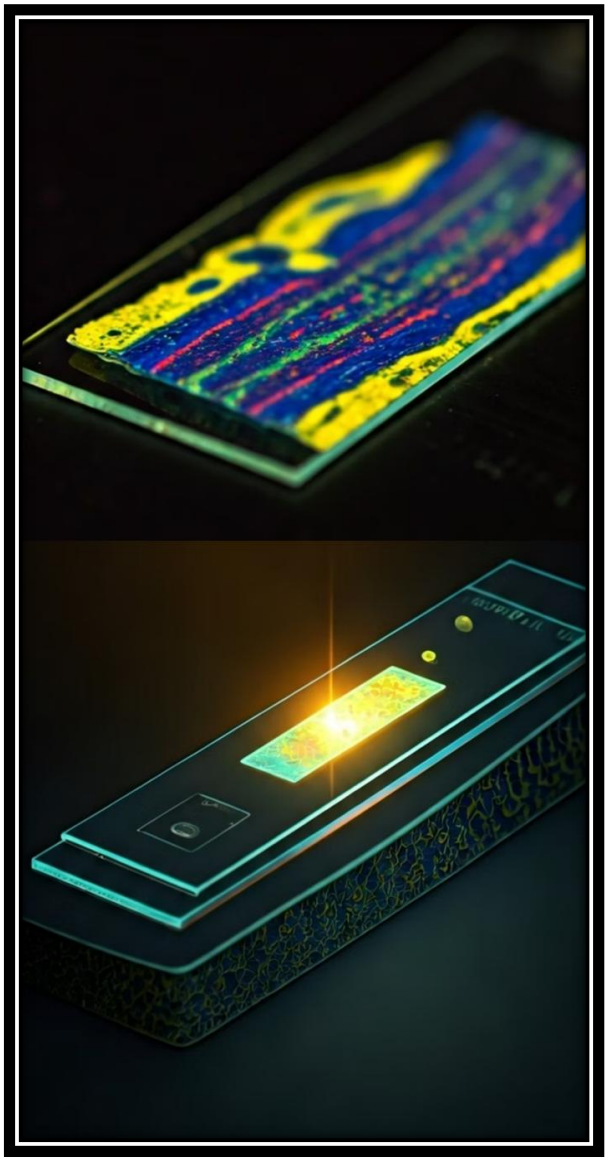
Most biological samples are prepared to be **5-20µm thick.**
The thickness can vary depending on the cell type and experimental purpose.

Mounting Medium

A layer **typically 10-30µm thick** to preserve the fluorescent signal and prevent photobleaching.

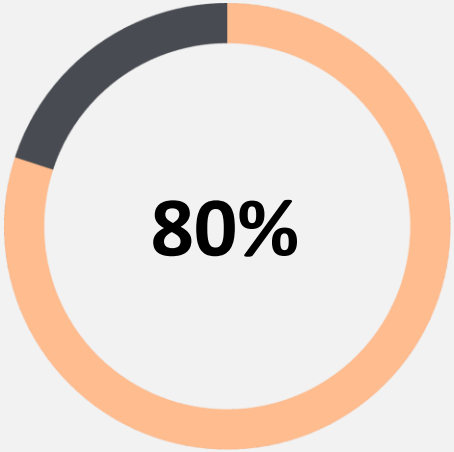
Coverslip

A thin glass, usually 0.13-0.17mm thick, which is critical for optical performance.



"If you prepare your fluorescence samples well, sometimes you don't need a confocal microscope."

Thickness rule



Research Coverage

Academic research uses samples <25µm

1

Coverage

Range covers most monolayer cells and standard tissue sections

2

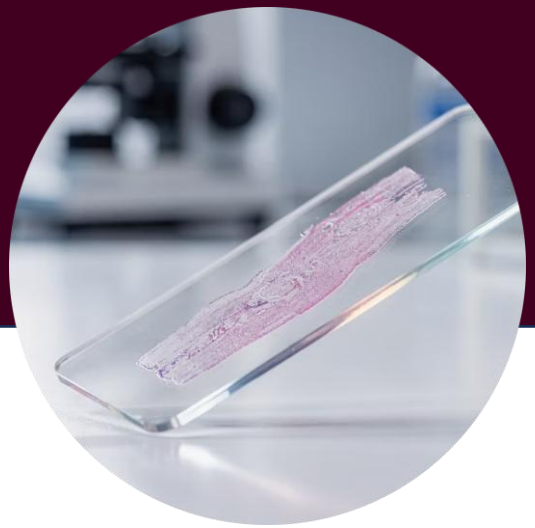
Efficiency Peak

Wide-field systems provide higher photon collection than Confocal pinholes

Thickness rule

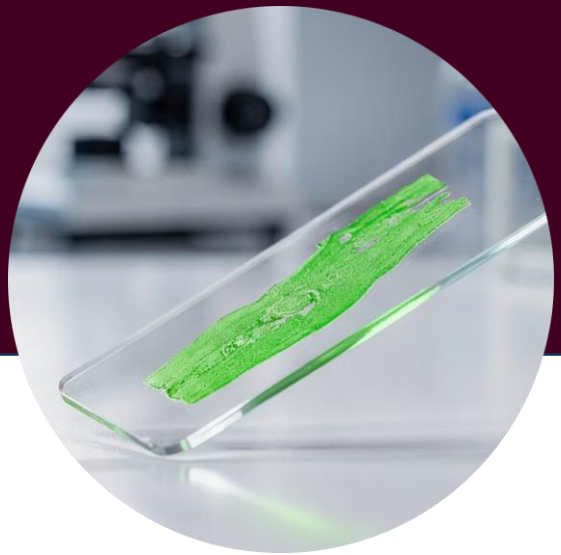
Optimize Smart

Choose the Right System for Your Sample Thickness



Thin Samples (5-20µm)

Provides optimal resolution and signal intensity _Red is the best for this thickness



Medium (20-30µm)

Suitable for some applications, with slight signal reduction- Red is the best for this thickness



Thick (>30µm)

Focus issues, signal reduction, increased background fluorescence.
It is better to use a confocal microscope.

Red

Fluorescence Microscope Technology

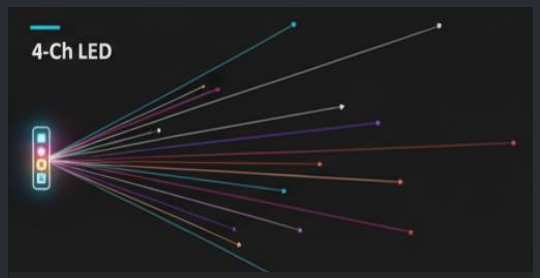
Through rigorous research into light path optimization and proprietary lens configurations, we've **developed technologies that dramatically improve fluorescence intensity in microscope systems.**



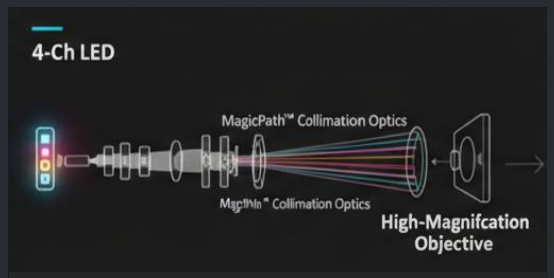
Launched. July.2024

Power of Collimation: Magicpath technology.

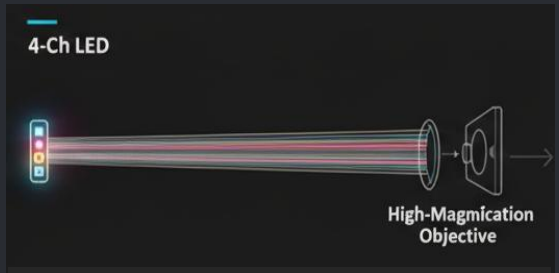
Red microscope's **optimized optical path system** approach to optical design represents the foundation for next-generation microscopy platforms capable of detecting single molecules and imaging deep within living tissues. **MagicPath optical technology with least optical losses in the illumination path, detecting the faintest fluorescence signal.**



Scattered Light: Significant photon loss over distance due to high divergence



MagicPath™ Collimation: Transforming scattered light into precise parallel rays



Highly collimated Light: Maximized Efficiency

Traditional LEDs scatters and this scattering reduces signal intensity.

By filling the objective's back aperture with parallel rays, we achieve **5.2x higher excitation intensity** compared to standard systems.

This ensures that even the faintest microbial structures, like Salmonella, capture image like **Confocal.**

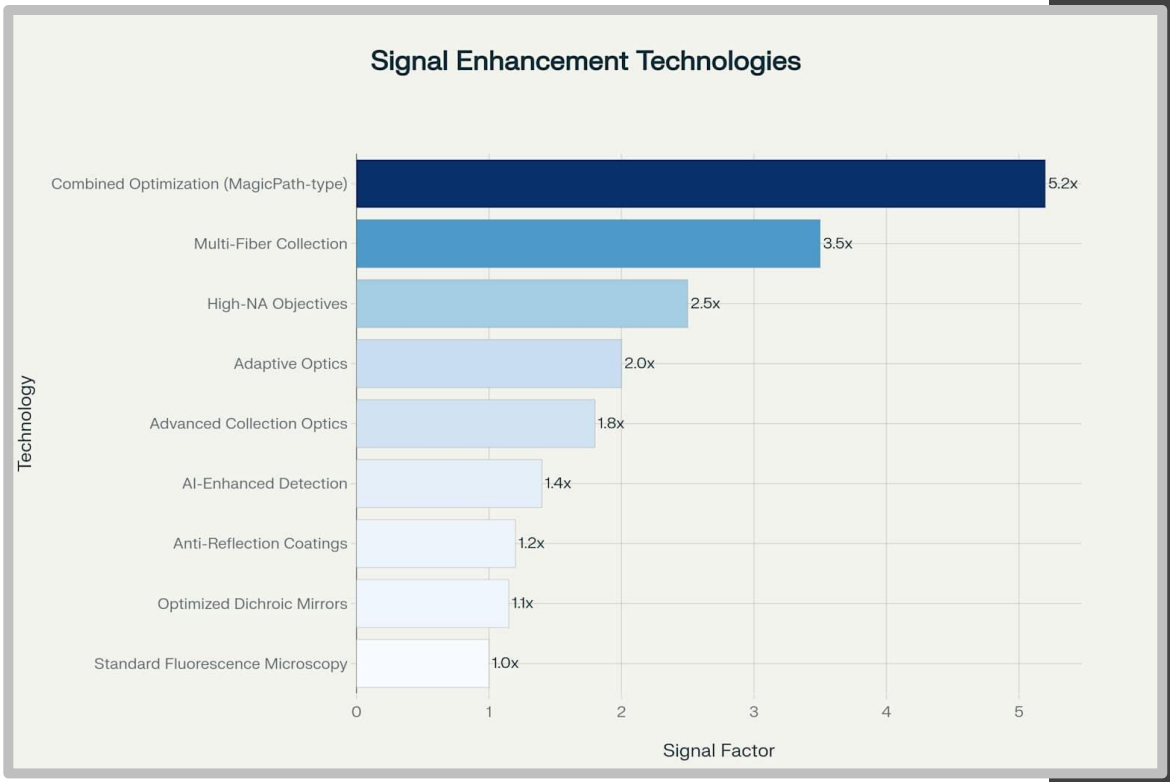
Signal Enhancement

5.2 X

compared to a standard fluorescence system.

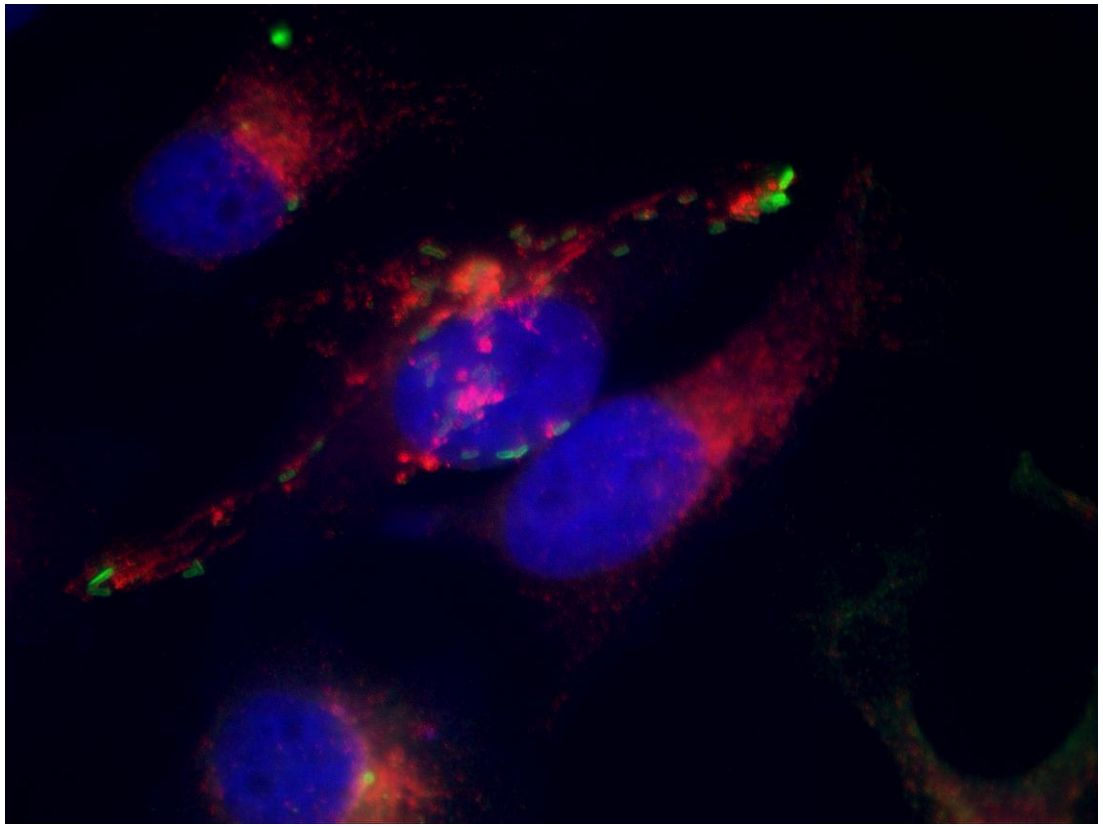
Technical Advantages

- Optimized excitation light delivery to the sample
- Enhanced collection of emitted fluorescence
- Minimized light loss at each optical interface
- Reduced optical aberrations for clearer images
- Improved signal-to-noise ratio across all fluorescence channels



“MagicPath Optical Technology”

1. Cell–microbe interactions



- This image shows cell-microbe interactions **captured with the 100x oil objective** lens of the Red imager **(final magnification 1000x).**

- HeLa (**human cancer cell line)**
- Blue fluorescent area : nuclei of Hela cells (DAPI)
- Red fluorescent area : Lysosome(LAMP1) / (Alexa 594)
- Green fluorescent area : Salmonella (Alexa 488) -> Microbe

Technological Highlights (Red Imager)

•**Confocal-Level Clarity:** Despite being a fluorescence imager, the image achieves sharpness comparable to a confocal microscope by utilizing **Magic Path technology** and **Stray Light Traps** to eliminate background noise.

•**Optimized Optical Path:**, maintaining high signal intensity even at high magnifications like 1,000x. The **Optimized Transmission** ensures that light remains as parallel rays

•**12MP Resolution:** The use of a high-resolution 12MP camera allows for the clear distinction of individual bacterial cells within the host cytoplasm.

Optimized Imaging Strategy by Sample Thickness

Image Before Deconvolution

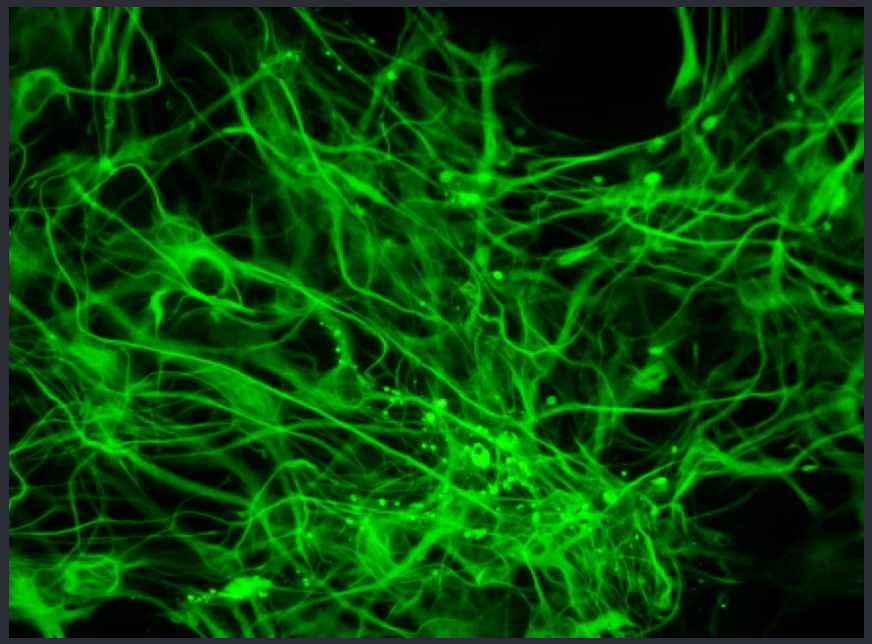
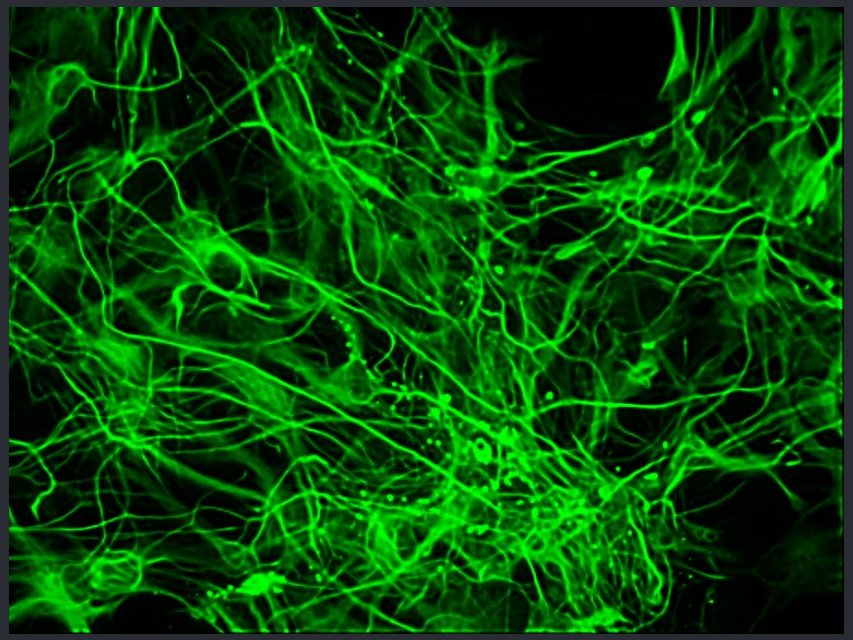


Image after Deconvolution



Slide glass, 10um section

Under 20um

The **DconEZ** software feature delivers dramatically improved image quality by removing blur and revealing fine structural details that would otherwise be obscured. This computational enhancement is particularly valuable for densely labeled specimens and thick tissue sections.

1. Enhancing Image Clarity of iPSC Cell Lines Using DconEZ

1) Introduction

This application note demonstrates the effectiveness of **DconEZ processing** in improving the visual quality and sharpness of multi-channel fluorescence images. Induced Pluripotent Stem Cells (iPSCs), which are essential for disease modeling and regenerative medicine, were visualized using high-magnification fluorescence microscopy.

2) Experimental Conditions

- **Sample:** iPSC (Induced Pluripotent Stem Cell) Line , Thickness: under 10um
- **Imaging System:** 40x Red Imager
- **Imaging Mode:** Fluorescence Mode
- **Fluorescence Dyes:**
  - **DAPI:** Nuclear staining (Blue)
  - **ALEXA 488:** Target protein A (Green)
  - **ALEXA 594:** Target protein B (Red)

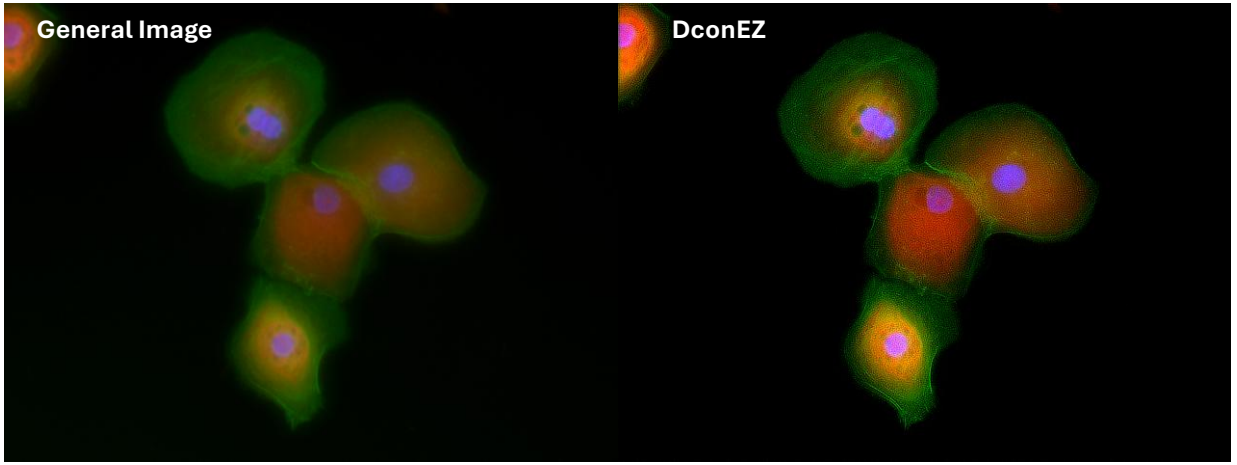


Figure 1. Comparison between standard fluorescence imaging and DconEZ processed imaging captured with a 40x objective lens. Both images were acquired using the Red Imager..

3) Results and Conclusion

The application of DconEZ significantly improved the image quality of the iPSC lines. The processed images showed:

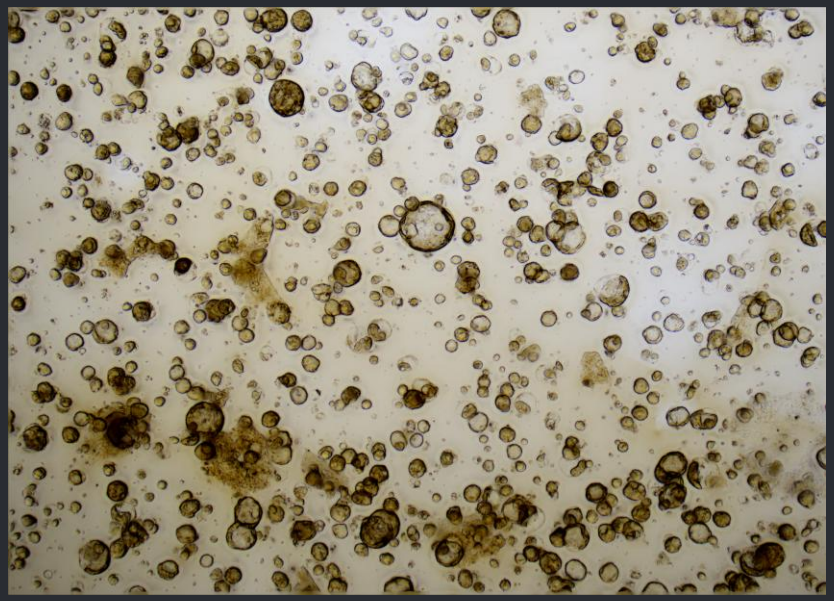
- **Clearer definition** of nuclear boundaries (DAPI).
- **Sharper visualization** of fine protein distributions (ALEXA 488/594).
- **Elimination of hazy artifacts**, providing publication-quality data for precise cellular analysis.

Optimized Imaging Strategy by Sample Thickness

Image Before Z-track



Image after Z-track



Around 30um

The Z-stack capability enables researchers to explore three-dimensional structures within specimens by capturing images at multiple focal planes. This feature is essential for analyzing thick tissue sections, cell cultures, and other samples where structural information extends beyond a single focal plane

1. Application Note: Precise Volumetric Imaging of Mouse Brain Tissue Using Red Imager Motorized Z-Track

✓ **Introduction**

Capturing high-resolution images of thick biological specimens requires precise control over the focal plane. As objective magnification increases, the depth of field (DOF) becomes significantly shallower, making a **Motorized Z-Track** system essential for capturing the full volumetric detail of a sample. This note demonstrates the Z-Track capability of the Red Imager using GFP-labeled mouse brain sections.

✓ **Experimental Conditions**

- **Sample: Mouse Brain Tissue (Cryo-sectioned)**
- **Tissue Thickness: 30 um**
- **Staining: GFP (Green Fluorescent Protein)**
- **Objective Lens: 20X High-Resolution Objective**
- **Imaging System: Red Imager with Motorized Z-Track**

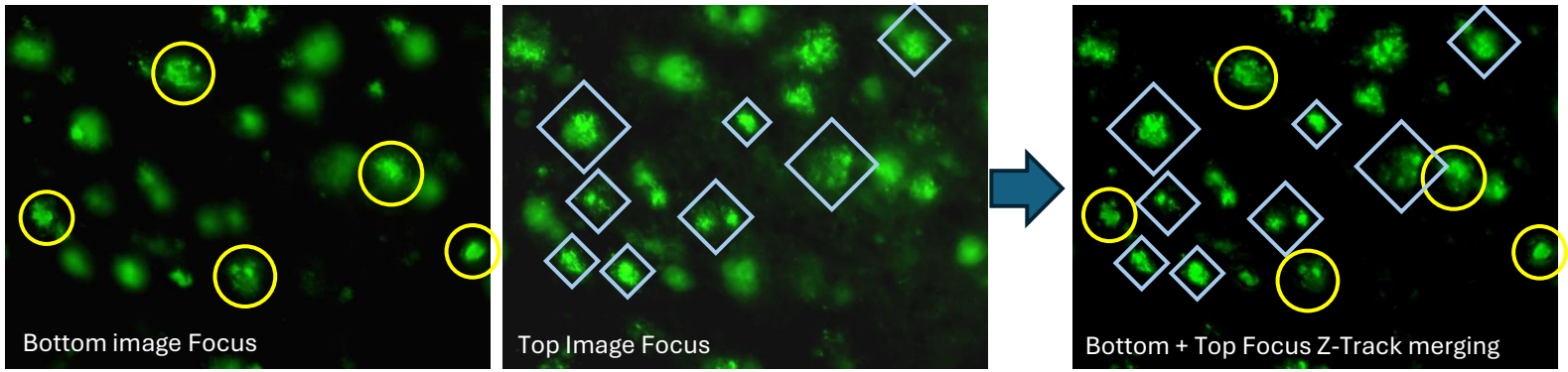


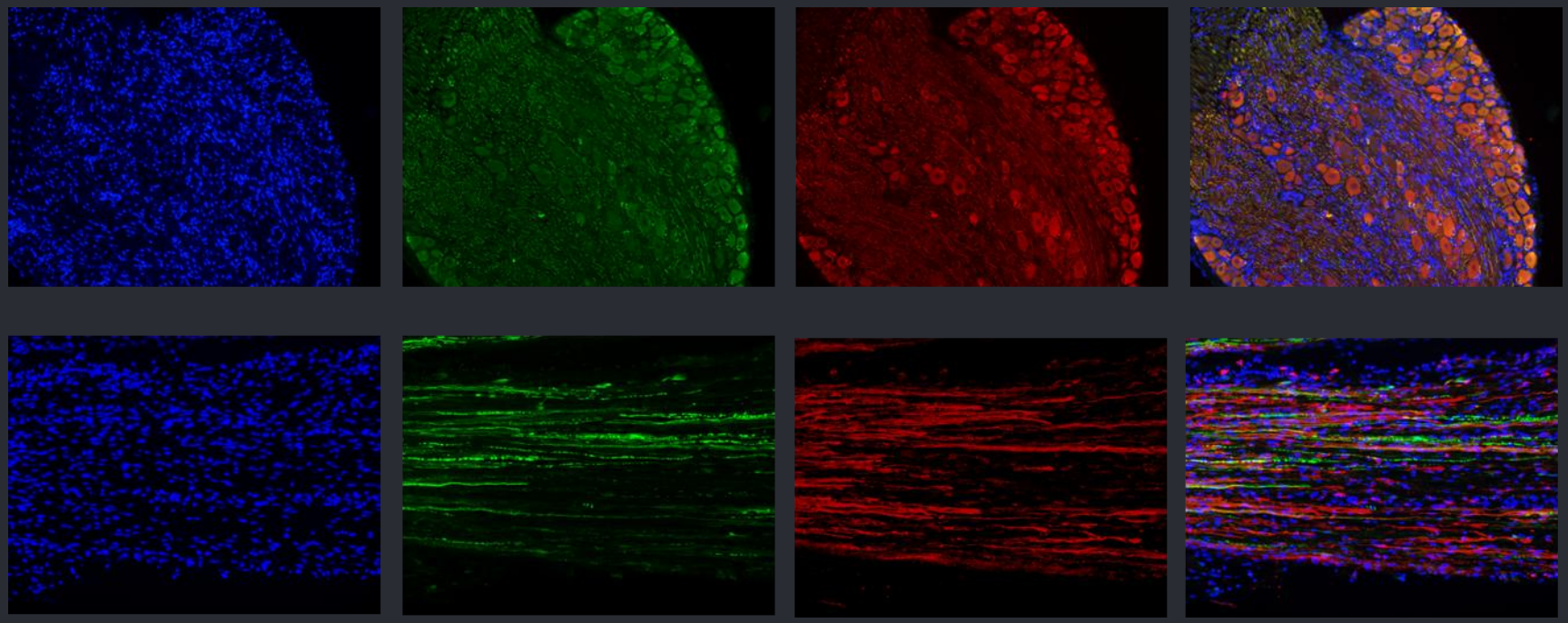
Figure 1. Figure 1. Comparison of bottom and top focal planes merged into a single volumetric image using the automated Z-Track processing

✓ **Results and Conclusion**

The Motorized Z-Track successfully reconstructed the GFP-stained neural structures within the 30 um mouse brain slice.
By utilizing the 15um step acquisition and automated merging, the Red Imager provided:

- **Enhanced Depth of Field:** All structures within the 30um thickness appeared in sharp focus.
- **Precise Mechanical Control:** The 0.1um minimum step ensures the system is ready for even higher magnification (40X or 100X) challenges.

Imaging by Red

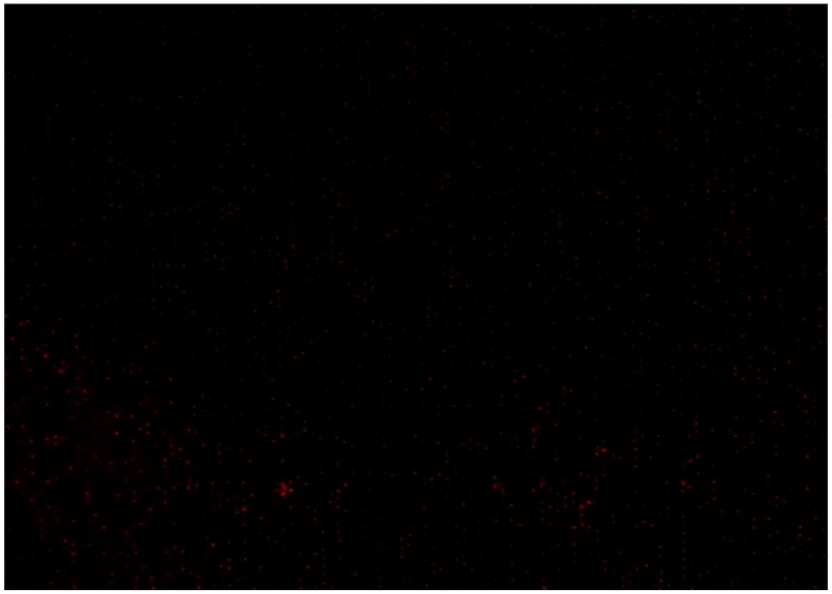


Superior performance with DAPI, FITC, Texas Red, Cy5, and multi-channel applications

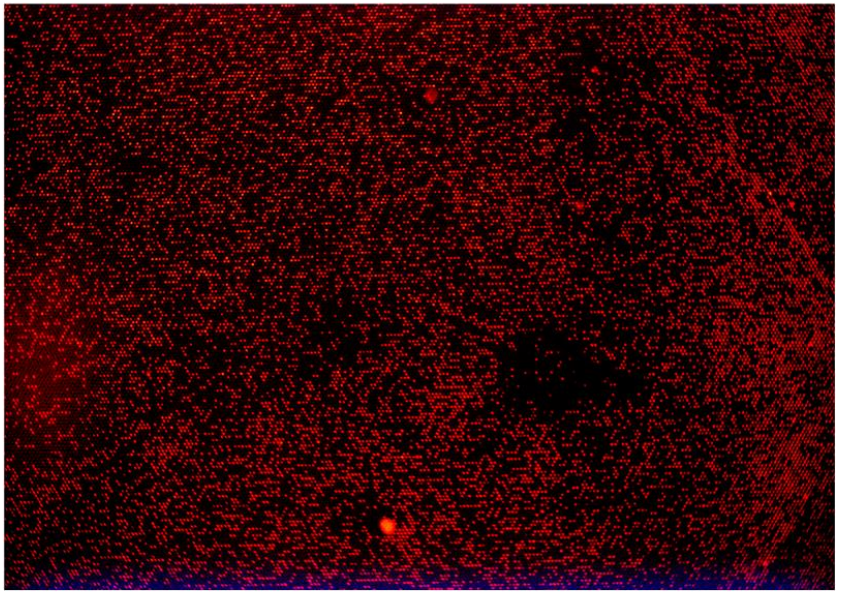
Comparative Analysis: Red vs Leading Brands

Red vs Conventional System A: Fluorescence Bead Imaging

Conventional System A



Red



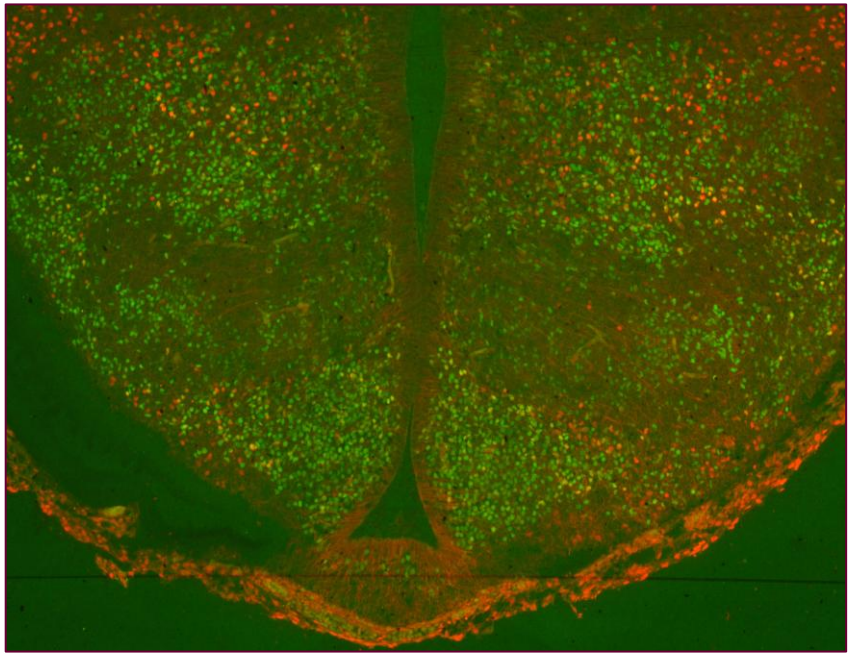
We conducted a direct comparison between Red microscopy systems and the **Conventional System A** using:

- 35,000 EA, 2μm fluorescence beads on Biochip
- 10X objective lens for both systems
- Identical exposure settings and filter configurations

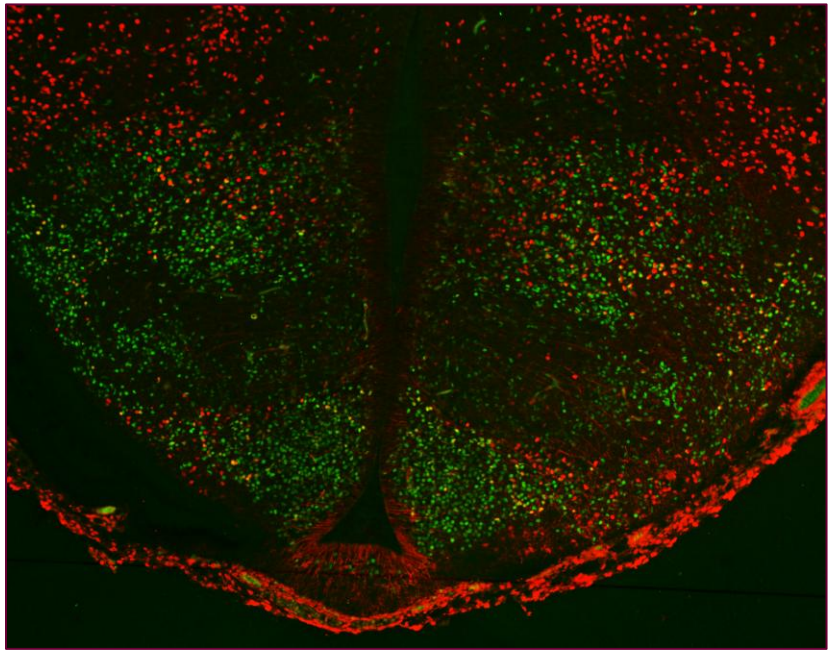
The comparison reveals significant differences in signal-to-noise ratio, with Red demonstrating enhanced fluorescence detection sensitivity and improved background suppression. The optical clarity and resolving power allow for clear visualization of individual beads, critical for quantitative analysis in cell tracking and microparticle studies.

Red vs Conventional System C
: Image Quality Comparison

Conventional System C



Red



Mouse brain / 20um paraffin section staining (488, 594) / objective: 10X

Weak Light Source

Requires excessive exposure time for adequate signal detection.

Elevated background signals require additional post-processing work.

Strong Light Source:

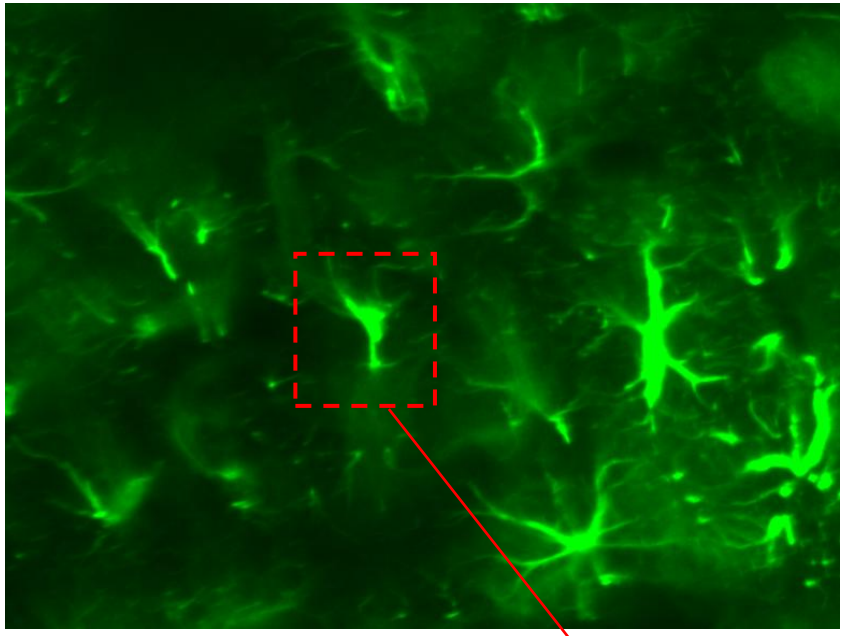
Powerful fluorescence illumination technology eliminates background noise.

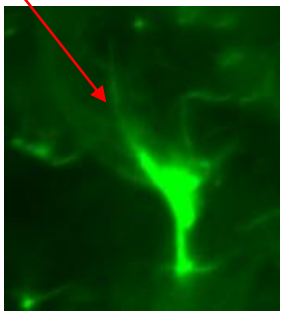
Precise observation of fluorescent emission regions only.

Red vs. Conventional system D: Astrocyte Imaging Analysis

Specimen Details: 30µm brain tissue section on standard slide glass, labeled with Alexa 488 fluorophore and imaged with 20X objective. The Red system demonstrates superior resolution of astrocyte dendrite morphology with enhanced signal intensity and reduced background interference

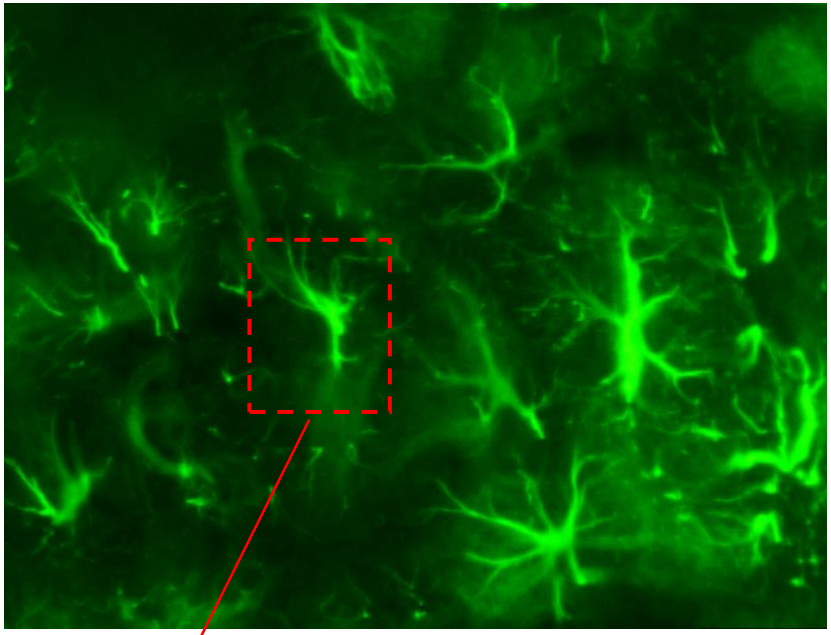
Conventional system D

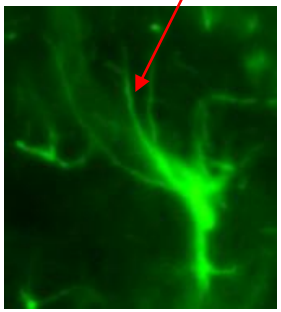




The conventional system D shows acceptable visualization of astrocyte morphology with moderate contrast between dendrites and background. Note the diffuse fluorescence signal around cell bodies and limited definition of fine dendritic processes.

Red



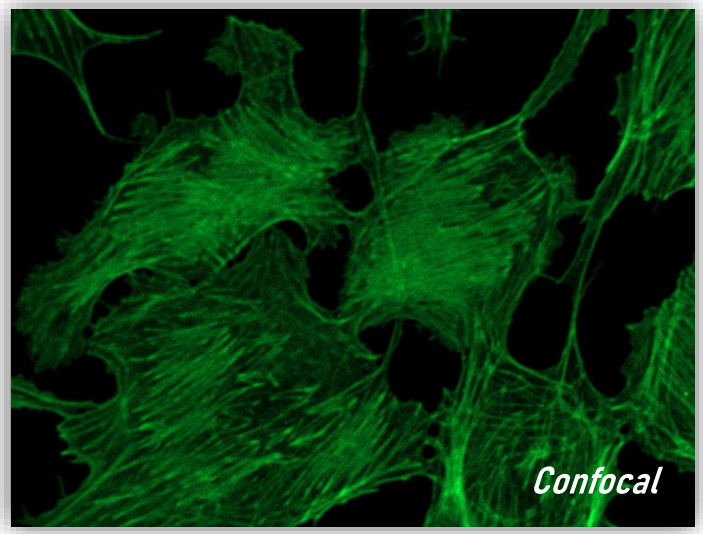


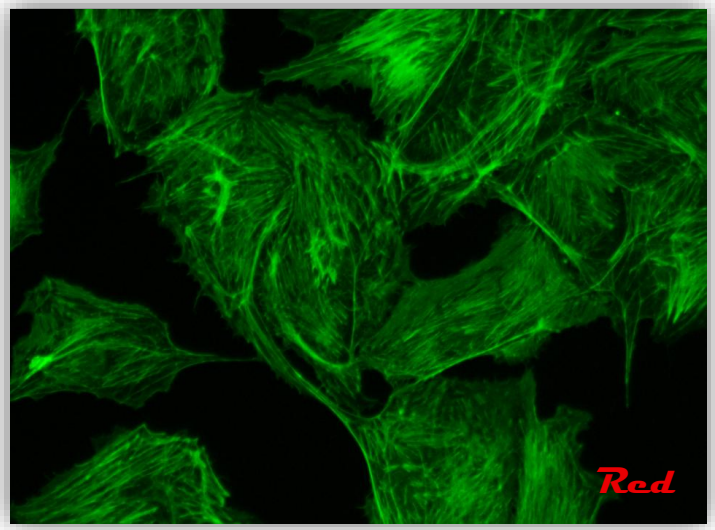
The Red system delivers superior visualization of astrocyte dendrites with enhanced contrast and clearer delineation of cellular structures. Note the improved detection of fine dendritic processes and more precise boundary definition.

Red

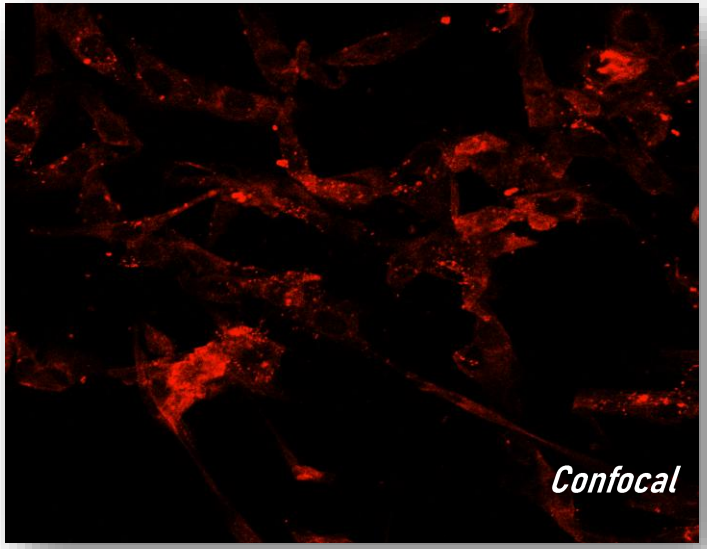
Sometimes, you don't need a confocal microscope

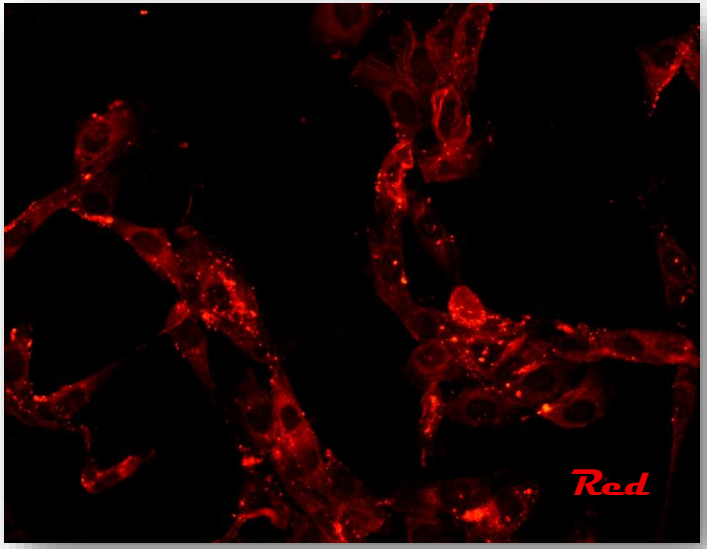
Fluorescence image test of the cell of the best condition, FluoCells™ Prepared Slide (Green : Alexa Fluor 488 Phalloidin) Cell line: BPAE cells (Bovine Pulmonary Artery Endothelial Cells)





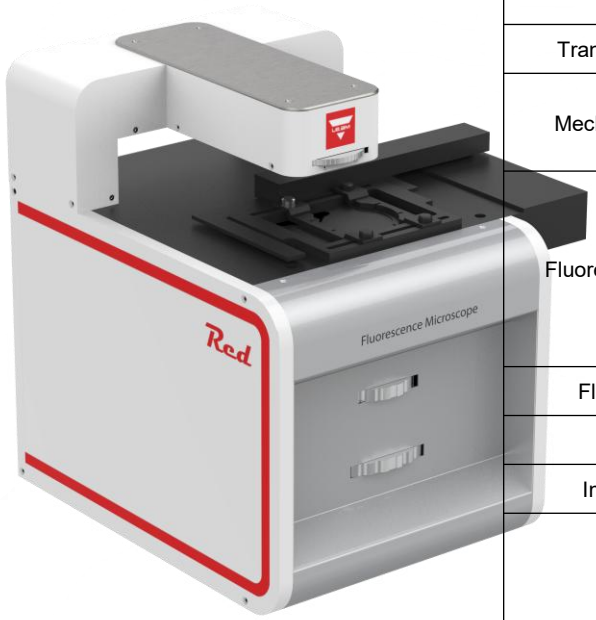
Fluorescence image test of the cell of the worst condition, Fluorophore staining after 24hours, Cell line: NRK-49F fibroblast cell (Kidney of a rat),





Red

Basic Specification.



Observation/Operation	Brightfield, Fluorescence, Phase contrast/Manual Operation
Sample Holder	Culture dish, Culture flask, well plate, Slide glass etc…
Objectives	Lplan fluor 4x / 0.13
	Lplan fluor 10x / 0.30
	Lplan fluor 20x /0.45
	Lplan fluor 40x / 0.65
	Optional: 20X phase contrast / 60X,100X(immersion oil)
	Five-position revolving nosepiece
Transmitted illuminator	Built-in White LED with Phase-contrast plate wheel
Mechanical stageStage	X-Y mechanical stage, Size 210 x 241mm, Moving range 120 x 80 mm Culture and slide glass holder
Fluorescence illumination	4-Channel LED illumination
	365nm,470nm,550nm,620nm
	Application of DAPI, Hochest, Alexaflour 350,FITC, EGFP, Alexaflour488, Cy2 TexasRed, mCherry, AlexaFlour594,Cy5
Fluorescence filter	Built in DAPI, FITC, Texas Red (or TRITC), Cy5
Image Sensor	1/1.8” Sony IMX226
Image Resolution	12M pixel
Software	Capture, Save, Batch Save, Fluorescence mode, R-G-B manual Merge, R-G-B Auto Merge, Black balance. Scale bar on the image, Cell count, Auto and manual Image intensity Measurement/Auto and Manual Z-stack/Deconvolution.
Weight	25.6 Kg
Dimension	W 302 x D 311 x H329 mm
Power supply	19.5 V/10 A
	-Input: 100-240 V~, 50/60 Hz, 3.5 A
	-Output: 19.5 Vdc., 11.8 A, 230.1 W

CE FC RoHS compliant KC

Red Products Line up

Products	Model		Key feature
Red Prime	RF40		• The Manual Standard • Auto focus/ Auto Z-stack/Deconvolution
Red discovery	RF40-A		• Full Automation technology(X-Y-Z)

Red Prime — The Manual Standard



Model : RF40

Red Prime RF40 is the foundational instrument in the series, offering researchers direct, hands-on control with an intuitive interface. It comes with built-in MagicPath, Deconvolution, and Z-stack technologies, paired with user-friendly software designed for streamlined workflows.

- MagicPath
- Deconvolution
- Auto focus and Z-stack

Now Available

Red Discovery – Fully Automated (June.2026)



Model : **RF40-A**

Red Discovery adds X-Y-Z automation and capabilities to Red Prime for unrivaled performance in live cell research and mass sample analysis.

- MagicPath
- Deconvolution
- Full automation
- XY Precision
- Auto Z-stack

Launch. OCT.2026



Made by LEAM KOREA
LEAM Solution Inc
Office : +82 31 434 2710
e-mail : leamsol@leamsol.com
www.leamsol.com

Elliot Scientific Ltd
Unit 11 Sandridge Park, Porters Wood,
St Albans, AL3 6PH, United Kingdom
Tel: +44 (0)1582 766300
Fax: +44 (0)1582 766340
www.elliotscientific.com
sales@elliotscientific.com

Sometimes, you don’t need a confocal microscope