

# DoubleHelix<sup>®</sup>

## More Than Does SPINLE<sup>®</sup> Data with SPINDLE<sup>2</sup> Introducing the SPINDLE<sup>2</sup>

### Unrivaled Precision and Depth 3D Imaging & Tracking Unrivaled Precision and Depth 3D Imaging & Tracking

Double Helix SPINDLE<sup>2</sup> gives researchers the ability to easily capture and analyze 3D image components of biomolecules down to the single molecule level.

Using SPINDLE<sup>2</sup> being optically patented Light Engineering™ technology, a simplification from the SPINDLE tracking and single image localization microscope to phase mask design and its foundation, the SPINDLE<sup>2</sup> can be easily installed on existing microscopes to enable advanced 3D imaging and tracking with super-resolution capabilities. Built-in bypass mode allows for easy return to non-3D imaging.

- Simultaneous multi-color 3D imaging, depth and lateral precision
- Patented phase mask design overcomes traditional limitations
- Two channel 3D imaging with unparalleled depth and axial precision
- Compatible with a wide range of microscopes, objectives and cameras
- Select from a library of masks optimized to the emission wavelength needed for your 3D experiment.
- Affordable and adaptable
- Single-shot extended depth imaging
- Compatible with wide range of microscopes, objectives and cameras

### Current Light Engineering™ Applications

**Super-resolution:**  
Reconstruct 3D super-resolution images with nanoscale precision for both axial and no axial stitching

**Super-resolution:**  
Reconstruct 3D super-resolution images with 3D Single Particle Tracking combination and no extended depth enables capture of longer particle tracks and faster acquisition. Compatible with fluorescent beads, dyes and photoactivatable proteins

**3D Particle Tracking:**  
Extended depth enables capture of longer particle tracks and faster acquisition.

**Extended Depth of Field:**  
Single-shot depth range up to 30x clear aperture

**Affordable and adaptable**

- **Small footprint** allows easy installation even in space constrained environments
- **Input and output C-mount adapters** support easy installation even in space constrained environments
- **Highly reliable system** with no moving parts. Switchable phase mask cartridges, custom built microscopes and cameras, auxiliary emission filter holders for

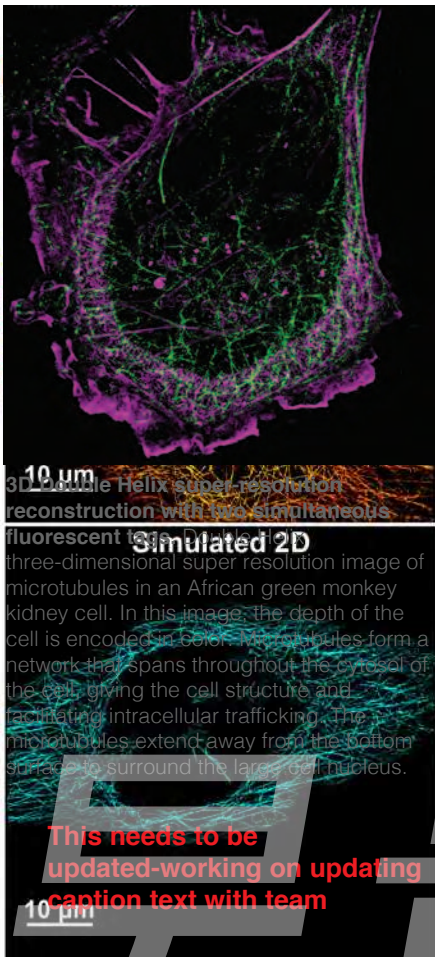
**Highly reliable system** with no moving parts. Switchable phase mask cartridges, custom built microscopes and cameras, auxiliary emission filter holders for maximum experimental flexibility

**Modular design** evolves your existing system into an advanced 3D imaging system with super-resolution capabilities

### Needs new mask holder pic



Replace mask holder to fit with your wavelength needs  
Replace mask to fit with your wavelength needs



**3D Double Helix super-resolution reconstruction of microtubules labeled with AlexaFluor 647.** 3D with Double Helix and simulated 2D reconstructions showing z depth encoded in color. The Double Helix 3D image captures a depth of 2.2 μm. The simulated 2D reconstruction of the same image shows 1 μm of z depth (-500 to +500 nm) and does not contain axial localization information.

*We are seeing biology we would have missed without the Double Helix SPINDLE®*

*We expect that the DH-PSE optics will become a regular attachment on advanced microscopes at BLIP, Promiers Institute, University of Colorado either for super-resolution 3D imaging of structures, or for 3D super-resolution tracking of individually labelled bio-molecules in cells or other environments*

Professor W.E. Moerner | Nobel Laureate  
Stanford University

**DoubleHelix**  
See Like No Other™

## Custom designed optics for precision imaging and tracking

- **Multi-channel imaging** to enable a broad range of biological experiments including 3D particle tracking, 3D SMLM, FRET, SOFI, and extended depth of field imaging.
- **Full field-of-view** imaging
- **Custom optics** ensure diffraction limited performance over the full field of view of large format sensors

**Exactly what goes where...to be discussed, but need your input**

## 3DTRAX™ software, a FIJI plugin provides

- **Transmission >95%**
- **Built-in corrective optics** to ensure pupil plane alignment to your microscope and objectives
- **Ease of install** with stable alignment of x, y, and z positions of the phase mask in the relay and pupil planes

## Intelligent data analysis

### 3DTRAX™ software, a FIJI plugin provides

- **Automated drift correction** available in all modules
- **Intuitive plots** help ensure quality data throughout the analysis process
- **SMLM module** calculates the position of every particle
- **Flexible file export** for extended analysis
- **Quantitative analysis**

## Specifications

Dimensions	100 mm x 195 mm x 300 mm
Single Shot Depth Range	Up to 30x clear aperture
Field of View (FOV)	up to 25 mm diagonal
Lateral (x-y) precision	20 nm
Axial precision	55 nm
Light efficiency	> 95%
Mask library wavelength range	400 nm to near IR
Depth range	± 250 μm
Custom masks (available upon request)	Larger than 200 x 200 μm
Field of View (FOV)	Larger than 200 x 200 μm
Precision specifications listed are based on results generated using Double Helix mask library and will vary according to NA of the objective used and the photon count of the specific experiment. Precision may be better than indicated.	
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## About Double Helix Optics

Double Helix Optics enables visualization and data capture of objects at an unmatched depth and precision quality. Its Light Engineering™ point-spread function-based technology is advancing the field of 3D imaging, allowing for new discoveries in research and new capabilities of promise to a range of applications. The SPINDLE2, SPINDLE®, engineered phase masks, and 3DTRAX™ software are currently in use by globally recognized scientists.

To learn more contact us at 3Dimaging@doublehelixoptics.com | doublehelixoptics.com  
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