Abberior Instruments -
STED microscopy from its inventors

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Work with the inventors of STED and RESOLFT microscopy

Dr. Gerald Donnert (# 10)

Dr. Alexander Egner (# 27)

Dr. Benjamin Harke (# 18)

Prof. Dr. Stefan W. Hell (# >300)

Dr. Lars Kastrup (# 16)

Dr. Matthias Reuss (# 9)

Dr. Andreas Schönle (# 37)

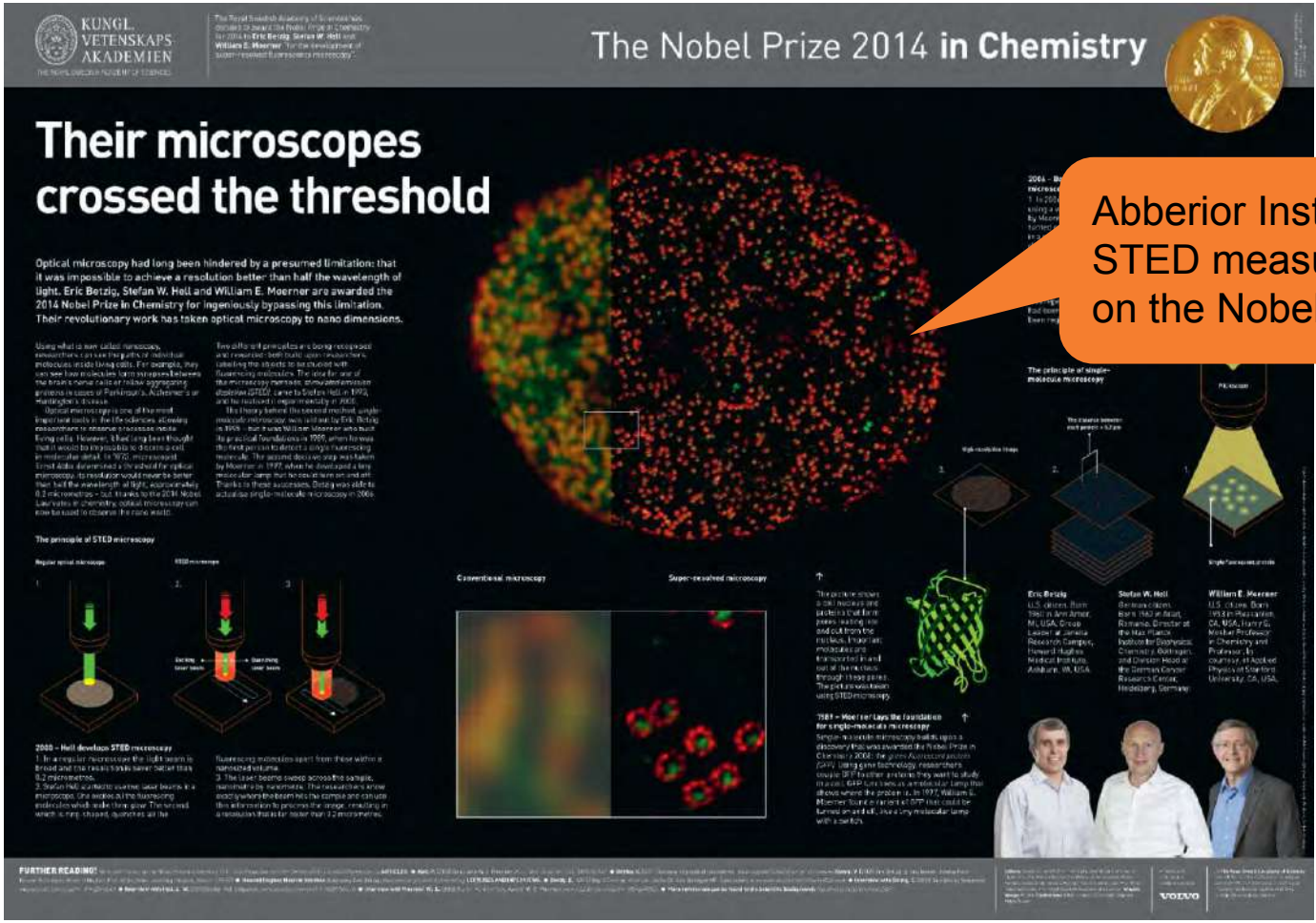
Dr. Christian Wurm (# 32)

Nobel Prize in Chemistry in 2014 for Stefan W. Hell

We have >100 years of experience in developing super-resolution!

abberior INSTRUMENTS

What can you expect from us – nobel performance



Abberior Instruments STED measurement on the Nobel Poster

abberior INSTRUMENTS

STED nanoscopy in a truck – is possible!

Abberior Roadshow

Abberior Demo-lab
– bringing the microscope to the users

Abberior DemoLab

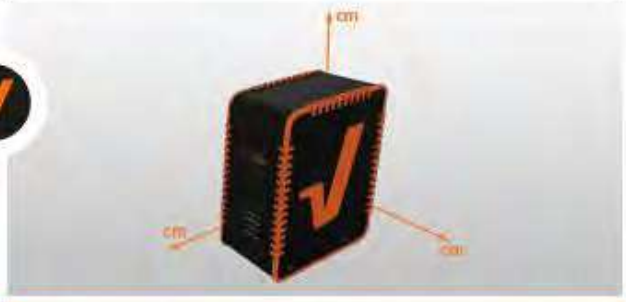
Two nanoscope platforms existing…

Expert line
STED / RESOLFT

At the physical limits...

- ✓ High-end / customized
- ✓ Cutting-edge 2D & 3D STED
- ✓ Continuously upgradable
- ✓ Multiple STED options
- ✓ Powerful software

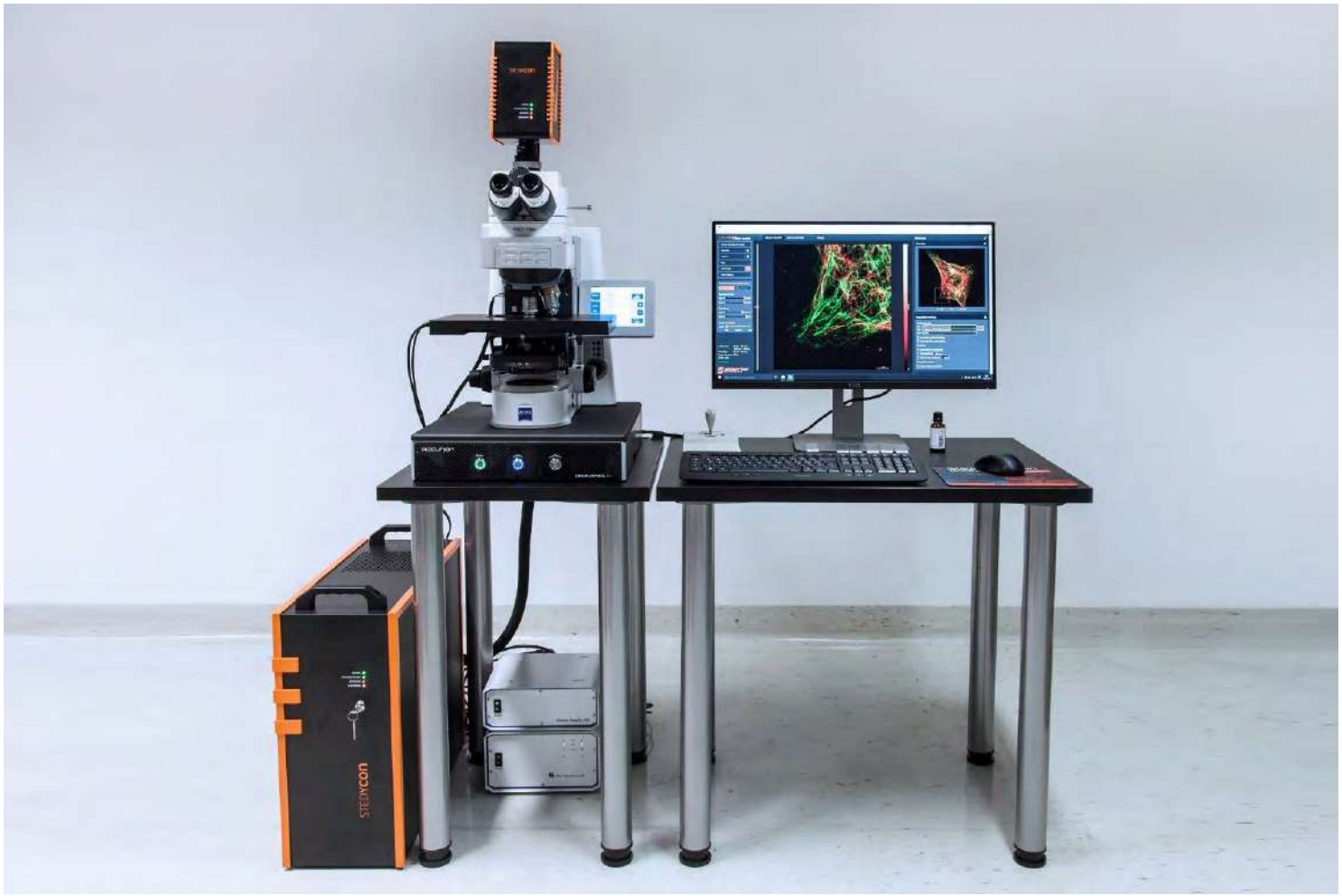
Compact line
STEDYCON



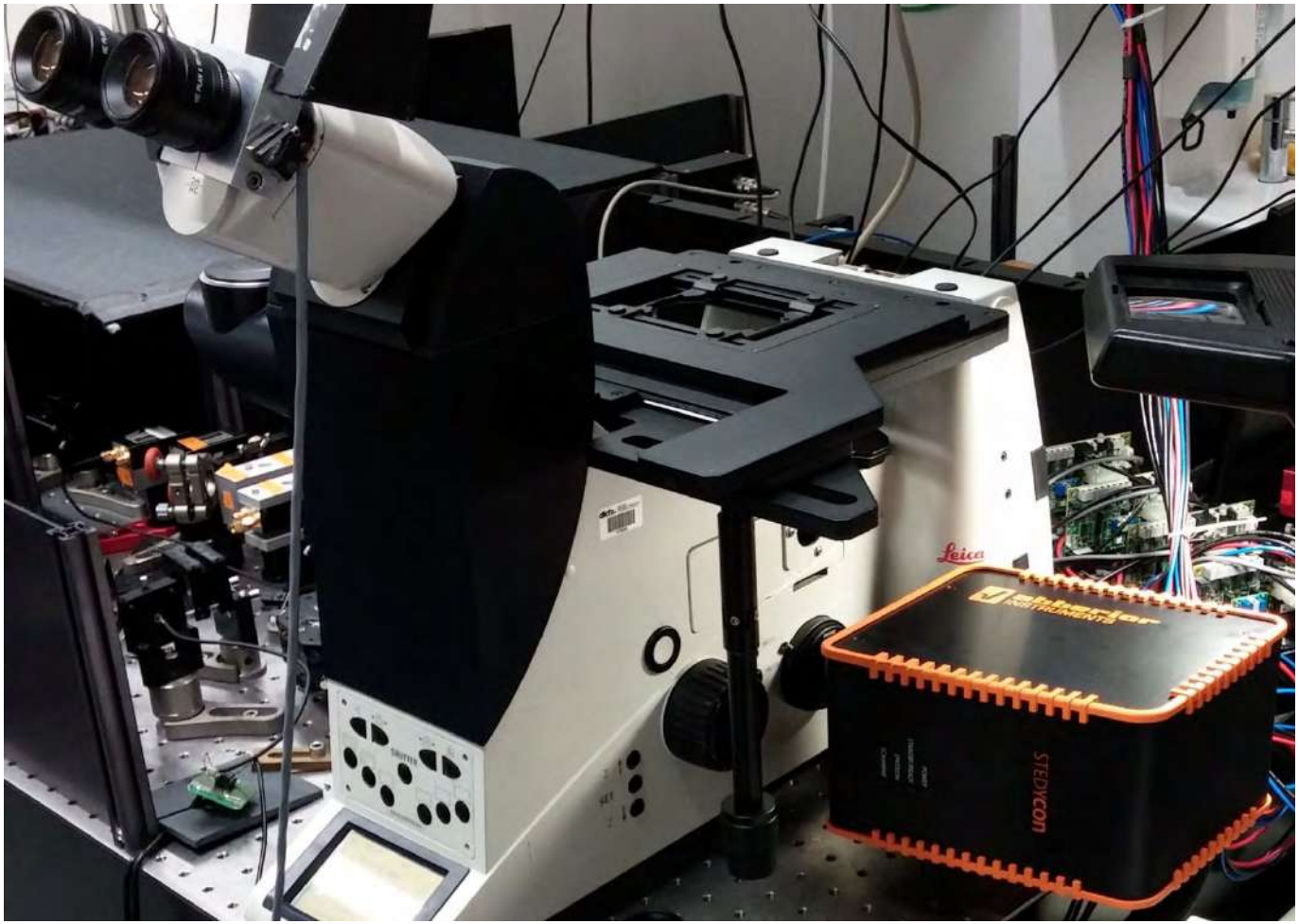
Expands any microscope stand to STED + confocal...

- ✓ Compact / rugged / economic
- ✓ Cutting-edge 2D STED
- ✓ Installation within minutes; plug & play STED + confocal imaging
- ✓ Fits any microscope body
- ✓ Intuitive software

STEDYCON – from unpacking to STED imaging in 3 minutes



STEDYCON - customer example



Leica DMI6000

STEDYCON - customer example

Nikon Ti-E

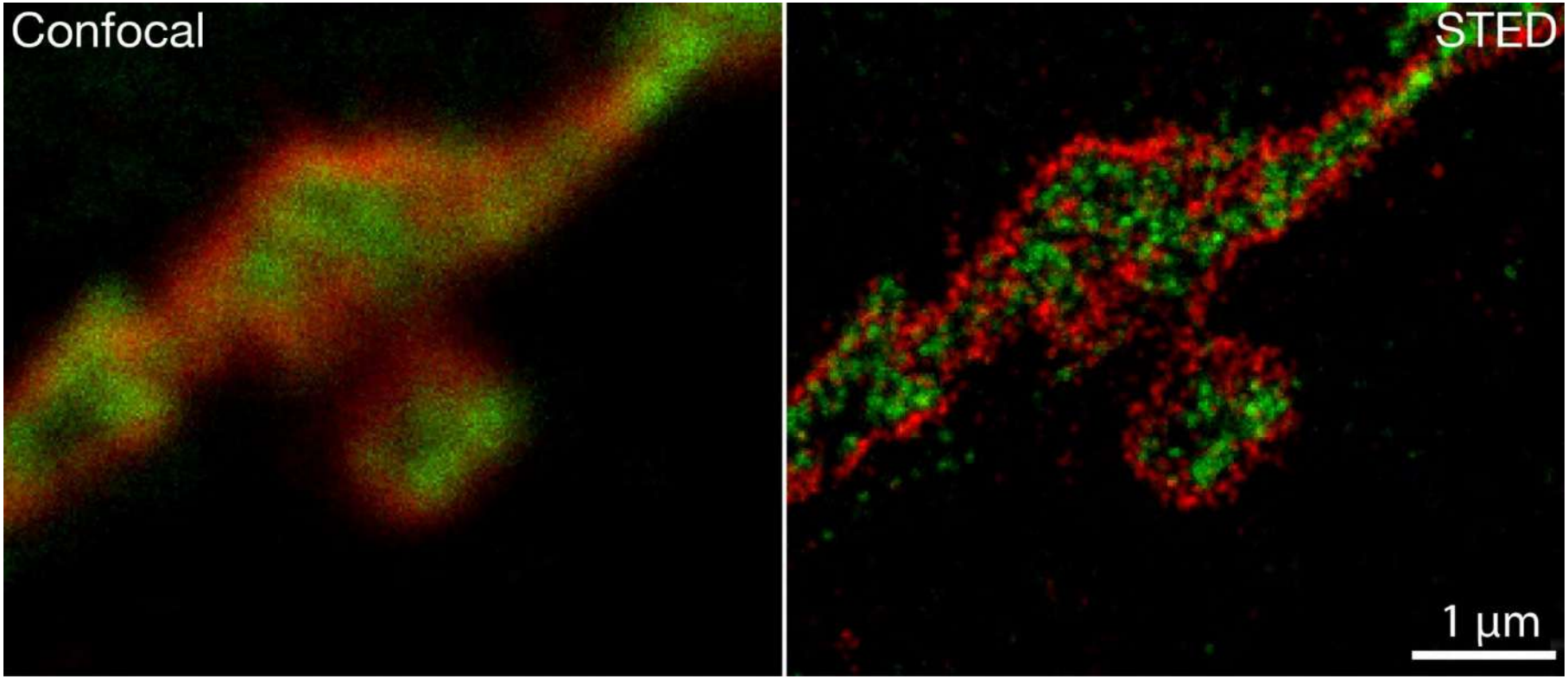
STEDYCON - customer example

Zeiss Observer Z1

STEDYCON – Inverted example Olympus

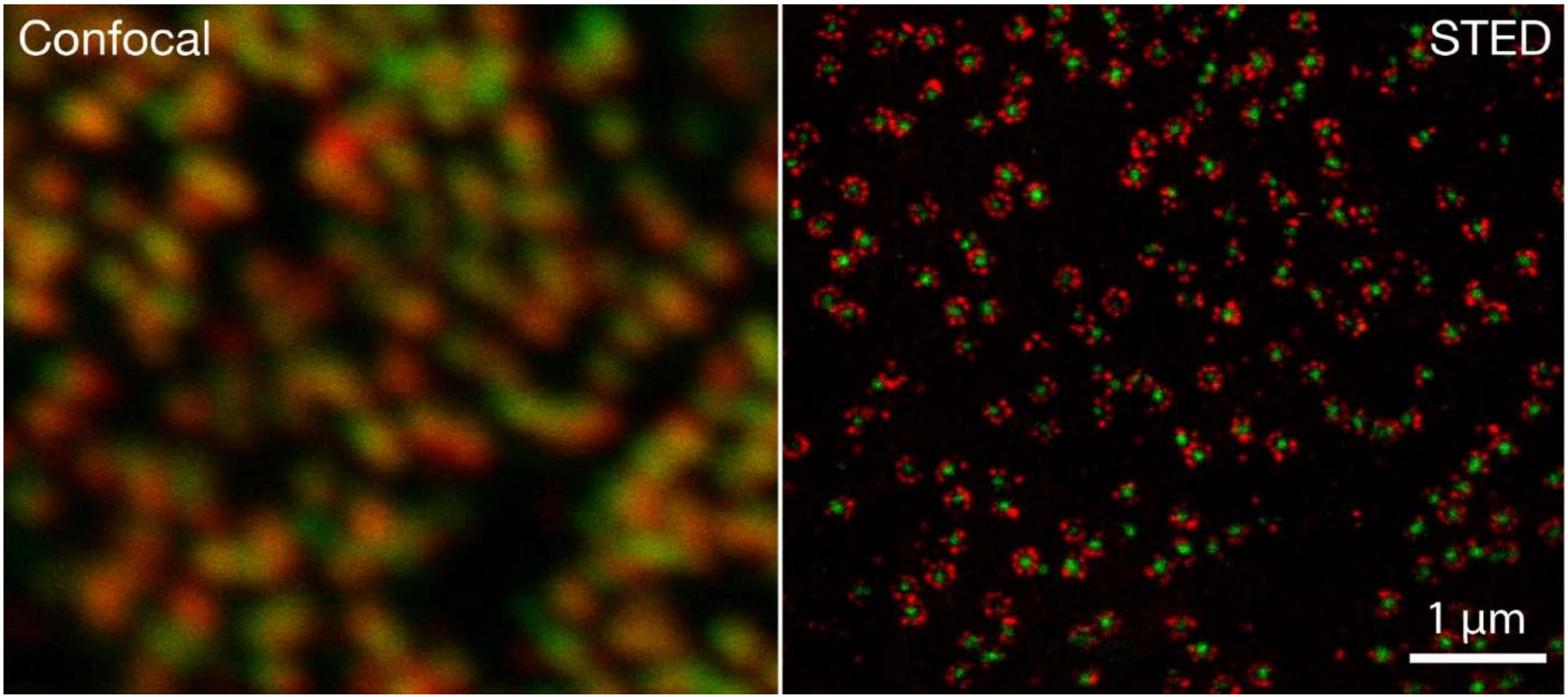
Olympus IX83

Microscopic Images



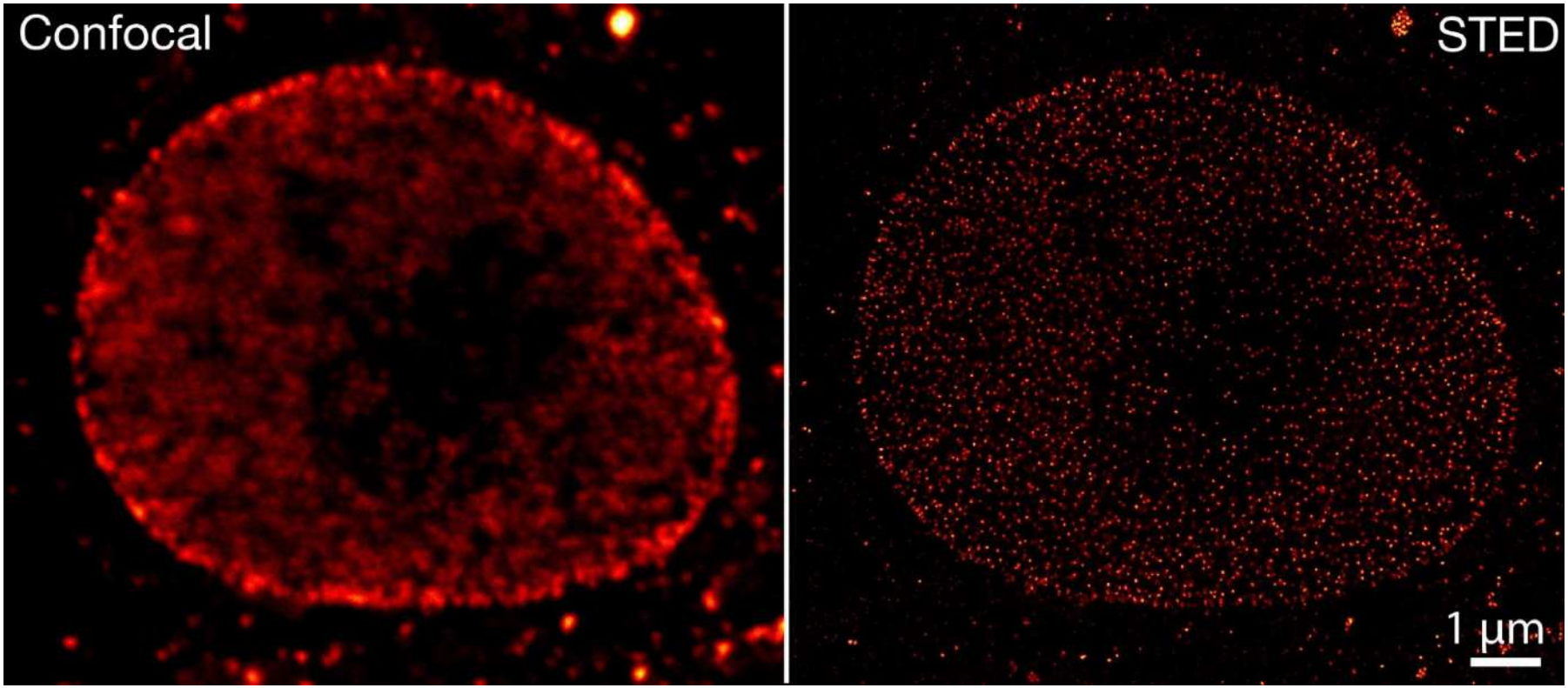
Two proteins in the Golgi apparatus were immunolabelled using primary antibodies specific for GM130 and Giantin and secondary antibodies coupled to Abberior STAR580 and Abberior STAR635P.
Shown is a close-up of the image shown above.

Microscopic Images



Two subunits of the nuclear pore complex were immunolabelled using antibodies against gp210 and antibodies with multiple specificities (PAN4/5) and secondary antibodies coupled to Abberior STAR580 and Abberior STAR635P. Note that gp210 is localized in an eightfold symmetric structure at the rim of the nuclear pore complex. Shown is RAW DATA.
Images were acquired using a STEDYCON attached to a Nikon Eclipse Ni.

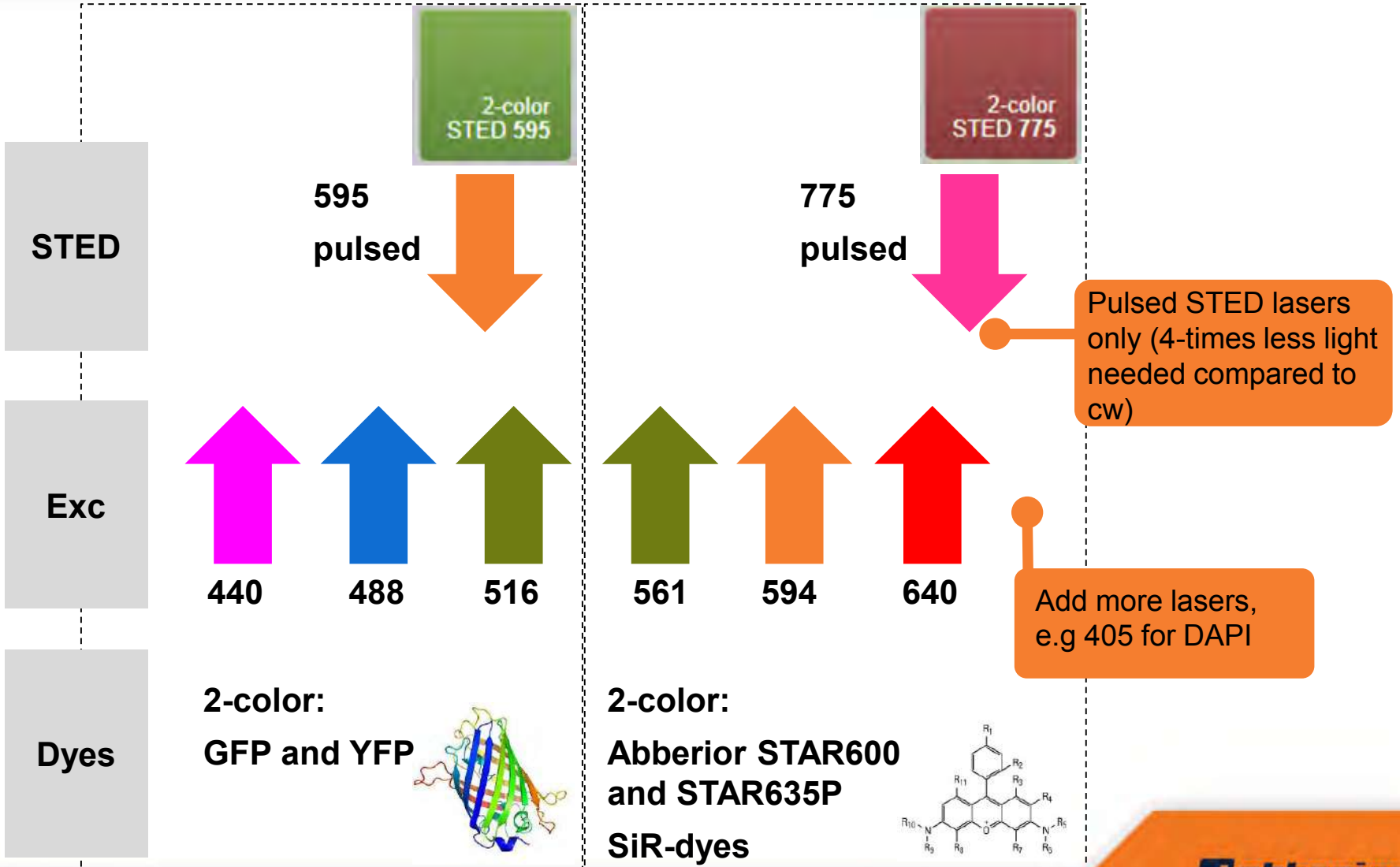
Microscopic Images



Nuclear pore complex subunits in the central channel (nup153) of mammalian cells immunolabelled using Abberior STAR635P. Shown is RAW DATA.
Images were acquired using a STEDYCON attached to a Zeiss Axio Imager Z2.

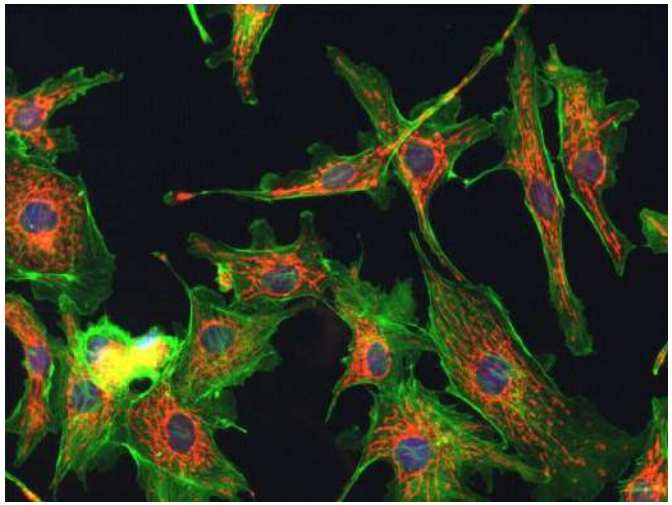
Abberior Instruments Expert Line

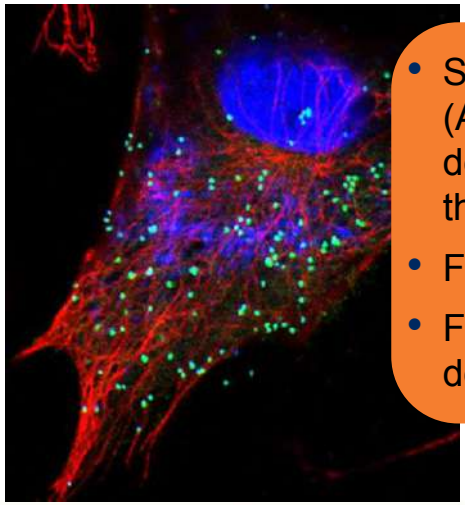
Schematic of the Abberior STED system with two pulsed STED laser @595 nm and @775 nm



Confocal microscope system covering all relevant dyes and proteins

Conf. lines	405	440	488	516	561	594	640
Selection of Markers	DAPI	STAR440Sx	STAR488 GFP	YFP	STAR580	STAR600	STAR635 STAR635P STARred mCherry

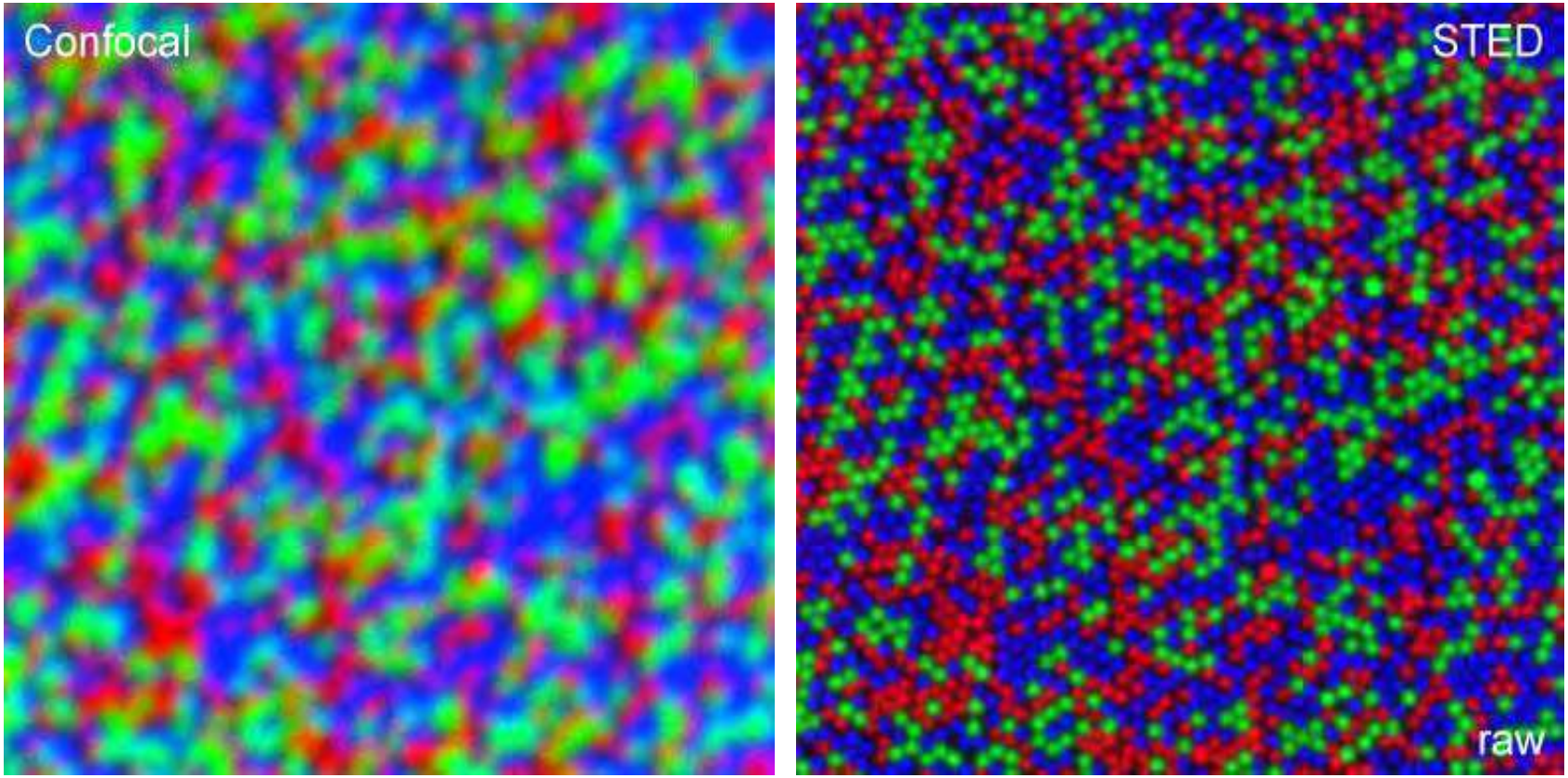




- Single molecule detectors (APDs) with the highest detection efficieny (e.g. 62% in the red) among all detectors
- FLIM (also in STED mode)
- FRET, FRAP, transmitted light detection

Multicolor STED imaging using 2 pulsed STED lasers @595 nm and @775 nm

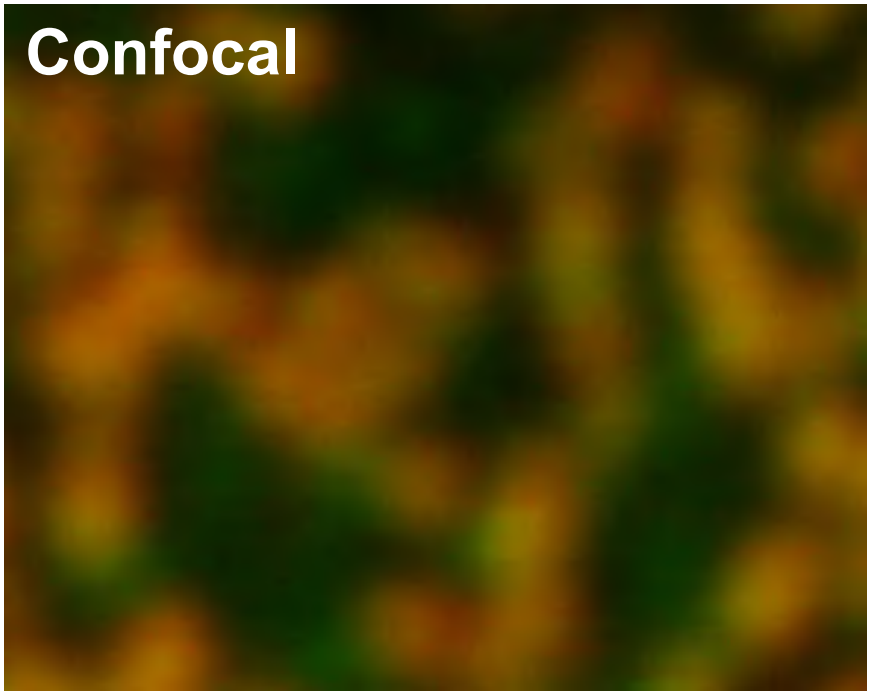
Resolution performance is equal to the current lab performance

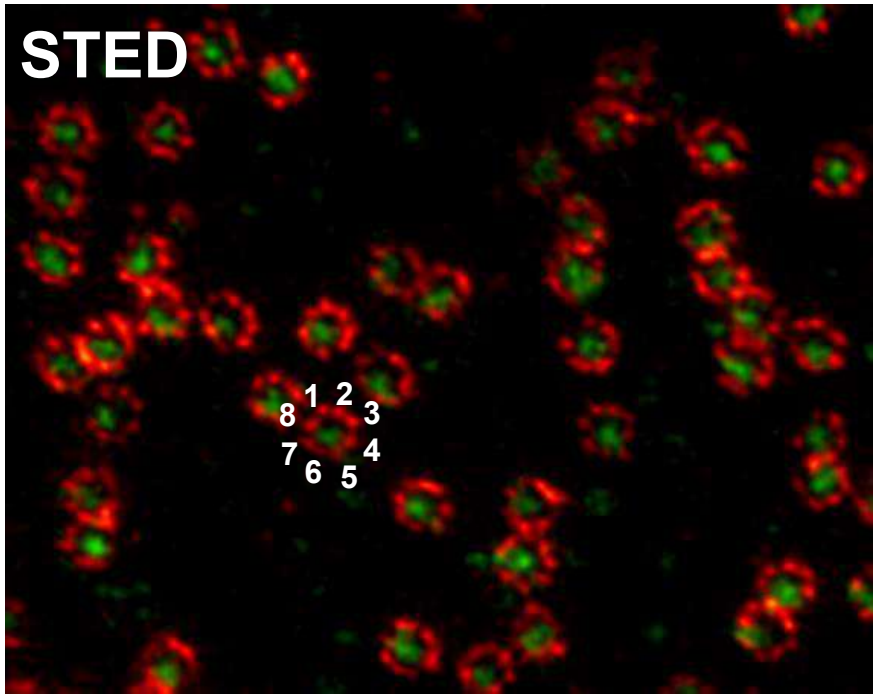


Monolayer of 3 species of fluorescent beads

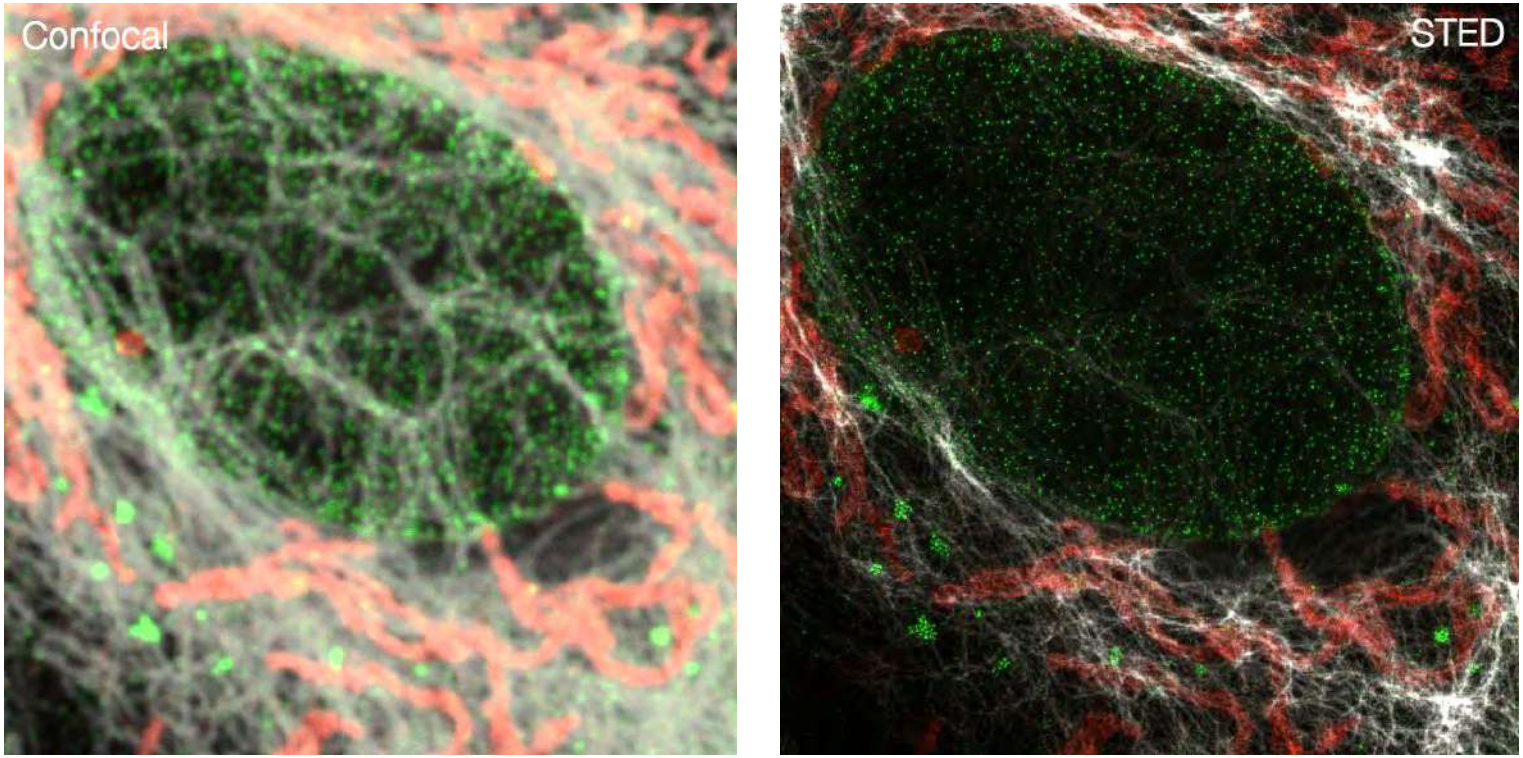
Microscopic images

Resolution performance is equal to the current lab performance



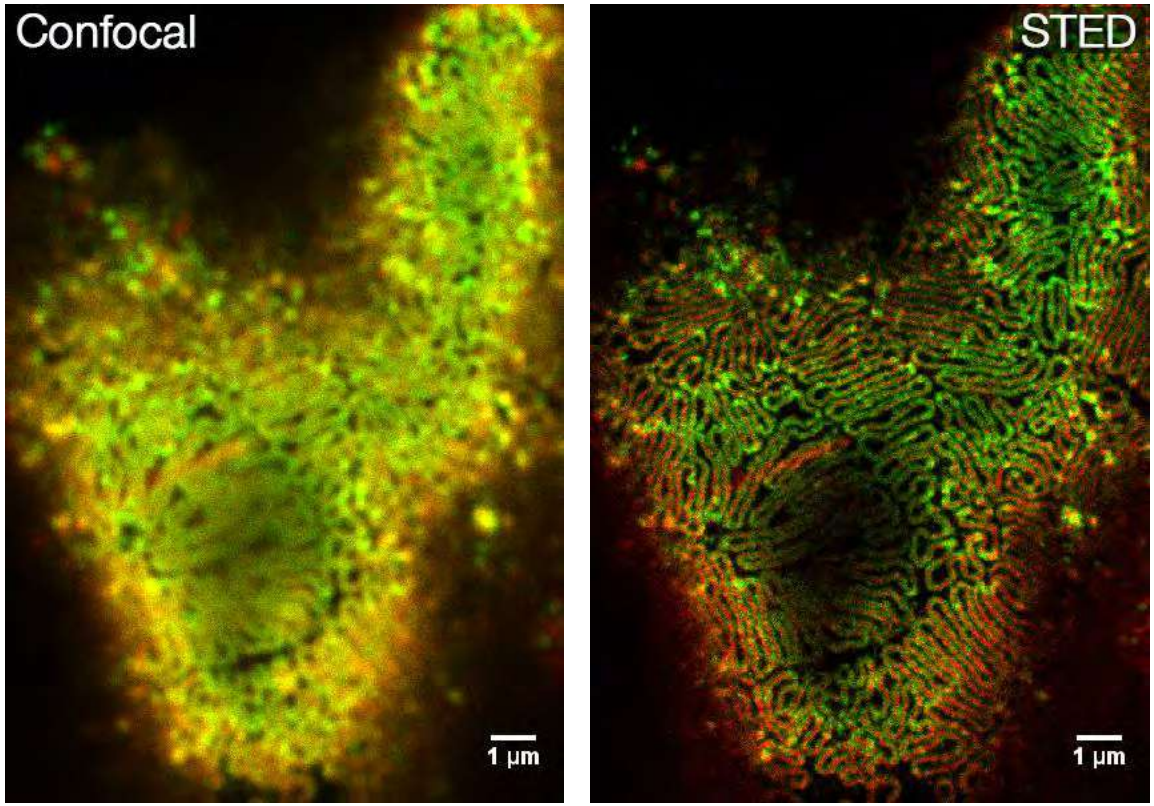


Microscopic images



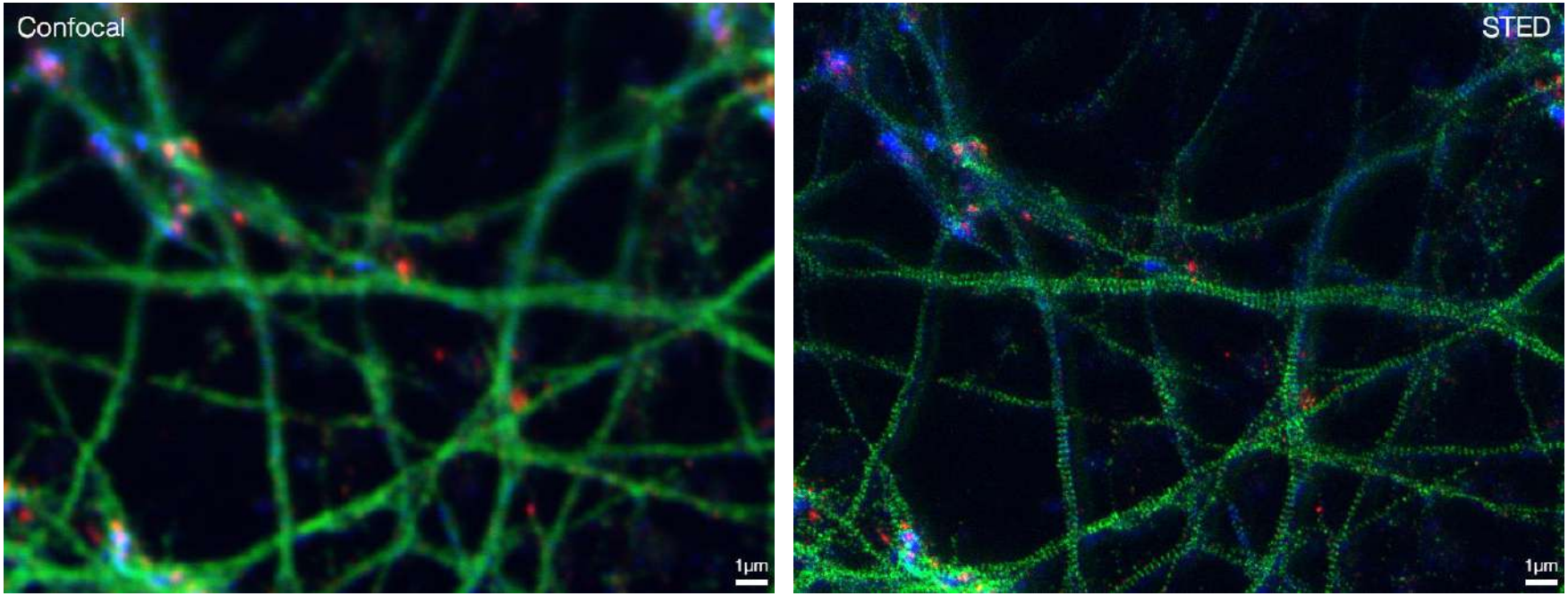
3-color RESCue STED images using both pulsed STED lasers @775nm and @595nm. Labelled structures: nuclear pore complex (green, nup153, Oregon green 488), vimentin (white, Abberior STAR635P) and mitochondria (red, Abberior STAR580).

Microscopic images



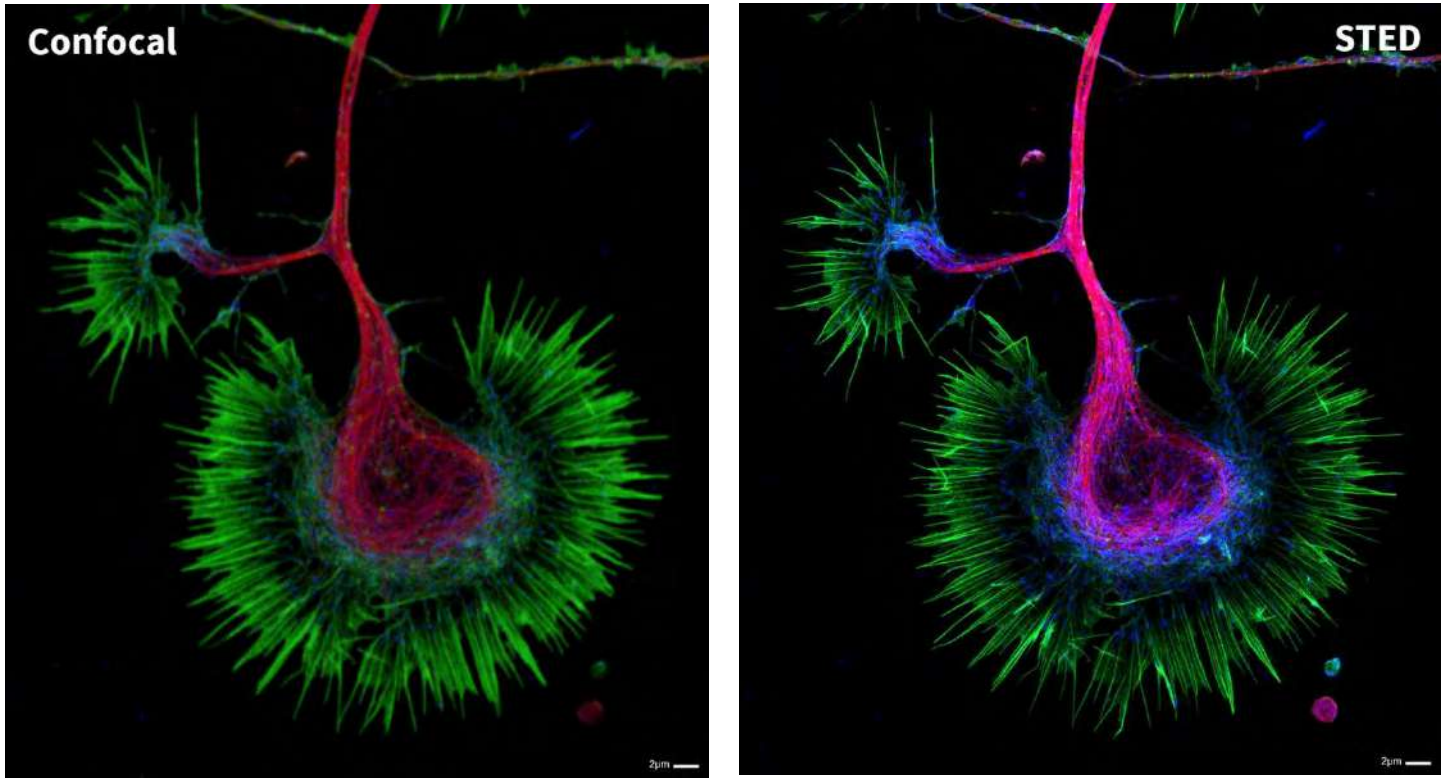
2-color 2D STED image of a cleared adult kidney sample of a rat. Shown is an image of a renal corpuscle showing Nephrin (red, Abberior STAR635P) structures inbetween the Podocin slits (green, AlexaFluor594). Sample was prepared by D. Unnersjö Jess and H.G. Blom @ KTH Stockholm, Sweden.

Microscopic images



3 color STED image of primary hippocampal neurons. Please note the characteristic ~190 nm beta II spectrin periodicity along distal axons (green) which is only visible in the STED image. Labelled structures: beta II Spectrin (green, Abberior STAR635P), Bassoon (red, Abberior STAR580), Actin cytoskeleton (blue, Phalloidin, Oregon Green 488). Imaged with Abberior Expert Line with 595nm and 775nm STED laser. Sample was prepared by Elisa D'Este @ MPIBPC, Göttingen.

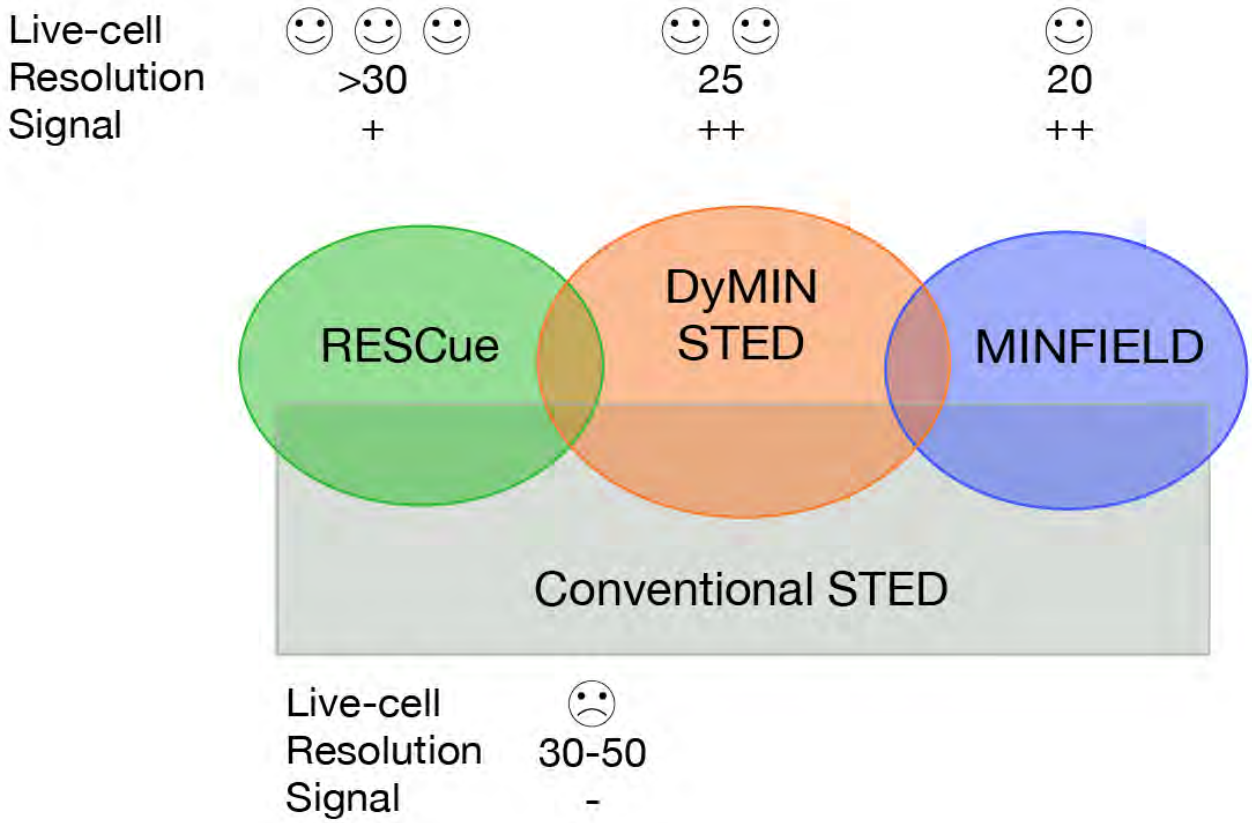
Microscopic images



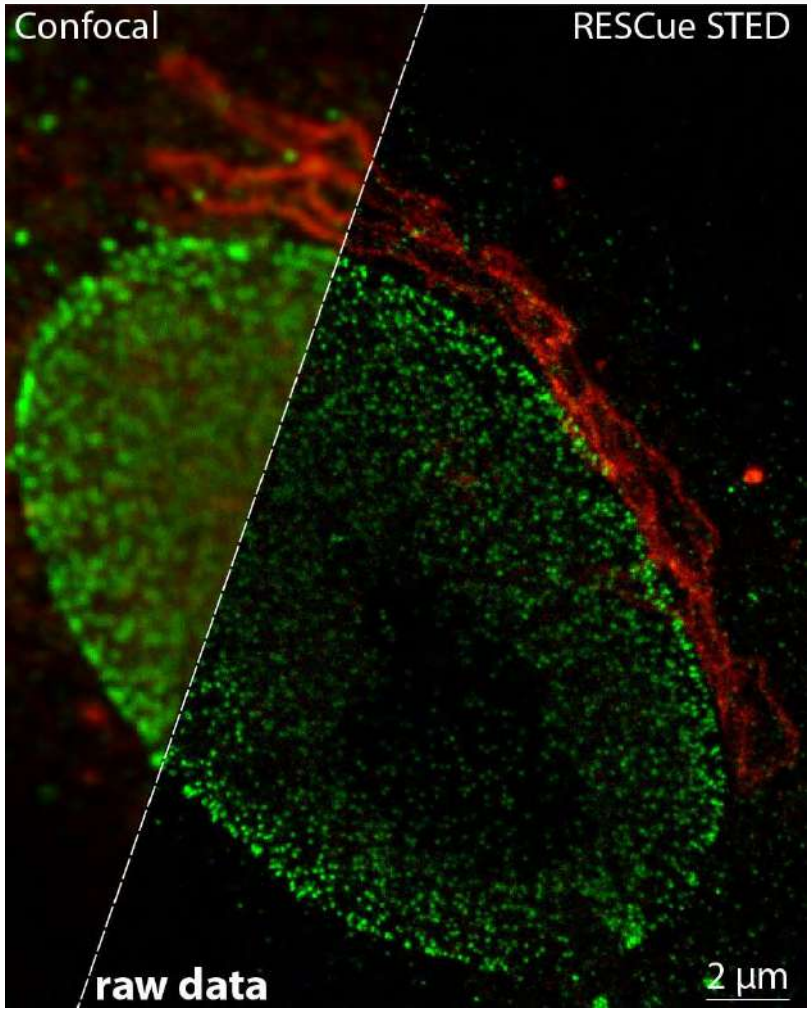
Growth cone at the tip of the axon of a primary hippocampal neuron at 1 day in vitro. Microtubules (Tuj1, Abberior STAR580, red) are bundled in the central-domain suggesting a pausing state. The molecular motor myosin IIB (confocal, Alexa488, blue) is enriched at the transition-zone, along the F-actin arcs. In the peripheral domain actin forms bundles in the filopodia (Phalloidin, Abberior STAR635, green). Imaged with Abberior Expert Line @ MPIbpc by Elisa D'Este.

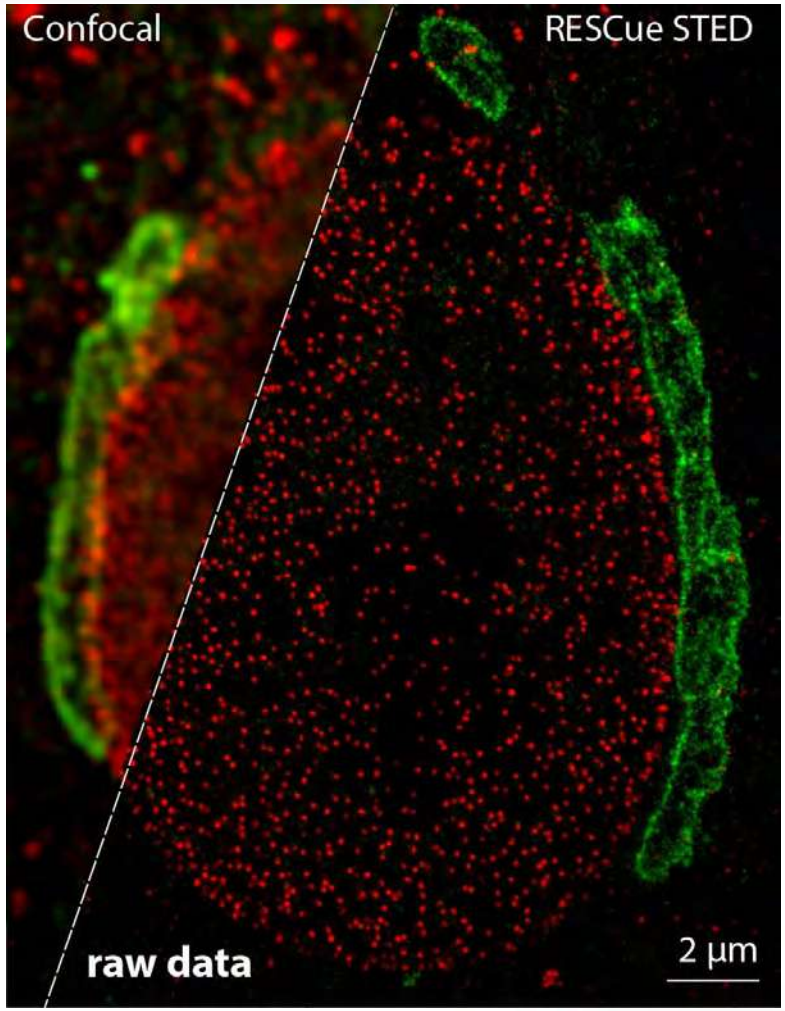
Intelligent illumination schemes for STED

RESCue STED, DyMIN STED and MINFIELD STED greatly expand the performance of STED in terms of live-cell imaging, signal and resolution.

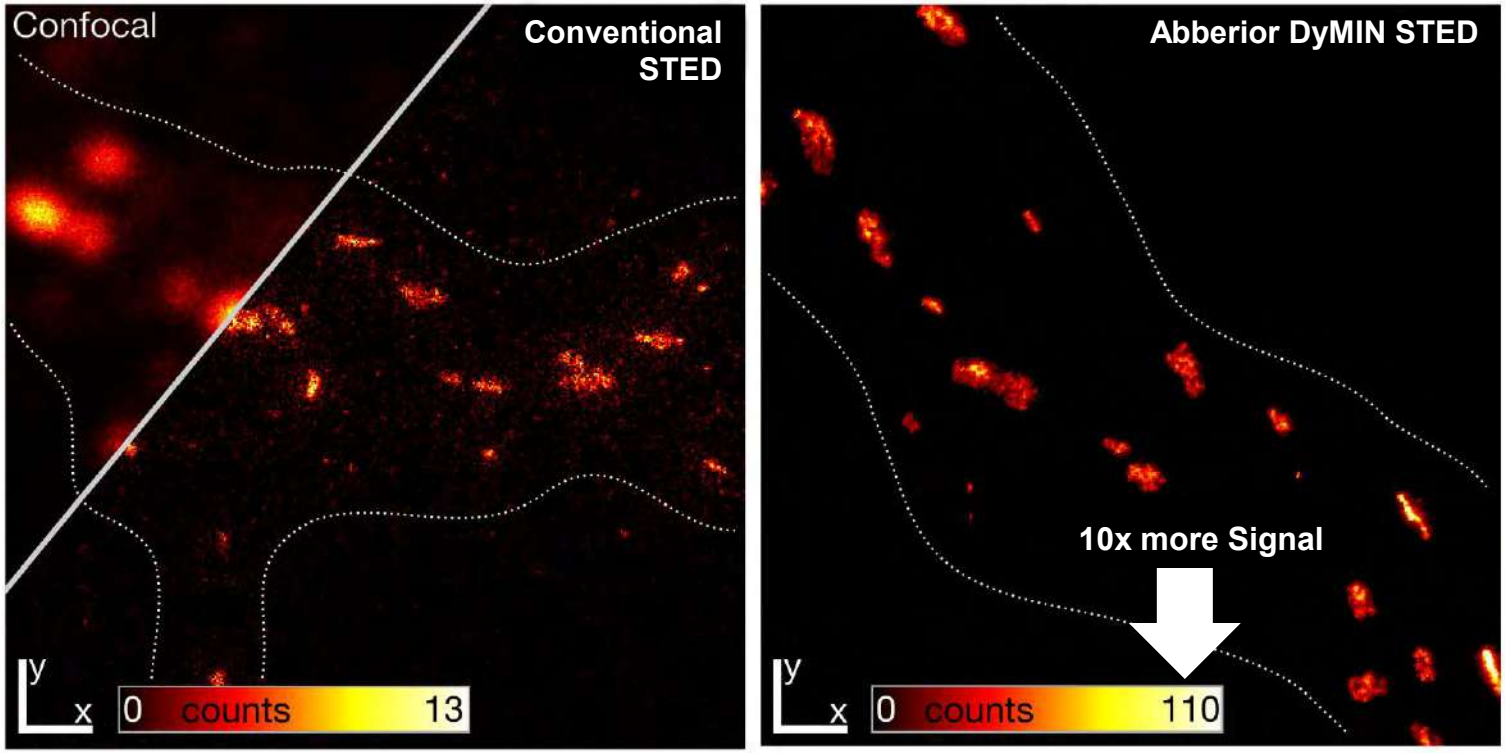


RESCue STED


Confocal
RESCue STED
raw data
2 µm


Confocal
RESCue STED
raw data
2 µm

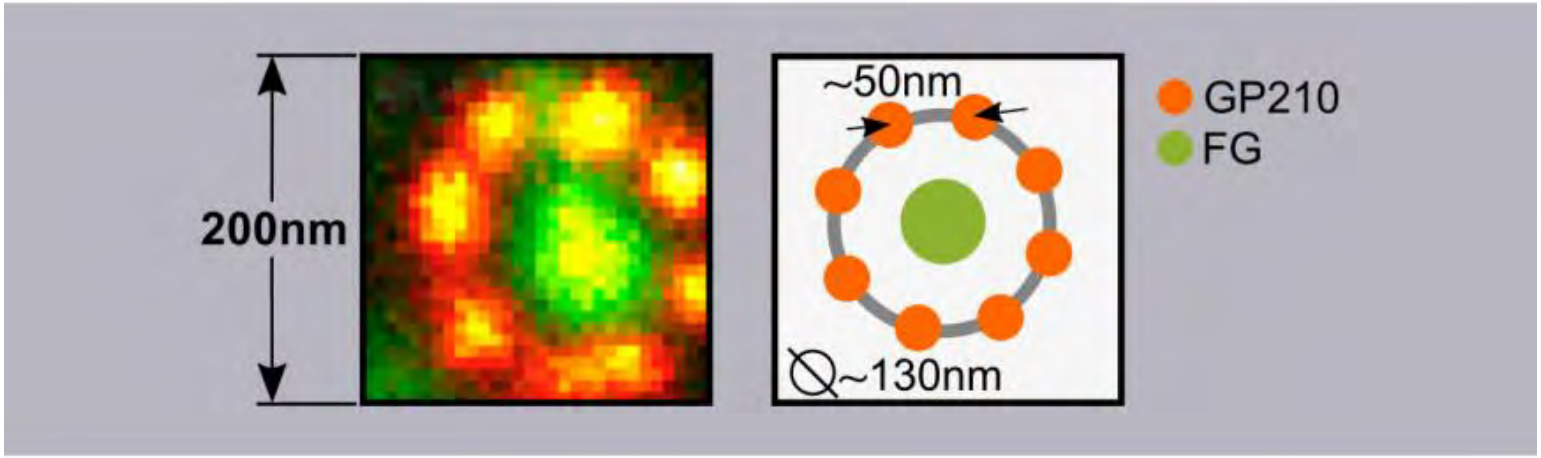
DyMIN STED – 10x more signal for the precise analysis of structures

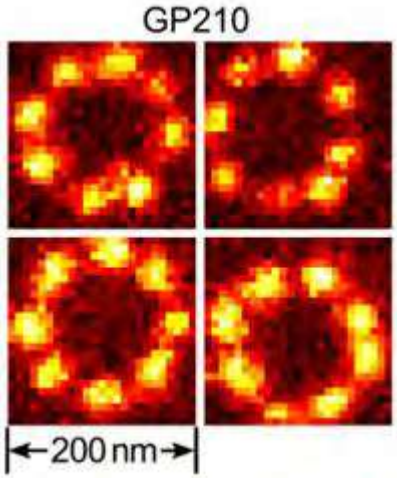


J. Heine*, M. Reuss*, B. Harke*, E. D'Este, S. J. Sahl and S. W. Hell, "Adaptive-illumination STED nanoscopy", PNAS (2017)

*Abberior Instruments GmbH

MINFIELD STED delivers STED resolutions < 20nm

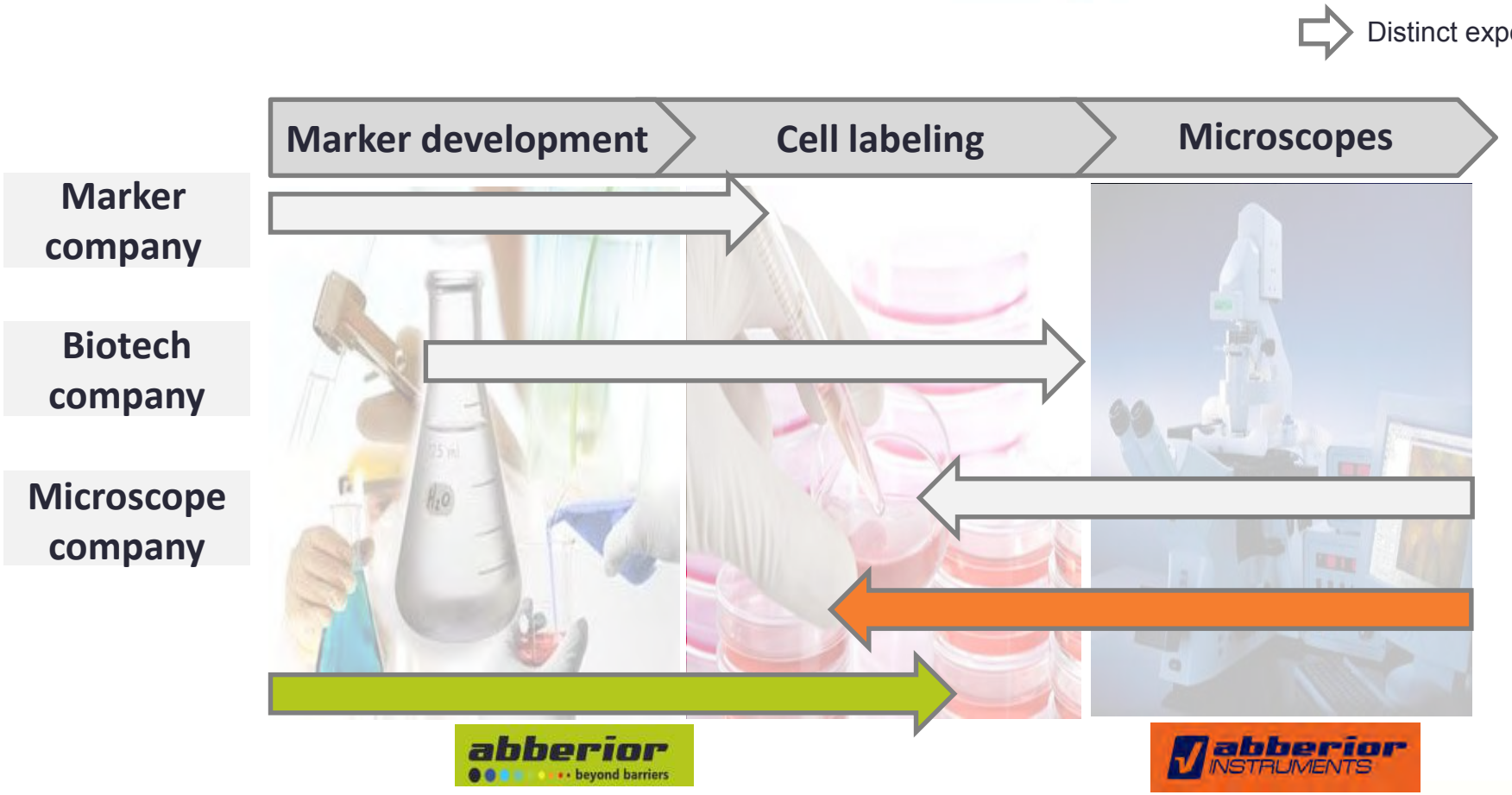




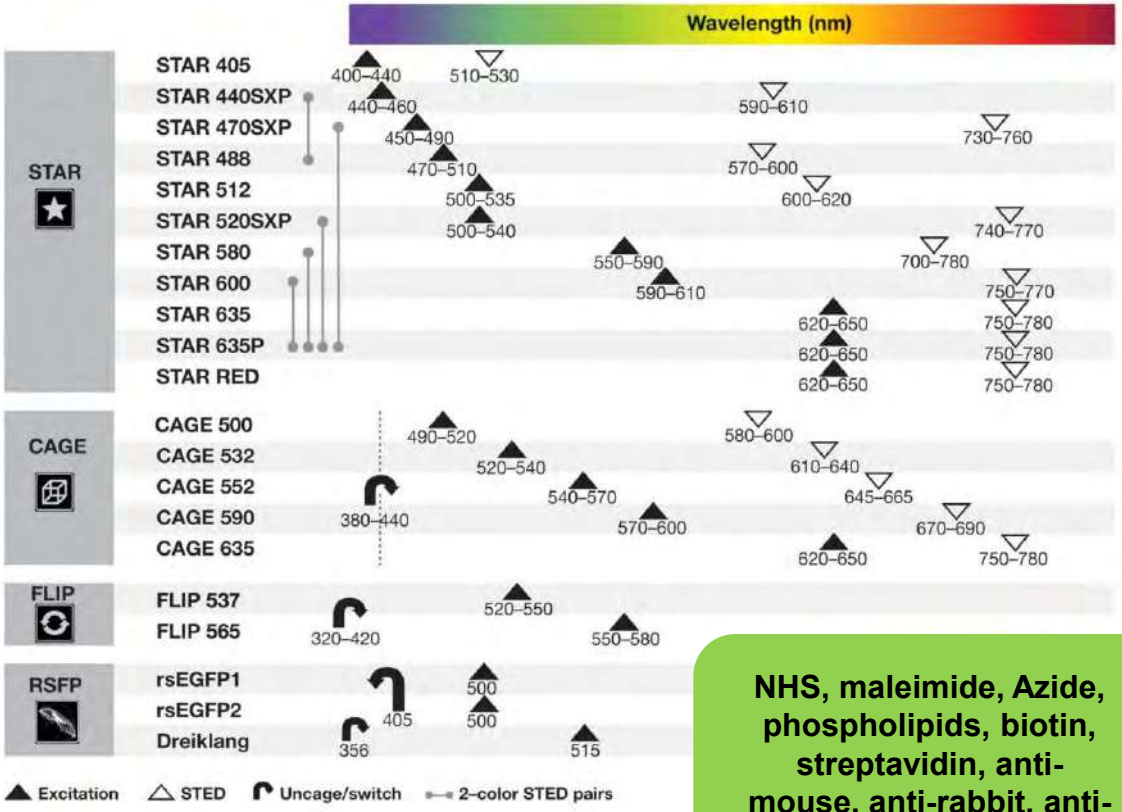
F. Göttfert, T. Pleiner, J. Heine*, V. Westphal, D. Görlich, S. J. Sahl, S. W. Hell, "Strong signal increase in STED fluorescence microscopy by imaging regions of subdiffraction extent", PNAS 1621495114 (2017)

*Abberior Instruments GmbH

It is important to optimize both the superresolution dyes as well as the microscope hardware



Overview of Abberior markers



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NHS, maleimide, Azide, phospholipids, biotin, streptavidin, anti-mouse, anti-rabbit, anti-rat, anti-chicken

Superresolution

abberior INSTRUMENTS

Organic Dyes for STED microscopy

E: Expert Line
Y: STEDYCON

Recommended dyes to be used with the Abberior Instruments Expert Line & the STEDYCON

STED pulsed	775 nm		595 nm	
Exc.	640nm	594/561nm	485nm	450nm
Nanos-cope	E/Y	E/Y	E	E/Y*
Always recom-mended	**Abberior STAR RED** **Abberior STAR635P** **Abberior STAR635**	**Alexa 594**	**Oregon Green 488**	**Oregon Green 488**
Sample dependent recom-mended	Atto 647N Atto 633 Alexa 637 Cy5	Abberior STAR580 Atto 594 Atto 530 Cy3	Abberior STAR488 Alexa 488 Atto 488 FITC	Abberior STAR488 Abberior STAR470SXP Alexa 488 Atto 488 FITC

Down to 25nm resolution**

abberior beyond barriers

abberior INSTRUMENTS

*STEDYCON with 450nm excitation for confocal imaging only
**only depending on the sample

Organic Dyes for live-cell STED microscopy

E: Expert line
Y: STEDYCON

Recommended dyes to be used with the Abberior Instruments Expert Line & the STEDYCON

STED pulsed	775 nm		595 nm	
Exc.	640nm	594/561nm	485nm	450nm
Nanos-cope	E/Y	E/Y	E	E/Y*
Always recom-mended	SiR	Abberior LIVE580	Abberior LIVE510 Abberior LIVE515	Abberior LIVE510 Abberior LIVE515

*STEDYCON with 450nm excitation for confocal imaging only
**only depending on the sample

abberior beyond barriers

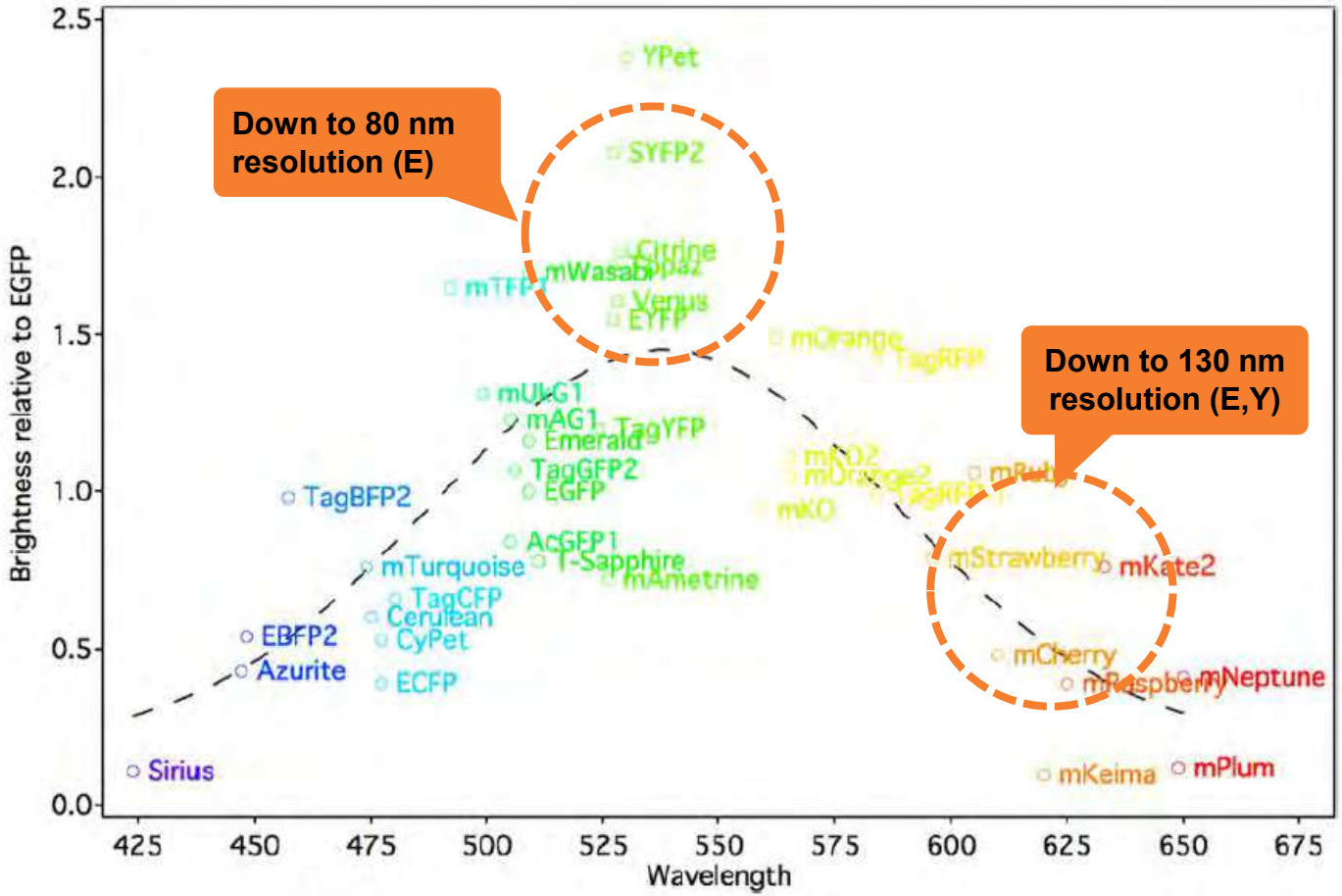
abberior INSTRUMENTS

Fluorescent Proteins for live-cell STED microscopy

E: Expert line
Y: STEDYCON

Recommended fluor. proteins to be used with the Abberior Instruments Expert Line & the STEDYCON

- Organic dyes throughout brighter & more photostable compared to fluorescent proteins
- Green fluorescent proteins superior to red fluorescent proteins
- Green proteins like EGFP, YFP & Citrine deliver ~ 80nm STED resolution (E)
- Red proteins like mCherry deliver ~ 130nm STED resolution (E,Y)



Meet part of our team...

abberior INSTRUMENTS