



# Highlighter Pens as Cheap & Cheerful Samples for Microscope Maintenance

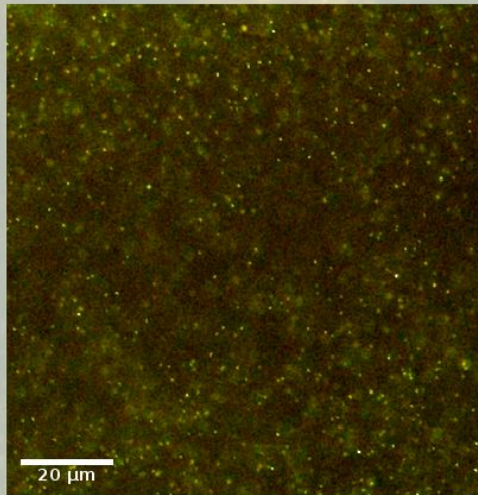
Christian Feldhaus, Aurora Panzera

MPI for Developmental Biology, Tübingen

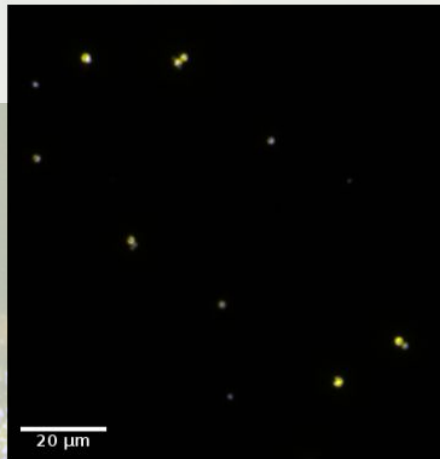
Ralf Palmisano

OICE, Erlangen

# Highlighter pens look differently under the microscope



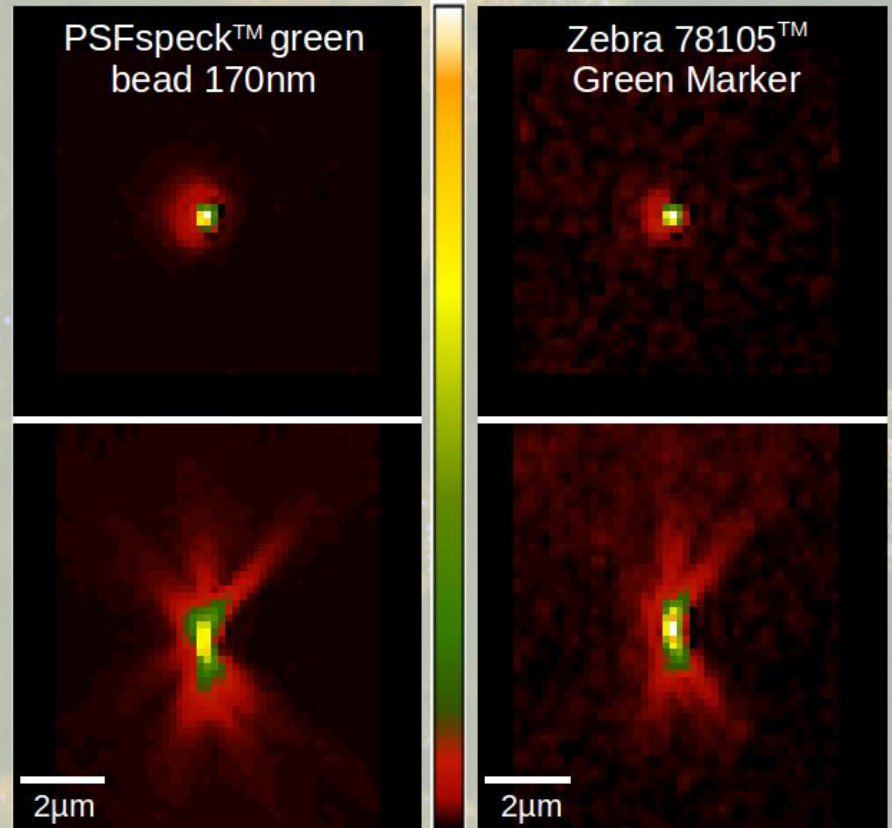
**Zebra 78105 (Mildliner)™** pens contain spherical sub-resolution fluorescent particles of uniform size.



**Pilot FriXion light and light soft™** pens contain bright, comparably large and quite irregular particles, usually with a mixture of fluorophores on a single particle

Some highlighter  
fluids can be used to  
replace standard  
calibration beads for  
PSF measurements

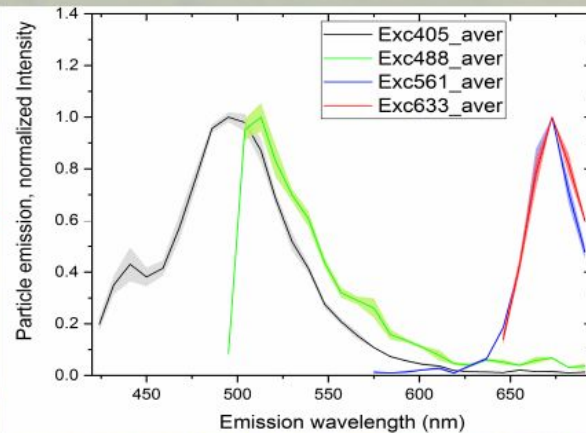
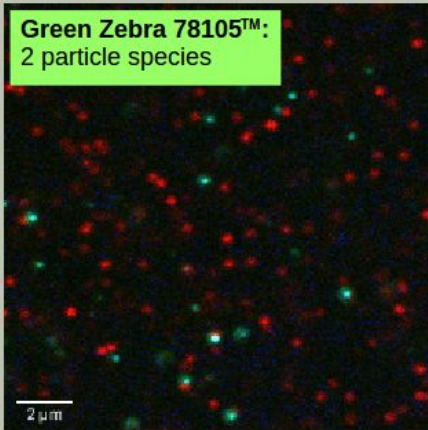
**Zebra 78105™** particles cross sections  
show same features as commercial beads  
used for microscope performance control.



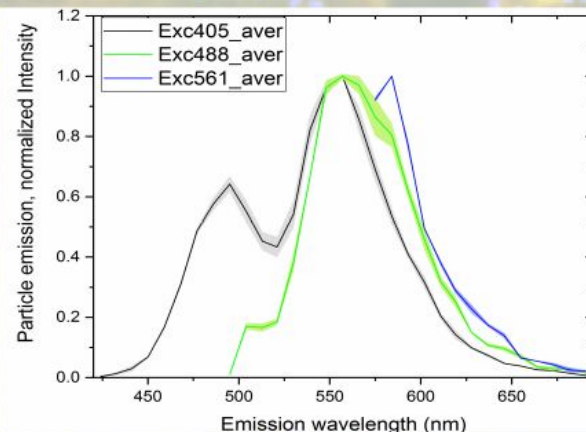
**Widefield**, Plan-Apochromat 63x/1,40 Oil  
filter 450-490/495/500-550

Spectra of **Zebra 78105™** show a strong reproducibility and their shape is ideally suited to characterise the precision of spectral detectors.

**Green Zebra 78105™:**  
2 particle species



**Orange Zebra 78105™:**  
1 particle species



Some highlighter fluids can be used for spectral calibration.

# Which pen for which purpose?

brand	model	P/N	Parfocality/ Parcentricity/ stage precision	PSF recording	spectral registration	spectral calibration	field flatness	illumination homogeneity
ZebraPen	Mildliner pastel	78105	limited/ fluorescence only	yes	yes	yes	sort of	limited
Pilot	Frixion light		yes	no	no		sort of	no
	Frixion light soft		yes	no	no		sort of	no
Stabilo	Pen 68 Neon	68/024, 68/033, 68/054, 68/056	limited/ fluorescence only	no	no	no	sort of	no
	BOSS	70/24, 70/33, 70/54, 70/58	limited/ fluorescence only	yes	<i>not yet tested</i>	<i>not yet tested</i>	sort of	no
	point 88 neon	88/033, 88/054	limited/ fluorescence only	yes	<i>not yet tested</i>	<i>not yet tested</i>	sort of	no
Pelikan		438	no	no	no	no	no	yes
Staedtler	tripplus fineliner neon	334SB6 CLA	limited/ fluorescence only	for low N.A.	<i>not yet tested</i>	<i>not yet tested</i>	sort of	no

**Please find more information about our highlighter pen  
evaluation and protocols on how to prepare samples  
here:**



<http://webdav.tuebingen.mpg.de/LM/>