# MID-ATLANTIC MEGALOPOLIS PROJECT

Funded by the Advancing Digitization of Biodiversity Collections program of the National Science Foundation.

# LIGHT BOX DESIGN: A CAUTIONARY TALE


https://www.idigbio.org/content/how-and-how-not-design-light-box-cautionary-tale

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ADBC Summit
Gainesville, FL
Wednesday 3 October 2018


# Fine Focus:

## A tool for the objective evaluation of focus quality in herbarium specimen imaging

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University of Pennsylvania

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Morris Arboretum of the University of Pennsylvania
100 E. Northwestern Avenue, Philadelphia PA 19119 USA

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  - random specimens not quite in focus(1:1), seen in image processing

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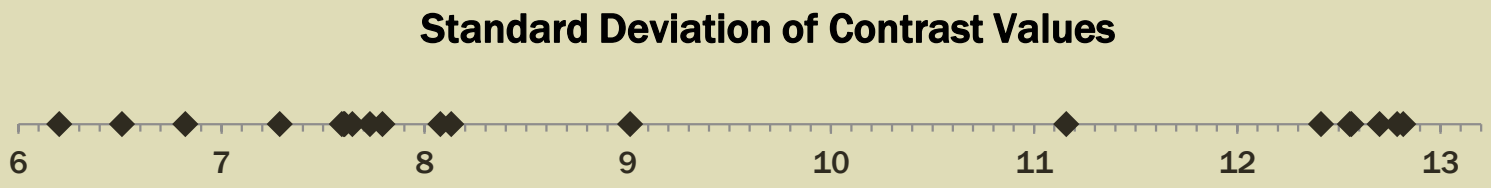

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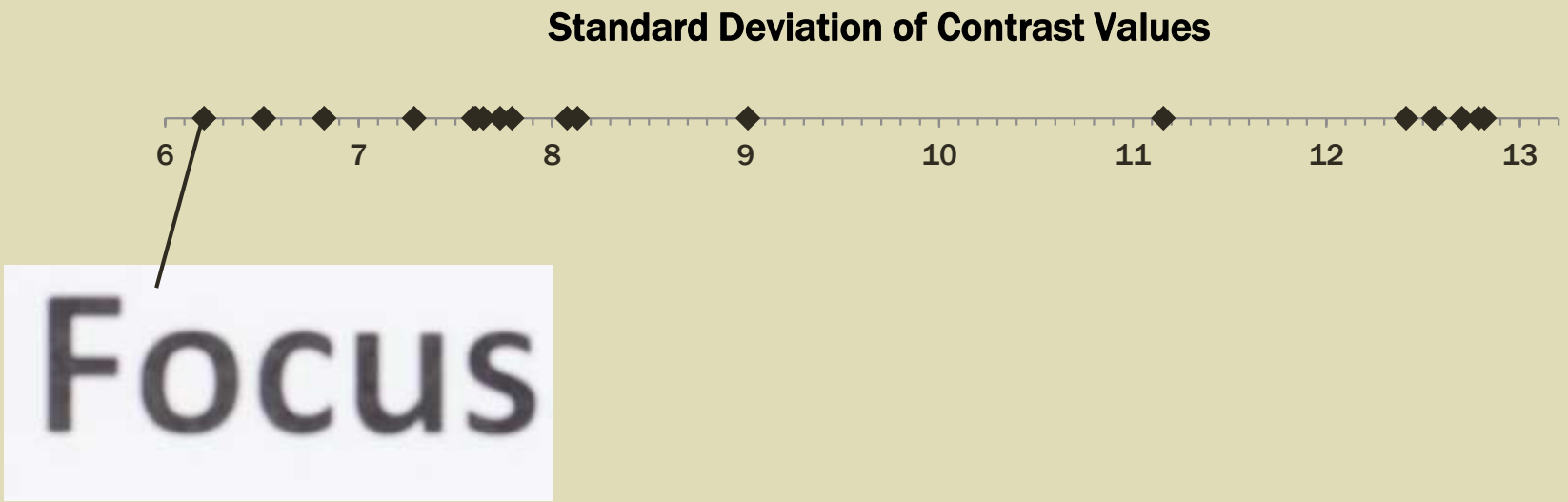

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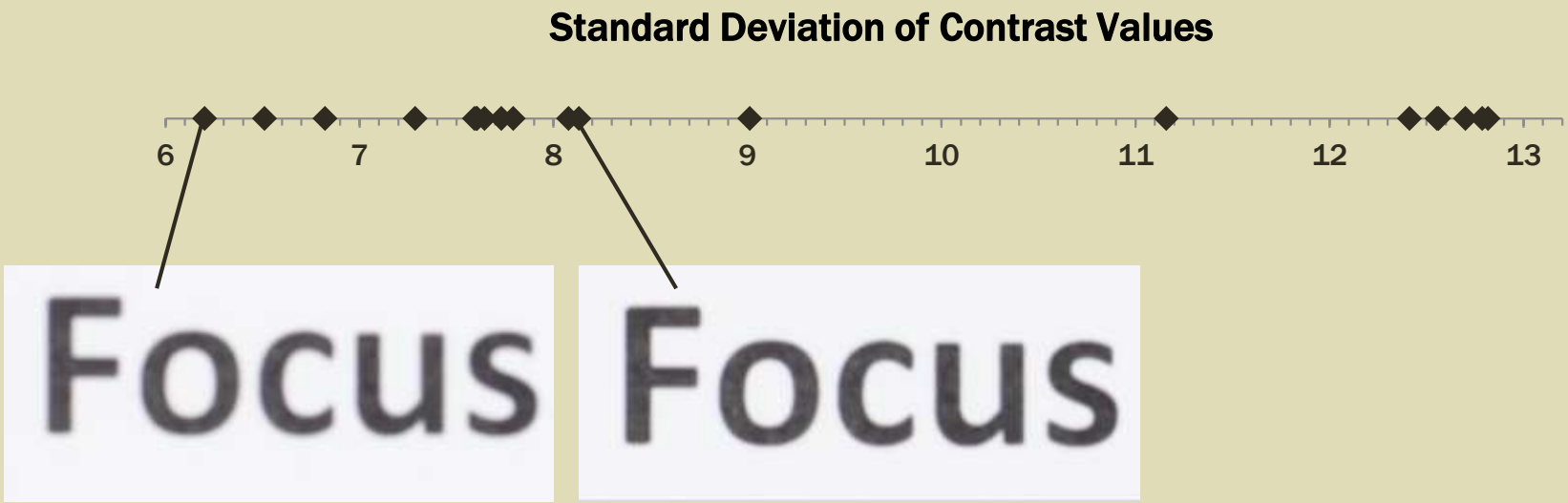

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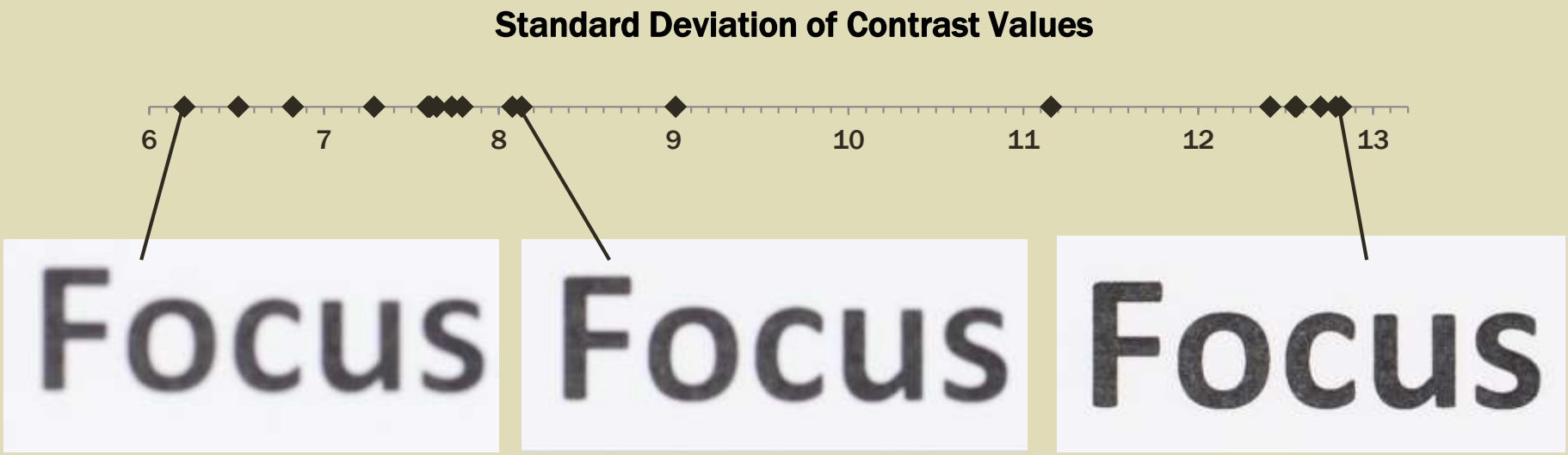

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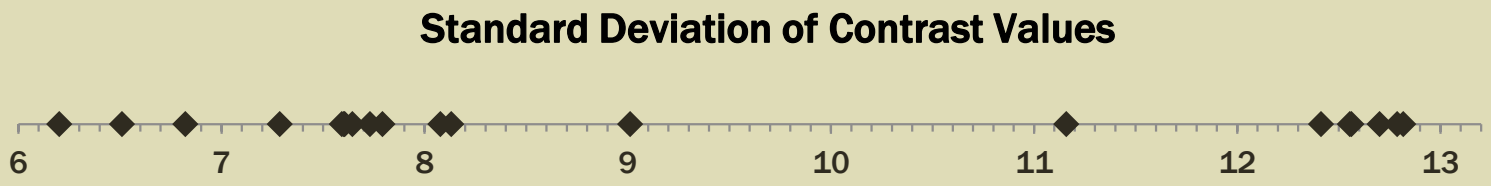


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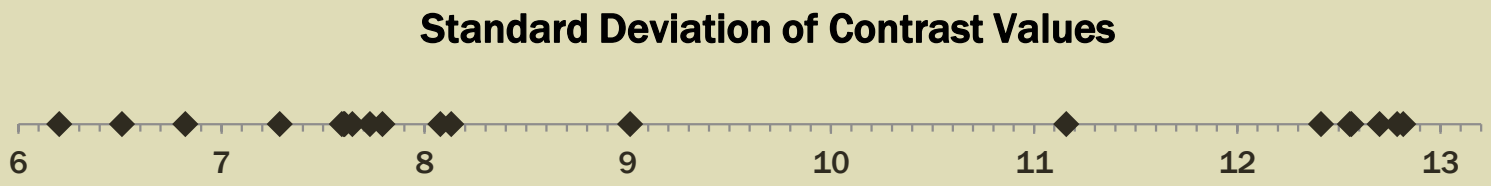


- values are specimen- and condition-dependent → only comparable for images of a single sheet taken with identical settings (e.g., aperture, lighting, placement of sheet)
  - → repeated imaging needed to understand focus quality possibilities for any one specimen

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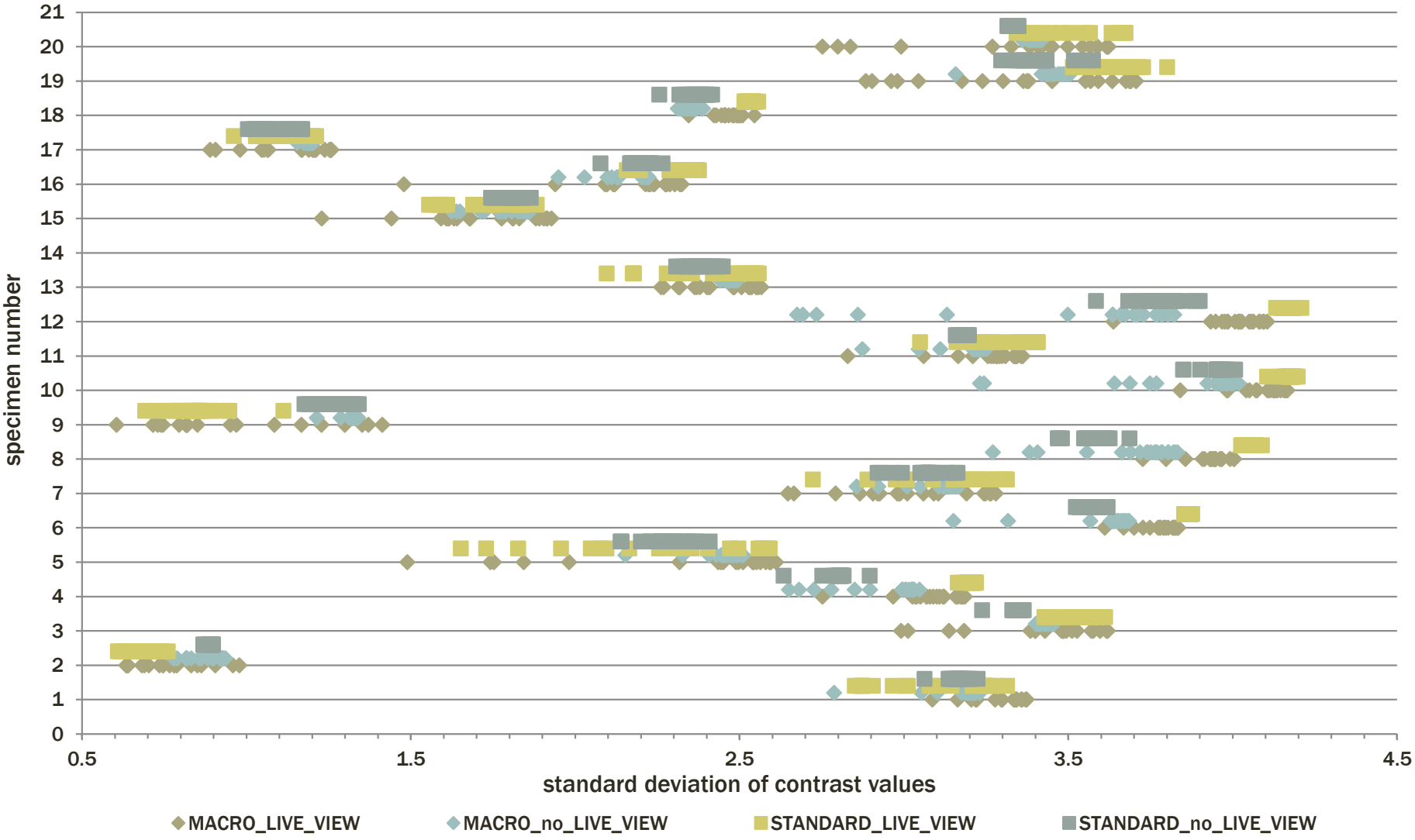

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"soft" focus difference

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- need more consistent focus quality from same equipment that will work with batch imaging (100-200 sheets/batch)

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Results

File Edit Font Results

| Nr | Image | Min | Max | Mean | S-Dev | Mass | L1 |
|---|---|---|---|---|---|---|---|
| 1 | temp.tif edges | 0 | 42.451 | 1.293 | 2.786 | 1.927E7 | 1.927E7 |

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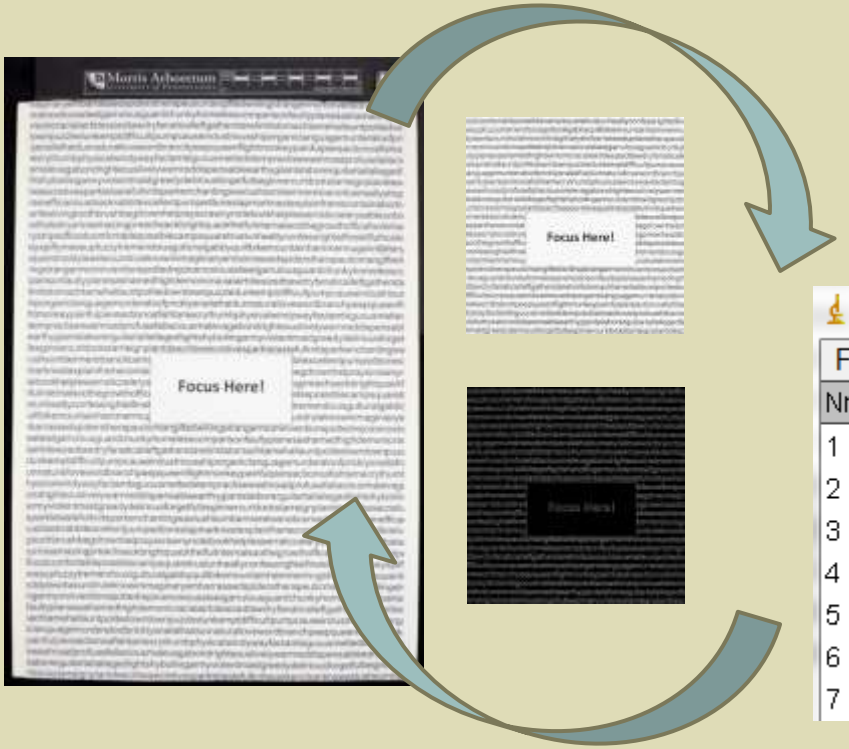


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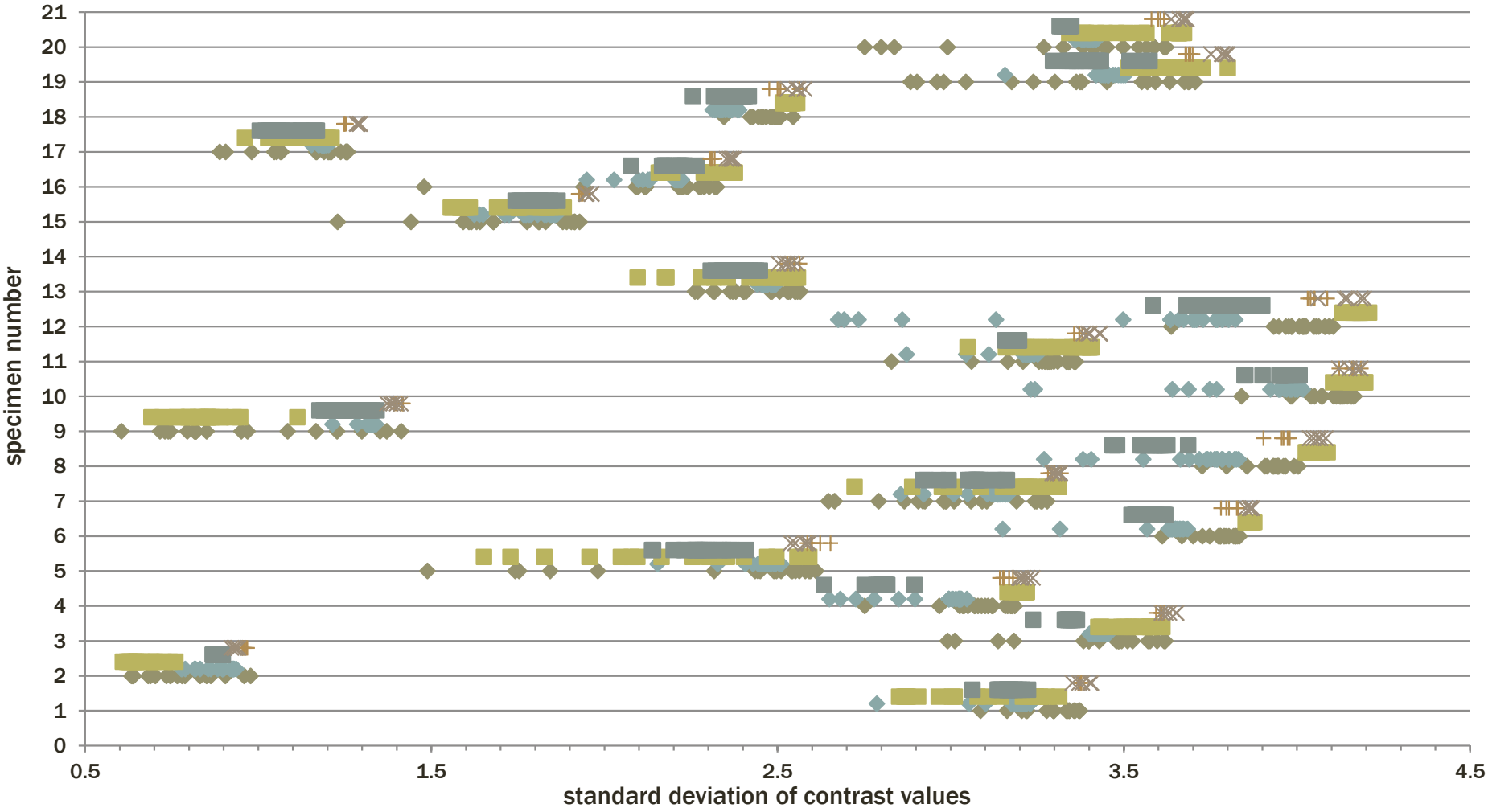
| 1 | temp.tif edges | 0 | 41.72 | 4.687 | 8.742 | 6.986E7 | 6.986E7 |
| 2 | temp-1.tif edges | 0 | 49.685 | 4.967 | 10.155 | 7.404E7 | 7.404E7 |
| 3 | temp-2.tif edges | 0 | 49.112 | 4.94 | 10.051 | 7.364E7 | 7.364E7 |
| 4 | temp-3.tif edges | 0 | 42.339 | 4.733 | 8.941 | 7.056E7 | 7.056E7 |
| 5 | temp-4.tif edges | 0 | 48.851 | 4.944 | 10.066 | 7.369E7 | 7.369E7 |
| 6 | temp-5.tif edges | 0 | 43.524 | 4.744 | 9.027 | 7.072E7 | 7.072E7 |
| 7 | temp-6.tif edges | 0 | 49.032 | 4.936 | 10.008 | 7.358E7 | 7.358E7 |

# FINE FOCUS

- use standard text target and numeric value to manually focus lens to optimal focus quality
- numeric value (st. dev. contrast value) generated through image analysis via batch file, using IrfanView and ImageJ
- “lock in” good focal point by switching lens back to autofocus (drift)
- image a batch of specimens without changing focal point

# 20-SPECIMEN TEST CASE + FINE FOCUS



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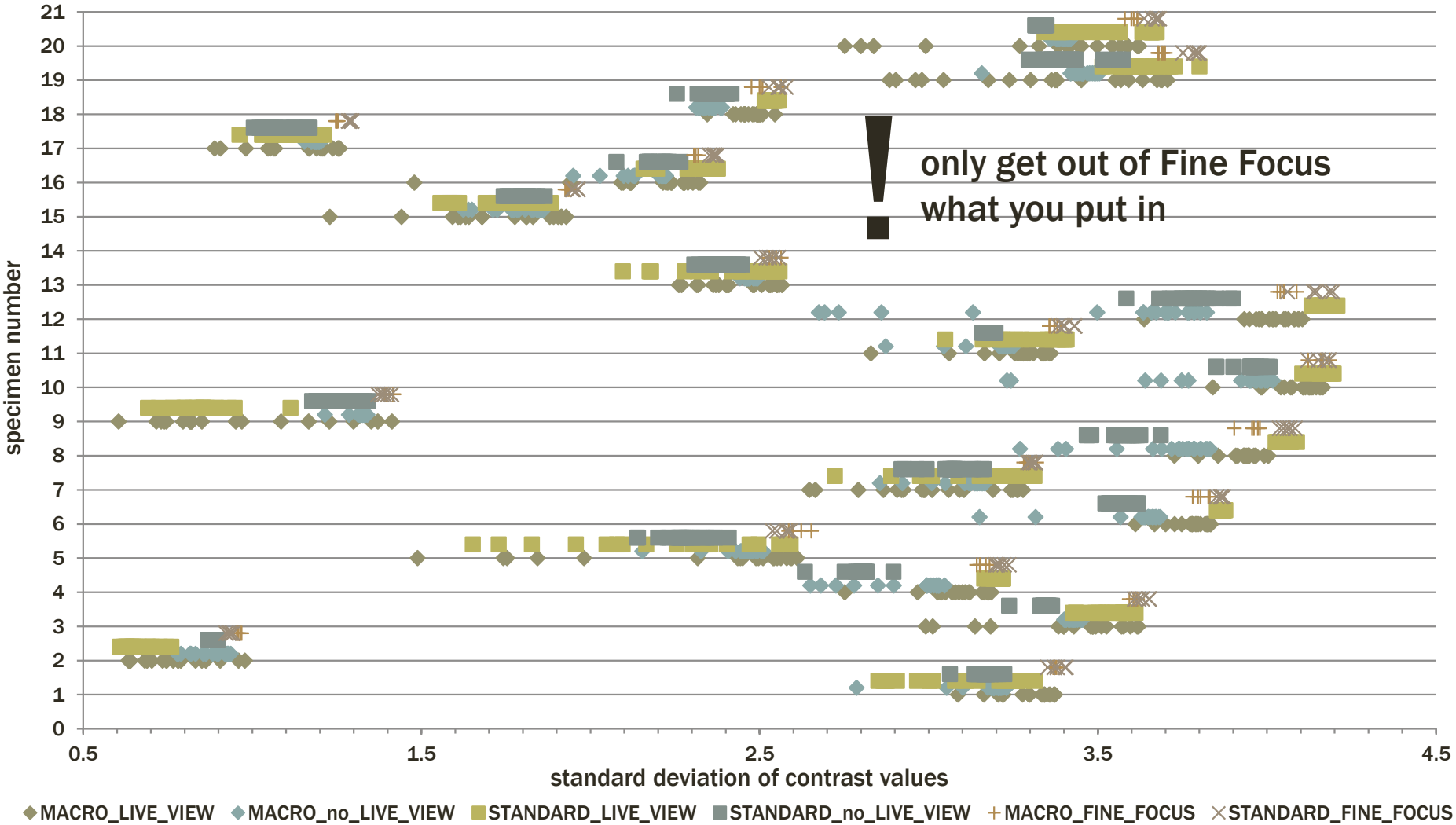

# is this only a Canon problem?

# 20-SPECIMEN TEST CASE: NIKON

- 20 specimens, all “2-D” but with variation in material
- repeated imaging (20-50x) of single sheets
- Nikon D850 DSLR (46 mp), standard 50 mm lens (Nikkor)
- camera settings held constant (1/100, f9, ISO100, picture auto-settings off)
- white-balanced to color checker by batch
- treatments:
  - Live View (two focal options) vs. no Live View
- varied treatment by specimen – to allow for single placement of sheet

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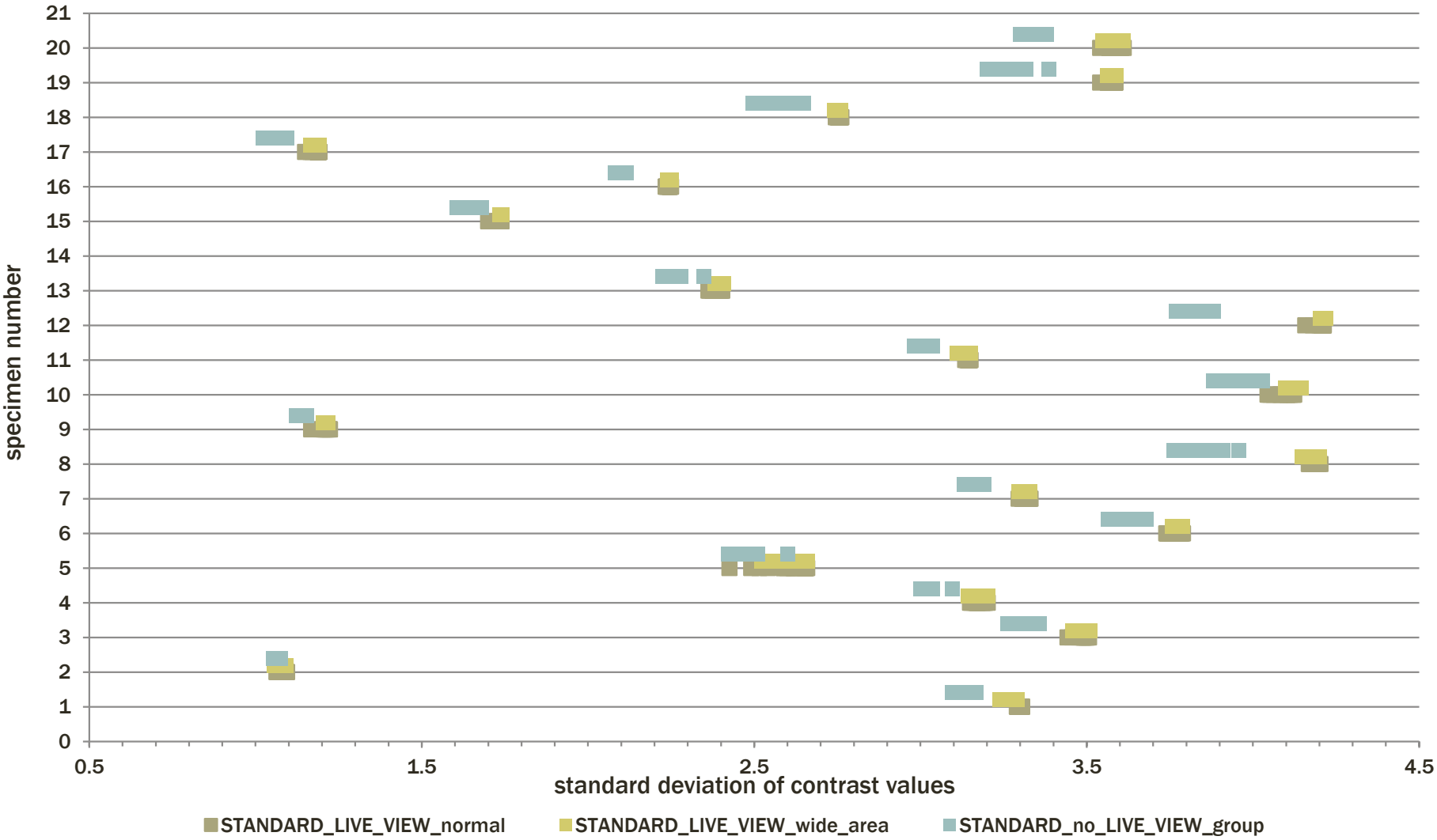

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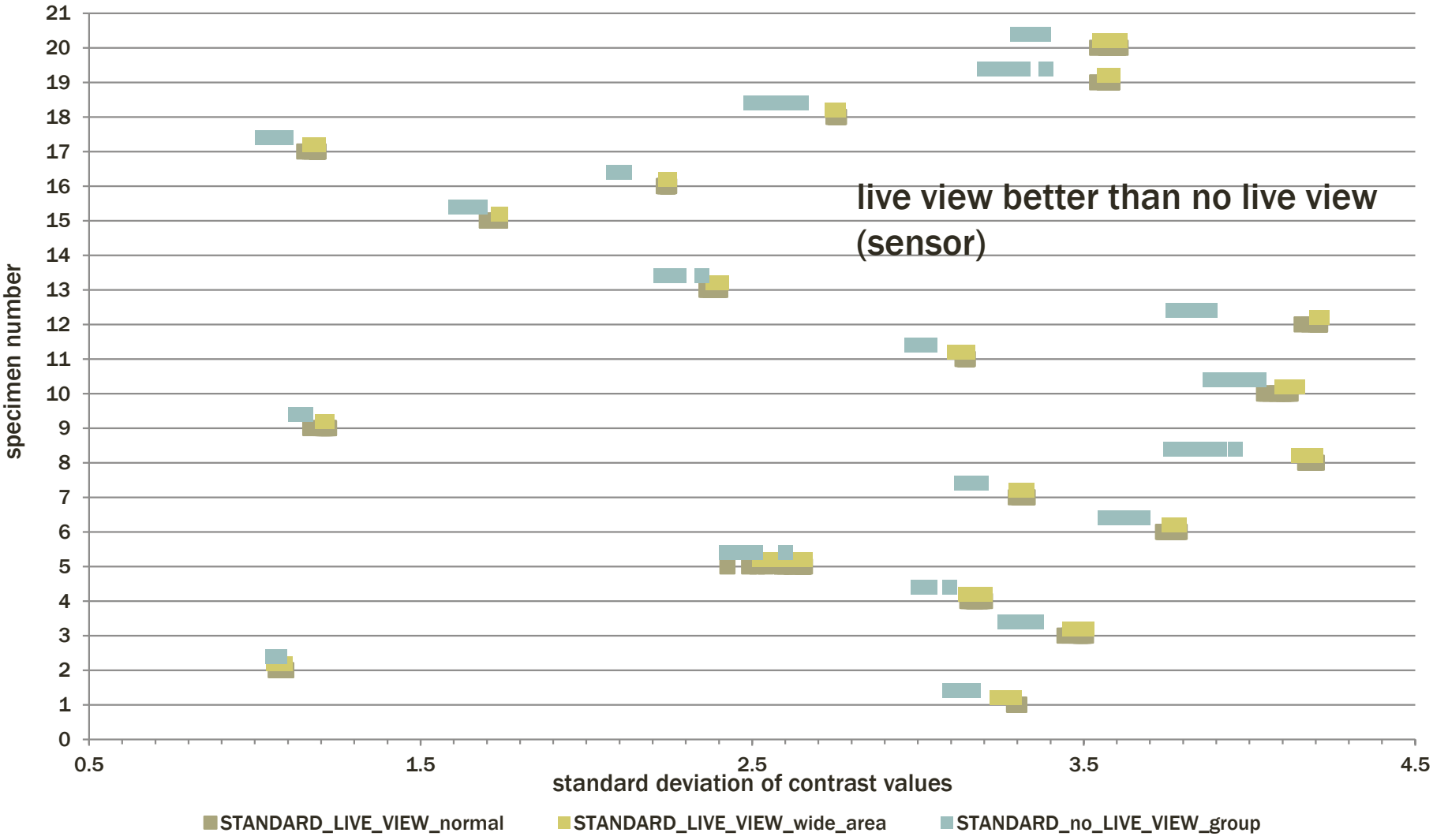

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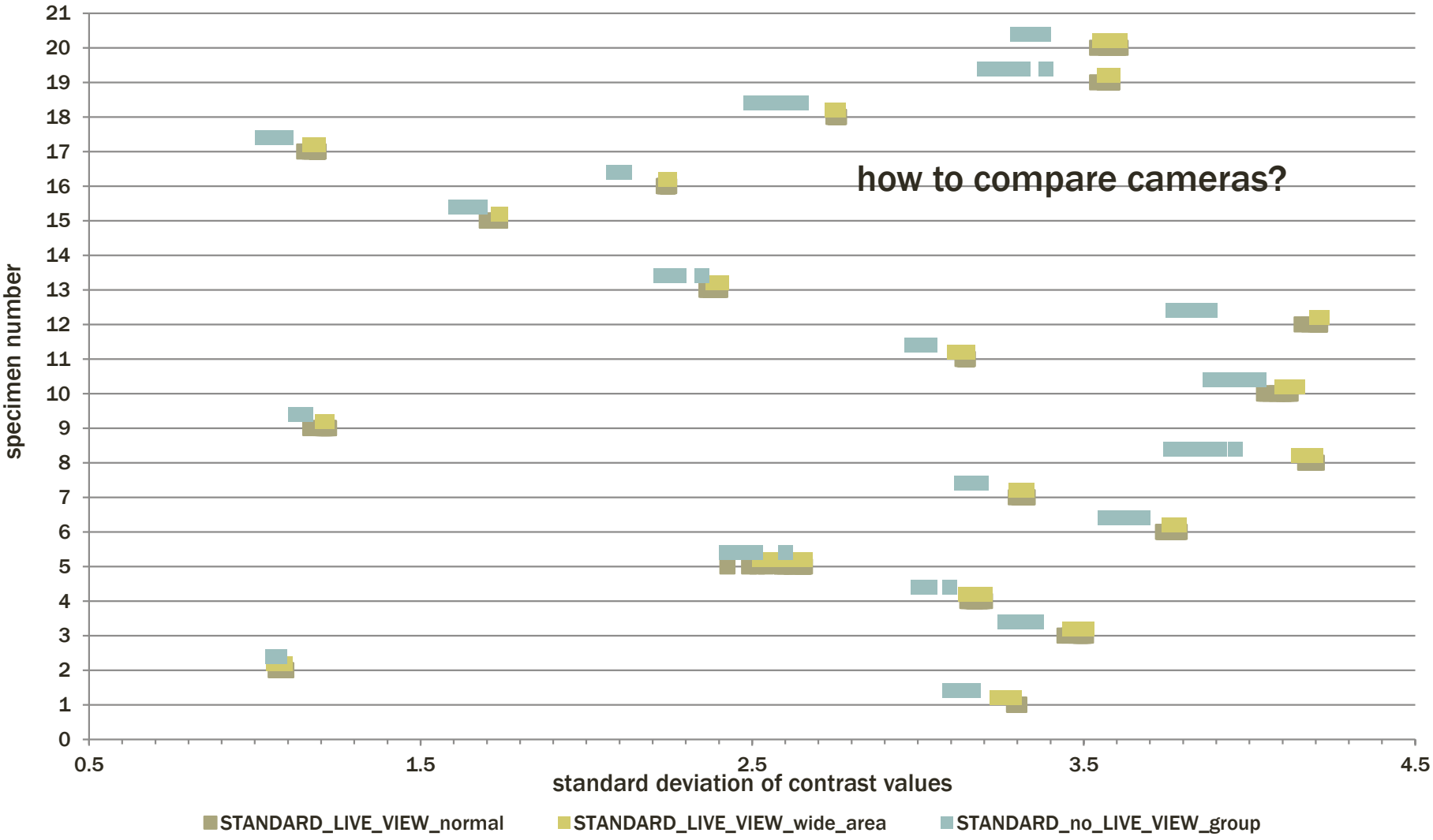

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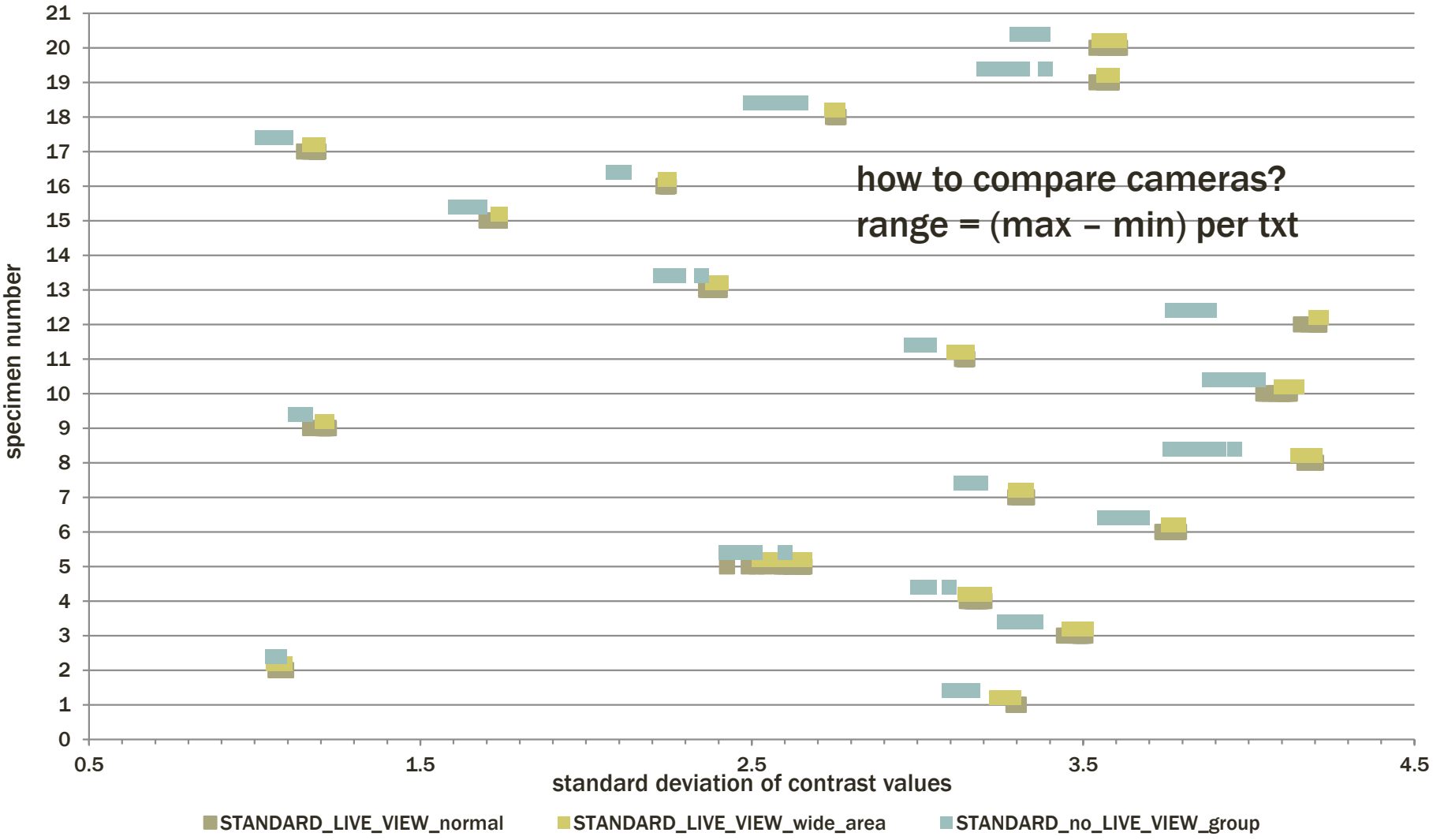

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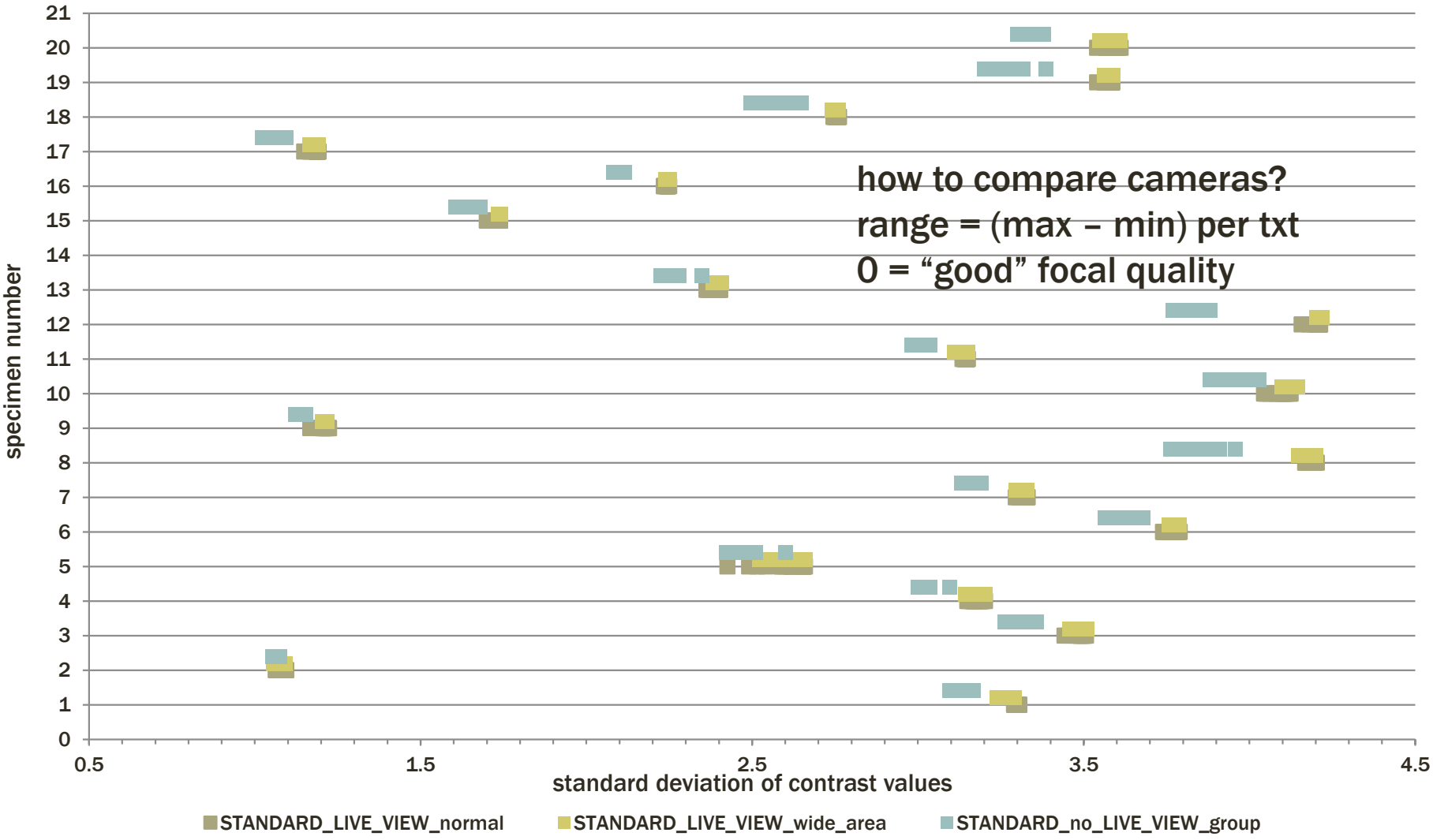
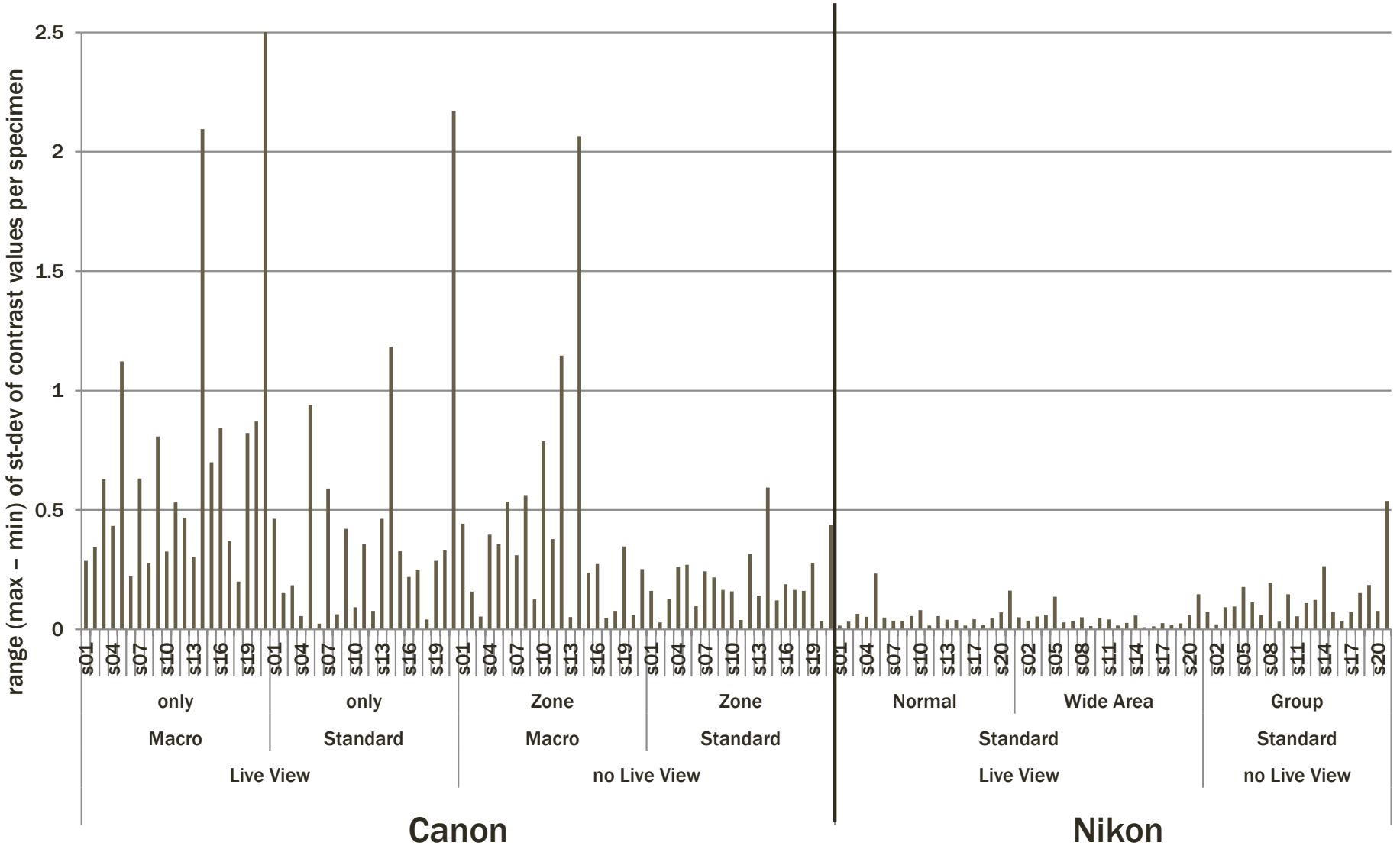


Canon

Nikon

# RANGE OF FOCAL QUALITY: CANON VS. NIKON



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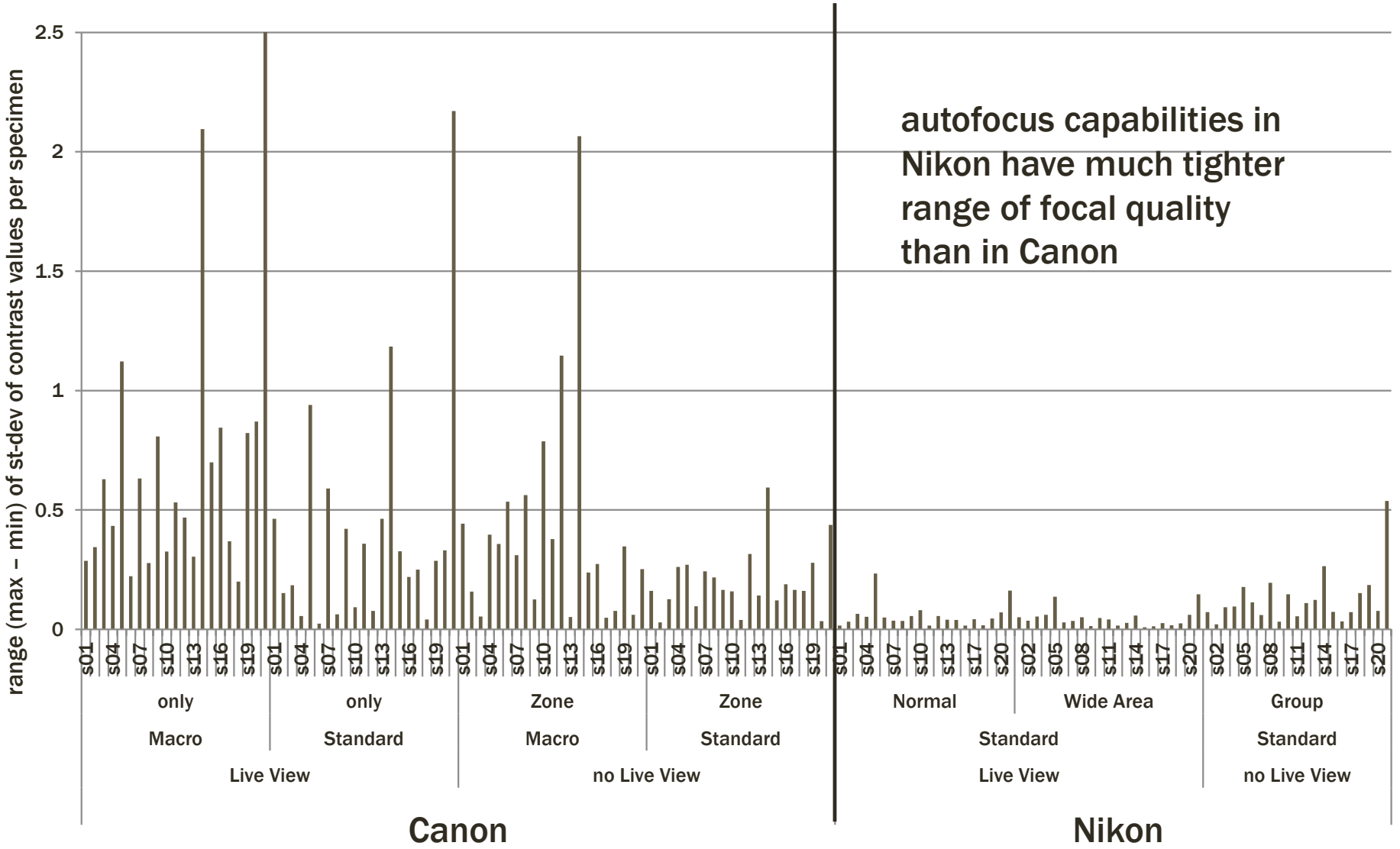

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- Fine Focus procedure
  - provides objective (but relative!) measure of focal quality
  - can narrow focal quality to upper end of range (when done correctly!)
- Nikon autofocus better in Live View than without Live View
- Nikon autofocus has tighter range around optimal focal quality than Canon

# FOR MORE INFO…

- cskema@upenn.edu
- mamdigitization.org – project website & FineFocus download

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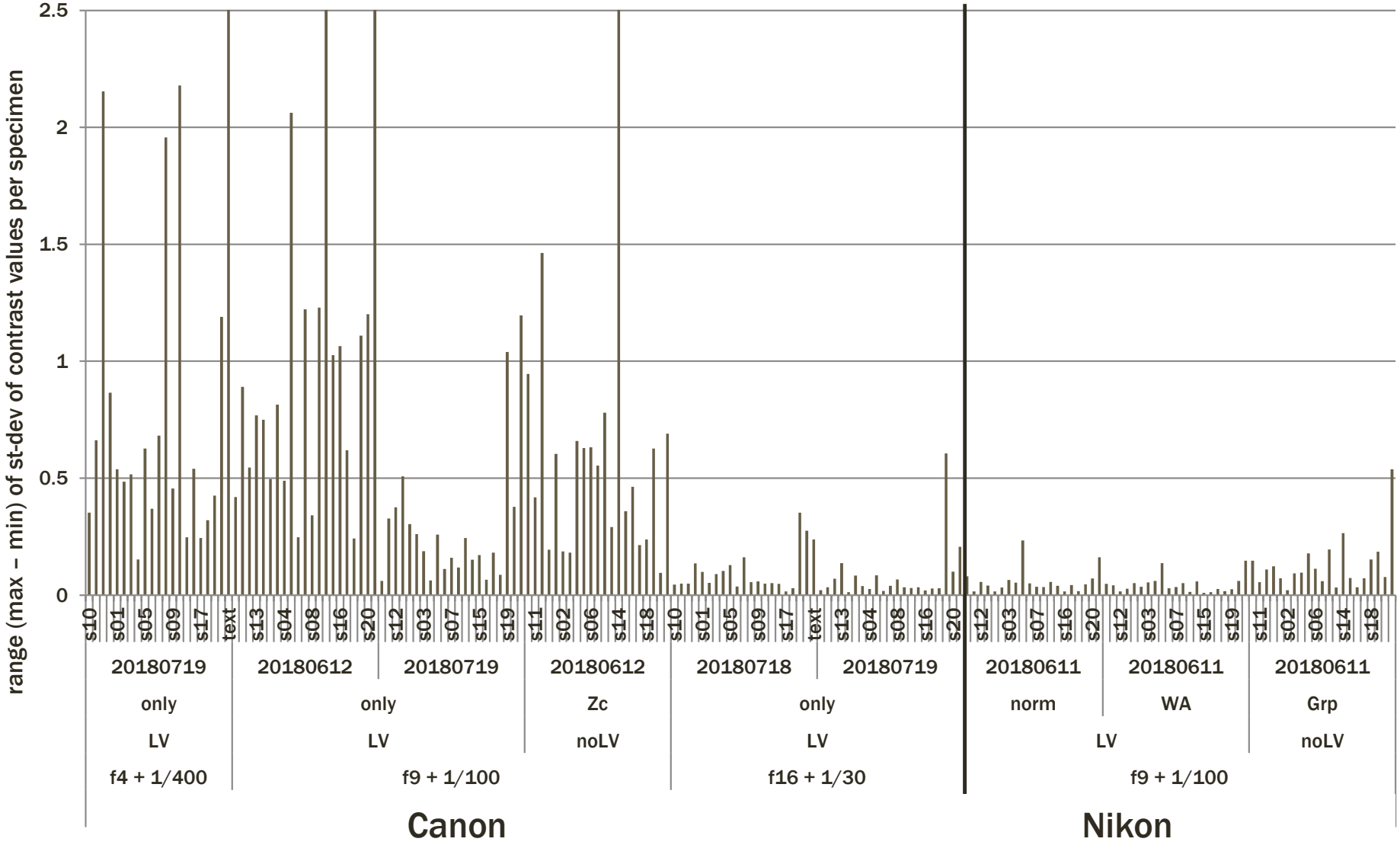
**A VIDEO DEMONSTRATION** – by Michelle Mancini & Cindy Skema

# F-STOP & FOCAL QUALITY



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