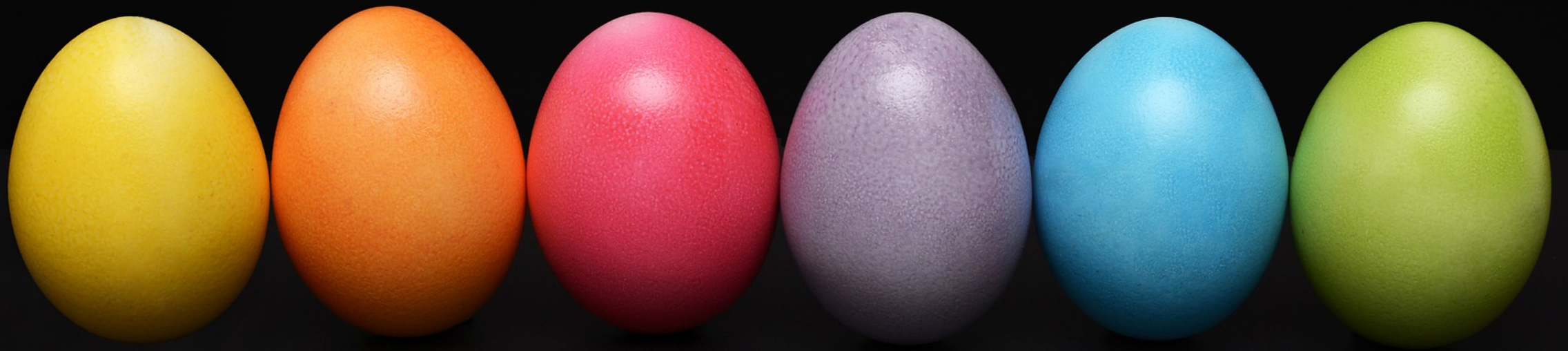




**Printing Beyond
4-Colour
Process:
Requirements
for N-Colour
Reproduction**



William Li



CMYKO



CMYKB



CMYKOG



CMYKRB



CMYKOB



CMYKRG



CMYKBG



CMYKOP



CMYKRGB



CMYKOGP

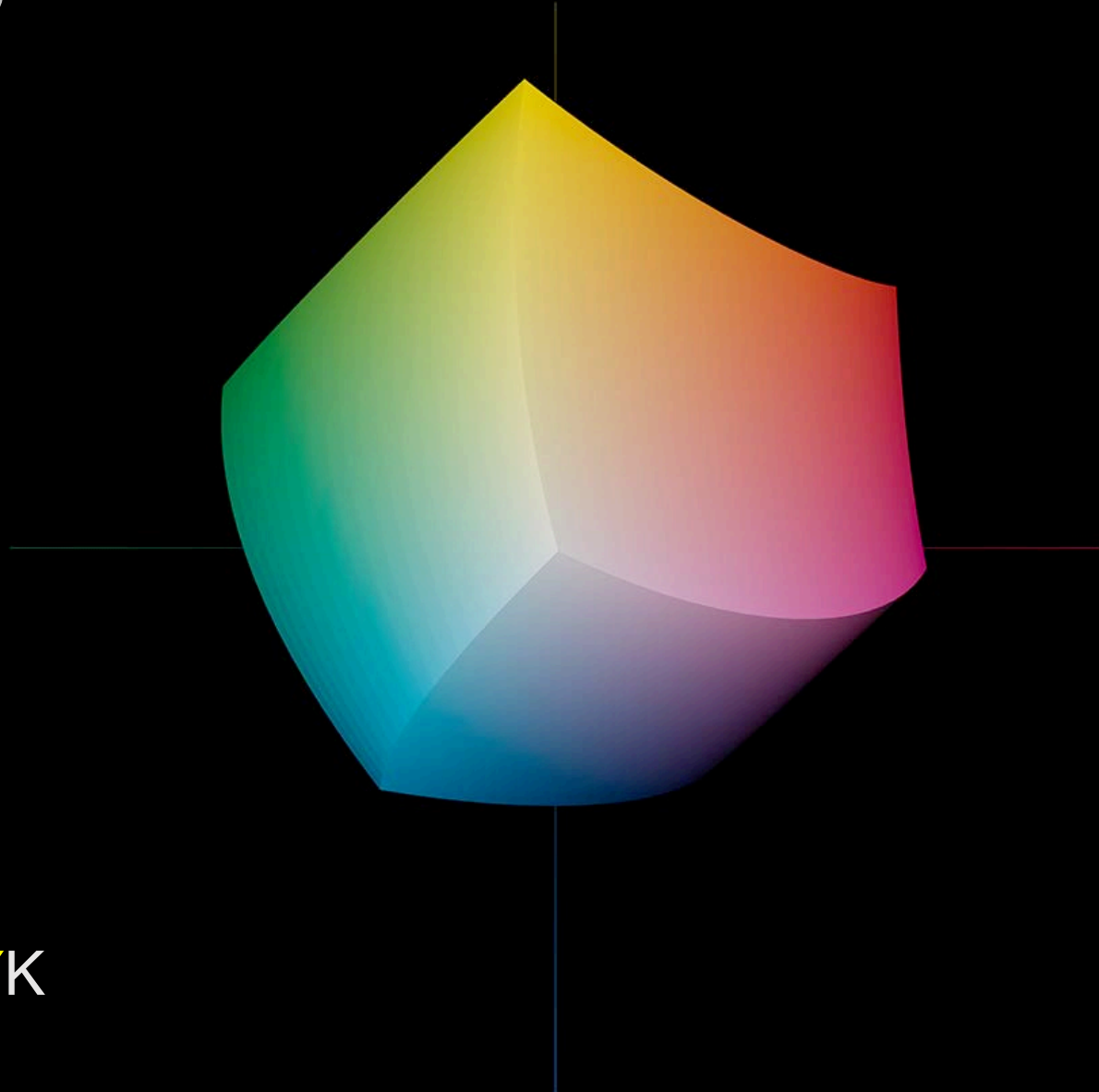


Ink Selection



Choosing Inks

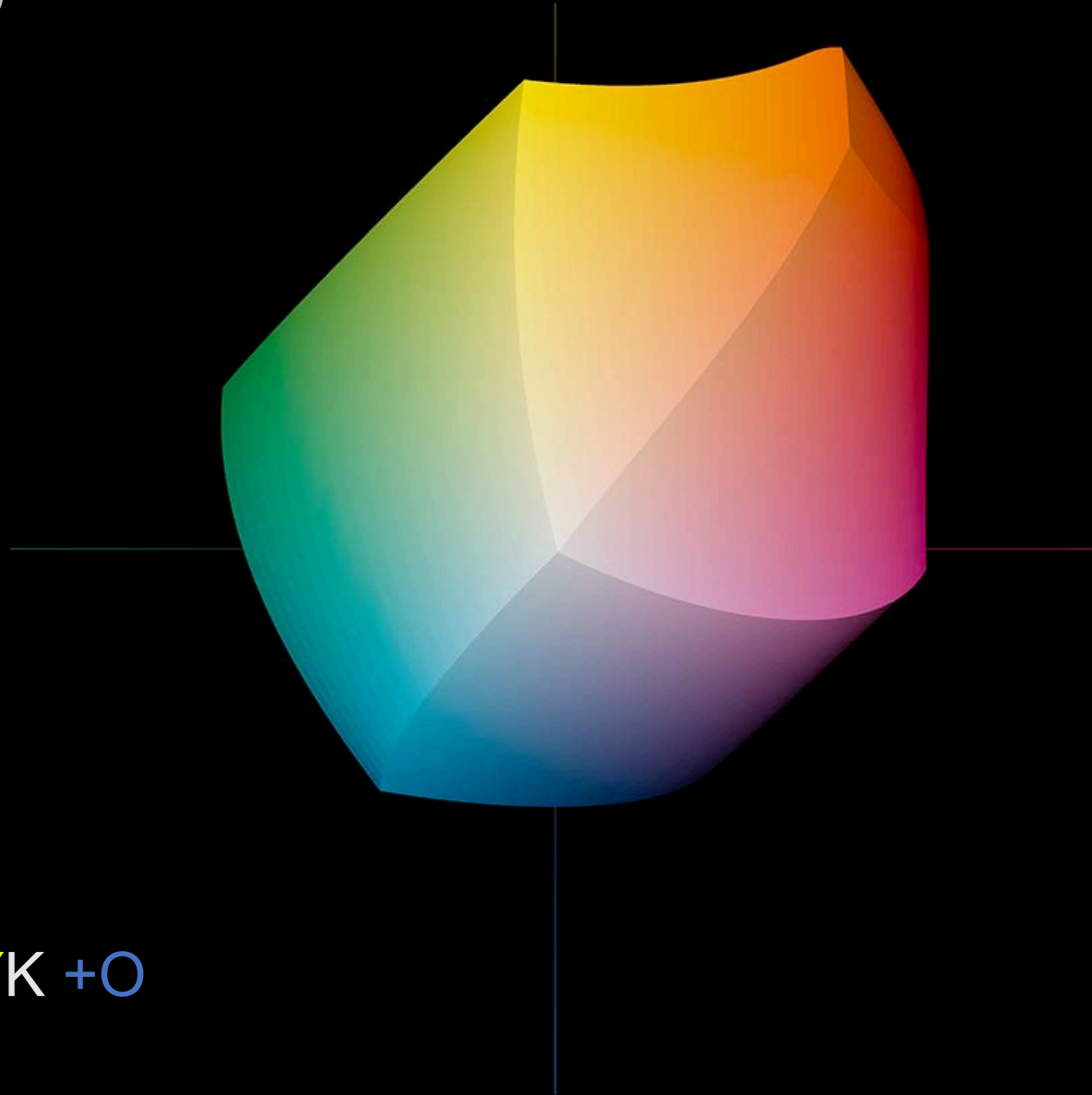
CMYK



CMYK

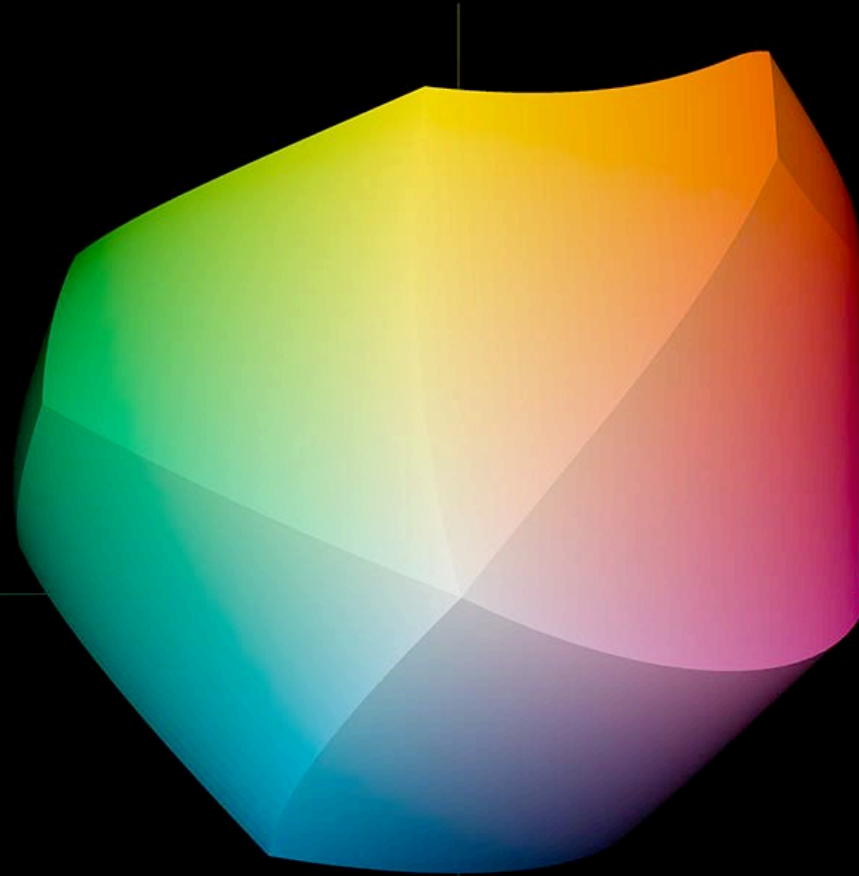
Choosing Inks

CMYK +0



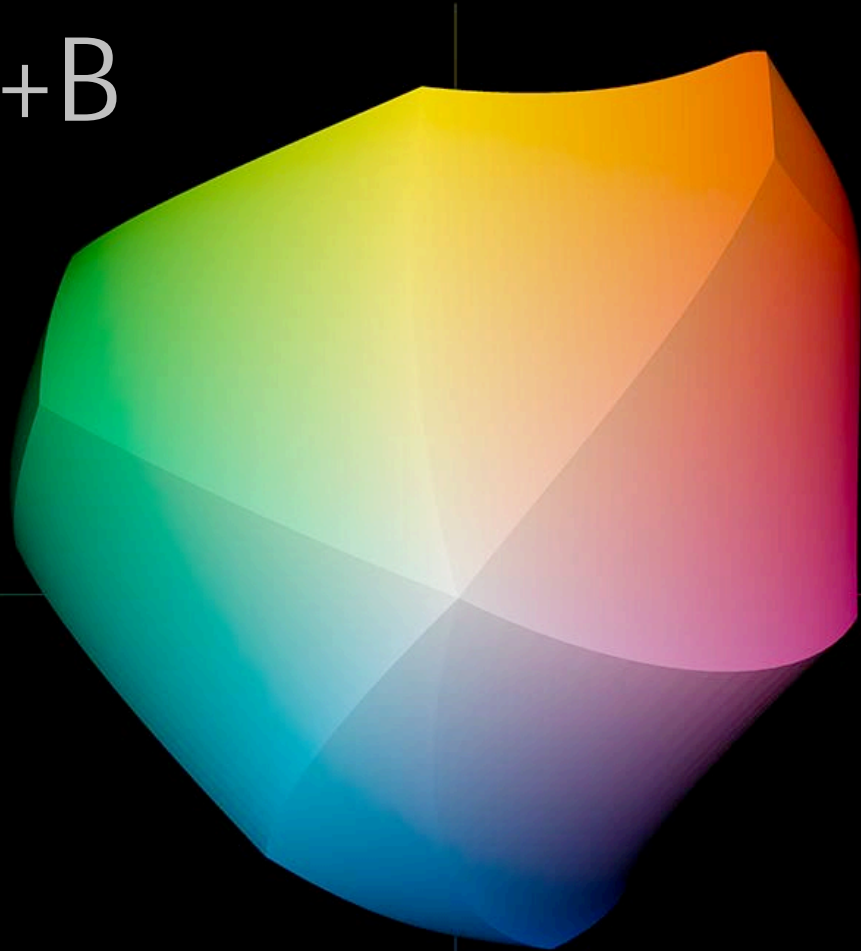
Choosing Inks

CMYK +O +G



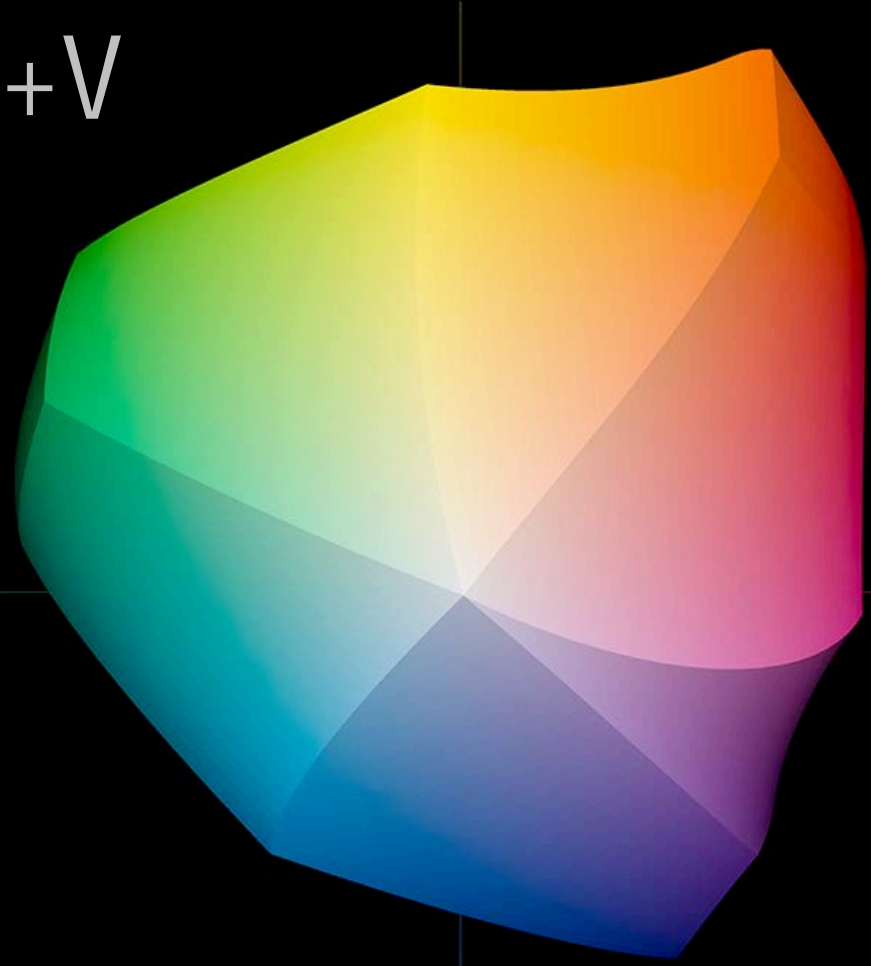
CMYK +O +G

Choosing Inks
CMYK +O +G +B



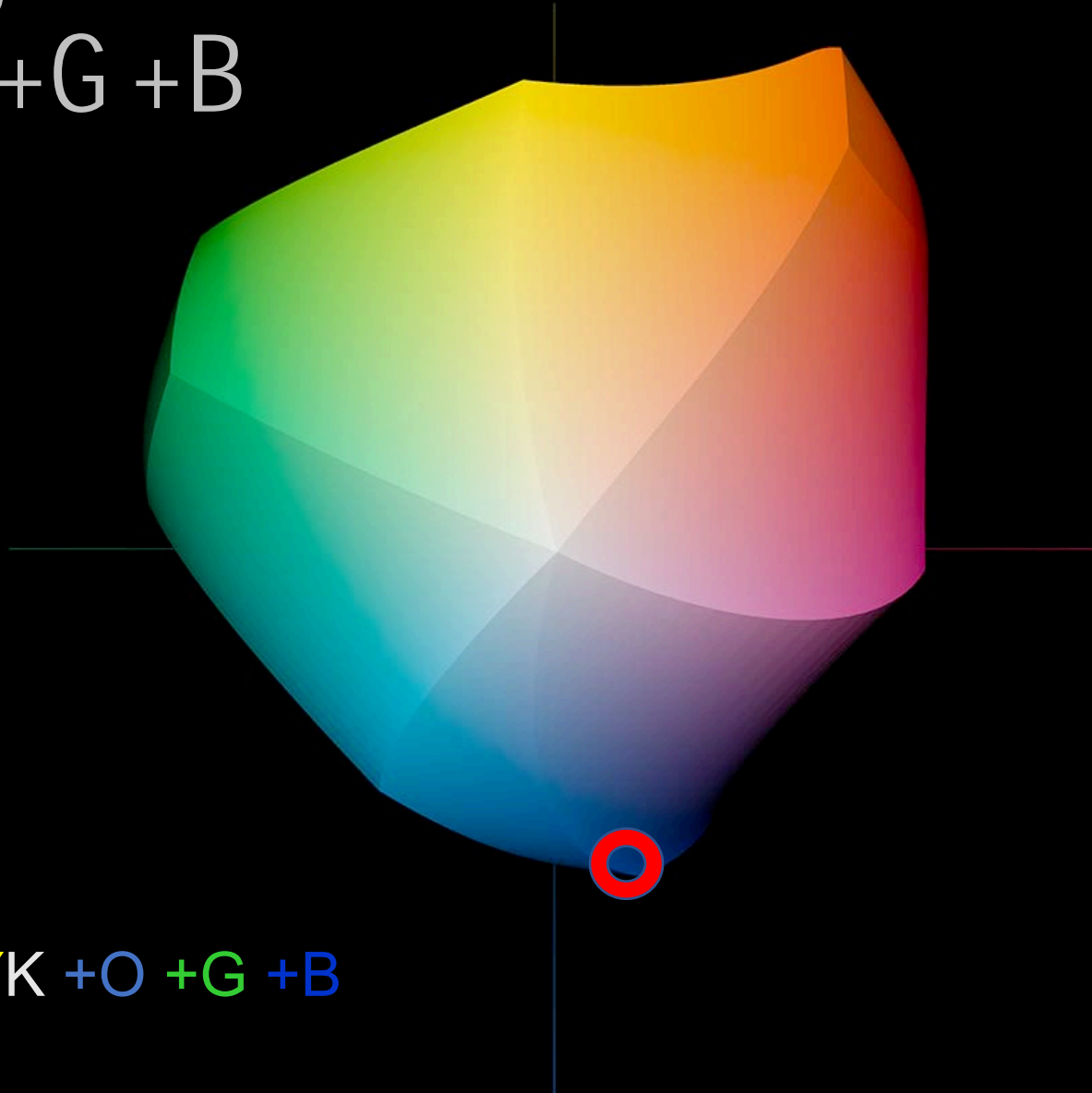
CMYK +O +G +B

Choosing Inks
CMYK +O +G +V



CMYK +O +G +V

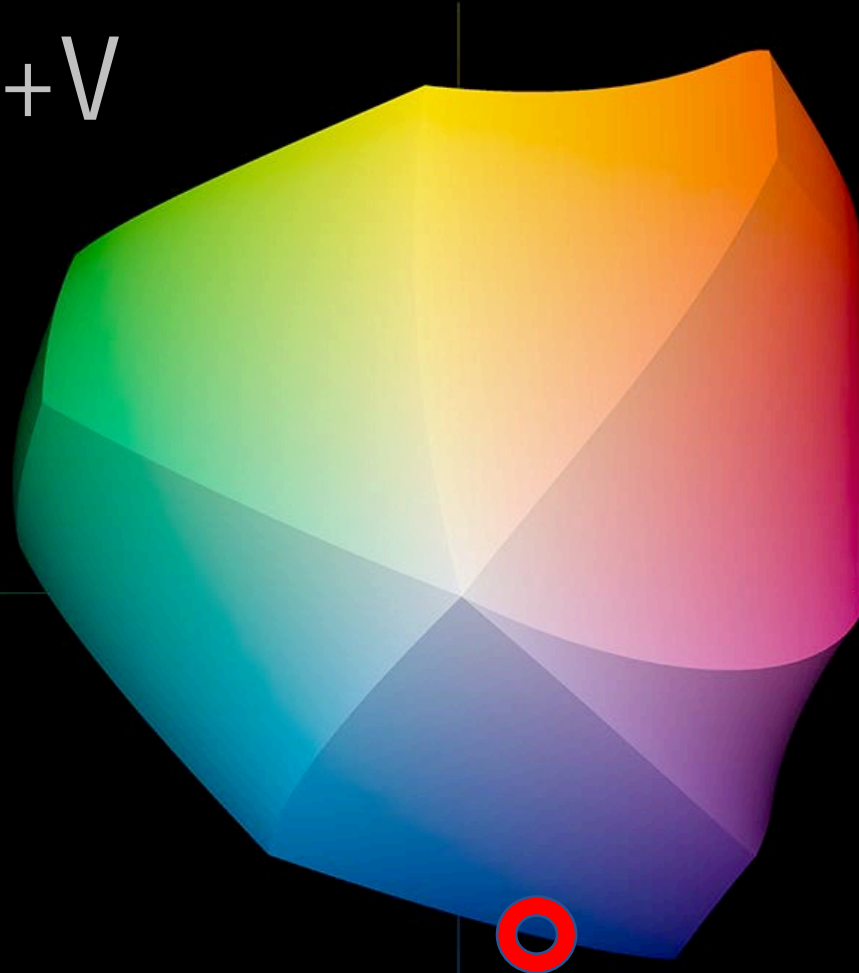
Choosing Inks
CMYK +O +G +B



CMYK +O +G +B

Choosing Inks

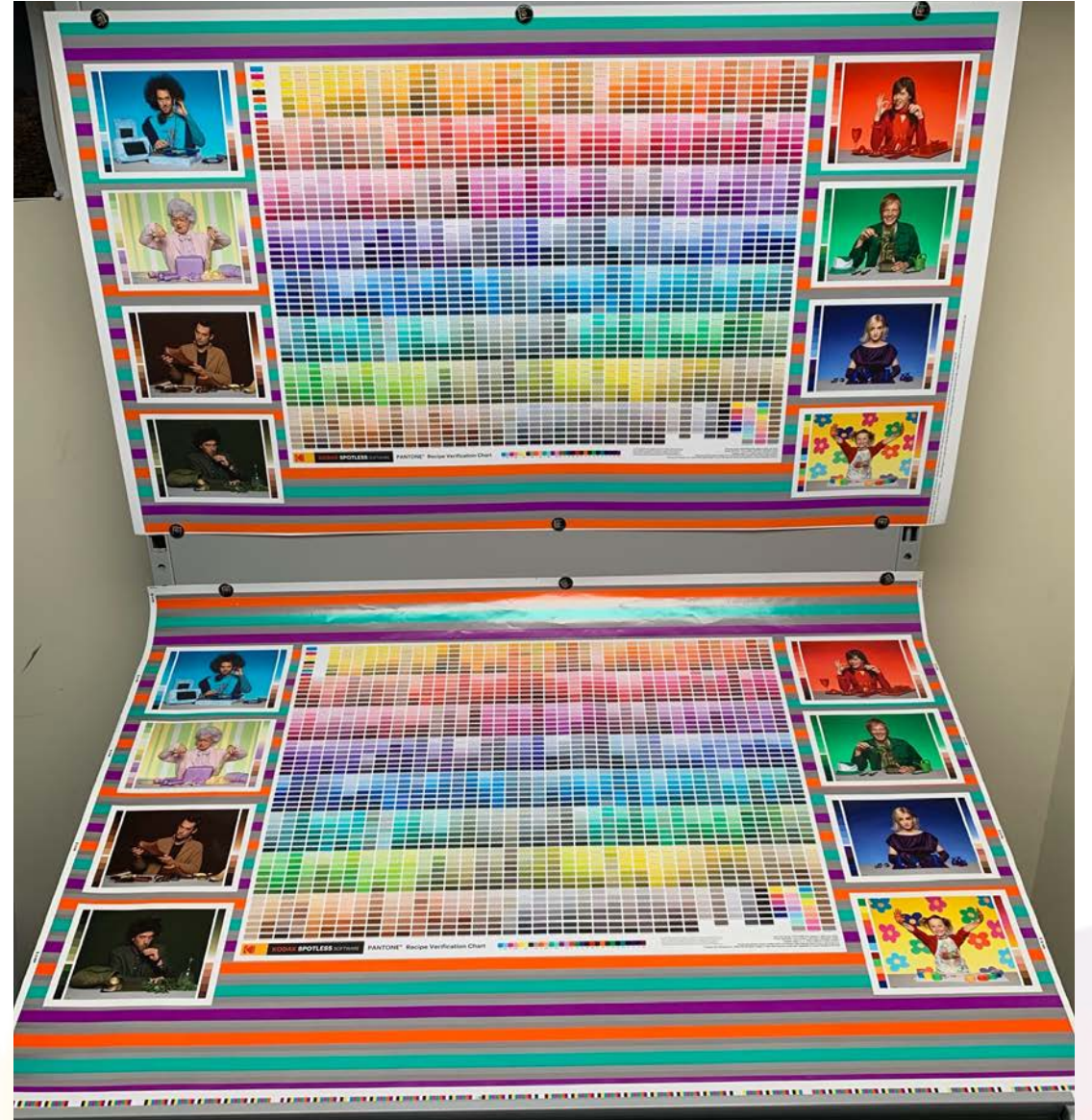
CMYK +O +G +V



CMYK +O +G +V

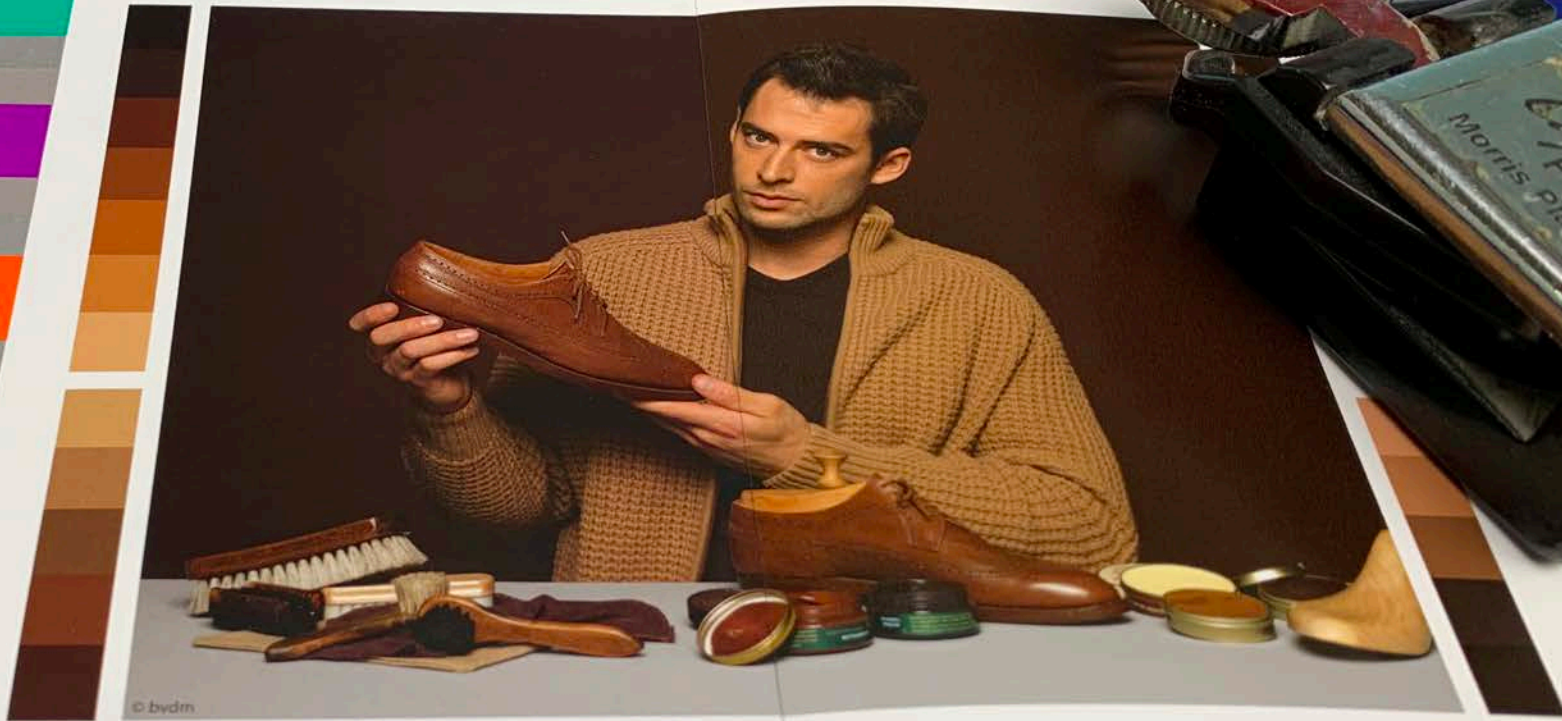
Colour Proofing

- Basic reproduction problem: Proof-to-press colour match.
- Inkjet vs. Offset press.
 - D50 – ish lighting.
 - Both reflective prints.
 - Similar levels of OBA's.
- Easy, right?





© Forstner



© bvdn



3588 C	PANTONE 4018 C	PANTONE 7411 C	PANTONE 7565 C	PANTONE 7572 C	PANTONE 4025 C
3564 C	PANTONE 4019 C	PANTONE 7412 C	PANTONE 7566 C	PANTONE 7573 C	PANTONE 4026 C
2428 C	PANTONE 4020 C	PANTONE 7413 C	PANTONE 7567 C	PANTONE 7574 C	PANTONE 4027 C
2429 C	PANTONE 4021 C	PANTONE 7414 C	PANTONE 7568 C	PANTONE 7575 C	PANTONE 4028 C
7618 C	PANTONE 7625 C	PANTONE 7415 C	PANTONE 182 C	PANTONE 4064 C	PANTONE 196 C
7619 C	PANTONE 7626 C	PANTONE 7416 C	PANTONE 183 C	PANTONE 4065 C	PANTONE 197 C
7620 C	PANTONE 7627 C	PANTONE 7417 C	PANTONE 184 C	PANTONE 4066 C	PANTONE 198 C
7621 C	PANTONE 7628 C	PANTONE 7418 C	PANTONE 185 C	PANTONE 4067 C	PANTONE 199 C
7622 C	PANTONE 7629 C	PANTONE 7419 C	PANTONE 186 C	PANTONE 4068 C	PANTONE 200 C
7623 C	PANTONE 7630 C	PANTONE 7420 C	PANTONE 187 C	PANTONE 4069 C	PANTONE 201 C
7624 C	PANTONE 7631 C	PANTONE 7421 C	PANTONE 188 C	PANTONE 4070 C	PANTONE 202 C
243 C	PANTONE 7646 C	PANTONE 250 C	PANTONE 2064 C	PANTONE 517 C	PANTONE 2351 C
244 C	PANTONE 7647 C	PANTONE 251 C	PANTONE 2065 C	PANTONE 516 C	PANTONE 2352 C
245 C	PANTONE 7648 C	PANTONE 252 C	PANTONE 2066 C	PANTONE 515 C	PANTONE 2353 C
246 C	PANTONE 7649 C	PANTONE Purple C	PANTONE 2067 C	PANTONE 514 C	PANTONE 2354 C
247 C	PANTONE 7650 C	PANTONE 253 C	PANTONE 2068 C	PANTONE 513 C	PANTONE 2355 C
248 C	PANTONE 7651 C	PANTONE 254 C	PANTONE 2069 C	PANTONE 512 C	PANTONE 2356 C
249 C	PANTONE 7652 C	PANTONE 255 C	PANTONE 2070 C	PANTONE 511 C	PANTONE 2357 C
2113 C	PANTONE 2366 C	PANTONE 538 C	PANTONE 7541 C	PANTONE 2162 C	PANTONE 4134 C
2114 C	PANTONE 2367 C	PANTONE 537 C	PANTONE 7542 C	PANTONE 2163 C	PANTONE 4135 C
2115 C	PANTONE 2368 C	PANTONE 536 C	PANTONE 7543 C	PANTONE 2164 C	PANTONE 4136 C
2116 C	PANTONE 2369 C	PANTONE 535 C	PANTONE 7544 C	PANTONE 2165 C	PANTONE 4137 C
2117 C	PANTONE 2370 C	PANTONE 534 C	PANTONE 7545 C	PANTONE 2166 C	PANTONE 4138 C
2118 C	PANTONE 2371 C	PANTONE 533 C	PANTONE 7546 C	PANTONE 2167 C	PANTONE 4139 C
2119 C	PANTONE 2372 C	PANTONE 532 C	PANTONE 7547 C	PANTONE 2168 C	PANTONE 4140 C
2176 C	PANTONE 2204 C	PANTONE 4155 C	PANTONE 7457 C	PANTONE 304 C	PANTONE 635 C





PANTONE 3588 C	PANTONE 4018 C	PANTONE 7411 C	PANTONE 7565 C	PANTONE 7572 C	PANTONE 4025 C
PANTONE 3564 C	PANTONE 4019 C	PANTONE 7412 C	PANTONE 7566 C	PANTONE 7573 C	PANTONE 4026 C
PANTONE 2428 C	PANTONE 4020 C	PANTONE 7413 C	PANTONE 7567 C	PANTONE 7574 C	PANTONE 4027 C
PANTONE 2429 C	PANTONE 4021 C	PANTONE 7414 C	PANTONE 7568 C	PANTONE 7575 C	PANTONE 4028 C
PANTONE 7618 C	PANTONE 7625 C	PANTONE 7415 C	PANTONE 182 C	PANTONE 4064 C	PANTONE 196 C
PANTONE 7619 C	PANTONE 7626 C	PANTONE 7416 C	PANTONE 183 C	PANTONE 4065 C	PANTONE 197 C
PANTONE 7620 C	PANTONE 7627 C	PANTONE 7417 C	PANTONE 184 C	PANTONE 4066 C	PANTONE 198 C
PANTONE 7621 C	PANTONE 7628 C	PANTONE 7418 C	PANTONE 185 C	PANTONE 4067 C	PANTONE 199 C
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PANTONE 7623 C	PANTONE 7630 C	PANTONE 7420 C	PANTONE 187 C	PANTONE 4069 C	PANTONE 201 C
PANTONE 7624 C	PANTONE 7631 C	PANTONE 7421 C	PANTONE 188 C	PANTONE 4070 C	PANTONE 202 C
PANTONE 243 C	PANTONE 7646 C	PANTONE 250 C	PANTONE 2064 C	PANTONE 517 C	PANTONE 2351 C
PANTONE 244 C	PANTONE 7647 C	PANTONE 251 C	PANTONE 2065 C	PANTONE 516 C	PANTONE 2352 C
PANTONE 245 C	PANTONE 7648 C	PANTONE 252 C	PANTONE 2066 C	PANTONE 515 C	PANTONE 2353 C
PANTONE 246 C	PANTONE 7649 C	PANTONE Purple C	PANTONE 2067 C	PANTONE 514 C	PANTONE 2354 C
PANTONE 247 C	PANTONE 7650 C	PANTONE 253 C	PANTONE 2068 C	PANTONE 513 C	PANTONE 2355 C
PANTONE 248 C	PANTONE 7651 C	PANTONE 254 C	PANTONE 2069 C	PANTONE 512 C	PANTONE 2356 C
PANTONE 249 C	PANTONE 7652 C	PANTONE 255 C	PANTONE 2070 C	PANTONE 511 C	PANTONE 2357 C
PANTONE 2113 C	PANTONE 2366 C	PANTONE 538 C	PANTONE 7541 C	PANTONE 2162 C	PANTONE 4134 C
PANTONE 2114 C	PANTONE 2367 C	PANTONE 537 C	PANTONE 7542 C	PANTONE 2163 C	PANTONE 4135 C
PANTONE 2115 C	PANTONE 2368 C	PANTONE 536 C	PANTONE 7543 C	PANTONE 2164 C	PANTONE 4136 C
PANTONE 2116 C	PANTONE 2369 C	PANTONE 535 C	PANTONE 7544 C	PANTONE 2165 C	PANTONE 4137 C
PANTONE 2117 C	PANTONE 2370 C	PANTONE 534 C	PANTONE 7545 C	PANTONE 2166 C	PANTONE 4138 C
PANTONE 2118 C	PANTONE 2371 C	PANTONE 533 C	PANTONE 7546 C	PANTONE 2167 C	PANTONE 4139 C
PANTONE 2119 C	PANTONE 2372 C	PANTONE 532 C	PANTONE 7547 C	PANTONE 2168 C	PANTONE 4140 C
PANTONE 2176 C	PANTONE 2204 C	PANTONE 4155 C	PANTONE 7457 C	PANTONE 304 C	PANTONE 635 C

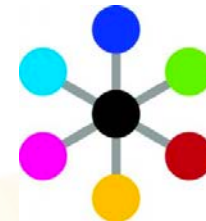
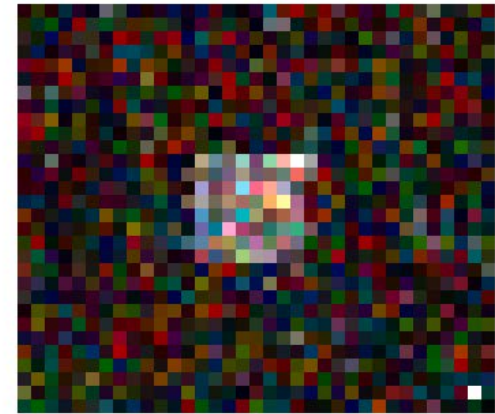
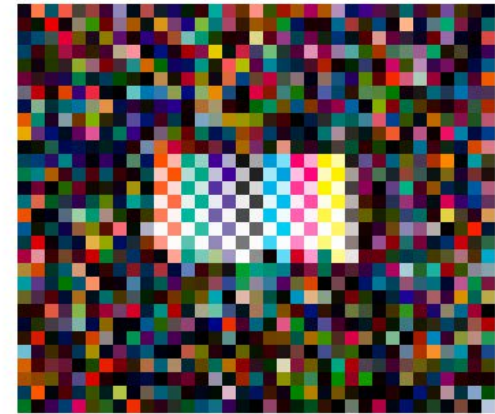
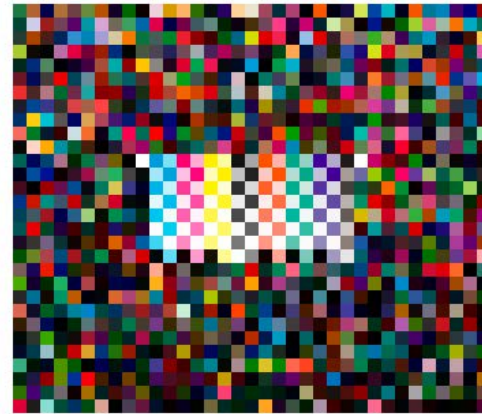


Phases of (Conventional) Profile Creation

1. Data capture.
2. Forward model generation.
3. Model inversion.
4. Etc...

Multi-Vendor Approach for International Standards

- ECG target for CMYKOGV jointly developed by multiple vendors.



Idealliance®



Sampling Efficiency

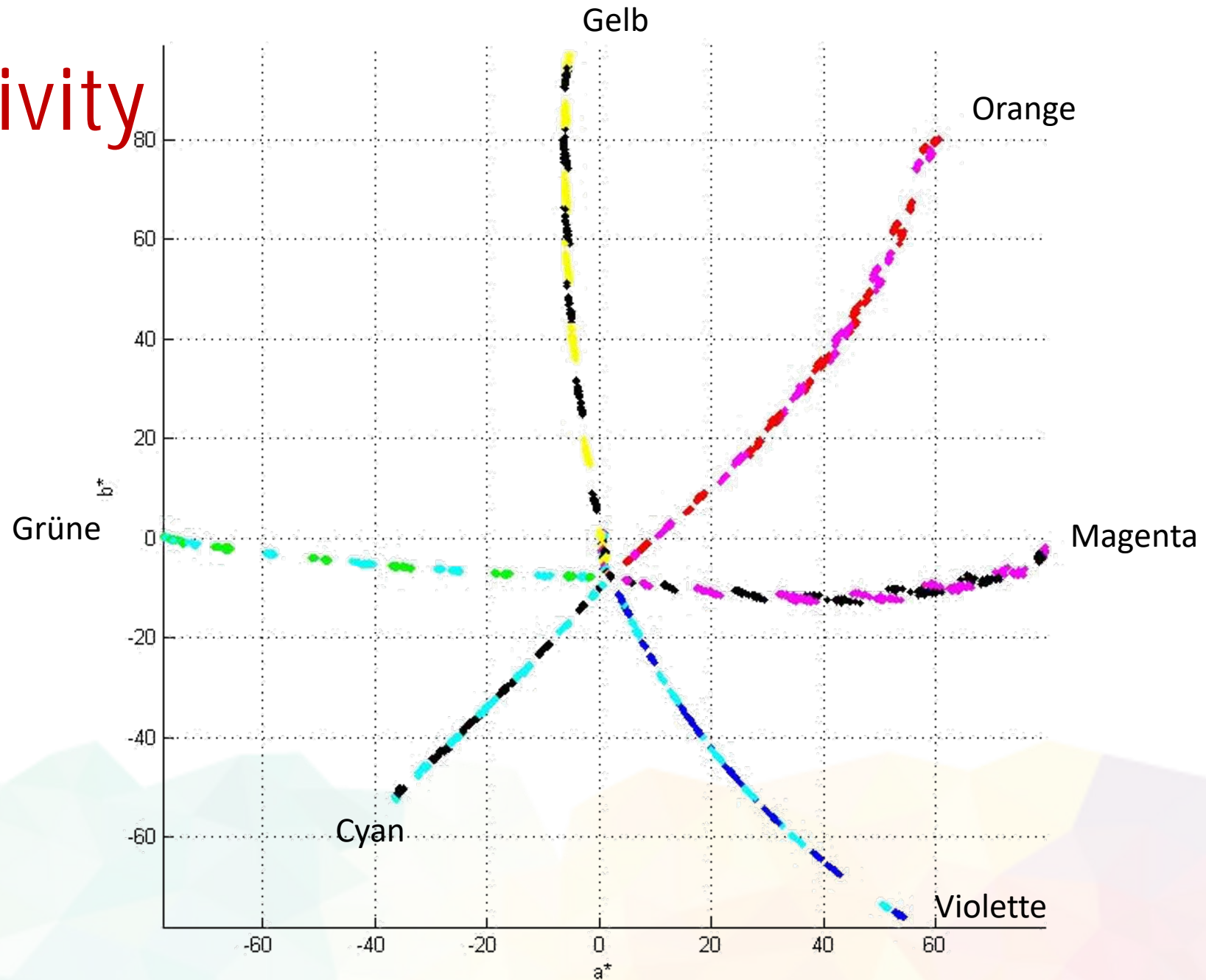
CMYK:

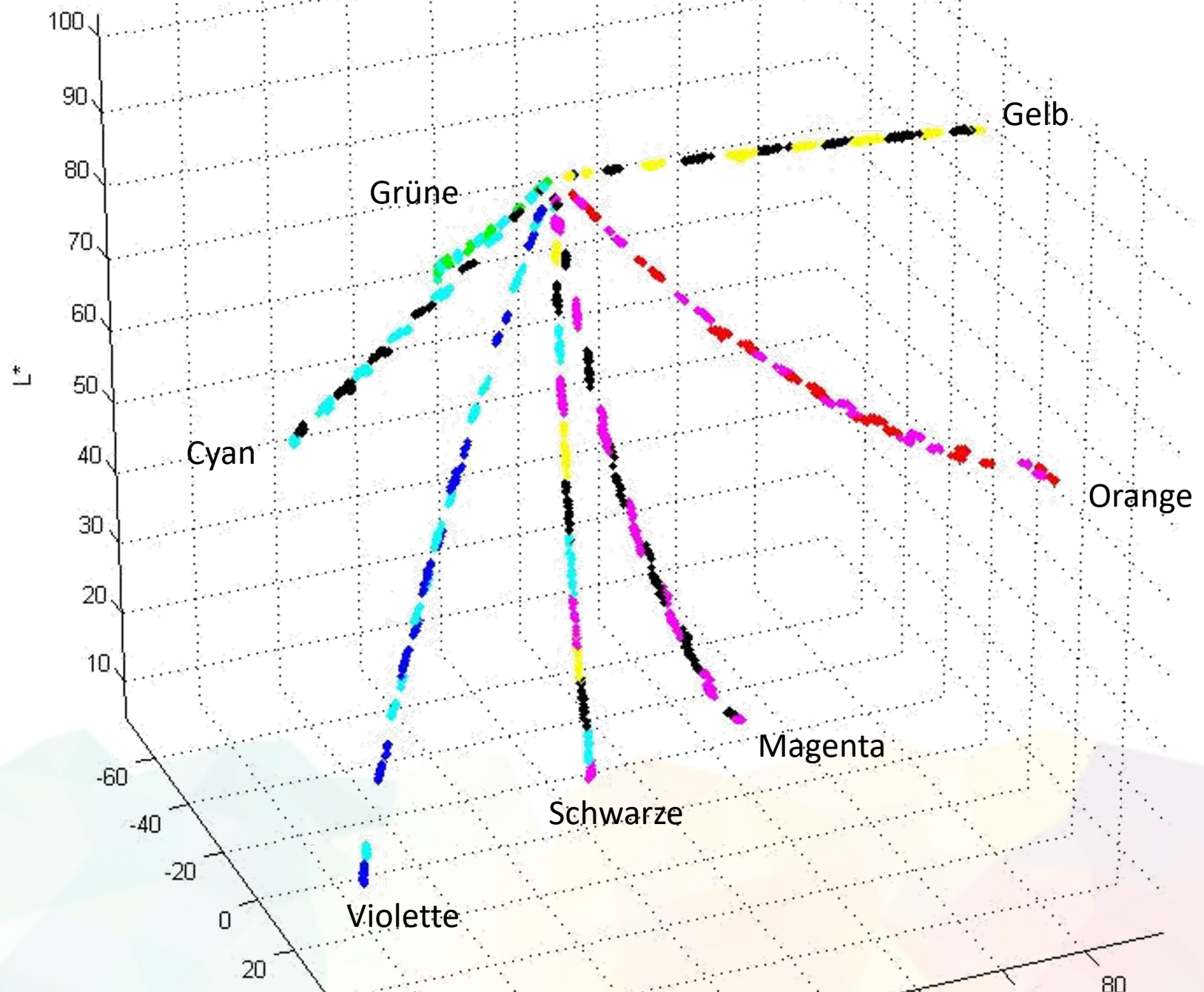
- 10% steps: $11^4 = 14,641$ samples.
- IT8.7/5 target: 1617 patches
- Sampling efficiency = 11%

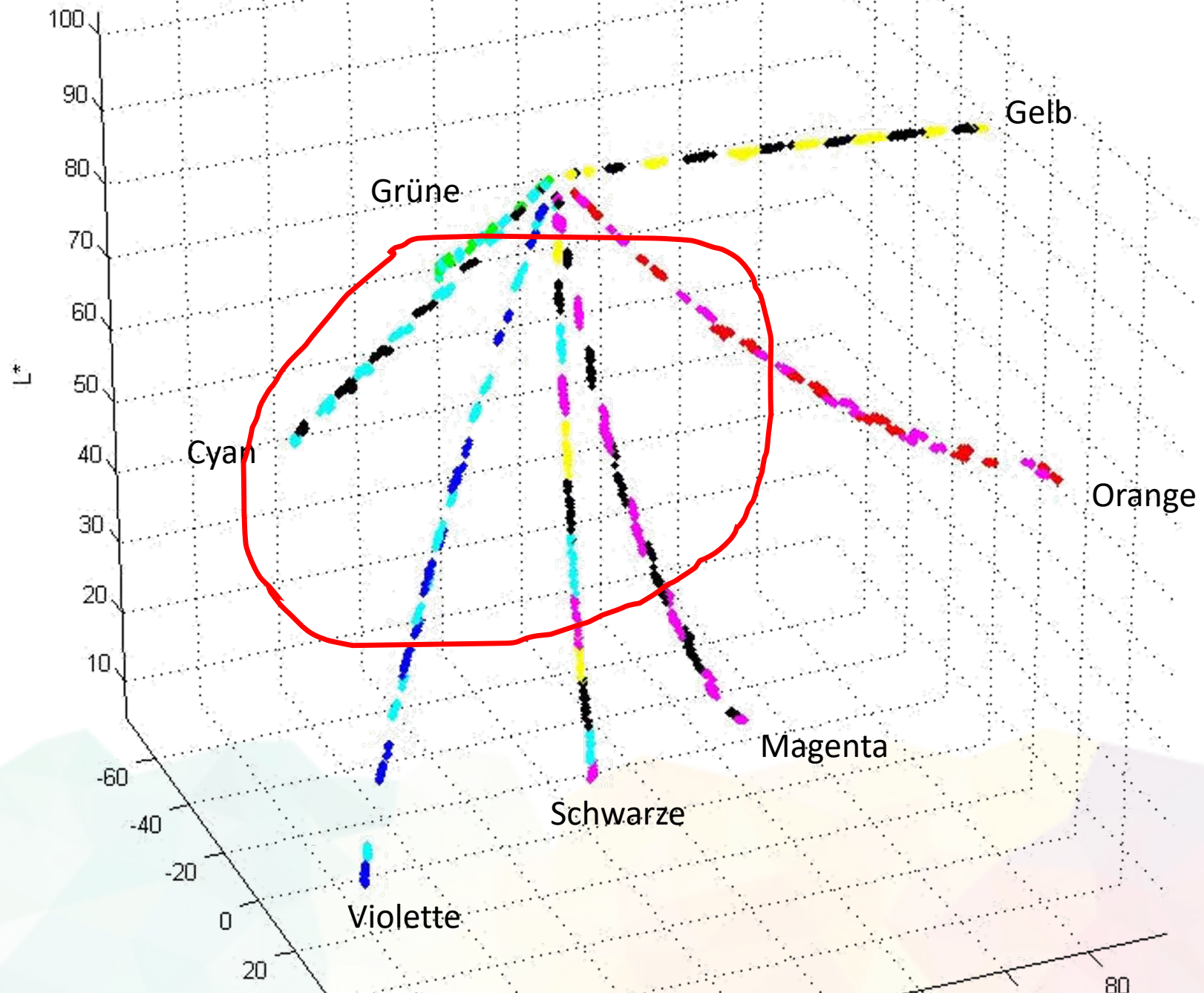
CMYKOGV:

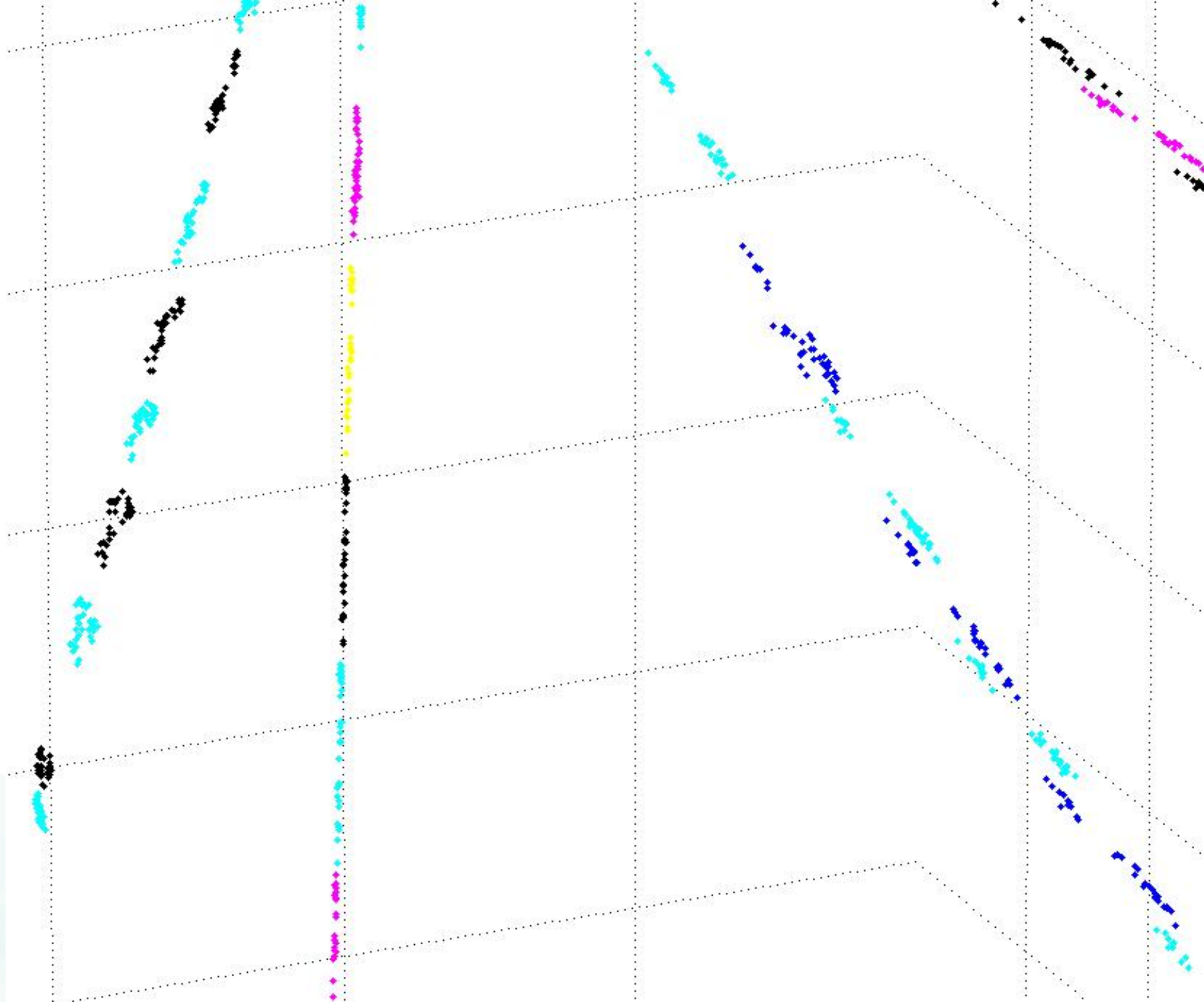
- 10% steps: $11^7 = 19,487,171$ samples.
- Idealliance ECG target: 4200 patches
- Sampling efficiency = 0.02%

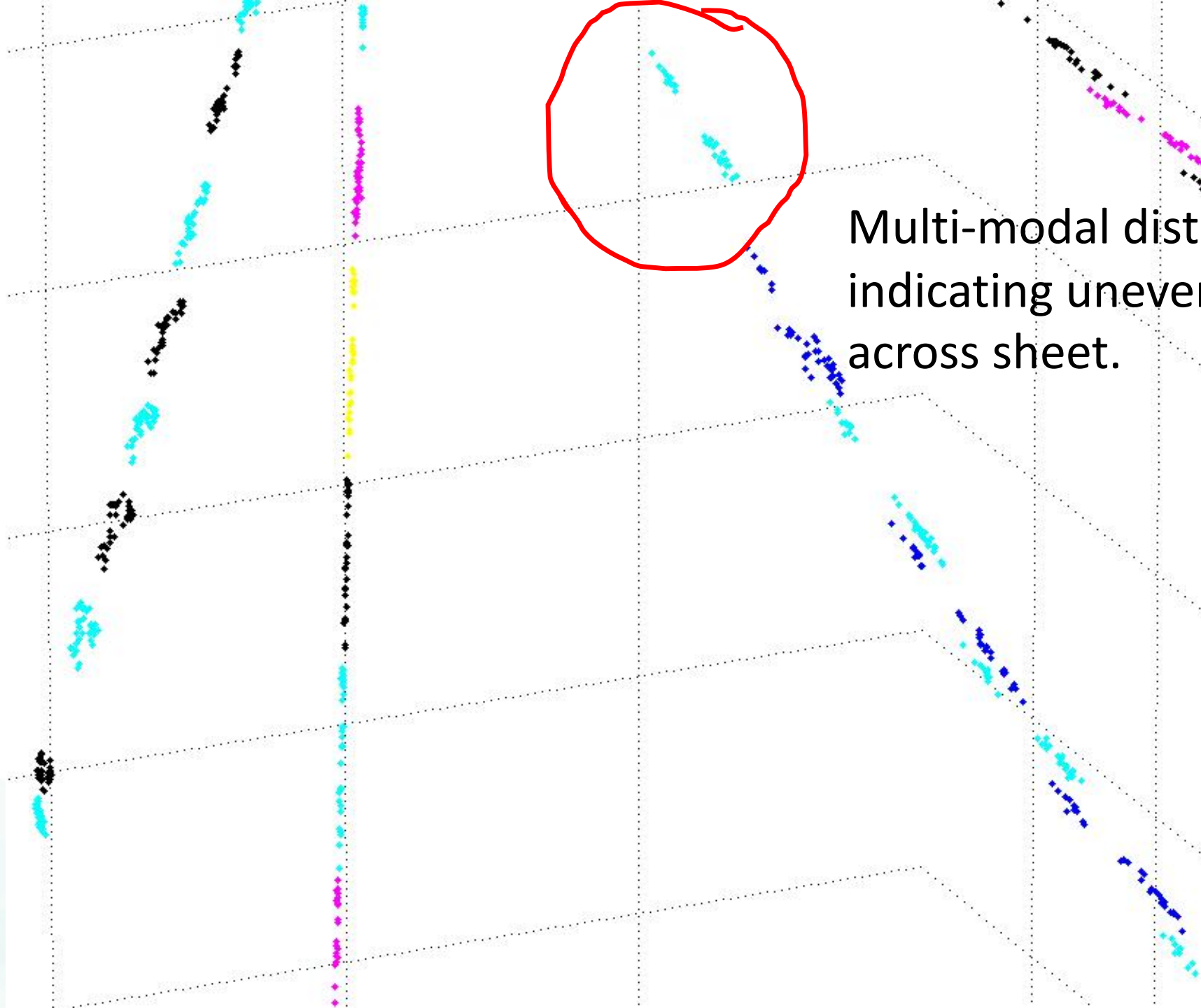
Sensitivity



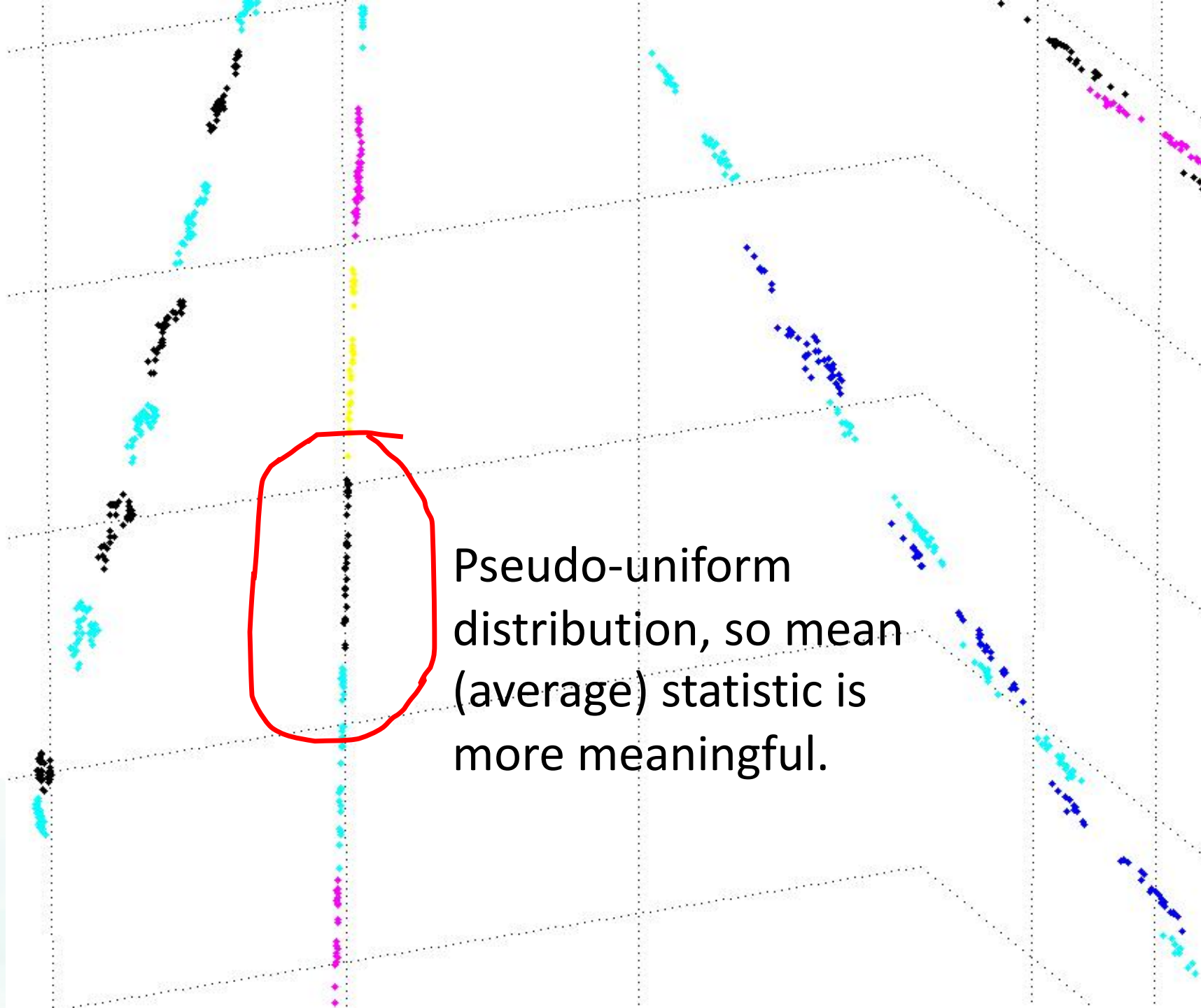




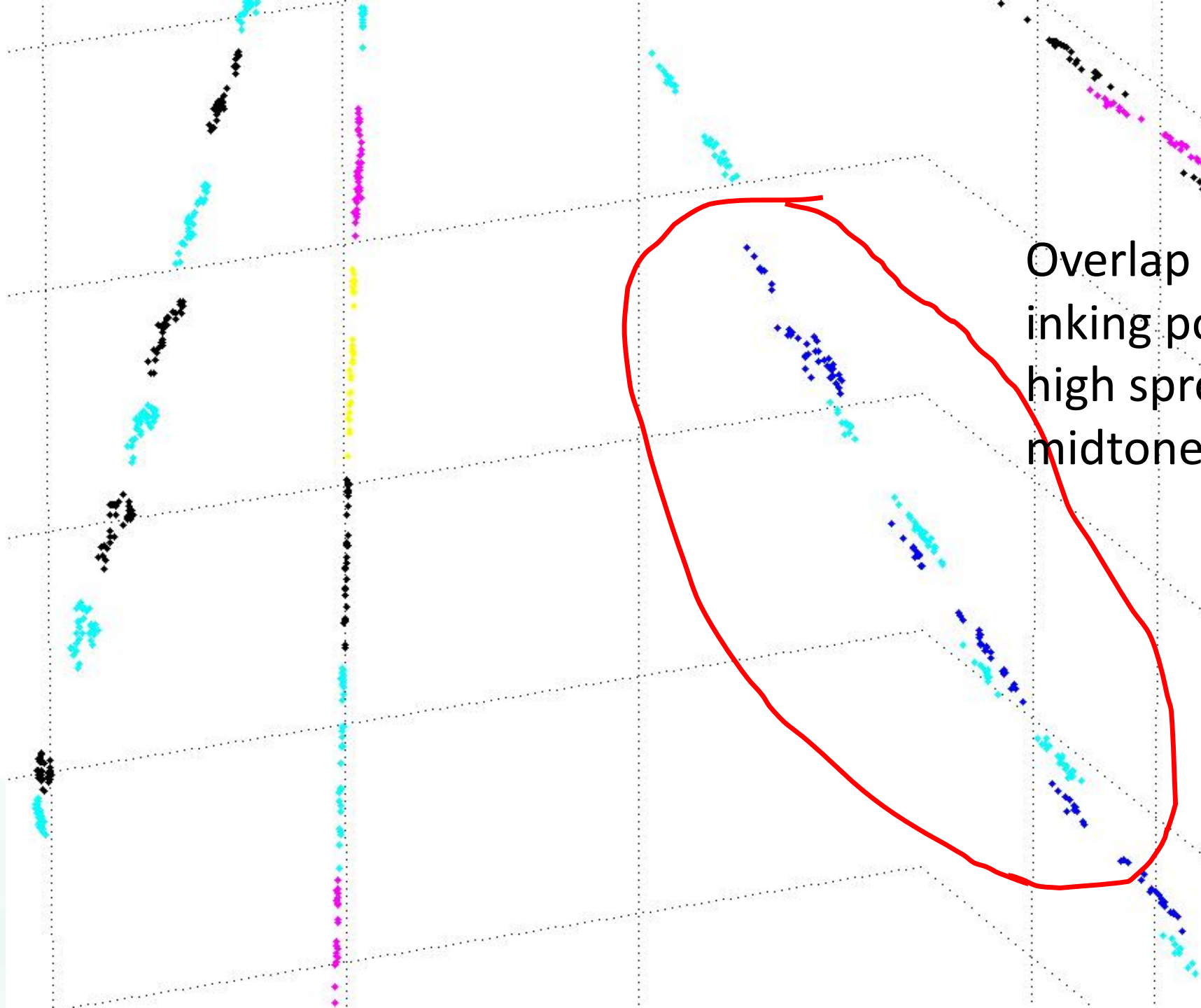




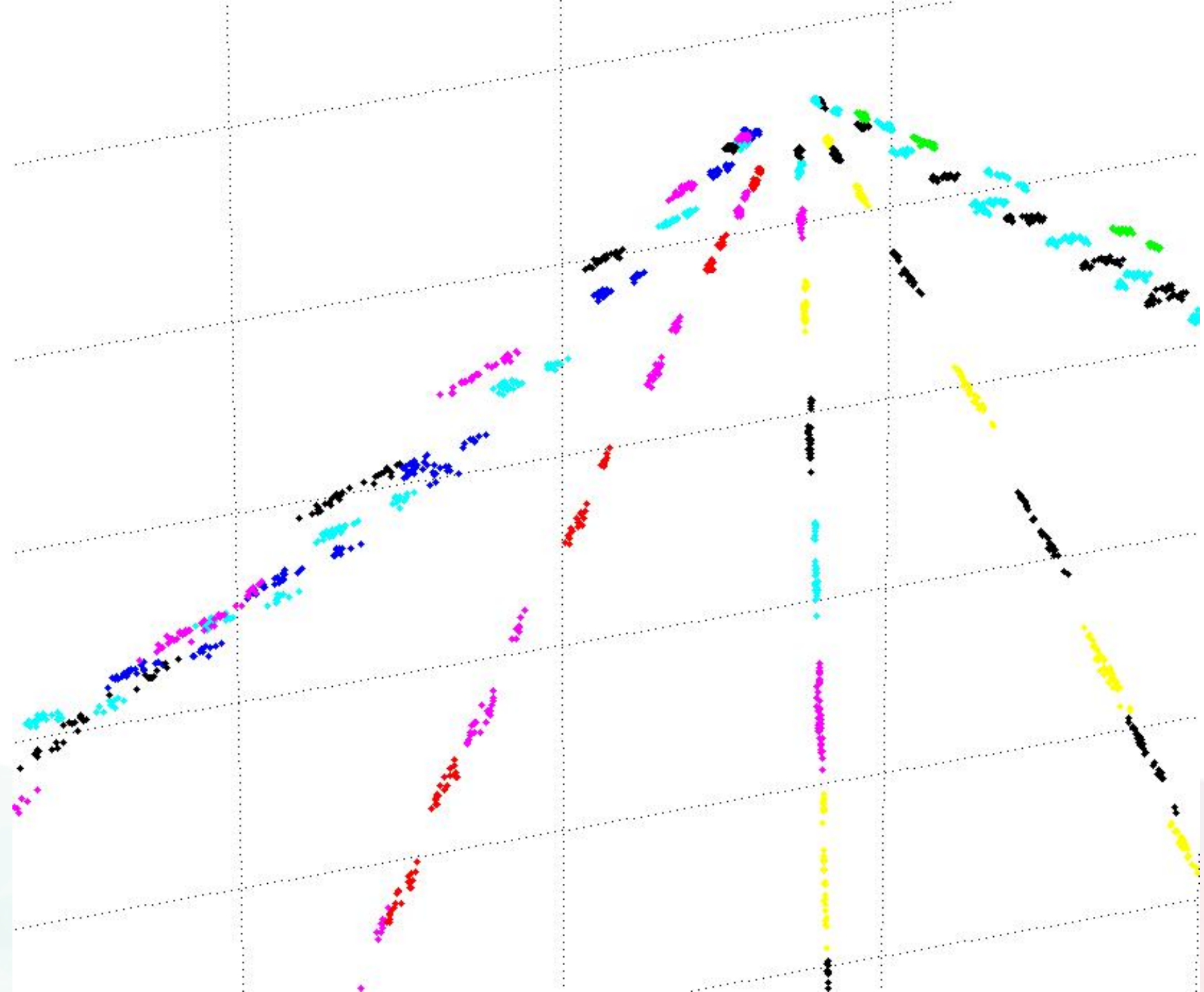
Multi-modal distribution
indicating uneven ink load
across sheet.

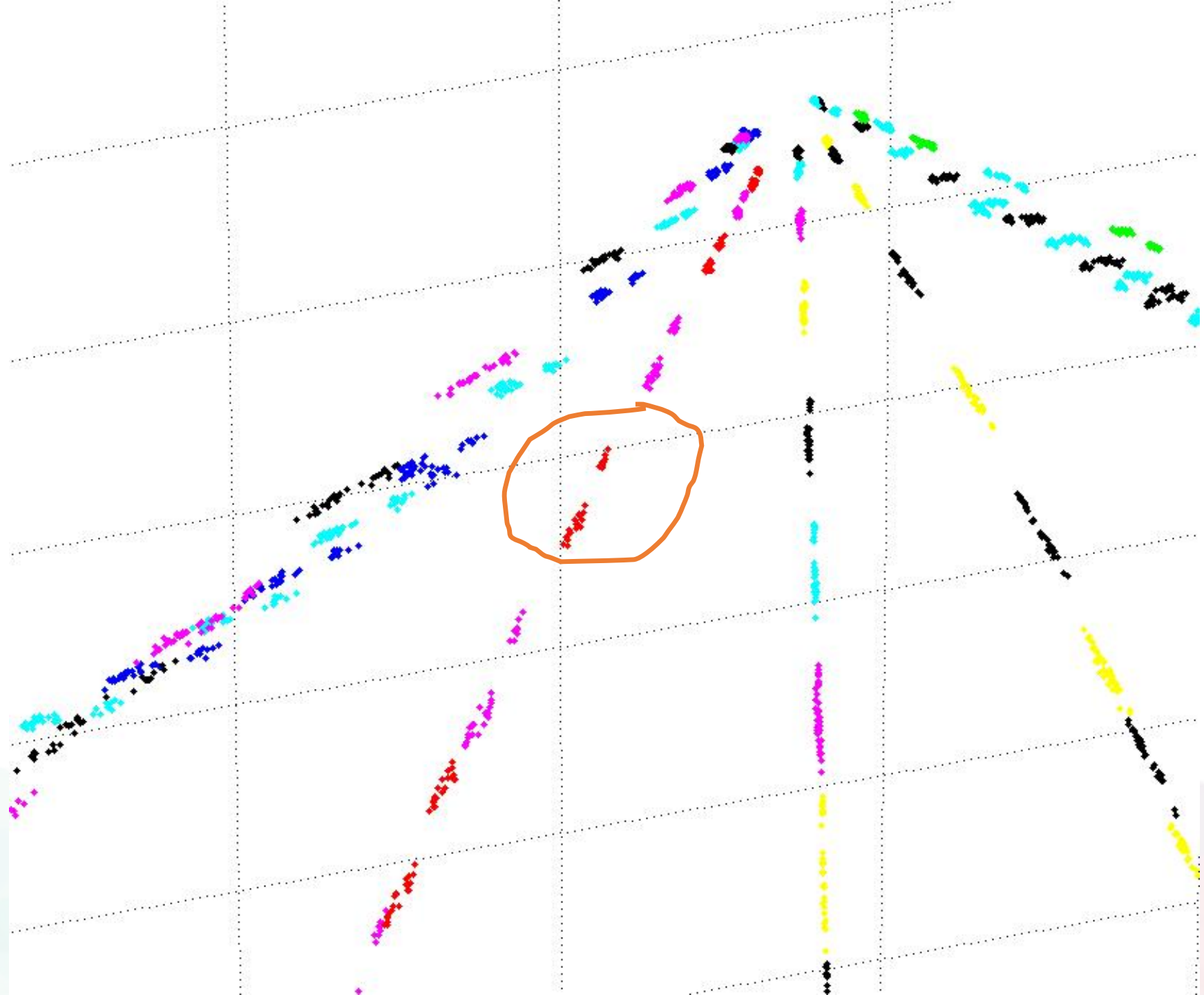


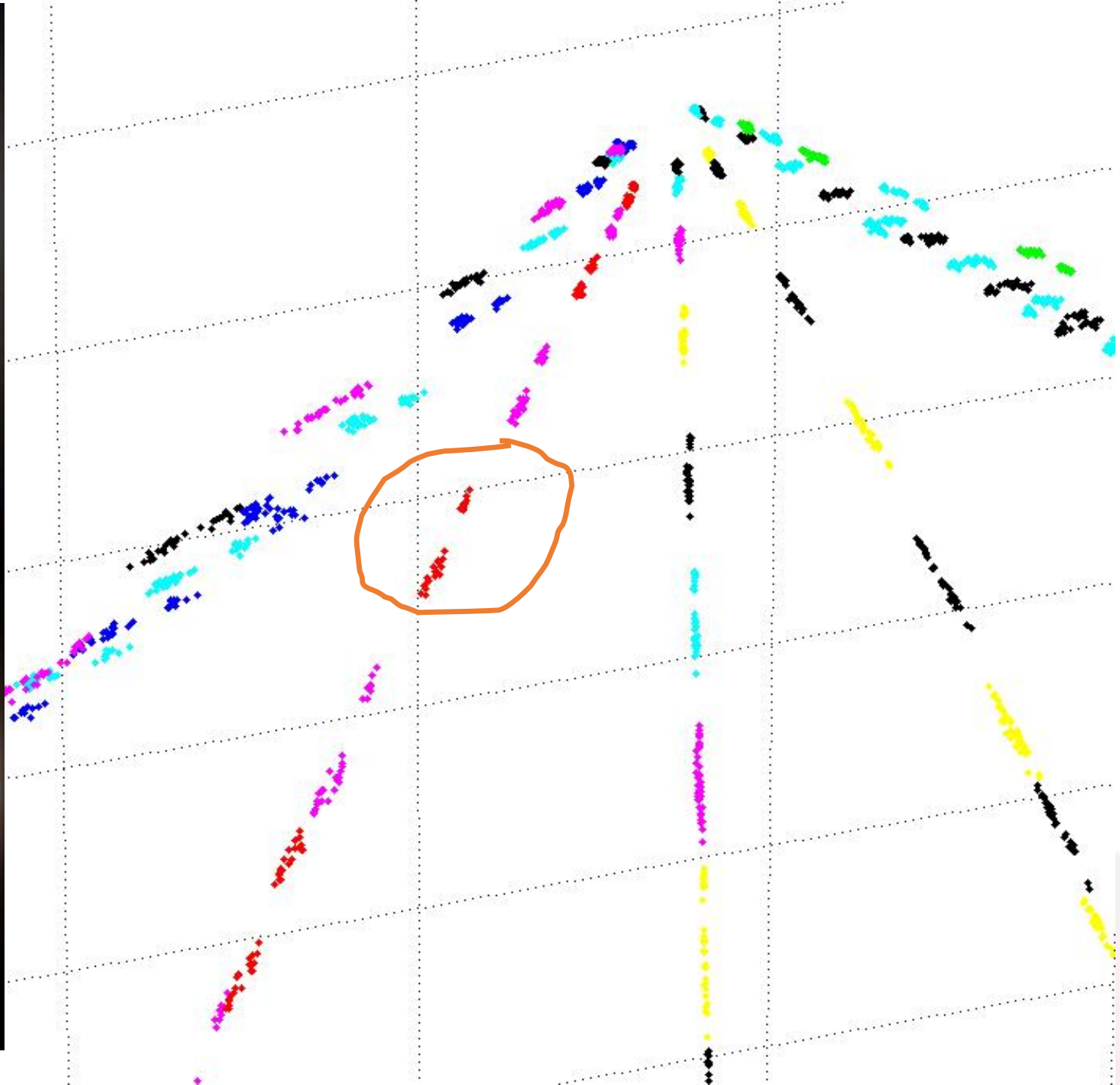
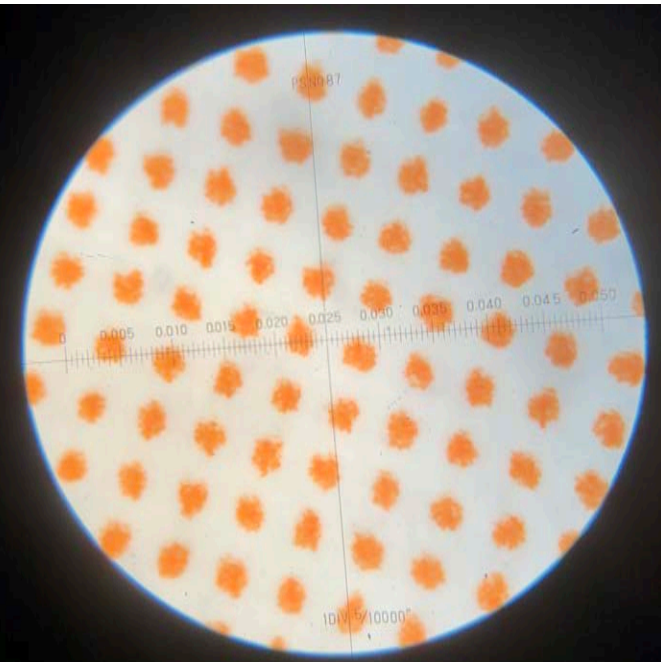
Pseudo-uniform distribution, so mean (average) statistic is more meaningful.



Overlap of adjacent inking points: very high spread in midtones.







Forward Model Sizes

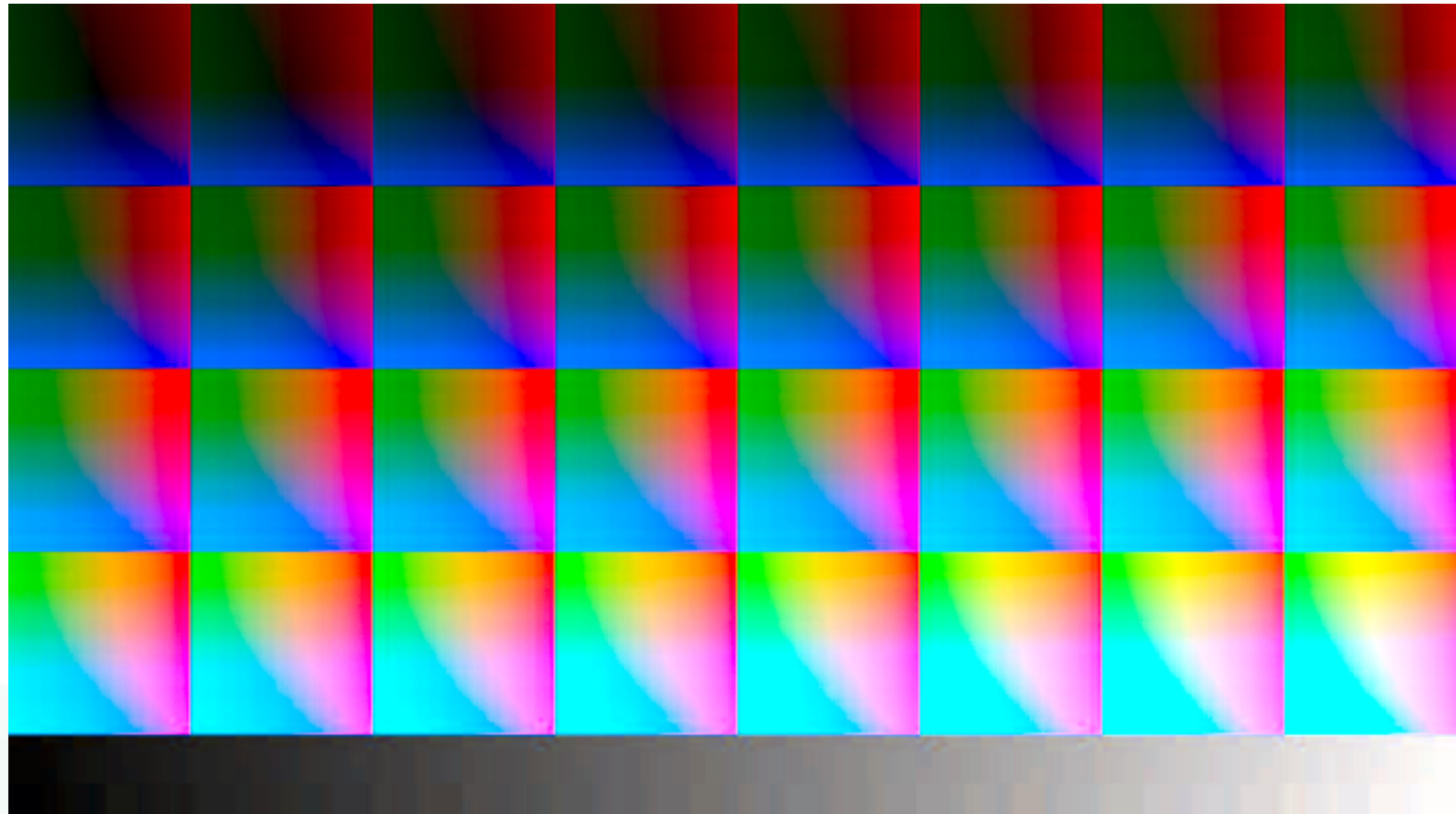
CMYK:

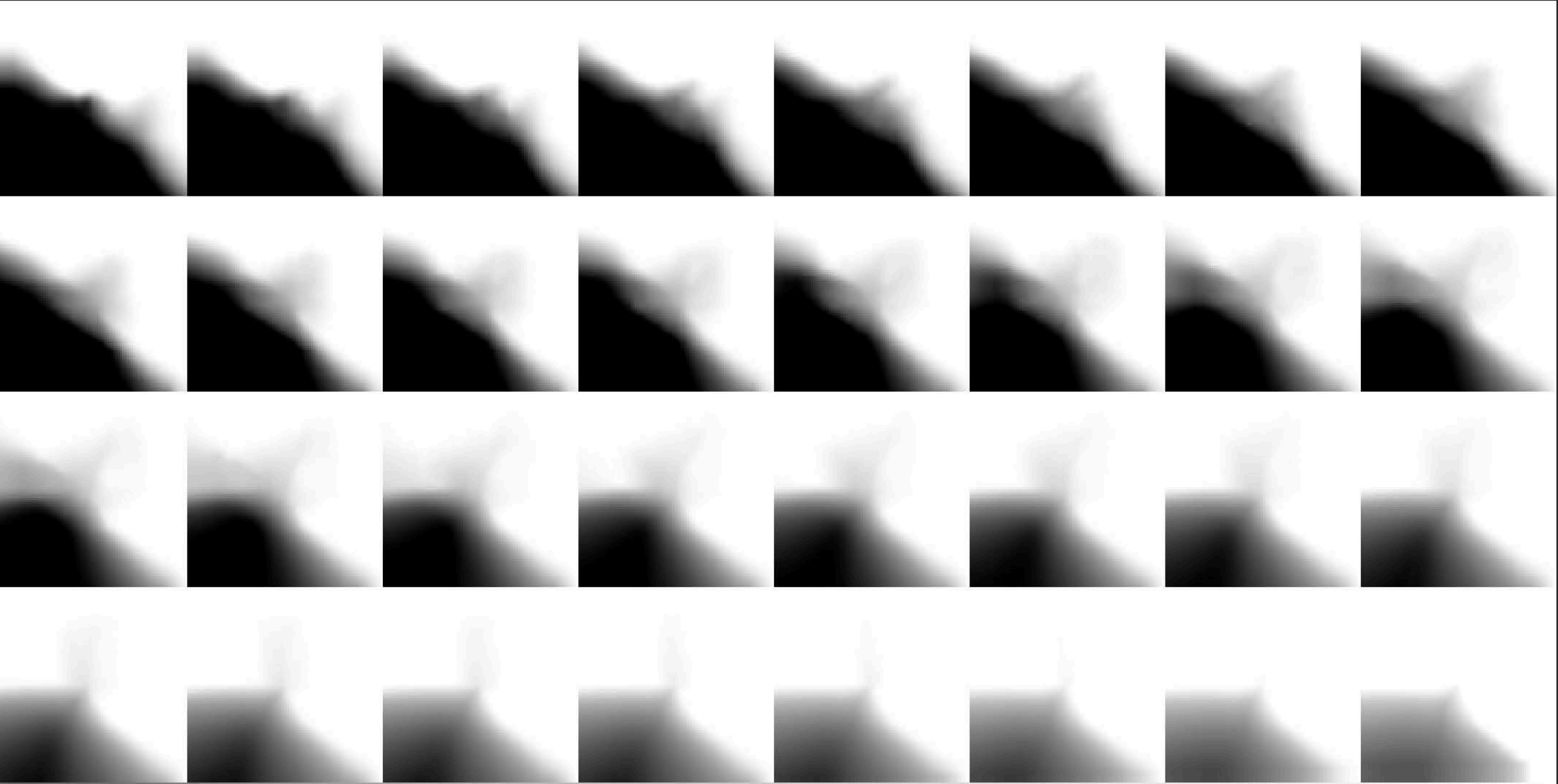
- 10% steps: $11^4 = 14,641$ samples.

CMYKOGV:

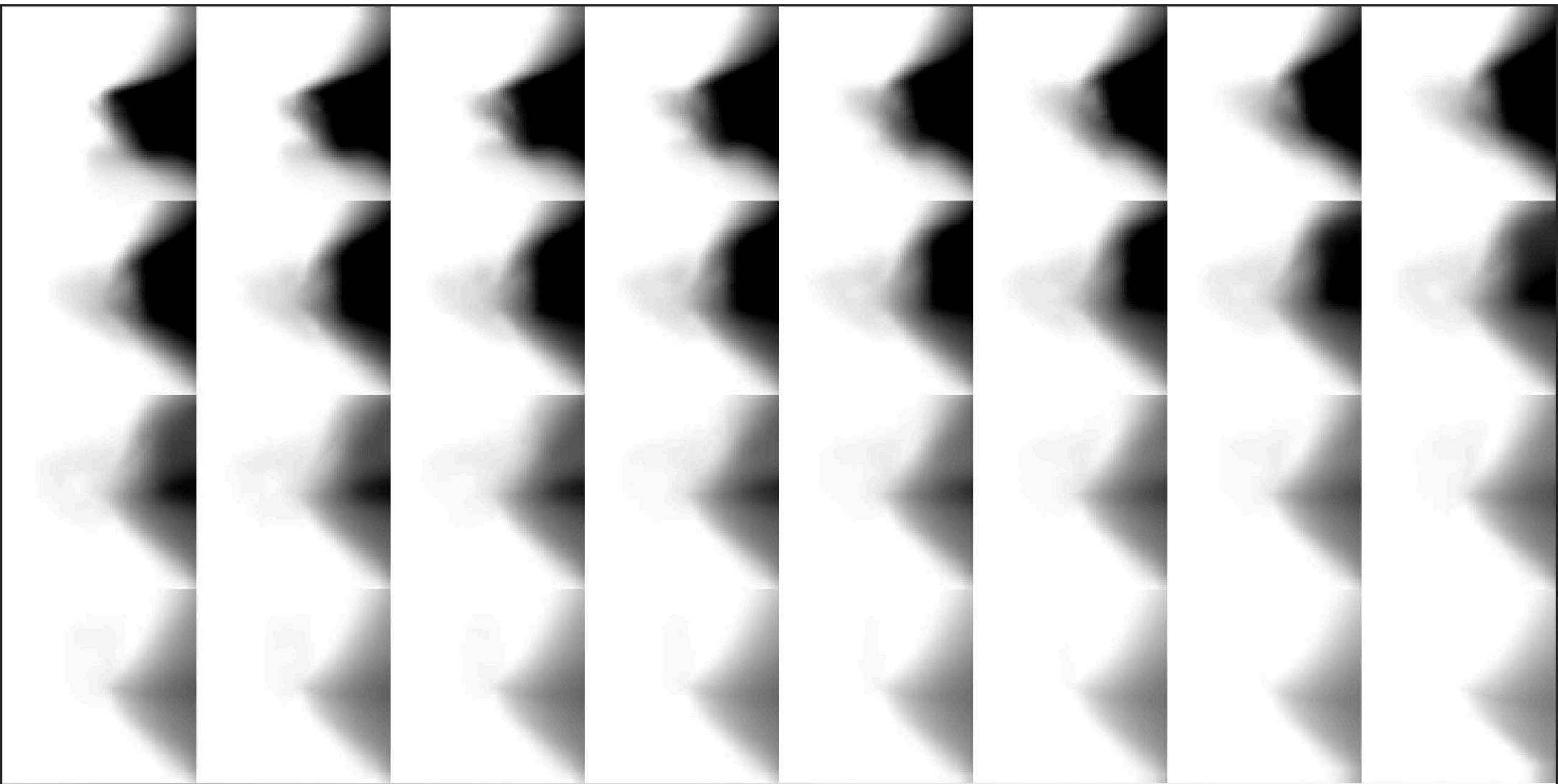
- 10% steps: $11^7 = 19,487,171$ samples.
- But: ICC v4 dictates linear interpolation (of some kind)...

Visual Assessment of Colour Separation

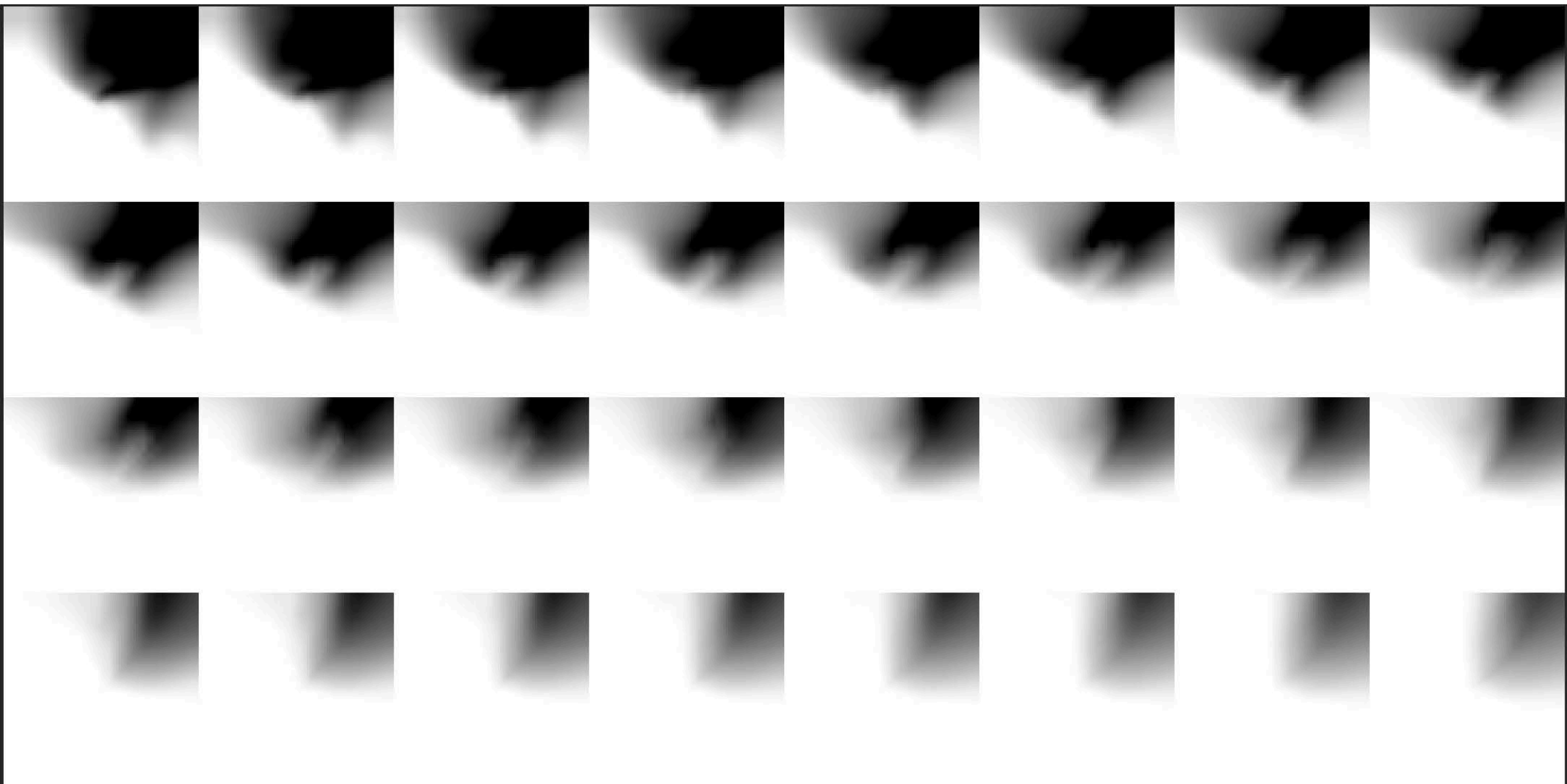




Cyan



Magenta



Orange

Other Issues

- PDF workflow:
 - Tagging of N-colour ICC profiles.
 - Embedding of iccMAX profiles.
- Sparser data capture.

