

Global Standards Expanded Gamut Printing & Supporting Tools

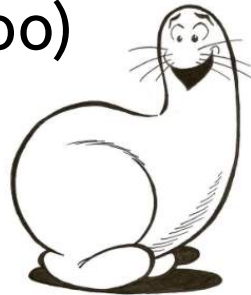
Bologna Italy Nov 23, 2016

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SmileyColor & Associates

Agenda

- Expanded Gamut use and projections about future in Packaging Industry
- Standardizing 7 color / Pros and Cons
 - impact on 7 color setup
 - Multiple directions – custom, common neutral appearance
 - ISO TC130 Extended Gamut Printing Direction
- Controlling TVI for Spot Colours, ISO 20654 (Schmoo)



FTA FQC Project -Objectives

- Where is Expanded Gamut in the Technology Life Cycle?
- Standards for Expanded Gamut Printing
 - FQC Work
 - First stab at standards



US Tradeshops

360 Imaging
Ad-Flex
Art Lithocraft
Color Technology
CSW
Cyber Graphics
Dixie Graphics
Dynamic Dyes
EC Shaw

Flexografix
Mark Trece
Matthews
National Printing Plate
OEC Graphics
Pen & Inc.
Phototype
R. R. Donnelley
Ray Schuman Associates

Schawk Cincinnati
Southern Atlanta
Southern Minneapolis
Southern Philadelphia
Southern Toronto
Trinity Graphics
United Engraving Corp.
West Essex Graphics



Printers

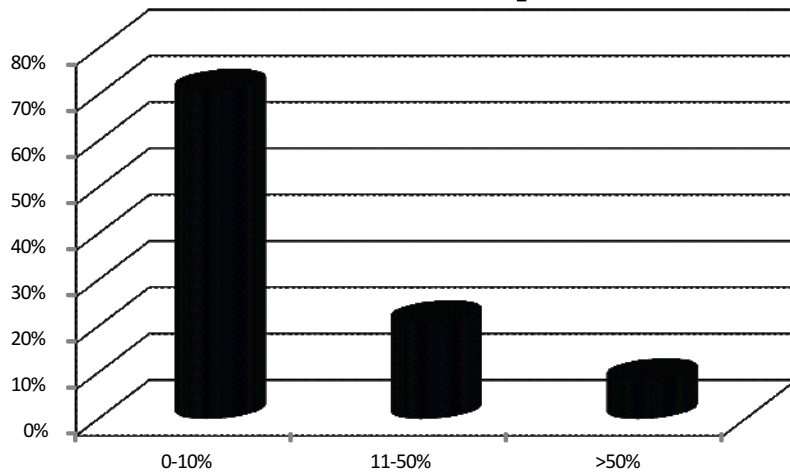
Accredo Packaging
American
Packaging
Belmark
Bemis Terra Haute
Berry Plastics
Bryce
CCL
CL&D
CP Flexible
Packaging
Cryovac

Exopack
Fastik
Folmex
Garlock Printing
McDowel Label
MPI Label
Robbie Fantastic Flexibles
Shields Bag
Superpac
Ultraflex
Walle



Distribution

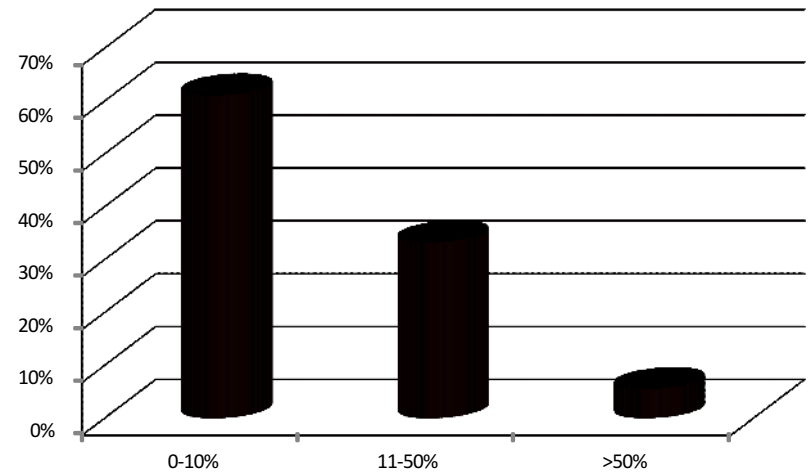
Tradeshops



Weighted average amount of Expanded gamut printing

15.8%

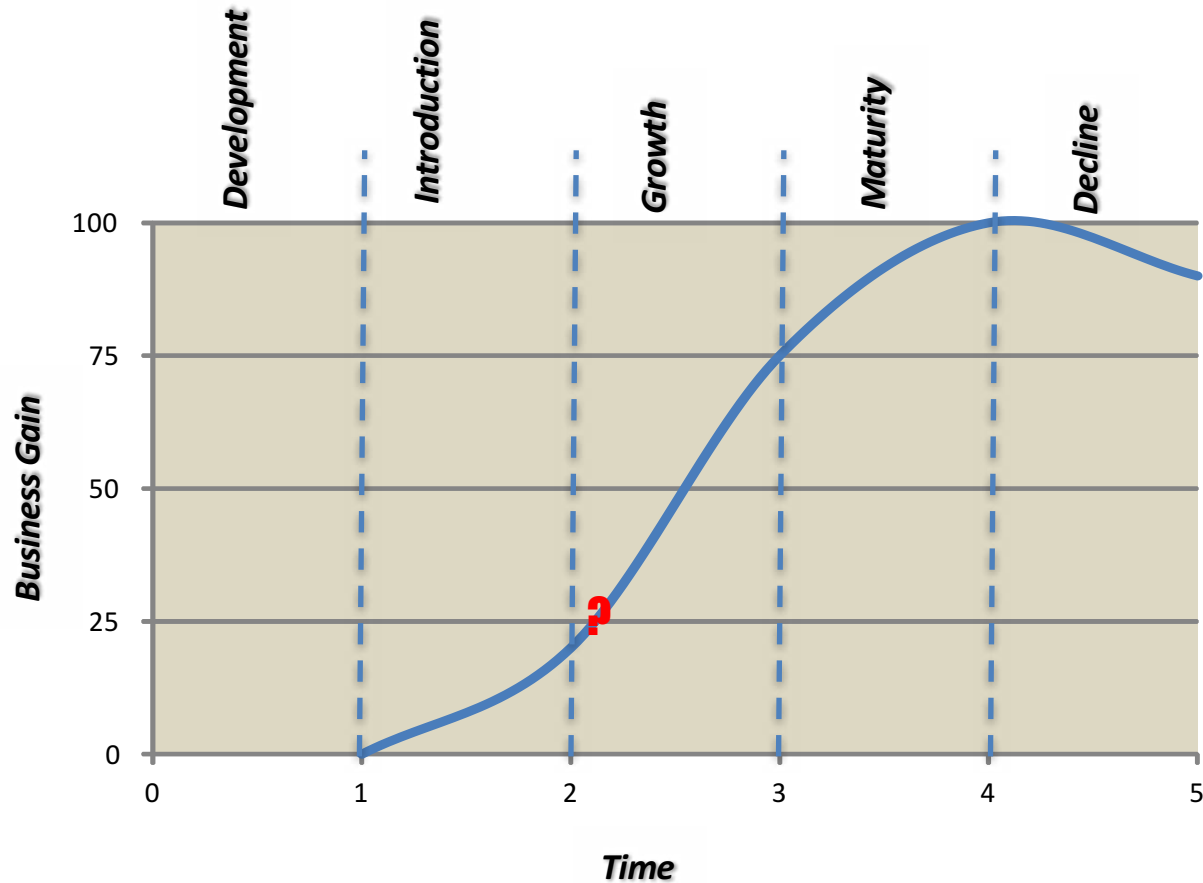
Printers



10.6%



Technology Life Cycle



Conclusion

- The amount of expanded gamut printing is significant
- Expanded gamut continues to grow
- The difference between trade shops and printers is an indication that more new jobs are going expanded gamut.
- Since this report many CPC's are increasing their consumption of 7/Color printing

– But now, there are more questions to move ahead!

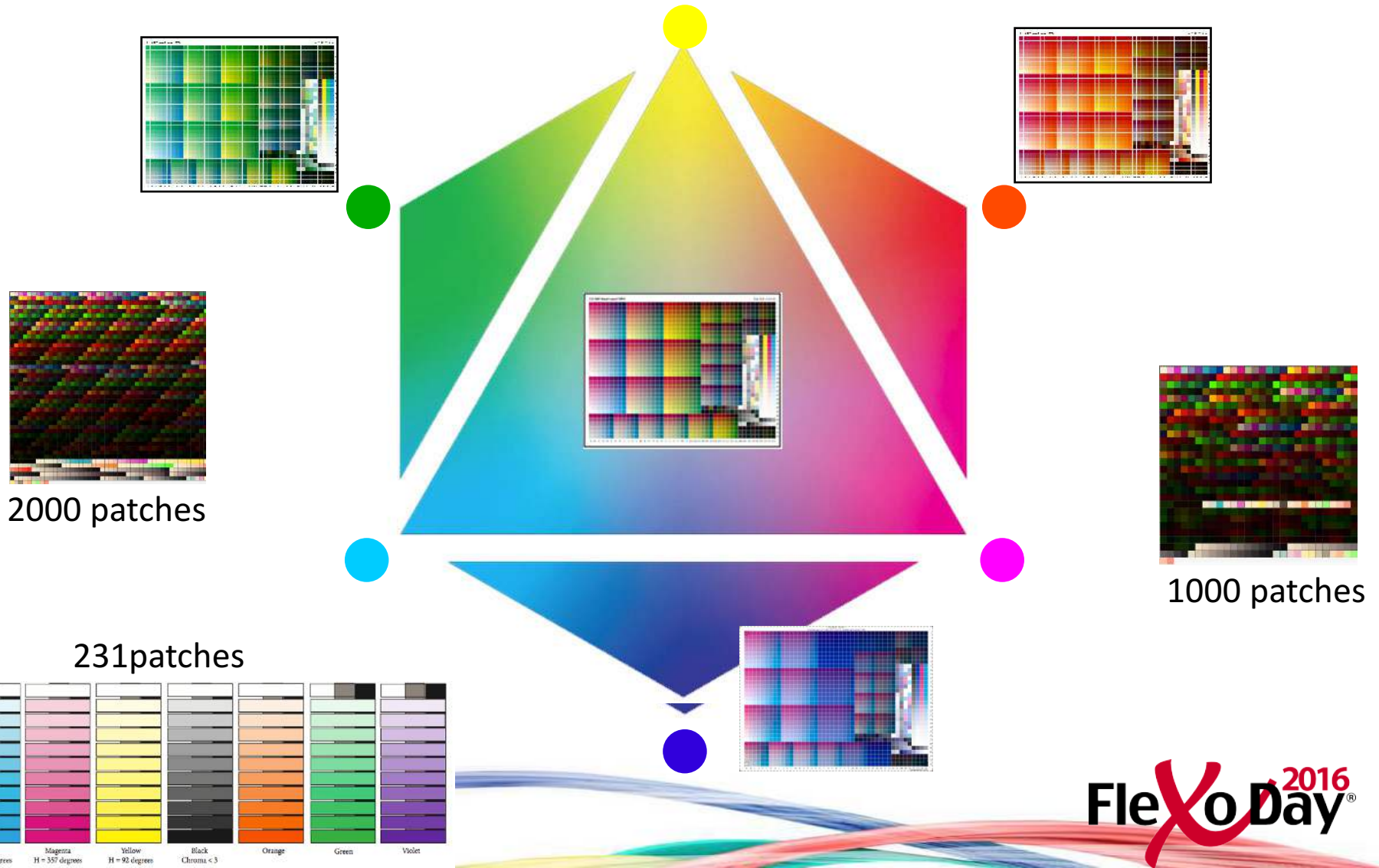


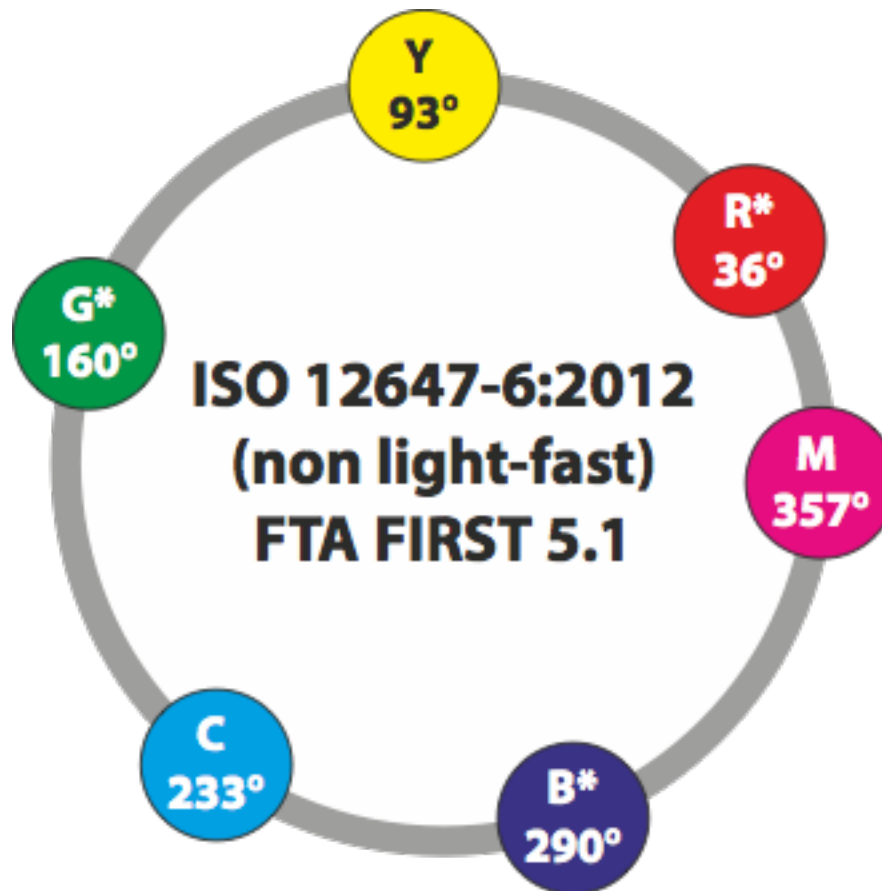
Which 7 colors / target to use?

- Simon / Ingram TAGA 1999
- FTA research 2013
- FTA FIRST – aims
- Pantone Ex Gamut Guide

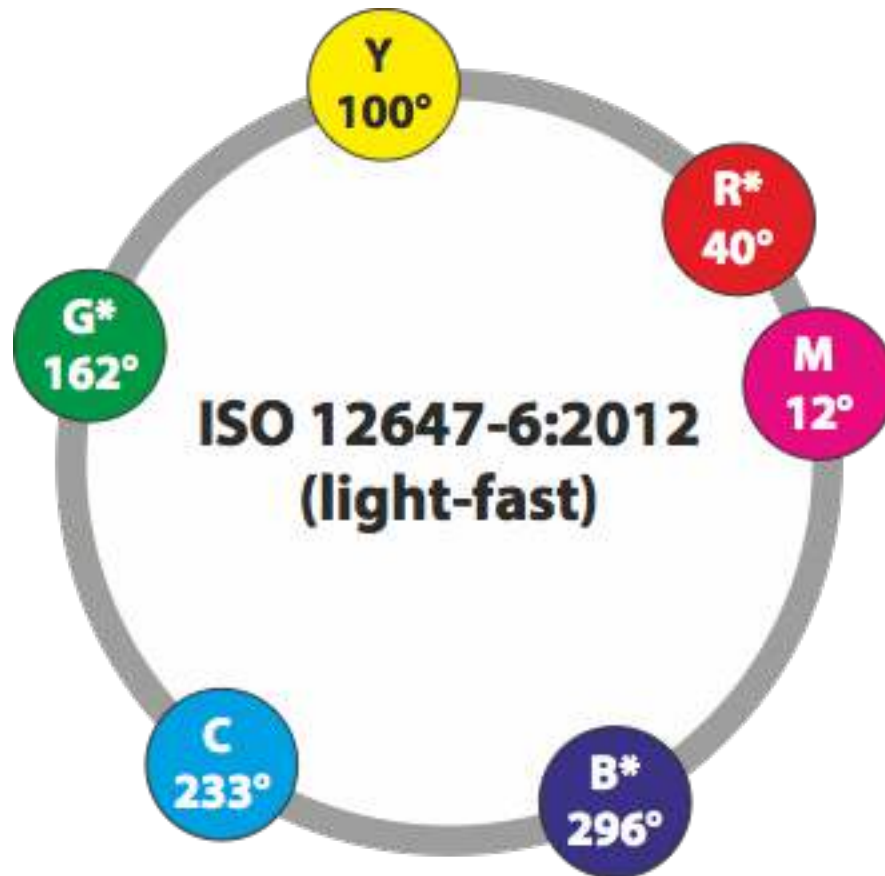


Which 7 targets to use? How many patches?

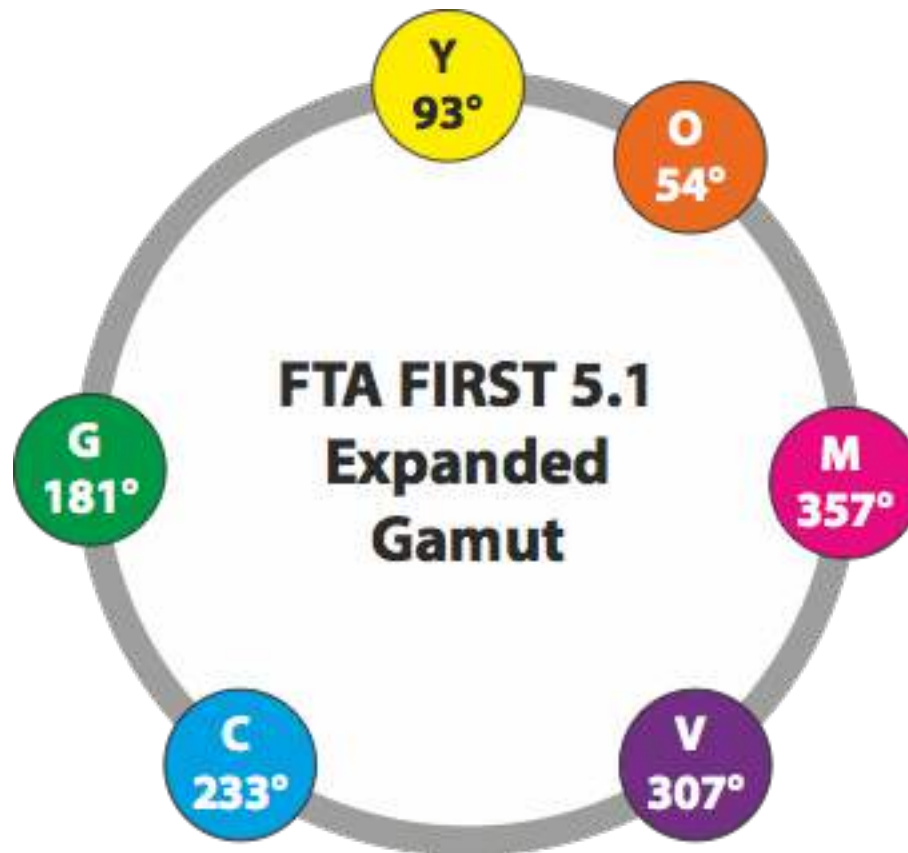




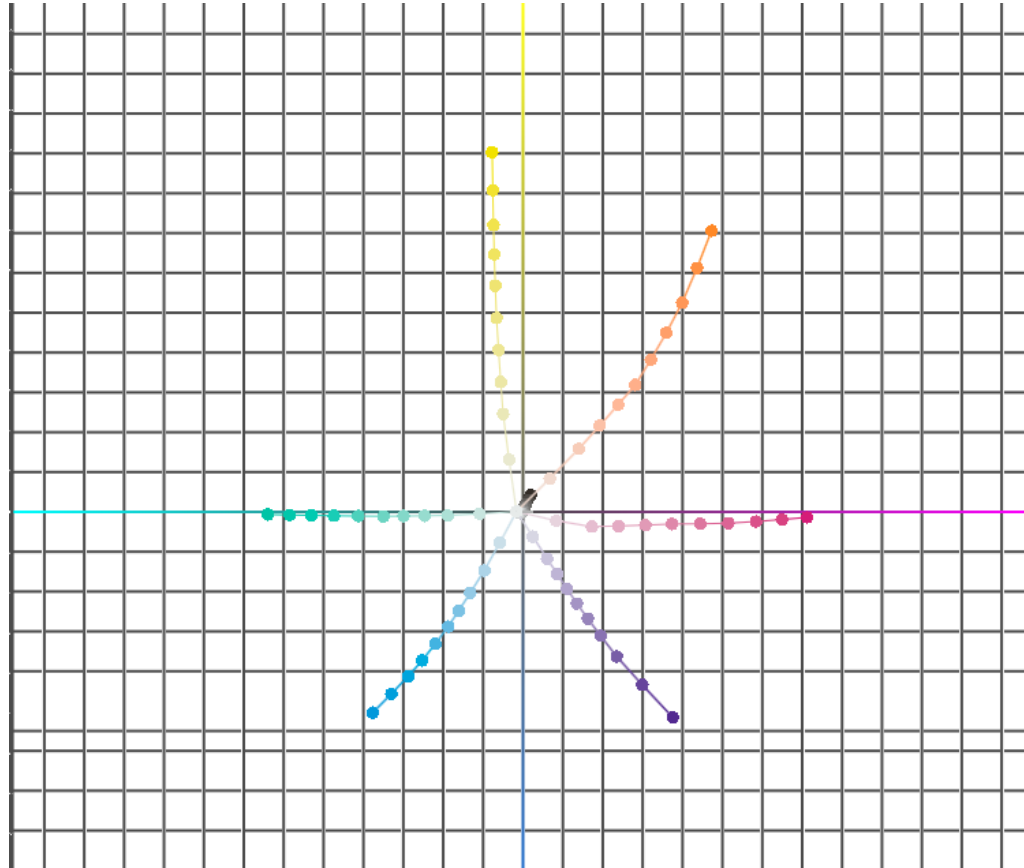
(*) only informative



(*) only informative



Important to Choose a Stable Hue Angle



ISO Alignment to CMYK OGV

- NWI
 - Defining Standards CMYKOGV in ISO Format
 - Developing CRPC with CMYKOGV



Brands

- Today many brands are asking for special OGV
 - Frito Lay example -- add picture
 - CocaCola example - utilizing their brand colours
-
- How does that affect printer efficiency?

Brands

- Today many brands are asking for special OGV
- How does that affect printer efficiency?



7 Colour Brand King



7 Colour Brand King



Different CMYK
Different Orange

Brand Colours are the 7/c



7 Colour Brand King



Different CMYK
Different Orange

Brand Colours are
the 7/c



Production requires 10 colour press!



Gamut Enhancement

- Larger gamut



Gamut Enhancement

- Match or Enhance
- CMYK Plus 8 SPOTS
 - Vs
- CMYKOGV

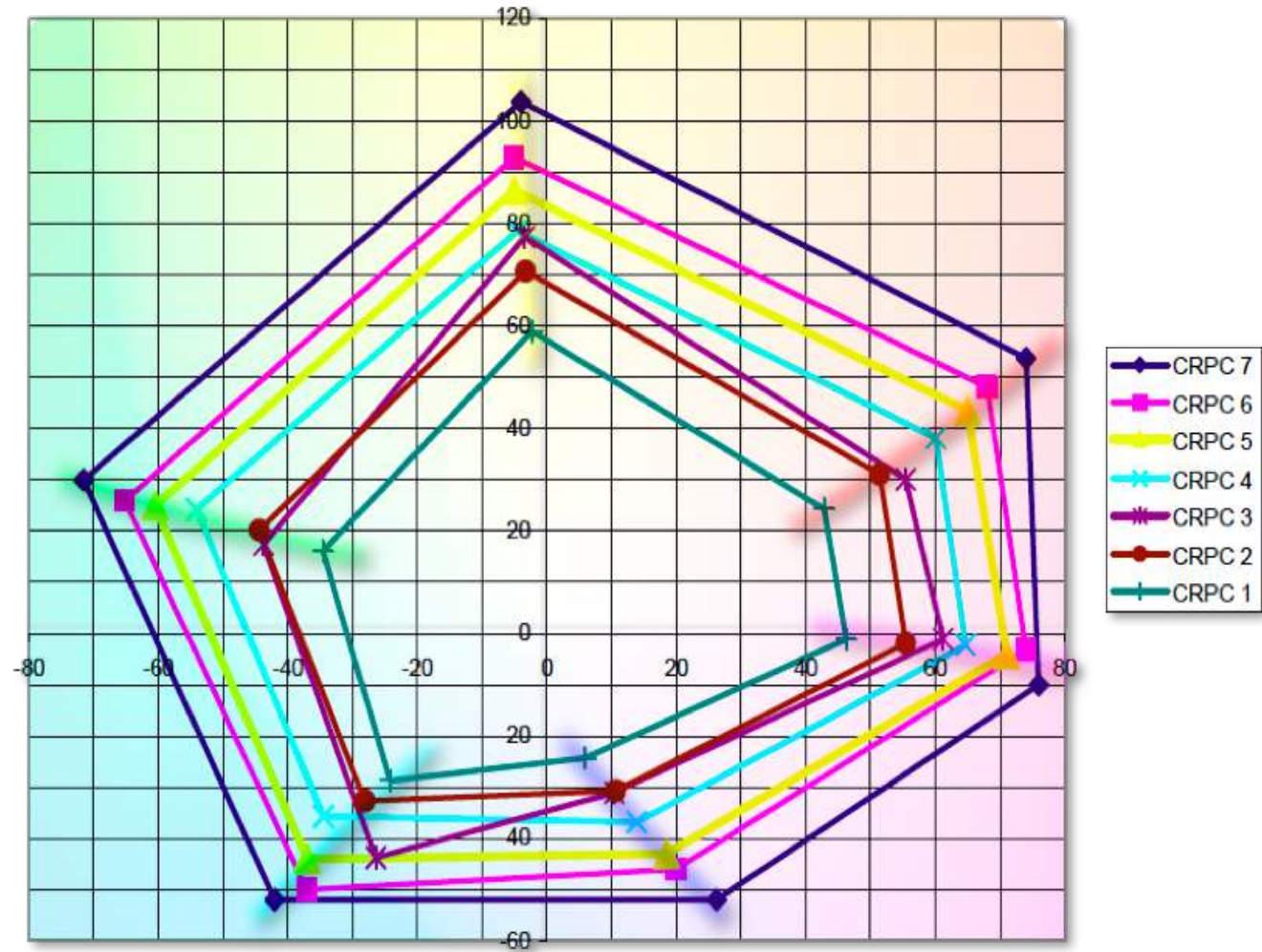


ISO 10128 Pre-Media Workflow

- This Technical Specification describes three methods for the adjustment of the digital content data that is input
 - to a printing system to achieve consistency in the printed results among a number of presses printing to the
 - same general aim conditions. These three methods are generally identified as 1) matching of tone value
 - curves, 2) use of near neutral scales, and 3) use of CMYK to CMYK multi-dimensional transforms.
 - The procedures for establishing the aim condition for the necessary transfer curves, the procedures for
 - determining the individual transfer curves, and a comparison of the applicability of these three methods are
 - included.
 - These adjustment procedures are intended for use with printing systems that use CMYK colorants. Such
 - systems are not restricted to those that use traditional ink on paper printing but may involve other
 - marking
 - technologies such as those used for proofing and/or digital printing.
-
- Linearization
 - G7 calibration
 - Spot Color



ISO 15339 common hue angles

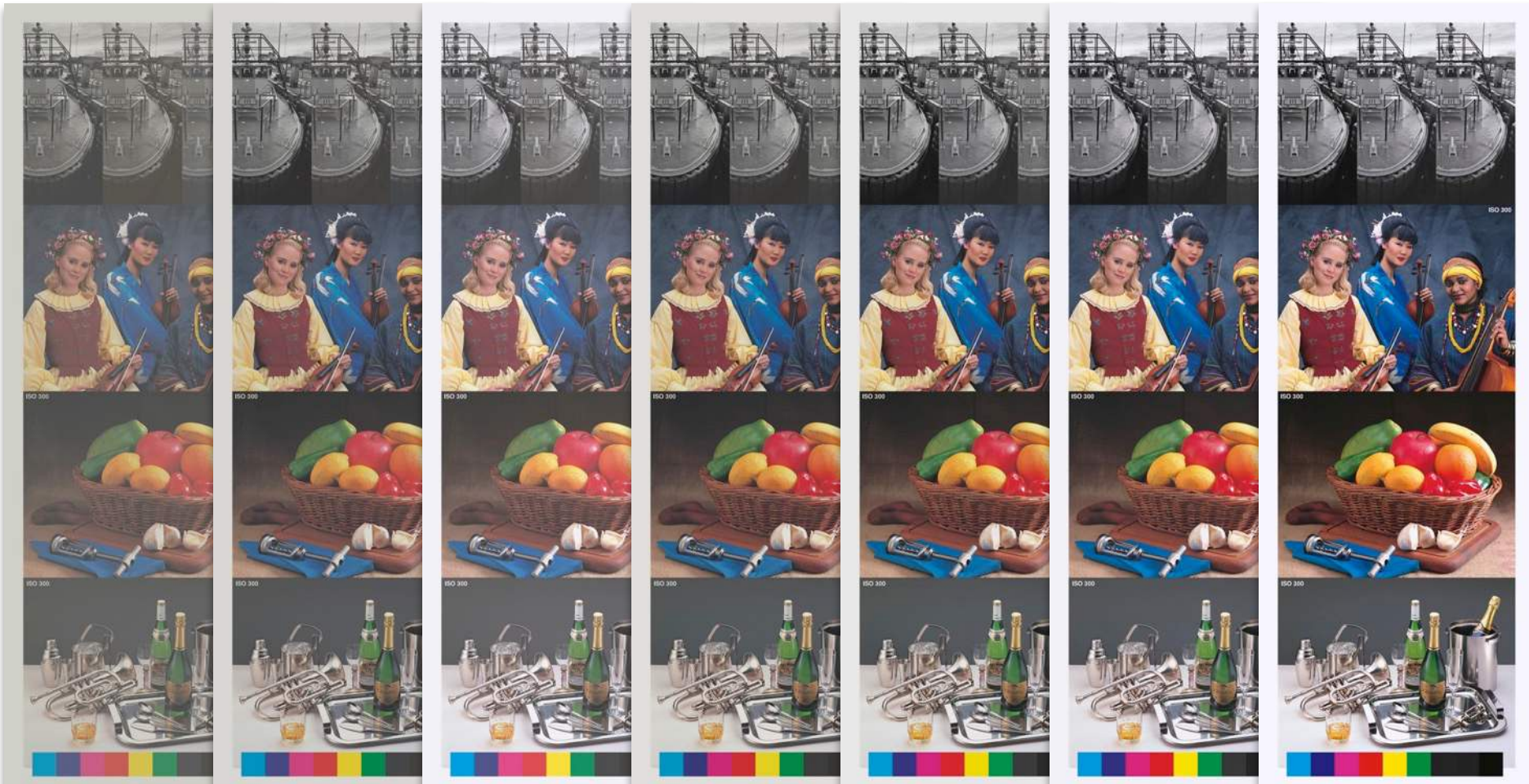


ISO 15339

- Process aligning to CMYK ISO 15339
 - CRPC 1 – Coldset News
 - CRPC 2 – Improved New, Corrugated Uncoated NO OBA
 - CRPC 3 – Uncoated, Uncoated Corrugated with OBA
 - CRPC 4 – Walmart, SCA, Cereal Box - Flexo Folding Carton
 - CRPC 5 – Wide Web Flexo, Web Offset, Corrugated Coated Flexo
 - CRPC 6 – Narrow Web Flexo, Sheetfed Coated, Gravure
 - CRPC 7 – Wide Gamut Digital, Flexo New Plate Technology



ISO 15339 - (including paper color)



2

3

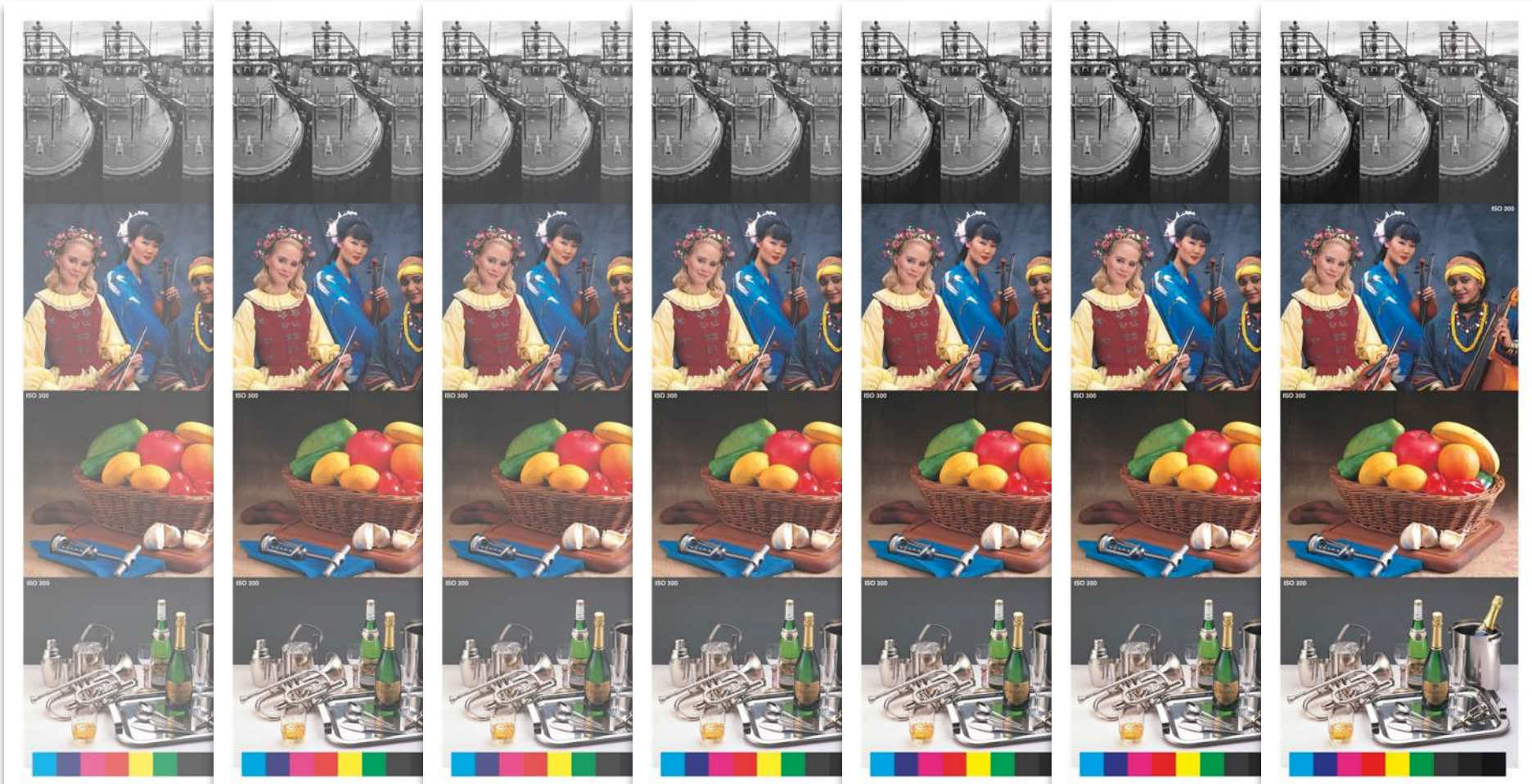
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5

6

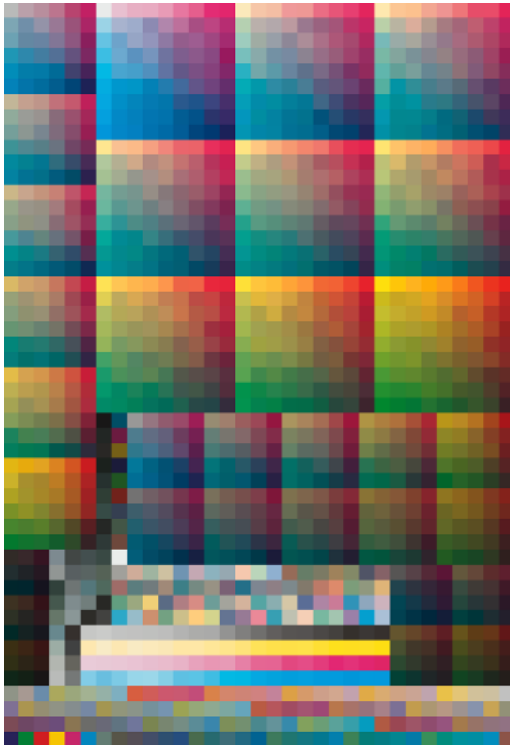
7

ISO 15339 – (paper-adapted)

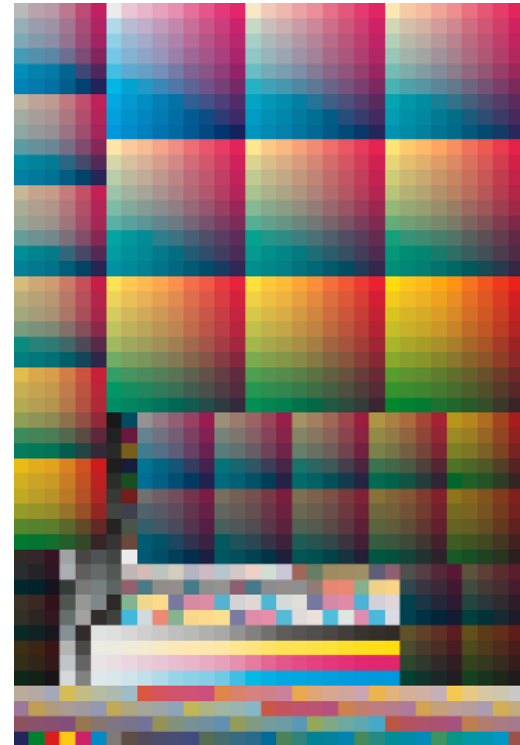


7 color calibration

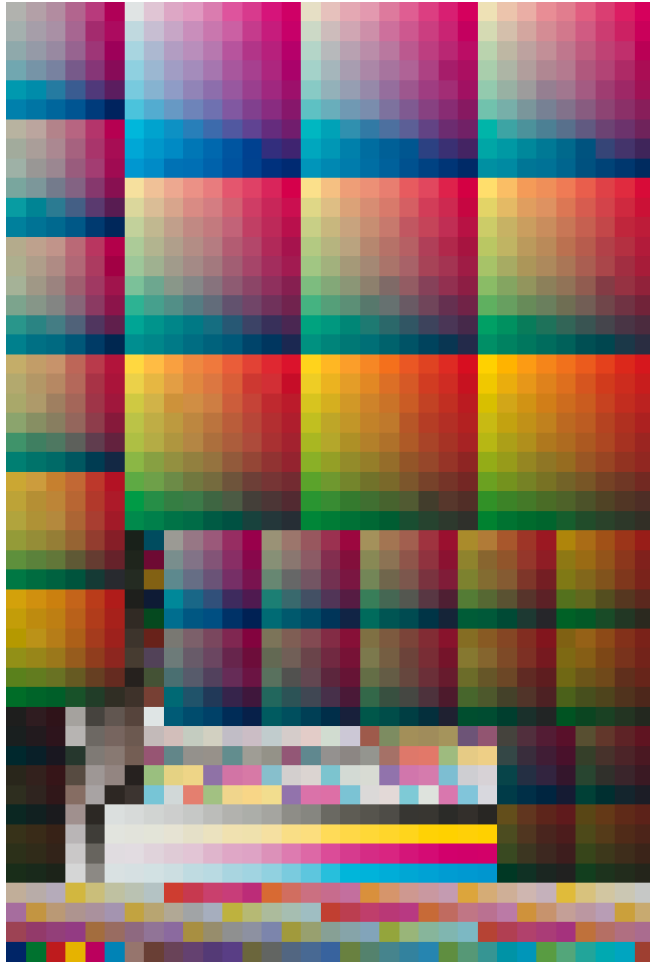
- Process aligning to CMYK as base – Calibration
- Standard file format



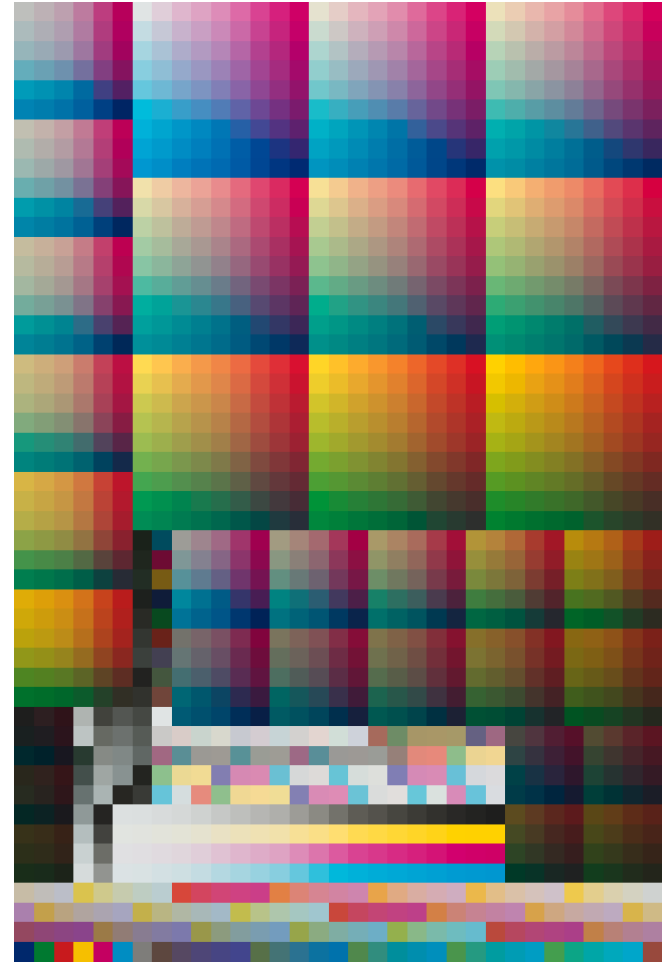
Note: This is a
real life
example,
not a
“PowerPoint
Exaggeration”



Typical Smoothing: Offset or Flexo



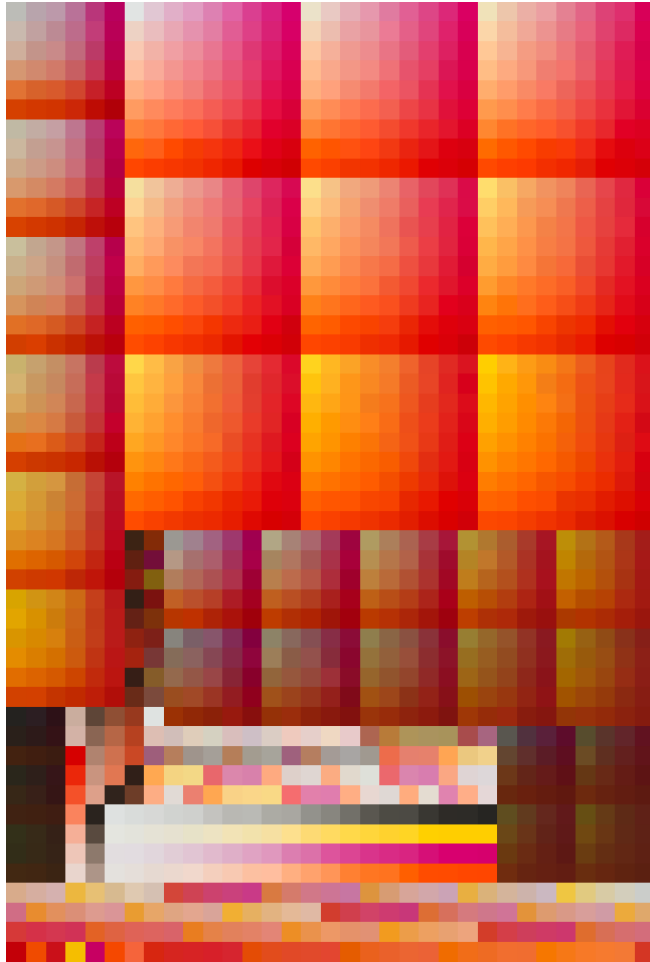
Original Data (before smoothing)



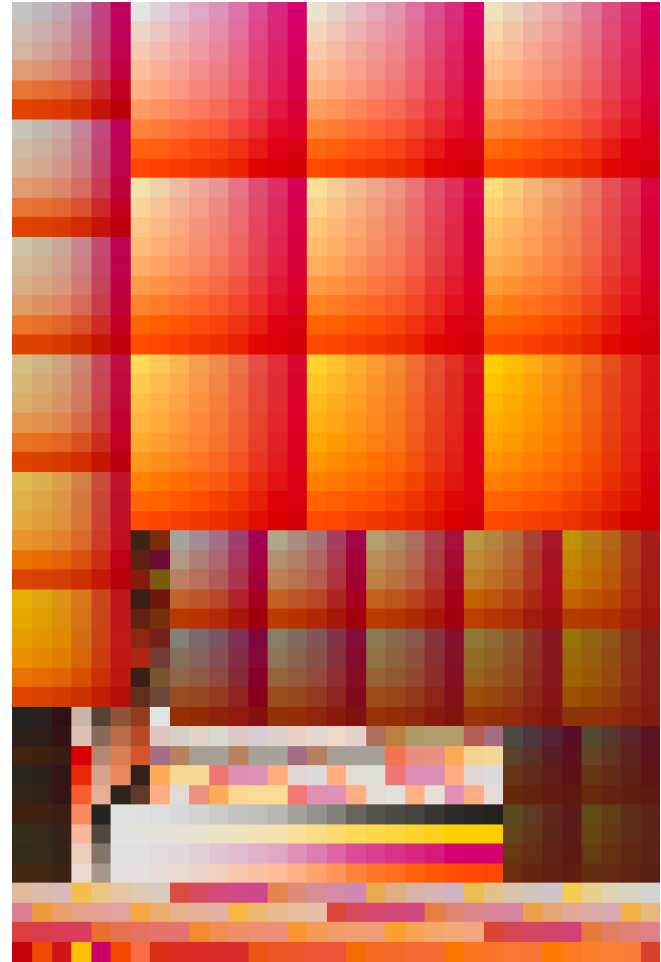
Final Data (after smoothing)



Typical Smoothing: Offset or Flexo

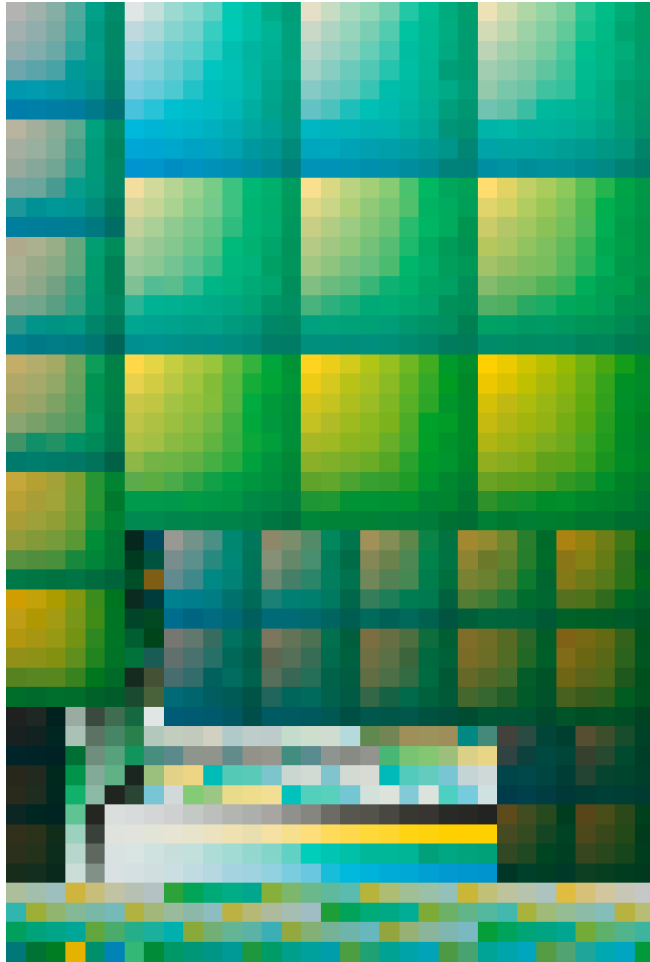


Original Data (before smoothing)

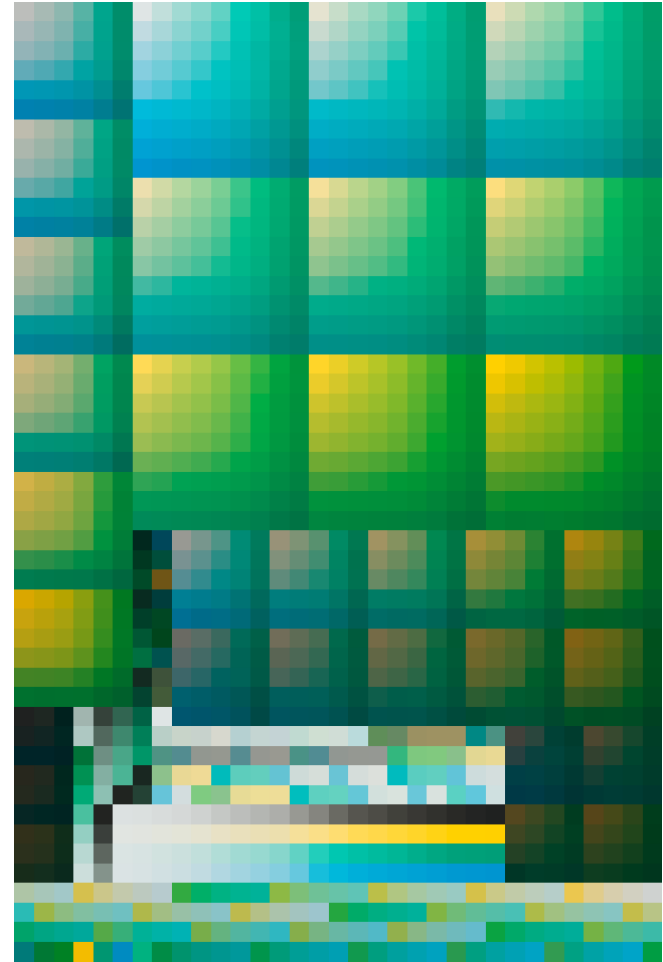


Final Data (after smoothing)

Typical Smoothing: Offset or Flexo

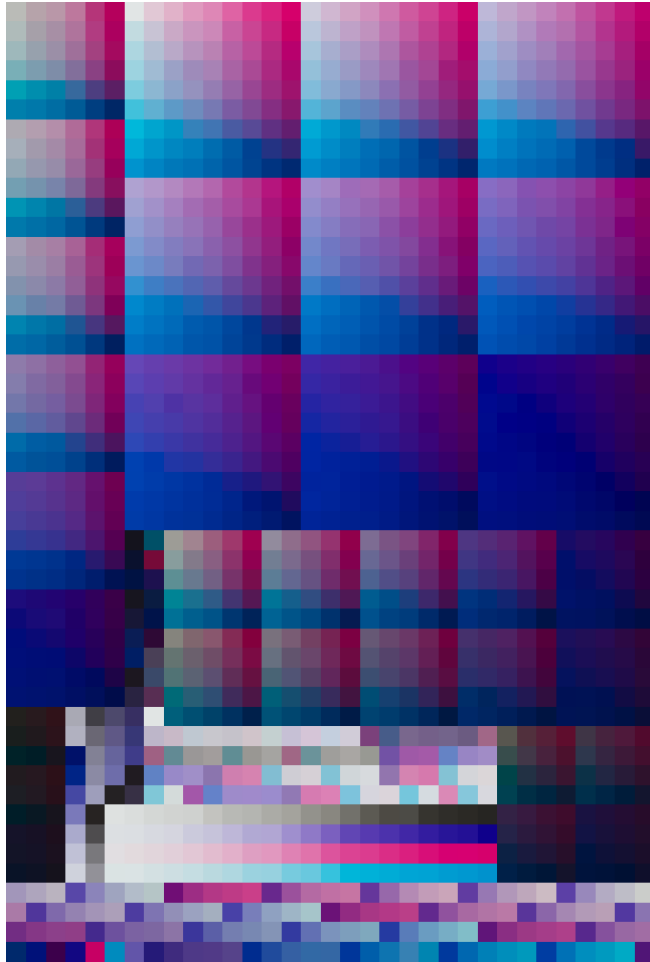


Original Data (before smoothing)

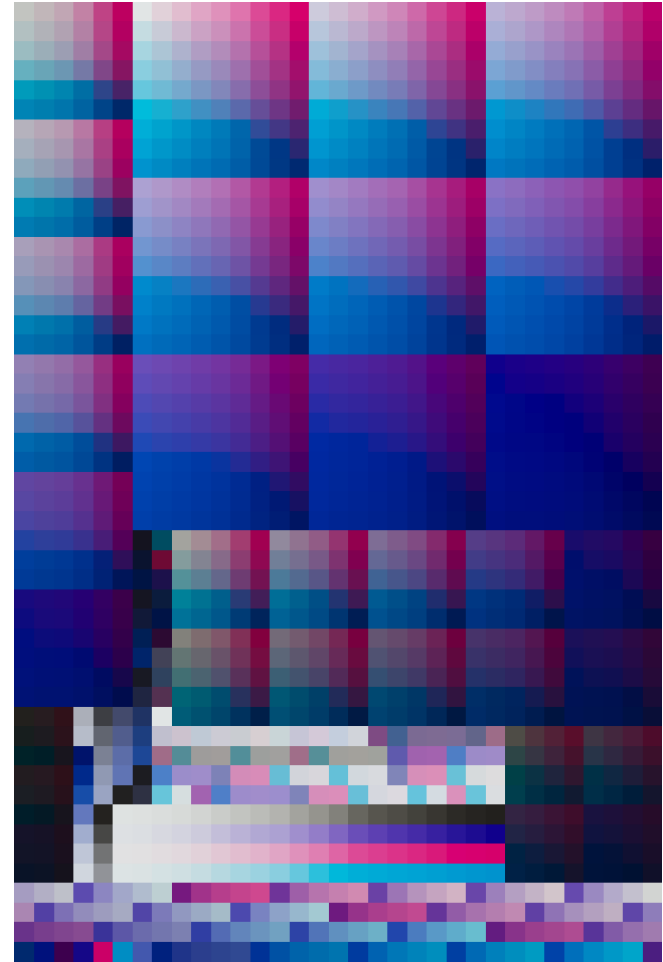


Final Data (after smoothing)

Typical Smoothing: Offset or Flexo



Original Data (before smoothing)



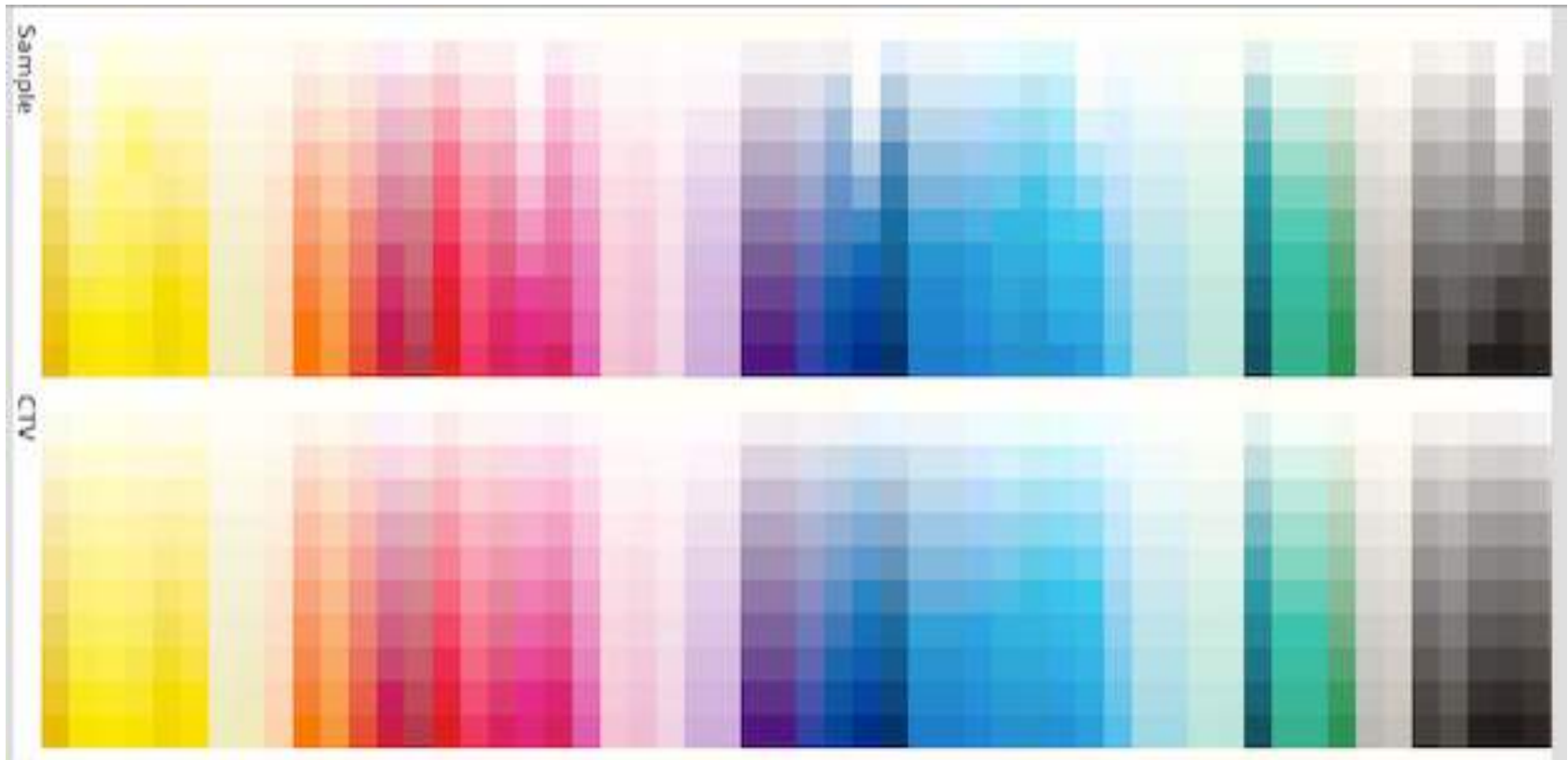
Final Data (after smoothing)

Aligning spot colours

- Current ISO state - misalignment with Spectral Density and Murray Davies
- Better Alignment with ISO 20654 – Spot Colour Characterization
- 7/colour profiles of CMYK with CxF/X for spots?



Current State – Spot Colour with TV

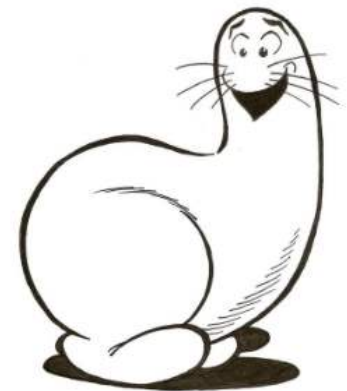


Schmoo

Spot Colour Halftone Metric Optimization

Org

- Now ISO DIS 20654 – Graphic Technology - Spot Colour Tone Value – ballot closes 21-11-2016



ISO 20654 –Measurement and Calculation of Spot Colour Tone Value

- Visual Alignment across tones, and colours
- Spectral data should be used where possible
- ISO 17972-4 CxF X4 communication
- Formulas for both:
 - Spectral
 - Lab
- Annex Spectral Density

ISO TC 130/SC N

Date: 2015-05-11

ISO/WD 20654

ISO TC 130/SC /WG 3

Secretariat: SAC

Graphic technology — Measurement and Calculation of Spot Colour Tone Value (SCTV)

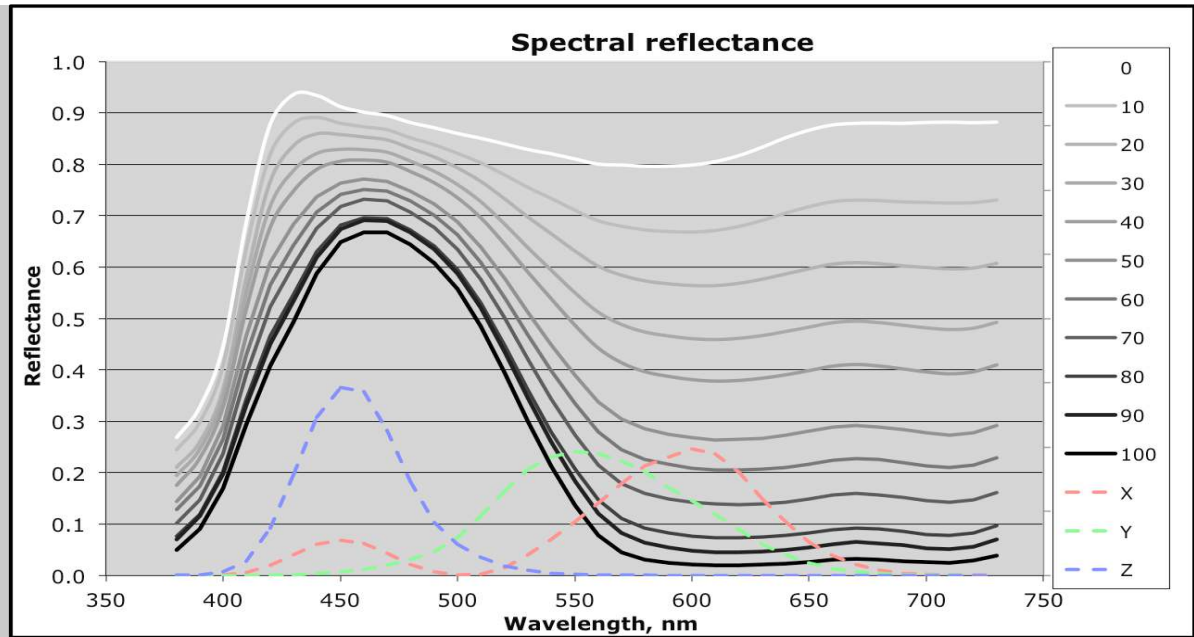
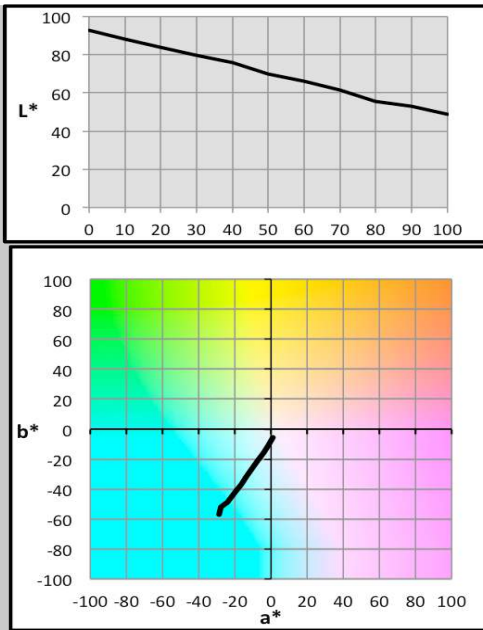
Élément introductif — Élément central — Élément complémentaire

Warning

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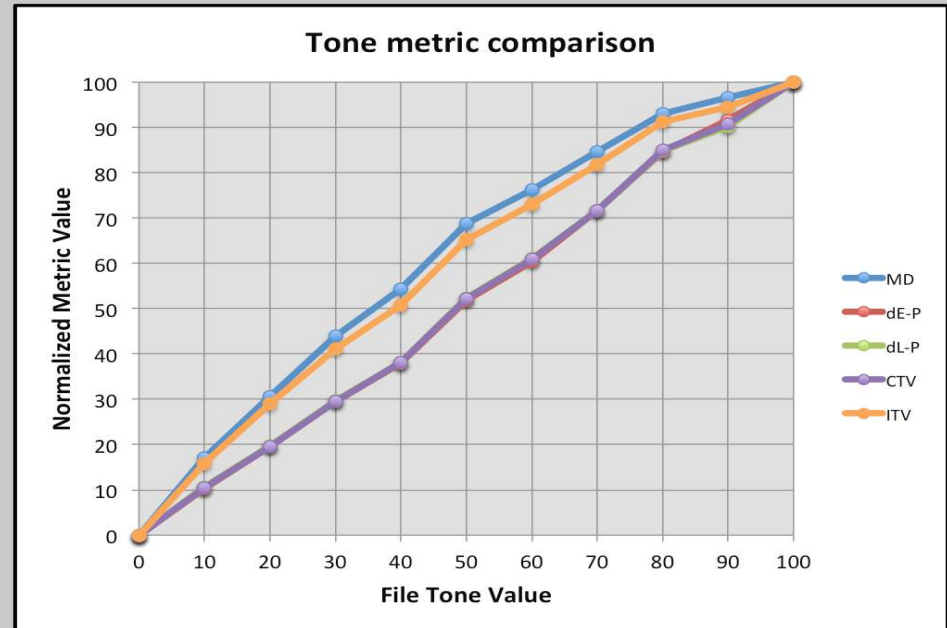
Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.





Blue Base

File TV	MD	dE-P	dL-P	CTV	ITV
0	0.0	0	0.0	0	0.0
10	17.0	10.2	10.6	10.5	15.8
20	30.7	19.5	19.7	19.6	29.1
30	44.0	29.5	29.7	29.6	41.2
40	54.3	38.0	38.1	38.0	50.7
50	68.8	51.8	52.3	52.2	65.1
60	76.3	60.4	61.0	60.9	73.0
70	84.7	71.6	71.6	71.6	81.7
80	93.0	84.7	84.9	85.0	91.2
90	96.6	91.6	90.2	90.7	94.4
100	100.0	100.0	100.0	100.0	100.0



Press Data

M-D

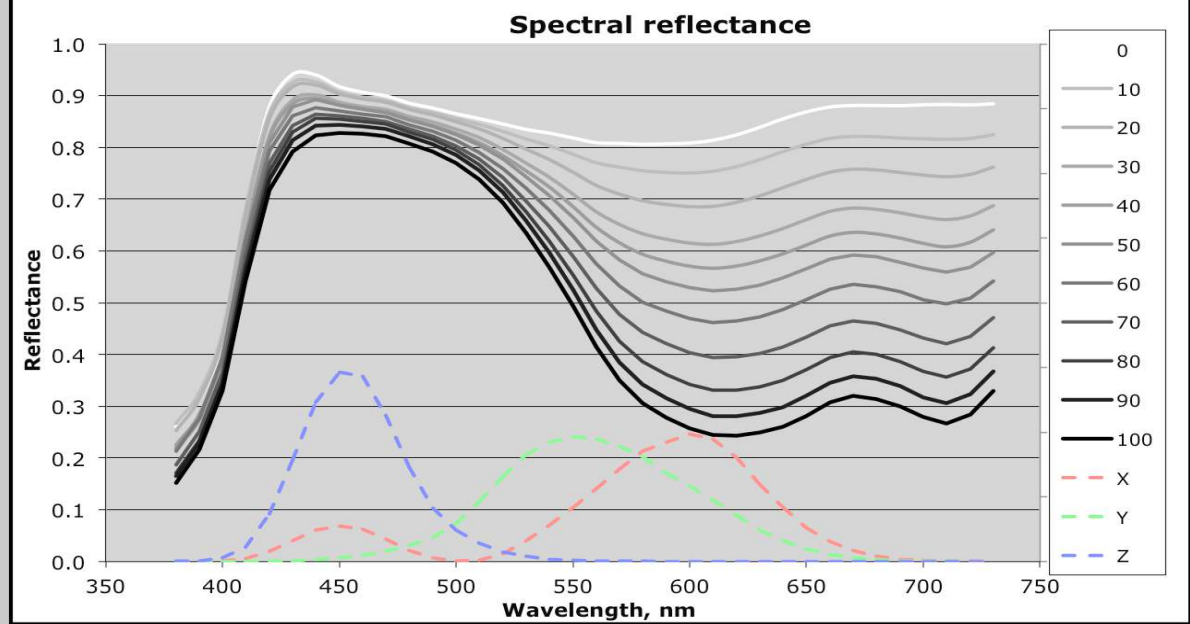
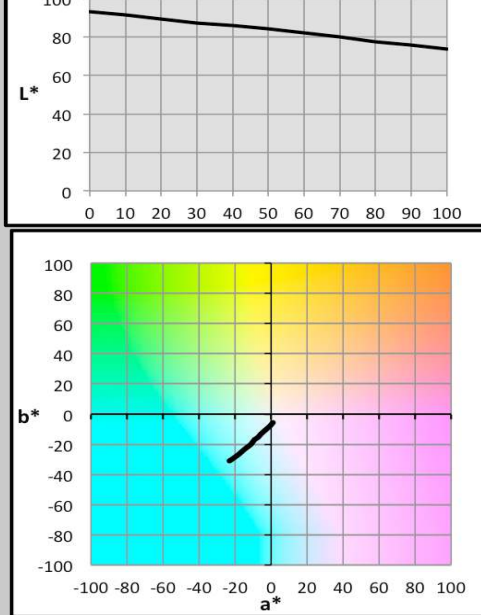
dE-P

dL-P

CTV

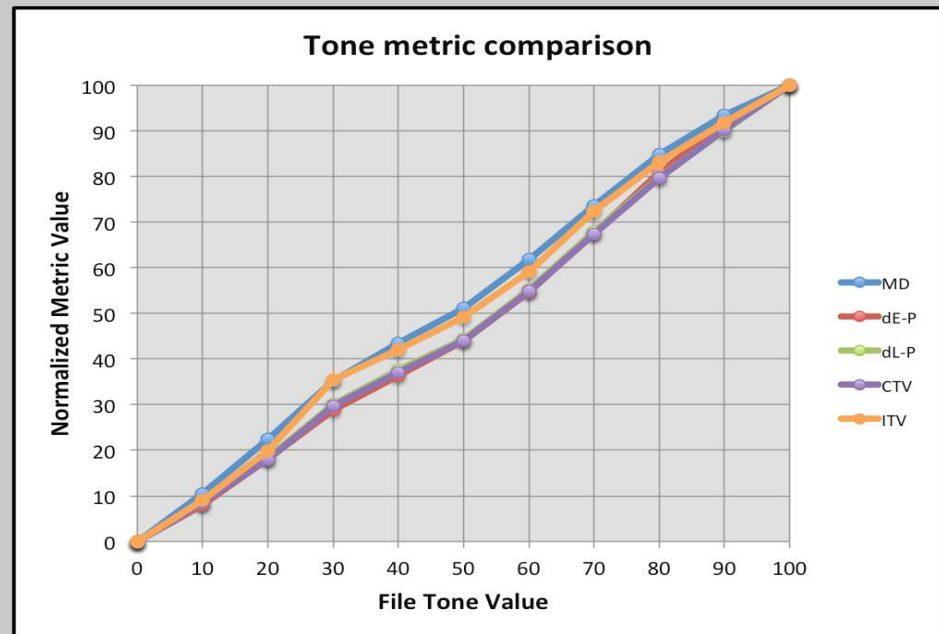
ITV





Blue Extended

File TV	MD	dE-P	dL-P	CTV	ITV
0	0.0	0	0.0	0	0.0
10	10.5	8.0	8.6	8.5	9.0
20	22.4	18.1	18.3	18.0	20.0
30	35.3	28.8	30.1	29.8	35.4
40	43.4	36.3	37.5	37.1	42.0
50	51.1	44.0	44.3	44.0	49.2
60	61.8	54.6	55.3	54.8	59.1
70	73.6	67.6	67.8	67.4	72.3
80	84.8	80.8	79.9	79.7	83.3
90	93.4	91.6	90.1	90.2	91.7
100	100.0	100.0	100.0	100.0	100.0



Press Data

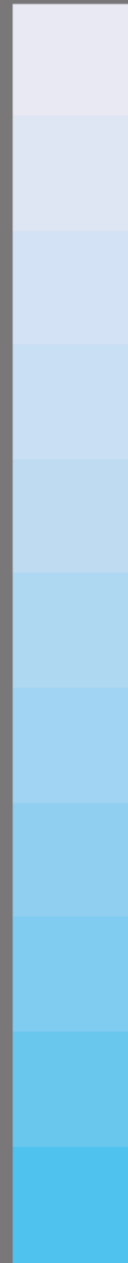
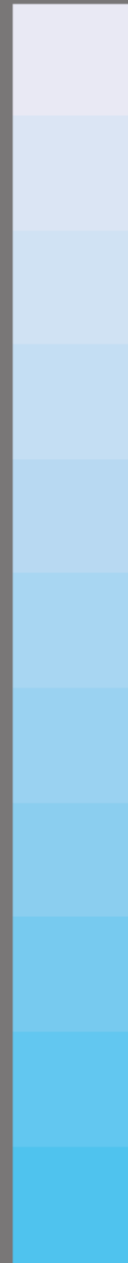
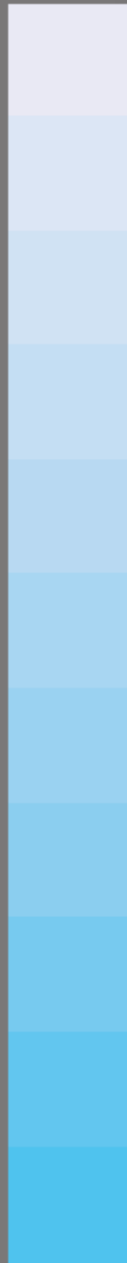
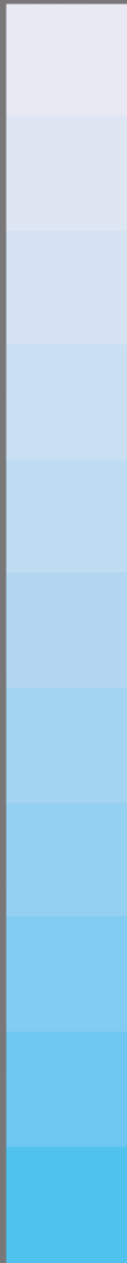
M-D

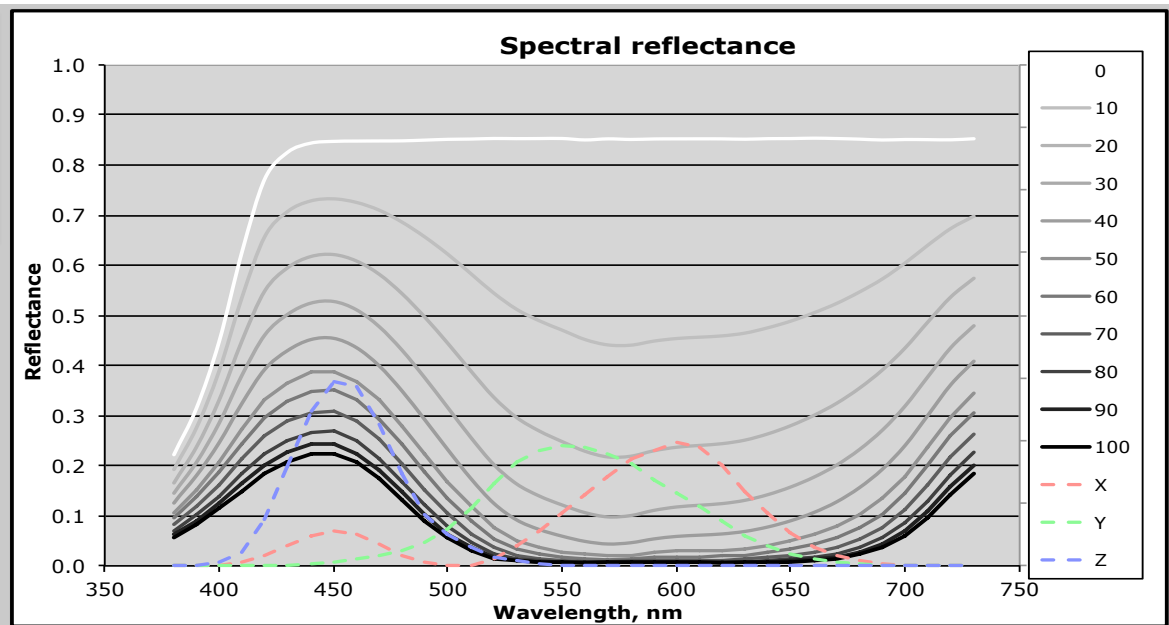
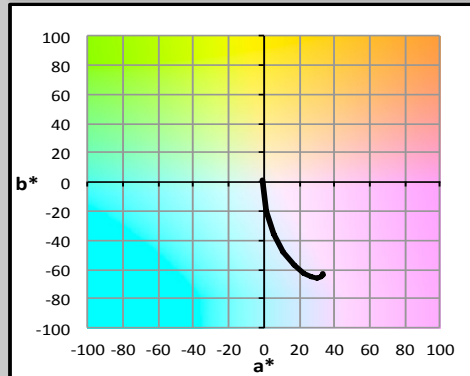
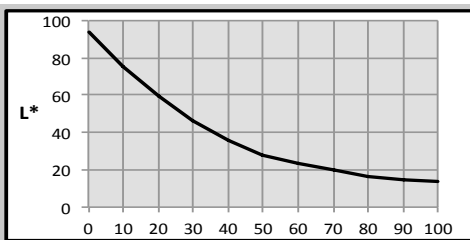
dE-P

dL-P

CTV

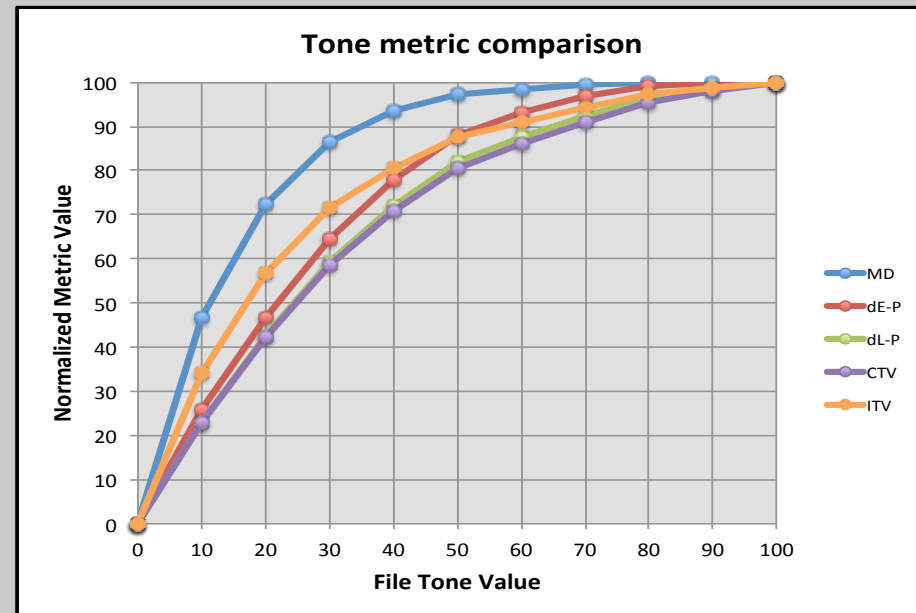
ITV





Reflex Blue

File TV	MD	dE-P	dL-P	CTV	ITV
0	0.0	0	0.0	0	0
10	46.7	25.8	22.9	22.8	34.21
20	72.2	46.7	42.5	42.1	56.74
30	86.3	64.6	59.2	58.4	71.44
40	93.4	77.9	71.9	70.7	80.69
50	97.1	87.8	82.0	80.6	87.49
60	98.5	93.1	87.6	86.1	90.98
70	99.3	96.9	92.4	91.1	94.29
80	99.8	99.2	96.3	95.4	97.12
90	99.9	100.0	98.6	98.1	98.85
100	100.0	100.0	100.0	100.0	100.00



ReflexBlue

Press Data

M-D

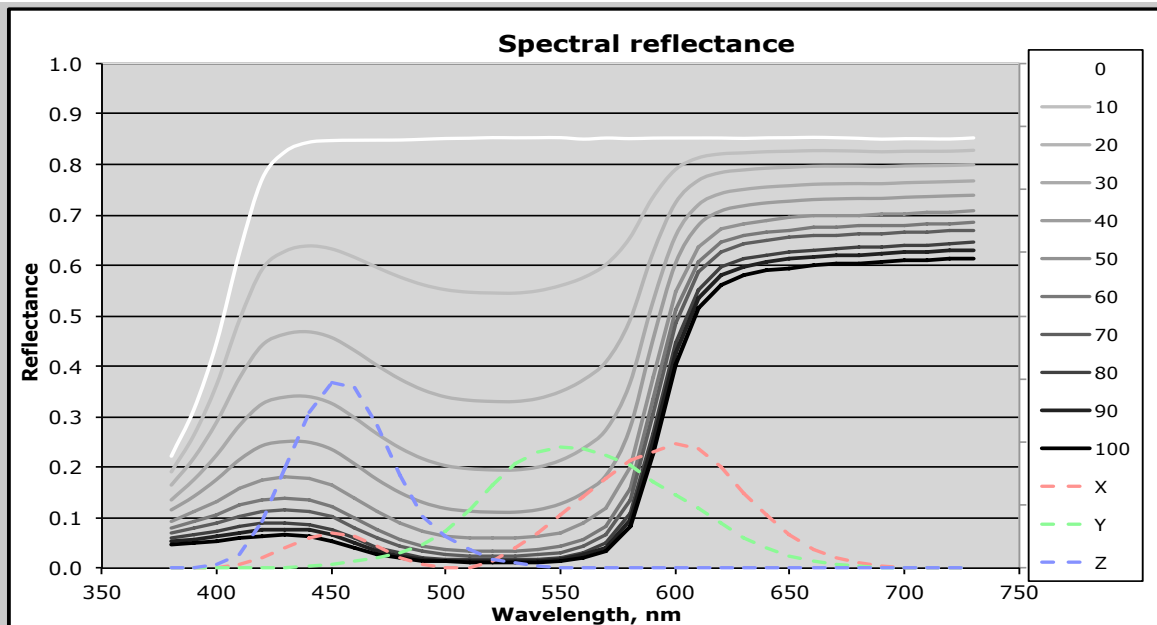
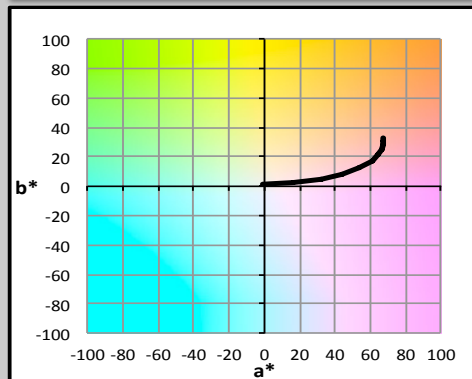
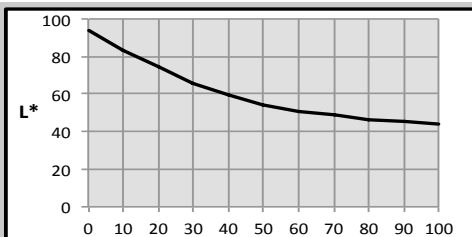
dE-P

dL-P

CTV

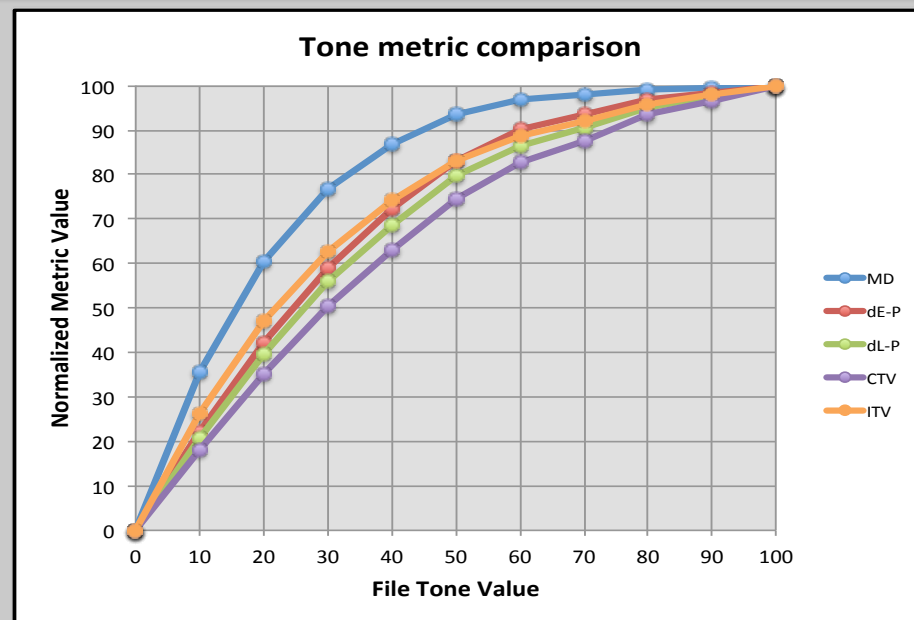
ITV





PMS186

File TV	MD	dE-P	dL-P	CTV	ITV
0	0.0	0	0.0	0	0.0
10	35.4	22.2	20.8	18.0	26.1
20	60.6	42.4	39.8	35.2	46.9
30	76.7	58.9	55.9	50.4	62.9
40	86.9	72.2	68.7	63.0	74.1
50	93.5	83.2	79.7	74.7	83.3
60	96.7	90.0	86.6	82.7	88.7
70	98.1	93.5	90.5	87.5	91.9
80	99.2	96.7	95.2	93.4	95.9
90	99.6	98.4	97.4	96.5	97.9
100	100.0	100.0	100.0	100.0	100.0



PMS186

Press Data

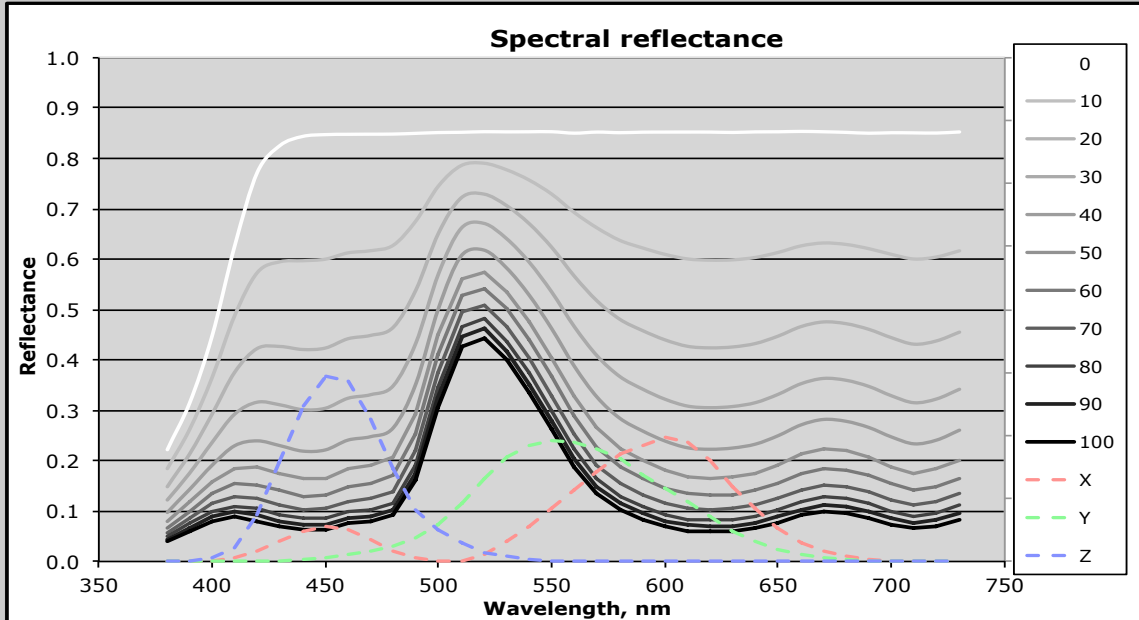
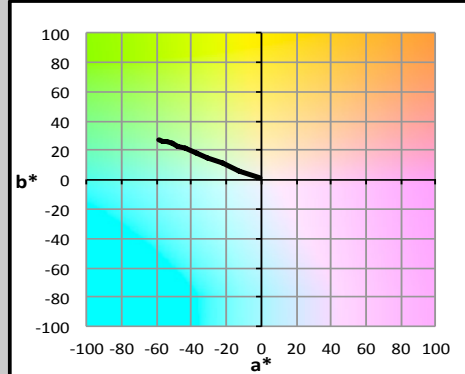
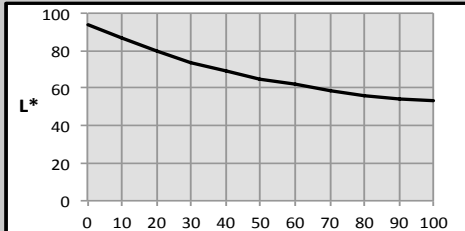
M-D

dE-P

dL-P

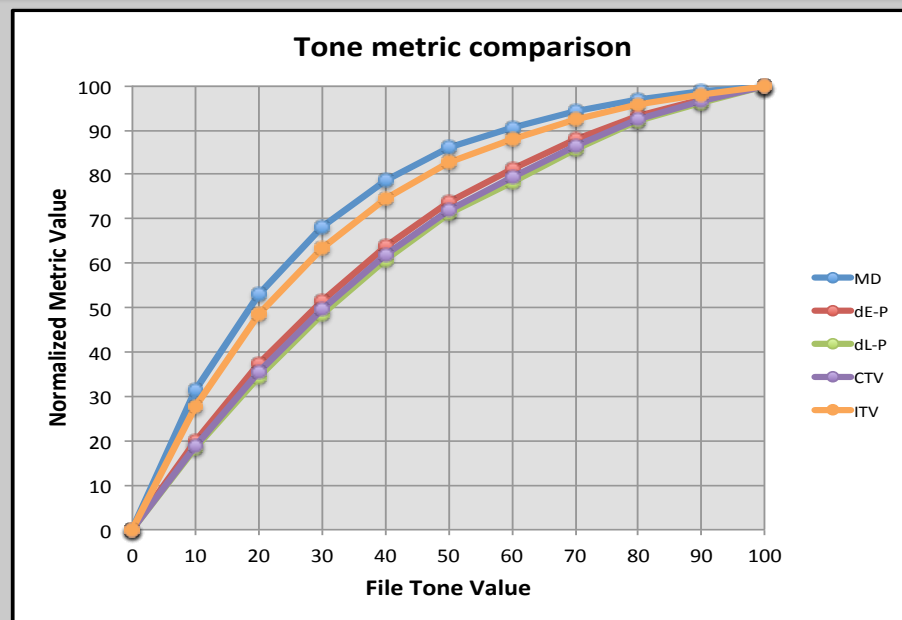
CTV

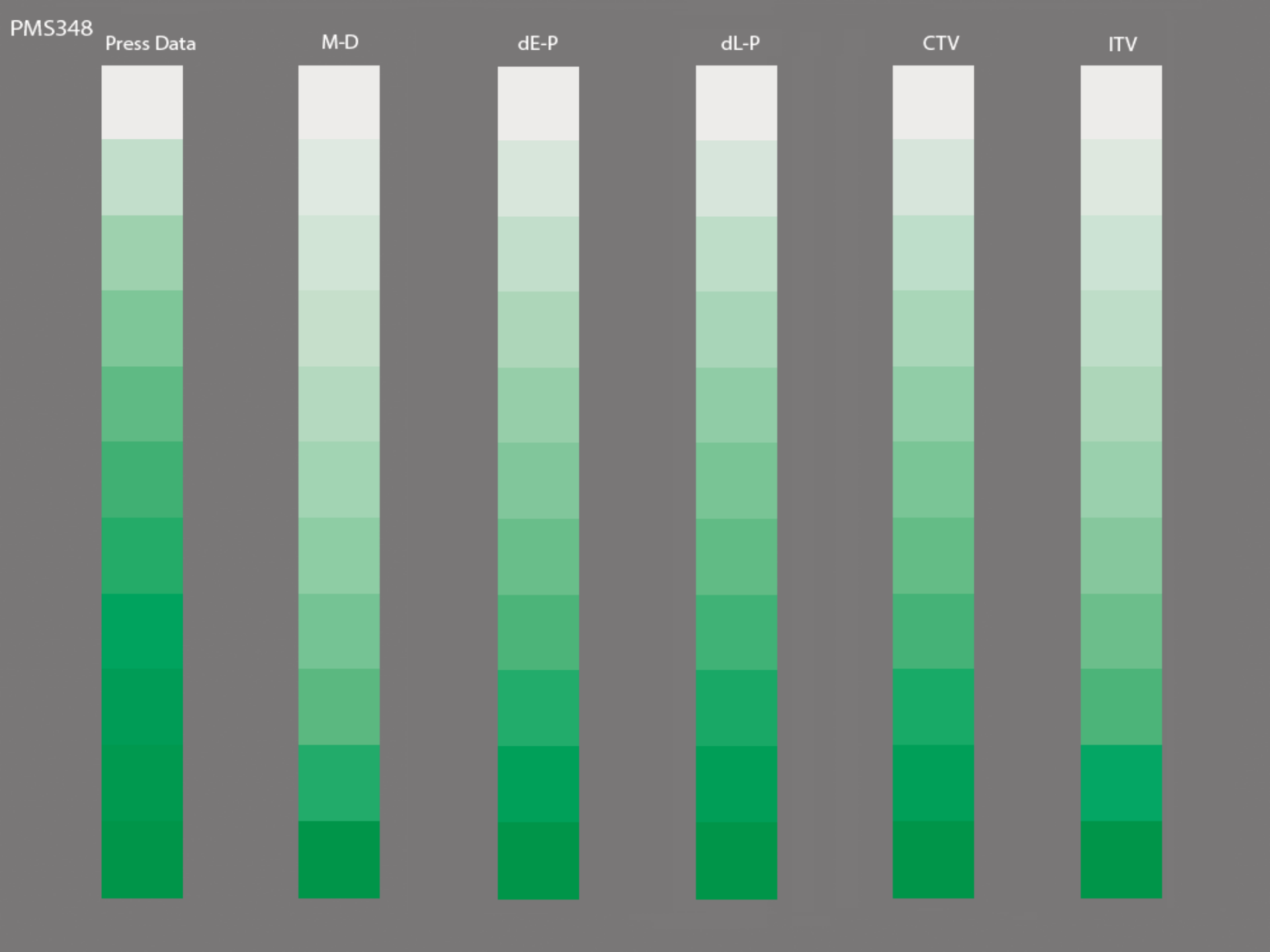
ITV



PMS348

File TV	MD	dE-P	dL-P	CTV	ITV
0	0.0	0	0.0	0	0.0
10	31.4	20.0	18.3	18.8	27.8
20	53.2	37.3	34.5	35.4	48.5
30	68.2	51.7	48.6	49.6	63.5
40	78.7	63.8	60.8	61.9	74.7
50	86.0	73.9	71.1	72.1	82.8
60	90.5	81.2	78.3	79.4	88.0
70	94.3	87.9	85.6	86.5	92.5
80	97.0	93.1	91.9	92.3	95.9
90	98.6	96.7	96.1	96.4	98.2
100	100.0	100.0	100.0	100.0	100.0



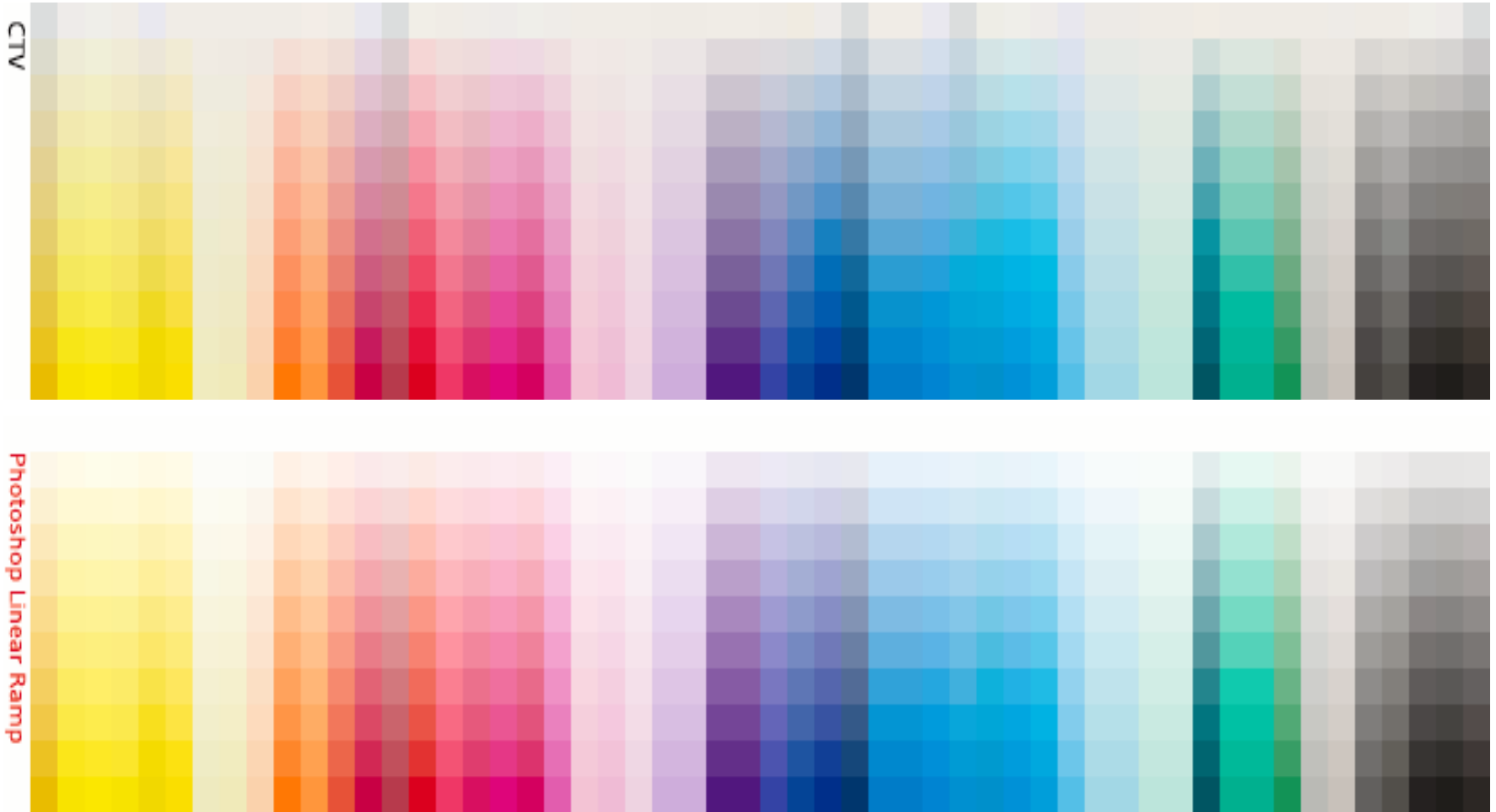


New Method for Calculations

- Using CTV style calculations - Bill Burket, Hanno Hoffstead
- Alignment across multiple colors, pastel, saturated, opaque, on kraft
- Alignment with Creation softwares – Adobe
- Aligns seamlessly with Offset, Digital, and Flexography
- Does not align perfectly with Gravure (gravure will require a slightly different co-efficient)



Alignment with creation software



Spectral Formula

- **Step 1:** measure the spectral reflectance of the substrate (R_{pl}), a patch of the solid spot ink (R_{sl}) and a patch of an intermediate tone (R_{tl}) and select or measure the spectral power distribution of the illuminant (S_l) to be used for viewing the print.
- **Step 2:** for each of these measurements calculate V_x , V_y and V_z as shown below:
 - $X = S_\lambda \times R_\lambda \times x_\lambda \quad V_x = f_{XX} n \times 10^{-16}$
 - $Y = S_\lambda \times R_\lambda \times y_\lambda \quad V_y = f_{YY} n \times 10^{-16}$
 - $Z = S_\lambda \times R_\lambda \times z_\lambda \quad V_z = f_{ZZ} n \times 10^{-16}$
 - $SCTV = \sqrt{V_{xt}^2 - V_{xp}^2 + V_{yt}^2 - V_{yp}^2 + V_{zt}^2 - V_{zp}^2} \sqrt{V_{xs}^2 - V_{xp}^2 + V_{ys}^2 - V_{yp}^2 + V_{zs}^2 - V_{zp}^2}$
 - Where:
 - V_{xs} , V_{ys} , V_{zs} are the V_x , V_y , V_z values calculated for the spot ink solid,
 - V_{xp} , V_{yp} , V_{zp} are the V_x , V_y , V_z values calculated for the substrate and
 - V_{xt} , V_{yt} , V_{zt} are the V_x , V_y , V_z values calculated for the intermediate spot ink tone.



Lab Formula

- **Step 1:** measure the CIELab of the substrate (L_p, a_p, b_p) a patch of the solid spot ink (L_s, a_s, b_s) and a patch of an intermediate tone (L_t, a_t, b_t).
- **Step 2:** for each of these measurements calculate V_x, V_y and V_z as shown below.
 - $V_x = L + 116 \times a / 500$
 - $V_y = L$
 - $V_z = L - 116 \times b / 200$
- **Step 3:** calculate SCTV as:
 - $SCTV = \sqrt{V_{xt} - V_{xp}}^2 + \sqrt{V_{yt} - V_{yp}}^2 + \sqrt{V_{zt} - V_{zp}}^2 \sqrt{V_{xs} - V_{xp}}^2 + \sqrt{V_{ys} - V_{yp}}^2 + \sqrt{V_{zs} - V_{zp}}^2$
- Where
 - V_{xs}, V_{ys}, V_{zs} are the V_x, V_y, V_z values calculated for the spot ink solid,
 - V_{xp}, V_{yp}, V_{zp} are the V_x, V_y, V_z values calculated for the substrate and
 - V_{xt}, V_{yt}, V_{zt} are the V_x, V_y, V_z values calculated for the intermediate spot ink tone.



Testing in Progress

- Second round of comments completed at ISO level
 - Round 3 for comments ready for submission
 - FTA is Producing test
 - Clemson Testing
 - Taga Italia
-
- NWI/CD Ballot to go out after discussion at TC130 Korea in November
 - This will require a 3 month ballot – so far no objections



Aligning and communicating spot colours

Current ISO state - misalignment

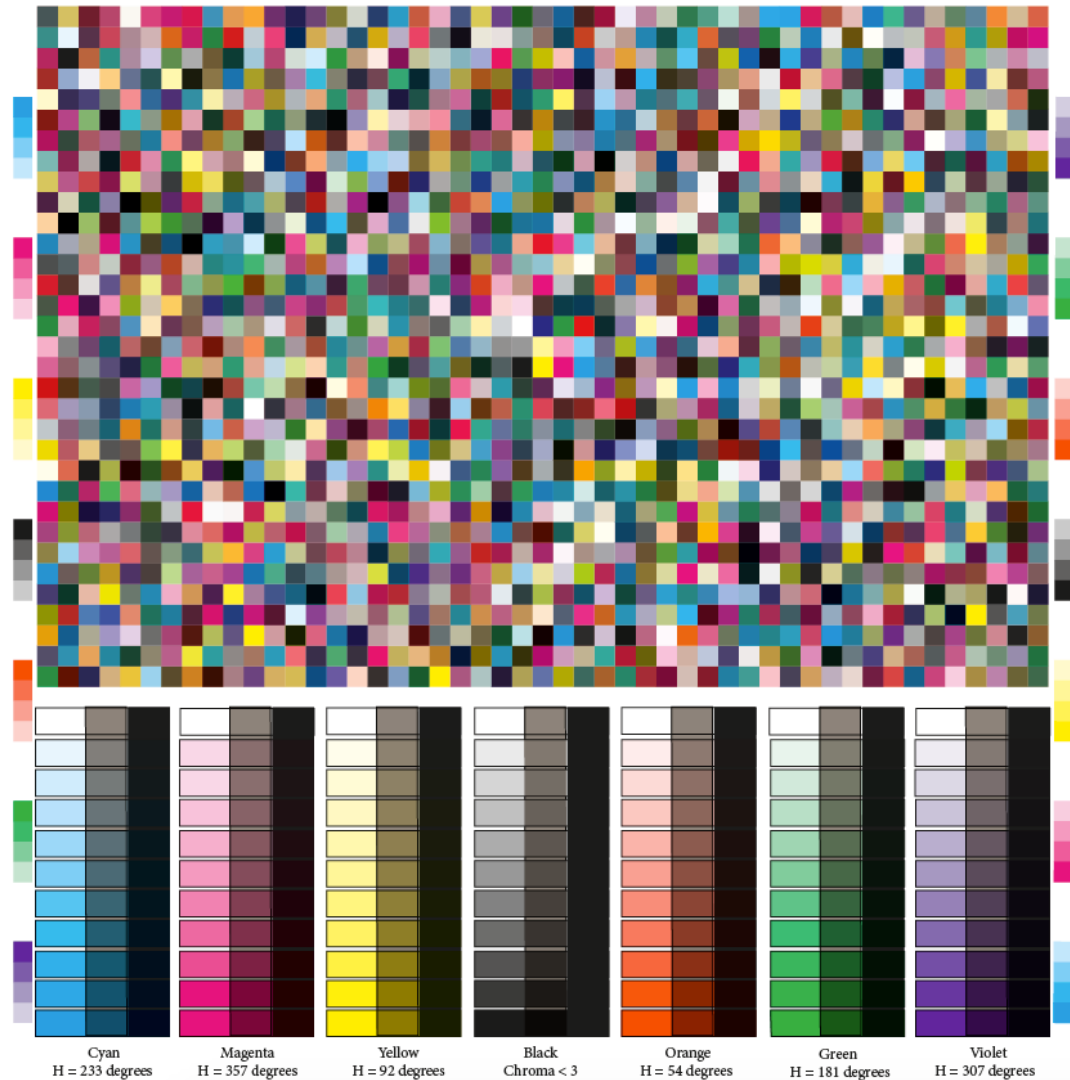
- Spectral Density and Murray Davies
- Better Alignment with ISO 20654 – Spot Colour Characterization

Workflows

- 4/colour profiles of CMYK, with CxFX for spots?
- 7/colour profiles with PDF/X5n

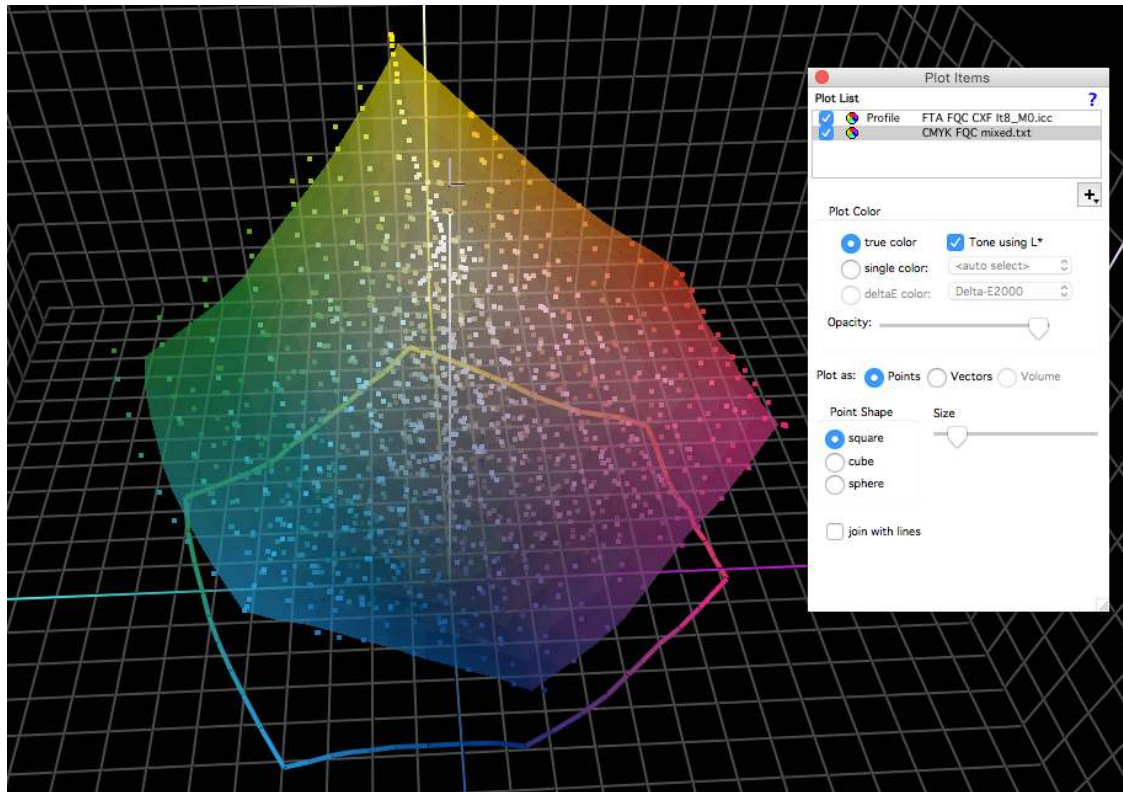


FTA FQC Testing – Using CxF/X for ICC Profiles



ICC Max Characterization Created

- Image show ICC Profile from IT8 chart
- Dots show Characterization data from CxF swatches



Summary

- 7/colour printing is here to stay
- Datasets are needed for Design and Workflow
- Spectral Blending seems to better align workflow!
- Testing with ICC Max

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Thank you for the opportunity to share!

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