Characterization

3rd C

Presented by: David Hunter

#3 Characterization (ICC Profile Creation)

Third of the 5 C's of Color Control

Capture — assess instrumentation capabilities

Calibration- make device consistent to itself & over time

Characterization — define device gamuts & create profile

Conversion — map one gamut to another in the workflow

Conformance — verify new results and meet expectations

ChromaChecker

#3 Characterization (ICC Profile Creation)

Steps:

1. Verify Printer is stable and consistent, calibrated and ink limit
2. Qualify substrates- Print target on all important substrates
   - *Use ChromaChecker substrate qualifier to group substrates per EF*
3. Choose Characterization software
4. Choose profile target (IT8 7/5) compatible w/capture device
5. Print multiple times immediately after calibration done
6. Measure multiple targets, compare differences, average
7. Create ICC Profile using correct settings
   - *Defining Black replacement of CMY, Black start, TAC limit*

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Characterization (ICC Profile Creation)

Characterization process is demanding- Requires:

- Ensuring printing devices are precise and repeatable
- Assess/grouping effect of paper stock on color result
- Using ICC Profile creation software to create profile(s)
- Understand how to configure ICC profiles in workflow

- **Benefits**- More accurate result over any type of calibration

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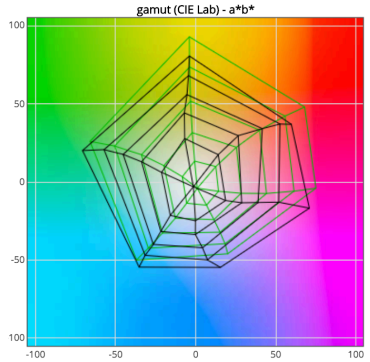
Characterization (ICC Profile Creation)

Defines Color Space of Printing Condition

- Defines gamut (range of color) of ink, substrate, calibration



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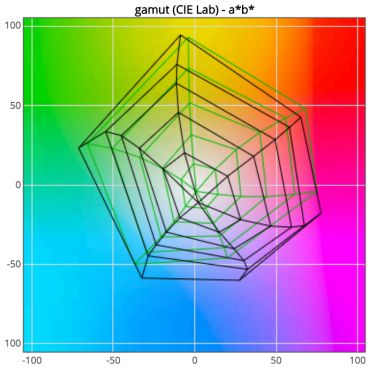
3, 62, 19, 0



C M Y K

3, 62, 19, 0

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Characterization (ICC Profile Creation)

Defines Color Space of Printing Condition

- Each device speaks a different language- define language
- Defines gamut (range of color) of ink, substrate, calibration
- Each substrate affects printed gamut/condition
- Qualify most frequently used substrates:
  - *Determine substrates that share similar color gamut*
  - *Reduces number of profiles to create, easier to manage*
  - *Relevant to E-Factor, tighter tolerance the more profiles*

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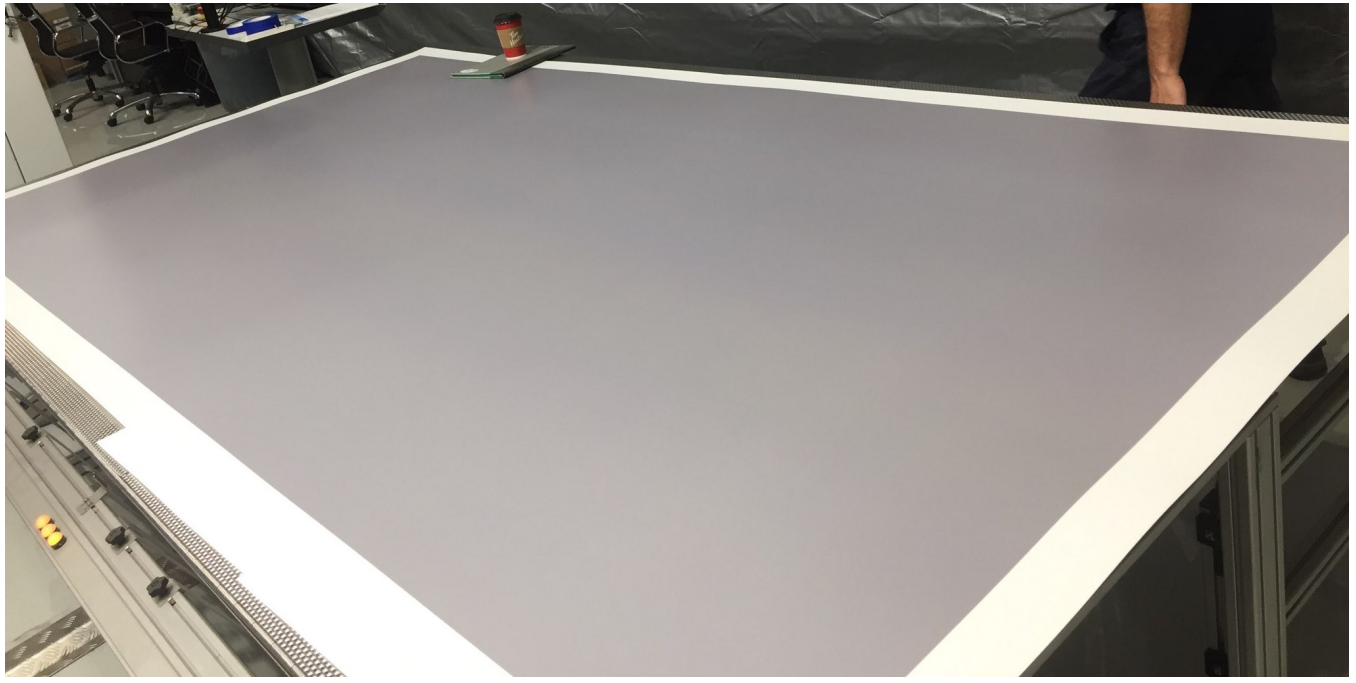
Characterization Steps

Baseline Printing devices

- Understand variation of printer by baselining
- Within Page Uniformity, Between Page, Between Job
- Fix any mechanically induced variations before profiling



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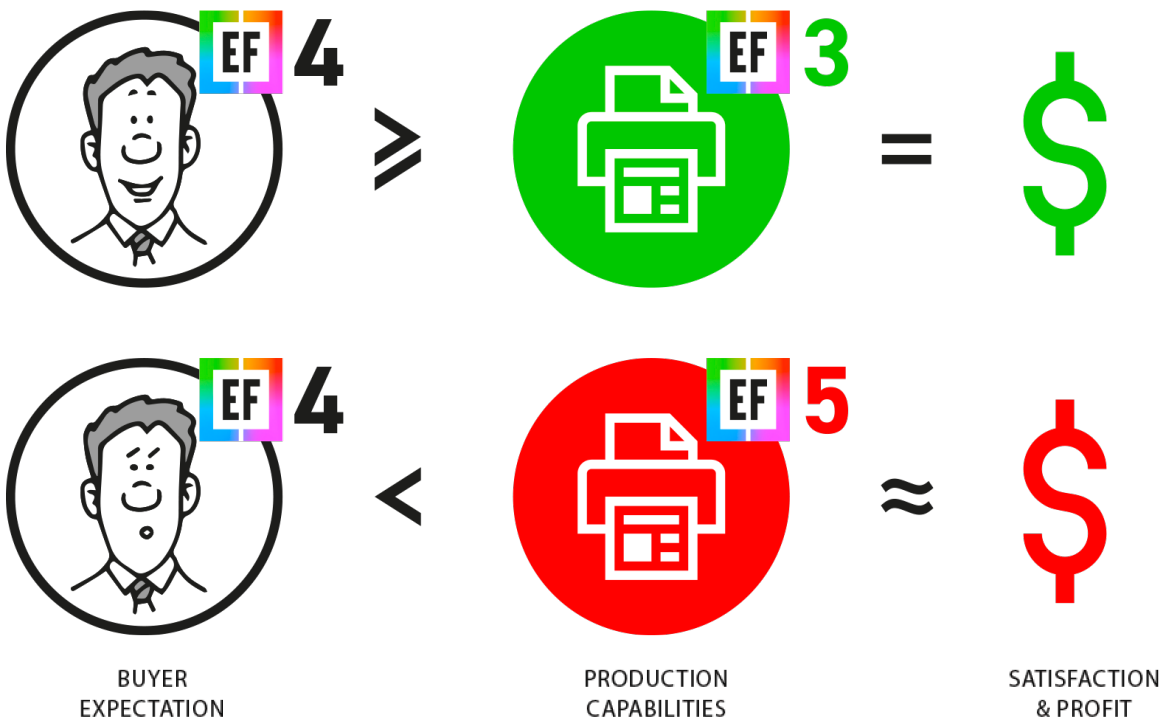
Conformance- is it Salable?

Summary/Result of all 5 C's - is the print salable?

- Does Print meet customer expectations (E-Factor)?
- Provide Job reports proving to customer job success



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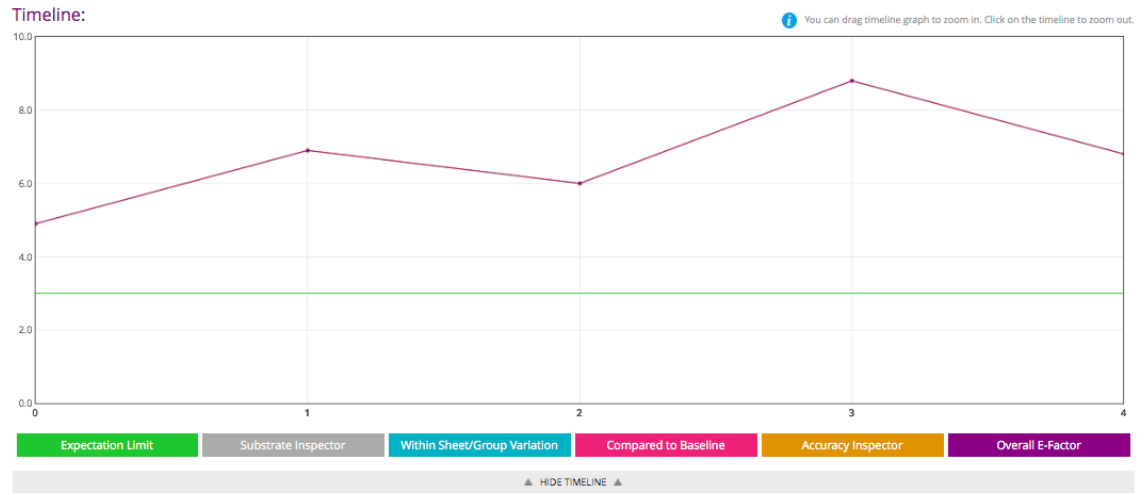
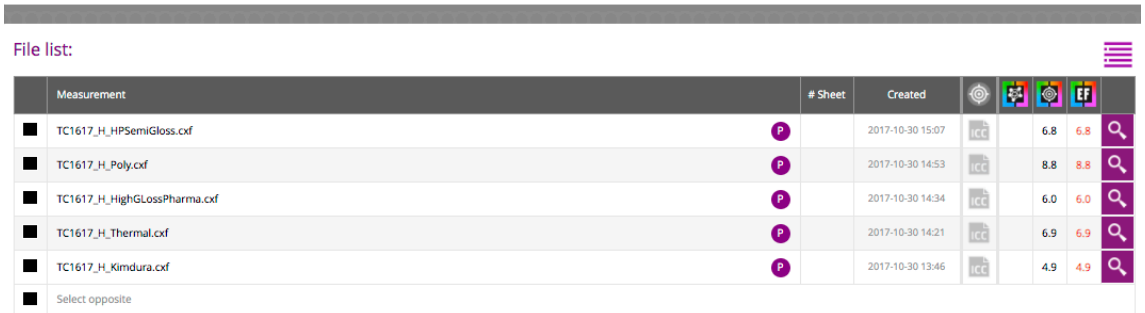
Qualifying Substrate Color affect on Print

Steps:

1. Qualify substrates- Print target on all important substrates
   - *Use ChromaChecker substrate qualifier to group substrates per EF*





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Qualifying Substrate Color affect on Print

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1. Qualify substrates- Print target on all important substrates
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Print Condition Qualifier

Device:	Printer Audit
Track:	Compare Printing Substrates
Number of files:	5
Number of groups:	3
ΔE threshold:	3.0
Mode:	95%

Calculate

Group qualification

Group 1:					CRPC
2	TC1617_H_Poly.cxf				CRPC4
Group 2:		**CRPC**	**max. ΔE**	**avg. ΔE**	**std. dev. ΔE**
1	TC1617_H_HPSemiGloss.cxf	CRPC5	2.60	2.60	0.00
3	TC1617_H_HighGLossPharma.cxf	CRPC4	2.60	2.60	0.00
Group 3:		**CRPC**	**max. ΔE**	**avg. ΔE**	**std. dev. ΔE**
4	TC1617_H_Thermal.cxf	CRPC5	2.91	2.91	0.00
5	TC1617_H_Kimdura.cxf	CRPC4	2.91	2.91	0.00

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Qualifying Substrate Color affect on Print

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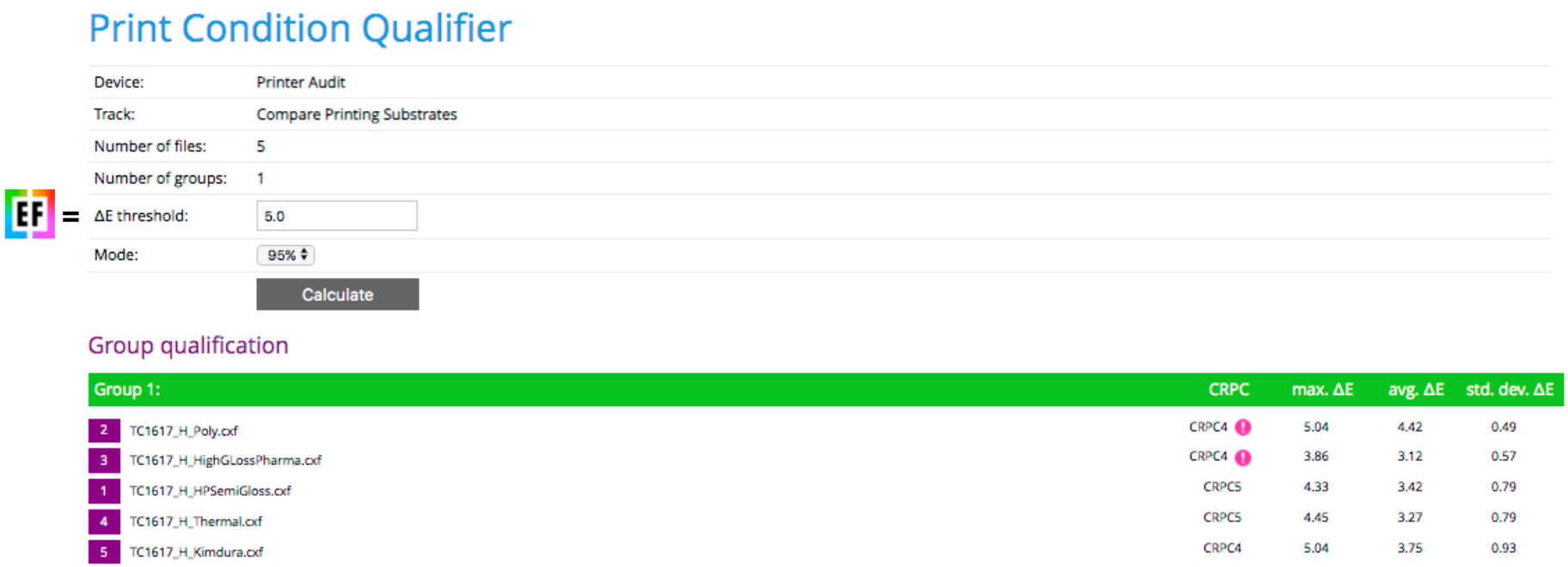

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Qualifying Substrate Color affect on Print

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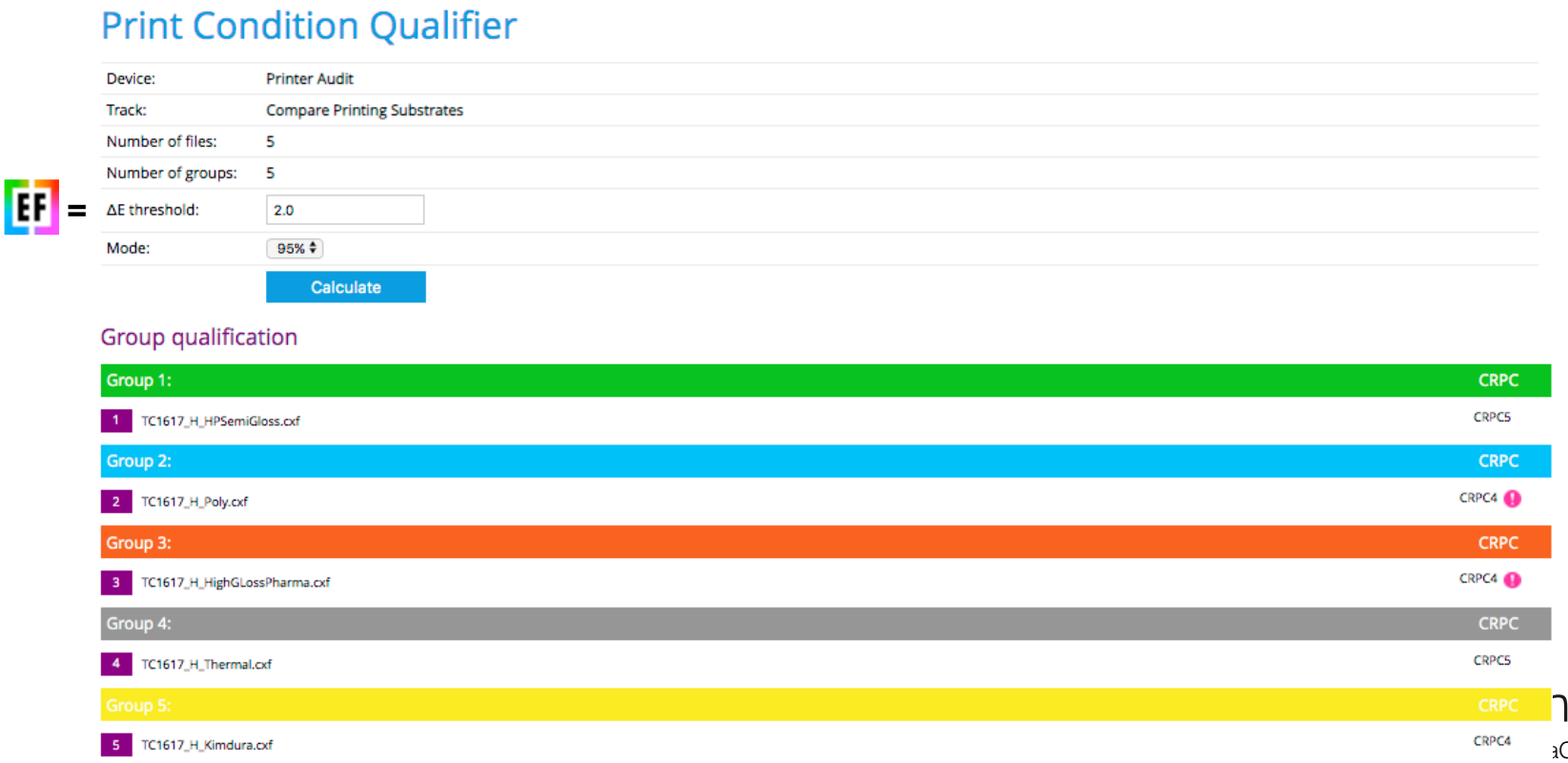

Characterization (ICC Profile Creation)

Steps:

1. Qualify substrates- Print target on all important substrates
   - *Use ChromaChecker substrate qualifier to group substrates per EF*
2. Choose Characterization software to use: ChromaChecker

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Characterization (ICC Profile Creation)

Steps:

1. Qualify substrates- Print target on all important substrates
   - *Use ChromaChecker substrate qualifier to group substrates per EF*
2. Choose Characterization software (ChromaChecker)
3. Choose print target (IT8 7/5) compatible w/capture device

iSIS & FD9 target

i1iO & Barbieri target

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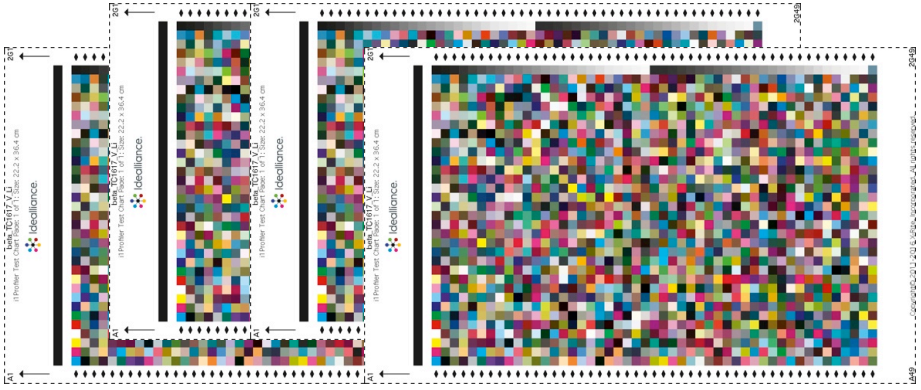
Characterization (ICC Profile Creation)

Steps:

1. Qualify substrates- Print target on all important substrates
   - *Use ChromaChecker substrate qualifier to group substrates per EF*
2. Choose Characterization software (ChromaChecker)
3. Choose print target (IT8 7/5) compatible w/capture device
4. Print multiple times immediately after calibration done
   1. Ensure color management turned off in RIP, Record Calibrations



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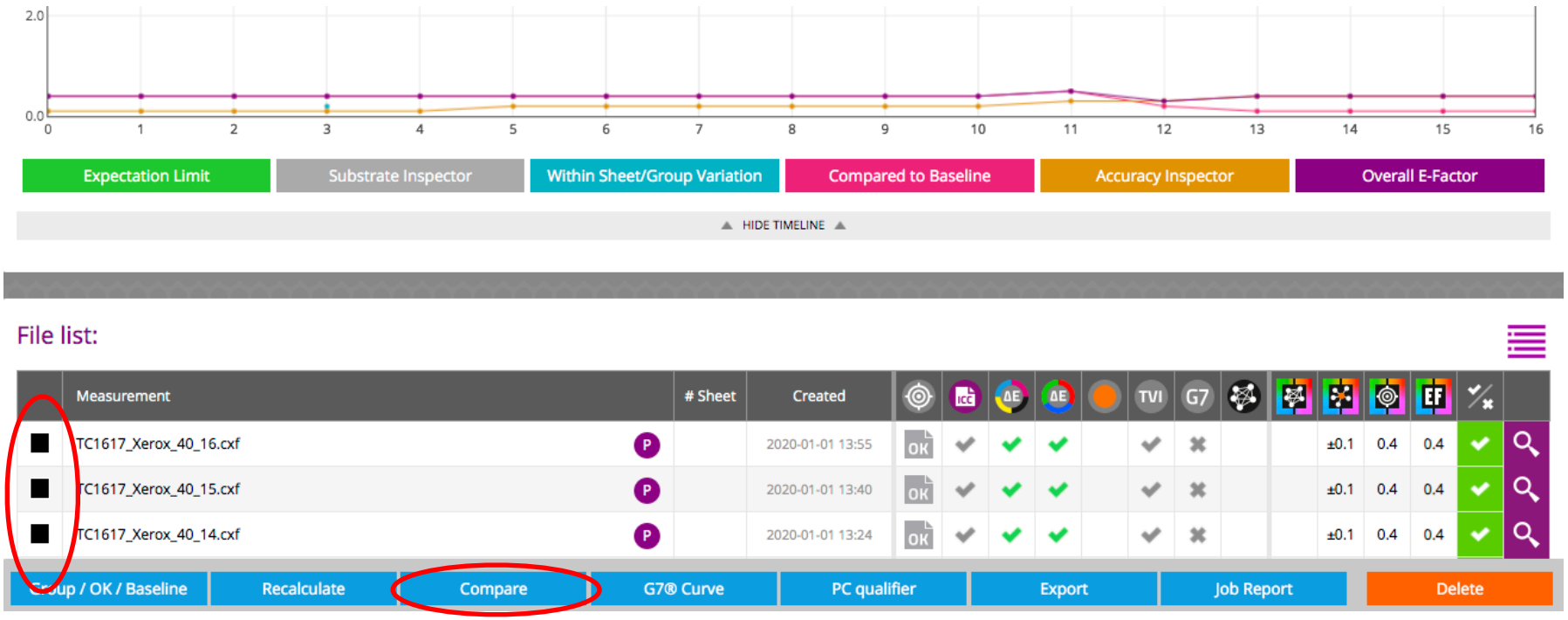
Characterization (ICC Profile Creation)

Steps:

5. Measure multiple targets, **Compare** differences, Average



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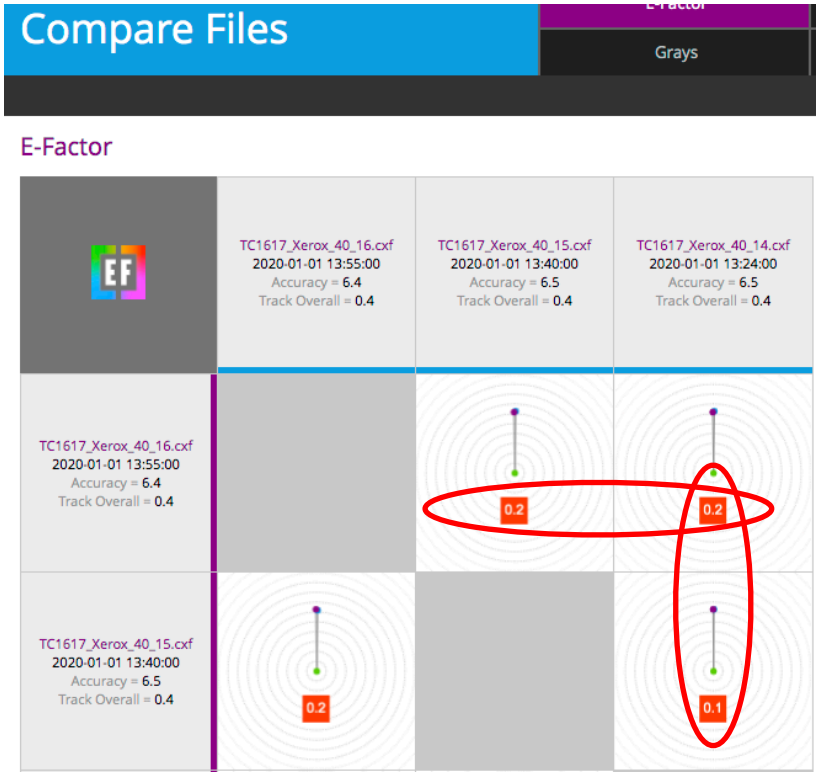
Characterization (ICC Profile Creation)

Steps:

5. Measure multiple targets, **Compare differences**

All values are within acceptable E-Factor values= .2

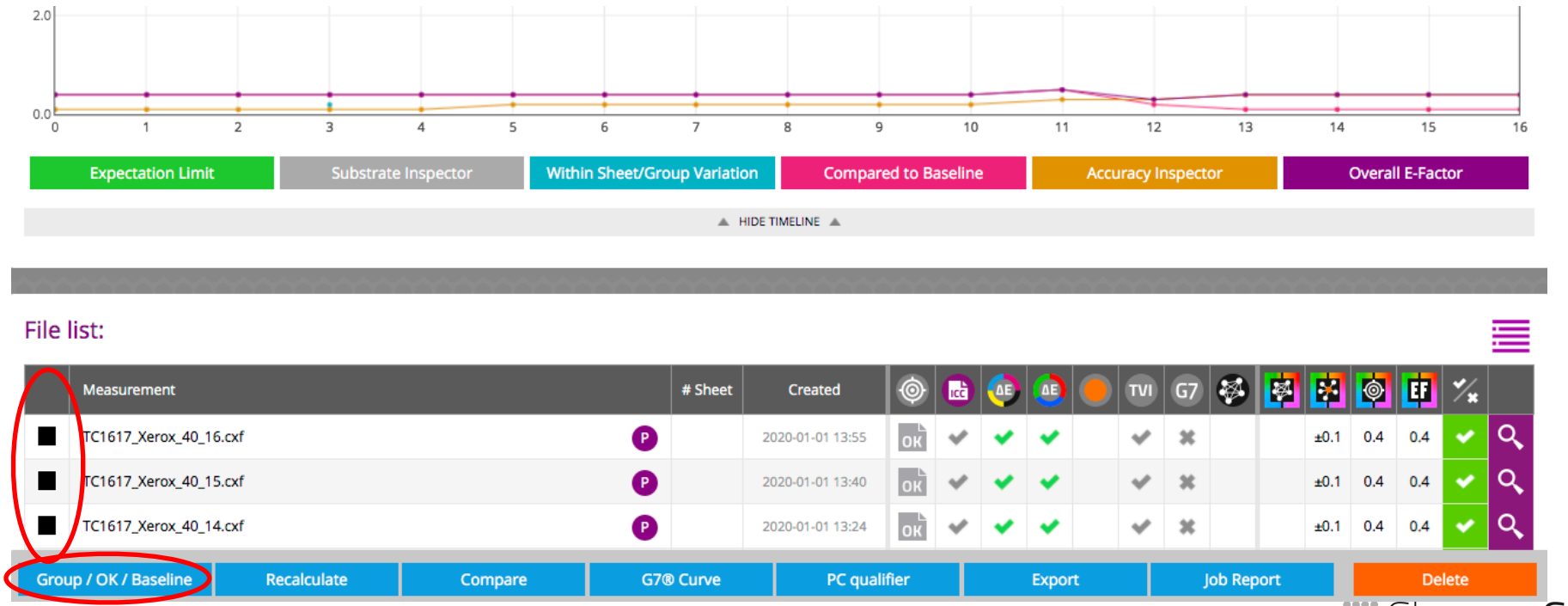


Characterization (ICC Profile Creation)

Steps:

5. Measure multiple targets, Compare differences, **Average**

*Choose **Group**- it will average all measurements*

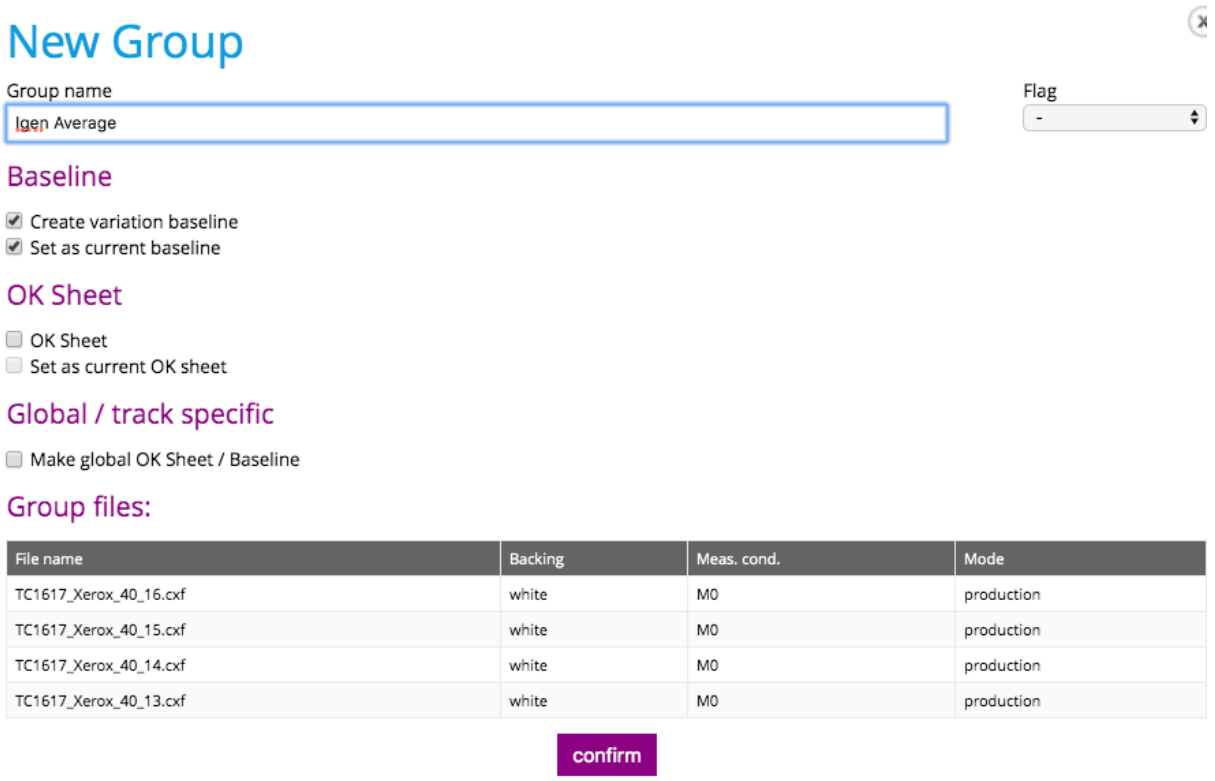


Characterization (ICC Profile Creation)

Steps:

5. Measure multiple targets, Compare differences, **Average**

   Name Group- Confirm



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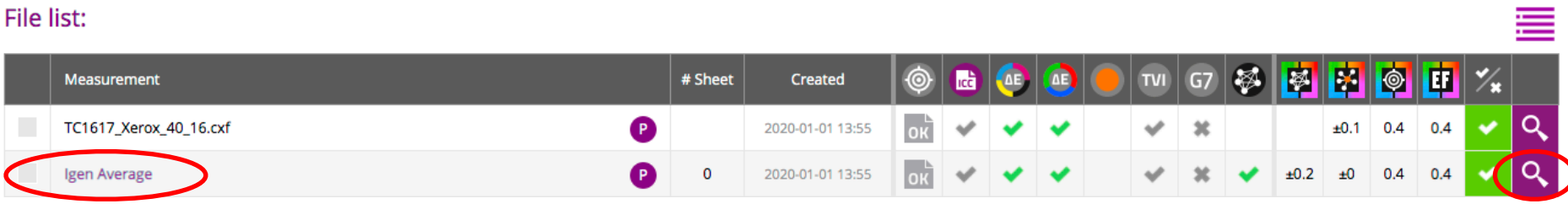
Characterization (ICC Profile Creation)

Steps:

6. Create ICC Profile for given print condition (substrate)

Click *on magnifying glass:*



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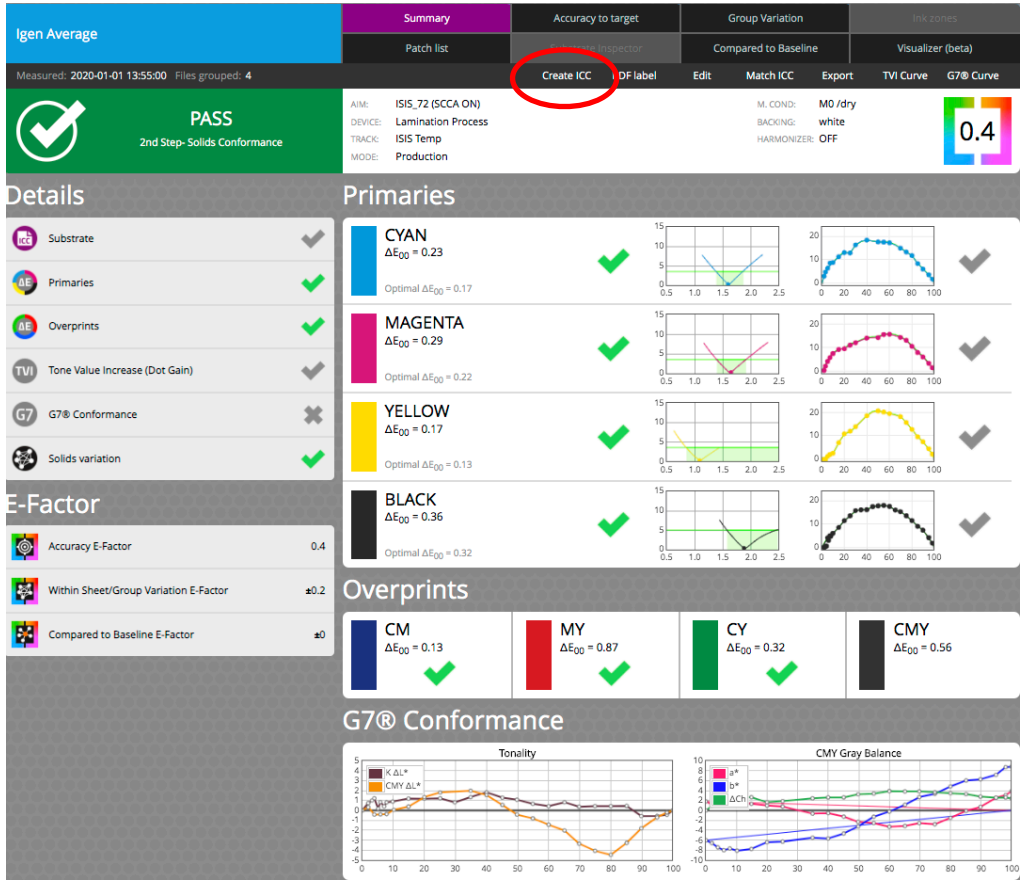
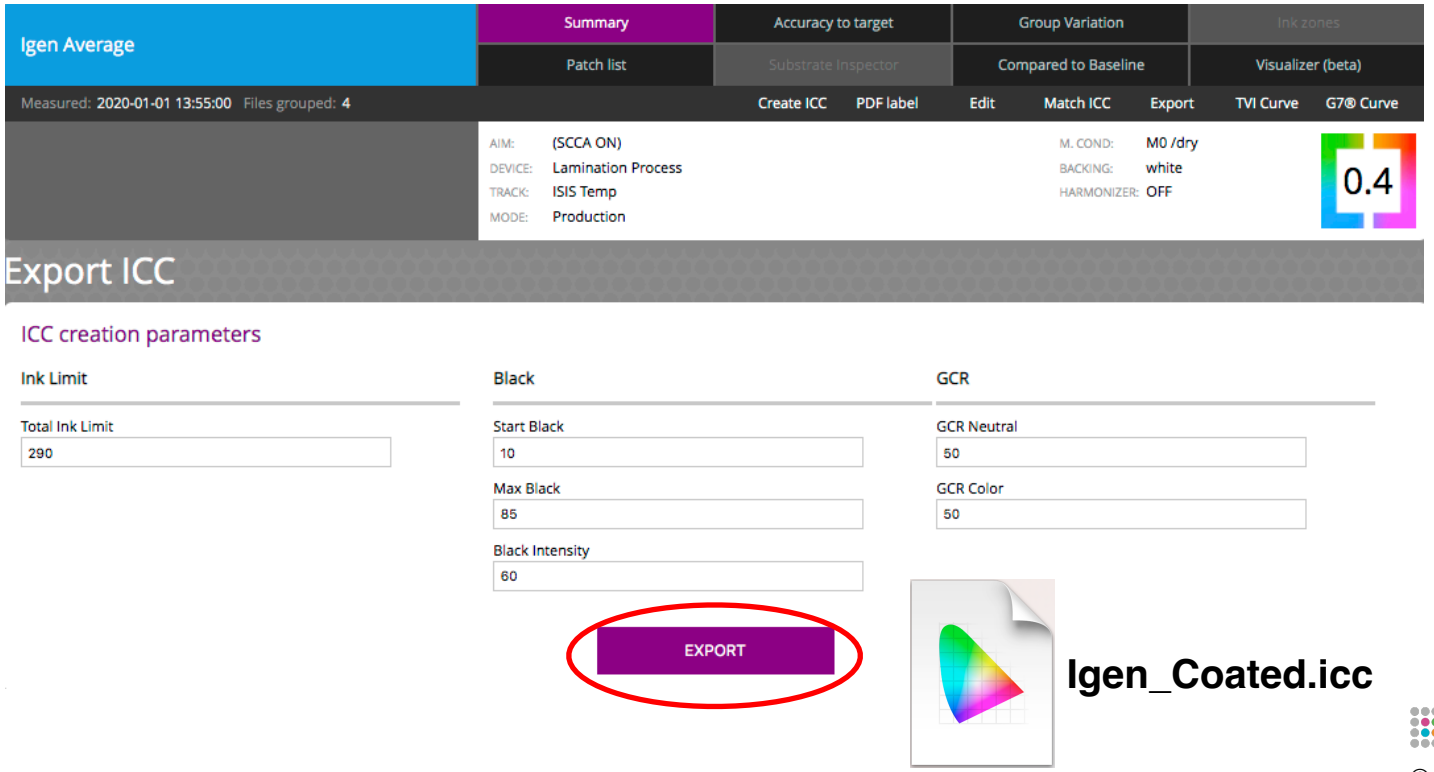


Characterization (ICC Profile Creation)

Steps:

6. Create ICC Profile for given print condition (substrate)

Customize ICC Profile settings if necessary- ***Export ICC Profile***



ICC Profile Inspector (Optional Assessments)

Evaluate Many Aspects of ICC Profiles

- Gamut Size

Profile built-in info

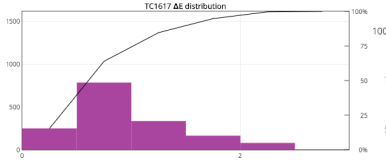
Profile class	Output device profile
Color space	CMYK (4 channels)
Connection space	Lab (3 channels)
Gamut volume	520,279

- Profile Match Integrity (LAB Round trip calculation)

FACTOR	0.77
Max	2.09
Average	0.20
Standard deviation	0.28

- Profile Comparisons- Gamut and Color Rendering

Difference between the two ICC Profiles



FACTOR	2.01
Max	2.66
Average	0.95
Standard deviation	0.50

- More… Review ICC Profile Inspector

ICC Profile Inspector

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Characterization Summary

Planning and Execution is Critical for Success

- Qualify how many profiles to create based on substrates
- Choose correct target for print
- Choose correct measurement device- same as for QC
- Measure multiple targets precisely
- Compare measurements, make sure they are precise
- Create ICC Profile, evaluate integrity
- Next, you will load in your workflow conversion tools

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Qualifying Multiple Similar Printers/Paper

Multiple Printers- Same Substrate- Multiple Profiles?

- Share one profile across 10+ printers
- Only need one workflow sending to all 10+ printers
- Only need to maintain one ICC Profile
- Perform normal maintenance to keep consistency
- Measure each printer every 4 hours to ensure conformance

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Making Multiple Printers Match

Ensure Printer Settings are Identical

- Print profile target on each printer
- Measure all targets with same or similar instrument
- Compare all results- if any are out of E-Factor- Recheck

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Easy mode ΔE 2000	Baltoro_Coated_Dec2020	Baltoro_GP_Boise28	Baltoro_IL_Boise28	Baltoro_SignalHill_XeroxPaper	Baltoro_Newville_4_8	Baltoro_Sumner_Uncoated
Baltoro_Coated_Dec2020		E-factor 10.49 Max 12.52 Average 5.34 Std. dev. 2.87 Details	E-factor 10.27 Max 12.82 Average 4.49 Std. dev. 3.01 Details	E-factor 12.00 Max 15.77 Average 5.20 Std. dev. 3.43 Details	E-factor 11.52 Max 15.13 Average 4.99 Std. dev. 3.22 Details	E-factor 11.75 Max 15.08 Average 4.84 Std. dev. 3.38 Details
Baltoro_GP_Boise28	E-factor 10.49 Max 12.52 Average 5.34 Std. dev. 2.87 Details		E-factor 3.26 Max 4.37 Average 2.11 Std. dev. 0.68 Details	E-factor 3.85 Max 6.47 Average 1.97 Std. dev. 0.94 Details	E-factor 3.33 Max 7.04 Average 1.90 Std. dev. 0.85 Details	E-factor 5.27 Max 7.60 Average 3.07 Std. dev. 1.29 Details
Baltoro_IL_Boise28	E-factor 10.27 Max 12.82 Average 4.49 Std. dev. 3.01 Details	E-factor 3.26 Max 4.37 Average 2.11 Std. dev. 0.68 Details		E-factor 3.10 Max 6.39 Average 1.73 Std. dev. 0.77 Details	E-factor 2.24 Max 6.63 Average 1.16 Std. dev. 0.66 Details	E-factor 3.20 Max 5.85 Average 1.60 Std. dev. 0.88 Details
Baltoro_SignalHill_XeroxPaper	E-factor 12.00 Max 15.77 Average 5.20 Std. dev. 3.43 Details	E-factor 3.85 Max 6.47 Average 1.97 Std. dev. 0.94 Details	E-factor 3.10 Max 6.39 Average 1.73 Std. dev. 0.77 Details		E-factor 2.00 Max 6.23 Average 1.21 Std. dev. 0.50 Details	E-factor 2.93 Max 4.42 Average 1.88 Std. dev. 0.64 Details
Baltoro_Newville_4_8	E-factor 11.52 Max 15.13 Average 4.99 Std. dev. 3.22 Details	E-factor 3.33 Max 7.04 Average 1.90 Std. dev. 0.85 Details	E-factor 2.24 Max 6.63 Average 1.16 Std. dev. 0.66 Details	E-factor 2.00 Max 6.23 Average 1.21 Std. dev. 0.50 Details		E-factor 2.65 Max 6.91 Average 1.59 Std. dev. 0.65 Details

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Color Control
Define Conformance

Presented by: David Hunter

5 C'S OF COLOR CONTROL AGENDA

Process Discipline for each color printer

Conformance — assess where your printers are at...

Capture — assess instrumentation capabilities

Calibration — make device consistent to itself & over time

Characterization — define device gamut and create profile

Conversion — map one gamut to another in the workflow

Conformance — verify new results and meet expectations

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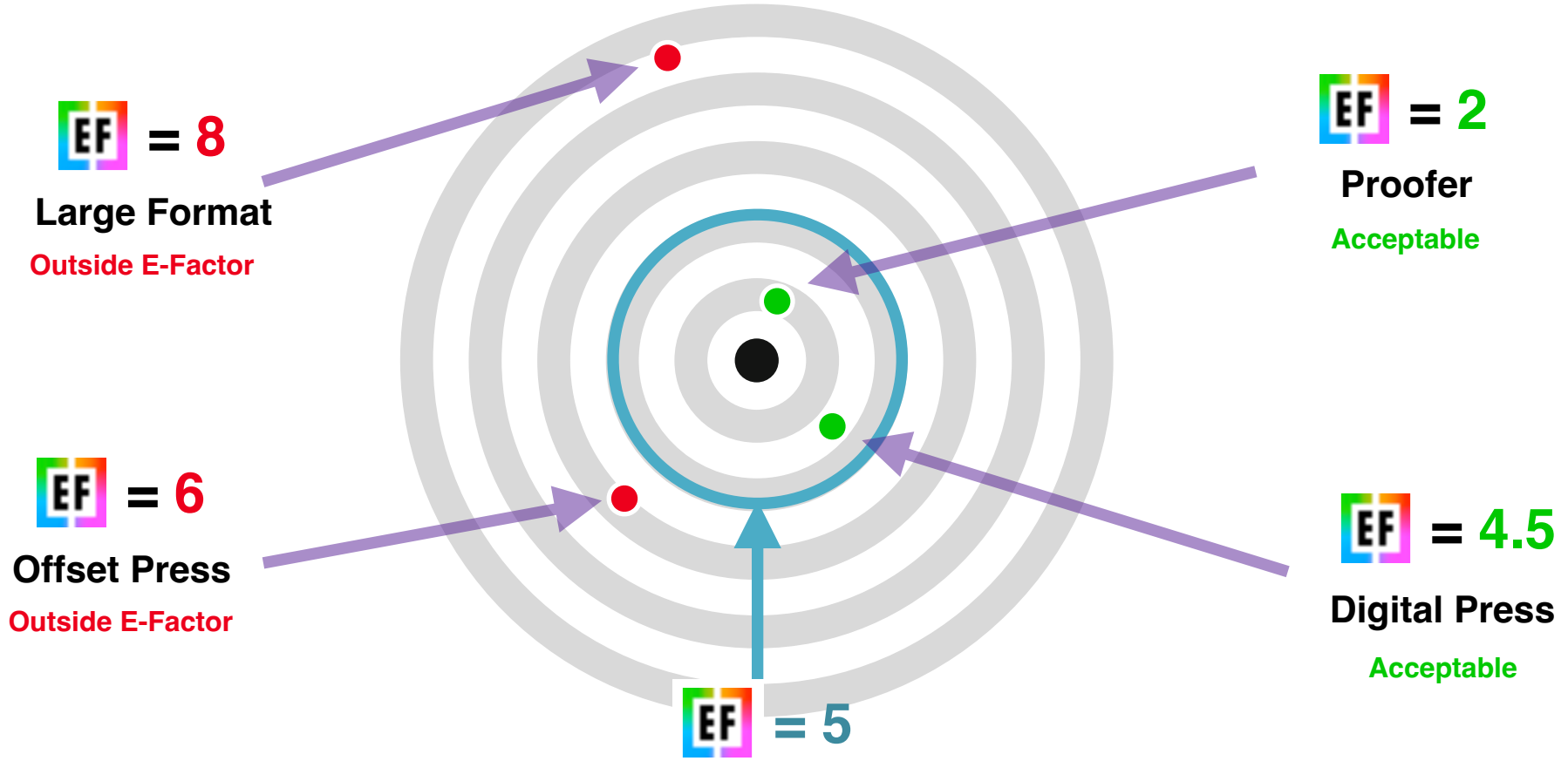
HOW CLOSE IS “CLOSE ENOUGH”?

What’s your color “match” Expectation Factor



Expectation Factor EF is the distance from the bullseye which is salable

Conformance Expectations

Quantify Color Expectations

- Baseline how printing devices are performing
- Visually understand where printers are at today
- Determine if you need to improve any of them
- Look at 5C's to improve printers if required
- Prioritize resources based on expectations

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Conformance Expectations

Baseline Kit Purpose

- Visual images to assess color expectations
  - Compare to GRACoL* and to one another
- Easily measure using CC Capture
  - Will assess E-Factor and G7 compliance
  - Works with most measurement instruments
  - Works on Mac or Windows
- Includes PDF (to print) and software to measure

* Requires E-Factor Exercise ($99) to compare to GRACoL

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Conformance Expectations

Baseline Printing Devices

- Register and Download Benchmark App and files
- Print ChromaChecker PDF out on all printers
  - Use Normal Production settings
- Measure using CC Capture
- Record E-Factor value at top
- Lower E-Factor- closer to GRACoL
- Compare to one another

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Video Showing How to Use CC Capture S/W

Measure the 3 row target

- Result:

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Determine Conformance Expectations

Visually compare prints to one another

- EF number shows how different from GRACoL*

Proofer

EF = 2

Large Format

EF = 8

Digital Press

EF = 4.5

GRACoL Sample

Included with E-Factor Exercise $99

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Determine Expectations

Compare prints to reference and one another

- E-Factor Difference to GRACoL

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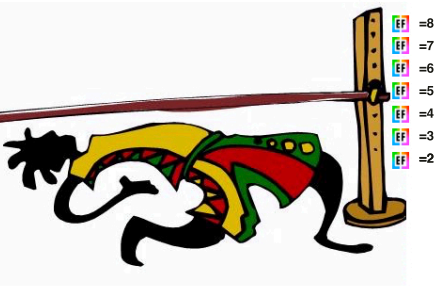
Determine E-Factor: Expectations

Factors to Consider

- Different customers have different expectations
- Evaluate how satisfied current customers are
- Nothing wrong with having high E-Factor if salable
- Start with higher E-Factor, reduce if necessary
  - Don’t set the bar to hard to begin with
  - Will lose support of operators and staff
  - Need to provide more time, tools, training to lower



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