

W1.1 Image Quality of Printers

W1.1 2003-012

Attribute: Macro-uniformity
Author: René Rasmussen
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Referenced documents:

Macro-uniformity ad hoc teleconference meeting minutes, 3 / 14 / 2003

Attendees: Kate Johnson (ImageXpert), Bill Kress (WK, Toshiba), Yee Ng (YN, NexPress), Rene Rasmussen (RR, Chair, Xerox)
Absent ad hoc members: Steven Korol (Xerox), Ina Eckerleben (Océ), Jodi Walsh (Lexmark)

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Agenda

1. Agenda check
2. Welcome to Kate Johnson
3. Attempt to finalize the scanner color calibration [SCC] test patterns
4. Meeting schedule

1. Agenda check

No changes to the agenda.

2. Welcome to Kate Johnson

We welcome Kate Johnson, ImageXpert, to the ad hoc as a replacement for Dave Wolin.

3. Discussion of the SCC test patterns

A brief summary of the purposes of the three SCC test patterns were provided to bring KJ up to speed.

The **last two iterations** of changes to the test patterns were explained by BK and RR. Notes from emails that explain these changes are appended at the end of these meeting minutes.

Several minor points about the **geometrical layout** of the test patterns were discussed, including patch size and grid. The RGB and CMYK test patterns use different patch size—the CMYK patch sizes being slightly larger. BK explained that from a practical point of view this is reasonable, since those printers that exhibit edge artifacts typically use CMYK image path, while RGB image path printers typically do not. However, for printers that exhibit edge artifacts it is always an option to print the test patterns at a larger size, so that the effect of the artifacts is eliminated.

A concern related to the possible mis-use of the test patterns to use scanners to measure color accuracy was raised by YN. Although RGB scanners are not likely to be able to provide accurate measurements of **color accuracy**, it is possible that this work and these test patterns could lead to such measurements. This becomes a greater concern because the scanner calibration test patterns for RGB image path printers is advantaged in the **fleshtones** relative to the scanner calibration test pattern for CMYK image path printers.

A similar concern was raised that the scanner color calibrations do not cover the full gamut, and the accuracy of color measurements may be very poor for certain colors, e.g. very high densities. RR proposed that we should move forward by stating that (i) the test patterns are design purely for uniformity measurements, and (ii) uniformity measurements should only be performed on base colors that are within the colors covered by the calibration test pattern.

To address this concern, **the following decisions were made:**

- Will add at least 10 flesh tones to the CMYK test pattern, preferably by removing redundant colors from the existing design.
- We will add a statement to the standard stating that the color calibration methodology is aimed at uniformity measurements and is not recommended for measurements of color accuracy.
- We will add a statement to the standard stating measurements of macro-uniformity should only be performed on a base color that is within the gamut covered by the calibration test pattern, and for which the accuracy has been tested, e.g., with the SCCTest test pattern.

Given these modifications to the W1.1.Macro.SCC.CMYK, the team approved all three test patterns. RR took the action item to update the test pattern as described.

RR raised an **issue regarding the already printed uniformity test patterns**. Several people had already printed the Macro-uniformity test patterns (up to 1 year ago), prior to the discussion about scanner color calibration, so that SCC test patterns are not available corresponding to those prints. We will need to decide whether to accept freshly printed SCC test patterns, given that materials may have changed and/or faded.

4. Meeting schedule

RR had previously proposed the following meeting schedule:

3/14, 4/4, 4/25,

5/16 - will be replaced by a real meeting during the PICS conference.

6/6, 6/27, 7/18, 8/8, 8/29, 9/19, 10/10, 10/31, 11/21, 12/12

The schedule was accepted and RR will try to plan a meeting during PICS.

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Appendix: Email notes regarding changes to SCC test patterns

Excerpt from RR mail note of 3/13/2003 (current iteration):

We iterated the test pattern design several times and we should be really close to a final design. Based partly on input from other W1.1 teams Bill Kress did another iteration, improving the test patterns in several ways: adding uniform gray background and borders, fleshtones, and some additional colors. All the rationale is attached below, in case you haven't seen it.

I would like to discuss the attached three PDF files. They are only slightly modified from the previous iteration as follows:

W1.1.Macro.SCC.CMYK:

- Fiducial marks surrounded by white to avoid interference with halftone.
- Areas meant for indicating process direction etc. moved slightly further away from the color patches.

W1.1.Macro.SCC.RGB:

- Same changes as for W1.1.Macro.SCC.CMYK.

W1.1.Macro.SCCTest:

- Since the test pattern is meant for both CMYK and RGB image path, the color patches are defined using both color spaces. Some colors (e.g. the reds, greens, blues) are defined in RGB color space, while others are in CMYK. This way we will more likely be able to exercise pure primary colors on any printer.
- To keep a larger margin, some of the hue circle colors have been moved into the 27 positions that contained redundant colors in version 1 of the test pattern.
- Same changes as for W1.1.Macro.SCC.CMYK.

Excerpt from BK mail note of 1/20/2003 (previous iteration):

After working with our W11 CMYK and RGB scanner characterization targets for awhile, I've made some minor changes. We may or may not want to make such modifications available for the general user.

Both targets:

I have re-formatted the targets in Adobe Illustrator 10 format and saved them as PDF, retaining AI editing capabilities. Anyone with AI can modify them easily and a number of objects have been grouped. Cropping fiducials have been added to ease cropping and squaring. An arrow was added for operator orientation. This is where we start the GretagMacbeth Spectroscan readings. Gray borders of 1.5 mm were added for (1) some reduction in ICE, (2) make similar patches more distinguishable. Gray background has been added, also for more accurate scanning.

I noted that additions of borders and backgrounds can introduce marking

artifacts on some technologies. Since all objects can be changed, we might reduce the border size to zero and make the gray background a white object and allow the user to custom make desired changes.

The RGB target:

I added a row of fleshtone patches at the bottom, making it 25x16. (This wasn't needed for good profiles, but it was of interest for one project).

Both targets generated good profiles for their intended technologies.

(See attached file: W11Macro.SCC.CMYK.v6.pdf) (See attached file: W11Macro.SCC.RGB.v2.pdf)

I've also modified the verification target, W1.1.Macro.SCC.CMYKTest.v2.pdf (renamed) a bit:

There were three redundant 3x3 patch sets on the original. I don't know if this was deliberate. For laser marking, the spatial redundancy caused these to be different in the measurements and therefore tested different areas of the transform. Ink jet marking caused them to be mostly identical. Now all 3x3's are different. I

All 3x3's are oriented in the same direction -- making analysis a bit easier.

Four columns are added, one with pure CMY's and the other with these plus 40% black. This adds some verification around the hue circle.

In principle, the idea of this target is good -- testing both spatial factors and the color transform. In practice, a combination of marking noise, internal printer linearization, scanner uniformity and printer color tables can make some patches measure identical -- and the cause is not so apparent. I might prefer to extend this target to test accuracy of color transform and test other factors in different ways. We can discuss. (See attached file: W11Macro.SCC.CMYKTest.v2.pdf)