Aardenburg
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IMAGING & ARCHIVES

Tested System:
ID#:257

Printer: Epson Stylus Pro 3880

Inks/Colorants: Epson OEM UltraChrome K3™ with Vivid Magenta

Media: Moab Somerset Enhanced Velvet 225gsm

Coating(s): no additional coating

Sample #: AaI_20101209_SN009

Testing Status: 100 Megalux hours total light exposure

Testing Is ongoing, next update on approximately JAN 05, 2015

Conservation Display Rating (CDR)

Lower limit: 70 Megalux hours (for weakest 10% of the color patches)
Upper limit: passing – evaluation is ongoing

Note: a CDR with narrow range (typically less than 2:1) indicates relatively even overall fading of the image. A wide range indicates faster fading in certain local colors/tones prior to general fading of most colors/tones in the entire image. Compare ratings for different systems directly and/or use the table on page 2 to estimate time (years) on display.

* Please read document AaI_2009_0118_TA-01.pdf, **"An Overview of the AaI&A Conservation Display Ratings"**, located on the Documents page of the AaI&A website for furhter explanation of the Conservation display ratings.

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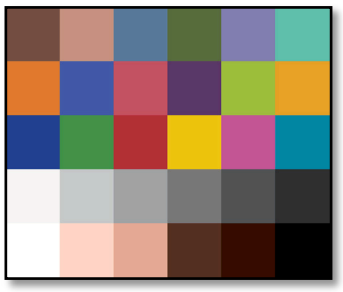
http://www.aardenburg-imaging.com

Aardenburg Imaging & Archives

About this Report

This report contains light fastness information about a sample test print produced by a specific digital printing system. "System" refers to all hardware, software, and materials used to make the finished print. The hardware, software, material components, and printmaker's skills contribute to the final image quality and image permanence. The tested sample is made with current or recently discontinued stocks of commercially available products unless otherwise stated. Each sample has been prepared by Aardenburg Imaging & Archives or one of its members in accordance with customary print making practices unless otherwise noted. The sample may also contain additional finishing materials such as overcoats and laminates which are also noted when used. Finally, the sample has been tested under standardized conditions that are defined on the Sample Description page (see page 4). AaI&A makes every effort to ensure but cannot guarantee that the samples are properly identified and documented and that test results are accurate. For this reason, AaI&A also strives to test independently produced sample replicates in order to increase sampling confidence and to provide information on process variability. Please compare the results in this report to replicate test samples when the data become available.

Understanding this Report



The magnitude and visual appearance of fading depends not only on the chosen printing system but the chosen image as well. In other words, different images are comprised of different colors, and the fading relationships between those colors dictate how the image will look as it fades. The sample print in this test report was made by reproducing the digital image shown on the left. It contains 30 standard colors. 24 of the colors are colorimetrically matched to the Macbeth ColorChecker™ chart viewed under D50 illumination. The remaining six colors supplement the ColorChecker™ array with four additional skin tone colors, one patch for paper white, and another for maximum black. The additional colors also round out the distribution of CIELAB L* (lightness) values in the test target.

Information about the fading characteristics of the product is provided in three ways:

1) You can visually assess the fading. The target images reproduced in this report are digitally reconstructed from the spectrally measured color data rather than scanning or otherwise reproducing the physical print by conventional techniques. This method ensures a colorimetrically accurate representation of the print appearance as the print fades. A calibrated monitor is recommended to experience the best possible reproduction of the test sample appearance. The side-by-side "before and after" presentation of the target images simulates looking at a perfect copy of the unexposed original print along side the same print after light exposure. You can also use Adobe Reader's full screen mode to cycle through the pages and "animate" the fading.

2) I* Color and tonal accuracy scores are reported. This report includes I* metric scores that compare the color and tonal relationships of the light exposed samples to the color and tonal relationships existing in the original print prior to light exposure. Perfect I* scores of 100% can be approached when no significant fading occurs. Average scores above 90% generally indicate excellent retention of original quality, 80% good, 70% fair, etc., but your conclusions may vary depending on your image quality requirements. I* color rates the retained color accuracy (hue and chroma) while I* tone rates the retained tonal accuracy (lightness and contrast). The score is on a percentile scale where 100% is a perfect match between the comparison image (e.g., "after" light exposure) and the reference image (e.g., "before" any light exposure). 0% I* color means no color accuracy is left. 0% I* tone means essentially no tonality remains and all image information content is lost. Negative I* values have significance as well and contribute to the average I* score when they occur. Negative I* color values mean false color has occurred, for example, when a skin tone turns green or a neutral gray becomes distinctly colorful. Negative I* tone scores mean visual contrast between colors has become inverted (i.e., like the tonal relationships in a photographic film negative). Serious image quality problems must arise before false colors and/or tones appear. For more information on the I* metric, please refer to the AaI&A web site.

3) Color changes are also reported using the classic color difference model, ΔE. Note that ΔE values lose perceptual scaling significance when they become large (e.g., > 15). Also, the ΔE equation does not unambiguously measure changes in image contrast. This limitation is generally not a problem for paints and textiles, but can be a serious oversight when evaluating photographic images. Properly tracking changes in image contrast was a major reason behind the development of the I* metric.

Table to Convert Megalux-hours of Light Exposure to estimated "Years on Display"											
Indoor Light Levels for Print Display		Multiply Mlux-hrs by	Megalux-hours in test								
Light Exposure	**Description**		**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
≤ 10 Lux 24 hours per day	Interior rooms, storage areas, or hallways without windows, illuminated sparingly by artificial lighting	**11.4**	**114**	**228**	**342**	**457**	**571**	**685**	**799**	**913**	**1027**	**1142**
50 Lux 12 hours per day	"Museum Standard" display condition	**4.6**	**46**	**91**	**137**	**183**	**228**	**274**	**325**	**365**	**411**	**457**
120 Lux 12 hours per day "Kodak Display Years" (1)	Average home illumination level for photos is ~ 60 lux. 90% of all displayed photos do not exceed 120 lux (1).	**1.9**	**19**	**38**	**57**	**76**	**95**	**114**	**133**	**152**	**171**	**190**
228 Lux 12 hours per day	Relatively bright home or office. Note the simple 1:1 relationship between "years on display" and Mlux-hr values at this condition.	**1.0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
450 Lux 12 hours per day "WIR Display Years" (2) Also equals 500 lux for 11.8 hours per day	A bright home or commercial office building illumination level is 200-500 lux. Also, good illumination for color critical viewing and color matching tasks begins at about 500 lux.	**0.5**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**41**	**46**	**51**

Light levels commonly encountered in the real world fluctuate widely throughout indoor print display environments and produce large variations in how long it takes for artwork to acquire light-induced damage. Use this table as a guide to estimate how many "years on display" (denoted in red text) it takes to accumulate the light exposure test dosage. Review the test results to decide which Megalux-hour dose has caused fading to your level of concern (e.g., just noticeable, easily noticeable, objectionable, etc.). Then choose the print display description that best represents how your print is likely to be displayed. You may want to obtain a lux meter and make some measurements in your own display environment!

Note that as the years of display time increase, light-induced fading can be eclipsed by other serious aging mechanisms such as fading and/or staining caused by heat, humidity, and air pollutants. Mould damage can also occur at high humidity. Even when colorants remain water fast, direct contact with liquids may result in physical deformation and staining of the substrate. Also, temperature and especially humidity cycling can cause physical cracks and/or flaking, etc. Handling damage such as scratching, abrasion, tears and creases, and catastrophic damage by smoke, fire, flood, etc., also degrade print quality over time. Thus, as illumination levels are reduced other forms of degradation take on greater proportion of risk and may appear in shorter time intervals.

(1) Eastman Kodak cited this exposure condition with a 90% confidence limit as a rationale for estimating print fading times of traditional color photo materials in typical home display environments. For light fading claims regarding its newer line of pigment-based inkjet printers, Kodak adopted the higher level of 450lux/12 hours per day which is also used by Wilhelm Imaging Research, Inc. (See below).

(2) Wilhelm Imaging Research (WIR) standardized its light fastness ratings on 450 lux for 12 hours per day in order to estimate the years on display necessary to reach "easily noticeable" fading. This average daily light exposure dose (at 75˚F/60%RH assumed temperature and humidity levels) used in conjunction with WIR's visually weighted densitometric endpoint criteria set V3.0 became a de facto industry standard during the first decade of the 21st century in the absence of a published International Standards Organization (ISO) test standard. However, the WIR V3.0 visual criteria set used to predict "easily noticeable fade" was designed for traditional 20th century silver–halide color photofinishing processes. It is not well suited to the evaluation of modern digital media. Nevertheless, the WIR assumed daily light exposure dose is one of many commonly encountered light exposure conditions existing within the range of real world picture display locations.

Sample Description

Sample # **AaI_20101209_SN009** **Batch #:** L1
Printer: Epson Stylus Pro 3880
Ink: Epson OEM UltraChrome K3™ with Vivid Magenta
Media: Moab Somerset Enhanced Velvet 225gsm
Coating(s): no additional coating

Test Print Prepared by: AaI&A member
Printed: December 9, 2010
Initial Print colors measured February 5, 2012
Test Started: February 6, 2012

Test Image: AaI_StandardColorSet(v2)forSRGB.tif
RIP?Driver settings: Qimage, 2880x1440dpi, Quality = 5 (highest), , finest detail, color = "off" (no color adjustment) Qimage manages color

Media Setting Velvet Fine Art paper

Profile: Moab Somerset Velvet Epson 3880.icc **Rendering** Perceptual w/BPC
Profile type: generic

Paper White Color (UV-included versus UV-excluded)

Optical Brighteners Present? *yes (low)*	**L***		**a***		**b***	
Media Whitepoint Color	UV inc	UV exc	UV inc	UV exc	UV inc	UV exc
	97.4	97.5	0.3	-0.1	-0.1	1.4
	UV-inc/UV-exc ΔL*, Δa*, Δb* respectively					
	0.1		0.4		1.5	
	Calculated differences, especially for Δb, indicate the role and magnitude of fluorescence on original paper color*					
Maximum Printed Black	**L***	**a***	**b***	Optical Density (Dmax)		
	22.2	1.2	2.4	1.45		

Light source: Phillips Colortone F40T12/C50 – 5000˚K full spectrum fluorescent. Color rendering Index (CRI) =92), soda lime glass filtered
Light Exposure Cycle: 8 hours on, 4 hours off, twice per 24 hours
CIELAB measurements: D50 2˚ observer, Xrite Gretag/Macbeth Spectrolino/Spectroscan

Average Illuminance during "on" cycle: 10429 Lux
Average Temperature: 23.8˚C over full test duration, 25.3˚C during light exposure.
Average Relative humidity: 55.7%RH over full test duration, 55.7%RH during light exposure.

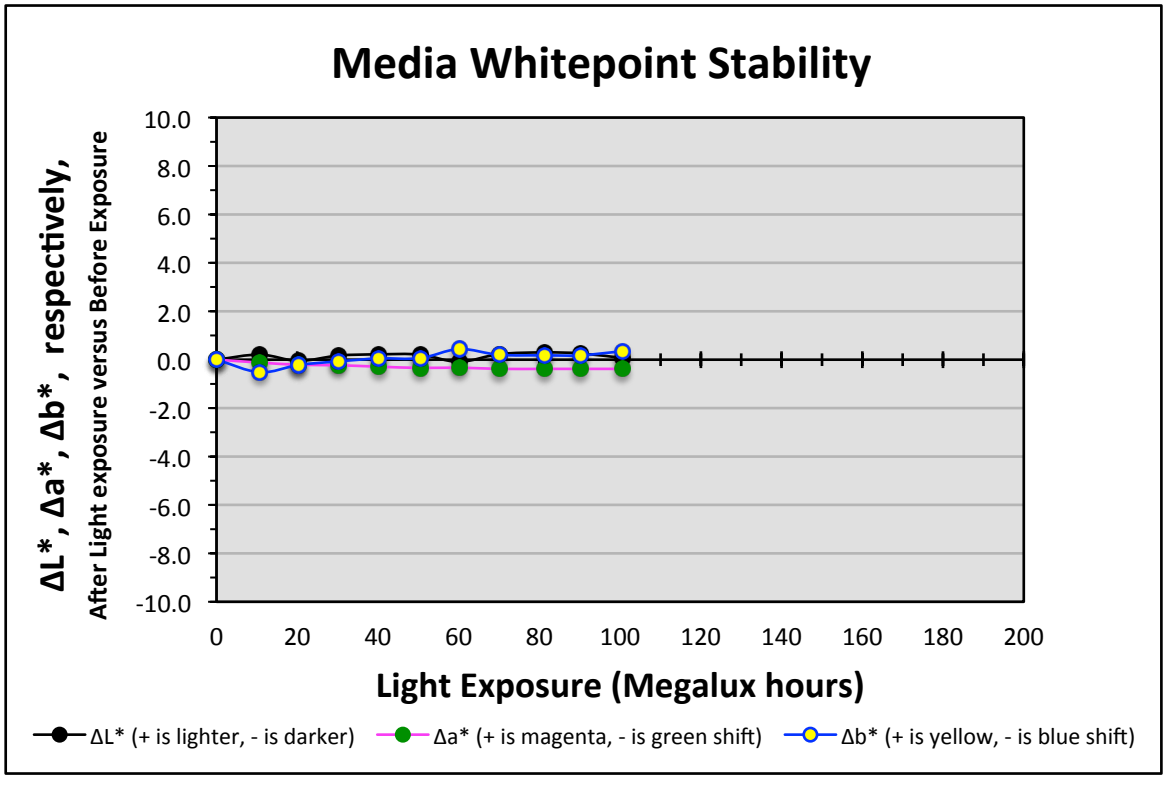
Replicates/Compare to:

Compare to sample # **AaI_20100905_SN004** which was printed on the same printer and same batch of Epson Exhibition Fiber paper but using the Epson OEM Ultrachrome K3 inkset . These two samples have also been tested side-by-side in the light fade testing unit (i.e., batch K1) to eliminate the testing equipment as a potential source of variablity in the comparative results.

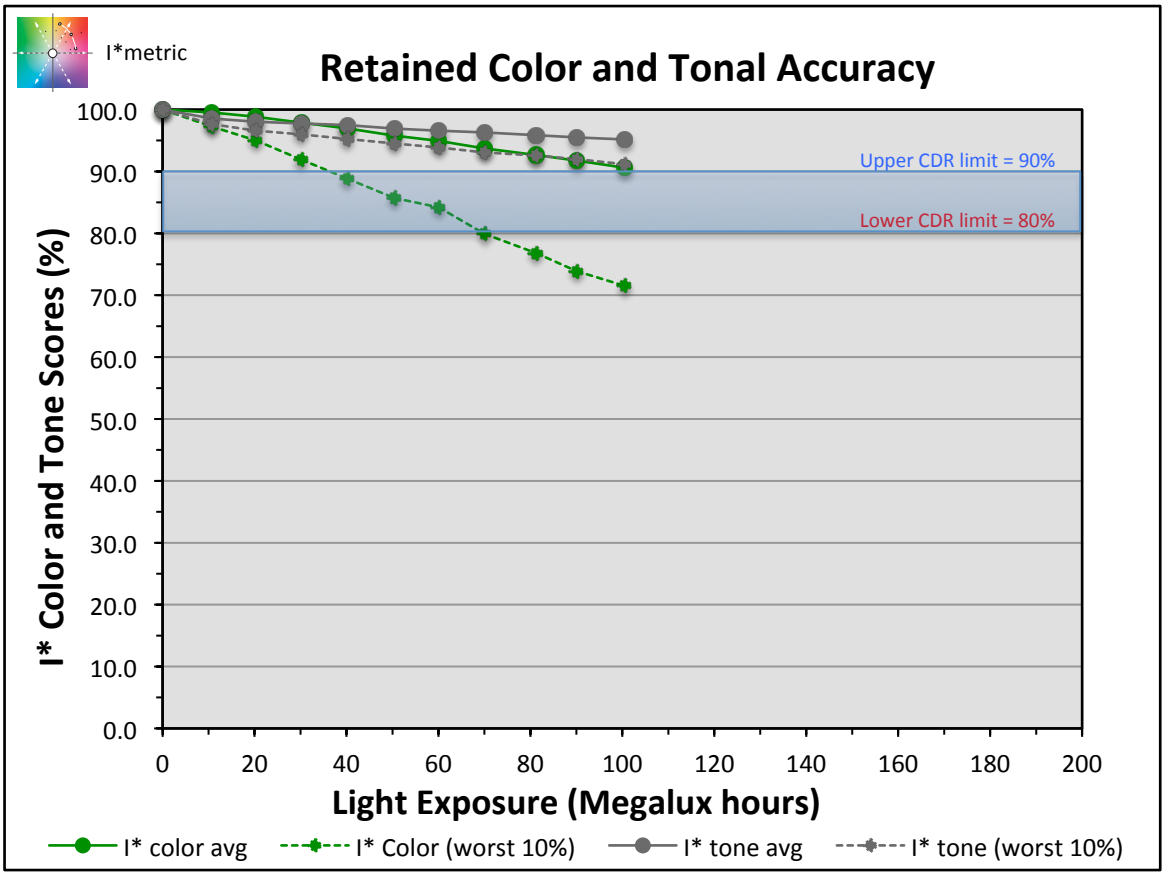
Notes/Comments:

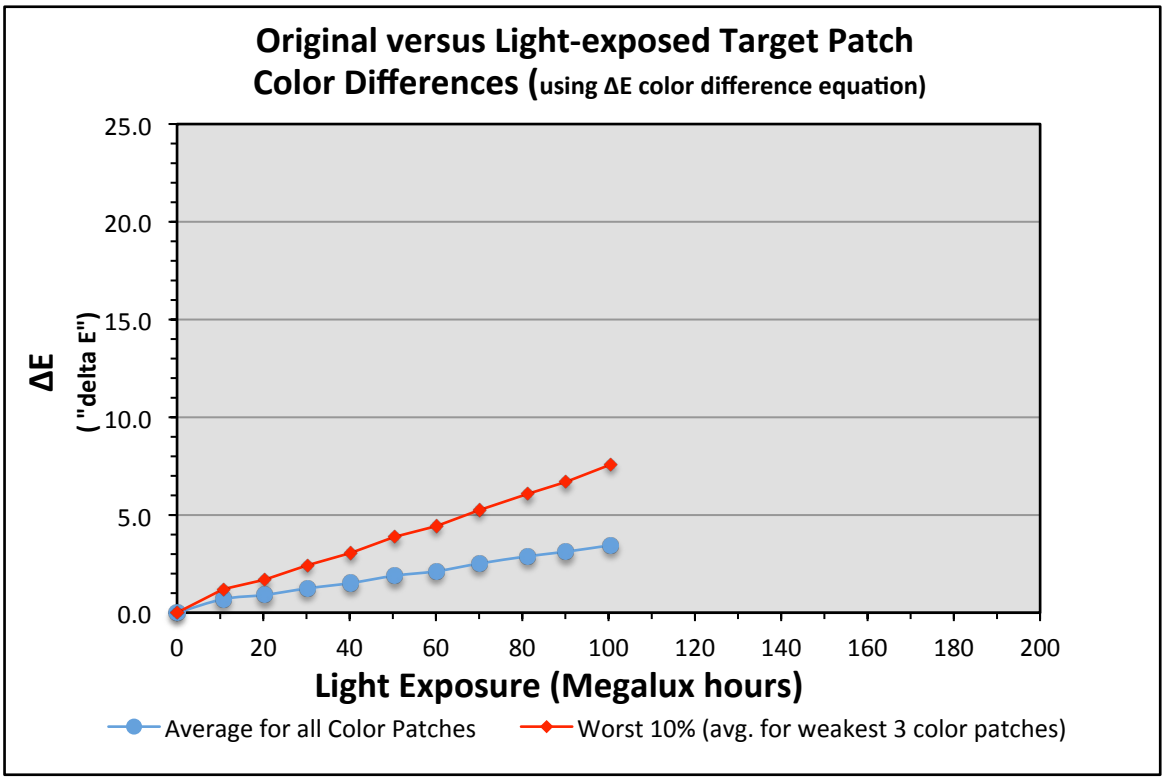
Graphs:

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



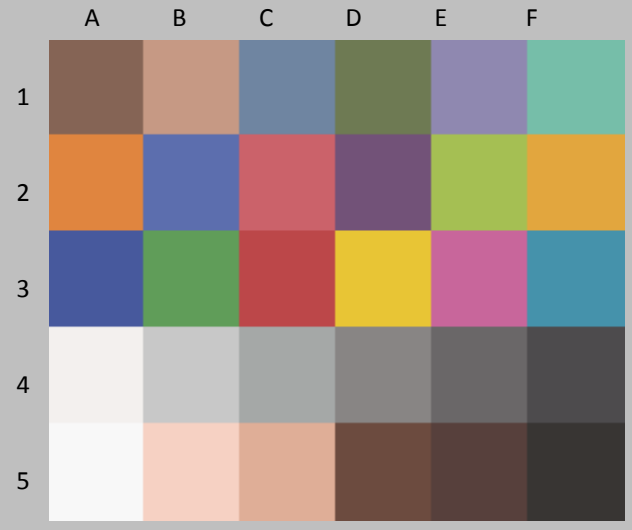
Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



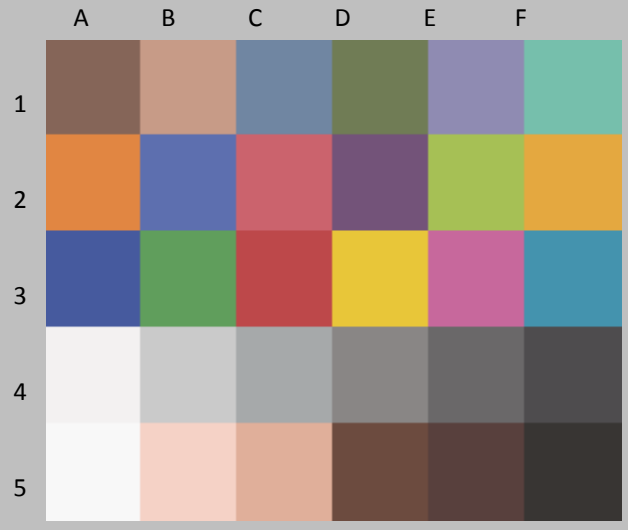


Values:

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure



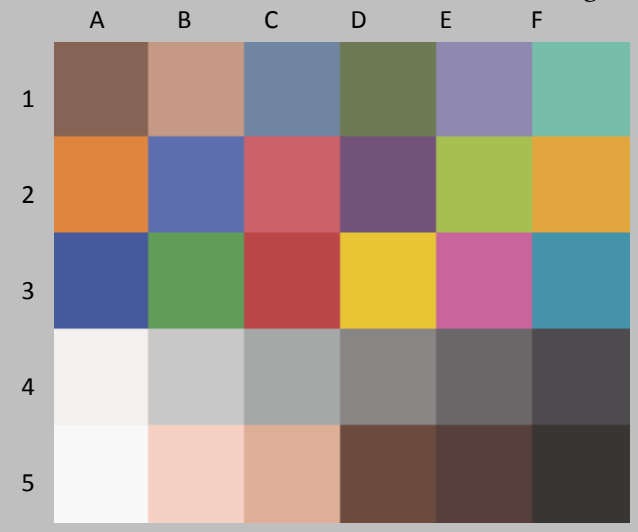
Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin	100.0	0.6	45.5	46.0	12.4	12.3	13.6	13.2
B1	Light Skin	98.6	1.0	67.1	67.7	15.0	14.7	18.3	17.5
C1	Blue sky	100.0	0.6	54.4	54.9	-3.1	-3.3	-17.8	-18.0
D1	Foliage	100.0	0.6	49.5	50.0	-10.3	-10.5	20.3	20.0
E1	blue flower	100.0	0.7	58.4	59.1	8.7	8.4	-19.5	-19.6
F1	bluish green	97.5	1.3	71.9	72.3	-26.7	-26.6	3.2	2.0
A1	orange	99.6	0.8	64.9	65.2	32.5	31.9	51.5	51.1
B2	purplish blue	99.8	0.7	47.0	47.4	7.2	6.6	-37.4	-37.4
C2	moderate red	99.3	0.9	54.9	55.3	43.4	43.1	15.6	14.8
D2	purple	100.0	0.5	39.7	40.1	19.0	18.8	-16.0	-16.2
E2	yellow green	99.5	0.9	73.6	74.0	-21.1	-21.3	50.4	49.6
F2	orange yellow	99.3	1.0	72.7	73.2	16.3	15.5	60.2	59.7
A3	blue	99.9	0.7	39.0	39.3	8.9	8.3	-40.5	-40.3
B3	green	99.9	0.7	59.3	59.7	-31.0	-31.1	28.7	28.2
C3	red	100.0	0.5	47.2	47.3	47.9	47.8	25.4	24.9
D3	yellow	99.4	1.0	80.7	81.1	2.8	2.2	70.6	69.9
E3	magenta	100.0	0.6	56.6	57.0	43.9	43.5	-10.0	-10.2
F3	cyan	100.0	0.5	56.3	56.7	-18.6	-18.7	-21.5	-21.8
A4	white	99.1	0.7	94.9	95.2	0.8	0.7	0.7	0.1
B4	neutral 8	100.0	0.6	80.6	81.0	-0.3	-0.4	0.1	-0.3
C4	neutral 6.5	100.0	0.6	68.6	69.1	-0.5	-0.7	-0.4	-0.7
D4	neutral 5	100.0	0.6	55.8	56.2	0.9	0.7	1.0	0.8
E4	neutral 3.5	100.0	0.6	43.8	44.3	1.2	1.1	0.4	0.0
F4	black	100.0	0.4	32.3	32.5	0.8	0.6	-0.6	-0.8
A5	paper white	99.6	0.6	97.5	97.7	0.5	0.4	0.1	-0.4
B5	Skin highlight L*=88	96.4	1.2	86.7	87.1	11.5	11.1	12.2	11.2
C5	Skin highlight L* =75	97.9	1.2	75.1	75.7	16.0	15.5	19.0	18.1
D5	Skin shadow L*=28	100.0	0.5	35.2	35.3	13.3	13.4	12.8	13.3
E5	Skin shadow L*=13	100.0	0.3	29.6	29.6	10.1	10.4	5.9	5.9
F5	Maximum Black	100.0	0.0	22.2	22.2	1.2	1.2	2.4	2.4

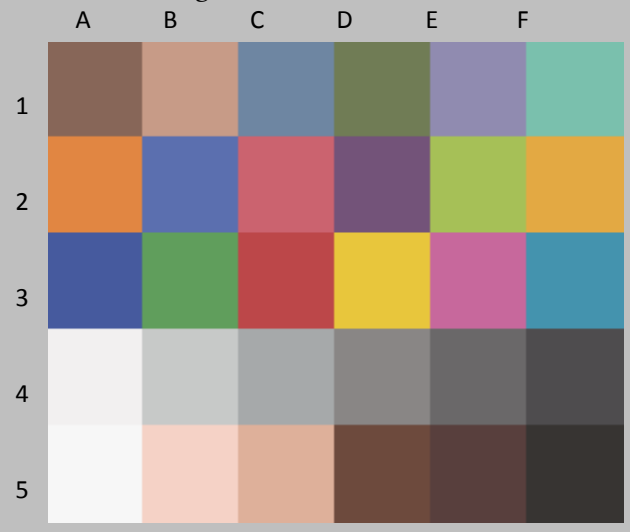
Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	99.5	98.6	0.7
Worst 10% (3 lowest scoring patches)	97.3	97.6	1.2

10 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure



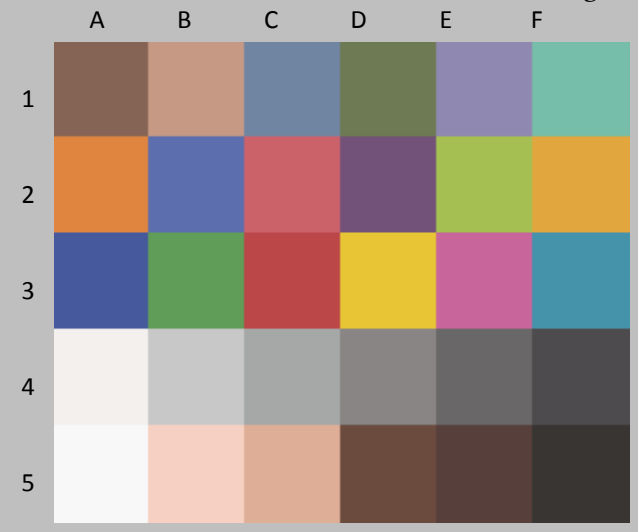
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	98.9	0.9	45.5	46.1	12.4	12.4	13.6	12.9
B1	Light Skin	96.6	1.5	67.1	67.8	15.0	14.6	18.3	17.0
C1	Blue sky	100.0	0.7	54.4	54.9	-3.1	-3.5	-17.8	-17.9
D1	Foliage	99.5	0.8	49.5	50.0	-10.3	-10.5	20.3	19.7
E1	blue flower	99.5	0.9	58.4	59.1	8.7	8.1	-19.5	-19.4
F1	bluish green	95.6	1.8	71.9	72.4	-26.7	-26.4	3.2	1.5
A1	orange	99.1	1.1	64.9	65.3	32.5	31.7	51.5	50.7
B2	purplish blue	98.8	1.1	47.0	47.5	7.2	6.3	-37.4	-37.0
C2	moderate red	98.5	1.3	54.9	55.2	43.4	43.1	15.6	14.4
D2	purple	100.0	0.6	39.7	40.1	19.0	18.8	-16.0	-16.3
E2	yellow green	98.1	1.6	73.6	74.1	-21.1	-21.2	50.4	48.9
F2	orange yellow	98.7	1.4	72.7	73.2	16.3	15.4	60.2	59.3
A3	blue	98.9	1.0	39.0	39.3	8.9	8.0	-40.5	-40.1
B3	green	98.7	1.1	59.3	59.7	-31.0	-31.1	28.7	27.7
C3	red	99.9	0.5	47.2	47.2	47.9	47.9	25.4	24.8
D3	yellow	98.5	1.6	80.7	81.1	2.8	2.0	70.6	69.3
E3	magenta	99.6	0.8	56.6	57.0	43.9	43.3	-10.0	-10.0
F3	cyan	100.0	0.5	56.3	56.7	-18.6	-18.8	-21.5	-21.6
A4	white	100.0	0.4	94.9	95.0	0.8	0.6	0.7	0.4
B4	neutral 8	100.0	0.4	80.6	80.8	-0.3	-0.5	0.1	-0.1
C4	neutral 6.5	100.0	0.5	68.6	69.0	-0.5	-0.8	-0.4	-0.5
D4	neutral 5	100.0	0.5	55.8	56.1	0.9	0.7	1.0	0.8
E4	neutral 3.5	99.3	0.7	43.8	44.3	1.2	1.1	0.4	-0.2
F4	black	100.0	0.5	32.3	32.5	0.8	0.6	-0.6	-0.9
A5	paper white	100.0	0.3	97.5	97.4	0.5	0.3	0.1	-0.1
B5	Skin highlight L*=88	93.9	1.6	86.7	87.0	11.5	11.0	12.2	10.8
C5	Skin highlight L* =75	95.6	1.7	75.1	75.6	16.0	15.3	19.0	17.6
D5	Skin shadow L*=28	97.8	0.9	35.2	35.2	13.3	13.5	12.8	13.6
E5	Skin shadow L*=13	100.0	0.5	29.6	29.4	10.1	10.5	5.9	6.0
F5	Maximum Black	100.0	0.3	22.2	21.9	1.2	1.2	2.4	2.5

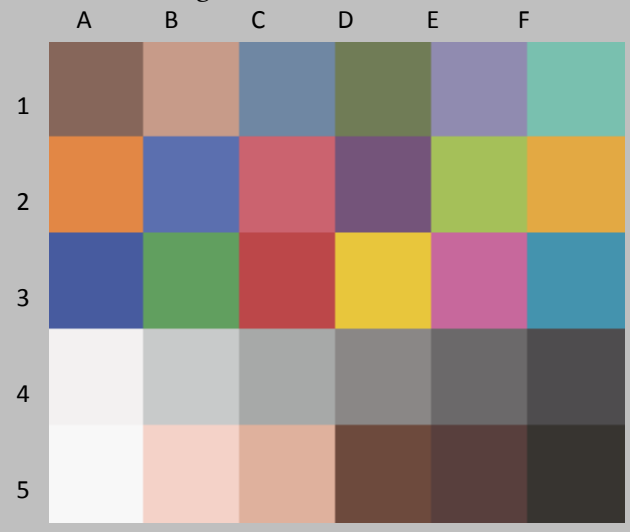
Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	98.9	98.0	0.9
Worst 10% (3 lowest scoring patches)	95.0	96.6	1.7

20 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure



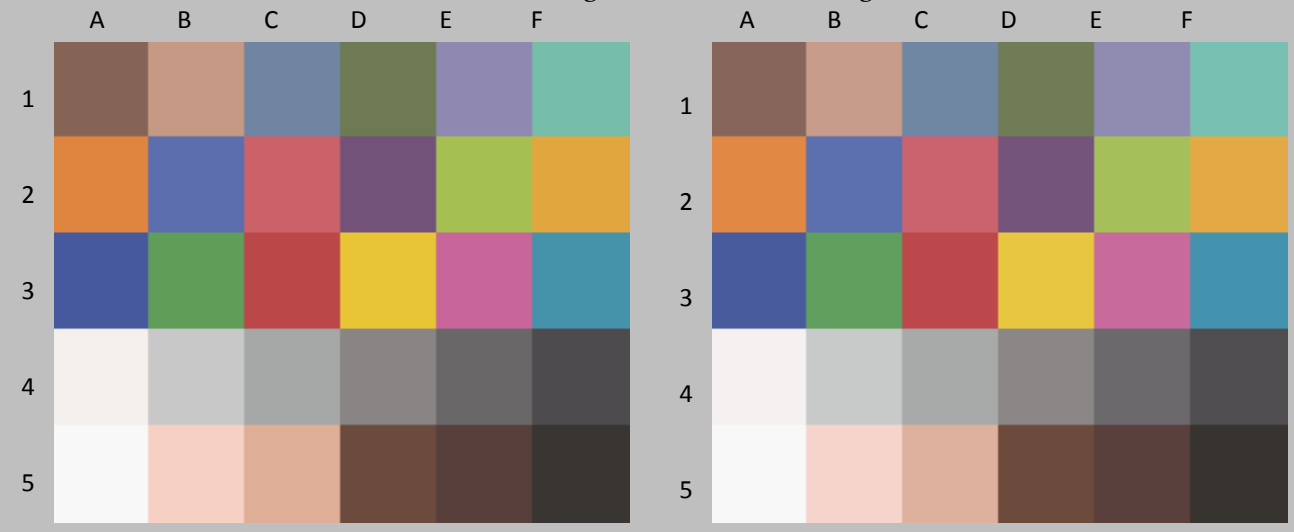
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	96.7	1.3	45.5	46.2	12.4	12.3	13.6	12.5
B1	Light Skin	94.1	2.1	67.1	68.0	15.0	14.6	18.3	16.4
C1	Blue sky	99.7	1.0	54.4	55.1	-3.1	-3.6	-17.8	-17.7
D1	Foliage	97.9	1.1	49.5	50.1	-10.3	-10.3	20.3	19.3
E1	blue flower	98.5	1.2	58.4	59.3	8.7	8.0	-19.5	-19.2
F1	bluish green	93.1	2.4	71.9	72.5	-26.7	-26.2	3.2	0.9
A1	orange	98.2	1.7	64.9	65.4	32.5	31.6	51.5	50.2
B2	purplish blue	98.1	1.4	47.0	47.6	7.2	6.1	-37.4	-36.8
C2	moderate red	97.3	1.8	54.9	55.3	43.4	43.0	15.6	13.9
D2	purple	100.0	0.7	39.7	40.3	19.0	18.7	-16.0	-16.3
E2	yellow green	96.6	2.4	73.6	74.2	-21.1	-21.1	50.4	48.0
F2	orange yellow	97.7	2.0	72.7	73.3	16.3	15.2	60.2	58.6
A3	blue	98.1	1.4	39.0	39.5	8.9	7.8	-40.5	-39.7
B3	green	97.7	1.6	59.3	59.9	-31.0	-30.9	28.7	27.3
C3	red	99.3	0.9	47.2	47.2	47.9	47.8	25.4	24.5
D3	yellow	97.6	2.3	80.7	81.2	2.8	1.9	70.6	68.7
E3	magenta	99.6	0.8	56.6	57.1	43.9	43.3	-10.0	-10.0
F3	cyan	100.0	0.6	56.3	56.8	-18.6	-18.9	-21.5	-21.6
A4	white	100.0	0.3	94.9	95.1	0.8	0.6	0.7	0.5
B4	neutral 8	100.0	0.5	80.6	81.0	-0.3	-0.6	0.1	0.0
C4	neutral 6.5	100.0	0.6	68.6	69.2	-0.5	-0.8	-0.4	-0.4
D4	neutral 5	100.0	0.7	55.8	56.4	0.9	0.7	1.0	0.8
E4	neutral 3.5	97.3	1.0	43.8	44.5	1.2	1.2	0.4	-0.4
F4	black	99.9	0.6	32.3	32.7	0.8	0.8	-0.6	-1.1
A5	paper white	100.0	0.3	97.5	97.6	0.5	0.3	0.1	0.0
B5	Skin highlight L*=88	89.8	2.3	86.7	87.2	11.5	11.0	12.2	10.1
C5	Skin highlight L* =75	92.9	2.4	75.1	75.9	16.0	15.3	19.0	16.9
D5	Skin shadow L*=28	96.8	1.1	35.2	35.3	13.3	13.5	12.8	13.8
E5	Skin shadow L*=13	99.4	0.6	29.6	29.6	10.1	10.5	5.9	6.3
F5	Maximum Black	100.0	0.2	22.2	22.0	1.2	1.2	2.4	2.6

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	97.9	97.8	1.2
Worst 10% (3 lowest scoring patches)	91.9	96.0	2.4

30 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure

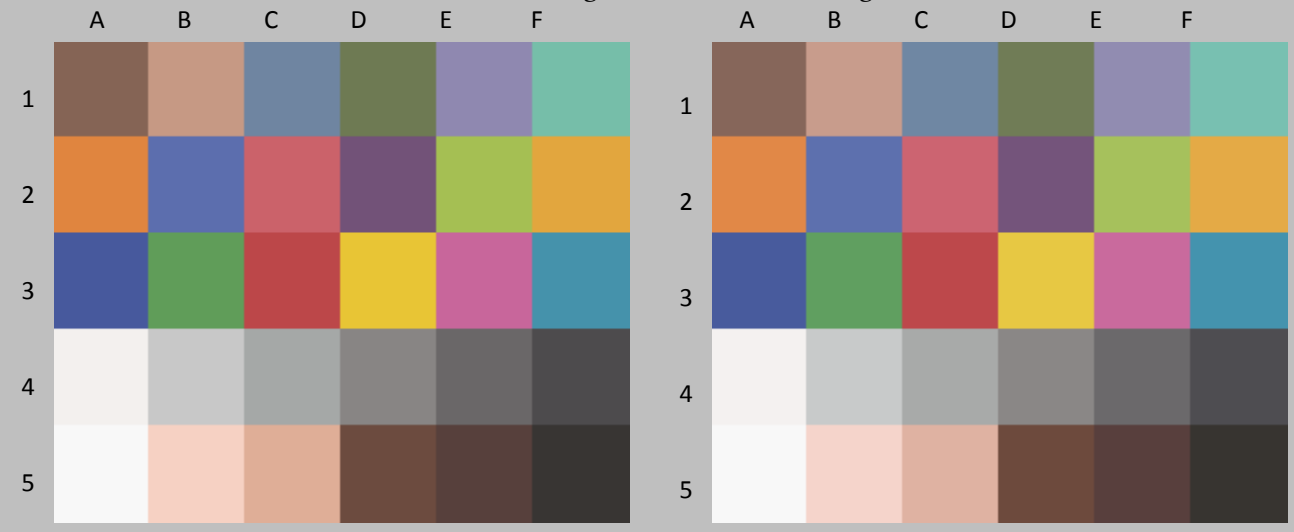
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	95.0	1.6	45.5	46.2	12.4	12.4	13.6	12.1
B1	Light Skin	91.9	2.6	67.1	68.1	15.0	14.7	18.3	15.9
C1	Blue sky	99.3	1.1	54.4	55.3	-3.1	-3.7	-17.8	-17.6
D1	Foliage	96.6	1.4	49.5	50.2	-10.3	-10.3	20.3	19.0
E1	blue flower	98.5	1.2	58.4	59.4	8.7	8.0	-19.5	-19.1
F1	bluish green	90.7	3.1	71.9	72.6	-26.7	-26.0	3.2	0.3
A1	orange	97.6	2.1	64.9	65.5	32.5	31.5	51.5	49.8
B2	purplish blue	97.8	1.5	47.0	47.7	7.2	6.1	-37.4	-36.6
C2	moderate red	96.6	2.1	54.9	55.5	43.4	43.1	15.6	13.5
D2	purple	100.0	0.7	39.7	40.3	19.0	18.8	-16.0	-16.4
E2	yellow green	95.6	3.0	73.6	74.3	-21.1	-21.2	50.4	47.5
F2	orange yellow	97.0	2.5	72.7	73.5	16.3	15.1	60.2	58.2
A3	blue	97.5	1.6	39.0	39.6	8.9	7.7	-40.5	-39.5
B3	green	96.3	2.2	59.3	60.0	-31.0	-30.9	28.7	26.7
C3	red	99.2	0.9	47.2	47.3	47.9	47.9	25.4	24.4
D3	yellow	96.8	2.9	80.7	81.4	2.8	1.7	70.6	68.1
E3	magenta	99.5	1.0	56.6	57.2	43.9	43.2	-10.0	-9.8
F3	cyan	100.0	0.6	56.3	56.8	-18.6	-18.8	-21.5	-21.6
A4	white	100.0	0.4	94.9	95.2	0.8	0.5	0.7	0.5
B4	neutral 8	100.0	0.6	80.6	81.1	-0.3	-0.6	0.1	0.1
C4	neutral 6.5	100.0	0.7	68.6	69.3	-0.5	-0.8	-0.4	-0.3
D4	neutral 5	100.0	0.8	55.8	56.5	0.9	0.7	1.0	0.8
E4	neutral 3.5	94.4	1.3	43.8	44.6	1.2	1.2	0.4	-0.7
F4	black	98.1	0.8	32.3	32.8	0.8	0.8	-0.6	-1.2
A5	paper white	100.0	0.4	97.5	97.7	0.5	0.2	0.1	0.1
B5	Skin highlight L*=88	85.5	3.0	86.7	87.4	11.5	11.0	12.2	9.3
C5	Skin highlight L* =75	90.4	3.1	75.1	76.2	16.0	15.3	19.0	16.2
D5	Skin shadow L*=28	96.2	1.2	35.2	35.3	13.3	13.5	12.8	13.9
E5	Skin shadow L*=13	98.2	0.7	29.6	29.6	10.1	10.7	5.9	6.3
F5	Maximum Black	100.0	0.2	22.2	22.1	1.2	1.2	2.4	2.6

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	96.9	97.5	1.5
Worst 10% (3 lowest scoring patches)	88.8	95.3	3.1

40 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure

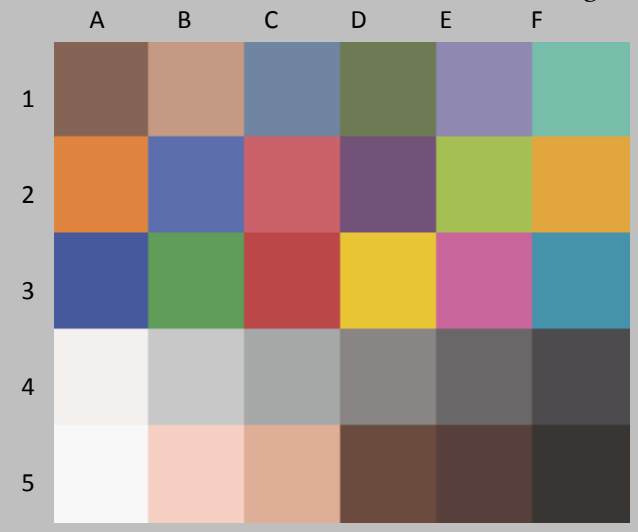
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	93.0	2.0	45.5	46.4	12.4	12.5	13.6	11.8
B1	Light Skin	89.6	3.2	67.1	68.3	15.0	14.6	18.3	15.3
C1	Blue sky	98.9	1.3	54.4	55.4	-3.1	-3.7	-17.8	-17.6
D1	Foliage	94.9	1.9	49.5	50.4	-10.3	-10.3	20.3	18.6
E1	blue flower	97.5	1.6	58.4	59.6	8.7	7.9	-19.5	-19.0
F1	bluish green	87.8	3.9	71.9	72.7	-26.7	-25.9	3.2	-0.5
A1	orange	96.6	2.7	64.9	65.7	32.5	31.3	51.5	49.2
B2	purplish blue	97.1	1.8	47.0	47.8	7.2	5.9	-37.4	-36.5
C2	moderate red	95.5	2.7	54.9	55.6	43.4	43.2	15.6	13.0
D2	purple	99.7	1.0	39.7	40.5	19.0	18.9	-16.0	-16.5
E2	yellow green	93.8	4.0	73.6	74.5	-21.1	-21.2	50.4	46.5
F2	orange yellow	95.9	3.2	72.7	73.7	16.3	14.9	60.2	57.5
A3	blue	97.1	1.8	39.0	39.7	8.9	7.5	-40.5	-39.4
B3	green	94.7	2.9	59.3	60.2	-31.0	-30.9	28.7	26.0
C3	red	98.5	1.3	47.2	47.4	47.9	48.0	25.4	24.1
D3	yellow	95.7	3.7	80.7	81.6	2.8	1.5	70.6	67.3
E3	magenta	99.5	1.1	56.6	57.4	43.9	43.3	-10.0	-9.7
F3	cyan	100.0	0.8	56.3	57.0	-18.6	-18.9	-21.5	-21.6
A4	white	100.0	0.4	94.9	95.2	0.8	0.5	0.7	0.6
B4	neutral 8	100.0	0.7	80.6	81.2	-0.3	-0.6	0.1	0.1
C4	neutral 6.5	100.0	0.9	68.6	69.4	-0.5	-0.9	-0.4	-0.3
D4	neutral 5	100.0	1.0	55.8	56.7	0.9	0.7	1.0	0.8
E4	neutral 3.5	92.1	1.6	43.8	44.8	1.2	1.2	0.4	-0.9
F4	black	95.1	1.1	32.3	32.8	0.8	0.9	-0.6	-1.5
A5	paper white	100.0	0.4	97.5	97.7	0.5	0.1	0.1	0.2
B5	Skin highlight L*=88	81.9	3.6	86.7	87.5	11.5	11.0	12.2	8.7
C5	Skin highlight L* =75	87.5	3.8	75.1	76.3	16.0	15.3	19.0	15.5
D5	Skin shadow L*=28	94.4	1.5	35.2	35.2	13.3	13.7	12.8	14.2
E5	Skin shadow L*=13	96.9	0.9	29.6	29.6	10.1	10.9	5.9	6.3
F5	Maximum Black	100.0	0.3	22.2	22.0	1.2	1.2	2.4	2.6

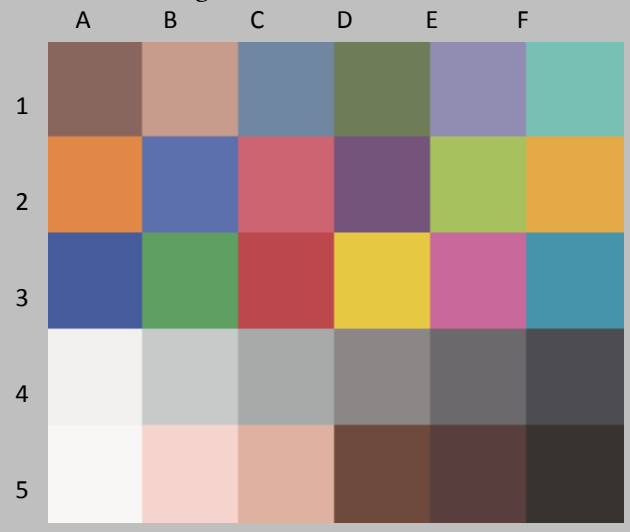
Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	95.8	96.9	1.9
Worst 10% (3 lowest scoring patches)	85.7	94.5	3.9

50 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure



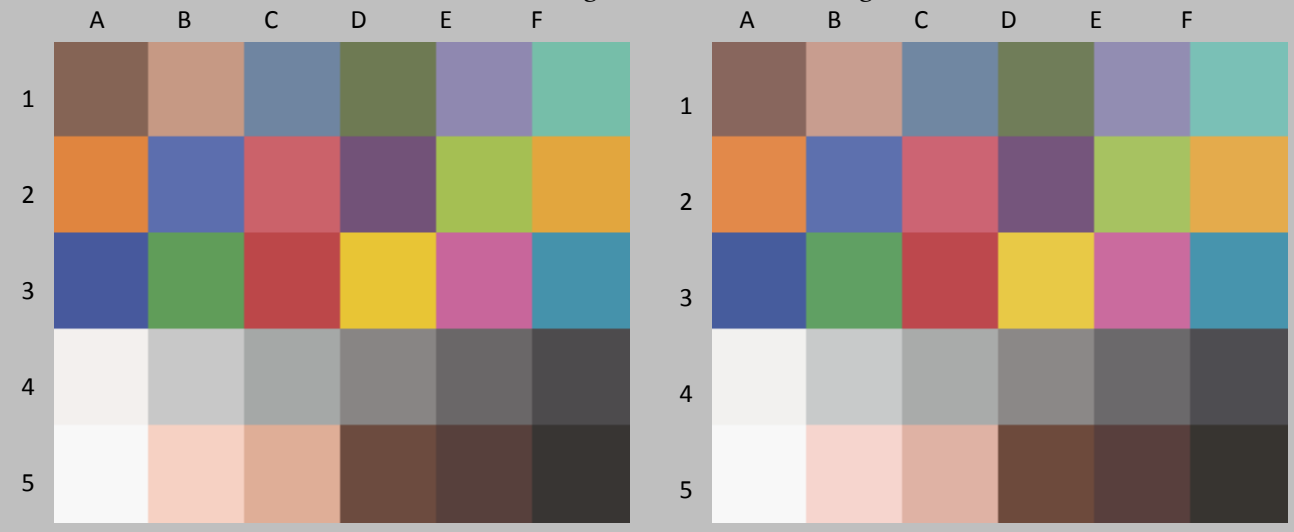
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	91.0	2.4	45.5	46.5	12.4	12.6	13.6	11.4
B1	Light Skin	87.8	3.6	67.1	68.4	15.0	14.7	18.3	14.9
C1	Blue sky	98.2	1.3	54.4	55.4	-3.1	-3.8	-17.8	-17.3
D1	Foliage	93.5	2.1	49.5	50.4	-10.3	-10.3	20.3	18.3
E1	blue flower	96.4	1.7	58.4	59.6	8.7	7.8	-19.5	-18.7
F1	bluish green	86.5	4.2	71.9	72.7	-26.7	-25.7	3.2	-0.8
A1	orange	96.0	3.0	64.9	65.7	32.5	31.4	51.5	48.8
B2	purplish blue	96.0	2.2	47.0	47.8	7.2	5.6	-37.4	-36.1
C2	moderate red	94.7	3.0	54.9	55.6	43.4	43.4	15.6	12.6
D2	purple	99.5	1.0	39.7	40.5	19.0	18.9	-16.0	-16.6
E2	yellow green	92.6	4.6	73.6	74.5	-21.1	-21.1	50.4	45.8
F2	orange yellow	95.2	3.7	72.7	73.7	16.3	14.8	60.2	57.0
A3	blue	96.1	2.2	39.0	39.7	8.9	7.2	-40.5	-39.2
B3	green	93.3	3.4	59.3	60.1	-31.0	-30.8	28.7	25.4
C3	red	98.1	1.5	47.2	47.4	47.9	48.1	25.4	23.9
D3	yellow	94.6	4.4	80.7	81.5	2.8	1.5	70.6	66.5
E3	magenta	99.0	1.2	56.6	57.4	43.9	43.2	-10.0	-9.4
F3	cyan	100.0	0.7	56.3	56.9	-18.6	-19.0	-21.5	-21.3
A4	white	100.0	0.4	94.9	94.9	0.8	0.5	0.7	1.0
B4	neutral 8	100.0	0.6	80.6	81.0	-0.3	-0.6	0.1	0.4
C4	neutral 6.5	100.0	0.8	68.6	69.3	-0.5	-0.9	-0.4	-0.1
D4	neutral 5	100.0	0.7	55.8	56.4	0.9	0.7	1.0	0.9
E4	neutral 3.5	91.1	1.6	43.8	44.7	1.2	1.3	0.4	-1.0
F4	black	93.6	1.2	32.3	32.7	0.8	1.1	-0.6	-1.6
A5	paper white	99.5	0.6	97.5	97.4	0.5	0.2	0.1	0.5
B5	Skin highlight L*=88	80.5	3.8	86.7	87.3	11.5	11.0	12.2	8.5
C5	Skin highlight L* =75	85.6	4.2	75.1	76.2	16.0	15.3	19.0	15.0
D5	Skin shadow L*=28	92.5	1.9	35.2	35.2	13.3	14.0	12.8	14.5
E5	Skin shadow L*=13	96.7	0.9	29.6	29.3	10.1	10.9	5.9	6.3
F5	Maximum Black	100.0	0.4	22.2	21.9	1.2	1.2	2.4	2.6

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	94.9	96.6	2.1
Worst 10% (3 lowest scoring patches)	84.2	93.9	4.4

60 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure

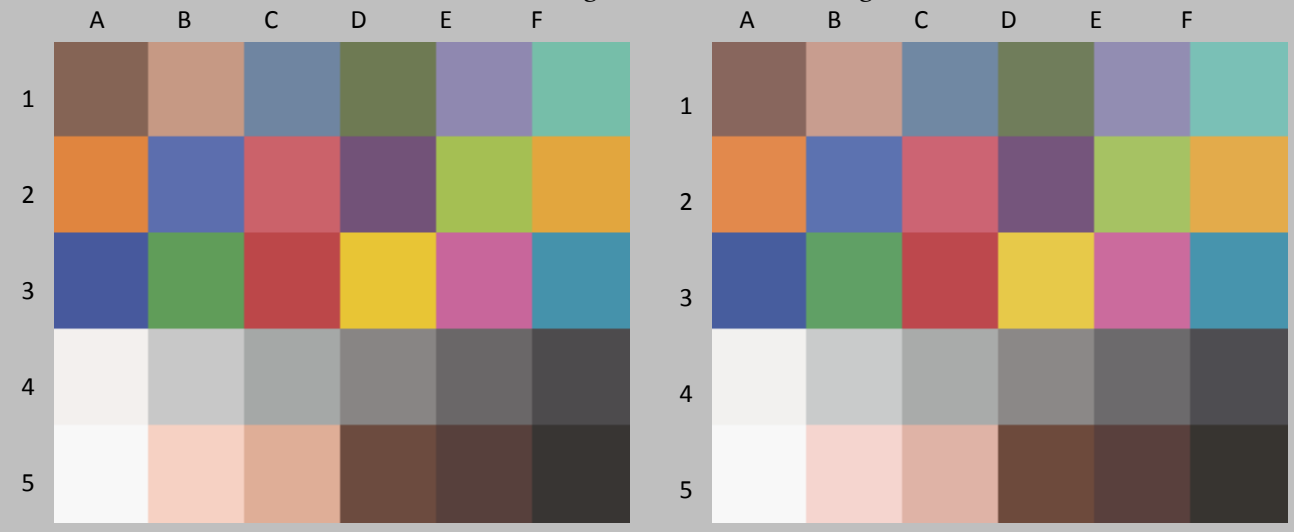
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	88.8	2.8	45.5	46.6	12.4	12.7	13.6	11.0
B1	Light Skin	85.0	4.3	67.1	68.6	15.0	14.7	18.3	14.2
C1	Blue sky	98.3	1.4	54.4	55.5	-3.1	-3.8	-17.8	-17.4
D1	Foliage	91.5	2.6	49.5	50.4	-10.3	-10.1	20.3	17.9
E1	blue flower	96.7	1.9	58.4	59.9	8.7	7.8	-19.5	-18.7
F1	bluish green	83.2	5.1	71.9	72.9	-26.7	-25.5	3.2	-1.7
A1	orange	94.8	3.8	64.9	65.8	32.5	31.2	51.5	48.1
B2	purplish blue	95.9	2.3	47.0	48.0	7.2	5.6	-37.4	-36.1
C2	moderate red	93.6	3.6	54.9	55.8	43.4	43.4	15.6	12.1
D2	purple	98.8	1.2	39.7	40.6	19.0	19.0	-16.0	-16.8
E2	yellow green	91.3	5.4	73.6	74.8	-21.1	-21.2	50.4	45.1
F2	orange yellow	94.0	4.4	72.7	74.0	16.3	14.6	60.2	56.3
A3	blue	96.1	2.2	39.0	39.8	8.9	7.2	-40.5	-39.2
B3	green	91.7	4.1	59.3	60.4	-31.0	-30.8	28.7	24.8
C3	red	97.5	1.9	47.2	47.5	47.9	48.1	25.4	23.5
D3	yellow	93.7	5.1	80.7	81.9	2.8	1.2	70.6	65.9
E3	magenta	99.1	1.4	56.6	57.7	43.9	43.1	-10.0	-9.6
F3	cyan	100.0	0.9	56.3	57.2	-18.6	-19.0	-21.5	-21.4
A4	white	100.0	0.5	94.9	95.2	0.8	0.4	0.7	0.7
B4	neutral 8	100.0	0.8	80.6	81.3	-0.3	-0.7	0.1	0.2
C4	neutral 6.5	100.0	1.1	68.6	69.6	-0.5	-1.0	-0.4	-0.2
D4	neutral 5	100.0	1.0	55.8	56.7	0.9	0.7	1.0	0.8
E4	neutral 3.5	87.6	2.0	43.8	44.9	1.2	1.3	0.4	-1.3
F4	black	90.6	1.5	32.3	32.9	0.8	1.1	-0.6	-1.9
A5	paper white	100.0	0.5	97.5	97.7	0.5	0.1	0.1	0.3
B5	Skin highlight L*=88	74.8	4.8	86.7	87.7	11.5	11.0	12.2	7.5
C5	Skin highlight L* =75	81.8	5.2	75.1	76.6	16.0	15.3	19.0	14.1
D5	Skin shadow L*=28	91.7	2.0	35.2	35.3	13.3	14.0	12.8	14.7
E5	Skin shadow L*=13	95.0	1.1	29.6	29.6	10.1	11.1	5.9	6.4
F5	Maximum Black	100.0	0.3	22.2	22.0	1.2	1.2	2.4	2.7

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	93.7	96.3	2.5
Worst 10% (3 lowest scoring patches)	79.9	93.1	5.2

70 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure

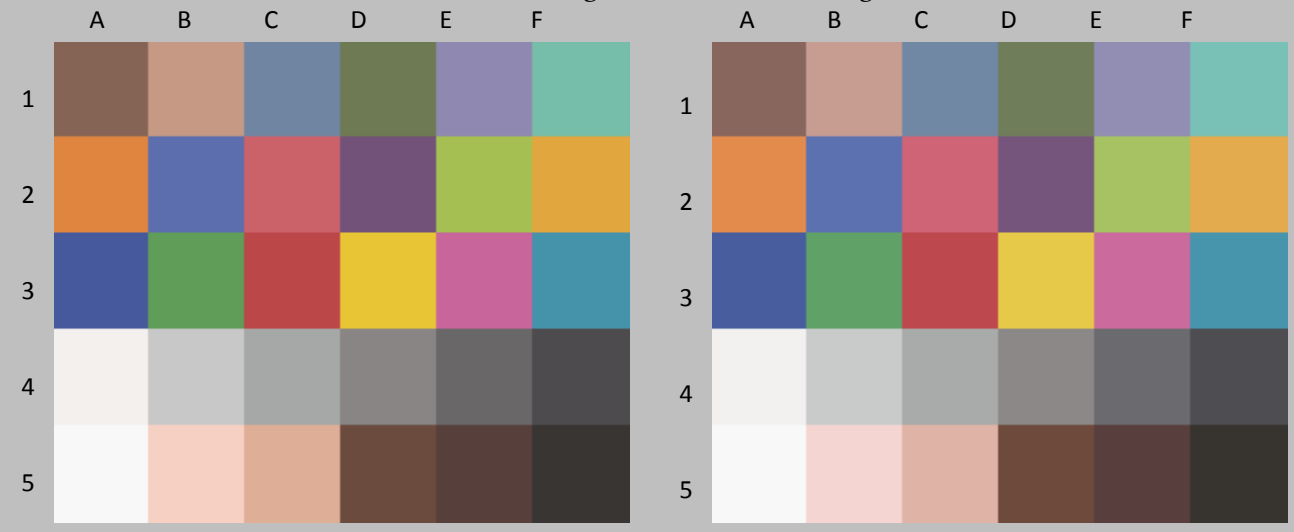
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	86.5	3.3	45.5	46.8	12.4	12.6	13.6	10.6
B1	Light Skin	82.4	4.9	67.1	68.7	15.0	14.7	18.3	13.6
C1	Blue sky	97.9	1.6	54.4	55.6	-3.1	-3.8	-17.8	-17.4
D1	Foliage	89.4	3.1	49.5	50.6	-10.3	-10.1	20.3	17.4
E1	blue flower	96.2	2.1	58.4	60.1	8.7	7.8	-19.5	-18.6
F1	bluish green	80.4	5.9	71.9	73.1	-26.7	-25.3	3.2	-2.4
A1	orange	93.4	4.6	64.9	66.0	32.5	31.0	51.5	47.3
B2	purplish blue	95.4	2.6	47.0	48.2	7.2	5.5	-37.4	-36.0
C2	moderate red	92.4	4.1	54.9	55.9	43.4	43.4	15.6	11.6
D2	purple	98.7	1.4	39.7	40.8	19.0	19.0	-16.0	-16.8
E2	yellow green	89.6	6.3	73.6	75.0	-21.1	-21.2	50.4	44.2
F2	orange yellow	92.7	5.3	72.7	74.2	16.3	14.4	60.2	55.5
A3	blue	95.6	2.5	39.0	40.0	8.9	7.1	-40.5	-39.0
B3	green	89.9	4.9	59.3	60.6	-31.0	-30.6	28.7	24.0
C3	red	96.7	2.3	47.2	47.6	47.9	48.0	25.4	23.1
D3	yellow	92.5	6.0	80.7	82.1	2.8	1.0	70.6	65.1
E3	magenta	99.0	1.6	56.6	57.9	43.9	43.1	-10.0	-9.5
F3	cyan	100.0	1.0	56.3	57.3	-18.6	-18.9	-21.5	-21.4
A4	white	100.0	0.5	94.9	95.3	0.8	0.5	0.7	0.7
B4	neutral 8	100.0	0.9	80.6	81.4	-0.3	-0.7	0.1	0.3
C4	neutral 6.5	100.0	1.2	68.6	69.7	-0.5	-1.0	-0.4	-0.2
D4	neutral 5	100.0	1.1	55.8	56.8	0.9	0.7	1.0	0.7
E4	neutral 3.5	85.5	2.3	43.8	45.1	1.2	1.3	0.4	-1.5
F4	black	88.4	1.8	32.3	33.0	0.8	1.2	-0.6	-2.1
A5	paper white	100.0	0.5	97.5	97.8	0.5	0.1	0.1	0.3
B5	Skin highlight L*=88	71.0	5.5	86.7	87.8	11.5	11.0	12.2	6.9
C5	Skin highlight L* =75	79.0	5.9	75.1	76.8	16.0	15.3	19.0	13.4
D5	Skin shadow L*=28	91.5	2.1	35.2	35.4	13.3	14.0	12.8	14.7
E5	Skin shadow L*=13	95.6	1.0	29.6	29.6	10.1	11.0	5.9	6.4
F5	Maximum Black	100.0	0.3	22.2	22.1	1.2	1.1	2.4	2.6

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	92.7	95.9	2.9
Worst 10% (3 lowest scoring patches)	76.8	92.6	6.1

80 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure

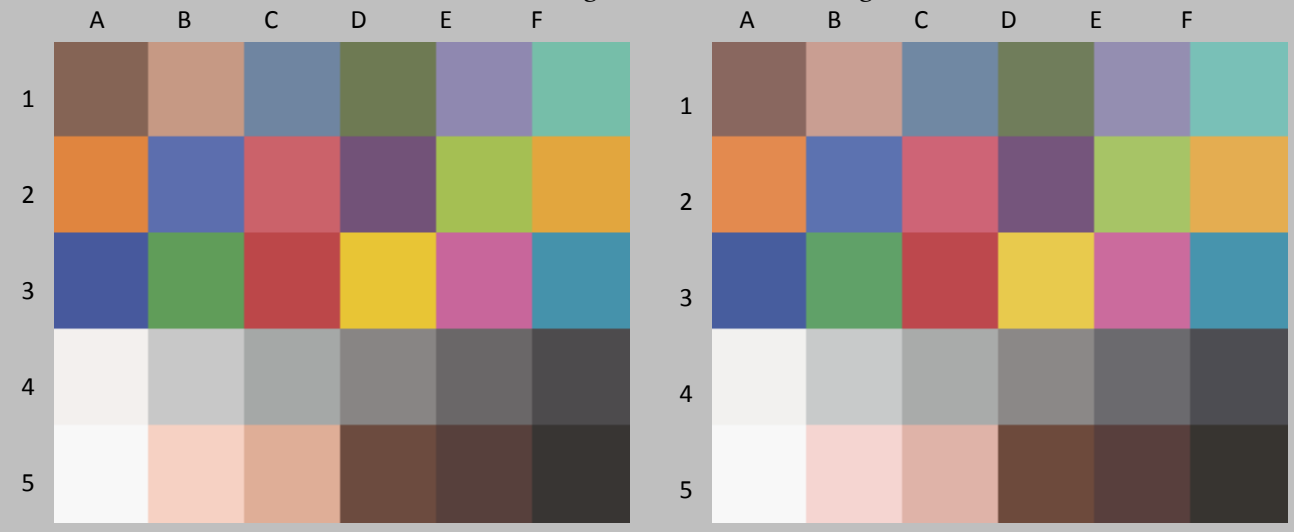
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	85.1	3.5	45.5	46.8	12.4	12.8	13.6	10.4
B1	Light Skin	80.2	5.5	67.1	68.8	15.0	14.8	18.3	13.1
C1	Blue sky	97.2	1.7	54.4	55.8	-3.1	-3.9	-17.8	-17.3
D1	Foliage	88.3	3.3	49.5	50.6	-10.3	-10.1	20.3	17.1
E1	blue flower	96.1	2.1	58.4	60.1	8.7	7.8	-19.5	-18.5
F1	bluish green	78.0	6.5	71.9	73.1	-26.7	-25.1	3.2	-3.0
A1	orange	92.9	5.0	64.9	66.1	32.5	31.0	51.5	47.0
B2	purplish blue	95.4	2.6	47.0	48.2	7.2	5.5	-37.4	-35.9
C2	moderate red	91.6	4.5	54.9	55.9	43.4	43.6	15.6	11.2
D2	purple	97.7	1.5	39.7	40.7	19.0	19.2	-16.0	-17.0
E2	yellow green	88.6	6.9	73.6	75.0	-21.1	-21.2	50.4	43.7
F2	orange yellow	91.8	5.8	72.7	74.3	16.3	14.3	60.2	55.0
A3	blue	95.5	2.5	39.0	39.9	8.9	7.0	-40.5	-39.0
B3	green	88.7	5.5	59.3	60.6	-31.0	-30.6	28.7	23.5
C3	red	96.4	2.5	47.2	47.5	47.9	48.2	25.4	22.9
D3	yellow	91.6	6.6	80.7	82.1	2.8	0.9	70.6	64.5
E3	magenta	99.3	1.5	56.6	57.9	43.9	43.4	-10.0	-9.4
F3	cyan	100.0	1.0	56.3	57.3	-18.6	-19.0	-21.5	-21.3
A4	white	100.0	0.6	94.9	95.3	0.8	0.4	0.7	0.7
B4	neutral 8	100.0	0.9	80.6	81.4	-0.3	-0.7	0.1	0.3
C4	neutral 6.5	100.0	1.2	68.6	69.7	-0.5	-1.0	-0.4	-0.1
D4	neutral 5	100.0	1.2	55.8	56.8	0.9	0.7	1.0	0.7
E4	neutral 3.5	83.3	2.5	43.8	45.2	1.2	1.4	0.4	-1.7
F4	black	85.9	1.9	32.3	32.9	0.8	1.2	-0.6	-2.3
A5	paper white	100.0	0.5	97.5	97.7	0.5	0.1	0.1	0.3
B5	Skin highlight L*=88	67.3	6.1	86.7	87.9	11.5	11.1	12.2	6.3
C5	Skin highlight L* =75	76.4	6.6	75.1	76.8	16.0	15.3	19.0	12.7
D5	Skin shadow L*=28	90.9	2.2	35.2	35.2	13.3	14.0	12.8	14.8
E5	Skin shadow L*=13	94.7	1.1	29.6	29.5	10.1	11.1	5.9	6.5
F5	Maximum Black	100.0	0.4	22.2	21.9	1.2	1.2	2.4	2.7

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	91.8	95.5	3.1
Worst 10% (3 lowest scoring patches)	73.9	92.0	6.7

90 Megalux hours

Epson Stylus Pro 3880, Epson OEM UltraChrome K3™ with Vivid Magenta, Moab Somerset Enhanced Velvet 225gsm, no additional coating



Original Print Colors before light exposure

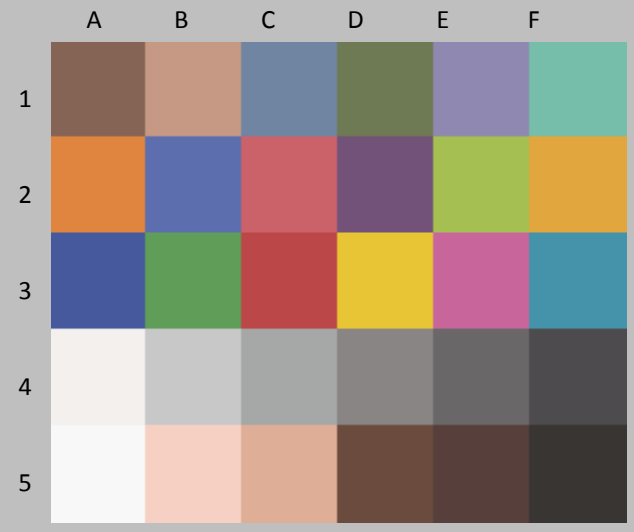
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	82.7	4.0	45.5	47.0	12.4	12.9	13.6	9.9
B1	Light Skin	78.0	6.0	67.1	68.9	15.0	14.8	18.3	12.6
C1	Blue sky	96.7	1.8	54.4	55.8	-3.1	-3.9	-17.8	-17.2
D1	Foliage	86.6	3.7	49.5	50.7	-10.3	-10.0	20.3	16.7
E1	blue flower	95.2	2.4	58.4	60.2	8.7	7.7	-19.5	-18.4
F1	bluish green	76.2	7.0	71.9	73.1	-26.7	-24.9	3.2	-3.5
A1	orange	91.9	5.6	64.9	66.2	32.5	31.0	51.5	46.3
B2	purplish blue	94.6	2.9	47.0	48.3	7.2	5.3	-37.4	-35.7
C2	moderate red	90.7	4.9	54.9	56.0	43.4	43.7	15.6	10.8
D2	purple	97.2	1.7	39.7	40.9	19.0	19.2	-16.0	-17.1
E2	yellow green	86.7	7.9	73.6	75.1	-21.1	-21.1	50.4	42.6
F2	orange yellow	90.6	6.6	72.7	74.4	16.3	14.2	60.2	54.2
A3	blue	94.9	2.8	39.0	39.9	8.9	6.8	-40.5	-38.8
B3	green	87.1	6.1	59.3	60.7	-31.0	-30.6	28.7	22.8
C3	red	95.9	2.8	47.2	47.6	47.9	48.3	25.4	22.7
D3	yellow	90.3	7.5	80.7	82.2	2.8	0.8	70.6	63.5
E3	magenta	98.9	1.8	56.6	58.0	43.9	43.2	-10.0	-9.3
F3	cyan	99.9	1.1	56.3	57.3	-18.6	-19.1	-21.5	-21.3
A4	white	100.0	0.5	94.9	95.1	0.8	0.4	0.7	0.8
B4	neutral 8	100.0	0.9	80.6	81.4	-0.3	-0.7	0.1	0.4
C4	neutral 6.5	99.3	1.2	68.6	69.7	-0.5	-1.0	-0.4	-0.1
D4	neutral 5	100.0	1.3	55.8	57.0	0.9	0.6	1.0	0.7
E4	neutral 3.5	80.9	2.7	43.8	45.2	1.2	1.5	0.4	-1.9
F4	black	82.9	2.2	32.3	32.9	0.8	1.3	-0.6	-2.6
A5	paper white	99.8	0.5	97.5	97.5	0.5	0.1	0.1	0.4
B5	Skin highlight L*=88	64.9	6.5	86.7	87.8	11.5	11.1	12.2	5.9
C5	Skin highlight L* =75	73.4	7.3	75.1	76.9	16.0	15.4	19.0	12.0
D5	Skin shadow L*=28	89.4	2.5	35.2	35.3	13.3	14.2	12.8	15.0
E5	Skin shadow L*=13	93.4	1.3	29.6	29.4	10.1	11.2	5.9	6.5
F5	Maximum Black	100.0	0.4	22.2	21.9	1.2	1.1	2.4	2.7

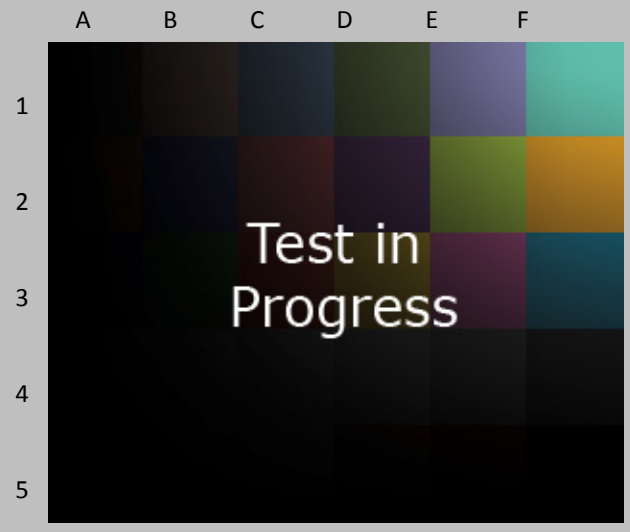
Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	90.6	95.2	3.5
Worst 10% (3 lowest scoring patches)	71.5	91.2	7.6

100 Megalux hours

The 120 Megalux hour Update will be posted on approximately JAN 05, 2015.



Original Print Colors before light exposure



Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin			45.5		12.4		13.6	
B1	Light Skin			67.1		15.0		18.3	
C1	Blue sky			54.4		-3.1		-17.8	
D1	Foliage			49.5		-10.3		20.3	
E1	blue flower			58.4		8.7		-19.5	
F1	bluish green			71.9		-26.7		3.2	
A1	orange			64.9		32.5		51.5	
B2	purplish blue			47.0		7.2		-37.4	
C2	moderate red			54.9		43.4		15.6	
D2	purple			39.7		19.0		-16.0	
E2	yellow green			73.6		-21.1		50.4	
F2	orange yellow			72.7		16.3		60.2	
A3	blue			39.0		8.9		-40.5	
B3	green			59.3		-31.0		28.7	
C3	red			47.2		47.9		25.4	
D3	yellow			80.7		2.8		70.6	
E3	magenta			56.6		43.9		-10.0	
F3	cyan			56.3		-18.6		-21.5	
A4	white			94.9		0.8		0.7	
B4	neutral 8			80.6		-0.3		0.1	
C4	neutral 6.5			68.6		-0.5		-0.4	
D4	neutral 5			55.8		0.9		1.0	
E4	neutral 3.5			43.8		1.2		0.4	
F4	black			32.3		0.8		-0.6	
A5	paper white			97.5		0.5		0.1	
B5	Skin highlight L*=88			86.7		11.5		12.2	
C5	Skin highlight L* =75			75.1		16.0		19.0	
D5	Skin shadow L*=28			35.2		13.3		12.8	
E5	Skin shadow L*=13			29.6		10.1		5.9	
F5	Maximum Black			22.2		1.2		2.4	

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches			
Worst 10% (3 lowest scoring patches)			

120 Megalux hours