

Fade Test – 8 Week Report Ebony-6, UC-MK, Toner

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My fade test of Ebony-6 (v. 1.1), as well as a similar inkset based on Epson UC MK and the blue toner based on Epson C and Canon Blue¹ on Arches Bright White and Premier Art Smooth Hot Press325 has reached 8 weeks of exposure. I have placed a scan of the test patches and their control test strips at <http://www.paulroark.com/BW-Info/8Wk-fade-4-20-2015-100ppi-8bit.jpg>². A description and photos of the device I use for accelerated fade testing is at <http://www.paulroark.com/BW-Info/Fader-Setup.pdf>.

The fader light is a compact fluorescent bulb that results in a brightness on the test samples of 22K Lux. Thus, while the 8 week exposure would be about 30 MLux-hours of exposure, variables in the setup do not allow direct comparison to other tests based on that exposure. My fader operates at an elevated temperature of 43 degrees C, and there is no glass over the samples to absorb the UV from the lamp, which no doubt, has a less than ideal spectrum. While these factors would accelerate fading, my inability to accurately measure or control humidity at the paper surface may be the dominate factor. In general, a very bright light will dry the samples and slow fading. To offset this, I place the fader in a water bath, but I have no idea what the actual paper surface humidity is.

Given the variables among the various types of tests, the usefulness of this test may be mostly to see the relative fading of samples within the test. There might be some value in comparison to other tests to the extent there are benchmarks within the test that allow one to find a rough comparison to other tests. The best tests we have available are from <http://www.aardenburg-imaging.com/>. One possible way in which some comparisons to these tests might be made is to see at what point similar pigments faded similar amounts in both testing setups.

The blue color toner, as expected, showing the most change. While there is no similar ink tested by Aal&A, the closest Aal&A test patch to the toner may be the "Sky Blue" (C1) patch. The darkest toner patch I tested had Lab L = 75. After the 8 week exposure it faded about 1.36 Lab L units.³ On H. Photo Rag, the test of a 7800 color UC Sky Blue Aal&A test patch (Lab L = 51) faded 1.3 Lab L units at 40 MLux-Hours of exposure. There are a lot of variables here that may make this comparison invalid.

It may be that to compare different density inks, the percentage of fade as opposed to the absolute value is more appropriate. If this is the case, the blue toner faded 1.8% in 8 weeks. For the Sky Blue, this might indicate that a Lab L fade of 0.9 units would be the equivalent. The K3 on HPR Sky Blue does this in about 25 MLux-Hours.

The blue toner is composed of Canon Blue and Epson K3 Cyan. If we look at percentage Lab L fades for those two pigments, we see the Canon Blue jump to that in about 20 MLux-hours, but then stay there and pull back a bit and not heading back up until 60 MLux-hours. With the Epson cyan, while the test patch is not exactly the color of the ink, it does not reach the 1.8% Lab L fade until after 30 MLux-hours.

¹ See <http://www.paulroark.com/BW-Info/Ebony-Variable-Tone.pdf> at page 2.

² The scan started as a 48 bit, 200 ppi scan, 4 times in one direction (top to bottom) and 4 times in the opposite direction (target with samples taped to it turned 180 degrees).

³ Average of 10 reads of each test patch with my Spyder3 unit, where the Lab L reads are quite accurate and consistent.

In Aal&A, tests of Epson K3 neutral test patches did about the same on Arches as on HPR. In my 8 week test the Eboni on Arches had about a Lab L fade of 0.5 units. In the Eboni 3MK Aal&A test on HPR, this amount of fade was reached at 20 MLux-Hours.

Comparisons of tests done with different setups will probably always be in the “apples to oranges” category. On the other hand, it’s inevitable that we’ll want to get a handle on about where we are compared to some other data set. It may be that this 8 week fade test can be considered somewhat similar to about a 20 MLux-hour test at Aal&A, but there are a lot of unknown variables here.

My tests stand on their own. They provide at least some data points that are not otherwise available.

Recommended Method to Measure the Scanned Targets

Very simply, using your eyes on the scanned samples tells you whether there are significant changes. In my view, there have been none in the carbon or “neutral” toned samples. Compared to some older B&W inksets, this in itself is significant.

Measuring the amount of fade and color change would be best done by an expensive spectrophotometer. However, my experience with the unit I have is that it is not accurate enough to be totally reliable regarding the small color changes we have. So, while I use it, I make 10 readings of each sample and average them. Still, for purposes of comparing the tested samples to the control samples, I think the scanner image shown on the web is very useful and provides valid comparison readings. While the scanner is not a professional unit that is highly profiled, and as such the Lab and rgb values are not accurate in an absolute sense (including the dmax values, due to where the scanner black point was set), they are very useful in a relative sense.

When the scanned image is pulled into Photoshop, the eyedropper tool can be used to read it. I recommend an 11 pixel wide read area on the eyedropper. While we like Lab values as a final output, and I use the Lab PS output values as a first approximation and where I have 2 digits of output, the RGB values in PS have better “resolution” in some cases. They use a 0 – 255 scale and give three digits of output, as opposed to the 0 – 100 Lab scale and, often, just a single digit output where we are looking at very low Lab A and B values. Given the small changes in the samples, single digit Lab A and B output of the PS eyedropper are not adequate. So, where the Lab output is a single digit, I note the RGB values and then convert them to Lab units using this converter: <http://colormine.org/convert/rgb-to-lab> .

I do not know the accuracy or comparability of this conversion system to what Photoshop uses. The Lab A and B values can be different than the direct PS output, even where the single digit readouts are not the limiting factor. So, with all of these numbers, looking at the relative changes is what has the most value, and, again, using your eyes on the scan gives you very valid feedback when it comes to color changes.

The bottom line is that I use the PS Lab outputs where I can, where there is only a single digit Lab A or B output shown and the changes are very low – like one unit – the RGB numbers may give a better look at the color changes.

Note that for each paper-ink combination, the tested sample is on top (marked in pencil). The control (dark storage) sample is just below it, marked in darker pen and labeled “control.”

Some abbreviations are as follows:

“Arch”=Arches Bright White watercolor paper.

“PA”=Premier Art Smooth Hot Press 325.⁴

“Eb”=Ebony v. 1.1.⁵

“UC”=Epson UltraChrome MK based “Ebony-6” type inkset.

“N”=Neutral, but note that I target the paper Lab values, not absolute neutral for this. That is, at added enough blue toner to make the graph of the Lab B values remain within 1 Lab B unit of the paper white value through the midtones. The very deepest shadows generally are cooler.

“W”=Warm, which means this is a 100% carbon pigment print sample.

“No Toner”=100% carbon. For one sample I used the Neutral profile but turned off the toner ink.

Tentative Results

It will take me a while to determine what these test results indicate. Some initial observations are as follows:

Overall, there are no serious surprises. The color toner did show fade, and the carbon pigments showed very little change. The neutralized carbon prints all held up very well, with some very minor Lab A reduction (“green shift”), but it was less than is visible.

One piece of good news is that the Ebony carbon held up well against the UC MK. Between the UC and Ebony alternatives, each showed some advantage in different tests. My tentative conclusion is that the new Ebony is a very solid carbon ink, as was the original. It’s claimed to be the same carbon, but it’s still nice to see some confirmation. At this point I see no reason to use the Epson MK as an input. I expect Ebony carbon will remain my main fine art printing substance for some time.

The toner test strip does show a “green shift” in the sense that the Lab A has dropped 0.5 units during the 8 weeks. This is not surprising since at the point where the Aal&A K3 C and Canon B patches had equivalent percentage Lab L changes, both had lost 0.4 Lab A units, and the paper itself shows a Lab A reduction of almost 0.2 units. So, the extent to which the Lab A reduction is from differential fade may be very small if not negligible. One reason for the pigments I chose is that their Lab L fade rates, to the extent that can be estimated from Aal&A tests, while being equal at 20 MLux-hours, at 100 MLux-hours the K3 C Lab L fade is twice that of the Canon Blue.

⁴ See http://www.premierimagingproducts.com/pm_smoothhp.php – this is the thicker version of the 205 weight that is also used as Epson Premier Art Scrapbook paper.

⁵ I used a batch from the supplier STS Inks, there called WJ 1082. It is said to be different than their standard MK, but is the same ink as Image Specialists (which they acquired) WJ 1082, which was the source of the original Ebony. I diluted my own “Ebony” using the generic base version C6c. See <http://www.paulroark.com/BW-Info/Ink-Mixing.pdf>.

Thus, while I expected the pigments to experience a reduction in Lab A initially, as more time goes by, the blue pigment, with its positive (even if slightly reduced) Lab A, may start to have a fade advantage over the cyan, with its very large negative Lab A. This, hopefully, will stop if not reverse the Lab A movement. In short, the initial reduction of Lab A was expected.

While the toner itself has experienced some fade, including Lab A reduction, the neutral test prints appear, visually, to be unchanged. Looking at the Premier Art Eboni Neutral print samples, while the PS Lab output shows a Lab A reduction, the RGB figures for the 50% test patch are equal or, as the eyedropper is moved, only very slightly different. The paper white shows the largest change in RGB values. The reduction in the toner Lab A appears to have had a very minimal impact on the final neutral print.

The Premier Art 325, 100% carbon as well as Neutral Eboni 50% patches actually got very slightly darker, according to the rgb measures. We have seen this in Aal&A tests with respect to the Epson UC MK, but the lighter values rarely if ever do this. So, the performance of the Eboni VT inkset on the PA 325 is something I have not seen in Aal&A tests. On the other hand, there are several reasons I use that paper. In my previous testing, it and the 205 version consistently turned in the best results. Epson at one point claimed the 205 version was its "most archival" paper.

I have placed a comparison of the PA325 Neutral samples and the Aal&A test of a selenium toned silver print at 20 MLux-hours at <http://www.paulroark.com/BW-Info/Eboni-VT-N-v-Silver-Print.jpg>. Let your eyes be the judge. There is, of course, the caveat that this might be "apples and oranges," but it may be that the Eboni VT Neutral on Premier Art 325 (and maybe other papers) will turn out to be the one neutral inkjet print that can beat a silver print.

I tested some sprayed samples. I did not use the Premier Art Print Shield that was used on the Aal&A test; I used the lighter, non-UV Lascaux Fixativ. Looking at the sprayed v. un-sprayed samples on Arches and PA 325, the spray seemed to help the Arches but actually hurt the PA 325 performance. This is a bit of a surprise. If that was the case for the Eboni on PA205 that Aal&A tested, one wonders just how good that combination would have been.

That's it for now. I welcome any feedback. I will start a second 8-week fade session in the not too distant future.