

W1.1 Image Quality of Printers

W1.1 2002 - 009

MicroUniformity

Robert E. Zeman

Jan 25th, 2002

Reference: W1.1 2001 – 060

**Micro Uniformity Ad-hoc Group Meeting, Jan 25th, 2002 1:30PM EST**

(Tele)present: Robert Zeman (Chair, Kodak), Bill Kress(Minolta-QMS), Paul Kane(Kodak), Marguerite Doyle(Lexmark), Rene Rasmussen(Xerox)

The discussion began regarding the **number of mean densities to be evaluated**. All agreed that both objective and subjective responses will vary with mean density. It was agreed initially that we use the same densities chosen by the Macro-uniformity team:  $L^*=40,60,80$ , and lowest  $L^*$  of the device being measured ( $D_{max}$ ). RR suggested that by using the test target designed by the macro team, more densities can be incorporated with varying percentages of black colorant to facilitate the final choice closest to a particular  $L^*$ . All agreed on this procedure.

**Viewing aperture size** was discussed next. MD asked why an aperture was necessary and BK & RR responded that without an aperture, macro defects could swamp an observer's response to micro defects if the task was to respond simply to "uniformity." RR shared that using a mask was artificial and required training, not suitable for consumers, with whom these studies should agree. BZ suggested using samples with no macro defects, but these may be hard to come by. RR mentioned that Steve Korol used different sized samples, using small samples viewed closely for micro and large samples viewed further away for macro evaluations. RZ suggested viewing samples either optically enlarged or digitally enlarged, so all samples could be viewed at the same distance. RR would choose a one-inch square (roughly) as a viewing aperture if forced to choose. BK used a wire loop held against the sample to restrict viewing analysis. In the end, it seemed that the suggestion of cutting the samples to, say, one-inch square and mounting on cardboard provided the cleanest solution. We will decide on this at the next conference.

Next, we dug into **target duplication**. MD commented that in the macro-uniformity sub-group, the decision was made to scan and print at high resolution. RR mentioned that it is harder to reproduce graininess and we possibly need to work on the 'originals.' BK said that he scanned some of PK's samples at 1640dpi and printed them at 2880dpi on an Epson 5500 printer. The results were somewhat credible, but high frequency noise was enhanced. He also stated that scans at 600dpi showed aliasing. RR suggested we could have just one set of samples and pass them around, but if they become damaged the reference is lost. RR discussed using a drum scanner, which would require printing a color calibration target, measuring spectrophotometrically, scanning on the drum, and converting to LAB space. This would need to be done for each pigment or dye set, as materials change. BK suggested using black initially, provided CMY are not being substituted to achieve a neutral. He also raised the problem of ghosting, in which a previous image affects the reproduction of a current image. RZ commented that equipment with this kind of problem should not be evaluated with a 'standard' procedure; RR concurred. RR offered that we could put smaller patches of selected densities at a selected size on the macro target for efficiency. No conclusion about duplication procedure was achieved.

We spoke very briefly about the **array of micro-uniformity defects** currently selected and agreed that we all need to look again at the samples and align with our definitions.

At the end, MD asked what action items emerged. Since we were trying to agree on procedures, no such list was generated. Therefore, we agreed to meet again quickly.

**Next Teleconference: 1:30PM (EST), February 1st, 2002. Phone number: 1-888-394-5271**

Robert E. Zeman  
Eastman Kodak Company  
1700 Dewey Ave. 1/67/RL  
Rochester, NY 14650-1860

Phone: (716)-722-7090  
Fax: (716)-588-1999  
email: [robert.zeman@kodak.com](mailto:robert.zeman@kodak.com)