

W1.1 Image Quality of Printers

W1.1 2001 - 043

MicroUniformity

Robert E. Zeman

May 11, 2001

Reference: W1.1 2001 – 040

Joint Macro/Micro Uniformity Ad-hoc Group Meeting, May 11, 2001 1:00PM EDT

(Tele)present: Marguerite Doyle (Lexmark), Rene Rasmussen (Xerox), Robert Zeman (Chair, Kodak), George Chiu (Purdue)

A new phone number for call-in has been established. It is: 1-888-394-5271. The passcode remains 71647.

The joint discussion opened with a review of the microuniformity attributes and their definitions. Then, we proceeded to read paragraph 3 of the guidelines, Design of Digital Test Targets. RZ sought clarification of sub-paragraph 3.3, which says the target “should not assume a certain printer resolution.” RZ mentioned that the ‘digital’ test targets have an inherent resolution, and if it is not an integer multiple of the printer resolution, interpolation will be required and this typically degrades the output somewhat. Thus, IQ measurements will vary by this coincidence. RR responded that at least in the case of microuniformity, there should not be an issue here, since the input must be uniform regardless of its resolution. RZ then questioned what degree of uniformity is required for the input: a field of absolutely uniform code values seems appropriate for graphic arts, but inappropriate for natural images. Further, many images will be captured with sensors (film, CCDs/CMOS, photoconductors) which already have their own noise characteristics, and it has been observed that adding a small amount of noise to an otherwise uniform flat field changes the screening algorithms employed (especially with ‘FM’ or frequency modulated screens) in ways that will significantly alter the printed noise. This then raises the problem of how to decide upon input noise level and its frequency content. Adding evaluation of noise propagation as a function of signal (i.e., output density) creates an extremely complex evaluation procedure. The four of us wrestled with these issues for the remainder of the discussion, with no significant resolution.

RR commented that typical usage of office printers would imply that we need to incorporate all three cases—uniform code values, film noise and CCD/CMOS noise—in the evaluations. GC questioned this complexity, suggesting that we restrict target input to uniform code values. RR commented that we need a method to measure a hardcopy area, which was intended to be uniform. GC commented that we would like an ‘MTF/black box’ approach. He also suggested that we work to find ‘key base vectors’ that describe noise and consolidate later, as we gain more understanding. RZ commented that this would turn into a research effort, to which GC commented that perhaps this was needed. RR proposed that we address all 2-D nonuniformity sources; let observers make overall judgements and we pull apart the pieces to generate the equations for understanding and utility. MD voted for simplicity, saying that we must keep the overall approach simple for it to be useful.

At the end, we decided to think about these issues before the next teleconference, concentrating on only the ‘noise’ attribute to keep the task simpler and well-defined.

Next Teleconference: Friday, May 18th, 1:30 EDT. New 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