

## **Micro Uniformity Ad-hoc Group Meeting, Feb 1st, 2002 1:30PM EST**

(Tele)present: Robert Zeman (Chair, Kodak), Bill Kress(Minolta-QMS), Paul Kane(Kodak)

Despite the low turnout, the three of us agreed to use the time as profitably as we could.

Referring now to the previous meeting notes and making decisions, we affirmed the decision of measuring at four **mean densities**, described as the product minimum  $L^*$ , and  $L^*=40,60,80$ . These mesh with the approach of the macro-uniformity sub-group.

With regard to **viewing aperture size**, we agreed that mounting samples on cardboard and letting the size of the sample define the effective viewing aperture seems to be the best approach. There still needs to be some discussion about the final sample size: BK has some issues with a 1" square, since a lot of low frequency defects can still be visible therein. It was also recognized that a 1" square does not provide enough real estate for measurement. This is discussed in the straw-man proposal below.

In the area of **target duplication**, we agreed that attempting to duplicate samples via other processes is subject to many problems and that using 'originals' from a given process is necessary. This then raises the problem of sample repeatability, for some processes, like electrophotography, typically do not repeat the image statistics exactly. After further discussion, we arrived at a consensus, that we now propose to the group at large as a straw-man proposal.

### **Straw-man Proposal for Dissemination of Originals**

We propose: 1. A number 'N' of ostensibly identical samples shall be generated from a given printer at one of the  $L^*$ 's listed above, 2. To provide 'K' subsets of N for measurements by 'K' individuals, the subsets are formed by taking every K-th sample (for example, 5 subsets of 10 samples each requires  $N=50$ , and the first subset comes from samples #1,6,11,etc.). 3. The measurement of an image quality attribute shall be the average value of that attribute measured over the N/K samples, and reported with the minimum and maximum values as well, 4. That N/K shall be so chosen by the originator to achieve TBD statistical precision (for example, the coefficient of variation ( $\sigma/\text{mean}$ ) shall be 0.1 or less), 5. The originator is responsible for avoiding systematic errors, 6. Identity of the printer (and manufacturer) being evaluated shall be kept secret until procedures are unambiguous and robust as agreed by the entire sub-group.

Practically, one can envision the following procedure to disseminate samples for granularity measurement confirmations on an electrophotographic printer: From previous experimentation, the originator has determined that 16 samples are necessary to achieve  $\text{COV}=0.1$ . The originator wants to send samples to 5 sub-group members for confirmation of procedures. Thus, he/she makes 80 'identical' samples, sending samples 1,6,11,16,21...76 to one of the sub-group members, sending samples 2,7,12,17,etc. to the next, etc. The sub-group members measure and report the granularity averaged over 16 samples, the COV and the maximum and minimum values. Further, if the originator makes 8.5x11" samples, he/she can designate areas to avoid undesirable artifacts (streaks, blotches) which are not the subject of the study. Also, the measurement area can thus be much larger than the area used for psychophysical evaluation, which ideally should also come from a directly measured area.

**Please email me before the next teleconference with your response to the straw-man proposal so that we can make progress on this issue!**

**Next Teleconference: 1:30PM (EST), February 15th, 2002. Phone number: 1-888-394-5271**

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