

W1.1 Image Quality of Printers

Document W1.1 2001 – 036

Gloss Uniformity

Yee Ng

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W1.1 Gloss Uniformity Ad Hoc Update

- Team Members
 - Yee Ng (NexPress, Chair)
 - Norm Burningham (HP)
 - Ted Bouk (Kodak)
 - Eric Schneider (HP)
 - Jeff Wang (NexPress)
 - Marguerite Doyle (Lexmark)
 - Eric Zeise (NexPress, contributor)

- **Gloss Uniformity sub-attributes Definitions included:**
 - **Gloss value**
 - **Within page (flat-field) gloss variability**
 - **Page to Page (flat-field) gloss variability**
 - **Differential Gloss**
 - **Gloss Artifacts**
- **Gloss Uniformity sub-attributes not included:**
 - **(global gloss value {preferred gloss}, surface textured gloss artifacts), for detail, see NCITS W1.1 2001-0016**

- **Gloss Value**

- Gloss value pertains to front surface reflection that varies with angle relative to the normal to the receiver surface. Images whose front surface exhibits a highly specular reflection are high gloss while whose front surface exhibits a lambertian (matte) reflection characteristic are low gloss. Gloss values can differ depending on the measurement methodology (such as measurement angle and the image size requirement for the measurement) and the magnitude of gloss level of interest (substrate and application dependence). There are many Standards (such as (a) TAPPI T480 for “Specular Gloss of Paper and Paperboard at 75 Degrees” and ASTM D1223-93 “Standard Test Method for Specular Gloss of Paper and paperboard at 75 degree”. These are typically use for lower gloss measurement. (b) ASTM Standard D523 and TAPPI T653 for gloss measurement at 20 degree. These are usually use for high gloss measurement. (c) ASTM D523 which uses a 60 degree measurement to cover a wider range of gloss applications. Our intend is to leverage the existing Standards and adapt that for use here when linked to the corresponding psychophysics.

- **Within page (flat-field) gloss variability**
 - This takes the form of a large-scale gloss gradient (gloss value change), or fade, from one side of the image (at the same colorant laydown) to the other or from top to bottom of the image. This can generally be evaluated over large flat field regions, as the same colorant laydown is needed over the entire region to identify this type of gloss variability.
- **Page to Page (flat-field) gloss variability**
 - This takes the form of variability in the gloss value of the document from page to page (one-sided printing as well as two-side printing), or between adjacent pages (of the same image contents). This gloss value variation can be accompanied by any of the other gloss categories enumerated here, such as within page gloss variability or sundry gloss artifacts and can probably only be meaningfully evaluated between pages exhibiting the same image content.

- **Differential Gloss**

- Differential gloss, when present, is an image content and substrate dependent effect. The gloss level can change with increase in colorant laydown (such as in a continuous ramp). Thus an image with variable spatial laydown can exhibit variation in gloss level and this variation may be large enough to observe. The appearance of this effect is dependent on the observed spatial frequency of the image content. Differential gloss, in this context, is most easily quantified when observing adjacent flat-field image regions of differing content (density, color, etc).

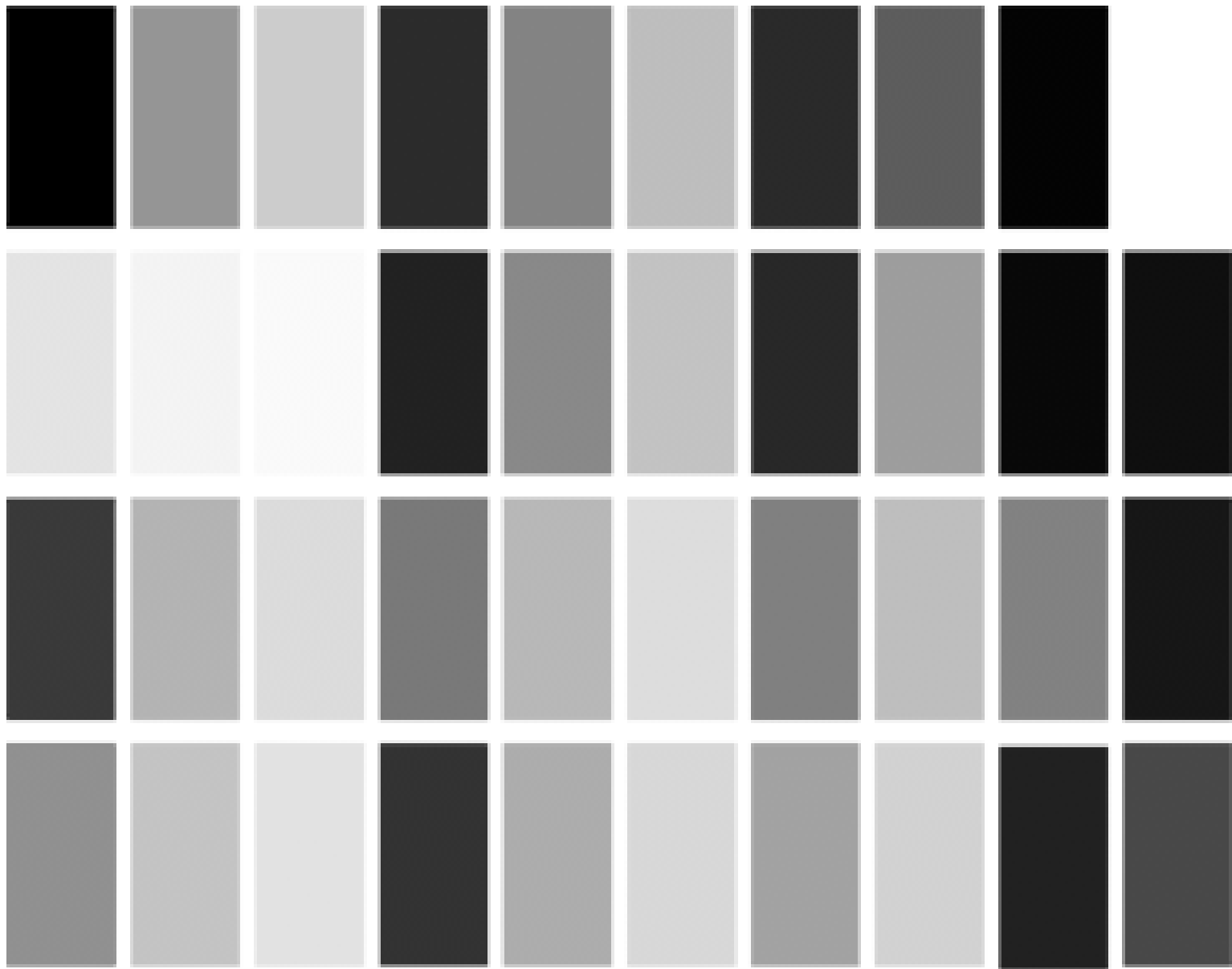
- **Gloss Artifacts**

- Gloss artifacts include such items as streaks and banding that are one-dimensional in nature, and blobs that are a form of two-dimensional, possibly sparse, mottle. Gloss bands, streaks, mottle and blobs are most easily evaluated in flat fields of uniform density.

- Measurement Methods and Test Targets

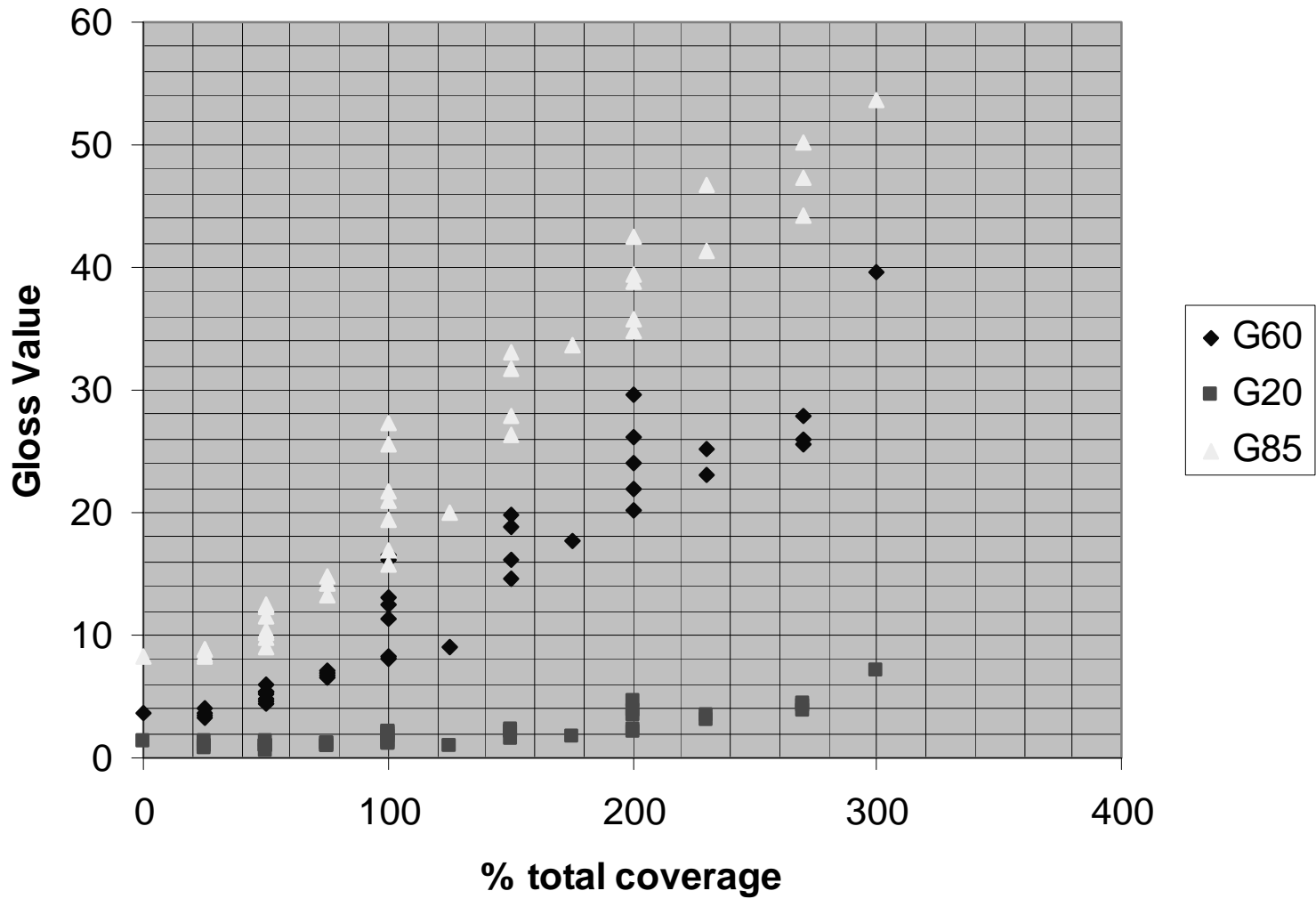
- . The ad hoc recognized in order to cover a wide range of gloss values and as yet maintain a more linear and uniform relationship between the objective numerical gloss values and the subjective visual gloss appearance of the reflection print, we may need to use more than one gloss measurement geometry. As yet, the ad hoc is not satisfied with a hard switch over from one measurement geometry (say from 60 degree to 20 degree) when the gloss value >70 . We may need to specify an overlapping gloss value region (base on gloss measurement's repeatability and reproducibility) within that region more than one measurement geometry can coexist (may be via a LUT maintaining the relationship of the gloss values measured by the two geometry), so that the transition can be smoother and as yet unambiguous.

- Furthermore the ad hoc is concerned that the current gloss measurement instruments build by different equipment manufacturers and maintained by different users may not produce a similar measured result from the same printed sample. As a first step, cross-lab correlation test samples of different marking material coverage (different density steps) and gloss values on media of a wide ranging media gloss value (coated calendar paper, photographic paper, uncoated paper) and marking technologies (thermal, electrophotography and inkjet) need to be created. Then the same samples can be sent to different laboratories for gloss measurement to establish the current capability on gloss measurement repeatability and reproducibility.
- A preliminary test target with density patches (with total coverage of <300% per patch and distribute across the color solid) large enough to be used for different gloss geometry measurement was created for this purpose. Some preliminary sample generation and measurements have been done, further refinement (such as distributing the patches and its color separation more uniformly on the page, choosing a better color space) and media definition is underway.
- The next step in the process is the generation of samples with different technologies on the media of choice, then exchange samples for inter-lab correlation measurement.



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Gloss value vs coverage



G60 vs G85 measurement

