7. SPATIAL MEASUREMENTS

Measuring the ability of the display to properly render detail often amounts to a measurement of high contrasts of small areas—a most difficult measurement to make. If you are not intimately familiar with some of the techniques for accounting for glare, do see the Metrology Appendix and § A2 Stray-Light Management & Veiling Glare, in particular, see § A2.1.6 Correcting for Glare with a Replica Mask and § A2.2 Accounting for Glare in Small-Area Measurements. Here we describe methods to make several measurements of detail luminance and contrast.

For a number of these methods it is necessary to employ high magnification. People are tempted to move in close with a camera, for example. However this can be a very bad idea because of the reflections off the camera and the lens back onto the screen. Even anti-reflection coatings on the lens can change the color that might be measured. It is suggested that macro lenses of long focal lengths (90 mm to 200 mm or longer) should be used. This will allow the camera to be removed from the proximity of the screen sufficiently far so that reflections from it do not influence the measurements.

Often an array detector (camera) is used to record the detail of the displayed image, even down to the subpixel level. There are a number of concerns in using such array detectors that are outlined in the appendix: A9 Array-Detector Measurements. Keep in mind that in order to capture the detail at a pixel level it is often helpful to have from 10 to 30 camera pixels or more per display pixel or subpixel.

STATUS OF PIXELS AND SUBPIXEL RENDERING FOR RESOLUTION MEASUREMENTS

The current version of the IDMS (IDMSv1p03b, June 2012) has been written with great care, expertise and enthusiasm for computer monitors with a distinct fixed relation between subpixels and pixels of a display. For this class of visual displays a pixel is defined as the smallest unit that can display the full range of display luminance and chromaticity.

There is another class of display screens where there is no fixed relation between the subpixels and the pixels, e.g. displays with PenTile® subpixel architectures. Also in monitors with color CRTs there is no fixed relation between the individual phosphor dots and the smallest light emitting elements which are determined by the scanning electron beam (its dimensions and its temporal intensity modulation).

Application of the measurement procedures according to the IDMSv1p03b to displays with no fixed subpixel to pixel relations, and literal rigid interpretation of the methods that have been implemented for computer monitors may lead to ambiguities and may be used to tweak evaluations and results into an intended direction.

The weak points of the IDMSv1p03b and the parts that need reconsideration and more specific definitions (for the case of application of this standard to displays without fixed pixels) have been identified by several parties. Quite some problems arise from the fact that application of the concept of fixed subpixel to pixel relations to advanced subpixel layouts may lead to contradictions and wiggle room.

It has been shown on the other hand that the principles laid down in the IDMS can be successfully applied to measurement of the resolution of displays with flexible pixel arrangements. One way to cope with the existing conflicts of the IDMSv1p03b is to give up thinking in terms of pixels, and to start thinking in terms of subpixels instead. This is often referred to as subpixel rendering. The determination of line widths should also be done in terms of subpixels. As soon as the width of the moving window used for averaging of luminance profiles is not taken from ill-defined subpixel-to-pixel relationships, the procedure for determination of visual display resolution becomes straightforward and transparent.

The addendum to Section 7.2 in conjunction with Section 7.8 provides an approach to the measurement of the visual resolution of display screens based upon the basic ideas and procedures presented in the IDMSv1p03b. The addendum makes sure that this approach can also be applied to advanced subpixel architectures (e.g. to PenTile® layouts and RGBW, RGBY, etc. arrangements) and any type of display technology. In a future version of this document we will make appropriate changes to the now existing text to clarify these concepts.

Updates, supplemental material, and other IDMS material can be found at either http://www.icdm-sid.org or at http://www.sid.org.
Revisions to 7 Spatial Measurements:

<table>
<thead>
<tr>
<th>IDMS Version</th>
<th>Ch.</th>
<th>Chapter Name</th>
<th>Section</th>
<th>Section Title</th>
<th>Rev.</th>
<th>Date</th>
<th>Approver</th>
<th>Revision Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDMS1 (1.03c)</td>
<td>7</td>
<td>Spatial</td>
<td>7.0</td>
<td>Spatial Measurements</td>
<td>01</td>
<td>May 24, 2016</td>
<td>Spatial Subcommittee</td>
<td>Explanatory text added under the heading “STATUS OF PIXELS AND SUBPIXEL RENDERING FOR RESOLUTION MEASUREMENTS”</td>
</tr>
</tbody>
</table>