

RECOMMENDATION ITU-R BT.1845

Guidelines on metrics to be used when tailoring* television programmes to broadcasting applications at various image quality levels and sizings

(2008)

Scope

This Recommendation provides some guidance on the metrics and on the choice of image rasters that may be appropriate when tailoring television programme material to broadcasting applications which are characterized by presentation requirements different from those for which the programme was originally produced.

The ITU Radiocommunication Assembly,

considering

- a) that the typical value of the minimum angular resolution of human vision in both the vertical and horizontal directions is 1 arc-min, which corresponds to the ability to discriminate detail that subtends an angle of 1 arc-min at the viewer's eye, within a rather wide range of values for image contrast and mean luminance; the same may also apply to the ability of the human eye to discriminate edge transitions;
- b) that, consequently, the optimal viewing distance for digital images can be taken to be the one at which the pixel pitch of the digital source image subtends an angle of 1 arc-min at the viewer's eye;
- c) that this characteristic of the human visual acuity applies to static images, since moving images may look blurred due to the limited ability of the display to portray movement, and of the human eye to follow movement on the display;
- d) that the static resolution of images is thus an appropriate parameter to characterize the resolution of image systems;
- e) that the considerations above may provide a scientific foundation to plot various image systems in a common, static resolution space, based on objective technical parameter values,

considering further

- a) that digital television image systems for production are based on a matrix of pixels, and digital flat-panel television displays also use a presentation based on a matrix of pixels;
- b) that the pixel density in the presentation matrix and the way its pixels are addressed are not necessarily related to the pixel density and addressing method used at source; consequently the source images to be displayed may need to be processed in the display, in order to re-map their pixel matrix on the pixel matrix of the display and to generally tailor them to the characteristics of the display,

* The verb "to tailor" is used in this text to indicate the post-processing operations required to adapt programme material for its presentation in broadcasting applications different from the one for which it had been originally produced, e.g. in terms of image size resolution, viewing conditions, etc.

recommends

1 that the “optimal viewing distance” and the “optimal horizontal viewing angle” should be used as guidelines on metrics applicable to digital image systems; these are shown for various digital image systems in Table 1 and Fig. 1;

2 that Table 1 and Fig. 1 should be taken into consideration as a help in identifying the digital image systems that best fit the viewing conditions of various television broadcasting applications, based on the optimal viewing distance or on the optimal horizontal viewing angle foreseen for each application;

3 that the following Notes should be regarded as part of this Recommendation:

NOTE 1 – For the purpose of this Recommendation the “optimal viewing distance” of a digital image is defined as the viewing distance at which two adjacent pixels of the source image (before it is re-mapped on the display) subtend an angle of 1 arc-min at the viewer’s eye.

NOTE 2 – For the purpose of this Recommendation the “optimal horizontal viewing angle” is the horizontal viewing angle under which an image is seen at its optimal viewing distance.

NOTE 3 – This approach was already conceptually delineated in Recommendation ITU-R BT.1127.

TABLE 1

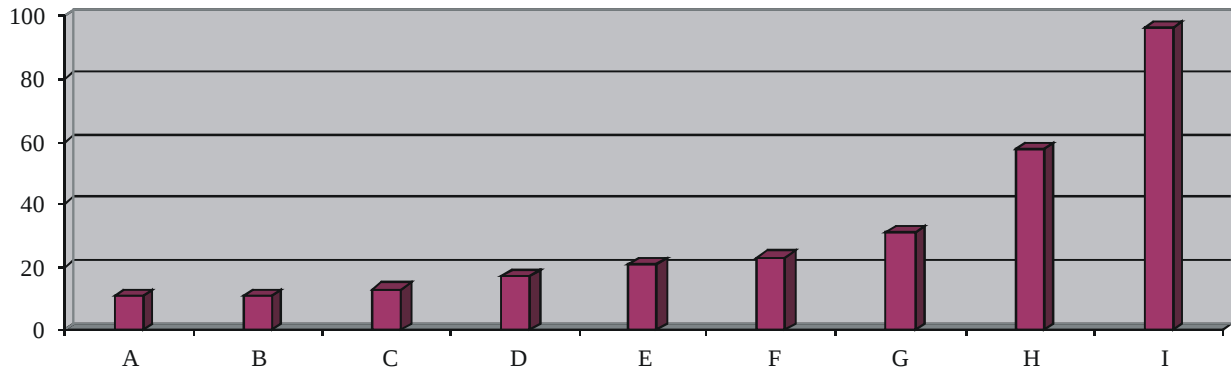
**Optimal horizontal viewing angle and optimal viewing distance in image heights (H)
for various digital image systems**

Bar in Fig. 1	Image system	Reference	Aspect ratio	Pixel aspect ratio	Optimal horiz. viewing angle	Optimal viewing distance ⁽¹⁾
A	720 × 483	Rec. ITU-R BT.601	4:3	0.88	11°	7 <i>H</i>
B	640 × 480	VGA	4:3	1	11°	7 <i>H</i>
C	720 × 576	Rec. ITU-R BT.601	4:3	1.07	13°	6 <i>H</i>
D	1 024 × 768	XGA	4:3	1	17°	4.4 <i>H</i>
E	1 280 × 720	Rec. ITU-R BT.1543	16:9	1	21°	4.8 <i>H</i>
F	1 400 × 1 050	SXGA+	4:3	1	23°	3.1 <i>H</i>
G	1 920 × 1 080	Rec. ITU-R BT.709	16:9	1	32°	3.1 <i>H</i>
H	3 840 × 2 160	Rec. ITU-R BT.1769	16:9	1	58°	1.5 <i>H</i>
I	7 680 × 4 320	Rec. ITU-R BT.1769	16:9	1	96°	0.75 <i>H</i>

⁽¹⁾ See Recommendations ITU-R BT.1127 and ITU-R BT.1769.

FIGURE 1

Optimal horizontal viewing angle (degrees) for various digital image systems



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NOTES:

Column 2 of Table 1 gives the sampling pixel structures for the image systems denoted as A, B, etc. in Table 1 and Fig. 1; column 3 gives the related reference BT Recommendations.

Rows H and I in Table 1 and the related bars in Fig. 1 identify the image systems recommended for the expanded hierarchy of large screen digital imagery (LSDI).

Rows B, D and F in Table 1 and the related bars in Fig. 1 identify some image systems used in computers.

Table 1 and Fig. 1 include (as examples) only some of the image rasters used in computers. For instance, the $1\,366 \times 768$ image raster used in several consumer television sets is not included, since its optimal viewing distance is very close to the one indicated in row E of Table 1 for the system of Recommendation ITU-R BT.1543, which has a similar pixel count.