RECOMMENDATION ITU-R BT.814-1

SPECIFICATIONS AND ALIGNMENT PROCEDURES FOR SETTING OF BRIGHTNESS AND CONTRAST OF DISPLAYS

(Question ITU-R 211/11)

(1992-1994)

The ITU Radiocommunication Assembly,

considering

a) that precision picture monitors are used in a variety of applications including subjective laboratory testing and control room monitoring of operational systems;

b) variations in the set-up and adjustment of monitors may lead to variations in displayed pictures;

c) that special waveforms that assist with the set-up and adjustment of monitors have been developed and have been in operational use for many years,

recommends

1. that the PLUGE test signal (see Note 1) described in Annex 1 should be used for setting of displays used for subjective assessments, and for operational monitoring of systems described in Recommendations ITU-R BT.470 and ITU-R BT.601. The procedure for the use of the test signal is described in Annex 2;

2. that further study is required on the derivation of a PLUGE signal for HDTV, and a suggested solution is included in Annex 3.

Note 1 – The acronym, PLUGE, was originally derived from "Picture Line Up Generating Equipment".

ANNEX 1

Specifications of PLUGE waveforms

The PLUGE waveform (see Fig. 1) is composed of:

a) three closely spaced narrow vertical stripes on the left-hand side of the picture. The central vertical stripe is at waveform black level. The left-hand stripe is slightly darker, and the right-hand stripe is slightly lighter than the central stripe;

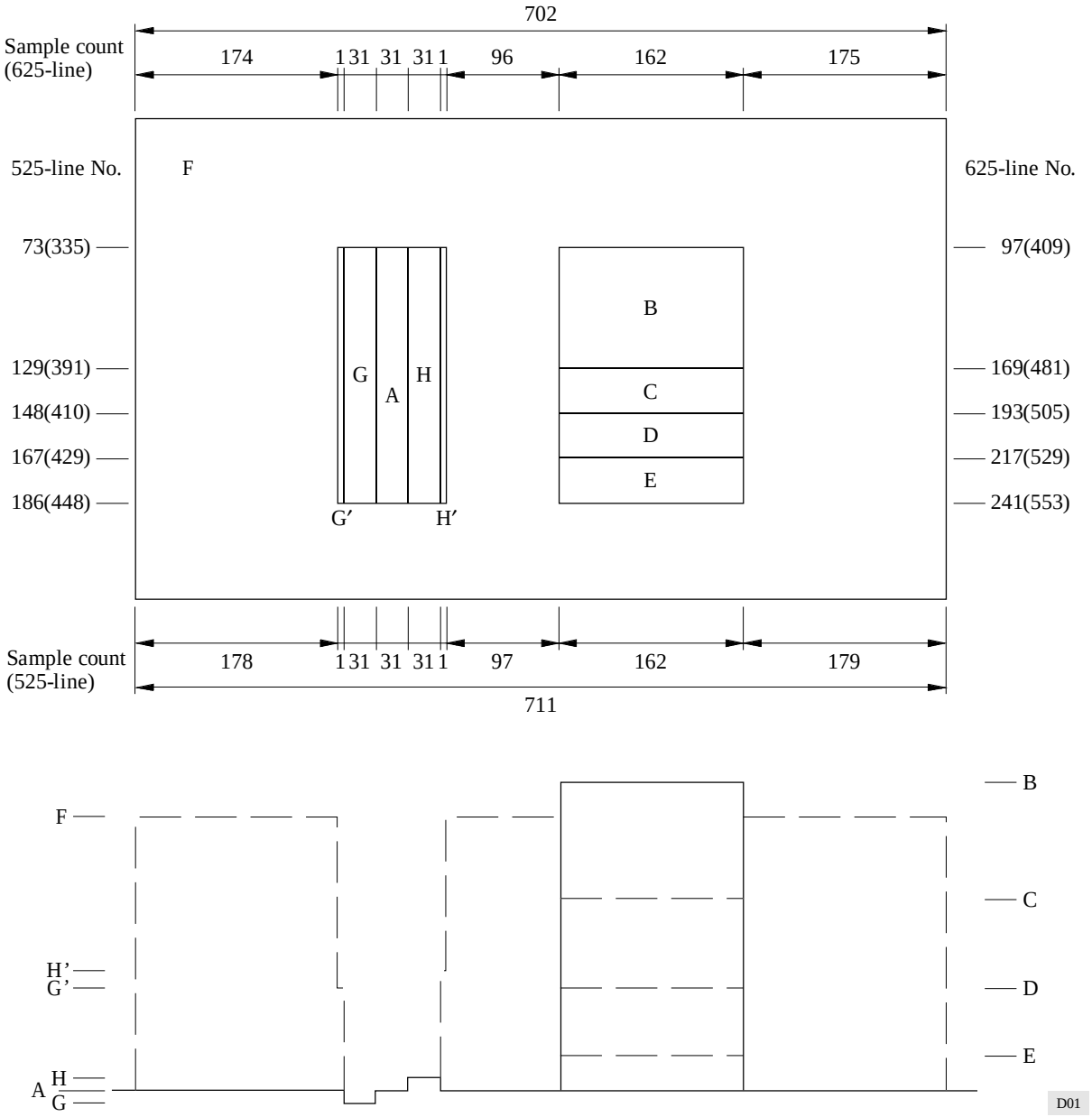
b) a broad bar signal located on the right-hand side of the picture. It is divided into four areas, one at white level and the other three at descending grey levels. This grey scale is in approximately equal steps, as seen by eye, over a contrast range of 30:1. The peak white area is sufficiently large to enable the peak luminance to be set by a measuring instrument;

c) a uniform background surrounding the vertical stripes and the broad bar described above. Two different levels for this background are specified according to the application:

- for operational monitoring the background level is set to waveform black level;
- for subjective assessments the background level is set to the grey level shown in Table 1. This background level has been optimized to give a picture display of subjective quality similar to that used in sequences used in subjective assessment.

FIGURE 1

PLUGE active field and waveform



To take account of the characteristics of the human eye, the luminance specified for the vertical stripes described in c) is slightly different for the two applications (see Table 1).

To ensure that the colour decoder of a display is working in its colour mode, it is recommended that a standard colour burst is included in the analogue waveform.

TABLE 1

Levels of waveform

	Operational monitoring			Subjective assessment monitoring		
	Level % mV digital			Level % mV digital		
	625-line	525-line		625-line	525-line	
A black level	0% 0 mV 16	0% 0 mV 16	7.5% 54 mV 16	0% 0 mV 16	0% 0 mV 16	7.5% 54 mV 16
B white level	100% 700 mV 235	100% 714 mV 235	100% 714 mV 235	100% 700 mV 235	100% 714 mV 235	100% 714 mV 235
C grey level 3	63.0% 441 mV 154	63.0% 450 mV 154	65.8% 470 mV 154	63.0% 441 mV 154	63.0% 450 mV 154	65.8% 470 mV 154
D grey level 2	35.2% 246 mV 93	35.2% 251 mV 93	40.0% 286 mV 93	35.2% 246 mV 93	35.2% 251 mV 93	40.0% 286 mV 93
E grey level 1	15.1% 105 mV 49	15.1% 108 mV 49	21.4% 153 mV 49	15.1% 105 mV 49	15.1% 108 mV 49	21.4% 153 mV 49
F background level	0% 0 mV 16	0% 0 mV 16	7.5% 54 mV 16	70.3% 492 mV 170	70.3% 502 mV 170	72.5% 518 mV 170
G black stripe level	–1.8% –13 mV 12	–1.8% –13 mV 12	5.8% 42 mV 12	–2.7% –19 mV 10	–2.7% –20 mV 10	5.0% 35 mV 10
G’ mid-level between black stripe and background levels	NA	NA	NA	33.8% 237 mV 90	33.8% 237 mV 90	38.8% 277 mV 90
H grey stripe level	1.8% 13 mV 20	1.8% 13 mV 20	9.2% 66 mV 20	2.7% 19 mV 22	2.7% 20 mV 22	10.0% 72 mV 22
H’ mid-level between grey stripe and background levels	NA	NA	NA	36.5% 256 mV 96	36.5% 256 mV 96	41.3% 295 mV 96

Note 1 – Digital levels are defined as the primary values, and the rest are derived.

Note 2 – Digital levels are expressed in the same way as described in Recommendation ITU-R BT.601.

Note 3 – For the subjective assessment monitoring waveform, mid-levels between stripes and background are introduced to avoid ringing due to the sharp transition of the waveform.

Note 4 – NA: the mid-level is not applied, and the level for this area is the same as the background.

ANNEX 2

Procedure for use of PLUGE test signals

These adjustments are very dependent on the viewing conditions and it is preferable to conform to the conditions for viewing distance and ambient illumination contained in Recommendation ITU-R BT.500:

– the brightness control is reduced until the blackest stripe disappears, whilst the brighter stripe remains visible. This setting shall correspond to the pre-set brightness condition;

– using a photometer, the contrast is adjusted until the centre of the white area (100% video level) has a luminance value of about 70 cd/m^2. This setting shall correspond to the pre-set contrast control condition;

– before a result that is entirely satisfactory is obtained, the procedure described above will usually be repeated, so as to reduce the effects of interactions between these two controls.

ANNEX 3

PLUGE for HDTV systems

A PLUGE signal for HDTV displays has been studied and is shown in Figs. 2 and 3. The peak white patch is used to set the peak luminance by means of the contrast control.

Two types of signal can be used to set the brightness of the black level of the display by means of the brightness control.

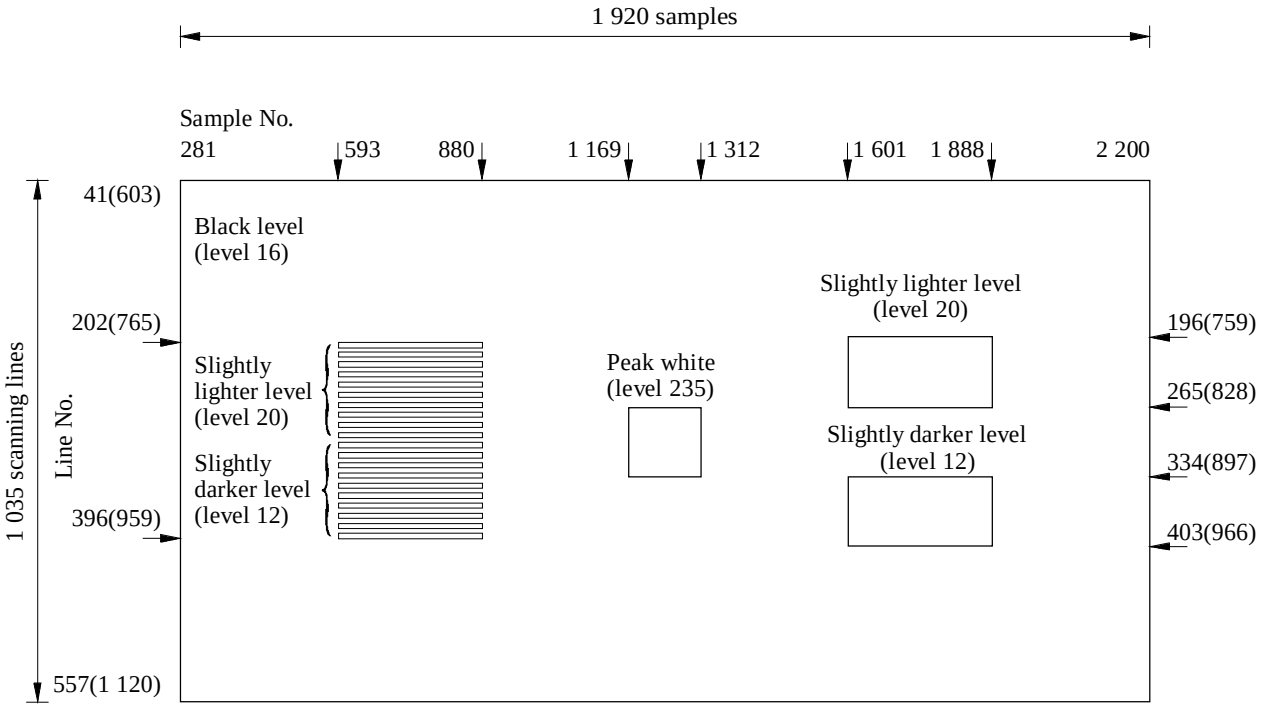
The signal on the left-hand side of the picture consists of narrow horizontal stripes (a width of 10 scanning lines). The stripes extend from approximately 2% above the black level of the waveform to approximately 2% below the black level. This signal gives the most accurate adjustment for CRT-type displays. The signal on the right-hand side of the picture consists of two coarse stripes (a width of 138 lines) one stripe is approximately 2% above black level the other is approximately 2% below black level. This signal is suitable for setting projection type displays.

As in Annex 2, the luminance of the black level of the display is adjusted by the display brightness control such that the negative horizontal stripes disappear, whilst the positive horizontal stripes remain visible.

Studies need to be carried out to ascertain if this type of PLUGE signal can also be used in conventional 525 and 625-line pictures.

FIGURE 2

Signal for adjusting the luminance of black level



( ) Indicates in 2nd field

FIGURE 3

Waveform of the signal for adjusting the luminance of black level