RECOMMENDATION ITU-R BR.1220-1*

Requirements for the generation, recording and presentation of high definition television programmes intended for release in the "electronic cinema"

(1995-2001)

The ITU Radiocommunication Assembly,

considering

a) that programmes produced in high-definition television (HDTV) can be intended for release on a variety of distribution media, including release in cinemas;

b) that such release in cinemas can be effected by distribution of conventional 35 mm film print copies (transferred from HDTV video tape recordings), by distribution of HDTV signals over transmission links such as satellite ones, or by distribution of HDTV recordings;

c) that the electronic presentation of HDTV programmes in cinema theatres is in an initial implementation stage at present and it may attain widespread use in the future,

recommends

1 that for the generation, recording and presentation of HDTV programmes intended for release in the "electronic cinema"[1], the guidelines given in Annex 1 should preferably be followed.

ANNEX 1

1 Viewing conditions for the electronic cinema

The electronic cinema is designed to parallel the viewing experience of conventional cinema theatres. Electronic cinema screenings are watched in darkened halls on very large screens, under conditions very similar to those that apply to conventional cinema viewing:

– A screen base of 10 m is typically used.

– Stray light in the screening hall is low and mainly comes from emergency exit signs.

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* This Recommendation should be brought to the attention of the International Organization for Standardization (ISO).

[1] The term "electronic cinema" describes a viewing experience parallel to the one encountered in conventional cinema theatres. Electronic cinema screenings are watched in darkened halls on very large screens, under conditions very similar to those that apply to conventional cinema viewing.

– The maximum contrast capability for images on the screen is quite high, similar to the contrast ratio obtainable when projecting film print copies; a value of 150 or more, including the effect of stray light, is typical.

– Viewers' seats are arranged in a way similar to the one typical of cinemas, with rows located at an approximate distance from the screen from one to five times the screen height, and with seats located within a reasonable angle from the normal to the screen centre. The viewers' preferred seating positions will typically be located at a distance of 2 to 4 times picture height from the screen.

– Concerning sound, stereo sound facilities are provided in electronic cinema presentations. In many cases, surround sound facilities are provided, conforming with Recommendation ITU-R BS.775.

2 Screen illumination in the electronic cinema

Some simple considerations may help to place screen illumination into perspective:

– if the screen has a reflectance coefficient of 1, a luminance of about 130 cd/m^2 on non-specular whites along the normal to the screen centre will be obtained with an illumination of about 130 lux (this will produce a brightness similar to that recommended for projecting film print copies);

– for an aspect ratio of 16/9, a screen with a 10-m base has a surface of 56 m^2 (it serves about 500 persons);

– high-output HDTV projectors are typically rated for an output of 3 000 lm or more.

In the assumption that all the light provided by the projector falls on the screen with no overspill, it is seen that high-output HDTV projectors can accommodate a screen with a 10-m base (diagonal about 460 in.), even if the screen is not a directional one. These projectors are normally placed behind the audience area; they may need to be placed in a soundproof enclosure, since their operation is often rather noisy.

The considerations above apply to the case when stray light in the screening hall is at a low level, comparable to the one found in cinema theatres. However, it sometimes happens that stray light cannot be perfectly controlled; in this case a higher screen illumination will be required in order to preserve an adequate contrast ratio on the screen, and this will influence the maximum screen size that can be used.

3 Main technical requirements for the electronic cinema

The main technical requirements for the electronic cinema derive from the viewing conditions specified for cinema theatres, as described in § 1, and from the screen illumination requirements described in § 2. The specific requirements are highlighted below.

3.1 The luminance of the image on the screen must be comparable to the one typical of cinema theatres, and it must be consistent with the existing level of stray light, in order to meet the contrast ratio requirement indicated in § 3.2.

3.2 To achieve an image on screen with a contrast capability of at least 150, the source image must have a contrast capability exceeding 200 (this refers to the maximum contrast capability, not to the actual contrast of each image of the programme, which is a matter of creative judgement).

In addition, the HDTV projector must keep internal stray light down to a low level, in order not to degrade the contrast of the source image[2]; in this way the only source of contrast degradation will come from ambient light and from light reflected back to the screen from the walls of the screening hall.

3.3 Screens with directional gains greater than about two should preferably not be used, since they limit the viewing angle at which an image of adequate brightness can be seen. This in turn reduces the number of seats that can be accommodated at the sides of the screening hall, away from the normal to the screen centre.

3.4 Since some members of the audience may sit at a distance from the screen equal to 2.5 times picture height or even less, HDTV cameras with the highest resolution must be used for electronic cinema productions, and the projected images must retain that resolution as far as possible[3] (again, this refers to resolution capability, rather than to actual resolution of each image, which is a matter of creative judgement).

In particular, the required light emission from the projector must be attained with a minimum loss of resolution on image highlights, or the image rendition may suffer and the viewing experience may be impaired.

Given a choice:

– the finest image sampling structure at source should be used;

– programme recording means should be used that retain the full sampling fineness;

– projection means should be used that provide the highest resolution, for the required light output.

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[2] It should be noted in this respect that the level of internal stray light in some high-output HDTV projectors depends on the average level of the image and it increases on low-key images.

[3] Any loss of resolution will be much more perceived by the electronic cinema audience, than it would be perceived by an audience at home, since HDTV consumer receivers do not yet normally match the resolution capability of modern HDTV cameras, and viewers in the home do not normally sit so close to the display.