

EBU Technical Recommendation R93-1998 Compromise Scanned Area Dimensions for Television from 35 mm Wide-Screen Films

<i>EBU Committee</i>	<i>First Issued</i>	<i>Revised</i>	<i>Re-issued</i>
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The EBU has considered:

- a) that EBU Recommendation R86 [1] specifies the maximum safe areas to be scanned from films intended for projection and from films specially shot and framed for television,
- b) that the scanning areas for wide-screen films given in R86 are based on one of the principles:
 - to fill the television display with a full height central area of the film image (full-screen),
 - to show the full width of the film with black areas top and bottom of the television screen (letterbox),
- c) that for some wide-screen films, a compromise may be preferred between the full-screen and letterbox scanning areas for artistic or traditional reasons,
- d) that there should be a minimum set of recognised image aspect ratio and related scanned areas that can be used as references for telecine scanning.

The EBU *recommends*:

- a) that, if required for artistic or other reasons, Members use the following compromise presentation formats for wide-screen film on television:
 - For 4:3 television 14:9 16:9 18:9
 - For 16:9 television 18:9
- b) that Members who prefer to use a compromise scanning area for wide-screen films should use one of the scanning areas listed in.
 - Annex 1, Table 1 for 4:3 television systems
 - Annex 1, Table 2 for 16:9 television systems.
- c) that Members use a test film to align telecine equipment according to the recommended scanned areas.*
- d) that Members take into account that the dimensions and diagrams in this Recommendation relate to the image content of the transmitted signal. The possible cropping of the image due to over-scanning in the receiver is discussed in Annex 1, Section 1.

* A suitable 35mm film test film will shortly be available from BKSTS* in London.

* <http://www.bksts.com>

ANNEX 1

Compromise scanned aspect ratios for 4:3 and 16:9 television

Introduction

Many of the wide-screen films produced in the past and at present for cinema presentation exist in formats with aspect ratios that are different to those used on television. These film aspect ratios include:

- 1.66:1 - non anamorphic, wide screen
- 1.85:1 - non anamorphic, wide screen
- 2.39:1 - anamorphic, wide screen

When these wide-screen film formats are scanned for 4:3 and 16:9 television, 2 basic principles are applied:

- The “full screen” method fills the TV-screen. The full height of the film image is shown but image area at each side will be cropped.
- “letterbox” method reproduces the film in its intended presentation format but leaves black areas at top and/or bottom of the television screen.

In different countries, one or the other method is established and preferred by the audience.

Some broadcasters have adopted a third, compromise, method to present some wide-screen films on television. This method is based on scanning between the full screen and the letterbox presentations. There will be smaller black areas top and bottom of the TV-screen than in full letterbox presentation and less of the film image area each side will be cropped than in the full screen presentation.

This recommendation specifies a minimum set of “compromise” aspect ratios and the corresponding image area dimensions to be scanned from 35mm wide-screen motion picture films. It is intended to be a reference document for “compromise” transfer from telecine of programmes intended for transmission, exchange or distribution.

2. Television presentation

The recommended “compromise” aspect ratios for reproduction on television are:

Television system	Recommended compromise aspect ratios			
4:3 television	14:9	16:9	18:9 (2:1)	(see figure 1.)
16:9 television			18:9 (2:1)	(see figure 2.)

Wide-screen films reproduced with one of these compromise aspect ratio will show the full height of the film image but some of the film image area will be cropped each side. In addition, there will be black areas at the top and/or bottom of the television display.

* Over-scanning in traditional cathode ray tube display results in some cropping of the transmitted image. The actual image content and the size of the black bars on the screen will depend on the amount of over-scanning. Receivers typically crop 5-10% of the overall image. In an image displayed full-screen, both the image height and width will be cropped. In a letterbox display, the width will be cropped but only part of the black bars will be cropped from the height. This will result in a change in the aspect ratio of the displayed image. However, future flat screen displays are not expected to suffer from the over-scanning effect and therefore will display the transmitted image without cropping.

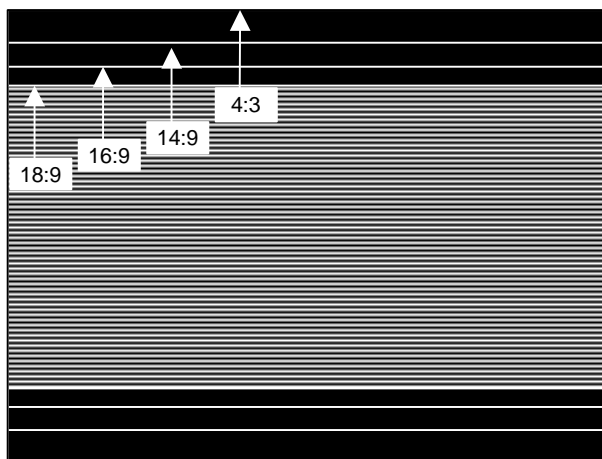


Figure 1. Compromise aspect ratios for 4:3 television systems

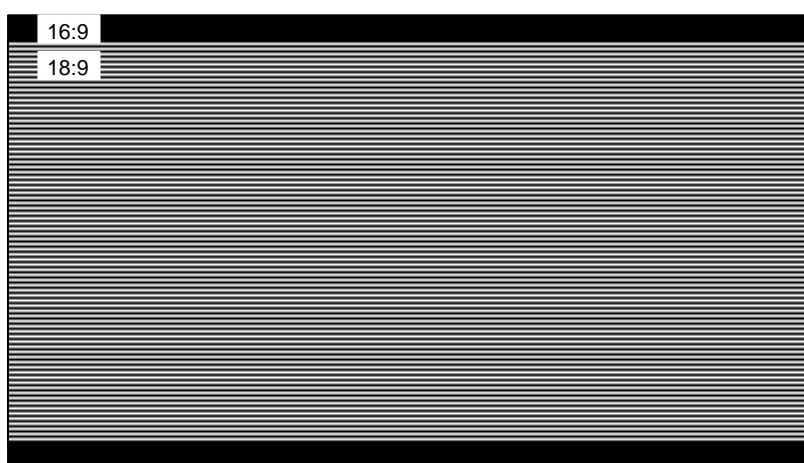


Figure 2. Compromise aspect ratios for 16:9 television systems

3. The scanning principle

Following EBU Recommendation R86, the wide-screen images on films shall be scanned based on the international standards for “projected image height”. The related scanned width shall be according to preferred “compromise” aspect ratio.

4. Anchor values for calculating scanned area dimensions

The “anchor dimensions” for adopted calculating the scanned areas for 4:3 and 16:9 television are based on the current ISO standard for projection of 35mm cinematographic films [2] The anchor dimensions are:

Format	Reference	Anchor dimension	Derived dimension	Image centre
35 mm Academy aperture Aspect ratio: 1.37:1	ISO 2907 [2]	Image height: 15.29 mm	Image width: 20.95 mm	18.75 mm

Based on the derived width, the calculated image heights for the projection apertures from film are:

Aspect ratio	Height
1.66:1	12.62mm
16:9	11.78mm
1.85:1	11.32mm
2.39:1	17.53mm

5. Scanned area dimensions for television

4:3 television systems:

Scanned dimensions for 4:3 television systems are given in Table 1. Relation between the scanning and film formats are shown in figures 3, 4 and 5.

16:9 television systems:







Scanned dimensions for 4:3 television systems are given in Table 2. Relation between the scanning and film formats are shown in figures 6.

6 Image area and television scanning

The scanned areas from film should relate to the nominal active picture area of analogue 625-line television systems as determined by the blanking given in ITU-R Recommendation 470-3 [3], that is a width of 52 μ s.

For the digital representation of 625-line television systems, based on ITU-R Recommendation 601-5 [4], it is important to note that the horizontal scanned dimension on film should coincide with the central 702 samples of the "digital active line" (Samples 9 to 710) as recommended in EBU Recommendation R92 [5].

TABLE 1
Film shot and framed for projection: Compromise scanned areas for 4:3 television
(Scanned area dimensions from images on film intended for contact printing and projection.
The film material can be a print, an intermediate or camera original)

	Image aspect ratio		Scanned area dimensions (mm)			Appearance	Notes
	framed for	displayed on 4:3 Television	width	height	centre		
1	35 mm: Academy aperture width						
1.1	1.66:1	14:9 letterbox	19.63	12.62	18.75		1
1.2	16:9	14:9 letterbox	18.33	11.78	18.75		1
1.3	1.85:1	14:9 letterbox	17.61	11.32	18.75		1
1.4	2.39:1	14:9 letterbox	13.63	17.53	18.75		1
1.5	2.39:1	16:9 letterbox	15.58	17.53	18.75		1
1.6	2.39:1	18:9 letterbox	17.53	17.53	18.75		1

Notes:

- 1 These dimensions will crop film image area on each side and there will be black areas top & bottom of the screen.



Cropped Area on the film image.



Black area on the television display

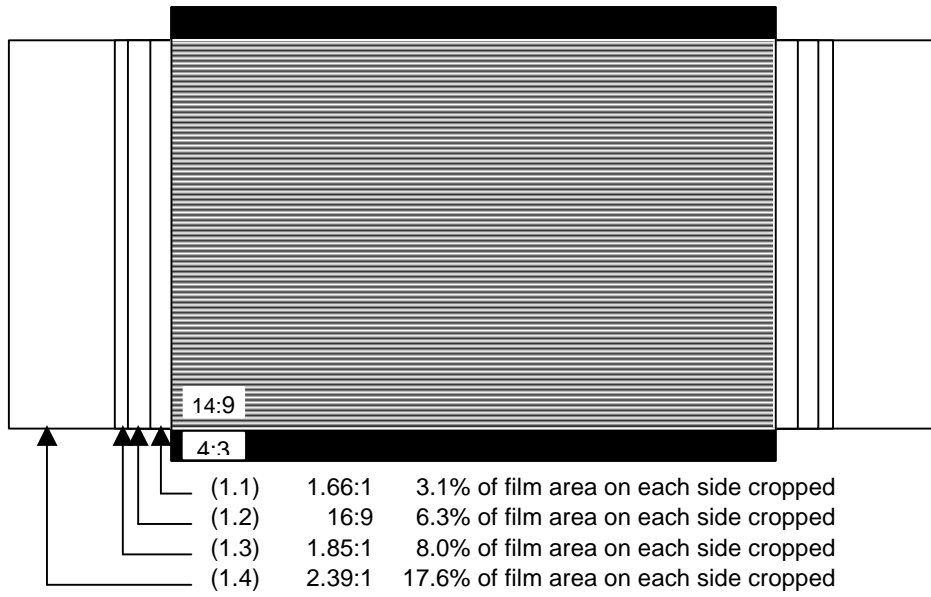


Figure 3. Compromise scanned areas, 14:9 for 4:3 television

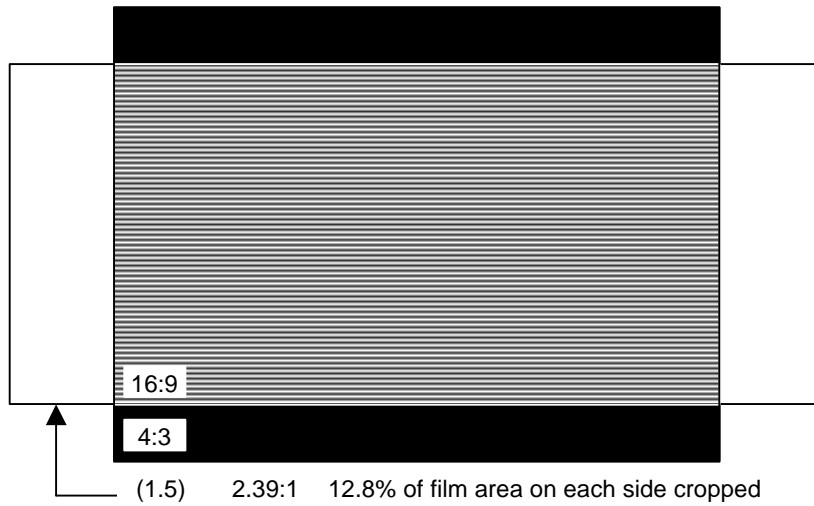


Figure 4. Compromise scanned areas, 16:9 for 4:3 television

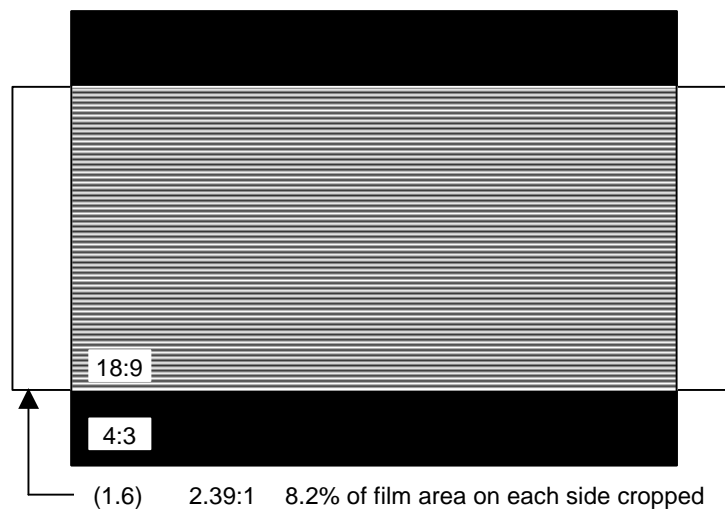



Figure 5. Compromise scanned areas, 18:9 for 4:3 television

TABLE 2


Film shot and framed for projection: Scanned for 16:9 television

*(Scanned area dimensions from images on film intended for contact printing and projection.
The film material can be a print, an intermediate or camera original)*

	Image aspect ratio		Scanned area dimensions (mm)			Appearance	Notes
	framed for	displayed on 16:9 Television	width	height	centre		
2	35 mm: Academy aperture width						
2.1.	2.39:1	18:9	17.53	17.53	18.75		1

Notes:

1. These dimensions will crop film image area on each side and there will be black areas top & bottom of the screen.

 Cropped Area on the film image.  Black area on the television display

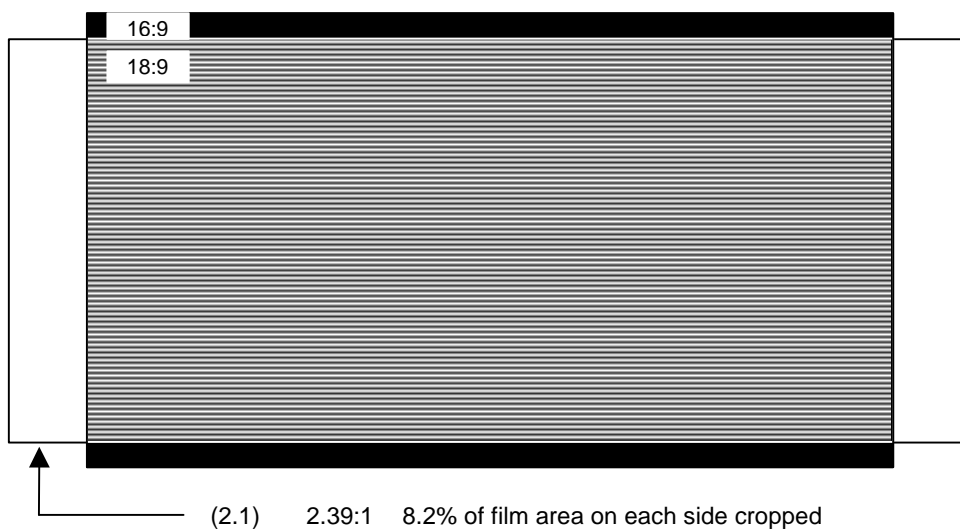


Figure 5. Compromise scanned areas, 18:9 for 16:9 television

Bibliography

- [1] EBU Recommendation R86-1997: **Scanned image area dimensions from films for television**
- [2] ISO 2907 - **Cinematography - Maximum projectable image area on 35mm motion picture film**
- [3] ITU-R Recommendation BT:601-5: **Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspect ratios**
- [4] ITU-R Recommendation BT:470-5: **Conventional television systems**
- [5] EBU Recommendation R92-1998: **Active line length in analogue and digital 625/50 television systems**