

RECOMMENDATION ITU-R BR.1374-1*

**Scanned area dimensions from 16 mm and 35 mm
cinematographic film used in television**

(Question ITU-R 240/11)

(1998-2001)

The ITU Radiocommunication Assembly,

considering

- a) that the image aspect ratios of television and film, in particular wide-screen feature films made for cinema presentation, do not coincide;
- b) that the conversion of film images for television takes place in telecine equipment that offers a multiple choice of what film image area dimensions to transfer to video for television;
- c) that it is normal practice in broadcasting organization to transfer programmes originated on film to video tape for programme transmission, exchange and distribution;
- d) that, more and more often, films are transferred to video by external post-production or facilities houses rather than in-house by broadcasters;
- e) that broadcasters would like to specify the expected picture area on film received as video from other organizations;
- f) that there should be recommendations specifying scanned area dimensions for television, from release films, that take into account established standards for optical projection;
- g) that there should be recommendations specifying image areas dimensions for film specially shot and framed for television,

recommends

1 that the scanned area dimensions, for film shot and framed for optical projection or television, listed in this Recommendation, should be used as reference values for transferring film images for use in television EBU R86 – 1997 “Scanned area dimensions from films for television”:

- Tables 1 and 3 specify scanned area dimensions for 4:3 television;
- Tables 2 and 4 specify scanned area dimensions for 16:9 television;
- Figures 1-2 show the aspect ratio relations for 4:3 television;
- Figures 3-4 show the aspect ratio relations for 16:9 television;

* This Recommendation should be brought to the attention of the International Standards Organization (ISO TC-36) and the Society of Motion Picture and Television Engineers (SMPTE).













- Appendix 1 shows the intentions, principles and anchor (reference) values behind the scanned area dimensions listed in Tables 1 to 4.

NOTE – This Recommendation replaces Recommendations ITU-R BR.782, ITU-R BR.783, ITU-R BR.716, ITU-R BR.1291, ITU-R BR.1288 and ITU-R BR.1289.

TABLE 1

Film shot and framed for projection and scanned 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			appearance	notes
	framed for	displayed on TV	width	height	centre		
<i>1.1 16 mm: Standard aperture</i>							
1.1.1	1.33:1	4:3 full screen	9.65	7.24	7.98		1
1.1.2	1.33:1	4:3 full screen	9.35	7.01	7.98		2
<i>1.2 35 mm: Academy aperture</i>							
1.2.1	1.37:1	4:3 full screen	20.39	15.29	18.75		3, 4
1.2.2	1.37:1	4:3 full screen	20.12	15.09	18.75		2, 4
1.2.3	1.66:1	4:3 full screen	16.83	12.62	18.75		4
1.2.4	1.66:1	1.66:1 letterbox	20.95	12.62	18.75		5
1.2.5	16:9	4:3 full screen	15.71	11.78	18.75		4
1.2.6	16:9	16:9 letterbox	20.95	11.78	18.75		5
1.2.7	1.85:1	4:3 full screen	15.09	11.32	18.75		4
1.2.8	1.85:1	1.85:1 letterbox	20.95	11.32	18.75		5
1.2.9	2.39:1	4:3 full screen	11.69	17.53	18.75		4
1.2.10	2.39:1	2.39:1 letterbox	20.95	17.53	18.75		5



Cropped area on the film image



Black area on the television display

NOTE 1 – These dimensions are based on the “projected area” dimensions in ISO 359 Standard – Cinematography – “Projectable image area on 16 mm motion-picture prints”.

NOTE 2 – These dimensions are based on the “transmitted area” dimensions in ISO 1223 Standard – Cinematography – “Picture areas for motion picture films for television”. These dimensions are related to the historic concept of scanning film for television transmission.

NOTE 3 – These dimensions are based on the “projected area” dimensions in ISO 2907 Standard – Cinematography – “Maximum projectable Image area on 35 mm motion picture film”.

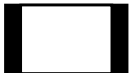

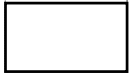


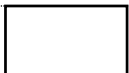

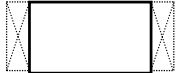

NOTE 4 – The television display will show the film image with areas on each side cropped.

NOTE 5 – The television display will show black areas at top and bottom of the film image.

TABLE 2

Film shot and framed for projection and 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			appearance	notes
	framed for	displayed on TV	width	height	centre		
2.1	16 mm: Standard aperture						
2.1.1	1.33:1	1.33:1 letterbox	9.65	7.26	7.98		1
2.2	35 mm: Academy aperture						
2.2.1	1.37:1	1.37:1 letterbox	20.95	15.29	18.75		1
2.2.2	1.66:1	16:9 full screen	20.95	11.78	18.75		2
2.2.3	1.66:1	1.66:1 letterbox	20.95	12.62	18.75		1
2.2.4	16:9	16:9 full screen	20.95	11.78	18.75		
2.2.5	1.85:1	16:9 full screen	20.12	11.32	18.75		3
2.2.6	1.85:1	1.85:1 letterbox	20.95	11.32	18.75		4
2.2.7	2.39:1	16:9 full screen	15.58	17.53	18.75		3
2.2.8	2.39:1	2.39:1 letterbox	20.95	17.53	18.75		4



Cropped area on the film image



Black area on the television display

NOTE 1 – The television display will show black areas on each side of the film area.

NOTE 2 – The television display will show the film image with areas top and bottom cropped.








NOTE 3 – The television display will show the film image with areas on each side cropped.

NOTE 4 – The television display will show black areas at top and bottom of the film area.

TABLE 3

Film specially shot and framed for television and scanned for 4:3 television

(Scanned area dimensions from images on film not intended for contact printing and projection. The film material will normally be a camera original)

	Image aspect ratio		Scanned area dimensions			appearance	notes
	framed for	displayed on TV	width	height	centre		
3.1 Super 16 mm aperture							
3.1.1	1.66:1	4:3 full screen	9.80	7.35	9.00		1, 6
3.1.2	1.66:1	1.66:1 letterbox	12.20	7.35	9.00		2, 6
3.1.3	16:9	4:3 full screen	9.15	6.86	9.00		1, 6
3.1.4	16:9	16:9 letterbox	12.20	6.86	9.00		2, 6
3.2 Super 35 mm: 4-perf. aperture							
3.2.1	4:3	4:3 full screen	24.00	18.00	17.48		3, 6
3.2.2	4:3	4:3 full screen	23.50	17.63	17.48		4
3.3 Super 35 mm: 3-perf. aperture							
3.3.1	4:3	4:3 full screen	18.00	13.50	17.48		5, 6



Cropped area on the film image



Black area on the television display

NOTE 1 – The television display will show the film image with areas on each side cropped.

NOTE 2 – The television display will show black areas at the top and bottom of the film area.

NOTE 3 – These dimensions are derived from the camera aperture dimensions in standard ANSI/SMPTE 59 – “35 mm Camera Aperture Images and Usage”.

NOTE 4 – These dimensions are derived from the camera aperture dimensions in DIN Standard 15502 – 6 Film 35 mm; Image produced by camera aperture and projected image area 1.33:1.

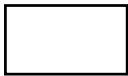



NOTE 5 – These scanned area dimensions are based on current production practice since no standard yet exists.

NOTE 6 – These dimensions are calculated for unsliced film.

TABLE 4

Film specially shot and framed for television and scanned for 16:9 television

(Scanned area dimensions from images on film not intended for contact printing and projection. The film material will normally be a camera original)

	Image aspect ratio		Scanned area dimensions			appearance	notes
	<i>framed for</i>	<i>displayed on TV</i>	<i>width</i>	<i>height</i>	<i>centre</i>		
4.1	<i>Super 16 mm aperture</i>						
4.1.1	16:9	16:9 full screen	12.20	6.86	9.00		4
4.2	<i>Super 35 mm: 4-perf. Aperture</i>						
4.2.1	16:9	16:9 full screen	24.00	13.50	17.48		1
4.2.2	16:9	16:9 full screen	23.50	13.22	17.48		2
4.3	<i>Super 35 mm: 3-perf. aperture</i>						
4.3.1	16:9	16:9 full screen	24.00	13.50	17.48		3, 4

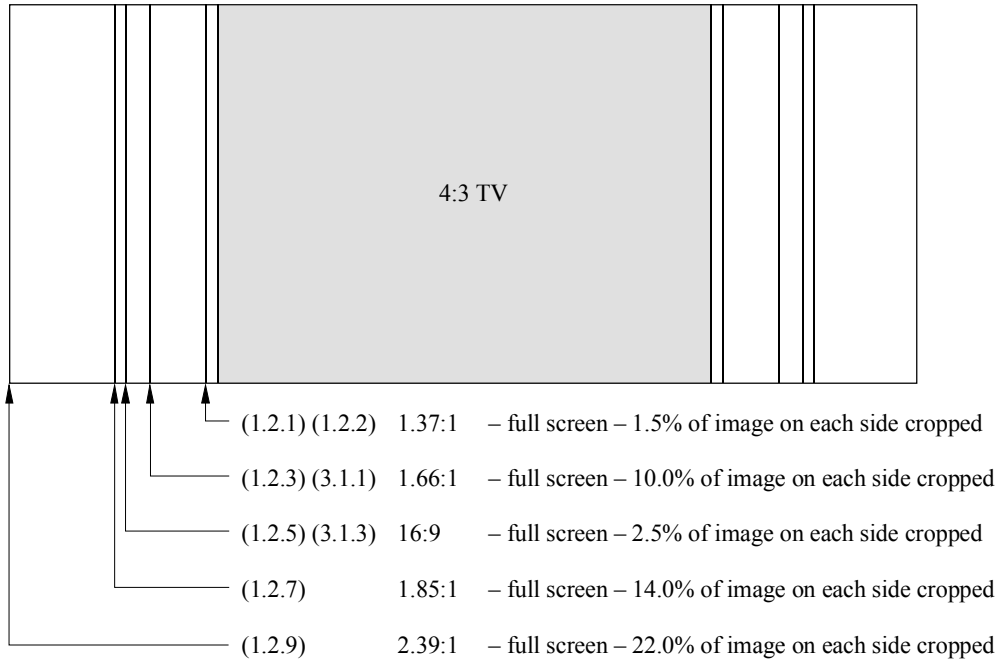
NOTE 1 – These dimensions are derived from the camera aperture dimensions in ANSI/SMPTE Standard 59 – “35 mm Camera Aperture Images and Usage”.

NOTE 2 – These dimensions are derived from the camera aperture dimensions in DIN Standard 15502 – 6 Film 35 mm; Image produced by camera aperture and projected image area 1.33:1.

NOTE 3 – These scanned area dimensions are based on current production practice since no standard yet exists.

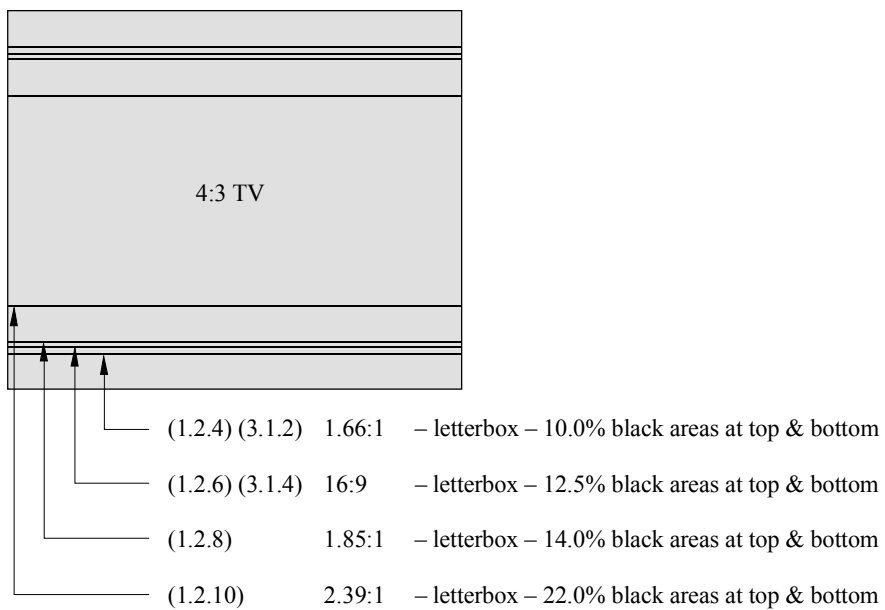
NOTE 4 – These dimensions are calculated for unspliced film.

FIGURE 1
Full screen presentation in 4:3 television



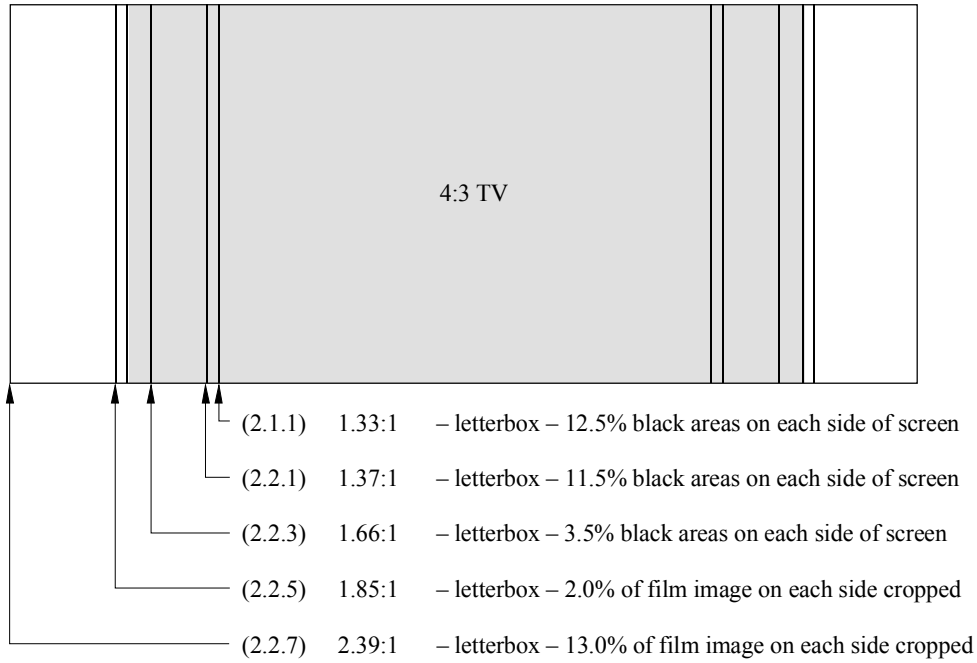
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FIGURE 2
Letterbox presentation in 4:3 television



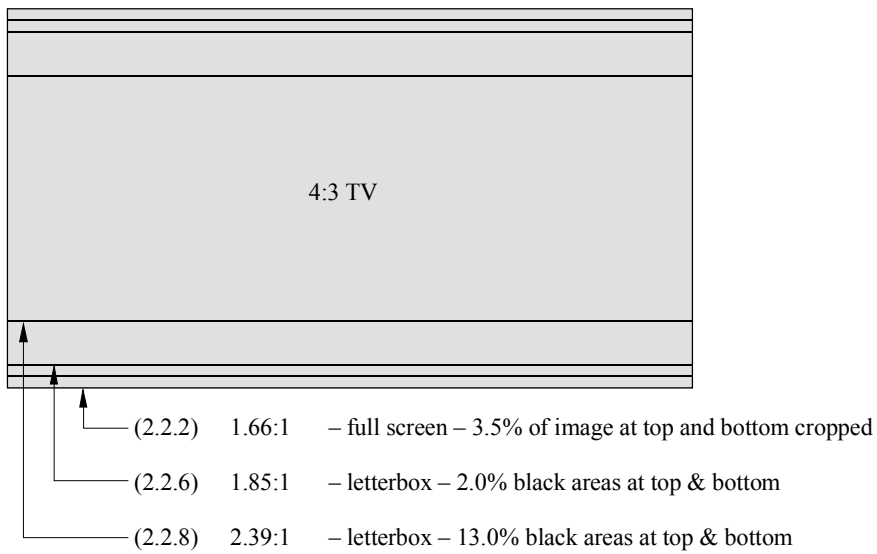
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FIGURE 3
Full screen/letterbox presentation in 16:9 television



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FIGURE 4
Full screen/letterbox presentation in 16:9 television



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APPENDIX 1

The intentions, principles and anchor (reference) values behind the listed scanned areas for motion picture film**1 Introduction**

This Recommendation specifies the dimensions of area to be scanned on 16 mm and 35 mm motion picture films. Its purpose is to be a reference document for harmonizing the areas used in film cameras, film projectors, telecines and test films for television purposes. The dimensions of the recommended areas are based on how film material and film technology are actually used for television production and reproduction. The technical properties of film and television techniques are taken into account, as well as the artistic criteria for format harmonization from shooting to presentation. The listed dimensions are based on key values taken from film industry standards and practices for exposure, printing, projection as well as past and present technology of television reproduction.

2 General

Motion picture film is used in many different ways in television. The film material might be prepared for television using conventional cinematographic techniques or the film might be part of an otherwise electronic process. A modern telecine allows film images to be captured from camera original or print material using a variable image area to suit different applications. To harmonize the image content throughout a production process, from exposure to presentation, it is therefore necessary to specify certain reference dimensions. This will give the equipment industry certain agreed performance standards to aim for and the users will benefit from improved image harmonization and consistency in production.

3 The scanning principles

In working out the scanned area dimensions, the different applications of film for production and reproduction are taken into account. Principles are laid down, based upon existing image area standards and recommendations, on production practice and on technical and artistic harmonization of the image area.

4 The basic principles

The areas defined in Tables 1-4 have been calculated from the following basic principles:

- a) Images on film which have been shot and framed for optical projection shall be scanned using existing international standards for "projected image area" dimensions.

- b) Images on film which have been specially shot and framed for television shall be scanned using “camera aperture” dimensions (typically camera aperture dimensions less 2%).
- c) If there is more than one standard for any area in current use and actively supported by the industry, each standard will be listed.

5 Anchor (reference) values

Because there are a number of aspect ratios used in film and television, “anchor” reference values of dimensions have been adopted for calculating the scanned areas for 4:3 and 16:9 television from the different aspect ratios used on film. These are as follows:

a) Release formats intended for projection

Format	Reference	Anchor	Dimension	Image centre
Standard 16 mm	ISO 359	width	9.65 mm	7.98 mm
Standard 16 mm	ISO 1223	width	9.35 mm	7.98 mm
35 mm Academy aperture	ISO 2907	height	15.29 mm	18.75 mm

b) Formats not intended for projection but used in television production

Format	Reference	Anchor	Dimensions	Image centre
Super 16 mm	derived from ISO 5768 ¹	width	12.20 mm	9.00 mm
Super 35 mm 4-perf.	derived from ISO 5768 ¹	width	24.00 mm	17.48 mm
Super 35 mm 4-perf.	derived from ANSI/SMPTE 59M	width	23.50 mm	17.48 mm
Super 35 mm 3-perf.	derived from ANSI/SMPTE 59M	width	24.00 mm	17.48 mm

¹ ISO 5768 – Cinematography – “Image produced by camera aperture Type W on 16 mm motion picture film”.

6 Television presentation

If the aspect ratio of the framed area on film is different from that of the television system, there are calculated scanned areas for the two typical presentations on television: “full screen” and “letterbox”. In “full screen” display the maximum safe area of the film image is scanned to fill the display. In the “letterbox” display, the total film image area is reproduced and the remaining areas of the television screen are black. Other compromise presentations will be between these two extreme cases.

The “full screen” dimensions are based on:

- the film image height, if the film aspect ratio is wider than the television aspect ratio;
- the film image width, if the film aspect ratio is narrower than the television aspect ratio.

The “letterbox” dimensions are based on:

- the film width, if the film aspect ratio is wider than the television aspect ratio;
- the film height if the film aspect ratio is narrower than the television aspect ratio.

The different presentations on television of the different film aspect ratios results in one of the following effects on television display:

- 1) the film image will be cropped on each side;
- 2) there will be black areas at top and bottom of the film image;
- 3) the film image will be cropped at top and bottom;
- 4) there will be black areas at the sides of the film image.

The percentage amount of these effects are given in Figs. 1-4.

7 Image area and television scanning

The scanned areas from film relate to the nominal active picture area of analogue 625-line television systems as determined by the blanking given in Recommendation ITU-R BT.470 – “Conventional Television systems”, that is a width of 52 μ s.

For the digital representation of 625-line television systems, based on Recommendation ITU-R BT.601 – “Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspects ratios”, 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).

8 Note on the dimensions

Historically, many film dimensions were calculated in imperial units. Therefore there may be slight differences between the values given here and those published elsewhere due to conversion and rounding. However, these are well within the range of normal working tolerances. The values given in this Recommendation have all been calculated in metric units and are consistent.

APPENDIX 2

Scanned image areas to be displayed on viewfinders of film camera used in television

The scanned area dimensions indicated in this Appendix can be used as reference values for the markings engraved on the ground glass of the viewfinder of film cameras used for the production of television programmes.

The detailed design of such ground glasses depends on the preferences of the user.

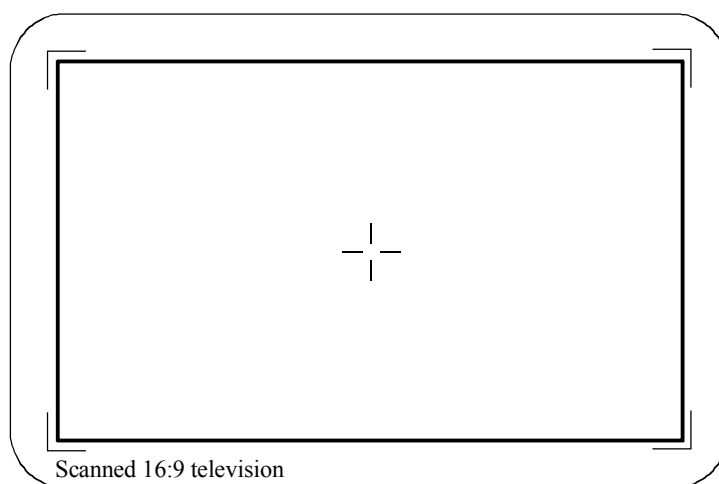
All ground glasses should desirably reflect both the camera aperture of the film format used, and the maximum scanned area of the chosen television system. In the transition period from the 4:3 to the 16:9 television aspect ratios, viewfinder markings should also desirably reflect the various presentation formats foreseen for the television programme.

If the ground glass markings reflect the safe action and safe title areas of the television image, these will depend on the different television presentation formats for which the image is to be exploited and on the broadcaster's practices and preferences on safe image areas. They should also take into account the effect of image cropping in consumer displays.

An example of possible ground glass markings is given in Fig. 5. The example applies to a ground glass designed for a Super 16 mm film camera prepared to shoot film expected to be scanned in the 16:9 television aspect ratio.

FIGURE 5

**Example of ground glass for Super 16 mm film camera
marked for 16:9 television scanning**



Corner marks: camera aperture for 1.66:1 aspect ratio (12.35 x 7.42 mm)

Inner frame: scanned image area (12.20 x 6.86 mm)

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