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Cinematography — Picture areas for motion-picture films for television — Position and dimensions

Cinématographie — Champs d'image pour films destinés à la télévision — Emplacements et dimensions

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 1223 was prepared by Technical Committee ISO/TC 36, *Cinematography*.

This fourth edition cancels and replaces the third edition (ISO 1223:1993), which has been technically revised.

Introduction

The use of film in television has evolved over many years, from being a source of programmes for transmission to becoming an integral part of the programme production. Thus, there is a need for a complete review of all existing standards and recommendations to ensure that they conform with how film is used today in television. The International Telecommunication Union Radiocommunication Sector (ITU-R), The European Broadcasting Union (EBU) and the Society of Motion Picture and Television Engineers (SMPTE) have worked independently, each endeavouring to harmonize all known recommendations on this subject and aiming at International Standards that will be references for worldwide performance and production practice. The results of these independent programmes demonstrate a remarkable consensus of opinion and it has therefore been possible to combine the products of all of these bodies of work in this International Standard.

This International Standard specifies the dimensions of area to be scanned from 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 and projection as well as past and present technology of television reproduction.

Cinematography — Picture areas for motion-picture films for television — Position and dimensions

1 Scope

This International Standard defines the position and dimensions of maximum safe areas of the images on 16 mm and 35 mm motion-picture film, which are transmitted or transferred by television. It applies to all formats which are intended for use with either or both of 4:3 and 16:9 aspect ratios.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 359:1983, *Cinematography — Projectable image area on 16 mm motion-picture prints — Dimensions and location*

ISO 2906:2002, *Cinematography — Image area produced by camera aperture on 35 mm motion-picture film — Position and dimensions*

ISO 2907:2002, *Cinematography — Maximum projectable image area on 35 mm motion-picture film — Position and dimensions*

ISO 5768:1998, *Cinematography — Image produced by camera aperture Type W on 16 mm motion-picture film — Position and dimensions*

3 Scanning requirements

3.1 Images for optical projection

Images on film which have been shot and framed for optical projection shall be scanned, based on the requirements of ISO 359 and of ISO 2907 as appropriate.

3.2 Images for television

Images on film which have been shot and framed for television shall be scanned, based on the requirements of ISO 2906 and ISO 5768 as appropriate.

3.3 Non-standard areas

Where image areas other than those specified in ISO 2906 and ISO 2907 for 35 mm film and ISO 359 and ISO 5768 for 16 mm film are used with the active support of the industry, these shall be specified in documentation available at the time of transmission transfer.

4 Requirements for scanned areas

4.1 Projection film intended for 4:3 television

For film originally shot and framed for projection but required for transmission/transfer via 4:3 television, the scanned areas shall be as defined in Table 1[1)].

4.2 Projection film intended for 16:9 television

For film originally shot and framed for projection but required for transmission/transfer via 16:9 television, the scanned areas shall be as defined in Table 2.

4.3 Film specially prepared for 4:3 television

For film specially shot and framed for 4:3 television, the scanned areas shall be as defined in Table 3.

4.4 Film specially prepared for 16:9 television

For film specially shot and framed for 16:9 television, the scanned areas shall be as defined in Table 4.

NOTE Annex A provides illustrations of the application of those scanned areas.

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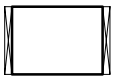
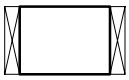
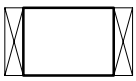
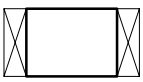
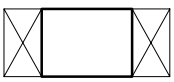
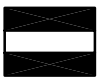
Table 1 — Film shot and framed for projection — Scanned for 4:3 television

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

Reference number	Image aspect ratio		Display [a]	Scanned area dimension mm			Notes
	framed for	displayed on TV		width	height	centre	
1.1	16 mm: Standard aperture						
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
1.2	35 mm: Academy aperture						
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	3,4
1.2.4	1,66:1	1,66:1 letter-box		20,95	12,62	18,75	3,5
1.2.5	16:9	4:3 full screen		15,71	11,78	18,75	3,4
1.2.6	16:9	16:9 letter-box		20,95	11,78	18,75	3,5
1.2.7	1,85:1	4:3 full screen		15,09	11,32	18,75	3,4
1.2.8	1,85:1	1,85:1 letter-box		20,95	11,32	18,75	3,5
1.2.9	2,39:1	4:3 full screen		11,69	17,53	18,75	3,4
1.2.10	2,39:1	2,39:1 letter-box		20,95	17,53	18,75	3,5

NOTE 1 These dimensions are based on the “projected area” dimensions given in ISO 35.

NOTE 2 These dimensions are related to the historic concept of scanning film for television specified as “transmitted area” dimensions in ISO 1223:1993, Annex A.

NOTE 3 These dimensions are based on the “projected area” dimensions in ISO 2907.

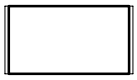
NOTE 4 The television display will show the film image with areas on each side cropped (see Figure A.1).

NOTE 5 The television display will show black areas at the top and bottom of the film image (see Figure A.2).

a  Cropped area on the film image  Black area on the television display

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 may be a print, an intermediate or camera original.)

Reference number	Image aspect ratio		Display [a]	Scanned area dimension mm			Notes
	framed for	displayed on TV		width	height	centre	
2.1	16 mm: Standard aperture						
2.1.1	1,33:1	1,33:1 letter-box		9,65	7,26	7,98	1,3
2.2	35 mm: Academy aperture						
2.2.1	1,37:1	1,37:1 letter-box		20,95	15,29	18,75	2,3
2.2.2	1,66:1	16:9 full screen		20,95	11,78	18,75	2,4
2.2.3	1,66:1	1,66:1 letter-box		20,95	12,62	18,75	2,3
2.2.4	16:9	16:9 full screen		20,95	11,78	18,75	2
2.2.5	1,85:1	16:9 full screen		20,12	11,32	18,75	2,5
2.2.6	1,85:1	1,85:1 letter-box		20,95	11,32	18,75	2,6
2.2.7	2,39:1	16:9 full screen		15,58	17,53	18,75	2,5
2.2.8	2,39:1	2,39:1 letter-box		20,95	17,53	18,75	2,5

NOTE 1 These dimensions are based on the “projected area” dimensions given in ISO 359.

NOTE 2 These dimensions are based on the “projected area” dimensions given in ISO 2907.

NOTE 3 The television display will show black areas on each side of the film area (see Figure A.3).

NOTE 4 The television display will show the film image with areas at the top and bottom cropped (see Figure A.4).

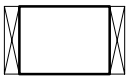
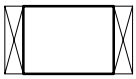
NOTE 5 The television display will show the film image with areas on each side cropped (see Figure A.3).

NOTE 6 The television display will show black areas at the top and bottom of the film area (see Figure A.4).

a  Cropped area on the film image  Black area on the television display

Table 3 — Film specially shot and framed for television — 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.)

Reference number	Image aspect ratio		Display [a]	Scanned area dimension mm			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	1,5,7
3.1.2	1,66:1	1,66:1 letter-box		12,20	7,35	9,00	1,6,7
3.1.3	16:9	4:3 full screen		9,15	6,86	9,00	1,5,7
3.1.4	16:9	16:9 letter-box		12,20	6,86	9,00	1,6,7
3.2	Super 35 mm: 4-perf. aperture						
3.2.1	4:3	4:3 full screen		24,00	18,00	17,48	2
3.2.2	4:3	4:3 full screen		23,50	17,63	17,48	3
3.3	Super 35 mm: 3-perf. aperture						
3.3.1	16:9	4:3 full screen		18,00	13,50	17,48	4,5

NOTE 1 These dimensions are derived from the camera aperture dimensions given ISO 5768.

NOTE 2 These dimensions are derived from the camera aperture dimensions in standard SMPTE 59-1998: 1998, Annex B.

NOTE 3 These dimensions are derived from the camera aperture dimensions in standard DIN 15502-6:1982, Annex B.

NOTE 4 These scanned area dimensions are based on current production practice since no standard currently exists.

NOTE 5 The television display will show the film image with areas on each side cropped (see Figure A.1).

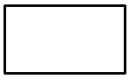
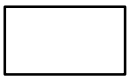
NOTE 6 The television display will show black areas at the top and bottom of the film area (see Figure A.2).

NOTE 7 The film is assumed not to be spliced.

a  Cropped area on the film image  Black area on the television display

Table 4 — Film specially shot and framed for television — 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.)

Reference number	Image aspect ratio		Display [a]	Scanned area dimension mm			Notes
	framed for	displayed on TV		width	height	centre	
4.1	Super 16 mm aperture						
4.1.1	1,66:1	16:9 full screen		12,20	6,86	9,00	1,5,7
4.1.2	1,66:1	1,66:1 letter-box		12,20	7,35	9,00	1,6,7
4.1.3	16:9	16:9 full screen		12,20	6,86	9,00	1,7
4.2	Super 35 mm: 4-perf. aperture						
4.2.1	16:9	16:9 full screen		24,00	13,50	17,48	2
4.2.2	16:9	16:9 full screen		23,50	13,22	17,48	3
4.3	Super 35 mm: 3-perf. aperture						
4.3.1	16:9	16:9 full screen		24,00	13,50	17,48	4,7

NOTE 1 These dimensions are derived from the camera aperture dimensions given in ISO 5768 .

NOTE 2 These dimensions are derived from the camera aperture dimensions in standard SMPTE 59-1998, Annex B.

NOTE 3 These dimensions are derived from the camera aperture dimensions in standard DIN 15502-6:1982, Annex B.

NOTE 4 These scanned area dimensions are based on current production practice since no standard currently exists.

NOTE 5 The television display will show the film image with areas at the top and bottom cropped (see Figure A.4).

NOTE 6 The television display will show black areas on each side of the film area (see Figure A.3).

NOTE 7 The film is assumed not to be spliced.

a  Cropped area on the film image  Black area on the television display

Annex A
(informative)

Basic principles applied in developing Tables 1 to 4

A.1 Introduction

Because there are a number of aspect ratios used in film and television, this International Standard has adopted “anchor dimensions” for calculating the scanned areas for 4:3 and 16:9 television from the different aspect ratios used on film. These are as given in A.1.1 and A.1.2.

A.1.1 Release formats intended for projection

Format	Reference	Anchor	Dimensions	Image centre
Standard 16 mm	ISO 359	width	9,65 mm	7,98 mm
Standard 16 mm	ISO 1223:1993	width	9,35 mm	7,98 mm
35 mm Academy aperture	ISO 2907	height	15,29 mm	18,75 mm

A.1.2 Formats not intended for projection but used in television production

Format	Reference	Anchor	Dimensions	Image centre
Super 16 mm	Derived from ISO 5768	width	12,20 mm[2)]	9,00 mm
Super 35 mm 4-perf.	Derived from SMPTE 59	width	24,00 mm	17,48 mm
Super 35 mm 4-perf.	DIN 15502-6	width	23,50 mm	17,48 mm
Super 35 mm 3-perf.	Derived from SMPTE 59	width	24,00 mm[2)]	17,48 mm

A.2 Television presentation

If the aspect ratio of the framed area on film is different from that of the television system, this International Standard recommends scanned areas for the two typical presentations on television: “full screen” and “letter-box”. In “full-screen” display, the maximum safe area of the film image is scanned to fill the display. In the "letter-box" 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, and

2) In calculating these dimensions, the film is assumed not to be spliced.

— the film-image width, if the film aspect ratio is narrower than the television aspect ratio.

The “letter-box” dimensions are based on

— the film width, if the film aspect ratio is wider than the television aspect ratio, and

— 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:

a) the film image will be cropped on each side;

b) there will be black areas at the top and bottom of the film image;

c) the film image will be cropped at the top and bottom;

d) there will be black areas at the sides of the film image.

The percentage amount of these effects are given in Figures A.1 to A.4 in reference to the notes to Tables 1 to 4.

A.3 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 International Standard have all been calculated in metric units and are consistent.

A.4 Relationship between scanned film-image area and transmitted television-image area

Implementers of this International Standard should be aware that processes in the electronic television production chain subsequent to the film-scanning stage may reduce the size of the visible portion of the image by a few percent (ref. SMPTE 274M-1998, Annex C).

This occurs in both analogue and digital television production systems. Analogue techniques anticipate generational blanking width growth (through operations such as picture resizing) by using narrower-than-transmission-standard blanking in the early stages of the production chain, followed by the application of transmission-specification blanking at the final output of the production chain. Digital techniques achieve the same result in a slightly different way, by designating a small band of pixels around the desired transmitted active image area as “sacrificial” pixels. These exist to accommodate certain edge-effect artefacts arising from digital processing and are removed at the end of the chain. The standards specifying digital television systems quantify the numbers of such pixels and define the terms “production aperture” and “clean aperture” to describe these larger and smaller image areas respectively. For example, SMPTE 274M-1998 specifies a “clean aperture” of 1 888 pixels horizontally by 1 062 lines vertically within a “production aperture” of 1 920 pixels by 1 080 lines. This matter is further discussed in SMPTE-RP 187-1995.

To avoid unintended cropping of the film image, therefore, the film-scanning stage must fit the desired scanned film-image area given in this International Standard matching the “clean aperture” rather than the larger “production aperture” of the final transmitted television signal.

The appropriate television standard documents should therefore be consulted to define “clean aperture” for the particular transmission system in use.

A.5 Diagramatic representation of scanned areas

Figures A.1 and A.2 show full-screen and letter-box presentation, respectively, on 4.3 television.

The references on the left side of Figures A.1 and A.2 are based on Tables 1 and 3.

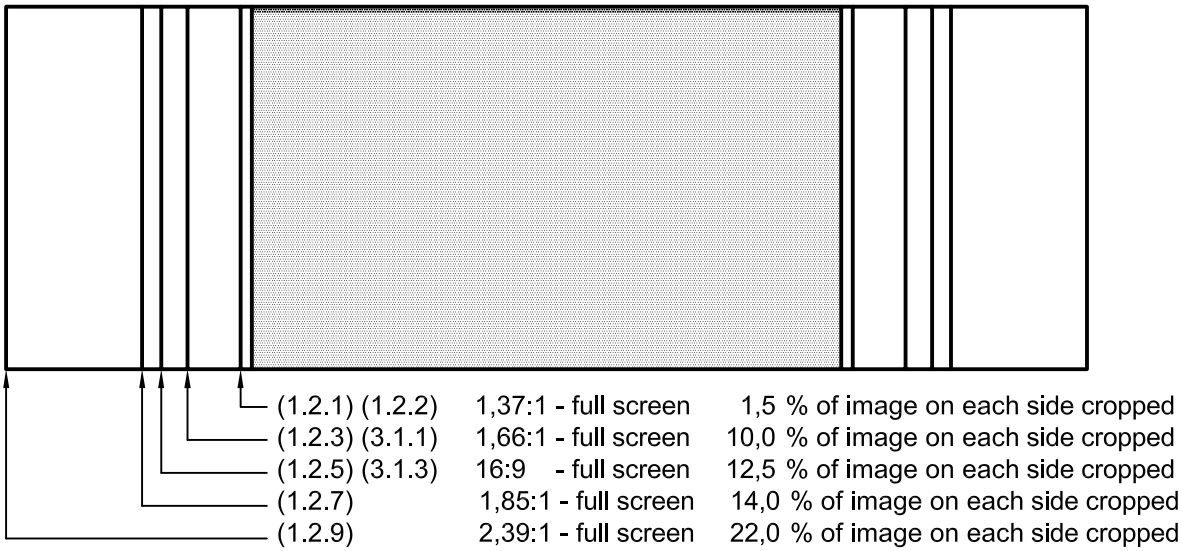


Figure A.1 — Full-screen presentation on 4:3 television

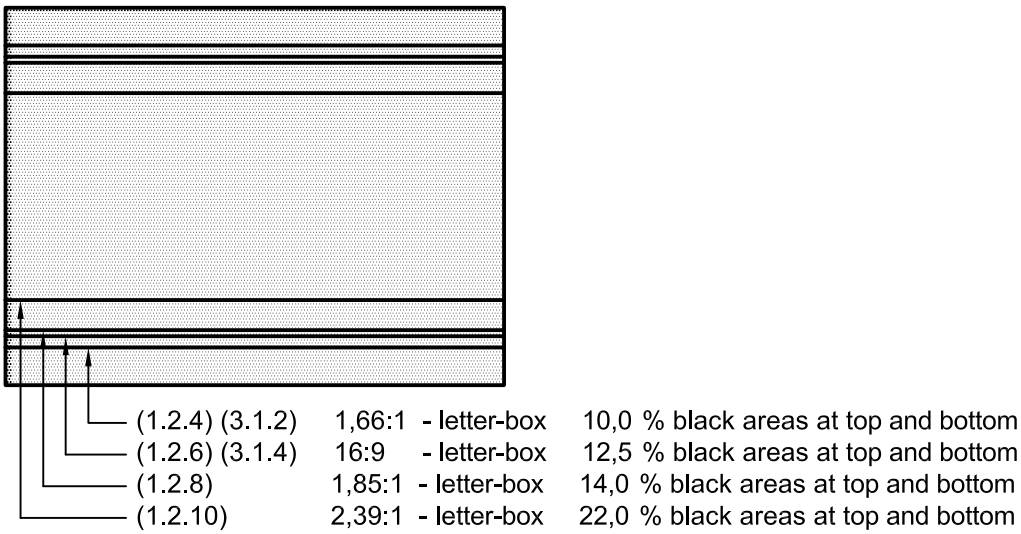


Figure A.2 — Letter-box presentation on 4:3 television

Figures A.3 and A.4 show letter-box/full-screen presentation and full-screen/letter-box presentation, respectively, on 16:9 television.

The references on the left side of Figures A.3 and A.4 are based on Table 2.

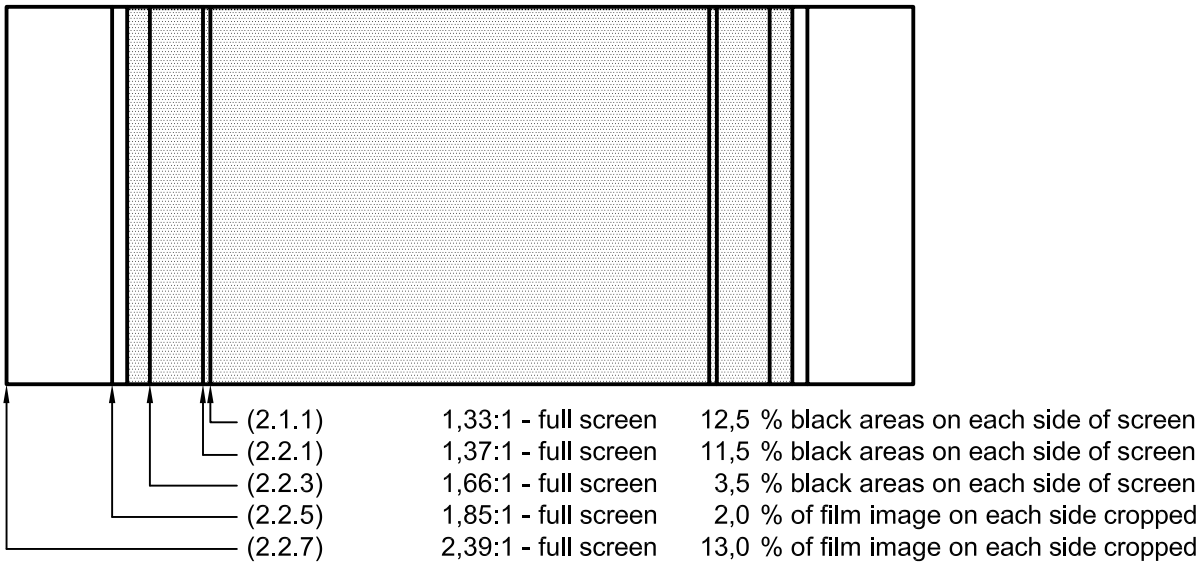


Figure A.3 — Letter-box/full-screen presentation on 16:9 television

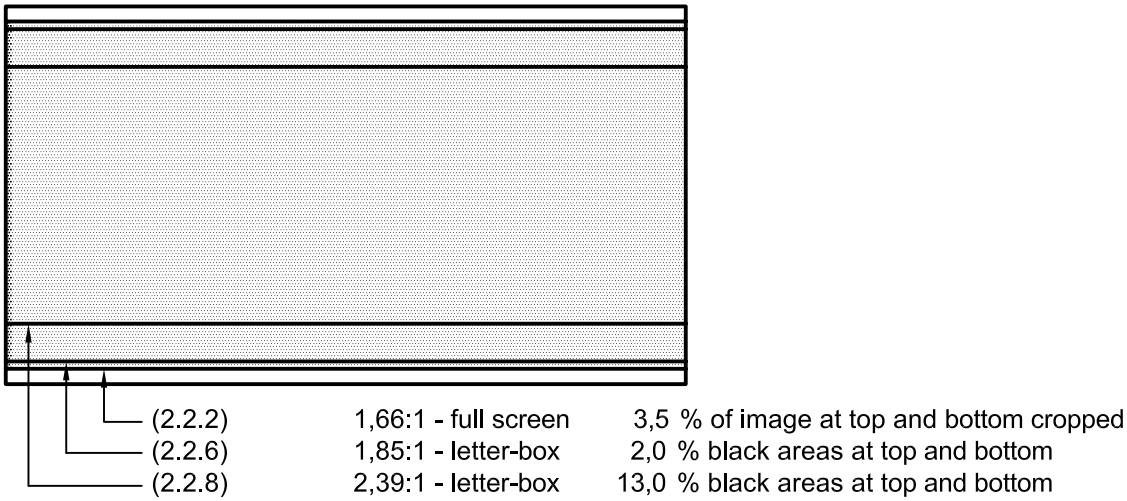


Figure A.4 — Full-screen/letter-box presentation on 16:9 television

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[1] ISO 1223:1993, *Cinematography — Picture areas for motion-picture films and slides for television — Position and dimensions*

[2] DIN 15502-6:1982, *Film 35 mm; image produced by camera aperture and projected image area, aspect ratio 1,33:1*

[3] EBU Technical Recommendation R86-1997, *Scanned image area dimensions from films for television*

[4] EBU Technical Recommendation R93-1998, *Compromise scanned area dimensions for television from 35 mm wide-screen films*

[5] Recommendation ITU-R BT.470-6, *Conventional television systems*

[6] Recommendation ITU-R BT.601-5, *Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspect ratios*

[7] Recommendation ITU-R BR.1374, *Scanned area dimensions from 16 mm and 35 mm cinematographic film used in television*

[8] SMPTE 59-1998, *Motion-Picture Film (35 mm) — Camera Aperture Images and Usage*

[9] SMPTE 96M-1999, *Television — 35- and 16-mm Motion-Picture Film and 2 × 2-in Slides — Scanned Area and Photographic Image Area for 4:3 Aspect Ratio*

[10] SMPTE 274M-1998, *Television — 1 920 × 1 080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates*

[11] SMPTE RP 187:1995, *SMPTE Recommended Practice — Center, Aspect Ratio and Blanking of Video Images*

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