RECOMMENDATION ITU-R BT.1210-2

Test materials to be used in subjective assessment

(Question ITU-R 211/11)

(1995-1997-2000)

The ITU Radiocommunication Assembly,

considering

a) that television system performance must be expressed by both objective and subjective measures;

b) that the picture quality of the system is evaluated mainly by subjective assessment;

c) that in subjective assessment, test procedures, viewing conditions and the test materials used may have a great influence on the assessment result;

d) that digital bit-rate reduction systems, the picture quality of which is generally dependent on, and sensitive to, the picture contents, are increasingly introduced in the broadcasting chain;

e) that the use of worldwide common test materials is one of the bases necessary to attain a universal assessment result;

f) that a set of materials that provide the characteristics suitable for test purposes must be properly chosen in the assessment;

g) that the test materials must be up to date in accordance with progress in television technology,

recommends

1 that the test materials listed in Annex 1 (issued in Recommendations ITU-R BT.710, ITU-R BT.802 and ITU-R BT.1128) should be preferably used in picture quality evaluation test of television systems;

2 that the test materials should be accompanied by the information shown in Annex 1 as it is useful in the selection of the materials and the statistics that serve to characterize them; candidates for suitable statistics are given in Annex 2;

3 that the latest information on test materials should be provided by the ITU-R computer system so that organizations wanting such materials can get the proper information through on-line access;

4 that the ITU-R computer system should accept the information about candidate test materials on a “draft” basis so that newly developed materials can be registered;

5 that test materials that are not listed in Annex 1, but used in picture quality evaluation tests, should be documented along with Annex 1 and be included in one ITU list, particularly if the test results have been submitted to the ITU.

ANNEX 1

List of test materials

TABLE 1

Test materials for standard definition TV (SDTV)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Availability		Statistic	Copyright status	Delivery format	Provider name
							525	625				
1	Formal pond	To be filled	To be filled	Luminance resolution	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
2	Boats	To be filled	To be filled	Luminance and colour resolution	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
3	Clown	To be filled	To be filled	Horizontal resolution	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
4	Boy with toys	To be filled	To be filled	Skin and colour edges	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
5	Girl with toys	To be filled	To be filled	Skin and colour edges	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
6	Young couple	To be filled	To be filled	Luminance and fine detail	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
7	Blackboard	To be filled	To be filled	Colour, vertical resolution	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
8	Tree	To be filled	To be filled	Luminance patterns	Still	Slide	o	o	To be filled	To be filled	D1 tape	To be filled
9	Old master	To be filled	To be filled	Chromakey FG	Still	Video	–	o	To be filled	To be filled	D1 tape	To be filled
10	Old master	To be filled	To be filled	Chromakey BG	Still	Video	–	o	To be filled	To be filled	D1 tape	To be filled
11	Still life	To be filled	To be filled	Chromakey FG	Still	Video	o	o	To be filled	To be filled	D1 tape	To be filled
12	Still life	To be filled	To be filled	Chromakey BG	Still	Video	o	o	To be filled	To be filled	D1 tape	To be filled
13	Kiel Harbour-1	To be filled	To be filled	High resolution	Still	8 × 10 slide	o	o	To be filled	To be filled	D1 tape	To be filled

TABLE 1 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Availability		Statistic	Copyright status	Delivery format	Provider name
							525	625				
14	Sailboat	To be filled	To be filled	Luminance resolution	Slow	Video	o	o	To be filled	To be filled	D1 tape	To be filled
15	Flower garden	To be filled	To be filled	Colour details	Slow pan	Video	o	o	To be filled	To be filled	D1 tape	To be filled
16	Susie	To be filled	To be filled	Skin tones	Slow	Video	o	o	To be filled	To be filled	D1 tape	To be filled
17	Diva with noise	To be filled	To be filled	Rapid entropy changes	Prod. wipe	Video	o	o	To be filled	To be filled	D1 tape	To be filled
18	Dinner party	To be filled	To be filled	Chroma key BG		Video	o	o	To be filled	To be filled	D1 tape	To be filled
19	Boy with toys	To be filled	To be filled	Skin and colour edges	Pan (H, V)	Slide	–	o	To be filled	To be filled	D1 tape	To be filled
20	Old master	To be filled	To be filled	Chroma key FG	Slow pan	Video	–	o	To be filled	To be filled	D1 tape	To be filled
21	Old master	To be filled	To be filled	Chroma key BG	Slow pan	Video	–	o	To be filled	To be filled	D1 tape	To be filled
22	Clown	To be filled	To be filled	Luminance and colour horizontal resolution	Pan (H, V)	Slide	–	o	To be filled	To be filled	D1 tape	To be filled
23	BBC disc	To be filled	To be filled	Random movement	Circular	Video	–	o	To be filled	To be filled	D1 tape	To be filled
24	Kiel Harbour-2	To be filled	To be filled	Cycle motion (narrow filter)	Rapid rocking	Component	o	o	To be filled	To be filled	D1 tape	To be filled
25	Kiel Harbour-3	To be filled	To be filled	Cycle motion (wide filter)	Rapid rocking	Component	o	o	To be filled	To be filled	D1 tape	To be filled
26	Kiel Harbour-4	To be filled	To be filled	High resolution in H, V, T dimensions	Slow pan/zoom	Component	o	o	To be filled	To be filled	D1 tape	To be filled
27	Balls of wool	To be filled	To be filled	Moving colours	Medium	Video	o	o	To be filled	To be filled	D1 tape	To be filled

TABLE 1 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Availability		Statistic	Copyright status	Delivery format	Provider name
							525	625				
28	Popple	To be filled	To be filled	Moving colours	Pan/rotate	Video	o	o	To be filled	To be filled	D1 tape	To be filled
29	Table tennis	To be filled	To be filled	Multiple rapid motions Standards conversion	Pan/zoom/cut	Video	o	o	To be filled	To be filled	D1 tape	To be filled
30	Mobile and calendar	To be filled	To be filled	Random motion of objects Standards conversion	Slow	Video	o	o	To be filled	To be filled	D1 tape	To be filled
31	Autumn leaves	To be filled	To be filled	Colour details	Slow pan/zoom	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
32	Summer flowers	To be filled	To be filled	Saturated colours, texture	Slow pan	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
33	Birches	To be filled	To be filled	Luminance details, sky	Slow tilt up	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
34	Horse riding	To be filled	To be filled	Landscape	Zoom	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
35	Bicycles	To be filled	To be filled	Bicycle wheels	Complex, fast	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
36	Ferris wheel	To be filled	To be filled	Luminance and colour details	Fast, complex	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
37	Shinjuku	To be filled	To be filled	Horizontal and vertical detail	Slow pan	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
38	Football	To be filled	To be filled	Sports	Rapid motion	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
39	Cheerleaders	To be filled	To be filled	Fast, complex	Zoom	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
40	Ciao!	To be filled	To be filled	CK, FG, luminance, colour details	Slow pan/zoom	Camera	o	o	To be filled	To be filled	D1 tape	To be filled
41	Ciao!	To be filled	To be filled	CK, BG, luminance, colour details	Slow pan/zoom	Camera	o	o	To be filled	To be filled	D1 tape	To be filled

TABLE 1 (*end*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Availability		Statistic	Copyright status	Delivery format	Provider name
							525	625				
42	Portrait de famille	To be filled	To be filled	Progressive utilization	Wipe	Camera/SE	o	–	To be filled	To be filled	D1 tape	To be filled
43	Diva	To be filled	To be filled	Cuts on titles/busy scene	Cuts	Camera/SE	o	–	To be filled	To be filled	D1 tape	To be filled
44	Tempête	To be filled	To be filled	H, V, luminance, colour details	Random motion	Camera	o	o	To be filled	To be filled	D1 tape	To be filled
45	Tempête with noise	To be filled	To be filled	H, V, luminance, colour details	Random motion	Camera	o	o	To be filled	To be filled	D1 tape	To be filled
46	TV trip	To be filled	To be filled	3D graph, H, V, luminance, colour details	Zoom/rotate	Graphics	o	–	To be filled	To be filled	D1 tape	To be filled
47	Cruising	To be filled	To be filled	Animated freeze frames	2-10 freezes	Camera	o	o	To be filled	To be filled	D1 tape	To be filled
48	Decoded NTSC	To be filled	To be filled	Cross luminance colour	Slow pan/zoom	Camera	o	–	To be filled	To be filled	D1 tape	To be filled
49	Decoded PAL	To be filled	To be filled	Cross luminance colour	Slow pan/zoom	Camera	–	o	To be filled	To be filled	D1 tape	To be filled
50	Un générique	To be filled	To be filled	Rolling and crawling titles	Crawl/roll	Camera/CG	o	o	To be filled	To be filled	D1 tape	To be filled
51	Error recovery	To be filled	To be filled	Frame and calibration	Slow	Camera/Key	o	o	To be filled	To be filled	D1 tape	To be filled
52	Text for 625 diva	To be filled	To be filled	Cuts on titles	Cuts	SE		o	To be filled	To be filled	D1 tape	To be filled
53	Basketball	Basketball match	Sport	Complex large area motion, high detail background	High	CCD camera recorded directly as YUV in D1 format	–	o	To be filled	Free	D1 tape	DoCA[1]

BBC: British Broadcasting Corporation
CG: Computer graphics.
SE: Special effects.
(1) Available from Director, Communications Laboratory, Department of Communications and the Arts, Australia. Tel.: +616 274 8412 Fax: +616 274 8440

TABLE 2

Test materials for conventional TV

Scene No.	Title	Contents	Represen-tative of	Attributes to be examined	Motion	Source	Availability		Statistic	Copyright status	Delivery format	Provider name
							525	625				
	Stills											
1	Formal pond	To be filled	To be filled	Luminance resolution	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
2	Boats with lighthouse	To be filled	To be filled	Luminance and colour resolution	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
3	Clown	Clown making up	To be filled	Horizontal resolution	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
4	Boy with toys	Boy playing with several coloured toys	Skin and colour edges	To be filled	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
5	Girl with toys	Girl playing with several coloured toys	Skin and colour edges	To be filled	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
6	Young couple	Man and woman with striped clothes	Fine detail	Luminance resolution	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
7	Toys and blackboards	To be filled	To be filled	Colour, vertical resolution	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
8	Tree	Luminance patterns	To be filled	To be filled	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
9	Male head	To be filled	To be filled	To be filled	Still	Slide			To be filled	To be filled	D1/MT	To be filled
10	Kiel Harbour	Detailed view of the Kiel Harbour	Fine resolution	Spatial resolution	Still	Slide	o	o	To be filled	To be filled	D1/MT	To be filled
11	Latin text	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	D1/MT	To be filled
12	Graph	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	D1/MT	To be filled

TABLE 2 (*end*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Availability		Statistic	Copyright status	Delivery format	Provider name
							525	625				
13	Test card	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	D1/MT	To be filled
14	Zone plate	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	To be filled	D1/MT	To be filled
	Stills – Chroma key											
15	Comb and pencil	To be filled	To be filled	To be filled	Still	To be filled			To be filled	To be filled	D1/MT	To be filled
16	Twigs and ribbon	To be filled	To be filled	To be filled	Still	To be filled			To be filled	To be filled	D1/MT	To be filled
17	Old master – foreground	To be filled	Chroma key FG	To be filled	Still	To be filled	–	o	To be filled	To be filled	D1/MT	To be filled
18	Old master – background	To be filled	Chroma key BG	To be filled	Still	To be filled	–	o	To be filled	To be filled	D1/MT	To be filled
19	Dummy with comb	To be filled	To be filled	To be filled	Still	To be filled			To be filled	To be filled	D1/MT	To be filled
	Moving sequences											
20	BBC disc 1	Rotating disc with several features attached on it. The axis of rotation is parallel to the viewing axis	Circular motion	To be filled	To be filled	To be filled	–	o	To be filled	To be filled	D1/MT	To be filled
21	BBC disc 2	Idem. Increased speed	Circular motion	To be filled	To be filled	To be filled			To be filled	To be filled	D1/MT	To be filled
22	BBC disc 3	Idem. Increased speed	Circular motion	To be filled	To be filled	To be filled			To be filled	To be filled	D1/MT	To be filled

TABLE 3

Test materials of still picture for high definition television (HDTV)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery format	Provider name
1	Woman	Bust shot of a woman with a red flower against uniform background	– Studio still portrait	– False contour, *Y*/*C* phase difference – Flesh tint and texture reproduction	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
2	Yacht harbour	Long shot of a yacht harbour with highly detailed yachts	– Outdoor still	– Waveform distortion – Aliasing – Sharpness	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
3	Sweaters and bag	Loose shot of sweaters, towels of various colours, a leather bag, metal pitcher, etc.	– Studio still – Textured objects	– Texture reproduction – Lustre	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
4	Eiffel tower	Long shot of Eiffel tower and landscape of Paris behind it	– Outdoor still	– Resolution – Sensation of reality	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
5	A hat shop	Scene of a stall and a couple talking beside it	– Drama	– Gray scale reproduction – Interlace artefacts	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
6	A couple in the snow	Loose shot, taken against the light, of a couple facing each other in the snow	– Scene taken against the light	– Gray scale reproduction – Uniformity – Large area flicker	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
7	Guide board	Full shot of a guide board written in various kinds of characters in different sizes	– Outdoor still	– Waveform distortion – Registration legibility	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
8	Tulip garden	Wide shot of a garden with red and yellow tulips in various sizes	– Highly saturated colours	– Chrominance/luminance resolution – Colour reproduction	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE
9	Chromakey	A woman sitting against blue back with detailed flowers	– Chromakey	– Chromakey process – False contour	Still	Slide	See Appendix 1 to Annex 2	See Annex 3	Slide/MT/ CD-ROM	ITE

ITE: The Institute of Image Information and Television Engineers, 3-5-8 Shibakoen, Minato-ku, Tokyo 105-0011, Japan, Phone: +81 3 3432 4677, Fax: +81 3 3432 4675, E-mail: ite@ite.or.jp.

NOTE 1 – Still pictures of 1 920 samples × 1 035 lines and 1 920 samples × 1 080 lines are available in MT and CD-ROM, respectively.

TABLE 4

Test materials for 1125/60 HDTV and 525/60 television

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery Format	Provider name
1	Cognac and fruit	Scene of cognac and fruit on the table	Texture	General picture quality	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
2	Flower basket	Picture of colourful flowers	Colour reproduction, texture	General picture quality	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
3	Woman with bird cage	Waist shot of a woman carrying a red bird cage	Aliaising error	General picture quality	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
4	Entrance hall	Loose shot of three women chatting indoors	Drama, gray scale	General picture quality	Fix	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
5	Boy and toys	Loose shot of a boy playing with toys	Motion adaptive processing	General picture quality	Tilt, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
6	Intersection	Scene of traffic at an intersection	Motion adaptive processing	General picture quality	Fix	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
7	European market	Loose shot of a market on a street	Colour reproduction, signal processing	General picture quality	Pan, slow, zoom	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
8	Walk through the square	Loose shot of a girl walking through a square	Resolution, signal processing	General picture quality	Fix	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
9	Calligraphy practice	Tight shot of a woman practicing calligraphy	Texture, distortion	General picture quality	Zoom, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
10	Streetcar	Scene of streetcar running on a street	Motion adaptive processing	General picture quality Standards conversion	Fix	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
11	Buildings along the canal	Scene of many buildings along a canal	Resolution, distortion	General picture quality	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE

TABLE 4 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery Format	Provider name
12	Harbour scene	Scene of a harbour with buildings and many people on a street	Resolution, signal processing	General picture quality	Pan, zoom	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
13	Church	Scene of a Gothic cathedral	Sharpness, distortion	General picture quality	Tilt	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
14	Yacht harbour	Scene of many yachts docking at harbour	Sharpness, distortion	General picture quality	Pan, slow	Camera	See Appendix to Annex 2	See Annex 3	DVTR	ITE
15	Yachting	Frame in and out shot of a yacht with a woman	Distortion, signal processing	General picture quality	Pan, zoom	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
16	Whale show	Scene of a whale jumping up in an aquarium	Signal processing	General picture quality	Pan	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
17	Rustling leaves	Scene of branches and leaves rustling by wind	Signal processing	General picture quality	Fix	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
18	Wintertime river	Scene of a boat on a calm river in winter season	Gray scale	General picture quality	Pan	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
19	Opening ceremony	Opening ceremony of an athletic meet	Resolution, signal processing	General picture quality	Fix	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
20	Soccer action	Loose shot of soccer game	Resolution, signal processing	General picture quality Standards conversion	Pan	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
21	Baseball	Loose shot of a night game of baseball	Motion reproduction	General picture quality	Pan	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
22	Marching in	Entrance march at an athletic meet	Resolution, signal processing	Performance of digital signal processing	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
23	Green leaves	Scene of a tree-lined road with green leaves	Resolution, signal processing	Performance of digital signal processing	Zoom, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE

TABLE 4 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery Format	Provider name
24	Swinging	Loose shot of women in swinging chair	Distortion, signal processing	Performance of digital signal processing	Zoom, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
25	Japanese room	Full shot of a woman walking in a Japanese-style room	Resolution, distortion	Distortion and aliasing	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
26	Japanese harp	Full shot of a woman playing the koto in front of a paper sliding door	Distortion, skin colour	Distortion and aliasing	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
27	Today's catch	Scene of a fishing boat and the unloading of fish	Distortion	Aliasing	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
28	Summertime tanning	Waist shot of a woman on a yacht	Texture, skin colour	Skin colour and texture	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
29	Knitting	Balls of yarn on a sofa and a woman knitting	Texture, colour reproduction	Colour production and texture	Pan, zoom, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
30	Crowded crosswalk	Scene of pedestrians on a crosswalk	Signal processing	Performance of motion-compensated processing	Slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
31	Flamingos	Loose shot of flamingos on the grass	Resolution	Resolution for moving area	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
32	Buddhist images	Stone Buddhist images covered with moss	Texture, signal processing	Performance of motion-compensated processing	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
33	Group game	A mass game at an athletic meet	Signal processing	Performance of motion-compensated processing and of digital signal processing	Pan, zoom	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
34	Ice hockey	Scene of a face-off at a hockey game	Resolution, signal processing	Performance of motion-compensated processing	Pan	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE

TABLE 4 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery Format	Provider name
35	Horse race	Horse racing at the start	Signal processing	Performance of motion-compensated processing	Pan, fast	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
36	Aeroplane landing	An aeroplane landing on a runway	Signal processing	Performance of motion-compensated processing	Pan, fast	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
37	Driving	A car moving along a tree-lined road	Signal processing	Performance of motion-compensated processing	Track	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
38	Skyscrapers	Scene of hazy buildings	Signal processing	Performance of motion-compensated processing	Pan, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
39	Weather report	Scene of a weather report with a CG picture in the background behind a reporter	Sharpness	Sharpness	Slow	Camera/CG	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
40	Flash photography	Taking pictures of a woman using flashes	Signal processing	Performance of digital signal processing	Slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
41	Racetrack with credits	Scene of a sports stadium with superimposition	Superimposition, signal processing	Performance of motion-compensated processing and of digital signal processing	Pan, slow	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
42	View from sky with credits	Aerial scene of a fiord with superimposition scrolling upwards	Superimposition, signal processing	Performance of motion-compensated processing	Slow	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
43	Bronze with credits	A bronze statue with superimposition moving horizontally	Superimposition, signal processing	Performance of motion-compensated processing	Pan, slow	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
44	Chromakey (fish bowl)	A scene of a woman and a fishbowl, for a chromakey test	Chromakey test	Performance of chroma key	Slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
45	Chromakey (flowers)	A scene of a woman arranging flowers and a lace curtain for a chromakey test	Chromakey test	Performance of chroma key	Slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE

TABLE 4 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery Format	Provider name
46	Chromakey (sprinkling)	A composed scene of a woman and sprinkling water	Composed scene	Performance of digital signal processing	Random	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
47	Chromakey (picture cuts)	A composed scene of a woman and short cut images	Composed scene	Performance of motion-compensated processing and of digital signal processing	Cuts	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
48	Overlap	Repeated superimpositions of gray patterns on general images	Overlap	Performance of motion-compensated processing	Overlaps	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
49	Character pattern	Scene of character patterns in various sizes	Character pattern	Legibility	Zoom, slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
50	Rotating disk (without shutter)	A rotating disk attached with still pictures (in the shutter speed of 1/60 s)	Shutter speed effect	Performance of motion-compensated processing	Rotating	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
51	Rotating disk (with 1/250 s shutter)	The same as the above (in the shutter speed of 1/250 s)	Shutter speed effect	Performance of motion-compensated processing	Rotating	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
52	Rotating disk (with 1/1000 s shutter)	The same as the above (in the shutter speed of 1/1000 s)	Shutter speed effect	Performance of motion-compensated processing	Rotating	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
53	Pendulum (without shutter)	A pendulum swinging in front of a still picture (in the shutter speed of 1/60 s)	Shutter speed effect	Performance of motion-compensated processing	Swinging	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
54	Pendulum (with 1/250 s shutter)	The same as the above (in the shutter speed of 1/250 s)	Shutter speed effect	Performance of motion-compensated processing	Swinging	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
55	Pendulum (with 1/1000 s shutter)	The same as the above (in the shutter speed of 1/1000 s)	Shutter speed effect	Performance of motion-compensated processing	Swinging	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
56	Woman in flowers	A waist shot of a woman in front of a garden of flowers	Noise, signal processing	Performance of digital signal processing	Slow	Camera	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE

TABLE 4 (*end*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery Format	Provider name
57	Woman in flowers with noise (S/N = 35 dB)	Adding noise of S/N = 35 dB to the above scene	Noise, signal processing	Performance of digital signal processing	With noise	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
58	Woman in flowers with noise (S/N = 30 dB)	The same as the above (S/N = 30 dB)	Noise, signal processing	Performance of digital signal processing	With noise	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
59	Woman in flowers with noise (S/N = 25 dB)	The same as the above (S/N = 25 dB)	Noise, signal processing	Performance of digital signal processing	With noise	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE
60	Woman in flowers with noise (S/N = 20 dB)	The same as the above (S/N = 20 dB)	Noise, signal processing	Performance of digital signal processing	With noise	Camera/SE	See Appendix 1 to Annex 2	See Annex 3	DVTR	ITE

CG: Computer graphics.

DVTR: Digital video tape recorder; 1-inch digital VTR for 1125/60, D1 for 525/60/2:1, 2 × D1 for 525/60/1:1.

ITE: The Institute of Image Information and Television Engineers, 3-5-8 Shibakoen, Minato-ku, Tokyo 105-0011, Japan, Phone: +81 3 3432 4677, Fax: +81 3 3432 4675, E-mail: ite@ite.or.jp.

SE: Special effects.

NOTE 1 – 1125/60/2:1 (Rec. ITU-R BT.709), 525/60/2:1 (Rec. ITU-R BT.601) and 525/60/1:1 (Rec. ITU-R BT.1358) are available. The sequences of 525/60/2:1 and 525/60/1:1 are those down-converted from the 1125/60/2:1 HDTV materials. Picture aspect ratio is 4:3 and 16:9 for 525/60/2:1, and 16:9 for 525/60/1:1.

TABLE 5

Test materials for 1250/50 HDTV

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery format	Provider name
1	English street	Natural street scene with mainly unsaturated colours; it includes zooming and motion	– Outdoor shooting – Documentary – Zoom	– Dynamic resolution – Block-switching – Artefacts	Zoom	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
2	Geranium (BBC)	Natural scene with erratic motion in saturated coloured area; it includes a scene cut	– Outdoor shooting – Nature documentary	– Chrominance block switching – Colour blindness	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
3	Arcade (RAI)	A background with complex texture foreground movement. Spectacular reflections on foreground rippled water	– Outdoor shooting – Panning	– Dynamic resolution – Block switching – Artefacts	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
4	Noël (BBC)	Close-up of talking head. Background is in soft focus. Slight camera motion	– Studio production – Talk shows – News, etc.	– Resolution at static motion boundary – Natural facial motion – Chrominance resolution	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
5	Singers (EU95)	Pan/zoom across detailed background with foreground singers. Foreground and background in focus	– Studio production – Culture programmes	– Portrayal of moving detail – Block switching – Artefacts – Natural facial motion	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU

TABLE 5 (*continued*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery format	Provider name
6	Winter Olympic (Thompson)	Pan across high coloured background to follow skier	– Outdoor shooting – Sports coverage	– Chrominance block switching – Colour blindness – Chrominance noise – Standards conversion	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
7	Olympic ceremony (Barcelona, 1250)	Wide angle and close-up shots of brightly dressed performers	– Outdoor shooting – Scene with large area of saturated colours	– Coherence luminance chrominance block decision – Chrominance noise	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
8	Tennis (BBC)	Wide angle shot of complex motion. Camera pan to track players	– Outdoor spectacle – Sports events – Logo insertion	– Block switching – Dynamic resolution – Standards conversion	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
9	Seats and grass (Barcelona, 1250)	Pan over empty stadium seating onto grass	– Outdoor sports – Field events	– Portrayal of moving fine detail – Behaviour for periodic structures – Luminance noise – Standards conversion	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
10	Kiel Harbour (FI-DBP)	Still of harbour scene with non-saturated colours and highly detailed yachts on calm water	– Outdoor stills	– Resolution of still pictures – Block switching – Noise	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU

TABLE 5 (*end*)

Scene No.	Title	Contents	Representative of	Attributes to be examined	Motion	Source	Statistic	Copyright status	Delivery format	Provider name
11	Tram (EU95)	Still of street scene. Fine text and periodic structures in buildings	– Outdoor stills	– Resolution of still pictures – Block switching – Artefacts	To be filled	To be filled	To be filled	To be filled	4 × D1 Exabyte	EBU
12	Mobile and calendar 2	Miniature train circulating in front of a coloured setting	To be filled	– Saturated colours – Zoom – Standards conversion	To be filled	To be filled	To be filled	To be filled	4 × D1	CCETT
13	Bicross	Mountain bike race	To be filled	– Foliage – Quick motion	To be filled	To be filled	To be filled	To be filled	4 × D1	CCETT
14	Saint Jacques	Plane landing	To be filled	– Quick motion	To be filled	To be filled	To be filled	To be filled	4 × D1	CCETT
15	Saint Malo	Sailing boats into harbour and buildings	To be filled	– Fine details – Irregular motions	To be filled	To be filled	To be filled	To be filled	4 × D1	CCETT
16	Table tennis 2	Play	To be filled	– Saturated colours – Irregular motions – Standards conversion	To be filled	To be filled	To be filled	To be filled	4 × D1	CCETT

CCETT: Centre commun d'études de télédiffusion et télécommunications (Joint Research Center for Broadcast and Telecommunications)
EBU: European Broadcasting Union
RAI: Radiotelevisione Italiana

ANNEX 2

Choice of statistics that can serve for characterization of materials

1 Introduction

Many test sequences for subjective assessment are described in Annex 1, and have been used in various evaluation tests. These sequences contain many different attributes as a whole, while each sequence provides a few attributes. It is important in actual evaluation tests to choose the sequences suitable for the test purposes. Statistics are useful in choosing proper sequences for the assessment purpose, as well as in analysing the quality degradation of the system to be evaluated.

In selecting the statistics described below, it is considered that there are increasing opportunities to conduct the evaluation tests of digital bit-rate reduction systems, the picture quality of which is generally sensitive to the picture contents, and therefore proper test materials must be used in the evaluation tests.

2 Statistics of test materials

2.1 Entropy of PCM data

This entrophy, E, represents the amount of information of a picture. It is defined by equation (1):

$$E = -\sum_{i=I_{min}}^{I_{max}} P(i) \times \log_2 P(i) \qquad \text{bit/pixel} \tag{1}$$

where:

I_{min}: The minimum level of the video signal

I_{max}: The maximum level of the video signal

$P(i)$: The probability occurrence for the video signal level i.

2.2 AC energy

This represents the degree of picture activity, such as fineness, and is defined to be the square sum of the DCT coefficients except for the DC coefficient, as shown below:

$$AC = \left[\frac{1}{N} \sum_{k=1}^{N} ac_k \right] \Big/ AC_{max} \tag{2}$$

where:

$$ac_k = \sum_{m=0}^{7} \sum_{n=0}^{7} C(m,n)^2 - C(0,0)^2$$

and $C(m, n)$ denotes the DCT coefficients and N the number of blocks in a field (or frame). AC_{max} is a normalizing factor and the theoretically maximum value of AC energy is taken here, which is obtained with such a picture that a half area within a block is black and the rest of the area within the block is white.

AC energy is calculated under several conditions, i.e. intra/inter-frame/field. Figure 1a) shows examples of the AC energy for intra-frame (frame DCT) and field DCT with motion-compensated frame difference (field DCT-MCFD).

2.3 Spectral entropy

This represents the degree of randomness of the DCT coefficients, and is useful to estimate the necessary bit rate of a DCT-based bit reduction system. It is defined by equation (3):

$$SE = \frac{1}{N}\sum_{k=1}^{N}(se_k)^2 \tag{3}$$

where:

$$se_k = -\sum_{m=0}^{7}\sum_{n=0}^{7}\frac{|C(m,n)|}{A}\log 2\left[\frac{C(m,n)}{A}\right]$$

$$A = \sum_{m=0}^{7}\sum_{n=0}^{7}|C(m,n)|$$

Spectral entropy is calculated under several conditions, i.e. intra/inter-frame/field. Fig. 1b) shows examples of the spectral entropy.

2.4 Motion vector

This represents a motion of an object by a two-dimensional parameter on a block-by-block basis. Block matching is one of the commonly used methods for motion estimation.

To express the degree of motion of the picture, two kinds of statistics are used, i.e. mean magnitude of the vectors averaged over a frame/field and standard deviation within the frame/field. They are calculated separately in horizontal and vertical directions as follows:

$$\mu_X = \frac{1}{N}\sum_{k=1}^{N}|X_k| \quad \text{and} \quad \mu_Y = \frac{1}{N}\sum_{k=1}^{N}|Y_k| \tag{4}$$

$$\sigma_X^2 = \left[\frac{1}{N}\sum_{k=1}^{N}X_k^2\right] - \mu_X^2 \quad \text{and} \quad \sigma_Y^2 = \left[\frac{1}{N}\sum_{k=1}^{N}Y_k^2\right] - \mu_Y^2 \tag{5}$$

where:

X_k and Y_k: horizontal and vertical components of the vector in a block

μ_X and μ_Y: mean magnitude of X_k and Y_k averaged over a field

σ_X and σ_Y: standard deviation of X_k and Y_k, respectively.

The mean magnitudes represent the degree of motions as a whole, while the standard deviations represent the degree of non-uniform motions.

Figures 1c) and 1d) show examples of the motion vector, calculated using block matching.

2.5 Motion-compensated prediction error power

The motion-compensated frame/field-difference signal, i.e. prediction error, is expressed by equation (6):

$$e_k(x, y) = f_0(x, y) - f_1(x - u_k, y - v_k) \tag{6}$$

where $e_k(*)$, $f_0(*)$ and $f_1(*)$ denote the motion-compensated frame/field-difference signal in the k-th block, the current frame/field signal, and the previous frame/field signal, respectively, while u_k and v_k the horizontal and vertical components of motion vector in the block.

The power of the prediction error, EP, is defined to be the mean square value of the difference signals as follows:

$$EP = \frac{1}{N}\sum_{k=1}^{N} ep_k \tag{7}$$

where:

$$ep_k = \frac{1}{X \times Y}\sum_{x=1}^{X}\sum_{y=1}^{Y} e(x, y)^2$$

X and Y denote horizontal and vertical sizes of a block.

This statistic value could be useful to estimate whether the sequence is critical for a bit reduction system using motion compensation.

Figure 1e) shows an example of the motion-compensated prediction error power.

2.6 Criticality by rate-buffer occupancy method

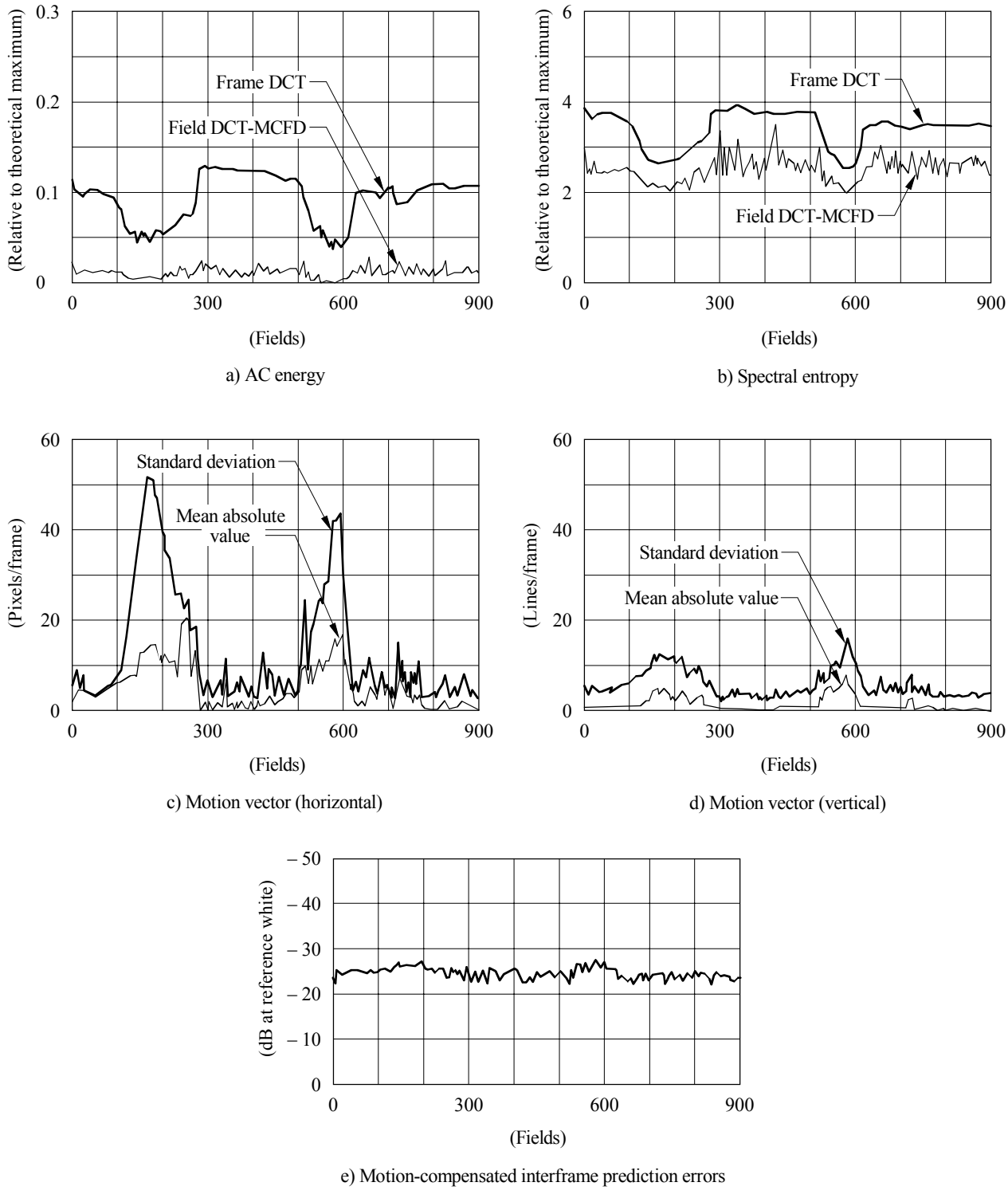
The Independent Television Commission of the United Kingdom and the EBU conducted a study on criticality under the RACE MOSAIC project. The MPEG-1 + coding algorithm with subjectively optimized quantizers was used to measure the criticality of broadcast programmes and test sequences. The criticality was calculated by means of a parallel processing computer using the rate-buffer occupancy, and was expressed in terms of bit/pixel. An example of criticality measurement is shown in Fig. 2.

2.7 Criticality by fixed quantizer method

This criticality is defined as “the number of output bits per pixel from MPEG-2 encoder with a fixed quantizer”. The quantizer characteristics are linear and comply with the MPEG-2 standard. The parameter value of “quantizer_scale” gives a quantizer step closely related to picture quality.

FIGURE 1

Example of statistics of motion sequences



1210-01

NOTE 1 – The results are shown only for the luminance signals of the scene No. 20 “Soccer action” in Table 4 of Annex 1. The ordinate of each chart indicates the statistic value, and the abscissa the field number, counting from the beginning of the sequence (900 fields correspond to 15 s). It can be seen that there are two large horizontal motions around the field numbers 200 and 600, which suppress fine detail components due to the integration effect of the camera, resulting in reduced AC energy and spectral entropy.

Examples of the criticality are shown in Fig. 3. The criticality was measured in each frame under the following condition: quantizer_scale = 12 (q_scale_code = 6 and q_scale_type = 0), field-based forward prediction and intra macroblock refreshment with a cycle of 0.5 s. Figure 3a) shows the fluctuation of the criticality over a 5 s interval. The criticality distribution of broadcast television programmes was measured on an NHK channel for one week, a total of 130 h, from 15 through 22 February 1995. In the measurement, composite NTSC signals were converted into component *Y*/*C* signals. The frequency of occurrence of the criticality for television programmes was calculated every 5×10^{-3} bit/pixel. The criticality distribution for different programme genres is shown in Fig. 3b). Sports programmes are relatively critical, while drama programmes are less critical. The statistical distribution of the criticality for overall television programmes is shown in Fig. 3c). This figure also shows the criticality for test sequences.

FIGURE 2

Criticality measurement result of rate-buffer occupancy method

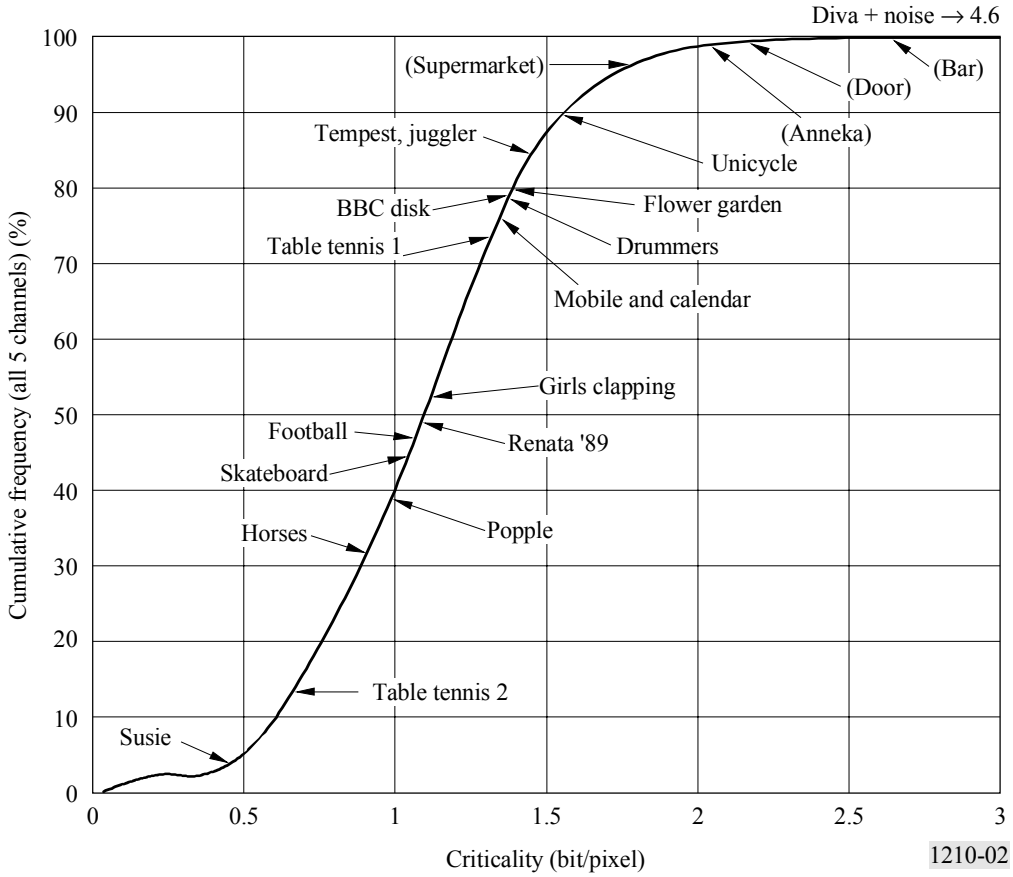
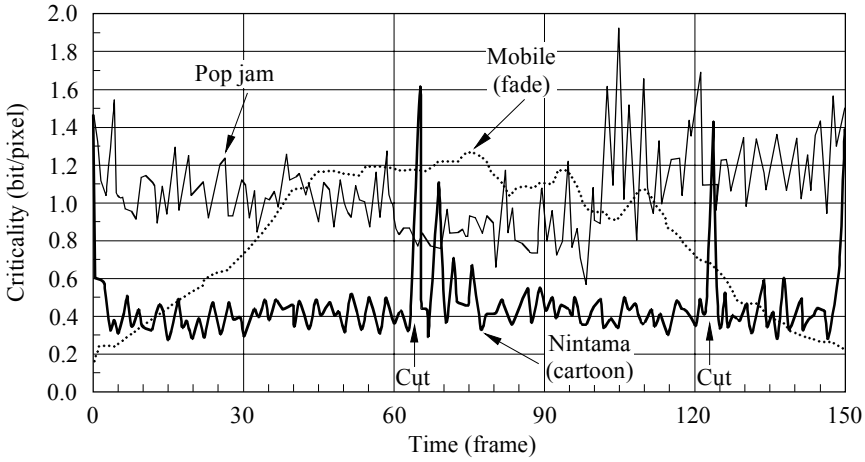
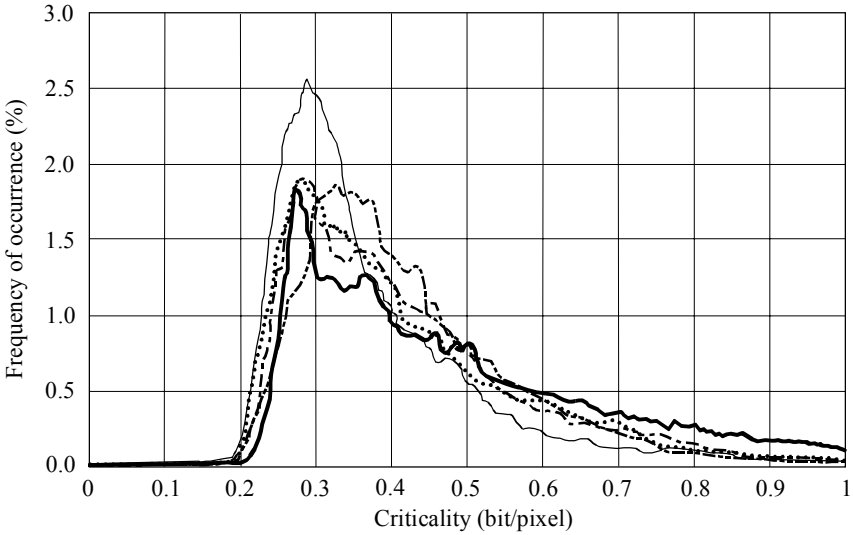


FIGURE 3

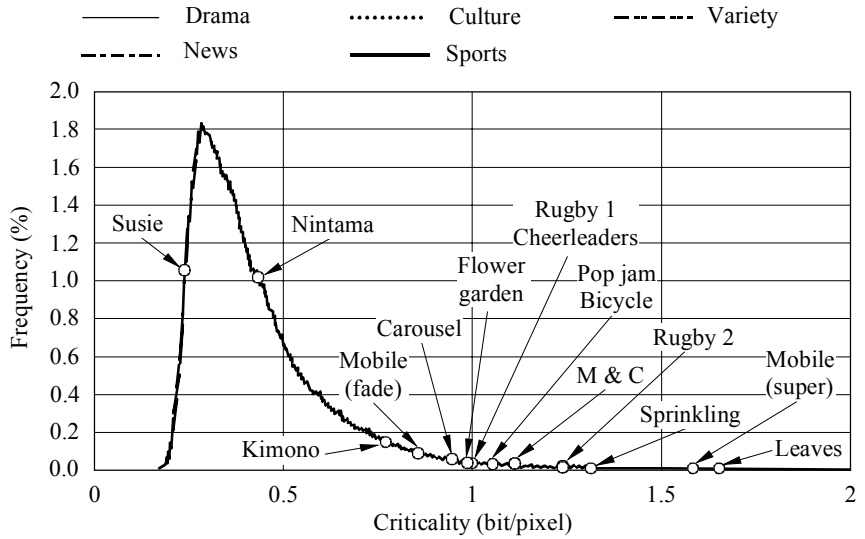
Criticality measurement results of fixed quantizer method



a) Fluctuation of criticality for 5 s interval



b) Criticality distribution for classified television programmes



c) Distribution of criticality for television programmes and criticality of test sequences

q_scale_code = 6

1210-03

APPENDIX 1

TO ANNEX 2

Statistics of the test materials

This Appendix reports some of the statistics of the test materials listed in Annex 1.

FIGURE 4

Entropy of PCM data of the scenes in Table 3

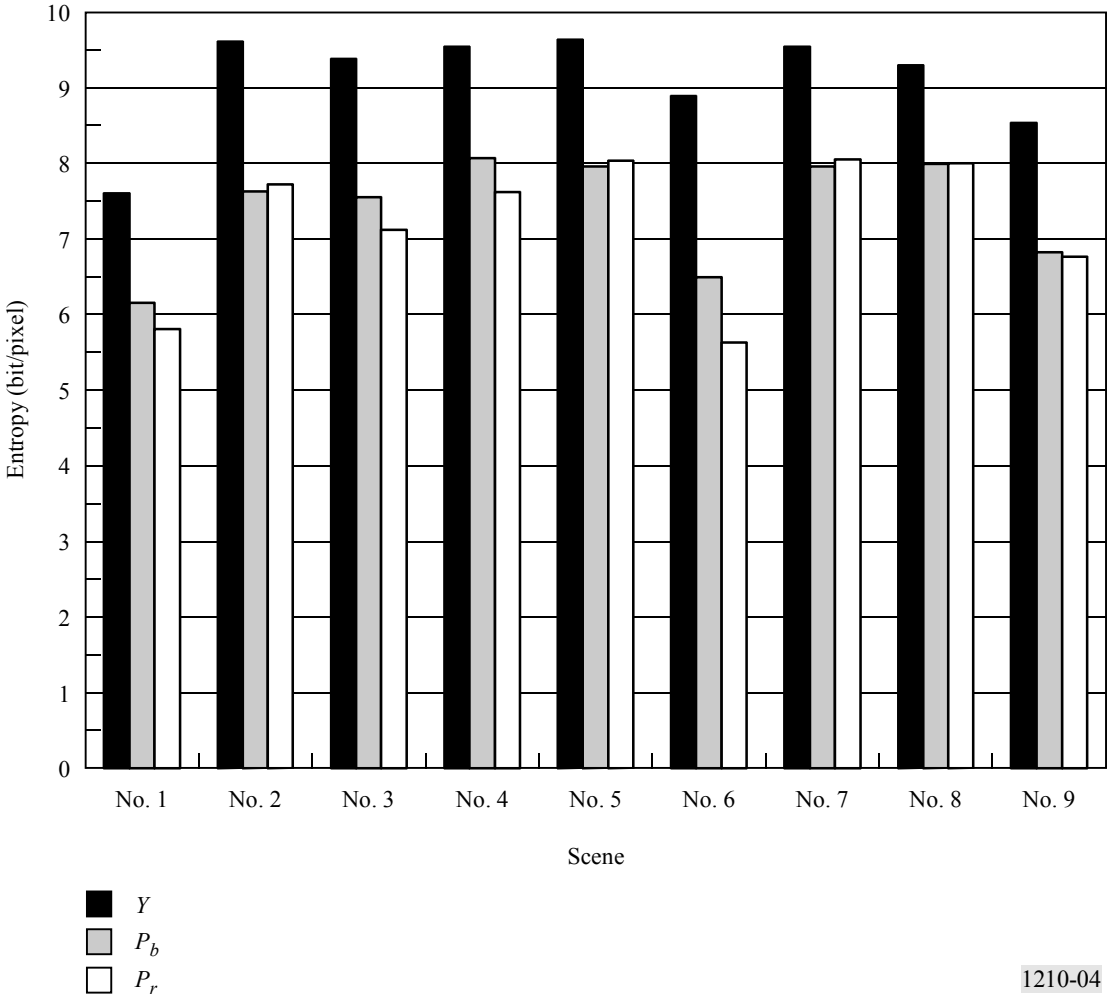
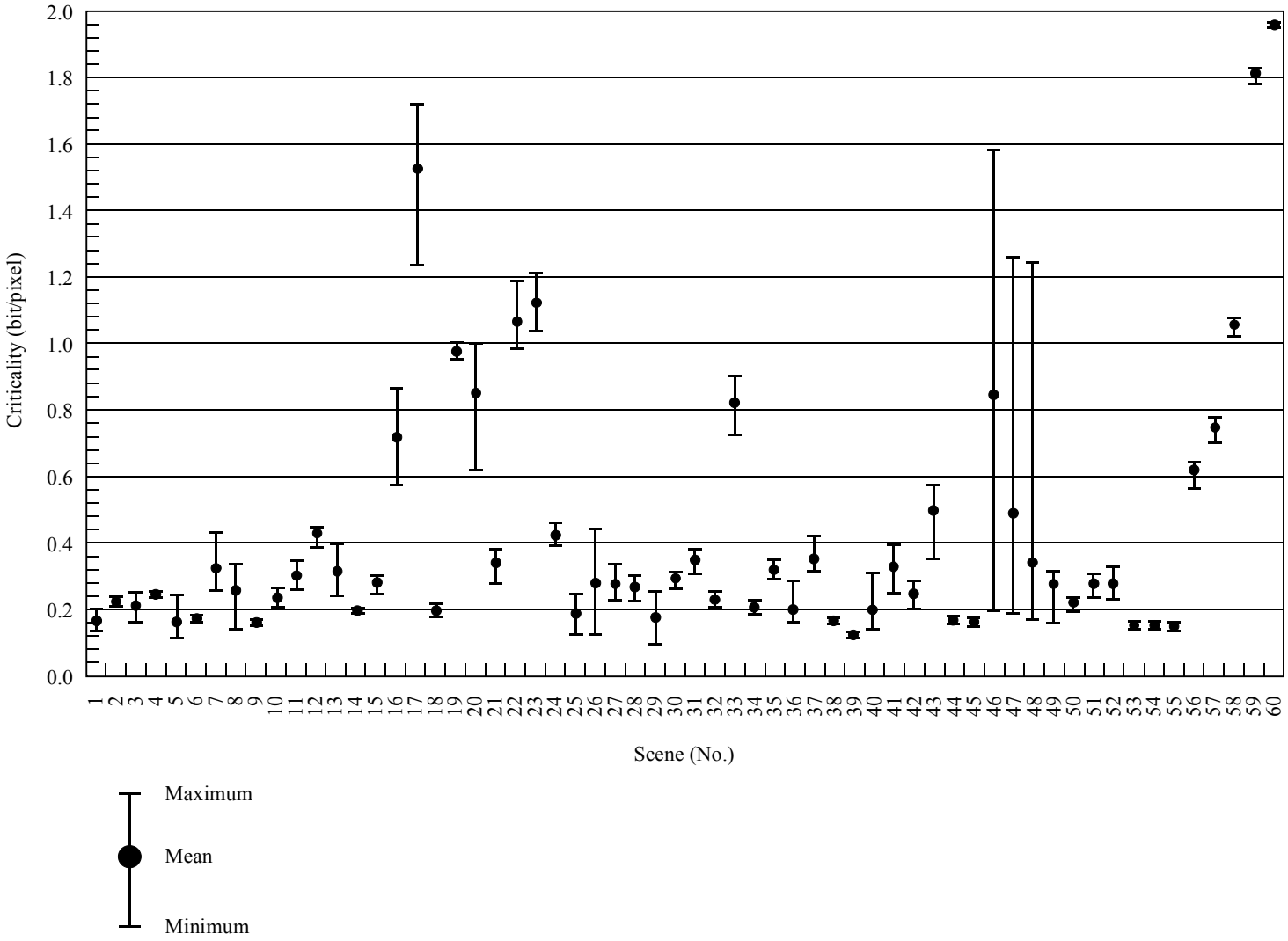


FIGURE 5

Criticality by the fixed quantizer method of the scenes in Table 4



Note 1 – Measurement condition: quantizer scale = 16 and intra-slice mode.

1210-05

ANNEX 3

Status for usage of the test materials (see Note 1)

Use of the test materials described in Tables 3 and 4 is restricted to the following purposes only.

a) Technical evaluation, including:
- research and development of equipment and systems;
- testing of equipment in development and production process;
- testing of transmission condition for broadcasting and telecommunication;
- maintenance of equipment.

b) Technical demonstration, including:
- presentation at technical conference and workshop;
- presentation of performance and functionality of equipment at exhibition.

Inclusion in commercial products and promotional demonstration of commercial products are not allowed.

NOTE 1 – Usage restrictions as proposed above can be considered as falling under the following category:

Commercial restricted

The test materials may be used for research projects, verification of equipment specifications and public demonstration of commercial products. Inclusion in commercial products is not allowed. Reproductions for distribution may only be made by the copyright holder or authorized distributor.