

## REPORT 1213

**TEST PICTURES AND SEQUENCES FOR SUBJECTIVE  
ASSESSMENTS OF DIGITAL CODECS**1. Introduction

(1990)

The evaluation of digital transmission equipment for video such as codecs, can best be performed on a subjective basis, due to the complex and adaptive natures of the multi-dimension impairments introduced by bit-rate reduction. CCIR Texts such as Recommendation 500, and Reports 1206 and 1211 provide information on the methods and objectives of this testing. The test pictures (both still and moving) and test sequences for the subjective evaluation of codecs is the subject of this Report, which describes also a recommended set available in digital form.

It is clear that the selection of appropriate test material is a key step in the planning of subjective assessment and that when results are to be correlated between a number of testing sites or groups that the same pictures be used and that they be available at the highest level of quality. The material detailed in this Report meets these criteria and offers the assessor material covering a wide range of criticality.

2. Distribution format

Two possible formats can be identified for this purpose, both based on digital recording techniques.

- i) The D1 - digital format specified in Recommendation 657. This format is based precisely on Recommendation 601, thus meeting the first user objective and is becoming widely available. In addition, the cassette format provides convenient handling, adequate playing time and ease of interchange.
- ii) The COST-211bis format on 1/2" computer tape (see ISO Document 1001). This format can be transparent to digital video signals in the Recommendation 601 format, but is limited in transfer speed. This format is useful for down-loading digital video into buffer stores or onto disk for real-time playback, but in this way is limited in uninterrupted play time. It has been found adequate for many laboratory purposes, and is widely used. The increasing use of the D1 format, coupled with the relatively slow transfer speed and bulky storage requirements limit future use of the COST-211 format in this application.

The use of analogue component formats for this purpose is not considered in this application, as only a digital format can deliver reliably and under controlled conditions the component digital video signal of Recommendation 601. At a future date optical or magnetic disks, using digital recording techniques might also be considered but are not today adequate in cost, performance, or flexibility for this purpose. Further studies are required.

From these considerations, the D1 format, defined in Recommendation 657, is the preferred one for the distribution of test pictures and sequences, offering high quality, transparent recording/reproduction and similar performance at both 525-line and 625-line standards.

### 3. Selection of scenes

In the preparation of subjective assessments, the assessor must have available a variety of scenes than can be considered critical but not unduly so, and which are representative in quality and production values with the best of television broadcasting. The level of difficulty may be checked by objective measurements, such as the determination of the worst-case differential entropy [CCIR 1986-90].

Subjective assessments may also consider a range of possible applications and situations making necessary the inclusion of scenes suitable for the evaluation of basic quality, processibility (chroma key, slow-motion, special effects, etc.), error performance and sound/vision synchronization. Tests for consistency of results as between the 525- and 625-line systems would require also that near-identical scenes for both systems be included.

A library of test scenes must then be based on the essential criteria following:

- images at a number of levels of difficulty and with different rates and modes of motion including stills;
- suitable for contribution and distribution uses;
- scene pairs suitable for colour matte evaluation are required;
- highest quality images with the lowest possible noise levels are needed, but noting the need for some scenes to have known amounts of noise added to evaluate certain facets of codec performance;
- covering a range of programme types;
- suitable for testing codec performance under normal conditions and in the presence of errors, both concealed and unconcealed.

A library of scenes meeting these criteria has been assembled in both the 525-line and the 625-line versions. The scene format is shown in Table I and the list of scenes and their content is shown in Table II. The scenes have been developed by a number of organizations engaged in codec development and evaluation and include the administrations of Canada, France, Federal Rep. of Germany, Italy, Japan and the United Kingdom.

#### 4. Scene arrangements

A number of methods for subjective tests are under consideration, each requiring a somewhat different arrangement of scene material. In addition, the need for a large selection of scenes and for their presentation in a random order for different presentations precludes the preparation of a tape suitable for direct use in sessions for subjective evaluation. A better arrangement is to produce a library tape of the scenes in a format that will allow the assembly of tapes for specific sessions with a minimum of inconvenience by editing between the playback of the library tape and the specific playback medium for that session. The quality loss in this process can be very small, if the interface between machines is in the digital form specified in Rec. 601, Rec. 656.

The scene lengths and their presentations can be arranged for a maximum of commonality with those of the session tape, while avoiding the need to shorten scenes for some presentations, thus reducing the coherence of evaluations using this material in different evaluations. Scenes selected are thought to be suitable for both contribution and distribution level codec evaluations by appropriate selection.

The library tape consists of a leader for technical evaluation, time-code for edit control, an index in video form and a number of scene blocks to be used for evaluations.

Scene identification is carried in a caption title located in the video and audio ahead of the actual scene. Scenes may thus be located visually or by reference to time-code based on addresses from the Index Page at the head of the tape.

#### 5. Ancillary information

Scene identification can be carried in time-code and in the longitudinal or digital audio areas of the D1-DTTR format. In the COST-211 bis format, this data can be included in the digital data of the header.

#### 6. Production

The library tape in both 525-line and 625-line versions has been produced in D1 format (see Recommendation 657). The Rev. 2 level of this tape is listed in Tables I and II.

#### 7. Distribution

Further study is required by IWP 11/7.

#### 8. Copyright

All segments of the library tape are in the public domain and may be used freely for evaluations and demonstrations.

#### REFERENCES

[1986-90]: IWP 11/7-261 (UKIBA).

**TABLE I****Scene arrangement**

Block Number	Duration (secs)	Time Code (start)	Video	Audio
1	60	00:54:15:00	Colour Bars - Full Level	Tone - 440 Hz (All Channels)
2	30	00:55:15:00	Flat Field 1	Tone (All Channels) 400 Hz
3	30	00:55:45:00	Flat Field 2	..
4	30	00:56:15:00	Ramp	..
5	20	00:56:45:00	Zone Plate - Y only - Still $C_B = C_R = 128$	..
6	20	00:57:05:00	Zone Plate - $C_B$ only - Still $Y=16, C_R = 128$	..
7	20	00:57:25:00	Zone Plate - $C_R$ only - Still $Y=16, C_B = 128$	..
8	20	00:57:45:00	Zone Plate - Y only - Moving $C_B = C_R = 128$	..
9	20	00:58:25:00	Zone Plate - $C_B$ only - Moving $Y=16, C_R = 128$	..
10	20	00:58:05:00	Zone Plate - $C_R$ only - Moving $Y=16, C_B = 128$	..
11	10	00:58:45:00	Title/Caption - CCIR Test tape Rev(x), YY/MM/DD	Voice announcement
12	10	00:58:55:00	Credits	Voice Over
13	40	00:59:05:00	Rolling Index	Silence
14(a)	10	00:59:45:00	Title - "Formal Pond"	"Formal Pond" (Ch.1)
14(b)	05	00:59:55:00	Grey ( $Y=64, C_B = C_R = 128$ )	Silence
14(c)	30	01:00:00:00	Test Scene 1 - Formal Pond	Tone Seq.(Ch.1)
14(d)	15	01:00:30:00	Grey	Silence
15(a)	10	01:00:45:00	Title-"Boats"	"Boats" (Ch.1)
			ETC.	ETC.
NN	60		Color Bars - End of Video	Tone (All Channels) 400 Hz

TABLE II

## CONTENT OF LIBRARY TAPE

SCENE NO	TITLE	CHARACTERISTIC	MOTION	SOURCE	525	625
1	Formal Pond	Luminance resolution	Still	Slide	o	o
2	Boats	Luminance & color resolution	Still	Slide	o	o
3	Clown	Horizontal resolution	Still	Slide	o	o
4	Boy with Toys	Skin & color edges	Still	Slide	o	o
5	Girl with Toys	Skin & color edges	Still	Slide	o	o
6	Young couple	Luminance & fine detail	Still	Slide	o	o
7	Blackboard	Color, vertical resolution	Still	Slide	o	o
8	Tree	Luminance patterns	Still	Slide	o	o
9	Old Master	Chroma key FG	Still	Video	- - -	o
10	Old Master	Chroma key BG	Still	Video	-	o
11	Still life	Chroma key FG	Still	Video	o	o
12	Still life	Chroma key BG	Still	Video	o	o
13	Kiel Harbour-1	High resolution	Still	8x10 slide	o	o
14	Sailboat	Luminance resolution	Slow	Video	o	o
15	Flower Garden	Color details	Slow pan	Video	o	o
16	Susie	Skin tones	Slow	Video	o	o
17	Diva with noise	Rapid entropy changes	Prod. wipe	Video	o	o
18	Dinner Party	Chroma key BG		Video	o	o
19	Boy with toys	Skin & color edges	Pan [H, V]	Slide	-	o
20	Old Master	Chroma key FG	Slow pan	Video	-	o
21	Old Master	Chroma key BG	Slow pan	Video	-	o
22	Clown	Lum. & color horiz. resolution	Pan [H, V]	Slide	-	o
23	BBC disc	Random movement	Circular	Video	-	o
24	Kiel Harbour-2	Cycle motion [narrow filter]	Rapid rocking	Component	o	o
25	Kiel Harbour-3	Cycle motion [wide filter]	Rapid rocking	Component	o	o
26	Kiel Harbour-4	High res. in H,V,T dimensions	Slow pan/zoom	Component	o	o
27	Balls of wool	Moving colors	Medium	Video	o	o
28	Popple	Moving colors	Pan/rotate	Video	o	o
29	Table tennis	Multiple rapid motions	Pan/zoom/cut	Video	o	o
30	Mobile & calendar	Random motion of objects	Slow	Video	o	o
31	Autumn leaves	Color details	Slow pan/zoom	Camera	o	-
32	Summer flowers	Saturated colors, texture	Slow pan	Camera	o	-
33	Birches	Luminance details, sky	Slow tilt up	Camera	o	-
34	Horse riding	Landscape	Zoom	Camera	o	-
35	Bicycles	Bicycle wheels	Complex, fast	Camera	o	-
36	Ferris wheel	Luminance & color details	Fast, complex	Camera	o	-
37	Shinjuku	Horizontal & vertical detail	Slow pan	Camera	o	-
38	Football	Sports	Rapid motion	Camera	o	-
39	Cheerleaders	Fast, complex	Zoom	Camera	o	-

TABLE II/Continued)

## CONTENT OF LIBRARY TAPE

SCENE NO	TITLE	CHARACTERISTIC	MOTION	SOURCE	525	625
40	Ciao!	CK FG, Lum, color details	Slow pan/zm	Camera	•	•
41	Ciao!	CK BG, Lum, color details	Slow pan/zm	Camera	•	•
42	Portrait de famille	Progressive tilisation	Wipe	Camera/SE	•	•
43	Diva	Cuts on titles/busy scene	Cuts	Camera/SE	•	•
44	Tempête	H,V Lum, color details	Rand. motion	Camera	•	•
45	Tempête with noise	H,V Lum, color details	Rand. motion	Camera	•	•
46	TV trip	3D graph. HV lum/col detail	zoom/rotate	Graphics	•	•
47	Cruising	Animated freeze frames	2-10 freezes	Camera	•	•
48	Decoded NTSC	Cross luminance color	Slow pan/zm	Camera	•	•
49	Decoded PAL	Cross luminance color	Slow pan/zm	Camera	•	•
50	Un générique	Rolling & crawling titles	Crawl/roll	Cam/CG	•	•
51	Error Recovery	Frame & calibration	Slow	Cam/Key	•	•
52	Text for 625 Diva	Cuts on titles	Cuts	SE		•