

## RECOMMENDATION ITU-R BR.1515

**International exchange of digital electronic  
news gathering recordings**

(Questions ITU-R 108/11 and ITU-R 239/11)

(2001)

The ITU Radiocommunication Assembly,

*considering*

- a) that digital electronic news gathering (ENG) is widely used in broadcasting in several parts of the world;
- b) that videotape recording is a fundamental element in ENG operation;
- c) that many countries retain large analogue archives of valuable, irreplaceable programmes, based on the signal formats in Recommendation ITU-R BR.715;
- d) that there are several types of equipment available for digital ENG recording today, that differ in the recording medium, in the recording format, or in the compression schemes used for signal processing;
- e) that it would be beneficial to broadcasters in their digital ENG recording operation if analogue ENG recordings and digital ENG recordings coexist in an edit environment and possibly if the compatibility of equipment in edit operations is provided;
- f) that the digital broadcasting service for high-definition television (HDTV) programmes is gaining its momentum. There are several services in operation;
- g) that digital ENG recording in HDTV quality is expected to be widely used in the coming HDTV broadcasting age;
- h) that bit-rate compression techniques based on discrete cosinus transform (DCT) and variable-length code (VLC) coding can provide highly efficient methods of recording HDTV programmes, whose source data rate exceeds 1 Gbit/s;
- j) that the operational and handling characteristics of digital HDTV video tape recorders (VTRs) have improved to the point that VTRs can be used not only in studios but also in the field, with a level of convenience similar to that of conventional VTRs;
- k) that HDTV cameras using two-million pixel charge coupled device (CCD) imaging devices and digital signal processing with advanced very large scale integration (VLSI) chip(s) can provide high quality HDTV pictures while offering the operating features and small size of conventional standard definition TV (SDTV) cameras,

*recommends*

**1** that since digital ENG recordings are based on either SDTV or HDTV, an aggregated SDTV and HDTV playback equipment, which can function with both types of recording and/or can facilitate up and/or down converted outputs, should preferably be used. It should also be preferable for the equipment to accept analogue and digital recordings;

**2** that, in order to facilitate the use by receiving organizations of programmes originated from digital ENG recordings and relayed over transmission facilities, every effort should be made to minimize the loss of quality in each stage of the broadcast chain;

**3** that analogue ENG tape recordings should preferably be transferred to a digital recording format for post-processing and archives;

**4** that the  $1\,080 \times 1\,920$  common image format specified in Recommendation ITU-R BT.709, Part 2 shall be preferred for image capture in digital HDTV ENG recordings, while the legacy image formats specified in Recommendation ITU-R BT.709, Part 1 will retain their value as an archive format of HDTV material.

NOTE 1 – Analogue ENG tape recordings can be processed to a higher number of generations without significant deterioration in picture quality, if they are first copied on full-broadcast quality digital VTR machines.

NOTE 2 – The Tables in Annex 1 indicate specifications of the available recording devices for digital ENG programmes for SDTV and HDTV scanning systems.

## ANNEX 1

### (Informative)

Tables 1-6 specify major features and specifications of the commercially available tape based storage devices for SDTV and HDTV acquisition camcorders:

Table 1 – Tape recorder for SDTV 525/59.94 and HDTV 1125/60, (59.94) – *Overview*

Table 2 – HDTV digital VTR for 1125/60, (59.94) – *Details*

Table 3 – SDTV digital VTR for 525/59.94 – *Details*

Table 4 – Digital VTRs for SDTV 625/50 and HDTV 1125/50 – *Overview*

Table 5 – HDTV digital VTR for 1125/50 – *Details*

Table 6 – SDTV digital DVR for 625/50 – *Details*

TABLE 1

**Tape recorder for SDTV 525/59.94 and HDTV 1125/60 (59.94) – Overview**

HDTV/SDTV		HDTV			SDTV						
Format		A	B	C	A	B	C	D	E	F	G
Commercial name <sup>(1)</sup>		HDCAM <sup>(2)</sup>	DVCPRO HD	D-9 HD	Digital BETACAM	DVCPRO	DVCAM	BETACAM SX	DVCPRO 50	Digital-S	MPEG IMX
Recording/playback time (maximum)		40/124 min	46 min	62 min	40/124 min	66/184 min	40/184 min	62/194 min	33/92 min	124 min	60/184 min
Video specification	Luminance (MHz)	23	20		5.75			4.5	5.75		5.75
	Chrominance (MHz)	7	10		2.75	1.5		2.0	2.75		2.75
	Number of lines	1080 (1035) <sup>(1)</sup>	1080		512	480 (+1) <sup>(3)</sup>	480	512	480 (+7.5) <sup>(3)</sup>	482	512
Audio specification	Digital or analogue	PCM			PCM						
	Number of channels	4	8	4/8	4	2	2/4	4			4/8
	Sampling frequency	48 kHz 20 bits	48 kHz 16 bits	48 kHz 20/16 bits	48 kHz 20 bits	48 kHz 16 bits	48/32 kHz 16/12 bits	48 kHz 16 bits			48 kHz 24/16 bits
Ancillary data											
Media	Size	S: 156 × 96 L: 254 × 145	L: 125 × 78	L: 188 × 104	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78	Standard: 125 × 78 Mini: 66 × 48	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78		S: 156 × 96 L: 254 × 145
	Substance	Metal particle			Metal particle						
Application example		Camcorder			Camcorder						
Notes		1/2 inch Intra field/ frame DCT (1/7) Field editable	6.35 mm Intra frame DCT (1/6.6)	1/2 inch Intra frame DCT (1/10)	1/2 inch Intra field DCT (1/2)	6.35 mm Intra frame DCT (1/5)		1/2 inch Intra frame DCT (1/10) Frame editable	6.35 mm Intra frame DCT (1/3.3)	12.65 mm Intra frame DCT (1/3.3)	1/2 inch Intra frame DCT (1/3.3) Field editable

PCM: pulse code modulation. S: small, M: medium, L: large.

<sup>(1)</sup> Each format as commercially known is listed here.

<sup>(2)</sup> The HDCAM product family provides some product models that can replay all analogue and digital recordings that are made within the Betacam family.

<sup>(3)</sup> Option.

TABLE 2

HDTV digital VTR for 1125/60 (59.94) – *Details*

Format		A	B	C
Commercial name <sup>(1)</sup>		HDCAM	DVCPRO HD	D-9 HD
Sampling frequency	Video (MHz)	74.25		
	Audio (kHz)	48		
Quantization	Video (bits)	8		
	Audio (bits)	20	16	20/16
Number of audio channels		4	8	4 (20 bits) 8 (16 bits)
Compression (video)		Intra field/ frame DCT 1/7 <sup>(2)</sup>	Intra frame DCT (1/6.6)	Intra frame DCT (1/10)
Channel coding		S-NRZI	24-25 I-NRZI	
Total rate (Mbit/s)		185	167	198
Video rate (Mbit/s)		140	100	
Number of recording RF channels		4 (camcorder)/2 (studio)		4
ECC	Inner	231, 219	85, 77	
	Outer	250, 226	149, 138	
Drum diameter (mm)		81.4	21.7	62
Drum rotation (rps)		45 (camcorder) /90 (studio)	149.85 (camcorder) /299.70 (studio)	75
Number of tracks		6/field	40/frame	20/frame
Tape speed (mm/s)		96.8	135.28	115.474
Track pitch (µm)		21.7	18	20
Min. wavelength (µm)		0.49		0.587
Width of tape (mm)		12.65	6.35	12.65
Media substance		Metal particle		
Hc (kA/m)		132	184	
Cassette size (mm)		S: 156 × 96 L: 254 × 145	L: 125 × 78	L: 188 × 104
Recording time (min)		40/124	46	62

EEC: Error correction code

(1) Each format as commercially known is listed here.

(2) 5/8 horizontal prefiltering and 1/4.4 DCT.

TABLE 3

## SDTV Digital VTR for 525/59.94 – Details

Format	A	B	C	D	E	F	G
Commercial name <sup>(1)</sup>	Digital BETACAM	DVCPRO	DVCAM	BETACAM SX	DVCPRO 50	Digital-S	MPEG IMX
Sampling frequency	Video (MHz)	13.5					
	Audio (kHz)	48		48/32	48		
Quantization	Video (bits)	10	8				
	Audio (bits)	20	16	16/12	16		24/16
Number of audio channels	4	2	2/4	4			4/8
Compression (video)	Intra field DCT (1/2)	Intra frame DCT (1/5)		Inter frame DCT (1/10)	Intra frame DCT (1/3.3)	DCT (1/3.3)	Intra frame DCT (1/3.3)
Channel coding	S-NRZI	24-25 I-NRZI		S-NRZI	24-25 I-NRZI		S-NRZI
Total rate (Mbit/s)	128	42		44	84	99	97
Video rate (Mbit/s)	90	25		18	50		
Number of recording RF channels	4 (camcorder) /2 (studio)	1		4 (camcorder) /2 (studio)	2		8 (camcorder) /2 (studio)
ECC	Inner	178, 164	85, 77		124, 112	85, 77	
	Outer	106, 96	149, 138		64, 50	149, 138	
Drum diameter (mm)	81.8 (camcorder) 81.4 (studio)	21.7		49.6 (camcorder) 81.4 (studio)	21.7		54.0 (camcorder) 81.4 (studio)
Drum rotation (rps)	44.96 (camcorder) 89.91 (studio)	149.85		37.46 (camcorder) 74.93 (studio)	149.85	75	29.97 (camcorder) 59.94 (studio)
Number of tracks	6/field	10/frame		10/2 frame	20/frame	10/frame	8/frame
Tape speed (mm/s)	96.7	33.820	28.193	59.5	67.640	57.737	64.5
Track pitch (μm)	21.7	18	15	32	18	20	21.7
Min. wavelength (μm)	0.69	0.49		0.74	0.49	0.587	0.56
Width of tape (mm)	12.65	6.35		12.65	6.35	12.65	
Media substance	Metal particle		Metal evaporated	Metal particle			
Hc (kA/m)	125	184	120		184	143	120
Cassette size (mm)	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78	S: 156 × 96 L: 254 × 145		M: 97.5 × 64.5 L: 125 × 78	L: 188 × 104	S: 156 × 96 L: 254 × 145
Recording time (min)	40/124	66/184	64/194		33/92	124	60/184

<sup>(1)</sup> Each format as commercially known is listed here.

TABLE 4  
**Digital VTRs for SDTV 625/50 and HDTV 1125/50 – Overview**

HDTV/SDTV		HDTV		SDTV						
Format		A	B	A	B	C	D	E	F	G
Commercial name <sup>(1)</sup>		HDCAM <sup>(1)</sup>	DVCPRO HD	Digital BETACAM	DVCPRO	DVCAM	BETACAM SX	DVCPRO 50	Digital-S	MPEG IMX
Recording/playback time (maximum)		124 min	46 min	40/124 min	66/184 min	40/184 min	64/194 min	33/92 min	124 min	72/224 min
Video specification	Luminance (MHz)	23		5.75			5.5	5.75		5.75
	Chrominance (MHz)	7	11	2.75	1.5	2		2.75		2.75
	Number of lines	1080		608	576 (+1) <sup>(2)</sup>	576	608	576 (+9) <sup>(2)</sup>	578	608
Audio specification	Digital or analogue	PCM		PCM						
	Number of channels	4	8	4	2	2/4	4		8/4	
	Sampling frequency	48 kHz 20 bits	48 kHz 16 bits	48 kHz 20 bits	48 kHz 16 bits	48/32 kHz 16/12 bits	48 kHz 16 bits		48 kHz 16/24 bits	
Ancillary data										
Media	Size	L: 254 × 145	L: 125 × 78	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78	Standard: 125 × 78 Mini: 66 × 48	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78	L: 188 × 104	S: 156 × 96 L: 254 × 145
	Substance	Metal particle		Metal particle		Metal evaporate	Metal particle			
Application example		Camcorder		Camcorder						
Notes		1/2 inch Intra field/frame Field editable DTC (1/7)	6.35 mm Intra frame DCT (1/6.6)	1/2 inch Intra field DCT (1/2)	6.35 mm Intra frame DCT (1/5)		1/2 inch Inter frame DCT (1/10) Frame editable	6.35 mm Intra frame DCT (1/3.3)	12.65 mm Intra frame DCT (1/3.3)	1/2 inch Intra frame DCT (1/3.3) Field editable

(1) Each format as commercially known is listed here.

(2) Option.

TABLE 5  
HDTV digital VTR for 1125/50 – Details

Format		A	B
Conventional name <sup>(1)</sup>		HDCAM	DVCPRO HD
Sampling frequency	Video (MHz)	74.25	
	Audio (kHz)	48	
Quantization	Video (bits)	8	
	Audio (bits)	20	16
Number of audio channels		4	8
Compression (video)		Intra field/frame DCT 1/7 <sup>(2)</sup>	Intra frame DCT (1/6.6)
Channel coding		S-NRZI	24-25 I-NRZI
Total rate (Mbit/s)		154	167
Video rate (Mbit/s)		117	100
Number of recording RF channels		4 (camcorder)/2 (studio)	
ECC	Inner	231, 219	85, 77
	Outer	250, 226	149, 138
Drum diameter (mm)		81.4	21.7
Drum rotation (rps)		37.5/75	150 (camcorder) /300 (studio)
Number of tracks		6/field	48/frame
Tape speed (mm/s)		80.7	135.415
Track pitch (μm)		21.7	18
Minimum wavelength (μm)		0.49	
Width of tape (mm)		12.65	6.35
Media substance		Metal particle	
Hc (kA/m)		132	184
Cassette size (mm)		M: 156 × 96 L: 254 × 145	L: 125 × 78
Recording time (min)		48/149	46

(1) Each format as commercially known is listed here.

(2) 5/8 horizontal prefiltering and 1/4.4 DCT.

TABLE 6  
SDTV digital VTR for 625/50 – Details

Format	A	B	C	D	E	F	G
Commercial name <sup>(1)</sup>	Digital BETACAM	DVCPRO	DVCAM	BETACAM SX	DVCPRO 50	Digital-S	MPEG IMX
Sampling frequency	Video (MHz)	13.5					
	Audio (kHz)	48		48/32	48		
Quantization	Video (bits)	10	8				
	Audio (bits)	20	16	16/12	16		24/16
Number of audio channels	4	2	2/4	4			4/8
Compression (video)	Intra field DCT (1/2)	Intra frame DCT (1/5)		Inter frame DCT (1/10)	Intra frame DCT (1/3.3)	DCT (1/3.3)	Intra frame DCT (1/3.3)
Channel coding	S-NRZI	24-25 I-NRZI		S-NRZI	24-25 I-NRZI		S-NRZI
Total rate (Mbit/s)	126	42		44	84	99	88
Video rate (Mbit/s)	89	25		18	50		
Number of recording RF channels	4 (camcorder) /2 (studio)	1		4 (camcorder) /1 (studio)	2		8 (camcorder) /2 (studio)
ECC	Inner	178, 164	85, 77		124, 112	85, 77	
	Outer	126, 114	149, 138		64, 50	149, 138	
Drum diameter (mm)	81.7 (camcorder) /81.4 (studio)	21.7		49.6 (camcorder) /81.4 (studio)	21.7	62	54.0 (camcorder) /81.4 (studio)
Drum rotation (rps)	37.5 (camcorder) /75 (studio)	150		37.5 (camcorder) /75 (studio)	150	75	25 (camcorder) /50 (studio)
Number of tracks	6/field	12/frame		12/2 frame	24/frame	12/frame	8/frame
Tape speed (mm/s)	96.7	33.854	28.221	59.6	67.708	57.795	53.8
Track pitch (µm)	26	18	15	32	18	20	21.7
Minimum wavelength (µm)	0.59	0.49		0.74	0.49	0.587	0.56
Width of tape (mm)	12.65	6.35		12.65	6.35	12.65	
Media substance	Metal particle		Metal evaporated	Metal particle			
Hc (kA/m)	125	184	120		184	143	120
Cassette size (mm)	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78	Standard: 125 × 78 Mini: 66 × 48	S: 156 × 96 L: 254 × 145	M: 97.5 × 64.5 L: 125 × 78	L: 188 × 104	S: 156 × 96 L: 254 × 145
Recording time (min)	40/124	66/184	40/184	64/194	33/92	124	72/224

(1) Each format as commercially known is listed here.