RECOMMENDATION ITU-R BR.469-7*, **

Analogue composite television tape recording

Standards for the international exchange of television programmes on magnetic tape***

(Question 239/11)

(1970-1974-1978-1982-1986-1990-1992-2002)

The ITU Radiocommunication Assembly,

recommends

that magnetic recordings of analogue composite signals used for the international exchange of television programmes should meet the following standards:

1 Television standards

Recording on magnetic tape of television programmes for international exchange should be carried out in accordance with one of the following classes of television systems:

– 625-lines, 50 fields/s;

– 525-lines, 60 fields/s.

NOTE 1 – The characteristics of the television systems are given in Recommendation ITU-R BT.470.

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* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44.

** This Recommendation should be brought to the attention of the International Electrotechnical Commission (IEC).

*** International programme exchange is defined as the transmission of television or sound programme material (or components thereof) among professional parties in different countries. It should be based on internationally agreed and widely employed technical standards or operating practices, except by prior bilateral agreement among the parties involved.

2 Recording format

2.1 Analogue recording of composite video signals

The recordings should conform with the following format:

– 25.4 mm helical recording Type C: IEC Publication 558 (1982 and Amendment No. 1 (1987)).

NOTE 1 – Tighter mechanical tolerances for the audio tracks have been agreed between the EBU and SMPTE (see EBU Recommendation N6-1989).

NOTE 2 – In the EBU, for 625-line 50 field/s recordings, no essential components of an exchange programme tape shall be recorded in the area between audio track 3 and the control track, unless prior agreement has been obtained.

NOTE 3 – Guidelines for the storage of magnetic tapes are contained in EBU Tech. 3202.

Prior agreement is necessary between the concerned parties regarding this format when it is used for programme exchange.

3 Specifications for programme sound recording

3.1 General

The sound reference level shall correspond to a recorded short circuit flux of 100 ± 5 nWb/m of track width (r.m.s.) (Federal Republic of Germany: 90 ± 5 nWb/m), at 1 000 Hz. (In some countries, a 400 Hz reference tone is used.) Normal operational practice will result in programme peaks corresponding to a maximum short circuit flux between 250 and 310 nWb/m (r.m.s.), i.e. about 9 dB above reference level. These maximum recorded levels correspond to the subjective overload level for television tape materials currently used for the international exchange of programmes.

NOTE 1 – When the programme peaks are measured by means of a programme meter, due account should be taken of the integration time of the instrument.

3.2 Recording characteristic

– Type C recording

The recording characteristic is defined in the relevant IEC Publication.

3.3 Programme sound allocation

– Type C recording

Table 1 presents in tabular form the preferred allocation of tracks to audio channels for the case when two synchronous sound channels accompany a picture.

NOTE 1 – More detailed information (including other tape formats) is contained in EBU Recommendation R38-1987.

NOTE 2 – Although many broadcasting organizations use companding for internal purposes (details of the techniques used by EBU members are given in EBU Recommendation R39-1986), the use of audio companding on recordings intended for international exchange is not recommended.

TABLE 1

Operation mode	Channel	Format
		C[1], [2]
Exchange of finished monophonic programmes	Monophonic programme mix	Track 1
	International sound (if any)	Track 2
Exchange of finished stereophonic television programmes	Stereo left	Track 1
	Stereo right	Track 2
Exchange of original news recording	Commentary (if any)	Track 1
	International sound	Track 2

(1) Track 1 is the inner track in format C.

(2) Audio track 3 in format C is allocated to the time code and may not carry an audio channel except by mutual agreement. Audio track 4 is optional and, in the case of an exchange of stereo recordings, it may be used by the sending organization, by mutual agreement, to record the monophonic mix; in the case of an exchange of monophonic programmes, it may be used by the receiving organization to record its own dubbed sound.

4 Editing

– Electronic editing shall maintain an off-tape synchronizing pulse train with a phase relationship to the playback reference of the machine sufficiently closely to avoid visible disturbance;

– the requirement for dominant field editing is given in Annex 1;

– for Type C recorders, the preferred operating practice for editing recordings made in PAL as well as the use of the PAL eight-field information on the control track is described in Annexes 2 and 3.

NOTE 1 – The EBU has issued Technical Statement D23-1984 describing in detail the EBU requirements for synchronizing pulse generators for 625-line/50 fields PAL signals.

– The output signal timing stability of PAL broadcast video tape machines is suggested to be within:

  – 2.5 ns quasi peak-to-peak for random perturbations;

  – 0.4 ns peak-to-peak for periodic perturbations for a single record/replay cycle;

– Information on the time and control code required for editing can be found in Recommendation ITU-R BR.780 and IEC Publication 461.

5 Composition and duration of leaders and trailers

Leader and trailer sections of monophonic recordings should be located on the tape in conformity with the sequence shown in Table 2. For stereophonic Type C recordings, see Table 3.

TABLE 2

Leader and trailer sections for the exchange of recorded television programmes with monophonic sound

Tape section		Duration (s)	Picture	Sound (on any channel carrying programme sound)	Control track signal
Leader	Protection leader	10 (minimum)	Blank tape		
	Alignment leader	60 (minimum)	Alignment signal	1 000 Hz at reference level(1)	Uninterrupted
	Optional	5 (maximum)	Blank tape		
	Identification leader	15 (minimum)	Programme identification	Spoken identification preferred, or silence	Uninterrupted
	Cue-up leader	8	Black or cue(2)	Silence or cue	
		2	Black(2)	Silence	
Programme(3)		Playing time of programme	Programme		
Run-out trailer		30 (minimum)	Black(2)	Silence	

(1) See § 3.1.

(2) In the case of colour recordings the black signal should be colour black. It is desirable that the colour field sequence (8 fields in PAL, 4 fields in NTSC) should continue uninterrupted in relation to the beginning and end of the programme recording.

(3) Where the time and control code is recorded on the assigned longitudinal track, the time indication of the programme start should be shown on the label accompanying the tape (see § 8.3).

TABLE 3

Leader and trailer sections for the exchange of recorded television programmes with stereophonic sound on format C tape

Tape section		Duration (s)	Picture	Sound track 1	Sound track 2	Control track signal
Leader	Protection leader	10 (minimum)	Blank tape			
	Alignment leader	60 (minimum)	Alignment signal(1)	1 000 Hz at reference level(2), interrupted(3), (4)	1 000 Hz at reference level(2), (4)	Uninterrupted
	Optional	5 (maximum)	Blank tape			
	Identification leader	15 (minimum)	Programme identification	Spoken identification preferred, or silence	Spoken identification preferred, or silence	Uninterrupted
	Cue-up leader	8	Black or cue(5)	Silence or cue	Silence or cue	
		2	Black(5)	Silence	Silence	
Programme(6)		Playing time of programme	Programme			Uninterrupted
Run-out trailer		30 (minimum)	Black(5)	Silence	Silence	

(1) Examples of suitable alignment signals for 625 lines, 50 field/s systems will be given in a draft new Recommendation.

(2) See § 3.1. The tones for both tracks must be coherent (i.e. from the same source) and in phase.

(3) The tone should be interrupted for 0.25 s every 3 s to enable identification of stereophonic recordings. The interruption may be made without using automatic equipment by organizations that only very occasionally need to interchange stereophonic video tape recordings. Under these circumstances, it is recognized that the specified interruption duration will not be strictly adhered to.

(4) In Australia the reference tone is on track 1 and the interrupted reference tone is on track 2. This is done to identify tracks and retain compatibility with mono track 1 reference tone.

(5) In the case of colour recordings, the black signal should be colour black. It is desirable that the colour field sequence (8 fields in PAL, 4 fields in SECAM) should continue uninterrupted in relation to the beginning and end of the programme recording.

(6) Where the time and control code is recorded on the assigned longitudinal track, the time indication of the programme start should be shown on the label accompanying the tape.

6 Winding of the tape on the spools

6.1 The tape should be wound on the spools specified in IEC Publications 347 and 503, with the start of the recording on the outside. In the case of Type C recordings the magnetic surface should be towards the hub of the spool.

6.2 The tape must be wound in such a way as to minimize the possibility of damage during transport; e.g. by using a constant winding tension. To prevent unwinding, the head end of the tape should be secured during storage and transport, by a suitable mechanical means, e.g. Scotch 8125 tape or equivalent; the use of a tape collar during transport is recommended.

6.3 Recordings of a single programme of up to 90 min duration should preferably be on one spool.

6.4 Separate programmes should always be on separate spools.

7 Packaging

Programme spools should be packed in containers affording protection against mechanical and environmental damage. The materials of which containers are constructed should not emit toxic fumes in the event of exposure to fire.

8 Programme identification

8.1 At least the following information should be supplied with each recorded television tape:

– name of the organization which made the recording;

– title of programme, or title, sub-title and episode number;

– total number of spools, and number of the spool in the sequence when the programme is contained on more than one spool;

– reference number (library number) of programme or of tape;

– total playing-time, and playing-time of the programme material recorded on the tape;

– in the case of 25.4 mm (one-inch) recording: the format, i.e. Type C;

– line and field system (625/50 or 525/60);

– indication of the colour system, for colour recordings;

– which audio tracks have been used;

– the content of each audio track;

– indication of monophonic or stereophonic recording;

– whether the sync track is recorded.

8.2 The information required in § 8.1 shall be provided in at least one of the official languages of the ITU.

8.3 The information required in § 8.1 shall be provided on labels affixed both to the programme spool and its container.

ANNEX 1

Recommended dominant field for 625-line 50 Hz video processing

The dominant field is that field of the video waveform at which a change of picture material occurs.

Historically, and for technical reasons, the beginning of field 2 was used in early video tape recorders as the edit point. This could cause edit point decision difficulties if the video signal contained picture material that changed at field 1. This would arise, for instance, if a telecine machine started its scanning of each new film frame at the beginning of field 1.

Modern video tape recorders usually edit at the beginning of field 1. Like other video processing equipment, for example electronic graphics equipment, the selection of other modes is possible.

Where picture material is switched, processed and edited in a complex way, a lack of discipline in the choice of dominant field can lead to difficulties and confusion. To avoid these, it is recommended that field 1 should be dominant in all but exceptional cases.

Where manufactured equipment permits selection of the field dominance, this should require positive user action and be clearly indicated when a non-standard condition exists.

Equipment should be set by users to operate in the field 1 dominant mode unless particular special requirements dictate otherwise.

ANNEX 2

Use of the PAL eight-field information on the control track of Type C recordings

Playback modes

– *Four-field lock mode*

The machine should lock to a PAL four-field sequence. A PAL four-field sequence can be derived from the eight-field edit pulse.

– *Eight-field frame mode*

The machine should use an eight-field edit pulse to secure eight-field framing but only during the initial lock-up period.

These two modes shall be switch-selectable.

ANNEX 3

Picture shift following a video tape recorder (VTR) edit in PAL systems

Undesirable horizontal picture shift following a VTR edit point may occur under certain conditions. When the picture content is similar before and after the electronic splice point, the shift may be easily visible and annoying; such picture jumps are especially irritating in the case of electronic animation. These horizontal picture shifts are the result of time-base-corrector action, which may be due to the PAL 8-field structure (a similar problem is experienced in 525-lines, 60 fields/s systems, with the NTSC four-field sequence) or to changes in the phase relationship between sub-carrier burst and line-synchronizing pulse caused by equipment instability or adjustment, or by a change to a source with a different burst-to-sync phase relationship.

Recommendation ITU-R BT.470 defines the relationship between sub-carrier phase and line synchronizing pulse. However, for sophisticated editing, it is mandatory that the video signals to be edited are recorded with a phase $\Phi(E'_U) = 0°$, and with a deviation not greater than $\pm 20°$ for the extrapolated E'_U-component of the video burst (see Note 1) at the leading edge of the line-synchronizing pulse of line 1 of field No. 1 (numbering of fields according to Recommendation ITU-R BT.470, Table 2, § 2.16). The central value of $\Phi = 0°$ is called "the preferred sub-carrier-to-line synchronizing (Sc-H) phase for video signals recorded on tape". In addition, jitter and drift of sub-carrier phase with respect to line synchronizing should be less than ± 1.5 ns ($\pm 2.5°$) for synchronizing pulse generators (SPGs) providing the reference for editing suites. These SPGs must supply a "field No. 1" indication for the correct, field-coincident operation of associated PAL-coders, time-code generators and recorders. A visual display of the frame number of a selected edit point within the 8-field sequence derived from the time and control code is useful to the programme producer making the edit decisions in order to enable him to achieve, when necessary, edits without an undesirable picture shift.

NOTE 1 – The E'_U-component of the video burst is the $(E'_B - E'_Y)$-component as defined in Recommendation ITU-R BT.470.