EG 10-2003
Revision of
EG 10-1996

SMPTE ENGINEERING GUIDELINE

Tape Transport Geometry Parameters for 19-mm Type D-1 Television Digital Component Recording

1 Scope

This guideline describes three feasible examples of mechanical designs and test conditions for achieving the record dimensions specified in SMPTE 224M. The parameters are for reference purposes only.

2 Definitions

2.1 scanner: A mechanical assembly containing a drum, rotating pole tips, and tape-guiding elements used to record and reproduce digital audio and video data.

2.2 drum: A cylindrical column around which the tape is at least partially wrapped in order to form a head-to-tape interface of a digital audio and video recording system.

2.3 helix angle: An angle formed between the path of the rotating pole tips and the tape reference edge-guiding system on the scanner of the helical-scan digital audio and video recording system.

2.4 track angle: An angle of the helical track record with respect to the reference edge of the tape.

2.5 effective wrap angle: An angle at the center of the drum subtended by the start and endpoint of the track.

2.6 total wrap angle: An angle at the center of the drum subtended by the lines of contact between the drum and the reference edge of the tape.

2.7 tape tension: Tape tension is defined by the tension after the entrance guide and before the exit guide scanner.

2.8 center span tension: A calculated value of the tape tension at a point midway between the tape entrance and exit guides of the scanner in the digital audio and video recording system.

Approved
February 7, 2003

3 General specifications

3.1 Dimensions are in the metric system.

3.2 Tests and measurements made on the recorder to check the requirements of this guideline shall be made under the following atmospheric conditions:

- Temperature: 20°C ± 1° C
- Relative humidity: (50 ± 2)%
- Barometric pressure: 96 kPa ± 10 kPa
- Conditioning of the recorder before testing: Not less than 24 hours

4 Scanner parameters

4.1 The effective drum diameter, tape tension, helix angle, and tape speed taken together determine the track angle. Different methods of design and/or variations in drum diameter and tape tension can produce equivalent recordings for interchange purposes.

4.2 Three possible design examples are specified in the tables and figures.

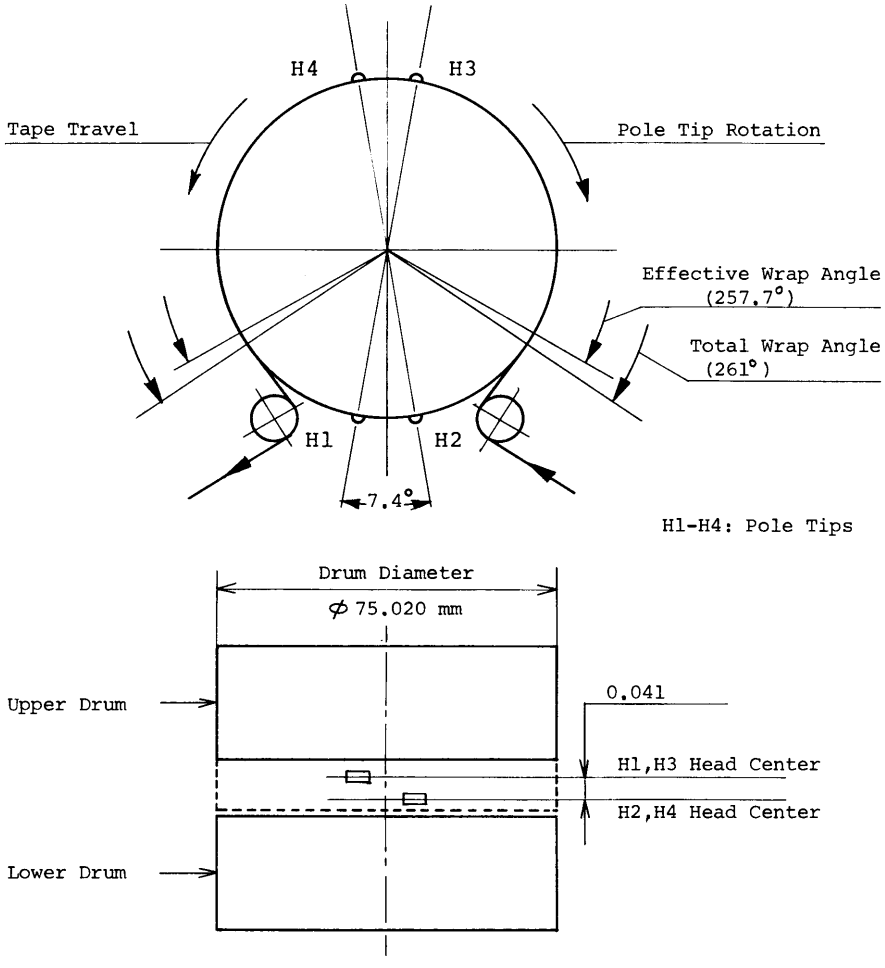

Figure 1 – Scanner configuration for design I

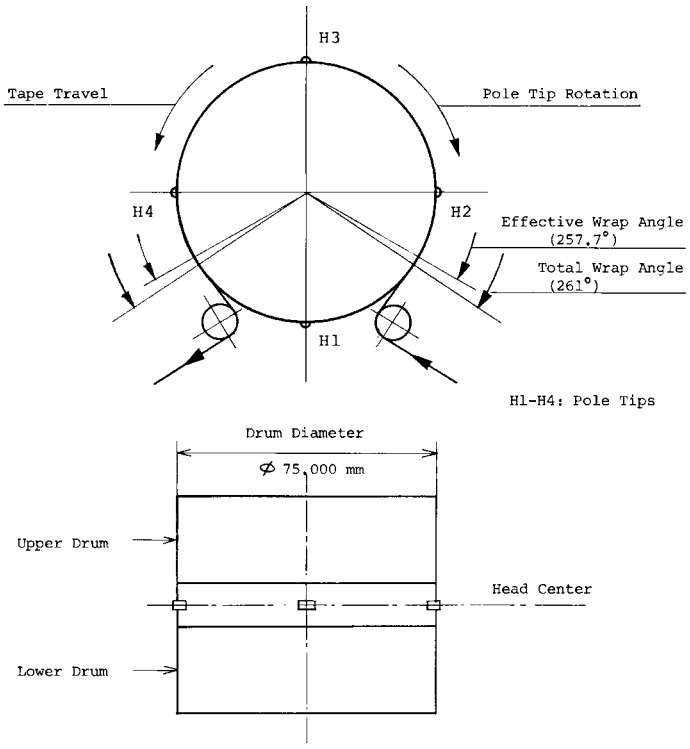

Figure 2 - Scanner configurtion for design II

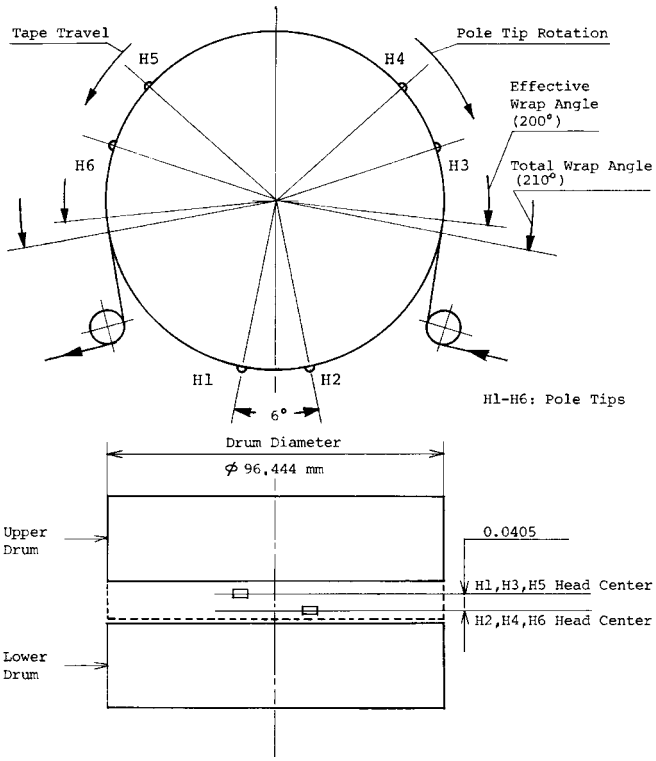

Figure 3 – Scanner configuration for design III

Table 1 – Pole tip relationships for design I, II and III

Parameters	Design I	Design II	Design III
Relevant figures	Figure 1	Figure 2	Figure 3
Minimum number of pole tips	4	4	6
Angular relationship	H1 – H2: 7.4°	H1, H2, H3, and H4	H1 – H2: 6.0°
	H3 – H4: 7.4°	equispaced	H3 – H4: 6.0°
	H1 – H3: 180°	90° ± .00833°	H5 – H6: 6.0°
	H2 – H4: 180°		H1 – H3: 120.0°
			H3 – H5: 120.0°
			H5 – H1: 120.0°
Vertical displacement (mm)	H1 – H2: 0.041	± 0.002 max	H1 – H2: 0.0405
	H3 – H4: 0.041		H3 – H4: 0.0405
			H5 – H6: 0.0405
Maximum tip projection (μm)	45	45	60

Table 2 - Scanner design parameters

Parameters		Design I	Design II	Design III
Scanner rotation speed (r.p.s.)		150/1.001	150/1.001	100/1.001
Number of tracks per rotation		4	4	6
Drum diameter				
Upper (mm)		75.020 ± 0.005	75.000 ± 0.005	96.444
Lower (mm)		75.000 ± 0.005	75.000 ± 0.005	96.400
Tape tension	IN	NA	0.6 ± 0.005	NA
	OUT		1.0 ± 0.1	NA
Center span tension	(N)		0.8 ± 0.2	
Helix angle		5.4444° ± .0028°	5.4441° ± .0002°	5.4517°
Effective wrap angle		257.7°	257.7°	200.0°
Total wrap angle		261.0°	261.0°	210.0°
Scanner circumferential speed (m/sec)		35.3	35.3	30.3

NA = Not available at this time.

Annex A (informative)
Bibliography

ANSI/SMPTE 226M-1996, Television Digital Recording — 19-mm Tape Cassette

ANSI/SMPTE 227M-1996, Television Digital Component Recording — 19-mm Type D-1 — Helical Data and Control Records

ANSI/SMPTE 228M-1996, Television Digital Component Recording — 19-mm Type D-1 — Time and Control Code and Cue Records

SMPTE 224M-2003, Television Digital Component Recording — 19-mm Type D-1 — Tape Record

SMPTE 225M-2003, Television Digital Component Recording — 19-mm Type D-1 — Magnetic Tape

SMPTE EG 21-1997, Nomenclature for Television Digital Recording of 19-mm Type D-1 Component and Type D-2 Composite Formats

ITU-R BT.601-5 (10/95), Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios