

Digital Cinema Initiatives, LLC

High Frame Rates Digital Cinema Recommended Practice

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1. Introduction

This document is a recommended practice for the near-term mastering, distribution and theatrical playback of motion picture D-Cinema content that exceeds the frame rates defined in the DCI Digital Cinema System Specification (DCSS). This recommended practice, which is not a specification, attempts to aid in the interoperability of this nascent High Frame Rate (HFR) content and address insufficient stereoscopic (3D) specifications, while recognizing that the D-Cinema industry is necessarily constrained by an existing installed base of equipment.

DCI continues to study the long-term needs of HFR content and may expand upon the parameters contained herein.

2. DCDM - Frame Rates

Proposed frame rates for the Digital Cinema Distribution Master (DCDM) are identified by the letter P in the table below.

Frame Rates (DCSS 1.2 [X], Proposed [P])			
EU/sec	2K2D	2K3D	4K2D
24	X	X	X
48	X	P	P
60	P	P	P
96	P		
120	P		

Table 1

DCI has limited frame rates in the above table for efficiency in terms of single inventory, interoperability, and supply chain. DCI believes that, as was the case with the initial digital cinema specifications, alternate frame rates to those indicated above will be identified by the relevant proponents and standardized by SMPTE.

3. Compression - Bit Rate

The maximum compressed bit rate for support of all proposed frame rates should be 500 Mb/sec.

NOTE: The frame rates and bit rate proposed above are provided to indicate the initial focus and work of DCI and do not insure that all combinations will provide acceptable results with all types of HFR content. For example, certain HFR scenes and content elements may not acceptably compress within the 500 Mb/sec limitation. DCI recommends that content creators should test and validate the entire content creation and delivery pipeline prior to committing to a resolution/frame rate combination.

4. Projection - 3D Peak White Luminance

For 3D presentations utilizing legacy lamp technology, the peak white luminance should be $24 \text{ cd/m}^2 \pm 6.9 \text{ cd/m}^2$ (7 fL \pm 2 fL) measured at the center of the screen through all filters and lenses, *i.e.*, light level to the eye. Relative luminance uniformity should be consistent with current SMPTE specifications.

Given the increased light level capabilities of 3D RGB laser illuminated projectors and multi-projector installations, peak white luminance for such projection systems should be $48 \text{ cd/m}^2 \pm 6.9 \text{ cd/m}^2$ (14 fL \pm 2 fL) measured at the center of the screen through all filters and lenses, *i.e.*, light level to the eye. Relative luminance uniformity should be consistent with current SMPTE specifications.

5. Projection - Forensic Marking

Forensic marking must be applied to all frames and in the case of any 3D presentations be recoverable from the recording of both eyes or a single eye. All image and audio security forensic requirements must be consistent with the current DCSS.

6. Theater Systems - Show Playlists

The projection system should allow show playlists to be created mixing any formats in Table 1 in any order. Each composition in the show playlist should be presented in its native frame rate. It is expected that playback of such show playlists would provide smooth, minimal transitions.

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