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AMENDMENT 5
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Information technology — JPEG 2000 image coding system: Core coding system

AMENDMENT 5: Enhancements for digital cinema and archive profiles (additional frame rates)

Technologies de l'information — Système de codage d'images JPEG 2000: Système de codage de noyau —

AMENDEMENT 5: Améliorations pour le cinéma numérique et les profils d'archive (taux de trame supplémentaire)

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Foreword

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The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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RECOMMENDATION ITU-T

Information technology – JPEG 2000 image coding system: Core coding system

Amendment 5

Enhancements for digital cinema and archive profiles (additional frame rates)

1) Annex A

a) The following material should be placed immediately after Table A.45. This replaces all text that previously followed Table A.45 up to but not including Table A.47.

A.10.1 Codestream restrictions for digital cinema applications including archiving

In addition to the profiles defined in Table A.10, five profiles are defined for digital cinema and archiving applications as detailed in Table A.46. The first two, in form of Profile-3 and Profile-4, are primarily intended for distribution. In addition, the three profiles listed under profile indication numbers 5 to 7 are intended for archiving and production purposes. The two extended scalable profiles (Profile-5 and Profile-6) are intended to be used for easily accessible archives. The long-term storage profile (Profile-7) is intended for original camera capture or post-production workflows.

Table A.46 – Codestream restrictions for digital cinema applications

	2K digital cinema profile	4K digital cinema profile	Scalable 2K digital cinema profile	Scalable 4K digital cinema profile	Long-term storage profile
SIZ marker segment					
Profile Indication	Rsiz=3	Rsiz=4	Rsiz=5	Rsiz=6	Rsiz=7
Image size	Xsiz <= 2048, Ysiz <= 1080	Xsiz <= 4096, Ysiz <= 2160	Xsiz <= 2048, Ysiz <= 1080	Xsiz <= 4096, Ysiz <= 2160	Xsiz <= 16384, Ysiz <= 8640
Tiles	one tile for the whole image: YTsiz + YTOsiz >= Ysiz XTsiz + XTOsiz >= Xsiz	one tile for the whole image: YTsiz + YTOsiz >= Ysiz XTsiz + XTOsiz >= Xsiz	one tile for the whole image: YTsiz + YTOsiz >= Ysiz XTsiz + XTOsiz >= Xsiz	one tile for the whole image: YTsiz + YTOsiz >= Ysiz XTsiz + XTOsiz >= Xsiz	One tile for the whole image or minimum tile size: YTsiz + YTOsiz >= 512 XTsiz + XTOsiz >= 1024
Image and tile origin	XOsiz = YOsiz = XTOsiz = YTOsiz = 0	XOsiz = YOsiz = XTOsiz = YTOsiz = 0	XOsiz = YOsiz = XTOsiz = YTOsiz = 0	XOsiz = YOsiz = XTOsiz = YTOsiz = 0	XOsiz = YOsiz = XTOsiz = YTOsiz = 0
Sub-sampling	$XRsiz^i = YRsiz^i = 1$	$XRsiz^i = YRsiz^i = 1$	$XRsiz^i = YRsiz^i = 1$	$XRsiz^i = YRsiz^i = 1$	No restriction
Number of components	Csiz = 3	Csiz = 3	Csiz = 3	Csiz = 3	Csiz<=8
Bitdepth	Ssizi = 11 (i.e., 12 bit unsigned)	Ssizi = 11 (i.e., 12 bit unsigned)	$Ssiz^i$ = 11 (i.e., 12 bit unsigned)	$Ssiz^i$ = 11 (i.e., 12 bit unsigned)	No restriction
RGN marker segment	Disallowed, i.e., no region of interest	Disallowed, i.e., no region of interest	Disallowed, i.e., no region of interest	Disallowed, i.e., no region of interest	Disallowed, i.e., no region of interest
COD/COC marker segments	Main header only	Main header only	Main header only	Main header only	Main header only
Coding style	Scod, Scoc = 0000 0esp, where p=1, e=0 or e=1, s=0 or s=1 NOTE – p=1: precincts defined in SPcodIi/SPcocI	Scod, Scoc = 0000 0esp, where p=1, e=0 or e=1, s=0 or s=1 NOTE – p=1: precincts defined in SPcodIi/SPcocI	Scod, Scoc = 0000 0esp, where e=s=0, and p=1 NOTE – e=0: EPH marker shall not be used s=0: SOP marker shall not be used p=1: precincts defined in $SPcodI^i$/$SPcocI^i$	Scod, Scoc = 0000 0esp, where e=s=0, and p=1 NOTE – e=0: EPH marker shall not be used s=0: SOP marker shall not be used p=1: precincts defined in $SPcodI^i$/$SPcocI^i$	Scod, Scoc = 0000 0esp, where e=s=1, and p=0 or 1 NOTE – e: EPH marker shall be used s: SOP marker may be used p: precincts with PPx=15 and PPy=15 or defined in $SPcodI^i$/$SPcocI^i$
Progression order	CPRL	CPRL	CPRL	CPRL	CPRL
Number of layers	L=1	L=1	L=2	L=2	L<=5
Multiple component transform	All component transforms defined in ITU-T Rec. T.800 | ISO/IEC 15444-1 may be used.	All component transforms defined in ITU-T Rec. T.800 | ISO/IEC 15444-1 may be used.	All component transforms defined in ITU-T Rec. T.800 | ISO/IEC 15444-1 may be used.	All component transforms defined in ITU-T Rec. T.800 | ISO/IEC 15444-1 may be used.	All component transforms defined in ITU-T Rec. T.800 | ISO/IEC 15444-1 may be used.

Table A.46 – Codestream restrictions for digital cinema applications

	2K digital cinema profile	4K digital cinema profile	Scalable 2K digital cinema profile	Scalable 4K digital cinema profile	Long-term storage profile
Number of decomposition levels	NL <= 5 Every component of every image of a distribution shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.	1<= NL <= 6 Every component of every image of a distribution shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.	NL <= 5 Every component of every image of a codestream shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.	1<= NL <= 6 Every component of every image of a codestream shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.	No restriction, with respect to: (Xsiz-XOsiz)/D(I) <= 64 (Ysiz-YOsiz)/D(I) <= 64 and D(I)=pow(2,NL) for each component I Every component of every image of a codestream shall have the same number of wavelet transform levels. The number of deployed decomposition levels shall be set accordingly in all COD and COC markers.
Code-block size	xcb=ycb=5 The corresponding values shall be set accordingly in all deployed COD and COC markers.	xcb=ycb=5 The corresponding values shall be set accordingly in all deployed COD and COC markers.	xcb = ycb = 5 The corresponding values shall be set accordingly in all deployed COD and COC markers.	xcb = ycb = 5 The corresponding values shall be set accordingly in all deployed COD and COC markers.	xcb <= 6, ycb <= 6 The corresponding values shall be set accordingly in all deployed COD and COC markers. Note that codeblock sizes might differ between the existing components.
Code-block style	SPcod, SPcoc = 0000 0000	SPcod, SPcoc = 0000 0000	SPcod, SPcoc = 0000 0000	SPcod, SPcoc = 0000 0000	SPcod, SPcoc = 00sp vtra where r = v = 0, and a, t, p, s = 0 or 1 NOTE – a = 1 for selective arithmetic coding bypass t = 1 for termination on each coding pass, p = 1 for predictive termination s = 1 for segmentation symbols

Table A.46 – Codestream restrictions for digital cinema applications

	2K digital cinema profile	4K digital cinema profile	Scalable 2K digital cinema profile	Scalable 4K digital cinema profile	Long-term storage profile
Transformation	5-3 reversible filter or 9-7 irreversible filter[1] The corresponding filter shall be set accordingly in all COD and COC markers.	5-3 reversible filter or 9-7 irreversible filter1 The corresponding filter shall be set accordingly in all COD and COC markers.	9-7 irreversible filter The corresponding filter shall be set accordingly in all COD and COC markers.	9-7 irreversible filter The corresponding filter shall be set accordingly in all COD and COC markers.	9-7 irreversible filter 5-3 reversible filter The corresponding filter shall be set accordingly in all COD and COC markers.
Precinct size	PPx = PPy = 7 for NLLL band, else 8 The corresponding values shall be set accordingly in all COD and COC markers.	PPx = PPy = 7 for NLLL band, else 8 The corresponding values shall be set accordingly in all COD and COC markers.	PPx = PPy = 7 for NLLL band, else 8 The corresponding values shall be set accordingly in all COD and COC markers.	PPx = PPy = 7 for NLLL band, else 8 The corresponding values shall be set accordingly in all COD and COC markers.	PPx >= xcb, PPy >= ycb The corresponding values shall be set accordingly in all COD and COC markers. Note that the precinct sizes might differ between existing components.
Tile-parts	Each compressed image shall have exactly 3 tile parts. Each tile part shall contain all data from one colour component	Each compressed image shall have exactly 6 tile parts as depicted in Figure A.25 and Figure A.26. Each of the first 3 tile parts shall contain all data necessary to decompress one 2K colour component. Each of the next 3 tile parts shall contain all additional data necessary to decompress one 4K colour component.	Each compressed image shall have exactly 6 tile parts as depicted in Figure A.29. Each of the first 3 tile parts shall contain all data necessary to decompress one 2K colour component compatible to 2K digital cinema profile. Each of the next 3 tile parts shall contain all additional data necessary to decompress the rest of one 2K colour component.	Each compressed image shall have exactly 12 tile parts as depicted in Figures A.28, A.27 and A.25. Each of the first 3 tile parts shall contain all data necessary to decompress one 2K colour component compatible to 2K digital cinema profile. Each of the next 3 tile parts shall contain all additional data necessary to decompress one 4K colour component. Each of the next 3 tile parts shall contain all additional data necessary for the rest of one 2K colour component. Each of the next 3 tile parts shall contain all additional data necessary to decompress the rest of one 4K colour component.	Each compressed image tile shall consist of exactly Csiz tile parts. Each tile part shall contain all data from one component of the considered tile.
Other markers					
Packed headers (PPM, PPT)	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed

1 The use of the 9-7 irreversible filter is highly recommended to increase the usability for archives, since both the scalable 2K digital cinema profile and the scalable 4K digital cinema profile are restricted to this wavelet filter. In addition, digital cinema packages (DCPs) conform to the 9-7 filter.

Table A.46 – Codestream restrictions for digital cinema applications

	2K digital cinema profile	4K digital cinema profile	Scalable 2K digital cinema profile	Scalable 4K digital cinema profile	Long-term storage profile
Tile-part lengths (TLM)	TLM marker segments are required in each image	TLM marker segments are required in each image	TLM marker segments are required in each image	TLM marker segments are required in each image	TLM marker segments are required in each image
Packet length, tile-part header (PLT)	Optional	Optional	For each tile-part a complete list of packet lengths shall be provided	For each tile-part a complete list of packet lengths shall be provided	For each tile-part a complete list of packet lengths shall be provided
QCD, QCC	Main header only	Main header only	Main header only	Main header only	Main header only
SOP, EPH	Optional	Optional	Disallowed	Disallowed	Each packet in any given tile-part shall be prepended with a SOP marker segment and each packet header in any given tile-part shall be postpended with an EPH marker segment
POC marker	Disallowed	There shall be exactly one POC marker segment in the main header. Other POC marker segments are disallowed. The POC marker segment shall specify exactly two progressions having the following parameters: First progression: RSpoc = 0, CSpoc = 0, LYEpoc = 1, REpoc = N_L, CEpoc = 3, Ppoc = 4 Second progression: RSpoc = N_L, CSpoc = 0, LYEpoc = 1, REpoc = N_L +1, CEpoc = 3, Ppoc = 4	There shall be exactly one POC marker segment in the main header. Other POC marker segments are disallowed. The POC marker segment shall specify exactly two progressions having the following parameters: First progression: RSpoc = 0, CSpoc = 0, LYEpoc = 1, REpoc = N_L+1, CEpoc = 3, Ppoc = 4 Second progression: RSpoc = 0, CSpoc = 0, LYEpoc = 2, REpoc = N_L+1, CEpoc = 3, Ppoc = 4	There shall be exactly one POC marker segment in the main header. Other POC marker segments are disallowed. The POC marker segment shall specify exactly four progressions having the following parameters: First progression: RSpoc = 0, CSpoc = 0, LYEpoc = 1, REpoc = N_L, CEpoc = 3, Ppoc = 4 Second progression: RSpoc = N_L, CSpoc = 0, LYEpoc = 1, REpoc = N_L+1, CEpoc = 3, Ppoc = 4 Third Progression: RSpoc = 0, CSpoc = 0, LYEpoc = 2, REpoc = N_L, CEpoc = 3, Ppoc = 4 Fourth Progression: RSpoc = N_L, CSpoc = 0, LYEpoc = 2, REpoc = N_L+1, CEpoc = 3, Ppoc = 4	Disallowed
Application specific restrictions					