

ISO/IEC 15444-1:2016-10 (E)

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

Contents

	Page	
	<i>Page</i>	
1	Scope	1
2	References	1
2.1	Identical Recommendations International Standards	1
2.2	Additional references	1
3	Definitions	2
4	Abbreviations and symbols	6
4.1	Abbreviations	6
4.2	Symbols	7
5	General description	8
5.1	Purpose	8
5.2	Codestream	8
5.3	Coding principles	9
6	Encoder requirements	10
7	Decoder requirements	10
7.1	Codestream syntax requirements	11
7.2	Optional file format requirements	11
8	Implementation requirements	11
Annex A	– Codestream syntax	12
A.1	Markers, marker segments, and headers	12
A.2	Information in the marker segments	14
A.3	Construction of the codestream	15
A.4	Delimiting markers and marker segments	19
A.5	Fixed information marker segment	20
A.6	Functional marker segments	23
A.7	Pointer marker segments	32
A.8	In-bit-stream marker and marker segments	36
A.9	Informational marker segments	37
A.10	Codestream restrictions conforming to this Recommendation International Standard	39
Annex B	– Image and compressed image data ordering	55
B.1	Introduction to image data structure concepts	55
B.2	Component mapping to the reference grid	55
B.3	Image area division into tiles and tile-components	57
B.4	Example of the mapping of components to the reference grid (informative)	58
B.5	Transformed tile-component division into resolution levels and sub-bands	61
B.6	Division of resolution levels into precincts	62
B.7	Division of the sub-bands into code-blocks	63
B.8	Layers	64
B.9	Packets	65
B.10	Packet header information coding	66
B.11	Tile and tile-parts	71
B.12	Progression order	72
Annex C	– Arithmetic entropy coding	77
C.1	Binary encoding (informative)	77
C.2	Description of the arithmetic encoder (informative)	78
C.3	Arithmetic decoding procedure	89

Annex D – Coefficient bit modelling.....	97
D.1 Code-block scan pattern within code-blocks.....	97
D.2 Coefficient bits and significance	97
D.3 Decoding passes over the bit-planes	98
D.4 Initializing and terminating	102
D.5 Error resilience segmentation symbol	103
D.6 Selective arithmetic coding bypass	103
D.7 Vertically causal context formation	104
D.8 Flow diagram of the code-block coding.....	105
Annex E – Quantization.....	107
E.1 Inverse quantization procedure	107
E.2 Scalar coefficient quantization (informative).....	108
Annex F – Discrete wavelet transformation of tile-components.....	110
F.1 Tile-component parameters.....	110
F.2 Discrete wavelet transformations	110
F.3 Inverse discrete wavelet transformation.....	110
F.4 Forward transformation (informative).....	121
Annex G – DC level shifting and multiple component transformations.....	131
G.1 DC level shifting of tile-components	131
G.2 Reversible multiple component transformation (RCT)	132
G.3 Irreversible multiple component transformation (ICT)	132
G.4 Chrominance component sub-sampling and the reference grid	133
Annex H – Coding of images with regions of interest.....	134
H.1 Decoding of ROI.....	134
H.2 Description of the Maxshift method.....	134
H.3 Remarks on region of interest coding (informative)	135
Annex I – JP2 file format syntax	138
I.1 File format scope.....	138
I.2 Introduction to the JP2 file format	138
I.3 Greyscale/Colour/Palettized/multi-component specification architecture	140
I.4 Box definition.....	142
I.5 Defined boxes.....	144
I.6 Adding intellectual property rights information in JP2	159
I.7 Adding vendor-specific information to the JP2 file format.....	159
I.8 Dealing with unknown boxes	162
Annex J – Examples and guidelines	163
J.1 Software conventions adaptive entropy decoder.....	163
J.2 Selection of quantization step sizes for irreversible transformations	164
J.3 Filter impulse responses corresponding to lifting-based irreversible filtering procedures.....	165
J.4 Example of discrete wavelet transformation	166
J.5 Row-based wavelet transform	169
J.6 Scan-based coding.....	178
J.7 Error resilience.....	178
J.8 Implementing the Restricted ICC method outside of a full ICC colour management engine	179
J.9 An example of the interpretation of multiple components	183
J.10 An example of decoding showing intermediate steps	183
J.11 Visual frequency weighting	187
J.12 Encoder sub-sampling of components.....	189
J.13 Rate control	190
J.14 Guidelines on handling YCC codestream	194
J.15 Guidelines for digital cinema applications.....	195
Annex K – Bibliography.....	211
K.1 General.....	211
K.2 Quantization and entropy coding	211
K.3 Wavelet transformation	211
K.4 Region of interest coding	212
K.5 Visual frequency weighting	212
K.6 Error resilience	212
K.7 Scan-based coding.....	213

K.8	Colour.....	213
K.9	Guidelines for digital cinema applications.....	213
Annex L	– Patent statement.....	215
Annex M	– Elementary stream for broadcast applications.....	216
M.1	Introduction.....	216
M.2	Definitions.....	216
M.3	Access unit construction.....	216
M.4	Elementary stream marker box (superbox).....	217