

ISO/IEC FDIS 23090-12:2025(en)

Date: 2025-02-07

ISO/IEC-JTC-1/SC-29

Secretariat: JISC

Date: 2025-04-30

Information technology — Coded representation of immersive media —

Part 12:
MPEG immersive video

Technologies de l'information — Représentation codée de média immersifs —

Partie 12: Vidéo immersive MPEG

ISO/IEC FDIS 23090-12

<https://standards.itech.ai/catalog/standards/iso/feab7001-cc58-485d-81cc-9bda3dea1516/iso-iec-fdis-23090-12>

FDIS stage

Edited DIS - MUST BE USED FOR FINAL DRAFT

© ISO/IEC 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO’s member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11

~~Fax: +41 22 749 09 47~~

~~Email~~**E-mail:** copyright@iso.org
Website: www.iso.orgwww.iso.org

Published in Switzerland

iteh Standards
(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai/catalog/standards/iso/feab7001-cc58-485d-81cc-9bda3dea1516/iso-iec-fdis-23090-12>

Contents

Foreword	viii
Introduction	ix
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	5
5 Conventions	5
6 Overall V3C characteristics, decoding operations, and post-decoding processes	5
7 Bitstream format, partitioning, and scanning processes	5
7.1 General.....	5
7.2 V3C bitstream formats.....	5
7.3 NAL bitstream formats.....	5
7.4 Partitioning of atlas frames into tiles.....	6
7.5 Mapping of views to V3C components.....	6
7.6 Sources and outputs.....	8
8 Syntax and semantics	8
8.1 Method of specifying syntax in tabular form.....	8
8.2 Specification of syntax functions and descriptors.....	8
8.3 Syntax in tabular form.....	8
8.3.1 General syntax.....	8
8.3.2 V3C unit syntax.....	11
8.3.3 Byte alignment syntax.....	11
8.3.4 V3C parameter set syntax.....	11
8.3.5 NAL unit syntax.....	11
8.3.6 Raw byte sequence payloads, trailing bits, and byte alignment syntax.....	11
8.3.7 Atlas tile data unit syntax.....	11
8.3.8 Supplemental enhancement information message syntax.....	11
8.3.9 V3C MIV extension syntax in tabular form.....	11
8.4 Semantics.....	23
8.4.1 General semantics.....	23
8.4.2 V3C MIV extension semantics.....	23
8.4.3 Order of V3C units and association to coded information.....	43
9 Decoding process	44
9.1 General decoding process.....	44
9.2 Atlas data decoding process.....	44
9.2.1 General atlas data decoding process.....	44
9.2.2 Decoding process for a coded atlas frame.....	44
9.2.3 Atlas NAL unit decoding process.....	44
9.2.4 Atlas tile header decoding process.....	44
9.2.5 Decoding process for patch data units.....	44
9.2.6 Decoding process of the block to patch map.....	47
9.2.7 Conversion of tile level patch information to atlas level patch information.....	47
9.3 Occupancy video decoding process.....	49
9.4 Geometry video decoding process.....	49
9.5 Attribute video decoding process.....	49
9.6 Packed video decoding process.....	49
9.7 Common atlas data decoding process.....	49

9.7.1	General common atlas data decoding process.....	49
9.7.2	Decoding process for a coded common atlas frame.....	49
9.7.3	Common atlas NAL unit decoding process.....	50
9.7.4	Common atlas frame order count derivation process.....	50
9.7.5	Common atlas frame MIV extension decoding process.....	50
9.8	Sub-bitstream extraction process.....	67
9.8.1	General.....	67
9.8.2	V3C unit extraction.....	67
9.8.3	NAL unit extraction process.....	67
9.8.4	Group extraction process.....	67
10	Pre-reconstruction process.....	67
11	Reconstruction process.....	67
12	Post-reconstruction process.....	68
13	Adaptation process.....	68
14	Parsing process.....	68
Annex A (normative)	Profiles, tiers, and levels.....	69
Annex B (informative)	Post-decoding conversion to nominal video formats.....	87
Annex C (normative)	Supplemental enhancement information.....	89
Annex D (normative)	Volumetric usability information.....	116
Annex E (informative)	Overview of the rendering processes.....	117
Bibliography		146

Foreword.....	vii
Introduction.....	viii
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Abbreviated terms.....	4
5 Conventions.....	5
6 Overall V3C characteristics, decoding operations, and post-decoding processes.....	5
7 Bitstream format, partitioning, and scanning processes.....	5
7.1 General.....	5
7.2 V3C bitstream formats.....	5
7.3 NAL bitstream formats.....	5
7.4 Partitioning of atlas frames into tiles.....	5
7.5 Mapping of views to V3C components.....	5
7.6 Sources and outputs.....	7
8 Syntax and semantics.....	7
8.1 Method of specifying syntax in tabular form.....	7
8.2 Specification of syntax functions and descriptors.....	7
8.3 Syntax in tabular form.....	7

8.3.1	General syntax	7
8.3.2	V3C unit syntax	8
8.3.3	Byte alignment syntax	8
8.3.4	V3C parameter set syntax	8
8.3.5	NAL unit syntax	8
8.3.6	Raw byte sequence payloads, trailing bits, and byte alignment syntax	8
8.3.7	Atlas tile data unit syntax	8
8.3.8	Supplemental enhancement information message syntax	8
8.3.9	V3C MIV extension syntax in tabular form	8
8.4	Semantics	18
8.4.1	General semantics	18
8.4.2	V3C MIV extension semantics	18
8.4.3	Order of V3C units and association to coded information	36
9	Decoding process	36
9.1	General decoding process	36
9.2	Atlas data decoding process	36
9.2.1	General atlas data decoding process	36
9.2.2	Decoding process for a coded atlas frame	36
9.2.3	Atlas NAL unit decoding process	36
9.2.4	Atlas tile header decoding process	36
9.2.5	Decoding process for patch data units	36
9.2.6	Decoding process of the block to patch map	38
9.2.7	Conversion of tile level patch information to atlas level patch information	38
9.3	Occupancy video decoding process	39
9.4	Geometry video decoding process	39
9.5	Attribute video decoding process	39
9.6	Packed video decoding process	39
9.7	Common atlas data decoding process	39
9.7.1	General common atlas data decoding process	39
9.7.2	Decoding process for a coded common atlas frame	40
9.7.3	Common atlas NAL unit decoding process	40
9.7.4	Common atlas frame order count derivation process	40
9.7.5	Common atlas frame MIV extension decoding process	40
9.8	Sub-bitstream extraction process	50
9.8.1	General	50
9.8.2	V3C unit extraction	51
9.8.3	NAL unit extraction process	51
9.8.4	Group extraction process	51
10	Pre-reconstruction process	51
11	Reconstruction process	51
12	Post-reconstruction process	51
13	Adaptation process	51
14	Parsing process	51
Annex A (normative)	Profiles, tiers, and levels	52
A.1	Overview of profiles, tiers, and levels	52
A.2	Profile, tier and level structure	52
A.3	CodecGroup profile components	52
A.4	Toolset profile components	52
A.4.1	General	52
A.4.2	General constraints	52
A.4.3	MIV toolset profile components	53

A.5	Reconstruction profile components	62
A.6	Tiers and levels	63
A.6.1	General tier and level limits	63
A.6.2	Profile specific level limits for the V3C dynamic profiles	63
A.7	Decoder instantiations	69
Annex B (informative)	Post-decoding conversion to nominal video formats	70
B.1	General	70
B.2	Nominal format conversion	70
B.2.1	General	70
B.2.2	Occupancy nominal format conversion	70
B.2.3	Geometry nominal format conversion	70
B.2.4	Auxiliary geometry nominal format conversion	70
B.2.5	Attribute nominal format conversion	70
B.2.6	Auxiliary attribute nominal format conversion	70
B.3	Conversion operations	70
B.3.1	Map extraction	70
B.3.2	Bit depth conversion	70
B.3.3	Resolution conversion	70
B.3.4	Output composition time conversion	70
B.3.5	Attribute dimension packing	71
B.3.6	Chroma up-sampling	71
B.3.7	Geometry map synthesis process	71
B.3.8	Attribute map synthesis process	71
B.3.9	Occupancy thresholding process	71
B.4	Unpacking process of a decoded packed video	71
Annex C (normative)	Supplemental enhancement information	72
C.1	General	72
C.2	SEI payload syntax	72
C.2.1	General	72
C.2.2	Viewing space SEI payload syntax	72
C.2.3	Viewing space handling SEI payload syntax	74
C.2.4	Geometry upscaling parameters SEI payload syntax	75
C.2.5	Atlas view enabled SEI payload syntax	75
C.2.6	OMAF v1 compatible SEI payload syntax	75
C.2.7	Geometry assistance SEI payload syntax	76
C.2.8	Extended geometry assistance SEI payload syntax	77
C.2.9	MIV registered SEI message syntax	79
C.2.10	MIV registered SEI message syntax	79
C.3	SEI payload semantics	80
C.3.1	General	80
C.3.2	General SEI payload semantics	80
C.3.3	Viewing space SEI payload semantics	80
C.3.4	Viewing space handling SEI payload semantics	85
C.3.5	Geometry upscaling parameters SEI payload semantics	86
C.3.6	Atlas view enabled SEI payload semantics	87
C.3.7	OMAF v1 compatible SEI payload semantics	87
C.3.8	Geometry assistance SEI payload semantics	88
C.3.9	Extended geometry assistance SEI payload semantics	90
C.3.10	MIV registered SEI message semantics	93
C.3.11	MIV registered SEI payload semantics	93

Annex D (normative) Volumetric usability information	94
Annex E (informative) Overview of the rendering processes	95
E.1 General	95
E.2 Sample 3D reconstruction process	96
E.2.1 General	96
E.2.2 Sample occupancy reconstruction process	97
E.2.3 Depth clamping process	98
E.2.4 Depth expansion process	98
E.2.5 Depth confidence expansion process	99
E.2.6 Coordinate unprojection process	100
E.2.7 Reference frame switching process	101
E.3 Entity filtering process	102
E.4 Texture reconstruction	103
E.4.1 Patch texture offset process	103
E.4.2 Chroma range restoration	103
E.5 Colorized geometry video bit depth conversion process	104
E.6 Geometry video scaling process	105
E.6.1 General	105
E.6.2 Nearest neighbour interpolation scaling process	105
E.6.3 Sample neighbours enumeration process	106
E.6.4 Foreground edge flag process	106
E.6.5 Selective geometry erosion process	107
E.6.6 Texture aligned geometry erosion process	107
E.6.7 Geometry contour smoothening process	108
E.7 Pruned view reconstruction process	109
E.8 Sample weighting recovery processes	111
E.8.1 General	111
E.8.2 Pruning graph parsing process	111
E.8.3 Sample weighting recovery process	111
E.9 Inpaint patch filtering process	112
E.10 Reconstruction of MPI process	113
Bibliography	116

<https://standards.iteh.ai/catalog/standards/iso/feab7001-cc58-485d-81cc-9bda3dea1516/iso-iec-fdis-23090-12>