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AMENDMENT 5
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**Information technology — Coding of
audio-visual objects —**

Part 27:
3D Graphics conformance

**AMENDMENT 5: Multi-resolution 3D
mesh compression**

*Technologies de l'information — Codage des objets audiovisuels —
Partie 27: Conformité aux graphiques 3D*

AMENDMENT 5: Compression de maille en 3D à résolution multiple

Reference number
ISO/IEC 14496-27:2009/Amd.5:2015(E)





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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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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Amendment 5 to ISO/IEC 14496-27:2009 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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Information technology — Coding of audio-visual objects — Part 27: 3D Graphics conformance, AMENDMENT 5: Multi- resolution 3D mesh compression

In 6.3.2 Test bitstreams, replace:

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|--|-------------|-----------------|-----------------|---------------------|
| Axe | File with simple static mesh | 3DMCe | axe | Axe | axe |
| Cottage | File with one big mesh | 3DMCe | cottage | Cottage | cottage |
| Xplaneh | File with more static meshes and color | 3DMCe | xplaneh | xplaneh | xplaneh |
| basketball | File with static mesh and texture | 3DMCe | basketball | basketball | basketball |
| Box | File with static mesh with texture | 3DMCe | box | Box | box |
| Rabbit | File with bone-based animation and texture | 3DMCe, BBA | N/A | Rabbit | rabbit |
| Eagle | File with bone-based animation and texture | 3DMCe, BBA | N/A | eagle | eagle |
| Hero | File with more meshes and animation | 3DMCe, BBA | Hero | hero | hero |
| PI_troll | File with Position Interpolator animation and textures | 3DMCe, PI | PI_Troll | PI_Troll | PI_Troll |
| OI_rabbit | File with Orientation Interpolator animation and textures | 3DMCe, OI | OI_rabbit | OI_rabbit | OI_rabbit |
| CI_box | File with Coordinate Interpolator animation | 3DMCe, CI | CI_box | CI_box | CI_box |
| eagle-fb | File with frame-based animation | 3DMCe, FAMC | eagle-fb | eagle-fb | eagle-fb |
| shark-fb | File with frame-based animation | 3DMCe, FAMC | shark-fb | shark-fb | shark-fb |
| wolf-fb | File with frame-based animation | 3DMCe, FAMC | wolf-fb | wolf-fb | wolf-fb |
| dragon-fb | File with frame-based animation | 3DMCe, FAMC | dragon-fb | dragon-fb | dragon-fb |
| tablecloth-fb | File with frame-based animation | 3DMCe, FAMC | tablecloth-fb | tablecloth-fb | tablecloth-fb |
| AXE_Q_CD_EG | QBCR, circular prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|--|------------|-----------------|-----------------|---------------------|
| AXE_Q_CD_AC | QBCR, circular prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_CD_BP | QBCR, circular prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_CD_4C | QBCR, circular prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Ad_EG | QBCR, adaptive prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_Q_Ad_AC | QBCR, adaptive prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Ad_BP | QBCR, adaptive prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Ad_4C | QBCR, adaptive prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Xo_EG | QBCR, XOR prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Xo_AC | QBCR, XOR prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_Q_Xo_BP | QBCR, XOR prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Xo_4C | QBCR, XOR prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Di_EG | QBCR, differential prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Di_BP | QBCR, differential prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_Q_Di_4C | QBCR, differential prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_CD_EG | SVA, circular prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_CD_AC | SVA, circular prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_CD_BP | SVA, circular prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|---|------------|-----------------|-----------------|---------------------|
| AXE_S_CD_4C | SVA, circular prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Ad_EG | SVA, adaptive prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Ad_AC | SVA, adaptive prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Ad_BP | SVA, adaptive prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Ad_4C | SVA, adaptive prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Xo_EG | SVA, XOR prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Xo_AC | SVA, XOR prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Xo_BP | SVA, XOR prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Xo_4C | SVA, XOR prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Di_EG | SVA, differential prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Di_AC | SVA, differential prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Di_BP | SVA, differential prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Di_4C | SVA, differential prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_CD_EG | TFAN, circular prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_CD_AC | TFAN, circular prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_CD_BP | TFAN, circular prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_T_CD_4C | TFAN, circular prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|--|------------|-----------------|-----------------|---------------------|
| AXE_T_Ad_EG | TFAN, adaptive prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Ad_AC | TFAN, adaptive prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Ad_BP | TFAN, adaptive prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Ad_4C | TFAN, adaptive prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_T_Xo_EG | TFAN, XOR prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Xo_AC | TFAN, XOR prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Xo_BP | TFAN, XOR prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Xo_4C | TFAN, XOR prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Di_BP | TFAN, differential prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Di_4C | TFAN, differential prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_EG | TFAN, TFAN-based parallelogram prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_AC | TFAN, TFAN-based parallelogram prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_T_Tf_BP | TFAN, TFAN-based parallelogram prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_4C | TFAN, TFAN-based parallelogram prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_EG_VO | TFAN with vertex ordering preservation, TFAN-based parallelogram prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|---|------------|-----------------|-----------------|---------------------|
| AXE_T_Tf_EG_VO_FO | TFAN with vertex and face ordering preservation, TFAN-based parallelogram prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |

with:

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|--|-------------|-----------------|-----------------|---------------------|
| axe | File with simple static mesh | 3DMCe | axe | Axe | axe |
| cottage | File with one big mesh | 3DMCe | cottage | Cottage | cottage |
| xplaneh | File with more static meshes and color | 3DMCe | xplaneh | xplaneh | xplaneh |
| basketball | File with static mesh and texture | 3DMCe | basketball | basketball | basketball |
| box | File with static mesh with texture | 3DMCe | box | Box | box |
| rabbit | File with bone-based animation and texture | 3DMCe, BBA | N/A | Rabbit | rabbit |
| eagle | File with bone-based animation and texture | 3DMCe, BBA | N/A | eagle | eagle |
| hero | File with more meshes and animation | 3DMCe, BBA | Hero | hero | hero |
| PI_troll | File with Position Interpolator animation and textures | 3DMCe, PI | PI_Troll | PI_Troll | PI_Troll |
| OI_rabbit | File with Orientation Interpolator animation and textures | 3DMCe, OI | OI_rabbit | OI_rabbit | OI_rabbit |
| CI_box | File with Coordinate Interpolator animation | 3DMCe, CI | CI_box | CI_box | CI_box |
| eagle-fb | File with frame-based animation | 3DMCe, FAMC | eagle-fb | eagle-fb | eagle-fb |
| shark-fb | File with frame-based animation | 3DMCe, FAMC | shark-fb | shark-fb | shark-fb |
| wolf-fb | File with frame-based animation | 3DMCe, FAMC | wolf-fb | wolf-fb | wolf-fb |
| dragon-fb | File with frame-based animation | 3DMCe, FAMC | dragon-fb | dragon-fb | dragon-fb |
| tablecloth-fb | File with frame-based animation | 3DMCe, FAMC | tablecloth-fb | tablecloth-fb | tablecloth-fb |
| AXE_Q_CD_EG | QBCR, circular prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|--|------------|-----------------|-----------------|---------------------|
| AXE_Q_CD_AC | QBCR, circular prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_CD_BP | QBCR, circular prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_CD_4C | QBCR, circular prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Ad_EG | QBCR, adaptive prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_Q_Ad_AC | QBCR, adaptive prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Ad_BP | QBCR, adaptive prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Ad_4C | QBCR, adaptive prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Xo_EG | QBCR, XOR prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Xo_AC | QBCR, XOR prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_Q_Xo_BP | QBCR, XOR prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Xo_4C | QBCR, XOR prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Di_EG | QBCR, differential prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_Q_Di_BP | QBCR, differential prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_Q_Di_4C | QBCR, differential prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_CD_EG | SVA, circular prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_CD_AC | SVA, circular prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_CD_BP | SVA, circular prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|---|------------|-----------------|-----------------|---------------------|
| AXE_S_CD_4C | SVA, circular prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Ad_EG | SVA, adaptive prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Ad_AC | SVA, adaptive prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Ad_BP | SVA, adaptive prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Ad_4C | SVA, adaptive prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Xo_EG | SVA, XOR prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Xo_AC | SVA, XOR prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Xo_BP | SVA, XOR prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Xo_4C | SVA, XOR prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Di_EG | SVA, differential prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Di_AC | SVA, differential prediction, Arithmetic coding | SC3DMC | N/A | N/A | axe |
| AXE_S_Di_BP | SVA, differential prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_S_Di_4C | SVA, differential prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_CD_EG | TFAN, circular prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_CD_AC | TFAN, circular prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_CD_BP | TFAN, circular prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_T_CD_4C | TFAN, circular prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |

| Name (for bitstream filename, add .mp4) | Attribute/Parameter | AFX codecs | X3D file (.x3d) | XMT file (.xmt) | COLLADA file (.dae) |
|---|--|------------|-----------------|-----------------|---------------------|
| AXE_T_Ad_EG | TFAN, adaptive prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Ad_AC | TFAN, adaptive prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Ad_BP | TFAN, adaptive prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Ad_4C | TFAN, adaptive prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | axe |
| AXE_T_Xo_EG | TFAN, XOR prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Xo_AC | TFAN, XOR prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Xo_BP | TFAN, XOR prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Xo_4C | TFAN, XOR prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Di_BP | TFAN, differential prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Di_4C | TFAN, differential prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_EG | TFAN, TFAN-based parallelogram prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_AC | TFAN, TFAN-based parallelogram prediction, Arithmetic coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_BP | TFAN, TFAN-based parallelogram prediction, Bit precision entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_4C | TFAN, TFAN-based parallelogram prediction, 4-bit entropy coding | SC3DMC | N/A | N/A | Axe |
| AXE_T_Tf_EG_VO | TFAN with vertex ordering preservation, TFAN-based parallelogram prediction, Exponential Golomb entropy coding | SC3DMC | N/A | N/A | Axe |

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