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AMENDMENT 1
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Information technology — Coding of audio-visual objects —

Part 4: Conformance testing

AMENDMENT 1: Conformance testing for MPEG-4

Technologies de l'information — Codage des objets audiovisuels —

Partie 4: Essai de conformité

AMENDEMENT 1: Essai de conformité pour MPEG-4

Reference number
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Amendment 1 to ISO/IEC 14496-4:2004 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 4: Conformance testing

AMENDMENT 1: Conformance testing for MPEG-4

Add the following text at the end of Clause 4.

4.8 Advanced Synchronization Model (FlexTime Model)

4.8.1 Bitstream conformance

4.8.1.1 Conformance Requirements

BIFS streams shall comply with the specifications of FlexTime nodes in Clause 9 of ISO/IEC 14496-1.

4.8.1.2 Measurement procedure

Syntax of the BIFS stream shall meet the requirements of FlexTime nodes in Clause 9 of ISO/IEC 14496-1.

4.8.1.3 Tolerance

There is no tolerance for bitstream syntax checking. The diagnosis is pass or fail.

4.8.2 Terminal conformance

4.8.2.1 Conformance Points

FlexTime conformance points are defined in the TemporalGroup node by the Temporal constraints "Co-End", "Meet" and "Co-Begin".

4.8.2.2 Measurement Procedure

The terminal shall produce formatted output each time a Temporal constraint is met. Typically, when a temporal constraint is met, certain objects end and certain objects begin. The output is to include:

- The time that the constraint was met, in seconds.
- The type of constraint that was met, i.e. "Co-End", "Meet" or "Co-Begin".
- A list of objects that end. For each ending object:
- The ES_ID.
- The minimum, optimum, and maximum duration.
- The actual duration.
- A list of objects that start. For each starting object:
- The ES_ID.
- The minimum, optimum, and maximum duration.

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4.8.2.3 Output Format

The output format is in XML. An example is:

```
<ConstraintMet time="4.7" constraint="Meet">

          <MediaEnded ES_ID="123" minDuration="6.0" optDuration="8.0"
          maxDuration="9.0" actDuration="8.5" \>

          <MediaStarted ES_ID="456" minDuration="4.0" optDuration="5.0"
          maxDuration="6.0" \>

</ConstraintMet>
```

4.8.2.4 Tolerance

The conformance is passed when the actual duration of an ending object falls in between the minimum and the maximum duration. If not, the test fails.

Add the following text at the end of Clause 5.

5.7 Normative test streams for Visual New Levels and Tools

5.7.1 Specification of the test bitstreams

5.7.1.1 Test Bitstreams — General

5.7.1.1.1 Test bitstream #A3GE-1

Specification: A bitstream with all slice and macroblock syntax transitions progressive and interlaced coded VOPs.

Functional stage: parser

Purpose: Check that decoder handles all scenarios in parsing tree.

5.7.1.1.2 Test bitstream #A3GE-2

Specification: A bitstream with many different combinations of values for top_field_first, intra_predictors_reset, alternate_scan, frame_pred_frame_dct, dct_precision, intra_dc_precision, q_scale_type, vop_fcode, dead_zone_disable, variable numbers of consecutive coded P-VOPs and coded I-VOPs with downloaded quantization weighting matrices. Ideally the bitstream should contain all possible legal combinations. Various syntax switches are toggled from VOP-to-VOP.

Functional stage: parser and control

Purpose: Check that decoder handle all scenarios.

5.7.1.1.3 Test bitstream #A3GE-3

Specification: All possible VLC's symbols and IDCT mismatch. Mismatch and saturation.

Functional stage: parser ; IDCT accuracy

Purpose: Test that decoders has included the complete VLC tables and implements mismatch control.

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5.7.1.1.4 Test bitstream #A3GE-4

Specification: Bitstream with only intra macroblocks using only the DC coefficient and predicted macroblocks having no DCT coefficients. Reconstructed motion vectors used for predicting both luminance and chrominance have all possible combinations of half-sample and full-sample values, both for the horizontal and the vertical coordinates, and all those combinations are used for each prediction mode in both progressive and interlaced coded VOPs.

Functional stage: MCP

Purpose: Check that decoder implements motion compensation stages with full accuracy in all cases. Except for reconstruction of Intra DC blocks, the test does not involve other decoder functions such as IDCT, inverse quantization and mismatch control. When a static decoder test is performed using the static test technique described in this document, the decoder under test shall reconstruct samples identical to those reconstructed by a reference decoder for all predicted macroblocks.

5.7.1.1.5 Test bitstream #A3GE-5

Specification: A bitstream implementing a test close to the IEEE 1180 IDCT mismatch test, to test the decoder's IDCT statistical accuracy. Can be done using I-VOPs with a flat custom quantization matrix with all 16, and a quantizer value of 1. Use whatever number of VOPs are required to satisfy statistic count. Note that because of saturation in [0, 255], the test cannot emulate exactly the IEEE 1180 IDCT test.

Functional stage: IDCT

Purpose: Check IDCT decoder accuracy. This is not a drift test since all macroblocks are of type Intra.

5.7.1.1.6 Test bitstream #A3GE-6

Specification: Bitstream causing maximum saturation of the inverse quantization by creating the greatest amplitude combinations of macroblock quantization (quantizer value 31), visual weighting matrix (value 2^n), and DCT coefficient (value -2^{n+3} or 2^{n+3}), where n is the maximum allowed number of bits per pixel for the profile-and-level combination.

Functional stage: inverse quantization

Purpose: Test that decoder implements properly the saturation of the inverse quantization (before the mismatch control).

5.7.1.1.7 Test bitstream #A3GE-7

Specification: Bitstream causing large positive sample domain coefficients f[y][x] (e.g., 2^n-1) added to large predicted values p[y][x] (e.g., 2^n-1), or large negative sample domain coefficients f[y][x] (e.g., -2^n) added to small predicted values p[y][x] (e.g., 0).

Functional stage: addition of the output of IDCT f[y][x] to the predicted values p[y][x] and saturation of the result to the range [0, 2^n-1].

Purpose: Test that decoder implements properly the addition of the output of IDCT f[y][x] to the predicted values p[y][x] and saturation of the result to the range [0, 2^n-1].

5.7.1.1.8 Test bitstream #A3GE-8

Specification: A bitstream with I-, P-VOPs, with motion vectors that are as large as permitted by the profile-and-level combination.

Functional stage: reconstruction of motion vectors, MCP, control

Purpose: Check that decoder implements motion compensation properly when motion vectors are very large.

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5.7.1.1.9 Test bitstream #A3GE-9

Specification: A bitstream with quantizer matrices (intra and non-intra, and if permitted, chroma matrices too). Matrices are not symmetrical (e.g., matrix coefficients are random numbers in the range [1, 2^n]). If permitted, use of both scanning orders.

Functional stage: quantizer matrix download, matrix scanning.

Purpose: Check that decoder can download properly quantizer matrices and that it uses of correct scanning of the matrices (i.e. not transposed).

5.7.1.1.10 Test bitstream #A3GE-10

Specification: A bitstream in which the output of the non-saturated integer number mathematical IDCT f ' (x, y), as defined in Annex A of ISO/IEC 14496-2, has large absolute values but values within the range [-2^n-2^{n-1}, 2^n+2^{n-1}−1] for each coded block, where n is the maximum allowed number of bits per pixel for the profile-and-level combination.

Functional stage: IDCT

Purpose: Check that IDCT decoder accuracy meets the requirements defined in Annex A of ISO/IEC 14496-2. The peak error for a compliant decoder shall be less or equal to than 2 when decoding this bitstream. Note that for blocks where f ' (x, y) has values within the range [−300, 300], decoders that have a peak error larger than 1 may not be compliant with the IEEE 1180 IDCT specification.

5.7.1.1.11 Test bitstream #A3GE-11

Specification: A bitstream with all macroblocks coded as the DPCM macroblock.

Functional stage: DPCM macroblock.

Purpose: Check that decoder implements the DPCM macroblock coding. When a static decoder test is performed using the static test technique described in this document, the decoder under test shall reconstruct samples identical to those reconstructed by the reference decoder for all DPCM macroblocks.

5.7.1.2 Test Bitstreams - Shape coding

Test bitstreams for shape coding in ISO/IEC 14496-4/Amd.3 do not belong to any class defined in 5.5.3.2 of ISO/IEC 14496-4.

5.7.1.2.1 Test Bitstream #A3SH-1

Specification: A series of consecutive I -VOP with all macroblocks lying on the boundary and coded using the HHC. The bitstream is designed such as to use ideally possible combinations of the HHC syntax and the VLC entries. This bitstream contains both binary shape and texture information.

Functional stage: HHC

Purpose: Check that decoder process the HHC.

5.7.1.2.2 Test Bitstream #A3SH-2

Specification: A series of consecutive I- and P-VOP with all macroblocks lying on the boundary and coded using shape MVs of non-zero. The bitstream is designed such as to use all entries of the VLC table for shape MV decoding.. This bitstream contains both binary shape and texture information.

Functional stage: shape MC, padding

Purpose: Check that decoder process the shape MC and padding for motion compensation correctly.

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5.7.1.3 Test Bitstreams - Sprite coding

Test bitstreams for sprite coding in ISO/IEC 14496-4/Amd.3 do not belong to any class defined in 5.5.3.7 of ISO/IEC 14496-4.

5.7.1.3.1 Test bitstream #A3SP-1

Specification: studio sprite, perspective warping (no_of_sprite_warping_points == 4), 1/16 pixel accuracy(sprite_warping_accuracy == "1/16 pixel"), sprite_defocusing

Functional stage: warping, pixel value interpolation, sprite defocusing

Purpose: check warping, pixel value interpolation, sprite defocusing function

5.7.2 Normative Test Suites for Simple Studio Profile and Core Studio Profile

NOTE Each row represents a single bitstream. A single bitstream is prepared independently of level for static test, while a single bitstream is prepared for each level @ a profile for dynamic test.

Categories	Bitstream	Donated by	Bitstream Name	Simple Studio				Core Studio			
				L1	L2	L3	L4	L1	L2	L3	L4
General	A3GE-1	Sony	vcon-stp1L1.bits					S			
	A3GE-2	Sony	vcon-stp2L1.bits					S			
	A3GE-3	Sony	vcon-stp3L1.bits					S			
	A3GE-4	Sony	vcon-stp4L1.bits					S			
	A3GE-5	Sony	vcon-stp5L1.bits					S			
	A3GE-6	Sony	vcon-stp6L1.bits					S			
	A3GE-7	Sony	vcon-stp7L1.bits					S			
	A3GE-8	Sony	vcon-stp8L1.bits					S			
	A3GE-9	Sony	vcon-stp9L1.bits					S			
	A3GE-10	Sony	vcon-stp10L1.bits					S			
	A3GE-11	Sony	vcon-stp11L1.bits					S			
Shape	A3SH-1	NHK	vcon-stpsh1L1.bits	S							
	A3SH-2	NHK	vcon-stpsh2L1.bits					S			
Sprite	A3SP-1	NHK	vcon-stpsp1L1.bits					S			

5.8 Normative sequences for Streaming Video Profile

5.8.1 Specification of the test bitstreams

5.8.1.1 Test Bitstreams – General

As the bitstreams related to Simple Profile Level 0 and Advanced Simple Profile only invoke tools already defined in ISO/IEC 14496-2, reference is made to bitstream definitions given in 5.5 and 5.6 of ISO/IEC 14496-4.

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5.8.1.2 Test Bitstreams – FGS tools

5.8.1.2.1 Test bitstream #A3FGS-1

Specification: FGS VOL only header bitstream.

Functional stage: FGS parser for the header

Purpose: Header only (VOL-header only)

5.8.1.2.2 Test bitstream #A3FGS-2

Specification: FGS VOL and VOP only header bitstream.

Functional stage: FGS parser for the header

Purpose: Header only (VOL+VOP-headers only)

5.8.1.2.3 Test bitstream #A3FGS-3

Specification: All possible VLC's symbols and IDCT mismatch. Mismatch and saturation.

Number of MB/s is the maximum allowed by the level definition.

Functional stage: CBP VLCs

Purpose: Check all possible entries of VLC tables

5.8.1.2.4 Test bitstream #A3FGS-4

Specification: All possible VLC's symbols for all bit-plane shifting combinations.

Number of MB/s is the maximum allowed by the level definition.

Functional stage: BP frequency weighting and BP VLCs

Purpose: Check all BP frequency weighting shiftings possible and all possible entries of VLC tables

5.8.1.2.5 Test bitstream #A3FGS-5

Specification: A bitstream containing all various selective enhancement shifting factors for all macroblocks.

Functional stage: BP selective enhancement

Purpose: Check all BP selective enhancement shiftings possible

5.8.1.2.6 Test bitstream #A3FGS-6

Specification: A bitstream containing the maximum number of selective enhancement shifting factor and maximum

frequency weighting for all DCT coefficients

Functional stage: frequency weighting and selective enhancement

Purpose: Check the range for maximum DCT coefficients combined with Maximum shifting (FW+SE), i.e. range test

5.8.1.2.7 Test bitstream #A3FGS-7

Specification: A bitstream with the maximum number of error resilience markers.

Functional stage: Error Resilience tools

Purpose: Check Resync markers

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5.8.1.2.8 Test bitstream #A3FGS-8

Specification: A bitstream that enforces post-clipping for the maximum number of pixels.

Functional stage: Post-clipping

Purpose: check correct clipping of values

5.8.1.2.9 Test bitstream #A3FGS-9

Specification: A bitstream for which all interlaced tools and FGS are combined to provide an interlaced output.

Functional stage: Interlaced (only for L4&5)

Purpose: Test interlaced tools in conjunction with FGS-tools

5.8.1.2.10 Test bitstream #A3FGS-10

Specification: FGST VOL only header bitstream.

Functional stage: FGS parser for the header for FGST-VOPs

Purpose: Header only (VOL-header only)

5.8.1.2.11 Test bitstream #A3FGS-11

Specification: FGST VOL and VOP only header bitstream.

Functional stage: FGS parser for the header for FGST-VOPs

Purpose: Header only (VOL+VOP-headers only)

5.8.1.2.12 Test bitstream #A3FGS-12

Specification: A bitstream implementing a test close to the IEEE 1180 IDCT mismatch test, to test the decoder's

IDCT statistical accuracy. Use whatever number of VOPs are required to satisfy statistic count.

Note that because of saturation in [0, 255], the test cannot emulate exactly the IEEE 1180 IDCT test.

Functional stage: IDCT for FGST-VOPs

5.8.1.2.13 Test bitstream #A3FGS-13

Specification: A bitstream implementing a test close to the IEEE 1180 IDCT mismatch test, to test the decoder's

IDCT statistical accuracy. Use whatever number of VOPs are required to satisfy statistic count.

Note that because of saturation in [0, 255], the test cannot emulate exactly the IEEE 1180 IDCT test.

Functional stage: IDCT for FGST-VOPs

5.8.1.2.14 Test bitstream #A3FGS-14

Specification: A bitstream with all motion vectors types (forward, backward, bi-directional) at half-sample accuracy.

Functional stage: MC-FGS

Purpose: Test all MV-types with P (forward and backward) and B-VOPs

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5.8.1.2.15 Test bitstream #A3FGS-15

Specification: A bitstream with all motion vectors types (forward, backward, bi-directional) at half-sample accuracy and predictions

From various fields for interlaced.

Functional stage: MC_FGS

Purpose: test all MV-types with P (forward and backward) and B-VOPs or interlaced

5.8.1.2.16 Test bitstream #A3FGS-16

Specification: FGST VOL and VOP only header bitstream.

Functional stage: Header parser

Purpose: Test the syntax for FGS_FGST

5.8.1.2.17 Test bitstream #A3FGS-17

Functional stage: 2 layer - base+FGS: bitstream with long VLCs without escape-code and 4 complete bit-plane case; number of objects, number of MB/s and bitrate are the maximum allowed for the profile-and-level combination; specific conditions for tools: maximum switching of selective enhancement affecting 4 bit planes, frequency weighting affecting 4 bit planes, maximum number of resync markers, interlace in levels 4 and 5

Functional stage: overall

Purpose: stretch tests for FGS bitstreams

5.8.1.2.18 Test bitstream #A3FGS-18

Specification: 3-layer - base+FGS+FGST: conditions for FGS and FGST as above, plus for FGST: As many half-sample components as possible in both the horizontal and vertical directions (such that both luminance and chrominance blocks are half-pel compensated). Maximize number of bi-directional prediction blocks required to reconstruct a macroblock, direct mode switched on.

Functional stage: overall

Purpose: stretch tests for FGST bitstreams

5.8.2 Normative Test Suites for Simple Profile Level 0, Advanced Simple Profile and FGS Profile

NOTE Each row represents a single bitstream. A single bitstream is prepared independently of level for static test, while a single bitstream is prepared for each level @ a profile for dynamic test.

Legend:
S – Bitstream is intended for functional test
D – Bitstream is intended for dynamic test
X – Bitstream is for functional and dynamic test

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Categories	Bitstream	Donated by	Bitstream Name	Profile Name												
				Simple	Advanced Simple						FGS					
				L0	L0	L1	L2	L3	L4	L5	L0	L1	L2	L3	L4	L5
General	GE-3	GI	vcon-ge3.cmp						S							
	GE-13	Siemens	vcon-ge13-L0.bits	S												
	GE-13	Mitsubishi	vcon-ge13-L0.bits		S											
	GE-13	Mitsubishi	vcon-ge13-L1.bits			S										
	GE-13	Mitsubishi	vcon-ge13-L2.bits				S									
	GE-13	Mitsubishi	vcon-ge13-L3.bits					S								
	GE-13	Mitsubishi	vcon-ge13-L4.bits						S							
	GE-13	Mitsubishi	vcon-ge13-L5.bits							S						
	GE-16	Siemens	vcon-ge16-L0.bits	S												
	GE-16	Mitsubishi	vcon-ge16-L0.bits		S											
	GE-16	Mitsubishi	vcon-ge16-L1.bits			S										
	GE-16	Mitsubishi	vcon-ge16-L2.bits				S									
	GE-16	Mitsubishi	vcon-ge16-L3.bits					S								
	GE-16	Mitsubishi	vcon-ge16-L4.bits						S							
	GE-16	Mitsubishi	vcon-ge16-L5.bits							S						
	GE-18	GI	vcon-ge18.cmp					S								
	GE-24	GI	vcon-ge24.cmp					S								
	GE-25	GI	vcon-ge25.cmp					S								
	er-2-1	Siemens	Vcon-er2-1.cmp	S												
	er-2-1	Toshiba	Vcon-er2-1.cmp		S											
	er-3-1	Siemens	Vcon-er3-1.cmp	S												
	er-3-1	Toshiba	Vcon-er3-1.cmp		S											
	A1GE-1	Bosch	vcon_a1ge_1_ace_l4.bits						X							
	A1GE-1	Bosch	vcon_a1ge_1_ace_l5.bits							X						
	A1GE-2	Univ. Hann.	a1ge-2_ace_l4.bits						X							
	A1GE-2	Univ. Hann.	a1ge-2_ace_l5.bits							X						
	A1GE-3	Hitachi	vcon-asp3L4.bits						X							
	A1GE-3	Hitachi	vcon-asp3L5.bits							X						
	A1GE-4	Univ. Hann.	a1ge-4_ace.bits		S											
	A1GE-5	Hitachi	vcon-asp5L0.bits		S											
	A1GE-6	Hitachi	vcon-asp6L0.bits		S											
	A1GE-7	Hitachi	vcon-asp7L0.bits		S											
	A1GE-8	Hitachi	vcon-asp8L0.bits		S											
	A1GE-9	Univ. Hann.	a1ge-9_ace_l0.bits		X											

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Categories	Bitstream	Donated by	Bitstream Name	Profile Name												
				Simple	Advanced Simple						FGS					
	A1GE-9	Univ. Hann.	a1ge-9_ace_l1.bits			X										
	A1GE-9	Univ. Hann.	a1ge-9_ace_l2.bits				X									
	A1GE-9	Univ. Hann.	a1ge-9_ace_l3.bits					X								
	A1GE-9	Univ. Hann.	a1ge-9_ace_l4.bits						X							
	A1GE-9	Univ. Hann.	a1ge-9_ace_l5.bits							X						
	A1GE-10	Bosch	vcon_a1ge_10_ace_l0.bits		X											
	A1GE-10	Bosch	vcon_a1ge_10_ace_l1.bits			X										
	A1GE-10	Bosch	vcon_a1ge_10_ace_l2.bits				X									
	A1GE-10	Bosch	vcon_a1ge_10_ace_l3.bits					X								
	A1GE-11	Hitachi	vcon-asp11L0.bits		X											
	A1GE-11	Hitachi	vcon-asp11L1.bits			X										
	A1GE-11	Hitachi	vcon-asp11L2.bits				X									
	A1GE-11	Hitachi	vcon-asp11L3.bits					X								
	A1GE-12	Univ. Hann.	a1ge-12_ace_l0.bits		X											
	A1GE-12	Univ. Hann.	a1ge-12_ace_l1.bits			X										
	A1GE-12	Univ. Hann.	a1ge-12_ace_l2.bits				X									
	A1GE-12	Univ. Hann.	a1ge-12_ace_l3.bits					X								
	A1GE-13	Bosch	vcon_a1ge_13_ace_l0.bits		X											
	A1GE-13	Bosch	vcon_a1ge_13_ace_l1.bits			X										
	A1GE-13	Bosch	vcon_a1ge_13_ace_l2.bits				X									
	A1GE-13	Bosch	vcon_a1ge_13_ace_l3.bits					X								
	A1GE-13	Bosch	vcon_a1ge_13_ace_l4.bits						X							
	A1GE-13	Bosch	vcon_a1ge_13_ace_l5.bits							X						
	A1GE-14	Hitachi	vcon-asp14L0.bits		S											
	A1GE-14	Hitachi	vcon-asp14L1.bits			S										
	A1GE-14	Hitachi	vcon-asp14L4.bits						S							
FGS	A3FGS-1	Webcast	a3fgs-1.cmp								S					
	A3FGS-2	Webcast	a3fgs-2.cmp								S					
	A3FGS-3	Webcast	a3fgs-3.cmp								S					
	A3FGS-4	Webcast	a3fgs-4.cmp								S					
	A3FGS-5	Philips	a3fgs-5.cmp								S					
	A3FGS-6	Intel	a3fgs-6.cmp								S					
	A3FGS-7	Microsoft	a3fgs-7.cmp								S					
	A3FGS-8	Intel	a3fgs-8.cmp								S					
	A3FGS-9	Webcast	a3fgs-9.cmp												S	

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Categories	Bitstream	Donated by	Bitstream Name	Profile Name												
				Simple	Advanced Simple						FGS					
	A3FGS-10	Webcast	a3fgs-10.cmp								S					
	A3FGS-11	Webcast	a3fgs-11.cmp								S					
	A3FGS-12	Philips	a3fgs-12.cmp								S					
	A3FGS-13	Intel	a3fgs-13.cmp								S					
	A3FGS-14	Philips	a3fgs-14.cmp								S					
	A3FGS-15	Philips	a3fgs-15.cmp												S	
	A3FGS-16	Philips	a3fgs-16.cmp								S					
	A3FGS-17	ETRI	a3fgs-17-L0.cmp								X					
	A3FGS-17	ETRI	a3fgs-17-L1.cmp									X				
	A3FGS-17	ETRI	a3fgs-17-L2.cmp										X			
	A3FGS-17	ETRI	a3fgs-17-L3.cmp											X		
	A3FGS-17	ETRI	a3fgs-17-L4.cmp												X	
	A3FGS-17	ETRI	a3fgs-17-L5.cmp													X
	A3FGS-18	ETRI	a3fgs-18-L0.cmp								X					
	A3FGS-18	ETRI	a3fgs-18-L1.cmp									X				
	A3FGS-18	ETRI	a3fgs-18-L2.cmp										X			
	A3FGS-18	ETRI	a3fgs-18-L3.cmp											X		
	A3FGS-18	ETRI	a3fgs-18-L4.cmp												X	
	A3FGS-18	ETRI	a3fgs-18-L5.cmp													X

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