

**WBU-ISOG
MPEG-4 (H.264) CONTRIBUTION
HD CODEC
INTEROPERABILITY PROGRAM
AND
TEST RESULTS
SECOND ROUND**

WBU-ISOG
Zagreb, Croatia
October 24-25, 2011
Tom Gibbon for NHK
Chair
MPEG-4 HD CODEC
INTEROPERABILITY PROGRAM

BASIC ELEMENTS OF WBU-ISOG MPEG-4 HD CODEC INTEROPERABILITY PROGRAM

1. Sponsorship by WBU-ISOG
2. Formal Participation Agreements Signed by Vendors
3. Payment of Test Fees By Vendor to Test Contractor - \$8,000
4. Appointment of Telesat as Test Contractor
5. Test Tapes and Transport Stream parameters provided by WBU-ISOG

BASIC ELEMENTS OF WBU-ISOG MPEG-4 HD CODEC INTEROPERABILITY PROGRAM (cont.)

6. Transport Streams created by Vendors and uploaded to Telesat server
7. Transport Streams downloaded by Vendors for informal tests by Vendors
8. Formal Tests conducted by Telesat
9. Publish Results of Tests on WBU-ISOG website

HISTORY

October 22-23, 2007 – WBU-ISOG decides at its semi-annual meeting in Dubrovnik to sponsor MPEG-4 Interoperability Tests. Tom Gibbon for NHK appointed as Chair.

June, 2009 – Round 1 Formal Tests at Telesat

October, 2009 – Round 1 Formal Test Results Published by WBU-ISOG.

December, 2009 – WBU-ISOG decided to sponsor Round 2 of MPEG-4 tests.

HISTORY (cont.)

April, 2010 – Telesat appointed as Test Contractor and invitations sent to vendors.

May, 2011 – Tests postponed

October 3-7, 2011 – Tests at Telesat.

MPEG-4 PARTICIPATING VENDORS

6 Vendors

1. ADTEC Digital
2. ATEME
3. Ericsson Television Inc.
4. Harris Broadcast
5. International Datacasting
6. NTT Electronics Corporation

TEST PARAMETERS SUMMARY

1. Tests were conducted only for high definition formats.
2. Tests were conducted using bit rates at 38 Mbps high quality contribution (e.g., major events, potential concatenation), at 20 Mbps medium quality contribution and 10.3 Mbps SNG.
3. Tests at 4:2:2 and 4:2:0
4. Tests with four Video Formats:
 - 1080i/59.94
 - 1080i/50
 - 720p/59.9
 - 720p/50

TEST PARAMETERS SUMMARY (cont.)

5. Tests with Four Audio Formats:

- 4 Ch. Audio MPEG-2 (MPEG 1 Layer 2)
- Dolby E 20 bit mode 8 Ch. (SMPTE 302 M 2002)
- 4 & 8 Ch. PCM (SMPTE 302 M 2002)
- AAC

6. Latency was tested. If Latency is too extreme for a particular vendor decoder, the decoder may not be interoperable because it cannot effectively be used.

7. Lip Sync

8. Carrier ID

DETAILS OF TEST PARAMETERS

- Video Formats:
 - 1080i/59.94
 - 1080i/50
 - 720p/59.94
 - 720p/50
- Transport Stream Bit Rates:
 - High Quality: 38 Mbps
 - Medium Quality: 20 Mbps
 - SNG: 10.3 Mbps
- Chroma:
 - High Quality: 4:2:2 (Hi 422 @L4 10 bit, 8 bit)
 - Medium Quality: 4:2:2 (Hi 422@L4 10 bit, 8 bit)
 - SNG: 4:2:0 (HiP@L4 8 bit)

DETAILS OF TEST PARAMETERS (cont.)

- or if 4:2:2 not supported:

High Quality: 4:2:0 (HiP @ L4 8 bit)

Medium Quality: 4:2:0 (HiP @ L4 8 bit)

- Coding Structure/GOP:

High Quality: Mfg's choice for high quality

Medium Quality: Mfg's choice for medium quality

SNG: Mfg's choice for SNG quality

Ultra Low Latency: Mfg's choice for lowest latency with medium quality.

DETAILS OF TEST PARAMETERS (cont.)

- Audio Format:
 - MPEG-2 4 Ch. Audio, (MPEG 1 Layer 2)
 - Dolby E 20 bit mode, 8 Channel (SMPTE 302 M 2002)
 - PCM – 4 Channel and 8 Channel (SMPTE 302 M 2002)
 - AAC – MPEG2 AAC-LC, audio synchronized to video, sample rate 48Khz
 - 4 channels @ 96Kb/channel
- Lip Sync:
 - Test all audio formats
- Latency:
 - High Quality - Standard latency
 - Medium Quality - Standard latency
 - Ultra Low latency
 - SNG - Low Latency

DETAILS OF TEST PARAMETERS (cont.)

- Resolution:

All tests were done at full resolution:

1920 (1080 line) h pixels

1280 (720 line) h pixels

- Carrier Identification:

Encoding equipment capable of carrier ID (CID) was enabled.

CHANGES TO TEST PARAMETERS

- Add test for pass-through of carrier ID
- Add test for 10-bit 4:2:2
- Remove GOP specification of transport streams – vendor choice
- Add test for 8-channel PCM for 38 mbps
- Add test for Ultra Low Delay Mode
- Reduce number of transport streams from 28 to 22

TRANSPORT STREAMS AND TESTS

- Up to 22 Transport Streams To Be Provided by Each Vendor
- 6 Encoders
- 132 Potential Transport Streams To Be Tested
- 6 Decoders
- 580 Video Tests
- 112 Audio Tests
- 121 Transport Streams were submitted in total

TEST PROCEDURES

1. Video Tests

- Uploaded ASI streams used for tests
(onsite encoders used only if technical problems arise)
- Pass/fail
(previous tests required expert viewers and ratings)
- TS sent to all 6 decoders simultaneously
- Decoder stations have 24" HD 1920x1080
(60Hz/50Hz monitors)
- Pass/fail assessment done directly at decoder station
- If video present (pass) but impairment is visible, impairment reported and video patched for larger 42" display for closer scrutiny

TEST PROCEDURES (cont.)

2. Audio Tests

- Uploaded ASI streams used for tests
(onsite encoders used only if technical problems arise)
- Pass/fail
- TS sent to all 6 decoders simultaneously
- Assessments done at central audio station
- Tests performed with one representative TS in each available audio encoded format (MPEG-2 4 Ch; AAC 4 Ch; PCM 2 Ch+; Dolby E 8 Ch)
- 1 Vendor did not support Dolby E

TEST PROCEDURES (cont.)

3. Latency Test

- Live test using on-site encoders and decoders
- Performed at 1080i/59.94 and 720p/59.94
- Tests at 38 Mbps (high quality) with standard latency
- Tests at 20 Mbps (medium quality) with standard latency
- Tests at 20 Mbps (medium quality) with lowest possible latency
- Tests at 10.3 Mbps (SNG quality) with low latency setting

TEST PROCEDURES (cont.)

4. Short Term Lip Sync

- Uploaded ASI streams used for tests
(onsite encoders to be used only if technical problems arise)
- Maximum 5 minute duration using 30 second Vistek loop
- 5 minutes reduced if tests show no significant drift
- Tests at 1080i/60Hz and 720p/50Hz for MPEG2
- Tests at 720p/60Hz for PCM, AAC, Dolby E
- Using representative TS

INTEROPERABILITY RESULTS

UNSUPPORTED PARAMETERS

- 4 vendors did not support 4:2:2 10 bit
- 2 vendors did not support 4:2:2 8 bit
- 1 vendor did not support Dolby E and PCM
- 2 vendors did not support AAC

INTEROPERABILITY VIDEO RESULTS

- 588 Tests
- 581 Unconditional Pass
- 98% Unconditional Pass Rate
(2009 Tests – 83%)
- 5 of 7 failures due to a single decoder
- 4 of 7 failures in Lowest Latency Transport stream
- 4 of 6 vendors had zero failures

INTEROPERABILITY AUDIO TEST RESULTS

- MPEG-2
 - 36 Tests
 - 35 Unconditional Pass
 - 1 failure
 - 97% (2009 Tests – 91%)

- Dolby E
 - 30 Tests
 - 29 Unconditional Pass
 - 1 failure with decoded Transport Stream
 - 97% (2009 Tests – 78%)

INTEROPERABILITY AUDIO TEST RESULTS (cont.)

- PCM
 - 30 Tests
 - 25 pass
 - 5 failures with single vendor decoder
 - 83% (2009 Tests – 83%)

- AAC
 - 16 tests
 - 16 pass
 - 100% (2009 Tests – 88%)

INTEROPERABILITY LIP SYNC RESULTS

- No Pass/Fail
- Vendor decoder lip sync adjustments set to zero.
- Positive value indicates audio lags video (milliseconds)
- Negative value indicates audio leads video (milliseconds)
- Generally acceptable (with ranges varying with video type and audio type).
- 1 Vendor decoder not available for large number of measurements.
- Results varied significantly among vendors.

INTEROPERABILITY LATENCY RESULTS

- NO PASS FAIL
- CLEAR THAT SOME ENCODERS PRESENTED CONSISTENTLY LONGER LATENCY PERIODS
- CLEAR THAT SOME DECODERS PRESENTED CONSISTENTLY LONGER LATENCY PERIODS

CARRIER IDENTIFICATION RESULTS

- June 4th, 2008 specification drawn up on WBU-ISOG initiative
- November 18th, 2009 – The Satellite Users Interference Reduction Group (SUIRG), completed the specification for the Carrier ID format for all video transmissions, whether fixed or transportable.
- WBU-ISOG endorsed this final specification and encourages broad industry adoption of this non-proprietary practice.
- 2 of the 6 Vendors had a compliant CID (33% pass rate)
- Non-compliant vendors advised they would adopt CID if;
 - Issued as part of an existing standard (example: ETSI - DVB)
 - Adopted by the majority of vendors
 - Requested by major clients