**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION**

**ORGANISATION INTERNATIONALE DE NORMALISATION**

**ISO/IEC JTC 1/SC 29/AG 5**

**MPEG VISUAL QUALITY ASSESSMENT**

**ISO/IEC JTC 1/SC 29/AG 5 N167**

**July 2025, Daejeon, KR**

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| **Title** | **Corrigendum to test plan for assessing MPEG multilayer video coding technology** |
| **Source** | **P. de Lagrange, InterDigital** |
| **Status** | **Approved** |
| **S/N** | **25450** |

# Corrigendum

This document is a corrigendum of document AG5N160 [1], where Table 2 did not reflect the intention because of an editorial issue (reordering of test sequence names). This document is a consolidated version of the test plan, identical to AG5N160 except for:

* correction of Table 2 to list the base layer QP values that were agreed (after adoption of m72639 [2]) and used in the test.
* correction of the numbering and reference of Table 3

1. ISO/IEC JTC 1/SC 29/AG 5, “Test plan for assessing MPEG multilayer video coding technology,” Doc. AG5N160, 19th meeting, online, Mar 2025.
2. P. de Lagrange, “[AHG ML] Adjusted base layer QPs,” doc. m72639, AG 5, online, Mar 2025.

# Introduction

This purpose of this test is to demonstrate MPEG multilayer video coding technology performance and functionality.

More specifically, LCEVC, VVC multi-layer profile, and SHVC are tested, in a 2x spatial scalability configuration.

The test aims at highlight preferable operation points for each technology. This can include tradeoffs or considerations of performance, complexity, bitrate, rate allocation across layers.

It is noted that reference software implementations for HEVC, VVC and LCEVC standards are used in this test, with settings that do not enable all the tools supported by each of the standards. It is expected that the performance of HEVC, VVC and LCEVC encoders can be improved in other implementations. Post-processing, disabled in this test, may be applied to each of the outputs, which can improve visual quality of the output for each of the standards. Multi-pass, different bitrate allocation, or otherwise optimized encoding, which is not part of this test, can also improve performance for each of the standards.

# Test coordination

The coordinator of the test is the convenor of AG 5.

# Test sites

Test sites should be capable of conducting formal subjective assessments of UHD video content in accordance with ITU-R BT.500-15 [1], following the DCR test method.

Test sites are RWTH Aachen University and VABTech.

# Test description

AG 5 was tasked to test videos coded at “good” to “very good” quality, for HDR and SDR content, coded with VVC, HEVC, and LCEVC. For each standard, the corresponding reference software implementation and random access (RA) configuration is used for performing the test.

The test configuration applies 2x spatial scalability with:

* two layers for VVC Multi-Layer profile
* LCEVC combined with a VVC base layer
* SHVC combined with a VVC base layer

The resolution of the tested content is HD (base layer) + UHD (enhancement layer). The base layer is intended to be common to all enhancement layers (EL). An upsampled version of the base layer (upsampled from HD to UHD) is included as a test point.

The quality of the base layer is chosen to be in the range of MOS 6 to 7 on the 11-grade scale (high quality yet allowing sufficient headroom to see the enhancement). The purpose of this test is to evaluate how various enhancement layers (obtained with the tested standards) allow to visually improve the base layer coded at this quality and understand the behavior of the tested standards in different conditions.

Two test cases are considered:

* 50% of EL corresponds to a simplified use case of quality scalability, where significant improvement is expected as in e.g. adaptive streaming, with a focus on coding efficiency. The goal of such layered coding is to save space in cache storage. The 50% ratio was similarly used in the SHVC Verification Tests. The bitrate ratio also resembles a scenario indicated by ATSC in their liaison letter sent to MPEG [3].
* 10% of EL corresponds to a use case of lightweight enhancement of an existing bitstream, providing improved visual quality of the content at moderate cost. Such ratio was, for example, tested by SBTVD for LCEVC when combined with VVC [4].

Current test scenario includes SDR, HDR PQ and HRD HLG test sequences, and thereby constitutes a scenario different from previous verification tests. The test focuses on settings where the enhancement layer makes a significant difference. Settings relevant for adaptive resolution (when the upsampled base layer would be better than full-resolution coding at the same bitrate) are not part of this test.

# Test sequences

The test sequences are UHD resolution, covering various frame rates and dynamic range (SDR, HDR HLG and HDR PQ). Due to specificities of spatial scalability, the test sequences have been selected to exhibit a sufficient amount of detail, such that the difference between UHD and upsampled HD version is clear, leaving room for improvement by an enhancement layer.

Table 1 contains the list of test sequences. The md5sum of the corresponding YUV file is indicated for each sequence.

Table 1 – Test sequences

|  |  |  |  |
| --- | --- | --- | --- |
| **Test sequence & format** | **Thumbnail** | **Test sequence & format** | **Thumbnail** |
| BodeMuseum  3840×2160, 60fps, 600 frames  SDR, BT.2020 color  f2b01ec32bd014ecc17cc0db069cb734 | A building with a dome on the side of it  AI-generated content may be incorrect. | Metro  3840×2160, 60fps, 600 frames  SDR, BT.709 color  ed4ac35cd1d659a3bf8cd846f5be0efc | People walking in a building  AI-generated content may be incorrect. |
| OberbaumSpree  3840×2160, 60fps, 600 frames  SDR, BT.2020 color  a5200ad0aee110ed6bd3c560edd96198 | A city next to a body of water  AI-generated content may be incorrect. | SubwayTree  3840×2160, 60fps, 600 frames  SDR, BT.2020 color  fc6a517ab5ce9ec0e28dd1c770c51fc8 | A bridge with a railing  AI-generated content may be incorrect. |
| WaterFront  3840×2160, 24fps, 240 frames  SDR, BT.709 color  1297ba70dea887e8138bbb2119581ebc | A small town near a body of water  AI-generated content may be incorrect. | FootballLargeAdvert  3840×2160, 60fps, 600 frames  HLG, BT.2020 color  cbb3532a286f568c0b0a32f6986c969e | A crowd of people in a stadium  AI-generated content may be incorrect. |
| H3-AMS01  3840×2160, 60fps, 600 frames  HLG, BT.2020 color  02be2d01e46a4d2316fc0e951f94f742 | A group of buses in a city  AI-generated content may be incorrect. | H3-AMS02  3840×2160, 60fps, 600 frames  HLG, BT.2020 color  d701f761b1f44a687fc51eb8c0ab9fbe | A boat on a river  AI-generated content may be incorrect. |
| H3-AMS05  3840×2160, 60fps, 600 frames  HLG, BT.2020 color  bd26ce99ea7da819d56a1a562e8e48df | A row of buildings next to a canal  AI-generated content may be incorrect. | WomenFootball  3840×2160, 50fps, 500 frames  HLG, BT.2020 color  71cc16a0f97a124b8f64de9aafed0c04 | A group of people playing football  AI-generated content may be incorrect. |
| GreenMountains1  3840×2160, 25fps, 250 frames  PQ, BT.2020 color  8e315d6d6a8d6891330008cc84807b0c | A high angle view of a mountain  AI-generated content may be incorrect. | KitchenDressin  3840×2160, 60fps, 600 frames  PQ, BT.2020 color  eefaabe95d4bff35c222973d4407990e | A person sitting in a kitchen  AI-generated content may be incorrect. |
| RiverPlate1  3840×2160, 60fps, 600 frames  PQ, BT.2020 color  0d95e0c1d4c559abfb9c56b44f71a5d3 | A group of logos on a wall  AI-generated content may be incorrect. | TiergartenParkway  3840×2160, 60fps, 600 frames  PQ, BT.2020 color  410e5bb4900840ba3642ba7678c53938 | A row of trees on a road  AI-generated content may be incorrect. |
| WalkInPark  3840×2160, 60fps, 600 frames  PQ, BT.2020 color  2b9c43c6e0f4b4b251756573ec2792a9 | A group of people walking on a path  AI-generated content may be incorrect. |  |  |

Note: WaterFront is a timelapse sequence. FootballLargeAdvert, WalkInPark, KitchenDressin, RiverPlate1 have at least one scene cut. KitchenDressin is originally 720 frames, but only the first 600 frames are used in this test.

# Test method

The test method adopted for this evaluation is DCR (Degradation Category Rating) [1]. In this case, the UHD uncompressed source is compared vs upsampled BL and BL enhanced using different standards with either 10% or 50% of EL bitrate. A quality rating scale consisting of 11 levels is adopted, ranging from "0" (lowest quality) to "10" (highest quality).

# Test points

In total, seven test points are evaluated for each sequence.

For each sequence, the base layer QP is chosen to match a MOS score of 6 to 7 when upsampled. This QP is used for VVC encoding using the VTM at RA configuration. The selected QP values are listed in Table 2.

Due to varying sample alignment between the standards, two VTM encodings are needed using the same QP and configuration, but with a different video source input (see section below for details).

An upsampled version of the base layer is used as one test point.

For each sequence and each of the two test cases (10% and 50% of EL):

* the VVC enhancement layer is encoded using the VTM
* the SHVC enhancement layer is encoded using the SHM
* the LCEVC enhancement layer is encoded using the LTM

For the enhancement layers in each case, corresponding EL quantization parameters are adjusted to match 10% and 50% total bitrate. Details on the procedure used for the corresponding quantization parameters selection are provided in the sections below.

The selected quantization parameters for each test point will be provided in the report for the test.

Table 2 – Base layer QPs

|  |  |
| --- | --- |
| **Test sequence** | **Base layer QP** |
| BodeMuseum | 29 |
| Metro | 29 |
| OberbaumSpree | 29 |
| SubwayTree | 31 |
| WaterFront | 27 |
| FootballLargeAdvert | 31 |
| H3-AMS01 | 29 |
| H3-AMS02 | 29 |
| H3-AMS05 | 29 |
| WomenFootball | 31 |
| GreenMountains1 | 27 |
| KitchenDressin | 27 |
| RiverPlate1 | 27 |
| TiergartenParkway | 29 |
| WalkInPark | 27 |

# Test settings and coding conditions

When testing different technologies together, it is a common practice in MPEG to align configurations as much as possible, and disable dual-pass, look-ahead analysis, rate control, and perceptual optimization (such as adaptive quantization, quantization matrices, post-processing, etc.), in an effort to get a baseline enabling evaluation on a comparable basis.

In the case of 2x spatial scalable coding, following aspects need to be defined, and are detailed in specific subsections:

* Non-normative downsampling used to generate the input of the base layer
* Normative upsampling used to predict the enhancement layer from the base layer
* Base layer coding
* Enhancement layer coding
* Potential post-processing

## Downsampling

As the normative upsampler used for inter-layer prediction by VVC and LCEVC use different sampling grids, two specific downsampled inputs (resulting in two specific base layers) are needed to match them, so that all encoders work in a recommended way and consistent objective metrics can be computed.

Downsampling is performed with the TAppDownConvert tool available from SHM 12.4, but compiled differently and using different command line parameters, for different standards.

For SHVC and VVC (alignment 1), TAppDownConvert is compiled normally, and the following command lines are used for BT.709 (chroma location 2) and BT.2020 (chroma location 0) content respectively:

TAppDownConvertStatic <win> <hin> <in.yuv> <wout> <hout> <out.yuv> 10 10

TAppDownConvertStatic <win> <hin> <in.yuv> <wout> <hout> <out.yuv> 10 10  
0 0 0 <frames> -phase 0 0 0 0

For LCEVC (alignment 2), #define ZERO\_PHASE 0 is first defined in DownConvert.h before compiling TAppDownConvert, then the following command line is used for all cases:

TAppDownConvertStatic <win> <hin> <in.yuv> <wout> <hout> <out.yuv> 10 10  
0 0 0 <frames> -phase 0 0 0 0

The md5sums of HD sequences obtained by such process and used as input for the base layer of respective standards, are listed in Table 3

Table 3 – md5sums of downsampled test sequences

|  |  |  |
| --- | --- | --- |
| **Test sequence** | **Alignment 1** | **Alignment 2** |
| BodeMuseum | ddea5e90e9fe941f555b7ecc2949182c | d677ea2786ef135a7b8fc2d474f21cc0 |
| Metro | 1030673bd52a31705ccbba36a2959f4f | f76d12d3eddb0198e3175f57dc5e31f2 |
| OberbaumSpree | db485275dd14504c9c6072db3eb6aefc | 727a839a3f972e9a68bf4db0f64e5fc2 |
| SubwayTree | 2dc88efaf563d4d3c1fdb48446442699 | 5923d391b9e8ec76adfa2b6713e87baa |
| WaterFront | c72143699640edf192c48a7109e73fb3 | 0ba418539e944013997719f4772931b3 |
| FootballLargeAdvert | 6ccbf340a9bd97a98c83ca31a36f9609 | a1e1037a3417dde41a8d5c7b002af3e9 |
| H3-AMS01 | 5f3e340d1079185524d46e809f6aab12 | 842d180ce89fe7055b712861ddfb0a05 |
| H3-AMS02 | 382922c79a4265eabffbbc2423c616e2 | b8d9a77495d648010fbec1084d6fa674 |
| H3-AMS05 | 1127b5d10202348c34c31e5ee6aceaf4 | 82a926d34b00ce0166115f7d4a92abbf |
| WomenFootball | 4ac8ab9a6b568bd845e05df5daa301a3 | be30d863b5e9b0d3588f20e9011ddcda |
| GreenMountains1 | a2819cdadef7aa46bb6787523c099dcb | 893bae865f80e0a7a39f70e10cd86237 |
| KitchenDressin | fdbded17ac1e6d705a5df6ba7edd54dc | c5ef290d4da73b904f9e8e38f57937c7 |
| RiverPlate1 | 5e4f29ba9bd67bca42f933553ffb6d88 | d15c552435ac7742b31990fc12ab60ba |
| TiergartenParkway | ecf0b8179946561d54de1a6a4d6d972d | bdea0f6e600bd6e93bf6b5005c56d791 |
| WalkInPark | 63674eefb5c9904c0e17656fd7666e72 | c1516b2b2eac9bc1786280ccbb4c1f75 |

## Upsampling

To encode enhancement layers, predicting from the upsampled base layer, SHVC and VVC use fixed upsampling filters that are neutral interpolating filters, while LCEVC has multiple normative options (various filters, including programmable coefficients, and an additional sharpening stage). To align inter-layer prediction for the different standards, the following LCEVC configuration is used in this test:

* “adaptive cubic” upsampling filter with specific coefficients are signaled in the bitstream, in order to best match the interpolating filter of SHVC and VVC
* the “predicted residual” tool (additional sharpening stage after the upsampling filter) is disabled

Using upsampled BL allows to assess the contribution of the enhancement layer on top of the prediction. For obtaining the upsampled BL sequences for the visual test, the same upsampling as the one used for coding is applied. The base layer with alignment 2 is used for obtaining upsampled BL sequences in this test. The following command line call is used:

ModelEncoder --upsample\_only --predicted\_residual=false  
--encoding\_upsample=adaptivecubic   
--upsampling\_coefficients="1945 14997 3825 493"   
--format=yuv420p10 -w 3840 -h 2160 -i <in.yuv> -o <out.yuv>

Note: a patch (bug fix) detailed in annex is required to enable upsampling with “adaptive cubic” coefficients.

## Base layer coding

VTM version 23.8 [5] is used in this test with the CTC RA configuration and corresponding SDR [6] and HDR [7] CTC testing conditions.

The “DMVREncControl” option commonly added in other VVC visual tests is inoperant for base layers in this test, as it impacts encoding from QP 33 and above, but selected QPs are below this threshold.

This test is using a setting with flat quantization matrices and disabled local quantization adaptation. Command lines calls are detailed in the annex.

## Enhancement layer coding: LCEVC

LTM version 7.0 [8] is used in this test.

In this test the same rule for SW1 is employed as the one used in the LCEVC VT, i.e.:

if 𝑄𝑃VVC ≥ 41 then 𝑆𝑊*1*= 3600 else 𝑆𝑊*1*= 32767.

After fixing SW1, the value of SW2 is adjusted with a step size of 250, until the rate closest to the target 10% and 50% of EL is reached.

A patch (bug fix) detailed in annex is required to enable encoding with the custom “adaptive cubic” coefficients as described in section 8.2.

This test is using a setting with flat quantization matrices. Command lines calls are detailed in annex.

## Enhancement layer coding: SHVC

SHM version 12.4 [9] is used in this test with the default random-access “scalable 10” configuration and with the layer configuration using external reference. The random-access period is identical to the base layer. For BT.2020 color content (whether SDR or HDR), a specific setting to specify chroma location 2 is used.

This test is using a setting with flat quantization matrices and disabled local quantization adaptation. Command line calls are detailed in annex.

## Enhancement layer coding: VVC

VTM version 23.8 [5] is used in this test with the CTC RA configuration and corresponding SDR [6] and HDR [7] CTC testing conditions. Additionally, the default configuration for spatial scalability is used. The random-access period is identical to the base layer.

The “DMVREncControl” setting is additionally used, as it is commonly done in other VVC visual tests.

The temporal filter pre-processing available in the VTM is disabled for the enhancement layer, for consistency with SHM and LTM, where a similar tool is not available.

This test is using a setting with flat quantization matrices and disabled local quantization adaptation. Command lines calls are detailed in annex.

Note: DMVREncControl avoids selecting coding modes involving DMVR that would result in visually annoying block artefacts, especially at high QP.

## Post-processing

Post processing after picture reconstruction is disabled at both encoding or decoding processes.

# Extra data to be collected

The objective metrics (e.g., PSNR) will be provided in the test report, as well as additional information on functionality and complexity for each standard.

# Timeline

* Test plan editing until 2025-04-09
* Bitstream availability by 2025-04-18
* Cross-check phase until 2025-04-29
* Conduction of tests in 1st half of May

# References

1. Recommendation ITU-R BT.500-15 (2023), “Methodologies for the subjective assessment of the quality of television images”.
2. Recommendation ITU-T P.910 (2023), “Subjective video quality assessment methods for multimedia applications”.
3. ATSC, “Liaison statement from ATSC to WG 2 on ATSC SHVC Use Cases and Testing”, MPEG document m70589, November 2024
4. https://forumsbtvd.org.br/wp-content/uploads/2024/03/SBTVD-TV\_3\_0-P3-VC-Report.pdf
5. https://vcgit.hhi.fraunhofer.de/jvet/VVCSoftware\_VTM/-/tree/VTM-23.8?ref\_type=tags
6. F. Bossen, X. Li, V. Seregin, K. Sharman, K. Sühring, “VTM and HM common test conditions and software reference configurations for SDR 4:2:0 10 bit video”, JVET-AK2010, March 2025.
7. A. Segall, E. François, W. Husak, S. Iwamura, D. Rusanovskyy "VTM and HM common test conditions and evaluation procedures for HDR/WCG video", JVET-AC2011, Feb. 2023.
8. https://git.mpeg.expert/MPEG/Video/LCEVC/LTM/-/tree/LTM\_7\_0?ref\_type=tags
9. https://vcgit.hhi.fraunhofer.de/jvet/SHM/-/tree/SHM-12.4?ref\_type=tags

# Annex - Test software

## Base layer

An example VTM command line is given below:

EncoderApp -c cfg/encoder\_randomaccess\_vtm.cfg -q <QP> -c resHD\_60.cfg \  
-i <hd\_input.yuv> -ip <IP> -b <output.bin>

<QP> is set according to Table 2.

<IP> is set to the multiple of 32 closest to frame rate.

encoder\_randomaccess\_vtm.cfg is found in the VTM code tree.

resHD\_60.cfg contains the following (example for 10-bit 60fps test content):

InputBitDepth : 10 # Input bitdepth

InputChromaFormat : 420 # Ratio of luminance to chrominance samples

FrameRate : 60 # Frame Rate per second

FrameSkip : 0 # Number of frames to be skipped in input

SourceWidth : 1920 # Input frame width

SourceHeight : 1080 # Input frame height

FramesToBeEncoded : 600 # Number of frames to be coded

Level : 4.1

The base layer for VVC multi-layer coding, when encoded separately, is required to additionally use --MaxNumALFAPS=4, to prevent errors with the APS overriding in the EL. In this test, the same base layer is used for VVC and SHVC. The base layer for LCEVC does not use the -–MaxNumALFAPS option.

For BT.2020 SDR content, the “--VerCollocatedChroma=1” option is added.

For HDR PQ content, the “-c cfg/per-class/classH1.cfg” option is added. For HDR HLG content, the “-c cfg/per-class/classH2.cfg” option is added. Those configuration files are found in the VTM code tree.

## VVC enhancement layer

An example VTM command line is given below:

EncoderApp -c cfg/encoder\_randomaccess\_vtm.cfg \  
-c cfg/multi-layer/two\_layers\_scalable.cfg --DMVREncMvSelect=1 \  
-l0 -q <QP\_BL> -l0 -c resHD\_60.cfg -l0 -i <hd\_input.yuv> \  
-l1 -q <QP\_EL> -l1 -c resUHD\_60.cfg -l1 -i <uhd\_input.yuv> \  
-l1 -c cfg/multi-layer/layer1\_gop\_randomaccess.cfg -l1 --Level=6.1 \  
-l1 --TemporalFilter=0 -ip <IP> -b <output.bin> -o /dev/null

To reuse a base layer encoding, “–l0 -–debugBitstream <baselayer.bin>” can be used.

<IP> and <QP\_BL> shall match the base layer settings described in the previous section. <QP\_EL> is adjusted to match the target bitrate, as described in section 8.6.

cfg/multi-layer/layer1\_gop\_randomaccess.cfg is found in the VTM code tree.

resUHD\_60.cfg is similar to the resHD\_60.cfg shown in the previous section, but with UHD resolution (width 3840, height 2160, and level 5.1).

For BT.2020 SDR content, the “--VerCollocatedChroma=1” option is added.

For HDR PQ content, the “-c cfg/per-class/classH1.cfg” option is added. For HDR HLG content, the “-c cfg/per-class/classH2.cfg” option is added. Those configuration files are found in the VTM code tree.

## SHVC enhancement layer

An example SHM command line is given below (for a 60 fps test sequences):

TAppEncoder -c cfg/encoder\_randomaccess\_scalable10.cfg -c <testpoint.cfg> \  
-c cfg/layers\_avcbase.cfg -ibl <decoded\_baselayer.yuv> -q1 <QP\_EL> \  
-b <output.bin>

encoder\_randomaccess\_scalable10.cfg and cfg/layers\_avcbase.cfg are found in the SHM code tree.

For BT.2020 color content (either SDR or HDR), the “--PhaseVerChroma1=0” option is added.

testpoint.cfg contains the following:

FrameSkip: 0

FramesToBeEncoded: 600

Level0: 5.1

Level1: 4.1

Level2: 5.1

InputFile0: <hd\_input.yuv> # Note: unused (base layer is external)

FrameRate0: 60

SourceWidth0: 1920

SourceHeight0: 1080

IntraPeriod0: <IP>

ConformanceMode0: 1

QP0: <QP\_BL> # Note: unused (base layer is external)

InputBitDepth0: 10

InternalBitDepth0: 10

RepFormatIdx0: 0

LayerPTLIndex0: 1

OutputBitDepth0: 10

InputFile1: <uhd\_input.yuv>

FrameRate1: 60

SourceWidth1: 3840

SourceHeight1: 2160

IntraPeriod1: <IP>

ConformanceMode1: 1

QP1: <QP\_EL>

InputBitDepth1: 10

InternalBitDepth1: 10

RepFormatIdx1: 1

LayerPTLIndex1: 2

OutputBitDepth1: 10

<IP> is set according to the same rule as VVC. <QP\_EL> is adjusted to match the target bitrate, as described in section 8.5.

## LCEVC enhancement layer

An example LTM command line is given below (for a 60 fps test sequences):

ModelEncoder -i <uhd\_input.yuv> -o <output.bin> --output\_recon=<rec.yuv> \  
-w 3840 -h 2160 -r 60 -l 600 -f yuv420p10 --encapsulation=nal \  
-b vvc --base <baselayer.bin> --base\_recon <decoded\_baselayer.yuv> \  
--qp=<QP\_BL> --intra\_period=<IP> --base\_depth=10 --parameter\_config=default \  
--dithering\_control=false --dithering\_type=none \  
--level\_1\_filtering\_enabled=false --quant\_matrix\_mode=custom \  
--qm\_coefficient\_1="0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0" \  
--qm\_coefficient\_2=”0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0” \  
--cq\_step\_width\_loq\_0=<SW2> --cq\_step\_width\_loq\_1=<SW1> \  
--predicted\_residual=false --encoding\_upsample=adaptivecubic \  
--upsampling\_coefficients="1945 14997 3825 493"

<QP\_BL> and <IP> match the base layer encoding.

<SW1> and <SW2> are adjusted to match the target bitrate, as described in section 8.4.

Note: the following change (bug fix) is first made to the LTM. In file encoder/src/FileEncoder.cpp, the line:

parameters\_["encoding\_upsample"].get\_vector<unsigned>(upsampling\_coefficients\_, 4);

is replaced with:

parameters\_["upsampling\_coefficients"].get\_vector<unsigned>(upsampling\_coefficients\_, 4);