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| *Title:* | **Verification test plan for HEVC screen content coding extensions** | | |
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| *Purpose:* | Test plan | | |
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# Abstract

This contribution provides a test plan for verification of the coding performance of HEVC screen content coding extensions. It describes a set of test conditions and presents a work plan for test preparation.

# Test conditions description

## General description

The coding performance of HEVC with screen content coding extensions, HEVC without screen content coding extensions, and AVC will be compared by encoding selected sequences at selected bit-rates using software representing the typical applications of these video coding standards.

## Test material

Table 1 below lists all the test sequences. These sequences are classified into two categories, namely ‘text and graphics with motion (TGM)’ and ‘mixed content (M)’category. Both 4:4:4 and 4:2:0 sampling formats will be tested. For the 4:4:4 colour sampling format, the tests will be conducted in both RGB and YUV colour spaces.

These test sequences are available to members at <ftp://hevc@ftp.tnt.uni-hannover.de/testsequences/FrExt-candidate-sequences/upload/screen_content/ScExt-TestSequences>. Their md5sums are given in Annex A.

**Table 1 - Test Sequences**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Resolution** | **Sequence name** | **Category** | **fps** | **Frames to be encoded** |
| 1920x1080 | CircuitLayoutPresentation  ClearTypeSpreadsheet  EnglishDocumentEditing  ChineseDocumentEditing  BigBuckBunnyStudio  KristenAndSaraScreen | TGM  TGM  TGM  TGM  M  M | 30  30  30  30  50\*  60 | 0-239  0-239  0-239  0-239  0-399  0-479 |
| \* Note that this sequence was captured at 60fps but it is tested at 50fps to provide adequate visual duration.  TGM: Text and graphics with motion; M: mixed content; | | | | |

## Encoder software

The bitstreams will be generated by using the following software:

* SCM-8.1: SCM software available at <https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/tags/HM-16.10+SCM-8.1>). This software will be used to generate both HEVC and HEVC-SCC bitstreams. When generating HEVC bitstreams, all the new coding tools adopted in the specifications of HEVC SCC extensions will be disabled.
* JM-19.0: http://iphome.hhi.de/suehring/tml/download/

## Coding modes, configurations, and bit-rates

Both lossy and mathematically lossless coding modes will be tested. For the lossy mode, three encoding configurations will be tested, which are All Intra (AI), Random Access (RA), and Low-delay (LB).

For the random access configuration, the period for intra random access frames for each test sequence is specified in SCM, as follows:

* IntraPeriod: Specifies the intra refresh period in the random access configuration. The intra refresh period is dependent on the frame rate of the test sequence. A value 32 will be used for test sequences at 30 fps, 48 for those at 50 fps, and 64 for those at 60 fps.

The same intra refresh structures can also be specified in JM-19.0.

A list of the encoder configuration files used in the tests is shown in Table 2.

**Table 2 – Configuration files for JM and SCM**

|  |  |  |
| --- | --- | --- |
| Coding mode | JM configuration file | SCM configuration file |
| 4:4:4 lossless |  |  |
| 4:2:0 lossless |  |  |
| 4:4:4 AI |  |  |
| 4:4:4 RA |  |  |
| 4:4:4 LB |  |  |
| 4:2:0 AI |  |  |
| 4:2:0 RA |  |  |
| 4:2:0 LB |  |  |

The generation of the HEVC bitstreams will be done by running the encoders at a set of QP values around 22, 27, 32, and 37. The final QP values will be selected based on the actual encoding results.

The AVC encoding will be done at the same bit rates resulting from HEVC SCC bitstreams.

# Test results evaluation

The test results from each coding mode in Table 2 will be collected into an Excel file similar to the result-reporting templates in JCTVC-U1015 [1]. The relative coding performance will be reported in BD-rates.

A formal subjective evaluation will be done only on the Lossy coding conditions.

The Lossless coding conditions will be evaluated objectively (compression ratio).

The test method will be the DCR (Degradation Category Rating) as specified in Recommendation ITU-T P.910 [2].

The DCR test method is commonly adopted when the material to be evaluated shows a range of visual quality that well distributes across all quality scales.

This method will be used under the schema of evaluation of the impairment between the images to test and an un-impaired reference.

An 11-grade impairment rating scale will be used, ranging from "0" (lowest quality) to "10" (highest quality). The test will be coordinated and supervised by the Test Chair person and will be run in Roma at the GBTech Laboratories.

The video material used for these tests will consist of video clips of around 10 seconds duration.

The structure of the Basic Test Cell (BTC) of DCR method is made of the following steps (see *Figure 1*):

* a mid grey screen showing the letter “A” in the middle (1 second);
* the SRC video clip (original not coded);
* a mid grey screen showing the letter “B” in the middle (1 second);
* the coded video clip to evaluate;
* a mid grey screen showing the message “Vote\_N”, where N is a progressive number indicating the BTC to vote.

*Figure 1 - DCR BTC*



B

A

The score will be collected on paper scoring sheets.

Eighteen young university students will be selected as the test subjects after being carefully screened for visual acuity and colour blindness, and will be carefully trained on both the test protocol and the kind of impairments they will have to detect.

A detailed explanation of the test experiment will be done to each viewer before the beginning of the testing activities. A short practice (training) session will be also run to allow the subjects to understand better he rules and to get practice with scoring process.

The training session will include a representative set of whole quality range of the video test material to allow a better detection of any possible impairment and a proper ranking of the test cases.

A stabilization phase will also be applied at the beginning of each SCC test sessions, to make more effective the evaluation process.

# Schedule

The following preliminary time-line is proposed for the test:

* Test plan finalization: Oct. 2016
* Some bitstreams will be delivered by mid November for dry run
* Final bitstreams will be delivered in two batches: 10 Dec (4:2:0 and RGB) and 2 Jan (YUV 4:4:4). In addition, the bitstreams of CircuitLayoutPresentation and ChineseDocumentEditing may be delivered a few days after the above dates.
* All the subjective tests will be completed by next meeting.

# References

1. JCTVC-U1015, “Common test conditions for screen content coding,” Warsaw, PL, 19–26 June 2015.
2. Rec. ITU-T P.910, *Subjective video quality assessment methods for multimedia applications*, April 2008.

# *Annex A. Test sequence md5sums*

For the test sequences used in this verification test, the ‘md5sum’ values are provided in Table 3 below.

**Table 3 – md5sum values of the test sequences**

|  |  |  |
| --- | --- | --- |
| Format | File name | MD5 |
| RGB and 4:4:4 YUV\* | ChineseDocumentEditing\_1920x1080\_30\_8bit.zip | 5300fd95c19d179a6ddfa12288240d00 |
| CircuitLayoutPresentation\_1920x1080\_30\_8bit.zip | 186b11635d64b1c5e146750aa4b803b7 |
| ClearTypeSpreadsheet\_1920x1080\_30\_8bit.zip | 6499a6bb378a4ad5ec55c5bc29632f16 |
| EnglishDocumentEditing\_1920x1080\_30\_8bit.zip | 98f865d30a01460a10e2903ea44fec79 |
| RGB | BigBuck\_1920x1080\_60p\_8b444.zip | 8b92be4db9461cf8ee05adb35ef9f5c1 |
| KristenAndSaraScreen\_1920x1080\_60p\_8b444.zip | a4d9217ba38a4b9a4a6818ae22b49a7e |
| 4:4:4 YUV | BigBuck\_1920x1080\_60p\_8b444YUV.zip | 6402bc8c267e5ebc7d6726793a801444 |
| KristenAndSaraScreen\_1920x1080\_60p\_8b444YUV.zip | b4bd1eb10b97df273860908498001306 |
| 4:2:0 YUV | ChineseDocumentEditing\_1920x1080\_30\_8bit\_420.zip | dbce1e459826c487e962f56b63f1b5ab |
| CircuitLayoutPresentation\_1920x1080\_30\_8bit\_420.zip | 3269bae52ed3054ca81b7d311921a10f |
| ClearTypeSpreadsheet\_1920x1080\_30\_8bit\_420.zip | 77ea70821ac9915778d3030548aceb2d |
| EnglishDocumentEditing\_1920x1080\_30\_8bit\_420.zip | 3fdb7e41963bd4d7ee3b26586b699d93 |
| BigBuck\_1920x1080\_60p\_8b420.zip | 79404d73847560f4e2c2a74475fbd7a1 |
| KristenAndSaraScreen\_1920x1080\_60p\_8b420.zip | 9d21a8054265e94e32c2bb8e2f49b984 |
| \*Note: each of these zip files consists of both RGB and 4:4:4 YUV sequences. | | |