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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  6th Meeting: Torino, IT, 14-22 July, 2011 | Document: JCTVC-F013 |

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| *Title:* | **JCT-VC AHG report: Screen Content Coding (SCC)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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| *Source:* | HKUST, Microsoft, Huawei | | |

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# Abstract

This contribution summarizes the Screen Content Coding (SCC) Ad Hoc Group activities between the 5th JCT-VC meeting in Geneva, Switzerland (16 to 23 March, 2011) and the current 6th JCT-VC meeting in Torino, Italy (14-22 July, 2011).

# Mandate

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| **AHG Title and Email Reflector** | **Chairs** | **Mtg** |
| Screen Content Coding (SCC)  ([jct-vc@lists.rwth-aachen.de](mailto:jct-vc@lists.rwth-aachen.de))   1. To coordinate the submission, evaluation and selection of "screen content" video test material 2. To study characteristics of screen content video 3. Analyze the effects of existing and proposed coding technology on screen content video 4. To study and establish evaluation methods, test conditions, and metrics for coding of screen content video 5. Study technology that may be particularly well suited to the coding of screen content video 6. Study use cases in which screen content video is prevalent and identify potential associated technical implications | O. C. Au (chair)  J. Xu (co-chair)  H. Yu (co-chair) | N |

# Background

In the 5th JCTVC meeting (in Geneva, Mar 2011), the SCC AHG report (JCTVC-E014) reported that 15 SCC test sequences were submitted. Two subjective viewing sessions and a BoG meeting were held. Some problems of the test sequences were identified and discussed in the BoG meeting and reported in the BoG report (JCTVC-E493). It was concluded that the test sequences were to be improved and test conditions were to be proposed.

# Reflector Activity

The AhG used the JCT-VC reflector for discussion. A kick-off message was sent on May 18, 2011, with the header *“[AhG13 SCC] Kick Off”.* There were a total of 38 messages on the reflector during the AhG period.

# Status

## Test Material submission

In the Geneva meeting, test sequences were submitted by BJUT, Huawei and HKUST. During the months between Geneva meeting and Torino meeting, Huawei revised their 9 sequences according to comments received in the Geneva meeting and submitted three new sequences in this meeting. HKUST redesigned their 3 sequences to avoid copyright problems pointed out in the Geneva meeting. The newly generated sequences were submitted to the SCC ftp site. BJUT has also updated their sequences.

The two ftp accounts (one for upload only and one for download only) created before Geneva meeting were discontinued. Two new ftp accounts were created. One account can both upload and download. The other account for the SCC Chair can move and change data also. There were quite a few enquiries from JCTVC members to access the test sequences on the ftp site.

## Color artifacts and 4:2:0 sampling of SCC Test Contents

There were many email discussion on this topic. It was pointed out in the reflector that 420 sampling can cause significant color artifacts in screen contents. This can cause difficulty in evaluating coding results when the ground truth is not good. Some suggest possible standardization of 420 down-sampling filter. Others find it an encoder issue and that it should not be standardized. Some suggests the possibility of doing SCC experiments in 444 sequences, but HM software currently supports 420 format only right now though 444 should be supported in the future. This SCC issue needs further discussion.

## Exploration of SCC Test Conditions

To explore possible SCC test conditions, AhG members did some testing on HM and HM-with-SDIP using the common test conditions and will report the test results in the Torino meeting. A set of possible test conditions will be submitted also.

# List of input documents related to this AHG

There are 10 documents related to screen content coding, and 4 of them are discussing coding tools for screen content.

* O.C. Au (Chair), J. Xu, H. Yu (Vice Chairs), “JCT-VC AHG report: Screen content coding (AHG13)”, *JCTVC-F013,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011. (this document)
* G. Cook, W. Gao, J. Zhou, H. Yu (Huawei), “Updated Video Test Material Submission for "Screen Content" Coding Experiments: Scrolling Text, Overlays, Editing Window Switching and On-line Gaming”,*JCTVC-F562,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* W. Gao, G. Cook, M. Yang, H. Yu (Huawei), “Near Lossless Coding for Screen Content”, *JCTVC-F564,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* W. Zhu, W. Ding, Y. Shi, B. Yin (BJUT), “Inter modes for screen content coding”, *JCTVC-F150,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* W. Ding, Y. Shi, B. Yin (BJUT), “Test material update for screen content”, *JCTVC-F741,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* C. Lan (Xidian Univ.), J. Xu, G. J. Sullivan, F. Wu (Microsoft), “Improvements of the BCIM modes in screen content coding”, *JCTVC-F200,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* W. Dai, M. Krishnan, P. Topiwala (FastVDO), “Resampling Filters For Scalability And Screen Content Applications”, *JCTVC-F618,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* X. Zhang, O. Au, W. Dai, S. Li, C. Pang, X. Wen, (HKUST), “ A study of SCC test sequences”, *JCTVC-F228,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* X. Zhang, O. Au, C. Pang, X. Wen (HKUST), “Suggested SCC Test Conditions”, *JCTVC-F696,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.
* X. Zhang, O. Au, C. Pang, X. Wen (HKUST), “Description of new test sequences from HKUST”, *JCTVC-F726,* 6th JCTVC meeting, Torino, IT, 14-22 July 2011.

# Recommendations

The recommendations of the AHG are

* To arrange viewing sessions of all submitted test materials and examine their copyright statements and terms of usage
* To evaluate and discuss the HM3.0 and HM3.0-with-SDIP results on the submitted test material and suggest SCC test conditions.
* To discuss the down-sampling filter to be used for the generation of SCC test material
* To discuss the possibility of generating 444 test material and performing experiments on them
* To study the coding tools proposed in this meeting for SCC

# Reference

1. O.C. Au (HKUST), J. Xu (Microsoft), H. Yu (Huawei), “JCT-VC AHG report : Screen Content Coding (SCC)”, *JCTVC-E014*, 5th JCTVC meeting, Geneva, CH, 16-23 Mar. 2011.
2. O.C. Au (HKUST), J. Xu (Microsoft), H. Yu (Huawei), “BoG report on Screen Content Coding (SCC)”, *JCTVC-E493*, 5th JCTVC meeting, Geneva, CH, 16-23 Mar. 2011.
3. G. Cook, W. Gao, D. Wang, J. Zhou, and H. Yu (Huawei), “Video Test Material Submission for "Screen Content" Coding Experiments: Scrolling Text, Overlays, Editing, and Window Switching”, *JCTVC-E305*, 5th JCTVC meeting, Geneva, CH, 16-23 Mar. 2011.
4. X. Zhang, O.C. Au, D. Soysa, S. Li, W. Dai, X. Wen (HKUST), “Test sequences for screen content coding“, *JCTVC-E176*, 5th JCTVC meeting, Geneva, CH, 16-23 Mar. 2011.
5. W. Ding (BJUT), “Test Material for Screen Content coding”, *JCTVC-E139*, 5th JCTVC meeting, Geneva, CH, 16-23 Mar. 2011.
6. C. Lan (Xidian), X. Peng (USTC), J. Xu, F. Wu (Microsoft), “Intra and inter coding tools for screen contents”, *JCTVC-E145*, 5th JCTVC meeting, Geneva, CH, 16-23 Mar. 2011.
7. O.C. Au (HKUST), J. Xu (Microsoft), H. Yu (Huawei), “BoG report on Screen Content Coding (SCC)”, *JCTVC-D458,* 4th JCTVC meeting, Daegu, KR, 20-28 Jan. 2011.
8. W. Ding, Y. Shi, B. Yin (BJUT), “Test Material for Screen Content coding”, *JCTVC-D252,* 4th JCTVC meeting, Daegu, KR, 20-28 Jan. 2011.
9. JNB, “JNB comments on WG11 Resolution 10.1.3: Coding of screen content”, *JCTVC-D028*, 4th JCTVC meeting, Daegu, KR, 20-28 Jan. 2011.
10. J. Xu (Microsoft), W. Ding (BJUT), “JCT-VC AHG report: Screen content coding”, *JCTVC-C009,* 3rd JCTVC meeting, Guangzhou, CN, 7-15 Oct. 2010.
11. C. Lan, J. Xu, F. Wu (Microsoft), “Screen content coding results using TMuC,” *JCTVC-C276*, 3rd JCTVC meeting, Guangzhou, CN, 7-15 Oct. 2010.
12. C. Lan, J. Xu, F. Wu and G. Sullivan (Microsoft), “Screen content coding”, *JCTVC-B084*, 2nd Geneva, CH, July, 2010.