

**Title:** JCT-3V AHG Report: Mixed Resolution Coding (AHG14)  
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## Abstract

This document reports on the work of the JCT-3V ad hoc group on Mixed Resolution Coding (AHG14) between the 3rd JCT-3V meeting in Geneva (17–23 January, 2013) and 4<sup>th</sup> JCT-3V meeting in Geneva (20-26 April, 2013).

## 1 Mandates

- Investigate possible benefits of mixed resolution coding in 3D-HEVC.
- Identify commonality of reduced resolution depth coding in MVC plus depth, 3D-ATM and 3D-HTM.
- Study approaches and design implications to support coding of mixed resolution data (texture and depth).
- Study implications of mixed resolution coding with regard to complexity and memory requirements of 3D-ATM and 3D-HTM

The email reflector for AHG14 is [jct-3v@lists.rwth-aachen.de](mailto:jct-3v@lists.rwth-aachen.de).

## 2 Related contributions

The following contributions are related to AHG14:

- JCT3V-D0080: Krzysztof Wegner, Olgierd Stankiewicz, Marek Domański, “Comparison of half resolution depth map coding versus full resolution depth map coding in 3D-ATM”
- JCT3V-D0164: Dmytro Rusanovskyy, Payman Aflaki, Miska M. Hannuksela “3D-AVC: Removal of texture to depth resolution ratio restrictions”
- JCT3V-D0215: S. Sugimoto, S. Shimizu, K. Kimata, “Report on Reduced Resolution Depth Map Coding in 3D-HEVC”
- JCT3V-D0216: S. Sugimoto, S. Shimizu, K. Kimata, “Report on Asymmetric Resolution Coding in 3D-HEVC”

## 3 Activity

**Mandate 1: Investigate possible benefits of mixed resolution coding in 3D-HEVC**

Enhancement of 3D-HEVC test model software allowing coding reduced resolution depth map is proposed. The proposed modifications let several coding tools to support variable resolution depth map with minor changes. Even through the experimental result presents slight loss on coding performance (2.5% BD rate on synth views) according to the common test conditions with full resolution depth map, it also presents reduction of coding complexity (26% decoding time reduction).

Moreover, if the renderer supports reduced resolution depth map, the postdecoder upsampling process is not needed. Thus the data volume is vastly reduced to 15/4 of Full HD and the requirement as specified in N11829 is satisfied.

***Mandate 2: Identify commonality of reduced resolution depth coding in MVC plus depth, 3D-ATM and 3D-HTM***

*There has not been any new activity on this mandate since the previous meeting, but further discussion on this mandate is expected during the meeting.*

***Mandate 3: Study approaches and design implications to support coding of mixed resolution data (texture and depth)***

The current 3D-AVC specification imposes restrictions on spatial resolution ratios between coded texture and depth: only two ratios are supported, 1:1 (texture and depth are coded at equal spatial resolution) and 1:0.5 (depth data is presented at half spatial resolution in horizontal and vertical directions). It is argued that these restrictions should be relaxed to make 3D-AVC applicable to a broader range of applications. This contribution asserts that MVD data with an arbitrary depth-to-texture resolution can be coded with 3D-AVC without significant changes to the codec design and proposes changes to the specification text.

***Mandate 4: Study implications of mixed resolution coding with regard to complexity and memory requirements of 3D-ATM and 3D-HTM***

Experimental results provided for the meeting show that coding with half resolution of depth (currently used in CTC) provides better results in comparison to coding with full resolution of depth. It is also more computationally efficient.

One of observations of the document is that comparing schemes of coding with different depth resolution require common reference in order to obtain meaningful results.

Coding with full resolution of depth requires 64-bit version of 3D-ATM to run correctly in case of Full HD sequences.

Some bug with reporting PSNR value of full resolution depth map was observed.

## **4 Recommendations**

The AHG on Mixed Resolution Coding recommends to:

1. Review the related input contributions
2. Supports reduced resolution depth map coding in 3D-HEVC.
3. Supports arbitrary depth-to-texture resolution in 3D-AVC.
4. Bug fix and improve 3D-ATM to properly report full resolution depth maps PSNR values
5. Re-establish the AHG for further study and experiments in this area