 ISO/IEC JTC 1/SC 29/WG 04 N0713

**ISO/IEC JTC 1/SC 29/WG 04  
MPEG Video Coding   
Convenorship: CN**

**Document type:** Output Document

**Title:** Summary report of the responses to the Call for Proposals for lenslet video coding

**Status:** Approved

**Date of document:** 2025-07-04

**Source:** ISO/IEC JTC 1/SC 29/WG 04

# Expected action: None

# Action due date: None

**No. of pages:** 4

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**Committee URL:** <https://sd.iso.org/documents/ui/#!/browse/iso/iso-iec-jtc-1/iso-iec-jtc-1-sc-29/iso-iec-jtc-1-sc-29-wg-4>

**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION**

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**ISO/IEC JTC 1/SC 29/WG 04 MPEG VIDEO CODING**

**ISO/IEC JTC 1/SC 29/WG 04 N** **0713**

**July 2025, Daejeon, Korea**

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| **Title** | **Summary report of the responses to the Call for Proposals for Lenslet Video Coding** |
| **Source** | **WG 04, MPEG Video Coding** |
| **Status** | **Approved** |
| **Serial Number** | **25491** |
| **Editors** | **Xin Jin (Tsinghua SIGS, CN), Mehrdad Teratani (AUT, JP)** |

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# Introduction

In the 20th *WG 04 MPEG video coding* meeting, two responses to the *Call for Proposals (CfP) for Lenslet Video Coding (LVC)* [1] have been received to address the requirements described in the *Use cases and requirements for Lenslet Video Coding* [2]. This document summarizes the technical features, objective and subjective performance of the responses. Both of the responses propose LVC encoder and decoder including Codec Agnostic Modules (Figure.1), and LVC bitstreams including a sub-bitstream compatible with Versatile Video Coding (VVC).

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自動的に生成された説明

Figure 1. Encoding and decoding process for LVC. [3]

# Summary of technical features in the responses

Technical features in the two responses are listed as follows:

1. Common features: both responses rearrange the microimages to reduce compression bitrate and introduce estimation and compensation methods to reconstruct lenslet frame with maintained Multiview PSNR (MV-PSNR) and Lenslet-PSNR.
2. One proposal introduces micro-image cropping and alignment to extract effective pixels for multiview rendering, which greatly reduces the number of pixels that need to be compressed while maintaining high quality in terms of MV-PSNR. It introduces edge pixel estimation and compensation to restore the pixels that are discarded at the encoder for a better reconstructed lenslet-PSNR.
3. The other proposal applies pixel shuffling based on estimated disparity to reproject the pixels in the lenslet video frame and applies filtering afterwards, resulting in a representation that is more compressible. Although MV-PSNR degrades noticeably, a large bitrate reduction may be achieved at low bit rate range.

# Summary of the objective performance

Figure. 2 provides the compression performance in terms of MV-PSNR and bitrate. MV-PSNR is averaged across Y, U, and V components using 4:1:1. As shown in the figure, one proposal can achieve stable performance improvement with an average of 20.96% bitrate saving. The other proposal shows distinct performance improvement in the low bit rate range for some sequences, which is complementary to the other proposal.

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| Figure. 2. Objective performance comparison among the responses and the anchor in terms of MV-PSNR and bitrate. | | |

# Summary of the subjective performance

Figure. 3 provides the compression performance in terms of multiview subjective quality and bitrate reported in the results of subjective testing [3] which was conducted by AG 5. The results are consistent with the objective performance.

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| Figure. 3. Subjective performance comparison among the responses and the anchor in terms of multiview subjective quality and bitrate. | | |

# Conformance with LVC Requirements

The responses’ compliance with requirements of LVC [2] is validated and listed in Table 1.

Table 1. Conformance checking between the responses and the LVC requirements.

|  |  |
| --- | --- |
| **Requirements** | **Meeting** |
| The specification shall support lenslet videos as input and output. | Y |
| The specification shall include technology that efficiently uses existing standardized video codecs. | Y |
| The specification shall support a substantial reduction in bitrate for lenslet video data compared to VVC, with no significant increase in encoding and decoding time. | Y |
| The specification shall support lenslet frames with diverse spatial-angular resolutions. | Y |
| The specification shall support highly efficient lossy compression with parameter control of bitrate for applications that need this. | Y |
| The specification shall enable coding a dynamic scene that contains non-Lambertian surfaces. | Y |
| The specification shall enable coding natural and application specific scenes with large field of view or diverse spatial-angular resolutions. | Y |
| The specification shall enable handling of metadata including the lenslet parameters, virtual camera parameters and object related parameters (e.g. intrinsic and extrinsic camera parameters, the coordinate of lenslet center, the diameters of lenslet, the same object point distance under adjacent lenslet and virtual camera array parameters) at the bitstream level. | Y |
| The specification shall enable coding a scene captured by plenoptic cameras. | Y |
| The specification shall support a trade-off between efficiency and end-to-end delay. | Y |

# Conclusion

Responses to the CfP for Lenslet Video Coding received in the 20th WG 4 meeting provide obvious and complementary performance improvements compared to the anchor and meet the LVC requirements. WG 02 confirmed that requirements are met. WG 04 has initiated a new project to standardize lenslet video coding from the 20th its meeting.

# Acknowledgement

# The following organizations are thanked for responding to the CfP: Tsinghua Shenzhen International Graduate School (SIGS), China Mobile, Beihang University, Université libre de Bruxelles, Nagoya University, and Aichi University of Technology for their contributions to the Call for Proposals on Lenslet Video Coding.

# References

1. Call for Proposals for Lenslet Video Coding, ISO/IEC JTC1/SC29/WG02 N432, January 2025, Geneva, Switzerland.
2. Use cases and requirements for Lenslet Video Coding, ISO/IEC JTC1/SC29/WG02 N360, Apr. 2024, Rennes, France.
3. Results of subjective testing of responses to the CfP for Lenslet Video Coding, ISO/IEC JTC1/SC29/AG05 N171, July 2025, Daejeon, Korea.