



# **Non-SCE5 : Simplified inter-layer MV scaling and sample position mapping**

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# Overall Summary

- In SHM, the scaling operations (containing division operations) of inter-layer MV prediction and sample position mapping are needed for each PU even if the spatial resolution ratio is fixed for the entire sequence.
- Propose to reduce the scaling operations as follows.
  - The scaling factors for inter-layer MV scaling and sample position mapping are first derived in the beginning of the slice coding
  - Reuse the scaling factors for all inter-layer MV scaling derivation and sample position mapping derivation
  - **No division is required during the rest of the slice coding**
  - Support spatial scalability with arbitrary ratio
  - **Unification with HEVC MV scaling**
- No BD-rate change, decoding time reduced by 1-2%

# Inter-layer MV scaling and position mapping in SHM-1.1

- Inter-layer MV scaling in SHM-1.1:
  - $mvEL\_X = (mvBL\_X \times picEL\_W + (picBL\_W/2-1) \times sign(mvBL\_X)) / picBL\_W$
  - $mvEL\_Y = (mvBL\_Y \times picEL\_H + (picBL\_H/2-1) \times sign(mvBL\_Y)) / picBL\_H$
- Inter-layer sample position mapping in SHM-1.1:
  - $xBL = (xEL \times picBL\_W + picEL\_W / 2) / picEL\_W$
  - $yBL = (yEL \times picBL\_H + picEL\_H / 2) / picEL\_H$
- The division has to be performed for every inter-layer MV scaling and inter-layer sample position mapping, although the picture resolution ratio of the EL to the BL is a fixed value.

# Proposed Methods

1. Calculate the scaling factors for inter-layer MV scaling factor and sample position mapping in the beginning of the slice coding
2. Reuse these values for all inter-layer MV scaling derivation and sample position mapping derivation
  - No division is required in the block-level process

- Inter-layer MV scaling:

Slice


–  $ILScalingFactor\_x = \text{Clip}(-4096, 4095, ((picEL\_W \ll 8) + (picBL\_W \gg 1)) / picBL\_W)$


Block

- $mvEL\_X = \text{Clip}(-32768, 32767, \text{sign}(ILScalingFactor\_x \times mvBL\_X) \times ((abs(ILScalingFactor\_x \times mvBL\_X) + 127)) \gg 8)$
- The dynamic range of the  $ILScalingFactor\_x$  is the same as that of the MV scaling factors in HEVC
- The HEVC MV scaling module can be reused for inter-layer MV scaling

# Proposed Methods

- Inter-layer sample position mapping:

 Slice – 
$$\text{ILPosScalingFactor\_x} = \frac{(\text{picBL\_W} \ll 14) + (\text{picEL\_W} \gg 1)}{\text{picEL\_W}}$$

 Block – 
$$\text{xBL} = (\text{xEL} \times \text{ILPosScalingFactor\_x} + (1 \ll 13)) \gg 14$$

# Simulation Results

- Anchor: SHM-1.1
- No coding efficiency loss
- The decoding time is reduced by 1-2%.
- Thank LG for cross-verification (JCTVC-M0284)

	RA-2x	RA-1.5x	RA-SNR	LP-2x	LP-1.5x	LP-SNR	Enc. Time	Dec. Time
IntraBL mode	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	98%
Refldx mode	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	99%

# Conclusions

- In this contribution, the modified inter-layer MV scaling factor and sample position mapping are proposed.
  1. The scaling factors for inter-layer MV scaling and sample position mapping are first derived in the beginning of the slice coding
  2. Reuse the scaling factors for all inter-layer MV scaling derivation and sample position mapping derivation
    - **No division is required in the block-level process**
    - Support spatial scalability with arbitrary ratio
    - The HEVC MV scaling module can be reused for inter-layer MV scaling
- No coding efficiency loss
- The decoding time is reduced by 1-2%.