



# JCTVC-P0134: Strawman SHVC level constraints

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# Introduction

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- Current SHM draft specification does not define level constraints for SHVC
- Strawman level constraints are proposed

# Proposed level constraints

- All existing general level constraints apply individually to each layer within the operation point corresponding to the output layer set conforming to the profile/tier/level
  - A.4.1 General tier and level constraints
    - Max picture size, number of tiles, etc.
  - A.4.2 Main profile-specific tier and level constraints
    - Sample rate, frame rate, etc.
- Also, cumulative constraints for all decoded layers equal to 2x the respective Main profile level limits, for
  - Total picture size
  - Total sample rate
  - Total bitrate

# Discussion

- Levels typically defined to correspond to expected use cases
  - Decoders conforming to a level can handle the expected use case without unnecessary overhead in capability
- Selecting level constraints for the cumulative sample rate and bitrate at 2x the single layer rates
  - Allows both 2-layer SNR scalability and 3+ layer spatial scalability to use the same level as is used for single layer at the highest resolution
  - Allows similar constraints as the 2-view case supported in the MV-HEVC Stereo Main profile

# Motivation

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- Use of 2x of single layer capability allows same level\_idc (and tier\_idc) to be used for same resolution/frame rate as a single layer using Main profile

## Example A: Two-layer SNR scalable

- Layer 0 at 1920x1080
- Layer 1 at 1920x1080
- Both at 60 fps.
- Two operation points defined
  - OP-A0 including only layer 0
  - OP-A1 including both layer 0 and layer 1

Operation point	Layers included	Resolutions/frame rates to be decoded	level_idc
OP-A0	0	1920x1080/60	4.1
OP-A1	0, 1	1920x1080/60, 1920x1080/60	4.1

## Example B: Three-layer spatial scalable

- Layer 0 at 640x480@60
- Layer 1 at 1280x720@60
- Layer 2 at 1920x1080@60
- Three operation points defined
  - OP-B0 including only layer 0
  - OP-B1 including layers 0 and 1
  - OP-B2 including layers 0, 1, and 2

Operation point	Layers included	Resolutions/frame rates to be decoded	level_idc
OP-B0	0	640x480/60	3
OP-B1	0, 1	640x480/60, 1280x720/60	4
OP-B2	0, 1, 2	640x480/60, 1280x720/60, 1920x1080/60	4.1

# Proposed specification text

## H.11.2 General tier and level limits

Bitstreams containing output layer sets conforming to the Scalable Main profile shall obey the constraints of A.4.1, for each layer in the TargetDecLayerIdList associated with layerSetIdx, which is the layer set for an output layer set conforming to the Scalable Main profile:

## H.11.3 Profile specific tier and level limits for the Scalable Main profile

Bitstreams containing output layer sets conforming to the Scalable Main profile shall obey the following constraints, with layerSetIdx being the layer set for an output layer set, and TargetDecLayerIdList being the target decoder layer identifier list for the output layer set, conforming to the Scalable Main profile:

Each layer in the TargetDecLayerIdList shall obey the Bitstreams Profile-specific level limits a), b), c), d) g), h), i), and j) for the Main profile specified in A.4.2

The value of TotalPicSizeInSamplesY shall be less than or equal to  $2 * \text{MaxLumaPs}$ , where MaxLumaPs is specified in Table A-1, and where TotalPicSizeInSamplesY is derived as follows:

```

TotalPicSizeInSamplesY = 0
for (i = 0; i < 64; i++)
if layer i in TargetDecLayerIdList
    TotalPicSizeInSamplesY += PicSizeInSamplesY of the layer with nuh_layer_id equal to i
  
```

The nominal removal time of access unit n (with n greater than 0) from the CPB, as specified in subclause C.2.3, shall satisfy the constraint that  $\text{AuNominalRemovalTime}[n] - \text{AuCpbRemovalTime}[n - 1]$  is greater than or equal to  $\text{Max}(\text{TotalPicSizeInSamplesY} \div (2 * \text{MaxLumaSr}), \text{fR})$  for the value of TotalPicSizeInSamplesY of access unit n - 1, where MaxLumaSr is the value specified in Table A-2 that applies to access unit n - 1.

For the VCL HRD parameters, BitRate[ i ] shall be less than or equal to  $2 * \text{CpbBrVclFactor} * \text{MaxBR}$  for at least one value of i in the range of 0 to cpb\_cnt\_minus1[ HighestTid ], inclusive, where BitRate[ i ] is specified in subclause E.2.3 based on parameters selected as specified in subclause C.1 and MaxBR is specified in Table A-2 in units of CpbBrVclFact or bits/s.

For the NAL HRD parameters, BitRate[ i ] shall be less than or equal to  $2 * \text{CpbBrNalFactor} * \text{MaxBR}$  for at least one value of i in the range of 0 to cpb\_cnt\_minus1[ HighestTid ], inclusive, where BitRate[ i ] is specified in subclause E.2.3 based on parameters selected as specified in subclause C.1 and MaxBR is specified in Table A-2 in units of CpbBrNalFactor bits/s.