

JCTVC-J0235

On tile size restrictions in HEVC

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Background

- Some multi-core encoder designs can *benefit* from using many tiles.
- Some single-core decoder implementations are *penalized* by supporting many tiles.

Proposal

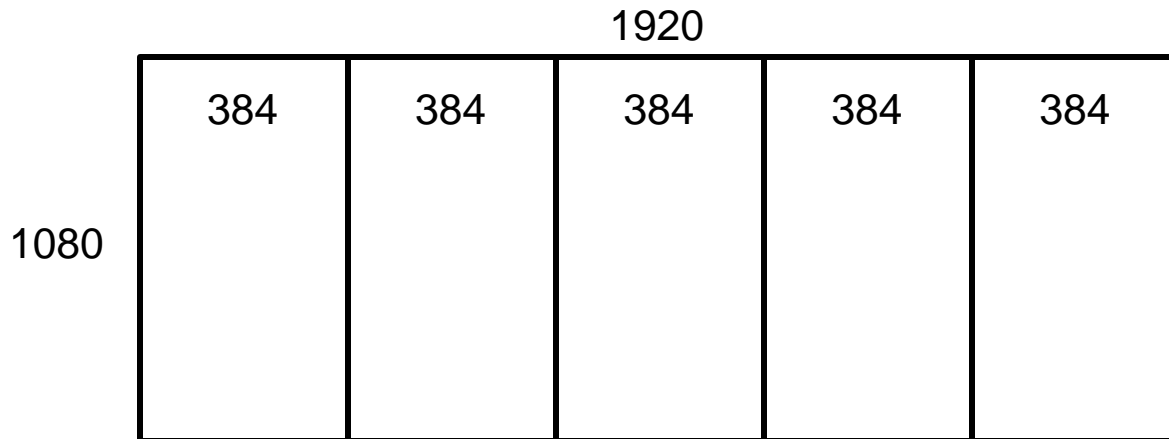
- Restriction on numbers of tiles vertically.
- Express tile restrictions in terms of “maximum number of tiles” instead of “minimum tile size”.
- Make tile restrictions level dependent instead of resolution dependent

Multiple tiles for HEVC encoding

- Multicore devices having 16-64 cores exist today.
- Experiments with HM software (class B & E).
- Number of tiles: 6 – 36
- BDR loss when doubling the number of tiles:
 - Common test conditions: 1% - 6%
 - Realistic bit rates: 2% - 3%
- Net gain by allocating more processing resources is expected.

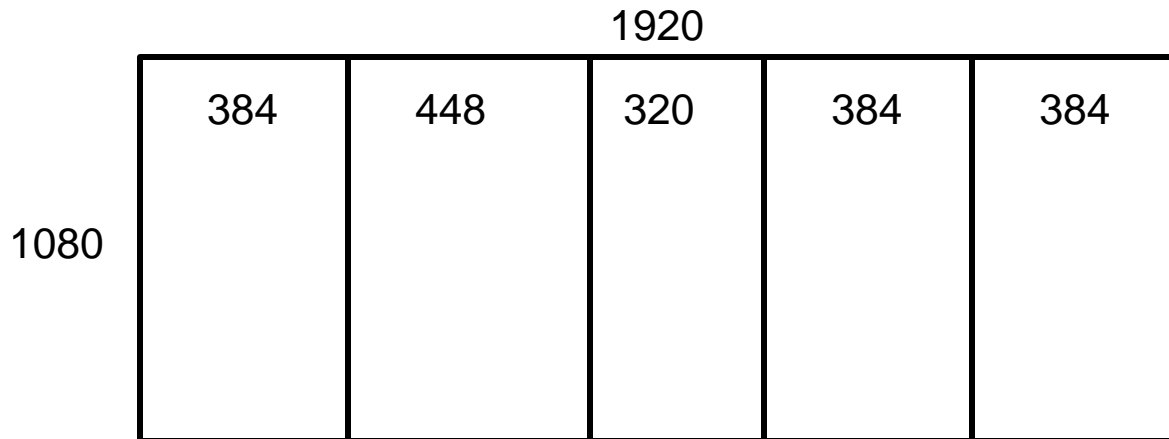
Maximum number of tiles

- Example: 1080x1920 resolution
- Current draft: Horizontal tile size ≤ 384 samples



Maximum number of tiles

- Example: 1080x1920 resolution
- Proposal: Number of tiles horizontally ≤ 5



Level-dependent limits

Level	Max luma pixel rate MaxLumaPR(s amples/sec)	Max luma picture size MaxLumaFS (samples)	Max bit rate MaxBR (1000 bits/s)	Min Compression Ratio MinCR	MaxDpbSize (picture storage buffers)	Max CPB size (1000 bits)	Max number of ver. tiles	Max number of hor. tiles
1	552,960	36,864	128	2	6	350	1	1
2	3,686,400	122,880	1,000	2	6	1,000	3	1
3	13,762,560	458,752	5,000	2	6	5,000	5	2
3.1	33,177,600	983,040	9,000	2	6	9,000	6	3
4	62,668,800	2,088,960	15,000	4	6	15,000	9	5
4.1	62,668,800	2,088,960	30,000	4	6	30,000	9	5
4.2	133,693,440	2,228,224	30,000	4	6	30,000	9	5
4.3	133,693,440	2,228,224	50,000	4	6	50,000	9	5
5	267,386,880	8,912,896	50,000	6	6	50,000	18	10
5.1	267,386,880	8,912,896	100,000	8	6	100,000	18	10
5.2	534,773,760	8,912,896	150,000	8	6	150,000	18	10
6	1,002,700,800	33,423,360	300,000	8	6	300,000	32	22
6.1	2,005,401,600	33,423,360	500,000	8	6	500,000	32	22
6.2	4,010,803,200	33,423,360	800,000	6	6	800,000	32	22

~ 128x384 tile size at maximum resolution for each level

Level-dependent limits

- Level 4 (1080p) decoder can decoder:
 - 1080p stream having 9x5 tiles
 - **720p stream having 9x5 tiles**
- Level 3.1 (720p) decoder can decoder:
 - 720p stream having 6x3 tiles

Summary

- Restriction on numbers of tiles vertically.
- Express tile restrictions in terms of “maximum number of tiles” instead of “minimum tile size”.
- Make tile restrictions level dependent instead of resolution dependent