

# JVET-Q0307

## CE4-related: Block-dimension based GEO mode selection

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# Summary

- The existing GEO causes difficulty for hardware conformance tests

- Proposal

- #1: Reduce the number of modes to 32 for a given CU

	# of HW validation tests	Storage for mode mapping LUT	# of mode for a given CU	# of modes in total
Common base	$82 \times 19 = 1558$	$(5+2) \times 82 / 8 = 72$ bytes	82	82
proposal	$32 \times 16 = 512$	$(5+2) \times 32 \times 2 / 8 = 56$ bytes	32	48
Saving	67%	22%	61%	41%

- #2: One-level scalability to only use the first 16 modes

- Experimental Results vs. VTM7.0

BD-rate Y	Test 1 (CE4-1+CE4-2.1+32modes)	Test 2 (CE4-1+CE4-2.1+CE4-3.1+32modes)	Test 3 (CE4-1+CE4-2.1+16modes)	Test 4 (CE4-1+CE4-2.1+CE4-3.1+16modes)
RA	-0.26%	-0.22%	-0.12%	-0.09%
LDB	-0.62%	-0.56%	-0.28%	-0.24%

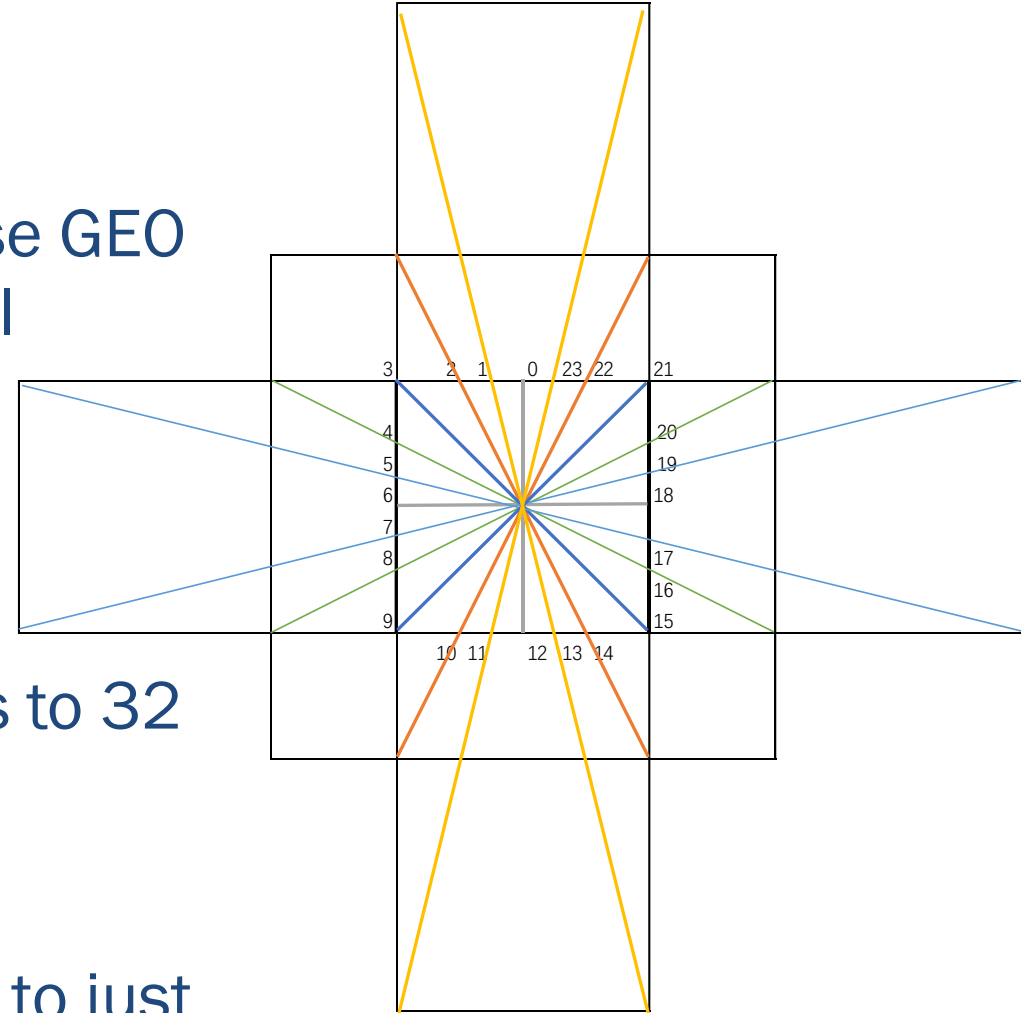
# Block-dimension based GEO mode selection

## ■ Observation

- Narrow blocks are more likely to choose GEO modes with angles close to the vertical direction (e.g., 1, 23, 11, 13...)
- Wide blocks are not

## ■ Proposal

- #1: Reduce the number of GEO modes to 32
  - The 1<sup>st</sup> set for  $H > W$
  - The 2<sup>nd</sup> set for  $H \leq W$
- #2: Enable one-level quality scalability to just use the first 16 modes
  - For less capable encoder



# Experimental results of 32 modes

vs. VTM-7.0		Y	U	V
Test 1 (CE4-1+CE4-2.1+32modes)	RA	-0.26%	-0.31%	-0.31%
	LDB	-0.62%	-0.72%	-0.71%
Test 2 (CE4-1+CE4-2.1+CE4-3.1+32modes)	RA	-0.22%	-0.29%	-0.29%
	LDB	-0.56%	-0.66%	-0.38%

vs. CE4 common base		Y	U	V
Test 1 (CE4-1+CE4-2.1+32modes)	RA	0.01%	0.05%	0.03%
	LDB	0.08%	-0.05%	0.05%
Test 2 (CE4-1+CE4-2.1+CE4-3.1+32modes)	RA	0.05%	0.06%	0.04%
	LDB	0.14%	0.01%	0.39%

# Experimental results of 16 modes

vs. VTM-7.0		Y	U	V
Test 3 (CE4-1+CE4-2.1+32modes)	RA	-0.12%	-0.11%	-0.07%
	LDB	-0.28%	-0.31%	-0.14%
Test 4 (CE4-1+CE4-2.1+CE4-3.1+32modes)	RA	-0.09%	-0.10%	-0.09%
	LDB	-0.24%	-0.30%	-0.26%

vs. CE4 common base		Y	U	V
Test 3 (CE4-1+CE4-2.1+32modes)	RA	0.16%	0.24%	0.27%
	LDB	0.43%	0.37%	0.63%
Test 4 (CE4-1+CE4-2.1+CE4-3.1+32modes)	RA	0.19%	0.26%	0.25%
	LDB	0.47%	0.38%	0.50%

# Conclusions

## ■ Benefits

- Reduce the # of hardware validation tests to 33%
- Negligible performance change
- Worst case is 32 GEO modes for a given CU
  - 56 bytes for the mode mapping table (vs. 72 bytes in common base)
  - In total 48 different GEO modes
- Quality scalable for less capable encoder
  - Support only using the first 16 modes, and still can get decent gain

## ■ It is recommended to adopt the proposed method

Thanks Intel for crosschecking! (JVET-Q0577)

# Spec changes

Table 36 – Specification of the angleIdx and distanceIdx values based on the merge\_geo\_partition\_idx value.

merge_geo_partition_idx	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IsNarrowBlk	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
angleIdx	18	12	6	0	12	0	16	1	20	12	2	2	0	2	4	1
distanceIdx	1	1	1	3	3	1	1	3	3	3	3	0	3	2	0	1
merge_geo_partition_idx	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
IsNarrowBlk	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
angleIdx	16	11	3	13	18	14	20	14	20	22	4	3	8	3	9	10
distanceIdx	3	2	1	3	3	1	1	2	2	1	3	2	2	3	2	1

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merge_geo_partition_idx	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
angleIdx	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4
distanceIdx	1	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2
merge_geo_partition_idx	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
angleIdx	4	6	6	8	8	8	8	9	9	9	9	10	10	10	10	11	11
distanceIdx	3	1	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1
merge_geo_partition_idx	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
angleIdx	11	11	12	12	13	13	13	14	14	14	15	15	15	16	16	16	18
distanceIdx	2	3	1	3	1	2	3	1	2	3	1	2	3	1	2	3	1
merge_geo_partition_idx	51	52	53	54	55	56	57	58	59	60	61	62	63				
angleIdx	18	20	20	20	21	21	21	22	22	22	23	23	23				
distanceIdx	3	1	2	3	1	2	3	1	2	3	1	2	3				