

# **EE1-related : Two unifications for PDPC (JVET-H0059)**

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# Summary

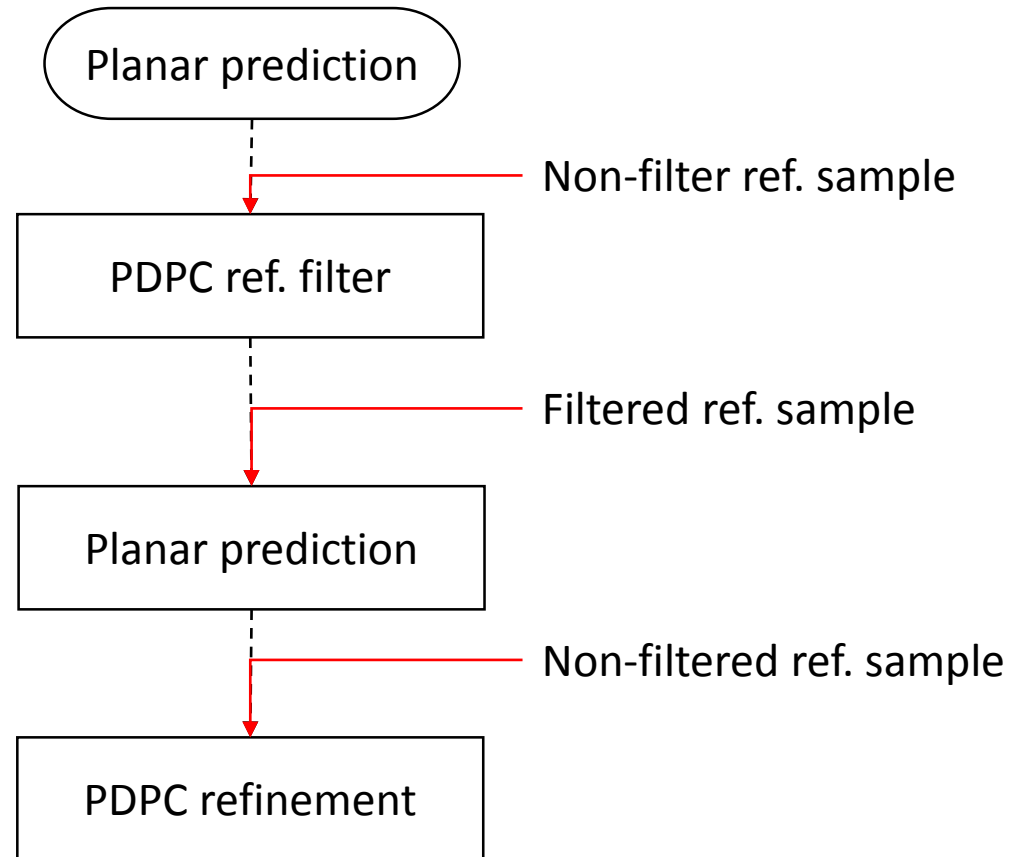
- Propose modifications for PDPC
  - Suggest unifying reference filtering process between Planar and the other intra mode
  - Simplifying reference sample buffer for planar mode
  - Combining PDPC and UWP as planar prediction
- Simulate suggested modification.
  1. Unifying reference sample filter (A)
  2. Simplifying reference buffer on top of proposed test 1 (B)
  3. Combining PDPC and UWP on top of proposed test 2 (C)
- Experimental results

	Over HM-16.6-JEM-7.0 (All intra main10)				
	Y	U	V	EncT	DecT
Method 1 (A)	0.07%	0.05%	0.06%	99%	99%
Method 2 (A+B)	0.07%	0.03%	0.06%	98%	98%
Method 3 (A+B+C)	0.04%	-0.01%	0.02%	100%	100%

- Crosscheck
  - JVET-H0078 (Samsung)

# Introduction

- Planar prediction in current JEM-7.0
  - PDPC is enabled only for planar prediction without addition signaling
  - Strong filter is disabled



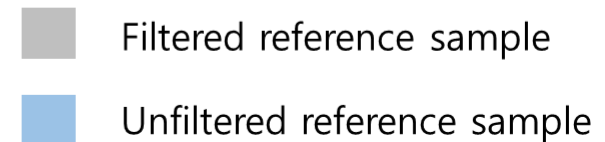
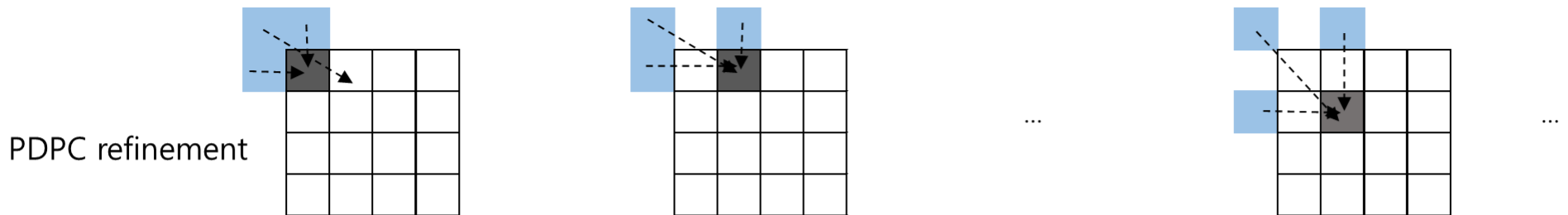
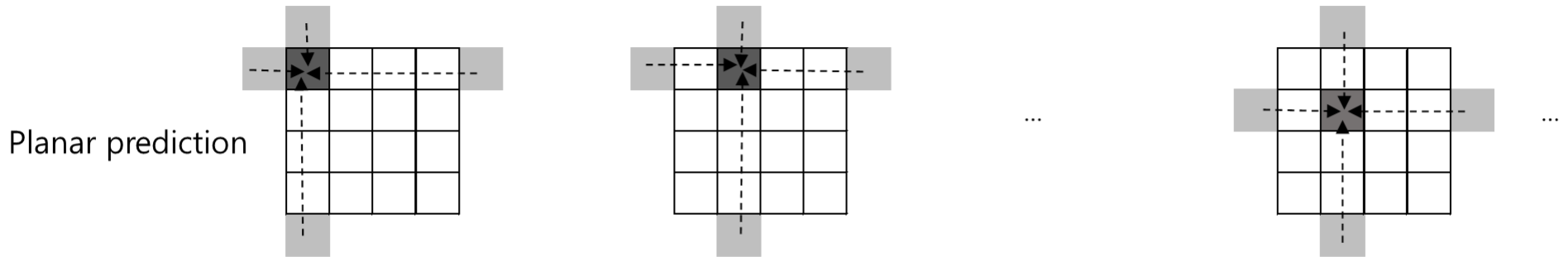
# Introduction

- PDPC on planar prediction
  - Step 1: Filtered reference samples are generated based on PDPC filter. As shown in below,  
\* Need to unify reference sample filtering between planar and other modes (A)

Block size	Filtering method
4x4	$((-19*[x])+(83*([x-1]+2*[x]+[x])>>2))>>6$
8x4, 4x8, 8x8	$((-37*[x])+(101*([x-1]+2*[x]+[x])>>2))>>6$
16x8, 8x16, 16x16	$(-4*[x])+(68*([x-3]+6*[x-2]+15*[x-1]+20*[x]+15*[x+1]+6*[x+2]+[x+3])>>6))>>6$
32x16, 16x32, 32x32	$(5*[x])+(59*(4*[x-3]+9*[x-2]+12*[x-1]+14*[x]+12*[x+1]+9*[x+2]+4*[x+3])>>6))>>6$

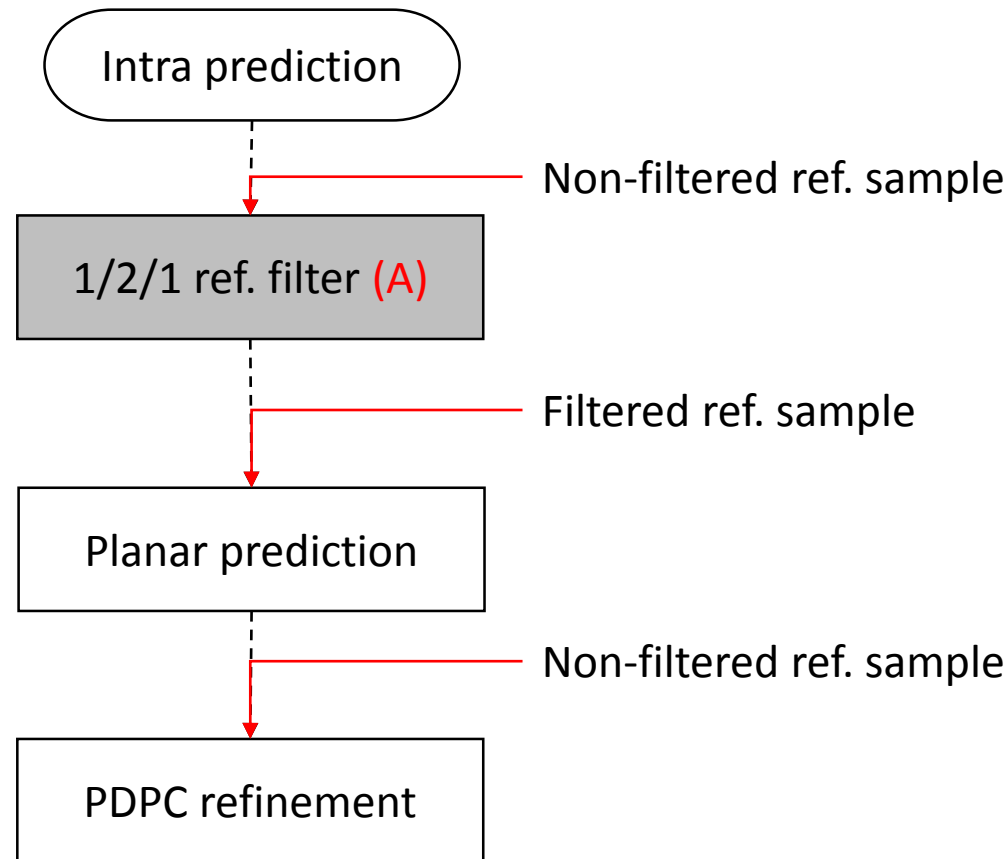
# Introduction

- PDPC on planar prediction
  - Step 2: Planar predictor is generated using filtered reference samples from Step 1
  - Step 3: PDPC refinement process based on predefined weight is performed using both the planar predictor from Step 2 and unfiltered reference samples.



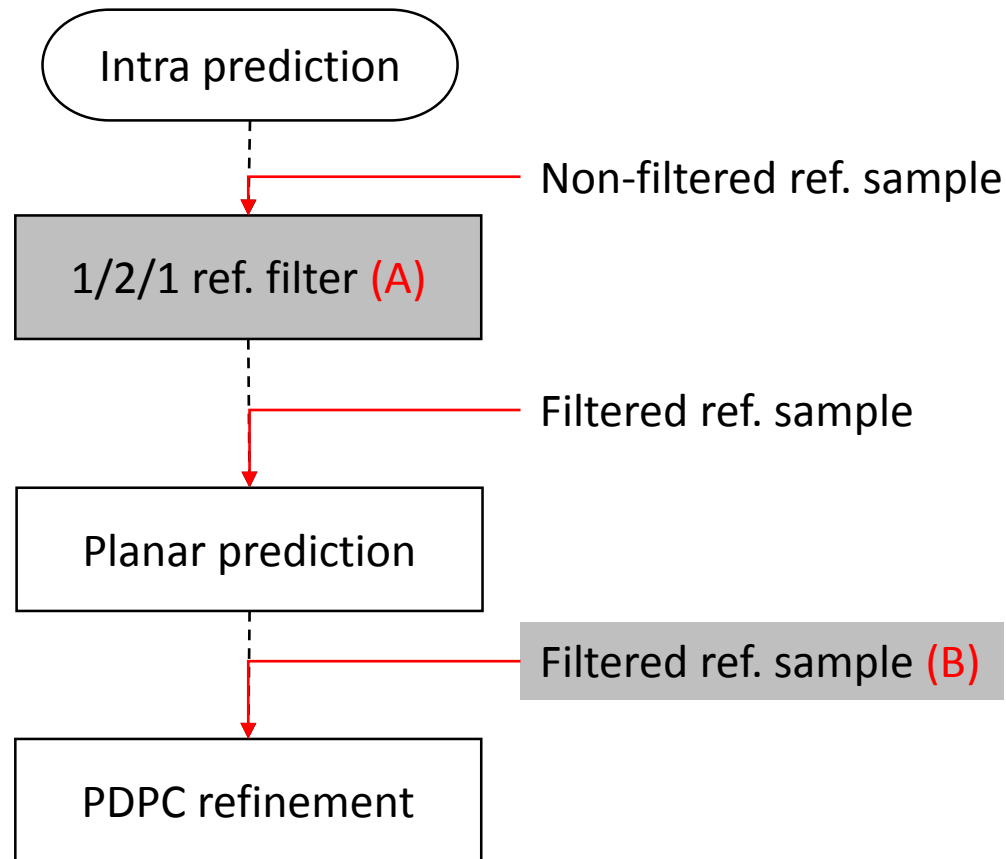
# Proposed method 1 (A)

- Unification of reference sample filtering process for planar mode as other intra modes
  - Replace reference sample filter of PDPC by conventional 1/2/1 filter.



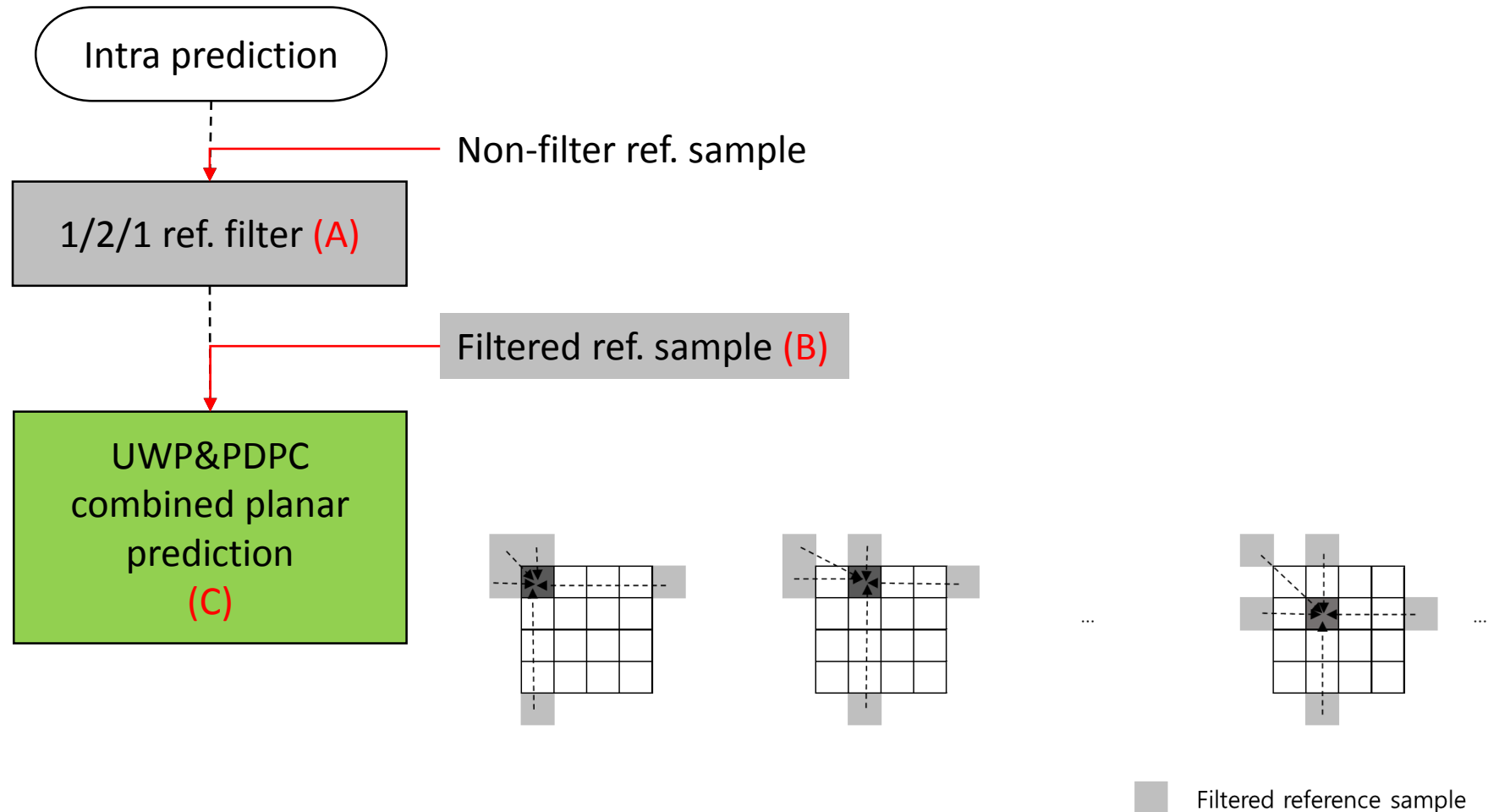
## Proposed method2 (A+B)

- Simplification referred sample buffer
  - Using unified reference sample buffer for PDPC refinement process



# Proposed method3 (A+B+C)

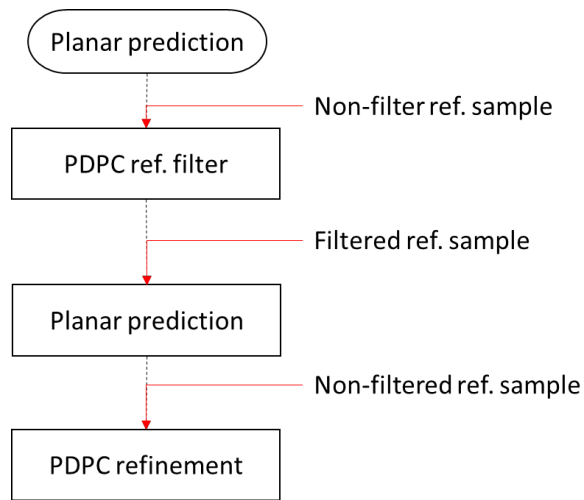
- Combining PDPC and UWP for planar predictor generation process
  - Generating planar predictor using combined PDPC and UWP



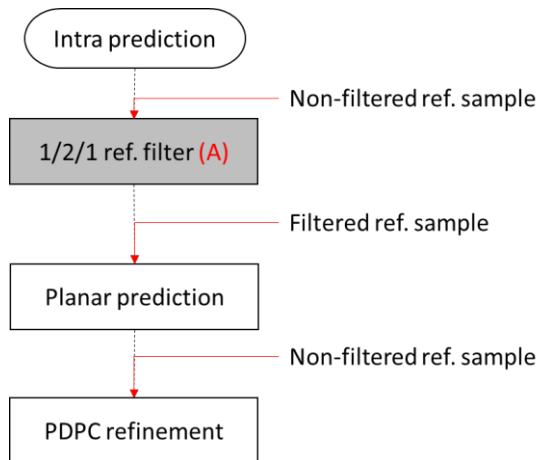


## Proposed methods

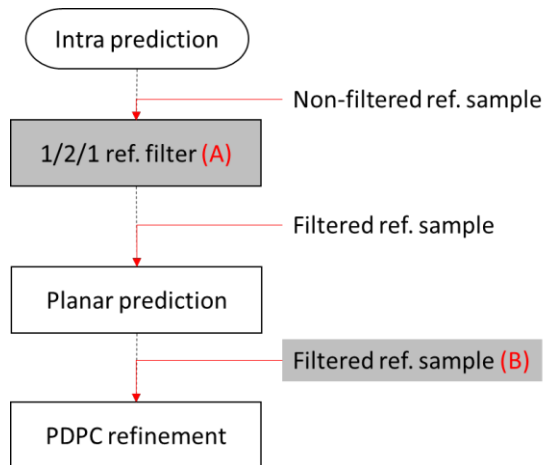
## Current JEM-7.0



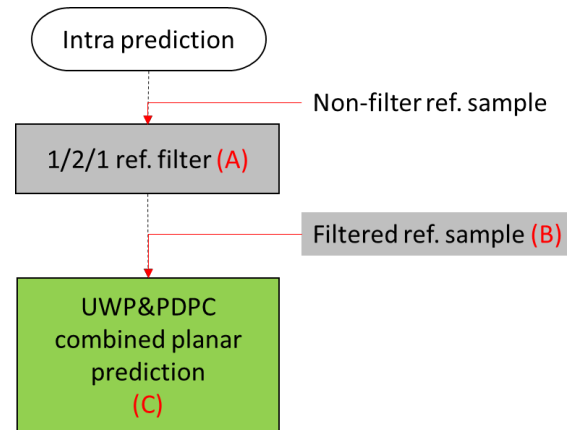
## Method 1



## Method 2



### Method 3



# Experimental results

- Test result of the proposed method 1 (unifying intra reference sample filter)

	Over HM-16.6-JEM-7.0 (All intra main10)				
	Y	U	V	EncT	DecT
Class A1	0.14%	0.15%	0.22%	1.00	1.02
Class A2	0.10%	0.10%	0.03%	1.00	1.00
Class B	0.09%	0.07%	0.10%	1.00	1.00
Class C	0.05%	-0.05%	0.05%	0.98	1.01
Class D	0.05%	0.04%	0.00%	1.00	0.95
Class E	0.00%	-0.04%	-0.08%	0.99	0.98
Overall (Ref)	0.07%	0.05%	0.06%	0.99	0.99
Class F (optional)	-0.07%	-0.01%	-0.16%	0.97	1.01

# Experimental results

- Test result of the proposed method 2 (simplification reference sample buffer)

	Over HM-16.6-JEM-7.0 (All intra main10)				
	Y	U	V	EncT	DecT
Class A1	0.13%	0.20%	0.23%	1.00	0.99
Class A2	0.10%	0.10%	0.04%	0.99	0.99
Class B	0.09%	0.06%	0.04%	0.99	0.99
Class C	0.03%	-0.05%	0.06%	0.97	0.98
Class D	0.04%	-0.07%	0.07%	0.98	0.93
Class E	0.01%	-0.13%	-0.15%	0.97	0.98
Overall (Ref)	0.07%	0.03%	0.06%	0.98	0.98
Class F (optional)	-0.06%	0.05%	-0.09%	0.97	1.00

# Experimental results

- Test result of the proposed method 3 (combined PDPC and UWP planar prediction)

	Over HM-16.6-JEM-7.0 (All intra main10)				
	Y	U	V	EncT	DecT
Class A1	0.08%	0.00%	0.07%	0.99	1.00
Class A2	0.02%	-0.02%	-0.12%	1.00	1.02
Class B	0.06%	-0.09%	-0.01%	1.00	1.01
Class C	0.04%	0.07%	0.05%	1.00	0.99
Class D	0.03%	0.09%	-0.01%	1.01	0.94
Class E	-0.01%	-0.11%	0.21%	1.00	1.01
Overall (Ref)	0.04%	-0.01%	0.02%	1.00	1.00
Class F (optional)	-0.02%	0.26%	0.01%	0.99	1.01

# Conclusion

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- Recommendation
  - It is recommended to unify reference sample filter and simplify reference buffer for intra prediction.