

# **Delta parameter derivation for inter reference picture set prediction (JCTVC-I0145)**

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# Introduction

## ❖ Committee Draft (CD) & HM6.0

- A RPS is predicted from previously reconstructed RPS in order to reduce signalling bits of RPS.
  - Index of previously reconstructed RPS (*reference RPS*)
  - Value to be added to reference RPS (*deltaRPS*)
- By adding *deltaRPS* to the reference RPS, a RPS can be obtained.
- Currently, RPS data are specified in sequence parameter set (**SPS**), and a RPS can be added in **slice header**.

# Introduction

- ❖ Committee Draft (CD) & HM6.0
  - Short-term reference picture set syntax

short_term_ref_pic_set( idx ) {	Descriptor
inter_ref_pic_set_prediction_flag	u(1)
if( inter_ref_pic_set_prediction_flag ) {	
delta_idx_minus1	ue(v)
delta_rps_sign	u(1)
abs_delta_rps_minus1	ue(v)
for( j = 0; j <= NumDeltaPocs[ RIdx ]; j++ ) {	
used_by_curr_pic_flag[ j ]	u(1)
if( !used_by_curr_pic_flag[ j ] )	
use_delta_flag[ j ]	u(1)
}	
}	
else {	
num_negative_pics	ue(v)
num_positive_pics	ue(v)
for( i = 0; i < num_negative_pics; i++ ) {	
delta_poc_s0_minus1[ i ]	ue(v)
used_by_curr_pic_s0_flag[ i ]	u(1)
}	
for( i = 0; i < num_positive_pics; i++ ) {	
delta_poc_s1_minus1[ i ]	ue(v)
used_by_curr_pic_s1_flag[ i ]	u(1)
}	
}	
}	

# Proposed (1)

- ❖ Additional syntax element *derived\_delta\_rps\_flag* is proposed
  - Save bits to signal a RPS information in a slice header
  - Effective when a regular temporal prediction structure is assumed.
  - When *derived\_delta\_rps\_flag* is equal to 1, deltaRPS is derived from POC difference between previous picture and current picture.
  - By deriving deltaRPS without explicit signalling of it, additional bit saving is possible.

#	Type	POC	QPOffset	QPfactor	temporal_id	ref_buf_size	ref_pic	#ref_pics	reference pictures	predict	deltaRIdx-1	deltaRPS	#ref_idcs	reference idcs
Frame1:	B	8	1	0.442	0	4	1	4	-8 -10 -12 -16	0		4	5	1 1 0 0 1
Frame2:	B	4	2	0.3536	0	2	1	3	-4 -6 4	1	0	2	4	1 1 1 1
Frame3:	B	2	3	0.3536	0	2	1	4	-2 -4 2 6	1	0	1	5	1 0 1 1 1
Frame4:	B	1	4	0.68	0	2	0	4	-1 1 3 7	1	0	-2	5	1 1 1 1 0
Frame5:	B	3	4	0.68	0	2	0	4	-1 -3 1 5	1	0	-3	5	1 1 1 1 0
Frame6:	B	6	3	0.3536	0	2	1	4	-2 -4 -6 2	1	0	1	5	1 0 1 1 1
Frame7:	B	5	4	0.68	0	2	0	4	-1 -5 1 3	1	0	-2	5	1 1 1 1 0
Frame8:	B	7	4	0.68	0	2	0	4	-1 -3 -7 1	1	0			

(a) Random access configuration

#	Type	POC	QPOffset	QPfactor	temporal_id	ref_buf_size	ref_pic	#ref_pics	reference pictures	predict	deltaRIdx-1	deltaRPS	#ref_idcs	reference idcs
Frame1:	B	1	3	0.4624	0	4	1	4	-1 -5 -9 -13	0		-1	5	1 1 1 0 1
Frame2:	B	2	2	0.4624	0	4	1	4	-1 -2 -6 -10	1	0	-1	5	0 1 1 1 1
Frame3:	B	3	3	0.4624	0	4	1	4	-1 -3 -7 -11	1	0	-1	5	0 1 1 1 1
Frame4:	B	4	1	0.578	0	4	1	4	-1 -4 -8 -12	1	0			

(B) Low delay configuration

# Proposed (2)

## ❖ Modified syntax table

short_term_ref_pic_set( idx ) {	Descriptor
inter_ref_pic_set_prediction_flag	u(1)
if( inter_ref_pic_set_prediction_flag ) {	
if( idx == num_short_term_ref_pic_sets )	
derived_delta_rps_flag	u(1)
if( !derived_delta_rps_flag ) {	
delta_idx_minus1	ue(v)
delta_rps_sign	u(1)
abs_delta_rps_minus1	ue(v)
}	
for( j = 0; j <= NumDeltaPocs[ RIdx ]; j++ ) {	
used_by_curr_pic_flag[ j ]	u(1)
if( !used_by_curr_pic_flag[ j ] )	
use_delta_flag[ j ]	u(1)
}	
}	
else {	
num_negative_pics	ue(v)
num_positive_pics	ue(v)
for( i = 0; i < num_negative_pics; i++ ) {	
delta_poc_s0_minus1[ i ]	ue(v)
used_by_curr_pic_s0_flag[ i ]	u(1)
}	
for( i = 0; i < num_positive_pics; i++ ) {	
delta_poc_s1_minus1[ i ]	ue(v)
used_by_curr_pic_s1_flag[ i ]	u(1)
}	
}	
}	

# Proposed (3)

## ❖ Modified semantics

- **derived\_delta\_rps\_flag** equal to 1 specifies that DeltaRPS of the current picture shall be derived as follows.
- $\text{DeltaRPS} = \text{prevPicOrderCntLsb} + \text{prevPicOrderCntMsb} - \text{PicOrderCntVal}$

# Conclusions

- ❖ In this contribution, additional syntax element *derived\_delta\_rps\_flag* was proposed to save bits to signal a RPS information in a slice header when a regular temporal prediction structure is assumed.
- ❖ When *derived\_delta\_rps\_flag* is equal to 1, deltaRPS is derived from POC difference between previous picture and current picture.
- ❖ By deriving deltaRPS without explicit signalling of it, additional bit saving is possible.
- ❖ In order to save bits for RPS signalling, it is recommended to adopt this proposal in the HEVC standard.