

MEDIATEK

CE8-related: Context modelling of transform skip mode

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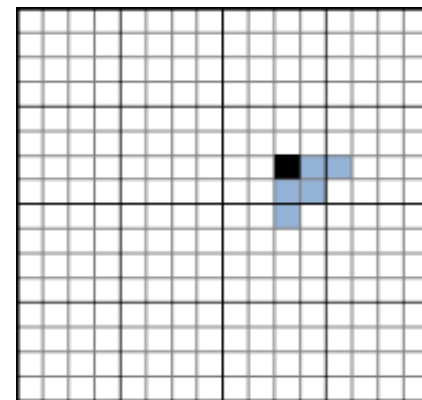
Overall Summary

1. It is proposed to use three neighbors (right, bottom, and bottom-right) for context modelling and Rice parameter derivation for transform skip mode
2. Separate context sets for transform skip mode for **sig_coeff_flag**, **par_level_flag**, **abs_level_gt1_flag**, and **abs_level_gt3_flag** are proposed
3. Additional separate context sets are proposed for **last_sig_coeff_x_prefix** and **last_sig_coeff_y_prefix**
 - Three tests are conducted
 - **Test-1:** Reducing the number of neighboring coefficients for transform skip mode (total number of context variables kept the same as that in VTM4.0, i.e., 232)
 - **Test-2:** Test-1 plus separate context sets for transform skip mode for **sig_coeff_flag**, **par_level_flag**, **abs_level_gt1_flag**, and **abs_level_gt3_flag** (total number of context variables = 265)
 - **Test-3:** Test-2 plus separate context sets for **last_sig_coeff_x_prefix** and **last_sig_coeff_y_prefix** (total number of context variables = 295)

		Y	U	V	Enc. T	Dec. T
Proposed Method for TGM under CTC	AI	-2.05%	-1.34%	-1.36%	101%	99%
	RA	-1.40%	-0.81%	-0.91%	101%	99%
	LB	-1.09%	-0.86%	-0.90%	101%	100%

Context modelling and Rice parameter derivation in VTM4.0

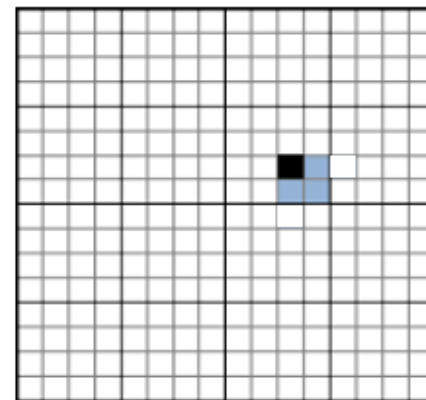
- Five neighboring positions are considered for deriving the context indices
- Following three variables are computed
 - **locSumAbsPass1**: sum of decoded neighboring coefficients after the first pass of decoding
 - **locNumSig** : number of nonzero neighboring coefficients
 - **locSumAbs**: sum of absolute value of decoded neighboring coefficients



Template in VTM-4.0

Proposed Method

1. Reduced number of neighbors :
 - For **transform skip** mode, 3 neighbors used as shown: bottom, right and bottom-right
 - For **transformed blocks**, the 5 neighbors are same as in VTM-4.0



Template in proposed method
in case of transform skip mode

Proposed Method

2. a. Separate context sets added for **sig_coeff_flag** for transform skip mode

- Additional **18** (= 6x3) contexts used for transform skip mode
- The derivation process of the context index of the syntax element **sig_coeff_flag** is as follows:

$d = xC + yC$

if luma:

$offset = (transform_skip_flag) ? 18 : (d < 2 ? 12 : (d < 5 ? 6 : 0))$

$ctxInc = 24 * Max(0, QState - 1) + Min(locSumAbsPass1, 5) + offset$

if chroma:

$offset = (d < 2 ? 6 : 0)$

$ctxInc = 72 + 12 * Max(0, QState - 1) + Min(locSumAbsPass1, 5) + offset$

Proposed Method

2. b. Separate context sets added for **par_level_flag**, **abs_level_gt1_flag**, and **abs_level_gt3_flag** for **transform skip** mode
- Additional **15**(5 for each syntax element) contexts are used for transform skip mode
 - The derivation process of the context index :

$$\text{ctxOffset} = \text{Min}(\text{locSumAbsPass1} - \text{locNumSig}, 4)$$

$$d = xC + yC$$

if last coefficient:

$$\text{ctxInc} = (\text{cldx} == 0 ? (\text{transform_skip_flag} ? 21 : 0) : 26)$$

else, if luma:

$$\text{offset} = (\text{transform_skip_flag}) ? 21 : (1 + (d == 0 ? 15 : (d < 3 ? 10 : (d < 10 ? 5 : 0))))$$

$$\text{ctxInc} = \text{offset} + \text{ctxOffset}$$

else, if chroma:

$$\text{ctxInc} = 27 + \text{ctxOffset} + (d == 0 ? 5 : 0)$$

Number of contexts In Test 2:

Syntax	Number of contexts in VTM 4.0		Additional contexts for Transform skip mode
	Luma	Chroma	
sig_coeff_flag	$18 \times 3 = 54$	$12 \times 3 = 36$	$3 \times 6 = 18$
abs_level_gt1_flag	21	11	5
par_level_flag	21	11	5
abs_level_gt3_flag	21	11	5
last_sig_coeff_x_prefix	20	3	-
last_sig_coeff_y_prefix	20	3	-
Total	157	75	33
	265		

Proposed Method

3. Separate context sets added for **last_sig_coeff_x_prefix** and **last_sig_coeff_y_prefix**

- Additional **30** (i.e. 15 for x and 15 for y) contexts used for **transform skip** mode

if luma:

ctxOffset = **(transform_skip_flag) ? 20 :**
 $(3 * (\log_2 \text{TbSize} - 2) + ((\log_2 \text{TbSize} - 1) \gg 2))$
 ctxShift = $(\log_2 \text{TbSize} + 1) \gg 2$.

if chroma:

ctxOffset is set equal to 35
 ctxShift is set equal to $\text{Clip3}(0, 2, 2\log_2 \text{TbSize} \gg 3)$.
 $\text{ctxInc} = (\text{binIdx} \gg \text{ctxShift}) + \text{ctxOffset}$

Number of contexts In Test 3:

Syntax	Number of contexts in VTM 4.0		Additional contexts for Transform skip mode
	Luma	Chroma	
sig_coeff_flag	$18 \times 3 = 54$	$12 \times 3 = 36$	$3 \times 6 = 18$
abs_level_gt1_flag	21	11	5
par_level_flag	21	11	5
abs_level_gt3_flag	21	11	5
last_sig_coeff_x_prefix	20	3	15
last_sig_coeff_y_prefix	20	3	15
Total	157	75	63
	295		

Simulation results

- **Test 1**: Only the number of neighbors for transform skip mode is reduced. Same context sets are used for both transform and transform skipped TU, i.e. number of contexts are exactly the same as that in VTM4.0 (i.e, 232).
- **Test 2**: Separate context sets for **transform skip mode** for **sig_coeff_flag**, **par_level_flag**, **abs_level_gt1_flag**, and **abs_level_gt3_flag** added on top of Test 1. The number of contexts is **265**.
- **Test 3**: Separate context sets for **last_sig_coeff_x_prefix** and **last_sig_coeff_y_prefix** added on top of Test 2. The number of contexts is **295**.

Summary for simulation results (CTC)

- Anchor: VTM4.0

Sequences	Test 1 (same number of contexts)	Test 2 (additional 33 contexts)	Test3 (additional 63 contexts)
Overall	AI: -0.02%/0.02%/0.02% RA: -0.02%/0.00%/-0.02% LB: -0.03%/0.13%/-0.10%	AI: -0.03%/-0.02%/0.01% RA: -0.03%/0.01%/-0.04% LB: -0.05%/-0.05%/0.23%	AI: -0.06%/-0.04%/-0.01% RA: -0.04%/0.00%/-0.08% LB: 0.00%/-0.37%/0.03%
Class F	AI: -0.59%/-0.38%/-0.39% RA: -0.56%/-0.41%/-0.42% LB: -0.60%/-0.34%/0.17%	AI: -1.19%/-0.92%/-0.90% RA: -1.04%/-0.70%/-0.72% LB: -0.69%/-0.77%/-0.31%	AI: -1.41%/-1.01%/-1.23% RA: -1.19%/-0.91%/-0.93% LB: -0.86%/-0.49%/-0.75%
TGM	AI: -1.01%/-0.66%/-0.67% RA: -0.68%/-0.32%/-0.39% LB: -0.63%/-0.36%/-0.33%	AI: -1.83%/-1.25%/-1.25% RA: -1.24%/-0.82%/-0.77% LB: -0.92%/-0.67%/-0.75%	AI: -2.05%/-1.34%/-1.36% RA: -1.40%/-0.81%/-0.91% LB: -1.09%/-0.86%/-0.90%

Thank Huawei for cross-checking

Summary for simulation results (low QP)

- Anchor: VTM4.0

Sequences	Test 1 (same number of contexts)	Test 2 (additional 33 contexts)	Test3 (additional 63 contexts)
Overall	AI: -0.02% 0.00% -0.01% RA: -0.03% 0.02% -0.02% LB: -0.02% -0.04% -0.06%	AI: -0.05% -0.03% -0.05% RA: -0.02% -0.05% -0.04% LB: 0.00% -0.06% -0.06%	AI: -0.05% -0.03% -0.03% RA: -0.01% -0.02% -0.01% LB: 0.00% -0.02% -0.05%
Class F	AI: -0.40% -0.28% -0.28% RA: -0.47% -0.36% -0.34% LB: -0.07% -0.02% -0.03%	AI: -0.70% -0.62% -0.59% RA: -0.80% -0.58% -0.64% LB: -0.49% -0.44% -0.51%	AI: -0.77% -0.68% -0.67% RA: -0.88% -0.67% -0.74% LB: -0.59% -0.60% -0.44%
TGM	AI: -1.01% -0.75% -0.74% RA: 0.02% -0.47% -0.46% LB: -0.97% -0.63% -0.68%	AI: -1.55% -1.13% -1.12% RA: -1.09% -0.80% -0.74% LB: -1.28% -0.95% -0.96%	AI: -1.62% -1.18% -1.15% RA: -0.58% -0.77% -0.77% LB: -1.51% -0.77% -0.84%

Thank Huawei for cross-checking

Conclusions

1. Three neighbors (right, bottom, and bottom-right) are proposed to be used for context modelling and Rice parameter derivation
2. Separate context sets for coding **sig_coeff_flag**, **par_level_flag**, **abs_level_gt1_flag**, and **abs_level_gt3_flag** proposed
3. Additional separate context sets are proposed for **last_sig_coeff_x_prefix** and **last_sig_coeff_y_prefix**
4. Compared to VTM4.0, this proposal (Test 3) reportedly achieves following BD-rates of TGM under CTC QP set

		Y	U	V	Enc. T	Dec. T
Proposed Method	AI	-2.05%	-1.34%	-1.36%	101%	99%
	RA	-1.40%	-0.81%	-0.91%	101%	99%
	LB	-1.09%	-0.86%	-0.90%	101%	100%



everyday genius

Proposed Method

■ Derivation of locNumSig and locSumAbsPass1 :

```

- locNumSig = 0
  locSumAbsPass1 = 0
  if( xC < (1 << log2TbWidth) - 1 ) {
    locNumSig += sig_coeff_flag[ xC + 1 ][ yC ]
    locSumAbsPass1 += AbsLevelPass1[ xC + 1 ][ yC ]
    if( xC < (1 << log2TbWidth) - 2 && !transform_skip_flag ) {
      locNumSig += sig_coeff_flag[ xC + 2 ][ yC ]
      locSumAbsPass1 += AbsLevelPass1[ xC + 2 ][ yC ]
    }
    if( yC < (1 << log2TbHeight) - 1 ) {
      locNumSig += sig_coeff_flag[ xC + 1 ][ yC + 1 ]
      locSumAbsPass1 += AbsLevelPass1[ xC + 1 ][ yC + 1 ]
    }
  }
  if( yC < (1 << log2TbHeight) - 1 ) {
    locNumSig += sig_coeff_flag[ xC ][ yC + 1 ]
    locSumAbsPass1 += AbsLevelPass1[ xC ][ yC + 1 ]
    if( yC < (1 << log2TbHeight) - 2 && !transform_skip_flag ) {
      locNumSig += sig_coeff_flag[ xC ][ yC + 2 ]
      locSumAbsPass1 += AbsLevelPass1[ xC ][ yC + 2 ]
    }
  }
}

```

Proposed Method

- Derivation of locSumAbs :

```

- locSumAbs = 0
  if( xC < (1 << log2TbWidth) - 1 ) {
    locSumAbs += AbsLevel[ xC + 1 ][ yC ] - sig_coeff_flag[ xC + 1 ][ yC ]
    if( xC < (1 << log2TbWidth) - 2 && !transform_skip_flag)
      locSumAbs += AbsLevel[ xC + 2 ][ yC ] - sig_coeff_flag[ xC + 2 ][ yC ]
    if( yC < (1 << log2TbHeight) - 1 )
      locSumAbs += AbsLevel[ xC + 1 ][ yC + 1 ] - sig_coeff_flag[ xC + 1 ][ yC + 1 ]
  }
  if( yC < (1 << log2TbHeight) - 1 ) {
    locSumAbs += AbsLevel[ xC ][ yC + 1 ] - sig_coeff_flag[ xC ][ yC + 1 ]
    if( yC < (1 << log2TbHeight) - 2 && !transform_skip_flag)
      locSumAbs += AbsLevelPass1 [ xC ][ yC + 2 ] - sig_coeff_flag[ xC ][ yC + 2 ]
  }
  if( locSumAbs > 31 )
    locSumAbs = 31

```

Simulation results : Test 1 (CTC)

■ Anchor: VTM4.0

	All Intra Main10				
	Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT
Class A1	-0.02%	-0.02%	-0.02%	100%	99%
Class A2	0.01%	0.02%	0.00%	100%	99%
Class B	-0.01%	0.01%	0.02%	100%	99%
Class C	-0.06%	0.07%	0.04%	101%	98%
Class E	0.01%	0.03%	0.02%	101%	99%
Overall	-0.02%	0.02%	0.02%	100%	99%
Class D	-0.05%	-0.08%	-0.04%	103%	98%
Class F	-0.59%	-0.38%	-0.39%	100%	98%
TGM	-1.01%	-0.66%	-0.67%	100%	99%

	Random Access Main 10				
	Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT
Class A1	0.00%	-0.20%	0.04%	100%	100%
Class A2	-0.02%	-0.06%	0.01%	100%	99%
Class B	0.01%	-0.07%	-0.06%	100%	95%
Class C	-0.05%	0.27%	-0.05%	100%	99%
Class E					
Overall	-0.02%	0.00%	-0.02%	100%	98%
Class D	-0.04%	-0.12%	0.10%	100%	97%
Class F	-0.56%	-0.41%	-0.42%	100%	95%
TGM	-0.68%	-0.32%	-0.39%	100%	98%

	Low delay B Main10				
	Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-0.01%	-0.10%	-0.09%	101%	103%
Class C	-0.09%	-0.04%	0.26%	101%	100%
Class E	0.01%	0.72%	-0.60%	101%	100%
Overall	-0.03%	0.13%	-0.10%	101%	101%
Class D	-0.05%	0.76%	0.58%	101%	103%
Class F	-0.60%	-0.34%	0.17%	100%	99%
TGM	-0.63%	-0.36%	-0.33%	100%	103%

Thank Huawei for cross-checking

Simulation results : Test 2 (CTC)

■ Anchor: VTM4.0

	All Intra Main10						Random Access Main 10				
	Over VTM-4.0 (enable CPR)						Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-0.05%	0.00%	0.03%	102%	101%	Class A1	-0.02%	-0.03%	0.04%	100%	100%
Class A2	0.00%	0.01%	-0.02%	101%	101%	Class A2	0.00%	0.03%	0.01%	101%	100%
Class B	-0.01%	-0.04%	0.02%	101%	100%	Class B	0.00%	-0.10%	-0.25%	101%	100%
Class C	-0.11%	0.02%	-0.02%	101%	100%	Class C	-0.10%	0.18%	0.14%	101%	105%
Class E	0.01%	-0.12%	0.06%	102%	102%	Class E					
Overall	-0.03%	-0.02%	0.01%	101%	101%	Overall	-0.03%	0.01%	-0.04%	101%	102%
Class D	-0.10%	-0.08%	0.05%	102%	99%	Class D	-0.03%	0.19%	0.26%	101%	100%
Class F	-1.19%	-0.92%	-0.90%	101%	102%	Class F	-1.04%	-0.70%	-0.72%	100%	99%
TGM	-1.83%	-1.25%	-1.25%	101%	101%	TGM	-1.24%	-0.82%	-0.77%	101%	100%

	Low delay B Main10				
	Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-0.01%	0.34%	-0.23%	102%	101%
Class C	-0.07%	-0.34%	-0.04%	101%	101%
Class E	-0.10%	-0.31%	1.36%	101%	101%
Overall	-0.05%	-0.05%	0.23%	101%	101%
Class D	-0.04%	0.95%	0.18%	101%	100%
Class F	-0.69%	-0.77%	-0.31%	100%	101%
TGM	-0.92%	-0.67%	-0.75%	100%	102%

Thank Huawei for cross-checking

Simulation results : Test 3 (CTC)

■ Anchor: VTM4.0

All Intra Main10						Random Access Main 10					
Over VTM-4.0 (enable CPR)						Over VTM-4.0 (enable CPR)					
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-0.06%	-0.01%	0.04%	102%	101%	Class A1	-0.02%	-0.06%	-0.02%	100%	99%
Class A2	0.01%	-0.02%	-0.01%	102%	100%	Class A2	-0.01%	-0.10%	0.01%	101%	99%
Class B	-0.02%	-0.06%	0.01%	101%	99%	Class B	-0.01%	-0.06%	-0.07%	101%	95%
Class C	-0.19%	-0.10%	-0.08%	101%	99%	Class C	-0.13%	0.21%	-0.22%	101%	99%
Class E	-0.01%	0.00%	-0.02%	101%	99%	Class E					
Overall	-0.06%	-0.04%	-0.01%	102%	100%	Overall	-0.04%	0.00%	-0.08%	101%	98%
Class D	-0.10%	-0.12%	-0.03%	102%	98%	Class D	-0.04%	0.04%	0.34%	101%	97%
Class F	-1.41%	-1.01%	-1.23%	101%	98%	Class F	-1.19%	-0.91%	-0.93%	100%	95%
TGM	-2.05%	-1.34%	-1.36%	101%	99%	TGM	-1.40%	-0.81%	-0.91%	101%	99%

Low delay B Main10					
Over VTM-4.0 (enable CPR)					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.01%	0.05%	-0.52%	101%	102%
Class C	-0.07%	-0.38%	-0.05%	101%	100%
Class E	0.08%	-1.05%	1.05%	101%	100%
Overall	0.00%	-0.37%	0.03%	101%	101%
Class D	-0.05%	0.45%	0.11%	101%	101%
Class F	-0.86%	-0.49%	-0.75%	101%	100%
TGM	-1.09%	-0.86%	-0.90%	101%	100%

Thank Huawei for cross-checking

Simulation results : Test 1 (low QP)

■ Anchor: VTM4.0

	All Intra Main10						Random Access Main 10				
	Over VTM-4.0 (enable CPR)						Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-0.06%	-0.05%	-0.06%	100%	100%	Class A1	-0.06%	-0.03%	-0.07%	100%	97%
Class A2	-0.01%	-0.02%	-0.01%	100%	100%	Class A2	-0.03%	-0.03%	-0.03%	100%	97%
Class B	-0.02%	0.00%	0.00%	100%	100%	Class B	-0.01%	-0.02%	0.01%	100%	99%
Class C	-0.02%	0.00%	0.00%	101%	97%	Class C	-0.02%	0.01%	0.00%	100%	100%
Class E	-0.01%	0.05%	0.00%	100%	100%	Class E					
Overall	-0.02%	0.00%	-0.01%	100%	99%	Overall	-0.03%	-0.02%	-0.02%	100%	99%
Class D	-0.01%	0.00%	0.03%	100%	100%	Class D	0.03%	-0.16%	0.03%	100%	100%
Class F	-0.40%	-0.28%	-0.28%	100%	99%	Class F	-0.47%	-0.36%	-0.34%	100%	100%
TGM	-1.01%	-0.75%	-0.74%	100%	100%	TGM	0.02%	-0.47%	-0.46%	100%	100%

	Low delay B Main10				
	Over VTM-4.0 (enable CPR)				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-0.01%	0.00%	-0.02%	100%	100%
Class C	-0.04%	-0.06%	-0.10%	100%	100%
Class E	-0.02%	-0.08%	-0.10%	100%	100%
Overall	-0.02%	-0.04%	-0.06%	100%	100%
Class D	0.01%	-0.04%	-0.06%	100%	105%
Class F	-0.07%	-0.02%	-0.03%	100%	99%
TGM	-0.97%	-0.63%	-0.68%	99%	102%

Thank Huawei for cross-checking

Simulation results : Test 2 (low QP)

■ Anchor: VTM4.0

All Intra Main10						Random Access Main 10					
Over VTM-4.0 (enable CPR)						Over VTM-4.0 (enable CPR)					
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-0.13%	-0.11%	-0.14%	102%	100%	Class A1	-0.10%	-0.08%	-0.04%	101%	101%
Class A2	-0.01%	-0.01%	-0.01%	102%	101%	Class A2	-0.02%	-0.01%	-0.02%	101%	97%
Class B	-0.03%	-0.01%	-0.02%	103%	101%	Class B	-0.01%	-0.03%	-0.01%	101%	102%
Class C	-0.03%	-0.02%	-0.04%	102%	97%	Class C	0.02%	-0.08%	-0.07%	101%	100%
Class E	-0.05%	-0.03%	-0.04%	101%	100%	Class E					
Overall	-0.05%	-0.03%	-0.05%	102%	100%	Overall	-0.02%	-0.05%	-0.04%	101%	100%
Class D	0.00%	0.00%	0.09%	102%	104%	Class D	0.09%	-0.15%	-0.02%	101%	100%
Class F	-0.70%	-0.62%	-0.59%	101%	98%	Class F	-0.80%	-0.58%	-0.64%	101%	98%
TGM	-1.55%	-1.13%	-1.12%	101%	101%	TGM	-1.09%	-0.80%	-0.74%	100%	98%

Low delay B Main10					
Over VTM-4.0 (enable CPR)					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-0.01%	-0.03%	-0.03%	101%	101%
Class C	0.02%	-0.09%	-0.10%	101%	101%
Class E	-0.02%	-0.06%	-0.04%	101%	101%
Overall	0.00%	-0.06%	-0.06%	101%	101%
Class D	0.09%	-0.06%	-0.08%	101%	100%
Class F	-0.49%	-0.44%	-0.51%	101%	101%
TGM	-1.28%	-0.95%	-0.96%	100%	100%

Thank Huawei for cross-checking

Simulation results : Test 3 (low QP)

■ Anchor: VTM4.0

All Intra Main10						Random Access Main 10					
Over VTM-4.0 (enable CPR)						Over VTM-4.0 (enable CPR)					
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-0.14%	-0.11%	-0.14%	102%	99%	Class A1	-0.10%	-0.07%	-0.05%	101%	101%
Class A2	-0.01%	0.00%	0.00%	102%	100%	Class A2	-0.02%	-0.01%	-0.01%	101%	98%
Class B	-0.03%	-0.02%	0.00%	102%	100%	Class B	-0.01%	-0.03%	-0.03%	101%	100%
Class C	-0.03%	-0.02%	-0.03%	102%	98%	Class C	0.06%	0.03%	0.04%	101%	99%
Class E	-0.05%	-0.01%	-0.01%	101%	100%	Class E					
Overall	-0.05%	-0.03%	-0.03%	102%	99%	Overall	-0.01%	-0.02%	-0.01%	101%	100%
Class D	0.01%	0.01%	0.09%	103%	99%	Class D	0.11%	-0.11%	0.09%	101%	99%
Class F	-0.77%	-0.68%	-0.67%	101%	99%	Class F	-0.88%	-0.67%	-0.74%	101%	99%
TGM	-1.62%	-1.18%	-1.15%	101%	99%	TGM	-0.58%	-0.77%	-0.77%	101%	99%

Low delay B Main10					
Over VTM-4.0 (enable CPR)					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-0.01%	-0.01%	-0.01%	101%	101%
Class C	0.05%	-0.01%	-0.11%	101%	101%
Class E	-0.02%	-0.06%	-0.02%	102%	101%
Overall	0.00%	-0.02%	-0.05%	101%	101%
Class D	0.12%	-0.06%	0.03%	100%	99%
Class F	-0.59%	-0.60%	-0.44%	102%	102%
TGM	-1.51%	-0.77%	-0.84%	101%	100%

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