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JCTVC-A117

Description of video coding technology proposal by TOSHIBA

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Summary

- **Submission method**

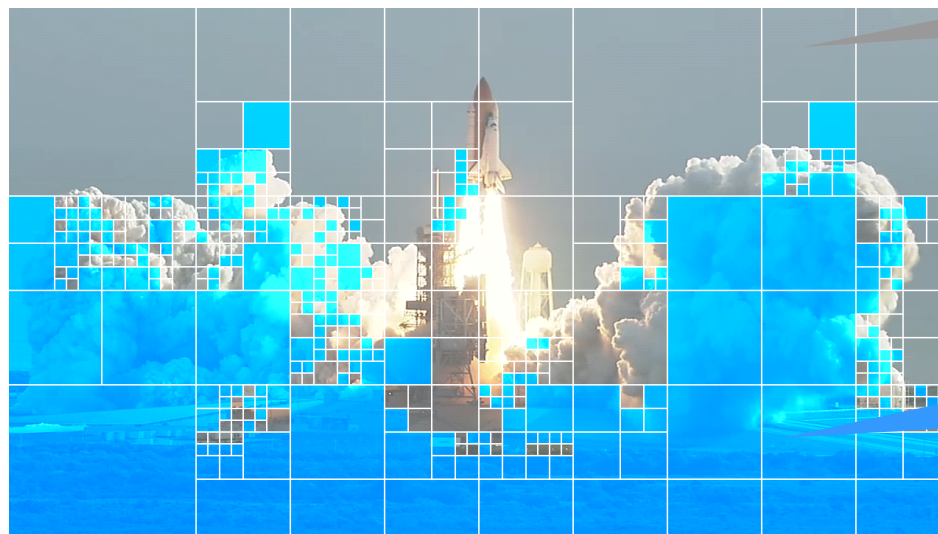
- Several tools are added to AVC
 - QALF (Quadtree-based Adaptive Loop Filter)
 - HAIF (High Accuracy Interpolation Filter)
 - IBDI (Internal Bit Depth Increase)
 - SAQMS (Subjectively Adaptive Quantization Matrix Selection)
 - BIP (Bidirectional Intra Prediction)
 - DUT (Directional Unified Transform)
 - STDS (Spatio-Temporal Direct Selection)
 - M3C (Multiple Macroblock based Motion Compensation)

- **Experimental results**

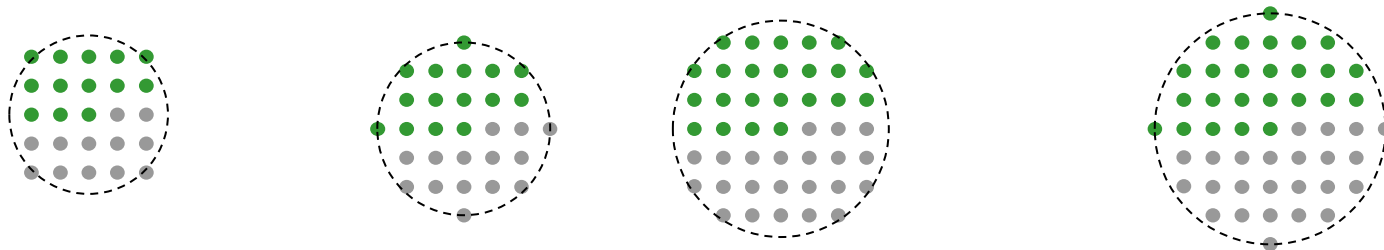
- Constraint set 1: average of 28.66% and up to 45.14% reduction
- Constraint set 2: average of 25.88% and up to 42.36% reduction

- **Quadtree-based Adaptive Loop Filter**

- Loop filter based on Wiener filter
- Variable size block-based filter on-off approach



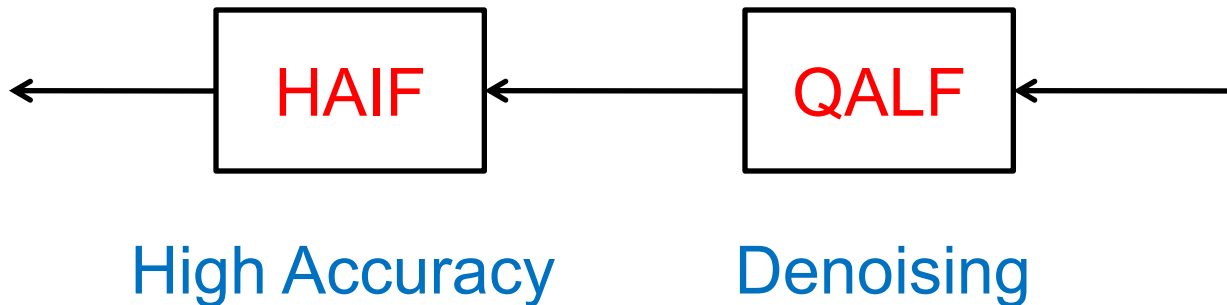
- Circular sharp filters



HAIF

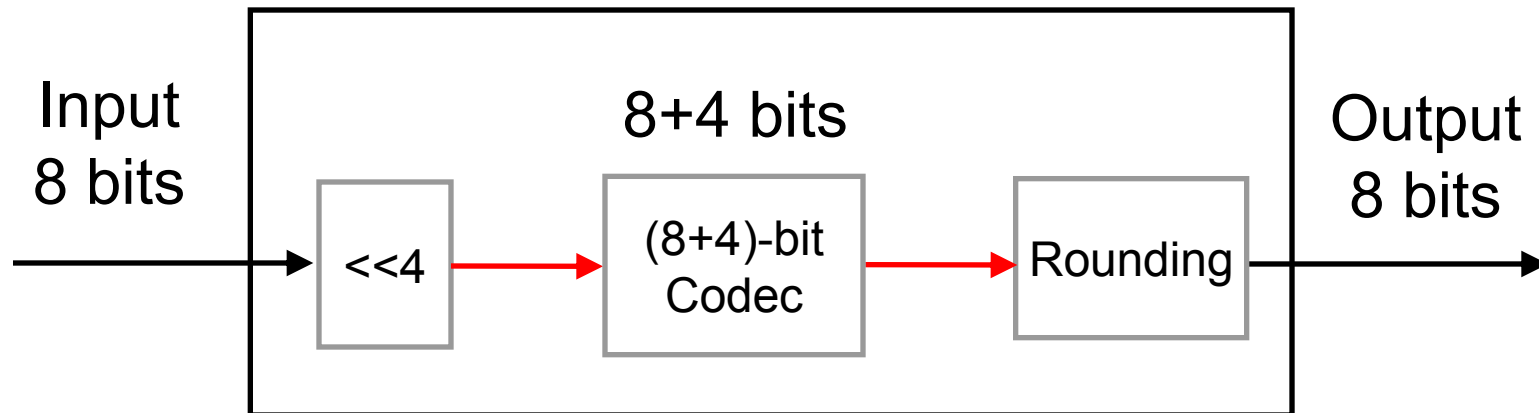
- **High Accuracy Interpolation Filter**

- QALF has already reduced noise.
- 8-tap filter for $\frac{1}{4}$ -pel resolution
 - 1/4 pixel position: $\{-3, 12, -37, 229, 71, -21, 6, -1\} // 256$
 - 1/2 pixel position: $\{-3, 12, -39, 158, 158, -39, 12, -3\} // 256$
- QALF + HAIF produce a synergistic effect



- **Internal Bit Depth Increase**

- High Accuracy Internal processing



- Internal arithmetic error is decreased.
 - Interpolation filter, Deblocking filter, Weighted prediction, et al.

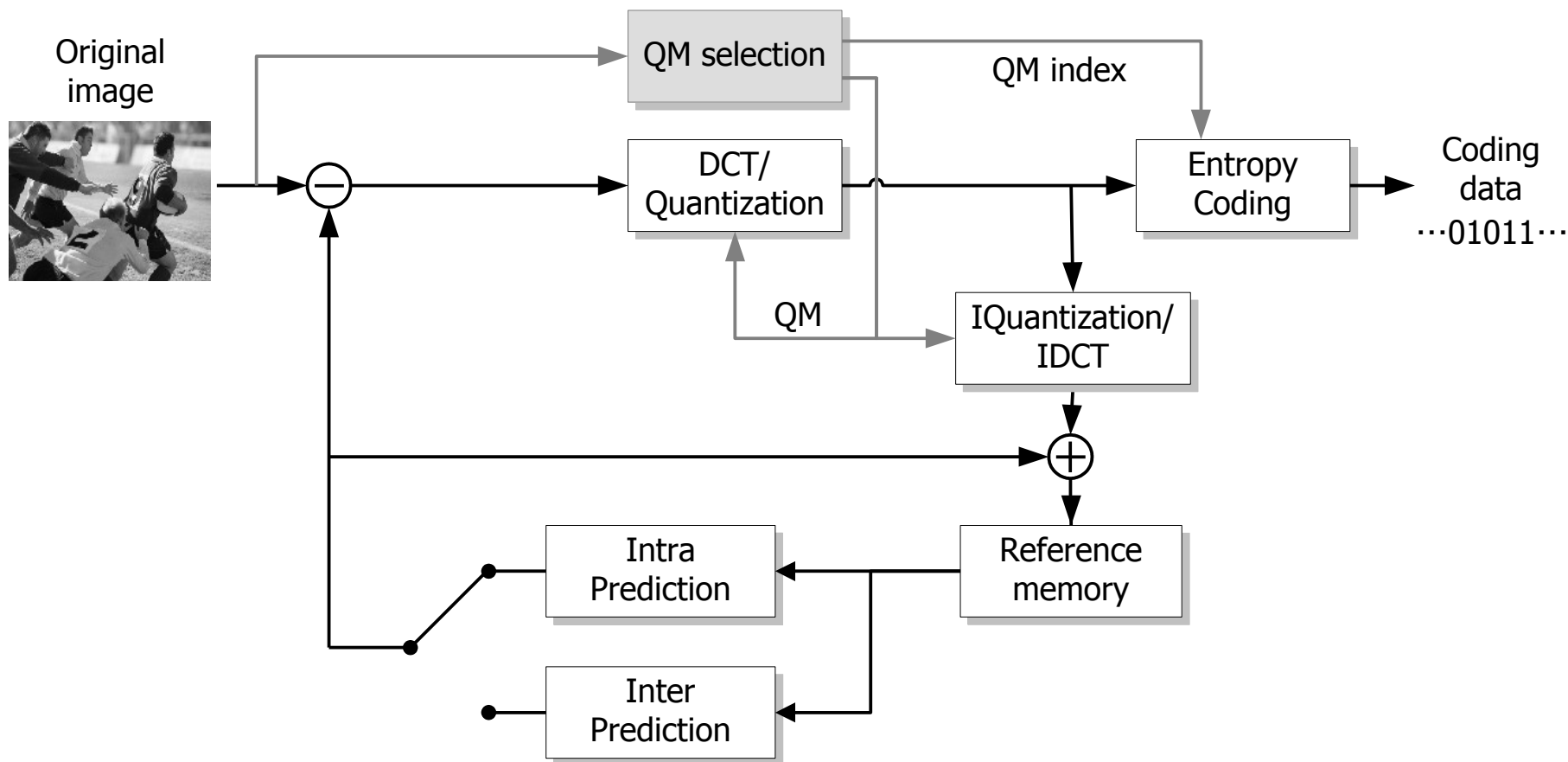
- **Decoded Picture Compression in DPB**

- Introduction of MB based adaptive rounding
- Memory bandwidth of DPB is kept 8-bit.

SAQMS

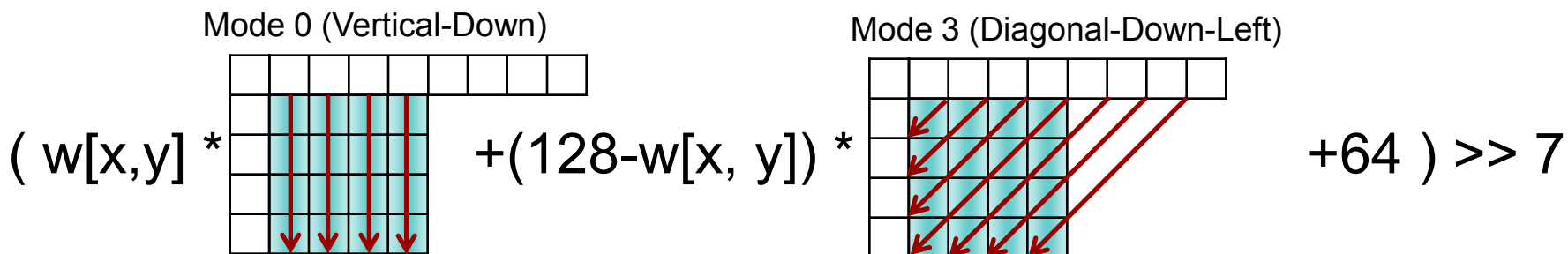
- **Subjectively Adaptive Quantization Matrix Selection**

- Multiple kinds of Quantization Matrix is selected MB by MB subjectively.



• Bidirectional Intra Prediction

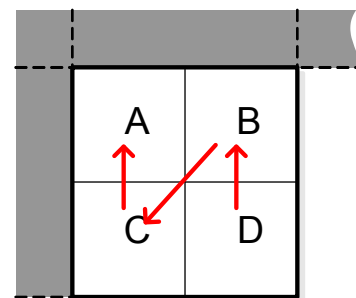
- Bidirectional spatial prediction
 - Weighted average of two kinds of unidirectional prediction



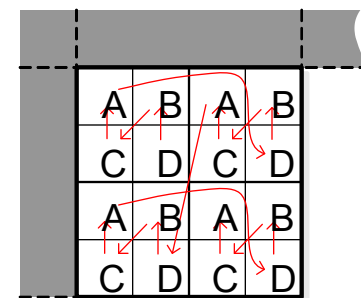
- Changing sub-block coding order in macroblock
 - Select sub-block coding order MB-by-MB
 - Raster order or Reverse order

- Reverse order

- Intra_8x8 : “D→B→C→A”
- Intra_4x4 : “D→B→C→A→D→...”



(a) Sub-block size
= 8x8

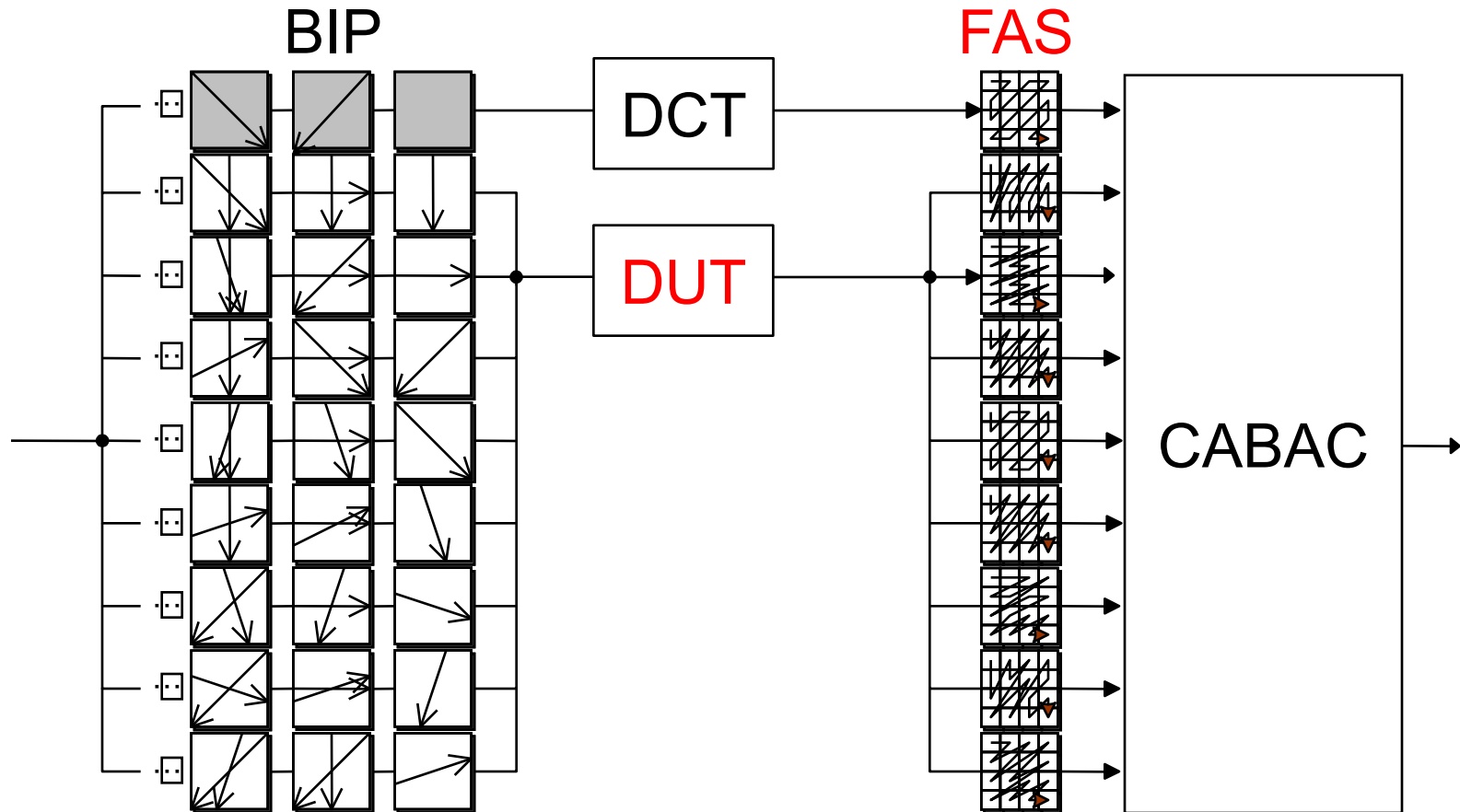


(b) Sub-block size
= 4x4

DUT

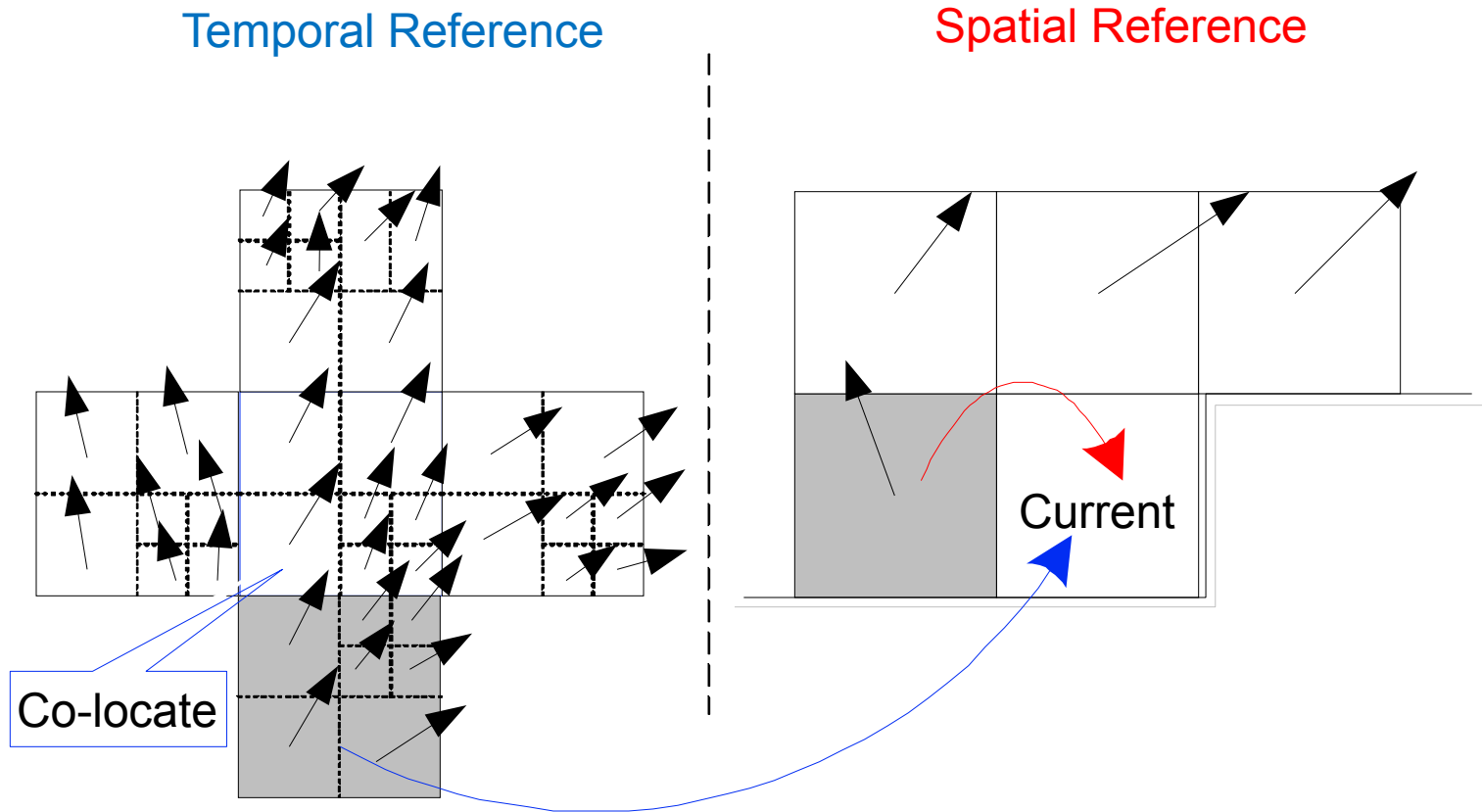
- **Directional Unified Transform (INTRA)**

- 4/8/16-point Directional Unified Transform
- Fixed Alternative Scan



STDS

- Spatio-Temporal Direct Selection

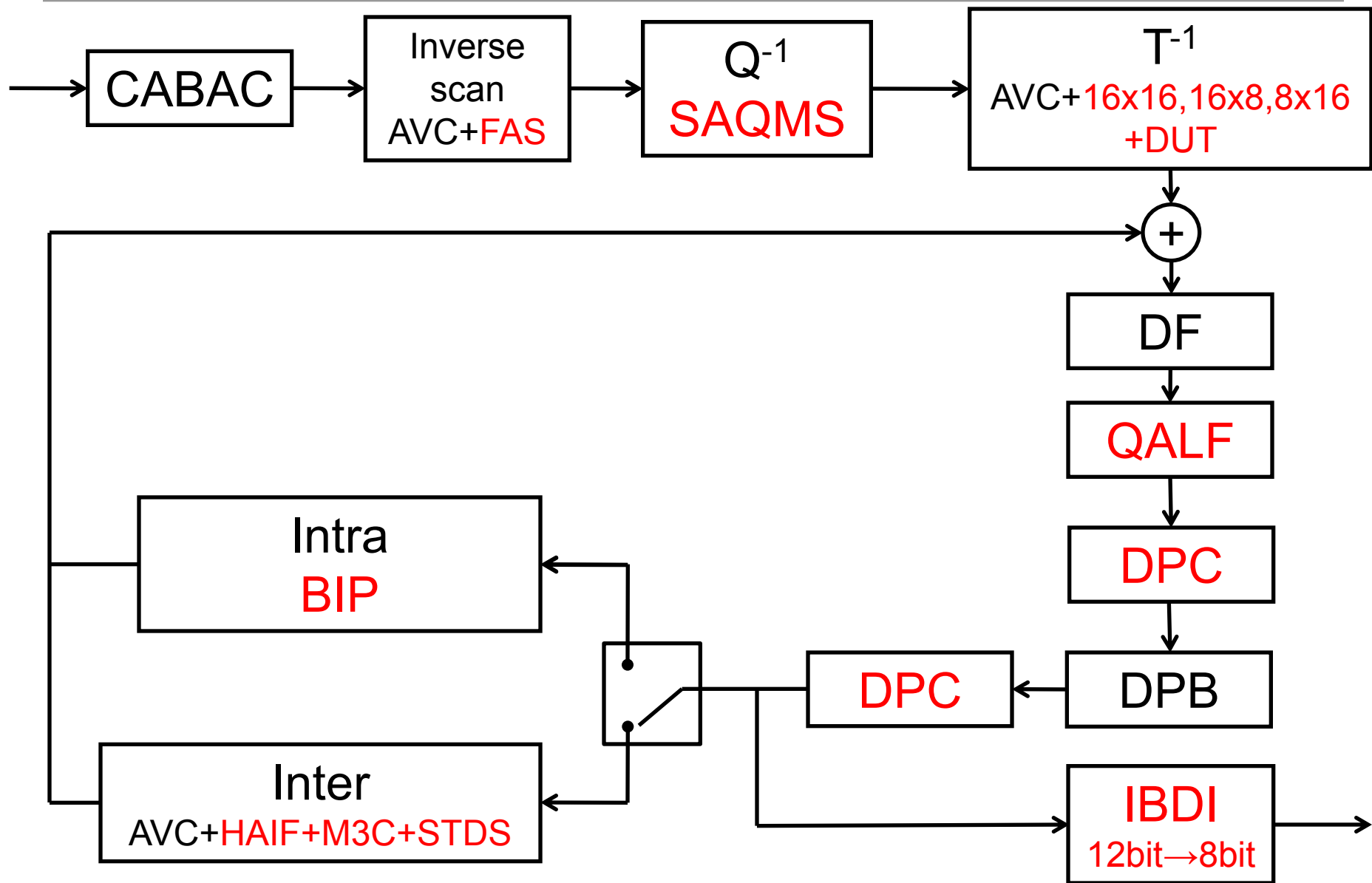


Spatial reference block and **temporal reference block** are selected adaptively

Other

- **M3C (Multiple Macroblock based Motion Compensation)**
 - Additional MC block size
 - 64x64, 64x32, 32x64, 32x32, 32x16, 16x32
- **Additional Transform size**
 - 16x16, 16x8, 8x16 DCT

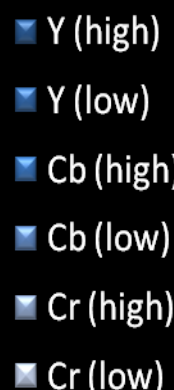
Overview



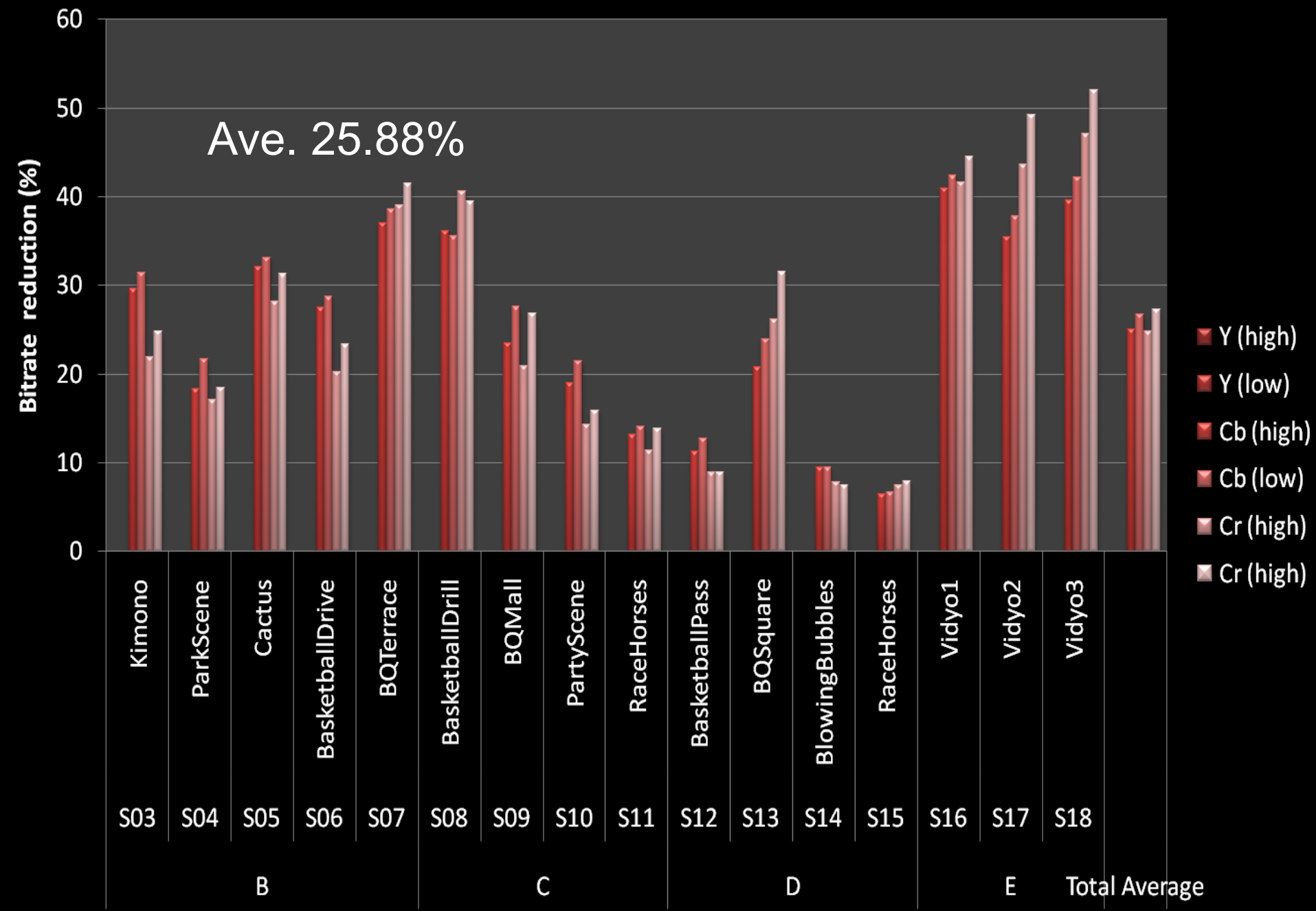
Test Condition

- **The encoder configurations are as follows:**
 - Most of conditions based on Anchor
 - Addition to one long-term reference for P-slice
 - RDOQ_QP_Num=5
- **All results within -3 % of anchor bitrate**
- **Bitrate saving (Δ Bitrate) are calculated based on BD-SNR (VCEG-M33) using BJM add-in supplied in VCEG-AE07.**
- **“high” means the higher 4 bitrate points and “low” means the lower 4 bitrate points.**

Constraint set 1



Constraint set 2



Conclusion

- **Toshiba's submission method for CfP in JCT-VC is reported**
- **Δ Bitrate of (high, low) and (Y, Cb, Cr) are balanced**
 - Constraint set 1: average of 28.66% and up to 45.14% reduction
 - Constraint set 2: average of 25.88% and up to 42.36% reduction
- **Subjective Quality**
- **Useful tools for core experiments**

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