

Companion to article 4.7 of Block 4. Print on A4.

1. Transform menu by codec

Codec	Primary	Secondary	Block sizes	Notes
H.264 / AVC	Integer DCT-II	Hadamard (DC)	4 / 8	4x4 core + 8x8 High profile
HEVC / H.265	DCT-II + DST-VII	-	4 - 32	DST-VII at 4x4 luma intra only
VP9	DCT + ADST	-	4 - 32	ADST for directional intra
AV1	DCT/ADST/FLIPADST/IDTX-	-	4 - 64	Up to 16 2D transforms per block
VVC / H.266	DCT-II/DCT-VIII/DST-VII	LFNST	4 - 64	MTS or LFNST per block, not both
AV2 (draft)	Redesigned + DDTs	IST	4 - 64	Data-driven transforms, intra+inter IST

2. When each transform kernel wins

Kernel	Best on	Typical gain over DCT-only baseline
DCT-II	smooth inter residuals, flat regions	baseline
DST-VII	4x4 intra luma in HEVC	~1 %
DCT-VIII	small intra blocks in VVC	~0.5 %
ADST	directional intra residuals (VP9, AV1)	~2 %
FLIPADST	reverse-slope intra residuals (AV1)	~0.5 - 1 %
IDTX	screen content, isolated spikes (AV1, VVC TS)	5 - 15 % on screen
LFNST	low-frequency corner of intra blocks (VVC)	~1 - 2 %

3. Tuning recipes by workload

Workload	Codec	Transform stage settings
VOD premium	AV1 / VVC	Full transform menu + LFNST/IST (intra), --tune=psnr or --tune=ssim
Live OTT 4K60	HEVC / AV1	DST-VII at 4x4 intra; tile-aligned transforms; --tune=zerolatency
WebRTC SFU	H.264	4x4 integer + Hadamard DC only; avoid 8x8 to keep CPU per stream low
Surveillance	HEVC / VVC	MTS on; LFNST off (sub-frames lose the gain); transform skip for screen
Screen content	AV1 / VVC	Allow IDTX / Transform Skip; expect 5 - 15 % win on text-heavy content

4. Pitfalls to avoid

- * Blaming the transform for blockiness or banding - the loss happens at quantization. Lower QP instead.
- * Leaving AV1's full transform search on for live - 3x encode time for ~2 % bitrate. Restrict the menu.
- * Stacking VVC MTS and LFNST in vendor presets that ignore the mutual-exclusivity rule. Read the docs.
- * Forgetting that H.264's 4x4 integer transform is a SCALED approximation - scaling lives in the quantizer.
- * Using H.264 8x8 transform on Baseline decoders - it is High profile only and will not play.