

Radiometric infrared, still images

Lossless, Phidelity: -40 % against PNG, +0 % against JPEG XL at maximum effort, -17 % against JPEG-LS.

Data

Thermitage ARCO (Zenodo 21672415, CC BY 4.0): 640 × 512 temperature images, 13 bits. 40 items, 25 MB raw.

On PC — one core

Codec	Lossless ratio	Bits per sample (lower = better)				Lossless speed (M samples/s)		Memory (MB)
		lossless	±1	±2	±4	encoding	decoding	
Phidelity compact	×3.96	4.045	3.049	2.341	1.578	10.5	15.5	1.4
Phidelity light	×3.82	4.192	3.286	2.581	1.820	56.2	86.8	3.8
JPEG XL e3	×3.86	4.146	—	—	—	24.4	25.2	11.8
JPEG XL e7	×3.95	4.048	3.140	2.419	1.642	3.4	19.6	12.2
JPEG XL e9	×3.97	4.030	—	—	—	1.0	19.4	16.7
JPEG-LS	×3.28	4.885	3.329	2.662	1.841	66.3	75.2	1.9
PNG ref.	×2.38	6.711	4.947	4.037	3.005	6.8	168.6	1.0

Embedded — instructions counted in emulation

ARM Cortex-A53, 64-bit

Codec	b/sample lossless	Instr./sample encoding	Instr./sample decoding	Encoding memory (KB)	Decoding memory (KB)
Phidelity compact	3.952	1,284	871	246	55
Phidelity fast	4.105	872	601	67	41
Phidelity light	4.099	214	191	3,647	774
JPEG-LS (CharLS)	4.816	208	156	25	25
CCSDS 123.0-B-2	4.639	459	464	3	3

Cortex-M7 (microcontroller)

Codec	b/sample lossless	Instr./sample encoding	Instr./sample decoding	Encoding memory (KB)	Decoding memory (KB)
Phidelity compact instructions and memory on a reduced sample	3.952	2,352	1,592	195	49
Phidelity fast	4.105	1,458	1,024	67	41
Phidelity light instructions and memory on a reduced sample	4.099	740	694	2,959	660
JPEG-LS (CharLS)	4.816	224	177	25	25
CCSDS 123.0-B-2	4.639	870	812	3	3

Good to know

- On isolated still images Phidelity and JPEG XL e9 are on par; the lead comes from sequences.

Conditions

- PC: AMD Ryzen 7 8700F, a single core; every file decoded and compared with the original (zero error lossless, at most k in ±k).
- ±k: guaranteed maximum error of k on every sample. Phidelity and JPEG-LS (NEAR) hold it natively; for JPEG XL and the reference format, the image is first rounded to a 2k + 1 step, then coded losslessly.
- Codecs: libjxl 0.12 (efforts 3, 7 and 9), CharLS (JPEG-LS), OpenJPEG (JPEG 2000), FFV1 through ffmpeg, LERC, CCSDS 123.0-B-2 (encoder written for the benchmark, byte-identical to the NTNU verification model).
- Memory: peak private memory during the call only, measured on the largest item of the set.
- Embedded: instruction counts in emulation (QEMU), not board timings; cropped samples, sizes comparable with each other only. Compact and light through the 1.7 kit, fast through its core; in both cases with a caller-provided output buffer. Byte-identical streams on PC and ARM. Code on Cortex-M7: fast 73 KB, compact 92 KB, CharLS 205 KB, CCSDS 123 6 KB.