

Medical: CT

Lossless, Phidelity: -47 % against JPEG 2000, +4 % against JPEG XL at maximum effort, -46 % against JPEG-LS.

Data

Medical imaging test set by R. Starosolski (University of Silesia): CT slices, 12 to 16 bits. 12 items, 6 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	×3.62	4.420	4.326	4.180	4.025	5.9	15.2	2.0
Phidelity light	×3.50	4.569	4.430	4.285	4.126	54.2	78.9	4.5
JPEG XL e3	×3.59	4.456	—	—	—	22.8	27.1	11.9
JPEG XL e7	×3.70	4.322	4.209	4.068	3.923	2.7	18.7	14.6
JPEG XL e9	×3.76	4.255	—	—	—	0.8	18.5	17.6
JPEG-LS	×1.97	8.111	6.798	6.187	5.498	56.9	54.4	1.9
JPEG 2000 ref.	×1.93	8.284	8.301	8.314	8.328	9.3	10.5	7.3

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	3.143	2,230	882	294	138
Phidelity fast	3.451	683	478	64	40
Phidelity light	3.298	209	191	2,959	637
JPEG-LS (CharLS)	6.767	146	128	8	8
CCSDS 123.0-B-2	9.433	461	474	2	2

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	3.143	3,944	1,615	294	138
Phidelity fast	3.451	1,137	813	64	40
Phidelity light instructions and memory on a reduced sample	3.298	734	691	2,959	637
JPEG-LS (CharLS)	6.767	167	150	8	8
CCSDS 123.0-B-2	9.433	877	826	2	2

Good to know

- JPEG XL at maximum effort stays about 4 % ahead.
- Format 1.5: the light mode is within 4 % of the compact mode here, at JPEG-LS speed.

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.