

Medical: ultrasound

Lossless, Phidelity: -19 % against JPEG 2000, +11 % against JPEG XL at maximum effort, -9 % against JPEG-LS.

Data

Medical imaging test set by R. Starosolski (University of Silesia): 8-bit ultrasound images. 12 items, 3 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	×3.19	2.508	1.553	1.252	0.956	4.8	16.8	2.2
Phidelity light	×2.82	2.837	1.667	1.332	1.006	65.4	81.2	5.0
JPEG XL e3	×2.96	2.702	—	—	—	27.3	32.8	10.1
JPEG XL e7	×3.40	2.350	1.478	1.134	0.838	3.6	21.3	19.9
JPEG XL e9	×3.53	2.265	—	—	—	0.7	21.3	19.2
JPEG-LS	×2.91	2.751	1.590	1.276	0.989	87.4	101.2	1.4
JPEG 2000 ref.	×2.58	3.101	2.958	2.782	2.743	19.5	21.7	5.8

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	2.251	2,601	866	919	600
Phidelity fast	2.293	430	336	66	40
Phidelity light	2.360	169	182	3,457	998
JPEG-LS (CharLS)	2.278	77	62	7	7
CCSDS 123.0-B-2	3.798	449	461	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	2.251	4,976	1,593	750	480
Phidelity fast	2.293	694	571	66	40
Phidelity light instructions and memory on a reduced sample	2.360	664	679	2,807	855
JPEG-LS (CharLS)	2.278	77	67	7	7
CCSDS 123.0-B-2	3.798	860	810	3	3

Good to know

- JPEG XL at maximum effort stays about 11 % ahead.

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.