

Raw side-scan sonar

Lossless, Phidelity: -23 % against deflate, -3 % against JPEG XL at maximum effort, -25 % against JPEG-LS.

Data

JNCC Bassurelle 2013, EdgeTech sonar (OGL v3) and USGS, Klein sonar (public domain): 512-ping blocks, 13 to 15 bits. 24 items, 251 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	×2.17	7.388	6.894	6.570	6.097	9.3	13.1	52.7
Phidelity light	×2.12	7.551	7.253	7.117	6.692	50.6	76.7	178.5
JPEG XL e3	×1.63	9.810	—	—	—	21.9	27.0	181.2
JPEG XL e7	×2.11	7.584	7.067	6.713	6.203	1.7	15.2	181.2
JPEG XL e9	×2.11	7.587	—	—	—	0.3	15.1	181.2
JPEG-LS	×1.62	9.898	8.314	7.587	6.751	46.0	46.9	69.2
deflate ref.	×1.67	9.603	9.585	9.363	8.931	3.1	163.8	66.2

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	7.934	1,376	956	705	130
Phidelity fast	9.424	876	687	155	95
Phidelity light	8.077	223	193	11,215	2,529
JPEG-LS (CharLS)	10.028	250	218	78	78
CCSDS 123.0-B-2	9.891	471	479	8	8

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	7.934	2,465	1,680	201	49
Phidelity fast	9.424	1,411	1,105	155	95
Phidelity light instructions and memory on a reduced sample	8.077	752	698	2,959	789
JPEG-LS (CharLS)	10.028	282	257	78	78
CCSDS 123.0-B-2	9.891	880	824	8	8

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), FFMpeg 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.