

Gridded multibeam bathymetry

Lossless, Phidelity: -40 % against LERC, +2 % against JPEG XL at maximum effort, -8 % against JPEG-LS.

Data

NOAA H12396 (public domain): BAG grids converted exactly to integers (millimetres), 11 to 14 bits; 0 = no data. 41 items, 65 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	×3.91	4.091	3.149	2.454	1.762	6.7	14.0	9.7
Phidelity light	×3.61	4.431	3.179	2.607	2.018	54.3	81.6	15.3
JPEG XL e3	×3.41	4.696	—	—	—	22.0	26.2	29.7
JPEG XL e7	×3.94	4.058	2.736	2.196	1.656	3.0	18.0	30.2
JPEG XL e9	×3.98	4.025	—	—	—	0.6	16.7	33.6
JPEG-LS	×3.58	4.469	3.199	2.653	2.127	69.8	80.2	7.0
LERC ref.	×2.36	6.781	5.979	5.175	4.385	36.3	81.1	29.9

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	2.852	3,170	840	3,153	1,108
Phidelity fast	3.049	535	393	85	55
Phidelity light	3.580	202	190	10,575	1,313
JPEG-LS (CharLS)	3.142	124	91	42	42
CCSDS 123.0-B-2	9.486	457	471	4	4

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	2.852	6,266	1,328	816	394
Phidelity fast	3.049	878	670	85	55
Phidelity light instructions and memory on a reduced sample	3.580	723	687	2,959	616
JPEG-LS (CharLS)	3.142	136	105	42	42
CCSDS 123.0-B-2	9.486	868	819	4	4

Good to know

- Format 1.7: JPEG XL at maximum effort keeps only a 1.6 % lead (14 % in 1.6); with bounded error, empty cells (0) stay exact.

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.