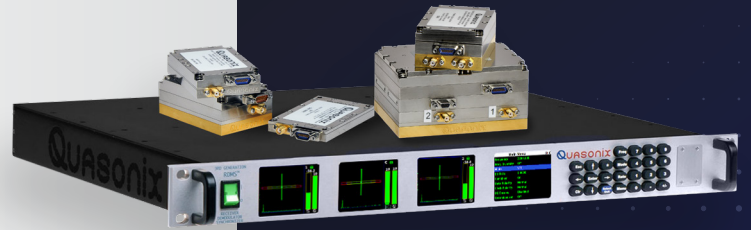


Low-Density Parity Check (LDPC) Error Correction System



Adopted by the Range Commander's Council, IRIG 106-17, Appendix 2-D

If it seems too good to be true, it probably is. Unless it's LDPC.

Errors in a telemetry link can be costly, resulting in lost data and re-testing. LDPC coding dramatically reduces the number of errors; it does so more cost effectively than any other approach; and you can only get both ends of the link from Quasonix. Quasonix is... Reinventing Telemetry™.

Improves Link Margin by 8.8 to 9.4 dB at BER = 1e-5 – Link margin improvement is equivalent to nearly **tripling** the operating distance on your telemetry link

Adaptive Decoder – Decoding performance is within 0.2 dB of theory. Iterative decoding is optimized to fully utilize available time, improving coding gain even further as the bit rate is reduced.

Fully Integrated Forward Error Correction System – Transmitter automatically synthesizes expanded over-the-air bit rate for encoded blocks and receiver seamlessly converts back to continuous output at the user bit rate. Operation is completely transparent to data devices.

Robust Synchronization – Reliable synchronization achieved as low as $-4 \text{ dB } E_b/N_0$.

Uses Spectrally Efficient SOQPSK Modulation – Even with the LDPC coding overhead, bandwidth can be 22%—or even 34%—less than PCM/FM at the same payload bit rate. Payload bit rates up to 35 Mbps are supported.

Simple ON / OFF Control – Allows transmitter/receiver operation with or without correction.

Tested on Multiple DoD Ranges – Proven effective under challenging real-world conditions.

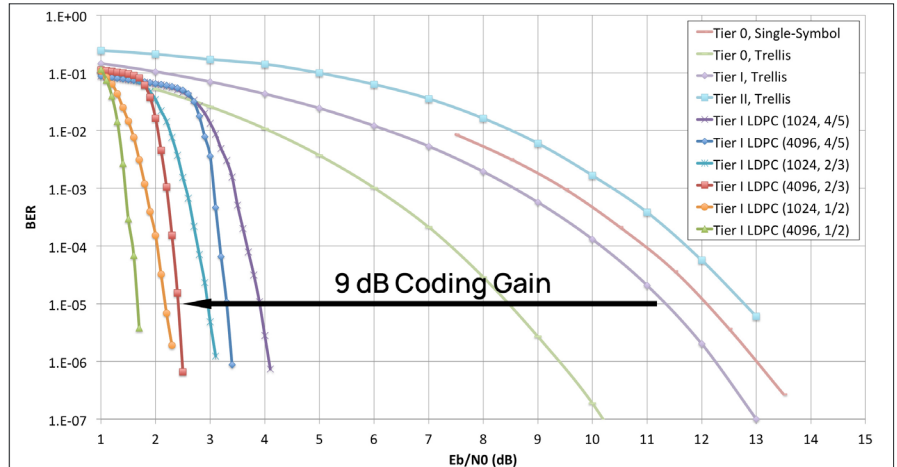
Already own Quasonix equipment?

The LDPC mode can be retrofitted to most Quasonix transmitters and receivers. Contact Quasonix for details.

Performance Overview

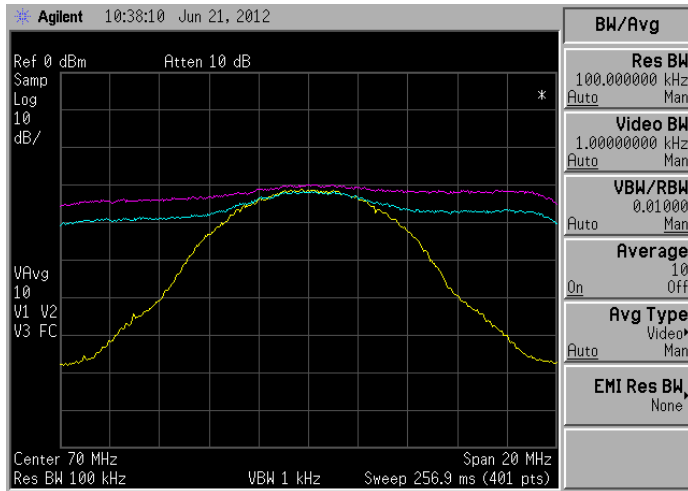
Quasonix is the only vendor in the market offering LDPC encoding and decoding for serial streaming telemetry. This approach yields nearly triple the communications range, yet it can do so with 22%, or even 34%, less bandwidth than conventional PCM/FM.

The IRIG standard calls out six variants of LDPC codes—all combinations of two different information block sizes ($k=4096$ bits and $k=1024$ bits) and three different code rates ($r=1/2$, $r=2/3$, and $r=4/5$). The larger block size offers better decoding performance in a static channel, but may work less well in a dynamic channel with fast fading or other impairments. Lower code rates also provide better decoding performance at the cost of increased occupied bandwidth.



Quasonix third-generation RDMS™ receivers offer all six block sizes/code rates. Contact Quasonix for transmitter offerings.

Receiver IF Output During 7 Mb/s $k=4096$, $r=2/3$ LDPC Operation



- Signal plus noise, synchronized at -3 dB Eb/N0
- Signal plus noise, error-free at +3 dB Eb/N0
- Strong Signal +35 dB Eb/N0

Synchronization Threshold

The best coding gain in the world won't help if the telemetry link cannot maintain synchronization through extremely deep fades. Only Quasonix can consistently show synchronization at negative Eb/N0 values, and the LDPC subsystem is no exception. The ability to maintain bit count integrity at Eb/N0 as low as -6 dB allows the user's crypto devices to stay synchronized under the most severe fading conditions, thereby eliminating the long data outages that occur when the crypto devices lose sync.

Not only does the LDPC subsystem maintain synchronization under highly adverse link conditions, but under worst-case link conditions the re-synchronization penalty is at most one LDPC code block.



All Quasonix products are under U.S. Dept. of Commerce jurisdiction. Transmitters are categorized as EAR99, receivers as 5A991. ISO 9001:2015 Certified | Specifications subject to change without notice.

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