Low Latency LDPC

FastLink™ LDPC is a low-latency Low Density Parity Code FEC from Paradise **designed specifically for latency-sensitive applications**.

The performance of traditional forward error correction schemes represents a trade-off between latency and coding gain. **FastLink™** LDPC has been designed by Paradise engineers from the ground up to optimize latency and throughput while giving coding gain that is close to the theoretical limits.

FastLink™ LDPC has better or comparable latency and coding gain performance relative to conventional LDPC and TPC, meaning potentially that no other FEC may ever be required.

FastLink™ is available on **Q-Flex™**, **Q-Lite™** and other Paradise satellite modems. New second-generation **FastLink™** provides even better performance!

Performance

A wide range of **FastLink™** modulation and FEC rate options have been designed to give optimal Es/No performance when charted against spectral efficiency. Typically these offer improved coding gains of around 1dB when compared to TPC and are similar to the coding gains of conventional LDPC. They reduce latency when compared to conventional LDPC by up to 90%. **FastLink™** is therefore well balanced, giving extremely good all round performance.

For particularly demanding applications you can choose to optimise latency or BER performance even further. Two optimisation settings are available. *Low Latency* mode is designed to give lower or comparable latency relative to industry-standard TPC while giving BER performance that is no worse and in many instances significantly better. If latency is not an issue, BER can be optimised instead in *Low BER* mode to be comparable with industry-standard conventional LDPC.

FastLink™ gives unparalleled flexibility designed to meet the needs of even the most demanding applications.

Summary

▶ Operation from 18kbps up to 100Mbps

▶ Supports symbol rates from 18ksps up to 40Msps

▶ Modulation: BPSK, (O)QPSK, 8PSK, 8QAM, 16APSK, 16QAM, 32APSK and 64QAM

▶ Ultra low latency for latency-sensitive applications

▶ Reduction in latency of up to 90% compared to DVB-S2

▶ Outstanding coding gain

▶ Replaces TPC and conventional LDPC

▶ User configurable - optimize latency, BER performance or both

▶ **FastLink™** LDPC is available on all Evolution and Quantum modems and on most Q Series modems (including the **Q-Flex™** and **Q-Lite™**)

▶ All modulations and all data rates up to 100Mbps supported for a single, low price (Q Series only)

▶ **New, second-generation implementation with enhanced performance!**

Availability

▶ The **Q-MultiFlex™** point-to-multipoint IP system uses **FastLink™** to support low-latency inbounds, while also being available as an option for the shared outbound

▶ Supported on the dual IF/L-band **Q-Flex™** satellite modem and the compact 'comms-on-the-move' **Q-Lite™** satellite modem

▶ Supported on **Quantum** and **Evolution** modems

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BER Performance Summary Table

The table below shows **FastLink™** LDPC performance in the three available modes:

- **Low BER**, where performance is optimized to give the best possible BER performance at the expense of extra latency. This mode is useful on high data rate links and where applications are not especially latency sensitive.
- **Balanced**, where latency and BER performance are given equal weight, giving good all-round performance. This is the recommended mode for most applications.
- **Low Latency**, where performance is optimized to give the lowest possible latency at the expense of a small increase in the Eb/No required to achieve a particular BER. This mode is for applications that require a real-time response.

FastLink™ Modulation	Code Rate	Eb/No for 5e-8 (Guaranteed)			Latency (ms) at 512kbps	
		Low BER	Balanced	Low Latency	Balanced	Low Latency
BPSK	0.499	2.1	2.9	3.4	4.3	1.0
(O)QPSK	0.532	2.1	2.6	2.9	8.4	4.4
(O)QPSK	0.639	2.4	2.8	3.2	8.4	4.4
(O)QPSK	0.710	2.7	3.2	3.7	8.4	4.4
(O)QPSK	0.798	3.1	3.9	4.2	8.4	4.4
8PSK	0.639 (See Note 1)	5.4	5.9	6.3	16.6	8.6
8PSK	0.710 (See Note 2)	5.6	5.5	5.8	16.6	8.6
8PSK	0.778	5.6	6.1	6.4	16.6	8.6
8QAM	0.639	4.4	4.8	5.0	16.6	8.8
8QAM	0.710	5.0	5.3	5.5	16.6	8.8
8QAM	0.778	5.5	5.9	6.1	16.6	8.8
16APSK	0.726 (See Note 3)	7.6	7.5	7.5	16.6	9.1
16APSK	0.778 (See Note 2)	7.8	7.1	7.5	16.6	9.1
16APSK	0.828	7.4	8.1	8.4	16.6	9.1
16APSK	0.851	7.9	8.3	8.8	16.6	9.1
16QAM	0.726 (See Note 2)	7.2	6.6	6.8	17.0	8.8
16QAM	0.778	6.7	7.1	7.4	17.0	8.8
16QAM	0.828	7.2	7.7	8.0	17.0	8.9
16QAM	0.851	7.5	8.0	8.4	17.0	9.0
32APSK	0.778 (See Note 2)	9.8	9.6	10.0	17.0	8.9
32APSK	0.828	9.8	10.6	10.9	17.0	8.9
32APSK	0.886	10.8	11.4	11.9	17.0	9.0
32APSK	0.938	12.6	13.2	13.9	17.0	9.0

▶ **Note 1**: 8PSK rate 0.639 operation is stated at a BER QEF point of 1e-12.

▶ **Note 2**: **Low BER mode** operation for this particular FEC rate is stated at a BER QEF point of 1e-12. Balanced and Low Latency mode operation for this FEC rate is stated at a BER QEF point of 5e-8.

▶ **Note 3**: **Low BER mode** and **Balanced mode** of operation for this particular FEC rate are stated at a BER QEF point of 1e-12. Low Latency mode operation for this FEC rate is stated at a BER QEF point of 5e-8.