

Turbo Code

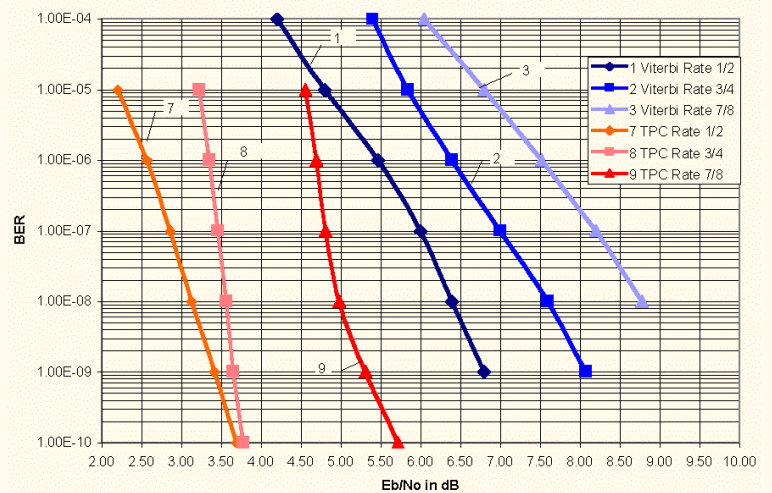


High Performance Turbo Code Option for PSM4900 Satellite Modem Family.

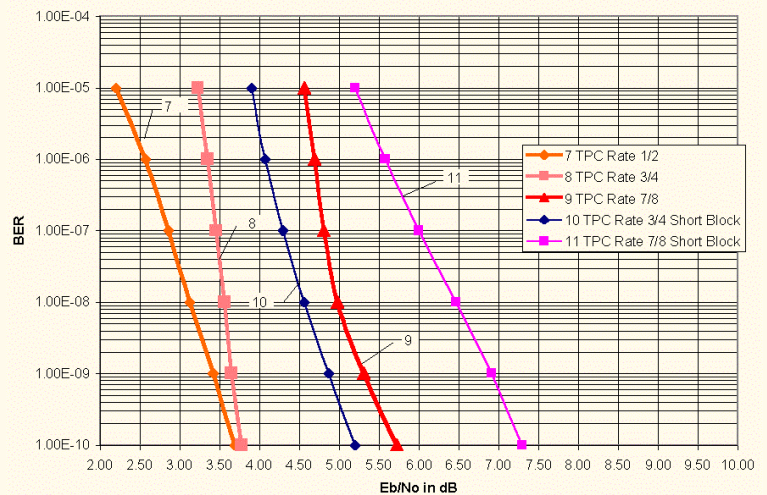
The installation of the optional Turbo Product Codes FEC Card provides the entire family of modems (PSM-4900/4900H/4900L) with a greater level of functional capability.

This optional daughter card is designed to fit onto the main modem assembly as an alternative to the built-in Viterbi FEC. Turbo Product Codes offers the maximum coding gain and performance available in Forward Error Correction.

Comparison of Turbo and Viterbi Performance



Comparison of Long & Short Block Turbo Performance



Turbo Product Codes FEC Performance

- TPC Rate 1/2 has performance approximately 3 dB better than normal Viterbi Rate 1/2. TPC Rate 7/8 will perform better than Viterbi Rate 1/2, but uses approximately 57% of the bandwidth.
- TPC Rate 3/4 has performance approximately equal to a concatenated Viterbi Rate 1/2 plus Reed-Solomon Codec, but uses approximately 60% of the bandwidth. In addition the bit delay for the TPC link would be 44 ms at 64 kbps, while the Reed-Solomon/Viterbi coding would result in a 75 ms end-to-end delay. (Some other manufacturers spec over 200 ms of delay in the same case).
- Datum Systems' selectable "Short Block TPC" uses a smaller block size optimised for low latency. The Short Block delay in the above example of Rate 3/4, 64 kbps is approximately 14.8 ms.
- Datum Systems' implementation of TPC outperforms other manufacturers performance by 0.3 to 2 dB depending on the Code Rate settings.
- TPC can provide better performance than 8PSK with Trellis Code Modulation and concatenated Reed-Solomon as per IESS-310. For example TPC in QPSK mode at Rate 7/8 uses less than 5% more bandwidth but 1.2 dB less power at a BER of 1 part in 10⁻⁷. QPSK is also much less sensitive to phase noise and can operate successfully at lower data rates than 8PSK.

Modes of Operation

Mode	Standard/ Compatibility	Overhead Ratio	Notes
Disabled	IESS-308/309		Reverts to Viterbi (or Reed-Solomon) as set.
Full Rate 1/2	Proprietary	2/1	Performance Optimised
Full Rate 3/4	Proprietary	4/3	Performance Optimised
Full Rate 7/8	Proprietary	8/7	Performance Optimised
Short Rate 3/4	Proprietary	4/3	Short Block, Delay minimized
Short Rate 7/8	Proprietary	8/7	Short Block, Delay minimized
Legacy 3/4 : 7/8	Proprietary	4/3 : 8/7	Full mode, compatible with M5 modems using firmware version lower than 0.76
CT Rate 3/4	Comtech	4/3	Full mode, compatible with some Comtech modems operating in QPSK Rate 3/4 TPC only.

BER vs. Eb/No Performance

BER	1 Viterbi Rate 1/2	2 Viterbi Rate 3/4	3 Viterbi Rate 7/8	7 TPC Rate 1/2 Full Block	8 TPC Rate 3/4 Full Block	9 TPC Rate 7/8 Full Block	10 TPC Rate 3/4 Short Block	11 TPC Rate 7/8 Short Block
1.00E-04	4.20	5.40	6.05					
1.00E-05	4.80	5.84	6.80	2.20	3.23	4.56	3.90	5.20
1.00E-06	5.47	6.40	7.52	2.57	3.35	4.69	4.07	5.58
1.00E-07	6.00	7.00	8.20	2.86	3.46	4.81	4.30	6.00
1.00E-08	6.40	7.60	8.78	3.13	3.56	4.98	4.56	6.47
1.00E-09	6.80	8.08		3.42	3.65	5.31	4.87	6.91
1.00E-10				3.69	3.78	5.72	5.20	7.30

BIPcorp reserves the right to change these specifications without notice