

Source: Hughes Network Systems

Title: Simulation Results for 8-state Turbo Codes vs. 4-state Serial Concatenated Codes

Document for: Decision

Abstract: This document presents a performance comparison of 8-state turbo codes and 4-state serial concatenated codes in the agreed upon simulation conditions of Turbo Adhoc.

Simulation Results:

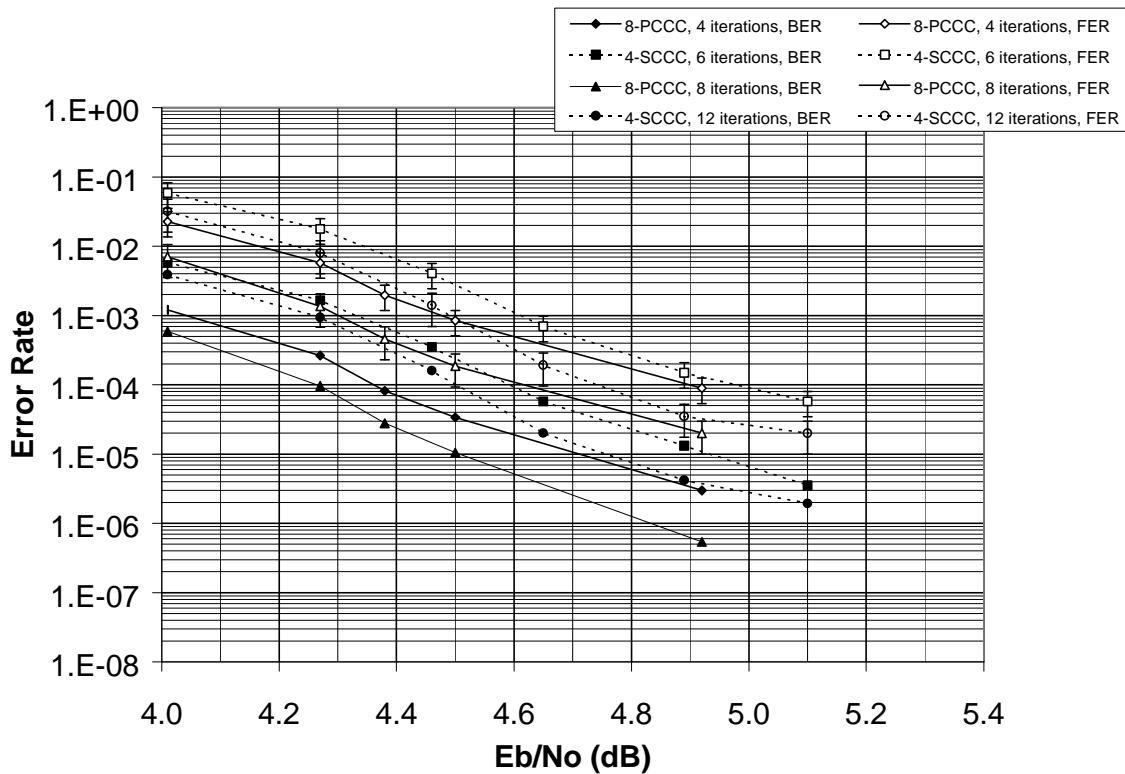


Figure 1: 32 kbps, 10 ms channel int., 3 kmph, MIL turbo interleaver, S-random SCCC interleaver

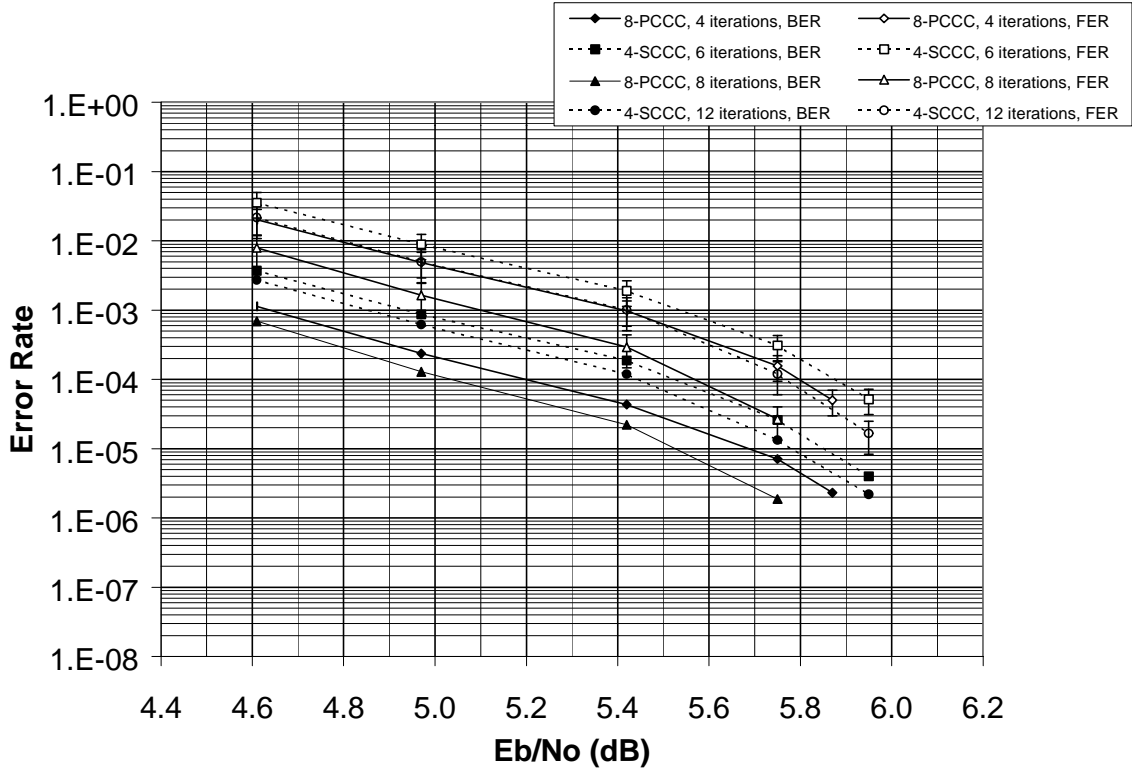


Figure 2: 32 kbps, 10 ms channel int., 30 kmph, GF turbo interleaver, S-random SCCC interleaver

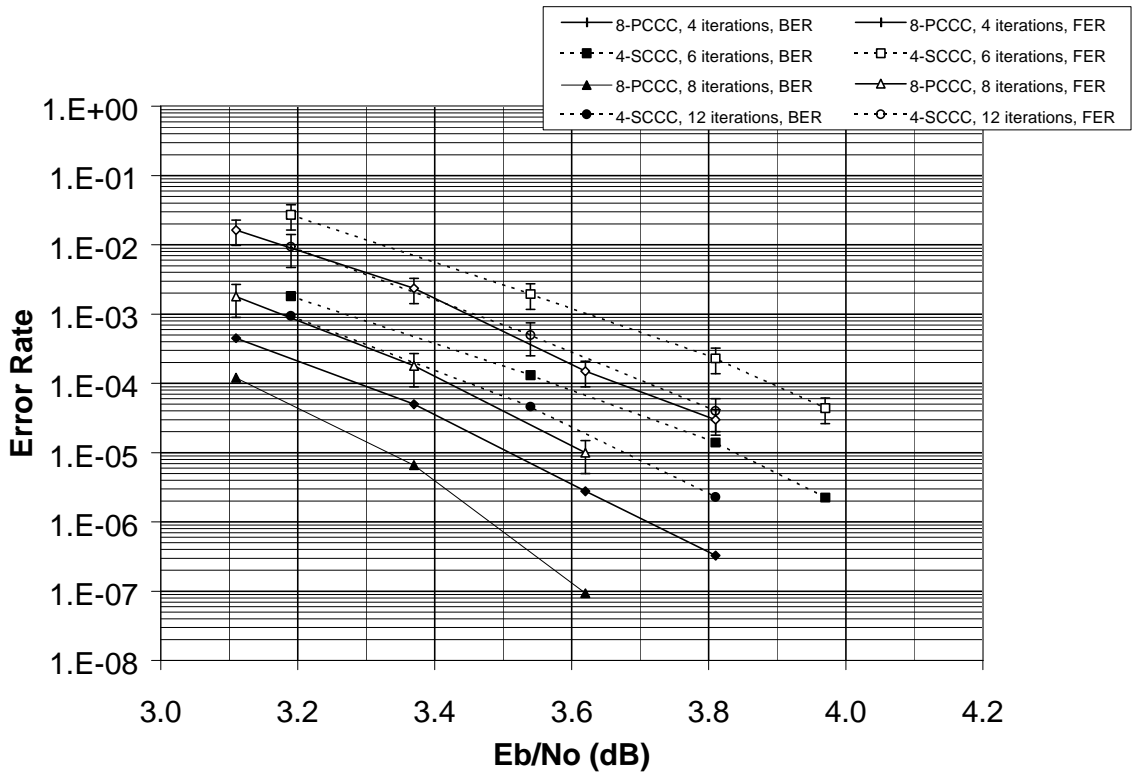


Figure 3: 64 kbps, 10 ms channel int., 3 kmph, CDI turbo interleaver, S-random SCCC interleaver

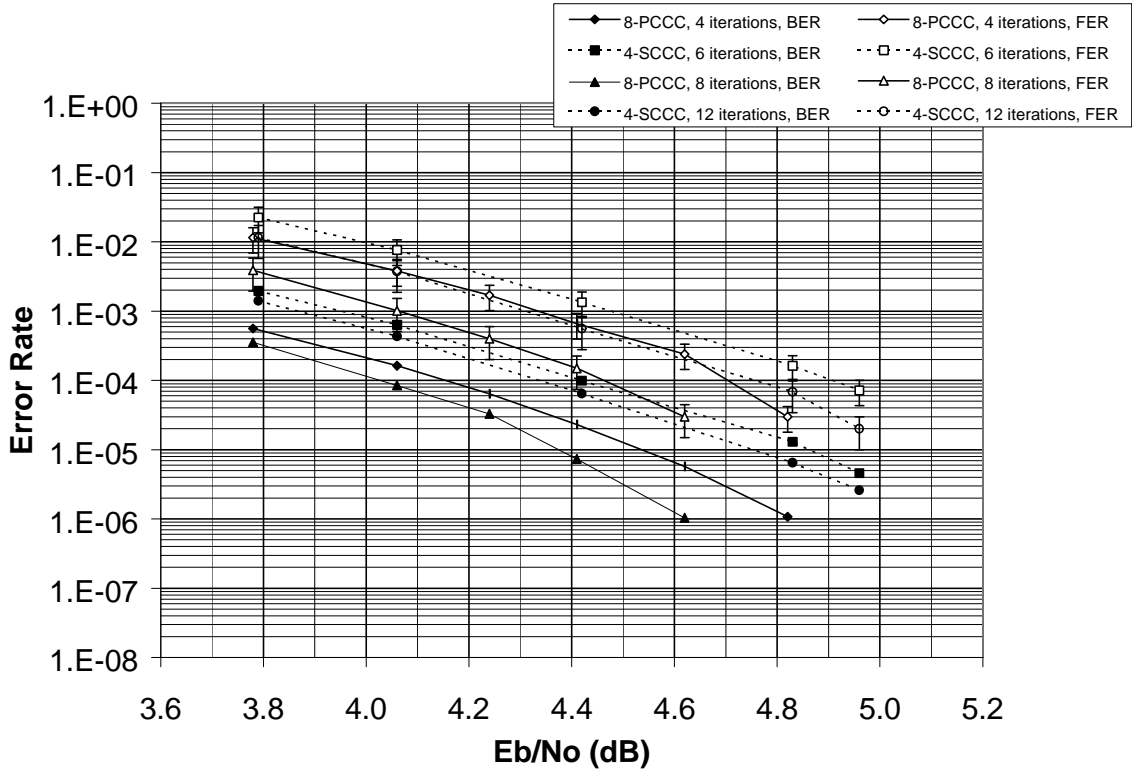


Figure 4: 64 kbps, 10 ms channel int., 30 kmph, CDI turbo interleaver, S-random SCCC interleaver

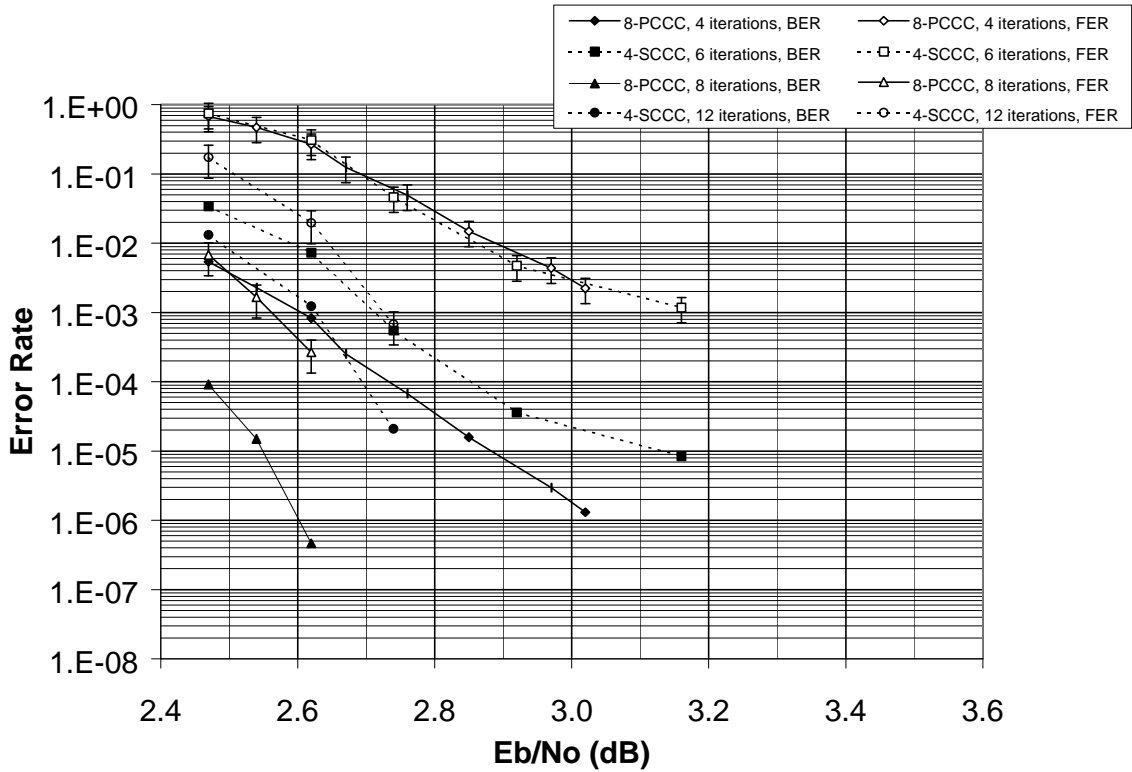


Figure 5: 64 kbps, 80 ms channel int., 3 kmph, MIL turbo interleaver, S-random SCCC interleaver

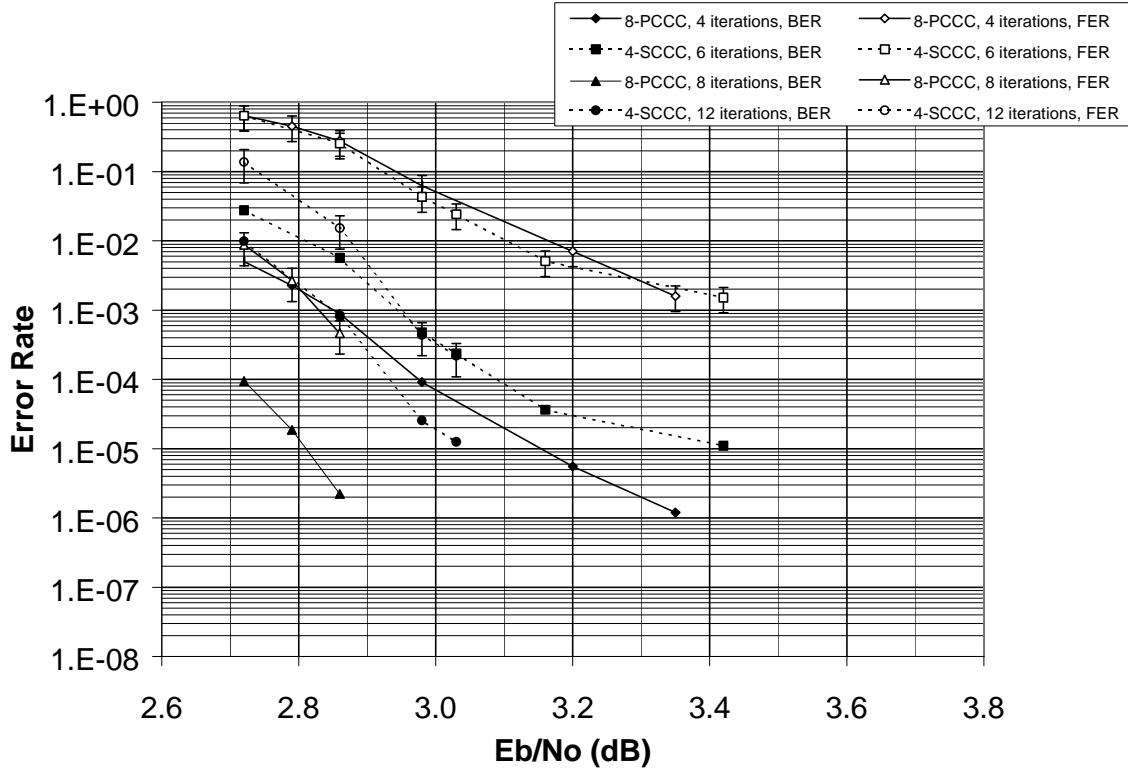


Figure 6: 64 kbps, 80 ms channel int., 30 kmph, GF turbo interleaver, S-random SCCC interleaver

Conclusion:

In all of the simulated cases 8-state PCCC outperform 4-state SCCC. The gains obtained by 8-state PCCC with 8 iterations with respect to 4-state SCCC with 12 iterations are approximately 0.3 dB in terms of BER and 0.2 dB in terms of FER for an interleaver size of 320; 0.4 dB in terms of BER and 0.3 dB in terms of FER for an interleaver size of 640; 0.5 dB in terms of BER and 0.2 dB in terms of FER for an interleaver size of 5120.

Furthermore 8-state PCCC with I iterations is approximately equivalent to 4-state SCCC with 3I/2 iterations in terms of computational cost, gate count and power consumption and SCCC suffers from the fact that it requires constituent decoders with different clock speed requirements [1].

Based on these facts, we recommend 8-state PCCC to be adopted by 3GPP.

Reference:

[1] Hughes Network Systems, "Decoder complexity of 8-state turbo decoders vs. 4-state serial concatenated codes", TSG(99)068.