

**NEW**

**TIMS TURBO CODING EXPERIMENTS**

TIMS allows students to see and experience the incredible performance of Turbo Coding, which amazed so many experts in the field of error control coding at the time of its introduction.

Using TIMS plug-in modules and the TIMS-DSP, students can quickly patch together a complete Turbo Coding experiment then view and measure performance with real signals, in real-time - not just simulation.

These measured results can then be correlated with theoretical predictions and results of simulation.

Turbo Codes are implemented in 4G and 3G mobile communications such as LTE and UMTS, and in deep space satellite communications, where engineers need to establish reliable information

transfer over noisy, bandwidth- or latency-constrained communication links.

**QUICK IMPLEMENTATION**

This TIMS experiment enables students to quickly and easily implement, with real signals, the theory and math from lectures and simulations.

Using real signals reinforces the reality of this highly abstract topic.



TIMS-DSP-6713 floating point DSP module used to implement the Turbo Coding algorithms.

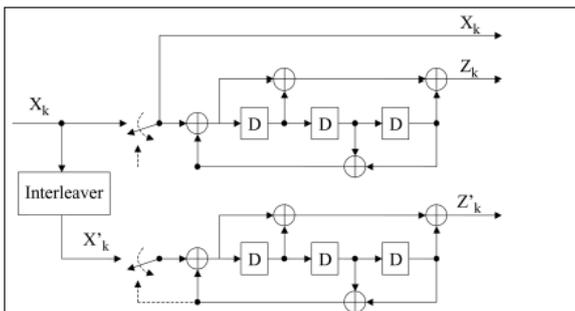
Taking measurements and plotting Eb/No curves around the region of the Turbo cliff supports students' understanding of the mathematical phenomenon of Turbo Coding.

**TIMS TURBO CODEC SPECIFICATIONS**

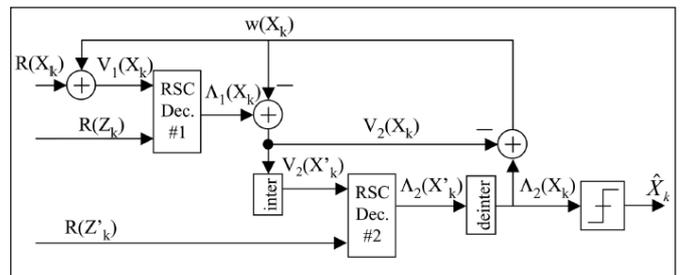
- PAYLOAD BLOCK LENGTH 256 bits
- ITERATIONS 10
- FRAME LENGTH 771 bits (3 x 256+3+ idle period)
- INTERLEAVER LENGTH 256 bits
- CODE RATE 1/3
- SYMBOL RATE 40kbps
- Linear Log MAP Implementation (from Valenti/Sun)



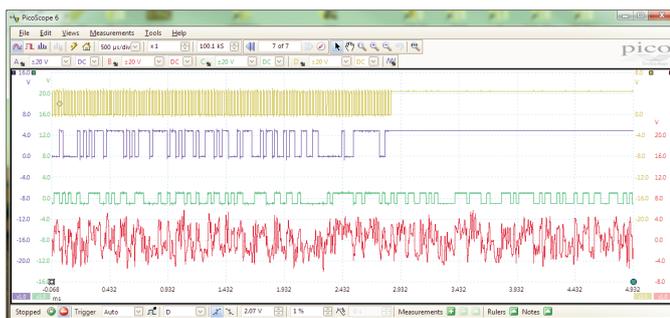
TIMS Turbo Coding experiment implementation with noisy baseband channel and BER measurement.



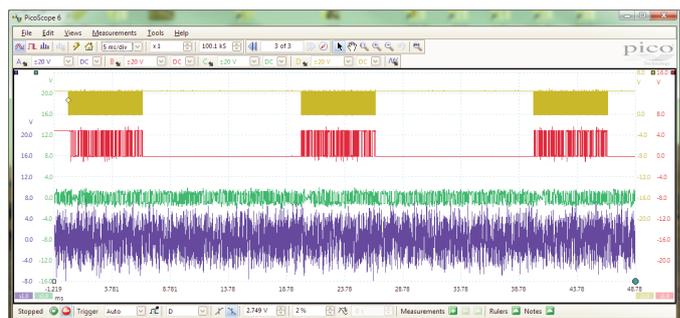
UMTS Turbo Encoder (taken from Valenti and Sun) as implemented in the TIMS-DSP-6713.



Turbo Decoder structure implemented in the TIMS-DSP-6713 module.



TIMS Turbo Coded signals with and without noise - Displayed are: DATA CLOCK, ORIGINAL INPUT DATA, BIPOLAR TURBO CODED DATA SIGNAL without NOISE, BIPOLAR TURBO CODED DATA with NOISE, at SNR = +1.8dB



Multiple frames of Turbo Coded signals - Displayed are: DATA CLOCK, ORIGINAL INPUT DATA, BIPOLAR TURBO CODED DATA SIGNAL without NOISE, BIPOLAR TURBO CODED DATA with NOISE.