

IESS-310 compliant Pragmatic Trellis Coded Modulation (PTCM) Decoder for TMS320C54xx

Signion announces the availability of a reusable (TMS320™ DSP Algorithm Standard compliant), MIPS and memory-efficient PTCM decoder. Traditionally, satellite communications (SATCOM) systems have been viewed as power-limited. As channel capacity, C , decreases when bits per second per Hz, r , is increased (i.e., required $E_b/N_0 > (2^r - 1)/r$), satellite systems have traditionally used QPSK with rate $1/2$ coding (i.e., $r=1$). However, orbital spectrum congestion has led to increased efforts to use higher order modulations in SATCOM. A recent satellite standard, IESS-310, suggests using an “industry standard” rate $1/2$ convolutional code on every other bit and mapping the resulting 3 bits to an 8-PSK signal constellation (Figures 1 and 2).

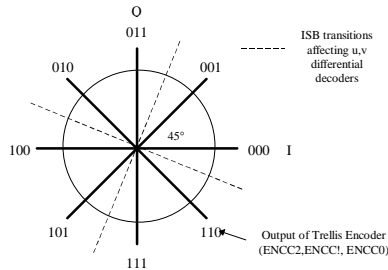


Figure 1. 8-PSK constellation and mapping

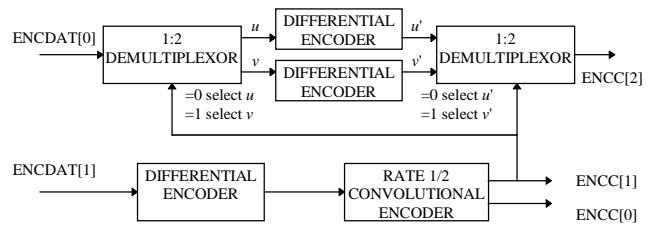


Figure 2. PTCM encoder

Signion’s PTCM decoder, diagrammed in Figure 3, accepts 8 I and Q values (for 8 symbols or 16 output bits), each quantized to 11 bits. The PTCM decoder’s performance (test software- in C- that exercises the C callable PTCM routine is also provided), shown in Figure 4, meets all requirements of IESS-310. The PTCM decoder is available for the TMS320C5400™ family of processors and consumes 350 cycles per decoded bit. The PTCM decoder self-synchronizes (when valid, but possibly erroneous, data is present at its input) within 292 symbol durations. Code size is 2600 bytes and data size (including heap) is 782 bytes. A minimum of 100 bytes of memory must be allocated to the system stack.

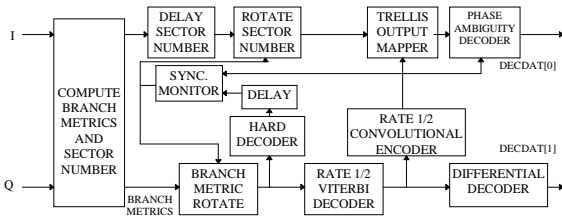


Figure 3. PTCM decoder Block Diagram

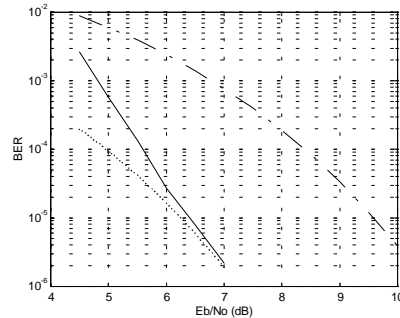


Figure 4. PTCM decoder’s AWGN performance (dashed line is uncoded QPSK BER, dotted line is lower bound for PTCM decoder's BER)

This PTCM decoder, that may be used as a component in implementing the IESS-310 standard¹, has two flavors. Object module: USD 295 (includes C test software) Source module: USD1500 (includes C test software). To order, please contact ptcm@signion.com.

¹ Users of this software must be aware that IESS-310 refers to US patents 5,233,630 and 5,469,452 in the context of pragmatic trellis codec chips manufactured by Qualcomm, Inc. While Signion’s implementation simplifies branch metric calculations and does not entirely follow the methodology described by one or both patents, purchasers of Signion’s software must be aware that the applicability of one or both patents to software implementations is unclear. Purchasers agree to use the software at their own risk and shall indemnify Signion against all proceedings that may be brought against Signion or the purchaser with respect to possible patent infringement.