

## 1. Introduction and Motivation

- The performance of a digital communication system over a fading channel depends on the code diversity as characterized by its Hamming distance rather than its Euclidean distance.
- Bit-Interleaved Coded Modulation attempts to increase the diversity order of conventional Trellis Coded Modulation using independent bit interleavers which helps to disperse the bursty errors induced by the correlated fading and render the bits associated with a given transmitted symbol uncorrelated or independent of each other.
- BICM is a pragmatic approach that takes advantage of the signal-space coding perspective, whilst allowing for the use of powerful families of binary codes with virtually any modulation format.

## 2. Design

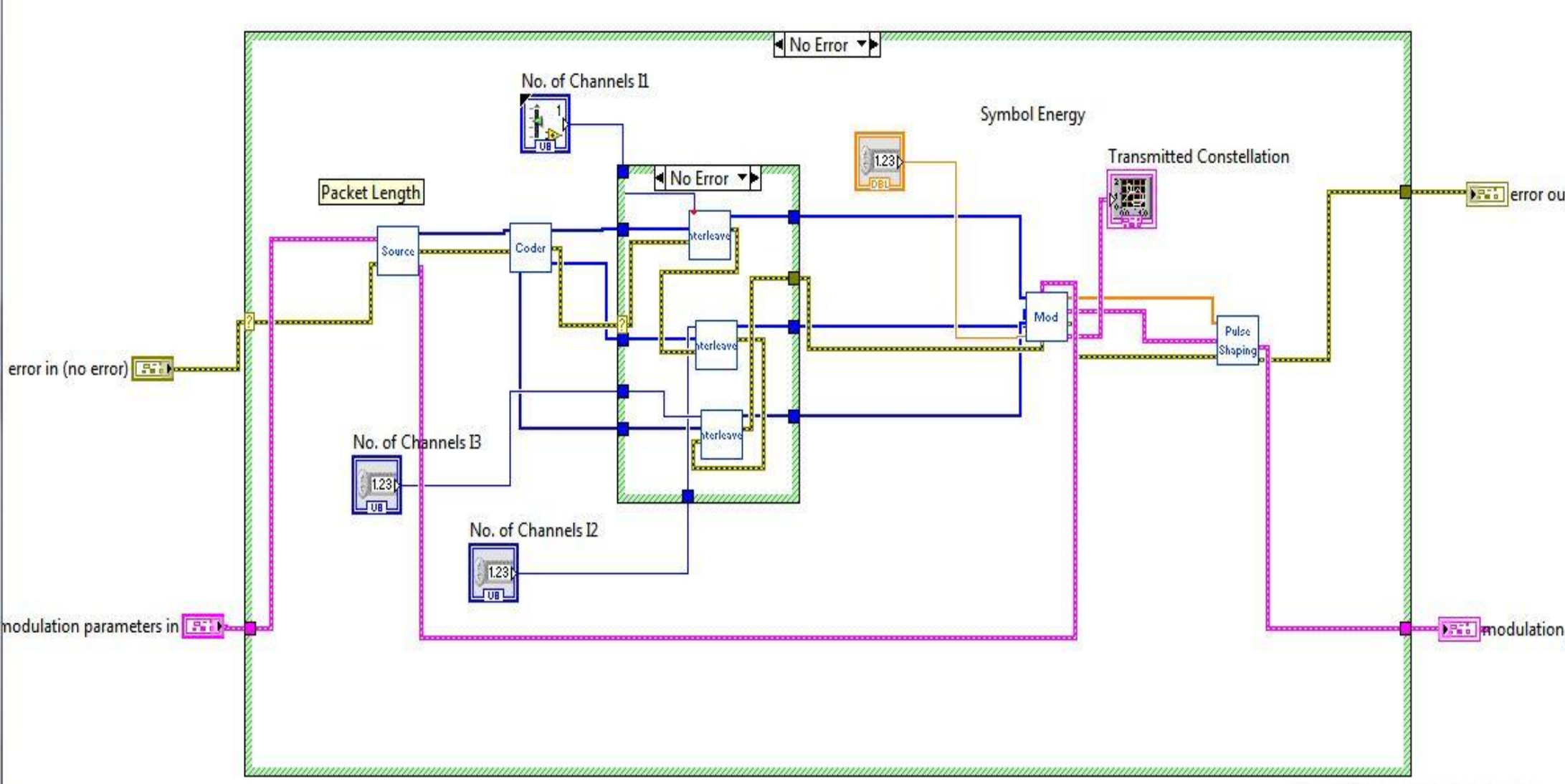
### At the Transmitter:

- Convolutional Encoder with rate 2/3
- Independent Bit interleavers for each coded bit stream
- Gray Labeled 8PSK Modulator

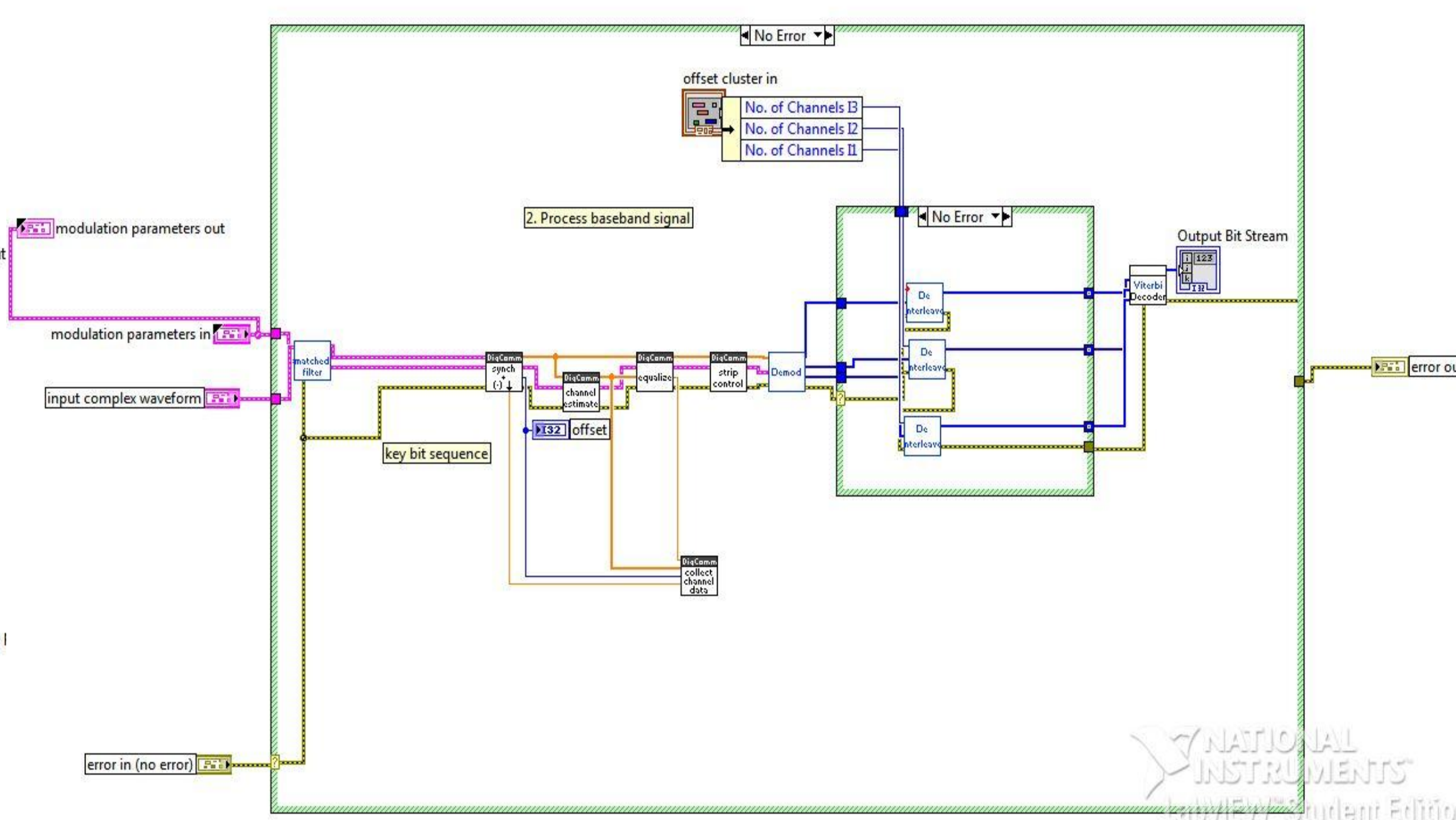
### At the Receiver:

- Maximum Likelihood 8PSK Detector
- Hard Decision based Viterbi Decoder

### Transmitter Modules:



### Receiver Modules:



## 5. References

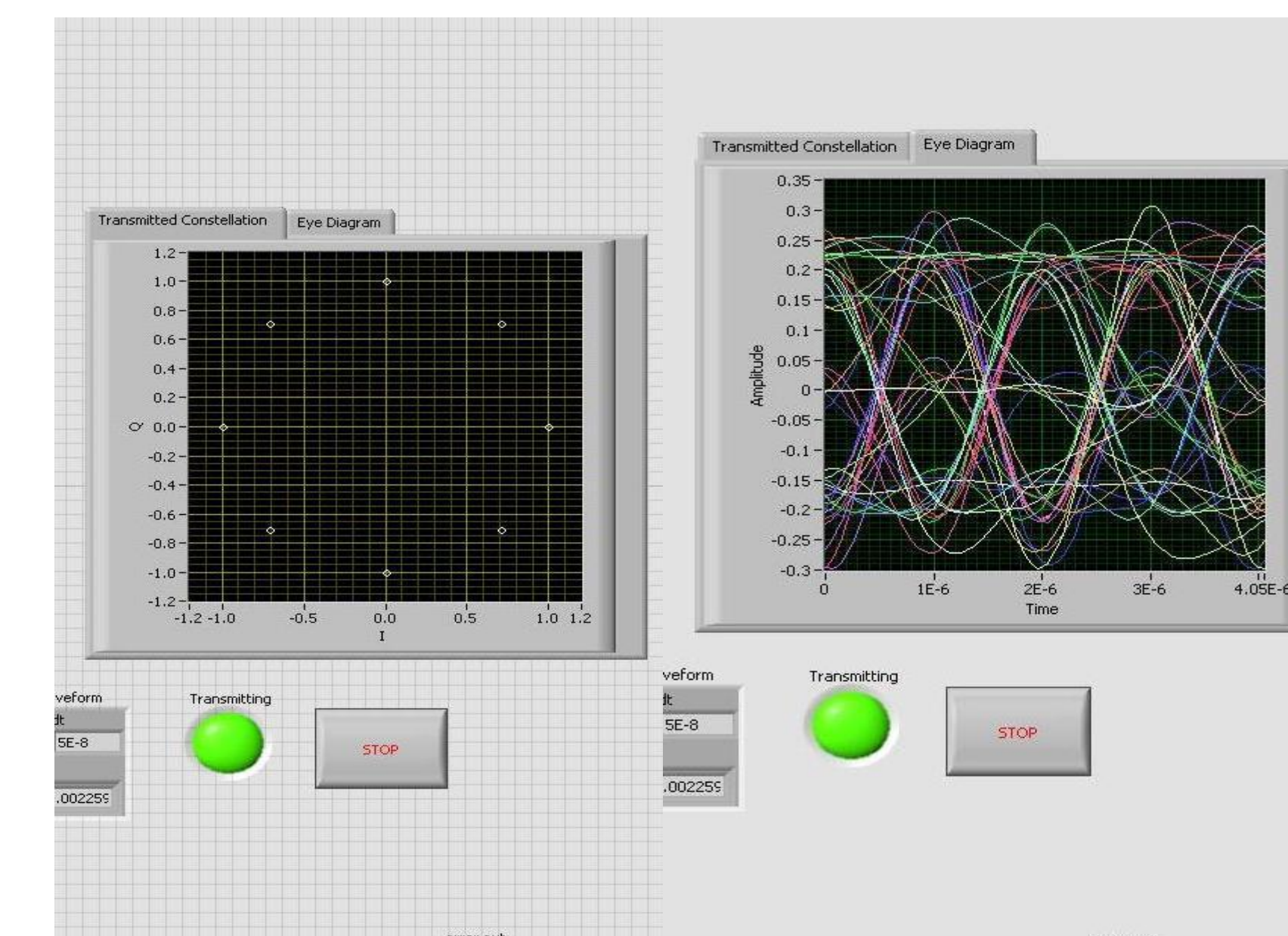
1. Xiaodong Li, James A. Ritcey, Trellis-Coded Modulation with Bit Interleaving and Iterative Decoding, IEEE Journal on Selected Areas in Communications, Vol. 17, No. 4, April 1999
2. Giuseppe Caire, Giorgio Taricco, Ezio Biglieri, Bit-Interleaved Coded Modulation, IEEE Transactions on Information Theory, Vol. 44, No. 3, May 1998
3. Albert Guillen I Fabregas, Alfonso Martinez, Giuseppe Caire, Bit-Interleaved Coded Modulation, Now Publishers Inc

## 3. Problem Statement

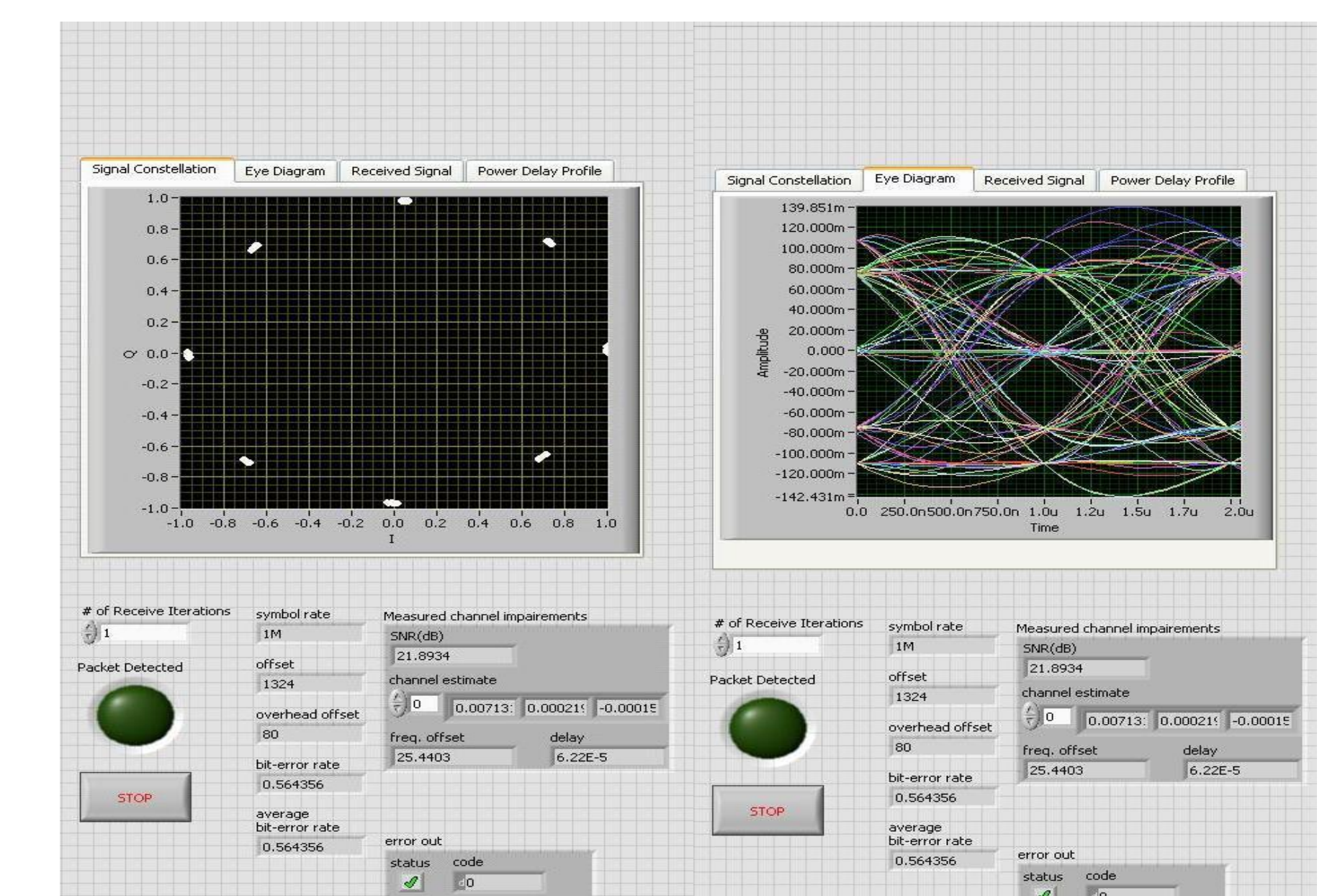
- To design a BICM encoder VI that takes a K bit binary sequence as input and groups it into N bit words and generates the corresponding modulated signal waveforms based on a M-ary signal constellation where  $\log(M) > N$  using LabVIEW
- To design a non-iterative BICM decoder based on gray labeling that takes a set of received M-ary signal waveforms/constellations and decodes them into an output K bit binary sequence using LabVIEW

## 4. Results

### Transmitter Constellation and Eye Diagram:



### Receiver Constellation and Eye Diagram:



### BER vs. SNR(AWGN)

