Lab 10: Part-2

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Aim of the experiment

- In Lab 10 part-1 the phase and frequency offsets were removed using error recovery circuits like Costas Loop and Viterbi-Viterbi. In this part you won't use those circuits instead recover the message using Differential Phase shift keying for small values of error in synchronisation.
- Transmit and recover a text file using following digital modulation techniques -

    1. BPSK
    2. Differential BPSK
    3. Differential QPSK

Pre-lab Work

- Make sure that you revise the previous lab experiments.
- Study about the additional blocks whose information is given.

- Implement a simple Bpsk modulation scheme to transmit and receive a message signal. Use the same template you created in lab-10 part 1.
    - sps=8 , Gain =3 ,Num_taps=11*sps
    - Symbol rate = 50k , Sample rate=sps×symbol rate
    - alpha = 1
    - Carrier frequency = 500 Khz , Sample rate = 8×10^6.
- Introduce a phase offset of π in the transmitter and observe the constellation, are you getting the correct message?

Taks-1 contd.. Differential modulation (BPSK)

- Task-1 assumed you have a perfect phase sync between the transmitter and the reciever. But what if you had a $180°$ phase shift between the transmitter and the reciever? Your constellation diagram would look perfect but your demodulated signal would be wrong!

- One solution to this problem is to not encode the information in the phase value of the output symbol, but in the phase differences.

- Repeat the whole task-1 with minor differences in introducing the differential blocks for DBPSK transmission.

- You should be able to receive the transmitted message correctly.

- Some information about Differential encoder and Decoder are given in next slide.

Differential Encoder and Decoder

- These blocks are to be used to perform Differential BPSK and Differential QPSK modulation schemes.
- The modulus value changes correspondingly, 2 for BPSK and 4 for QPSK.

Differential Decoder
Modulus:

Differential Encoder
Modulus:

- Perform the D-QPSK with the same parameters in task-1.
- Introduce a phase offset of $\frac{2\pi}{3}$ in the transmitter.
- Recover the message you transmitted.