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**Digital Communications Laboratory**

**Experiment 5: BFSK Modulation and Demodulation – Simulink Lab Report**

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Bernoulli Binary generator block generates 0 and 1 bits with equal probability. If the bit = 0, the switch selects the carrier whose frequency is , otherwise it selects the carrier whose frequency is .

Construct the below diagram in Simulink.

Diagram

Description automatically generated

**Figure 1**BFSK Modulator and Demodulator Block Diagram

**The required blocks are given below:**

1. Bernoulli Binary Generator

2. Sine Wave Generator

3. Switch

4. Constant

5. Equality

6. Charge Pump PLL

7. Scope, Zero-order hold and spectrum analyzer

**Q1)** Set , and . After obtaining BFSK signal, take a screen-shot of the scope result for 10 periods of message signal and explain what you see.

**Q2)** What is the bandwidth of the BFSK modulated signal? Observe it using spectrum analyzer. Add screen-shot of the spectrum analyzer which shows the BFSK spectrum.

**Q3)** Assume that . Set value according to the first zeros crossing of the correlation diagram (n=1). What is the bandwidth of the BFSK modulated signal for n=1? Observe it using spectrum analyzer.

**Q4)** Assume that . Set value according to the n-th zeros crossing of the correlation diagram. What is the bandwidth of the BFSK modulated signal? Fill the below table.

|  |  |  |
| --- | --- | --- |
| n-th zero crossing | Theoretical BW | Measured BW |
| n=2 |  |  |
| n=4 |  |  |
| n=8 |  |  |

**Q5)** Design an asynchronous demodulator which consists of two BFP and two envelope detectors. Assume that . Show that it works properly for n=4 (n: # of zero-crossing).

A. Take a screen-shot of your proposed block diagrams and add them to your report. Give each of block’s parameters.

B. Add the scope screen-shot which shows the random Bernoulli input, BFSK modulated signal, and the comparator outputs together.

C. Add the filter outputs for each bit duration.

D. What is the threshold value and how did you determine it?

You must configure PLL block as below:

Graphical user interface, text, application

Description automatically generated