**Kocaeli University,Electronics and Telecommunications EngineeringDepartment**

**Digital Communications Laboratory**

**Experiment 7: QPSK Modulation and Demodulation - Lab Report**

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| Name-Surname-Number: |
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**The main objectives of this experiment:**

* Understanding the difference between bit rate and symbol rate
* Understanding Carrier Phases in QPSK
* Understanding bandwidth and power consumption of QPSK
* Understanding the Synchronous Demodulation of QPSK

**STM32 PART - Section1: Transmitting a Data Byte Using QPSK Modulation**

**Step 1:Write a C code for QPSK Modulation (you can modify BASK or BFSK C code for this purpose).** Set the carrier frequency and txData values as **it is given on the whiteboard**. Build STM32 code and flash the MCU then reset it, you don’t need to run MCU in debug mode.

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| --- | --- | --- |
| **txData** | **Carrier Frequency** | **Symbol Rate** |
|  |  |  |

**Step 2:**Connect NI Elvis II Scope CH0 to **Frame Sync Signal (D8 on Nucleo-64 or PA9 on Discovery)**.

**Step 3:** Connect NI Elvis II Scope CH1 to **QPSK Modulation output(A2 on Nucleo-64 or PA4 on Discovery).**

**Step 4:** Adjust the Scope divisions (1V/Div, 500µS/Div). Set Scope CH0 vertical position at -3V. Set your Scope “Trigger Type” to “Edge”, “Level” to “1V” and Trigger “Source” to “Scope CH0”.

**Step 5:** Plot your Scope screen on the graph. (30 pts)

A grid of black lines

Description automatically generated

**Section 2: Exploring Frequency Spectrum of QPSK Modulation**

**Step 6:** Stop the Scope then Open NI Elvis II DSA. Adjust the DSA parameters as listed in the left table. Observe the frequency components which have magnitude above -40dB, Fill the first three ones in the right table. (10 pts)

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| --- | --- |
| **Source Channel** | SCOPE CH1 |
| **Frequency Span** | 40000 |
| **Units** | Linear |

|  |  |
| --- | --- |
| Frequency of the Carrier (kHz) |  |
| Symbol rate (symbol/s) |  |
| Bandwidth (kHz) |  |

**Section 3: Comments on QPSK**

**Step 7:** Answer the question written on the whiteboard. (10 pts)