

**ALANYA ALAADDIN KEYKUBAT UNIVERSITY**

**FPGA BASED OPTICAL PULSE MODULATOR**

**EEE 402 GRADUATION PROJECT**

**IN**

**ELECTRICAL & ELECTRONICS ENGINEERING**

 **BY**

**Name SURNAME**

**JUNE 2022**

**ABSTRACT**

**FPGA Based Optical Pulse Modulator**

**SURNAME, Name**

**Graduation Project in Electrical and Electronics Engineering**

**Supervisor: Assist. Prof. Dr. Name SURNAME**

**June 2022, XX pages**

Abstract

**Keywords:** FPGA, Optical, Modulator

 UYGUNL

**ÖZET**

**FPGA Based Optical Pulse Modulator**

**SURNAME, Name**

**Mezuniyet Projesi, Elektrik ve Elektronik Mühendisliği Bölümü**

**Proje yöneticisi: Dr. Öğr. Üyesi Name SURNAME**

**Haziran 2022, XX sayfa**

Özet

**Anahtar kelimeler:** FPGA, Optik, Modülatör

VE ONAY

**ACKNOWLEDGEMENTS**

First and foremost, I would like to thank my supervisor, Assist. Prof. Dr. Name SURNAME, who guided me during term.

I would also like to extend a warm thanks to my fellow friends; Name SURNAME for his efforts, Name SURNAME for providing components and Name SURNAME for helping out my programming process.

Finally, I would like to thank my father and my mother that have supported me throughout the year.

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SYMBOLS

**Symbol Defination**

$ε\_{p}$ : Dielectric coefficient of prisma

$ε\_{m}$ : Dielectric coefficient of medium

θ : Phase angle

*ns* : Refractive index of medium

$ω\_{p}$ : Plasma frequency

$φ$ : Free electron density

$λ\_{p}$ : Plasma wavelength

$λ\_{c}$ : Collision wavelength

$λ\_{s}$ : Oscillation wavelength

*c* : Speed of light at free space

ABBREVIATIONS

SPR : Surface Plasmon Resonance

ELISA : Enzyme-Linked ImmunoSorbent Assay

PCR : Polymerase Chain Reaction

RIU : Refractive Index Unit

FOM : Figure of Merit

NA : Numerical Aparture

μm : Micrometer

nm : Nanometer

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1. **INTRODUCTION**

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Figure 1.1. Schematic.

**2. FPGA BASED OPTICAL MODULATOR**

**2.1. How FPGA Works**

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Figure 2.1. Schematic.

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Figure 2.2: Xxxx Xxx.

**2.2.2. Xxxx Xxxxxx**

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Figure 2.3. Xxxxxx Xxx Xxxxxxxxx Xx

**2.3. Xxxxx (Xxxx)**

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**3. HARDWARE**

**3.1. Monitor**

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There are 2 main units of this system;

* Xxxxx
* Xxxxxx

**3.2. Xxxxx Xxxxx**

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**3.3. Xxxxxxx Xxxxxxxxx Xxxxxxxxx Xxxx**

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**3.4. XXX Xxxxxxx**

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**3.5. Xxxxxxxx**

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**3.6. Xxx Xxxx XXXX Xxxx**

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**3.7. Xxxxxxxxxxxxxxxxxxx**

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**4. SOFTWARE**

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Below is given MATLAB codes;

>> s=tf('s');H1=(10\*exp(-0.2\*s))/s^3+4.5\*(s^2)+5.5\*s+15

H1 =

 a =

 x1 x2 x3 x4 x5 x6 x7 x8

 x1 0 0 0 0 0 0 0 0

 x2 1 0 0 0 0 0 0 0

 x3 0 1 0 0 0 0 0 0

 x4 0 0 0 1 0 0 0 0

 x5 0 0 0 0 1 0 0 0

 x6 0 0 0 0 0 1 0 0

 x7 0 0 0 0 0 0 1 0

 x8 0 0 0 0 0 0 0 1

 b =

 u1

 x1 4

 x2 0

 x3 0

 x4 0

 x5 0

 x6 -2

 x7 0

 x8 -2

 c =

 x1 x2 x3 x4 x5 x6 x7 x8

 y1 0 0 2.5 2.25 0 0 2.75 0

 d =

 u1

 y1 15

 e =

 x1 x2 x3 x4 x5 x6 x7 x8

 x1 1 0 0 0 0 0 0 0

 x2 0 1 0 0 0 0 0 0

 x3 0 0 1 0 0 0 0 0

 x4 0 0 0 0 1 0 0 0

 x5 0 0 0 0 0 1 0 0

 x6 0 0 0 0 0 0 0 0

 x7 0 0 0 0 0 0 0 1

 x8 0 0 0 0 0 0 0 0

 (values computed with all internal delays set to zero)

**5. CONCLUSION**

The idea behind xxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxx x xxxxxx. Xxxxxxxxxxxxxxxxx xxxxx x xxxxxxxxx xxxxxxxxxxxxxxxxxx. Xxxxxxxxxxxxxxxxxxx. Xxxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxx x xxxxxx. Xxxxxxxxxxxxxxxxx xxxxx x xxxxxxxxx xxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxx. Xxxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxx x xxxxxx.

By achieving this project, this system essentially helps people who xxxx xxxx xxxxxxxxxxx xx xxxxxxxx.

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**4.** https://refractiveindex.info/?shelf=other&book=air&page=Ciddor

**APPENDICES**

**A) COST ANALYSIS**

|  |  |  |
| --- | --- | --- |
| Count | Item | Cost |
| TL | € |
| 1 |  | 8 | 100,75 |
| 1 |  | 15 | 150,50 |
| 1 |  | 0,25 | 10 |
| 2 |  | 7 | 125 |
| 2 |  | 1,5 | 25,42 |
| 2 |  | 1 | 16,17 |
| 10 |  | 0,75 | 12,47 |
| Total: | X,X TL | X,X € |

**B) CODES**

>> s=tf('s');H1=(10\*exp(-0.2\*s))/s^3+4.5\*(s^2)+5.5\*s+15

>> s=tf('s');H1=(10\*exp(-0.2\*s))/s^3+4.5\*(s^2)+5.5\*s+15

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>> s=tf('s');H1=(10\*exp(-0.2\*s))/s^3+4.5\*(s^2)+5.5\*s+15

>> s=tf('s');H1=(10\*exp(-0.2\*s))/s^3+4.5\*(s^2)+5.5\*s+15

**C) TIME PLAN**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Week 1** | **Week 2**  | **Week 3**  | **Week 4** | **Week 5**  | **Week 6** |
| **Research** |  |  |  |  |  |  |
| **Planning** |  |  |  |  |  |  |
| **Xxxxxxx** |  |  |  |  |  |  |
| **Xxxxxxxx** |  |  |  |  |  |  |
| **Xxxxxxx** |  |  |  |  |  |  |
| **Presentation** |  |  |  |  |  |  |