SELECTED TOPICS IN
ADVANCED ELECTRONICS

CONTENTS

Chapter 1 .............................................................................................................................................. 1
WIRELESS CONNECTIVITY OF PC PERIPHERALS USING ULTRAWIDE
BAND (UWB) PULSES
Khalid A. S. Al-Khateeb and Ahmed Ramzi Mohammed

Chapter 2 ............................................................................................................................................. 11
VOLTAGE CONTROLLED OSCILLATOR FOR STANDARD GSM USING
MEMS
Khalid A. S. Al-Khateeb

Chapter 3 ............................................................................................................................................. 23
MEMS SURFACE ACOUSTIC WAVES OSCILLATOR
Jamilah Karim, Anis Nurashikin Nordin and AHM Zahirul Alam

Chapter 4 ............................................................................................................................................. 37
USING MEMS IN CLASS D AMPLIFIERS FOR STANDARD GSM
CARRIER
Khalid A. S. Al-Khateeb

Chapter 5 ............................................................................................................................................. 52
MEMS CAPACITIVE ULTRASONIC TRANSDUCERS
Khalid A. S. Al-Khateeb

Chapter 6 ............................................................................................................................................. 57
DESIGN OF MEMS CANTILEVER ENERGY HARVESTER
Anis Nurashikin Nordin and Aliza Aini Md Ralib

Chapter 7 ............................................................................................................................................. 67
THEORY OF QUANTUM CRYPTOGRAPHY
Ali Sallami and Khalid A. S. Al-Khateeb

Chapter 8 ............................................................................................................................................. 77
QUANTUM KEY DISTRIBUTION PROTOCOLS
Ali Sallami and Khalid A. S. Al-Khateeb
| Chapter 20 | AVALANCHE PHOTO DIODES AS SINGLE PHOTON DETECTORS | Khalid A. S. Al-Khateeb | 230 |
| Chapter 21 | COOLING TECHNIQUES FOR SINGLE PHOTON AVALANCHE DIODE | Nurul Fadzlin Hasbullah, Nurul Izzati Samsuddin and Salmiah Ahmad | 243 |
| Chapter 22 | SUPERVISORY CONTROL AND DATA AQUISITION SYSTEM (SCADA) USING MICROCONTROLLER | Khalid A. S. Al-Khateeb and Mohamad Azman Shah | 256 |
| Chapter 23 | ELECTRONIC REMOTE MONITORING OF INDUSTRIAL SYSTEMS | Khalid A. S. Al-Khateeb | 268 |
| Chapter 24 | MEDICAL CARE SYSTEM FOR REMOTE MONITORING OF FOETAL ECG | Khalid A. S. Al-Khateeb and Mohammed I. Ibrahimy | 276 |
| Chapter 25 | INTELLIGENT AUTO TRACKING IN 3D SPACE BY IMAGE PROCESSING | Khalid A. S. Al-Khateeb and Othman O. Khalifa | 287 |
| Chapter 26 | CIRCUIT DESIGN FOR RADIO FREQUENCY IDENTIFICATION DEVICES (RFID) | Aisyah Jaaafar, Nurul Syuhadah Izwar Arfani and Othman O. Khalifa | 300 |
| Chapter 27 | DYNAMIC TRAFFIC LIGHT SEQUENCE ALGORITHM USING RFID | Khalid A. S. Al-Khateeb, Jaiz A.Y. Johari and Wajdi F. Al-Khateeb | 309 |
| Chapter 28 | ADVANCED RFID SECURITY FRAMEWORK FOR DYNAMIC TRAFFIC MANAGEMENT | Khalid A. S. Al-Khateeb, Jaiz A. Y. Johari | 326 |
| Chapter 29 | MODELING CMOS WAFER PRODUCTION LINE USING PROMODEL SOFTWARE | Khalid A. S. Al-Khateeb and Khairul Hakimin B. Zainiddin | 337 |
Chapter 30........................................................................................................348
ASIC DESIGN FLOW
Sreedharan Baskara Dass, Aisha_Hassan A. Hashim and Loay Faisal

Chapter 31........................................................................................................355
ELECTRONIC DESIGN AUTOMATION TOOLS
Sreedharan Baskara Dass, Aisha_Hassan A. Hashim and Loay Faisal

Chapter 32........................................................................................................365
CIRCUIT DESIGN OF A CLOCK DATA RECOVERY
Z. M. Ashari and Anis N. Nordin

Chapter 33........................................................................................................376
EFFECTS OF NEUTRON IRRADIATION ON VARIOUS ELECTRONIC DEVICES
Nuurul Iffah Che Omar and Nurul Fadzlin Hasbullah

Chapter 34........................................................................................................384
NEUTRON SOURCE AND NEUTRON SHIELDING
Nuurul Iffah Che Omar and Nurul Fadzlin Hasbullah

Chapter 35........................................................................................................390
QUANTUM DOTS AS A SOLUTION TO RADIATION HARDNESS
Nuurul Iffah Che Omar and Nurul Fadzlin Hasbullah
CHAPTER 35

QUANTUM DOTS AS A SOLUTION TO RADIATION HARDNESS

By

Nuurul Iffah Che Omar, Nurul Fadzlin Hasbullah
Department of Electrical and Computer Engineering (ECE)
International Islamic University Malaysia (IIUM)
Gombak, Selangor, Malaysia

Synopsis
Most electronic devices nowadays are fabricated using semiconductor materials. Silicon is the most common semiconductor material used to produce devices such as MOSFET, transistor, solar cell and silicon detectors. Compared to silicon devices above, semiconductor devices made from GaAs are more resistant to radiation. This is because GaAs has a larger bandgap over silicon thus has a lower ionisation generation rate. This is one of the reasons why GaAs is widely use in radioactive environment for example in solar batteries installed in the space [1]. Great efforts are being put into designing, growing and fabricating semiconductor devices. However, the doping introduced in the semiconductor during growth process may not be the intended doping in the design of the structure. This can be due to the limitation of the growth machine such as auto-doping problem which makes it difficult to have a precise control of the doping.

Not only that, exposure to neutrons can produce measurable changes in the electrical properties and degradations of various semiconductors such as displacement damage effects and indirect ionisation [2]. Due to this reason, there is a need for radiation hardening where electronic components and systems are designed and tested resistant to damages caused by radiation [3].

A study by Beanland et al. [4] reported that quantum dot devices have a better resistance towards defect propagation in strained layers of a semiconductor structure as it act as barriers to dislocation movements. Quantum dot (QD) is a semiconductor crystal structure with a diameter of a few nanometers embedded in layers of