TABLE OF CONTENT

APPROVAL PAGE

ORIGINALITY STATEMENT SHEET

ABSTRACT **iv**

PREFACE **v**

ACKNOWLEDGMENTS **vi**

TABLE OF CONTENT **vii**

LIST OF FIGURE **ix**

LIST OF TABLE **xi**

I INTRODUCTION **1**

1.1 Background 1
1.2 Formulation of Problem 3
1.3 Objectives and Benefits 3
1.4 Limitation of Problem 3
1.5 Research Methods 3

II BASIC CONCEPT **5**

2.1 Ground Penetating Radar 5
2.2 GPR's Works Principle 6
2.2.1 A-scan 6
2.2.2 B-scan 8
2.2.3 C-scan 10
2.3 GPR Modelling Using VNA 10
2.4 Propagation in Medium 12
2.5 Stepped Frequency Continuous Wave 12
2.6 Pulse Shaping 14
2.6.1 Monocycle Pulse 14
2.6.2 Gaussian Pulse 15

2.6.3 Ricker Wavelet 16

III SYSTEM MODEL AND SIMULATION 17

3.1 Framework 17
3.2 Experiment Design 17
3.3 Experiment Schema 18
3.4 Implementation of Experiments 18
3.4.1 Installation of Tools 18
3.4.2 Calibration 20
3.4.3 A-scan at One Sample Point 21
3.4.4 B-scan 22

IV RESULT AND ANALYSIS 23

4.1 Comparison of Pulse 23
4.1.1 One Period with 0.585% Duty Cycle 23
4.1.2 One Period 3.42% Duty Cycle 23
4.1.3 One Period with 9.52% Duty Cycle 25
4.2 Comparison of Resolution 25
4.2.1 Monocycle Pulse 25
4.2.2 Gaussian Pulse 25
4.2.3 Ricker Wavelet 29
4.3 Analysis about the Pulse and Scale 29

V CONCLUSION AND SUGGESTION 33

5.1 Conclusion 33
5.2 Suggestion 33

REFERENCE 34

ATTACHMENT A