

TABLE OF CONTENTS

APPROVAL PAGE	i
SELF DECLARATION AGAINST PLAGIARISM	ii
ABSTRACT	iii
ACKNOWLEDGMENTS	iv
PREFACE	v
TABLE OF CONTENTS	vi
LIST OF PICTURE	xi
LIST OF TABLES	xviii
CHAPTER I	1
1.1 Background	1
1.2 Identification of problems	2
1.3 Purpose.....	2
1.4 Scope of problem.....	2
1.5 Expected Results.....	3
1.6 Research methods	3
1.7 Writing system.....	3
CHAPTER II BASIC THEORY	4
2.1 Through the Wall Radar (TWR).....	4
2.2 Convolution	6
2.3 Deconvolution Method	6
2.4 Delay Estimation method.....	8
2.5 Radar Modeling using Vector Network Analyzer (VNA)	11
2.6 Types and properties of barrier wall materials	13
2.7 Improved Through the Wall Radar performance	15
CHAPTER III RESEARCH METHODOLOGY	19
3.1 Through the Wall Radar System Method	19
3.2 Signal Processing Methods	20
3.3 Lab experiment stage.....	21
CHAPTER VI RESULTS AND ANALYSIS	24

4.1	S21 Data Retrieval without Walls and Objects	24
4.2	S21 data retrieval uses a barrier wall without using objects	26
4.2.1	Testing a one-layer light brick wall without using objects	27
4.2.2	Testing of light brick walls without using objects.....	28
4.2.3	Testing 1 layer plywood walls without using objects.....	31
4.2.4	Testing of two-layer plywood walls without using objects	33
4.3	S ₂₁ data retrieval of barrier walls using objects.....	35
4.3.1	Testing of light brick walls with objects at a variance distance from the wall ..	35
4.3.2	Testing a two-layer printed brick wall with an object at a variance distance (d) from the wall.....	48
4.3.3	Testing of single-layer plywood walls at a distance of variance cm from the wall 60	
4.3.4	Testing of two-layer plywood walls at a distance of variance cm from the wall 72	
4.4	The reconstruction signal processing results from the reference signal	85
4.4.1	The reconstruction signal results from the effect of a one-layer light brick wall using an object with a distance of 30 cm	86
4.4.2	The reconstruction signal results from the effect of a one-layer printed brick wall using an object with a distance of 40 cm.....	89
4.4.3	The reconstruction signal results from the effect of a one-layer printed brick wall using an object with a distance of 50 cm.....	92
4.4.4	The reconstruction signal results from the effect of a one-layer light brick wall using an object with a distance of 60 cm	94
4.4.5	The reconstruction signal results from the effect of a one-layer light brick wall using an object with a distance of 70 cm	97
4.4.6	The reconstruction signal results from the effect of a one-layer light brick wall using an object with a distance of 80 cm	99
4.4.7	The reconstruction signal results from the effect of a two-layer light brick wall using an object with a distance of 30 cm	102
4.4.8	The reconstruction signal results from the effect of a two-layer light brick wall using an object with a distance of 40 cm	104
4.4.9	The reconstruction signal results from the effect of a two-layer light brick wall using an object with a distance of 50 cm	106

4.4.10 the reconstruction signal results from the effect of a two-layer light brick wall using an object with a distance of 60 cm	109
4.4.11 The reconstruction signal results from the effect of a two-layer light brick wall using an object with a distance of 70 cm	112
4.4.12 The reconstruction signal results from the effect of a two-layer light brick wall using an object with a distance of 80 cm	114
4.4.13 the reconstruction signal results from the effect of a one-layer plywood wall using an object with a distance of 30 cm	116
4.4.14 the reconstruction signal results from the effect of a one-layer plywood wall using an object with a distance of 40 cm	119
4.4.15 the reconstruction signal results from the influence of the single-layer plywood wall using an object with a distance of 50 cm.....	121
4.4.16 the reconstruction signal results from the effect of a one-layer plywood wall using an object with a distance of 60 cm	124
4.4.17 the reconstruction signal results from the effect of a one-layer plywood wall using an object with a distance of 70 cm	127
4.4.18 the reconstruction signal results from the effect of a one-layer plywood wall using an object with a distance of 80 cm	129
4.4.19 the reconstruction signal results from the effect of a two-layer plywood wall using an object with a distance of 30 cm	131
4.4.20 the reconstruction signal results from the effect of a two-layer plywood wall using an object with a distance of 40 cm	133
4.4.21 The reconstruction signal results from the influence of the two-layer plywood wall using an object with a distance of 50 cm.....	135
4.4.22 the reconstruction signal results from the effect of a two-layer plywood wall using an object with a distance of 60 cm	138
4.4.23 the reconstruction signal results from the effect of a two-layer plywood wall using an object with a distance of 70 cm	141
4.4.24 the reconstruction signal results from the effect of a two-layer plywood wall using an object with a distance of 80 cm	143
4.5 The results of processing the reference signal using the Delay Estimation method	145
4.5.1 The result of the delay estimation method of the effect of a one-layer light brick wall uses an object with a distance of 30 cm	145
4.5.2 The result of the delay estimation method of the effect of a one-layer light brick wall uses an object with a distance of 40 cm	146

4.5.3 The result of the delay estimation method of the effect of a one-layer light brick wall uses an object with a distance of 50 cm	147
4.5.4 The result of the delay estimation method of the effect of a one-layer light brick wall uses an object with a distance of 60 cm	148
4.5.5 The result of the delay estimation method of the effect of a one-layer light brick wall uses an object with a distance of 70 cm	148
4.5.6 The result of the delay estimation method of the effect of a one-layer light brick wall uses an object with a distance of 80 cm	149
4.5.7 The result of the delay estimation method of the effect of a two-layer printed brick wall uses an object with a distance of 30 cm.....	150
4.5.8 The result of the delay estimation method of the effect of a two-layer light brick wall uses an object with a distance of 40 cm	151
4.5.9 The result of the delay estimation method of the effect of a two-layer printed brick wall uses an object with a distance of 50 cm.....	151
4.5.10 The result of the delay estimation method of the effect of a two-layer printed brick wall uses an object with a distance of 60 cm.....	152
4.5.11 The result of the delay estimation method of the effect of a two-layer printed brick wall uses an object with a distance of 70 cm.....	153
4.5.12 The result of the delay estimation method of the effect of a two-layer printed brick wall uses an object with a distance of 80 cm.....	154
4.5.13 the results of the delay estimation method of the effect of the single-layer plywood wall using objects with a distance of 30 cm	154
4.5.14 the results of the delay estimation method of the effect of the single-layer plywood wall using objects with a distance of 40 cm	155
4.5.15 the results of the delay estimation method of the effect of the single-layer plywood wall using objects with a distance of 50 cm	156
4.5.16 the results of the delay estimation method of the effect of the single-layer plywood wall using objects with a distance of 60 cm	157
4.5.17 the results of the delay estimation method of the effect of the single-layer plywood wall using objects with a distance of 70 cm	157
4.5.18 the results of the delay estimation method of the effect of the single-layer plywood wall using objects with a distance of 80 cm	158
4.5.19 the results of the delay estimation method of the effect of the two-layer plywood wall using objects with a distance of 30 cm	159
4.5.20 the results of the delay estimation method of the effect of the two-layer plywood wall using objects with a distance of 40 cm	160

4.5.21 the results of the delay estimation method of the effect of the two-layer
plywood wall using objects with a distance of 50 cm 160

4.5.22 the results of the delay estimation method of the effect of the two-layer
plywood wall using objects with a distance of 60 cm 161

4.5.23 the results of the delay estimation method of the effect of the two-layer
plywood wall using objects with a distance of 70 cm 162

4.5.24 the results of the delay estimation method of the effect of the two-layer
plywood wall using objects with a distance of 80 cm 163

CHAPTER IV CONCLUSION..... 165

REFERENCE..... 166

ATTACHMENT 167