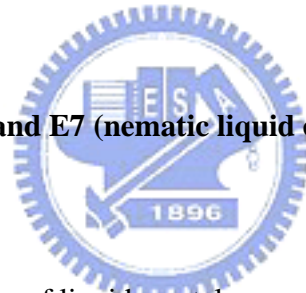


Contents

中文摘要	i
Abstract	ii
致謝	iii
Contents	iv
List of Figures	vi
1. Introduction	1
1.1. Terahertz technology	1
1.2. THz Time-domain-spectroscopy (THz-TDS)	3
1.2.1. Antenna-based emitter and detector	4
1.2.2. Electro-optical sampling (EOS) in TDS	6
1.3. Nematic liquid crystal	7
1.4. Thesis highlights	10
Bibliography	12
Figure	14
2. Optical constants of 5CB and E7 (nematic liquid crystals) in terahertz frequency range	
2.1. Introduction	19
2.2. Theory	
2.2.1. Refractive indices of liquid crystal	20
2.2.2. Determination of optical constants	22
2.3. Sample preparation	
2.3.1. Liquid crystal cell and reference cell	26
2.3.2. Temperature and humidity controlled system	26
2.4. Experiment	
2.4.1. Focusing beam system	27
2.4.2. Collimated beam system	28
2.5. Results	29
2.5.1. Time-domain signals	29
2.5.2. Frequency dependence	30
2.5.3. Temperature dependence	31
2.5.4. Birefringence and order parameter	32
2.6. Discussion	
2.6.1. Comparison between focusing beam and collimated beam	33
2.6.2. Humidity effect	35
2.6.3. Error analysis	36



2.7. Summary	38
Bibliography	40
Figure	43
3. Liquid-crystal-based tunable terahertz phase shifter/retarder	
3.1. Introduction	63
3.2. Theory	64
3.3. Electrically-controlled liquid crystal terahertz phase shifter/retarder	
3.3.1. Design and sample preparation	66
3.3.2. Experimental results	67
3.3.3. Discussion and summary	68
3.4. Magnetically-controlled liquid crystal terahertz phase shifter/retarder	
3.4.1. Design of the device	69
3.4.2. Sample preparation	70
3.4.3. Experimental results	
3.4.3.1. Single cell	71
3.4.3.2. Sandwich cell	72
3.4.4. Discussion	73
3.4.5. Summary	74
Bibliography	76
Figure	78
4. Liquid-crystal-based tunable terahertz Lyot filter	
4.1. Introduction	85
4.2. Theory	86
4.3. Experiment	
4.3.1. Evaluation and design	89
4.3.2. Elements preparation	91
4.3.3. Testing of each elements	91
4.4. Results	93
4.5. Discussion	
4.5.1. Azimuthal angle issue	94
4.5.2. Improvement	96
4.6. Summary	96
Bibliography	97
Figure	99
5. Conclusion	105
A Theory of THz antenna	
Biography	

