

Index of Contents

List of abbreviations	ii
Index of Contents	iv
Index of Figures	vi
Index of Tables	xi
Abstract	xii
Resumen	xiv
Resum	xvi
1. Introduction	1
1.1. Polarization Controllers	3
1.2. Linear and Nonlinear Phenomena for Polarization Control of Light . . .	4
1.3. Stimulated Brillouin Scattering	5
1.4. Stimulated Brillouin Scattering for Polarization Control	7
1.5. Thesis Outlook	9
2. Birefringence Control	10
2.1. Birefringence Control Using SBS	11
2.1.1. SBS-induced Dynamic Arbitrary Birefringence	14
2.1.2. SBS-induced Dynamic Differential Group Delay	16
2.1.3. SBS-induced Dynamic Differential Group Delay Dispersion . . .	17
2.2. Experimental Setup	18
2.3. Results and Discussion	19
3. Retardance Spectrum Shaping	26
3.1. Fundamentals of Spectral Broadening of SBS Polarization-Dependent Interactions	27
3.1.1. Phase-to-Retardance Conversion	30

3.1.2. Engineering Retardance	31
3.2. Experimental Setup	33
3.3. Results and Discussion	34
3.3.1. Design of the Pump Profile	34
3.3.2. Feedback Loop Regulation	35
3.3.3. Broadening Retardance	35
3.3.4. Flattened Retardance	37
4. Applications	43
4.1. Signal Routing	43
4.2. Photonic Microwave Filtering	45
4.2.1. Microwave Photonic Filter Based on Polarization-Sensitive Ba- lanced Detection	46
4.2.2. Experimental Setup	49
4.2.3. Results and Discussion	51
5. Conclusions	55
A. Theory of Brillouin Light Scattering	58
A.1. Spontaneous Brillouin Scattering	59
A.2. Stimulated Backward Brillouin Scattering	61
A.3. Other Acousto-Optic Scattering Interactions	64
B. Models and Characterization of SBS Gain and Loss Spectra	67
B.1. Models for SBS Gain Spectrum	67
B.2. Experimental Characterization of SBS Gain and Loss Spectra	69
References	71
Publications	81
Acknowledgment	83