

Table of Contents

Abbreviations, Constants & Symbols	vii
Abstract	ix
Introduction	1
1 Introduction to Laser-Ablation &-Surface Structuring	4
1.1 Femtosecond Laser Ablation of Metals and Semiconductors	4
1.2 Laser-Induced Periodic Surface Structures	5
1.2.1 A Universal Phenomenon	5
1.2.2 "Static" (Interference) Model	7
1.2.3 "Dynamic"- (Self-Organization) Model	8
2 Generation of White Light Supercontinuum	12
2.1 Nonlinear Optical Effects	12
2.1.1 Self-Focusing	13
2.1.2 Self-Phase Modulation	15
3 Instrumentation and Experimental Setup	19
3.1 Laser System and Beam Quality	19
3.2 Experimental Setup	20
3.3 Short-Pass Filters	22
3.4 Sample- and Spectral-Analysis Devices	23
4 Characterization of White Light Supercontinuum	24
4.1 Onset of Continuum Generation	25
4.2 Energy Conversion Efficiency & Continuum Behavior	30
4.3 White-Light Polarization	34
4.4 Spatial Properties	36
4.5 Long Term Stability	40
4.6 Spatial Coherence	42
4.6.1 Filament Interference	44
4.6.2 Pump-Laser	46
4.6.3 White-Light	48
4.7 Conclusion	53
5 Self-Organized Pattern Formation with Ultrafast White-Light	54
5.1 White-Light Beam Propagation	55
5.2 Image Processing and Period Length Determination	60
5.3 Structure Formation on Various Materials	61
5.3.1 Silicon	62
5.3.2 Stainless Steel	68

5.3.3	Copper	72
5.3.4	Brass	76
5.4	Effect of White-Light Polarization	79
5.5	EDX-Measurements	80
6	Conclusion & Outlook	84
Appendix		87
A	Temporal Intensity distribution and Pulse duration of the Laser-Beam	87
B	Spatial Intensity Distribution and Propagation of the Laser-Beam	88
Bibliography		92
Acknowledgments		97