TABLE OF CONTENTS

page

ABSTRACT iii

ACKNOWLEDGMENTS iv

LIST OF TABLES viii

LIST OF FIGURES ix

LIST OF ABBREVIATIONS xiii

CHAPTER TITLE 1

First-Level Subheading 1

Another First-Level Subheading 1

Second-Level Subheading 1

Another Second-Level Subheading 1

Third-level subheading 2

Another third-level subheading 2

BACKGROUND 4

2.1 Stratospheric Aerosol 4

2.1.1 Aerosol Microphysics 4

2.1.2 Climate Effects 4

2.2 Aerosol Measurements 4

2.2.1 Ground based and in-situ 4

2.2.2 Occultation 4

2.2.3 Lidar 4

2.2.4 Limb Scatter 4

2.3 Requirement for Higher Spatial Resolution 4

2.4 ALI Prototype and Stratospheric Balloon Flight 4

OPTICAL DESIGN AND CALIBRATIONS 5

3.1 AOTF Theory and Background 5

3.1.1 Solution to the Acoustic Equation 5

3.1.2 Diffraction Efficiency 9

3.1.3 Diffraction Angle 10

3.1.4 Tuning Curve 13

3.2 AOTF Calibration and Operation 15

3.2.1 AOTF Operation 15

3.2.2 AOTF Tuning Curve Analysis 17

3.2.3 AOTF Point Spread Function 20

3.2.4 AOTF Diffraction Efficiency 21

3.3 Optical Chain Development 21

3.3.1 Telecentric System Prototype 22

3.3.2 Telescopic System Prototype 29

3.3.3 ALI Optical Design 34

3.3.4 Correction to the Optical Design 39

3.4 Opto-Mechanical Design and Thermal Balancing 40

3.4.1 Opto-Mechanical Design 41

3.4.2 Baffle Design 46

3.4.3 Light Tight Case 51

3.4.4 Thermal Considerations 52

3.5 Control Software 54

3.6 ALI Calibrations and System Test 58

3.6.1 Exposure Time Determination 58

3.6.2 DC Offset Removal 60

3.6.3 Dark Current Correction 62

3.6.4 Stray Light Calibration 63

3.6.5 Relative Flat-Fielding Correction 65

3.6.6 Integrated Testing 67

HOW TO USE THE TABLES AND LISTS 69

For Windows 69

For Macintosh Users 70

USING PAPERS IN A DISSERTATION OR THESIS 71

Acceptable Usage 71

Unacceptable Usage 72

HOW TO COPY AND PASTE INFORMATION FROM OTHER FILES 73

LIST OF REFERENCES 74

TITLE OF APPENDIX A 76

TITLE OF APPENDIX B 77

Vita 77