

Basics of Optical Spectrum Analyzer

— Spectroscope using Diffraction Grating —



Table of Contents

1. Introduction	3
2. Basic Structure of Spectroscope	3
3. Optical Parts Comprising Spectroscope	3
3.1 Diffraction Grating	3
3.1.1 What is a Diffraction Grating?	3
3.1.2 Diffraction Grating Formula	3
3.1.3 Diffraction Grating Performance	4
3.1.3.1 Diffraction Efficiency	4
3.1.3.2 Wood Anomaly	6
3.1.3.3 Diffraction Grating Engraved Grooves (Lattice) and Theoretical Performance	6
3.2 Collimator/Camera Mirror	7
3.3 Slit	7
3.4 Spectroscope Substrate	8
4. Examples of Spectroscope Mountings	9
4.1 Czerny-Turner Spectroscope	9
4.2 Littrow Spectroscope	10
4.3 Littman-Metcalf Spectroscope	10
4.4 Littrow Double-pass Spectroscope	11
4.5 Littman-Metcalf Quad-pass Spectroscope	11
5. Spectroscope Performance	12
5.1 Wavelength Resolution	12
5.1.1 Angular Dispersion	12
5.1.2 Linear Dispersion	13
5.1.3 Reciprocal Linear Dispersion	13
5.1.4 Single-pass Type (Littrow/Czerny-Turner) Spectroscope Wavelength Resolution Calculation	13
5.1.5 Improved Resolution Double-pass Wavelength Resolution Calculation	16
5.2 Stray Light	17
5.3 Spectroscope Numerical Aperture (NA)	18
5.4 Spectroscope Polarization Dependent Loss (PDL)	18
5.5 Spectroscope Ghost Spectrum	19