

CONTENTS

INTRODUCTION

I. GENERATION AND PROPERTIES OF ELECTROMAGNETIC RADIATION

1. Wave and quantum representation	13
2. Wavelength and spectrum	13
3. Other properties	15
4. Excitation and forms of radiation	16

II. QUANTITATIVE CHARACTERISTICS OF RADIANT ENERGY

1. Radiators	18
2. Detectors	20
3. Spectral concentrations and radiation distribution	21
4. Graphic representation of radiation distribution	23
5. Reflection, absorption, transmission	26
6. Illumination units	27

III. BLACK BODY AND RADIATION LAWS

1. Planck's radiation law	31
2. Wien's law and Rayleigh's law	31
3. Stefan-Boltzmann law and Wien's displacement law	32
4. Emissivity and Kirchhoff's law	33
5. Colour temperature, distribution temperature, black temperature	35

IV. THE MOST IMPORTANT AUXILIARY RADIATORS

1. Introduction	37
2. Thermal radiators	38
3. Gas discharge radiators	41
4. Arc and spark discharges	45

V. SPECTRAL ANALYSIS

1. Scope of spectral analysis	46
2. Spectroscope and spectrograph	50
3. Monochromator	54
4. Filters	59

VI. RADIATOR AND SPECTRAL APPARATUS

1. Introduction	61
2. Radiator not imaged on entrance slit	61
3. Radiator imaged on entrance slit	62
4. Radiator not imaged on entrance slit, but with field lens	64
5. Image formation by a lens-raster	64
6. Conclusions	65

VII. INTRODUCTION TO RADIATION DETECTORS

1. Principles	66
2. Sensitivity	66
3. Spectral sensitivity	67
4. Overall sensitivity	68
5. Arrangement of the detector	68
6. Measurement with continuous radiation and intermittent radiation	70

VIII. THERMAL RADIATION DETECTORS

1. Principles	71
2. Thermoelectric radiation detector	72
3. Bolometer	77
4. Detectors using longitudinal or volume expansion	79
5. Sensitivity limits	81
6. Applications	84

IX. PHOTOELECTRIC RADIATION DETECTORS

1. Principles	85
2. Photo-cells and photo-multipliers	85
3. Barrier layer photovoltaic cells	89
4. Photoconductive cells	91
5. Sensitivity limits	92
6. Applications	93

X. METHODS OF RADIATION MEASUREMENT

1. Relative and absolute measurement	94
2. Detectors of known spectral sensitivity	94
3. Radiators of known spectral emission	96
4. Measurement of radiators	97
5. Measurement of detectors	98
6. Additional information	99

XI. MEASUREMENT OF SPECTRAL EMISSION OF RADIATORS WITH THE MONOCHROMATOR

1. Introduction	103
2. Measurement with a detector of known spectral sensitivity	108
3. Measurement with a radiator of known spectral emission	109

XII. MEASUREMENT OF SPECTRAL EMISSION OF RADIATORS BY MEANS OF FILTERS

1.	Introduction	112
2.	Measurement with a detector of known spectral sensitivity	114
3.	Measurement with a radiator of known spectral emission	115

XIII. MEASUREMENT OF TOTAL RADIATION

1.	Introduction	118
2.	Measurement with a detector of known spectral sensitivity	118
3.	Measurement with a radiator of known spectral emission	119
4.	Choice of detector and comparison radiator	121
5.	Measurement technique	122

XIV. MEASUREMENT OF DETECTOR SENSITIVITY

1.	Introduction	125
2.	Measurement of spectral sensitivity	125
3.	Measurement of total sensitivity	127

LITERATURE REFERENCES	129
-----------------------	-----

INDEX	133
-------	-----

ERRATA

- p. 19, first line: for " f_0/r^2 " read " f/r^2 ".
- p. 21, equation (9a) should read " $E = \Phi/f_2 = I \cos \varepsilon_2/r^2$ ".
- p. 33, after equation (26): for "radiant intensity" read "radiance".
- p. 53, lines 10, 13, 14: for "radiant intensity" read "radiance".
- p. 61, Section 2, first line: for "radiant intensity" read "radiance".
- p. 63, end of the caption for Fig. 42 should read: " φ = aperture angle; $\varphi_1 \approx \varphi_2$ ".
- p. 65, Section 6, lines 16, 17: for "radiant intensity" read "radiance".
- p. 66, Section 2, line 7: for "irradiation intensity" read "irradiance".
- p. 68, Section 4, line 3, Section 5, line 5: for "irradiation intensity", read "irradiance".
- p. 69, line 2: for "radiation intensity" read "irradiance".
- p. 75, line 4: for "irradiation intensity" read "irradiance".
- p. 87, caption for Fig. 58: for "radiation intensity" read "irradiance".
- p. 96, last but one line: for "filament lamp" read "incandescent lamp".
- p. 115, equation (59) should read " $C = I / \int_{\lambda_1}^{\lambda_2} (E_\lambda)_\tau \tau(\lambda) s(\lambda) d\lambda$ ".